

# STORMWATER MANAGEMENT REPORT

AVE E LOFTS  
**194 - 200 AVE E, BAYONNE NJ.**

Proposed 6-Story Multi-Family Residential Building With 36 Residential Units  
Block 458, Lots 7-9  
Bayonne, New Jersey

January 26, 2020



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John C. Inglese, AIA, PE, LEED AP

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## **Introduction**

### I. Project Description and Location

The property to be developed is designated as Block 458, Lot 7-9. The property is in a tidal flood zone with base flood elevation of 11 – 12 ft above sea level. The proposed scope of work is the construction of a new 6-story structure, to create a 40-unit residential building.

### II. Existing Site Conditions

The property is located on Avenue E in the city of Bayonne, NJ. It is 12,500 sq. ft. (0.287-acre) site that is currently occupied with an existing building scheduled to be demolished. The site topography ranges between 11 ft to 14 ft. The soil type for this site is classified as Urban land, Till Substratum (URTILB), 0 to 8 percent slopes.

### III. Stormwater Management Description

The pre- and post-development runoff flows were calculated in accordance with the City of Bayonne Stormwater Ordinance and the Stormwater Best Management Practices (BMP). The proposed site is 12,500 sq. ft. (0.287-acre), and the development exceeds ¼ acre of new impervious coverage. Storm water runoff quality management will be discussed in this report. Storm water runoff management system is in accordance with Bayonne stormwater management plan dated august 2008.

## **Pre & Post Development Runoff Conditions**

It is the purpose of this report to provide information on the methods and techniques employed in the stormwater management analysis that demonstrate that the stormwater runoff will not be increased due to the development.

Accordingly, stormwater management analysis in this report consists of:

1. Calculating runoff from the rainfall for 2, 10- and 100-year storm events for the pre- and post-development conditions of each drainage area
2. Comparing the results of the pre-developed vs. post-developed conditions to ensure that all stormwater regulations have been met

I. Predevelopment Conditions

The total drainage area for the site is 12,500 sq. ft. (0.287-acre) which is currently an occupied lot with one (1) 1-Story building, One (1) Two story dwelling and paved driveway. The design parameters for pre-developed condition are as follows: The rainfall intensities for the 2, 10- and 100-year storm events are 4.3 in/hour, 5.8 in/hour and 8 in/hour, respectively.

Total Site Drainage Area	Existing Area (SF)	Area (ac)	C
<i>Lot</i>	12500.00	0.287	<i>0.90</i>
<i>Building</i>	7044.93	0.162	0.98
<i>Paved</i>	4107.86	0.094	0.95
<i>Landscape</i>	1347.21	0.031	0.30

Total Site Drainage Area	Existing Flows (cfs)
<i>Q(2 year)</i>	1.107
<i>Q(10 year)</i>	1.493
<i>Q(100 year)</i>	2.059

II. Post Development Conditions

The proposed site drainage area is 12,500 sq. ft. (0.287-acre) which consists of a 6-story Residential Building with ground floor parking garage. The proposed drainage area will be detained in a non-perforated detention basin, which releases the storm water to the city’s sewer system in accordance with the City of Bayonne Storm Water Ordinance and BMP guidelines. See Drainage and Utility Site Plan for exact location of new basins, inlets and manhole. The rainfall intensities for the 2, 10- and 100-year storm events are 4.3 in/hour, 5.8 in/hour and 8.0 in/hour, respectively.

Total Site Drainage Area	Proposed Area (SF)	Area (ac)	C
<i>Lot</i>	12500.00	0.2870	<i>0.94</i>
<i>Building</i>	11469.09	0.2630	0.98
<i>Paved</i>	228.97	0.0053	0.95
<i>Landscape</i>	801.94	0.0184	0.30

Total Site Drainage Area	Unreduced Proposed Flows (cfs)
<i>Q(2 year)</i>	1.155
<i>Q(10 year)</i>	1.558
<i>Q(100 year)</i>	2.150

III. Basin Discussion and Design

Building: Detention Basin Design

The proposed detention basin has been designed to accept stormwater runoff from the building’s roof. Stormwater will be conveyed from the roof drains with leaders at the roof deck to the detention basin. The detention basin is located below the first/ground floor garage level. The detention basin will discharge the stormwater to the manhole on Avenue E. A summary of the required storage, peak inflow and outflow for existing, allowable and proposed conditions, and basin peak elevations will be provided below.

