**H B H**
**C O N S U L T I N G**
**E N G I N E E R S**

501 E First Street
Newberg, Oregon 97132
Ph. 503-554-9553 | Fax 503-537-9554
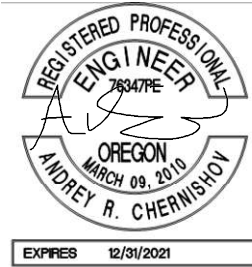
S T O R M W A T E R   M E M O R A N D U M

<u>**Overview**</u>
The proposed project is a hotel located on parcels 1900 & 2002 on Brutscher Street in Newberg, OR which covers an area of 1.92 acres.  The existing site consists of a parking lot and a large field.  The parking lot is collected by a catch basin that drains to a public main.  The large grassy field slopes gently to the east and drains offsite to the neighboring properties.  The proposed project turns the existing field into a hotel with associated infrastructure.  This project increases the amount of impervious area onsite which triggers the need for onsite water quality and detention treatment.  Two detention/treatment facilities will be installed onsite to offset the increase in impervious area: a 164 SF water quality/detention planter in the existing parking lot and a 2,212 SF extended dry basin incorporated with the hotel.

Under the proposed conditions, peak runoff is reduced as a result of the detention provided.  Treatment will consist of plants and planter media incorporated with the detention facilities.

**Design Methodology & Applicable Standards**

The Santa Barbara Urban Hydrograph (SBUH) Method was used to analyze stormwater runoff for the site.  This method utilizes the SCS Type 1A 24-hour design storm.  HydroCAD 10 computer software was used in the analysis.

City of Newberg requires onsite stormwater detention facilities to be designed to capture runoff so the post-development runoff rates from the site do not exceed the pre-development runoff rates from the site, based on 24-hour storm events ranging from the ½ of the 2-year return storm to the 25-year return storm.  City of Newberg also requires developments that create a net impervious area greater than 2,877 SF to treat all new net impervious area created.

The HydroCAD model utilized the 24-hour storm rainfall intensities listed in the City of Newberg Design Standards, shown in Table 1 below:

Table 1 – Storm Event Rainfall Intensities

| Recurrence Interval (years) | Total Precipitation Depth (inches) |
|---|---|
| ½ of 2 | 1.25 |
| 2 | 2.5 |
| 10 | 3.5 |
| 25 | 4.0 |

**Existing Conditions**

Per USDA NRCS WSS records, the soil underlying the project site is 100% woodburn silt loam (HSG C). Based on survey and site visits, the existing site consists of a parking lot and a large grass field with several trees.  These are modeled as two separate catchments: 1S for the parking lot and 2S for the field (See Attachment B).  The area around the development for the downstream analysis was modeled as catchments 5S & 6S (7S & 8S for post-developed model), which represent the areas on the West & East of Brutscher Street and along Highway 99 which drain into the public storm system.  These areas were interpreted as Urban Commercial with 85% impervious area (HSG C) (See Attachment C).  The conditions for these catchments are summarized in Table 2-5 below.

Table 2 – Catchment 1S

| Surface | CN | Area (SF) | % of Total Area |
|---|---|---|---|
| Impervious | 98 | 7,660 | 92% |
| Landscaping | 74 | 638 | 8% |
| Total | 96 | 8,298 | 100% |

Table 4 – Catchment 5S

| Surface | CN | Area (SF) | % of Total Area |
|---|---|---|---|
| Urban Com. | 94 | 153,361 | 100% |
| Total | 94 | 153,361 | 100% |

Table 3 – Catchment 2S

| Surface | CN | Area (SF) | % of Total Area |
|---|---|---|---|
| Grass | 79 | 75,367 | 100% |
| Total | 79 | 75,367 | 100% |

Table 5 – Catchment 6S

| Surface | CN | Area (SF) | % of Total Area |
|---|---|---|---|
| Urban Com. | 94 | 484,823 | 100% |
| Total | 94 | 484,823 | 100% |

These conditions corresponding to weighted CN's of 96 and 79 for Catchments 1S & 2S respectively and 94 for catchments 5S & 6S.

