raSmith

CREATIVITY BEYOND ENGINEERING

Storm Water Management Plan for

STOR-IT Right - Waukesha
City of Waukesha, WI

Project No. 3250218

June 23, 2026

PREPARED BY:
Madolyn Flaherty, E.I.T.
Christopher White, P.E.

raSmith, Inc
16745 W Bluemound Rd
Brookfield, WI 53004-5938
(262)-317-1000

PREPARED FOR:
HCI Properties
Joseph Grasch
W284N3234 Lakeside Road
Pewaukee, WI 53072

Table of Contents

INTRODUCTION 3

METHOD OF ANALYSIS 4

WATER QUANTITY DESIGN 4

EXISTING CONDITIONS 4

PROPOSED CONDITIONS 5

WATER QUALITY DESIGN 6

INFILTRATION DESIGN 6

PROTECTION AREAS 6

STORM SEWER DESIGN 7

SUMMARY 7

APPENDIX 8

INTRODUCTION

This storm water analysis was completed for STOR-IT Right Waukesha. The site is located at the northeast corner of the Dolphin Drive and Coral Drive intersection in the City of Waukesha, Wisconsin. The site includes two self-storage buildings that includes a small office, drive isle, parking stalls, and stormwater detention pond. The site is 4.27 acres with a disturbance area of 3.63 acres.

Storm water management facilities for the proposed development site were designed according to the City of Waukesha Municipal Code Chapter 32 – Storm Water Management and Erosion Control, and the Wisconsin Administrative Code – Chapter NR 151 The following is a summary of key performance standards:

- Water Quantity
    - Per Chapter 32.10(D)(1) Peak Discharge – "The calculated post-development peak storm water discharge rate shall not exceed the calculated pre-development discharge rates for the 1-year, 2-year, 10-year, and 100-year, 24-hour design storms."

    - Per Chapter 32.11(A)(2) Rainfall Depths – The rainfall depths for design storms in Waukesha County are seen in table 1 below.

TABLE 1 – DESIGN STORM EVENTS
NOAA Atlas 14 24-HR Rainfall Depths

Frequency (years)	Duration (hours)	Rainfall Depth (inches)
1	24	2.40
2	24	2.70
10	24	3.81
100	24	6.18

    - Per Chapter 32.11(A)(3) Runoff Curve Numbers – "All computations of predevelopment conditions as specified in this ordinance shall use those NRCS runoff curve numbers assigned for 'good' hydraulic condition for each land cover type. For lands where the pre development land use was woodland, grassland/meadow, or cropland, the following NRCS curve number values shall be used as maximums."

TABLE 2 – RUNOFF CURVE NUMBERS

Soil Hydrologic Group	**A**	**B**	**C**	**D**
Woodland	30	55	70	77
Grassland	39	61	71	78
Cropland	55	69	78	83

    - Per Chapter 32.11(A)(5) Rainfall Distribution – "All peak flow calculations shall use MSE3 rainfall distribution patterns, as defined in NRCS methodologies.

- Water Quality
    - Per Chapter 32.10(D)(2)(a)(1) Total Suspended Solids – "For new land development and in-fill development, 80% reduction in total suspended solids load."

    - Per Chapter 32.10(D)(2)(b) Maximum Extent Practicable – "If the design standard cannot meet a total suspended solids reduction performance standard of this section, the storm water management plan shall include a written, site-specific explanation of why the total suspended solids reduction performance standard cannot be met and why

the total suspended solids loads will be reduced only to the maximum extent practicable."

- Per Chapter 32.10(D)(2)(c) Off-site Drainage – "When designing BMPs, runoff draining from off-site shall be taken into account in determining the treatment efficiency of the practices. Any impact on the efficiency shall be compensated for by increasing the size of the BMP accordingly."

- Infiltration
  - Per Chapter 32.10(D)(3)(e) and NR 151, where the infiltration rate of the soil is less than 0.6 inches per hour the site is exempt from infiltration.

- Protective Areas
  - Impervious surfaces shall be kept out of the protective area to the maximum extent practicable.

In addition to the above storm water management requirements, this report address stormwater conveyance for site runoff.

METHOD OF ANALYSIS

Hydrologic analysis included in this report was performed using the HydroCAD (version 10.20-8a) hydrologic simulation computer model. The discharges were generated using the SCS Dimensionless Unit Hydrograph Method for a 24-hour duration storm. Model parameters include drainage area, SCS runoff curve number, time of concentration, 24-hour precipitation (see Table 1) with MS3 distribution.

Water quality analysis included in this report was performed using the Source Loading and Management Model (WinSLAMM computer model version 10.5).

Storm sewer design for the 10-yr and 100-yr analysis were completed using Hydraflow Express Extension for Autodesk Civil 3D 2026.

WATER QUANTITY DESIGN

EXISTING CONDITIONS

The study area is 5.335 acres which includes offsite area from the properties to the north. The current cover is dense grass, and the soil is classified as hydraulic soil group D. A copy of the geotechnical report completed by Giles on April 21, 2026 can be found in the appendix. There are delineated wetlands on the property along with a navigable waterway which can be seen in the report in the appendix of this report. Due to grading constraints, the fringe greenspace in the proposed condition was removed from the existing watershed.

Below is an outline of the existing watersheds on the property and watersheds that discharge to the property, and how the watersheds discharge from the property.

- Watershed E-1 is the site in the existing condition that drains to the wetland along the south edge of the property. The watershed contains greenspace and drains via overland flow.
- Watershed O-1 is the offsite area that drains into the proposed stormwater pond in the proposed condition. The offsite area consists of grass from the property to the north of the site.
- Watershed O-2 is the offsite area that drains to the existing offsite detention pond. The stormwater that spills over the emergency spillway makes it to the proposed pond.

Table 3 summarizes the existing watersheds and peak discharge rate for each of the storm events. The offsite area is excluded in the discharge rates since it drains in a swale along the property line in the existing condition. The appendix of this report contains a pre-development hydrology exhibit and HydroCAD calculations.

TABLE 3 – PRE-DEVELOPMENT PEAK DISCHARGE RATES

Watershed Characteristics				**Peak Discharge**			
Watershed ID	Area Acres	CN	Tc Minutes	1-year cfs	2-year cfs	10-year cfs	100-year cfs
E-1	2.868	80	11.1	3.41	4.33	8.03	16.59
O-1	0.312	80	6.0	0.30	0.37	0.69	1.41
O-2	2.155	94	6.0	6.73	7.75	11.45	19.28
Existing North Pond*	-	-	-	0.27	0.30	0.36	0.57
Total Existing Discharge Rate	5.335	-	-	3.61	4.59	8.52	17.61

*Peak Discharge Rates for the pond are post detention.

PROPOSED CONDITIONS

The proposed project consists of two self-storage buildings with a small office space, parking stalls, drive isle, and stormwater detention pond. Due to grading constraints, the fringe greenspace was not included in the stormwater models. The project has detained the water to the maximum extent practicable.

The stormwater pond has a 12” culvert at an elevation of 73.00, that connects to an outlet control structure with a weir plate. The outlet control structure has a 1.5” orifice at an elevation of 73.00 and a 4” orifice at an elevation of 75.50. The top of the weir plate in the outlet control structure is at 76.50. Leaving the outlet control structure is a 12” culvert at an elevation of 73.00 that discharges to the existing wetland at an elevation of 72.50.

During catastrophic events of storms larger than the 100 year event, the excess water would pass over the emergency spillway. The spillway was designed to pass the 100 year event if the outlet control structure were to be plugged and the pond is already full. The designed spillway is 20 feet in length and 1 foot in depth and should be lined with turf reinforcement matting.

Below is an outline of the proposed watersheds on the property and watersheds that discharge to the property, and how the watersheds discharge from the property.

- Watershed P-1 is the site in the existing condition that drains to the wetland along the south edge of the property. The watershed contains greenspace and drains via overland flow.
- Watershed P-2 is the site area that drains to the filter strip along the eastern driveway edge. The watershed contains pavement and the grass area of the filter strip.
- Watershed P-3 is undetained area that includes the pavement from the southern driveway. The watershed drains to Coral Drive which drains to the existing wetland.
- Watershed P-4 is the undetained area that includes the pavement from the western driveway. The watershed drains to Dolphin Drive where it is captured in the City storm sewer system.
- Watershed O-1 is the offsite area that drains into the proposed stormwater pond in the proposed condition. The offsite area consists of grass from the property to the north of the site.
- Watershed O-2 is the offsite area that drains to the existing offsite detention pond. The stormwater that spills over the emergency spillway makes it to the proposed pond.

Table 4 summarizes the proposed watersheds and peak discharge rate for the 1-yr, 2-yr, 10-yr, and 100-yr storm events. The appendix of this report contains a post-development hydrology exhibit and HydroCAD calculations. Table 5 summarizes the maximum water surface elevations for the 10-year and 100-year storm events for the wet detention pond.

TABLE 4 – POST-DEVELOPMENT PEAK DISCHARGE RATES WITH OFFSITE AREA

Watershed Characteristics				Peak Discharge (cfs)			
ID	Area (ac)	TC (mins)	CN	1-year	2-year	10-year	100-year
P-1	2.683	6.0	95	8.67	9.92	14.52	24.21
Pond 1*	-	-	-	0.09	0.13	0.47	5.53
P-2	0.106	6.0	92	0.30	0.35	0.54	0.93
P-3	0.064	6.0	98	0.22	0.25	0.36	0.59
P-4	0.015	6.0	98	0.05	0.06	0.09	0.14
O-1	0.312	6.0	80	0.47	0.60	1.09	2.23
O-2	2.155	6.0	94	6.73	7.75	11.45	19.28
Existing Pond*	-	-	-	0.27	0.30	0.36	0.57
Allowable**	5.335	-	-	3.61	4.59	8.52	17.61
Total	5.335	-	-	**0.65**	**0.74**	**1.07**	**6.53**

*Peak Discharge Rates for the pond are post detention.
**Allowable discharge rates from table 2

TABLE 5 – POND MAXIMUM WATER SURFACE ELEVATIONS

Pond ID	Maximum Water Surface Elevation		Top of Spillway	Top of Berm
	10-year	100-year		
Pond #1	76.40	77.31	78.00	79.00
Existing Pond	81.49	83.02	83.00	84.00

WATER QUALITY DESIGN

Storm water quality was evaluated using the Source Loading and Management Model (WinSLAMM). Water quality improvements were obtained through a wet detention pond and filter strip. Due to grading constraints, the undetained fringe greenspace was removed from the model. The undetained impervious area at the driveways were still included in the model. The results are shown in Table 5 with the applicable computer generated information located in the appendix.

TABLE 6 – POST-DEVELOPMENT TSS LOAD

TSS Before (lbs)	**TSS After (lbs)**	**Removal (%)**
1,458	174.50	88.03%

INFILTRATION DESIGN

The geotechnical investigation completed by Giles Engineering in April 2026, shows excessive non-native clay fill. Per DNR Technical standard 1002, the infiltration rate for clay is 0.07 inches per hour. The clay soils are exempt from infiltration requirements per NR 151. Some deeper native sandy soils were identified however; groundwater was then encountered which also exempts the site from infiltration. A copy of the geotechnical report is in the appendix of this report.

PROTECTION AREAS

There are delineated wetlands on the property. The artificial wetland permit application has been completed and submitted for two wetlands on site. The third will include 1455 square feet of wetland fill at the southern driveway connection. The wetland fill permits will be applied for soon.

A portion of the wetland is considered navigable and includes an ordinary high water mark (OHWM) with an elevation of 72.45. Per City and State code, there is a 50 ft structure offset from the OHWM. Building 2 is located outside of the offset and there are no impervious surfaces located within the offset.

STORM SEWER DESIGN

The proposed project includes storm sewer along the north and south property line to capture the roof water and convey it to the pond. The project includes a trench drain to capture the stormwater before it reaches Dolphin Drive so it can be treated before being released to the wetland. The storm sewer was designed using AUTODESK HydraFLOW Storm Sewers Extension. The proposed storm sewer will control the 10 year storm and allow the 100 year storm to pass through without damage to downstream storm sewer facilities.

The proposed southern driveway blocks the drainage of the existing wetland so culverts are required to allow drainage. The duel culverts were designed to the 10 year design storm. The culverts were designed using flow data from StreamStats and modeled using AUTODESK HydraFLOW Express Extension. Calculations for the storm sewer and culvert design can be found in the appendix.

SUMMARY

The proposed site storm water management system will meet the applicable requirements to the maximum extent practicable prior to discharging from the site. Feel free contact me at (262)-317-3286 if you have any questions or require any additional information.

Sincerely,

Christopher B. White, P.E.
Project Manager

APPENDIX

Appendix A - Site Location

Appendix B - Water Quantity Design
1. Existing Hydrology Exhibit
2. HydroCAD – Existing Conditions
3. Proposed Hydrology Exhibit
4. HydroCAD – Proposed Conditions
5. HydroCAD – Plugged Condition

Appendix C - Water Quality Design
1. WinSLAMM Model Space
2. WinSLAMM Inputs
3. WinSLAMM Outputs

Appendix D - Soils Information
1. Geotechnical Report
2. Wetland Delineation Report

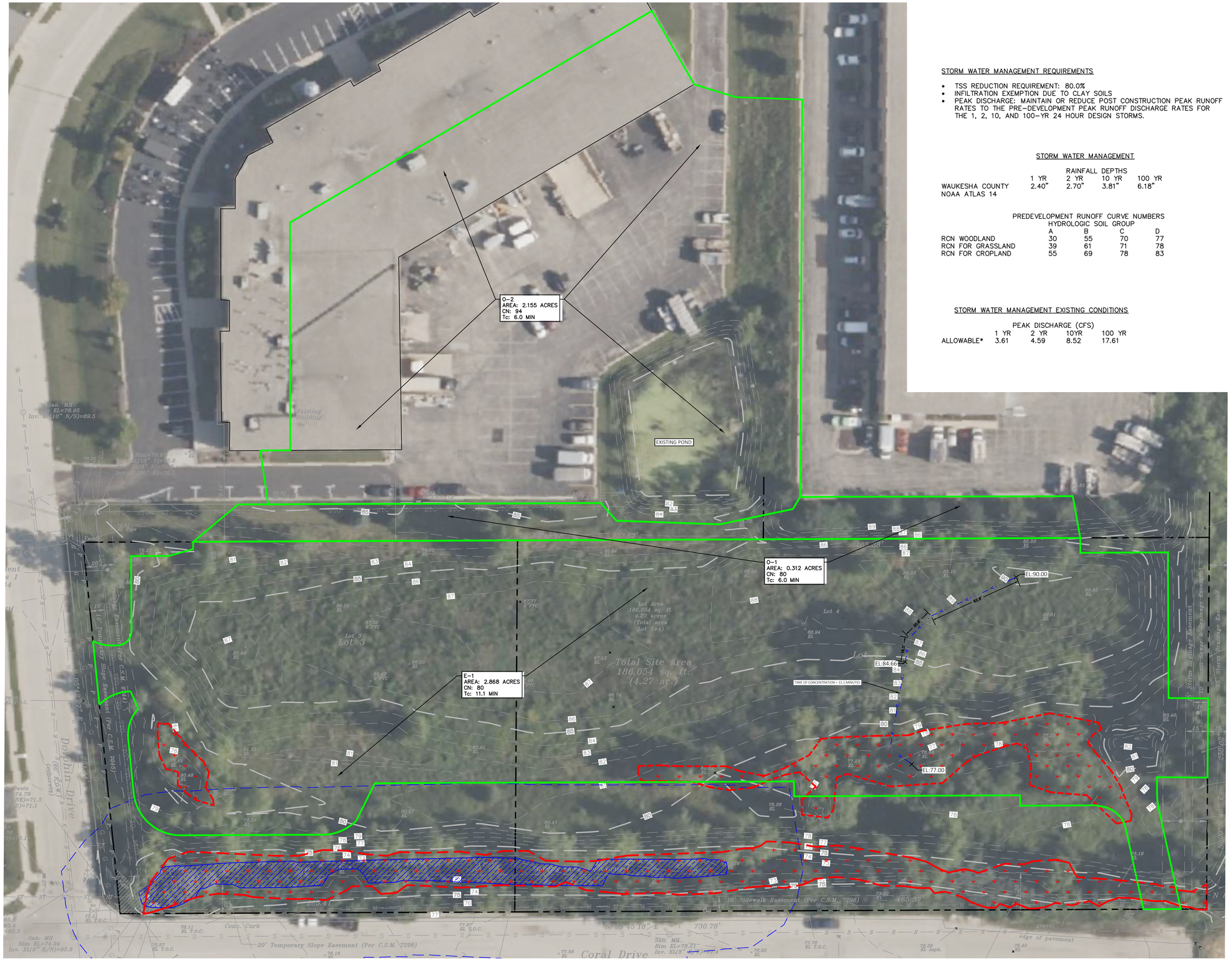
Appendix E - Storm Sewer Design
1. Storm Sewer Catchment Area Exhibit
2. NOAA 14 Precipitation Data
3. 10-yr and 100-yr Storm Sewer Design
4. Stream Stats Report
5. Culvert Design

Appendix A
Site Location

Google Maps – not to scale

North

Appendix B
Water Quantity Design



STORM WATER MANAGEMENT REQUIREMENTS

- TSS REDUCTION REQUIREMENT: 80.0%
- INFILTRATION EXEMPTION DUE TO CLAY SOILS
- PEAK DISCHARGE: MAINTAIN OR REDUCE POST CONSTRUCTION PEAK RUNOFF RATES TO THE PRE-DEVELOPMENT PEAK RUNOFF DISCHARGE RATES FOR THE 1, 2, 10, AND 100-YR 24 HOUR DESIGN STORMS.

STORM WATER MANAGEMENT

	RAINFALL DEPTHS			
	1 YR	2 YR	10 YR	100 YR
WAUKESHA COUNTY NOAA ATLAS 14	2.40"	2.70"	3.81"	6.18"

PREDEVELOPMENT RUNOFF CURVE NUMBERS

	HYDROLOGIC SOIL GROUP			
	A	B	C	D
RCN WOODLAND	30	55	70	77
RCN FOR GRASSLAND	39	61	71	78
RCN FOR CROPLAND	55	69	78	83

STORM WATER MANAGEMENT EXISTING CONDITIONS

	PEAK DISCHARGE (CFS)			
	1 YR	2 YR	10YR	100 YR
ALLOWABLE*	3.61	4.59	8.52	17.61

N

0 30 60
GRAPHIC SCALE
Feet

Know what's below.
Call before you dig.

R.A.SMITH, INC. ASSUMES NO RESPONSIBILITY FOR DAMAGES, LIABILITY OR COSTS RESULTING FROM CHANGES OR ALTERATIONS MADE TO THIS PLAN WITHOUT THE EXPRESSED WRITTEN CONSENT OF R.A.SMITH, INC.

ALL COPYRIGHTS TO THESE DRAWINGS ARE RESERVED. THEY MAY NOT BE COPIED, CHANGED, OR ASSIGNED TO ANY THIRD PARTY IN ANY MANNER WITHOUT OBTAINING THE EXPRESSED WRITTEN PERMISSION OF R.A.SMITH, INC.

DESCRIPTION	DATE

raSmith
CREATIVITY BEYOND ENGINEERING
16745 W. Bluemound Road
Brookfield, WI 53005-5938
(262) 781-1000
rasmith.com
Brookfield, WI | Appleton, WI | Madison, WI
Cedarburg, WI | Naperville, IL | Irvine, CA

STOR-IT RIGHT WAUKESHA
CITY OF WAUKESHA

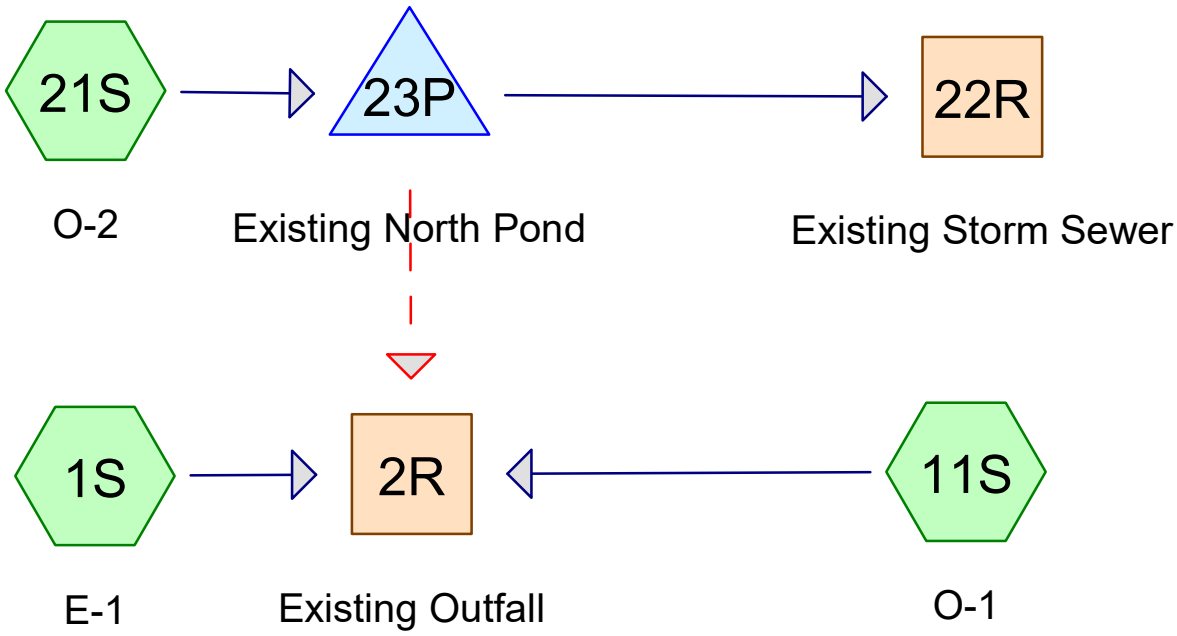
EXISTING HYDROLOGY EXHIBIT

© COPYRIGHT 2026
R.A. Smith, Inc.

DATE: 06/23/2026
SCALE: 1" = 30'
JOB NO. 3250218
PROJECT MANAGER: CHRISTOPHER WHITE, P.E.
DESIGNED BY: MAF
CHECKED BY: CBW

SHEET NUMBER
HX-01

P:\3250218\Dwg\Exhibits\3250218-HX01.dwg, EXISTING HYDROLOGY EXHIBIT, 6/23/2026 1:26:52 PM, mot2



Subcat Reach Pond Link

Routing Diagram for 3250218 Waukesha STOR-IT Right
Prepared by RA Smith, Printed 6/23/2026
HydroCAD® 10.20-8a s/n 02878 © 2025 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-year	MSE 24-hr	3	Default	24.00	1	2.40	2
2	2-year	MSE 24-hr	3	Default	24.00	1	2.70	2
3	10-year	MSE 24-hr	3	Default	24.00	1	3.81	2
4	100-year	MSE 24-hr	3	Default	24.00	1	6.18	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.508	80	>75% Grass cover, Good, HSG D (1S, 11S, 21S)
0.130	98	Water Surface, HSG D (21S)
1.581	98	impervious (21S)
5.219	**86**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
3.638	HSG D	1S, 11S, 21S
1.581	Other	21S
5.219		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	3.508	0.000	3.508	>75% Grass cover, Good	1S, 11S, 21S
0.000	0.000	0.000	0.130	0.000	0.130	Water Surface	21S
0.000	0.000	0.000	0.000	1.581	1.581	impervious	21S
0.000	**0.000**	**0.000**	**3.638**	**1.581**	**5.219**	**TOTAL AREA**	

Time span=0.00-70.00 hrs, dt=0.02 hrs, 3501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: E-1 Runoff Area=124,947 sf 0.00% Impervious Runoff Depth=0.82"
Flow Length=177' Tc=11.1 min CN=80 Runoff=3.41 cfs 0.196 af

Subcatchment 11S: O-1 Runoff Area=8,551 sf 0.00% Impervious Runoff Depth=0.82"
Tc=6.0 min CN=80 Runoff=0.30 cfs 0.013 af

Subcatchment 21S: O-2 Runoff Area=93,856 sf 79.45% Impervious Runoff Depth=1.77"
Tc=6.0 min CN=94 Runoff=6.73 cfs 0.319 af

Reach 2R: Existing Outfall Inflow=3.61 cfs 0.210 af
Outflow=3.61 cfs 0.210 af

Reach 22R: Existing Storm Sewer Inflow=0.27 cfs 0.318 af
Outflow=0.27 cfs 0.318 af

Pond 23P: Existing North Pond Peak Elev=80.46' Storage=0.213 af Inflow=6.73 cfs 0.319 af
Primary=0.27 cfs 0.318 af Secondary=0.00 cfs 0.000 af Outflow=0.27 cfs 0.318 af

Total Runoff Area = 5.219 ac Runoff Volume = 0.528 af Average Runoff Depth = 1.21"
67.20% Pervious = 3.508 ac 32.80% Impervious = 1.712 ac

Summary for Subcatchment 1S: E-1

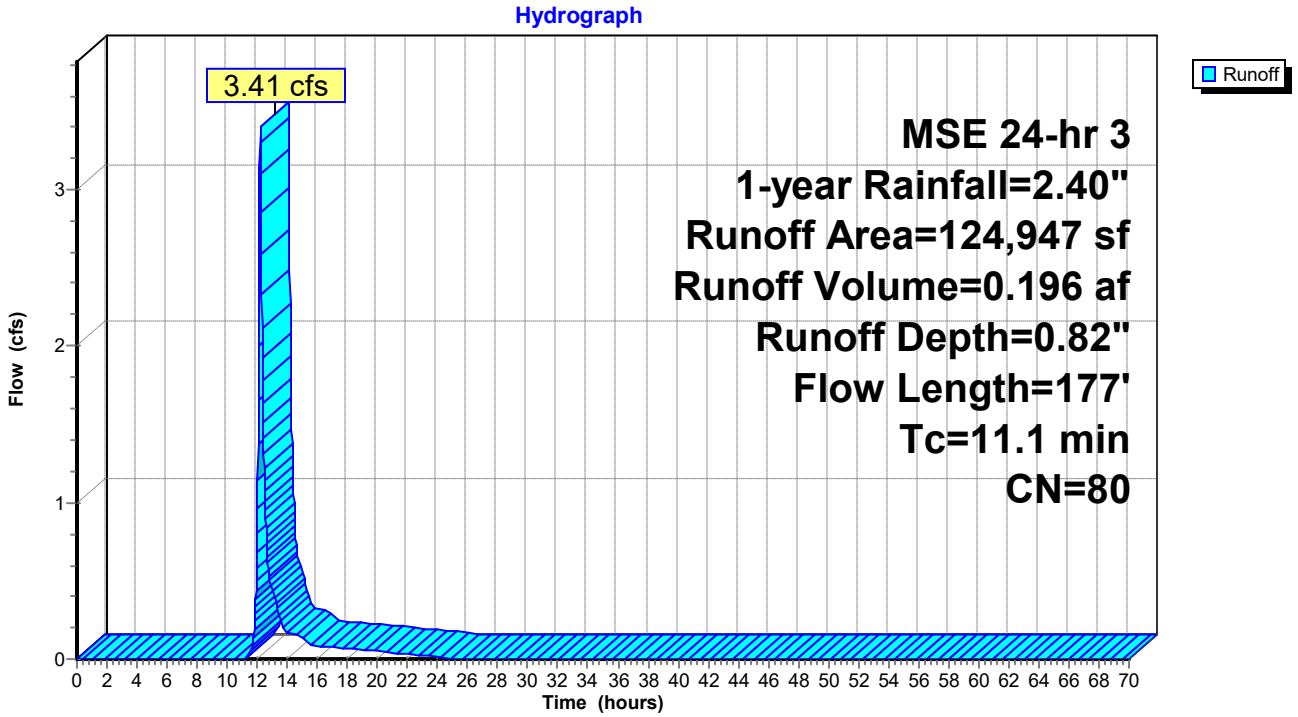
Runoff = 3.41 cfs @ 12.20 hrs, Volume= 0.196 af, Depth= 0.82"
Routed to Reach 2R : Existing Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 1-year Rainfall=2.40"

Area (sf)	CN	Description
124,947	80	>75% Grass cover, Good, HSG D
124,947		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.0534	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.6	77	0.0995	2.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	177	Total			

Subcatchment 1S: E-1



Summary for Subcatchment 11S: O-1

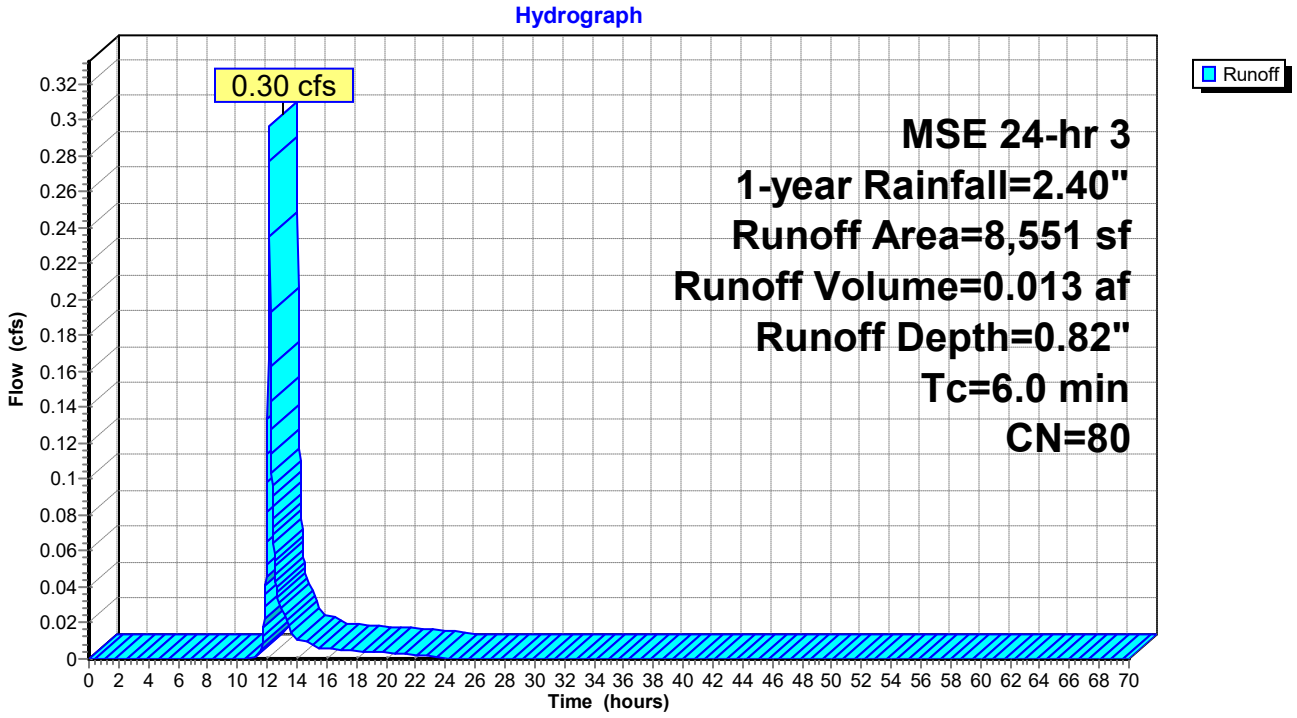
Runoff = 0.30 cfs @ 12.14 hrs, Volume= 0.013 af, Depth= 0.82"
Routed to Reach 2R : Existing Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 1-year Rainfall=2.40"

Area (sf)	CN	Description
8,551	80	>75% Grass cover, Good, HSG D
8,551		100.00% Pervious Area

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

Subcatchment 11S: O-1



Summary for Subcatchment 21S: O-2

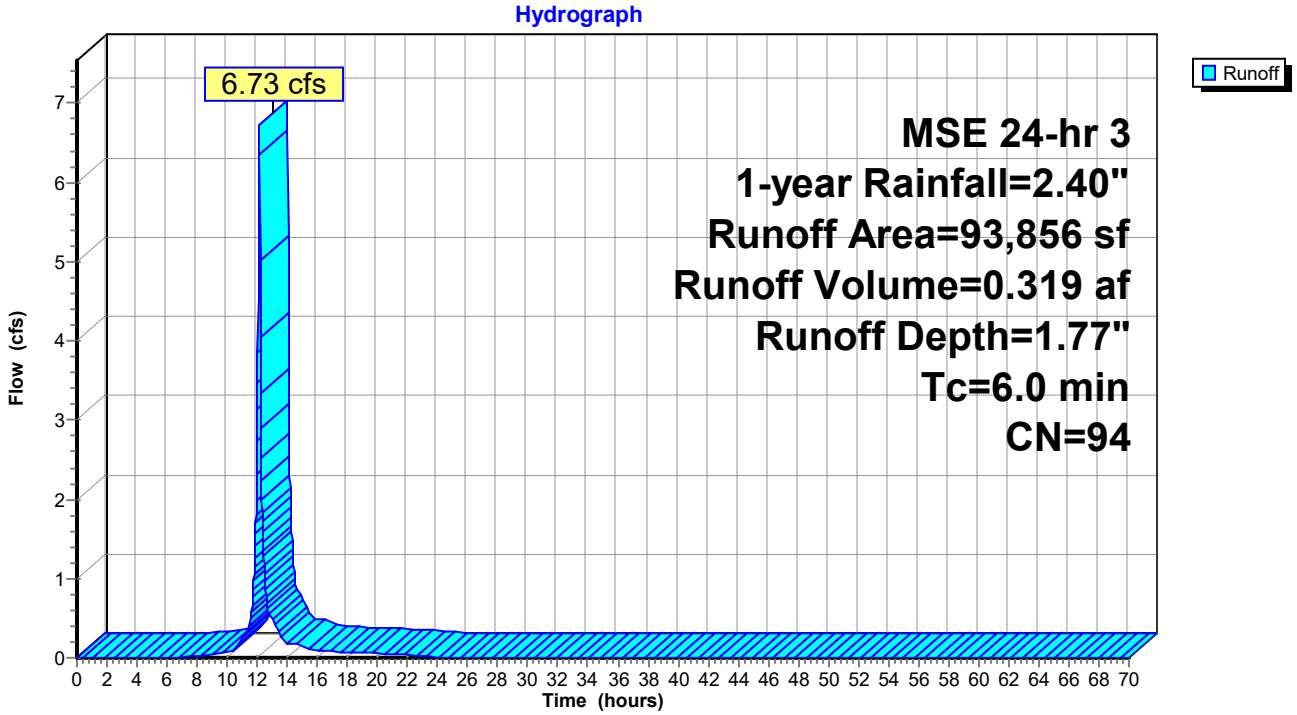
Runoff = 6.73 cfs @ 12.13 hrs, Volume= 0.319 af, Depth= 1.77"
Routed to Pond 23P : Existing North Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 1-year Rainfall=2.40"

	Area (sf)	CN	Description
*	68,882	98	impervious
	5,684	98	Water Surface, HSG D
	19,290	80	>75% Grass cover, Good, HSG D
	93,856	94	Weighted Average
	19,290		20.55% Pervious Area
	74,566		79.45% Impervious Area

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

Subcatchment 21S: O-2

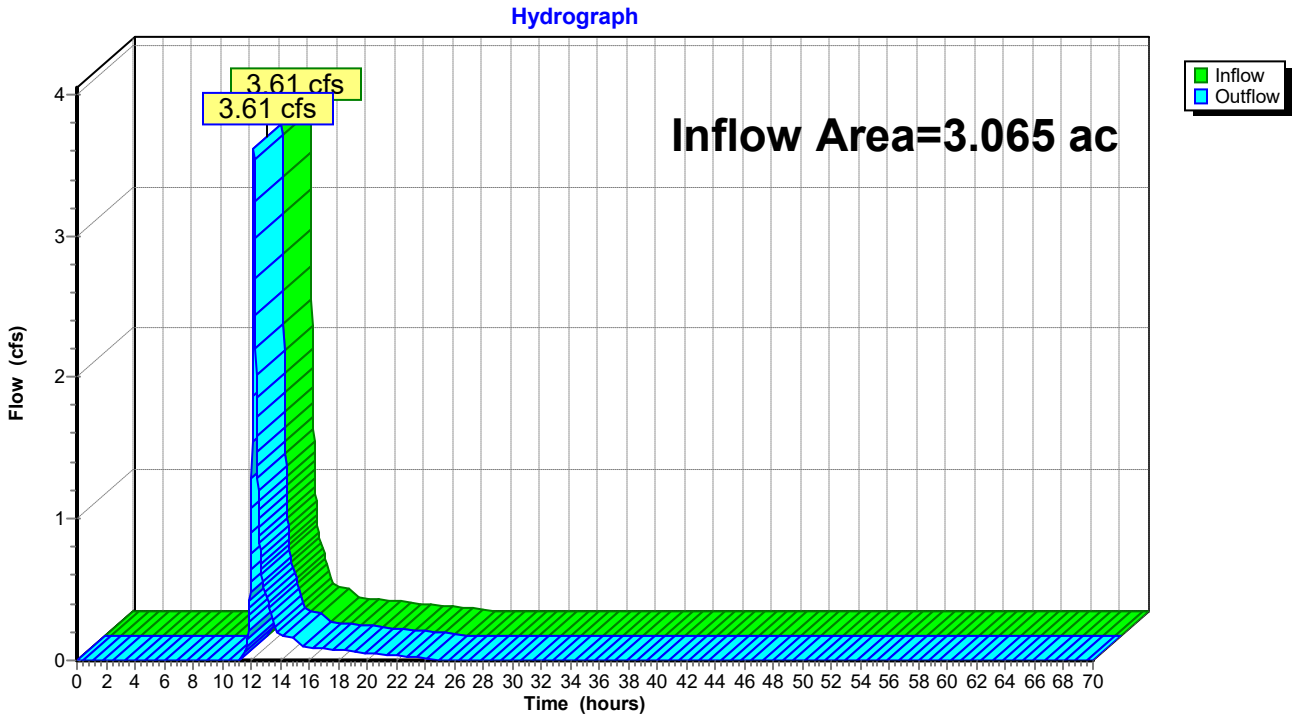


Summary for Reach 2R: Existing Outfall

Inflow Area = 3.065 ac, 0.00% Impervious, Inflow Depth = 0.82" for 1-year event
Inflow = 3.61 cfs @ 12.19 hrs, Volume= 0.210 af
Outflow = 3.61 cfs @ 12.19 hrs, Volume= 0.210 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs

Reach 2R: Existing Outfall

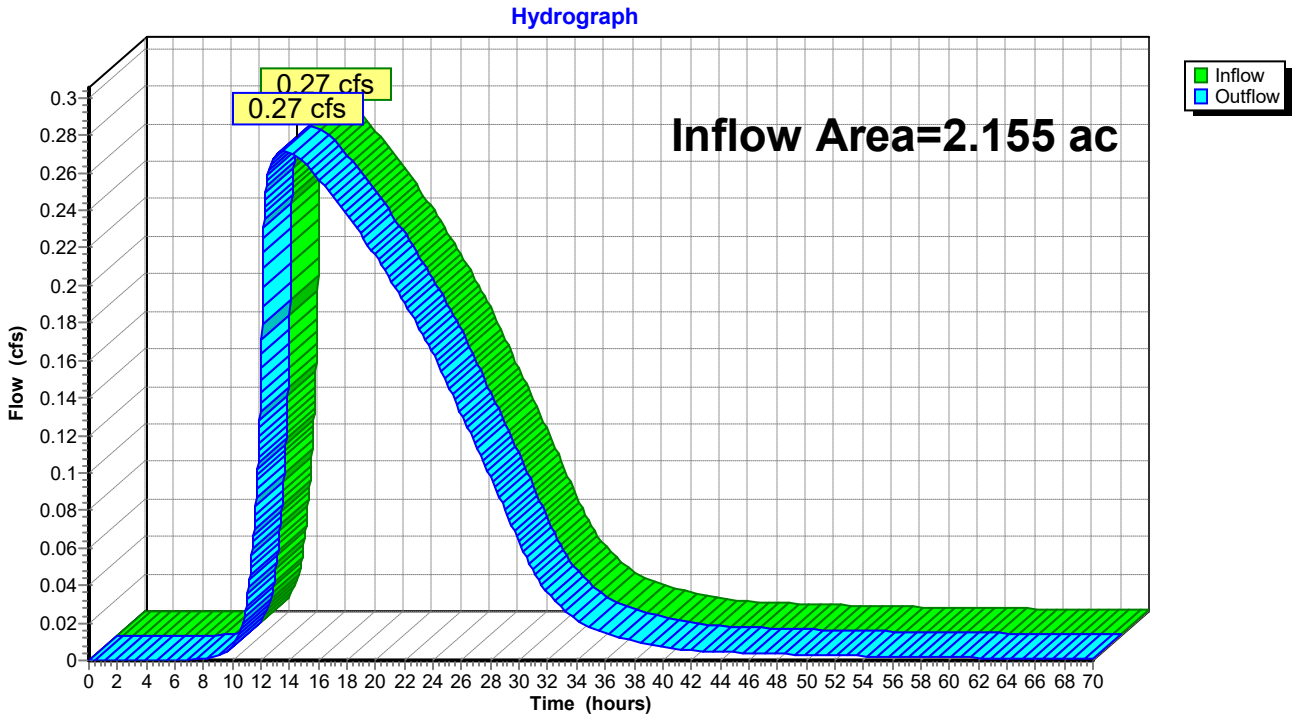


Summary for Reach 22R: Existing Storm Sewer

Inflow Area = 2.155 ac, 79.45% Impervious, Inflow Depth > 1.77" for 1-year event
Inflow = 0.27 cfs @ 13.55 hrs, Volume= 0.318 af
Outflow = 0.27 cfs @ 13.55 hrs, Volume= 0.318 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs

Reach 22R: Existing Storm Sewer



Summary for Pond 23P: Existing North Pond

Inflow Area = 2.155 ac, 79.45% Impervious, Inflow Depth = 1.77" for 1-year event
Inflow = 6.73 cfs @ 12.13 hrs, Volume= 0.319 af
Outflow = 0.27 cfs @ 13.55 hrs, Volume= 0.318 af, Atten= 96%, Lag= 85.0 min
Primary = 0.27 cfs @ 13.55 hrs, Volume= 0.318 af
Routed to Reach 22R : Existing Storm Sewer
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 2R : Existing Outfall

Routing by Stor-Ind method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
Peak Elev= 80.46' @ 13.55 hrs Surf.Area= 0.162 ac Storage= 0.213 af

Plug-Flow detention time= 455.3 min calculated for 0.318 af (100% of inflow)
Center-of-Mass det. time= 453.3 min (1,235.4 - 782.0)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	0.940 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

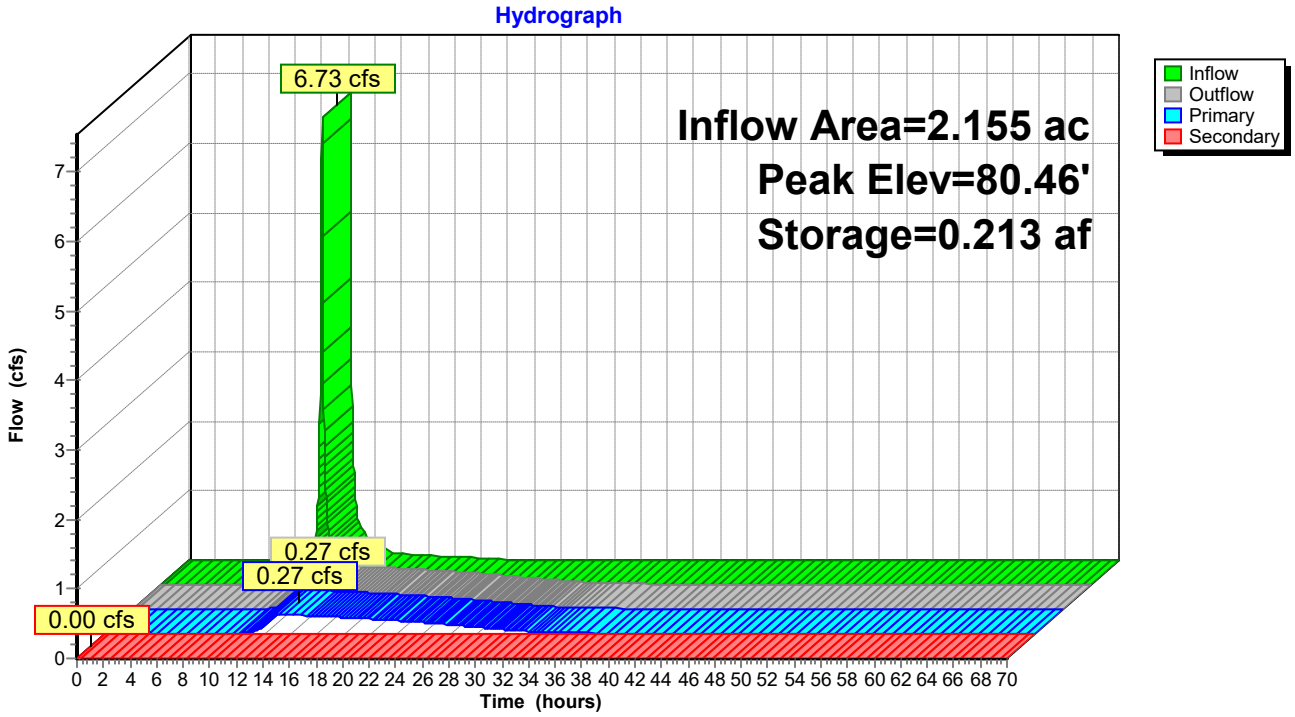
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
79.00	0.131	0.000	0.000
80.00	0.152	0.141	0.141
81.00	0.174	0.163	0.304
82.00	0.198	0.186	0.490
83.00	0.224	0.211	0.701
84.00	0.252	0.238	0.940

Device	Routing	Invert	Outlet Devices
#1	Primary	79.00'	**8.0" Round Culvert** L= 15.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 79.00' / 78.48' S= 0.0347 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.35 sf
#2	Device 1	79.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	83.00'	**10.0' long + 3.0 '/' SideZ x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.27 cfs @ 13.55 hrs HW=80.46' (Free Discharge)
└**1=Culvert** (Passes 0.27 cfs of 2.23 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 0.27 cfs @ 5.56 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=79.00' (Free Discharge)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 23P: Existing North Pond



Time span=0.00-70.00 hrs, dt=0.02 hrs, 3501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: E-1 Runoff Area=124,947 sf 0.00% Impervious Runoff Depth=1.03"
Flow Length=177' Tc=11.1 min CN=80 Runoff=4.33 cfs 0.246 af

Subcatchment 11S: O-1 Runoff Area=8,551 sf 0.00% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=80 Runoff=0.37 cfs 0.017 af

Subcatchment 21S: O-2 Runoff Area=93,856 sf 79.45% Impervious Runoff Depth=2.06"
Tc=6.0 min CN=94 Runoff=7.75 cfs 0.370 af

Reach 2R: Existing Outfall Inflow=4.59 cfs 0.263 af
Outflow=4.59 cfs 0.263 af

Reach 22R: Existing Storm Sewer Inflow=0.30 cfs 0.369 af
Outflow=0.30 cfs 0.369 af

Pond 23P: Existing North Pond Peak Elev=80.68' Storage=0.251 af Inflow=7.75 cfs 0.370 af
Primary=0.30 cfs 0.369 af Secondary=0.00 cfs 0.000 af Outflow=0.30 cfs 0.369 af

Total Runoff Area = 5.219 ac Runoff Volume = 0.633 af Average Runoff Depth = 1.46"
67.20% Pervious = 3.508 ac 32.80% Impervious = 1.712 ac

Summary for Subcatchment 1S: E-1

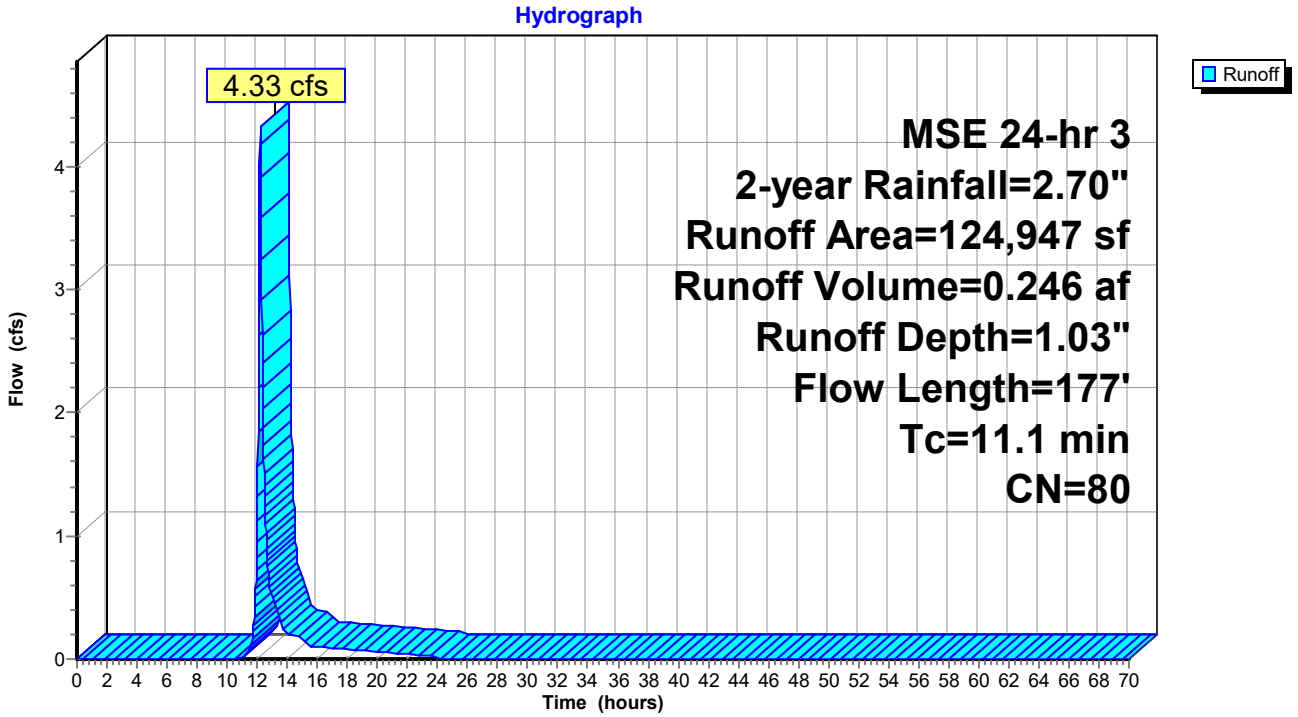
Runoff = 4.33 cfs @ 12.20 hrs, Volume= 0.246 af, Depth= 1.03"
Routed to Reach 2R : Existing Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 2-year Rainfall=2.70"

Area (sf)	CN	Description
124,947	80	>75% Grass cover, Good, HSG D
124,947		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.0534	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.6	77	0.0995	2.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	177	Total			

Subcatchment 1S: E-1



Summary for Subcatchment 11S: O-1

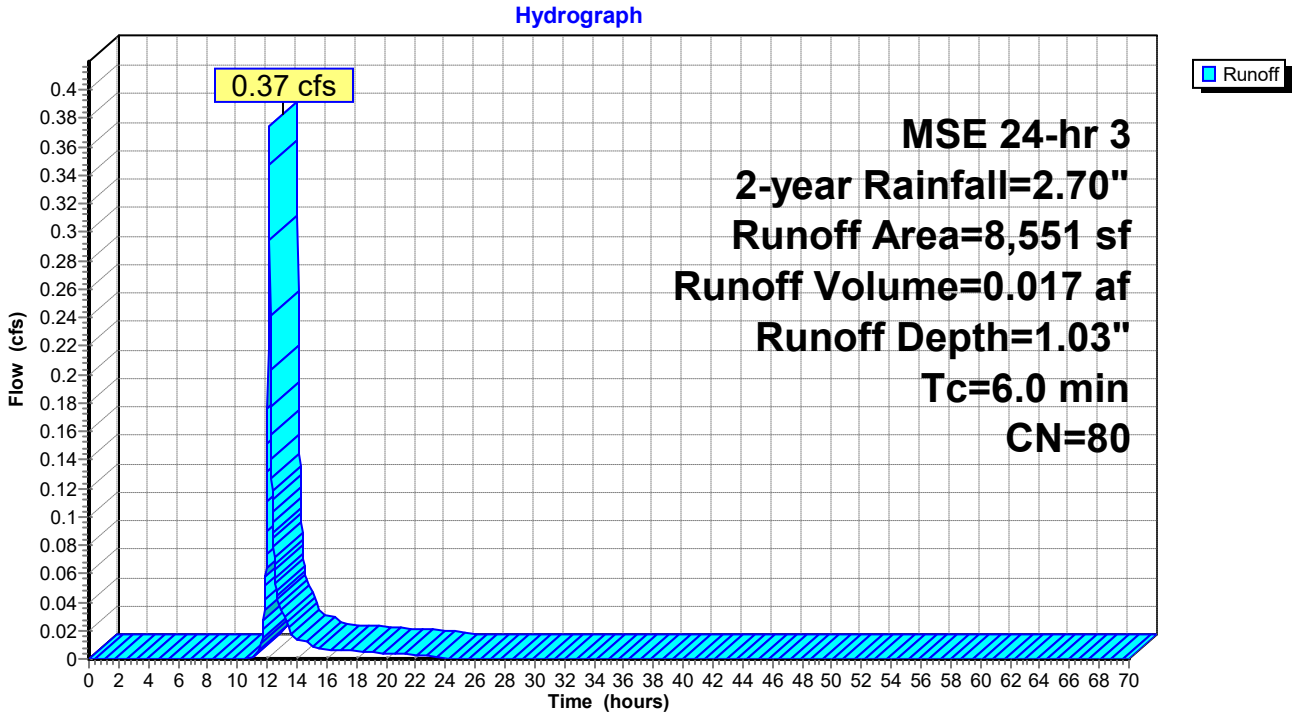
Runoff = 0.37 cfs @ 12.14 hrs, Volume= 0.017 af, Depth= 1.03"
Routed to Reach 2R : Existing Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 2-year Rainfall=2.70"

Area (sf)	CN	Description
8,551	80	>75% Grass cover, Good, HSG D
8,551		100.00% Pervious Area

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

Subcatchment 11S: O-1



Summary for Subcatchment 21S: O-2

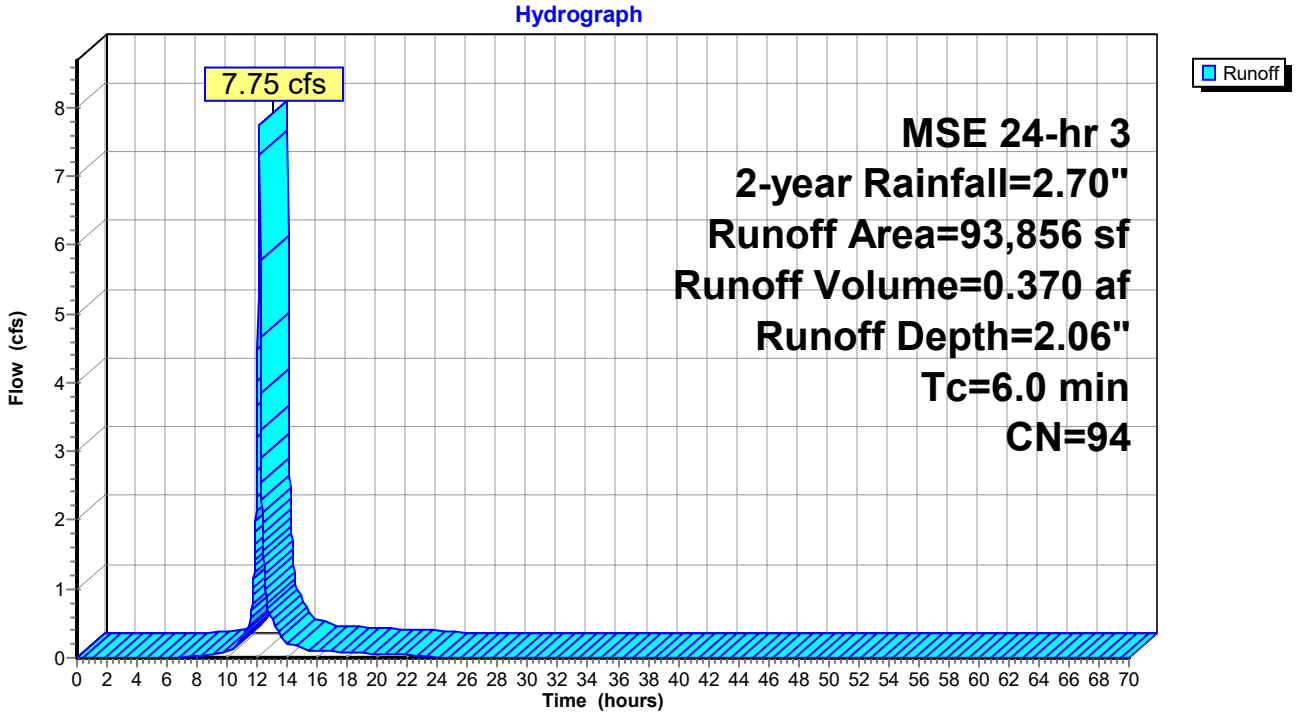
Runoff = 7.75 cfs @ 12.13 hrs, Volume= 0.370 af, Depth= 2.06"
Routed to Pond 23P : Existing North Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 2-year Rainfall=2.70"

	Area (sf)	CN	Description
*	68,882	98	impervious
	5,684	98	Water Surface, HSG D
	19,290	80	>75% Grass cover, Good, HSG D
	93,856	94	Weighted Average
	19,290		20.55% Pervious Area
	74,566		79.45% Impervious Area

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

Subcatchment 21S: O-2

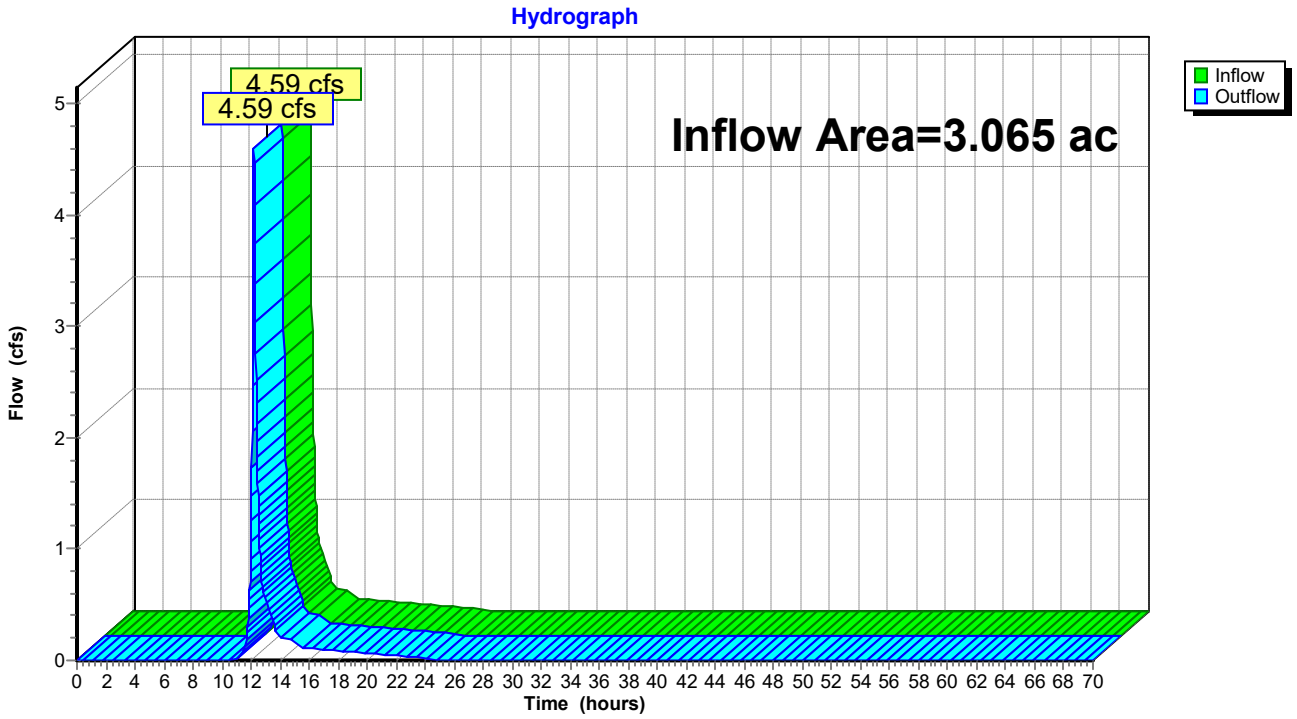


Summary for Reach 2R: Existing Outfall

Inflow Area = 3.065 ac, 0.00% Impervious, Inflow Depth = 1.03" for 2-year event
Inflow = 4.59 cfs @ 12.19 hrs, Volume= 0.263 af
Outflow = 4.59 cfs @ 12.19 hrs, Volume= 0.263 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs

Reach 2R: Existing Outfall

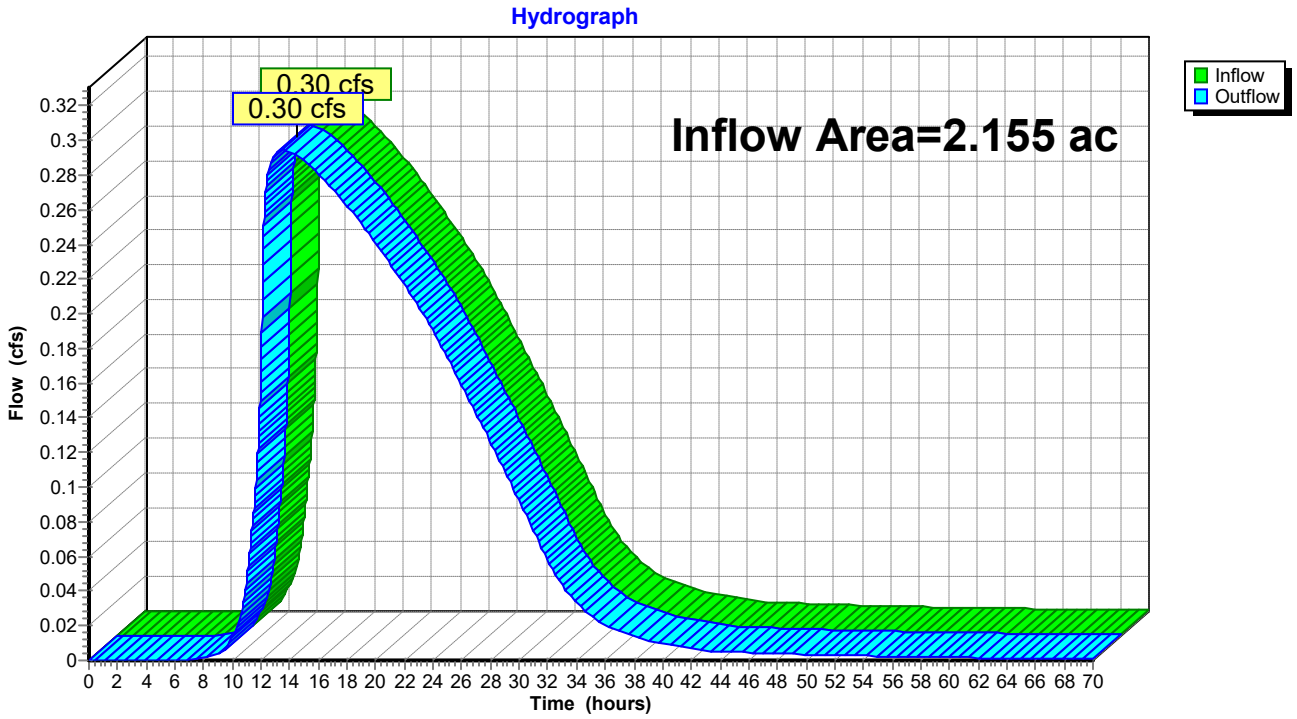


Summary for Reach 22R: Existing Storm Sewer

Inflow Area = 2.155 ac, 79.45% Impervious, Inflow Depth > 2.05" for 2-year event
Inflow = 0.30 cfs @ 13.56 hrs, Volume= 0.369 af
Outflow = 0.30 cfs @ 13.56 hrs, Volume= 0.369 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs

Reach 22R: Existing Storm Sewer



Summary for Pond 23P: Existing North Pond

Inflow Area = 2.155 ac, 79.45% Impervious, Inflow Depth = 2.06" for 2-year event
Inflow = 7.75 cfs @ 12.13 hrs, Volume= 0.370 af
Outflow = 0.30 cfs @ 13.56 hrs, Volume= 0.369 af, Atten= 96%, Lag= 86.0 min
Primary = 0.30 cfs @ 13.56 hrs, Volume= 0.369 af
Routed to Reach 22R : Existing Storm Sewer
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 2R : Existing Outfall

Routing by Stor-Ind method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
Peak Elev= 80.68' @ 13.56 hrs Surf.Area= 0.167 ac Storage= 0.251 af

Plug-Flow detention time= 482.8 min calculated for 0.369 af (100% of inflow)
Center-of-Mass det. time= 481.5 min (1,260.6 - 779.1)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	0.940 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

