

# STORMWATER DRAINAGE REPORT

**For:**

**6465 Sawmill Road  
City of Dublin, Ohio**

**Prepared For:**

**Christoff**

**Prepared By:**



AMERICAN  
**STRUCTUREPOINT**  
INC.

**2550 Corporate Exchange Drive, Suite 300  
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**Prepared: October 2013  
Revised: November 2013**

**Prepared By:**



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**Shawn L. Goodwin, PE**

**Date**

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**STORMWATER DRAINAGE REPORT**  
for  
**6465 Sawmill Road**  
**City of Columbus, Ohio**

**I. PROJECT DESCRIPTION**

The proposed project is located on the west side of Sawmill Road just north of State Route 161 in the City of Dublin, Ohio. The project consist of re-development of 0.448 acres of urban residential single-family to a 3,064 square foot commercial building along with associated parking and drives.

An aerial map can be found in Appendix A and a soils map can be found in Appendix B of this report.

**II. PRE-DEVELOPED DRAINAGE**

The “pre-developed” drainage for the re-developed area drains overland to Sawmill Road to the east, to an alley to the west and to commercial parking lots to the north and south, respectively. The subject parcel is relatively flat and consists of 0.118 acres of existing pavement and 0.330 acres urban grasses, which results in “pre-developed” a weighted runoff coefficient (CN) of 80. Additionally, a 10.0 minute time of concentration was assumed.

A pre-developed tributary area map can be found in Appendix C of this report. Additionally, pre-developed runoff calculations using HydroCAD Version 9.00 by HydroCAD Software Solutions, LLC, and can be found in Appendix D of this report.

**III. POST-DEVELOPED DRAINAGE**

An onsite storm sewer system designed for the 2-year design storm will be installed to convey stormwater for the re-development to the provided detention areas. Since the storm sewer system is being used as detention a 5-year check storm is not valid and has not been provided. Storm sewer calculations can be found in Appendix G of this report. The overall “post-developed” area consists of 0.338 acres of building/pavement/sidewalk and 0.110 acres of grassed open space, which results in a weighted runoff coefficient (CN) of 92.

Per chapter 2 of the *City of Dublin Stormwater Management design manual*, the percent of increase in runoff volume due to development was calculated by comparing the 1-year, 24-hour storm event using the SCS Type II distribution curve for existing and proposed conditions. The percent increase from the pre-developed total runoff volume to post-developed total runoff is shown below:

| <b>Location</b> | <b>Pre-Dev<br/>1-year<br/>Release Rate<br/>(cfs)</b> | <b>Post-Dev<br/>1-year<br/>Release Rate<br/>(cfs)</b> |
|-----------------|------------------------------------------------------|-------------------------------------------------------|
| Site            | 0.46                                                 | 0.96                                                  |

$$\frac{[(\text{Total 1 yr Post-Dev}) - (\text{Total 1 yr Pre-Dev})]/[\text{Total 1 yr Pre-Dev}] \times 100\% = \% \text{ Increase}}{[0.96 \text{ cfs} - 0.46 \text{ cfs}]/[0.46 \text{ cfs}] \times 100\% = \mathbf{109\% (25\text{-year Critical Storm)}}$$

Using Table 2-5 in the *City of Dublin Stormwater Management Design Manual*, a 109% increase in runoff volume assigns the critical storm for this project as the 25-year storm event. Additionally, Storms of less frequent occurrence than the 25-year storm event shall have the allowable peak rate of runoff not greater than the allowable peak rate of runoff for the same storm under predeveloped conditions. See the pre-development and post-development release rate table on page 3.

| <b>STORMWATER MANAGEMENT SUMMARY</b> |                         |                              |                   |
|--------------------------------------|-------------------------|------------------------------|-------------------|
| Storm Event                          | Allowable Release Rates | Post-Developed Release Rates | Ponding Elevation |
|                                      | (cfs)                   | (cfs)                        | (feet)            |
| 1-year                               | 0.46                    | 0.43                         | 907.23            |
| 2-year                               | 0.46                    | 0.43                         | 907.35            |
| 5-year                               | 0.46                    | 0.44                         | 907.48            |
| 10-year                              | 0.46                    | 0.45                         | 907.57            |
| 25-year                              | 0.46                    | 0.45                         | 907.68            |
| 50-year                              | 2.00                    | 0.46                         | 907.75            |
| 100-year                             | 2.36                    | 0.46                         | 907.83            |

| <b>STORMWATER STORAGE SUMMARY</b> |                 |
|-----------------------------------|-----------------|
| Storage Elevation                 | Volume Provided |
| (feet)                            | (ac-ft)         |
| 906.85                            | 0.000           |
| 907.35                            | 0.013           |
| 907.85                            | 0.058           |
| Total Storage Utilized:           | 0.055 ac-ft     |
| Total Storage Provided:           | 0.058 ac-ft     |

Orifice plates will be used to provide detention and to control the release rate. Refer to Sheet 5 of Minor Site Plan for the outlet control structure and orifice plate details.

Post-Developed Tributary Area Exhibits can be found in Exhibit E of this report. Post-developed runoff calculations using HydroCAD Version 9.00 by HydroCAD Software Solutions, LLC, and can be found in Appendix F of this report.

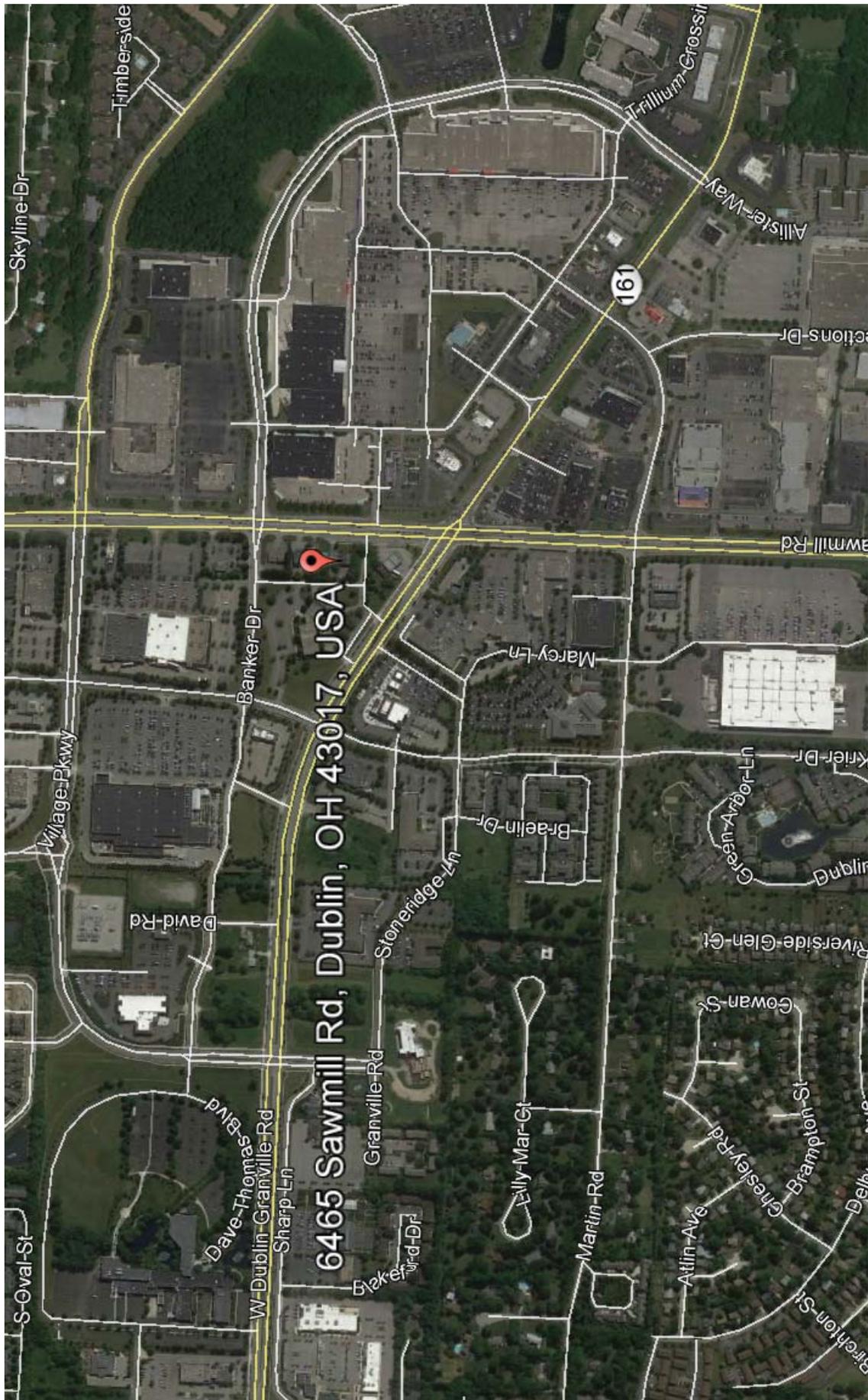
Water quality for the re-development project will utilize a Flexstorm 62MSQFX inlet filter. The FX filtration system has an 82% filtration efficiency. Per chapter 5-6 of *City of Dublin Stormwater Management design manual*, for “Prefabricated Devices”, the use of a catch basin inlet device is an acceptable use for re-development situations. The Flexstorm inlet filter specification and maintenance requirements can be found in Appendix H of this report.

#### **IV. SUMMARY AND CONCLUSIONS**

The re-development of this property meets or exceeds water quality requirements for and detention requirements per the *City of Dublin Stormwater Management Design Manual*.

Accordingly, we believe the proposed improvements will not adversely affect this site, adjacent property owners or the City of Dublin.

**APPENDIX A**  
**PROJECT LOCATION MAP**



6465 Sawmill Rd, Dublin, OH 43017, USA

**APPENDIX B**  
SOILS MAP

Soil Map—Franklin County, Ohio



## MAP LEGEND

-  Area of Interest (AOI)
-  Soil Map Unit Polygons
-  Soil Map Unit Lines
-  Soil Map Unit Points
- Special Point Features**
  -  Blowout
  -  Borrow Pit
  -  Clay Spot
  -  Closed Depression
  -  Gravel Pit
  -  Gravelly Spot
  -  Landfill
  -  Lava Flow
  -  Marsh or swamp
  -  Mine or Quarry
  -  Miscellaneous Water
  -  Perennial Water
  -  Rock Outcrop
  -  Saline Spot
  -  Sandy Spot
  -  Severely Eroded Spot
  -  Sinkhole
  -  Slide or Slip
  -  Sodic Spot
- Water Features**
  -  Streams and Canals
- Transportation**
  -  Rails
  -  Interstate Highways
  -  US Routes
  -  Major Roads
  -  Local Roads
- Background**
  -  Aerial Photography
-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.  
 Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Franklin County, Ohio  
 Survey Area Data: Version 10, Mar 16, 2012

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 27, 2012—Mar 10, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

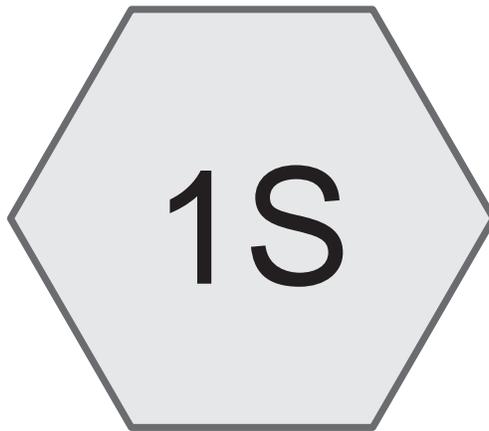
## Map Unit Legend

| Franklin County, Ohio (OH049)      |                                         |              |                |
|------------------------------------|-----------------------------------------|--------------|----------------|
| Map Unit Symbol                    | Map Unit Name                           | Acres in AOI | Percent of AOI |
| CrA                                | Crosby silt loam, 0 to 2 percent slopes | 0.6          | 100.0%         |
| <b>Totals for Area of Interest</b> |                                         | <b>0.6</b>   | <b>100.0%</b>  |

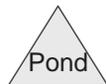
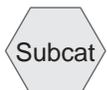
**APPENDIX C**  
PRE-DEVELOPED TRIBUTARY AREA EXHIBIT



**APPENDIX D**  
PRE-DEVELOPED RUNOFF CALCULATIONS



# Overall Pre-Developed



**02013.01025 Detention.Current Revised Layout** *Type II 24-hr 1-year, 24 HR Rainfall=2.20"*

Prepared by American Structurepoint

Printed 11/14/2013

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Page 2

Time span=0.00-200.00 hrs, dt=0.01 hrs, 20001 points x 3

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 1S: Overall Pre-Developed** Runoff Area=0.448 ac 25.00% Impervious Runoff Depth=0.69"  
Tc=10.0 min CN=80 Runoff=0.46 cfs 0.026 af

**Total Runoff Area = 0.448 ac Runoff Volume = 0.026 af Average Runoff Depth = 0.69"**  
**75.00% Pervious = 0.336 ac 25.00% Impervious = 0.112 ac**

**Summary for Subcatchment 1S: Overall Pre-Developed**

Runoff = 0.46 cfs @ 12.03 hrs, Volume= 0.026 af, Depth= 0.69"

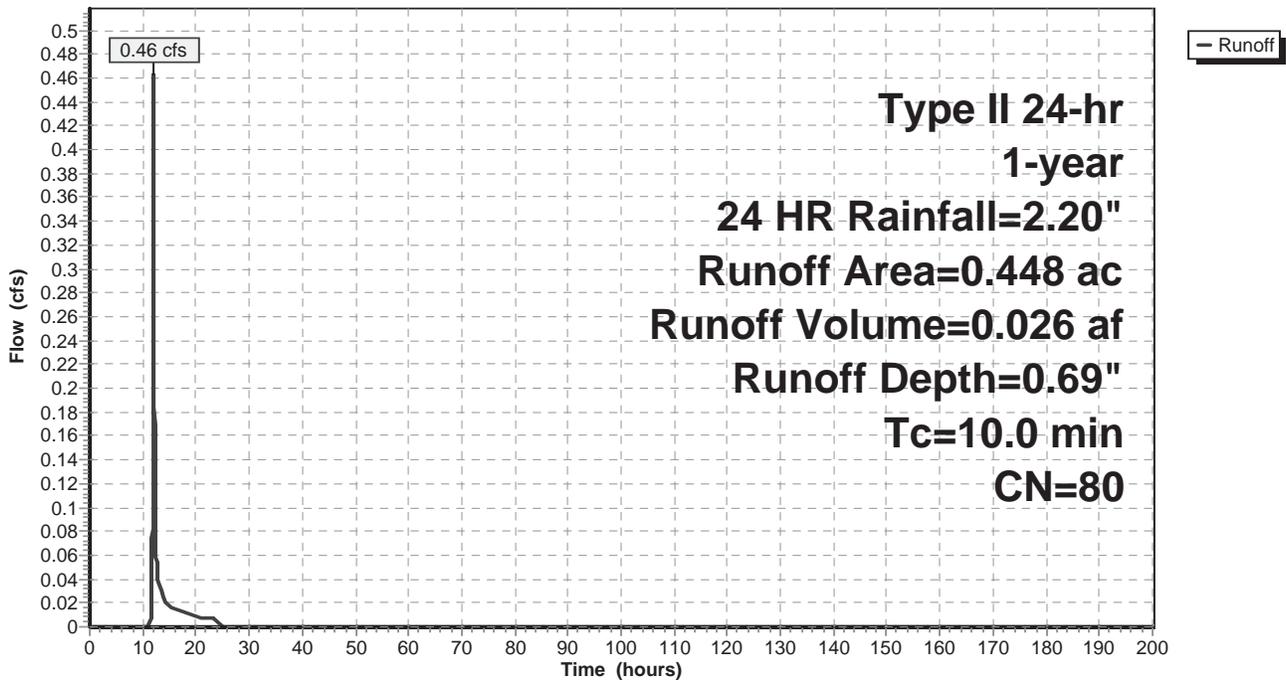
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs  
 Type II 24-hr 1-year, 24 HR Rainfall=2.20"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.448     | 80 | 1/2 acre lots, 25% imp, HSG C |
| 0.336     |    | 75.00% Pervious Area          |
| 0.112     |    | 25.00% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                 |
|----------|---------------|---------------|-------------------|----------------|-----------------------------|
| 10.0     |               |               |                   |                | Direct Entry, Pre-Developed |

**Subcatchment 1S: Overall Pre-Developed**

Hydrograph



**02013.01025 Detention.Current Revised Layout** *Type II 24-hr 2-year, 24 HR Rainfall=2.63"*

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Time span=0.00-200.00 hrs, dt=0.01 hrs, 20001 points x 3

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 1S: Overall Pre-Developed** Runoff Area=0.448 ac 25.00% Impervious Runoff Depth=0.98"  
Tc=10.0 min CN=80 Runoff=0.67 cfs 0.037 af

**Total Runoff Area = 0.448 ac Runoff Volume = 0.037 af Average Runoff Depth = 0.98"**  
**75.00% Pervious = 0.336 ac 25.00% Impervious = 0.112 ac**

**Summary for Subcatchment 1S: Overall Pre-Developed**

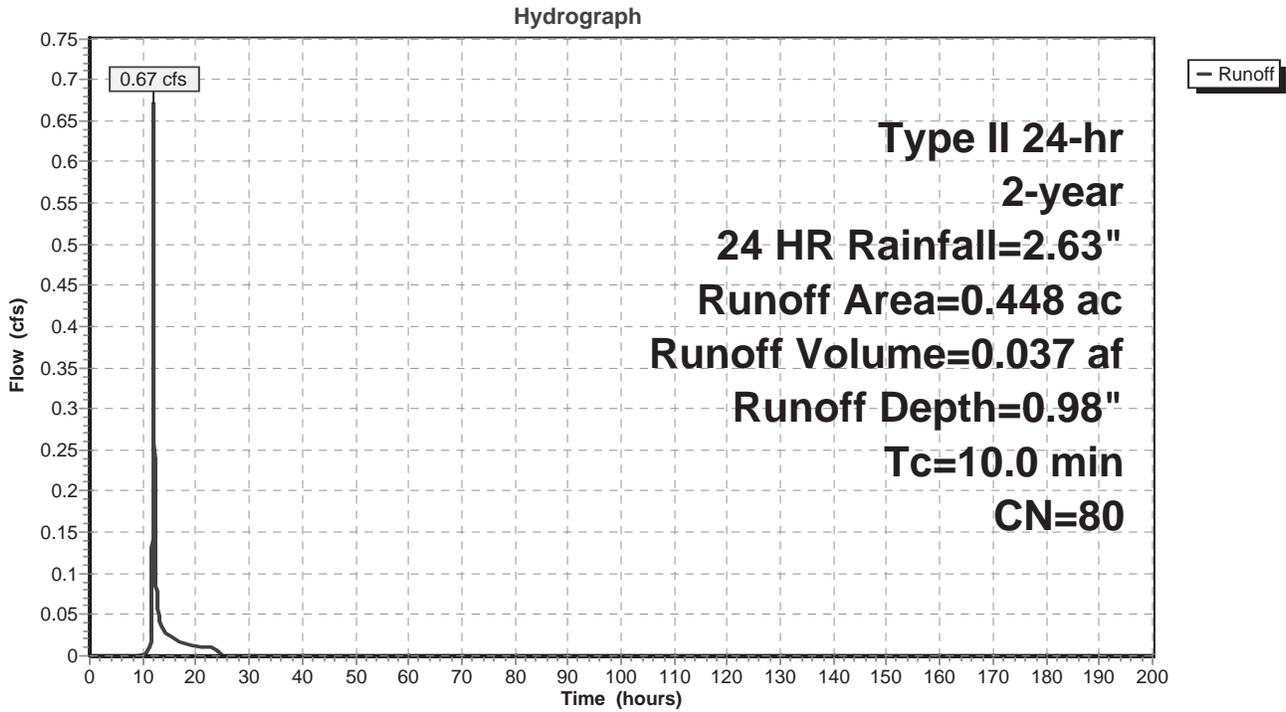
Runoff = 0.67 cfs @ 12.02 hrs, Volume= 0.037 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs  
 Type II 24-hr 2-year, 24 HR Rainfall=2.63"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.448     | 80 | 1/2 acre lots, 25% imp, HSG C |
| 0.336     |    | 75.00% Pervious Area          |
| 0.112     |    | 25.00% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                 |
|----------|---------------|---------------|-------------------|----------------|-----------------------------|
| 10.0     |               |               |                   |                | Direct Entry, Pre-Developed |