Storm Event (Yr.)	Inflow	Allowable Outflow (cfs)	Unreduced Proposed Outflow (cfs)	Total Inflow Volume (cf)
2	0.87	0.553	1.155	2,954.00
10	1.35	1.120	1.558	5,054.00
100	2.10	1.647	2.150	8,426.00

Storm Event (Yr.)	Allowable outflow (cfs)	Computed Outflow (cfs)	Maximum Pond Storage (cf)	Pond Storage Depth (ft)
2	0.553	0.55	176.00	1.46
10	1.120	0.67	448.00	2.15
100	1.647	0.88	956.00	3.59

As demonstrated above, the post development computed stormwater discharge for all 3 storm events are less than or equal to the allowable discharge rates as regulated by the City of Bayonne Stormwater Ordinance and BMP. The allowable stormwater discharge is a factored existing stormwater discharge as defined in the BMP. As a result, this design satisfies the NJDEP Stormwater Management rules for the stormwater quantity reduction.

The discharge pipe from the outlet structure to the manhole was designed to handle the proposed outflow from the 100-year storm event. A 12” diameter RCP pipe with a 0.5% slope exceeds the allowable 100-year storm event flow.

IV. Soil Erosion and Sediment Control

To minimize the effects of erosion, the proposed design and construction concepts and practices incorporate the standards for Soil Erosion and Sediment Control in New Jersey as provided by the New Jersey State Soil Conservation Committee. The soil erosion is controlled predominantly by one factor:

- The building occupies 92% of the lot, and the stormwater runoff is collected with roof leaders and inlets and directed to the stormwater storage chambers. The runoff from this area mostly percolate into the ground and the soil erosion is controlled by the landscape.

Other erosion deterrents include but are not limited to the use of silt fence or other sediment barriers around the property. In addition, dust control measures, stone tracking mats, and temporary and permanent vegetative cover will be utilized. General notes and guidelines are provided on the Soil Erosion Plan for the contractor in order to ensure against soil erosion on the site while construction is in progress.

#### V. Water Quality Treatment

The proposed site development area is 12,500 sq. ft. (0.287-acre) and although the proposed development's lot area exceeds 1/4 Ac, most of the rain runoff will be captured at the roof level (11,682.33 sf), and therefore no water quality treatment is required prior to discharge.

#### Summary

In conclusion, the stormwater management system for this project has been designed in accordance with the City of Bayonne Storm Water Ordinance and the BMP. This project is in the Tidal flood zone. We have demonstrated that our detention basin exceeds the minimum requirements set forth by the City of Bayonne Water Ordinance and the BMP. Furthermore, in our design, we have also demonstrated that the stormwater drainage systems reduce the proposed site drainage impact of the storm water runoff into the city's sewer system.

As a result of these measures, the total developed impact of the proposed storm water drainage system on the city's sewer system is significantly less than the existing storm drainage discharge.

Therefore, it is our professional opinion that the proposed stormwater drainage design has no negative impacts on the existing stormwater system.

# APPENDIX

STORMWATER CALCULATION PACKET WITH HYDROGRAPH

# National Flood Hazard Layer FIRMMette



74°7'23"W 40°39'51"N



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

<b>SPECIAL FLOOD HAZARD AREAS</b>		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		Regulatory Floodway
<b>OTHER AREAS OF FLOOD HAZARD</b>		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>
<b>OTHER AREAS</b>		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
<b>GENERAL STRUCTURES</b>		Area of Undetermined Flood Hazard <i>Zone D</i>
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
<b>OTHER FEATURES</b>		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation 17.5
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
<b>MAP PANELS</b>		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Digital Data Available
		No Digital Data Available
		Unmapped
		The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

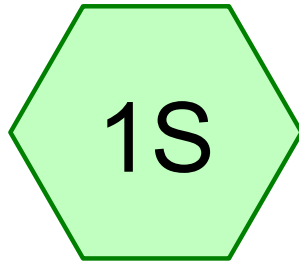


This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

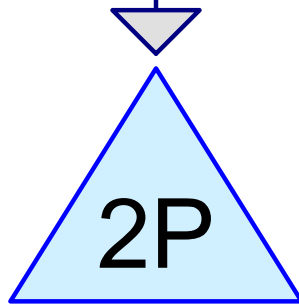
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **1/13/2021 at 4:25 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

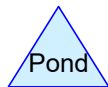
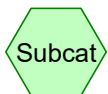




Proposed Building &  
Site



Storage Pipes



## **21-0112 Ave E Storm Management**

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### **Project Notes**

Copied 10 events from NJ\_Jersey City\_Depth 24-hr S1 storm

Copied 10 events from AveE 24-hr S1 storm

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### Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
12,502	94	(1S)
<b>12,502</b>	<b>94</b>	<b>TOTAL AREA</b>

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### Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
0	HSG D	
12,502	Other	1S
<b>12,502</b>		<b>TOTAL AREA</b>

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## 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	Subcatchment Numbers
0	0	0	0	12,502	12,502		1
<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>12,502</b>	<b>12,502</b>	<b>TOTAL AREA</b>	<b>S</b>

