NEEDHAM PLANNING BOARD
Tuesday, October 29, 2024
7:00 p.m.

Charles River Room
Public Services Administration Building, 500 Dedham Avenue
AND
Virtual Meeting using Zoom
Meeting ID: **880 4672 5264**
(Instructions for accessing below)

To view and participate in this virtual meeting on your phone, download the "Zoom Cloud Meetings" app in any app store or at www.zoom.us. At the above date and time, click on "Join a Meeting" and enter the following Meeting ID: 880 4672 5264

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Direct Link to meeting: https://us02web.zoom.us/j/88046725264

1. Public Hearing:

   7:00 p.m. Major Project Site Plan Special Permit No. 2024-01: Needham Housing Authority (NHA), 21 Highland Circle, Suite 10, Needham, MA, Petitioner (Property is located at 0 Linden Street and 5 Chambers Street, Needham, Massachusetts). Regarding request to redevelop the NHA Linden-Chambers property. *Please note that this hearing has been continued from the September 24, 2024 and October 15, 2024 Planning Board meetings.*

2. Board of Health – Article 1: Regulation Affecting Smoking and the Sale and Distribution of Tobacco Products in Needham.

3. Minutes.

4. Report from Planning Director and Board members.

5. Correspondence.

(Items for which a specific time has not been assigned may be taken out of order.)

Needham Housing Authority
21 Highland Circle, #11
Needham, MA 02494

October 11, 2024

Planning Board
Town of Needham
500 Dedham Avenue
Needham, MA 02492

RE: NHA Linden Street Redevelopment Project
-- Follow-up on 9/24/2024 Site Plan Review Public Hearing
SPR documents, rev 2 – 10/11/2024

Dear Members of the Planning Board:

The Planning Board opened the Site Plan Review (SPR) public hearing for the above-referenced project on September 24, 2024. It received a presentation from the project team and considered comments, concerns and questions offered by the general public. Planning Board members also offered comments and posed questions. The Board asked the NHA to follow-up, and voted to continue the SPR public hearing to 7 pm on October 15, 2024.

On October 8, 2024, the NHA submitted an initial response to the Planning Board on the issues raised throughout the site plan review process. Revisions to the SPR documents were also submitted, referred to as revision 1, dated 10/8/24. NHA advised of one remaining department meeting, scheduled for October 9, 2024 with the Needham Fire Department.

This letter reports on the October 9, 2024 meeting. The Linden Redevelopment team, the Needham Fire Department, and the Needham Building Commissioner attended. The following summarizes that meeting.

FIRE DEPARTMENT:

At a meeting on October 9, 2024, the Needham Fire Department made a request to extend the two fire lanes around the back side of the proposed building as much as possible, without encroaching on the 25' wetland buffer zone. This request was made due to the town's purchase of a new Tower/Ladder truck. Since that meeting, the Linden Redevelopment Team and the Fire Department have worked together on a solution. The Project Team has modified the plans, as follows:

1. The two 20' wide fire lanes from Linden Street to the east side of the site have been extended slightly to allow a fire truck to approach the back corner of the building – specifically the NE corner of Phase 1A and the SE corner of Phase 1B. This will allow the ladder truck, which has a reach of approximately 100', better coverage of the back (east side) of the building. The Fire Department confirmed that a full vehicular fire lane is not required behind the 1A/1B buildings. Sufficient emergency vehicle access is provided at 3 sides of the building.

2. The two new fire hydrants shown on the original SPR drawings will remain, but the SE hydrant location has been adjusted to accommodate the extended fire lane.

3. The wider sidewalks shown in revision 1, 10/8/24 have been modified slightly to

accommodate the new extended fire lanes.

PLANNING DEPARTMENT:

Upon receipt of the NHA's 10/8/24 revisions, the Planning Department requested that a full set of Site Plan Review documents be resubmitted with all revisions since the 8/23/24 submission. The plans and the Stormwater Report have been revised and are dated October 11, 2024. The NHA team intends to submit these materials electronically to the Planning Department on 10/11/24, and have hard copies delivered on Tuesday 10/15/24.

Following is a summary of changes reflected in the SPR documents, revision 2:

C3.0 – Changes to east side sidewalks and fire lane extensions; re-distribution of EV parking spaces between Phase 1A and Phase 1B.

C4.0 - Changes to east side sidewalks and fire lane extensions; re-distribution of EV parking spaces between Phase 1A and Phase 1B; redesign for expanded stormwater recharge system under Phase 1B parking lot; change from solid to perforated drain pipe at Phase 1B parking lot.

C5.0 - Changes to east side sidewalks and fire lane extensions; re-distribution of EV parking spaces between Phase 1A and Phase 1B; redesign for expanded stormwater recharge system under Phase 1B parking lot; change from solid to perforated drain pipe at Phase 1B parking lot.

C6.0 & C6.1 – Changes to details related to expanded recharge system.

L102A & L102B - Changes to east side sidewalks and fire lane extensions; re-distribution of EV parking spaces between Phase 1A and Phase 1B, reference to expanded recharge system.

L104 & L105 - Changes to east side sidewalks and fire lane extensions; re-distribution of EV parking spaces between Phase 1A and Phase 1B.

A201 – Addition of Phase 1A south exterior elevation, temporary condition, should Phase 1B construction not begin immediately following the completion of Phase 1A.

Stormwater Report – Revised to incorporate the extended fire lane pavement as well as the expanded recharge system included in revision 1. This new report, dated 10/11/24, supersedes the previous reports submitted on 8/23/24 and 10/8/24.

* * * * * * * * * *

We look forward to answering questions about and finalizing our responses at the upcoming October 15, 2024 public hearing continuations. Thank you again for your consideration.

Sincerely,

Reginald C. Foster

Reginald C. Foster, Chair
Board of Commissioners
Needham Housing Authority

cc: Cheryl Gosmon, NHA Executive Director; Robert Smart, Esq.; Betsy Collins and Mike Mattos - APD; Dan Chen and Brad McCord - BH+A; Anthony Donato and Olin Richter – Hancock; Curtis Puncher and Shauna Gillies-Smith - Ground; Greg Hochmuth and Chelsea Davidson - Epsilon

LINDEN STREET REDEVELOPMENT
Needham Housing Authority

PHASE 1
138-188 LINDEN STREET

NEEDHAM, MASSACHUSSETTS 02492
PREPARED FOR
NEEDHAM HOUSING AUTHORITY
21 HIGHLAND CIRCLE
NEEDHAM, MA 02494
199/133-23-00
199/133-24-00
199/133-41-00

APPLICANT/OWNER
NEEDHAM HOUSING AUTHORITY
21 HIGHLAND CIRCLE
NEEDHAM, MA 02494

ARCHITECT
BARGMANN HENDRIE + ARCHETYPE, INC.
9 CHANNEL CENTER STREET, SUITE 300
BOSTON, MA 02210
(617) 350 0450

CIVIL ENGINEER
HANCKOCK ASSOCIATES
121 EAST BERKELEY ST.
BOSTON, MA 02118

SURVEYOR
HANCOCK ASSOCIATES
121 EAST BERKELEY ST.
BOSTON, MA 02118

LANDSCAPE ARCHITECT
GROUND LANDSCAPE, INC.
285 WASHINGTON STREET, UNIT G
SOMERVILLE, MA 02143

ZONING COMPLIANCE CHART

	REQUIRED ZONING	PROPOSED PROJECT - PHASE 1 *	COMPLIANCE	NOTES
ZONING DISTRICT	**Affordable Housing District (AHD)**	**Affordable Housing District (AHD)**		
USES	Affordable Multi-Family	Affordable Multi-Family		
ZONING DIMENSIONAL ANALYSIS				
Gross Lot Area	-	478,540 sq. ft.	-	10,9858 acres per Consolidated Plan
Minimum Lot Size	20,000 sq. ft.	182,400 sq. ft.	Y	
Frontage	150 ft	740 ft	Y	
# Of Dwelling Units	-	216	-	* PHASES 1A/1B/CHAMBERS (EXIST.)
Front yard	40 ft	88 ft	Y	
Side Yard - north	25 ft	155 ft	Y	
Side Yard - south	25 ft	283 ft	Y	lawful pe-existing Chambers Building 50 ft
Rear Yard	25 ft	33 ft	Y	
Height	58 ft	53 ft	Y	
Mechanical Height	15 ft	8 ft	Y	
Mechanical Roof Coverage	25%	< 1%	Y	
Stories	4	4	Y	PHASES 1A/1B
FAR	0.5	0.36	Y	* PHASES 1A/1B/CHAMBERS (EXIST.)
Units per Acre	25	19.7	Y	* PHASES 1A/1B/CHAMBERS (EXIST.)
Lot Coverage	20%	12.4%	Y	
Parking				
Parking Spaces	0.5/unit	0.5/unit	Y	PHASES 1A/1B = 136 units requires 68 parking spaces
Parking Lot Illumination	per 5.1.3 (a)	per 5.1.3 (a)	Y	
Loading Requirement	per 5.1.3 (b)	per 5.1.3 (b)	Y	
Handicapped Parking	per 5.1.3 (c)	per 5.1.3 (c)	Y	
Driveway Openings	per 5.1.3 (d)	per 5.1.3 (d)	Y	
Compact Cars	per 5.1.3 (e)	per 5.1.3 (e)	Y	
Parking Space Size	per 5.1.3 (f)	per 5.1.3 (f)	Y	
Bumper Overhang	per 5.1.3 (g)	per 5.1.3 (g)	Y	
Parking Space Layout	per 5.1.3 (h)	per 5.1.3 (h)	Y	
Width of Maneuvering Aisle	per 5.1.3 (i)	per 5.1.3 (i)	Y	
Parking Setbacks	per 5.1.3 (j)	per 5.1.3 (j)	Y	
Landscape Areas	per 5.1.3 (k)	per 5.1.3 (k)	Y	
Trees	per 5.1.3 (l)	per 5.1.3 (l)	Y	
Location	per 5.1.3 (m)	per 5.1.3 (m)	Y	
Bicycle Racks	per 5.1.3 (n)	per 5.1.3 (n)	Y	

* The Linden Street Redevelopment includes Phase 1A and 1B, which will replace the 18 Linden Street buildings, increasing the number of Linden units from 72 to 136. This redevelopment will not affect the 80 existing Chambers Street units which will remain until replaced during a future Phase 2.

LIST OF DRAWINGS

A000 Cover Sheet

CIVIL
C0 Existing Conditions Plan
C1 Phasing Plan
C2 Demolition, Soil Erosion, and Sediment Control Plan
C3 Site Layout and Materials Plan I
C4 Grading and Drainage
C5 Utility Plan
C6 Construction Details I
C6.1 Construction Details II

LANDSCAPE
L099 Tree Protection Plan
L102A Material Plan
L102B Material Plan
L104 Planting Plan
L105 Site Lighting Plan
L501 Details
L503 Details
L504 Details
L505 Details
L506 Details
L510 Details

ARCHITECTURAL
A100 Phase 1 - Plans
A101 Phase 1A - First Floor Plan
A102 Phase 1A - Typical Floor Plan - Floors 2-4
A104 Phase 1B - First Floor Plan
A105 Phase 1B - Typical Floor Plan - Floors 2-4
A200 Phase 1 - Elevations
A201 Phase 1A - Elevations
A202 Phase 1A - Elevations
A203 Phase 1B - Elevations
A300 Building Sections

ELECTRICAL
E000 Electrical Legend, Notes, and Abbreviations
E100 Electrical Site Plan
E101 Electrical Site Plan Photometrics

Locus Plan

Area Plan
1" = 200'-0"

SITE PLAN REVIEW - 08/23/2024
revision 2 - 10/11/2024

ARCHITECT
bh+a
Bargmann Hendrie + Archetype, Inc.
9 Channel Center Street, Suite 300
Boston, MA 02210
(617) 350 0450

PROJECT NAME
Linden Street Redevelopment

CLIENT
Needham Housing Authority
21 Highland Circle,
Neeham, MA, 02494

PROJECT TEAM

Civil Engineer
Hancock Associates
121 East Berkeley Street, 4th Floor
Boston, MA 02118
617.357.8145

Landscape Architect
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617.718.0889

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63 Pleasant Street, Suite 300
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617.926.9300

MEP/FP Engineer
NV5
200 Brickstone Square
Andover, MA 01810
978.296.6219

REVISIONS

2	NFD COMMENTS	10/11/2024
1	SPR COMMENTS	10/8/2024
		DATE

DRAWING TITLE
Cover Sheet

DRAWING INFORMATION

08/23/2024 DATE OF ISSUE
Site Plan Review DESCRIPTION
1" = 200'-0" SCALE
Author DRAWN BY
3489.00 PROJECT #
revit.rvt FILE NAME

DRAWING NUMBER
000

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V.2.1

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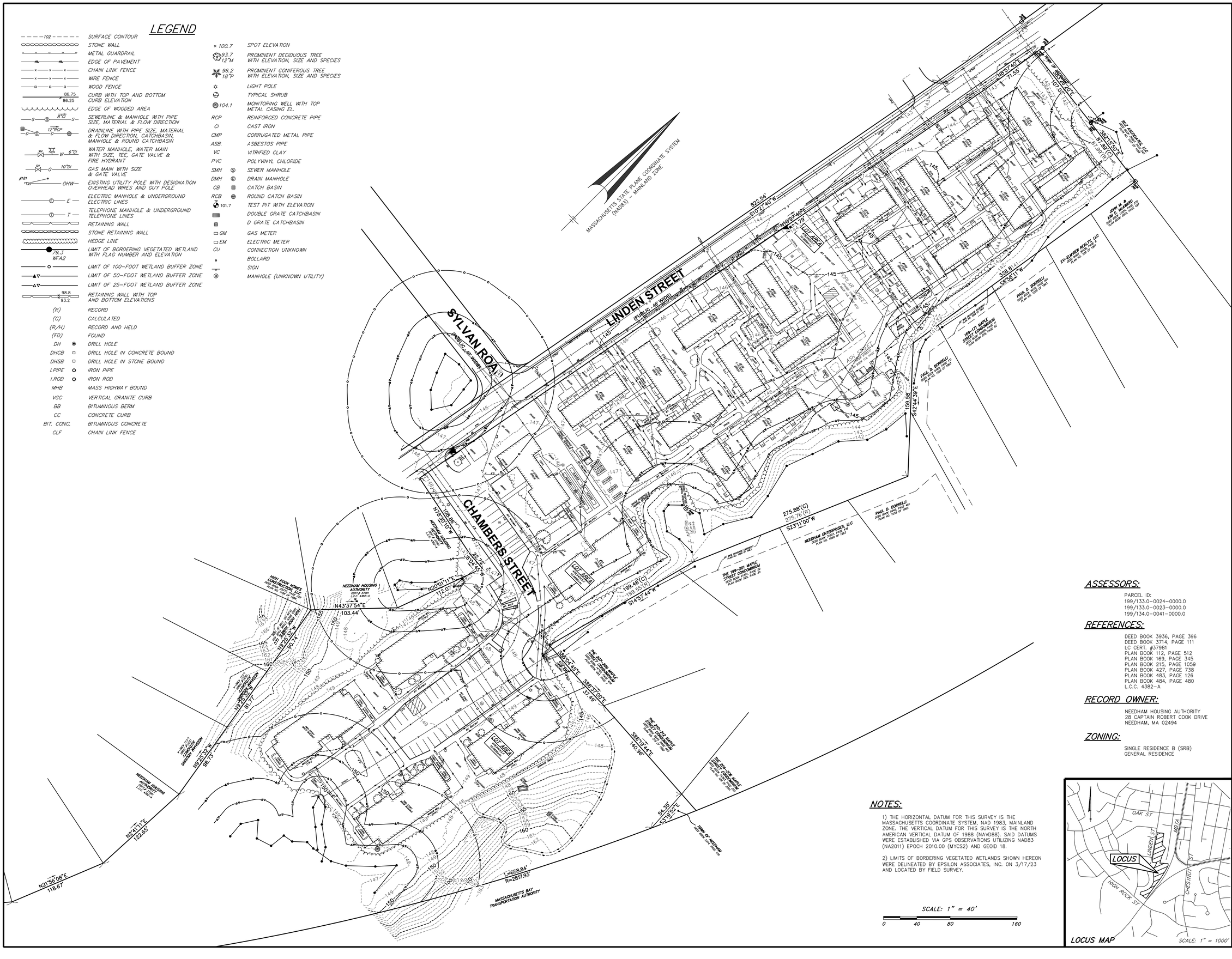
8/23/2024 12:34:32 PM Author

LEGEND

102	SURFACE CONTOUR
	STONE WALL
	METAL GUARDRAIL
	EDGE OF PAVEMENT
x x x	CHAIN LINK FENCE
x x x	WIRE FENCE
	WOOD FENCE
86.75 / 86.25	CURB WITH TOP AND BOTTOM CURB ELEVATION
	EDGE OF WOODED AREA
S 8"VC S	SEWERLINE & MANHOLE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION
D 12"RCP D	DRAINLINE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION, CATCHBASIN, MANHOLE & ROUND CATCHBASIN
W 6"DI	WATER MANHOLE, WATER MAIN WITH SIZE, TEE, GATE VALVE & FIRE HYDRANT
G 10"DI	GAS MAIN WITH SIZE & GATE VALVE
#181 OHW	EXISTING UTILITY POLE WITH DESIGNATION OVERHEAD WIRES AND GUY POLE
E	ELECTRIC MANHOLE & UNDERGROUND ELECTRIC LINES
T	TELEPHONE MANHOLE & UNDERGROUND TELEPHONE LINES
	RETAINING WALL
	STONE RETAINING WALL
	HEDGE LINE
79.3 WFA2	LIMIT OF BORDERING VEGETATED WETLAND WITH FLAG NUMBER AND ELEVATION
	LIMIT OF 100-FOOT WETLAND BUFFER ZONE
	LIMIT OF 50-FOOT WETLAND BUFFER ZONE
	LIMIT OF 25-FOOT WETLAND BUFFER ZONE
98.8 / 93.2	RETAINING WALL WITH TOP AND BOTTOM ELEVATIONS
(R)	RECORD
(C)	CALCULATED
(R/H)	RECORD AND HELD
(FD)	FOUND
DH	DRILL HOLE
DHCB	DRILL HOLE IN CONCRETE BOUND
DHSB	DRILL HOLE IN STONE BOUND
I.PIPE	IRON PIPE
I.ROD	IRON ROD
MHB	MASS HIGHWAY BOUND
VGC	VERTICAL GRANITE CURB
BB	BITUMINOUS BERM
CC	CONCRETE CURB
BIT. CONC.	BITUMINOUS CONCRETE
CLF	CHAIN LINK FENCE

× 100.7	SPOT ELEVATION
93.7 / 12"M	PROMINENT DECIDUOUS TREE WITH ELEVATION, SIZE AND SPECIES
96.2 / 18"P	PROMINENT CONIFEROUS TREE WITH ELEVATION, SIZE AND SPECIES
	LIGHT POLE
	TYPICAL SHRUB
MW 104.1	MONITORING WELL WITH TOP METAL CASING EL.
RCP	REINFORCED CONCRETE PIPE
CI	CAST IRON
CMP	CORRUGATED METAL PIPE
ASB.	ASBESTOS PIPE
VC	VITRIFIED CLAY
PVC	POLYVINYL CHLORIDE
SMH	SEWER MANHOLE
DMH	DRAIN MANHOLE
CB	CATCH BASIN
RCB	ROUND CATCH BASIN
TP 101.7	TEST PIT WITH ELEVATION
	DOUBLE GRATE CATCHBASIN
	D GRATE CATCHBASIN
GM	GAS METER
EM	ELECTRIC METER
CU	CONNECTION UNKNOWN
	BOLLARD
	SIGN
MH	MANHOLE (UNKNOWN UTILITY)



ASSESSORS:

PARCEL ID:
199/133.0-0024-0000.0
199/133.0-0023-0000.0
199/134.0-0041-0000.0

REFERENCES:

DEED BOOK 3936, PAGE 396
DEED BOOK 3714, PAGE 111
LC CERT. #37981
PLAN BOOK 112, PAGE 512
PLAN BOOK 169, PAGE 345
PLAN BOOK 215, PAGE 1059
PLAN BOOK 427, PAGE 738
PLAN BOOK 483, PAGE 126
PLAN BOOK 484, PAGE 480
L.C.C. 4382-A

RECORD OWNER:

NEEDHAM HOUSING AUTHORITY
28 CAPTAIN ROBERT COOK DRIVE
NEEDHAM, MA 02494

ZONING:

SINGLE RESIDENCE B (SRB)
GENERAL RESIDENCE

NOTES:

1) THE HORIZONTAL DATUM FOR THIS SURVEY IS THE MASSACHUSETTS COORDINATE SYSTEM, NAD 1983, MAINLAND ZONE. THE VERTICAL DATUM FOR THIS SURVEY IS THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). SAID DATUMS WERE ESTABLISHED VIA GPS OBSERVATIONS UTILIZING NAD83 (NA2011) EPOCH 2010.00 (MYCS2) AND GEOID 18.

2) LIMITS OF BORDERING VEGETATED WETLANDS SHOWN HEREON WERE DELINEATED BY EPSILON ASSOCIATES, INC. ON 3/17/23 AND LOCATED BY FIELD SURVEY.

LOCUS MAP SCALE: 1" = 1000'

LINDEN/ CHAMBERS REDEVELOPMENT

667 Linden St & 5 Chambers St
Needham, Massachusetts 02492

PREPARED FOR:

BARGMANN HENDRIE + ARCHETYPE, INC.

9 Channel Center St, Suite 300
Boston, Massachusetts 02210

HANCOCK ASSOCIATES

Civil Engineers

Land Surveyors

Wetland Scientists

121 EAST BERKELEY STREET, BOSTON, MA 02118
VOICE (617) 357-8145, FAX (617) 357-9495
WWW.HANCOCKASSOCIATES.COM

COMMONWEALTH OF MASSACHUSETTS
JASON M. ELLIS
No. 49052
REGISTERED PROFESSIONAL LAND SURVEYOR

NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE: 5/11/2023 DESIGN BY: JML
SCALE: 1" = 40' CHECK BY: JAE

EXISTING CONDITIONS PLAN OF LAND IN NEEDHAM, MA

PLOT DATE: Aug 23, 2024 12:26 pm
PATH: O:\Civil 3D Projects\26774 - BHA - Needham\Surv\DWG\

DWG: 26774ec.dwg
LAYOUT: EC(30x42)
SHEET: X OF X

PROJECT NO.: 26774

MASSACHUSETTS STATE PLANE COORDINATE SYSTEM (NAD 83)

PHASE 1B WORK AREA

PHASE 1A WORK AREA

LINDEN STREET

FIRE TRUCK ACCESS TO EXISTING PHASE 1B BUILDINGS STILL IN SERVICE DURING PHASE 1A CONSTRUCTION

HIGH ROCK HOMES CONSTRUCTION, LLC DEED BOOK 29375, PAGE 359 PLAN NO. 1105 OF 1986

CAP PHASE 1A STORM DRAIN

INSTALL GATE VALVE FOR PHASE 1B FIRE WATER LINE

CAP PHASE 1A STORM DRAIN

LIMIT OF PHASE 1A BUILDING CONSTRUCTION

LIMIT OF PHASE 1A SITE DEMOLITION

PHASE 1A PLAN

SCALE: 1"=40'

PHASE 1B WORK AREA

PHASE 1A WORK AREA

LINDEN STREET

HIGH ROCK HOMES CONSTRUCTION, LLC DEED BOOK 29375, PAGE 359 PLAN NO. 1105 OF 1986

PHASE 1B PLAN

SCALE: 1"=40'

THIS PLAN IS TO BE UTILIZED FOR DEMOLITION, SOIL EROSION AND SEDIMENT CONTROL PURPOSES ONLY

SCALE: 1" = 40'

0 40 80 160

NOT FOR CONSTRUCTION - PERMITTING USE ONLY

C:\Local Revit\3489 Linden Chambers Redevelopment NHA_SD_dtlzwatter5kDZ6.rvt Author

5/6/2024 2:45:36 PM

ARCHITECT

bh+a

Bargmann Hendrie + Archetype, Inc.
9 Channel Center Street, Suite 300
Boston, MA 02210
(617) 350 0450

PROJECT NAME

Linden Street Redevelopment

138-188 Linden St, Needham MA, 02494
Assessor's Map:
199/133-23-00
199/133-24-00
199/134-41-00

CLIENT

Needham Housing Authority

21 Highland Circle,
Needham, MA, 02494

PROJECT TEAM

Civil Engineer
Hancock Associates
121 East Berkeley Street, 4th Floor
Boston, MA 02118
617.357.8145

Landscape Architect
Ground Landscape Inc.
285 Washington Street, Unit G
Somerville, MA 02143
617.718.0889

Structural Engineer
RSE Associates Inc.
63 Pleasant Street, Suite 300
Watertown, MA 02472
617.926.9300

MEP/FP Engineer
NV5
200 Brickstone Square
Andover, MA 01810
978.296.6219

REVISIONS

#	COMMENT/DESCRIPTION	DATE
2	NFD COMMENTS	10/11/2024
1	SPR COMMENTS	10/08/2024

DRAWING TITLE

PHASING PLAN

DRAWING INFORMATION

COMMONWEALTH OF MASSACHUSETTS ANTHONY DINARO CIVIL No. 52672 REGISTERED PROFESSIONAL ENGINEER

08/23/2024
DATE OF ISSUE

50% DESIGN DEVELOPMENT
DESCRIPTION

SCALE

OMR
DRAWN BY

26774
PROJECT #

FILE NAME

DRAWING NUMBER

C1

SHEET NUMBER 1 OF 7

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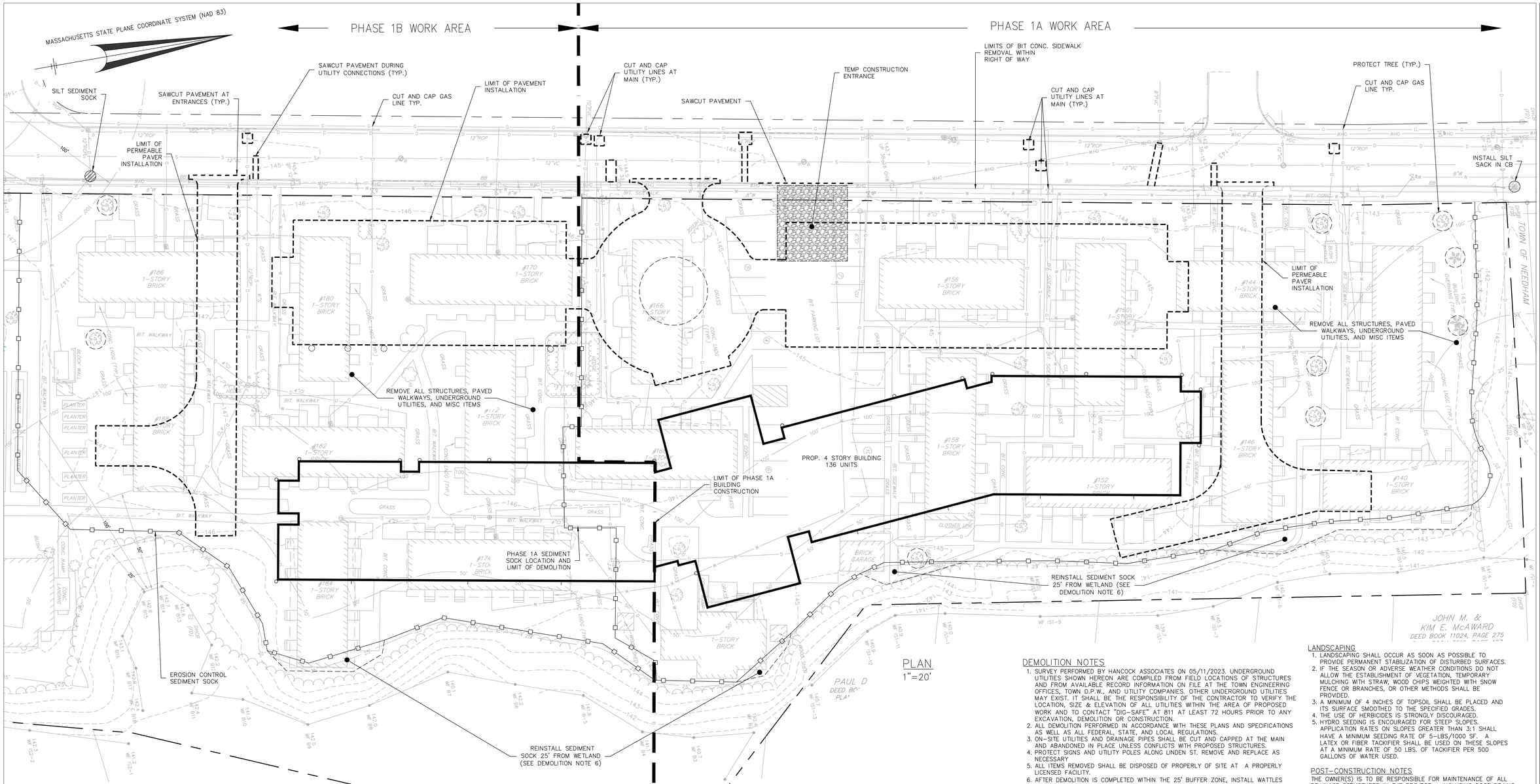
V.2.1



PLAN
1"=20'

DEMOLITION NOTES

1. SURVEY PERFORMED BY HANCOCK ASSOCIATES ON 05/11/2023. UNDERGROUND UTILITIES SHOWN HEREON ARE COMPILED FROM FIELD LOCATIONS OF STRUCTURES AND FROM AVAILABLE RECORD INFORMATION ON FILE AT THE TOWN ENGINEERING OFFICES, TOWN D.P.W., AND UTILITY COMPANIES. OTHER UNDERGROUND UTILITIES MAY EXIST. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE LOCATION, SIZE & ELEVATION OF ALL UTILITIES WITHIN THE AREA OF PROPOSED WORK AND TO CONTACT "DIG–SAFE" AT 811 AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION, DEMOLITION OR CONSTRUCTION.
2. ALL DEMOLITION PERFORMED IN ACCORDANCE WITH THESE PLANS AND SPECIFICATIONS AS WELL AS ALL FEDERAL, STATE, AND LOCAL REGULATIONS.
3. ON–SITE UTILITIES AND DRAINAGE PIPES SHALL BE CUT AND CAPPED AT THE MAIN AND ABANDONED IN PLACE UNLESS CONFLICTS WITH PROPOSED STRUCTURES.
4. PROTECT SIGNS AND UTILITY POLES ALONG LINDEN ST. REMOVE AND REPLACE AS NECESSARY
5. ALL ITEMS REMOVED SHALL BE DISPOSED OF PROPERLY OF SITE AT A PROPERLY LICENSED FACILITY.
6. AFTER DEMOLITION IS COMPLETED WITHIN THE 25' BUFFER ZONE, INSTALL WATTLES ALONG THE 25' BUFFER BUT DO NOT REMOVE EXISTING EROSION CONTROL. NEXT, STABILIZE AND ESTABLISH NATIVE PLANTINGS, SEE LANDSCAPE ARCHITECT'S PLANS FOR DETAILS. ONCE PLANTINGS ARE ESTABLISHED, REMOVE THE DOWNSLOPE WATTLES THAT ARE IN WITHIN THE 25' BUFFER ZONE.

EROSION AND SEDIMENTATION NOTES

PRE–CONSTRUCTION

1. THE CONTRACTOR SHALL HAVE A STOCKPILE OF MATERIALS REQUIRED TO CONTROL EROSION ON–SITE TO BE USED TO SUPPLEMENT OR REPAIR EROSION CONTROL DEVICES. THESE MATERIALS SHALL INCLUDE, BUT ARE NOT LIMITED TO STRAW WATTLES, SILT FENCE AND CRUSHED STONE.
2. THE CONTRACTOR IS RESPONSIBLE FOR EROSION CONTROL ON SITE AND SHALL UTILIZE EROSION CONTROL MEASURES WHERE NEEDED, REGARDLESS OF WHETHER THE MEASURES ARE SPECIFIED ON THE PLAN OR IN THE ORDER OF CONDITIONS.
3. UNSUITABLE EXCAVATED MATERIAL SHALL BE REMOVED FROM THE SITE.
4. CONSTRUCTION ENTRANCE SHALL BE INSTALLED.
5. EXISTING CATCH BASINS SHALL BE PROTECTED WITH SILT SACKS.

PRELIMINARY SITE WORK

1. EXCAVATED MATERIALS SHOULD BE STOCKPILED, SEPARATING THE TOPSOIL FOR FUTURE USE ON THE SITE. EROSION CONTROL SHALL BE UTILIZED ALONG THE DOWN SLOPE SIDE OF THE PILES AND SIDE SLOPES SHALL NOT EXCEED 2:1.
2. IF INTENSE RAINFALL IS ANTICIPATED, THE INSTALLATION OF SUPPLEMENTAL STRAW BALE DIKES, SILT FENCES, OR ARMORED DIKES SHALL BE CONSIDERED.

ONGOING SITE WORK

1. EROSION CONTROL MEASURES SHALL BE INSPECTED DAILY AND REPLACED AS NEEDED. SEDIMENT BUILT UP BEHIND SILT FENCES SHALL BE REMOVED WHEN LEVEL REACHES ONE HALF WATTLE HEIGHT AND DISPOSED IN ACCORDANCE WITH APPLICABLE REGULATIONS.
2. DEWATERING SHALL BE DONE IN A MANNER SO AS NOT TO TRANSMIT SILT, SAND, OR PARTICULATE MATTER TO THE RECEIVING WATER OR EXISTING DRAINAGE SYSTEM.
3. CATCH BASIN SILT SACKS SHALL BE INSPECTED WEEKLY. SILT SACKS SHALL BE REMOVED AND CLEANED WHEN SEDIMENT IS WITHIN 6" OF THE BOTTOM OF THE GRATE. SEDIMENT SHALL BE DISPOSED IN ACCORDANCE WITH APPLICABLE REGULATIONS.
4. CONSTRUCTION ENTRANCE SHALL BE INSPECTED WEEKLY. STONE SHALL BE REMOVED AND REPLACED WHEN SEDIMENT REACHES TOP OF STONE.
5. LINDEN STREET SHALL BE INSPECTED DAILY AND SWEPT AS NEEDED TO KEEP PAVED SURFACE FREE OF SOIL AND DEBRIS.
6. DUST SHALL BE CONTROLLED VIA MECHANICAL WATER SPRAYING.
7. NO EXISTING UTILITIES SHALL BE ABANDONED IN PLACE.
8. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING A FUNCTIONAL STORM DRAINAGE SYSTEM IN LINDEN STREET AT ALL TIMES DURING CONSTRUCTION, INCLUDING PERIODIC CLEAN OUT OF SEDIMENT.

LANDSCAPING

1. LANDSCAPING SHALL OCCUR AS SOON AS POSSIBLE TO PROVIDE PERMANENT STABILIZATION OF DISTURBED SURFACES.
2. IF THE SEASON OR ADVERSE WEATHER CONDITIONS DO NOT ALLOW THE ESTABLISHMENT OF VEGETATION, TEMPORARY MULCHING WITH STRAW, WOOD CHIPS WEIGHTED WITH SNOW FENCE OR BRANCHES, OR OTHER METHODS SHALL BE PROVIDED.
3. A MINIMUM OF 4 INCHES OF TOPSOIL SHALL BE PLACED AND ITS SURFACE SMOOTHED TO THE SPECIFIED GRADES.
4. THE USE OF HERBICIDES IS STRONGLY DISCOURAGED.
5. HYDRO SEEDING IS ENCOURAGED FOR STEEP SLOPES. APPLICATION RATES ON SLOPES GREATER THAN 3:1 SHALL HAVE A MINIMUM SEEDING RATE OF 5–LBS/1000 SF. A LATEX OR FIBER TACKIFIER SHALL BE USED ON THESE SLOPES AT A MINIMUM RATE OF 50 LBS. OF TACKIFIER PER 500 GALLONS OF WATER USED.

POST–CONSTRUCTION NOTES

THE OWNER(S) IS TO BE RESPONSIBLE FOR MAINTENANCE OF ALL DRAINAGE STRUCTURES IN THE PROJECT – INCLUDING ROOF DRAINS, DRAIN PIPES, CATCH BASINS, AND DRAIN MANHOLES.

REGULAR MAINTENANCE IS TO INCLUDE THE FOLLOWING:

1. INSPECTION OF ALL DRAINAGE FACILITIES (CATCH BASINS, PIPES, OUTLET CONTROL STRUCTURES, AND DETENTION BASINS) EVERY THREE MONTHS. DURING THESE INSPECTIONS, THE INSPECTOR (A REGISTERED PROFESSIONAL CIVIL ENGINEER QUALIFIED IN DRAINAGE SYSTEMS) SHALL LOOK FOR EVIDENCE OF THE FOLLOWING: STRUCTURAL DAMAGE, SILT ACCUMULATION (NEAR INLET INVERTS ON CATCH BASINS AND OUTLET CONTROL STRUCTURES), AND IMPROPER FUNCTION. A REPORT ON THE SYSTEM SHALL BE DELIVERED TO THE OWNER.
2. AFTER INSPECTION, IF ANY OF THE ABOVE CONDITIONS EXIST, THE INSPECTOR SHALL NOTIFY THE OWNER. WHO SHALL IMMEDIATELY ARRANGE FOR ALL NECESSARY REPAIRS AND/OR SEDIMENT REMOVAL.
3. THE PAVEMENT AREA IS TO BE SWEPT CLEAN, AS REQUIRED (I.E., VISUALLY NOTICEABLE DEBRIS BUILD–UP). A MINIMUM OF ONCE PER YEAR.
4. ALL GRADED SLOPES SHALL BE INSPECTED EVERY SPRING FOR EROSION. UPON DISCOVERY OF ANY FAILURE (IE. EROSION), LOAM AND SEED SHALL BE PUT IN PLACE AND NURTURED.
5. DURING THE WINTER MONTHS, ALL SNOW IS TO BE STORED SUCH THAT SNOW MELT IS CONTROLLED WITHIN THE PAVED AREA.

CONSTRUCTION SEQUENCE

1. INSTALL CONSTRUCTION ENTRANCE
2. INSTALL EROSION CONTROL AND SILT SACKS
3. SITE DEMOLITION AND PREPARATION PER PLAN.
4. UTILITY AND FOUNDATION CONSTRUCTION.
5. BACKFILL OF UTILITIES AND FOUNDATIONS.
6. PARKING LOT AND BUILDING CONSTRUCTION.
7. REMOVE CONSTRUCTION ENTRANCE.
8. FINAL GRADING, AND PAVING.
9. LANDSCAPING, LOAM AND SEED.
10. REMOVAL OF EROSION CONTROL AND SILT SACKS ONCE FULLY STABILIZED.

LEGEND

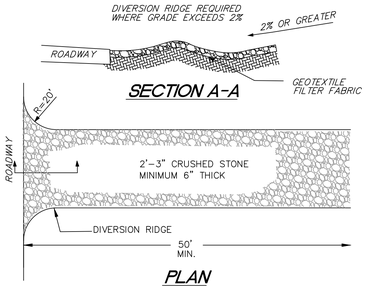
- TEMPORARY CONSTRUCTION ENTRANCE
- SAWCUT
- SEDIMENT SOCK
- SEDIMENT SOCK LOCATION DURING DEMOLITION

SCALE: 1" = 20'

0 20 40 80

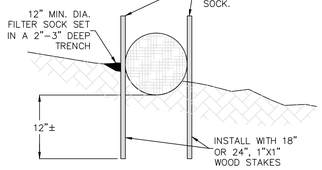
THIS PLAN IS TO BE UTILIZED FOR DEMOLITION, SOIL EROSION AND SEDIMENT CONTROL PURPOSES ONLY

NOT FOR CONSTRUCTION - PERMITTING USE ONLY



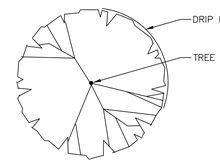
NOTES:
1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT–OF–WAYS. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY WHEELS SHALL BE CLEANED PRIOPR TO ENTRANCE ONTO PUBLIC RIGHT–OF–WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABLIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.

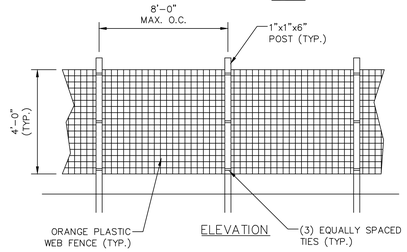
TEMPORARY GRAVEL CONSTRUCTION ENTRANCE/EXIT
NOT TO SCALE



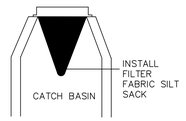
NOTES:
1. SOCK SIZE DEPICTED IS FOR GENERAL USE. GREATER SLOPES MAY REQUIRE LARGER SOCK.
2. COMPOST MATERIAL MAY BE DISPERSED ON SITE AT THE DISCRETION OF THE APPROVING AUTHORITY.
3. PRIOR TO SETTING THE SOCK REMOVE LOOSE LITTER, BRANCHES AND OTHER MATERIAL THAT MAY PREVENT THE SOCK FROM DIRECT CONTACT WITH SOIL.

WATTLE
NOT TO SCALE





TREE PROTECTION DETAIL
NOT TO SCALE



CATCH BASIN SEDIMENT TRAP
NOT TO SCALE

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Boston, MA 02210
(617) 350 0450

PROJECT NAME
Linden Street Redevelopment
138-188 Linden St, Needham MA, 02494
Assessor's Map:
199/133-23-00
199/133-24-00
199/134-41-00

CLIENT
Needham Housing Authority
21 Highland Circle,
Needham, MA, 02494

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REVISIONS

#	COMMENT/DESCRIPTION	DATE

DRAWING TITLE
DEMOLITION, SOIL EROSION, AND SEDIMENTATION CONTROL PLAN

DRAWING INFORMATION

ANTHONY DENINO CIVIL No. 49350 REGISTERED PROFESSIONAL ENGINEER COMMONWEALTH OF MASSACHUSETTS

08/23/2024
DATE OF ISSUE
SITE PLAN REVIEW
DESCRIPTION
OMR
SCALE
DRAWN BY
26774
PROJECT #
FILE NAME

DRAWING NUMBER
C2.0
SHEET NUMBER 2 OF 7

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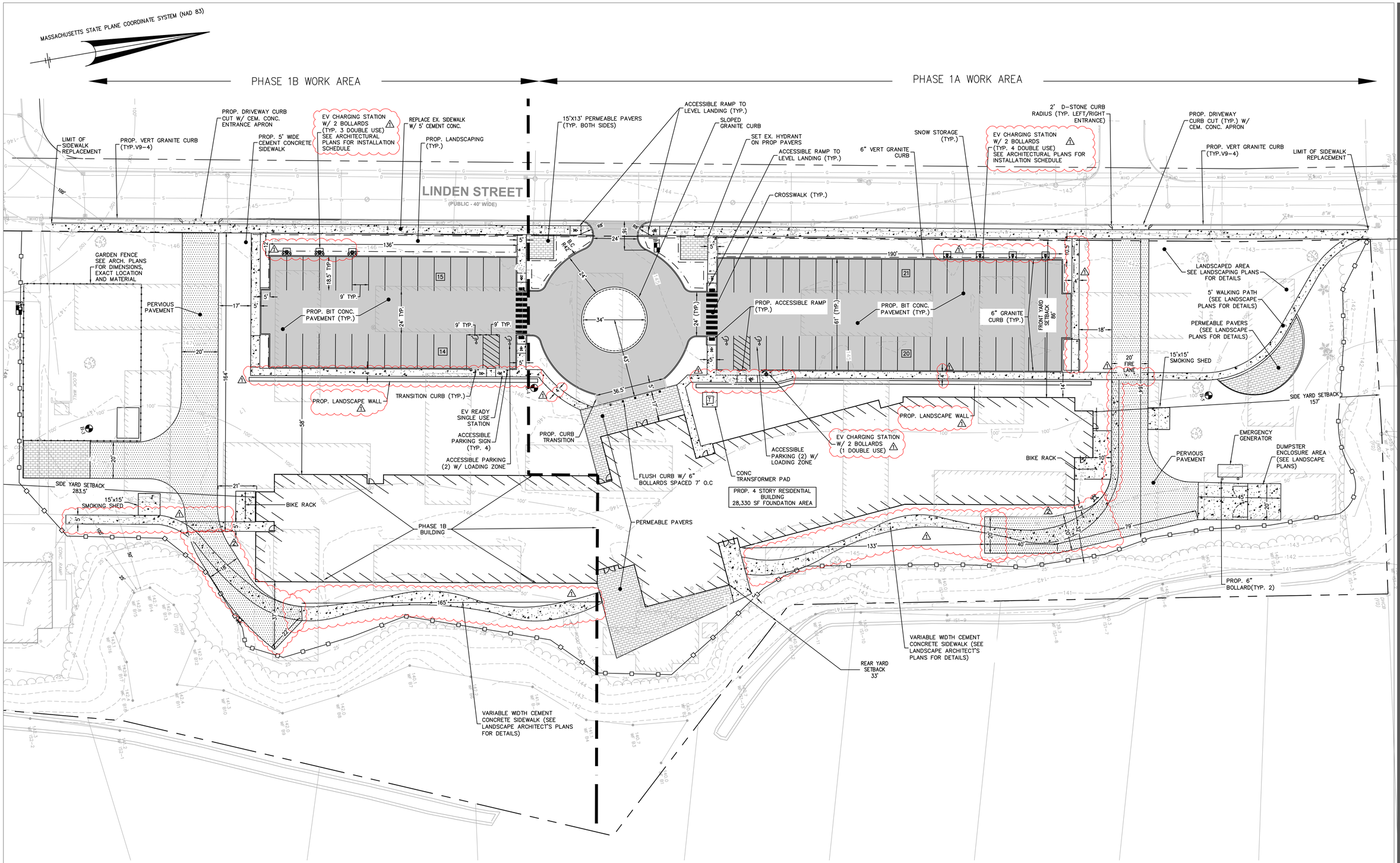

PLAN
1"=20'

BUILDING ANALYSIS TABLE (PHASE 1)	
GROSS FLOOR AREA	–
BUILDING COVERAGE (PHASE 1A & AB)	28,330 SF(16%)
LANDSCAPE OPEN SPACE (PHASE 1A & 1B)	55%
BUILDING HEIGHT	4 STORY
MAX FLOOR AREA RATIO	0.22
PARKING REQUIREMENT (0.5 SPACES PER UNIT)	68 SPACES
UNITS	136
IMPERVIOUS PAVEMENT	46,960 SF (27%)

NOTES
1. SURVEY PERFORMED BY HANCOCK ASSOCIATES ON 05/11/2023. UNDERGROUND UTILITIES SHOWN HEREON ARE COMPILED FROM FIELD LOCATIONS OF STRUCTURES AND FROM AVAILABLE RECORD INFORMATION ON FILE AT THE TOWN ENGINEERING OFFICES, TOWN D.P.W., MASSDOT AND UTILITY COMPANIES. OTHER UNDERGROUND UTILITIES MAY EXIST. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE LOCATION, SIZE & ELEVATION OF ALL UTILITIES WITHIN THE AREA OF PROPOSED WORK AND TO CONTACT "DIG-SAFE" AT 811 AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION, DEMOLITION OR CONSTRUCTION.
2. CONTRACTOR SHALL OBTAIN REQUIRED PERMITS PRIOR TO CONSTRUCTION.
3. ALL WORK TO BE PERFORMED IN STRICT ACCORDANCE WITH PLANS AND SPECIFICATIONS AND REQUIREMENTS OF THE TOWN OF NEEDHAM.
4. DEBRIS SHALL NOT BE BURIED ON SITE. ALL UNSUITABLE MATERIAL AND DEBRIS SHALL BE DISPOSED OF OFF SITE IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL REQUIREMENTS.
5. CONTRACTOR IS RESPONSIBLE FOR ALL SHORING REQUIRED DURING EXCAVATION AND CONSTRUCTION TO BE PERFORMED IN ACCORDANCE WITH OSHA STANDARDS.
6. SEE LANDSCAPING PLANS FOR PROPOSED PLANTINGS AND SITE FEATURES (BIKE RACK, SMOKING SHED, ETC)

LEGEND
- PROP. SNOW STORAGE
- # — PARKING SPACE COUNT
- LANDSCAPING WALL
- POROUS PAVEMENT
- CEMENT CONCRETE
- PERMEABLE PAVERS
- TP1 — TEST PIT LOCATION
- ACCESSIBLE PARKING SPACE SYMBOL
- B-3 — BORING LOCATION
- PAINTED CROSSWALK
- SEDIMENT SOCK

SCALE: 1" = 20'
0 20 40 80

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(617) 350 0450

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REVISIONS

#	COMMENT/DESCRIPTION	DATE
2	NFO COMMENTS	10/11/2024
1	SPR COMMENTS	10/08/2024

DRAWING TITLE
SITE LAYOUT AND MATERIALS PLAN

DRAWING INFORMATION

COMMONWEALTH OF MASSACHUSETTS — ANTHONY EDWARD CIVIL — REGISTERED PROFESSIONAL ENGINEER

08/23/2024 — DATE OF ISSUE
50% DESIGN DEVELOPMENT — DESCRIPTION
SCALE — DRAWN BY: OMR
26774 — PROJECT #
FILE NAME

DRAWING NUMBER
C3.0

SHEET NUMBER 3 OF 7

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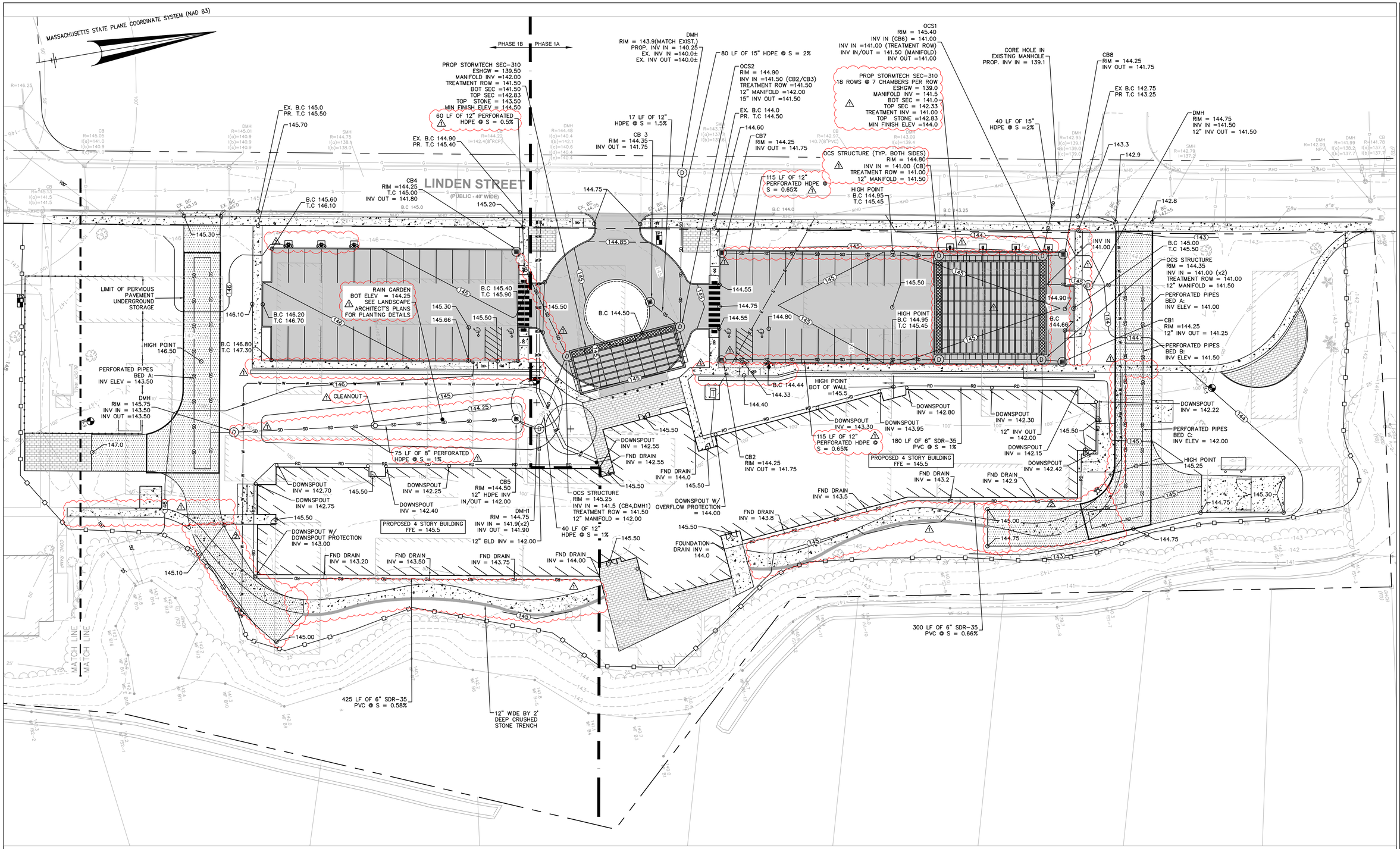

PLAN
1"=20'

NOTES:

1. LOCATION OF ALL EXISTING AND PROPOSED SERVICES MUST BE CONFIRMED IN THE FIELD PRIOR TO CONSTRUCTION. ALL DISCREPANCIES MUST BE REPORTED TO THE ENGINEER.
2. ALL UTILITIES AND SERVICES WITHIN LIMITS OF DISTURBANCES SHALL BE VERTICALLY AND HORIZONTALLY LOCATED.
3. CONTRACTOR TO COMPLY WITH UTILITY NOTIFICATION REQUIREMENTS.
4. ALL NEW UTILITIES/SERVICES ARE TO BE INSTALLED UNDERGROUND

LEGEND

	EXISTING	PROPOSED
DRAIN MANHOLE	ⓓ	ⓓ
CATCH BASIN	▦	▦
DRAIN PIPE	—SD—	—SD—
CONTOUR	— — —	—①—
BORE LOCATION	◒	

SOIL TESTING DATA:

PERFORMED ON MAY 30, 2024 BY ANTHONY DONATO = (#598)

Test Pit#1		Test Pit#2	
Elevation:	144.6 ±	Elevation:	146.8±
0-6"	Loam/Fill	0-6"	Loam/Fill
6"-84"	Sand	6"-80"	Sand
Weeping:	None	Weeping:	72"
ESHWT:	72"/6'p(Elev. 138.6)	ESHWT:	78"/6'p(Elev. 140.8)

SCALE: 1" = 20'

0 20 40 80

NOT FOR CONSTRUCTION - PERMITTING USE ONLY

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Author
5/6/2024 2:45:36 PM

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REVISIONS

#	COMMENT/DESCRIPTION	DATE
2	NFD COMMENTS	10/11/2024
1	SPR COMMENTS	10/08/2024

DRAWING TITLE
GRADING AND DRAINAGE

DRAWING INFORMATION

COMMONWEALTH OF MASSACHUSETTS ANTHONY DONATO CIVIL No. 49598 REGISTERED PROFESSIONAL ENGINEER

08/23/2024 DATE OF ISSUE
50% DESIGN DEVELOPMENT DESCRIPTION
SCALE
OMR DRAWN BY
26774 PROJECT #
FILE NAME

DRAWING NUMBER
C4.0

SHEET NUMBER 4 OF 7

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MASSACHUSETTS STATE PLANE COORDINATE SYSTEM (NAD 83)

PHASE 1B | PHASE 1A

PROP. SEWER CONNECTION
INV UNKNOWN, MATCH EXIST.
(PHASE 1B)

180 LF OF 6" CLDI
SEWER LINE S = 2%±
(PHASE 1B)

PROP. 8" FIRE WATER LINE CONNECT
VIA TAPPING SLEEVE AND VALVE

PROP 6" WATER LINE
CONNECT TO EXISTING MAIN VIA
TAPPING SLEEVE AND VALVE

PROP. SEWER
CONNECTION
INV = 137.8±

90 LF OF 6" CLDI SEWER
LINE @ S = 1%

PROP. 4" DUCT BANK

CONNECT PROP. DUCT
BANK TO EX. UTILITY POLE

PROP. SEWER
CONNECTION
INV = 137.25±

130 LF OF 6" CLDI
SEWER LINE @ S =
3.5%

WATER INV=140.25
STORM DRAIN INV=141.9
SMH
RIM=145.4
INV IN = 138.80
INV OUT = 138.70

LINDEN STREET
(PUBLIC - 40' WIDE)

SEWER INV=138.5
STORM DRAIN INV=141.7

PROP. TAPPING
SLEEVE AND VALVE

PROP
6"WATER LINE

PROP. 6"x6"x2" TEE
(INSTALL GATE VALVE
DURING PHASE 1A)

PROP.
TRANSFORMER

6" SEWER INV
OUT = 139.80

SMH
RIM=145.0
INV IN = 139.60
INV OUT = 139.50

SMH
RIM=145.0
INV IN = 142.0
INV OUT = 141.75

SEWER INV
OUT = 142.5

PROP. FIRE HYDRANT
WITH GATE VALVE

SEWER INV=141.2±
STORM DRAIN INV=143.5
WATER INV = 140.0

SEWER INV=138.9
STORM DRAIN INV=141.6

WATER INV=140.0
STORM DRAIN INV=141.8

PROP. 4" DOMESTIC
WATER LINE
W/ CURB STOP

SEWER INV
OUT = 142.5
(PHASE 1B)

36 LF OF 6" CLDI
SEWER LINE @ S = 2%

TRASH

EMERGENCY GENERATOR

SMH (PHASE 1B)
RIM=145.0
INV IN = 142.25
INV OUT = 142.00

PROP. 6"
WATER LINE
(PHASE 1B)

PROP. HYDRANT
WITH GATE VALVE
(PHASE 1B)

TOWN OF NEEDHAM

THE 199-201 MAPLE STREET CONDOMINIUM
DEED BOOK 21391, PAGE 22
PLAN BOOK 525, PAGE 30

NEEDHAM ENTERPRISES, LLC
DEED BOOK 31607, PAGE
PLAN NO.

PAUL D. BORRELLI
DEED BOOK 6369, PAGE 131
PLAN NO. 1059 OF 1963

169-171 MAPLE STREET CONDOMINIUM
DEED BOOK 20520, PAGE 11
PLAN BOOK 518, PAGE 52

PAUL D. BORRELLI
DEED BOOK 9245, PAGE 461
PLAN NO. 1059 OF 1963

EV-ELMVIEW REALTY, LLC
DEED BOOK 36138, PAGE 8
PLAN NO. 738 OF 1961

JOHN M. &
KIM E. McAWARD
DEED BOOK 11024, PAGE 275
PLAN BOOK 3910, PAGE 427

NOTES:
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LEGEND

	EXISTING	PROPOSED
UNDERGROUND WATER LINE	W	W
UNDERGROUND ELECTRIC	E	E
SANITARY SEWER LINE	SS	SS
HYDRANT		

SCALE: 1" = 20'
0 20 40 80

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REVISIONS

#	COMMENT/DESCRIPTION	DATE
2	NFD COMMENTS	10/11/2024
1	SPR COMMENTS	10/08/2024

DRAWING TITLE
UTILITY PLAN

DRAWING INFORMATION

COMMONWEALTH OF MASSACHUSETTS
ANTHONY DONATO CIVIL No. 49,250
REGISTERED PROFESSIONAL ENGINEER

08/23/2024
DATE OF ISSUE
50% DESIGN DEVELOPMENT
DESCRIPTION
SCALE
OMR
DRAWN BY
26774
PROJECT #
FILE NAME

DRAWING NUMBER
C5.0

SHEET NUMBER 5 OF 7

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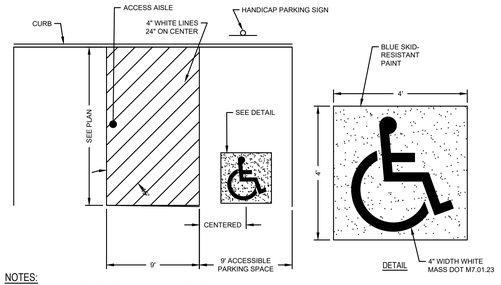
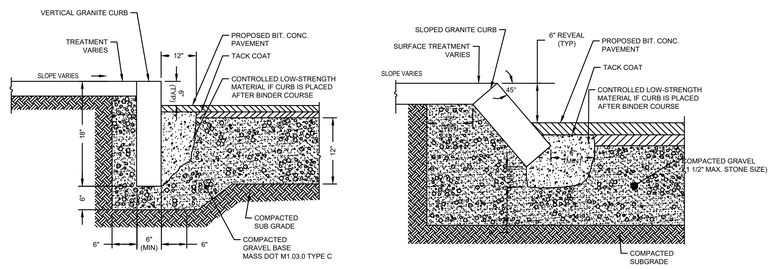


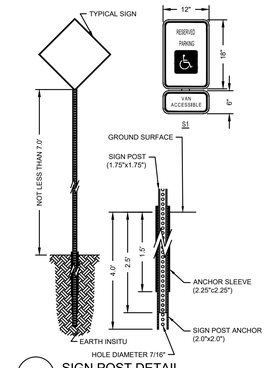
NOTES:

1. ALL DIMENSIONS TO EDGES OF 4" PAVEMENT STRIPING.
2. ALL STRIPING SHALL BE 4" WIDE SOLID WHITE PAVEMENT MARKINGS UNLESS OTHERWISE NOTED. MASS DOT M7.01.23 FAST DRYING WHITE WATER-BORNE TRAFFIC PAINT.

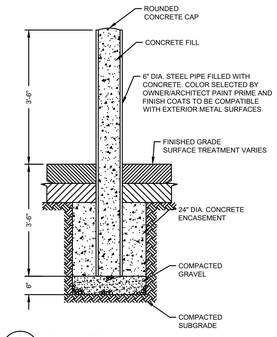
1 ACCESSIBLE PARKING SPACE
NOT TO SCALE



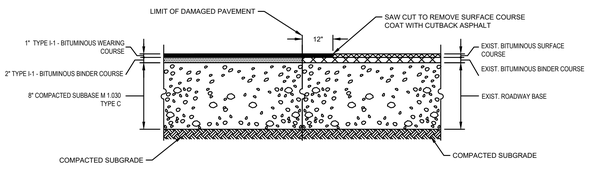
2 VERTICAL GRANITE CURB & SLOPED GRANITE CURB
NOT TO SCALE



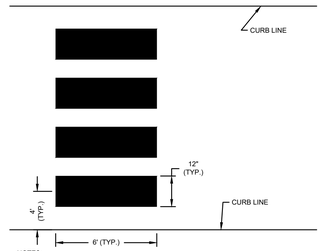
3 SIGN POST DETAIL
NOT TO SCALE



4 BOLLARD
NOT TO SCALE



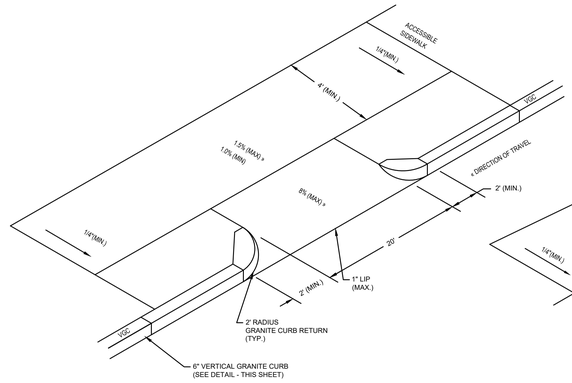
5 BIT. CONC. PAVEMENT PAVEMENT DETAIL
NOT TO SCALE

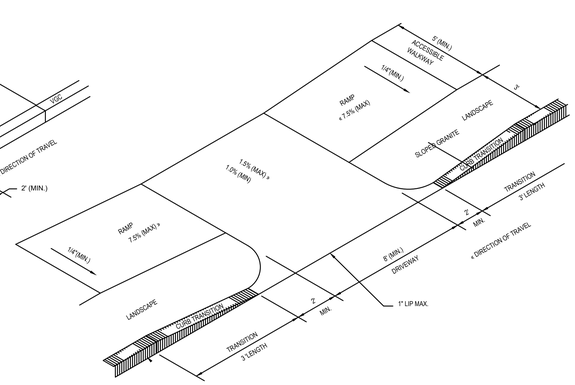


NOTES:

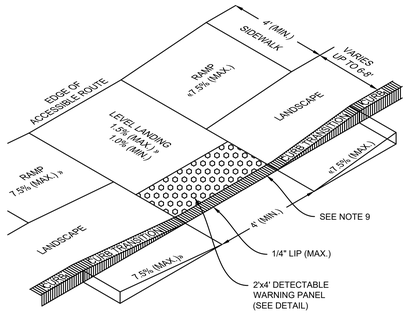
1. TWELVE INCH (12") LINES SHALL BE APPLIED IN ONE APPLICATION, NO COMBINATION OF LINES (TWO - 6 INCH LINES) WILL BE ACCEPTED.
2. LONGITUDINAL CROSSWALK LINES TO BE PARALLEL TO CURB LINE.
3. ALL LONGITUDINAL CROSSWALK LINES TO BE THE SAME LENGTH AND PROPERLY ALIGNED.
4. CROSS WALK SIDE SLOPE SHALL NOT EXCEED 1.5%.

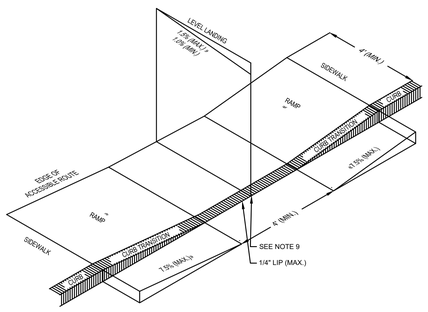
6 CROSSWALK
NOT TO SCALE

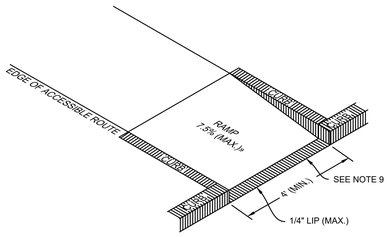




7 TYPICAL ENTRANCE
NOT TO SCALE



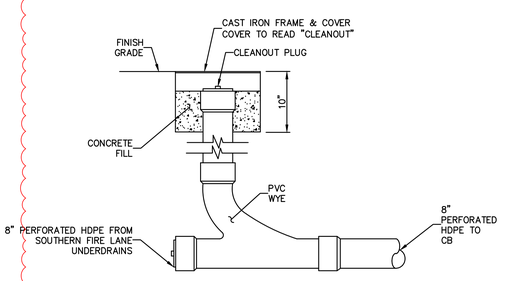




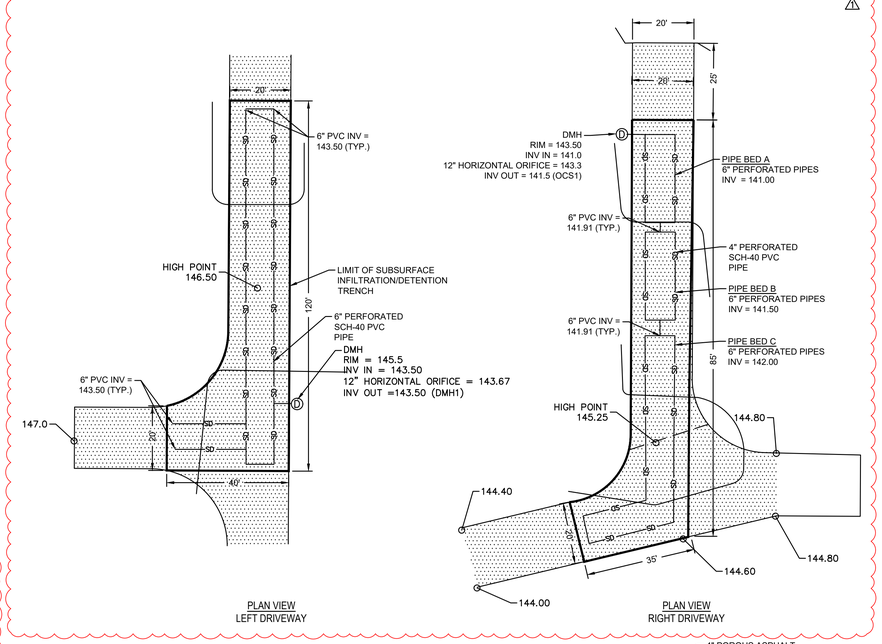
NOTES:

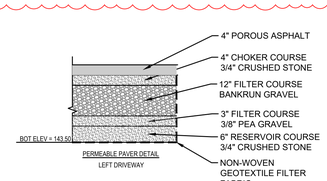
1. THE MAXIMUM ALLOWABLE SIDEWALK AND RAMP CROSS SLOPES SHALL BE 1.5% (1% MIN).
2. THE MAXIMUM ALLOWABLE SLOPE OF ACCESSIBLE ROUTE EXCLUDING CURB RAMPS SHALL BE 5%.
3. THE MAXIMUM ALLOWABLE SLOPE OF ACCESSIBLE ROUTE CURB RAMPS SHALL BE 7.5%.
4. A MINIMUM OF 3 FEET CLEAR SHALL BE MAINTAINED AT ANY PERMANENT OBSTACLE IN ACCESSIBLE ROUTE (I.E., HYDRANTS, UTILITY POLES, TREE WELLS, SIGNS, ETC.)
5. CURB TREATMENT VARIES. SEE PLAN FOR CURB TYPE.
6. RAMP, CURB AND ADJACENT PAVEMENTS SHALL BE GRADED TO PREVENT PONDING.
7. SEE TYPICAL SIDEWALK SECTION FOR RAMP CONSTRUCTION.
8. WHERE ACCESSIBLE ROUTES ARE LESS THAN 5' IN WIDTH (EXCLUDING CURBING) A 5'x5' PASSING AREA SHALL BE PROVIDED AT INTERVALS NOT TO EXCEED 200 FEET.
9. ELIMINATE CURBING AT RAMP WHERE IT ABUTS ROADWAY, EXCEPT WHERE VERTICAL CURBING IS INDICATED ON THE DRAWINGS TO BE INSTALLED AND SET FLUSH.

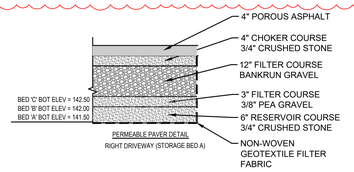
8 ACCESSIBLE CURB RAMP
NOT TO SCALE



9 CLEANOUT
NOT TO SCALE







10 PERVIOUS ASPHALT
NOT TO SCALE

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PROJECT NAME
Linden Street Redevelopment
138-188 Linden St, Needham MA, 02494
Assessor's Map:
199/133-23-00
199/133-24-00
199/134-41-00

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Needham Housing Authority
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Needham, MA, 02494

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REVISIONS

2	NFD COMMENTS	10/11/2024
1	SPR COMMENTS	10/08/2024
#	COMMENT/DESCRIPTION	DATE

DRAWING TITLE
CONSTRUCTION DETAILS I

DRAWING INFORMATION

COMMONWEALTH OF MASSACHUSETTS ANTHONY DONATO CIVIL No. 49630 REGISTERED PROFESSIONAL ENGINEER

08/23/2024
DATE OF ISSUE
50% DESIGN DEVELOPMENT
DESCRIPTION
SCALE
DMR
DRAWN BY
26774
PROJECT #
FILE NAME

DRAWING NUMBER
C6.0

SHEET NUMBER 6 OF 7

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V.2.1

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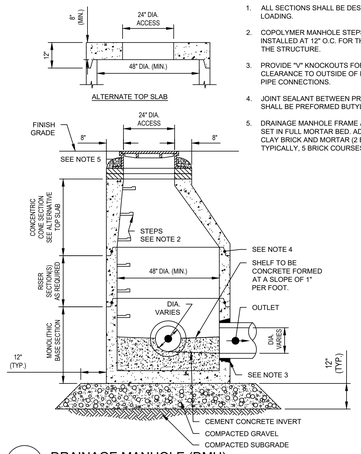
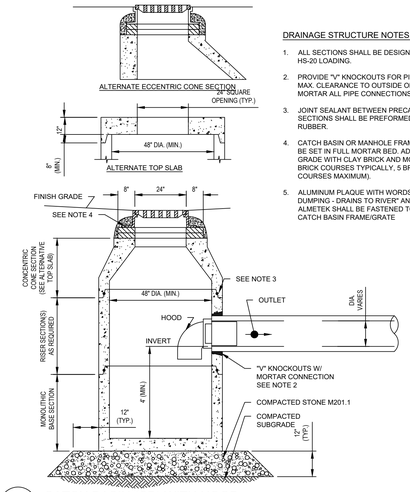
Author



NOTES:

1. ALL SECTIONS SHALL BE DESIGNED FOR HS-20 LOADING.
2. COPOLYMER MANHOLE STEPS SHALL BE INSTALLED AT 12" O.C. FOR THE FULL DEPTH OF THE STRUCTURE.
3. PROVIDE "V" KNOCKOUTS FOR PIPES WITH 2" MAX. CLEARANCE TO OUTSIDE OF PIPE. MORTAR ALL PIPE CONNECTIONS.
4. JOINT SEALANT BETWEEN PRECAST SECTIONS SHALL BE PREFORMED BUTYL RUBBER.
5. DRAINAGE MANHOLE FRAME AND COVER SHALL BE SET IN FULL MORTAR BED, ADJUST TO GRADE WITH CLAY BRICK AND MORTAR (2 BRICK COURSES TYPICALLY, 5 BRICK COURSES MAXIMUM).

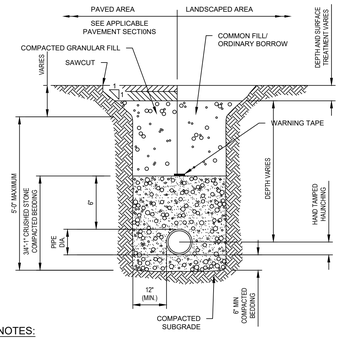
1 DRAINAGE MANHOLE (DMH)
1



DRAINAGE STRUCTURE NOTES:

1. ALL SECTIONS SHALL BE DESIGNED FOR HS-20 LOADING.
2. PROVIDE "V" KNOCKOUTS FOR PIPES WITH 2" MAX. CLEARANCE TO OUTSIDE OF PIPE. MORTAR ALL PIPE CONNECTIONS.
3. JOINT SEALANT BETWEEN PRECAST SECTIONS SHALL BE PREFORMED BUTYL RUBBER.
4. CATCH BASIN OR MANHOLE FRAMES SHALL BE SET IN FULL MORTAR BED. ADJUST TO GRADE WITH CLAY BRICK AND MORTAR (2 BRICK COURSES TYPICALLY, 5 BRICK COURSES MAXIMUM).
5. ALUMINUM PLAQUE WITH WORDS "NO DUMPING - DRAINS TO RIVER" AND MADE BY ALMETEK SHALL BE FASTENED TO EACH CATCH BASIN FRAME/GRATE

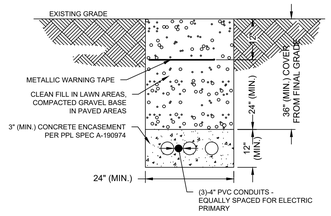
2 CATCH BASIN (CB) WITH HOOD
1



NOTES:

1. WHERE UTILITY TRENCHES ARE CONSTRUCTED THROUGH DETENTION BASIN BERMS OR OTHER SUCH SPECIAL SECTIONS, PLACE TRENCH BACKFILL WITH MATERIALS SIMILAR TO THE SPECIAL SECTION REQUIREMENTS.
2. USE METALLIC TRACING/WARNING TAPE OVER ALL PIPES.

3 UTILITY TRENCH
1



4 ELECTRIC PRIMARY DUCT BANK
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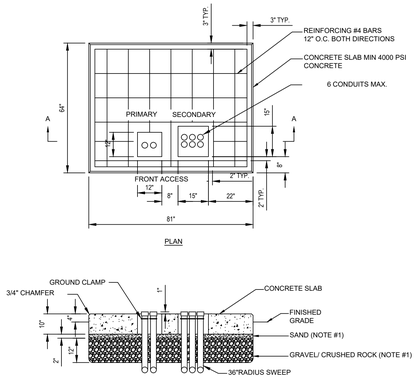
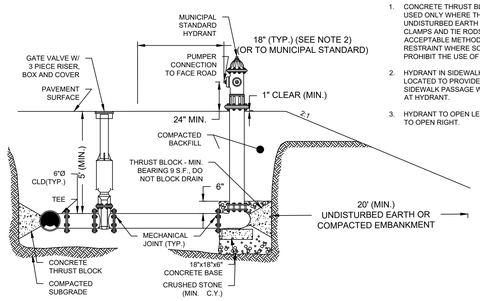


5 TRANSFORMER PAD DETAIL
1

NOTES:

1. CONCRETE THRUST BLOCKS TO BE USED ONLY WHERE THEY CAN BEAR ON UNDISTURBED EARTH AS SHOWN. USE CLAMPS AND TIE RODS OR OTHER ACCEPTABLE METHOD OF JOINT RESTRAINT WHERE SOIL CONDITIONS PROHIBIT THE USE OF THRUST BLOCKS.
2. HYDRANT IN SIDEWALK AREAS TO BE LOCATED TO PROVIDE MINIMUM CLEAR SIDEWALK PASSAGE WIDTH OF 3 FEET AT HYDRANT.
3. HYDRANT TO OPEN LEFT. GATE VALVES TO OPEN RIGHT.



6 HYDRANT CONNECTION
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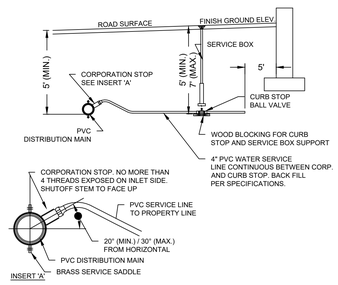

7 WATER SERVICE INSTALLATION
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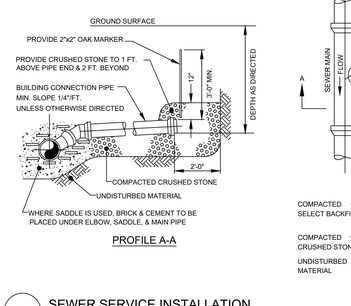

8 SEWER SERVICE INSTALLATION
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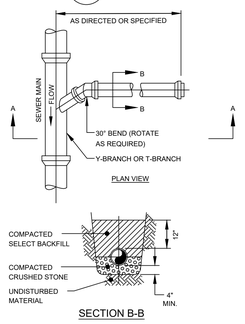

9 TAPPING SLEEVE AND VALVE
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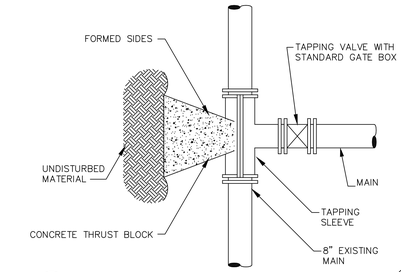

10 STONE INFILTRATION TRENCH
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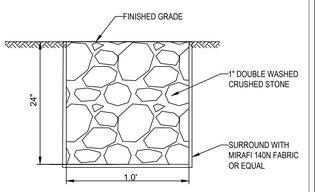

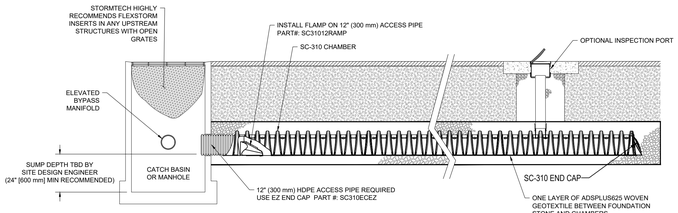

11 ISOLATOR ROW DETAIL
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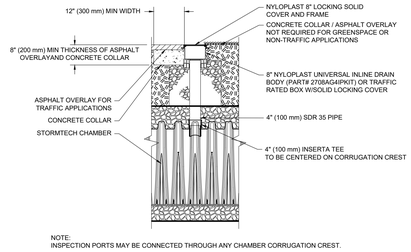

12 INSPECTION PORT DETAIL
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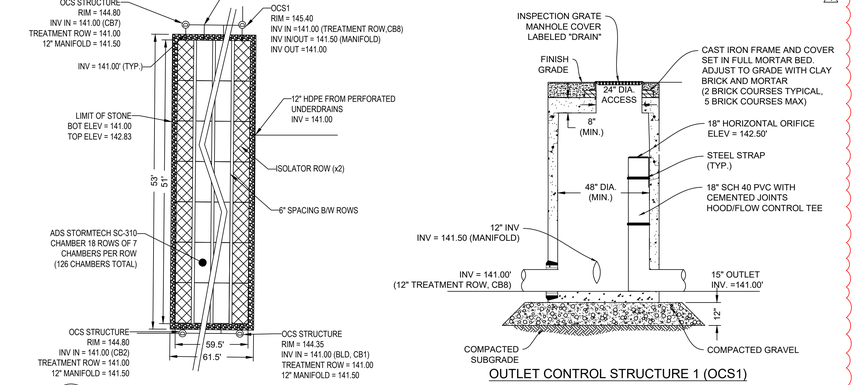
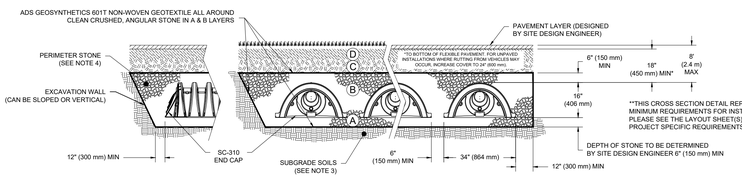


13 SC-310 SYSTEM 1
1

ACCEPTABLE FILL MATERIALS: STORMTECH SC-310 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER.	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[3]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[3]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]



14 SC-310 SECTION DETAIL
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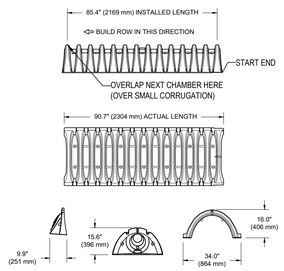

15 SC-310 CHAMBER DETAILS
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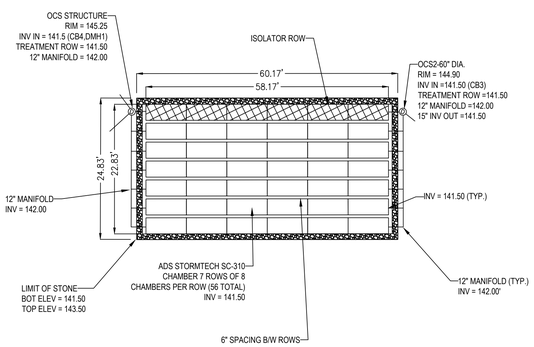

16 SC-310 SYSTEM 2
1

NOT FOR CONSTRUCTION - PERMITTING USE ONLY

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PROJECT NAME
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REVISIONS

#	COMMENT/DESCRIPTION	DATE
2	NFD COMMENTS	10/11/2024
1	SPA COMMENTS	10/08/2024

DRAWING TITLE
CONSTRUCTION DETAILS II

DRAWING INFORMATION
08/23/2024
DATE OF ISSUE
50% DESIGN DEVELOPMENT
DESCRIPTION
CMR
DRAWN BY
26774
PROJECT #
FILE NAME

DRAWING NUMBER
C6.1

SHEET NUMBER 7 OF 7

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C:\local Revit\3489 Linden Chambers Redevelopment NHA_53_cfloweller5KDD6.rvt
Author
5/6/2024 2:45:36 PM

TREE INVENTORY

ID#	DBH	Common Name	Health	Status	Notes
1	14	Hemlock	Poor	Remove	Half dead
2	12	Hemlock	Fair	Preserve	
3	13	Hemlock	Fair	Preserve	
4	15	Hemlock	Fair	Preserve	
5	16	Crabapple	Fair	Preserve	
6	15	Crabapple	Fair	Remove	Poor Structure
7	21	Honeylocust	Fair	Preserve	
8	18	Crabapple	Poor	Remove	Decline in canopy
9	10	Crabapple	Poor	Remove	Decline in canopy
10	12	Crabapple	Poor	Remove	Decline in canopy
11	24	Honey locust	Good	Preserve	
12	12	Crabapple	Poor	Remove	Decline in canopy
13	12	Crabapple	Poor	Remove	Decline in canopy
14	21	Honeylocust	Good	Preserve	
15	27	Honeylocust	Good	Preserve	
16	24	Honeylocust	Good	Preserve	
17	22	Honeylocust	Good	Remove	
18	13	Norway maple	Fair	Remove	Invasive species, thin canopy
19	12	Crabapple	Fair	Remove	Many cavities
20	19	Norway maple	Fair	Remove	Invasive species, thin canopy
21	10	Dogwood	Fair	Remove	Disease prone
22	19	Norway maple	Fair	Remove	Invasive species, disfigured by utilities, in decline

ID#	DBH	Common Name	Health	Status	Notes
23	14	Crabapple	Fair	Preserve	
24	17	Magnolia	Poor	Remove	Poor health
25	12	Honeylocust	Good	Remove	
26	29	Tulip Tree	Good	Preserve	
27	10	Kwanzan cherry	Good	Remove	Near dead
28	23	Red maple	Poor	Remove	In decline- girdling roots
29	23	Red maple	Poor	Remove	Girdling roots, disfigured by utilities
30	21	London Plane	Poor	Remove	Near dead
31	21	Crabapple	Poor	Remove	Sooty mold
32	22	Honeylocust	Fair	Remove	
33	18	Norway maple	Good	Remove	Invasive species
34	21	Silver maple	Fair	Preserve	
35	17	Silver maple	Good	Preserve	
36	17	Silver maple	Poor	Remove	Weak, in decline
37	19	Silver maple	Poor	Remove	Poor health
38	23	Silver maple	Fair	Preserve	
39	10	Crabapple	Good	Preserve	
40	16	Crabapple	Good	Preserve	
41	14	Crabapple	Good	Preserve	
42	13	Crabapple	Good	Preserve	
43	24	Silver maple	Good	Preserve	

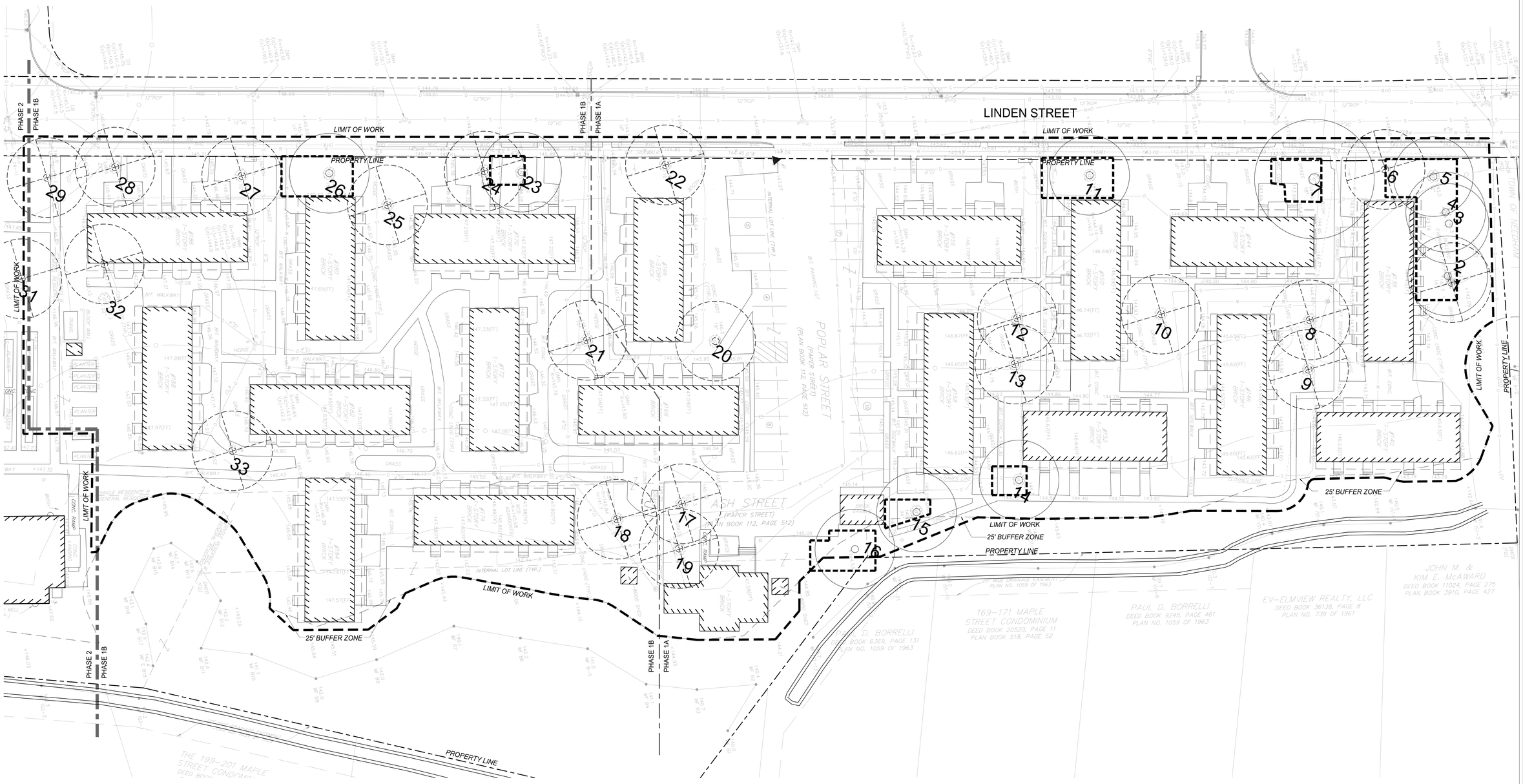
LEGEND

TREE PROTECTION FENCE

EXISTING TREES TO REMOVE

EXISTING TREES TO REMAIN

TREE ID NUMBER 26



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REVISIONS

DATE

DRAWING TITLE
TREE PROTECTION PLAN

DRAWING INFORMATION

08/23/2024
DATE OF ISSUE

Site Plan Review
DESCRIPTION

1" = 20'
SCALE

CP
DRAWN BY

3489.00
PROJECT #

FILE NAME

DRAWING NUMBER
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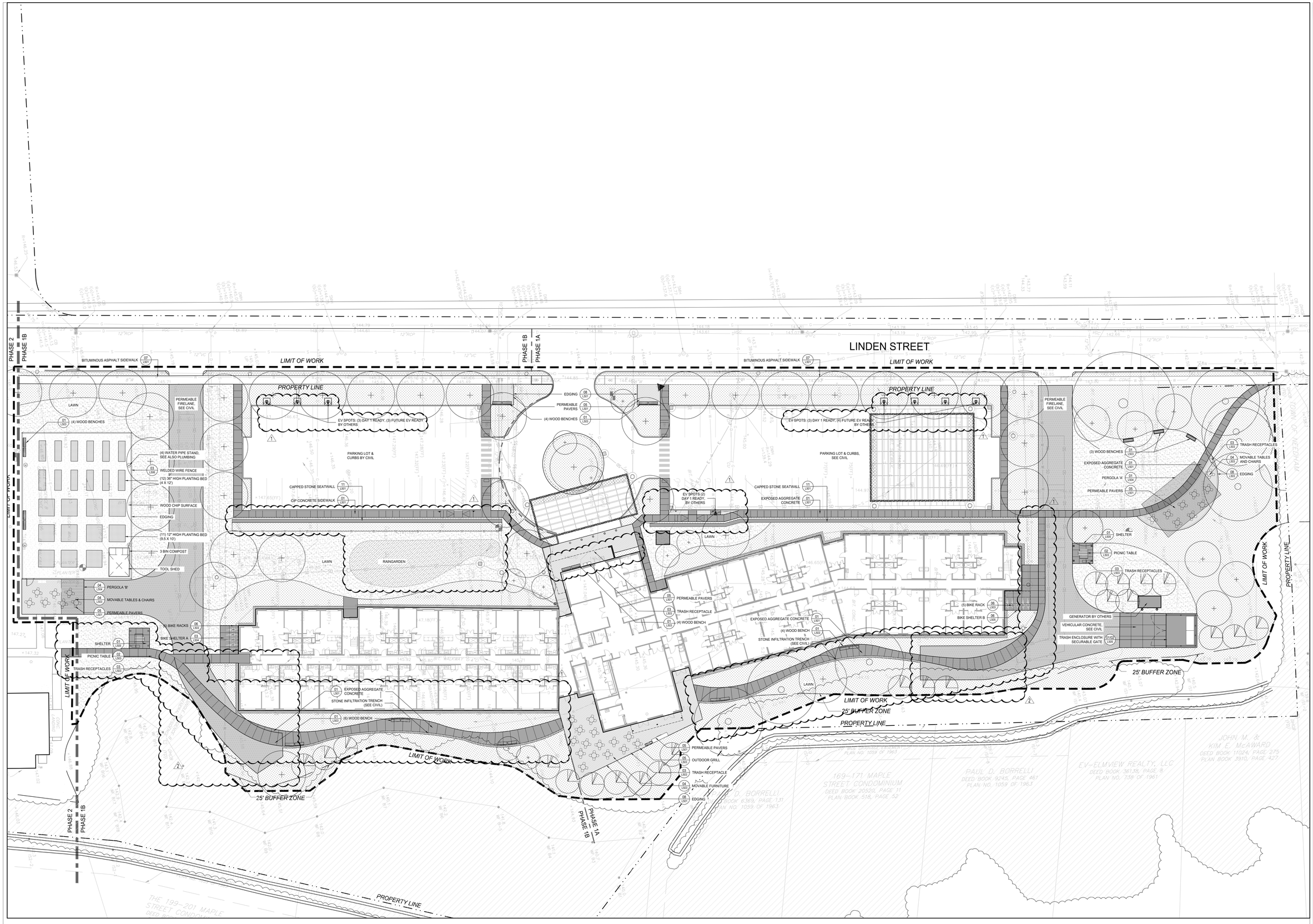

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Andover, MA 01810
978.296.6219

REVISIONS

2	NFD COMMENTS	10/11/2024
1	SPR COMMENTS	10/08/2024
		DATE

DRAWING TITLE

MATERIAL PLAN

DRAWING INFORMATION

08/23/2024
DATE OF ISSUE

Site Plan Review
DESCRIPTION

1" = 20'
SCALE

CP
DRAWN BY

3489.00
PROJECT #

FILE NAME

DRAWING NUMBER

L102A

SCALE: 1" = 20'

0 20 40 80

N

ARCHITECT

bh+a

Bargmann Hendrie + Archetype, Inc.
9 Channel Center Street, Suite 300
Boston, MA 02210
(617) 350 0450

PROJECT NAME

Linden Street Redevelopment

CLIENT

Needham Housing Authority
21 Highland Circle,
Needham, MA, 02494

PROJECT TEAM

Civil Engineer
Hancock Associates
121 East Berkeley Street, 4th Floor
Boston, MA 02118
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Landscape Architect
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Structural Engineer
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Watertown, MA 02472
617.926.9300

MEP/FP Engineer
NV5
200 Brickstone Square
Andover, MA 01810
978.296.6219

REVISIONS

2	NFD COMMENTS	10/11/2024
1	SPR COMMENTS	10/08/2024
		DATE

DRAWING TITLE

MATERIAL PLAN

DRAWING INFORMATION

08/23/2024
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L102B

Linden Chambers Plant Palettes

Plant material will be selected from the following lists or similar species

North Garden Palette

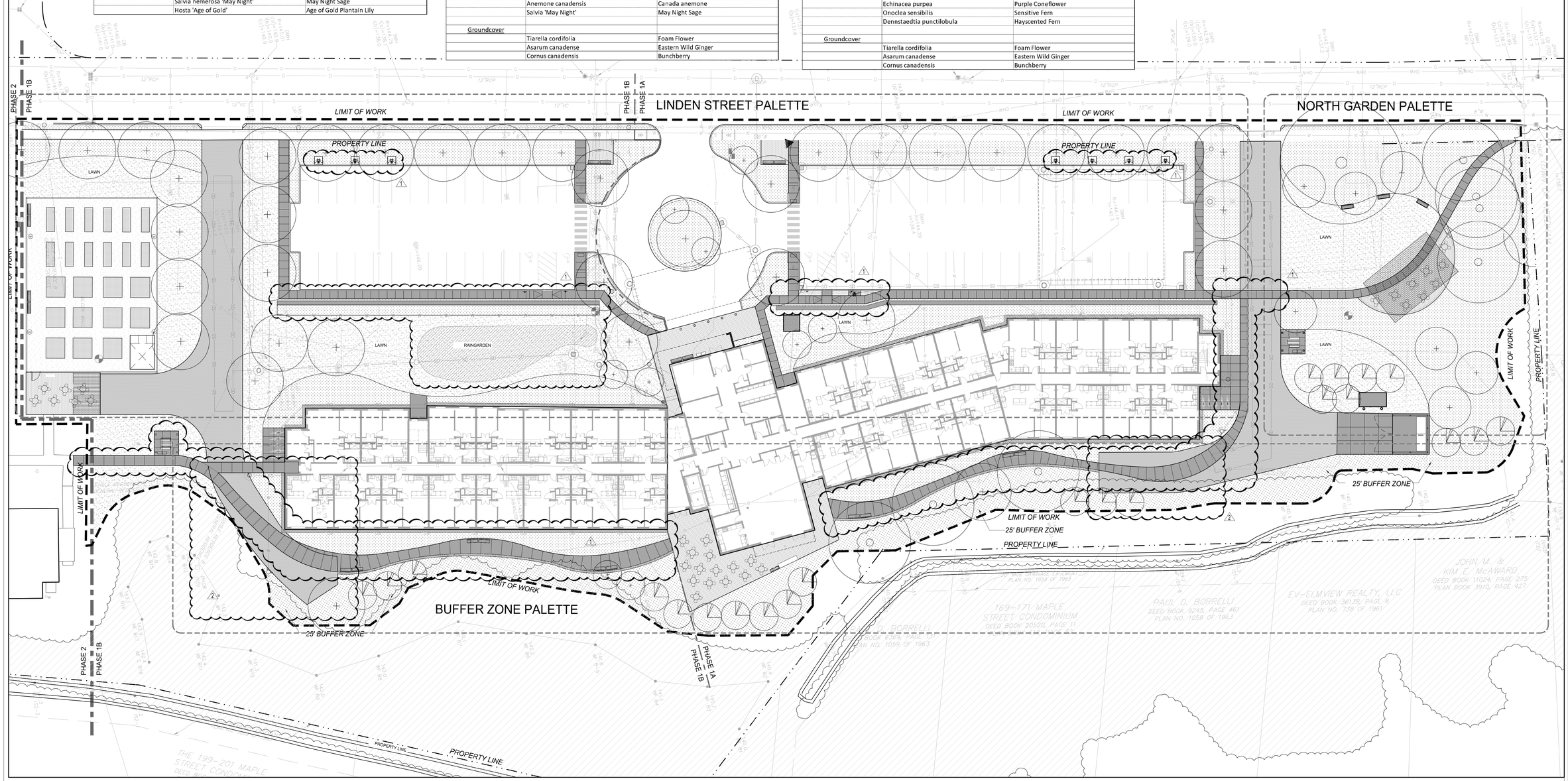
	Botanical Name	Commom Name
Trees - Canopy		
	Liriodendron tulipifera	Tulip Tree
	Acer rubrum	Red Maple
	Ulmus americana	American Elm
	Quercus rubra	Red Oak
Trees - Understory		
	Cornus alternifolia	Pagoda Dogwood
	Amelanchier canadensis	Serviceberry
	Cornus kousa	Kousa Dogwood
Shrubs		
	Buxus 'Green Gem'	Green Gem Boxwood
	Rosa 'Apricot Drift'	Apricot Drift Rose
	Rosa 'Blushing Knockout'	Blushing Knockout Rose
	Ilx glabra	Inkberry
	Rhododendron 'Cunningham White'	Cunningham White Rhododendron
Perennials		
	Geranium maculatum	Geranium
	Leucanthemum x superbum	Shasta Daisy
	Lobelia cardinalis	Cardinal Flower
	Rudbeckia fulgida 'Goldstrum'	Black Eyed Susans
	Hemerocalis 'Stella D'Oro'	Stella D'Oro Daylily
	Nepeta x faassenii 'Walkers Low'	Walkers Low Catmint
	Symphyotrichum novae-angliae	New England Aster
	Echinacea purpea	Purple Coneflower
	Anemone canadensis	Canada anemone
	Salvia nemerosa 'May Night'	May Night Sage
	Hosta 'Age of Gold'	Age of Gold Plantain Lily

Linden Street Palette

	Botanical Name	Commom Name
Trees - Canopy		
	Liriodendron tulipifera	Tulip Tree
	Acer rubrum	Red Maple
	Ulmus americana	American Elm
	Ostrya virginiana	Eastern Hophornbeam
	Nyssa sylvatica	Black Gum
	Gleditsia triacanthos 'Shademaster'	Shademaster Honeylocust
Trees - Understory		
	Cercis canadensis	Redbud
	Amelanchier canadensis	Serviceberry
	Cornus kousa	Kousa Dogwood
Shrubs		
	Hydrangea 'Endless Summer'	Endless Summer Hydrangea
	Clethra alnifolia	Summersweet
	Rhododendron 'Cunningham White'	Cunningham White Rhododendron
	Rosa 'Apricot Drift'	Apricot Drift Rose
	Rosa virginiana	Virginia Rose
Grasses		
	Pennisetum alopecuroides 'Hameln'	Hameln Dwarf Fountain Grass
	Eragrostis spectabilis	Purple Lovegrass
	Deschampsia cespitosa	Tufted Hair Grass
	Carex pennsylvanica	Pennsylvania Sedge
Perennials		
	Nepeta x faassenii 'Walkers Low'	Walkers Low Catmint
	Symphyotrichum novae-angliae	New England Aster
	Echinacea purpea	Purple Coneflower
	Onoclea sensibilis	Sensitive Fern
	Anemone canadensis	Canada anemone
	Salvia 'May Night'	May Night Sage
Groundcover		
	Tiarella cordifolia	Foam Flower
	Asarum canadense	Eastern Wild Ginger
	Cornus canadensis	Bunchberry

Buffer Zone Palette

	Botanical Name	Commom Name
Trees - Canopy		
	Betula nigra	River Birch
	Quercus rubra	Northern Red Oak
	Quercus alba	White Oak
	Acer rubrum	Red Maple
Trees - Understory		
	Cercis canadensis	Redbud
	Amelanchier canadensis	Serviceberry
	Hamemalis virginiana	Witchhazel
Shrubs		
	Aronia melanocarpa	Chokeberry
	Clethra alnifolia	Summersweet
	Myrica pennsylvanica	Bayberry
	Ilex glabra	Inkberry
	Viburnum acerifolium	Mapleleaf Viburnum
	Spirea tomentosa	Steeplebush
	Hypericum calycinum	St. John's Wort
	Cornus sericea	Red osier Dogwood
Grasses		
	Eragrostis spectabilis	Purple Lovegrass
	Schizachyrium scoparium	Little Bluestem
	Deschampsia cespitosa	Tufted Hair Grass
	Carex pennsylvanica	Pennsylvania Sedge
Perennials		
	Asclepias tuberosa	Butterfly Milkweed
	Symphyotrichum novae-angliae	New England Aster
	Monarda didyma	Bee Balm
	Echinacea purpea	Purple Coneflower
	Onoclea sensibilis	Sensitive Fern
	Dennstaedtia punctilobula	Hayscented Fern
Groundcover		
	Tiarella cordifolia	Foam Flower
	Asarum canadense	Eastern Wild Ginger
	Cornus canadensis	Bunchberry



SCALE: 1" = 20'

0 20 40 80

N

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REVISIONS

2	NFD COMMENTS	10/11/2024
1	SPR COMMENTS	10/09/2024
		DATE

DRAWING TITLE

PLANTING PLAN

DRAWING INFORMATION

08/23/2024
DATE OF ISSUE

Site Plan Review
DESCRIPTION

1" = 20'
SCALE

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3489.00
PROJECT #

FILE NAME

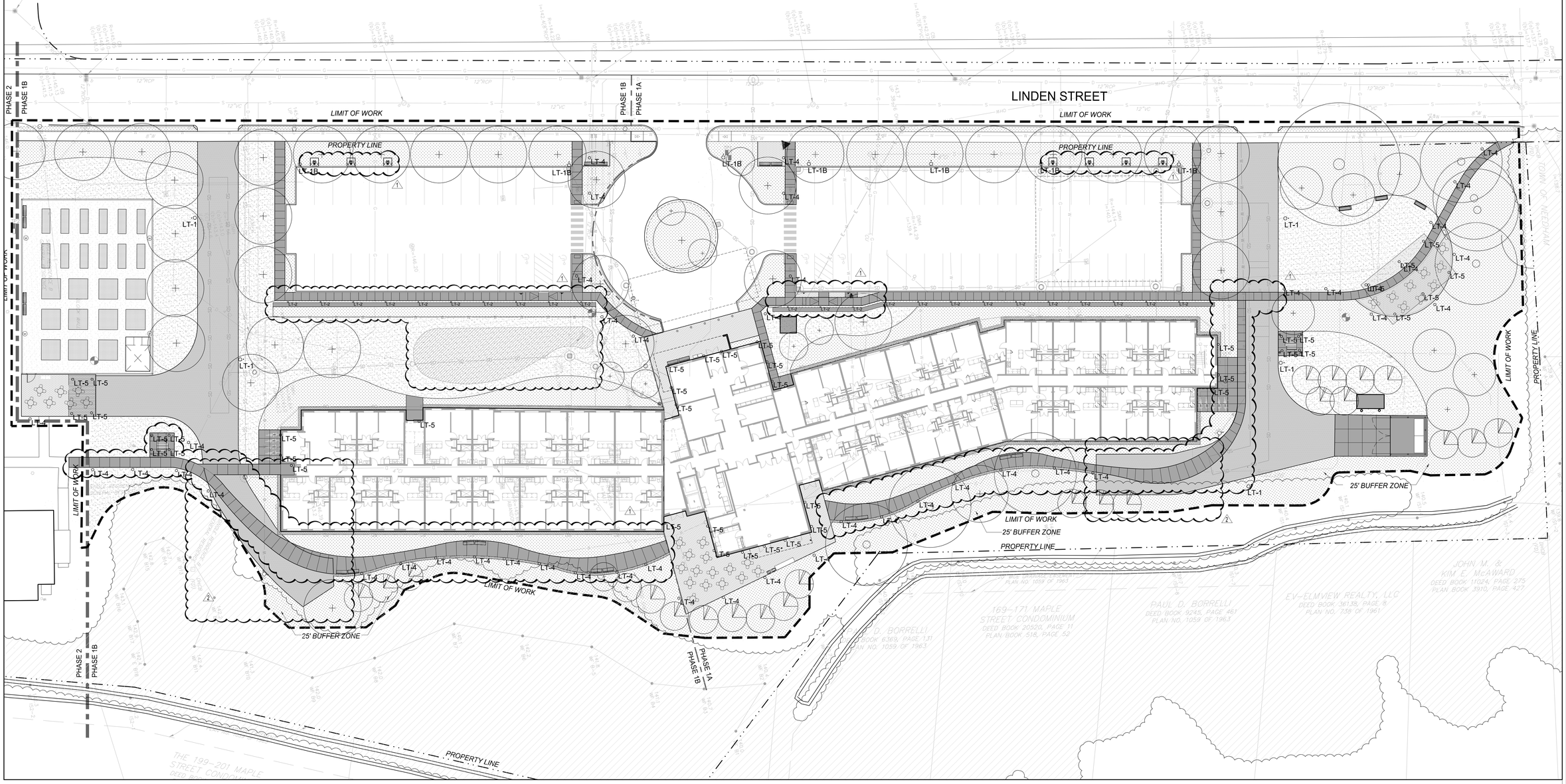
DRAWING NUMBER

L104

SCHEDULE

Symbol	Label	Quantity	Manufacturer	Catalog Number	Description	Light Loss Factor	Wattage
	LT-1	5	Lumenpulse	PURXXXT VOLT CSL M150 30K CRI 80 3BLS FINISH DIM XX TN4	Pure T Area Light | Type 3 w/ Backlight Control | *ADVISE POLE*	0.9	132
	LT-1B	9	Lumenpulse	PURXXXT VOLT CSL M150 30K CRI 80 4BLS FINISH DIM XX TN4	Pure T Area Light | Type 4 w/ Backlight Control | *ADVISE POLE*	0.9	132
	LT-2	23	Sage Lighting	SLVR 27 FINISH	SLVR Step Light	0.9	2.98
	LT-4	47	Spitzer	BRA F42 24LC VOLTAGE CC D3 FINISH	Architectural Round Bollard | 3'-5"	0.9	21.6769
	LT-5	35	Luminis Lighting	SYP400 L1L10 VWD K40 VOLTAGE FINISH MOUNTING XX	Syrios Pro - Wall Mount	0.9	12
	LT-5B	6	Luminis Lighting	SYP410 L1L10 VWD K40 VOLTAGE FINISH MOUNTING XX	Syrios Pro - Surface Mount	0.9	12

NOTE: FOR LIGHTING SPECIFICATIONS SEE ELECTRICAL.
LANDSCAPE FOR LOCATION ONLY.