**Subcatchment 1S: Overall Pre-Developed**



**02013.01025 Detention.Current Revised Layout** *Type II 24-hr 5-year, 24 HR Rainfall=3.24"*

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Time span=0.00-200.00 hrs, dt=0.01 hrs, 20001 points x 3

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 1S: Overall Pre-Developed** Runoff Area=0.448 ac 25.00% Impervious Runoff Depth=1.43"  
Tc=10.0 min CN=80 Runoff=0.99 cfs 0.053 af

**Total Runoff Area = 0.448 ac Runoff Volume = 0.053 af Average Runoff Depth = 1.43"**  
**75.00% Pervious = 0.336 ac 25.00% Impervious = 0.112 ac**

**Summary for Subcatchment 1S: Overall Pre-Developed**

Runoff = 0.99 cfs @ 12.02 hrs, Volume= 0.053 af, Depth= 1.43"

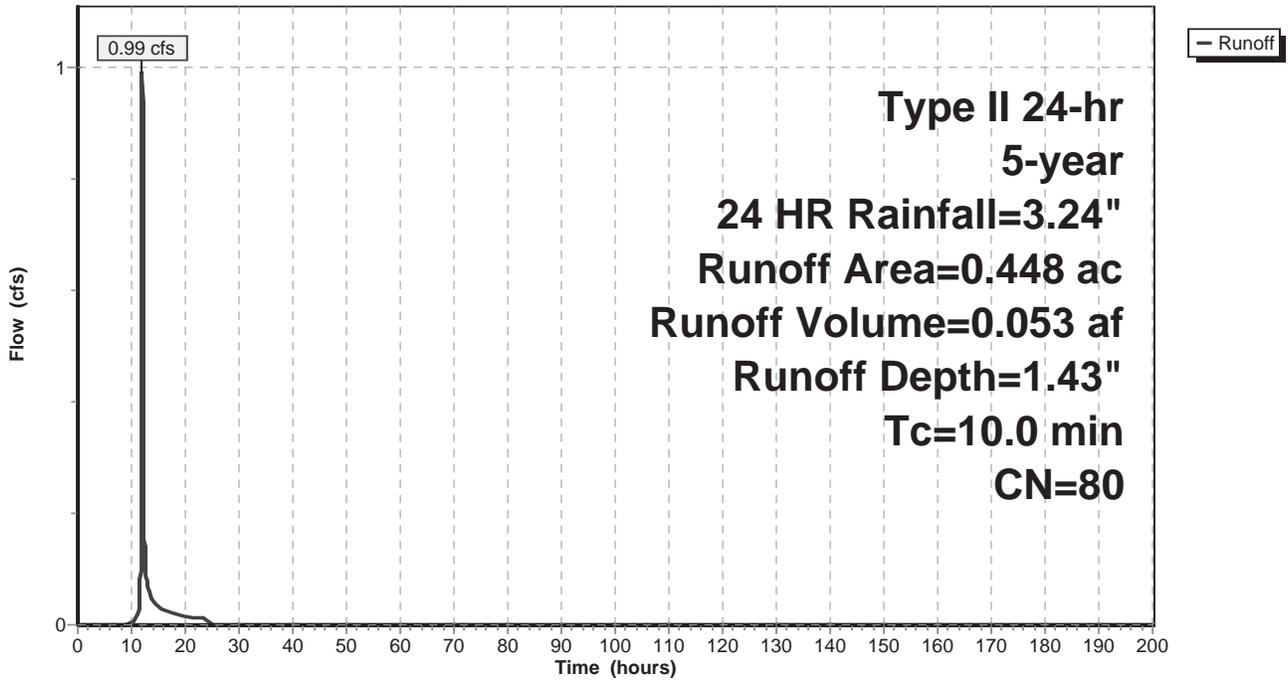
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs  
 Type II 24-hr 5-year, 24 HR Rainfall=3.24"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.448     | 80 | 1/2 acre lots, 25% imp, HSG C |
| 0.336     |    | 75.00% Pervious Area          |
| 0.112     |    | 25.00% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                 |
|----------|---------------|---------------|-------------------|----------------|-----------------------------|
| 10.0     |               |               |                   |                | Direct Entry, Pre-Developed |

**Subcatchment 1S: Overall Pre-Developed**

Hydrograph



Time span=0.00-200.00 hrs, dt=0.01 hrs, 20001 points x 3  
Runoff by SCS TR-20 method, UH=SCS  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 1S: Overall Pre-Developed** Runoff Area=0.448 ac 25.00% Impervious Runoff Depth=1.83"  
Tc=10.0 min CN=80 Runoff=1.26 cfs 0.068 af

**Total Runoff Area = 0.448 ac Runoff Volume = 0.068 af Average Runoff Depth = 1.83"**  
**75.00% Pervious = 0.336 ac 25.00% Impervious = 0.112 ac**

**Summary for Subcatchment 1S: Overall Pre-Developed**

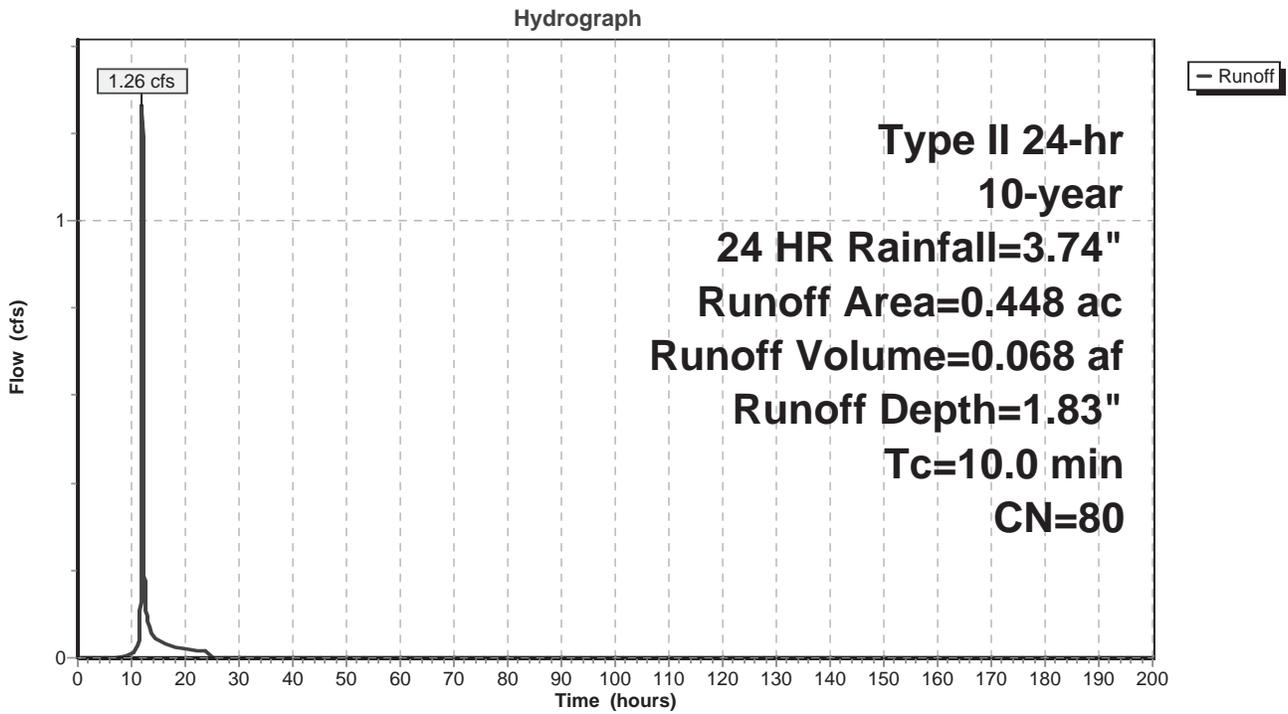
Runoff = 1.26 cfs @ 12.02 hrs, Volume= 0.068 af, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs  
 Type II 24-hr 10-year, 24 HR Rainfall=3.74"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.448     | 80 | 1/2 acre lots, 25% imp, HSG C |
| 0.336     |    | 75.00% Pervious Area          |
| 0.112     |    | 25.00% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                 |
|----------|---------------|---------------|-------------------|----------------|-----------------------------|
| 10.0     |               |               |                   |                | Direct Entry, Pre-Developed |

**Subcatchment 1S: Overall Pre-Developed**



**02013.01025 Detention.Current Revised Layout** *Type II 24-hr 25-year, 24 HR Rainfall=4.44"*

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Time span=0.00-200.00 hrs, dt=0.01 hrs, 20001 points x 3

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 1S: Overall Pre-Developed** Runoff Area=0.448 ac 25.00% Impervious Runoff Depth=2.41"  
Tc=10.0 min CN=80 Runoff=1.66 cfs 0.090 af

**Total Runoff Area = 0.448 ac Runoff Volume = 0.090 af Average Runoff Depth = 2.41"**  
**75.00% Pervious = 0.336 ac 25.00% Impervious = 0.112 ac**

**Summary for Subcatchment 1S: Overall Pre-Developed**

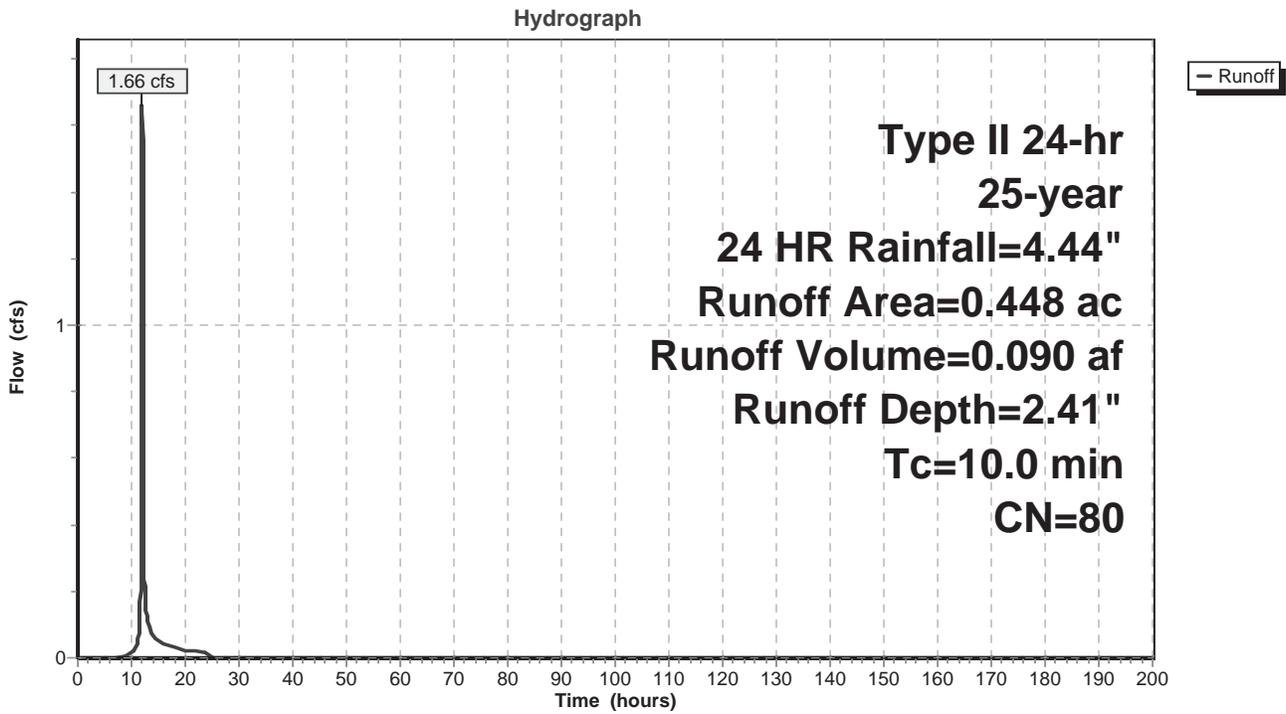
Runoff = 1.66 cfs @ 12.02 hrs, Volume= 0.090 af, Depth= 2.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs  
 Type II 24-hr 25-year, 24 HR Rainfall=4.44"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.448     | 80 | 1/2 acre lots, 25% imp, HSG C |
| 0.336     |    | 75.00% Pervious Area          |
| 0.112     |    | 25.00% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                 |
|----------|---------------|---------------|-------------------|----------------|-----------------------------|
| 10.0     |               |               |                   |                | Direct Entry, Pre-Developed |

**Subcatchment 1S: Overall Pre-Developed**



**02013.01025 Detention.Current Revised Layout** *Type II 24-hr 50-year, 24 HR Rainfall=5.02"*

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Time span=0.00-200.00 hrs, dt=0.01 hrs, 20001 points x 3

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 1S: Overall Pre-Developed** Runoff Area=0.448 ac 25.00% Impervious Runoff Depth=2.91"  
Tc=10.0 min CN=80 Runoff=2.00 cfs 0.109 af

**Total Runoff Area = 0.448 ac Runoff Volume = 0.109 af Average Runoff Depth = 2.91"**  
**75.00% Pervious = 0.336 ac 25.00% Impervious = 0.112 ac**

**Summary for Subcatchment 1S: Overall Pre-Developed**

Runoff = 2.00 cfs @ 12.02 hrs, Volume= 0.109 af, Depth= 2.91"

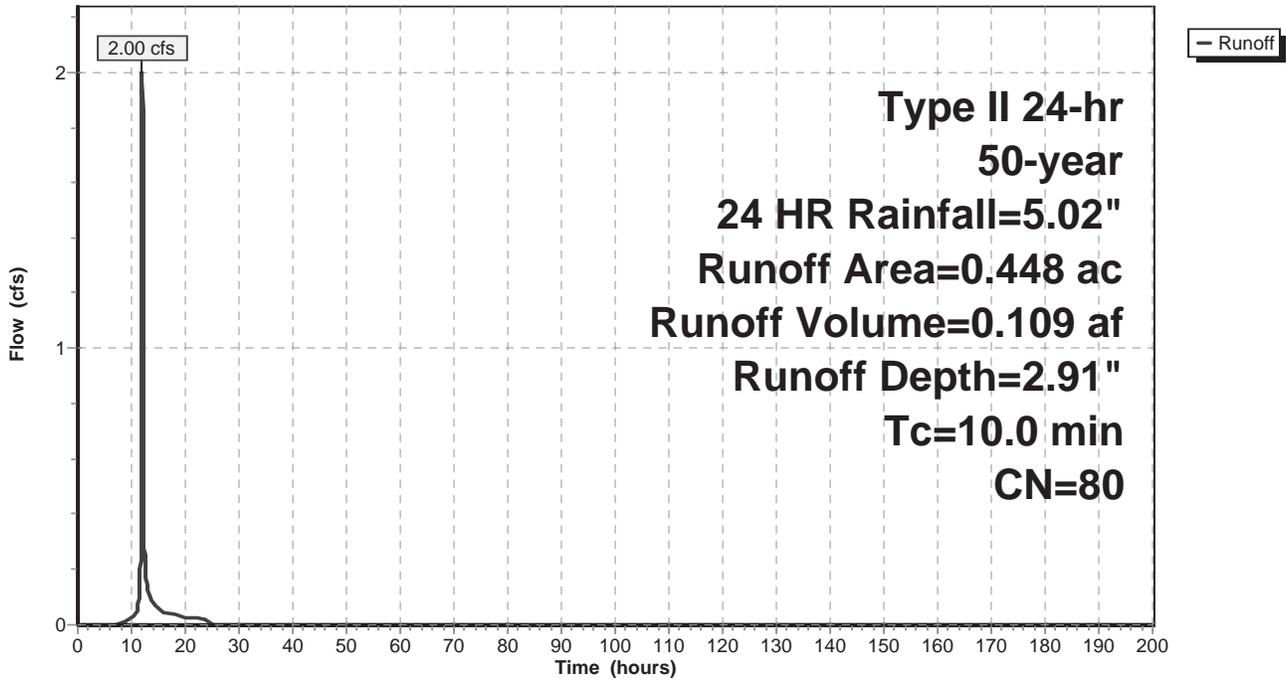
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs  
 Type II 24-hr 50-year, 24 HR Rainfall=5.02"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.448     | 80 | 1/2 acre lots, 25% imp, HSG C |
| 0.336     |    | 75.00% Pervious Area          |
| 0.112     |    | 25.00% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                 |
|----------|---------------|---------------|-------------------|----------------|-----------------------------|
| 10.0     |               |               |                   |                | Direct Entry, Pre-Developed |

**Subcatchment 1S: Overall Pre-Developed**

Hydrograph



Time span=0.00-200.00 hrs, dt=0.01 hrs, 20001 points x 3  
Runoff by SCS TR-20 method, UH=SCS  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 1S: Overall Pre-Developed** Runoff Area=0.448 ac 25.00% Impervious Runoff Depth=3.45"  
Tc=10.0 min CN=80 Runoff=2.36 cfs 0.129 af

**Total Runoff Area = 0.448 ac Runoff Volume = 0.129 af Average Runoff Depth = 3.45"**  
**75.00% Pervious = 0.336 ac 25.00% Impervious = 0.112 ac**

