

01 May 2025

Gary Schneider
Town of Waterford
1000 Hartford Turnpike
Waterford, CT 06385

**RE: Stormwater Management Report
LEARN Early Childhood School
Waterford, Connecticut
Langan Project No.: 140310301**

Dear Mr. Schneider:

This report provides an analysis of the proposed peak runoff discharges and the engineering design for the proposed stormwater conveyance system at 51 Daniels Avenue.

PROJECT DESCRIPTION

Existing Conditions

The project site is located at 51 Daniels Avenue in Waterford, CT; see Figure 1. The existing overall parcel is approximately 19.32 acres. LEARN is acquiring 15.36 acres of the existing parcel to be utilized for a proposed elementary school. The remaining 3.96 acres will be retained by the Town of Waterford. The site is currently occupied by an existing school and includes impervious, grassy, and wooded areas. The parcel is located within the Niantic River subregional drainage basin. The parcel area does not contain any known locations of State and Federal Listed Species and Critical Habitats per the CT Natural Diversity Data Base Areas map of Waterford, CT dated December 2024. To the west, the project site is bordered by residential properties on High Street and High Ridge Drive, to the south by residential properties on Seaview Terrace and the Bayview Healthcare building, and to the east by residential properties and wooded areas. To the north, the project site is bordered by Daniels Avenue. The existing project site is currently a closed school building with associated impervious parking, drive aisles and pervious areas with the majority of stormwater running overland towards off-site wetlands to the west or Daniels Avenue.

Based upon a topographic survey titled "Lot Line Modification Survey" prepared by Benesch, dated March 28, 2024, the site grades generally slope downward from the eastern property line towards High Street and the off-site wetland to the west, with a small northeastern portion of the site sloping downward towards the northeast wetland. Elevations range from approximately 120 feet to about 80 feet.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Study of New London County, Connecticut map number 09011C0483J with an effective date of August 5, 2013, the proposed development is located within Zone X (Unshaded). Zone X (Unshaded) is considered a Low-Risk Area and described by FEMA as areas outside the 0.2-percent-annual-chance flood. No base flood elevations or base flood depths are shown within these zones; see Figure 2.

According to the USDA Natural Resources Conservation Service Web Soil Survey, the site's soil type varies throughout. The site is mostly classified as either Woodbridge fine sandy loam with a D hydrologic rating with slopes between 0% and 3%, Paxton and Montauk fine sandy loams with a C hydrologic rating with slopes between 3% and 8%, or Urban land with a D hydrologic rating. Additionally, small portions of the site are classified as Woodbridge fine sandy loam with a D hydrologic rating with slopes between 3% and 8%, Paxton and Montauk fine sandy loams with a C hydrologic rating with slopes between 3% and 8%, very stony, and Charlton-Chatfield complex with a B hydrologic rating with slopes between 0% and 15%, very rocky.

There is one off-site wetland located off the southwest corner of the site. No site work is proposed within the 100-foot upland review area of this wetland or within the 100-foot vernal pool envelope. Another off-site wetland is located off the southeastern corner of the site. A small section of sidewalk is proposed within the upland review area of this wetland, however, the sidewalk is downgradient of this wetland and no direct impacts are proposed. A small portion of a vernal is located on the parcel to be retained by the Town of Waterford. No permanent site features will be located within the 100-ft vernal pool envelope. No direct impacts are proposed.

Proposed Project

The proposed project consists of the construction of a ±87,500 square-foot footprint early childhood school. Additional improvements include new driveways, parking areas, stormwater and utility infrastructure, as well as hardscape and landscaped areas. A summary of the change in impervious is shown below.

Project Site Impervious Cover [SF]

Existing Conditions	Proposed Conditions	Net Increase
±162,430	±319,660	±157,230

The proposed stormwater system has been designed to maintain existing site hydrology to the maximum extent practicable. The majority of runoff from the new development will be collected in a traditional pipe and catchbasin network and conveyed to various stormwater management systems before discharging to either the southwestern property boundary or to the existing storm sewer system in Daniels Avenue. Water quality improvements include catchbasins with sumps, water quality unit, and underground and aboveground detention systems with outlet control structures. These water quality improvements have been designed to meet the minimum average annual pollutant load reduction targets for redevelopment sites per Table 4.3 of the 2024 CT *Stormwater Quality Manual*.

Details of the size and location of the stormwater network can be found on the Grading & Drainage Plans, detail sheets, and supporting calculations in the appendices of this report.

PEAK RUNOFF ANALYSIS (See Appendices A & B)

The stormwater management system is designed to control the rate runoff from the site's watersheds to be equal or less than existing conditions up to, and including, a 100-year design storm event.

The peak runoff discharges for the existing and proposed conditions were analyzed using Soil Conservation Service (SCS) methodology which outlines procedures for calculating peak rates of runoff resulting from precipitation events as well as procedures for developing runoff hydrographs. The entire site was included in the analysis; see Figures EXWS and PRWS. Values for area, curve number (CN), and a time of concentration were calculated for the existing and proposed conditions.

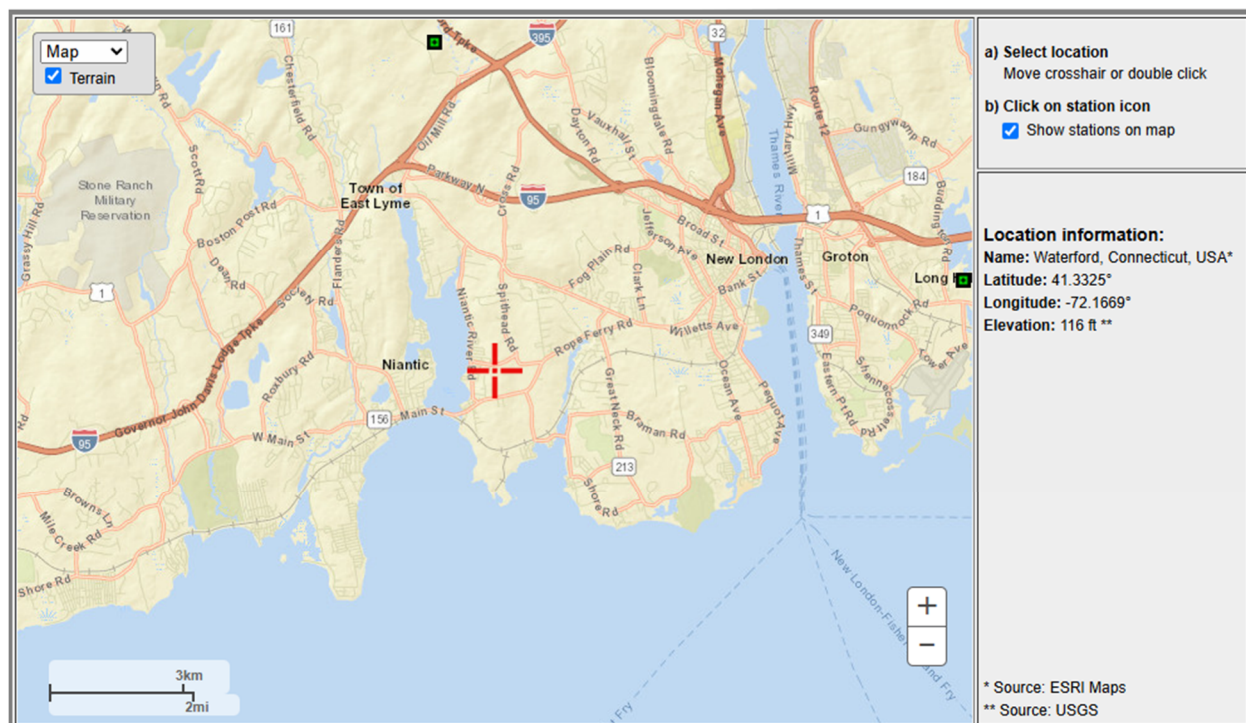
The curve number is a land sensitive coefficient that dictates the relationship between total rainfall depth and direct storm runoff. The soils within the watershed are divided into hydrologic soil groups (A, B, C, and D). The SCS classification system evaluates the runoff potential of a soil according to its infiltration and transmission rates. "A" soils have the lowest runoff potential, while "D" soils have the greatest runoff potential. Soils within the project area are predominantly Woodbridge fine sandy loam with a "D" hydrologic rating, Paxton and Montauk fine sandy loams with a "C" hydrologic rating, or Urban land with a "D" hydrologic rating.

The time of concentration (T_c) is defined as the time for runoff to travel from the hydraulically most distant point in the watershed to a point of interest. Values of time of concentration were determined for existing and proposed conditions based on land cover and slope of the flow path using methods outlined in TR-55.

For this study, a 24-hour NOAA D rainfall distribution was used to determine the peak flow rate to all points of discharge from the site. Precipitation data used for the various storm events is based on the "NOAA Atlas 14 Point Precipitation Frequency Estimates: CT" for the location as

shown in Graphic 1. A summary of all rainfall data utilized in the analysis for this site is provided below and a complete compilation of data provided by NOAA for this location is included in Appendix C.

Graphic 1. NOAA Rainfall Data Location Map



NOAA Precipitation Depth per Average Recurrence Interval [in]

Duration	2-Year	10-Year	25-Year	100-Year
24-hour	3.44	5.14	6.21	7.85

Existing Condition (See Appendix A)

The project area's existing drainage conditions were analyzed as Watersheds 1, 2, and 3 (See Drawing EXWS).

Existing Watershed 1 is approximately 8.21 acres and consists mostly of grassy and wooded areas south of the existing school. Stormwater runoff from this watershed flows overland to the west and towards the off-site western wetland.

Existing Watershed 2 is approximately 5.53 acres and consists of the existing school parking area and grass areas west of the school. Stormwater runoff from this watershed flows overland to the northwest and towards the stormwater network within Daniels Avenue.

Existing Watershed 3 is approximately 2.56 acres and consists mostly of grassy and paved areas east of the existing school. Stormwater runoff from this watershed flows overland to the northeastern wetland.

Proposed Condition (See Appendix B)

In the proposed condition, the site hydrology has been designed to match existing conditions to the maximum extent possible, and all watershed design points remain the same.

Proposed Watershed 1 has been divided into two sub-watersheds: Proposed Watershed 1A and Proposed Watershed 1B. Proposed Watershed 1A is about 3.81 acres and consists of the southern parking lot and some landscape areas. Stormwater from these areas will be collected in a series of catch basins before being directed to a proposed underground infiltration system (System 1A). Discharge from this system will then be routed to an outfall located to the southwest. Proposed Watershed 1B is about 2.86 acres and consists of mostly grassy and some hardscaped areas. Stormwater from these areas will continue to flow west, overland, to the existing off-site wetland.

Proposed Watershed 2 has been divided into three sub-watersheds: Proposed Watershed 2A, Proposed Watershed 2B, and Proposed Watershed 2C. Proposed Watershed 2A is about 3.41 acres and consists mostly of roof tops, amenity and some landscape areas. Stormwater from these areas will be collected in roof drains and a series of yard drains before being directed to a proposed aboveground infiltration basin (System 2A). Discharge from this system will then be routed to the existing stormwater system in Daniels Avenue. Proposed Watershed 2B is about 3.19 acres and consists of the northern parking lot, site driveway, roof tops, amenity and some landscape areas. Stormwater from these areas will be collected in roof drains and a series of catch basins before being direct to a proposed underground infiltration basin (System 2B). Discharge from this system will then be routed to the existing stormwater system in Daniels Avenue. Proposed Watershed 2C is about 1.68 acres and consists of mostly grassy areas. Stormwater from these areas will continue to flow northwest, overland, to the existing stormwater system in Daniels Avenue.

Proposed Watershed 3 is about 1.35 acres and consists mostly of grassy and wooded areas. Stormwater from these areas will continue to flow northeast, overland, to the northeastern wetland.

Details of the sizes and locations of the stormwater collection systems can be found on drawings CG101 and CG102. On-site infiltration test was performed on April 16th, 2025, by Langan Engineering. Refer to Appendix F for test locations, results and test pit information. A 50% reduction was applied to the slowest test result for each system, see summary table below.

Detention System	Design Infiltration Rate
1A	2 in/hr
2A	0.25 in/hr
2B	2 in/hr

Site Discharge Peak Flow Comparison for WS-1 (CF)

Storm	Current	Proposed	Delta	% Reduction
2-Year	10.65	5.03	-5.62	-53%
10-Year	20.01	13.53	-6.48	-32%
25-Year	26.08	18.28	-7.80	-30%
100-Year	35.44	28.67	-6.77	-19%

Site Discharge Peak Flow Comparison for WS-2 (CF)

Storm	Current	Proposed	Delta	% Reduction
2-Year	10.97	4.78	-6.19	-56%
10-Year	18.68	10.58	-8.10	-43%
25-Year	23.53	17.35	-6.18	-26%
100-Year	30.92	24.24	-6.68	-22%

Site Discharge Peak Flow Comparison for WS-3 (CF)

Storm	Current	Proposed	Delta	% Reduction
2-Year	4.62	1.69	-2.93	-63%
10-Year	8.34	3.51	-4.83	-58%
25-Year	10.73	4.74	-5.99	-56%
100-Year	14.39	6.67	-7.72	-54%

Site Discharge Peak Flow Comparison for Total Site (CF)

Storm	Current	Proposed	Delta	% Reduction
2-Year	25.00	10.37	-14.51	-58%
10-Year	44.96	24.83	-19.81	-44%
25-Year	57.76	37.84	-19.46	-34%
100-Year	77.45	58.86	-17.89	-23%

As can be seen from the tables above, runoff from each watershed and the total site will be reduced for the storms up to, and including, the 100-year storm. Additionally, per the 2024 CT *Stormwater Quality Manual* requirements, runoff from each watershed that includes proposed site development will be reduced by 50% for the 2-year storm event.

STORMWATER CONVEYANCE SYSTEM (See Appendix D)

The stormwater conveyance system was sized using the Rational Method for the 10-year storm event. Values for area, runoff coefficient, C, and a time of concentration were calculated for each drainage area. The average runoff coefficient was calculated based upon the following cover types:

<u>Cover</u>	<u>C</u>
Grass/Pervious	0.3
Roof/Pavement/Impervious	0.9

Rainfall intensities were taken from the “NOAA Atlas 14 Point Precipitation Frequency Estimates: CT”. Stormwater pipes were then sized based upon the Manning’s Equation for full flow pipe capacity and solving for the hydraulic grade line. The computer program Hydraflow Storm Sewers 2011 by Intellisolve was used in the analysis.

The proposed storm sewer system has been analyzed using a starting HGL elevation equal to the outlet pipe’s crown elevation. This mimics a tailwater elevation equal to the outlet pipe’s diameter or a scenario where a proposed pipe is entering an existing pipe flow at full capacity.

STORMWATER QUALITY (See Appendix E)

The proposed stormwater management system has been designed to incorporate stormwater quality measures including catch basins with sumps, water quality units, underground and aboveground detention systems with outlet control structures. These measures will be implemented to increase water quality, maintain pre-development hydrology and minimize the passage of pollutants to the existing stormwater systems as compared to current conditions to the maximum extent achievable.

Standard 2 - Stormwater Runoff Quantity Control, was prioritized due to concerns about discharge upgradient of residential properties and the limited capacity of the existing storm sewer network in Daniels Avenue. Therefore, due to the site’s presence of groundwater and low infiltration rates, the stormwater runoff volume retained on-site (as dead storage) does not meet the required retention volume (100% of the site’s WQV). However, per the 2022 New England Stormwater Retrofit Manual performance curves for infiltration basin (HSG C & D), the retention volumes provided exceeds the required minimum average annual pollutant load reduction requirements for redevelopment sites listed in Table 4.3 of the CT Stormwater Quality Manual. The WQV is fully infiltrated for all design storms across the site, except for Pond 2A, where the

infiltration rate does not make it feasible due to poor infiltration rates. A summary of the retention volume (as dead storage) for each stormwater basin is summarized below (see Appendix E).

Detention System	2022 NE Stormwater Retrofit Minimum Retention Volume	Provided Retention Volume
1A	1,689 CF	1,809 CF
2A	3,576 CF	3,651 CF
2B	2,832 CF	2,891 CF

Each water quality unit has been sized to treat the water quality flow for 100% of the WQV. We will utilize Contech CDS hydrodynamic separators (water quality units) as pretreatment units, which are rated to provide 80% TSS removal. Additionally, per the New England Stormwater Retrofit Manual, the retention volume provided by pond 1A provides 80% TSS removal and ponds 2A and 2B provide 92% TSS removal.

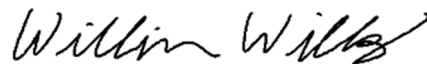
CONCLUSION

The proposed stormwater management system has been designed in general accordance with the 2024 CTDEEP Stormwater Quality Manual, 2000 CTDOT Drainage Manual, and the Town of Waterford ordinances for stormwater management (Section 25.6). It has been designed to mimic existing site hydrology to the maximum extent practicable with no increase in the peak flow rates.

This Langan report confirms that the proposed stormwater management system, as designed, will effectively manage quality and quantity of stormwater runoff for the proposed development. Please refer to the Drawings for additional drainage information.

Sincerely,

Langan Engineering and Environmental Services, LLC



Bill Willsey, P.E.
Senior Staff Engineer



Kathryn Gagnon, P.E., LEED AP
Senior Project Manager

LIST OF FIGURES

Fig. 1	Location Map
Fig. 2	FEMA Flood Map
Fig. 3	NRCS Soil Map

LIST OF DRAWINGS

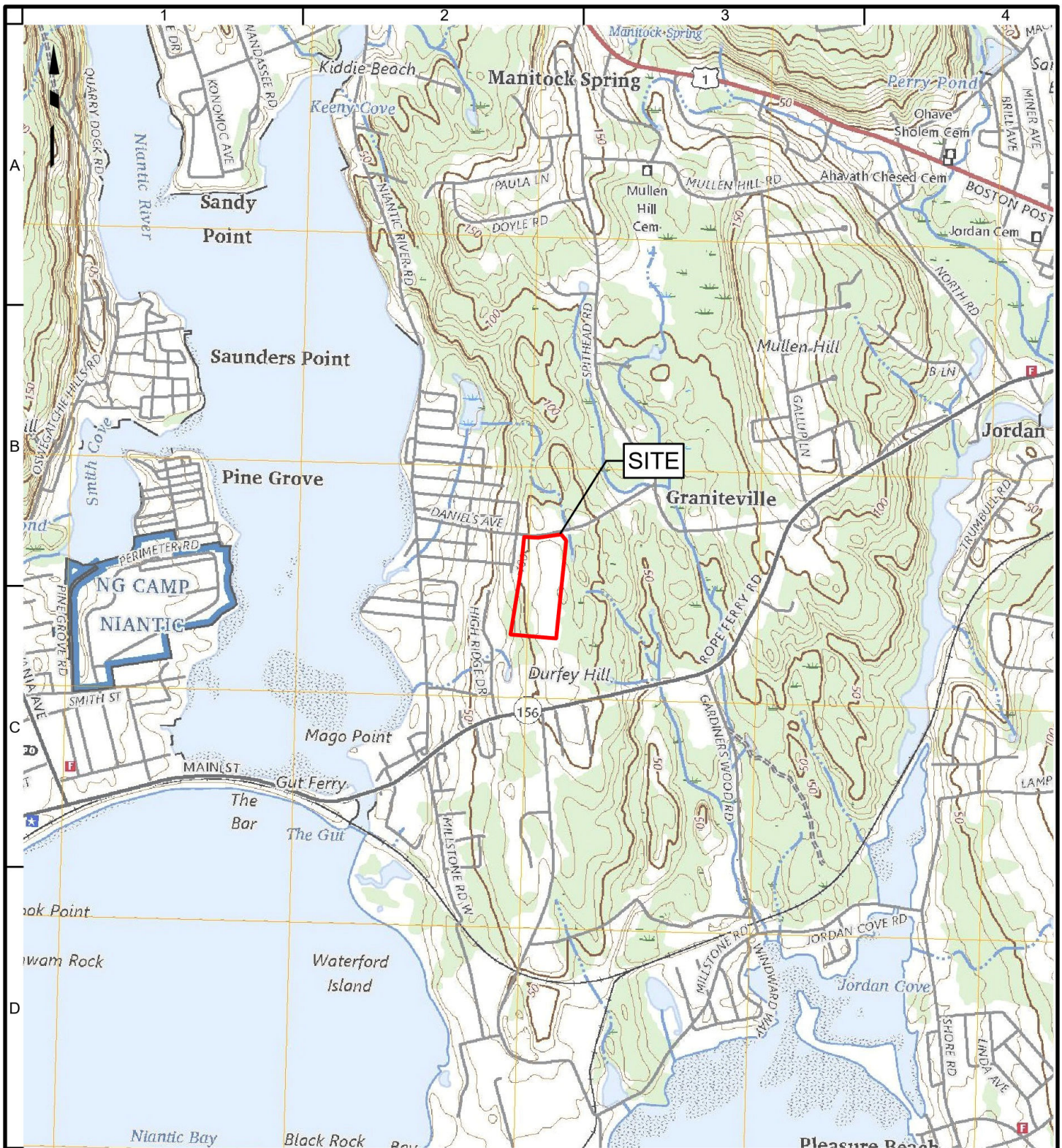
EXWS	Existing Watershed Map
PRWS	Proposed Watershed Map
DACB	Drainage Area Catchment Basin Map

REFERENCE DRAWINGS

CG100	Overall Grading & Drainage Plan
CG101	Grading & Drainage Plan I
CG102	Grading & Drainage Plan II
CE100	Overall Soil Erosion & Sediment Control Plan
CE101	Soil Erosion & Sediment Control Plan I
CE102	Soil Erosion & Sediment Control Plan II

LIST OF APPENDICES

Appendix A	Existing Stormwater Discharge Calculations
Appendix B	Proposed Stormwater Discharge Calculations
Appendix C	NOAA Rainfall Data
Appendix D	Stormwater Collection System Calculations
Appendix E	Supporting Calculations
Appendix F	Test Pit & Infiltration Logs
Appendix G	Stormwater Management System Operation and Maintenance Plan



Legend

Approximate Site Boundary



NOTES:
1. BASEMAP ADAPTED FROM UNITED STATES GEOLOGICAL SURVEY (USGS) 7.5-MINUTE SERIES TOPOGRAPHICAL MAPS, NIANTIC, CONNECTICUT, QUADRANGLE, DATED 2024.

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Langan International LLC

Collectively known as Langan

Project

LEARN SCHOOL

51 DANIELS AVENUE

WATERFORD

CONNECTICUT

Figure Title

SITE LOCATION MAP

Project No.

140310301

Date

3/18/2025

Scale

1"=2,000'

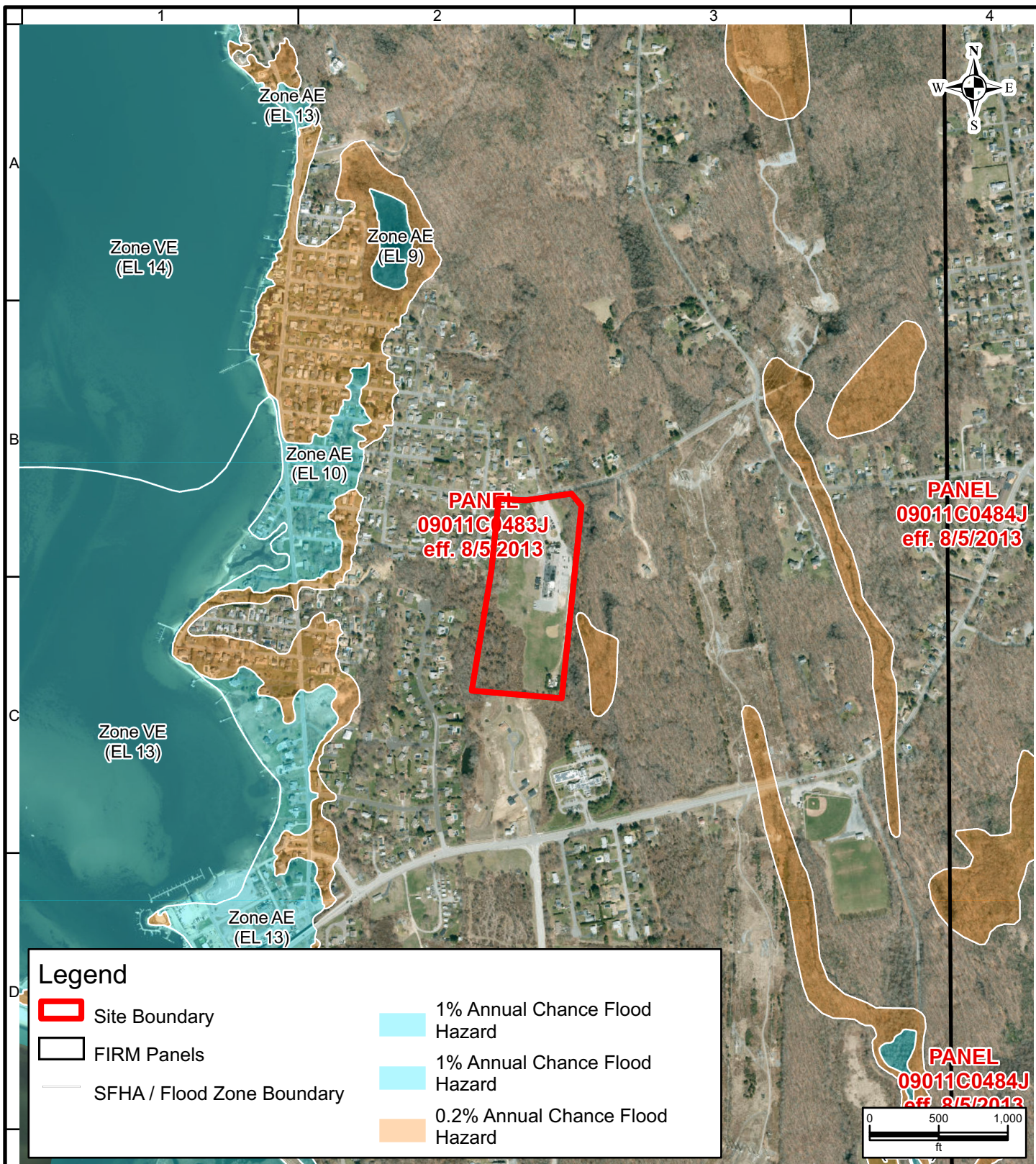
Drawn By

MG

Submission Date

Figure No.

1



Town of Waterford, MassGIS, UConn/CTDEEP, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA, State of Connecticut, Maxar, FEMA, FEMA RiskMap CDS

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WATERFORD
CONNECTICUT
SOUTHEASTERN

CT

Figure Title

**EFFECTIVE FEMA
FIRM**

Project No.

140310301

Date

3/17/2025

Scale

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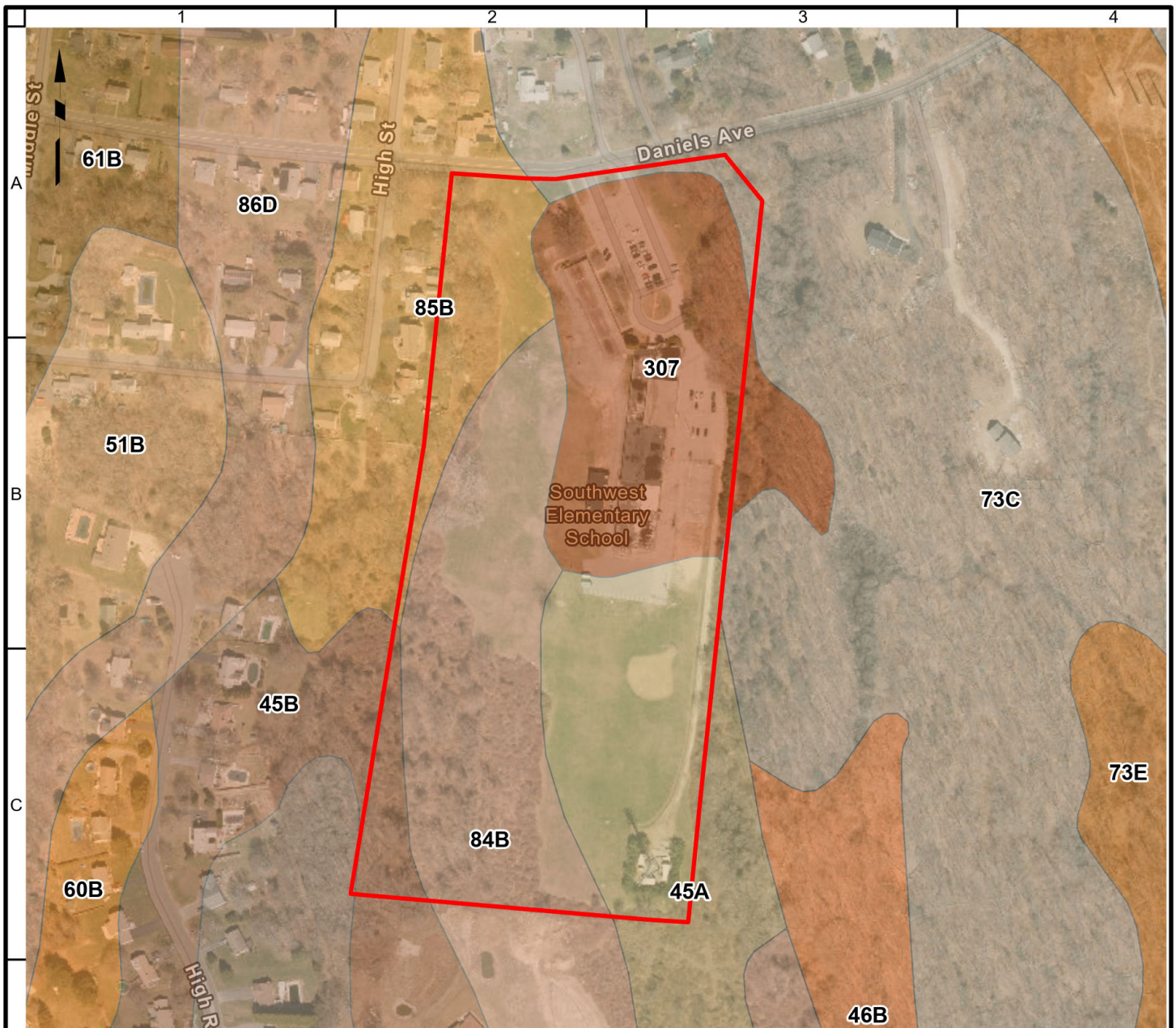
Site Analyzer

Submission Date

3/17/2025

Figure

2



Legend

- | | |
|---|---|
| Approximate Site Boundary | 60B-Canton and Charlton fine sandy loams, 3 to 8 percent slopes |
| 306-Udorthents-Urban land complex | 61B-Canton and Charlton fine sandy loams, 0 to 8 percent slopes, very stony |
| 307-Urban land | 73C-Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky |
| 45A-Woodbridge fine sandy loam, 0 to 3 percent slopes | 73E-Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky |
| 45B-Woodbridge fine sandy loam, 3 to 8 percent slopes | 84B-Paxton and Montauk fine sandy loams, 3 to 8 percent slopes |
| 46B-Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony | 85B-Paxton and Montauk fine sandy loams, 3 to 8 percent slopes, very stony |
| 51B-Sutton fine sandy loam, 0 to 8 percent slopes, very stony | 86D-Paxton and Montauk fine sandy loams, 15 to 35 percent slopes, extremely stony |



NOTES:

1. SOIL DATA PROVIDED BY THE USDA NATURAL RESOURCES CONSERVATION SERVICE (NRCS)

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51 DANIELS AVENUE

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Figure Title

NRCS SOILS MAP

Project No.

140310301

Date

3/18/2025

Scale

1"=300'

Drawn By

MG

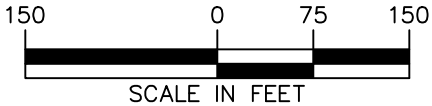
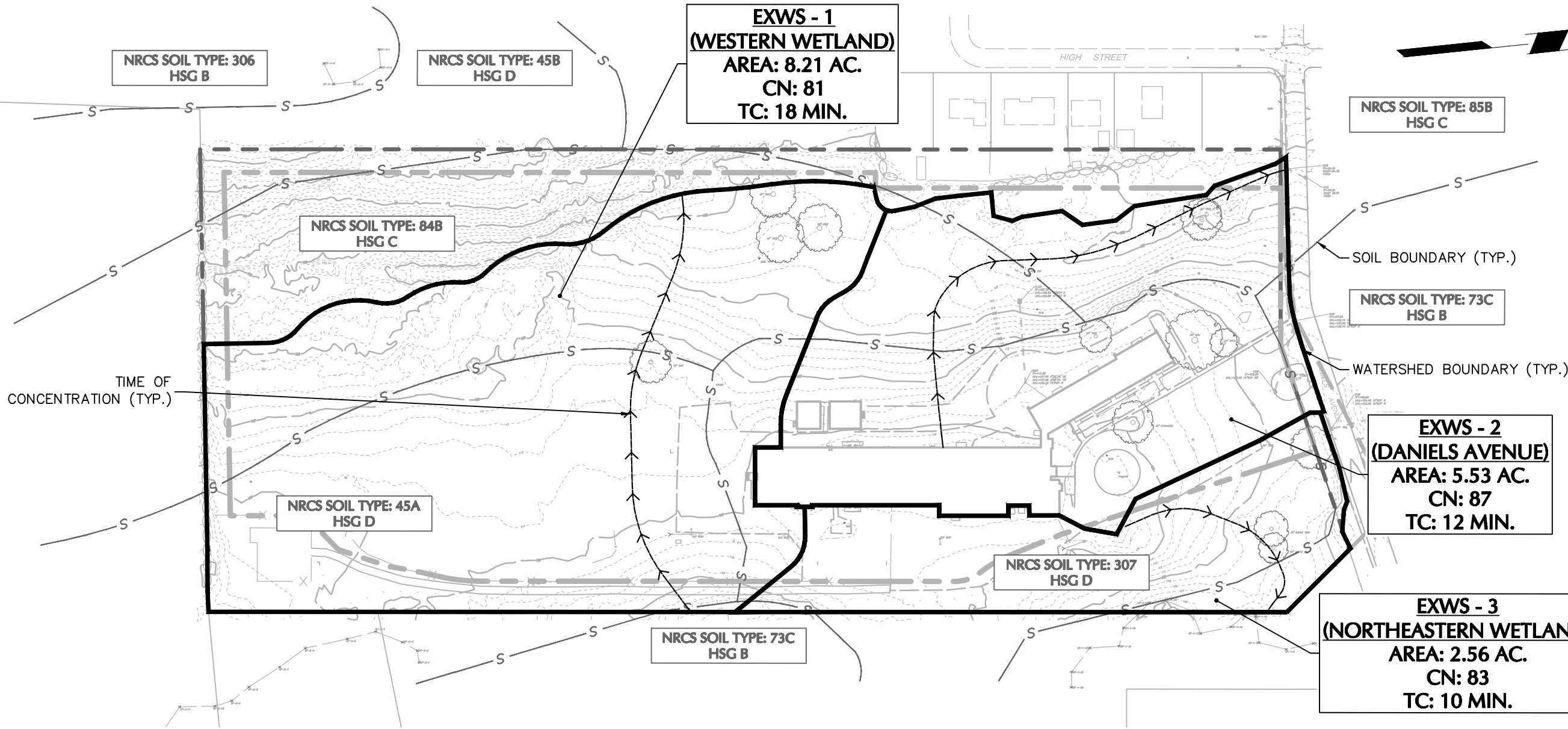
Submission Date

Figure No.

3

GENERAL NOTES

- EXISTING AND TOPOGRAPHIC INFORMATION OBTAINED FROM A PLAN TITLED "LOT LINE MODIFICATION SURVEY" PREPARED BY BENESCH, DATED MARCH 28, 2024.
- THE SITE IS LOCATED WITHIN ZONE X, AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN, PER FEMA MAP 09011C0483J FOR NEW LONDON COUNTY, EFFECTIVE DATE AUGUST 5, 2013.
- THE PROPOSED BUILDING FOOTPRINT WAS RECEIVED ELECTRONICALLY FROM NEWMAN ARCHITECTS IN APRIL 2025.



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Project
**LEARN EARLY
CHILDHOOD SCHOOL**
WATERFORD CONNECTICUT

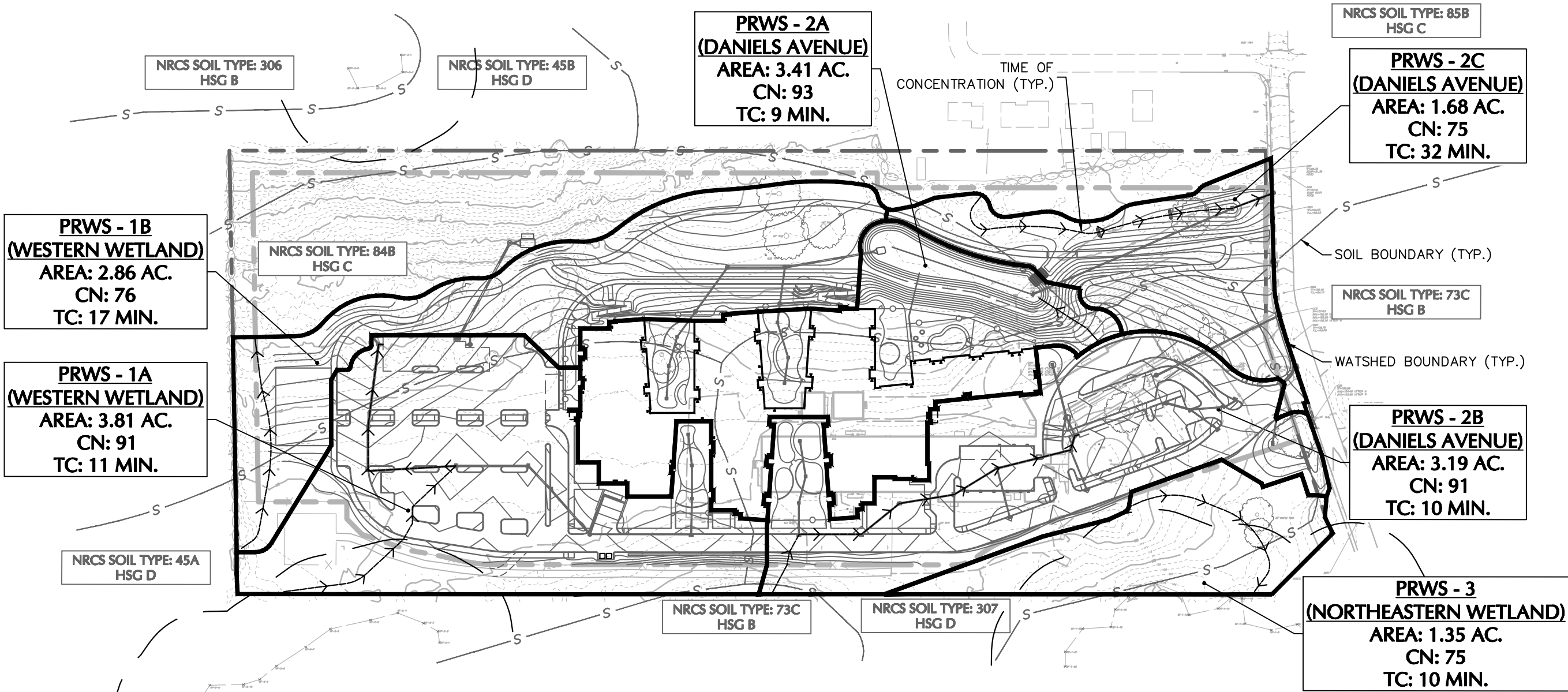
Drawing Title
**EXISTING
WATERSHED
MAP**

Project No.
140310301
Date
05/01/2025
Drawn By
BTW
Checked By
KEG

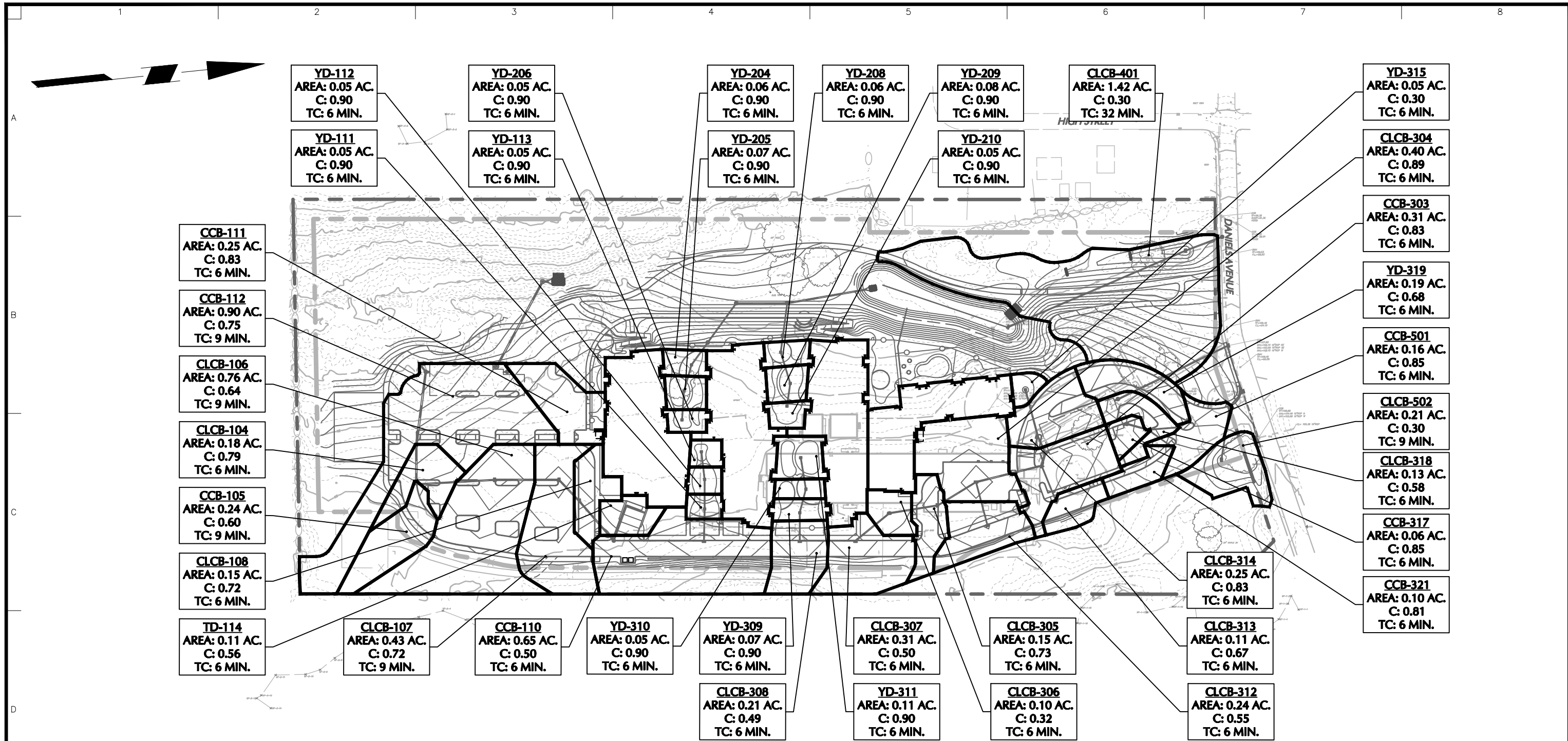
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EX-WS
Sheet 1 of 3

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LANGAN Langan CT, Inc. 555 Long Wharf Drive, 9th Floor New Haven, CT 06511 T: 203.562.5771 F: 203.789.6142 www.langan.com	Project	LEARN EARLY CHILDHOOD SCHOOL	Drawing Title	PROPOSED WATERSHED MAP		Project No.	140310301	Drawing No.	PR-WS
						Date	05/01/2025		
						Drawn By	BTW		
						Checked By	KEG		
	WATERFORD	CONNECTICUT						Sheet 2 of 3	



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WATERFORD CONNECTICUT

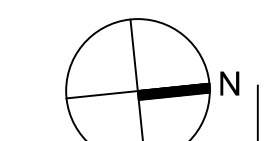
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**DRAINAGE AREA
CATCHMENT
BASIN MAP**

Project No.
140310301
Date
05/01/2025
Drawn By
BTW
Checked By
KEG

Drawing No.
DACB
Sheet **3** of **3**

DRAWING NUMBER:

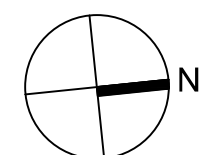
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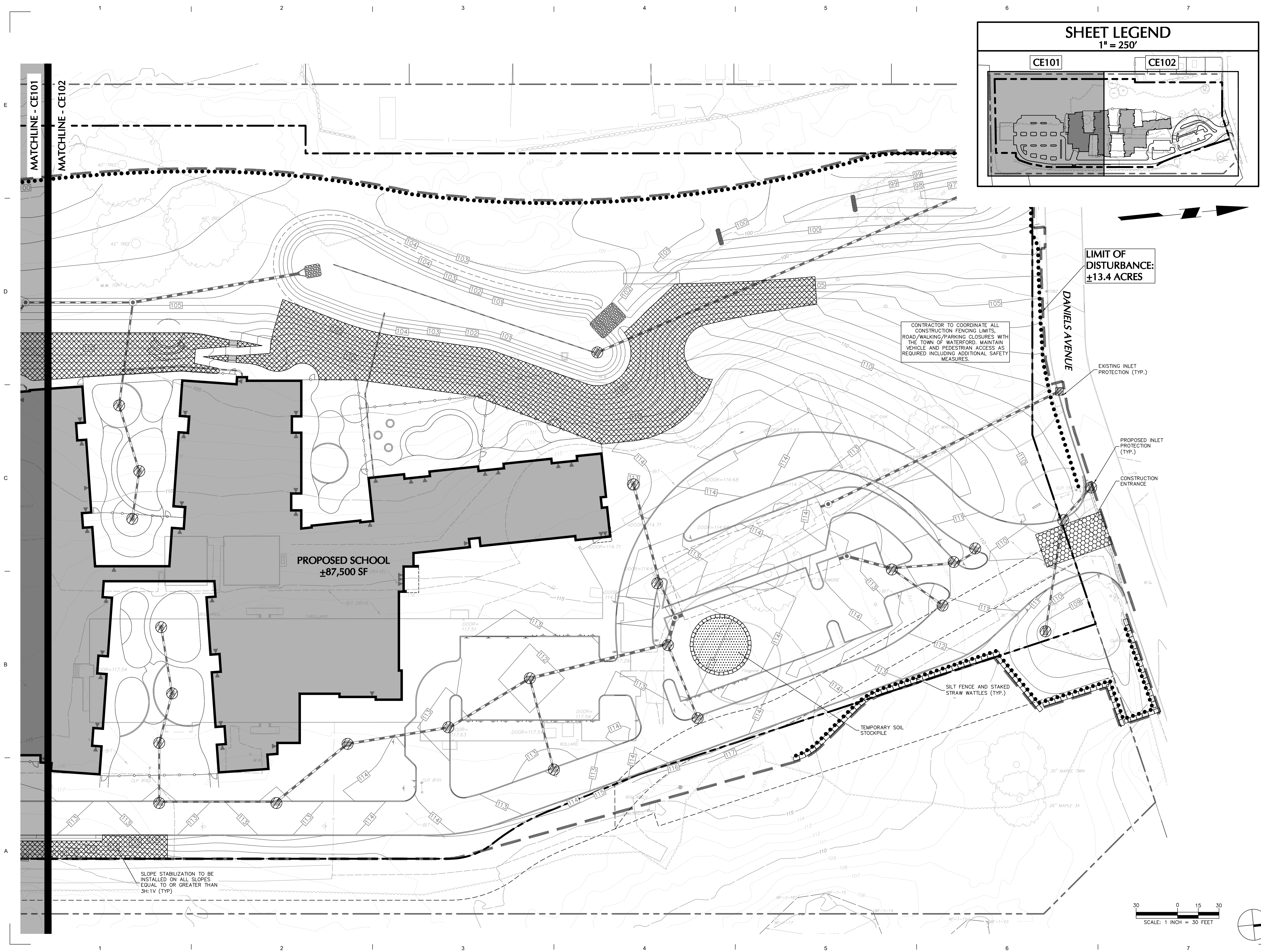


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DRAWING NUMBER:
05100





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**NOT FOR
CONSTRUCTION**

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PHASE: **WATERFORD PLANNING AND ZONING COMMISSION**

REVISIONS

[illegible]

PROJECT NAME: **LEARN - EARLY CHILDHOOD SCHOOL**

PROJECT ADDRESS:
**51 DANIELS AVE,
WATERFORD, CT 06385**

STATE PROJECT NUMBER:
245-0090 MAG/N/PF

NEWMAN PROJECT NUMBER:
20240069

DRAWING TITLE:

**SOIL EROSION &
SEDIMENT
CONTROL PLAN II**

SCALE: As indicated	DRAWN BY: BTW
-------------------------------	-------------------------

DATE:	CHECKED BY:
05/01/2025	KEG

DRAWING NUMBER:
05100

CE102

MATCHLINE - CG102

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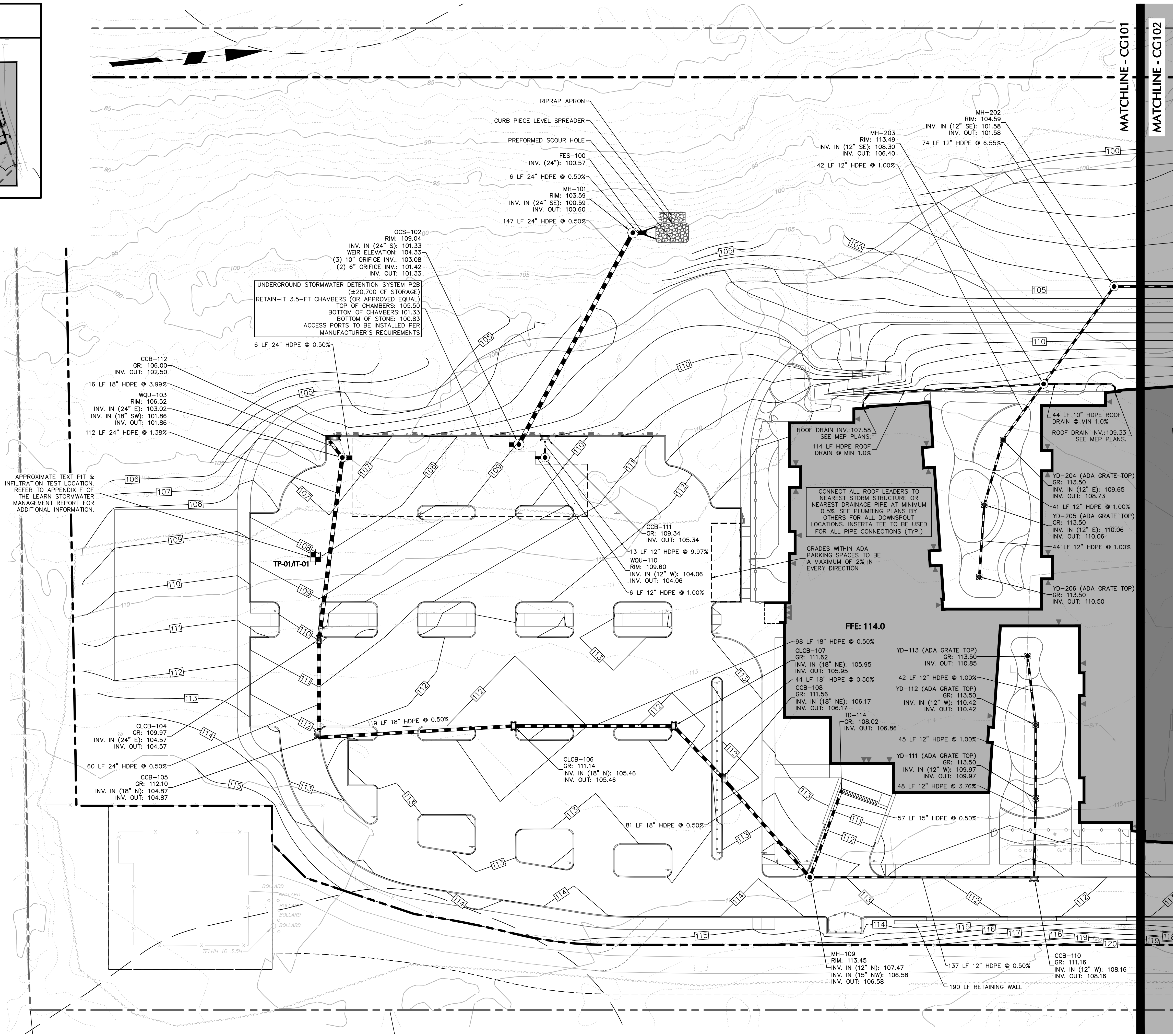
GRADING AND DRAINAGE PLAN

As indicated

05/01/2025

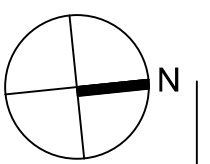
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CG101



30 0 15 30

SCALE: 1 INCH = 30 FEET



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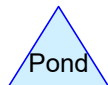
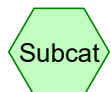
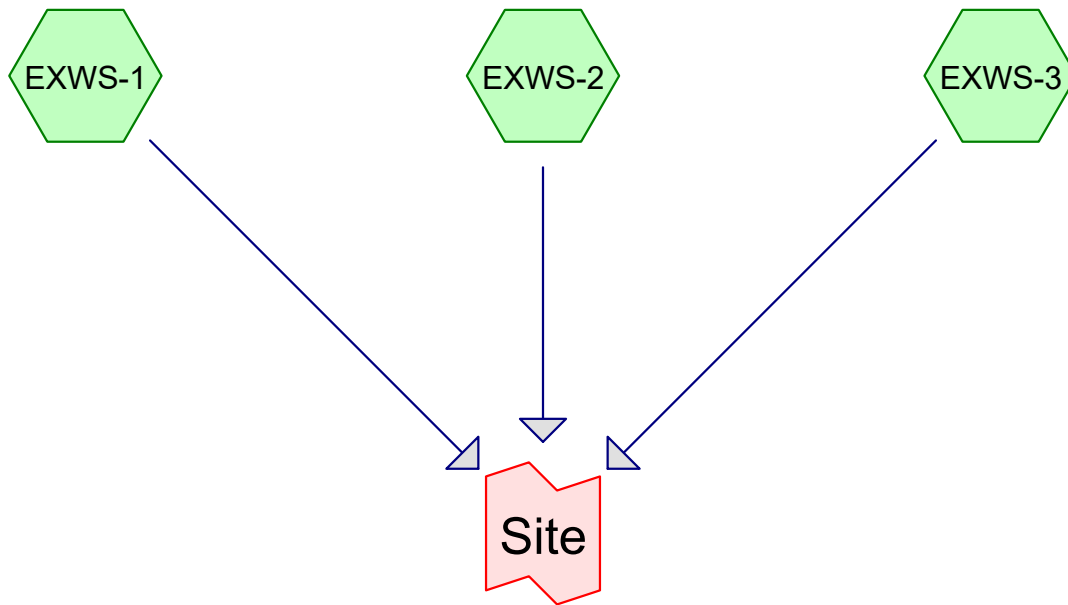
DRAWING NUMBER:

CG102



APPENDIX A

Existing Stormwater Discharge Calculations



EX WS_Conservation Submission

Prepared by Langan Engineering

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Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.13	69	50-75% Grass cover, Fair, HSG B (EXWS-2, EXWS-3)
3.33	79	50-75% Grass cover, Fair, HSG C (EXWS-1, EXWS-2)
6.01	84	50-75% Grass cover, Fair, HSG D (EXWS-1, EXWS-2, EXWS-3)
3.73	98	Impervious (EXWS-1, EXWS-2, EXWS-3)
0.29	55	Woods, Good, HSG B (EXWS-1, EXWS-3)
1.82	70	Woods, Good, HSG C (EXWS-1, EXWS-2)
0.99	77	Woods, Good, HSG D (EXWS-1, EXWS-2, EXWS-3)
16.30	84	TOTAL AREA

EX WS_Conservation Submission

NOAA 24-hr D 2-Year Rainfall=3.44"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEXWS-1:

Runoff Area=357,584 sf 8.39% Impervious Runoff Depth=1.66"
Flow Length=560' Tc=18 min CN=81 Runoff=10.65 cfs 49,469 CF

SubcatchmentEXWS-2:

Runoff Area=240,801 sf 39.65% Impervious Runoff Depth=2.13"
Flow Length=687' Tc=12 min CN=87 Runoff=10.97 cfs 42,714 CF

SubcatchmentEXWS-3:

Runoff Area=111,601 sf 33.10% Impervious Runoff Depth=1.81"
Flow Length=295' Tc=10 min CN=83 Runoff=4.62 cfs 16,816 CF

Link Site:

Inflow=24.88 cfs 108,999 CF
Primary=24.88 cfs 108,999 CF

Total Runoff Area = 16.30 ac Runoff Volume = 108,999 CF Average Runoff Depth = 1.84"
77.12% Pervious = 12.57 ac 22.88% Impervious = 3.73 ac

EX WS_Conservation Submission

NOAA 24-hr D 2-Year Rainfall=3.44"

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Summary for Subcatchment EXWS-1:

Runoff = 10.65 cfs @ 12.28 hrs, Volume= 49,469 CF, Depth= 1.66"

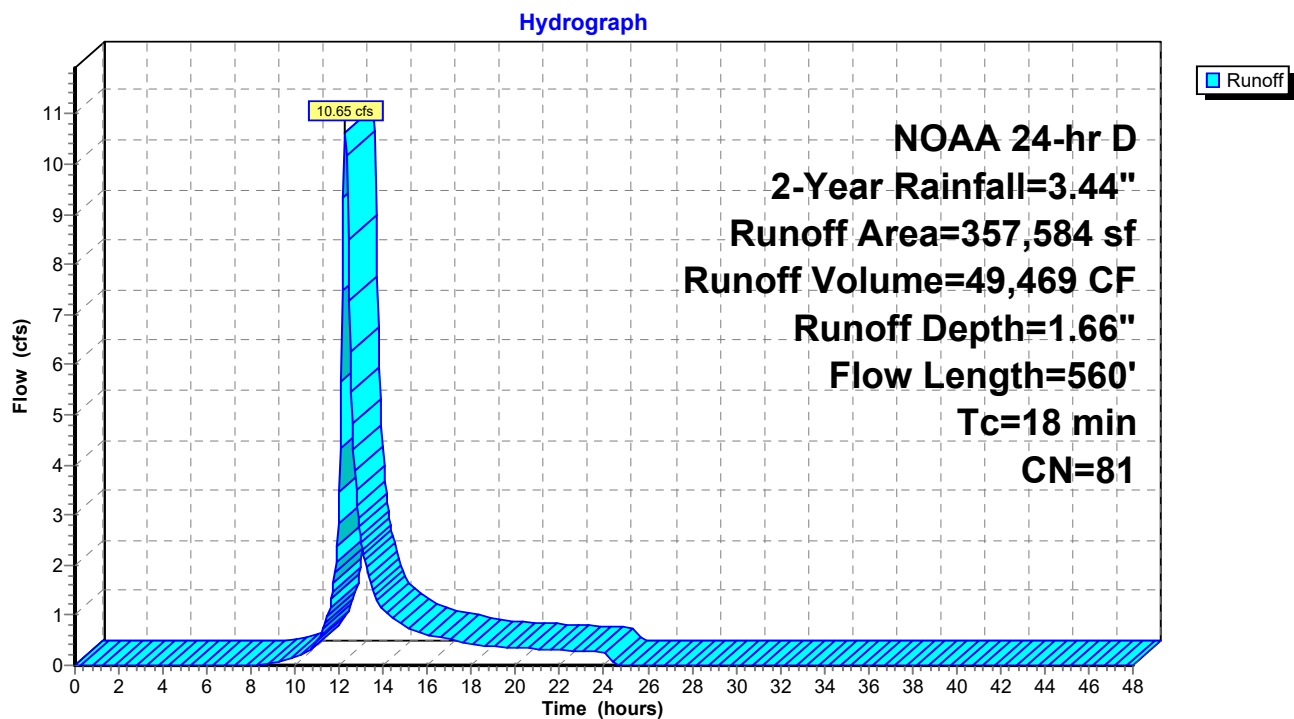
Routed to Link Site :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

	Area (sf)	CN	Description
*	30,013	98	Impervious
	0	69	50-75% Grass cover, Fair, HSG B
	76,186	79	50-75% Grass cover, Fair, HSG C
	173,587	84	50-75% Grass cover, Fair, HSG D
	784	55	Woods, Good, HSG B
	62,291	70	Woods, Good, HSG C
	14,723	77	Woods, Good, HSG D
	357,584	81	Weighted Average
	327,571		91.61% Pervious Area
	30,013		8.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5	28	0.0666	0.10		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 3.44"
0	12	0.0666	1.51		Sheet Flow, BC Smooth surfaces n= 0.011 P2= 3.44"
5	90	0.0667	0.28		Sheet Flow, CD Grass: Short n= 0.150 P2= 3.44"
3	20	0.0200	0.13		Sheet Flow, DE Grass: Short n= 0.150 P2= 3.44"
3	180	0.0150	0.86		Shallow Concentrated Flow, EF Short Grass Pasture Kv= 7.0 fps
2	230	0.0667	1.81		Shallow Concentrated Flow, FG Short Grass Pasture Kv= 7.0 fps
18	560	Total			

Subcatchment EXWS-1:



EX WS_Conservation Submission

NOAA 24-hr D 2-Year Rainfall=3.44"

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Summary for Subcatchment EXWS-2:

Runoff = 10.97 cfs @ 12.20 hrs, Volume= 42,714 CF, Depth= 2.13"