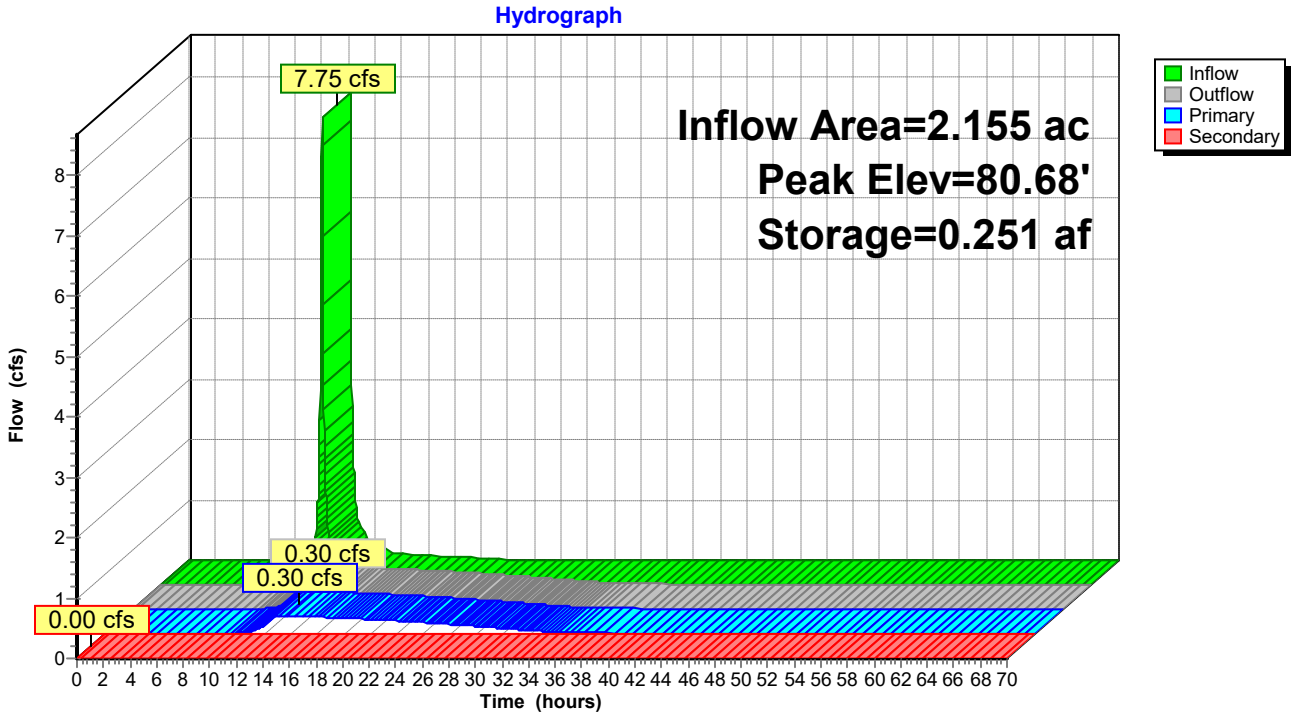
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
79.00	0.131	0.000	0.000
80.00	0.152	0.141	0.141
81.00	0.174	0.163	0.304
82.00	0.198	0.186	0.490
83.00	0.224	0.211	0.701
84.00	0.252	0.238	0.940

Device	Routing	Invert	Outlet Devices
#1	Primary	79.00'	**8.0" Round Culvert** L= 15.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 79.00' / 78.48' S= 0.0347 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.35 sf
#2	Device 1	79.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	83.00'	**10.0' long + 3.0 '/' SideZ x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.30 cfs @ 13.56 hrs HW=80.68' (Free Discharge)
1=Culvert (Passes 0.30 cfs of 2.44 cfs potential flow)
2=Orifice/Grate (Orifice Controls 0.30 cfs @ 6.01 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=79.00' (Free Discharge)
3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 23P: Existing North Pond



Time span=0.00-70.00 hrs, dt=0.02 hrs, 3501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: E-1 Runoff Area=124,947 sf 0.00% Impervious Runoff Depth=1.89"
Flow Length=177' Tc=11.1 min CN=80 Runoff=8.03 cfs 0.451 af

Subcatchment 11S: O-1 Runoff Area=8,551 sf 0.00% Impervious Runoff Depth=1.89"
Tc=6.0 min CN=80 Runoff=0.69 cfs 0.031 af

Subcatchment 21S: O-2 Runoff Area=93,856 sf 79.45% Impervious Runoff Depth=3.14"
Tc=6.0 min CN=94 Runoff=11.45 cfs 0.563 af

Reach 2R: Existing Outfall Inflow=8.52 cfs 0.482 af
Outflow=8.52 cfs 0.482 af

Reach 22R: Existing Storm Sewer Inflow=0.36 cfs 0.562 af
Outflow=0.36 cfs 0.562 af

Pond 23P: Existing North Pond Peak Elev=81.49' Storage=0.393 af Inflow=11.45 cfs 0.563 af
Primary=0.36 cfs 0.562 af Secondary=0.00 cfs 0.000 af Outflow=0.36 cfs 0.562 af

Total Runoff Area = 5.219 ac Runoff Volume = 1.045 af Average Runoff Depth = 2.40"
67.20% Pervious = 3.508 ac 32.80% Impervious = 1.712 ac

Summary for Subcatchment 1S: E-1

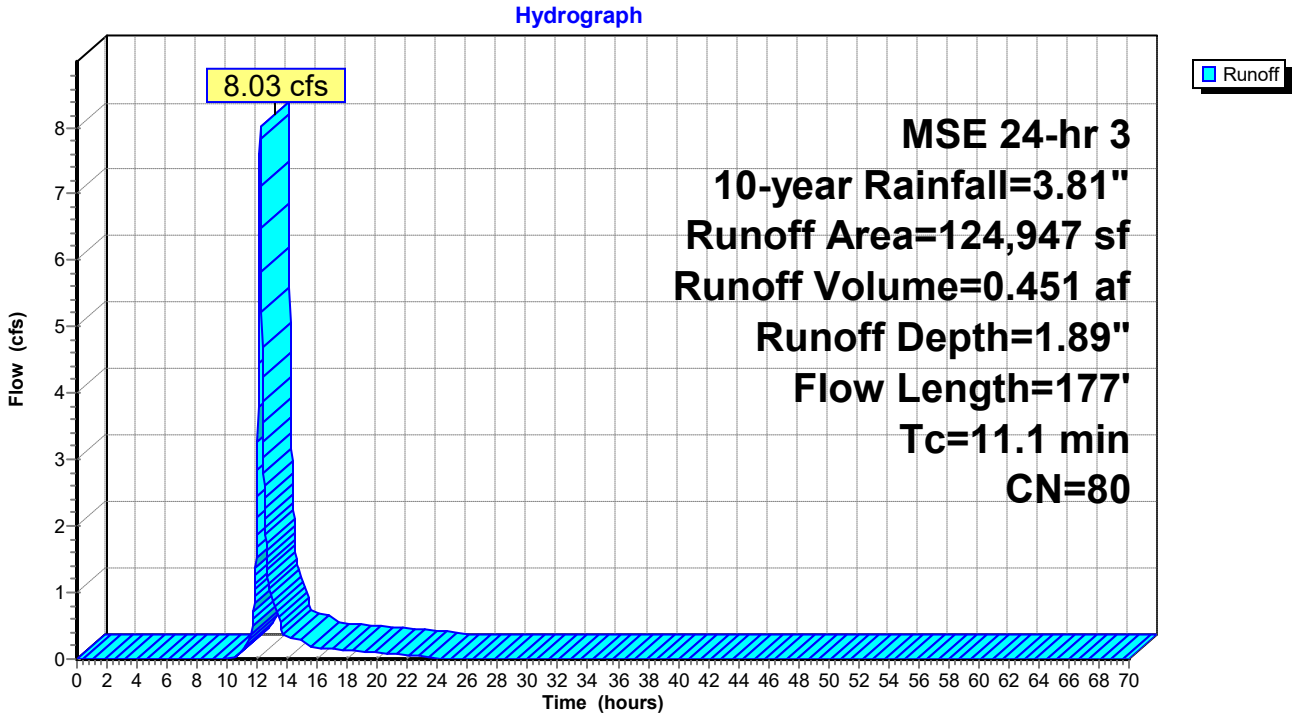
Runoff = 8.03 cfs @ 12.19 hrs, Volume= 0.451 af, Depth= 1.89"
Routed to Reach 2R : Existing Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 10-year Rainfall=3.81"

Area (sf)	CN	Description
124,947	80	>75% Grass cover, Good, HSG D
124,947		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.0534	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.6	77	0.0995	2.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	177	Total			

Subcatchment 1S: E-1



Summary for Subcatchment 11S: O-1

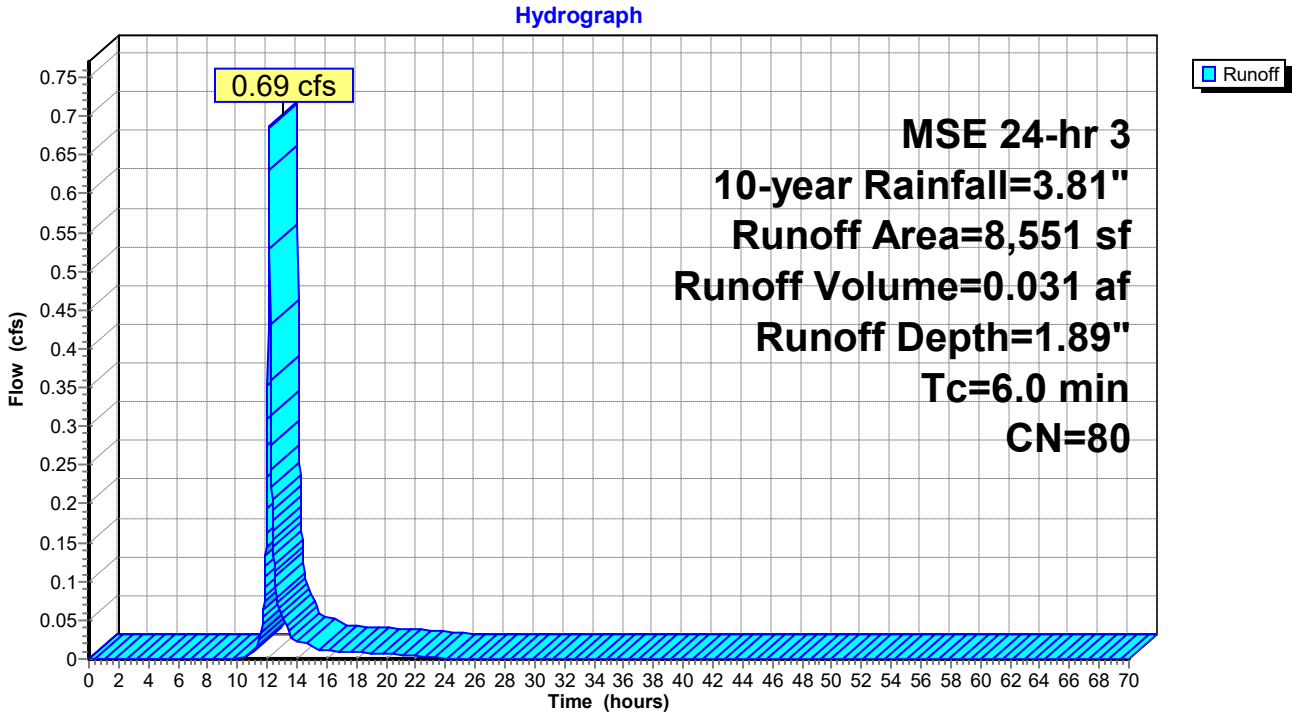
Runoff = 0.69 cfs @ 12.13 hrs, Volume= 0.031 af, Depth= 1.89"
Routed to Reach 2R : Existing Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 10-year Rainfall=3.81"

Area (sf)	CN	Description
8,551	80	>75% Grass cover, Good, HSG D
8,551		100.00% Pervious Area

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

Subcatchment 11S: O-1



Summary for Subcatchment 21S: O-2

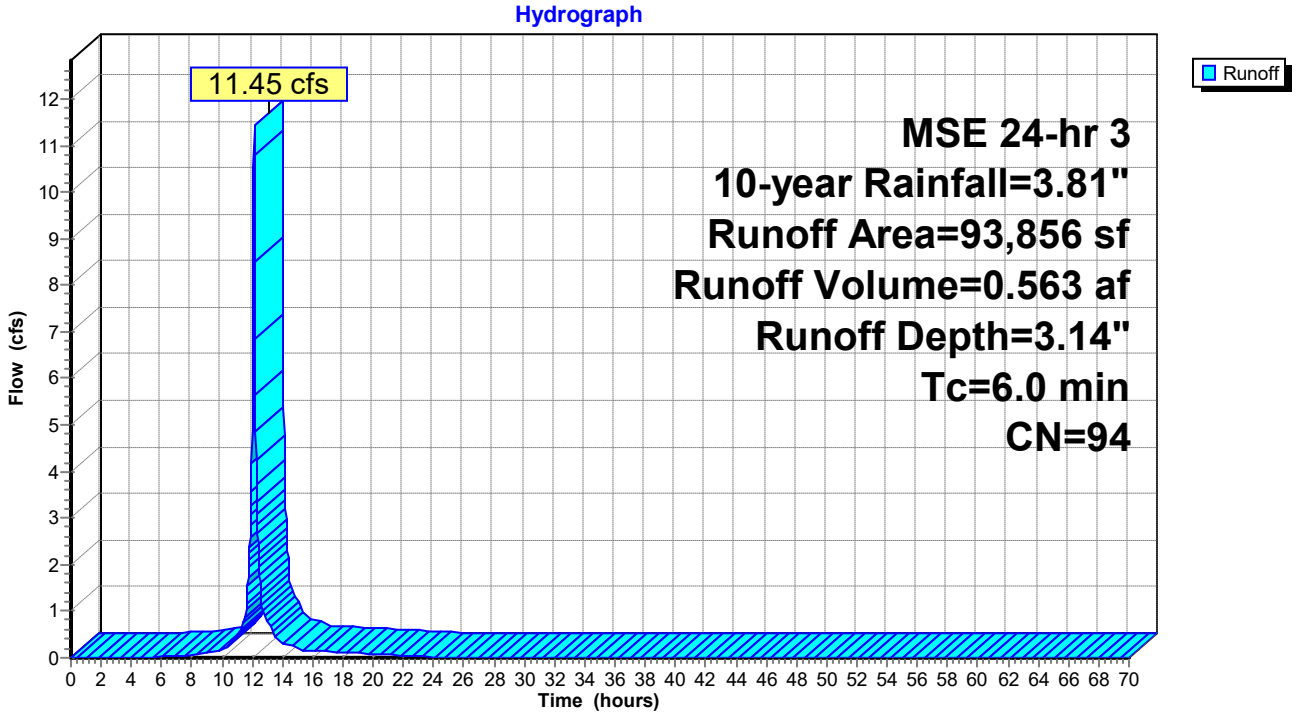
Runoff = 11.45 cfs @ 12.13 hrs, Volume= 0.563 af, Depth= 3.14"
Routed to Pond 23P : Existing North Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 10-year Rainfall=3.81"

	Area (sf)	CN	Description
*	68,882	98	impervious
	5,684	98	Water Surface, HSG D
	19,290	80	>75% Grass cover, Good, HSG D
	93,856	94	Weighted Average
	19,290		20.55% Pervious Area
	74,566		79.45% Impervious Area

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

Subcatchment 21S: O-2

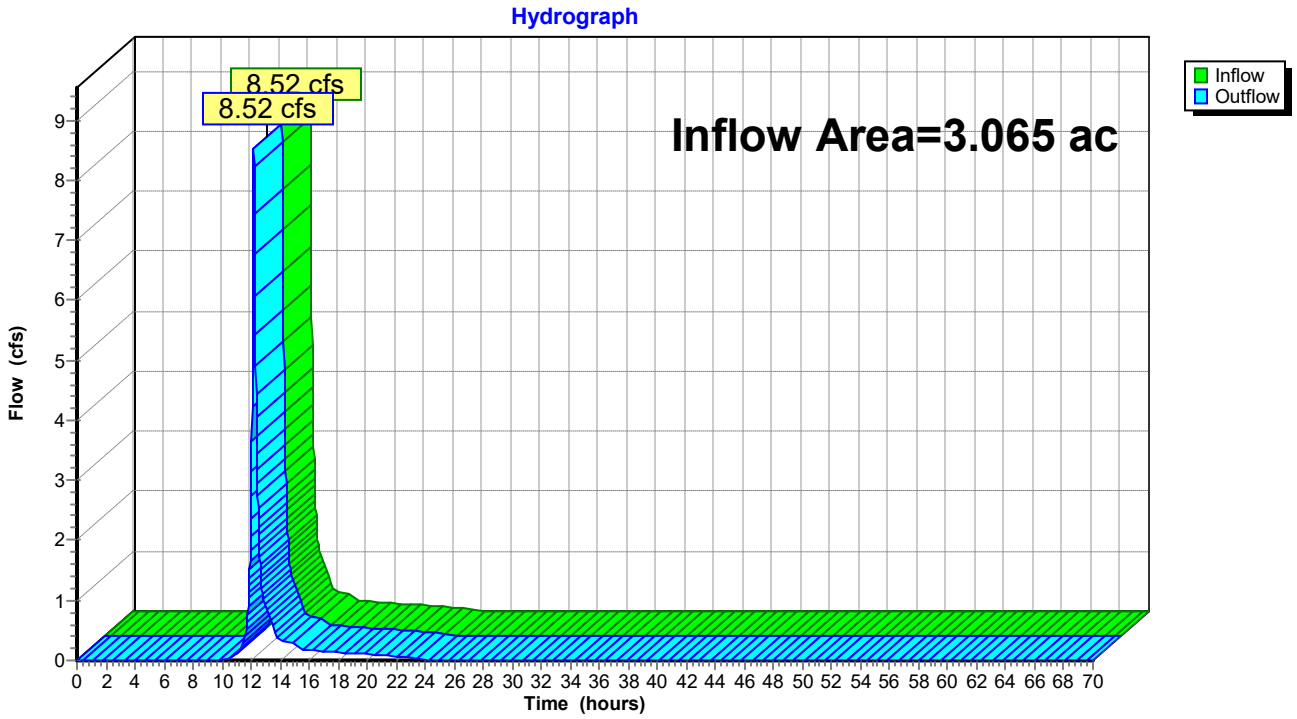


Summary for Reach 2R: Existing Outfall

Inflow Area = 3.065 ac, 0.00% Impervious, Inflow Depth = 1.89" for 10-year event
Inflow = 8.52 cfs @ 12.19 hrs, Volume= 0.482 af
Outflow = 8.52 cfs @ 12.19 hrs, Volume= 0.482 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs

Reach 2R: Existing Outfall

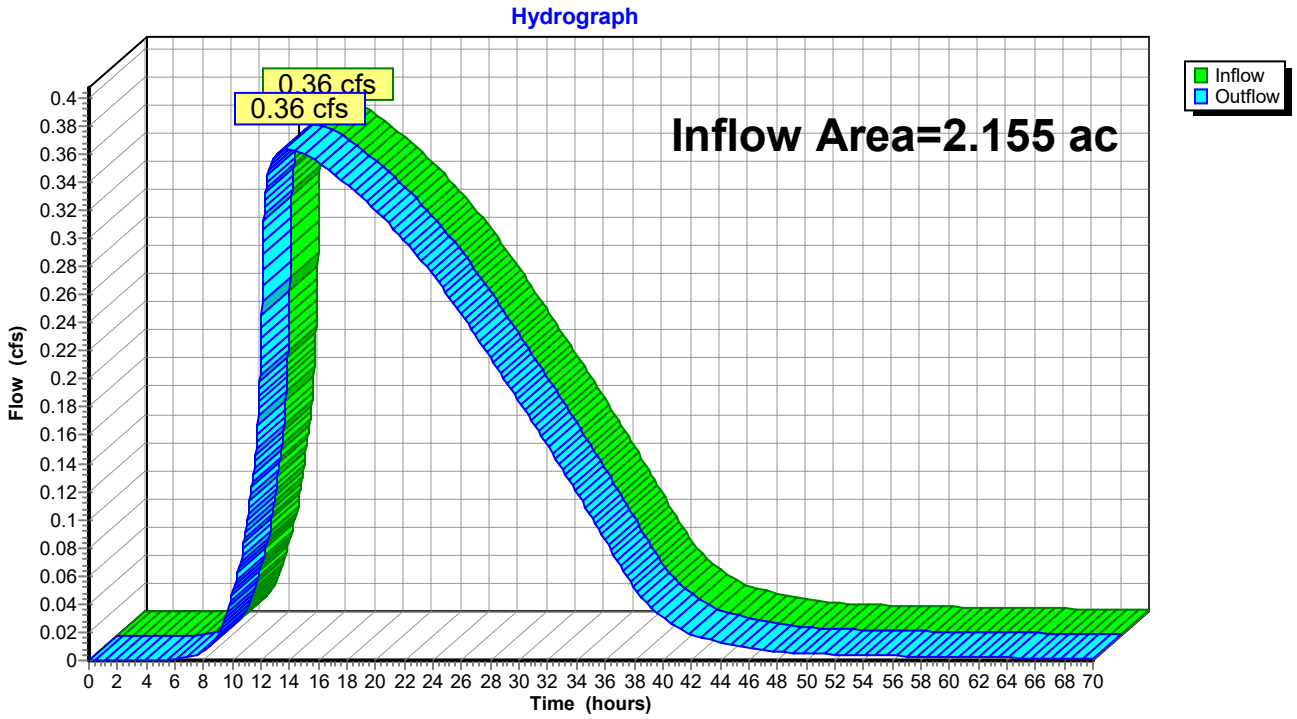


Summary for Reach 22R: Existing Storm Sewer

Inflow Area = 2.155 ac, 79.45% Impervious, Inflow Depth > 3.13" for 10-year event
Inflow = 0.36 cfs @ 13.60 hrs, Volume= 0.562 af
Outflow = 0.36 cfs @ 13.60 hrs, Volume= 0.562 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs

Reach 22R: Existing Storm Sewer



Summary for Pond 23P: Existing North Pond

Inflow Area = 2.155 ac, 79.45% Impervious, Inflow Depth = 3.14" for 10-year event
Inflow = 11.45 cfs @ 12.13 hrs, Volume= 0.563 af
Outflow = 0.36 cfs @ 13.60 hrs, Volume= 0.562 af, Atten= 97%, Lag= 88.5 min
Primary = 0.36 cfs @ 13.60 hrs, Volume= 0.562 af
Routed to Reach 22R : Existing Storm Sewer
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 2R : Existing Outfall

Routing by Stor-Ind method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
Peak Elev= 81.49' @ 13.60 hrs Surf.Area= 0.186 ac Storage= 0.393 af

Plug-Flow detention time= 583.0 min calculated for 0.562 af (100% of inflow)
Center-of-Mass det. time= 581.7 min (1,352.6 - 770.9)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	0.940 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

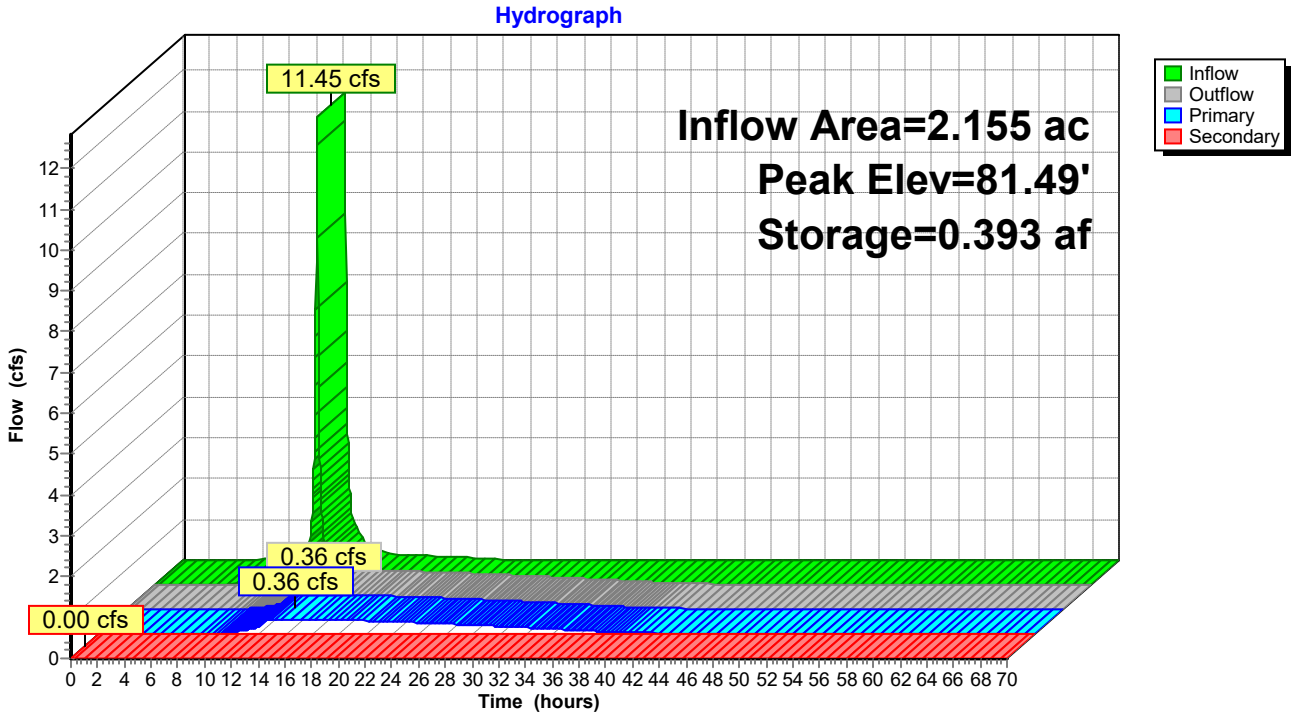
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
79.00	0.131	0.000	0.000
80.00	0.152	0.141	0.141
81.00	0.174	0.163	0.304
82.00	0.198	0.186	0.490
83.00	0.224	0.211	0.701
84.00	0.252	0.238	0.940

Device	Routing	Invert	Outlet Devices
#1	Primary	79.00'	**8.0" Round Culvert** L= 15.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 79.00' / 78.48' S= 0.0347 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.35 sf
#2	Device 1	79.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	83.00'	**10.0' long + 3.0 '/' SideZ x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.36 cfs @ 13.60 hrs HW=81.49' (Free Discharge)
└**1=Culvert** (Passes 0.36 cfs of 3.09 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 0.36 cfs @ 7.40 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=79.00' (Free Discharge)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 23P: Existing North Pond



Time span=0.00-70.00 hrs, dt=0.02 hrs, 3501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: E-1 Runoff Area=124,947 sf 0.00% Impervious Runoff Depth=3.94"
Flow Length=177' Tc=11.1 min CN=80 Runoff=16.59 cfs 0.943 af

Subcatchment 11S: O-1 Runoff Area=8,551 sf 0.00% Impervious Runoff Depth=3.94"
Tc=6.0 min CN=80 Runoff=1.41 cfs 0.065 af

Subcatchment 21S: O-2 Runoff Area=93,856 sf 79.45% Impervious Runoff Depth=5.47"
Tc=6.0 min CN=94 Runoff=19.28 cfs 0.983 af

Reach 2R: Existing Outfall Inflow=17.61 cfs 1.014 af
Outflow=17.61 cfs 1.014 af

Reach 22R: Existing Storm Sewer Inflow=0.47 cfs 0.973 af
Outflow=0.47 cfs 0.973 af

Pond 23P: Existing North Pond Peak Elev=83.02' Storage=0.706 af Inflow=19.28 cfs 0.983 af
Primary=0.47 cfs 0.973 af Secondary=0.11 cfs 0.007 af Outflow=0.57 cfs 0.980 af

Total Runoff Area = 5.219 ac Runoff Volume = 1.990 af Average Runoff Depth = 4.58"
67.20% Pervious = 3.508 ac 32.80% Impervious = 1.712 ac

Summary for Subcatchment 1S: E-1

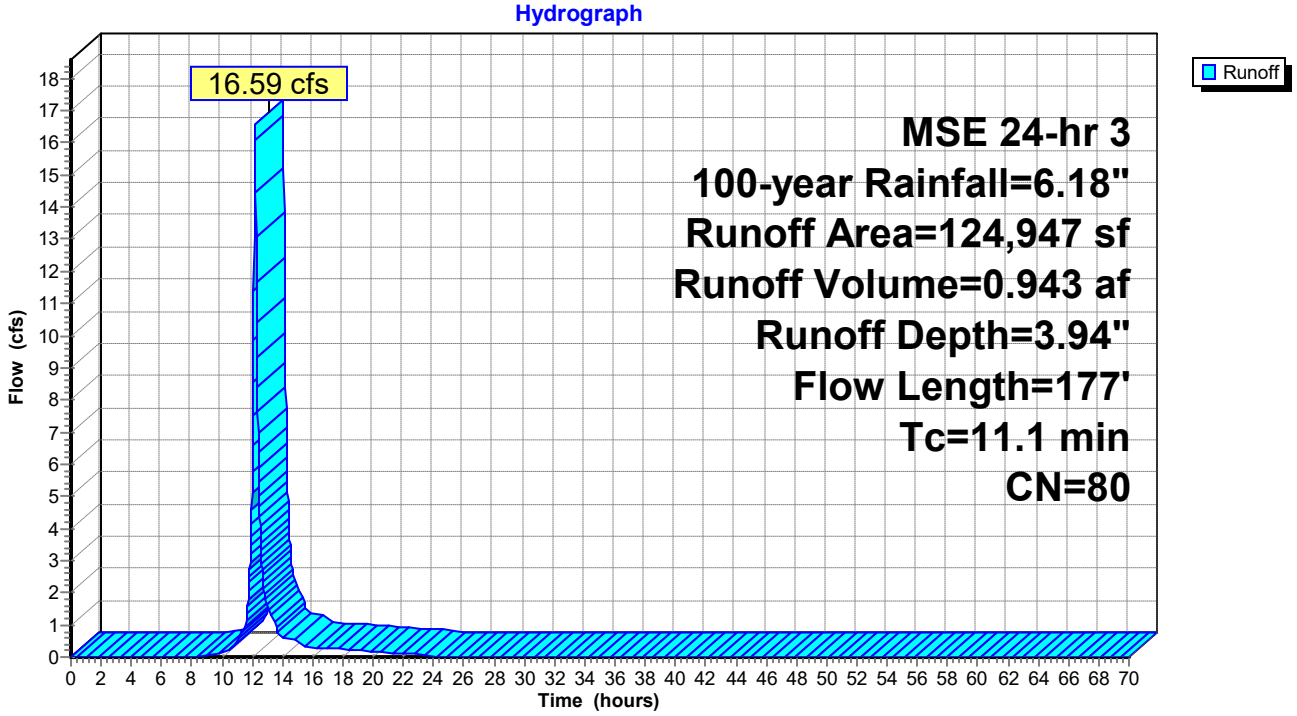
Runoff = 16.59 cfs @ 12.19 hrs, Volume= 0.943 af, Depth= 3.94"
Routed to Reach 2R : Existing Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 100-year Rainfall=6.18"

Area (sf)	CN	Description
124,947	80	>75% Grass cover, Good, HSG D
124,947		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.0534	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
0.6	77	0.0995	2.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	177	Total			

Subcatchment 1S: E-1



Summary for Subcatchment 11S: O-1

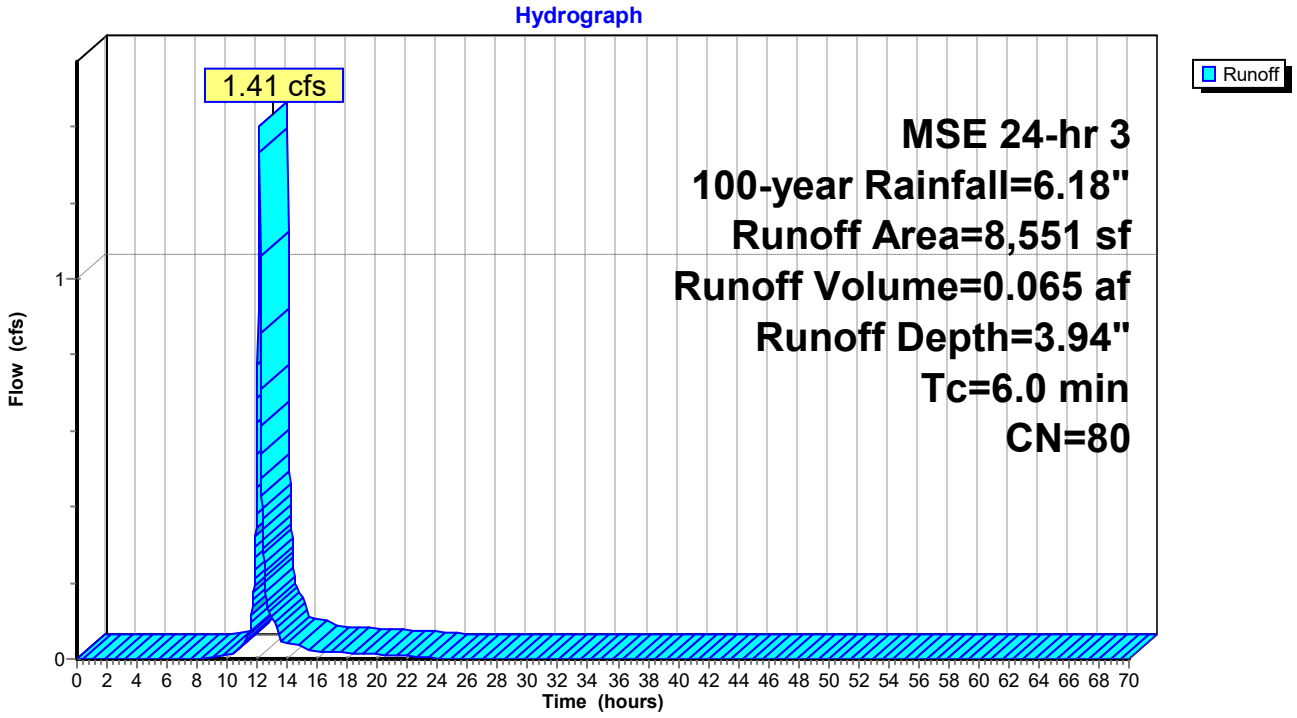
Runoff = 1.41 cfs @ 12.13 hrs, Volume= 0.065 af, Depth= 3.94"
Routed to Reach 2R : Existing Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 100-year Rainfall=6.18"

Area (sf)	CN	Description
8,551	80	>75% Grass cover, Good, HSG D
8,551		100.00% Pervious Area

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

Subcatchment 11S: O-1



Summary for Subcatchment 21S: O-2

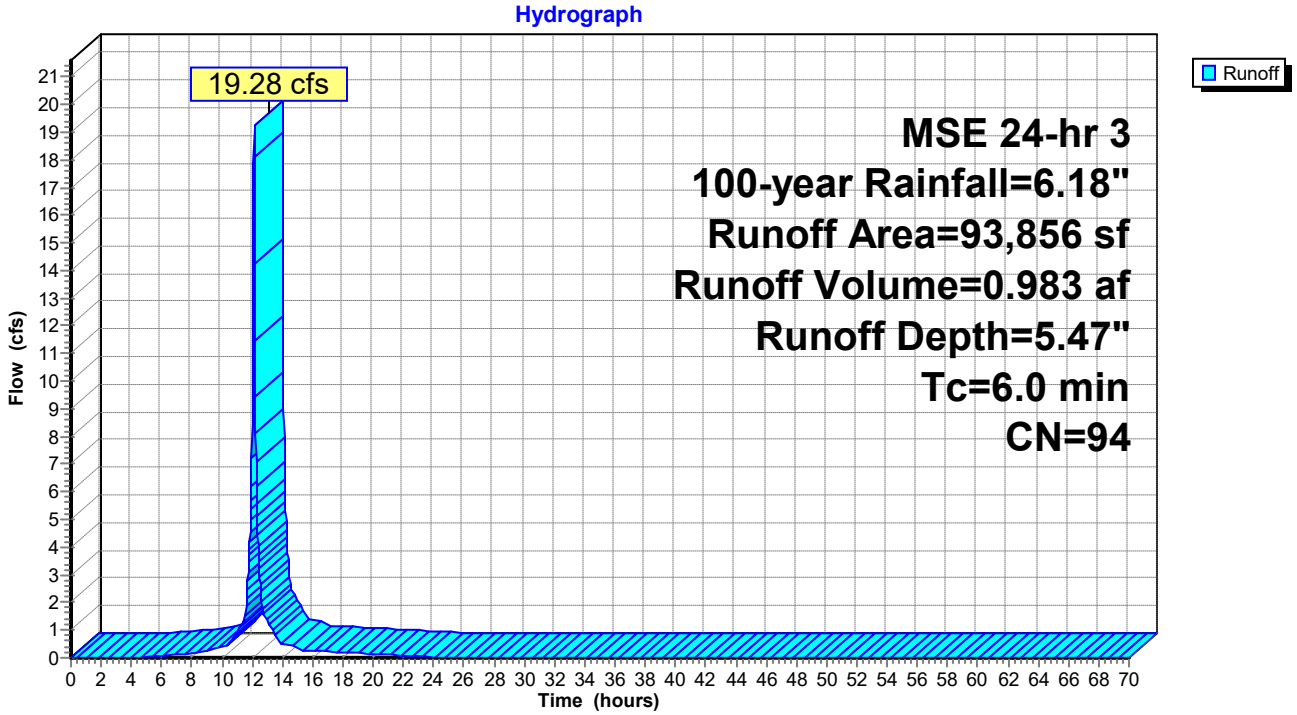
Runoff = 19.28 cfs @ 12.13 hrs, Volume= 0.983 af, Depth= 5.47"
Routed to Pond 23P : Existing North Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 100-year Rainfall=6.18"

	Area (sf)	CN	Description
*	68,882	98	impervious
	5,684	98	Water Surface, HSG D
	19,290	80	>75% Grass cover, Good, HSG D
	93,856	94	Weighted Average
	19,290		20.55% Pervious Area
	74,566		79.45% Impervious Area

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

Subcatchment 21S: O-2

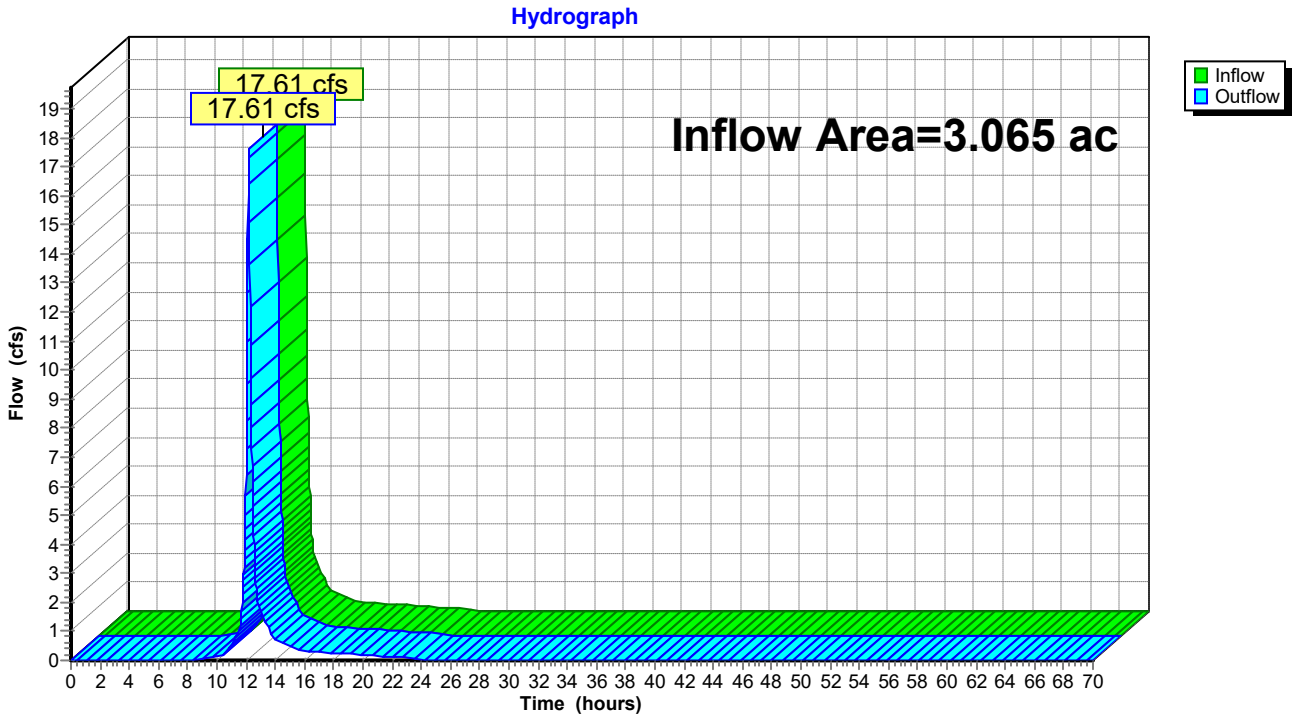


Summary for Reach 2R: Existing Outfall

Inflow Area = 3.065 ac, 0.00% Impervious, Inflow Depth = 3.97" for 100-year event
Inflow = 17.61 cfs @ 12.18 hrs, Volume= 1.014 af
Outflow = 17.61 cfs @ 12.18 hrs, Volume= 1.014 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs

Reach 2R: Existing Outfall

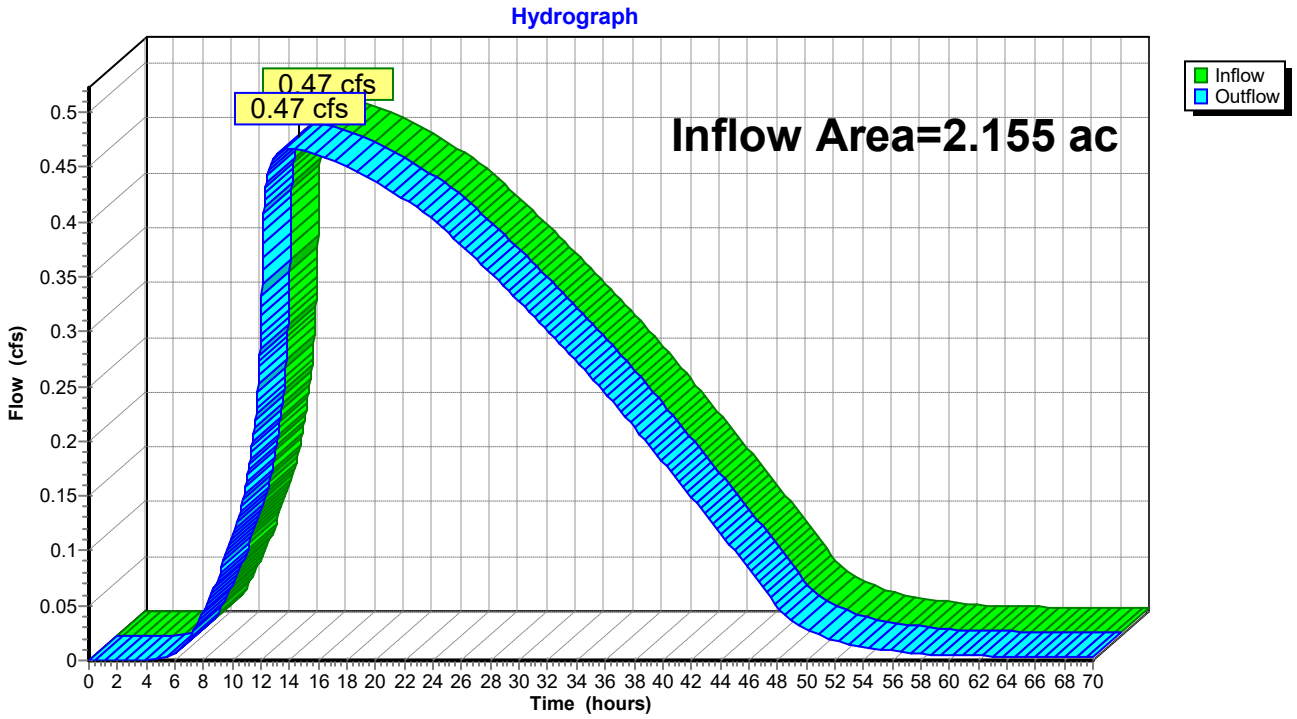


Summary for Reach 22R: Existing Storm Sewer

Inflow Area = 2.155 ac, 79.45% Impervious, Inflow Depth > 5.42" for 100-year event
Inflow = 0.47 cfs @ 13.62 hrs, Volume= 0.973 af
Outflow = 0.47 cfs @ 13.62 hrs, Volume= 0.973 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs

Reach 22R: Existing Storm Sewer



Summary for Pond 23P: Existing North Pond

Inflow Area = 2.155 ac, 79.45% Impervious, Inflow Depth = 5.47" for 100-year event
Inflow = 19.28 cfs @ 12.13 hrs, Volume= 0.983 af
Outflow = 0.57 cfs @ 13.62 hrs, Volume= 0.980 af, Atten= 97%, Lag= 89.4 min
Primary = 0.47 cfs @ 13.62 hrs, Volume= 0.973 af
Routed to Reach 22R : Existing Storm Sewer
Secondary = 0.11 cfs @ 13.62 hrs, Volume= 0.007 af
Routed to Reach 2R : Existing Outfall

Routing by Stor-Ind method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
Peak Elev= 83.02' @ 13.62 hrs Surf.Area= 0.225 ac Storage= 0.706 af

Plug-Flow detention time= 768.4 min calculated for 0.980 af (100% of inflow)
Center-of-Mass det. time= 766.9 min (1,527.5 - 760.6)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	0.940 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
79.00	0.131	0.000	0.000
80.00	0.152	0.141	0.141
81.00	0.174	0.163	0.304
82.00	0.198	0.186	0.490
83.00	0.224	0.211	0.701
84.00	0.252	0.238	0.940

Device	Routing	Invert	Outlet Devices
#1	Primary	79.00'	**8.0" Round Culvert** L= 15.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 79.00' / 78.48' S= 0.0347 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.35 sf
#2	Device 1	79.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	83.00'	**10.0' long + 3.0 '/' SideZ x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.47 cfs @ 13.62 hrs HW=83.02' (Free Discharge)
1=Culvert (Passes 0.47 cfs of 4.01 cfs potential flow)
2=Orifice/Grate (Orifice Controls 0.47 cfs @ 9.50 fps)

Secondary OutFlow Max=0.07 cfs @ 13.62 hrs HW=83.02' (Free Discharge)
3=Broad-Crested Rectangular Weir (Weir Controls 0.07 cfs @ 0.34 fps)

Pond 23P: Existing North Pond

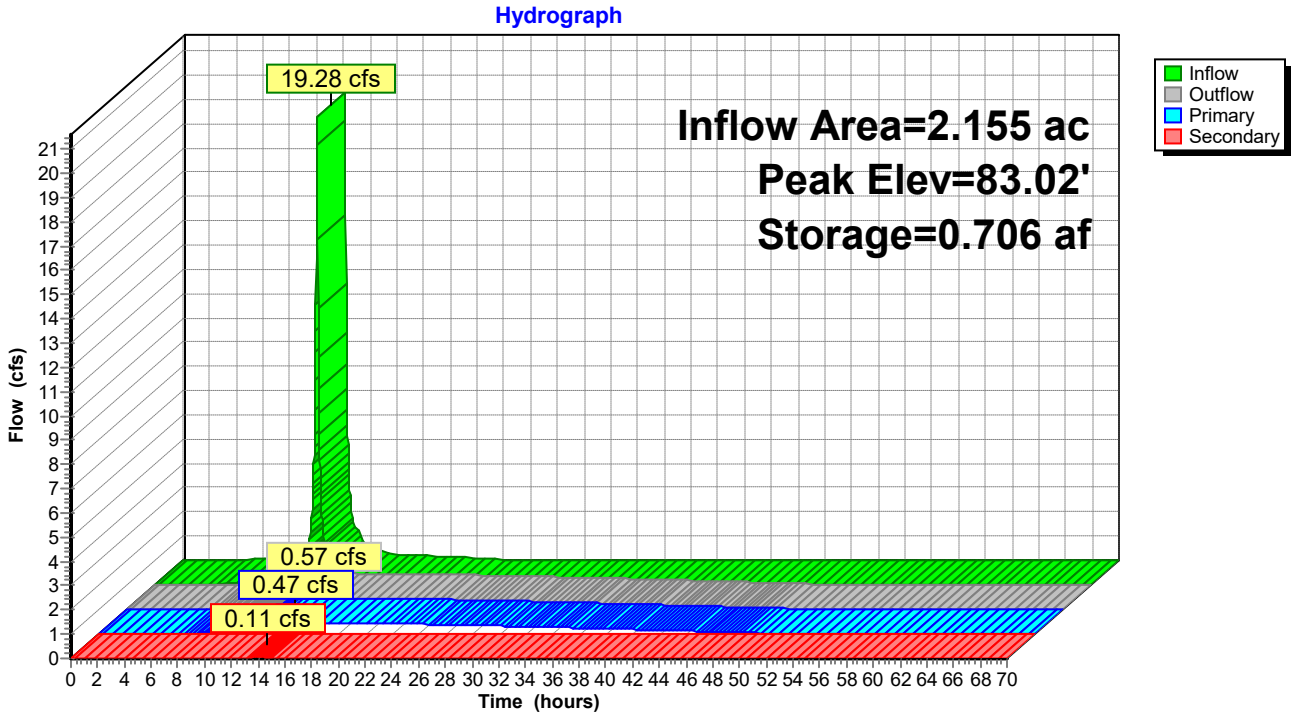


TABLE OF CONTENTS

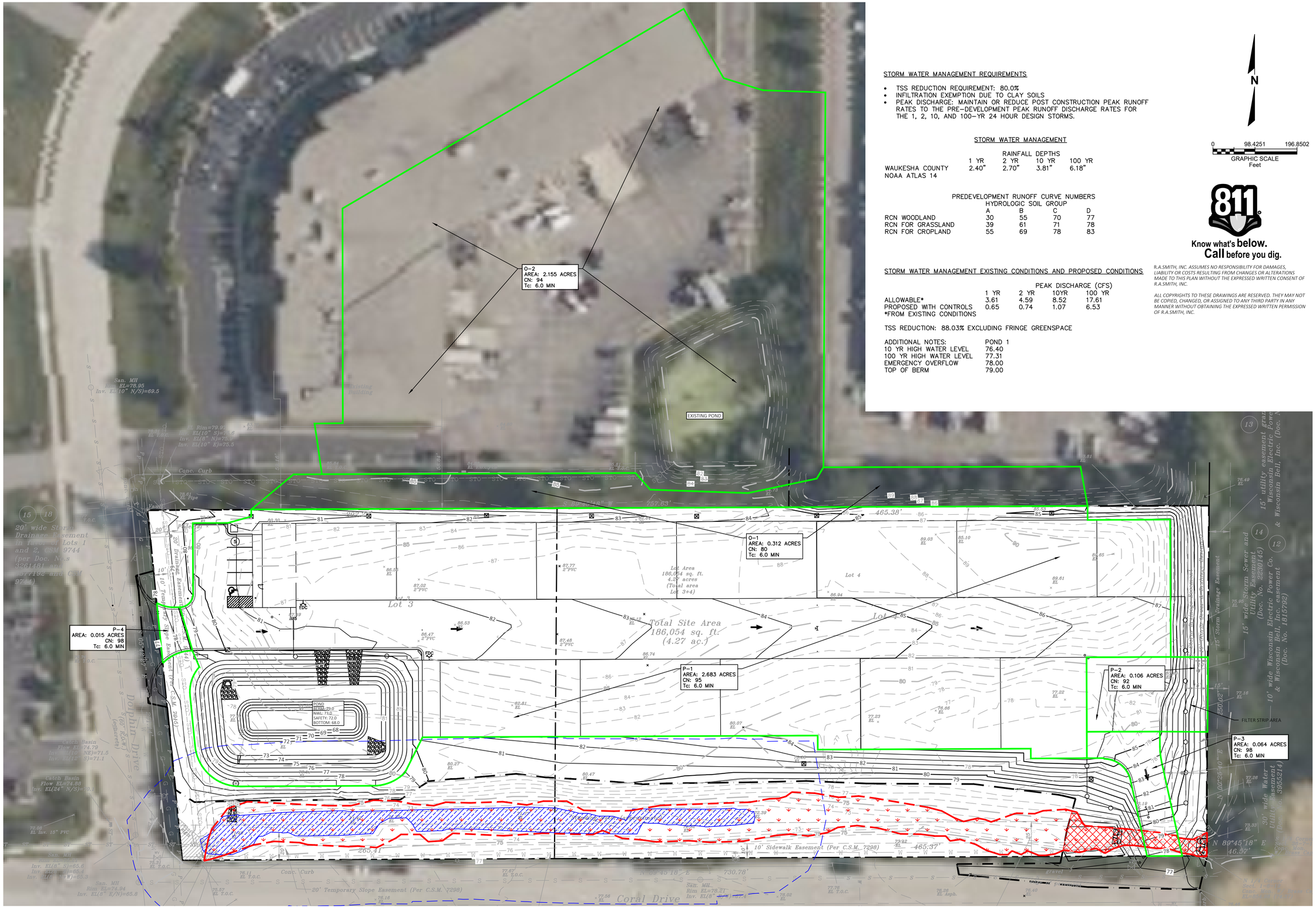
Project Reports
1 Routing Diagram
2 Rainfall Events Listing
3 Area Listing (selected nodes)
4 Soil Listing (selected nodes)
5 Ground Covers (selected nodes)

1-year Event
6 Node Listing
7 Subcat 1S: E-1
8 Subcat 11S: O-1
9 Subcat 21S: O-2
10 Reach 2R: Existing Outfall
11 Reach 22R: Existing Storm Sewer
12 Pond 23P: Existing North Pond

2-year Event
14 Node Listing
15 Subcat 1S: E-1
16 Subcat 11S: O-1
17 Subcat 21S: O-2
18 Reach 2R: Existing Outfall
19 Reach 22R: Existing Storm Sewer
20 Pond 23P: Existing North Pond

10-year Event
22 Node Listing
23 Subcat 1S: E-1
24 Subcat 11S: O-1
25 Subcat 21S: O-2
26 Reach 2R: Existing Outfall
27 Reach 22R: Existing Storm Sewer
28 Pond 23P: Existing North Pond

100-year Event
30 Node Listing
31 Subcat 1S: E-1
32 Subcat 11S: O-1
33 Subcat 21S: O-2
34 Reach 2R: Existing Outfall
35 Reach 22R: Existing Storm Sewer
36 Pond 23P: Existing North Pond



STORM WATER MANAGEMENT REQUIREMENTS

- TSS REDUCTION REQUIREMENT: 80.0%
- INFILTRATION EXEMPTION DUE TO CLAY SOILS
- PEAK DISCHARGE: MAINTAIN OR REDUCE POST CONSTRUCTION PEAK RUNOFF RATES TO THE PRE-DEVELOPMENT PEAK RUNOFF DISCHARGE RATES FOR THE 1, 2, 10, AND 100-YR 24 HOUR DESIGN STORMS.

STORM WATER MANAGEMENT

	RAINFALL DEPTHS			
	1 YR	2 YR	10 YR	100 YR
WAUKESHA COUNTY NOAA ATLAS 14	2.40"	2.70"	3.81"	6.18"

PREDEVELOPMENT RUNOFF CURVE NUMBERS

	HYDROLOGIC SOIL GROUP			
	A	B	C	D
RCN WOODLAND	30	55	70	77
RCN FOR GRASSLAND	39	61	71	78
RCN FOR CROPLAND	55	69	78	83

STORM WATER MANAGEMENT EXISTING CONDITIONS AND PROPOSED CONDITIONS

	PEAK DISCHARGE (CFS)			
	1 YR	2 YR	10YR	100 YR
ALLOWABLE*	3.61	4.59	8.52	17.61
PROPOSED WITH CONTROLS	0.65	0.74	1.07	6.53
*FROM EXISTING CONDITIONS				

TSS REDUCTION: 88.03% EXCLUDING FRINGE GREENSPACE

ADDITIONAL NOTES:	POND 1
10 YR HIGH WATER LEVEL	76.40
100 YR HIGH WATER LEVEL	77.31
EMERGENCY OVERFLOW	78.00
TOP OF BERM	79.00

N

0 98.4251 196.8502
GRAPHIC SCALE
Feet

Know what's **below.**
Call before you dig.

R.A.SMITH, INC. ASSUMES NO RESPONSIBILITY FOR DAMAGES, LIABILITY OR COSTS RESULTING FROM CHANGES OR ALTERATIONS MADE TO THIS PLAN WITHOUT THE EXPRESSED WRITTEN CONSENT OF R.A.SMITH, INC.

ALL COPYRIGHTS TO THESE DRAWINGS ARE RESERVED. THEY MAY NOT BE COPIED, CHANGED, OR ASSIGNED TO ANY THIRD PARTY IN ANY MANNER WITHOUT OBTAINING THE EXPRESSED WRITTEN PERMISSION OF R.A.SMITH, INC.

DESCRIPTION	DATE

raSmith
CREATIVITY BEYOND ENGINEERING
16745 W. Bluemound Road
Brookfield, WI 53005-5938
(262) 781-1000
rasmith.com
Brookfield, WI | Appleton, WI | Madison, WI
Cedarburg, WI | Naperville, IL | Irvine, CA

STOR-IT RIGHT WAUKESHA
CITY OF WAUKESHA

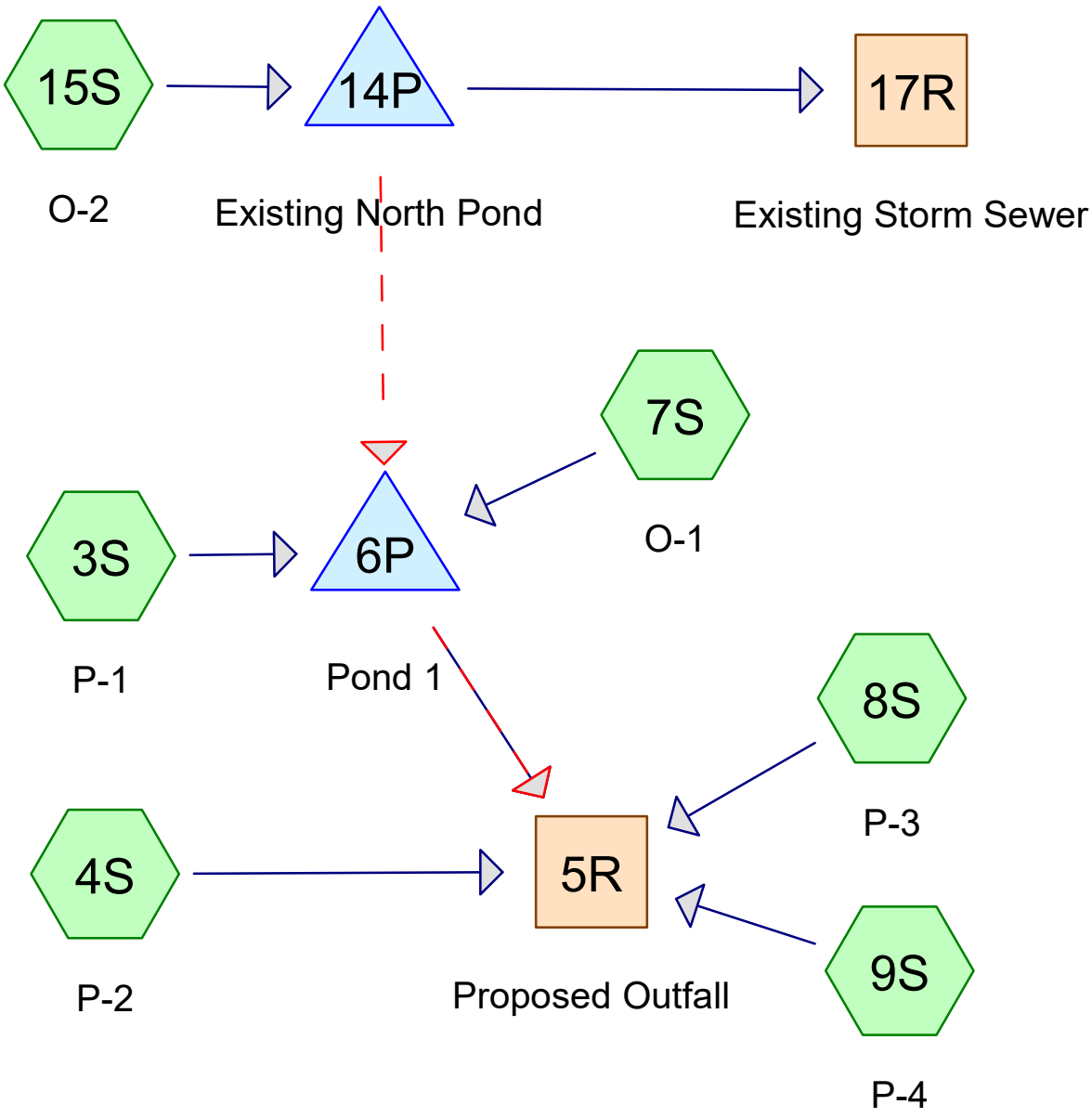
PROPOSED HYDROLOGY EXHIBIT

© COPYRIGHT 2026
R.A. Smith, Inc.