**Summary for Subcatchment 1S: Overall Pre-Developed**

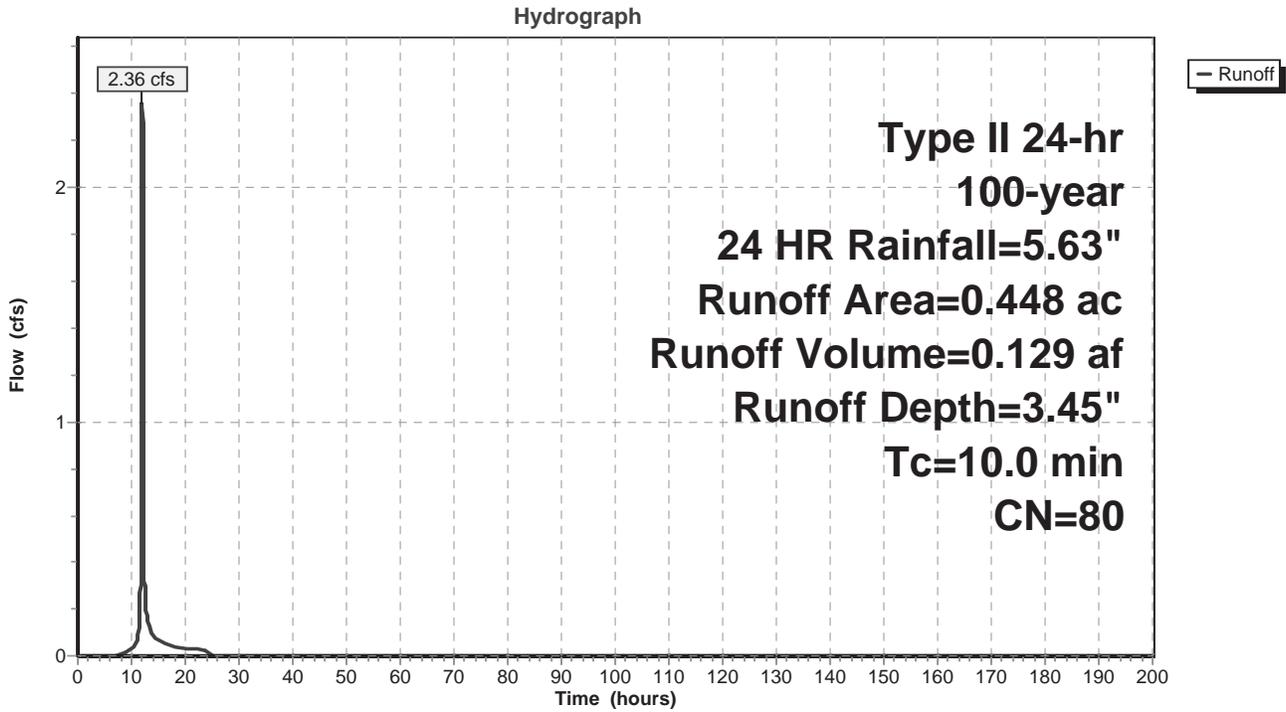
Runoff = 2.36 cfs @ 12.01 hrs, Volume= 0.129 af, Depth= 3.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs  
 Type II 24-hr 100-year, 24 HR Rainfall=5.63"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.448     | 80 | 1/2 acre lots, 25% imp, HSG C |
| 0.336     |    | 75.00% Pervious Area          |
| 0.112     |    | 25.00% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                 |
|----------|---------------|---------------|-------------------|----------------|-----------------------------|
| 10.0     |               |               |                   |                | Direct Entry, Pre-Developed |

**Subcatchment 1S: Overall Pre-Developed**



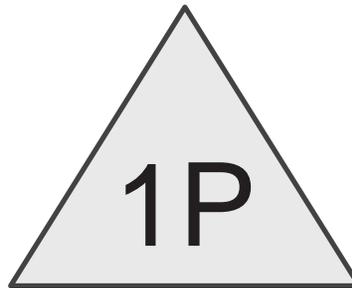
**APPENDIX E**  
POST-DEVELOPED TRIBUTARY AREA EXHIBIT



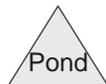
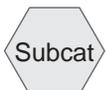
**APPENDIX F**  
POST-DEVELOPED RUNOFF CALCULATIONS



Overall Post-Developed



Site Detention



Time span=0.00-200.00 hrs, dt=0.01 hrs, 20001 points x 3  
Runoff by SCS TR-20 method, UH=SCS  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 2S: Overall Post-Developed** Runoff Area=0.448 ac 75.45% Impervious Runoff Depth=1.42"  
Tc=10.0 min CN=92 Runoff=0.96 cfs 0.053 af

**Pond 1P: Site Detention** Peak Elev=907.23' Storage=0.008 af Inflow=0.96 cfs 0.053 af  
Outflow=0.43 cfs 0.053 af

**Total Runoff Area = 0.448 ac Runoff Volume = 0.053 af Average Runoff Depth = 1.42"**  
**24.55% Pervious = 0.110 ac 75.45% Impervious = 0.338 ac**

**Summary for Subcatchment 2S: Overall Post-Developed**

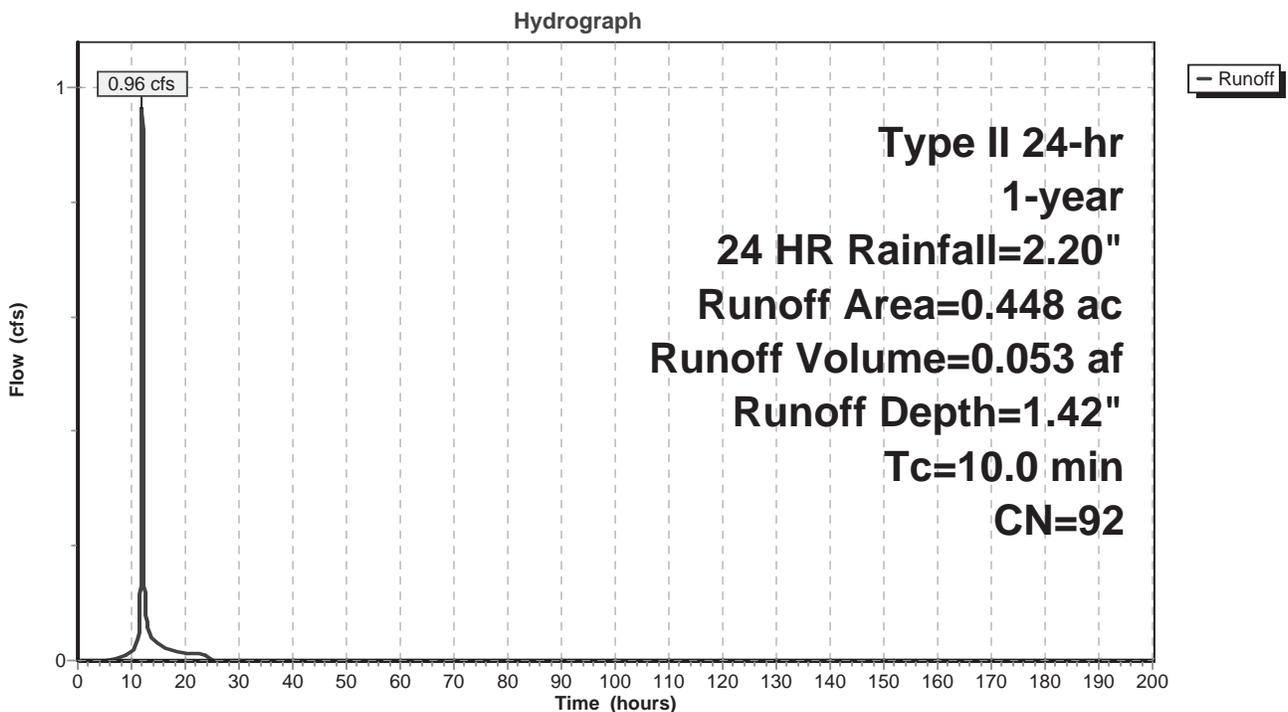
Runoff = 0.96 cfs @ 12.01 hrs, Volume= 0.053 af, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs  
 Type II 24-hr 1-year, 24 HR Rainfall=2.20"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.338     | 98 | Paved parking, HSG C          |
| 0.110     | 74 | >75% Grass cover, Good, HSG C |
| 0.448     | 92 | Weighted Average              |
| 0.110     |    | 24.55% Pervious Area          |
| 0.338     |    | 75.45% Impervious Area        |

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

**Subcatchment 2S: Overall Post-Developed**



**Summary for Pond 1P: Site Detention**

Inflow Area = 0.448 ac, 75.45% Impervious, Inflow Depth = 1.42" for 1-year, 24 HR event  
 Inflow = 0.96 cfs @ 12.01 hrs, Volume= 0.053 af  
 Outflow = 0.43 cfs @ 12.14 hrs, Volume= 0.053 af, Atten= 56%, Lag= 7.8 min  
 Primary = 0.43 cfs @ 12.14 hrs, Volume= 0.053 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 907.23' @ 12.14 hrs Surf.Area= 0.038 ac Storage= 0.008 af

Plug-Flow detention time= 3.3 min calculated for 0.053 af (100% of inflow)  
 Center-of-Mass det. time= 3.3 min ( 815.9 - 812.6 )

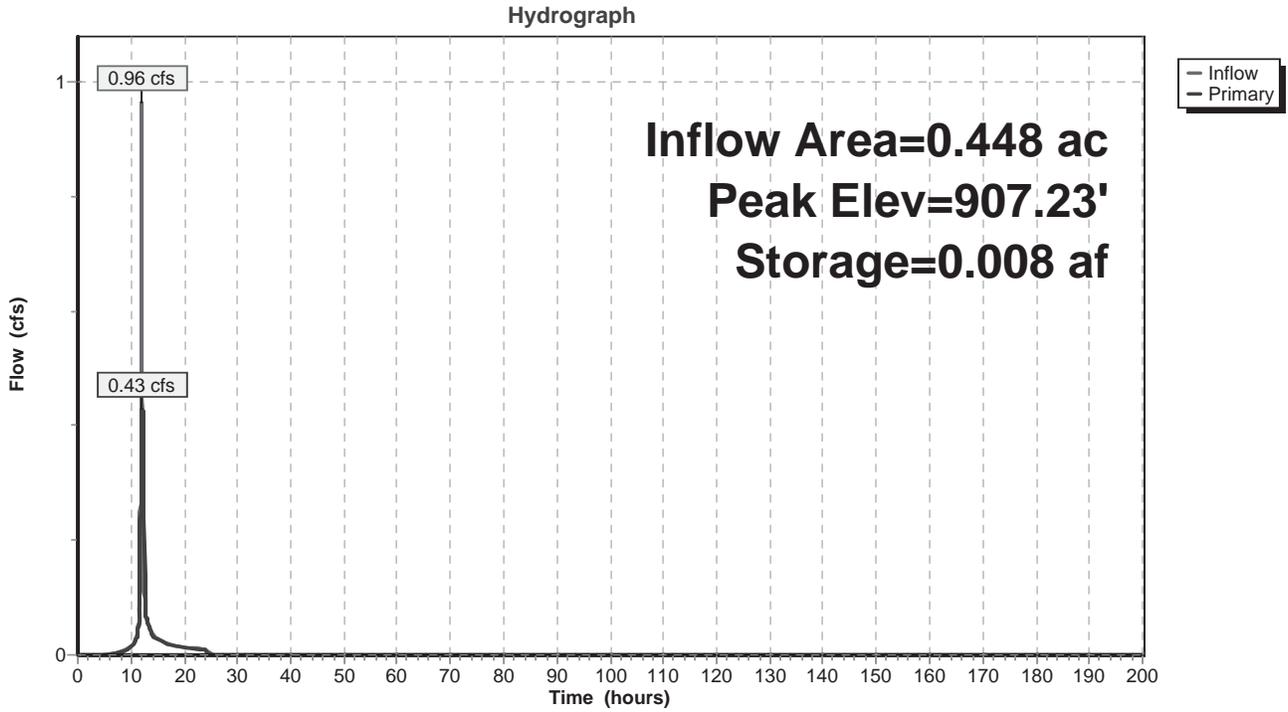
| Volume | Invert  | Avail.Storage | Storage Description                                          |
|--------|---------|---------------|--------------------------------------------------------------|
| #1     | 903.35' | 0.000 af      | <b>2.00'W x 2.00'L x 3.50'H CB #1</b>                        |
| #2     | 906.85' | 0.057 af      | <b>Parking Lot Ponding (Prismatic)</b> Listed below (Recalc) |
|        |         | 0.058 af      | Total Available Storage                                      |

| Elevation<br>(feet) | Surf.Area<br>(acres) | Inc.Store<br>(acre-feet) | Cum.Store<br>(acre-feet) |
|---------------------|----------------------|--------------------------|--------------------------|
| 906.85              | 0.000                | 0.000                    | 0.000                    |
| 907.35              | 0.049                | 0.012                    | 0.012                    |
| 907.85              | 0.131                | 0.045                    | 0.057                    |

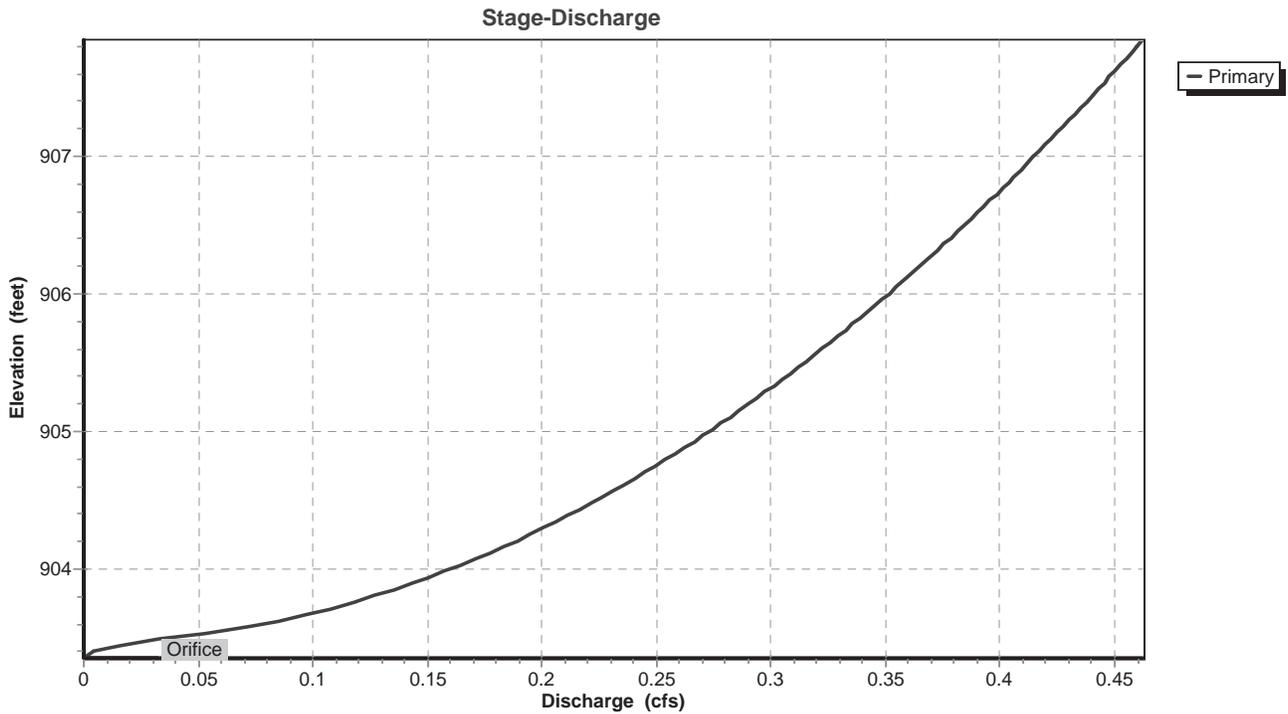
| Device | Routing | Invert  | Outlet Devices                     |
|--------|---------|---------|------------------------------------|
| #1     | Primary | 903.35' | <b>2.9" Vert. Orifice</b> C= 0.600 |

**Primary OutFlow** Max=0.43 cfs @ 12.14 hrs HW=907.23' (Free Discharge)  
 ↑**1=Orifice** (Orifice Controls 0.43 cfs @ 9.34 fps)

**Pond 1P: Site Detention**

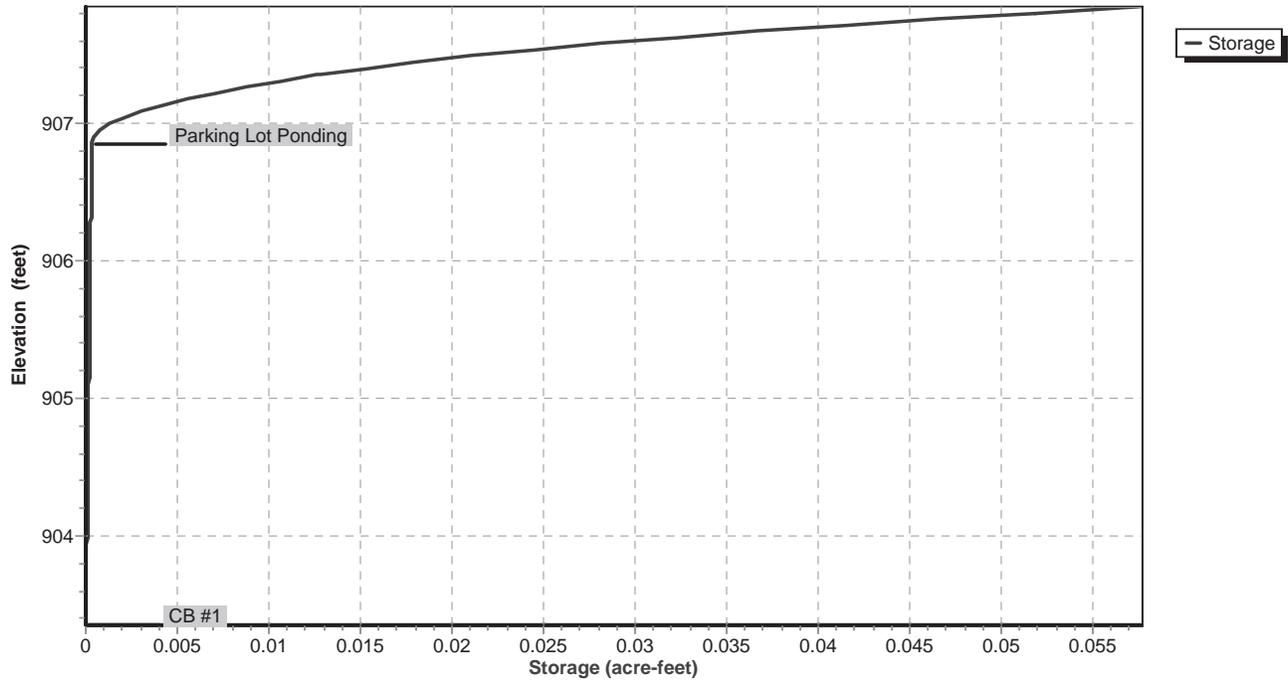


**Pond 1P: Site Detention**



### Pond 1P: Site Detention

Stage-Area-Storage



**02013.01025 Detention.Current Revised Layout** *Type II 24-hr 2-year, 24 HR Rainfall=2.63"*

Prepared by American Structurepoint

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Time span=0.00-200.00 hrs, dt=0.01 hrs, 20001 points x 3

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 2S: Overall Post-Developed** Runoff Area=0.448 ac 75.45% Impervious Runoff Depth=1.81"  
Tc=10.0 min CN=92 Runoff=1.22 cfs 0.068 af