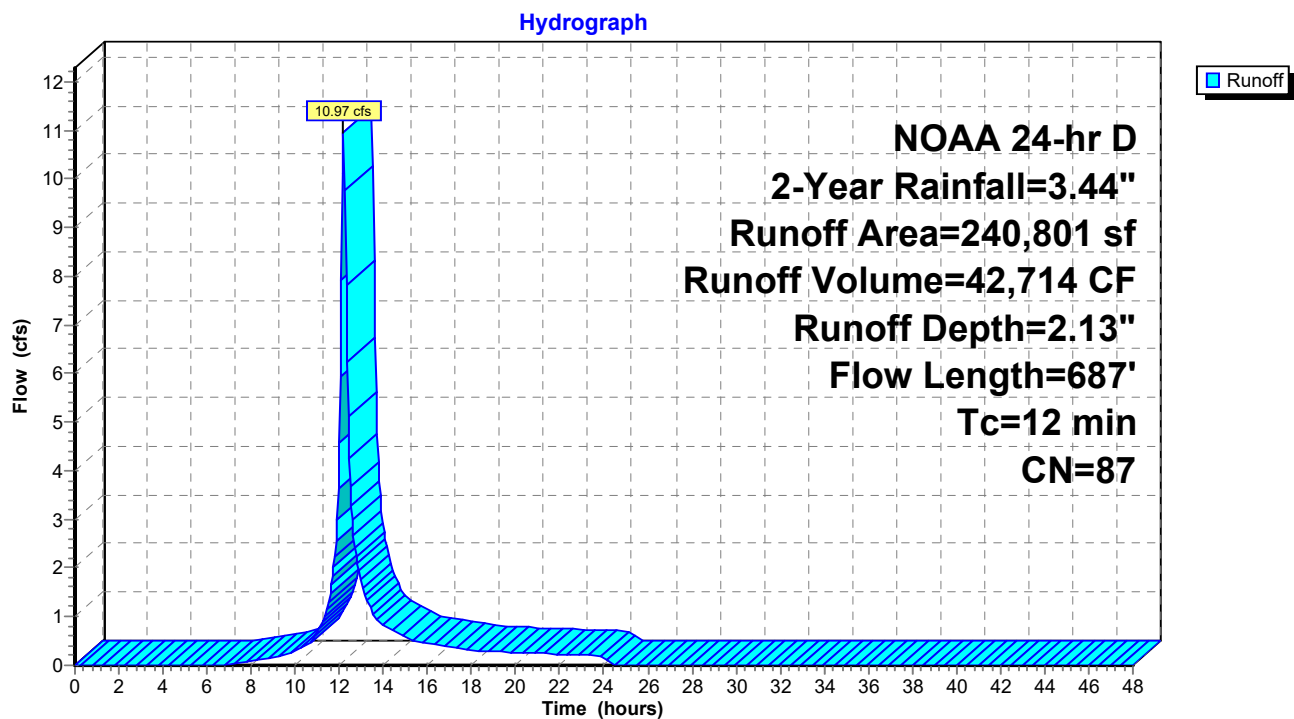
Routed to Link Site :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

	Area (sf)	CN	Description
*	95,484	98	Impervious
	3,180	69	50-75% Grass cover, Fair, HSG B
	68,825	79	50-75% Grass cover, Fair, HSG C
	56,323	84	50-75% Grass cover, Fair, HSG D
	0	55	Woods, Good, HSG B
	16,771	70	Woods, Good, HSG C
	218	77	Woods, Good, HSG D
	240,801	87	Weighted Average
	145,317		60.35% Pervious Area
	95,484		39.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0	24	0.0120	0.87		Sheet Flow, AB
					Smooth surfaces n= 0.011 P2= 3.44"
1	126	0.0833	2.64		Sheet Flow, BC
					Smooth surfaces n= 0.011 P2= 3.44"
2	145	0.0300	1.21		Shallow Concentrated Flow, CD
					Short Grass Pasture Kv= 7.0 fps
9	392	0.0120	0.77		Shallow Concentrated Flow, DE
					Short Grass Pasture Kv= 7.0 fps
12	687	Total			

Subcatchment EXWS-2:



EX WS_Conservation Submission

NOAA 24-hr D 2-Year Rainfall=3.44"

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Summary for Subcatchment EXWS-3:

Runoff = 4.62 cfs @ 12.17 hrs, Volume= 16,816 CF, Depth= 1.81"

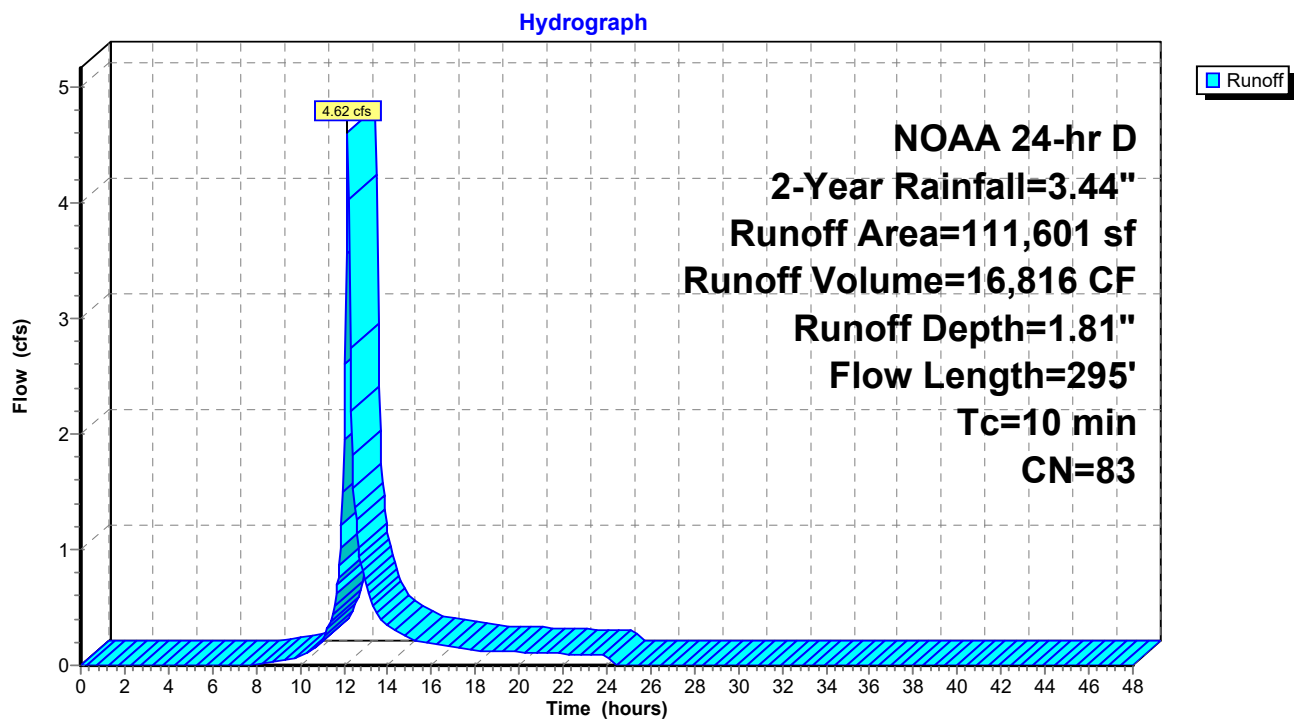
Routed to Link Site :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

	Area (sf)	CN	Description
*	36,939	98	Impervious
	2,483	69	50-75% Grass cover, Fair, HSG B
	0	79	50-75% Grass cover, Fair, HSG C
	31,886	84	50-75% Grass cover, Fair, HSG D
	12,066	55	Woods, Good, HSG B
	0	70	Woods, Good, HSG C
	28,227	77	Woods, Good, HSG D
	111,601	83	Weighted Average
	74,662		66.90% Pervious Area
	36,939		33.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8	150	0.0650	0.31		Sheet Flow, AB
					Grass: Short n= 0.150 P2= 3.44"
1	80	0.0650	1.78		Shallow Concentrated Flow, BC
					Short Grass Pasture Kv= 7.0 fps
1	65	0.0550	1.17		Shallow Concentrated Flow, CD
					Woodland Kv= 5.0 fps
10	295	Total			

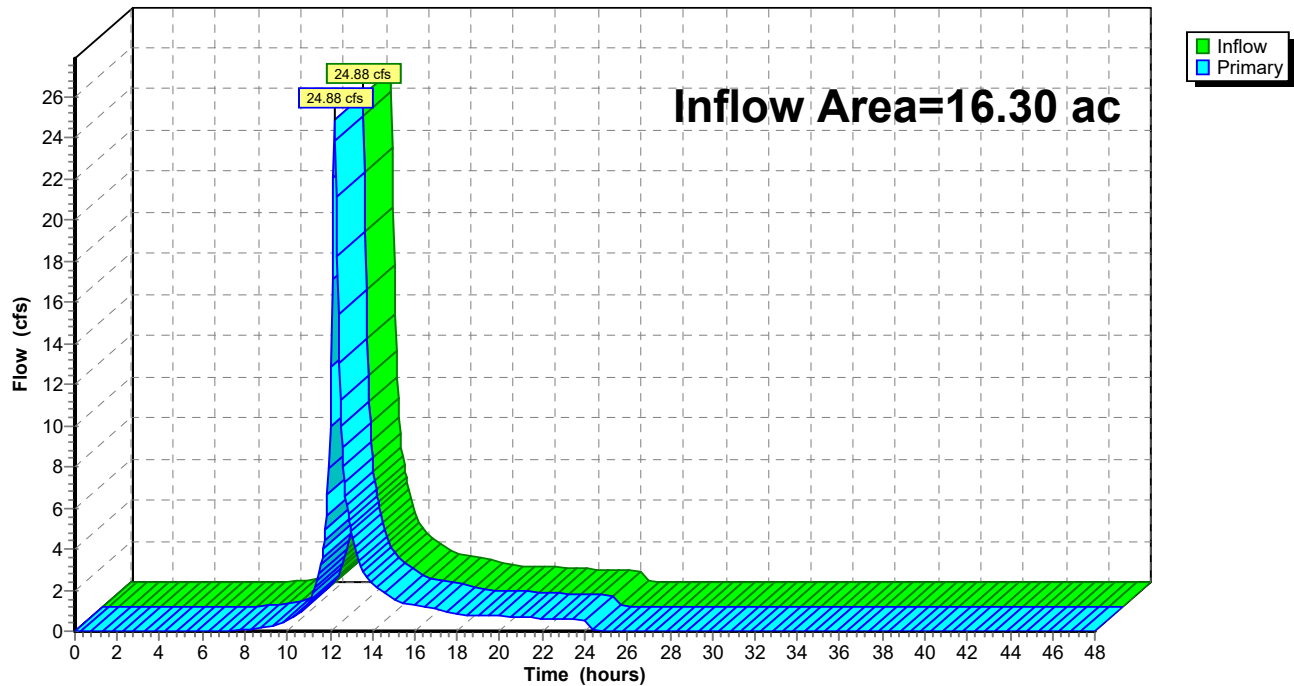
Subcatchment EXWS-3:



Summary for Link Site:

Inflow Area = 16.30 ac, 22.88% Impervious, Inflow Depth = 1.84" for 2-Year event
Inflow = 24.88 cfs @ 12.21 hrs, Volume= 108,999 CF
Primary = 24.88 cfs @ 12.21 hrs, Volume= 108,999 CF, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link Site:**Hydrograph**

EX WS_Conservation Submission

NOAA 24-hr D 10-Year Rainfall=5.14"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEXWS-1:

Runoff Area=357,584 sf 8.39% Impervious Runoff Depth=3.11"
Flow Length=560' Tc=18 min CN=81 Runoff=20.01 cfs 92,655 CF

SubcatchmentEXWS-2:

Runoff Area=240,801 sf 39.65% Impervious Runoff Depth=3.70"
Flow Length=687' Tc=12 min CN=87 Runoff=18.68 cfs 74,233 CF

SubcatchmentEXWS-3:

Runoff Area=111,601 sf 33.10% Impervious Runoff Depth=3.30"
Flow Length=295' Tc=10 min CN=83 Runoff=8.34 cfs 30,700 CF

Link Site:

Inflow=44.64 cfs 197,588 CF
Primary=44.64 cfs 197,588 CF

Total Runoff Area = 16.30 ac Runoff Volume = 197,588 CF Average Runoff Depth = 3.34"
77.12% Pervious = 12.57 ac 22.88% Impervious = 3.73 ac

EX WS_Conservation Submission

NOAA 24-hr D 10-Year Rainfall=5.14"

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Summary for Subcatchment EXWS-1:

Runoff = 20.01 cfs @ 12.27 hrs, Volume= 92,655 CF, Depth= 3.11"

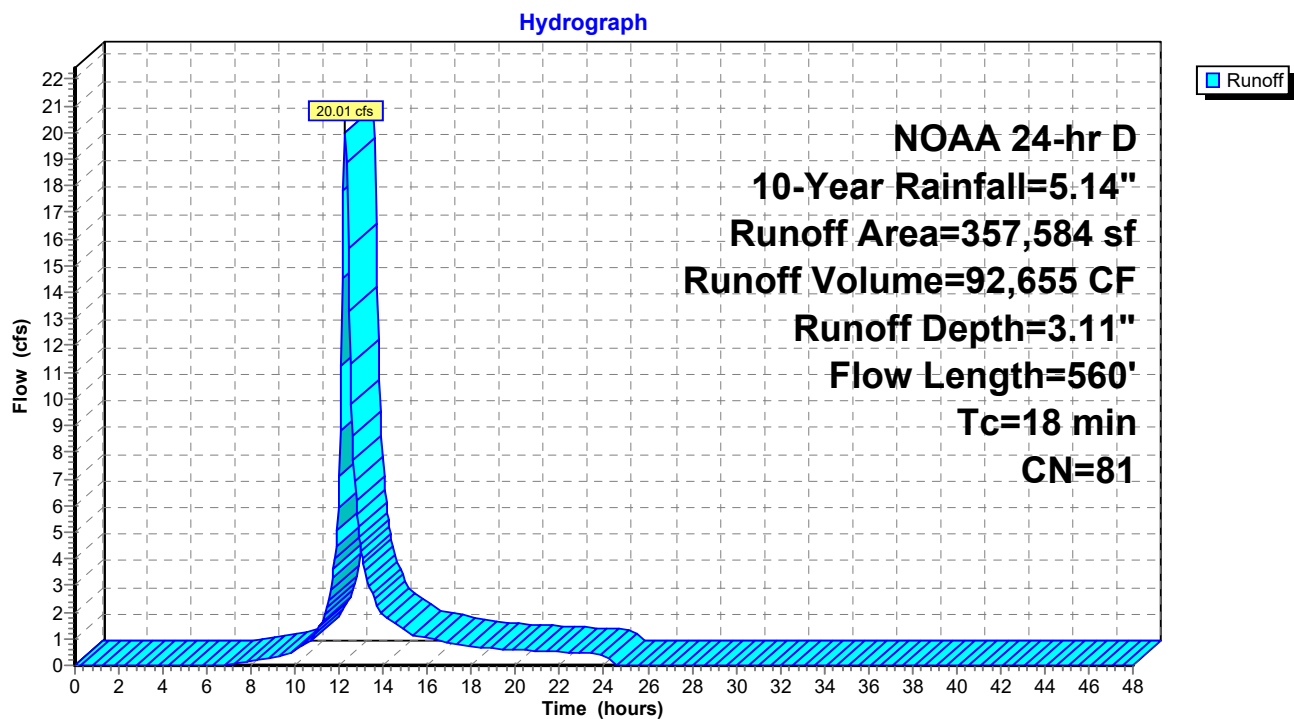
Routed to Link Site :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.14"

	Area (sf)	CN	Description
*	30,013	98	Impervious
	0	69	50-75% Grass cover, Fair, HSG B
	76,186	79	50-75% Grass cover, Fair, HSG C
	173,587	84	50-75% Grass cover, Fair, HSG D
	784	55	Woods, Good, HSG B
	62,291	70	Woods, Good, HSG C
	14,723	77	Woods, Good, HSG D
	357,584	81	Weighted Average
	327,571		91.61% Pervious Area
	30,013		8.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5	28	0.0666	0.10		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 3.44"
0	12	0.0666	1.51		Sheet Flow, BC Smooth surfaces n= 0.011 P2= 3.44"
5	90	0.0667	0.28		Sheet Flow, CD Grass: Short n= 0.150 P2= 3.44"
3	20	0.0200	0.13		Sheet Flow, DE Grass: Short n= 0.150 P2= 3.44"
3	180	0.0150	0.86		Shallow Concentrated Flow, EF Short Grass Pasture Kv= 7.0 fps
2	230	0.0667	1.81		Shallow Concentrated Flow, FG Short Grass Pasture Kv= 7.0 fps
18	560	Total			

Subcatchment EXWS-1:



EX WS_Conservation Submission

NOAA 24-hr D 10-Year Rainfall=5.14"

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Summary for Subcatchment EXWS-2:

Runoff = 18.68 cfs @ 12.19 hrs, Volume= 74,233 CF, Depth= 3.70"

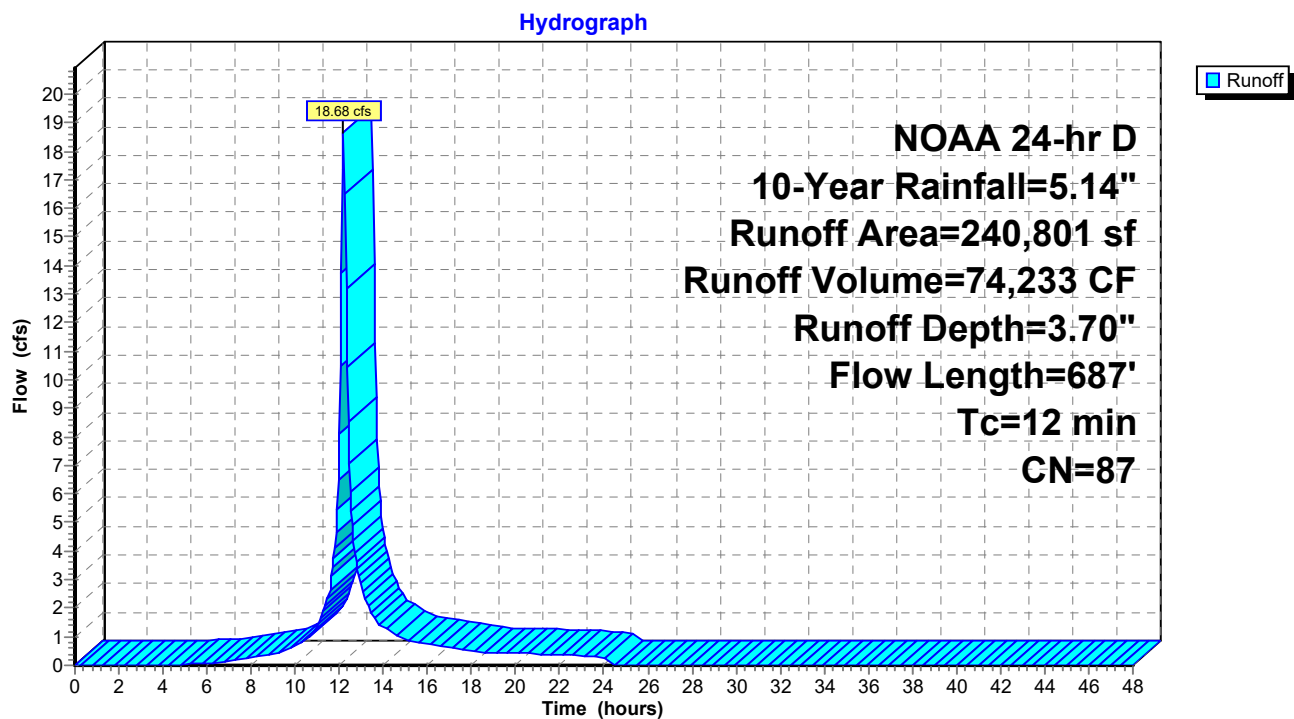
Routed to Link Site :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.14"

	Area (sf)	CN	Description
*	95,484	98	Impervious
	3,180	69	50-75% Grass cover, Fair, HSG B
	68,825	79	50-75% Grass cover, Fair, HSG C
	56,323	84	50-75% Grass cover, Fair, HSG D
	0	55	Woods, Good, HSG B
	16,771	70	Woods, Good, HSG C
	218	77	Woods, Good, HSG D
	240,801	87	Weighted Average
	145,317		60.35% Pervious Area
	95,484		39.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0	24	0.0120	0.87		Sheet Flow, AB
					Smooth surfaces n= 0.011 P2= 3.44"
1	126	0.0833	2.64		Sheet Flow, BC
					Smooth surfaces n= 0.011 P2= 3.44"
2	145	0.0300	1.21		Shallow Concentrated Flow, CD
					Short Grass Pasture Kv= 7.0 fps
9	392	0.0120	0.77		Shallow Concentrated Flow, DE
					Short Grass Pasture Kv= 7.0 fps
12	687	Total			

Subcatchment EXWS-2:



EX WS_Conservation Submission

NOAA 24-hr D 10-Year Rainfall=5.14"

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Summary for Subcatchment EXWS-3:

Runoff = 8.34 cfs @ 12.17 hrs, Volume= 30,700 CF, Depth= 3.30"

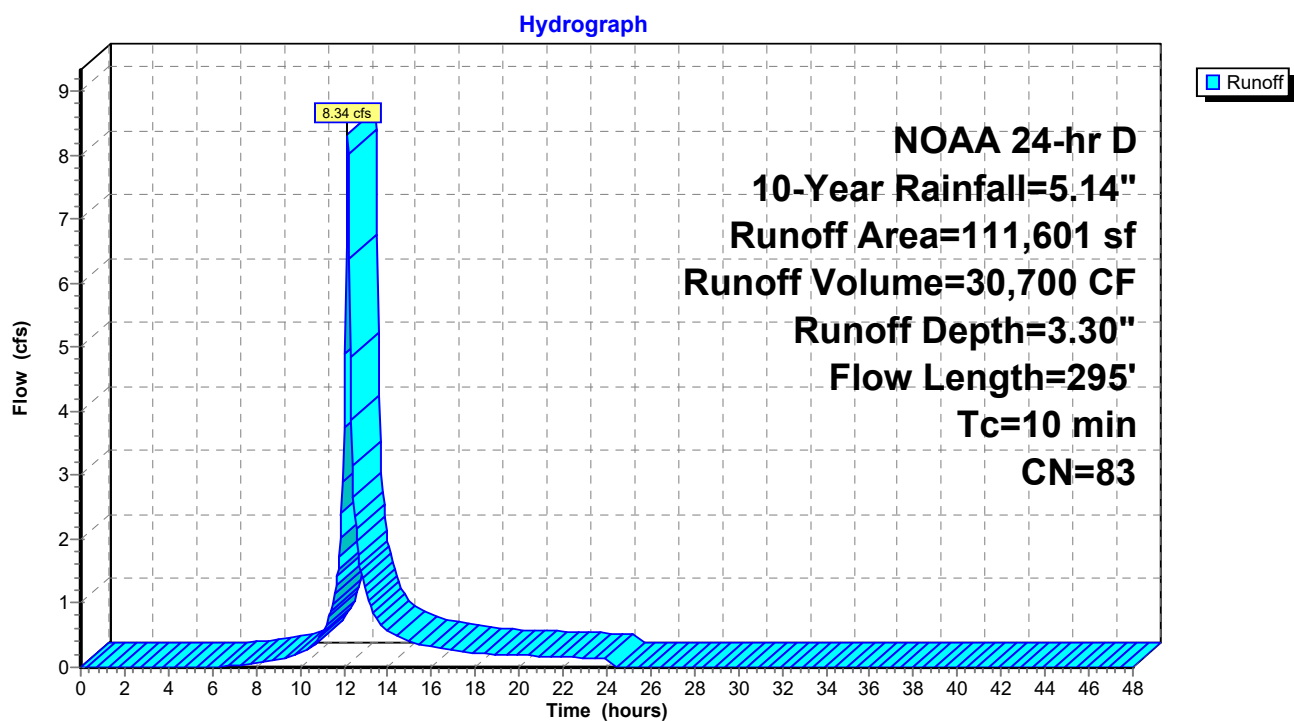
Routed to Link Site :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.14"

	Area (sf)	CN	Description
*	36,939	98	Impervious
	2,483	69	50-75% Grass cover, Fair, HSG B
	0	79	50-75% Grass cover, Fair, HSG C
	31,886	84	50-75% Grass cover, Fair, HSG D
	12,066	55	Woods, Good, HSG B
	0	70	Woods, Good, HSG C
	28,227	77	Woods, Good, HSG D
	111,601	83	Weighted Average
	74,662		66.90% Pervious Area
	36,939		33.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8	150	0.0650	0.31		Sheet Flow, AB
					Grass: Short n= 0.150 P2= 3.44"
1	80	0.0650	1.78		Shallow Concentrated Flow, BC
					Short Grass Pasture Kv= 7.0 fps
1	65	0.0550	1.17		Shallow Concentrated Flow, CD
					Woodland Kv= 5.0 fps
10	295	Total			

Subcatchment EXWS-3:



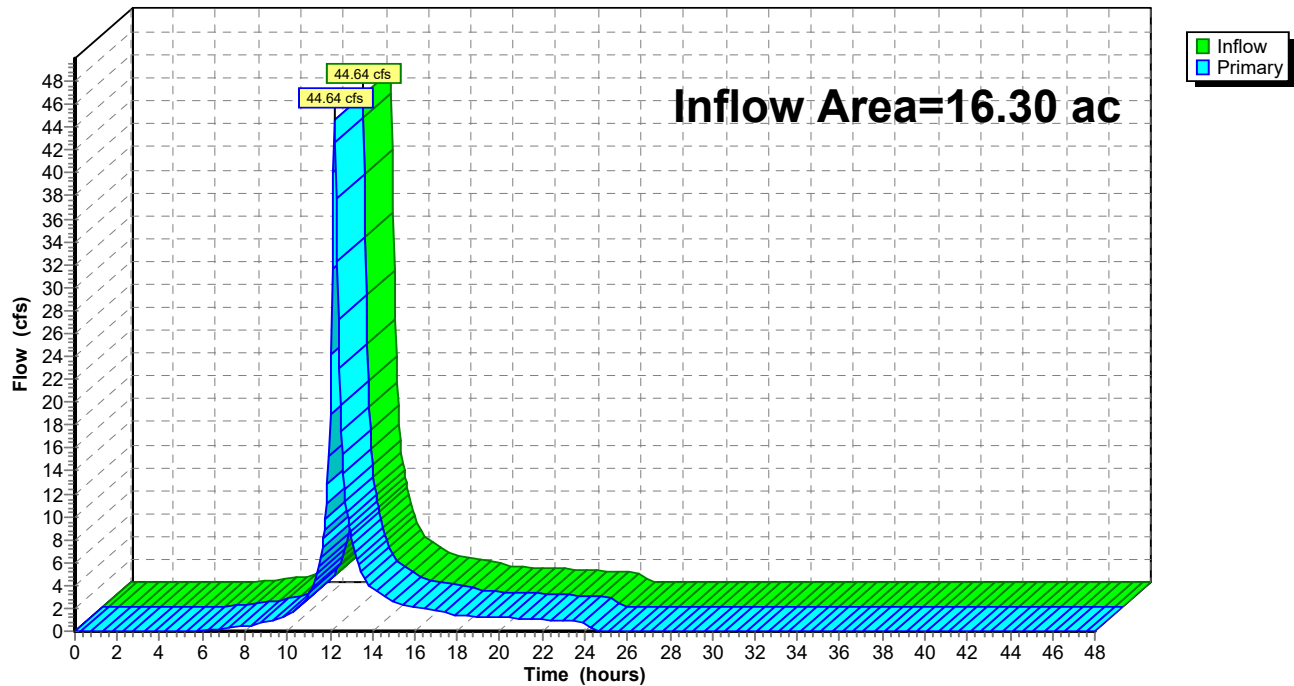
Summary for Link Site:

Inflow Area = 16.30 ac, 22.88% Impervious, Inflow Depth = 3.34" for 10-Year event
Inflow = 44.64 cfs @ 12.21 hrs, Volume= 197,588 CF
Primary = 44.64 cfs @ 12.21 hrs, Volume= 197,588 CF, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link Site:

Hydrograph



EX WS_Conservation Submission

NOAA 24-hr D 25-Year Rainfall=6.21"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEXWS-1: Runoff Area=357,584 sf 8.39% Impervious Runoff Depth=4.08"
Flow Length=560' Tc=18 min CN=81 Runoff=26.08 cfs 121,447 CF

SubcatchmentEXWS-2: Runoff Area=240,801 sf 39.65% Impervious Runoff Depth=4.72"
Flow Length=687' Tc=12 min CN=87 Runoff=23.53 cfs 94,683 CF

SubcatchmentEXWS-3: Runoff Area=111,601 sf 33.10% Impervious Runoff Depth=4.29"
Flow Length=295' Tc=10 min CN=83 Runoff=10.73 cfs 39,866 CF

Link Site: Inflow=57.30 cfs 255,997 CF
Primary=57.30 cfs 255,997 CF

Total Runoff Area = 16.30 ac Runoff Volume = 255,997 CF Average Runoff Depth = 4.33"
77.12% Pervious = 12.57 ac 22.88% Impervious = 3.73 ac

EX WS_Conservation Submission

NOAA 24-hr D 25-Year Rainfall=6.21"

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Summary for Subcatchment EXWS-1:

Runoff = 26.08 cfs @ 12.27 hrs, Volume= 121,447 CF, Depth= 4.08"

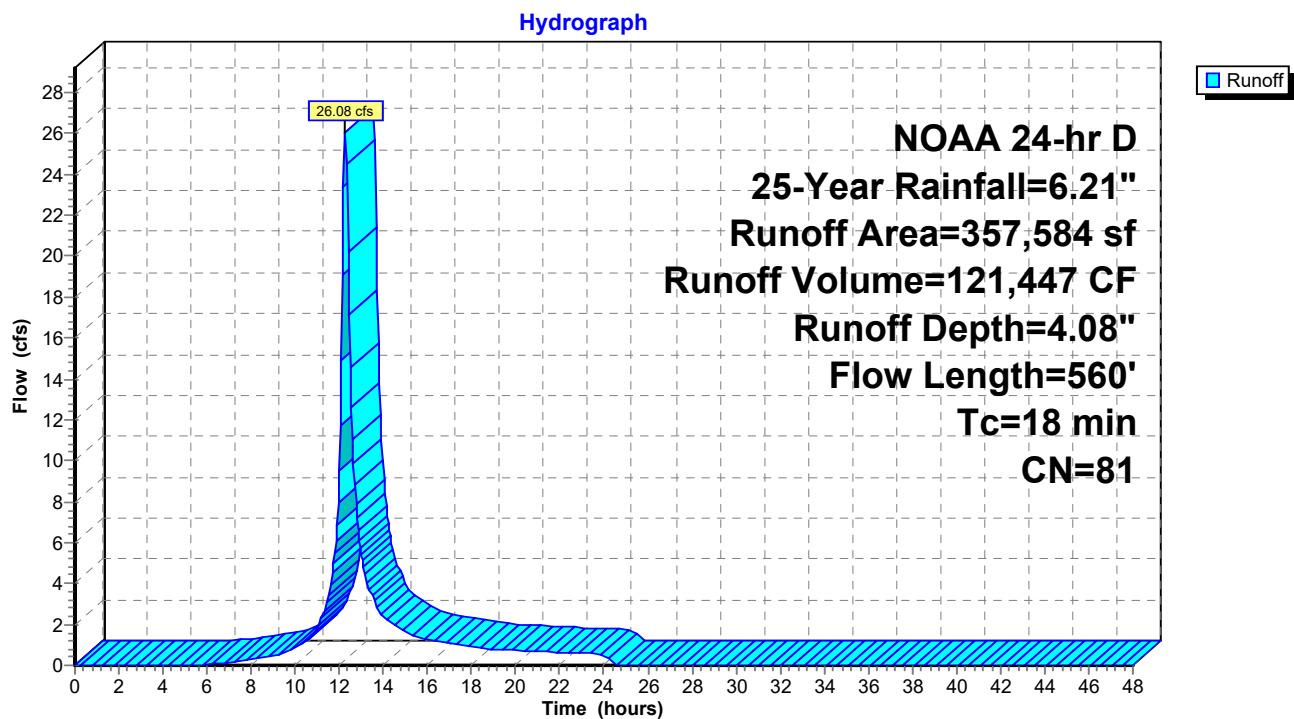
Routed to Link Site :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25-Year Rainfall=6.21"

	Area (sf)	CN	Description
*	30,013	98	Impervious
	0	69	50-75% Grass cover, Fair, HSG B
	76,186	79	50-75% Grass cover, Fair, HSG C
	173,587	84	50-75% Grass cover, Fair, HSG D
	784	55	Woods, Good, HSG B
	62,291	70	Woods, Good, HSG C
	14,723	77	Woods, Good, HSG D
	357,584	81	Weighted Average
	327,571		91.61% Pervious Area
	30,013		8.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5	28	0.0666	0.10		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 3.44"
0	12	0.0666	1.51		Sheet Flow, BC Smooth surfaces n= 0.011 P2= 3.44"
5	90	0.0667	0.28		Sheet Flow, CD Grass: Short n= 0.150 P2= 3.44"
3	20	0.0200	0.13		Sheet Flow, DE Grass: Short n= 0.150 P2= 3.44"
3	180	0.0150	0.86		Shallow Concentrated Flow, EF Short Grass Pasture Kv= 7.0 fps
2	230	0.0667	1.81		Shallow Concentrated Flow, FG Short Grass Pasture Kv= 7.0 fps
18	560	Total			

Subcatchment EXWS-1:



EX WS_Conservation Submission

NOAA 24-hr D 25-Year Rainfall=6.21"

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Summary for Subcatchment EXWS-2:

Runoff = 23.53 cfs @ 12.19 hrs, Volume= 94,683 CF, Depth= 4.72"

Routed to Link Site :

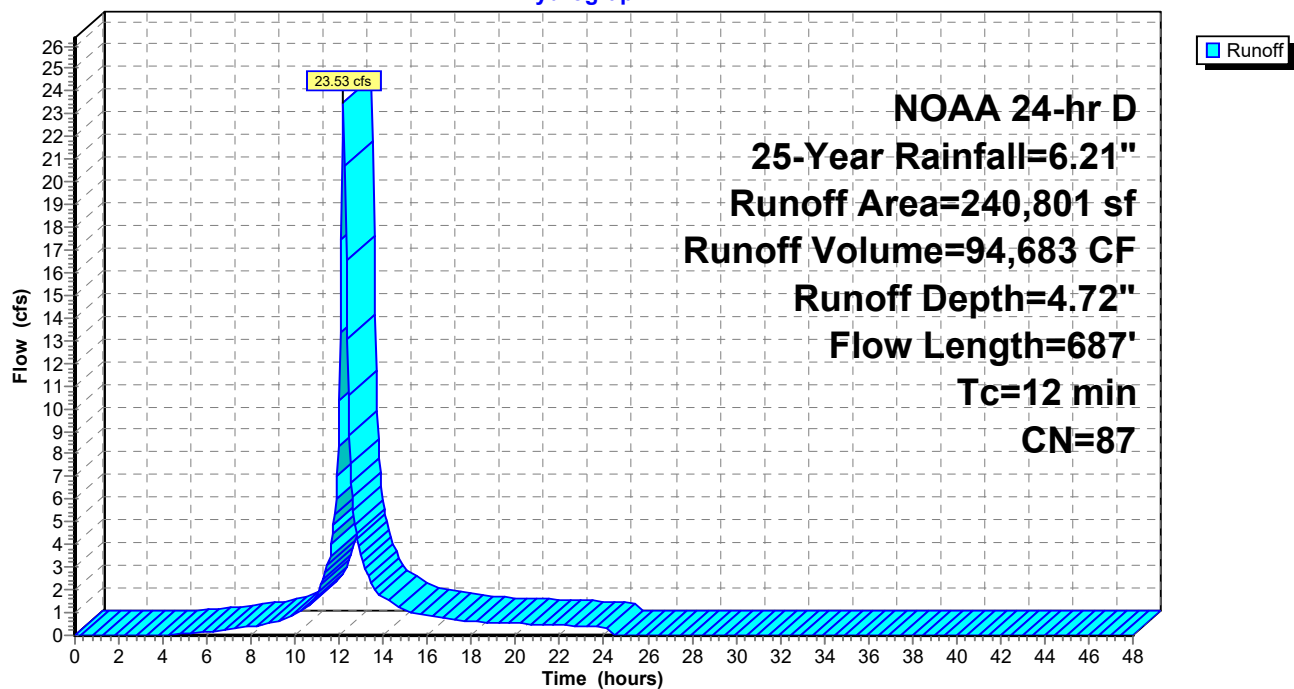
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25-Year Rainfall=6.21"

	Area (sf)	CN	Description
*	95,484	98	Impervious
	3,180	69	50-75% Grass cover, Fair, HSG B
	68,825	79	50-75% Grass cover, Fair, HSG C
	56,323	84	50-75% Grass cover, Fair, HSG D
	0	55	Woods, Good, HSG B
	16,771	70	Woods, Good, HSG C
	218	77	Woods, Good, HSG D
	240,801	87	Weighted Average
	145,317		60.35% Pervious Area
	95,484		39.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0	24	0.0120	0.87		Sheet Flow, AB
					Smooth surfaces n= 0.011 P2= 3.44"
1	126	0.0833	2.64		Sheet Flow, BC
					Smooth surfaces n= 0.011 P2= 3.44"
2	145	0.0300	1.21		Shallow Concentrated Flow, CD
					Short Grass Pasture Kv= 7.0 fps
9	392	0.0120	0.77		Shallow Concentrated Flow, DE
					Short Grass Pasture Kv= 7.0 fps
12	687	Total			

Subcatchment EXWS-2:

Hydrograph



EX WS_Conservation Submission

NOAA 24-hr D 25-Year Rainfall=6.21"

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Summary for Subcatchment EXWS-3:

Runoff = 10.73 cfs @ 12.17 hrs, Volume= 39,866 CF, Depth= 4.29"

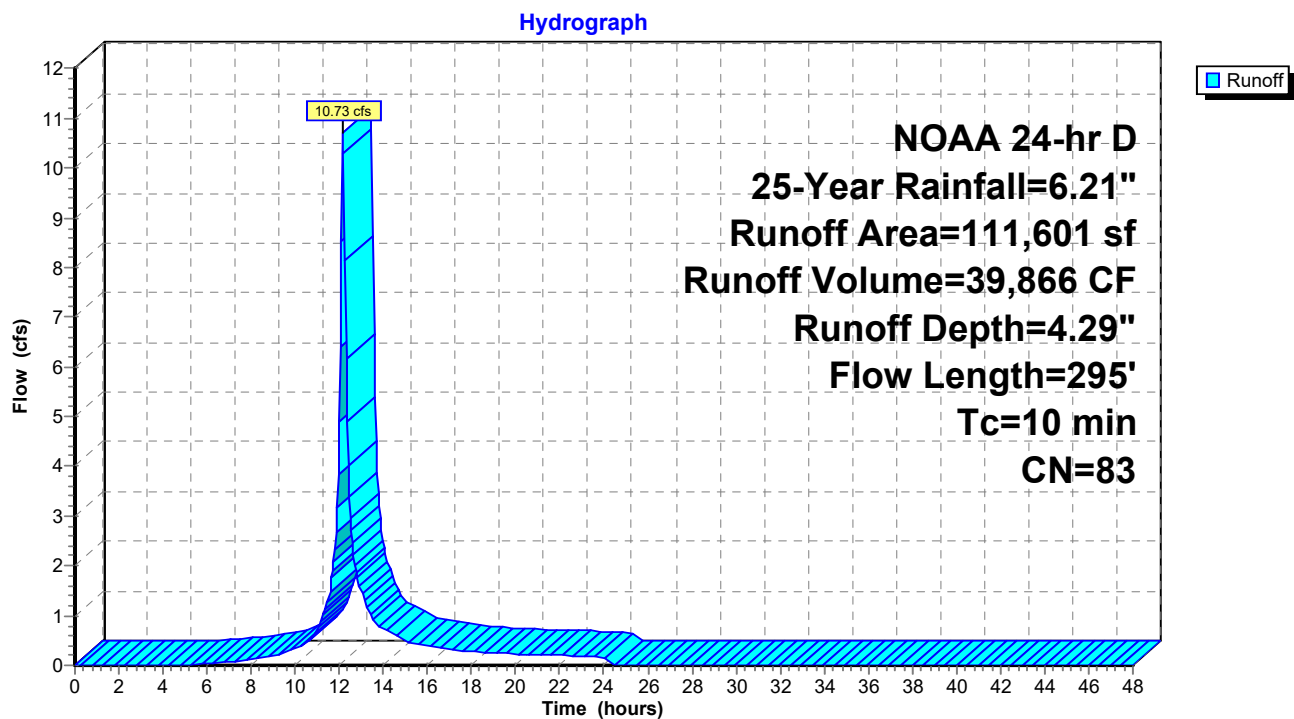
Routed to Link Site :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 25-Year Rainfall=6.21"

	Area (sf)	CN	Description
*	36,939	98	Impervious
	2,483	69	50-75% Grass cover, Fair, HSG B
	0	79	50-75% Grass cover, Fair, HSG C
	31,886	84	50-75% Grass cover, Fair, HSG D
	12,066	55	Woods, Good, HSG B
	0	70	Woods, Good, HSG C
	28,227	77	Woods, Good, HSG D
	111,601	83	Weighted Average
	74,662		66.90% Pervious Area
	36,939		33.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8	150	0.0650	0.31		Sheet Flow, AB
					Grass: Short n= 0.150 P2= 3.44"
1	80	0.0650	1.78		Shallow Concentrated Flow, BC
					Short Grass Pasture Kv= 7.0 fps
1	65	0.0550	1.17		Shallow Concentrated Flow, CD
					Woodland Kv= 5.0 fps
10	295	Total			

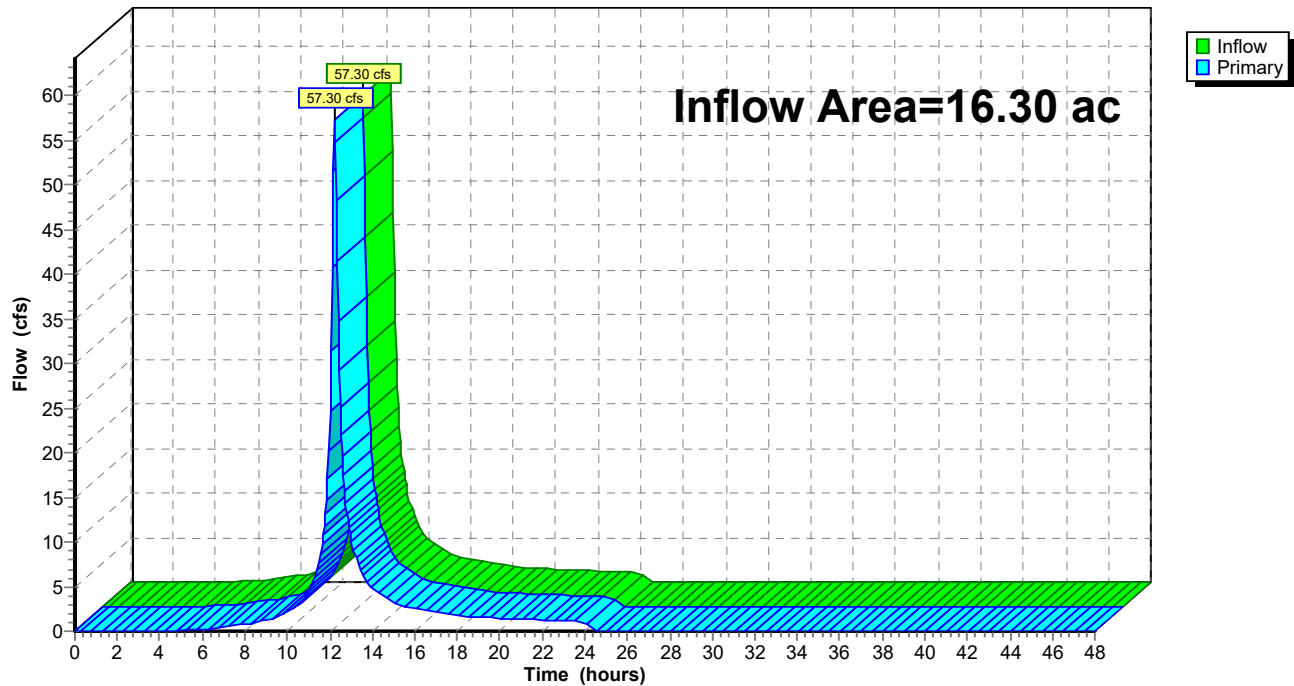
Subcatchment EXWS-3:



Summary for Link Site:

Inflow Area = 16.30 ac, 22.88% Impervious, Inflow Depth = 4.33" for 25-Year event
Inflow = 57.30 cfs @ 12.21 hrs, Volume= 255,997 CF
Primary = 57.30 cfs @ 12.21 hrs, Volume= 255,997 CF, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link Site:**Hydrograph**

EX WS_Conservation Submission

NOAA 24-hr D 100-Year Rainfall=7.85"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEXWS-1: Runoff Area=357,584 sf 8.39% Impervious Runoff Depth=5.60"
Flow Length=560' Tc=18 min CN=81 Runoff=35.44 cfs 166,899 CF

SubcatchmentEXWS-2: Runoff Area=240,801 sf 39.65% Impervious Runoff Depth=6.30"
Flow Length=687' Tc=12 min CN=87 Runoff=30.92 cfs 126,496 CF

SubcatchmentEXWS-3: Runoff Area=111,601 sf 33.10% Impervious Runoff Depth=5.83"
Flow Length=295' Tc=10 min CN=83 Runoff=14.39 cfs 54,259 CF

Link Site: Inflow=76.75 cfs 347,654 CF
Primary=76.75 cfs 347,654 CF

Total Runoff Area = 16.30 ac Runoff Volume = 347,654 CF Average Runoff Depth = 5.88"
77.12% Pervious = 12.57 ac 22.88% Impervious = 3.73 ac

EX WS_Conservation Submission

NOAA 24-hr D 100-Year Rainfall=7.85"

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Summary for Subcatchment EXWS-1:

Runoff = 35.44 cfs @ 12.27 hrs, Volume= 166,899 CF, Depth= 5.60"

Routed to Link Site :

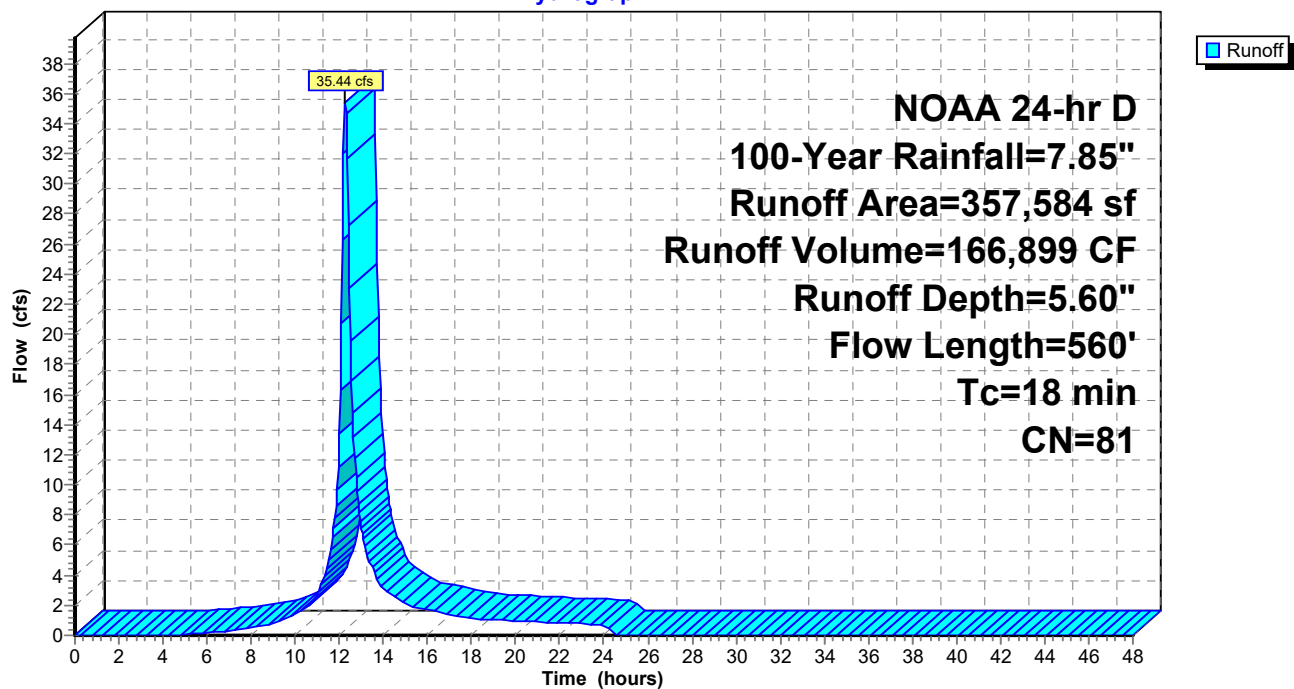
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=7.85"

	Area (sf)	CN	Description
*	30,013	98	Impervious
	0	69	50-75% Grass cover, Fair, HSG B
	76,186	79	50-75% Grass cover, Fair, HSG C
	173,587	84	50-75% Grass cover, Fair, HSG D
	784	55	Woods, Good, HSG B
	62,291	70	Woods, Good, HSG C
	14,723	77	Woods, Good, HSG D
	357,584	81	Weighted Average
	327,571		91.61% Pervious Area
	30,013		8.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5	28	0.0666	0.10		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 3.44"
0	12	0.0666	1.51		Sheet Flow, BC Smooth surfaces n= 0.011 P2= 3.44"
5	90	0.0667	0.28		Sheet Flow, CD Grass: Short n= 0.150 P2= 3.44"
3	20	0.0200	0.13		Sheet Flow, DE Grass: Short n= 0.150 P2= 3.44"
3	180	0.0150	0.86		Shallow Concentrated Flow, EF Short Grass Pasture Kv= 7.0 fps
2	230	0.0667	1.81		Shallow Concentrated Flow, FG Short Grass Pasture Kv= 7.0 fps
18	560	Total			

Subcatchment EXWS-1:

Hydrograph



EX WS_Conservation Submission

NOAA 24-hr D 100-Year Rainfall=7.85"

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Summary for Subcatchment EXWS-2:

Runoff = 30.92 cfs @ 12.19 hrs, Volume= 126,496 CF, Depth= 6.30"

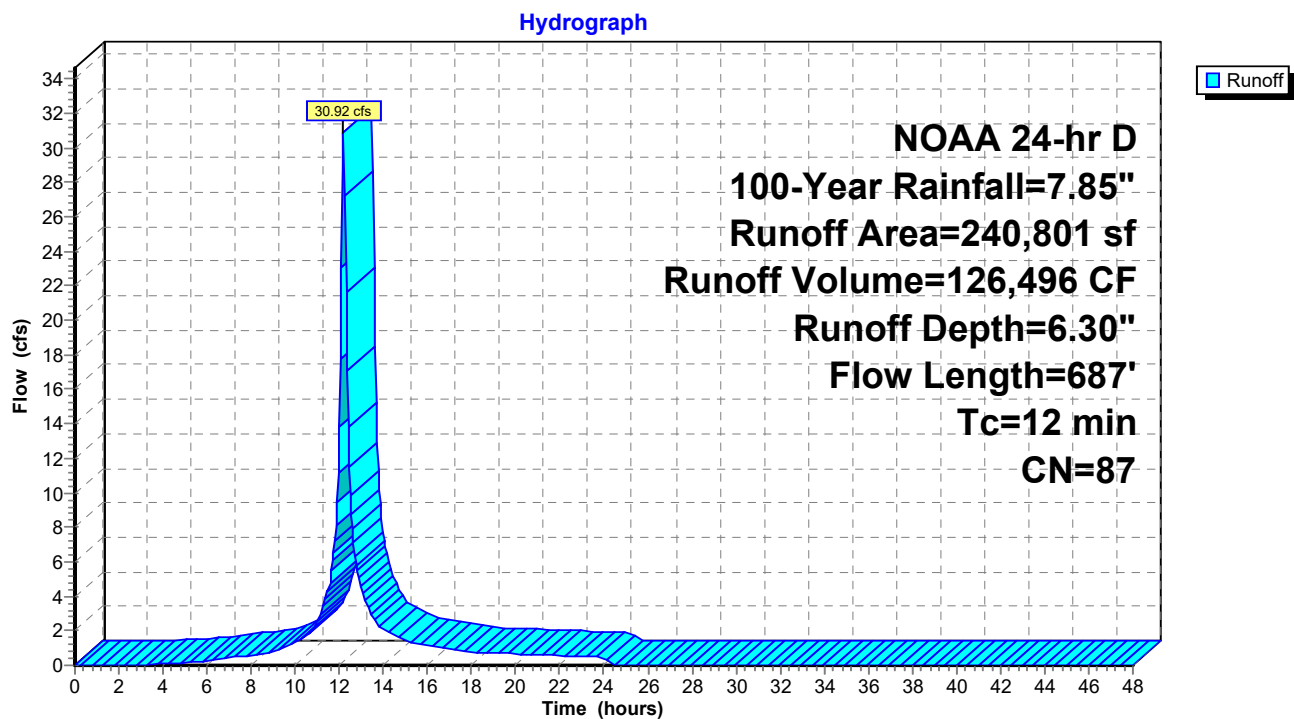
Routed to Link Site :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=7.85"

	Area (sf)	CN	Description
*	95,484	98	Impervious
	3,180	69	50-75% Grass cover, Fair, HSG B
	68,825	79	50-75% Grass cover, Fair, HSG C
	56,323	84	50-75% Grass cover, Fair, HSG D
	0	55	Woods, Good, HSG B
	16,771	70	Woods, Good, HSG C
	218	77	Woods, Good, HSG D
	240,801	87	Weighted Average
	145,317		60.35% Pervious Area
	95,484		39.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0	24	0.0120	0.87		Sheet Flow, AB
					Smooth surfaces n= 0.011 P2= 3.44"
1	126	0.0833	2.64		Sheet Flow, BC
					Smooth surfaces n= 0.011 P2= 3.44"
2	145	0.0300	1.21		Shallow Concentrated Flow, CD
					Short Grass Pasture Kv= 7.0 fps
9	392	0.0120	0.77		Shallow Concentrated Flow, DE
					Short Grass Pasture Kv= 7.0 fps
12	687	Total			

Subcatchment EXWS-2:



EX WS_Conservation Submission

NOAA 24-hr D 100-Year Rainfall=7.85"

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Summary for Subcatchment EXWS-3:

Runoff = 14.39 cfs @ 12.17 hrs, Volume= 54,259 CF, Depth= 5.83"

Routed to Link Site :

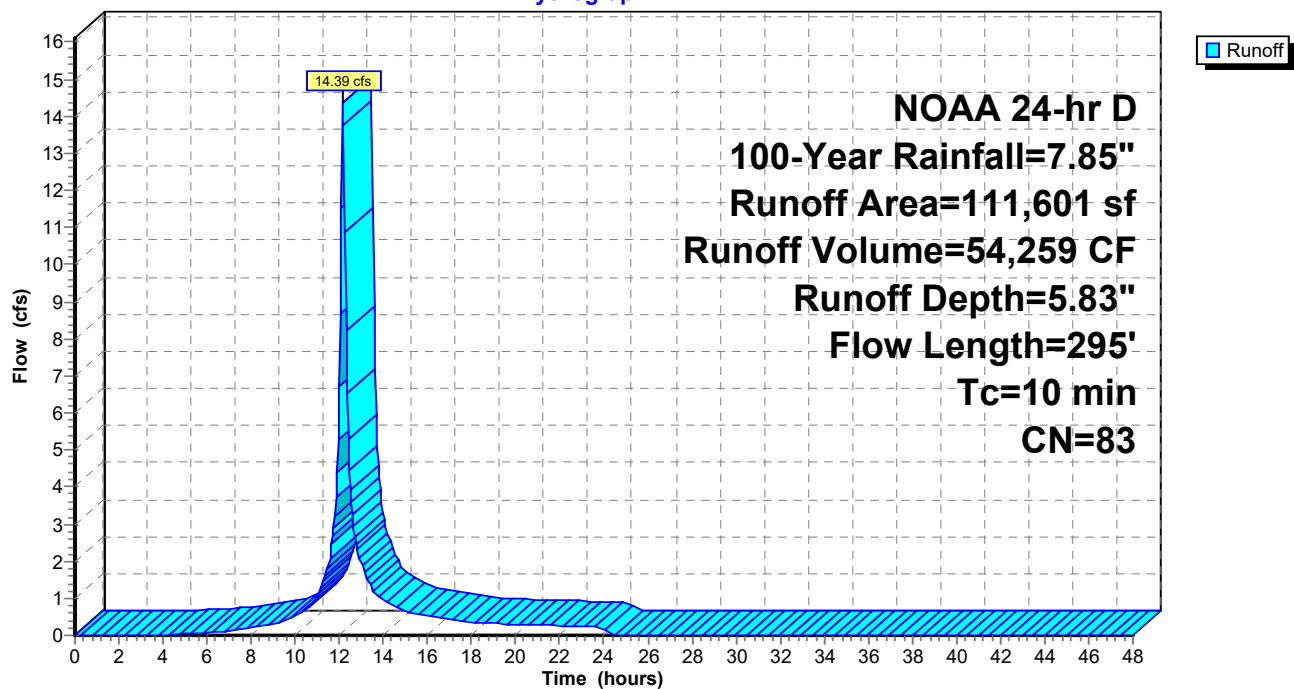
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=7.85"

	Area (sf)	CN	Description
*	36,939	98	Impervious
	2,483	69	50-75% Grass cover, Fair, HSG B
	0	79	50-75% Grass cover, Fair, HSG C
	31,886	84	50-75% Grass cover, Fair, HSG D
	12,066	55	Woods, Good, HSG B
	0	70	Woods, Good, HSG C
	28,227	77	Woods, Good, HSG D
	111,601	83	Weighted Average
	74,662		66.90% Pervious Area
	36,939		33.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8	150	0.0650	0.31		Sheet Flow, AB
					Grass: Short n= 0.150 P2= 3.44"
1	80	0.0650	1.78		Shallow Concentrated Flow, BC
					Short Grass Pasture Kv= 7.0 fps
1	65	0.0550	1.17		Shallow Concentrated Flow, CD
					Woodland Kv= 5.0 fps
10	295	Total			

Subcatchment EXWS-3:

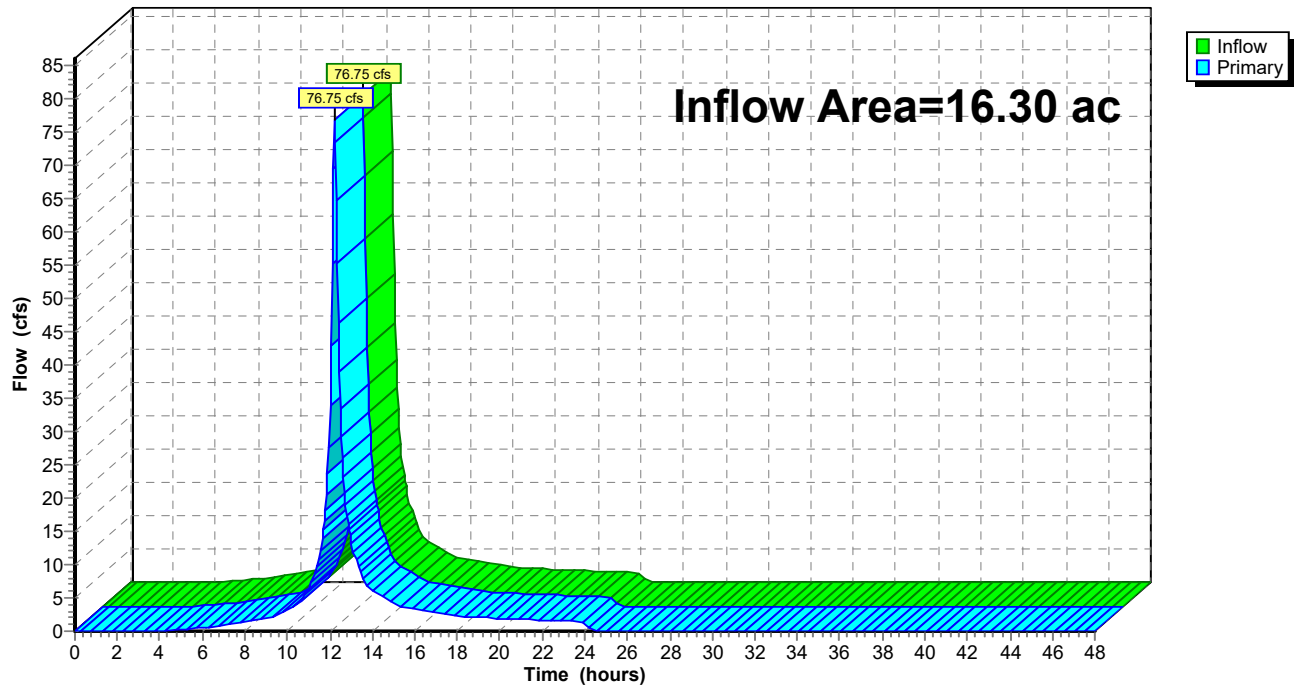
Hydrograph



Summary for Link Site:

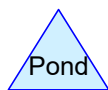
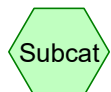
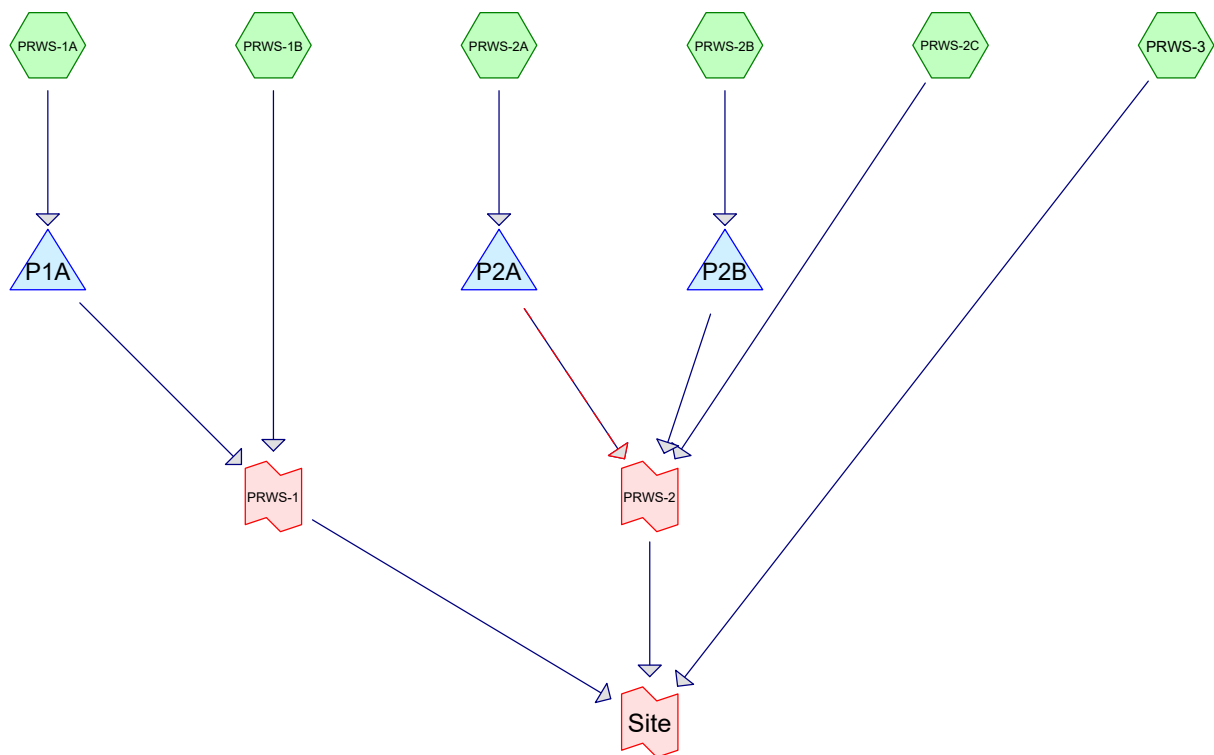
Inflow Area = 16.30 ac, 22.88% Impervious, Inflow Depth = 5.88" for 100-Year event
Inflow = 76.75 cfs @ 12.21 hrs, Volume= 347,654 CF
Primary = 76.75 cfs @ 12.21 hrs, Volume= 347,654 CF, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link Site:**Hydrograph**