DATE: 06/23/2026
SCALE: 1" = 30'
JOB NO. 3250218
PROJECT MANAGER: CHRISTOPHER WHITE, P.E.
DESIGNED BY: MAF
CHECKED BY: CBW

SHEET NUMBER
HX-02

P:\3250218\Dwg\Exhibits\3250218-HX02.dwg, PROPOSED HYDROLOGY EXHIBIT, 6/23/2026 1:27:29 PM, mcf2



Subcat Reach Pond Link

Routing Diagram for 3250218 Waukesha STOR-IT Right
Prepared by RA Smith, Printed 6/23/2026
HydroCAD® 10.20-8a s/n 02878 © 2025 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-year	MSE 24-hr	3	Default	24.00	1	2.40	2
2	2-year	MSE 24-hr	3	Default	24.00	1	2.70	2
3	10-year	MSE 24-hr	3	Default	24.00	1	3.81	2
4	100-year	MSE 24-hr	3	Default	24.00	1	6.18	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.283	80	>75% Grass cover, Good, HSG D (3S, 4S, 7S, 15S)
0.259	98	Water Surface, HSG D (3S, 15S)
1.661	98	impervious (8S, 9S, 15S)
2.132	98	impervious area (3S, 4S)
5.335	**94**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
1.542	HSG D	3S, 4S, 7S, 15S
3.793	Other	3S, 4S, 8S, 9S, 15S
5.335		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	1.283	0.000	1.283	>75% Grass cover, Good	3S, 4S, 7S, 15S
0.000	0.000	0.000	0.259	0.000	0.259	Water Surface	3S, 15S
0.000	0.000	0.000	0.000	1.661	1.661	impervious	8S, 9S, 15S
0.000	0.000	0.000	0.000	2.132	2.132	impervious area	3S, 4S
0.000	**0.000**	**0.000**	**1.542**	**3.793**	**5.335**	**TOTAL AREA**	

Time span=0.00-70.00 hrs, dt=0.02 hrs, 3501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 3S: P-1 Runoff Area=116,887 sf 81.69% Impervious Runoff Depth=1.87"
Tc=6.0 min CN=95 Runoff=8.67 cfs 0.417 af

Subcatchment 4S: P-2 Runoff Area=4,600 sf 64.89% Impervious Runoff Depth=1.60"
Tc=6.0 min CN=92 Runoff=0.30 cfs 0.014 af

Subcatchment 7S: O-1 Runoff Area=13,580 sf 0.00% Impervious Runoff Depth=0.82"
Tc=6.0 min CN=80 Runoff=0.47 cfs 0.021 af

Subcatchment 8S: P-3 Runoff Area=2,794 sf 100.00% Impervious Runoff Depth=2.17"
Tc=6.0 min CN=98 Runoff=0.22 cfs 0.012 af

Subcatchment 9S: P-4 Runoff Area=664 sf 100.00% Impervious Runoff Depth=2.17"
Tc=6.0 min CN=98 Runoff=0.05 cfs 0.003 af

Subcatchment 15S: O-2 Runoff Area=93,856 sf 79.45% Impervious Runoff Depth=1.77"
Tc=6.0 min CN=94 Runoff=6.73 cfs 0.319 af

Reach 5R: Proposed Outfall Inflow=0.65 cfs 0.376 af
Outflow=0.65 cfs 0.376 af

Reach 17R: Existing Storm Sewer Inflow=0.27 cfs 0.318 af
Outflow=0.27 cfs 0.318 af

Pond 6P: Pond 1 Peak Elev=75.33' Storage=0.362 af Inflow=9.16 cfs 0.439 af
Primary=0.09 cfs 0.348 af Secondary=0.00 cfs 0.000 af Outflow=0.09 cfs 0.348 af

Pond 14P: Existing North Pond Peak Elev=80.46' Storage=0.213 af Inflow=6.73 cfs 0.319 af
Primary=0.27 cfs 0.318 af Secondary=0.00 cfs 0.000 af Outflow=0.27 cfs 0.318 af

Total Runoff Area = 5.335 ac Runoff Volume = 0.786 af Average Runoff Depth = 1.77"
24.05% Pervious = 1.283 ac 75.95% Impervious = 4.052 ac

Summary for Subcatchment 3S: P-1

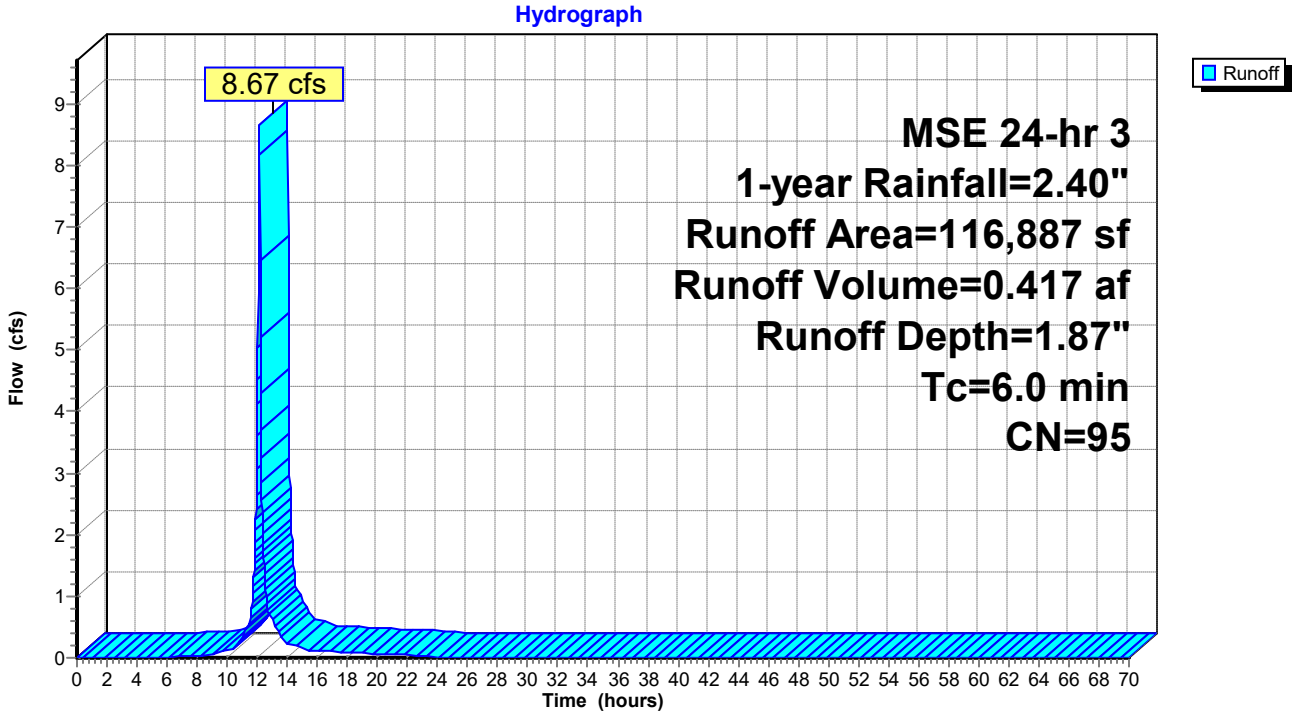
Runoff = 8.67 cfs @ 12.13 hrs, Volume= 0.417 af, Depth= 1.87"
Routed to Pond 6P : Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 1-year Rainfall=2.40"

	Area (sf)	CN	Description
	21,402	80	>75% Grass cover, Good, HSG D
*	89,879	98	impervious area
	5,606	98	Water Surface, HSG D
	116,887	95	Weighted Average
	21,402		18.31% Pervious Area
	95,485		81.69% Impervious Area

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

Subcatchment 3S: P-1



Summary for Subcatchment 4S: P-2

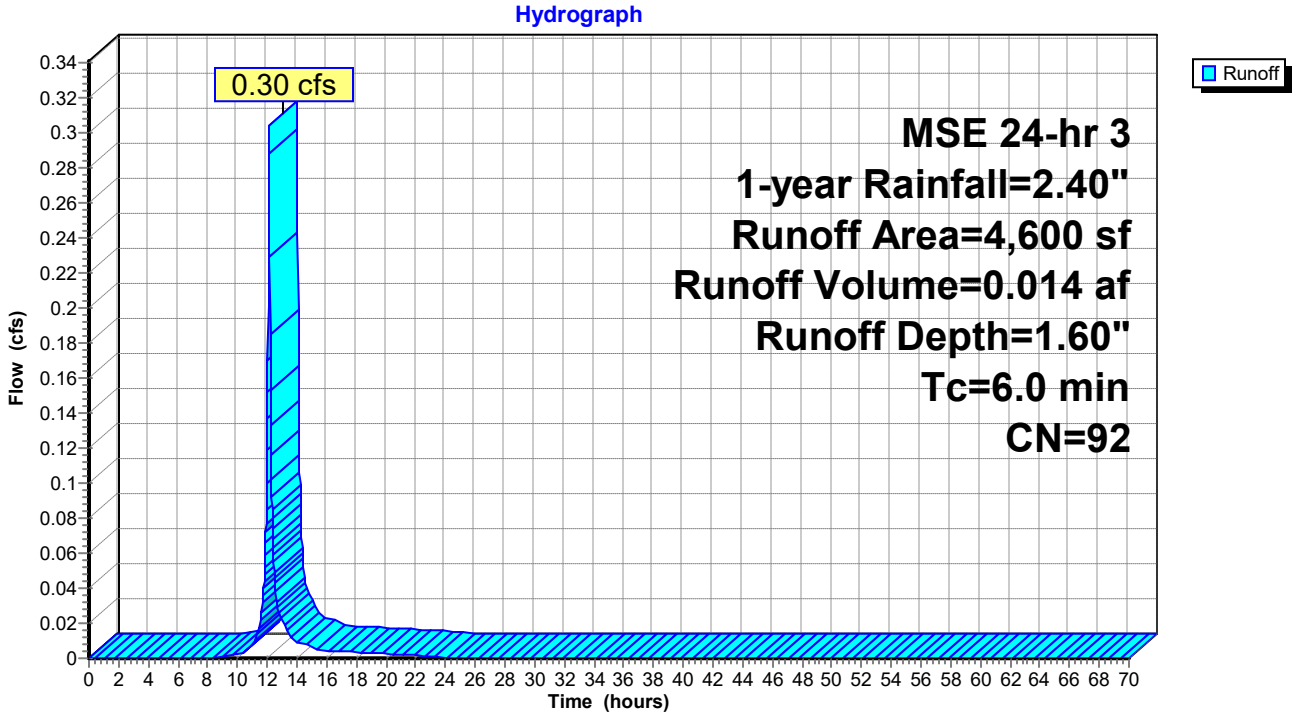
Runoff = 0.30 cfs @ 12.13 hrs, Volume= 0.014 af, Depth= 1.60"
Routed to Reach 5R : Proposed Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 1-year Rainfall=2.40"

	Area (sf)	CN	Description
	1,615	80	>75% Grass cover, Good, HSG D
*	2,985	98	impervious area
	4,600	92	Weighted Average
	1,615		35.11% Pervious Area
	2,985		64.89% Impervious Area

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

Subcatchment 4S: P-2



Summary for Subcatchment 7S: O-1

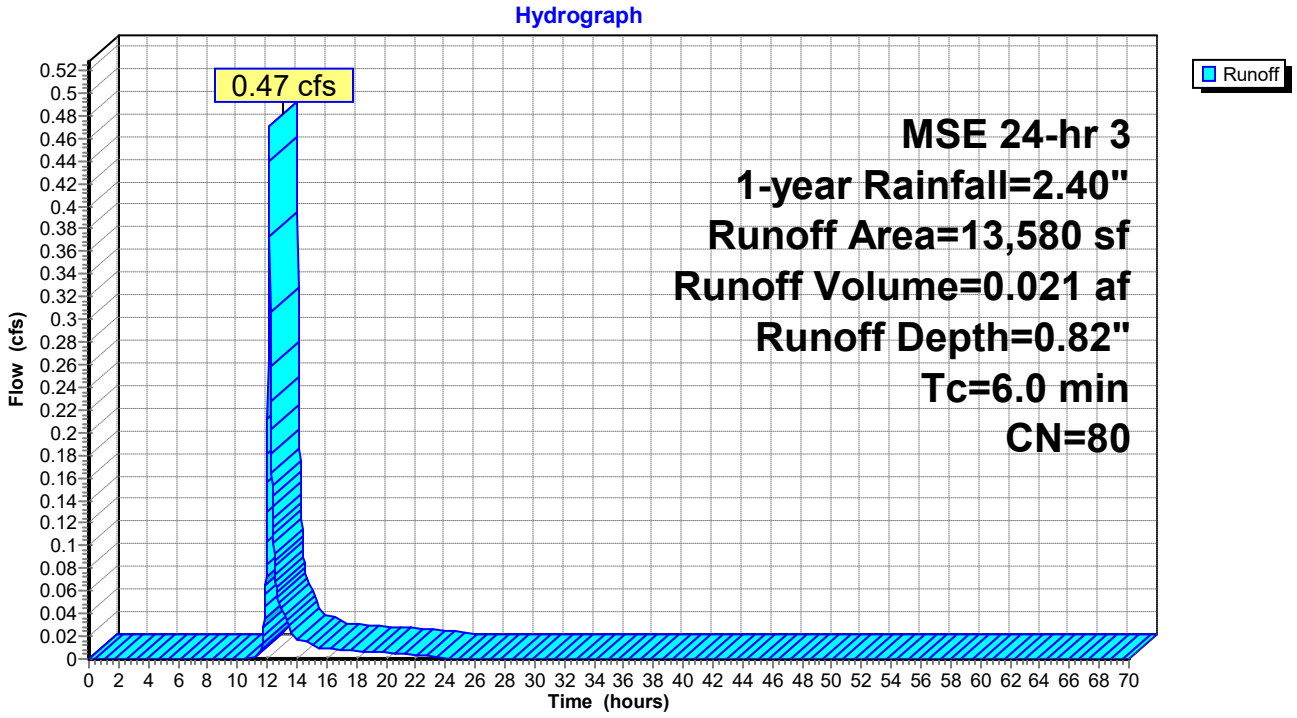
Runoff = 0.47 cfs @ 12.14 hrs, Volume= 0.021 af, Depth= 0.82"
Routed to Pond 6P : Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 1-year Rainfall=2.40"

Area (sf)	CN	Description
13,580	80	>75% Grass cover, Good, HSG D
13,580		100.00% Pervious Area

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

Subcatchment 7S: O-1



Summary for Subcatchment 8S: P-3

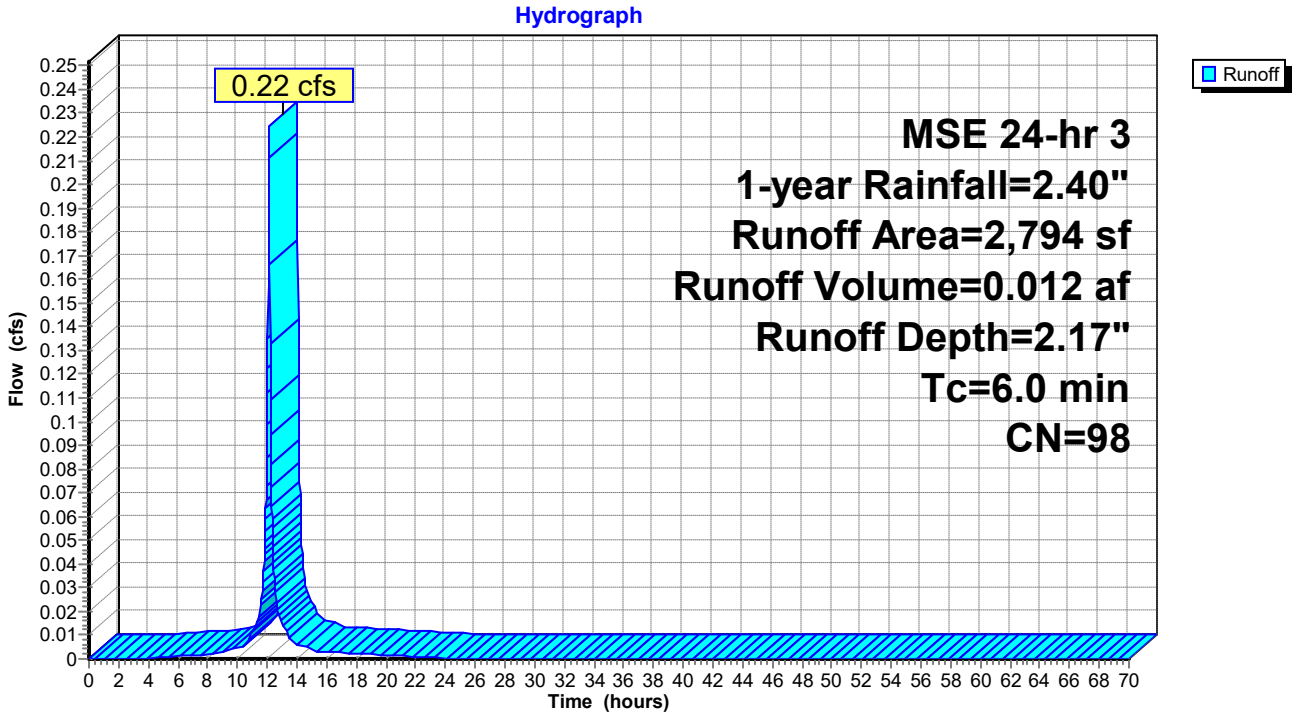
Runoff = 0.22 cfs @ 12.13 hrs, Volume= 0.012 af, Depth= 2.17"
Routed to Reach 5R : Proposed Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 1-year Rainfall=2.40"

	Area (sf)	CN	Description
*	2,794	98	impervious
	2,794		100.00% Impervious Area

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

Subcatchment 8S: P-3



Summary for Subcatchment 9S: P-4

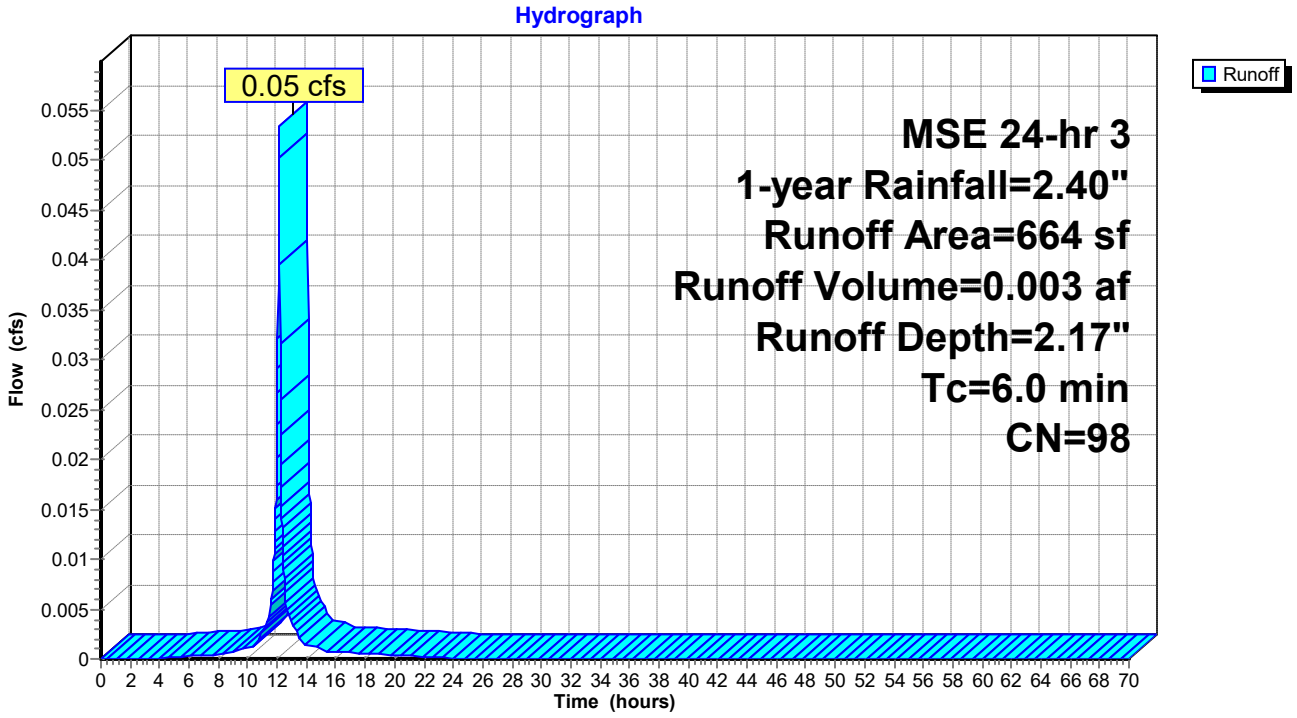
Runoff = 0.05 cfs @ 12.13 hrs, Volume= 0.003 af, Depth= 2.17"
Routed to Reach 5R : Proposed Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 1-year Rainfall=2.40"

	Area (sf)	CN	Description
*	664	98	impervious
	664		100.00% Impervious Area

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

Subcatchment 9S: P-4



Summary for Subcatchment 15S: O-2

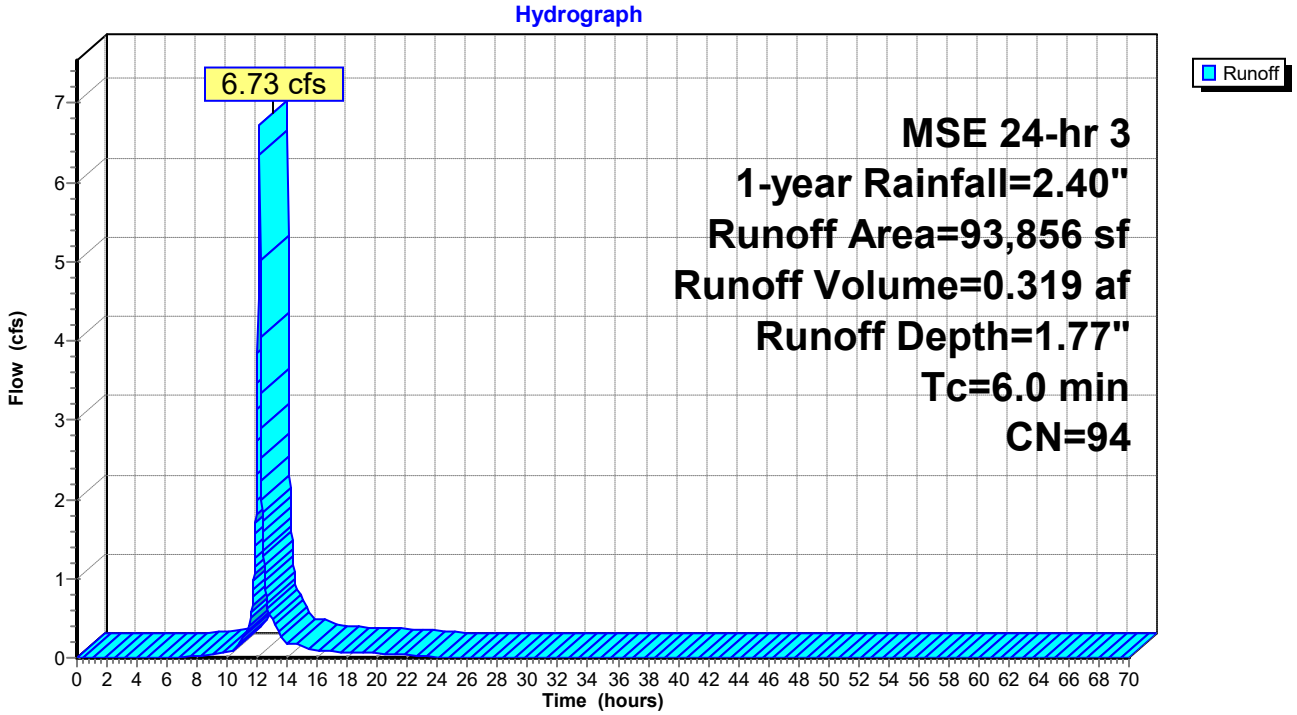
Runoff = 6.73 cfs @ 12.13 hrs, Volume= 0.319 af, Depth= 1.77"
Routed to Pond 14P : Existing North Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 1-year Rainfall=2.40"

	Area (sf)	CN	Description
*	68,882	98	impervious
	5,684	98	Water Surface, HSG D
	19,290	80	>75% Grass cover, Good, HSG D
	93,856	94	Weighted Average
	19,290		20.55% Pervious Area
	74,566		79.45% Impervious Area

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

Subcatchment 15S: O-2

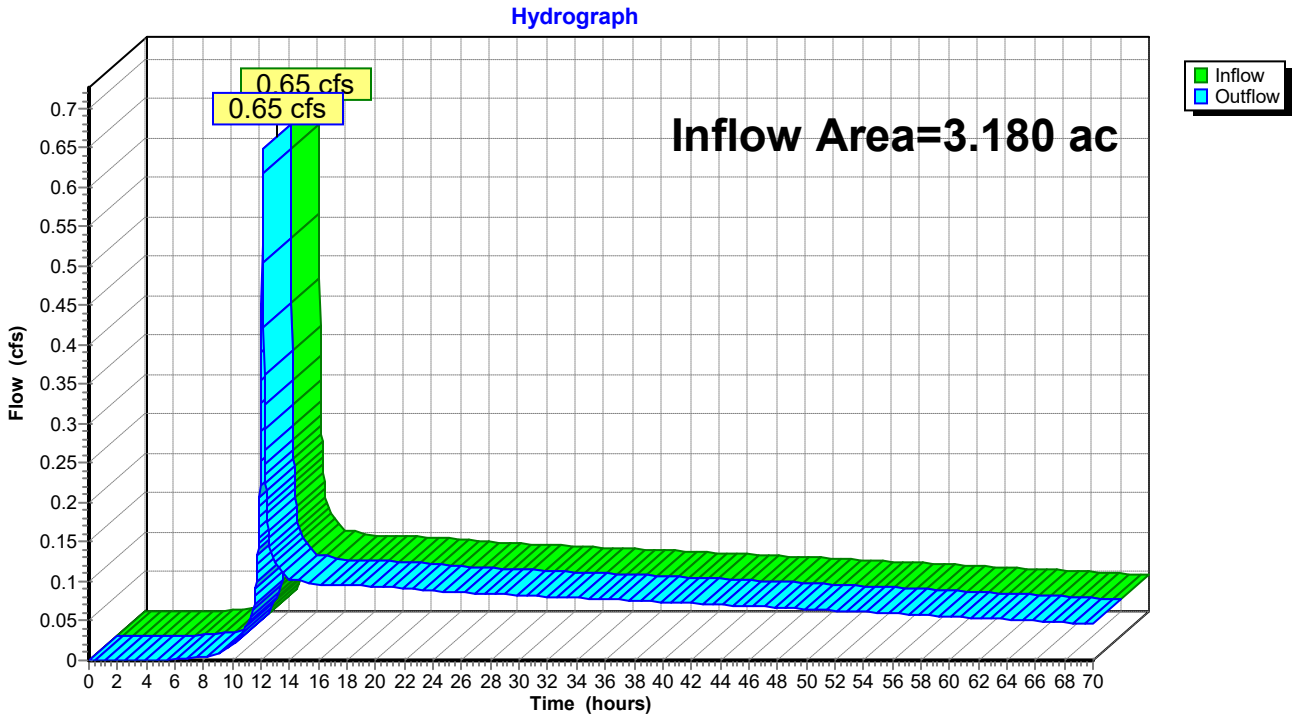


Summary for Reach 5R: Proposed Outfall

Inflow Area = 3.180 ac, 73.58% Impervious, Inflow Depth > 1.42" for 1-year event
Inflow = 0.65 cfs @ 12.13 hrs, Volume= 0.376 af
Outflow = 0.65 cfs @ 12.13 hrs, Volume= 0.376 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs

Reach 5R: Proposed Outfall

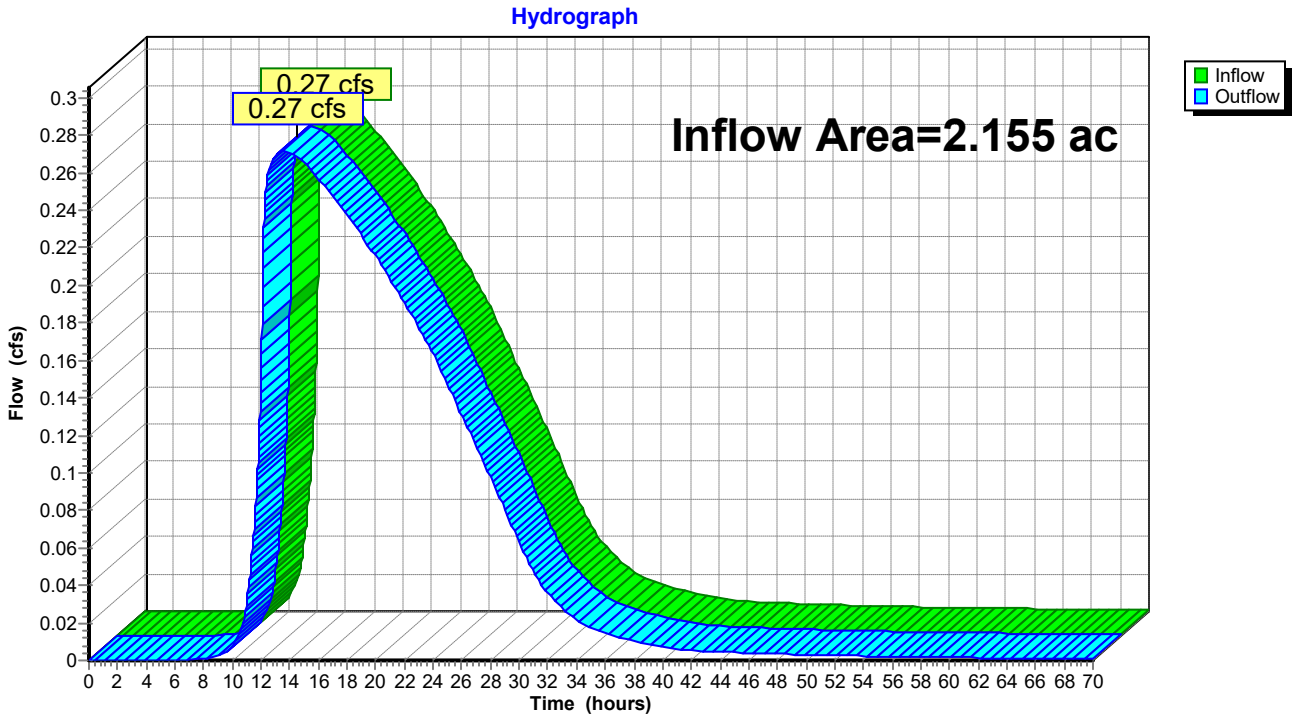


Summary for Reach 17R: Existing Storm Sewer

Inflow Area = 2.155 ac, 79.45% Impervious, Inflow Depth > 1.77" for 1-year event
Inflow = 0.27 cfs @ 13.55 hrs, Volume= 0.318 af
Outflow = 0.27 cfs @ 13.55 hrs, Volume= 0.318 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs

Reach 17R: Existing Storm Sewer



Summary for Pond 6P: Pond 1

Inflow Area = 2.995 ac, 73.19% Impervious, Inflow Depth = 1.76" for 1-year event
Inflow = 9.16 cfs @ 12.13 hrs, Volume= 0.439 af
Outflow = 0.09 cfs @ 18.70 hrs, Volume= 0.348 af, Atten= 99%, Lag= 394.1 min
Primary = 0.09 cfs @ 18.70 hrs, Volume= 0.348 af
Routed to Reach 5R : Proposed Outfall
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 5R : Proposed Outfall

Routing by Stor-Ind method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
Peak Elev= 75.33' @ 18.70 hrs Surf.Area= 0.183 ac Storage= 0.362 af

Plug-Flow detention time= 1,535.1 min calculated for 0.348 af (79% of inflow)
Center-of-Mass det. time= 1,474.1 min (2,253.7 - 779.6)

Volume	Invert	Avail.Storage	Storage Description
#1	73.00'	1.212 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

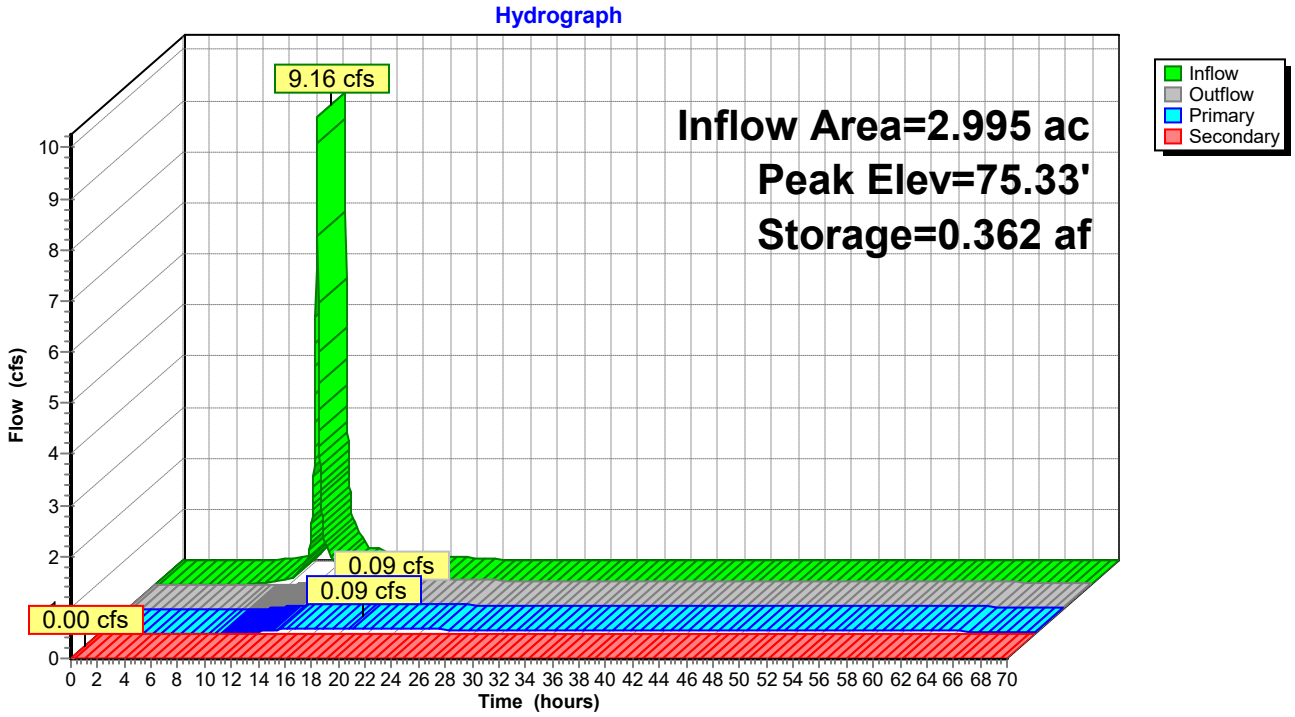
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
73.00	0.129	0.000	0.000
74.00	0.151	0.140	0.140
75.00	0.175	0.163	0.303
76.00	0.200	0.187	0.490
77.00	0.226	0.213	0.703
78.00	0.254	0.240	0.943
79.00	0.283	0.269	1.212

Device	Routing	Invert	Outlet Devices
#1	Primary	73.00'	**12.0" Round Culvert** L= 33.5' Ke= 1.000 Inlet / Outlet Invert= 73.00' / 72.00' S= 0.0299 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	73.00'	**1.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	75.50'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	76.50'	**6.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)
#5	Secondary	78.00'	**20.0' long + 1.0 '/' SideZ x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.09 cfs @ 18.70 hrs HW=75.33' (Free Discharge)
└**1=Culvert** (Passes 0.09 cfs of 3.84 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 0.09 cfs @ 7.25 fps)
└**3=Orifice/Grate** (Controls 0.00 cfs)
└**4=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=73.00' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Pond 1



Summary for Pond 14P: Existing North Pond

Inflow Area = 2.155 ac, 79.45% Impervious, Inflow Depth = 1.77" for 1-year event
Inflow = 6.73 cfs @ 12.13 hrs, Volume= 0.319 af
Outflow = 0.27 cfs @ 13.55 hrs, Volume= 0.318 af, Atten= 96%, Lag= 85.0 min
Primary = 0.27 cfs @ 13.55 hrs, Volume= 0.318 af
Routed to Reach 17R : Existing Storm Sewer
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6P : Pond 1

Routing by Stor-Ind method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
Peak Elev= 80.46' @ 13.55 hrs Surf.Area= 0.162 ac Storage= 0.213 af

Plug-Flow detention time= 455.3 min calculated for 0.318 af (100% of inflow)
Center-of-Mass det. time= 453.3 min (1,235.4 - 782.0)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	0.940 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

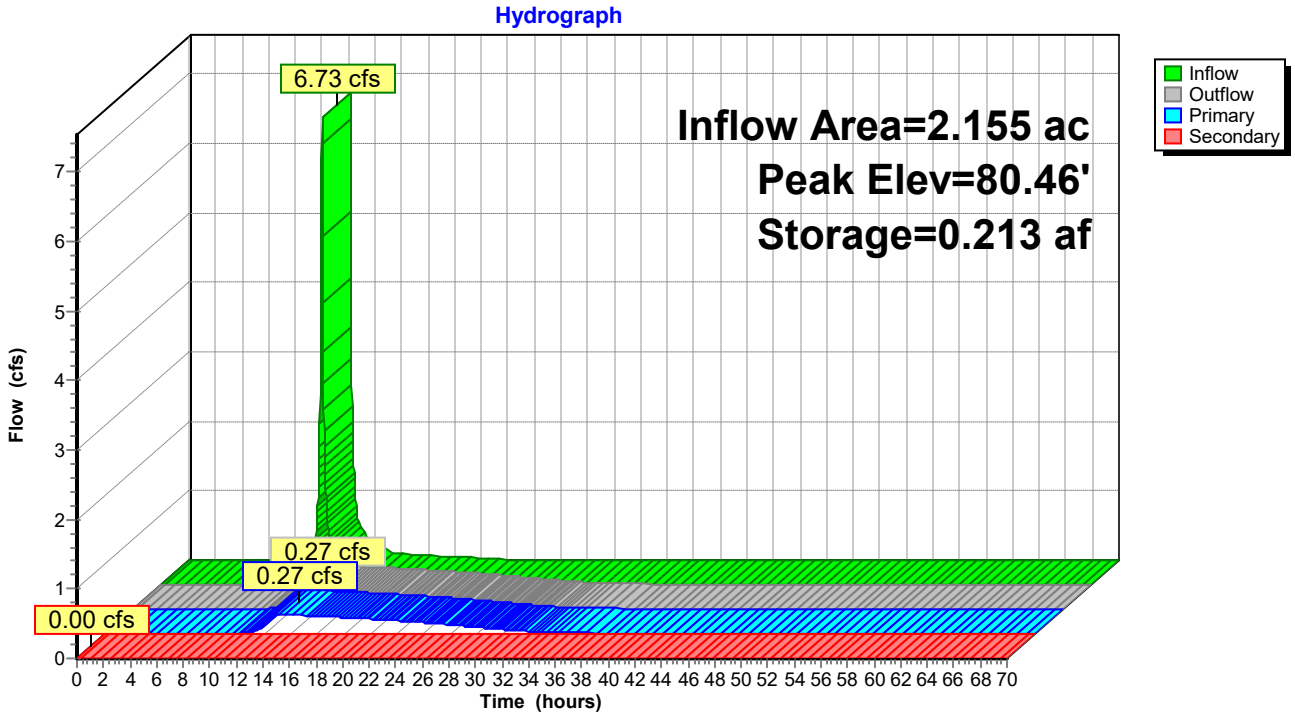
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
79.00	0.131	0.000	0.000
80.00	0.152	0.141	0.141
81.00	0.174	0.163	0.304
82.00	0.198	0.186	0.490
83.00	0.224	0.211	0.701
84.00	0.252	0.238	0.940

Device	Routing	Invert	Outlet Devices
#1	Primary	79.00'	**8.0" Round Culvert** L= 15.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 79.00' / 78.48' S= 0.0347 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.35 sf
#2	Device 1	79.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	83.00'	**10.0' long + 3.0 '/' SideZ x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.27 cfs @ 13.55 hrs HW=80.46' (Free Discharge)
1=Culvert (Passes 0.27 cfs of 2.23 cfs potential flow)
2=Orifice/Grate (Orifice Controls 0.27 cfs @ 5.56 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=79.00' (Free Discharge)
3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 14P: Existing North Pond



Time span=0.00-70.00 hrs, dt=0.02 hrs, 3501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 3S: P-1 Runoff Area=116,887 sf 81.69% Impervious Runoff Depth=2.16"
Tc=6.0 min CN=95 Runoff=9.92 cfs 0.482 af

Subcatchment 4S: P-2 Runoff Area=4,600 sf 64.89% Impervious Runoff Depth=1.88"
Tc=6.0 min CN=92 Runoff=0.35 cfs 0.017 af

Subcatchment 7S: O-1 Runoff Area=13,580 sf 0.00% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=80 Runoff=0.60 cfs 0.027 af

Subcatchment 8S: P-3 Runoff Area=2,794 sf 100.00% Impervious Runoff Depth=2.47"
Tc=6.0 min CN=98 Runoff=0.25 cfs 0.013 af

Subcatchment 9S: P-4 Runoff Area=664 sf 100.00% Impervious Runoff Depth=2.47"
Tc=6.0 min CN=98 Runoff=0.06 cfs 0.003 af

Subcatchment 15S: O-2 Runoff Area=93,856 sf 79.45% Impervious Runoff Depth=2.06"
Tc=6.0 min CN=94 Runoff=7.75 cfs 0.370 af

Reach 5R: Proposed Outfall Inflow=0.74 cfs 0.425 af
Outflow=0.74 cfs 0.425 af

Reach 17R: Existing Storm Sewer Inflow=0.30 cfs 0.369 af
Outflow=0.30 cfs 0.369 af

Pond 6P: Pond 1 Peak Elev=75.62' Storage=0.416 af Inflow=10.54 cfs 0.509 af
Primary=0.13 cfs 0.393 af Secondary=0.00 cfs 0.000 af Outflow=0.13 cfs 0.393 af

Pond 14P: Existing North Pond Peak Elev=80.68' Storage=0.251 af Inflow=7.75 cfs 0.370 af
Primary=0.30 cfs 0.369 af Secondary=0.00 cfs 0.000 af Outflow=0.30 cfs 0.369 af

Total Runoff Area = 5.335 ac Runoff Volume = 0.912 af Average Runoff Depth = 2.05"
24.05% Pervious = 1.283 ac 75.95% Impervious = 4.052 ac

Summary for Subcatchment 3S: P-1

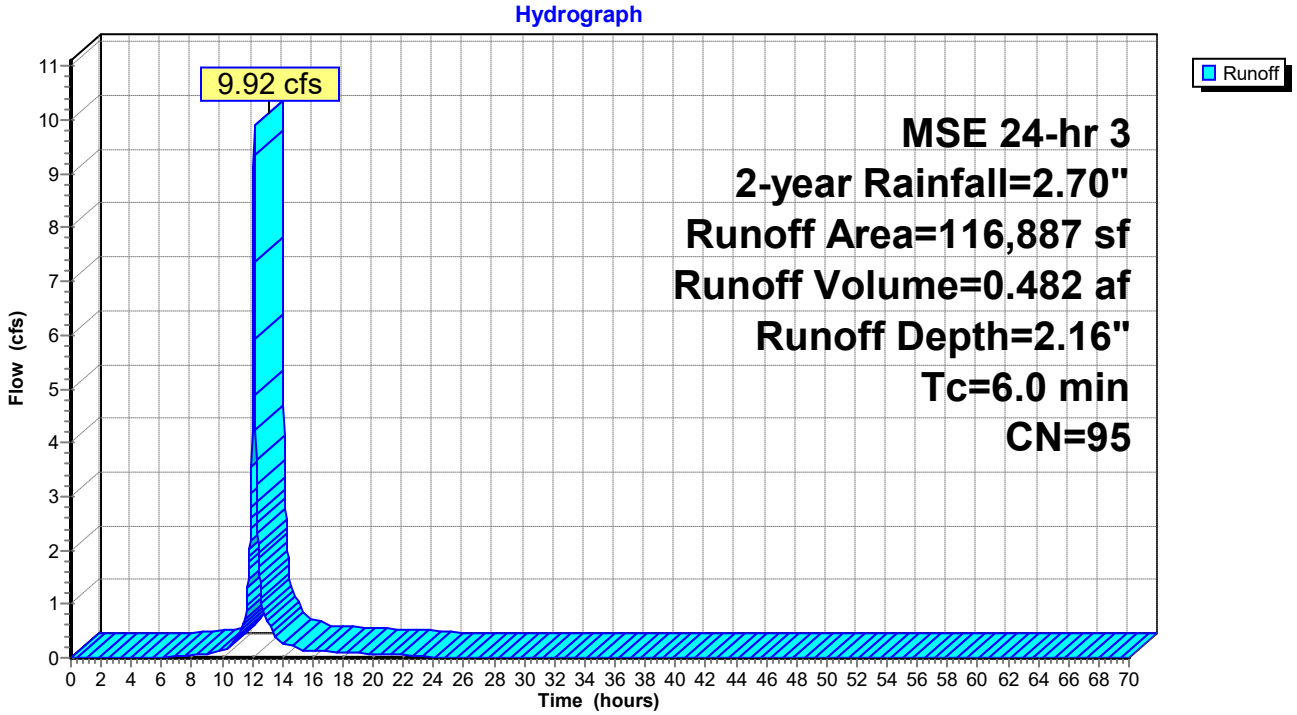
Runoff = 9.92 cfs @ 12.13 hrs, Volume= 0.482 af, Depth= 2.16"
Routed to Pond 6P : Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 2-year Rainfall=2.70"

	Area (sf)	CN	Description
	21,402	80	>75% Grass cover, Good, HSG D
*	89,879	98	impervious area
	5,606	98	Water Surface, HSG D
	116,887	95	Weighted Average
	21,402		18.31% Pervious Area
	95,485		81.69% Impervious Area

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

Subcatchment 3S: P-1



Summary for Subcatchment 4S: P-2

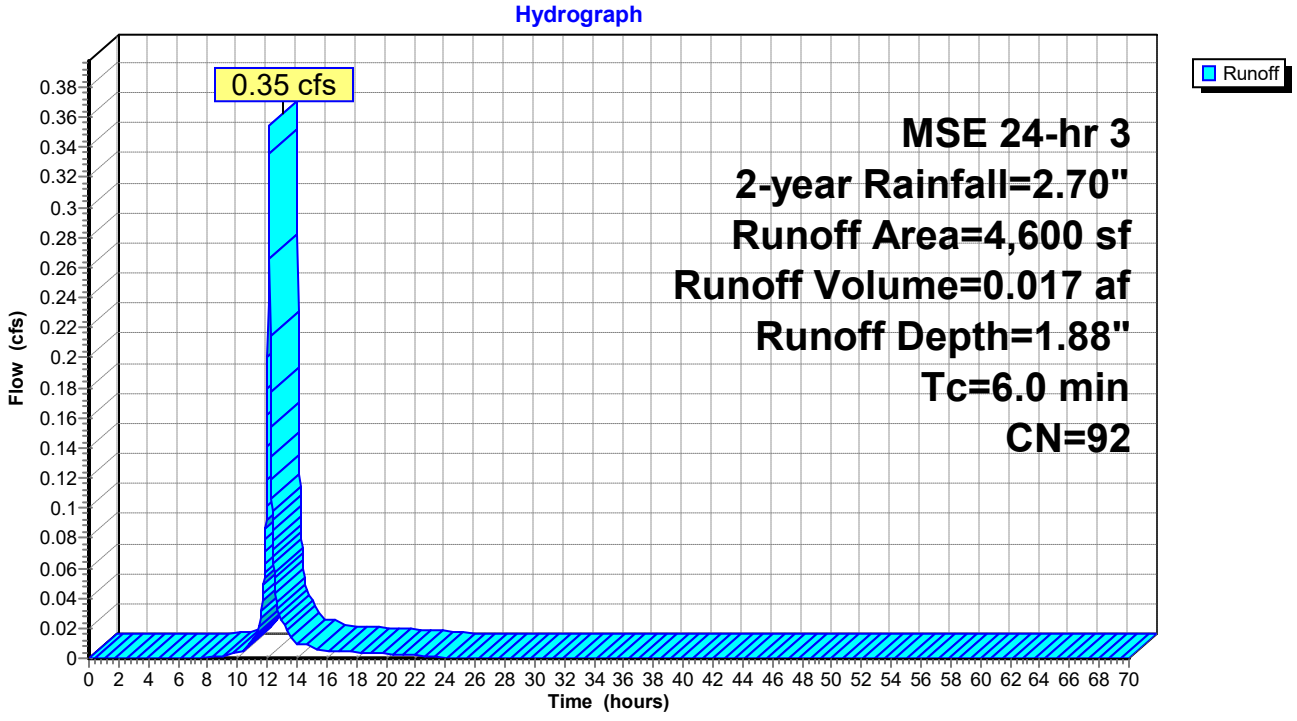
Runoff = 0.35 cfs @ 12.13 hrs, Volume= 0.017 af, Depth= 1.88"
Routed to Reach 5R : Proposed Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 2-year Rainfall=2.70"

	Area (sf)	CN	Description
	1,615	80	>75% Grass cover, Good, HSG D
*	2,985	98	impervious area
	4,600	92	Weighted Average
	1,615		35.11% Pervious Area
	2,985		64.89% Impervious Area

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

Subcatchment 4S: P-2



Summary for Subcatchment 7S: O-1

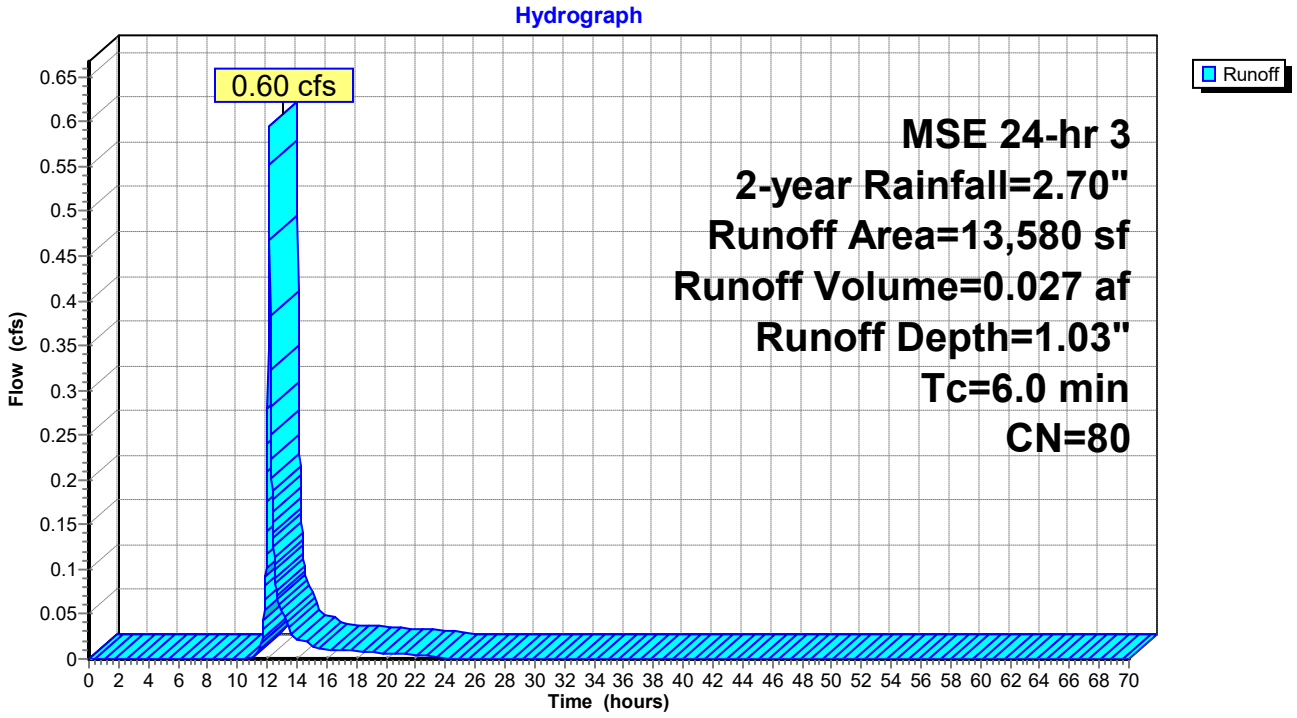
Runoff = 0.60 cfs @ 12.14 hrs, Volume= 0.027 af, Depth= 1.03"
Routed to Pond 6P : Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 2-year Rainfall=2.70"

Area (sf)	CN	Description
13,580	80	>75% Grass cover, Good, HSG D
13,580		100.00% Pervious Area

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

Subcatchment 7S: O-1



Summary for Subcatchment 8S: P-3

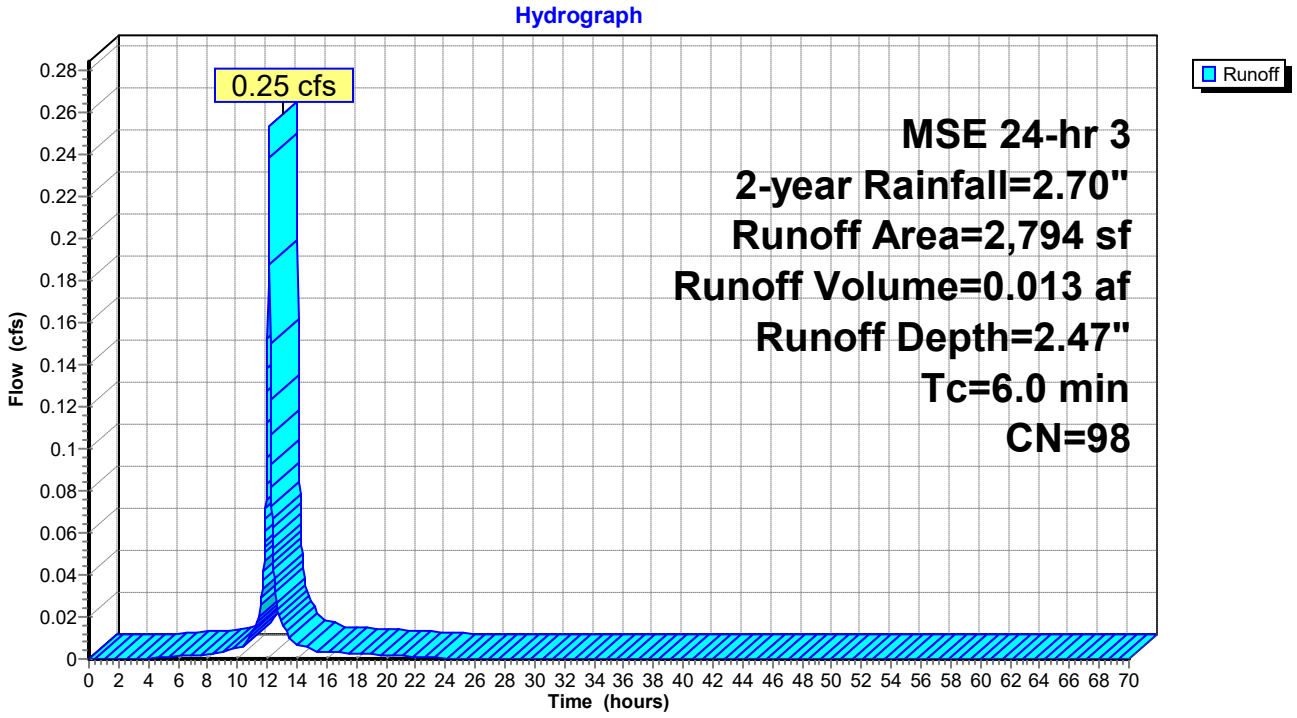
Runoff = 0.25 cfs @ 12.13 hrs, Volume= 0.013 af, Depth= 2.47"
Routed to Reach 5R : Proposed Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 2-year Rainfall=2.70"

	Area (sf)	CN	Description
*	2,794	98	impervious
	2,794		100.00% Impervious Area

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

Subcatchment 8S: P-3



Summary for Subcatchment 9S: P-4

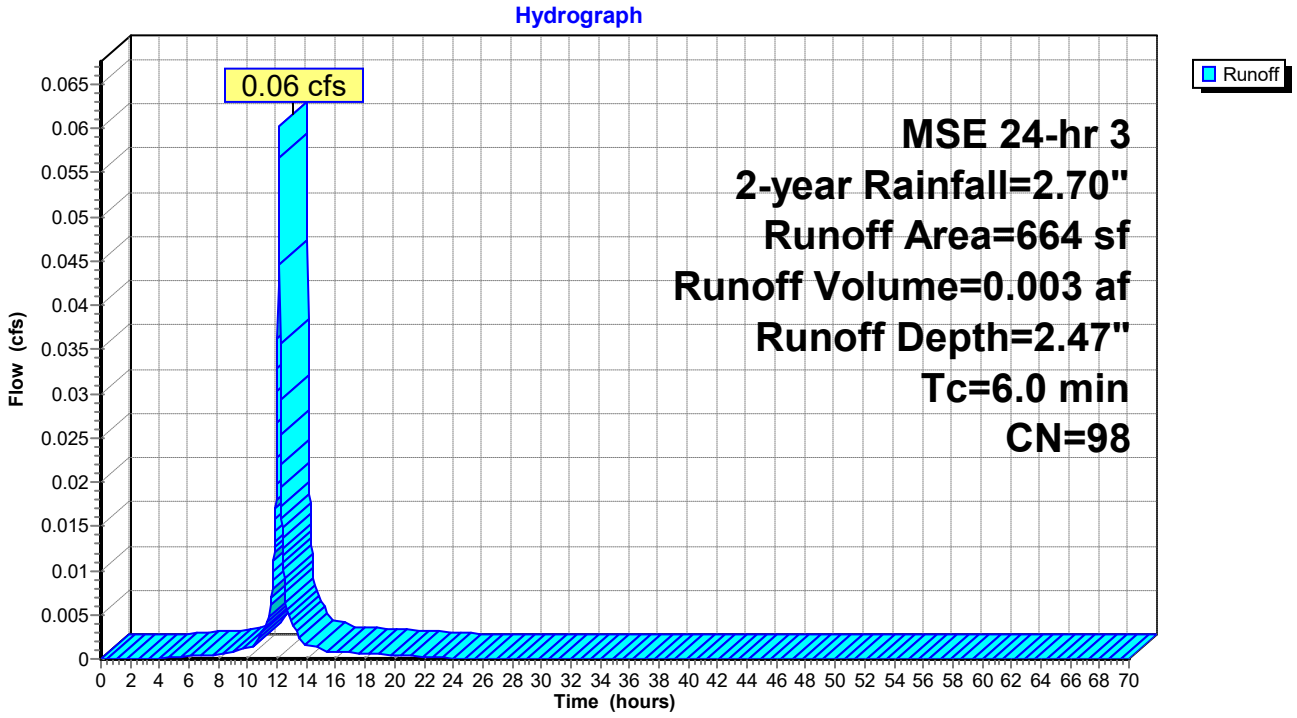
Runoff = 0.06 cfs @ 12.13 hrs, Volume= 0.003 af, Depth= 2.47"
Routed to Reach 5R : Proposed Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 2-year Rainfall=2.70"

	Area (sf)	CN	Description
*	664	98	impervious
	664		100.00% Impervious Area

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

Subcatchment 9S: P-4



Summary for Subcatchment 15S: O-2

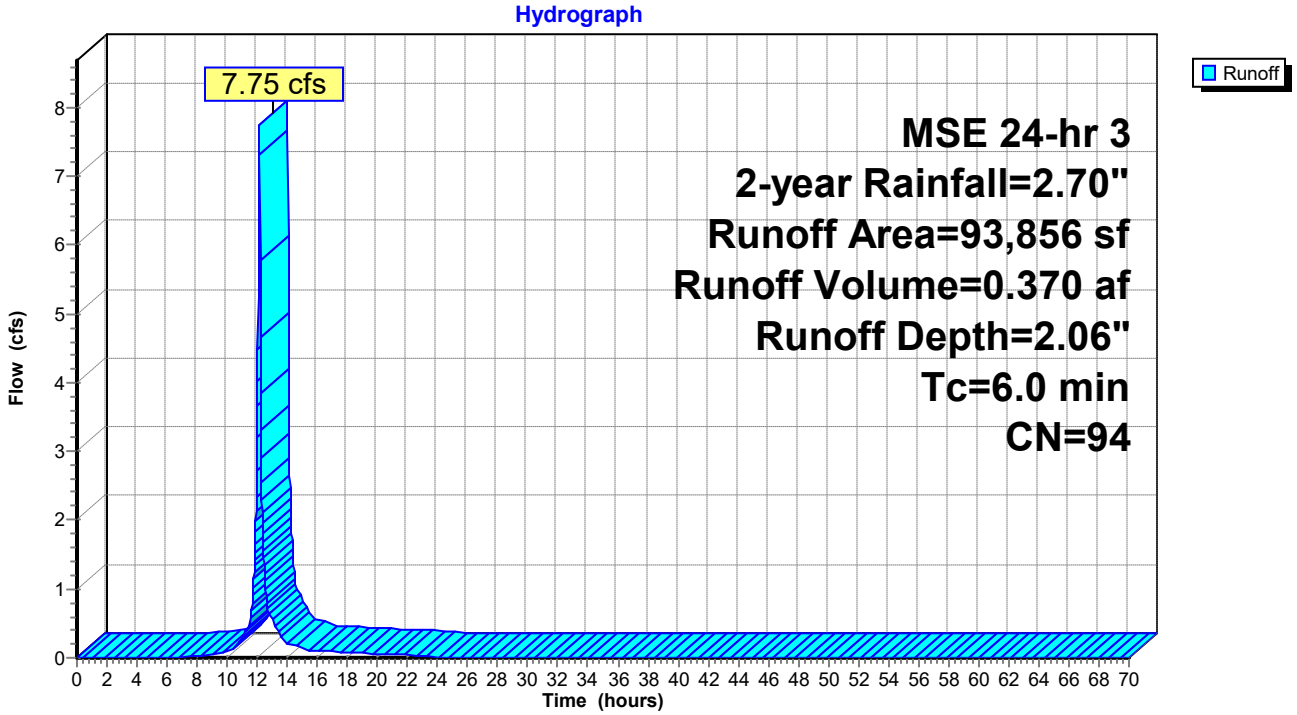
Runoff = 7.75 cfs @ 12.13 hrs, Volume= 0.370 af, Depth= 2.06"
Routed to Pond 14P : Existing North Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 2-year Rainfall=2.70"

	Area (sf)	CN	Description
*	68,882	98	impervious
	5,684	98	Water Surface, HSG D
	19,290	80	>75% Grass cover, Good, HSG D
	93,856	94	Weighted Average
	19,290		20.55% Pervious Area
	74,566		79.45% Impervious Area

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

Subcatchment 15S: O-2

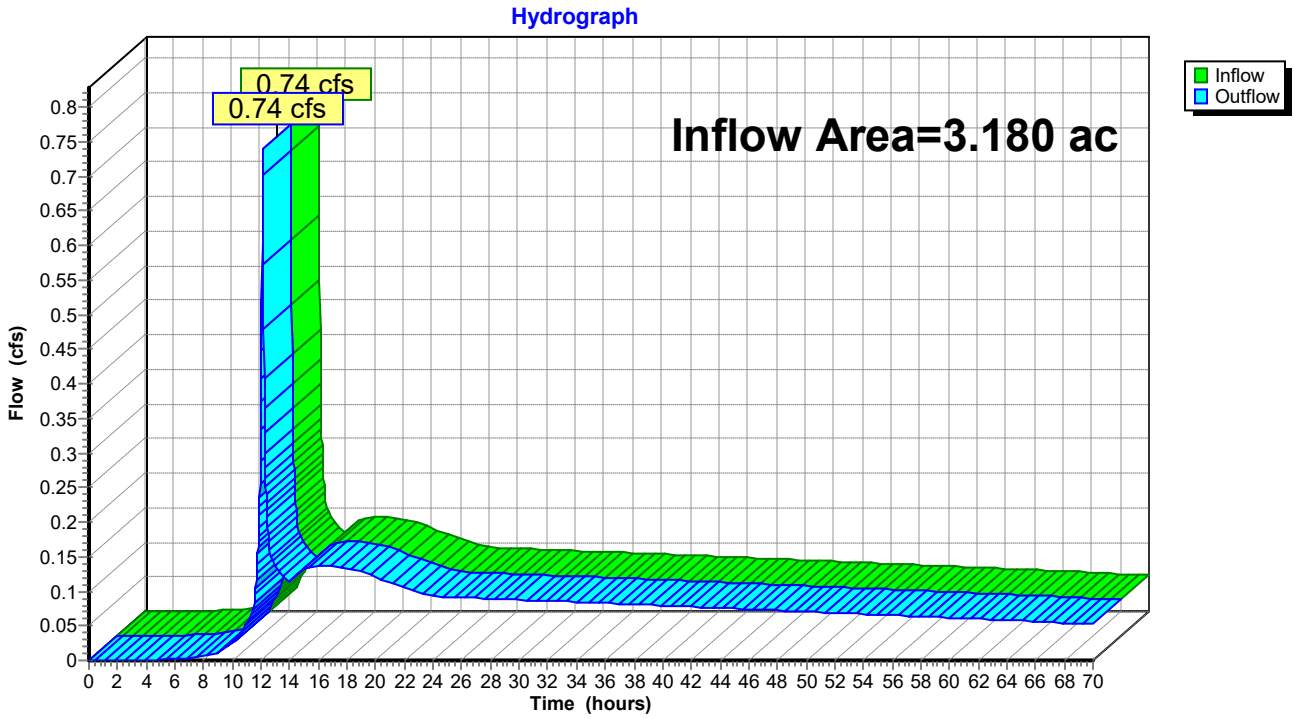


Summary for Reach 5R: Proposed Outfall

Inflow Area = 3.180 ac, 73.58% Impervious, Inflow Depth > 1.61" for 2-year event
Inflow = 0.74 cfs @ 12.13 hrs, Volume= 0.425 af
Outflow = 0.74 cfs @ 12.13 hrs, Volume= 0.425 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs

Reach 5R: Proposed Outfall

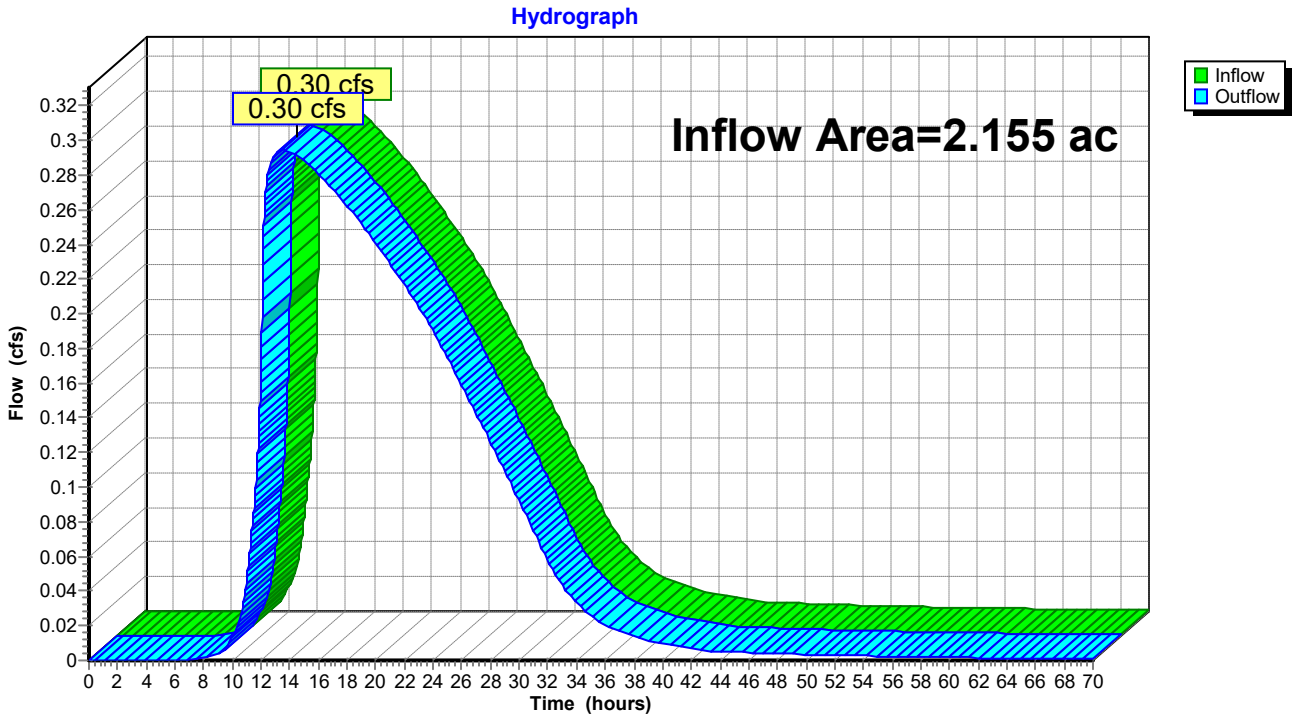


Summary for Reach 17R: Existing Storm Sewer

Inflow Area = 2.155 ac, 79.45% Impervious, Inflow Depth > 2.05" for 2-year event
Inflow = 0.30 cfs @ 13.56 hrs, Volume= 0.369 af
Outflow = 0.30 cfs @ 13.56 hrs, Volume= 0.369 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs

Reach 17R: Existing Storm Sewer



Summary for Pond 6P: Pond 1

Inflow Area = 2.995 ac, 73.19% Impervious, Inflow Depth = 2.04" for 2-year event
Inflow = 10.54 cfs @ 12.13 hrs, Volume= 0.509 af
Outflow = 0.13 cfs @ 16.93 hrs, Volume= 0.393 af, Atten= 99%, Lag= 288.1 min
Primary = 0.13 cfs @ 16.93 hrs, Volume= 0.393 af
Routed to Reach 5R : Proposed Outfall
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 5R : Proposed Outfall