SCALE: 1" = 20'
0 20 40 80

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		DATE

DRAWING TITLE
SITE LIGHTING PLAN

DRAWING INFORMATION

09/23/2024
DATE OF ISSUE

Site Plan Review
DESCRIPTION

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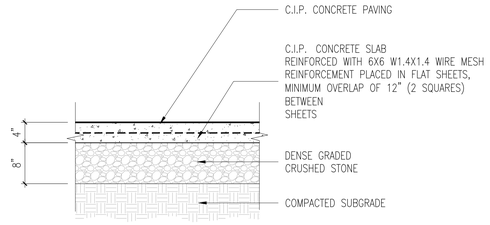
PROJECT #

FILE NAME

DRAWING NUMBER
L105



01 C.I.P CONC. PAVING - PEDESTRIAN

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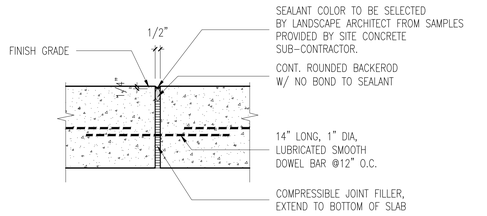

02 EXPANSION JOINT

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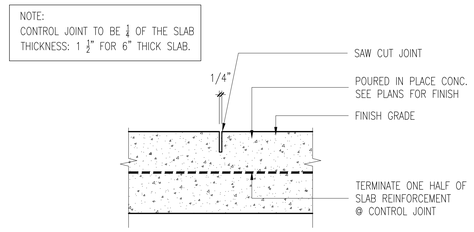

03 CONTROL JOINT

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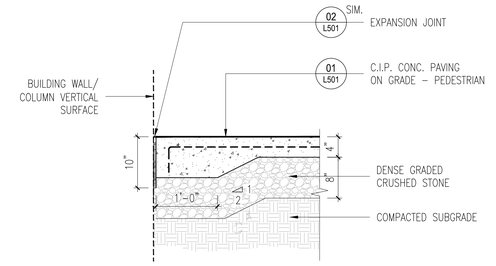
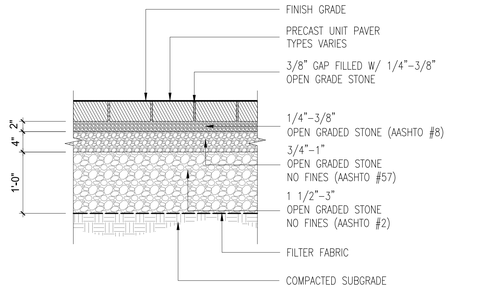


04 C.I.P CONCRETE EDGE CONDITION

SCALE: 1" = 1'-0"



05 PERMEABLE PAVING

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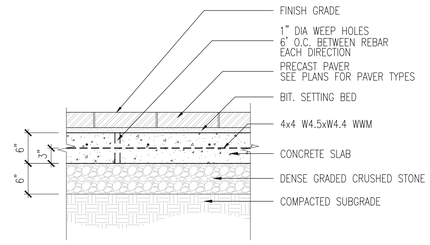

06 PRECAST PAVERS ON CONCRETE

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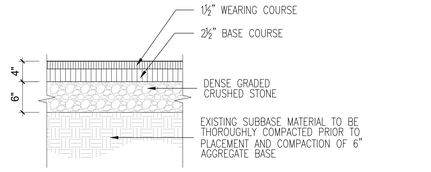
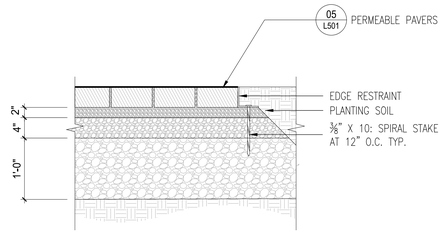


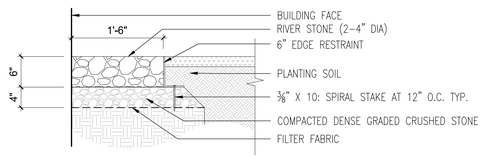
07 BITUMINOUS ASPHALT

SCALE: 1" = 1'-0"



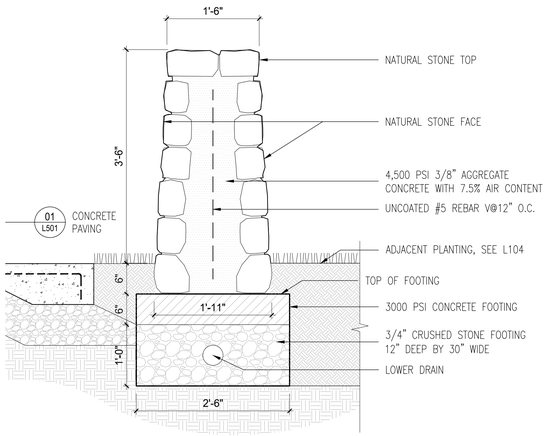
08 EDGING AT PERMEABLE PAVING

SCALE: 1" = 1'-0"



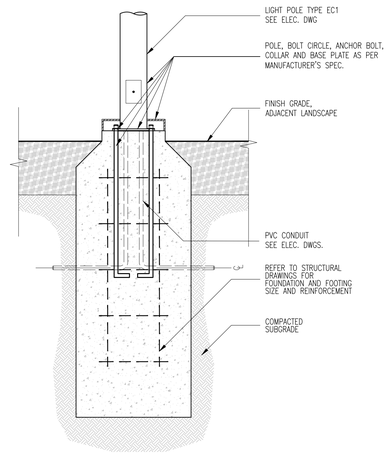
09 AGGREGATE STRIP AT BUILDING FACE

SCALE: 1" = 1'-0"



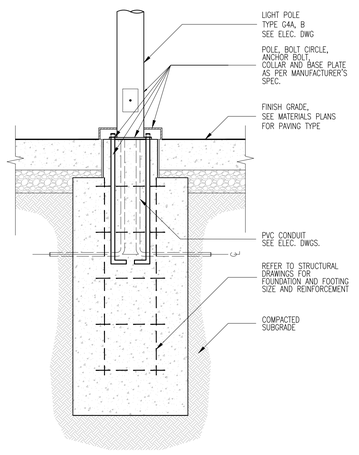
10 CAPPED STONE SEATWALL

SCALE: 1"=1'-0"



11 LIGHT POLE FOOTING IN PLANTING

SCALE: 3/4"=1'-0"



12 LIGHT POLE FOOTING IN PAVING

SCALE: 3/4"=1'-0"

ARCHITECT

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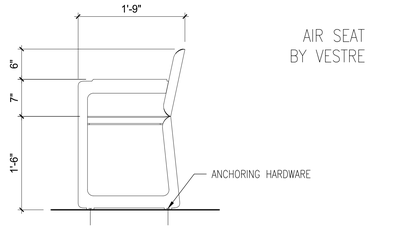
FILE NAME

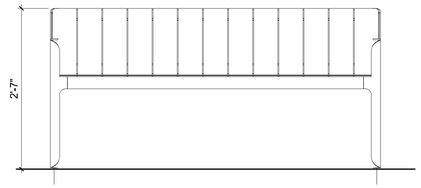
DRAWING NUMBER

L501

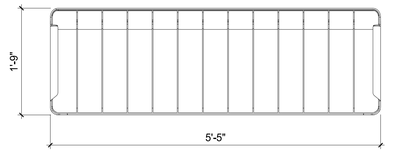
AIR SEAT
BY VESTRE



SIDE ELEVATION



FRONT ELEVATION

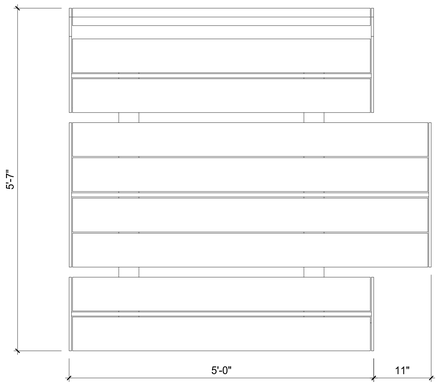


PLAN

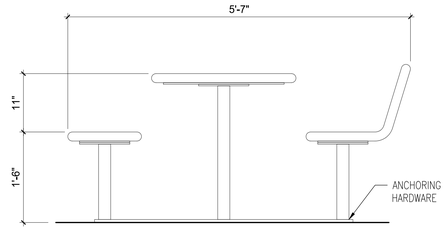
01 BACKED WOOD BENCH W/ ARMRESTS

SCALE: 1"=1'-0"

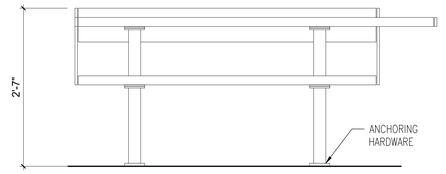
APRIL PICNIC TABLE
BY VESTRE



PLAN



SIDE ELEVATION

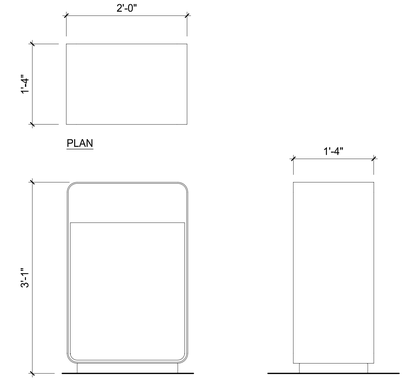


FRONT ELEVATION

02 PICNIC TABLE

SCALE: 1"=1'-0"

VROOM LITTER BIN
BY VESTRE



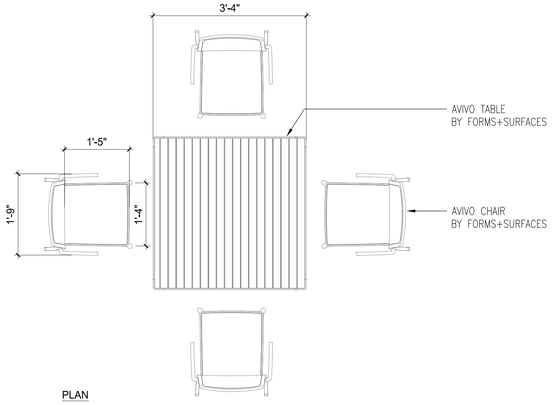
PLAN

FRONT ELEVATION

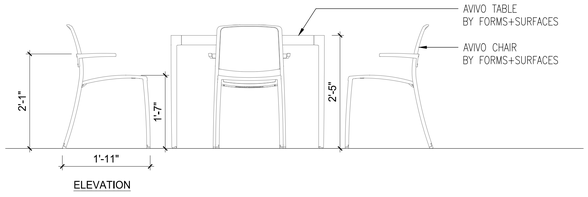
SIDE ELEVATION

03 TRASH RECEPTACLE

SCALE: 1"=1'-0"



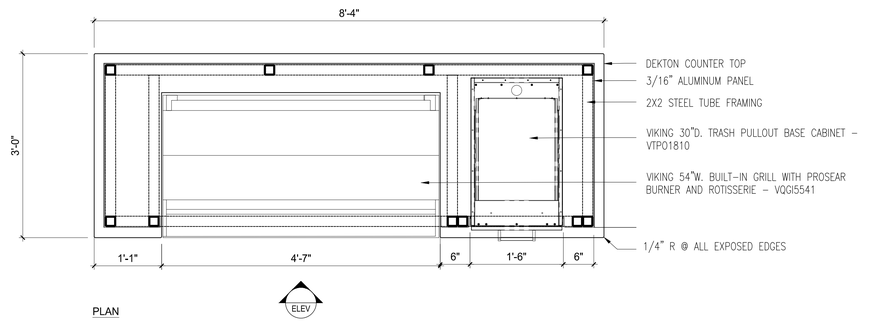
PLAN



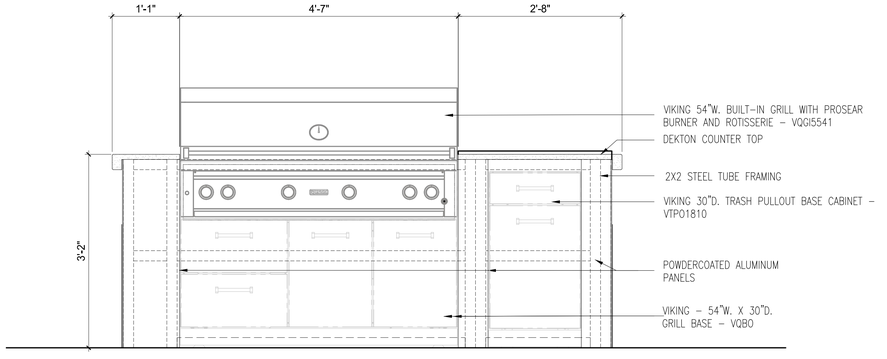
ELEVATION

04 MOVABLE TABLE AND CHAIRS

SCALE: 3/4"=1'-0"



PLAN

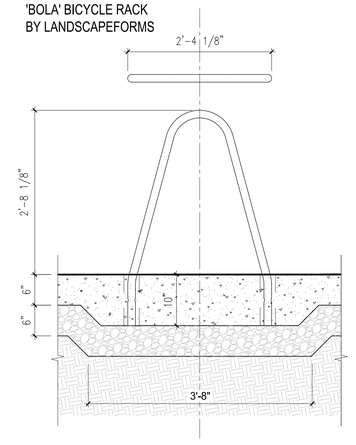


ELEVATION

05 OUTDOOR GRILL

SCALE: 1"=1'-0"

'BOLA' BICYCLE RACK
BY LANDSCAPEFORMS



06 BIKE RACK

SCALE: 1"=1'-0"

ARCHITECT
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TILE NAME

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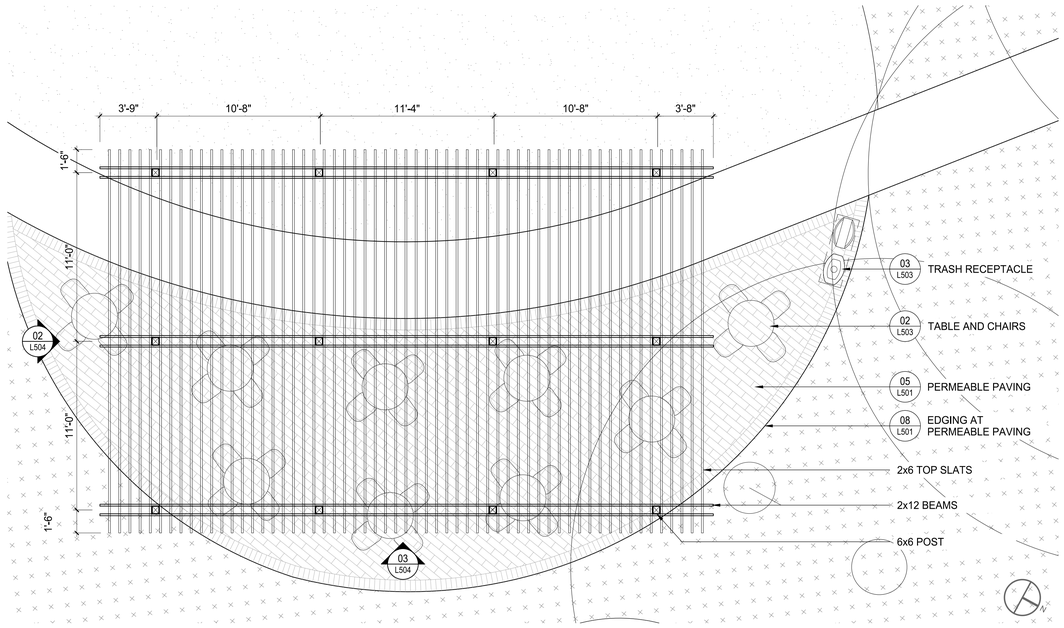
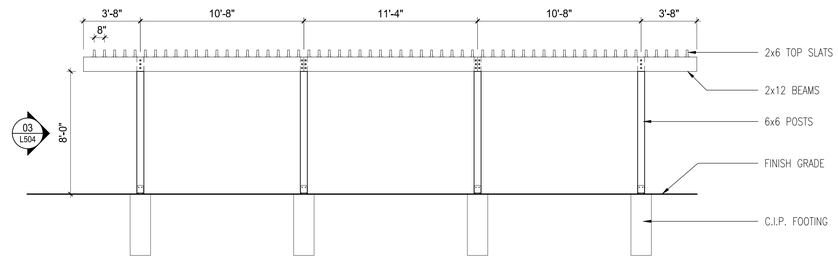


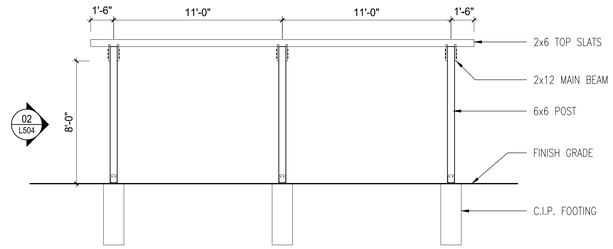
01 PERGOLA 'A' - PLAN

SCALE: 1/4"=1'-0"



02 PERGOLA 'A' - ELEVATION (EAST/ WEST)

SCALE: 1/4"=1'-0"

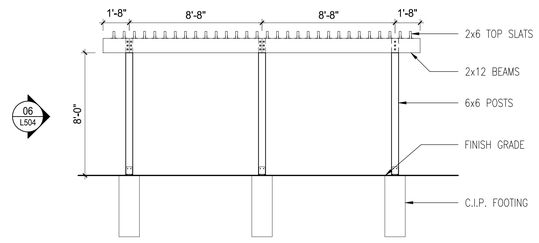


03 PERGOLA 'A' - ELEVATION (NORTH/ SOUTH)

SCALE: 1/4"=1'-0"

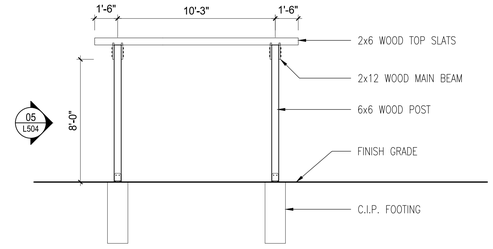
04 PERGOLA 'B' - PLAN

SCALE: 1/4"=1'-0"



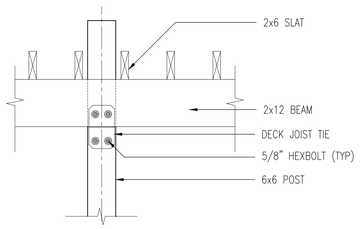
05 PERGOLA 'B' - ELEVATION (NORTH/ SOUTH)

SCALE: 1/4"=1'-0"



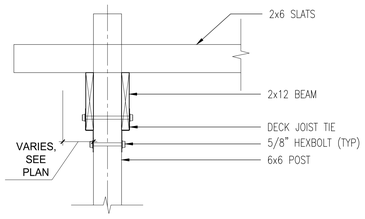
06 PERGOLA 'B' - ELEVATION (EAST/ WEST)

SCALE: 1/4"=1'-0"



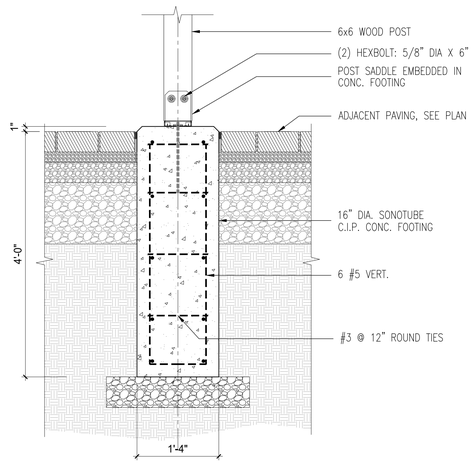
07 PERGOLA CONNECTION A

SCALE: 1"=1'-0"



08 PERGOLA CONNECTION B

SCALE: 1"=1'-0"



09 PERGOLA POST FOOTING

SCALE: 1"=1'-0"

NOTES:

- ALL CONNECTORS AND ANCHORS (I.E. POST SADDLE, DECK JOIST TIE, ETC.) TO BE STAINLESS STEEL
- PERGOLA MEMBER SIZING AND CONNECTIONS REQUIRE STRUCTURAL REVIEW OR ENGINEERED SHOP DRAWINGS

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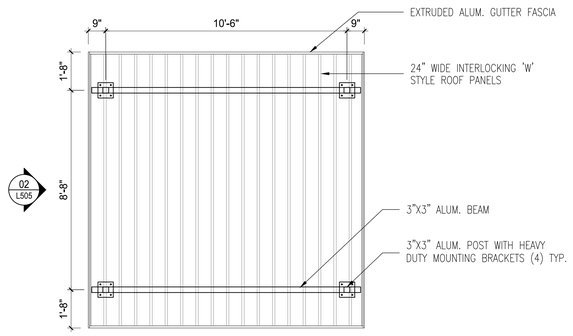
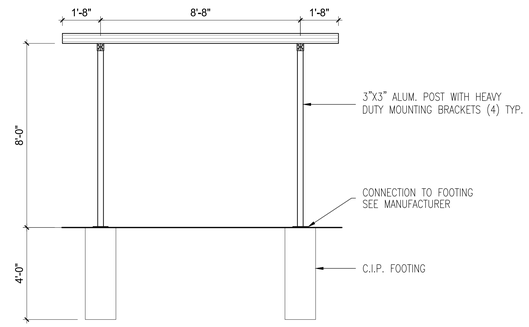
L504



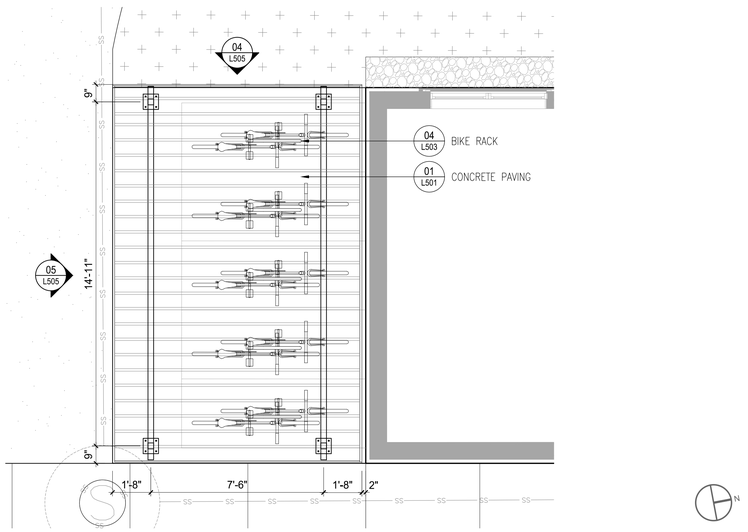
01 SHELTER- PLAN

SCALE: 3/8"=1'-0"



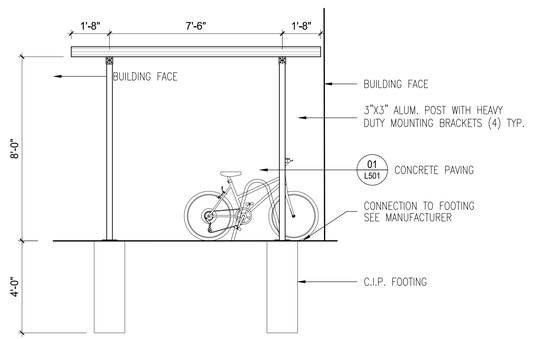
02 SHELTER- PLAN

SCALE: 3/8"=1'-0"



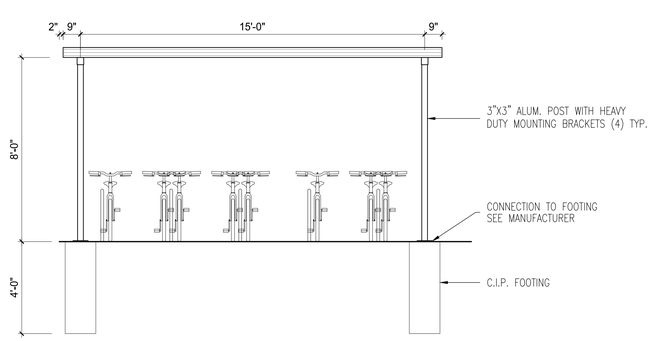
03 BIKE SHELTER 'A' - PLAN

SCALE: 1/4"=1'-0"



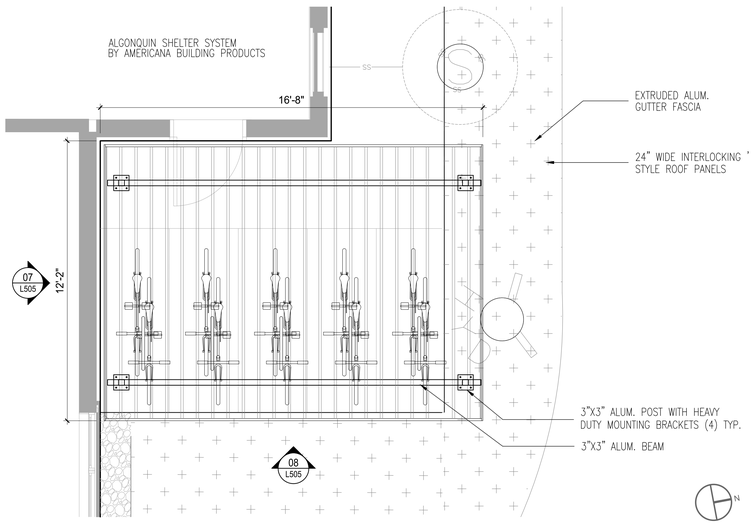
04 BIKE SHELTER 'A' - ELEVATION

SCALE: 3/8"=1'-0"



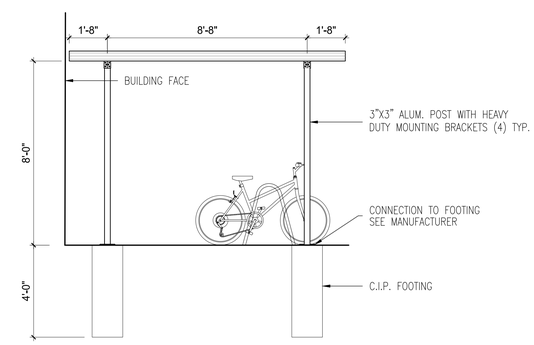
05 BIKE SHELTER 'A' - ELEVATION

SCALE: 3/8"=1'-0"



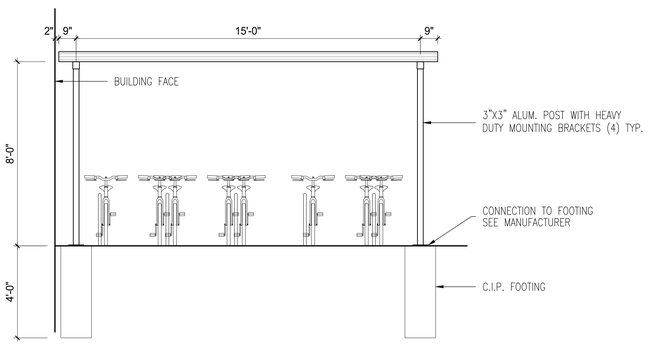
06 BIKE SHELTER 'B' - PLAN

SCALE: 1/4"=1'-0"



07 BIKE SHELTER 'B' - ELEVATION

SCALE: 3/8"=1'-0"



08 BIKE SHELTER 'B' - ELEVATION

SCALE: 3/8"=1'-0"

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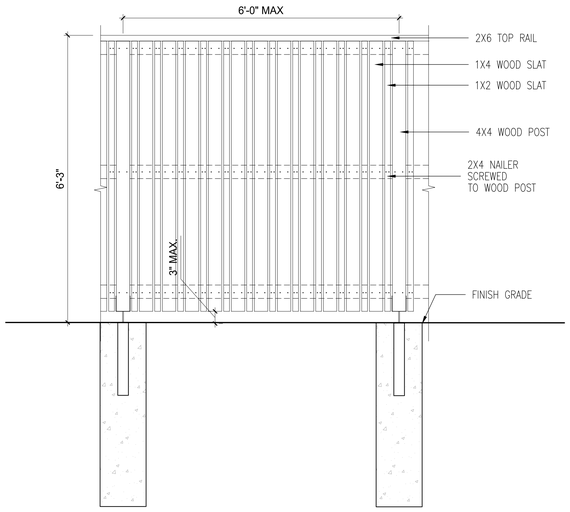
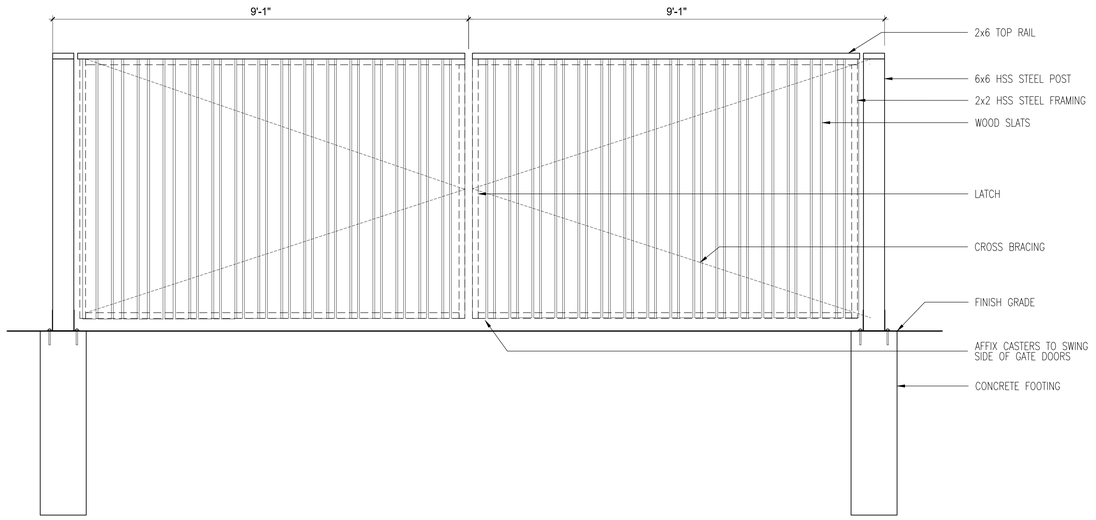


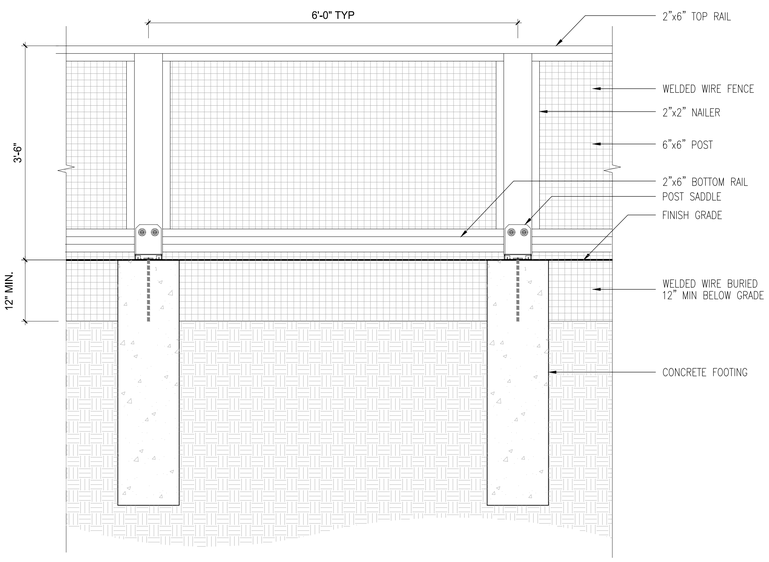
01 TRASH ENCLOSURE FENCE PANEL

SCALE: 3/4"=1'-0"



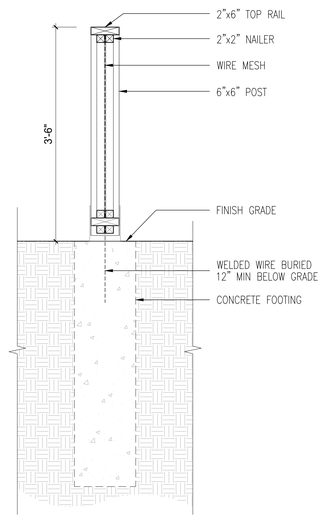
02 TRASH ENCLOSURE GATE

SCALE: 3/4"=1'-0"



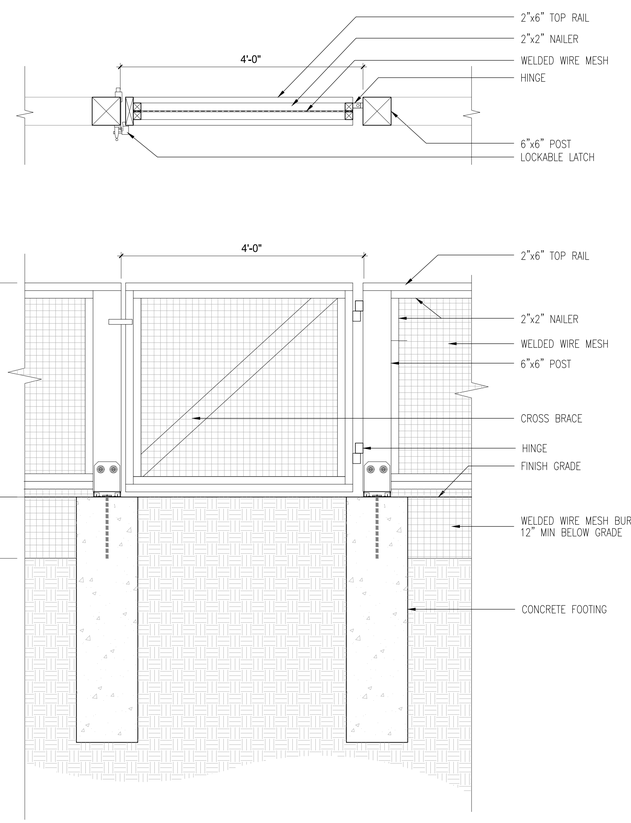
03 COMMUNITY GARDEN FENCE - ELEVATION

SCALE: 1"=1'-0"



04 COMMUNITY GARDEN FENCE - SECTION

SCALE: 1"=1'-0"



05 COMMUNITY GARDEN GATE - ELEVATION AND PLAN

SCALE: 1"=1'-0"

ARCHITECT

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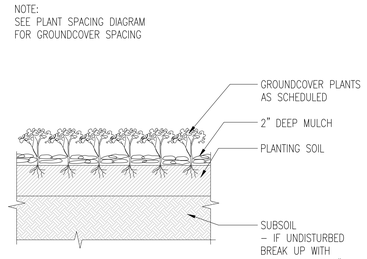
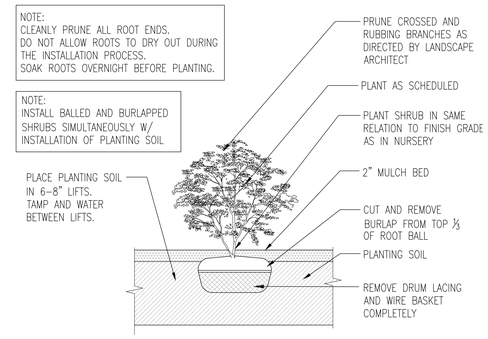


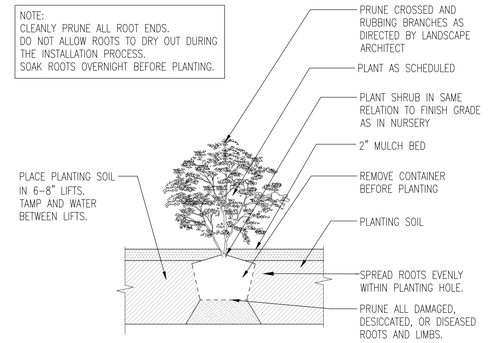
01 GROUNDCOVER PLANTING

SCALE: 1" = 1'-0"



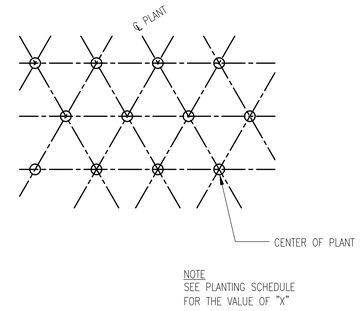
02 SHRUB PLANTING - B&B

SCALE: 3/4" = 1'-0"



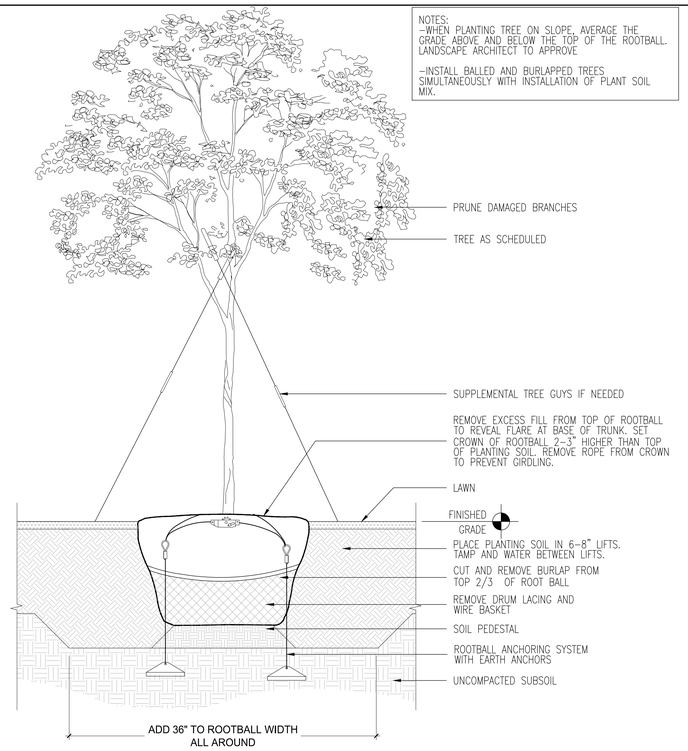
03 SHRUB/PERENNIAL - CONTAINER

SCALE: 3/4" = 1'-0"



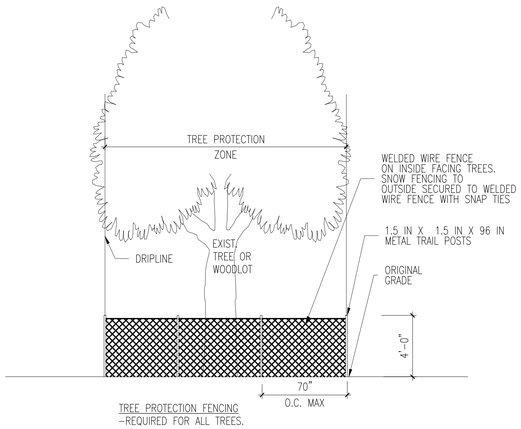
04 PLANT SPACING DIAGRAM - PLAN

SCALE: 1"=1'-0"



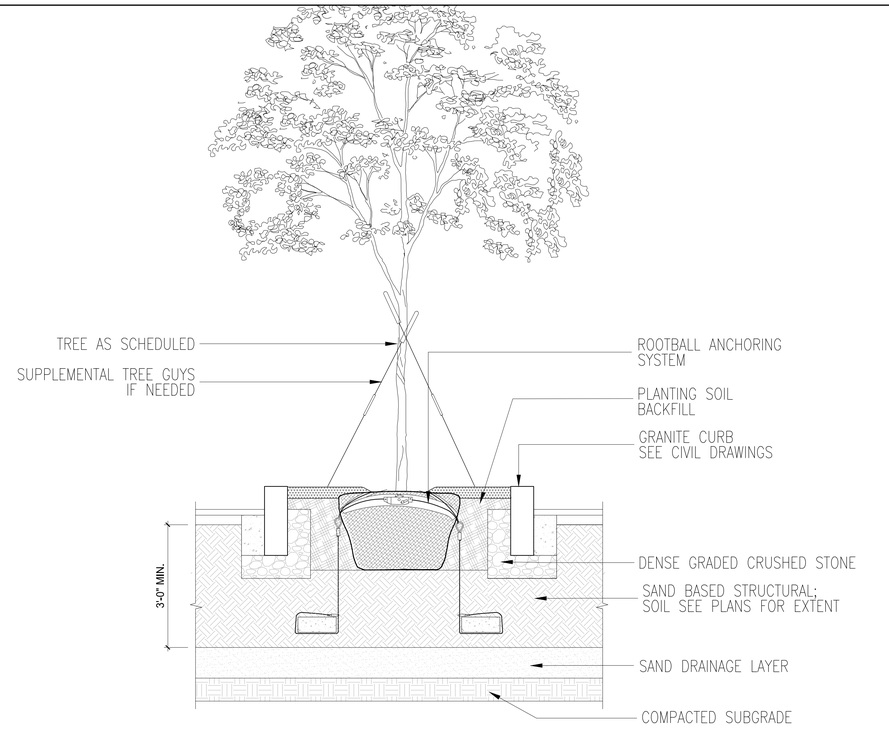
05 TREE PLANTING IN OPEN BED

SCALE: 3/4"=1'-0"



06 TREE PROTECTION

SCALE: 1/4"=1'-0"



07 TREE PLANTING IN STRUCTURAL SOIL

SCALE: 3/4"=1'-0"

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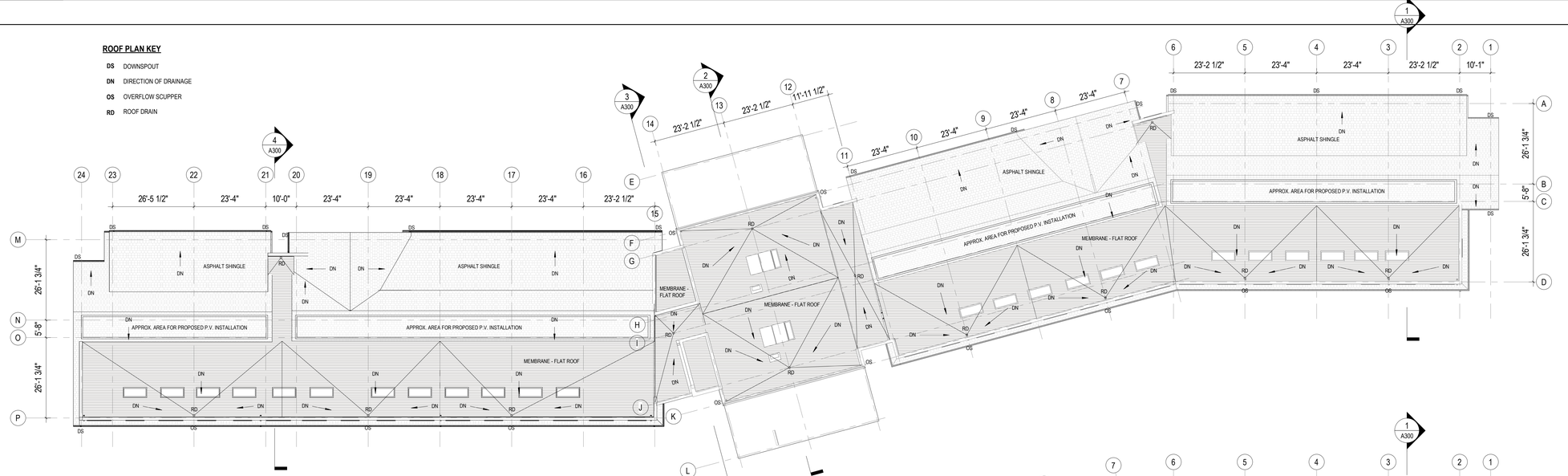
ROOF PLAN KEY

DS	DOWNSPOUT
DN	DIRECTION OF DRAINAGE
OS	OVERFLOW SCUPPER
RD	ROOF DRAIN



3 Phase 1 - Roof Plan
1/16" = 1'-0"

2 Phase 1 - Typical Floor Plan - Floors 2-4
1/16" = 1'-0"

1 Phase 1 - First Floor Plan
1/16" = 1'-0"

0' 8' 16' 32'

N

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1 Phase 1A - First Floor Plan
1/8" = 1'-0"

0' 4' 8' 16'

N

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Phase 1A - First Floor Plan

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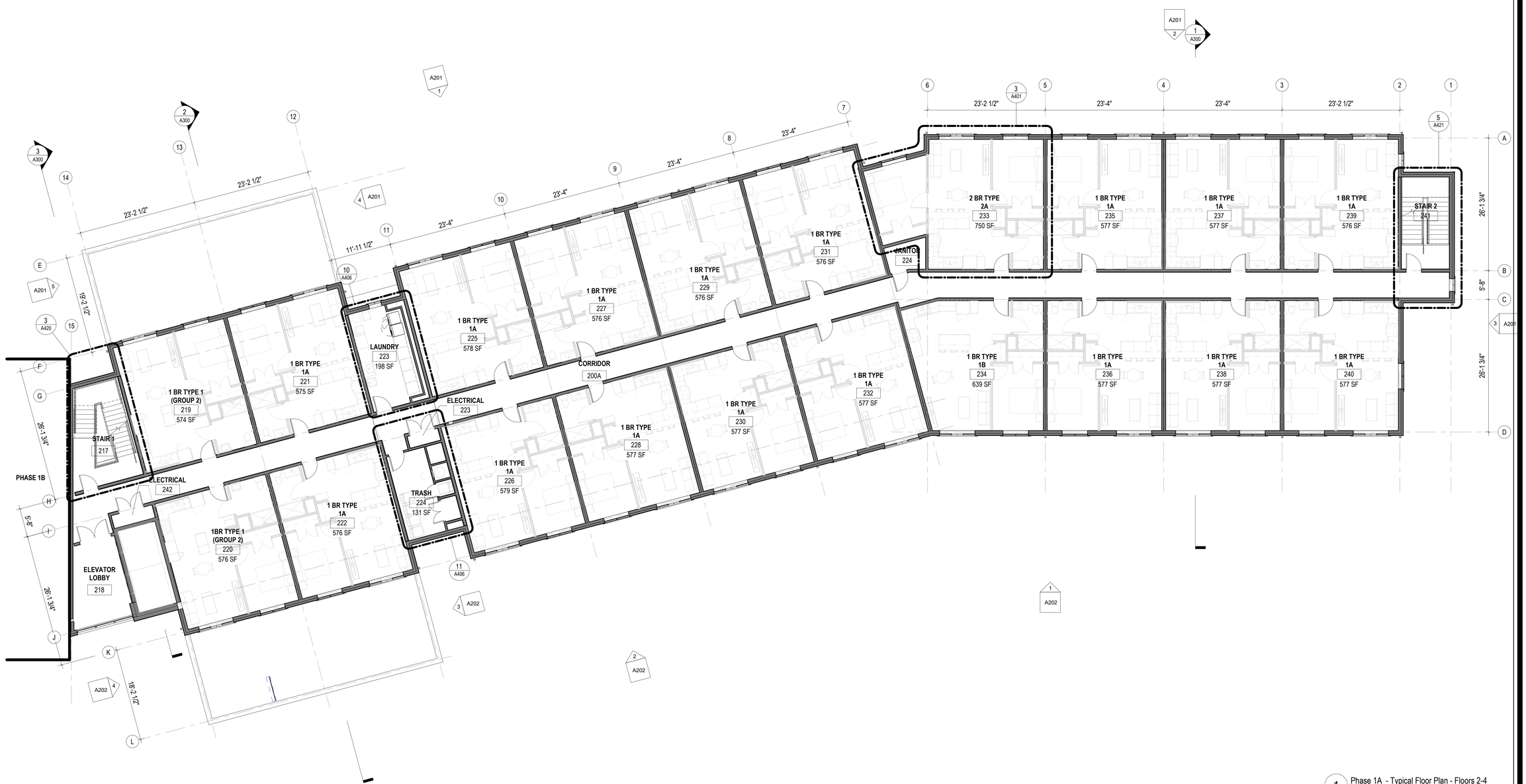

1 Phase 1A - Typical Floor Plan - Floors 2-4
1/8" = 1'-0"

0' 4' 8' 16'

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Phase 1A - Typical Floor Plan - Floors 2-4

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1 Phase 1B - First Floor Plan
1/8" = 1'-0"

0' 4' 8' 16'

N

ARCHITECT

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Phase 1B - First Floor Plan

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DRAWING NUMBER

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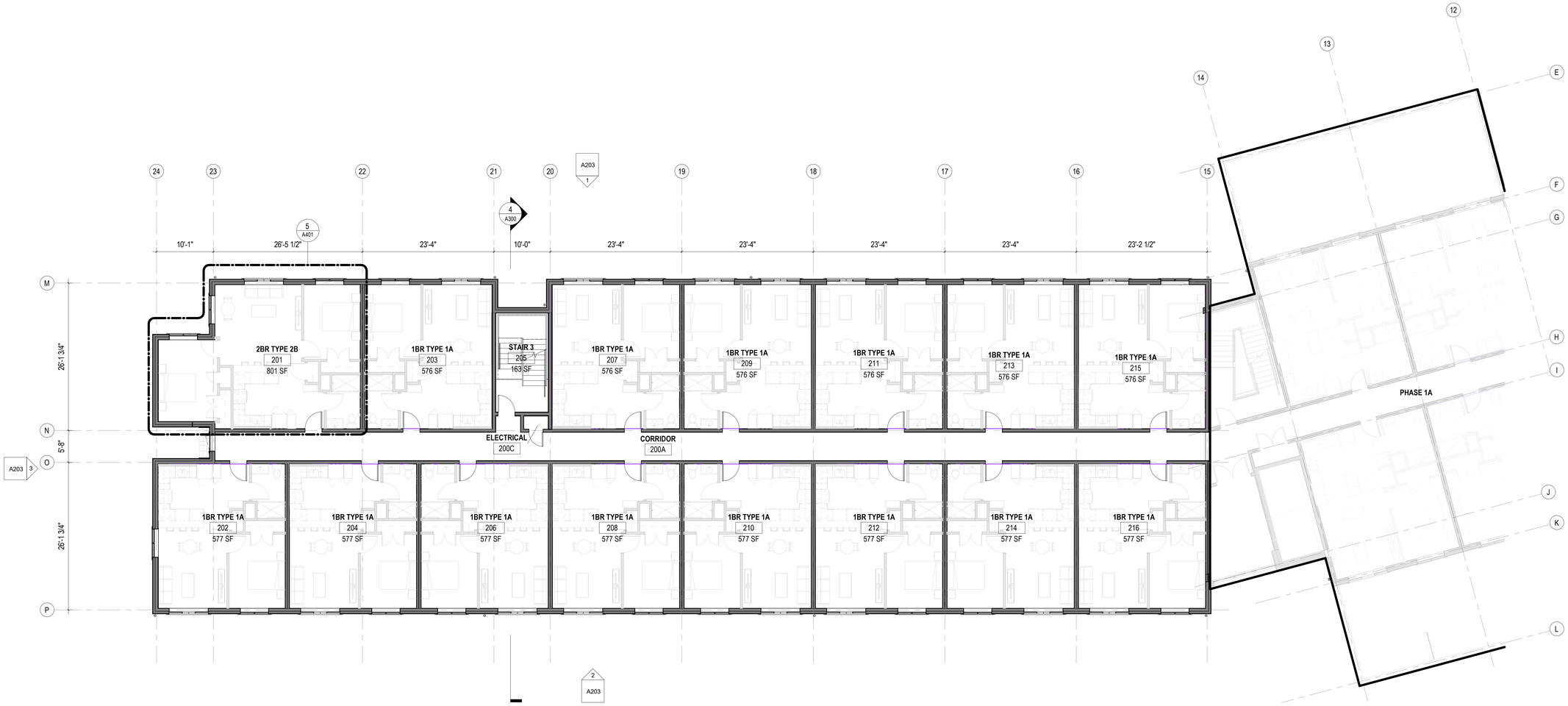

1 Phase 1B - Typical Floor Plan - Floors 2-4
1/8" = 1'-0"

0' 4' 8' 16'

N

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REVISIONS

DATE

DRAWING TITLE

Phase 1B - Typical Floor Plan - Floors 2-4

DRAWING INFORMATION

08/23/2024
DATE OF ISSUE

Site Plan Review
DESCRIPTION

1/8" = 1'-0" — SCALE
Author — DRAWN BY

3489.00 — PROJECT #
revit.rvt — FILE NAME

DRAWING NUMBER

A105

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V.2.1

1 Phase 1 - West Elevation
1/16" = 1'-0"

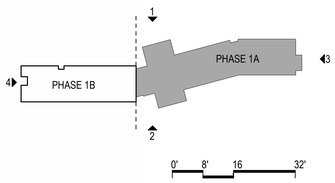
2 Phase 1 - East Elevation
1/16" = 1'-0"

3 Phase 1 - North Elevation
1/16" = 1'-0"

4 Phase 1 - South Elevation
1/16" = 1'-0"

EXTERIOR WALL ASSEMBLY TYPES - SEE A011

EW1-1	THIN MASONRY VENEER SYSTEM AS WALL BASE WITH TYPICAL WOOD FRAME WALL ASSEMBLY
EW2-1	HIGH DENSITY FIBER CEMENT PANEL RAINSCREEN WITH TYPICAL WOOD FRAME WALL ASSEMBLY
EW3-1	THIN MASONRY VENEER SYSTEM AS WALL BASE WITH TYPICAL WOOD FRAME WALL ASSEMBLY
EW4-1	HIGH DENSITY FIBER CEMENT PANEL RAINSCREEN WITH CMU WALL ASSEMBLY



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REVISIONS

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DRAWING TITLE
Phase 1 - Elevations

DRAWING INFORMATION

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1 Phase 1A - West Elevation 2
1/8" = 1'-0"

4 Lobby North Elevation
1/8" = 1'-0"

5 Lobby South Elevation
1/8" = 1'-0"

2 Phase 1A - West Elevation 1
1/8" = 1'-0"

6 Phase 1A - South Elevation (Alternate Temporary Condition, Pre Phase 1B)
1/8" = 1'-0"

3 Phase 1A - North Elevation
1/8" = 1'-0"

EXTERIOR WALL ASSEMBLY TYPES - SEE A011

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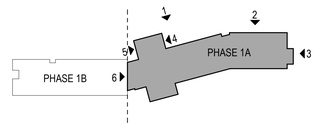

0' 4' 8' 16"

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REVISIONS

1	SPR COMMENTS	10/08/2024
		DATE

DRAWING TITLE
Phase 1A - Elevations

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08/23/2024 DATE OF ISSUE
Site Plan Review DESCRIPTION
As indicated SCALE
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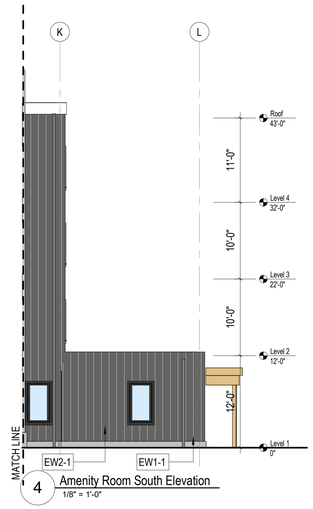
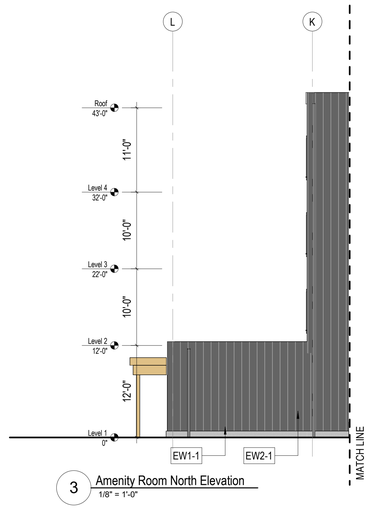
1 Phase 1A - East Elevation 1
1/8" = 1'-0"

2 Phase 1A - East Elevation 2
1/8" = 1'-0"



4 Amenity Room South Elevation
1/8" = 1'-0"



3 Amenity Room North Elevation
1/8" = 1'-0"

EXTERIOR WALL ASSEMBLY TYPES - SEE A011

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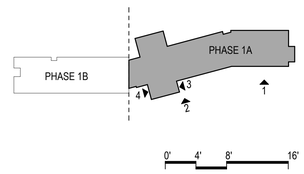

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REVISIONS

DATE

DRAWING TITLE
Phase 1A - Elevations

DRAWING INFORMATION

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Site Plan Review
DESCRIPTION
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A202

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1 Phase 1B - West Elevation
1/8" = 1'-0"

3 Phase 1B - South Elevation
1/8" = 1'-0"

2 Phase 1B - East Elevation
1/8" = 1'-0"

EXTERIOR WALL ASSEMBLY TYPES - SEE A011

EW1-1	THIN MASONRY VENEER SYSTEM AS WALL BASE WITH TYPICAL WOOD FRAME WALL ASSEMBLY
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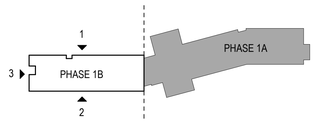

0' 4' 8' 16'

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REVISIONS

DATE

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Phase 1B - Elevations

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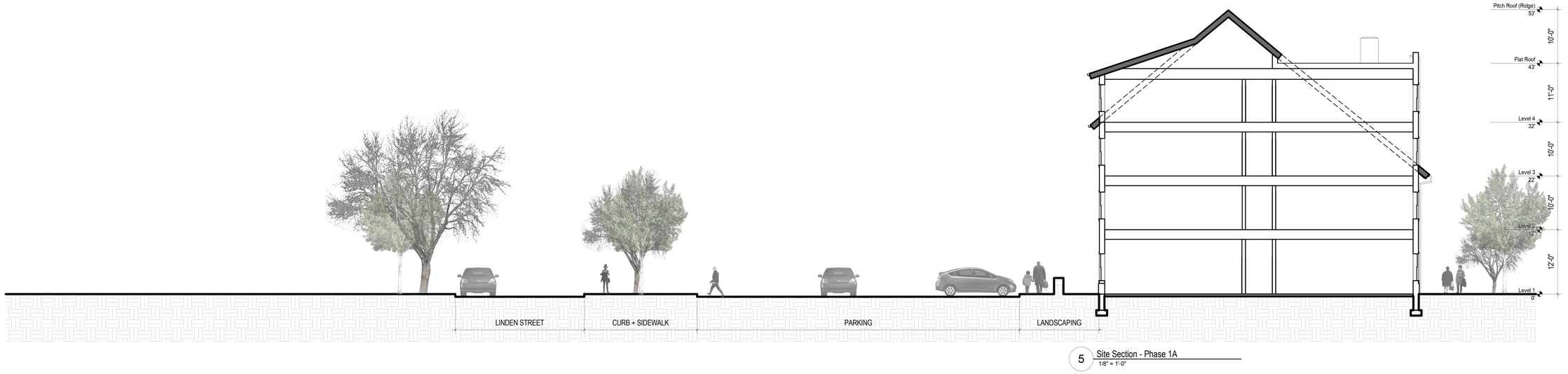
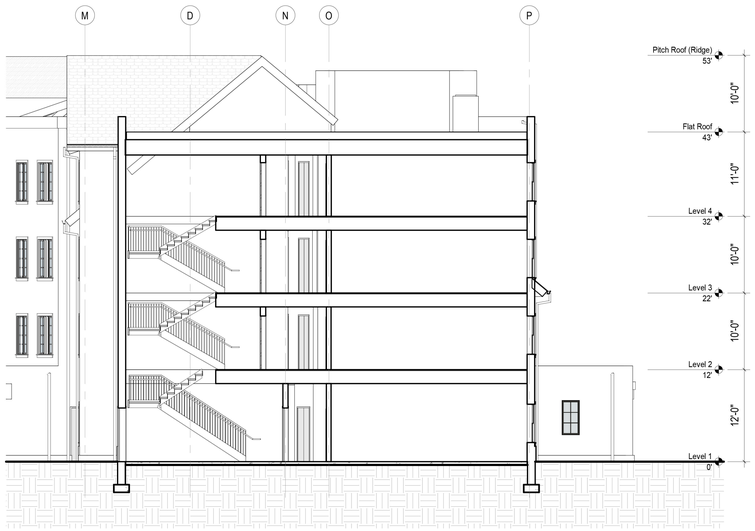
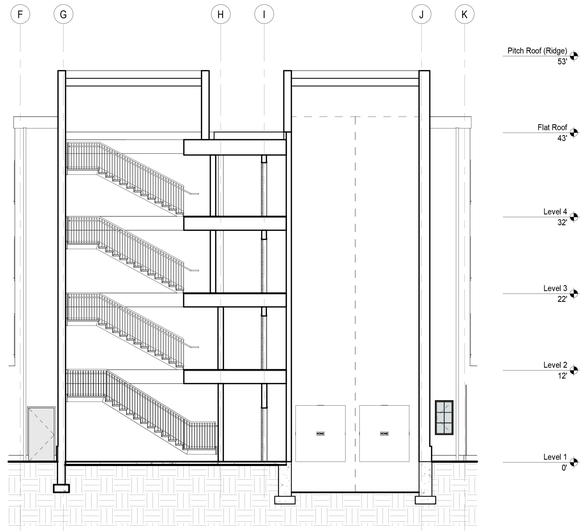


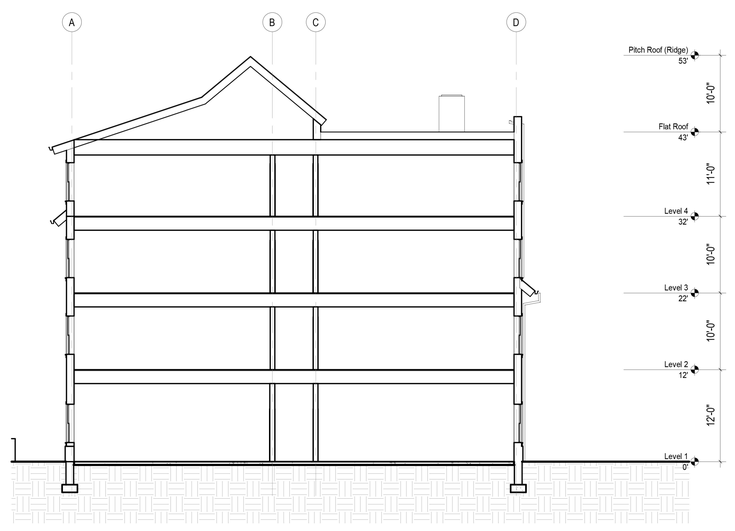
5 Site Section - Phase 1A
1/8" = 1'-0"



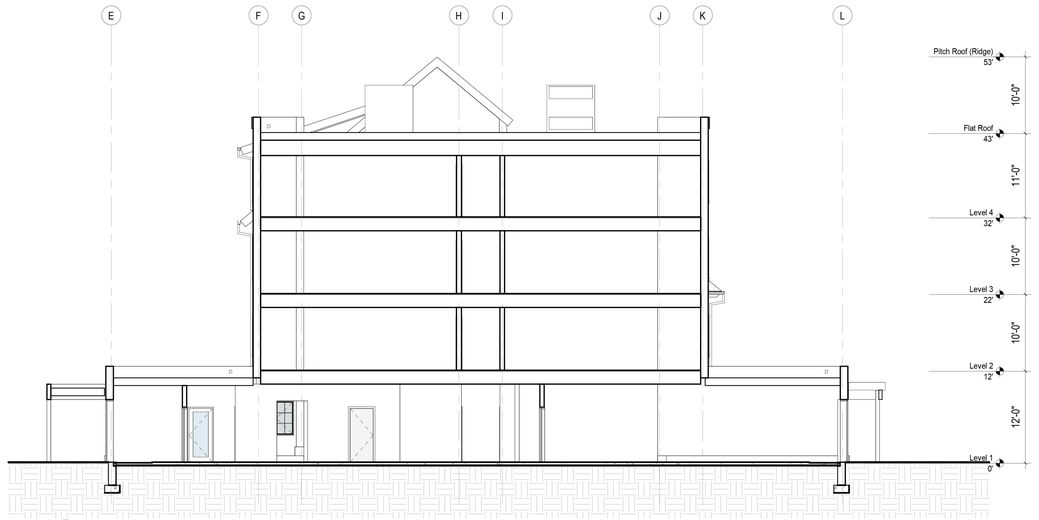
4 Building Section - Phase 1B @ Stair2
1/8" = 1'-0"



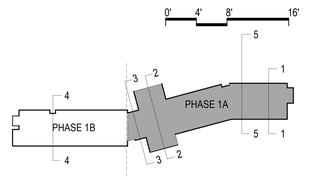
3 Building Section - Phase 1A @ Elevator
1/8" = 1'-0"



1 Building Section - Phase 1A
1/8" = 1'-0"



2 Building Section - Phase 1A @ Core
1/8" = 1'-0"



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REVISIONS

DATE

DRAWING TITLE
Building Sections

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SECURITY LEGEND

SYMBOL	DESCRIPTION
DR	DOOR RELEASE BUTTON
DC	DOOR CONTACT
CR	CARD READER
RD	REQUEST TO EXIT MOTION DETECTOR
ES	ELECTRIC DOOR STRIKE
SC	SECURITY CAMERA
KP	KEY PAD
MD C	MOTION DETECTOR, WALL MOUNTED "C"- INDICATES CIRCULAR BEAM "L"- INDICATES LINEAR BEAM
MD	MOTION DETECTOR, CEILING MOUNTED
SCP	SECURITY CONTROL PANEL

TELECOMMUNICATIONS LEGEND

SYMBOL	DESCRIPTION
	FLOOR TELECOM OUTLET
	WALL TELECOM OUTLET
	CEILING TELECOM OUTLET
S LS	SPEAKER, CEILING MOUNTED "LS" INDICATES LOCAL SOUND SYSTEM "VC" INDICATES INTEGRAL VOLUME CONTROL KNOB
	PUSHBUTTON
TV	TV OUTLET, WALL MOUNTED
TV	TV OUTLET, CEILING MOUNTED DATA/VIDEO PROJECTOR OUTLET W/ CONDUIT TO TV OUTLET

SITE LEGEND

SYMBOL	DESCRIPTION
A #	UNDERGROUND SECTION, REFER TO SECTION DETAIL "A" INDICATES DETAIL LETTER "#" INDICATES DRAWING NUMBER
EM	ELECTRIC MANHOLE
TM	TELEPHONE MANHOLE / TELECOMMUNICATIONS
EH	ELECTRIC HAND HOLE
TH	TELEPHONE HAND HOLE / TELECOMMUNICATIONS
G	GROUND CABLE
UE	UNDERGROUND ELECTRIC
UT	UNDERGROUND TELEPHONE / TELECOMMUNICATIONS
UF	UNDERGROUND FIRE ALARM
OE	OVERHEAD ELECTRIC
OT	OVERHEAD TELEPHONE / TELECOMMUNICATIONS
OF	OVERHEAD FIRE ALARM

FIRE ALARM LEGEND

SYMBOL	DESCRIPTION
FACP	FIRE ALARM CONTROL PANEL
DMP	DEDICATED MONITORING PANEL
FB	FIRE ALARM MASTER BOX
RAA	REMOTE ALARM ANNUNCIATOR
ARA	

ELECTRICAL ABBREVIATIONS

#	NUMBER	LOC	LOCATION
+18"	MOUNTING HEIGHTS ARE TO CENTERLINE OF DEVICE ABOVE FINISH FLOOR OR FINISH GRADE	LOR	LOCK OUT RELAY
		LTG	LIGHTING
		LV	LOW VOLTAGE
A, AMP	AMPERES	(M)	EXISTING EQUIPMENT TO BE REWORKED/MODIFIED
A/C	AIR CONDITIONING	M, MTR	MOTOR
AC	ALTERNATING CURRENT	MG	MOTOR/GENERATOR SET
ADA	AMERICAN WITH DISABILITIES ACT	MAN	MANUAL
AF	AMPERE FRAME	MAX	MAXIMUM
AFCI	ARC FAULT CIRCUIT INTERRUPTER	MCA	MINIMUM CIRCUIT AMPS
AFF	ABOVE FINISHED FLOOR	MCB	MAIN CIRCUIT BREAKER
AFG	ABOVE FINISHED GRADE	MCC	MOTOR CONTROL CENTER
AHJ	AUTHORITY HAVING JURISDICTION	MCP	MOTOR CONTROL PANEL
AHU	AIR HANDLING UNIT	MEC	MASSACHUSETTS ELECTRICAL CODE
AIC	AMPERE INTERRUPTING CAPACITY	MECH	MECHANICAL
AL	ALUMINUM	MFR	MANUFACTURER
APPROX	APPROXIMATE	MH	MAINTENANCE HATCH
ARCH	ARCHITECT	MIN	MINIMUM
ATS	AUTOMATIC TRANSFER SWITCH	MISC	MISCELLANEOUS
AUTO	AUTOMATIC	MLO	MAIN LUGS ONLY
AVG	AVERAGE	MOCP	MAXIMUM OVER CURRENT PROTECTION
AWG	AMERICAN WIRE GAUGE	MSB	MAIN SWITCHBOARD
		MTD	MOUNTED
B	BURIED	MTG	MOUNTING
BKR	BREAKER	MTS	MANUAL TRANSFER SWITCH
BLDG	BUILDING		
		(N)	NEW LOCATION OF EXISTING WORK
C	CONDUIT	N	NEUTRAL
CA	CABLE	NA	NOT APPLICABLE
CAB	CABINET	NC	NORMALLY CLOSED
CAT	CATALOG	NEC	NATIONAL ELECTRICAL CODE
CATV	CABLE TELEVISION	NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
CB	CIRCUIT BREAKER	NF	NON-FUSED
CCTV	CLOSED CIRCUIT TELEVISION	NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
CEC	CALIFORNIA ELECTRICAL CODE	NIC	NOT IN CONTRACT
CKT	CIRCUIT	NO	NORMALLY OPEN
CL	CENTERLINE	NORM	NORMAL
CLF	CURRENT LIMITING FUSE	NRTL	NATIONALLY RECOGNIZED TESTING LABORATORY
CLG	CEILING	NTS	NOT TO SCALE
COL	COLUMN	NVE	NEVADA ENERGY
COMB	COMBINATION		
CONN	CONNECTION	OC	ON CENTER
CONST	CONSTRUCTION	OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
CONTR	CONTRACTOR	OH	OVERHEAD
CPU	CENTRAL PROCESSING UNIT	OPD	OVER CURRENT PROTECTION DEVICE
CS	CONTROL SWITCH	OSHPD	OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
CTRL	CONTROL		
CU	COPPER		
		P	POLE
(D)	DEMO	PB	PUSH BUTTON
dB	DECIBEL	PDU	POWER DISTRIBUTION UNIT
DB	DISTRIBUTION BOARD	PF	POWER FACTOR
DC	DIRECT CURRENT	PH(ø)	PHASE
DET	DETAIL	PL	PILOT LIGHT
DIA	DIAMETER	PNL	PANEL
DISC	DISCONNECT	POC	POINT OF CONNECTION
DIST	DISTRIBUTION	POD	POINT OF DISCONNECTION
DN	DOWN	POS	PROVIDED UNDER OTHER SECTIONS
DWG	DRAWING	PP	POWER POLE
		PTZ	PAN, TILT, ZOOM
(E), EXIST	EXISTING	PVC	POLYVINYL CHLORIDE
EA	EACH	PWR	POWER
EC	ELECTRICAL CONTRACTOR		
EHU	ELECTRIC HEATING UNIT	(R)	EXISTING WORK TO BE RELOCATED
EL	ELEVATION	RECEPT	RECEPTACLE
ELEC	ELECTRICAL	REFRIG	REFRIGERATOR
ELR	END OF LINE RESISTOR	REQ'D	REQUIRED
EMERG	EMERGENCY	RGS	RIGID GALVANIZED STEEL
EMT	ELECTRIC METALLIC TUBING	RM	ROOM
ENG	ENGINEER	RMS	ROOT MEAN SQUARE VALUE
EQUIP	EQUIPMENT	RND	ROUND
(ER)	EXISTING TO BE RELOCATED	RPM	REVOLUTIONS PER MINUTE
ETC	ELAPSED TIME CONTROLLER		
EWH	ELECTRIC WATER HEATER	SEC	SECOND
		SN	SOLID NEUTRAL
F/A	FIRE ALARM	SNEC	SOUTHERN NEVADA ELECTRICAL CODE AMENDMENTS
FAAP	FIRE ALARM ANNUNCIATOR PANEL	SPD	SURGE PROTECTIVE DEVICE
FACP	FIRE ALARM CONTROL PANEL	SPEC	SPECIFICATION
FDR	FEEDER	SQ	SQUARE
FIXT	FIXTURE	SQFT	SQUARE FEET
FL	FLOOR	SS	SAFETY SWITCH
FLA	FULL LOAD AMPS		SYNC SWITCH
FLMT	FLEXIBLE LIQUID TIGHT METALLIC TUBING	STR	STARTER
		STRUCT	STRUCTURAL
FLUOR	FLUORESCENT	SW	SWITCH
FR	FRAME	SWBD	SWITCHBOARD
FREQ	FREQUENCY	SWGR	SWITCHGEAR
FT	FOOT	SYM	SYMMETRICAL
G, GND	GROUND	T, XFMR	TRANSFORMER
GEC	GROUNDING ELECTRODE CONDUCTOR	TB	TERMINAL BLOCK
GEN	GENERATOR	TEL	TELEPHONE
GFI, GFCI	GROUND FAULT CIRCUIT INTERRUPTER	TERM	TERMINAL
GFP	GROUND FAULT PROTECTION	TS	TEMPERATURE SWITCH
		TSP	TWISTED SHIELDED-PAIR
HH	HANDHOLE	TT	THERMAL SWITCH
HID	HIGH INTENSITY DISCHARGE	TV	TELEVISION
HOA	HAND OFF AUTOMATIC	TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSER
HORZ	HORIZONTAL	TYP	TYPICAL
HP	HORSEPOWER		
HTR	HEATER	UFD	UNDERFLOOR DUCT
HV	HIGH VOLTAGE	UG	UNDERGROUND
HVAC	HEATING, VENTILATING, AND AIR CONDITIONING	UH	UNIT HEATER
HZ	HERTZ	UL	UNDERWRITERS LABORATORIES
		UNO	UNLESS NOTED OTHERWISE
IBC	INTERNATIONAL BUILDING CODE	UPS	UNINTERRUPTIBLE POWER SUPPLY
IG	ISOLATED GROUND	UTP	UNSHIELDED TWISTED-PAIR
IMC	INTERMEDIATE METALLIC CONDUIT		
INCAND	INCANDESCENT	V	VOLT
		VA	VOLT AMPERE
JB	JUNCTION BOX	VA	VOLT-AMP
JCT	JUNCTION	VAV	VARIABLE AIR VOLUME
		VD	VOLTAGE DROP
kCMIL	THOUSAND CIRCULAR MILS	VENT	VENTILATION
KO	KNOCK OUT	VERT	VERTICAL
kV	KILOVOLT	VFD	VARIABLE FREQUENCY DRIVE
KVA	KILOVOLT AMPERES	VSD	VARIABLE SPEED DRIVE
KW	KILOWATT		
KWH	KILOWATT HOURS	W	WATT
		WP	WEATHER-PROOF (NEMA 3R)
		XP	EXPLOSION PROOF

ELECTRICAL SYMBOL LEGEND

(THIS IS A MASTER LEGEND, NOT ALL SYMBOLS MAY APPEAR ON DRAWINGS.)

GENERAL

SYMBOL	DESCRIPTION
XX	SHEET NOTE
XX	FEEDER NOTE
XX-XXX	KITCHEN EQUIPMENT TAG
1	REVISION NUMBER
MSB	ELECTRICAL EQUIPMENT TAG
-	MECHANICAL EQUIPMENT TYPE
-	MECHANICAL EQUIPMENT NUMBER - SEE HVAC AND PLUMBING DRAWINGS.
-	SECTION DRAWING NUMBER
-	REFERENCING SHEET
-	CALLOUT DRAWING NUMBER
-	REFERENCING SHEET

EXISTING DEVICE LEGEND

SYMBOL	DESCRIPTION
	NEW WORK
X(M/E)	EXISTING WORK TO REMAIN
X(D)	EXISTING WORK TO BE REMOVED (DEMO)
X(R)	EXISTING WORK TO BE RELOCATED
X(N)	NEW LOCATION OF EXISTING WORK

LIGHTING

SYMBOL	DESCRIPTION
A1 2.a	LIGHTING FIXTURE (SEE LIGHTING FIXTURE SCHEDULE) "A1" - INDICATES LIGHTING FIXTURE TYPE "2" - INDICATES CIRCUIT NUMBER "a" - INDICATES SWITCH CONTROL
	FIXTURE SHADING INDICATES FIXTURE ON EMERGENCY CIRCUIT, LIFE SAFTEY OR INTEGRAL BATTERY BACK-UP
	FIXTURE HALF SHADING INDICATES FIXTURE ON CRITICAL BRANCH CIRCUITING
	LINEAR PENDANT FIXTURE
	LINEAR STRIP FIXTURE
	RECESSED LINEAR SLOT LIGHT
LED	LINEAR LED FIXTURE
	DOWNLIGHT FIXTURE
	PENDANT FIXTURE
	TRACK LIGHT WITH FIXTURE HEADS
	WALL WASH / ACCENT LIGHT
	SPECIALTY FIXTURE - PROFILE SPOT LIGHT
	SPECIALTY FIXTURE - WASH LIGHT
	WALL MOUNTED FIXTURE
	STEP LIGHT
	POLE MOUNTED FIXTURE
	BOLLARD FIXTURE
	EXIT SIGN WITH DIRECTIONAL ARROWS AND EXIT FACE (SHADED) AS INDICATED CEILING MOUNTED
	EXIT SIGN WITH DIRECTIONAL ARROWS AND EXIT FACE (SHADED) AS INDICATED WALL MOUNTED
	EMERGENCY BATTERY LIGHTING UNIT WITH TWIN HEADS
	EMERGENCY BATTERY LIGHTING UNIT WITH TWIN HEADS AND EXIT SIGN

POWER DISTRIBUTION

SYMBOL	DESCRIPTION
	DARK SHADING ON EQUIPMENT INDICATES 208/120V, LIGHT SHADING INDICATES 480/277V
	SURFACE MOUNTED PANELBOARD
	FLUSH MOUNTED PANELBOARD
TS	DRY TYPE TRANSFORMER "TS" - INDICATES KVA RATING OF TRANSFORMER REFER TO DRY TYPE K-RATED TRANSFORMER SCHEDULE
	SWITCHBOARD, MOTOR CONTROL CENTER OR DISTRIBUTION BOARD
LCP	LIGHTING CONTROL PANEL
CP	CONTROL PANEL
	LADDER CABLE TRAY
	CHANNEL CABLE TRAY
BW	BUSWAY, HORIZONTAL, REFER TO RISER FOR RATING
BW	BUSWAY, VERTICAL, REFER TO RISER FOR RATING
BW	BUSWAY, HORIZONTAL, WITH FUSED PLUG-IN DISCONNECT
G	GROUND BAR
M	CUSTOMER METER
M	UTILITY METER AND SOCKET
CT	CURRENT TRANSFORMER CABINET

WIRING DEVICES

SYMBOL	DESCRIPTION
WP 5	RECEPTACLE RATED 20A, 125V. MOUNTED AT +18" UNLESS NOTED OTHERWISE. RECEPTACLE HEIGHTS SHALL COMPLY WITH ANSI 117.1 REQUIREMENTS "5" - INDICATES CIRCUIT NUMBER "IG" - INDICATES ISOLATED GROUND TYPE "WP" - INDICATES WEATHERPROOF GFCI RECEPTACLE "GF" - GFCI RECEPTACLE
	DUPLEX RECEPTACLE
	DOUBLE DUPLEX RECEPTACLE
	FLUSH FLOOR/CEILING DUPLEX RECEPTACLE
	FLUSH FLOOR/CEILING DOUBLE DUPLEX RECEPTACLE
XX XX XX	SPECIAL PURPOSE RECEPTACLE - WALL / FLOOR / CEILING. "XX" INDICATES TAG NUMBER. REFER TO SPECIAL PURPOSE RECEPTACLE SCHEDULE
	HOSPITAL GRADE RECEPTACLE
	HOSPITAL GRADE DOUBLE DUPLEX RECEPTACLE
	MULTI-OUTLET PLUGSTRIP
	MULTI-OUTLET ASSEMBLY, DEVICES AS INDICATED
	WALL JUNCTION BOX
	FLOOR/CEILING JUNCTION BOX
FS	JUNCTION BOX AND SWITCH WITH CONNECTION TO FIRE/SMOKE DAMPER. COORDINATE REQUIREMENTS WITH FIRE ALARM SYSTEM AND MECHANICAL CONTROL DIAGRAMS
V	JUNCTION BOX AND SWITCH WITH CONNECTION TO VARIABLE AIR VOLUME BOX. COORDINATE REQUIREMENTS WITH MECHANICAL CONTROL DIAGRAMS
DH	DOOR HOLDER
	CLOCK RECEPTACLE AT +90" UNLESS NOTED OTHERWISE
SB SB SB	SPECIALTY BOX - WALL / FLOOR / CEILING
P	FLOOR MOUNTED BOX FOR POWER CONNECTION TO PRE-WIRED FURNITURE PARTITIONS
P	WALL MOUNTED BOX FOR POWER CONNECTION TO PRE-WIRED FURNITURE PARTITIONS
FB1	FLOOR MOUNTED BOX WITH MULTIPLE DEVICES. "FB1"-INDICATES TYPE AS DEFINED IN NOTES/SCHEDULES.
PB	PULL BOX
PP	POWER POLE
	CORD DROP WITH DUPLEX RECEPTACLE
	CORD DROP WITH DOUBLE DUPLEX RECEPTACLE
XX	CORD DROP WITH SPECIAL PURPOSE RECEPTACLE, "XX" INDICATES TAG NUMBER. REFER TO SPECIAL PURPOSE RECEPTACLE SCHEDULE

BRANCH CIRCUITS AND FEEDERS

SYMBOL	DESCRIPTION
R22A-1,3,5	BRANCH CURCUIT HOME RUN TICKS INDICATE QUANTITY OF CONDUCTORS, GROUND CONDUCTORS ARE NOT INDICATED. NO TICKS INDICATES 2@12 & 1#12G IN 3/4"C MINIMUM. R22A-1,3,5 INDICATES PANEL AND CIRCUIT DESIGNATION FROM WHICH HOMERUN SHALL ORIGINATE. EACH CIRCUIT SHALL BE 20A-1P (20AMP SINGLE POLE) UNLESS NOTED OTHERWISE.
	CONDUIT BELOW FLOOR OR BELOW GRADE
	CONDUIT STUB-OUT
	CONDUIT AND/OR WIRE TURNED UP
	CONDUIT AND/OR WIRE TURNED DOWN
	FLEXIBLE CONNECTION TO EQUIPMENT. RACEWAY AND CONDUCTOR RATING TO MATCH ASSOCIATED BRANCH CIRCUIT OR FEEDER
E	BRANCH CIRCUIT FOR EMERGENCY BATTERY DC CIRCUIT, MINIMUM 2#10 IN 3/4"C. UNLESS OTHERWISE NOTED

MOTOR AND CONTROLS

SYMBOL	DESCRIPTION
S_M	MANUAL MOTOR STARTING SWITCH WITH THERMAL OVERLOAD PROTECTION
60AS 50AF	MAGNETIC MOTOR STARTER, REFER TO MAGNETIC MOTOR STARTER & VFD SCHEDULE FOR TYPE, SIZE AND ENCLOSURE
	COMBINATION FUSED DISCONNECT MAGNETIC MOTOR STARTER. REFER TO MAGNETIC MOTOR STARTER AND VFD SCHEDULE FOR TYPE, SIZE AND ENCLOSURE
C	CONTACTOR IN NEMA 1 ENCLOSURE UNLESS OTHERWISE NOTED
MCC	MOTOR CONTROL CENTER
CP	EQUIPMENT CONTROL PANEL
VFD	VARIABLE SPEED DRIVE
2	MOTOR, NUMERAL INDICATES HORSEPOWER "2" - INDICATES HORSEPOWER RATING
60AS	DISCONNECT SWITCH RATED 30AMP, 3-POLE, IN NEMA TYPE 1 ENCLOSURE, UNLESS OTHERWISE NOTED "3R" - INDICATES NEMA TYPE 3R ENCLOSURE "2P" - INDICATES 2 POLE SINGLE PHASE DISCONNECT "60AS" - INDICATES 60A SWITCH
60AS 50AF	FUSED DISCONNECT SWITCH, 3-POLE, IN NEMA TYPE 1 ENCLOSURE, UNLESS OTHERWISE NOTED. "3R" - INDICATES NEMA TYPE 3R ENCLOSURE "60AS" - INDICATES 60AMP SWITCH "50AF" - INDICATES 50AMP FUSES
CB	ENCLOSED CIRCUIT BREAKER IN NEMA TYPE 1 ENCLOSURE, UNLESS OTHERWISE NOTED

DIAGRAMS

SYMBOL	DESCRIPTION
	TRANSFORMER
	CIRCUIT BREAKER
ST	SHUNT TRIP CIRCUIT BREAKER
	DRAW-OUT CIRCUIT BREAKER - MEDIUM VOLTAGE
	DRAW-OUT CIRCUIT BREAKER - LOW VOLTAGE
	SWITCH FUSE
G	GENERATOR
	POTENTIAL TRANSFORMER
	CURRENT TRANSFORMER
	GROUNDING ELECTRODE
M	METER
N O E	AUTOMATIC TRANSFER SWITCH
E L N	AUTOMATIC TRANSFER SWITCH WITH BYPASS MAINTENANCE
	CAPACITOR
SPD	SURGE PROTECTION DEVICE
K	KIRK KEY INTERLOCK
A	AMMETER
V	VOLTMETER
W	WATT METER
WH	WATTHOUR METER
ST	SHUNT TRIP DEVICE
PANEL R21A	PANELBOARD

SWITCHING CONTROLS

SYMBOL	DESCRIPTION
S^a	SINGLE POLE SWITCH AT +44" UNLESS NOTED OTHERWISE. MOUNTING HEIGHTS SHALL COMPLY WITH ANSI 117.1 REQUIREMENTS (AT +44" UNLESS NOTED OTHERWISE) "a" - INDICATES SWITCH CONTROL
S_2	"2" - INDICATES 2 POLE SINGLE THROW SWITCH "3" - INDICATES 3-WAY SWITCH "LV" - INDICATES LOW VOLTAGE SWITCH "LVD" - INDICATES LOW VOLTAGE DIMMER SWITCH "M" - INDICATES SWITCH WITH MOTION SENSOR "OS" - INDICATES SWITCH WITH OCCUPANCY SENSOR "WP" - INDICATES WEATHERPROOF
DL DL	CEILING/WALL DAYLIGHT SENSOR
DM	DIMMING MODULE
xx OS/VS xx	CEILING/WALL OCCUPANCY SENSOR (XX REFERS TO TYPE DESIGNATION, SEE OCCUPANCY SENSOR SCHEDULE - WALL / CEILING
PC/EC	PHOTO CELL - WALL / CEILING
R/R	RELAY - WALL / CEILING
ER	EMERGENCY SUPERVISORY BYPASS RELAY
RC	ROOM CONTROLLER
SM	SWITCHING MODULE
EPO	PUSHBUTTON TYPE CONTROL STATION, "EPO" INDICATES EMERGENCY POWER OFF
TP	TOUCH PANEL
PS	PRESET STATION

ELECTRICAL GENERAL NOTES

1. DO NOT SCALE DRAWINGS. VERIFY DIMENSIONS IN FIELD PRIOR TO COMMENCEMENT OF WORK.
2. ALL RECEPTACLES TO BE MOUNTED AT +18" UNLESS OTHERWISE NOTED. RECEPTACLE HIGHTS SHALL COMPLY WITH ANSI 117.1 REQUIREMENTS
3. REFER TO ARCHITECTURAL DEMOLITION DRAWINGS FOR LOCATION AND EXTENT OF DEMOLITION REQUIRED. CONTRACTOR SHALL VISIT SITE PRIOR TO BID TO DETERMINE EXTENT OF WORK INVOLVED. PROVIDE LABOR AND MATERIALS AS REQUIRED TO MAINTAIN AND/OR RESTORE CONTINUITY OF SERVICE TO EXISTING CIRCUITS.
4. CONTRACTOR SHALL PROVIDE ALL NECESSARY DEMOLITION TO REMOVE EXISTING UNUSED CONDUIT, WIRE, CABLE, JUNCTION BOXES, RECEPTACLES, SWITCHES, LIGHTS, ETC COMPLETE WITH ASSOCIATED CIRCUITING TO SOURCE.
5. SYSTEM OUTAGES SHALL BE PERMITTED ONLY AT TIMES APPROVED BY OWNER, IN WRITING. WORK WHICH COULD RESULT IN AN ACCIDENTAL OUTAGE (BEYOND BRANCH CIRCUITS) SHALL BE PERFORMED WITH THE OWNER'S MAINTENANCE PERSONNEL ADVISED OF SUCH WORK.
6. PRIOR TO COMMENCEMENT OF ROUGH-IN WORK, COORDINATE WITH ARCHITECT, DRAWING NOTES, ELEVATIONS, SECTIONS, SPECIFICATIONS, FURNITURE, FIXTURES, AND EQUIPMENT FOR ALL RECEPTACLE AND COMMUNICATION DEVICE MOUNTING HEIGHT AND MOUNTING LOCATION.
7. ALL 125V, SINGLE PHASE, 15 AND 20 AMP RECEPTACLE OUTLETS THAT ARE USED AS TEMPORARY POWER DURING CONSTRUCTION SHALL HAVE GFCI PROTECTION.
8. ALL PENETRATIONS, SLEEVES, OPENINGS, ETC, THROUGH SMOKE OR FIRE RATED WALLS, CEILINGS, OR FLOORS SHALL BE PROPERLY CAULKED WITH AN APPROVED FIRE CAULKING MATERIAL, APPROVED BY ENGINEER, UNLESS NOTED OTHERWISE.
9. ALL PENETRATIONS THROUGH SOUND, SECURITY OR FIRE WALLS SHALL BE SLEEVED FOR MECHANICAL PROTECTION. ALL PENETRATIONS AND SLEEVES SHALL BE SEALED WITH CAULKING AND INTUMESCENT MATERIAL (WHERE APPROPRIATE) TO MAINTAIN RESPECTIVE RATINGS OF WALL.
10. PROVIDE EQUIPMENT BONDING JUMPER GROUND CONNECTION IN ALL BOXES, ENCLOSURES, ETC, FROM THE EQUIPMENT GROUNDING CONDUCTOR.
11. ALL EMPTY RACEWAY SYSTEMS SHALL HAVE A #12 PULLWIRE OR EQUAL AND SHALL BE IDENTIFIED AT ALL JUNCTIONS, PULL AND TERMINATION POINTS, USING PERMANENT METALLIC TAGS. TAG SHALL INDICATE INTENDED USE OF CONDUIT, ORIGINATION AND TERMINATION POINTS OF EACH INDIVIDUAL CONDUIT.
12. CONTRACTOR SHALL COORDINATE INSTALLATION OF ALL LIGHT FIXTURES TO ENSURE THAT THE LIGHT FIXTURES DO NOT INTERFERE WITH ANY STRUCTURAL, MECHANICAL, OR PLUMBING COMPONENTS AND EQUIPMENT. COORDINATE RELOCATION OF ANY LIGHT FIXTURE DUE TO INTERFERENCES WITH STRUCTURAL, MECHANICAL, OR PLUMBING COMPONENTS AND EQUIPMENT.
13. FIXTURES RECESSED IN "T-BAR" CEILING SHALL BE SUPPORTED INDEPENDENTLY OF CEILING SYSTEM, WITH TWO #12 HANGER WIRES UP TO STRUCTURE. SECURE HANGER WIRES TO OPPOSITE CORNERS OF FIXTURE. CLIP FIXTURE TO GRID ON TWO SIDES WITH FACTORY-FURNISHED CLIPS. FINAL CONNECTION TO FIXTURE SHALL BE MADE WITH A FLEXIBLE UL APPROVED ASSEMBLY.
14. CONDUITS PENETRATING THROUGH ROOF SHALL HAVE ROOF FLASHING WITH CAULK TYPE COUNTER FLASHING SLEEVE. INSTALLATION SHALL BE WATERTIGHT. CONDUITS SHALL NOT BE RUN HORIZONTALLY ON THE ROOF. PENETRATIONS SHALL BE AT EQUIPMENT LOCATIONS ONLY AND SHALL BE COORDINATED WITH MECHANICAL EQUIPMENT.
15. FINAL CONNECTIONS TO MOTORS, TRANSFORMERS AND OTHER VIBRATING EQUIPMENT SHALL BE WITH FLEXIBLE METAL CONDUIT (INDOORS) OR LIQUIDTIGHT FLEXIBLE METAL CONDUIT (OUTDOORS) AND APPROVED FITTINGS. DO NOT SECURE CONDUITS, DISCONNECTS OR DEVICES TO DUCTWORK OR MECHANICAL EQUIPMENT.
16. WIRE TERMINATION PROVISIONS FOR PANELBOARDS, CIRCUIT BREAKERS, SAFETY SWITCHES, AND ALL OTHER ELECTRICAL APPARATUS SHALL BE LISTED AS SUITABLE FOR 75°C.
17. CONTRACTOR SHALL PROVIDE A VOLTAGE BARRIER IN BOXES CONTAINING MULTIPLE SWITCHES WITH A VOLTAGE POTENTIAL OF 300V OR GREATER.
18. COORDINATE ELECTRICAL DEVICES AND EQUIPMENT WITH THE INTERIOR AND ARCHITECTURAL DRAWINGS. IF CONFLICTS OCCUR, BRING THEM TO THE ARCHITECTS ATTENTION PROMPTLY.
19. CONTRACTOR SHALL COORDINATE WITH OTHER TRADES TO INSURE THAT PIPING, DUCTS, ETC INSTALLED WITHIN ELECTRICAL ROOMS OR SPACES SHALL BE INSTALLED PER NEC 110-26, ALL PIPING, DUCTS, ETC SHALL BE INDICATED ON THE SHOP DRAWINGS.
20. EACH RECEPTACLE INSTALLED OUTDOORS, WITHIN 72" OF SINKS, ELECTRIC WATER COOLERS, IN DAMP OR WET AREAS, ON ROOF, BELOW GRADE ELEVATOR PITS, JANITOR CLOSETS AND TOILET ROOMS, SHALL HAVE INDIVIDUAL GROUND FAULT (GFCI) PROTECTION.
21. REFER TO MECHANICAL CONTROL DIAGRAMS FOR ADDITIONAL WIRING REQUIREMENTS. PROVIDE ALL RACEWAYS, WIRING, CONTROL SWITCHES, ETC AS REQUIRED.
22. FINAL CONNECTIONS TO EQUIPMENT SHALL BE PER MANUFACTURER'S APPROVED WIRING DIAGRAMS, DETAILS AND INSTRUCTIONS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE MATERIALS AND EQUIPMENT COMPATIBLE WITH EQUIPMENT SUPPLIED.

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REVISIONS

DATE

DRAWING TITLE
Electrical Legend, Notes and Abbreviations

DRAWING INFORMATION

08/23/2024 DATE OF ISSUE
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12" = 1'-0" SCALE
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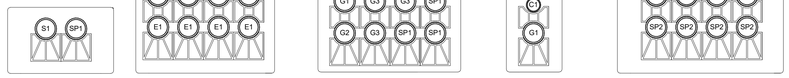


SECTION "A-A"
N.T.S.

SECTION "B-B"
N.T.S.

SECTION "C-C"
N.T.S.

SECTION "D-D"
N.T.S.

SECTION "E-E"
N.T.S.

NOTES:
1. REFER TO TYPICAL ELECTRICAL DUCT DETAIL THIS SHEET FOR GENERAL CONSTRUCTION REQUIREMENTS.

2. REFER TO THE DUCT BANK CONDUIT SCHEDULE THIS SHEET FOR CONDUIT AND CONDUCTOR REQUIREMENTS ASSOCIATED WITH CONDUIT TAG.

NV5 ELECTRICAL DUCT SECTIONS E504

DUCT BANK CONDUIT SCHEDULE

TAG	DESCRIPTION	CONDUIT	CONDUCTORS
ES	PRIMARY ELECTRIC	5"	SEE NOTE 6
E1	SECONDARY ELECTRIC	4"	4#600kCMIL
G1	LIFE-SAFETY BRANCH		
G2	LEGALLY REQUIRED STANDBY BRANCH		
G3	OPTIONAL STANDBY BRANCH		
C1	GENERATOR START	2"	
C2	GENERATOR AUXILLARIES	2"	
SP1	SPARE	5"	NOTE 6
SP2	SPARE	4"	NOTE 6
SP3	SPARE	2"	NOTE 6

NOTES:

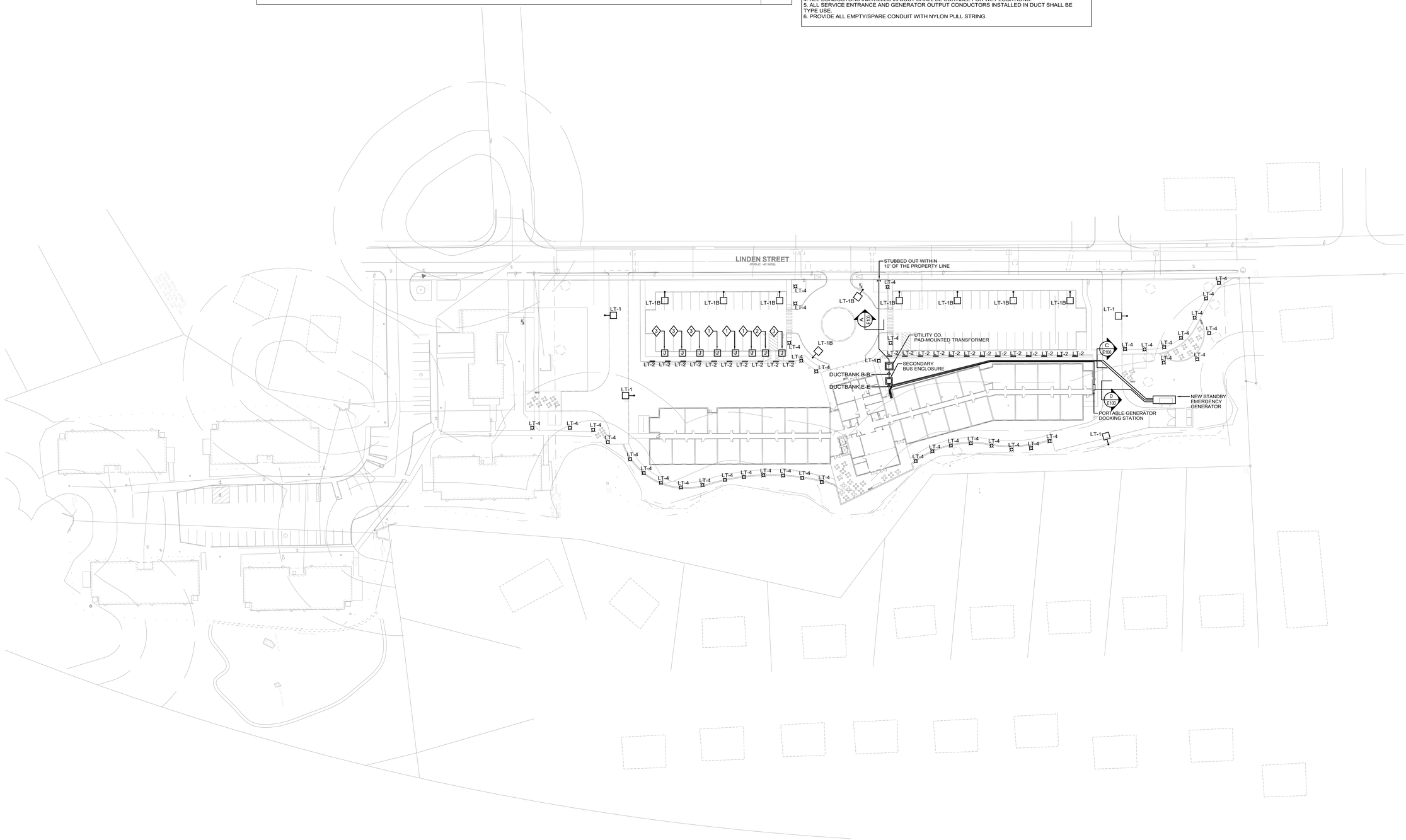
1. REFER TO DUCT BANK SECTIONS FOR CORRESPONDING CONDUIT AND CONDUCTOR.
2. REFER TO THE TYPICAL DUCTBANK SECTION FOR DETAILS REQUIRED IN THE CONSTRUCTION OF THE DUCT BANK ENVELOPE.
3. REFER TO THE SPECIFICATIONS FOR ADDITIONAL INFORMATION INCLUDING BUT NOT LIMITED TO DUCT BANK REINFORCEMENT REQUIRED UNDER PAVED AREAS INTENDED FOR VEHICULAR TRAFFIC AND AT MANHOLE/BUILDING INTERFACES.
4. ALL CONDUCTORS INSTALLED IN DUCT SHALL BE SUITABLE FOR WET LOCATIONS.
5. ALL SERVICE ENTRANCE AND GENERATOR OUTPUT CONDUCTORS INSTALLED IN DUCT SHALL BE TYPE USE.
6. PROVIDE ALL EMPTY/SPARE CONDUIT WITH NYLON PULL STRING.

KEYNOTES

1	FOR DUAL EV CHARGER MANUFACTURED BY CHARGEPOINT CP6000 SERIES - MAXIMUM 80A (POWER SHARE) DUAL PORT WITH SINGLE POWER CONNECTION RATED 19.2kW, 125A,208V/1PH. PROVIDE WEATHERPROOF (NEMA 3R) JUNCTION BOX MOUNTED AT 12" AFG. UTILIZE RIGID STEEL CONDUIT/SWEEP FOR ABOVE GRADE INSTALLATION.
2	FOR SINGLE EV CHARGER MANUFACTURED BY CHARGEPOINT CP6000 SERIES - MAXIMUM 80A (STANDARD) SINGLE PORT WITH SINGLE POWER CONNECTION RATED 19.2kW, 125A,208V/1PH. PROVIDE WEATHERPROOF (NEMA 3R) JUNCTION BOX MOUNTED AT 12" AFG. UTILIZE RIGID STEEL CONDUIT/SWEEP FOR ABOVE GRADE INSTALLATION.
3	FOR FUTURE SINGLE EV CHARGER PROVIDE WEATHERPROOF (NEMA 3R) JUNCTION BOX MOUNTED AT 12" AFG. UTILIZE RIGID STEEL CONDUIT/SWEEP FOR ABOVE GRADE INSTALLATION.

NOTES:

1 REFER TO SPECIFICATIONS, DETAILS, AND CONTROL DRAWINGS FOR ADDITIONAL INFORMATION.
2 X
3 X



1 ELECTRICAL SITE PLAN
1" = 40'-0"

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Electrical Site Plan

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08/23/2024 DATE OF ISSUE
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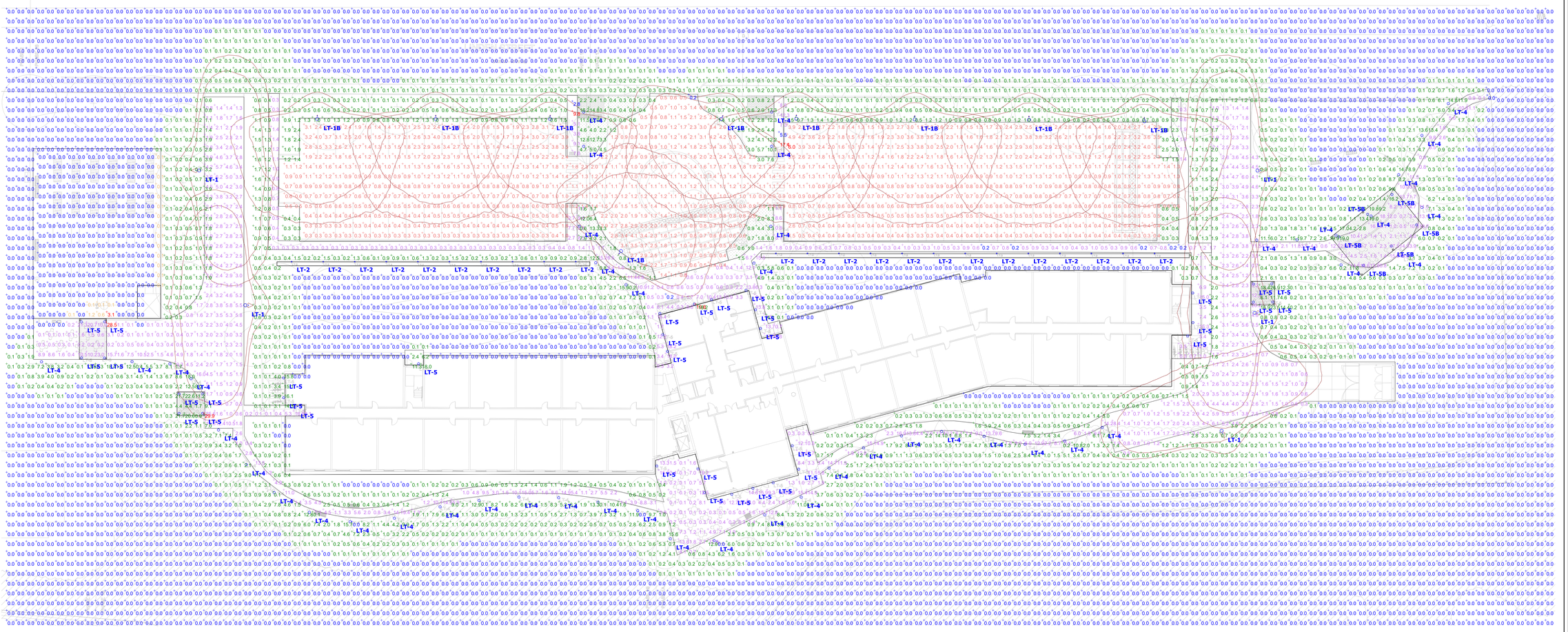

STATISTICS

DESCRIPTION	SYMBOL	AVG.	MAX	MIN.	MAX/MIN	AVG/MIN
GARDEN	+	0.0 fc	3.1 fc	0.0 fc	N/A	N/A
Outer Perimeter	+	0.5 fc	29.9 fc	0.0 fc	N/A	N/A
PARKING	+	1.3 fc	6.0 fc	0.2 fc	30.0:1	6.5:1
WALKING PATH	+	6.4 fc	9.8 fc	2.8 fc	3.5:1	2.3:1
WALKING PATH	+	10.4 fc	17.4 fc	5.5 fc	3.2:1	1.9:1
WALKING PATH	+	2.7 fc	19.6 fc	0.2 fc	98.0:1	13.5:1
ACCESS ROAD / PATH	+	3.9 fc	28.5 fc	0.0 fc	N/A	N/A

SCHEDULE

Symbol	Label	Quantity	Manufacturer	Catalog Number	Description	Light Loss Factor	Wattage
	LT-1	5	Lumenpulse	PURXXXT VOLT CSL M150 30K CRI 80 3BLS FINISH DIM XX TN4	Pure T Area Light | Type 3 w/ Backlight Control | *ADVISE POLE*	0.9	132
	LT-1B	9	Lumenpulse	PURXXXT VOLT CSL M150 30K CRI 80 4BLS FINISH DIM XX TN4	Pure T Area Light | Type 4 w/ Backlight Control | *ADVISE POLE*	0.9	132
	LT-2	23	Sage Lighting	SLVR 27 FINISH	SLVR Step Light	0.9	2.98
	LT-4	47	Spitzer	BRA F42 24LC VOLTAGE CC D3 FINISH	Architectural Round Bollard | 3'-5"	0.9	21.6769
	LT-5	35	Luminis Lighting	SYP400 L1L10 VWD K40 VOLTAGE FINISH MOUNTING XX	Syrios Pro - Wall Mount	0.9	12
	LT-5B	6	Luminis Lighting	SYP410 L1L10 VWD K40 VOLTAGE FINISH MOUNTING XX	Syrios Pro - Surface Mount	0.9	12

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REVISIONS

DATE

DRAWING TITLE

Electrical Site Plan Photometrics

DRAWING INFORMATION

08/23/2024
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FOR REFERENCE
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SCALE

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HANCOCK
ASSOCIATES

Site Plan Review submission – 08/23/24

Rev 2 – 10/11/24

Note: This report includes two extended fire lanes and an expanded recharge system. This report supersedes the two preceding reports submitted on 8/23/24 and 10/8/24

Stormwater Report

In Support Of

Notice of intent

For

Linden Street Redevelopment

(Map 133, Lots 23 and 24)

Needham MA

PREPARED BY:
Hancock Associates
#26774

PREPARED FOR:
Needham Housing Authority
21 Highland Circle,
Needham MA, 02494

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Introduction

Needham Housing Authority proposes to redevelop the site located at 133-188 Linden St, Needham MA with a 136 unit, four-story residential building. Associated improvements will include paved parking and circulation, pedestrian walkways, recreation areas, landscaped areas, stormwater management systems, utility services, and fire truck and equipment access.

The project area is currently developed with single story multi-unit residential buildings, paved walkways, and grassed lawn areas. A central parking lot provides parking for each unit. The buildings are serviced by municipal sewer, water, gas, and electric services. The site is abutted by residential houses to the north, east, and south. The eastern residential houses on Maple St are separated from the site by a bordering vegetated wetland (BVW). The BVW has a concrete open channel which has an inlet pipe on the southern side and outlet pipe on the northern side which drains to a manhole north of the site property line. To the west and across Linden Street are playing fields apart of High Rock Middle School. The site is relatively level but does slope upwards from north to south from elevation 142' to 147'.

The existing stormwater system consists of roof drains which discharge into a series of pipes and manholes which discharge to the existing storm drain in Linden Street. A drainage divide roughly down the center of the developed site diverts runoff west to Linden St (DP1) and East to the BVW (DP2) and can be seen in the Appendix IV Pre Development Drainage Plan. The site is located at a low spot in a drainage basin consisting of 50+ acres of land. There is limited infrastructure to handle the large volume of stormwater experienced during large storm events and consequently, the are sees extreme flooding at the intersection of Blake Street and Linden Street.

The proposed stormwater management system will include a series of deep sump hooded catch basins, drain manholes and roof drains which will convey stormwater from paved areas and roof areas into two subsurface Stormtech SC-310 infiltration systems. Stormwater discharges to the existing storm drain located in Linden Street. The underground infiltration system located under the northern parking lot has been expanded beyond the requirements set forth in the Massachusetts stormwater handbook to mitigate contribution to the existing flood events in the area. There are two fire truck access lanes on the northern and southern sides of the building which will be constructed using pervious pavement and subsurface crushed gravel reservoirs. Stomrwater is collected from the surrounding landscaped areas. A network of perforated pvc pipes will help distribute stormwater though the stone reservoirs and overflow pipes connect the underdrains to the SC-310 infiltration systems. A crushed stone infiltration trench is proposed along the concrete sidewalk at the rear of the building to collect stormwater runoff from the sidewalk and landscaping. Pipes with long runs are to be perforated and set in crushed stone to further promote groundwater infiltration.

The proposed stormwater management system is designed to exceed the Stormwater Management Standards described in the Massachusetts Stormwater Handbook to the maximum extent practicable and the Town of Needham Stormwater Standards. The following report describes the system's compliance with these standards.

Standard 1: No New Untreated Discharges

The Massachusetts Stormwater Handbook states that no new stormwater conveyances may discharge untreated stormwater directly to or cause erosions in wetlands or waters of the Commonwealth. The project does not include new stormwater conveyances.

Standard 2: Peak Rate Attenuation

The Massachusetts Stormwater Handbook states that stormwater management systems shall be designed so that post-development peak stormwater discharge rates do not exceed pre-development peak stormwater discharge rates to the municipal system (DP1) and BVW. The post development discharge rates are below the existing rates to the same design points. See Table 1 for peak flow rate and runoff volume data for the base design approved under Massachusetts Stormwater regulations and for the expanded design approved by the DPW. See Appendix IV and HydroCAD output (Appendix V) for more information.

For the purpose of these calculations the following assumptions were made:

- The project property lines, wetland boundary, Linden Street, and the Phase ½ boundary have been used to delineate the Pre/Post Development watershed boundary.
- The same total watershed area of the drainage areas is used to compare the existing and proposed conditions.
- The Natural Resources Conservation Service (NRCS) Web Soil Survey of Essex County defines multiple soils in the project area as 655, Udorthents, wet substrate (Hydrologic Soil Group not rated). A Preliminary Geotechnical Study completed by Intertek Professional Service Industries (PSI) on February 08,2023 indicates that the upper layer consists of fill containing course sand, gravel and silt. The underlying layers consists of glacial till containing fine to coarse sand, some gravel and little to some silt. Soil testing was conducted by Hancock Associates and the two test pits confirm that the subsoil consists of sand.

Two design analysis points have been modeled to represent the pre and post development watershed:

- Design Point DP1 defines the curb line of Linden Street along the front of the property (west)
- Design Point DP2 defines the bordering vegetated wetlands at the rear of the site (east)

The following sub catchments define the watershed of the Pre-development condition of the Phase 1 work area:

Subcatchment EX1 is comprised of single story buildings, asphalt parking lot, asphalt walkways, concrete steps and landings, landscaped grassed lawns, and wooded areas. Stormwater flows overland to DP1 and is comprised of sheet flow and shallow concentrated flow.

Subcatchment EX2 is comprised of single story buildings, asphalt walkways, concrete steps and landings, landscaped grassed lawns, and wooded areas. Stormwater flows overland to DP2 and is comprised of sheet flow and shallow concentrated flow.

Subcatchment EX3 is situated on HSG 'D' soils and is comprised of single story buildings, asphalt parking lot, asphalt walkways, concrete steps and landings, landscaped grassed lawns, and wooded areas. Stormwater flows overland to DP1 and is comprised of sheet flow and shallow concentrated flow.

Subcatchment BLD is comprised of all building roofs. Stormwater flows via pipes to DP1.

The following sub catchments define the watershed of the Post-development condition of the Phase 1 work area:

Subcatchment P1 consists of the area at rear (east) of the building and to the north of the building that drains to DP2. The area is comprised of woods, non grazed meadow, and P1A and P1B. P1A consists of landscaped area and concrete sidewalk directly adjacent to the rear (east) side of the building. Stormwater flows overland to the stone infiltration trench (Pond 7P) which infiltrates runoff. P1B consists of the rear patio constructed from permeable pavers. All Stormwater is infiltrated through the subsurface storage below the pavers (Pond 5P).

Subcatchment P2A consists of the area that infiltrates into the upper section (Pond 1P) of the pervious pavement fire access driveway on the northeastern side of the building. The area is comprised of concrete walkway, pervious pavement, and landscape/meadow. Overflow from the system drains to subcatchment P2B via a perforated pipe underdrain or sheet flow over the pervious pavement.

Subcatchment P2B consists of the area that infiltrates into the lower section (Pond 2P & 3P) of the pervious pavement fire access driveway on the northwestern side of the building. The area is comprised of concrete

walkway, pervious pavement, and landscape/meadow. Overflow from the system drains to infiltration system 1 (IS1) via an overflow pipe or sheet flow over the pervious pavement to DP1.

Subcatchment P3-P4 consists of the northern parking lot. Stormwater sheet flows into deep sump catch basin CB1/CB8 and CB2/CB7 respectively which then flows into SC-310 infiltration system 1 (Pond IS1). Overflow from the system drains to DP1 (only in the 100 year storm event). The area is comprised of concrete walkway, bituminous concrete parking lot, and landscaped areas.

Subcatchment P5-P6 consists of the southern parking lot and entrance driveway/circle. Stormwater sheet flows into deep sump catch basins CB3, and CB4 respectively, which then flows into SC-310 infiltration system 2 (Pond IS2). Overflow from the system drains to DP1. The areas are comprised of concrete walkway, bituminous concrete parking lot, and landscaped areas.

Subcatchment P7 consists of the area between the southern parking lot and the southeastern portion of the building. Stormwater flows into a shallow rain garden which also received overflow water from southern pervious driveway underdrains. Catch basin CB5 drains excess stormwater to SC-310 System 2 (IS2). The area is comprised of landscaped areas.

Subcatchment P8 consists of the area on the southwestern side of the building that infiltrates into the stone reservoir (Pond 4P) located under the pervious asphalt driveway Overflow from the system drains to the rain garden and CB5 via an overflow pipe. The area is comprised of concrete walkway, permeable pavement, and landscaped areas.

Subcatchment P9 consists of the area abutting Linden Street that does not enter any of the infiltration systems. Overflow from the system drains to DP1. The area is comprised of concrete walkway, permeable paved driveway, and grassed landscaped areas.

Subcatchments B1A & B1B consist of roof area which discharge to Infiltration system 1 (IS1) & 2 (IS2) respectively.

Table 1: Peak Rates of Runoff

Discharge Point	**Peak Rate (cfs)**							
	2-Year Storm (3.30" Rainfall Depth)		**10-Year Storm** (5.20" Rainfall Depth)		**25-Year Storm** (6.40" Rainfall Depth)		**100-Year Storm** (8.20" Rainfall Depth)	
	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
DP1 (Linden St)	3.31	1.06	6.81	3.36	9.27	4.68	13.16	7.69
DP2 (Wetland)	0.05	0.00	0.75	0.00	1.64	0.13	3.23	0.63

Table 2: Runoff Volume

Discharge Point	**Volume (cf)**							
	2-Year Storm (3.30" Rainfall Depth)		**10-Year Storm** (5.20" Rainfall Depth)		**25-Year Storm** (6.40" Rainfall Depth)		**100-Year Storm** (8.20" Rainfall Depth)	
	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
DP1 (Linden St)	11,658	1,071	22,602	4,626	30,303	7,664	42,573	14,477
DP2 (wetland)	626	0.00	3,568	38	6,300	447	11,291	1,926

Table 3: Base System (Original Design - SPR 8/23/24) peak flow rate and run-off volume for reoccurring storm events

Design Point	Peak Flow Rate (cfs) Flowing Off-Site- Base Design											
	2-Year Storm (3.30" Rainfall Depth)			10-Year Storm (5.20" Rainfall Depth)			25-Year Storm (6.40" Rainfall Depth)			100-Year Storm (8.20" Rainfall Depth)		
	Existing Conditions	Proposed Conditions	% Reduction from existing conditions	Existing Conditions	Proposed Conditions	% Reduction from existing conditions	Existing Conditions	Proposed Conditions	% Reduction from existing conditions	Existing Conditions	Proposed Conditions	% Reduction from existing conditions
DP1 (Linden St)	3.31	3.31	0%	6.81	6.79	0%	9.27	8.9	4%	13.16	11.46	13%
DP2 (Wetland)	0.05	0	100%	0.75	0	100%	1.64	0.01	99%	3.23	0.41	87%

Design Point	Stormwater Volume(cf) flowing off site -Base Design											
	2-Year Storm (3.30" Rainfall Depth)			10-Year Storm (5.20" Rainfall Depth)			25-Year Storm (6.40" Rainfall Depth)			100-Year Storm (8.20" Rainfall Depth)		
	Existing Conditions	Proposed Conditions	% Reduction from existing conditions	Existing Conditions	Proposed Conditions	% Reduction from existing conditions	Existing Conditions	Proposed Conditions	% Reduction from existing conditions	Existing Conditions	Proposed Conditions	% Reduction from existing conditions
DP1 (Linden St)	11,658	3,746	68%	22,602	10,840	52%	30,303	16,453	46%	42,573	26,102	39%
DP2 (wetland)	626	0	100%	3,568	38	99%	6,300	385	94%	11,291	1,715	85%

Table 4: Expanded System and extended fire lanes (rev 2, 10/11/24) peak flow rate and run-off volume for reoccurring storm events

Design Point	Peak Flow Rate (cfs) Flowing Off-Site - Expanded Subsurface System											
	2-Year Storm (3.30" Rainfall Depth)			10-Year Storm (5.20" Rainfall Depth)			25-Year Storm (6.40" Rainfall Depth)			100-Year Storm (8.20" Rainfall Depth)		
	Existing Conditions	Proposed Conditions	% Reduction from existing conditions	Existing Conditions	Proposed Conditions	% Reduction from existing conditions	Existing Conditions	Proposed Conditions	% Reduction from existing conditions	Existing Conditions	Proposed Conditions	% Reduction from existing conditions
DP1 (Linden St)	3.31	1.06	68%	6.81	3.36	51%	9.27	4.68	50%	13.16	7.69	42%
DP2 (Wetland)	0.05	0	100%	0.75	0	100%	1.64	0.013	99%	3.23	0.63	80%

Design Point	Stormwater Volume(cf) flowing off site - Expanded Subsurface System											
	2-Year Storm (3.30" Rainfall Depth)			10-Year Storm (5.20" Rainfall Depth)			25-Year Storm (6.40" Rainfall Depth)			100-Year Storm (8.20" Rainfall Depth)		
	Existing Conditions	Proposed Conditions	% Reduction from existing conditions	Existing Conditions	Proposed Conditions	% Reduction from existing conditions	Existing Conditions	Proposed Conditions	% Reduction from existing conditions	Existing Conditions	Proposed Conditions	% Reduction from existing conditions
DP1 (Linden St)	11,658	1,071	91%	22,602	4,626	80%	30,303	7,664	75%	42,573	14,477	66%
DP2 (wetland)	626	0	100%	3,568	38	99%	6,300	447	93%	11,291	1,926	83%

Standard 3: Recharge

The Massachusetts Stormwater Handbook states that loss of annual recharge to groundwater shall be eliminated or minimized. The annual recharge from the post-development site shall match or exceed the annual recharge from the pre-development conditions based on soil type. Recharge volumes are provided for all the proposed impervious areas. For the purpose of these calculations, all of the project areas are considered to be Hydrologic Soil Group A. The required recharge volume is 1" multiplied by the area of impervious surfaces per Needham Stormwater Regulations 5.2.1.3E. See Appendix VI for the attached HydroCAD summaries for the recharge volumes provided. The volumes is as follows:

Required Recharge Volume, HSG B = Target Depth * Impervious Area = 1"/12" * 66,254 SF = 5,521 CF

This project is a redevelopment by reducing the overall impervious area by introducing landscaped areas and reducing the amount of roof area. This project is also an improvement on the existing condition due to the installation of stormwater management systems on a site where none exist.

Recharge Volumes (volume under lowest outlet)
Subsurface system 1 (IS1): 3,072 cf
Subsurface system 2 (IS2): 1,099 cf
Pervious Pavement (north fire lane 1P,2P,3P): (1304+388+759)=2,451 cf
Pervious Pavement (south fire lane 4P): 250cf
Permeable Pavers (patio back 5P): 516 cf
Permeable Pavers (patios front 6P): 420 cf
Stone Infiltration trench (7P): 480cf
Total recharge volume = 8,120cf>5,521 cf

The total recharge volume is 8,120 cubic feet. Since the volume provided is greater than the required recharge volume, the standard is met. Please refer to the HydroCAD output for Recharge Volumes (Appendix VI) for more information.

The Massachusetts Stormwater Handbook states that the recharge volume must drain within 72 hours. Observations in test pits observed on-site indicate that the soil that the subsurface systems will be installed upon is sand. Please see the attached "Geotechnical Engineering Report" (Appendix VII) and soil test pit information on the pre and post development drainage plans (Appendix IV). The following "drawdown" calculation assumes a Rawl's Rate of 8.27 inches per hour, corresponding to texture class "sand".

Drawdown Time = Storage Volume / (Rawl's Rate * Bottom Area)

Subsurface system 1 (IS1):
= 3,072 CF / (8.27 in/hr * 3,260 SF) = 1.4 Hours
Subsurface system 2 (IS2):
= 1,099 CF / (8.27 in/hr * 1494 SF) = 1.1 Hours
Permeable Pavement (north fire lane 1P,2P,3P):
= 2,451 CF / (8.27 in/hr * 5,185 SF) = 0.7 Hours
Permeable Pavement (south fire lane 4P):
= 250 CF / (8.27 in/hr * 4666 SF) = 0.1 Hours
Permeable Pavement (patio back 5P):
= 516 CF / (8.27 in/hr * 1,720 SF) = 0.4 Hours
Permeable pavement (patio front 6P):
= 420 CF / (8.27 in/hr * 400 SF) = 1.5 Hours
Stone Infiltration trench (7P)
= 480 CF / (8.27 in/hr * 600 SF) = 1.2 Hours
Since the drawdown time of all infiltration practices is less than 72 hours, the requirement is met.

Standard 4: Water Quality

The Massachusetts Stormwater Handbook states that systems shall be designed to remove 80% of the average annual post-development construction load of Total Suspended Solids (TSS).
Stormwater runoff from vehicular paved areas will be treated to the required TSS removal via deep sump hooded catch basins, SC=310 treatment rows, and permeable pavers. The treatment train computation is as follows:

Table 2A: Treatment Train Calculation: SC-310

BMP	**TSS Removal Rate**	**Starting TSS Load**	**Amount Removed**	**Remaining Load**
Deep sump catch basin	0.25	1	.25	.75
Total TSS Pretreatment				75%
SC-310	0.80	.75	0.6	0.15
Total TSS Removal				85%
Total Phosphorus removal				68%

Table 2B: Treatment Train Calculation: Permeable Pavers

BMP	**TSS Removal Rate**	**Starting TSS Load**	**Amount Removed**	**Remaining Load**
Grassed Filter Strips	0.1	1	.1	.90
Street Sweeping	0.1	.9	.9	.81
Total TSS Pretreatment				19%
Permeable paver/Infiltration Trench	0.80	.81	0.65	0.16
Total TSS Removal				84%
Total Phosphorus removal				70%

Water Quality Volume Calculations

Standard 4 requires a certain amount of stormwater to be infiltrated to remove sediment and nutrients from stormwater runoff.

WQV = (A)*1in.

Where:

A = impervious surface drainage area (in square feet)
WQV = water quality volume in watershed inches (1-inch in within an area of infiltration >2.4”/hr)

Subsurface System 1 (IS1)
WQV = (30,525)(1 inch.) (1ft / 12inches)
WQV = 2,543 CF (3,072 cf provided below the lowest outlet)

Subsurface System 2 (IS2)
WQV = (30,237)(1 inch.) (1ft / 12inches)
WQV = 2,520 CF (3,043cf infiltrated in the 1.6” storm, 0cf discharge from system)

Back patio (No impervious area)

Front patio (No impervious area)

Permeable Pavement (drive right 1P,2P,3P):
WQV = (2,150)(1 inch.) (1ft / 12inches)
WQV = 180 CF (2,451 cf of storage below the lowest outlet)

Permeable Pavement (drive left 4P):
WQV = (1020 SF)(1 inch.) (1ft / 12inches)
WQV = 85 CF (250 cf of storage below the lowest outlet)

Stone Infiltration Trench (7P)
WQV = (3,700 SF)(1 inch.) (1ft / 12inches)
WQV = 308 CF (480 cf of storage below the lowest outlet)

All of the systems provide more storage volume than the required calculated water quality volume; therefore, the requirement is met.

Standard 5: Land Uses with Higher Potential Pollutant Loads

This site will not be considered a Land Use with Higher Potential Pollutant Load since it will not have more than 1000 vehicle trips per day and will not have any industrial use.

Standard 6: Critical Area

The proposed project is not within a critical area.

Standard 7: Redevelopment

The proposed project is a redevelopment. The project aims to develop the existing degraded single story residential buildings into a multi-unit residential building serviced by ADA compliant parking and sidewalks. In doing so, the project will reduce the amount of impervious area, create landscaping/open space, and provide stormwater infiltration systems where none currently exist. This project intends to comply with all the Massachusetts Stormwater Standards to the maximum extent practicable.

Standard 8: Construction Period Pollution Prevention and Erosion & Sedimentation Control

Best management practices (BMP) for erosion and sedimentation control are staked compost wattles, hydro seeding, construction entrance, catch basin sediment sacks, and phased development. Many stormwater BMP technologies (e.g., infiltration systems) are not designed to handle the high concentrations of sediments typically found in construction runoff and must be protected from construction-related sediment loadings. Construction BMP's must be maintained. In developing the proposed project, certain measures will be implemented to minimize impacts erosion and sedimentation could have on surrounding areas. This section addresses items that involve proper construction techniques, close surveillance of workmanship, and immediate response to emergency situations. The developer must be prepared to provide whatever reasonable measures are necessary to protect the environment during construction and to stabilize all disturbed areas as soon as construction ends. Construction period pollution prevention and erosion and sediment control shall meet the requirements for the 2022 EPA Construction General Permit for all projects requiring coverage under the CGP.

Pre-Construction

1. The contractor shall have a stockpile of materials required to control erosion on-site to be used to supplement or repair erosion control devices. These materials shall include, but are not limited to, wattles and crushed stone.
2. The contractor is responsible for erosion control on site and shall utilize erosion control measures where needed, regardless of whether the measures are specified on the plan or in the order of conditions.

Preliminary Site Work

1. Excavated materials should be stockpiled, separating the topsoil for future use on the site. Erosion control shall be utilized along the down slope side of the piles and side slopes shall not exceed 2:1.
2. If intense rainfall is anticipated, the installation of supplemental straw bale dikes, silt fences, or armored dikes shall be considered.
3. Unsuitable excavated material shall be removed from the site.
4. Construction entrance shall be installed.
5. Existing catchbasins shall be protected with silt sacks.

Ongoing Site Work

1. Erosion control measures shall be regularly inspected and replaced as needed.
2. Dewatering shall be done in a manner so as not to transmit silt, sand or particulate matter to the receiving water or existing drainage system.
3. Concrete washout shall be contained on site and runoff from washout areas shall be prevented.

Landscaping

1. Landscaping shall occur as soon as possible to provide permanent stabilization of disturbed surfaces.
2. If the season or adverse weather conditions do not allow the establishment of vegetation, temporary mulching with straw, wood chips weighted with snow fence or branches, or other methods shall be provided.
3. A minimum of 4 inches of topsoil shall be placed and its surface smoothed to the specified grades.
4. The use of herbicides is strongly discouraged.
5. Hydro seeding is encouraged for steep slopes. Application rates on slopes greater than 3:1 shall have a minimum seeding rate of 5-lbs/1000 SF. A latex or fiber tackifier shall be used on these slopes at a minimum rate of 50 lbs. of tackifier per 500 gallons of water used.

Standard 9: Operations and Maintenance Plan

The information provided herein is intended to provide the base information for operation and maintenance of the site in perpetuity subject to updates and revisions as required at a future date. As such all future property owners must be notified in writing of this plan and be provided with a copy of this plan, a complete set of the design drawings and/or a completed as-built plan showing all the drainage features as they were constructed, which are considered part of this document. Please see the attached Operations and Maintenance Log (Table 3).