**Proposed Conditions**

The improvements will increase impervious area by approximately 59%.  Runoff from the hotel development will drain via surface and pipe flow to a 2,212 SF detention facility.  Runoff from the existing parking lot will drain into a new stormwater detention/infiltration facility located in the planter on the northwest corner of the lot.  For all design storms, orifices and overflows control the runoff such that the peak flowrate for the post developed condition does not exceed the peak runoff rate from the pre-developed conditions ½ of the 2, 2, 10 & 25-year storm events.  The existing parking lot area and the hotel area are modeled as catchments 3S and 4S respectively (See Attachment D).  Tables 6 & 7 below summarize the conditions for these catchments.

Table 6 – Catchment 3S

| Surface | CN | Area (SF) | % of Total Area |
|---------|----|-----------|-----------------|
| Impervious | 98 | 8,428 | 75% |
| Landscaping | 74 | 2,835 | 25% |
| Total | 92 | 11,263 | 100% |

Table 7 – Catchment 4S

| Surface | CN | Area (SF) | % of Total Area |
|---------|----|-----------|-----------------|
| Building | 98 | 10,847 | 15% |
| Asphalt | 98 | 29,742 | 41% |
| Concrete | 98 | 8,202 | 11% |
| Landscaping | 74 | 23,611 | 33% |
| Total | 90 | 72,402 | 100% |

These conditions correspond to weighted CN's of 92 and 90 for Catchments 3S & 4S respectively.

**Hydrology**

Analyses were performed using the HydroCAD software (inputs and outputs attached).  Flows leaving the site are summarized in Table 8 below.

Table 8 – Runoff Summary (excluding area in the Public ROW)

| Development Condition | ½ of 2 Year Storm (cfs) | 2 Year Storm (cfs) | 10 Year Storm (cfs) | 25 Year Storm (cfs) |
|-----------------------|-------------------------|--------------------|---------------------|---------------------|
| Pre-Development (1S+2S) | 0.064 | 0.351 | 0.705 | 0.901 |
| Post-Development (1P+2P) | 0.044 | 0.133 | 0.247 | 0.366 |

There will be a decrease in flows offsite for the post-developed condition when compared to the pre-developed condition.

**Water Quantity**

Stormwater quantity treatment for the development is provided by an extended dry basin & flow through planter which are approved by the City of Newberg for water quality and quantity treatment.  The extended dry basin & planter were selected because LIDA facilities/Regional facilities are the highest option in the City of Newberg water quality/quantity facility selection hierarchy (Newberg Design Standards section 4.6.8).  Analyses were performed using HydroCAD software (See Attachment D) to show the capacity and conveyance of the proposed facilities at each of the storm events.  As shown in Table 8 above, post-development stormwater runoff rates in all storm events is less than pre-development rates, as per code requirements.

**Water Quality Treatment**

The City of Newberg requires that owners of new developments that create new impervious surfaces or increase the amount of stormwater runoff or pollution leaving the site to construct permanent water quality facilities to reduce contaminants entering the storm and surface water system.

The stormwater facilities selected, an extended dry basin and flow through planter, are approved by the City of Newberg to treat water quality as well as quantity.  The facility collects and holds stormwater runoff, allowing pollutants to filter out and settle into the vegetated bottom of the basin.
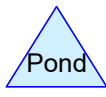
**Downstream Analyses**

The pre-developed analyses (Catchments 1S, 5S, & 6S and Reach 6R-10R) shows that the system currently has sufficient capacity to convey the 25-year design storm event.  The flows attributed to the downstream system from the proposed development reduce the peak flow at the ¼ mile downstream point by 0.030

cfs. This means that development is improving the downstream systems functionality and not contributing adverse effects.

**Conclusion**

The proposed development complies with the City of Newberg requirements for stormwater quality and quantity treatment. An extended dry basin & private planter are proposed to provide stormwater quality and quantity treatment. Post-development peak stormwater runoff is reduced from pre-development, despite a 59% increase in impervious site area.