Routing by Stor-Ind method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
Peak Elev= 75.62' @ 16.93 hrs Surf.Area= 0.190 ac Storage= 0.416 af

Plug-Flow detention time= 1,501.5 min calculated for 0.393 af (77% of inflow)
Center-of-Mass det. time= 1,439.1 min (2,215.9 - 776.8)

Volume	Invert	Avail.Storage	Storage Description
#1	73.00'	1.212 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

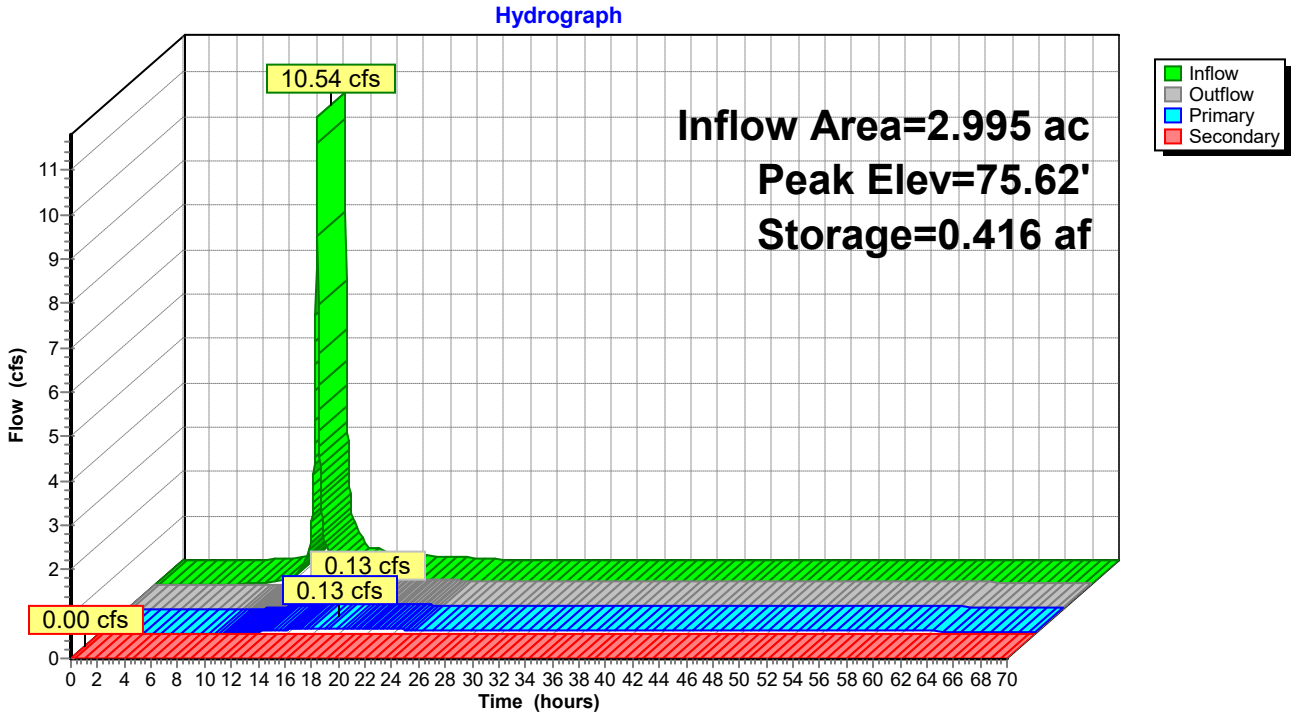
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
73.00	0.129	0.000	0.000
74.00	0.151	0.140	0.140
75.00	0.175	0.163	0.303
76.00	0.200	0.187	0.490
77.00	0.226	0.213	0.703
78.00	0.254	0.240	0.943
79.00	0.283	0.269	1.212

Device	Routing	Invert	Outlet Devices
#1	Primary	73.00'	**12.0" Round Culvert** L= 33.5' Ke= 1.000 Inlet / Outlet Invert= 73.00' / 72.00' S= 0.0299 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	73.00'	**1.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	75.50'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	76.50'	**6.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)
#5	Secondary	78.00'	**20.0' long + 1.0 '/' SideZ x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.13 cfs @ 16.93 hrs HW=75.62' (Free Discharge)
└**1=Culvert** (Passes 0.13 cfs of 4.13 cfs potential flow)
├**2=Orifice/Grate** (Orifice Controls 0.09 cfs @ 7.70 fps)
├**3=Orifice/Grate** (Orifice Controls 0.03 cfs @ 1.17 fps)
└**4=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=73.00' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Pond 1



Summary for Pond 14P: Existing North Pond

Inflow Area = 2.155 ac, 79.45% Impervious, Inflow Depth = 2.06" for 2-year event
Inflow = 7.75 cfs @ 12.13 hrs, Volume= 0.370 af
Outflow = 0.30 cfs @ 13.56 hrs, Volume= 0.369 af, Atten= 96%, Lag= 86.0 min
Primary = 0.30 cfs @ 13.56 hrs, Volume= 0.369 af
Routed to Reach 17R : Existing Storm Sewer
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6P : Pond 1

Routing by Stor-Ind method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
Peak Elev= 80.68' @ 13.56 hrs Surf.Area= 0.167 ac Storage= 0.251 af

Plug-Flow detention time= 482.8 min calculated for 0.369 af (100% of inflow)
Center-of-Mass det. time= 481.5 min (1,260.6 - 779.1)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	0.940 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

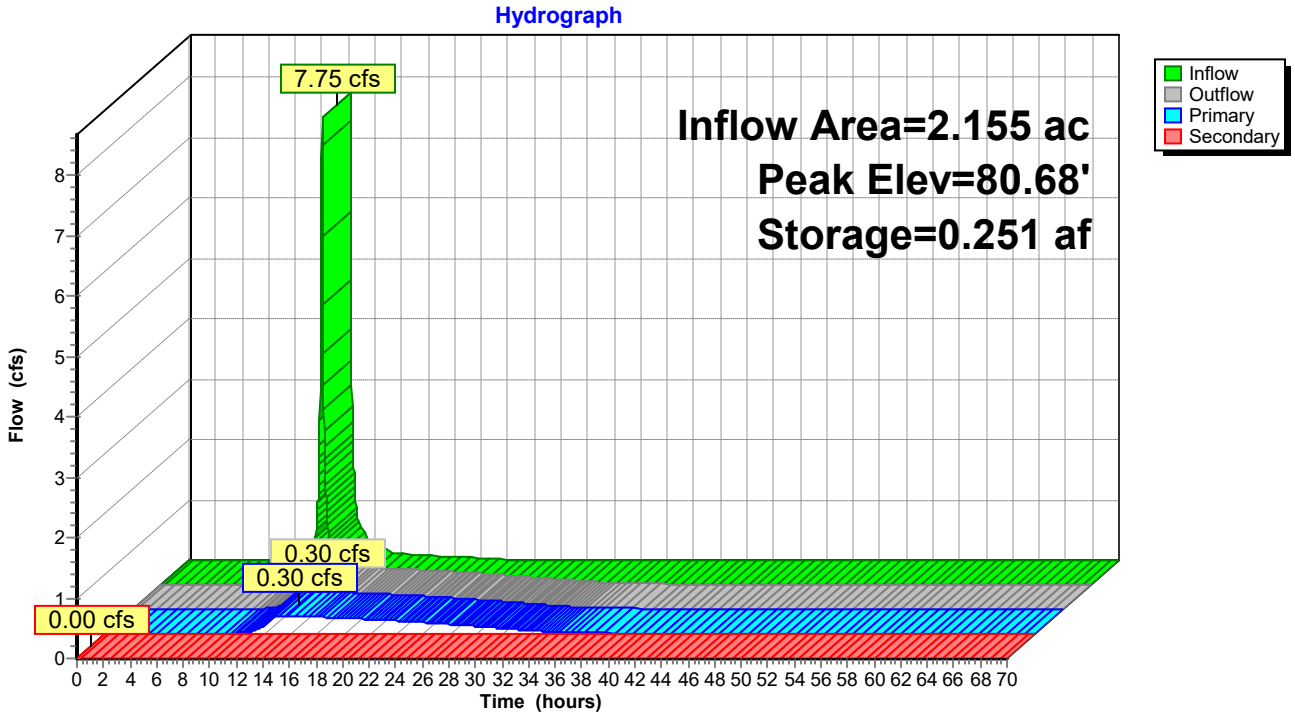
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
79.00	0.131	0.000	0.000
80.00	0.152	0.141	0.141
81.00	0.174	0.163	0.304
82.00	0.198	0.186	0.490
83.00	0.224	0.211	0.701
84.00	0.252	0.238	0.940

Device	Routing	Invert	Outlet Devices
#1	Primary	79.00'	**8.0" Round Culvert** L= 15.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 79.00' / 78.48' S= 0.0347 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.35 sf
#2	Device 1	79.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	83.00'	**10.0' long + 3.0 '/' SideZ x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.30 cfs @ 13.56 hrs HW=80.68' (Free Discharge)
↑—**1=Culvert** (Passes 0.30 cfs of 2.44 cfs potential flow)
↑—**2=Orifice/Grate** (Orifice Controls 0.30 cfs @ 6.01 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=79.00' (Free Discharge)
↑—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 14P: Existing North Pond



Time span=0.00-70.00 hrs, dt=0.02 hrs, 3501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 3S: P-1 Runoff Area=116,887 sf 81.69% Impervious Runoff Depth=3.24"
Tc=6.0 min CN=95 Runoff=14.52 cfs 0.725 af

Subcatchment 4S: P-2 Runoff Area=4,600 sf 64.89% Impervious Runoff Depth=2.93"
Tc=6.0 min CN=92 Runoff=0.54 cfs 0.026 af

Subcatchment 7S: O-1 Runoff Area=13,580 sf 0.00% Impervious Runoff Depth=1.89"
Tc=6.0 min CN=80 Runoff=1.09 cfs 0.049 af

Subcatchment 8S: P-3 Runoff Area=2,794 sf 100.00% Impervious Runoff Depth=3.58"
Tc=6.0 min CN=98 Runoff=0.36 cfs 0.019 af

Subcatchment 9S: P-4 Runoff Area=664 sf 100.00% Impervious Runoff Depth=3.58"
Tc=6.0 min CN=98 Runoff=0.09 cfs 0.005 af

Subcatchment 15S: O-2 Runoff Area=93,856 sf 79.45% Impervious Runoff Depth=3.14"
Tc=6.0 min CN=94 Runoff=11.45 cfs 0.563 af

Reach 5R: Proposed Outfall Inflow=1.07 cfs 0.693 af
Outflow=1.07 cfs 0.693 af

Reach 17R: Existing Storm Sewer Inflow=0.36 cfs 0.562 af
Outflow=0.36 cfs 0.562 af

Pond 6P: Pond 1 Peak Elev=76.40' Storage=0.572 af Inflow=15.61 cfs 0.774 af
Primary=0.47 cfs 0.644 af Secondary=0.00 cfs 0.000 af Outflow=0.47 cfs 0.644 af

Pond 14P: Existing North Pond Peak Elev=81.49' Storage=0.393 af Inflow=11.45 cfs 0.563 af
Primary=0.36 cfs 0.562 af Secondary=0.00 cfs 0.000 af Outflow=0.36 cfs 0.562 af

Total Runoff Area = 5.335 ac Runoff Volume = 1.387 af Average Runoff Depth = 3.12"
24.05% Pervious = 1.283 ac 75.95% Impervious = 4.052 ac

Summary for Subcatchment 3S: P-1

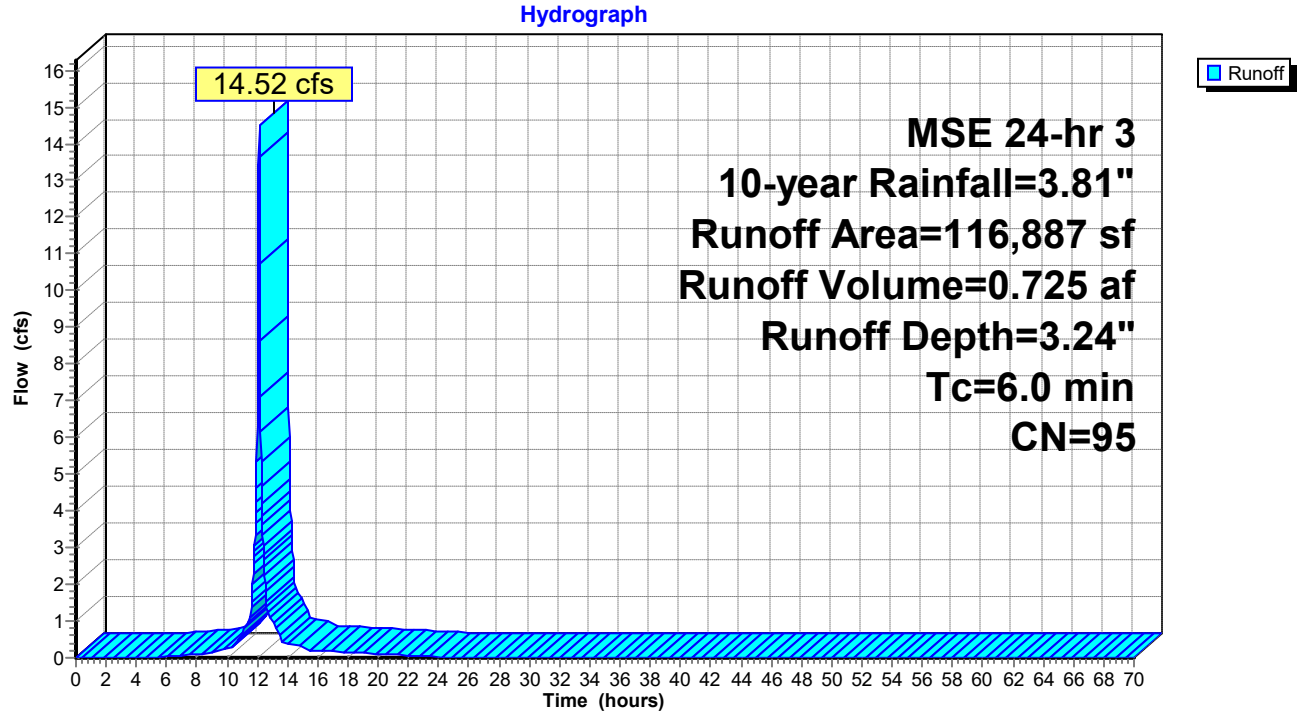
Runoff = 14.52 cfs @ 12.13 hrs, Volume= 0.725 af, Depth= 3.24"
Routed to Pond 6P : Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 10-year Rainfall=3.81"

	Area (sf)	CN	Description
	21,402	80	>75% Grass cover, Good, HSG D
*	89,879	98	impervious area
	5,606	98	Water Surface, HSG D
	116,887	95	Weighted Average
	21,402		18.31% Pervious Area
	95,485		81.69% Impervious Area

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

Subcatchment 3S: P-1



Summary for Subcatchment 4S: P-2

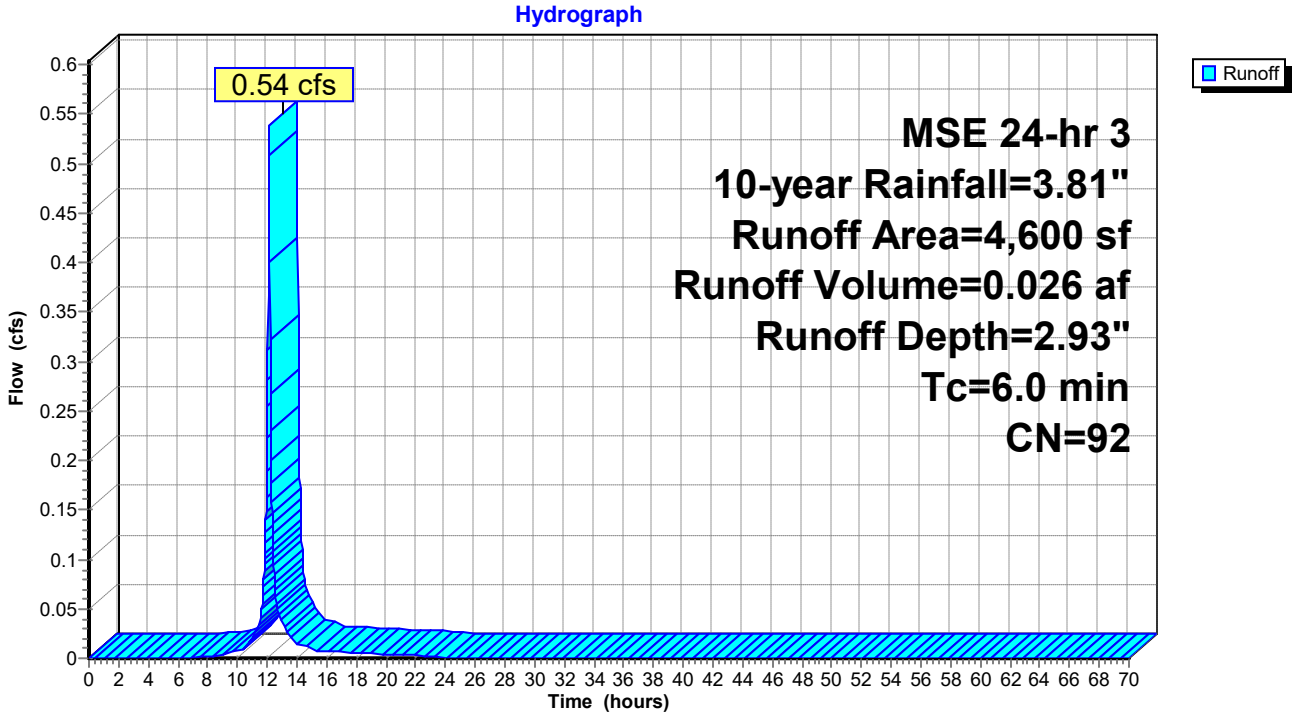
Runoff = 0.54 cfs @ 12.13 hrs, Volume= 0.026 af, Depth= 2.93"
Routed to Reach 5R : Proposed Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 10-year Rainfall=3.81"

	Area (sf)	CN	Description
	1,615	80	>75% Grass cover, Good, HSG D
*	2,985	98	impervious area
	4,600	92	Weighted Average
	1,615		35.11% Pervious Area
	2,985		64.89% Impervious Area

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

Subcatchment 4S: P-2



Summary for Subcatchment 7S: O-1

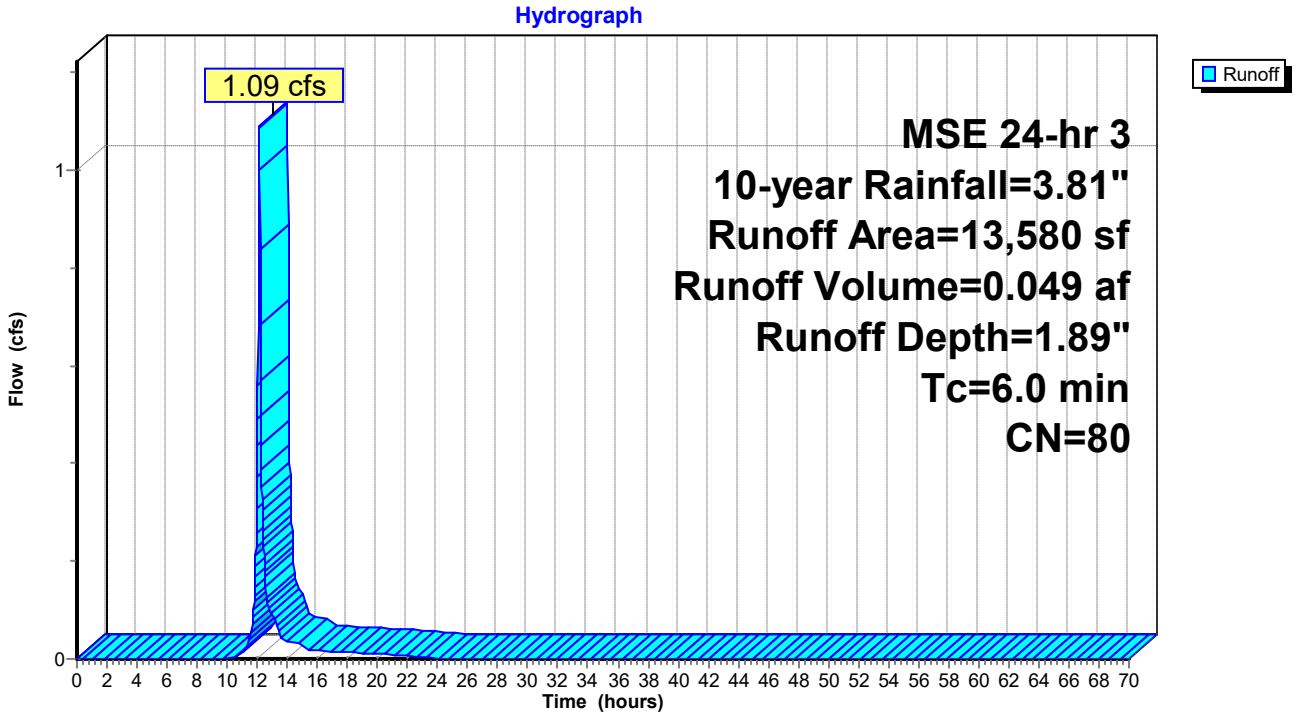
Runoff = 1.09 cfs @ 12.13 hrs, Volume= 0.049 af, Depth= 1.89"
Routed to Pond 6P : Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 10-year Rainfall=3.81"

Area (sf)	CN	Description
13,580	80	>75% Grass cover, Good, HSG D
13,580		100.00% Pervious Area

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

Subcatchment 7S: O-1



Summary for Subcatchment 8S: P-3

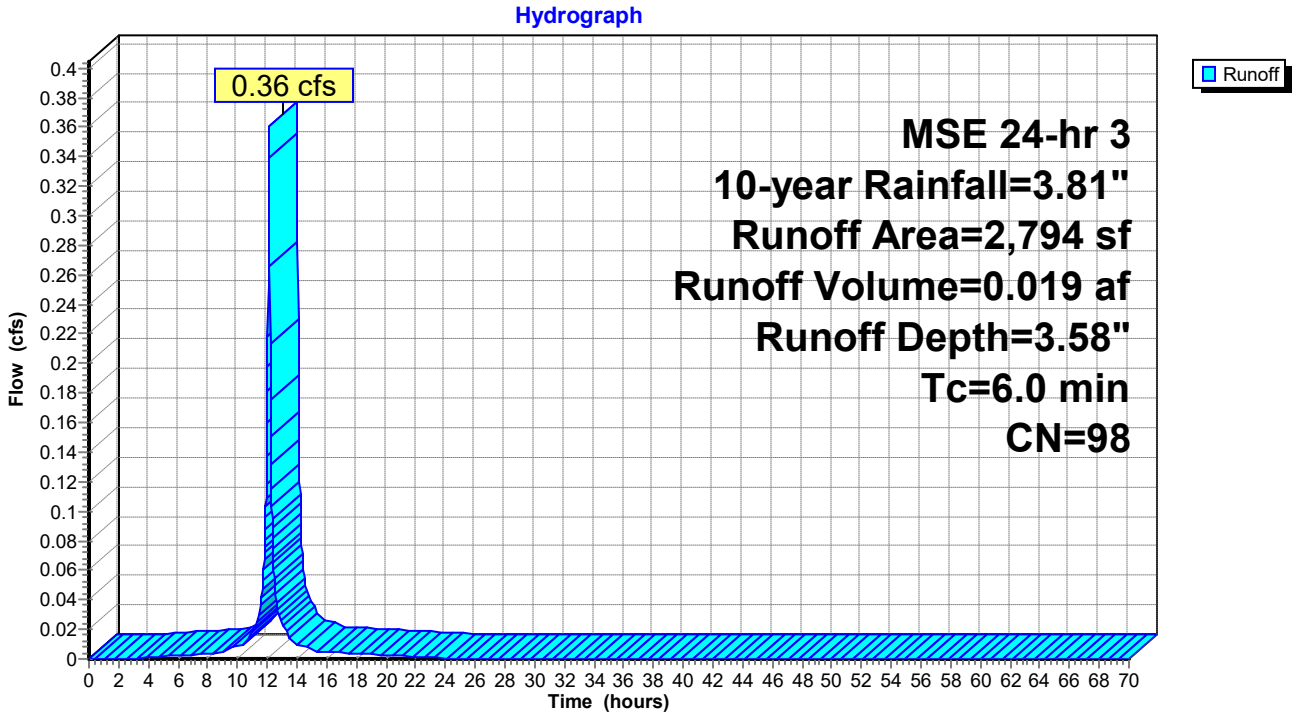
Runoff = 0.36 cfs @ 12.13 hrs, Volume= 0.019 af, Depth= 3.58"
Routed to Reach 5R : Proposed Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 10-year Rainfall=3.81"

	Area (sf)	CN	Description
*	2,794	98	impervious
	2,794		100.00% Impervious Area

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

Subcatchment 8S: P-3



Summary for Subcatchment 9S: P-4

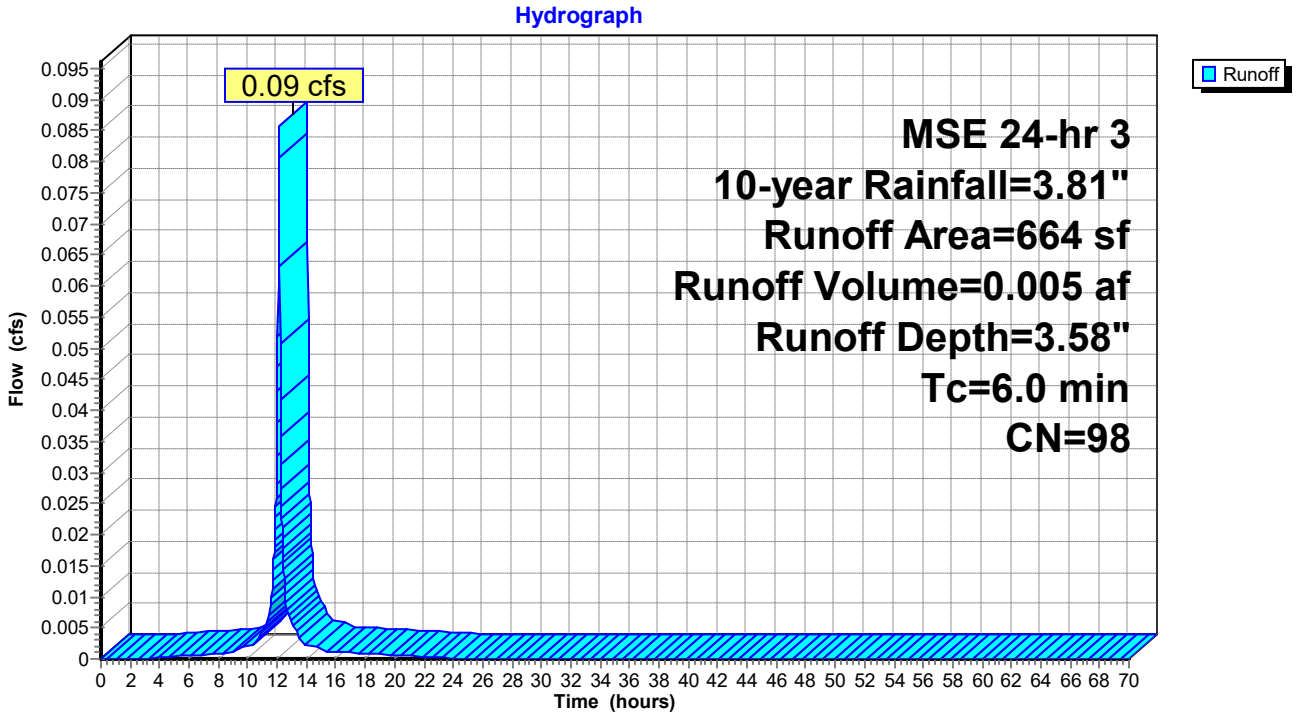
Runoff = 0.09 cfs @ 12.13 hrs, Volume= 0.005 af, Depth= 3.58"
Routed to Reach 5R : Proposed Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 10-year Rainfall=3.81"

	Area (sf)	CN	Description
*	664	98	impervious
	664		100.00% Impervious Area

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

Subcatchment 9S: P-4



Summary for Subcatchment 15S: O-2

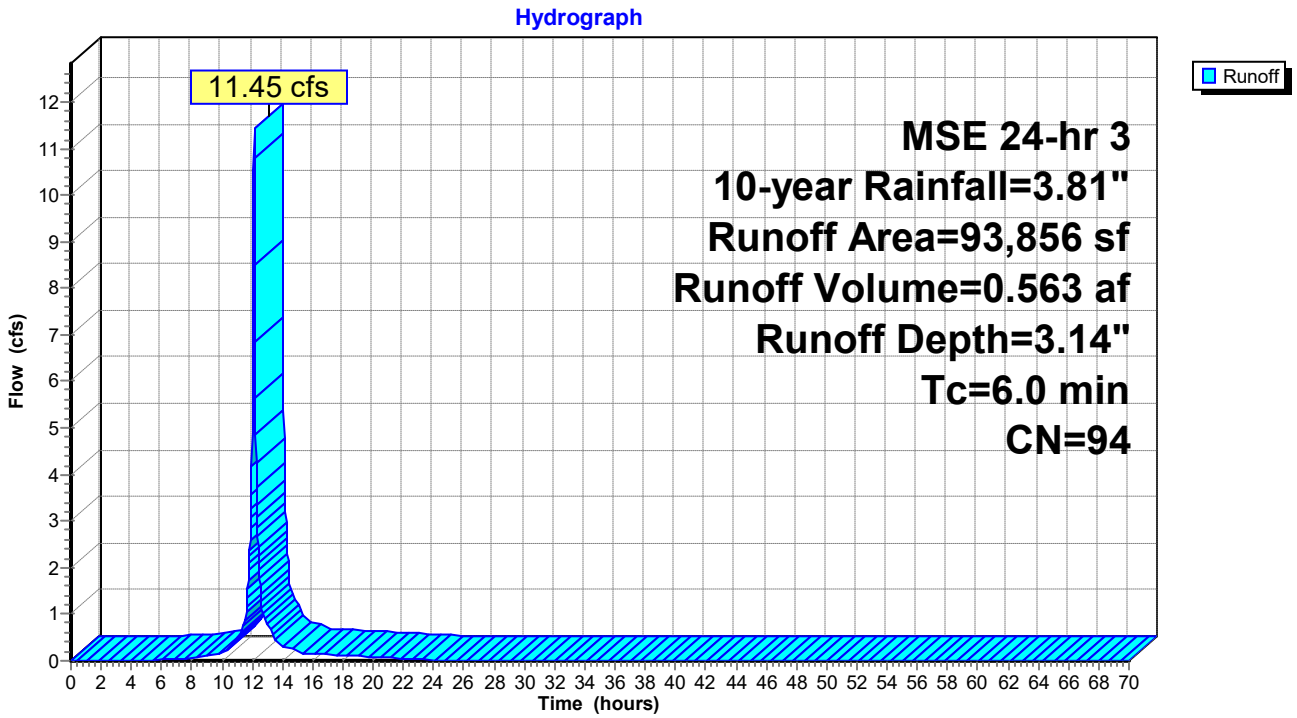
Runoff = 11.45 cfs @ 12.13 hrs, Volume= 0.563 af, Depth= 3.14"
Routed to Pond 14P : Existing North Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 10-year Rainfall=3.81"

	Area (sf)	CN	Description
*	68,882	98	impervious
	5,684	98	Water Surface, HSG D
	19,290	80	>75% Grass cover, Good, HSG D
	93,856	94	Weighted Average
	19,290		20.55% Pervious Area
	74,566		79.45% Impervious Area

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

Subcatchment 15S: O-2

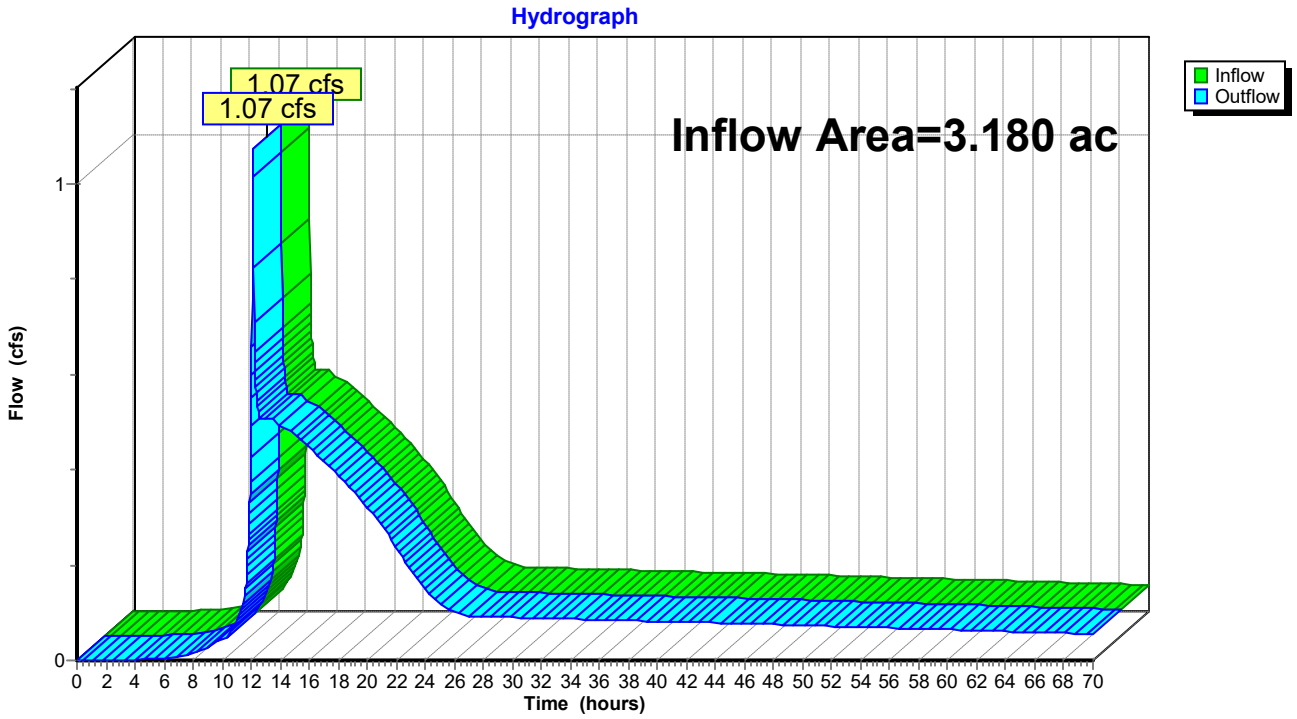


Summary for Reach 5R: Proposed Outfall

Inflow Area = 3.180 ac, 73.58% Impervious, Inflow Depth > 2.62" for 10-year event
Inflow = 1.07 cfs @ 12.13 hrs, Volume= 0.693 af
Outflow = 1.07 cfs @ 12.13 hrs, Volume= 0.693 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs

Reach 5R: Proposed Outfall

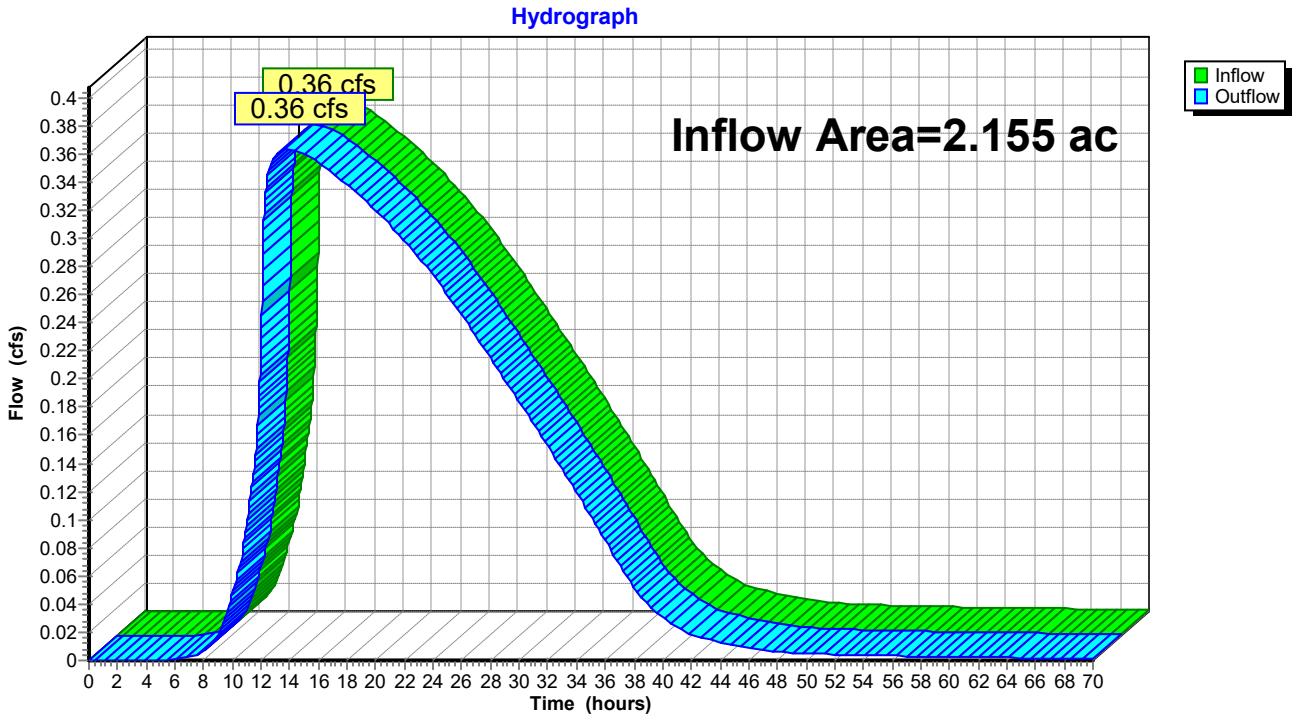


Summary for Reach 17R: Existing Storm Sewer

Inflow Area = 2.155 ac, 79.45% Impervious, Inflow Depth > 3.13" for 10-year event
Inflow = 0.36 cfs @ 13.60 hrs, Volume= 0.562 af
Outflow = 0.36 cfs @ 13.60 hrs, Volume= 0.562 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs

Reach 17R: Existing Storm Sewer



Summary for Pond 6P: Pond 1

Inflow Area = 2.995 ac, 73.19% Impervious, Inflow Depth = 3.10" for 10-year event
Inflow = 15.61 cfs @ 12.13 hrs, Volume= 0.774 af
Outflow = 0.47 cfs @ 13.63 hrs, Volume= 0.644 af, Atten= 97%, Lag= 89.9 min
Primary = 0.47 cfs @ 13.63 hrs, Volume= 0.644 af
Routed to Reach 5R : Proposed Outfall
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 5R : Proposed Outfall

Routing by Stor-Ind method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
Peak Elev= 76.40' @ 13.63 hrs Surf.Area= 0.210 ac Storage= 0.572 af

Plug-Flow detention time= 1,061.4 min calculated for 0.644 af (83% of inflow)
Center-of-Mass det. time= 1,007.0 min (1,776.2 - 769.2)

Volume	Invert	Avail.Storage	Storage Description
#1	73.00'	1.212 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

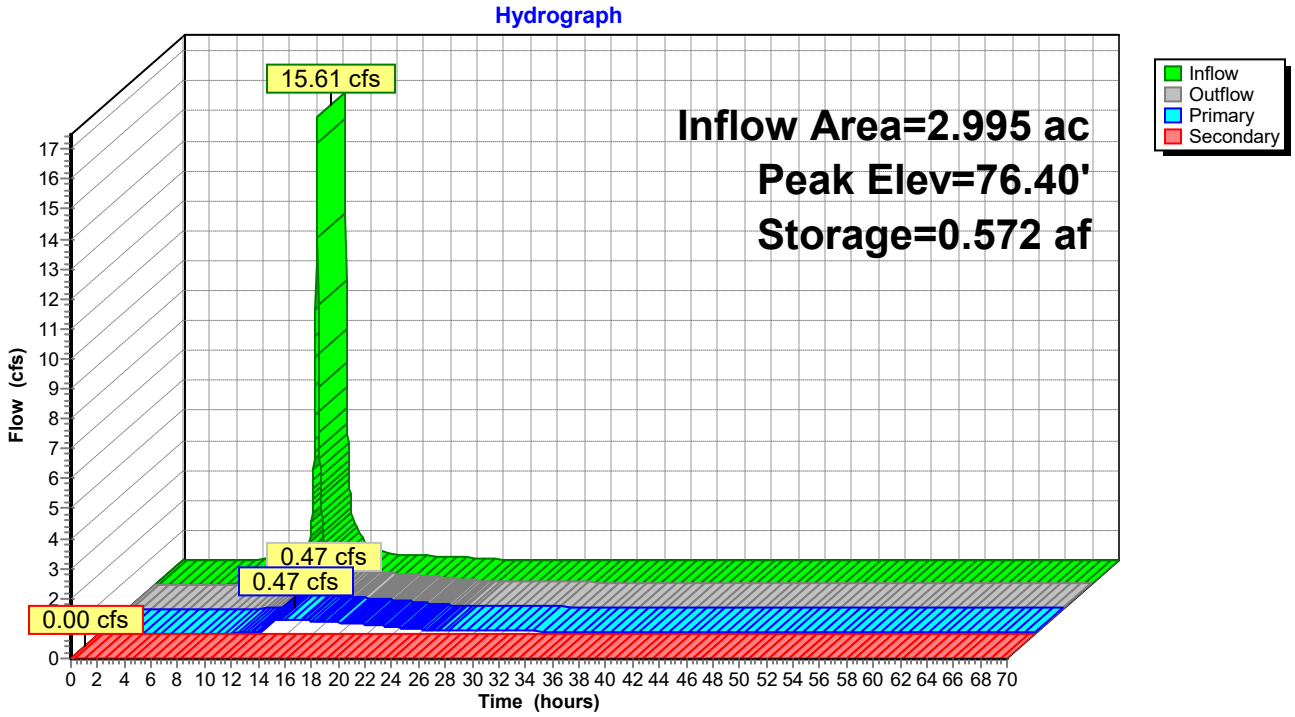
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
73.00	0.129	0.000	0.000
74.00	0.151	0.140	0.140
75.00	0.175	0.163	0.303
76.00	0.200	0.187	0.490
77.00	0.226	0.213	0.703
78.00	0.254	0.240	0.943
79.00	0.283	0.269	1.212

Device	Routing	Invert	Outlet Devices
#1	Primary	73.00'	**12.0" Round Culvert** L= 33.5' Ke= 1.000 Inlet / Outlet Invert= 73.00' / 72.00' S= 0.0299 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	73.00'	**1.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	75.50'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	76.50'	**6.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)
#5	Secondary	78.00'	**20.0' long + 1.0 '/' SideZ x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.47 cfs @ 13.63 hrs HW=76.40' (Free Discharge)
└**1=Culvert** (Passes 0.47 cfs of 4.83 cfs potential flow)
├**2=Orifice/Grate** (Orifice Controls 0.11 cfs @ 8.79 fps)
├**3=Orifice/Grate** (Orifice Controls 0.36 cfs @ 4.11 fps)
└**4=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=73.00' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Pond 1



Summary for Pond 14P: Existing North Pond

Inflow Area = 2.155 ac, 79.45% Impervious, Inflow Depth = 3.14" for 10-year event
Inflow = 11.45 cfs @ 12.13 hrs, Volume= 0.563 af
Outflow = 0.36 cfs @ 13.60 hrs, Volume= 0.562 af, Atten= 97%, Lag= 88.5 min
Primary = 0.36 cfs @ 13.60 hrs, Volume= 0.562 af
Routed to Reach 17R : Existing Storm Sewer
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 6P : Pond 1

Routing by Stor-Ind method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
Peak Elev= 81.49' @ 13.60 hrs Surf.Area= 0.186 ac Storage= 0.393 af

Plug-Flow detention time= 583.0 min calculated for 0.562 af (100% of inflow)
Center-of-Mass det. time= 581.7 min (1,352.6 - 770.9)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	0.940 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

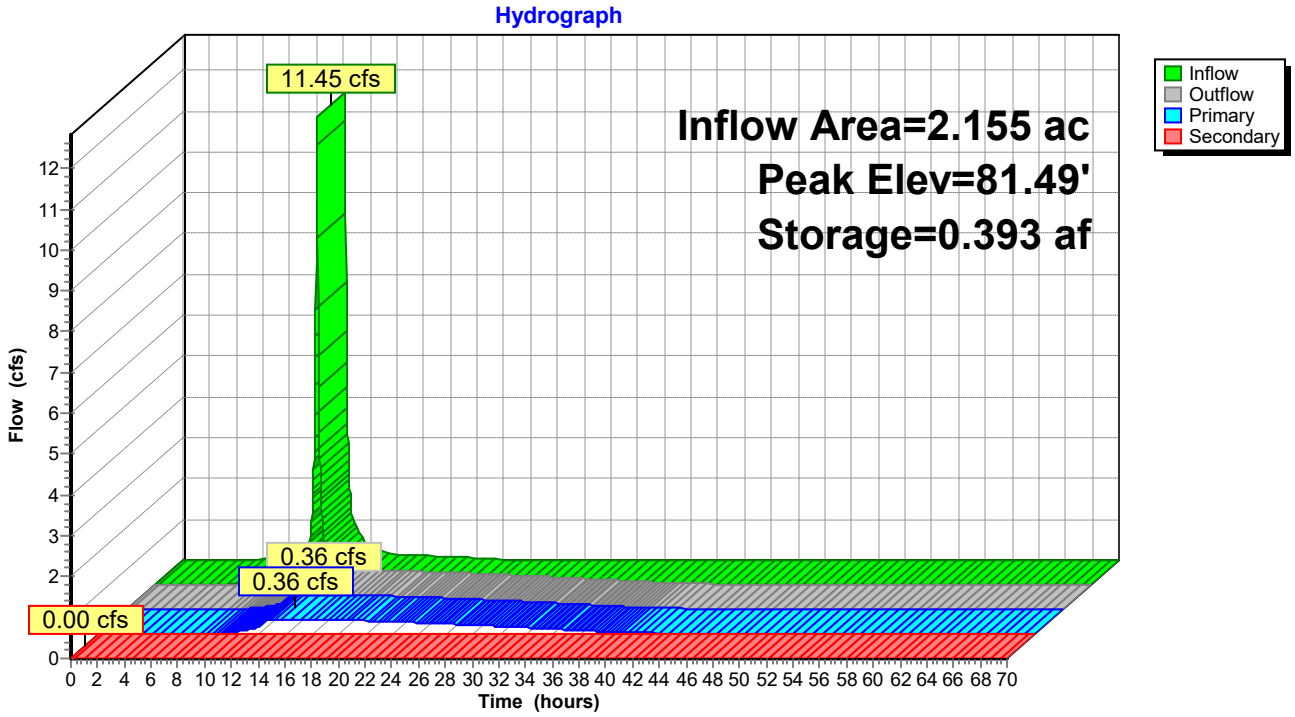
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
79.00	0.131	0.000	0.000
80.00	0.152	0.141	0.141
81.00	0.174	0.163	0.304
82.00	0.198	0.186	0.490
83.00	0.224	0.211	0.701
84.00	0.252	0.238	0.940

Device	Routing	Invert	Outlet Devices
#1	Primary	79.00'	**8.0" Round Culvert** L= 15.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 79.00' / 78.48' S= 0.0347 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.35 sf
#2	Device 1	79.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	83.00'	**10.0' long + 3.0 '/' SideZ x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.36 cfs @ 13.60 hrs HW=81.49' (Free Discharge)
└**1=Culvert** (Passes 0.36 cfs of 3.09 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 0.36 cfs @ 7.40 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=79.00' (Free Discharge)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 14P: Existing North Pond



Time span=0.00-70.00 hrs, dt=0.02 hrs, 3501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 3S: P-1 Runoff Area=116,887 sf 81.69% Impervious Runoff Depth=5.59"
Tc=6.0 min CN=95 Runoff=24.21 cfs 1.250 af

Subcatchment 4S: P-2 Runoff Area=4,600 sf 64.89% Impervious Runoff Depth=5.25"
Tc=6.0 min CN=92 Runoff=0.93 cfs 0.046 af

Subcatchment 7S: O-1 Runoff Area=13,580 sf 0.00% Impervious Runoff Depth=3.94"
Tc=6.0 min CN=80 Runoff=2.23 cfs 0.102 af

Subcatchment 8S: P-3 Runoff Area=2,794 sf 100.00% Impervious Runoff Depth=5.94"
Tc=6.0 min CN=98 Runoff=0.59 cfs 0.032 af

Subcatchment 9S: P-4 Runoff Area=664 sf 100.00% Impervious Runoff Depth=5.94"
Tc=6.0 min CN=98 Runoff=0.14 cfs 0.008 af

Subcatchment 15S: O-2 Runoff Area=93,856 sf 79.45% Impervious Runoff Depth=5.47"
Tc=6.0 min CN=94 Runoff=19.28 cfs 0.983 af

Reach 5R: Proposed Outfall Inflow=6.53 cfs 1.306 af
Outflow=6.53 cfs 1.306 af

Reach 17R: Existing Storm Sewer Inflow=0.47 cfs 0.973 af
Outflow=0.47 cfs 0.973 af

Pond 6P: Pond 1 Peak Elev=77.31' Storage=0.774 af Inflow=26.44 cfs 1.359 af
Primary=5.53 cfs 1.220 af Secondary=0.00 cfs 0.000 af Outflow=5.53 cfs 1.220 af

Pond 14P: Existing North Pond Peak Elev=83.02' Storage=0.706 af Inflow=19.28 cfs 0.983 af
Primary=0.47 cfs 0.973 af Secondary=0.11 cfs 0.007 af Outflow=0.57 cfs 0.980 af

Total Runoff Area = 5.335 ac Runoff Volume = 2.421 af Average Runoff Depth = 5.45"
24.05% Pervious = 1.283 ac 75.95% Impervious = 4.052 ac

Summary for Subcatchment 3S: P-1

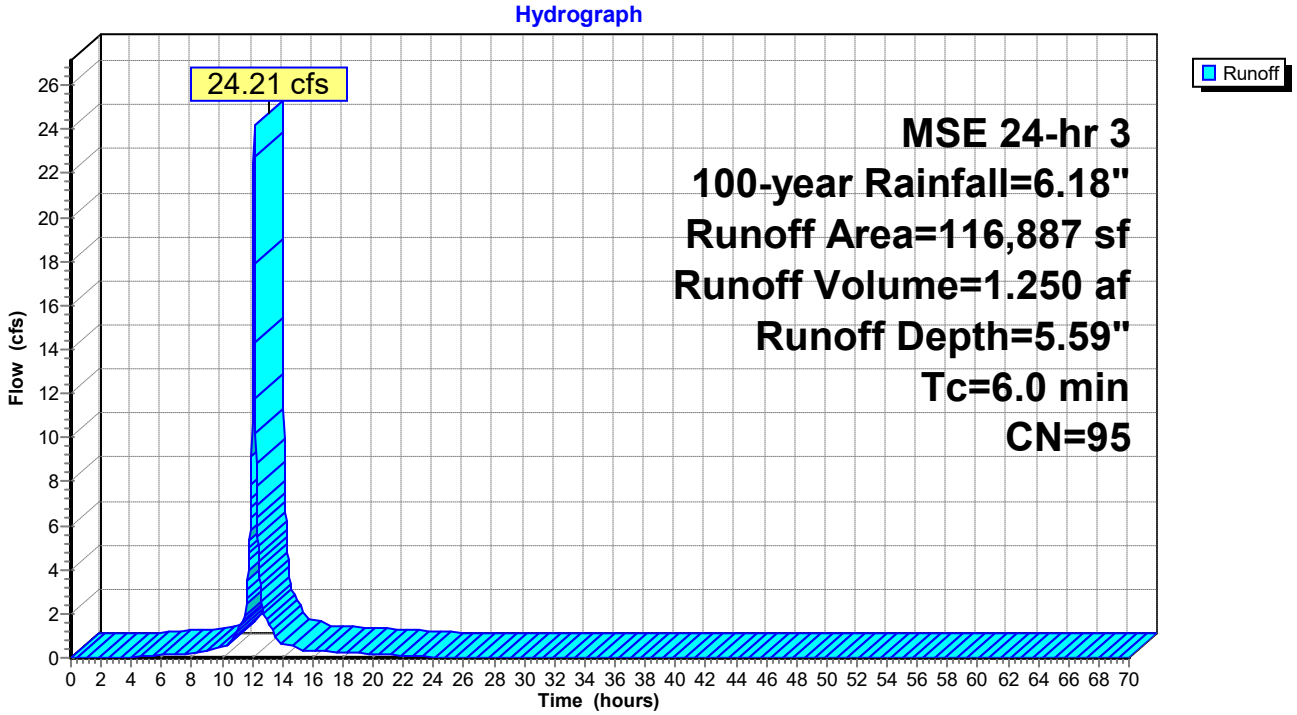
Runoff = 24.21 cfs @ 12.13 hrs, Volume= 1.250 af, Depth= 5.59"
Routed to Pond 6P : Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 100-year Rainfall=6.18"

	Area (sf)	CN	Description
	21,402	80	>75% Grass cover, Good, HSG D
*	89,879	98	impervious area
	5,606	98	Water Surface, HSG D
	116,887	95	Weighted Average
	21,402		18.31% Pervious Area
	95,485		81.69% Impervious Area

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

Subcatchment 3S: P-1



Summary for Subcatchment 4S: P-2

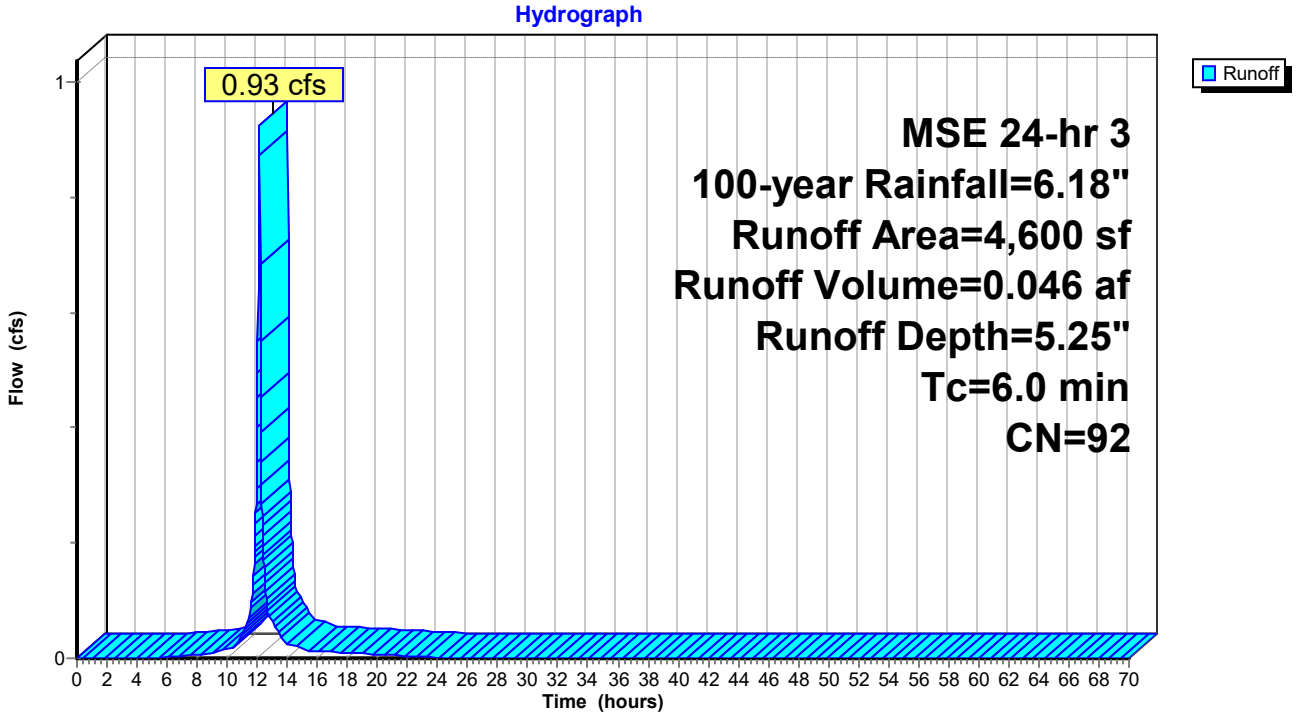
Runoff = 0.93 cfs @ 12.13 hrs, Volume= 0.046 af, Depth= 5.25"
Routed to Reach 5R : Proposed Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 100-year Rainfall=6.18"

	Area (sf)	CN	Description
	1,615	80	>75% Grass cover, Good, HSG D
*	2,985	98	impervious area
	4,600	92	Weighted Average
	1,615		35.11% Pervious Area
	2,985		64.89% Impervious Area

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

Subcatchment 4S: P-2



Summary for Subcatchment 7S: O-1

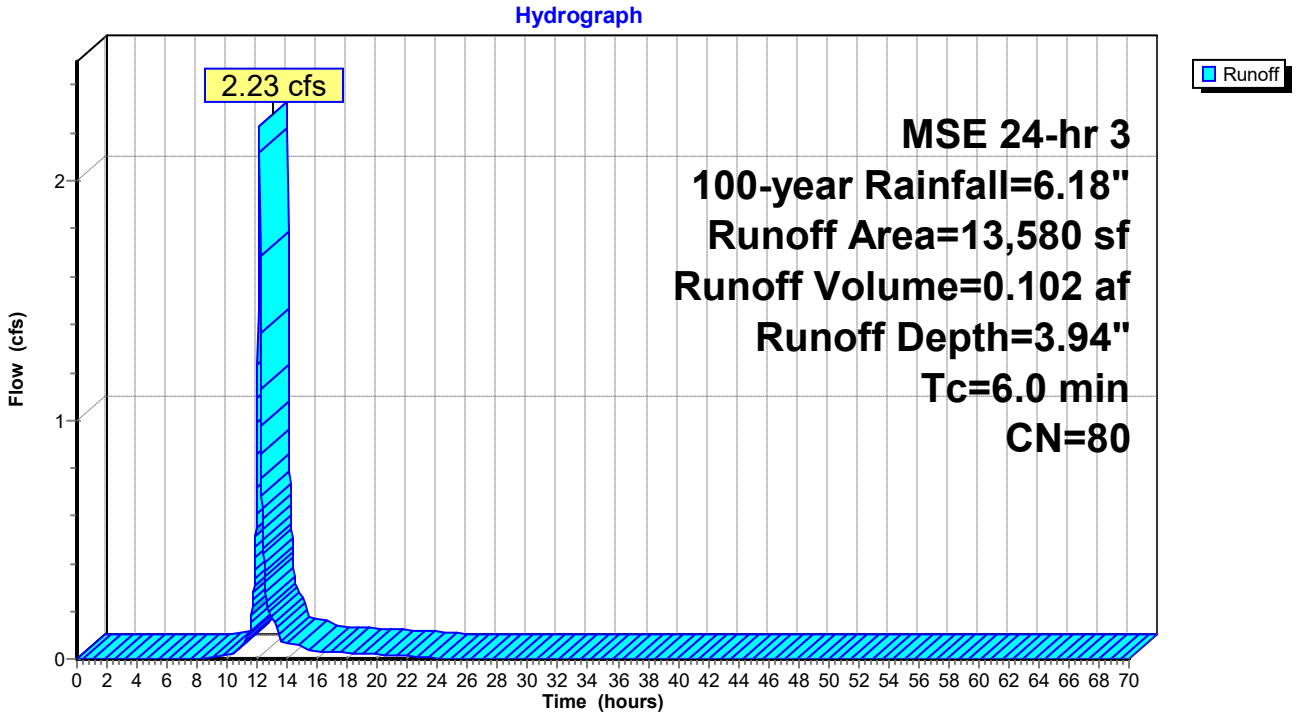
Runoff = 2.23 cfs @ 12.13 hrs, Volume= 0.102 af, Depth= 3.94"
Routed to Pond 6P : Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 100-year Rainfall=6.18"

Area (sf)	CN	Description
13,580	80	>75% Grass cover, Good, HSG D
13,580		100.00% Pervious Area

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

Subcatchment 7S: O-1



Summary for Subcatchment 8S: P-3

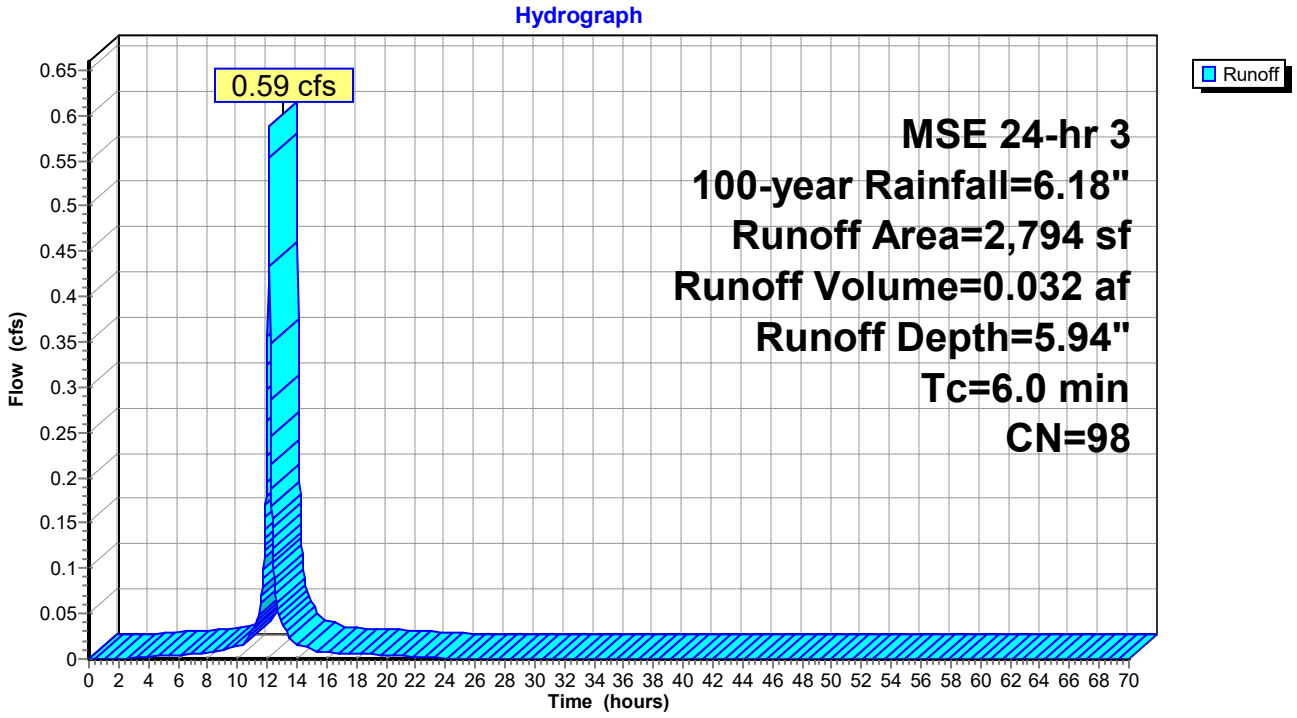
Runoff = 0.59 cfs @ 12.13 hrs, Volume= 0.032 af, Depth= 5.94"
Routed to Reach 5R : Proposed Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 100-year Rainfall=6.18"

	Area (sf)	CN	Description
*	2,794	98	impervious
	2,794		100.00% Impervious Area

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

Subcatchment 8S: P-3



Summary for Subcatchment 9S: P-4

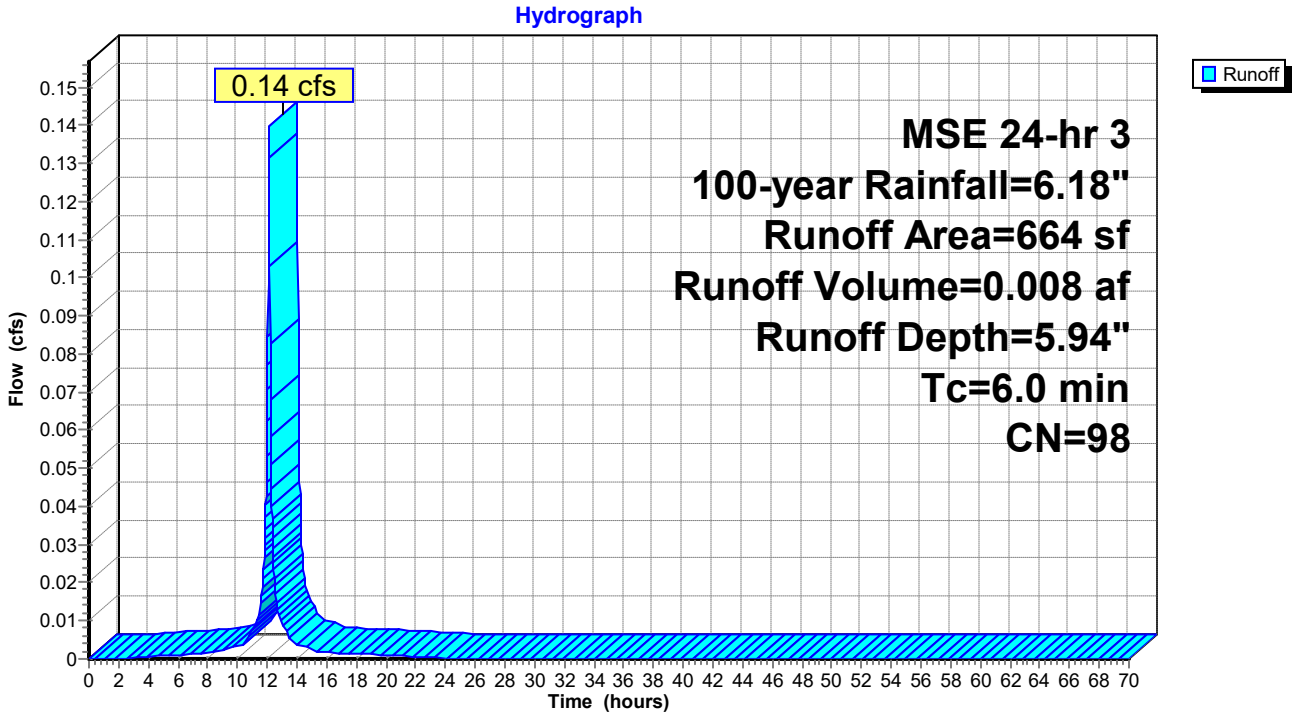
Runoff = 0.14 cfs @ 12.13 hrs, Volume= 0.008 af, Depth= 5.94"
Routed to Reach 5R : Proposed Outfall