**Pond 1P: Site Detention** Peak Elev=907.35' Storage=0.012 af Inflow=1.22 cfs 0.068 af  
Outflow=0.43 cfs 0.068 af

**Total Runoff Area = 0.448 ac Runoff Volume = 0.068 af Average Runoff Depth = 1.81"**  
**24.55% Pervious = 0.110 ac 75.45% Impervious = 0.338 ac**

**Summary for Subcatchment 2S: Overall Post-Developed**

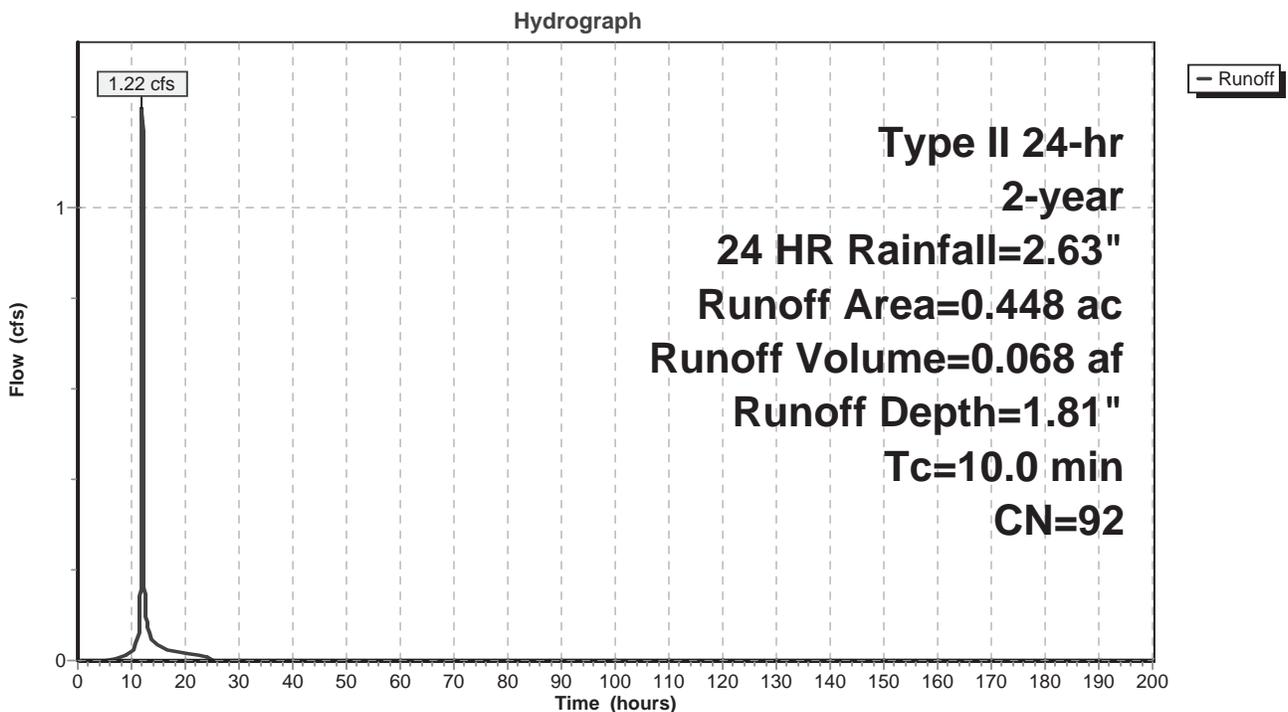
Runoff = 1.22 cfs @ 12.01 hrs, Volume= 0.068 af, Depth= 1.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs  
 Type II 24-hr 2-year, 24 HR Rainfall=2.63"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.338     | 98 | Paved parking, HSG C          |
| 0.110     | 74 | >75% Grass cover, Good, HSG C |
| 0.448     | 92 | Weighted Average              |
| 0.110     |    | 24.55% Pervious Area          |
| 0.338     |    | 75.45% Impervious Area        |

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

**Subcatchment 2S: Overall Post-Developed**



**Summary for Pond 1P: Site Detention**

Inflow Area = 0.448 ac, 75.45% Impervious, Inflow Depth = 1.81" for 2-year, 24 HR event  
 Inflow = 1.22 cfs @ 12.01 hrs, Volume= 0.068 af  
 Outflow = 0.43 cfs @ 12.17 hrs, Volume= 0.068 af, Atten= 64%, Lag= 9.3 min  
 Primary = 0.43 cfs @ 12.17 hrs, Volume= 0.068 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 907.35' @ 12.17 hrs Surf.Area= 0.049 ac Storage= 0.012 af

Plug-Flow detention time= 5.7 min calculated for 0.068 af (100% of inflow)  
 Center-of-Mass det. time= 5.7 min ( 811.3 - 805.6 )

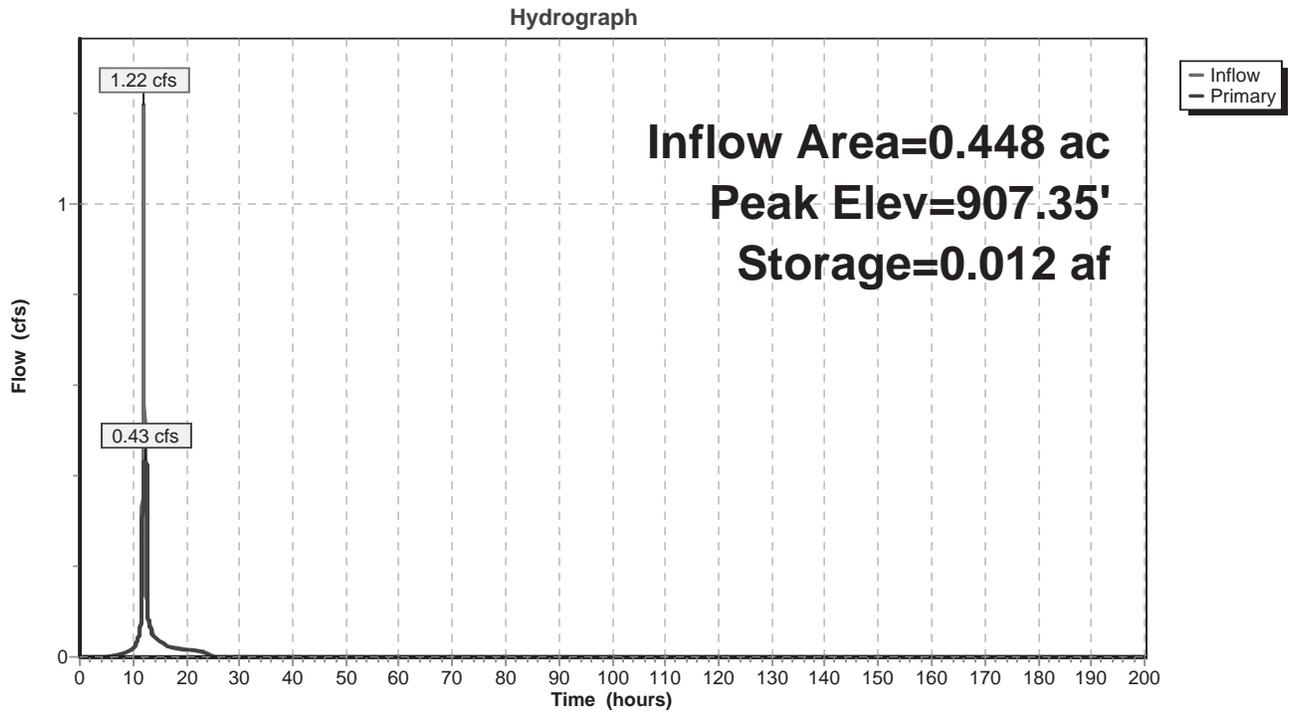
| Volume | Invert  | Avail.Storage | Storage Description                                          |
|--------|---------|---------------|--------------------------------------------------------------|
| #1     | 903.35' | 0.000 af      | <b>2.00'W x 2.00'L x 3.50'H CB #1</b>                        |
| #2     | 906.85' | 0.057 af      | <b>Parking Lot Ponding (Prismatic)</b> Listed below (Recalc) |
|        |         | 0.058 af      | Total Available Storage                                      |

| Elevation<br>(feet) | Surf.Area<br>(acres) | Inc.Store<br>(acre-feet) | Cum.Store<br>(acre-feet) |
|---------------------|----------------------|--------------------------|--------------------------|
| 906.85              | 0.000                | 0.000                    | 0.000                    |
| 907.35              | 0.049                | 0.012                    | 0.012                    |
| 907.85              | 0.131                | 0.045                    | 0.057                    |

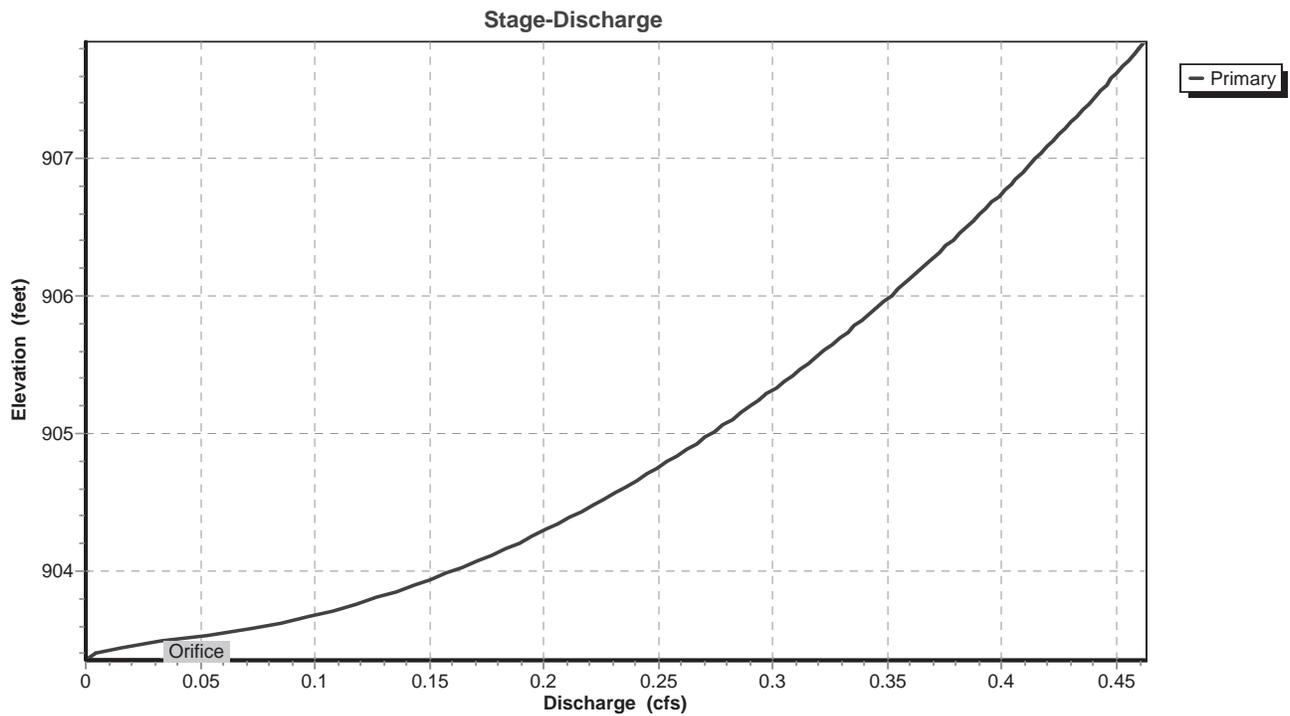
| Device | Routing | Invert  | Outlet Devices                     |
|--------|---------|---------|------------------------------------|
| #1     | Primary | 903.35' | <b>2.9" Vert. Orifice</b> C= 0.600 |

**Primary OutFlow** Max=0.43 cfs @ 12.17 hrs HW=907.35' (Free Discharge)  
 ↑**1=Orifice** (Orifice Controls 0.43 cfs @ 9.48 fps)

**Pond 1P: Site Detention**

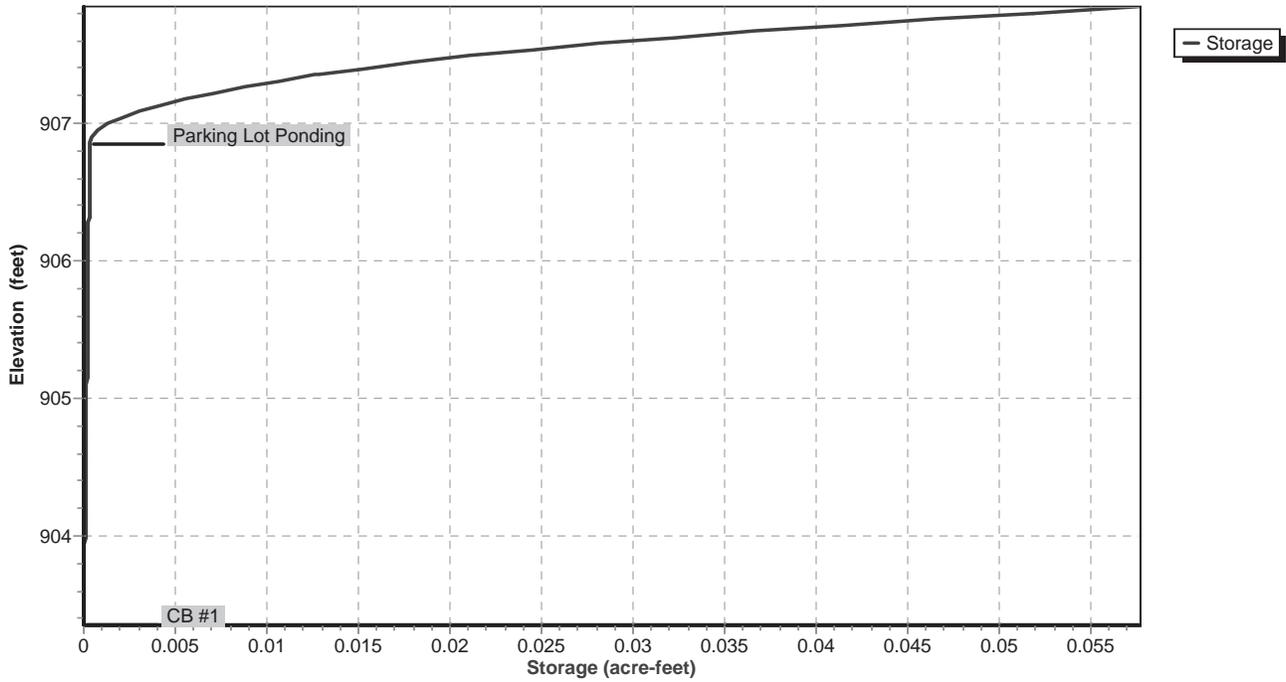


**Pond 1P: Site Detention**



### Pond 1P: Site Detention

Stage-Area-Storage



**02013.01025 Detention.Current Revised Layout** *Type II 24-hr 5-year, 24 HR Rainfall=3.24"*

Prepared by American Structurepoint

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Time span=0.00-200.00 hrs, dt=0.01 hrs, 20001 points x 3

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 2S: Overall Post-Developed** Runoff Area=0.448 ac 75.45% Impervious Runoff Depth=2.39"  
Tc=10.0 min CN=92 Runoff=1.58 cfs 0.089 af

**Pond 1P: Site Detention**

Peak Elev=907.48' Storage=0.020 af Inflow=1.58 cfs 0.089 af  
Outflow=0.44 cfs 0.089 af

**Total Runoff Area = 0.448 ac Runoff Volume = 0.089 af Average Runoff Depth = 2.39"**  
**24.55% Pervious = 0.110 ac 75.45% Impervious = 0.338 ac**

**Summary for Subcatchment 2S: Overall Post-Developed**

Runoff = 1.58 cfs @ 12.01 hrs, Volume= 0.089 af, Depth= 2.39"

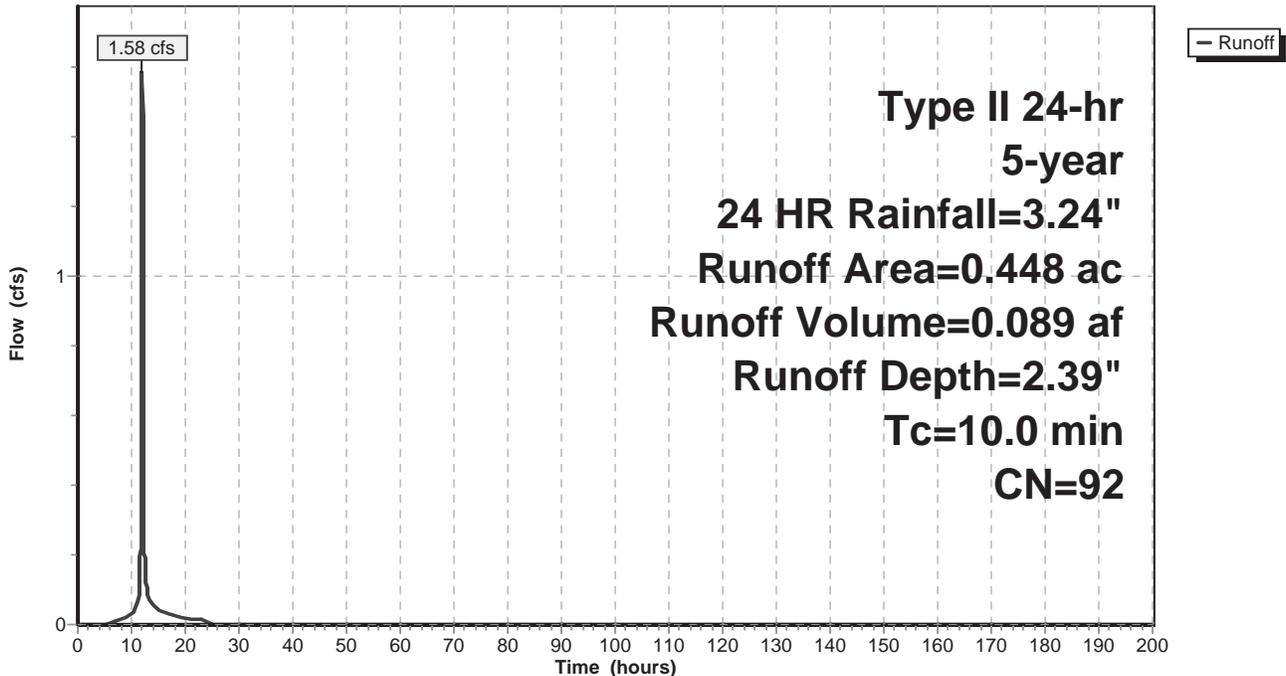
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs  
 Type II 24-hr 5-year, 24 HR Rainfall=3.24"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.338     | 98 | Paved parking, HSG C          |
| 0.110     | 74 | >75% Grass cover, Good, HSG C |
| 0.448     | 92 | Weighted Average              |
| 0.110     |    | 24.55% Pervious Area          |
| 0.338     |    | 75.45% Impervious Area        |