# ATTACHMENT A
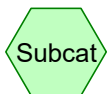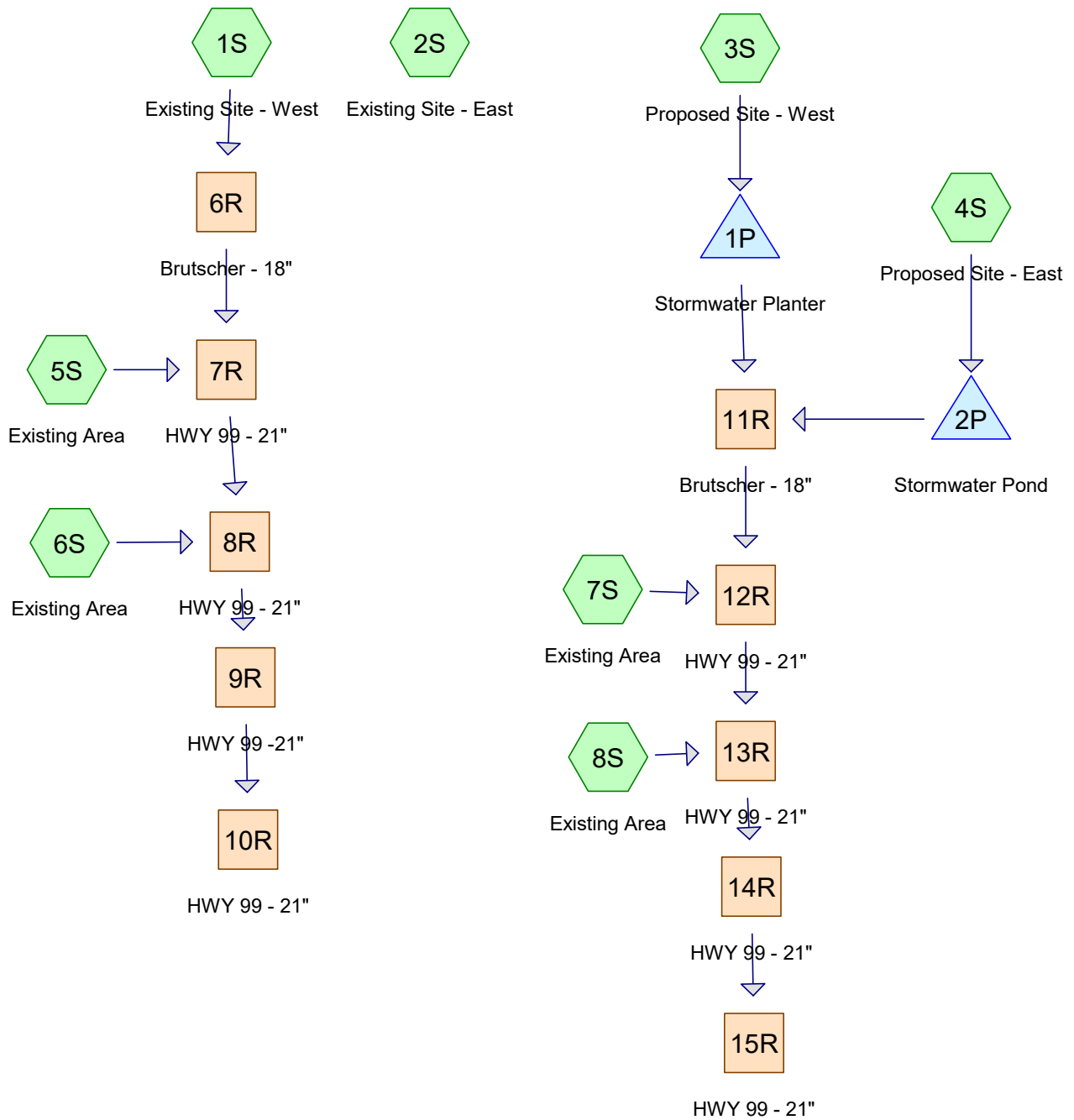


**1S** Existing Site - West

**2S** Existing Site - East

**3S** Proposed Site - West

**6R** Brutscher - 18"

**5S** Existing Area

**7R** HWY 99 - 21"

**6S** Existing Area

**8R** HWY 99 - 21"

**9R** HWY 99 - 21"

**10R** HWY 99 - 21"

**1P** Stormwater Planter

**4S** Proposed Site - East

**11R** Brutscher - 18"

**2P** Stormwater Pond

**7S** Existing Area

**12R** HWY 99 - 21"

**8S** Existing Area

**13R** HWY 99 - 21"

**14R** HWY 99 - 21"

**15R** HWY 99 - 21"

Subcat | Reach | Pond | Link

**Routing Diagram for Faifield Inn 2020-006**
Prepared by HBH Consulting Engineers, Printed 3/2/2020
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Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind method  -  Pond routing by Stor-Ind method

**Subcatchment 1S: Existing Site - West**      Runoff Area=8,298 sf  92.31% Impervious  Runoff Depth=0.96"
         Flow Length=110'  Slope=0.0315 '/'  Tc=10.0 min  CN=74/98  Runoff=0.045 cfs  664 cf

**Subcatchment 2S: Existing Site - East**      Runoff Area=75,367 sf  0.00% Impervious  Runoff Depth=0.15"
         Flow Length=270'  Slope=0.0200 '/'  Tc=10.0 min  CN=79/0  Runoff=0.019 cfs  960 cf

**Subcatchment 3S: Proposed Site - West**      Runoff Area=11,263 sf  74.83% Impervious  Runoff Depth=0.79"
         Flow Length=110'  Slope=0.0315 '/'  Tc=10.0 min  CN=74/98  Runoff=0.049 cfs  744 cf