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 100-year Rainfall=6.18"

	Area (sf)	CN	Description
*	664	98	impervious
	664		100.00% Impervious Area

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

Subcatchment 9S: P-4



Summary for Subcatchment 15S: O-2

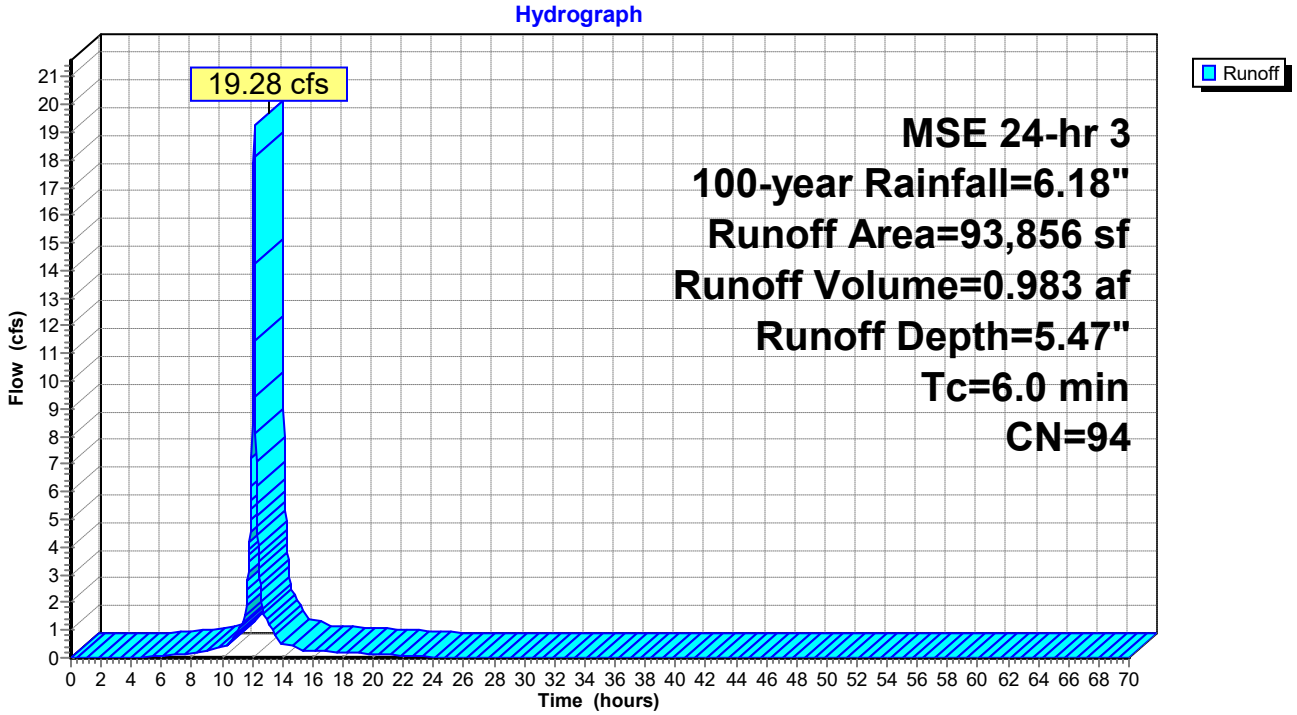
Runoff = 19.28 cfs @ 12.13 hrs, Volume= 0.983 af, Depth= 5.47"
Routed to Pond 14P : Existing North Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 100-year Rainfall=6.18"

	Area (sf)	CN	Description
*	68,882	98	impervious
	5,684	98	Water Surface, HSG D
	19,290	80	>75% Grass cover, Good, HSG D
	93,856	94	Weighted Average
	19,290		20.55% Pervious Area
	74,566		79.45% Impervious Area

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

Subcatchment 15S: O-2

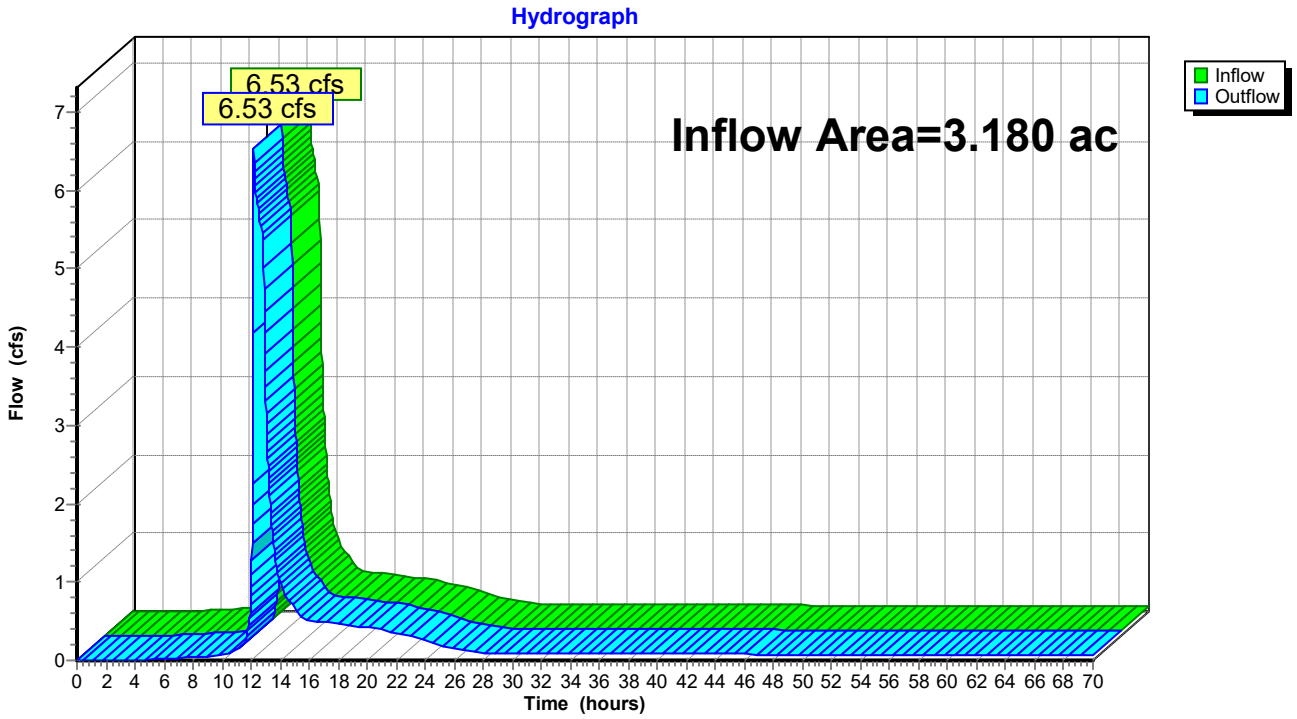


Summary for Reach 5R: Proposed Outfall

Inflow Area = 3.180 ac, 73.58% Impervious, Inflow Depth > 4.93" for 100-year event
Inflow = 6.53 cfs @ 12.18 hrs, Volume= 1.306 af
Outflow = 6.53 cfs @ 12.18 hrs, Volume= 1.306 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs

Reach 5R: Proposed Outfall

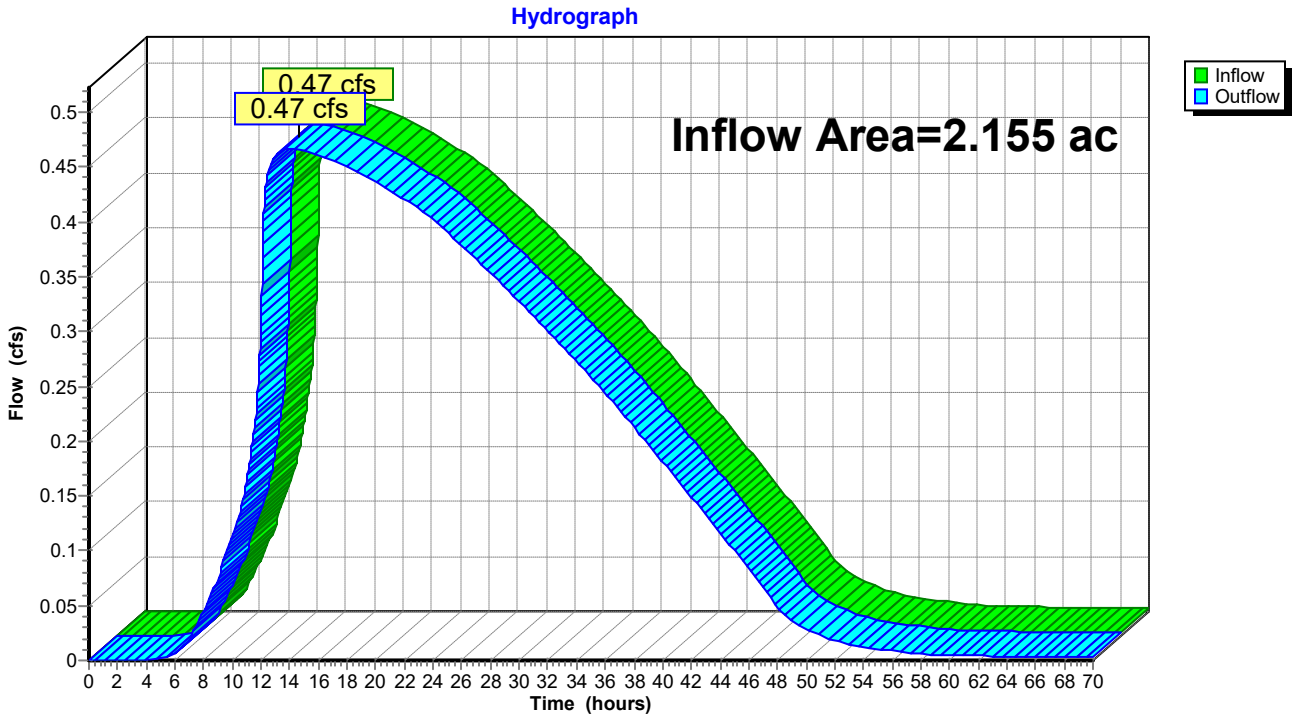


Summary for Reach 17R: Existing Storm Sewer

Inflow Area = 2.155 ac, 79.45% Impervious, Inflow Depth > 5.42" for 100-year event
Inflow = 0.47 cfs @ 13.62 hrs, Volume= 0.973 af
Outflow = 0.47 cfs @ 13.62 hrs, Volume= 0.973 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs

Reach 17R: Existing Storm Sewer



Summary for Pond 6P: Pond 1

Inflow Area = 2.995 ac, 73.19% Impervious, Inflow Depth = 5.45" for 100-year event
Inflow = 26.44 cfs @ 12.13 hrs, Volume= 1.359 af
Outflow = 5.53 cfs @ 12.38 hrs, Volume= 1.220 af, Atten= 79%, Lag= 15.2 min
Primary = 5.53 cfs @ 12.38 hrs, Volume= 1.220 af
Routed to Reach 5R : Proposed Outfall
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 5R : Proposed Outfall

Routing by Stor-Ind method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
Peak Elev= 77.31' @ 12.38 hrs Surf.Area= 0.235 ac Storage= 0.774 af

Plug-Flow detention time= 625.7 min calculated for 1.220 af (90% of inflow)
Center-of-Mass det. time= 584.4 min (1,344.4 - 760.1)

Volume	Invert	Avail.Storage	Storage Description
#1	73.00'	1.212 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

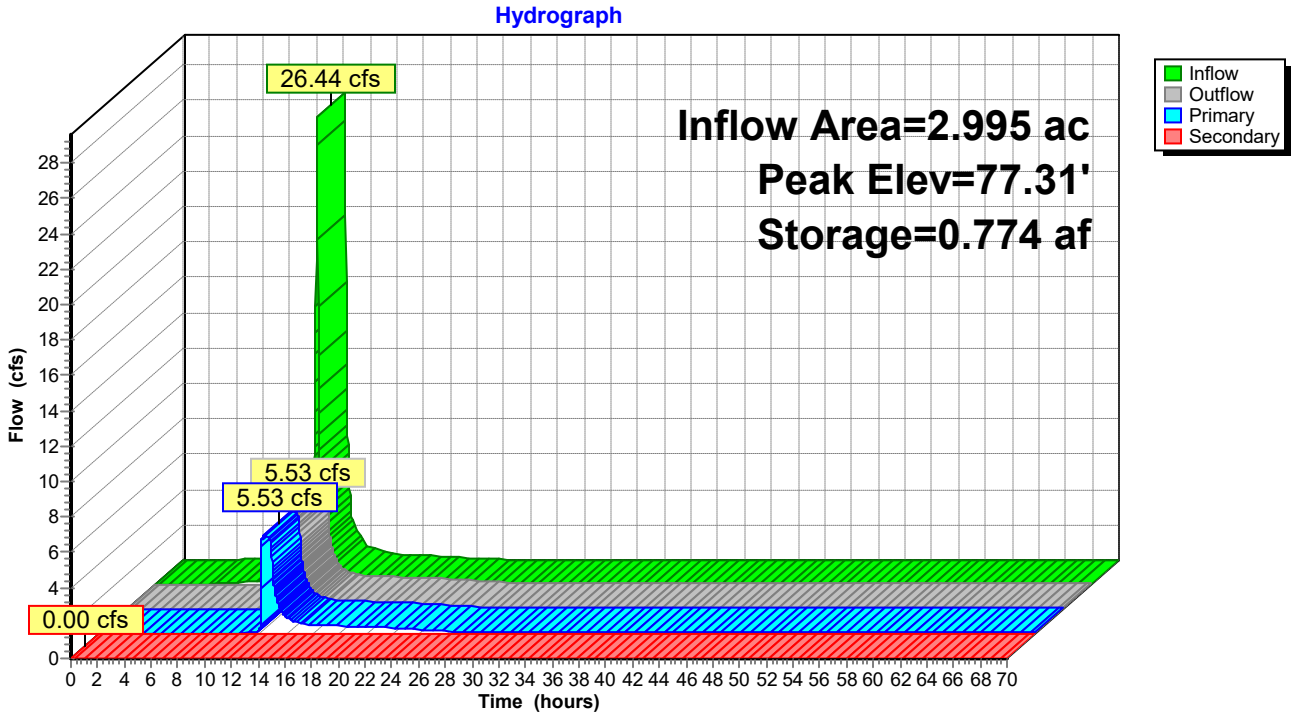
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
73.00	0.129	0.000	0.000
74.00	0.151	0.140	0.140
75.00	0.175	0.163	0.303
76.00	0.200	0.187	0.490
77.00	0.226	0.213	0.703
78.00	0.254	0.240	0.943
79.00	0.283	0.269	1.212

Device	Routing	Invert	Outlet Devices
#1	Primary	73.00'	**12.0" Round Culvert** L= 33.5' Ke= 1.000 Inlet / Outlet Invert= 73.00' / 72.00' S= 0.0299 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	73.00'	**1.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	75.50'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	76.50'	**6.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)
#5	Secondary	78.00'	**20.0' long + 1.0 '/' SideZ x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=5.53 cfs @ 12.38 hrs HW=77.31' (Free Discharge)
└**1=Culvert** (Inlet Controls 5.53 cfs @ 7.05 fps)
└**2=Orifice/Grate** (Passes < 0.12 cfs potential flow)
└**3=Orifice/Grate** (Passes < 0.54 cfs potential flow)
└**4=Sharp-Crested Vee/Trap Weir** (Passes < 14.25 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=73.00' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Pond 1



Summary for Pond 14P: Existing North Pond

Inflow Area = 2.155 ac, 79.45% Impervious, Inflow Depth = 5.47" for 100-year event
Inflow = 19.28 cfs @ 12.13 hrs, Volume= 0.983 af
Outflow = 0.57 cfs @ 13.62 hrs, Volume= 0.980 af, Atten= 97%, Lag= 89.4 min
Primary = 0.47 cfs @ 13.62 hrs, Volume= 0.973 af
Routed to Reach 17R : Existing Storm Sewer
Secondary = 0.11 cfs @ 13.62 hrs, Volume= 0.007 af
Routed to Pond 6P : Pond 1

Routing by Stor-Ind method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
Peak Elev= 83.02' @ 13.62 hrs Surf.Area= 0.225 ac Storage= 0.706 af

Plug-Flow detention time= 768.4 min calculated for 0.980 af (100% of inflow)
Center-of-Mass det. time= 766.9 min (1,527.5 - 760.6)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	0.940 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
79.00	0.131	0.000	0.000
80.00	0.152	0.141	0.141
81.00	0.174	0.163	0.304
82.00	0.198	0.186	0.490
83.00	0.224	0.211	0.701
84.00	0.252	0.238	0.940

Device	Routing	Invert	Outlet Devices
#1	Primary	79.00'	**8.0" Round Culvert** L= 15.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 79.00' / 78.48' S= 0.0347 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.35 sf
#2	Device 1	79.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	83.00'	**10.0' long + 3.0 '/' SideZ x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.47 cfs @ 13.62 hrs HW=83.02' (Free Discharge)
└**1=Culvert** (Passes 0.47 cfs of 4.01 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 0.47 cfs @ 9.50 fps)

Secondary OutFlow Max=0.07 cfs @ 13.62 hrs HW=83.02' (Free Discharge)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 0.07 cfs @ 0.34 fps)

Pond 14P: Existing North Pond

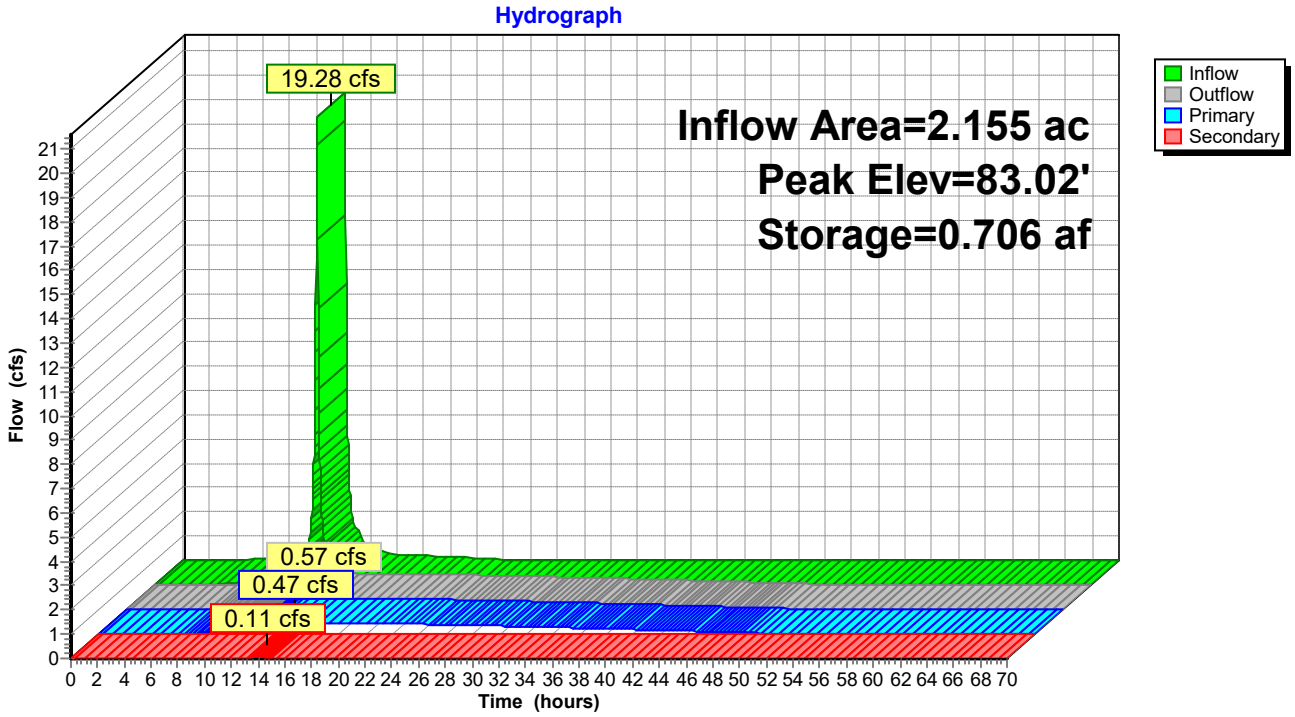


TABLE OF CONTENTS

Project Reports
1 Routing Diagram
2 Rainfall Events Listing
3 Area Listing (selected nodes)
4 Soil Listing (selected nodes)
5 Ground Covers (selected nodes)

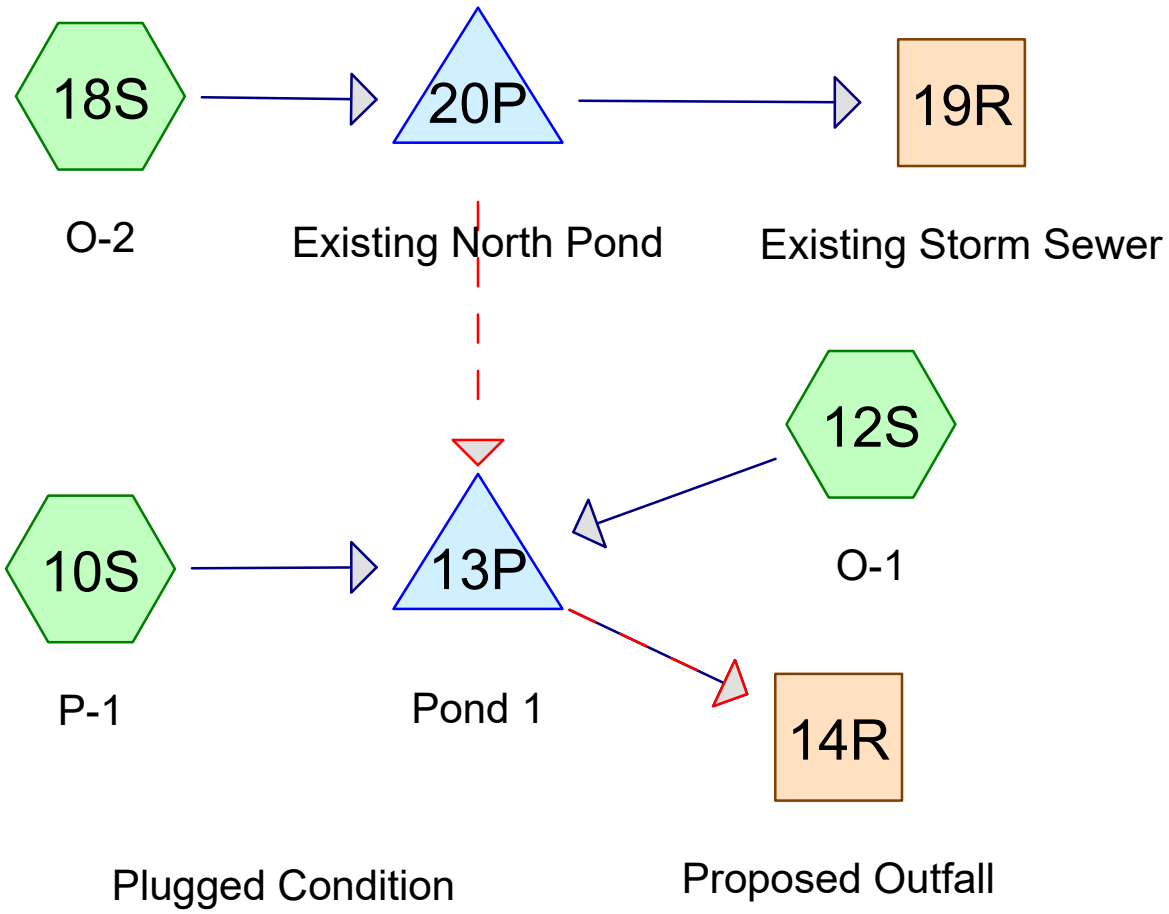
1-year Event
6 Node Listing
7 Subcat 3S: P-1
8 Subcat 4S: P-2
9 Subcat 7S: O-1
10 Subcat 8S: P-3
11 Subcat 9S: P-4
12 Subcat 15S: O-2
13 Reach 5R: Proposed Outfall
14 Reach 17R: Existing Storm Sewer
15 Pond 6P: Pond 1
17 Pond 14P: Existing North Pond

2-year Event
19 Node Listing
20 Subcat 3S: P-1
21 Subcat 4S: P-2
22 Subcat 7S: O-1
23 Subcat 8S: P-3
24 Subcat 9S: P-4
25 Subcat 15S: O-2
26 Reach 5R: Proposed Outfall
27 Reach 17R: Existing Storm Sewer
28 Pond 6P: Pond 1
30 Pond 14P: Existing North Pond

10-year Event
32 Node Listing
33 Subcat 3S: P-1
34 Subcat 4S: P-2
35 Subcat 7S: O-1
36 Subcat 8S: P-3
37 Subcat 9S: P-4
38 Subcat 15S: O-2
39 Reach 5R: Proposed Outfall
40 Reach 17R: Existing Storm Sewer
41 Pond 6P: Pond 1
43 Pond 14P: Existing North Pond

100-year Event

45 Node Listing
46 Subcat 3S: P-1
47 Subcat 4S: P-2
48 Subcat 7S: O-1
49 Subcat 8S: P-3
50 Subcat 9S: P-4
51 Subcat 15S: O-2
52 Reach 5R: Proposed Outfall
53 Reach 17R: Existing Storm Sewer
54 Pond 6P: Pond 1
56 Pond 14P: Existing North Pond



Subcat Reach Pond Link

Routing Diagram for 3250218 Waukesha STOR-IT Right
Prepared by RA Smith, Printed 6/23/2026
HydroCAD® 10.20-8a s/n 02878 © 2025 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	100-year	MSE 24-hr	3	Default	24.00	1	6.18	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.246	80	>75% Grass cover, Good, HSG D (10S, 12S, 18S)
0.259	98	Water Surface, HSG D (10S, 18S)
1.581	98	impervious (18S)
2.063	98	impervious area (10S)
5.150	**94**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
1.505	HSG D	10S, 12S, 18S
3.645	Other	10S, 18S
5.150		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	1.246	0.000	1.246	>75% Grass cover, Good	10S, 12S, 18S
0.000	0.000	0.000	0.259	0.000	0.259	Water Surface	10S, 18S
0.000	0.000	0.000	0.000	1.581	1.581	impervious	18S
0.000	0.000	0.000	0.000	2.063	2.063	impervious area	10S
0.000	**0.000**	**0.000**	**1.505**	**3.645**	**5.150**	**TOTAL AREA**	

Time span=0.00-70.00 hrs, dt=0.02 hrs, 3501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10S: P-1 Runoff Area=116,887 sf 81.69% Impervious Runoff Depth=5.59"
Tc=6.0 min CN=95 Runoff=24.21 cfs 1.250 af

Subcatchment 12S: O-1 Runoff Area=13,580 sf 0.00% Impervious Runoff Depth=3.94"
Tc=6.0 min CN=80 Runoff=2.23 cfs 0.102 af

Subcatchment 18S: O-2 Runoff Area=93,856 sf 79.45% Impervious Runoff Depth=5.47"
Tc=6.0 min CN=94 Runoff=19.28 cfs 0.983 af

Reach 14R: Proposed Outfall Inflow=23.07 cfs 1.359 af
Outflow=23.07 cfs 1.359 af

Reach 19R: Existing Storm Sewer Inflow=0.47 cfs 0.973 af
Outflow=0.47 cfs 0.973 af

Pond 13P: Pond 1 Peak Elev=78.56' Storage=1.091 af Inflow=26.44 cfs 1.359 af
Outflow=23.07 cfs 1.359 af

Pond 20P: Existing North Pond Peak Elev=83.02' Storage=0.706 af Inflow=19.28 cfs 0.983 af
Primary=0.47 cfs 0.973 af Secondary=0.11 cfs 0.007 af Outflow=0.57 cfs 0.980 af

Total Runoff Area = 5.150 ac Runoff Volume = 2.336 af Average Runoff Depth = 5.44"
24.19% Pervious = 1.246 ac 75.81% Impervious = 3.904 ac

Summary for Subcatchment 10S: P-1

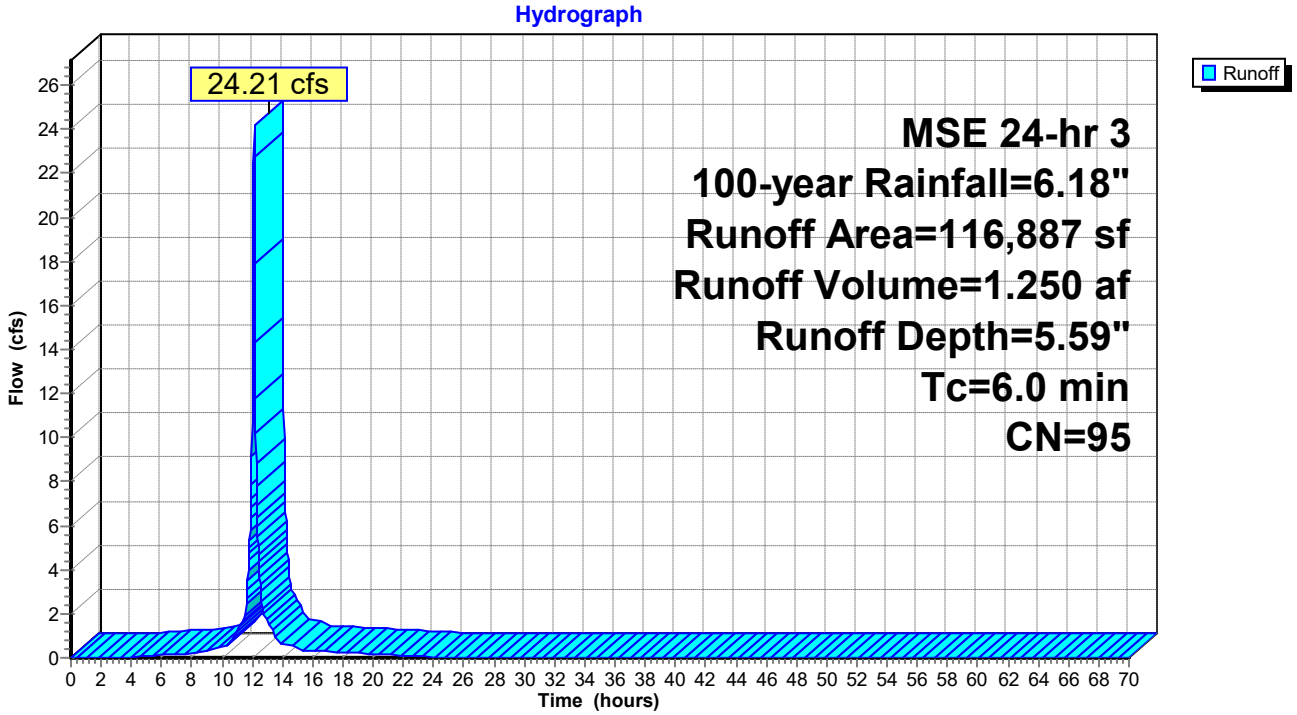
Runoff = 24.21 cfs @ 12.13 hrs, Volume= 1.250 af, Depth= 5.59"
Routed to Pond 13P : Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 100-year Rainfall=6.18"

	Area (sf)	CN	Description
	21,402	80	>75% Grass cover, Good, HSG D
*	89,879	98	impervious area
	5,606	98	Water Surface, HSG D
	116,887	95	Weighted Average
	21,402		18.31% Pervious Area
	95,485		81.69% Impervious Area

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

Subcatchment 10S: P-1



Summary for Subcatchment 12S: O-1

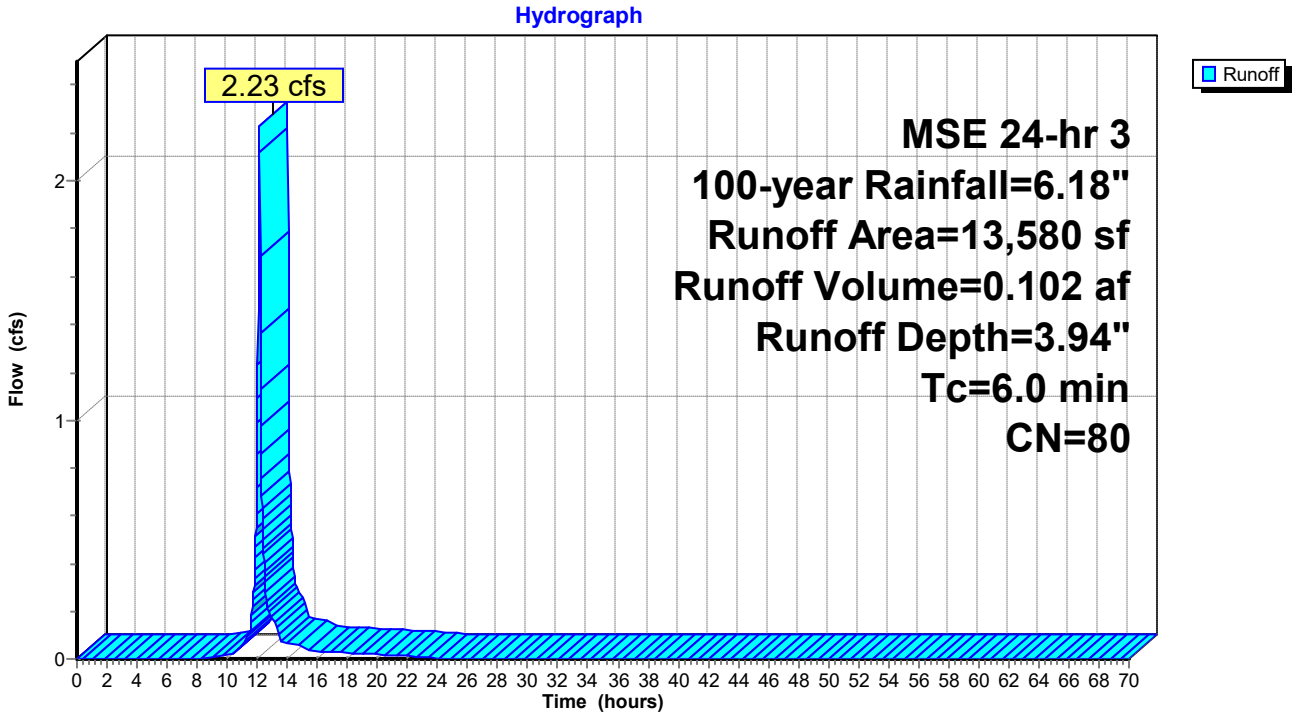
Runoff = 2.23 cfs @ 12.13 hrs, Volume= 0.102 af, Depth= 3.94"
Routed to Pond 13P : Pond 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 100-year Rainfall=6.18"

Area (sf)	CN	Description
13,580	80	>75% Grass cover, Good, HSG D
13,580		100.00% Pervious Area

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

Subcatchment 12S: O-1



Summary for Subcatchment 18S: O-2

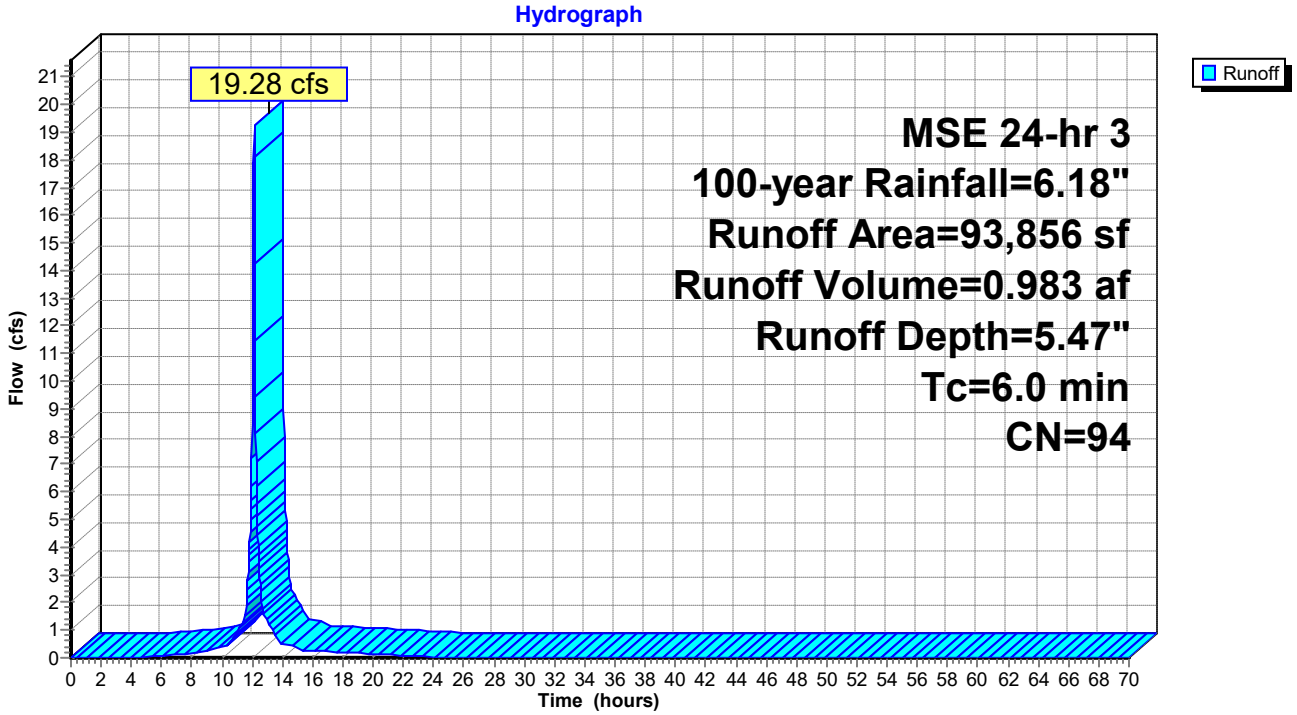
Runoff = 19.28 cfs @ 12.13 hrs, Volume= 0.983 af, Depth= 5.47"
Routed to Pond 20P : Existing North Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
MSE 24-hr 3 100-year Rainfall=6.18"

	Area (sf)	CN	Description
*	68,882	98	impervious
	5,684	98	Water Surface, HSG D
	19,290	80	>75% Grass cover, Good, HSG D
	93,856	94	Weighted Average
	19,290		20.55% Pervious Area
	74,566		79.45% Impervious Area

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

Subcatchment 18S: O-2

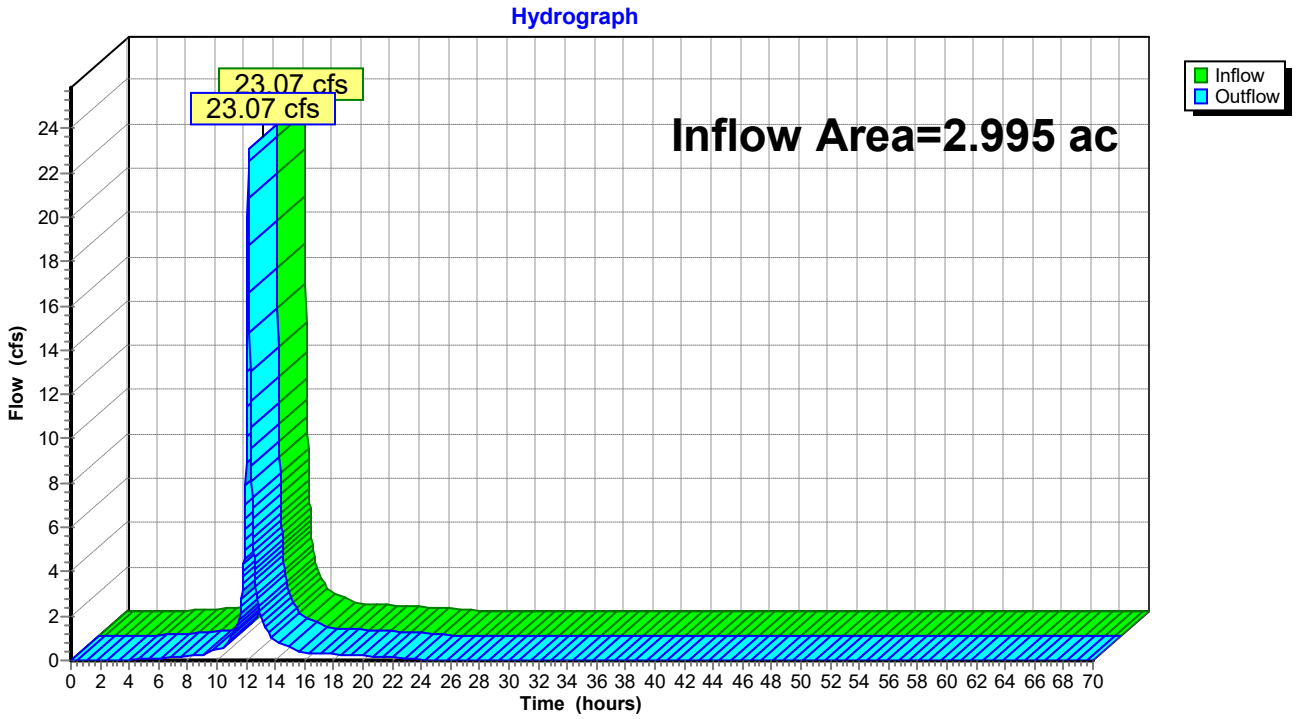


Summary for Reach 14R: Proposed Outfall

Inflow Area = 2.995 ac, 73.19% Impervious, Inflow Depth = 5.45" for 100-year event
Inflow = 23.07 cfs @ 12.16 hrs, Volume= 1.359 af
Outflow = 23.07 cfs @ 12.16 hrs, Volume= 1.359 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs

Reach 14R: Proposed Outfall

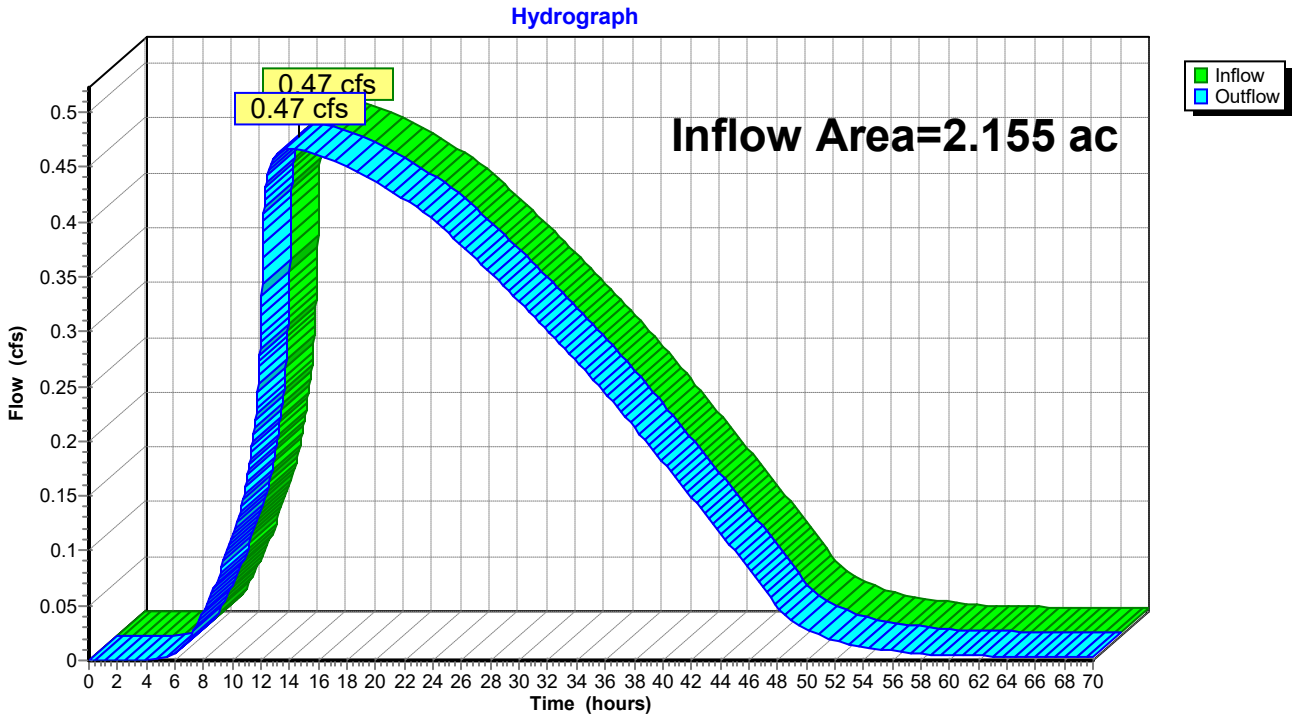


Summary for Reach 19R: Existing Storm Sewer

Inflow Area = 2.155 ac, 79.45% Impervious, Inflow Depth > 5.42" for 100-year event
Inflow = 0.47 cfs @ 13.62 hrs, Volume= 0.973 af
Outflow = 0.47 cfs @ 13.62 hrs, Volume= 0.973 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs

Reach 19R: Existing Storm Sewer



Summary for Pond 13P: Pond 1

Inflow Area = 2.995 ac, 73.19% Impervious, Inflow Depth = 5.45" for 100-year event
Inflow = 26.44 cfs @ 12.13 hrs, Volume= 1.359 af
Outflow = 23.07 cfs @ 12.16 hrs, Volume= 1.359 af, Atten= 13%, Lag= 2.0 min
Secondary = 23.07 cfs @ 12.16 hrs, Volume= 1.359 af
Routed to Reach 14R : Proposed Outfall

Routing by Stor-Ind method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
Starting Elev= 78.00' Surf.Area= 0.254 ac Storage= 0.943 af
Peak Elev= 78.56' @ 12.16 hrs Surf.Area= 0.270 ac Storage= 1.091 af (0.148 af above start)

Plug-Flow detention time= 291.6 min calculated for 0.416 af (31% of inflow)
Center-of-Mass det. time= 10.5 min (770.6 - 760.1)

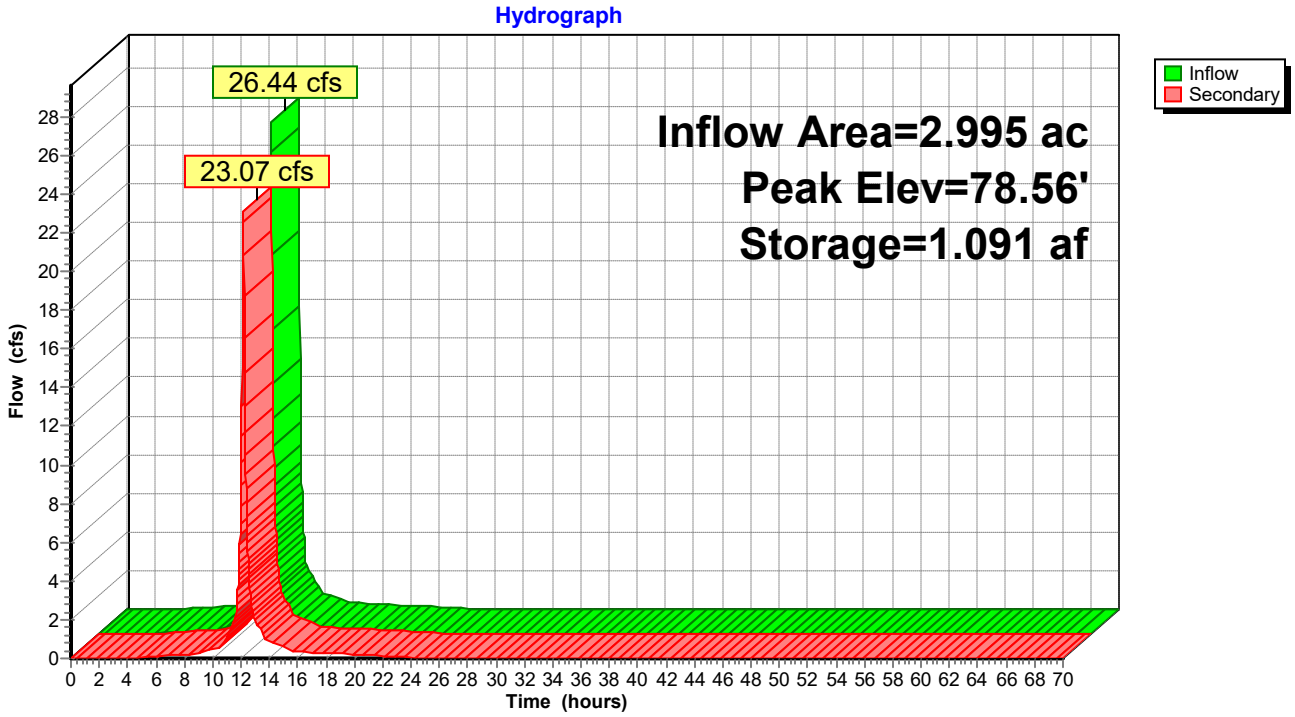
Volume	Invert	Avail.Storage	Storage Description
#1	73.00'	1.212 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
73.00	0.129	0.000	0.000
74.00	0.151	0.140	0.140
75.00	0.175	0.163	0.303
76.00	0.200	0.187	0.490
77.00	0.226	0.213	0.703
78.00	0.254	0.240	0.943
79.00	0.283	0.269	1.212

Device	Routing	Invert	Outlet Devices
#1	Secondary	78.00'	**20.0' long + 1.0 '/' SideZ x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Secondary OutFlow Max=22.94 cfs @ 12.16 hrs HW=78.56' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 22.94 cfs @ 1.98 fps)

Pond 13P: Pond 1



Summary for Pond 20P: Existing North Pond

Inflow Area = 2.155 ac, 79.45% Impervious, Inflow Depth = 5.47" for 100-year event
Inflow = 19.28 cfs @ 12.13 hrs, Volume= 0.983 af
Outflow = 0.57 cfs @ 13.62 hrs, Volume= 0.980 af, Atten= 97%, Lag= 89.4 min
Primary = 0.47 cfs @ 13.62 hrs, Volume= 0.973 af
Routed to Reach 19R : Existing Storm Sewer
Secondary = 0.11 cfs @ 13.62 hrs, Volume= 0.007 af
Routed to Pond 13P : Pond 1

Routing by Stor-Ind method, Time Span= 0.00-70.00 hrs, dt= 0.02 hrs
Peak Elev= 83.02' @ 13.62 hrs Surf.Area= 0.225 ac Storage= 0.706 af

Plug-Flow detention time= 768.4 min calculated for 0.980 af (100% of inflow)
Center-of-Mass det. time= 766.9 min (1,527.5 - 760.6)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	0.940 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
79.00	0.131	0.000	0.000
80.00	0.152	0.141	0.141
81.00	0.174	0.163	0.304
82.00	0.198	0.186	0.490
83.00	0.224	0.211	0.701
84.00	0.252	0.238	0.940

Device	Routing	Invert	Outlet Devices
#1	Primary	79.00'	**8.0" Round Culvert** L= 15.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 79.00' / 78.48' S= 0.0347 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.35 sf
#2	Device 1	79.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	83.00'	**10.0' long + 3.0 '/' SideZ x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.47 cfs @ 13.62 hrs HW=83.02' (Free Discharge)
1=Culvert (Passes 0.47 cfs of 4.01 cfs potential flow)
2=Orifice/Grate (Orifice Controls 0.47 cfs @ 9.50 fps)

Secondary OutFlow Max=0.07 cfs @ 13.62 hrs HW=83.02' (Free Discharge)
3=Broad-Crested Rectangular Weir (Weir Controls 0.07 cfs @ 0.34 fps)

Pond 20P: Existing North Pond

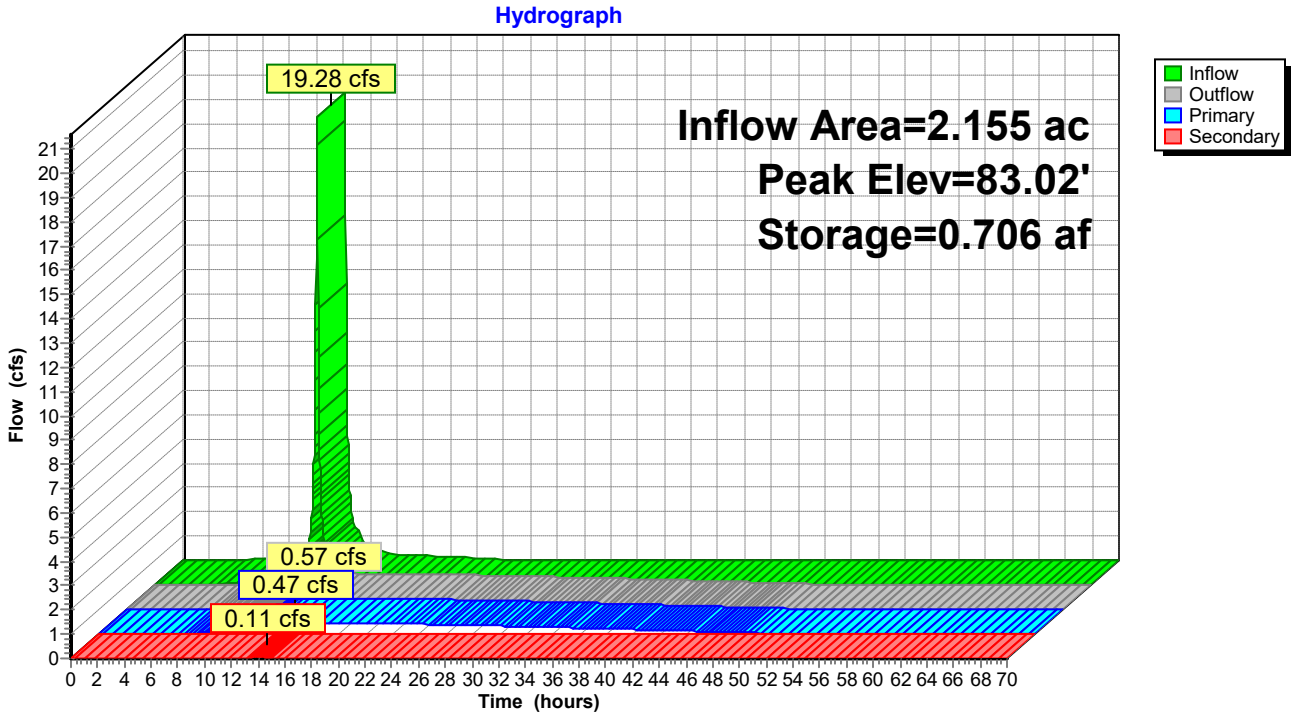


TABLE OF CONTENTS

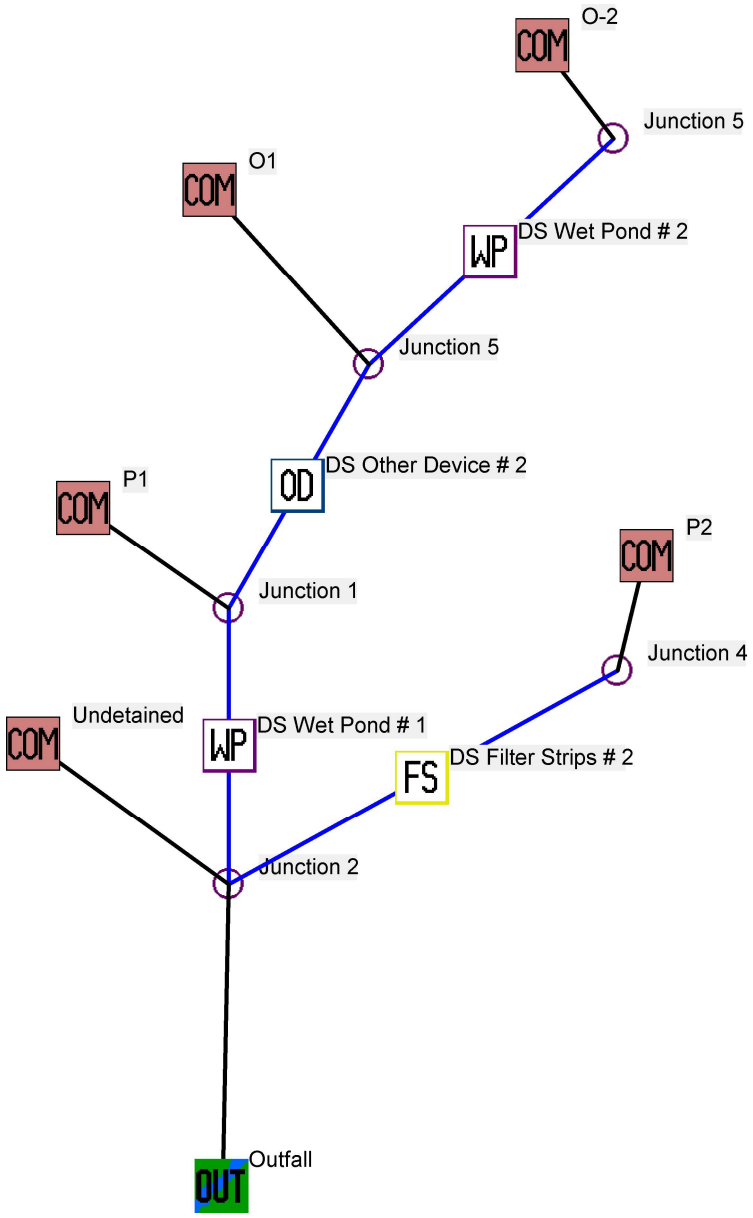
Project Reports

1 Routing Diagram
2 Rainfall Events Listing (selected events)
3 Area Listing (selected nodes)
4 Soil Listing (selected nodes)
5 Ground Covers (selected nodes)

100-year Event

6 Node Listing
7 Subcat 10S: P-1
8 Subcat 12S: O-1
9 Subcat 18S: O-2
10 Reach 14R: Proposed Outfall
11 Reach 19R: Existing Storm Sewer
12 Pond 13P: Pond 1
14 Pond 20P: Existing North Pond

Appendix C
Water Quality Design


O-2
COM
Junction 5
O1
COM
DS Wet Pond # 2
WP
Junction 5
DS Other Device # 2
OD
P1
COM
P2
COM
Junction 1
Junction 4
Undetained
COM
DS Wet Pond # 1
WP
DS Filter Strips # 2
FS
Junction 2
Outfall
OUT

Data file name: P:\3250218\Eng Data\Hydrology\3250218 STOR-IT Waukesha WinSLAMM-filter.mdb
WinSLAMM Version 10.5.0
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Milwaukee WI 1969.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
If Other Device Pollutant Load Reduction Values = 1, Off-site Pollutant Loads are Removed from Pollutant Load % Reduction calculations
Seed for random number generator: -42
Study period starting date: 01/05/69 Study period ending date: 12/31/69
Start of Winter Season: 12/06 End of Winter Season: 03/28
Date: 06-23-2026 Time: 14:37:19
Site information:

LU# 1 - Commercial: P1 Total area (ac): 2.683
1 - Roofs 1: 1.470 ac. Pitched Connected PSD File: C:\WinSLAMM Files\NURP.cpz Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
13 - Paved Parking 1: 0.585 ac. Connected PSD File: C:\WinSLAMM Files\NURP.cpz Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.008 ac. Connected PSD File: C:\WinSLAMM Files\NURP.cpz Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.491 ac. Normal Clayey Low Density PSD File: C:\WinSLAMM Files\NURP.cpz Source Area PSD File: C:\WinSLAMM Fi
70 - Water Body Areas: 0.129 ac. PSD File: Source Area PSD File:

LU# 2 - Commercial: Undetained Total area (ac): 0.079
25 - Driveways 1: 0.064 ac. Connected PSD File: C:\WinSLAMM Files\NURP.cpz Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
26 - Driveways 2: 0.015 ac. Connected PSD File: C:\WinSLAMM Files\NURP.cpz Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 3 - Commercial: O1 Total area (ac): 0.198
45 - Large Landscaped Areas 1: 0.198 ac. Normal Clayey Low Density PSD File: C:\WinSLAMM Files\NURP.cpz Source Area PSD File: C:\WinSLAMM Fi

LU# 4 - Commercial: P2 Total area (ac): 0.106
13 - Paved Parking 1: 0.069 ac. Connected PSD File: C:\WinSLAMM Files\NURP.cpz Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
70 - Water Body Areas: 0.037 ac. PSD File: Source Area PSD File:

LU# 5 - Commercial: O-2 Total area (ac): 2.024
1 - Roofs 1: 0.575 ac. Flat Connected PSD File: C:\WinSLAMM Files\NURP.cpz Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
13 - Paved Parking 1: 1.006 ac. Connected PSD File: C:\WinSLAMM Files\NURP.cpz Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.443 ac. Normal Clayey Low Density PSD File: C:\WinSLAMM Files\NURP.cpz Source Area PSD File: C:\WinSLAMM Fi

Control Practice 1: Wet Detention Pond CP# 1 (DS) - DS Wet Pond # 1

Particle Size Distribution file name: Not needed - calculated by program
Initial stage elevation (ft): 5
Peak to Average Flow Ratio: 3.8
Maximum flow allowed into pond (cfs): No maximum value entered
Outlet Characteristics:

Outlet type: Sharp Crested Weir
1. Sharp crested weir length (ft): 6
2. Sharp crested weir height from invert: 2
3. Sharp crested weir invert elevation above datum (ft): 9

Outlet type: Orifice 1
1. Orifice diameter (ft): 0.13
2. Number of orifices: 1
3. Invert elevation above datum (ft): 5

Outlet type: Orifice 2
1. Orifice diameter (ft): 0.33
2. Number of orifices: 1
3. Invert elevation above datum (ft): 7.5

Outlet type: Broad Crested Weir
1. Weir crest length (ft): 20
2. Weir crest width (ft): 10
3. Height from datum to bottom of weir opening: 10

Pond stage and surface area

Entry Number	Stage (ft)	Pond Area (acres)	Natural Seepage (in/hr)	Other Outflow (cfs)
0	0.00	0.0000	0.00	0.00
1	0.01	0.0245	0.00	0.00
2	1.00	0.0328	0.00	0.00
3	2.00	0.0418	0.00	0.00
4	3.00	0.0513	0.00	0.00
5	4.00	0.0614	0.00	0.00
6	5.00	0.1287	0.00	0.00
7	6.00	0.1511	0.00	0.00
8	7.00	0.1748	0.00	0.00
9	8.00	0.1998	0.00	0.00
10	9.00	0.2262	0.00	0.00
11	10.00	0.2538	0.00	0.00
12	11.00	0.2827	0.00	0.00

Control Practice 2: Filter Strip CP# 1 (DS) - DS Filter Strips # 2

Total drainage area (acres)= 0.106
Fraction of drainage area served by filter strips (ac) = 1.00
Total filter strip width (ft) = 55.0
Effective flow length (ft) = 30
Infiltration rate (in/hr)= 0.010
Typical longitudinal slope (ft.H/ft.V) = 0.250
Typical grass height (in) = 8.0
Swale retardance factor = B
Use stochastic analysis to determine infiltration rate: False
Infiltration rate coeficient of variation (COV) = 0.00
Particle size distribution file name: Not needed - calculated by program
Surface Clogging Load (lbs/sf) = 3.50

Control Practice 3: Other Device CP# 1 (DS) - DS Other Device # 2

Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 0.00
Runoff volume reduction fraction = 0

Control Practice 4: Wet Detention Pond CP# 2 (DS) - DS Wet Pond # 2

Particle Size Distribution file name: Not needed - calculated by program

Initial stage elevation (ft): 3

Peak to Average Flow Ratio: 3.8

Maximum flow allowed into pond (cfs): No maximum value entered

Outlet Characteristics:

Outlet type: Orifice 1

1. Orifice diameter (ft): 0.25
2. Number of orifices: 1
3. Invert elevation above datum (ft): 3

Outlet type: Broad Crested Weir

1. Weir crest length (ft): 10
2. Weir crest width (ft): 4
3. Height from datum to bottom of weir opening: 7

Pond stage and surface area

Entry Number	Stage (ft)	Pond Area (acres)	Natural Seepage (in/hr)	Other Outflow (cfs)
0	0.00	0.0000	0.00	0.00
1	0.01	0.1305	0.00	0.00
2	1.00	0.1305	0.00	0.00
3	2.00	0.1305	0.00	0.00
4	3.00	0.1305	0.00	0.00
5	4.00	0.1517	0.00	0.00
6	5.00	0.1744	0.00	0.00
7	6.00	0.1984	0.00	0.00
8	7.00	0.2243	0.00	0.00
9	8.00	0.2516	0.00	0.00

SLAMM for Windows Version 10.5.0
(c) Copyright Robert Pitt and John Voorhees 2019, All Rights Reserved

Data file name: P:\3250218\Eng Data\Hydrology\3250218 STOR-IT Waukesha WinSLAMM-filter.mdb
WinSLAMM Version 10.5.0
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Milwaukee WI 1969.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
If Other Device Pollutant Load Reduction Values = 1, Off-site Pollutant Loads are Removed from Pollutant Load % Reduction calculations
Seed for random number generator: -42
Study period starting date: 01/05/69 Study period ending date: 12/31/69
Start of Winter Season: 12/06 End of Winter Season: 03/28
Model Run Start Date: 01/05/69 Model Run End Date: 12/31/69
Date of run: 06-23-2026 Time of run: 14:41:07
Total Area Modeled (acres): 5.090
Years in Model Run: 0.99

	Runoff Volume (cu ft)	Percent Runoff Volume Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction
Total of all Land Uses without Controls:	349461	-	66.85	1458	-
Outfall Total with Controls:	348659	0.23%	8.019	174.5	88.03%
Annualized Total After Outfall Controls:	353501			177.0	

Appendix D
Soil Information

Geotechnical Engineering Exploration and Analysis

Proposed Stor It Right
Coral Drive and Dolphin Drive
Waukesha, Wisconsin

Prepared for:

Stor It Right
Pewaukee, Wisconsin

April 21, 2026
Giles Project No. 1G-2603032

GILES
ENGINEERING ASSOCIATES, INC.