Stormwater management system owner:	Needham Housing Authority
The party responsible for operation and maintenance:	Needham Housing Authority

Preliminary Stormwater Operation and Maintenance Budget

Quarterly Inspection and Maintenance x $2,500 per visit = $10,000 annually

Illicit Discharge - Practices to Minimize Storm Water Contamination

- All waste materials will be collected and stored in a securely lidded metal dumpster.
- All trash and debris from the site will be deposited in the dumpster. The dumpster will be emptied on a regular schedule prior to being over full.
- All personnel will be instructed regarding the correct procedure for waste disposal.
- Good housekeeping and spill control practices will be followed to minimize storm water contamination from petroleum products, paints, and cleaning products.
- All site vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage.
- Spill kits will be provided with any activity that could provide contamination.
- All paint containers and curing compounds will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewers but will be properly disposed of according to the manufacturer's instructions.
- All spills will be cleaned up immediately upon discovery. Spills large enough to reach the storm sewers will be reported to the Massachusetts Department of Environmental Protection Northeast Regional Office at 1-888-304-1133.

Subsurface Infiltration Systems IS1 and IS2

The infiltration BMP (subsurface SC-310 chamber system) shall be inspected after every major storm for the first few months to ensure it is stabilized and functioning properly. If necessary, corrective action shall be taken until the system functions properly. Inspectors should note how long water remains standing in the inspection port after a storm; standing water within the basin 48 to 72 hours after a storm indicates that the infiltration capacity may have been overestimated. If the ponding is due to clogging, immediately address the reasons for the clogging. Thereafter, inspect the infiltration BMP at least twice per year.

Pervious Pavement

The infiltration BMP shall be inspected after every major storm for the first few months to ensure it is stabilized and functioning properly. If necessary, corrective action shall be taken until the system functions properly. Inspectors should note how long water remains standing in the inspection port after a storm; standing water within the underdrains 48 to 72 hours after a storm indicates that the infiltration capacity may have been overestimated. If the ponding is due to clogging, immediately address the reasons for the clogging. Thereafter, inspect the infiltration BMP at least twice per year. Sanding is not allowed over pervious pavement. Vacuum sweep the surface bi-annually.

Deep Sump Hooded Catch Basins

Inspect deep sump catch basins four times per year including the end of the foliage and snow removal seasons. Sediments must also be removed four times per year or when the depth of deposits is greater than or equal to one half the depth of the sump. Vacuum trucks are to be used to remove trapped sediment and supernatant.
Although catch basin debris often contains concentrations of oil and hazardous materials such as petroleum hydrocarbons and metals, MassDEP classifies them as solid waste. Any contaminated materials must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.00, and handled as hazardous waste. MassDEP regulations prohibit landfills from accepting materials that contain free draining liquids.

Roof Drain Leaders

Routine roof inspections shall be performed two times per year. The roof shall be kept clean and free of debris, and the roof drainage systems shall be kept clear. Gutters, downspouts, and roof grates/inlets shall be cleaned at least twice per year, or more frequently as necessary.

Vegetated Areas Maintenance

Although not a structural component of the drainage system, the maintenance of vegetated areas may affect the functioning of stormwater management practices. This includes the health/density of vegetative cover and activities such as the application and disposal of lawn and garden care products, disposal of leaves and yard trimmings.

Initial Post-Construction Inspection

During the initial period of vegetation establishment pruning and weeding are required twice in first year by contractor or owner. Any dead vegetation/plantings found after the first year will be replaced. Proper mulching is mandatory and regular watering may be required initially to ensure proper establishment of new vegetation.

Long-Term Maintenance

The planted areas shall be inspected on a semi-annual basis and any litter removed. Weeds and invasive plant species shall be removed by hand. Maintain planted areas adjacent to pavement to prevent soil washout. Immediately clean any soil deposits on pavement. Leaf litter and other detritus shall be removed twice per year. If needed to maintain aesthetic appearance, perennial plantings may be trimmed at the end of the growing season.

Trees and shrubs shall be inspected twice per year to evaluate health and attended to as necessary. Seeded ground cover or grass areas shall not receive mulching. Re-seed bare areas; install appropriate erosion control measures when native soil is exposed or erosion channels are forming. Plant alternative mixtures of grass species in the event of unsuccessful establishment. The grass vegetation should not be cut to a height less than four inches.

Pesticide/Herbicide Usage

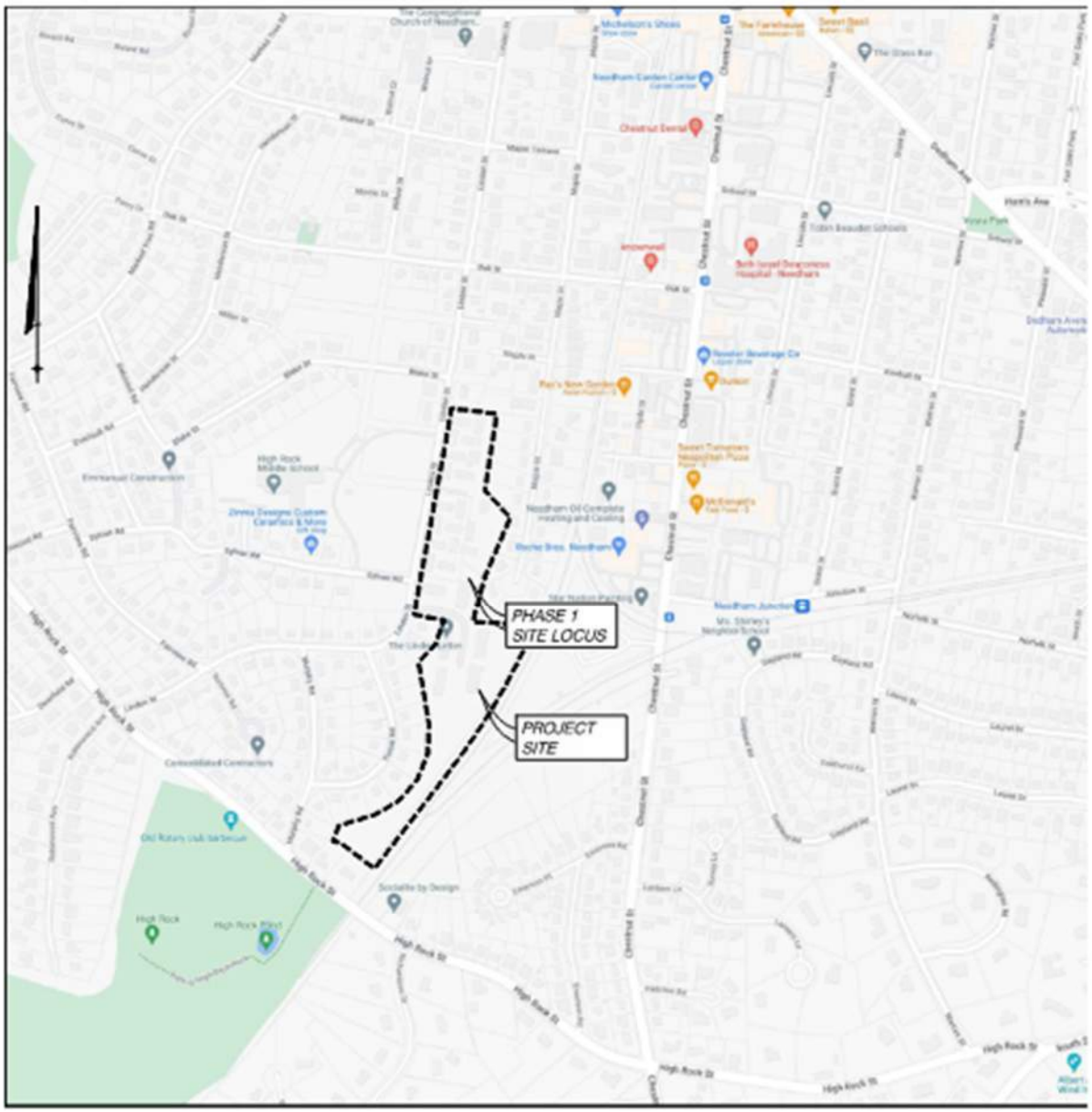
No pesticides are to be used unless a single spot treatment is required for a specific control application.

Structural Best Management Practice	Action	Date Completed	Completed By	Comments
Infiltration Systems - Inspect twice per year. Clean as required	Inspect/repair/ clean			
Roof Drain Leaders – Inspect/clean twice per year.	Inspect/Clean			
Pervious Pavement. Inspect twice per year. Vacuum sweep Bi-annually. Clean underdrain as required	Inspect/maintain			
Deep Sump Catch Basins/Outlet Control structures– Inspect/clean four times per year. Clean when sump is 50% full.	Inspect/Clean			
Vegetated Areas Maintenance – Inspect twice per year. Maintain as required.	Inspect			
	Inspect			

Standard 10: Prohibition of Illicit Discharges

No illicit discharges currently exist and no future illicit discharges will be allowed including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, soil, or grease.

Appendix I Locus Map



LOCUS MAP
SCALE: 1" = 1000'

Appendix II NCRS Soils Map

Appendix III FEMA Firmette

MASSACHUSETTS STATE PLANE COORDINATE SYSTEM (NAD 83)

HYDROLOGIC SOIL GROUP B

HYDROLOGIC SOIL GROUP D

EX1

EX2

EX3

DP1

DP2

#186 1-STORY BRICK

#180 1-STORY BRICK

#170 1-STORY BRICK

#166 1-STORY BRICK

#188 1-STORY BRICK

#182 1-STORY BRICK

#172 1-STORY BRICK

#168 1-STORY BRICK

#184 1-STORY BRICK

#174 1-STORY BRICK

#156 1-STORY BRICK

#158 1-STORY BRICK

#152 1-STORY BRICK

#144 1-STORY BRICK

#146 1-STORY BRICK

#140 1-STORY BRICK

#138 1-STORY BRICK

BUILDING OVERHANG (TYP.)

CONC. RAMP

RET. WALL

PLANTER

CLOTHES LINE

HOOD SHED

THE 199-201 MAPLE STREET CONDOMINIUM
DEED BOOK 21391, PAGE 22
PLAN BOOK 525, PAGE 30

PAUL D. BORRELLI
DEED BOOK 6369, PAGE 131
PLAN NO. 1059 OF 1963

169-171 MAPLE STREET CONDOMINIUM
DEED BOOK 20520, PAGE 11
PLAN BOOK 518, PAGE 52

PAUL D. BORRELLI
DEED BOOK 9245, PAGE 461
PLAN NO. 1059 OF 1963

EV-ELMVIEW REALTY, LLC
DEED BOOK 36138, PAGE 8
PLAN NO. 738 OF 1961

JOHN M. & KIM E. McAWARD
DEED BOOK 11024, PAGE 275
PLAN BOOK 3910, PAGE 427

TOWN OF NEEDHAM

SCALE: 1" = 20'

0 20 40 80

NOT FOR CONSTRUCTION - PERMITTING USE ONLY

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5/6/2024 2:45:36 PM Author

ARCHITECT

bh+a

Bargmann Hendrie + Archetype, Inc.
9 Channel Center Street, Suite 300
Boston, MA 02210
(617) 350 0450

PROJECT NAME

Linden Street Redevelopment

138-188 Linden St, Needham MA, 0249
Assessor's Map:
199/133-23-00
199/133-24-00
199/134-41-00

CLIENT

Needham Housing Authority

21 Highland Circle,
Needham, MA, 02494

PROJECT TEAM

Civil Engineer
Hancock Associates
121 East Berkeley Street, 4th Floor
Boston, MA 02118
617.357.8145

Landscape Architect
Ground Landscape Inc.
285 Washington Street, Unit G
Somerville, MA 02143
617.718.0889

Structural Engineer
RSE Associates Inc.
63 Pleasant Street, Suite 300
Watertown, MA 02472
617.926.9300

MEP/FP Engineer
NV5
200 Brickstone Square
Andover, MA 01810
978.296.6219

REVISIONS

#	COMMENT/DESCRIPTION	DATE
2	NFD COMMENTS	10/11/2
1	SPR COMMENTS	10/8/2

DRAWING TITLE

PRE-DEVELOPMEN DRAINAGE PLAN

DRAWING INFORMATION

08/23/2024
DATE OF ISSUE

50% DESIGN DEVELOPMENT
DESCRIPTION

SCALE

OMR
DRAWN BY

26774
PROJECT #

FILE NAME

DRAWING NUMBER

EX1

SHEET NUMBER OF 7

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MASSACHUSETTS STATE PLANE COORDINATE SYSTEM (NAD 83)

HYDROLOGIC SOIL GROUP B

HYDROLOGIC SOIL GROUP D

LINDEN STREET
(PUBLIC - 40' WIDE)

TOWN OF NEEDHAM

P1 P1A P1B P2A P2B P3 P4 P5 P6 P7 P8 P9 B1A B1B DP1 DP2

THE 199-201 MAPLE STREET CONDOMINIUM
DEED BOOK 21391, PAGE 23
PLAN BOOK 322, PAGE 30

PAUL D. BORRELLI
DEED BOOK 6369, PAGE 131
PLAN NO. 1059 OF 1963

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DEED BOOK 36138, PAGE 8
PLAN NO. 738 OF 1961

JOHN M. & KIM E. McAWARD
DEED BOOK 11024, PAGE 275
PLAN BOOK 3910, PAGE 427

NOTES:
1. LOCATION OF ALL EXISTING AND PROPOSED SERVICES MUST BE CONFIRMED IN THE FIELD PRIOR TO CONSTRUCTION. ALL DISCREPANCIES MUST BE REPORTED TO THE ENGINEER.
2. ALL UTILITIES AND SERVICES WITHIN LIMITS OF DISTURBANCES SHALL BE VERTICALLY AND HORIZONTALLY LOCATED.
3. CONTRACTOR TO COMPLY WITH UTILITY NOTIFICATION REQUIREMENTS.
4. ALL NEW UTILITIES/SERVICES ARE TO BE INSTALLED UNDERGROUND

LEGEND

	EXISTING	PROPOSED
DRAIN MANHOLE	ⓓ	ⓓ
CATCH BASIN	▦	▦
DRAIN PIPE	—SD—	—SD—
CONTOUR	— — — —	—○—
BORE LOCATION	◓	

SCALE: 1" = 20'

0 20 40 80

NOT FOR CONSTRUCTION - PERMITTING USE ONLY

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Author
5/6/2024 12:45:36 PM

ARCHITECT
bh+a
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Boston, MA 02210
(617) 350 0450

PROJECT NAME
Linden Street Redevelopment
138-188 Linden St, Needham MA, 02494
Assessor's Map:
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63 Pleasant Street, Suite 300
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617.926.9300

MEP/FP Engineer
NV5
200 Brickstone Square
Andover, MA 01810
978.296.6219

REVISIONS

#	COMMENT/DESCRIPTION	DATE
2	NFD COMMENTS	10/11/2024
1	SPR COMMENTS	10/08/2024

DRAWING TITLE
POST-DEVELOPMENT DRAINAGE PLAN

DRAWING INFORMATION
08/23/2024 DATE OF ISSUE
50% DESIGN DEVELOPMENT DESCRIPTION
SCALE
OMR DRAWN BY
26774 PROJECT #
FILE NAME

DRAWING NUMBER
PR1
SHEET NUMBER OF 7

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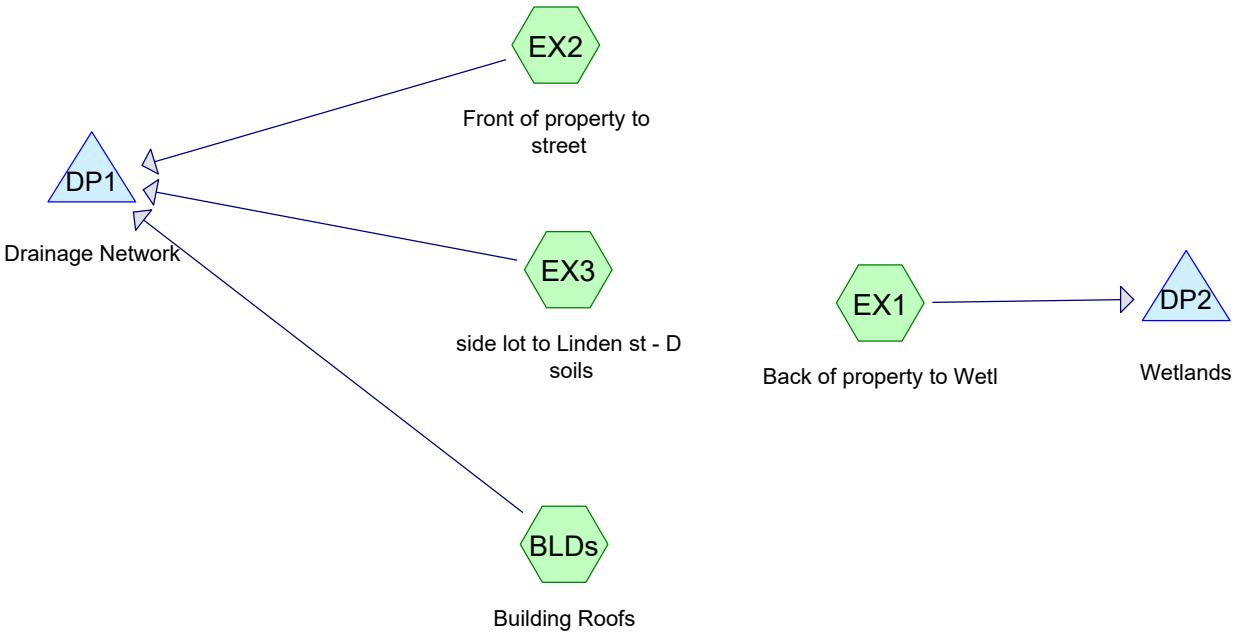
Appendix V HydroCAD Output



Subcat Reach Pond Link

Routing Diagram for 2024-05-07_Pre-Development
Prepared by Hancock Associates, Printed 8/16/2024
HydroCAD® 10.20-3g s/n 00711 © 2023 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 year	Type III 24-hr		Default	24.00	1	3.30	2
2	10 yr	Type III 24-hr		Default	24.00	1	5.20	2
3	25 yr	Type III 24-hr		Default	24.00	1	6.40	2
4	100 yr	Type III 24-hr		Default	24.00	1	8.20	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
67,987	39	>75% Grass cover, Good, HSG A (EX1, EX2)
4,620	80	>75% Grass cover, Good, HSG D (EX3)
39,660	98	Paved parking, HSG A (EX1, EX2)
355	98	Paved parking, HSG D (EX3)
36,050	98	Unconnected roofs, HSG A (BLDs)
19,150	30	Woods, Good, HSG A (EX1)
167,822	**66**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
162,847	HSG A	BLDs, EX1, EX2
0	HSG B	
0	HSG C	
4,975	HSG D	EX3
0	Other	
167,822		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
67,987	0	0	4,620	0	72,607	>75% Grass cover, Good	
39,660	0	0	355	0	40,015	Paved parking	
36,050	0	0	0	0	36,050	Unconnected roofs	
19,150	0	0	0	0	19,150	Woods, Good	
162,847	**0**	**0**	**4,975**	**0**	**167,822**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentBLDs: Building Roofs Runoff Area=36,050 sf 100.00% Impervious Runoff Depth>2.87"
Tc=6.0 min CN=98 Runoff=2.59 cfs 8,608 cf

SubcatchmentEX1: Back of property to Runoff Area=63,035 sf 22.78% Impervious Runoff Depth>0.12"
Flow Length=143' Slope=0.0100 '/' Tc=9.7 min CN=50 Runoff=0.05 cfs 626 cf

SubcatchmentEX2: Front of property to Runoff Area=63,762 sf 39.68% Impervious Runoff Depth>0.46"
Tc=6.0 min CN=62 Runoff=0.63 cfs 2,455 cf

SubcatchmentEX3: side lot to Linden st - D Runoff Area=4,975 sf 7.14% Impervious Runoff Depth>1.44"
Tc=0.0 min CN=81 Runoff=0.24 cfs 596 cf

Pond DP1: Drainage Network Inflow=3.31 cfs 11,658 cf
Primary=3.31 cfs 11,658 cf

Pond DP2: Wetlands Inflow=0.05 cfs 626 cf
Primary=0.05 cfs 626 cf

Total Runoff Area = 167,822 sf Runoff Volume = 12,284 cf Average Runoff Depth = 0.88"
54.68% Pervious = 91,757 sf 45.32% Impervious = 76,065 sf

Summary for Subcatchment BLDs: Building Roofs

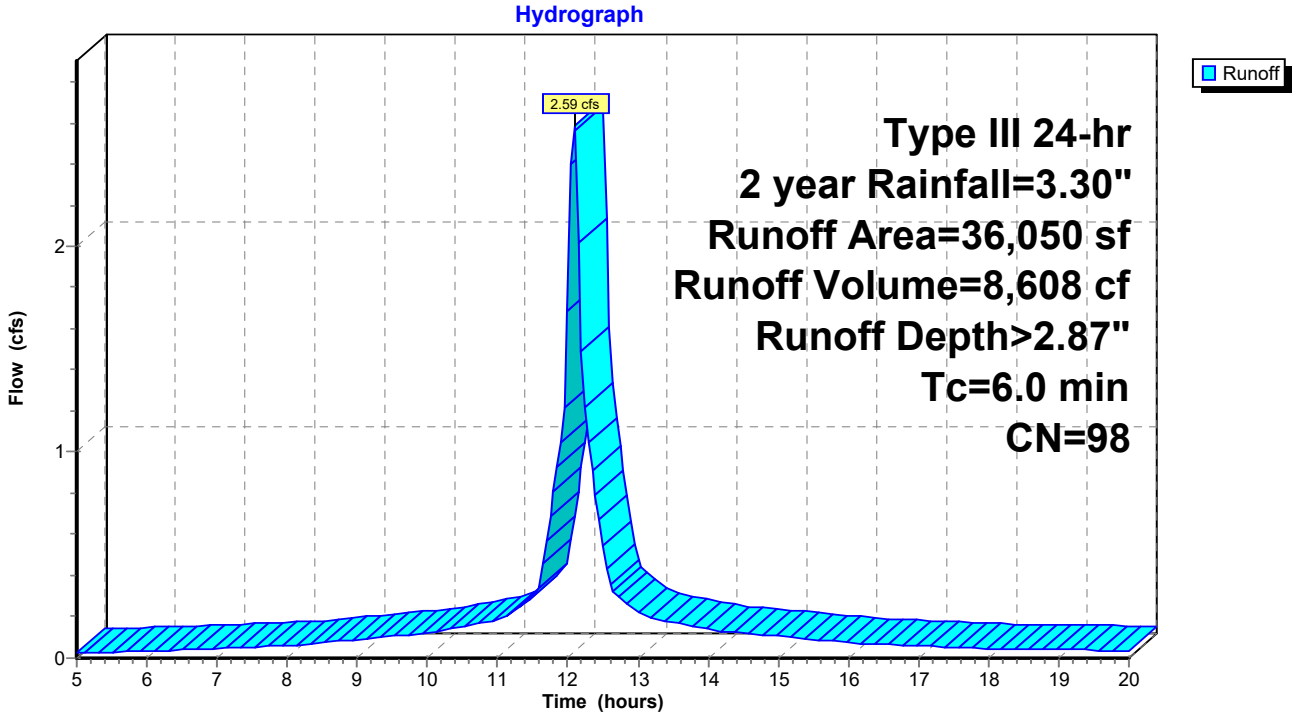
Runoff = 2.59 cfs @ 12.09 hrs, Volume= 8,608 cf, Depth> 2.87"
Routed to Pond DP1 : Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

Area (sf)	CN	Description
36,050	98	Unconnected roofs, HSG A
36,050		100.00% Impervious Area
36,050		100.00% Unconnected

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

Subcatchment BLDs: Building Roofs



Summary for Subcatchment EX1: Back of property to Wetl

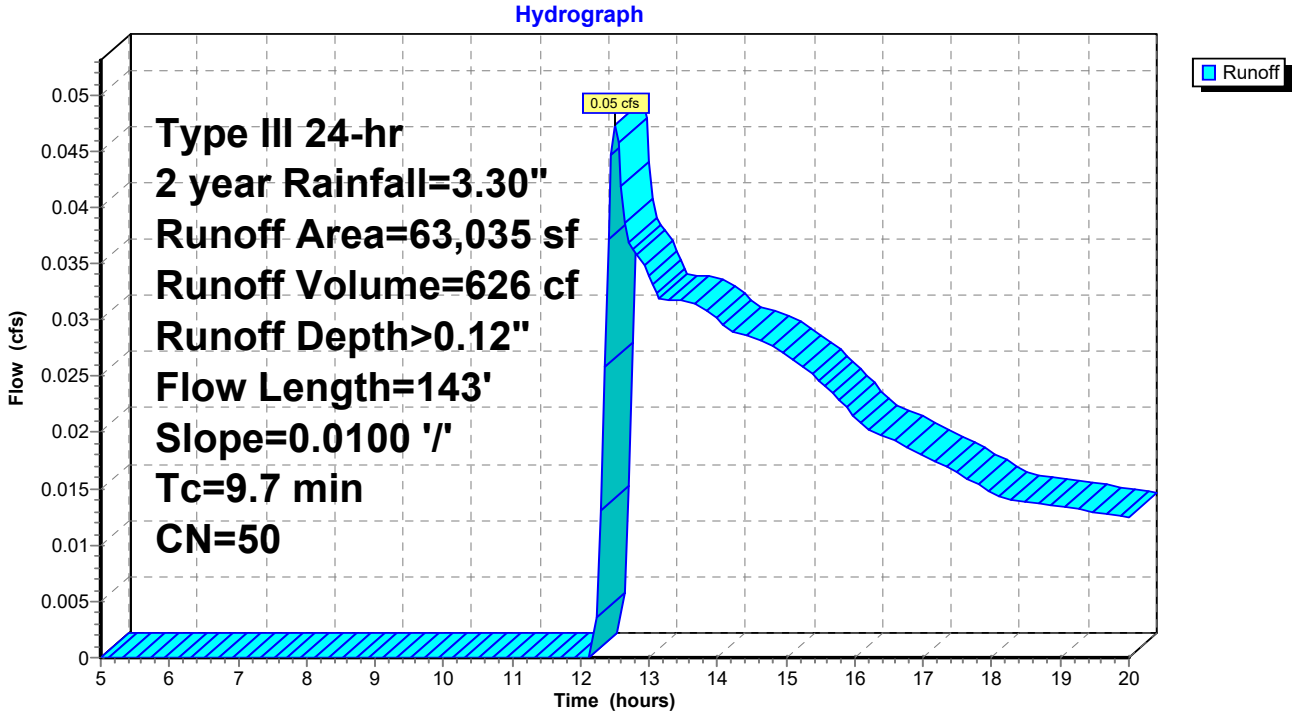
Runoff = 0.05 cfs @ 12.51 hrs, Volume= 626 cf, Depth> 0.12"
Routed to Pond DP2 : Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

Area (sf)	CN	Description
19,150	30	Woods, Good, HSG A
14,360	98	Paved parking, HSG A
29,525	39	>75% Grass cover, Good, HSG A
63,035	50	Weighted Average
48,675		77.22% Pervious Area
14,360		22.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
1.7	73	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	20	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.7	143	Total			

Subcatchment EX1: Back of property to Wetl



Summary for Subcatchment EX2: Front of property to street

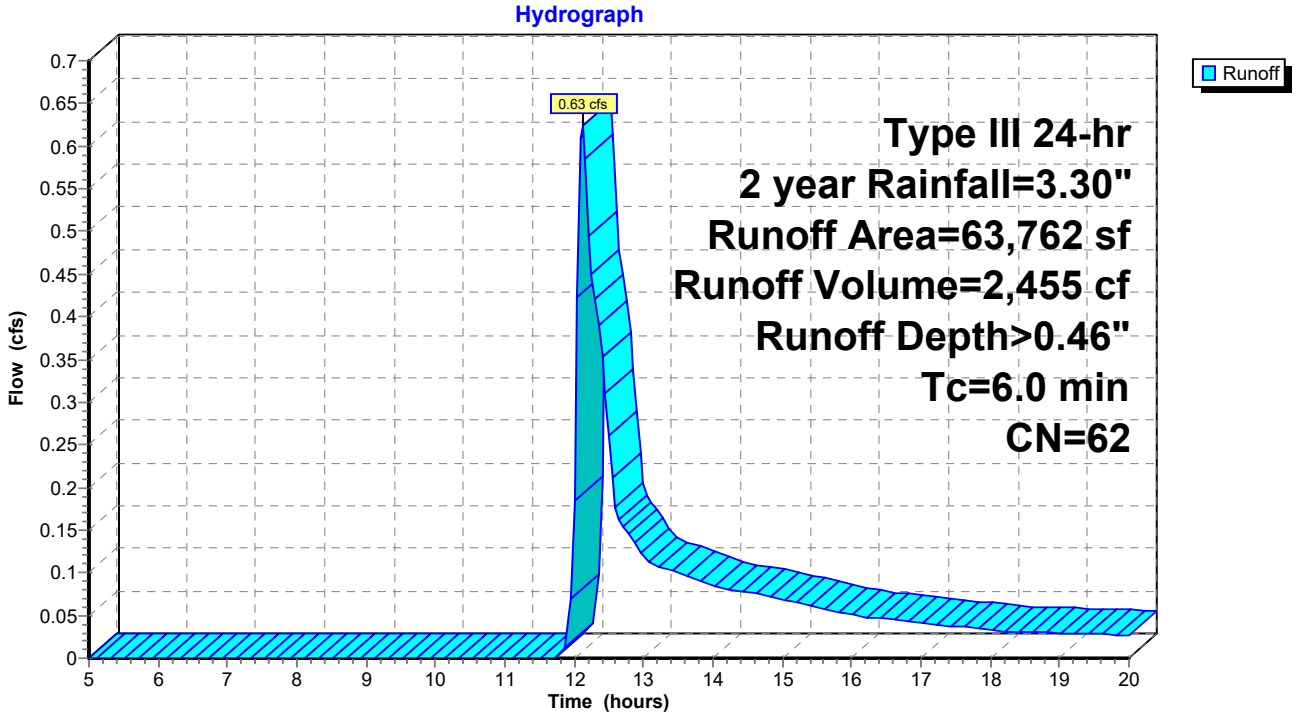
Runoff = 0.63 cfs @ 12.12 hrs, Volume= 2,455 cf, Depth> 0.46"
Routed to Pond DP1 : Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

Area (sf)	CN	Description
38,462	39	>75% Grass cover, Good, HSG A
25,300	98	Paved parking, HSG A
63,762	62	Weighted Average
38,462		60.32% Pervious Area
25,300		39.68% Impervious Area

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

Subcatchment EX2: Front of property to street



Summary for Subcatchment EX3: side lot to Linden st - D soils

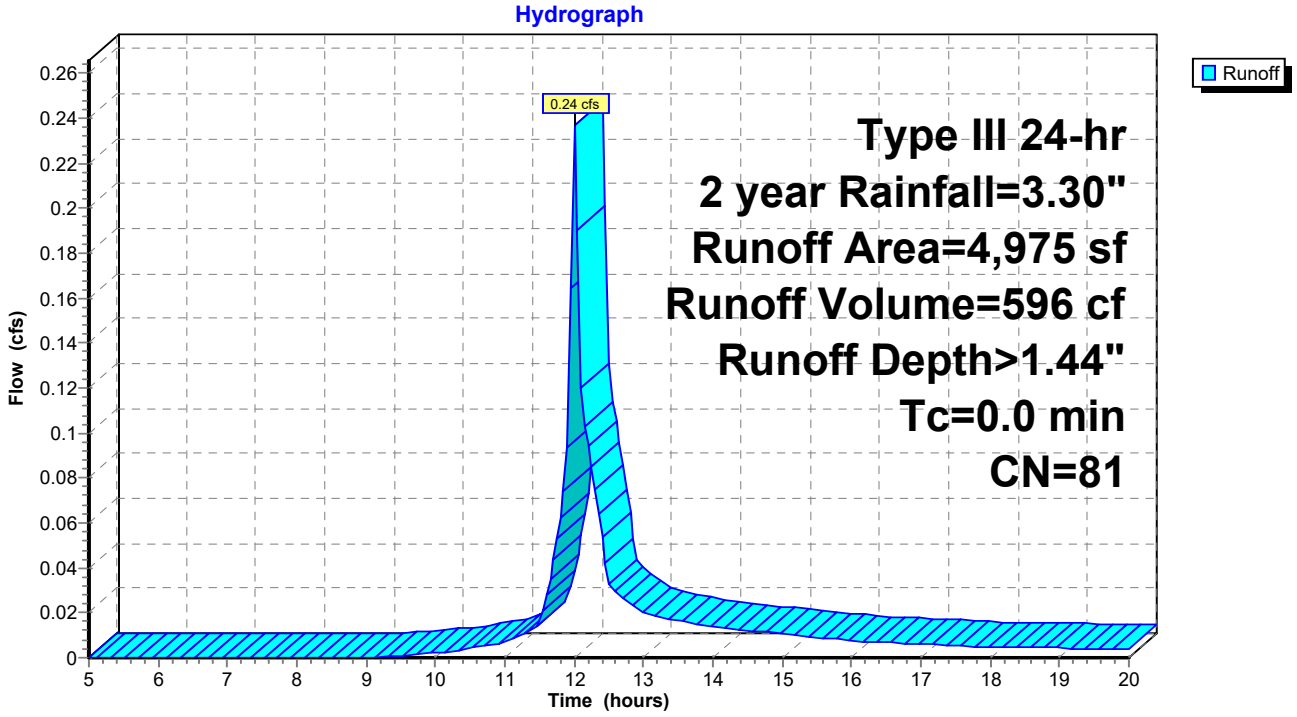
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.24 cfs @ 12.01 hrs, Volume= 596 cf, Depth> 1.44"
Routed to Pond DP1 : Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

Area (sf)	CN	Description
355	98	Paved parking, HSG D
4,620	80	>75% Grass cover, Good, HSG D
4,975	81	Weighted Average
4,620		92.86% Pervious Area
355		7.14% Impervious Area

Subcatchment EX3: side lot to Linden st - D soils



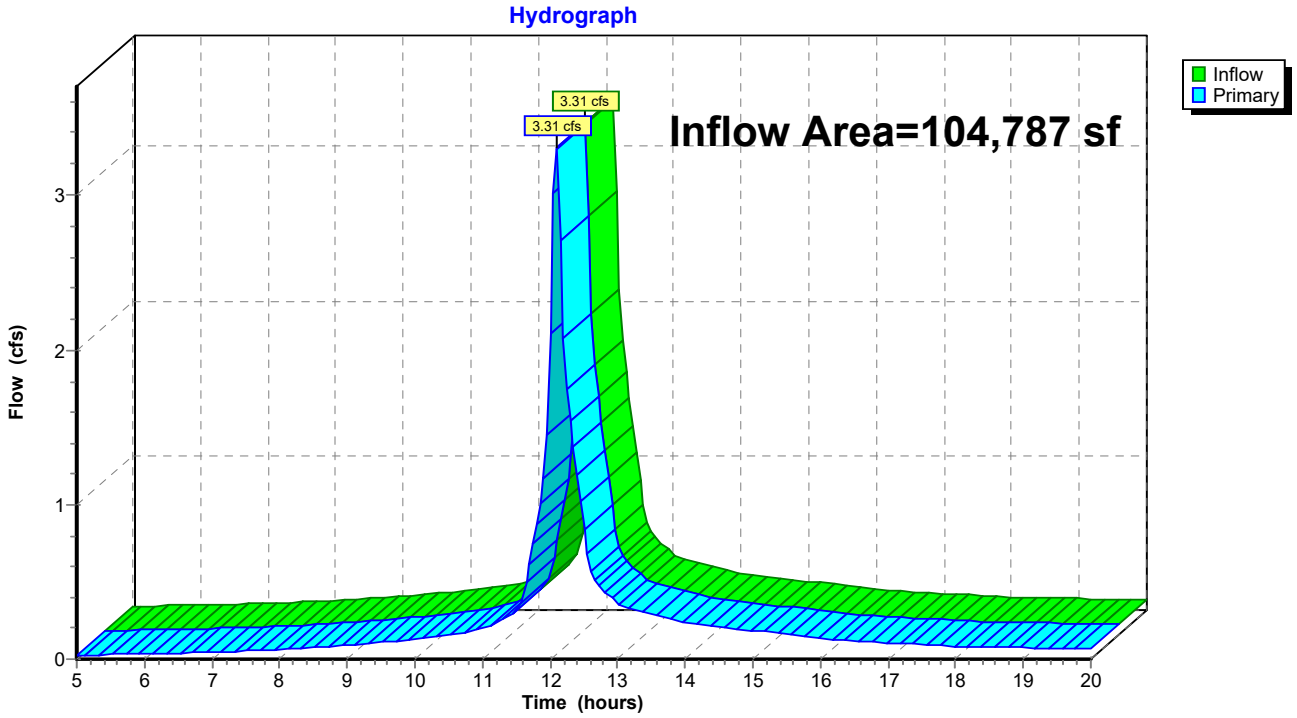
Summary for Pond DP1: Drainage Network

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 104,787 sf, 58.89% Impervious, Inflow Depth > 1.34" for 2 year event
Inflow = 3.31 cfs @ 12.09 hrs, Volume= 11,658 cf
Primary = 3.31 cfs @ 12.09 hrs, Volume= 11,658 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond DP1: Drainage Network



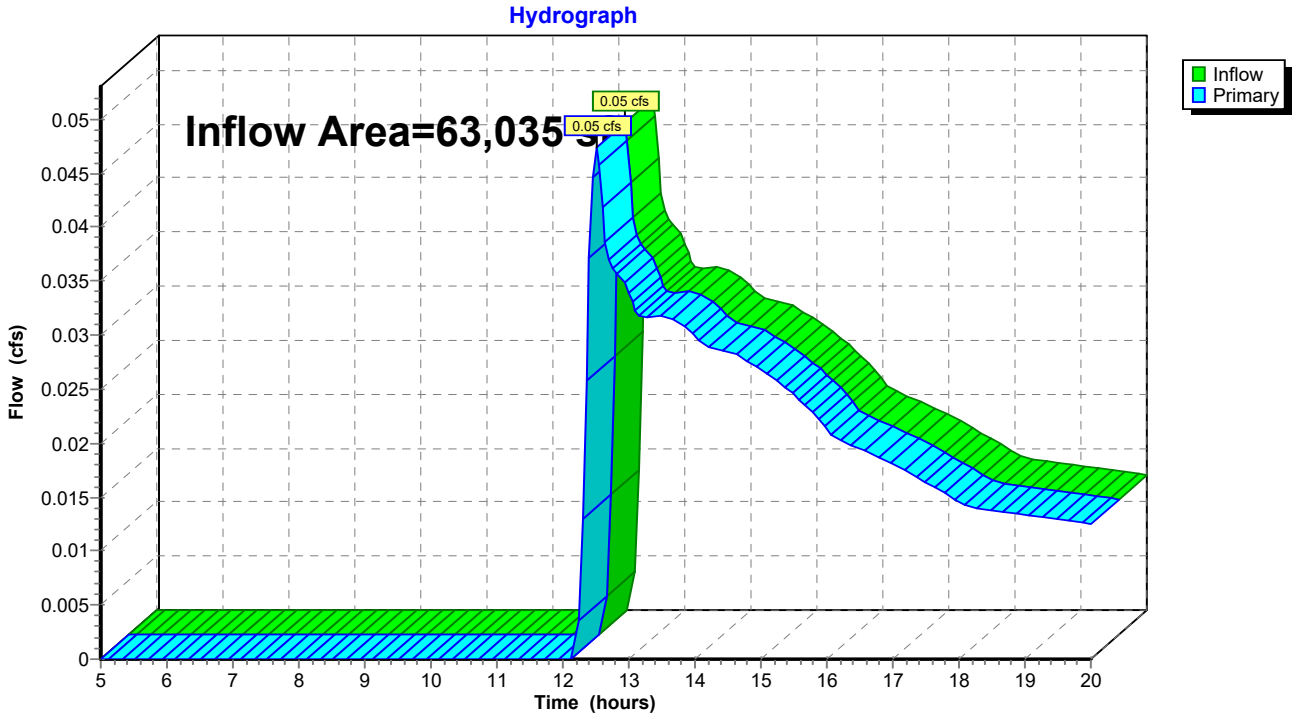
Summary for Pond DP2: Wetlands

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 63,035 sf, 22.78% Impervious, Inflow Depth > 0.12" for 2 year event
Inflow = 0.05 cfs @ 12.51 hrs, Volume= 626 cf
Primary = 0.05 cfs @ 12.51 hrs, Volume= 626 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond DP2: Wetlands



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentBLDs: Building Roofs Runoff Area=36,050 sf 100.00% Impervious Runoff Depth>4.60"
Tc=6.0 min CN=98 Runoff=4.11 cfs 13,822 cf

SubcatchmentEX1: Back of property to Runoff Area=63,035 sf 22.78% Impervious Runoff Depth>0.68"
Flow Length=143' Slope=0.0100 '/' Tc=9.7 min CN=50 Runoff=0.75 cfs 3,568 cf

SubcatchmentEX2: Front of property to Runoff Area=63,762 sf 39.68% Impervious Runoff Depth>1.42"
Tc=6.0 min CN=62 Runoff=2.46 cfs 7,551 cf

SubcatchmentEX3: side lot to Linden st - D Runoff Area=4,975 sf 7.14% Impervious Runoff Depth>2.97"
Tc=0.0 min CN=81 Runoff=0.49 cfs 1,230 cf

Pond DP1: Drainage Network Inflow=6.81 cfs 22,602 cf
Primary=6.81 cfs 22,602 cf

Pond DP2: Wetlands Inflow=0.75 cfs 3,568 cf
Primary=0.75 cfs 3,568 cf

Total Runoff Area = 167,822 sf Runoff Volume = 26,170 cf Average Runoff Depth = 1.87"
54.68% Pervious = 91,757 sf 45.32% Impervious = 76,065 sf

Summary for Subcatchment BLDs: Building Roofs

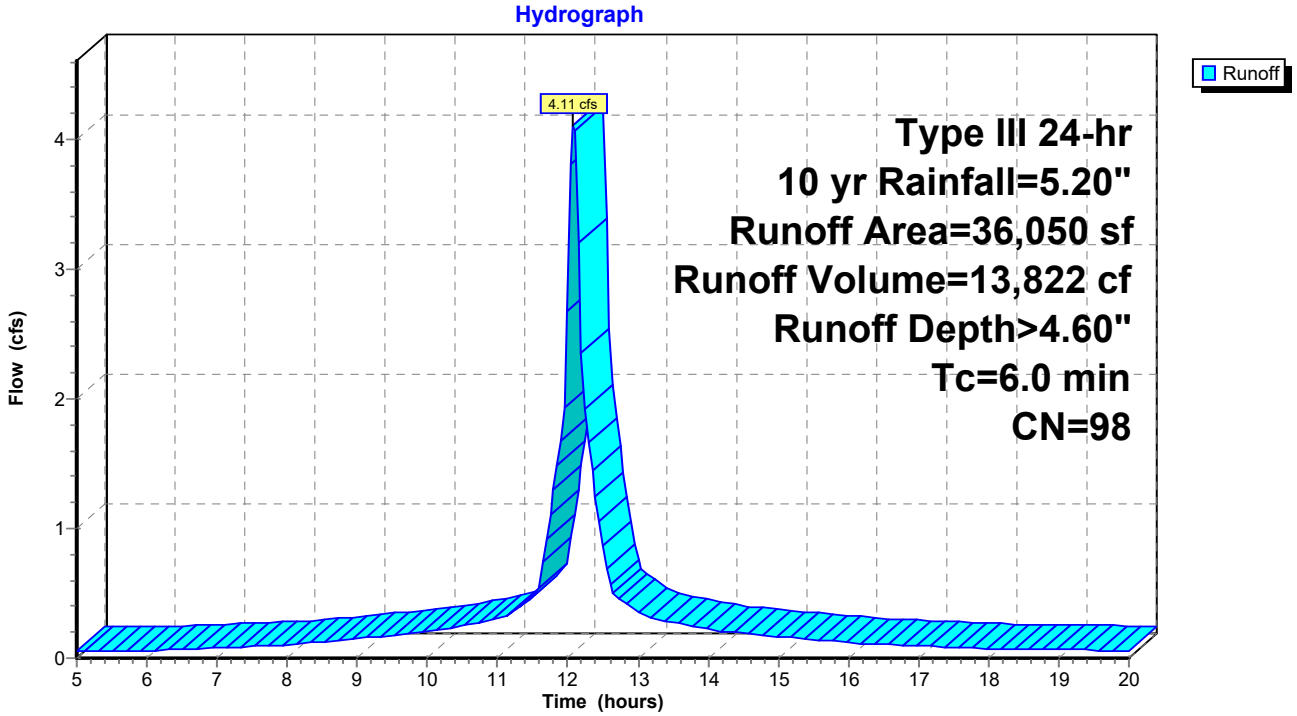
Runoff = 4.11 cfs @ 12.09 hrs, Volume= 13,822 cf, Depth> 4.60"
Routed to Pond DP1 : Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

Area (sf)	CN	Description
36,050	98	Unconnected roofs, HSG A
36,050		100.00% Impervious Area
36,050		100.00% Unconnected

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

Subcatchment BLDs: Building Roofs



Summary for Subcatchment EX1: Back of property to Wetl

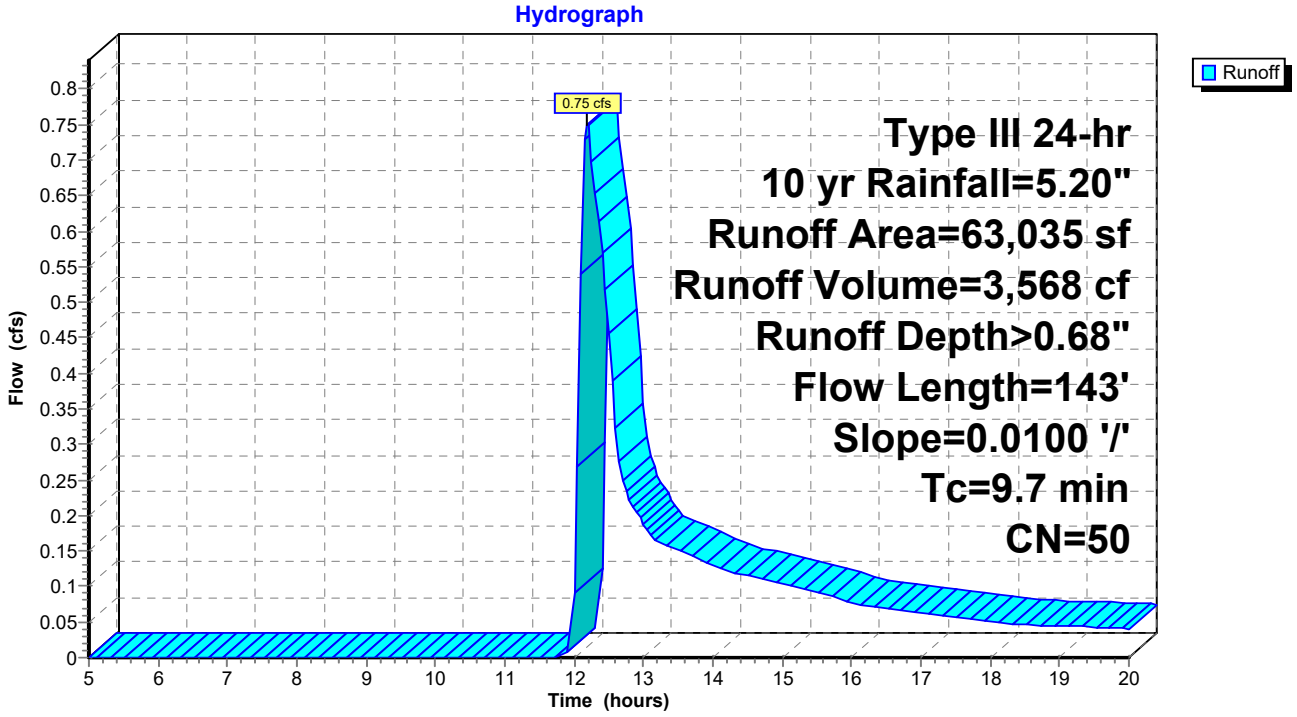
Runoff = 0.75 cfs @ 12.19 hrs, Volume= 3,568 cf, Depth> 0.68"
Routed to Pond DP2 : Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

Area (sf)	CN	Description
19,150	30	Woods, Good, HSG A
14,360	98	Paved parking, HSG A
29,525	39	>75% Grass cover, Good, HSG A
63,035	50	Weighted Average
48,675		77.22% Pervious Area
14,360		22.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
1.7	73	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	20	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.7	143	Total			

Subcatchment EX1: Back of property to Wetl



Summary for Subcatchment EX2: Front of property to street

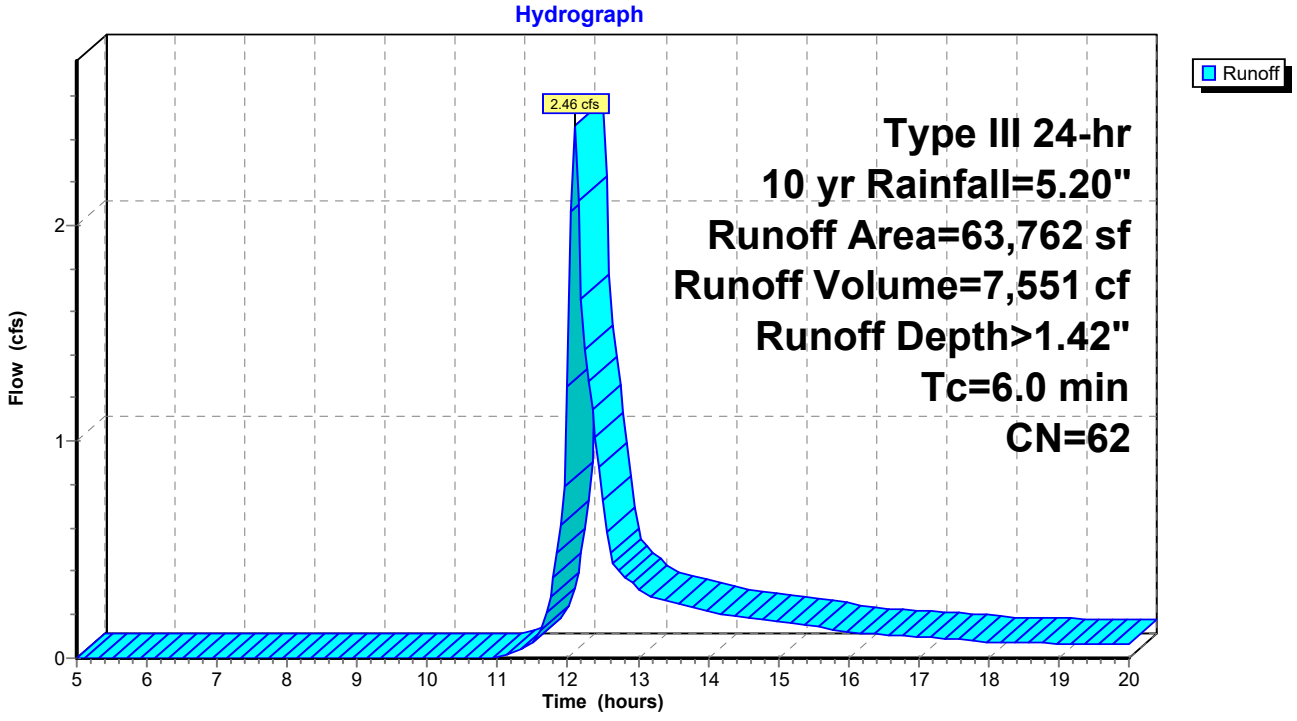
Runoff = 2.46 cfs @ 12.10 hrs, Volume= 7,551 cf, Depth> 1.42"
Routed to Pond DP1 : Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

Area (sf)	CN	Description
38,462	39	>75% Grass cover, Good, HSG A
25,300	98	Paved parking, HSG A
63,762	62	Weighted Average
38,462		60.32% Pervious Area
25,300		39.68% Impervious Area

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

Subcatchment EX2: Front of property to street



Summary for Subcatchment EX3: side lot to Linden st - D soils

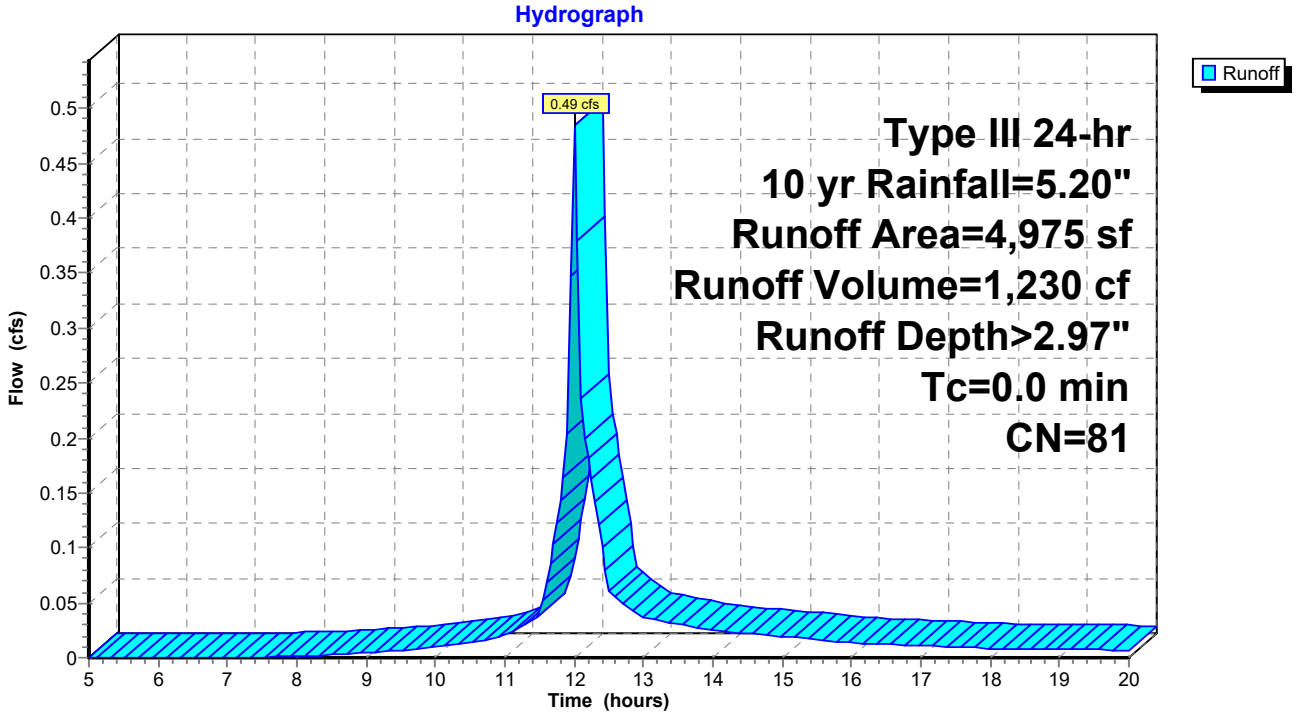
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.49 cfs @ 12.00 hrs, Volume= 1,230 cf, Depth> 2.97"
Routed to Pond DP1 : Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

Area (sf)	CN	Description
355	98	Paved parking, HSG D
4,620	80	>75% Grass cover, Good, HSG D
4,975	81	Weighted Average
4,620		92.86% Pervious Area
355		7.14% Impervious Area

Subcatchment EX3: side lot to Linden st - D soils



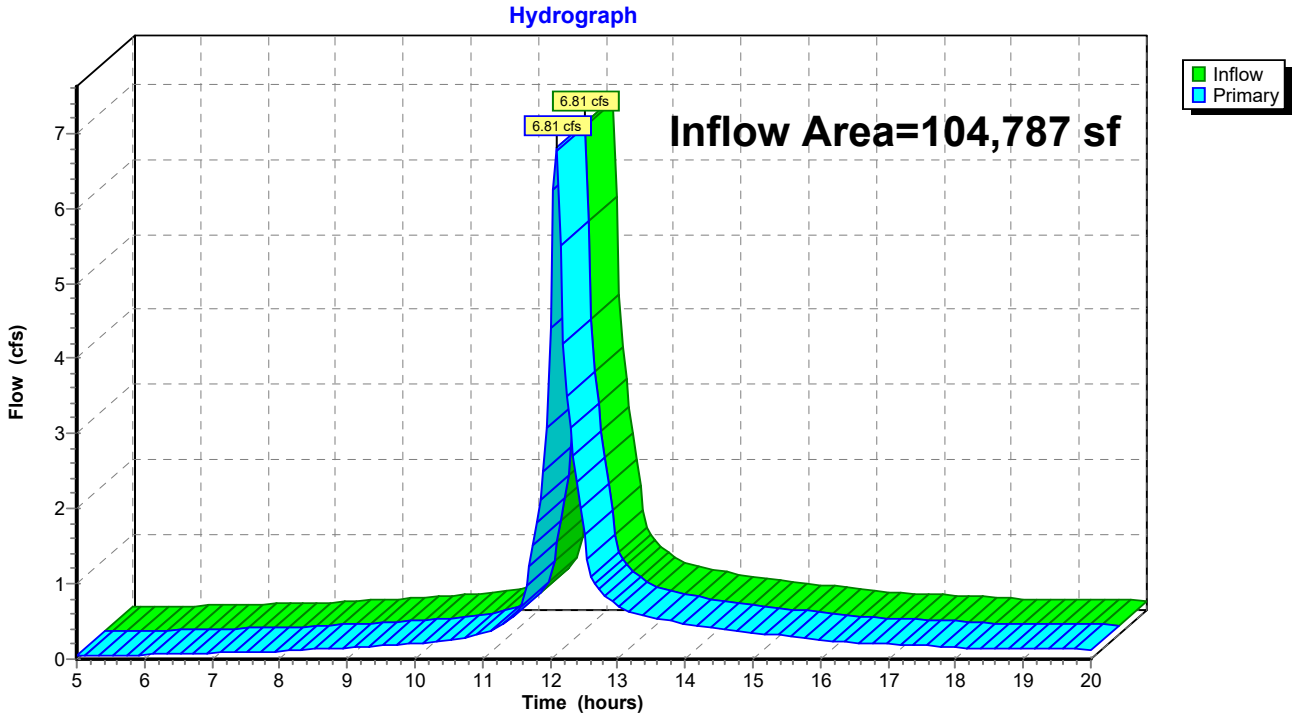
Summary for Pond DP1: Drainage Network

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 104,787 sf, 58.89% Impervious, Inflow Depth > 2.59" for 10 yr event
Inflow = 6.81 cfs @ 12.09 hrs, Volume= 22,602 cf
Primary = 6.81 cfs @ 12.09 hrs, Volume= 22,602 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond DP1: Drainage Network



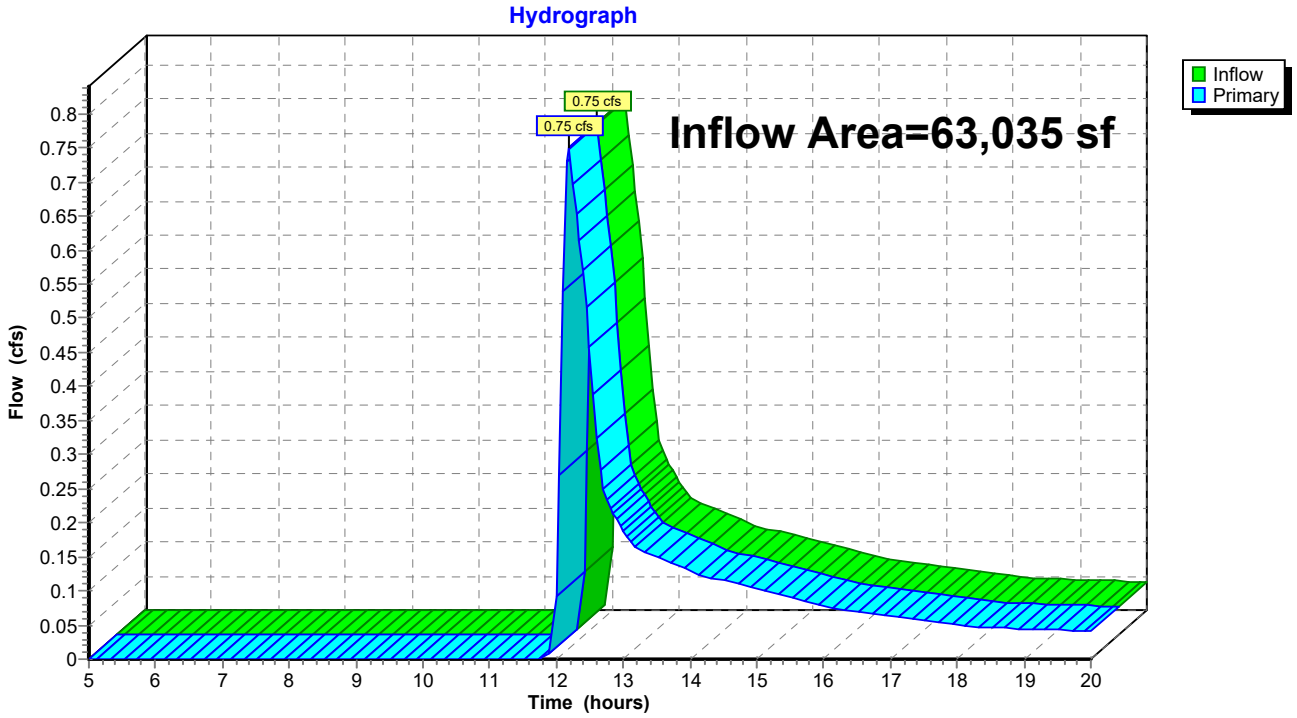
Summary for Pond DP2: Wetlands

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 63,035 sf, 22.78% Impervious, Inflow Depth > 0.68" for 10 yr event
Inflow = 0.75 cfs @ 12.19 hrs, Volume= 3,568 cf
Primary = 0.75 cfs @ 12.19 hrs, Volume= 3,568 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond DP2: Wetlands



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentBLDs: Building Roofs Runoff Area=36,050 sf 100.00% Impervious Runoff Depth>5.69"
Tc=6.0 min CN=98 Runoff=5.07 cfs 17,102 cf

SubcatchmentEX1: Back of property to Runoff Area=63,035 sf 22.78% Impervious Runoff Depth>1.20"
Flow Length=143' Slope=0.0100 '/' Tc=9.7 min CN=50 Runoff=1.64 cfs 6,300 cf

SubcatchmentEX2: Front of property to Runoff Area=63,762 sf 39.68% Impervious Runoff Depth>2.17"
Tc=6.0 min CN=62 Runoff=3.88 cfs 11,543 cf

SubcatchmentEX3: side lot to Linden st - D Runoff Area=4,975 sf 7.14% Impervious Runoff Depth>4.00"
Tc=0.0 min CN=81 Runoff=0.65 cfs 1,658 cf

Pond DP1: Drainage Network Inflow=9.27 cfs 30,303 cf
Primary=9.27 cfs 30,303 cf

Pond DP2: Wetlands Inflow=1.64 cfs 6,300 cf
Primary=1.64 cfs 6,300 cf

Total Runoff Area = 167,822 sf Runoff Volume = 36,603 cf Average Runoff Depth = 2.62"
54.68% Pervious = 91,757 sf 45.32% Impervious = 76,065 sf

Summary for Subcatchment BLDs: Building Roofs

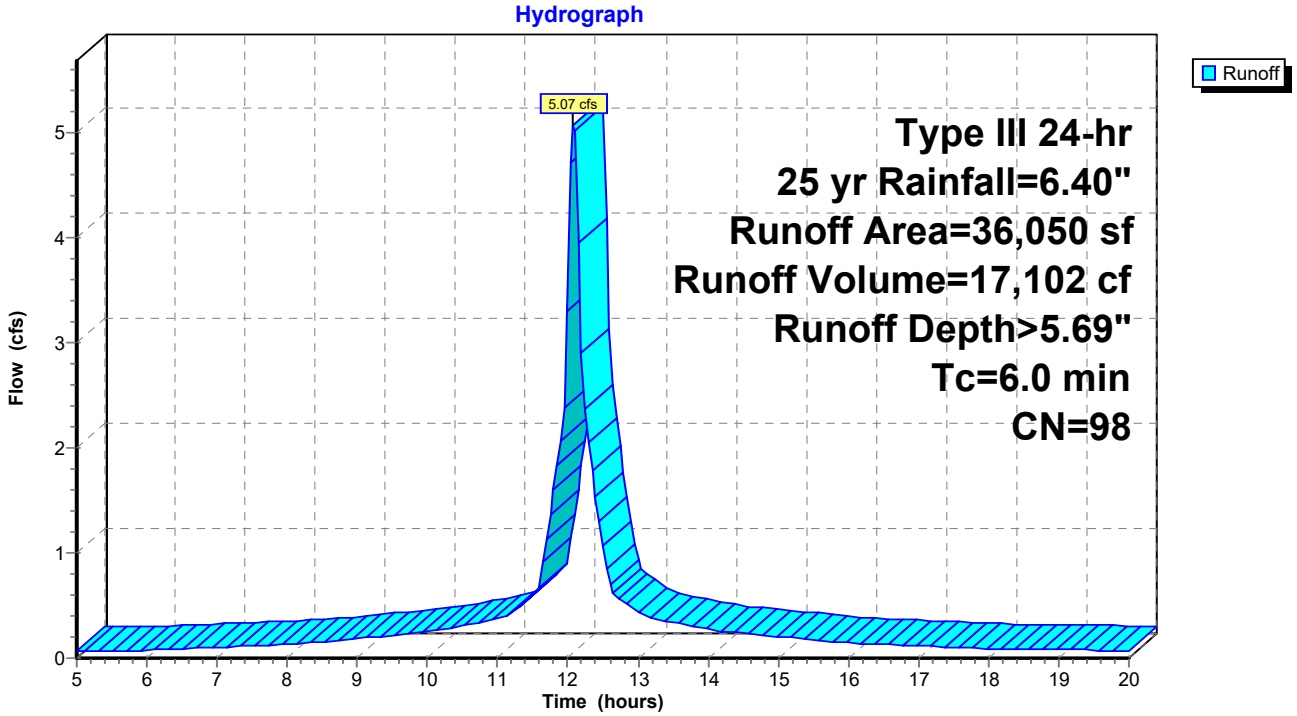
Runoff = 5.07 cfs @ 12.09 hrs, Volume= 17,102 cf, Depth> 5.69"
Routed to Pond DP1 : Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

Area (sf)	CN	Description
36,050	98	Unconnected roofs, HSG A
36,050		100.00% Impervious Area
36,050		100.00% Unconnected

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

Subcatchment BLDs: Building Roofs



Summary for Subcatchment EX1: Back of property to Wetl

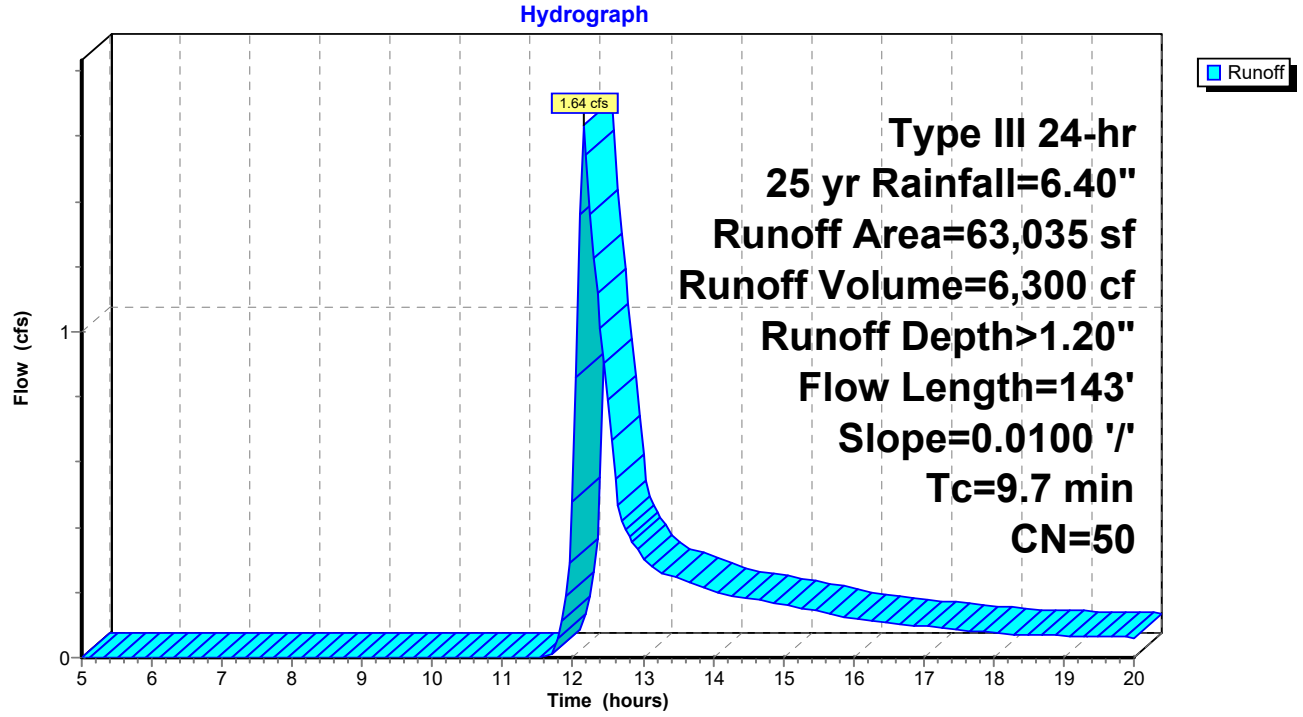
Runoff = 1.64 cfs @ 12.16 hrs, Volume= 6,300 cf, Depth> 1.20"
Routed to Pond DP2 : Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

Area (sf)	CN	Description
19,150	30	Woods, Good, HSG A
14,360	98	Paved parking, HSG A
29,525	39	>75% Grass cover, Good, HSG A
63,035	50	Weighted Average
48,675		77.22% Pervious Area
14,360		22.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
1.7	73	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	20	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.7	143	Total			

Subcatchment EX1: Back of property to Wetl



Summary for Subcatchment EX2: Front of property to street

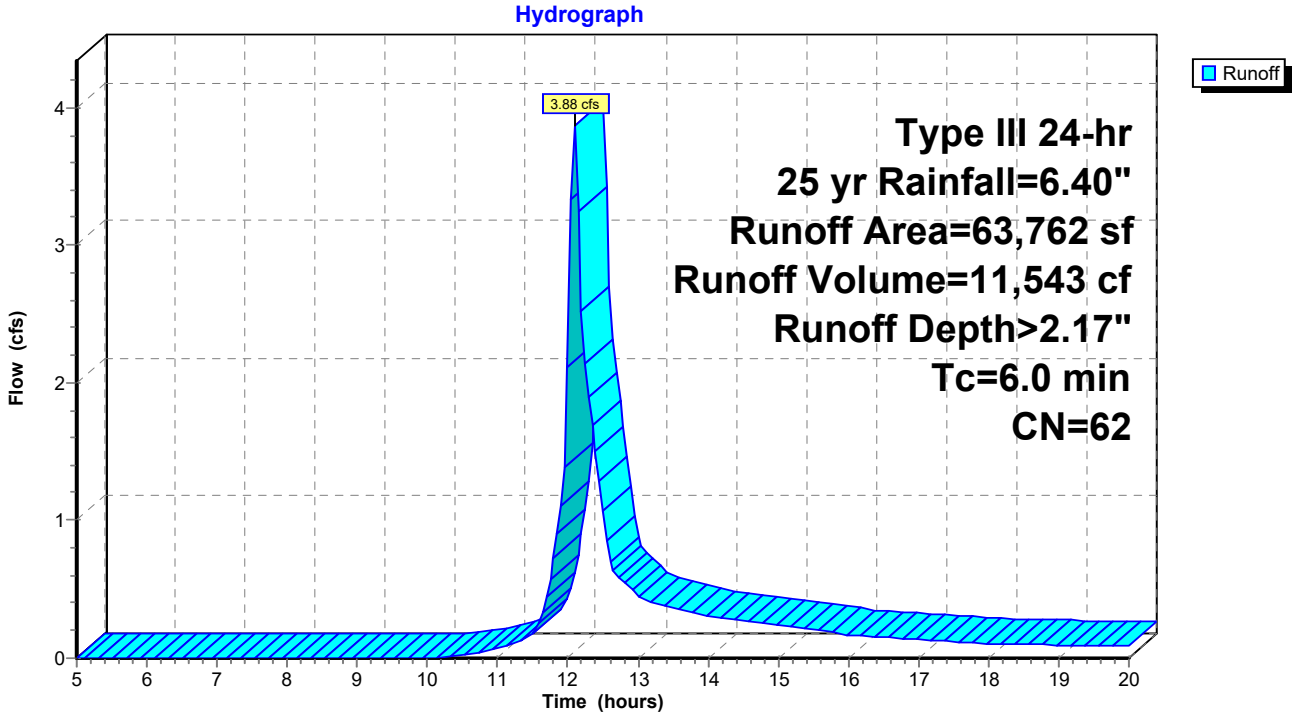
Runoff = 3.88 cfs @ 12.10 hrs, Volume= 11,543 cf, Depth> 2.17"
Routed to Pond DP1 : Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

Area (sf)	CN	Description
38,462	39	>75% Grass cover, Good, HSG A
25,300	98	Paved parking, HSG A
63,762	62	Weighted Average
38,462		60.32% Pervious Area
25,300		39.68% Impervious Area

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

Subcatchment EX2: Front of property to street



Summary for Subcatchment EX3: side lot to Linden st - D soils

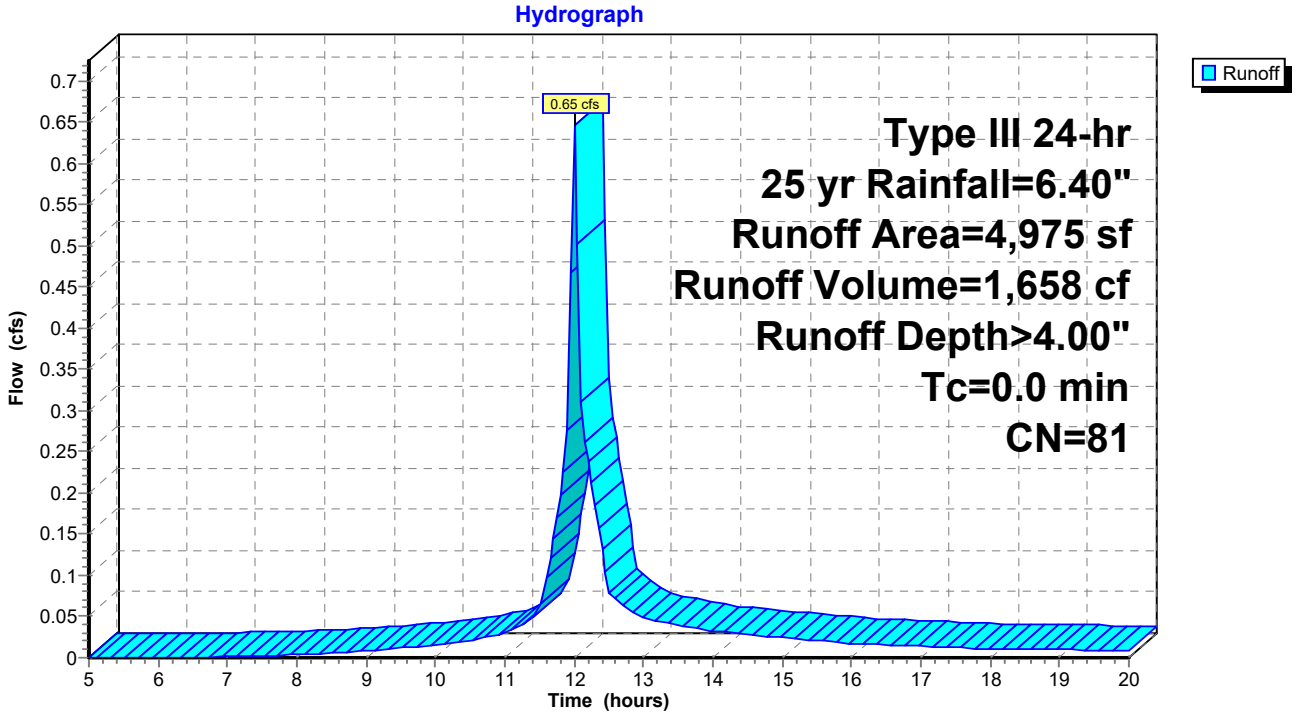
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.65 cfs @ 12.00 hrs, Volume= 1,658 cf, Depth> 4.00"
Routed to Pond DP1 : Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

Area (sf)	CN	Description
355	98	Paved parking, HSG D
4,620	80	>75% Grass cover, Good, HSG D
4,975	81	Weighted Average
4,620		92.86% Pervious Area
355		7.14% Impervious Area

Subcatchment EX3: side lot to Linden st - D soils



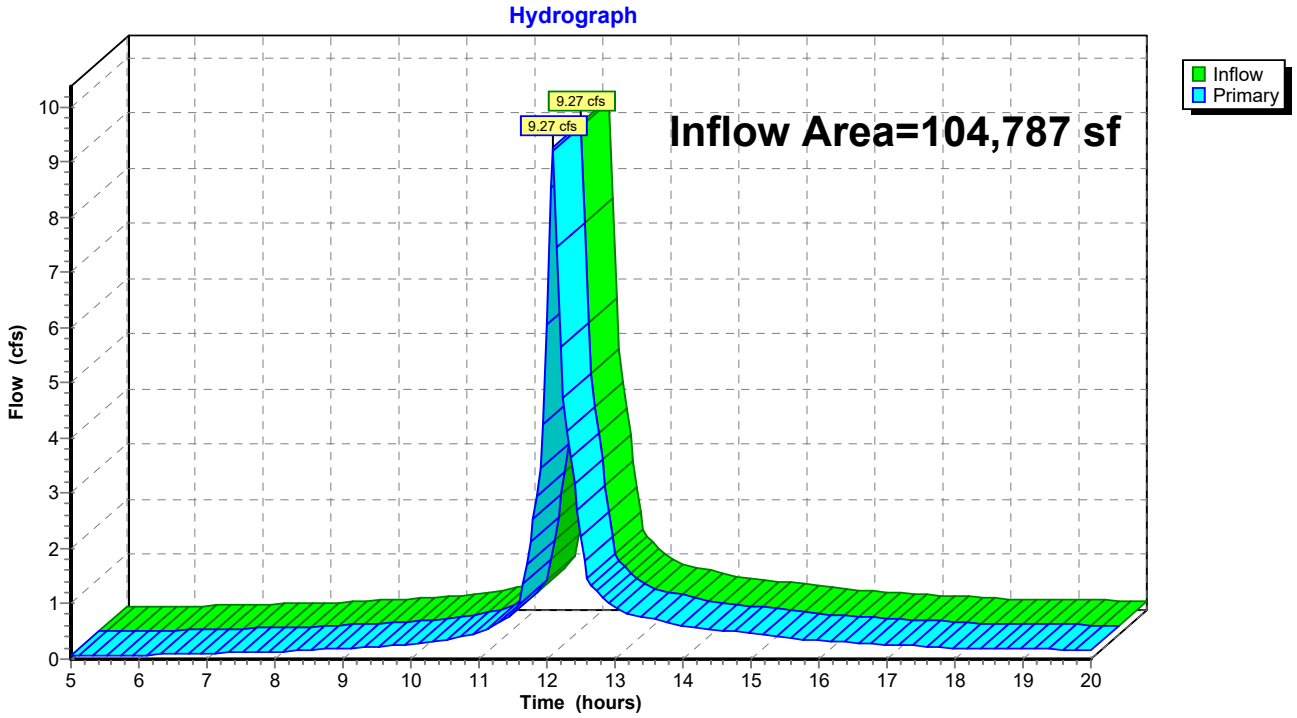
Summary for Pond DP1: Drainage Network

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 104,787 sf, 58.89% Impervious, Inflow Depth > 3.47" for 25 yr event
Inflow = 9.27 cfs @ 12.09 hrs, Volume= 30,303 cf
Primary = 9.27 cfs @ 12.09 hrs, Volume= 30,303 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond DP1: Drainage Network



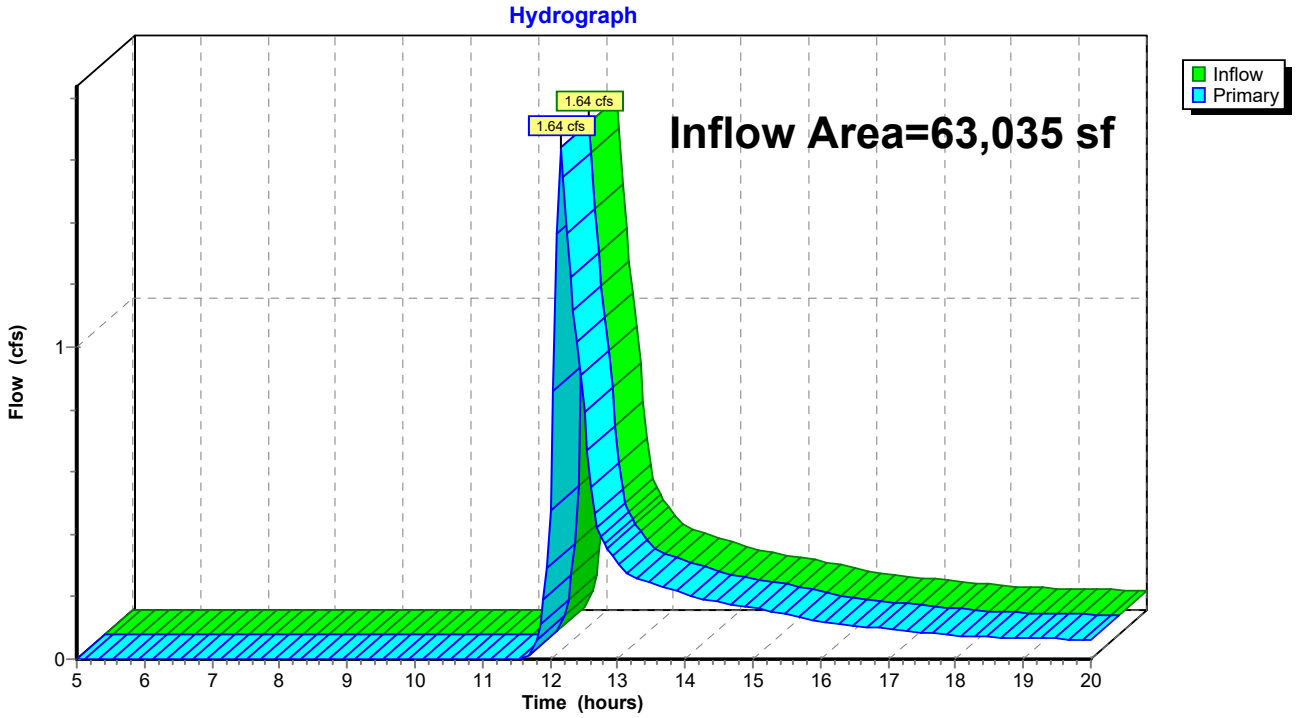
Summary for Pond DP2: Wetlands

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 63,035 sf, 22.78% Impervious, Inflow Depth > 1.20" for 25 yr event
Inflow = 1.64 cfs @ 12.16 hrs, Volume= 6,300 cf
Primary = 1.64 cfs @ 12.16 hrs, Volume= 6,300 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond DP2: Wetlands



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentBLDs: Building Roofs Runoff Area=36,050 sf 100.00% Impervious Runoff Depth>7.33"
Tc=6.0 min CN=98 Runoff=6.51 cfs 22,009 cf

SubcatchmentEX1: Back of property to Runoff Area=63,035 sf 22.78% Impervious Runoff Depth>2.15"
Flow Length=143' Slope=0.0100 '/' Tc=9.7 min CN=50 Runoff=3.23 cfs 11,291 cf

SubcatchmentEX2: Front of property to Runoff Area=63,762 sf 39.68% Impervious Runoff Depth>3.43"
Tc=6.0 min CN=62 Runoff=6.21 cfs 18,242 cf

SubcatchmentEX3: side lot to Linden st - D Runoff Area=4,975 sf 7.14% Impervious Runoff Depth>5.60"
Tc=0.0 min CN=81 Runoff=0.89 cfs 2,322 cf

Pond DP1: Drainage Network Inflow=13.16 cfs 42,573 cf
Primary=13.16 cfs 42,573 cf

Pond DP2: Wetlands Inflow=3.23 cfs 11,291 cf
Primary=3.23 cfs 11,291 cf

Total Runoff Area = 167,822 sf Runoff Volume = 53,864 cf Average Runoff Depth = 3.85"
54.68% Pervious = 91,757 sf 45.32% Impervious = 76,065 sf

Summary for Subcatchment BLDs: Building Roofs

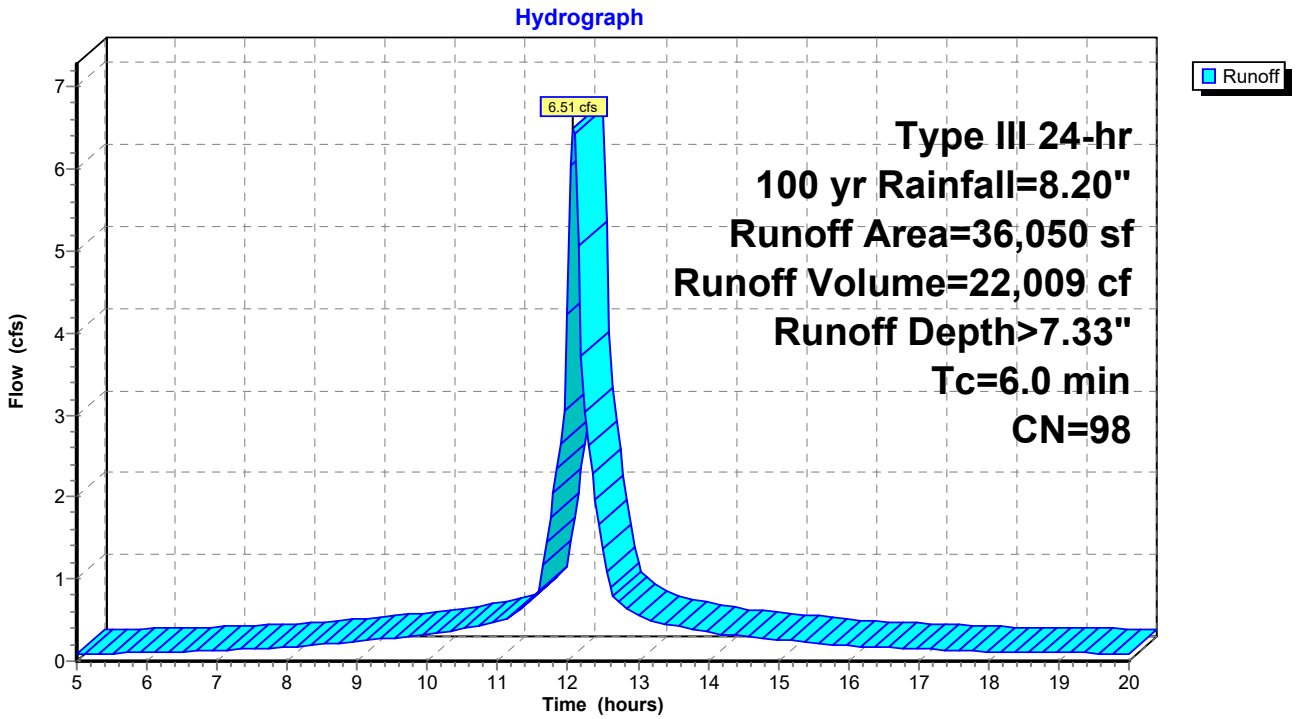
Runoff = 6.51 cfs @ 12.09 hrs, Volume= 22,009 cf, Depth> 7.33"
Routed to Pond DP1 : Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

Area (sf)	CN	Description
36,050	98	Unconnected roofs, HSG A
36,050		100.00% Impervious Area
36,050		100.00% Unconnected

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

Subcatchment BLDs: Building Roofs



Summary for Subcatchment EX1: Back of property to Wetl

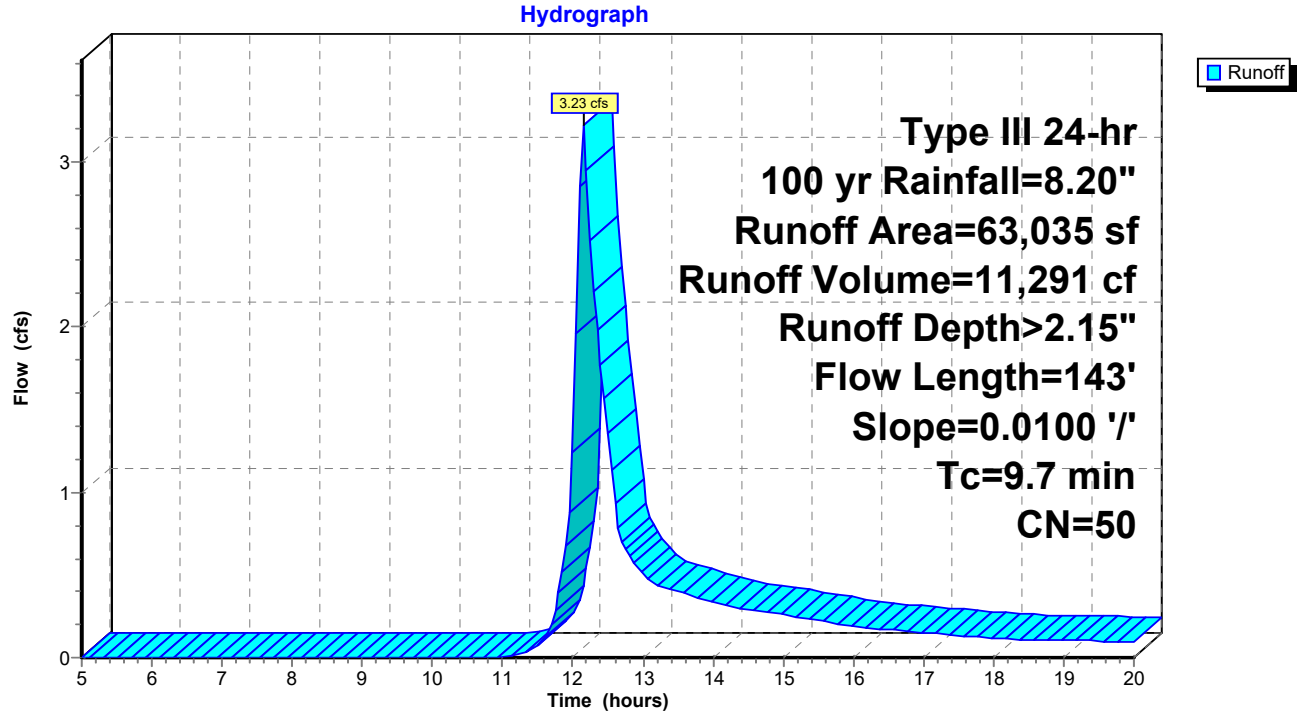
Runoff = 3.23 cfs @ 12.15 hrs, Volume= 11,291 cf, Depth> 2.15"
Routed to Pond DP2 : Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

Area (sf)	CN	Description
19,150	30	Woods, Good, HSG A
14,360	98	Paved parking, HSG A
29,525	39	>75% Grass cover, Good, HSG A
63,035	50	Weighted Average
48,675		77.22% Pervious Area
14,360		22.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
1.7	73	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	20	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.7	143	Total			

Subcatchment EX1: Back of property to Wetl



Summary for Subcatchment EX2: Front of property to street

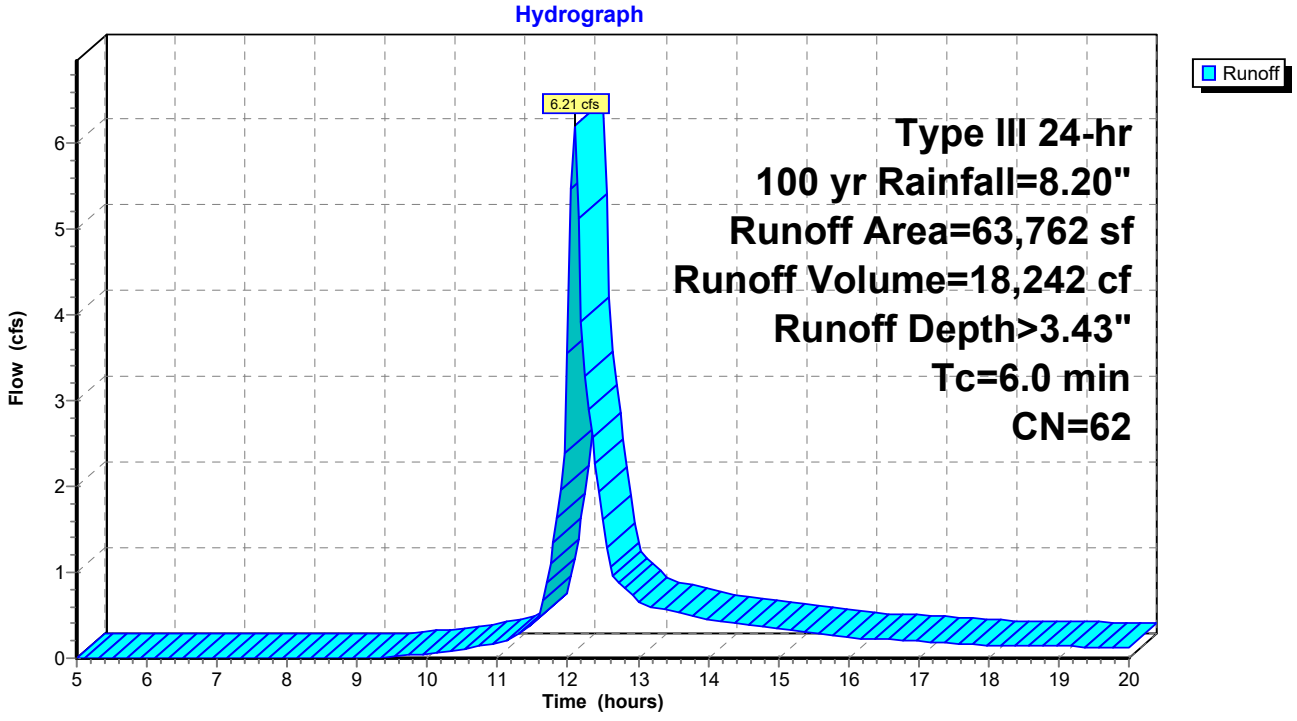
Runoff = 6.21 cfs @ 12.10 hrs, Volume= 18,242 cf, Depth> 3.43"
Routed to Pond DP1 : Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

Area (sf)	CN	Description
38,462	39	>75% Grass cover, Good, HSG A
25,300	98	Paved parking, HSG A
63,762	62	Weighted Average
38,462		60.32% Pervious Area
25,300		39.68% Impervious Area

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

Subcatchment EX2: Front of property to street



Summary for Subcatchment EX3: side lot to Linden st - D soils

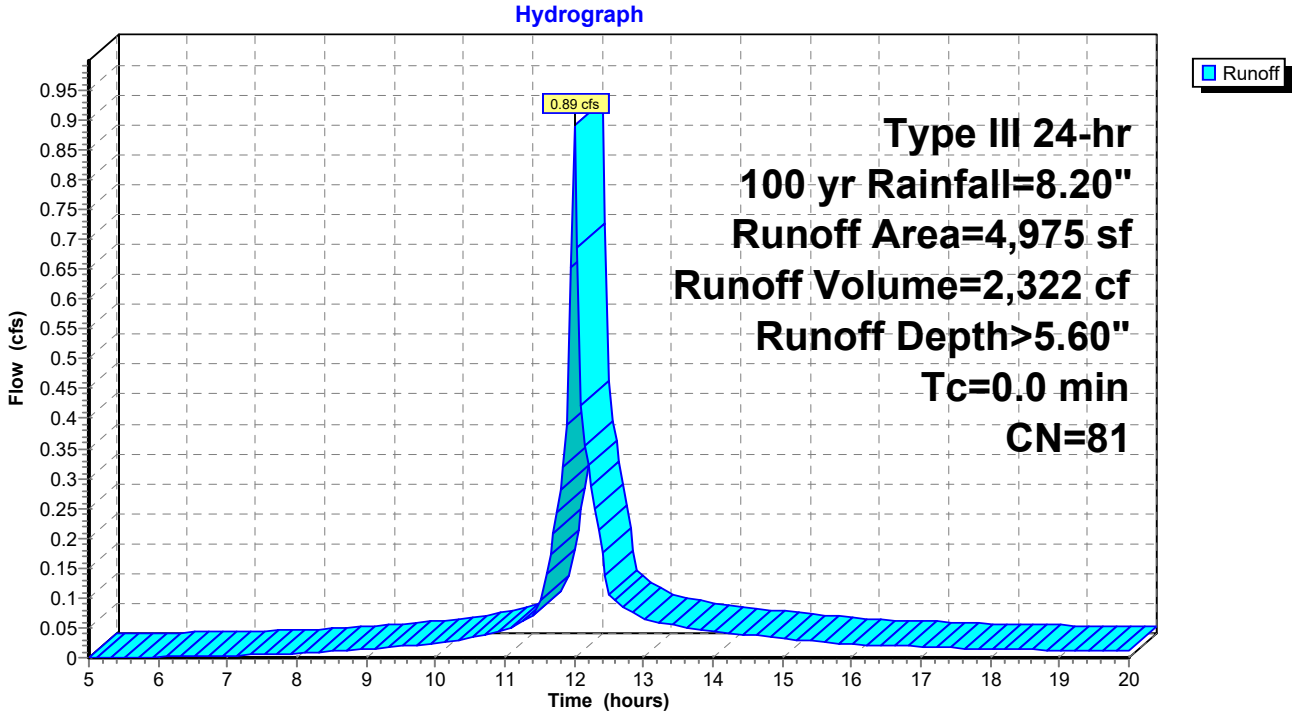
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.89 cfs @ 12.00 hrs, Volume= 2,322 cf, Depth> 5.60"
Routed to Pond DP1 : Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

Area (sf)	CN	Description
355	98	Paved parking, HSG D
4,620	80	>75% Grass cover, Good, HSG D
4,975	81	Weighted Average
4,620		92.86% Pervious Area
355		7.14% Impervious Area

Subcatchment EX3: side lot to Linden st - D soils



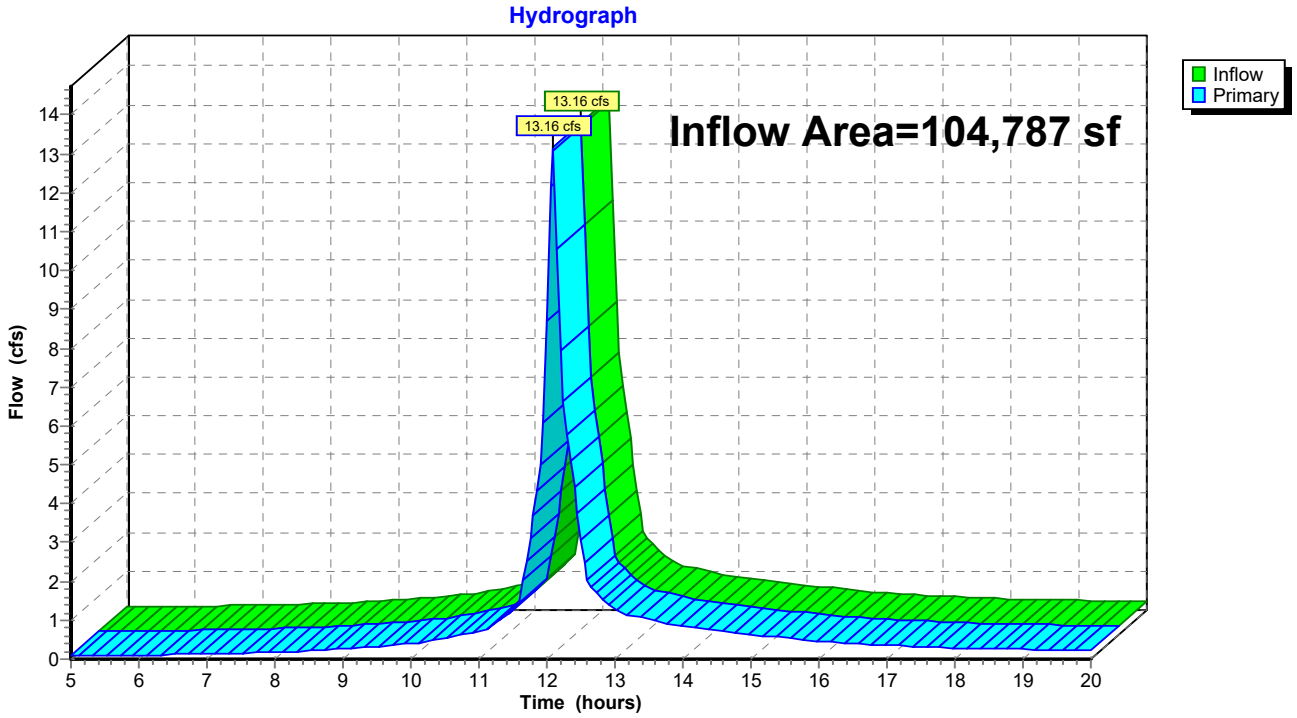
Summary for Pond DP1: Drainage Network

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 104,787 sf, 58.89% Impervious, Inflow Depth > 4.88" for 100 yr event
Inflow = 13.16 cfs @ 12.09 hrs, Volume= 42,573 cf
Primary = 13.16 cfs @ 12.09 hrs, Volume= 42,573 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond DP1: Drainage Network



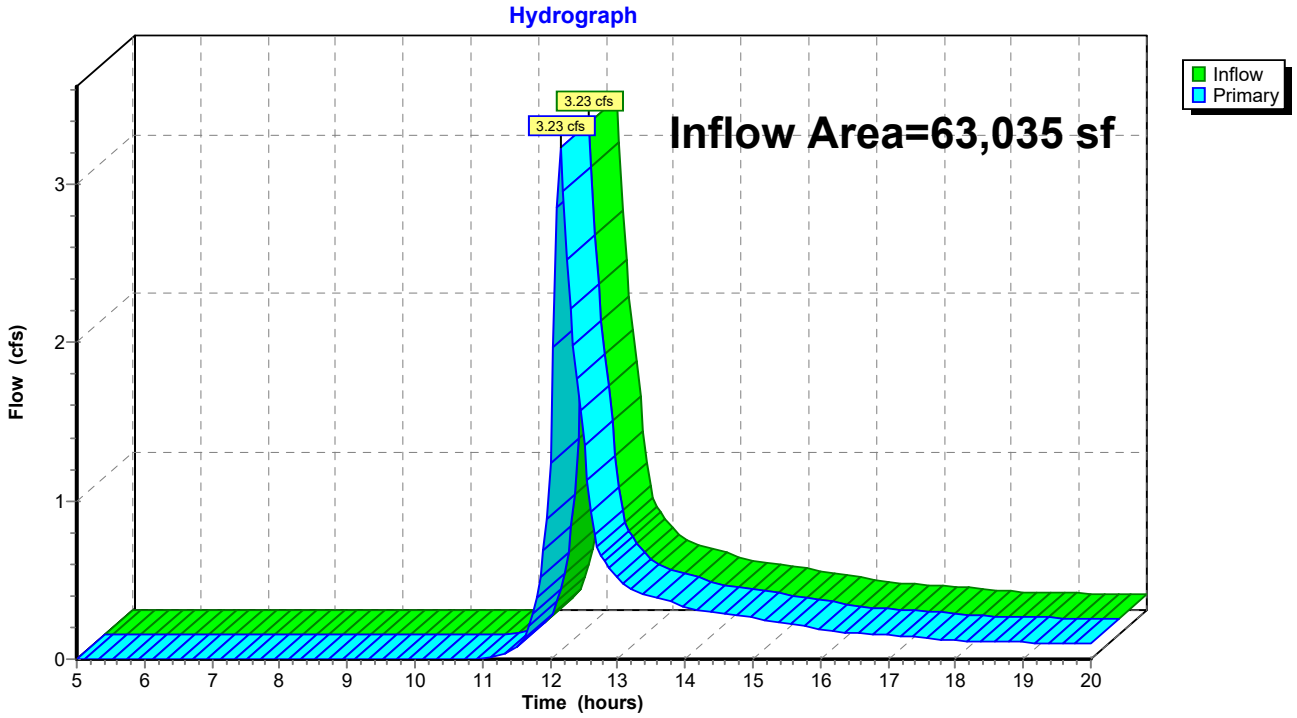
Summary for Pond DP2: Wetlands

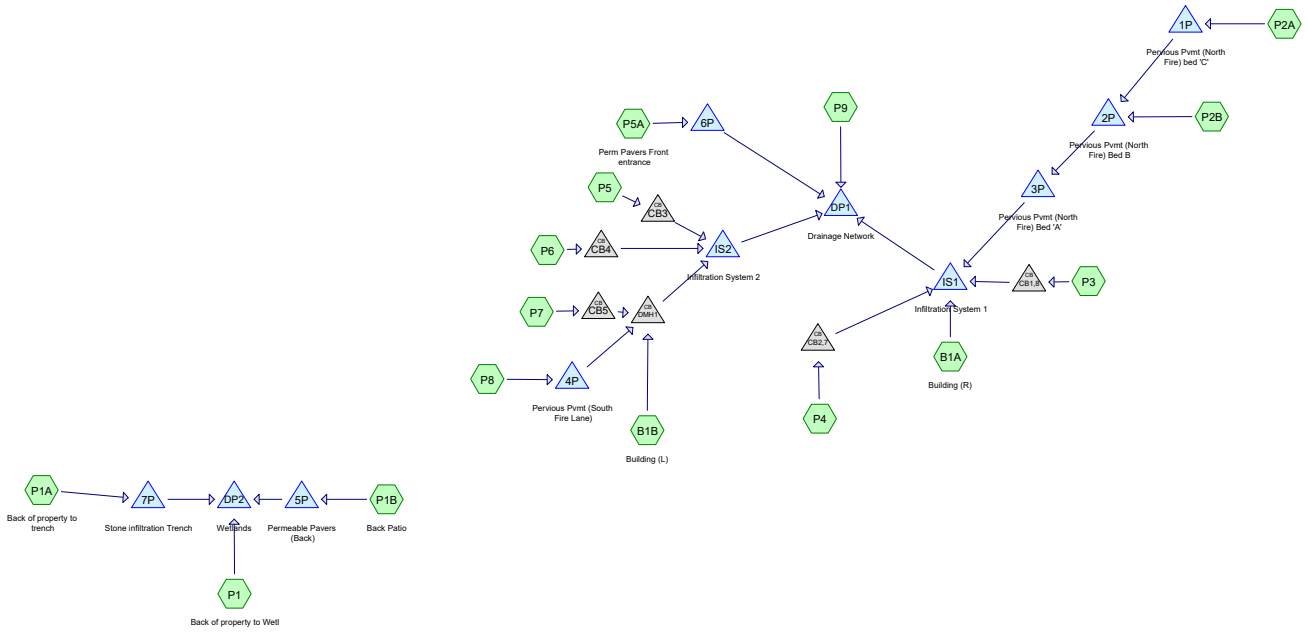
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 63,035 sf, 22.78% Impervious, Inflow Depth > 2.15" for 100 yr event
Inflow = 3.23 cfs @ 12.15 hrs, Volume= 11,291 cf
Primary = 3.23 cfs @ 12.15 hrs, Volume= 11,291 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond DP2: Wetlands





Subcat Reach Pond Link

Routing Diagram for 2024-09-26_Post-Development_Med Sys
Prepared by Hancock Associates, Printed 10/11/2024
HydroCAD® 10.20-3g s/n 00711 © 2023 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
36,975	39	>75% Grass cover, Good, HSG A (P3, P4, P5, P5A, P6, P7, P8, P9)
5,400	80	>75% Grass cover, Good, HSG D (P8)
9,240	98	CONCRETE (P2A, P2B, P3, P4, P5, P6, P8, P9)
3,700	98	CONCRETE/Pervious Pvmt (P1A)
25,422	30	Meadow, non-grazed, HSG A (P1, P1A, P2A, P2B)
26,391	98	Paved parking, HSG A (P3, P4, P5, P6, P9)
28,328	98	Roofs, HSG A (B1A, B1B)
19,150	30	Woods, Good, HSG A (P1)
9,946	96	permeable pavement (P2A, P2B, P8)
3,270	80	permeable pavers (P1B, P5, P5A)
167,822	**66**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
136,266	HSG A	B1A, B1B, P1, P1A, P2A, P2B, P3, P4, P5, P5A, P6, P7, P8, P9
0	HSG B	
0	HSG C	
5,400	HSG D	P8
26,156	Other	P1A, P1B, P2A, P2B, P3, P4, P5, P5A, P6, P8, P9
167,822		**TOTAL AREA**

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	1P	142.00	141.50	5.0	0.1000	0.013	0.0	6.0	0.0	
2	2P	141.50	141.00	5.0	0.1000	0.013	0.0	6.0	0.0	
3	3P	141.50	141.00	25.0	0.0200	0.013	0.0	12.0	0.0	
4	4P	143.50	142.00	170.0	0.0088	0.013	0.0	12.0	0.0	
5	CB1,8	141.25	141.00	4.0	0.0625	0.013	0.0	12.0	0.0	
6	CB2,7	141.75	141.00	115.0	0.0065	0.013	0.0	12.0	0.0	
7	CB3	141.75	141.50	20.0	0.0125	0.013	0.0	12.0	0.0	
8	CB4	141.80	141.50	60.0	0.0050	0.013	0.0	12.0	0.0	
9	CB5	142.00	141.90	5.0	0.0200	0.013	0.0	12.0	0.0	
10	DMH1	141.90	141.50	40.0	0.0100	0.013	0.0	12.0	0.0	
11	IS1	141.00	140.00	40.0	0.0250	0.013	0.0	15.0	0.0	
12	IS2	141.50	140.00	80.0	0.0187	0.013	0.0	15.0	0.0	

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

SubcatchmentB1A: Building (R) Runoff Area=14,492 sf 100.00% Impervious Runoff Depth=3.07"
Tc=6.0 min CN=98 Runoff=1.04 cfs 3,704 cf

SubcatchmentB1B: Building (L) Runoff Area=13,836 sf 100.00% Impervious Runoff Depth=3.07"
Tc=6.0 min CN=98 Runoff=0.99 cfs 3,536 cf

SubcatchmentP1: Back of property to Wetl Runoff Area=38,559 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0 cf

SubcatchmentP1A: Back of property to Runoff Area=7,565 sf 48.91% Impervious Runoff Depth=0.56"
Tc=6.0 min CN=63 Runoff=0.08 cfs 356 cf

SubcatchmentP1B: Back Patio Runoff Area=2,070 sf 0.00% Impervious Runoff Depth=1.48"
Tc=6.0 min CN=80 Runoff=0.08 cfs 255 cf

SubcatchmentP2A: Runoff Area=6,132 sf 27.32% Impervious Runoff Depth=2.35"
Tc=6.0 min CN=91 Runoff=0.37 cfs 1,202 cf

SubcatchmentP2B: Runoff Area=3,446 sf 13.78% Impervious Runoff Depth=0.65"
Tc=6.0 min CN=65 Runoff=0.05 cfs 187 cf

SubcatchmentP3: Runoff Area=7,500 sf 90.93% Impervious Runoff Depth=2.54"
Tc=6.0 min CN=93 Runoff=0.48 cfs 1,589 cf

SubcatchmentP4: Runoff Area=9,561 sf 73.85% Impervious Runoff Depth=1.69"
Tc=6.0 min CN=83 Runoff=0.43 cfs 1,348 cf

SubcatchmentP5: Runoff Area=7,429 sf 68.84% Impervious Runoff Depth=1.84"
Tc=6.0 min CN=85 Runoff=0.36 cfs 1,141 cf

SubcatchmentP5A: Perm Pavers Front Runoff Area=560 sf 0.00% Impervious Runoff Depth=0.25"
Tc=6.0 min CN=54 Runoff=0.00 cfs 12 cf

SubcatchmentP6: Runoff Area=10,912 sf 94.08% Impervious Runoff Depth=2.74"
Tc=6.0 min CN=95 Runoff=0.74 cfs 2,494 cf

SubcatchmentP7: Runoff Area=9,750 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 2 cf

SubcatchmentP8: Runoff Area=18,366 sf 5.55% Impervious Runoff Depth=0.84"
Flow Length=175' Slope=0.0100 '/' Tc=9.5 min CN=69 Runoff=0.32 cfs 1,280 cf

SubcatchmentP9: Runoff Area=17,644 sf 18.14% Impervious Runoff Depth=0.15"
Tc=6.0 min CN=50 Runoff=0.01 cfs 220 cf

Pond 1P: Pervious Pvmt (North Fire) bed 'C' Peak Elev=142.00' Storage=0 cf Inflow=0.37 cfs 1,202 cf
Discarded=0.37 cfs 1,202 cf Primary=0.00 cfs 0 cf Outflow=0.37 cfs 1,202 cf

Pond 2P: Pervious Pvmt (North Fire) Bed B Peak Elev=141.50' Storage=0 cf Inflow=0.05 cfs 187 cf
Discarded=0.05 cfs 187 cf Primary=0.00 cfs 0 cf Outflow=0.05 cfs 187 cf

Pond 3P: Pervious Pvmt (North Fire) Bed 'A' Peak Elev=141.00' Storage=0 cf Inflow=0.00 cfs 0 cf
Discarded=0.00 cfs 0 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 0 cf

Pond 4P: Pervious Pvmt (South Fire Lane) Peak Elev=143.70' Storage=296 cf Inflow=0.32 cfs 1,280 cf
Discarded=0.04 cfs 40 cf Primary=0.13 cfs 1,219 cf Outflow=0.17 cfs 1,259 cf

Pond 5P: Permeable Pavers (Back) Peak Elev=144.00' Storage=0 cf Inflow=0.08 cfs 255 cf
Discarded=0.08 cfs 255 cf Primary=0.00 cfs 0 cf Outflow=0.08 cfs 255 cf

Pond 6P: Peak Elev=143.00' Storage=0 cf Inflow=0.00 cfs 12 cf
Discarded=0.00 cfs 12 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 12 cf

Pond 7P: Stone infiltration Trench Peak Elev=144.00' Storage=0 cf Inflow=0.08 cfs 356 cf
Discarded=0.08 cfs 356 cf Primary=0.00 cfs 0 cf Outflow=0.08 cfs 356 cf

Pond CB1,8: Peak Elev=141.60' Inflow=0.48 cfs 1,589 cf
12.0" Round Culvert n=0.013 L=4.0' S=0.0625 '/' Outflow=0.48 cfs 1,589 cf

Pond CB2,7: Peak Elev=142.10' Inflow=0.43 cfs 1,348 cf
12.0" Round Culvert n=0.013 L=115.0' S=0.0065 '/' Outflow=0.43 cfs 1,348 cf

Pond CB3: Peak Elev=142.73' Inflow=0.36 cfs 1,141 cf
12.0" Round Culvert n=0.013 L=20.0' S=0.0125 '/' Outflow=0.36 cfs 1,141 cf

Pond CB4: Peak Elev=142.75' Inflow=0.74 cfs 2,494 cf
12.0" Round Culvert n=0.013 L=60.0' S=0.0050 '/' Outflow=0.74 cfs 2,494 cf

Pond CB5: Peak Elev=142.58' Inflow=0.00 cfs 2 cf
12.0" Round Culvert n=0.013 L=5.0' S=0.0200 '/' Outflow=0.00 cfs 2 cf

Pond DMH1: Peak Elev=142.77' Inflow=1.01 cfs 4,757 cf
12.0" Round Culvert n=0.013 L=40.0' S=0.0100 '/' Outflow=1.01 cfs 4,757 cf

Pond DP1: Drainage Network Inflow=1.06 cfs 1,071 cf
Primary=1.06 cfs 1,071 cf

Pond DP2: Wetlands Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Pond IS1: Infiltration System 1 Peak Elev=141.35' Storage=888 cf Inflow=1.95 cfs 6,641 cf
Discarded=0.73 cfs 6,651 cf Primary=0.00 cfs 0 cf Outflow=0.73 cfs 6,651 cf

Pond IS2: Infiltration System 2 Peak Elev=142.73' Storage=1,226 cf Inflow=2.12 cfs 8,392 cf
Discarded=0.46 cfs 7,548 cf Primary=1.06 cfs 851 cf Outflow=1.52 cfs 8,399 cf

Total Runoff Area = 167,822 sf Runoff Volume = 17,326 cf Average Runoff Depth = 1.24"
59.68% Pervious = 100,163 sf 40.32% Impervious = 67,659 sf

Summary for Subcatchment B1A: Building (R)

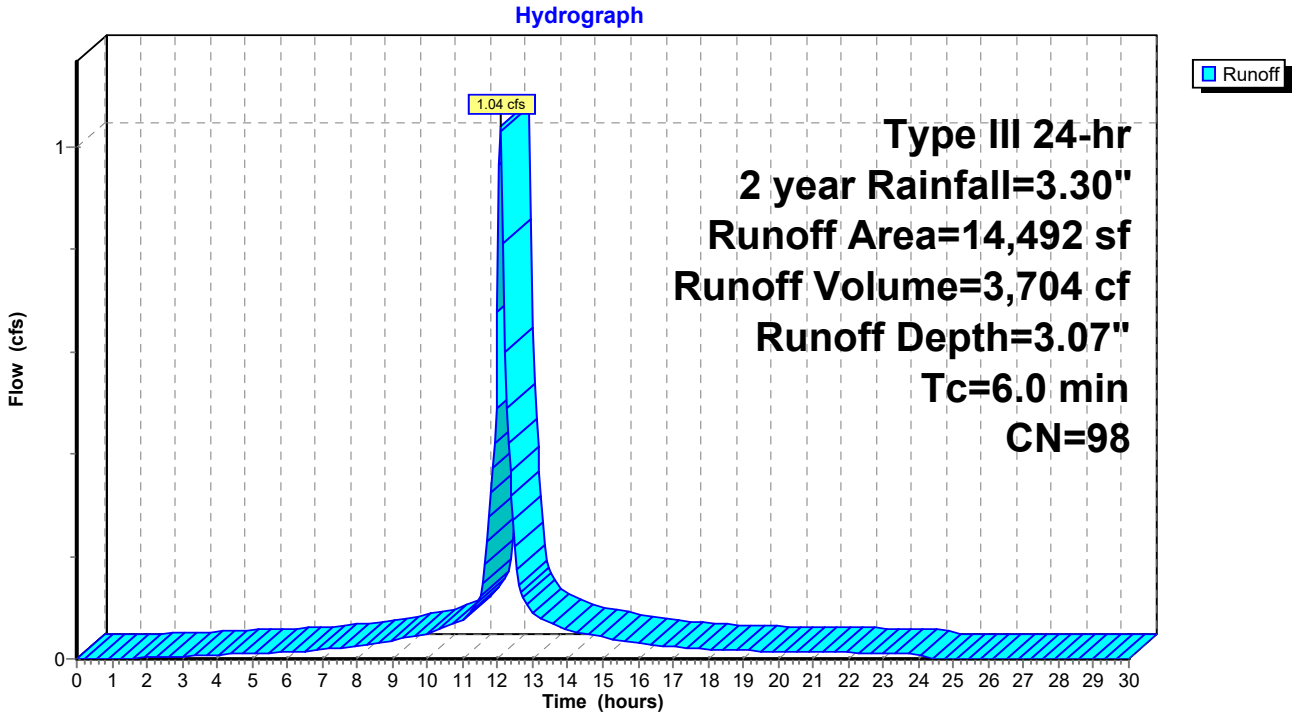
Runoff = 1.04 cfs @ 12.09 hrs, Volume= 3,704 cf, Depth= 3.07"
Routed to Pond IS1 : Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

Area (sf)	CN	Description
14,492	98	Roofs, HSG A
14,492		100.00% Impervious Area

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

Subcatchment B1A: Building (R)



Summary for Subcatchment B1B: Building (L)