## 21-0112 Ave E Storm Management

AveE 24-hr S1 2-yr Rainfall=3.50"

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Time span=0.00-26.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: Proposed Building & Site** Runoff Area=0.287 ac 0.00% Impervious Runoff Depth=2.84"  
Tc=10.0 min CN=94 Runoff=0.87 cfs 2,954 cf

### Pond 2P: Storage Pipes

Peak Elev=1.46' Storage=176 cf Inflow=0.87 cfs 2,954 cf  
Outflow=0.55 cfs 4,144 cf

**Total Runoff Area = 12,502 sf Runoff Volume = 2,954 cf Average Runoff Depth = 2.84"**  
**100.00% Pervious = 12,502 sf 0.00% Impervious = 0 sf**

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AveE 24-hr S1 2-yr Rainfall=3.50"

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## Summary for Subcatchment 1S: Proposed Building & Site

Runoff = 0.87 cfs @ 12.09 hrs, Volume= 2,954 cf, Depth= 2.84"

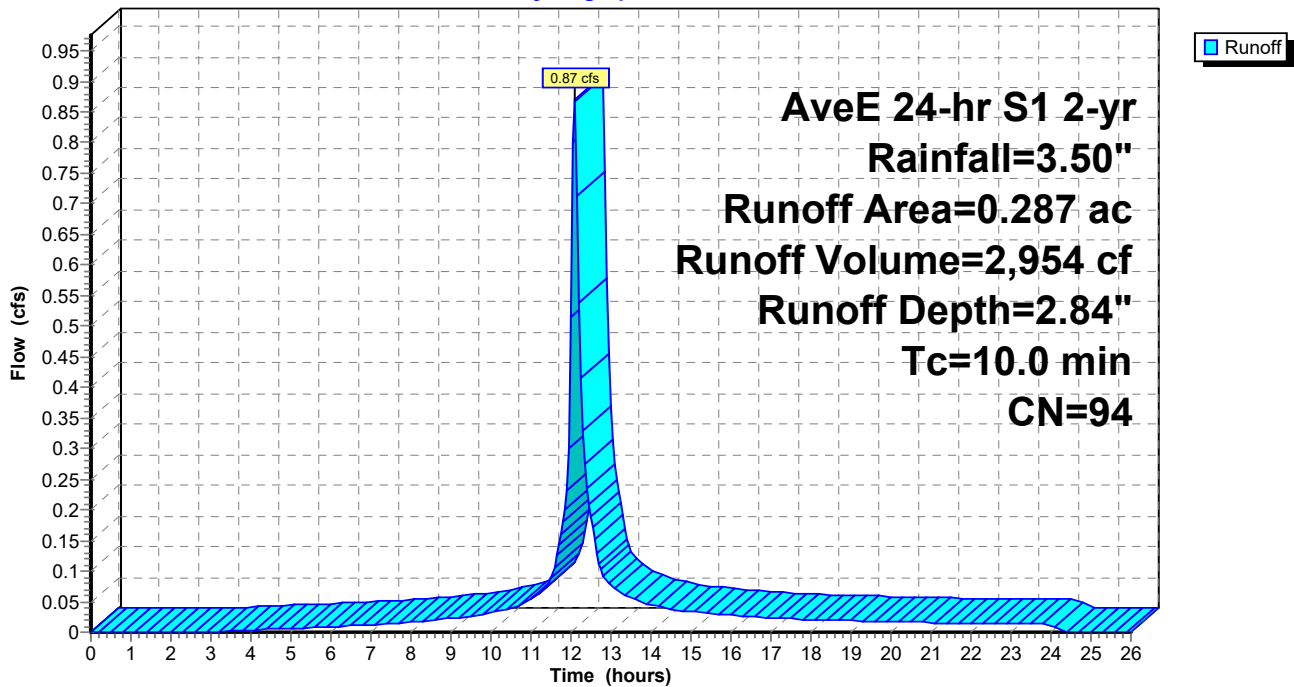
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs  
AveE 24-hr S1 2-yr Rainfall=3.50"

Area (ac)	CN	Description
* 0.287	94	
0.287		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry, 10 MIN

## Subcatchment 1S: Proposed Building & Site

Hydrograph



# 21-0112 Ave E Storm Management

AveE 24-hr S1 2-yr Rainfall=3.50"

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## Summary for Pond 2P: Storage Pipes

Inflow Area = 12,502 sf, 0.00% Impervious, Inflow Depth = 2.84" for 2-yr event  
Inflow = 0.87 cfs @ 12.09 hrs, Volume= 2,954 cf  
Outflow = 0.55 cfs @ 12.20 hrs, Volume= 4,144 cf, Atten= 37%, Lag= 6.8 min  
Primary = 0.55 cfs @ 12.20 hrs, Volume= 4,144 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 4  
Peak Elev= 1.46' @ 12.20 hrs Surf.Area= 822 sf Storage= 176 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
Center-of-Mass det. time= 54.5 min ( 849.9 - 795.4 )