GILES
ENGINEERING ASSOCIATES, INC.
GEOTECHNICAL, ENVIRONMENTAL & CONSTRUCTION MATERIALS CONSULTANTS

• Dallas, TX
• Los Angeles, CA
• Milwaukee, WI

April 21, 2026

Stor It Right
W284 N3234 Lakeside Road
Pewaukee, WI 53072

Attention: Joe Grasch
Manager

Subject: Geotechnical Engineering Exploration and Analysis
Proposed Stor It Right
Coral Drive and Dolphin Drive
Waukesha, Wisconsin
Giles Project No. 1G-2603032

Dear Mr. Grasch:

As requested, Giles Engineering Associates, Inc. conducted a *Geotechnical Engineering Exploration and Analysis* for the proposed project. The accompanying report describes the services that were performed, and it provides geotechnical-related findings, conclusions, and recommendations that were derived from those services.

We sincerely appreciate the opportunity to provide geotechnical services for the proposed project. Please contact the undersigned if there are questions about the report or if we may be of further service.

Very truly yours,

GILES ENGINEERING ASSOCIATES, INC.

Evan R. Axtell, E.I.T.
Staff Professional

Colleen M. Finley, P.E.
Geotechnical Department Manager

WISCONSIN
COLLEEN M. FINLEY
100150-6
OCONOMOWOC, WISCONSIN
4/21/26
PROFESSIONAL ENGINEER

Distribution: Stor It Right
Attn: Joe Grasch (email: jgrasch@hcipropertieswi.com)

TABLE OF CONTENTS

GEOTECHNICAL ENGINEERING EXPLORATION AND ANALYSIS

PROPOSED STOR IT RIGHT
CORAL DRIVE AND DOLPHIN DRIVE
WAUKESHA, WISCONSIN
GILES PROJECT NO. 1G-2603032

Section No.	Description	Page No.
EXECUTIVE SUMMARY		i
1.0	SCOPE OF SERVICES	1
2.0	SITE DESCRIPTION	1
3.0	WEB SOIL SURVEY	2
4.0	PROJECT DESCRIPTION	2
5.0	GEOTECHNICAL SUBSURFACE EXPLORATION PROGRAM	3
6.0	GEOTECHNICAL LABORATORY SERVICES	3
7.0	MATERIAL CONDITIONS	4
7.1.	Surface Material	4
7.2.	Fill Material	4
7.3.	Native Soil	4
8.0	GROUNDWATER CONDITIONS	5
9.0	CONCLUSIONS AND RECOMMENDATIONS	5
9.1.	Risk of Excessive Settlement	5
9.2.	Seismic Design Considerations	6
9.3.	Building Foundation Recommendations	6
9.4.	At-Grade Floor Slab Recommendations	8
9.5.	Pavement Recommendations	9
9.6.	Generalized Site Preparation Recommendations	11
9.7.	Generalized Construction Considerations	13
9.8.	Recommended Construction Materials Testing Services	14
10.0	BASIS OF REPORT	14

APPENDICES
Appendix A - Figure (1) and Test Boring Logs (7)
Appendix B - Field Procedures
Appendix C - Laboratory Testing and Classification
Appendix D - General Information and Important Information about This Geotechnical Report

© Giles Engineering Associates, Inc. 2026

GEOTECHNICAL ENGINEERING EXPLORATION AND ANALYSIS

PROPOSED STOR IT RIGHT
CORAL DRIVE AND DOLPHIN DRIVE
WAUKESHA, WISCONSIN
GILES PROJECT NO. 1G-2603032

EXECUTIVE SUMMARY

This Executive Summary provides limited geotechnical information regarding the proposed project. Because this Executive Summary is exceedingly abbreviated, it must be read in complete context with the following report ("Report").

Subsurface Conditions

- Seven geotechnical test borings were conducted at the site.
- Topsoil fill was at the surface at each test boring and was between ±3½ and ±8 inches thick.
- At each test boring, material classified as fill was below the topsoil and was encountered to depths between ±9 and ±23 feet below-ground. The fill material was variable and consisted of lean clay, sandy clay, clayey sand, sand (various gradations), and sandy silt with variable amounts of sand and gravel throughout the samples. Concrete rubble was encountered within the fill at Test Borings 1 and 2. Glass debris was encountered within the fill at Test Boring 4. Brick rubble and wood fragments were encountered within the fill at Test Boring 5. Based on field and laboratory testing, the fill material typically exhibited relatively moderate strength characteristics.
- A layer of buried topsoil was encountered below the fill at Test Borings 1 and 5 to depths of ±13½ and ±20 feet below-ground, respectively. Peat was encountered below the buried topsoil at Test Boring 1 and was encountered to ±16½ feet below-ground. Slightly organic silty clay was encountered below the fill material at Test Boring 3 and was encountered to the ±26-foot termination depth. Based on laboratory testing, the organic soil had relatively high moisture contents and is considered to be moderately compressible.
- Native non-organic soil was encountered below the native organic soil and fill material and was present to the test boring termination depths. The native non-organic soil generally consisted of lean clay and sand (various gradations) with variable amounts of gravel; however, silty clay, sandy silt, and silty sand were also encountered.
- Based on the subsurface conditions encountered in the test borings, it is estimated that the water table was about ±11½ to ±23 feet below the ground surface at the time of drilling. Furthermore, it is estimated that the water table was between approximately ±El. 843 and ±El. 849. However, the site also appears to be subject to shallower perched-groundwater conditions, where groundwater perches above the water table, especially within the existing fill and shallow cohesive soils.

Building Foundations

- The proposed buildings can be supported by spread-footing foundations; however, because of the existing fill, a layer of compacted aggregate is recommended to be directly below each footing. The aggregate layer is recommended to be at least 12 inches thick and must extend horizontally at least 6 inches beyond the bottom edges of each footing pad.
- Assuming that all foundations will be supported by the recommended aggregate layer, a 2,000 pound per square foot (psf) maximum, net, allowable soil bearing capacity is recommended for foundation design. For geotechnical considerations and regardless of the calculated foundation-bearing stress, strip footings are recommended to be at least 18 inches wide and isolated footings are recommended to be at least 24 inches wide and long.

At-Grade Floor Slabs

- With proper subgrade preparation, it is expected that site soil will be suitable for support of at-grade floor slabs. Engineered fill that is selected, placed, and compacted according to the Report could also support concrete floor slabs. However, subgrade improvement might be necessary to develop uniform slab support, especially considering the existing fill material.
- Assuming proper site preparation, the floor slab may be designed using a *Modulus of Subgrade Reaction* (K_{v1}) value of 75 pounds per square inch per inch (psi/in). It is recommended and assumed that a structural engineer will specify the actual floor slab thickness, reinforcing, joint details, and other parameters.
- A minimum 4-inch-thick aggregate base course and a 10-mil vapor retarder are recommended to be below the floor slab. It is recommended that a structural engineer or architect specify the vapor retarder position (above or below the base course).

Pavement Recommendations

- Hot-mix asphalt (HMA) pavement is adequate for this site, except that Portland cement concrete (PCC) pavement is recommended in areas of higher traffic stress, such as parking lot entrance and exit aprons.

Building and Site Design Considerations

- Based on the soil conditions, it is recommended that site filling be minimized as much as possible. Filling operations could cause excessive settlement beyond what is estimated in this report.
- From a geotechnical perspective, the risk of excessive settlement and other structural problems, due to the proposed buildings being supported by existing fill material, appears to be reasonable. Nevertheless, the property owner must accept the risk of excessive settlement and other structural problems based on their risk tolerance.
- The foundation system is recommended to be relatively rigid to account for differing support conditions and building design is recommended to account for some differential settlement, such as through reduced control joint spacing, especially considering the length of the buildings.

GEOTECHNICAL ENGINEERING EXPLORATION AND ANALYSIS

PROPOSED STOR IT RIGHT
CORAL DRIVE AND DOLPHIN DRIVE
WAUKESHA, WISCONSIN
GILES PROJECT NO. 1G-2603032

1.0 SCOPE OF SERVICES

This report provides the results of the *Geotechnical Engineering Exploration and Analysis* that Giles Engineering Associates, Inc. ("Giles") conducted for the proposed project. The *Geotechnical Engineering Exploration and Analysis* included a geotechnical subsurface exploration program, geotechnical laboratory services, and geotechnical engineering. The scope of each service area was narrow and limited as directed by our client and based on our understanding and assumptions about the proposed project. Services are briefly described later. Environmental consulting was beyond Giles' authorized scope for this project.

Geotechnical-related recommendations are provided in this report for design and construction of the foundations and at-grade floor slabs for the proposed storage buildings. Recommendations are also provided for new pavement. Site preparation recommendations are also given but are only preliminary because the means and methods of site preparation will depend on factors that were unknown when this report was prepared. These factors include, but are not limited to, the weather before and during construction, the subsurface conditions that are exposed during construction, and the final details of the proposed project.

2.0 SITE DESCRIPTION

The subject site is located northeast of the intersection between Coral Drive and Dolphin Drive in Waukesha, Wisconsin. The site area is shown on the *Test Boring Location Plan*, enclosed as Figure 1 in Appendix A. When the test borings (described later) were performed, the proposed site was a vacant grass-covered lot with some wooded and wetlands areas. Topographically, the site was mounded in the northeast corner with the elevations decreasing away from the mound, generally to the south, and included a depression near the southern property line. The ground elevations at the test boring locations ranged between ±El. 858.3 and ±El. 868.4; Giles determined the test boring elevations on-site using a Trimble® R2 receiver. Approximate locations of the test borings are shown on the *Test Boring Location Plan*.

Historic Aerials

Based on a review of aerial photographs available through Waukesha County GIS – Map Atlas, accessed online, the site appears to be used for agricultural purposes prior to 1990 aerial. In the 1990 aerial, a development directly south of the site had been constructed and a new roadway has been built. Additionally, some soil disturbances can be seen in the south portion of the site. Significant soil disturbances can be seen throughout the entire site in the 1995 and 2000 aerial photographs with the development of the existing business park and roadways. The 2005 aerial shows a new development and some soil disturbances north of the site. Review of aerial photographs from Google Maps from October and December 2005 shows additional grading in

the north half of the site. The site appears to be relatively unchanged between the 2006 and 2024 aerial photographs. The 2024 aerial photograph is considered to be generally representative of the site at the time of this report.

3.0 WEB SOIL SURVEY

The *Web Soil Survey*, operated by the USDA Natural Resources Conservation Service, identifies the two main site soil types as Houghton muck and Palms muck. The unit description, provided by the *Web Soil Survey*, indicates that a typical profile for Houghton muck generally consists of muck and Palms muck generally consists of muck underlain by silty clay loam. Also, the Web Soil Survey states that the depth to water table for Houghton muck and Palms muck is about 0 to 4 inches.

4.0 PROJECT DESCRIPTION

Proposed Storage Buildings

Two proposed storage buildings (Buildings 1 and 2) will be constructed in the areas shown on the *Test Boring Location Plan*. Details of the buildings were not provided to us; therefore, this report assumes that the buildings will be constructed of steel framing. Also, it is assumed that the buildings will be one story and will not have basements or other below-ground spaces. It is assumed that bearing walls and columns will support the buildings. Maximum foundation loads were not provided but are expected to be relatively light. This report assumes maximum foundation loads of 3,000 pounds per lineal foot (plf) from bearing walls and 50,000 pounds per column. The floors are planned to be ground-bearing concrete slabs, but the maximum floor load was not provided to us. The maximum floor load of the proposed floor slab is assumed to be 125 pounds per square foot (psf).

The proposed floor elevations (FFE) for the proposed buildings were not provided to us. Therefore, to prepare this report, it was necessary to assume the first-floor elevations. It is assumed that the finish floor elevation of the north building (Building 1) will be at about El. 864.6 (El. 84 in City of Waukesha Datum) and the south building (Building 2) will be between ±El. 860.6 and ±El. 864.6 (El. 80 to El. 84 in City of Waukesha Datum). Based on the existing ground grades and assumed finish floor elevations, it is expected that up to 3 feet of fill and 3 to 6 feet of cutting will be necessary to construct the buildings. **Based on the soil conditions (discussed later), it is recommended that site filling be minimized as much as possible. Filling operations could cause excessive settlement beyond what is estimated in this report. Giles should review the final grading plan and proposed building elevations once available; this report may need to be revised if the planned elevations are higher than assumed.**

Proposed Pavement

Parking areas and drive lanes are planned throughout the site as shown on the *Test Boring Location Plan.* It is assumed that asphalt-concrete pavement is planned to be used except that Portland cement concrete pavement is expected in areas of higher traffic stress. Because Giles was not provided with traffic information, the pavement recommendations provided herein are based on assumed traffic conditions. Based on the existing grades and assumed building elevations, this report assumes that up to ±4 feet of cut/fill will be necessary to establish pavement (surface) grades.

5.0 GEOTECHNICAL SUBSURFACE EXPLORATION PROGRAM

To explore subsurface conditions, seven geotechnical test borings were conducted at the site using a mechanical drill-rig. The test borings were drilled in or near the proposed storage buildings. Test Borings 1, 2, 3, 6, and 7 were advanced to ±26 feet below-ground and Test Borings 4 and 5 were advanced to ±41 feet below-ground, as planned. Giles positioned the test boring locations using a Trimble® R2 receiver. The approximate locations of the test borings are shown on the *Test Boring Location Plan*. Previous test borings by PSI Intertek were completed at the site in 2018 for a different development but were reviewed as part of this report.

Soil samples were collected from each test boring, at certain depths, using the Standard Penetration Test (SPT), conducted with the drill rig. A brief description of the SPT is given in Appendix B along with descriptions of other field procedures. Immediately after sampling, select portions of the SPT samples were placed in containers that were labeled at the site for identification. A Standard Penetration Resistance value (N-value) was determined from each SPT. The N-values are reported on the *Test Boring Logs* (in Appendix A), which are records of the test borings. N-values are used to estimate the relative density of granular soil; however, some of the N-values that were recorded are considered to be unrepresentative of in-place density because gravel, cobbles, and/or concrete rubble were encountered during testing.

The boreholes were backfilled upon completion; however, backfill material will likely settle or heave, creating a hazard that can injure people and animals. Borehole areas should, therefore, be carefully and routinely monitored by the property owner or by others; settlement and heave of backfill material should be repaired immediately. Giles will not monitor or repair boreholes.

Ground elevations at the test borings are shown on the *Test Boring Logs*. Giles determined these elevations using a Trimble® R2 receiver.

6.0 GEOTECHNICAL LABORATORY SERVICES

The soil samples that were retained from the test borings were transported to Giles' geotechnical laboratory, where they were classified using the descriptive terms and particle-size criteria shown on the *General Notes* in Appendix D, and by using the Unified Soil Classification System (ASTM

D 2488) as a general guide. The classifications are shown on the *Test Boring Logs*, along with horizontal lines that show estimated depths of material change. Field-related information pertaining to the test borings is also shown on the *Test Boring Logs*. For simplicity and abbreviation, terms and symbols are used on the *Test Boring Logs;* the terms and symbols are defined on the *General Notes*.

Unconfined compressive strength (without controlled strain), calibrated penetrometer resistance, and water content tests were performed on select soil samples to evaluate their engineering properties. Results of the laboratory tests are shown on the *Test Boring Logs*. Laboratory procedures are briefly described in Appendix C. Because testing was conducted on SPT samples, which are categorized as disturbed samples, results of the strength-related tests are approximate.

7.0 MATERIAL CONDITIONS

Because material sampling at the test borings was discontinuous, it was necessary to estimate conditions between sample intervals. The estimated conditions at the test borings are briefly discussed in this section and are described in more detail on the *Test Boring Logs*. The conclusions and recommendations in this report are only based on the estimated conditions shown on the *Test Boring Logs*.

7.1. Surface Material

Topsoil fill was at the surface at each test boring and was between ±3½ and ±8 inches thick. The topsoil fill consisted of lean clay, sandy clay, and sandy silt that included variable amounts of sand and organic matter.

7.2. Fill Material

At each test boring, material classified as fill was below the topsoil and was encountered to depths between ±9 and ±23 feet below-ground. The fill material was variable and consisted of lean clay, sandy clay, clayey sand, sand (various gradations), and sandy silt with variable amounts of sand and gravel throughout the samples. Concrete rubble was encountered within the fill at Test Borings 1 and 2. Glass debris was encountered within the fill at Test Boring 4. Brick rubble and wood fragments were encountered within the fill at Test Boring 5. Based on field and laboratory testing, the fill material typically exhibited relatively moderate strength characteristics.

7.3. Native Soil

Organic Soil: A layer of possible buried topsoil was encountered below the fill material at Test Borings 1 and 5 to depths of ±13½ and ±20 feet below-ground, respectively. Peat was encountered below the buried topsoil at Test Boring 1 and was encountered to ±16½ feet below-ground. Slightly organic silty clay was encountered below the fill material at Test Boring 3 and

was encountered to the ±26-foot termination depth. Based on laboratory testing, the organic soil had relatively high moisture contents and is considered to be moderately compressible.

Non-Organic Soil: Native non-organic soil was encountered below the native organic soil and fill material and was present to the test boring termination depths. The native non-organic soil generally consisted of cohesive soil underlain by granular soil. The native cohesive soil consisted of lean clay with up to estimated trace amounts of sand and gravel. The native granular soil consisted of sand (various gradations) with variable amounts of gravel, but sandy silt and silty sand were also encountered. SPT N-values within native granular soil correlate between loose to firm relative densities. Based on laboratory testing, the native cohesive soil exhibited comparative consistencies between medium stiff to stiff.

8.0 GROUNDWATER CONDITIONS

Based on the subsurface conditions encountered in the test borings, it is estimated that the water table was about ±11½ to ±23 feet below the ground surface at the time of drilling. Furthermore, it is estimated that the water table was between approximately ±El. 843 and ±El. 849. However, the site also appears to be subject to shallower perched-groundwater conditions, where groundwater perches above the water table, especially within the existing fill and shallow cohesive soils. Groundwater conditions will likely fluctuate depending on precipitation, surface run-off, and other factors.

The estimated groundwater conditions is only an approximation based on the colors and relative moisture conditions of the retained soil samples, and the water encountered within the test borings. It is important to note that the groundwater conditions discussed above are only an estimate; if a precise determination of the groundwater conditions is needed, groundwater observation wells are recommended to be installed (and monitored) at the site. Giles can install and monitor groundwater observation wells, if observation wells are needed.

9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1. Risk of Excessive Settlement

As discussed in Section 7.0, fill material and native organic soils extended to depths ranging between ±9 and ±23 feet below-ground at the test borings. Existing fill can (indirectly) support spread-footing foundations for the proposed storage buildings provided that a layer of compacted aggregate is directly below and horizontally beyond each foundation. However, the property owner must accept the risk of possible excessive foundation and floor slab settlement and other structural problems, such as cracking and distortion of building components. From a geotechnical perspective, considering the subsurface conditions at the test borings and that the fill appears to have been in-place for at least 20 years (based on review of aerial photographs), the risk of excessive settlement and other structural problems appears to be reasonable. Nevertheless, the property owner must accept the risk of excessive settlement and other structural problems based

on their risk tolerance. Giles must be notified if the property owner is unwilling to accept the risk; revision of this report will be necessary. Specific foundation and floor slab recommendations for the proposed storage buildings are provided in Sections 9.3 and 9.4, respectively. The recommendations assume that the property owner will accept the risk of excessive settlement and other structural problems.

Complete removal of this risk would require all existing fill and organic soils within foundation influence zones to be removed to a suitable bearing native subgrade. Additionally, foundation bearing soils could be improved in-place through ground improvement methods, such as installation of compacted aggregate piers or stone columns within foundation influence zones. Giles must be notified if the property owner is unwilling to accept the risk; revision of this report will be necessary.

9.2. Seismic Design Considerations

A soil Site Class D is recommended for seismic design. By definition, Site Class is based on the average properties of subsurface materials to 100 feet below-ground. Because a 100-foot test boring was not conducted, it was necessary to estimate Site Class based on the test borings, presumed area geology, and the International Building Code.

9.3. Building Foundation Recommendations

The proposed buildings can be supported by spread-footing foundations; however, because of the existing fill and native organic soils, a layer of compacted aggregate is recommended to be directly below each footing, as discussed in Section 9.1. The aggregate layer is recommended to be at least 12 inches thick and must extend horizontally at least 6 inches beyond the bottom edges of each footing pad. Aggregate is recommended to consist of dense-graded crushed stone that meets the gradation requirements of *dense-graded base* (1¼-inch) in Section 305 of the Wisconsin Department of Transportation Standard Specifications. Aggregate with other gradation characteristics could possibly also be used but must be approved by Giles before the material is placed.

Aggregate is recommended to be placed in uniform layers that are a maximum of 8 inches thick (measured loose), and each layer is recommended to be compacted to at least 95 percent of the material's maximum dry density determined from the Standard Proctor compaction test (ASTM D698). The water content of aggregate is recommended to be uniform and within a narrow range of the optimum moisture content, also determined by the Standard Proctor compaction test. A subsequent layer of aggregate should not be placed until a geotechnical engineer confirms (by testing and observation) that the previous layer was properly compacted to the required in-place density. Full-time observation and testing by a geotechnical engineer during placement and compaction of each aggregate layer is critical.

Assuming that all foundations will be supported by the recommended aggregate layer, a 2,000 pound per square foot (psf) maximum, net, allowable soil bearing capacity is recommended for foundation design. For geotechnical considerations and regardless of the calculated foundation-bearing stress, strip footings are recommended to be at least 18 inches wide and isolated footings are recommended to be at least 24 inches wide and long. **Also, due to the existing fill and native organic soils, the foundation system is recommended to be relatively rigid to account for differing support conditions. Therefore, from a geotechnical perspective, foundation walls are recommended to be constructed of reinforced cast-in-place concrete, rather than concrete masonry units (CMU). Also, building design is recommended to account for some differential settlement, such as through reduced control joint spacing, especially considering the length of the buildings.** Specific foundation details including footing and wall dimensions, reinforcing, and other details are recommended to be specified by the project structural engineer.

A minimum 48-inch foundation-embedment depth is required by the building code. It is, therefore, recommended that footings for perimeter walls and other exterior elements of the buildings bear at least 48 inches below the finished ground-grade at the perimeter of the building for frost protection. Because it is assumed that the buildings will be heated, interior footings can bear directly below the floor slab. If the buildings will not be heated, interior footings should bear at or below the 48-inch foundation-embedment depth.

A frictional coefficient of 0.34 is recommended to determine lateral resistance at the base of the foundation. The recommended frictional coefficient is only for concrete cast directly on engineered fill used for the recommended aggregate fill layer. Lateral resistance due to friction should be determined based on dead load only. Also, the ultimate lateral resistance determined from the frictional coefficient is recommended to be factored to determine an allowable value. Passive resistance is recommended to be neglected to at least the recommended 48-inch foundation-embedment depth due to seasonal changes and due to the amount of lateral movement necessary to develop full passive pressure.

Foundation excavations are recommended to be dug with a smooth-edge bucket to develop a relatively undisturbed bearing grade. A toothed bucket will likely disturb foundation-bearing soil more than a smooth-edge bucket thereby making soil at the excavation base more susceptible to saturation and instability, especially during adverse weather. It is critical that contractors protect foundation-support soil and foundation construction materials (concrete and reinforcing). Furthermore, engineered fill is recommended to be placed and compacted in benched excavations along foundation walls immediately after the foundation walls can properly support lateral pressures from backfill, compaction, and compaction equipment. Earth-formed footing construction techniques are likely not feasible due to caving of granular soil.

Foundation Support-Soil Requirements

As previously described, each footing is recommended to be directly supported by a compacted-aggregate layer. Aggregate may be placed on suitable existing soil, including existing fill, and native soil. Based on the recommended 2,000 psf maximum, net, allowable soil bearing capacity, the in-situ unconfined compressive strength of existing cohesive soil within the foundation influence zone is recommended to be at least 1.0 ton per square foot (tsf). Existing granular soil within the foundation influence zone is recommended to have a corrected N-value (determined from SPTs and correlated from other in-situ tests) of at least 7, based on the recommended bearing capacity. It is further recommended that the strength characteristics of soil within all foundation influence zones (determined by a geotechnical engineer during construction) meet or exceed the recommended values unless Giles approves other values.

Because of the existing fill materials and recommended aggregate fill layer, full-time evaluation by a geotechnical engineer during excavation for the recommended aggregate layer for the buildings is critical. The purpose of the recommended evaluation is (1) to confirm that the aggregate layer will be placed on suitable existing soil, (2) to determine the required thickness and width of the aggregate layer, and (3) to confirm that the subsurface conditions are similar to those described on the *Test Boring Logs*. If a firm other than Giles performs the recommended evaluations, Giles must be notified if the composition or strength characteristics of existing soils differ from those shown on the *Test Boring Logs*; revision of this report might be necessary. Without evaluation and approval of foundation support materials by a geotechnical engineer, the proposed building could be improperly supported, which could lead to excessive settlement and structural distress.

Estimated Foundation Settlement

The post-construction total and differential settlements of a spread-footing foundation designed and constructed based on this report are estimated to be less than about 1¼ inch and ⅝ inch, respectively. Estimated settlements assume that the recommendations in this report will be followed and that foundation-support soil will be evaluated and approved by a geotechnical engineer during construction. As described in Section 9.1, the property owner must accept the risk of possible excessive settlement and other structural problems. The actual foundation settlements could exceed the estimated settlements.

9.4. At-Grade Floor Slab Recommendations

With proper subgrade preparation and assuming the property owner will accept the risk discussed in Section 9.1, existing soil (including existing fill) can be used to be suitable to support an isolated ground-bearing concrete floor slab for the proposed buildings; new engineered fill that is placed on properly prepared existing soil is also expected to be suitable. However, subgrade improvement might be necessary to develop proper slab support. Consequently, the entire floor area is recommended to be thoroughly evaluated and approved by a geotechnical engineer

immediately before fill placement and before floor construction. Without a thorough evaluation of floor slab support materials, the floor slabs could be improperly supported.

Assuming proper site preparation, the floor slabs may be designed using a *Modulus of Subgrade Reaction* (K_{v1}) value of 75 pounds per square inch per inch (psi/in). It is recommended and assumed that a structural engineer or architect will specify the actual floor slab thickness, reinforcing, joint details, and other parameters.

A minimum 4-inch-thick base course is recommended to be below the floor slabs to serve as a capillary break and for support considerations. It is recommended that the base course consist of compacted free-draining crushed stone that meets the gradation requirements of ASTM No. 57 aggregate. Depending on the subgrade conditions and materials, geotextile might need to be below the base course to serve as a separator. The need for geotextile should be determined during construction with the assistance of a geotechnical engineer.

A minimum 10-mil vapor retarder is recommended to be directly above or below the base course throughout all floor areas. The position (above or below the base course) of the vapor retarder should be specified by the project structural engineer or architect. Abutting vapor retarder sheets are recommended to be overlapped at least six inches, and the overlaps are recommended to be fully taped. Furthermore, vapor retarders must extend to all foundation walls. Vapor retarders are recommended to be in accordance with ASTM E 1745, entitled *Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs*, or other relevant documents. If the base course has sharp, angular aggregate, protecting the vapor retarders with geotextile or by other means is recommended.

Due to the frost-susceptible site soil, areas of the floor slabs (such as near exterior doors and entrance/exit vestibules) might be susceptible to freeze-thaw related movement. Installation of insulation or other protective measures against freeze-thaw movement should be considered for these areas. Pavement and ground grades are recommended to be sloped away from the buildings and sidewalks to reduce water infiltration and potential freeze-thaw problems.

Estimated Floor Slab Settlement

The post-construction total and differential settlements of an isolated floor slab constructed in accordance with this report are estimated to be less than about ⅝ inch and ⅓ inch, respectively, over about 20 feet. Estimated settlements assume that the building areas will be prepared per this report and that floor slab support materials will be thoroughly tested and approved by a geotechnical engineer during construction.

9.5. Pavement Recommendations

Traffic-related information was not provided to us. Therefore, recommendations are provided herein for light-duty vehicle areas and medium-duty vehicle areas. The light-duty pavement

section is for passenger-vehicle parking lots and is based on an assumed traffic condition of five 18-kip Equivalent Single Axle Loads (ESALs) per day. The medium-duty pavement section is for drives that will be subject to other heavy vehicles and is based on an assumed traffic condition consisting of fifteen 18-kip ESALs per day. The light-duty and medium-duty pavement sections assume no increase in traffic volume and no changes in vehicle type or traffic pattern. It is assumed that the ESALs noted above will be in one direction for each lane.

It is important that the project owner, developer, civil engineer, and other design professionals involved with the project confirm that the ESALs noted above are appropriate for the expected traffic conditions, vehicle types, and axle loadings. If requested, Giles can provide supplemental pavement recommendations based on other traffic conditions, vehicle types, and axle loads. The recommended pavement sections could underperform or fail prematurely if the design ESALs are exceeded.

Based on the test borings and with proper subgrade preparation, it is expected that pavement support materials will predominantly consist of variable fill materials. Therefore, the recommended pavement sections were developed with an assumed field CBR value of 3 and a *Modulus of Subgrade Reaction* (K_{V1}) value of 75 psi/in. Engineered fill that is placed in proposed pavement areas is recommended to have a field CBR value and a *Modulus of Subgrade Reaction* (K_{V1}) value at least equivalent to these design values. Fill is recommended to be placed and compacted per this report.

Asphalt-Concrete Pavement

The following table shows the recommended thicknesses for hot-mix asphalt (HMA) pavement with an aggregate base course. State specifications are also included in the table. The recommended pavement sections are based on the traffic conditions described above.

TABLE 1
RECOMMENDED HMA PAVEMENT SECTION

Materials	Light Duty	Medium Duty	Wisconsin DOT Standard Specifications
Hot-Mix Asphalt Surface Course	1.5 inches	1.5 inches	Section 460
Hot Mix Asphalt Binder Course	2.0 inches	2.5 inches	Section 460
Dense-Graded Aggregate Base Course	8.0 inches	8.0 inches	Section 305, 1¼-inch Crushed Stone

Portland Cement Concrete Pavement

Portland cement concrete pavement is recommended in areas of higher traffic stress, such as parking lot entrance and exit aprons and in areas where heavy vehicles will turn or will be parked. Based on the assumed ESALs, discussed above, concrete pavement is recommended to be at

least 6 inches thick and is recommended to be underlain by a minimum 6-inch-thick aggregate base course. It is recommended that concrete pavement have load-transfer reinforcement, where appropriate. Control-joint spacing should be determined in accordance with the current ACI code. Expansion joints should be provided where pavement abuts fixed objects, such as light poles. The recommended thickness assumes that the 28-day compressive strength of concrete will be at least 4,000 psi, and the concrete is recommended to be properly air-entrained for freeze-thaw durability. It is recommended and assumed that a civil engineer will provide specific recommendations for concrete pavement, including reinforcing details and control-joint spacing. Materials and construction procedures for concrete pavement and the aggregate base are recommended to be in accordance with Wisconsin DOT specifications.

General Pavement Considerations

The pavement recommendations assume that the pavement subgrade will be prepared according to this report, the base course will be properly drained, and a geotechnical engineer will observe and test pavement construction. Pavement was designed based on AASHTO design parameters for a twenty-year design period, but the actual service life could be less, especially considering the existing fill. Local codes may require specific testing to determine soil support characteristics, and a minimum pavement section might be required.

9.6. Generalized Site Preparation Recommendations

This section provides recommendations for preparation of floor slab, pavement, and engineered fill areas. The means and methods of site preparation will greatly depend on the weather conditions before and during construction, the subsurface conditions that are exposed during earthwork operations, and the finalized details of the proposed development. Therefore, only general site preparation recommendations are given.

In addition to being general, the following site preparation recommendations are abbreviated; the *Guide Specifications* in Appendix D gives further recommendations. The *Guide Specifications* should be read along with this section. Also, the *Guide Specifications* are recommended to be used as an aid to develop the project specifications.

Stripping and Removal

Surface vegetation, trees and bushes (including root-balls), topsoil, and other unsuitable materials are recommended to be removed from the proposed building areas, proposed pavement areas, and other proposed structural areas. Stripping should extend at least several feet beyond proposed development areas, where feasible.

Proof-Rolling and Fill Placement

After the recommended stripping and removal, and once the building area is cut as needed, the subgrade is recommended to be proof-rolled with a fully-loaded tandem-axle dump truck, or other suitable construction equipment, to locate unstable soil based on subgrade deflection caused by the wheel loads of the proof-roll equipment. The entire building area is recommended to be thoroughly proof-rolled. And, where feasible, proof-rolling should extend at least several feet beyond the building areas. Also, for safety, proof-roll equipment must be kept a sufficient distance from excavations. It is recommended that a geotechnical engineer observe proof-roll operations and evaluate subgrade stability based on those observations. Areas that cannot be proof-rolled are recommended to be evaluated (and approved) by a geotechnical engineer using appropriate means and methods.

Because of the existing fill and possible perched groundwater conditions, unsuitable materials will likely be encountered during proof-rolling and testing. Unsuitable materials are recommended to be replaced with engineered fill or improved. Recommendations for subgrade improvement should, however, be made by a geotechnical engineer based on the site conditions during construction. Depending on the conditions during construction, areas requiring soil improvement might be large and improvement methods might need to extend significantly below the planned subgrade. Areas requiring subgrade improvement should be defined during construction with the assistance of a geotechnical engineer. Specific improvement methods should be determined during construction on an area-by-area basis. Where subgrade improvement is needed, it might be necessary to construct “test strips” to determine the most cost-effective and appropriate means of developing a suitable subgrade.

The development areas recommended to be raised, where necessary, to the planned finished grade with engineered fill immediately after the subgrade is confirmed to be stable and suitable to support the proposed development. Engineered fill is recommended to be placed in thin layers (lifts) that are uniform in elevation. Each layer of engineered fill is recommended to be compacted to at least 95 percent of the fill material’s maximum dry density determined from the Standard Proctor compaction test (ASTM D 698). As an exception, the in-place dry density of engineered fill within one foot of a pavement subgrade is recommended to be compacted to at least 100 percent of the fill’s maximum dry density. The water content of fill material is recommended to be uniform and within a narrow range of the optimum moisture content, also determined from the Standard Proctor compaction test. Item Nos. 4 and 5 of the *Guide Specifications* give more information pertaining to selection and compaction of engineered fill.

Engineered fill that does not meet the density and water content requirements is recommended to be replaced or scarified to a sufficient depth (likely 6 to 12 inches, or more), moisture-conditioned, and compacted to the required density. A subsequent lift of fill should only be placed after a geotechnical engineer confirms that the previous lift was properly placed and compacted. Subgrade soil will likely need to be recompacted immediately before construction, since equipment traffic and adverse weather may reduce soil stability.

Use of Site Soil as Engineered Fill

Site soil that does not contain adverse organic content or other deleterious materials, as noted in the *Guide Specifications*, could be used as engineered fill. However, site soil will likely need to be moisture conditioned (uniformly moistened or dried) prior to being used as engineered fill. If construction is during adverse weather (discussed in the following section), drying site soil will likely not be feasible. In that case, fill material might need to be imported to the site. Additional recommendations regarding fill selection, placement, and compaction are given in the *Guide Specifications*.

9.7. Generalized Construction Considerations

Adverse Weather

Site soil is moisture sensitive and will become unstable when exposed to adverse weather, such as rain, snow, and freezing temperatures. Therefore, it might be necessary to remove or stabilize the upper 6 to 12 inches (or more) of soil due to adverse weather, which commonly occurs during late fall, winter, and early spring. At least some over-excavation or stabilization of unstable soil should be expected if construction is during or after adverse weather. Because site preparation depends on weather, bids for site preparation and other earthwork activities should consider the time of year that construction will be conducted.

To protect soil from adverse weather, the site surface is recommended to be smoothly graded and contoured during construction to divert surface water away from construction areas. Contoured subgrades are recommended to be rolled with a smooth-drum compactor before precipitation to “seal” the surface. Furthermore, construction traffic should be restricted to certain aggregate-covered areas to limit traffic-related soil disturbance.

Dewatering

Excavations for the proposed development are expected to be above the water table, but perched groundwater could be encountered during construction. If water does collect within excavations due to perched groundwater, or due to precipitation, filtered sump pumps, drawing water from sump pits, are expected to be suitable for dewatering. Excavated sump pits should be lined with a geotextile and filled with open-graded, free-draining aggregate. Water should be removed from construction areas, including excavations, as soon as possible, along with unstable soil.

Excavation Stability

Excavations may cave during construction, especially considering the granular site soil. Excavations are recommended to be made in accordance with current OSHA excavation and trench safety standards, and other applicable requirements. Sides of excavations might need to

be sloped or braced to maintain or develop a safe work environment. Temporary shoring must be designed according to applicable regulatory requirements. Contractors are responsible for excavation safety.

Questionable Materials

Questionable materials, if encountered, are recommended to be evaluated by a geotechnical engineer to determine if removal and replacement with engineered fill is necessary. Disposal of unsuitable material is recommended to be in accordance with local, state, and federal regulations for the material type. This report might need to be revised if the actual subsurface conditions differ from those noted on the *Test Boring Logs*.

9.8. Recommended Construction Materials Testing Services

This report was prepared assuming that a geotechnical engineer will perform Construction Materials Testing ("CMT") services during construction of the proposed development. Supplemental geotechnical recommendations may be needed based on the results of CMT services and specific details of the project not known at this time.

10.0 BASIS OF REPORT

This report is strictly based on the project description given in Section 4.0. Giles must be notified if the project description or our assumptions about the project are not accurate so that this report can be amended, if needed. This report assumes that the proposed improvements will be designed and constructed according to the codes that govern construction at the site.

The conclusions and recommendations in this report are based on the estimated subsurface conditions shown on the *Test Boring Logs*. Giles must be notified if the subsurface conditions that are encountered during construction of the proposed development differ from those shown on the *Test Boring Logs*; revision of this report might be necessary. General comments and limitations of this report are given in the appendix.

The conclusions and recommendations in this report have been promulgated in accordance with generally accepted professional engineering practices in the field of geotechnical engineering. No other warranty is either expressed or implied.

© Giles Engineering Associates, Inc. 2026

APPENDIX A

FIGURES AND TEST BORING LOGS

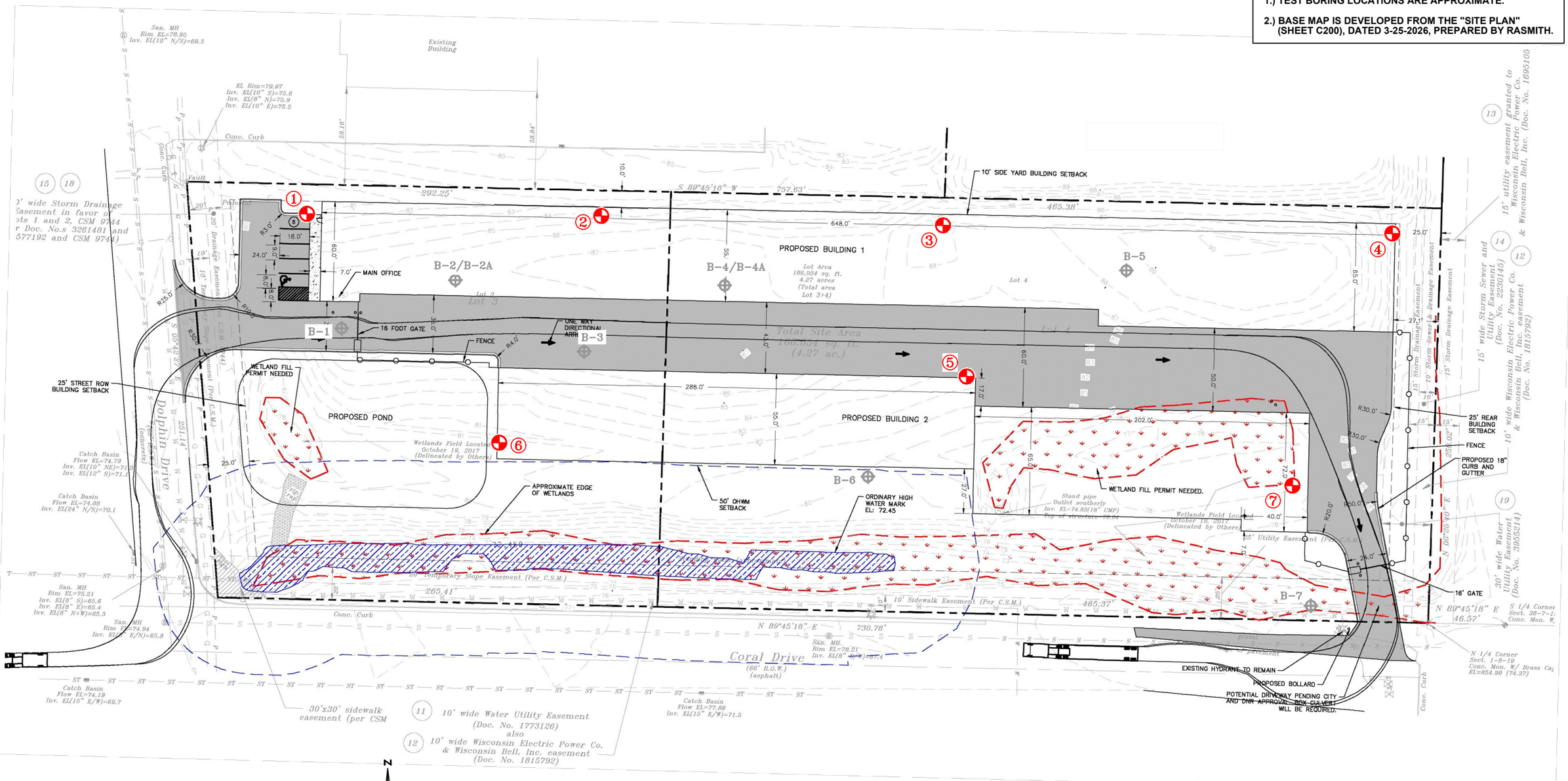
The Test Boring Location Plan contained herein was prepared based upon information supplied by *Giles'* client, or others, along with *Giles'* field measurements and observations. The diagram is presented for conceptual purposes only and is intended to assist the reader in report interpretation.

The Test Boring Logs and related information enclosed herein depict the subsurface (soil and water) conditions encountered at the specific boring locations on the date that the exploration was performed. Subsurface conditions may differ between boring locations and within areas of the site that were not explored with test borings. The subsurface conditions may also change at the boring locations over the passage of time.

NOTES:

1.) TEST BORING LOCATIONS ARE APPROXIMATE.

2.) BASE MAP IS DEVELOPED FROM THE "SITE PLAN" (SHEET C200), DATED 3-25-2026, PREPARED BY RASMITH.



N

W E

S

0 30' 60'

APPROXIMATE SCALE

LEGEND:

① GEOTECHNICAL TEST BORING

B-1 PREVIOUS BORING (BY OTHERS)

GILES ENGINEERING ASSOCIATES, INC.
N8 W22350 JOHNSON DRIVE, SUITE A1
WAUKESHA, WI 53186 (262)544-0118
www.gilesengr.com

FIGURE 1
TEST BORING LOCATION PLAN
PROPOSED STOR IT RIGHT
CORAL DRIVE AND DOLPHIN DRIVE
WAUKESHA, WISCONSIN

DESIGNED	DRAWN	SCALE	DATE	REVISED
ERA		approx. 1"=60'	04-21-26	--
PROJECT NO.: 1G-2603032			CAD No.	1g2603032-blp

TEST BORING LOG

BORING # 1

PROJECT	GENERAL LOCATION	GROUND ELEVATION
Stor It Right	Coral Drive and Dolphin Drive	861.3'
PROJECT NO.	**PROJECT CITY, STATE**	**DATE COMPLETED**
1G-2603032	Waukesha, Wisconsin	04/09/2026

DRILLER/PM	RIG TYPE	DRILLING CONTRACTOR	LATITUDE	LONGITUDE
Davis Luckett	CME-55LC	Giles Engineering Associates, Inc.	-	-

Material Description	Depth (ft)	Elevation (ft)	Sample Type / No.	N-Value	Compressive Strength	Q_p (tsf)	Vane Shear (tsf)	WC (%)	Notes
±8" TOPSOIL FILL: Dark Brown Sandy Clay, little Organic Matter - Moist	0	860	1-SS	4		1.8		24	(a)
FILL: Dark Brown and Brown Sandy Clay, trace Gravel - Moist			2-SS	12		1.0		18	
	5	855	3-SS	57		3.5		9	(b)
FILL: Dark Brown and Brown Sandy Clay, little Gravel - Moist (Includes Concrete Rubble)			4-SS	60/9"		2.8		15	
	10	850	5-SS	22		1.3		62	
POSSIBLE BURIED TOPSOIL: Black Sandy Clay, little Organic Matter - Moist			6-SS	18		1.3		278	
Black amorphous Peat - Wet	15	845	7-SS	11	1.7	1.5		98	
Dark Gray to Gray lean Clay, trace Sand - Very Moist			8-SS	4	1.4	2.0		19	
	20	840	9-SS	7					
Brown fine to coarse Sand, little Gravel - Wet (Includes Cobbles)	25		10-SS	11					

Boring terminated at 26'

REMARKS

(a) Poor Sample Recovery

(b) No SPT Sample Recovery - Auger Sample Obtained

Water Levels

Water encountered @ 13.5'

-

TEST BORING LOG

BORING # 2

PROJECT	GENERAL LOCATION	GROUND ELEVATION
Stor It Right	Coral Drive and Dolphin Drive	864.4'
PROJECT NO.	**PROJECT CITY, STATE**	**DATE COMPLETED**
1G-2603032	Waukesha, Wisconsin	04/09/2026

DRILLER/PM	RIG TYPE	DRILLING CONTRACTOR	LATITUDE	LONGITUDE
Davis Luckett	CME-55LC	Giles Engineering Associates, Inc.	-	-

Material Description	Depth (ft)	Elevation (ft)	Sample Type / No.	N-Value	Compressive Strength	Q_p (tsf)	Vane Shear (tsf)	WC (%)	Notes
±8" TOPSOIL FILL: Dark Brown lean Clay, trace Sand, little Organic Matter - Moist			1-SS	4		1.8		15	
FILL: Brown Sandy Clay, trace Gravel - Moist			2-SS	13		2.8		9	
FILL: Dark Brown and Brown Clayey fine to medium Sand, trace to little Gravel - Moist		860	3-SS	11		1.3		13	(a)
	5		4-SS	12					
FILL: Brown and Dark Gray Sandy Clay, trace Gravel - Moist		855	5-SS	20		3.3		9	
	10		6-SS	12	1.2	3.8		15	
(Includes Concrete Rubble at ±15 feet below ground)	15	850	7-SS	54/9"					(b)
FILL: Gray fine to medium Sand with Gravel, trace Silt - Moist to Wet			8-SS	40					
	20	845	9-SS	11					
FILL: Gray fine to medium Sand, trace Silt and Gravel - Wet (Includes Concrete Rubble)		840							
Brown fine to coarse Sand, little Gravel - Wet	25		10-SS	16					

Boring terminated at 26'

REMARKS

(a) Poor Sample Recovery

(b) No SPT Sample Recovery

Water Levels

▽ Water encountered @ 19'

▼ -

TEST BORING LOG

BORING # 3

PROJECT	GENERAL LOCATION	GROUND ELEVATION
Stor It Right	Coral Drive and Dolphin Drive	868.4'
PROJECT NO.	**PROJECT CITY, STATE**	**DATE COMPLETED**
1G-2603032	Waukesha, Wisconsin	04/09/2026

DRILLER/PM	RIG TYPE	DRILLING CONTRACTOR	LATITUDE	LONGITUDE
Davis Luckett	CME-55LC	Giles Engineering Associates, Inc.	-	-

Material Description	Depth (ft)	Elevation (ft)	Sample Type / No.	N-Value	Compressive Strength	Q_p (tsf)	Vane Shear (tsf)	WC (%)	Notes
±8" TOPSOIL FILL: Dark Brown lean Clay, little Organic Matter, trace Sand - Moist			1-SS	7		2.0		9	
FILL: Brown and Dark Brown Sandy Clay, trace to little Gravel - Moist		865	2-SS	11		2.0		9	
	5		3-SS	8		2.5		18	
FILL: Brown Sandy Silt, little Gravel - Moist		860	4-SS	50/5"					(a)
FILL: Brown lean Clay, little Sand, trace Gravel - Moist	10		5-SS	15		4.0		14	
FILL: Brown and Gray lean Clay, little Sand and Gravel - Moist		855	6-SS	13		1.8		15	
	15		7-SS	10		2.0		12	
		850	8-SS	9		1.0		13	
	20		9-SS	7		1.0		23	
	▽	845							
Gray Slightly Organic Silty Clay, trace Sand and Gravel - Wet	25		10-SS	5		0.8		92	

Boring terminated at 26'

REMARKS

(a) Poor Sample Recovery

Water Levels

▽ Water encountered @ 23'

▼ -

TEST BORING LOG

BORING # **4**

PROJECT	GENERAL LOCATION	GROUND ELEVATION
Stor It Right	Coral Drive and Dolphin Drive	862.3'
PROJECT NO.	**PROJECT CITY, STATE**	**DATE COMPLETED**
1G-2603032	Waukesha, Wisconsin	04/07/2026

DRILLER/PM	RIG TYPE	DRILLING CONTRACTOR	LATITUDE	LONGITUDE
Davis Luckett	CME-55LC	Giles Engineering Associates, Inc.	-	-

Material Description	Graphic Log	Depth (ft)	Elevation (ft)	Sample Type / No.	N-Value	Compressive Strength	Q_p (tsf)	Vane Shear (tsf)	WC (%)	Notes
±3½" TOPSOIL FILL: Dark Brown Sandy Clay, little Organic Matter - Moist		0	860	1-SS	4		1.5		11	
FILL: Dark Brown Sandy Clay, trace Gravel - Moist				2-SS	8		2.3		13	
FILL: Dark Brown lean Clay, little Sand, trace Gravel - Moist to Very Moist (Includes Glass debris)		5	855	3-SS	5		1.3		15	
FILL: Brown and Dark Brown Sandy Clay, little Gravel - Moist				4-SS	9		2.0		12	
		10	850	5-SS	14		2.0		9	
				6-SS	15		1.0		16	
FILL: Brown and Dark Brown lean Clay, little Sand and Gravel - Moist		15	845	7-SS	10		1.5		12	
FILL: Dark Gray lean Clay, little Sand, trace Gravel - Very Moist				8-SS	9					
Dark Gray lean Clay, trace Sand - Very Moist		20	840	9-SS	9					
Gray lean Clay, trace Sand and Gravel - Very Moist		25	835	10-SS	11		2.0		29	
Brown fine to coarse Sand with Gravel, trace Silt - Wet		30	830	11-SS	20					
Brown fine to medium Sand, trace Silt and Gravel - Wet		35	825	12-SS	14					
		40		13-SS	9					
Boring terminated at 41'										

REMARKS

Water Levels

▽ Water encountered @ 28'

▼ -

TEST BORING LOG

GILES

BORING # 5

PROJECT	GENERAL LOCATION	GROUND ELEVATION
Stor It Right	Coral Drive and Dolphin Drive	865.5'
PROJECT NO.	**PROJECT CITY, STATE**	**DATE COMPLETED**
1G-2603032	Waukesha, Wisconsin	04/07/2026

DRILLER/PM	RIG TYPE	DRILLING CONTRACTOR	LATITUDE	LONGITUDE
Davis Luckett	CME-55LC	Giles Engineering Associates, Inc.	-	-

Material Description	Depth (ft)	Elevation (ft)	Sample Type / No.	N-Value	Compressive Strength	Q_p (tsf)	Vane Shear (tsf)	WC (%)	Notes
±4" TOPSOIL FILL: Dark Brown lean Clay, little Organic Matter, trace Sand - Moist			1-SS	4		1.8		13	
FILL: Brown Sandy Clay, trace Gravel - Moist			2-SS	6				13	
FILL: Brown lean Clay, little Sand, trace Gravel - Moist to Very Moist (Includes Brick Rubble)	5	860	3-SS	7		1.0		16	
FILL: Brown and Dark Brown Sandy Clay, little Gravel - Moist			4-SS	18				13	
	10	855	5-SS	16		2.0		16	
FILL: Brown and Gray lean Clay, little Sand, trace Gravel - Moist (Includes Wood fragments)			6-SS	9				11	
	15	850	7-SS	9				14	
FILL: Dark Gray lean Clay, little Sand, trace Gravel - Very Moist			8-SS	8		1.0		16	
POSSIBLE BURIED TOPSOIL: Dark Brown lean Clay, little Organic Matter - Moist	20	845	9-SS	12		1.3		54	
Dark Gray lean Clay - Very Moist	25	840	10-SS	15		2.0		32	
Brown fine to coarse Sand, little Gravel - Wet	30	835	11-SS	26					
Brown fine to medium Sand, trace Silt and Gravel - Wet	35	830	12-SS	14					
	40	825	13-SS	7					
Boring terminated at 41'									

REMARKS

Water Levels

▽ Water encountered @ 28'

▼ -

TEST BORING LOG

BORING # 6

PROJECT	GENERAL LOCATION	GROUND ELEVATION
Stor It Right	Coral Drive and Dolphin Drive	861.4'
PROJECT NO.	**PROJECT CITY, STATE**	**DATE COMPLETED**
1G-2603032	Waukesha, Wisconsin	04/09/2026

DRILLER/PM	RIG TYPE	DRILLING CONTRACTOR	LATITUDE	LONGITUDE
Davis Luckett	CME-55LC	Giles Engineering Associates, Inc.	-	-

Material Description	Depth (ft)	Elevation (ft)	Sample Type / No.	N-Value	Compressive Strength	Q_p (tsf)	Vane Shear (tsf)	WC (%)	Notes
±6" TOPSOIL FILL: Brown Sandy Silt, little Organic Matter - Moist	0	860	1-SS	12				13	(a)
FILL: Brown Sandy Silt, trace Gravel - Wet to Very Moist			2-SS	11				8	
	5	855	3-SS	13				14	(b)
			4-SS	7				17	(a)
FILL: Dark Gray little Sand, trace Gravel - Very Moist	10	850	5-SS	10		1.3		19	
Dark Gray lean Clay, trace Sand - Very Moist			6-SS	15					
	15 ▽	845	7-SS	8		1.5		21	
Brown fine to coarse Sand with Gravel, trace Silt - Wet			8-SS	27					
	20	840	9-SS	25					
Gray fine to coarse Sand with Gravel, trace Silt - Wet	25		10-SS	15					

Boring terminated at 26'

REMARKS

(a) Poor Sample Recovery

(b) No SPT Sample Recovery

Water Levels

▽ Water encountered @ 16.5'

▼ -

TEST BORING LOG

BORING # 7

PROJECT	GENERAL LOCATION	GROUND ELEVATION
Stor It Right	Coral Drive and Dolphin Drive	858.3'
PROJECT NO.	**PROJECT CITY, STATE**	**DATE COMPLETED**
1G-2603032	Waukesha, Wisconsin	04/09/2026

DRILLER/PM	RIG TYPE	DRILLING CONTRACTOR	LATITUDE	LONGITUDE
Davis Luckett	CME-55LC	Giles Engineering Associates, Inc.	-	-

Material Description	Depth (ft)	Elevation (ft)	Sample Type / No.	N-Value	Compressive Strength	Q_p (tsf)	Vane Shear (tsf)	WC (%)	Notes
±6" TOPSOIL FILL: Dark Brown lean Clay, little Organic Matter, trace Sand - Moist			1-SS	9				11	
FILL: Brown Sandy Silt, little Gravel - Moist		855	2-SS	10		2.3		18	
FILL: Brown and Dark Brown Sandy Clay - Moist									
FILL: Brown and Gray lean Clay, trace Sand and Gravel - Moist	5		3-SS	18		1.3		29	
		850	4-SS	9		2.0		12	
Dark Gray lean Clay, trace Sand and Gravel - Very Moist	10		5-SS	7		1.3		27	
Light Brown Mottled with Gray lean Clay, trace Sand and Gravel - Moist		845	6-SS	6		2.8		14	
Brown fine to coarse Sand with Gravel, trace Silt - Wet	15		7-SS	20					
		840	8-SS	26					
Light Brown Sandy Silt, little Gravel - Wet	20		9-SS	35					
		835							
Gray Silty fine Sand, trace Gravel - Wet	25		10-SS	22				17	

Boring terminated at 26'

REMARKS

Water Levels

▽ Water encountered @ 14'

▼ -

APPENDIX B

FIELD PROCEDURES

The field operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) designation D

420 entitled “Standard Guide for Sampling Rock and Rock” and/or other relevant specifications. Soil samples were preserved and transported to *Giles'* laboratory in general accordance with the procedures recommended by ASTM designation D 4220 entitled “Standard Practice for Preserving and Transporting Soil Samples.” Brief descriptions of the sampling, testing and field procedures commonly performed by *Giles* are provided herein.

GENERAL FIELD PROCEDURES

Test Boring Elevations

The ground surface elevations reported on the Test Boring Logs are referenced to the assumed benchmark shown on the Boring Location Plan (Figure 1). Unless otherwise noted, the elevations were determined with a conventional hand-level and are accurate to within about 1 foot.

Test Boring Locations

The test borings were located on-site based on the existing site features and/or apparent property lines. Dimensions illustrating the approximate boring locations are reported on the Boring Location Plan (Figure 1).

Water Level Measurement

The water levels reported on the Test Boring Logs represent the depth of "free" water encountered during drilling and/or after the drilling tools were removed from the borehole. Water levels measured within a granular (sand and gravel) soil profile are typically indicative of the water table elevation. It is usually not possible to accurately identify the water table elevation with cohesive (clayey) soils, since the rate of seepage is slow. The water table elevation within cohesive soils must therefore be determined over a period of time with groundwater observation wells.

It must be recognized that the water table may fluctuate seasonally and during periods of heavy precipitation. Depending on the subsurface conditions, water may also become perched above the water table, especially during wet periods.

Borehole Backfilling Procedures

Each borehole was backfilled upon completion of the field operations. If potential contamination was encountered, and/or if required by state or local regulations, boreholes were backfilled with an "impervious" material (such as bentonite slurry). Borings that penetrated pavements, sidewalks, etc. were "capped" with Portland Cement concrete, asphaltic concrete, or a similar surface material. It must, however, be recognized that the backfill material may settle, and the surface cap may subside, over a period of time. Further backfilling and/or re-surfacing by *Giles'* client or the property owner may be required.

FIELD SAMPLING AND TESTING PROCEDURES

Auger Sampling (AU)

Soil samples are removed from the auger flights as an auger is withdrawn above the ground surface. Such samples are used to determine general soil types and identify approximate soil stratifications. Auger samples are highly disturbed and are therefore not typically used for geotechnical strength testing.

Split-Barrel Sampling (SS) – (ASTM D-1586)

A split-barrel sampler with a 2-inch outside diameter is driven into the subsoil with a 140-pound hammer free-falling a vertical distance of 30 inches. The summation of hammer-blows required to drive the sampler the final 12-inches of an 18-inch sample interval is defined as the "Standard Penetration Resistance" or N-value is an index of the relative density of granular soils and the comparative consistency of cohesive soils. A soil sample is collected from each SPT interval.

Shelby Tube Sampling (ST) – (ASTM D-1587)

A relatively undisturbed soil sample is collected by hydraulically advancing a thin-walled Shelby Tube sampler into a soil mass. Shelby Tubes have a sharp cutting edge and are commonly 2 to 5 inches in diameter.

Bulk Sample (BS)

A relatively large volume of soils is collected with a shovel or other manually-operated tool. The sample is typically transported to *Giles'* materials laboratory in a sealed bag or bucket.

Dynamic Cone Penetration Test (DC) – (ASTM STP 399)

This test is conducted by driving a 1.5-inch-diameter cone into the subsoil using a 15-pound steel ring (hammer), free-falling a vertical distance of 20 inches. The number of hammer-blows required to drive the cone 1¾ inches is an indication of the soil strength and density, and is defined as "N". The Dynamic Cone Penetration test is commonly conducted in hand auger borings, test pits and within excavated trenches.

- Continued -

Ring-Lined Barrel Sampling – (ASTM D 3550)

In this procedure, a ring-lined barrel sampler is used to collect soil samples for classification and laboratory testing. This method provides samples that fit directly into laboratory test instruments without additional handling/disturbance.

Sampling and Testing Procedures

The field testing and sampling operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) and/or other relevant specifications. Results of the field testing (i.e. N-values) are reported on the Test Boring Logs. Explanations of the terms and symbols shown on the logs are provided on the appendix enclosure entitled “General Notes”.

APPENDIX C

LABORATORY TESTING AND CLASSIFICATION

The laboratory testing was conducted under the supervision of a geotechnical engineer in accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) and/or other relevant specifications. Brief descriptions of laboratory tests commonly performed by *Giles* are provided herein.

LABORATORY TESTING AND CLASSIFICATION

Photoionization Detector (PID)

In this procedure, soil samples are "scanned" in *Giles'* analytical laboratory using a Photoionization Detector (PID). The instrument is equipped with an 11.7 eV lamp calibrated to a Benzene Standard and is capable of detecting a minute concentration of **certain** Volatile Organic Compound (VOC) vapors, such as those commonly associated with petroleum products and some solvents. Results of the PID analysis are expressed in HNu (manufacturer's) units rather than actual concentration.

Moisture Content (w) (ASTM D 2216)

Moisture content is defined as the ratio of the weight of water contained within a soil sample to the weight of the dry solids within the sample. Moisture content is expressed as a percentage.

Unconfined Compressive Strength (qu) (ASTM D 2166)

An axial load is applied at a uniform rate to a cylindrical soil sample. The unconfined compressive strength is the maximum stress obtained or the stress when 15% axial strain is reached, whichever occurs first.

Calibrated Penetrometer Resistance (qp)

The small, cylindrical tip of a hand-held penetrometer is pressed into a soil sample to a prescribed depth to measure the soils capacity to resist penetration. This test is used to evaluate unconfined compressive strength.

Vane-Shear Strength (qs)

The blades of a vane are inserted into the flat surface of a soil sample and the vane is rotated until failure occurs. The maximum shear resistance measured immediately prior to failure is taken as the vane-shear strength.

Loss-on-Ignition (ASTM D 2974; Method C)

The Loss-on-Ignition (L.O.I.) test is used to determine the organic content of a soil sample. The procedure is conducted by heating a dry soil sample to 440°C in order to burn-off or "ash" organic matter present within the sample. The L.O.I. value is the ratio of the weight loss due to ignition compared to the initial weight of the dry sample. L.O.I. is expressed as a percentage.

Particle Size Distribution (ASTB D 421, D 422, and D 1140)

This test is performed to determine the distribution of specific particle sizes (diameters) within a soil sample. The distribution of coarse-grained soil particles (sand and gravel) is determined from a “sieve analysis,” which is conducted by passing the sample through a series of nested sieves. The distribution of fine-grained soil particles (silt and clay) is determined from a “hydrometer analysis” which is based on the sedimentation of particles suspended in water.

Consolidation Test (ASTM D 2435)

In this procedure, a series of cumulative vertical loads are applied to a small, laterally confined soil sample. During each load increment, vertical compression (consolidation) of the sample is measured over a period of time. Results of this test are used to estimate settlement and time rate of settlement.

Classification of Samples

Each soil sample was visually-manually classified, based on texture and plasticity, in general accordance with the Unified Soil Classification System (ASTM D-2488-75). The classifications are reported on the Test Boring Logs.