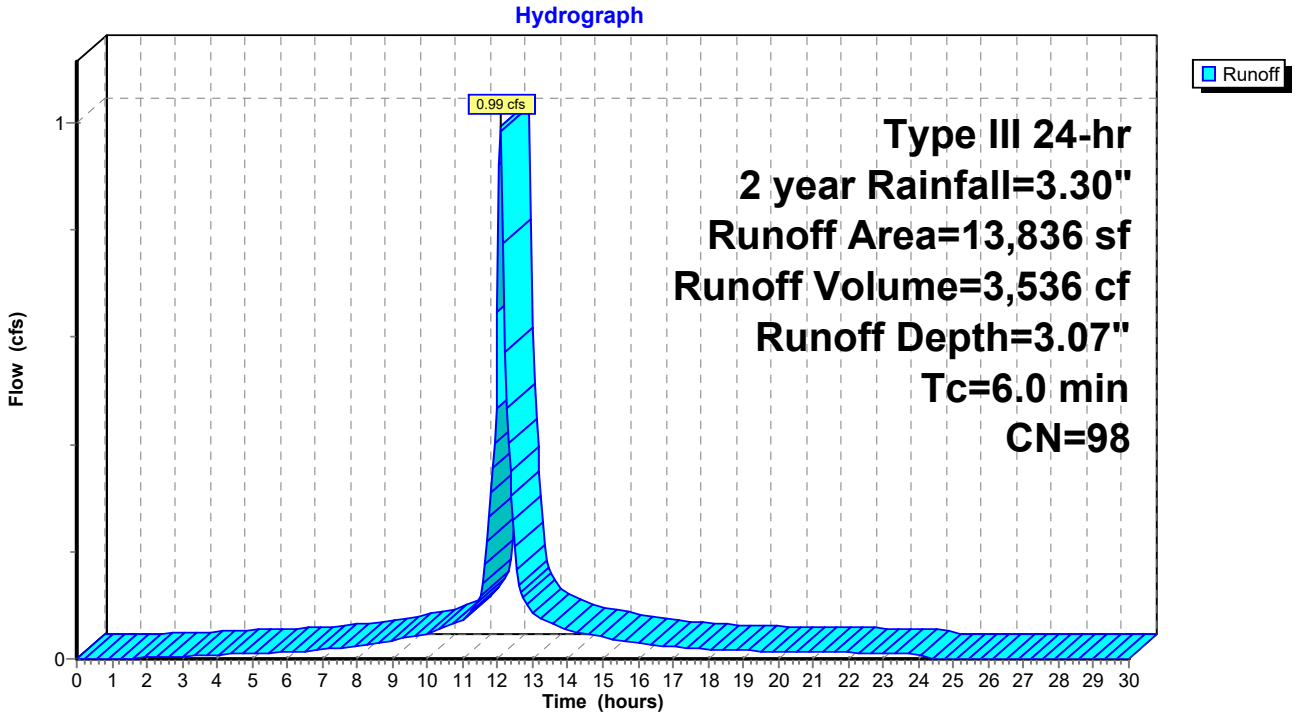
Runoff = 0.99 cfs @ 12.09 hrs, Volume= 3,536 cf, Depth= 3.07"
Routed to Pond DMH1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

Area (sf)	CN	Description
13,836	98	Roofs, HSG A
13,836		100.00% Impervious Area

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

Subcatchment B1B: Building (L)



Summary for Subcatchment P1: Back of property to Wetl

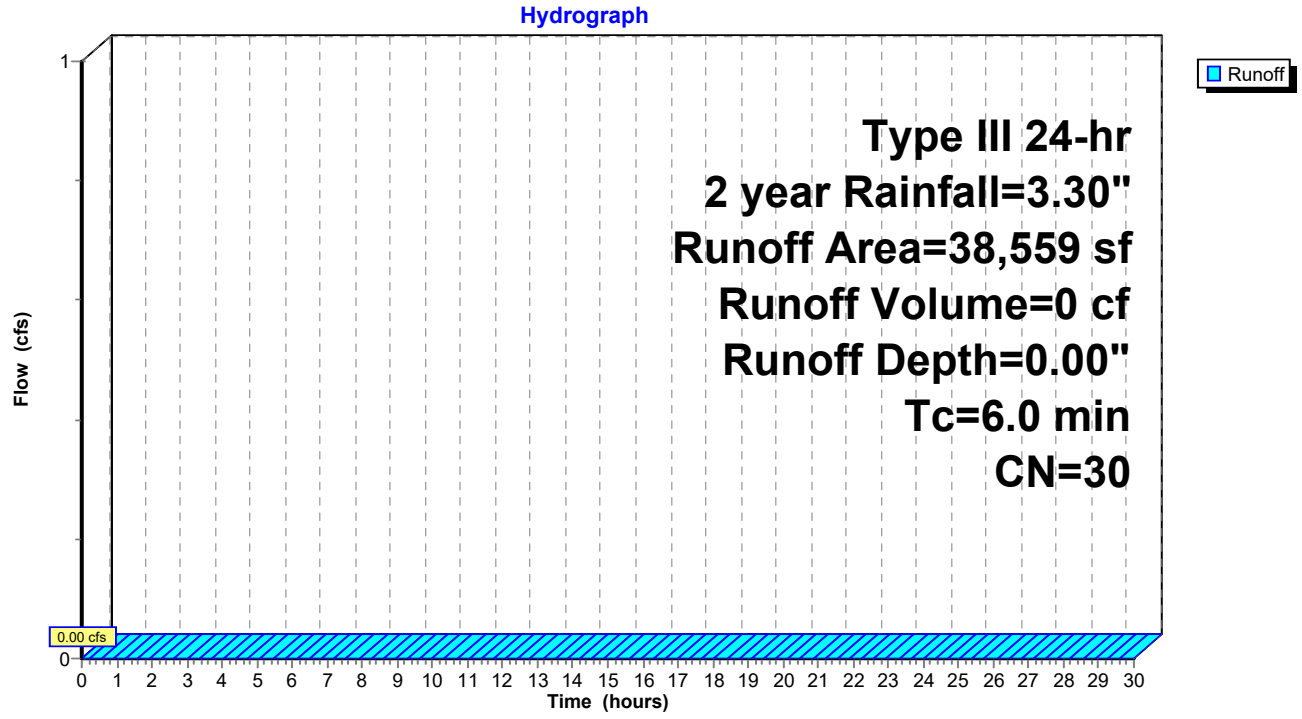
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Pond DP2 : Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

Area (sf)	CN	Description
19,150	30	Woods, Good, HSG A
19,409	30	Meadow, non-grazed, HSG A
38,559	30	Weighted Average
38,559		100.00% Pervious Area

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

Subcatchment P1: Back of property to Wetl



Summary for Subcatchment P1A: Back of property to trench

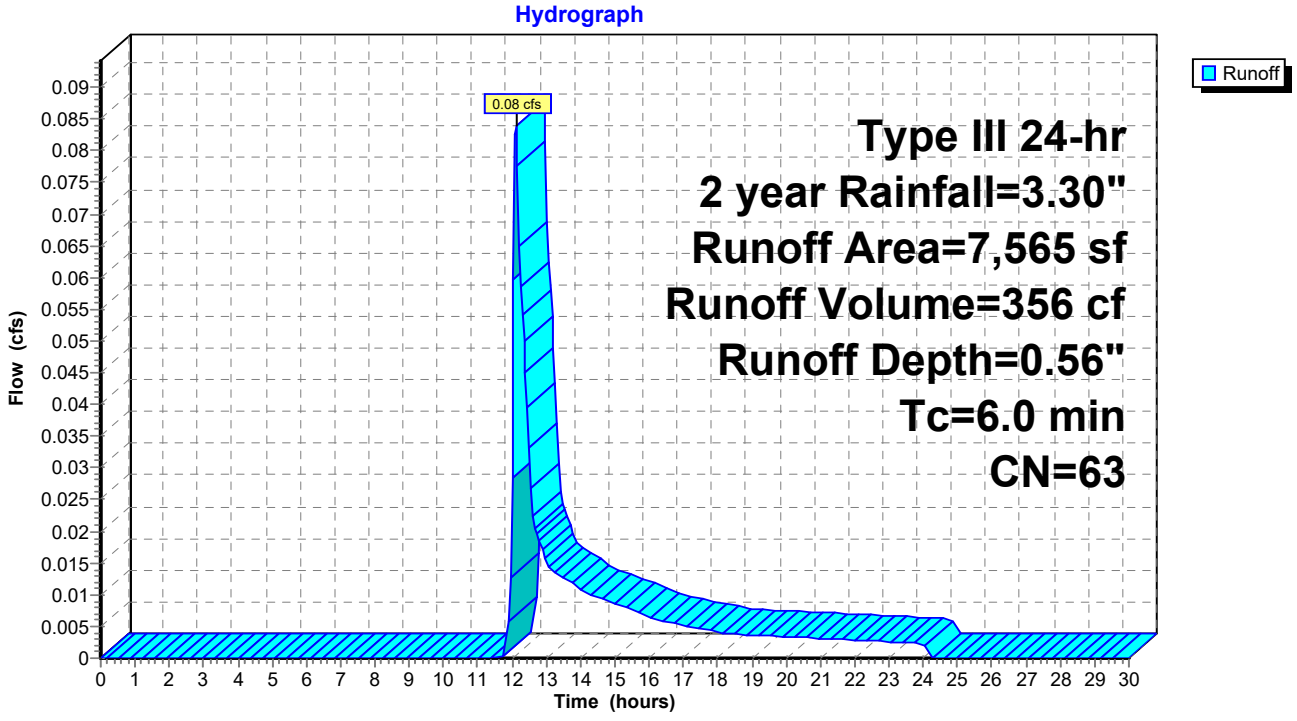
Runoff = 0.08 cfs @ 12.12 hrs, Volume= 356 cf, Depth= 0.56"
Routed to Pond 7P : Stone infiltration Trench

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

	Area (sf)	CN	Description
*	3,700	98	CONCRETE/Pervious Pvmt
	3,865	30	Meadow, non-grazed, HSG A
	7,565	63	Weighted Average
	3,865		51.09% Pervious Area
	3,700		48.91% Impervious Area

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

Subcatchment P1A: Back of property to trench



Summary for Subcatchment P1B: Back Patio

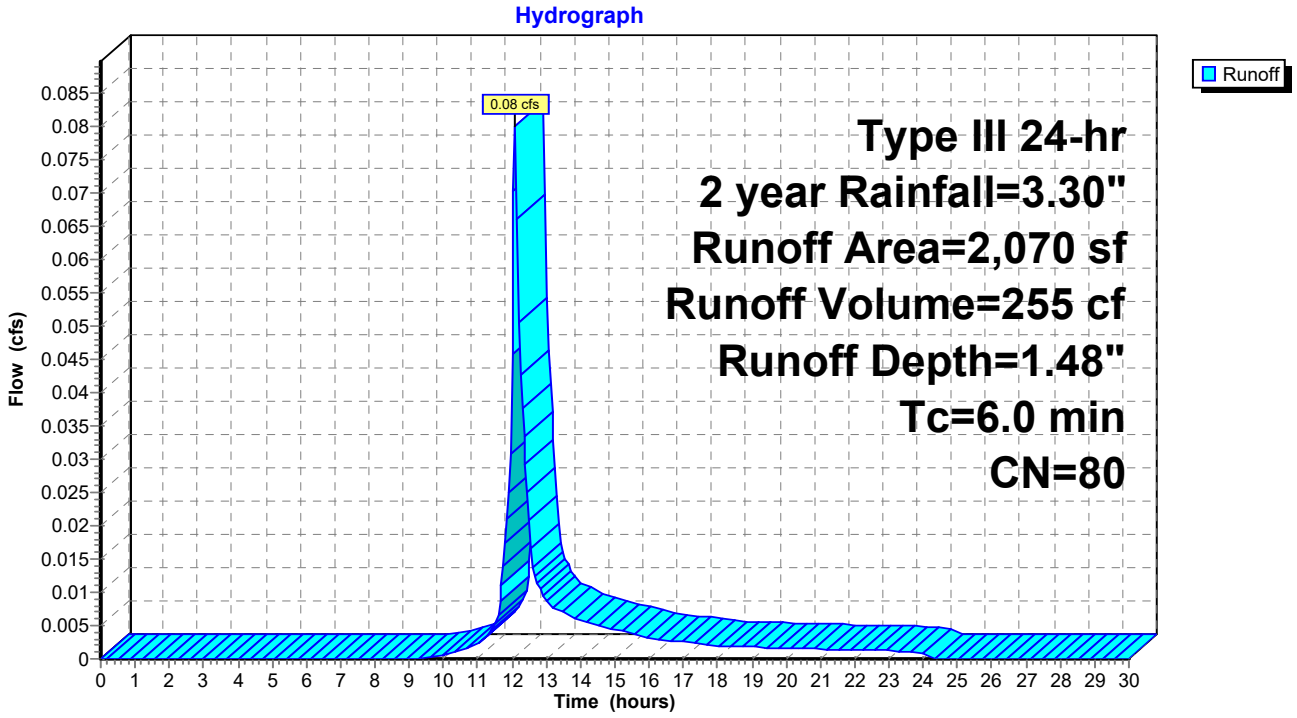
Runoff = 0.08 cfs @ 12.10 hrs, Volume= 255 cf, Depth= 1.48"
Routed to Pond 5P : Permeable Pavers (Back)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

	Area (sf)	CN	Description
*	2,070	80	permeable pavers
	2,070		100.00% Pervious Area

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

Subcatchment P1B: Back Patio



Summary for Subcatchment P2A:

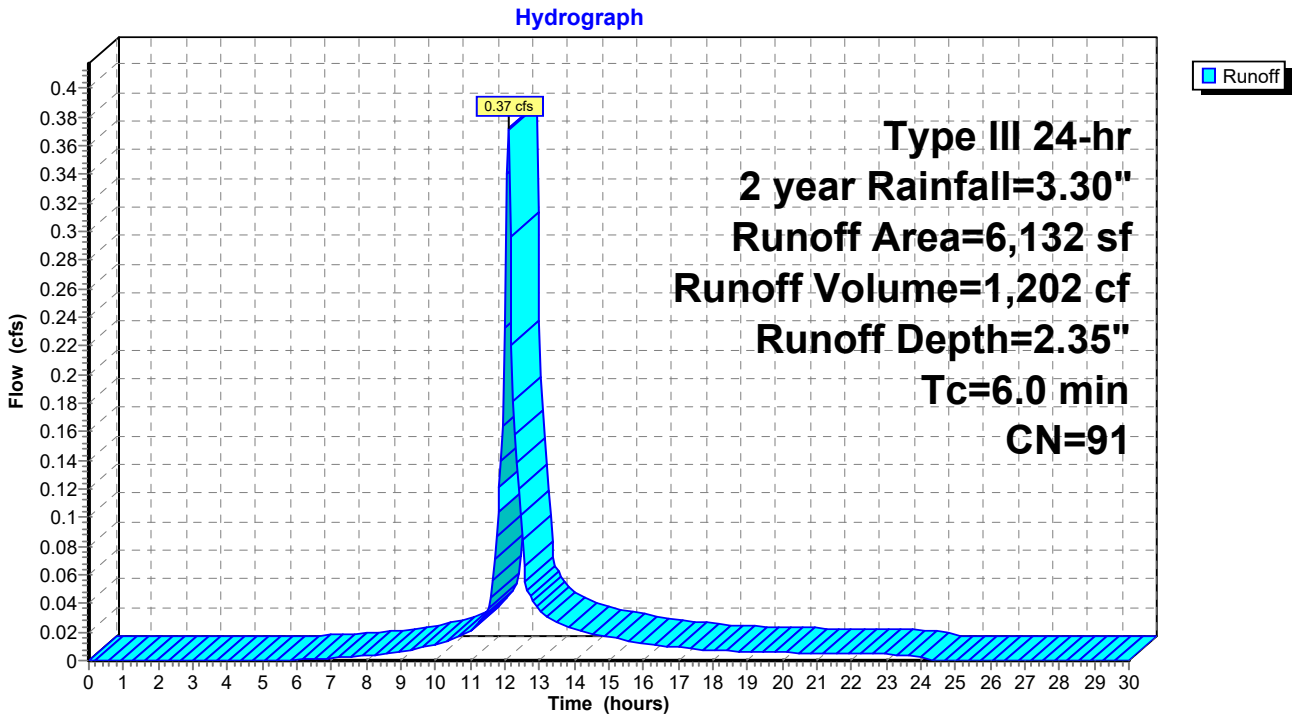
Runoff = 0.37 cfs @ 12.09 hrs, Volume= 1,202 cf, Depth= 2.35"
Routed to Pond 1P : Pervious Pvmt (North Fire) bed 'C'

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

	Area (sf)	CN	Description
*	1,675	98	CONCRETE
*	3,929	96	permeable pavement
	528	30	Meadow, non-grazed, HSG A
	6,132	91	Weighted Average
	4,457		72.68% Pervious Area
	1,675		27.32% Impervious Area

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

Subcatchment P2A:



Summary for Subcatchment P2B:

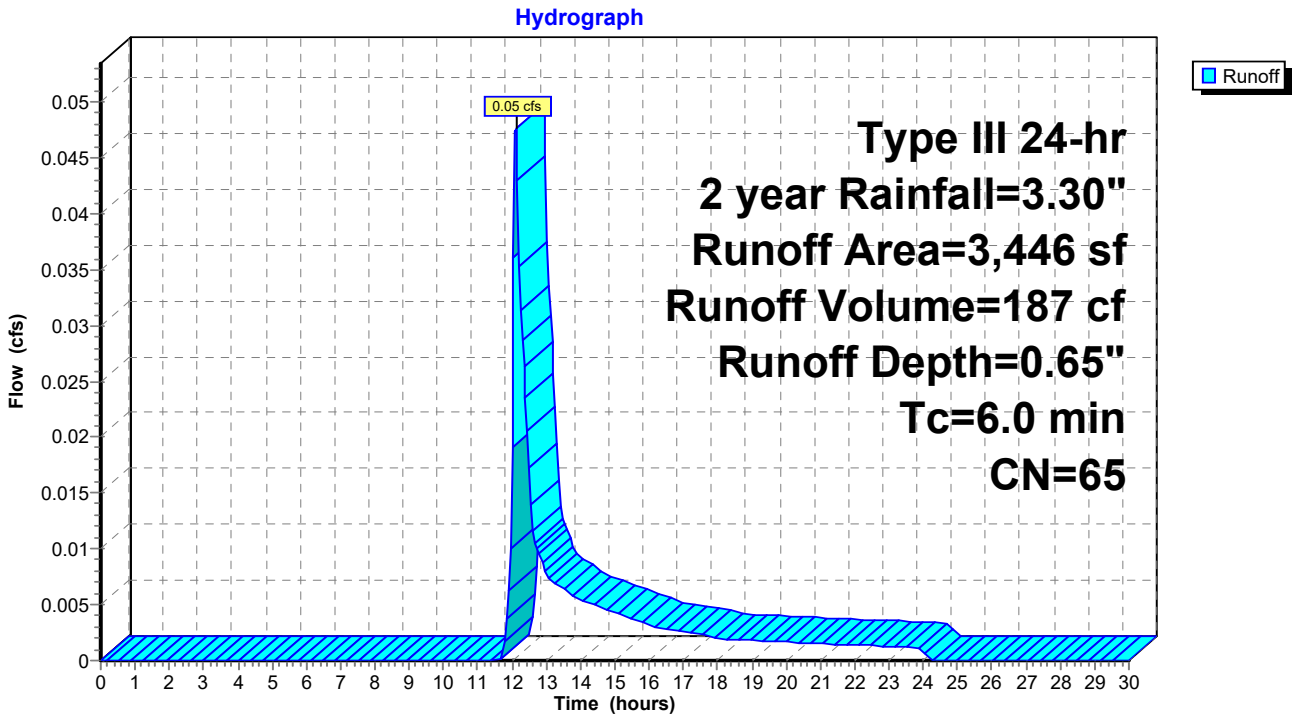
Runoff = 0.05 cfs @ 12.11 hrs, Volume= 187 cf, Depth= 0.65"
Routed to Pond 2P : Pervious Pvmt (North Fire) Bed B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

	Area (sf)	CN	Description
*	475	98	CONCRETE
*	1,351	96	permeable pavement
	1,620	30	Meadow, non-grazed, HSG A
	3,446	65	Weighted Average
	2,971		86.22% Pervious Area
	475		13.78% Impervious Area

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

Subcatchment P2B:



Summary for Subcatchment P3:

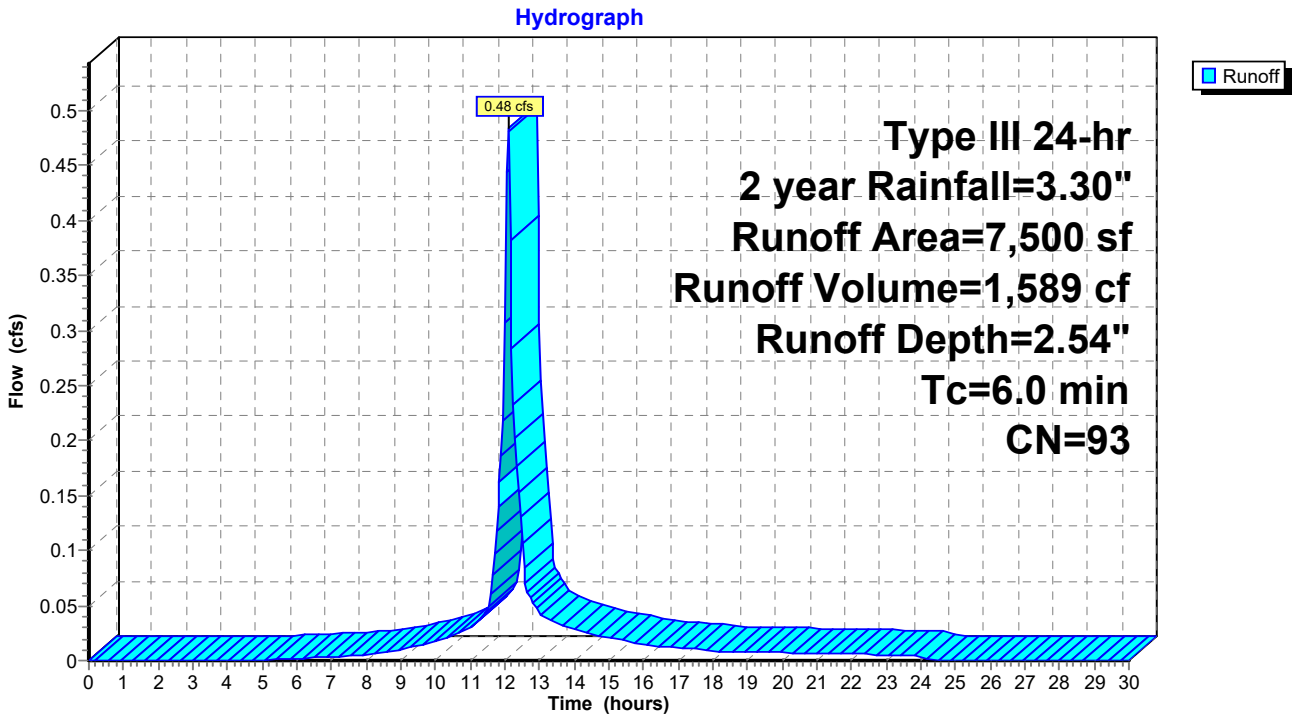
Runoff = 0.48 cfs @ 12.09 hrs, Volume= 1,589 cf, Depth= 2.54"
Routed to Pond CB1,8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

	Area (sf)	CN	Description
*	670	98	CONCRETE
	6,150	98	Paved parking, HSG A
	680	39	>75% Grass cover, Good, HSG A
	7,500	93	Weighted Average
	680		9.07% Pervious Area
	6,820		90.93% Impervious Area

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

Subcatchment P3:



Summary for Subcatchment P4:

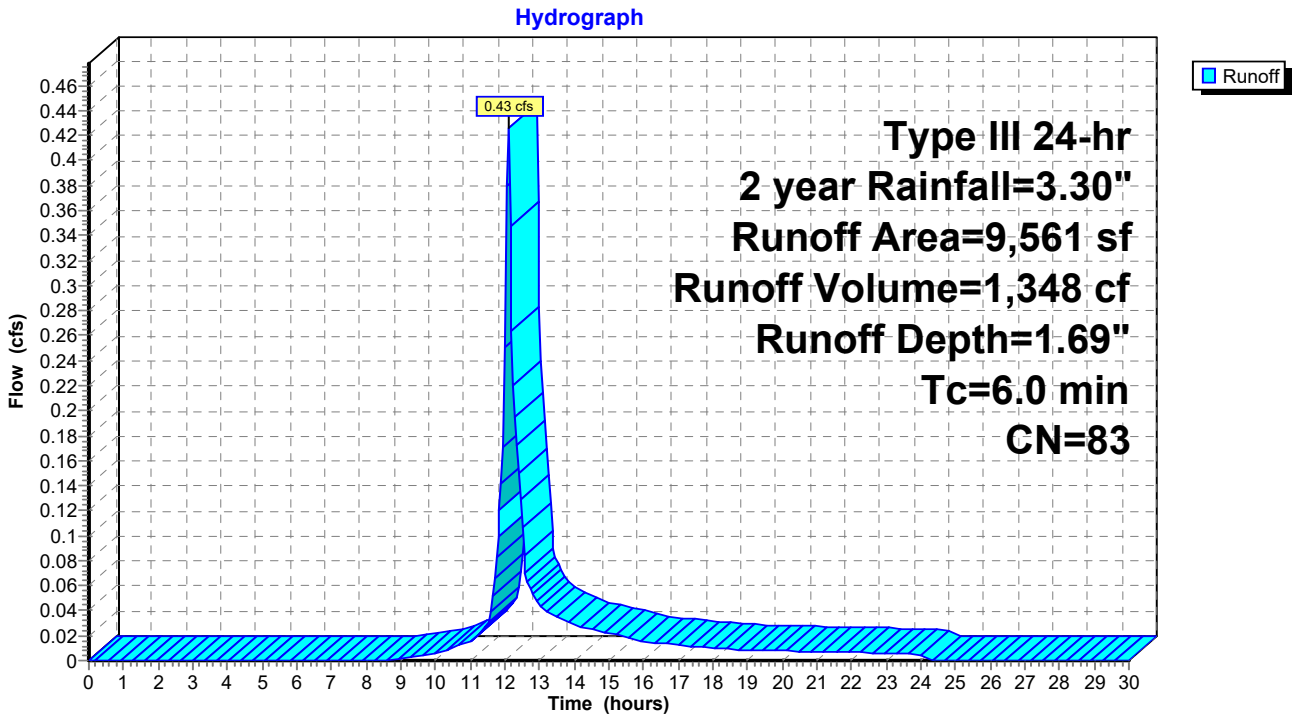
Runoff = 0.43 cfs @ 12.09 hrs, Volume= 1,348 cf, Depth= 1.69"
Routed to Pond CB2,7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

	Area (sf)	CN	Description
*	900	98	CONCRETE
	6,161	98	Paved parking, HSG A
	2,500	39	>75% Grass cover, Good, HSG A
	9,561	83	Weighted Average
	2,500		26.15% Pervious Area
	7,061		73.85% Impervious Area

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

Subcatchment P4:



Summary for Subcatchment P5:

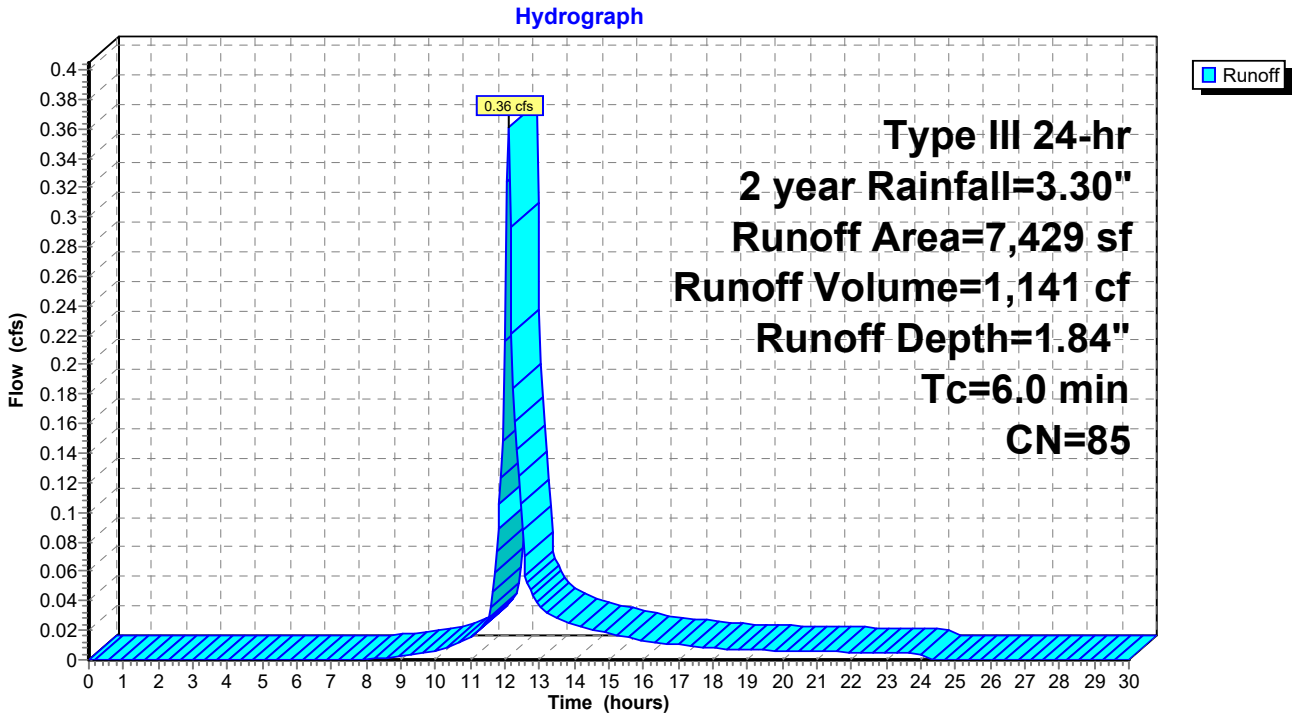
Runoff = 0.36 cfs @ 12.09 hrs, Volume= 1,141 cf, Depth= 1.84"
Routed to Pond CB3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

	Area (sf)	CN	Description
*	450	98	CONCRETE
	4,664	98	Paved parking, HSG A
	1,315	39	>75% Grass cover, Good, HSG A
*	1,000	80	permeable pavers
	7,429	85	Weighted Average
	2,315		31.16% Pervious Area
	5,114		68.84% Impervious Area

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

Subcatchment P5:



Summary for Subcatchment P5A: Perm Pavers Front entrance

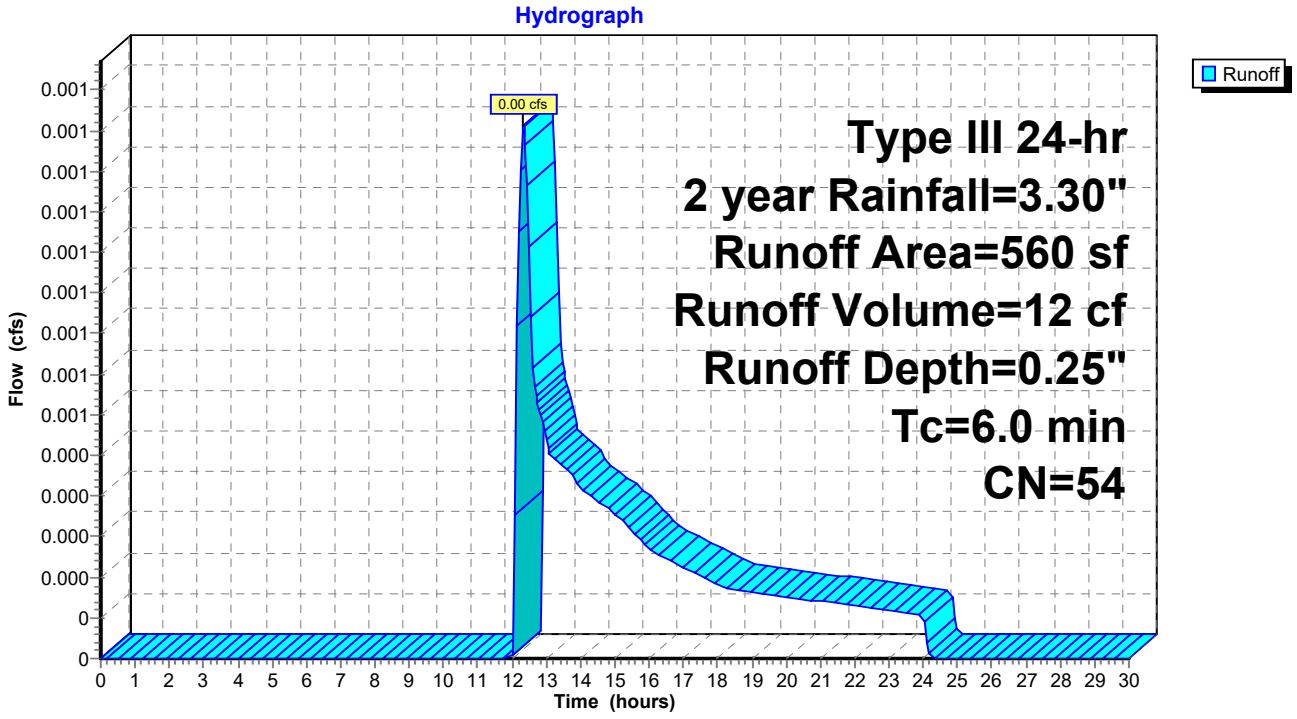
Runoff = 0.00 cfs @ 12.34 hrs, Volume= 12 cf, Depth= 0.25"
Routed to Pond 6P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

	Area (sf)	CN	Description
*	200	80	permeable pavers
	360	39	>75% Grass cover, Good, HSG A
	560	54	Weighted Average
	560		100.00% Pervious Area

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

Subcatchment P5A: Perm Pavers Front entrance



Summary for Subcatchment P6:

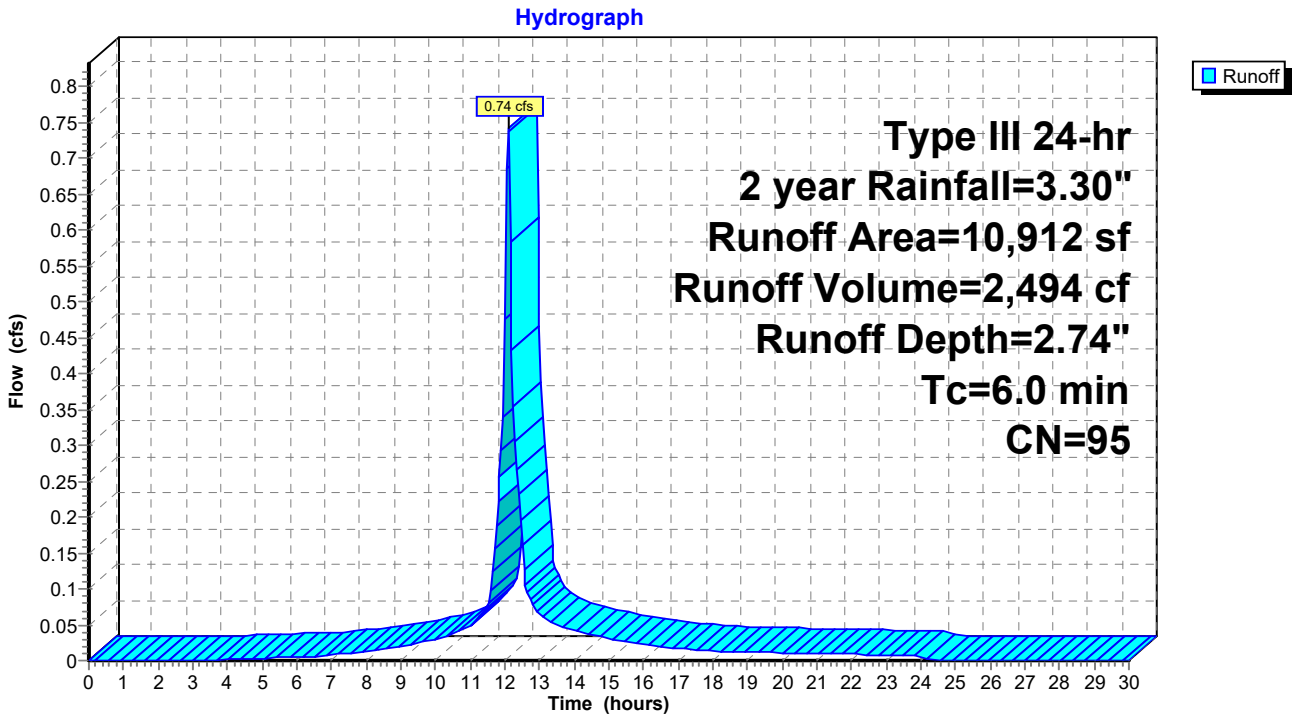
Runoff = 0.74 cfs @ 12.09 hrs, Volume= 2,494 cf, Depth= 2.74"
Routed to Pond CB4 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

	Area (sf)	CN	Description
*	1,200	98	CONCRETE
	9,066	98	Paved parking, HSG A
	646	39	>75% Grass cover, Good, HSG A
	10,912	95	Weighted Average
	646		5.92% Pervious Area
	10,266		94.08% Impervious Area

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

Subcatchment P6:



Summary for Subcatchment P7:

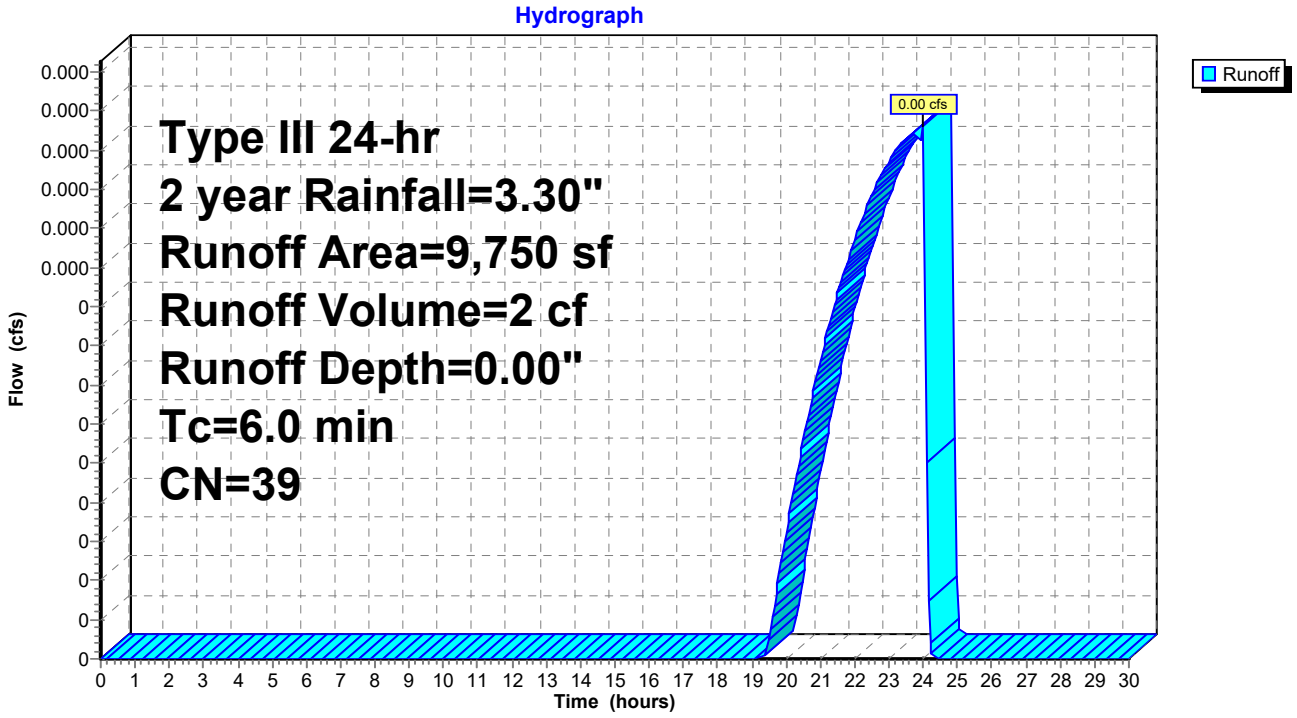
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 2 cf, Depth= 0.00"
Routed to Pond CB5 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

Area (sf)	CN	Description
9,750	39	>75% Grass cover, Good, HSG A
9,750		100.00% Pervious Area

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

Subcatchment P7:



Summary for Subcatchment P8:

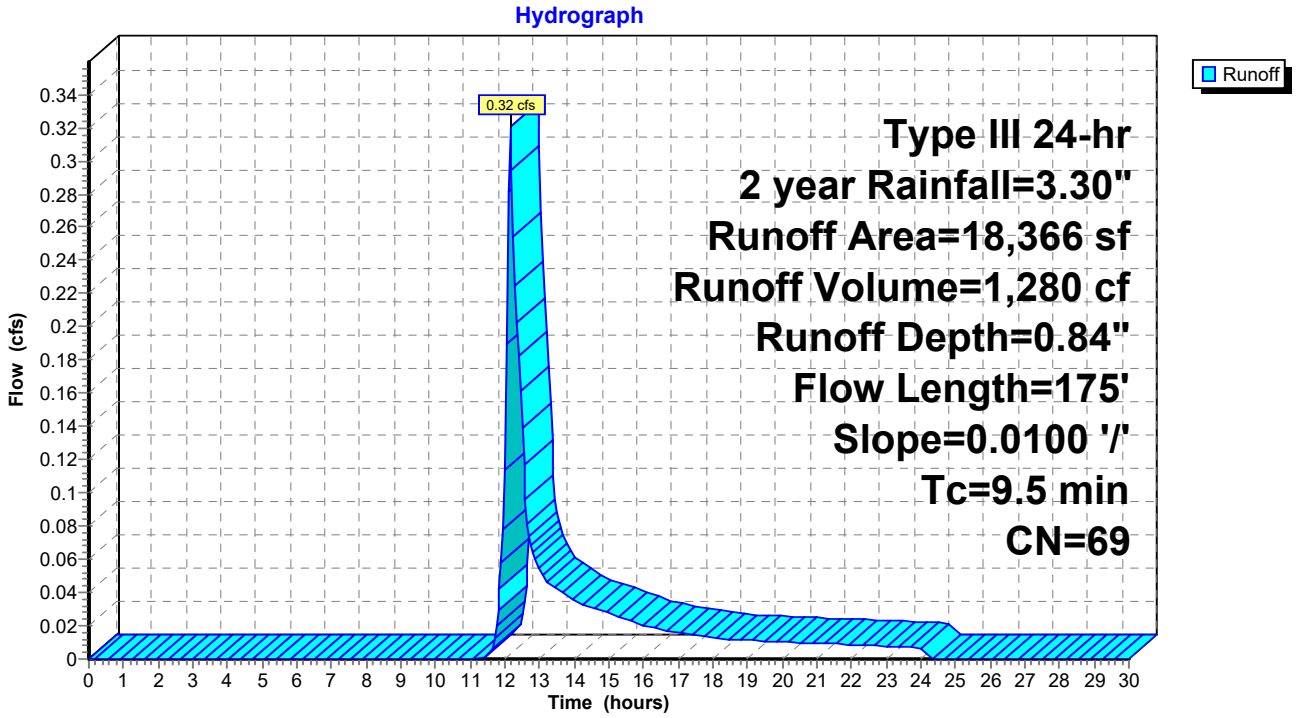
Runoff = 0.32 cfs @ 12.15 hrs, Volume= 1,280 cf, Depth= 0.84"
Routed to Pond 4P : Pervious Pvmt (South Fire Lane)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

	Area (sf)	CN	Description
*	1,020	98	CONCRETE
*	4,666	96	permeable pavement
	7,280	39	>75% Grass cover, Good, HSG A
	5,400	80	>75% Grass cover, Good, HSG D
	18,366	69	Weighted Average
	17,346		94.45% Pervious Area
	1,020		5.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
0.6	25	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.6	100	0.0100	1.06		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
9.5	175	Total			

Subcatchment P8:



Summary for Subcatchment P9:

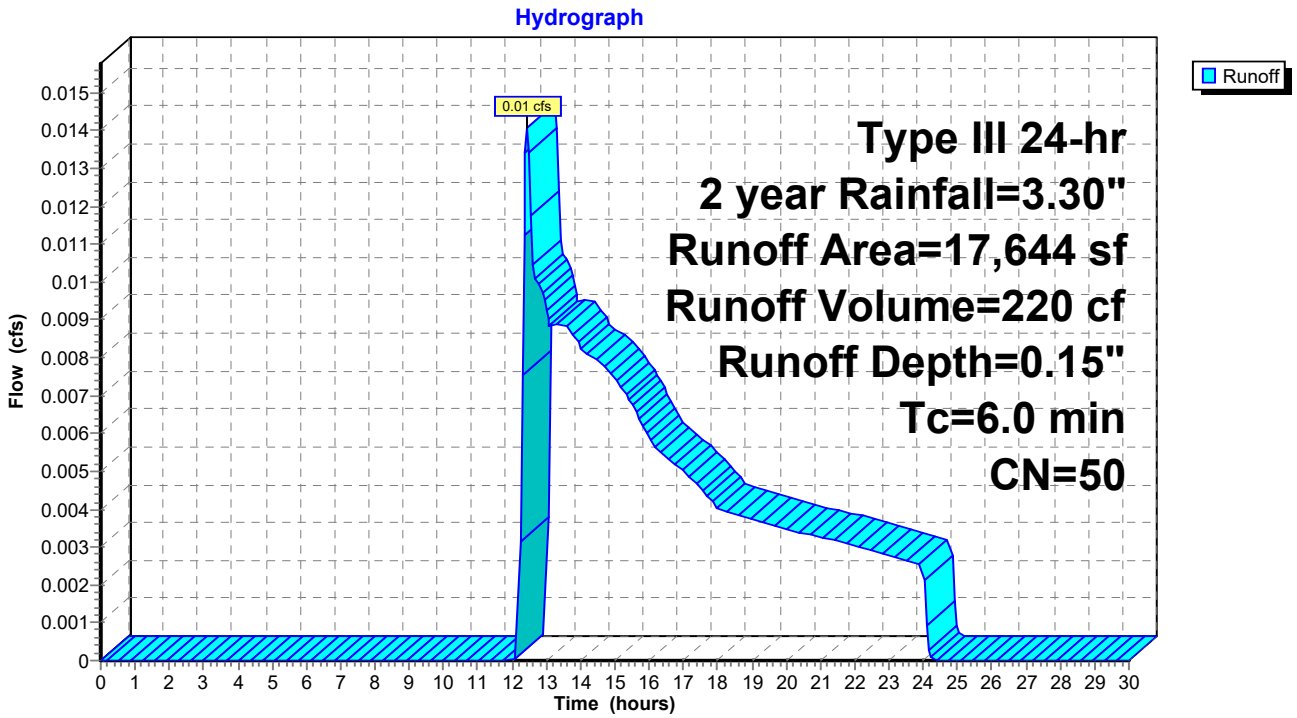
Runoff = 0.01 cfs @ 12.45 hrs, Volume= 220 cf, Depth= 0.15"
Routed to Pond DP1 : Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

	Area (sf)	CN	Description
*	2,850	98	CONCRETE
	350	98	Paved parking, HSG A
	14,444	39	>75% Grass cover, Good, HSG A
	17,644	50	Weighted Average
	14,444		81.86% Pervious Area
	3,200		18.14% Impervious Area

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

Subcatchment P9:



Summary for Pond 1P: Pervious Pvmt (North Fire) bed 'C'

Inflow Area = 6,132 sf, 27.32% Impervious, Inflow Depth = 2.35" for 2 year event
Inflow = 0.37 cfs @ 12.09 hrs, Volume= 1,202 cf
Outflow = 0.37 cfs @ 12.09 hrs, Volume= 1,202 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.37 cfs @ 12.09 hrs, Volume= 1,202 cf
Primary = 0.00 cfs @ 12.10 hrs, Volume= 0 cf
Routed to Pond 2P : Pervious Pvmt (North Fire) Bed B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.00' @ 12.10 hrs Surf.Area= 3,280 sf Storage= 0 cf
Flood Elev= 144.33' Surf.Area= 3,280 sf Storage= 2,071 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (801.3 - 801.3)

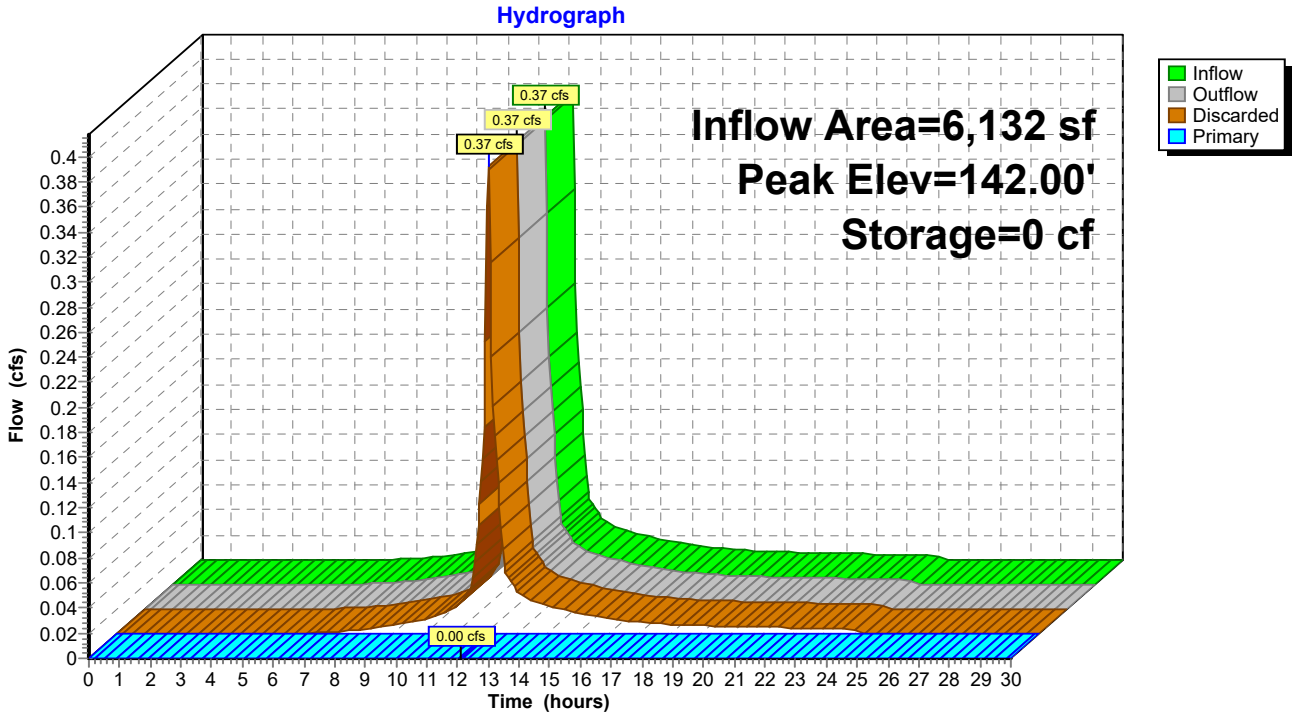
Volume	Invert	Avail.Storage	Storage Description
#1	142.00'	2,036 cf	**20.00'W x 164.00'L x 2.08'H Prismatoid** 6,822 cf Overall - 35 cf Embedded = 6,787 cf x 30.0% Voids
#2	142.00'	35 cf	**6.0" Round Pipe Storage** Inside #1 L= 180.0'
		2,071 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	142.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 138.00'
#2	Primary	142.00'	**6.0" Round Culvert X 2.00** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 142.00' / 141.50' S= 0.1000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf

Discarded OutFlow Max=0.63 cfs @ 12.09 hrs HW=142.00' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.63 cfs)

Primary OutFlow Max=0.00 cfs @ 12.10 hrs HW=142.00' TW=141.50' (Dynamic Tailwater)
↑—**2=Culvert** (Barrel Controls 0.00 cfs)

Pond 1P: Pervious Pvmt (North Fire) bed 'C'



Summary for Pond 2P: Pervious Pvmt (North Fire) Bed B

Inflow Area = 9,578 sf, 22.45% Impervious, Inflow Depth = 0.23" for 2 year event
Inflow = 0.05 cfs @ 12.11 hrs, Volume= 187 cf
Outflow = 0.05 cfs @ 12.11 hrs, Volume= 187 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.05 cfs @ 12.11 hrs, Volume= 187 cf
Primary = 0.00 cfs @ 11.65 hrs, Volume= 0 cf
Routed to Pond 3P : Pervious Pvmt (North Fire) Bed 'A'

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 141.50' @ 0.00 hrs Surf.Area= 700 sf Storage= 0 cf
Flood Elev= 143.83' Surf.Area= 700 sf Storage= 447 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (892.4 - 892.4)

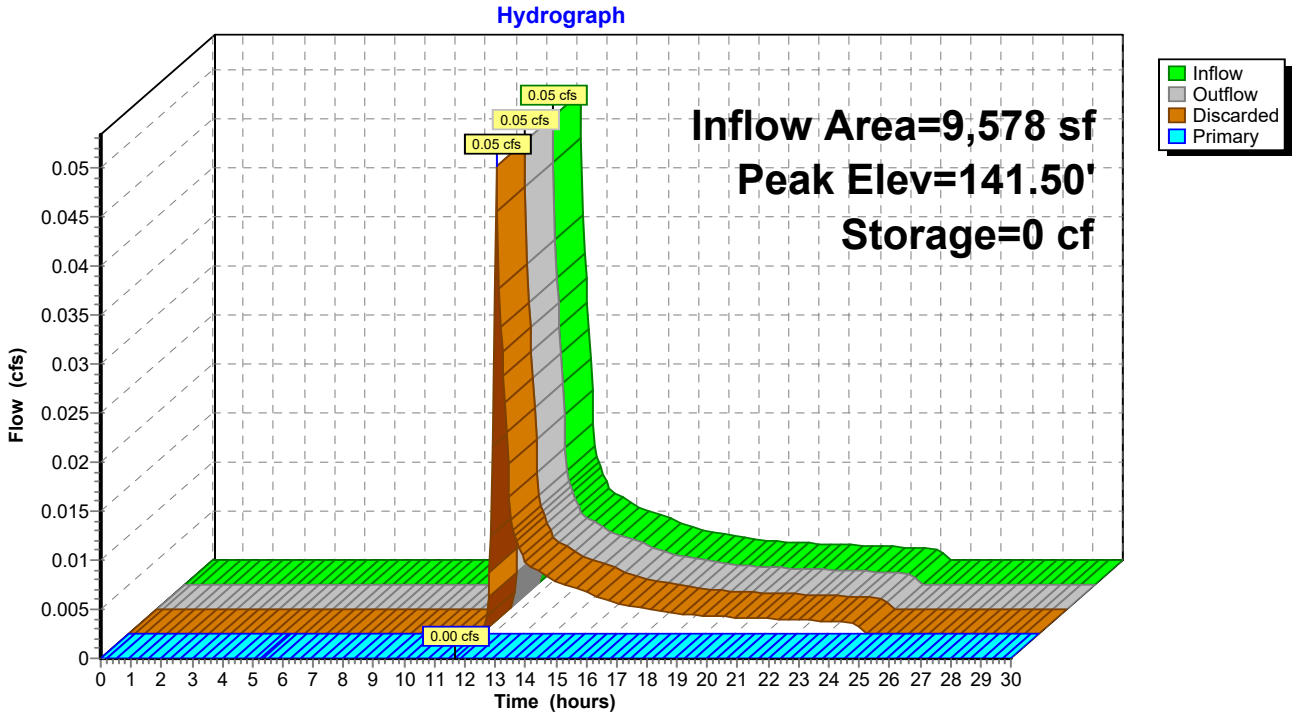
Volume	Invert	Avail.Storage	Storage Description
#1	141.50'	432 cf	**20.00'W x 35.00'L x 2.08'H Prismatoid** 1,456 cf Overall - 15 cf Embedded = 1,441 cf x 30.0% Voids
#2	141.50'	15 cf	**6.0" Round Pipe Storage** Inside #1 L= 75.0'
		447 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	141.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 138.00'
#2	Primary	141.50'	**6.0" Round Culvert X 2.00** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 141.50' / 141.00' S= 0.1000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf

Discarded OutFlow Max=0.00 cfs @ 12.11 hrs HW=141.50' (Free Discharge)
↑—**1=Exfiltration** (Passes 0.00 cfs of 0.13 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 11.65 hrs HW=141.50' TW=141.00' (Dynamic Tailwater)
↑—**2=Culvert** (Controls 0.00 cfs)

Pond 2P: Pervious Pvmt (North Fire) Bed B



Summary for Pond 3P: Pervious Pvmt (North Fire) Bed 'A'

Inflow Area = 9,578 sf, 22.45% Impervious, Inflow Depth = 0.00" for 2 year event
Inflow = 0.00 cfs @ 11.65 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 11.66 hrs, Volume= 0 cf, Atten= 27%, Lag= 0.6 min
Discarded = 0.00 cfs @ 11.66 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond IS1 : Infiltration System 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 141.00' @ 0.00 hrs Surf.Area= 1,200 sf Storage= 0 cf
Flood Elev= 143.33' Surf.Area= 1,200 sf Storage= 759 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 2.2 min (694.6 - 692.4)

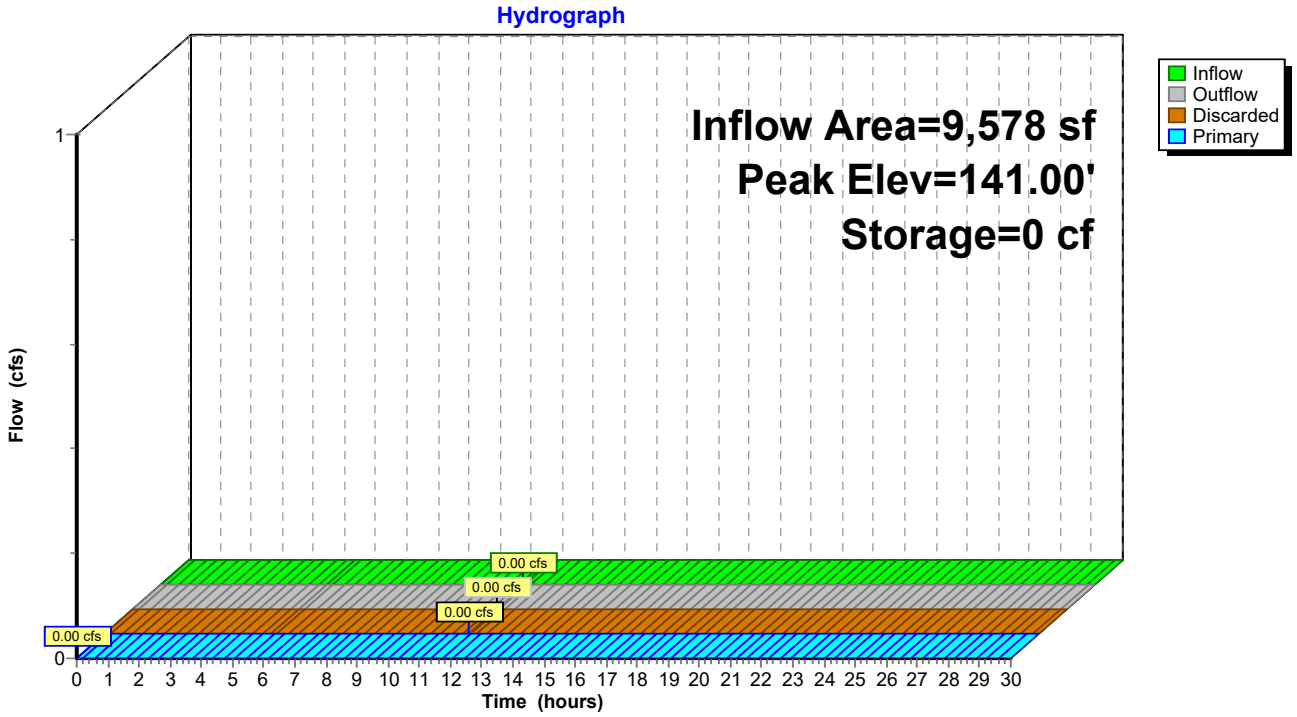
Volume	Invert	Avail.Storage	Storage Description
#1	141.00'	744 cf	**20.00'W x 60.00'L x 2.08'H Prismatoid** 2,496 cf Overall - 15 cf Embedded = 2,481 cf x 30.0% Voids
#2	141.00'	15 cf	**6.0" Round Pipe Storage** Inside #1 L= 75.0'
		759 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	141.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 138.00'
#2	Primary	141.50'	**12.0" Round Culvert** L= 25.0' Ke= 0.500 Inlet / Outlet Invert= 141.50' / 141.00' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#3	Device 2	143.30'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 11.66 hrs HW=141.00' (Free Discharge)
└**1=Exfiltration** (Passes 0.00 cfs of 0.23 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=141.00' TW=141.00' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 3P: Pervious Pvmt (North Fire) Bed 'A'



Summary for Pond 4P: Pervious Pvmt (South Fire Lane)

Inflow Area = 18,366 sf, 5.55% Impervious, Inflow Depth = 0.84" for 2 year event
Inflow = 0.32 cfs @ 12.15 hrs, Volume= 1,280 cf
Outflow = 0.17 cfs @ 12.45 hrs, Volume= 1,259 cf, Atten= 48%, Lag= 17.6 min
Discarded = 0.04 cfs @ 12.44 hrs, Volume= 40 cf
Primary = 0.13 cfs @ 12.46 hrs, Volume= 1,219 cf
Routed to Pond DMH1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.70' @ 12.44 hrs Surf.Area= 4,660 sf Storage= 296 cf
Flood Elev= 145.50' Surf.Area= 4,660 sf Storage= 2,837 cf

Plug-Flow detention time= 70.7 min calculated for 1,259 cf (98% of inflow)
Center-of-Mass det. time= 61.5 min (941.7 - 880.2)

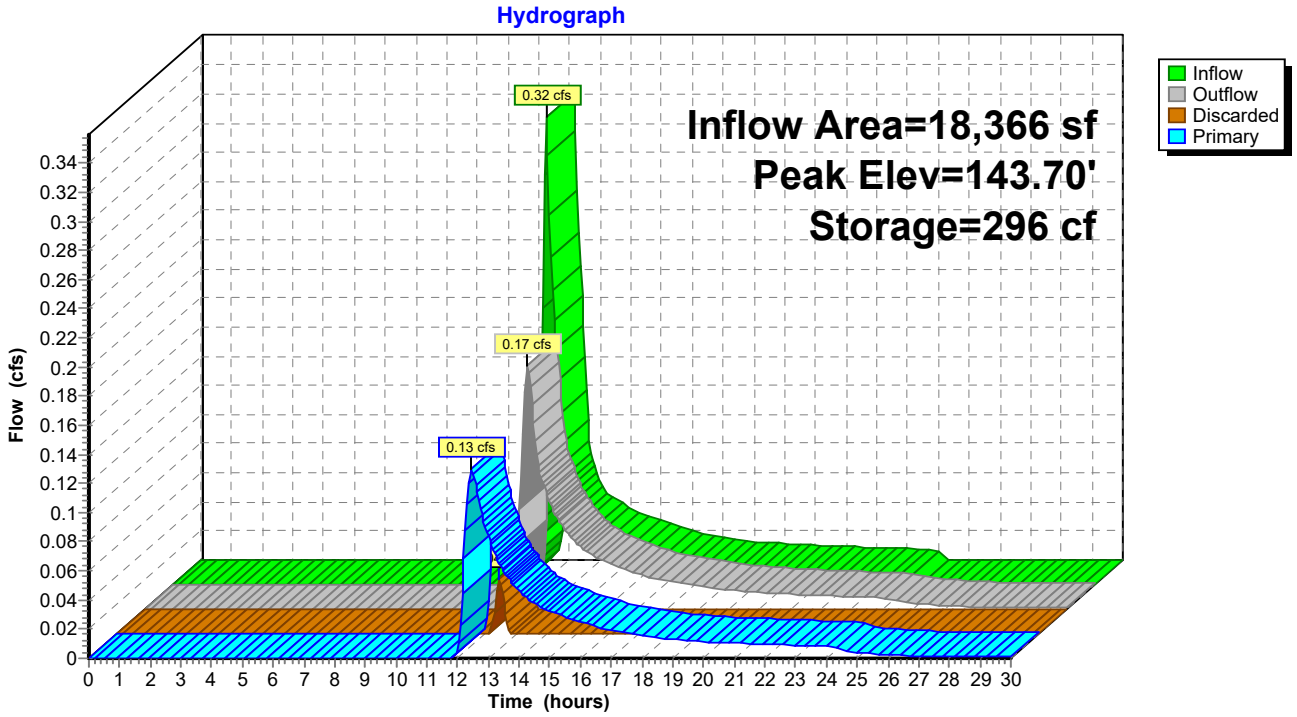
Volume	Invert	Avail.Storage	Storage Description
#1	143.50'	2,890 cf	**20.00'W x 233.00'L x 2.08'H Prismatoid** 9,693 cf Overall - 59 cf Embedded = 9,634 cf x 30.0% Voids
#2	143.50'	59 cf	**6.0" Round Pipe Storage** Inside #1 L= 300.0'
		2,949 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#0	Primary	145.58'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	143.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 141.50'
#2	Primary	143.50'	**12.0" Round Culvert** L= 170.0' Ke= 0.500 Inlet / Outlet Invert= 143.50' / 142.00' S= 0.0088 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#3	Device 1	143.67'	**8.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 12.44 hrs HW=143.70' (Free Discharge)
└**1=Exfiltration** (Passes 0.04 cfs of 0.98 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 0.04 cfs @ 0.57 fps)

Primary OutFlow Max=0.13 cfs @ 12.46 hrs HW=143.70' TW=142.67' (Dynamic Tailwater)
└**2=Culvert** (Outlet Controls 0.13 cfs @ 1.76 fps)

Pond 4P: Pervious Pvmt (South Fire Lane)



Summary for Pond 5P: Permeable Pavers (Back)

Inflow Area = 2,070 sf, 0.00% Impervious, Inflow Depth = 1.48" for 2 year event
Inflow = 0.08 cfs @ 12.10 hrs, Volume= 255 cf
Outflow = 0.08 cfs @ 12.10 hrs, Volume= 255 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.08 cfs @ 12.10 hrs, Volume= 255 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DP2 : Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 144.00' @ 0.00 hrs Surf.Area= 1,720 sf Storage= 0 cf
Flood Elev= 145.50' Surf.Area= 1,720 sf Storage= 516 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (841.2 - 841.2)

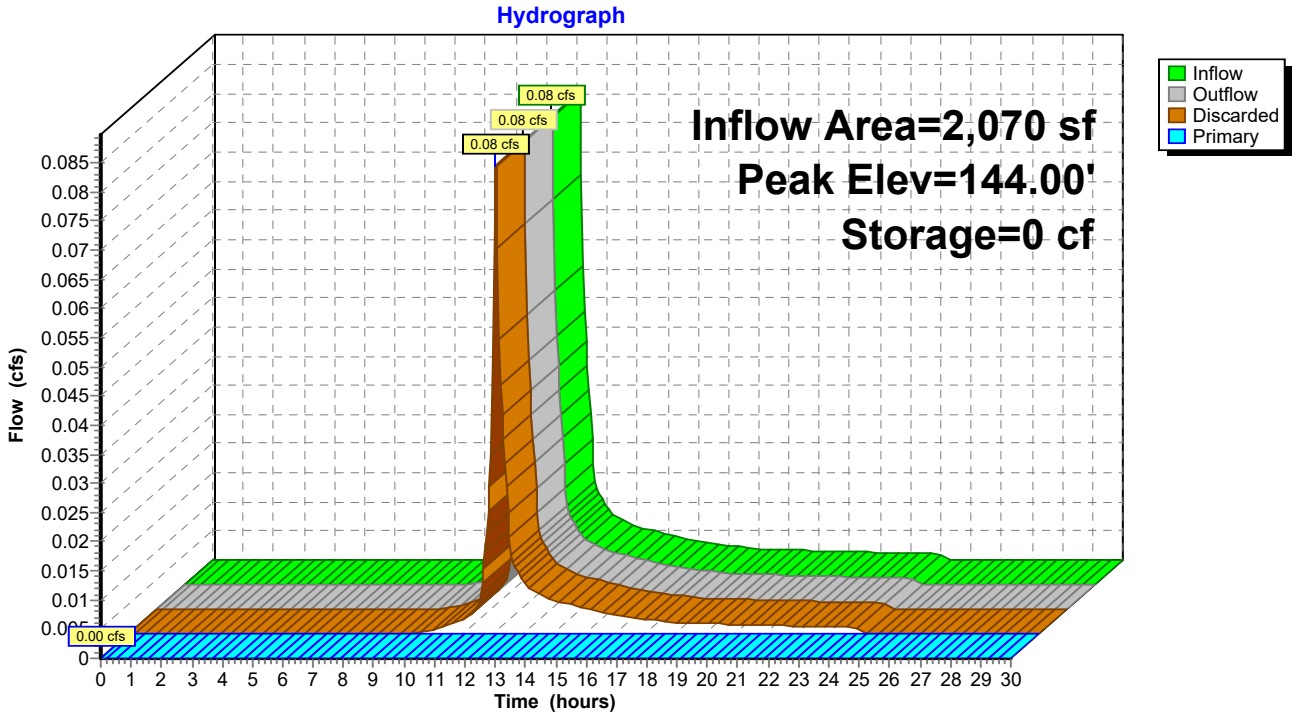
Volume	Invert	Avail.Storage	Storage Description
#1	144.00'	516 cf	**20.00'W x 86.00'L x 1.00'H Prismatoid** 1,720 cf Overall x 30.0% Voids

Device	Routing	Invert	Outlet Devices
#0	Primary	145.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	144.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.00'

Discarded OutFlow Max=0.00 cfs @ 12.10 hrs HW=144.00' (Free Discharge)
↑**1=Exfiltration** (Passes 0.00 cfs of 0.33 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=144.00' TW=0.00' (Dynamic Tailwater)

Pond 5P: Permeable Pavers (Back)



Summary for Pond 6P:

Inflow Area = 560 sf, 0.00% Impervious, Inflow Depth = 0.25" for 2 year event
Inflow = 0.00 cfs @ 12.34 hrs, Volume= 12 cf
Outflow = 0.00 cfs @ 12.34 hrs, Volume= 12 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 12.34 hrs, Volume= 12 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DP1 : Drainage Network

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.00' @ 0.00 hrs Surf.Area= 400 sf Storage= 0 cf
Flood Elev= 145.00' Surf.Area= 400 sf Storage= 120 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (957.4 - 957.4)

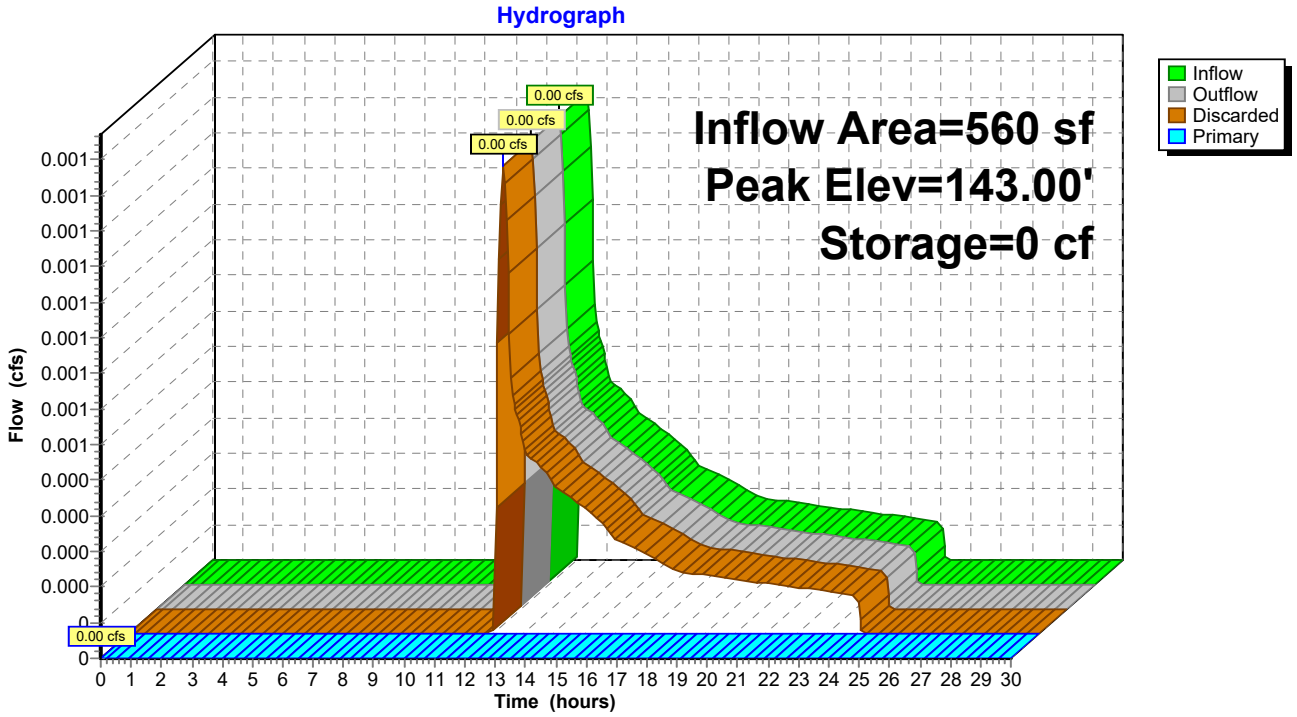
Volume	Invert	Avail.Storage	Storage Description
#1	143.00'	120 cf	**20.00'W x 20.00'L x 1.00'H Prismatoid** 400 cf Overall x 30.0% Voids

Device	Routing	Invert	Outlet Devices
#0	Primary	144.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	143.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.00'

Discarded OutFlow Max=0.00 cfs @ 12.34 hrs HW=143.00' (Free Discharge)
↑—**1=Exfiltration** (Passes 0.00 cfs of 0.08 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=143.00' TW=0.00' (Dynamic Tailwater)

Pond 6P:


Hydrograph
Inflow Area=560 sf
Peak Elev=143.00'
Storage=0 cf
Inflow
Outflow
Discarded
Primary
0.00 cfs
0.00 cfs
0.00 cfs
0.00 cfs
Flow (cfs)
0.001
0.001
0.001
0.001
0.001
0.001
0.001
0.001
0.000
0.000
0.000
0
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Time (hours)

Summary for Pond 7P: Stone infiltration Trench

Inflow Area = 7,565 sf, 48.91% Impervious, Inflow Depth = 0.56" for 2 year event
Inflow = 0.08 cfs @ 12.12 hrs, Volume= 356 cf
Outflow = 0.08 cfs @ 12.12 hrs, Volume= 356 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.08 cfs @ 12.12 hrs, Volume= 356 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DP2 : Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 144.00' @ 12.10 hrs Surf.Area= 600 sf Storage= 0 cf
Flood Elev= 145.00' Surf.Area= 600 sf Storage= 240 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (901.2 - 901.2)

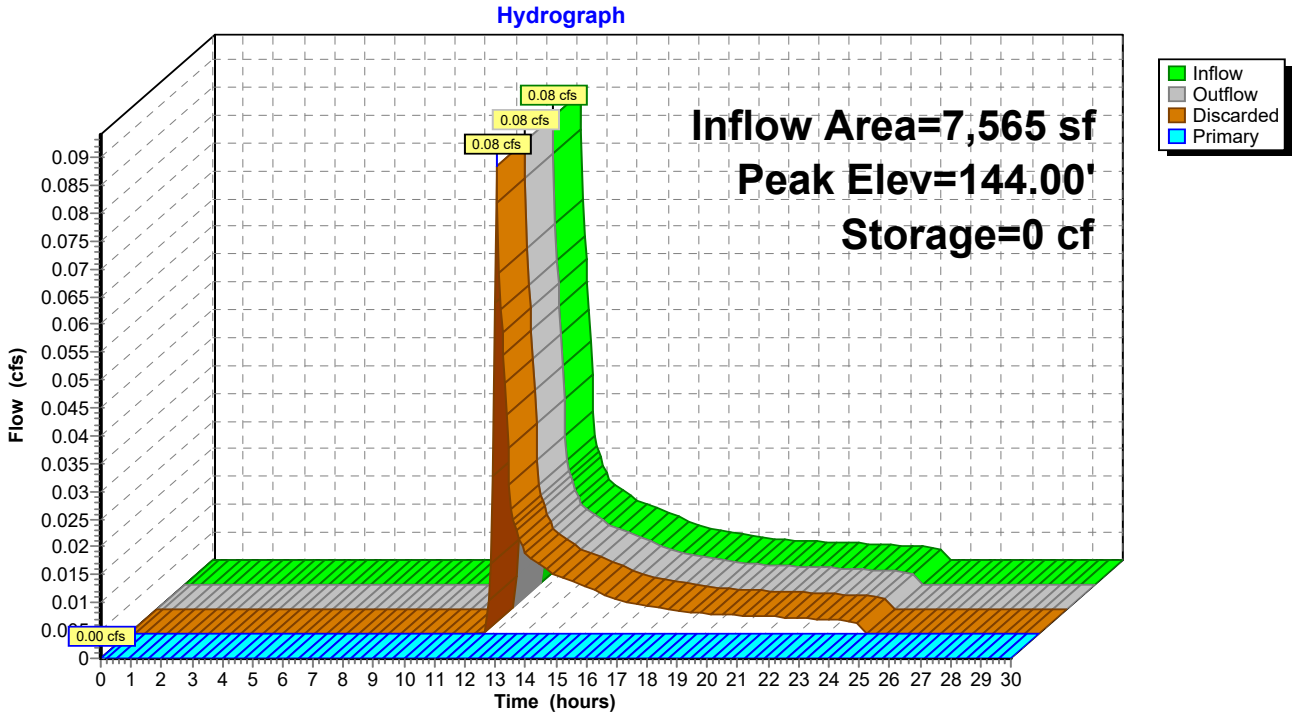
Volume	Invert	Avail.Storage	Storage Description
#1	144.00'	480 cf	**2.00'W x 300.00'L x 2.00'H Prismatoid** 1,200 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#0	Primary	146.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	144.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.00'
#2	Primary	145.00'	**500.0' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.11 cfs @ 12.12 hrs HW=144.00' (Free Discharge)
↑└**1=Exfiltration** (Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=144.00' TW=0.00' (Dynamic Tailwater)
↑└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Stone infiltration Trench



Summary for Pond CB1,8:

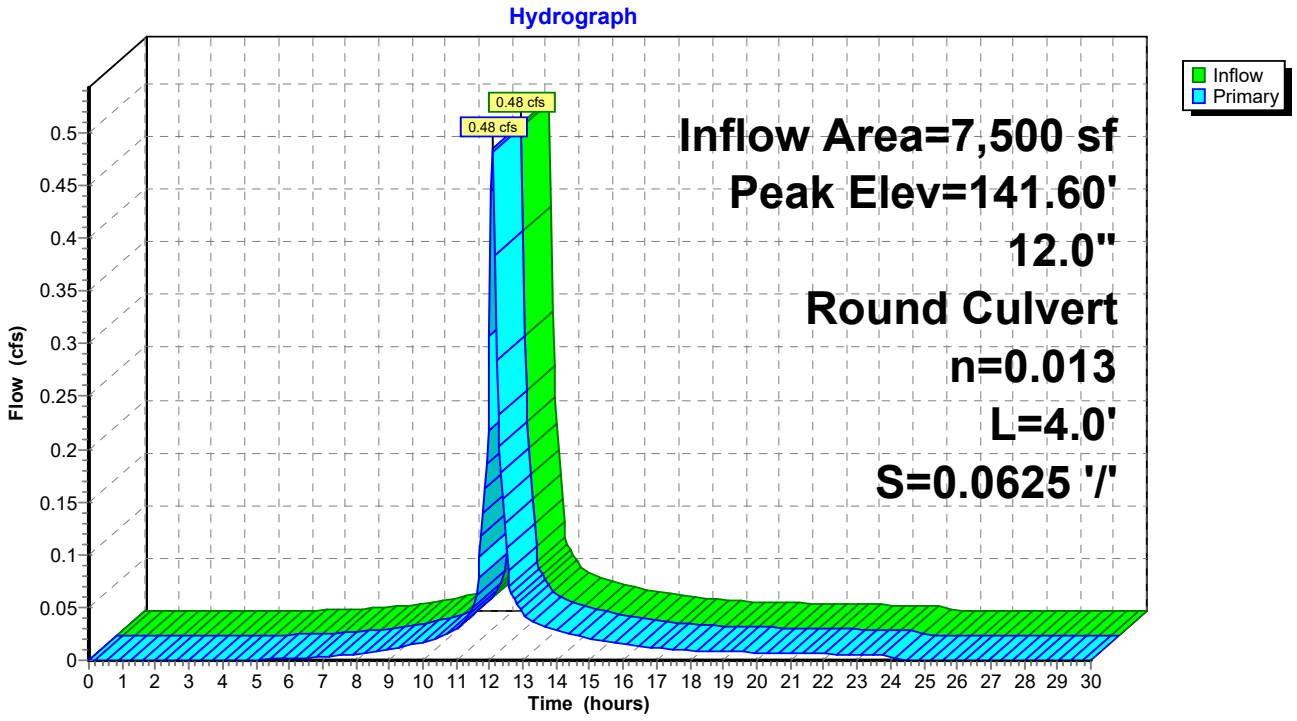
Inflow Area = 7,500 sf, 90.93% Impervious, Inflow Depth = 2.54" for 2 year event
Inflow = 0.48 cfs @ 12.09 hrs, Volume= 1,589 cf
Outflow = 0.48 cfs @ 12.09 hrs, Volume= 1,589 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.48 cfs @ 12.09 hrs, Volume= 1,589 cf
Routed to Pond IS1 : Infiltration System 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 141.60' @ 12.09 hrs
Flood Elev= 144.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.25'	**12.0" Round Culvert** L= 4.0' Ke= 0.500 Inlet / Outlet Invert= 141.25' / 141.00' S= 0.0625 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.47 cfs @ 12.09 hrs HW=141.59' TW=141.17' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.47 cfs @ 1.99 fps)

Pond CB1,8:



Summary for Pond CB2,7:

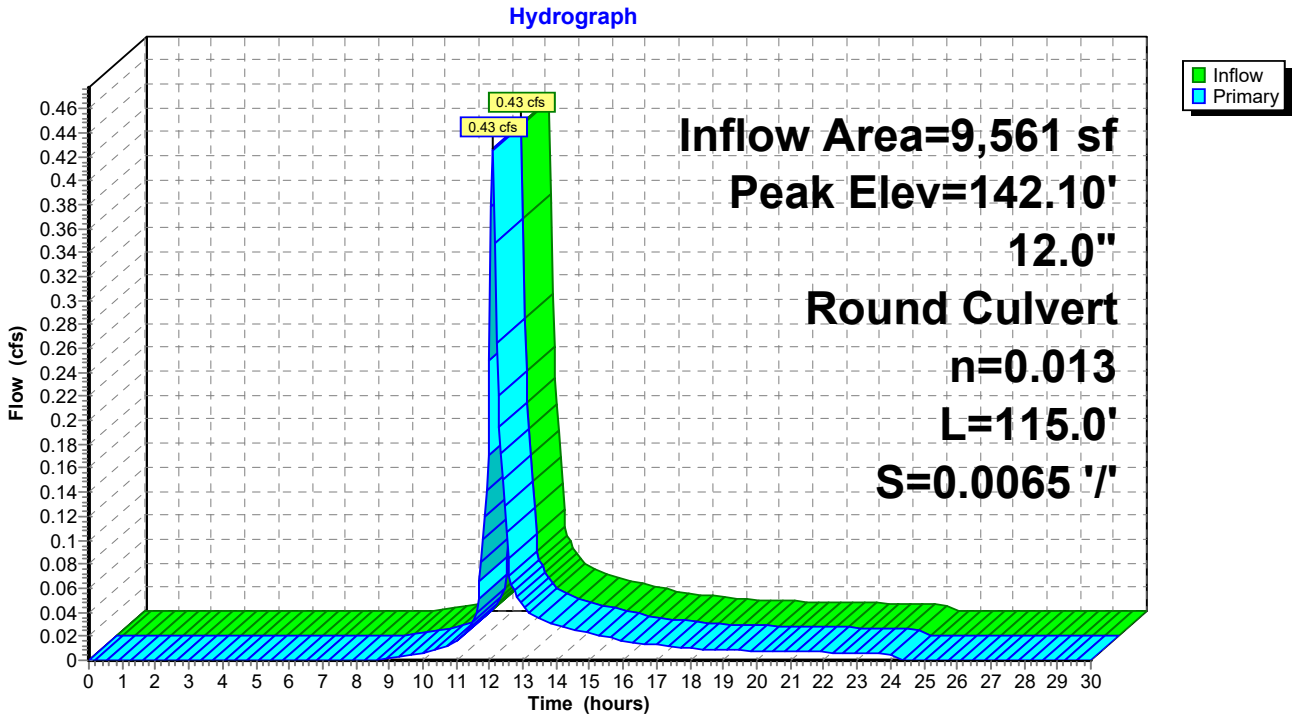
Inflow Area = 9,561 sf, 73.85% Impervious, Inflow Depth = 1.69" for 2 year event
Inflow = 0.43 cfs @ 12.09 hrs, Volume= 1,348 cf
Outflow = 0.43 cfs @ 12.09 hrs, Volume= 1,348 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.43 cfs @ 12.09 hrs, Volume= 1,348 cf
Routed to Pond IS1 : Infiltration System 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.10' @ 12.09 hrs
Flood Elev= 144.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.75'	**12.0" Round Culvert** L= 115.0' Ke= 0.500 Inlet / Outlet Invert= 141.75' / 141.00' S= 0.0065 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.42 cfs @ 12.09 hrs HW=142.10' TW=141.18' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.42 cfs @ 2.53 fps)

Pond CB2,7:



Summary for Pond CB3:

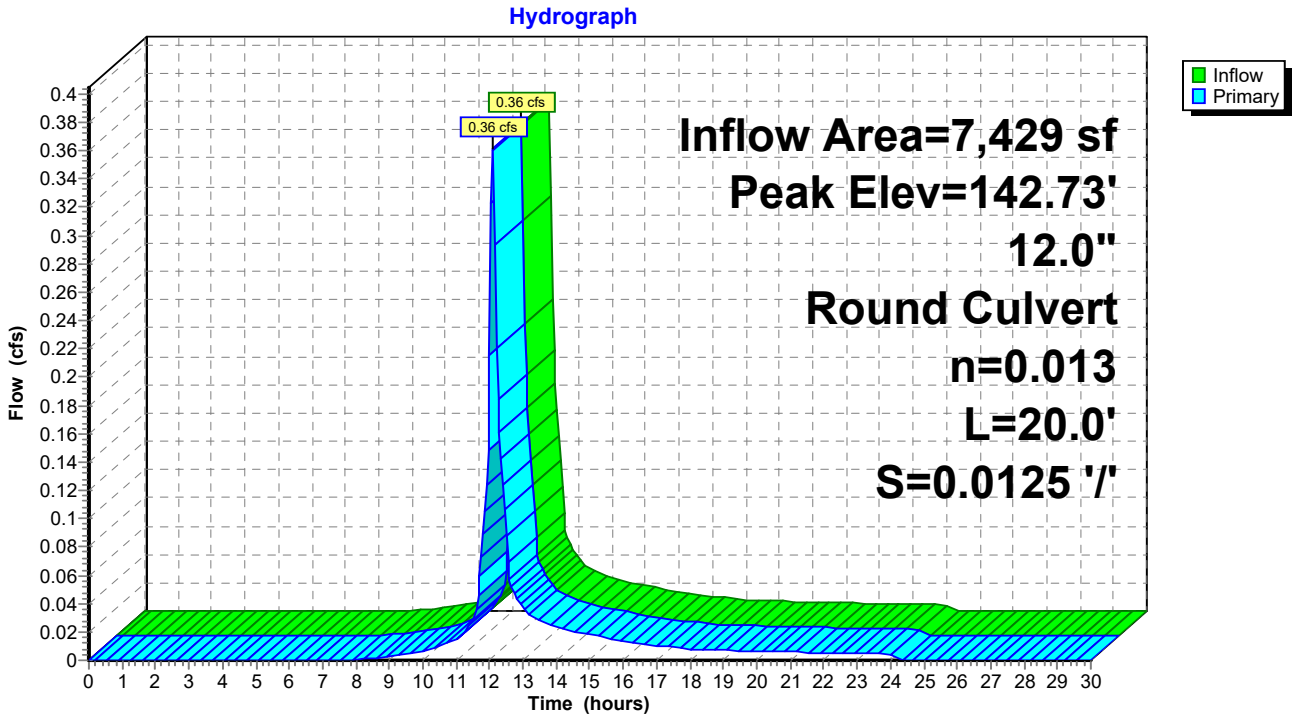
Inflow Area = 7,429 sf, 68.84% Impervious, Inflow Depth = 1.84" for 2 year event
Inflow = 0.36 cfs @ 12.09 hrs, Volume= 1,141 cf
Outflow = 0.36 cfs @ 12.09 hrs, Volume= 1,141 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.36 cfs @ 12.09 hrs, Volume= 1,141 cf
Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.73' @ 12.24 hrs
Flood Elev= 144.35'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.75'	**12.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 141.75' / 141.50' S= 0.0125 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=142.21' TW=142.42' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Pond CB3:



Summary for Pond CB4:

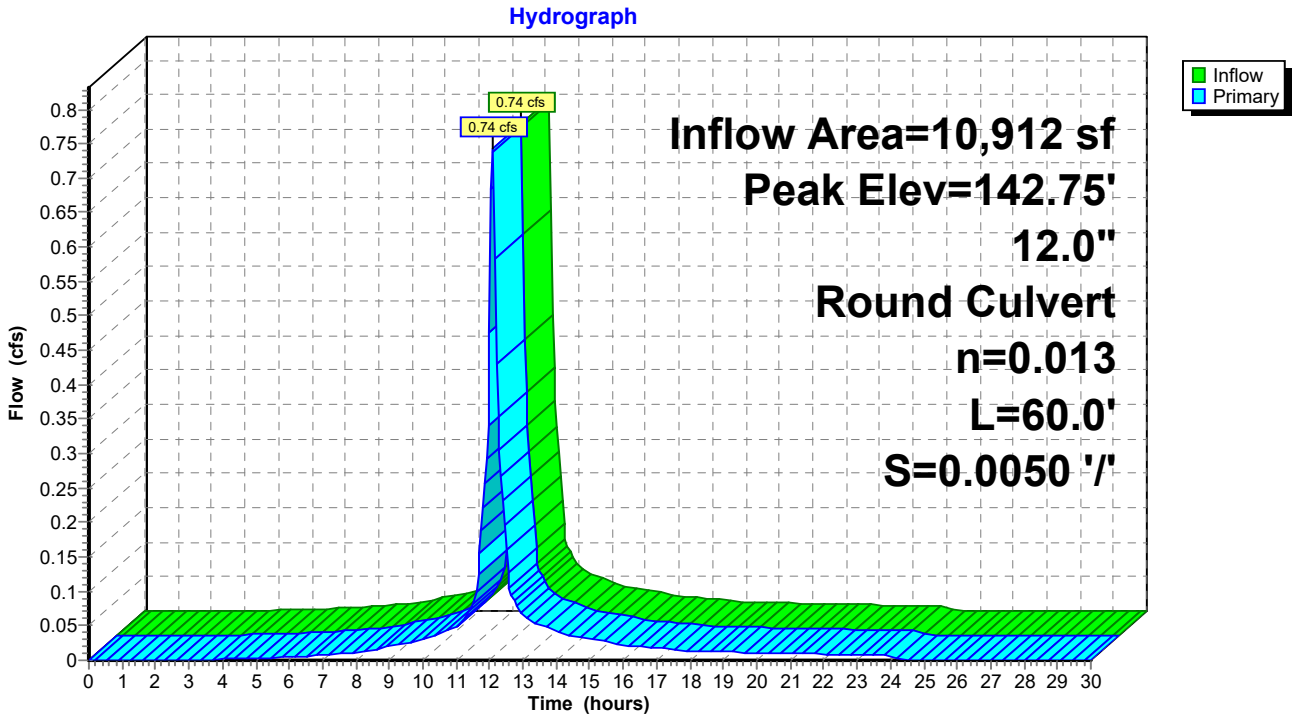
Inflow Area = 10,912 sf, 94.08% Impervious, Inflow Depth = 2.74" for 2 year event
Inflow = 0.74 cfs @ 12.09 hrs, Volume= 2,494 cf
Outflow = 0.74 cfs @ 12.09 hrs, Volume= 2,494 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.74 cfs @ 12.09 hrs, Volume= 2,494 cf
Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.75' @ 12.24 hrs
Flood Elev= 144.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.80'	**12.0" Round Culvert** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 141.80' / 141.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=142.38' TW=142.39' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Pond CB4:



Summary for Pond CB5:

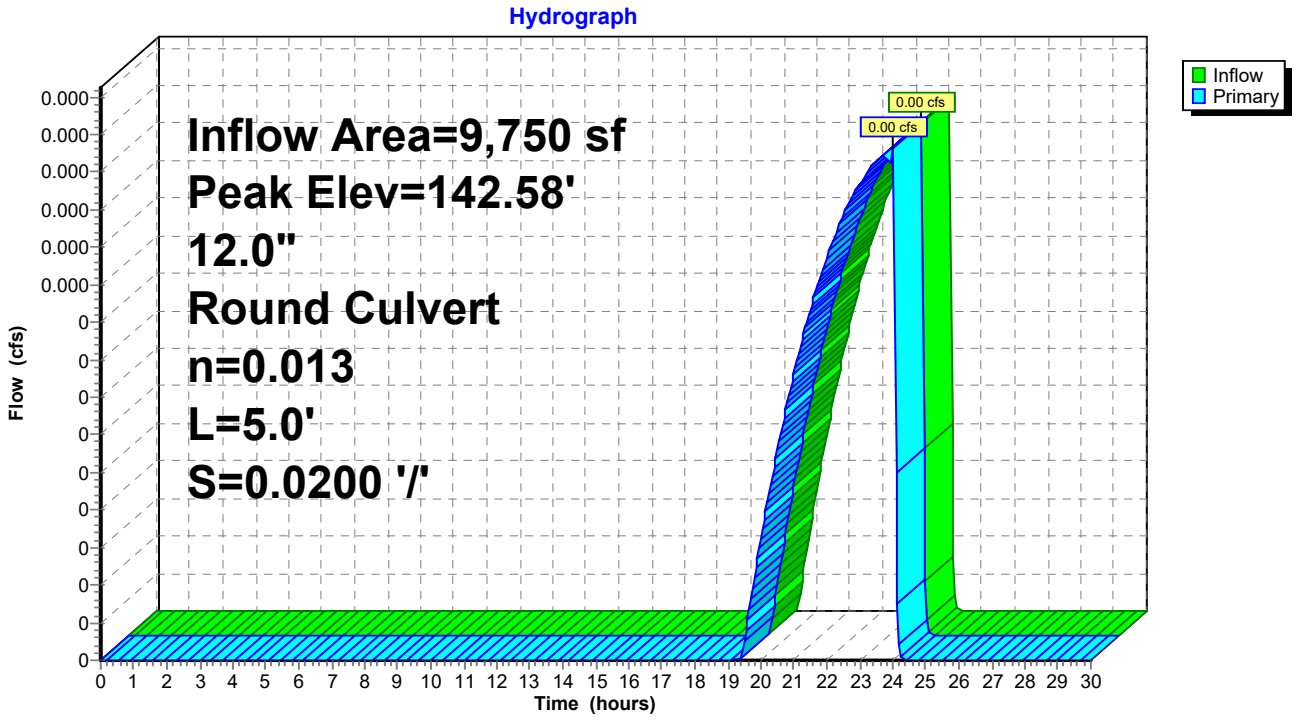
Inflow Area = 9,750 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2 year event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 2 cf
Outflow = 0.00 cfs @ 24.00 hrs, Volume= 2 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 24.00 hrs, Volume= 2 cf
Routed to Pond DMH1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.58' @ 12.73 hrs
Flood Elev= 144.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	142.00'	**12.0" Round Culvert** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 142.00' / 141.90' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 24.00 hrs HW=142.01' TW=141.97' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.00 cfs @ 0.24 fps)

Pond CB5:



Summary for Pond DMH1:

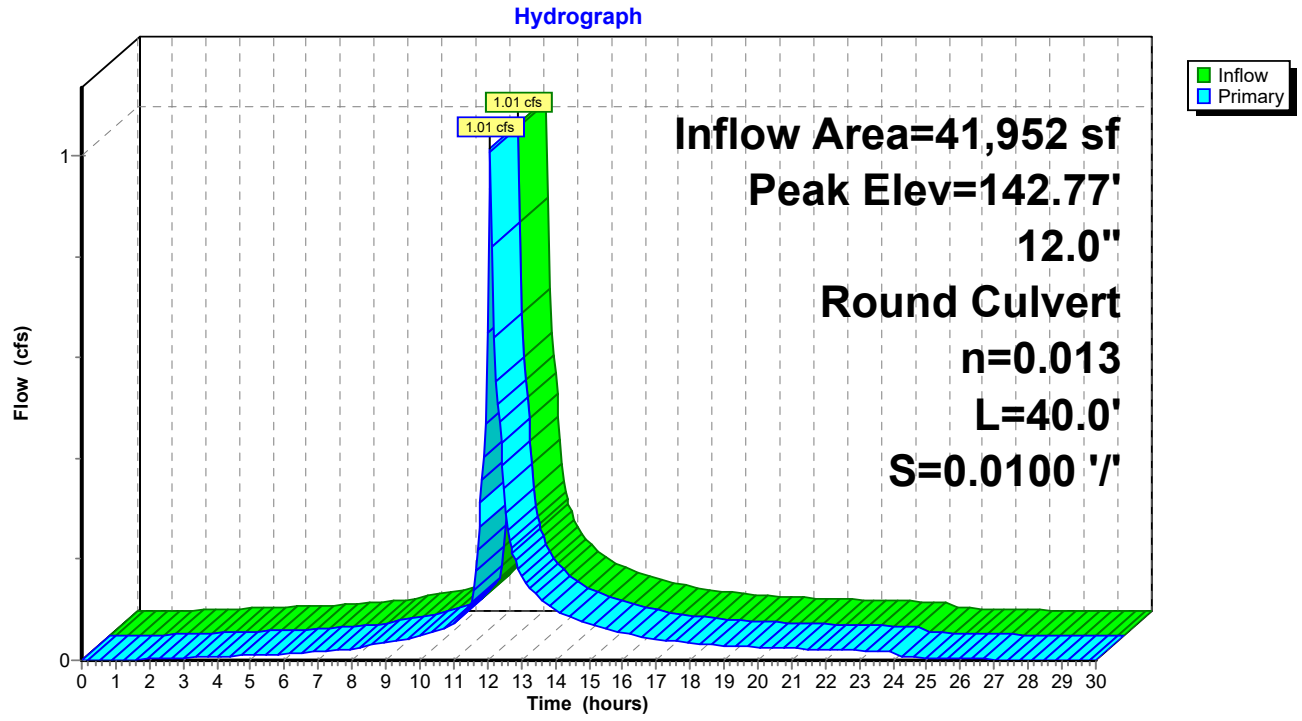
Inflow Area = 41,952 sf, 35.41% Impervious, Inflow Depth > 1.36" for 2 year event
Inflow = 1.01 cfs @ 12.09 hrs, Volume= 4,757 cf
Outflow = 1.01 cfs @ 12.09 hrs, Volume= 4,757 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.01 cfs @ 12.09 hrs, Volume= 4,757 cf
Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.77' @ 12.23 hrs
Flood Elev= 144.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.90'	**12.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 141.90' / 141.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.51 cfs @ 12.09 hrs HW=142.50' TW=142.40' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.51 cfs @ 1.49 fps)

Pond DMH1:

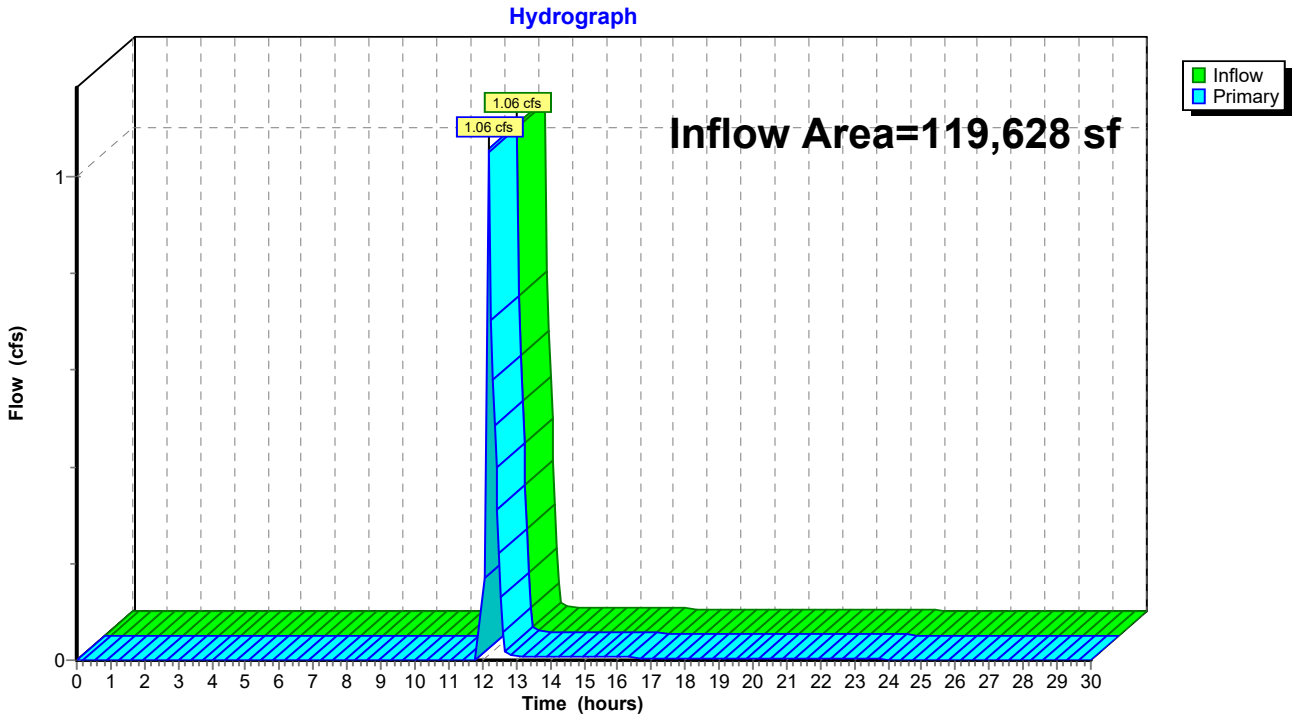


Summary for Pond DP1: Drainage Network

Inflow Area = 119,628 sf, 53.46% Impervious, Inflow Depth = 0.11" for 2 year event
Inflow = 1.06 cfs @ 12.19 hrs, Volume= 1,071 cf
Primary = 1.06 cfs @ 12.19 hrs, Volume= 1,071 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Pond DP1: Drainage Network

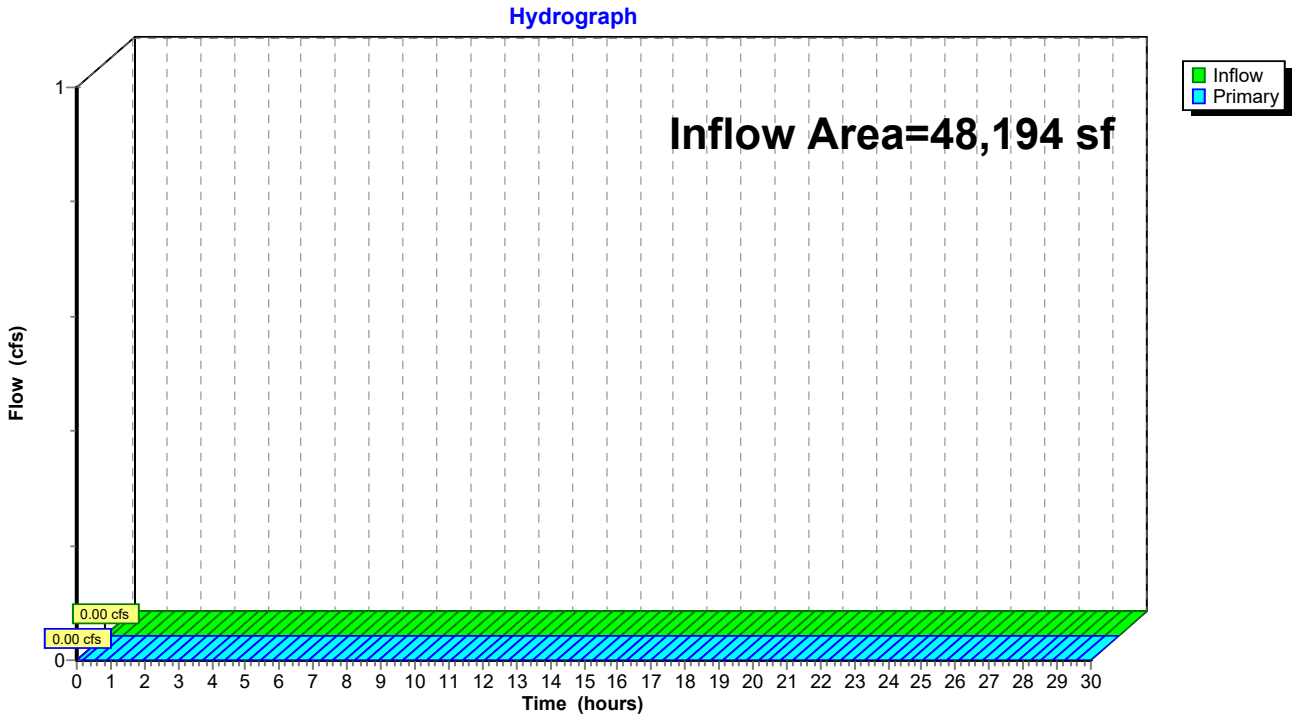


Summary for Pond DP2: Wetlands

Inflow Area = 48,194 sf, 7.68% Impervious, Inflow Depth = 0.00" for 2 year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Pond DP2: Wetlands



Summary for Pond IS1: Infiltration System 1

Inflow Area = 41,131 sf, 74.21% Impervious, Inflow Depth = 1.94" for 2 year event
Inflow = 1.95 cfs @ 12.09 hrs, Volume= 6,641 cf
Outflow = 0.73 cfs @ 12.34 hrs, Volume= 6,651 cf, Atten= 62%, Lag= 15.2 min
Discarded = 0.73 cfs @ 12.34 hrs, Volume= 6,651 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DP1 : Drainage Network

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 141.35' @ 12.34 hrs Surf.Area= 3,262 sf Storage= 888 cf
Flood Elev= 142.83' Surf.Area= 3,262 sf Storage= 3,502 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 5.7 min (785.4 - 779.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	141.00'	1,649 cf	**61.50'W x 53.04'L x 1.83'H Field A** 5,980 cf Overall - 1,857 cf Embedded = 4,123 cf x 40.0% Voids
#2A	141.00'	1,857 cf	**ADS_StormTech SC-310 +Cap** x 126 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 126 Chambers in 18 Rows
		3,507 cf	Total Available Storage

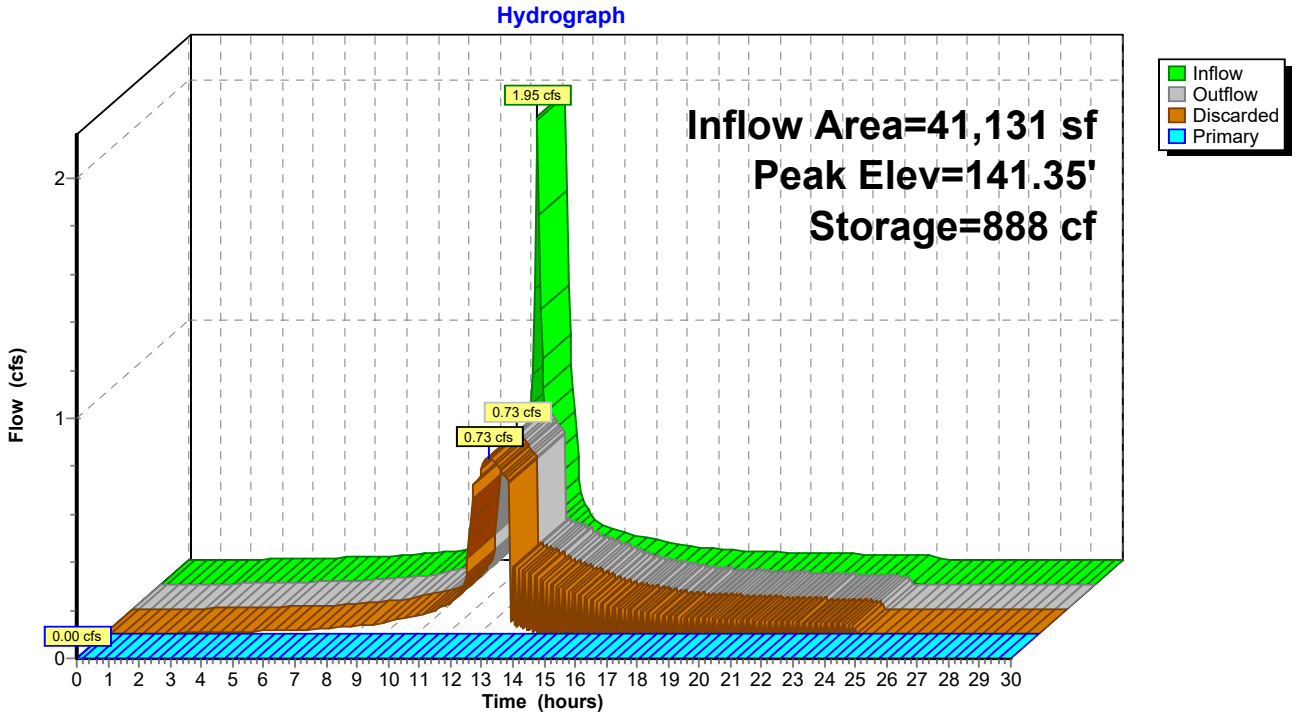
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	141.00'	**15.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 141.00' / 140.00' S= 0.0250 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	141.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.00'
#3	Device 1	142.50'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.73 cfs @ 12.34 hrs HW=141.35' (Free Discharge)
└**2=Exfiltration** (Controls 0.73 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=141.00' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond IS1: Infiltration System 1



Summary for Pond IS2: Infiltration System 2

Inflow Area = 60,293 sf, 50.15% Impervious, Inflow Depth > 1.67" for 2 year event
Inflow = 2.12 cfs @ 12.09 hrs, Volume= 8,392 cf
Outflow = 1.52 cfs @ 12.19 hrs, Volume= 8,399 cf, Atten= 28%, Lag= 6.2 min
Discarded = 0.46 cfs @ 12.19 hrs, Volume= 7,548 cf
Primary = 1.06 cfs @ 12.19 hrs, Volume= 851 cf
Routed to Pond DP1 : Drainage Network

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.73' @ 12.19 hrs Surf.Area= 1,494 sf Storage= 1,226 cf
Flood Elev= 143.50' Surf.Area= 1,494 sf Storage= 1,691 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 14.3 min (814.7 - 800.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	141.50'	865 cf	**24.83'W x 60.16'L x 2.00'H Field A** 2,988 cf Overall - 826 cf Embedded = 2,162 cf x 40.0% Voids
#2A	141.50'	826 cf	**ADS_StormTech SC-310 +Cap** x 56 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 56 Chambers in 7 Rows
		1,691 cf	Total Available Storage

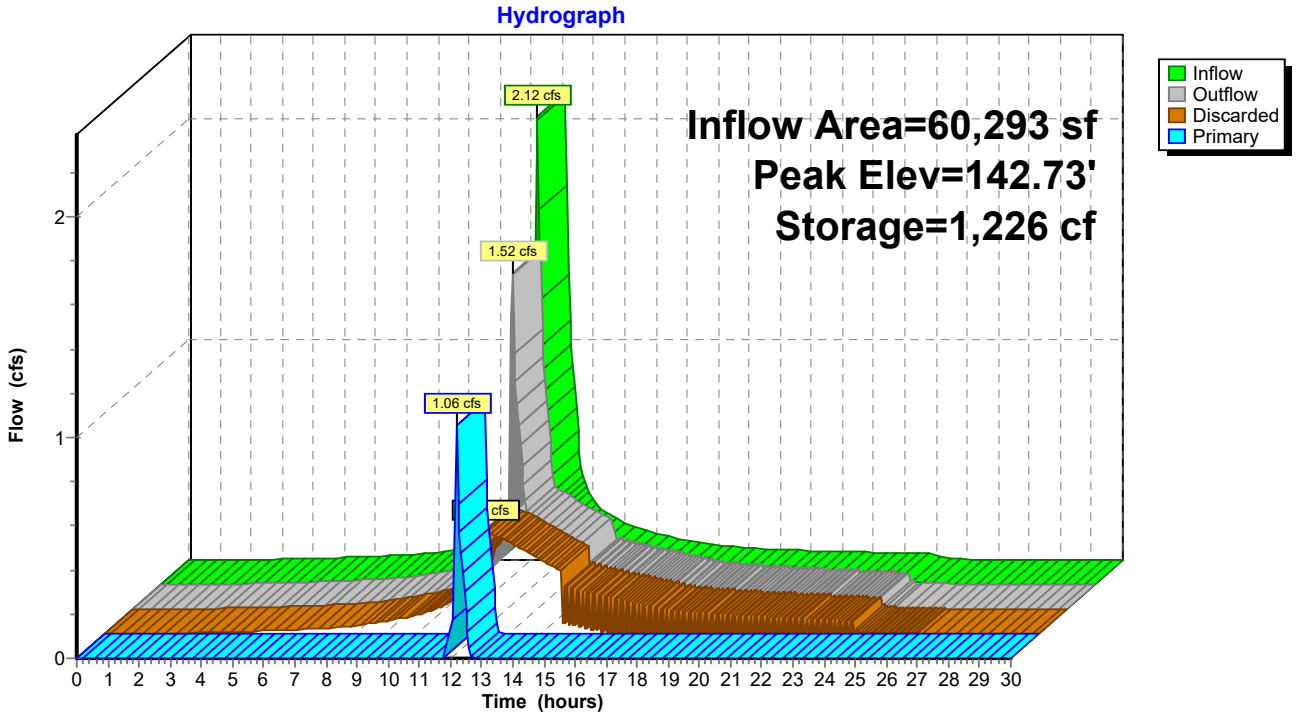
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	141.50'	**15.0" Round Culvert** L= 80.0' Ke= 0.500 Inlet / Outlet Invert= 141.50' / 140.00' S= 0.0187 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	141.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.50'
#3	Device 1	142.56'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.46 cfs @ 12.19 hrs HW=142.72' (Free Discharge)
└**2=Exfiltration** (Controls 0.46 cfs)

Primary OutFlow Max=1.02 cfs @ 12.19 hrs HW=142.72' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.02 cfs of 4.60 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 1.02 cfs @ 1.32 fps)

Pond IS2: Infiltration System 2



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

SubcatchmentB1A: Building (R) Runoff Area=14,492 sf 100.00% Impervious Runoff Depth=4.96"
Tc=6.0 min CN=98 Runoff=1.65 cfs 5,993 cf

SubcatchmentB1B: Building (L) Runoff Area=13,836 sf 100.00% Impervious Runoff Depth=4.96"
Tc=6.0 min CN=98 Runoff=1.58 cfs 5,722 cf

SubcatchmentP1: Back of property to Wetl Runoff Area=38,559 sf 0.00% Impervious Runoff Depth=0.01"
Tc=6.0 min CN=30 Runoff=0.00 cfs 38 cf

SubcatchmentP1A: Back of property to Runoff Area=7,565 sf 48.91% Impervious Runoff Depth=1.64"
Tc=6.0 min CN=63 Runoff=0.31 cfs 1,032 cf

SubcatchmentP1B: Back Patio Runoff Area=2,070 sf 0.00% Impervious Runoff Depth=3.07"
Tc=6.0 min CN=80 Runoff=0.17 cfs 529 cf

SubcatchmentP2A: Runoff Area=6,132 sf 27.32% Impervious Runoff Depth=4.18"
Tc=6.0 min CN=91 Runoff=0.64 cfs 2,134 cf

SubcatchmentP2B: Runoff Area=3,446 sf 13.78% Impervious Runoff Depth=1.79"
Tc=6.0 min CN=65 Runoff=0.16 cfs 513 cf

SubcatchmentP3: Runoff Area=7,500 sf 90.93% Impervious Runoff Depth=4.39"
Tc=6.0 min CN=93 Runoff=0.81 cfs 2,747 cf

SubcatchmentP4: Runoff Area=9,561 sf 73.85% Impervious Runoff Depth=3.36"
Tc=6.0 min CN=83 Runoff=0.84 cfs 2,674 cf

SubcatchmentP5: Runoff Area=7,429 sf 68.84% Impervious Runoff Depth=3.55"
Tc=6.0 min CN=85 Runoff=0.69 cfs 2,200 cf

SubcatchmentP5A: Perm Pavers Front Runoff Area=560 sf 0.00% Impervious Runoff Depth=1.02"
Tc=6.0 min CN=54 Runoff=0.01 cfs 47 cf

SubcatchmentP6: Runoff Area=10,912 sf 94.08% Impervious Runoff Depth=4.62"
Tc=6.0 min CN=95 Runoff=1.21 cfs 4,199 cf

SubcatchmentP7: Runoff Area=9,750 sf 0.00% Impervious Runoff Depth=0.24"
Tc=6.0 min CN=39 Runoff=0.01 cfs 197 cf

SubcatchmentP8: Runoff Area=18,366 sf 5.55% Impervious Runoff Depth=2.10"
Flow Length=175' Slope=0.0100 '/' Tc=9.5 min CN=69 Runoff=0.89 cfs 3,220 cf

SubcatchmentP9: Runoff Area=17,644 sf 18.14% Impervious Runoff Depth=0.78"
Tc=6.0 min CN=50 Runoff=0.24 cfs 1,141 cf

Pond 1P: Pervious Pvmt (North Fire) bed 'C' Peak Elev=142.00' Storage=3 cf Inflow=0.64 cfs 2,134 cf
Discarded=0.62 cfs 2,138 cf Primary=0.00 cfs 0 cf Outflow=0.62 cfs 2,138 cf

Pond 2P: Pervious Pvmt (North Fire) Bed B Peak Elev=141.52' Storage=4 cf Inflow=0.16 cfs 513 cf
Discarded=0.13 cfs 515 cf Primary=0.00 cfs 1 cf Outflow=0.14 cfs 515 cf

Pond 3P: Pervious Pvmt (North Fire) Bed 'A' Peak Elev=141.00' Storage=0 cf Inflow=0.00 cfs 1 cf
Discarded=0.00 cfs 1 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 1 cf

Pond 4P: Pervious Pvmt (South Fire Lane) Peak Elev=143.83' Storage=492 cf Inflow=0.89 cfs 3,220 cf
Discarded=0.44 cfs 681 cf Primary=0.31 cfs 2,516 cf Outflow=0.75 cfs 3,197 cf

Pond 5P: Permeable Pavers (Back) Peak Elev=144.00' Storage=0 cf Inflow=0.17 cfs 529 cf
Discarded=0.17 cfs 529 cf Primary=0.00 cfs 0 cf Outflow=0.17 cfs 529 cf

Pond 6P: Peak Elev=143.00' Storage=0 cf Inflow=0.01 cfs 47 cf
Discarded=0.01 cfs 47 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 47 cf

Pond 7P: Stone infiltration Trench Peak Elev=144.52' Storage=126 cf Inflow=0.31 cfs 1,032 cf
Discarded=0.13 cfs 1,035 cf Primary=0.00 cfs 0 cf Outflow=0.13 cfs 1,035 cf

Pond CB1,8: Peak Elev=142.01' Inflow=0.81 cfs 2,747 cf
12.0" Round Culvert n=0.013 L=4.0' S=0.0625 '/' Outflow=0.81 cfs 2,747 cf