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	0 cf	<b>11.75"W x 70.00'L x 4.50'H Field A</b> 3,701 cf Overall - 1,218 cf Embedded = 2,483 cf x 0.0% Voids
#2A	0.50'	976 cf	<b>ADS N-12 36"</b> x 6 Inside #1 Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf 6 Chambers in 2 Rows 8.75' Header x 7.10 sf x 2 = 124.2 cf Inside
		976 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	<b>3.0" Vert. Orifice/Grate X 2.00</b> C= 0.600

**Primary OutFlow** Max=0.55 cfs @ 12.20 hrs HW=1.45' (Free Discharge)

↑**1=Orifice/Grate** (Orifice Controls 0.55 cfs @ 5.55 fps)



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AveE 24-hr S1 2-yr Rainfall=3.50"

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## Pond 2P: Storage Pipes - Chamber Wizard Field A

### Chamber Model = ADS N-12 36" (ADS N-12® Pipe)

Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf

Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf

42.0" Wide + 21.0" Spacing = 63.0" C-C Row Spacing

3 Chambers/Row x 20.00' Long +3.50' Header x 2 = 67.00' Row Length +18.0" End Stone x 2 = 70.00' Base Length

2 Rows x 42.0" Wide + 21.0" Spacing x 1 + 18.0" Side Stone x 2 = 11.75' Base Width

6.0" Base + 42.0" Chamber Height + 6.0" Cover = 4.50' Field Height

6 Chambers x 142.0 cf + 8.75' Header x 7.10 sf x 2 = 976.2 cf Chamber Storage

6 Chambers x 177.2 cf + 8.75' Header x 8.86 sf x 2 = 1,218.4 cf Displacement

3,701.2 cf Field - 1,218.4 cf Chambers = 2,482.8 cf Stone x 0.0% Voids = 0.0 cf Stone Storage

Chamber Storage = 976.2 cf = 0.022 af

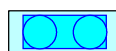
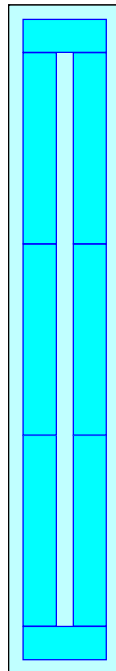
Overall Storage Efficiency = 26.4%

Overall System Size = 70.00' x 11.75' x 4.50'