APPENDIX B

Proposed Stormwater Discharge Calculations



PR WS_Convservation Submission

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.05	84	50-75% Grass cover, Fair, HSG D (PRWS-1A, PRWS-1B, PRWS-2B, PRWS-3)
0.89	74	>75% Grass cover, Good, HSG C (PRWS-1A, PRWS-1B)
0.87	80	>75% Grass cover, Good, HSG D (PRWS-1A, PRWS-1B, PRWS-2B)
7.18	98	Impervious (PRWS-1A, PRWS-1B, PRWS-2A, PRWS-2B, PRWS-2C)
0.14	58	Meadow, HSG B (PRWS-2B, PRWS-2C)
2.60	71	Meadow, HSG C (PRWS-1B, PRWS-2A, PRWS-2C)
1.36	78	Meadow, HSG D (PRWS-1A, PRWS-1B, PRWS-2A, PRWS-2B, PRWS-2C, PRWS-3)
0.17	89	Playground Surface, HSG C (PRWS-2A)
0.42	91	Playground Surface, HSG D (PRWS-1A, PRWS-2A, PRWS-2B)
0.15	98	Pond (PRWS-2A)
0.29	55	Woods, Good, HSG B (PRWS-1A, PRWS-2B, PRWS-3)
0.24	70	Woods, Good, HSG C (PRWS-1B, PRWS-2C)
0.93	77	Woods, Good, HSG D (PRWS-1A, PRWS-1B, PRWS-2B, PRWS-3)
16.30	86	TOTAL AREA

PR WS_Convservation Submission

NOAA 24-hr D 2-Year Rainfall=3.44"

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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+Trans method - Pond routing by Stor-Ind method

SubcatchmentPRWS-1A: Runoff Area=3.81 ac 61.09% Impervious Runoff Depth=2.48"
Flow Length=594' Tc=11 min CN=91 Runoff=9.07 cfs 34,350 CF

SubcatchmentPRWS-1B: Runoff Area=2.86 ac 13.06% Impervious Runoff Depth=1.32"
Flow Length=300' Tc=17 min CN=76 Runoff=3.02 cfs 13,744 CF

SubcatchmentPRWS-2A: Runoff Area=3.41 ac 72.31% Impervious Runoff Depth=2.68"
Flow Length=102' Tc=9 min CN=93 Runoff=9.18 cfs 33,087 CF

SubcatchmentPRWS-2B: Runoff Area=3.19 ac 61.07% Impervious Runoff Depth=2.48"
Flow Length=580' Tc=10 min CN=91 Runoff=7.88 cfs 28,795 CF

SubcatchmentPRWS-2C: Runoff Area=73,269 sf 13.38% Impervious Runoff Depth=1.26"
Flow Length=462' Tc=32 min CN=75 Runoff=1.22 cfs 7,690 CF

SubcatchmentPRWS-3: Runoff Area=58,762 sf 0.00% Impervious Runoff Depth=1.26"
Flow Length=284' Tc=10 min CN=75 Runoff=1.69 cfs 6,168 CF

Pond P1A: Peak Elev=103.04' Storage=10,760 CF Inflow=9.07 cfs 34,350 CF
Discarded=0.32 cfs 16,624 CF Primary=2.22 cfs 17,727 CF Outflow=2.54 cfs 34,350 CF

Pond P2A: Peak Elev=102.32' Storage=15,160 cf Inflow=9.18 cfs 33,087 CF
Discarded=0.06 cfs 6,921 CF Primary=1.67 cfs 25,397 CF Secondary=0.00 cfs 0 CF Outflow=1.72 cfs 32,318 CF

Pond P2B: Peak Elev=109.44' Storage=9,369 CF Inflow=7.88 cfs 28,795 CF
Discarded=0.30 cfs 15,957 CF Primary=1.91 cfs 12,838 CF Outflow=2.21 cfs 28,795 CF

Link PRWS-1: Inflow=5.03 cfs 31,470 CF
Primary=5.03 cfs 31,470 CF

Link PRWS-2: Inflow=4.78 cfs 45,925 CF
Primary=4.78 cfs 45,925 CF

Link Site: Inflow=10.37 cfs 83,562 CF
Primary=10.37 cfs 83,562 CF

Total Runoff Area = 16.30 ac Runoff Volume = 123,834 CF Average Runoff Depth = 2.09"
54.99% Pervious = 8.96 ac 45.01% Impervious = 7.34 ac

PR WS_Convservation Submission

NOAA 24-hr D 2-Year Rainfall=3.44"

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Summary for Subcatchment PRWS-1A:

Runoff = 9.07 cfs @ 12.18 hrs, Volume= 34,350 CF, Depth= 2.48"

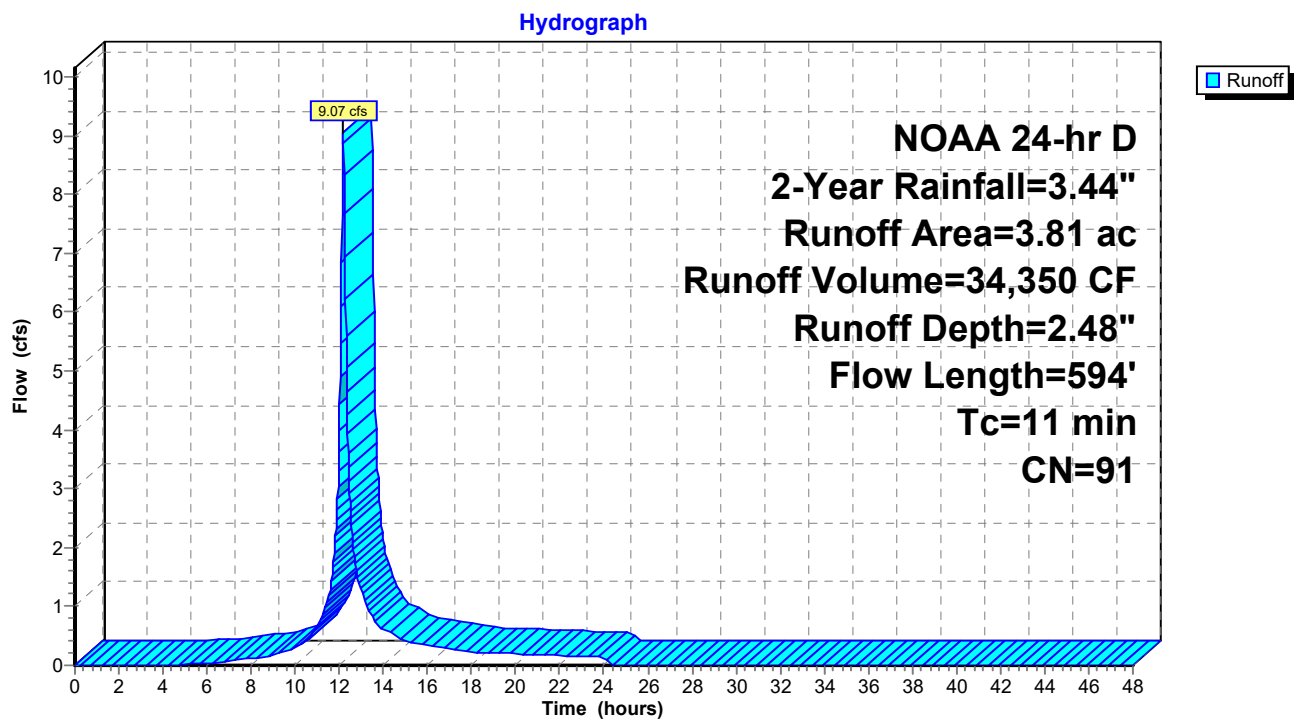
Routed to Pond P1A :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (ac)	CN	Description
* 2.33	98	Impervious
0.00	61	>75% Grass cover, Good, HSG B
0.01	74	>75% Grass cover, Good, HSG C
0.38	80	>75% Grass cover, Good, HSG D
0.00	69	50-75% Grass cover, Fair, HSG B
0.00	79	50-75% Grass cover, Fair, HSG C
0.42	84	50-75% Grass cover, Fair, HSG D
0.02	55	Woods, Good, HSG B
0.00	70	Woods, Good, HSG C
0.24	77	Woods, Good, HSG D
* 0.00	71	Meadow, HSG C
* 0.32	78	Meadow, HSG D
* 0.00	89	Playground Surface, HSG C
* 0.08	91	Playground Surface, HSG D
3.81	91	Weighted Average
1.48		38.91% Pervious Area
2.33		61.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9	150	0.0500	0.28		Sheet Flow, AB Grass: Short n= 0.150 P2= 3.44"
0	12	0.0500	4.54		Shallow Concentrated Flow, BC Paved Kv= 20.3 fps
0	18	0.1000	2.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
1	132	0.0200	2.87		Shallow Concentrated Flow, DE Paved Kv= 20.3 fps
1	282	0.0100	7.20	22.62	Pipe Channel, EF 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
11	594	Total			

Subcatchment PRWS-1A:



PR WS_Convservation Submission

NOAA 24-hr D 2-Year Rainfall=3.44"

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Summary for Subcatchment PRWS-1B:

Runoff = 3.02 cfs @ 12.26 hrs, Volume= 13,744 CF, Depth= 1.32"

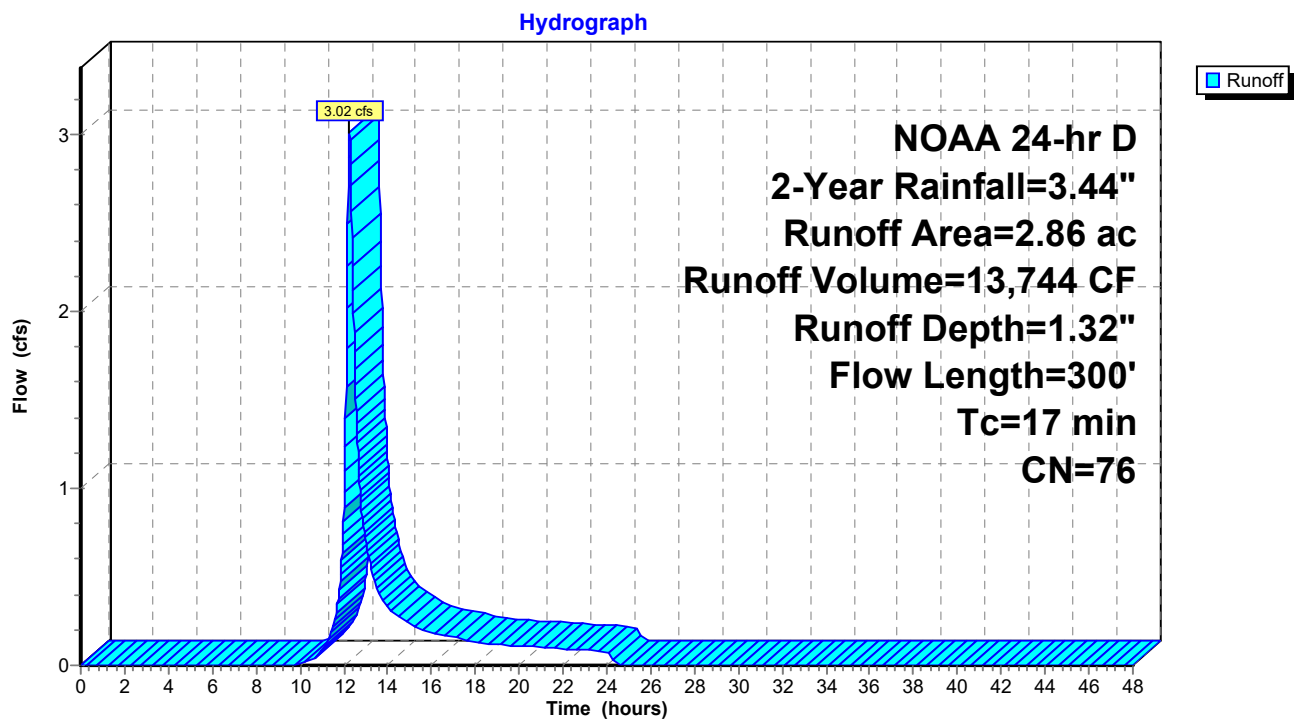
Routed to Link PRWS-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (ac)	CN	Description
* 0.37	98	Impervious
0.00	61	>75% Grass cover, Good, HSG B
0.87	74	>75% Grass cover, Good, HSG C
0.03	80	>75% Grass cover, Good, HSG D
0.00	69	50-75% Grass cover, Fair, HSG B
0.00	79	50-75% Grass cover, Fair, HSG C
0.07	84	50-75% Grass cover, Fair, HSG D
0.00	55	Woods, Good, HSG B
0.12	70	Woods, Good, HSG C
0.04	77	Woods, Good, HSG D
* 1.24	71	Meadow, HSG C
* 0.12	78	Meadow, HSG D
* 0.00	89	Playground Surface, HSG C
* 0.00	91	Playground Surface, HSG D
2.86	76	Weighted Average
2.49		86.94% Pervious Area
0.37		13.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2	25	0.2500	0.17		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 3.44"
3	35	0.0400	0.19		Sheet Flow, BC Grass: Short n= 0.150 P2= 3.44"
6	50	0.0400	0.14		Sheet Flow, CD Grass: Dense n= 0.240 P2= 3.44"
4	40	0.0650	0.16		Sheet Flow, DE Grass: Dense n= 0.240 P2= 3.44"
1	150	0.0800	1.98		Shallow Concentrated Flow, EF Short Grass Pasture Kv= 7.0 fps
17	300	Total			

Subcatchment PRWS-1B:



PR WS_Convservation Submission

NOAA 24-hr D 2-Year Rainfall=3.44"

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Summary for Subcatchment PRWS-2A:

Runoff = 9.18 cfs @ 12.16 hrs, Volume= 33,087 CF, Depth= 2.68"

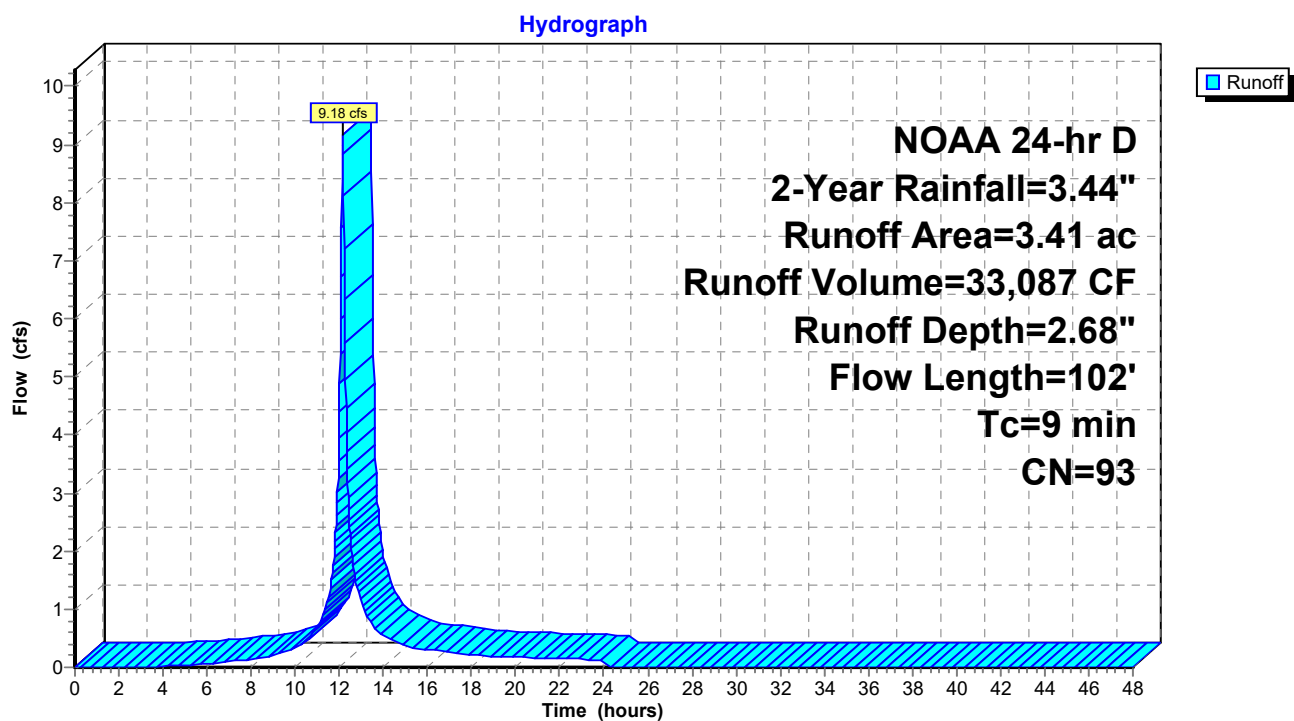
Routed to Pond P2A :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (ac)	CN	Description
* 2.31	98	Impervious
* 0.15	98	Pond
0.00	61	>75% Grass cover, Good, HSG B
0.00	74	>75% Grass cover, Good, HSG C
0.00	80	>75% Grass cover, Good, HSG D
0.00	69	50-75% Grass cover, Fair, HSG B
0.00	79	50-75% Grass cover, Fair, HSG C
0.00	84	50-75% Grass cover, Fair, HSG D
0.00	55	Woods, Good, HSG B
0.00	70	Woods, Good, HSG C
0.00	77	Woods, Good, HSG D
* 0.00	58	Meadow, HSG B
* 0.49	71	Meadow, HSG C
* 0.10	78	Meadow, HSG D
* 0.17	89	Playground Surface, HSG C
* 0.19	91	Playground Surface, HSG D
3.41	93	Weighted Average
0.94		27.69% Pervious Area
2.46		72.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6	80	0.1250	0.24		Sheet Flow, AB
					Grass: Dense n= 0.240 P2= 3.44"
3	12	0.0200	0.08		Sheet Flow, BC
					Grass: Dense n= 0.240 P2= 3.44"
1	10	0.3333	0.24		Sheet Flow, CD
					Grass: Dense n= 0.240 P2= 3.44"
9	102	Total			

Subcatchment PRWS-2A:



PR WS_Convservation Submission

NOAA 24-hr D 2-Year Rainfall=3.44"

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Summary for Subcatchment PRWS-2B:

Runoff = 7.88 cfs @ 12.17 hrs, Volume= 28,795 CF, Depth= 2.48"

Routed to Pond P2B :

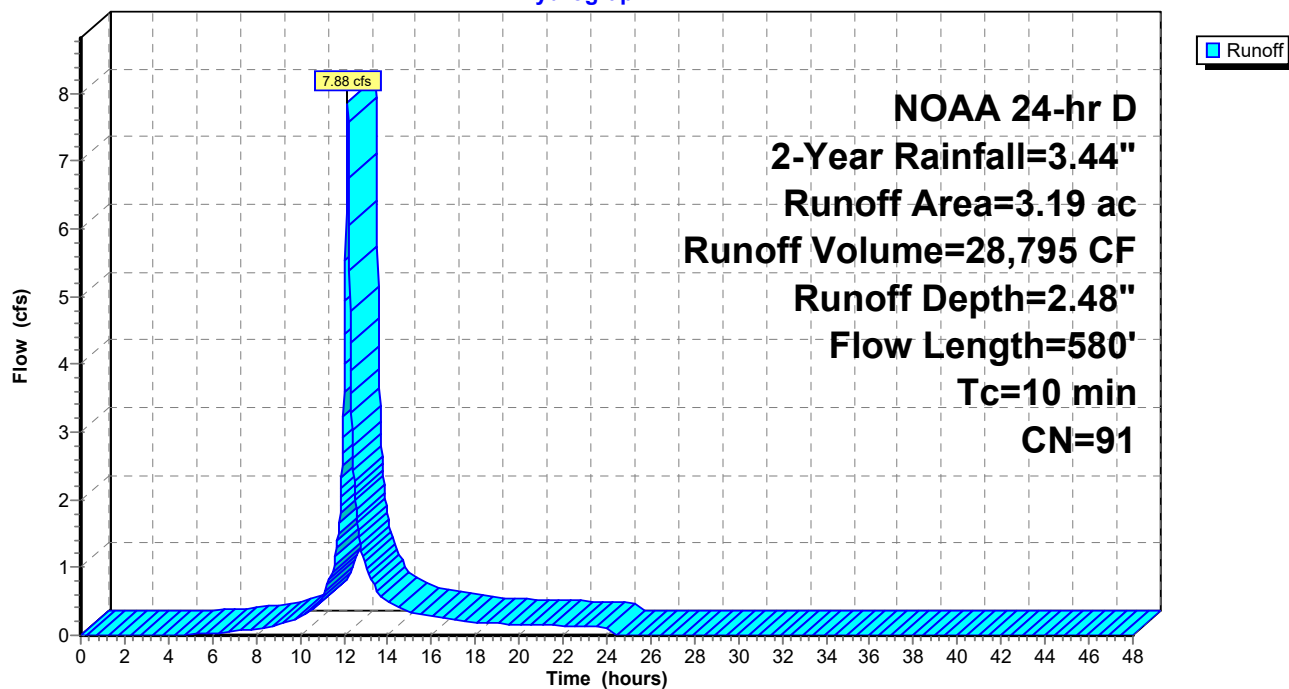
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

Area (ac)	CN	Description
* 1.95	98	Impervious
0.00	61	>75% Grass cover, Good, HSG B
0.00	74	>75% Grass cover, Good, HSG C
0.46	80	>75% Grass cover, Good, HSG D
0.00	69	50-75% Grass cover, Fair, HSG B
0.00	79	50-75% Grass cover, Fair, HSG C
0.06	84	50-75% Grass cover, Fair, HSG D
0.02	55	Woods, Good, HSG B
0.00	70	Woods, Good, HSG C
0.06	77	Woods, Good, HSG D
* 0.06	58	Meadow, HSG B
* 0.43	78	Meadow, HSG D
* 0.00	89	Playground Surface, HSG C
* 0.16	91	Playground Surface, HSG D
3.19	91	Weighted Average
1.24		38.93% Pervious Area
1.95		61.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3	16	0.0600	0.09		Sheet Flow, AB
					Woods: Light underbrush n= 0.400 P2= 3.44"
3	25	0.0600	0.14		Sheet Flow, BC
					Grass: Dense n= 0.240 P2= 3.44"
1	11	0.3300	0.24		Sheet Flow, DE
					Grass: Dense n= 0.240 P2= 3.44"
1	7	0.1000	0.14		Sheet Flow, EF
					Grass: Dense n= 0.240 P2= 3.44"
2	521	0.0100	4.54	3.56	Pipe Channel, FG
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.013 Corrugated PE, smooth interior
10	580	Total			

Subcatchment PRWS-2B:

Hydrograph



PR WS_Convservation Submission

NOAA 24-hr D 2-Year Rainfall=3.44"

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Summary for Subcatchment PRWS-2C:

Runoff = 1.22 cfs @ 12.47 hrs, Volume= 7,690 CF, Depth= 1.26"

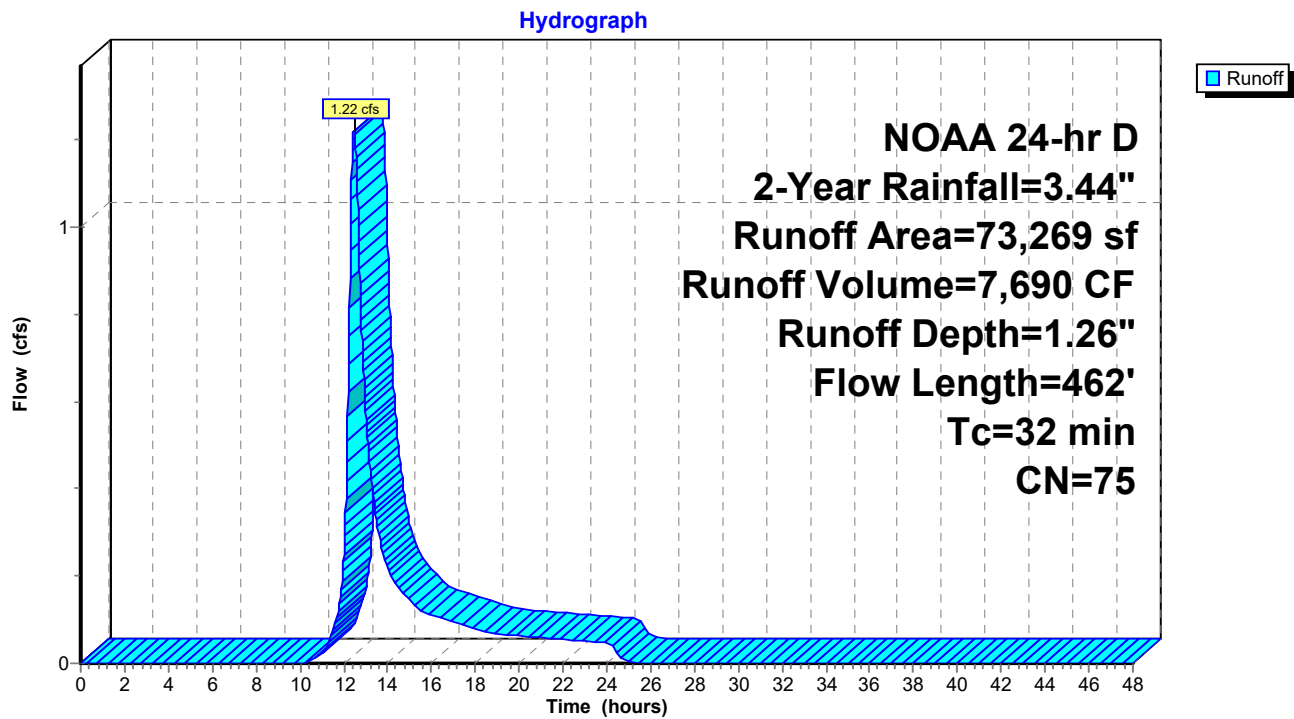
Routed to Link PRWS-2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

	Area (sf)	CN	Description
*	9,801	98	Impervious
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
	0	69	50-75% Grass cover, Fair, HSG B
	0	79	50-75% Grass cover, Fair, HSG C
	0	84	50-75% Grass cover, Fair, HSG D
	0	55	Woods, Good, HSG B
	5,097	70	Woods, Good, HSG C
	0	77	Woods, Good, HSG D
*	3,703	58	Meadow, HSG B
*	37,941	71	Meadow, HSG C
*	16,727	78	Meadow, HSG D
*	0	89	Playground Surface, HSG C
*	0	91	Playground Surface, HSG D
	73,269	75	Weighted Average
	63,468		86.62% Pervious Area
	9,801		13.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19	87	0.0200	0.08		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 3.44"
10	63	0.0200	0.11		Sheet Flow, BC Grass: Dense n= 0.240 P2= 3.44"
1	60	0.0300	1.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
3	192	0.0200	0.99		Shallow Concentrated Flow, DE Short Grass Pasture Kv= 7.0 fps
0	60	0.0100	5.26	6.46	Pipe Channel, EF 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
32	462	Total			

Subcatchment PRWS-2C:



PR WS_Convservation Submission

NOAA 24-hr D 2-Year Rainfall=3.44"

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Summary for Subcatchment PRWS-3:

Runoff = 1.69 cfs @ 12.18 hrs, Volume= 6,168 CF, Depth= 1.26"

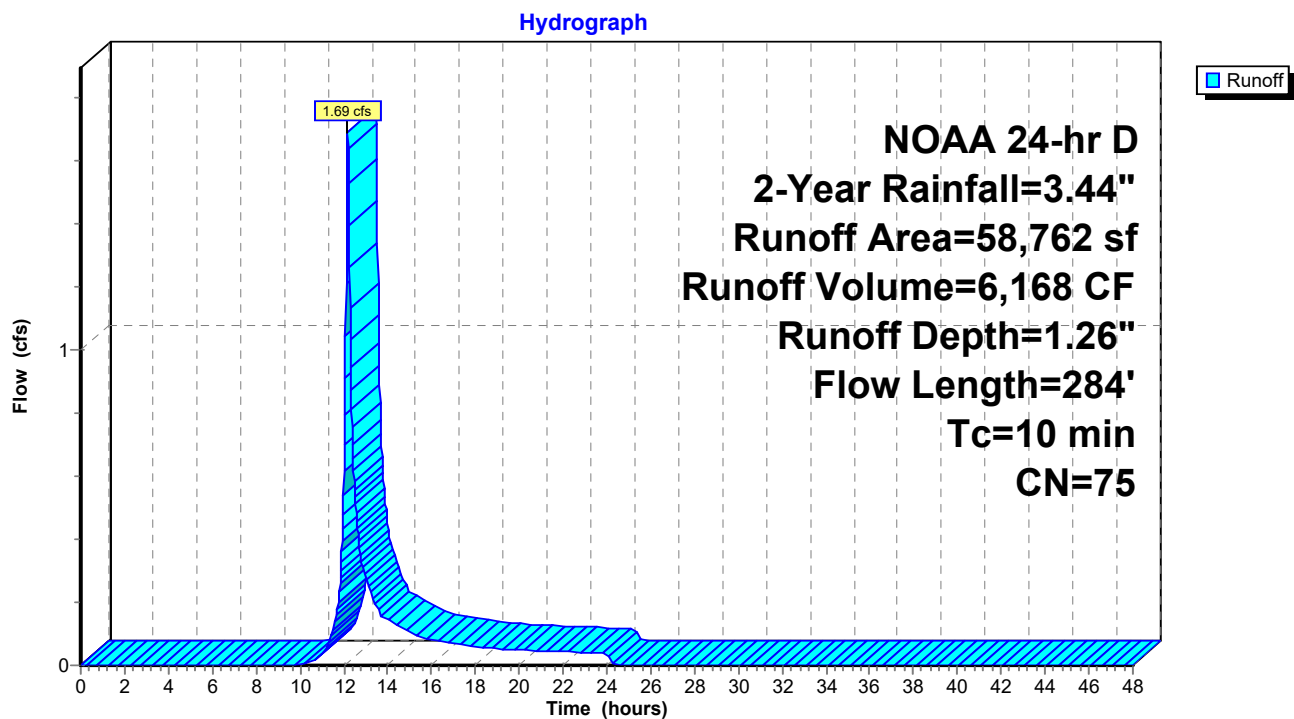
Routed to Link Site :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

	Area (sf)	CN	Description
*	0	98	Impervious
	0	69	50-75% Grass cover, Fair, HSG B
	0	79	50-75% Grass cover, Fair, HSG C
	21,344	84	50-75% Grass cover, Fair, HSG D
	0	80	>75% Grass cover, Good, HSG D
	10,977	55	Woods, Good, HSG B
	0	70	Woods, Good, HSG C
	25,352	77	Woods, Good, HSG D
*	1,089	78	Meadow, HSG D
	58,762	75	Weighted Average
	58,762		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8	150	0.0650	0.31		Sheet Flow, AB
					Grass: Short n= 0.150 P2= 3.44"
0	50	0.0650	1.78		Shallow Concentrated Flow, BC
					Short Grass Pasture Kv= 7.0 fps
1	84	0.0550	1.17		Shallow Concentrated Flow, CD
					Woodland Kv= 5.0 fps
10	284	Total			

Subcatchment PRWS-3:



Summary for Pond P1A:

Inflow Area = 3.81 ac, 61.09% Impervious, Inflow Depth = 2.48" for 2-Year event
 Inflow = 9.07 cfs @ 12.18 hrs, Volume= 34,350 CF
 Outflow = 2.54 cfs @ 12.52 hrs, Volume= 34,350 CF, Atten= 72%, Lag= 20.2 min
 Discarded = 0.32 cfs @ 12.52 hrs, Volume= 16,624 CF
 Primary = 2.22 cfs @ 12.52 hrs, Volume= 17,727 CF

Routed to Link PRWS-1 :

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
 Peak Elev= 103.04' @ 12.52 hrs Surf.Area= 0.14 ac Storage= 10,760 CF

Plug-Flow detention time= 63.7 min calculated for 34,336 CF (100% of inflow)
 Center-of-Mass det. time= 63.7 min (874.4 - 810.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.83'	1,254 CF	56.00'W x 112.00'L x 4.67'H Field A 29,269 CF Overall - 26,133 CF Embedded = 3,136 CF x 40.0% Voids
#2A	101.33'	19,419 CF	retain_it retain_it 3.5' x 98 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 7 Rows adjusted for 257.9 cf perimeter wall
		20,673 CF	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	100.83'	2.000 in/hr Exfiltration over Wetted area
#2	Primary	101.33'	24.0" Round Culvert L= 40.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 101.33' / 101.13' S= 0.0050 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	101.42'	6.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#4	Device 2	103.08'	10.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#5	Device 2	104.33'	5.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.32 cfs @ 12.52 hrs HW=103.04' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.32 cfs)

Primary OutFlow Max=2.22 cfs @ 12.52 hrs HW=103.04' (Free Discharge)

↑ **2=Culvert** (Passes 2.22 cfs of 8.92 cfs potential flow)
 ↑ **3=Orifice/Grate** (Orifice Controls 2.22 cfs @ 5.64 fps)
 ↑ **4=Orifice/Grate** (Controls 0.00 cfs)
 ↑ **5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P1A: - Chamber Wizard Field A

Chamber Model = retain_it retain_it 3.5' (retain-it@)

Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf

Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf

7 Rows adjusted for 257.9 cf perimeter wall

14 Chambers/Row x 8.00' Long = 112.00' Row Length

7 Rows x 96.0" Wide = 56.00' Base Width

6.0" Stone Base + 50.0" Chamber Height = 4.67' Field Height

6.1 cf Sidewall x 14 x 2 + 6.1 cf Endwall x 7 x 2 = 257.9 cf Perimeter Wall

98 Chambers x 200.8 cf - 257.9 cf Perimeter wall = 19,418.6 cf Chamber Storage

98 Chambers x 266.7 cf = 26,133.3 cf Displacement

29,269.3 cf Field - 26,133.3 cf Chambers = 3,136.0 cf Stone x 40.0% Voids = 1,254.4 cf Stone Storage

Chamber Storage + Stone Storage = 20,673.0 cf

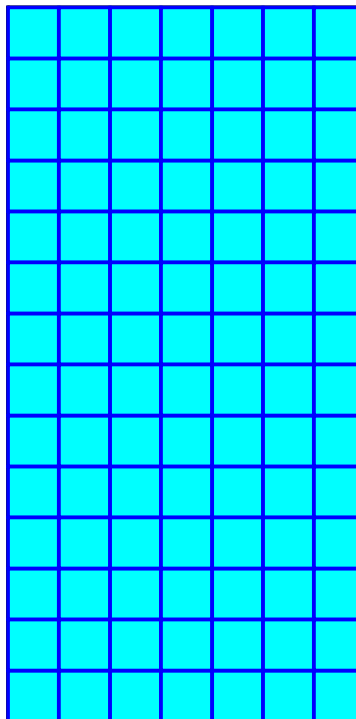
Overall Storage Efficiency = 70.6%

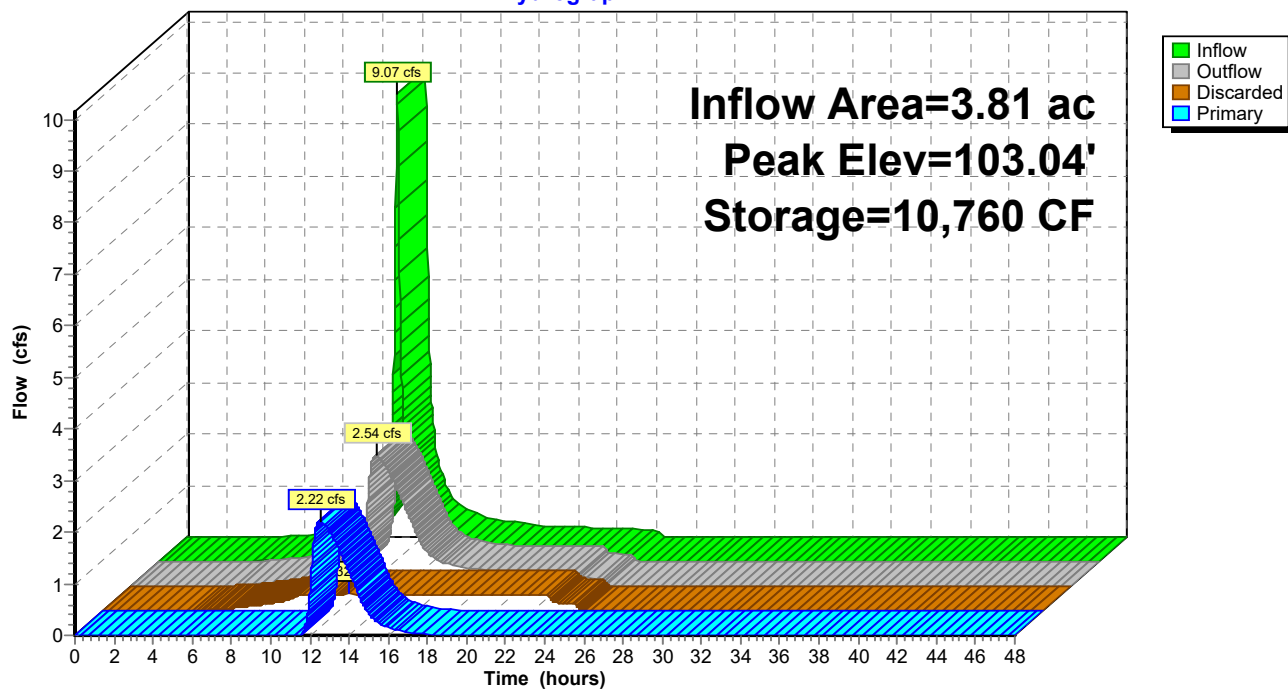
Overall System Size = 112.00' x 56.00' x 4.67'

98 Chambers

1,084.0 cy Field

116.1 cy Stone



Pond P1A:**Hydrograph**

Stage-Discharge for Pond P1A:

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
100.83	0.00	0.00	0.00	103.43	4.15	0.33	3.82
100.88	0.29	0.29	0.00	103.48	4.55	0.33	4.22
100.93	0.29	0.29	0.00	103.53	4.97	0.33	4.64
100.98	0.29	0.29	0.00	103.58	5.41	0.33	5.08
101.03	0.29	0.29	0.00	103.63	5.87	0.33	5.54
101.08	0.29	0.29	0.00	103.68	6.34	0.33	6.01
101.13	0.30	0.30	0.00	103.73	6.81	0.34	6.47
101.18	0.30	0.30	0.00	103.78	7.26	0.34	6.93
101.23	0.30	0.30	0.00	103.83	7.69	0.34	7.35
101.28	0.30	0.30	0.00	103.88	8.06	0.34	7.73
101.33	0.30	0.30	0.00	103.93	8.37	0.34	8.03
101.38	0.30	0.30	0.00	103.98	8.69	0.34	8.35
101.43	0.30	0.30	0.00	104.03	9.00	0.34	8.66
101.48	0.32	0.30	0.02	104.08	9.29	0.34	8.95
101.53	0.37	0.30	0.07	104.13	9.58	0.34	9.24
101.58	0.45	0.30	0.15	104.18	9.85	0.34	9.51
101.63	0.55	0.30	0.24	104.23	10.12	0.34	9.77
101.68	0.66	0.30	0.36	104.28	10.37	0.34	10.03
101.73	0.79	0.30	0.48	104.33	10.62	0.34	10.28
101.78	0.92	0.31	0.62	104.38	11.05	0.35	10.70
101.83	1.06	0.31	0.75	104.43	11.61	0.35	11.27
101.88	1.18	0.31	0.87	104.48	12.27	0.35	11.93
101.93	1.27	0.31	0.96	104.53	13.01	0.35	12.66
101.98	1.36	0.31	1.05	104.58	13.80	0.35	13.45
102.03	1.44	0.31	1.13	104.63	14.64	0.35	14.29
102.08	1.52	0.31	1.21	104.68	15.54	0.35	15.19
102.13	1.59	0.31	1.28	104.73	16.48	0.35	16.13
102.18	1.66	0.31	1.35	104.78	17.46	0.35	17.11
102.23	1.73	0.31	1.41	104.83	18.48	0.35	18.12
102.28	1.79	0.31	1.48	104.88	19.42	0.35	19.07
102.33	1.85	0.31	1.54	104.93	19.61	0.35	19.26
102.38	1.91	0.31	1.59	104.98	19.80	0.35	19.44
102.43	1.96	0.32	1.65	105.03	19.98	0.36	19.62
102.48	2.02	0.32	1.70	105.08	20.16	0.36	19.80
102.53	2.07	0.32	1.75	105.13	20.34	0.36	19.98
102.58	2.12	0.32	1.80	105.18	20.52	0.36	20.16
102.63	2.17	0.32	1.85	105.23	20.70	0.36	20.34
102.68	2.22	0.32	1.90	105.28	20.87	0.36	20.51
102.73	2.27	0.32	1.95	105.33	21.04	0.36	20.68
102.78	2.31	0.32	1.99	105.38	21.22	0.36	20.86
102.83	2.36	0.32	2.04	105.43	21.39	0.36	21.03
102.88	2.40	0.32	2.08	105.48	21.56	0.36	21.20
102.93	2.45	0.32	2.12				
102.98	2.49	0.32	2.16				
103.03	2.53	0.32	2.21				
103.08	2.57	0.33	2.25				
103.13	2.64	0.33	2.32				
103.18	2.77	0.33	2.44				
103.23	2.95	0.33	2.63				
103.28	3.19	0.33	2.86				
103.33	3.47	0.33	3.14				
103.38	3.79	0.33	3.46				

Stage-Area-Storage for Pond P1A:

Elevation (feet)	Wetted (acres)	Storage (cubic-feet)	Elevation (feet)	Wetted (acres)	Storage (cubic-feet)
100.83	0.14	0	103.43	0.16	12,906
100.88	0.14	125	103.48	0.16	13,183
100.93	0.14	251	103.53	0.16	13,460
100.98	0.15	376	103.58	0.17	13,738
101.03	0.15	502	103.63	0.17	14,015
101.08	0.15	627	103.68	0.17	14,293
101.13	0.15	753	103.73	0.17	14,570
101.18	0.15	878	103.78	0.17	14,847
101.23	0.15	1,004	103.83	0.17	15,125
101.28	0.15	1,129	103.88	0.17	15,402
101.33	0.15	1,254	103.93	0.17	15,680
101.38	0.15	1,532	103.98	0.17	15,957
101.43	0.15	1,809	104.03	0.17	16,234
101.48	0.15	2,087	104.08	0.17	16,512
101.53	0.15	2,364	104.13	0.17	16,789
101.58	0.15	2,641	104.18	0.17	17,067
101.63	0.15	2,919	104.23	0.17	17,344
101.68	0.15	3,196	104.28	0.17	17,622
101.73	0.15	3,474	104.33	0.17	17,899
101.78	0.15	3,751	104.38	0.17	18,176
101.83	0.15	4,028	104.43	0.17	18,454
101.88	0.15	4,306	104.48	0.17	18,731
101.93	0.15	4,583	104.53	0.17	19,009
101.98	0.15	4,861	104.58	0.17	19,286
102.03	0.15	5,138	104.63	0.17	19,563
102.08	0.15	5,416	104.68	0.17	19,841
102.13	0.15	5,693	104.73	0.17	20,118
102.18	0.15	5,970	104.78	0.17	20,396
102.23	0.15	6,248	104.83	0.17	20,673
102.28	0.16	6,525	104.88	0.18	20,673
102.33	0.16	6,803	104.93	0.18	20,673
102.38	0.16	7,080	104.98	0.18	20,673
102.43	0.16	7,357	105.03	0.18	20,673
102.48	0.16	7,635	105.08	0.18	20,673
102.53	0.16	7,912	105.13	0.18	20,673
102.58	0.16	8,190	105.18	0.18	20,673
102.63	0.16	8,467	105.23	0.18	20,673
102.68	0.16	8,744	105.28	0.18	20,673
102.73	0.16	9,022	105.33	0.18	20,673
102.78	0.16	9,299	105.38	0.18	20,673
102.83	0.16	9,577	105.43	0.18	20,673
102.88	0.16	9,854	105.48	0.18	20,673
102.93	0.16	10,131			
102.98	0.16	10,409			
103.03	0.16	10,686			
103.08	0.16	10,964			
103.13	0.16	11,241			
103.18	0.16	11,519			
103.23	0.16	11,796			
103.28	0.16	12,073			
103.33	0.16	12,351			
103.38	0.16	12,628			

PR WS_Convservation Submission

NOAA 24-hr D 2-Year Rainfall=3.44"

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Summary for Pond P2A:

Inflow Area = 3.41 ac, 72.31% Impervious, Inflow Depth = 2.68" for 2-Year event
 Inflow = 9.18 cfs @ 12.16 hrs, Volume= 33,087 CF
 Outflow = 1.72 cfs @ 12.63 hrs, Volume= 32,318 CF, Atten= 81%, Lag= 28.6 min
 Discarded = 0.06 cfs @ 12.63 hrs, Volume= 6,921 CF
 Primary = 1.67 cfs @ 12.63 hrs, Volume= 25,397 CF
 Routed to Link PRWS-2 :
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 CF
 Routed to Link PRWS-2 :

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
 Peak Elev= 102.32' @ 12.63 hrs Surf.Area= 9,822 sf Storage= 15,160 cf

Plug-Flow detention time= 271.8 min calculated for 32,318 CF (98% of inflow)
 Center-of-Mass det. time= 257.4 min (1,055.6 - 798.2)

Volume	Invert	Avail.Storage	Storage Description
#1	100.50'	35,494 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)
100.50	6,910	520.0	0	0	6,910
101.00	7,700	530.0	3,651	3,651	7,786
102.00	9,310	550.0	8,492	12,143	9,588
103.00	10,980	566.0	10,134	22,277	11,114
104.00	12,700	585.0	11,830	34,106	12,947
104.10	15,100	586.0	1,388	35,494	13,057

Device	Routing	Invert	Outlet Devices
#1	Primary	98.50'	15.0" Round Culvert L= 150.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 98.50' / 97.75' S= 0.0050 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Discarded	100.50'	0.250 in/hr Exfiltration over Wetted area
#3	Device 1	101.00'	8.0" Vert. Orifice C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.00'	24.0" x 36.0" Horiz. Grate C= 0.600 Limited to weir flow at low heads
#5	Secondary	103.50'	20.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.06 cfs @ 12.63 hrs HW=102.32' (Free Discharge)

↑**2=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=1.67 cfs @ 12.63 hrs HW=102.32' (Free Discharge)

↑**1=Culvert** (Passes 1.67 cfs of 7.72 cfs potential flow)

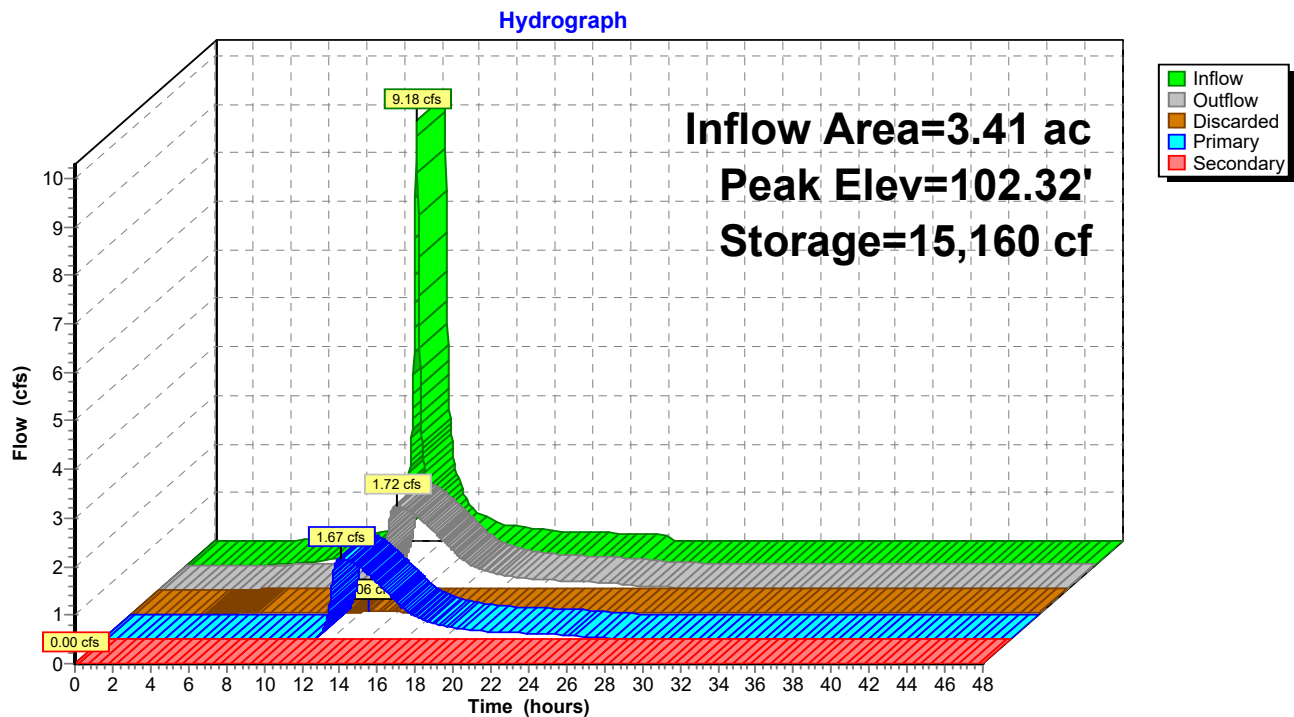
↑**3=Orifice** (Orifice Controls 1.67 cfs @ 4.77 fps)

↑**4=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=100.50' (Free Discharge)

↑**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2A:



PR WS_Convservation Submission

NOAA 24-hr D 2-Year Rainfall=3.44"

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Stage-Discharge for Pond P2A:

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
100.50	0.00	0.00	0.00	0.00
100.60	0.04	0.04	0.00	0.00
100.70	0.04	0.04	0.00	0.00
100.80	0.04	0.04	0.00	0.00
100.90	0.04	0.04	0.00	0.00
101.00	0.05	0.05	0.00	0.00
101.10	0.08	0.05	0.04	0.00
101.20	0.18	0.05	0.13	0.00
101.30	0.33	0.05	0.28	0.00
101.40	0.52	0.05	0.47	0.00
101.50	0.73	0.05	0.68	0.00
101.60	0.92	0.05	0.87	0.00
101.70	1.07	0.05	1.02	0.00
101.80	1.20	0.05	1.15	0.00
101.90	1.32	0.05	1.27	0.00
102.00	1.43	0.06	1.37	0.00
102.10	1.53	0.06	1.47	0.00
102.20	1.62	0.06	1.56	0.00
102.30	1.71	0.06	1.65	0.00
102.40	1.79	0.06	1.74	0.00
102.50	1.88	0.06	1.82	0.00
102.60	1.95	0.06	1.89	0.00
102.70	2.03	0.06	1.96	0.00
102.80	2.10	0.06	2.04	0.00
102.90	2.17	0.06	2.10	0.00
103.00	2.23	0.06	2.17	0.00
103.10	3.33	0.07	3.27	0.00
103.20	5.29	0.07	5.22	0.00
103.30	7.80	0.07	7.73	0.00
103.40	8.96	0.07	8.89	0.00
103.50	9.06	0.07	8.99	0.00
103.60	10.64	0.07	9.09	1.48
103.70	13.45	0.07	9.19	4.19
103.80	17.31	0.07	9.29	7.95
103.90	22.11	0.07	9.38	12.65
104.00	27.94	0.07	9.48	18.38
104.10	34.75	0.08	9.57	25.10

Stage-Area-Storage for Pond P2A:

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
100.50	6,910	6,910	0
100.60	7,065	7,084	699
100.70	7,221	7,258	1,413
100.80	7,379	7,433	2,143
100.90	7,539	7,609	2,889
101.00	7,700	7,786	3,651
101.10	7,854	7,963	4,428
101.20	8,010	8,141	5,222
101.30	8,167	8,319	6,030
101.40	8,326	8,498	6,855
101.50	8,486	8,678	7,696
101.60	8,648	8,859	8,552
101.70	8,811	9,040	9,425
101.80	8,976	9,222	10,315
101.90	9,142	9,404	11,220
102.00	9,310	9,588	12,143
102.10	9,471	9,738	13,082
102.20	9,633	9,889	14,037
102.30	9,797	10,041	15,009
102.40	9,961	10,193	15,997
102.50	10,128	10,345	17,001
102.60	10,295	10,498	18,022
102.70	10,465	10,652	19,060
102.80	10,635	10,805	20,115
102.90	10,807	10,959	21,187
103.00	10,980	11,114	22,277
103.10	11,146	11,295	23,383
103.20	11,314	11,476	24,506
103.30	11,483	11,658	25,646
103.40	11,653	11,840	26,802
103.50	11,824	12,023	27,976
103.60	11,997	12,207	29,167
103.70	12,171	12,391	30,376
103.80	12,346	12,576	31,602
103.90	12,522	12,761	32,845
104.00	12,700	12,947	34,106
104.10	15,100	13,057	35,494

Summary for Pond P2B:

Inflow Area = 3.19 ac, 61.07% Impervious, Inflow Depth = 2.48" for 2-Year event
 Inflow = 7.88 cfs @ 12.17 hrs, Volume= 28,795 CF
 Outflow = 2.21 cfs @ 12.47 hrs, Volume= 28,795 CF, Atten= 72%, Lag= 18.4 min
 Discarded = 0.30 cfs @ 12.47 hrs, Volume= 15,957 CF
 Primary = 1.91 cfs @ 12.47 hrs, Volume= 12,838 CF

Routed to Link PRWS-2 :

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
 Peak Elev= 109.44' @ 12.47 hrs Surf.Area= 0.13 ac Storage= 9,369 CF

Plug-Flow detention time= 86.4 min calculated for 28,783 CF (100% of inflow)
 Center-of-Mass det. time= 86.4 min (896.1 - 809.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	107.33'	1,152 CF	48.00'W x 120.00'L x 5.17'H Field A 29,760 CF Overall - 26,880 CF Embedded = 2,880 CF x 40.0% Voids
#2A	107.83'	20,467 CF	retain_it retain_it 4.0' x 90 Inside #1 Inside= 84.0"W x 48.0"H => 28.87 sf x 8.00'L = 230.9 cf Outside= 96.0"W x 56.0"H => 37.33 sf x 8.00'L = 298.7 cf 6 Rows adjusted for 317.1 cf perimeter wall
		21,619 CF	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	107.33'	2.000 in/hr Exfiltration over Wetted area
#2	Primary	107.83'	15.0" Round Culvert L= 40.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 107.83' / 105.83' S= 0.0500 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#3	Device 2	108.17'	6.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#4	Device 2	109.50'	12.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Device 2	111.33'	5.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.30 cfs @ 12.47 hrs HW=109.44' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.30 cfs)

Primary OutFlow Max=1.91 cfs @ 12.47 hrs HW=109.44' (Free Discharge)

↑ **2=Culvert** (Passes 1.91 cfs of 4.62 cfs potential flow)
 ↑ **3=Orifice/Grate** (Orifice Controls 1.91 cfs @ 4.85 fps)
 ↑ **4=Orifice/Grate** (Controls 0.00 cfs)
 ↑ **5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2B: - Chamber Wizard Field A**Chamber Model = retain_it retain_it 4.0' (retain-it@)**

Inside= 84.0"W x 48.0"H => 28.87 sf x 8.00'L = 230.9 cf

Outside= 96.0"W x 56.0"H => 37.33 sf x 8.00'L = 298.7 cf

6 Rows adjusted for 317.1 cf perimeter wall

15 Chambers/Row x 8.00' Long = 120.00' Row Length

6 Rows x 96.0" Wide = 48.00' Base Width

6.0" Stone Base + 56.0" Chamber Height = 5.17' Field Height

7.5 cf Sidewall x 15 x 2 + 7.5 cf Endwall x 6 x 2 = 317.1 cf Perimeter Wall

90 Chambers x 230.9 cf - 317.1 cf Perimeter wall = 20,467.5 cf Chamber Storage

90 Chambers x 298.7 cf = 26,880.0 cf Displacement

29,760.0 cf Field - 26,880.0 cf Chambers = 2,880.0 cf Stone x 40.0% Voids = 1,152.0 cf Stone Storage

Chamber Storage + Stone Storage = 21,619.5 cf

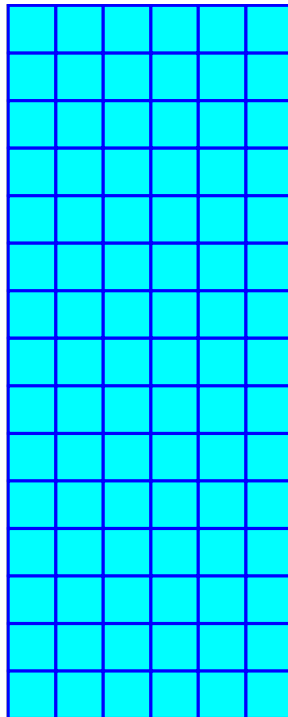
Overall Storage Efficiency = 72.6%

Overall System Size = 120.00' x 48.00' x 5.17'

90 Chambers

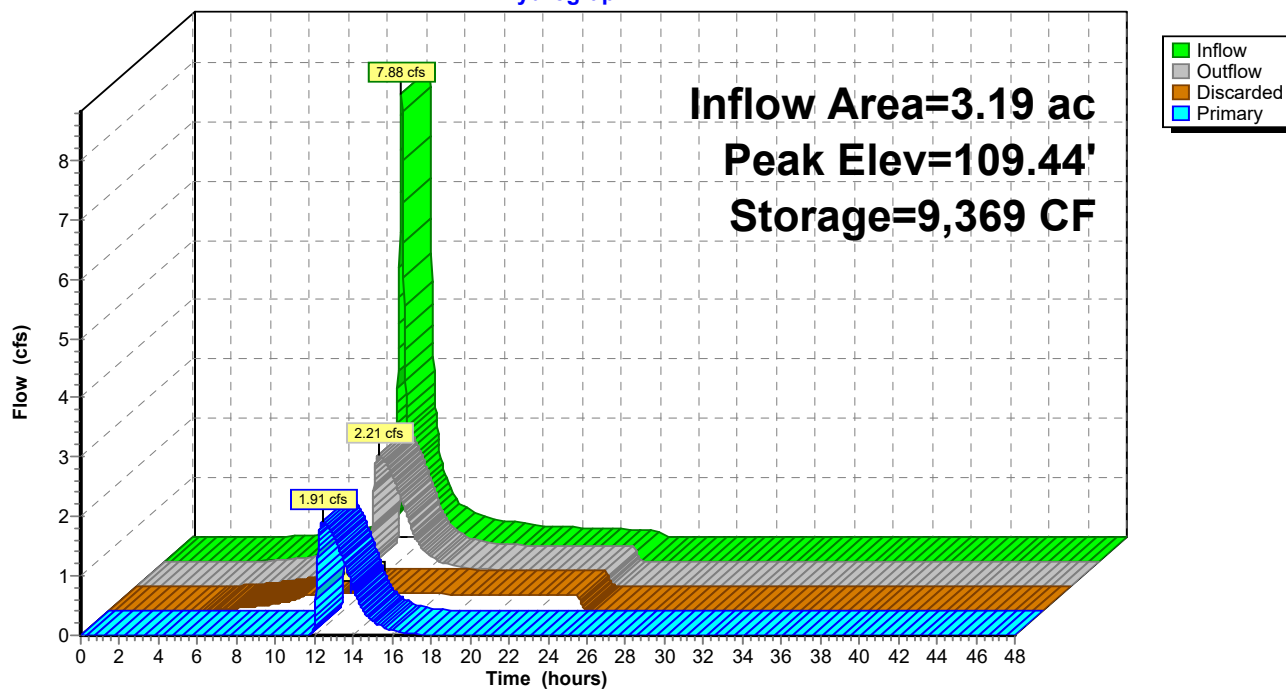
1,102.2 cy Field

106.7 cy Stone



Pond P2B:

Hydrograph



Stage-Discharge for Pond P2B:

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
107.33	0.00	0.00	0.00	109.93	3.35	0.31	3.04
107.38	0.27	0.27	0.00	109.98	3.55	0.31	3.24
107.43	0.27	0.27	0.00	110.03	3.76	0.31	3.45
107.48	0.27	0.27	0.00	110.08	3.97	0.31	3.66
107.53	0.27	0.27	0.00	110.13	4.19	0.31	3.88
107.58	0.27	0.27	0.00	110.18	4.42	0.31	4.11
107.63	0.27	0.27	0.00	110.23	4.64	0.31	4.33
107.68	0.27	0.27	0.00	110.28	4.87	0.31	4.56
107.73	0.27	0.27	0.00	110.33	5.09	0.31	4.77
107.78	0.27	0.27	0.00	110.38	5.30	0.31	4.99
107.83	0.27	0.27	0.00	110.43	5.50	0.31	5.18
107.88	0.28	0.28	0.00	110.48	5.66	0.32	5.35
107.93	0.28	0.28	0.00	110.53	5.82	0.32	5.50
107.98	0.28	0.28	0.00	110.58	5.98	0.32	5.66
108.03	0.28	0.28	0.00	110.63	6.13	0.32	5.81
108.08	0.28	0.28	0.00	110.68	6.28	0.32	5.96
108.13	0.28	0.28	0.00	110.73	6.42	0.32	6.10
108.18	0.28	0.28	0.00	110.78	6.56	0.32	6.24
108.23	0.30	0.28	0.02	110.83	6.70	0.32	6.38
108.28	0.35	0.28	0.07	110.88	6.84	0.32	6.51
108.33	0.43	0.28	0.15	110.93	6.97	0.32	6.64
108.38	0.53	0.28	0.24	110.98	7.09	0.32	6.77
108.43	0.64	0.28	0.36	111.03	7.22	0.32	6.89
108.48	0.77	0.28	0.48	111.08	7.34	0.33	7.01
108.53	0.90	0.29	0.62	111.13	7.46	0.33	7.13
108.58	1.04	0.29	0.75	111.18	7.58	0.33	7.25
108.63	1.16	0.29	0.87	111.23	7.69	0.33	7.36
108.68	1.25	0.29	0.96	111.28	7.80	0.33	7.48
108.73	1.34	0.29	1.05	111.33	7.92	0.33	7.59
108.78	1.42	0.29	1.13	111.38	8.21	0.33	7.88
108.83	1.50	0.29	1.21	111.43	8.38	0.33	8.05
108.88	1.57	0.29	1.28	111.48	8.44	0.33	8.11
108.93	1.64	0.29	1.35	111.53	8.51	0.33	8.18
108.98	1.71	0.29	1.41	111.58	8.58	0.33	8.25
109.03	1.77	0.29	1.48	111.63	8.65	0.33	8.31
109.08	1.83	0.29	1.54	111.68	8.71	0.33	8.38
109.13	1.89	0.29	1.59	111.73	8.78	0.34	8.44
109.18	1.94	0.30	1.65	111.78	8.84	0.34	8.51
109.23	2.00	0.30	1.70	111.83	8.91	0.34	8.57
109.28	2.05	0.30	1.75	111.88	8.97	0.34	8.63
109.33	2.10	0.30	1.80	111.93	9.03	0.34	8.70
109.38	2.15	0.30	1.85	111.98	9.10	0.34	8.76
109.43	2.20	0.30	1.90	112.03	9.16	0.34	8.82
109.48	2.25	0.30	1.95	112.08	9.22	0.34	8.88
109.53	2.30	0.30	2.00	112.13	9.28	0.34	8.94
109.58	2.37	0.30	2.06	112.18	9.35	0.34	9.00
109.63	2.46	0.30	2.15	112.23	9.41	0.34	9.06
109.68	2.56	0.30	2.26	112.28	9.47	0.34	9.12
109.73	2.69	0.30	2.39	112.33	9.53	0.34	9.18
109.78	2.83	0.30	2.53	112.38	9.59	0.35	9.24
109.83	2.99	0.31	2.69	112.43	9.65	0.35	9.30
109.88	3.17	0.31	2.86	112.48	9.71	0.35	9.36

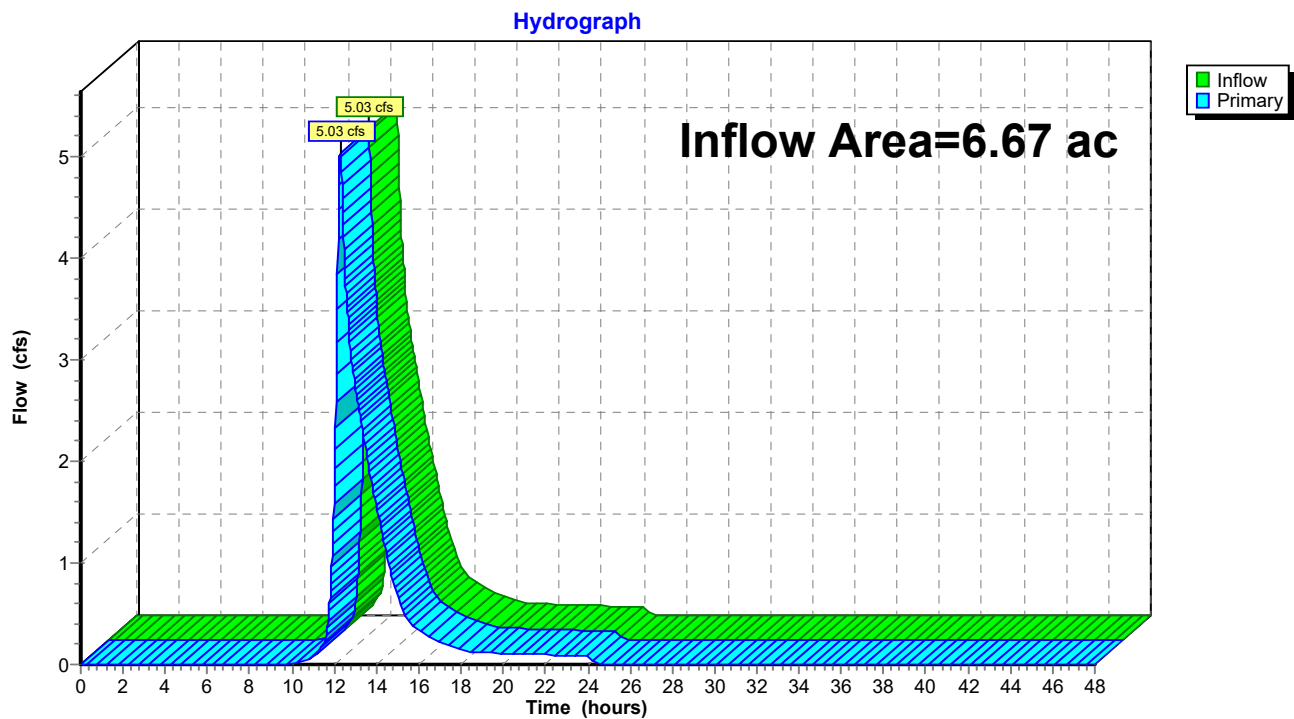
Stage-Area-Storage for Pond P2B:

Elevation (feet)	Wetted (acres)	Storage (cubic-feet)	Elevation (feet)	Wetted (acres)	Storage (cubic-feet)
107.33	0.13	0	109.93	0.15	11,897
107.38	0.13	115	109.98	0.15	12,153
107.43	0.13	230	110.03	0.15	12,409
107.48	0.13	346	110.08	0.15	12,665
107.53	0.13	461	110.13	0.15	12,921
107.58	0.13	576	110.18	0.15	13,177
107.63	0.13	691	110.23	0.15	13,432
107.68	0.13	806	110.28	0.15	13,688
107.73	0.14	922	110.33	0.16	13,944
107.78	0.14	1,037	110.38	0.16	14,200
107.83	0.14	1,152	110.43	0.16	14,456
107.88	0.14	1,408	110.48	0.16	14,712
107.93	0.14	1,664	110.53	0.16	14,968
107.98	0.14	1,920	110.58	0.16	15,223
108.03	0.14	2,175	110.63	0.16	15,479
108.08	0.14	2,431	110.68	0.16	15,735
108.13	0.14	2,687	110.73	0.16	15,991
108.18	0.14	2,943	110.78	0.16	16,247
108.23	0.14	3,199	110.83	0.16	16,503
108.28	0.14	3,455	110.88	0.16	16,758
108.33	0.14	3,710	110.93	0.16	17,014
108.38	0.14	3,966	110.98	0.16	17,270
108.43	0.14	4,222	111.03	0.16	17,526
108.48	0.14	4,478	111.08	0.16	17,782
108.53	0.14	4,734	111.13	0.16	18,038
108.58	0.14	4,990	111.18	0.16	18,294
108.63	0.14	5,245	111.23	0.16	18,549
108.68	0.14	5,501	111.28	0.16	18,805
108.73	0.14	5,757	111.33	0.16	19,061
108.78	0.14	6,013	111.38	0.16	19,317
108.83	0.14	6,269	111.43	0.16	19,573
108.88	0.14	6,525	111.48	0.16	19,829
108.93	0.14	6,781	111.53	0.16	20,084
108.98	0.14	7,036	111.58	0.17	20,340
109.03	0.15	7,292	111.63	0.17	20,596
109.08	0.15	7,548	111.68	0.17	20,852
109.13	0.15	7,804	111.73	0.17	21,108
109.18	0.15	8,060	111.78	0.17	21,364
109.23	0.15	8,316	111.83	0.17	21,619
109.28	0.15	8,571	111.88	0.17	21,619
109.33	0.15	8,827	111.93	0.17	21,619
109.38	0.15	9,083	111.98	0.17	21,619
109.43	0.15	9,339	112.03	0.17	21,619
109.48	0.15	9,595	112.08	0.17	21,619
109.53	0.15	9,851	112.13	0.17	21,619
109.58	0.15	10,107	112.18	0.17	21,619
109.63	0.15	10,362	112.23	0.17	21,619
109.68	0.15	10,618	112.28	0.17	21,619
109.73	0.15	10,874	112.33	0.17	21,619
109.78	0.15	11,130	112.38	0.17	21,619
109.83	0.15	11,386	112.43	0.17	21,619
109.88	0.15	11,642	112.48	0.17	21,619

Summary for Link PRWS-1:

Inflow Area = 6.67 ac, 40.48% Impervious, Inflow Depth = 1.30" for 2-Year event
Inflow = 5.03 cfs @ 12.28 hrs, Volume= 31,470 CF
Primary = 5.03 cfs @ 12.28 hrs, Volume= 31,470 CF, Atten= 0%, Lag= 0.0 min
Routed to Link Site :

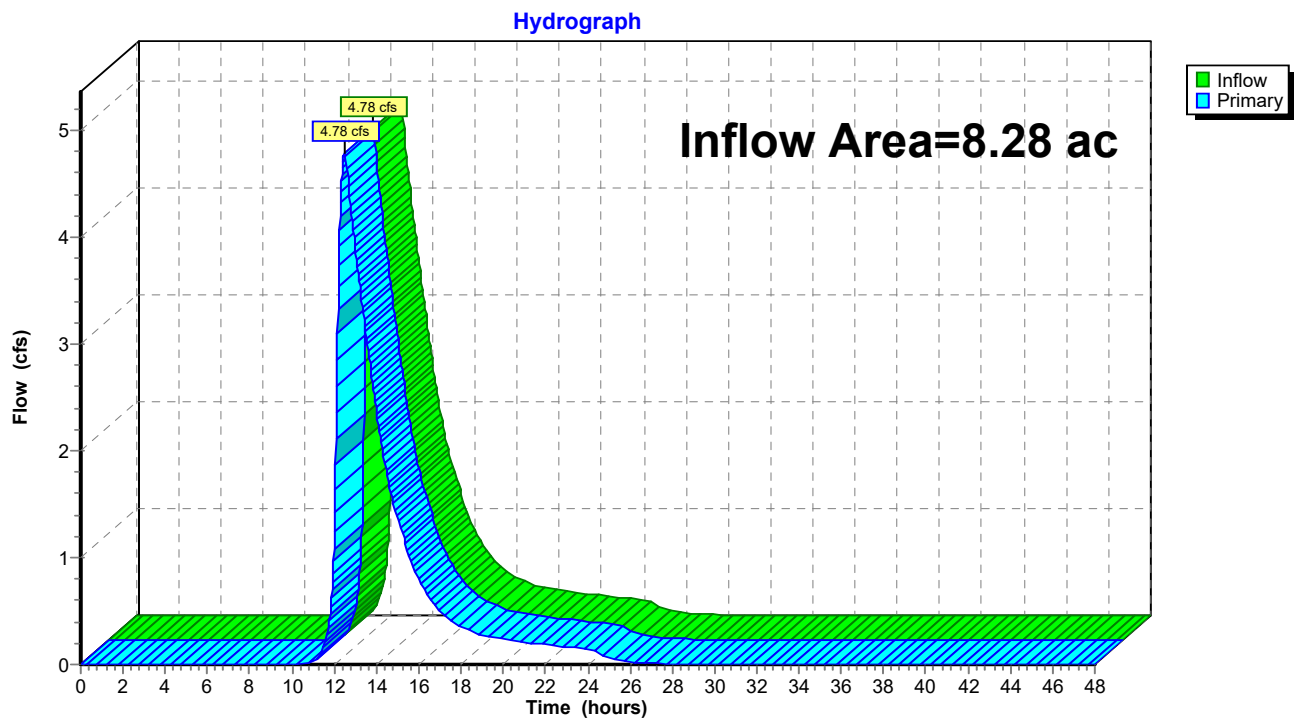
Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

Link PRWS-1:

Summary for Link PRWS-2:

Inflow Area = 8.28 ac, 56.00% Impervious, Inflow Depth = 1.53" for 2-Year event
Inflow = 4.78 cfs @ 12.48 hrs, Volume= 45,925 CF
Primary = 4.78 cfs @ 12.48 hrs, Volume= 45,925 CF, Atten= 0%, Lag= 0.0 min
Routed to Link Site :

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

Link PRWS-2:

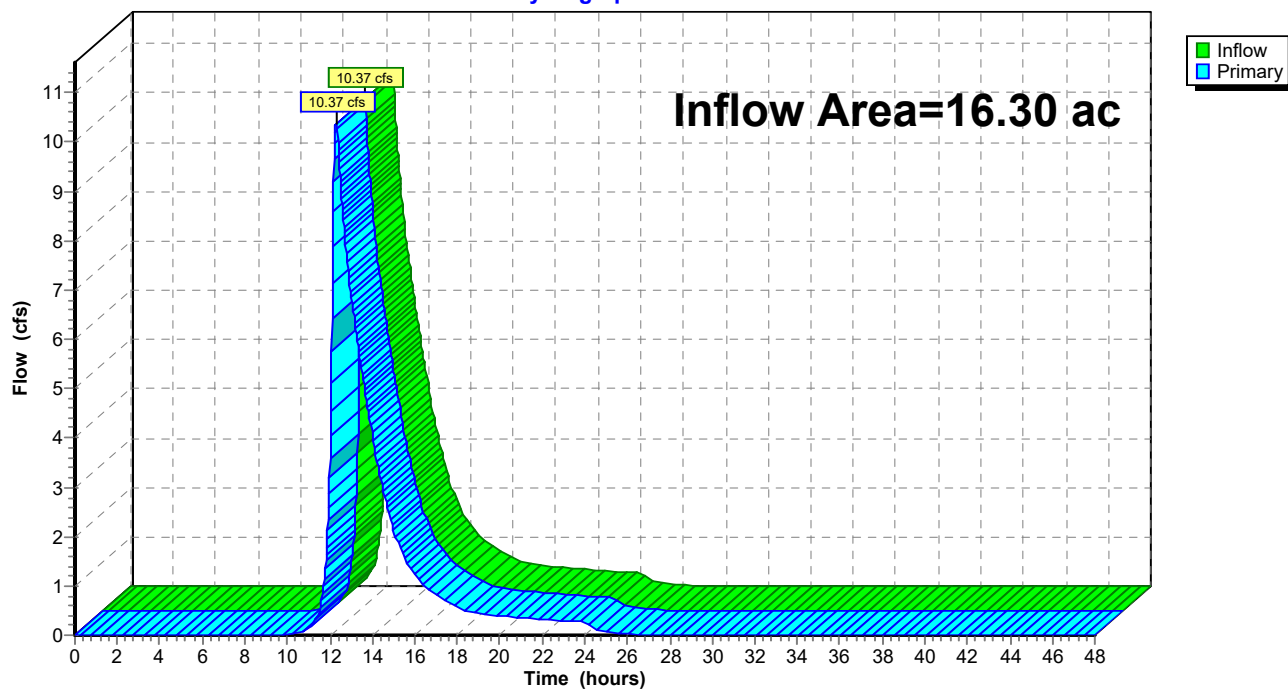
Summary for Link Site:

Inflow Area = 16.30 ac, 45.01% Impervious, Inflow Depth = 1.41" for 2-Year event
Inflow = 10.37 cfs @ 12.29 hrs, Volume= 83,562 CF
Primary = 10.37 cfs @ 12.29 hrs, Volume= 83,562 CF, Atten= 0%, Lag= 0.0 min

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

Link Site:

Hydrograph



PR WS_Convservation Submission

NOAA 24-hr D 10-Year Rainfall=5.14"

Prepared by Langan Engineering

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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+Trans method - Pond routing by Stor-Ind method

SubcatchmentPRWS-1A: Runoff Area=3.81 ac 61.09% Impervious Runoff Depth=4.12"
Flow Length=594' Tc=11 min CN=91 Runoff=14.62 cfs 56,940 CF

SubcatchmentPRWS-1B: Runoff Area=2.86 ac 13.06% Impervious Runoff Depth=2.65"
Flow Length=300' Tc=17 min CN=76 Runoff=6.18 cfs 27,564 CF

SubcatchmentPRWS-2A: Runoff Area=3.41 ac 72.31% Impervious Runoff Depth=4.34"
Flow Length=102' Tc=9 min CN=93 Runoff=14.44 cfs 53,587 CF

SubcatchmentPRWS-2B: Runoff Area=3.19 ac 61.07% Impervious Runoff Depth=4.12"
Flow Length=580' Tc=10 min CN=91 Runoff=12.70 cfs 47,731 CF

SubcatchmentPRWS-2C: Runoff Area=73,269 sf 13.38% Impervious Runoff Depth=2.56"
Flow Length=462' Tc=32 min CN=75 Runoff=2.57 cfs 15,651 CF

SubcatchmentPRWS-3: Runoff Area=58,762 sf 0.00% Impervious Runoff Depth=2.56"
Flow Length=284' Tc=10 min CN=75 Runoff=3.51 cfs 12,552 CF

Pond P1A: Peak Elev=103.86' Storage=15,316 CF Inflow=14.62 cfs 56,940 CF
Discarded=0.34 cfs 20,839 CF Primary=7.62 cfs 36,101 CF Outflow=7.96 cfs 56,940 CF

Pond P2A: Peak Elev=103.10' Storage=23,361 cf Inflow=14.44 cfs 53,587 CF
Discarded=0.07 cfs 7,354 CF Primary=3.24 cfs 45,362 CF Secondary=0.00 cfs 0 CF Outflow=3.31 cfs 52,716 CF

Pond P2B: Peak Elev=110.41' Storage=14,352 CF Inflow=12.70 cfs 47,731 CF
Discarded=0.31 cfs 19,954 CF Primary=5.10 cfs 27,778 CF Outflow=5.42 cfs 47,731 CF

Link PRWS-1: Inflow=13.53 cfs 63,664 CF
Primary=13.53 cfs 63,664 CF

Link PRWS-2: Inflow=10.58 cfs 88,790 CF
Primary=10.58 cfs 88,790 CF

Link Site: Inflow=24.83 cfs 165,007 CF
Primary=24.83 cfs 165,007 CF

Total Runoff Area = 16.30 ac Runoff Volume = 214,024 CF Average Runoff Depth = 3.62"
54.99% Pervious = 8.96 ac 45.01% Impervious = 7.34 ac

PR WS_Convservation Submission

NOAA 24-hr D 10-Year Rainfall=5.14"

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Summary for Subcatchment PRWS-1A:

Runoff = 14.62 cfs @ 12.18 hrs, Volume= 56,940 CF, Depth= 4.12"

Routed to Pond P1A :

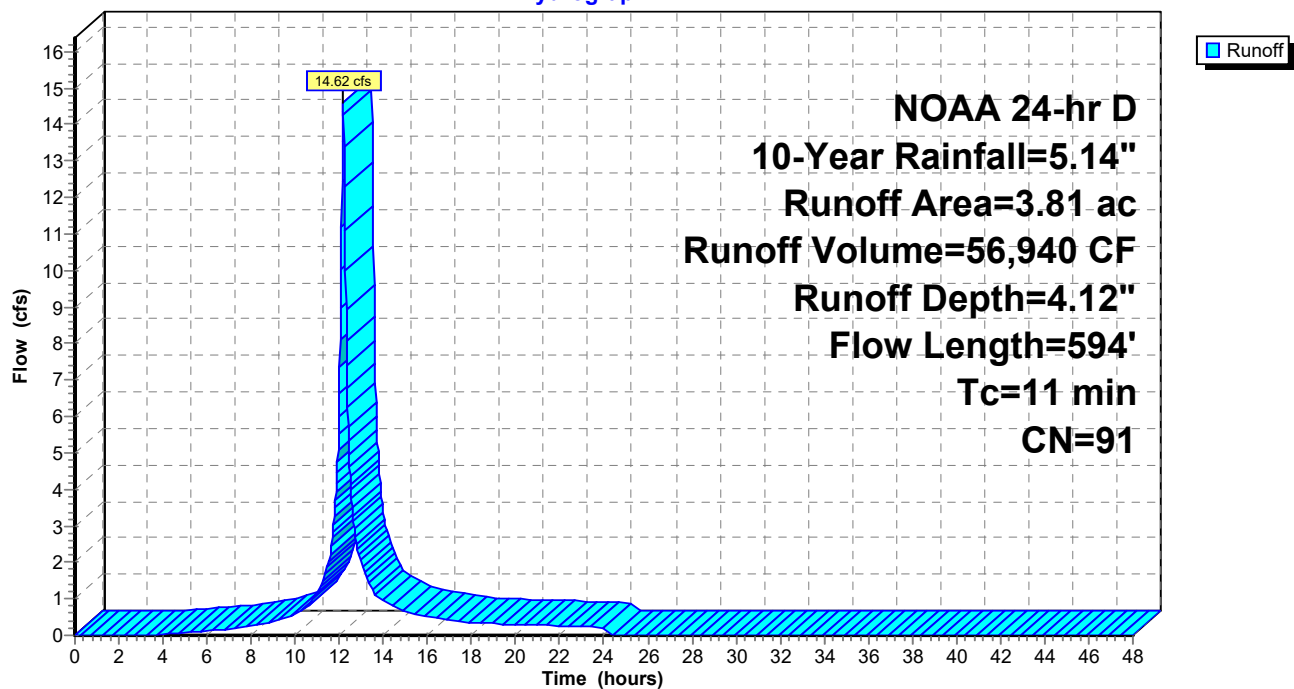
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 10-Year Rainfall=5.14"

Area (ac)	CN	Description
* 2.33	98	Impervious
0.00	61	>75% Grass cover, Good, HSG B
0.01	74	>75% Grass cover, Good, HSG C
0.38	80	>75% Grass cover, Good, HSG D
0.00	69	50-75% Grass cover, Fair, HSG B
0.00	79	50-75% Grass cover, Fair, HSG C
0.42	84	50-75% Grass cover, Fair, HSG D
0.02	55	Woods, Good, HSG B
0.00	70	Woods, Good, HSG C
0.24	77	Woods, Good, HSG D
* 0.00	71	Meadow, HSG C
* 0.32	78	Meadow, HSG D
* 0.00	89	Playground Surface, HSG C
* 0.08	91	Playground Surface, HSG D
3.81	91	Weighted Average
1.48		38.91% Pervious Area
2.33		61.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9	150	0.0500	0.28		Sheet Flow, AB Grass: Short n= 0.150 P2= 3.44"
0	12	0.0500	4.54		Shallow Concentrated Flow, BC Paved Kv= 20.3 fps
0	18	0.1000	2.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
1	132	0.0200	2.87		Shallow Concentrated Flow, DE Paved Kv= 20.3 fps
1	282	0.0100	7.20	22.62	Pipe Channel, EF 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
11	594	Total			

Subcatchment PRWS-1A:

Hydrograph



PR WS_Convservation Submission

NOAA 24-hr D 10-Year Rainfall=5.14"

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Summary for Subcatchment PRWS-1B:

Runoff = 6.18 cfs @ 12.26 hrs, Volume= 27,564 CF, Depth= 2.65"

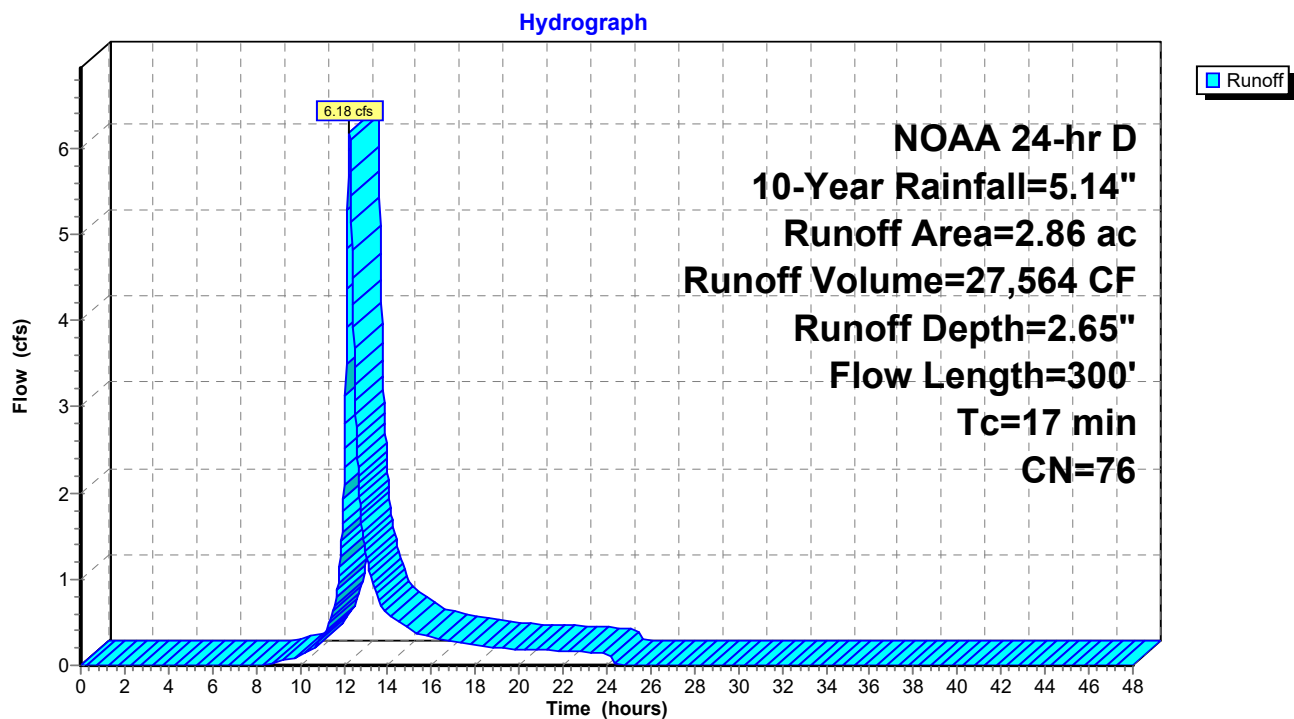
Routed to Link PRWS-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 10-Year Rainfall=5.14"

Area (ac)	CN	Description
* 0.37	98	Impervious
0.00	61	>75% Grass cover, Good, HSG B
0.87	74	>75% Grass cover, Good, HSG C
0.03	80	>75% Grass cover, Good, HSG D
0.00	69	50-75% Grass cover, Fair, HSG B
0.00	79	50-75% Grass cover, Fair, HSG C
0.07	84	50-75% Grass cover, Fair, HSG D
0.00	55	Woods, Good, HSG B
0.12	70	Woods, Good, HSG C
0.04	77	Woods, Good, HSG D
* 1.24	71	Meadow, HSG C
* 0.12	78	Meadow, HSG D
* 0.00	89	Playground Surface, HSG C
* 0.00	91	Playground Surface, HSG D
2.86	76	Weighted Average
2.49		86.94% Pervious Area
0.37		13.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2	25	0.2500	0.17		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 3.44"
3	35	0.0400	0.19		Sheet Flow, BC Grass: Short n= 0.150 P2= 3.44"
6	50	0.0400	0.14		Sheet Flow, CD Grass: Dense n= 0.240 P2= 3.44"
4	40	0.0650	0.16		Sheet Flow, DE Grass: Dense n= 0.240 P2= 3.44"
1	150	0.0800	1.98		Shallow Concentrated Flow, EF Short Grass Pasture Kv= 7.0 fps
17	300	Total			

Subcatchment PRWS-1B:



PR WS_Convservation Submission

NOAA 24-hr D 10-Year Rainfall=5.14"

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Summary for Subcatchment PRWS-2A:

Runoff = 14.44 cfs @ 12.16 hrs, Volume= 53,587 CF, Depth= 4.34"

Routed to Pond P2A :

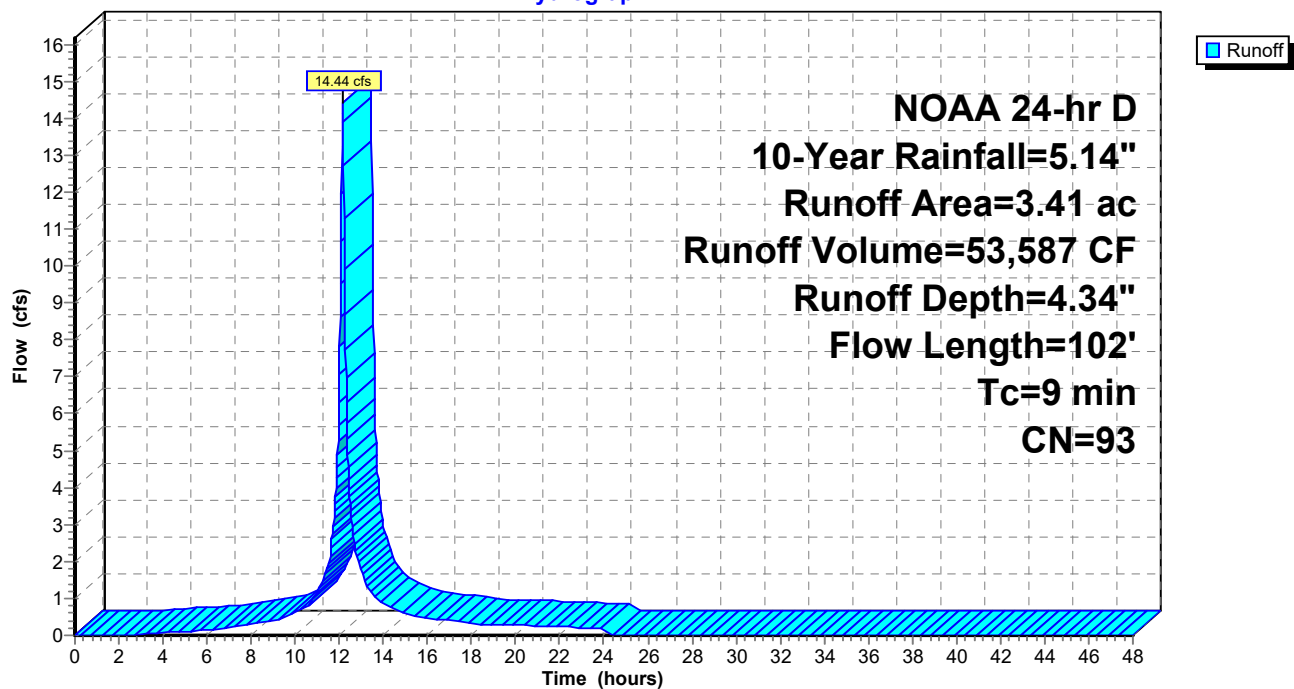
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 10-Year Rainfall=5.14"

Area (ac)	CN	Description
* 2.31	98	Impervious
* 0.15	98	Pond
0.00	61	>75% Grass cover, Good, HSG B
0.00	74	>75% Grass cover, Good, HSG C
0.00	80	>75% Grass cover, Good, HSG D
0.00	69	50-75% Grass cover, Fair, HSG B
0.00	79	50-75% Grass cover, Fair, HSG C
0.00	84	50-75% Grass cover, Fair, HSG D
0.00	55	Woods, Good, HSG B
0.00	70	Woods, Good, HSG C
0.00	77	Woods, Good, HSG D
* 0.00	58	Meadow, HSG B
* 0.49	71	Meadow, HSG C
* 0.10	78	Meadow, HSG D
* 0.17	89	Playground Surface, HSG C
* 0.19	91	Playground Surface, HSG D
3.41	93	Weighted Average
0.94		27.69% Pervious Area
2.46		72.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6	80	0.1250	0.24		Sheet Flow, AB
					Grass: Dense n= 0.240 P2= 3.44"
3	12	0.0200	0.08		Sheet Flow, BC
					Grass: Dense n= 0.240 P2= 3.44"
1	10	0.3333	0.24		Sheet Flow, CD
					Grass: Dense n= 0.240 P2= 3.44"
9	102	Total			

Subcatchment PRWS-2A:

Hydrograph



PR WS_Convservation Submission

NOAA 24-hr D 10-Year Rainfall=5.14"

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Summary for Subcatchment PRWS-2B:

Runoff = 12.70 cfs @ 12.17 hrs, Volume= 47,731 CF, Depth= 4.12"

Routed to Pond P2B :

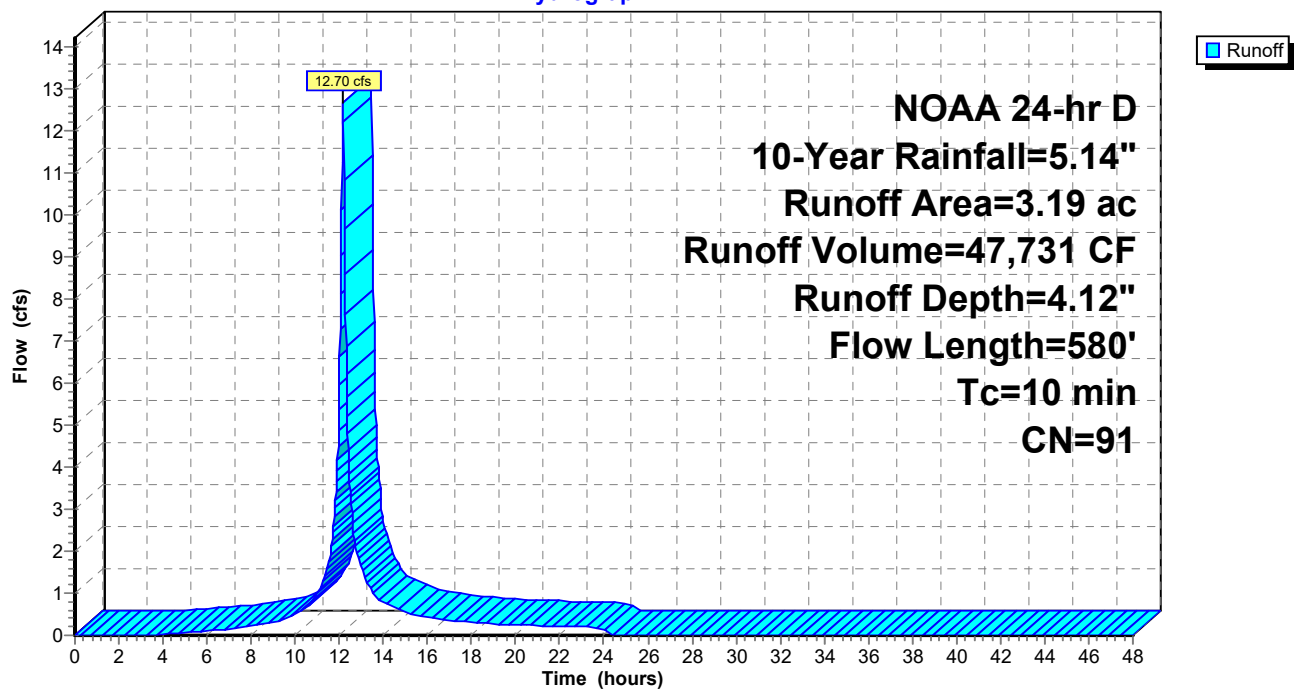
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 10-Year Rainfall=5.14"

Area (ac)	CN	Description
* 1.95	98	Impervious
0.00	61	>75% Grass cover, Good, HSG B
0.00	74	>75% Grass cover, Good, HSG C
0.46	80	>75% Grass cover, Good, HSG D
0.00	69	50-75% Grass cover, Fair, HSG B
0.00	79	50-75% Grass cover, Fair, HSG C
0.06	84	50-75% Grass cover, Fair, HSG D
0.02	55	Woods, Good, HSG B
0.00	70	Woods, Good, HSG C
0.06	77	Woods, Good, HSG D
* 0.06	58	Meadow, HSG B
* 0.43	78	Meadow, HSG D
* 0.00	89	Playground Surface, HSG C
* 0.16	91	Playground Surface, HSG D
3.19	91	Weighted Average
1.24		38.93% Pervious Area
1.95		61.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3	16	0.0600	0.09		Sheet Flow, AB
					Woods: Light underbrush n= 0.400 P2= 3.44"
3	25	0.0600	0.14		Sheet Flow, BC
					Grass: Dense n= 0.240 P2= 3.44"
1	11	0.3300	0.24		Sheet Flow, DE
					Grass: Dense n= 0.240 P2= 3.44"
1	7	0.1000	0.14		Sheet Flow, EF
					Grass: Dense n= 0.240 P2= 3.44"
2	521	0.0100	4.54	3.56	Pipe Channel, FG
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.013 Corrugated PE, smooth interior
10	580	Total			

Subcatchment PRWS-2B:

Hydrograph



PR WS_Convservation Submission

NOAA 24-hr D 10-Year Rainfall=5.14"

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Summary for Subcatchment PRWS-2C:

Runoff = 2.57 cfs @ 12.46 hrs, Volume= 15,651 CF, Depth= 2.56"

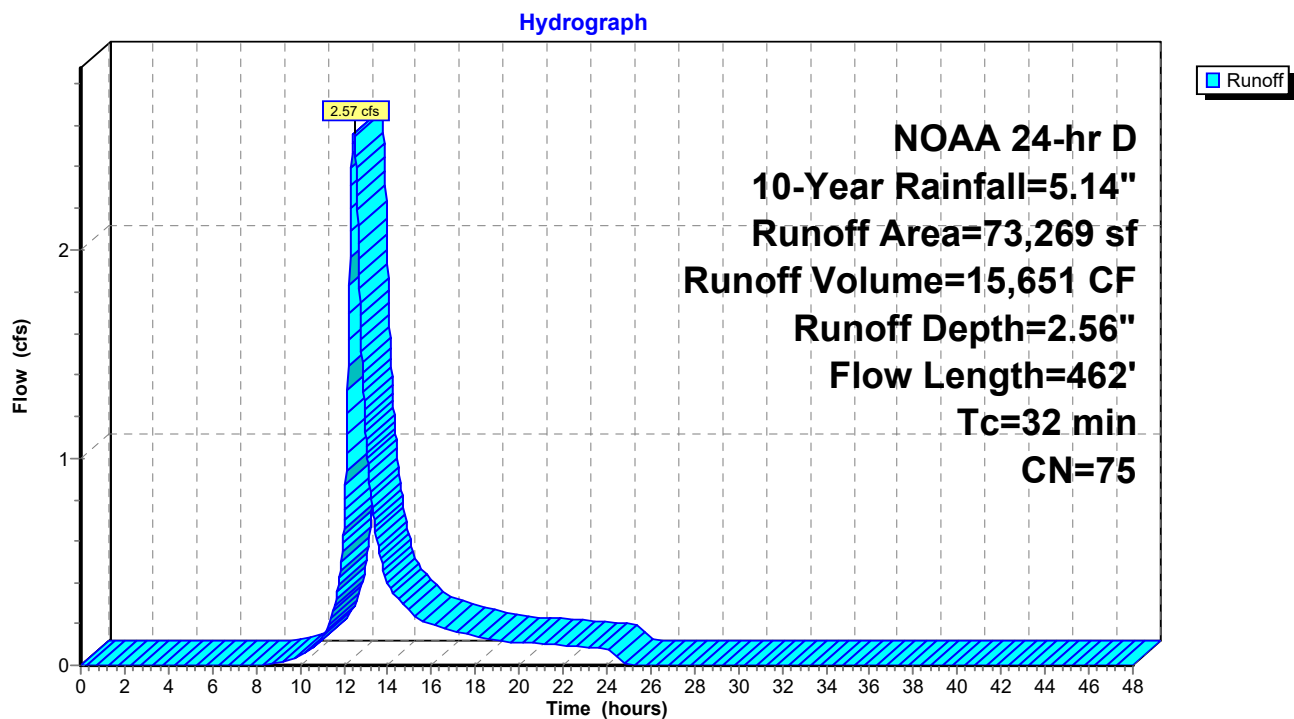
Routed to Link PRWS-2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 10-Year Rainfall=5.14"

	Area (sf)	CN	Description
*	9,801	98	Impervious
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
	0	69	50-75% Grass cover, Fair, HSG B
	0	79	50-75% Grass cover, Fair, HSG C
	0	84	50-75% Grass cover, Fair, HSG D
	0	55	Woods, Good, HSG B
	5,097	70	Woods, Good, HSG C
	0	77	Woods, Good, HSG D
*	3,703	58	Meadow, HSG B
*	37,941	71	Meadow, HSG C
*	16,727	78	Meadow, HSG D
*	0	89	Playground Surface, HSG C
*	0	91	Playground Surface, HSG D
	73,269	75	Weighted Average
	63,468		86.62% Pervious Area
	9,801		13.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19	87	0.0200	0.08		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 3.44"
10	63	0.0200	0.11		Sheet Flow, BC Grass: Dense n= 0.240 P2= 3.44"
1	60	0.0300	1.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
3	192	0.0200	0.99		Shallow Concentrated Flow, DE Short Grass Pasture Kv= 7.0 fps
0	60	0.0100	5.26	6.46	Pipe Channel, EF 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
32	462	Total			

Subcatchment PRWS-2C:



PR WS_Convservation Submission

NOAA 24-hr D 10-Year Rainfall=5.14"

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Summary for Subcatchment PRWS-3:

Runoff = 3.51 cfs @ 12.17 hrs, Volume= 12,552 CF, Depth= 2.56"

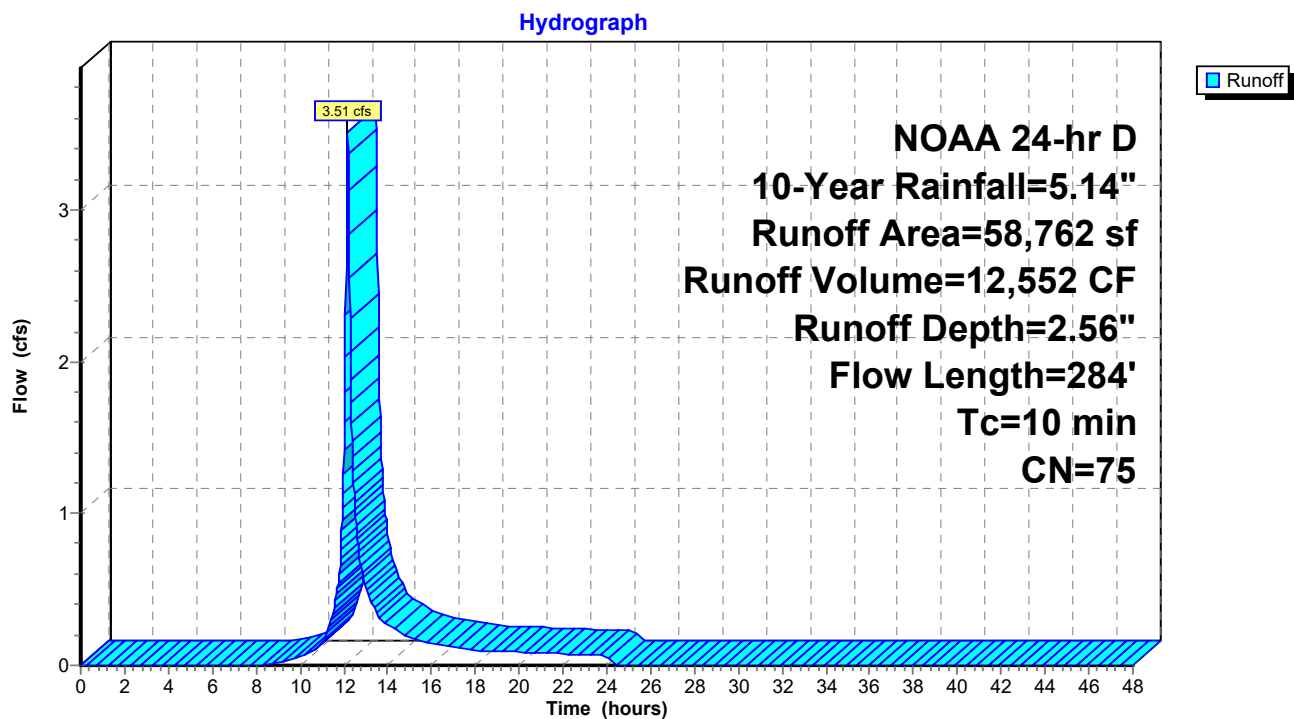
Routed to Link Site :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 10-Year Rainfall=5.14"

Area (sf)	CN	Description
* 0	98	Impervious
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
21,344	84	50-75% Grass cover, Fair, HSG D
0	80	>75% Grass cover, Good, HSG D
10,977	55	Woods, Good, HSG B
0	70	Woods, Good, HSG C
25,352	77	Woods, Good, HSG D
* 1,089	78	Meadow, HSG D
58,762	75	Weighted Average
58,762		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8	150	0.0650	0.31		Sheet Flow, AB
					Grass: Short n= 0.150 P2= 3.44"
0	50	0.0650	1.78		Shallow Concentrated Flow, BC
					Short Grass Pasture Kv= 7.0 fps
1	84	0.0550	1.17		Shallow Concentrated Flow, CD
					Woodland Kv= 5.0 fps
10	284	Total			

Subcatchment PRWS-3:



Summary for Pond P1A:

Inflow Area = 3.81 ac, 61.09% Impervious, Inflow Depth = 4.12" for 10-Year event
 Inflow = 14.62 cfs @ 12.18 hrs, Volume= 56,940 CF
 Outflow = 7.96 cfs @ 12.32 hrs, Volume= 56,940 CF, Atten= 46%, Lag= 8.8 min
 Discarded = 0.34 cfs @ 12.32 hrs, Volume= 20,839 CF
 Primary = 7.62 cfs @ 12.32 hrs, Volume= 36,101 CF

Routed to Link PRWS-1 :

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
 Peak Elev= 103.86' @ 12.32 hrs Surf.Area= 0.14 ac Storage= 15,316 CF

Plug-Flow detention time= 61.5 min calculated for 56,940 CF (100% of inflow)
 Center-of-Mass det. time= 61.5 min (856.7 - 795.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.83'	1,254 CF	56.00'W x 112.00'L x 4.67'H Field A 29,269 CF Overall - 26,133 CF Embedded = 3,136 CF x 40.0% Voids
#2A	101.33'	19,419 CF	retain_it retain_it 3.5' x 98 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 7 Rows adjusted for 257.9 cf perimeter wall
		20,673 CF	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	100.83'	2.000 in/hr Exfiltration over Wetted area
#2	Primary	101.33'	24.0" Round Culvert L= 40.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 101.33' / 101.13' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	101.42'	6.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#4	Device 2	103.08'	10.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#5	Device 2	104.33'	5.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.34 cfs @ 12.32 hrs HW=103.86' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.34 cfs)

Primary OutFlow Max=7.61 cfs @ 12.32 hrs HW=103.86' (Free Discharge)

↑ **2=Culvert** (Passes 7.61 cfs of 14.79 cfs potential flow)
 ↑ **3=Orifice/Grate** (Orifice Controls 2.80 cfs @ 7.13 fps)
 ↑ **4=Orifice/Grate** (Orifice Controls 4.81 cfs @ 3.01 fps)
 ↑ **5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P1A: - Chamber Wizard Field A

Chamber Model = retain_it retain_it 3.5' (retain-it@)

Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf

Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf

7 Rows adjusted for 257.9 cf perimeter wall

14 Chambers/Row x 8.00' Long = 112.00' Row Length

7 Rows x 96.0" Wide = 56.00' Base Width

6.0" Stone Base + 50.0" Chamber Height = 4.67' Field Height

6.1 cf Sidewall x 14 x 2 + 6.1 cf Endwall x 7 x 2 = 257.9 cf Perimeter Wall

98 Chambers x 200.8 cf - 257.9 cf Perimeter wall = 19,418.6 cf Chamber Storage

98 Chambers x 266.7 cf = 26,133.3 cf Displacement

29,269.3 cf Field - 26,133.3 cf Chambers = 3,136.0 cf Stone x 40.0% Voids = 1,254.4 cf Stone Storage

Chamber Storage + Stone Storage = 20,673.0 cf

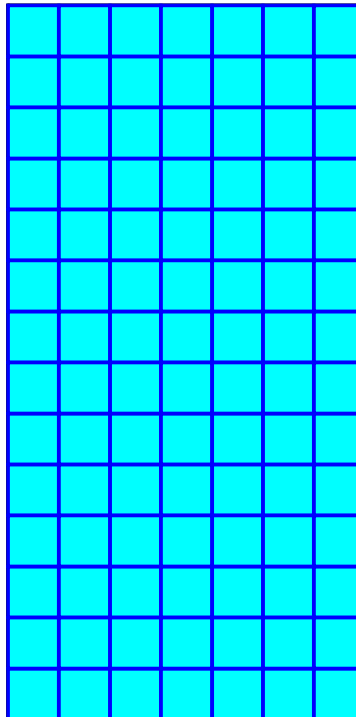
Overall Storage Efficiency = 70.6%

Overall System Size = 112.00' x 56.00' x 4.67'

98 Chambers

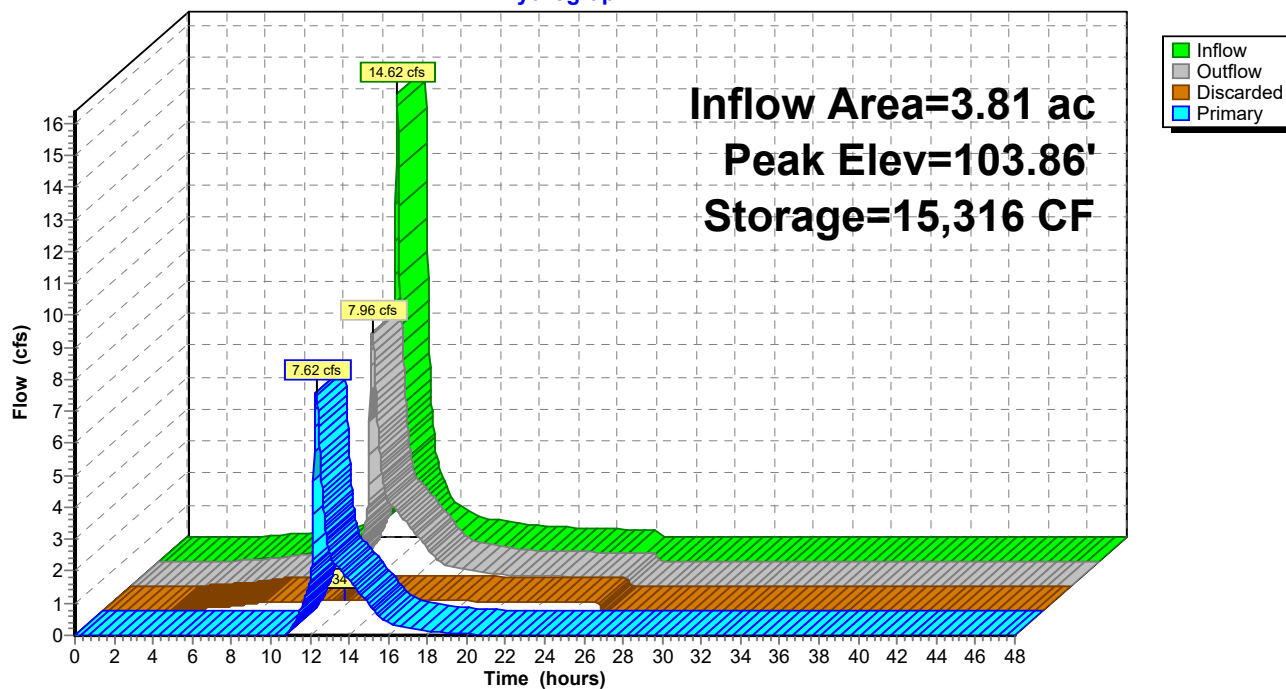
1,084.0 cy Field

116.1 cy Stone



Pond P1A:

Hydrograph



Stage-Discharge for Pond P1A:

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
100.83	0.00	0.00	0.00	103.43	4.15	0.33	3.82
100.88	0.29	0.29	0.00	103.48	4.55	0.33	4.22
100.93	0.29	0.29	0.00	103.53	4.97	0.33	4.64
100.98	0.29	0.29	0.00	103.58	5.41	0.33	5.08
101.03	0.29	0.29	0.00	103.63	5.87	0.33	5.54
101.08	0.29	0.29	0.00	103.68	6.34	0.33	6.01
101.13	0.30	0.30	0.00	103.73	6.81	0.34	6.47
101.18	0.30	0.30	0.00	103.78	7.26	0.34	6.93
101.23	0.30	0.30	0.00	103.83	7.69	0.34	7.35
101.28	0.30	0.30	0.00	103.88	8.06	0.34	7.73
101.33	0.30	0.30	0.00	103.93	8.37	0.34	8.03
101.38	0.30	0.30	0.00	103.98	8.69	0.34	8.35
101.43	0.30	0.30	0.00	104.03	9.00	0.34	8.66
101.48	0.32	0.30	0.02	104.08	9.29	0.34	8.95
101.53	0.37	0.30	0.07	104.13	9.58	0.34	9.24
101.58	0.45	0.30	0.15	104.18	9.85	0.34	9.51
101.63	0.55	0.30	0.24	104.23	10.12	0.34	9.77
101.68	0.66	0.30	0.36	104.28	10.37	0.34	10.03
101.73	0.79	0.30	0.48	104.33	10.62	0.34	10.28
101.78	0.92	0.31	0.62	104.38	11.05	0.35	10.70
101.83	1.06	0.31	0.75	104.43	11.61	0.35	11.27
101.88	1.18	0.31	0.87	104.48	12.27	0.35	11.93
101.93	1.27	0.31	0.96	104.53	13.01	0.35	12.66
101.98	1.36	0.31	1.05	104.58	13.80	0.35	13.45
102.03	1.44	0.31	1.13	104.63	14.64	0.35	14.29
102.08	1.52	0.31	1.21	104.68	15.54	0.35	15.19
102.13	1.59	0.31	1.28	104.73	16.48	0.35	16.13
102.18	1.66	0.31	1.35	104.78	17.46	0.35	17.11
102.23	1.73	0.31	1.41	104.83	18.48	0.35	18.12
102.28	1.79	0.31	1.48	104.88	19.42	0.35	19.07
102.33	1.85	0.31	1.54	104.93	19.61	0.35	19.26
102.38	1.91	0.31	1.59	104.98	19.80	0.35	19.44
102.43	1.96	0.32	1.65	105.03	19.98	0.36	19.62
102.48	2.02	0.32	1.70	105.08	20.16	0.36	19.80
102.53	2.07	0.32	1.75	105.13	20.34	0.36	19.98
102.58	2.12	0.32	1.80	105.18	20.52	0.36	20.16
102.63	2.17	0.32	1.85	105.23	20.70	0.36	20.34
102.68	2.22	0.32	1.90	105.28	20.87	0.36	20.51
102.73	2.27	0.32	1.95	105.33	21.04	0.36	20.68
102.78	2.31	0.32	1.99	105.38	21.22	0.36	20.86
102.83	2.36	0.32	2.04	105.43	21.39	0.36	21.03
102.88	2.40	0.32	2.08	105.48	21.56	0.36	21.20
102.93	2.45	0.32	2.12				
102.98	2.49	0.32	2.16				
103.03	2.53	0.32	2.21				
103.08	2.57	0.33	2.25				
103.13	2.64	0.33	2.32				
103.18	2.77	0.33	2.44				
103.23	2.95	0.33	2.63				
103.28	3.19	0.33	2.86				
103.33	3.47	0.33	3.14				
103.38	3.79	0.33	3.46				

Stage-Area-Storage for Pond P1A:

Elevation (feet)	Wetted (acres)	Storage (cubic-feet)	Elevation (feet)	Wetted (acres)	Storage (cubic-feet)
100.83	0.14	0	103.43	0.16	12,906
100.88	0.14	125	103.48	0.16	13,183
100.93	0.14	251	103.53	0.16	13,460
100.98	0.15	376	103.58	0.17	13,738
101.03	0.15	502	103.63	0.17	14,015
101.08	0.15	627	103.68	0.17	14,293
101.13	0.15	753	103.73	0.17	14,570
101.18	0.15	878	103.78	0.17	14,847
101.23	0.15	1,004	103.83	0.17	15,125
101.28	0.15	1,129	103.88	0.17	15,402
101.33	0.15	1,254	103.93	0.17	15,680
101.38	0.15	1,532	103.98	0.17	15,957
101.43	0.15	1,809	104.03	0.17	16,234
101.48	0.15	2,087	104.08	0.17	16,512
101.53	0.15	2,364	104.13	0.17	16,789
101.58	0.15	2,641	104.18	0.17	17,067
101.63	0.15	2,919	104.23	0.17	17,344
101.68	0.15	3,196	104.28	0.17	17,622
101.73	0.15	3,474	104.33	0.17	17,899
101.78	0.15	3,751	104.38	0.17	18,176
101.83	0.15	4,028	104.43	0.17	18,454
101.88	0.15	4,306	104.48	0.17	18,731
101.93	0.15	4,583	104.53	0.17	19,009
101.98	0.15	4,861	104.58	0.17	19,286
102.03	0.15	5,138	104.63	0.17	19,563
102.08	0.15	5,416	104.68	0.17	19,841
102.13	0.15	5,693	104.73	0.17	20,118
102.18	0.15	5,970	104.78	0.17	20,396
102.23	0.15	6,248	104.83	0.17	20,673
102.28	0.16	6,525	104.88	0.18	20,673
102.33	0.16	6,803	104.93	0.18	20,673
102.38	0.16	7,080	104.98	0.18	20,673
102.43	0.16	7,357	105.03	0.18	20,673
102.48	0.16	7,635	105.08	0.18	20,673
102.53	0.16	7,912	105.13	0.18	20,673
102.58	0.16	8,190	105.18	0.18	20,673
102.63	0.16	8,467	105.23	0.18	20,673
102.68	0.16	8,744	105.28	0.18	20,673
102.73	0.16	9,022	105.33	0.18	20,673
102.78	0.16	9,299	105.38	0.18	20,673
102.83	0.16	9,577	105.43	0.18	20,673
102.88	0.16	9,854	105.48	0.18	20,673
102.93	0.16	10,131			
102.98	0.16	10,409			
103.03	0.16	10,686			
103.08	0.16	10,964			
103.13	0.16	11,241			
103.18	0.16	11,519			
103.23	0.16	11,796			
103.28	0.16	12,073			
103.33	0.16	12,351			
103.38	0.16	12,628			

PR WS_Convservation Submission

NOAA 24-hr D 10-Year Rainfall=5.14"

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Summary for Pond P2A:

Inflow Area = 3.41 ac, 72.31% Impervious, Inflow Depth = 4.34" for 10-Year event
 Inflow = 14.44 cfs @ 12.16 hrs, Volume= 53,587 CF
 Outflow = 3.31 cfs @ 12.53 hrs, Volume= 52,716 CF, Atten= 77%, Lag= 22.2 min
 Discarded = 0.07 cfs @ 12.53 hrs, Volume= 7,354 CF
 Primary = 3.24 cfs @ 12.53 hrs, Volume= 45,362 CF
 Routed to Link PRWS-2 :
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 CF
 Routed to Link PRWS-2 :

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
 Peak Elev= 103.10' @ 12.53 hrs Surf.Area= 11,143 sf Storage= 23,361 cf

Plug-Flow detention time= 220.8 min calculated for 52,716 CF (98% of inflow)
 Center-of-Mass det. time= 210.4 min (994.5 - 784.0)

Volume	Invert	Avail.Storage	Storage Description		
#1	100.50'	35,494 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)
100.50	6,910	520.0	0	0	6,910
101.00	7,700	530.0	3,651	3,651	7,786
102.00	9,310	550.0	8,492	12,143	9,588
103.00	10,980	566.0	10,134	22,277	11,114
104.00	12,700	585.0	11,830	34,106	12,947
104.10	15,100	586.0	1,388	35,494	13,057

Device	Routing	Invert	Outlet Devices
#1	Primary	98.50'	15.0" Round Culvert L= 150.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 98.50' / 97.75' S= 0.0050 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Discarded	100.50'	0.250 in/hr Exfiltration over Wetted area
#3	Device 1	101.00'	8.0" Vert. Orifice C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.00'	24.0" x 36.0" Horiz. Grate C= 0.600 Limited to weir flow at low heads
#5	Secondary	103.50'	20.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.07 cfs @ 12.53 hrs HW=103.10' (Free Discharge)

↑ **2=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=3.23 cfs @ 12.53 hrs HW=103.10' (Free Discharge)

↑ **1=Culvert** (Passes 3.23 cfs of 8.58 cfs potential flow)

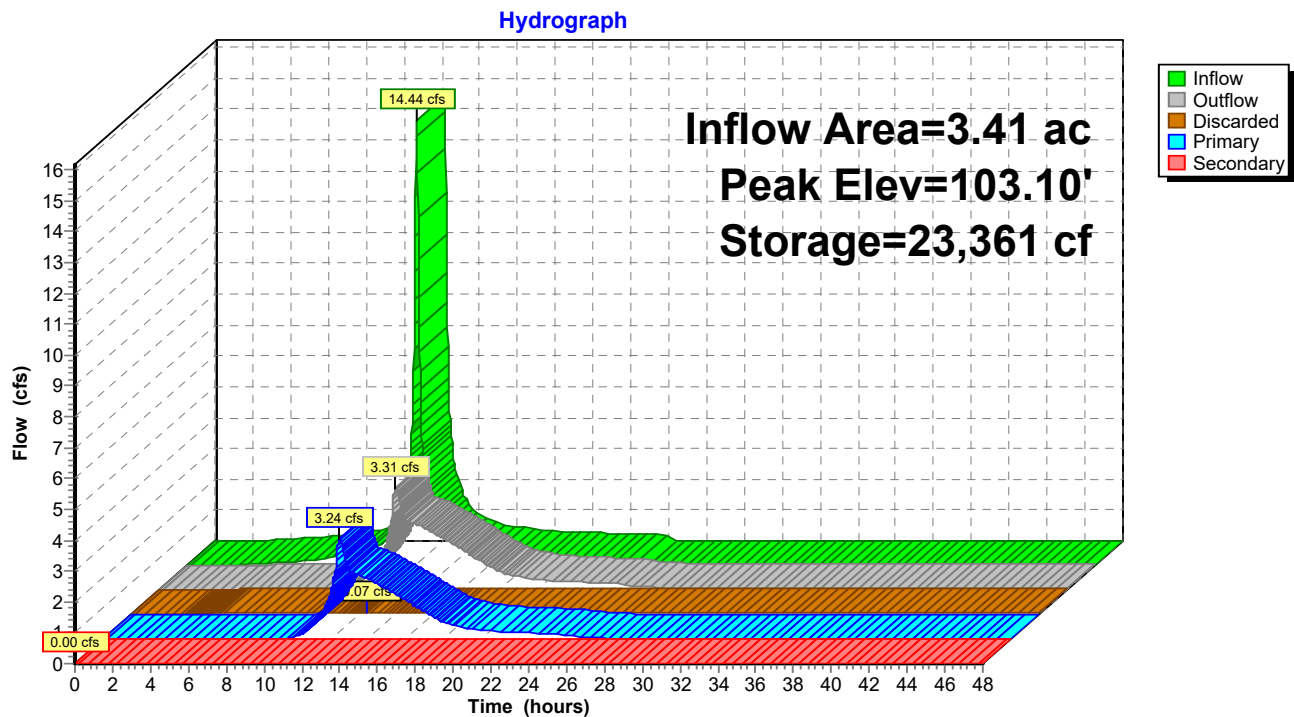
↑ **3=Orifice** (Orifice Controls 2.23 cfs @ 6.40 fps)