Pond CB2,7: Peak Elev=142.26' Inflow=0.84 cfs 2,674 cf
12.0" Round Culvert n=0.013 L=115.0' S=0.0065 '/' Outflow=0.84 cfs 2,674 cf

Pond CB3: Peak Elev=142.93' Inflow=0.69 cfs 2,200 cf
12.0" Round Culvert n=0.013 L=20.0' S=0.0125 '/' Outflow=0.69 cfs 2,200 cf

Pond CB4: Peak Elev=143.02' Inflow=1.21 cfs 4,199 cf
12.0" Round Culvert n=0.013 L=60.0' S=0.0050 '/' Outflow=1.21 cfs 4,199 cf

Pond CB5: Peak Elev=143.16' Inflow=0.01 cfs 197 cf
12.0" Round Culvert n=0.013 L=5.0' S=0.0200 '/' Outflow=0.01 cfs 197 cf

Pond DMH1: Peak Elev=143.11' Inflow=1.78 cfs 8,435 cf
12.0" Round Culvert n=0.013 L=40.0' S=0.0100 '/' Outflow=1.78 cfs 8,435 cf

Pond DP1: Drainage Network Inflow=3.36 cfs 4,626 cf
Primary=3.36 cfs 4,626 cf

Pond DP2: Wetlands Inflow=0.00 cfs 38 cf
Primary=0.00 cfs 38 cf

Pond IS1: Infiltration System 1 Peak Elev=142.00' Storage=2,349 cf Inflow=3.31 cfs 11,414 cf
Discarded=0.94 cfs 11,429 cf Primary=0.00 cfs 0 cf Outflow=0.94 cfs 11,429 cf

Pond IS2: Infiltration System 2 Peak Elev=142.91' Storage=1,335 cf Inflow=3.68 cfs 14,834 cf
Discarded=0.49 cfs 11,351 cf Primary=3.13 cfs 3,485 cf Outflow=3.61 cfs 14,836 cf

Total Runoff Area = 167,822 sf Runoff Volume = 32,387 cf Average Runoff Depth = 2.32"
59.68% Pervious = 100,163 sf 40.32% Impervious = 67,659 sf

Summary for Subcatchment B1A: Building (R)

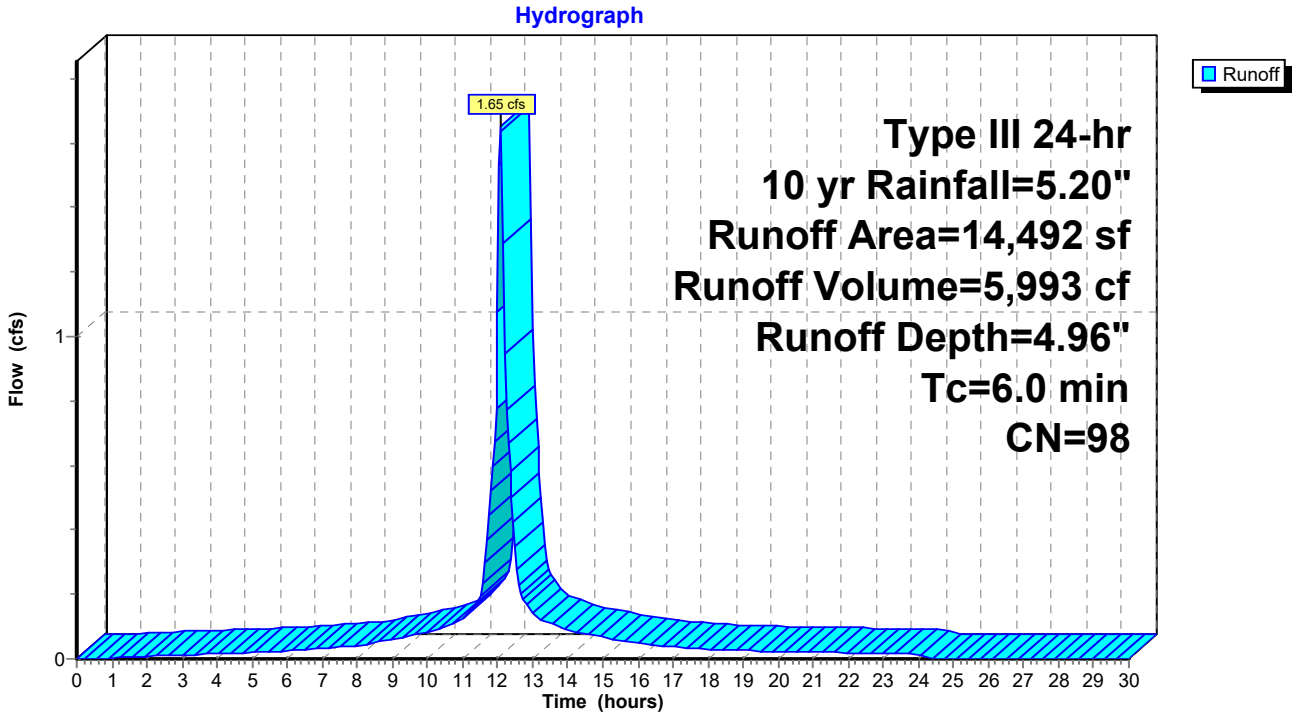
Runoff = 1.65 cfs @ 12.09 hrs, Volume= 5,993 cf, Depth= 4.96"
Routed to Pond IS1 : Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

Area (sf)	CN	Description
14,492	98	Roofs, HSG A
14,492		100.00% Impervious Area

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

Subcatchment B1A: Building (R)



Summary for Subcatchment B1B: Building (L)

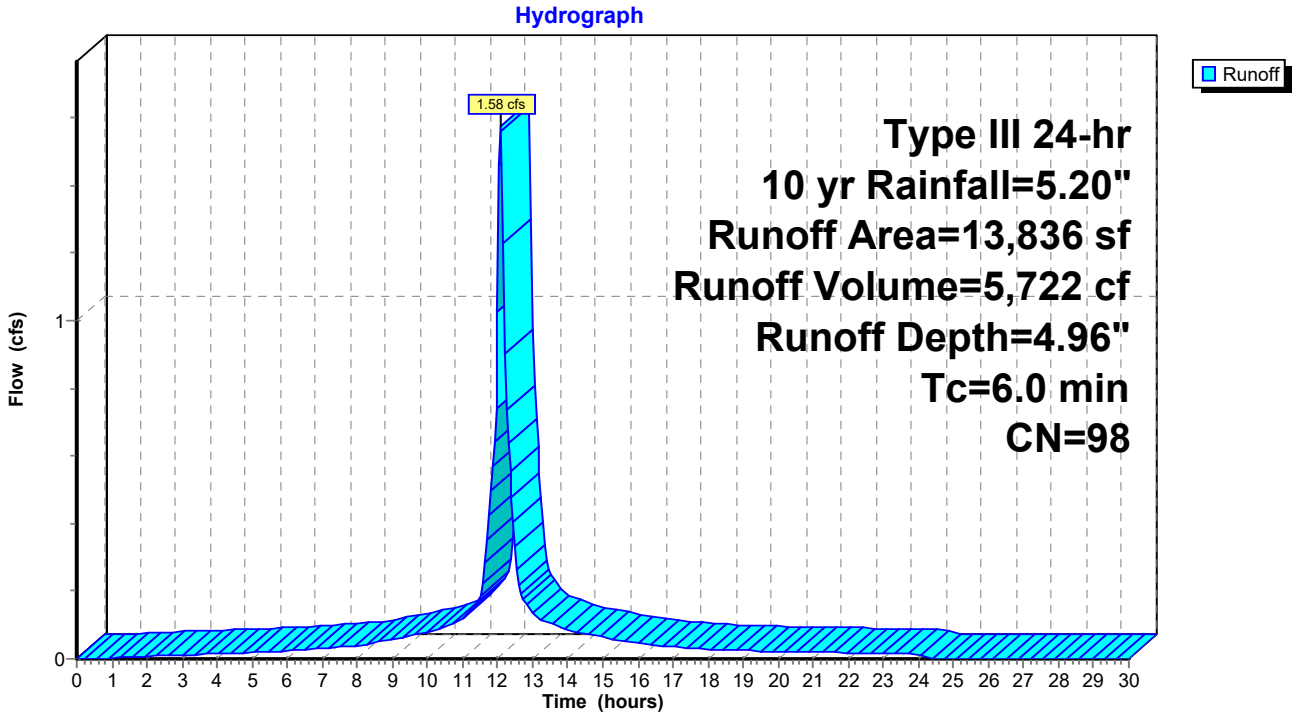
Runoff = 1.58 cfs @ 12.09 hrs, Volume= 5,722 cf, Depth= 4.96"
Routed to Pond DMH1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

Area (sf)	CN	Description
13,836	98	Roofs, HSG A
13,836		100.00% Impervious Area

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

Subcatchment B1B: Building (L)



Summary for Subcatchment P1: Back of property to Wetl

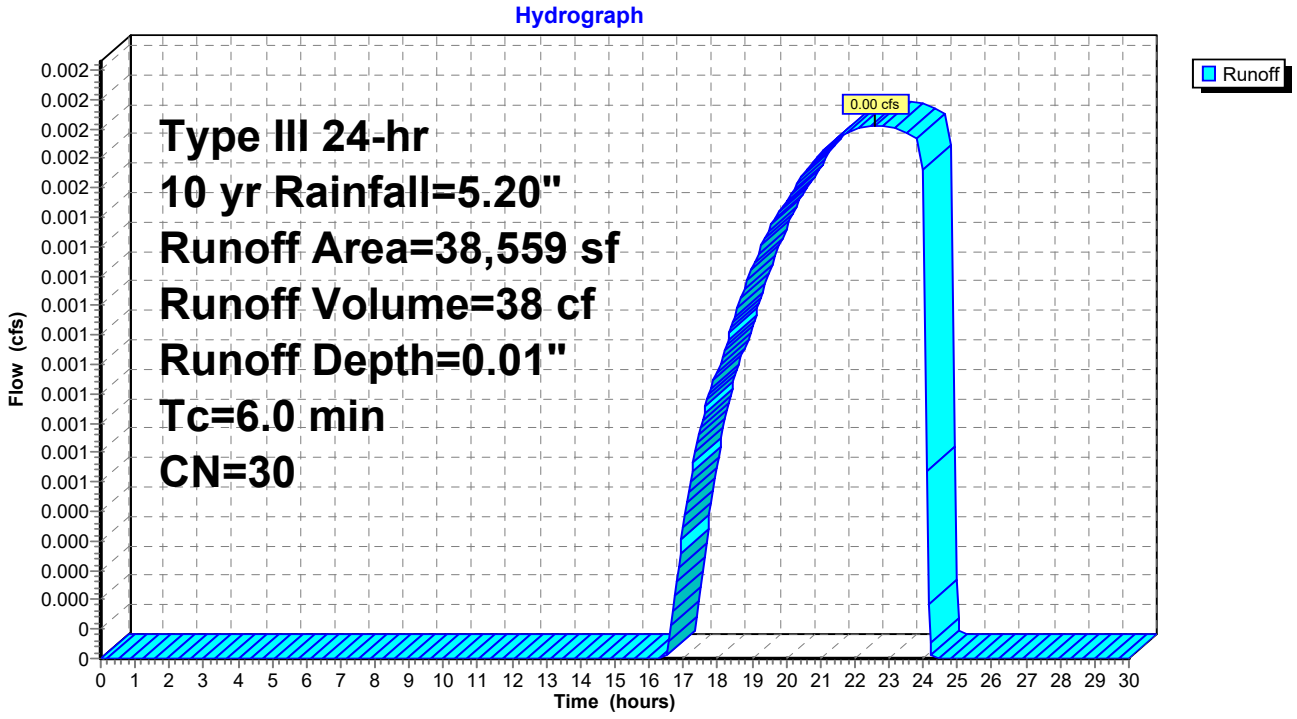
Runoff = 0.00 cfs @ 22.61 hrs, Volume= 38 cf, Depth= 0.01"
Routed to Pond DP2 : Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

Area (sf)	CN	Description
19,150	30	Woods, Good, HSG A
19,409	30	Meadow, non-grazed, HSG A
38,559	30	Weighted Average
38,559		100.00% Pervious Area

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

Subcatchment P1: Back of property to Wetl



Summary for Subcatchment P1A: Back of property to trench

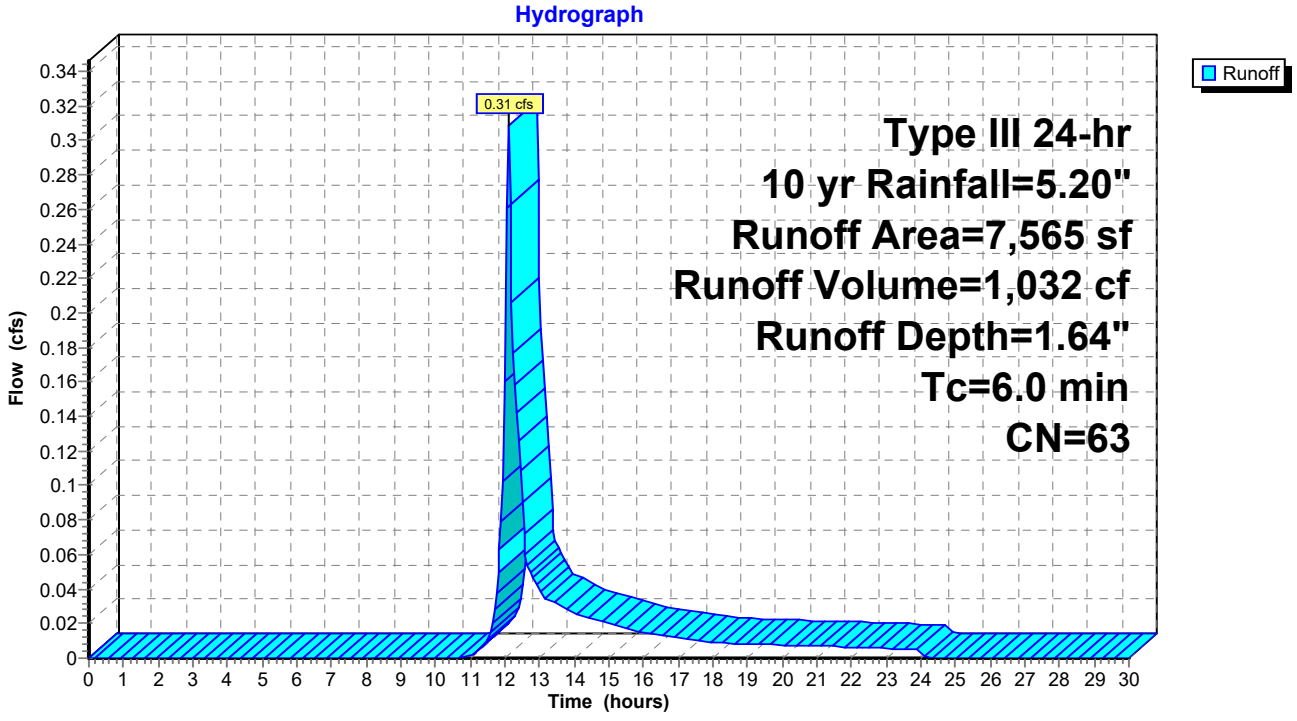
Runoff = 0.31 cfs @ 12.10 hrs, Volume= 1,032 cf, Depth= 1.64"
Routed to Pond 7P : Stone infiltration Trench

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

	Area (sf)	CN	Description
*	3,700	98	CONCRETE/Pervious Pvmt
	3,865	30	Meadow, non-grazed, HSG A
	7,565	63	Weighted Average
	3,865		51.09% Pervious Area
	3,700		48.91% Impervious Area

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

Subcatchment P1A: Back of property to trench



Summary for Subcatchment P1B: Back Patio

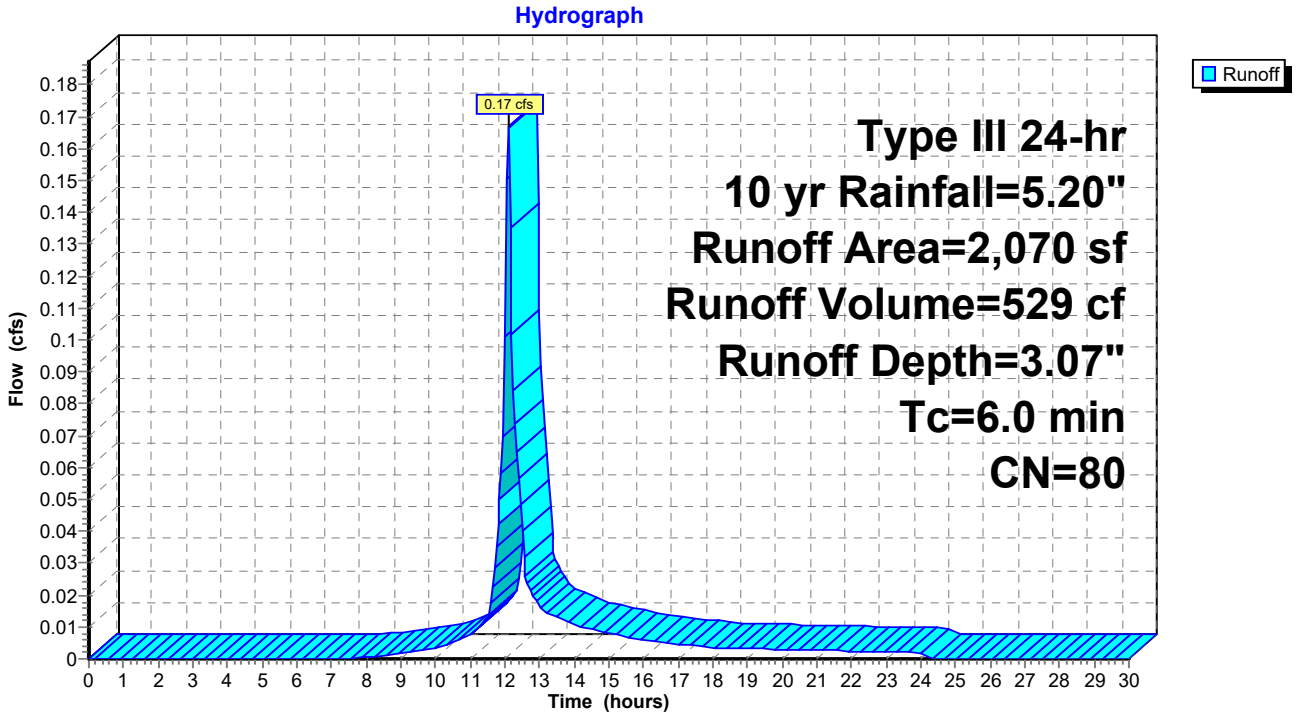
Runoff = 0.17 cfs @ 12.09 hrs, Volume= 529 cf, Depth= 3.07"
Routed to Pond 5P : Permeable Pavers (Back)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

	Area (sf)	CN	Description
*	2,070	80	permeable pavers
	2,070		100.00% Pervious Area

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

Subcatchment P1B: Back Patio



Summary for Subcatchment P2A:

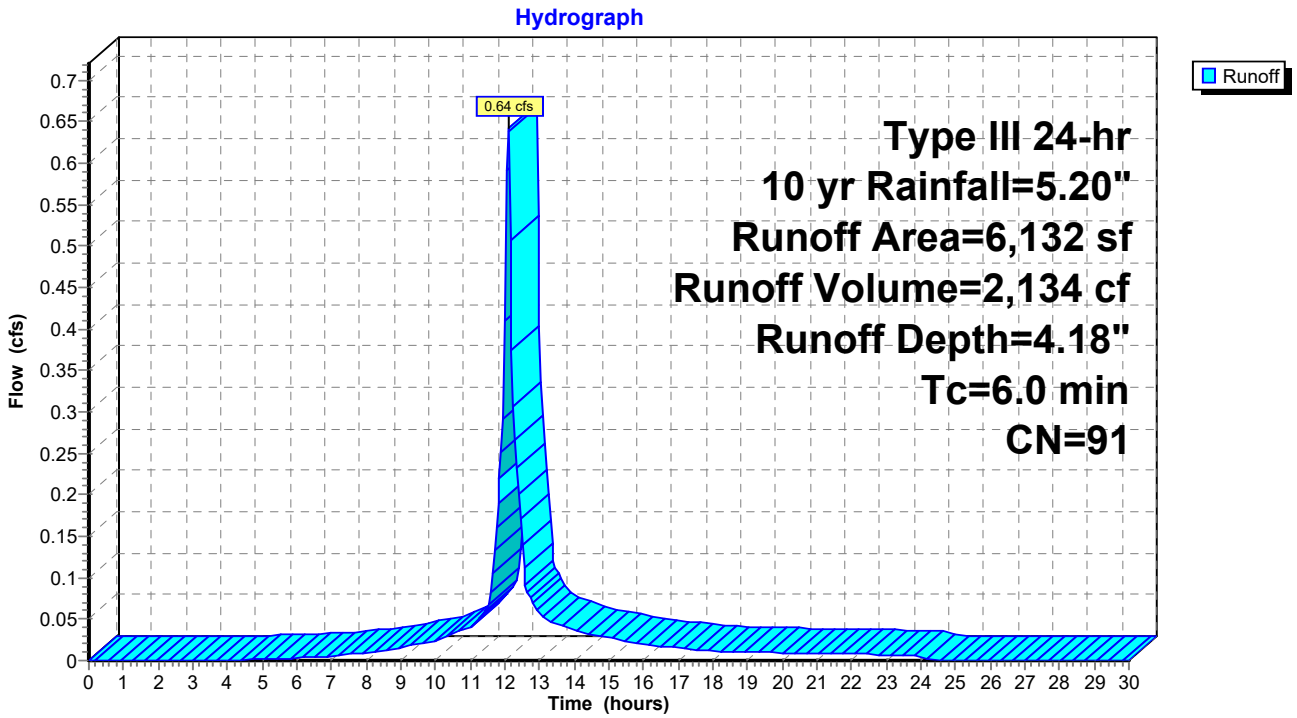
Runoff = 0.64 cfs @ 12.09 hrs, Volume= 2,134 cf, Depth= 4.18"
Routed to Pond 1P : Pervious Pvmt (North Fire) bed 'C'

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

	Area (sf)	CN	Description
*	1,675	98	CONCRETE
*	3,929	96	permeable pavement
	528	30	Meadow, non-grazed, HSG A
	6,132	91	Weighted Average
	4,457		72.68% Pervious Area
	1,675		27.32% Impervious Area

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

Subcatchment P2A:



Summary for Subcatchment P2B:

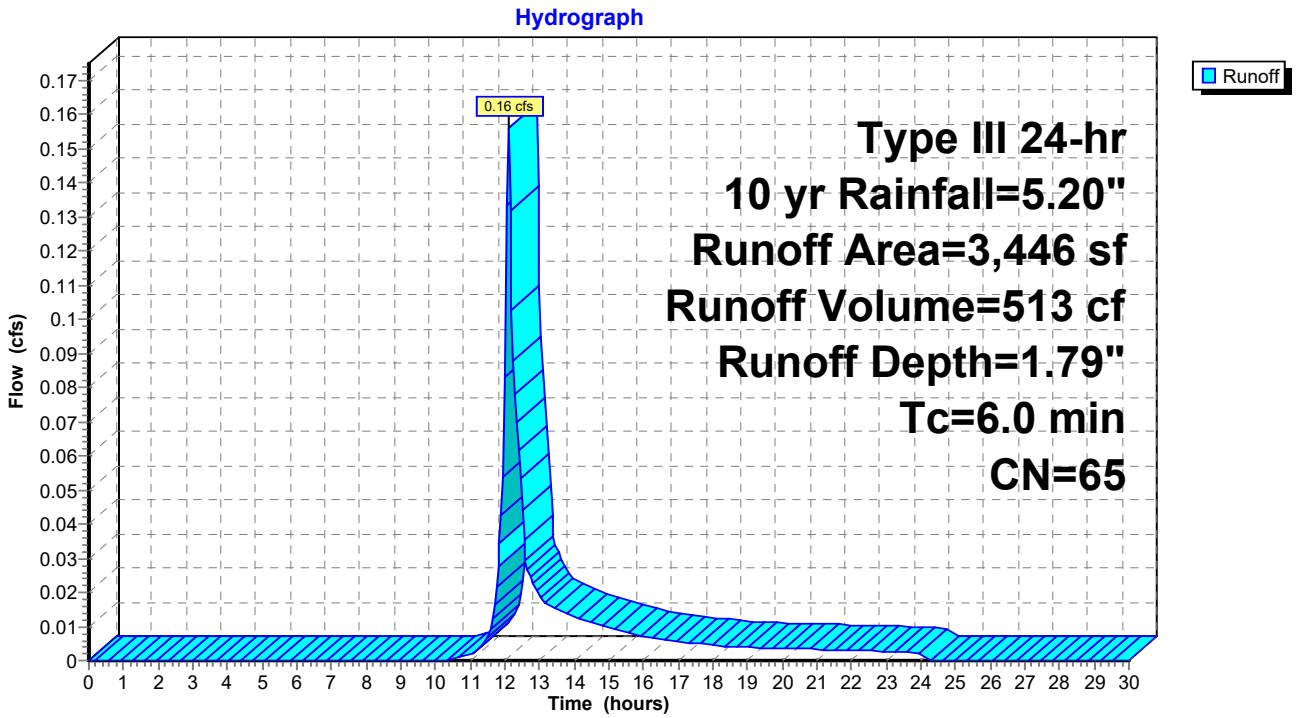
Runoff = 0.16 cfs @ 12.10 hrs, Volume= 513 cf, Depth= 1.79"
Routed to Pond 2P : Pervious Pvmt (North Fire) Bed B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

	Area (sf)	CN	Description
*	475	98	CONCRETE
*	1,351	96	permeable pavement
	1,620	30	Meadow, non-grazed, HSG A
	3,446	65	Weighted Average
	2,971		86.22% Pervious Area
	475		13.78% Impervious Area

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

Subcatchment P2B:



Summary for Subcatchment P3:

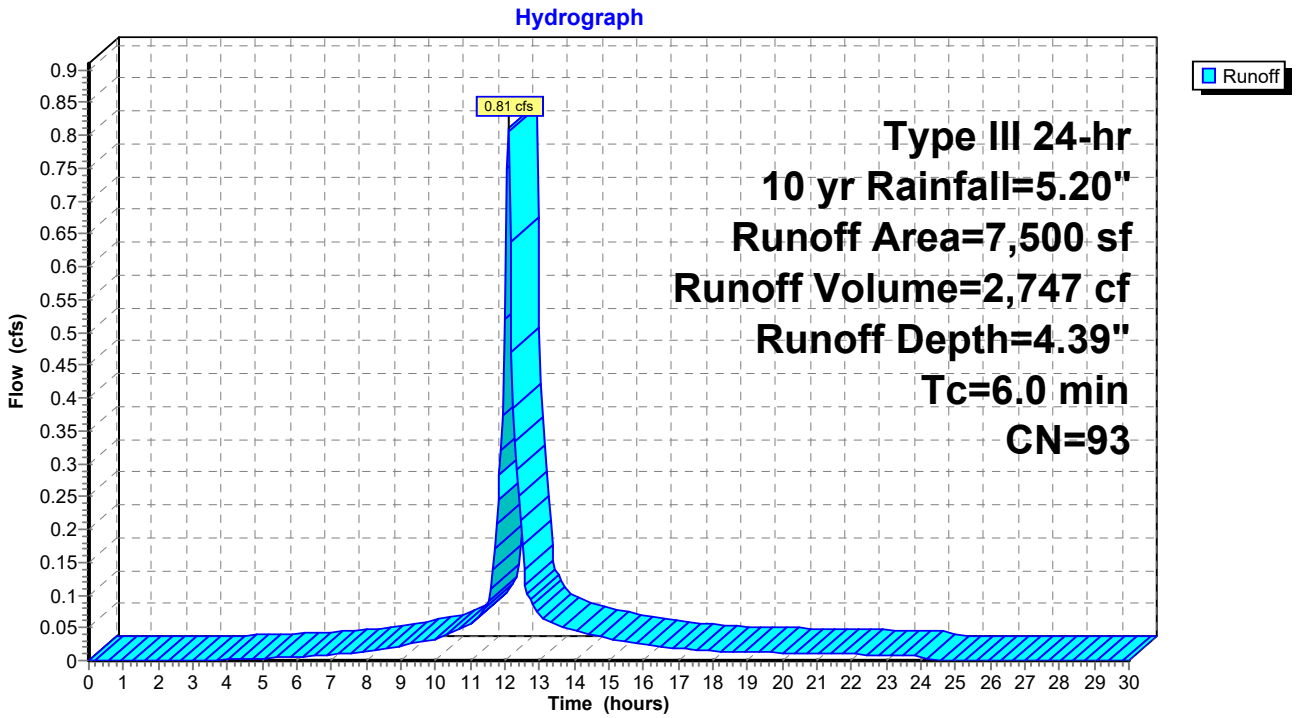
Runoff = 0.81 cfs @ 12.09 hrs, Volume= 2,747 cf, Depth= 4.39"
Routed to Pond CB1,8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

	Area (sf)	CN	Description
*	670	98	CONCRETE
	6,150	98	Paved parking, HSG A
	680	39	>75% Grass cover, Good, HSG A
	7,500	93	Weighted Average
	680		9.07% Pervious Area
	6,820		90.93% Impervious Area

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

Subcatchment P3:



Summary for Subcatchment P4:

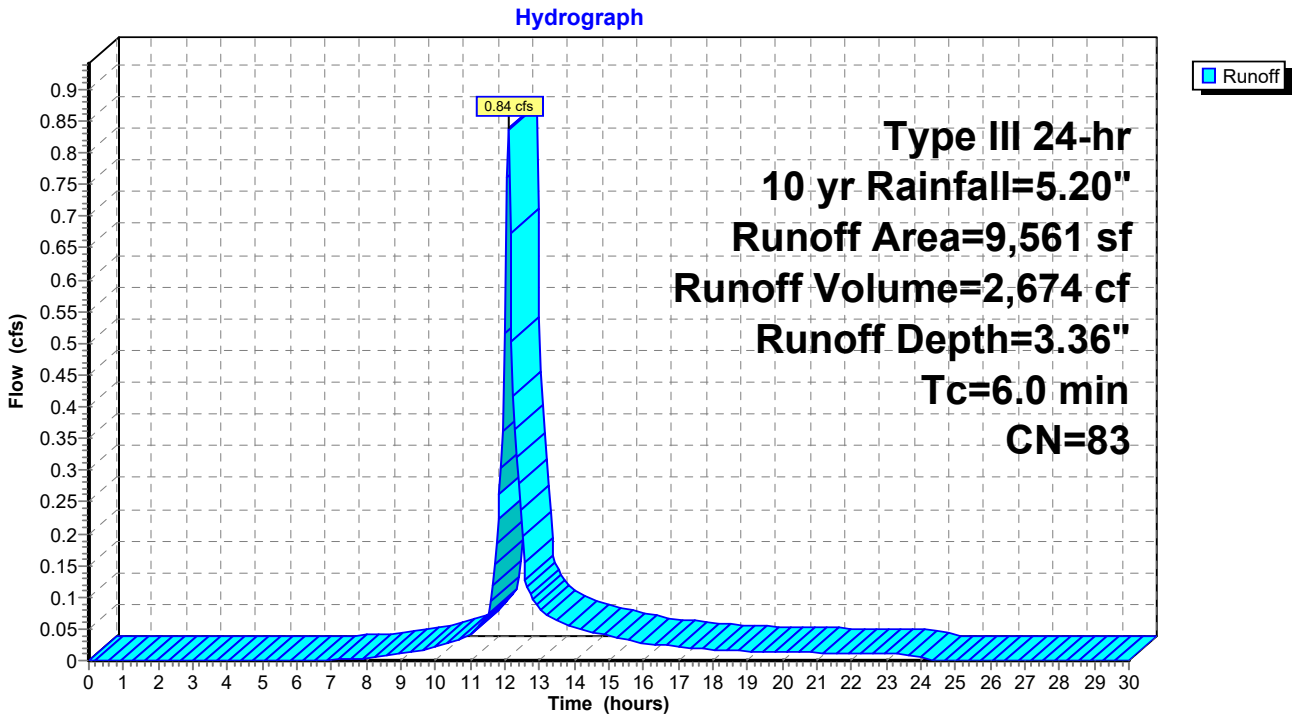
Runoff = 0.84 cfs @ 12.09 hrs, Volume= 2,674 cf, Depth= 3.36"
Routed to Pond CB2,7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

	Area (sf)	CN	Description
*	900	98	CONCRETE
	6,161	98	Paved parking, HSG A
	2,500	39	>75% Grass cover, Good, HSG A
	9,561	83	Weighted Average
	2,500		26.15% Pervious Area
	7,061		73.85% Impervious Area

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

Subcatchment P4:



Summary for Subcatchment P5:

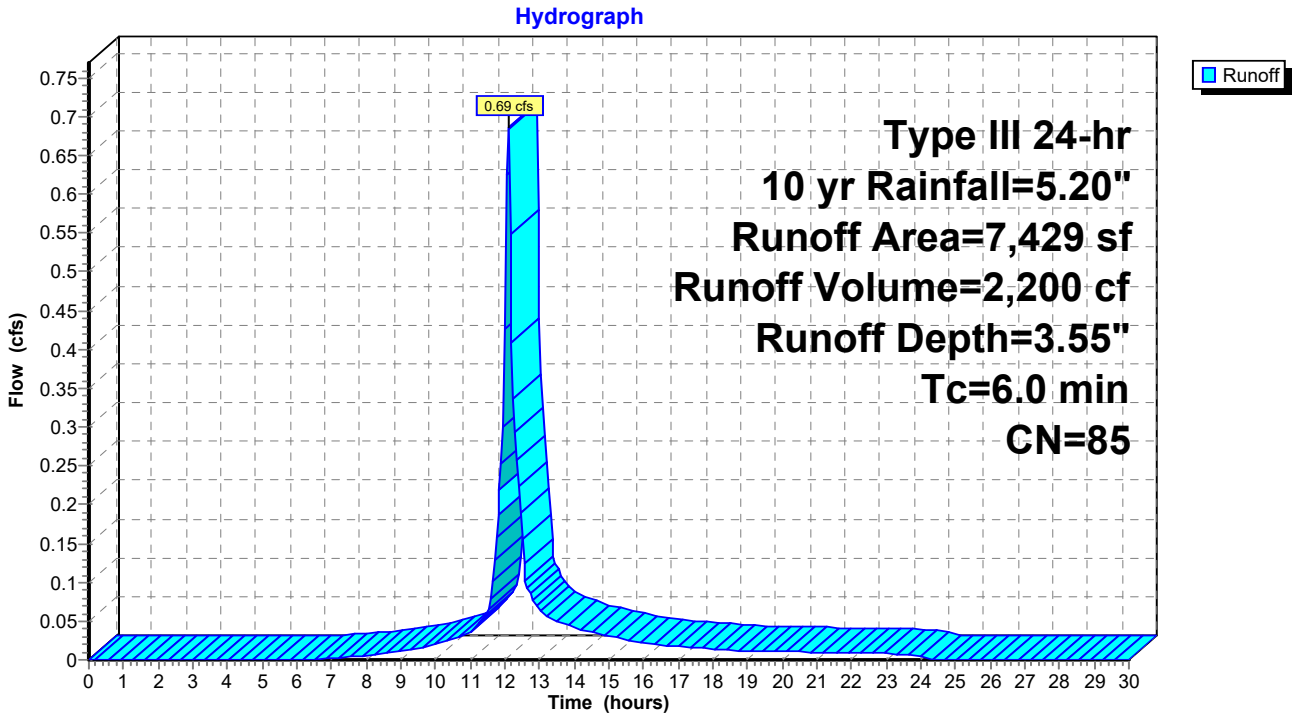
Runoff = 0.69 cfs @ 12.09 hrs, Volume= 2,200 cf, Depth= 3.55"
Routed to Pond CB3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

	Area (sf)	CN	Description
*	450	98	CONCRETE
	4,664	98	Paved parking, HSG A
	1,315	39	>75% Grass cover, Good, HSG A
*	1,000	80	permeable pavers
	7,429	85	Weighted Average
	2,315		31.16% Pervious Area
	5,114		68.84% Impervious Area

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

Subcatchment P5:



Summary for Subcatchment P5A: Perm Pavers Front entrance

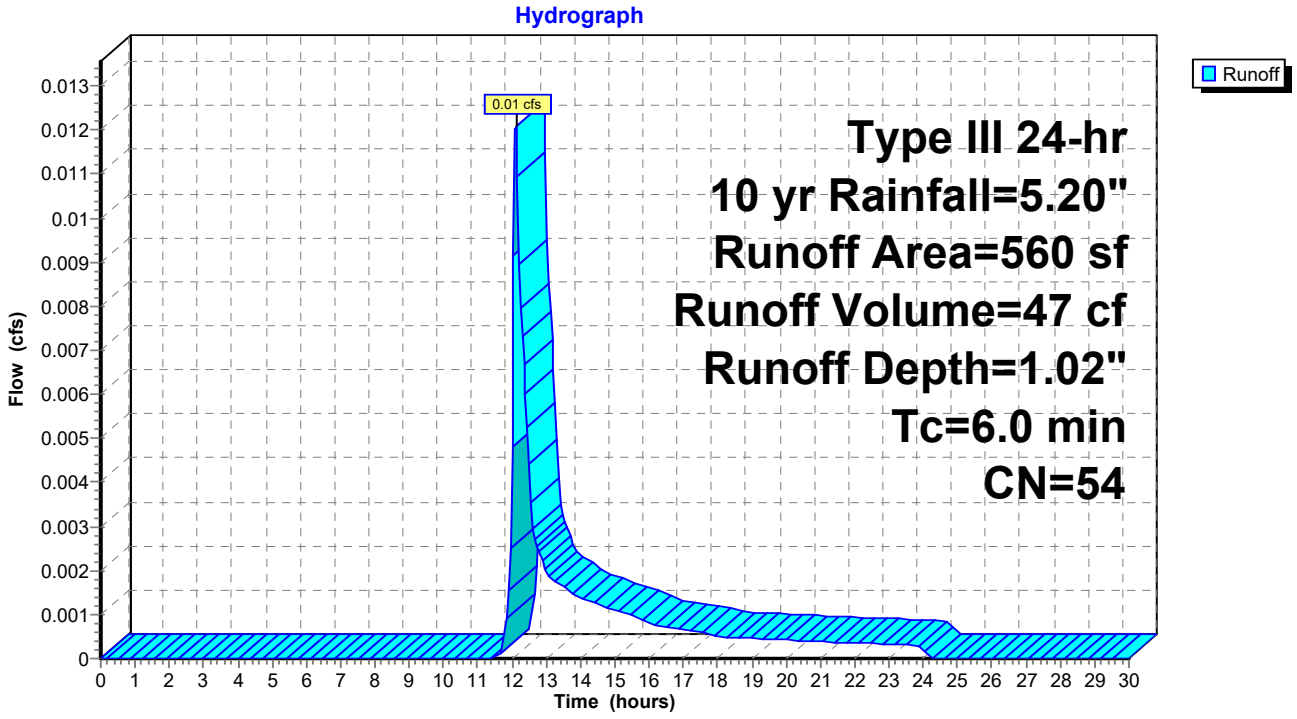
Runoff = 0.01 cfs @ 12.11 hrs, Volume= 47 cf, Depth= 1.02"
Routed to Pond 6P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

	Area (sf)	CN	Description
*	200	80	permeable pavers
	360	39	>75% Grass cover, Good, HSG A
	560	54	Weighted Average
	560		100.00% Pervious Area

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

Subcatchment P5A: Perm Pavers Front entrance



Summary for Subcatchment P6:

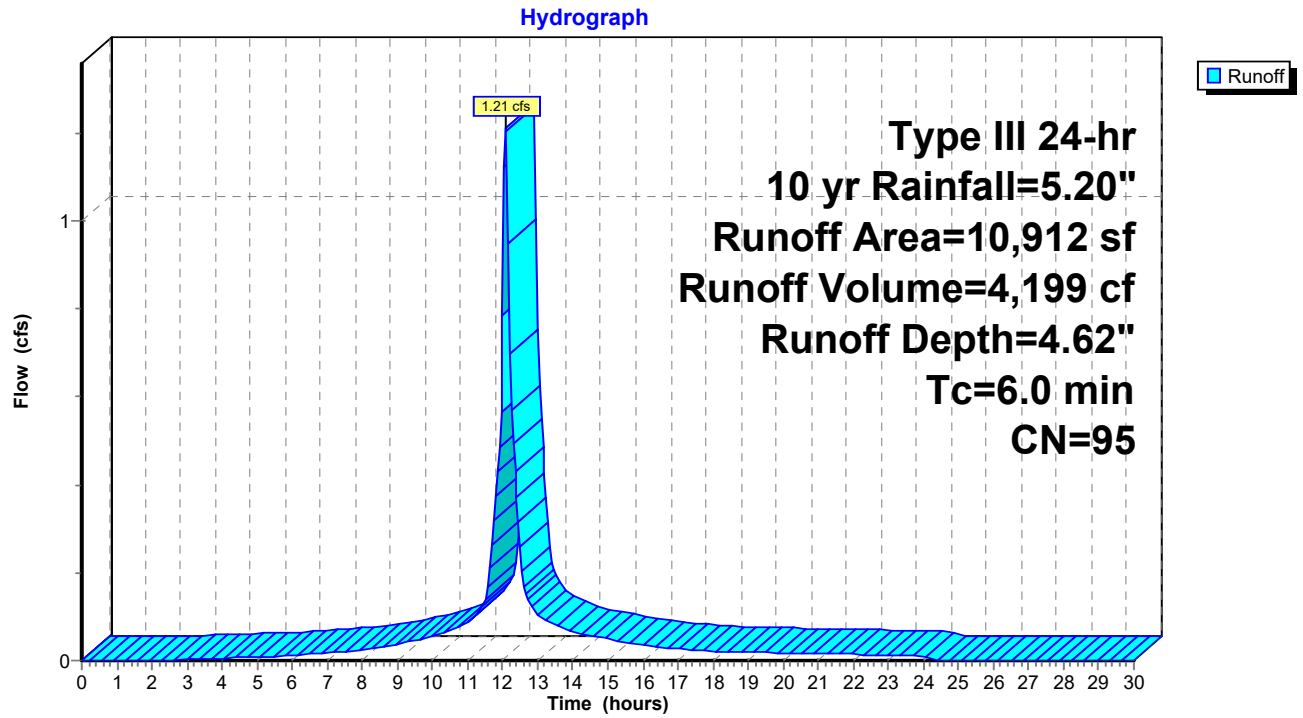
Runoff = 1.21 cfs @ 12.09 hrs, Volume= 4,199 cf, Depth= 4.62"
Routed to Pond CB4 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

	Area (sf)	CN	Description
*	1,200	98	CONCRETE
	9,066	98	Paved parking, HSG A
	646	39	>75% Grass cover, Good, HSG A
	10,912	95	Weighted Average
	646		5.92% Pervious Area
	10,266		94.08% Impervious Area

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

Subcatchment P6:



Summary for Subcatchment P7:

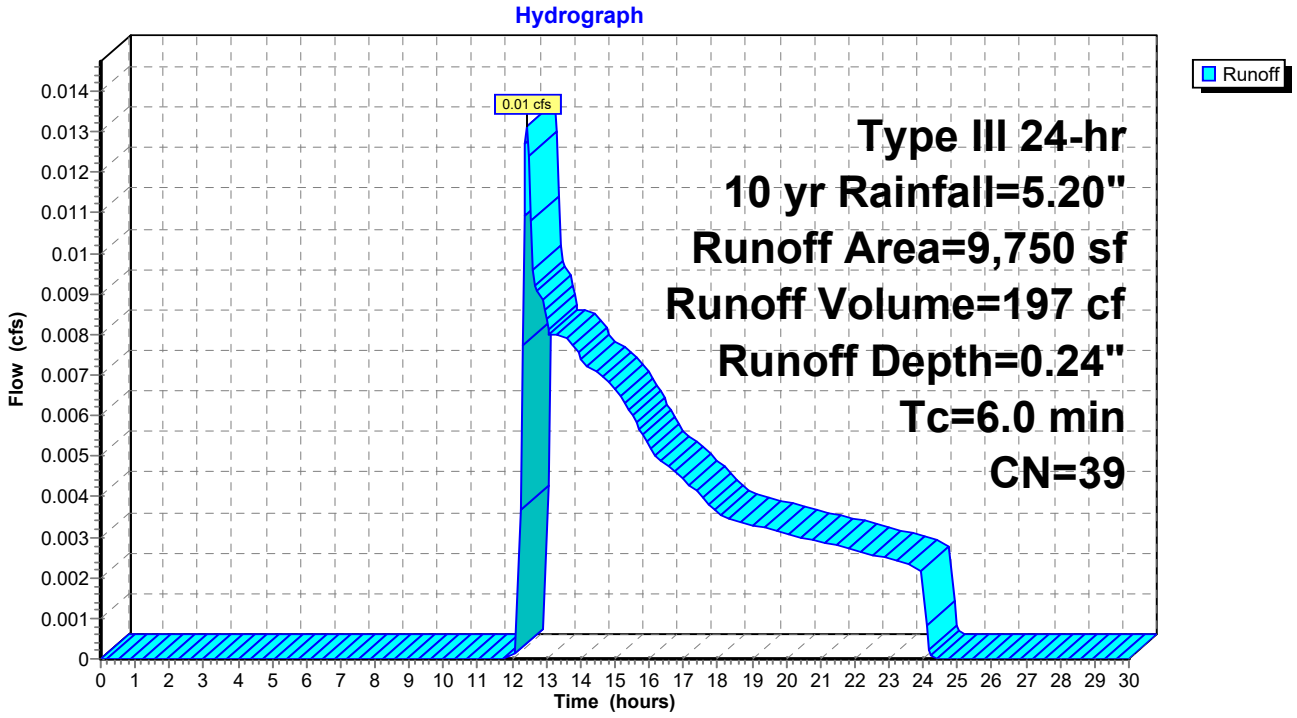
Runoff = 0.01 cfs @ 12.44 hrs, Volume= 197 cf, Depth= 0.24"
Routed to Pond CB5 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

Area (sf)	CN	Description
9,750	39	>75% Grass cover, Good, HSG A
9,750		100.00% Pervious Area

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

Subcatchment P7:



Summary for Subcatchment P8:

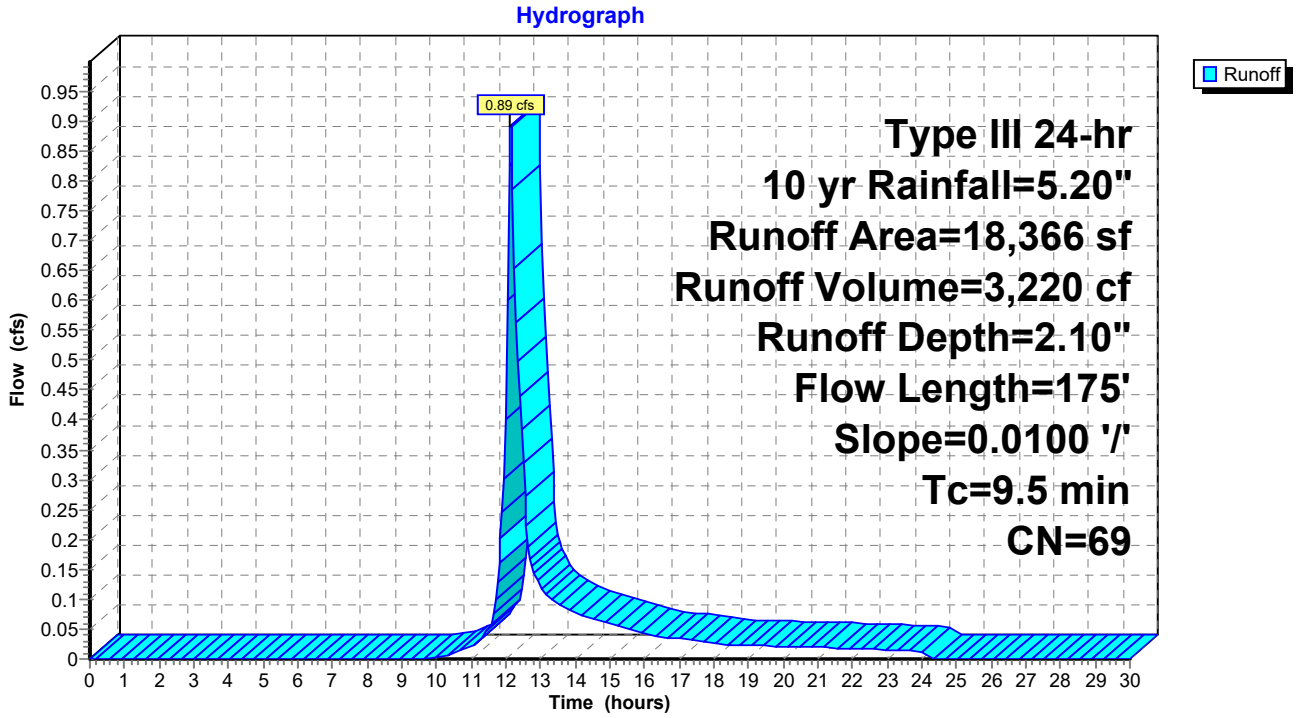
Runoff = 0.89 cfs @ 12.14 hrs, Volume= 3,220 cf, Depth= 2.10"
Routed to Pond 4P : Pervious Pvmt (South Fire Lane)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

	Area (sf)	CN	Description
*	1,020	98	CONCRETE
*	4,666	96	permeable pavement
	7,280	39	>75% Grass cover, Good, HSG A
	5,400	80	>75% Grass cover, Good, HSG D
	18,366	69	Weighted Average
	17,346		94.45% Pervious Area
	1,020		5.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
0.6	25	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.6	100	0.0100	1.06		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
9.5	175	Total			

Subcatchment P8:



Summary for Subcatchment P9:

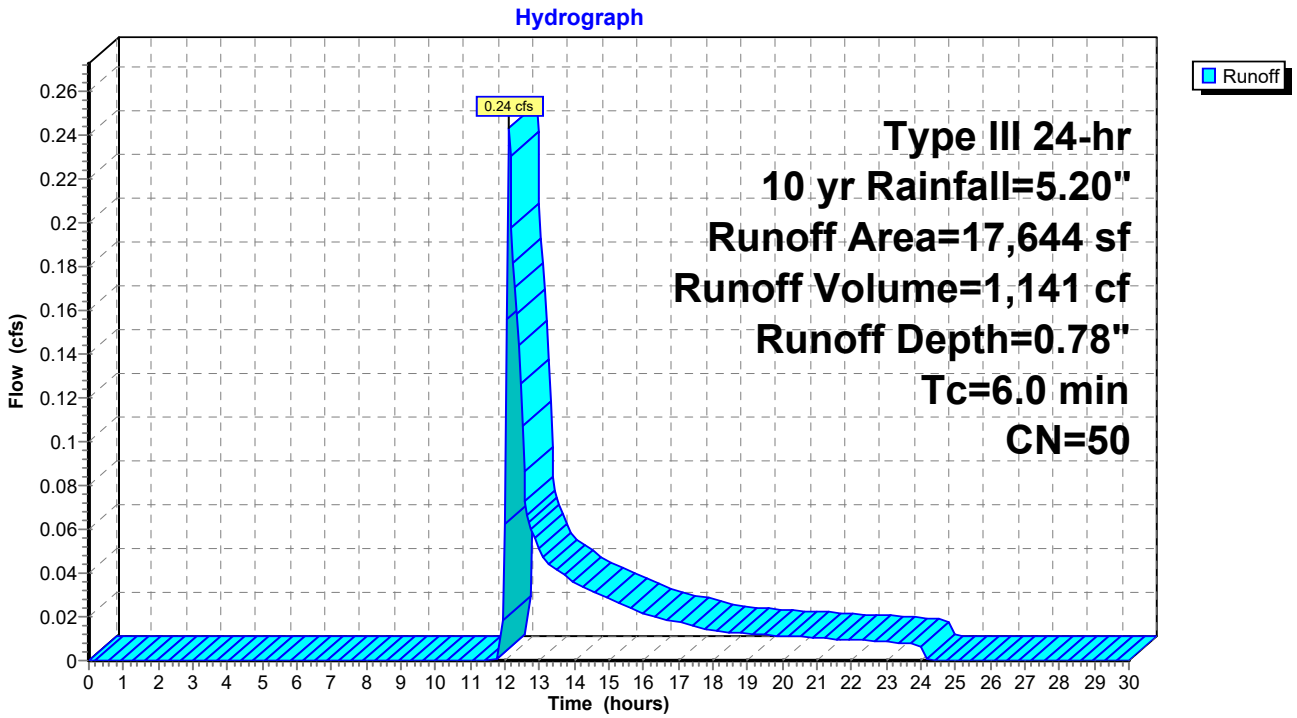
Runoff = 0.24 cfs @ 12.12 hrs, Volume= 1,141 cf, Depth= 0.78"
Routed to Pond DP1 : Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.20"

	Area (sf)	CN	Description
*	2,850	98	CONCRETE
	350	98	Paved parking, HSG A
	14,444	39	>75% Grass cover, Good, HSG A
	17,644	50	Weighted Average
	14,444		81.86% Pervious Area
	3,200		18.14% Impervious Area

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

Subcatchment P9:



Summary for Pond 1P: Pervious Pvmt (North Fire) bed 'C'

Inflow Area = 6,132 sf, 27.32% Impervious, Inflow Depth = 4.18" for 10 yr event
Inflow = 0.64 cfs @ 12.09 hrs, Volume= 2,134 cf
Outflow = 0.62 cfs @ 12.09 hrs, Volume= 2,138 cf, Atten= 4%, Lag= 0.2 min
Discarded = 0.62 cfs @ 12.09 hrs, Volume= 2,138 cf
Primary = 0.00 cfs @ 12.10 hrs, Volume= 0 cf
Routed to Pond 2P : Pervious Pvmt (North Fire) Bed B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.00' @ 12.10 hrs Surf.Area= 3,280 sf Storage= 3 cf
Flood Elev= 144.33' Surf.Area= 3,280 sf Storage= 2,071 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.5 min (786.0 - 785.6)

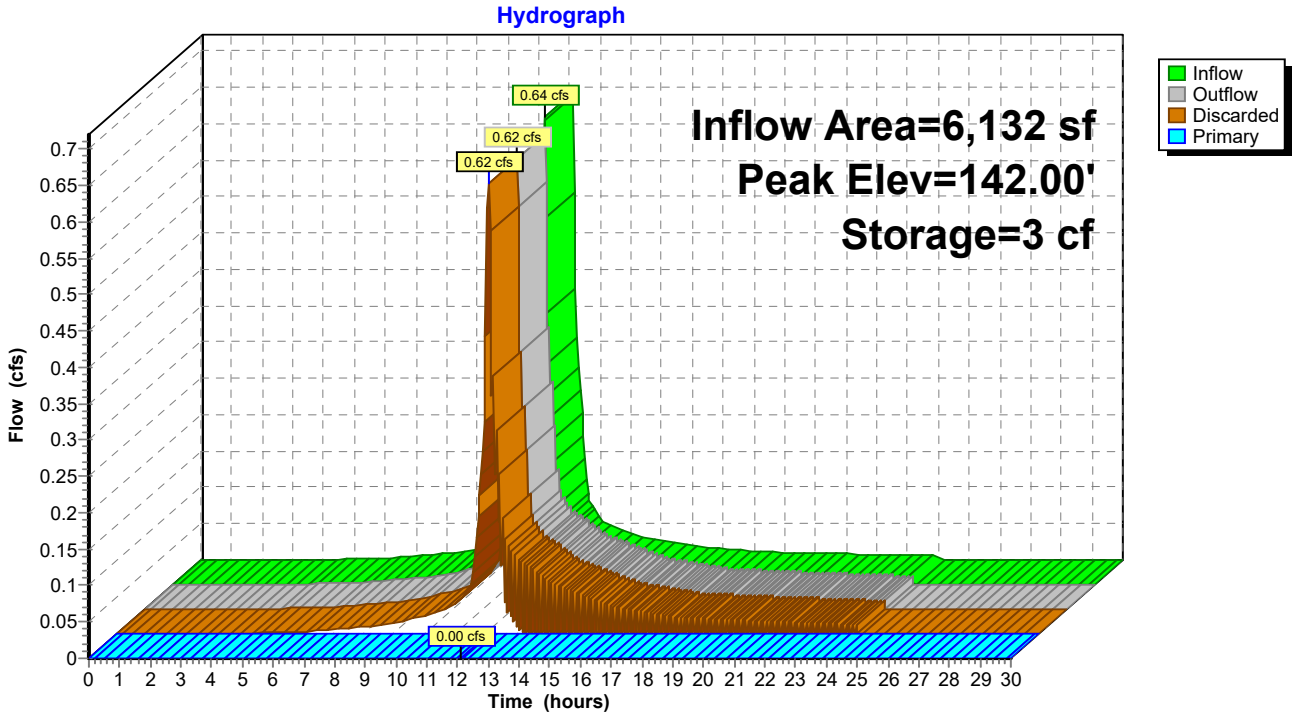
Volume	Invert	Avail.Storage	Storage Description
#1	142.00'	2,036 cf	**20.00'W x 164.00'L x 2.08'H Prismatoid** 6,822 cf Overall - 35 cf Embedded = 6,787 cf x 30.0% Voids
#2	142.00'	35 cf	**6.0" Round Pipe Storage** Inside #1 L= 180.0'
		2,071 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	142.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 138.00'
#2	Primary	142.00'	**6.0" Round Culvert X 2.00** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 142.00' / 141.50' S= 0.1000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf

Discarded OutFlow Max=0.63 cfs @ 12.09 hrs HW=142.00' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.63 cfs)

Primary OutFlow Max=0.00 cfs @ 12.10 hrs HW=142.00' TW=141.51' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 0.00 cfs @ 0.18 fps)

Pond 1P: Pervious Pvmt (North Fire) bed 'C'



Summary for Pond 2P: Pervious Pvmt (North Fire) Bed B

Inflow Area = 9,578 sf, 22.45% Impervious, Inflow Depth = 0.64" for 10 yr event
Inflow = 0.16 cfs @ 12.10 hrs, Volume= 513 cf
Outflow = 0.14 cfs @ 12.14 hrs, Volume= 515 cf, Atten= 12%, Lag= 2.4 min
Discarded = 0.13 cfs @ 12.13 hrs, Volume= 515 cf
Primary = 0.00 cfs @ 12.14 hrs, Volume= 1 cf
Routed to Pond 3P : Pervious Pvmt (North Fire) Bed 'A'

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 141.52' @ 12.14 hrs Surf.Area= 700 sf Storage= 4 cf
Flood Elev= 143.83' Surf.Area= 700 sf Storage= 447 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.5 min (858.9 - 858.4)

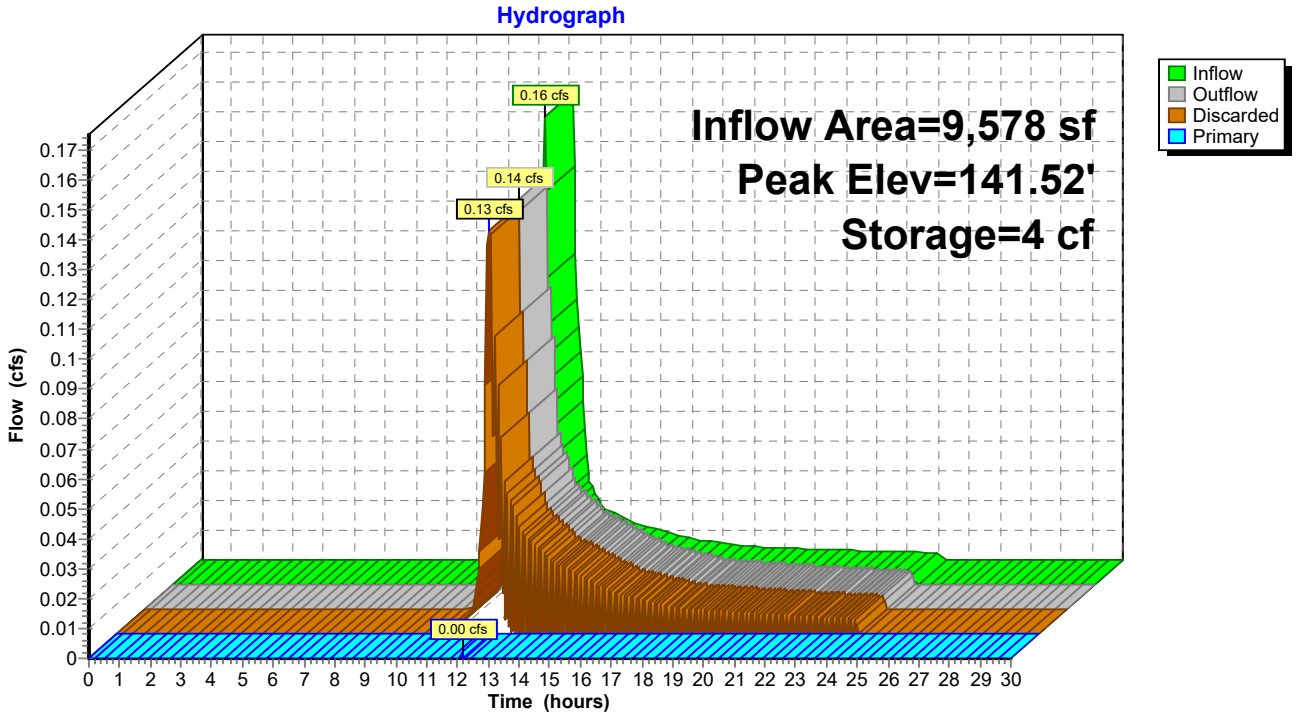
Volume	Invert	Avail.Storage	Storage Description
#1	141.50'	432 cf	**20.00'W x 35.00'L x 2.08'H Prismatoid** 1,456 cf Overall - 15 cf Embedded = 1,441 cf x 30.0% Voids
#2	141.50'	15 cf	**6.0" Round Pipe Storage** Inside #1 L= 75.0'
		447 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	141.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 138.00'
#2	Primary	141.50'	**6.0" Round Culvert X 2.00** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 141.50' / 141.00' S= 0.1000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf

Discarded OutFlow Max=0.13 cfs @ 12.13 hrs HW=141.52' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 12.14 hrs HW=141.52' TW=141.00' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 0.00 cfs @ 0.45 fps)

Pond 2P: Pervious Pvmt (North Fire) Bed B



Summary for Pond 3P: Pervious Pvmt (North Fire) Bed 'A'

Inflow Area = 9,578 sf, 22.45% Impervious, Inflow Depth = 0.00" for 10 yr event
Inflow = 0.00 cfs @ 12.14 hrs, Volume= 1 cf
Outflow = 0.00 cfs @ 12.14 hrs, Volume= 1 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 12.14 hrs, Volume= 1 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond IS1 : Infiltration System 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 141.00' @ 0.00 hrs Surf.Area= 1,200 sf Storage= 0 cf
Flood Elev= 143.33' Surf.Area= 1,200 sf Storage= 759 cf

Plug-Flow detention time= 0.0 min calculated for 1 cf (100% of inflow)
Center-of-Mass det. time= 0.0 min (728.2 - 728.2)

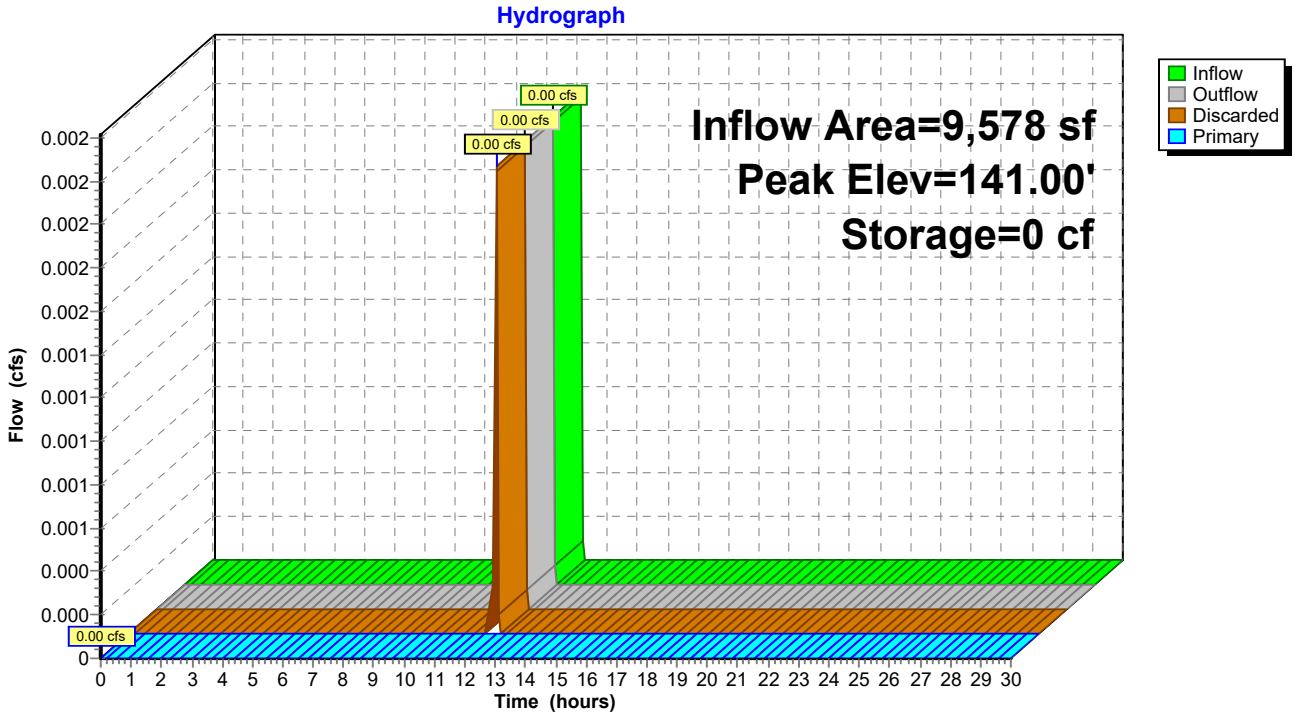
Volume	Invert	Avail.Storage	Storage Description
#1	141.00'	744 cf	**20.00'W x 60.00'L x 2.08'H Prismatoid** 2,496 cf Overall - 15 cf Embedded = 2,481 cf x 30.0% Voids
#2	141.00'	15 cf	**6.0" Round Pipe Storage** Inside #1 L= 75.0'
		759 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	141.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 138.00'
#2	Primary	141.50'	**12.0" Round Culvert** L= 25.0' Ke= 0.500 Inlet / Outlet Invert= 141.50' / 141.00' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#3	Device 2	143.30'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 12.14 hrs HW=141.00' (Free Discharge)
↑└**1=Exfiltration** (Passes 0.00 cfs of 0.23 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=141.00' TW=141.00' (Dynamic Tailwater)
↑└**2=Culvert** (Controls 0.00 cfs)
↑└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 3P: Pervious Pvmt (North Fire) Bed 'A'



Summary for Pond 4P: Pervious Pvmt (South Fire Lane)

Inflow Area = 18,366 sf, 5.55% Impervious, Inflow Depth = 2.10" for 10 yr event
Inflow = 0.89 cfs @ 12.14 hrs, Volume= 3,220 cf
Outflow = 0.75 cfs @ 12.23 hrs, Volume= 3,197 cf, Atten= 16%, Lag= 4.9 min
Discarded = 0.44 cfs @ 12.22 hrs, Volume= 681 cf
Primary = 0.31 cfs @ 12.25 hrs, Volume= 2,516 cf
Routed to Pond DMH1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.83' @ 12.22 hrs Surf.Area= 4,660 sf Storage= 492 cf
Flood Elev= 145.50' Surf.Area= 4,660 sf Storage= 2,837 cf

Plug-Flow detention time= 41.6 min calculated for 3,197 cf (99% of inflow)
Center-of-Mass det. time= 37.4 min (888.8 - 851.3)

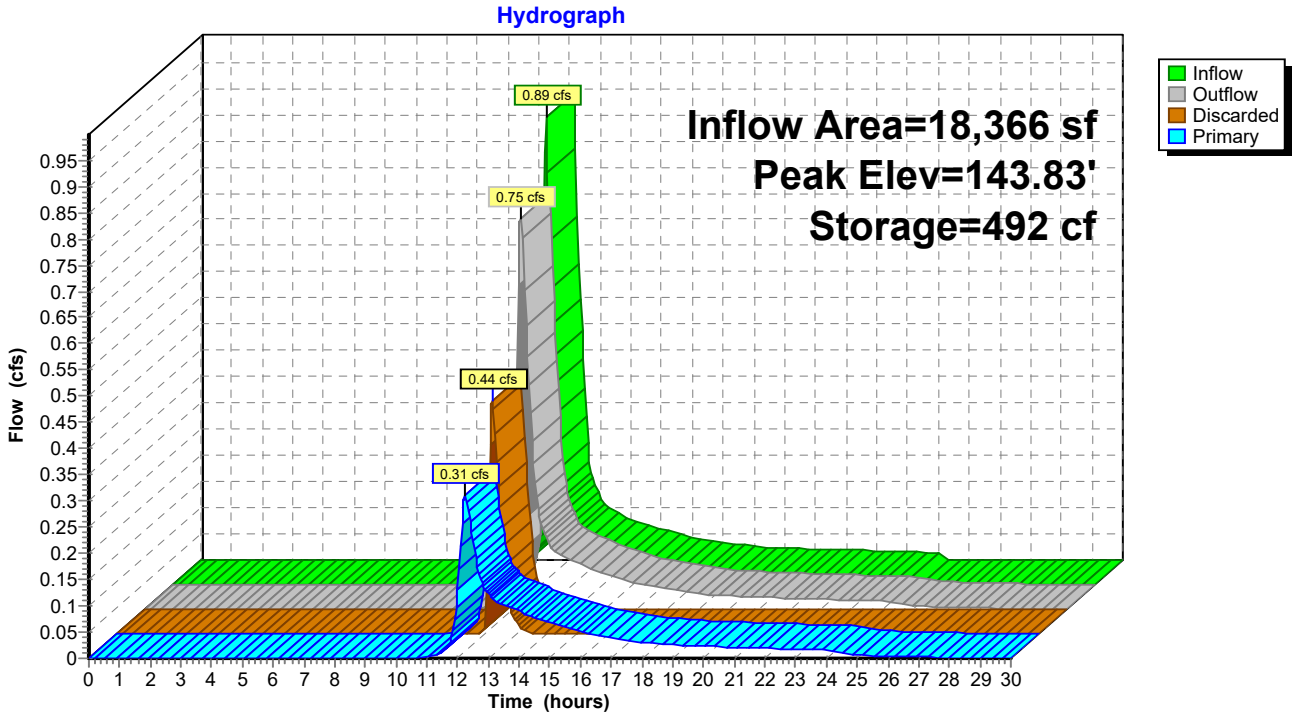
Volume	Invert	Avail.Storage	Storage Description
#1	143.50'	2,890 cf	**20.00'W x 233.00'L x 2.08'H Prismatoid** 9,693 cf Overall - 59 cf Embedded = 9,634 cf x 30.0% Voids
#2	143.50'	59 cf	**6.0" Round Pipe Storage** Inside #1 L= 300.0'
		2,949 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#0	Primary	145.58'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	143.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 141.50'
#2	Primary	143.50'	**12.0" Round Culvert** L= 170.0' Ke= 0.500 Inlet / Outlet Invert= 143.50' / 142.00' S= 0.0088 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#3	Device 1	143.67'	**8.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.43 cfs @ 12.22 hrs HW=143.83' (Free Discharge)
└**1=Exfiltration** (Passes 0.43 cfs of 1.04 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 0.43 cfs @ 1.30 fps)

Primary OutFlow Max=0.32 cfs @ 12.25 hrs HW=143.83' TW=142.92' (Dynamic Tailwater)
└**2=Culvert** (Outlet Controls 0.32 cfs @ 2.15 fps)

Pond 4P: Pervious Pvmt (South Fire Lane)



Summary for Pond 5P: Permeable Pavers (Back)

Inflow Area = 2,070 sf, 0.00% Impervious, Inflow Depth = 3.07" for 10 yr event
Inflow = 0.17 cfs @ 12.09 hrs, Volume= 529 cf
Outflow = 0.17 cfs @ 12.09 hrs, Volume= 529 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.17 cfs @ 12.09 hrs, Volume= 529 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DP2 : Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 144.00' @ 12.10 hrs Surf.Area= 1,720 sf Storage= 0 cf
Flood Elev= 145.50' Surf.Area= 1,720 sf Storage= 516 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (820.1 - 820.1)

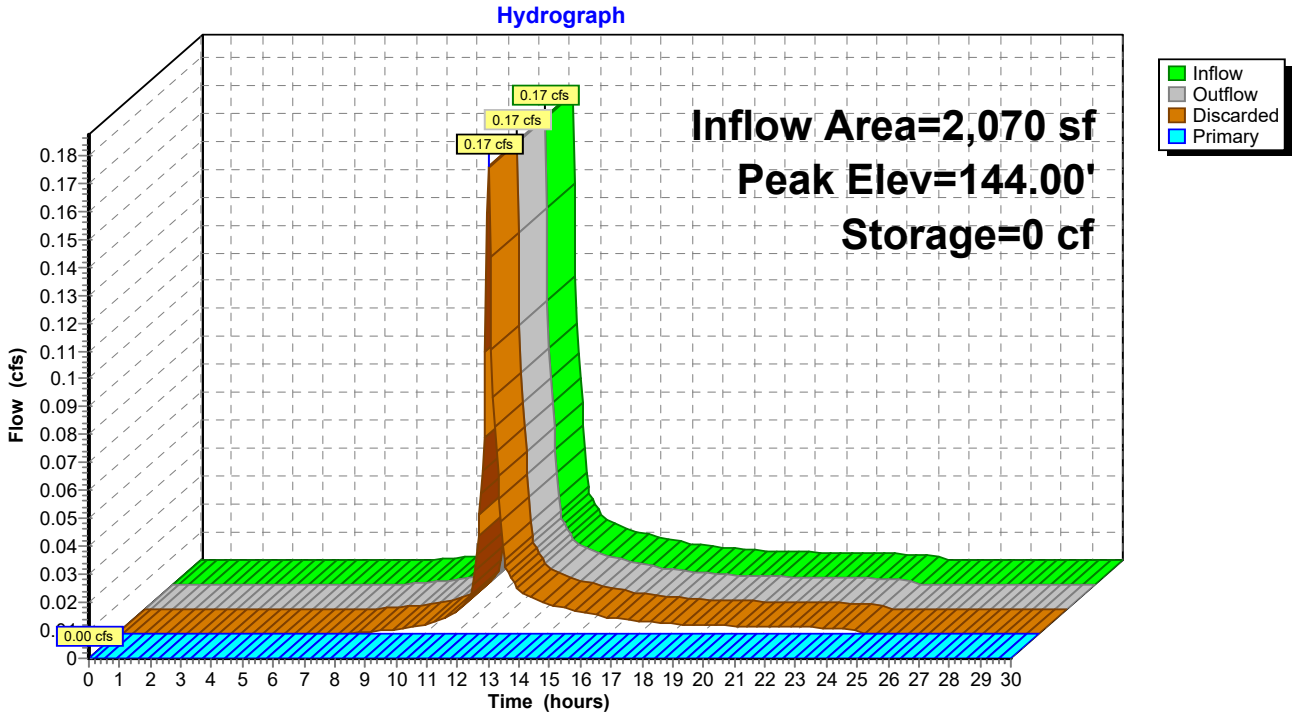
Volume	Invert	Avail.Storage	Storage Description
#1	144.00'	516 cf	**20.00'W x 86.00'L x 1.00'H Prismatoid** 1,720 cf Overall x 30.0% Voids

Device	Routing	Invert	Outlet Devices
#0	Primary	145.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	144.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.00'

Discarded OutFlow Max=0.33 cfs @ 12.09 hrs HW=144.00' (Free Discharge)
↑**1=Exfiltration** (Controls 0.33 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=144.00' TW=0.00' (Dynamic Tailwater)

Pond 5P: Permeable Pavers (Back)



Summary for Pond 6P:

Inflow Area = 560 sf, 0.00% Impervious, Inflow Depth = 1.02" for 10 yr event
Inflow = 0.01 cfs @ 12.11 hrs, Volume= 47 cf
Outflow = 0.01 cfs @ 12.11 hrs, Volume= 47 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.01 cfs @ 12.11 hrs, Volume= 47 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DP1 : Drainage Network

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.00' @ 0.00 hrs Surf.Area= 400 sf Storage= 0 cf
Flood Elev= 145.00' Surf.Area= 400 sf Storage= 120 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (892.8 - 892.8)

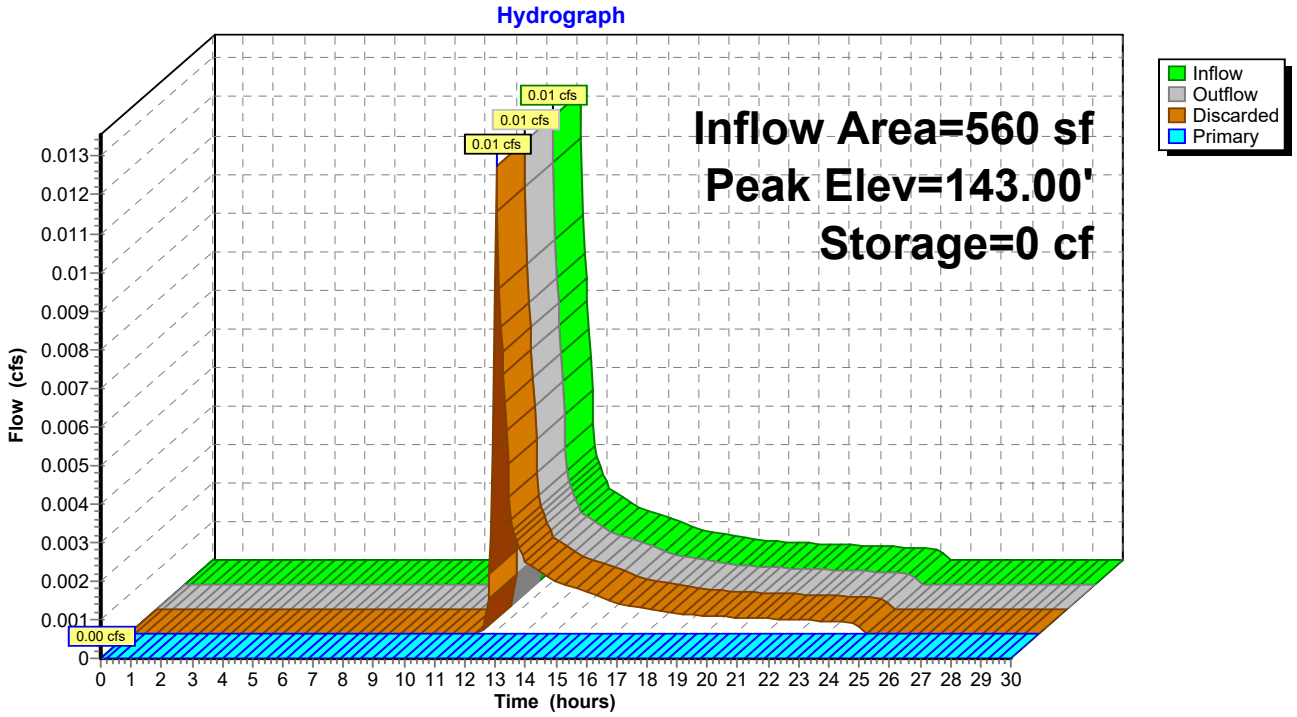
Volume	Invert	Avail.Storage	Storage Description
#1	143.00'	120 cf	**20.00'W x 20.00'L x 1.00'H Prismatoid** 400 cf Overall x 30.0% Voids

Device	Routing	Invert	Outlet Devices
#0	Primary	144.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	143.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.00'

Discarded OutFlow Max=0.00 cfs @ 12.11 hrs HW=143.00' (Free Discharge)
↑**1=Exfiltration** (Passes 0.00 cfs of 0.08 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=143.00' TW=0.00' (Dynamic Tailwater)

Pond 6P:


Hydrograph
Inflow Area=560 sf
Peak Elev=143.00'
Storage=0 cf
Inflow
Outflow
Discarded
Primary
0.01 cfs
0.01 cfs
0.01 cfs
0.00 cfs
Flow (cfs)
0.013
0.012
0.011
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Time (hours)

Summary for Pond 7P: Stone infiltration Trench

Inflow Area = 7,565 sf, 48.91% Impervious, Inflow Depth = 1.64" for 10 yr event
Inflow = 0.31 cfs @ 12.10 hrs, Volume= 1,032 cf
Outflow = 0.13 cfs @ 12.40 hrs, Volume= 1,035 cf, Atten= 59%, Lag= 17.7 min
Discarded = 0.13 cfs @ 12.40 hrs, Volume= 1,035 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DP2 : Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 144.52' @ 12.40 hrs Surf.Area= 600 sf Storage= 126 cf
Flood Elev= 145.00' Surf.Area= 600 sf Storage= 240 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.9 min (868.8 - 863.9)

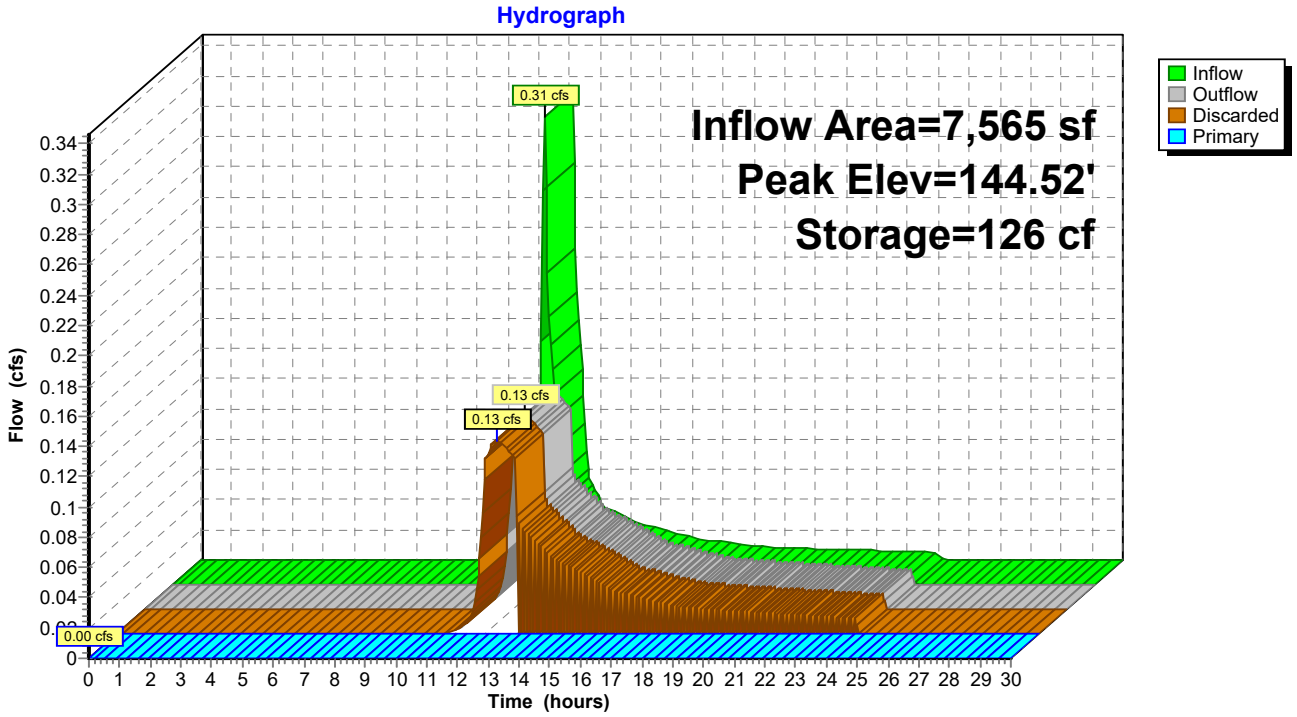
Volume	Invert	Avail.Storage	Storage Description
#1	144.00'	480 cf	**2.00'W x 300.00'L x 2.00'H Prismatoid** 1,200 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#0	Primary	146.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	144.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.00'
#2	Primary	145.00'	**500.0' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.13 cfs @ 12.40 hrs HW=144.52' (Free Discharge)
↑└**1=Exfiltration** (Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=144.00' TW=0.00' (Dynamic Tailwater)
↑└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Stone infiltration Trench



Summary for Pond CB1,8:

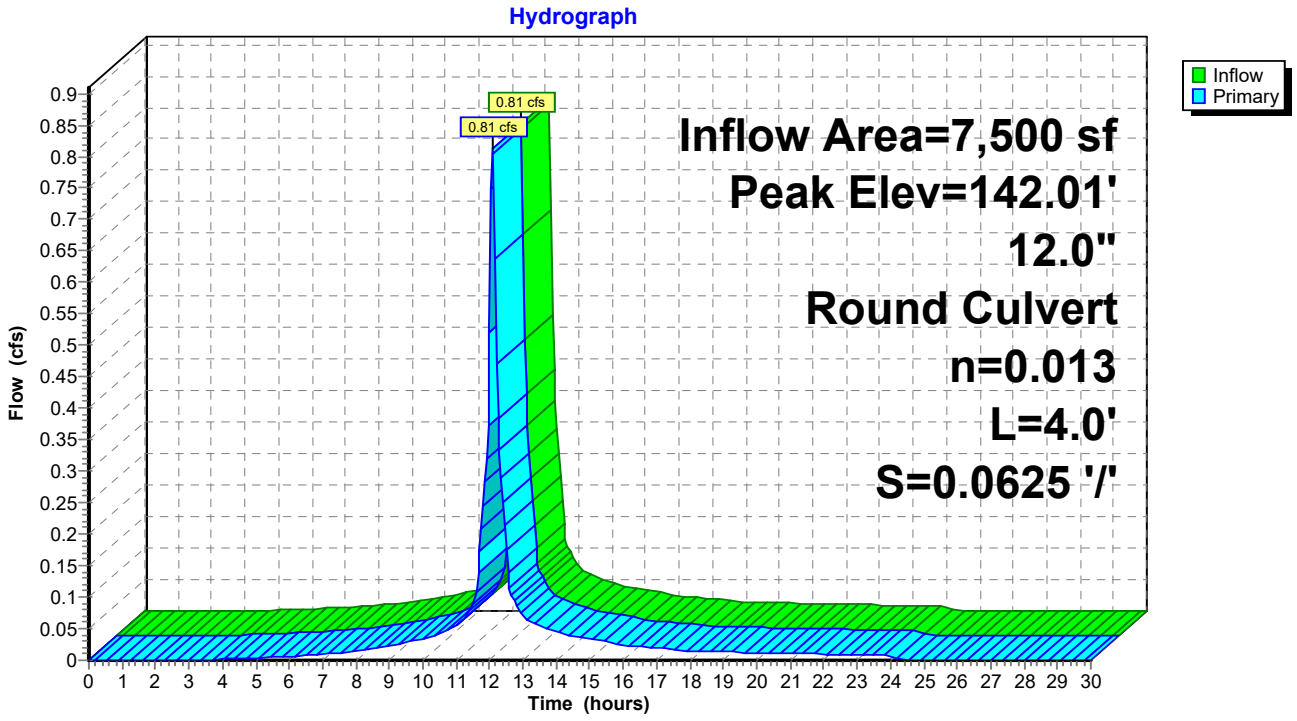
Inflow Area = 7,500 sf, 90.93% Impervious, Inflow Depth = 4.39" for 10 yr event
Inflow = 0.81 cfs @ 12.09 hrs, Volume= 2,747 cf
Outflow = 0.81 cfs @ 12.09 hrs, Volume= 2,747 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.81 cfs @ 12.09 hrs, Volume= 2,747 cf
Routed to Pond IS1 : Infiltration System 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.01' @ 12.47 hrs
Flood Elev= 144.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.25'	**12.0" Round Culvert** L= 4.0' Ke= 0.500 Inlet / Outlet Invert= 141.25' / 141.00' S= 0.0625 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.65 cfs @ 12.09 hrs HW=141.70' TW=141.50' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.65 cfs @ 2.78 fps)

Pond CB1,8:



Summary for Pond CB2,7:

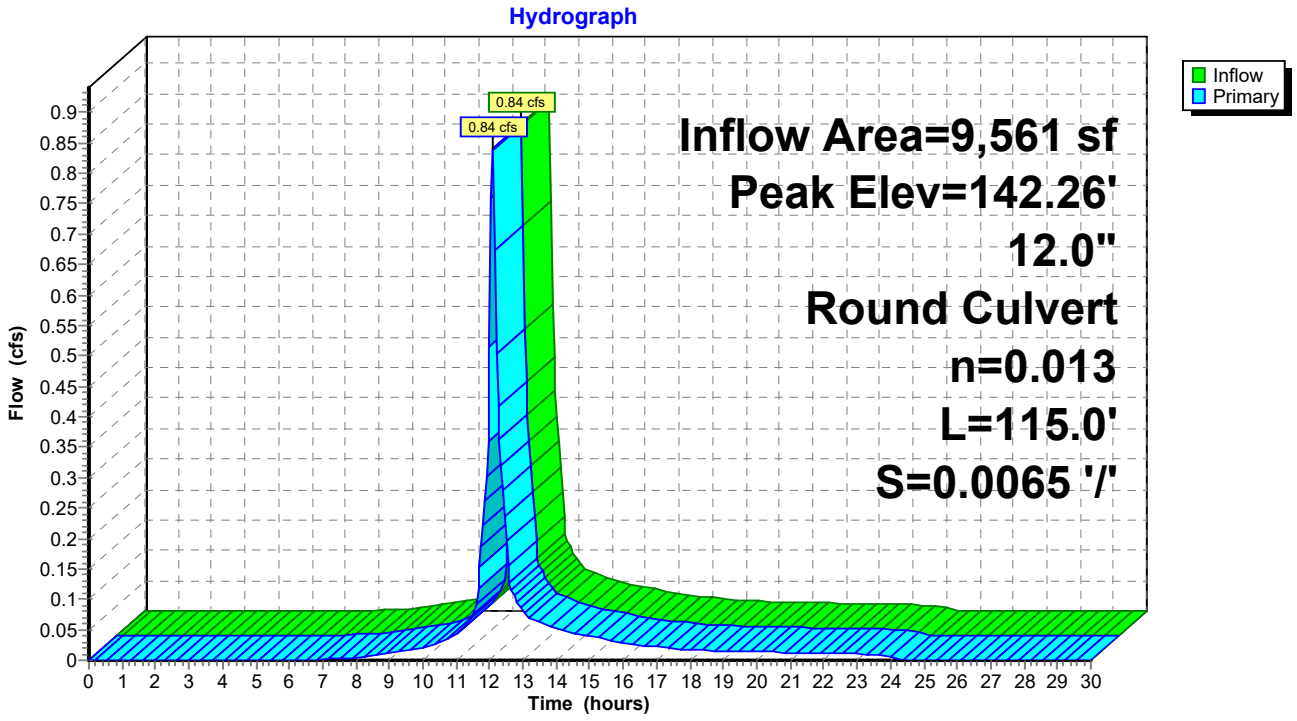
Inflow Area = 9,561 sf, 73.85% Impervious, Inflow Depth = 3.36" for 10 yr event
Inflow = 0.84 cfs @ 12.09 hrs, Volume= 2,674 cf
Outflow = 0.84 cfs @ 12.09 hrs, Volume= 2,674 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.84 cfs @ 12.09 hrs, Volume= 2,674 cf
Routed to Pond IS1 : Infiltration System 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.26' @ 12.10 hrs
Flood Elev= 144.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.75'	**12.0" Round Culvert** L= 115.0' Ke= 0.500 Inlet / Outlet Invert= 141.75' / 141.00' S= 0.0065 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.76 cfs @ 12.09 hrs HW=142.25' TW=141.51' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.76 cfs @ 2.78 fps)

Pond CB2,7:



Summary for Pond CB3:

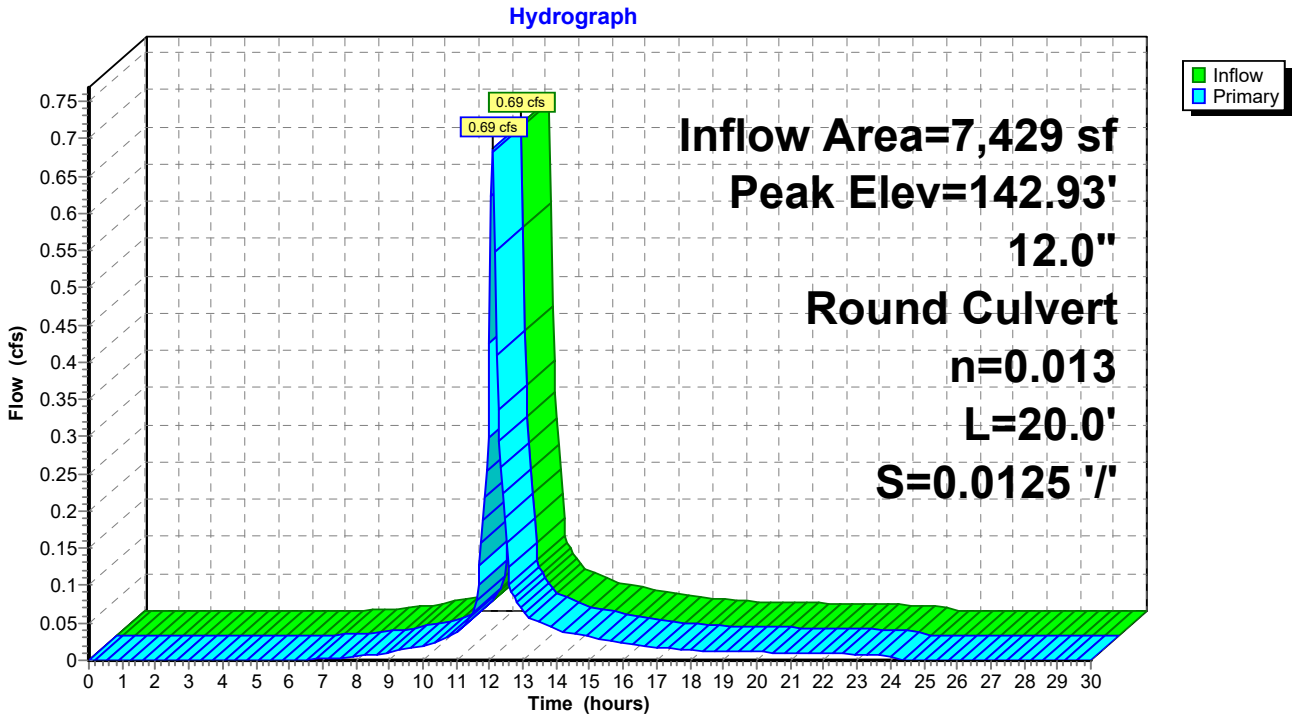
Inflow Area = 7,429 sf, 68.84% Impervious, Inflow Depth = 3.55" for 10 yr event
Inflow = 0.69 cfs @ 12.09 hrs, Volume= 2,200 cf
Outflow = 0.69 cfs @ 12.09 hrs, Volume= 2,200 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.69 cfs @ 12.09 hrs, Volume= 2,200 cf
Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.93' @ 12.14 hrs
Flood Elev= 144.35'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.75'	**12.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 141.75' / 141.50' S= 0.0125 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=142.87' TW=142.90' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Pond CB3:



Summary for Pond CB4:

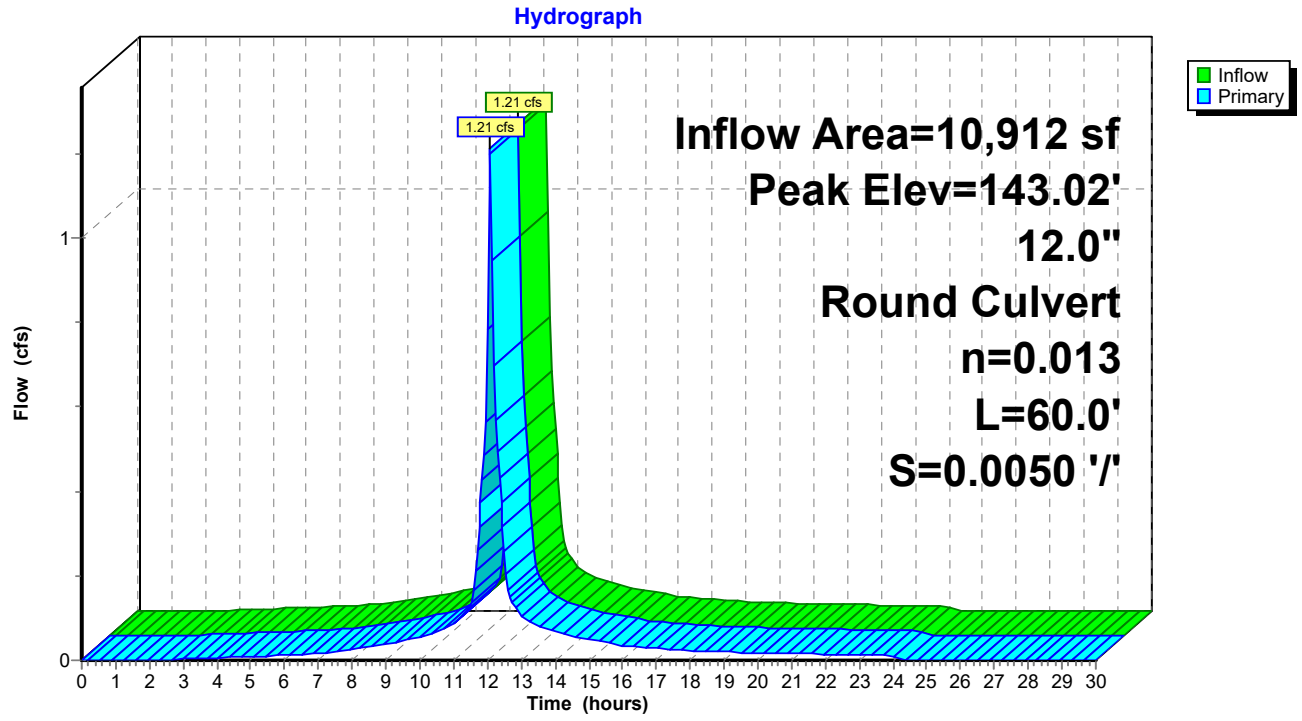
Inflow Area = 10,912 sf, 94.08% Impervious, Inflow Depth = 4.62" for 10 yr event
Inflow = 1.21 cfs @ 12.09 hrs, Volume= 4,199 cf
Outflow = 1.21 cfs @ 12.09 hrs, Volume= 4,199 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.21 cfs @ 12.09 hrs, Volume= 4,199 cf
Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.02' @ 12.12 hrs
Flood Elev= 144.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.80'	**12.0" Round Culvert** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 141.80' / 141.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.80 cfs @ 12.09 hrs HW=142.95' TW=142.90' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.80 cfs @ 1.10 fps)

Pond CB4:



Summary for Pond CB5:

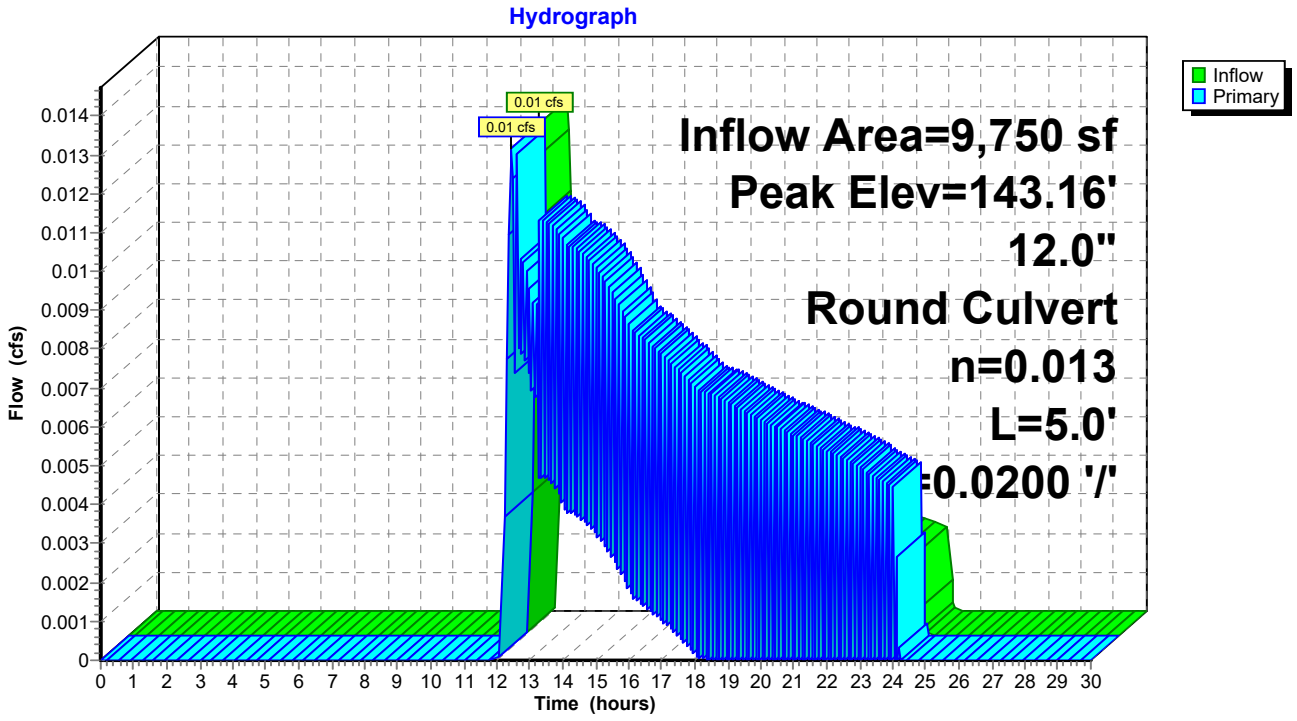
Inflow Area = 9,750 sf, 0.00% Impervious, Inflow Depth = 0.24" for 10 yr event
Inflow = 0.01 cfs @ 12.44 hrs, Volume= 197 cf
Outflow = 0.01 cfs @ 12.44 hrs, Volume= 197 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.01 cfs @ 12.44 hrs, Volume= 197 cf
Routed to Pond DMH1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.16' @ 12.17 hrs
Flood Elev= 144.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	142.00'	**12.0" Round Culvert** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 142.00' / 141.90' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.54 cfs @ 12.44 hrs HW=142.81' TW=142.78' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.54 cfs @ 1.09 fps)

Pond CB5:



Summary for Pond DMH1:

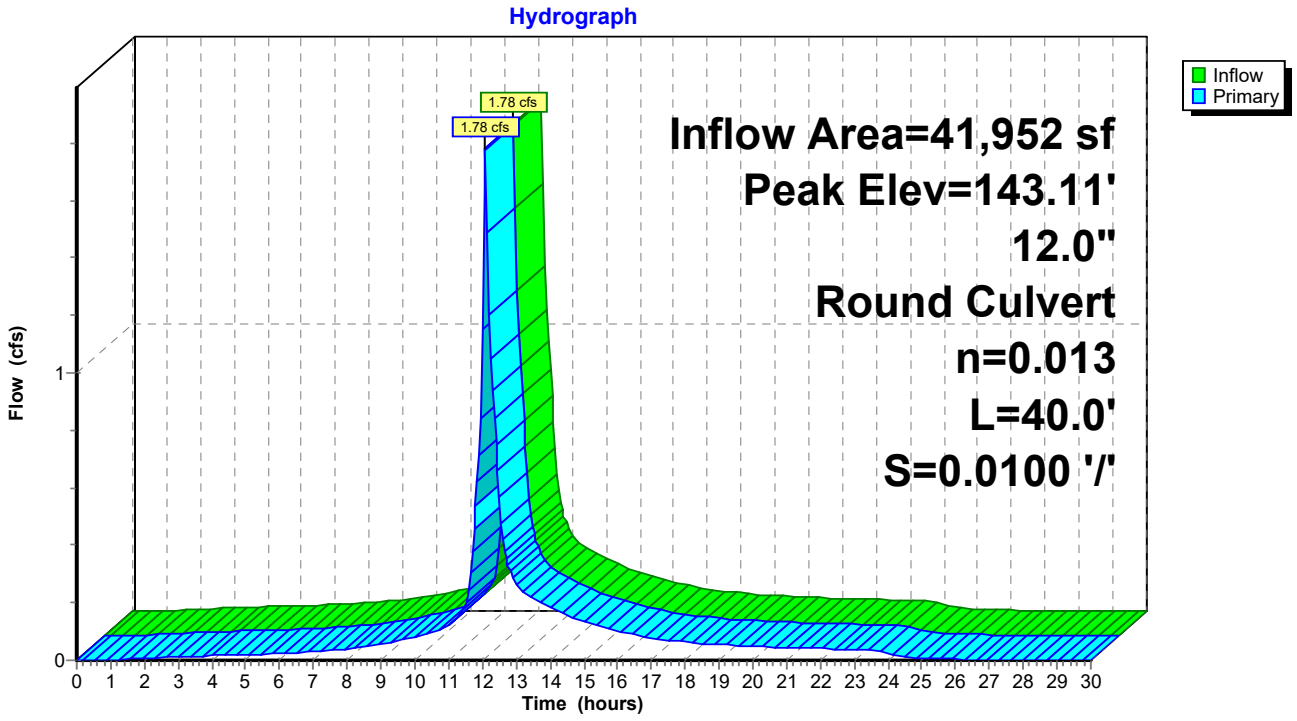
Inflow Area = 41,952 sf, 35.41% Impervious, Inflow Depth > 2.41" for 10 yr event
Inflow = 1.78 cfs @ 12.09 hrs, Volume= 8,435 cf
Outflow = 1.78 cfs @ 12.09 hrs, Volume= 8,435 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.78 cfs @ 12.09 hrs, Volume= 8,435 cf
Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.11' @ 12.12 hrs
Flood Elev= 144.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.90'	**12.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 141.90' / 141.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.54 cfs @ 12.09 hrs HW=143.07' TW=142.90' (Dynamic Tailwater)
1=Culvert (Outlet Controls 1.54 cfs @ 2.10 fps)

Pond DMH1:

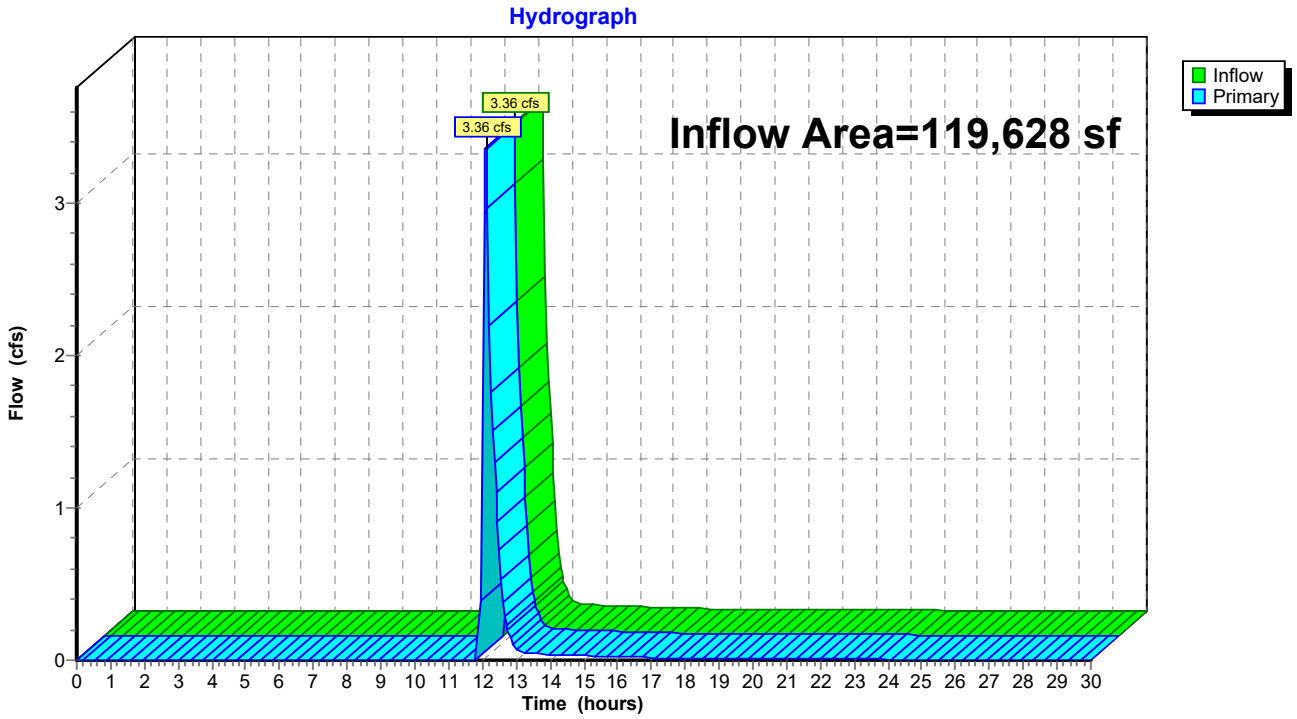


Summary for Pond DP1: Drainage Network

Inflow Area = 119,628 sf, 53.46% Impervious, Inflow Depth = 0.46" for 10 yr event
Inflow = 3.36 cfs @ 12.10 hrs, Volume= 4,626 cf
Primary = 3.36 cfs @ 12.10 hrs, Volume= 4,626 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Pond DP1: Drainage Network

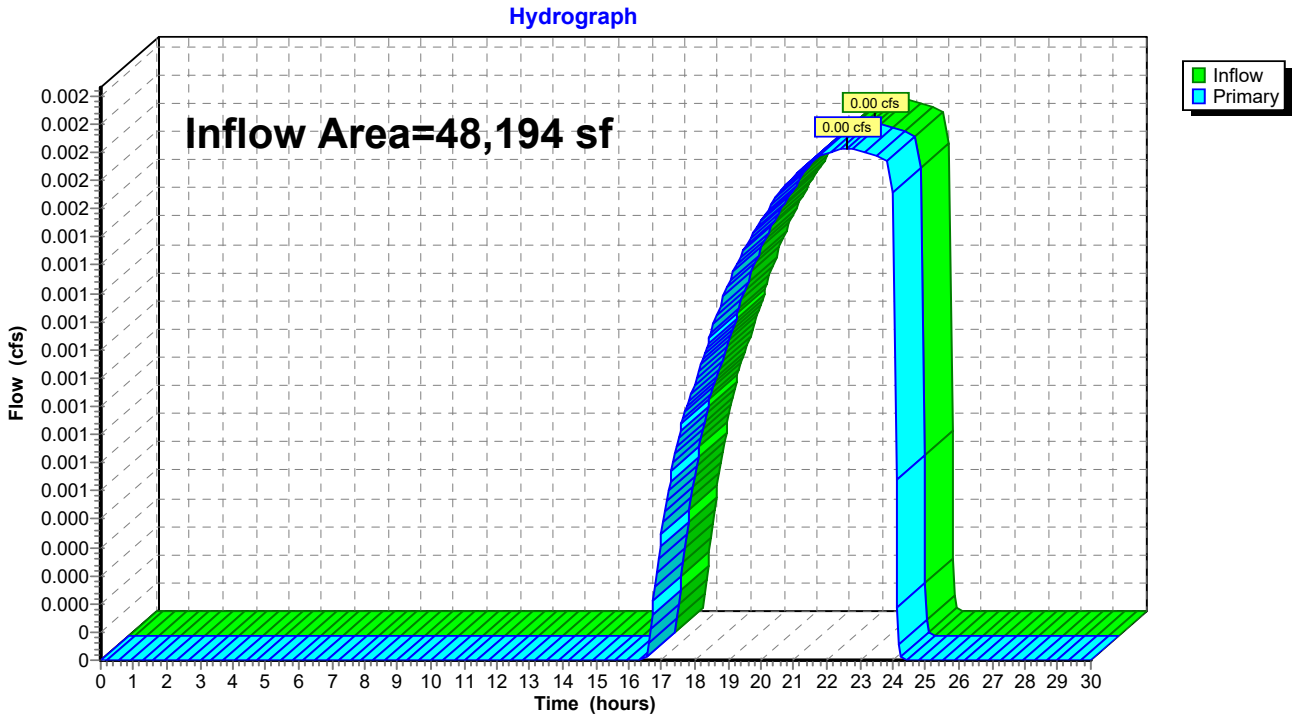


Summary for Pond DP2: Wetlands

Inflow Area = 48,194 sf, 7.68% Impervious, Inflow Depth = 0.01" for 10 yr event
Inflow = 0.00 cfs @ 22.61 hrs, Volume= 38 cf
Primary = 0.00 cfs @ 22.61 hrs, Volume= 38 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Pond DP2: Wetlands



Summary for Pond IS1: Infiltration System 1

Inflow Area = 41,131 sf, 74.21% Impervious, Inflow Depth = 3.33" for 10 yr event
Inflow = 3.31 cfs @ 12.09 hrs, Volume= 11,414 cf
Outflow = 0.94 cfs @ 12.43 hrs, Volume= 11,429 cf, Atten= 72%, Lag= 20.5 min
Discarded = 0.94 cfs @ 12.43 hrs, Volume= 11,429 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DP1 : Drainage Network

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.00' @ 12.43 hrs Surf.Area= 3,262 sf Storage= 2,349 cf
Flood Elev= 142.83' Surf.Area= 3,262 sf Storage= 3,502 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 14.0 min (783.7 - 769.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	141.00'	1,649 cf	**61.50'W x 53.04'L x 1.83'H Field A** 5,980 cf Overall - 1,857 cf Embedded = 4,123 cf x 40.0% Voids
#2A	141.00'	1,857 cf	**ADS_StormTech SC-310 +Cap** x 126 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 126 Chambers in 18 Rows
		3,507 cf	Total Available Storage

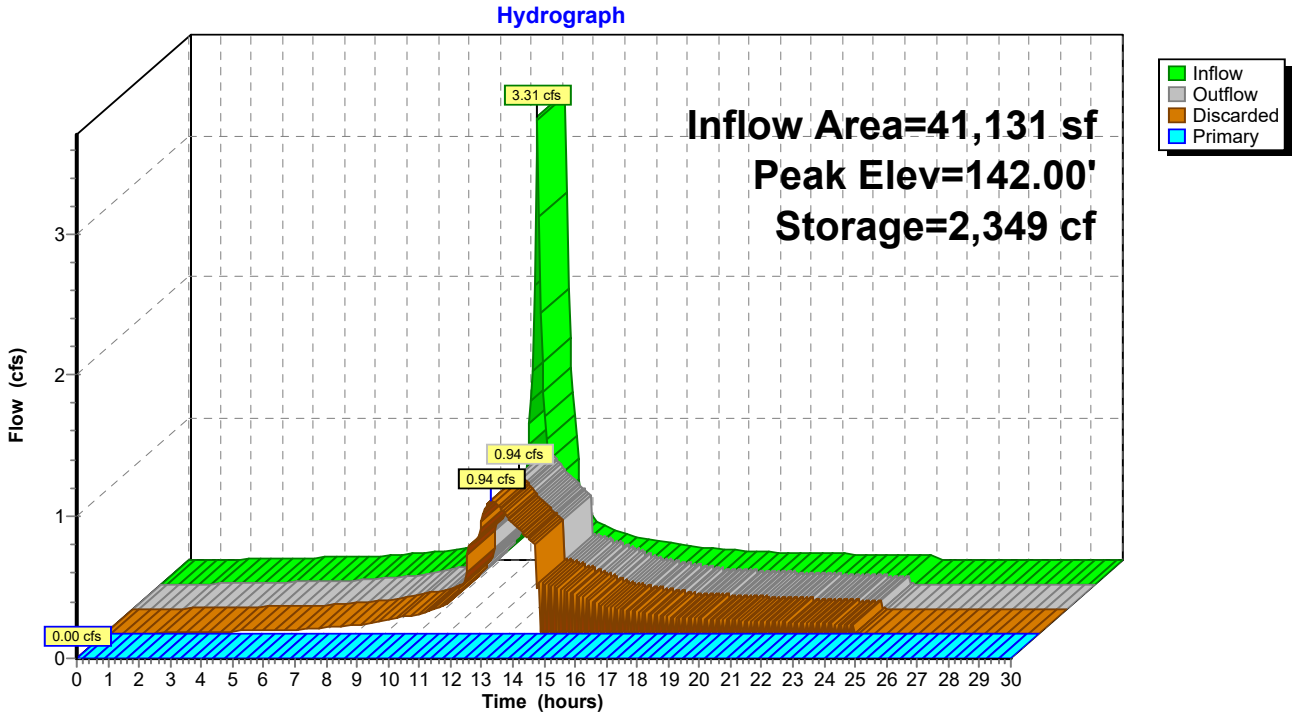
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	141.00'	**15.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 141.00' / 140.00' S= 0.0250 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	141.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.00'
#3	Device 1	142.50'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.94 cfs @ 12.43 hrs HW=142.00' (Free Discharge)
└**2=Exfiltration** (Controls 0.94 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=141.00' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond IS1: Infiltration System 1



Summary for Pond IS2: Infiltration System 2

Inflow Area = 60,293 sf, 50.15% Impervious, Inflow Depth > 2.95" for 10 yr event
Inflow = 3.68 cfs @ 12.09 hrs, Volume= 14,834 cf
Outflow = 3.61 cfs @ 12.10 hrs, Volume= 14,836 cf, Atten= 2%, Lag= 0.6 min
Discarded = 0.49 cfs @ 12.10 hrs, Volume= 11,351 cf
Primary = 3.13 cfs @ 12.10 hrs, Volume= 3,485 cf
Routed to Pond DP1 : Drainage Network

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.91' @ 12.10 hrs Surf.Area= 1,494 sf Storage= 1,335 cf
Flood Elev= 143.50' Surf.Area= 1,494 sf Storage= 1,691 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 13.4 min (809.2 - 795.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	141.50'	865 cf	**24.83'W x 60.16'L x 2.00'H Field A** 2,988 cf Overall - 826 cf Embedded = 2,162 cf x 40.0% Voids
#2A	141.50'	826 cf	**ADS_StormTech SC-310 +Cap** x 56 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 56 Chambers in 7 Rows
		1,691 cf	Total Available Storage