6 Chambers

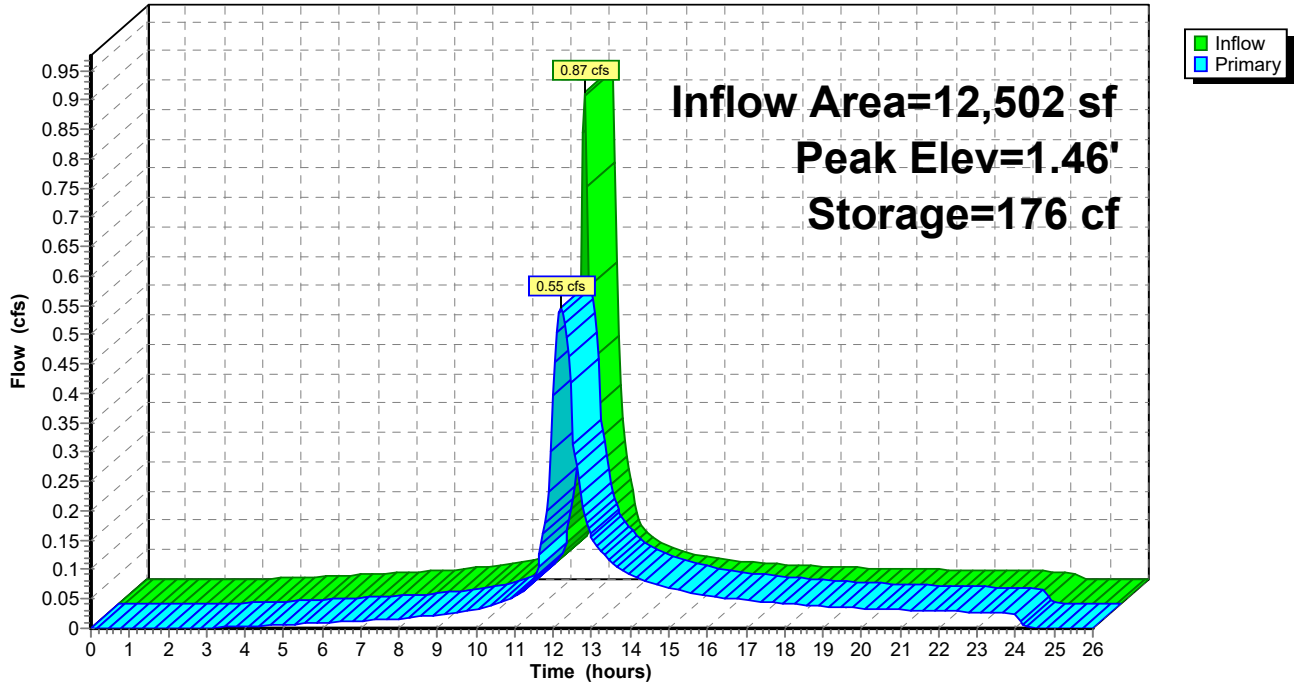
137.1 cy Field

92.0 cy Stone



### Pond 2P: Storage Pipes

Hydrograph



## 21-0112 Ave E Storm Management

AveE 24-hr S1 10-yr Rainfall=5.55"

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Time span=0.00-26.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: Proposed Building & Site** Runoff Area=0.287 ac 0.00% Impervious Runoff Depth=4.85"  
Tc=10.0 min CN=94 Runoff=1.35 cfs 5,054 cf

### Pond 2P: Storage Pipes

Peak Elev=2.15' Storage=448 cf Inflow=1.35 cfs 5,054 cf  
Outflow=0.67 cfs 3,518 cf

**Total Runoff Area = 12,502 sf Runoff Volume = 5,054 cf Average Runoff Depth = 4.85"**  
**100.00% Pervious = 12,502 sf 0.00% Impervious = 0 sf**

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AveE 24-hr S1 10-yr Rainfall=5.55"

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## Summary for Subcatchment 1S: Proposed Building & Site

Runoff = 1.35 cfs @ 12.09 hrs, Volume= 5,054 cf, Depth= 4.85"

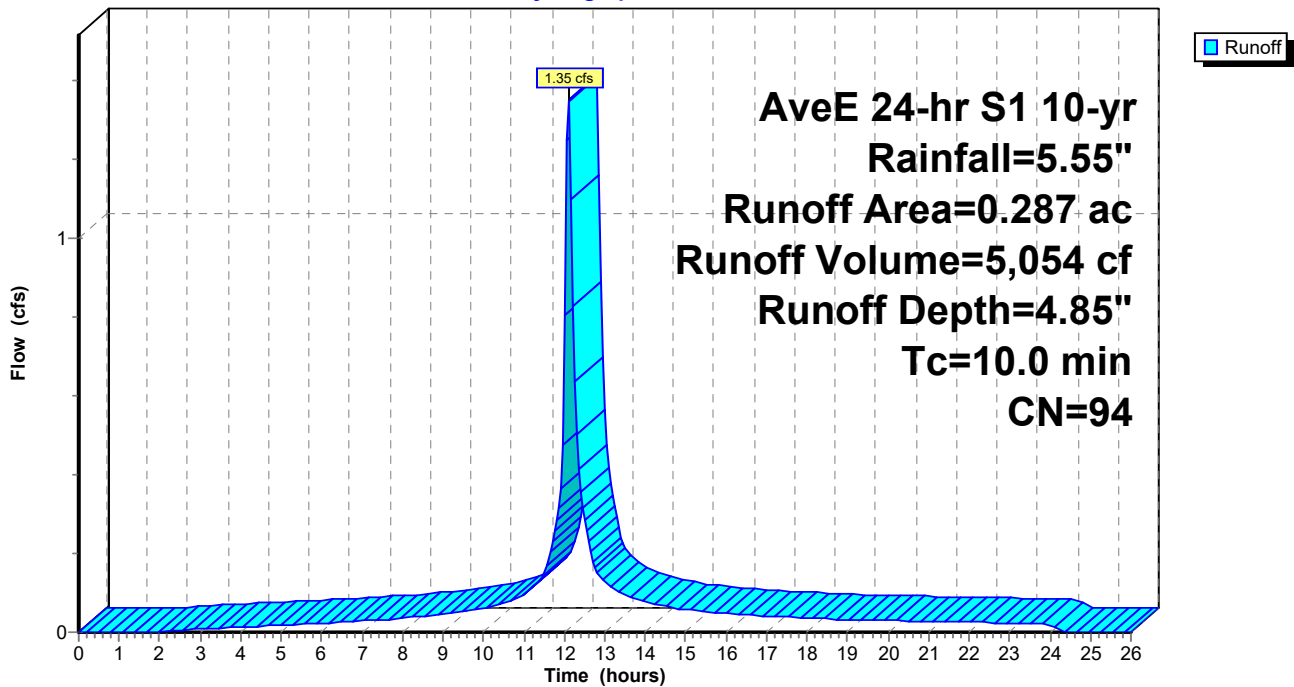
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs  
AveE 24-hr S1 10-yr Rainfall=5.55"