↑ **4=Grate** (Weir Controls 1.00 cfs @ 1.02 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=100.50' (Free Discharge)

↑ **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2A:



PR WS_Convservation Submission

NOAA 24-hr D 10-Year Rainfall=5.14"

Prepared by Langan Engineering

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Stage-Discharge for Pond P2A:

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
100.50	0.00	0.00	0.00	0.00
100.60	0.04	0.04	0.00	0.00
100.70	0.04	0.04	0.00	0.00
100.80	0.04	0.04	0.00	0.00
100.90	0.04	0.04	0.00	0.00
101.00	0.05	0.05	0.00	0.00
101.10	0.08	0.05	0.04	0.00
101.20	0.18	0.05	0.13	0.00
101.30	0.33	0.05	0.28	0.00
101.40	0.52	0.05	0.47	0.00
101.50	0.73	0.05	0.68	0.00
101.60	0.92	0.05	0.87	0.00
101.70	1.07	0.05	1.02	0.00
101.80	1.20	0.05	1.15	0.00
101.90	1.32	0.05	1.27	0.00
102.00	1.43	0.06	1.37	0.00
102.10	1.53	0.06	1.47	0.00
102.20	1.62	0.06	1.56	0.00
102.30	1.71	0.06	1.65	0.00
102.40	1.79	0.06	1.74	0.00
102.50	1.88	0.06	1.82	0.00
102.60	1.95	0.06	1.89	0.00
102.70	2.03	0.06	1.96	0.00
102.80	2.10	0.06	2.04	0.00
102.90	2.17	0.06	2.10	0.00
103.00	2.23	0.06	2.17	0.00
103.10	3.33	0.07	3.27	0.00
103.20	5.29	0.07	5.22	0.00
103.30	7.80	0.07	7.73	0.00
103.40	8.96	0.07	8.89	0.00
103.50	9.06	0.07	8.99	0.00
103.60	10.64	0.07	9.09	1.48
103.70	13.45	0.07	9.19	4.19
103.80	17.31	0.07	9.29	7.95
103.90	22.11	0.07	9.38	12.65
104.00	27.94	0.07	9.48	18.38
104.10	34.75	0.08	9.57	25.10

Stage-Area-Storage for Pond P2A:

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
100.50	6,910	6,910	0
100.60	7,065	7,084	699
100.70	7,221	7,258	1,413
100.80	7,379	7,433	2,143
100.90	7,539	7,609	2,889
101.00	7,700	7,786	3,651
101.10	7,854	7,963	4,428
101.20	8,010	8,141	5,222
101.30	8,167	8,319	6,030
101.40	8,326	8,498	6,855
101.50	8,486	8,678	7,696
101.60	8,648	8,859	8,552
101.70	8,811	9,040	9,425
101.80	8,976	9,222	10,315
101.90	9,142	9,404	11,220
102.00	9,310	9,588	12,143
102.10	9,471	9,738	13,082
102.20	9,633	9,889	14,037
102.30	9,797	10,041	15,009
102.40	9,961	10,193	15,997
102.50	10,128	10,345	17,001
102.60	10,295	10,498	18,022
102.70	10,465	10,652	19,060
102.80	10,635	10,805	20,115
102.90	10,807	10,959	21,187
103.00	10,980	11,114	22,277
103.10	11,146	11,295	23,383
103.20	11,314	11,476	24,506
103.30	11,483	11,658	25,646
103.40	11,653	11,840	26,802
103.50	11,824	12,023	27,976
103.60	11,997	12,207	29,167
103.70	12,171	12,391	30,376
103.80	12,346	12,576	31,602
103.90	12,522	12,761	32,845
104.00	12,700	12,947	34,106
104.10	15,100	13,057	35,494

Summary for Pond P2B:

Inflow Area = 3.19 ac, 61.07% Impervious, Inflow Depth = 4.12" for 10-Year event
 Inflow = 12.70 cfs @ 12.17 hrs, Volume= 47,731 CF
 Outflow = 5.42 cfs @ 12.35 hrs, Volume= 47,731 CF, Atten= 57%, Lag= 11.1 min
 Discarded = 0.31 cfs @ 12.35 hrs, Volume= 19,954 CF
 Primary = 5.10 cfs @ 12.35 hrs, Volume= 27,778 CF
 Routed to Link PRWS-2 :

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
 Peak Elev= 110.41' @ 12.35 hrs Surf.Area= 0.13 ac Storage= 14,352 CF

Plug-Flow detention time= 81.3 min calculated for 47,711 CF (100% of inflow)
 Center-of-Mass det. time= 81.3 min (875.6 - 794.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	107.33'	1,152 CF	48.00'W x 120.00'L x 5.17'H Field A 29,760 CF Overall - 26,880 CF Embedded = 2,880 CF x 40.0% Voids
#2A	107.83'	20,467 CF	retain_it retain_it 4.0' x 90 Inside #1 Inside= 84.0"W x 48.0"H => 28.87 sf x 8.00'L = 230.9 cf Outside= 96.0"W x 56.0"H => 37.33 sf x 8.00'L = 298.7 cf 6 Rows adjusted for 317.1 cf perimeter wall
		21,619 CF	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	107.33'	2.000 in/hr Exfiltration over Wetted area
#2	Primary	107.83'	15.0" Round Culvert L= 40.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 107.83' / 105.83' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#3	Device 2	108.17'	6.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#4	Device 2	109.50'	12.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Device 2	111.33'	5.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.31 cfs @ 12.35 hrs HW=110.41' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=5.10 cfs @ 12.35 hrs HW=110.41' (Free Discharge)

↑ **2=Culvert** (Passes 5.10 cfs of 6.52 cfs potential flow)
 ↑ **3=Orifice/Grate** (Orifice Controls 2.67 cfs @ 6.79 fps)
 ↑ **4=Orifice/Grate** (Orifice Controls 2.43 cfs @ 3.25 fps)
 ↑ **5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2B: - Chamber Wizard Field A**Chamber Model = retain_it retain_it 4.0' (retain-it@)**

Inside= 84.0"W x 48.0"H => 28.87 sf x 8.00'L = 230.9 cf

Outside= 96.0"W x 56.0"H => 37.33 sf x 8.00'L = 298.7 cf

6 Rows adjusted for 317.1 cf perimeter wall

15 Chambers/Row x 8.00' Long = 120.00' Row Length

6 Rows x 96.0" Wide = 48.00' Base Width

6.0" Stone Base + 56.0" Chamber Height = 5.17' Field Height

7.5 cf Sidewall x 15 x 2 + 7.5 cf Endwall x 6 x 2 = 317.1 cf Perimeter Wall

90 Chambers x 230.9 cf - 317.1 cf Perimeter wall = 20,467.5 cf Chamber Storage

90 Chambers x 298.7 cf = 26,880.0 cf Displacement

29,760.0 cf Field - 26,880.0 cf Chambers = 2,880.0 cf Stone x 40.0% Voids = 1,152.0 cf Stone Storage

Chamber Storage + Stone Storage = 21,619.5 cf

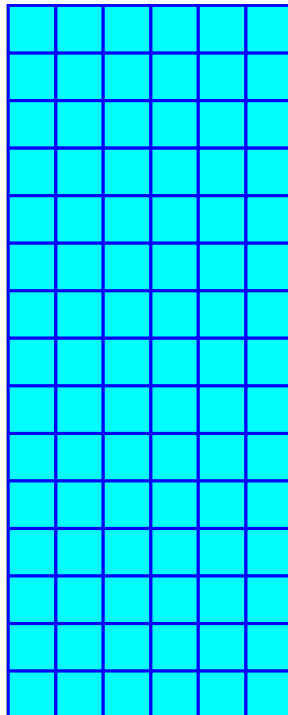
Overall Storage Efficiency = 72.6%

Overall System Size = 120.00' x 48.00' x 5.17'

90 Chambers

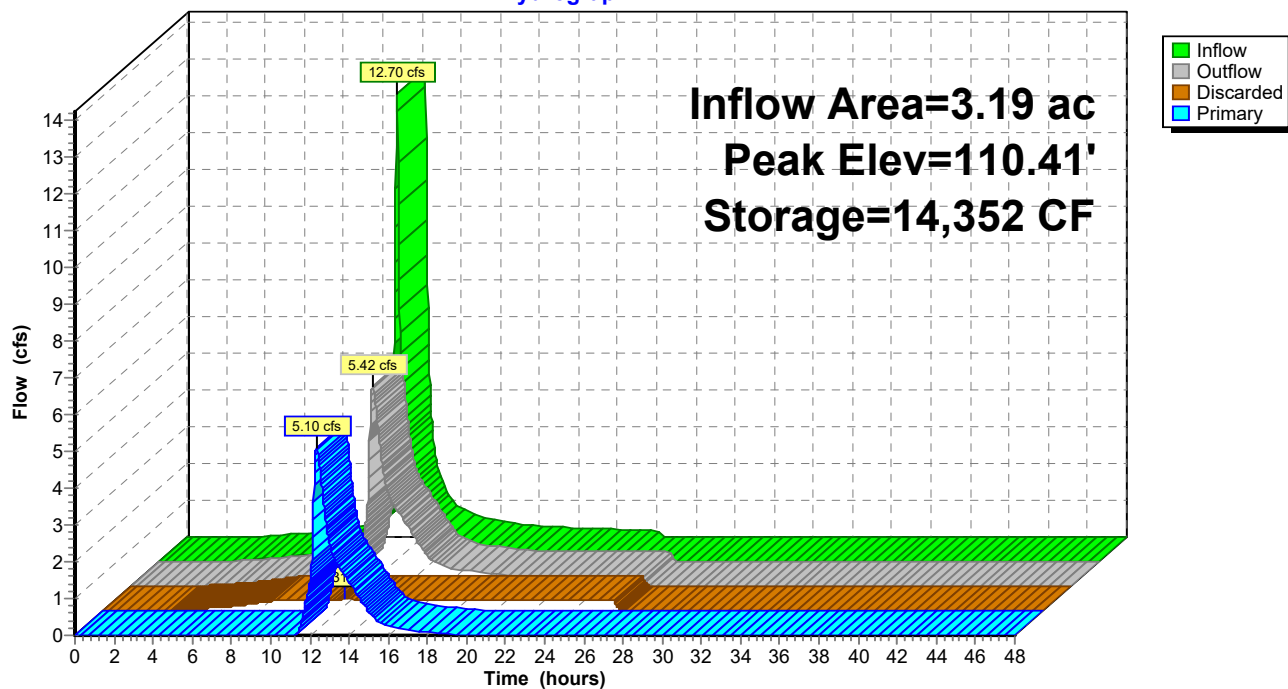
1,102.2 cy Field

106.7 cy Stone



Pond P2B:

Hydrograph



Stage-Discharge for Pond P2B:

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
107.33	0.00	0.00	0.00	109.93	3.35	0.31	3.04
107.38	0.27	0.27	0.00	109.98	3.55	0.31	3.24
107.43	0.27	0.27	0.00	110.03	3.76	0.31	3.45
107.48	0.27	0.27	0.00	110.08	3.97	0.31	3.66
107.53	0.27	0.27	0.00	110.13	4.19	0.31	3.88
107.58	0.27	0.27	0.00	110.18	4.42	0.31	4.11
107.63	0.27	0.27	0.00	110.23	4.64	0.31	4.33
107.68	0.27	0.27	0.00	110.28	4.87	0.31	4.56
107.73	0.27	0.27	0.00	110.33	5.09	0.31	4.77
107.78	0.27	0.27	0.00	110.38	5.30	0.31	4.99
107.83	0.27	0.27	0.00	110.43	5.50	0.31	5.18
107.88	0.28	0.28	0.00	110.48	5.66	0.32	5.35
107.93	0.28	0.28	0.00	110.53	5.82	0.32	5.50
107.98	0.28	0.28	0.00	110.58	5.98	0.32	5.66
108.03	0.28	0.28	0.00	110.63	6.13	0.32	5.81
108.08	0.28	0.28	0.00	110.68	6.28	0.32	5.96
108.13	0.28	0.28	0.00	110.73	6.42	0.32	6.10
108.18	0.28	0.28	0.00	110.78	6.56	0.32	6.24
108.23	0.30	0.28	0.02	110.83	6.70	0.32	6.38
108.28	0.35	0.28	0.07	110.88	6.84	0.32	6.51
108.33	0.43	0.28	0.15	110.93	6.97	0.32	6.64
108.38	0.53	0.28	0.24	110.98	7.09	0.32	6.77
108.43	0.64	0.28	0.36	111.03	7.22	0.32	6.89
108.48	0.77	0.28	0.48	111.08	7.34	0.33	7.01
108.53	0.90	0.29	0.62	111.13	7.46	0.33	7.13
108.58	1.04	0.29	0.75	111.18	7.58	0.33	7.25
108.63	1.16	0.29	0.87	111.23	7.69	0.33	7.36
108.68	1.25	0.29	0.96	111.28	7.80	0.33	7.48
108.73	1.34	0.29	1.05	111.33	7.92	0.33	7.59
108.78	1.42	0.29	1.13	111.38	8.21	0.33	7.88
108.83	1.50	0.29	1.21	111.43	8.38	0.33	8.05
108.88	1.57	0.29	1.28	111.48	8.44	0.33	8.11
108.93	1.64	0.29	1.35	111.53	8.51	0.33	8.18
108.98	1.71	0.29	1.41	111.58	8.58	0.33	8.25
109.03	1.77	0.29	1.48	111.63	8.65	0.33	8.31
109.08	1.83	0.29	1.54	111.68	8.71	0.33	8.38
109.13	1.89	0.29	1.59	111.73	8.78	0.34	8.44
109.18	1.94	0.30	1.65	111.78	8.84	0.34	8.51
109.23	2.00	0.30	1.70	111.83	8.91	0.34	8.57
109.28	2.05	0.30	1.75	111.88	8.97	0.34	8.63
109.33	2.10	0.30	1.80	111.93	9.03	0.34	8.70
109.38	2.15	0.30	1.85	111.98	9.10	0.34	8.76
109.43	2.20	0.30	1.90	112.03	9.16	0.34	8.82
109.48	2.25	0.30	1.95	112.08	9.22	0.34	8.88
109.53	2.30	0.30	2.00	112.13	9.28	0.34	8.94
109.58	2.37	0.30	2.06	112.18	9.35	0.34	9.00
109.63	2.46	0.30	2.15	112.23	9.41	0.34	9.06
109.68	2.56	0.30	2.26	112.28	9.47	0.34	9.12
109.73	2.69	0.30	2.39	112.33	9.53	0.34	9.18
109.78	2.83	0.30	2.53	112.38	9.59	0.35	9.24
109.83	2.99	0.31	2.69	112.43	9.65	0.35	9.30
109.88	3.17	0.31	2.86	112.48	9.71	0.35	9.36

Stage-Area-Storage for Pond P2B:

Elevation (feet)	Wetted (acres)	Storage (cubic-feet)	Elevation (feet)	Wetted (acres)	Storage (cubic-feet)
107.33	0.13	0	109.93	0.15	11,897
107.38	0.13	115	109.98	0.15	12,153
107.43	0.13	230	110.03	0.15	12,409
107.48	0.13	346	110.08	0.15	12,665
107.53	0.13	461	110.13	0.15	12,921
107.58	0.13	576	110.18	0.15	13,177
107.63	0.13	691	110.23	0.15	13,432
107.68	0.13	806	110.28	0.15	13,688
107.73	0.14	922	110.33	0.16	13,944
107.78	0.14	1,037	110.38	0.16	14,200
107.83	0.14	1,152	110.43	0.16	14,456
107.88	0.14	1,408	110.48	0.16	14,712
107.93	0.14	1,664	110.53	0.16	14,968
107.98	0.14	1,920	110.58	0.16	15,223
108.03	0.14	2,175	110.63	0.16	15,479
108.08	0.14	2,431	110.68	0.16	15,735
108.13	0.14	2,687	110.73	0.16	15,991
108.18	0.14	2,943	110.78	0.16	16,247
108.23	0.14	3,199	110.83	0.16	16,503
108.28	0.14	3,455	110.88	0.16	16,758
108.33	0.14	3,710	110.93	0.16	17,014
108.38	0.14	3,966	110.98	0.16	17,270
108.43	0.14	4,222	111.03	0.16	17,526
108.48	0.14	4,478	111.08	0.16	17,782
108.53	0.14	4,734	111.13	0.16	18,038
108.58	0.14	4,990	111.18	0.16	18,294
108.63	0.14	5,245	111.23	0.16	18,549
108.68	0.14	5,501	111.28	0.16	18,805
108.73	0.14	5,757	111.33	0.16	19,061
108.78	0.14	6,013	111.38	0.16	19,317
108.83	0.14	6,269	111.43	0.16	19,573
108.88	0.14	6,525	111.48	0.16	19,829
108.93	0.14	6,781	111.53	0.16	20,084
108.98	0.14	7,036	111.58	0.17	20,340
109.03	0.15	7,292	111.63	0.17	20,596
109.08	0.15	7,548	111.68	0.17	20,852
109.13	0.15	7,804	111.73	0.17	21,108
109.18	0.15	8,060	111.78	0.17	21,364
109.23	0.15	8,316	111.83	0.17	21,619
109.28	0.15	8,571	111.88	0.17	21,619
109.33	0.15	8,827	111.93	0.17	21,619
109.38	0.15	9,083	111.98	0.17	21,619
109.43	0.15	9,339	112.03	0.17	21,619
109.48	0.15	9,595	112.08	0.17	21,619
109.53	0.15	9,851	112.13	0.17	21,619
109.58	0.15	10,107	112.18	0.17	21,619
109.63	0.15	10,362	112.23	0.17	21,619
109.68	0.15	10,618	112.28	0.17	21,619
109.73	0.15	10,874	112.33	0.17	21,619
109.78	0.15	11,130	112.38	0.17	21,619
109.83	0.15	11,386	112.43	0.17	21,619
109.88	0.15	11,642	112.48	0.17	21,619

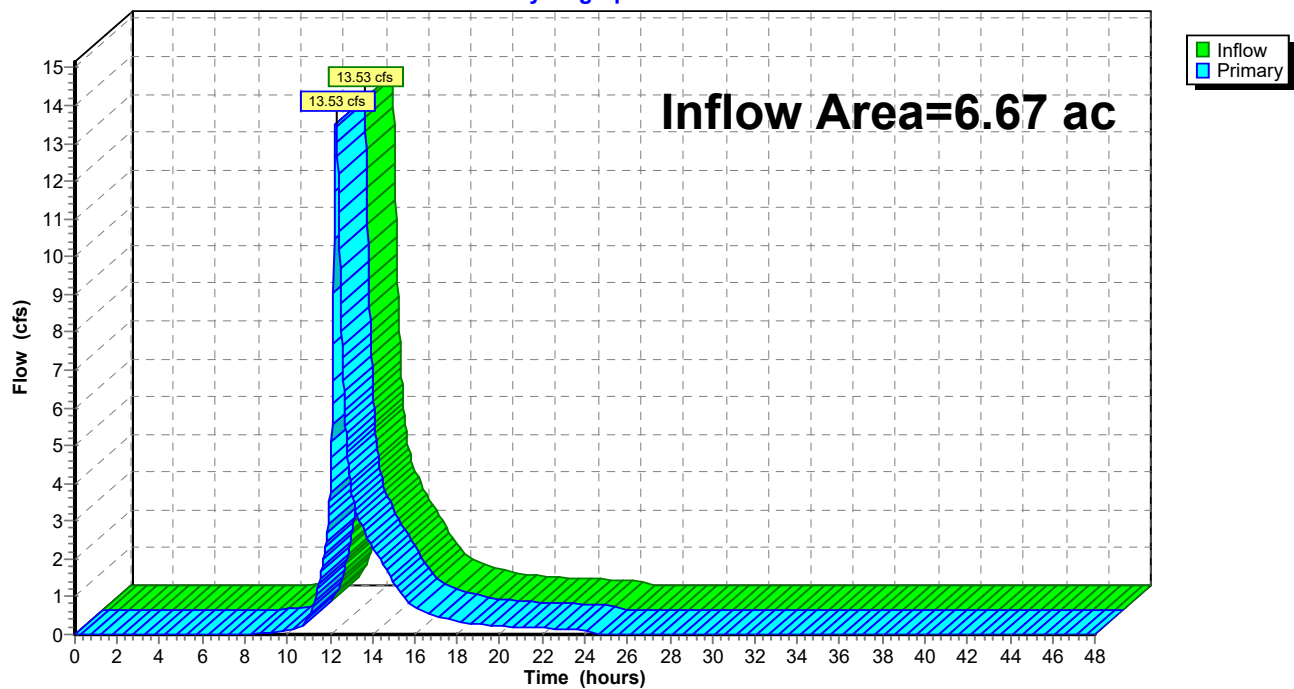
Summary for Link PRWS-1:

Inflow Area = 6.67 ac, 40.48% Impervious, Inflow Depth = 2.63" for 10-Year event
Inflow = 13.53 cfs @ 12.29 hrs, Volume= 63,664 CF
Primary = 13.53 cfs @ 12.29 hrs, Volume= 63,664 CF, Atten= 0%, Lag= 0.0 min
Routed to Link Site :

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

Link PRWS-1:

Hydrograph



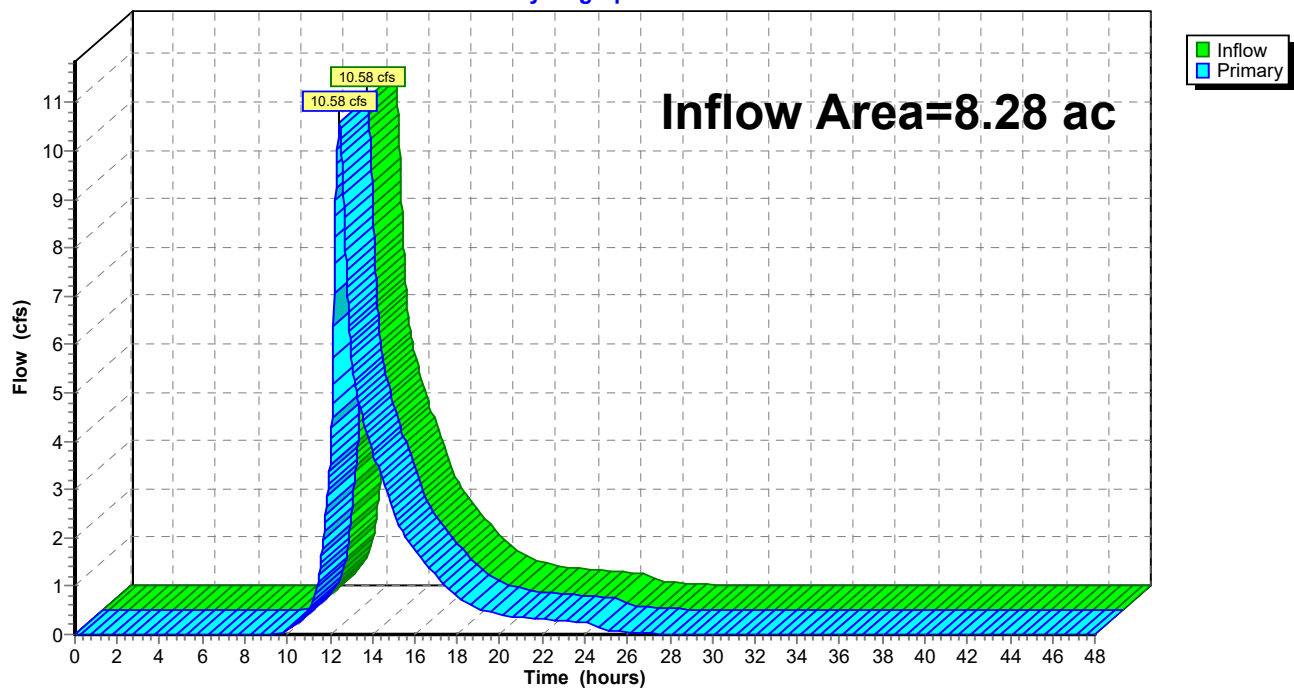
Summary for Link PRWS-2:

Inflow Area = 8.28 ac, 56.00% Impervious, Inflow Depth = 2.95" for 10-Year event
Inflow = 10.58 cfs @ 12.44 hrs, Volume= 88,790 CF
Primary = 10.58 cfs @ 12.44 hrs, Volume= 88,790 CF, Atten= 0%, Lag= 0.0 min
Routed to Link Site :

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

Link PRWS-2:

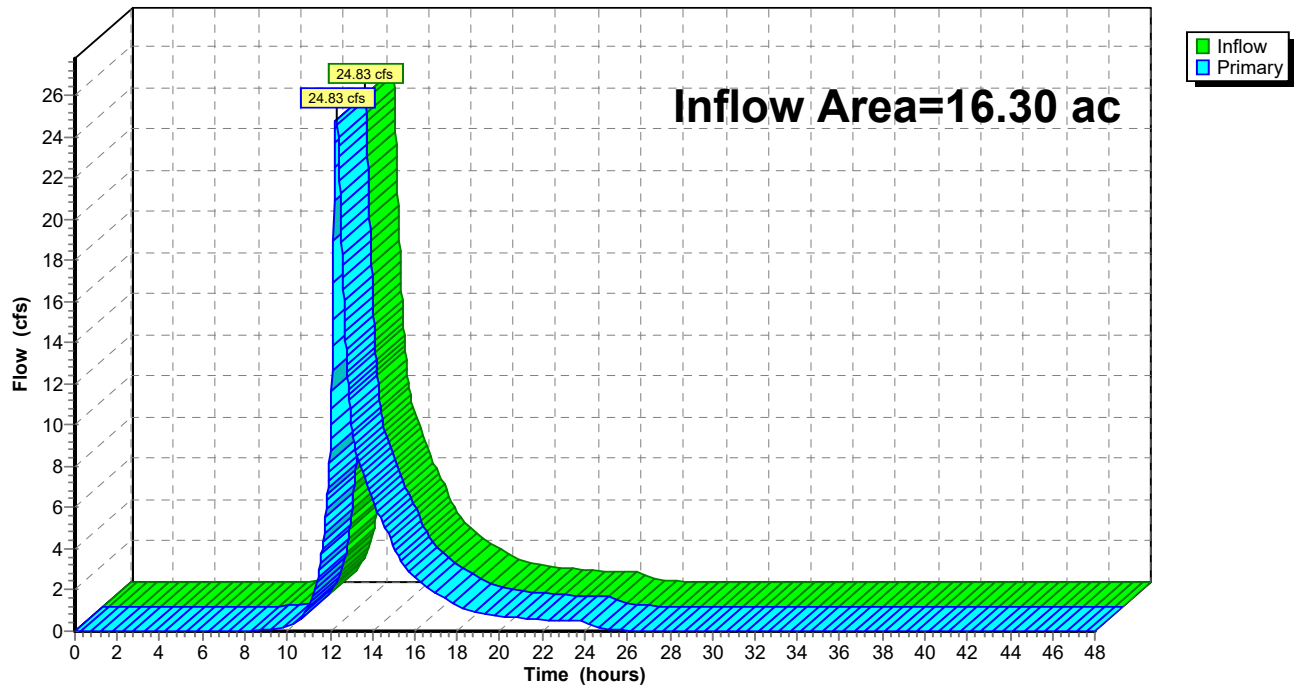
Hydrograph



Summary for Link Site:

Inflow Area = 16.30 ac, 45.01% Impervious, Inflow Depth = 2.79" for 10-Year event
Inflow = 24.83 cfs @ 12.30 hrs, Volume= 165,007 CF
Primary = 24.83 cfs @ 12.30 hrs, Volume= 165,007 CF, Atten= 0%, Lag= 0.0 min

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

Link Site:**Hydrograph**

PR WS_Convservation Submission

NOAA 24-hr D 25-Year Rainfall=6.21"

Prepared by Langan Engineering

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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+Trans method - Pond routing by Stor-Ind method

SubcatchmentPRWS-1A: Runoff Area=3.81 ac 61.09% Impervious Runoff Depth=5.16"
Flow Length=594' Tc=11 min CN=91 Runoff=18.08 cfs 71,386 CF

SubcatchmentPRWS-1B: Runoff Area=2.86 ac 13.06% Impervious Runoff Depth=3.56"
Flow Length=300' Tc=17 min CN=76 Runoff=8.31 cfs 37,032 CF

SubcatchmentPRWS-2A: Runoff Area=3.41 ac 72.31% Impervious Runoff Depth=5.39"
Flow Length=102' Tc=9 min CN=93 Runoff=17.71 cfs 66,620 CF

SubcatchmentPRWS-2B: Runoff Area=3.19 ac 61.07% Impervious Runoff Depth=5.16"
Flow Length=580' Tc=10 min CN=91 Runoff=15.70 cfs 59,841 CF

SubcatchmentPRWS-2C: Runoff Area=73,269 sf 13.38% Impervious Runoff Depth=3.46"
Flow Length=462' Tc=32 min CN=75 Runoff=3.48 cfs 21,136 CF

SubcatchmentPRWS-3: Runoff Area=58,762 sf 0.00% Impervious Runoff Depth=3.46"
Flow Length=284' Tc=10 min CN=75 Runoff=4.74 cfs 16,951 CF

Pond P1A: Peak Elev=104.31' Storage=17,789 CF Inflow=18.08 cfs 71,386 CF
Discarded=0.34 cfs 22,459 CF Primary=10.18 cfs 48,926 CF Outflow=10.52 cfs 71,386 CF

Pond P2A: Peak Elev=103.29' Storage=25,551 cf Inflow=17.71 cfs 66,620 CF
Discarded=0.07 cfs 7,516 CF Primary=7.51 cfs 58,193 CF Secondary=0.00 cfs 0 CF Outflow=7.58 cfs 65,709 CF

Pond P2B: Peak Elev=110.95' Storage=17,133 CF Inflow=15.70 cfs 59,841 CF
Discarded=0.32 cfs 21,643 CF Primary=6.70 cfs 38,198 CF Outflow=7.02 cfs 59,841 CF

Link PRWS-1: Inflow=18.28 cfs 85,958 CF
Primary=18.28 cfs 85,958 CF

Link PRWS-2: Inflow=17.35 cfs 117,528 CF
Primary=17.35 cfs 117,528 CF

Link Site: Inflow=37.84 cfs 220,437 CF
Primary=37.84 cfs 220,437 CF

Total Runoff Area = 16.30 ac Runoff Volume = 272,967 CF Average Runoff Depth = 4.61"
54.99% Pervious = 8.96 ac 45.01% Impervious = 7.34 ac

PR WS_Convservation Submission

NOAA 24-hr D 25-Year Rainfall=6.21"

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Summary for Subcatchment PRWS-1A:

Runoff = 18.08 cfs @ 12.18 hrs, Volume= 71,386 CF, Depth= 5.16"

Routed to Pond P1A :

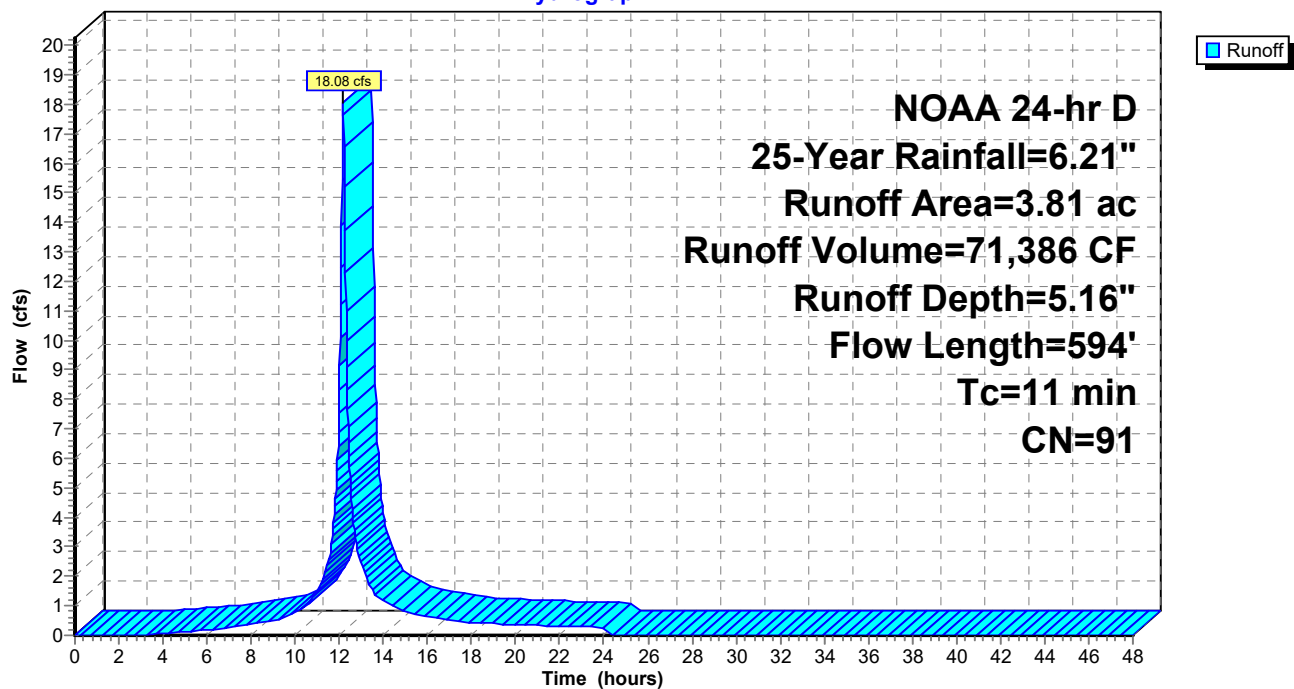
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 25-Year Rainfall=6.21"

Area (ac)	CN	Description
* 2.33	98	Impervious
0.00	61	>75% Grass cover, Good, HSG B
0.01	74	>75% Grass cover, Good, HSG C
0.38	80	>75% Grass cover, Good, HSG D
0.00	69	50-75% Grass cover, Fair, HSG B
0.00	79	50-75% Grass cover, Fair, HSG C
0.42	84	50-75% Grass cover, Fair, HSG D
0.02	55	Woods, Good, HSG B
0.00	70	Woods, Good, HSG C
0.24	77	Woods, Good, HSG D
* 0.00	71	Meadow, HSG C
* 0.32	78	Meadow, HSG D
* 0.00	89	Playground Surface, HSG C
* 0.08	91	Playground Surface, HSG D
3.81	91	Weighted Average
1.48		38.91% Pervious Area
2.33		61.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9	150	0.0500	0.28		Sheet Flow, AB Grass: Short n= 0.150 P2= 3.44"
0	12	0.0500	4.54		Shallow Concentrated Flow, BC Paved Kv= 20.3 fps
0	18	0.1000	2.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
1	132	0.0200	2.87		Shallow Concentrated Flow, DE Paved Kv= 20.3 fps
1	282	0.0100	7.20	22.62	Pipe Channel, EF 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
11	594	Total			

Subcatchment PRWS-1A:

Hydrograph



PR WS_Convservation Submission

NOAA 24-hr D 25-Year Rainfall=6.21"

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Summary for Subcatchment PRWS-1B:

Runoff = 8.31 cfs @ 12.26 hrs, Volume= 37,032 CF, Depth= 3.56"

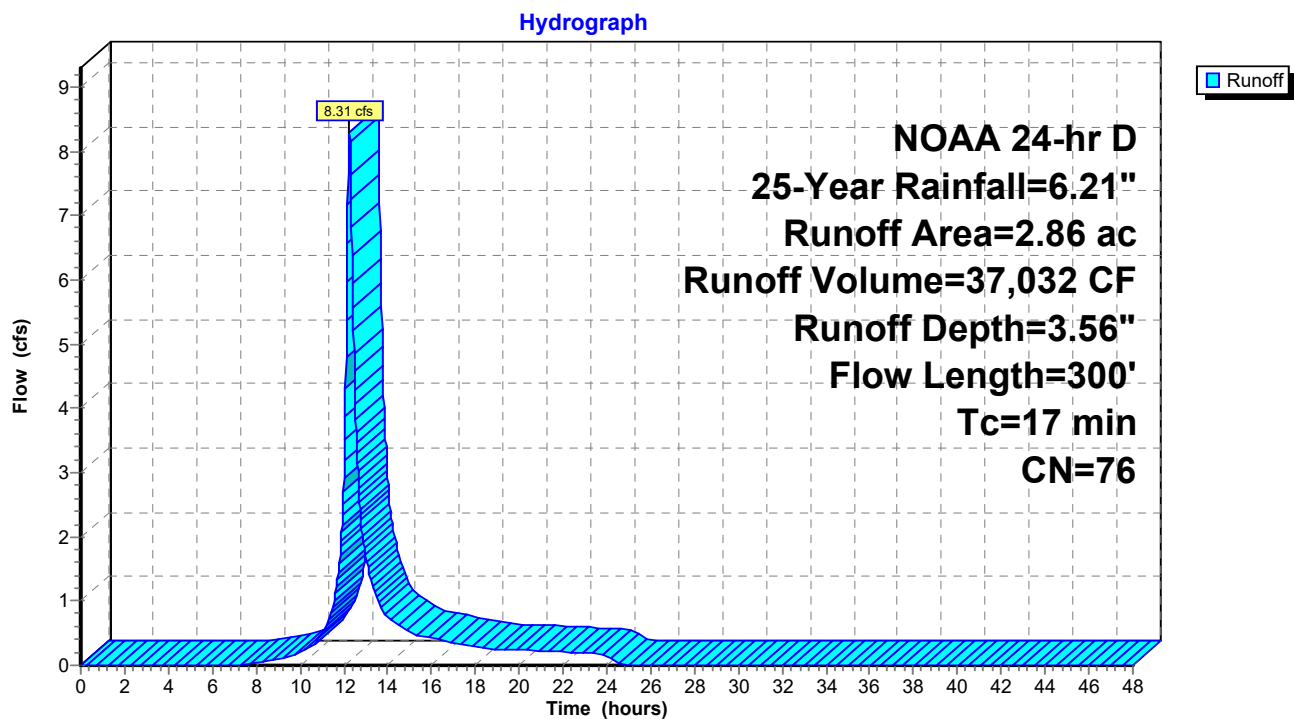
Routed to Link PRWS-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 25-Year Rainfall=6.21"

Area (ac)	CN	Description
* 0.37	98	Impervious
0.00	61	>75% Grass cover, Good, HSG B
0.87	74	>75% Grass cover, Good, HSG C
0.03	80	>75% Grass cover, Good, HSG D
0.00	69	50-75% Grass cover, Fair, HSG B
0.00	79	50-75% Grass cover, Fair, HSG C
0.07	84	50-75% Grass cover, Fair, HSG D
0.00	55	Woods, Good, HSG B
0.12	70	Woods, Good, HSG C
0.04	77	Woods, Good, HSG D
* 1.24	71	Meadow, HSG C
* 0.12	78	Meadow, HSG D
* 0.00	89	Playground Surface, HSG C
* 0.00	91	Playground Surface, HSG D
2.86	76	Weighted Average
2.49		86.94% Pervious Area
0.37		13.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2	25	0.2500	0.17		Sheet Flow, AB
					Woods: Light underbrush n= 0.400 P2= 3.44"
3	35	0.0400	0.19		Sheet Flow, BC
					Grass: Short n= 0.150 P2= 3.44"
6	50	0.0400	0.14		Sheet Flow, CD
					Grass: Dense n= 0.240 P2= 3.44"
4	40	0.0650	0.16		Sheet Flow, DE
					Grass: Dense n= 0.240 P2= 3.44"
1	150	0.0800	1.98		Shallow Concentrated Flow, EF
					Short Grass Pasture Kv= 7.0 fps
17	300	Total			

Subcatchment PRWS-1B:



PR WS_Convservation Submission

NOAA 24-hr D 25-Year Rainfall=6.21"

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Summary for Subcatchment PRWS-2A:

Runoff = 17.71 cfs @ 12.16 hrs, Volume= 66,620 CF, Depth= 5.39"

Routed to Pond P2A :

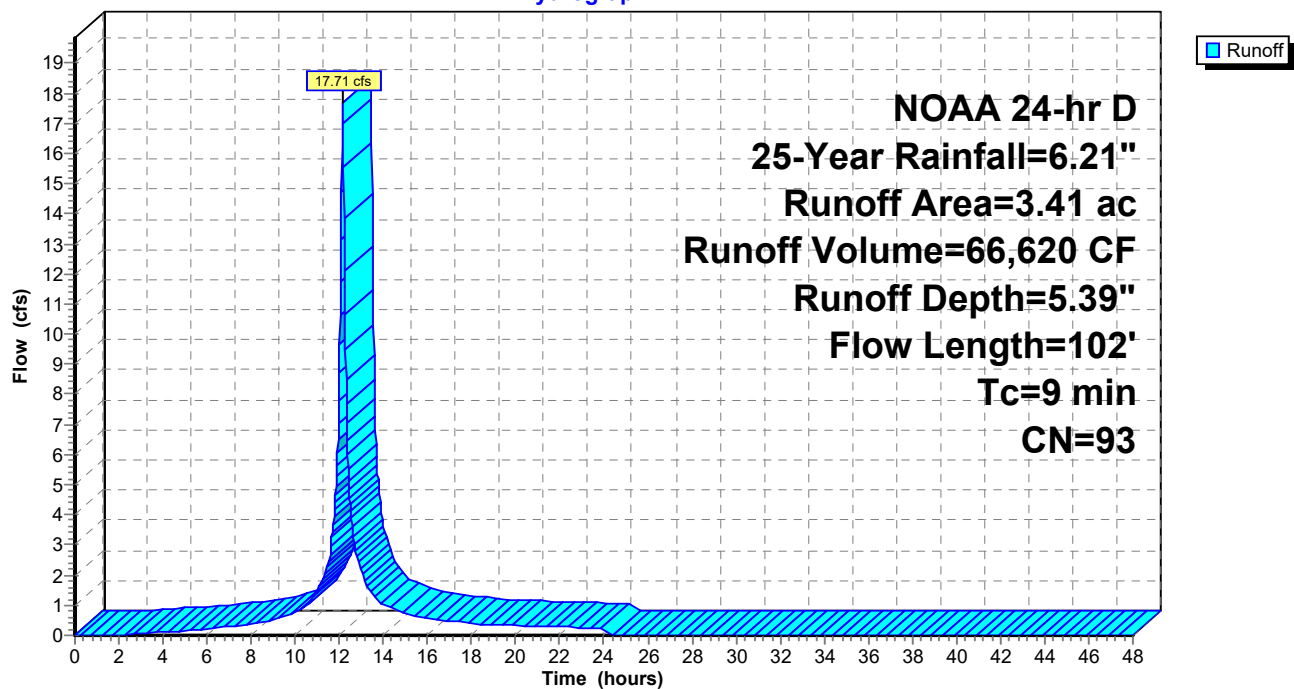
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 25-Year Rainfall=6.21"

Area (ac)	CN	Description
* 2.31	98	Impervious
* 0.15	98	Pond
0.00	61	>75% Grass cover, Good, HSG B
0.00	74	>75% Grass cover, Good, HSG C
0.00	80	>75% Grass cover, Good, HSG D
0.00	69	50-75% Grass cover, Fair, HSG B
0.00	79	50-75% Grass cover, Fair, HSG C
0.00	84	50-75% Grass cover, Fair, HSG D
0.00	55	Woods, Good, HSG B
0.00	70	Woods, Good, HSG C
0.00	77	Woods, Good, HSG D
* 0.00	58	Meadow, HSG B
* 0.49	71	Meadow, HSG C
* 0.10	78	Meadow, HSG D
* 0.17	89	Playground Surface, HSG C
* 0.19	91	Playground Surface, HSG D
3.41	93	Weighted Average
0.94		27.69% Pervious Area
2.46		72.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6	80	0.1250	0.24		Sheet Flow, AB
					Grass: Dense n= 0.240 P2= 3.44"
3	12	0.0200	0.08		Sheet Flow, BC
					Grass: Dense n= 0.240 P2= 3.44"
1	10	0.3333	0.24		Sheet Flow, CD
					Grass: Dense n= 0.240 P2= 3.44"
9	102	Total			

Subcatchment PRWS-2A:

Hydrograph



PR WS_Convservation Submission

NOAA 24-hr D 25-Year Rainfall=6.21"

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Summary for Subcatchment PRWS-2B:

Runoff = 15.70 cfs @ 12.17 hrs, Volume= 59,841 CF, Depth= 5.16"

Routed to Pond P2B :

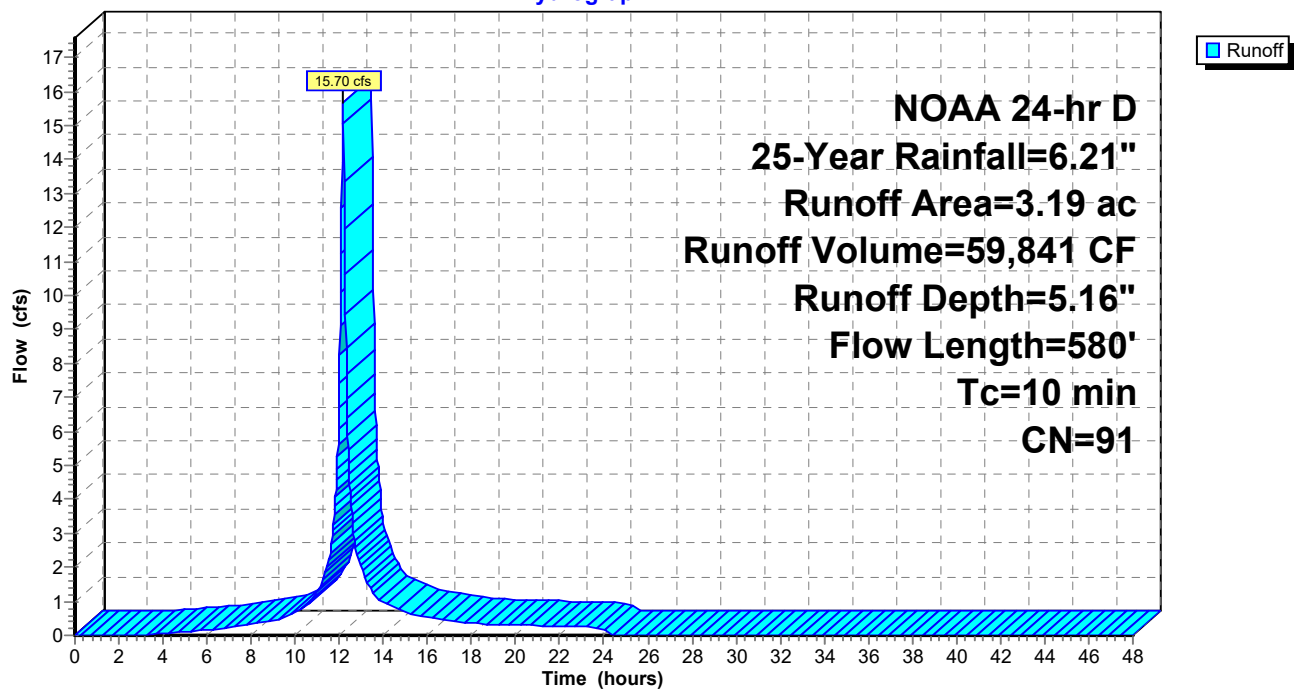
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 25-Year Rainfall=6.21"

Area (ac)	CN	Description
* 1.95	98	Impervious
0.00	61	>75% Grass cover, Good, HSG B
0.00	74	>75% Grass cover, Good, HSG C
0.46	80	>75% Grass cover, Good, HSG D
0.00	69	50-75% Grass cover, Fair, HSG B
0.00	79	50-75% Grass cover, Fair, HSG C
0.06	84	50-75% Grass cover, Fair, HSG D
0.02	55	Woods, Good, HSG B
0.00	70	Woods, Good, HSG C
0.06	77	Woods, Good, HSG D
* 0.06	58	Meadow, HSG B
* 0.43	78	Meadow, HSG D
* 0.00	89	Playground Surface, HSG C
* 0.16	91	Playground Surface, HSG D
3.19	91	Weighted Average
1.24		38.93% Pervious Area
1.95		61.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3	16	0.0600	0.09		Sheet Flow, AB
					Woods: Light underbrush n= 0.400 P2= 3.44"
3	25	0.0600	0.14		Sheet Flow, BC
					Grass: Dense n= 0.240 P2= 3.44"
1	11	0.3300	0.24		Sheet Flow, DE
					Grass: Dense n= 0.240 P2= 3.44"
1	7	0.1000	0.14		Sheet Flow, EF
					Grass: Dense n= 0.240 P2= 3.44"
2	521	0.0100	4.54	3.56	Pipe Channel, FG
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.013 Corrugated PE, smooth interior
10	580	Total			

Subcatchment PRWS-2B:

Hydrograph



PR WS_Convservation Submission

NOAA 24-hr D 25-Year Rainfall=6.21"

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Summary for Subcatchment PRWS-2C:

Runoff = 3.48 cfs @ 12.45 hrs, Volume= 21,136 CF, Depth= 3.46"

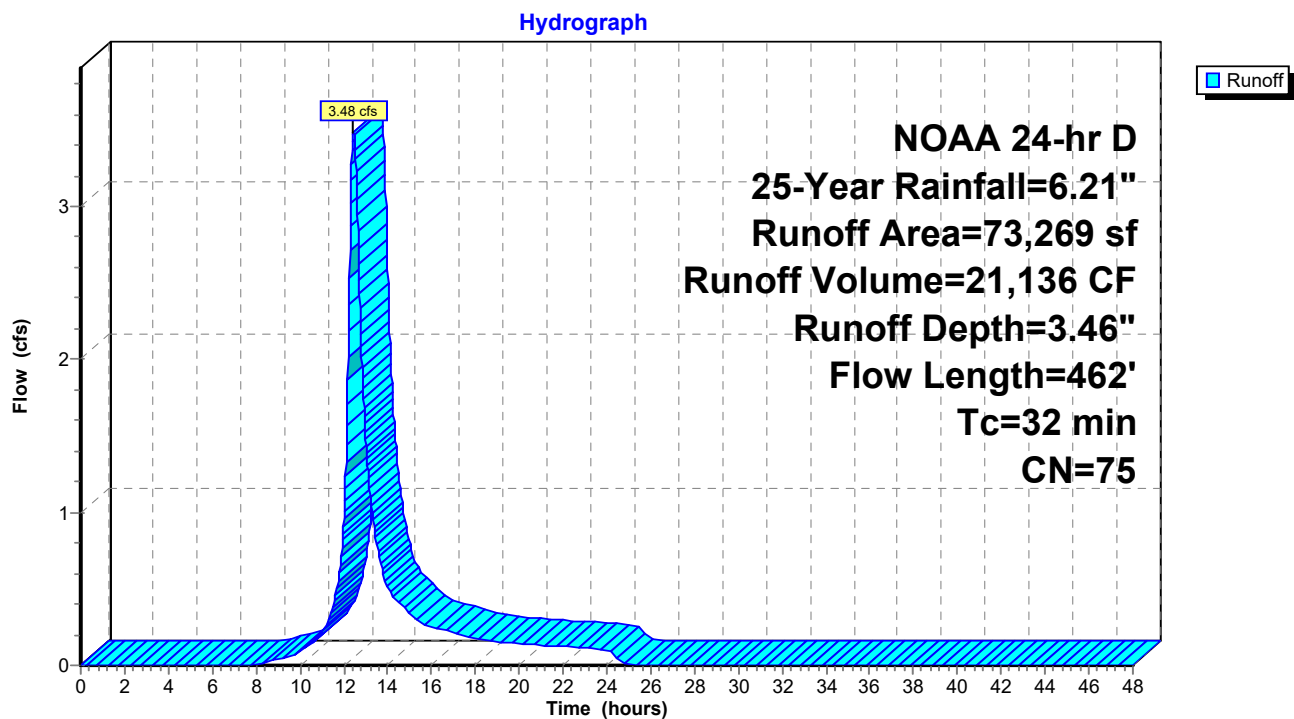
Routed to Link PRWS-2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 25-Year Rainfall=6.21"

	Area (sf)	CN	Description
*	9,801	98	Impervious
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
	0	69	50-75% Grass cover, Fair, HSG B
	0	79	50-75% Grass cover, Fair, HSG C
	0	84	50-75% Grass cover, Fair, HSG D
	0	55	Woods, Good, HSG B
	5,097	70	Woods, Good, HSG C
	0	77	Woods, Good, HSG D
*	3,703	58	Meadow, HSG B
*	37,941	71	Meadow, HSG C
*	16,727	78	Meadow, HSG D
*	0	89	Playground Surface, HSG C
*	0	91	Playground Surface, HSG D
	73,269	75	Weighted Average
	63,468		86.62% Pervious Area
	9,801		13.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19	87	0.0200	0.08		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 3.44"
10	63	0.0200	0.11		Sheet Flow, BC Grass: Dense n= 0.240 P2= 3.44"
1	60	0.0300	1.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
3	192	0.0200	0.99		Shallow Concentrated Flow, DE Short Grass Pasture Kv= 7.0 fps
0	60	0.0100	5.26	6.46	Pipe Channel, EF 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
32	462	Total			

Subcatchment PRWS-2C:



PR WS_Convservation Submission

NOAA 24-hr D 25-Year Rainfall=6.21"

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Summary for Subcatchment PRWS-3:

Runoff = 4.74 cfs @ 12.17 hrs, Volume= 16,951 CF, Depth= 3.46"

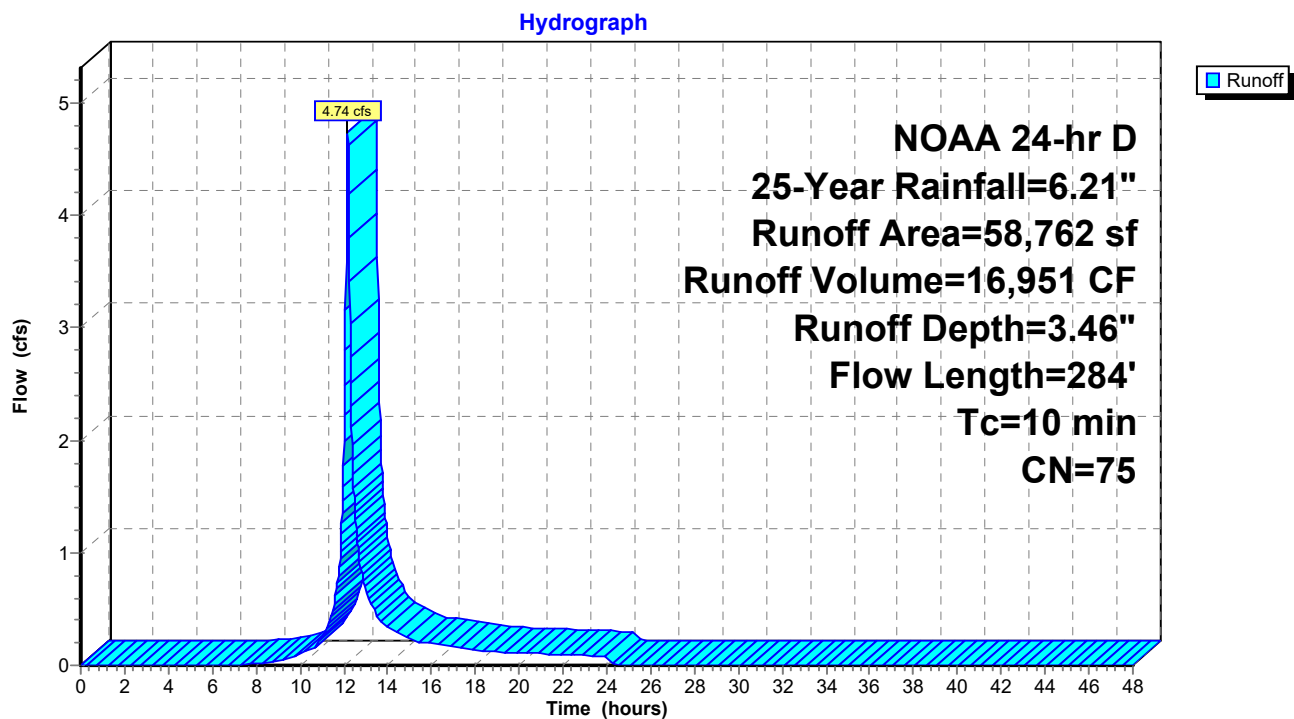
Routed to Link Site :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 25-Year Rainfall=6.21"

	Area (sf)	CN	Description
*	0	98	Impervious
	0	69	50-75% Grass cover, Fair, HSG B
	0	79	50-75% Grass cover, Fair, HSG C
	21,344	84	50-75% Grass cover, Fair, HSG D
	0	80	>75% Grass cover, Good, HSG D
	10,977	55	Woods, Good, HSG B
	0	70	Woods, Good, HSG C
	25,352	77	Woods, Good, HSG D
*	1,089	78	Meadow, HSG D
	58,762	75	Weighted Average
	58,762		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8	150	0.0650	0.31		Sheet Flow, AB
					Grass: Short n= 0.150 P2= 3.44"
0	50	0.0650	1.78		Shallow Concentrated Flow, BC
					Short Grass Pasture Kv= 7.0 fps
1	84	0.0550	1.17		Shallow Concentrated Flow, CD
					Woodland Kv= 5.0 fps
10	284	Total			

Subcatchment PRWS-3:



Summary for Pond P1A:

Inflow Area = 3.81 ac, 61.09% Impervious, Inflow Depth = 5.16" for 25-Year event
 Inflow = 18.08 cfs @ 12.18 hrs, Volume= 71,386 CF
 Outflow = 10.52 cfs @ 12.31 hrs, Volume= 71,386 CF, Atten= 42%, Lag= 7.9 min
 Discarded = 0.34 cfs @ 12.31 hrs, Volume= 22,459 CF
 Primary = 10.18 cfs @ 12.31 hrs, Volume= 48,926 CF

Routed to Link PRWS-1 :

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
 Peak Elev= 104.31' @ 12.31 hrs Surf.Area= 0.14 ac Storage= 17,789 CF

Plug-Flow detention time= 58.2 min calculated for 71,356 CF (100% of inflow)
 Center-of-Mass det. time= 58.2 min (846.9 - 788.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.83'	1,254 CF	56.00'W x 112.00'L x 4.67'H Field A 29,269 CF Overall - 26,133 CF Embedded = 3,136 CF x 40.0% Voids
#2A	101.33'	19,419 CF	retain_it retain_it 3.5' x 98 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 7 Rows adjusted for 257.9 cf perimeter wall
		20,673 CF	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	100.83'	2.000 in/hr Exfiltration over Wetted area
#2	Primary	101.33'	24.0" Round Culvert L= 40.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 101.33' / 101.13' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	101.42'	6.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#4	Device 2	103.08'	10.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#5	Device 2	104.33'	5.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.34 cfs @ 12.31 hrs HW=104.31' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.34 cfs)

Primary OutFlow Max=10.17 cfs @ 12.31 hrs HW=104.31' (Free Discharge)

↑ **2=Culvert** (Passes 10.17 cfs of 16.80 cfs potential flow)
 ↑ **3=Orifice/Grate** (Orifice Controls 3.07 cfs @ 7.82 fps)
 ↑ **4=Orifice/Grate** (Orifice Controls 7.10 cfs @ 4.34 fps)
 ↑ **5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P1A: - Chamber Wizard Field A

Chamber Model = retain_it retain_it 3.5' (retain-it@)

Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf

Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf

7 Rows adjusted for 257.9 cf perimeter wall

14 Chambers/Row x 8.00' Long = 112.00' Row Length

7 Rows x 96.0" Wide = 56.00' Base Width

6.0" Stone Base + 50.0" Chamber Height = 4.67' Field Height

6.1 cf Sidewall x 14 x 2 + 6.1 cf Endwall x 7 x 2 = 257.9 cf Perimeter Wall

98 Chambers x 200.8 cf - 257.9 cf Perimeter wall = 19,418.6 cf Chamber Storage

98 Chambers x 266.7 cf = 26,133.3 cf Displacement

29,269.3 cf Field - 26,133.3 cf Chambers = 3,136.0 cf Stone x 40.0% Voids = 1,254.4 cf Stone Storage