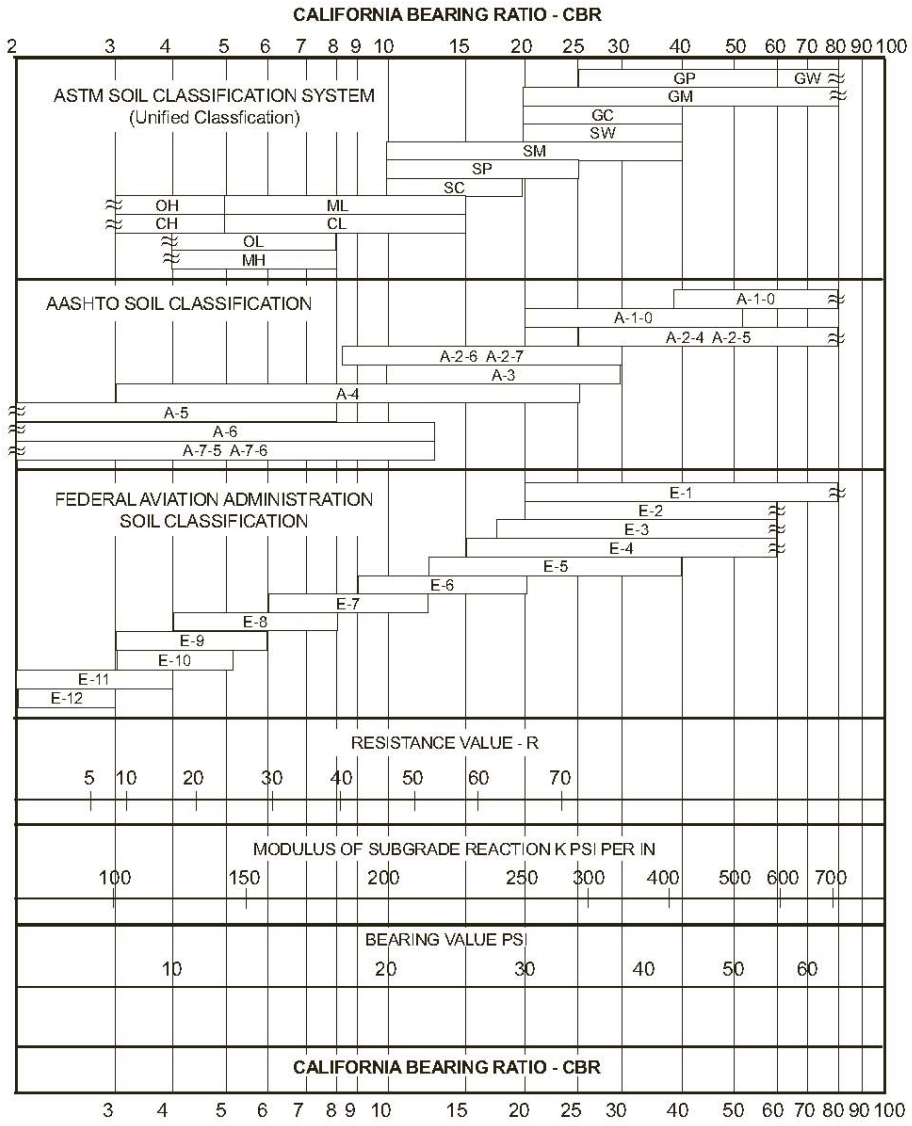
Laboratory Testing

The laboratory testing operations were conducted in general accordance with the procedures recommended by the American Society for Testing and Materials (ASTM) and/or other relevant specifications. Results of the laboratory tests are provided on the Test Boring Logs or other appendix enclosures. Explanation of the terms and symbols used on the logs is provided on the appendix enclosure entitled “General Notes.”

California Bearing Ratio (CBR) Test ASTM D-1833

The CBR test is used for evaluation of a soil subgrade for pavement design. The test consists of measuring the force required for a 3-square-inch cylindrical piston to penetrate 0.1 or 0.2 inch into a compacted soil sample. The result is expressed as a percent of force required to penetrate a standard compacted crushed stone.

Unless a CBR test has been specifically requested by the client, the CBR is estimated from published charts, based on soil classification and strength characteristics. A typical correlation chart is below.



APPENDIX D

GENERAL INFORMATION

AND
IMPORTANT INFORMATION ABOUT
THIS GEOTECHNICAL REPORT

GENERAL COMMENTS

The soil samples obtained during the subsurface exploration will be retained for a period of thirty days. If no instructions are received, they will be disposed of at that time.

This report has been prepared exclusively for the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. Copies of this report may be provided to contractor(s), with contract documents, to disclose information relative to this project. The report, however, has not been prepared to serve as the plans and specifications for actual construction without the appropriate interpretation by the project architect, structural engineer, and/or civil engineer. Reproduction and distribution of this report must be authorized by the client and *Giles*.

This report has been based on assumed conditions/characteristics of the proposed development where specific information was not available. It is recommended that the architect, civil engineer and structural engineer along with any other design professionals involved in this project carefully review these assumptions to ensure they are consistent with the actual planned development. When discrepancies exist, they should be brought to our attention to ensure they do not affect the conclusions and recommendations provided herein. The project plans and specifications may also be submitted to *Giles* for review to ensure that the geotechnical related conclusions and recommendations provided herein have been correctly interpreted.

The analysis of this site was based on a subsoil profile interpolated from a limited subsurface exploration. If the actual conditions encountered during construction vary from those indicated by the borings, *Giles* must be contacted immediately to determine if the conditions alter the recommendations contained herein.

The conclusions and recommendations presented in this report have been promulgated in accordance with generally accepted professional engineering practices in the field of geotechnical engineering. No other warranty is either expressed or implied.

GUIDE SPECIFICATIONS FOR SUBGRADE AND GRADE PREPARATION FOR FILL, FOUNDATION, FLOOR SLAB AND PAVEMENT SUPPORT; AND SELECTION, PLACEMENT AND COMPACTION OF FILL SOILS USING STANDARD PROCTOR PROCEDURES

1. Construction monitoring and testing of subgrades and grades for fill, foundation, floor slab and pavement; and fill selection, placement and compaction shall be performed by an experienced soils engineer and/or his representatives.

2. All compaction fill, subgrades and grades shall be (a) underlain by suitable bearing material; (b) free of all organic, frozen, or other deleterious material, and (c) observed, tested and approved by qualified engineering personnel representing an experienced soils engineer. Preparation of subgrades after stripping vegetation, organic or other unsuitable materials shall consist of (a) proof-rolling to detect soil, wet yielding soils or other unstable materials that must be undercut, (b) scarifying top 6 to 8 inches, (c) moisture conditioning the soils as required, and (d) recompaction to same minimum in-situ density required for similar materials indicated under Item 5. Note: compaction requirements for pavement subgrade are higher than other areas. Weather and construction equipment may damage compacted fill surface and reworking and retesting may be necessary to assure proper performance.

3. In overexcavation and fill areas, the compacted fill must extend (a) a minimum 1 foot lateral distance beyond the exterior edge of the foundation at bearing grade or pavement subgrade and down to compacted fill subgrade on a maximum 0.5(H):1(V) slope, (b) 1 foot above footing grade outside the building, and (c) to floor subgrade inside the building. Fill shall be placed and compacted on a 5(H):1(V) slope or must be stepped or benched as required to flatten if not specifically approved by qualified personnel under the direction of an experienced soil engineer.

4. The compacted fill materials shall be free of deleterious, organic, or frozen matter, shall contain no chemicals that may result in the material being classified as "contaminated", and shall be low-expansive with a maximum Liquid Limit (ASTM D-423) and Plasticity Index (ASTM D-424) of 30 and 15, respectively, unless specifically tested and found to have low expansive properties and approved by an experienced soils engineer. The top 12 inches of compacted fill should have a maximum 3-inch-particle diameter and all underlying compacted fill a maximum 6-inch-diameter unless specifically approved by an experienced soils engineer. All fill materials must be tested and approved under the direction of an experienced soils engineer prior to placement. If the fill is to provide non-frost susceptible characteristics, it must be classified as a clean GW, GP, SW or SP per the Unified Soil Classification System (ASTM D-2487).

5. For structural fill depths less than 20 feet, the density of the structural compacted fill and scarified subgrade and grades shall not be less than 95 percent of the maximum dry density as determined by Standard Proctor (ASTM-698) with the exception of the top 12 inches of pavement subgrade which shall have a minimum in-situ density of 100 percent of maximum dry density, or 5 percent higher than underlying fill materials. Where the structural fill depth is greater than 20 feet, the portions below 20 feet should have a minimum in-place density of 100 percent of its maximum dry density of 5 percent greater than the top 20 feet. The moisture content of cohesive soil shall not vary by more than -1 to +3 percent and granular soil ±3 percent of the optimum when placed and compacted or recompacted, unless specifically recommended/approved by the soils engineer monitoring the placement and compaction. Cohesive soils with moderate to high expansion potentials (PI>15) should, however, be placed, compacted and maintained prior to construction at a moisture content 3±1 percent above optimum moisture content to limit further heave. The fill shall be placed in layers with a maximum loose thickness of 8 inches for foundations and 10 inches for floor slabs and pavement, unless specifically approved by the soils engineer taking into consideration the type of materials and compaction equipment being used. The compaction equipment should consist of suitable mechanical equipment specifically designed for soil compaction. Bulldozers or similar tracked vehicles are typically not suitable for compaction.

6. Excavation, filling, subgrade and grade preparation shall be performed in a manner and sequence that will provide drainage at all times and proper control of erosion. Precipitation, springs and seepage water encountered shall be pumped or drained to provide a suitable working platform. Springs or water seepage encountered during grading/foundation construction must be called to the soil engineer's attention immediately for possible construction procedure revision or inclusion of an underdrain system.

7. Non-structural fill adjacent to structural fill should typically be placed in unison to provide lateral support. Backfill along walls must be placed and compacted with care to ensure excessive unbalanced lateral pressures do not develop. The type of fill material placed adjacent to below-grade walls (i.e. basement walls and retaining walls) must be properly tested and approved by an experienced soils engineer with consideration for the lateral pressure used in the wall design.

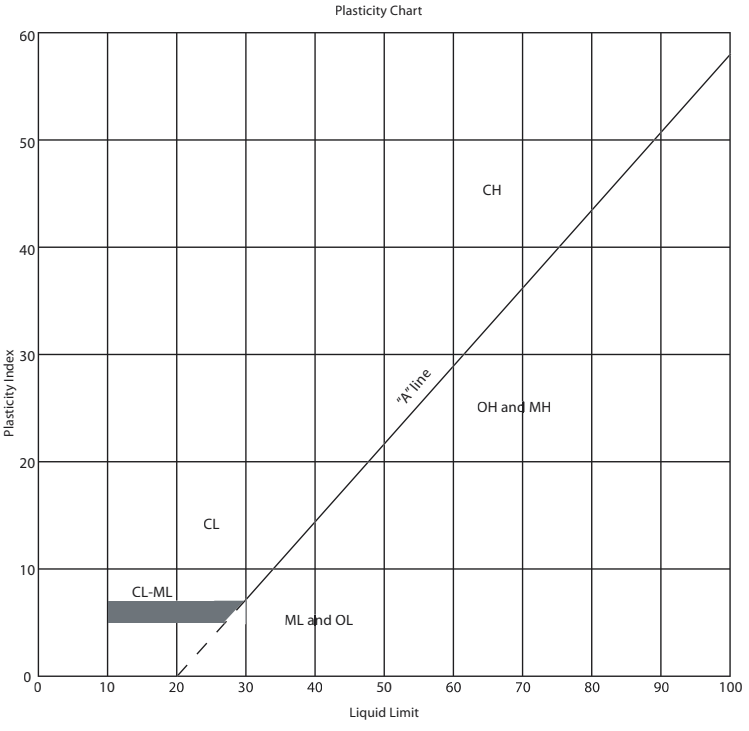
8. Whenever, in the opinion of the soils engineer or the Owner's Representatives, an unstable condition is being created either by cutting or filling, the work shall not proceed into that area until an appropriate geotechnical exploration and analysis has been performed and the grading plan revised, if found necessary.

CHARACTERISTICS AND RATINGS OF UNIFIED SOIL SYSTEM CLASSES FOR SOIL CONSTRUCTION *									
Class	**Compaction Characteristics**	**Max. Dry Density Standard Proctor (pcf)**	**Compressibility and Expansion**	**Drainage and Permeability**	**Value as an Embankment Material**	**Value as Subgrade When Not Subject to Frost**	**Value as Base Course**	**Value as Temporary Pavement**	
								With Dust Palliative	**With Bituminous Treatment**
GW	Good: tractor, rubber-tired, steel wheel or vibratory roller	125-135	Almost none	Good drainage, pervious	Very stable	Excellent	Good	Fair to poor	Excellent
GP	Good: tractor, rubber-tired, steel wheel or vibratory roller	115-125	Almost none	Good drainage, pervious	Reasonably stable	Excellent to good	Poor to fair	Poor	
GM	Good: rubber-tired or light sheepsfoot roller	120-135	Slight	Poor drainage, semipervious	Reasonably stable	Excellent to good	Fair to poor	Poor	Poor to fair
GC	Good to fair: rubber-tired or sheepsfoot roller	115-130	Slight	Poor drainage, impervious	Reasonably stable	Good	Good to fair **	Excellent	Excellent
SW	Good: tractor, rubber-tired or vibratory roller	110-130	Almost none	Good drainage, pervious	Very stable	Good	Fair to poor	Fair to poor	Good
SP	Good: tractor, rubber-tired or vibratory roller	100-120	Almost none	Good drainage, pervious	Reasonably stable when dense	Good to fair	Poor	Poor	Poor to fair
SM	Good: rubber-tired or sheepsfoot roller	110-125	Slight	Poor drainage, impervious	Reasonably stable when dense	Good to fair	Poor	Poor	Poor to fair
SC	Good to fair: rubber-tired or sheepsfoot roller	105-125	Slight to medium	Poor drainage, impervious	Reasonably stable	Good to fair	Fair to poor	Excellent	Excellent
ML	Good to poor: rubber-tired or sheepsfoot roller	95-120	Slight to medium	Poor drainage, impervious	Poor stability, high density required	Fair to poor	Not suitable	Poor	Poor
CL	Good to fair: sheepsfoot or rubber-tired roller	95-120	Medium	No drainage, impervious	Good stability	Fair to poor	Not suitable	Poor	Poor
OL	Fair to poor: sheepsfoot or rubber-tired roller	80-100	Medium to high	Poor drainage, impervious	Unstable, should not be used	Poor	Not suitable	Not suitable	Not suitable
MH	Fair to poor: sheepsfoot or rubber-tired roller	70-95	High	Poor drainage, impervious	Poor stability, should not be used	Poor	Not suitable	Very poor	Not suitable
CH	Fair to poor: sheepsfoot roller	80-105	Very high	No drainage, impervious	Fair stability, may soften on expansion	Poor to very poor	Not suitable	Very poor	Not suitable
OH	Fair to poor: sheepsfoot roller	65-100	High	No drainage, impervious	Unstable, should not be used	Very poor	Not suitable	Not suitable	Not suitable
Pt	Not suitable		Very high	Fair to poor drainage	Should not be used	Not suitable	Not suitable	Not suitable	Not suitable

* "The Unified Classification: Appendix A - Characteristics of Soil, Groups Pertaining to Roads and Airfields, and Appendix B - Characteristics of Soil Groups Pertaining to Embankments and Foundations," Technical Memorandum 357, U.S. Waterways Ixperiment Station, Vicksburg, 1953.

** Not suitable if subject to frost.

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

Major Divisions			Group Symbols	Typical Names	Laboratory Classification Criteria	
Coarse-grained soils (more than half of material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 percent: GW, GP, SW, SP. More than 12 percent: GM, GC, SM, SC. 5 to 12 percent: *Borderline* cases requiring dual symbols[b]	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			GP	Poorly graded gravels, gravel-sand mixtrues, little or no fines		Not meeting all gradation requirements for GW
		Gravels with fines (appreciable amount of fines)	GM[a] d	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Limits plotting within shaded area, above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
			GM[a] u			
			GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits above "A" line or P.I. greater than 7	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			SP	Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW
		Sands with fines (Appreciable amount of fines)	SM[a] d	Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Limits plotting within shaded area, above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
			SM[a] u			
			SC	Clayey sands, sand-clay mixtures	Atterberg limits above "A" line or P.I. greater than 7	
Fine-grained soils (More than half material is smaller than No. 200 sieve size)	Silts and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity		
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays		
			OL	Organic silts and organic silty clays of low plasticity		
	Silts and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			CH	Inorganic clays of high plasticity, fat clays		
			OH	Organic clays of medium to high plasticity, organic silts		
	Highly organic soils		Pt	Peat and other highly organic soils		

[a] Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits, suffix d used when L.L. is 28 or less and the P.I. is 6 or less; the suffix u is used when L.L. is greater than 28.

[b] Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group sympols. For example GW-GC, well-graded gravel-sand mixture with clay binder.

GENERAL NOTES

SAMPLE IDENTIFICATION

All samples are visually classified in general accordance with the Unified Soil Classification System (ASTM D-2487-75 or D-2488-75)

DESCRIPTIVE TERM (% BY DRY WEIGHT)

Trace:	1-10%
Little:	11-20%
Some:	21-35%
And/Adjective	36-50%

PARTICLE SIZE (DIAMETER)

Boulders:	8 inch and larger
Cobbles:	3 inch to 8 inch
Gravel:	coarse - ¾ to 3 inch
	fine – No. 4 (4.76 mm) to ¾ inch
Sand:	coarse – No. 4 (4.76 mm) to No. 10 (2.0 mm)
	medium – No. 10 (2.0 mm) to No. 40 (0.42 mm)
	fine – No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt:	No. 200 (0.074 mm) and smaller (non-plastic)
Clay:	No 200 (0.074 mm) and smaller (plastic)

SOIL PROPERTY SYMBOLS

Dd:	Dry Density (pcf)
LL:	Liquid Limit, percent
PL:	Plastic Limit, percent
PI:	Plasticity Index (LL-PL)
LOI:	Loss on Ignition, percent
Gs:	Specific Gravity
K:	Coefficient of Permeability
w:	Moisture content, percent
qp:	Calibrated Penetrometer Resistance, tsf
qs:	Vane-Shear Strength, tsf
qu:	Unconfined Compressive Strength, tsf
qc:	Static Cone Penetrometer Resistance (correlated to Unconfined Compressive Strength, tsf)
PID:	Results of vapor analysis conducted on representative samples utilizing a Photoionization Detector calibrated to a benzene standard. Results expressed in HNU-Units. (BDL=Below Detection Limit)

DRILLING AND SAMPLING SYMBOLS

SS:	Split-Spoon
ST:	Shelby Tube – 3 inch O.D. (except where noted)
CS:	3 inch O.D. California Ring Sampler
DC:	Dynamic Cone Penetrometer per ASTM Special Technical Publication No. 399
AU:	Auger Sample
DB:	Diamond Bit
CB:	Carbide Bit
WS:	Wash Sample
RB:	Rock-Roller Bit
BS:	Bulk Sample
Note:	Depth intervals for sampling shown on Record of Subsurface Exploration are not indicative of sample recovery, but position where sampling initiated

N: Penetration Resistance per 12 inch interval, or fraction thereof, for a standard 2 inch O.D. (1⅜ inch I.D.) split spoon sampler driven with a 140 pound weight free-falling 30 inches. Performed in general accordance with Standard Penetration Test Specifications (ASTM D-1586). N in blows per foot equals sum of N-Values where plus sign (+) is shown.

Nc: Penetration Resistance per 1¾ inches of Dynamic Cone Penetrometer. Approximately equivalent to Standard Penetration Test N-Value in blows per foot.

Nr: Penetration Resistance per 12 inch interval, or fraction thereof, for California Ring Sampler driven with a 140 pound weight free-falling 30 inches per ASTM D-3550. Not equivalent to Standard Penetration Test N-Value.

SOIL STRENGTH CHARACTERISTICS

COHESIVE (CLAYEY) SOILS

COMPARATIVE CONSISTENCY	BLOWS PER FOOT (N)	UNCONFINED COMPRESSIVE STRENGTH (TSF)
Very Soft	0 - 2	0 - 0.25
Soft	3 - 4	0.25 - 0.50
Medium Stiff	5 – 8	0.50 - 1.00
Stiff	9 – 15	1.00 - 2.00
Very Stiff	16 – 30	2.00 - 4.00
Hard	31+	4.00+

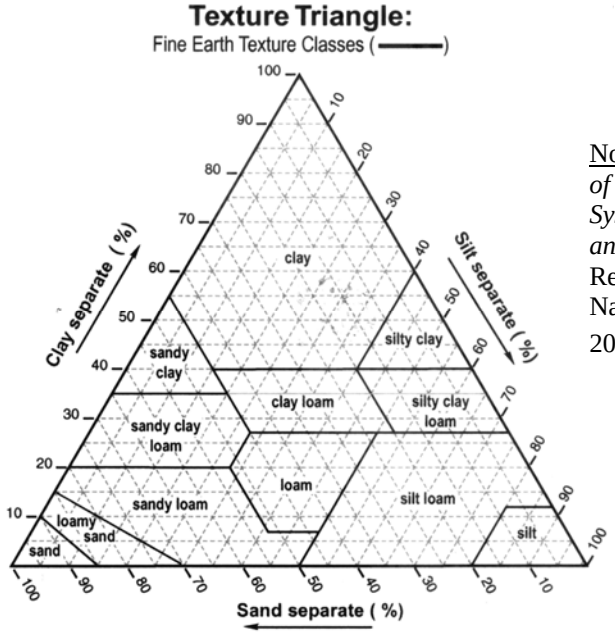
NON-COHESIVE (GRANULAR) SOILS

RELATIVE DENSITY	BLOWS PER FOOT (N)
Very Loose	0 - 4
Loose	5 - 10
Firm	11 - 30
Dense	31 - 50
Very Dense	51+

DEGREE OF PLASTICITY	PI
None to Slight	0 - 4
Slight	5 - 10
Medium	11 - 30
High to Very High	31+

DEGREE OF EXPANSIVE POTENTIAL	PI
Low	0 - 15
Medium	15 - 25
High	25+

SOIL CLASSIFICATION NOTES



Note: *Texture Triangle* and *Comparison of Particle Size Classes in Different Systems* from *Field Book for Describing and Sampling Soil*, USDA Natural Resources Conservation Service National Soil Survey Center (September 2002).

Comparison of Particle Size Classes in Different Systems

	FINE EARTH									ROCK FRAGMENTS					
										channers			flagst.	stones	boulders
USDA [1]	Clay [2]		Silt		Sand					Gravel			Cobbles	Stones	Boulders
	fine	co.	fine	co.	v.fi.	fi.	med.	co.	v. co.	fine	medium	coarse			
millimeters:	0.0002	.002 mm		.02	.05	.1	.25	.5	1	2 mm	5	20	76	250	600 mm
U.S. Standard Sieve No. *(opening)*:					300 [3]	140	60	35	18	10	4	*(3/4")*	*(3")*	*(10")*	*(25")*

International [4]	Clay	Silt	Sand		Gravel	Stones
			fine	coarse		
millimeters:	.002 mm	.02	.20		2 mm	20 mm
U.S. Standard Sieve No. *(opening)*:					10	*(3/4")*

Unified [5]	Silt or Clay	Sand			Gravel		Cobbles	Boulders
		fine	medium	co.	fine	coarse		
millimeters:	.074	.42	2 mm	4.8	19	76	300 mm	
U.S. Standard Sieve No. *(opening)*:	200	40	10	4	*(3/4")*	*(3")*		

AASHTO [6,7]	Clay	Silt	Sand		Gravel or Stones			Broken Rock (angular), or Boulders (rounded)
			fine	coarse	fine	med.	co.	
millimeters:	.005 mm	.074	.42	2 mm	9.5	25	75 mm	
U.S. Standard Sieve No.:		200	40	10	*(3/8")*	*(1")*	*(3")*	

phi #:	12	10	9	8	7	6	5	4	3	2	1	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-12
Modified Wentworth [8]	clay			silt				sand					pebbles						Cobbles	boulders			
millimeters:	.002	.004	.008	.016	.031	.062	.125	.25	.5	1	2 mm	8	16	32	64		256			4092 mm			
U.S. Standard Sieve No.:						230	120	60	35	18	10	5											

1. Soil Survey Staff. 1995. Soil survey Laboratory information manual. USDA, Natural Resources Conservation Service, Soil Survey Investigations Report No. 45, Version 1.0, National Soil Survey Center, Lincoln, NE. 305 p.
2. Soil Survey Staff. 1995. Soil Survey Lab information manual. USDA-NRCS, Soil Survey Investigation Report #45, version 1.0, National Soil Survey Center, Lincoln, NE. Note: Mineralogy studies may subdivide clay into three size ranges; fine (<0.08µm), medium (0.08-0.2µm), and coarse (0.2-2µm); Jackson, 1969.
3. The Soil Survey Lab (Lincoln, NE) uses a no. 300 sieve (0.047 mm opening) for the USDA-sand/silt measurement. A no. 270 sieve (0.053 mm opening) is more readily available and widely used.
4. International Soil Science Society. 1951. *In*: Soil Survey Manual. Soil Survey Staff, USDA-Soil Conservation Service, Agricultural Handbook No. 18, U.S. Gov. Print. Office, Washington, D.C. 214 p.
5. ASTM. 1993. Standard classification of soils for engineering purposes (Unified Soil Classification System). ASTM designation D2487-92. *In*: Soil and rock; dimension stone; geosynthetics. Annual book of ASTM standards-Vol. 04.08.
6. AASHTO. 1986a. Recommended practice for the classification of soils and soil-aggregate mixtures for highway construction purposes. AASHTO designation M145-82. *In*: Standard specifications for transportation materials and methods of sampling and testing; Part 1: Specifications (14th ed.). American Association of State Highway and Transportation Officials, Washington, D.C.
7. AASHTO. 1986b. Standard definitions of terms relating to subgrade, soil-aggregate, and fill materials. AASHTO designation M146-70 (1980). *In*: sampling and testing; Part 1: Specifications (14th ed.). American Association of State Highway and Transportation Officials, Washington, D.C.
8. Ingram, R.L. 1982. Modified Wentworth scale. *In*: Grain-size scales. AGI Date Sheet 29.1. *In*: Dutro, J.T., Dietrich, R.V., and Foose, R.M. 1989. AGI data sheets for geology in the field, laboratory, and office, 3rd edition. American Geological Institute, Washington, D.C.

GILES ENGINEERING ASSOCIATES, INC.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

Copyright 2019 by Geoprofessional Business Association (GBA). Duplication, reproduction, or copying of this document, in whole or in part, by any means whatsoever, is strictly prohibited, except with GBA's specific written permission. Excerpting, quoting, or otherwise extracting wording from this document is permitted only with the express written permission of GBA, and only for purposes of scholarly research or book review. Only members of GBA may use this document or its wording as a complement to or as an element of a report of any kind. Any other firm, individual, or other entity that so uses this document without being a GBA member could be committing negligent or intentional (fraudulent) misrepresentation.

Geotechnical, Environmental & Construction Materials Consultants

GILES

ENGINEERING ASSOCIATES, INC.

www.gilesengr.com

raSmith

CREATIVITY BEYOND ENGINEERING

WDNR PROFESSIONALLY ASSURED WETLAND DELINEATION REPORT

Project Name: Stor-It-Right Waukesha

Project Location: City of Waukesha, Waukesha County, Wisconsin

Prepared For: HCL Properties

Prepared By: raSmith, 16745 West Bluemound Road, Suite 200, Brookfield, WI 53005-5938

Date: 06/15/2026

raSmith Project Number: 3250218

File Path:P\3250218\Doc\Ecological\Wetland Delineation\VERSIONS

raSmith

CREATIVITY BEYOND ENGINEERING

Table of Contents

EXECUTIVE SUMMARY 3

1. INTRODUCTION 3

2. METHODOLOGY 4

2.1 Resource Review 4

2.2 Field Methods 4

3. RESULTS & DISCUSSION 5

3.1 Desktop Resource Review 5

3.1.1 Topography, Slope, and Aspect 5

3.1.2 Hydrology 5

3.1.3 Antecedent Precipitation 6

3.1.4 Soils 6

3.1.5 Wetland Inventory and Classification 7

3.1.6 Historic Land Use Summary 7

3.1.7 Desktop Conclusions 8

3.2 Wetland Summaries 9

Wetland W-1 9

Wetland W-2 10

Wetland W-3 11

3.3 Surrounding Uplands 11

4. CONCLUSION 12

5. REGULATORY 12

Validity (Wis. Stat. § 23.321): 13

Wetland Protective Area Requirements NR 151 .12(5)(c) 13

6. STATEMENT OF QUALIFICATIONS 13

7. REFERENCES 13

EXECUTIVE SUMMARY

raSmith conducted a wetland delineation within an approximately 4.27-acre study area located in the City of Waukesha, Waukesha County, Wisconsin. The purpose of the investigation was to identify and map wetlands and other aquatic resources that may influence future planning, design, and permitting activities associated with the property.

A desktop review was completed utilizing available environmental resources including Wisconsin Wetland Inventory (WWI) mapping, NRCS soil survey information, historical aerial photography, historical land use mapping, and topographic mapping. Field investigations were completed on April 28, 2026 in accordance with the 1987 U.S. Army Corps of Engineers Wetlands Delineation Manual and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region.

Three wetlands totaling approximately 0.60 acre were identified within the study area. Wetland W-1 (0.02 acre), Wetland W-2 (0.20 acre), and Wetland W-3 (0.38 acre) exhibited hydrophytic vegetation, hydric soils, and wetland hydrology sufficient to satisfy federal wetland criteria under normal circumstances.

Review of historical mapping resources and aerial photography indicates the property has undergone substantial alteration over time. Historic aerial imagery depicts the site as actively cultivated agricultural land in 1980 before transitioning to a disturbed landscape characterized by grading, excavation, drainage modification, and altered topography by 2000. The current site configuration, including localized depressions and modified drainage features, has remained generally consistent since that time.

Field observations documented excavated depressions, disturbed soil profiles, spoil berms, and modified drainage features associated with portions of the delineated wetlands. The delineation documents existing wetland conditions and the disturbance history observed within the Study Area at the time of investigation.

---

1. INTRODUCTION

raSmith was retained by HCI Properties to conduct a wetland delineation for approximately 4.27 acres located in the City of Waukesha, Waukesha County, Wisconsin (Study Area). The purpose of the delineation was to identify and map wetlands and other aquatic resources that may influence future site planning, development, and permitting activities.

Field investigations were conducted on April 28, 2026 by Erica Pergande, PWS, WDNR Professionally Assured Wetland Delineator. Wetlands were identified and delineated in accordance with the 1987 U.S. Army Corps of Engineers Wetlands Delineation Manual and the

Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region.

The delineation documented the location and extent of wetlands present within the Study Area at the time of investigation. Wetland boundaries were established through evaluation of vegetation, soils, and hydrology and were subsequently mapped using sub-meter GPS equipment.

2. METHODOLOGY

2.1 Resource Review

The delineation followed the **U.S. Army Corps of Engineers Northcentral and Northeast Regional Supplement (2012)** and **WDNR Professional Assurance Program** standards (**USACE 1987; USACE 2012**).

- **Data Sources:**
- Wisconsin Wetland Inventory (WWI)
- NRCS Web Soil Survey (gSSURGO)
- Historic Aerial Photography (1937–2026)
- WDNR Surface Water Data Viewer
- NOAA Antecedent Precipitation Tool (APT)
- Public Land Survey Records
- Bordner Survey Mapping
- Wisconsin Land Economic Inventory Mapping
- Historic USGS Topographic Mapping
- LiDAR / County 1-foot Contour Mapping

2.2 Field Methods

Field investigations were conducted on April 28, 2026.

- Representative wetland and upland sample points were established.
- Vegetation was evaluated by strata using dominance and prevalence methods.
- Soils were examined to approximately 20 inches or refusal.
- Wetland hydrology indicators were documented in the field.
- Wetland boundaries were flagged and mapped using GPS equipment.

3. RESULTS & DISCUSSION

3.1 Desktop Resource Review

The desktop review corroborated field observations indicating the presence of hydric soils, drainage features, and localized depressional areas capable of supporting wetland conditions within the Study Area. Historical mapping resources, aerial photography, topographic mapping, and soil survey information were reviewed to evaluate historic site conditions and guide field investigations.

Review of historical aerial photography indicates the property has undergone substantial alteration over time. The earliest available aerial imagery depicts the site as actively cultivated agricultural land. By 2000, substantial disturbance, grading, and earthwork activities were evident across portions of the property. Subsequent aerial photography documents a generally stable site configuration characterized by localized depressions, modified drainage features, and disturbed land cover conditions that persist through present day.

Field observations documented excavated depressions, disturbed soil profiles, spoil berms, and modified drainage pathways within portions of the Study Area. These altered landscape features currently influence localized hydrology and wetland development throughout the property.

3.1.1 Topography, Slope, and Aspect

The Study Area occupies a relatively low-lying landscape position within a developed commercial corridor in the City of Waukesha. Surface elevations generally decrease toward the southern property boundary where a linear drainage feature parallels Coral Drive.

County contour mapping, LiDAR review, and field observations document several localized depressions, modified drainage pathways, and disturbed topographic features throughout the property. Field investigations identified spoil berms, excavated depressions, and altered surface grades associated with historic earthwork activities. These features currently influence runoff concentration, localized ponding, and hydrologic conditions within portions of the Study Area.

The southern drainage corridor represents the primary surface drainage feature within the property and corresponds generally with drainage signatures visible throughout portions of the historic aerial record.

3.1.2 Hydrology

Hydrology within the Study Area is influenced by localized depressions, modified drainage pathways, and runoff from adjacent upland areas. Field observations documented surface

water, saturation, water marks, aquatic fauna, drainage patterns, geomorphic position, and water-stained leaves within delineated wetland areas.

Historic aerial photography indicates portions of the site have exhibited wet signatures and drainage features over time. Field observations further documented excavated depressions, spoil berms, and altered drainage patterns associated with historic site disturbance that currently influence hydrologic conditions within portions of the Study Area.

The southern drainage corridor represents the primary drainage feature within the property and generally corresponds with drainage signatures visible throughout portions of the historic aerial record.

3.1.3 Antecedent Precipitation

Antecedent precipitation conditions at the time of the site investigation were classified as **"Wetter than Normal"** based on NOAA Antecedent Precipitation Tool (APT) outputs. Thirty-day precipitation totals exceeded the 70th percentile for the region prior to the April 28, 2026 field investigation.

Although precipitation conditions were wetter than normal at the time of the investigation, wetland determinations were based on the combined evaluation of vegetation, soils, and hydrology indicators in accordance with the 1987 U.S. Army Corps of Engineers Wetlands Delineation Manual and applicable Regional Supplement.

3.1.4 Soils

NRCS soil mapping identifies Houghton muck (HtA) and Palms muck (Pa) as the primary mapped soil units within and adjacent to the Study Area. Both soil series are classified as hydric soils and are associated with poorly drained landscape positions capable of supporting wetland conditions.

Houghton muck consists of very poorly drained organic soils that commonly occur within depressions and low-lying drainageways. Palms muck similarly consists of poorly drained organic soils formed under prolonged saturated conditions. These mapped soil units are consistent with the broader wetland and drainage characteristics observed throughout portions of the surrounding landscape.

Field investigations confirmed the presence of hydric soil indicators within representative wetland sampling locations. Wetland sample points exhibited depleted conditions, redox concentrations, and hydric soil indicators including Hydric Soil Indicator F3 (Depleted Matrix) and Hydric Soil Indicator F6 (Redox Dark Surface). Representative upland sampling locations lacked hydric soil indicators and generally consisted of disturbed mineral soils, spoil material, and reworked soil profiles associated with historic site disturbance.

3.1.5 Wetland Inventory and Classification

Wisconsin Wetland Inventory (WWI) mapping identifies a linear wetland feature associated with the southern drainage corridor within the Study Area. Additional mapped wetlands occur adjacent to the property and throughout the surrounding landscape.

Field delineation refined wetland boundaries to reflect current site conditions observed during the April 2026 investigation. The delineated wetlands generally correspond with localized depressions and drainage features identified during desktop review; however, field investigations documented site-specific wetland boundaries based on the presence of hydrophytic vegetation, hydric soils, and wetland hydrology.

Wetland communities identified within the Study Area consisted primarily of emergent depressional wetlands and drainage-associated wetland features occurring within a disturbed landscape influenced by historic grading and drainage modification activities.

3.1.6 Historic Land Use Summary

Historic mapping resources, aerial photography, topographic mapping, and land inventory information were reviewed to evaluate historical site conditions and changes in land use within the Study Area. Available resources indicate the property has transitioned from an agricultural landscape to a disturbed remnant parcel characterized by modified drainage features, localized depressions, and altered topography. A summary of observed historical conditions is provided below.

Time Frame	Key Observations	Source Figures
1830s–1930s	Original Public Land Survey records and Bordner Survey mapping depict the broader landscape as agricultural and rural in character with regional drainage features present throughout portions of the surrounding area. Wisconsin Land Economic Inventory mapping classified much of the property as cultivated agricultural land.	Public Land Survey, Bordner Survey, Wisconsin Land Economic Inventory
1937–1963	Historic aerial photography depicts the Study Area as active agricultural land consisting primarily of cultivated fields. A linear drainage feature is visible along the southern portion of the property; however, the current wetland configuration and localized depressions identified during the 2026 investigation are not readily apparent.	1937, 1956, and 1963 Historic Aerial Photography
1959–1971	Historic USGS topographic mapping and soil survey resources depict the site within a broader low-lying landscape containing poorly drained organic soils and drainage features common to the region. Mapped	1959 and 1971 USGS topographic mapping

	Houghton muck and Palms muck indicate a landscape capable of supporting wetland conditions where hydrology is present.	
1980	The property remained in agricultural production with row crop cultivation evident throughout much of the site. A drainage feature remained visible along the southern property boundary. Present-day wetland geometry and depressional features were not apparent.	1980 historic aerial imagery
1990	Agricultural use had ceased and portions of the property exhibited disturbed conditions, exposed soils, and localized wet signatures. The southern drainage feature remained evident.	1990 historic aerial imagery
2000	Substantial disturbance, grading, excavation, and alteration of site conditions were evident throughout portions of the property. Areas of exposed soil and modified topography were visible and differed substantially from the agricultural landscape documented in earlier imagery.	2000 Historic Aerial Imagery
2005–2020	The site maintained a generally stable configuration characterized by disturbed soils, localized depressions, modified drainage pathways, and a linear drainage corridor along the southern boundary. The landscape observed during this period generally corresponds to the features documented during the 2026 field investigation.	2005, 2010, 2015, and 2020 Historic Aerial Photography
2026	Field investigations documented wetlands associated with localized depressions, modified drainage features, disturbed soil profiles, and adjacent spoil berms. Delineated boundaries reflect site conditions observed during the April 2026 investigation.	April 2026 Field Investigation

3.1.7 Desktop Conclusions

Desktop resources generally corroborated field observations and documented hydric soils, drainage features, and localized depressional areas capable of supporting wetland conditions within the Study Area.

Historical mapping and aerial photography indicate the property has undergone substantial alteration over time, transitioning from cultivated agricultural land to a disturbed landscape characterized by grading, excavation, modified drainage pathways, and altered topography. Historic aerial photography documents substantial site disturbance occurring between approximately 1980 and 2000, with the current site configuration remaining generally consistent since that time.

Field investigations documented excavated depressions, disturbed soil profiles, spoil berms, and modified drainage features throughout portions of the Study Area. These altered landscape features currently influence hydrology and wetland development within the delineated

wetlands. The identified wetlands occur within a landscape that exhibits evidence of historic earthwork activities and drainage modification, warranting consideration of site history and disturbance chronology when evaluating existing wetland conditions.

No Areas of Special Natural Resource Interest (ASNRI) were identified within the Study Area based on WDNR Surface Water Data Viewer review. Desktop review findings were utilized to guide placement of representative data points and wetland boundary flagging during the field investigation.

3.2 Wetland Summaries

A total of three (3) wetlands (W-1 through W-3) were identified and delineated within the approximately 4.27-acre Study Area during the April 28, 2026 field investigation. The delineated wetlands consist of two depressional wetland features and one linear drainage-associated wetland occurring within a disturbed landscape characterized by modified topography, localized depressions, spoil berms, and altered drainage features.

Historic aerial photography indicates the property has undergone substantial alteration over time, transitioning from agricultural use to a disturbed landscape exhibiting evidence of grading, excavation, and modified drainage patterns. Field observations documented excavated depressions, disturbed soil profiles, and spoil berms adjacent to portions of the delineated wetlands. These altered landscape features currently influence hydrology and wetland development throughout the Study Area.

Regardless of origin, all delineated wetlands presently exhibit hydrophytic vegetation, hydric soils, and wetland hydrology under normal circumstances at the time of investigation.

Wetland W-1

Wetland W-1 consists of a small emergent depressional wetland located in the western portion of the Study Area. The wetland occupies a localized depression and exhibits wetland hydrology, hydric soils, and hydrophytic vegetation sufficient to satisfy wetland criteria under normal circumstances.

- **Type:** PEMC – Palustrine Emergent, Seasonally Flooded/Saturated
- **Size:** Approximately 990 square feet (0.02 acre)
- **Landscape Position & Connectivity:** Located within a localized depression in the western portion of the Study Area. The feature receives runoff from adjacent uplands and functions as a small isolated depressional wetland.
- **Dominant Vegetation in Herbaceous Layer:** Sparse emergent vegetation due to prolonged inundation observed at the time of investigation.
- **Dominant Vegetation in Tree Layer:**
    - None observed

- **Soils:**
  - Houghton muck (HtA)
  - Hydric Soil Indicator F6 (Redox Dark Surface)
- **Hydrology Indicators:**
  - Surface Water (A1)
  - Saturation (A3)
  - Water Marks (B1)
  - Aquatic Fauna (B13)
  - Drainage Patterns (B10)
  - Geomorphic Position (D2)
  - Water-Stained Leaves (B9)
- **Data Point:** DP-1 WET
- **Notes:** Field observations documented an excavated depression and adjacent disturbed soil conditions associated with historic grading activities. Wetland hydrology appears influenced by localized ponding within the depression.

Wetland W-2

Wetland W-2 consists of an emergent depressional wetland located within the east-central portion of the Study Area. The wetland occupies a distinct low area and exhibits hydrophytic vegetation, hydric soils, and wetland hydrology under normal circumstances.

- **Type:** PEMC – Palustrine Emergent, Seasonally Flooded/Saturated
- **Size:** Approximately 8,577 square feet (0.20 acre)
- **Landscape Position & Connectivity:** Located within a localized depression receiving runoff from adjacent uplands and surrounding disturbed areas.
- **Dominant Vegetation in Herbaceous Layer:**
  - *Phalaris arundinacea* (Reed Canary Grass) – FACW
  - *Eleocharis obtusa* (Blunt Spikerush) – OBL
- **Dominant Vegetation in Shrub/Tree Layer:**
  - *Salix interior* (Sandbar Willow) – FACW
  - *Acer negundo* (Box Elder) – FAC
- **Soils:**
  - Houghton muck (HtA)
  - Hydric Soil Indicator F6 (Redox Dark Surface)
- **Hydrology Indicators:**
  - Surface Water (A1)
  - Saturation (A3)
  - Water Marks (B1)
  - Aquatic Fauna (B13)
  - Drainage Patterns (B10)
  - Geomorphic Position (D2)
  - Water-Stained Leaves (B9)
- **Data Point:** DP-3 WET

- **Notes:** Field observations documented disturbed soil profiles, adjacent spoil berms, and modified topography surrounding the wetland feature. Hydrology appears influenced by localized ponding and runoff accumulation within the depression.

Wetland W-3

Wetland W-3 consists of a linear emergent wetland associated with a drainage corridor extending along the southern portion of the Study Area. The wetland occupies a linear drainage corridor that generally corresponds with drainage features visible throughout portions of the historic aerial record and depicted on Wisconsin Wetland Inventory mapping.

- **Type:** PEM – Palustrine Emergent Wetland
- **Size:** Approximately 16,673 square feet (0.38 acre)
- **Landscape Position & Connectivity:** Located along the southern property boundary within a linear drainage corridor receiving runoff from adjacent portions of the Study Area.
- **Dominant Vegetation in Herbaceous Layer:**
  - *Phalaris arundinacea* (Reed Canary Grass) – FACW
  - *Typha x glauca* (Hybrid Cattail) – OBL
  - *Impatiens capensis* (Jewelweed) – FACW
- **Dominant Vegetation in Shrub Layer:**
  - *Salix interior* (Sandbar Willow) – FACW
  - *Sambucus canadensis* (Common Elderberry) – FAC
- **Soils:**
  - Palms muck (Pa)
  - Hydric Soil Indicator F3 (Depleted Matrix)
- **Hydrology Indicators:**
  - Surface Water (A1)
  - Saturation (A3)
  - Water Marks (B1)
  - Aquatic Fauna (B13)
  - Drainage Patterns (B10)
  - Geomorphic Position (D2)
  - Water-Stained Leaves (B9)
- **Data Point:** DP-5 WET
- **Notes:** Wetland W-3 occupies a linear drainage corridor visible in historic aerial photography and Wisconsin Wetland Inventory mapping. Field observations documented evidence of historic disturbance, modified drainage conditions, and altered topography within portions of the corridor; however, drainage signatures have been present within this general landscape position throughout much of the available historic record.

3.3 Surrounding Uplands

Adjacent uplands within the Study Area are dominated by disturbed ruderal and early successional vegetation typical of previously graded and unmanaged sites. Representative

upland species observed during the investigation included common disturbance-tolerant grasses and forbs associated with historic earthwork activities and abandoned open land conditions. Upland areas consist primarily of disturbed mineral soils, reworked spoil material, elevated berm features, and previously graded surfaces surrounding the delineated wetlands.

Representative upland sampling locations lacked hydric soil indicators and wetland hydrology indicators under normal circumstances. Field observations documented evidence of historic site disturbance including excavation, grading, soil redistribution, and berm construction throughout portions of the Study Area.

The surrounding uplands contribute runoff to adjacent depressional wetlands and drainage features and influence localized hydrologic conditions within the Study Area.

4. CONCLUSION

Three wetlands (W-1 through W-3), totaling approximately 0.60 acre, were identified and delineated within the approximately 4.27-acre Study Area in accordance with the 1987 U.S. Army Corps of Engineers Wetlands Delineation Manual and the applicable Regional Supplement. These wetlands satisfy the criteria for hydrophytic vegetation, hydric soils, and wetland hydrology under normal circumstances.

Desktop review, historical mapping resources, aerial photography, topographic mapping, and field observations indicate the Study Area has undergone substantial alteration over time. Historic aerial photography documents a transition from cultivated agricultural land to a disturbed landscape characterized by grading, excavation, modified drainage features, and altered topography. The current site configuration generally became established between 1980 and 2000 and has remained relatively consistent through recent years.

Field investigations documented localized depressions, disturbed soil profiles, spoil berms, and modified drainage features throughout portions of the property. Wetlands W-1 and W-2 occur within depressional landscape positions exhibiting evidence of historic earthwork activities, while Wetland W-3 occupies a drainage corridor that generally corresponds with drainage signatures visible throughout the historic aerial record. The delineated wetland boundaries reflect existing site conditions observed during the April 2026 investigation.

The wetland delineation documents current wetland conditions and does not constitute a formal jurisdictional determination by the Wisconsin Department of Natural Resources or the U.S. Army Corps of Engineers. Evaluation of potential applicability under Wisconsin's artificial wetland exemption provisions was beyond the scope of this delineation.

5. REGULATORY

Wetlands in the project area are regulated by the **USACE and EPA** (federal) and the **WDNR** (state). Projects that alter wetlands or waterways may require permits, and violations may result in penalties.

Validity (Wis. Stat. § 23.321): WDNR-confirmed delineations are valid for 5 years. For nonfederal wetlands where a property owner acquires a WDNR Non-Federal Wetland Exemption, delineations may remain valid for up to 15 years, unless site conditions change.

Wetland Protective Area Requirements NR 151 .12(5)(c)

NR 151 is part of Wisconsin's Runoff Management Administrative Code, which establishes minimum performance standards for stormwater management in post-construction development. Section NR 151.12(5)(c) specifically addresses "protective areas", also referred to as vegetated buffer zones, that must be maintained adjacent to water resources — including wetlands.

Wetland Type	***Required Buffer***
Highly susceptible wetlands (e.g., calcareous fens, sedge meadows, bogs, marshes)	50 feet
All wetlands ≥ 2 acres	25 feet
All wetlands < 2 acres	10 feet
Wetlands adjacent to lakes, rivers, or streams	50 feet

6. STATEMENT OF QUALIFICATIONS

This wetland delineation was conducted by **Erica Pergande, PWS**, Senior Wetland Ecologist with raSmith. Ms. Pergande is a **Wisconsin DNR Professionally Assured Wetland Delineator** and a **Professional Wetland Scientist (PWS #3051)** with over 20 years of experience in wetland determinations, delineations, functional assessments, permitting, and mitigation planning. She has completed hundreds of delineations throughout Wisconsin following the USACE *Wetlands Delineation Manual* (1987) and Regional Supplements. Her qualifications meet the WDNR and USACE standards for professional delineations, ensuring the accuracy and regulatory reliability of this report.

7. REFERENCES

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Fish and Wildlife Service, Washington, D.C.

Eggers, S.D., and D.M. Reed. 2014. *Wetland Plants and Plant Communities of Minnesota and Wisconsin*, 3rd Edition. U.S. Army Corps of Engineers, St. Paul District, St. Paul, Minnesota.

GretagMacbeth. 2009. *Munsell Soil Color Charts*. Munsell Color, Grand Rapids, Michigan.

Gutenson, J.L., C.O. Hamilton, and J.C. Deters. 2023. *Antecedent Precipitation Tool (APT) Version 2.0: Technical and User Guide*. ERDC/WRAP-23-2. U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi.

Natural Resources Conservation Service (NRCS). 2026. *Web Soil Survey*. United States Department of Agriculture. Available at: https://websoilsurvey.sc.egov.usda.gov

Southeastern Wisconsin Regional Planning Commission (SEWRPC). 1963. *Wisconsin Land Use Inventory and Land Cover Mapping*. Waukesha County, Wisconsin.

U.S. Army Corps of Engineers (USACE). 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. Waterways Experiment Station, Vicksburg, Mississippi.

U.S. Army Corps of Engineers (USACE). 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)*. ERDC/EL TR-12-1. Vicksburg, Mississippi.

U.S. Army Corps of Engineers (USACE). 2020. *National Wetland Plant List*. U.S. Army Corps of Engineers, Washington, D.C.

U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS). 2024. *Field Indicators of Hydric Soils in the United States, Version 9.0*. USDA-NRCS, Washington, D.C.

U.S. Geological Survey (USGS). 1959. *Waukesha Quadrangle, Wisconsin*. 7.5-Minute Topographic Map.

U.S. Geological Survey (USGS). 2018. *US Topo Series, Waukesha Quadrangle, Wisconsin*.

Wisconsin Department of Natural Resources (WDNR). 1992. *Wisconsin Wetland Inventory Classification Guide*. PUBL-WZ-0223. Madison, Wisconsin.

Wisconsin Department of Natural Resources (WDNR). 2026. *Surface Water Data Viewer*. Madison, Wisconsin. Available at: https://dnrmaps.wi.gov/H5/?Viewer=SWDV

Wisconsin Legislature. 2026. *Wisconsin Statutes § 23.321 – Wetland Delineations*.

Wisconsin Legislature. 2026. *Wisconsin Administrative Code NR 151 – Runoff Management*.

Wisconsin State Cartographer's Office. Historic Aerial Photography Collection. University of Wisconsin–Madison. Accessed 2026.

Figures

Figure 1A - USGS Site Location Map
Figure 1B – Waukesha County 1’ Contour Map
Figure 2 - Wisconsin Wetland Inventory LiDAR Map
Figure 3 - NRCS Soil Survey Map
Figure 4 - Historic Aerials
Figure 5 - Wetland Delineation Boundary Map

HCI Properties
STOR-IT Right Waukesha
City of Waukesha
Waukesha County, Wisconsin

Map Legend

Study Area (4.27 Acres)

Document Path: P:\3250218\GIS\3250218 Wetland Delineation\3250218 Wetland Delineation.aprx

DW_Map_Dynamic/EN_PLSS_Boundaries_WTM_Ext:
World Transportation: Esri, HERE, iPC
Study Area (4.27 Acres):
USA_Topo_Maps: Copyright:© 2013 National Geographic Society, i-cubed

Figure 1A
USGS Site Location Map

raSmith
CREATIVITY BEYOND ENGINEERING

June 1, 2026
3250218

0 500 1,000
1-inch equals 1,000-feet

HCI Properties
STOR-IT Right Waukesha
City of Waukesha
Waukesha County, Wisconsin

Map Legend

- Study Area (4.27 Acres)
- Intermediate Contour (1-foot)
- Index Contour (5-foot)

Document Path: P:\3250218\GIS\3250218 Wetland Delineation\3250218 Wetland Delineation.aprx

World Transportation: Esri, HERE, iPC
Study Area (4.27 Acres):
Contours:
World Imagery: SE Wisc Reg Planning Comm, Microsoft, Vantor

Figure 1B
County 1-foot Contour Map

raSmith
CREATIVITY BEYOND ENGINEERING

June 1, 2026
3250218

0 30 60
1-inch equals 61-feet

HCI Properties
STOR-IT Right Waukesha
City of Waukesha
Waukesha County, Wisconsin

Map Legend

- Study Area (4.27 Acres)
- Intermittent Stream
- Rivers and Streams
- Wisconsin Wetland Inventory

WiDNR Surface Water Data Viewer
World Transportation: Esri, HERE, iPC
Study Area (4.27 Acres):
USDA Wetspots:
Intermittent Stream:
Rivers and Streams:
Open Water:
Wetland Class Points:

Figure 2A
Wisconsin Wetland Inventory Map

raSmith
CREATIVITY BEYOND ENGINEERING

June 1, 2026
3250218

0 30 60
1-inch equals 61-feet

HCI Properties
STOR-IT Right Waukesha
City of Waukesha
Waukesha County, Wisconsin

Map Legend

- Study Area (4.27 Acres)
- NRCS Wisconsin Soils
- Very poorly drained

Soil Survey Staff. Gridded Soil Survey Geographic (gSSURGO) Database for Wisconsin. United States Department of Agriculture, Natural Resources Conservation Service
World Transportation: Esri, HERE, iPC
Study Area (4.27 Acres):
NRCS Wisconsin Soils (via DNR):
World Imagery: SE Wisc Reg Planning Comm, Microsoft, Vantor

Figure 3
NRCS Soil Survey Map

raSmith
CREATIVITY BEYOND ENGINEERING

June 1, 2026
3250218

0 30 60
1-inch equals 61-feet

Document Path: P:\3250218\GIS\3250218_Wetland Delineation\3250218_Wetland Delineation.aprx

Palms muck, 0 to 2 percent slopes

Palms muck, 0 to 2 percent slopes

WI133

Houghton muck, 0 to 2 percent slopes

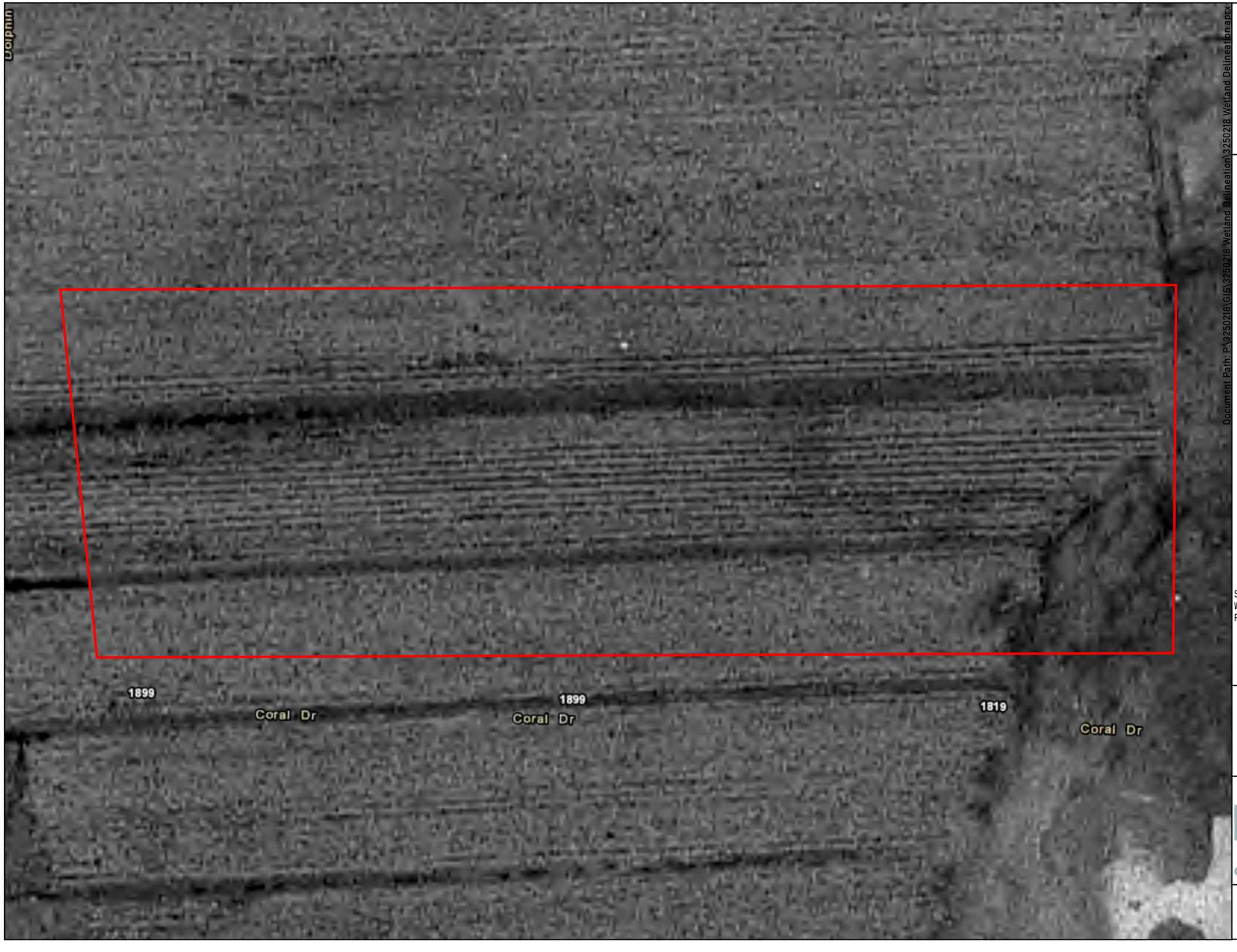
1899 Coral Dr

1899 Coral Dr

Palms muck, 0 to 2 percent slopes

1819 Coral Dr

Fox loam, 6 to 12 percent slopes, eroded



HCI Properties
STOR-IT Right Waukesha
City of Waukesha
Waukesha County, Wisconsin

Map Legend

Study Area (4.27 Acres)

Study Area (4.27 Acres):
World Transportation: Esri, HERE, iPC
RASTER\ORTHO1980:

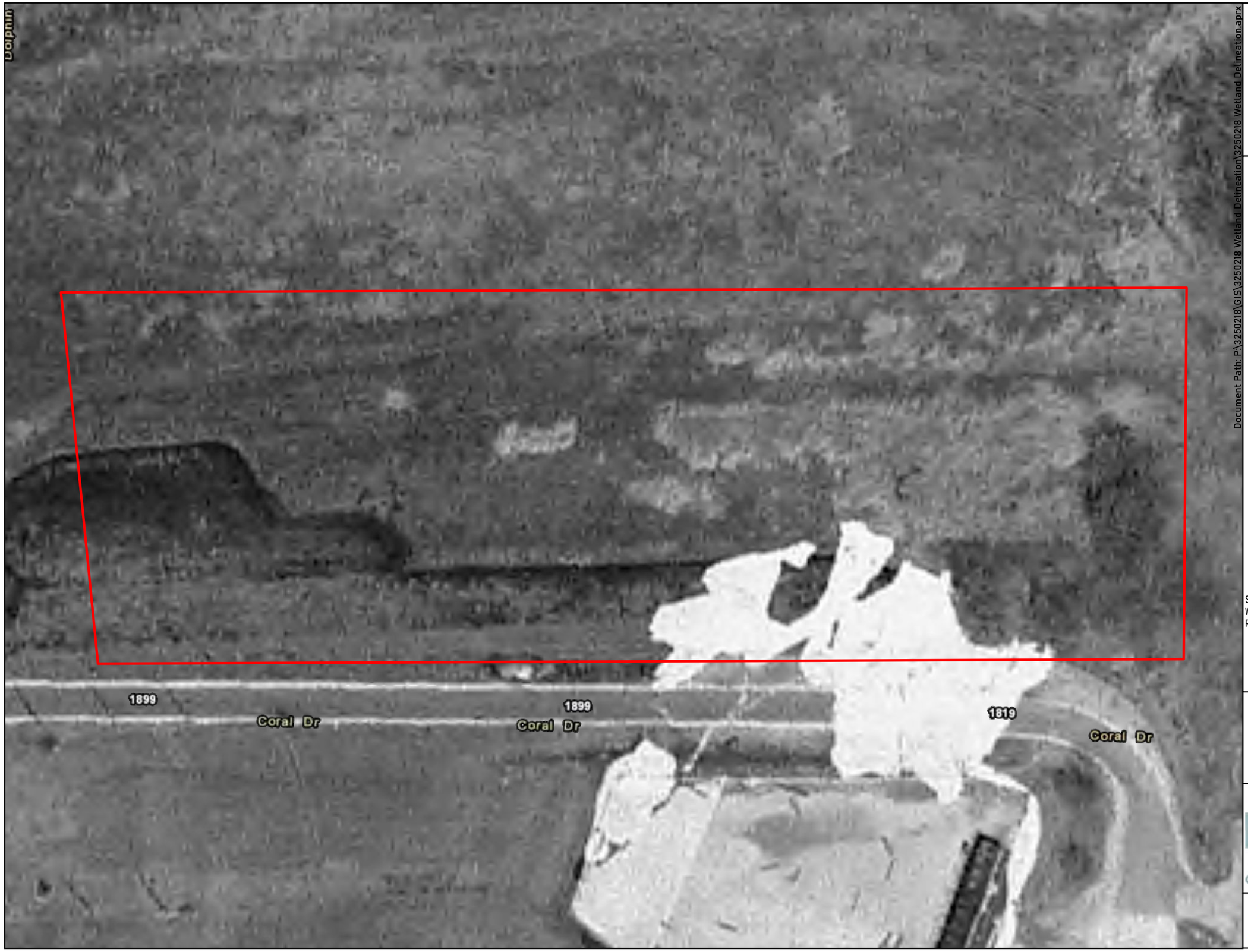
Figure 4A
1980 Historic Aerials

raSmith
CREATIVITY BEYOND ENGINEERING

June 1, 2026
3250218

0 30 60
1-inch equals 61-feet

Document Path: P:\3250218\GIS\3250218 Wetland Delineation\3250218 Wetland Delineation.aprx



Document Path: P:\3250218\GIS\3250218 Wetland Delineation\3250218 Wetland Delineation.aprx

HCI Properties
STOR-IT Right Waukesha
City of Waukesha
Waukesha County, Wisconsin

Map Legend

Study Area (4.27 Acres)

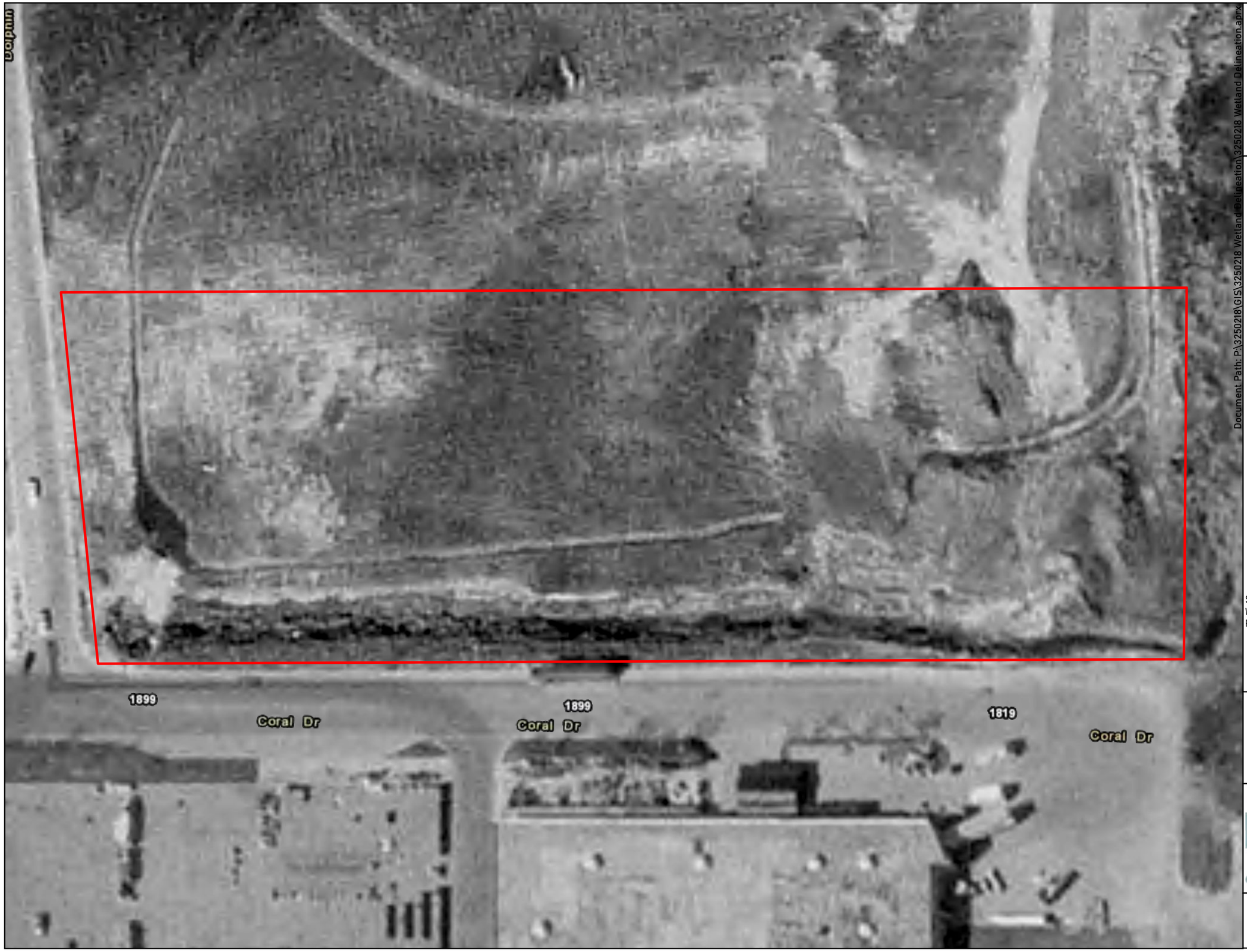
Study Area (4.27 Acres):
World Transportation: Esri, HERE, iPC
RASTER\ORTHO1990:

Figure 4B
1990 Historic Aerials

raSmith
CREATIVITY BEYOND ENGINEERING

June 1, 2026
3250218

0 30 60
1-inch equals 61-feet



HCI Properties
STOR-IT Right Waukesha
City of Waukesha
Waukesha County, Wisconsin

Map Legend

Study Area (4.27 Acres)

Study Area (4.27 Acres):
World Transportation: Esri, HERE, iPC
RASTER\ORTHO2000:

Figure 4C
2000 Historic Aerials

raSmith
CREATIVITY BEYOND ENGINEERING

June 1, 2026
3250218

0 30 60
1-inch equals 61-feet

HCI Properties
STOR-IT Right Waukesha
City of Waukesha
Waukesha County, Wisconsin

Map Legend

Study Area (4.27 Acres)

Study Area (4.27 Acres):
World Transportation: Esri, HERE, iPC
RASTER\ORTHO2005:

Figure 4D
2005 Historic Aerials

raSmith
CREATIVITY BEYOND ENGINEERING

June 1, 2026
3250218

0 30 60
1-inch equals 61-feet

Document Path: P:\3250218\GIS\3250218_Wetland Delineation\3250218 Wetland Delineation.aprx

Map Legend

Study Area (4.27 Acres)

Study Area (4.27 Acres):
World Transportation: Esri, HERE, iPC
RASTER\ORTHO2010: Waukesha County - Land Information System Division

Figure 4E
2010 Historic Aerials

raSmith
CREATIVITY BEYOND ENGINEERING

June 1, 2026
3250218

0 30 60

1-inch equals 61-feet

Document Path: P:\3250218\GIS\3250218 Wetland Delineation\3250218 Wetland Delineation.aprx

Map Legend

Study Area (4.27 Acres)

Study Area (4.27 Acres):
World Transportation: Esri, HERE, iPC
RASTER\ORTHO2015:

Figure 4F
2015 Historic Aerials

raSmith
CREATIVITY BEYOND ENGINEERING

June 1, 2026

0 30 60

1-inch equals 61-feet

HCI Properties
STOR-IT Right Waukesha
City of Waukesha
Waukesha County, Wisconsin

Map Legend

Study Area (4.27 Acres)

Document Path: P:\3250218\GIS\3250218 Wetland Delineation\3250218 Wetland Delineation.aprx

Study Area (4.27 Acres):
World Transportation: Esri, HERE, iPC
RASTER\ORTHO2020: WC Land Information Office, WLIP, SEWRPC, Ayres Associates

Figure 4G
2020 Historic Aerials

raSmith
CREATIVITY BEYOND ENGINEERING

June 1, 2026
3250218

0 30 60
1-inch equals 61-feet

HCI Properties
STOR-IT Right Waukesha
City of Waukesha
Waukesha County, Wisconsin

Map Legend

- Study Area (4.27 Acres)
- Wetland
- Off-Site Wetland
- Sampling Point
- Cursory Point
- Structure Point
- Overland Swale

World Transportation: Esri, HERE, iPC
Study Area (4.27 Acres):
Points:
Lines:
Polygons:
World Imagery: SE Wisc Reg Planning Comm, Microsoft, Vantor

Figure 5
Wetland Boundary Map

raSmith
CREATIVITY BEYOND ENGINEERING

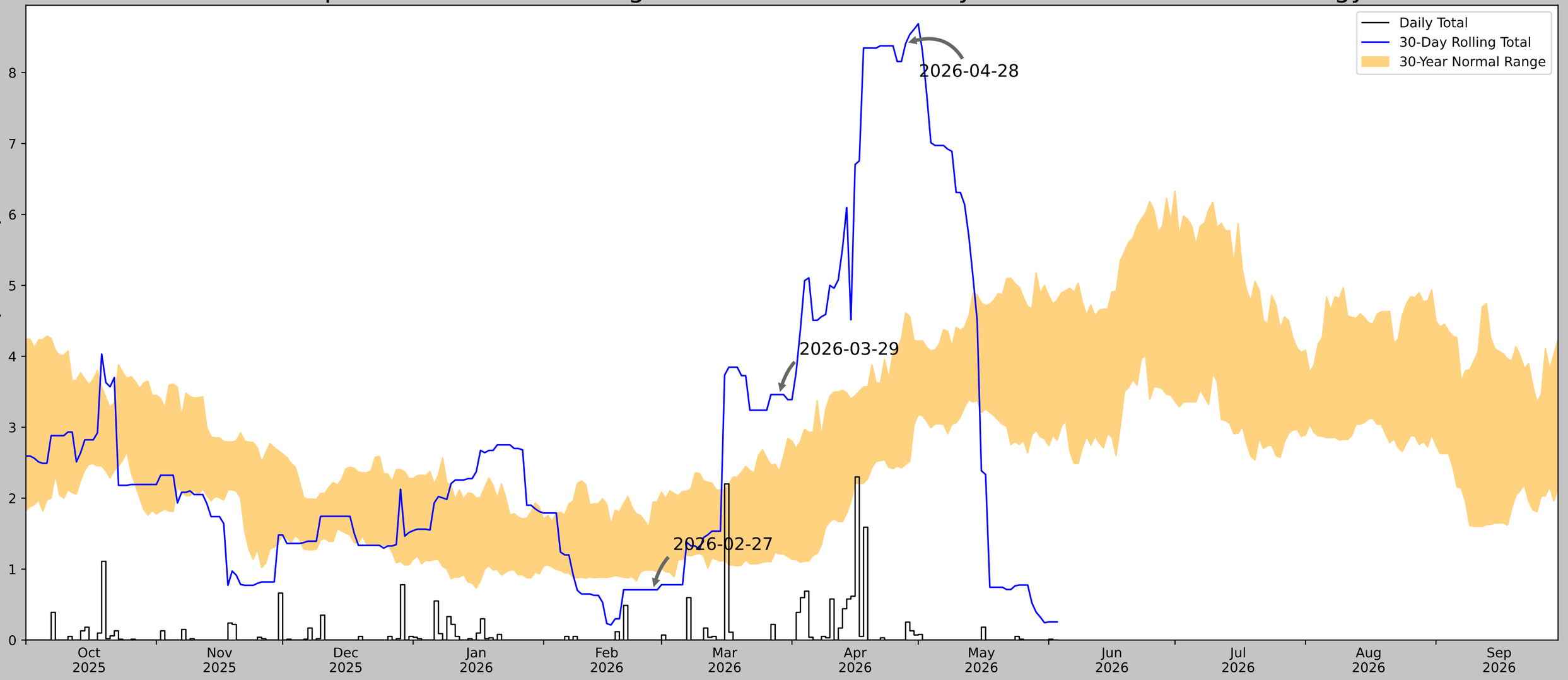
June 3, 2026
3250218

0 30 60
1-inch equals 61-feet

Document Path: P:\3250218\GIS\3250218 Wetland Delineation\3250218 Wetland Delineation.aprx

Appendix A -
Antecedent Precipitation

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	43.01774, -88.19903
Observation Date	2026-04-28
Elevation (ft)	859.275
Drought Index (PDSI)	Severe wetness
WebWIMP H_2O Balance	Wet Season

30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2026-04-28	2.475984	4.61378	8.409449	Wet	3	3	9
2026-03-29	1.215354	2.373228	3.46063	Wet	3	2	6
2026-02-27	0.985827	1.944882	0.708661	Dry	1	1	1
Result							Wetter than Normal - 16

Figures and tables made by the Antecedent Precipitation Tool Version 3.0

US Army Corps of Engineers.
ERDC

Developed by:
U.S. Army Corps of Engineers and
U.S. Army Engineer Research and Development Center

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
WAUKESHA WWTP	42.9986, -88.2525	801.837	3.008	57.438	1.526	11253	90
WAUKESHA 2.1 SSW	42.9847, -88.2531	816.929	0.961	15.092	0.447	19	0
WAUKESHA 2.5 SE	42.9851, -88.2052	859.908	2.566	58.071	1.304	1	0
WAUKESHA 1.6 NW	43.0287, -88.2609	967.848	2.123	166.011	1.308	15	0
WAUKESHA 1.6 NW	43.0307, -88.2584	979.003	2.238	177.166	1.404	1	0
WAUKESHA 2.0 NNW	43.036, -88.2596	926.837	2.609	125.0	1.5	7	0
BROOKFIELD WWTP	43.0522, -88.1775	830.053	5.298	28.216	2.534	6	0
W ALLIS	42.9981, -88.0242	772.966	11.537	28.871	5.525	44	0
MT MARY COLLEGE	43.0722, -88.0294	714.895	12.362	86.942	6.638	7	0

Appendix B -
Wetland Determination Data Forms

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region
See ERDC/EL TR-12-1; the proponent agency is CECW-COR

OMB Control #: 0710-0024, Exp: 09/30/2027
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Stor-It-Right City/County: Waukesha Sampling Date: 2026-04-28
Applicant/Owner: SRVR LLC State: Wisconsin Sampling Point: DP 1-WET
Investigator(s): Erica Pergande Section, Township, Range: S36 T7N R19E
Landform (hillside, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope %: 2
Subregion (LRR or MLRA): L 95 Lat: 43.01773577 Long: -88.1990313 Datum: WGS 84
Soil Map Unit Name: HtA - Houghton muck, 0 to 2 percent slopes NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✔ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ✔
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔	No ____	**Is the Sampled Area within a Wetland?** Yes ✔ No ____
Hydric Soil Present?	Yes ✔	No ____	If yes, optional Wetland Site ID: W-1
Wetland Hydrology Present?	Yes ✔	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)

DP is located in an excavated depression as a result of historic grading and site disturbance.
*Climatic conditions are considered "wetter than normal"

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✔ Surface Water (A1)
- ✔ High Water Table (A2)
- ✔ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ✔ Sparsely Vegetated Concave Surface (B8)
- ✔ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ✔ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✔	No ____	Depth (inches): 2
Water Table Present?	Yes ✔	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes ✔	No ____	Depth (inches): 0

Wetland Hydrology Present? Yes ✔ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Hydrology is met with numerous primary and secondary indicators.

VEGETATION – Use scientific names of plants.

Sampling Point: DP 1-WET

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
Herb Stratum (Plot size: 5 ft r)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		=Total Cover	
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 0 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.00 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	0	(A)	0 (B)

Prevalence Index = B/A = 0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✔ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Vegetation is absent due to prolonged inundation.

SOIL

Sampling Point DP 1-WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 10	10YR 3/1	90	10YR 3/3	10	C	M	Silt Loam	
10 - 12	10YR 3/1	80	10YR 3/4	20	C	M	Sandy Loam	with rock and gravel
-								
-								
-								
-								
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Iron Monosulfide (A18)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✔ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**) Thin
- ___ Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ✔ **No** ___

Remarks:

Soils meet F6-Redox Dark Surface.

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region
See ERDC/EL TR-12-1; the proponent agency is CECW-COR

OMB Control #: 0710-0024, Exp: 09/30/2027
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Stor-It-Right City/County: Waukesha Sampling Date: 2026-04-28
Applicant/Owner: SRVR LLC State: Wisconsin Sampling Point: DP 2-UPL
Investigator(s): Erica Pergande Section, Township, Range: S36 T7N R19E
Landform (hillside, terrace, etc.): Berm Local relief (concave, convex, none): Convex Slope %: 2
Subregion (LRR or MLRA): L 95 Lat: 43.01771703 Long: -88.19915245 Datum: WGS 84
Soil Map Unit Name: HtA - Houghton muck, 0 to 2 percent slopes NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✔ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ✔
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔	No ____	**Is the Sampled Area within a Wetland?** Yes ____ No ✔
Hydric Soil Present?	Yes ____	No ✔	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ____	No ✔	

Remarks: (Explain alternative procedures here or in a separate report.)

Climate Conditions are considered wetter than normal according to APT WETS Analysis. DP is located on an upland berm of sidecasted spoils.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No ✔	Depth (inches): ____
Water Table Present?	Yes ____	No ✔	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No ✔	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydrology was observed.

VEGETATION – Use scientific names of plants.

Sampling Point: DP 2-UPL

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus deltoides	10	✔	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	10	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Rhamnus cathartica	5	✔	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	5	=Total Cover	
Herb Stratum (Plot size: 5 ft r)			
1. Poa pratensis	100	✔	FACU
2. Prunus americana	10		UPL
3. Solidago canadensis	5		FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	115	=Total Cover	
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.66 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	15	x 3 =	45
FACU species	105	x 4 =	420
UPL species	10	x 5 =	50
Column Totals:	130 (A)		515 (B)

Prevalence Index = B/A = 3.96

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✔ No ___

Remarks: (Include photo numbers here or on a separate sheet.)

Veg passes dominance test.

SOIL

Sampling Point DP 2-UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0 - 6	10YR 3/2	100					Silt Loam	with rock and gravel fill.
-								
-								
-								
-								
-								
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Iron Monosulfide (A18)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**) Thin
- ___ Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: rock and gravel fill

Depth (inches): _____

Hydric Soil Present? **Yes** ___ **No** ✔

Remarks:

Soils do not meet any hydric indicators.

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region
See ERDC/EL TR-12-1; the proponent agency is CECW-COR

OMB Control #: 0710-0024, Exp: 09/30/2027
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Stor-It-Right City/County: Waukesha Sampling Date: 2026-04-28
Applicant/Owner: SRVR LLC State: Wisconsin Sampling Point: DP 3-WET
Investigator(s): Erica Pergande Section, Township, Range: S36 T7N R19E
Landform (hillside, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope %: 2
Subregion (LRR or MLRA): L 95 Lat: 43.0177 Long: -88.197237 Datum: WGS 84
Soil Map Unit Name: HtA - Houghton muck, 0 to 2 percent slopes NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✔ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ✔
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔	No ____	**Is the Sampled Area within a Wetland?** Yes ✔ No ____
Hydric Soil Present?	Yes ✔	No ____	If yes, optional Wetland Site ID: W-1
Wetland Hydrology Present?	Yes ✔	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)

DP is located in an excavated depression as a result of historic grading and site disturbance.
*Climatic conditions are considered "wetter than normal"

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✔ Surface Water (A1)
- ✔ High Water Table (A2)
- ✔ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ✔ Sparsely Vegetated Concave Surface (B8)
- ✔ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ✔ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✔	No ____	Depth (inches): 2
Water Table Present?	Yes ✔	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes ✔	No ____	Depth (inches): 0

Wetland Hydrology Present? Yes ✔ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Hydrology is met with numerous primary and secondary indicators.

VEGETATION – Use scientific names of plants.

Sampling Point: DP 3-WET

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer negundo	25	✔	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	25	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Salix interior	15	✔	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	15	=Total Cover	
Herb Stratum (Plot size: 5 ft r)			
1. Phalaris arundinacea	30	✔	FACW
2. Eleocharis obtusa	20	✔	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	50	=Total Cover	
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.00 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	20	x 1 =	20
FACW species	45	x 2 =	90
FAC species	25	x 3 =	75
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	90 (A)		185 (B)

Prevalence Index = B/A = 2.05

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

✔ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✔ No ___

Remarks: (Include photo numbers here or on a separate sheet.)

Vegetation is absent due to prolonged inundation.

SOIL

Sampling Point DP 3-WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 - 10	10YR 3/1	90	10YR 3/3	10	C	M	Silt Loam	
10 - 12	10YR 3/1	80	10YR 3/4	20	C	M	Sandy Loam	with rock and gravel
-								
-								
-								
-								
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Iron Monosulfide (A18)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✔ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**) Thin
- ___ Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ✔ **No** ___

Remarks:

Soils meet F6-Redox Dark Surface.

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region
See ERDC/EL TR-12-1; the proponent agency is CECW-COR

OMB Control #: 0710-0024, Exp: 09/30/2027
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Stor-It-Right City/County: Waukesha Sampling Date: 2026-04-28
Applicant/Owner: SRVR LLC State: Wisconsin Sampling Point: DP 4-UPL
Investigator(s): Erica Pergande Section, Township, Range: S36 T7N R19E
Landform (hillside, terrace, etc.): Hillslope Local relief (concave, convex, none): Concave Slope %: 2
Subregion (LRR or MLRA): L 95 Lat: 43.01784843 Long: -88.19720683 Datum: WGS 84
Soil Map Unit Name: Pa - Palms muck, 0 to 2 percent slopes NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✔ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ✔
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✔	**Is the Sampled Area within a Wetland?** Yes ____ No ✔
Hydric Soil Present?	Yes ____	No ✔	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ____	No ✔	

Remarks: (Explain alternative procedures here or in a separate report.)

DP is located on an upland berm excavated from the wetland. Conditions are a result of previous disturbance and excavation. Climate conditions are considered "wetter than normal"

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No ✔	Depth (inches): ____
Water Table Present?	Yes ____	No ✔	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No ✔	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydrology was observed.

VEGETATION – Use scientific names of plants. Sampling Point: DP 4-UPL

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Salix interior	15	✔	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	15 =Total Cover		
Herb Stratum (Plot size: 5 ft r)			
1. Alliaria petiolata	60	✔	FACU
2. Poa pratensis	30	✔	FACU
3. Solidago gigantea	10		FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.33 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	25	x 2 =	50
FAC species	0	x 3 =	0
FACU species	90	x 4 =	360
UPL species	0	x 5 =	0
Column Totals:	115 (A)		410 (B)

Prevalence Index = B/A = 3.56

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No ✔

Remarks: (Include photo numbers here or on a separate sheet.)

Upland vegetation is dominant.

SOIL

Sampling Point DP 4-UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0 - 4	10YR 3/3	100					Silt Loam	with rock and gravel fill
-								
-								
-								
-								
-								
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Iron Monosulfide (A18)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**) Thin
- ___ Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: rock and gravel fill

Depth (inches): 4

Hydric Soil Present? **Yes** ___ **No** ✔

Remarks:

Soils were extremely disturbed and restricted at 4 inches.

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region
See ERDC/EL TR-12-1; the proponent agency is CECW-COR

OMB Control #: 0710-0024, Exp: 09/30/2027
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Stor-It-Right City/County: Waukesha Sampling Date: 2026-04-28
Applicant/Owner: SRVR LLC State: Wisconsin Sampling Point: DP 5-WET
Investigator(s): Erica Pergande Section, Township, Range: S36 T7N R19E
Landform (hillside, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope %: 2
Subregion (LRR or MLRA): L 95 Lat: 43.017505 Long: -88.197317 Datum: WGS 84
Soil Map Unit Name: Pa - Palms muck, 0 to 2 percent slopes NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ✔ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ✔
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔	No ____	**Is the Sampled Area within a Wetland?** Yes ✔ No ____
Hydric Soil Present?	Yes ✔	No ____	If yes, optional Wetland Site ID: W-3
Wetland Hydrology Present?	Yes ✔	No ____	

Remarks: (Explain alternative procedures here or in a separate report.)

*Climate Conditions are considered wetter than normal according to APT WETS Analysis. DP is located in a previously over excavated ditch.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✔ Surface Water (A1)
- ✔ High Water Table (A2)
- ✔ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ✔ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ✔ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ✔ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ Marl Deposits (B15)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ✔ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ✔ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✔	No ____	Depth (inches): 1
Water Table Present?	Yes ✔	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes ✔	No ____	Depth (inches): 0

Wetland Hydrology Present? Yes ✔ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland hydrology is met with various primary and secondary indicators.

VEGETATION – Use scientific names of plants.

Sampling Point: DP 5-WET

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Salix interior	35	✔	FACW
2. Sambucus canadensis	10	✔	
3.			
4.			
5.			
6.			
7.			
	45	=Total Cover	
Herb Stratum (Plot size: 5 ft r)			
1. Phalaris arundinacea	35	✔	FACW
2. Typha X glauca	35	✔	OBL
3. Impatiens capensis	10		FACW
4. Solidago gigantea	5		FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	85	=Total Cover	
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.00 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	35	x 1 =	35
FACW species	85	x 2 =	170
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	120 (A)		205 (B)

Prevalence Index = B/A = 1.70

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

✔ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✔ No ___

Remarks: (Include photo numbers here or on a separate sheet.)

Wetland vegetation is dominant.

SOIL

Sampling Point DP 5-WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 - 4	10YR 2/1	90	10YR 4/6	10	C	M	Sandy Loam	
4 - 15	10YR 4/2	90	5GY 5/1	10	C	M	Sandy Clay Loam	
-								
-								
-								
-								
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Iron Monosulfide (A18)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**) Thin
- ___ Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ✔ **No** ___

Remarks:

Soils meet F3.

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region
See ERDC/EL TR-12-1; the proponent agency is CECW-COR

OMB Control #: 0710-0024, Exp: 09/30/2027
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Stor-It-Right City/County: Waukesha Sampling Date: 2026-04-28
Applicant/Owner: SRVR LLC State: Wisconsin Sampling Point: DP 6-UPL
Investigator(s): Erica Pergande Section, Township, Range: S36 T7N R19E
Landform (hillside, terrace, etc.): Terrace Local relief (concave, convex, none): None Slope %: 1
Subregion (LRR or MLRA): L 95 Lat: 43.017666 Long: -88.197258 Datum: WGS 84
Soil Map Unit Name: Pa - Palms muck, 0 to 2 percent slopes NWI classification:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No ✔ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✔
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No ✔	**Is the Sampled Area within a Wetland?** Yes ___ No ✔
Hydric Soil Present?	Yes ___	No ✔	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes ___	No ✔	

Remarks: (Explain alternative procedures here or in a separate report.)

DP is located on an upland berm excavated from adjacent ditch wetland to the south (W-3). Conditions are a result of previous disturbance and excavation.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✔	Depth (inches): ___
Water Table Present?	Yes ___	No ✔	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No ✔	Depth (inches): ___

Wetland Hydrology Present? Yes ___ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydrology was observed.

VEGETATION – Use scientific names of plants.

Sampling Point: DP 6-UPL

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Herb Stratum (Plot size: 5 ft r)			
1. Bromus inermis	40	✔	UPL
2. Poa pratensis	35	✔	FACU
3. Solidago canadensis	25	✔	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 =Total Cover		
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.00 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	60	x 4 =	240
UPL species	40	x 5 =	200
Column Totals:	100 (A)		440 (B)

Prevalence Index = B/A = 4.40

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No ✔

Remarks: (Include photo numbers here or on a separate sheet.)

Upland vegetation is dominant.

SOIL

Sampling Point DP 6-UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0 - 11	10YR 3/2	100					Silt Loam	
11 - 14	10YR 3/3	100					Sandy Loam	
-								
-								
-								
-								
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Iron Monosulfide (A18)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**) Thin
- ___ Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Red Parent Material (F21) **(outside MLRA 145)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: rock and gravel fill

Depth (inches): 4

Hydric Soil Present? **Yes** ___ **No** ✔

Remarks:

Soils were extremely disturbed and restricted at 4 inches.

Appendix C -
Site Photographs

raSmith
CREATIVITY BEYOND ENGINEERING

Site Photos

Photo 1: DP1-WET

Photo 2: Wetland W-1 facing northwest

raSmith
CREATIVITY BEYOND ENGINEERING

Site Photos

Photo 3: DP 2-UPL

Photo 4: Culvert Pipe located on the south end of W-2; connecting to W-3

raSmith
CREATIVITY BEYOND ENGINEERING

Site Photos

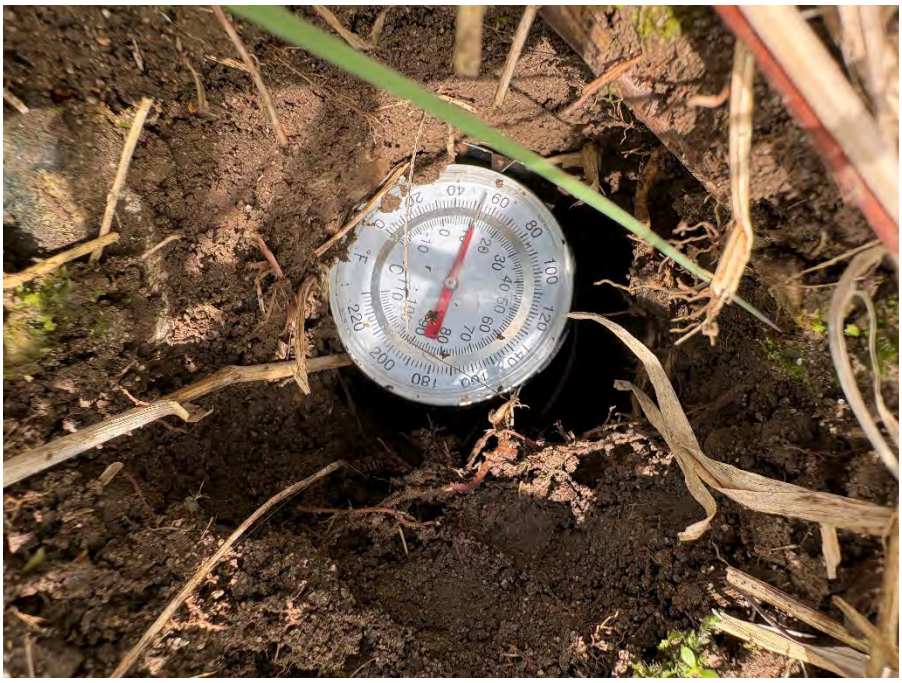


Photo 5: Soil temp at 50 degrees

Photo 6: DP 3-WET

raSmith
CREATIVITY BEYOND ENGINEERING

Site Photos

Photo 7: Wetland W-2 facing east.

Photo 8: W-2 facing south.

raSmith
CREATIVITY BEYOND ENGINEERING

Site Photos

raSmith
CREATIVITY BEYOND ENGINEERING

Site Photos

Photo 9: Wetland W-3 facing east

Photo 10: W-3 facing west

raSmith
CREATIVITY BEYOND ENGINEERING

Site Photos

Photo 11: Upland area adjacent to Dolphin Drive

Photo 12:Dolphin Drive facing north with parcel for-sale sign.

Appendix D -

Assured Wetland Delineator 2026 Confirmation Letter

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
1027 W. Saint Paul Avenue
Milwaukee WI 53233

Tony Evers, Governor
Karen Hyun, Ph.D., Secretary
Telephone 608-266-2621
Toll Free 1-888-936-7463
TTY Access via relay - 711

April 1, 2026

Erica Pergande, PWS
raSmith
16745 West Bluemound Road
Brookfield, WI 53005

Subject: 2026 Assured Wetland Delineator Confirmation

Dear Erica Pergande:

This letter provides Wisconsin Department of Natural Resources (WDNR) confirmation for the wetland delineations you conduct during the 2026 growing season. You and your clients will not need to wait for the WDNR to review your wetland delineations before moving forward with project planning. This will help expedite the review process for WDNR's wetland regulatory program. Your name and contact information will continue to be listed on our website at: http://dnr.wi.gov/topic/wetlands/assurance.html.

In the instance where a municipality may require a letter of confirmation for your work prior to moving forward in the local regulatory process, this letter shall serve as that confirmation. Although your wetland delineations do not require WDNR field review, inclusion of a Wetland Delineation Report is required for projects needing State authorized wetland, waterway and/or storm water permit approvals.

To comply with Chapter 23.321, State Statutes, please supply the department with a polygon shapefile of the wetland boundaries delineated within the project area. Please do not include data such as parcel boundaries, project limits, wetland graphic representation symbols, etc. If internal upland polygons are found within a wetland polygon, then please label as UPLAND. The shapefile should utilize a State Plane Projection and be overlain onto recent aerial photography. If a different projection system is used, please indicate in which system the data are projected. In the correspondence sent with the shapefile, please supply a brief description of each wetland's plant community (eg: wet meadow, floodplain forest, etc.). Please send these data to Calvin Lawrence (608-266-0756 or email at calvin.lawrence@wisconsin.gov).

If you or any client has a question regarding your status in the Wetland Delineation Professional Assurance Program, contact me by email at kara.brooks@wisconsin.gov or phone at 414-308-6780. Thank you for all your hard work and best wishes for the upcoming field season.

Sincerely,

Kara Brooks
Wetland Identification Coordinator
Bureau of Watershed Management

PRINTED ON RECYCLED PAPER

Appendix E -

Wetland Delineation Confirmation Request Checklist

Wetland Delineation Confirmation Request Check List

WDNR Wetland Identification Program

The following is the preferred order for all information provided in wetland delineation reports submitted for wetland confirmation. Please include this completed checklist with all wetland delineation report submittals. All of the following must be included with all wetland delineation reports that are submitted for confirmation:

☑ Basic Report Components (check to make sure these are in the report)

☑ Introductory Section

- Why the delineation was undertaken
- Date the field work was completed
- Who conducted field work
- Qualifications

☑ Methods used during the wetland delineation

- Description of methods
- Sources Reviewed (WWI mapping, Soil Survey, etc.)
- Description of any site specific agency guidance (site meetings, etc.)

☑ Results and Discussion

- Antecedent hydrologic condition analysis
- Previous wetland delineation mapping
- Existing environmental mapping (WWI mapping, Soil survey, etc.)
- Amount and types of wetland located within the project area
- Discussion explaining how the wetland/upland boundary was differentiated
- Disturbed and problematic areas encountered during the delineation
- Other water resources located in the project area (navigable streams, etc.)

☑ Topographic mapping (Include map scale, clearly identified review area, a north arrow)

☑ WWI mapping (Include map scale, clearly identified review area, a north arrow)

☑ Soil Survey mapping (Include map scale, clearly identified review area, a north arrow)

☑ Wetland Delineation Map showing an accurate depiction of wetland boundaries and data points identified during field investigation (Include map scale, clearly identified review area, a north arrow)

☑ Complete, legible wetland delineation data forms from the appropriate regional supplement

☑ Site photos

☑ Any previous delineation information

☑ Areas that are currently, or were recently (less than three years prior to the delineation) under agricultural production must include a Farm Service Agency (FSA) Slide Review. All FSA Slide Reviews should include the following:

- Copies or photos of slides if available
- A completed wetland documentation form (NRCS form NRCS-CPA-32W)
- A copy of the draft NRCS Wetland Inventory map if available

☑ Literature Cited

Appendix E
Storm Sewer Design

DESCRIPTION	DATE

raSmith
CREATIVITY BEYOND ENGINEERING
16745 W. Bluemound Road
Brookfield, WI 53005-5938
(262) 781-1000
rasmith.com
Brookfield, WI | Appleton, WI | Madison, WI
Cedarburg, WI | Naperville, IL | Irvine, CA

STOR-IT RIGHT WAUKESHA
CITY OF WAUKESHA
STORM SEWER CATCHMENT AREA EXHIBIT

N

0 30 60
GRAPHIC SCALE
Feet

San. MH
Rim EL=78.95
Inv. EL(10" N/S)=69.5

Existing Building

EL Rim=79.97
Inv. EL(10" S)=75.6
Inv. EL(8" N)=75.9
Inv. EL(10" E)=75.5

Conc. Curb

78.61 EL Pipe

78.91 EL T.O.C.

83.75 EL

84.60 EL

59.16'

58.64'

85.84 EL T.O.C.

84.68 EL T.O.C./CB

85.81 EL T.O.C.

83.81 EL

78.49 EL

15 18

77.77 EL T.O.C.

20' wide Storm Drainage Easement in favor of Lots 1 and 2, CSM 9744 (per Doc. No.s 3261481 and 3577192 and CSM 9744)

STO CB 115

STO CB 120

STO CB 125

STO CB 130

STO CB 135

STO CB 140

STO CB 145

STO STUB 155

S 89°45'18" W 757.63'

465.38'

13 14 12

15' utility easement granted to Wisconsin Electric Power Co. & Wisconsin Bell, Inc. (Doc. No. 1695105

15' wide Storm Sewer and Utility Easement (Doc. No. 2280145)

15' Storm Drainage Easement

10' wide Wisconsin Electric Power Co. & Wisconsin Bell, Inc. easement (Doc. No. 1815782)

Lot 3

Lot 4

Lot Area
186,054 sq. ft.
4.27 acres
(Total Area
Lot 3+4)

Total Site Area
186,054 sq. ft.
(4.27 ac.)

STO TRENCH DRAIN 110

FDC

POND
BERM: 79.0'
RAIL: 71.0
SAFETY: 72.0
BOTTOM: 68.0

Dolphin Drive
(60' R.O.W.)
(asphalt)

251.14'

10' Temporary Slope Easement (Per C.S.M. 7298)

Catch Basin
Flow EL=74.79
Inv. EL(10" NE)=71.5
Inv. EL(12" S)=71.1

Catch Basin
Flow EL=74.88
Inv. EL(24" N/S)=70.1

72.08 EL Inv. 15" PVC

San. MH
Rim EL=75.21
Inv. EL(8" S)=65.6
Inv. EL(8" E)=65.4
Inv. EL(8" N+W)=65.3

San. MH
Rim EL=74.94
Inv. EL(8" E/N)=65.8

Catch Basin
Flow EL=74.19
Inv. EL(15" E/W)=69.7

69.62 EL Inv. 40" CMP

71.13 Top end wall

70.86 Top end wall

30'x30' sidewalk easement (per CSM 7298)

11 10' wide Water Utility Easement (Doc. No. 1773126) also

12 10' wide Wisconsin Electric Power Co. & Wisconsin Bell, Inc. easement (Doc. No. 1815792)

Conc. Curb

20' Temporary Slope Easement (Per C.S.M. 7298)

265.41'

N 89°45'18" E 730.78'

Coral Drive
(66' R.O.W.)
(asphalt)

Catch Basin
Flow EL=77.89
Inv. EL(15" E/W)=71.5

STO CB 210

STO CB 215

10' Sidewalk Easement (Per C.S.M. 7298)

465.37'

25' Utility Easement (Per C.S.M. 7015)

19

30' wide Water Utility Easement (Doc. No. 3955214)

N 89°45'18" E 46.57'

S 1/4 Corner
Sect. 36-7
Conc. Mon.
W/ Brass C

N 1/4 Corner
Sect. 1-8-19
Conc. Mon. W/ Brass
EL=854.98 (74.37)

gravel

parking

Conc. Curb

Know what's below.
Call before you dig.

R.A.SMITH, INC. ASSUMES NO RESPONSIBILITY FOR DAMAGES, LIABILITY OR COSTS RESULTING FROM CHANGES OR ALTERATIONS MADE TO THIS PLAN WITHOUT THE EXPRESSED WRITTEN CONSENT OF R.A.SMITH, INC.

ALL COPYRIGHTS TO THESE DRAWINGS ARE RESERVED. THEY MAY NOT BE COPIED, CHANGED, OR ASSIGNED TO ANY THIRD PARTY IN ANY MANNER WITHOUT OBTAINING THE EXPRESSED WRITTEN PERMISSION OF R.A.SMITH, INC.

© COPYRIGHT 2026
R.A. Smith, Inc.

DATE: 06/23/2026
SCALE: 1" = 30'
JOB NO. 3250218
PROJECT MANAGER: CHRISTOPHER WHITE, P.E.
DESIGNED BY: MAF
CHECKED BY: CBW

SHEET NUMBER
HX-03

P:\3250218\Dwg\Exhibits\3250218-HX02.dwg, STORM SEWER EXHIBIT, 6/23/2026 2:08:08 PM, maf2

NOAA Atlas 14, Volume 8, Version 2
Location name: Waukesha, Wisconsin, USA*
Latitude: 43.018°, Longitude: -88.1978°
Elevation: 868 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.02 (3.23-4.98)	4.81 (3.86-5.96)	6.07 (4.87-7.55)	7.12 (5.68-8.86)	8.52 (6.60-10.7)	9.58 (7.30-12.2)	10.6 (7.88-13.6)	11.7 (8.39-15.2)	13.0 (9.07-17.2)	14.0 (9.60-18.7)
10-min	2.95 (2.36-3.65)	3.52 (2.83-4.37)	4.45 (3.56-5.53)	5.21 (4.15-6.48)	6.23 (4.83-7.85)	7.01 (5.34-8.90)	7.78 (5.77-9.99)	8.54 (6.14-11.1)	9.53 (6.65-12.6)	10.3 (7.03-13.7)
15-min	2.39 (1.92-2.97)	2.86 (2.30-3.55)	3.62 (2.90-4.49)	4.23 (3.38-5.27)	5.07 (3.93-6.39)	5.70 (4.34-7.24)	6.32 (4.69-8.12)	6.94 (4.99-9.04)	7.75 (5.40-10.2)	8.34 (5.72-11.1)
30-min	1.65 (1.33-2.05)	1.98 (1.59-2.46)	2.52 (2.02-3.13)	2.95 (2.35-3.67)	3.54 (2.74-4.46)	3.98 (3.03-5.06)	4.42 (3.28-5.68)	4.86 (3.49-6.32)	5.42 (3.78-7.16)	5.84 (4.00-7.79)
60-min	1.06 (0.854-1.32)	1.27 (1.02-1.58)	1.63 (1.30-2.02)	1.92 (1.53-2.39)	2.34 (1.82-2.97)	2.67 (2.04-3.40)	3.00 (2.23-3.87)	3.34 (2.41-4.37)	3.80 (2.66-5.04)	4.16 (2.85-5.55)
2-hr	0.649 (0.528-0.795)	0.778 (0.633-0.954)	0.997 (0.809-1.22)	1.18 (0.957-1.46)	1.46 (1.15-1.83)	1.67 (1.30-2.11)	1.90 (1.43-2.43)	2.13 (1.55-2.76)	2.45 (1.73-3.22)	2.70 (1.87-3.57)
3-hr	0.483 (0.397-0.588)	0.576 (0.472-0.700)	0.736 (0.602-0.897)	0.878 (0.714-1.07)	1.09 (0.868-1.37)	1.26 (0.985-1.59)	1.44 (1.10-1.84)	1.64 (1.20-2.12)	1.91 (1.36-2.50)	2.12 (1.48-2.79)
6-hr	0.292 (0.242-0.351)	0.339 (0.282-0.408)	0.426 (0.353-0.513)	0.506 (0.417-0.611)	0.629 (0.512-0.787)	0.734 (0.583-0.920)	0.847 (0.654-1.08)	0.971 (0.725-1.25)	1.15 (0.830-1.50)	1.29 (0.909-1.68)
12-hr	0.172 (0.145-0.204)	0.195 (0.164-0.231)	0.237 (0.199-0.282)	0.278 (0.232-0.332)	0.342 (0.283-0.425)	0.398 (0.321-0.495)	0.460 (0.360-0.579)	0.528 (0.400-0.675)	0.627 (0.459-0.812)	0.709 (0.504-0.916)
24-hr	0.099 (0.084-0.116)	0.111 (0.095-0.131)	0.135 (0.115-0.159)	0.158 (0.134-0.186)	0.193 (0.161-0.236)	0.223 (0.182-0.274)	0.256 (0.203-0.319)	0.293 (0.224-0.370)	0.345 (0.256-0.443)	0.389 (0.280-0.498)
2-day	0.055 (0.047-0.063)	0.063 (0.055-0.073)	0.079 (0.068-0.091)	0.092 (0.079-0.108)	0.113 (0.095-0.136)	0.130 (0.107-0.157)	0.148 (0.119-0.182)	0.168 (0.130-0.210)	0.196 (0.146-0.248)	0.218 (0.159-0.278)
3-day	0.040 (0.035-0.046)	0.046 (0.040-0.053)	0.057 (0.049-0.065)	0.066 (0.057-0.076)	0.080 (0.068-0.096)	0.092 (0.076-0.111)	0.105 (0.084-0.128)	0.119 (0.092-0.147)	0.138 (0.103-0.173)	0.153 (0.112-0.194)
4-day	0.032 (0.028-0.037)	0.037 (0.032-0.042)	0.045 (0.039-0.052)	0.052 (0.045-0.060)	0.063 (0.054-0.075)	0.072 (0.060-0.086)	0.082 (0.066-0.099)	0.092 (0.072-0.114)	0.107 (0.081-0.134)	0.119 (0.087-0.150)
7-day	0.022 (0.019-0.024)	0.024 (0.022-0.028)	0.030 (0.026-0.034)	0.034 (0.030-0.039)	0.041 (0.035-0.048)	0.046 (0.039-0.055)	0.052 (0.042-0.062)	0.058 (0.046-0.071)	0.067 (0.051-0.083)	0.074 (0.055-0.092)
10-day	0.017 (0.015-0.019)	0.019 (0.017-0.022)	0.023 (0.021-0.026)	0.027 (0.024-0.030)	0.032 (0.027-0.037)	0.036 (0.030-0.042)	0.040 (0.033-0.047)	0.044 (0.035-0.053)	0.050 (0.038-0.062)	0.055 (0.041-0.068)
20-day	0.011 (0.010-0.013)	0.013 (0.012-0.014)	0.015 (0.014-0.017)	0.017 (0.015-0.019)	0.020 (0.017-0.023)	0.022 (0.019-0.025)	0.024 (0.020-0.028)	0.026 (0.021-0.032)	0.029 (0.023-0.036)	0.031 (0.024-0.039)
30-day	0.009 (0.009-0.010)	0.010 (0.010-0.012)	0.012 (0.011-0.014)	0.014 (0.012-0.015)	0.016 (0.014-0.018)	0.017 (0.015-0.020)	0.019 (0.016-0.022)	0.020 (0.016-0.024)	0.022 (0.017-0.027)	0.023 (0.018-0.029)
45-day	0.008 (0.007-0.009)	0.009 (0.008-0.010)	0.010 (0.009-0.011)	0.011 (0.010-0.012)	0.013 (0.011-0.014)	0.014 (0.012-0.016)	0.015 (0.012-0.017)	0.016 (0.013-0.018)	0.017 (0.013-0.020)	0.018 (0.013-0.022)
60-day	0.007 (0.006-0.007)	0.008 (0.007-0.008)	0.009 (0.008-0.010)	0.010 (0.009-0.011)	0.011 (0.010-0.012)	0.012 (0.010-0.013)	0.013 (0.011-0.014)	0.013 (0.011-0.016)	0.014 (0.011-0.017)	0.015 (0.011-0.018)

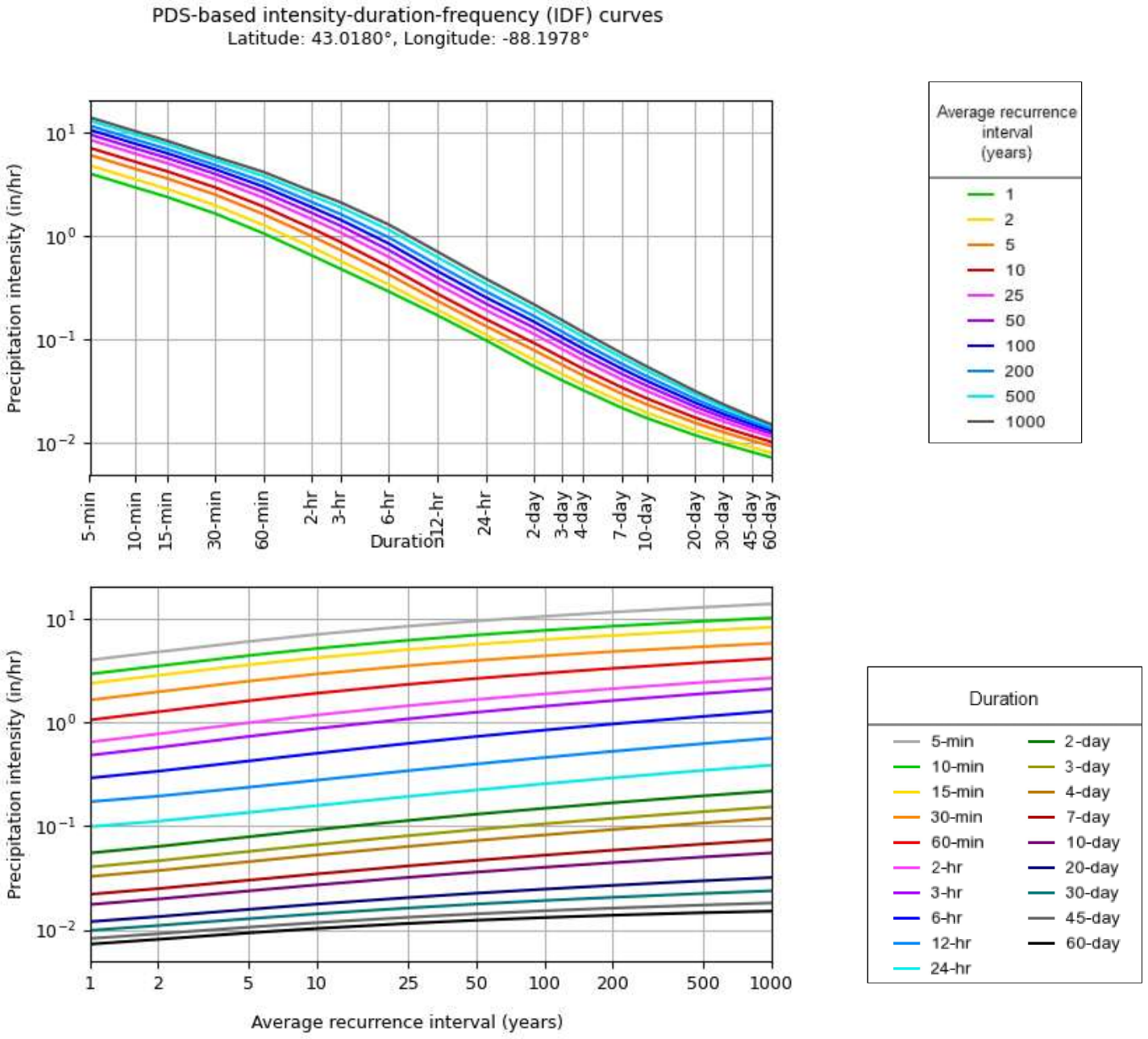
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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.

Back to Top

PF graphical



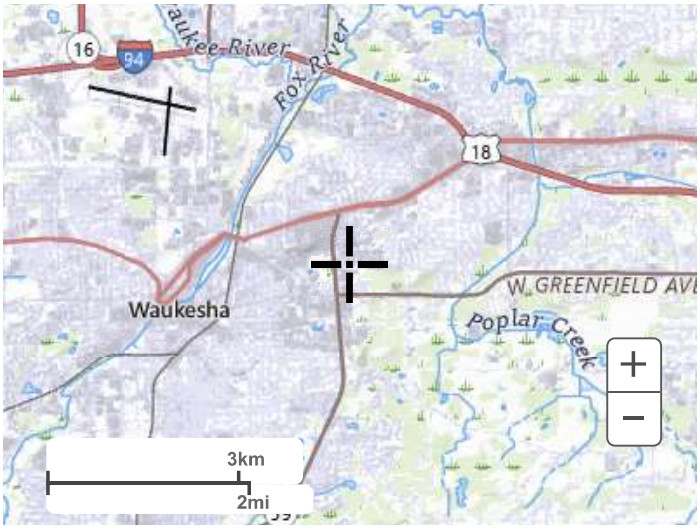
NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Wed May 20 15:28:54 2026

Back to Top

Maps & aerials

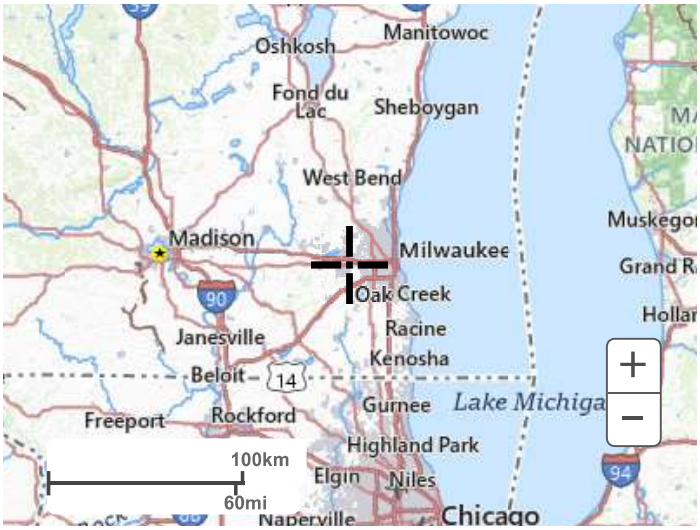
Small scale terrain



Large scale terrain

Large scale map

Large scale aerial

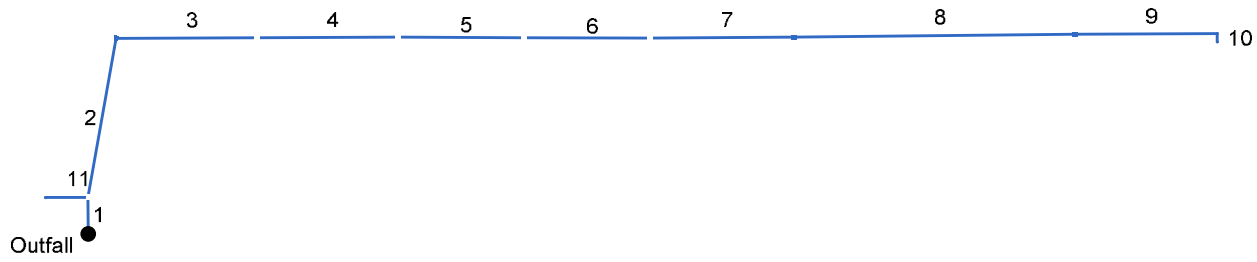


Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

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



Project File: STO 100.stm	Number of lines: 11	Date: 6/23/2026

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	21.901	-90.265	DrGrt	0.00	0.03	0.90	6.0	73.00	2.28	73.50	18	Cir	0.013	1.50	80.10	105-100
2	1	96.543	10.275	DrGrt	0.00	0.16	0.66	6.0	73.50	0.99	74.46	18	Cir	0.013	1.48	80.18	115-105
3	2	83.969	79.743	DrGrt	0.00	0.17	0.65	6.0	74.46	1.62	75.82	18	Cir	0.013	0.50	81.02	120-115
4	3	83.969	0.000	DrGrt	0.00	0.15	0.68	6.0	75.82	1.00	76.66	18	Cir	0.013	0.50	81.86	125-120
5	4	75.000	0.502	DrGrt	0.00	0.15	0.70	6.0	77.16	1.00	77.91	12	Cir	0.013	0.50	82.61	130-125
6	5	74.999	-0.092	DrGrt	0.00	0.18	0.74	6.0	77.91	1.00	78.66	12	Cir	0.013	0.50	83.36	135-130
7	6	85.663	-0.540	DrGrt	0.00	0.17	0.65	6.0	78.66	1.00	79.52	12	Cir	0.013	0.50	84.67	140-135
8	7	167.658	-0.212	DrGrt	0.00	0.19	0.60	6.0	79.52	1.00	81.20	12	Cir	0.013	0.50	84.70	145-140
9	8	84.558	0.371	MH	0.00	0.00	0.00	0.0	81.37	1.12	82.32	10	Cir	0.012	1.00	85.20	150-145
10	9	4.957	89.971	MH	0.00	0.11	0.90	6.0	82.32	2.02	82.42	10	Cir	0.012	1.00	87.27	155-150
11	1	25.230	-89.982	MH	0.00	0.12	0.90	6.0	74.55	0.99	74.80	12	Cir	0.013	1.00	78.49	110-105

Project File: STO 100.stm | Number of lines: 11 | Date: 6/23/2026

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	21.901	0.03	1.42	0.90	0.03	1.01	6.0	11.9	4.9	4.95	15.87	6.34	18	2.28	73.00	73.50	73.58	74.35	74.79	80.10	105-100
2	1	96.543	0.16	1.27	0.66	0.11	0.87	6.0	11.3	5.0	4.40	10.47	4.39	18	0.99	73.50	74.46	74.35	75.26	80.10	80.18	115-105
3	2	83.969	0.17	1.11	0.65	0.11	0.77	6.0	10.7	5.2	3.96	0.00	5.02	18	1.62	74.46	75.82	75.48	76.78	80.18	81.02	120-115
4	3	83.969	0.15	0.94	0.68	0.10	0.66	6.0	10.1	5.3	3.50	0.00	4.75	18	1.00	75.82	76.66	76.78	77.56	81.02	81.86	125-120
5	4	75.000	0.15	0.79	0.70	0.10	0.56	6.0	9.8	5.4	2.99	0.00	5.93	12	1.00	77.16	77.91	78.16	79.44	81.86	82.61	130-125
6	5	74.999	0.18	0.65	0.74	0.13	0.45	6.0	9.4	5.5	2.49	0.00	4.91	12	1.00	77.91	78.66	79.72	80.60	82.61	83.36	135-130
7	6	85.663	0.17	0.47	0.65	0.11	0.32	6.0	8.8	5.6	1.82	0.00	3.57	12	1.00	78.66	79.52	80.78	81.32	83.36	84.67	140-135
8	7	167.658	0.19	0.30	0.60	0.11	0.21	6.0	7.2	6.2	1.32	0.00	2.85	12	1.00	79.52	81.20	81.41	81.94	84.67	84.70	145-140
9	8	84.558	0.00	0.11	0.00	0.00	0.10	0.0	6.1	6.6	0.65	0.00	2.74	10	1.12	81.37	82.32	82.02	82.76	84.70	85.20	150-145
10	9	4.957	0.11	0.11	0.90	0.10	0.10	6.0	6.0	6.6	0.66	0.00	3.36	10	2.02	82.32	82.42	82.76	82.86	85.20	87.27	155-150
11	1	25.230	0.12	0.12	0.90	0.11	0.11	6.0	6.0	6.6	0.72	0.00	3.60	12	0.99	74.55	74.80	74.93	75.23	80.10	78.49	110-105

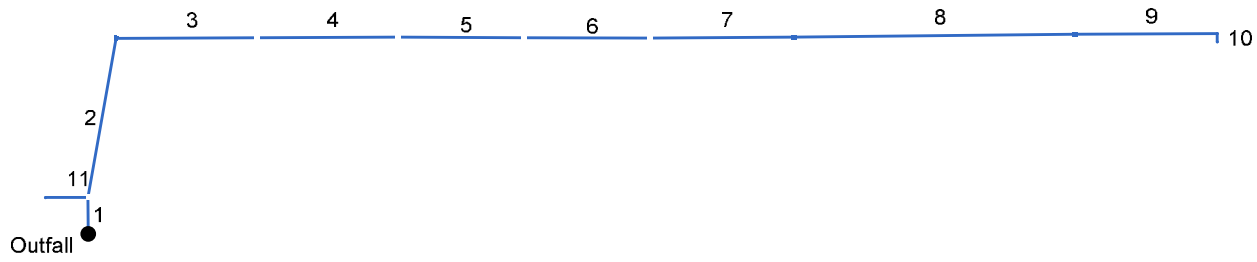
Project File: STO 100.stm

Number of lines: 11

Run Date: 6/23/2026

NOTES:Intensity = 34.01 / (Inlet time + 4.70) ^ 0.69; Return period =Yrs. 10 ; c = cir e = ellip b = box

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



Project File: STO 100.stm	Number of lines: 11	Date: 6/23/2026

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	21.901	0.03	1.42	0.90	0.03	1.01	6.0	11.9	4.9	4.95	15.87	4.76	18	2.28	73.00	73.50	73.85	74.35	74.79	80.10	105-100
2	1	96.543	0.16	1.27	0.66	0.11	0.87	6.0	11.3	5.0	4.40	10.47	4.39	18	0.99	73.50	74.46	74.35	75.26	80.10	80.18	115-105
3	2	83.969	0.17	1.11	0.65	0.11	0.77	6.0	10.7	5.2	3.96	13.36	4.25	18	1.62	74.46	75.82	75.26	76.58	80.18	81.02	120-115
4	3	83.969	0.15	0.94	0.68	0.10	0.66	6.0	10.1	5.3	3.50	10.50	4.06	18	1.00	75.82	76.66	76.58	77.37	81.02	81.86	125-120
5	4	75.000	0.15	0.79	0.70	0.10	0.56	6.0	9.8	5.4	2.99	3.56	4.94	12	1.00	77.16	77.91	77.86	78.65	81.86	82.61	130-125
6	5	74.999	0.18	0.65	0.74	0.13	0.45	6.0	9.4	5.5	2.49	3.56	4.20	12	1.00	77.91	78.66	78.65	79.33	82.61	83.36	135-130
7	6	85.663	0.17	0.47	0.65	0.11	0.32	6.0	8.8	5.6	1.82	3.57	3.57	12	1.00	78.66	79.52	79.33	80.09	83.36	84.67	140-135
8	7	167.658	0.19	0.30	0.60	0.11	0.21	6.0	7.2	6.2	1.32	3.56	3.15	12	1.00	79.52	81.20	80.09	81.68	84.67	84.70	145-140
9	8	84.558	0.00	0.11	0.00	0.00	0.10	0.0	6.1	6.6	0.65	2.51	3.21	10	1.12	81.37	82.32	81.68	82.68	84.70	85.20	150-145
10	9	4.957	0.11	0.11	0.90	0.10	0.10	6.0	6.0	6.6	0.66	3.37	2.96	10	2.02	82.32	82.42	82.68	82.78	85.20	87.27	155-150
11	1	25.230	0.12	0.12	0.90	0.11	0.11	6.0	6.0	6.6	0.72	3.55	3.21	12	0.99	74.55	74.80	74.86	75.15	80.10	78.49	110-105

Project File: STO 100.stm

Number of lines: 11

Run Date: 6/23/2026

NOTES:Intensity = 34.01 / (Inlet time + 4.70) ^ 0.69; Return period =Yrs. 10 ; c = cir e = ellip b = box

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

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	298.968	2.241	DrGrt	0.00	0.36	0.90	6.0	73.00	1.00	76.00	12	Cir	0.012	0.50	81.70	210-200
2	1	205.355	0.900	DrGrt	0.00	0.29	0.90	6.0	76.00	0.93	77.90	12	Cir	0.012	1.00	81.48	215-210

Project File: STO 200.stm | Number of lines: 2 | Date: 6/23/2026

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	298.968	0.36	0.65	0.90	0.32	0.59	6.0	7.6	6.0	3.54	3.86	5.41	12	1.00	73.00	76.00	73.75	76.80	74.13	81.70	210-200
2	1	205.355	0.29	0.29	0.90	0.26	0.26	6.0	6.0	6.6	1.73	3.71	3.20	12	0.93	76.00	77.90	76.80	78.46	81.70	81.48	215-210

Project File: STO 200.stm | Number of lines: 2 | Run Date: 6/23/2026

NOTES:Intensity = 34.01 / (Inlet time + 4.70) ^ 0.69; Return period =Yrs. 10 ; c = cir e = ellip b = box

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

Project File: STO 200.stm	Number of lines: 2	Date: 6/23/2026

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	298.968	0.36	0.65	0.90	0.32	0.59	6.0	7.0	9.2	5.36	3.86	6.92	12	1.00	73.00	76.00	73.93	79.35	74.13	81.70	210-200
2	1	205.355	0.29	0.29	0.90	0.26	0.26	6.0	6.0	9.8	2.56	3.71	3.26	12	0.93	76.00	77.90	79.71	80.62	81.70	81.48	215-210

Project File: STO 200.stm

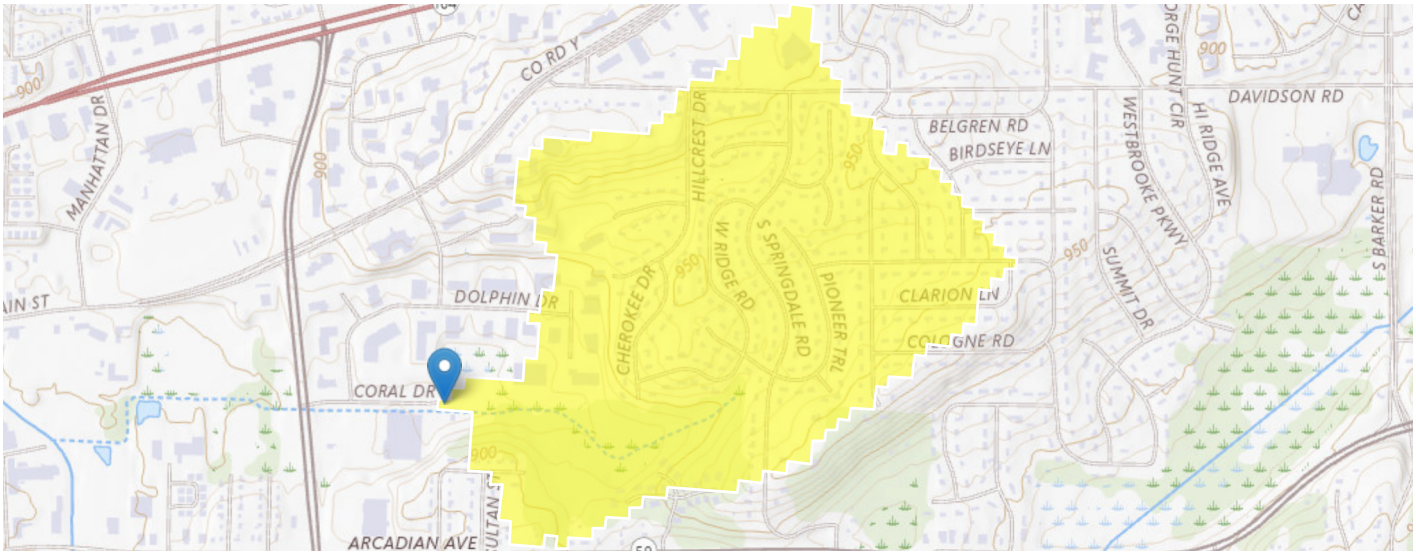
Number of lines: 2

Run Date: 6/23/2026

NOTES:Intensity = 34.56 / (Inlet time + 2.40) ^ 0.59; Return period =Yrs. 100 ; c = cir e = ellip b = box

StreamStats Report

Region ID: WI
Clicked Point (Latitude, Longitude): 43.01739, -88.19655
Time: 2026-02-16 11:34:52 -0600



StreamStats Update

Starting with version 4.30.0, the StreamStats application uses services that were redeveloped with open-source software components. Users may observe minor variations in computed results when compared to those from previous versions. These differences are expected and do not reflect errors in the underlying data or analytical methods. Users are advised to consider these potential variations when interpreting or comparing results generated across different versions of StreamStats. Please email streamstats@usgs.gov with any questions or concerns. A full list of changes can be found at **https://www.usgs.gov/streamstats/news/streamstats-data-updates-open-source-code-release (https://www.usgs.gov/streamstats/news/streamstats-data-updates-open-source-code-release)** .

Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.42	square miles
LC01WATER	Percentage of open water, class 11, from NLCD 2001	0	percent
WETLAND	Percentage of Wetlands	1.746	percent

General Disclaimers

Parameter values have been edited, computed flows may not apply.

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Wisconsin Peakflow Region 3 2022 5118]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.42	square miles	1.01	5994.64

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
LC01WATER	LC01WATER	0	percent	0	9.75
WETLAND	Percent Wetlands	1.746	percent	0	29.57

Peak-Flow Statistics Disclaimers [Wisconsin Peakflow Region 3 2022 5118]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [Wisconsin Peakflow Region 3 2022 5118]

Statistic	Value	Unit
50-percent AEP flood	20.3	ft^3/s
20-percent AEP flood	36.8	ft^3/s
10-percent AEP flood	49.8	ft^3/s
4-percent AEP flood	68.1	ft^3/s
2-percent AEP flood	82.9	ft^3/s
1-percent AEP flood	98.7	ft^3/s
0.5-percent AEP flood	116	ft^3/s
0.2-percent AEP flood	139	ft^3/s

Peak-Flow Statistics Citations

Levin, Sara B., Sanocki, Chris A. 2022, Estimating Flood Magnitude and Frequency for Unregulated Streams in Wisconsin: U.S. Geological Survey Scientific Investigations Report 2022-5118, 25p. (https://doi.org/10.3133/sir20225118)

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

USGS Software Disclaimer: This software has been approved for release by the U.S. Geological Survey (USGS). Although the software has been subjected to rigorous review, the USGS reserves the right to update the software as needed pursuant to further analysis and review. No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the software and related material nor shall the fact of release constitute any such warranty. Furthermore, the software is released on condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from its authorized or unauthorized use.

USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.31.0
SSHydro Services Version: 1.1.0
SSDelineate Services Version: 1.0.1
NSS Services Version: 2.2.1
GageStats Services Version: 1.2.1
Pourpoint Services Version: 1.2.0
Batch Processor Version: 1.6.1

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, May 20 2026

Wetland Culvert Crossing - 10 yr

Invert Elev Dn (ft)	=	73.34
Pipe Length (ft)	=	55.00
Slope (%)	=	0.16
Invert Elev Up (ft)	=	73.43
Rise (in)	=	30.0
Shape	=	Circular
Span (in)	=	30.0
No. Barrels	=	2
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

Top Elevation (ft)	=	77.93
Top Width (ft)	=	32.50
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	49.80
Qmax (cfs)	=	49.80
Tailwater Elev (ft)	=	Normal

Highlighted

Qtotal (cfs)	=	49.80
Qpipe (cfs)	=	49.80
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.07
Veloc Up (ft/s)	=	5.07
HGL Dn (ft)	=	75.84
HGL Up (ft)	=	76.01
Hw Elev (ft)	=	76.49
Hw/D (ft)	=	1.23
Flow Regime	=	Outlet Control