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

**Subcatchment 2S: Overall Post-Developed**

Hydrograph



**Summary for Pond 1P: Site Detention**

Inflow Area = 0.448 ac, 75.45% Impervious, Inflow Depth = 2.39" for 5-year, 24 HR event  
 Inflow = 1.58 cfs @ 12.01 hrs, Volume= 0.089 af  
 Outflow = 0.44 cfs @ 12.20 hrs, Volume= 0.089 af, Atten= 72%, Lag= 11.2 min  
 Primary = 0.44 cfs @ 12.20 hrs, Volume= 0.089 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 907.48' @ 12.20 hrs Surf.Area= 0.070 ac Storage= 0.020 af

Plug-Flow detention time= 9.8 min calculated for 0.089 af (100% of inflow)  
 Center-of-Mass det. time= 9.8 min ( 807.7 - 797.9 )

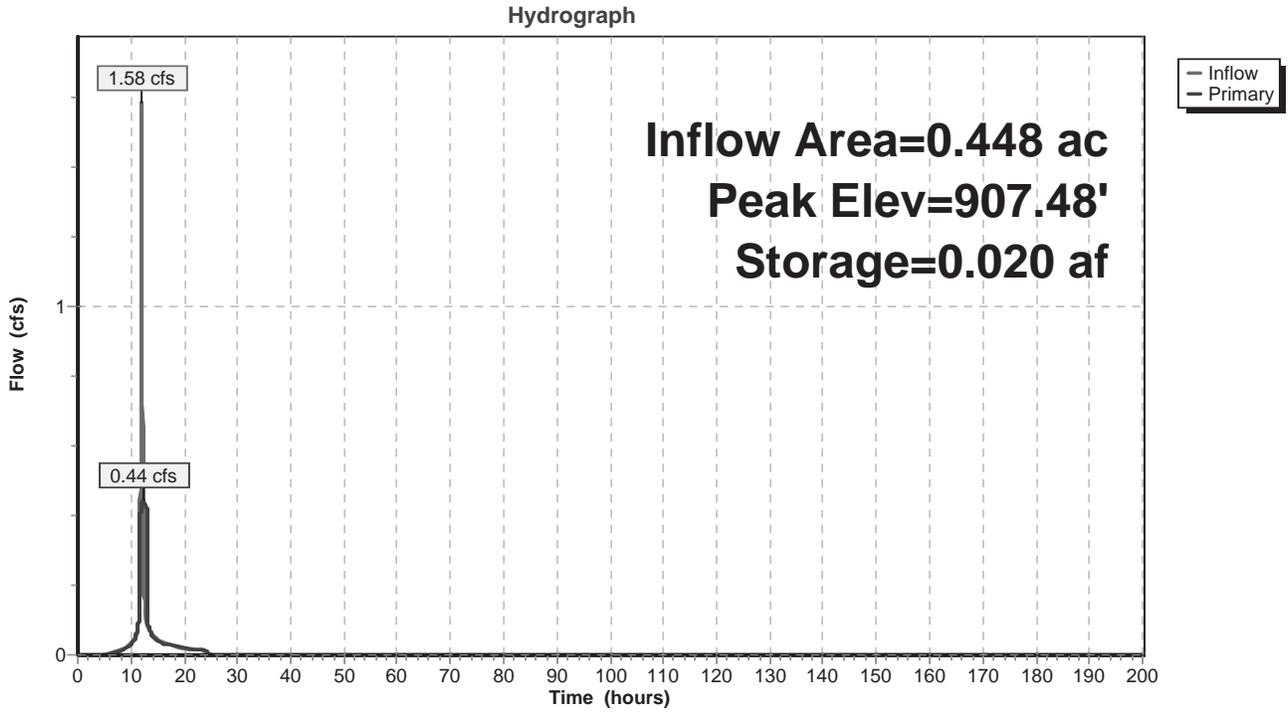
| Volume | Invert  | Avail.Storage | Storage Description                                          |
|--------|---------|---------------|--------------------------------------------------------------|
| #1     | 903.35' | 0.000 af      | <b>2.00'W x 2.00'L x 3.50'H CB #1</b>                        |
| #2     | 906.85' | 0.057 af      | <b>Parking Lot Ponding (Prismatic)</b> Listed below (Recalc) |
|        |         | 0.058 af      | Total Available Storage                                      |

| Elevation (feet) | Surf.Area (acres) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------------------|-----------------------|
| 906.85           | 0.000             | 0.000                 | 0.000                 |
| 907.35           | 0.049             | 0.012                 | 0.012                 |
| 907.85           | 0.131             | 0.045                 | 0.057                 |

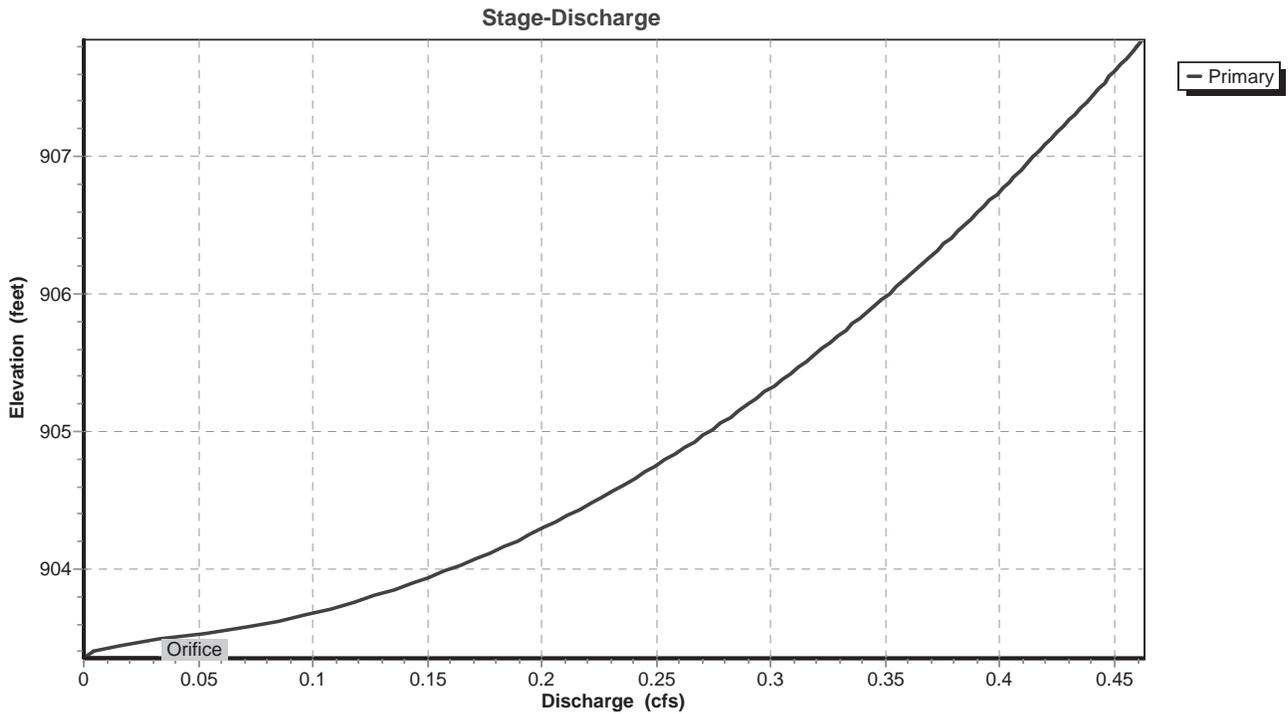
| Device | Routing | Invert  | Outlet Devices                     |
|--------|---------|---------|------------------------------------|
| #1     | Primary | 903.35' | <b>2.9" Vert. Orifice</b> C= 0.600 |

**Primary OutFlow** Max=0.44 cfs @ 12.20 hrs HW=907.48' (Free Discharge)  
 ↑**1=Orifice** (Orifice Controls 0.44 cfs @ 9.64 fps)

**Pond 1P: Site Detention**

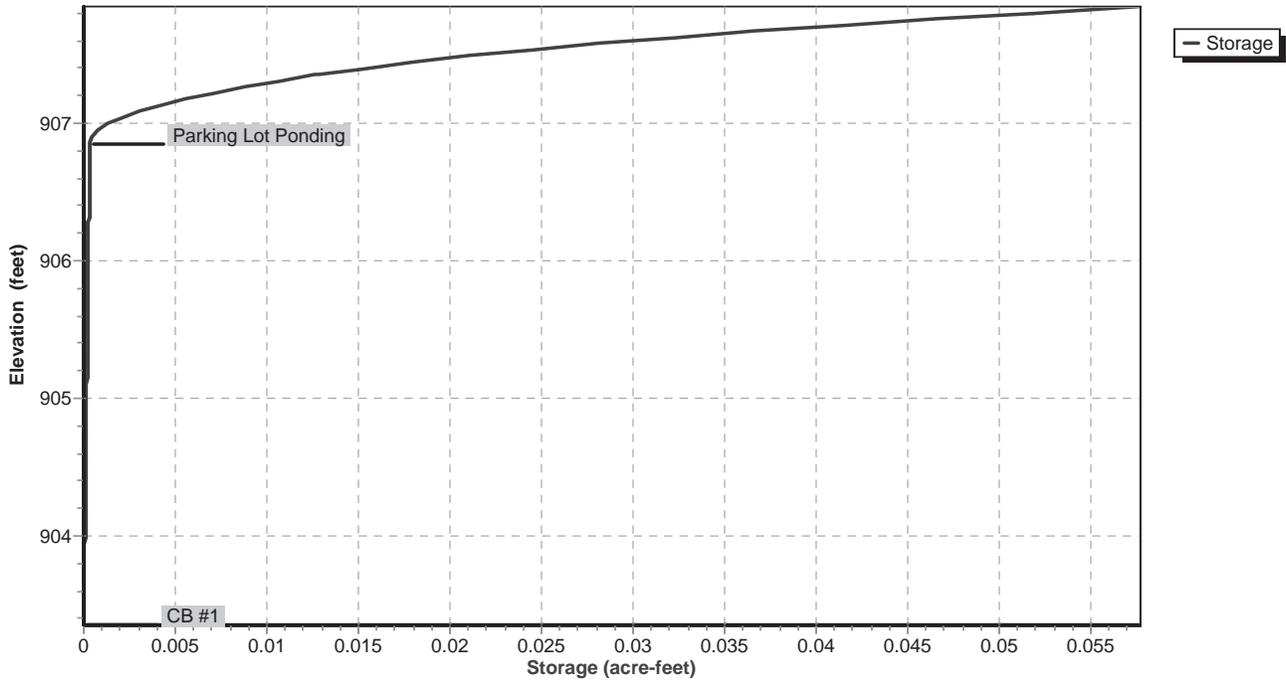


**Pond 1P: Site Detention**



### Pond 1P: Site Detention

Stage-Area-Storage



**02013.01025 Detention.Current Revised Layout** *Type II 24-hr 10-year, 24 HR Rainfall=3.74"*

Prepared by American Structurepoint

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Time span=0.00-200.00 hrs, dt=0.01 hrs, 20001 points x 3

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 2S: Overall Post-Developed** Runoff Area=0.448 ac 75.45% Impervious Runoff Depth=2.87"  
Tc=10.0 min CN=92 Runoff=1.88 cfs 0.107 af

**Pond 1P: Site Detention**

Peak Elev=907.57' Storage=0.027 af Inflow=1.88 cfs 0.107 af  
Outflow=0.45 cfs 0.107 af

**Total Runoff Area = 0.448 ac Runoff Volume = 0.107 af Average Runoff Depth = 2.87"**  
**24.55% Pervious = 0.110 ac 75.45% Impervious = 0.338 ac**

**Summary for Subcatchment 2S: Overall Post-Developed**

Runoff = 1.88 cfs @ 12.01 hrs, Volume= 0.107 af, Depth= 2.87"

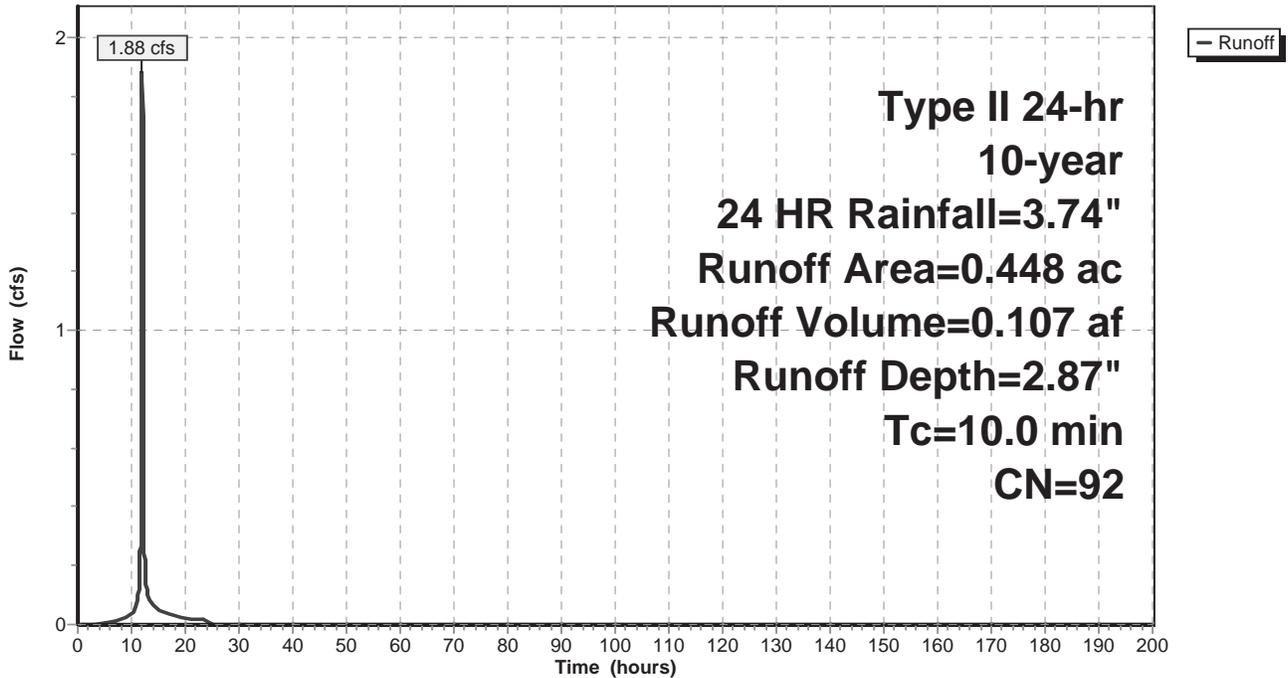
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs  
 Type II 24-hr 10-year, 24 HR Rainfall=3.74"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.338     | 98 | Paved parking, HSG C          |
| 0.110     | 74 | >75% Grass cover, Good, HSG C |
| 0.448     | 92 | Weighted Average              |
| 0.110     |    | 24.55% Pervious Area          |
| 0.338     |    | 75.45% Impervious Area        |

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

**Subcatchment 2S: Overall Post-Developed**

Hydrograph



**Summary for Pond 1P: Site Detention**

Inflow Area = 0.448 ac, 75.45% Impervious, Inflow Depth = 2.87" for 10-year, 24 HR event  
 Inflow = 1.88 cfs @ 12.01 hrs, Volume= 0.107 af  
 Outflow = 0.45 cfs @ 12.22 hrs, Volume= 0.107 af, Atten= 76%, Lag= 12.7 min  
 Primary = 0.45 cfs @ 12.22 hrs, Volume= 0.107 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 907.57' @ 12.22 hrs Surf.Area= 0.085 ac Storage= 0.027 af

Plug-Flow detention time= 13.7 min calculated for 0.107 af (100% of inflow)  
 Center-of-Mass det. time= 13.7 min ( 806.5 - 792.8 )

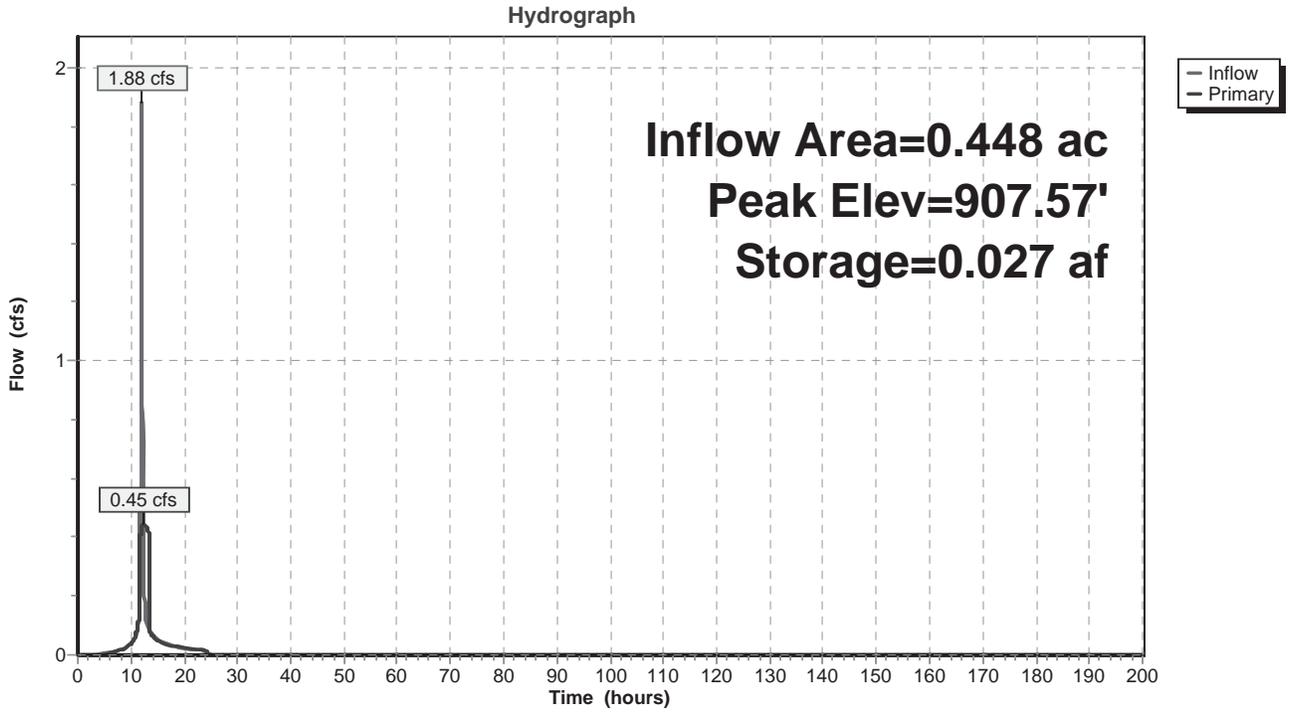
| Volume | Invert  | Avail.Storage | Storage Description                                          |
|--------|---------|---------------|--------------------------------------------------------------|
| #1     | 903.35' | 0.000 af      | <b>2.00'W x 2.00'L x 3.50'H CB #1</b>                        |
| #2     | 906.85' | 0.057 af      | <b>Parking Lot Ponding (Prismatic)</b> Listed below (Recalc) |
|        |         | 0.058 af      | Total Available Storage                                      |

| Elevation (feet) | Surf.Area (acres) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------------------|-----------------------|
| 906.85           | 0.000             | 0.000                 | 0.000                 |
| 907.35           | 0.049             | 0.012                 | 0.012                 |
| 907.85           | 0.131             | 0.045                 | 0.057                 |