Area (ac)	CN	Description
* 0.287	94	
0.287		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry, 10 MIN

## Subcatchment 1S: Proposed Building & Site

Hydrograph



## 21-0112 Ave E Storm Management

AveE 24-hr S1 10-yr Rainfall=5.55"

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### Summary for Pond 2P: Storage Pipes

Inflow Area = 12,502 sf, 0.00% Impervious, Inflow Depth = 4.85" for 10-yr event  
Inflow = 1.35 cfs @ 12.09 hrs, Volume= 5,054 cf  
Outflow = 0.67 cfs @ 12.24 hrs, Volume= 3,518 cf, Atten= 50%, Lag= 9.3 min  
Primary = 0.67 cfs @ 12.24 hrs, Volume= 3,518 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 4  
Peak Elev= 2.15' @ 12.24 hrs Surf.Area= 822 sf Storage= 448 cf

Plug-Flow detention time= 5.4 min calculated for 3,518 cf (70% of inflow)  
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	0 cf	<b>11.75"W x 70.00'L x 4.50'H Field A</b> 3,701 cf Overall - 1,218 cf Embedded = 2,483 cf x 0.0% Voids
#2A	0.50'	976 cf	<b>ADS N-12 36"</b> x 6 Inside #1 Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf 6 Chambers in 2 Rows 8.75' Header x 7.10 sf x 2 = 124.2 cf Inside
		976 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	<b>3.0" Vert. Orifice/Grate X 2.00</b> C= 0.600

**Primary OutFlow** Max=0.67 cfs @ 12.24 hrs HW=2.15' (Free Discharge)

↑**1=Orifice/Grate** (Orifice Controls 0.67 cfs @ 6.85 fps)

**21-0112 Ave E Storm Management**

*AveE 24-hr S1 10-yr Rainfall=5.55"*

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**Pond 2P: Storage Pipes - Chamber Wizard Field A**

**Chamber Model = ADS N-12 36" (ADS N-12® Pipe)**

Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf

Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf

42.0" Wide + 21.0" Spacing = 63.0" C-C Row Spacing

3 Chambers/Row x 20.00' Long +3.50' Header x 2 = 67.00' Row Length +18.0" End Stone x 2 = 70.00' Base Length

2 Rows x 42.0" Wide + 21.0" Spacing x 1 + 18.0" Side Stone x 2 = 11.75' Base Width

6.0" Base + 42.0" Chamber Height + 6.0" Cover = 4.50' Field Height

6 Chambers x 142.0 cf + 8.75' Header x 7.10 sf x 2 = 976.2 cf Chamber Storage

6 Chambers x 177.2 cf + 8.75' Header x 8.86 sf x 2 = 1,218.4 cf Displacement

3,701.2 cf Field - 1,218.4 cf Chambers = 2,482.8 cf Stone x 0.0% Voids = 0.0 cf Stone Storage

Chamber Storage = 976.2 cf = 0.022 af

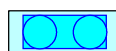
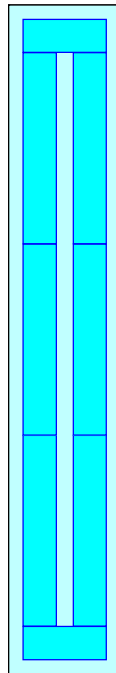
Overall Storage Efficiency = 26.4%

Overall System Size = 70.00' x 11.75' x 4.50'