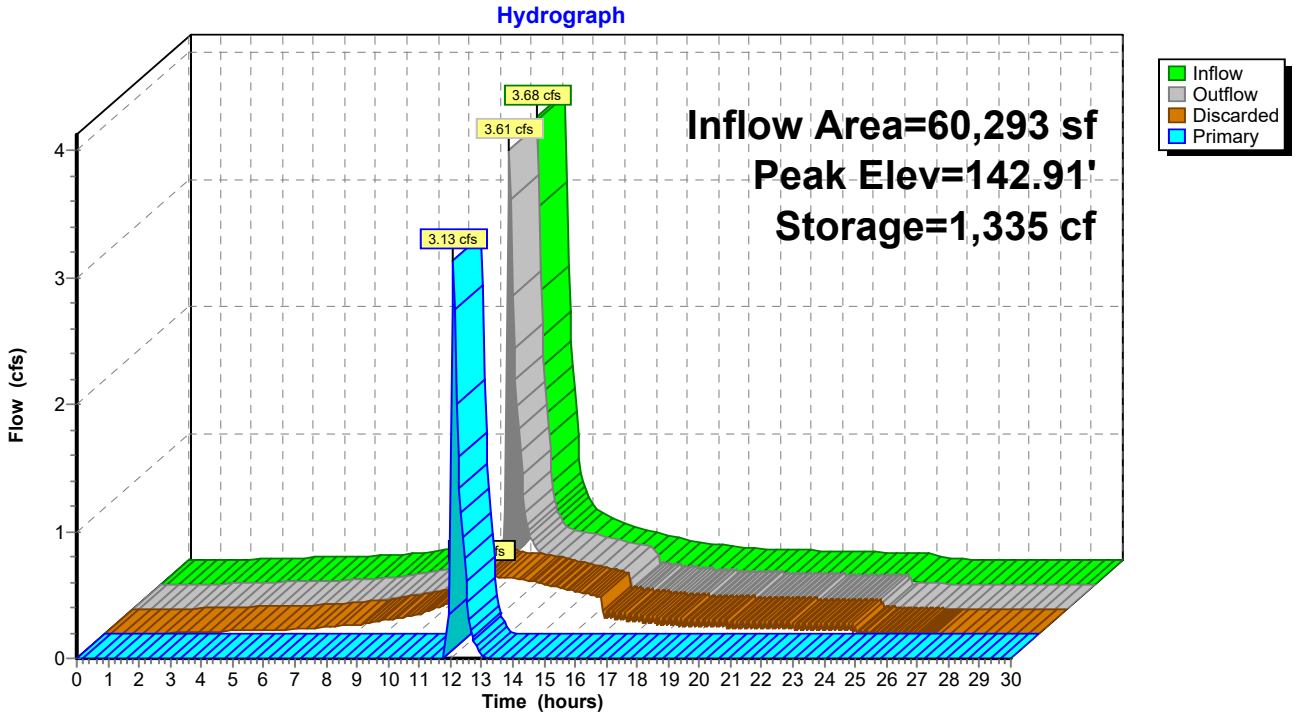
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	141.50'	**15.0" Round Culvert** L= 80.0' Ke= 0.500 Inlet / Outlet Invert= 141.50' / 140.00' S= 0.0187 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	141.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.50'
#3	Device 1	142.56'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.49 cfs @ 12.10 hrs HW=142.90' (Free Discharge)
└**2=Exfiltration** (Controls 0.49 cfs)

Primary OutFlow Max=3.12 cfs @ 12.10 hrs HW=142.90' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 3.12 cfs of 5.22 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 3.12 cfs @ 1.92 fps)

Pond IS2: Infiltration System 2



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

SubcatchmentB1A: Building (R) Runoff Area=14,492 sf 100.00% Impervious Runoff Depth=6.16"
Tc=6.0 min CN=98 Runoff=2.04 cfs 7,441 cf

SubcatchmentB1B: Building (L) Runoff Area=13,836 sf 100.00% Impervious Runoff Depth=6.16"
Tc=6.0 min CN=98 Runoff=1.95 cfs 7,104 cf

SubcatchmentP1: Back of property to Wetl Runoff Area=38,559 sf 0.00% Impervious Runoff Depth=0.12"
Tc=6.0 min CN=30 Runoff=0.01 cfs 385 cf

SubcatchmentP1A: Back of property to Runoff Area=7,565 sf 48.91% Impervious Runoff Depth=2.46"
Tc=6.0 min CN=63 Runoff=0.48 cfs 1,551 cf

SubcatchmentP1B: Back Patio Runoff Area=2,070 sf 0.00% Impervious Runoff Depth=4.14"
Tc=6.0 min CN=80 Runoff=0.22 cfs 715 cf

SubcatchmentP2A: Runoff Area=6,132 sf 27.32% Impervious Runoff Depth=5.35"
Tc=6.0 min CN=91 Runoff=0.81 cfs 2,733 cf

SubcatchmentP2B: Runoff Area=3,446 sf 13.78% Impervious Runoff Depth=2.65"
Tc=6.0 min CN=65 Runoff=0.24 cfs 760 cf

SubcatchmentP3: Runoff Area=7,500 sf 90.93% Impervious Runoff Depth=5.58"
Tc=6.0 min CN=93 Runoff=1.02 cfs 3,486 cf

SubcatchmentP4: Runoff Area=9,561 sf 73.85% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=83 Runoff=1.11 cfs 3,557 cf

SubcatchmentP5: Runoff Area=7,429 sf 68.84% Impervious Runoff Depth=4.68"
Tc=6.0 min CN=85 Runoff=0.89 cfs 2,898 cf

SubcatchmentP5A: Perm Pavers Front Runoff Area=560 sf 0.00% Impervious Runoff Depth=1.67"
Tc=6.0 min CN=54 Runoff=0.02 cfs 78 cf

SubcatchmentP6: Runoff Area=10,912 sf 94.08% Impervious Runoff Depth=5.81"
Tc=6.0 min CN=95 Runoff=1.51 cfs 5,282 cf

SubcatchmentP7: Runoff Area=9,750 sf 0.00% Impervious Runoff Depth=0.57"
Tc=6.0 min CN=39 Runoff=0.06 cfs 460 cf

SubcatchmentP8: Runoff Area=18,366 sf 5.55% Impervious Runoff Depth=3.03"
Flow Length=175' Slope=0.0100 '/' Tc=9.5 min CN=69 Runoff=1.30 cfs 4,635 cf

SubcatchmentP9: Runoff Area=17,644 sf 18.14% Impervious Runoff Depth=1.34"
Tc=6.0 min CN=50 Runoff=0.52 cfs 1,977 cf

Pond 1P: Pervious Pvmt (North Fire) bed 'C' Peak Elev=142.05' Storage=50 cf Inflow=0.81 cfs 2,733 cf
Discarded=0.64 cfs 2,745 cf Primary=0.02 cfs 6 cf Outflow=0.65 cfs 2,751 cf

Pond 2P: Pervious Pvmt (North Fire) Bed B Peak Elev=141.61' Storage=25 cf Inflow=0.25 cfs 765 cf
Discarded=0.14 cfs 727 cf Primary=0.07 cfs 39 cf Outflow=0.21 cfs 766 cf

Pond 3P: Pervious Pvmt (North Fire) Bed 'A' Peak Elev=141.00' Storage=0 cf Inflow=0.07 cfs 39 cf
Discarded=0.07 cfs 39 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 39 cf

Pond 4P: Pervious Pvmt (South Fire Lane) Peak Elev=143.90' Storage=593 cf Inflow=1.30 cfs 4,635 cf
Discarded=0.75 cfs 1,267 cf Primary=0.41 cfs 3,344 cf Outflow=1.15 cfs 4,611 cf

Pond 5P: Permeable Pavers (Back) Peak Elev=144.00' Storage=0 cf Inflow=0.22 cfs 715 cf
Discarded=0.22 cfs 715 cf Primary=0.00 cfs 0 cf Outflow=0.22 cfs 715 cf

Pond 6P: Peak Elev=143.00' Storage=0 cf Inflow=0.02 cfs 78 cf
Discarded=0.02 cfs 78 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 78 cf

Pond 7P: Stone infiltration Trench Peak Elev=145.00' Storage=240 cf Inflow=0.48 cfs 1,551 cf
Discarded=0.14 cfs 1,490 cf Primary=0.13 cfs 62 cf Outflow=0.26 cfs 1,553 cf

Pond CB1,8: Peak Elev=142.59' Inflow=1.02 cfs 3,486 cf
12.0" Round Culvert n=0.013 L=4.0' S=0.0625 '/' Outflow=1.02 cfs 3,486 cf

Pond CB2,7: Peak Elev=142.61' Inflow=1.11 cfs 3,557 cf
12.0" Round Culvert n=0.013 L=115.0' S=0.0065 '/' Outflow=1.11 cfs 3,557 cf

Pond CB3: Peak Elev=143.01' Inflow=0.89 cfs 2,898 cf
12.0" Round Culvert n=0.013 L=20.0' S=0.0125 '/' Outflow=0.89 cfs 2,898 cf

Pond CB4: Peak Elev=143.12' Inflow=1.51 cfs 5,282 cf
12.0" Round Culvert n=0.013 L=60.0' S=0.0050 '/' Outflow=1.51 cfs 5,282 cf

Pond CB5: Peak Elev=143.29' Inflow=0.06 cfs 460 cf
12.0" Round Culvert n=0.013 L=5.0' S=0.0200 '/' Outflow=0.06 cfs 460 cf

Pond DMH1: Peak Elev=143.29' Inflow=2.27 cfs 10,908 cf
12.0" Round Culvert n=0.013 L=40.0' S=0.0100 '/' Outflow=2.27 cfs 10,908 cf

Pond DP1: Drainage Network Inflow=4.68 cfs 7,664 cf
Primary=4.68 cfs 7,664 cf

Pond DP2: Wetlands Inflow=0.13 cfs 447 cf
Primary=0.13 cfs 447 cf

Pond IS1: Infiltration System 1 Peak Elev=142.58' Storage=3,177 cf Inflow=4.16 cfs 14,484 cf
Discarded=1.12 cfs 14,318 cf Primary=0.35 cfs 179 cf Outflow=1.47 cfs 14,496 cf

Pond IS2: Infiltration System 2 Peak Elev=142.98' Storage=1,378 cf Inflow=4.67 cfs 19,089 cf
Discarded=0.50 cfs 13,581 cf Primary=4.15 cfs 5,509 cf Outflow=4.65 cfs 19,090 cf

Total Runoff Area = 167,822 sf Runoff Volume = 43,062 cf Average Runoff Depth = 3.08"
59.68% Pervious = 100,163 sf 40.32% Impervious = 67,659 sf

Summary for Subcatchment B1A: Building (R)

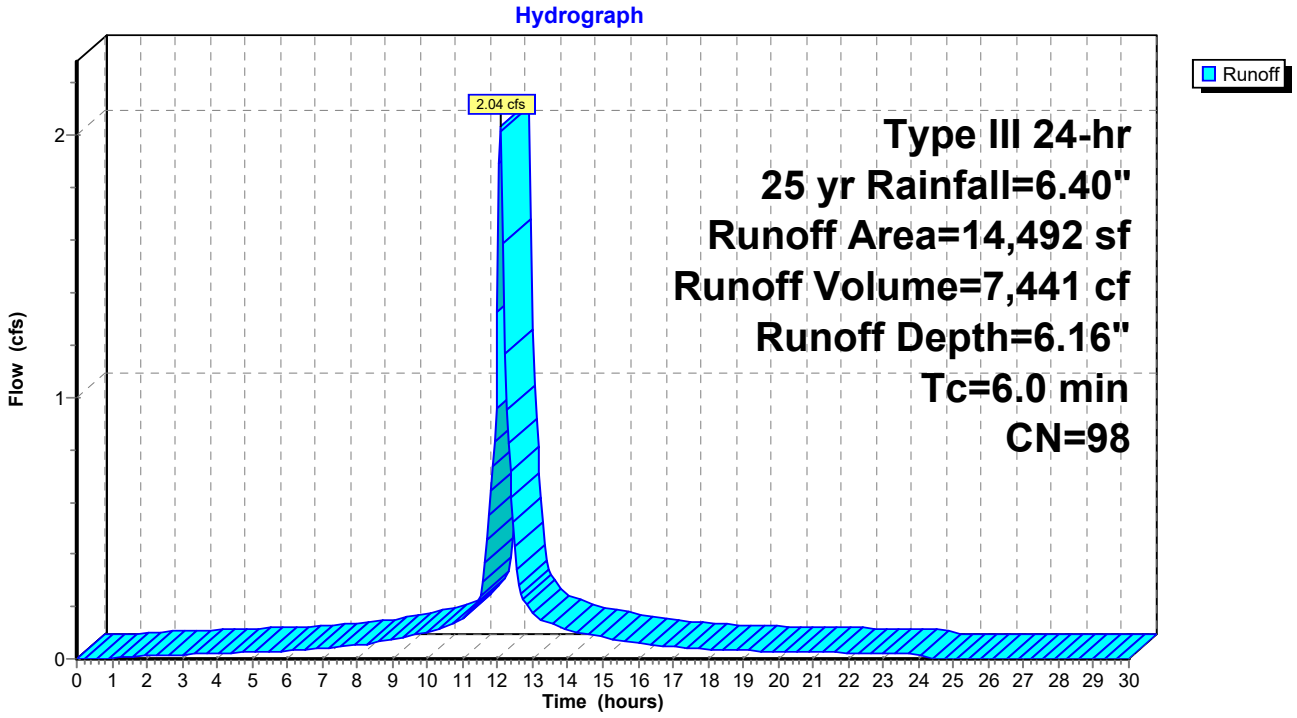
Runoff = 2.04 cfs @ 12.09 hrs, Volume= 7,441 cf, Depth= 6.16"
Routed to Pond IS1 : Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

Area (sf)	CN	Description
14,492	98	Roofs, HSG A
14,492		100.00% Impervious Area

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

Subcatchment B1A: Building (R)



Summary for Subcatchment B1B: Building (L)

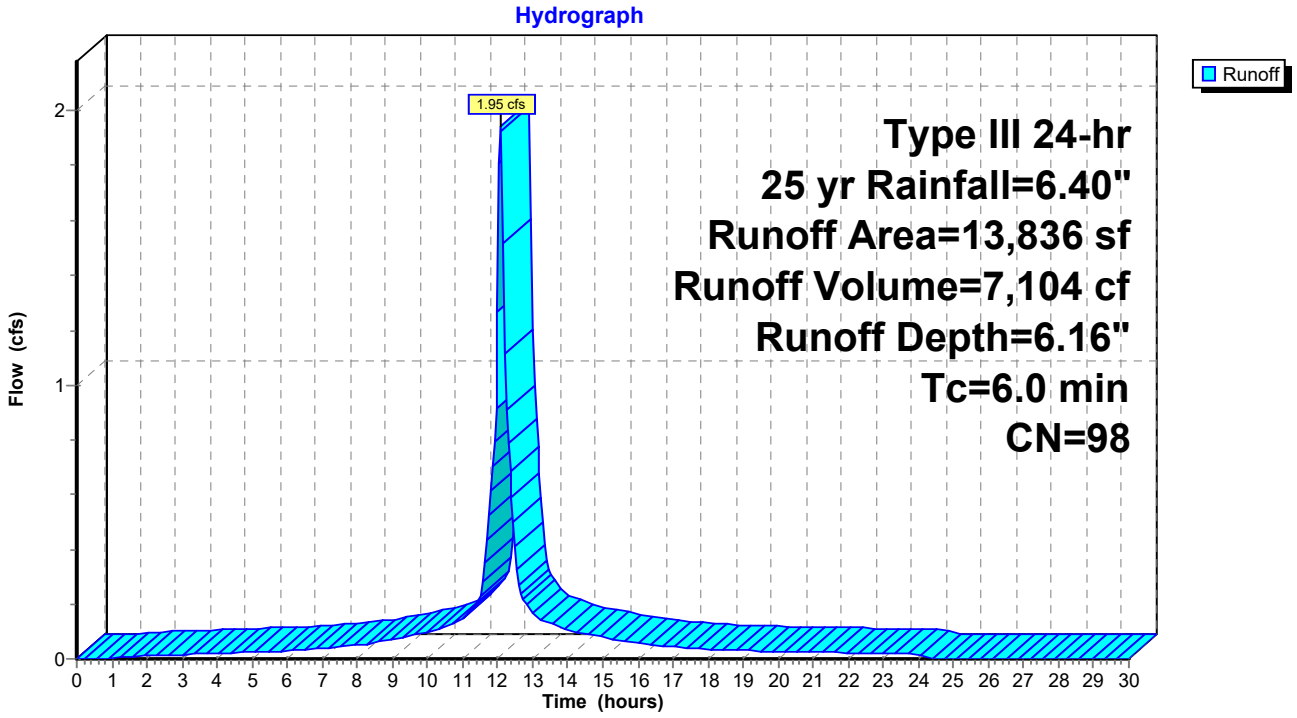
Runoff = 1.95 cfs @ 12.09 hrs, Volume= 7,104 cf, Depth= 6.16"
Routed to Pond DMH1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

Area (sf)	CN	Description
13,836	98	Roofs, HSG A
13,836		100.00% Impervious Area

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

Subcatchment B1B: Building (L)



Summary for Subcatchment P1: Back of property to Wetl

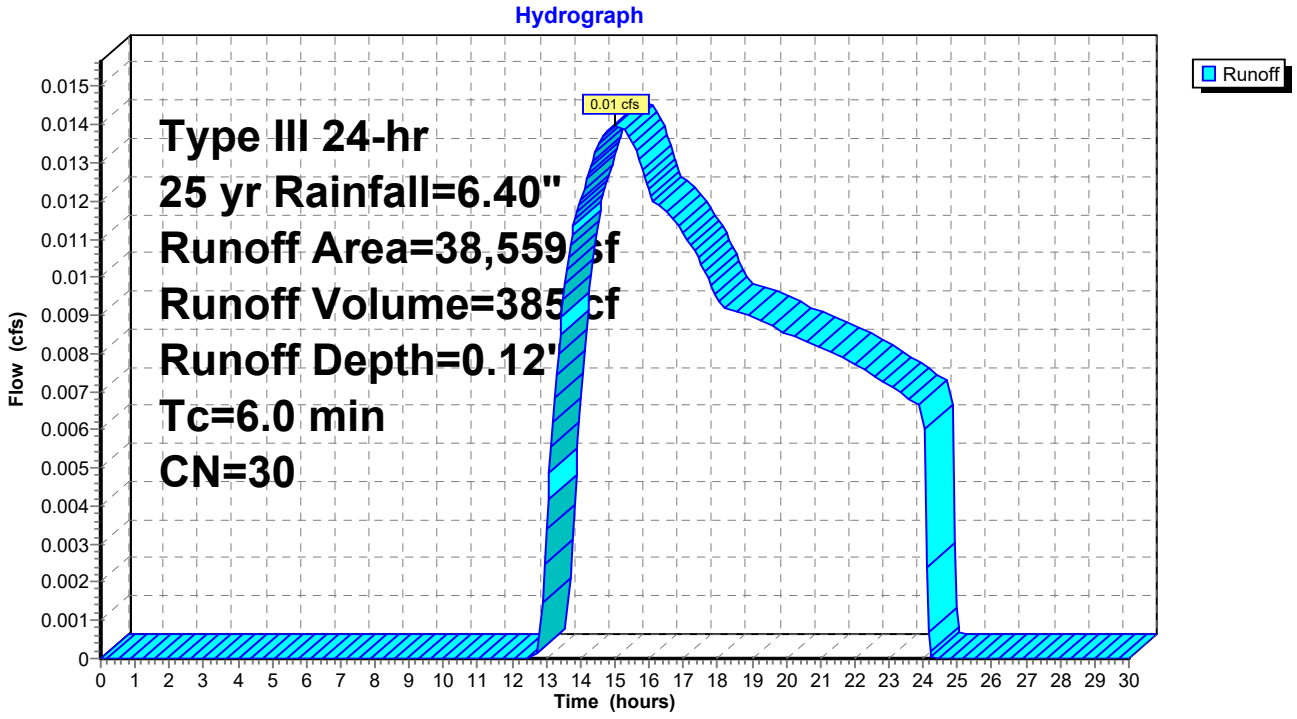
Runoff = 0.01 cfs @ 15.01 hrs, Volume= 385 cf, Depth= 0.12"
Routed to Pond DP2 : Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

Area (sf)	CN	Description
19,150	30	Woods, Good, HSG A
19,409	30	Meadow, non-grazed, HSG A
38,559	30	Weighted Average
38,559		100.00% Pervious Area

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

Subcatchment P1: Back of property to Wetl



Summary for Subcatchment P1A: Back of property to trench

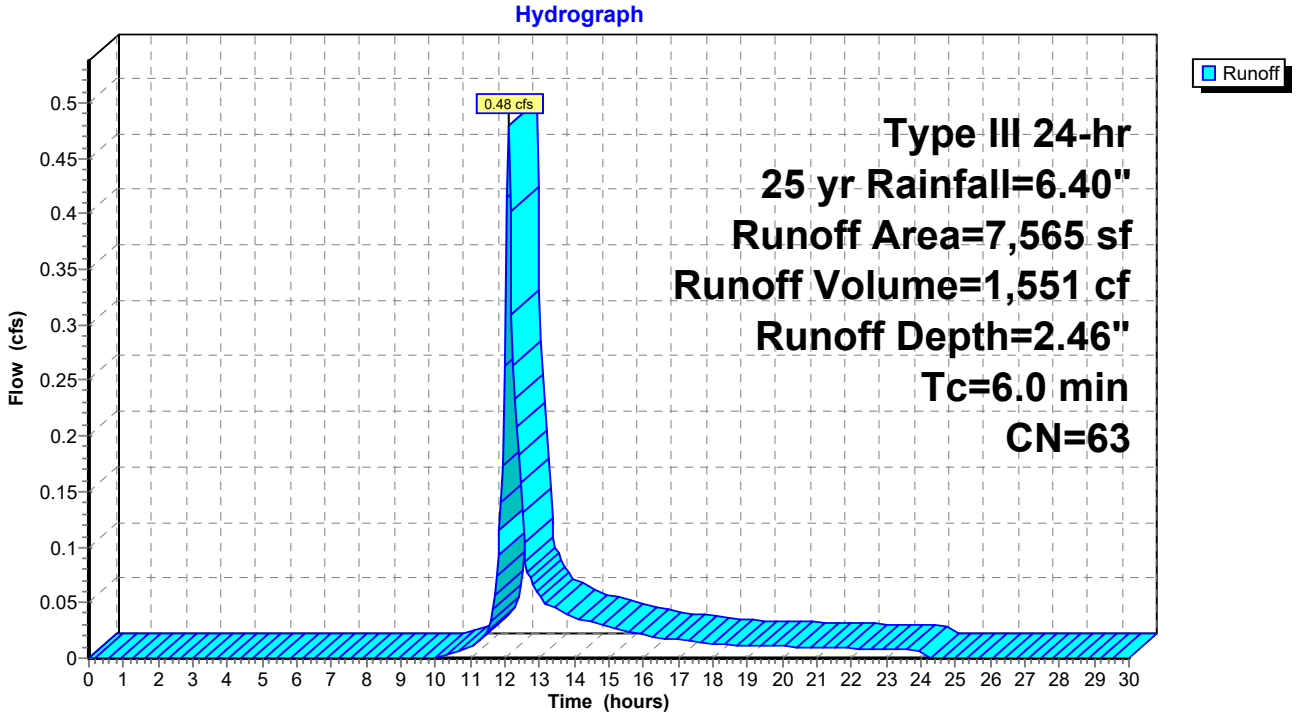
Runoff = 0.48 cfs @ 12.10 hrs, Volume= 1,551 cf, Depth= 2.46"
Routed to Pond 7P : Stone infiltration Trench

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

	Area (sf)	CN	Description
*	3,700	98	CONCRETE/Pervious Pvmt
	3,865	30	Meadow, non-grazed, HSG A
	7,565	63	Weighted Average
	3,865		51.09% Pervious Area
	3,700		48.91% Impervious Area

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

Subcatchment P1A: Back of property to trench



Summary for Subcatchment P1B: Back Patio

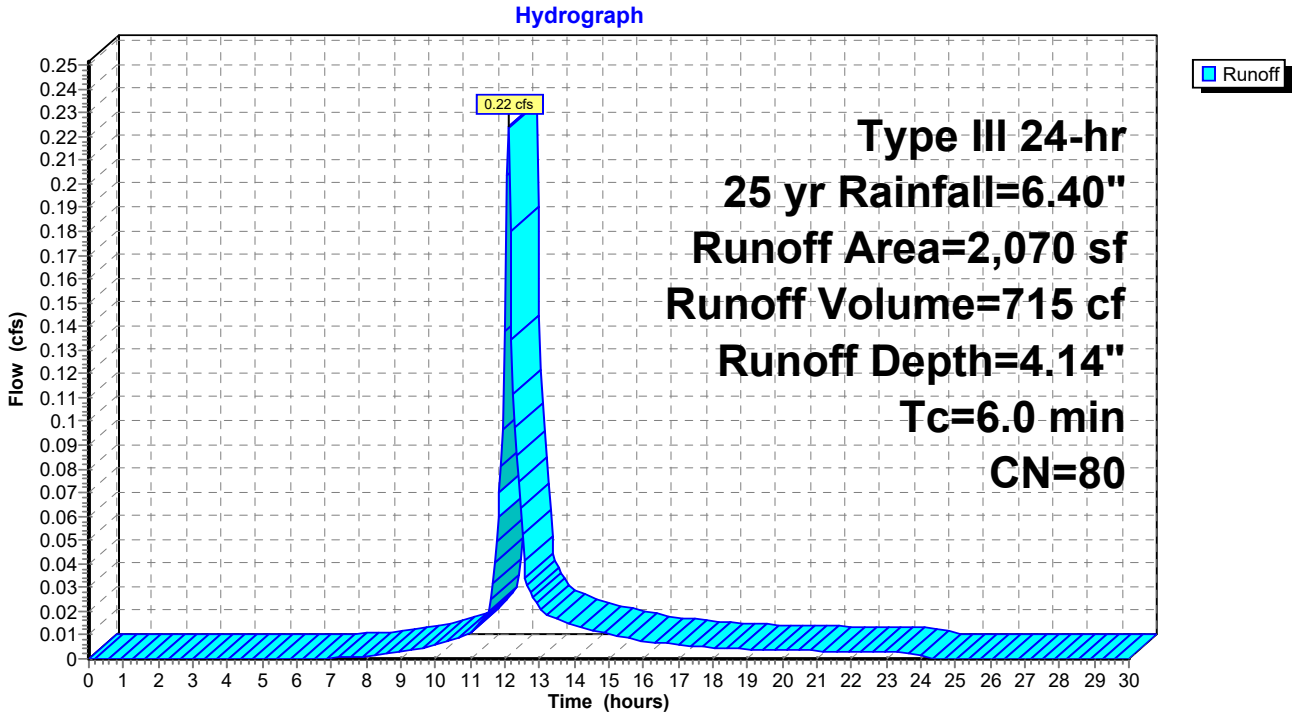
Runoff = 0.22 cfs @ 12.09 hrs, Volume= 715 cf, Depth= 4.14"
Routed to Pond 5P : Permeable Pavers (Back)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

	Area (sf)	CN	Description
*	2,070	80	permeable pavers
	2,070		100.00% Pervious Area

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

Subcatchment P1B: Back Patio



Summary for Subcatchment P2A:

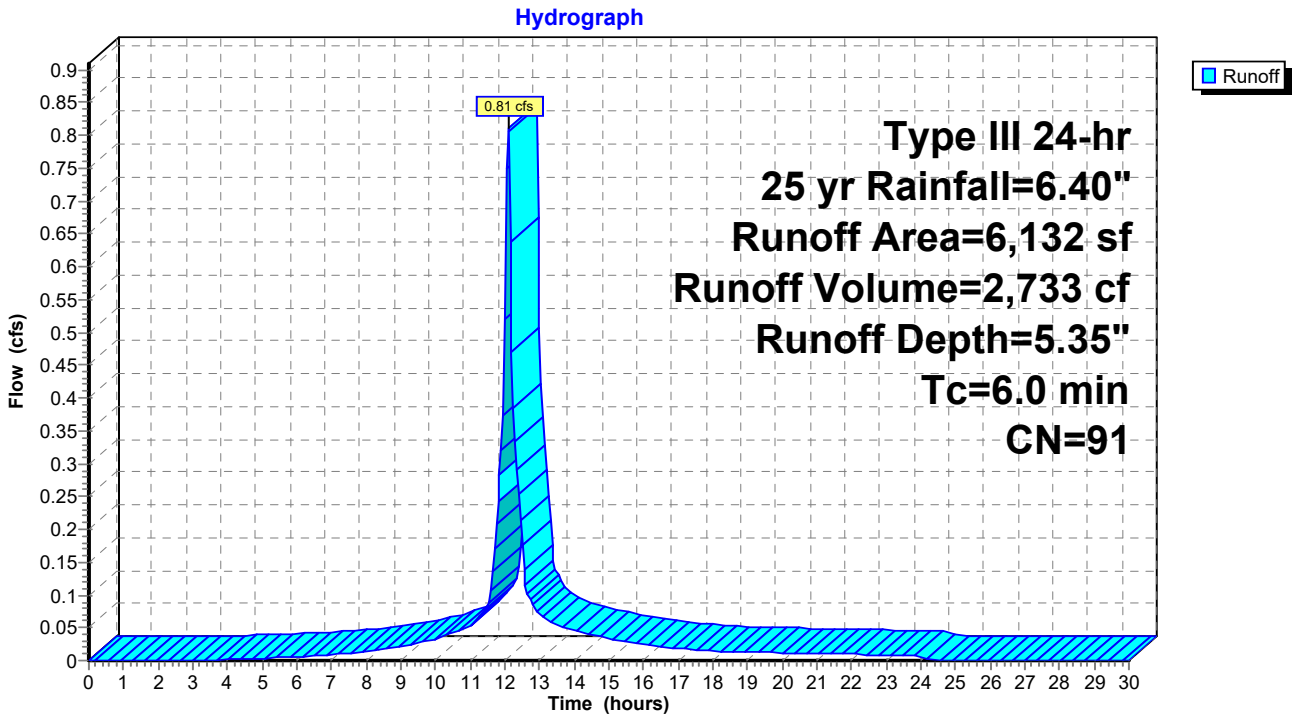
Runoff = 0.81 cfs @ 12.09 hrs, Volume= 2,733 cf, Depth= 5.35"
Routed to Pond 1P : Pervious Pvmt (North Fire) bed 'C'

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

	Area (sf)	CN	Description
*	1,675	98	CONCRETE
*	3,929	96	permeable pavement
	528	30	Meadow, non-grazed, HSG A
	6,132	91	Weighted Average
	4,457		72.68% Pervious Area
	1,675		27.32% Impervious Area

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

Subcatchment P2A:



Summary for Subcatchment P2B:

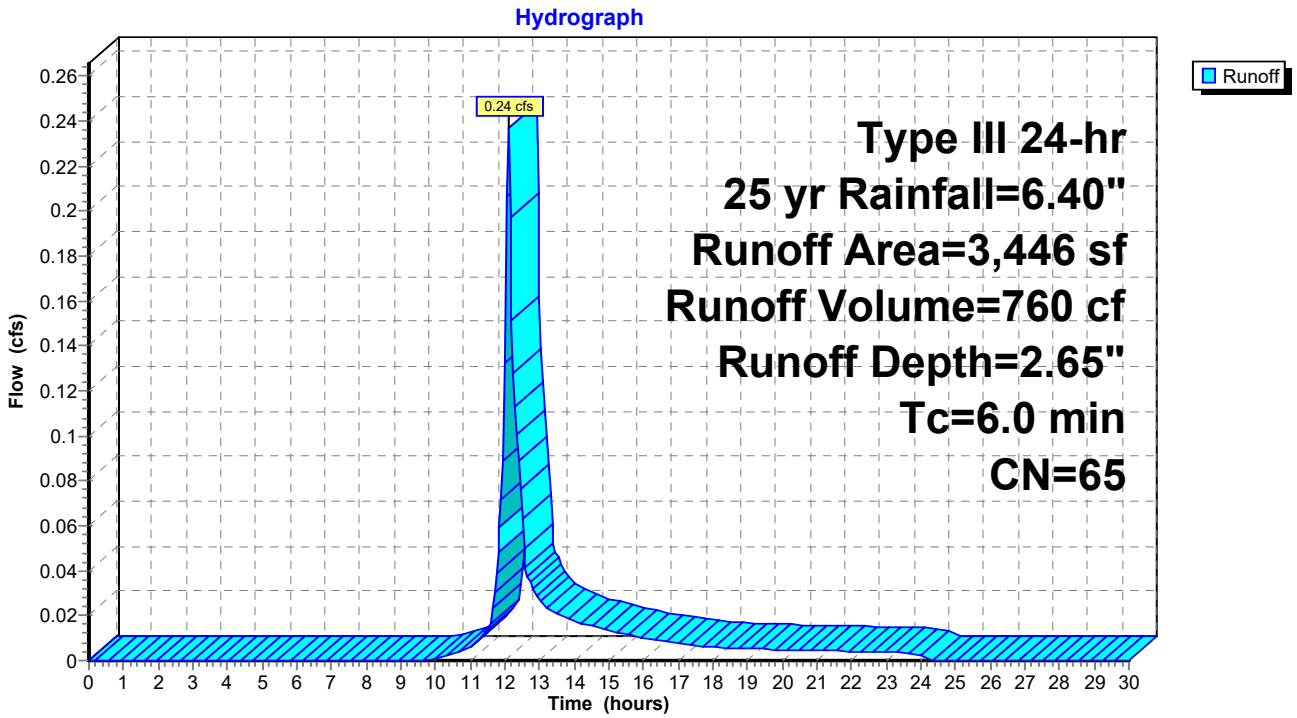
Runoff = 0.24 cfs @ 12.10 hrs, Volume= 760 cf, Depth= 2.65"
Routed to Pond 2P : Pervious Pvmt (North Fire) Bed B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

	Area (sf)	CN	Description
*	475	98	CONCRETE
*	1,351	96	permeable pavement
	1,620	30	Meadow, non-grazed, HSG A
	3,446	65	Weighted Average
	2,971		86.22% Pervious Area
	475		13.78% Impervious Area

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

Subcatchment P2B:



Summary for Subcatchment P3:

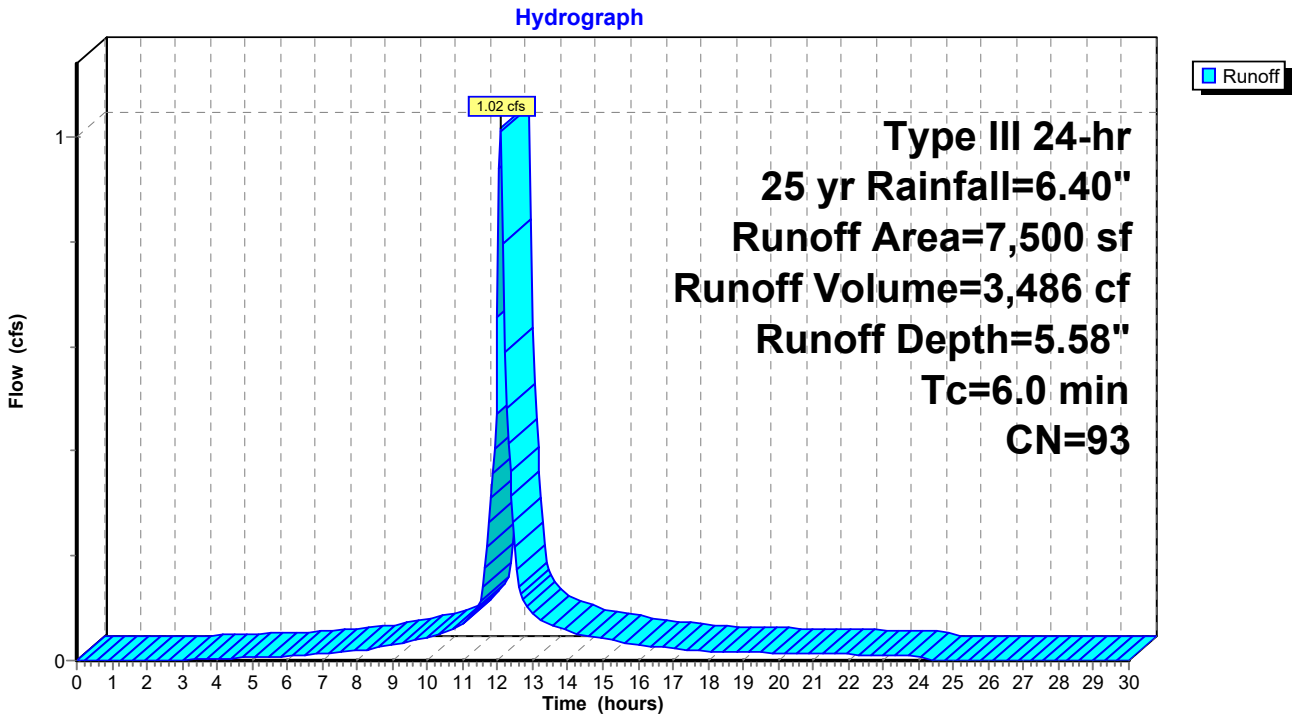
Runoff = 1.02 cfs @ 12.09 hrs, Volume= 3,486 cf, Depth= 5.58"
Routed to Pond CB1,8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

	Area (sf)	CN	Description
*	670	98	CONCRETE
	6,150	98	Paved parking, HSG A
	680	39	>75% Grass cover, Good, HSG A
	7,500	93	Weighted Average
	680		9.07% Pervious Area
	6,820		90.93% Impervious Area

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

Subcatchment P3:



Summary for Subcatchment P4:

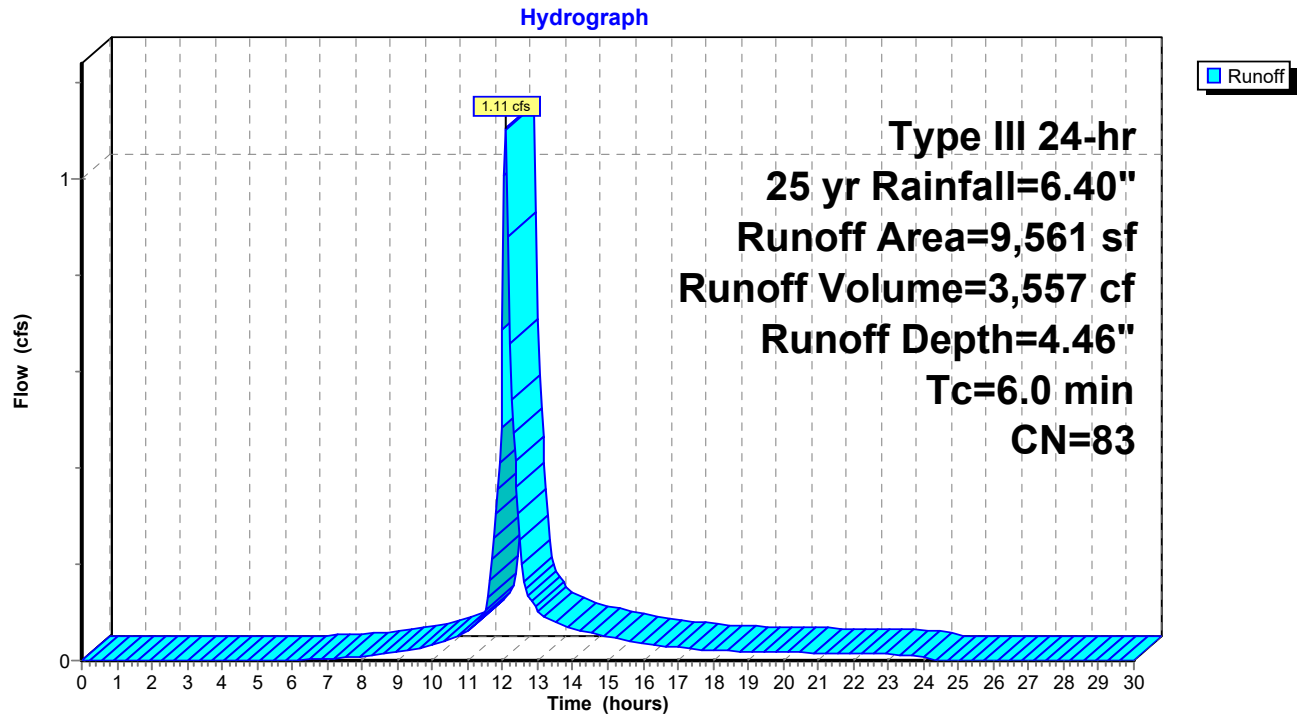
Runoff = 1.11 cfs @ 12.09 hrs, Volume= 3,557 cf, Depth= 4.46"
Routed to Pond CB2,7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

	Area (sf)	CN	Description
*	900	98	CONCRETE
	6,161	98	Paved parking, HSG A
	2,500	39	>75% Grass cover, Good, HSG A
	9,561	83	Weighted Average
	2,500		26.15% Pervious Area
	7,061		73.85% Impervious Area

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

Subcatchment P4:



Summary for Subcatchment P5:

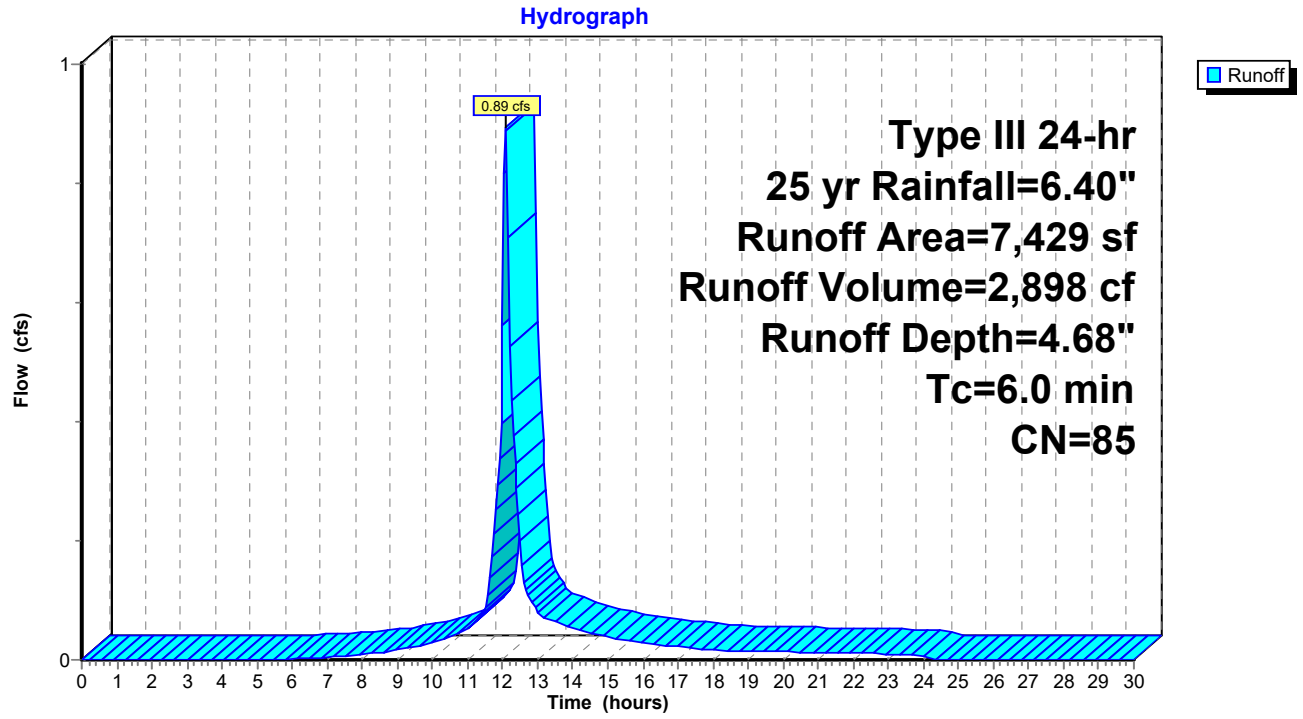
Runoff = 0.89 cfs @ 12.09 hrs, Volume= 2,898 cf, Depth= 4.68"
Routed to Pond CB3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

	Area (sf)	CN	Description
*	450	98	CONCRETE
	4,664	98	Paved parking, HSG A
	1,315	39	>75% Grass cover, Good, HSG A
*	1,000	80	permeable pavers
	7,429	85	Weighted Average
	2,315		31.16% Pervious Area
	5,114		68.84% Impervious Area

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

Subcatchment P5:



Summary for Subcatchment P5A: Perm Pavers Front entrance

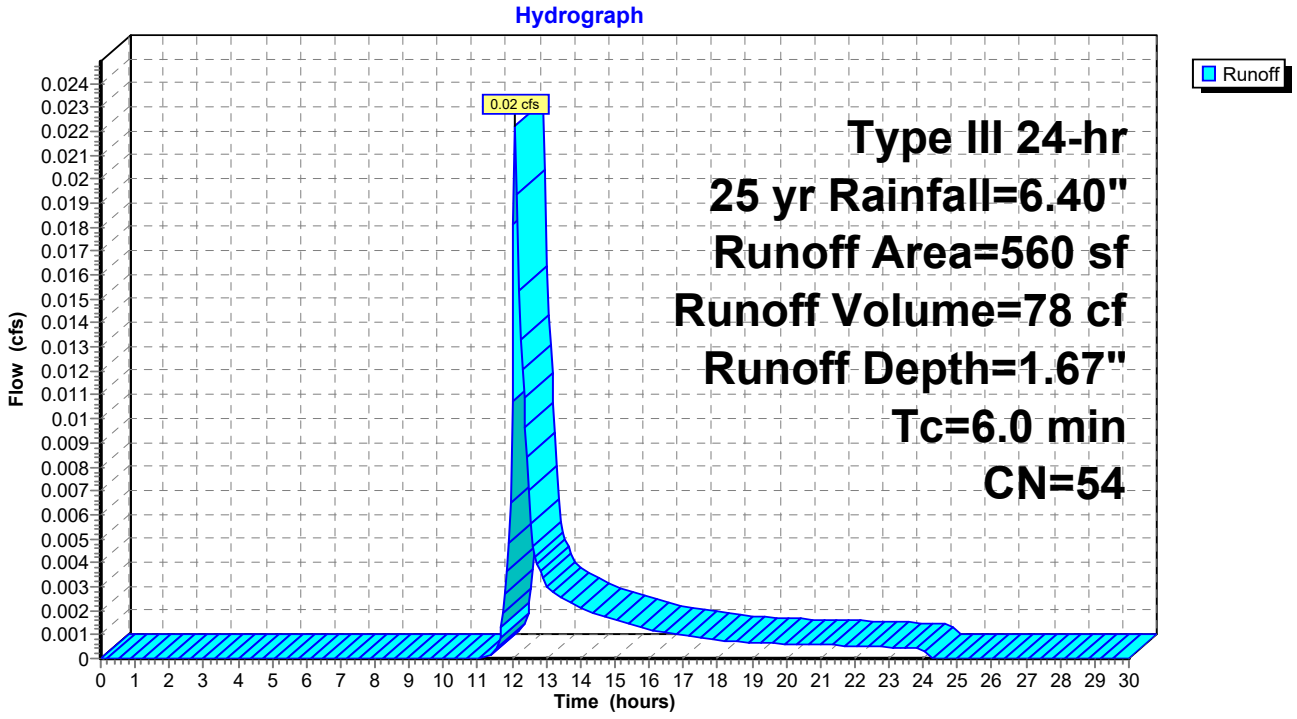
Runoff = 0.02 cfs @ 12.10 hrs, Volume= 78 cf, Depth= 1.67"
Routed to Pond 6P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

	Area (sf)	CN	Description
*	200	80	permeable pavers
	360	39	>75% Grass cover, Good, HSG A
	560	54	Weighted Average
	560		100.00% Pervious Area

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

Subcatchment P5A: Perm Pavers Front entrance



Summary for Subcatchment P6:

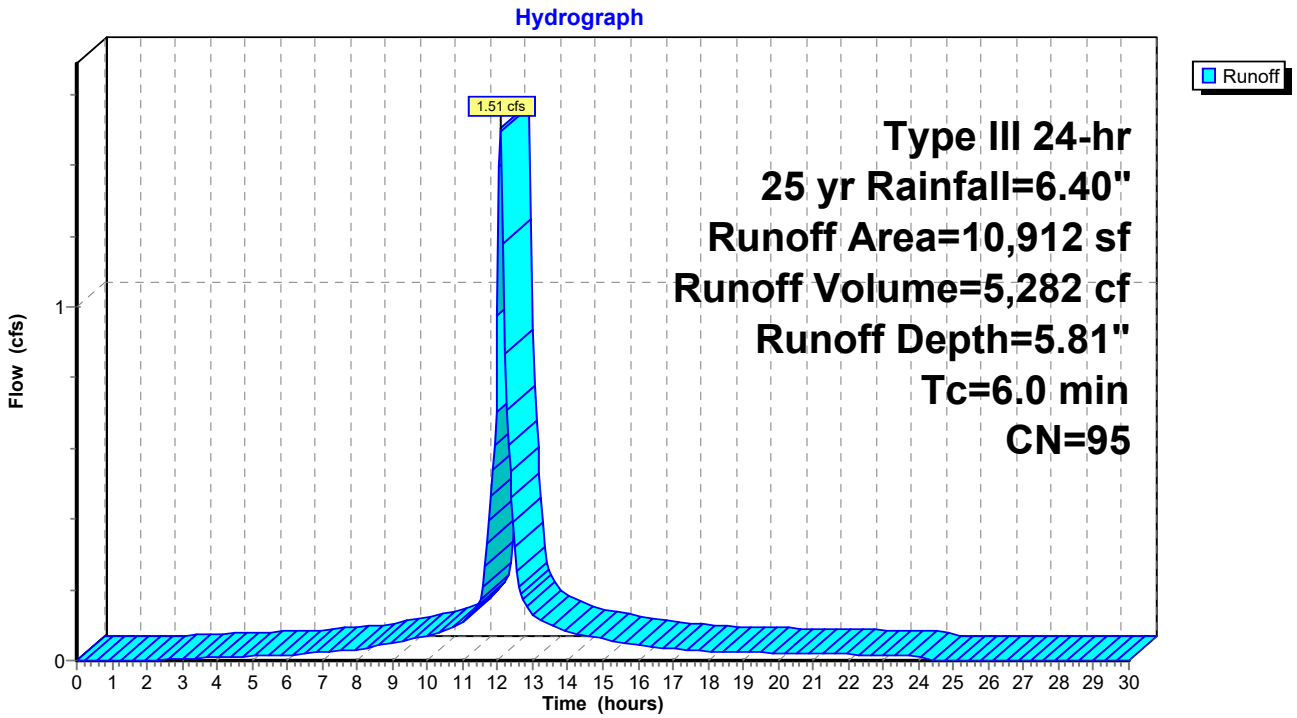
Runoff = 1.51 cfs @ 12.09 hrs, Volume= 5,282 cf, Depth= 5.81"
Routed to Pond CB4 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

	Area (sf)	CN	Description
*	1,200	98	CONCRETE
	9,066	98	Paved parking, HSG A
	646	39	>75% Grass cover, Good, HSG A
	10,912	95	Weighted Average
	646		5.92% Pervious Area
	10,266		94.08% Impervious Area

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

Subcatchment P6:



Summary for Subcatchment P7:

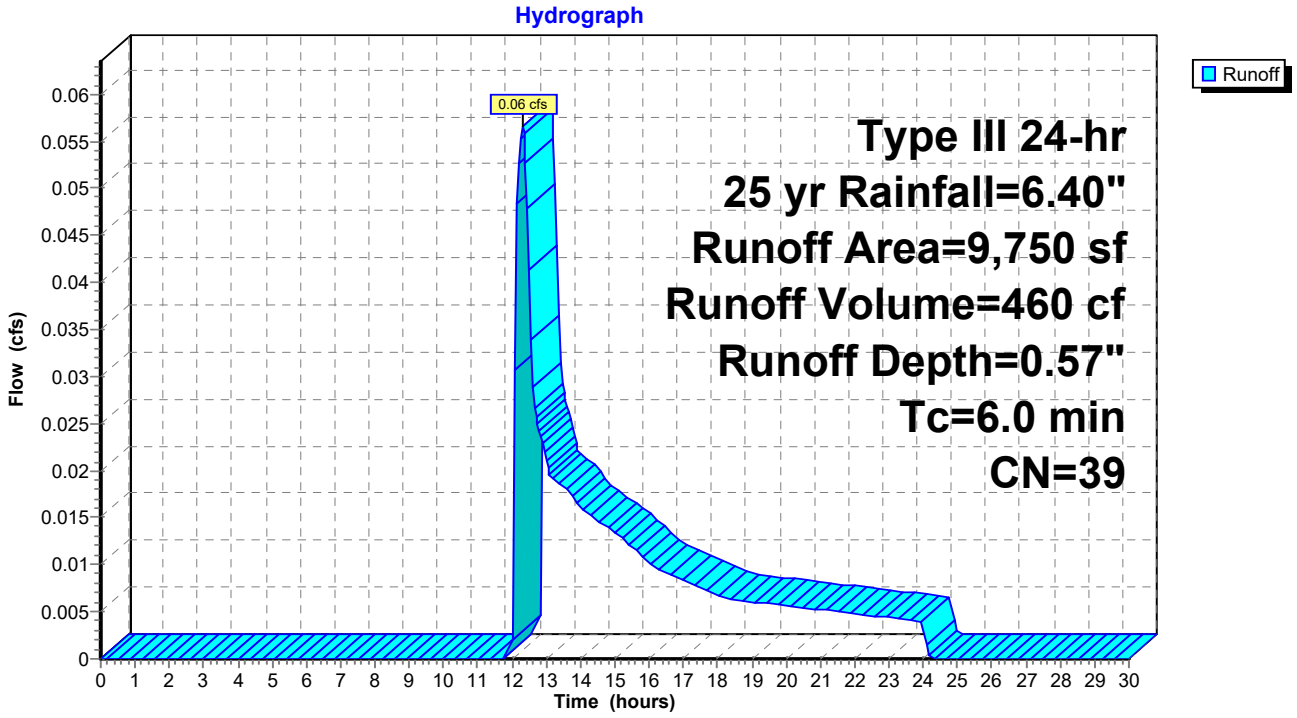
Runoff = 0.06 cfs @ 12.30 hrs, Volume= 460 cf, Depth= 0.57"
Routed to Pond CB5 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

Area (sf)	CN	Description
9,750	39	>75% Grass cover, Good, HSG A
9,750		100.00% Pervious Area

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

Subcatchment P7:



Summary for Subcatchment P8:

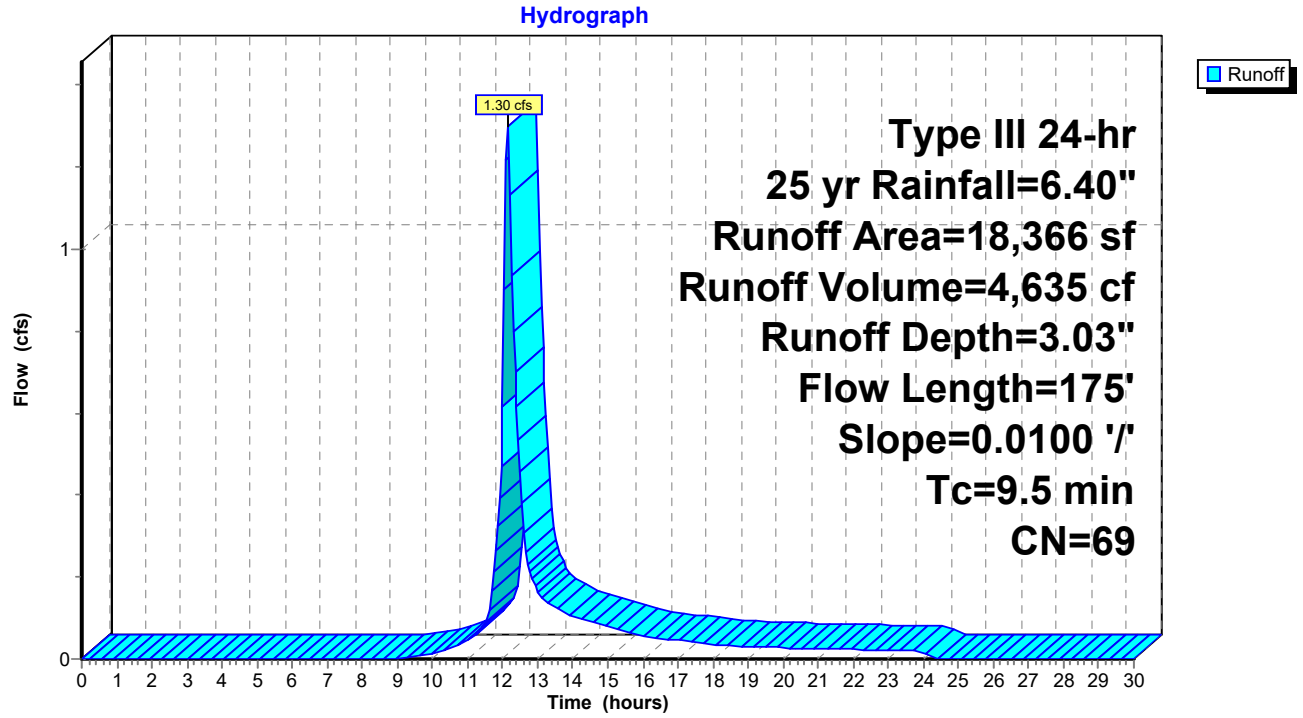
Runoff = 1.30 cfs @ 12.14 hrs, Volume= 4,635 cf, Depth= 3.03"
Routed to Pond 4P : Pervious Pvmt (South Fire Lane)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

	Area (sf)	CN	Description
*	1,020	98	CONCRETE
*	4,666	96	permeable pavement
	7,280	39	>75% Grass cover, Good, HSG A
	5,400	80	>75% Grass cover, Good, HSG D
	18,366	69	Weighted Average
	17,346		94.45% Pervious Area
	1,020		5.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
0.6	25	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.6	100	0.0100	1.06		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
9.5	175	Total			

Subcatchment P8:



Summary for Subcatchment P9:

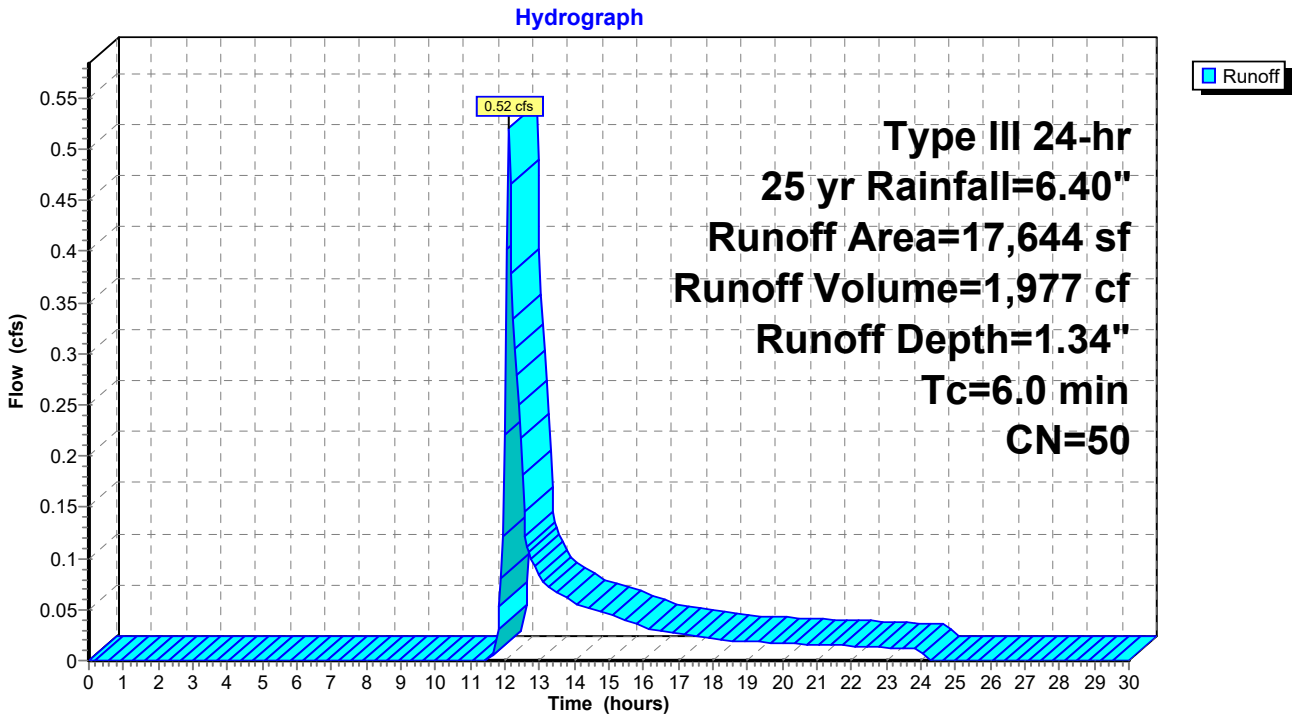
Runoff = 0.52 cfs @ 12.11 hrs, Volume= 1,977 cf, Depth= 1.34"
Routed to Pond DP1 : Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.40"

	Area (sf)	CN	Description
*	2,850	98	CONCRETE
	350	98	Paved parking, HSG A
	14,444	39	>75% Grass cover, Good, HSG A
	17,644	50	Weighted Average
	14,444		81.86% Pervious Area
	3,200		18.14% Impervious Area

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

Subcatchment P9:



Summary for Pond 1P: Pervious Pvmt (North Fire) bed 'C'

Inflow Area = 6,132 sf, 27.32% Impervious, Inflow Depth = 5.35" for 25 yr event
Inflow = 0.81 cfs @ 12.09 hrs, Volume= 2,733 cf
Outflow = 0.65 cfs @ 12.15 hrs, Volume= 2,751 cf, Atten= 20%, Lag= 3.6 min
Discarded = 0.64 cfs @ 12.15 hrs, Volume= 2,745 cf
Primary = 0.02 cfs @ 12.15 hrs, Volume= 6 cf
Routed to Pond 2P : Pervious Pvmt (North Fire) Bed B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.05' @ 12.15 hrs Surf.Area= 3,280 sf Storage= 50 cf
Flood Elev= 144.33' Surf.Area= 3,280 sf Storage= 2,071 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.5 min (779.6 - 779.1)

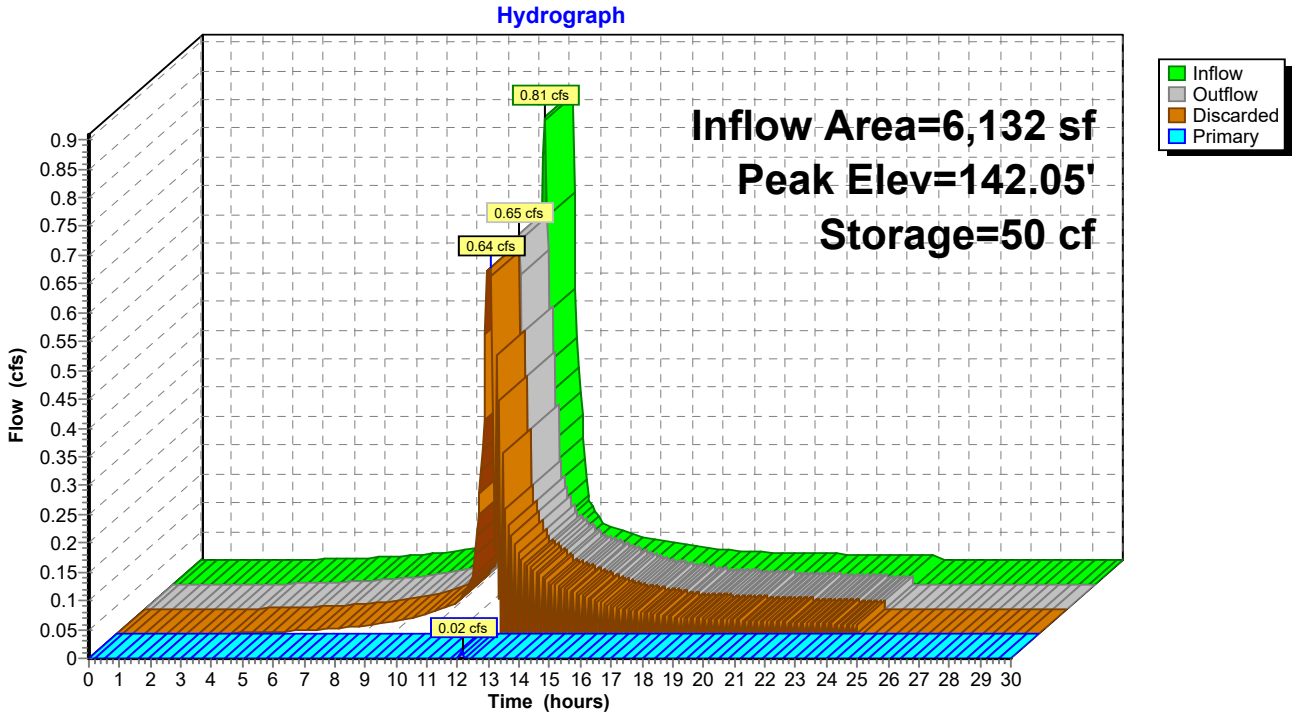
Volume	Invert	Avail.Storage	Storage Description
#1	142.00'	2,036 cf	**20.00'W x 164.00'L x 2.08'H Prismatoid** 6,822 cf Overall - 35 cf Embedded = 6,787 cf x 30.0% Voids
#2	142.00'	35 cf	**6.0" Round Pipe Storage** Inside #1 L= 180.0'
		2,071 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	142.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 138.00'
#2	Primary	142.00'	**6.0" Round Culvert X 2.00** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 142.00' / 141.50' S= 0.1000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf

Discarded OutFlow Max=0.64 cfs @ 12.15 hrs HW=142.05' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.64 cfs)

Primary OutFlow Max=0.01 cfs @ 12.15 hrs HW=142.05' TW=141.61' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 0.01 cfs @ 0.75 fps)

Pond 1P: Pervious Pvmt (North Fire) bed 'C'



Summary for Pond 2P: Pervious Pvmt (North Fire) Bed B

Inflow Area = 9,578 sf, 22.45% Impervious, Inflow Depth = 0.96" for 25 yr event
Inflow = 0.25 cfs @ 12.10 hrs, Volume= 765 cf
Outflow = 0.21 cfs @ 12.16 hrs, Volume= 766 cf, Atten= 14%, Lag= 3.4 min
Discarded = 0.14 cfs @ 12.16 hrs, Volume= 727 cf
Primary = 0.07 cfs @ 12.16 hrs, Volume= 39 cf
Routed to Pond 3P : Pervious Pvmt (North Fire) Bed 'A'

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 141.61' @ 12.16 hrs Surf.Area= 700 sf Storage= 25 cf
Flood Elev= 143.83' Surf.Area= 700 sf Storage= 447 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.6 min (846.4 - 845.8)

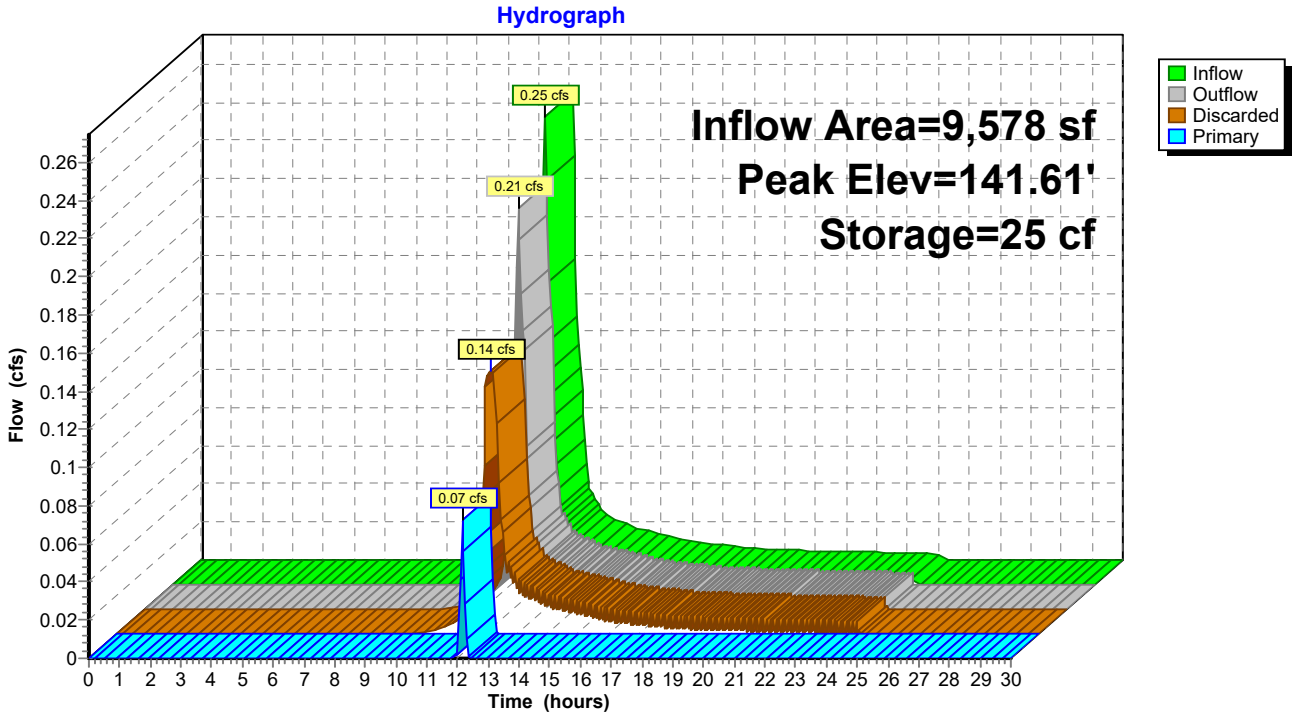
Volume	Invert	Avail.Storage	Storage Description
#1	141.50'	432 cf	**20.00'W x 35.00'L x 2.08'H Prismatoid** 1,456 cf Overall - 15 cf Embedded = 1,441 cf x 30.0% Voids
#2	141.50'	15 cf	**6.0" Round Pipe Storage** Inside #1 L= 75.0'
		447 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	141.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 138.00'
#2	Primary	141.50'	**6.0" Round Culvert X 2.00** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 141.50' / 141.00' S= 0.1000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf

Discarded OutFlow Max=0.14 cfs @ 12.16 hrs HW=141.61' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.14 cfs)

Primary OutFlow Max=0.07 cfs @ 12.16 hrs HW=141.61' TW=141.00' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 0.07 cfs @ 1.12 fps)

Pond 2P: Pervious Pvmt (North Fire) Bed B



Summary for Pond 3P: Pervious Pvmt (North Fire) Bed 'A'

Inflow Area = 9,578 sf, 22.45% Impervious, Inflow Depth = 0.05" for 25 yr event
Inflow = 0.07 cfs @ 12.16 hrs, Volume= 39 cf
Outflow = 0.07 cfs @ 12.16 hrs, Volume= 39 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.07 cfs @ 12.16 hrs, Volume= 39 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond IS1 : Infiltration System 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 141.00' @ 0.00 hrs Surf.Area= 1,200 sf Storage= 0 cf
Flood Elev= 143.33' Surf.Area= 1,200 sf Storage= 759 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (730.3 - 730.3)

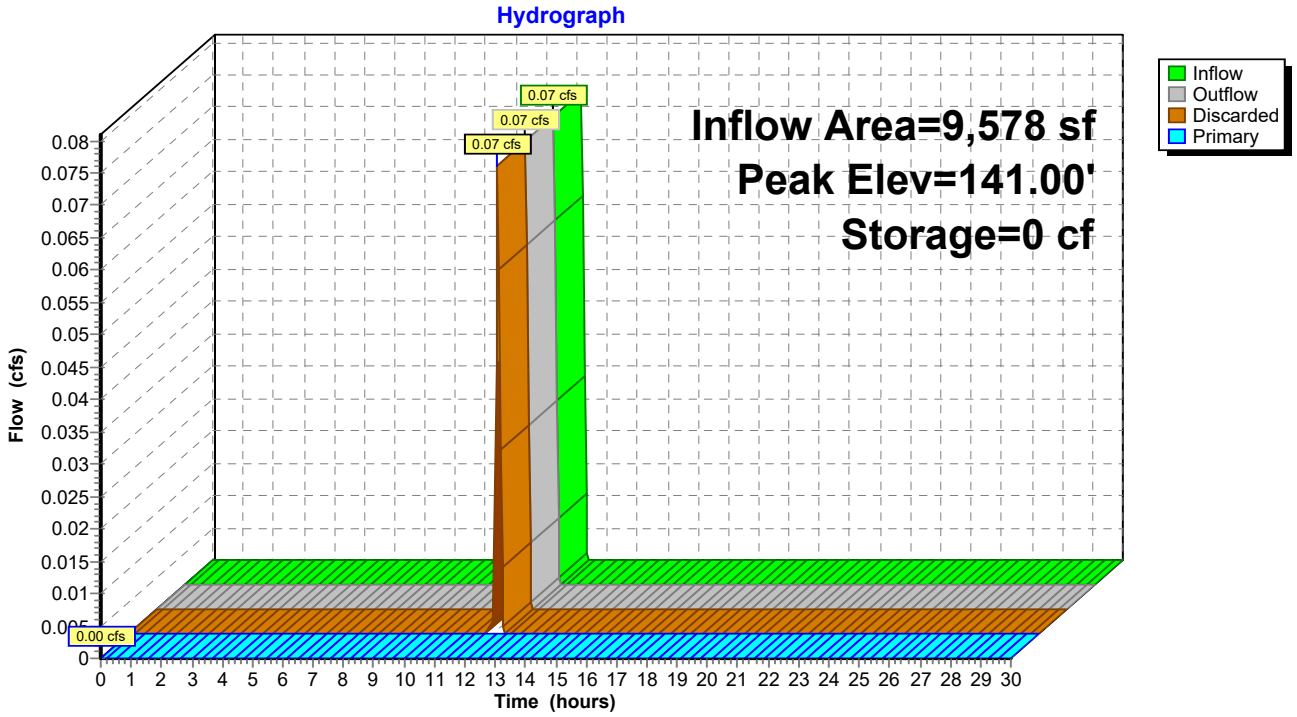
Volume	Invert	Avail.Storage	Storage Description
#1	141.00'	744 cf	**20.00'W x 60.00'L x 2.08'H Prismatoid** 2,496 cf Overall - 15 cf Embedded = 2,481 cf x 30.0% Voids
#2	141.00'	15 cf	**6.0" Round Pipe Storage** Inside #1 L= 75.0'
		759 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	141.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 138.00'
#2	Primary	141.50'	**12.0" Round Culvert** L= 25.0' Ke= 0.500 Inlet / Outlet Invert= 141.50' / 141.00' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#3	Device 2	143.30'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 12.16 hrs HW=141.00' (Free Discharge)
↑—**1=Exfiltration** (Passes 0.00 cfs of 0.23 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=141.00' TW=141.00' (Dynamic Tailwater)
↑—**2=Culvert** (Controls 0.00 cfs)
↑—**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 3P: Pervious Pvmt (North Fire) Bed 'A'



Summary for Pond 4P: Pervious Pvmt (South Fire Lane)

Inflow Area = 18,366 sf, 5.55% Impervious, Inflow Depth = 3.03" for 25 yr event
Inflow = 1.30 cfs @ 12.14 hrs, Volume= 4,635 cf
Outflow = 1.15 cfs @ 12.21 hrs, Volume= 4,611 cf, Atten= 11%, Lag= 4.3 min
Discarded = 0.75 cfs @ 12.20 hrs, Volume= 1,267 cf
Primary = 0.41 cfs @ 12.24 hrs, Volume= 3,344 cf
Routed to Pond DMH1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.90' @ 12.20 hrs Surf.Area= 4,660 sf Storage= 593 cf
Flood Elev= 145.50' Surf.Area= 4,660 sf Storage= 2,837 cf

Plug-Flow detention time= 33.9 min calculated for 4,604 cf (99% of inflow)
Center-of-Mass det. time= 31.3 min (872.0 - 840.6)

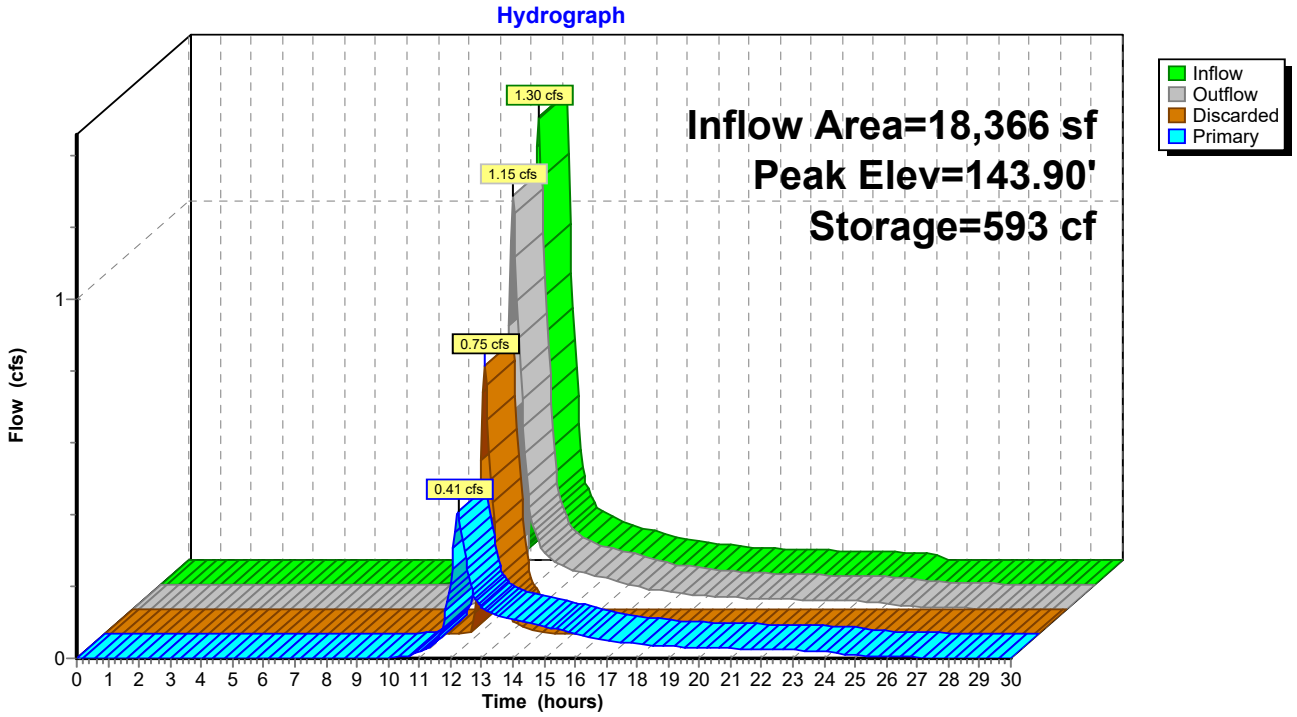
Volume	Invert	Avail.Storage	Storage Description
#1	143.50'	2,890 cf	**20.00'W x 233.00'L x 2.08'H Prismatoid** 9,693 cf Overall - 59 cf Embedded = 9,634 cf x 30.0% Voids
#2	143.50'	59 cf	**6.0" Round Pipe Storage** Inside #1 L= 300.0'
		2,949 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#0	Primary	145.58'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	143.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 141.50'
#2	Primary	143.50'	**12.0" Round Culvert** L= 170.0' Ke= 0.500 Inlet / Outlet Invert= 143.50' / 142.00' S= 0.0088 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#3	Device 1	143.67'	**8.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.74 cfs @ 12.20 hrs HW=143.90' (Free Discharge)
└**1=Exfiltration** (Passes 0.74 cfs of 1.07 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 0.74 cfs @ 1.56 fps)

Primary OutFlow Max=0.43 cfs @ 12.24 hrs HW=143.89' TW=143.04' (Dynamic Tailwater)
└**2=Culvert** (Outlet Controls 0.43 cfs @ 2.28 fps)

Pond 4P: Pervious Pvmt (South Fire Lane)



Summary for Pond 5P: Permeable Pavers (Back)

Inflow Area = 2,070 sf, 0.00% Impervious, Inflow Depth = 4.14" for 25 yr event
Inflow = 0.22 cfs @ 12.09 hrs, Volume= 715 cf
Outflow = 0.22 cfs @ 12.09 hrs, Volume= 715 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.22 cfs @ 12.09 hrs, Volume= 715 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DP2 : Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 144.00' @ 12.10 hrs Surf.Area= 1,720 sf Storage= 0 cf
Flood Elev= 145.50' Surf.Area= 1,720 sf Storage= 516 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (811.5 - 811.5)

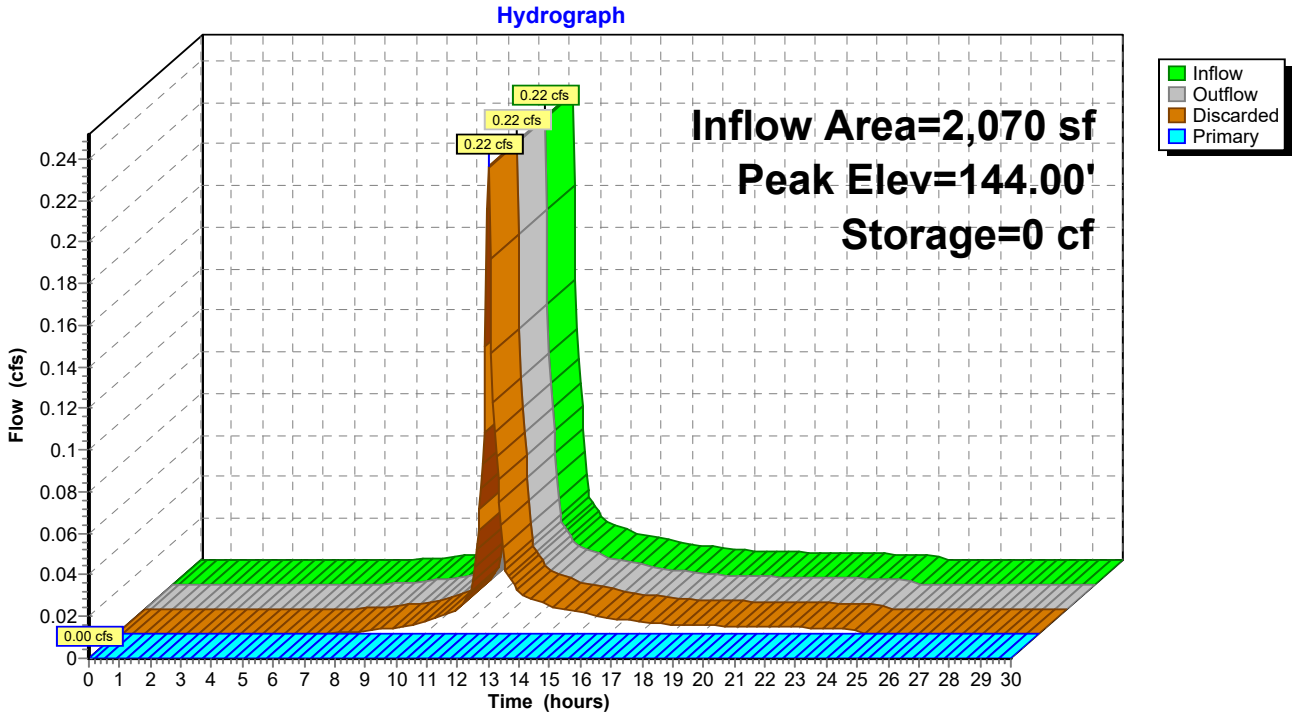
Volume	Invert	Avail.Storage	Storage Description
#1	144.00'	516 cf	**20.00'W x 86.00'L x 1.00'H Prismatoid** 1,720 cf Overall x 30.0% Voids

Device	Routing	Invert	Outlet Devices
#0	Primary	145.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	144.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.00'

Discarded OutFlow Max=0.33 cfs @ 12.09 hrs HW=144.00' (Free Discharge)
↑**1=Exfiltration** (Controls 0.33 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=144.00' TW=0.00' (Dynamic Tailwater)

Pond 5P: Permeable Pavers (Back)



Summary for Pond 6P:

Inflow Area = 560 sf, 0.00% Impervious, Inflow Depth = 1.67" for 25 yr event
Inflow = 0.02 cfs @ 12.10 hrs, Volume= 78 cf
Outflow = 0.02 cfs @ 12.10 hrs, Volume= 78 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.02 cfs @ 12.10 hrs, Volume= 78 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DP1 : Drainage Network

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.00' @ 0.00 hrs Surf.Area= 400 sf Storage= 0 cf
Flood Elev= 145.00' Surf.Area= 400 sf Storage= 120 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (875.3 - 875.3)

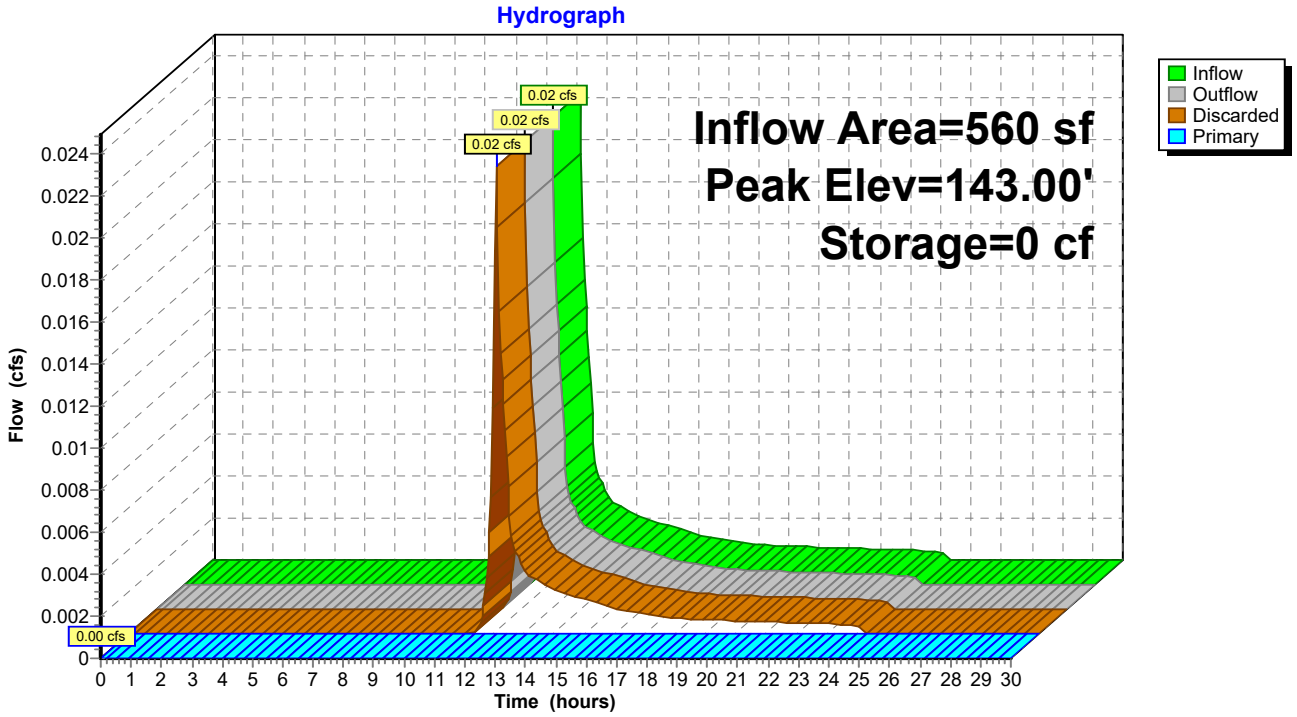
Volume	Invert	Avail.Storage	Storage Description
#1	143.00'	120 cf	**20.00'W x 20.00'L x 1.00'H Prismatoid** 400 cf Overall x 30.0% Voids

Device	Routing	Invert	Outlet Devices
#0	Primary	144.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	143.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.00'

Discarded OutFlow Max=0.00 cfs @ 12.10 hrs HW=143.00' (Free Discharge)
↑**1=Exfiltration** (Passes 0.00 cfs of 0.08 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=143.00' TW=0.00' (Dynamic Tailwater)

Pond 6P:


Hydrograph
Inflow Area=560 sf
Peak Elev=143.00'
Storage=0 cf
Inflow
Outflow
Discarded
Primary
0.02 cfs
0.02 cfs
0.02 cfs
0.00 cfs
Flow (cfs)
0.024
0.022
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Time (hours)

Summary for Pond 7P: Stone infiltration Trench

Inflow Area = 7,565 sf, 48.91% Impervious, Inflow Depth = 2.46" for 25 yr event
Inflow = 0.48 cfs @ 12.10 hrs, Volume= 1,551 cf
Outflow = 0.26 cfs @ 12.29 hrs, Volume= 1,553 cf, Atten= 45%, Lag= 11.4 min
Discarded = 0.14 cfs @ 12.30 hrs, Volume= 1,490 cf
Primary = 0.13 cfs @ 12.29 hrs, Volume= 62 cf
Routed to Pond DP2 : Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 145.00' @ 12.30 hrs Surf.Area= 600 sf Storage= 240 cf
Flood Elev= 145.00' Surf.Area= 600 sf Storage= 240 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 9.3 min (860.7 - 851.4)

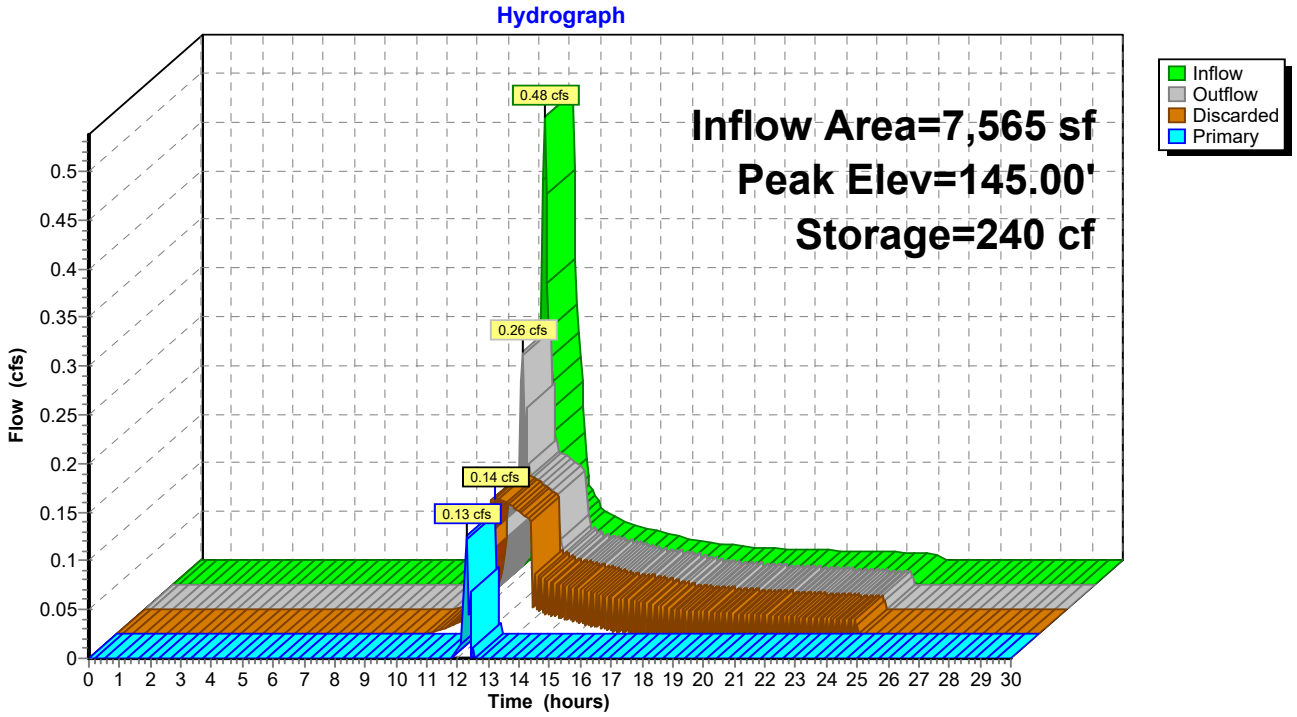
Volume	Invert	Avail.Storage	Storage Description
#1	144.00'	480 cf	**2.00'W x 300.00'L x 2.00'H Prismatoid** 1,200 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#0	Primary	146.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	144.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.00'
#2	Primary	145.00'	**500.0' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.14 cfs @ 12.30 hrs HW=145.00' (Free Discharge)
↑**1=Exfiltration** (Controls 0.14 cfs)

Primary OutFlow Max=0.12 cfs @ 12.29 hrs HW=145.00' TW=0.00' (Dynamic Tailwater)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 0.12 cfs @ 0.12 fps)

Pond 7P: Stone infiltration Trench



Summary for Pond CB1,8:

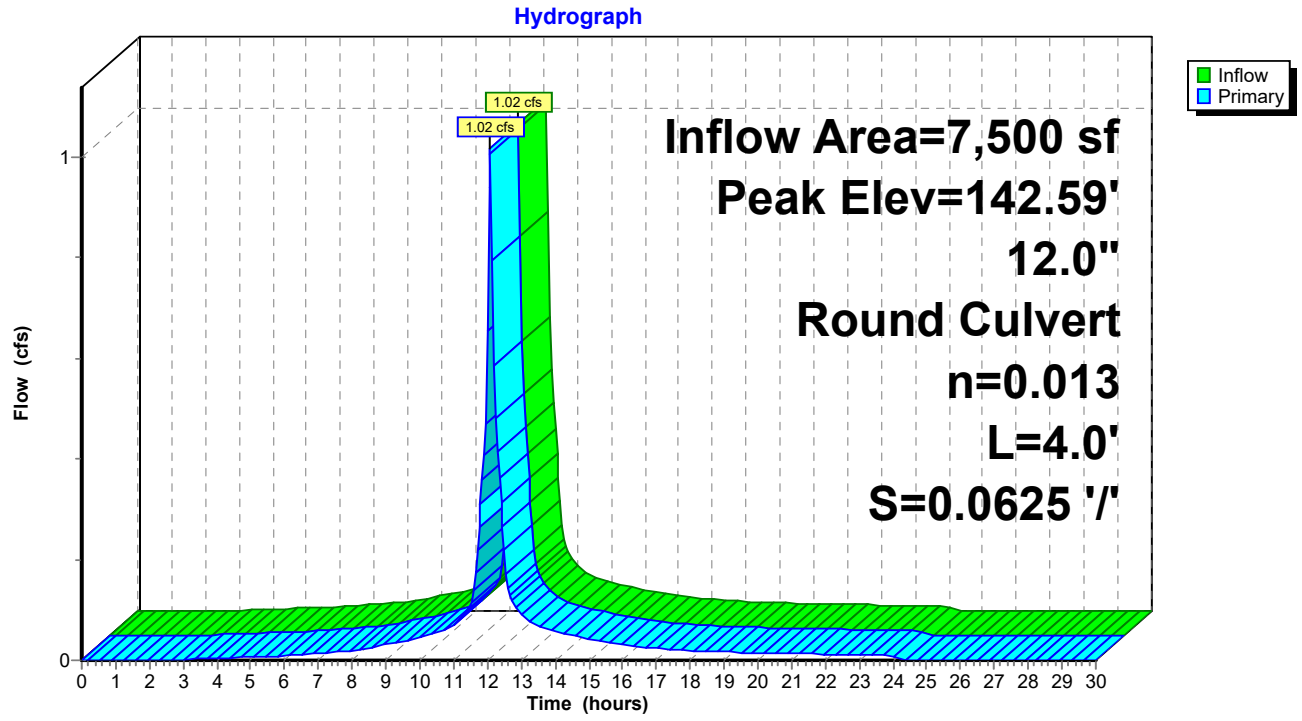
Inflow Area = 7,500 sf, 90.93% Impervious, Inflow Depth = 5.58" for 25 yr event
Inflow = 1.02 cfs @ 12.09 hrs, Volume= 3,486 cf
Outflow = 1.02 cfs @ 12.09 hrs, Volume= 3,486 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.02 cfs @ 12.09 hrs, Volume= 3,486 cf
Routed to Pond IS1 : Infiltration System 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.59' @ 12.42 hrs
Flood Elev= 144.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.25'	**12.0" Round Culvert** L= 4.0' Ke= 0.500 Inlet / Outlet Invert= 141.25' / 141.00' S= 0.0625 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.43 cfs @ 12.09 hrs HW=141.80' TW=141.75' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.43 cfs @ 1.40 fps)

Pond CB1,8:



Summary for Pond CB2,7:

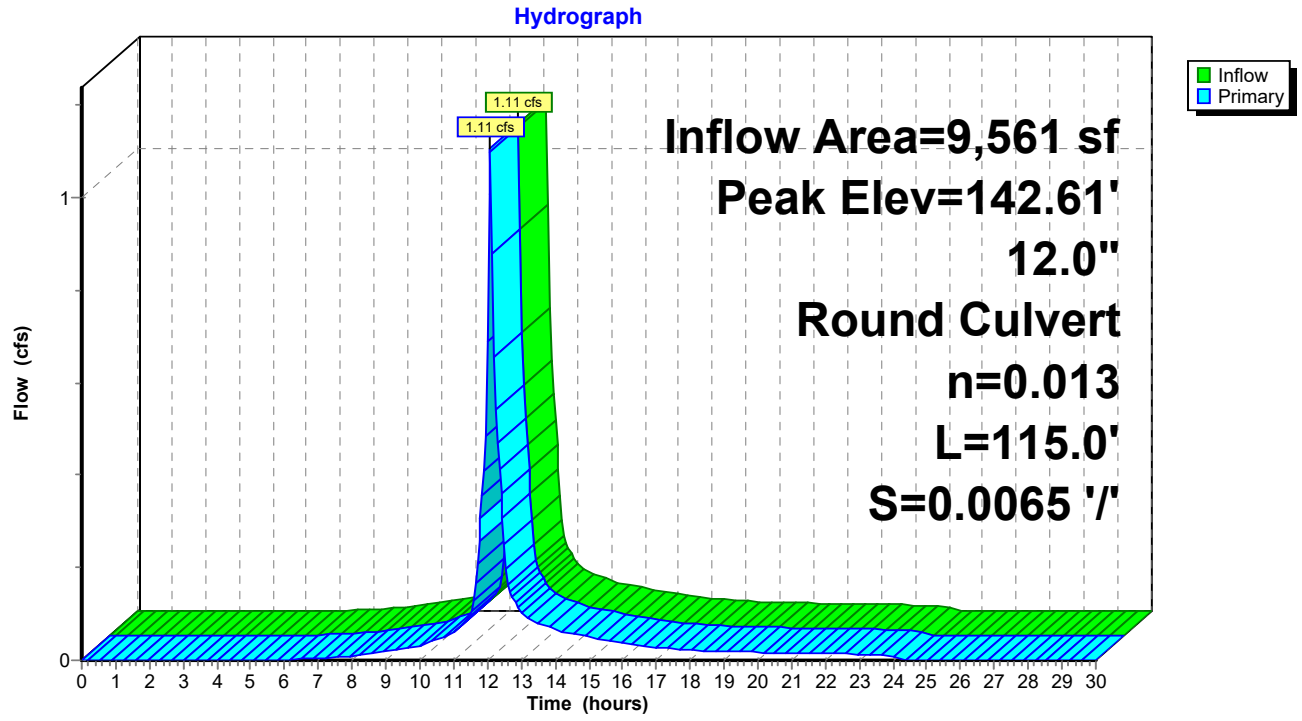
Inflow Area = 9,561 sf, 73.85% Impervious, Inflow Depth = 4.46" for 25 yr event
Inflow = 1.11 cfs @ 12.09 hrs, Volume= 3,557 cf
Outflow = 1.11 cfs @ 12.09 hrs, Volume= 3,557 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.11 cfs @ 12.09 hrs, Volume= 3,557 cf
Routed to Pond IS1 : Infiltration System 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.61' @ 12.41 hrs
Flood Elev= 144.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.75'	**12.0" Round Culvert** L= 115.0' Ke= 0.500 Inlet / Outlet Invert= 141.75' / 141.00' S= 0.0065 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.92 cfs @ 12.09 hrs HW=142.36' TW=141.76' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.92 cfs @ 2.65 fps)

Pond CB2,7:



Summary for Pond CB3:

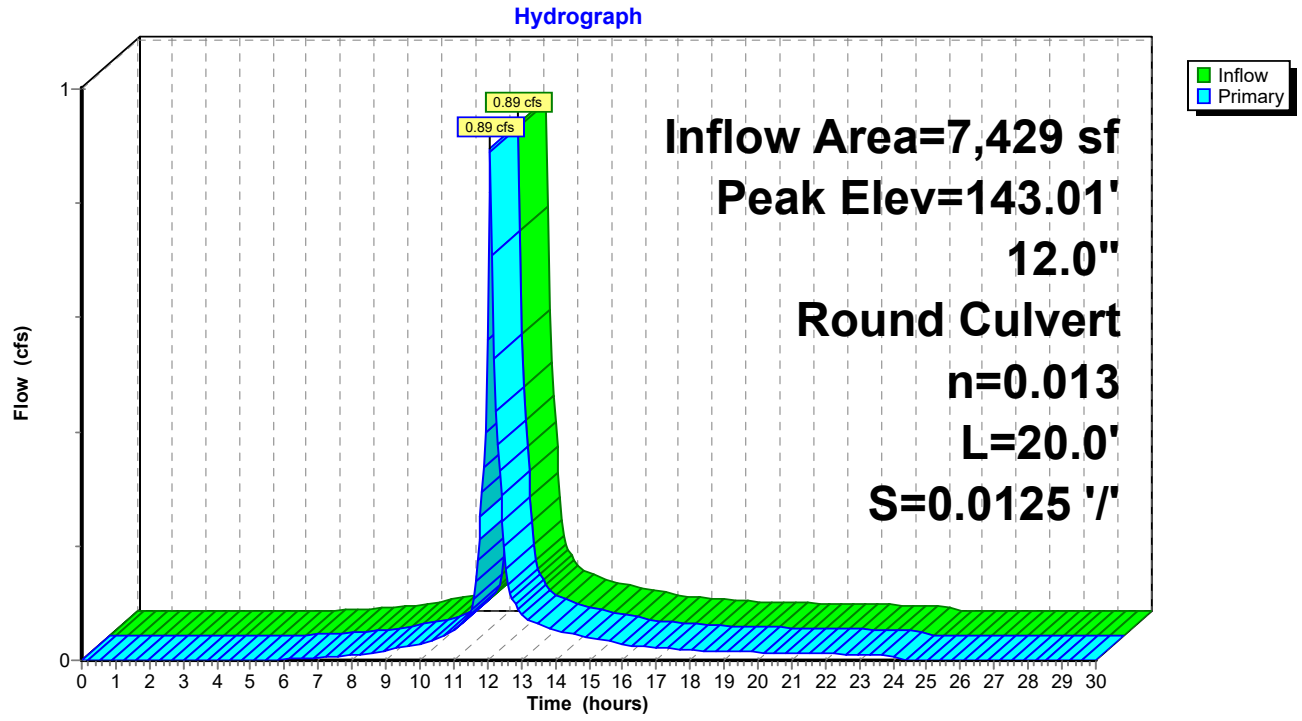
Inflow Area = 7,429 sf, 68.84% Impervious, Inflow Depth = 4.68" for 25 yr event
Inflow = 0.89 cfs @ 12.09 hrs, Volume= 2,898 cf
Outflow = 0.89 cfs @ 12.09 hrs, Volume= 2,898 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.89 cfs @ 12.09 hrs, Volume= 2,898 cf
Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.01' @ 12.14 hrs
Flood Elev= 144.35'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.75'	**12.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 141.75' / 141.50' S= 0.0125 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=142.96' TW=142.97' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Pond CB3:



Summary for Pond CB4:

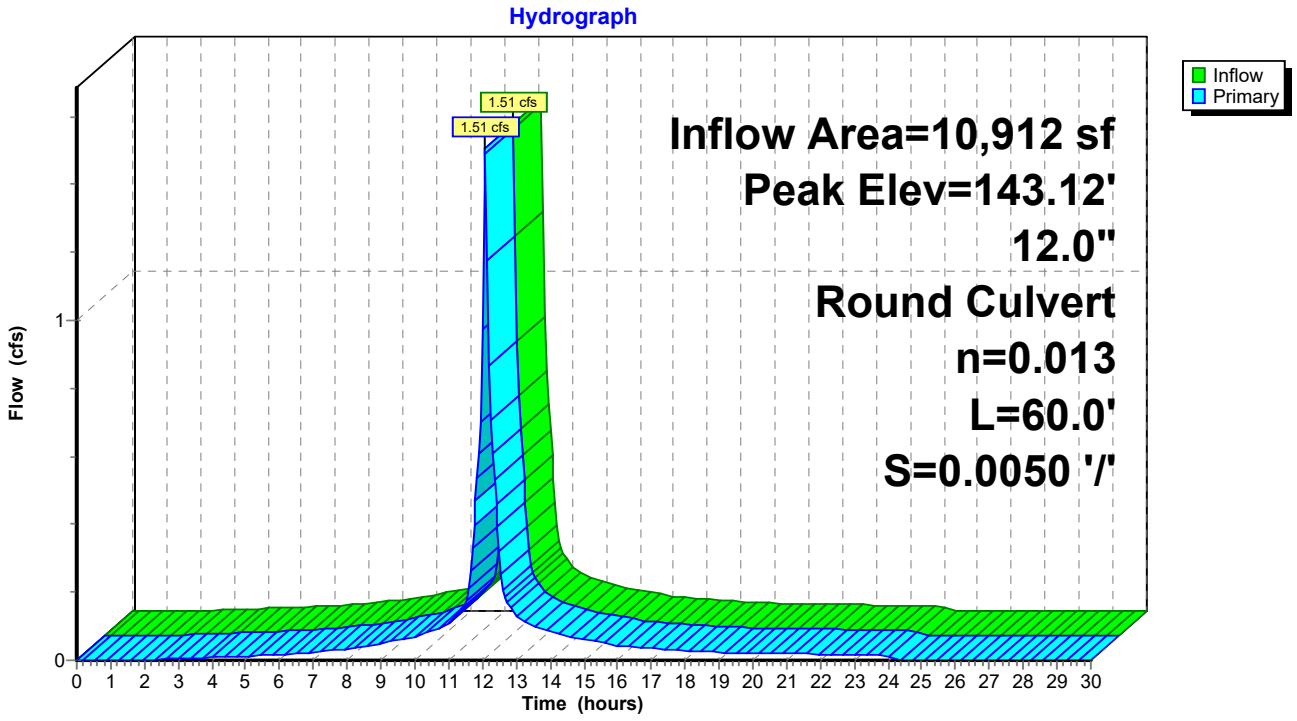
Inflow Area = 10,912 sf, 94.08% Impervious, Inflow Depth = 5.81" for 25 yr event
Inflow = 1.51 cfs @ 12.09 hrs, Volume= 5,282 cf
Outflow = 1.51 cfs @ 12.09 hrs, Volume= 5,282 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.51 cfs @ 12.09 hrs, Volume= 5,282 cf
Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.12' @ 12.12 hrs
Flood Elev= 144.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.80'	**12.0" Round Culvert** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 141.80' / 141.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.20 cfs @ 12.09 hrs HW=143.08' TW=142.96' (Dynamic Tailwater)
1=Culvert (Outlet Controls 1.20 cfs @ 1.55 fps)

Pond CB4:



Summary for Pond CB5:

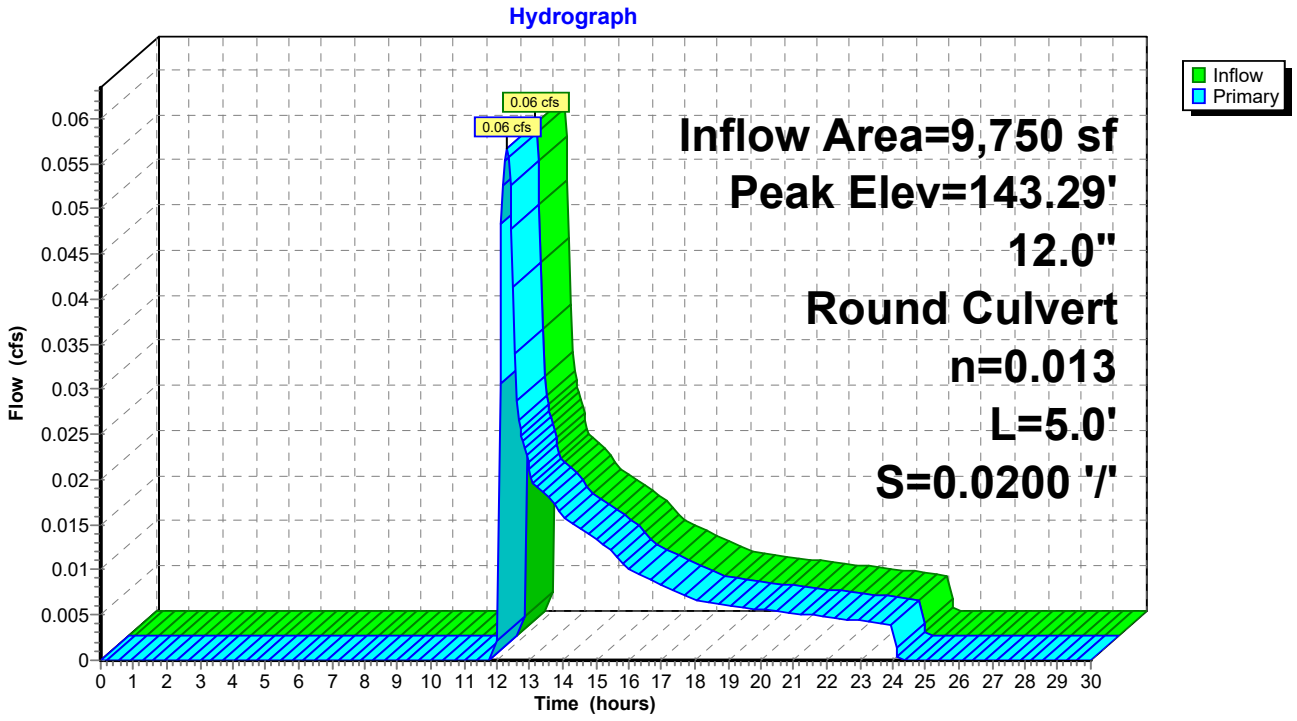
Inflow Area = 9,750 sf, 0.00% Impervious, Inflow Depth = 0.57" for 25 yr event
Inflow = 0.06 cfs @ 12.30 hrs, Volume= 460 cf
Outflow = 0.06 cfs @ 12.30 hrs, Volume= 460 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.06 cfs @ 12.30 hrs, Volume= 460 cf
Routed to Pond DMH1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.29' @ 12.16 hrs
Flood Elev= 144.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	142.00'	**12.0" Round Culvert** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 142.00' / 141.90' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.92 cfs @ 12.30 hrs HW=143.01' TW=142.95' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.92 cfs @ 1.17 fps)

Pond CB5:



Summary for Pond DMH1:

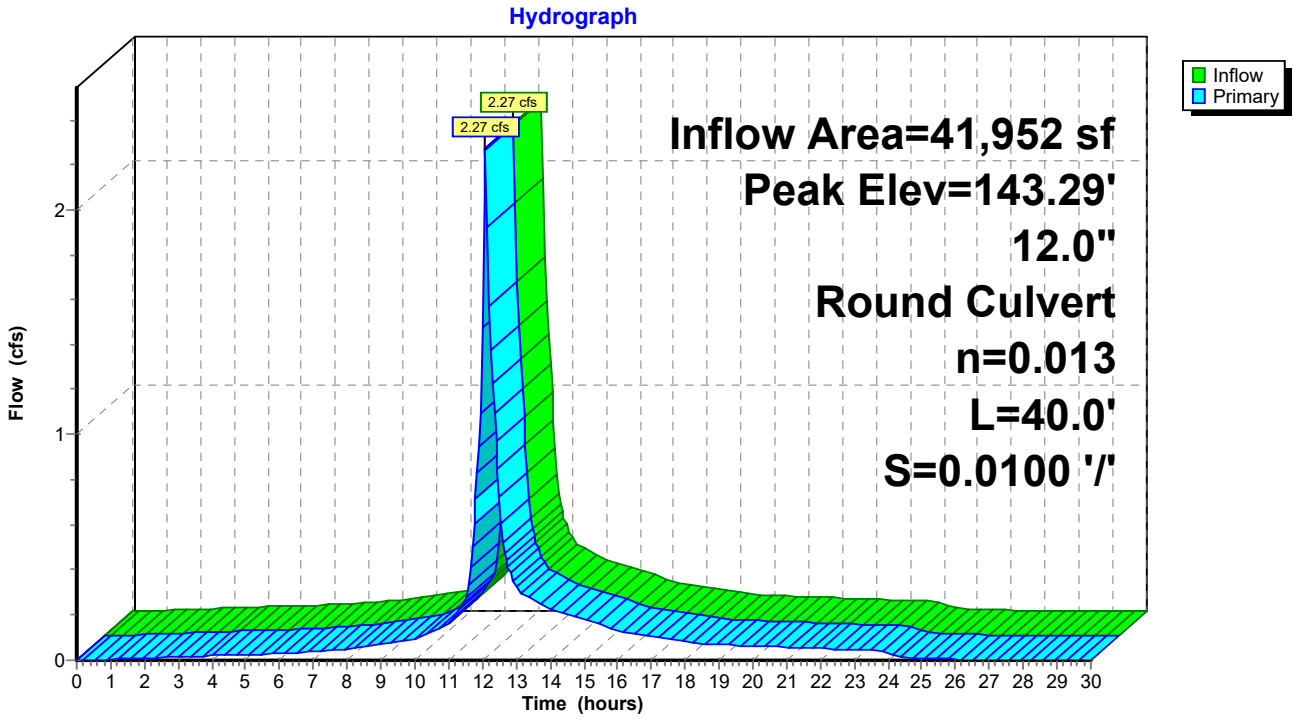
Inflow Area = 41,952 sf, 35.41% Impervious, Inflow Depth > 3.12" for 25 yr event
Inflow = 2.27 cfs @ 12.09 hrs, Volume= 10,908 cf
Outflow = 2.27 cfs @ 12.09 hrs, Volume= 10,908 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.27 cfs @ 12.09 hrs, Volume= 10,908 cf
Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.29' @ 12.11 hrs
Flood Elev= 144.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.90'	**12.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 141.90' / 141.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=2.06 cfs @ 12.09 hrs HW=143.27' TW=142.97' (Dynamic Tailwater)
1=Culvert (Inlet Controls 2.06 cfs @ 2.62 fps)

Pond DMH1:

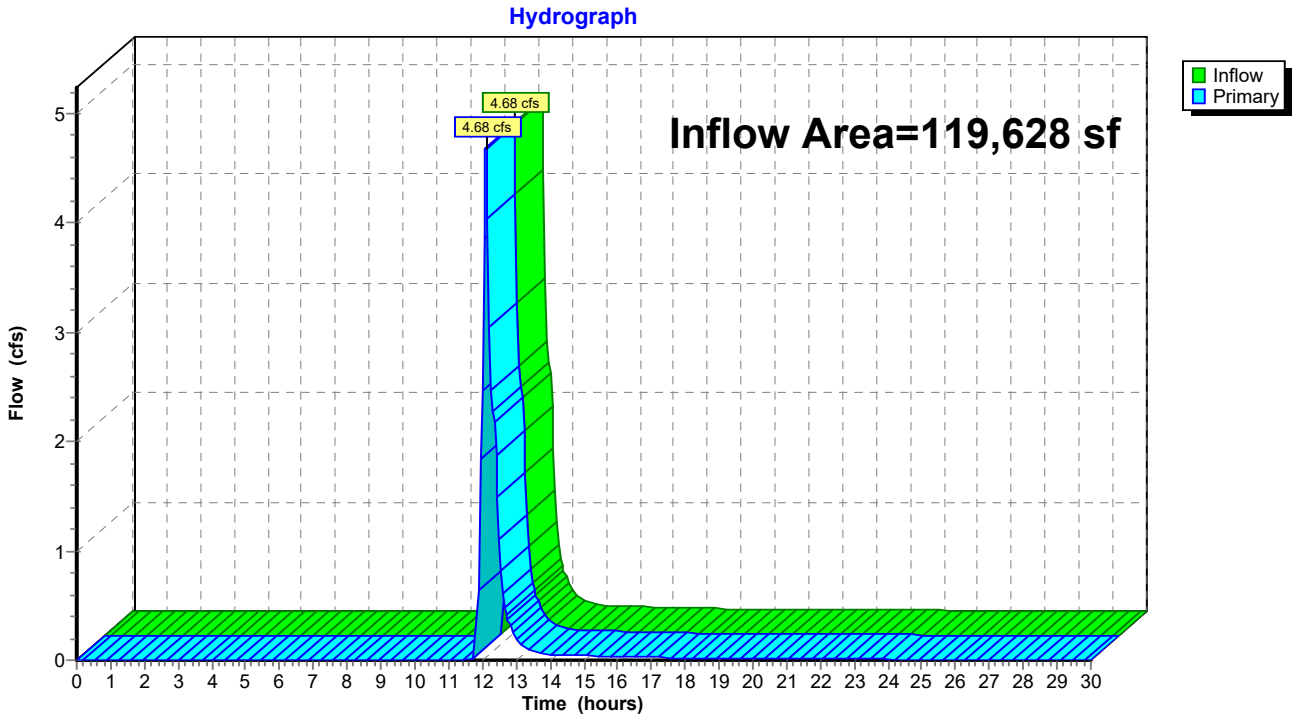


Summary for Pond DP1: Drainage Network

Inflow Area = 119,628 sf, 53.46% Impervious, Inflow Depth = 0.77" for 25 yr event
Inflow = 4.68 cfs @ 12.10 hrs, Volume= 7,664 cf
Primary = 4.68 cfs @ 12.10 hrs, Volume= 7,664 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Pond DP1: Drainage Network

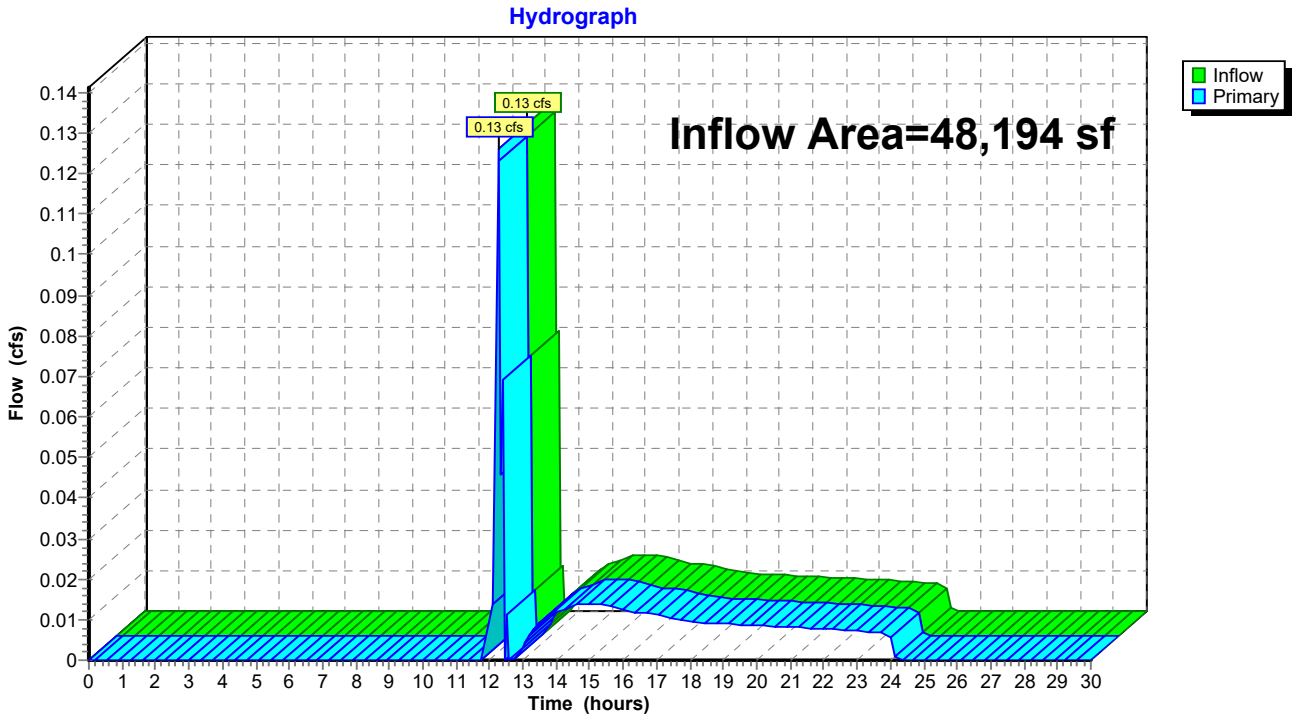


Summary for Pond DP2: Wetlands

Inflow Area = 48,194 sf, 7.68% Impervious, Inflow Depth = 0.11" for 25 yr event
Inflow = 0.13 cfs @ 12.29 hrs, Volume= 447 cf
Primary = 0.13 cfs @ 12.29 hrs, Volume= 447 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Pond DP2: Wetlands