Chamber Storage + Stone Storage = 20,673.0 cf

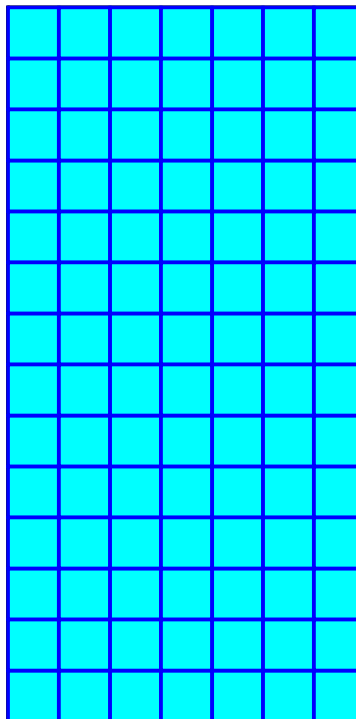
Overall Storage Efficiency = 70.6%

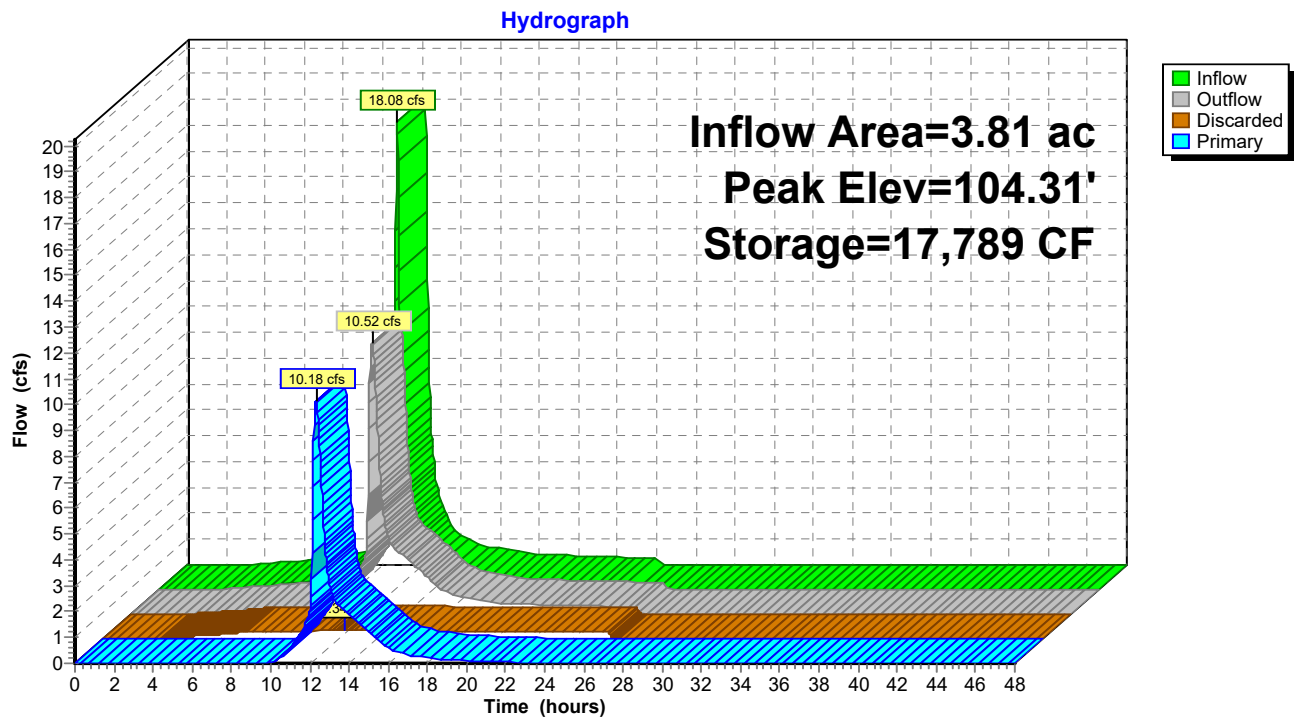
Overall System Size = 112.00' x 56.00' x 4.67'

98 Chambers

1,084.0 cy Field

116.1 cy Stone



Pond P1A:

Stage-Discharge for Pond P1A:

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
100.83	0.00	0.00	0.00	103.43	4.15	0.33	3.82
100.88	0.29	0.29	0.00	103.48	4.55	0.33	4.22
100.93	0.29	0.29	0.00	103.53	4.97	0.33	4.64
100.98	0.29	0.29	0.00	103.58	5.41	0.33	5.08
101.03	0.29	0.29	0.00	103.63	5.87	0.33	5.54
101.08	0.29	0.29	0.00	103.68	6.34	0.33	6.01
101.13	0.30	0.30	0.00	103.73	6.81	0.34	6.47
101.18	0.30	0.30	0.00	103.78	7.26	0.34	6.93
101.23	0.30	0.30	0.00	103.83	7.69	0.34	7.35
101.28	0.30	0.30	0.00	103.88	8.06	0.34	7.73
101.33	0.30	0.30	0.00	103.93	8.37	0.34	8.03
101.38	0.30	0.30	0.00	103.98	8.69	0.34	8.35
101.43	0.30	0.30	0.00	104.03	9.00	0.34	8.66
101.48	0.32	0.30	0.02	104.08	9.29	0.34	8.95
101.53	0.37	0.30	0.07	104.13	9.58	0.34	9.24
101.58	0.45	0.30	0.15	104.18	9.85	0.34	9.51
101.63	0.55	0.30	0.24	104.23	10.12	0.34	9.77
101.68	0.66	0.30	0.36	104.28	10.37	0.34	10.03
101.73	0.79	0.30	0.48	104.33	10.62	0.34	10.28
101.78	0.92	0.31	0.62	104.38	11.05	0.35	10.70
101.83	1.06	0.31	0.75	104.43	11.61	0.35	11.27
101.88	1.18	0.31	0.87	104.48	12.27	0.35	11.93
101.93	1.27	0.31	0.96	104.53	13.01	0.35	12.66
101.98	1.36	0.31	1.05	104.58	13.80	0.35	13.45
102.03	1.44	0.31	1.13	104.63	14.64	0.35	14.29
102.08	1.52	0.31	1.21	104.68	15.54	0.35	15.19
102.13	1.59	0.31	1.28	104.73	16.48	0.35	16.13
102.18	1.66	0.31	1.35	104.78	17.46	0.35	17.11
102.23	1.73	0.31	1.41	104.83	18.48	0.35	18.12
102.28	1.79	0.31	1.48	104.88	19.42	0.35	19.07
102.33	1.85	0.31	1.54	104.93	19.61	0.35	19.26
102.38	1.91	0.31	1.59	104.98	19.80	0.35	19.44
102.43	1.96	0.32	1.65	105.03	19.98	0.36	19.62
102.48	2.02	0.32	1.70	105.08	20.16	0.36	19.80
102.53	2.07	0.32	1.75	105.13	20.34	0.36	19.98
102.58	2.12	0.32	1.80	105.18	20.52	0.36	20.16
102.63	2.17	0.32	1.85	105.23	20.70	0.36	20.34
102.68	2.22	0.32	1.90	105.28	20.87	0.36	20.51
102.73	2.27	0.32	1.95	105.33	21.04	0.36	20.68
102.78	2.31	0.32	1.99	105.38	21.22	0.36	20.86
102.83	2.36	0.32	2.04	105.43	21.39	0.36	21.03
102.88	2.40	0.32	2.08	105.48	21.56	0.36	21.20
102.93	2.45	0.32	2.12				
102.98	2.49	0.32	2.16				
103.03	2.53	0.32	2.21				
103.08	2.57	0.33	2.25				
103.13	2.64	0.33	2.32				
103.18	2.77	0.33	2.44				
103.23	2.95	0.33	2.63				
103.28	3.19	0.33	2.86				
103.33	3.47	0.33	3.14				
103.38	3.79	0.33	3.46				

Stage-Area-Storage for Pond P1A:

Elevation (feet)	Wetted (acres)	Storage (cubic-feet)	Elevation (feet)	Wetted (acres)	Storage (cubic-feet)
100.83	0.14	0	103.43	0.16	12,906
100.88	0.14	125	103.48	0.16	13,183
100.93	0.14	251	103.53	0.16	13,460
100.98	0.15	376	103.58	0.17	13,738
101.03	0.15	502	103.63	0.17	14,015
101.08	0.15	627	103.68	0.17	14,293
101.13	0.15	753	103.73	0.17	14,570
101.18	0.15	878	103.78	0.17	14,847
101.23	0.15	1,004	103.83	0.17	15,125
101.28	0.15	1,129	103.88	0.17	15,402
101.33	0.15	1,254	103.93	0.17	15,680
101.38	0.15	1,532	103.98	0.17	15,957
101.43	0.15	1,809	104.03	0.17	16,234
101.48	0.15	2,087	104.08	0.17	16,512
101.53	0.15	2,364	104.13	0.17	16,789
101.58	0.15	2,641	104.18	0.17	17,067
101.63	0.15	2,919	104.23	0.17	17,344
101.68	0.15	3,196	104.28	0.17	17,622
101.73	0.15	3,474	104.33	0.17	17,899
101.78	0.15	3,751	104.38	0.17	18,176
101.83	0.15	4,028	104.43	0.17	18,454
101.88	0.15	4,306	104.48	0.17	18,731
101.93	0.15	4,583	104.53	0.17	19,009
101.98	0.15	4,861	104.58	0.17	19,286
102.03	0.15	5,138	104.63	0.17	19,563
102.08	0.15	5,416	104.68	0.17	19,841
102.13	0.15	5,693	104.73	0.17	20,118
102.18	0.15	5,970	104.78	0.17	20,396
102.23	0.15	6,248	104.83	0.17	20,673
102.28	0.16	6,525	104.88	0.18	20,673
102.33	0.16	6,803	104.93	0.18	20,673
102.38	0.16	7,080	104.98	0.18	20,673
102.43	0.16	7,357	105.03	0.18	20,673
102.48	0.16	7,635	105.08	0.18	20,673
102.53	0.16	7,912	105.13	0.18	20,673
102.58	0.16	8,190	105.18	0.18	20,673
102.63	0.16	8,467	105.23	0.18	20,673
102.68	0.16	8,744	105.28	0.18	20,673
102.73	0.16	9,022	105.33	0.18	20,673
102.78	0.16	9,299	105.38	0.18	20,673
102.83	0.16	9,577	105.43	0.18	20,673
102.88	0.16	9,854	105.48	0.18	20,673
102.93	0.16	10,131			
102.98	0.16	10,409			
103.03	0.16	10,686			
103.08	0.16	10,964			
103.13	0.16	11,241			
103.18	0.16	11,519			
103.23	0.16	11,796			
103.28	0.16	12,073			
103.33	0.16	12,351			
103.38	0.16	12,628			

PR WS_Convservation Submission

NOAA 24-hr D 25-Year Rainfall=6.21"

Prepared by Langan Engineering

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Summary for Pond P2A:

Inflow Area = 3.41 ac, 72.31% Impervious, Inflow Depth = 5.39" for 25-Year event
 Inflow = 17.71 cfs @ 12.16 hrs, Volume= 66,620 CF
 Outflow = 7.58 cfs @ 12.33 hrs, Volume= 65,709 CF, Atten= 57%, Lag= 10.1 min
 Discarded = 0.07 cfs @ 12.33 hrs, Volume= 7,516 CF
 Primary = 7.51 cfs @ 12.33 hrs, Volume= 58,193 CF
 Routed to Link PRWS-2 :
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 CF
 Routed to Link PRWS-2 :

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
 Peak Elev= 103.29' @ 12.33 hrs Surf.Area= 11,469 sf Storage= 25,551 cf

Plug-Flow detention time= 192.1 min calculated for 65,681 CF (99% of inflow)
 Center-of-Mass det. time= 183.8 min (961.8 - 778.0)

Volume	Invert	Avail.Storage	Storage Description
#1	100.50'	35,494 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)
100.50	6,910	520.0	0	0	6,910
101.00	7,700	530.0	3,651	3,651	7,786
102.00	9,310	550.0	8,492	12,143	9,588
103.00	10,980	566.0	10,134	22,277	11,114
104.00	12,700	585.0	11,830	34,106	12,947
104.10	15,100	586.0	1,388	35,494	13,057

Device	Routing	Invert	Outlet Devices
#1	Primary	98.50'	15.0" Round Culvert L= 150.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 98.50' / 97.75' S= 0.0050 ' S= 0.0050 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Discarded	100.50'	0.250 in/hr Exfiltration over Wetted area
#3	Device 1	101.00'	8.0" Vert. Orifice C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.00'	24.0" x 36.0" Horiz. Grate C= 0.600 Limited to weir flow at low heads
#5	Secondary	103.50'	20.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.07 cfs @ 12.33 hrs HW=103.29' (Free Discharge)

↑ **2=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=7.49 cfs @ 12.33 hrs HW=103.29' (Free Discharge)

↑ **1=Culvert** (Passes 7.49 cfs of 8.78 cfs potential flow)

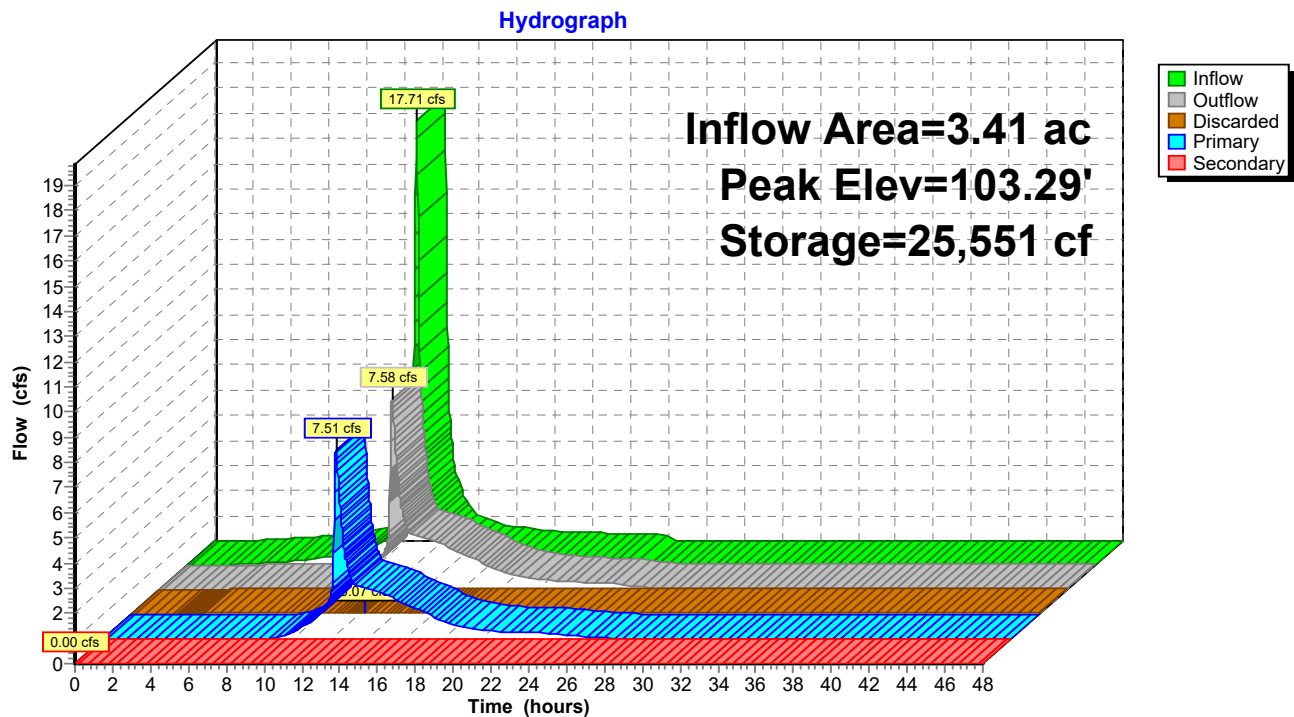
↑ **3=Orifice** (Orifice Controls 2.35 cfs @ 6.74 fps)

↑ **4=Grate** (Weir Controls 5.14 cfs @ 1.76 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=100.50' (Free Discharge)

↑ **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2A:



PR WS_Convservation Submission

NOAA 24-hr D 25-Year Rainfall=6.21"

Prepared by Langan Engineering

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Stage-Discharge for Pond P2A:

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
100.50	0.00	0.00	0.00	0.00
100.60	0.04	0.04	0.00	0.00
100.70	0.04	0.04	0.00	0.00
100.80	0.04	0.04	0.00	0.00
100.90	0.04	0.04	0.00	0.00
101.00	0.05	0.05	0.00	0.00
101.10	0.08	0.05	0.04	0.00
101.20	0.18	0.05	0.13	0.00
101.30	0.33	0.05	0.28	0.00
101.40	0.52	0.05	0.47	0.00
101.50	0.73	0.05	0.68	0.00
101.60	0.92	0.05	0.87	0.00
101.70	1.07	0.05	1.02	0.00
101.80	1.20	0.05	1.15	0.00
101.90	1.32	0.05	1.27	0.00
102.00	1.43	0.06	1.37	0.00
102.10	1.53	0.06	1.47	0.00
102.20	1.62	0.06	1.56	0.00
102.30	1.71	0.06	1.65	0.00
102.40	1.79	0.06	1.74	0.00
102.50	1.88	0.06	1.82	0.00
102.60	1.95	0.06	1.89	0.00
102.70	2.03	0.06	1.96	0.00
102.80	2.10	0.06	2.04	0.00
102.90	2.17	0.06	2.10	0.00
103.00	2.23	0.06	2.17	0.00
103.10	3.33	0.07	3.27	0.00
103.20	5.29	0.07	5.22	0.00
103.30	7.80	0.07	7.73	0.00
103.40	8.96	0.07	8.89	0.00
103.50	9.06	0.07	8.99	0.00
103.60	10.64	0.07	9.09	1.48
103.70	13.45	0.07	9.19	4.19
103.80	17.31	0.07	9.29	7.95
103.90	22.11	0.07	9.38	12.65
104.00	27.94	0.07	9.48	18.38
104.10	34.75	0.08	9.57	25.10

Stage-Area-Storage for Pond P2A:

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
100.50	6,910	6,910	0
100.60	7,065	7,084	699
100.70	7,221	7,258	1,413
100.80	7,379	7,433	2,143
100.90	7,539	7,609	2,889
101.00	7,700	7,786	3,651
101.10	7,854	7,963	4,428
101.20	8,010	8,141	5,222
101.30	8,167	8,319	6,030
101.40	8,326	8,498	6,855
101.50	8,486	8,678	7,696
101.60	8,648	8,859	8,552
101.70	8,811	9,040	9,425
101.80	8,976	9,222	10,315
101.90	9,142	9,404	11,220
102.00	9,310	9,588	12,143
102.10	9,471	9,738	13,082
102.20	9,633	9,889	14,037
102.30	9,797	10,041	15,009
102.40	9,961	10,193	15,997
102.50	10,128	10,345	17,001
102.60	10,295	10,498	18,022
102.70	10,465	10,652	19,060
102.80	10,635	10,805	20,115
102.90	10,807	10,959	21,187
103.00	10,980	11,114	22,277
103.10	11,146	11,295	23,383
103.20	11,314	11,476	24,506
103.30	11,483	11,658	25,646
103.40	11,653	11,840	26,802
103.50	11,824	12,023	27,976
103.60	11,997	12,207	29,167
103.70	12,171	12,391	30,376
103.80	12,346	12,576	31,602
103.90	12,522	12,761	32,845
104.00	12,700	12,947	34,106
104.10	15,100	13,057	35,494

Summary for Pond P2B:

Inflow Area = 3.19 ac, 61.07% Impervious, Inflow Depth = 5.16" for 25-Year event
 Inflow = 15.70 cfs @ 12.17 hrs, Volume= 59,841 CF
 Outflow = 7.02 cfs @ 12.34 hrs, Volume= 59,841 CF, Atten= 55%, Lag= 10.4 min
 Discarded = 0.32 cfs @ 12.34 hrs, Volume= 21,643 CF
 Primary = 6.70 cfs @ 12.34 hrs, Volume= 38,198 CF
 Routed to Link PRWS-2 :

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
 Peak Elev= 110.95' @ 12.34 hrs Surf.Area= 0.13 ac Storage= 17,133 CF

Plug-Flow detention time= 76.8 min calculated for 59,816 CF (100% of inflow)
 Center-of-Mass det. time= 76.8 min (864.5 - 787.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	107.33'	1,152 CF	48.00'W x 120.00'L x 5.17'H Field A 29,760 CF Overall - 26,880 CF Embedded = 2,880 CF x 40.0% Voids
#2A	107.83'	20,467 CF	retain_it retain_it 4.0' x 90 Inside #1 Inside= 84.0"W x 48.0"H => 28.87 sf x 8.00'L = 230.9 cf Outside= 96.0"W x 56.0"H => 37.33 sf x 8.00'L = 298.7 cf 6 Rows adjusted for 317.1 cf perimeter wall
		21,619 CF	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	107.33'	2.000 in/hr Exfiltration over Wetted area
#2	Primary	107.83'	15.0" Round Culvert L= 40.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 107.83' / 105.83' S= 0.0500 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#3	Device 2	108.17'	6.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#4	Device 2	109.50'	12.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Device 2	111.33'	5.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.32 cfs @ 12.34 hrs HW=110.95' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.32 cfs)

Primary OutFlow Max=6.70 cfs @ 12.34 hrs HW=110.95' (Free Discharge)

↑ **2=Culvert** (Passes 6.70 cfs of 7.37 cfs potential flow)
 ↑ **3=Orifice/Grate** (Orifice Controls 3.01 cfs @ 7.66 fps)
 ↑ **4=Orifice/Grate** (Orifice Controls 3.69 cfs @ 4.70 fps)
 ↑ **5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2B: - Chamber Wizard Field A**Chamber Model = retain_it retain_it 4.0' (retain-it@)**

Inside= 84.0"W x 48.0"H => 28.87 sf x 8.00'L = 230.9 cf

Outside= 96.0"W x 56.0"H => 37.33 sf x 8.00'L = 298.7 cf

6 Rows adjusted for 317.1 cf perimeter wall

15 Chambers/Row x 8.00' Long = 120.00' Row Length

6 Rows x 96.0" Wide = 48.00' Base Width

6.0" Stone Base + 56.0" Chamber Height = 5.17' Field Height

7.5 cf Sidewall x 15 x 2 + 7.5 cf Endwall x 6 x 2 = 317.1 cf Perimeter Wall

90 Chambers x 230.9 cf - 317.1 cf Perimeter wall = 20,467.5 cf Chamber Storage

90 Chambers x 298.7 cf = 26,880.0 cf Displacement

29,760.0 cf Field - 26,880.0 cf Chambers = 2,880.0 cf Stone x 40.0% Voids = 1,152.0 cf Stone Storage

Chamber Storage + Stone Storage = 21,619.5 cf

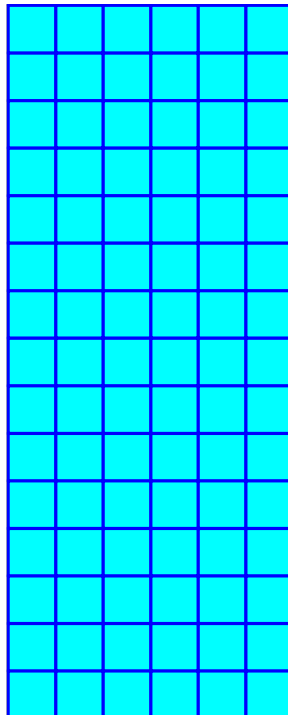
Overall Storage Efficiency = 72.6%

Overall System Size = 120.00' x 48.00' x 5.17'

90 Chambers

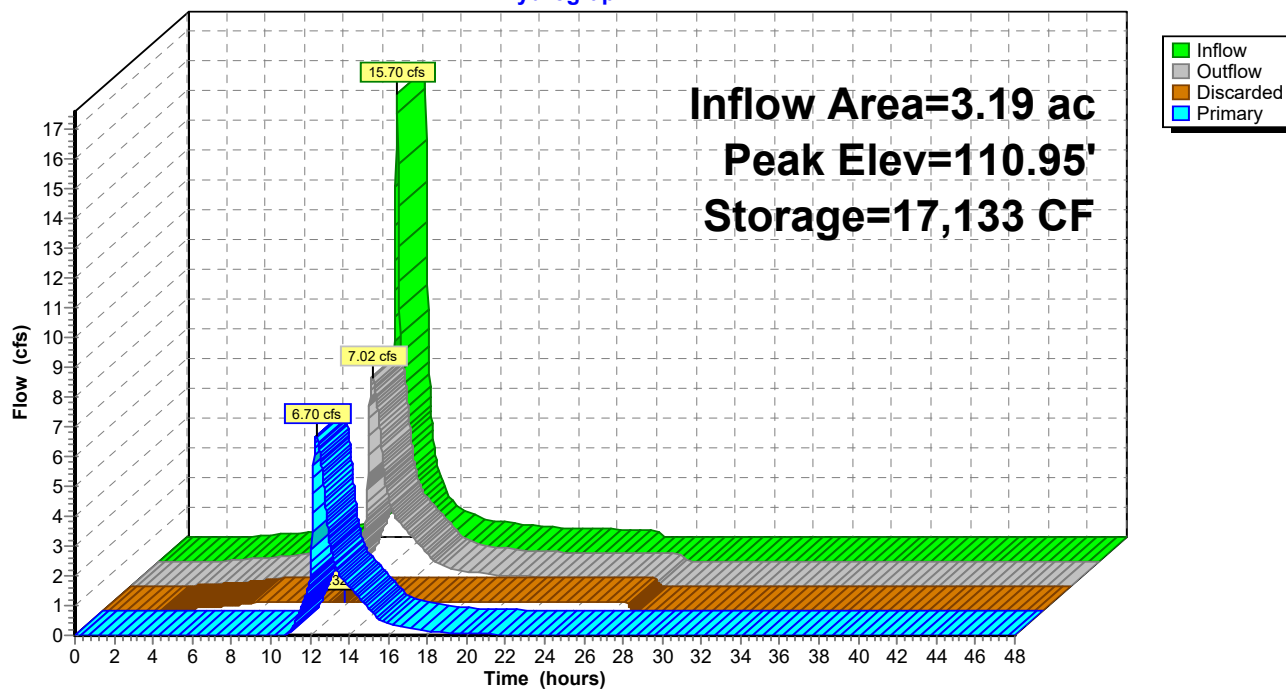
1,102.2 cy Field

106.7 cy Stone



Pond P2B:

Hydrograph



Stage-Discharge for Pond P2B:

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
107.33	0.00	0.00	0.00	109.93	3.35	0.31	3.04
107.38	0.27	0.27	0.00	109.98	3.55	0.31	3.24
107.43	0.27	0.27	0.00	110.03	3.76	0.31	3.45
107.48	0.27	0.27	0.00	110.08	3.97	0.31	3.66
107.53	0.27	0.27	0.00	110.13	4.19	0.31	3.88
107.58	0.27	0.27	0.00	110.18	4.42	0.31	4.11
107.63	0.27	0.27	0.00	110.23	4.64	0.31	4.33
107.68	0.27	0.27	0.00	110.28	4.87	0.31	4.56
107.73	0.27	0.27	0.00	110.33	5.09	0.31	4.77
107.78	0.27	0.27	0.00	110.38	5.30	0.31	4.99
107.83	0.27	0.27	0.00	110.43	5.50	0.31	5.18
107.88	0.28	0.28	0.00	110.48	5.66	0.32	5.35
107.93	0.28	0.28	0.00	110.53	5.82	0.32	5.50
107.98	0.28	0.28	0.00	110.58	5.98	0.32	5.66
108.03	0.28	0.28	0.00	110.63	6.13	0.32	5.81
108.08	0.28	0.28	0.00	110.68	6.28	0.32	5.96
108.13	0.28	0.28	0.00	110.73	6.42	0.32	6.10
108.18	0.28	0.28	0.00	110.78	6.56	0.32	6.24
108.23	0.30	0.28	0.02	110.83	6.70	0.32	6.38
108.28	0.35	0.28	0.07	110.88	6.84	0.32	6.51
108.33	0.43	0.28	0.15	110.93	6.97	0.32	6.64
108.38	0.53	0.28	0.24	110.98	7.09	0.32	6.77
108.43	0.64	0.28	0.36	111.03	7.22	0.32	6.89
108.48	0.77	0.28	0.48	111.08	7.34	0.33	7.01
108.53	0.90	0.29	0.62	111.13	7.46	0.33	7.13
108.58	1.04	0.29	0.75	111.18	7.58	0.33	7.25
108.63	1.16	0.29	0.87	111.23	7.69	0.33	7.36
108.68	1.25	0.29	0.96	111.28	7.80	0.33	7.48
108.73	1.34	0.29	1.05	111.33	7.92	0.33	7.59
108.78	1.42	0.29	1.13	111.38	8.21	0.33	7.88
108.83	1.50	0.29	1.21	111.43	8.38	0.33	8.05
108.88	1.57	0.29	1.28	111.48	8.44	0.33	8.11
108.93	1.64	0.29	1.35	111.53	8.51	0.33	8.18
108.98	1.71	0.29	1.41	111.58	8.58	0.33	8.25
109.03	1.77	0.29	1.48	111.63	8.65	0.33	8.31
109.08	1.83	0.29	1.54	111.68	8.71	0.33	8.38
109.13	1.89	0.29	1.59	111.73	8.78	0.34	8.44
109.18	1.94	0.30	1.65	111.78	8.84	0.34	8.51
109.23	2.00	0.30	1.70	111.83	8.91	0.34	8.57
109.28	2.05	0.30	1.75	111.88	8.97	0.34	8.63
109.33	2.10	0.30	1.80	111.93	9.03	0.34	8.70
109.38	2.15	0.30	1.85	111.98	9.10	0.34	8.76
109.43	2.20	0.30	1.90	112.03	9.16	0.34	8.82
109.48	2.25	0.30	1.95	112.08	9.22	0.34	8.88
109.53	2.30	0.30	2.00	112.13	9.28	0.34	8.94
109.58	2.37	0.30	2.06	112.18	9.35	0.34	9.00
109.63	2.46	0.30	2.15	112.23	9.41	0.34	9.06
109.68	2.56	0.30	2.26	112.28	9.47	0.34	9.12
109.73	2.69	0.30	2.39	112.33	9.53	0.34	9.18
109.78	2.83	0.30	2.53	112.38	9.59	0.35	9.24
109.83	2.99	0.31	2.69	112.43	9.65	0.35	9.30
109.88	3.17	0.31	2.86	112.48	9.71	0.35	9.36

Stage-Area-Storage for Pond P2B:

Elevation (feet)	Wetted (acres)	Storage (cubic-feet)	Elevation (feet)	Wetted (acres)	Storage (cubic-feet)
107.33	0.13	0	109.93	0.15	11,897
107.38	0.13	115	109.98	0.15	12,153
107.43	0.13	230	110.03	0.15	12,409
107.48	0.13	346	110.08	0.15	12,665
107.53	0.13	461	110.13	0.15	12,921
107.58	0.13	576	110.18	0.15	13,177
107.63	0.13	691	110.23	0.15	13,432
107.68	0.13	806	110.28	0.15	13,688
107.73	0.14	922	110.33	0.16	13,944
107.78	0.14	1,037	110.38	0.16	14,200
107.83	0.14	1,152	110.43	0.16	14,456
107.88	0.14	1,408	110.48	0.16	14,712
107.93	0.14	1,664	110.53	0.16	14,968
107.98	0.14	1,920	110.58	0.16	15,223
108.03	0.14	2,175	110.63	0.16	15,479
108.08	0.14	2,431	110.68	0.16	15,735
108.13	0.14	2,687	110.73	0.16	15,991
108.18	0.14	2,943	110.78	0.16	16,247
108.23	0.14	3,199	110.83	0.16	16,503
108.28	0.14	3,455	110.88	0.16	16,758
108.33	0.14	3,710	110.93	0.16	17,014
108.38	0.14	3,966	110.98	0.16	17,270
108.43	0.14	4,222	111.03	0.16	17,526
108.48	0.14	4,478	111.08	0.16	17,782
108.53	0.14	4,734	111.13	0.16	18,038
108.58	0.14	4,990	111.18	0.16	18,294
108.63	0.14	5,245	111.23	0.16	18,549
108.68	0.14	5,501	111.28	0.16	18,805
108.73	0.14	5,757	111.33	0.16	19,061
108.78	0.14	6,013	111.38	0.16	19,317
108.83	0.14	6,269	111.43	0.16	19,573
108.88	0.14	6,525	111.48	0.16	19,829
108.93	0.14	6,781	111.53	0.16	20,084
108.98	0.14	7,036	111.58	0.17	20,340
109.03	0.15	7,292	111.63	0.17	20,596
109.08	0.15	7,548	111.68	0.17	20,852
109.13	0.15	7,804	111.73	0.17	21,108
109.18	0.15	8,060	111.78	0.17	21,364
109.23	0.15	8,316	111.83	0.17	21,619
109.28	0.15	8,571	111.88	0.17	21,619
109.33	0.15	8,827	111.93	0.17	21,619
109.38	0.15	9,083	111.98	0.17	21,619
109.43	0.15	9,339	112.03	0.17	21,619
109.48	0.15	9,595	112.08	0.17	21,619
109.53	0.15	9,851	112.13	0.17	21,619
109.58	0.15	10,107	112.18	0.17	21,619
109.63	0.15	10,362	112.23	0.17	21,619
109.68	0.15	10,618	112.28	0.17	21,619
109.73	0.15	10,874	112.33	0.17	21,619
109.78	0.15	11,130	112.38	0.17	21,619
109.83	0.15	11,386	112.43	0.17	21,619
109.88	0.15	11,642	112.48	0.17	21,619

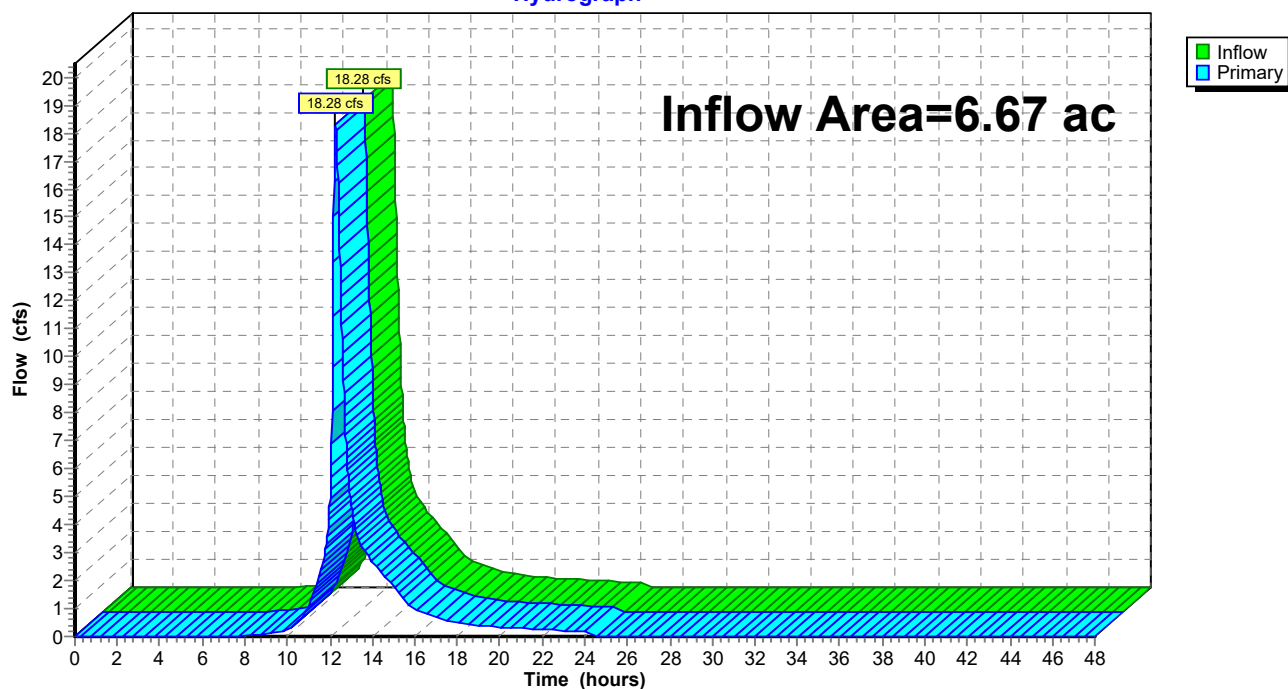
Summary for Link PRWS-1:

Inflow Area = 6.67 ac, 40.48% Impervious, Inflow Depth = 3.55" for 25-Year event
Inflow = 18.28 cfs @ 12.28 hrs, Volume= 85,958 CF
Primary = 18.28 cfs @ 12.28 hrs, Volume= 85,958 CF, Atten= 0%, Lag= 0.0 min
Routed to Link Site :

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

Link PRWS-1:

Hydrograph



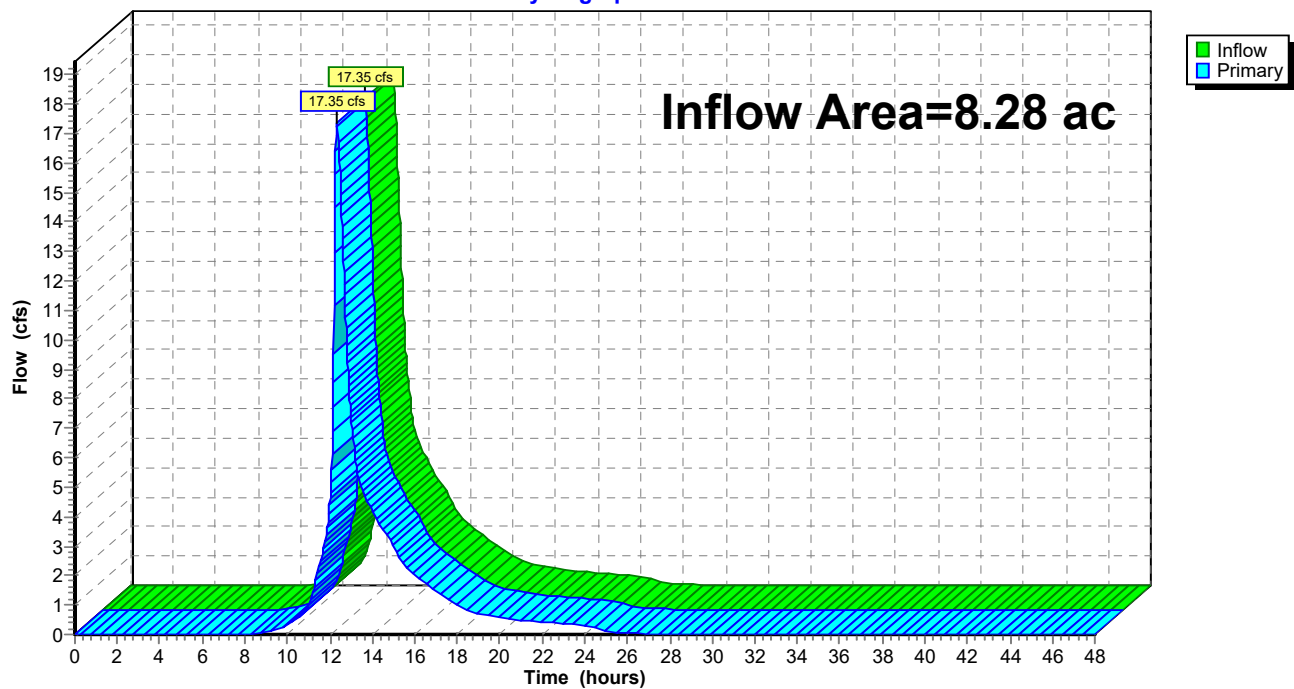
Summary for Link PRWS-2:

Inflow Area = 8.28 ac, 56.00% Impervious, Inflow Depth = 3.91" for 25-Year event
Inflow = 17.35 cfs @ 12.35 hrs, Volume= 117,528 CF
Primary = 17.35 cfs @ 12.35 hrs, Volume= 117,528 CF, Atten= 0%, Lag= 0.0 min
Routed to Link Site :

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

Link PRWS-2:

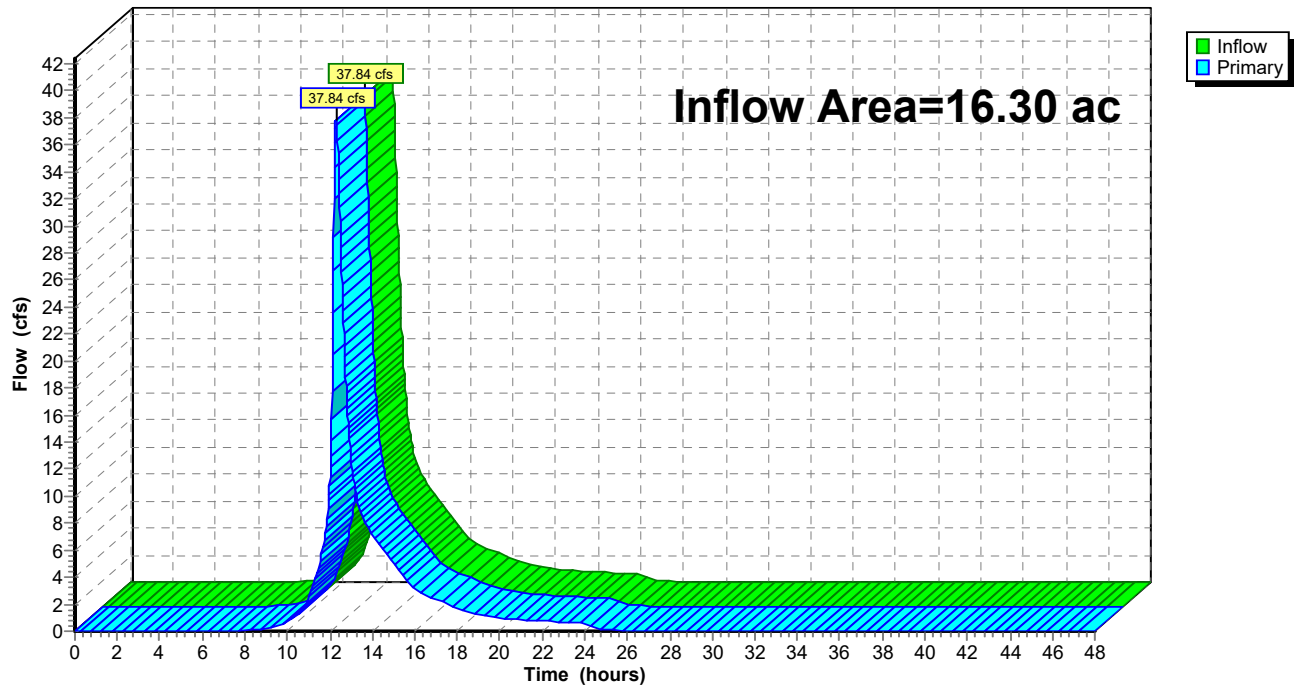
Hydrograph



Summary for Link Site:

Inflow Area = 16.30 ac, 45.01% Impervious, Inflow Depth = 3.73" for 25-Year event
Inflow = 37.84 cfs @ 12.29 hrs, Volume= 220,437 CF
Primary = 37.84 cfs @ 12.29 hrs, Volume= 220,437 CF, Atten= 0%, Lag= 0.0 min

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

Link Site:**Hydrograph**

PR WS_Convservation Submission

NOAA 24-hr D 100-Year Rainfall=7.85"

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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+Trans method - Pond routing by Stor-Ind method

SubcatchmentPRWS-1A: Runoff Area=3.81 ac 61.09% Impervious Runoff Depth=6.78"
Flow Length=594' Tc=11 min CN=91 Runoff=23.34 cfs 93,695 CF

SubcatchmentPRWS-1B: Runoff Area=2.86 ac 13.06% Impervious Runoff Depth=5.02"
Flow Length=300' Tc=17 min CN=76 Runoff=11.64 cfs 52,206 CF

SubcatchmentPRWS-2A: Runoff Area=3.41 ac 72.31% Impervious Runoff Depth=7.01"
Flow Length=102' Tc=9 min CN=93 Runoff=22.70 cfs 86,692 CF

SubcatchmentPRWS-2B: Runoff Area=3.19 ac 61.07% Impervious Runoff Depth=6.78"
Flow Length=580' Tc=10 min CN=91 Runoff=20.27 cfs 78,542 CF

SubcatchmentPRWS-2C: Runoff Area=73,269 sf 13.38% Impervious Runoff Depth=4.91"
Flow Length=462' Tc=32 min CN=75 Runoff=4.93 cfs 29,958 CF

SubcatchmentPRWS-3: Runoff Area=58,762 sf 0.00% Impervious Runoff Depth=4.91"
Flow Length=284' Tc=10 min CN=75 Runoff=6.67 cfs 24,026 CF

Pond P1A: Peak Elev=104.78' Storage=20,379 CF Inflow=23.34 cfs 93,695 CF
Discarded=0.35 cfs 24,156 CF Primary=17.05 cfs 69,539 CF Outflow=17.40 cfs 93,695 CF

Pond P2A: Peak Elev=103.64' Storage=29,670 cf Inflow=22.70 cfs 86,692 CF
Discarded=0.07 cfs 7,710 CF Primary=9.13 cfs 76,621 CF Secondary=2.51 cfs 1,402 CF Outflow=11.71 cfs 85,733 CF

Pond P2B: Peak Elev=111.80' Storage=21,456 CF Inflow=20.27 cfs 78,542 CF
Discarded=0.34 cfs 23,347 CF Primary=8.53 cfs 55,196 CF Outflow=8.87 cfs 78,542 CF

Link PRWS-1: Inflow=28.67 cfs 121,745 CF
Primary=28.67 cfs 121,745 CF

Link PRWS-2: Inflow=24.24 cfs 163,177 CF
Primary=24.24 cfs 163,177 CF

Link Site: Inflow=56.86 cfs 308,948 CF
Primary=56.86 cfs 308,948 CF

Total Runoff Area = 16.30 ac Runoff Volume = 365,119 CF Average Runoff Depth = 6.17"
54.99% Pervious = 8.96 ac 45.01% Impervious = 7.34 ac

PR WS_Convservation Submission

NOAA 24-hr D 100-Year Rainfall=7.85"

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Summary for Subcatchment PRWS-1A:

Runoff = 23.34 cfs @ 12.18 hrs, Volume= 93,695 CF, Depth= 6.78"

Routed to Pond P1A :

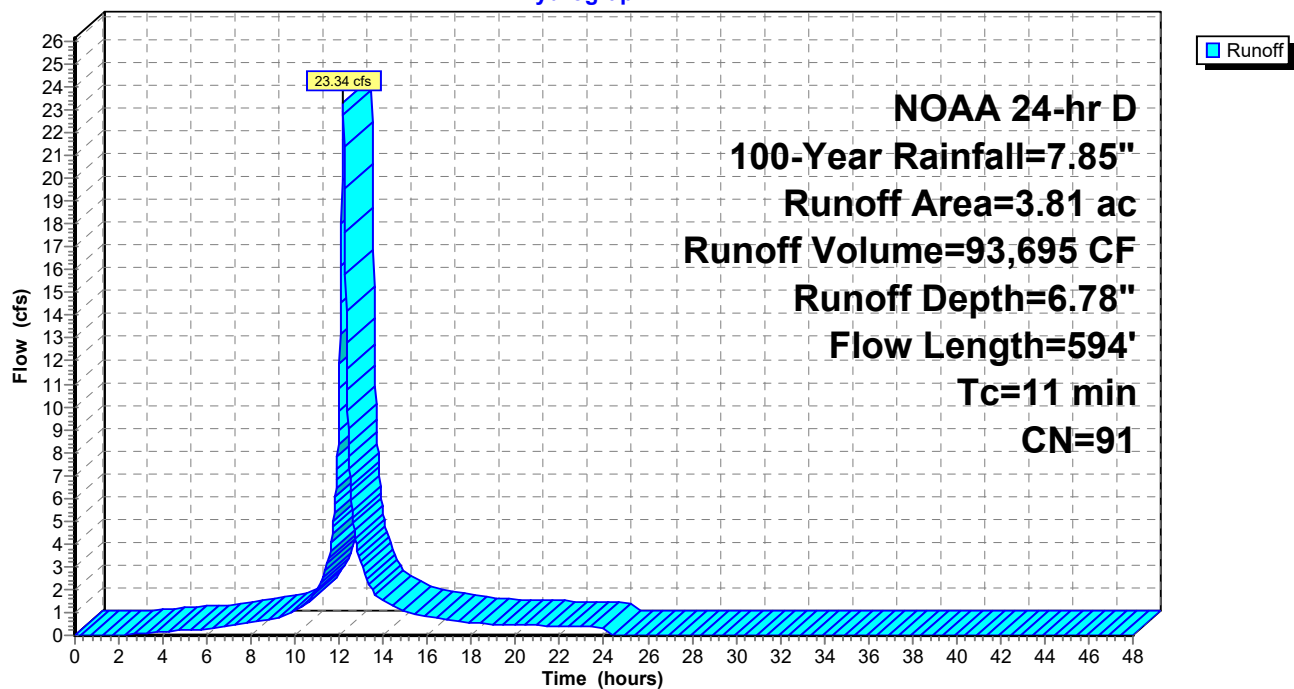
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 100-Year Rainfall=7.85"

Area (ac)	CN	Description
* 2.33	98	Impervious
0.00	61	>75% Grass cover, Good, HSG B
0.01	74	>75% Grass cover, Good, HSG C
0.38	80	>75% Grass cover, Good, HSG D
0.00	69	50-75% Grass cover, Fair, HSG B
0.00	79	50-75% Grass cover, Fair, HSG C
0.42	84	50-75% Grass cover, Fair, HSG D
0.02	55	Woods, Good, HSG B
0.00	70	Woods, Good, HSG C
0.24	77	Woods, Good, HSG D
* 0.00	71	Meadow, HSG C
* 0.32	78	Meadow, HSG D
* 0.00	89	Playground Surface, HSG C
* 0.08	91	Playground Surface, HSG D
3.81	91	Weighted Average
1.48		38.91% Pervious Area
2.33		61.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9	150	0.0500	0.28		Sheet Flow, AB Grass: Short n= 0.150 P2= 3.44"
0	12	0.0500	4.54		Shallow Concentrated Flow, BC Paved Kv= 20.3 fps
0	18	0.1000	2.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
1	132	0.0200	2.87		Shallow Concentrated Flow, DE Paved Kv= 20.3 fps
1	282	0.0100	7.20	22.62	Pipe Channel, EF 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
11	594	Total			

Subcatchment PRWS-1A:

Hydrograph



PR WS_Convservation Submission

NOAA 24-hr D 100-Year Rainfall=7.85"

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Summary for Subcatchment PRWS-1B:

Runoff = 11.64 cfs @ 12.25 hrs, Volume= 52,206 CF, Depth= 5.02"

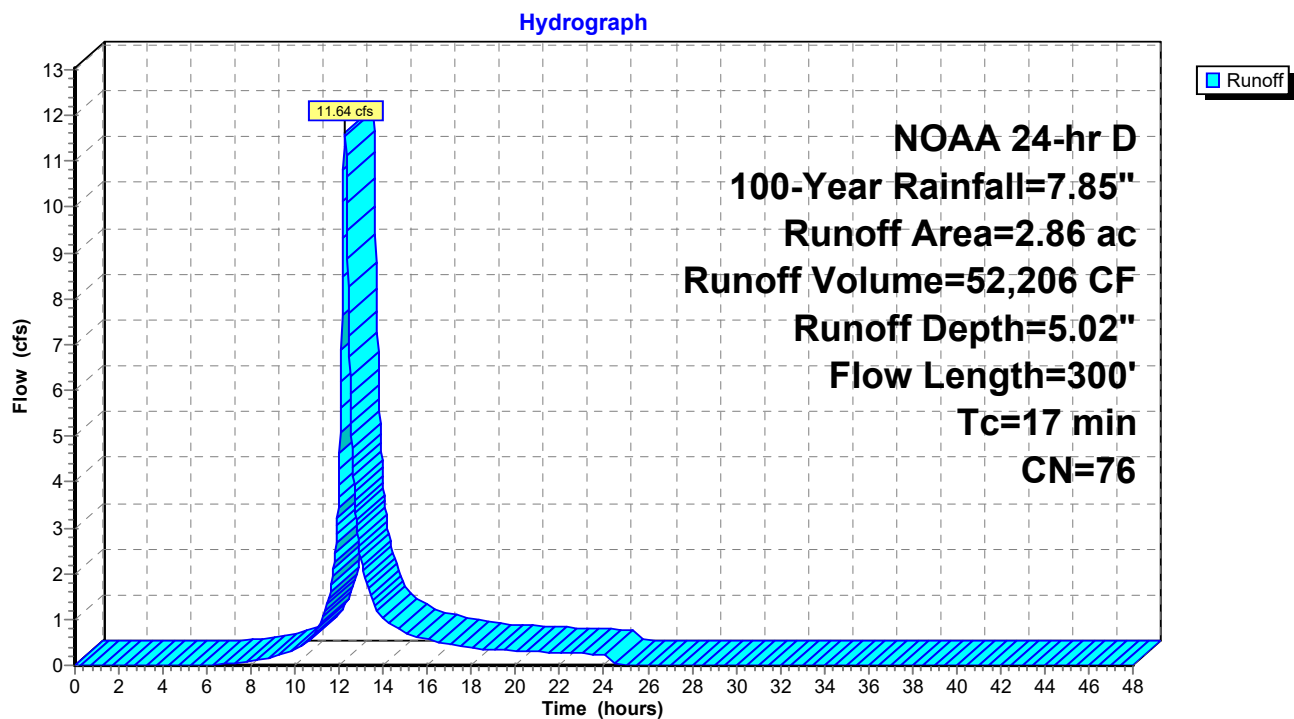
Routed to Link PRWS-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 100-Year Rainfall=7.85"

Area (ac)	CN	Description
* 0.37	98	Impervious
0.00	61	>75% Grass cover, Good, HSG B
0.87	74	>75% Grass cover, Good, HSG C
0.03	80	>75% Grass cover, Good, HSG D
0.00	69	50-75% Grass cover, Fair, HSG B
0.00	79	50-75% Grass cover, Fair, HSG C
0.07	84	50-75% Grass cover, Fair, HSG D
0.00	55	Woods, Good, HSG B
0.12	70	Woods, Good, HSG C
0.04	77	Woods, Good, HSG D
* 1.24	71	Meadow, HSG C
* 0.12	78	Meadow, HSG D
* 0.00	89	Playground Surface, HSG C
* 0.00	91	Playground Surface, HSG D
2.86	76	Weighted Average
2.49		86.94% Pervious Area
0.37		13.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2	25	0.2500	0.17		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 3.44"
3	35	0.0400	0.19		Sheet Flow, BC Grass: Short n= 0.150 P2= 3.44"
6	50	0.0400	0.14		Sheet Flow, CD Grass: Dense n= 0.240 P2= 3.44"
4	40	0.0650	0.16		Sheet Flow, DE Grass: Dense n= 0.240 P2= 3.44"
1	150	0.0800	1.98		Shallow Concentrated Flow, EF Short Grass Pasture Kv= 7.0 fps
17	300	Total			

Subcatchment PRWS-1B:



PR WS_Convservation Submission

NOAA 24-hr D 100-Year Rainfall=7.85"

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Summary for Subcatchment PRWS-2A:

Runoff = 22.70 cfs @ 12.16 hrs, Volume= 86,692 CF, Depth= 7.01"

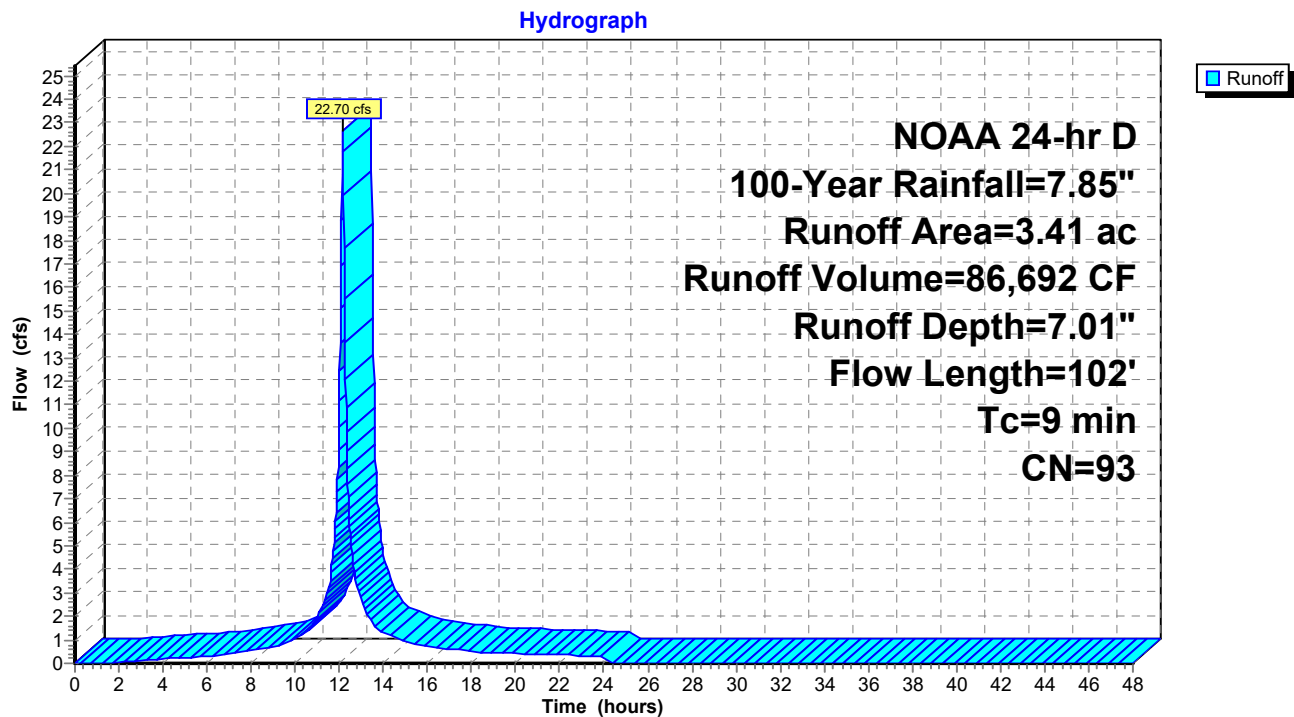
Routed to Pond P2A :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 100-Year Rainfall=7.85"

Area (ac)	CN	Description
* 2.31	98	Impervious
* 0.15	98	Pond
0.00	61	>75% Grass cover, Good, HSG B
0.00	74	>75% Grass cover, Good, HSG C
0.00	80	>75% Grass cover, Good, HSG D
0.00	69	50-75% Grass cover, Fair, HSG B
0.00	79	50-75% Grass cover, Fair, HSG C
0.00	84	50-75% Grass cover, Fair, HSG D
0.00	55	Woods, Good, HSG B
0.00	70	Woods, Good, HSG C
0.00	77	Woods, Good, HSG D
* 0.00	58	Meadow, HSG B
* 0.49	71	Meadow, HSG C
* 0.10	78	Meadow, HSG D
* 0.17	89	Playground Surface, HSG C
* 0.19	91	Playground Surface, HSG D
3.41	93	Weighted Average
0.94		27.69% Pervious Area
2.46		72.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6	80	0.1250	0.24		Sheet Flow, AB
					Grass: Dense n= 0.240 P2= 3.44"
3	12	0.0200	0.08		Sheet Flow, BC
					Grass: Dense n= 0.240 P2= 3.44"
1	10	0.3333	0.24		Sheet Flow, CD
					Grass: Dense n= 0.240 P2= 3.44"
9	102	Total			

Subcatchment PRWS-2A:



PR WS_Convservation Submission

NOAA 24-hr D 100-Year Rainfall=7.85"

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Summary for Subcatchment PRWS-2B:

Runoff = 20.27 cfs @ 12.17 hrs, Volume= 78,542 CF, Depth= 6.78"

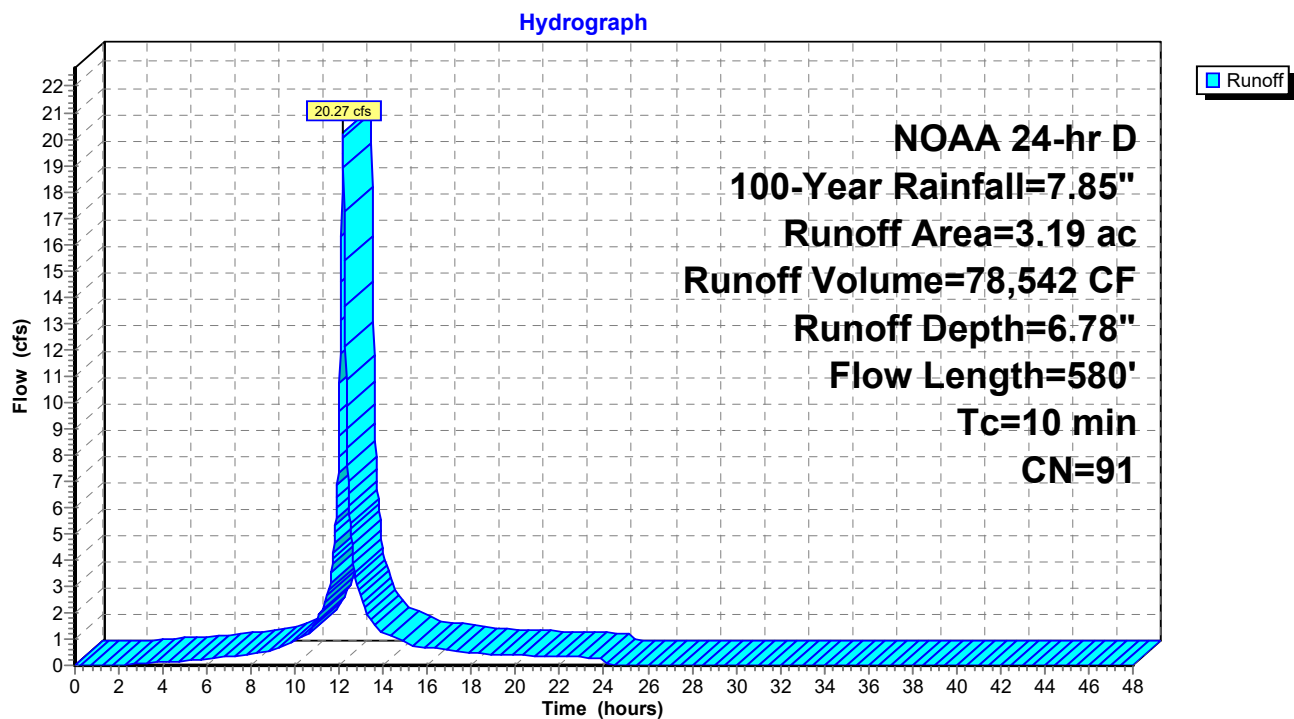
Routed to Pond P2B :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 100-Year Rainfall=7.85"

Area (ac)	CN	Description
* 1.95	98	Impervious
0.00	61	>75% Grass cover, Good, HSG B
0.00	74	>75% Grass cover, Good, HSG C
0.46	80	>75% Grass cover, Good, HSG D
0.00	69	50-75% Grass cover, Fair, HSG B
0.00	79	50-75% Grass cover, Fair, HSG C
0.06	84	50-75% Grass cover, Fair, HSG D
0.02	55	Woods, Good, HSG B
0.00	70	Woods, Good, HSG C
0.06	77	Woods, Good, HSG D
* 0.06	58	Meadow, HSG B
* 0.43	78	Meadow, HSG D
* 0.00	89	Playground Surface, HSG C
* 0.16	91	Playground Surface, HSG D
3.19	91	Weighted Average
1.24		38.93% Pervious Area
1.95		61.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3	16	0.0600	0.09		Sheet Flow, AB
					Woods: Light underbrush n= 0.400 P2= 3.44"
3	25	0.0600	0.14		Sheet Flow, BC
					Grass: Dense n= 0.240 P2= 3.44"
1	11	0.3300	0.24		Sheet Flow, DE
					Grass: Dense n= 0.240 P2= 3.44"
1	7	0.1000	0.14		Sheet Flow, EF
					Grass: Dense n= 0.240 P2= 3.44"
2	521	0.0100	4.54	3.56	Pipe Channel, FG
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.013 Corrugated PE, smooth interior
10	580	Total			