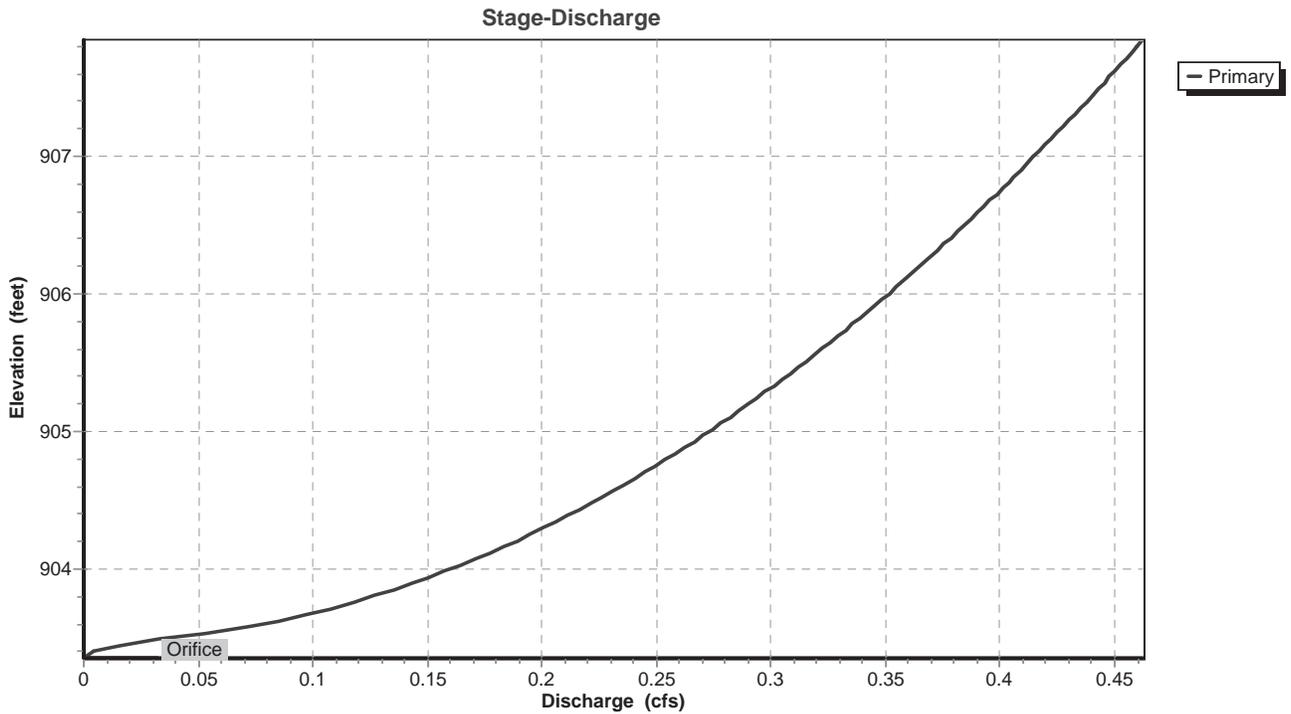
| Device | Routing | Invert  | Outlet Devices                     |
|--------|---------|---------|------------------------------------|
| #1     | Primary | 903.35' | <b>2.9" Vert. Orifice</b> C= 0.600 |

**Primary OutFlow** Max=0.45 cfs @ 12.22 hrs HW=907.57' (Free Discharge)  
 ↑**1=Orifice** (Orifice Controls 0.45 cfs @ 9.75 fps)

**Pond 1P: Site Detention**

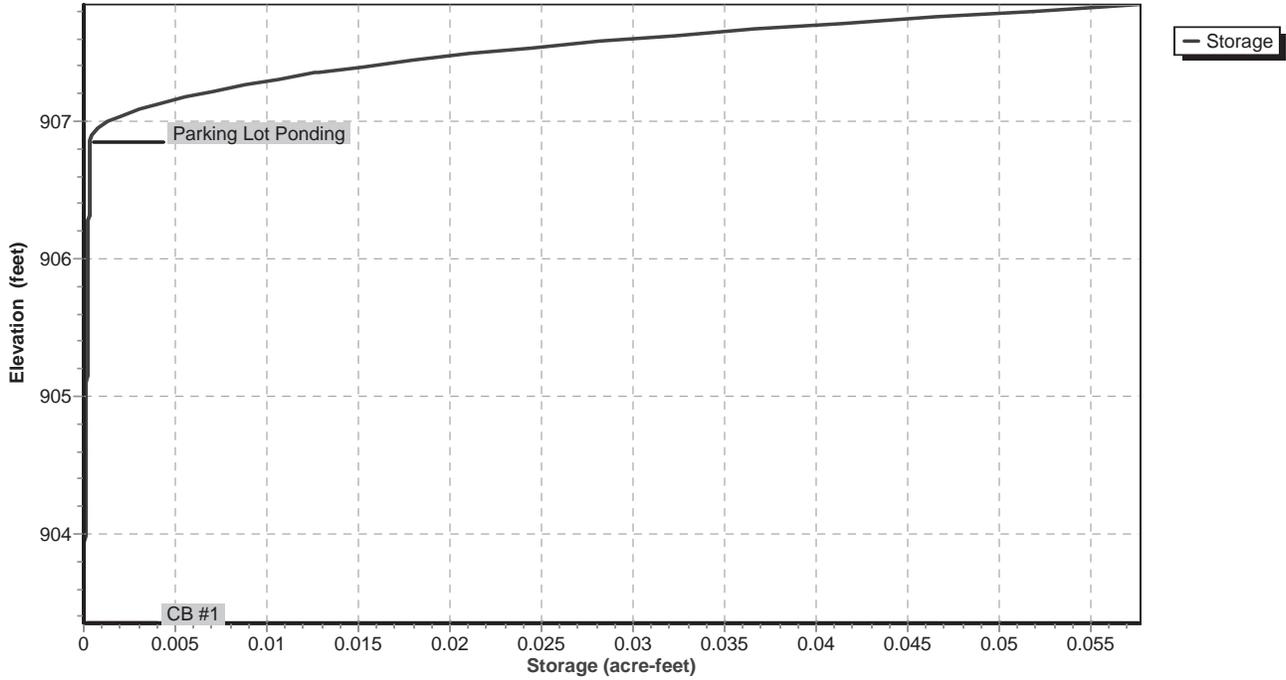


**Pond 1P: Site Detention**



### Pond 1P: Site Detention

Stage-Area-Storage



Time span=0.00-200.00 hrs, dt=0.01 hrs, 20001 points x 3  
Runoff by SCS TR-20 method, UH=SCS  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 2S: Overall Post-Developed** Runoff Area=0.448 ac 75.45% Impervious Runoff Depth=3.54"  
Tc=10.0 min CN=92 Runoff=2.29 cfs 0.132 af

**Pond 1P: Site Detention** Peak Elev=907.68' Storage=0.037 af Inflow=2.29 cfs 0.132 af  
Outflow=0.45 cfs 0.132 af

**Total Runoff Area = 0.448 ac Runoff Volume = 0.132 af Average Runoff Depth = 3.54"**  
**24.55% Pervious = 0.110 ac 75.45% Impervious = 0.338 ac**

**Summary for Subcatchment 2S: Overall Post-Developed**

Runoff = 2.29 cfs @ 12.01 hrs, Volume= 0.132 af, Depth= 3.54"

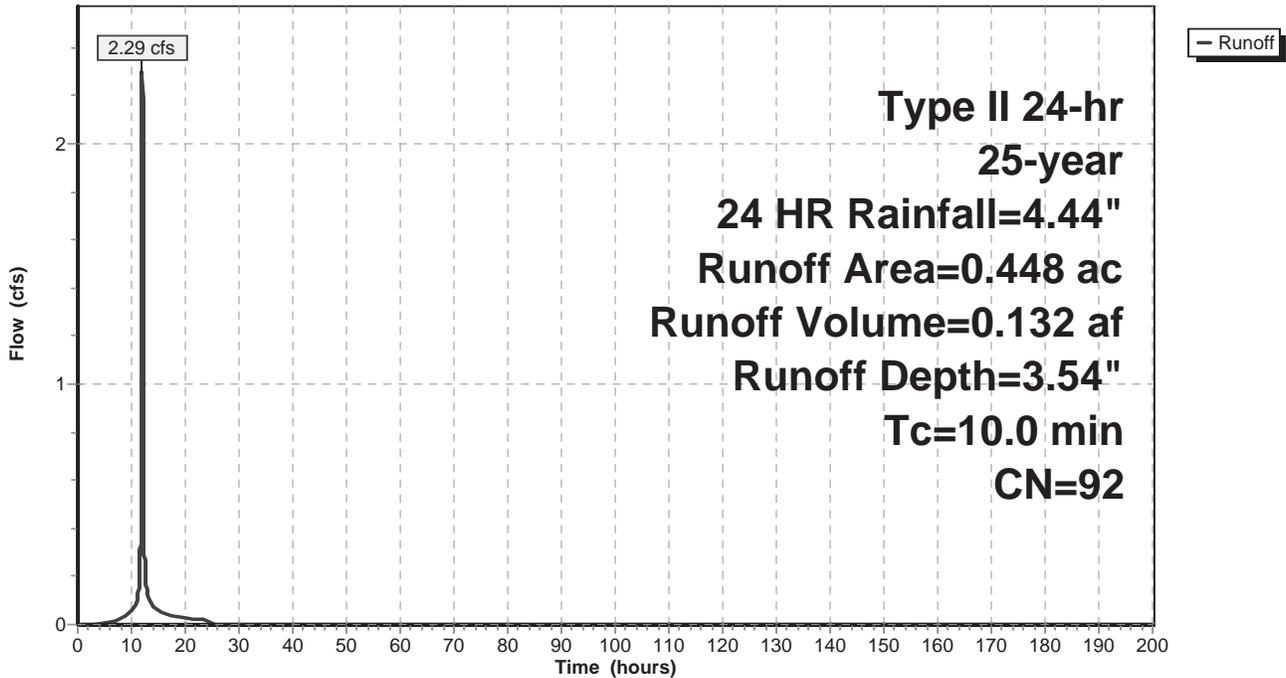
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs  
 Type II 24-hr 25-year, 24 HR Rainfall=4.44"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.338     | 98 | Paved parking, HSG C          |
| 0.110     | 74 | >75% Grass cover, Good, HSG C |
| 0.448     | 92 | Weighted Average              |
| 0.110     |    | 24.55% Pervious Area          |
| 0.338     |    | 75.45% Impervious Area        |

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

**Subcatchment 2S: Overall Post-Developed**

Hydrograph



**Summary for Pond 1P: Site Detention**

Inflow Area = 0.448 ac, 75.45% Impervious, Inflow Depth = 3.54" for 25-year, 24 HR event  
 Inflow = 2.29 cfs @ 12.01 hrs, Volume= 0.132 af  
 Outflow = 0.45 cfs @ 12.26 hrs, Volume= 0.132 af, Atten= 80%, Lag= 14.8 min  
 Primary = 0.45 cfs @ 12.26 hrs, Volume= 0.132 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 907.68' @ 12.26 hrs Surf.Area= 0.102 ac Storage= 0.037 af

Plug-Flow detention time= 19.6 min calculated for 0.132 af (100% of inflow)  
 Center-of-Mass det. time= 19.6 min ( 806.5 - 786.9 )

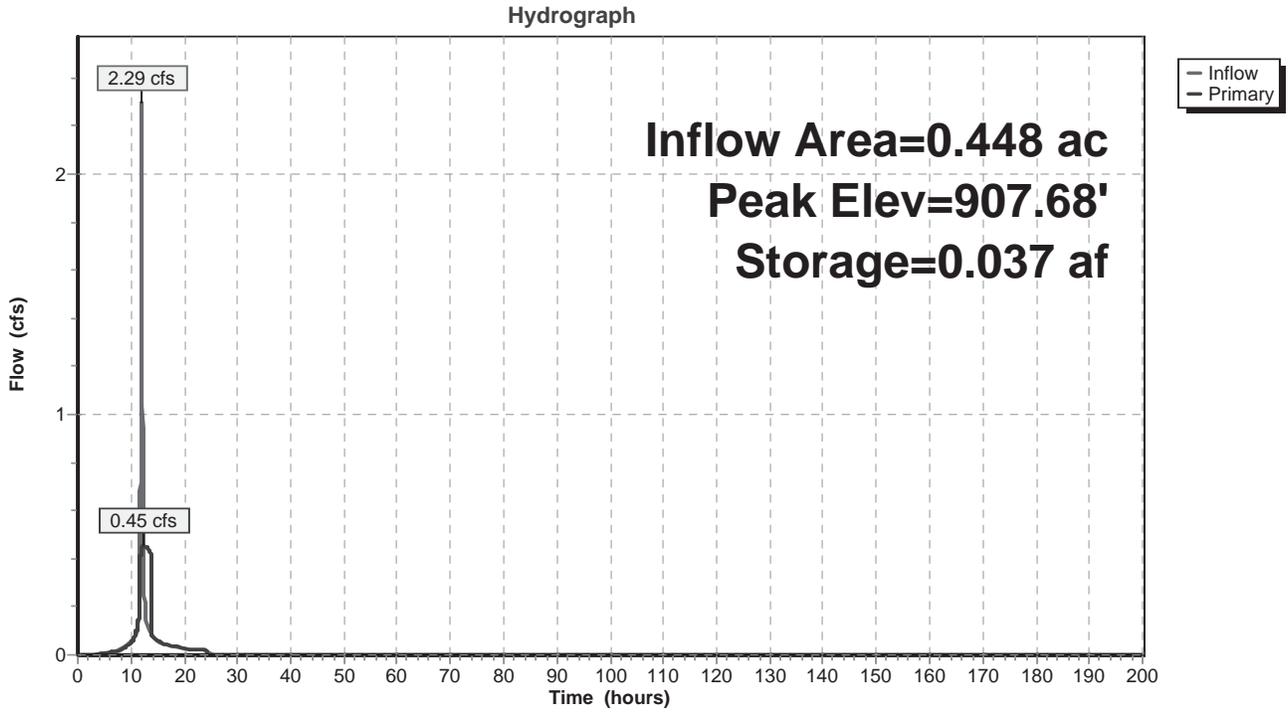
| Volume | Invert  | Avail.Storage | Storage Description                                          |
|--------|---------|---------------|--------------------------------------------------------------|
| #1     | 903.35' | 0.000 af      | <b>2.00'W x 2.00'L x 3.50'H CB #1</b>                        |
| #2     | 906.85' | 0.057 af      | <b>Parking Lot Ponding (Prismatic)</b> Listed below (Recalc) |
|        |         | 0.058 af      | Total Available Storage                                      |

| Elevation (feet) | Surf.Area (acres) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------------------|-----------------------|
| 906.85           | 0.000             | 0.000                 | 0.000                 |
| 907.35           | 0.049             | 0.012                 | 0.012                 |
| 907.85           | 0.131             | 0.045                 | 0.057                 |

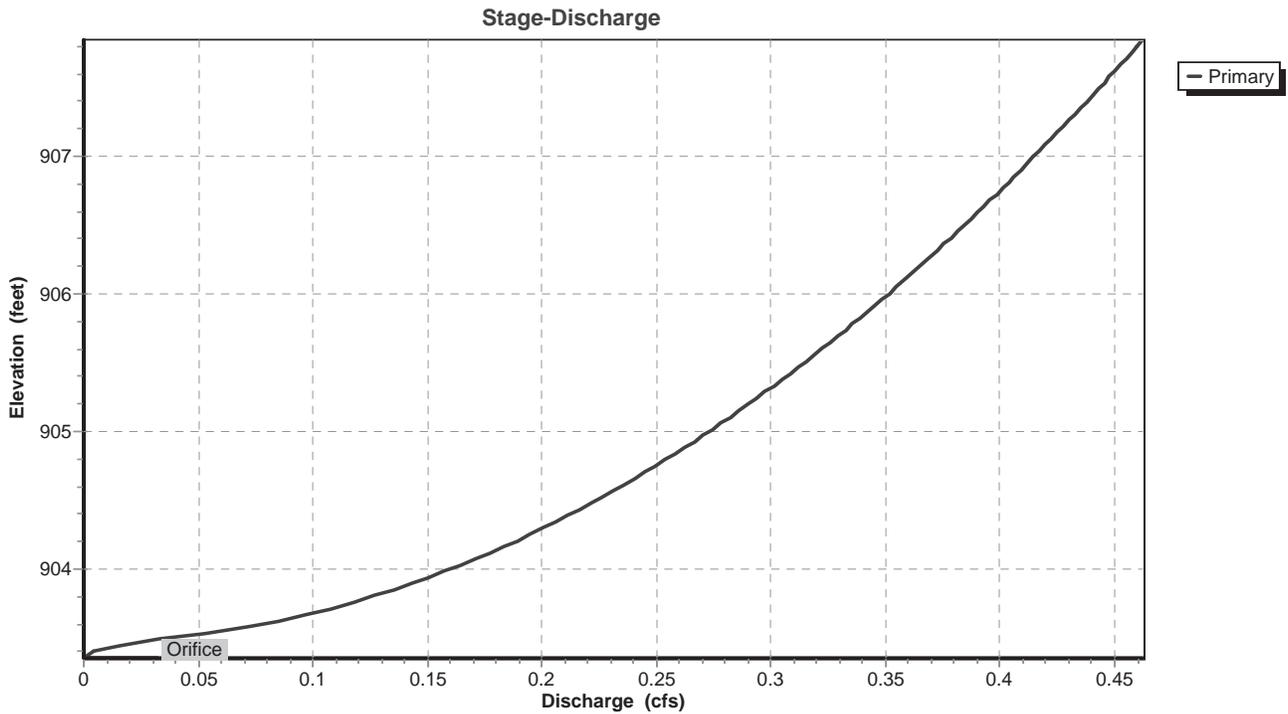
| Device | Routing | Invert  | Outlet Devices                     |
|--------|---------|---------|------------------------------------|
| #1     | Primary | 903.35' | <b>2.9" Vert. Orifice</b> C= 0.600 |

**Primary OutFlow** Max=0.45 cfs @ 12.26 hrs HW=907.68' (Free Discharge)  
 ↑**1=Orifice** (Orifice Controls 0.45 cfs @ 9.87 fps)