6 Chambers

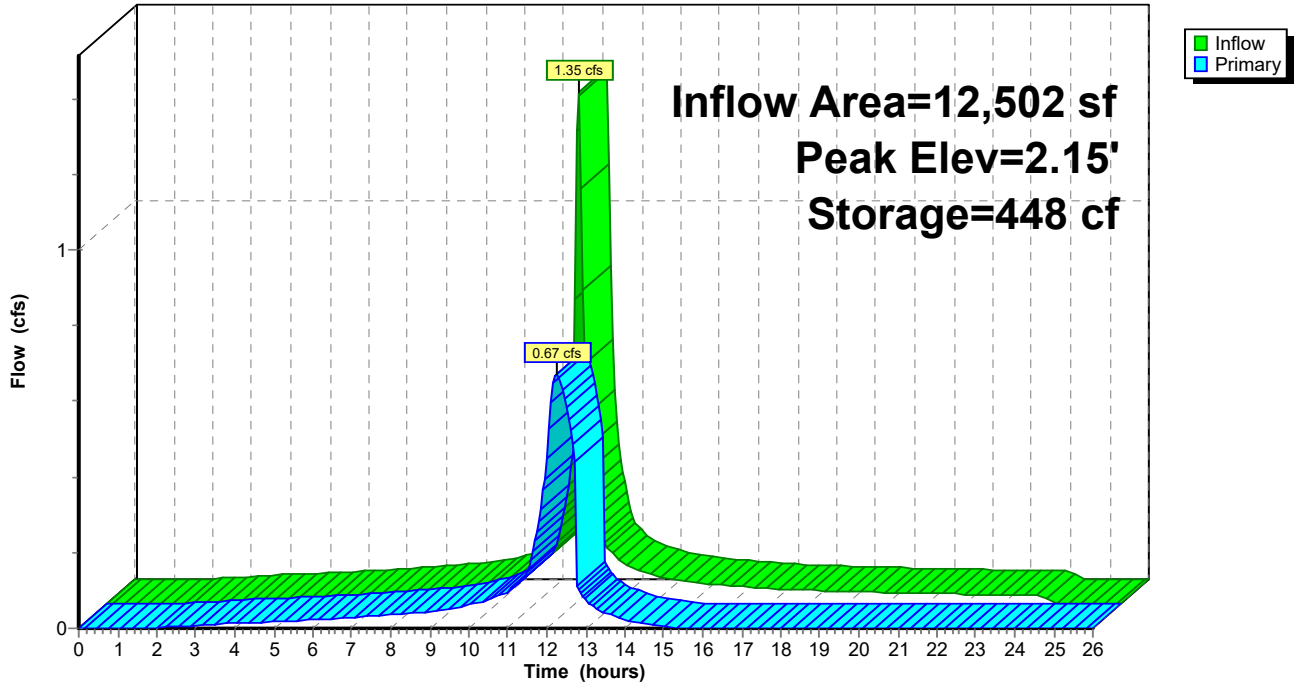
137.1 cy Field

92.0 cy Stone



Pond 2P: Storage Pipes

Hydrograph



**21-0112 Ave E Storm Management**

*AveE 24-hr S1 100-yr Rainfall=8.81"*

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Time span=0.00-26.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: Proposed Building & Site** Runoff Area=0.287 ac 0.00% Impervious Runoff Depth=8.09"  
Tc=10.0 min CN=94 Runoff=2.10 cfs 8,426 cf

**Pond 2P: Storage Pipes** Peak Elev=3.59' Storage=956 cf Inflow=2.10 cfs 8,426 cf  
Outflow=0.88 cfs 9,192 cf

**Total Runoff Area = 12,502 sf Runoff Volume = 8,426 cf Average Runoff Depth = 8.09"**  
**100.00% Pervious = 12,502 sf 0.00% Impervious = 0 sf**



# 21-0112 Ave E Storm Management

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AveE 24-hr S1 100-yr Rainfall=8.81"

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## Summary for Subcatchment 1S: Proposed Building & Site

Runoff = 2.10 cfs @ 12.09 hrs, Volume= 8,426 cf, Depth= 8.09"

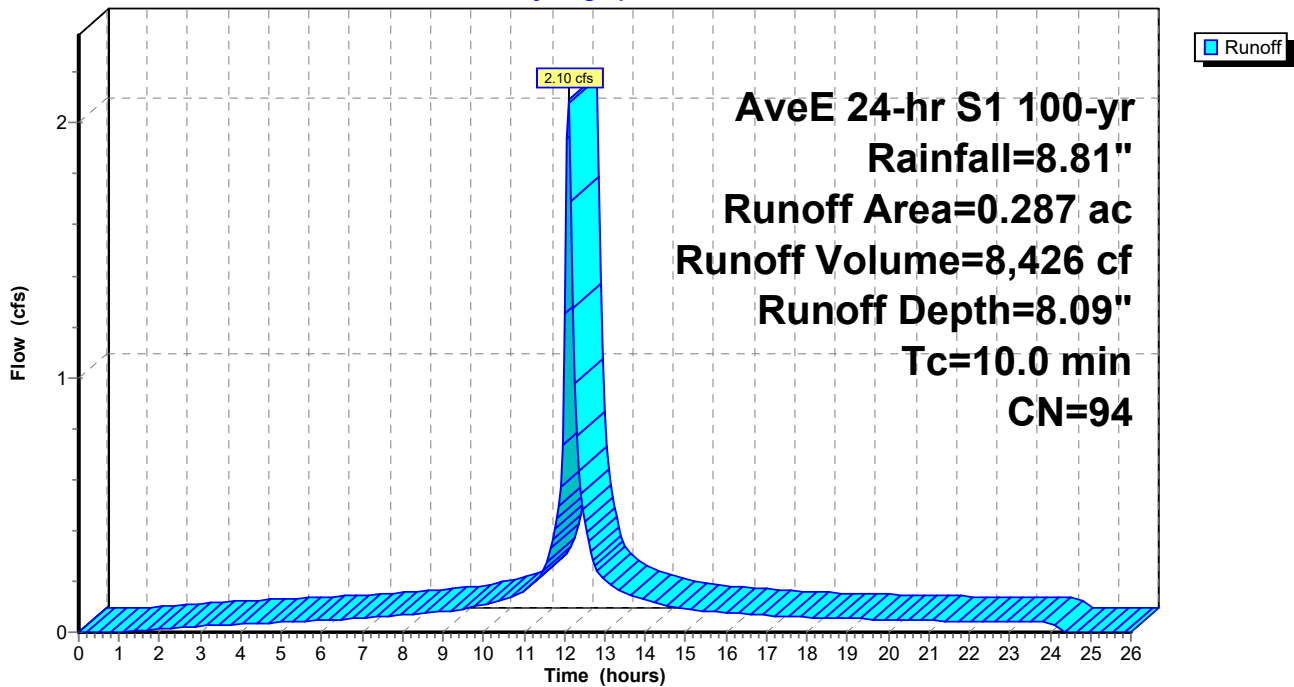
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs  
AveE 24-hr S1 100-yr Rainfall=8.81"