Subcatchment PRWS-2B:



PR WS_Convservation Submission

NOAA 24-hr D 100-Year Rainfall=7.85"

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Summary for Subcatchment PRWS-2C:

Runoff = 4.93 cfs @ 12.44 hrs, Volume= 29,958 CF, Depth= 4.91"

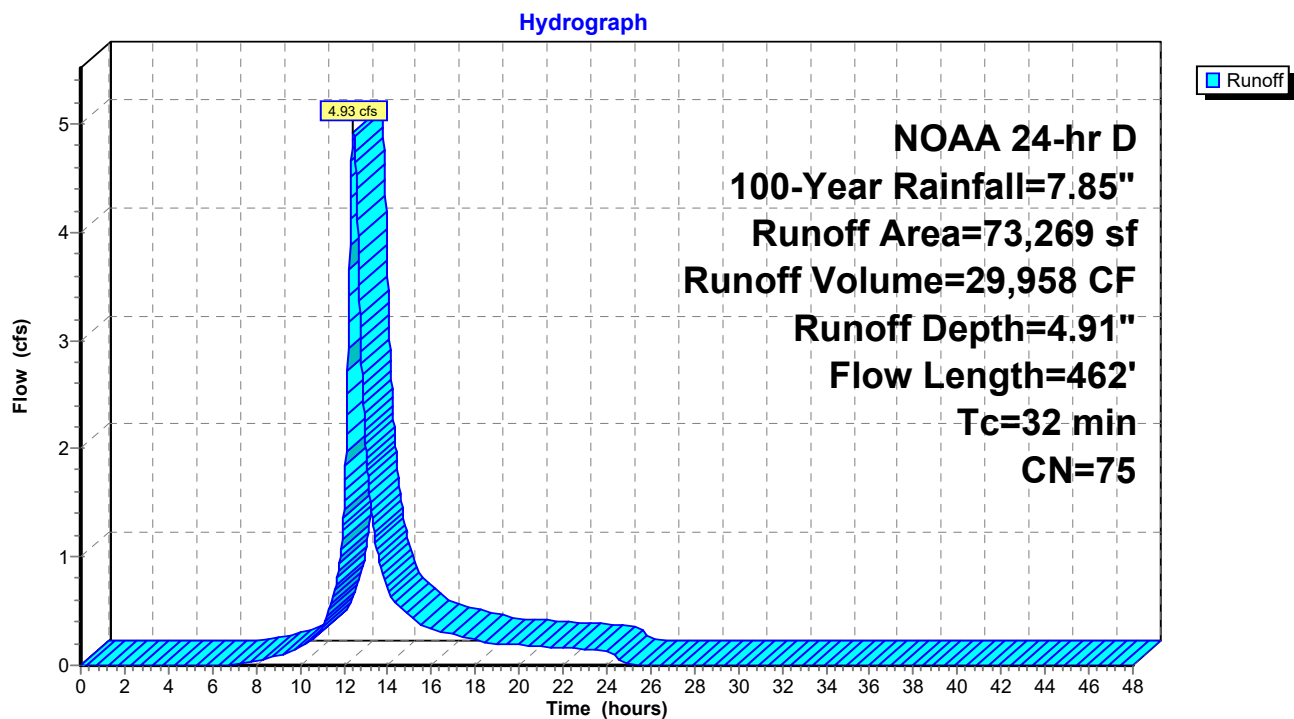
Routed to Link PRWS-2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 100-Year Rainfall=7.85"

	Area (sf)	CN	Description
*	9,801	98	Impervious
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
	0	69	50-75% Grass cover, Fair, HSG B
	0	79	50-75% Grass cover, Fair, HSG C
	0	84	50-75% Grass cover, Fair, HSG D
	0	55	Woods, Good, HSG B
	5,097	70	Woods, Good, HSG C
	0	77	Woods, Good, HSG D
*	3,703	58	Meadow, HSG B
*	37,941	71	Meadow, HSG C
*	16,727	78	Meadow, HSG D
*	0	89	Playground Surface, HSG C
*	0	91	Playground Surface, HSG D
	73,269	75	Weighted Average
	63,468		86.62% Pervious Area
	9,801		13.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19	87	0.0200	0.08		Sheet Flow, AB Woods: Light underbrush n= 0.400 P2= 3.44"
10	63	0.0200	0.11		Sheet Flow, BC Grass: Dense n= 0.240 P2= 3.44"
1	60	0.0300	1.21		Shallow Concentrated Flow, CD Short Grass Pasture Kv= 7.0 fps
3	192	0.0200	0.99		Shallow Concentrated Flow, DE Short Grass Pasture Kv= 7.0 fps
0	60	0.0100	5.26	6.46	Pipe Channel, EF 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
32	462	Total			

Subcatchment PRWS-2C:



PR WS_Convservation Submission

NOAA 24-hr D 100-Year Rainfall=7.85"

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Summary for Subcatchment PRWS-3:

Runoff = 6.67 cfs @ 12.17 hrs, Volume= 24,026 CF, Depth= 4.91"

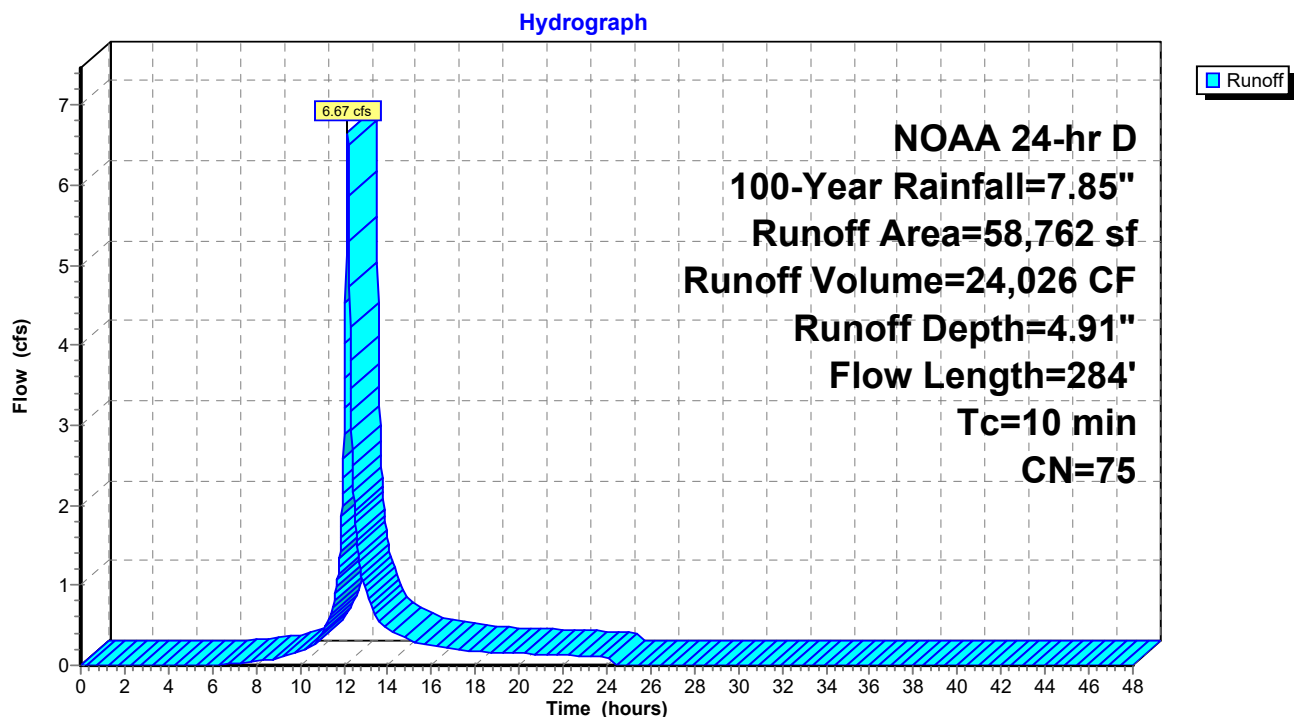
Routed to Link Site :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 100-Year Rainfall=7.85"

Area (sf)	CN	Description
* 0	98	Impervious
0	69	50-75% Grass cover, Fair, HSG B
0	79	50-75% Grass cover, Fair, HSG C
21,344	84	50-75% Grass cover, Fair, HSG D
0	80	>75% Grass cover, Good, HSG D
10,977	55	Woods, Good, HSG B
0	70	Woods, Good, HSG C
25,352	77	Woods, Good, HSG D
* 1,089	78	Meadow, HSG D
58,762	75	Weighted Average
58,762		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8	150	0.0650	0.31		Sheet Flow, AB Grass: Short n= 0.150 P2= 3.44"
0	50	0.0650	1.78		Shallow Concentrated Flow, BC Short Grass Pasture Kv= 7.0 fps
1	84	0.0550	1.17		Shallow Concentrated Flow, CD Woodland Kv= 5.0 fps
10	284	Total			

Subcatchment PRWS-3:



Summary for Pond P1A:

Inflow Area = 3.81 ac, 61.09% Impervious, Inflow Depth = 6.78" for 100-Year event
 Inflow = 23.34 cfs @ 12.18 hrs, Volume= 93,695 CF
 Outflow = 17.40 cfs @ 12.26 hrs, Volume= 93,695 CF, Atten= 25%, Lag= 5.2 min
 Discarded = 0.35 cfs @ 12.26 hrs, Volume= 24,156 CF
 Primary = 17.05 cfs @ 12.26 hrs, Volume= 69,539 CF
 Routed to Link PRWS-1 :

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
 Peak Elev= 104.78' @ 12.26 hrs Surf.Area= 0.14 ac Storage= 20,379 CF

Plug-Flow detention time= 53.7 min calculated for 93,695 CF (100% of inflow)
 Center-of-Mass det. time= 53.7 min (834.7 - 781.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.83'	1,254 CF	56.00'W x 112.00'L x 4.67'H Field A 29,269 CF Overall - 26,133 CF Embedded = 3,136 CF x 40.0% Voids
#2A	101.33'	19,419 CF	retain_it retain_it 3.5' x 98 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 7 Rows adjusted for 257.9 cf perimeter wall
		20,673 CF	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	100.83'	2.000 in/hr Exfiltration over Wetted area
#2	Primary	101.33'	24.0" Round Culvert L= 40.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 101.33' / 101.13' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	101.42'	6.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#4	Device 2	103.08'	10.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#5	Device 2	104.33'	5.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.35 cfs @ 12.26 hrs HW=104.77' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.35 cfs)

Primary OutFlow Max=17.00 cfs @ 12.26 hrs HW=104.77' (Free Discharge)

↑ **2=Culvert** (Passes 17.00 cfs of 18.67 cfs potential flow)

↑ **3=Orifice/Grate** (Orifice Controls 3.33 cfs @ 8.48 fps)

↑ **4=Orifice/Grate** (Orifice Controls 8.91 cfs @ 5.44 fps)

↑ **5=Sharp-Crested Rectangular Weir** (Weir Controls 4.76 cfs @ 2.18 fps)

Pond P1A: - Chamber Wizard Field A

Chamber Model = retain_it retain_it 3.5' (retain-it@)

Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf

Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf

7 Rows adjusted for 257.9 cf perimeter wall

14 Chambers/Row x 8.00' Long = 112.00' Row Length

7 Rows x 96.0" Wide = 56.00' Base Width

6.0" Stone Base + 50.0" Chamber Height = 4.67' Field Height

6.1 cf Sidewall x 14 x 2 + 6.1 cf Endwall x 7 x 2 = 257.9 cf Perimeter Wall

98 Chambers x 200.8 cf - 257.9 cf Perimeter wall = 19,418.6 cf Chamber Storage

98 Chambers x 266.7 cf = 26,133.3 cf Displacement

29,269.3 cf Field - 26,133.3 cf Chambers = 3,136.0 cf Stone x 40.0% Voids = 1,254.4 cf Stone Storage

Chamber Storage + Stone Storage = 20,673.0 cf

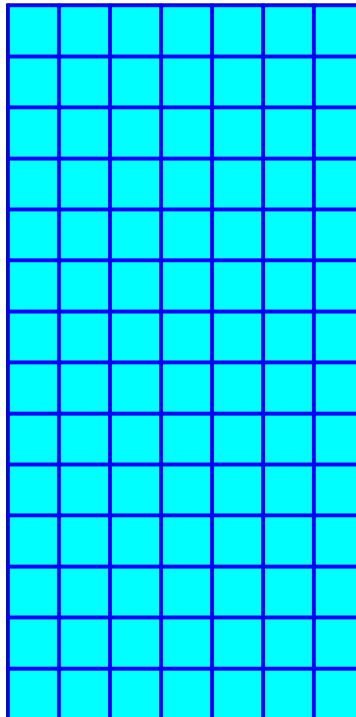
Overall Storage Efficiency = 70.6%

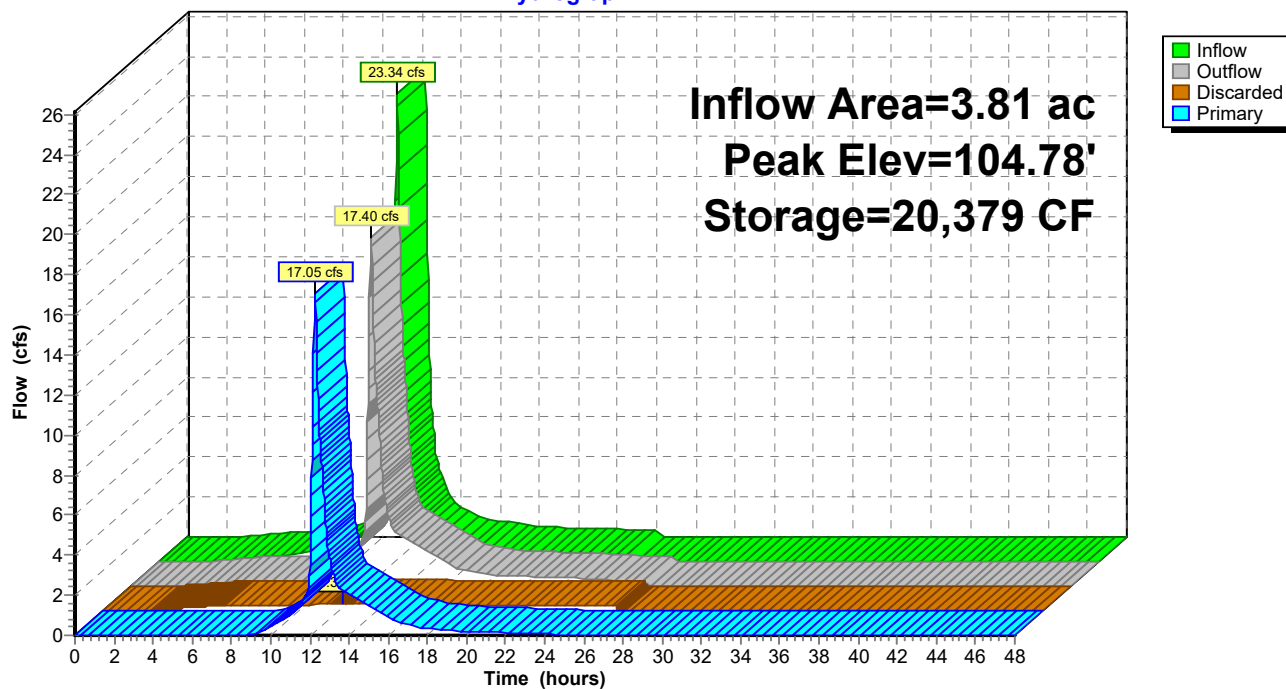
Overall System Size = 112.00' x 56.00' x 4.67'

98 Chambers

1,084.0 cy Field

116.1 cy Stone



Pond P1A:**Hydrograph**

PR WS_Convservation Submission

NOAA 24-hr D 100-Year Rainfall=7.85"

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Stage-Discharge for Pond P1A:

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
100.83	0.00	0.00	0.00	103.43	4.15	0.33	3.82
100.88	0.29	0.29	0.00	103.48	4.55	0.33	4.22
100.93	0.29	0.29	0.00	103.53	4.97	0.33	4.64
100.98	0.29	0.29	0.00	103.58	5.41	0.33	5.08
101.03	0.29	0.29	0.00	103.63	5.87	0.33	5.54
101.08	0.29	0.29	0.00	103.68	6.34	0.33	6.01
101.13	0.30	0.30	0.00	103.73	6.81	0.34	6.47
101.18	0.30	0.30	0.00	103.78	7.26	0.34	6.93
101.23	0.30	0.30	0.00	103.83	7.69	0.34	7.35
101.28	0.30	0.30	0.00	103.88	8.06	0.34	7.73
101.33	0.30	0.30	0.00	103.93	8.37	0.34	8.03
101.38	0.30	0.30	0.00	103.98	8.69	0.34	8.35
101.43	0.30	0.30	0.00	104.03	9.00	0.34	8.66
101.48	0.32	0.30	0.02	104.08	9.29	0.34	8.95
101.53	0.37	0.30	0.07	104.13	9.58	0.34	9.24
101.58	0.45	0.30	0.15	104.18	9.85	0.34	9.51
101.63	0.55	0.30	0.24	104.23	10.12	0.34	9.77
101.68	0.66	0.30	0.36	104.28	10.37	0.34	10.03
101.73	0.79	0.30	0.48	104.33	10.62	0.34	10.28
101.78	0.92	0.31	0.62	104.38	11.05	0.35	10.70
101.83	1.06	0.31	0.75	104.43	11.61	0.35	11.27
101.88	1.18	0.31	0.87	104.48	12.27	0.35	11.93
101.93	1.27	0.31	0.96	104.53	13.01	0.35	12.66
101.98	1.36	0.31	1.05	104.58	13.80	0.35	13.45
102.03	1.44	0.31	1.13	104.63	14.64	0.35	14.29
102.08	1.52	0.31	1.21	104.68	15.54	0.35	15.19
102.13	1.59	0.31	1.28	104.73	16.48	0.35	16.13
102.18	1.66	0.31	1.35	104.78	17.46	0.35	17.11
102.23	1.73	0.31	1.41	104.83	18.48	0.35	18.12
102.28	1.79	0.31	1.48	104.88	19.42	0.35	19.07
102.33	1.85	0.31	1.54	104.93	19.61	0.35	19.26
102.38	1.91	0.31	1.59	104.98	19.80	0.35	19.44
102.43	1.96	0.32	1.65	105.03	19.98	0.36	19.62
102.48	2.02	0.32	1.70	105.08	20.16	0.36	19.80
102.53	2.07	0.32	1.75	105.13	20.34	0.36	19.98
102.58	2.12	0.32	1.80	105.18	20.52	0.36	20.16
102.63	2.17	0.32	1.85	105.23	20.70	0.36	20.34
102.68	2.22	0.32	1.90	105.28	20.87	0.36	20.51
102.73	2.27	0.32	1.95	105.33	21.04	0.36	20.68
102.78	2.31	0.32	1.99	105.38	21.22	0.36	20.86
102.83	2.36	0.32	2.04	105.43	21.39	0.36	21.03
102.88	2.40	0.32	2.08	105.48	21.56	0.36	21.20
102.93	2.45	0.32	2.12				
102.98	2.49	0.32	2.16				
103.03	2.53	0.32	2.21				
103.08	2.57	0.33	2.25				
103.13	2.64	0.33	2.32				
103.18	2.77	0.33	2.44				
103.23	2.95	0.33	2.63				
103.28	3.19	0.33	2.86				
103.33	3.47	0.33	3.14				
103.38	3.79	0.33	3.46				

Stage-Area-Storage for Pond P1A:

Elevation (feet)	Wetted (acres)	Storage (cubic-feet)	Elevation (feet)	Wetted (acres)	Storage (cubic-feet)
100.83	0.14	0	103.43	0.16	12,906
100.88	0.14	125	103.48	0.16	13,183
100.93	0.14	251	103.53	0.16	13,460
100.98	0.15	376	103.58	0.17	13,738
101.03	0.15	502	103.63	0.17	14,015
101.08	0.15	627	103.68	0.17	14,293
101.13	0.15	753	103.73	0.17	14,570
101.18	0.15	878	103.78	0.17	14,847
101.23	0.15	1,004	103.83	0.17	15,125
101.28	0.15	1,129	103.88	0.17	15,402
101.33	0.15	1,254	103.93	0.17	15,680
101.38	0.15	1,532	103.98	0.17	15,957
101.43	0.15	1,809	104.03	0.17	16,234
101.48	0.15	2,087	104.08	0.17	16,512
101.53	0.15	2,364	104.13	0.17	16,789
101.58	0.15	2,641	104.18	0.17	17,067
101.63	0.15	2,919	104.23	0.17	17,344
101.68	0.15	3,196	104.28	0.17	17,622
101.73	0.15	3,474	104.33	0.17	17,899
101.78	0.15	3,751	104.38	0.17	18,176
101.83	0.15	4,028	104.43	0.17	18,454
101.88	0.15	4,306	104.48	0.17	18,731
101.93	0.15	4,583	104.53	0.17	19,009
101.98	0.15	4,861	104.58	0.17	19,286
102.03	0.15	5,138	104.63	0.17	19,563
102.08	0.15	5,416	104.68	0.17	19,841
102.13	0.15	5,693	104.73	0.17	20,118
102.18	0.15	5,970	104.78	0.17	20,396
102.23	0.15	6,248	104.83	0.17	20,673
102.28	0.16	6,525	104.88	0.18	20,673
102.33	0.16	6,803	104.93	0.18	20,673
102.38	0.16	7,080	104.98	0.18	20,673
102.43	0.16	7,357	105.03	0.18	20,673
102.48	0.16	7,635	105.08	0.18	20,673
102.53	0.16	7,912	105.13	0.18	20,673
102.58	0.16	8,190	105.18	0.18	20,673
102.63	0.16	8,467	105.23	0.18	20,673
102.68	0.16	8,744	105.28	0.18	20,673
102.73	0.16	9,022	105.33	0.18	20,673
102.78	0.16	9,299	105.38	0.18	20,673
102.83	0.16	9,577	105.43	0.18	20,673
102.88	0.16	9,854	105.48	0.18	20,673
102.93	0.16	10,131			
102.98	0.16	10,409			
103.03	0.16	10,686			
103.08	0.16	10,964			
103.13	0.16	11,241			
103.18	0.16	11,519			
103.23	0.16	11,796			
103.28	0.16	12,073			
103.33	0.16	12,351			
103.38	0.16	12,628			

PR WS_Convservation Submission

NOAA 24-hr D 100-Year Rainfall=7.85"

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Summary for Pond P2A:

Inflow Area = 3.41 ac, 72.31% Impervious, Inflow Depth = 7.01" for 100-Year event
 Inflow = 22.70 cfs @ 12.16 hrs, Volume= 86,692 CF
 Outflow = 11.71 cfs @ 12.29 hrs, Volume= 85,733 CF, Atten= 48%, Lag= 7.8 min
 Discarded = 0.07 cfs @ 12.29 hrs, Volume= 7,710 CF
 Primary = 9.13 cfs @ 12.29 hrs, Volume= 76,621 CF
 Routed to Link PRWS-2 :
 Secondary = 2.51 cfs @ 12.29 hrs, Volume= 1,402 CF
 Routed to Link PRWS-2 :

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
 Peak Elev= 103.64' @ 12.29 hrs Surf.Area= 12,069 sf Storage= 29,670 cf

Plug-Flow detention time= 164.6 min calculated for 85,733 CF (99% of inflow)
 Center-of-Mass det. time= 157.3 min (928.5 - 771.2)

Volume	Invert	Avail.Storage	Storage Description		
#1	100.50'	35,494 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)
100.50	6,910	520.0	0	0	6,910
101.00	7,700	530.0	3,651	3,651	7,786
102.00	9,310	550.0	8,492	12,143	9,588
103.00	10,980	566.0	10,134	22,277	11,114
104.00	12,700	585.0	11,830	34,106	12,947
104.10	15,100	586.0	1,388	35,494	13,057

Device	Routing	Invert	Outlet Devices
#1	Primary	98.50'	15.0" Round Culvert L= 150.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 98.50' / 97.75' S= 0.0050 ' S= 0.0050 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Discarded	100.50'	0.250 in/hr Exfiltration over Wetted area
#3	Device 1	101.00'	8.0" Vert. Orifice C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.00'	24.0" x 36.0" Horiz. Grate C= 0.600 Limited to weir flow at low heads
#5	Secondary	103.50'	20.0' long x 5.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.07 cfs @ 12.29 hrs HW=103.64' (Free Discharge)

↑ **2=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=9.13 cfs @ 12.29 hrs HW=103.64' (Free Discharge)

↑ **1=Culvert** (Barrel Controls 9.13 cfs @ 7.44 fps)

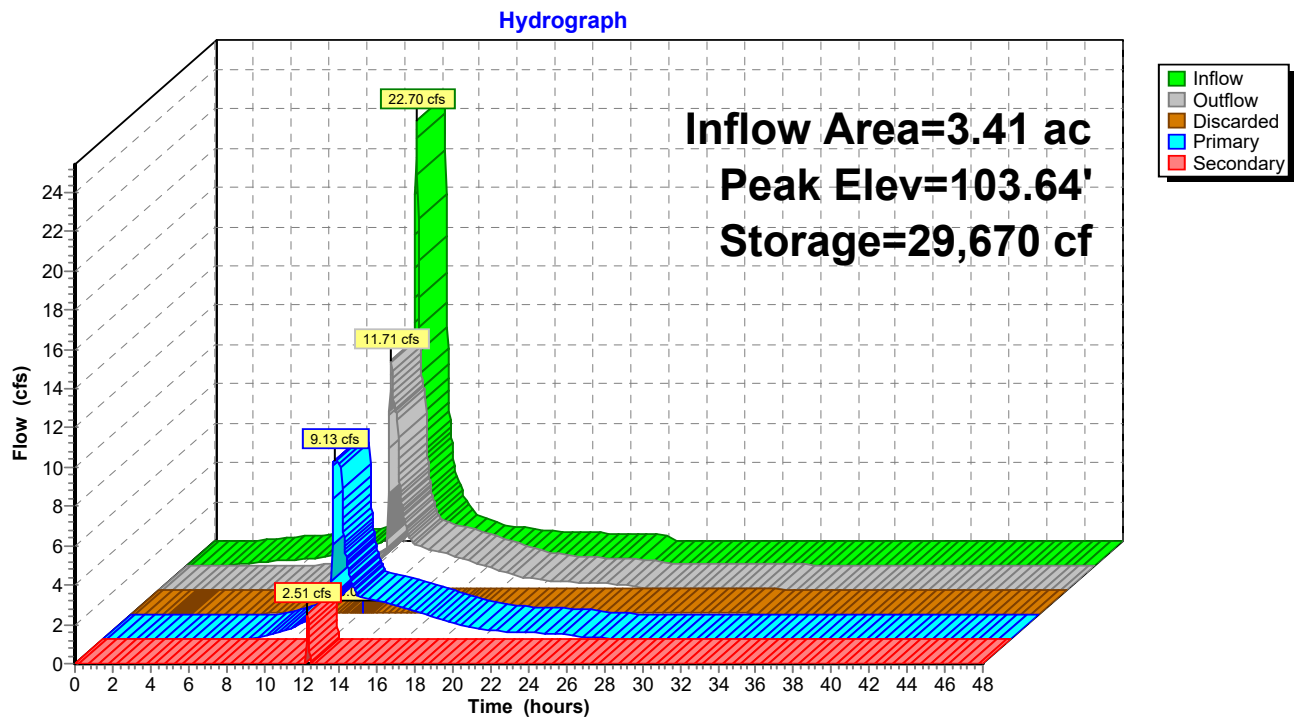
↑ **3=Orifice** (Passes < 2.55 cfs potential flow)

↑ **4=Grate** (Passes < 16.77 cfs potential flow)

Secondary OutFlow Max=2.47 cfs @ 12.29 hrs HW=103.64' (Free Discharge)

↑ **5=Broad-Crested Rectangular Weir** (Weir Controls 2.47 cfs @ 0.88 fps)

Pond P2A:



PR WS_Convservation Submission

NOAA 24-hr D 100-Year Rainfall=7.85"

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Stage-Discharge for Pond P2A:

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
100.50	0.00	0.00	0.00	0.00
100.60	0.04	0.04	0.00	0.00
100.70	0.04	0.04	0.00	0.00
100.80	0.04	0.04	0.00	0.00
100.90	0.04	0.04	0.00	0.00
101.00	0.05	0.05	0.00	0.00
101.10	0.08	0.05	0.04	0.00
101.20	0.18	0.05	0.13	0.00
101.30	0.33	0.05	0.28	0.00
101.40	0.52	0.05	0.47	0.00
101.50	0.73	0.05	0.68	0.00
101.60	0.92	0.05	0.87	0.00
101.70	1.07	0.05	1.02	0.00
101.80	1.20	0.05	1.15	0.00
101.90	1.32	0.05	1.27	0.00
102.00	1.43	0.06	1.37	0.00
102.10	1.53	0.06	1.47	0.00
102.20	1.62	0.06	1.56	0.00
102.30	1.71	0.06	1.65	0.00
102.40	1.79	0.06	1.74	0.00
102.50	1.88	0.06	1.82	0.00
102.60	1.95	0.06	1.89	0.00
102.70	2.03	0.06	1.96	0.00
102.80	2.10	0.06	2.04	0.00
102.90	2.17	0.06	2.10	0.00
103.00	2.23	0.06	2.17	0.00
103.10	3.33	0.07	3.27	0.00
103.20	5.29	0.07	5.22	0.00
103.30	7.80	0.07	7.73	0.00
103.40	8.96	0.07	8.89	0.00
103.50	9.06	0.07	8.99	0.00
103.60	10.64	0.07	9.09	1.48
103.70	13.45	0.07	9.19	4.19
103.80	17.31	0.07	9.29	7.95
103.90	22.11	0.07	9.38	12.65
104.00	27.94	0.07	9.48	18.38
104.10	34.75	0.08	9.57	25.10

Stage-Area-Storage for Pond P2A:

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
100.50	6,910	6,910	0
100.60	7,065	7,084	699
100.70	7,221	7,258	1,413
100.80	7,379	7,433	2,143
100.90	7,539	7,609	2,889
101.00	7,700	7,786	3,651
101.10	7,854	7,963	4,428
101.20	8,010	8,141	5,222
101.30	8,167	8,319	6,030
101.40	8,326	8,498	6,855
101.50	8,486	8,678	7,696
101.60	8,648	8,859	8,552
101.70	8,811	9,040	9,425
101.80	8,976	9,222	10,315
101.90	9,142	9,404	11,220
102.00	9,310	9,588	12,143
102.10	9,471	9,738	13,082
102.20	9,633	9,889	14,037
102.30	9,797	10,041	15,009
102.40	9,961	10,193	15,997
102.50	10,128	10,345	17,001
102.60	10,295	10,498	18,022
102.70	10,465	10,652	19,060
102.80	10,635	10,805	20,115
102.90	10,807	10,959	21,187
103.00	10,980	11,114	22,277
103.10	11,146	11,295	23,383
103.20	11,314	11,476	24,506
103.30	11,483	11,658	25,646
103.40	11,653	11,840	26,802
103.50	11,824	12,023	27,976
103.60	11,997	12,207	29,167
103.70	12,171	12,391	30,376
103.80	12,346	12,576	31,602
103.90	12,522	12,761	32,845
104.00	12,700	12,947	34,106
104.10	15,100	13,057	35,494

Summary for Pond P2B:

Inflow Area = 3.19 ac, 61.07% Impervious, Inflow Depth = 6.78" for 100-Year event
 Inflow = 20.27 cfs @ 12.17 hrs, Volume= 78,542 CF
 Outflow = 8.87 cfs @ 12.34 hrs, Volume= 78,542 CF, Atten= 56%, Lag= 10.7 min
 Discarded = 0.34 cfs @ 12.34 hrs, Volume= 23,347 CF
 Primary = 8.53 cfs @ 12.34 hrs, Volume= 55,196 CF
 Routed to Link PRWS-2 :

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
 Peak Elev= 111.80' @ 12.34 hrs Surf.Area= 0.13 ac Storage= 21,456 CF

Plug-Flow detention time= 71.0 min calculated for 78,510 CF (100% of inflow)
 Center-of-Mass det. time= 71.0 min (851.1 - 780.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	107.33'	1,152 CF	48.00'W x 120.00'L x 5.17'H Field A 29,760 CF Overall - 26,880 CF Embedded = 2,880 CF x 40.0% Voids
#2A	107.83'	20,467 CF	retain_it retain_it 4.0' x 90 Inside #1 Inside= 84.0"W x 48.0"H => 28.87 sf x 8.00'L = 230.9 cf Outside= 96.0"W x 56.0"H => 37.33 sf x 8.00'L = 298.7 cf 6 Rows adjusted for 317.1 cf perimeter wall
		21,619 CF	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	107.33'	2.000 in/hr Exfiltration over Wetted area
#2	Primary	107.83'	15.0" Round Culvert L= 40.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 107.83' / 105.83' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#3	Device 2	108.17'	6.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#4	Device 2	109.50'	12.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Device 2	111.33'	5.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.34 cfs @ 12.34 hrs HW=111.80' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.34 cfs)

Primary OutFlow Max=8.53 cfs @ 12.34 hrs HW=111.80' (Free Discharge)

↑ **2=Culvert** (Inlet Controls 8.53 cfs @ 6.95 fps)

↑ **3=Orifice/Grate** (Passes < 3.47 cfs potential flow)

↑ **4=Orifice/Grate** (Passes < 5.07 cfs potential flow)

↑ **5=Sharp-Crested Rectangular Weir** (Passes < 5.12 cfs potential flow)

Pond P2B: - Chamber Wizard Field A**Chamber Model = retain_it retain_it 4.0' (retain-it@)**

Inside= 84.0"W x 48.0"H => 28.87 sf x 8.00'L = 230.9 cf

Outside= 96.0"W x 56.0"H => 37.33 sf x 8.00'L = 298.7 cf

6 Rows adjusted for 317.1 cf perimeter wall

15 Chambers/Row x 8.00' Long = 120.00' Row Length

6 Rows x 96.0" Wide = 48.00' Base Width

6.0" Stone Base + 56.0" Chamber Height = 5.17' Field Height

7.5 cf Sidewall x 15 x 2 + 7.5 cf Endwall x 6 x 2 = 317.1 cf Perimeter Wall

90 Chambers x 230.9 cf - 317.1 cf Perimeter wall = 20,467.5 cf Chamber Storage

90 Chambers x 298.7 cf = 26,880.0 cf Displacement

29,760.0 cf Field - 26,880.0 cf Chambers = 2,880.0 cf Stone x 40.0% Voids = 1,152.0 cf Stone Storage

Chamber Storage + Stone Storage = 21,619.5 cf

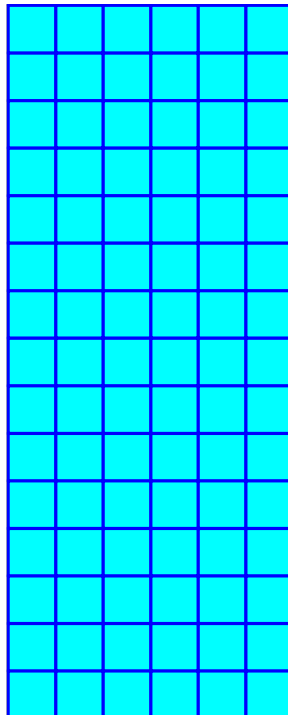
Overall Storage Efficiency = 72.6%

Overall System Size = 120.00' x 48.00' x 5.17'

90 Chambers

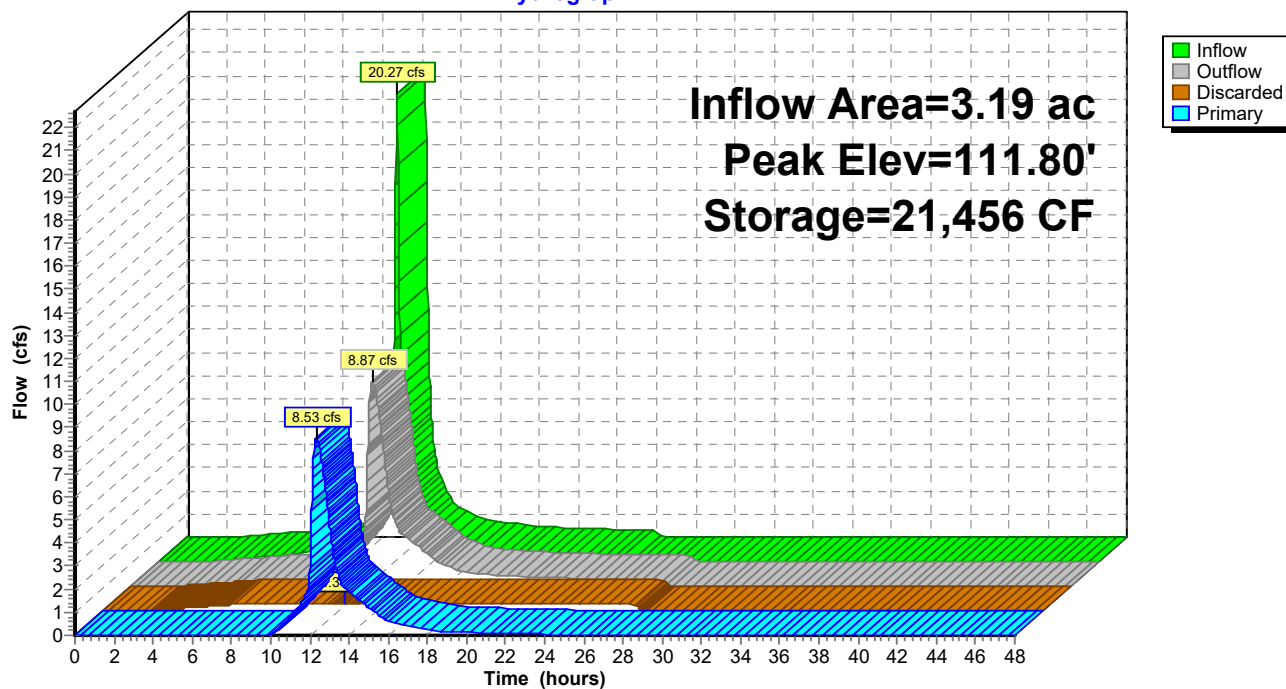
1,102.2 cy Field

106.7 cy Stone



Pond P2B:

Hydrograph



PR WS_Convservation Submission

NOAA 24-hr D 100-Year Rainfall=7.85"

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Stage-Discharge for Pond P2B:

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
107.33	0.00	0.00	0.00	109.93	3.35	0.31	3.04
107.38	0.27	0.27	0.00	109.98	3.55	0.31	3.24
107.43	0.27	0.27	0.00	110.03	3.76	0.31	3.45
107.48	0.27	0.27	0.00	110.08	3.97	0.31	3.66
107.53	0.27	0.27	0.00	110.13	4.19	0.31	3.88
107.58	0.27	0.27	0.00	110.18	4.42	0.31	4.11
107.63	0.27	0.27	0.00	110.23	4.64	0.31	4.33
107.68	0.27	0.27	0.00	110.28	4.87	0.31	4.56
107.73	0.27	0.27	0.00	110.33	5.09	0.31	4.77
107.78	0.27	0.27	0.00	110.38	5.30	0.31	4.99
107.83	0.27	0.27	0.00	110.43	5.50	0.31	5.18
107.88	0.28	0.28	0.00	110.48	5.66	0.32	5.35
107.93	0.28	0.28	0.00	110.53	5.82	0.32	5.50
107.98	0.28	0.28	0.00	110.58	5.98	0.32	5.66
108.03	0.28	0.28	0.00	110.63	6.13	0.32	5.81
108.08	0.28	0.28	0.00	110.68	6.28	0.32	5.96
108.13	0.28	0.28	0.00	110.73	6.42	0.32	6.10
108.18	0.28	0.28	0.00	110.78	6.56	0.32	6.24
108.23	0.30	0.28	0.02	110.83	6.70	0.32	6.38
108.28	0.35	0.28	0.07	110.88	6.84	0.32	6.51
108.33	0.43	0.28	0.15	110.93	6.97	0.32	6.64
108.38	0.53	0.28	0.24	110.98	7.09	0.32	6.77
108.43	0.64	0.28	0.36	111.03	7.22	0.32	6.89
108.48	0.77	0.28	0.48	111.08	7.34	0.33	7.01
108.53	0.90	0.29	0.62	111.13	7.46	0.33	7.13
108.58	1.04	0.29	0.75	111.18	7.58	0.33	7.25
108.63	1.16	0.29	0.87	111.23	7.69	0.33	7.36
108.68	1.25	0.29	0.96	111.28	7.80	0.33	7.48
108.73	1.34	0.29	1.05	111.33	7.92	0.33	7.59
108.78	1.42	0.29	1.13	111.38	8.21	0.33	7.88
108.83	1.50	0.29	1.21	111.43	8.38	0.33	8.05
108.88	1.57	0.29	1.28	111.48	8.44	0.33	8.11
108.93	1.64	0.29	1.35	111.53	8.51	0.33	8.18
108.98	1.71	0.29	1.41	111.58	8.58	0.33	8.25
109.03	1.77	0.29	1.48	111.63	8.65	0.33	8.31
109.08	1.83	0.29	1.54	111.68	8.71	0.33	8.38
109.13	1.89	0.29	1.59	111.73	8.78	0.34	8.44
109.18	1.94	0.30	1.65	111.78	8.84	0.34	8.51
109.23	2.00	0.30	1.70	111.83	8.91	0.34	8.57
109.28	2.05	0.30	1.75	111.88	8.97	0.34	8.63
109.33	2.10	0.30	1.80	111.93	9.03	0.34	8.70
109.38	2.15	0.30	1.85	111.98	9.10	0.34	8.76
109.43	2.20	0.30	1.90	112.03	9.16	0.34	8.82
109.48	2.25	0.30	1.95	112.08	9.22	0.34	8.88
109.53	2.30	0.30	2.00	112.13	9.28	0.34	8.94
109.58	2.37	0.30	2.06	112.18	9.35	0.34	9.00
109.63	2.46	0.30	2.15	112.23	9.41	0.34	9.06
109.68	2.56	0.30	2.26	112.28	9.47	0.34	9.12
109.73	2.69	0.30	2.39	112.33	9.53	0.34	9.18
109.78	2.83	0.30	2.53	112.38	9.59	0.35	9.24
109.83	2.99	0.31	2.69	112.43	9.65	0.35	9.30
109.88	3.17	0.31	2.86	112.48	9.71	0.35	9.36

Stage-Area-Storage for Pond P2B:

Elevation (feet)	Wetted (acres)	Storage (cubic-feet)	Elevation (feet)	Wetted (acres)	Storage (cubic-feet)
107.33	0.13	0	109.93	0.15	11,897
107.38	0.13	115	109.98	0.15	12,153
107.43	0.13	230	110.03	0.15	12,409
107.48	0.13	346	110.08	0.15	12,665
107.53	0.13	461	110.13	0.15	12,921
107.58	0.13	576	110.18	0.15	13,177
107.63	0.13	691	110.23	0.15	13,432
107.68	0.13	806	110.28	0.15	13,688
107.73	0.14	922	110.33	0.16	13,944
107.78	0.14	1,037	110.38	0.16	14,200
107.83	0.14	1,152	110.43	0.16	14,456
107.88	0.14	1,408	110.48	0.16	14,712
107.93	0.14	1,664	110.53	0.16	14,968
107.98	0.14	1,920	110.58	0.16	15,223
108.03	0.14	2,175	110.63	0.16	15,479
108.08	0.14	2,431	110.68	0.16	15,735
108.13	0.14	2,687	110.73	0.16	15,991
108.18	0.14	2,943	110.78	0.16	16,247
108.23	0.14	3,199	110.83	0.16	16,503
108.28	0.14	3,455	110.88	0.16	16,758
108.33	0.14	3,710	110.93	0.16	17,014
108.38	0.14	3,966	110.98	0.16	17,270
108.43	0.14	4,222	111.03	0.16	17,526
108.48	0.14	4,478	111.08	0.16	17,782
108.53	0.14	4,734	111.13	0.16	18,038
108.58	0.14	4,990	111.18	0.16	18,294
108.63	0.14	5,245	111.23	0.16	18,549
108.68	0.14	5,501	111.28	0.16	18,805
108.73	0.14	5,757	111.33	0.16	19,061
108.78	0.14	6,013	111.38	0.16	19,317
108.83	0.14	6,269	111.43	0.16	19,573
108.88	0.14	6,525	111.48	0.16	19,829
108.93	0.14	6,781	111.53	0.16	20,084
108.98	0.14	7,036	111.58	0.17	20,340
109.03	0.15	7,292	111.63	0.17	20,596
109.08	0.15	7,548	111.68	0.17	20,852
109.13	0.15	7,804	111.73	0.17	21,108
109.18	0.15	8,060	111.78	0.17	21,364
109.23	0.15	8,316	111.83	0.17	21,619
109.28	0.15	8,571	111.88	0.17	21,619
109.33	0.15	8,827	111.93	0.17	21,619
109.38	0.15	9,083	111.98	0.17	21,619
109.43	0.15	9,339	112.03	0.17	21,619
109.48	0.15	9,595	112.08	0.17	21,619
109.53	0.15	9,851	112.13	0.17	21,619
109.58	0.15	10,107	112.18	0.17	21,619
109.63	0.15	10,362	112.23	0.17	21,619
109.68	0.15	10,618	112.28	0.17	21,619
109.73	0.15	10,874	112.33	0.17	21,619
109.78	0.15	11,130	112.38	0.17	21,619
109.83	0.15	11,386	112.43	0.17	21,619
109.88	0.15	11,642	112.48	0.17	21,619

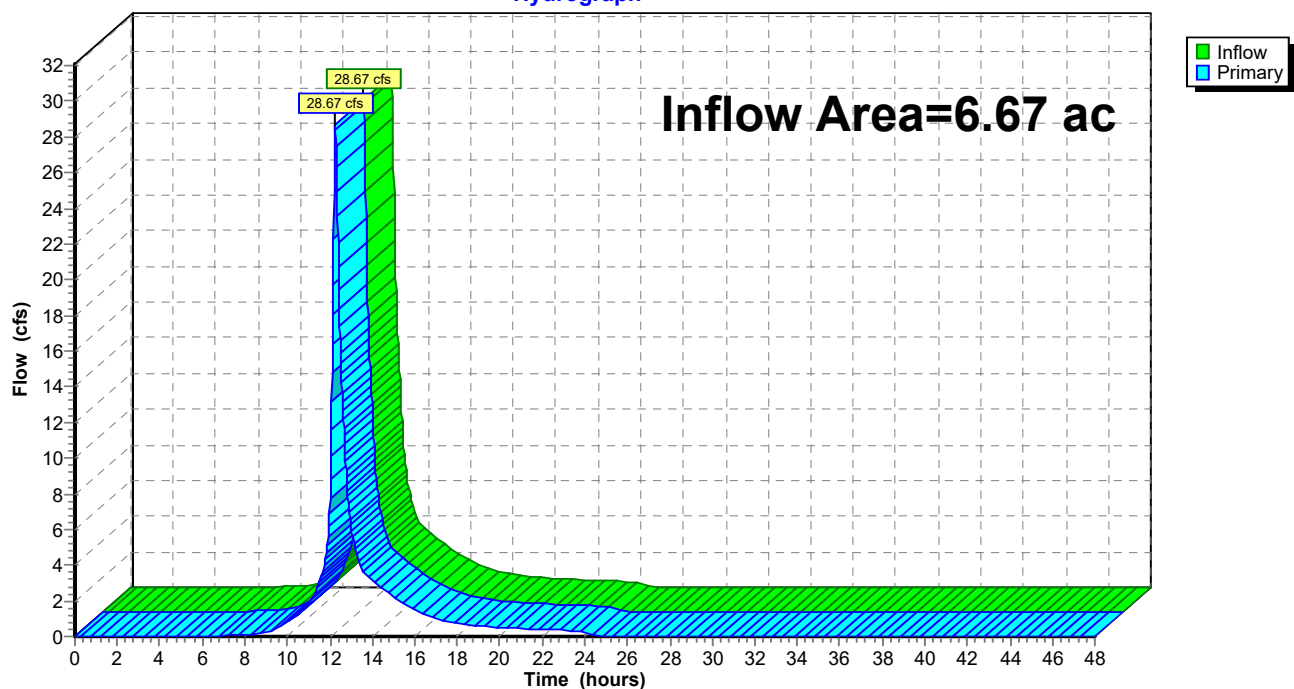
Summary for Link PRWS-1:

Inflow Area = 6.67 ac, 40.48% Impervious, Inflow Depth = 5.03" for 100-Year event
Inflow = 28.67 cfs @ 12.26 hrs, Volume= 121,745 CF
Primary = 28.67 cfs @ 12.26 hrs, Volume= 121,745 CF, Atten= 0%, Lag= 0.0 min
Routed to Link Site :

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

Link PRWS-1:

Hydrograph



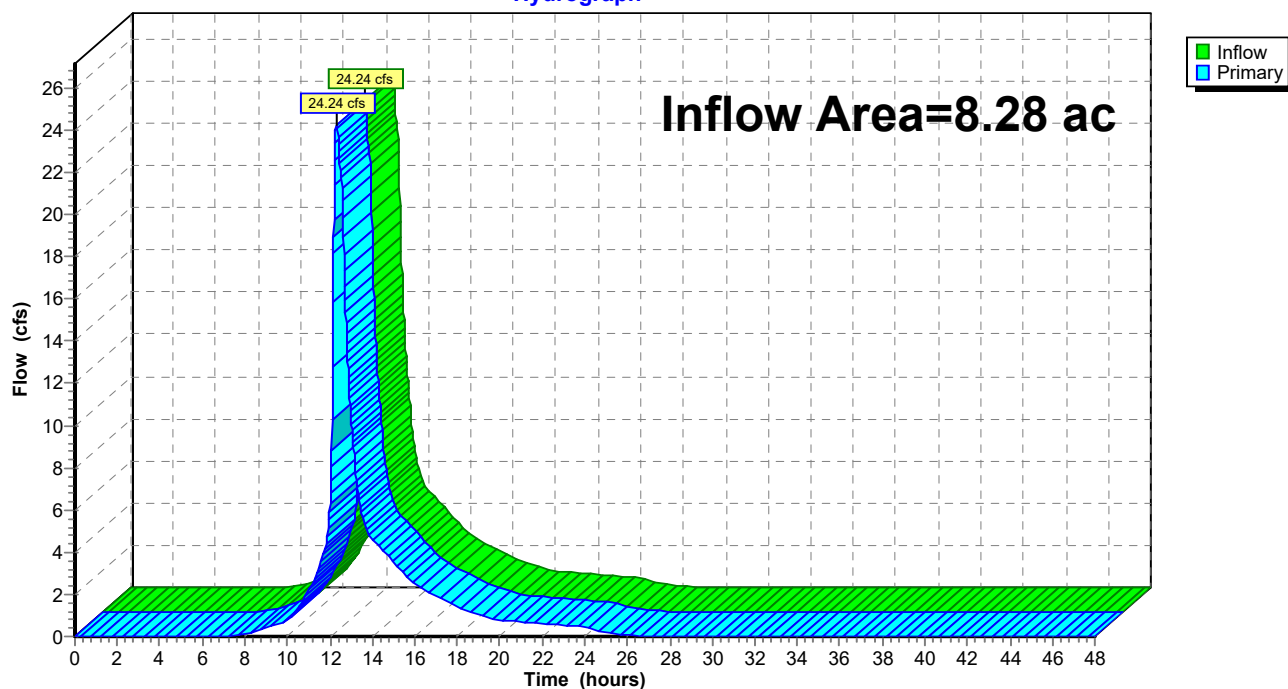
Summary for Link PRWS-2:

Inflow Area = 8.28 ac, 56.00% Impervious, Inflow Depth = 5.43" for 100-Year event
Inflow = 24.24 cfs @ 12.32 hrs, Volume= 163,177 CF
Primary = 24.24 cfs @ 12.32 hrs, Volume= 163,177 CF, Atten= 0%, Lag= 0.0 min
Routed to Link Site :

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

Link PRWS-2:

Hydrograph



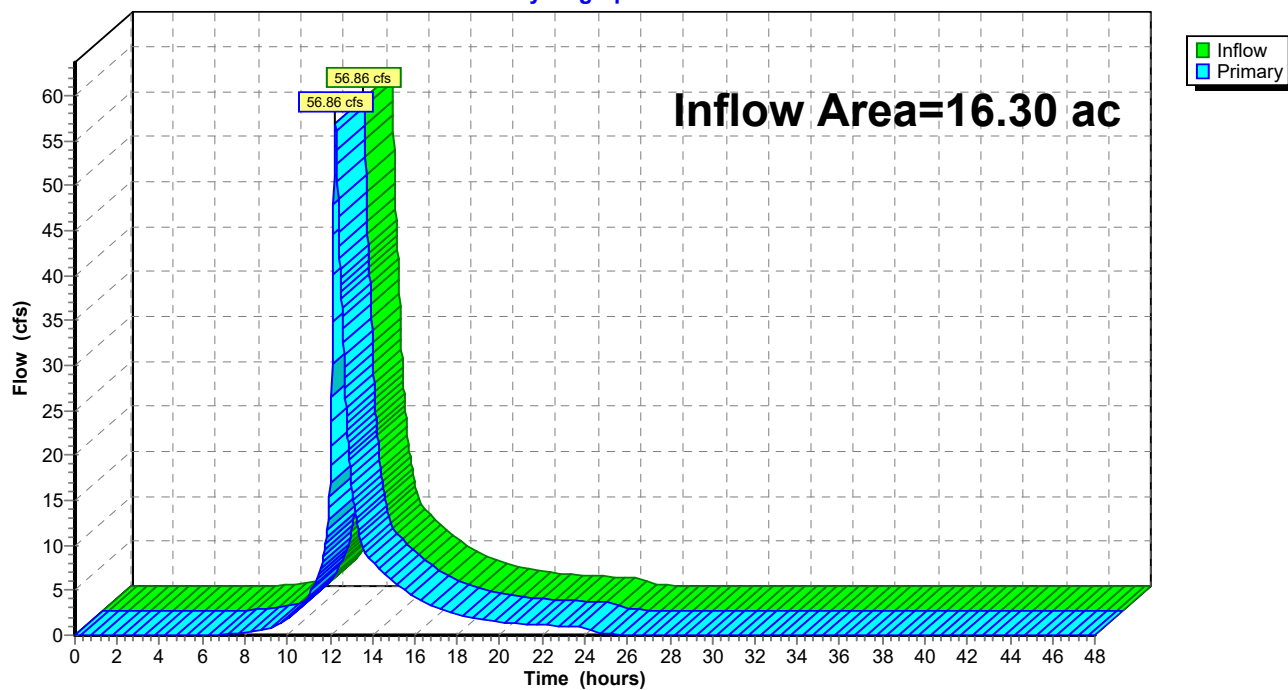
Summary for Link Site:

Inflow Area = 16.30 ac, 45.01% Impervious, Inflow Depth = 5.22" for 100-Year event
Inflow = 56.86 cfs @ 12.26 hrs, Volume= 308,948 CF
Primary = 56.86 cfs @ 12.26 hrs, Volume= 308,948 CF, Atten= 0%, Lag= 0.0 min

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

Link Site:

Hydrograph



APPENDIX C

NOAA Rainfall Data



NOAA Atlas 14, Volume 10, Version 3
Location name: Town of Waterford, Connecticut,
USA*

Latitude: 41.3325°, Longitude: -72.1669°

Elevation: 116 ft**

* source: ESRI Maps

** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

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PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.336 (0.259-0.427)	0.402 (0.310-0.511)	0.510 (0.392-0.651)	0.600 (0.458-0.768)	0.723 (0.537-0.960)	0.816 (0.594-1.10)	0.914 (0.648-1.27)	1.03 (0.689-1.44)	1.19 (0.770-1.72)	1.33 (0.840-1.95)
10-min	0.475 (0.367-0.605)	0.569 (0.438-0.725)	0.723 (0.555-0.921)	0.850 (0.649-1.09)	1.02 (0.760-1.36)	1.16 (0.841-1.56)	1.30 (0.918-1.80)	1.45 (0.977-2.05)	1.69 (1.09-2.44)	1.88 (1.19-2.76)
15-min	0.559 (0.431-0.711)	0.670 (0.516-0.852)	0.851 (0.654-1.09)	1.00 (0.764-1.28)	1.21 (0.894-1.60)	1.36 (0.989-1.84)	1.52 (1.08-2.12)	1.71 (1.15-2.40)	1.98 (1.28-2.86)	2.21 (1.40-3.24)
30-min	0.791 (0.610-1.01)	0.946 (0.729-1.20)	1.20 (0.922-1.53)	1.41 (1.08-1.81)	1.70 (1.26-2.26)	1.92 (1.40-2.59)	2.15 (1.52-2.99)	2.41 (1.62-3.39)	2.79 (1.81-4.03)	3.11 (1.97-4.56)
60-min	1.02 (0.789-1.30)	1.22 (0.942-1.56)	1.55 (1.19-1.98)	1.82 (1.39-2.33)	2.20 (1.63-2.91)	2.48 (1.80-3.34)	2.77 (1.96-3.85)	3.11 (2.09-4.37)	3.60 (2.33-5.20)	4.01 (2.54-5.88)
2-hr	1.34 (1.04-1.69)	1.60 (1.25-2.02)	2.04 (1.58-2.58)	2.39 (1.85-3.04)	2.89 (2.16-3.80)	3.26 (2.39-4.36)	3.65 (2.61-5.03)	4.10 (2.77-5.71)	4.76 (3.10-6.82)	5.32 (3.38-7.73)
3-hr	1.56 (1.22-1.95)	1.86 (1.46-2.34)	2.36 (1.84-2.97)	2.78 (2.15-3.51)	3.35 (2.52-4.38)	3.77 (2.78-5.02)	4.23 (3.04-5.80)	4.76 (3.22-6.59)	5.53 (3.61-7.87)	6.19 (3.94-8.93)
6-hr	1.98 (1.56-2.46)	2.36 (1.87-2.94)	2.99 (2.36-3.73)	3.51 (2.75-4.40)	4.23 (3.21-5.48)	4.77 (3.55-6.28)	5.34 (3.86-7.26)	6.00 (4.09-8.23)	6.98 (4.58-9.83)	7.80 (5.00-11.1)
12-hr	2.45 (1.96-3.02)	2.92 (2.33-3.60)	3.69 (2.94-4.56)	4.33 (3.42-5.37)	5.21 (3.99-6.69)	5.87 (4.40-7.66)	6.57 (4.79-8.84)	7.38 (5.06-10.0)	8.57 (5.65-12.0)	9.57 (6.16-13.5)
24-hr	2.87 (2.32-3.50)	3.44 (2.77-4.19)	4.37 (3.51-5.34)	5.14 (4.11-6.31)	6.21 (4.80-7.90)	7.00 (5.30-9.06)	7.85 (5.78-10.5)	8.85 (6.11-11.9)	10.3 (6.85-14.3)	11.6 (7.50-16.2)
2-day	3.20 (2.61-3.86)	3.87 (3.16-4.68)	4.98 (4.04-6.03)	5.89 (4.76-7.17)	7.16 (5.59-9.04)	8.09 (6.19-10.4)	9.10 (6.77-12.1)	10.3 (7.17-13.8)	12.2 (8.13-16.7)	13.8 (8.97-19.1)
3-day	3.46 (2.84-4.15)	4.18 (3.43-5.03)	5.37 (4.39-6.47)	6.36 (5.16-7.68)	7.71 (6.06-9.69)	8.72 (6.70-11.1)	9.80 (7.33-13.0)	11.1 (7.76-14.7)	13.1 (8.78-17.9)	14.9 (9.69-20.5)
4-day	3.71 (3.06-4.43)	4.47 (3.68-5.34)	5.70 (4.68-6.84)	6.73 (5.49-8.11)	8.15 (6.42-10.2)	9.19 (7.10-11.7)	10.3 (7.74-13.6)	11.7 (8.18-15.4)	13.8 (9.23-18.6)	15.6 (10.2-21.4)
7-day	4.42 (3.67-5.24)	5.23 (4.34-6.21)	6.56 (5.43-7.81)	7.67 (6.30-9.16)	9.19 (7.29-11.4)	10.3 (8.01-13.0)	11.5 (8.67-15.0)	13.0 (9.12-17.0)	15.1 (10.2-20.3)	16.9 (11.1-23.1)
10-day	5.11 (4.27-6.03)	5.96 (4.98-7.04)	7.35 (6.11-8.70)	8.50 (7.02-10.1)	10.1 (8.03-12.4)	11.3 (8.77-14.1)	12.5 (9.42-16.1)	14.0 (9.87-18.2)	16.1 (10.9-21.5)	17.9 (11.7-24.2)
20-day	7.25 (6.13-8.47)	8.16 (6.89-9.54)	9.65 (8.11-11.3)	10.9 (9.09-12.8)	12.6 (10.1-15.2)	13.9 (10.9-17.0)	15.2 (11.4-19.1)	16.6 (11.8-21.3)	18.5 (12.6-24.4)	20.0 (13.2-26.8)
30-day	9.03 (7.68-10.5)	9.99 (8.49-11.6)	11.5 (9.77-13.5)	12.8 (10.8-15.0)	14.6 (11.8-17.5)	16.0 (12.6-19.5)	17.4 (13.1-21.6)	18.7 (13.4-23.9)	20.5 (14.0-26.8)	21.8 (14.4-29.0)
45-day	11.2 (9.63-13.0)	12.3 (10.5-14.2)	13.9 (11.9-16.1)	15.3 (12.9-17.8)	17.2 (13.9-20.4)	18.7 (14.7-22.5)	20.1 (15.1-24.7)	21.4 (15.4-27.1)	23.0 (15.8-29.9)	24.1 (16.0-31.9)
60-day	13.1 (11.3-15.1)	14.2 (12.2-16.3)	15.9 (13.6-18.4)	17.4 (14.7-20.1)	19.4 (15.7-22.9)	21.0 (16.5-25.1)	22.4 (16.9-27.3)	23.7 (17.1-29.9)	25.2 (17.4-32.7)	26.2 (17.5-34.5)

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

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

Please refer to NOAA Atlas 14 document for more information.