**Pond 1P: Site Detention**

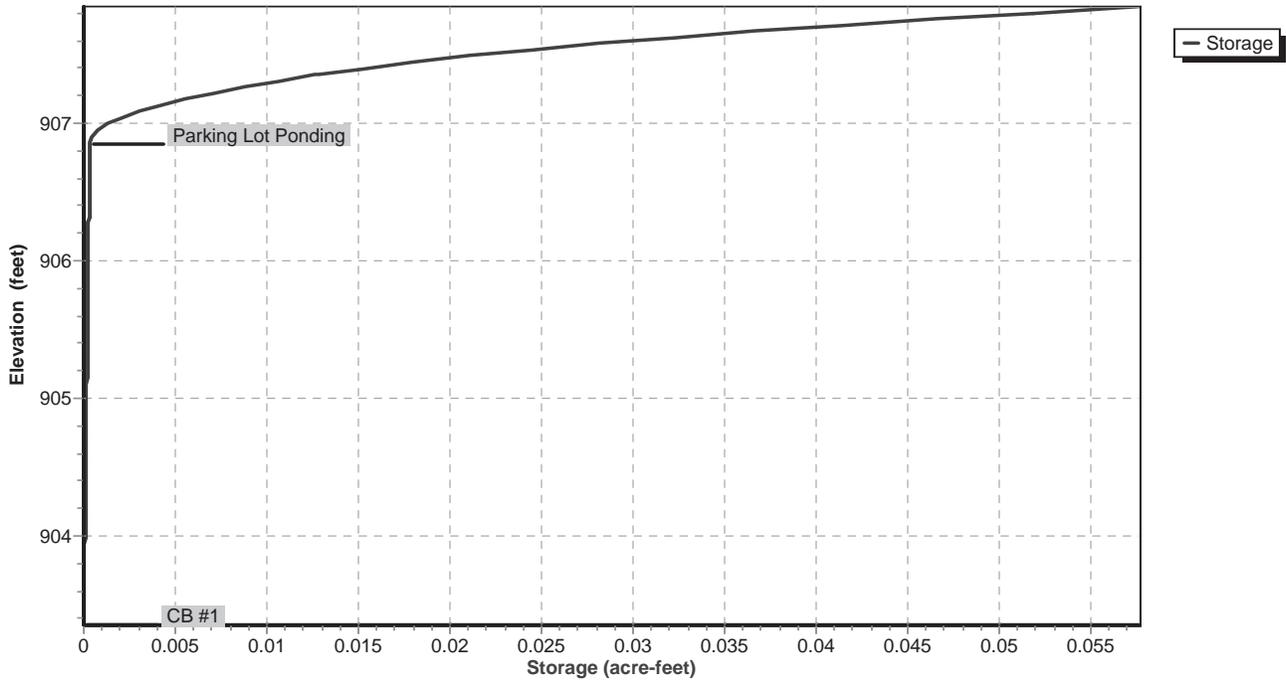


**Pond 1P: Site Detention**



### Pond 1P: Site Detention

Stage-Area-Storage



**02013.01025 Detention.Current Revised Layout** *Type II 24-hr 50-year, 24 HR Rainfall=5.02"*

Prepared by American Structurepoint

Printed 11/14/2013

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Time span=0.00-200.00 hrs, dt=0.01 hrs, 20001 points x 3

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 2S: Overall Post-Developed** Runoff Area=0.448 ac 75.45% Impervious Runoff Depth=4.11"  
Tc=10.0 min CN=92 Runoff=2.64 cfs 0.153 af

**Pond 1P: Site Detention**

Peak Elev=907.75' Storage=0.046 af Inflow=2.64 cfs 0.153 af  
Outflow=0.46 cfs 0.153 af

**Total Runoff Area = 0.448 ac Runoff Volume = 0.153 af Average Runoff Depth = 4.11"**  
**24.55% Pervious = 0.110 ac 75.45% Impervious = 0.338 ac**

**Summary for Subcatchment 2S: Overall Post-Developed**

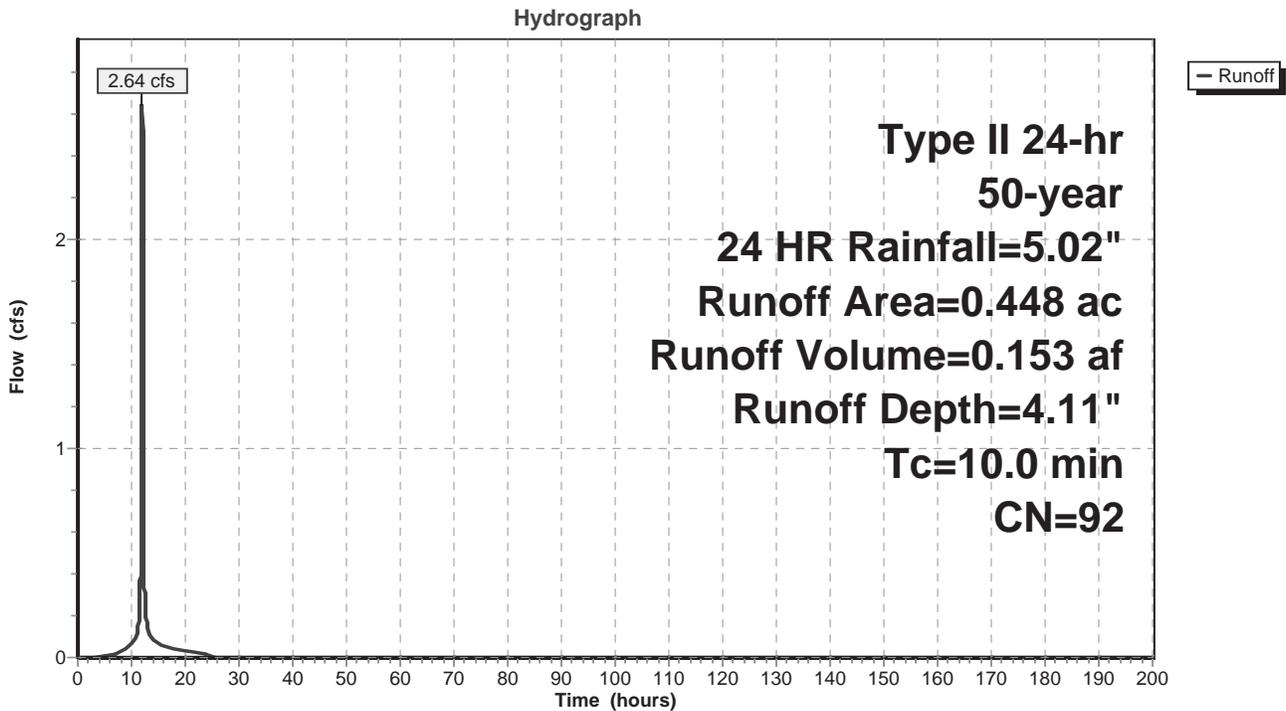
Runoff = 2.64 cfs @ 12.01 hrs, Volume= 0.153 af, Depth= 4.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs  
 Type II 24-hr 50-year, 24 HR Rainfall=5.02"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.338     | 98 | Paved parking, HSG C          |
| 0.110     | 74 | >75% Grass cover, Good, HSG C |
| 0.448     | 92 | Weighted Average              |
| 0.110     |    | 24.55% Pervious Area          |
| 0.338     |    | 75.45% Impervious Area        |

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

**Subcatchment 2S: Overall Post-Developed**



**Summary for Pond 1P: Site Detention**

Inflow Area = 0.448 ac, 75.45% Impervious, Inflow Depth = 4.11" for 50-year, 24 HR event  
 Inflow = 2.64 cfs @ 12.01 hrs, Volume= 0.153 af  
 Outflow = 0.46 cfs @ 12.29 hrs, Volume= 0.153 af, Atten= 83%, Lag= 16.5 min  
 Primary = 0.46 cfs @ 12.29 hrs, Volume= 0.153 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 907.75' @ 12.29 hrs Surf.Area= 0.115 ac Storage= 0.046 af

Plug-Flow detention time= 24.8 min calculated for 0.153 af (100% of inflow)  
 Center-of-Mass det. time= 24.8 min ( 807.8 - 782.9 )

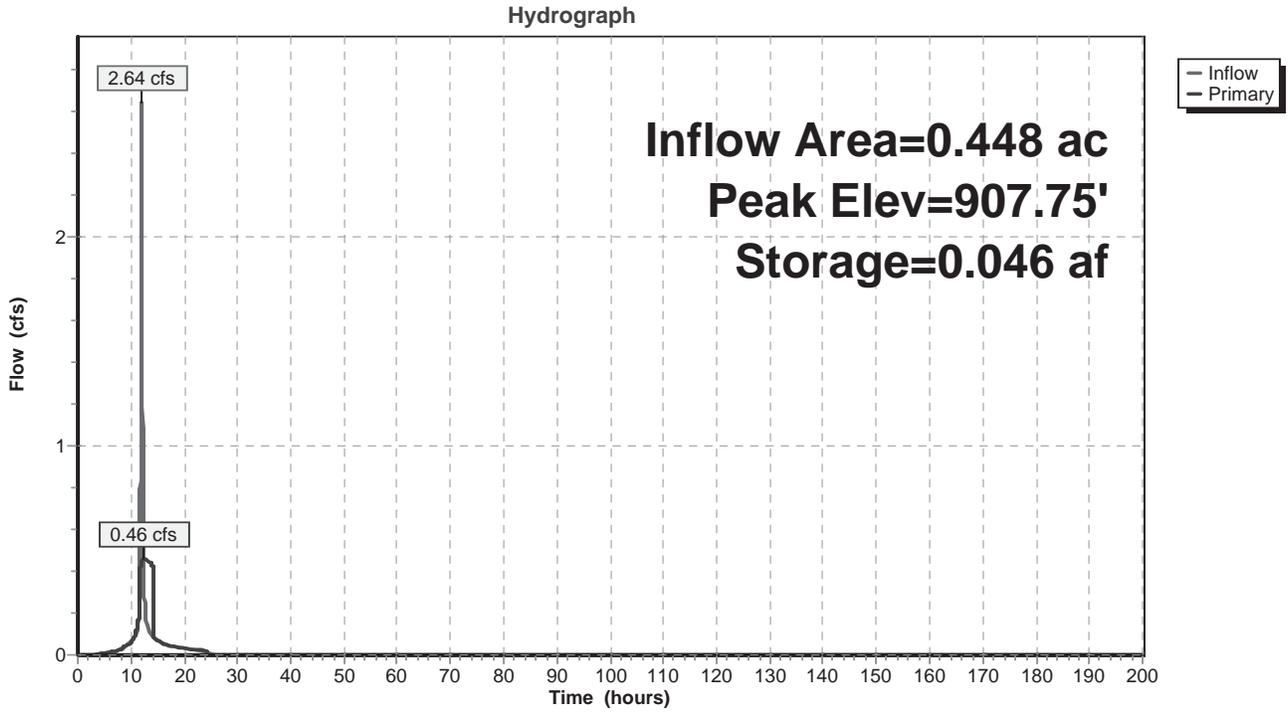
| Volume | Invert  | Avail.Storage | Storage Description                                          |
|--------|---------|---------------|--------------------------------------------------------------|
| #1     | 903.35' | 0.000 af      | <b>2.00'W x 2.00'L x 3.50'H CB #1</b>                        |
| #2     | 906.85' | 0.057 af      | <b>Parking Lot Ponding (Prismatic)</b> Listed below (Recalc) |
|        |         | 0.058 af      | Total Available Storage                                      |

| Elevation (feet) | Surf.Area (acres) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------------------|-----------------------|
| 906.85           | 0.000             | 0.000                 | 0.000                 |
| 907.35           | 0.049             | 0.012                 | 0.012                 |
| 907.85           | 0.131             | 0.045                 | 0.057                 |

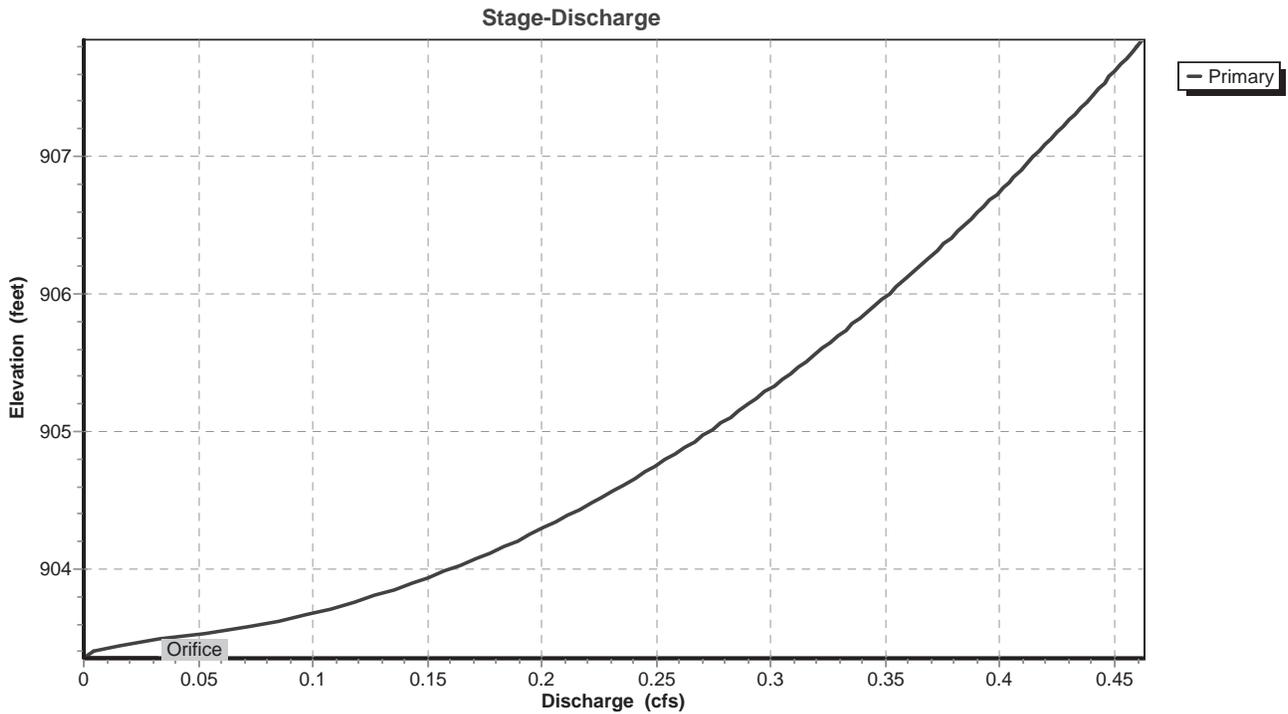
| Device | Routing | Invert  | Outlet Devices                     |
|--------|---------|---------|------------------------------------|
| #1     | Primary | 903.35' | <b>2.9" Vert. Orifice</b> C= 0.600 |

**Primary OutFlow** Max=0.46 cfs @ 12.29 hrs HW=907.75' (Free Discharge)  
 ↑**1=Orifice** (Orifice Controls 0.46 cfs @ 9.97 fps)

**Pond 1P: Site Detention**

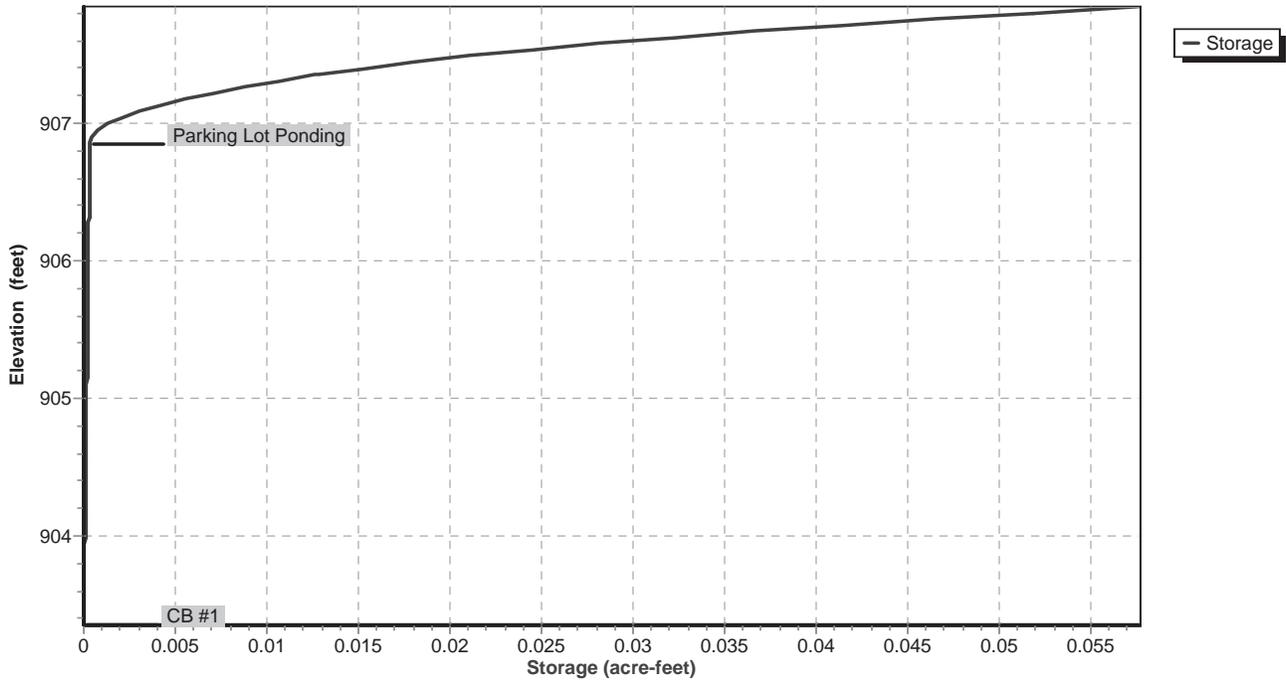


**Pond 1P: Site Detention**



### Pond 1P: Site Detention

Stage-Area-Storage



Time span=0.00-200.00 hrs, dt=0.01 hrs, 20001 points x 3  
Runoff by SCS TR-20 method, UH=SCS  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 2S: Overall Post-Developed** Runoff Area=0.448 ac 75.45% Impervious Runoff Depth=4.71"  
Tc=10.0 min CN=92 Runoff=2.99 cfs 0.176 af

**Pond 1P: Site Detention** Peak Elev=907.83' Storage=0.055 af Inflow=2.99 cfs 0.176 af  
Outflow=0.46 cfs 0.176 af

**Total Runoff Area = 0.448 ac Runoff Volume = 0.176 af Average Runoff Depth = 4.71"**  
**24.55% Pervious = 0.110 ac 75.45% Impervious = 0.338 ac**

**Summary for Subcatchment 2S: Overall Post-Developed**

Runoff = 2.99 cfs @ 12.01 hrs, Volume= 0.176 af, Depth= 4.71"