Area (ac)	CN	Description
* 0.287	94	
0.287		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry, 10 MIN

## Subcatchment 1S: Proposed Building & Site

Hydrograph



# 21-0112 Ave E Storm Management

AveE 24-hr S1 100-yr Rainfall=8.81"

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## Summary for Pond 2P: Storage Pipes

Inflow Area = 12,502 sf, 0.00% Impervious, Inflow Depth = 8.09" for 100-yr event  
Inflow = 2.10 cfs @ 12.09 hrs, Volume= 8,426 cf  
Outflow = 0.88 cfs @ 12.27 hrs, Volume= 9,192 cf, Atten= 58%, Lag= 11.1 min  
Primary = 0.88 cfs @ 12.27 hrs, Volume= 9,192 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs / 4  
Peak Elev= 3.59' @ 12.27 hrs Surf.Area= 822 sf Storage= 956 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
Center-of-Mass det. time= 33.0 min ( 799.7 - 766.8 )

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	0 cf	<b>11.75"W x 70.00'L x 4.50'H Field A</b> 3,701 cf Overall - 1,218 cf Embedded = 2,483 cf x 0.0% Voids
#2A	0.50'	976 cf	<b>ADS N-12 36"</b> x 6 Inside #1 Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf 6 Chambers in 2 Rows 8.75' Header x 7.10 sf x 2 = 124.2 cf Inside
		976 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	<b>3.0" Vert. Orifice/Grate X 2.00</b> C= 0.600

**Primary OutFlow** Max=0.88 cfs @ 12.27 hrs HW=3.56' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 0.88 cfs @ 8.93 fps)

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AveE 24-hr S1 100-yr Rainfall=8.81"

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## Pond 2P: Storage Pipes - Chamber Wizard Field A

### Chamber Model = ADS N-12 36" (ADS N-12® Pipe)

Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf

Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf

42.0" Wide + 21.0" Spacing = 63.0" C-C Row Spacing

3 Chambers/Row x 20.00' Long +3.50' Header x 2 = 67.00' Row Length +18.0" End Stone x 2 = 70.00' Base Length

2 Rows x 42.0" Wide + 21.0" Spacing x 1 + 18.0" Side Stone x 2 = 11.75' Base Width

6.0" Base + 42.0" Chamber Height + 6.0" Cover = 4.50' Field Height

6 Chambers x 142.0 cf + 8.75' Header x 7.10 sf x 2 = 976.2 cf Chamber Storage

6 Chambers x 177.2 cf + 8.75' Header x 8.86 sf x 2 = 1,218.4 cf Displacement

3,701.2 cf Field - 1,218.4 cf Chambers = 2,482.8 cf Stone x 0.0% Voids = 0.0 cf Stone Storage

Chamber Storage = 976.2 cf = 0.022 af

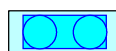
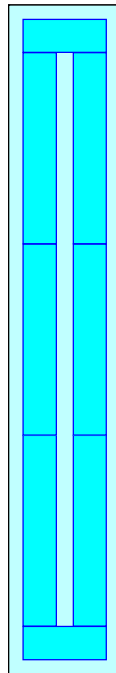
Overall Storage Efficiency = 26.4%

Overall System Size = 70.00' x 11.75' x 4.50'

6 Chambers

137.1 cy Field

92.0 cy Stone



Pond 2P: Storage Pipes

Hydrograph