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PF graphical



NOAA Atlas 14, Volume 10, Version 3
Location name: Town of Waterford, Connecticut,
USA*

Latitude: 41.3325°, Longitude: -72.1669°

Elevation: 116 ft**

* source: ESRI Maps

** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerals](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.03 (3.11-5.12)	4.82 (3.72-6.13)	6.12 (4.70-7.81)	7.20 (5.50-9.22)	8.68 (6.44-11.5)	9.79 (7.13-13.2)	11.0 (7.78-15.3)	12.3 (8.27-17.3)	14.3 (9.24-20.6)	15.9 (10.1-23.4)
10-min	2.85 (2.20-3.63)	3.41 (2.63-4.35)	4.34 (3.33-5.53)	5.10 (3.89-6.53)	6.15 (4.56-8.16)	6.94 (5.05-9.36)	7.77 (5.51-10.8)	8.72 (5.86-12.3)	10.1 (6.55-14.6)	11.3 (7.14-16.5)
15-min	2.24 (1.72-2.84)	2.68 (2.06-3.41)	3.40 (2.62-4.34)	4.00 (3.06-5.12)	4.82 (3.58-6.40)	5.44 (3.96-7.34)	6.09 (4.32-8.48)	6.84 (4.59-9.62)	7.94 (5.14-11.5)	8.85 (5.60-13.0)
30-min	1.58 (1.22-2.01)	1.89 (1.46-2.41)	2.40 (1.84-3.06)	2.82 (2.16-3.62)	3.40 (2.52-4.51)	3.84 (2.79-5.18)	4.29 (3.04-5.97)	4.82 (3.24-6.78)	5.59 (3.62-8.07)	6.22 (3.94-9.13)
60-min	1.02 (0.789-1.30)	1.22 (0.942-1.56)	1.55 (1.19-1.98)	1.82 (1.39-2.33)	2.20 (1.63-2.91)	2.48 (1.80-3.34)	2.77 (1.96-3.85)	3.11 (2.09-4.37)	3.60 (2.33-5.20)	4.01 (2.54-5.88)
2-hr	0.670 (0.522-0.845)	0.802 (0.624-1.01)	1.02 (0.789-1.29)	1.20 (0.923-1.52)	1.44 (1.08-1.90)	1.63 (1.20-2.18)	1.82 (1.30-2.52)	2.05 (1.38-2.86)	2.38 (1.55-3.41)	2.66 (1.69-3.86)
3-hr	0.518 (0.405-0.649)	0.620 (0.485-0.777)	0.786 (0.613-0.989)	0.924 (0.716-1.17)	1.11 (0.838-1.46)	1.26 (0.927-1.67)	1.41 (1.01-1.93)	1.58 (1.07-2.19)	1.84 (1.20-2.62)	2.06 (1.31-2.97)
6-hr	0.330 (0.261-0.410)	0.394 (0.311-0.490)	0.499 (0.393-0.622)	0.586 (0.459-0.733)	0.706 (0.536-0.915)	0.796 (0.592-1.05)	0.891 (0.644-1.21)	1.00 (0.683-1.37)	1.16 (0.764-1.64)	1.30 (0.834-1.86)
12-hr	0.203 (0.162-0.250)	0.242 (0.193-0.298)	0.306 (0.243-0.378)	0.359 (0.284-0.445)	0.432 (0.331-0.555)	0.487 (0.365-0.635)	0.545 (0.397-0.733)	0.612 (0.420-0.831)	0.711 (0.469-0.991)	0.793 (0.511-1.12)
24-hr	0.119 (0.096-0.145)	0.143 (0.115-0.174)	0.182 (0.146-0.222)	0.214 (0.171-0.263)	0.258 (0.199-0.329)	0.291 (0.220-0.377)	0.327 (0.240-0.437)	0.368 (0.254-0.496)	0.430 (0.285-0.594)	0.483 (0.312-0.677)
2-day	0.066 (0.054-0.080)	0.080 (0.065-0.097)	0.103 (0.084-0.125)	0.122 (0.099-0.149)	0.149 (0.116-0.188)	0.168 (0.128-0.216)	0.189 (0.141-0.252)	0.215 (0.149-0.286)	0.254 (0.169-0.347)	0.287 (0.186-0.398)
3-day	0.048 (0.039-0.057)	0.058 (0.047-0.069)	0.074 (0.060-0.089)	0.088 (0.071-0.106)	0.107 (0.084-0.134)	0.121 (0.093-0.154)	0.136 (0.101-0.180)	0.154 (0.107-0.204)	0.182 (0.122-0.248)	0.206 (0.134-0.284)
4-day	0.038 (0.031-0.046)	0.046 (0.038-0.055)	0.059 (0.048-0.071)	0.070 (0.057-0.084)	0.084 (0.066-0.106)	0.095 (0.073-0.121)	0.107 (0.080-0.141)	0.121 (0.085-0.160)	0.143 (0.096-0.194)	0.162 (0.105-0.222)
7-day	0.026 (0.021-0.031)	0.031 (0.025-0.036)	0.039 (0.032-0.046)	0.045 (0.037-0.054)	0.054 (0.043-0.067)	0.061 (0.047-0.077)	0.068 (0.051-0.089)	0.077 (0.054-0.100)	0.089 (0.060-0.120)	0.100 (0.066-0.137)
10-day	0.021 (0.017-0.025)	0.024 (0.020-0.029)	0.030 (0.025-0.036)	0.035 (0.029-0.042)	0.042 (0.033-0.051)	0.046 (0.036-0.058)	0.052 (0.039-0.067)	0.058 (0.041-0.075)	0.067 (0.045-0.089)	0.074 (0.048-0.100)
20-day	0.015 (0.012-0.017)	0.016 (0.014-0.019)	0.020 (0.016-0.023)	0.022 (0.018-0.026)	0.026 (0.021-0.031)	0.028 (0.022-0.035)	0.031 (0.023-0.039)	0.034 (0.024-0.044)	0.038 (0.026-0.050)	0.041 (0.027-0.055)
30-day	0.012 (0.010-0.014)	0.013 (0.011-0.016)	0.016 (0.013-0.018)	0.017 (0.014-0.020)	0.020 (0.016-0.024)	0.022 (0.017-0.027)	0.024 (0.018-0.029)	0.025 (0.018-0.033)	0.028 (0.019-0.037)	0.030 (0.020-0.040)
45-day	0.010 (0.008-0.012)	0.011 (0.009-0.013)	0.012 (0.010-0.014)	0.014 (0.011-0.016)	0.015 (0.012-0.018)	0.017 (0.013-0.020)	0.018 (0.014-0.022)	0.019 (0.014-0.025)	0.021 (0.014-0.027)	0.022 (0.014-0.029)
60-day	0.009 (0.007-0.010)	0.009 (0.008-0.011)	0.011 (0.009-0.012)	0.012 (0.010-0.013)	0.013 (0.010-0.015)	0.014 (0.011-0.017)	0.015 (0.011-0.018)	0.016 (0.011-0.020)	0.017 (0.012-0.022)	0.018 (0.012-0.023)

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

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

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

APPENDIX D

Stormwater Collection System Calculations

The diagram illustrates a sewerage network layout. It features a central vertical backbone of pipes, with various lateral connections branching off. Key components include:

- Pipes:** Numerous pipes are shown, many of which are numbered. The numbering includes 1-37, 38-51, 40-45, 47-49, and 15-18.
- Outfalls:** Several nodes are marked with black dots and labeled "Outfall". These are located at various points along the network, including at the top left, top center, middle right, and bottom left.
- Network Structure:** The network is complex, showing a main vertical backbone with various lateral connections. For example, a long vertical pipe (pipes 1-6) has several lateral connections (pipes 7-10, 11-14, 15-18, 19-22, 23-26, 27-30, 31-34, 35-37, 38-41, 42-45, 46-49, 50-51).

Date: 4/30/2025

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (l)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	6.000	0.00	2.36	0.00	0.00	1.65	0.0	9.1	6.2	10.26	17.33	5.51	24	0.50	107.86	107.89	109.01	109.04	0.00	112.51	P2B-WQU302
2	1	19.873	0.31	2.06	0.83	0.26	1.43	6.0	9.0	6.2	8.89	17.38	5.01	24	0.50	107.89	107.99	109.04	109.05	112.51	112.00	WQU302-CCB303
3	2	102.659	0.40	1.64	0.89	0.36	1.09	6.0	8.7	6.3	6.91	8.02	5.11	18	0.50	107.99	108.50	109.06	109.57	112.00	111.50	CCB303-CLCB30
4	3	67.999	0.15	1.00	0.73	0.11	0.61	6.0	8.3	6.4	3.87	6.68	3.16	15	0.91	108.50	109.12	110.18	110.37	111.50	112.42	CLCB304-CCB30
5	4	74.853	0.10	0.85	0.32	0.03	0.50	6.0	7.9	6.5	3.23	4.92	2.71	15	0.49	109.12	109.49	110.47	110.61	112.42	112.90	CCB305-CLCB30
6	5	66.337	0.31	0.75	0.50	0.16	0.46	6.0	7.5	6.6	3.06	5.01	2.77	15	0.51	109.49	109.83	110.71	110.79	112.90	112.25	CLCB306-CCB30
7	6	84.787	0.21	0.44	0.49	0.10	0.31	6.0	7.0	6.7	2.08	2.72	2.71	12	0.50	109.83	110.25	110.94	111.16	112.25	112.25	CCB307-CCB308
8	7	42.512	0.07	0.23	0.90	0.06	0.21	6.0	6.6	6.8	1.41	3.35	1.94	12	0.75	110.25	110.57	111.34	111.38	112.25	113.72	CCB308-YD309
9	8	37.003	0.05	0.16	0.90	0.05	0.14	6.0	6.3	6.9	0.99	2.76	2.30	12	0.51	110.57	110.76	111.41	111.18	113.72	113.50	YD309-YD310
10	9	48.565	0.11	0.11	0.90	0.10	0.10	6.0	6.0	7.0	0.69	2.71	2.54	12	0.49	110.76	111.00	111.18	111.35	113.50	113.50	YD310-YD311
11	2	57.034	0.11	0.11	0.67	0.07	0.07	6.0	6.0	7.0	0.51	3.86	3.02	12	1.00	109.33	109.90	109.58	110.20	112.00	112.90	CCB303-CCB313
12	1	28.763	0.25	0.30	0.83	0.21	0.22	6.0	7.3	6.6	1.47	3.87	4.11	12	1.01	108.69	108.98	109.12	109.49	112.51	112.32	WQU302-CCB314
13	12	72.540	0.05	0.05	0.30	0.02	0.02	6.0	6.0	7.0	0.10	7.02	0.93	15	1.01	108.97	109.70	109.49	109.82	112.32	112.70	CCB314-YD315
14	3	67.419	0.24	0.24	0.55	0.13	0.13	6.0	6.0	7.0	0.92	2.86	1.17	12	0.55	108.50	108.87	110.18	110.22	111.50	111.87	CLCB304-CCB31
15	End	6.000	0.00	3.57	0.00	0.00	2.39	0.0	10.3	6.0	14.26	17.33	6.21	24	0.50	101.83	101.86	103.19	103.24	0.00	106.52	P1A-WQU103
16	15	112.251	0.18	2.67	0.79	0.14	1.71	6.0	10.1	6.0	10.32	28.79	6.96	24	1.38	103.02	104.57	103.85	105.72	106.52	109.97	WQU103-CLCB10
17	16	59.828	0.24	2.49	0.60	0.14	1.57	9.0	9.9	6.1	9.52	17.35	5.23	24	0.50	104.57	104.87	105.72	105.97	109.97	112.10	CLCB104-CCB10
18	17	119.205	0.76	2.25	0.64	0.49	1.43	9.0	9.5	6.1	8.76	8.00	4.96	18	0.49	104.87	105.46	106.37	107.08	112.10	111.14	CCB105-CLCB10
19	18	98.000	0.43	1.49	0.72	0.31	0.94	9.0	9.0	6.2	5.87	8.04	3.32	18	0.50	105.46	105.95	107.27	107.53	111.14	111.62	CLCB106-CLCB1
20	19	43.621	0.15	1.06	0.72	0.11	0.63	6.0	8.1	6.4	4.06	8.08	2.30	18	0.50	105.95	106.17	107.73	107.78	111.62	111.56	CLCB107-CCB10
21	20	80.880	0.00	0.91	0.00	0.00	0.52	0.0	7.6	6.5	3.41	8.10	2.01	18	0.51	106.17	106.58	107.82	107.88	111.56	113.45	CCB108-MH109
22	21	137.164	0.65	0.80	0.50	0.33	0.46	6.0	7.1	6.7	3.08	2.74	3.92	12	0.50	107.47	108.16	108.47	109.34	113.45	111.16	MH109-CCB110
Project File: Proposed Storm Network.stm																Number of lines: 51				Run Date: 4/30/2025		
NOTES:Intensity = 88.24 / (Inlet time + 15.50) ^ 0.83; Return period =Yrs. 10 ; c = cir e = ellip b = box																						

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (l)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
23	22	48.218	0.05	0.15	0.90	0.05	0.14	6.0	6.7	6.8	0.92	7.47	2.14	12	3.75	108.16	109.97	109.70	110.37	111.16	113.50	CCB110-YD111
24	23	44.928	0.05	0.10	0.90	0.05	0.09	6.0	6.4	6.9	0.62	3.86	2.43	12	1.00	109.97	110.42	110.37	110.75	113.50	113.50	YD111-YD112
25	24	42.329	0.05	0.05	0.90	0.05	0.05	6.0	6.0	7.0	0.31	3.89	1.85	12	1.02	110.42	110.85	110.75	111.08	113.50	113.50	YD112-YD113
26	21	56.702	0.11	0.11	0.56	0.06	0.06	6.0	6.0	7.0	0.43	4.92	0.36	15	0.49	106.58	106.86	107.95	107.95	113.45	108.02	MH109-TD114
27	15	16.122	0.90	0.90	0.75	0.68	0.68	9.0	9.0	6.2	4.22	22.67	2.46	18	3.97	101.86	102.50	103.83	103.83	106.52	106.00	WQU103-CCB112
28	End	120.523	0.00	0.37	0.00	0.00	0.33	0.0	7.6	6.5	2.18	8.61	3.65	18	0.57	100.50	101.19	101.06	101.75	102.25	104.59	FES200-WQU201
29	28	49.538	0.00	0.19	0.00	0.00	0.17	0.0	6.8	6.8	1.16	13.10	2.96	12	11.53	101.19	106.90	101.75	107.35	104.59	113.20	WQU201-MH207
30	29	25.627	0.06	0.19	0.90	0.05	0.17	6.0	6.6	6.8	1.16	3.81	3.80	12	0.98	109.40	109.65	109.78	110.10	113.20	113.50	MH207-YD208
31	30	49.727	0.08	0.13	0.90	0.07	0.12	6.0	6.3	6.9	0.80	3.87	2.66	12	1.01	109.65	110.15	110.10	110.52	113.50	113.50	YD208-YD209
32	31	34.941	0.05	0.05	0.90	0.05	0.05	6.0	6.0	7.0	0.31	3.86	1.73	12	1.00	110.15	110.50	110.52	110.73	113.50	113.50	YD209-YD210
33	28	77.646	0.00	0.18	0.00	0.00	0.16	0.0	7.2	6.7	1.08	2.73	2.84	12	0.50	101.19	101.58	101.75	102.02	104.59	104.59	WQU201-MH202
34	33	73.599	0.00	0.18	0.00	0.00	0.16	0.0	6.8	6.7	1.09	9.87	3.30	12	6.55	101.58	106.40	102.02	106.84	104.59	113.49	MH202-MH203
35	34	42.311	0.06	0.18	0.90	0.05	0.16	6.0	6.6	6.8	1.10	3.89	3.78	12	1.02	108.30	108.73	108.66	109.17	113.49	113.50	MH203-YD204
36	35	41.189	0.07	0.12	0.90	0.06	0.11	6.0	6.4	6.8	0.74	3.85	3.35	12	1.00	109.65	110.06	109.95	110.42	113.50	113.50	YD204-YD205
37	36	44.215	0.05	0.05	0.90	0.05	0.05	6.0	6.0	7.0	0.31	3.85	1.76	12	1.00	110.06	110.50	110.42	110.73	113.50	113.50	YD205-YD206
38	End	6.000	0.00	0.48	0.00	0.00	0.34	0.0	6.6	6.8	2.29	8.04	3.70	18	0.50	107.83	107.86	108.40	108.43	0.00	113.47	P2B-WQU319
39	38	33.359	0.06	0.48	0.85	0.05	0.34	6.0	6.4	6.9	2.31	8.12	3.72	18	0.51	107.86	108.03	108.43	108.60	113.47	112.20	WQU316-CCB317
40	39	47.388	0.13	0.32	0.58	0.08	0.20	6.0	6.2	6.9	1.41	2.75	3.29	12	0.51	108.03	108.27	108.60	108.78	112.20	110.85	CCB317-CCB318
41	40	17.403	0.19	0.19	0.68	0.13	0.13	6.0	6.0	7.0	0.90	2.62	1.78	12	0.46	108.27	108.35	108.92	108.93	110.85	110.42	CCB318-CCB319
42	39	44.933	0.10	0.10	0.81	0.08	0.08	6.0	6.0	7.0	0.56	2.70	1.95	12	0.49	108.03	108.25	108.60	108.56	112.20	111.18	CCB317-CCB321
43	End	185.410	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	5.10	9.65	5.30	15	1.90	104.30	107.83	105.21	108.74	107.60	113.38	CCB300-OCS301
44	End	30.653	0.16	0.37	0.85	0.14	0.20	6.0	9.8	6.1	1.21	8.76	3.40	12	5.15	103.00	104.58	103.46	105.04	108.44	109.29	CLCB500-CCB-50
Project File: Proposed Storm Network.stm																Number of lines: 51				Run Date: 4/30/2025		
NOTES:Intensity = 88.24 / (Inlet time + 15.50) ^ 0.83; Return period =Yrs. 10 ; c = cir e = ellip b = box																						

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (l)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
45	44	82.345	0.21	0.21	0.30	0.06	0.06	9.0	9.0	6.2	0.39	3.85	1.77	12	1.00	104.58	105.40	105.04	105.66	109.29	108.40	CCB501-CLCB50
46	End	6.000	0.00	0.25	0.00	0.00	0.21	0.0	6.1	6.9	1.44	3.86	3.60	12	1.00	104.00	104.06	104.51	104.57	0.00	109.60	P1A-WQU110
47	46	12.840	0.25	0.25	0.83	0.21	0.21	6.0	6.0	7.0	1.44	12.18	3.60	12	9.97	104.06	105.34	104.57	105.85	109.60	109.34	WQU110-CCB111
48	End	6.000	0.00	0.00	0.00	0.00	0.00	0.0	0.5	0.0	7.62	17.33	4.97	24	0.50	100.57	100.60	101.55	101.58	102.82	103.59	FES100-MH101
49	48	147.069	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	7.62	17.38	4.94	24	0.50	100.59	101.33	101.58	102.31	103.59	109.04	MH101-OCS102
50	End	59.624	1.42	1.42	0.83	1.18	1.18	32.0	32.0	3.6	7.49	10.68	6.61	15	2.33	93.00	94.39	94.09	95.48	95.21	96.50	MH400-CLCB401
51	50	293.631	0.00	0.00	0.00	0.00	0.00	0.0	0.0	3.6	3.24	8.28	3.62	15	1.40	94.39	98.50	95.48	99.22	96.50	103.00	CLCB401-OCS40
Project File: Proposed Storm Network.stm																Number of lines: 51				Run Date: 4/30/2025		
NOTES:Intensity = 88.24 / (Inlet time + 15.50) ^ 0.83; Return period =Yrs. 10 ; c = cir e = ellip b = box																						

Project LEARN Early Childhood School By BW Date 5/1/2025
 Location Waterford, CT Checked KEG Date 5/1/2025
 Circle one: Present Developed Job No. 140310301

1. Rational 'C' Runoff Coefficient & Area Calculations

Catchment Area	Total Area		Impervious (C=.9)		Gravel (C=0.6)		Pervious (C=0.3)		Percent Impervious	C
	SF	AC	SF	AC	SF	AC	SF	AC		
CCB-303	13,580	0.31	11,984	0.28	0	0.00	1,596	0.04	88%	0.83
CLCB-304	17,214	0.40	16,832	0.39	0	0.00	382	0.01	98%	0.89
CCB-305	6,617	0.15	4,777	0.11	0	0.00	1,840	0.04	72%	0.73
CLCB-306	4,307	0.10	133	0.00	0	0.00	4,174	0.10	3%	0.32
CCB-307	13,294	0.31	4,434	0.10	0	0.00	8,860	0.20	33%	0.50
CCB-308	9,181	0.21	2,895	0.07	0	0.00	6,286	0.14	32%	0.49
YD-309	2,853	0.07	2,853	0.07	0	0.00	0	0.00	100%	0.90
YD-310	2,289	0.05	2,289	0.05	0	0.00	0	0.00	100%	0.90
YD-311	4,854	0.11	4,854	0.11	0	0.00	0	0.00	100%	0.90
CCB-313	4,739	0.11	2,883	0.07	0	0.00	1,856	0.04	61%	0.67
CCB-314	10,894	0.25	9,642	0.22	0	0.00	1,252	0.03	89%	0.83
YD-315	2,001	0.05	0	0.00	0	0.00	2,001	0.05	0%	0.30
CCB-312	10,325	0.24	4,307	0.10	0	0.00	6,018	0.14	42%	0.55
CLCB-104	7,722	0.18	6,281	0.14	0	0.00	1,441	0.03	81%	0.79
CCB-105	10,439	0.24	5,272	0.12	0	0.00	5,167	0.12	51%	0.60
CLCB-106	32,893	0.76	18,391	0.42	0	0.00	14,502	0.33	56%	0.64
CLCB-107	18,828	0.43	13,287	0.31	0	0.00	5,541	0.13	71%	0.72
CCB-108	6,702	0.15	4,738	0.11	0	0.00	1,964	0.05	71%	0.72
CCB-110	28,317	0.65	9,304	0.21	0	0.00	19,013	0.44	33%	0.50
YD-111	2,069	0.05	2,069	0.05	0	0.00	0	0.00	100%	0.90
YD-112	2,145	0.05	2,145	0.05	0	0.00	0	0.00	100%	0.90
YD-113	2,020	0.05	2,020	0.05	0	0.00	0	0.00	100%	0.90
TD-114	4,778	0.11	2,092	0.05	0	0.00	2,686	0.06	44%	0.56
CCB-112	39,204	0.90	29,527	0.68	0	0.00	9,677	0.22	75%	0.75
YD-208	2,740	0.06	2,740	0.06	0	0.00	0	0.00	100%	0.90
YD-209	3,368	0.08	3,368	0.08	0	0.00	0	0.00	100%	0.90
YD-210	2,383	0.05	2,383	0.05	0	0.00	0	0.00	100%	0.90
YD-204	2,748	0.06	2,748	0.06	0	0.00	0	0.00	100%	0.90
YD-205	3,177	0.07	3,177	0.07	0	0.00	0	0.00	100%	0.90
YD-206	2,197	0.05	2,197	0.05	0	0.00	0	0.00	100%	0.90
CCB-317	2,505	0.06	2,302	0.05	0	0.00	203	0.00	92%	0.85
CCB-318	5,604	0.13	2,578	0.06	0	0.00	3,026	0.07	46%	0.58
CCB-319	8,388	0.19	5,362	0.12	0	0.00	3,026	0.07	64%	0.68
CCB-321	4,175	0.10	3,530	0.08	0	0.00	645	0.01	85%	0.81
CCB-501	7,140	0.16	6,542	0.15	0	0.00	598	0.01	92%	0.85
CLCB-502	9,074	0.21	0	0.00	0	0.00	9,074	0.21	0%	0.30
CCB-111	10,770	0.25	9,426	0.22	0	0.00	1,344	0.03	88%	0.83
CLCB-401	61,646	1.42	0	0.00	0	0.00	61,646	1.42	0%	0.30

APPENDIX E

Supporting Calculations

Project **140310301 - LEARN Early Childhood School**

Date **5/1/2025**

Location **Waterford, CT**

By **BTW**

Water Quality Parameter	New Development	Redevelopment/Retrofits
Total Suspended Solids (TSS)	90%	80%
Total Phosphorus (TP)	60%	50%
Total Nitrogen (TN)	40%	30%

New England Stormwater Retrofit Manual - Infiltration Basin (HSG C) Performance Curve

Pollutant	Design Storage Volume: Runoff Depth from Impervious Area (in)								
	0	0.10	0.20	0.40	0.60	0.80	1.00	1.50	2.00
TP	0%	35%	52%	72%	82%	88%	92%	97%	99%
TN	0%	52%	69%	85%	92%	96%	98%	99%	100%
Bacteria	0%	24%	40%	63%	79%	88%	93%	98%	99%
TSS	0%	64%	80%	93%	98%	99%	100%	100%	100%
Metals	0%	71%	86%	96%	98%	99%	100%	100%	100%

New England Stormwater Retrofit Manual - Infiltration Basin (HSG C) Performance Curve

Pollutant	Design Storage Volume: Runoff Depth from Impervious Area (in)								
	0	0.10	0.20	0.40	0.60	0.80	1.00	1.50	2.00
TP	0%	28%	43%	64%	77%	86%	91%	97%	99%
TN	0%	52%	67%	83%	90%	94%	97%	99%	100%
Bacteria	0%	22%	36%	58%	73%	83%	89%	97%	99%
TSS	0%	63%	80%	92%	95%	97%	98%	99%	100%
Metals	0%	61%	78%	90%	94%	96%	98%	99%	100%

$$\text{Depth of Runoff from Impervious Area (inches)} = \frac{V}{DCIA} * 12 \frac{\text{inches}}{\text{foot}}$$

PRWS-1A - Stormwater Basin (HSG C)

Minimum Runoff Depth required to meet CT Stormwater Quality Requirements: **0.2 in**

Depth of runoff = 0.2 in

DCIA = 101,358 SF

V = 1,689 CF

PRWS-2A - Stormwater Basin (HSG D)

Minimum Runoff Depth required to meet CT Stormwater Quality Requirements: **0.4 in**

Depth of runoff = 0.4 in

DCIA = 107,266 SF

V = 3,576 CF

PRWS-2B - Stormwater Basin (HSG D)

Minimum Runoff Depth required to meet CT Stormwater Quality Requirements: **0.4 in**

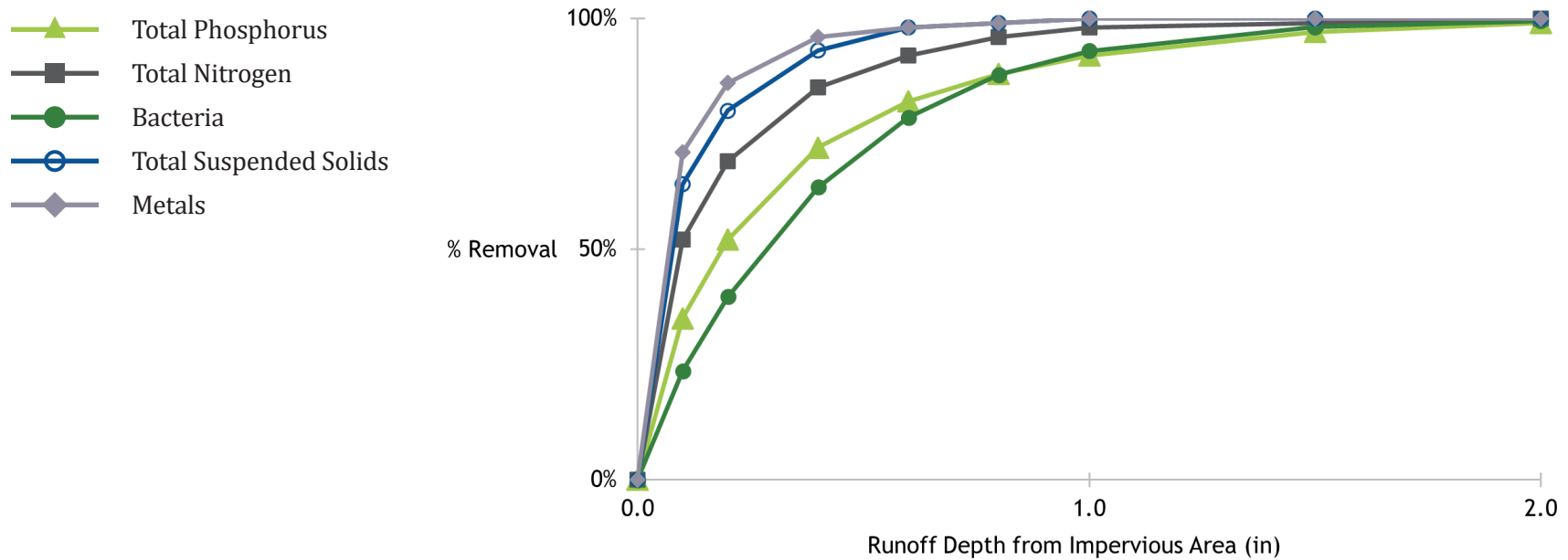
Depth of runoff = 0.4 in

DCIA = 84,946 SF

V = 2,832 CF

Infiltration Basin (HSG C)

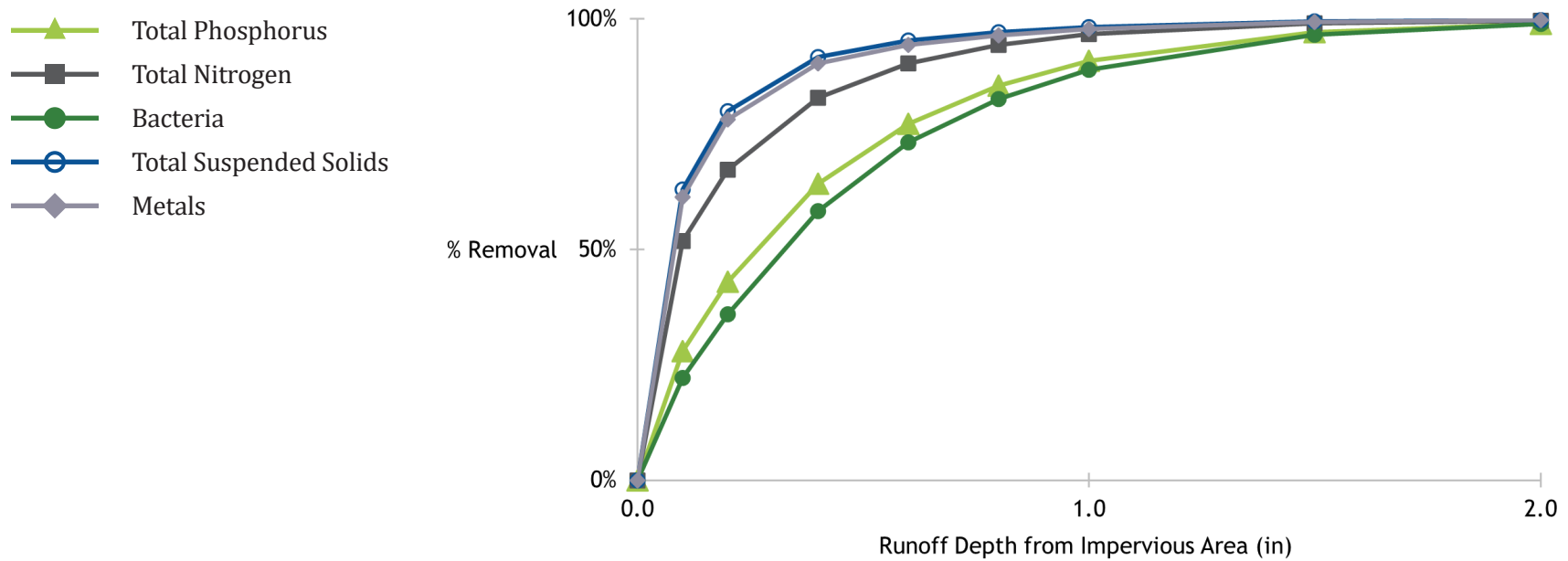
(Infiltration Rate = 0.17 in/hr)



Pollutant	Design Storage Volume: Runoff Depth from Impervious Area (in)								
	0	0.10	0.20	0.40	0.60	0.80	1.00	1.50	2.00
TP	0%	35%	52%	72%	82%	88%	92%	97%	99%
TN	0%	52%	69%	85%	92%	96%	98%	99%	100%
Bacteria	0%	24%	40%	63%	79%	88%	93%	98%	99%
TSS	0%	64%	80%	93%	98%	99%	100%	100%	100%
Metals	0%	71%	86%	96%	98%	99%	100%	100%	100%

Infiltration Basin (HSG D)¹⁷

(Infiltration Rate = 0.10 in/hr)

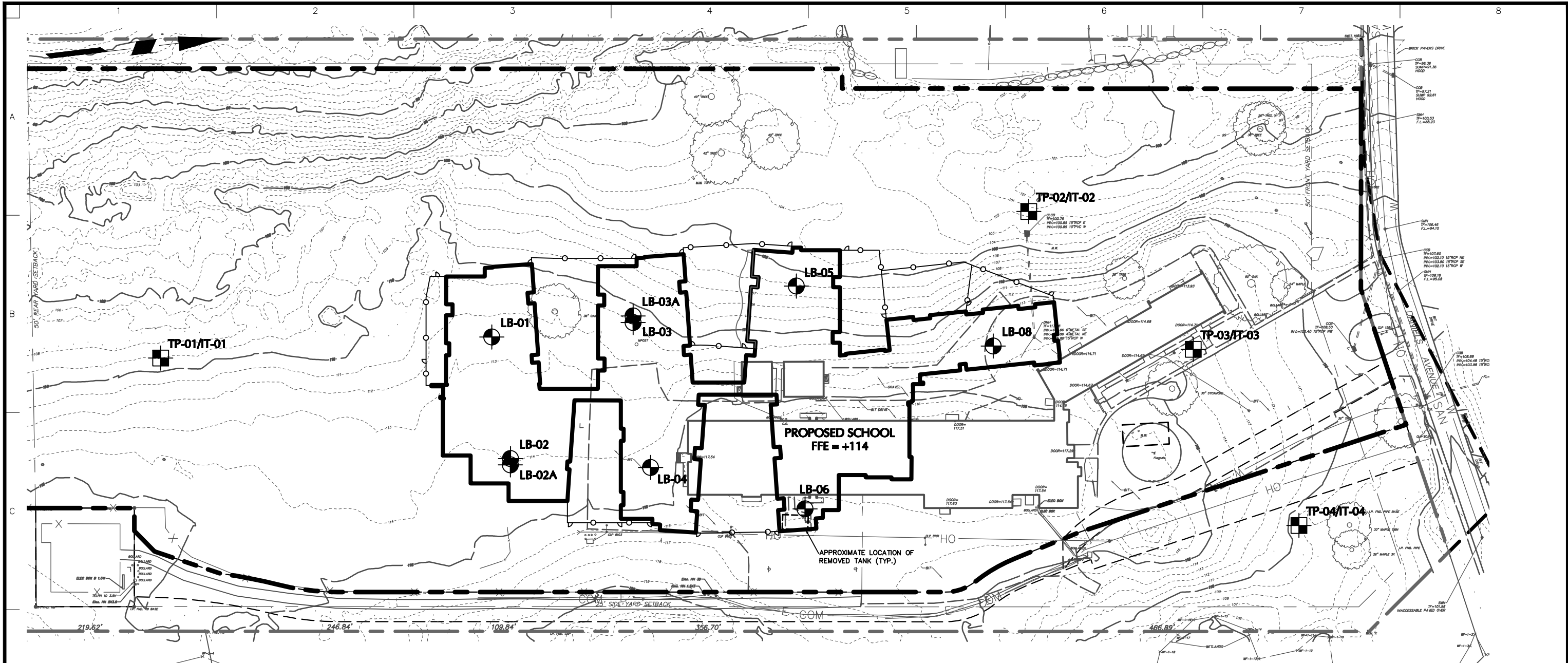


Pollutant	Design Storage Volume: Runoff Depth from Impervious Area (in)								
	0	0.10	0.20	0.40	0.60	0.80	1.00	1.50	2.00
TP	0%	28%	43%	64%	77%	86%	91%	97%	99%
TN	0%	52%	67%	83%	90%	94%	97%	99%	100%
Bacteria	0%	22%	36%	58%	73%	83%	89%	97%	99%
TSS	0%	63%	80%	92%	95%	97%	98%	99%	100%
Metals	0%	61%	78%	90%	94%	96%	98%	99%	100%

¹⁷HSG D Performance Curves come from new modeling performed by EPA and will be included in subsequent MS4 permits/supporting documentation.

APPENDIX F

Test Pit & Infiltration Logs



GENERAL NOTES

- BORING LOCATIONS ARE APPROXIMATE.
- SURVEY BACKGROUND FROM A PLAN TITLED "LOT LINE MODIFICATION SURVEY", PREPARED BY BENESCH DATED 28 MARCH 2024.
- SITE PLAN IS TAKEN FROM A PLAN TITLED "OVERALL SITE PLAN" PREPARED BY LANGAN, DATED 20 MARCH 2025.
- ELEVATIONS SHOWN ARE IN REFERENCE TO THE NORTH AMERICAN VERTICAL DATUM 1988 (NAVD88).
- BORINGS LB-01, LB-02, LB-02A, LB-03, LB-03A, LB-04, LB-05, LB-06, AND LB-08 WERE PERFORMED BY GENERAL BORINGS, INC. BETWEEN 13 AND 14 MARCH 2025, UNDER THE FULL TIME OBSERVATION OF A LANGAN FIELD ENGINEER.

LEGEND



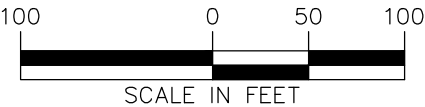
LANGAN BORING LOCATIONS



PROPOSED BUILDING FOOTPRINT



PROPERTY LINE



LANGAN

Langan CT, Inc.
555 Long Wharf Drive, 9th Floor
New Haven, CT 06511
T: 203.562.5771 F: 203.789.6142 www.langan.com

Project

LEARN

51 DANIELS AVE
WATERFORD, CT 06385
CONNECTICUT

Drawing Title

**EXPLORATION
LOCATION
PLAN**

Project No.

140310301
Date
4/21/2025
Drawn By
OAC
Checked By
TSD

Drawing No.

5
Sheet **0** of **1**

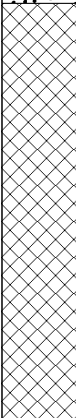
Project		LEARN - Newman Architects		Project No.		140310301		Date		4/16/2025	
Location				51 Daniel's Ave, Waterford, Connecticut							
Excavation Company				Polster Industries, LLC				Depth		9.0 ft	
Excavation Equipment				Kubota KX080-4 Mini Excavator				Excavation Foreman		Ben Ignace	
								Water Level - First		9.0 ▽	
								Water Level - Completion		N/A ▼	
								Field Engineer		Shawn OConnor	

SYMBOL	Elev. (ft)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+109.0		0			
	+108.0	Brown Silty fine SAND, trace fine gravel, trace root (moist) [TOPSOIL]	1			
	+106.5	Light brown medium to fine SAND, some silt, trace fine gravel, trace root (moist) [FILL]	2			
	+100.0	Grayish brown fine to coarse SAND, some fine to coarse gravel, trace boulder, trace cobble, trace silt (moist) [TILL]	3			G-1 from 2ft to 2.5ft
			4			
			5			G-2 from 5ft to 5.5ft
			6			
			7			Infiltration test performed at about 7ft below grade.
			8			Boulder in test pit sidewall at 8ft
			9			G-3 from 8.5ft to 9ft
		End of Test Pit at 9.0ft.	10			Groundwater pooling at 9ft. Bottom of test pit at 9ft. Test pit backfilled to grade in lifts of the excavated material and tamped with the excavator bucket.
			11			
			12			
			13			
			14			
			15			
			16			
			17			
			18			
			19			
			20			

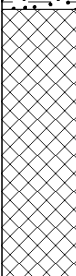
Project		LEARN - Newman Architects		Project No.		140310301		Date		4/16/2025			
Location				51 Daniel's Ave, Waterford, Connecticut									
Excavation Company				Polster Industries, LLC				Elevation and Datum		Approx. el. + 101.5 (NAVD 88)			
Excavation Equipment				Kubota KX080-4 Mini Excavator				Depth		7.0 ft			
								Water Level - First		7.0 ▽			
								Water Level - Completion		N/A ▼			
Excavation Foreman				Ben Ignace				Field Engineer				Shawn OConnor	

SYMBOL	Elev. (ft)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+101.5		0			
		Brown Silty fine SAND, trace fine gravel, trace root (moist) [TOPSOIL]				G-1 from 2.5ft to 3ft
	+100.5		1			
		Light brown to grayish brown fine to coarse SAND, trace fine gravel, trace silt (moist) [TILL]	2			
			3			Infiltration test performed at about 3ft below grade. Perched groundwater visible in test pit sidewall at 3ft
			4			
		Grayish brown fine to coarse SAND, some silt, trace fine gravel (moist) [TILL]	5			G-2 from 4.5ft to 5ft
			6			
	+94.5	Grayish brown fine to coarse SAND, some fine to coarse gravel, trace silt (moist) [TILL]	7			G-3 from 6.5ft to 7ft
		End of Test Pit at 7.0ft.	8			Groundwater pooling at 7ft. Bottom of test pit at 7ft. Test pit backfilled to grade in lifts of the excavated material and tamped with the excavator bucket.
			9			
			10			
			11			
			12			
			13			
			14			
			15			
			16			
			17			
			18			
			19			
			20			

Project	LEARN - Newman Architects	Project No.	140310301	Date	4/16/2025
Location	51 Daniel's Ave, Waterford, Connecticut	Elevation and Datum Approx. el. + 114.0 (NAVD 88)			
Excavation Company	Polster Industries, LLC	Depth	10.0 ft	Water Level - First	10.0 ▽
Excavation Equipment	Kubota KX080-4 Mini Excavator	Excavation Foreman	Ben Ignace	Water Level - Completion	N/A ▼
				Field Engineer	Shawn OConnor

SYMBOL	Elev. (ft)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+114.0		0			
	+113.0	Brown Silty fine SAND, trace fine gravel, trace root (moist) [TOPSOIL]	1			
		Brown medium to fine SAND, trace boulder, trace fine gravel, trace root (moist) [FILL]	2			G-1 from 2ft to 2.5ft
			3			
			4			
			5			
		Orangish brown medium to fine SAND, some silt, trace fine gravel (moist) [FILL]	6			G-2 from 5.5ft to 6ft
	+107.0		7			Infiltration test performed at about 7ft below grade.
		Grayish brown fine to coarse SAND, trace fine gravel, trace silt (moist) [TILL]	8			
			9			
	+104.0	End of Test Pit at 10.0ft.	10			G-3 from 9.5ft to 10ft Groundwater visible in test pit sidewall at 10ft. Bottom of test pit at 10ft. Test pit backfilled to grade in lifts of the excavated material and tamped with the excavator bucket.
			11			
			12			
			13			
			14			
			15			
			16			
			17			
			18			
			19			
			20			

Project		LEARN - Newman Architects		Project No.		140310301		Date		4/16/2025			
Location				51 Daniel's Ave, Waterford, Connecticut									
Excavation Company				Polster Industries, LLC				Elevation and Datum		Approx. el. + 109.0 (NAVD 88)			
Excavation Equipment				Kubota KX080-4 Mini Excavator				Depth		10.0 ft			
								Water Level - First		10.0 ▽			
								Water Level - Completion		N/A ▼			
Excavation Foreman				Ben Ignace				Field Engineer				Shawn OConnor	

SYMBOL	Elev. (ft)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+109.0		0			
	+108.0	Brown Silty fine SAND, trace fine gravel, trace root (moist) [TOPSOIL]	1			
		Brown medium to fine SAND, trace boulder, trace fine gravel, trace silt, trace brick, trace metal (moist) [FILL]	2			G-1 from 2ft to 2.5ft
	+104.0		3			
	+104.0	Dark brown SILT, trace medium to fine sand, trace root (moist) [BURIED TOPSOIL]	4			
	+103.0	Grayish brown fine to coarse SAND, trace coarse to fine gravel, trace silt (moist) [TILL]	5			Infiltration test performed at about 6ft below grade. G-2 from 5.5ft to 6ft
			6			Perched groundwater flowing in from test pit sidewall at 7ft; G-3 from 6.5ft to 7ft
			7			Mottling observed from 6ft to 10ft
			8			
			9			G-4 from 8.5ft to 9ft
			10			G-5 from 9.5ft to 10ft
	+99.0	End of Test Pit at 10.0ft.	11			Groundwater pooling at 10ft. Bottom of test pit at 10ft. Test pit backfilled to grade in lifts of the excavated material and tamped with the excavator bucket.
			12			
			13			
			14			
			15			
			16			
			17			
			18			
			19			
			20			

LANGAN

INFILTRATION TESTS									
IT-01 in TP-01 (Basin 1A)									
PROJECT LEARN			PROJECT NO. 140310301						
LOCATION Waterford, CT			DATE 16 April 2025						
INSPECTOR Shawn O'Connor			WEATHER Partly Sunny, 45-52°F						
PRESOAK	TIME	DEPTH OF HOLE (INCH)		ELEVATION AND DATUM					
	Start	1:56	24	Surface Elevation	Approx.	109 (NAVD88)			
	End	2:56	24	Top of Hole Elevation	Approx.	104 (NAVD88)			
				Bottom of Hole Elevation	Approx.	102 (NAVD88)			
METHOD OF INFILTRATION TEST TP-01 was advanced to a depth of about 9 feet below existing grade. The test pit was benched to the side of the pit about 5 foot below grade. A 24-inch deep and about 6-inch diameter hole was dug by hand with a post hole digger. A 30-inch long pipe with a 6-inch diameter was inserted into the hole. The hole was presoaked for 1 hour with 24-inches of water. At the end of the presoak, about 21-inches of water had infiltrated. For each infiltration test, the hole was filled with water to a predetermined depth. Then, after every 15 minutes, the depth to water was measured to calculate the total drop of water over that time period. The tables below outline the calculations for determining the average rate in which the water dissipated.									
	TIME (MIN)	DEPTH TO WATER (IN)	DROP (IN)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS Grayish brown fine to coarse SAND, some fine to coarse gravel, trace boulder, trace cobble, trace silt [TILL]			
TEST 1 @ 2:59	0	6	-	-					
	15	19.5	13.5	0.90	54				
	30	21.5	2	0.13	8				
	-	-	-	-	-				
	-	-	-	-	-				
Average Rate:					31.0				
<table border="1" style="margin: auto;"> <tr> <td style="text-align: right;">Average Rate:</td> <td style="text-align: center;">31.0</td> <td style="text-align: left;">inches/hour</td> </tr> </table>							Average Rate:	31.0	inches/hour
Average Rate:	31.0	inches/hour							

**INFILTRATION TESTS**

IT-02 in TP-02 Basin 2A

PROJECT LEARN			PROJECT NO. 140310301			
LOCATION Waterford, CT			DATE 16 April 2025			
INSPECTOR Shawn O'Connor			WEATHER Partly Sunny, 45-52°F			
PRESOAK	TIME	DEPTH OF HOLE (INCH)	ELEVATION AND DATUM			
	Start	12:34	24	Surface Elevation	Approx.	101.5 (NAVD88)
	End	1:40	24	Top of Hole Elevation	Approx.	100.5 (NAVD88)
				Bottom of Hole Elevation	Approx.	98.5 (NAVD88)

METHOD OF INFILTRATION TEST

TP-02 was advanced to a depth of about 7 feet below existing grade. The test pit was benched to the side of the pit about 1 foot below grade. A 24-inch deep and about 6-inch diameter hole was dug by hand with a post hole digger. A 30-inch long pipe with a 6-inch diameter was inserted into the hole. The hole was presoaked for about 1 hour with 24-inches of water. At the end of the presoak, about 1-inch of water had infiltrated. For each infiltration test, the hole was filled with water to a predetermined depth.

Then, after every 15 minutes, the depth to water was measured to calculate the total drop of water over that time period. The tables below outline the calculations for determining the average rate in which the water dissipated.

	TIME (MIN)	DEPTH TO WATER (IN)	DROP (IN)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 @ 1:41	0	6	-	-	-	Light brown to grayish brown fine to coarse SAND, trace fine gravel, trace silt (moist) [TILL]
	15	6.25	0.25	0.02	1	
	30	6.25	0	0.00	0	
	45	6.5	0.25	0.02	1	
	60	6.5	0	0.00	0	
	Average Rate:				0.5	

	TIME (MIN)	WATER LEVEL (IN)	DROP (IN)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 2 @ 2:43	0	6	-	-	-	Light brown to grayish brown fine to coarse SAND, trace fine gravel, trace silt (moist) [TILL]
	15	6	0	0.00	0.0	
	30	6.25	0.25	0.02	1.0	
	-	-	-	-	-	
	-	-	-	-	-	
	Average Rate:				0.5	

Average Rate:	0.5	inches/hour
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LANGAN

INFILTRATION TESTS

IT-03 in TP-03 Basin 2B

PROJECT LEARN			PROJECT NO. 140310301		
LOCATION Waterford, CT			DATE 16 April 2025		
INSPECTOR Shawn O'Connor			WEATHER Partly Sunny, 45-52°F		
PRESOAK	TIME	DEPTH OF HOLE (INCH)	ELEVATION AND DATUM		
	Start	11:12	24	Surface Elevation	Approx. 114 (NAVD88)
	End	12:13	24	Top of Hole Elevation	Approx. 109 (NAVD88)
				Bottom of Hole Elevation	Approx. 107 (NAVD88)

METHOD OF INFILTRATION TEST

TP-03 was advanced to a depth of about 10 feet below existing grades. The test pit was benched to the side of the pit about 5 feet below grade. A 24-inch deep and about 6 inch diameter hole was dug by hand with a post hole digger. A 30-inch long pipe with a 4-inch diameter was inserted into the hole. The hole was presoaked for about 1 hour with 24-inches of water. At the end of the presoak, about 12.5-inches of water had infiltrated. For each infiltration test, the hole was filled with water to a predetermined depth. Then, after every 15 minutes, the depth to water was measured to calculate the total drop of water over that time period. The tables below outline the calculations for determining the average rate in which the water dissipated.

	TIME (MIN)	DEPTH TO WATER (IN)	DROP (IN)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 @ 12:17	0	6	-	-		Grayish brown fine to coarse SAND, trace coarse to fine gravel, trace silt [TILL]
	15	12.5	6.5	0.43	26	
	30	15	2.5	0.17	10	
	45	16.5	1.5	0.10	6	
	60	17.5	1	0.07	4	
	Average Rate:				11.5	

	TIME (MIN)	WATER LEVEL (IN)	DROP (IN)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 2 @ 1:18	0	6	-	-		Grayish brown fine to coarse SAND, trace fine gravel, trace silt [TILL]
	15	10.5	4.5	0.30	18.0	
	30	13	2.5	0.17	10.0	
	45	15	2	0.13	8.0	
	60	17	2	0.13	8.0	
	Average Rate:				11.0	

	TIME (MIN)	WATER LEVEL (IN)	DROP (IN)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 3 @ 2:20	0	6	-	-		Grayish brown fine to coarse SAND, trace fine gravel, trace silt [TILL]
	15	10.5	4.5	0.30	18.0	
	30	13	2.5	0.17	10.0	
	-	-	-	-	-	
	-	-	-	-	-	
	Average Rate:				14.0	

Average Rate: 12.2 inches/hour

LANGAN

INFILTRATION TESTS										
IT-04 in TP-04 Basin 5A										
PROJECT LEARN				PROJECT NO. 140310301						
LOCATION Waterford, CT				DATE 16 April 2025						
INSPECTOR Shawn O'Connor				WEATHER Partly Sunny, 45-52°F						
PRESOAK	TIME	DEPTH OF HOLE (INCH)		ELEVATION AND DATUM						
	Start	10:23	24	Surface Elevation	Approx.	109	(NAVD88)			
	End	11:40	24	Top of Hole Elevation	Approx.	105	(NAVD88)			
				Bottom of Hole Elevation	Approx.	103	(NAVD88)			
METHOD OF INFILTRATION TEST										
TP-04 was advanced to a depth of about 10 feet below existing grades. The test pit benched to the side of the pit about 4 feet below grade. A 24-inch deep and about 6-inch diameter hole was dug by hand with a post hole digger. A 25-inch long pipe with a 4-inch diameter was inserted into the hole. The hole was presoaked for about 1 hour with 24-inches of water. At the end of the presoak, about 16-inches of water had infiltrated. For each infiltration test, the hole was filled with water to a predetermined depth. Then, after every 15 minutes, the depth to water was measured to calculate the total drop of water over that time period. The tables below outline the calculations for determining the average rate in which the water dissipated.										
	TIME (MIN)	DEPTH TO WATER (IN)	DROP (IN)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS				
TEST 1 @ 11:56	0	1	-	-		Grayish brown fine to coarse SAND, trace coarse to fine gravel, trace silt [TILL]				
	15	10.5	9.5	0.63	38					
	30	13.5	3	0.20	12					
	45	15.5	2	0.13	8					
	60	16.5	1	0.07	4					
	Average Rate:				15.5					
	TIME (MIN)	WATER LEVEL (IN)	DROP (IN)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS				
TEST 2 @ 1:05	0	1	-	-		Grayish brown fine to coarse SAND, trace coarse to fine gravel, trace silt [TILL]				
	15	9.5	8.5	0.57	34.0					
	30	12.5	3	0.20	12.0					
	45	14.5	2	0.13	8.0					
	60	16	1.5	0.10	6.0					
	Average Rate:				15.0					
	TIME (MIN)	WATER LEVEL (IN)	DROP (IN)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS				
TEST 3 @ 2:06	0	1	-	-		Grayish brown fine to coarse SAND, trace coarse to fine gravel, trace silt [TILL]				
	15	9	8	0.53	32.0					
	30	12.5	3.5	0.23	14.0					
	-	-	-	-	-					
	-	-	-	-	-					
	Average Rate:				23.0					
<table border="1" style="margin: auto;"> <tr> <td>Average Rate:</td> <td>17.8</td> <td>inches/hour</td> </tr> </table>								Average Rate:	17.8	inches/hour
Average Rate:	17.8	inches/hour								

APPENDIX G

Stormwater Management System Operation and Maintenance Plan

Stormwater Management System Operation and Maintenance Plan

LEARN Early Childhood School, 51 Daniels Ave.

Regular inspection and maintenance of the stormwater management system and uphill areas is necessary to ensure proper operation. Inspections of the stormwater management system and pavement areas should be conducted monthly and should follow the schedule outlined in the sections below:

SITE AREAS:

Inspection and Maintenance

<i>Check for:</i>	<i>Corrective Measure:</i>
Erosion	Install erosion control measures and provide stabilization measures.
Spillage	Contain spill as close to source as possible with a dike of absorbent materials installed to protect drainage inlets, stormwater areas, or downstream wetlands and streams. All hazardous waste material, including absorbent materials must be disposed of by a licensed hazardous waste transporter and disposed of in an environmentally acceptable manner.
Sediment Accumulation	Stabilize any disturbed areas uphill of where the sedimentation is occurring. Use temporary erosion control measures (i.e. silt fence, straw bales) to filter stormwater runoff.
Trash	Pick up and dispose of trash and litter in an environmentally acceptable manner.

At a minimum the following maintenance measures shall be provided at the frequency listed in the following table:

Routine Maintenance

<i>Maintenance Measure:</i>	<i>Frequency:</i>
Pavement Sweeping	Minimum two times per year: during spring cleanup (after last snow event) and during fall cleanup (to remove fallen leaves).
Pavement De-icing	Apply anti-icing treatment prior to storms. Apply deicing treatments as needed during and after snow storms and mixed precipitation events to control ice and compact snow not removed during plowing

CATCH BASINS, YARD DRAINS, AND PIPES:

All catch basins shall be inspected annually.

Inspection and Maintenance

<i>Check for:</i>	<i>Corrective Measure:</i>
Trash, Sediment, and Debris at CB Grate	Remove trash, sediment, and debris and dispose of in an environmentally acceptable manner.
Sediment & Trash Accumulation in Sump	Remove sediment from sumps if depth of deposits is greater than one-half the depth from the bottom of the catch basin to the invert of the lowest pipe in the catch basin.
Pipe blockages	Flush pipes to remove blockages. TV inspect as required.

Stormwater Management System Operation and Maintenance Plan

LEARN Early Childhood School, 51 Daniels Ave.

At a minimum the following maintenance measures shall be provided at the frequency listed in the following table:

Routine Maintenance

<i>Maintenance Measure:</i>	<i>Frequency:</i>
Sediment Removal	Minimum one time per year. Remove accumulated sediment and trash from catch basin sumps, grates and pipe inverts. Dispose of sediment and trash in an environmentally acceptable manner.

WATER QUALITY UNITS

Water Quality Units shall be inspected monthly.

Inspection and Maintenance

<i>Check for:</i>	<i>Corrective Measure:</i>
Sediment Accumulation	Remove sediment when accumulation exceeds 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated per manufacturer's specifications.
Trash and Debris	Remove trash and debris and dispose of in an environmentally acceptable manner.
Hydrocarbons	Clean out water quality unit sump immediately following any recorded petroleum spill. May be performed using vacuum pump or absorbent pads.

At a minimum the following maintenance measures shall be provided at the frequency listed in the following table:

Routine Maintenance

<i>Maintenance Measure:</i>	<i>Frequency:</i>
Sediment Removal	Inspected at a minimum immediately after completion of the site's construction and twice a year afterwards. Remove sediment accumulation as required. Dispose of sediment in an environmentally acceptable manner.
Trash and Debris	Inspected at a minimum immediately after completion of the site's construction and twice a year afterwards. Dispose trash in an environmentally acceptable manner.

In addition to the above measures, water quality units are to be inspected and maintained per manufacturer's specifications. Product information is attached.

Stormwater Management System Operation and Maintenance Plan

LEARN Early Childhood School, 51 Daniels Ave.

DETENTION PONDS

Detention Ponds shall be inspected monthly. Inspect after every major storm during the first three months of operation and monthly thereafter.

Inspection and Maintenance

<i>Check for:</i>	<i>Corrective Measure:</i>
Sediment Accumulation	Remove sediment from the detention pond as necessary. Wait until floor of the pond is thoroughly dry before removing sediment.
Erosion and cracking	Install erosion control measures and provide stabilization measures. Undercut or eroded areas shall be repaired within 30 days of documentation.
Trash and Debris	Remove trash, dead branches, and debris from pond and dispose of in an environmentally acceptable manner.
Invasive and Excess Vegetation	Remove excess vegetation, weeds and invasive species from the rain pond. Revegetate as needed.
Condition of stone inlets	Area should be cleared of all sediment deposits and invasive plant species. Damage and deterioration of the area shall be repaired immediately.

At a minimum the following maintenance measures shall be provided at the frequency listed in the following table:

Routine Maintenance

<i>Maintenance Measure:</i>	<i>Frequency:</i>
Weeding & Mowing	Mow grass within infiltration basin to a height of 3 to 6 inches. Maintain healthy grass cover; re-seed as necessary. Remove trash and debris, grass clippings and accumulated organic matter.

UNDERGROUND INFILTRATION SYSTEMS

Underground infiltration systems shall be inspected twice per year at a minimum. Inspect after every major storm during the first three months of operation and monthly thereafter.

Inspection and Maintenance

<i>Check for:</i>	<i>Corrective Measure:</i>
Sediment Accumulation	Remove sediment from the isolator row as necessary. Inspect the remainder of the system annually. Remove debris, sediment and floatables using a high-pressure water nozzle and vacuum truck

Stormwater Management System Operation and Maintenance Plan

LEARN Early Childhood School, 51 Daniels Ave.

VEGETATED SWALES

The grass drainage channel shall be inspected monthly. Inspect after every major storm during the first three months of operation and monthly thereafter.

Inspection and Maintenance

<i>Check for:</i>	<i>Corrective Measure:</i>
Sediment Accumulation	Remove sediment from the channel as necessary. Wait until floor of the channel is thoroughly dry before removing sediment.
Erosion and cracking	Install erosion control measures and provide stabilization measures. Undercut or eroded areas shall be repaired within 30 days of documentation.
Trash and Debris	Remove trash, dead branches, and debris from channel and dispose of in an environmentally acceptable manner.
Invasive and Excess Vegetation	Remove excess vegetation and invasive species from the rain garden. Revegetate as needed.
Condition of stone inlets	Area should be cleared of all sediment deposits and invasive plant species. Damage and deterioration of the area shall be repaired immediately.

At a minimum the following maintenance measures shall be provided at the frequency listed in the following table:

Routine Maintenance

<i>Maintenance Measure:</i>	<i>Frequency:</i>
Mowing	Twice a year: mow the buffer area and side slopes. Remove trash and debris, grass clippings and accumulated organic matter.

Stormwater Management System Operation and Maintenance Plan
LEARN Early Childhood School, 51 Daniels Ave.

STORMWATER MANAGEMENT SYSTEM INSPECTION AND MAINTENANCE CHECKLIST

51 Daniels Ave.		Inspector:	
Date:		Time:	
Date Since Last Precipitation Event:		Site Conditions:	
Inspection Item	Satisfactory? Yes (Y) or No (N)		Comments or Corrective Measures Taken
Site Areas			
Erosion	Y	N	
Spillage	Y	N	
Sediment Accumulation	Y	N	
Trash	Y	N	
Catch Basins and Pipe			
Trash, Sediment, and Debris at Inlet Grates	Y	N	
Sediment & Trash Accumulation in Sump	Y	N	
Pipe blockages	Y	N	
Water Quality Unit			
Sediment Accumulation	Y	N	
Trash and Debris	Y	N	
Hydrocarbons	Y	N	
Rain Gardens			
Sediment Accumulation	Y	N	
Erosion and Cracking	Y	N	
Trash and Debris	Y	N	
Invasive and Excess Vegetation	Y	N	
Condition of Stone Inlets	Y	N	
Underground Infiltration Systems			
Sediment Accumulation	Y	N	
Vegetated Swale			
Sediment Accumulation	Y	N	
Erosion and Cracking	Y	N	
Trash and Debris	Y	N	
Invasive and Excess Vegetation	Y	N	
Condition of Stone Inlets	Y	N	

CDS® Inspection and Maintenance Guide



Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allow both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine whether the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS system should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.



CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y ³	m ³
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.3	3.0	0.9	1.3	1.0
CDS2020	5	1.3	3.5	1.1	1.3	1.0
CDS2025	5	1.3	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities



Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

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CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

[illegible]

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**
2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.