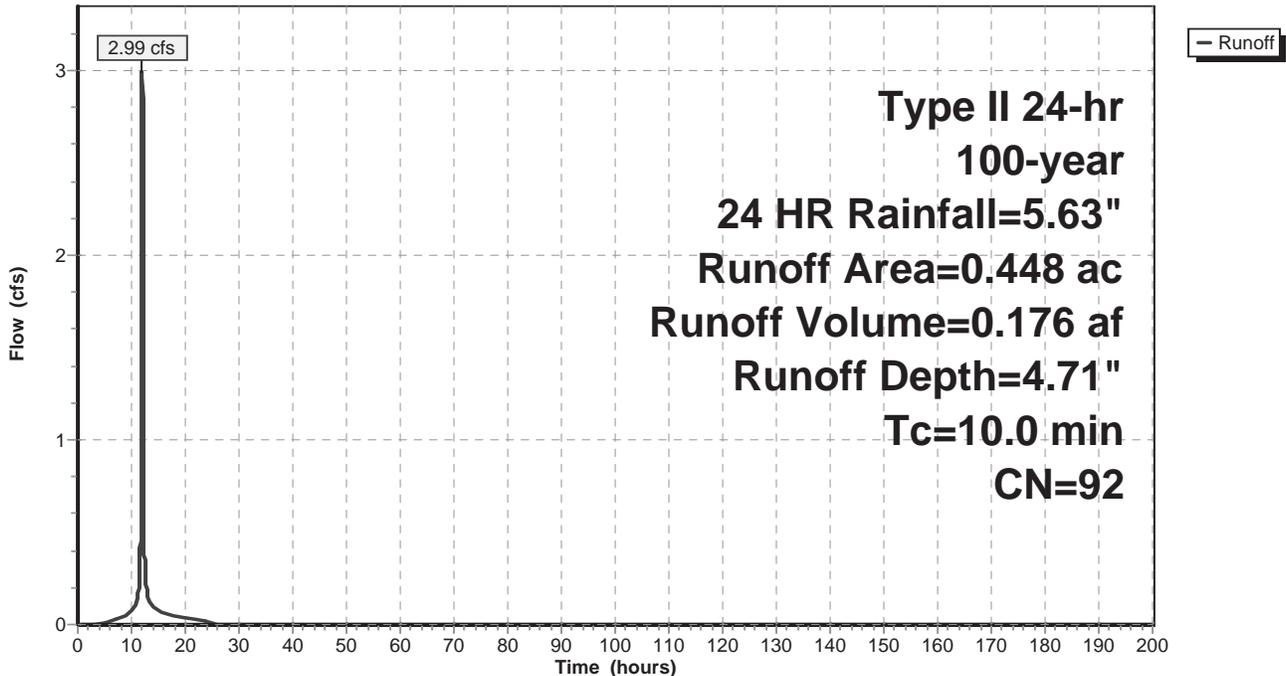
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs  
 Type II 24-hr 100-year, 24 HR Rainfall=5.63"

| Area (ac) | CN | Description                   |
|-----------|----|-------------------------------|
| 0.338     | 98 | Paved parking, HSG C          |
| 0.110     | 74 | >75% Grass cover, Good, HSG C |
| 0.448     | 92 | Weighted Average              |
| 0.110     |    | 24.55% Pervious Area          |
| 0.338     |    | 75.45% Impervious Area        |

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

**Subcatchment 2S: Overall Post-Developed**

Hydrograph



**Summary for Pond 1P: Site Detention**

Inflow Area = 0.448 ac, 75.45% Impervious, Inflow Depth = 4.71" for 100-year, 24 HR event  
 Inflow = 2.99 cfs @ 12.01 hrs, Volume= 0.176 af  
 Outflow = 0.46 cfs @ 12.32 hrs, Volume= 0.176 af, Atten= 85%, Lag= 18.5 min  
 Primary = 0.46 cfs @ 12.32 hrs, Volume= 0.176 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-200.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 907.83' @ 12.32 hrs Surf.Area= 0.128 ac Storage= 0.055 af

Plug-Flow detention time= 30.5 min calculated for 0.176 af (100% of inflow)  
 Center-of-Mass det. time= 30.5 min ( 809.9 - 779.4 )

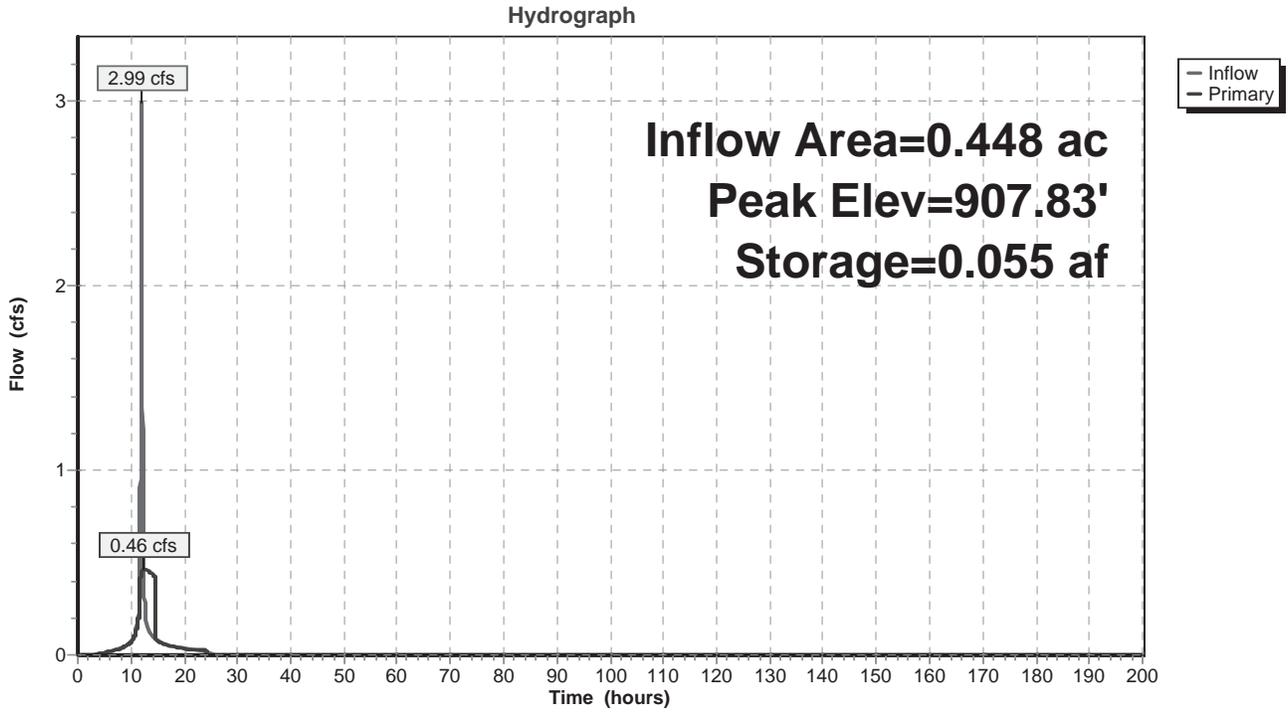
| Volume | Invert  | Avail.Storage | Storage Description                                          |
|--------|---------|---------------|--------------------------------------------------------------|
| #1     | 903.35' | 0.000 af      | <b>2.00'W x 2.00'L x 3.50'H CB #1</b>                        |
| #2     | 906.85' | 0.057 af      | <b>Parking Lot Ponding (Prismatic)</b> Listed below (Recalc) |
|        |         | 0.058 af      | Total Available Storage                                      |

| Elevation (feet) | Surf.Area (acres) | Inc.Store (acre-feet) | Cum.Store (acre-feet) |
|------------------|-------------------|-----------------------|-----------------------|
| 906.85           | 0.000             | 0.000                 | 0.000                 |
| 907.35           | 0.049             | 0.012                 | 0.012                 |
| 907.85           | 0.131             | 0.045                 | 0.057                 |

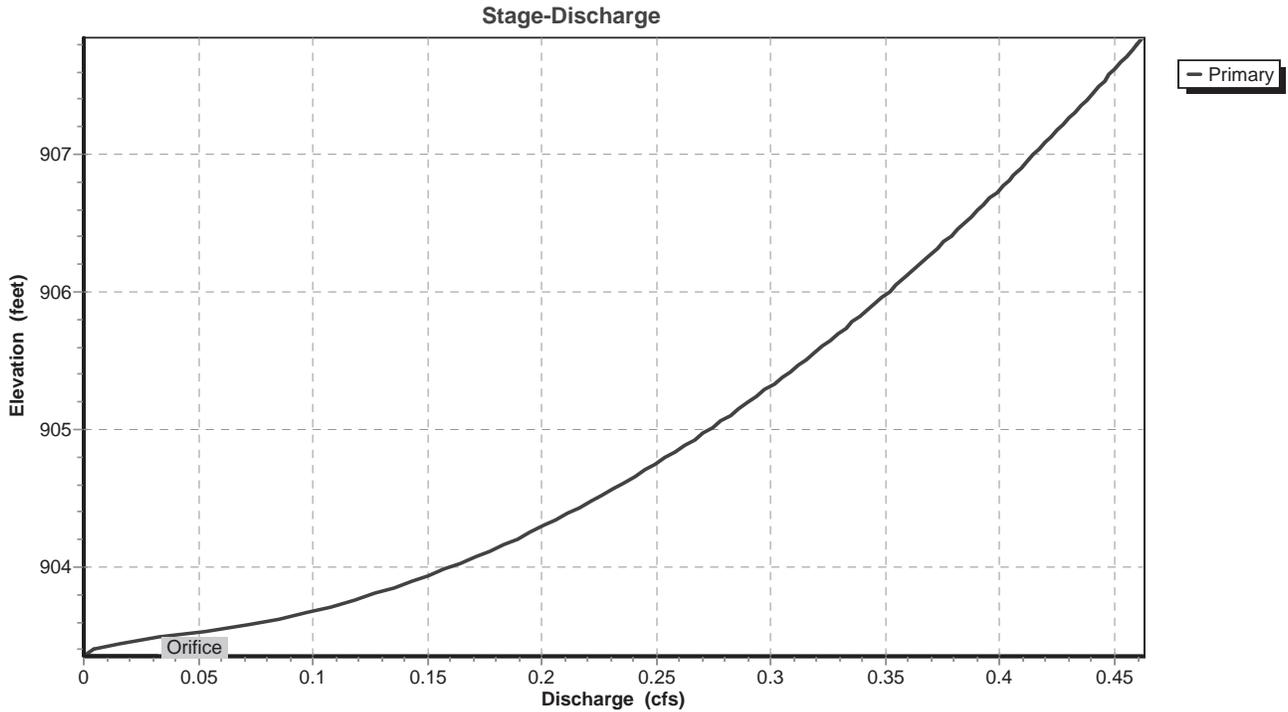
| Device | Routing | Invert  | Outlet Devices                     |
|--------|---------|---------|------------------------------------|
| #1     | Primary | 903.35' | <b>2.9" Vert. Orifice</b> C= 0.600 |

**Primary OutFlow** Max=0.46 cfs @ 12.32 hrs HW=907.83' (Free Discharge)  
 ↑**1=Orifice** (Orifice Controls 0.46 cfs @ 10.05 fps)

**Pond 1P: Site Detention**

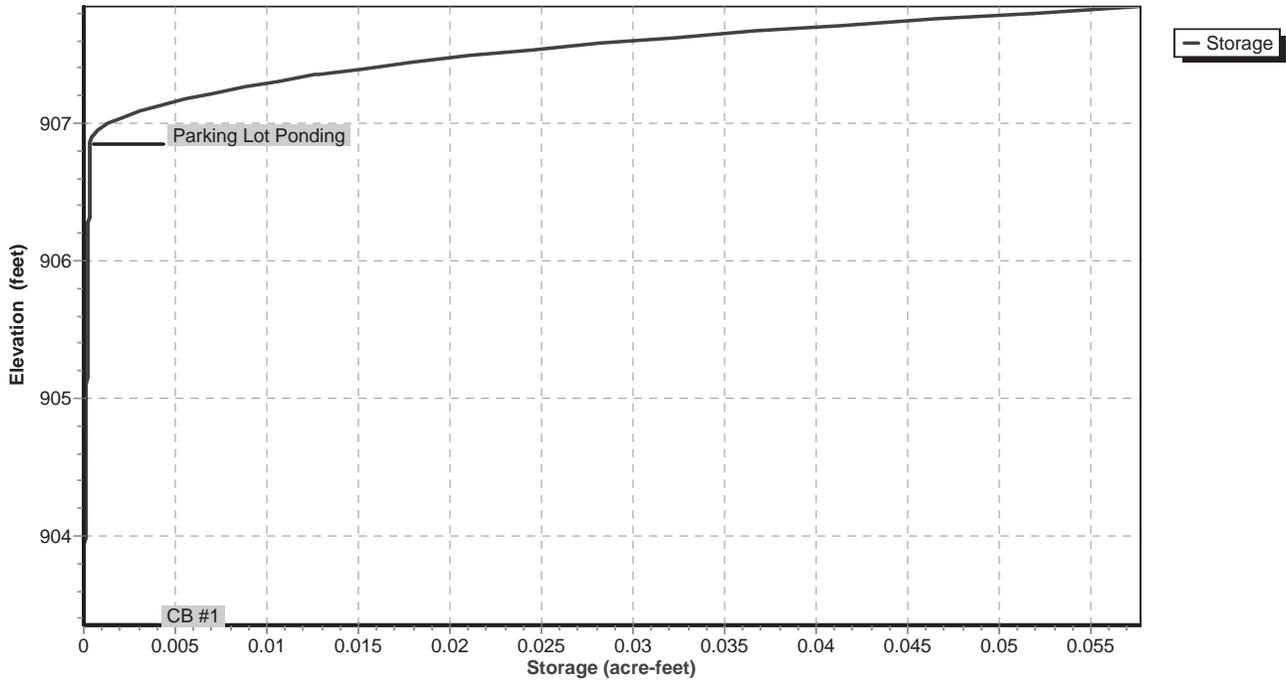


**Pond 1P: Site Detention**



### Pond 1P: Site Detention

Stage-Area-Storage



**APPENDIX G**  
**STORM SEWER CALCULATIONS**



**APPENDIX H**  
WATER QUALITY – FLEXSTORM INLET FILTER



## FILTER BAG OPTIONS

FLEXSTORM offers seven different filter bag options for any of the framing styles. For complete test results visit [www.inletfilters.com](http://www.inletfilters.com)

| FLEXSTORM FILTER BAGS     | STANDARD BAG P/N (22" depth) | SHORT BAG P/N (12" depth) |
|---------------------------|------------------------------|---------------------------|
| FX: Standard Woven Bag    | FX                           | FX-S                      |
| FX+: Woven w/ MyCelx      | FXP                          | FXP-S                     |
| FX0: Woven w/ Oil Boom    | FX0                          | FX0-S                     |
| PC: Post Construction Bag | PC                           | PC-S                      |
| PC+: PC Bag w/ MyCelx     | PCP                          | PCP-S                     |
| LL: Litter and Leaf Bag   | LL                           | LL-S                      |
| IL: IDOT NonWoven Bag     | IL                           | IL-S                      |

## FILTER BAG TEST RESULTS

**FX FILTRATION EFFICIENCY = 82% †**

† Large scale, 3rd party testing per ASTM D 7351, Standard Test Method for Determination of Sediment Retention Device Effectiveness in Sheet Flow Application using 7% USDA Sandy Loam

**PC/PC+ TSS = 99% TPH = 97% ‡**

‡ Large scale testing at 90 GPM. 3rd party results using US Silica OK-110 sand at 1750 mg/L measuring TSS per SM 2540D. TPH tested at 243 mg/L used motor oil using EPA Method 1664A.

## FILTER BAG SPECIFICATIONS & CAPABILITES

| Bag Type (P/N)         | Clean Water Flow Rate (GPM/SqFt) | Min A.O.S. (US Sieve) |
|------------------------|----------------------------------|-----------------------|
| Woven (FX)             | 200                              | 40                    |
| Post Construction (PC) | 137                              | 140                   |
| NonWoven (IL)          | 145                              | 70                    |
| Litter & Leaf Bag (LL) | High                             | 3.5                   |

**Total Bypass Capacity:**  
Bypass capacity will vary with each size drainage structure. Flexstorm designs filter bypass to meet the minimum design flow of the particular drainage structure.

| Standard Bag Sizes (match frame sizes) § | Solids Storage Capacity (CuFt) | Filtered Flow Rate at 50% Max (CFS) |     |     | Oil Retention (Oz) |       |     |
|------------------------------------------|--------------------------------|-------------------------------------|-----|-----|--------------------|-------|-----|
|                                          |                                | FX                                  | PC  | IL  | PC*                | PCP** | FX+ |
| Small                                    | 1.6                            | 1.2                                 | 0.8 | 0.9 | 66                 | 155   | 89  |
| Medium                                   | 2.1                            | 1.8                                 | 1.2 | 1.3 | 96                 | 185   | 89  |
| Large                                    | 3.8                            | 2.2                                 | 1.5 | 1.6 | 120                | 209   | 89  |
| XL                                       | 4.2                            | 3.6                                 | 2.4 | 2.6 | 192                | 370   | 178 |

\* PC filter bag at 50% max adsorption capacity

\*\* PC filter bag at 50% capacity and MyCelx skimmer at 100% capacity

§ Bag Sizes match the framing sizes based on clear opening dimensions. Standard bags are 22" in depth.

Short bags are 12" in depth, reducing solids storage capacity by approximately 50%.



## **OPERATION & MAINTENANCE PLAN**

### **Installation Instructions:**

1. Remove the grate from the casting or concrete drainage structure.
2. Clean the ledge (lip) of the casting frame or drainage structure to ensure it is free of stone and dirt.
3. Drop in the FLEXSTORM Inlet Filter through the clear opening and be sure the suspension hangers rest firmly on the inside ledge (lip) of the casting.
4. Replace the grate and confirm it is elevated no more than 1/8", which is the thickness of the steel hangers.

### **Frequency of Inspections:**

1. Construction site inspection should occur following each ½" or more rain event.
2. Post Construction inspections should occur three times per year (every four months) in areas with year round rainfall and three times per year (every three months) in areas with rainy seasons before and after snowfall season.
3. Industrial application site inspections (loading ramps, wash racks, maintenance facilities) should occur on a regularly scheduled basis no less than three times per year.

### **Maintenance Guidelines:**

1. Empty the sediment bag if more than half filled with sediment and debris, or as directed by the Engineer.
2. Remove the grate, engage the lifting bars or handles with the FLEXSTORM Removal Tool, and lift from the drainage structure.
3. Dispose of the sediment or debris as directed by the Engineer or Maintenance Contract in accordance with EPA guidelines.
4. As an alternative, an industrial vacuum may be used to collect the accumulated sediment.
5. Remove any caked on silt from the sediment bag and reverse flush the bag with medium spray for optimal filtration.

6. Replace the bag if torn or punctured to ½” diameter or greater on the lower half of the bag.
7. Post Construction PC Bags maint: At 50% saturation, the average 2’ x 2’ Adsorb-it lined PC filter will retain approximately 75 oz (4.2 lbs) of oil and should be serviced. It can be centrifuged or passed through a wringer to recover the oils, and the fabric reused with 85% to 90% efficacy. It may also be recycled for its fuel value through waste to energy incineration.
8. MyCelx Skimmer Pouches: The skimmers start yellow in color and will gradually turn brown as they become saturated, indicating time for replacement. Each MyCelx skimmer pouch will absorb approximately 89 oz (5 lbs) of oil before requiring replacement.
9. Dispose of all oil contaminated products in accordance with EPA guidelines.

**Sediment Bag Replacement:**

1. Remove the bag by loosening or cutting off the clamping band.
2. Take the new sediment bag, which is equipped with a stainless steel worm drive clamping band, and use a screw driver to tighten the bag around the frame channel.
3. Ensure the bag is secure and that there is no slack around the perimeter of the band.