Summary for Pond IS1: Infiltration System 1

Inflow Area = 41,131 sf, 74.21% Impervious, Inflow Depth = 4.23" for 25 yr event
Inflow = 4.16 cfs @ 12.09 hrs, Volume= 14,484 cf
Outflow = 1.47 cfs @ 12.37 hrs, Volume= 14,496 cf, Atten= 65%, Lag= 16.8 min
Discarded = 1.12 cfs @ 12.37 hrs, Volume= 14,318 cf
Primary = 0.35 cfs @ 12.37 hrs, Volume= 179 cf
Routed to Pond DP1 : Drainage Network

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.58' @ 12.37 hrs Surf.Area= 3,262 sf Storage= 3,177 cf
Flood Elev= 142.83' Surf.Area= 3,262 sf Storage= 3,502 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 17.3 min (782.6 - 765.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	141.00'	1,649 cf	**61.50'W x 53.04'L x 1.83'H Field A** 5,980 cf Overall - 1,857 cf Embedded = 4,123 cf x 40.0% Voids
#2A	141.00'	1,857 cf	**ADS_StormTech SC-310 +Cap** x 126 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 126 Chambers in 18 Rows
		3,507 cf	Total Available Storage

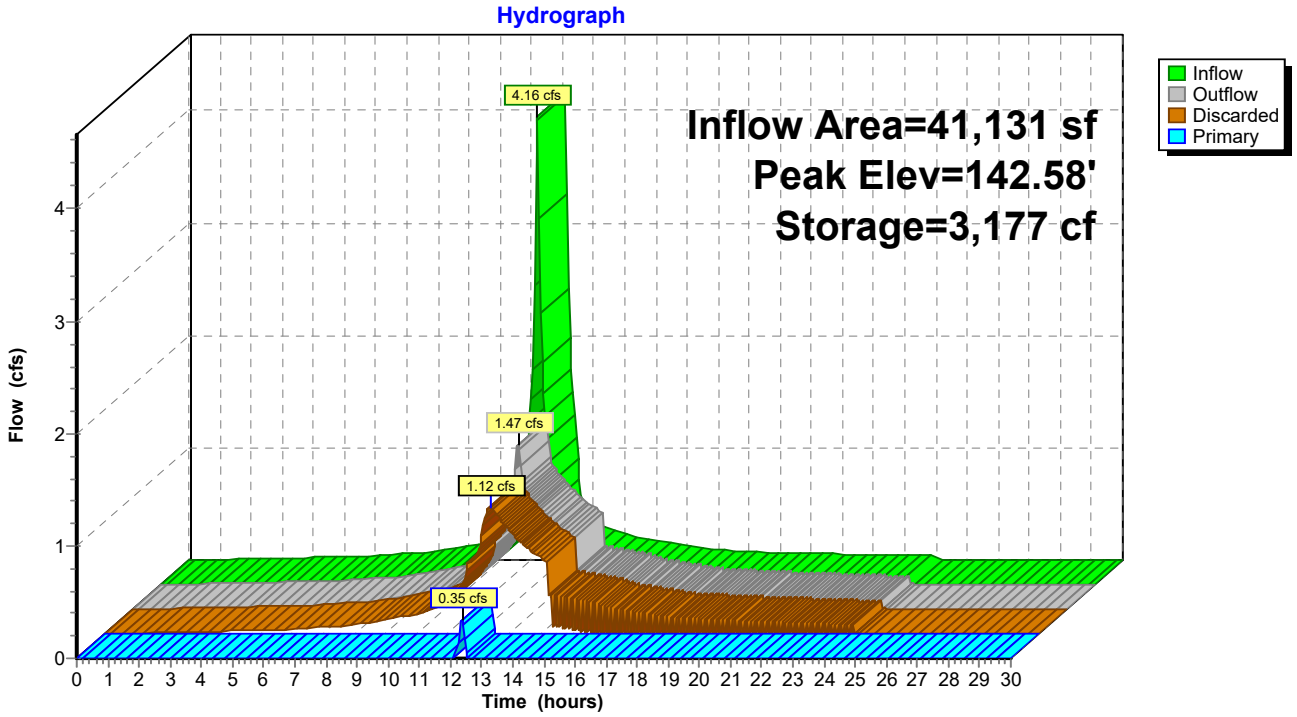
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	141.00'	**15.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 141.00' / 140.00' S= 0.0250 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	141.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.00'
#3	Device 1	142.50'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=1.12 cfs @ 12.37 hrs HW=142.58' (Free Discharge)
└**2=Exfiltration** (Controls 1.12 cfs)

Primary OutFlow Max=0.32 cfs @ 12.37 hrs HW=142.58' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.32 cfs of 5.76 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 0.32 cfs @ 0.90 fps)

Pond IS1: Infiltration System 1



Summary for Pond IS2: Infiltration System 2

Inflow Area = 60,293 sf, 50.15% Impervious, Inflow Depth > 3.80" for 25 yr event
Inflow = 4.67 cfs @ 12.09 hrs, Volume= 19,089 cf
Outflow = 4.65 cfs @ 12.10 hrs, Volume= 19,090 cf, Atten= 0%, Lag= 0.7 min
Discarded = 0.50 cfs @ 12.10 hrs, Volume= 13,581 cf
Primary = 4.15 cfs @ 12.10 hrs, Volume= 5,509 cf
Routed to Pond DP1 : Drainage Network

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.98' @ 12.10 hrs Surf.Area= 1,494 sf Storage= 1,378 cf
Flood Elev= 143.50' Surf.Area= 1,494 sf Storage= 1,691 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 13.6 min (806.8 - 793.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	141.50'	865 cf	**24.83'W x 60.16'L x 2.00'H Field A** 2,988 cf Overall - 826 cf Embedded = 2,162 cf x 40.0% Voids
#2A	141.50'	826 cf	**ADS_StormTech SC-310 +Cap** x 56 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 56 Chambers in 7 Rows
		1,691 cf	Total Available Storage

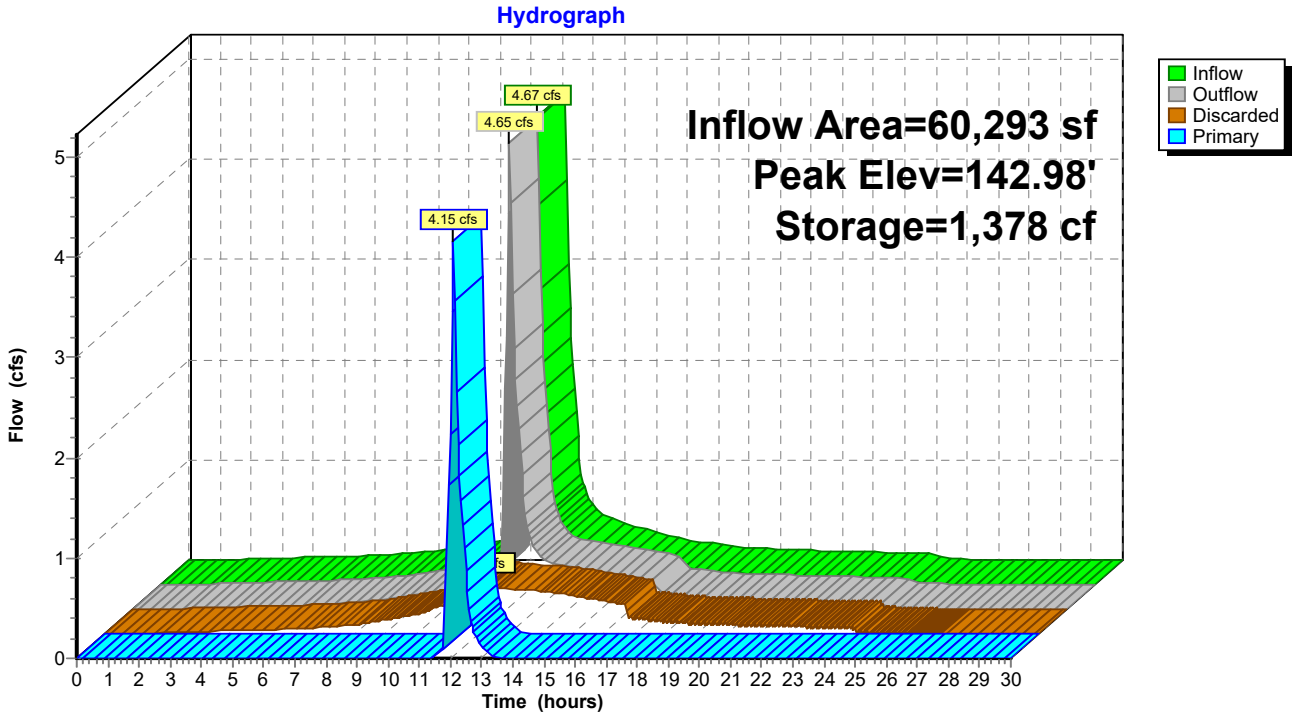
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	141.50'	**15.0" Round Culvert** L= 80.0' Ke= 0.500 Inlet / Outlet Invert= 141.50' / 140.00' S= 0.0187 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	141.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.50'
#3	Device 1	142.56'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.50 cfs @ 12.10 hrs HW=142.98' (Free Discharge)
└**2=Exfiltration** (Controls 0.50 cfs)

Primary OutFlow Max=4.13 cfs @ 12.10 hrs HW=142.98' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 4.13 cfs of 5.45 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 4.13 cfs @ 2.11 fps)

Pond IS2: Infiltration System 2



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

SubcatchmentB1A: Building (R) Runoff Area=14,492 sf 100.00% Impervious Runoff Depth=7.96"
Tc=6.0 min CN=98 Runoff=2.62 cfs 9,613 cf

SubcatchmentB1B: Building (L) Runoff Area=13,836 sf 100.00% Impervious Runoff Depth=7.96"
Tc=6.0 min CN=98 Runoff=2.50 cfs 9,178 cf

SubcatchmentP1: Back of property to Wetl Runoff Area=38,559 sf 0.00% Impervious Runoff Depth=0.46"
Tc=6.0 min CN=30 Runoff=0.13 cfs 1,493 cf

SubcatchmentP1A: Back of property to Runoff Area=7,565 sf 48.91% Impervious Runoff Depth=3.83"
Tc=6.0 min CN=63 Runoff=0.76 cfs 2,412 cf

SubcatchmentP1B: Back Patio Runoff Area=2,070 sf 0.00% Impervious Runoff Depth=5.81"
Tc=6.0 min CN=80 Runoff=0.31 cfs 1,003 cf

SubcatchmentP2A: Runoff Area=6,132 sf 27.32% Impervious Runoff Depth=7.12"
Tc=6.0 min CN=91 Runoff=1.06 cfs 3,639 cf

SubcatchmentP2B: Runoff Area=3,446 sf 13.78% Impervious Runoff Depth=4.06"
Tc=6.0 min CN=65 Runoff=0.37 cfs 1,165 cf

SubcatchmentP3: Runoff Area=7,500 sf 90.93% Impervious Runoff Depth=7.36"
Tc=6.0 min CN=93 Runoff=1.32 cfs 4,601 cf

SubcatchmentP4: Runoff Area=9,561 sf 73.85% Impervious Runoff Depth=6.17"
Tc=6.0 min CN=83 Runoff=1.51 cfs 4,915 cf

SubcatchmentP5: Runoff Area=7,429 sf 68.84% Impervious Runoff Depth=6.41"
Tc=6.0 min CN=85 Runoff=1.21 cfs 3,966 cf

SubcatchmentP5A: Perm Pavers Front Runoff Area=560 sf 0.00% Impervious Runoff Depth=2.81"
Tc=6.0 min CN=54 Runoff=0.04 cfs 131 cf

SubcatchmentP6: Runoff Area=10,912 sf 94.08% Impervious Runoff Depth=7.60"
Tc=6.0 min CN=95 Runoff=1.95 cfs 6,911 cf

SubcatchmentP7: Runoff Area=9,750 sf 0.00% Impervious Runoff Depth=1.24"
Tc=6.0 min CN=39 Runoff=0.22 cfs 1,009 cf

SubcatchmentP8: Runoff Area=18,366 sf 5.55% Impervious Runoff Depth=4.52"
Flow Length=175' Slope=0.0100 '/' Tc=9.5 min CN=69 Runoff=1.95 cfs 6,918 cf

SubcatchmentP9: Runoff Area=17,644 sf 18.14% Impervious Runoff Depth=2.37"
Tc=6.0 min CN=50 Runoff=1.03 cfs 3,489 cf

Pond 1P: Pervious Pvmt (North Fire) bed 'C' Peak Elev=142.14' Storage=144 cf Inflow=1.06 cfs 3,639 cf
Discarded=0.65 cfs 3,573 cf Primary=0.11 cfs 68 cf Outflow=0.76 cfs 3,641 cf

Pond 2P: Pervious Pvmt (North Fire) Bed B Peak Elev=141.72' Storage=51 cf Inflow=0.44 cfs 1,233 cf
Discarded=0.14 cfs 1,026 cf Primary=0.27 cfs 209 cf Outflow=0.41 cfs 1,234 cf

Pond 3P: Pervious Pvmt (North Fire) Bed 'A' Peak Elev=141.02' Storage=8 cf Inflow=0.27 cfs 209 cf
Discarded=0.23 cfs 213 cf Primary=0.00 cfs 0 cf Outflow=0.23 cfs 213 cf

Pond 4P: Pervious Pvmt (South Fire Lane) Peak Elev=144.04' Storage=798 cf Inflow=1.95 cfs 6,918 cf
Discarded=1.02 cfs 2,278 cf Primary=0.66 cfs 4,616 cf Outflow=1.66 cfs 6,894 cf

Pond 5P: Permeable Pavers (Back) Peak Elev=144.00' Storage=0 cf Inflow=0.31 cfs 1,003 cf
Discarded=0.31 cfs 1,003 cf Primary=0.00 cfs 0 cf Outflow=0.31 cfs 1,003 cf

Pond 6P: Peak Elev=143.00' Storage=0 cf Inflow=0.04 cfs 131 cf
Discarded=0.04 cfs 131 cf Primary=0.00 cfs 0 cf Outflow=0.04 cfs 131 cf

Pond 7P: Stone infiltration Trench Peak Elev=145.01' Storage=241 cf Inflow=0.76 cfs 2,412 cf
Discarded=0.14 cfs 1,984 cf Primary=0.63 cfs 433 cf Outflow=0.77 cfs 2,417 cf

Pond CB1,8: Peak Elev=142.82' Inflow=1.32 cfs 4,601 cf
12.0" Round Culvert n=0.013 L=4.0' S=0.0625 '/' Outflow=1.32 cfs 4,601 cf

Pond CB2,7: Peak Elev=142.87' Inflow=1.51 cfs 4,915 cf
12.0" Round Culvert n=0.013 L=115.0' S=0.0065 '/' Outflow=1.51 cfs 4,915 cf

Pond CB3: Peak Elev=143.14' Inflow=1.21 cfs 3,966 cf
12.0" Round Culvert n=0.013 L=20.0' S=0.0125 '/' Outflow=1.21 cfs 3,966 cf

Pond CB4: Peak Elev=143.34' Inflow=1.95 cfs 6,911 cf
12.0" Round Culvert n=0.013 L=60.0' S=0.0050 '/' Outflow=1.95 cfs 6,911 cf

Pond CB5: Peak Elev=143.68' Inflow=0.22 cfs 1,009 cf
12.0" Round Culvert n=0.013 L=5.0' S=0.0200 '/' Outflow=0.22 cfs 1,009 cf

Pond DMH1: Peak Elev=143.68' Inflow=3.07 cfs 14,803 cf
12.0" Round Culvert n=0.013 L=40.0' S=0.0100 '/' Outflow=3.07 cfs 14,803 cf

Pond DP1: Drainage Network Inflow=7.69 cfs 14,477 cf
Primary=7.69 cfs 14,477 cf

Pond DP2: Wetlands Inflow=0.63 cfs 1,926 cf
Primary=0.63 cfs 1,926 cf

Pond IS1: Infiltration System 1 Peak Elev=142.80' Storage=3,457 cf Inflow=5.45 cfs 19,129 cf
Discarded=1.19 cfs 17,319 cf Primary=2.48 cfs 1,831 cf Outflow=3.66 cfs 19,149 cf

Pond IS2: Infiltration System 2 Peak Elev=143.08' Storage=1,437 cf Inflow=6.23 cfs 25,681 cf
Discarded=0.51 cfs 16,526 cf Primary=5.71 cfs 9,157 cf Outflow=6.23 cfs 25,683 cf

Total Runoff Area = 167,822 sf Runoff Volume = 60,444 cf Average Runoff Depth = 4.32"
59.68% Pervious = 100,163 sf 40.32% Impervious = 67,659 sf

Summary for Subcatchment B1A: Building (R)

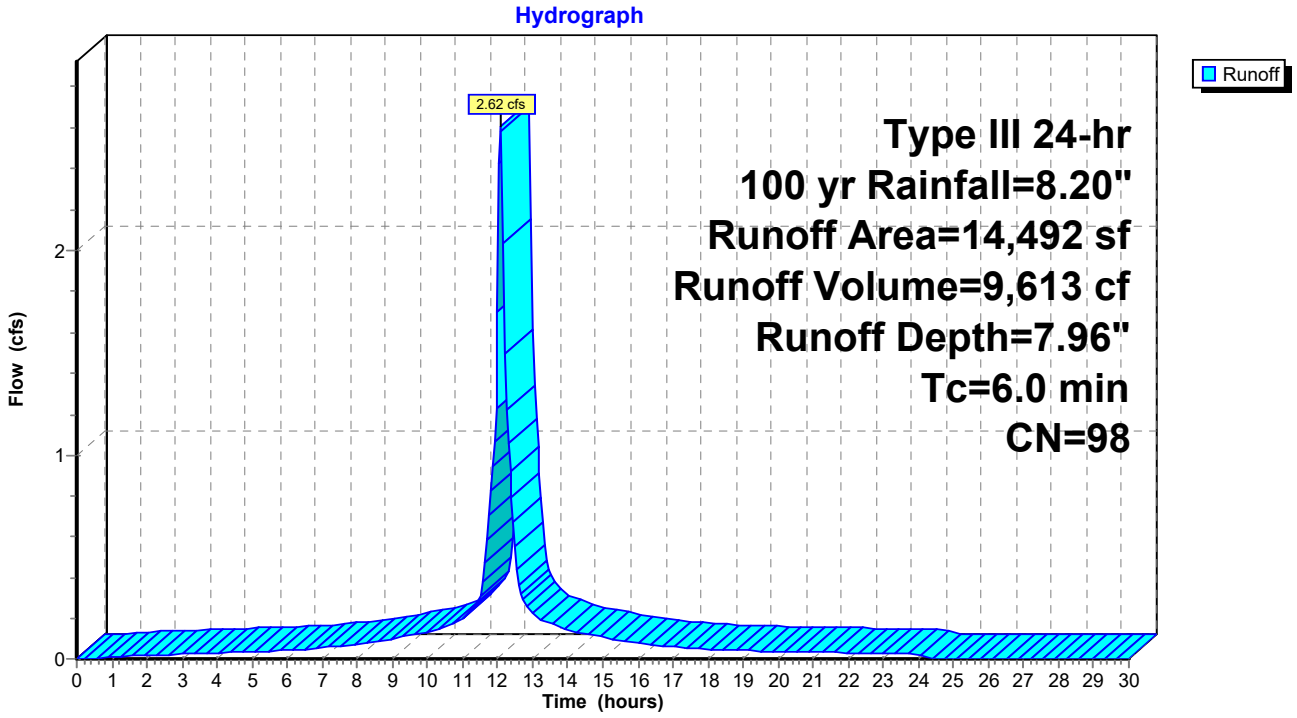
Runoff = 2.62 cfs @ 12.09 hrs, Volume= 9,613 cf, Depth= 7.96"
Routed to Pond IS1 : Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

Area (sf)	CN	Description
14,492	98	Roofs, HSG A
14,492		100.00% Impervious Area

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

Subcatchment B1A: Building (R)



Summary for Subcatchment B1B: Building (L)

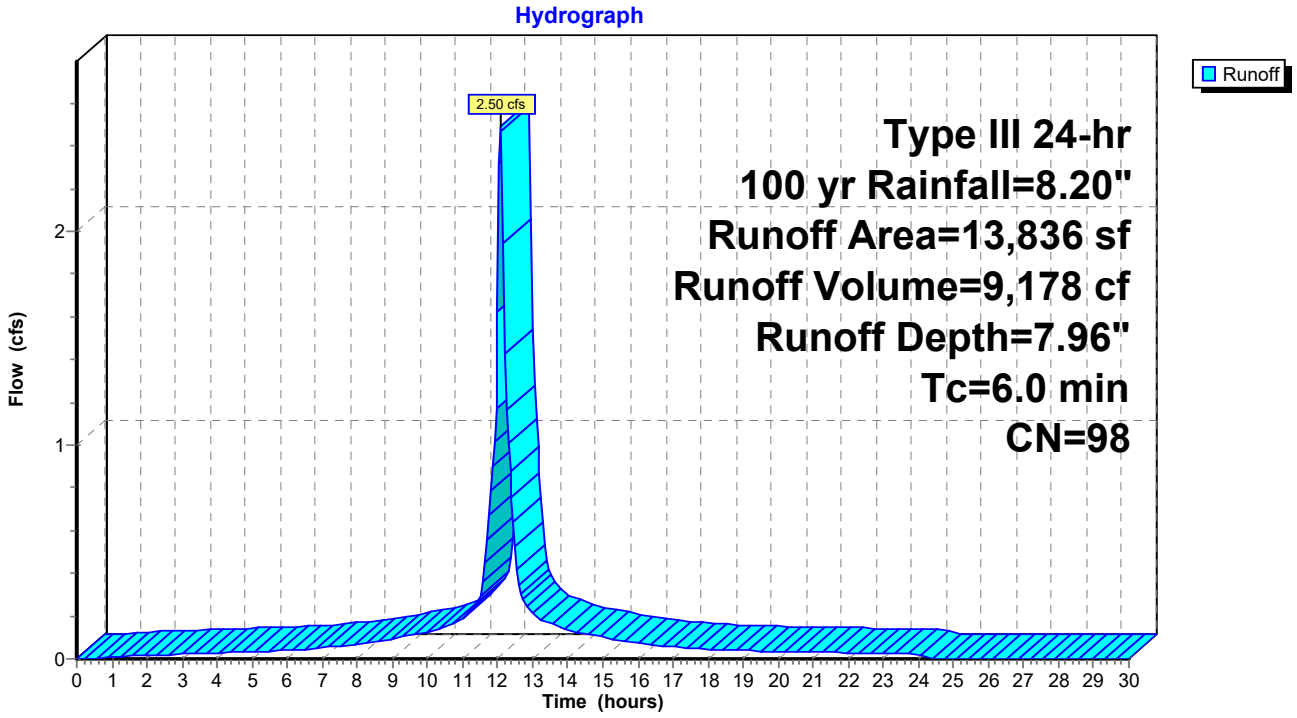
Runoff = 2.50 cfs @ 12.09 hrs, Volume= 9,178 cf, Depth= 7.96"
Routed to Pond DMH1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

Area (sf)	CN	Description
13,836	98	Roofs, HSG A
13,836		100.00% Impervious Area

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

Subcatchment B1B: Building (L)



Summary for Subcatchment P1: Back of property to Wetl

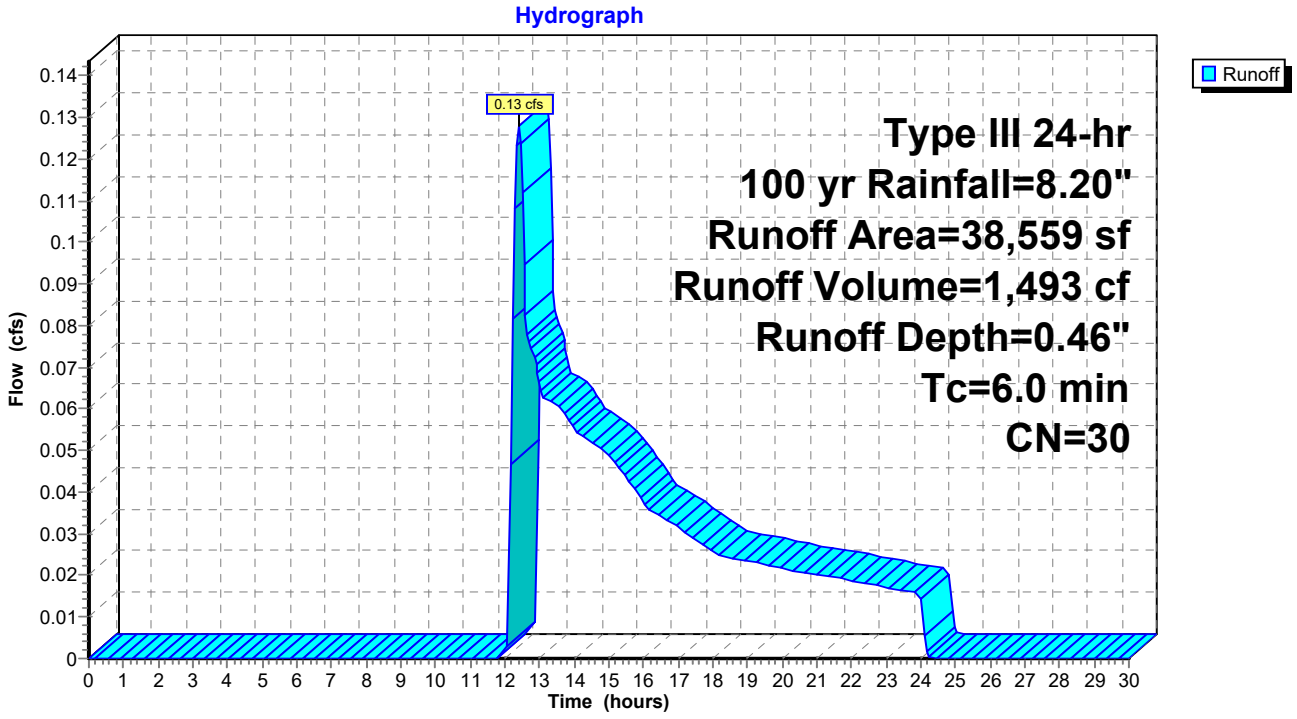
Runoff = 0.13 cfs @ 12.40 hrs, Volume= 1,493 cf, Depth= 0.46"
Routed to Pond DP2 : Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

Area (sf)	CN	Description
19,150	30	Woods, Good, HSG A
19,409	30	Meadow, non-grazed, HSG A
38,559	30	Weighted Average
38,559		100.00% Pervious Area

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

Subcatchment P1: Back of property to Wetl



Summary for Subcatchment P1A: Back of property to trench

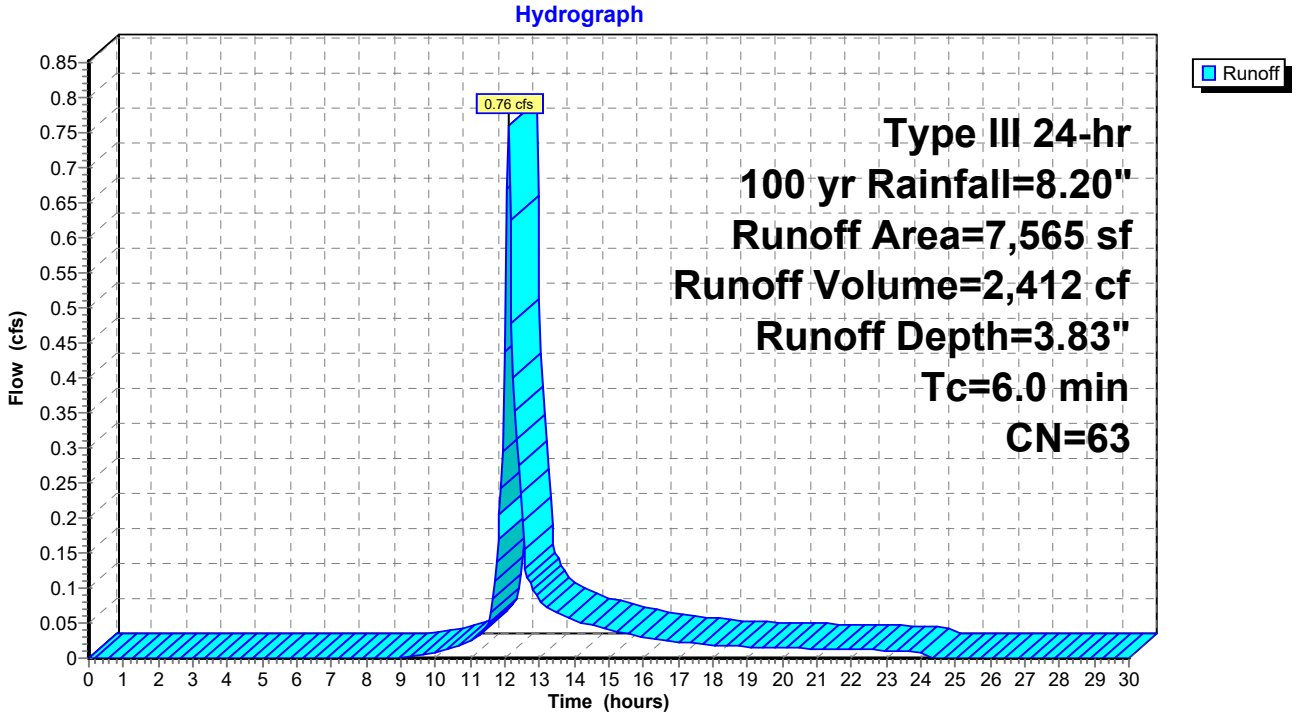
Runoff = 0.76 cfs @ 12.09 hrs, Volume= 2,412 cf, Depth= 3.83"
Routed to Pond 7P : Stone infiltration Trench

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

	Area (sf)	CN	Description
*	3,700	98	CONCRETE/Pervious Pvmt
	3,865	30	Meadow, non-grazed, HSG A
	7,565	63	Weighted Average
	3,865		51.09% Pervious Area
	3,700		48.91% Impervious Area

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

Subcatchment P1A: Back of property to trench



Summary for Subcatchment P1B: Back Patio

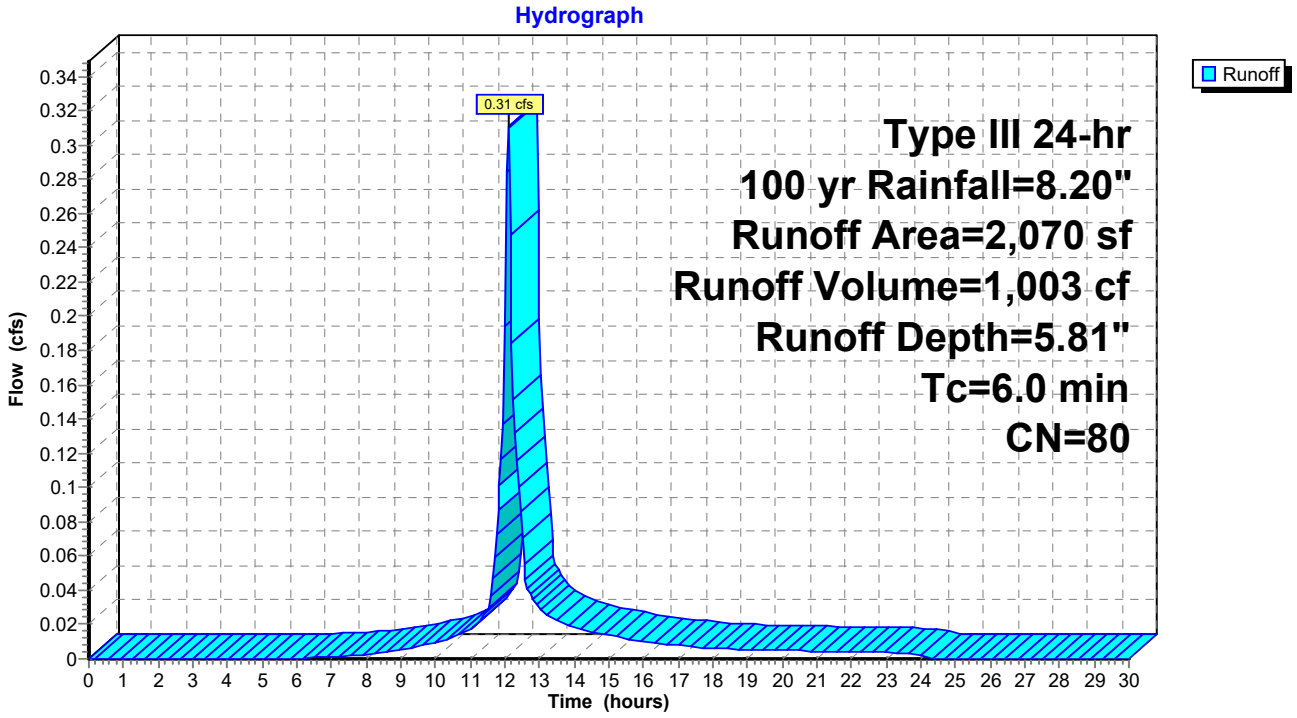
Runoff = 0.31 cfs @ 12.09 hrs, Volume= 1,003 cf, Depth= 5.81"
Routed to Pond 5P : Permeable Pavers (Back)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

	Area (sf)	CN	Description
*	2,070	80	permeable pavers
	2,070		100.00% Pervious Area

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

Subcatchment P1B: Back Patio



Summary for Subcatchment P2A:

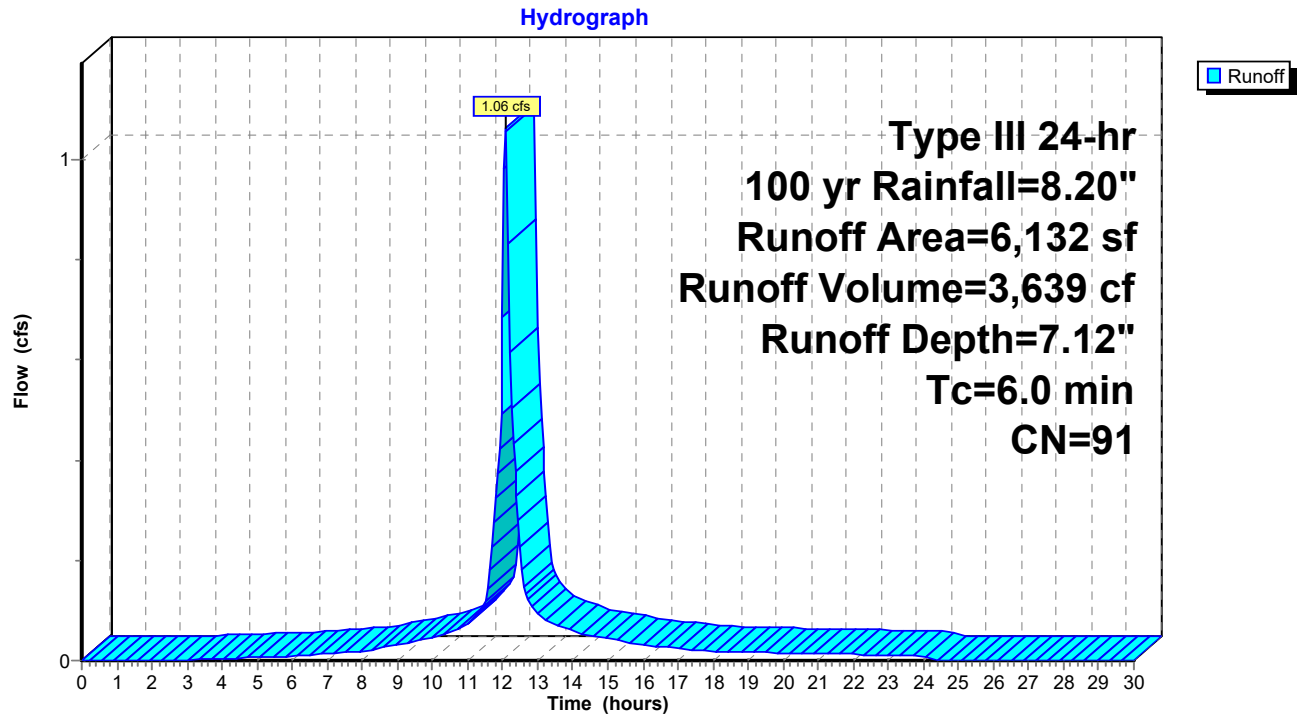
Runoff = 1.06 cfs @ 12.09 hrs, Volume= 3,639 cf, Depth= 7.12"
Routed to Pond 1P : Pervious Pvmt (North Fire) bed 'C'

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

	Area (sf)	CN	Description
*	1,675	98	CONCRETE
*	3,929	96	permeable pavement
	528	30	Meadow, non-grazed, HSG A
	6,132	91	Weighted Average
	4,457		72.68% Pervious Area
	1,675		27.32% Impervious Area

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

Subcatchment P2A:



Summary for Subcatchment P2B:

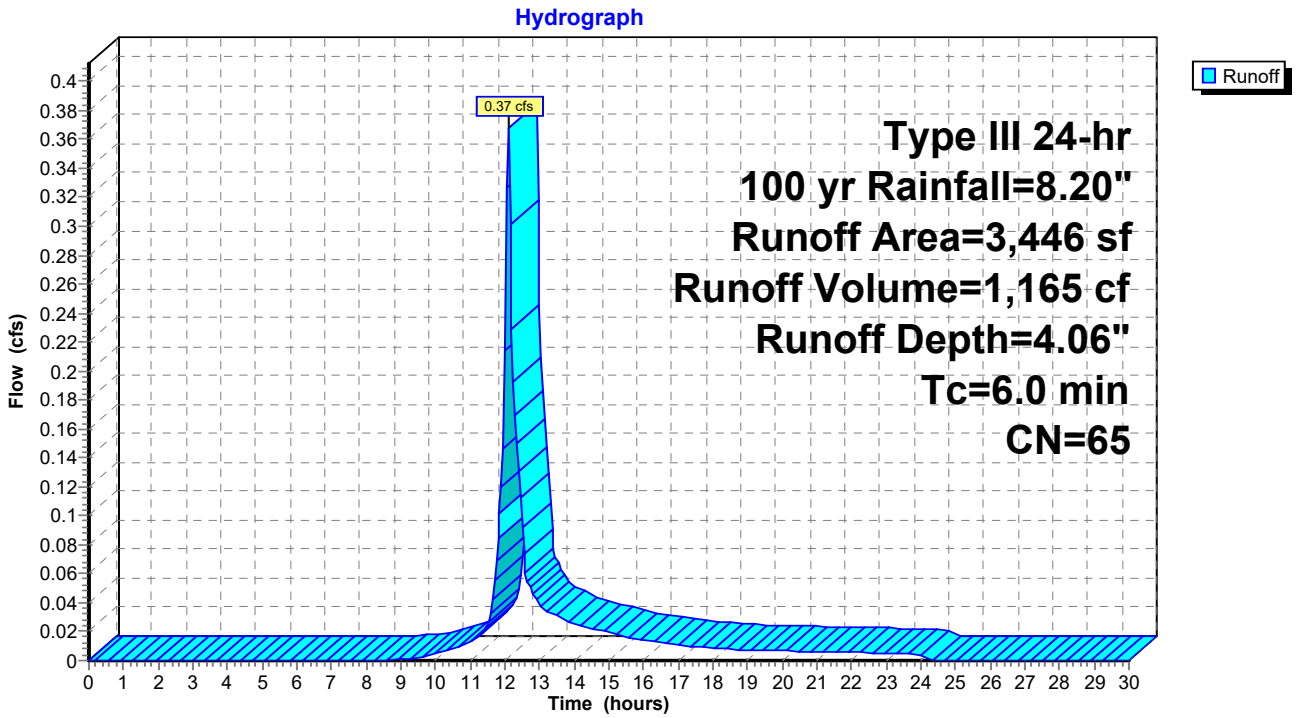
Runoff = 0.37 cfs @ 12.09 hrs, Volume= 1,165 cf, Depth= 4.06"
Routed to Pond 2P : Pervious Pvmt (North Fire) Bed B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

	Area (sf)	CN	Description
*	475	98	CONCRETE
*	1,351	96	permeable pavement
	1,620	30	Meadow, non-grazed, HSG A
	3,446	65	Weighted Average
	2,971		86.22% Pervious Area
	475		13.78% Impervious Area

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

Subcatchment P2B:



Summary for Subcatchment P3:

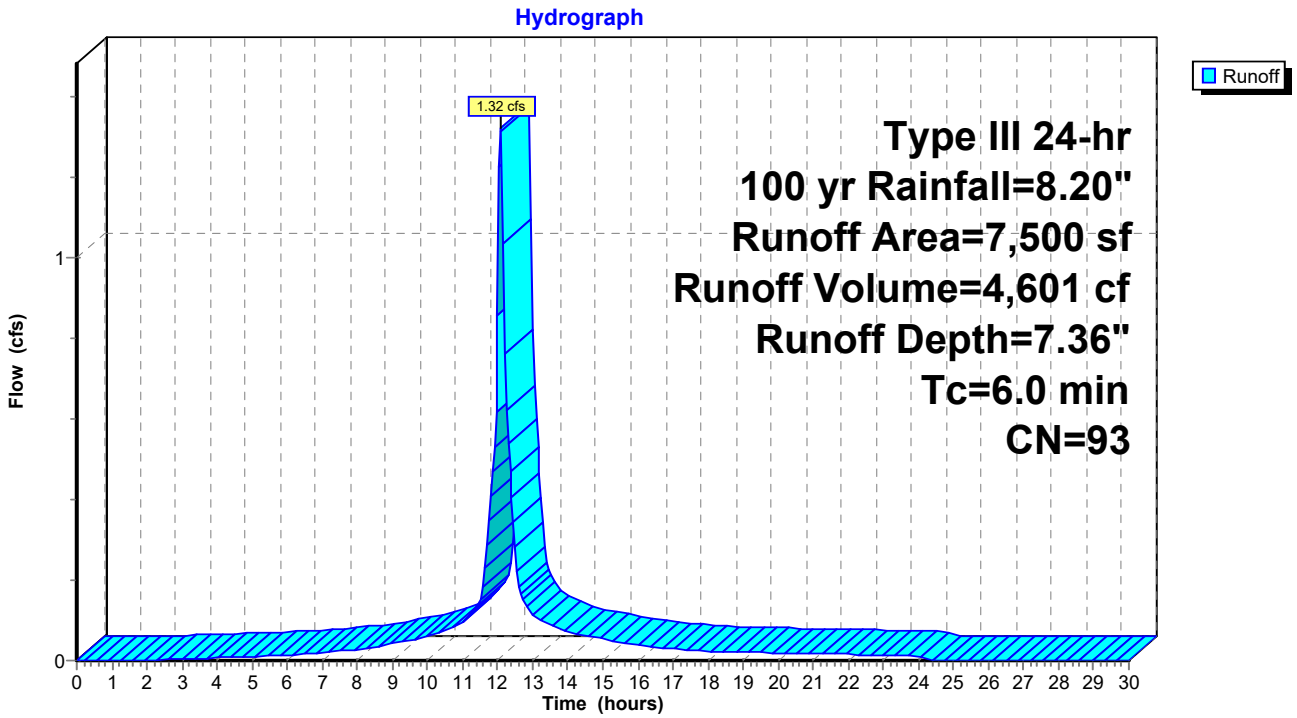
Runoff = 1.32 cfs @ 12.09 hrs, Volume= 4,601 cf, Depth= 7.36"
Routed to Pond CB1,8 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

	Area (sf)	CN	Description
*	670	98	CONCRETE
	6,150	98	Paved parking, HSG A
	680	39	>75% Grass cover, Good, HSG A
	7,500	93	Weighted Average
	680		9.07% Pervious Area
	6,820		90.93% Impervious Area

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

Subcatchment P3:



Summary for Subcatchment P4:

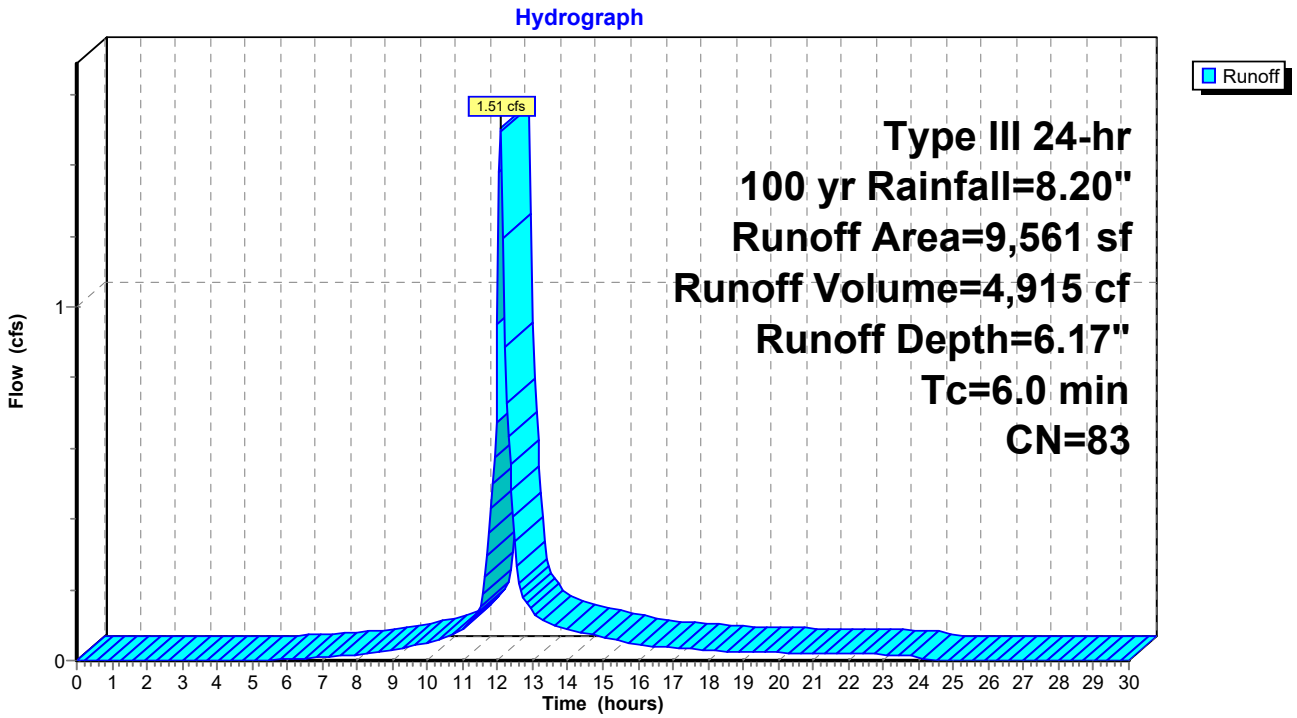
Runoff = 1.51 cfs @ 12.09 hrs, Volume= 4,915 cf, Depth= 6.17"
Routed to Pond CB2,7 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

	Area (sf)	CN	Description
*	900	98	CONCRETE
	6,161	98	Paved parking, HSG A
	2,500	39	>75% Grass cover, Good, HSG A
	9,561	83	Weighted Average
	2,500		26.15% Pervious Area
	7,061		73.85% Impervious Area

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

Subcatchment P4:



Summary for Subcatchment P5:

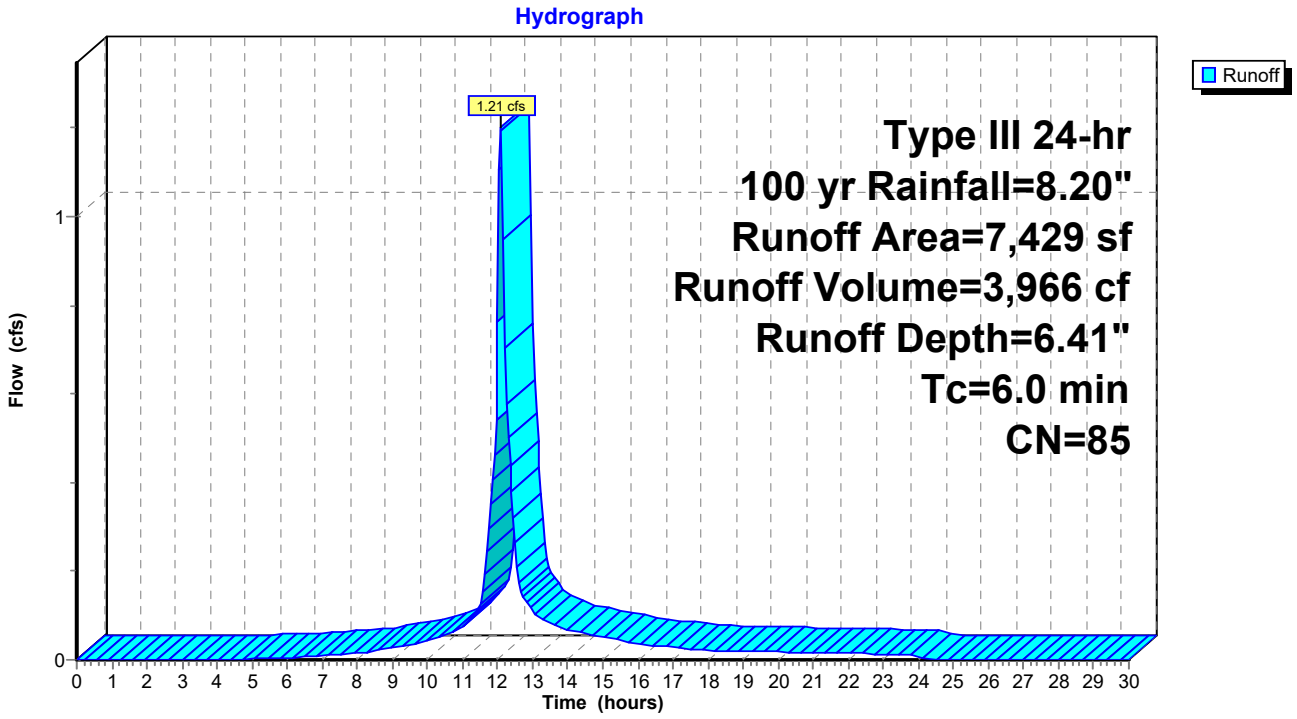
Runoff = 1.21 cfs @ 12.09 hrs, Volume= 3,966 cf, Depth= 6.41"
Routed to Pond CB3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

	Area (sf)	CN	Description
*	450	98	CONCRETE
	4,664	98	Paved parking, HSG A
	1,315	39	>75% Grass cover, Good, HSG A
*	1,000	80	permeable pavers
	7,429	85	Weighted Average
	2,315		31.16% Pervious Area
	5,114		68.84% Impervious Area

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

Subcatchment P5:



Summary for Subcatchment P5A: Perm Pavers Front entrance

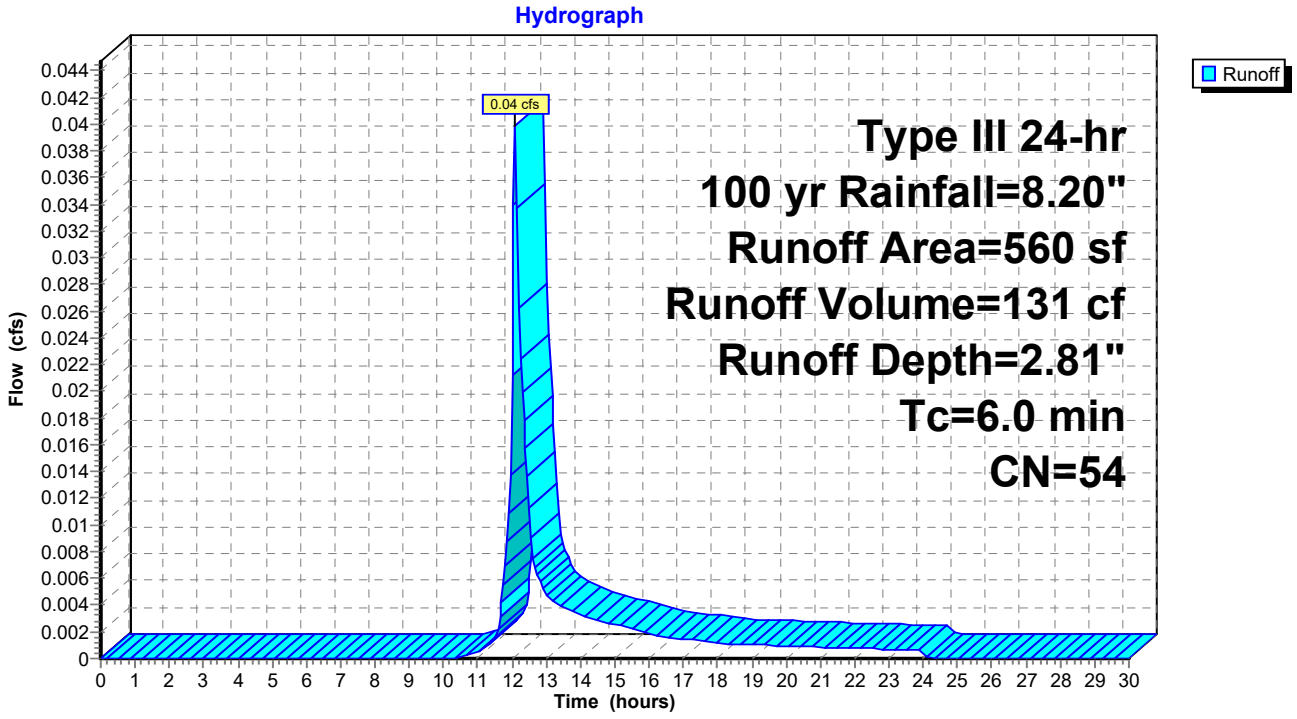
Runoff = 0.04 cfs @ 12.10 hrs, Volume= 131 cf, Depth= 2.81"
Routed to Pond 6P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

	Area (sf)	CN	Description
*	200	80	permeable pavers
	360	39	>75% Grass cover, Good, HSG A
	560	54	Weighted Average
	560		100.00% Pervious Area

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

Subcatchment P5A: Perm Pavers Front entrance



Summary for Subcatchment P6:

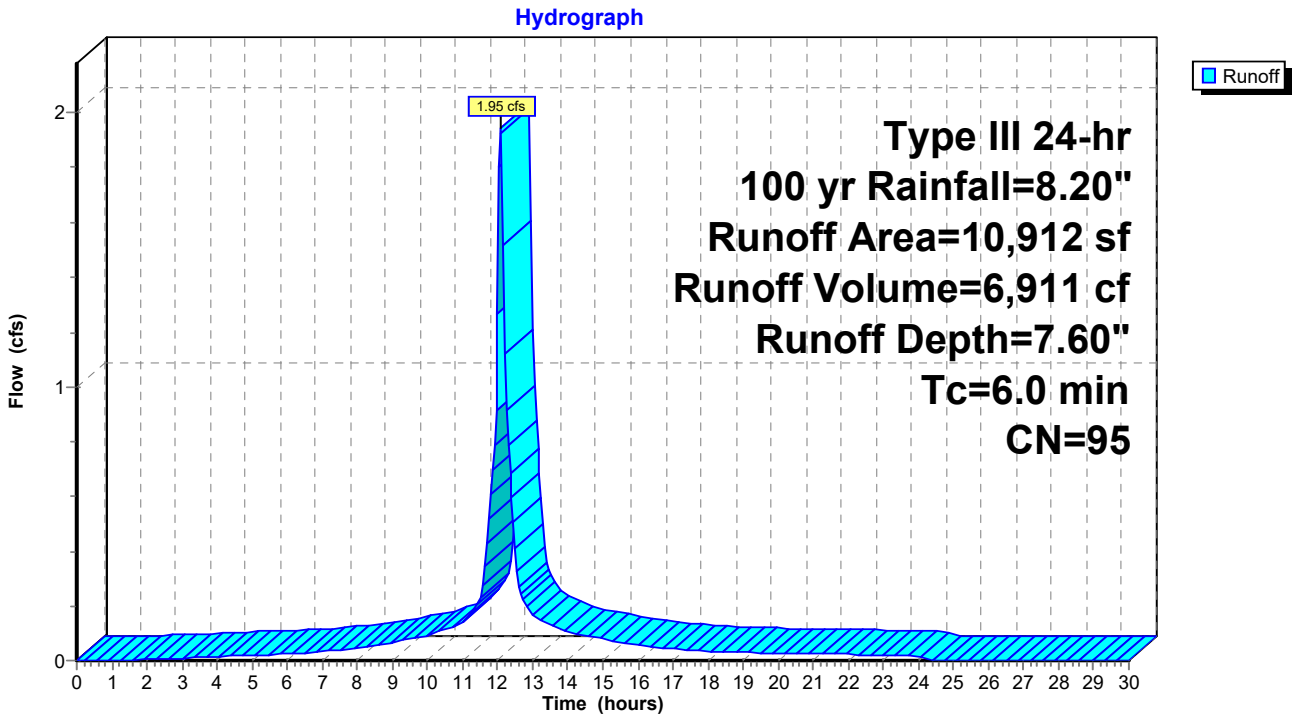
Runoff = 1.95 cfs @ 12.09 hrs, Volume= 6,911 cf, Depth= 7.60"
Routed to Pond CB4 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

	Area (sf)	CN	Description
*	1,200	98	CONCRETE
	9,066	98	Paved parking, HSG A
	646	39	>75% Grass cover, Good, HSG A
	10,912	95	Weighted Average
	646		5.92% Pervious Area
	10,266		94.08% Impervious Area

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

Subcatchment P6:



Summary for Subcatchment P7:

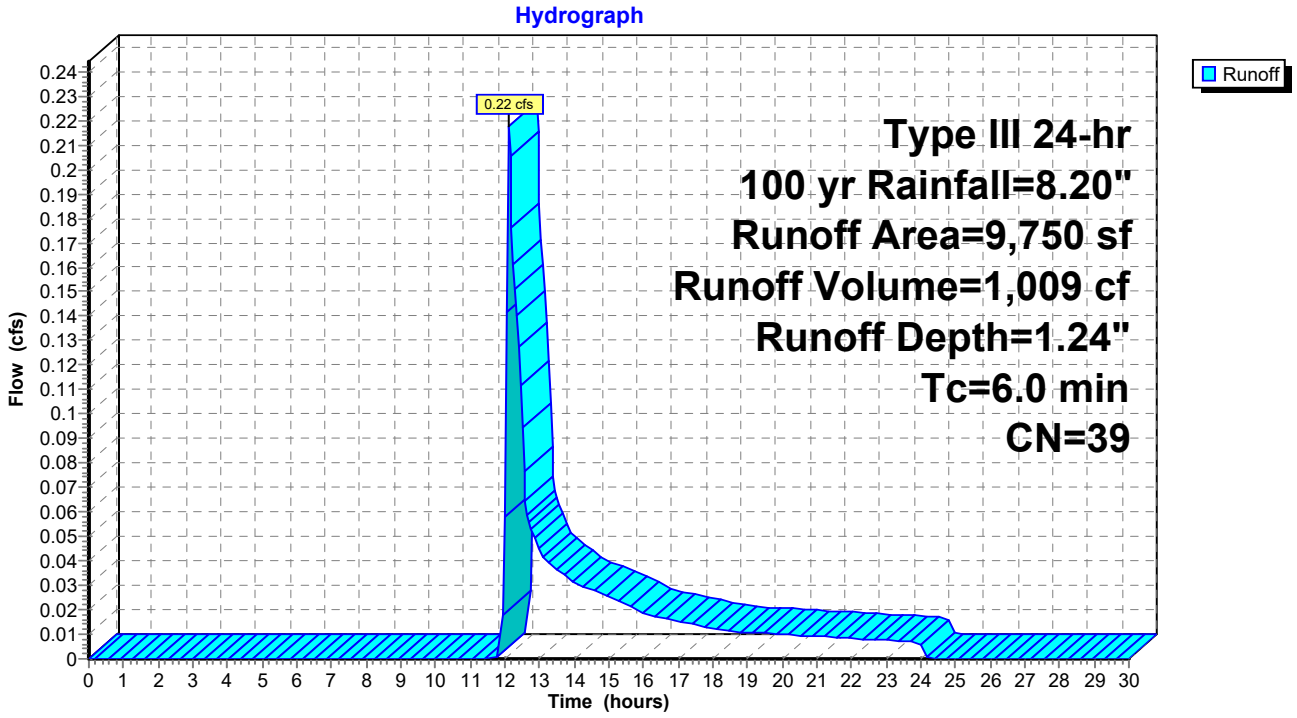
Runoff = 0.22 cfs @ 12.12 hrs, Volume= 1,009 cf, Depth= 1.24"
Routed to Pond CB5 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

Area (sf)	CN	Description
9,750	39	>75% Grass cover, Good, HSG A
9,750		100.00% Pervious Area

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

Subcatchment P7:



Summary for Subcatchment P8:

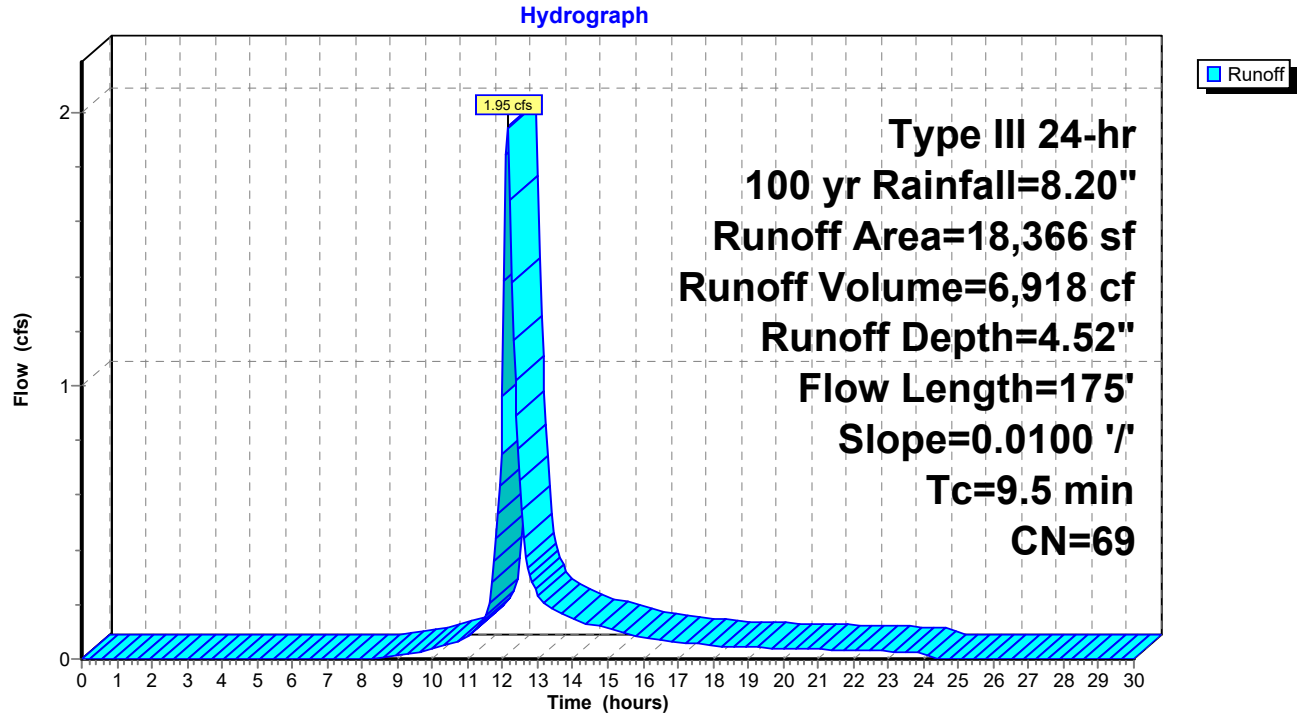
Runoff = 1.95 cfs @ 12.14 hrs, Volume= 6,918 cf, Depth= 4.52"
Routed to Pond 4P : Pervious Pvmt (South Fire Lane)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

	Area (sf)	CN	Description
*	1,020	98	CONCRETE
*	4,666	96	permeable pavement
	7,280	39	>75% Grass cover, Good, HSG A
	5,400	80	>75% Grass cover, Good, HSG D
	18,366	69	Weighted Average
	17,346		94.45% Pervious Area
	1,020		5.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
0.6	25	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.6	100	0.0100	1.06		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
9.5	175	Total			

Subcatchment P8:



Summary for Subcatchment P9:

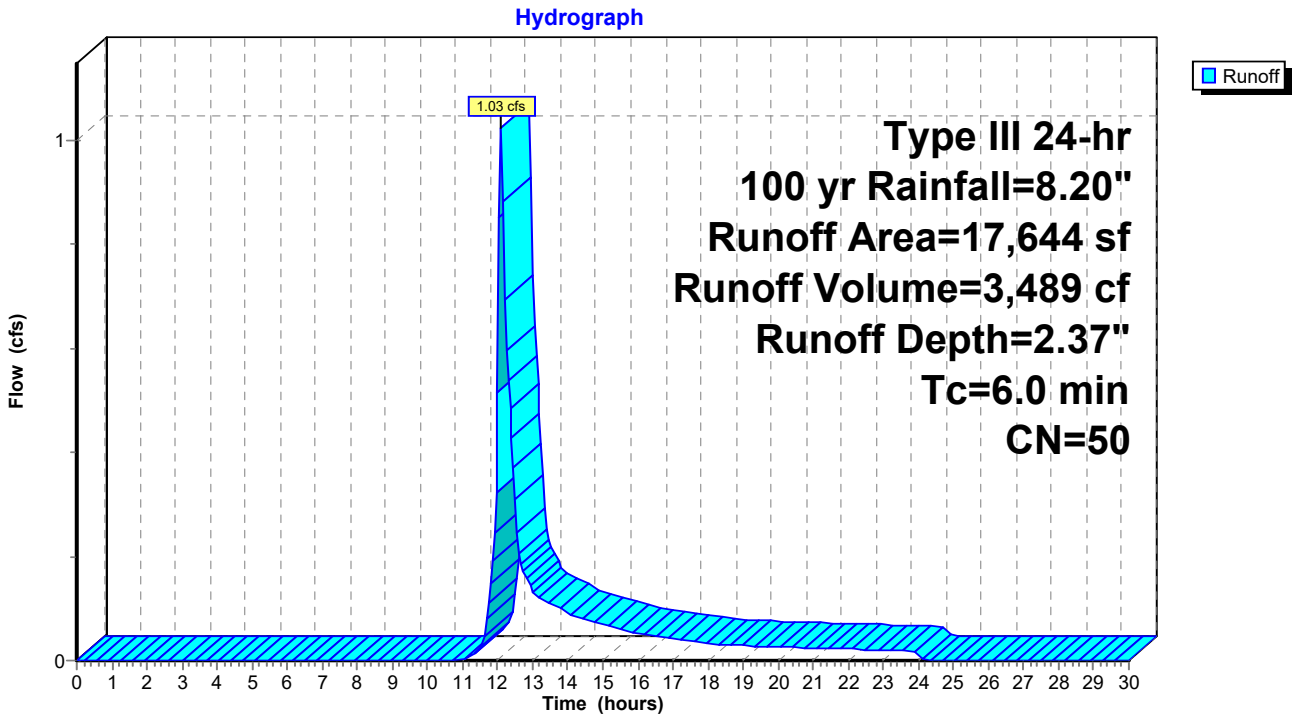
Runoff = 1.03 cfs @ 12.10 hrs, Volume= 3,489 cf, Depth= 2.37"
Routed to Pond DP1 : Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.20"

	Area (sf)	CN	Description
*	2,850	98	CONCRETE
	350	98	Paved parking, HSG A
	14,444	39	>75% Grass cover, Good, HSG A
	17,644	50	Weighted Average
	14,444		81.86% Pervious Area
	3,200		18.14% Impervious Area

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

Subcatchment P9:



Summary for Pond 1P: Pervious Pvmt (North Fire) bed 'C'

Inflow Area = 6,132 sf, 27.32% Impervious, Inflow Depth = 7.12" for 100 yr event
Inflow = 1.06 cfs @ 12.09 hrs, Volume= 3,639 cf
Outflow = 0.76 cfs @ 12.17 hrs, Volume= 3,641 cf, Atten= 28%, Lag= 4.8 min
Discarded = 0.65 cfs @ 12.17 hrs, Volume= 3,573 cf
Primary = 0.11 cfs @ 12.17 hrs, Volume= 68 cf
Routed to Pond 2P : Pervious Pvmt (North Fire) Bed B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.14' @ 12.17 hrs Surf.Area= 3,280 sf Storage= 144 cf
Flood Elev= 144.33' Surf.Area= 3,280 sf Storage= 2,071 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.8 min (772.7 - 771.9)

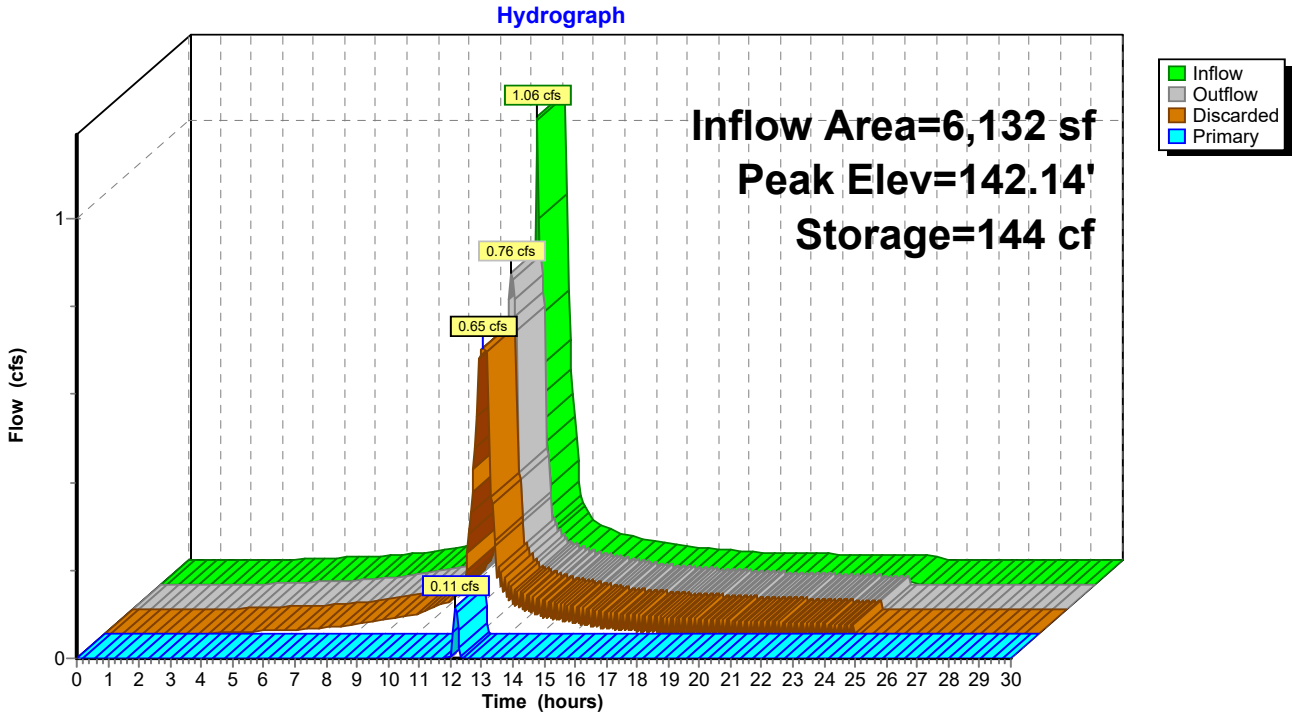
Volume	Invert	Avail.Storage	Storage Description
#1	142.00'	2,036 cf	**20.00'W x 164.00'L x 2.08'H Prismatoid** 6,822 cf Overall - 35 cf Embedded = 6,787 cf x 30.0% Voids
#2	142.00'	35 cf	**6.0" Round Pipe Storage** Inside #1 L= 180.0'
		2,071 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	142.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 138.00'
#2	Primary	142.00'	**6.0" Round Culvert X 2.00** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 142.00' / 141.50' S= 0.1000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf

Discarded OutFlow Max=0.65 cfs @ 12.17 hrs HW=142.14' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.65 cfs)

Primary OutFlow Max=0.11 cfs @ 12.17 hrs HW=142.14' TW=141.72' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 0.11 cfs @ 1.25 fps)

Pond 1P: Pervious Pvmt (North Fire) bed 'C'



Summary for Pond 2P: Pervious Pvmt (North Fire) Bed B

Inflow Area = 9,578 sf, 22.45% Impervious, Inflow Depth = 1.54" for 100 yr event
Inflow = 0.44 cfs @ 12.12 hrs, Volume= 1,233 cf
Outflow = 0.41 cfs @ 12.16 hrs, Volume= 1,234 cf, Atten= 5%, Lag= 2.4 min
Discarded = 0.14 cfs @ 12.16 hrs, Volume= 1,026 cf
Primary = 0.27 cfs @ 12.16 hrs, Volume= 209 cf
Routed to Pond 3P : Pervious Pvmt (North Fire) Bed 'A'

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 141.72' @ 12.16 hrs Surf.Area= 700 sf Storage= 51 cf
Flood Elev= 143.83' Surf.Area= 700 sf Storage= 447 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.2 min (829.6 - 828.5)

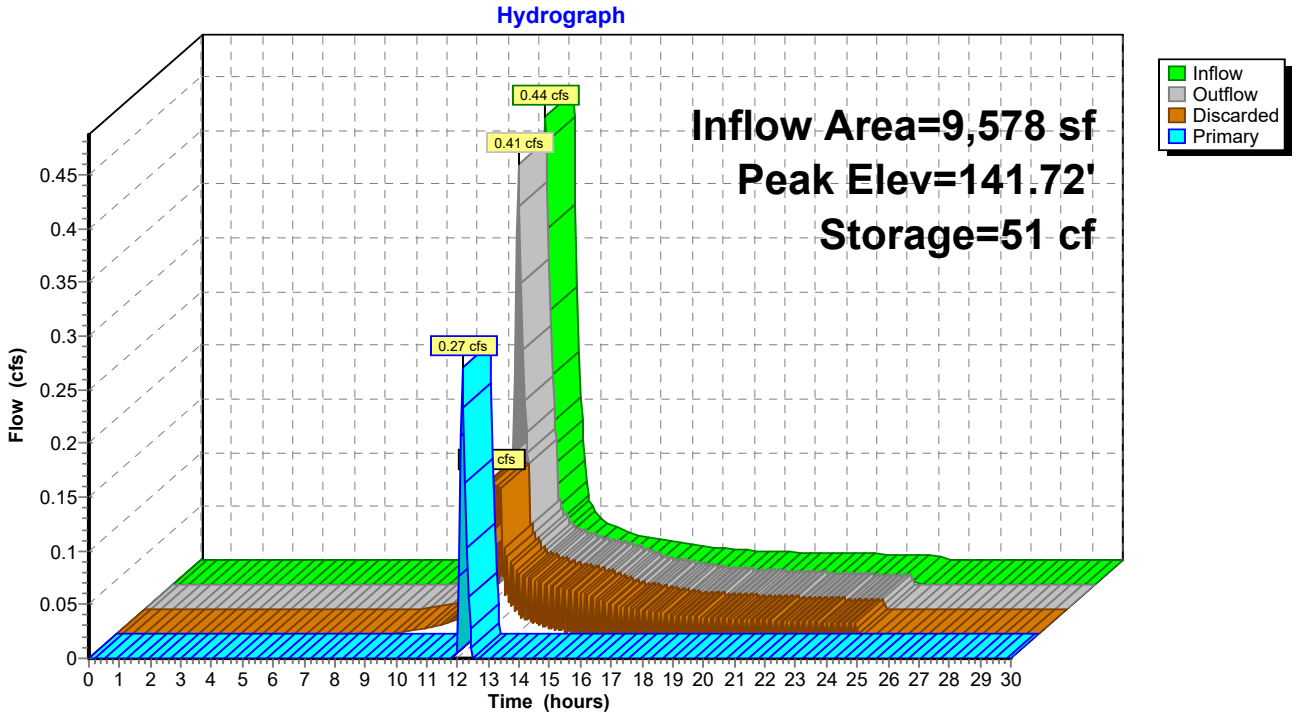
Volume	Invert	Avail.Storage	Storage Description
#1	141.50'	432 cf	**20.00'W x 35.00'L x 2.08'H Prismatoid** 1,456 cf Overall - 15 cf Embedded = 1,441 cf x 30.0% Voids
#2	141.50'	15 cf	**6.0" Round Pipe Storage** Inside #1 L= 75.0'
		447 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	141.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 138.00'
#2	Primary	141.50'	**6.0" Round Culvert X 2.00** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 141.50' / 141.00' S= 0.1000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf

Discarded OutFlow Max=0.14 cfs @ 12.16 hrs HW=141.72' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.14 cfs)

Primary OutFlow Max=0.27 cfs @ 12.16 hrs HW=141.72' TW=141.01' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 0.27 cfs @ 1.60 fps)

Pond 2P: Pervious Pvmt (North Fire) Bed B



Summary for Pond 3P: Pervious Pvmt (North Fire) Bed 'A'

Inflow Area = 9,578 sf, 22.45% Impervious, Inflow Depth = 0.26" for 100 yr event
Inflow = 0.27 cfs @ 12.16 hrs, Volume= 209 cf
Outflow = 0.23 cfs @ 12.19 hrs, Volume= 213 cf, Atten= 15%, Lag= 1.9 min
Discarded = 0.23 cfs @ 12.19 hrs, Volume= 213 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond IS1 : Infiltration System 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 141.02' @ 12.20 hrs Surf.Area= 1,200 sf Storage= 8 cf
Flood Elev= 143.33' Surf.Area= 1,200 sf Storage= 759 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.5 min (731.8 - 731.4)

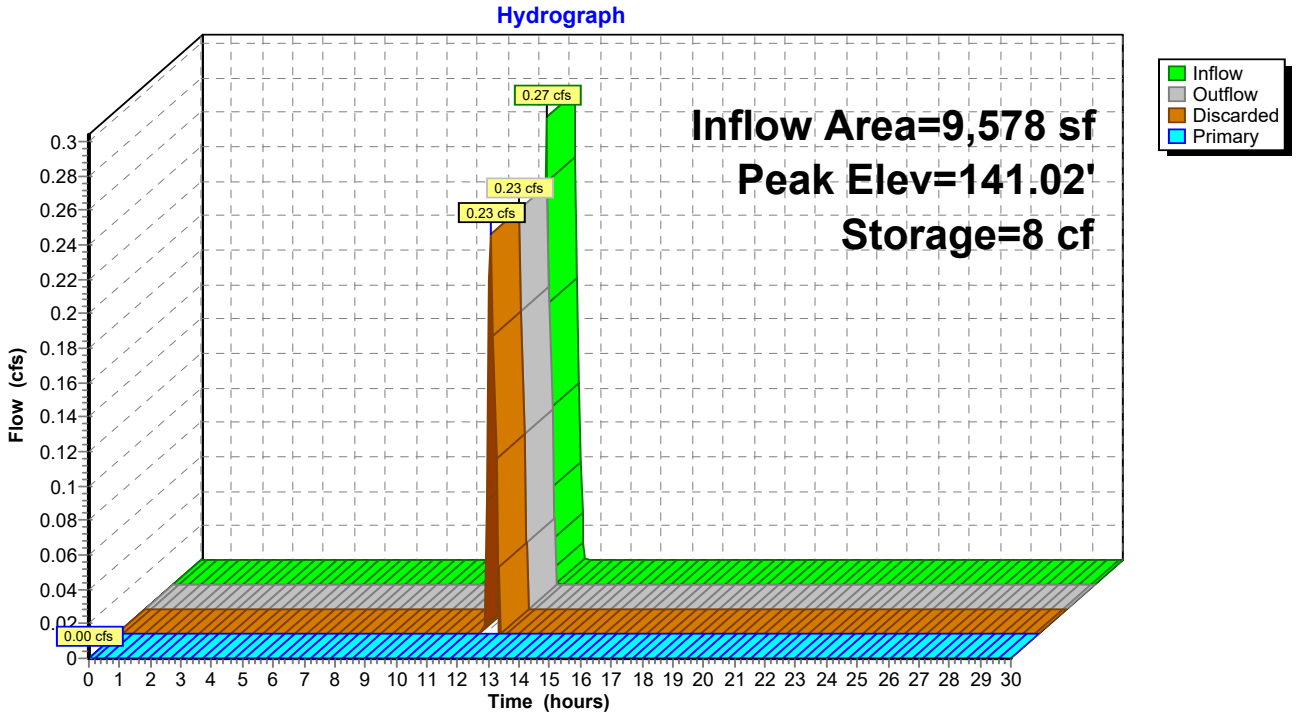
Volume	Invert	Avail.Storage	Storage Description
#1	141.00'	744 cf	**20.00'W x 60.00'L x 2.08'H Prismatoid** 2,496 cf Overall - 15 cf Embedded = 2,481 cf x 30.0% Voids
#2	141.00'	15 cf	**6.0" Round Pipe Storage** Inside #1 L= 75.0'
		759 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	141.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 138.00'
#2	Primary	141.50'	**12.0" Round Culvert** L= 25.0' Ke= 0.500 Inlet / Outlet Invert= 141.50' / 141.00' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#3	Device 2	143.30'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.23 cfs @ 12.19 hrs HW=141.02' (Free Discharge)
↑**1=Exfiltration** (Controls 0.23 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=141.00' TW=141.00' (Dynamic Tailwater)
↑**2=Culvert** (Controls 0.00 cfs)
↑**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 3P: Pervious Pvmt (North Fire) Bed 'A'



Summary for Pond 4P: Pervious Pvmt (South Fire Lane)

Inflow Area = 18,366 sf, 5.55% Impervious, Inflow Depth = 4.52" for 100 yr event
Inflow = 1.95 cfs @ 12.14 hrs, Volume= 6,918 cf
Outflow = 1.66 cfs @ 12.24 hrs, Volume= 6,894 cf, Atten= 15%, Lag= 6.0 min
Discarded = 1.02 cfs @ 12.21 hrs, Volume= 2,278 cf
Primary = 0.66 cfs @ 12.25 hrs, Volume= 4,616 cf
Routed to Pond DMH1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 144.04' @ 12.21 hrs Surf.Area= 4,660 sf Storage= 798 cf
Flood Elev= 145.50' Surf.Area= 4,660 sf Storage= 2,837 cf

Plug-Flow detention time= 27.8 min calculated for 6,882 cf (99% of inflow)
Center-of-Mass det. time= 26.1 min (855.1 - 829.0)

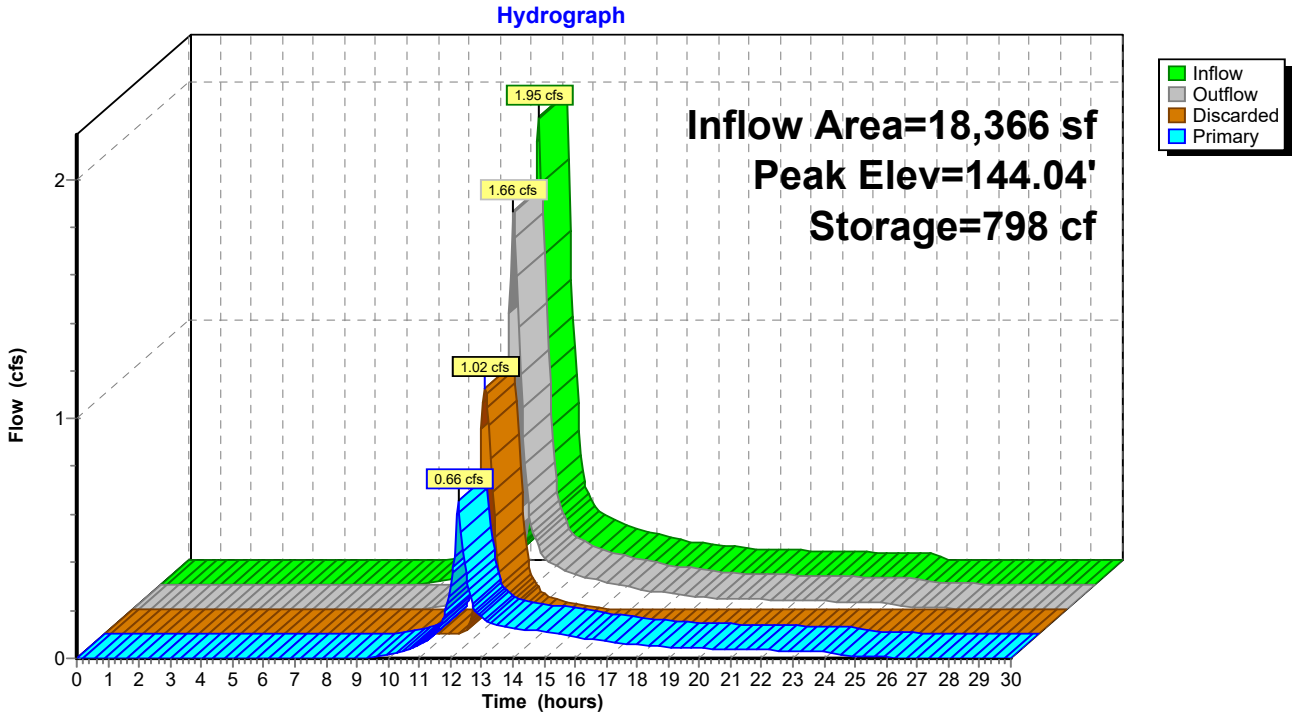
Volume	Invert	Avail.Storage	Storage Description
#1	143.50'	2,890 cf	**20.00'W x 233.00'L x 2.08'H Prismatoid** 9,693 cf Overall - 59 cf Embedded = 9,634 cf x 30.0% Voids
#2	143.50'	59 cf	**6.0" Round Pipe Storage** Inside #1 L= 300.0'
		2,949 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#0	Primary	145.58'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	143.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 141.50'
#2	Primary	143.50'	**12.0" Round Culvert** L= 170.0' Ke= 0.500 Inlet / Outlet Invert= 143.50' / 142.00' S= 0.0088 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#3	Device 1	143.67'	**8.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=1.02 cfs @ 12.21 hrs HW=144.04' (Free Discharge)
└**1=Exfiltration** (Passes 1.02 cfs of 1.13 cfs potential flow)
└**3=Orifice/Grate** (Orifice Controls 1.02 cfs @ 2.92 fps)

Primary OutFlow Max=0.72 cfs @ 12.25 hrs HW=144.02' TW=143.22' (Dynamic Tailwater)
└**2=Culvert** (Outlet Controls 0.72 cfs @ 2.52 fps)

Pond 4P: Pervious Pvmt (South Fire Lane)



Summary for Pond 5P: Permeable Pavers (Back)

Inflow Area = 2,070 sf, 0.00% Impervious, Inflow Depth = 5.81" for 100 yr event
Inflow = 0.31 cfs @ 12.09 hrs, Volume= 1,003 cf
Outflow = 0.31 cfs @ 12.09 hrs, Volume= 1,003 cf, Atten= 1%, Lag= 0.0 min
Discarded = 0.31 cfs @ 12.09 hrs, Volume= 1,003 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DP2 : Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 144.00' @ 12.10 hrs Surf.Area= 1,720 sf Storage= 0 cf
Flood Elev= 145.50' Surf.Area= 1,720 sf Storage= 516 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.2 min (802.2 - 802.0)

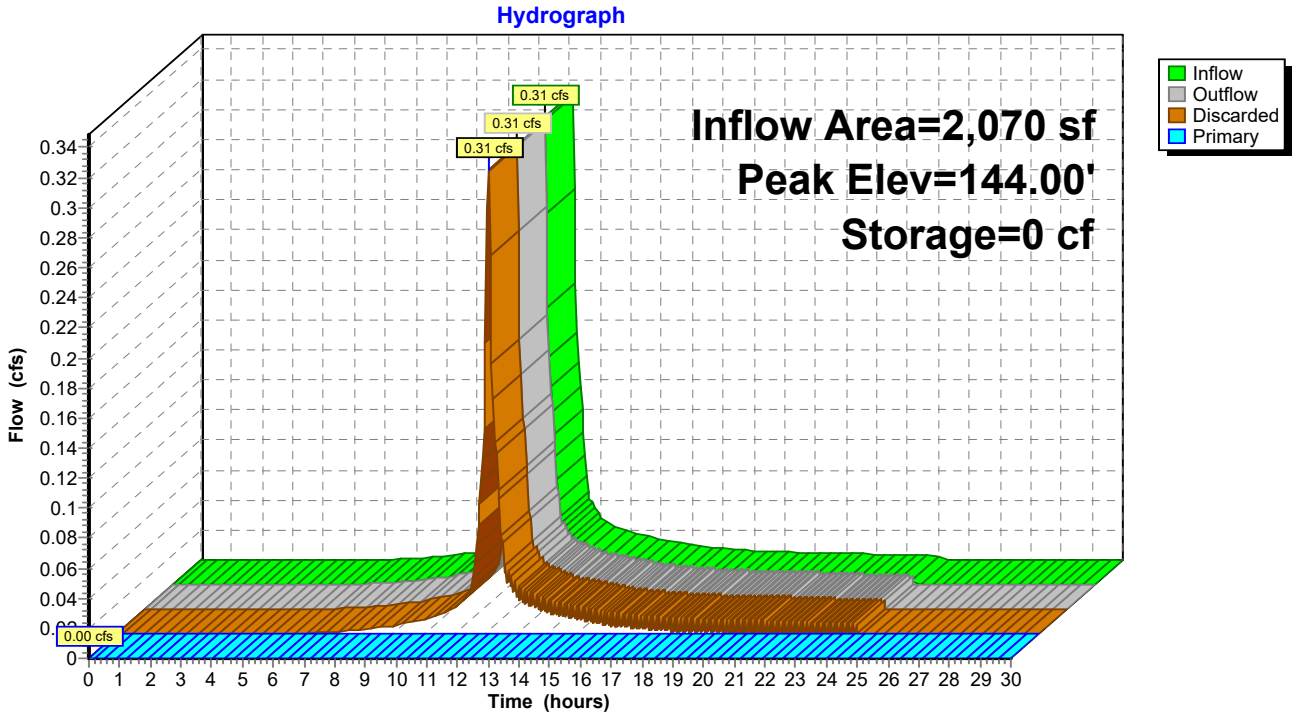
Volume	Invert	Avail.Storage	Storage Description
#1	144.00'	516 cf	**20.00'W x 86.00'L x 1.00'H Prismatoid** 1,720 cf Overall x 30.0% Voids

Device	Routing	Invert	Outlet Devices
#0	Primary	145.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	144.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.00'

Discarded OutFlow Max=0.33 cfs @ 12.09 hrs HW=144.00' (Free Discharge)
↑**1=Exfiltration** (Controls 0.33 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=144.00' TW=0.00' (Dynamic Tailwater)

Pond 5P: Permeable Pavers (Back)



Summary for Pond 6P:

Inflow Area = 560 sf, 0.00% Impervious, Inflow Depth = 2.81" for 100 yr event
Inflow = 0.04 cfs @ 12.10 hrs, Volume= 131 cf
Outflow = 0.04 cfs @ 12.10 hrs, Volume= 131 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.04 cfs @ 12.10 hrs, Volume= 131 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DP1 : Drainage Network

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.00' @ 12.10 hrs Surf.Area= 400 sf Storage= 0 cf
Flood Elev= 145.00' Surf.Area= 400 sf Storage= 120 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (858.6 - 858.6)

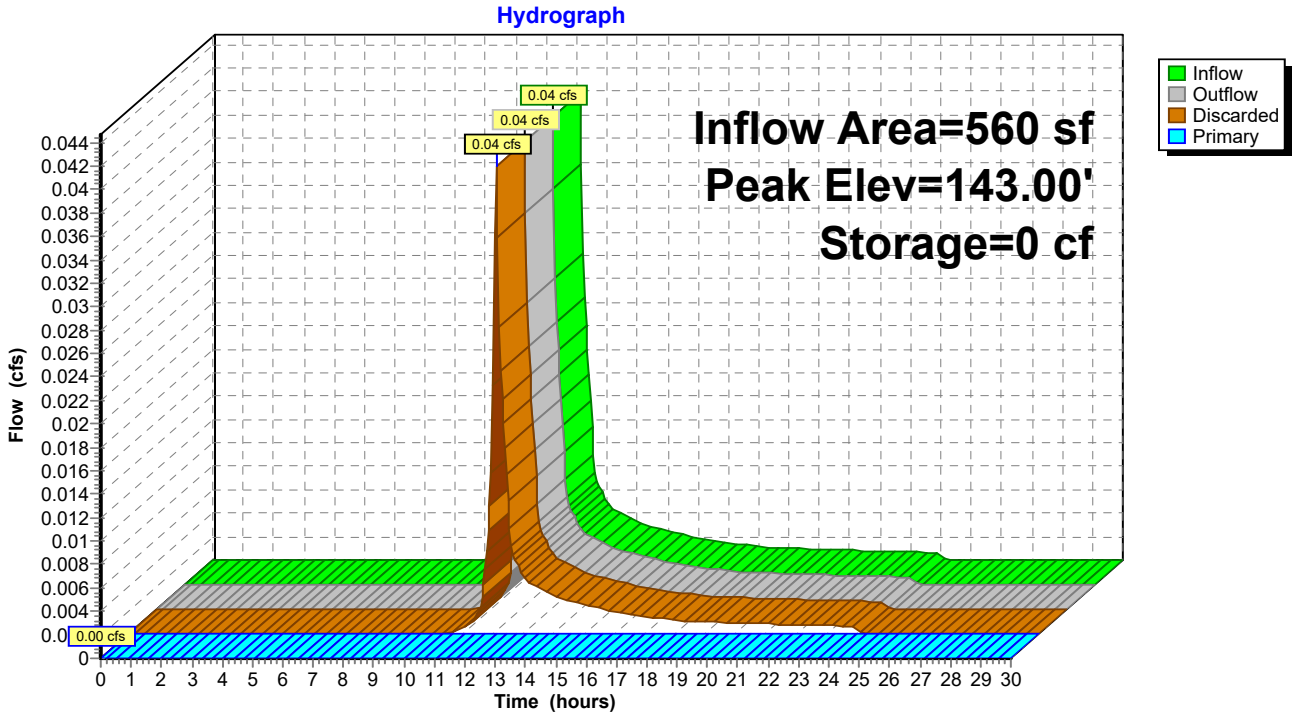
Volume	Invert	Avail.Storage	Storage Description
#1	143.00'	120 cf	**20.00'W x 20.00'L x 1.00'H Prismatoid** 400 cf Overall x 30.0% Voids

Device	Routing	Invert	Outlet Devices
#0	Primary	144.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	143.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.00'

Discarded OutFlow Max=0.08 cfs @ 12.10 hrs HW=143.00' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=143.00' TW=0.00' (Dynamic Tailwater)

Pond 6P:


Hydrograph
Inflow Area=560 sf
Peak Elev=143.00'
Storage=0 cf
Inflow
Outflow
Discarded
Primary
0.04 cfs
0.04 cfs
0.04 cfs
0.00 cfs
Flow (cfs)
Time (hours)

Summary for Pond 7P: Stone infiltration Trench

Inflow Area = 7,565 sf, 48.91% Impervious, Inflow Depth = 3.83" for 100 yr event
Inflow = 0.76 cfs @ 12.09 hrs, Volume= 2,412 cf
Outflow = 0.77 cfs @ 12.12 hrs, Volume= 2,417 cf, Atten= 0%, Lag= 1.7 min
Discarded = 0.14 cfs @ 12.10 hrs, Volume= 1,984 cf
Primary = 0.63 cfs @ 12.12 hrs, Volume= 433 cf
Routed to Pond DP2 : Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 145.01' @ 12.10 hrs Surf.Area= 600 sf Storage= 241 cf
Flood Elev= 145.00' Surf.Area= 600 sf Storage= 240 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 8.4 min (846.8 - 838.4)

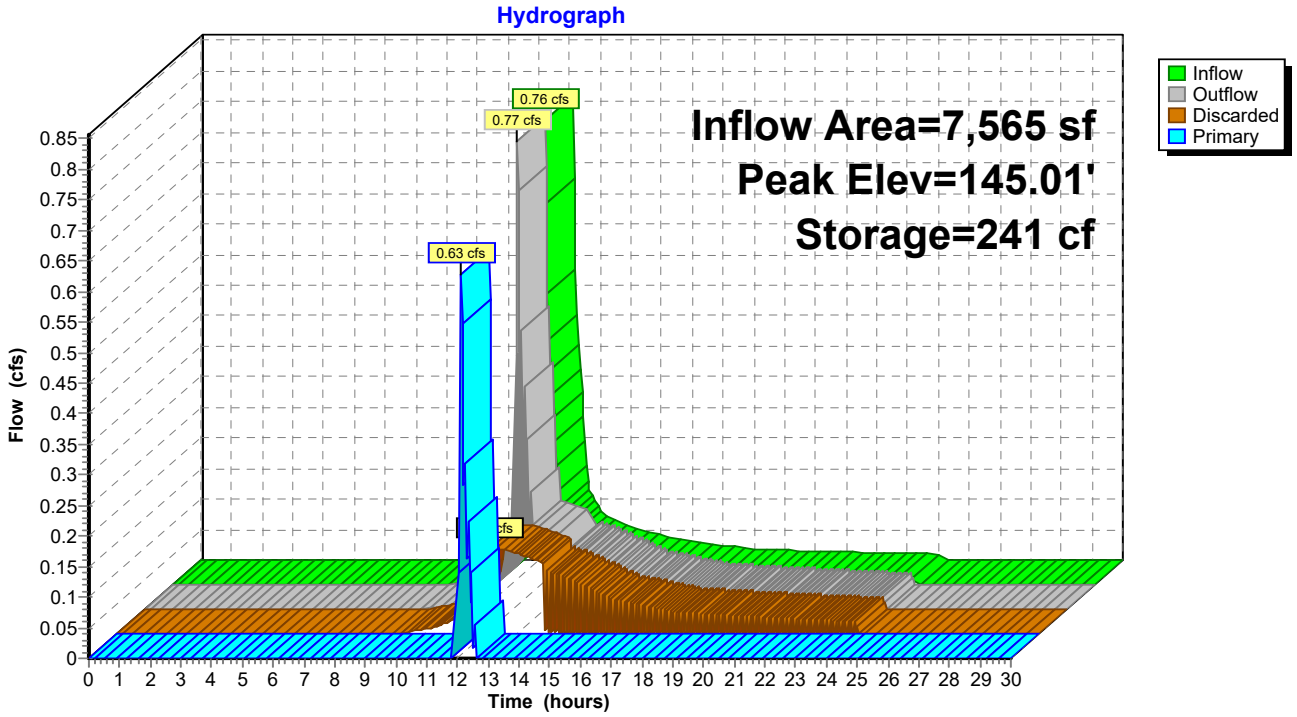
Volume	Invert	Avail.Storage	Storage Description
#1	144.00'	480 cf	**2.00'W x 300.00'L x 2.00'H Prismatoid** 1,200 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#0	Primary	146.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	144.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.00'
#2	Primary	145.00'	**500.0' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Discarded OutFlow Max=0.14 cfs @ 12.10 hrs HW=145.01' (Free Discharge)
↑**1=Exfiltration** (Controls 0.14 cfs)

Primary OutFlow Max=0.55 cfs @ 12.12 hrs HW=145.01' TW=0.00' (Dynamic Tailwater)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 0.55 cfs @ 0.20 fps)

Pond 7P: Stone infiltration Trench



Summary for Pond CB1,8:

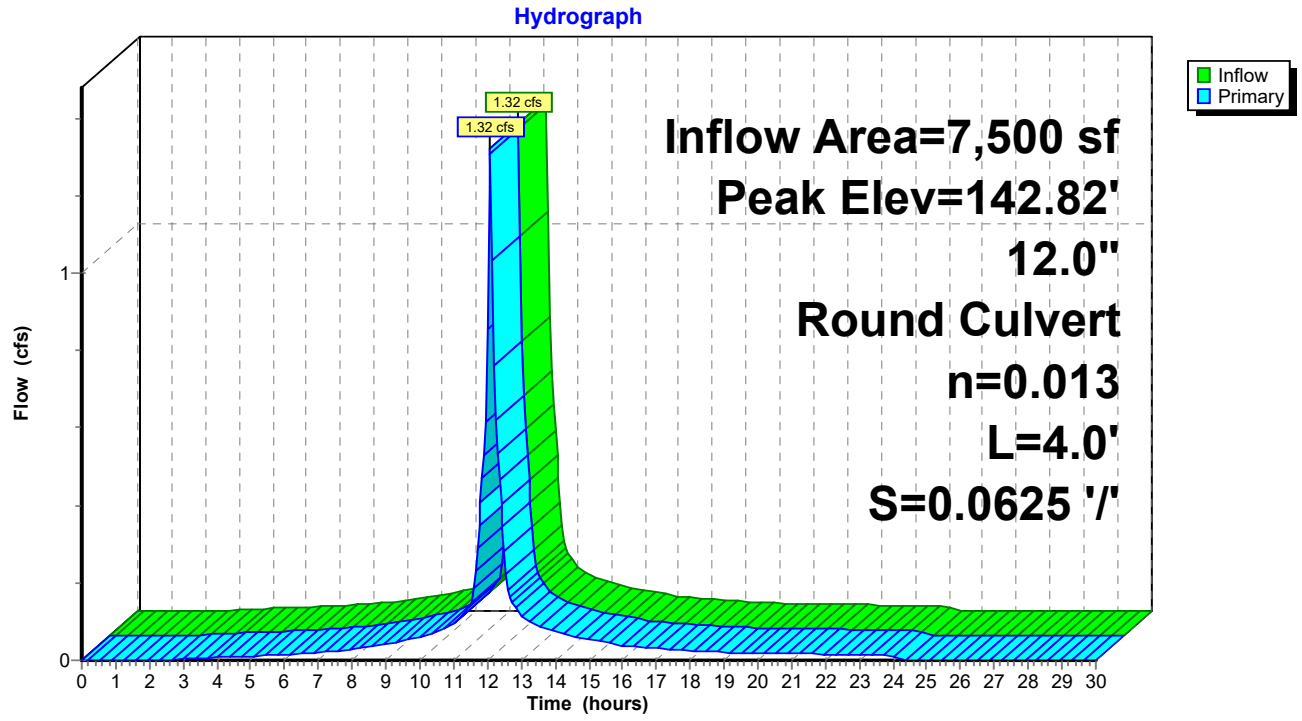
Inflow Area = 7,500 sf, 90.93% Impervious, Inflow Depth = 7.36" for 100 yr event
Inflow = 1.32 cfs @ 12.09 hrs, Volume= 4,601 cf
Outflow = 1.32 cfs @ 12.09 hrs, Volume= 4,601 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.32 cfs @ 12.09 hrs, Volume= 4,601 cf
Routed to Pond IS1 : Infiltration System 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.82' @ 12.24 hrs
Flood Elev= 144.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.25'	**12.0" Round Culvert** L= 4.0' Ke= 0.500 Inlet / Outlet Invert= 141.25' / 141.00' S= 0.0625 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=142.02' TW=142.25' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Pond CB1,8:



Summary for Pond CB2,7:

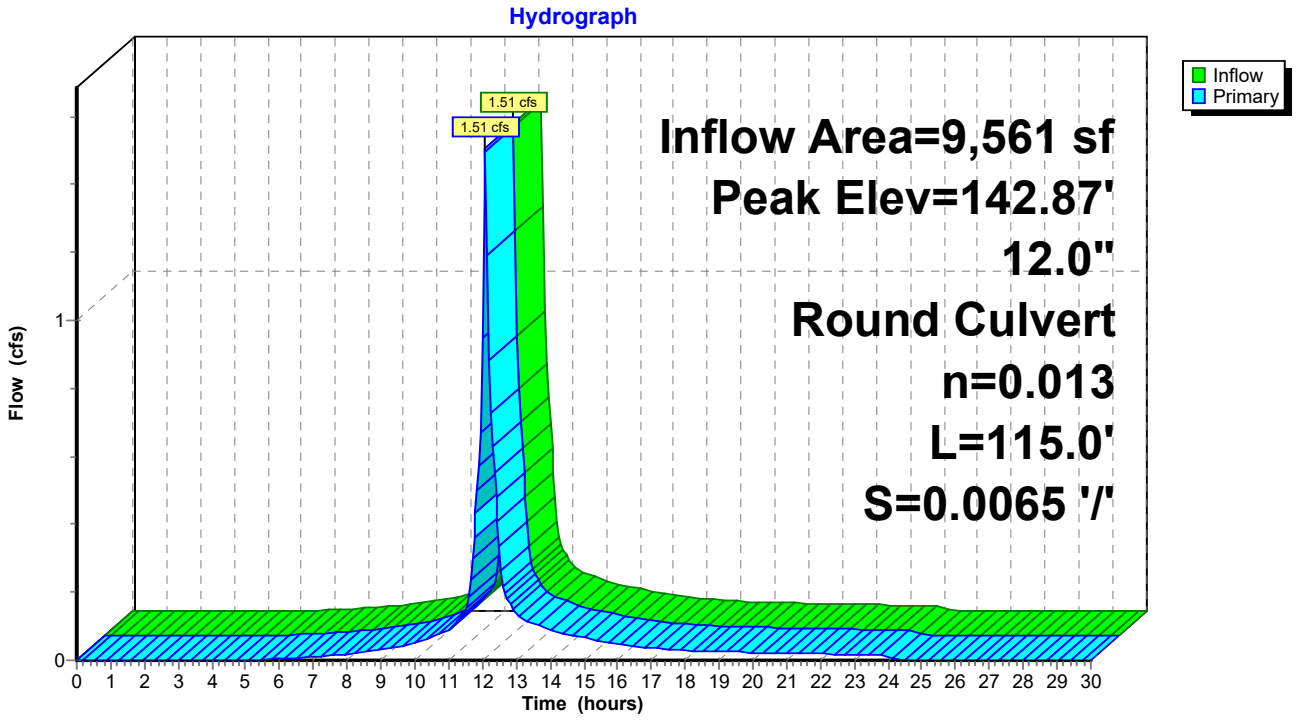
Inflow Area = 9,561 sf, 73.85% Impervious, Inflow Depth = 6.17" for 100 yr event
Inflow = 1.51 cfs @ 12.09 hrs, Volume= 4,915 cf
Outflow = 1.51 cfs @ 12.09 hrs, Volume= 4,915 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.51 cfs @ 12.09 hrs, Volume= 4,915 cf
Routed to Pond IS1 : Infiltration System 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.87' @ 12.23 hrs
Flood Elev= 144.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.75'	**12.0" Round Culvert** L= 115.0' Ke= 0.500 Inlet / Outlet Invert= 141.75' / 141.00' S= 0.0065 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.91 cfs @ 12.09 hrs HW=142.53' TW=142.27' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.91 cfs @ 1.90 fps)

Pond CB2,7:



Summary for Pond CB3:

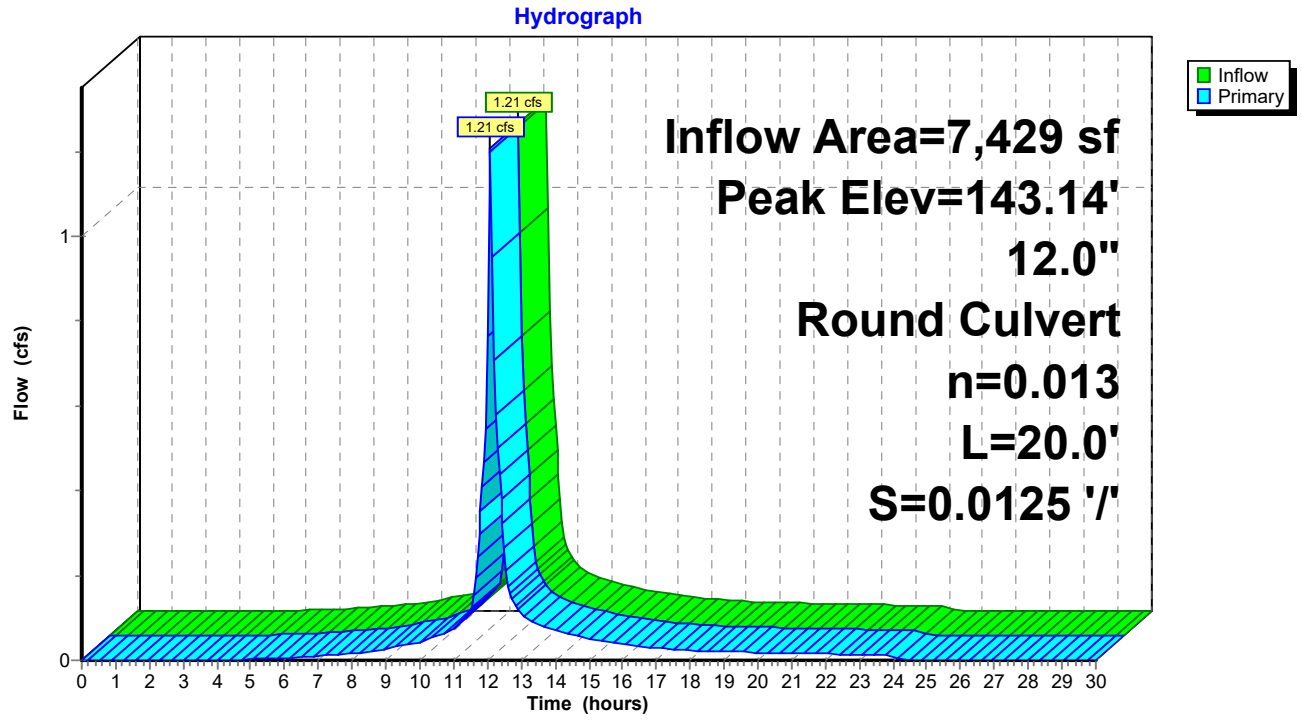
Inflow Area = 7,429 sf, 68.84% Impervious, Inflow Depth = 6.41" for 100 yr event
Inflow = 1.21 cfs @ 12.09 hrs, Volume= 3,966 cf
Outflow = 1.21 cfs @ 12.09 hrs, Volume= 3,966 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.21 cfs @ 12.09 hrs, Volume= 3,966 cf
Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.14' @ 12.13 hrs
Flood Elev= 144.35'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.75'	**12.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 141.75' / 141.50' S= 0.0125 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.64 cfs @ 12.09 hrs HW=143.09' TW=143.06' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.64 cfs @ 0.81 fps)

Pond CB3:



Summary for Pond CB4:

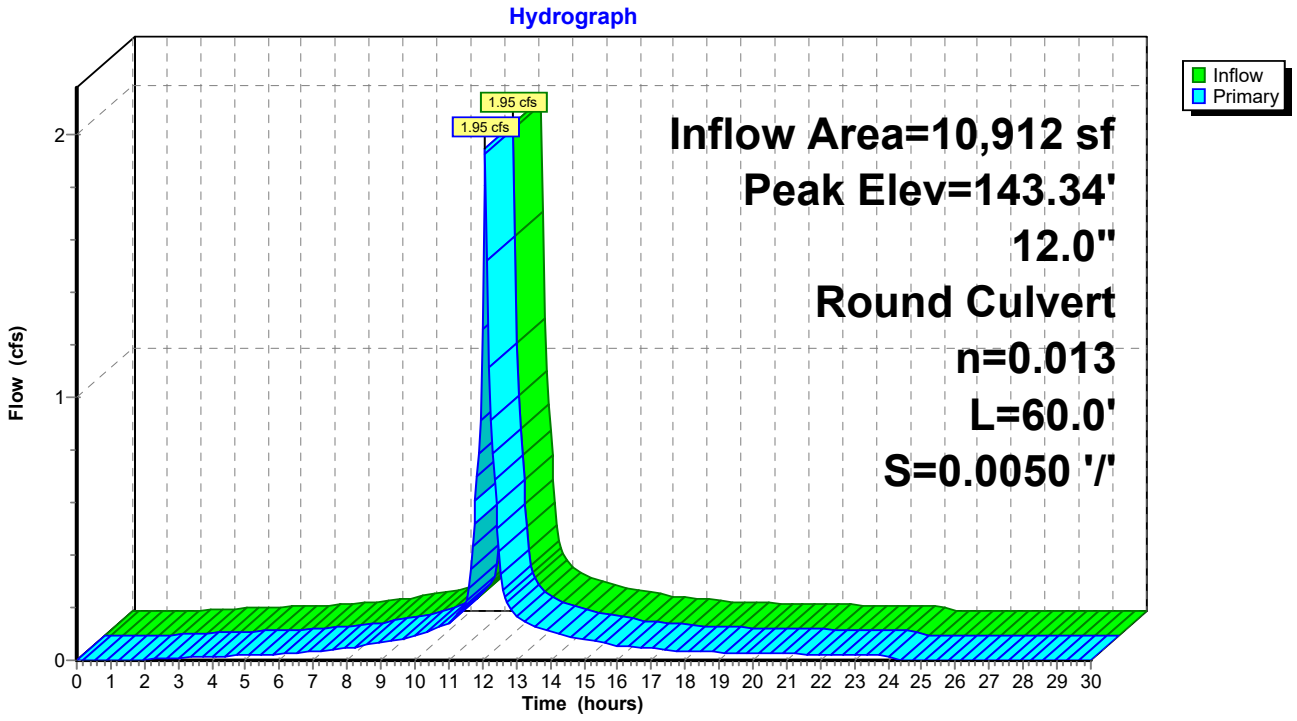
Inflow Area = 10,912 sf, 94.08% Impervious, Inflow Depth = 7.60" for 100 yr event
Inflow = 1.95 cfs @ 12.09 hrs, Volume= 6,911 cf
Outflow = 1.95 cfs @ 12.09 hrs, Volume= 6,911 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.95 cfs @ 12.09 hrs, Volume= 6,911 cf
Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.34' @ 12.11 hrs
Flood Elev= 144.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.80'	**12.0" Round Culvert** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 141.80' / 141.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.66 cfs @ 12.09 hrs HW=143.30' TW=143.06' (Dynamic Tailwater)
1=Culvert (Outlet Controls 1.66 cfs @ 2.12 fps)

Pond CB4:



Summary for Pond CB5:

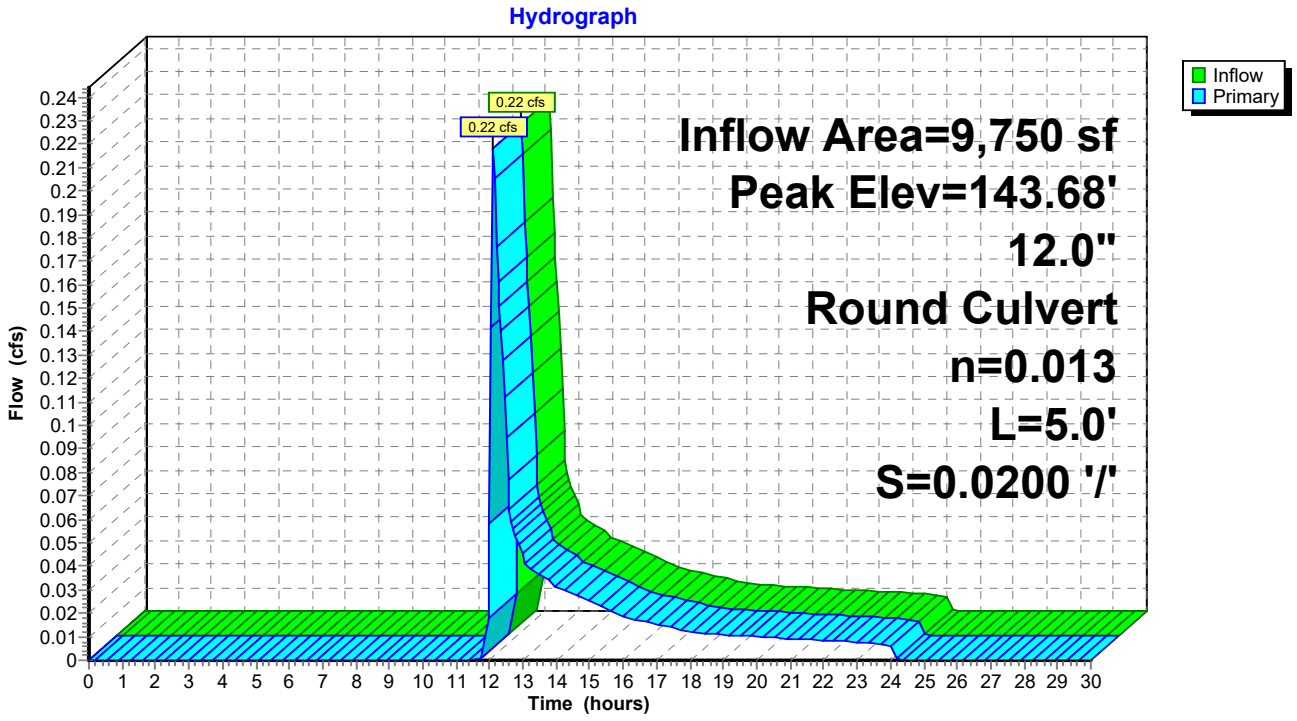
Inflow Area = 9,750 sf, 0.00% Impervious, Inflow Depth = 1.24" for 100 yr event
Inflow = 0.22 cfs @ 12.12 hrs, Volume= 1,009 cf
Outflow = 0.22 cfs @ 12.12 hrs, Volume= 1,009 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.22 cfs @ 12.12 hrs, Volume= 1,009 cf
Routed to Pond DMH1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.68' @ 12.16 hrs
Flood Elev= 144.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	142.00'	**12.0" Round Culvert** L= 5.0' Ke= 0.500 Inlet / Outlet Invert= 142.00' / 141.90' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.12 hrs HW=143.56' TW=143.62' (Dynamic Tailwater)
↳**1=Culvert** (Controls 0.00 cfs)

Pond CB5:



Summary for Pond DMH1:

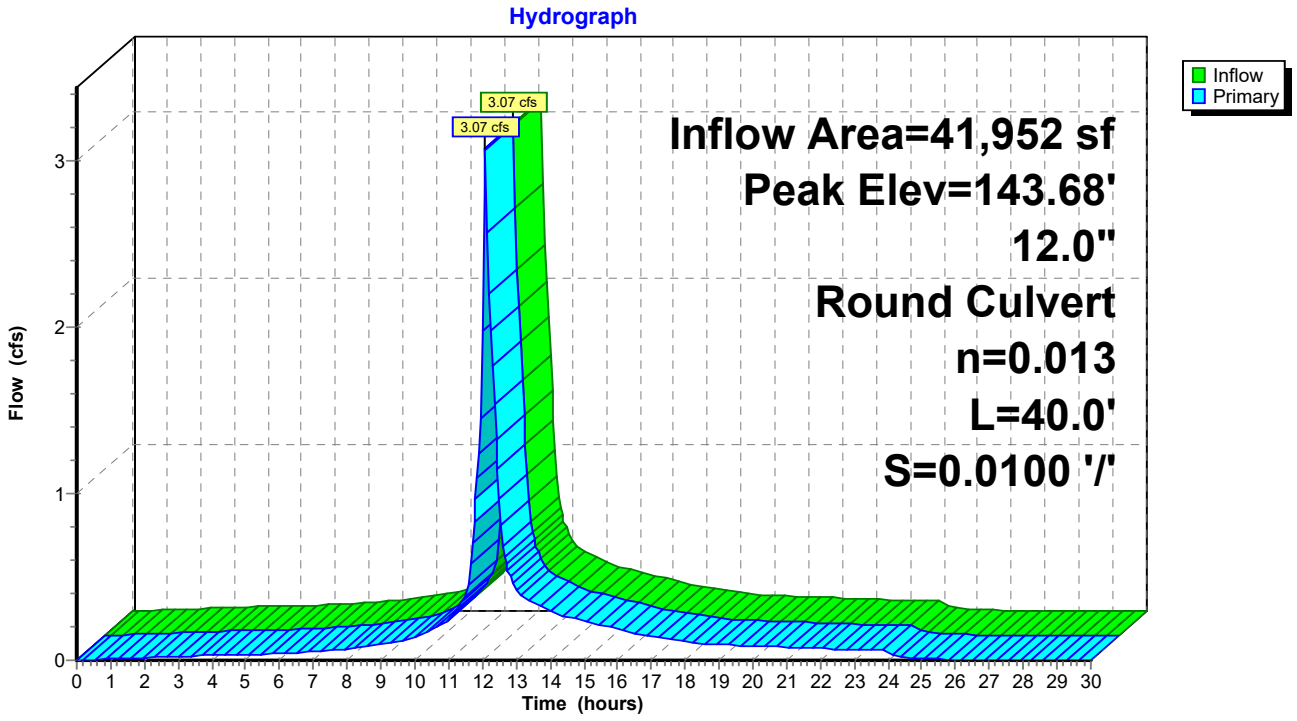
Inflow Area = 41,952 sf, 35.41% Impervious, Inflow Depth > 4.23" for 100 yr event
Inflow = 3.07 cfs @ 12.09 hrs, Volume= 14,803 cf
Outflow = 3.07 cfs @ 12.09 hrs, Volume= 14,803 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.07 cfs @ 12.09 hrs, Volume= 14,803 cf
Routed to Pond IS2 : Infiltration System 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.68' @ 12.11 hrs
Flood Elev= 144.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	141.90'	**12.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 141.90' / 141.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=2.87 cfs @ 12.09 hrs HW=143.64' TW=143.07' (Dynamic Tailwater)
1=Culvert (Inlet Controls 2.87 cfs @ 3.65 fps)

Pond DMH1:

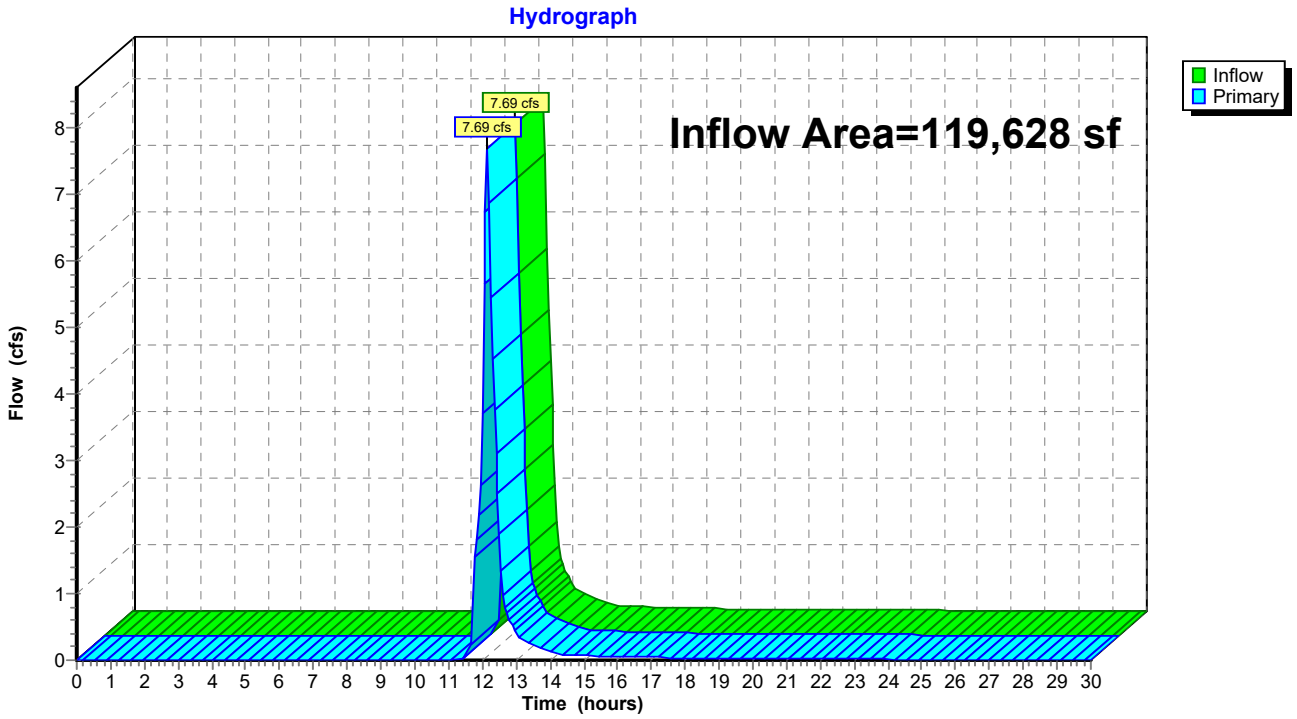


Summary for Pond DP1: Drainage Network

Inflow Area = 119,628 sf, 53.46% Impervious, Inflow Depth = 1.45" for 100 yr event
Inflow = 7.69 cfs @ 12.15 hrs, Volume= 14,477 cf
Primary = 7.69 cfs @ 12.15 hrs, Volume= 14,477 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Pond DP1: Drainage Network

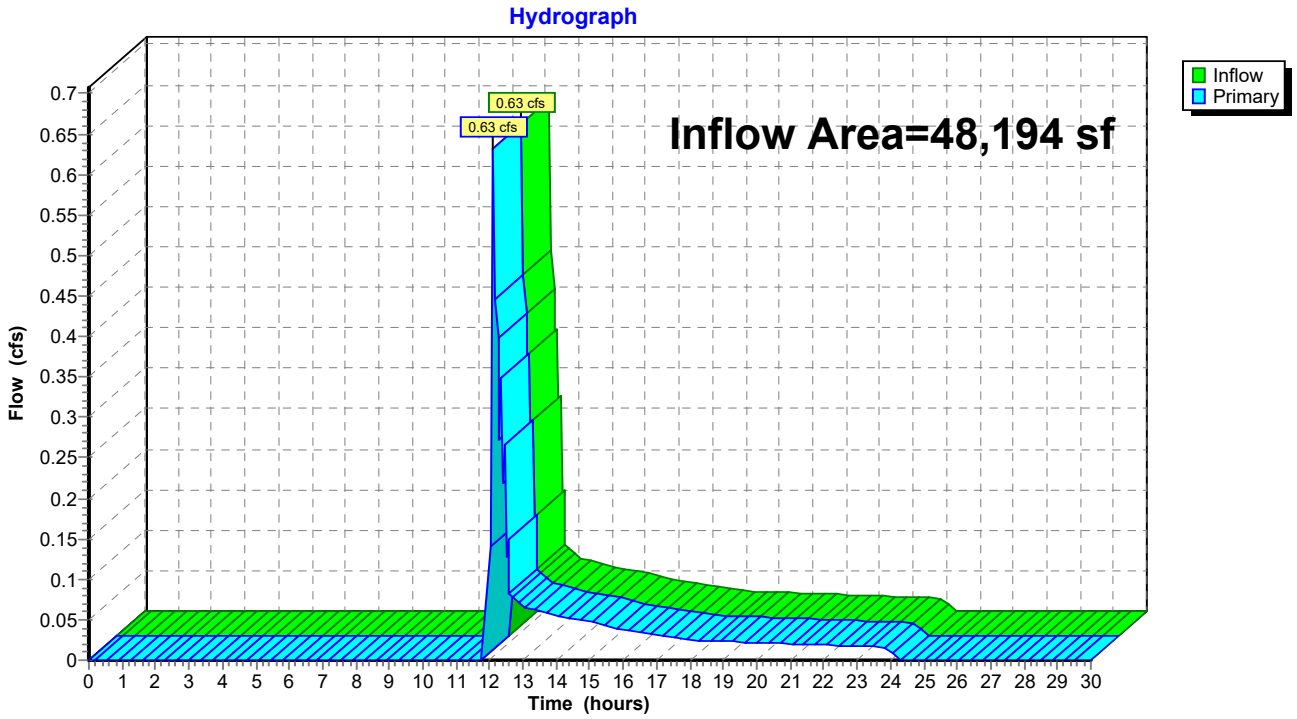


Summary for Pond DP2: Wetlands

Inflow Area = 48,194 sf, 7.68% Impervious, Inflow Depth = 0.48" for 100 yr event
Inflow = 0.63 cfs @ 12.12 hrs, Volume= 1,926 cf
Primary = 0.63 cfs @ 12.12 hrs, Volume= 1,926 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Pond DP2: Wetlands



Summary for Pond IS1: Infiltration System 1

Inflow Area = 41,131 sf, 74.21% Impervious, Inflow Depth = 5.58" for 100 yr event
Inflow = 5.45 cfs @ 12.09 hrs, Volume= 19,129 cf
Outflow = 3.66 cfs @ 12.20 hrs, Volume= 19,149 cf, Atten= 33%, Lag= 6.5 min
Discarded = 1.19 cfs @ 12.20 hrs, Volume= 17,319 cf
Primary = 2.48 cfs @ 12.20 hrs, Volume= 1,831 cf
Routed to Pond DP1 : Drainage Network

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 142.80' @ 12.20 hrs Surf.Area= 3,262 sf Storage= 3,457 cf
Flood Elev= 142.83' Surf.Area= 3,262 sf Storage= 3,502 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 16.0 min (776.5 - 760.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	141.00'	1,649 cf	**61.50'W x 53.04'L x 1.83'H Field A** 5,980 cf Overall - 1,857 cf Embedded = 4,123 cf x 40.0% Voids
#2A	141.00'	1,857 cf	**ADS_StormTech SC-310 +Cap** x 126 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 126 Chambers in 18 Rows
		3,507 cf	Total Available Storage

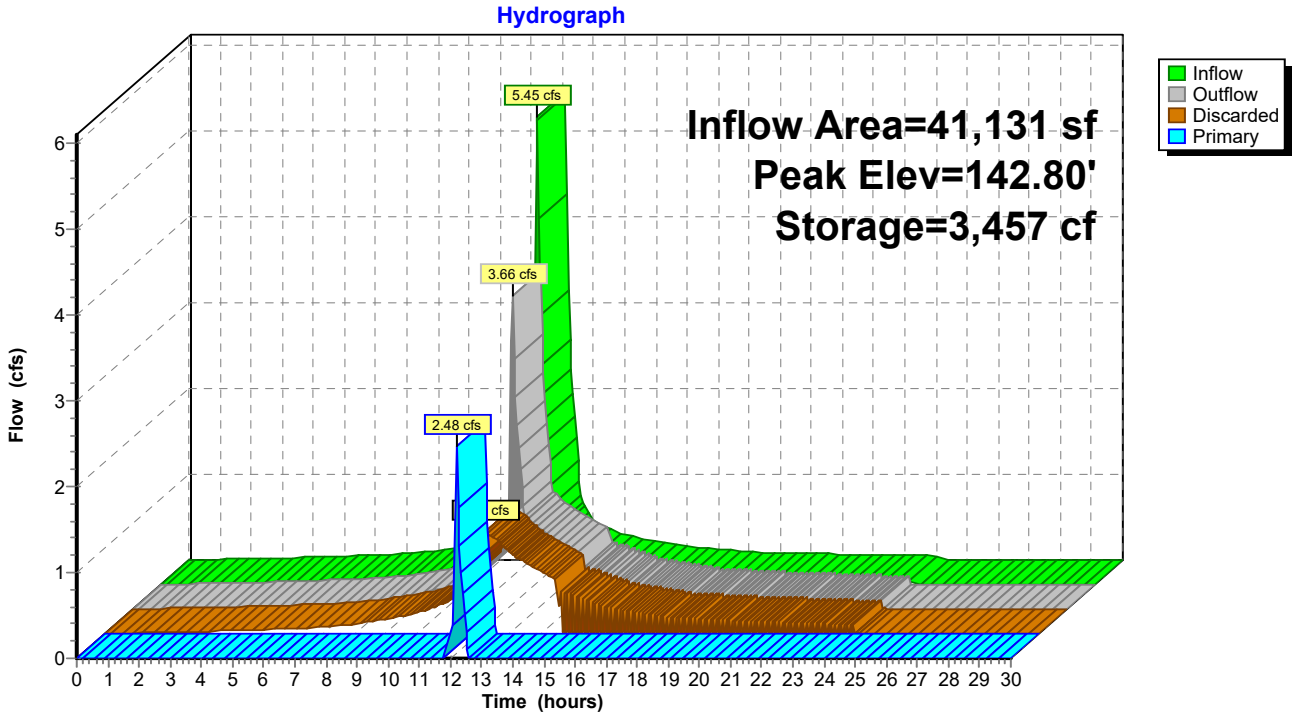
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	141.00'	**15.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 141.00' / 140.00' S= 0.0250 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	141.00'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.00'
#3	Device 1	142.50'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=1.18 cfs @ 12.20 hrs HW=142.79' (Free Discharge)
└**2=Exfiltration** (Controls 1.18 cfs)

Primary OutFlow Max=2.43 cfs @ 12.20 hrs HW=142.79' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.43 cfs of 6.38 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 2.43 cfs @ 1.77 fps)

Pond IS1: Infiltration System 1



Summary for Pond IS2: Infiltration System 2

Inflow Area = 60,293 sf, 50.15% Impervious, Inflow Depth > 5.11" for 100 yr event
Inflow = 6.23 cfs @ 12.09 hrs, Volume= 25,681 cf
Outflow = 6.23 cfs @ 12.10 hrs, Volume= 25,683 cf, Atten= 0%, Lag= 0.7 min
Discarded = 0.51 cfs @ 12.10 hrs, Volume= 16,526 cf
Primary = 5.71 cfs @ 12.10 hrs, Volume= 9,157 cf
Routed to Pond DP1 : Drainage Network

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 143.08' @ 12.10 hrs Surf.Area= 1,494 sf Storage= 1,437 cf
Flood Elev= 143.50' Surf.Area= 1,494 sf Storage= 1,691 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 13.8 min (803.2 - 789.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	141.50'	865 cf	**24.83'W x 60.16'L x 2.00'H Field A** 2,988 cf Overall - 826 cf Embedded = 2,162 cf x 40.0% Voids
#2A	141.50'	826 cf	**ADS_StormTech SC-310 +Cap** x 56 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 56 Chambers in 7 Rows
		1,691 cf	Total Available Storage

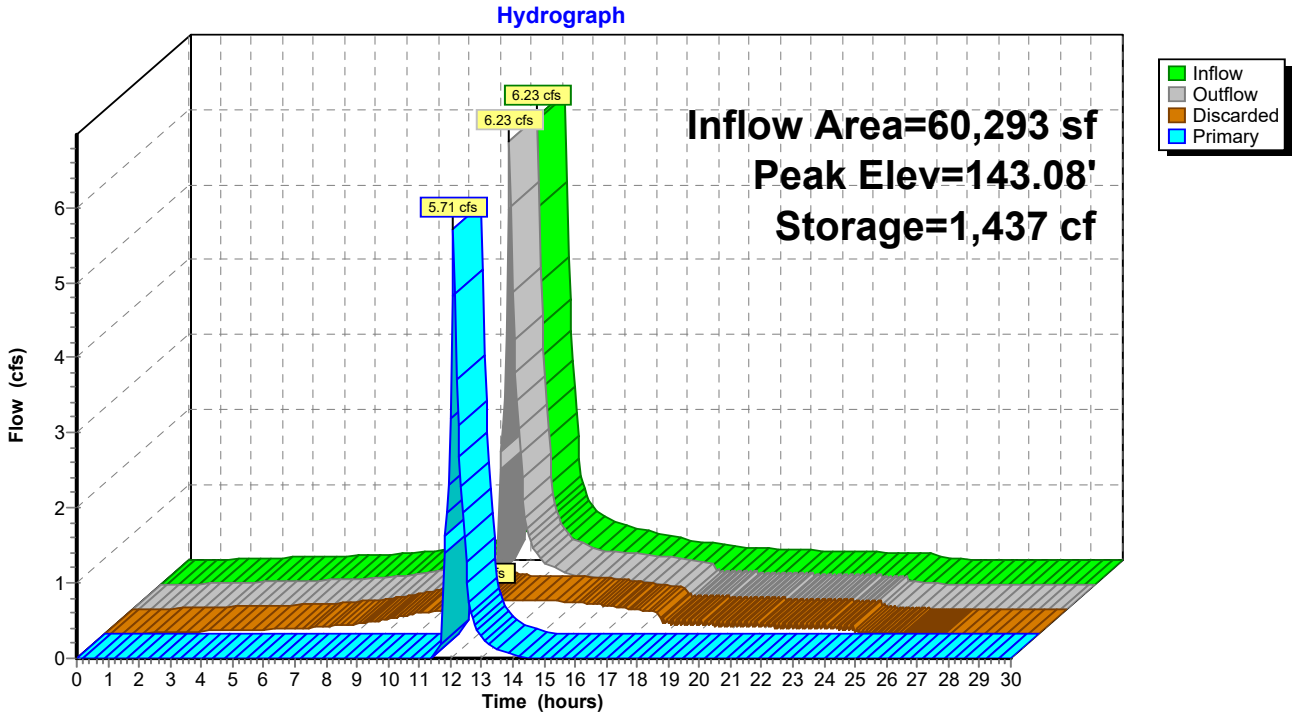
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	141.50'	**15.0" Round Culvert** L= 80.0' Ke= 0.500 Inlet / Outlet Invert= 141.50' / 140.00' S= 0.0187 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	141.50'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 139.50'
#3	Device 1	142.56'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.51 cfs @ 12.10 hrs HW=143.08' (Free Discharge)
└**2=Exfiltration** (Controls 0.51 cfs)

Primary OutFlow Max=5.71 cfs @ 12.10 hrs HW=143.08' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 5.71 cfs of 5.76 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 5.71 cfs @ 2.35 fps)

Pond IS2: Infiltration System 2



Appendix VI HydroCAD Output for Recharge Volume

Infiltration System 1 (IS1)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
141.00	**3,262**	0
141.05	3,262	130
141.10	3,262	260
141.15	3,262	388
141.20	3,262	516
141.25	3,262	643
141.30	3,262	769
141.35	3,262	893
141.40	3,262	1,016
141.45	3,262	1,137
141.50	3,262	1,257
141.55	3,262	1,375
141.60	3,262	1,492
141.65	3,262	1,607
141.70	3,262	1,720
141.75	3,262	1,830
141.80	3,262	1,938
141.85	3,262	2,043
141.90	3,262	2,146
141.95	3,262	2,245
142.00	3,262	2,341
142.05	3,262	2,431
142.10	3,262	2,516
142.15	3,262	2,595
142.20	3,262	2,670
142.25	3,262	2,741
142.30	3,262	2,810
142.35	3,262	2,876
142.40	3,262	2,941
142.45	3,262	3,006
142.50	3,262	3,072
142.55	3,262	3,137
142.60	3,262	3,202
142.65	3,262	3,267
142.70	3,262	3,333
142.75	3,262	3,398
142.80	3,262	**3,463**

Infiltration System 2 (IS2)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
141.50	**1,494**	0
141.55	1,494	59
141.60	1,494	117
141.65	1,494	175
141.70	1,494	233
141.75	1,494	290
141.80	1,494	347
141.85	1,494	403
141.90	1,494	459
141.95	1,494	513
142.00	1,494	568
142.05	1,494	621
142.10	1,494	674
142.15	1,494	726
142.20	1,494	777
142.25	1,494	827
142.30	1,494	875
142.35	1,494	923
142.40	1,494	970
142.45	1,494	1,015
142.50	1,494	1,058
142.55	1,494	1,099
142.60	1,494	1,138
142.65	1,494	1,174
142.70	1,494	1,208
142.75	1,494	1,240
142.80	1,494	1,272
142.85	1,494	1,302
142.90	1,494	1,332
142.95	1,494	1,362
143.00	1,494	1,392
143.05	1,494	1,422
143.10	1,494	1,451
143.15	1,494	1,481
143.20	1,494	1,511
143.25	1,494	1,541
143.30	1,494	1,571
143.35	1,494	1,601
143.40	1,494	1,631
143.45	1,494	1,661
143.50	1,494	**1,691**

Pervious Northern Fire Lane(1P)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
142.00	**3,280**	0
142.05	3,280	50
142.10	3,280	102
142.15	3,280	154
142.20	3,280	206
142.25	3,280	258
142.30	3,280	311
142.35	3,280	363
142.40	3,280	415
142.45	3,280	466
142.50	3,280	517
142.55	3,280	566
142.60	3,280	615
142.65	3,280	664
142.70	3,280	714
142.75	3,280	763
142.80	3,280	812
142.85	3,280	861
142.90	3,280	910
142.95	3,280	960
143.00	3,280	1,009
143.05	3,280	1,058
143.10	3,280	1,107
143.15	3,280	1,156
143.20	3,280	1,206
143.25	3,280	1,255
143.30	3,280	1,304

Pervious Northern Fire Lane (2P)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
141.50	**700**	0
141.55	700	11
141.60	700	22
141.65	700	34
141.70	700	46
141.75	700	58
141.80	700	69
141.85	700	81
141.90	700	93
141.95	700	104
142.00	700	115
142.05	700	126
142.10	700	136
142.15	700	147
142.20	700	157
142.25	700	168
142.30	700	178
142.35	700	189
142.40	700	199
142.45	700	210
142.50	700	220
142.55	700	231
142.60	700	241
142.65	700	252
142.70	700	262
142.75	700	273
142.80	700	283
142.85	700	294
142.90	700	304
142.95	700	315
143.00	700	325
143.05	700	336
143.10	700	346
143.15	700	357
143.20	700	367
143.25	700	378
143.30	700	388

Pervious Northern Fire Lane (3P)

141.55	1,200	208
141.60	1,200	226
141.65	1,200	244
141.70	1,200	262
141.75	1,200	280
141.80	1,200	298
141.85	1,200	316
141.90	1,200	334
141.95	1,200	352
142.00	1,200	370
142.05	1,200	388
142.10	1,200	406
142.15	1,200	424
142.20	1,200	442
142.25	1,200	460
142.30	1,200	478
142.35	1,200	496
142.40	1,200	514
142.45	1,200	532
142.50	1,200	550
142.55	1,200	568
142.60	1,200	586
142.65	1,200	604
142.70	1,200	622
142.75	1,200	640
142.80	1,200	658
142.85	1,200	676
142.90	1,200	694
142.95	1,200	712
143.00	1,200	730
143.05	1,200	**748**
143.10	1,200	**759**

Pervious Southern Fire Lane (4P)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
143.50	**4,660**	0
143.55	4,660	72
143.60	4,660	146
143.65	4,660	220
143.70	4,660	295
143.75	4,660	370
143.80	4,660	445
143.85	4,660	520
143.90	4,660	595
143.95	4,660	668
144.00	4,660	740
144.05	4,660	810
144.10	4,660	880
144.15	4,660	950
144.20	4,660	1,020
144.25	4,660	1,090
144.30	4,660	1,160
144.35	4,660	1,230
144.40	4,660	1,299
144.45	4,660	1,369
144.50	4,660	1,439
144.55	4,660	1,509
144.60	4,660	1,579
144.65	4,660	1,649
144.70	4,660	1,719
144.75	4,660	1,789
144.80	4,660	1,859
144.85	4,660	1,929
144.90	4,660	1,998
144.95	4,660	2,068
145.00	4,660	2,138
145.05	4,660	2,208
145.10	4,660	2,278
145.15	4,660	2,348
145.20	4,660	2,418
145.25	4,660	2,488
145.30	4,660	2,558
145.35	4,660	2,628
145.40	4,660	2,697
145.45	4,660	2,767
145.50	4,660	2,837
145.55	4,660	**2,907**

Permeable Pavers Back patio: 1,720 x 1’ x 30% voids = 516 cf
Permeable Pavers Front patios: 1400sf x 1’ x 30% voids = 420 cf
Stone Infiltration Trench: 300’ X 2’ x 2’ x 40% voids = 480cf

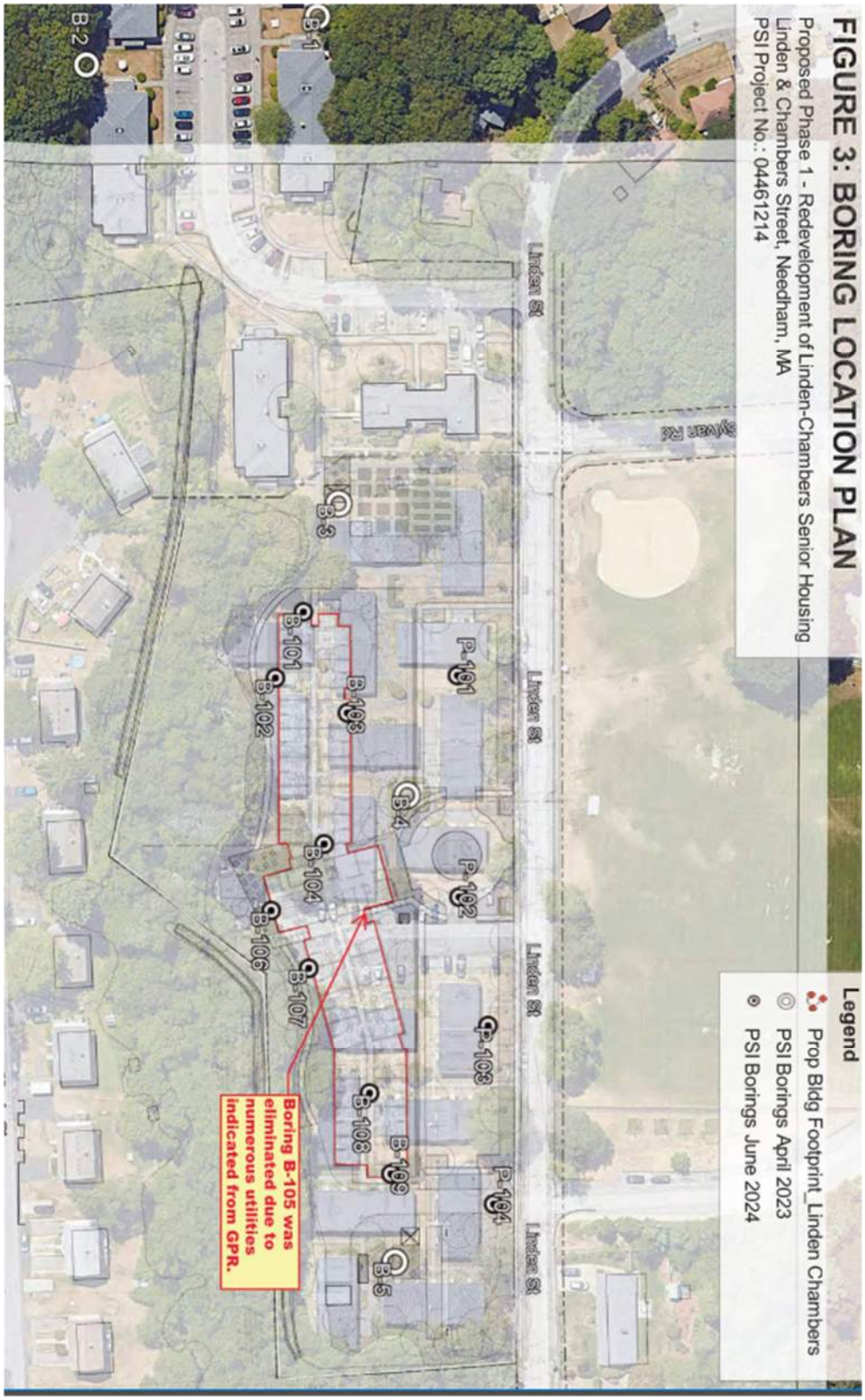
Appendix VII HydroCAD Output for Water Quality Volume

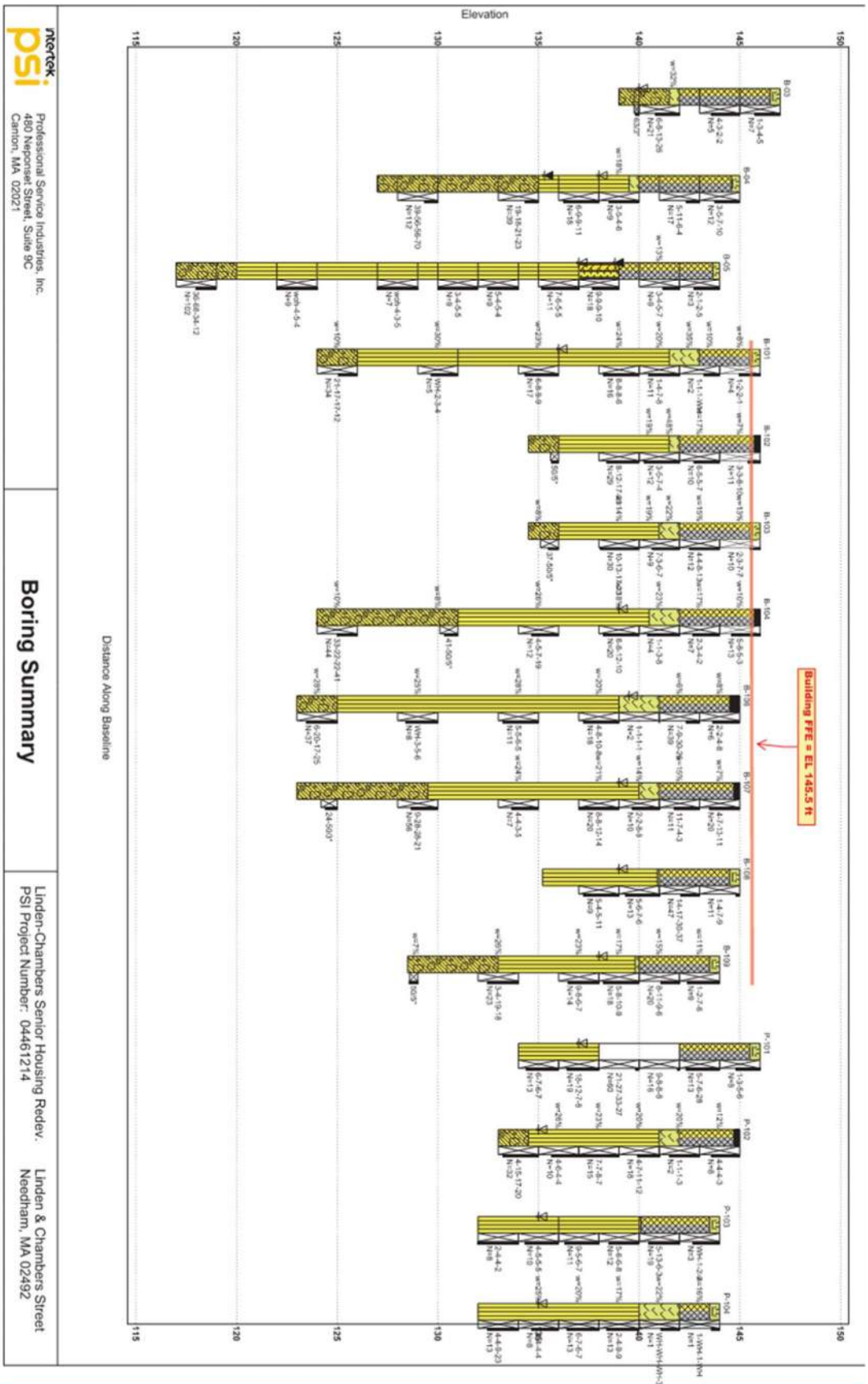
Infiltration System 2

Inflow Area = 60,293 sf, 50.15% Impervious, Inflow Depth > 0.61" for 1.6 event
Inflow = 0.88 cfs @ 12.09 hrs, Volume= 3,043 cf
Outflow = 0.33 cfs @ 12.34 hrs, Volume= 3,060 cf, Atten= 62%, Lag= 15.2 min
Discarded = 0.33 cfs @ 12.34 hrs, Volume= 3,060 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DP1 : Drainage Network

Pervious Pavement Left Driveway: (See reports in Appendix VI)
Pervious Pavement Right Driveway: (See reports in Appendix VI)
Permeable Pavers Back patio: (See reports in Appendix VI)
Permeable Pavers Front patios: (See reports in Appendix VI)

Appendix VIII Geotechnical Report




Elevation
Distance Along Baseline
Building FFE = EL 145.5 ft
Boring Summary
Professional Service Industries, Inc.
480 Neponset Street, Suite 9C
Canton, MA 02021
Linden-Chambers Senior Housing Redev.
PSI Project Number: 04461214
Linden & Chambers Street
Needham, MA 02492

HANCOCK
ASSOCIATES

Surveyors | Engineers | Scientists

Alexandra Clee

From: Tom Conroy
Sent: Thursday, October 24, 2024 12:35 PM
To: Alexandra Clee
Cc: Donald Anastasi; Jay Steeves; Ronnie Gavel; Joseph Prondak
Subject: RE: request for comment - revised Linden Chambers

Hi Alex,
The Fire Department met with the stakeholders and feel comfortable with the revisions. Fire dept. is in favor.
Tom

Thomas M. Conroy
Fire Chief - Needham Fire Department
tconroy@needhamma.gov
Ph (781) 455-7580

From: Alexandra Clee <aclee@needhamma.gov>
Sent: Wednesday, October 23, 2024 12:37 PM
To: Thomas Ryder <tryder@needhamma.gov>; Tom Conroy <TConroy@needhamma.gov>
Cc: Lee Newman <LNewman@needhamma.gov>; Donald Anastasi <DAnastasi@needhamma.gov>; Elisa Litchman <elitchman@needhamma.gov>
Subject: request for comment - revised Linden Chambers
Importance: High

Dear Chief Conroy and Tom,

Attached is a cover letter explaining the revisions to the Linden Chambers plans. The revised plans and the revised Stormwater report can be found here: https://app.box.com/s/jkcbhmrjmapu2kqe8w288xte99mmc1r4 (if you have any trouble, let me know and I will put these documents on the K drive instead).

Please send your comments ion advance of the Planning Board continued hearing on Tuesday Oct 29.

THank you! Alex.

Alexandra Clee
Assistant Town Planner
Needham, MA
781-455-7550 ext. 271
www.needhamma.gov

TOWN OF NEEDHAM, MASSACHUSETTS
PUBLIC WORKS DEPARTMENT
500 Dedham Avenue, Needham, MA 02492
Telephone (781) 455-7550 FAX (781) 449-9023

October 24, 2024

Needham Planning Board
Needham Public Service Administration Building
Needham, MA 02492

RE: Major Project Special Permit MPSP 2024-01
Linden Chambers Housing Redevelopment

Dear Members of the Board,

The Department of Public Works has completed its review of the updated plans for the above referenced site. The applicant is proposing to demolish and redevelop property at 0 Linden and 5 Chamber Street. Phase IA consists of demolishing 10-existing buildings on Linden Street and constructing a new 4-story building with 76- units. Phase IB consists of demolishing 8-existing buildings on Linden Street and constructing the remaining 60- unit wing of the proposed building.

The updated documents submitted for review are based on the Housing Authority's meeting with the Fire department on October 9, 2024 and as follows:

1. Letter from Reginald C. Foster, Chair, Board of Commissioners, Needham Housing Authority, dated October 11, 2024.
2. Stormwater Report, titled "Stormwater Report In Support of Notice of Intent for Linden Street Redevelopment (Map 133, Lots 23 and 24) Needham MA" by Hancock Associates, dated 8/23/24, revised 10/11/2024.
3. Plan Set for Neeham Housing Authority prepared by Bargmann Hendrie + Archetype Inc., , Hancock Associates, and Ground Landscape Inc., consisting of 33 sheets dated September 6, 2024, revised October 11, 2024.

Our comments and recommendations are as follows:

- We have no comments or concerns.

If you have any questions regarding the above, please contact our office at 781-455-7538.

Truly yours,

Thomas A Ryder
Town Engineer

From: noreply@civicplus.com
To: Alexandra Clee; Lee Newman; Elisa Litchman
Subject: Online Form Submittal: Contact Planning Board
Date: Tuesday, October 15, 2024 7:49:25 PM

Contact Planning Board

Please use this form to contact the Planning Board. Thank you.

Contact Information

Full Name:	Kaleigh Moriarty
Email Address:	KaleighMoriarty@gmail.com
Address:	39 Chambers St Apt B
City/Town:	Needham
State:	MA
Zip Code:	02492
Telephone Number:	6178637185
Comments / Questions	What is the plan for the residents being relocated and housed during the renovation? The residents cannot live there during the renovation as smoke inhalation is incredibly dangerous and essentially putting the elderly and low income individuals into a predetermined death. This is absolutely concerning.

Email not displaying correctly? View it in your browser.

Alexandra Clee

From: Timothy McDonald
Sent: Tuesday, October 15, 2024 11:17 AM
To: Lee Newman; Alexandra Clee
Subject: Board of Health considering Nicotine Free Generation Policy (via amending Article 1)
Attachments: NFG Packet.pdf; Article 1 Packet.pdf

Hi Lee and Alex.

The Board of Health is actively considering whether to amend its Article 1: Regulation Affecting Smoking and the Sale and Distribution of Tobacco Products in Needham. In addition to some housekeeping and updating, the biggest potential change is the proposed adoption of the Nicotine Free Generation (NFG) policy, whereby the legal sales age would move from 21 years old to a gatekeeping date of January 1, 2004 (as an example) making persons born after that date forever ineligible to purchase nicotine and tobacco products in the Town of Needham.

The Board of Health has a multi-month public hearing that is continued over to the Board's next meeting on Friday 11/22/2024. The Board of Health is sending this information, including the attached packets with the equity analysis of the proposed changes, to ask if the Planning Board would like to provide comment at, or in advance of, the Board's next meeting.

Thanks for your consideration.
TMM

Timothy Muir McDonald
He/Him/His (What's this?)

Director, Needham Department of Health & Human Services

Rosemary Recreation Complex
178 Rosemary Street
Needham, MA 02494

Public Health Division Office: 781-455-7940
Public Health Division Fax: 781-455-7922
Email: tmcdonald@needhamma.gov

Follow Needham Public Health on Twitter!

Needham Public Health Division
Prevent. Promote. Protect.

Board of Health
Town of Needham
AGENDA FACT SHEET

MEETING DATE: October 8, 2024

Agenda Item	Nicotine Free Generation testimony
Presenter(s)	Maureen Buzby, Regional Tobacco Inspection Coordinator City of Melrose & Mark Gottlieb, Executive Director, Public Health Advocacy Institute: Northeastern University School of Law

1.	**BRIEF DESCRIPTION OF TOPIC TO BE DISCUSSED**
Ms. Buzby and Mr. Gottlieb will give testimony about Nicotine Free Generation as municipal government policy.	
2.	**VOTE REQUIRED BY BOARD OF HEALTH**
Discussion only.	
3.	**BACK UP INFORMATION:**

a) Public Health Division Equity Analysis for Proposed Nicotine Free Generation Policy
b) Nicotine Free Generation supporting documents from September 5, 2024 Board of Health Meeting

MEMORANDUM

To: Needham Board of Health
From: Karen Shannon, Substance Use Prevention Program Coordinator
Monica De Winter, Substance Use Prevention Program Assistant
CC: Tiffany Benoit, Assistant Public Health Director
Date: October 6, 2024
Re: Equity Analysis of Nicotine Free Generation

Overview:
The Nicotine Free Generation is an end-game approach to preventing youth nicotine addiction by prohibiting the sale of nicotine products to individuals born after a specified date. This phased-in policy targets the prevention of future nicotine use while leaving current users unaffected. Given that 99% of smokers begin before age 26 (2014 Surgeon General Report), this policy aligns with public health goals to reduce smoking rates among future generations.

The Needham Public Health Division (NPHD) is committed to addressing health inequities, particularly those rooted in systemic racism. This equity analysis assesses how the Nicotine Free Generation policy may impact diverse populations in Needham, using equity assessment questions from the NPHD's Racial and Health Equity policy.

What are the racial equity impacts of a Nicotine Free Generation policy in Needham?
Implementing a Nicotine Free Generation policy in Needham has important implications for racial equity, particularly concerning the health and well-being of marginalized communities that have been disproportionately affected by tobacco use and marketing practices.

Targeted marketing to minority groups:
Tobacco companies have historically targeted racial and ethnic minority groups, including American Indian and Alaska Native populations. This predatory marketing has led to higher rates of tobacco use in these communities, exacerbating health disparities.

High smoking rates have had a devastating impact on American Indians, especially those in the Northern Plains region. Of all racial/ethnic groups, American Indian adults have the highest smoking rate in the U.S. and are almost twice as likely as white Americans to die from lung cancer.[1]

The tobacco industry has heavily marketed menthol cigarettes and other tobacco products like flavored cigars to Black Americans, particularly youth. This has resulted in

[1] Ahébée, S., (2021), *Sacred tobacco and American Indians, tradition and conflict*, The Pulse, WHYY, https://whyy.org/segments/keep-it-sacred-smoking-indigenous-people-tradition-and-conflict/

significant health disparities, with smoking-related illnesses being the leading cause of death in the African American community, surpassing other major health threats. Approximately 45,000 African Americans die annually from smoking-related diseases.[2]

The National Youth Tobacco Survey indicates that e-cigarettes are the most commonly used tobacco product among African American youth, with 5.6% of high schoolers and 5.7% of middle schoolers reported as current users in 2023. This trend underscores the urgent need for policies that restrict youth access to tobacco products.[3]

Data from the 2023 MetroWest Adolescent Health Survey shows 2.1% of Needham High School students (29 students) report smoking cigarettes in the past 30 days. Among students who reported smoking cigarettes, the rates for Black and Hispanic &Latino students exceed the overall rate, despite their smaller representation: 3.0% of Black students (1 student), 6.4% of Hispanic/Latino students (8 students), 1.5% of White students (14 students), and 0.8% of Asian students (1 student).**

The 2023 MWAHS survey shows 8.6% of Needham High School students (117 students) report current use of electronic vapor products. Among those who vape, a higher percentage of Black and Hispanic & Latino students report current use compared to White and Asian students, despite their smaller numbers: 24.2% of Black students (9 students), 14.5% of Hispanic & Latino students (26 students), 7.4% of White students (70 students), and 4.5% of Asian students (6 students).**

Disparities in smoking rates among LGBTQ+ community

Smoking among lesbian, gay, and bisexual adults in the United States is much higher than among heterosexual/straight adults. About 1 in 6 (15.3%) of lesbian, gay, and bisexual adults smoke cigarettes, compared with about 1 in 9 (11.4%) of heterosexual or straight adults. Cigarette smoking is also higher among transgender adults (35.5%), than among adults whose gender identity corresponds with their birth sex (cisgender).[4]

The disparities in cigarette use and electronic vapor product use extend to Needham High School students who identify as LGBTQ+. The 2023 MetroWest Adolescent Health Survey reveals: of the 2.1% of students who report current use of cigarettes, 4.5% of students (10 students) who identify as LGBTQ+ report current cigarette use compared to 1.3% who do not identify at LGBTQ+ (14 students). Of the 8.6% of students who report current use electronic vapor products, 12.7% students (29 students) who identify as LGBTQ+ report current use of EVPs compared to 7.6% of students (83 students) who do not identify as LGBTQ+. **

** The number of students is rounded to nearest whole number.

[2] *Tobacco Use and Black Americans*, (2021), Campaign for Tobacco Free Kids, https://www.tobaccofreekids.org/problem/health-disparities
[3] Minosa, M. (2024), *Tobacco Use Among African Americans*, Campaign for Tobacco Free Kids, https://assets.tobaccofreekids.org/factsheets/0006.pdf
[4] *LGBTQ+ People*, (2024), Centers for Disease Control and Prevention, https://www.cdc.gov/tobacco/campaign/tips/groups/lgbt.html#:~:text=Know%20the%20Facts,%25)%20of%20heterosexual/straight%20adults.&text=Cigarette%20smoking%20is%20also%20higher,their%20birth%20sex%20(cisgender

Who will benefit from or be burdened by the particular decision?

Economic impact:
The implementation of a Nicotine Free Generation policy is likely to have economic implications, particularly for retail store owners with Tobacco Product Sales Permits. Understanding these impacts is crucial for planning and transition strategies.

Retailers that rely on sales from nicotine products may experience a decrease in profits as young people become ineligible to purchase these products. This can particularly affect convenience stores where tobacco sales form a portion of revenue.

Fortunately, the policy is designed to phase out sales gradually. This allows retailers adequate time to adjust their business models and providing an opportunity to explore alternative revenue streams. By investing in healthier alternatives or other non-tobacco products, they can mitigate potential losses from reduced nicotine sales.

Data from the National Health Interview Surveys indicates a substantial decline in smoking prevalence among young adults aged 18 to 24 years, dropping from 19.2% in 2011 to 4.9% in 2022. This trend suggests that even without the policy, there is a natural decline in youth smoking rates, potentially mitigating some economic impacts on retailers over time.[5]

In Needham, youth smoking rates have also significantly decreased, from 12.9% in 2006 to just 2.1% in 2023 (MWAHS 2023). This decrease indicates that local efforts to reduce tobacco use are already having a positive impact, suggesting that a transition to a Nicotine Free Generation policy may be less disruptive than anticipated.

Youth benefit:
Almost 90 percent of adult daily smokers started smoking by the age of 18, and about 1,500 youth under 18 smoke their first cigarette every day in the United States. In fact, use of tobacco products, no matter what type, is almost always started and established during adolescence when the developing brain is most vulnerable to nicotine addiction.[6] By implementing policies that restrict access to nicotine products for youth, communities can significantly reduce initiation rates. Limiting legal access creates a barrier that can help protect young people from starting to use nicotine.

Impact on current nicotine users:

Quitting among populations:
While current nicotine users retain access to nicotine products, they may consider quitting, particularly if cessation medications and programs are readily available. Nearly

[5] Meza, Rafael, PhD., et al, *Trends in US Adult Smoking Prevalence, 2011 to 2022*,(2023), JAMA Health Forum, https://jamanetwork.com/journals/jama-health-forum/fullarticle/2812427

[6] *Youth and Tobacco*, (2024), U.S. Food & Drug Administration, https://www.fda.gov/tobacco-products/public-health-education/youth-and-tobacco#:~:text=Almost%2090%20percent%20of%20adult,day%20in%20the%20United%20States.

70% of smokers say they want to quit. For many smokers, it may take 30 or more quit attempts before successfully quitting smoking.[7]

American Indian and Alaska Native Adults: Only 55.6% express a desire to quit smoking, which is lower compared to other racial and ethnic groups.[8]

In contrast, higher percentages of individuals wanting to quit include 72.8% of African Americans, 69.6% of Asians, 67.5% of Whites, and 67.4% of Hispanics. This discrepancy highlights the unique challenges faced by Indigenous populations regarding tobacco cessation.[8]

Cessation program considerations:

Socioeconomic status and health disparities:
The National Health Interview Survey indicates that focusing cessation efforts on individuals with low socioeconomic status could yield the most significant reductions in smoking-related morbidity and mortality. This group often experiences higher smoking rates and poorer health outcomes, making targeted interventions essential for health equity. (5) Smoking rates among Medicaid enrollees are significantly higher (23.9%) compared to adults with private health insurance (10.5%).[5]

Insurance coverage for cessation:
Massachusetts law (Chapter 176B, Section 4NN) mandates that insurers cover tobacco cessation counseling and products, benefiting MassHealth subscribers. Ensuring access to these resources is vital for supporting individuals in marginalized communities who wish to quit.

The tobacco industry's impact on specific populations highlights the need for culturally specific cessation programs. By focusing on groups with lower quitting intentions and higher smoking rates, public health initiatives can reduce health disparities and improve outcomes.

Ensuring access to culturally specific cessation resources is vital for effectively supporting marginalized groups, including Native American citizens and individuals who identify as LGBTQ+. These communities often face unique challenges and barriers to quitting smoking, making tailored interventions essential.

American Indians and Alaska Natives: As stated earlier in this document, this group has the highest rates of tobacco use in the U.S. It is crucial to differentiate between commercial tobacco use and traditional tobacco practices, which are deeply rooted in cultural and spiritual traditions. Traditional tobacco is often viewed as a sacred element

[7] *Quitting Tobacco*, (2024), Truth Initiative, https://truthinitiative.org/sites/default/files/media/files/2024/04/Quitting%20Tobacco%20Fact%20Sheet%202024_approved.pdf

[8] *American Indians/Alaska Natives*, (2020), Truth Initiative, https://truthinitiative.org/sites/default/files/media/files/2022/05/Truth_Race-ethnicity%20Series%20Factsheets-Amer%20Ind_051722.pdf

used in peace, healing, and ceremonial practices, necessitating culturally sensitive cessation programs that respect these traditions.[9]

LGBTQ+ Smoking Rates:
Approximately 66.7% of LGBTQ+ adult smokers express interest in quitting, with 48.4% attempting to quit in the past year. These rates are lower than those of their heterosexual counterparts, indicating a need for targeted support within this community.[7]

Culturally specific programs:
Initiatives like the Queer Tobacco Intervention Project (QueerTIP) provide culturally relevant support for LGBTQ+ individuals, allowing participants to discuss their unique challenges in a safe environment. Such programs demonstrate the effectiveness of addressing cultural contexts in smoking cessation efforts.[10]

Funding and resource allocation:
States are projected to collect $25.9 billion from tobacco settlements and taxes in fiscal year 2024 but plan to allocate only 2.8% ($728.6 million) to tobacco prevention and cessation programs. This is far below the CDC's recommendations, highlighting the need for greater investment in comprehensive tobacco control programs that can effectively support diverse populations.[7]

Expanding access to digital resources:
The Surgeon General recommends increasing access to digital quitting resources, such as internet and text message interventions. These platforms can be particularly effective for marginalized groups, providing accessible and convenient support for those looking to quit.[7]

Are there strategies to mitigate the unintended consequences?

Positive Community Norms:
The implementation of a Nicotine Free Generation policy can significantly influence community perceptions and behaviors surrounding nicotine use. By creating a clear stance against nicotine consumption among youth, the policy may foster an environment that encourages current users to reconsider their habits.

As the policy takes effect and fewer young people have access to nicotine products, non-use can become the predominant social norm. This shift can encourage current users to quit as they observe a growing number of peers choosing not to use nicotine.

[9] *Tobacco use in the American Indian/Alaska Native community*, (2020), Truth Initiative, https://truthinitiative.org/research-resources/targeted-communities/tobacco-use-american-indianalaska-native-community

[10] Smoking Cessation Interventions in San Francisco's Queer* Communities, Science to Community, https://prevention.ucsf.edu/sites/prevention.ucsf.edu/files/uploads/pubs/reports/pdf/Q-TIPS2C.pdf

Friends and family may encourage current users to quit, reducing stigma around seeking help and enhancing access to resources.

Culturally specific cessation programs:
An uptick in the number of current nicotine users expressing interest in quitting can be the impetus for the development and implementation of culturally specific cessation programs.

Cessation programs tailored to specific populations can significantly enhance the effectiveness of smoking cessation efforts, particularly among populations with higher smoking rates. For example, a clinical trial of a youth quit-vaping program using interactive text messaging showed promising results. The study, This is Quitting, by Truth Initiative shows 35% of teens are more likely to quit vaping nicotine within seven months compared to those not enrolled in the program.[11]

Cross-border purchases:
There is a potential concern that youth may cross town lines to purchase nicotine products.
When Needham Massachusetts became the first town to enact Tobacco 21, opponents of the policy made the argument that youth between 18-21 would just buy from the next town over. Yet following the passage of Tobacco 21, Needham experienced more than a 50% decrease in high school smoking, the steepest decline in Needham's youth smoking rates. The percentage of high schoolers who smoked declined at nearly triple the rate in Needham than in surrounding towns that had not adopted the policy (Winickoff 2014; Schneider 2016). Decreasing access to tobacco in even one town has been proven to work.[12]

A Nicotine Free Generation policy presents the opportunity to advance racial and health equity by addressing systemic inequities rooted in tobacco use and the tobacco industry's marketing tactics. With thoughtful implementation that includes culturally sensitive approaches and barrier-free access to cessation programs, a Nicotine Free Generation policy can reduce health disparities and foster a healthier community for all.

[11] Text message program from Truth Initiative helps teens quit e-cigarettes, (2024), Truth Initiative, https://truthinitiative.org/research-resources/quitting-smoking-vaping/text-message-program-truth-initiative-helps-teens-quit-e
[12] *Savage T., Ishak A., Silbaugh K., Chadwick G., Hartmann L., Gottlieb M., Buzby M., Winickoff J. Nicotine-Free Generation Frequently Asked Questions and Answers. Version 08132024*

Board of Health
Town of Needham
AGENDA FACT SHEET

MEETING DATE:

Agenda Item	Nicotine Free Generation
Presenter(s)	Timothy McDonald, Director of Health & Human Services

1.	**BRIEF DESCRIPTION OF TOPIC TO BE DISCUSSED**

Mr. McDonald will lead the Board in a discussion and a public hearing about the Nicotine Free Generation concept.

2.	**VOTE REQUIRED BY BOARD OF HEALTH**

The Board will hold a public hearing on the concept of the Nicotine Free Generation. The Board will accept public comments, and will engage in its own discussion about the proposal. There is no proposed regulatory language at this stage, so the Board is very unlikely to vote in the month of September. The hearing will likely be carried over to the Board's October meeting.

3.	**BACK UP INFORMATION:**

- Nicotine Free Generation MA – one page overview from Savage, Chadwick, and Winickoff
- Nicotine Free Generation FAQs
- Example of email opposing Nicotine Free Generation concept
- Correspondence supporting the adoption of the Nicotine Free Generation
    - Dr. Alan Stern, former Needham BOH member and recently retired Needham Public School Physician
    - Needham Public Schools Superintendent Dr. Dan Gutekanst
    - Beth Israel Deaconess Hospital – Needham President John Fogarty
    - State Public Health Official Rachael Cain

178 Rosemary Street, Needham, MA 02494 P: (781) 455-7940 E: healthdivision@needhamma.gov

Nicotine-Free Generation (NFG) Overview

What is Nicotine:

The term nicotine includes all tobacco and synthetically derived nicotine products such as vapes or e-cigarettes, cigarettes, cigars, chew, and pouches.

The Problem:

Nicotine containing tobacco products remain the single greatest cause of addiction and death in Massachusetts with over 9,000 deaths each year,[I] more than three times the number of deaths from the state's opioid crisis. Tobacco kills one-half of its users,[II] accounting for 1 out of every 5 deaths in the US.[III] Despite decades of control efforts, the tobacco industry continually innovates new products and nicotine delivery methods, undermining regulation and targeting susceptible young adult populations.

Nicotine-Free Generation:

Nicotine-Free Generation (NFG) proposes a definitive, streamlined approach to tobacco control. NFG policy prohibits the sale of nicotine products to anyone born after a chosen date (e.g. January 1, 2004). Those born before this date, who currently use nicotine, may be sold products indefinitely. The policy prevents sales to the next generation, phasing out sales slowly over time.

NFG:

- **Respects the rights of users:** Those who already use nicotine products can continue to be sold nicotine indefinitely. NFG doesn't shame or stigmatize users.
- **Considers retailer needs:** NFG is gradual, providing retailers time to adjust their business model so it does not depend on selling a deadly, addictive product—the market declines only marginally each year.
- **Is socially reinforcing:** Over time, teens and young adults will be further removed in age from those who can be sold nicotine, decreasing early nicotine initiation that sparks lifelong addiction.
- **Accounts for personal rights and freedoms:** The Massachusetts Supreme Court unanimously upheld the policy in Brookline.[IV] Like asbestos or lead paint, selling tobacco is not a constitutional right. The purchase, use, or possession of tobacco is never criminalized.
- **Provides a smooth transition:** NFG avoids black market sales, as current dependent users are never cut off from legal nicotine access. Additionally, NFG curtails future demand by preventing the next generation from becoming addicted.
- **Comes at the right time and place:** NFG policy is spreading quickly, and has already been adopted by six Massachusetts towns. MA has led the country in spearheading nicotine policies such as flavor restrictions and minimum sales age of 21. Many places are meaningfully considering NFG, including other jurisdictions in the US and the countries of UK, EU, Malaysia, Singapore, Ireland, Denmark, France, Spain, and Canada.
- **Opposed strongly by Big Tobacco:** Will reduce sales, and improve public health.

[I] Campaign for Tobacco-Free Kids, "The Toll of Tobacco in Massachusetts," April 17, 2024, https://www.tobaccofreekids.org/problem/ toll-us/massachusetts.

[II] World Health Organization, "Tobacco," July 31, 2023, https://www.who.int/news-room/fact-sheets/detail/tobacco.

[III] Centers for Disease Control and Prevention, "Health Effects of Cigarette Smoking," October 29, 2011, https://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/effects_cig_smoking.

[IV] Action on Smoking and Health, "Massachusetts Supreme Judicial Court Upholds Tobacco-Free Generation Law," March 8, 2024, https://ash.org/massachusetts-supreme-court-upholds-tobacco-free-generation-law.

Citation: Savage T, Chadwick G, Winickoff JP. Nicotine Free Generation One-Page Overview. Version 08132024

Nicotine-Free Generation Frequently Asked Questions and Answers

Won't youth just go to the next town over?
When Needham Massachusetts became the first town to enact Tobacco 21, opponents of the policy made the argument that youth between 18-21 would just buy from the next town over. Yet following the passage of Tobacco 21, we saw the steepest decline in youth smoking ever recorded in Needham with a more than 50% decrease in high school smoking. The percentage of high schoolers who smoked declined at nearly triple the rate in Needham than in surrounding towns that had not adopted the policy (Winickoff 2014; Schneider 2016). Decreasing access to tobacco in even one town has been proven to work.

Doesn't NFG take away free choice for adults? Doesn't it infringe on personal rights?
The tobacco industry likes to frame NFG as a free choice issue. However, 95% of tobacco use begins before the age of 21, and 99% before 26. Early tobacco use is more likely to lead to addiction, which by definition means the loss of free choice. There is no free choice when addiction drives desire. Tobacco is not a freedom, it is an addiction and a burden—just ask people who use tobacco. Do they smoke because they want to, or because they need to?

Because tobacco has been sold legally for so long, it's understandable why it might feel like a right or freedom. However, bans on sales of lead paints, asbestos, or FDA-banned supplements for public health reasons obviously don't take away any "personal rights." Tobacco has caused the greatest health detriment of any consumer product in history, killing more people annually than AIDS, alcohol, care accidents, illegal drugs, murders, and suicides combined. NFG does not take away personal rights or freedoms, it phases out the sale of a dangerous and addictive product.

Is NFG constitutional?
Nicotine is not a constitutional right. The Massachusetts Supreme Judicial Court upheld the legality of NFG policy in Brookline, affirming that it was "not inconsistent with the Constitution" and was "rationally related to the town's legitimate interest in mitigating tobacco use overall and in particular by minors" (see Six Brothers Inc. v. Town of Brookline pg. 11 and 32).

Doesn't NFG split adults into two groups? Why are we judging who is "adult enough" to buy nicotine?
It is important to remember that tobacco products are dangerous at all ages; there is no safe age of nicotine sale. NFG recognizes that nicotine is a harmful and addictive product that should not be sold to anyone: it's not about who is an adult or not. The goal of the cutoff date is to ensure a smooth, practical transition to a nicotine-free future. The distinction NFG makes is rational, because it allows sale to individuals already using nicotine, and curtails sales to those too young to be using at the time the law is passed. This approach avoids a black market, safeguards future generations from addiction, gives retailers time to adjust, and continues nicotine access for current users.

What about veterans?
Men and women who choose to serve in the United States armed forces have greater military readiness, including increased stamina, fitness, and work capacity, when they do not use tobacco products. (Institute of Medicine 2009). Additionally, they enjoy superior wound healing (Silverstein 1992) and are nearly twice as likely to successfully complete basic training (Klesges 2000). NFG will improve our military readiness over time because fewer and fewer recruits will use tobacco products. Someone who is addicted to tobacco will have more trouble hauling gear over distance due to their diminished lung capacity. NFG does not change current veterans' access to tobacco in any way. Rather, it aids the creation of a stronger and more resilient group of future American servicemembers.

What about young people who have already been trapped by their tobacco addiction? What happens to them with NFG?
Over time, there will be fewer and fewer users who fall into this category. However, safe and effective FDA-approved nicotine (NRT) is available throughout Massachusetts over the counter and is covered by all Massachusetts insurance programs. In addition, the MA quitline gives away free NRT as part of their program. As an outcome of NFG, those who are already addicted to tobacco products will now use safe and freely available FDA-approved nicotine, retaining more money to spend on basic necessities, experiencing a lower incidence of disease, and living longer, more productive lives.

Will a "Black Market" develop?
NFG doesn't create additional black market sales. In fact, the policy attempts to avoid further black market nicotine, because current users can continue to legally be sold nicotine, and therefore have no need to turn to a black market. NFG also prevents future generations from becoming addicted, gradually shrinking the dependent user base the black market relies on. Reducing demand for nicotine products means reducing black market sales. A 2015 study found that banning menthol cigarettes resulted in no surge in illicit cigarettes. NFG is even safer than menthol bans because it never removes access to nicotine where a demand exists.

Isn't NFG like Prohibition?
NFG is nothing like Prohibition. Prohibition fueled a massive Black Market because it immediately removed access to a substance that at least half of the adult population wanted to use. It removed the supply of alcohol while demand remained high, creating a huge economic incentive for illegal sales. On the other hand, NFG naturally reduces nicotine demand over time by preventing those under a certain age from becoming addicted. Additionally, NFG never removes the nicotine access of current users like Prohibition did, preventing any increase in illegal sales.

How can I support this while Marijuana access is increasing, etc.?
Nicotine-Free Generation addresses the specific issue of nicotine use, and does not hinder other public health initiatives in any way. Supporters of NFG recognize that nicotine is uniquely

dangerous and addictive, and that the policy offers a practical way to prevent tobacco-related deaths among the next generation. Additionally, as NFG starts to reduce the scope of the tobacco issue, it will allow more public health resources to be allocated towards addressing other problems over time.

Is NFG too experimental? Is it actually being considered anywhere else?
NFG is innovative, and builds on the success of tobacco age restrictions such as Tobacco-21. Though it is a relatively new approach, NFG has already received serious consideration globally. British Prime Minister Sunak proposed an NFG law in 2023, which received endorsement from King Charles and the Opposition Party. In New Zealand, NFG was nearly enacted on a nationwide scale until a new government came in and succumbed to tobacco industry pressure in early 2024. Bills have been forwarded in California, Hawaii, Minnesota, the Philippines, Singapore, Malaysia, Denmark, Spain, France, and the European Union. Six towns in Massachusetts have already adopted the policy, likely with more to come following the MA Supreme Judicial Court ruling that upheld the policy in Brookline. Policymakers everywhere are recognizing the effective approach and public benefit that NFG provides.

Will NFG hurt small-business retailers?
Nicotine-Free Generation laws are gradual, and the market for tobacco will only decline gradually each year. Most retailers won't see a difference for years. The policy provides time for retailers to develop their business model so as to not depend on selling a harmful and exploitative product.

Why are we preventing nicotine from being sold to adults? Shouldn't we focus on youth use?
NFG aims to tackle youth nicotine addiction first, by preventing youth from ever trying nicotine and becoming addicted. 99% of smokers start before they are 26 (2014 Surgeon General Report). NFG Over time, youth will be further removed in age from anyone who can be sold nicotine legally,

Citation: Savage T., Ishak A., Silbaugh K., Chadwick G., Hartmann L., Gottlieb M., Buzby M., Winickoff J. Nicotine-Free Generation Frequently Asked Questions and Answers. Version 08132024

Dawn Stiller

From: Tiffany Zike
Sent: Tuesday, August 20, 2024 12:38 PM
To: Dawn Stiller
Subject: FW: Online Form Submittal: Contact the Health Department

So you have it for the packet.

Tiffany (Zike) Benoit, MPH, BSN, RN
Assistant Director of Public Health
Needham Health Division
178 Rosemary St.
Needham, MA 02494
781-455-7940
Fax: 781-455-7922

From: noreply@civicplus.com <noreply@civicplus.com>
Sent: Tuesday, August 20, 2024 12:31 PM
To: Timothy McDonald <tmcdonald@needhamma.gov>; Tiffany Zike <tzike@needhamma.gov>
Subject: Online Form Submittal: Contact the Health Department

Contact the Health Department

What is this in relation to:	Other
Contact Information	
Email Address:	parthsammy@yahoo.com
Full Name:	Shailesh Patel
Address:	37 Riverside Ave
City/Town:	Medford
State:	MA
Zip Code:	02155
Telephone Number:	781-454-5226
Bill Number:	*Field not completed.*
Parcel Number:	*Field not completed.*

Comments / Questions	Dear Board of Health Member Edward Cosgrove, Some cities and towns in Massachusetts are considering a new policy called Nicotine Free Generation (NFG). I ask that you reject this policy for the following reasons: - When a person is 21 years of age, that person is an adult and should be able to use legal adult products. - It applies different laws to two groups of adults treating them differently from one another for the purchase and use of the same products despite both being 21 years of age or older. - It does nothing to address youth use of nicotine products since the policy targets adults upon reaching the age of 21. - It is blatantly hypocritical allow an adult to purchase and use cannabis or alcoholic beverages or gamble on sports, but prohibit that same adult from purchasing and using a nicotine product. This policy goes way too far. Say NO to NFG regulations in Massachusetts. Regards, Shailesh Patel 37 Riverside Ave Medford, MA 02155

Email not displaying correctly? View it in your browser.

August 20, 2024

Needham Board of Health

Needham, MA 02492

To the esteemed members of the Needham Board of Health,

I am pleased to submit a letter in support of the upcoming decision on making Needham one of the Nicotine Free Generation towns.

Twenty years ago, the members of the Needham Board of Health, made the bold decision to increase the purchasing age of tobacco related products to over the age of 21. We were criticized at first by many businesses in the area, but we held firm because we knew it was the right decision for the youth of the town. And what a movement we started! Youth tobacco use decreased, and the nation caught on.

We now have the opportunity to do even more for the community. By joining other communities in eastern Massachusetts, we can once again, show our residents how important it is to protect individuals from such a highly addictive substance. Nicotine is a gateway drug for many other substances and its use leads to multiple health issues. The fewer young people that sample nicotine, the fewer will end up addicted. This will directly minimize the multitude of health issues that are seen twenty or thirty years down the road.

As an active instructor at Harvard Medical School, I witness first-hand the horrible effects of tobacco use in patients when they are hospitalized at BWH. From cancer to pulmonary disease to other substance use disorders, the patients all say they are sorry that they ever started using tobacco.

As a pediatrician in the Needham community, I have been thrilled to see a reduction in tobacco use amongst teens. There is still work to be done, however. We need to reduce the chances of anyone becoming addicted to nicotine, and we still need to move the needle on THC use in adolescents. The move to make Needham a Nicotine Free Generation town is a move in the right direction.

I have been honored to have worked so closely with a health department that cares deeply about its residents, especially the youth of Needham. This will be another bold move in

the right direction. Approval of the NFG policy is another step that the Needham Board of Health can and should take.

Alan K. Stern, M.D.

Needham Pediatrics

145 Rosemary Street, Entry K

Needham, MA 02494

Instructor in Pediatrics, Harvard Medical School, Boston Children's Hospital

Co-Site Director BWH for the Practice of Medicine Course, HMS1

Needham
Public Schools

Daniel E. Gutekanst, Ed. D.
Superintendent of Schools

August 28, 2024

Needham Board of Health
Needham Town Hall
1471 Highland Avenue
Needham, MA 02492

Dear Needham Board of Health:

I am writing to express my concern about the detrimental effects of nicotine on developing brains and bodies that are well-documented and have far-reaching consequences for young people's health and well-being.

Nicotine addiction is a serious public health issue that can lead to a variety of health problems, including:

- Lung damage
- Heart disease
- Stroke
- Type 2 diabetes
- Mental health issues

Moreover, nicotine addiction can hinder academic performance, social development, and overall quality of life.

I urge the Needham Board of Health to take immediate action to phase out the sale of nicotine products to underage youth. Strategies for implementing this could include:

- Implementing stricter enforcement of existing laws
- Educating retailers about the dangers of selling nicotine products to minors
- Promoting public awareness campaigns about the harmful effects of nicotine

By taking these steps, we can help protect our young people from the devastating consequences of nicotine addiction and create a healthier, more vibrant community for all.

Thank you for your attention and partnership.

Sincerely,

Daniel E. Gutekanst, Ed.D.
Superintendent of Schools

Beth Israel Lahey Health
Beth Israel Deaconess Needham

August 26, 2024

Tim McDonald
Needham Board of Health
178 Rosemary Street
Needham, MA 02494

Dear Mr. McDonald,

Beth Israel Deaconess Hospital – Needham writes in support of the Nicotine-Free Generation policy and encourages adoption in the Town of Needham. As a leading provider of compassionate healthcare services in the metrowest suburban Boston area, BID Needham is committed to ensuring the health of residents in the communities we serve. As part of this commitment, BID Needham has a focus on forwarding public health policies and initiatives that promote the health of priority populations, including youth. BID Needham applauds the ongoing regional efforts to ensure youth can avoid the negative health impacts of nicotine addiction through this important policy change.

By prohibiting the lifetime sale of nicotine-containing products to youth born after a policy-designated date, the Nicotine-Free Generation policy will create a tobacco-free future for our youth that will reduce risks for chronic diseases including cancer, pulmonary disease, and cardiovascular disease. Data indicates that early tobacco usage is a strong predictor of habitual usage in adulthood. According to the American Cancer Society, almost 90% of adult cigarette smokers experimented with tobacco before the age of 18[1]. Adoption of this policy will ensure a public health system that reduces substance use through prevention and promotes healthy choices, paving the way for a healthier next generation.

BID Needham encourages the Needham Board of Health to support and implement the Nicotine-Free Generation policy in Needham.

1- American Cancer Society

Best regards,

John Fogarty, FACHE
President, Beth Israel Deaconess Hospital – Needham

Dawn Stiller

From: Rachael Cain <r.cain.124@gmail.com>
Sent: Monday, August 26, 2024 6:10 AM
To: Health Division
Subject: Public Comment - Nicotine Free Generation Policy

Hello,

My name is Rachael Cain. I am a Needham resident with a doctorate in public health and ~15 years working in the field. I am writing largely in support of the Nicotine Free Generation policy being considered as a Needham Board of Health regulation.

Tobacco use remains a serious public health issue in Needham, particularly among our youth. As e-cigarettes and vaping are being used by Needham teens, leading to illnesses and addiction, we need a policy to address this ongoing issue.

Needham was the first municipality in the country to raise the minimum age to buy nicotine products to 21. It set the stage for long term, nationwide change that strengthened our country's public health system. Needham should be at the forefront of change again and join Brookline to adopt this forward thinking policy.

Prior to adoption, I strongly encourage the Board of Health to examine the equity implications of this policy. What is the potential impact of the policy on residents who currently use nicotine? Does the policy allow for religious and ceremonial use of tobacco? Are there inequitable policy impacts across race, gender, religion, or otherwise? Answers to this question should inform if the policy should be adopted as is, modified to become more equitable, or not adopted.

Thank you for your time,
Rachael

--
Rachael Cain, DrPH
r.cain.124@gmail.com
518-469-5193

Friends and family may encourage current users to quit, reducing stigma around seeking help and enhancing access to resources.

Culturally specific cessation programs:
An uptick in the number of current nicotine users expressing interest in quitting can be the impetus for the development and implementation of culturally specific cessation programs.

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There is a potential concern that youth may cross town lines to purchase nicotine products.
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A Nicotine Free Generation policy presents the opportunity to advance racial and health equity by addressing systemic inequities rooted in tobacco use and the tobacco industry's marketing tactics. With thoughtful implementation that includes culturally sensitive approaches and barrier-free access to cessation programs, a Nicotine Free Generation policy can reduce health disparities and foster a healthier community for all.

[11] Text message program from Truth Initiative helps teens quit e-cigarettes, (2024), Truth Initiative, https://truthinitiative.org/research-resources/quitting-smoking-vaping/text-message-program-truth-initiative-helps-teens-quit-e
[12] *Savage T., Ishak A., Silbaugh K., Chadwick G., Hartmann L., Gottlieb M., Buzby M., Winickoff J. Nicotine-Free Generation Frequently Asked Questions and Answers. Version 08132024*

Needham Public Health Division
Prevent. Promote. Protect.

Board of Health
Town of Needham
AGENDA FACT SHEET

MEETING DATE: October 8, 2024

Agenda Item	**Public Hearing – Article 1: Regulation Affecting Smoking and the Sale and Distribution of Tobacco Products in Needham**
Presenter(s)	Timothy McDonald, Director of Health & Human Services

1.	**BRIEF DESCRIPTION OF TOPIC TO BE DISCUSSED**

The Board of Health will continue its hearing, begun at the September 5, 2024 Board meeting, of proposed amendments to Article 1: Regulation Affecting Smoking and the Sale and Distribution of Tobacco Products in Needham. The proposed amendments to Article 1 include a number of updates and housekeeping, as well as the incorporation of the Nicotine Free Generation (NFG) policy which would restrict the sale of tobacco products to all persons born after January 1, 2004.

2.	**VOTE REQUIRED BY BOARD OF HEALTH**

Suggested Motion: *That the Board of Health continue its hearing on Article 1 over to its next meeting, planned for Friday November 22, 2024 at 8:00 a.m.*

3.	**BACK UP INFORMATION:**

a) Draft Article 1—Regulation Affecting Smoking and the Sale and Distribution of Tobacco Products in Needham.

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Needham Public Health Division
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Board of Health

Edward Cosgrove, PhD Stephen Epstein, MD, MPP Tejal K. Gandhi, MD, MPH
Robert Partridge, MD, MPH Aarti Sawant-Basak, PhD

ARTICLE 1
Regulation Affecting Smoking and the Sale and Distribution of Tobacco Products in Needham

A. Statement of Purpose:

Whereas, there exists conclusive evidence that tobacco smoking causes cancer, respiratory and cardiac diseases, negative birth outcomes, irritations to the eyes, nose and throat;[1]

Whereas, the U.S. Department of Health and Human Services has concluded that nicotine is as addictive as cocaine or heroin[2] and the Surgeon General found that nicotine exposure during adolescence, a critical window for brain development, may have lasting adverse consequences for brain development,[3] and that it is addiction to nicotine that keeps youth smoking past adolescence;[4]

Whereas, a Federal District Court found that Phillip Morris, RJ Reynolds and other leading cigarette manufacturers "spent billions of dollars every year on their marketing activities in order to encourage young people to try and then continue purchasing their cigarette products in order to provide the replacement smokers they need to survive" and that these companies were likely to continue targeting underage smokers;[5]

[1] U.S. Center for Disease Control and Prevention (CDC), *Health Effects of Cigarette Smoking Fact Sheet* (2021), https://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/effects_cig_smoking/index.htm.

[2] CDC, *How Tobacco Smoke Causes Disease: The Biology and Behavioral Basis for Smoking-Attributable Disease*, (2010), http://www.cdc.gov/tobacco/data_statistics/sgr/2010/.
[3] U.S. Dep't of Health and Hum. Servs., *The Health Consequences of Smoking – 50 Years of Progress: A Report of the Surgeon General* at 122 (2014), http://www.surgeongeneral.gov/library/ reports/ 50-years-of-progress/full-report.pdf.
[4] Id. *at* 13 (Executive Summary).
[5] *United States v. Phillip Morris,* 449 F.Supp.2d 1, 1605-07 (D.D.C. 2006).

Whereas, the majority (90%) of smokers begin smoking before the age of 25, and over 5 million youth and young adults (ages 25 and under) smoke;[6]

Whereas, cigars and cigarillos, can be sold in a single "dose;" and enjoy a relatively low tax as compared to cigarettes;[7]

Whereas, spitless tobacco sales have increased from 100,000 units a year in 2018 to over 700,000 units a year by 2023;[8]

Whereas, nicotine use in any form during adolescence can cause addiction and can harm parts of the brain that control attention, learning, memory, mood, and impulse control. Nicotine use may also increase adolescents' risk of future addiction to other drugs;[9]

Whereas more than 90 percent of all adult smokers begin smoking before the age of 18. , In 2023, 22.2% of U.S. middle and high school students reported ever using any tobacco product, corresponding to 6.21 million persons, and 10% or 2.8 million middle and high school students reported current tobacco use;[10]

According to the 2021 National Youth Tobacco Survey (NYTS), 17.1% of current youth smokers reported directly purchasing cigarettes from a gas station or convenience store and 7.0% reported directly purchasing cigarettes from a vape shop or tobacco shop [11]

Whereas the Institute of Medicine (IOM) concludes that raising the minimum age of legal access to tobacco products to 21 will likely reduce tobacco initiation, particularly among adolescents 15 – 17, which would improve health across the lifespan and save lives[12].

Whereas the 2023 MetroWest Adolescent Health Survey (MHAWS) results show that 2% of Needham high school students used cigarettes on at least one day of the 30 days before the survey, compared with 3% of students in 2021. And whereas the 2023 MetroWest Adolescent Health Survey (MHAWS) results show that 10% of Needham high school students used cigarettes in their lifetime, compared with 9% of students in 2021

Whereas, data from the 2023 MetroWest Adolescent Health Survey shows 9.6% of Needham High School students and 11.1% of high school students from 24 communities in the Metro West Region used any nicotine products in the past 30 days (cigarettes, smokeless tobacco, cigars, pouches, gum or electronic vapor products).

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[6] Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration, *Key substance use and mental health indicators in the United States: Results from the 2020 National Survey on Drug Use and Health* (HHS Publication No. PEP21-07-01-003, NSDUH Series H-56) (2021) (Retrieved from https://www.samhsa.gov/data/).
[7] CDC, *Youth Risk Behavior, Surveillance Summaries* (MMWR 2010: 59, 12, note 5) (2009) (Retrieved from: http:www.cdc.gov/mmwr/pdf/ss/ss5905.pdf).
[8] Massachusetts Dept. of Public Health, *Updated Presentation: Monitoring the Impacts of MA Flavored Tobacco Law* (2024).
[9] Campaign for Tobacco Free Kids, *The Rise of Products Using Synthetic Nicotine* (2021) (https://assets.tobaccofreekids.org/factsheets/0420.pdf)
[10] Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, CDC; [2]Center for Tobacco Products, Food and Drug Administration, Silver Spring, Maryland.
[11] 2021 National Youth Survey, https://www.cdc.gov/mmwr/volumes/71/ss/ss7105a1.htm
[12] IOM (Institute of Medicine) 2015. *Public Health Implications of Raising the Minimum Age of Legal Access to Tobacco Products.* Washington DC: The National Academies Press, 2015.

Whereas use of e-cigarettes among students in Massachusetts is 16%, representing a decrease of 1.5% for highschoolers between 2021 and 2023.Middle school 30 day use remained the same at 4.9 between 2021 and 2023[13]

Whereas 16% of Massachusetts youth currently use e-cigarettes and 30.4% have tried them[14] and in Needham 8.6% of Needham high school students currently use e-cigarettes and 17% of those students have tried e-cigarettes once in their lifetime, according to the 2023MetroWest Adolescent Health Survey (MWAHS).[15]

Whereas, spitless tobacco, in particular nicotine salt packages, provides a discrete, cheap nicotine delivery system;[16]

Whereas, the Surgeon General found that exposure to tobacco marketing in stores and price discounting increase youth smoking;[17]

Whereas, the U.S. Food and Drug Administration and the U.S. Surgeon General have stated that flavored tobacco products are considered to be "starter" products that help establish smoking habits that can lead to long-term addiction;[18]

Whereas, the U.S. Surgeon General recognized in his 2014 report that a complementary strategy to assist in eradicating tobacco-related death and disease is for local governments to ban categories of products from retail sale;[19]

Whereas, the Massachusetts Department of Environmental Protection has classified liquid nicotine in any amount as an "acutely hazardous waste;"[20]

Whereas, research indicates that the density and proximity of tobacco retailers increase smoking behaviors, including number of cigarettes smoked per day, reduced smoking abstinence during a quit attempt, and increased smoking prevalence among youth;[21]

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[13] Massachusetts Department of Public Health, Massachusetts Youth Health Survey (MYHS) 2023
[14] Massachusetts Department of Public Health, 2023 Massachusetts Youth Health Survey (MYHS)
[15] MetroWest Adolescent Health Survey: Needham High School Reports 2023
[16] Ibid.
[17] U.S. Dep't of Health and Human Servs., *Preventing Tobacco Use Among Youth and Young Adults: A Report of the Surgeon General* 508, 530 (2012) (www.surgeongeneral.gov/library/reports/preventing-youth-tobacco-use/full-report.pdf).
[18] Food and Drug Administration, *Fact Sheet: Flavored Tobacco Products* (2011), www.fda.gov/downloads/TobaccoProducts/ProtectingKidsfromTobacco/FlavoredTobacco/UCM183214.pdf; U.S. Dep't of Health and Human Services, *Preventing Tobacco Use Among Youth and Young Adults: A Report of the Surgeon General*, 508, 539 (2012) www.surgeongeneral.gov/library/reports/preventing-youth-tobacco-use/full-report.pdf.
[19] *See* fn. 3 at p. 85.
[20] 310 CMR 30.136
[21] Ying-Chih Chuang et al., *Effects of neighbourhood socioeconomic status and convenience store concentration on individual level smoking*, 59(7) J. Epidemiol Cmty Health 568 (2005) (doi: 10.1136/ jech.2004.029041); Shelley D. Golden et al., *County-level associations between tobacco retailer density and smoking prevalence in the USA, 2012*, 17 (101005) Prev. Med. Rep. (Mar. 2020) (doi: 10.1016/j.pmedr.2019.101005); Eric C. Leas et al., *Place-Based Inequity in Smoking Prevalence in the Largest Cities in the United States*, 179(3) JAMA Intern Med., 442 (2019) (doi: 10.1001/jamainternmed.2018.5990); JG Lee et al., *Associations of tobacco retailer density and proximity with adult tobacco use behaviors and health outcomes: a meta-analysis*. Tobacco Control. Published Online First: 03 September 2021; LR Reitzel et al., *The effect of tobacco outlet density and proximity on smoking cessation.* American Journal of Public Health. 2011, 101(2):315-320; L Henriksen et al., *Is adolescent smoking related to the density and proximity of tobacco retailers and retail cigarette advertising near schools?* Preventive Medicine. 2008, 47(2): 210-4.

Whereas, the density of tobacco retailers near adolescents' homes has been associated with increased youth smoking rates and initiation of non-cigarette tobacco product use;[22]

Whereas, tobacco retailers are more prevalent in underserved communities, especially in neighborhoods with a higher proportion of African American or Hispanic residents;[23]

Whereas, policies to reduce tobacco retailer density have been shown to be effective and can reduce or eliminate social and racial inequities in the location and distribution of tobacco retailers;[24]

Whereas, the Massachusetts Supreme Judicial Court has held that ". . . [t]he right to engage in business must yield to the paramount right of government to protect the public health by any rational means."[25]

Now, therefore it is the intention of the Needham Board of Health to regulate the sale of tobacco products.

B. <u>Authority</u>:

This regulation is promulgated pursuant to the authority granted to the Needham Board of Health by Massachusetts General Laws Chapter 111, Section 31 which states that "Boards of health may make reasonable health regulations".

C. <u>Definitions</u>:

For the purpose of this regulation, the following words shall have the following meanings:

Adult-only retail tobacco store: (also known as "Retail Tobacco Store" in MGL Ch. 270): An establishment that is not required to possess a retail food permit whose primary purpose is to sell or offer for sale but not for resale, tobacco products and tobacco paraphernalia, in which the sale of other products is merely incidental, and in which the entry of persons under the minimum legal sales age is prohibited at all times, and maintains a valid permit for the retail sale of tobacco products as required to be issued by the Needham Board of Health. As of the effective date of this regulation, no new adult-only retail tobacco stores shall be located within twenty-five (25) feet of a retailer with a tobacco product sales permit.

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[22] LJ Finan et al., *Tobacco Outlet Density and Adolescents' Cigarette Smoking: A Meta-Analysis*, 28(1) Tob Control. 27 (2019) (doi: 10.1136/tobaccocontrol-2017-054065); Abdel Magid HS et al., *Tobacco Retail Density and Initiation of Alternative Tobacco Product Use Among Teens*, 66(4) J. Adolescent Health 423 (2020) (doi: 10.1016/j.jadohealth.2019.09.004).

[23] Siahpush M. et al., *Association of availability of tobacco products with socio-economic and racial/ethnic characteristics of neighbourhoods*, 124(9) Pub. Health 525 (2010) (doi: 10.1016/j. puhe.2010.04.010); Lee JG,et al., *Inequalities in tobacco outlet density by race, ethnicity and socioeconomic status, 2012, USA: results from the ASPiRE Study*, 71(5) J. Epidemiol Cmty Health 487 (2017) (doi: 10.1136/jech-2016-208475); D.O. Fakunle et al., *Black, White, or Green? The Effects of Racial Composition and Socioeconomic Status on Neighborhood-Level Tobacco Outlet Density*, Ethn Health. 1 (2019) (doi: 10.1080/13557858.2019.1620178).

[24] Ribisl KM, et al., *Reducing Disparities in Tobacco Retailer Density by Banning Tobacco Product Sales Near Schools*, 19(2) Nicotine Tobacco Res. 239 (2017) (doi: 10.1093/ntr/ntw185); HG, Henry et al., *Tobacco Retail Licensing and Density 3 Years After License Regulations in Philadelphia, Pennsylvania (2012-2019)*, 110 (4) Am J. Pub. Health 547 (2020) (doi: 10.2105/AJPH.2019.305512); A.E. Myers et al., *A comparison of three policy approaches for tobacco retailer reduction*, 74 Prev. Med. 67(2015) (doi: 10.1016/j.ypmed.2015.01.025).

[25] *Druzik et al v. Board of Health of Haverhill*, 324 Mass. 129 (1949).

Blunt Wrap: Any product made wholly or in part from a tobacco product, manufactured or packaged with loose and removable leaves or section of a leaf, or as a hollow tube, that may be used by the consumer to wrap or contain loose tobacco or other fillers.

Bona Fide Purchaser for Value: A bona fide purchaser is someone who exchanges value for property without any reason to expect irregularities in the transaction.

Business Agent: An individual who has been designated by the owner or operator of any establishment to be the manager or otherwise in charge of said establishment.

Characterizing flavor: A distinguishable taste or aroma, other than the taste or aroma of tobacco, imparted or detectable either prior to or during consumption of a tobacco product or component part thereof, including, but not limited to, tastes or aromas relating to any fruit, chocolate, vanilla, honey, candy, cocoa, dessert, alcoholic beverage, menthol, mint, wintergreen, herb or spice; provided, however, that no tobacco product shall be determined to have a characterizing flavor solely because of the provision of ingredient information or the use of additives or flavorings that do not contribute to the distinguishable taste or aroma of the product.

Child-Resistant Package: Packaging intended to reduce the risk of a child ingesting nicotine and that meets the minimum standards of 16 C.F.R. 1700 *et seq.*, pursuant to 15 U.S.C. 1471 through 1476.

Cigar: Any roll of tobacco that is wrapped in leaf tobacco or in any substance containing tobacco, with or without a tip or mouthpiece, that is in a readily usable state immediately when removed from its packaging without any modification, preparation or assembly required as in a kit or roll-your-own package, and is not otherwise defined as a cigarette under G.L. c. 64C, §1, Paragraph 1. Tobacco leaf in kits or roll-your-own packages shall be considered “blunt wraps” for the purpose of this regulation.

Component part: Any element of a tobacco product, including, but not limited to, the tobacco, filter and paper, but not including any constituent.

Constituent: Any ingredient, substance, chemical or compound, other than tobacco, water or reconstituted tobacco sheet, that is added by the manufacturer to a tobacco product during the processing, manufacturing or packaging of the tobacco product.

Coupon: Any card, paper, note, form, statement, ticket or other issue distributed for commercial or promotional purposes to be later surrendered by the bearer so as to receive an article, service or accommodation without charge or at a discount price.

Distinguishable: Perceivable by either the sense of smell or taste.

Educational Institution: Any public or private college, school, professional school, scientific or technical institution, university or other institution furnishing a program of higher education.

Electronic Nicotine Delivery System: An electronic device, whether for one-time use or reusable, that can be used to deliver nicotine or another substance to a person inhaling from the device including, but not limited to, electronic cigarettes, electronic cigars, electronic cigarillos, electronic pipes, vaping pens, hookah pens and other similar devices that rely on vaporization or aerosolization; provided, however, that “electronic nicotine delivery system” shall also include any noncombustible liquid or gel that is manufactured into a finished product for use in such electronic device; provided further, that “electronic nicotine delivery system” shall also include any component, part or accessory of a device used during the operation of the device even if the part or accessory was sold separately; provided further, that “electronic nicotine delivery system” shall not include a product that has been approved by the United States Food and Drug Administration for the sale of or use as a tobacco cessation product or for other medical purposes and is marketed and sold or prescribed exclusively for that approved purpose.

Employee: Any individual who performs services for an employer.

Employer: Any individual, partnership, association, corporation, trust or other organized group of individuals that uses the services of one (1) or more employees.

Flavored Tobacco Product: Any tobacco product or component part thereof that contains a constituent that has or produces a characterizing flavor. A public statement, claim or indicia made or disseminated by the manufacturer of a tobacco product, or by any person authorized or permitted by the manufacturer to make or disseminate public statements concerning such tobacco product, that such tobacco product has or produces a characterizing flavor shall constitute presumptive evidence that the tobacco product is a Flavored Tobacco Product.

Health Care Institution: An individual, partnership, association, corporation or trust or a person or group of persons who provides health care services and employs health care providers subject to licensing under this chapter; or a retail establishment that sells pharmaceutical goods and services and is subject to regulation by the board of registration in pharmacy. Health care institutions include but are not limited to hospitals, clinics, health centers, pharmacies, drug stores, doctors’ offices, and dental offices.

Liquid Nicotine Container: A package: (i) from which nicotine in a solution or other form is accessible through normal and foreseeable use by a consumer; and (ii) that is used to hold a soluble nicotine in any concentration; provided however, that "liquid nicotine container" shall not include a sealed, prefilled and disposable container of nicotine in a solution or other form in which the container is inserted directly into an electronic cigarette, electronic nicotine delivery system or other similar product if the nicotine or other substance in the container is inaccessible through customary or reasonably foreseeable handling or use, including reasonably foreseeable ingestion or other contact by children.

Listed or non-discounted price: The higher of the price listed for a tobacco product on its package or the price listed on any related shelving, posting, advertising or display at the place where the tobacco

product is sold or offered for sale plus all applicable taxes if such taxes are not included in the state price, and before the application of any discounts or coupons.

Manufacturer Documentation: A written document from a manufacturer that certifies which of each of its products are not flavored, as defined under Massachusetts law and these regulations. Manufacturer Documentation shall also mean a written document from a manufacturer that certifies the nicotine content expressed as milligrams per milliliter for each of its Electronic Nicotine Delivery System products.

Minimum Legal Sales Age (MLSA): The age an individual must be before that individual can be sold a tobacco product in the municipality.

Non-Residential Roll-Your-Own (RYO) Machine: A mechanical device made available for use (including to an individual who produces cigars, cigarettes, smokeless tobacco, pipe tobacco, or roll-your-own tobacco solely for the individual's own personal consumption or use) that is capable of making cigarettes, cigars or other tobacco products. RYO machines located in private homes used for solely personal consumption are not Non-Residential RYO machines.

Oral Nicotine Pouches: Pre-portioned pouches containing nicotine, flavorings, fillers, and other ingredients, not containing tobacco leaf, intended to be used between the cheek and gum to deliver nicotine, and do not require spitting as traditional smokeless tobacco does.

Permit Holder: Any person engaged in the sale or distribution of tobacco products who applies for and receives a tobacco product sales permit or any person who is required to apply for a Tobacco Product Sales Permit pursuant to these regulations, or his or her business agent.

Person: Any retailer firm, partnership, association, corporation, company or organization of any kind, including but not limited to, an owner, operator, manager, proprietor or person in charge of any establishment, business or retail store.

Retailer: A person who operates a retail establishment.

Retail Establishment: A physical place of business or a section of a physical place of business in which a tobacco product is offered for sale to consumers.

Rolling Papers: sheets, rolls, tubes, cones or leaves, that do not contain tobacco, which are used for rolling cigarettes either by hand or with a roll-your-own machine. When rolling a cigarette, the filler may be tobacco, cannabis or other commonly-smoked herbs.

Self-Service Display: Any display from which customers may select a tobacco product, as defined herein, without assistance from employee or store personnel.

Schools: Public or private elementary or secondary schools.

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Smoke Constituent: Any chemical or chemical compound in mainstream or sidestream tobacco smoke that either transfers from any component of the tobacco product to the smoke or that is formed by the combustion or heating of tobacco, additives or other component of the tobacco product.

Smoking Bar: An establishment that: (i) exclusively occupies an enclosed indoor space and is primarily engaged in the retail sale of tobacco products for consumption by customers on the premises; (ii) derives revenue from the sale of food, alcohol or other beverages that is incidental to the sale of a tobacco product and prohibits entry to a person under 21 years of age; (iii) prohibits a food or beverage not sold directly by the establishment from being consumed on the premises; (iv) maintains a valid permit for the retail sale of a tobacco product as required to be issued by the Town of Needham; and (v) maintains a valid license issued by the department of revenue to operate as a smoking bar. “Smoking bar” shall include, but not be limited to, those establishments that are commonly known as “cigar bars”, “hookah bars” and “vape bars.”

Tobacco Product Flavor Enhancer: Any product designed, manufactured, produced, marketed or sold to produce a characterizing flavor when added to any tobacco product. A rolling paper with a characterizing flavor shall be considered a Tobacco Product Flavor Enhancer.

Tobacco Product: Any product containing, made, or derived from tobacco or nicotine that is intended for human consumption, whether smoked, chewed, absorbed, dissolved, inhaled, snorted, sniffed, or ingested by any other means, including, but not limited to: cigarettes, cigars, little cigars, chewing tobacco, pipe tobacco, snuff; or electronic cigarettes, electronic cigars, electronic pipes, electronic hookah, liquid nicotine, “e-liquids” or other similar products, regardless of nicotine content, that rely on vaporization or aerosolization. “Tobacco product” includes any component or part of a tobacco product. “Tobacco product” also includes all nicotine delivery products. “Tobacco product” does not include any product that has been approved by the United States Food and Drug Administration either as a tobacco use cessation product or for other medical purposes and which is being marketed and sold or prescribed solely for the approved purpose.

Vending Machine: Any automated or mechanical self-service device, which upon insertion of money, tokens or any other form of payment, dispenses or makes cigarettes or any other tobacco products, as defined herein.

Workplace: Any enclosed area of a structure, indoor area, facility or a portion thereof at which one (1) or more employees perform services for their employer (including the personal residence of the employer during those hours when used as a place of employment); other enclosed spaces rented to or otherwise used by the public; and where the employer has the right or authority to exercise control over the space. It also include motor vehicles, employee lounges, restrooms, conference rooms, hallways, stairways and entrance ways, as well as exterior, unenclosed spaces at stairs, ramps, landings, patios, porches, decks, adjacent yards, loading docks and other areas within twenty (20) feet of the entrance doors or other areas where smoke would migrate into the enclosed area of a structure.

D. Tobacco Sales to Persons Born on or after January 1, 2004

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1. No person shall sell or provide a tobacco product to a person born on or after January 1, 2004.

2. Required Signage:

   a. All retail establishments, including adult-only retail tobacco stores, shall conspicuously post signage, made available from the Needham Board of Health. Such signage shall include: (i) referral information for smoking cessation resources; (ii) a statement that sale of tobacco products, including e-cigarettes, [to a person born on or after January 1, 2004] is prohibited; (iii) health warnings associated with using electronic nicotine delivery systems; and (iv) except in the case of smoking bars, notice to consumers that the sale of flavored tobacco products are prohibited at all times. Such signage shall be posted conspicuously in the retail establishment or other place in such a manner so that it may be readily seen by a person standing at or approaching the cash register. The notice shall directly face the purchaser and shall not be obstructed from view or placed at a height of less than four feet or greater than nine feet from the floor. The signage may be in a form developed and made available by the Massachusetts Department of Public Health.

   b. All smoking bars and adult-only retail tobacco stores shall post signage, in the form developed and made available by DPH, on the exterior of the door providing entrance to the tobacco retail store or smoking bar and such sign shall not be obstructed from view or placed at a height of less than four feet or greater than nine from the bottom of the door. Such signage shall state that "No person younger than 21 years old is permitted on the premises at any time."

   c. All smoking bars and those adult-only retail tobacco stores that allow for onsite consumption of tobacco products shall post signage, in the form developed and made available by DPH, on the exterior of the door providing entrance to the tobacco retail store or smoking bar and such sign shall not be obstructed from view or placed at a height of less than four feet or greater than nine from the bottom of the door. Such signage shall warn persons entering that smoking and vaping may be present on the premises and provide information concerning the health risks associated with secondhand smoke and the use of tobacco products, including electronic nicotine delivery systems.

   d. The owner or other person in charge of a shop or other place used to sell tobacco products, as defined herein, at retail shall conspicuously post signage provided by the Needham Public Health Division that discloses current referral information about smoking cessation.

   e. The owner or other person in charge of a shop or other place used to sell tobacco products that rely on vaporization or aerosolization, as defined herein as “tobacco products”, at retail shall conspicuously post a sign stating that “The sale of tobacco products, including e-cigarettes, to someone under the minimum legal sales age of 21 years is prohibited.” The notice shall be no smaller than 8.5 inches by 11 inches and shall be posted conspicuously in the retail establishment or other place in such a manner so that it may be readily seen by a person standing at or approaching the cash register. The notice shall directly face the purchaser and shall not be obstructed from view or placed at a height of less than four (4) feet or greater than nine (9) feet from the floor. Additionally, signage which show health warnings associated with using electronic nicotine delivery systems and a notice to consumers that the sale of flavored tobacco products are prohibited at all times must be posted.

3. Identification:

a. Each person selling or distributing tobacco products shall first verify the age of **every** purchaser of tobacco products by means of a valid government-issued photographic identification containing the bearer's date of birth that the purchaser

b. Each person admitting entrance into a smoking bar or adult-only retail tobacco store shall first verify the age of **every** person entering by means of a valid government-issued photographic identification containing the bearer's date of birth that the purchaser is [21 or older] or [is born on or before January 1, 2004.].

4. All retail sales of tobacco products, as defined herein, must be face-to-face between the seller and the buyer and occur at the permitted location.

5. No person or entity selling tobacco products shall allow anyone under twenty-one (21) years of age to sell tobacco products.

E. <u>Tobacco Product Sales Permit</u>:

1. No person shall sell or otherwise distribute tobacco products, as defined herein, within the town of Needham without first obtaining a Tobacco Product Sales Permit issued annually by the Needham Board of Health. Only owners of establishments with a permanent, indoor, non-mobile location in Needham are eligible to apply for a permit and sell tobacco products, as defined herein, at the specified location in Needham**.**

2. As part of the Tobacco Product Sales Permit application process, the applicant will be provided with the Needham regulation. Each applicant is required to sign a statement declaring that the applicant has read said regulation and that the applicant is responsible for instructing any and all employees who will be responsible for tobacco product sales regarding federal, state and local laws regarding the sale of tobacco and this regulation.

3. As a condition for obtaining and/or renewing a Tobacco Sales Permit, the Needham Board of Health may require tobacco retailers and any employee involved in the act of sale of tobacco products to participate in training programs provided by or approved by the Board regarding compliance with the laws and regulations prohibiting the sale of tobacco products to persons born on or after January 1, 2004.

4. No Tobacco Sales Permit holder shall allow any employee to sell cigarettes or other tobacco products until such employee reads this regulation and state laws regarding the sale of tobacco products and signs a statement, a copy of which will be placed on file in the office of the employer, that the employee has read and understands the regulation and applicable state laws.

5. Each applicant who sells tobacco products is required to provide proof of a current Tobacco Retailer License issued by the Massachusetts Department of Revenue, when required by state law, before a Tobacco Product Sales Permit can be issued. Applicant may be asked to provide evidence that a legitimate business transfer or business purchase has taken place.

6. A separate permit, displayed conspicuously, is required for each retail establishment selling tobacco products, as defined herein. The fee for which shall be determined by the Needham Board of

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Health annually. All required Massachusetts Department of Revenue licenses related to the sale of tobacco products, as defined herein, must also be displayed conspicuously at the retail establishment.

7. A Tobacco Product Sales Permit is non-transferable. A new owner of an establishment that wishes to sell tobacco products, as defined herein, must apply for a new permit Tobacco Product Sales Permit and one may only be issued at the Needham Board of Health's discretion. At the very least, no new permit will be issued unless and until all outstanding penalties incurred by the previous permit holder are satisfied in full.

8. Issuance of a Tobacco Product Sales Permit shall be conditioned on an applicant's consent to unannounced, periodic inspections of his/her retail establishment to ensure compliance with this regulation. Neither the permit holder nor their employees shall interfere with or obstruct an inspection.

9. A Tobacco Product Sales Permit will not be renewed if the permit holder has failed to pay all fines issued and the time period to appeal the fines has expired and/or the permit holder has not satisfied any outstanding permit suspensions.

10. A Tobacco Product Sales Permit will not be renewed if the permit holder has sold a tobacco product to a person born on or after January 1, 2004 three times within the permit year or six times within the 36 month period of performance and the time period to appeal has expired. The violator may request a hearing in accordance with subsection 4 of the Violations section.

11. Maximum Number of Tobacco Product Sales Permits.

    a. At any given time, there shall be no more than six (6) Tobacco Product Sales Permits issued in Needham. Any permit holder who has failed to renew their permit within thirty (30) days of expiration will be treated as a first-time permit applicant.

    b. As of the effective date of this regulation, any permit surrendered, revoked or not renewed either because a retailer no longer sells tobacco products, as defined herein, or because a retailer closes the retail business, shall be returned to the Needham Board of Health and shall be permanently retired by the Board of Health and the total allowable number of Tobacco Product Sales Permits under paragraph (a) shall be reduced by the number of the retired permits.

12. Sale of Business.

    a. Notwithstanding a cap on the total number of permit holders, the seller of a business holding a valid tobacco sales permit may transfer said permit to a bona fide purchaser for value of the business, subject to approval by the Board of Health, as required herein.

    b. The purchaser shall apply for the transfer of the permit no later than (30) calendar days after said purchase. The purchaser shall not sell tobacco product until the transfer of the permit is approved by the Board of Health; and

    c. All fines and suspensions of the previous owner must be satisfied prior to the sale.

13. Retail Density.

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a. A new Tobacco Product Sales Permit shall not be issued to any new applicant for a retail location within five hundred (500) feet of a public or private elementary or secondary school as measured by a straight line from the nearest point of the property line of the school to the nearest point of the property line of the site of the applicant's business premises

b. A new Tobacco Product Sales Permit shall not be issued to any new applicant for a retail location within 500 feet of an existing retailer with a valid Tobacco Product Sales Permit as measured by a straight line from the nearest point of the property line of the retailer with a valid Tobacco Product Sales Permit to the nearest point of the property line of the site of the applicant's business premises.

c. If the purchaser of a business with a valid tobacco sales permit pursuant to Section E. 9 or the current holder of tobacco sales permit changes the location of the business, the new location shall be subject to the retail density requirements of Section E.10

F. Prohibition of Smoking Bars:

Smoking Bars are prohibited in the Town of Needham**.**

G. Oral Nicotine Pouches:

Oral nicotine products can only be sold in adult-only retail tobacco stores.

H. Cigar Sales Regulated:

1. No person shall sell or distribute or cause to be sold or distributed a single cigar unless such cigar is priced for retail sale at two dollars and ninety cents ($2.90) or more.

2. No person shall sell or distribute or cause to be sold or distributed any original factory-wrapped package of two or more cigars, unless such package is priced for retail sale at five dollars and eighty cents ($5.80) or more.

3. This Section shall not apply to a person or entity engaged in the business of selling or distributing cigars for commercial purposes to another person or entity engaged in the business of selling or distributing cigars for commercial purposes with the intent to sell or distribute outside the boundaries of Needham.

4. The Needham Board of Health may adjust from time to time the amounts specified in this Section to reflect changes in the applicable Consumer Price Index by amendment of this regulation.

I. Sale of Flavored Tobacco Products Prohibited:

No person, as defined herein, shall possess, hold, keep, sell or distribute or cause to be possessed, held, kept, sold or distributed any flavored tobacco product, as defined herein, or any flavored tobacco product enhancer, as defined herein.

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Retailers must obtain manufacturer documentation certifying that all products possessed, held, kept, sold or distributed by the retailer do not meet the definition of a flavored tobacco product or tobacco product flavor enhancer (105 CMR 665.010(E)).

J. Nicotine Content in Electronic Nicotine Delivery Systems:

No person shall sell an electronic nicotine delivery system with nicotine content greater than 35 milligrams per milliliter; provided, however, that this subsection shall not apply to adult-only retail tobacco stores or smoking bars.

Retailers must obtain manufacturer documentation verifying that all electronic nicotine delivery products possessed, held, kept, sold or distributed by the retailer indicating the nicotine content expressed as milligrams per milliliter for each electron nicotine delivery system to be sold in the retail establishment (105 CMR 665.010(C)).

K. Prohibition of the Sale of Blunt Wraps:

No person or entity shall sell or distribute blunt wraps in Needham**.**

L. Free Distribution and Coupon Redemption:

No person shall:

1. Distribute or cause to be distributed, any free samples of tobacco products, as defined herein;
2. Accept or redeem, offer to accept or redeem, or cause or hire any person to accept or redeem or offer
   to accept or redeem any coupon that provides any tobacco product, as defined herein, without charge or for less than the listed or non-discounted price; or
3. Sell a tobacco product, as defined herein, to consumers through any multi-pack discounts (e.g., "buy-two-get-one-free") or otherwise provide or distribute to consumers any tobacco product, as defined herein, without charge or for less than the listed or non-discounted price in exchange for the purchase of any other tobacco product.
4. Sections 2 and 3 shall not apply to products, such as cigarettes, for which there is a state law prohibiting them from being sold as loss leaders and for which a minimum retail price is required by state law.

M. Out-of-Package Sales:

1. The sale or distribution of tobacco products, as defined herein, in any form other than an original factory-wrapped package is prohibited, including the repackaging or dispensing of any tobacco product, as defined herein, for retail sale. No person, as defined herein, shall possess, hold, keep, sell or distribute or cause to be possessed, held, kept, sold or distributed any cigarette package that contains fewer than twenty (20) cigarettes, including single cigarettes.
2. Permit holders who sell Liquid Nicotine Containers must comply with the provisions of 310 CMR 30.000, Massachusetts Hazardous Waste Regulations.

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3. All permit holders must comply with 940 CMR 21.05 which reads: "It shall be an unfair or deceptive act or practice for any person to sell or distribute nicotine in a liquid or gel substance in Massachusetts after March 15, 2016 unless the liquid or gel product is contained in a child-resistant package that, at a minimum, meets the standard for special packaging as set forth in 15 U.S.C.§§1471 through 1476 and 16 CFR §1700 *et seq*."
4. No permit holder shall refill a cartridge that is prefilled with nicotine in a liquid or gel substance and sealed by the manufacturer and not intended to be opened by the consumer or retailer.

N. Self-Service Displays:

All self-service displays of tobacco products, as defined herein, are prohibited. All humidors including, but not limited to, walk-in humidors must be locked. Adult-Only Retail Tobacco Stores are exempt from this section.

O. Vending Machines:

All vending machines containing tobacco products, as defined herein, are prohibited.

P. Non-Residential Roll-Your-Own Machines:

All Non-Residential Roll-Your-Own machines are prohibited.

Q. Prohibition of the Sale of Tobacco Products by Health Care Institutions:

No health care institution located in Needham shall sell or cause to be sold tobacco products, as defined herein. No retail establishment that operates or has a health care institution within it, such as a pharmacy, optician/optometrist or drug store, shall sell or cause to be sold tobacco products, as defined herein.

R. Prohibition of the Sale of Tobacco Products by Educational Institutions:

No educational institution located in Needham shall sell or cause to be sold tobacco products, as defined herein. This includes all educational institutions as well as any retail establishments that operate on the property of an educational institution.

S. Incorporation of State Laws and State Regulations:

1. The sale or distribution of tobacco products, as defined herein, must comply with those provisions found at M.G.L. Ch. 270, §§6, 6A, 7, 28, 29 and M.G.L. Ch. 112, §61A.

2. The sale and distribution of tobacco products, as defined herein, must comply with state regulations including but not limited to those provisions found at 940 CMR 21.00, Sale and Distribution of Cigarettes, Smokeless Tobacco Products, and Electronic Smoking Devices in

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Massachusetts, 940 CMR 22.00 Sale and Distribution of Cigars in Massachusetts; and 105 CMR 665.00, Minimum Standards for Retail Sale of Tobacco and Electronic Nicotine Delivery Systems..

T. PROHIBITION ON SMOKING IN PUBLIC PLACES AND WORKPLACES: No person shall smoke or use an e-cigarette nor shall any person having control of the premises upon which smoking is prohibited by this regulation or by M.G.L. c. 270, §22, or the business agent or designee of such person, permit a person to smoke or use an e-cigarette in any of the following places as defined herein: restaurants and all outdoor areas of restaurants, bars, taverns, and any other outdoor place where food and/or beverages, and/or non-alcoholic beverages are sold, served, or otherwise consumed or carried, health care facilities, municipal buildings, municipal vehicles, public places, public transportation, retail stores, town-owned parks and playgrounds, town-owned athletic fields, town-owned property, conservation land, nursing homes, hotels, motels, inns, bed and breakfast, lodging homes, any establishment that is required to possess a valid Tobacco Sales Permit from the Needham Board of Health (including, but not limited to, smoke shops, tobacconists, retail tobacco stores) and workplaces except as otherwise provided in § S.2 of this regulation. It shall be the responsibility of the employer to provide a smoke-free environment for all employees working in an enclosed workplace as well as those workplaces listed. Additionally, no person shall smoke in any place in which a sign conforming to the requirements of Section S.1 of this regulation is posted. No person shall remove a sign posted under the authority § S.1 of this regulation.

1. Every person having control of premises upon which smoking is prohibited by and under the authority of this regulation shall conspicuously display upon the premises "No Smoking" signs provided by the Massachusetts Department of Public Health and available from the Needham Board of Health or the international "No Smoking" symbol (consisting of a pictorial representation of a burning cigarette enclosed in a circle with a bar across it) and comparable in size to the sign provided by the Massachusetts Department of Public Health and available from the Needham Board of Health.

2. Notwithstanding any other provision of these regulations, smoking may be permitted in the following places and/or under the following circumstances consistent with all applicable state laws:

    a. Private residences except those portions used as a public place, food service establishment, childcare, adult care, or health care office during the hours when operating as such.
    b. Hotel, motel, inn and bed and breakfast rooms rented to guests at smoke free (100%) at all times. A room so designated shall have signs posted indicating that no smoking is allowed**.**
    c. Private clubs if all employees are members. When a private club is open to the general public, that portion of said establishment open to the general public must be smokefree, separately enclosed and shall have self-closing doors. Premises occupied by a membership association, if the premises are owned, or under a written lease for a term of not less than 90 consecutive days, by an association during the time of the permitted activity if the premises are not located in a public building. Smoking may be permitted in a distinct part of the premises of a membership association, provided that this part (a) is physically separated from any area open to the public or occupied by a non-member who is not a guest. The separation shall be sufficient to prevent any migration of smoke into the public areas. Any doors separating the areas shall be self-

closing; (b) is occupied solely by those persons specified in 105 CMR 661.100(b). The membership association shall adopt and effectively implement a policy that ensures only such persons are permitted to enter the part of the premises where smoking is permitted; and (c) there are no signs inviting or encouraging the public or non-members who are not guests to enter. No smoking shall be permitted in an enclosed indoor space of a membership association during the time the space is:

1) open to the public. A membership association shall be regarded as open to the public when it has signs or advertising inviting or encouraging non-members to the premises or takes other action that may reasonably be regarded as inviting or allowing non-members to enter the premises; or
2) occupied by a non-member who is not an invited guest of a member or an employee of the association. A non-member shall be regarded as a guest if entering the premises (a) accompanied by a member, provided the member remains on the premises while the guest is present, and (b) signing a guest register that clearly specifies the name and address of the guest and the inviting member;
3) rented from the association for a fee or other agreement that compensates the association for the use of such space; OR
4) occupied by a contract employee, temporary employee or independent contractor.
5) Smoking may be permitted in an enclosed indoor space of a membership association at all times, if the space is restricted by the association to admittance only of its members, the invited guest of a member, and the employees of the membership association. A person shall not be regarded as a member if entering the premises under terms of a membership that differ in duration, cost or privileges from the terms of a full membership in the association. A person who is a contract employee, temporary employee, or independent contractor shall be considered an employee of a membership association under this subsection. A person who is a member of an affiliated chapter or branch of a membership association that is fraternal in nature operating under the lodge system, and is visiting the affiliated association, shall be an invited guest for the purpose of this association.

Nothing shall prohibit an establishment from being completely smoke free.

U. <u>Violations</u>:

1. It shall be the responsibility of the establishment, permit holder and/or his or her business agent to ensure compliance with all sections of this regulation. For violations of the sections of this regulation, the violator shall receive:

a. In the case of a first violation, a fine of one thousand dollars ($1,000.00) shall be issued and, additionally, if the violation is a sale of tobacco product to a person born on or after January 1, 2004, the Tobacco Product Sales Permit shall be suspended for seven (7) consecutive business days.

b. In the case of a second violation within 36 months of the date of the first violation, a fine of two thousand dollars ($2,000.00) shall be issued and the Tobacco Product Sales Permit shall be suspended for fourteen (14) consecutive business days.
c. In the case of a third violation within 36 months of the date of the first violation, a fine of five thousand dollars ($5,000.00) shall be issued and the Tobacco Product Sales Permit shall be suspended for thirty (30) consecutive business days.
d. In the case of a fourth violation within 36 months of the date of the first violation, a fine of five thousand dollars ($5,000.00) shall be issued and the Tobacco Product Sales Permit shall be suspended for ninety (90) consecutive business days.
e. In the case of a fifth violation or repeated, egregious violations of this regulation within a 36-month period, a fine of five thousand dollars ($5,000.00) shall be issued and the Board of Health shall hold a hearing in accordance with subsection 4 of this section and shall permanently revoke a Tobacco Product Sales Permit.

Permit suspensions and permit revocations are calculated using the total number of a retailer's violations, combining those violations that receive state-mandated fines and those that receive local fines. Where there is a difference in permit suspension periods, the longer period shall apply.

3. Failure to cooperate or interference with inspections pursuant to this regulation shall result in the suspension of the Tobacco Product Sales Permit for thirty (30) consecutive business days.

4. In addition to the monetary fines set above, any permit holder who engages in the sale or distribution of tobacco products while his or her permit is suspended shall be subject to the suspension of all Board of Health issued permits for thirty (30) consecutive business days. Multiple suspensions of a Tobacco Product Sales Permit shall not be served concurrently

5. The Needham Board of Health shall provide notice of the intent to suspend or revoke a Tobacco Product Sales Permit, which notice shall contain the reasons therefor and establish a time and date for a hearing which date shall be no earlier than seven (7) days after the date of said notice. The permit holder or its business agent shall have an opportunity to be heard at such hearing and shall be notified of the Board of Health's decision and the reasons therefor in writing. After a hearing, the Needham Board of Health shall suspend or revoke the Tobacco Product Sales Permit if the Board of Health finds that a violation of this regulation occurred. For purposes of such suspensions or revocations, the Board shall make the determination notwithstanding any separate criminal or non-criminal proceedings brought in court hereunder or under the Massachusetts General Laws for the same offense. All tobacco products, as defined herein, shall be removed from the retail establishment upon suspension or revocation of the Tobacco Product Sales Permit. Failure to remove all tobacco products, as defined herein, shall constitute a separate violation of this regulation.

6. For purposes of such fines, the Board of Health shall make the determination notwithstanding any separate criminal or non-criminal proceedings brought in court hereunder or under the Massachusetts General Laws for the same offense.

U. Separate Violations: Each day any violation exists shall be deemed to be a separate offense.

V. Enforcement:

Enforcement of this regulation shall be by the Needham Board of Health, its Director of Health & Human Services, and its designated agents.

The Board of Health may enforce these regulations or enjoin violations thereof through any lawful process, and the election of one remedy by the Board of Health shall not preclude enforcement through any other lawful means.

Any resident who desires to register a complaint pursuant to the regulation may do so by contacting the Needham Board of Health or its designated agent(s) and the Board shall investigate.

W. Severability:

If any provision of this regulation is declared invalid or unenforceable, the other provisions shall not be affected thereby but shall continue in full force and effect.

X. Effective Date:

Board of Health discussion about the Nicotine Free Generation (NFG) policy occurred at public meetings on May 10, June 14, and July 12, 2024. A public hearing about the Nicotine Free Generation policy occurred on September 5, 2024, and was continued until October 8, 2024 and then again until November 22, 2024, where the NFG policy and a draft version of this regulation incorporating NFG were discussed and debated. This regulation was [approved] by a [unanimous] vote of the Needham Board of Health on October 8, 2024 and shall take effect on January 1, 2025.

A notice and summary of the regulation was posted by the Needham Town Clerk, was posted on the Needham Public Health Division's website, and was published in a newspaper in circulation in the Town of Needham. Copies of this regulation have also been filed with the Needham Town Clerk and the Massachusetts Department of Environmental Protection.

The original Needham Board of Health smoking and tobacco regulation was enacted in September 1991. It has been amended extensively over the years, most notably in 2005 with the enactment of the Tobacco 21 policy, which was phased-in over a three-year period. This regulation was amended again in 2009 with the implementation of a prohibition on the sale of tobacco products in pharmacies. A ban on flavored tobacco was incorporated in 2015, the tolling period for violations was revised in 2017, and restrictions on electronic nicotine delivery systems were incorporated in 2018 and 2019. Updates on the number of permits and also the adoption of updated state regulation requirements, along with the adoption of the state fine schedule, took place in 2020 and 2021. An update to the regulation, unanimously approved by the Board of Health on September 23, 2021, included a modification to the definition of "person" on page six and shall go into effect on October 15, 2021.

BOARD OF APPEALS
DOVER, MASSACHUSETTS 02030

NOTICE OF PUBLIC HEARING

Notice is hereby given that the Board of Appeals of the Town of Dover, Massachusetts will hold a public hearing on Monday, October 28, 2024 at 7:00 PM through Remote Participation (Zoom) on the application of Julie Cohen-Shafiki of 25 Dover Road, Dover, MA 02030. The application requests the Board of Appeals to issue a special permit (Dover Bylaw Section 185-52) to allow short term rentals of said 25 Dover Road, subject to such conditions as the Board may require.

Anyone interested or wishing to be heard should follow the instructions found on the agenda posted online for this hearing at doverma.gov. Copies of the Application may be viewed at the Town Clerk's office, during its regular hours.

Dover-Sherborn Hometown Weekly
10/10/2024, 10/17/2024

George Chimento
Chair

LEGAL NOTICE
DOVER PLANNING BOARD

The Dover Planning Board will hold a public hearing on Monday, November 4, 2024 at 7:00 PM remotely on Zoom [To join by computer, laptop, tablet, or phone Zoom application: https://us06web.zoom.us/j/81654944819?pwd=Tajmf7Q5chb8Iwcw6EYyCUbOIGS7Fw.1 Meeting ID: 816 5494 4819, Passcode: 093932, or dial: 1(646)876-9923 to connect via telephone] to consider the following amendments to the Dover Zoning Bylaws:

To see if the Board will vote to amend Sections 185.46-185.55 of the Dover Zoning Bylaws by making non-substantive changes in the numbering and heading of these bylaws in order that they be in compliance with the format of the Dover Town Code

Copies of the draft of these proposed revisions are available online and on file with the Town Clerk and the Planning Board and may be inspected, by appointment, during office hours. Any person interested or wishing to be heard should appear at the time and place designated.

Hometown Weekly Newspaper
10/17/24, 10/24/24

Carol Lisbon, Chair
Dover Planning Board

BOARD OF APPEALS
DOVER, MASSACHUSETTS 02030

NOTICE OF PUBLIC HEARING

Notice is hereby given that the Board of Appeals of the Town of Dover, Massachusetts will hold a public hearing on Monday, November 4, 2024 at 7:00 PM through Remote Participation (Zoom) on the application of Tisdale Land, LLC of 10 Springdale Ave, Dover, MA 02030 for the issuance of a Comprehensive Permit under Gen. Laws chapter 40B, sections 20-23, to construct a 42-unit (11 affordable) apartment building at 81 & 85 Tisdale Drive, Dover, MA 02030 (Assessors Map 25, Parcels 9B and 9A) with all associated site improvements.

Anyone interested or wishing to be heard should follow the instructions found on the agenda posted online for this hearing at doverma.gov. Copies of the Application may be viewed at the Town Clerk's office, during its regular hours.

Dover-Sherborn Hometown Weekly
10/17/2024, 10/24/2024

George Chimento
Chairman, Board of Appeals