**Subcatchment 4S: Proposed Site - East**      Runoff Area=72,402 sf  67.39% Impervious  Runoff Depth=0.72"
         Flow Length=216'  Slope=0.0200 '/'  Tc=10.0 min  CN=74/98  Runoff=0.285 cfs  4,352 cf

**Subcatchment 5S: Existing Area**             Runoff Area=3.520 ac  85.00% Impervious  Runoff Depth=0.89"
         Flow Length=1,468'  Tc=10.0 min  CN=71/98  Runoff=0.762 cfs  11,316 cf

**Subcatchment 6S: Existing Area**             Runoff Area=11.130 ac  85.00% Impervious  Runoff Depth=0.89"
         Flow Length=1,468'  Tc=10.0 min  CN=71/98  Runoff=2.409 cfs  35,781 cf

**Subcatchment 7S: Existing Area**             Runoff Area=3.520 ac  85.00% Impervious  Runoff Depth=0.89"
         Flow Length=1,468'  Tc=10.0 min  CN=71/98  Runoff=0.762 cfs  11,316 cf

**Subcatchment 8S: Existing Area**             Runoff Area=11.130 ac  85.00% Impervious  Runoff Depth=0.89"
         Flow Length=1,468'  Tc=10.0 min  CN=71/98  Runoff=2.409 cfs  35,781 cf

**Reach 6R: Brutscher - 18"**              Avg. Flow Depth=0.06'  Max Vel=1.71 fps  Inflow=0.045 cfs  664 cf
         18.0" Round Pipe  n=0.015  L=300.0'  S=0.0203 '/'  Capacity=12.960 cfs  Outflow=0.044 cfs  664 cf

**Reach 7R: HWY 99 - 21"**                 Avg. Flow Depth=0.29'  Max Vel=3.12 fps  Inflow=0.806 cfs  11,980 cf
         21.0" Round Pipe  n=0.015  L=199.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=0.804 cfs  11,980 cf

**Reach 8R: HWY 99 - 21"**                 Avg. Flow Depth=0.58'  Max Vel=4.65 fps  Inflow=3.213 cfs  47,761 cf
         21.0" Round Pipe  n=0.015  L=235.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=3.205 cfs  47,761 cf

**Reach 9R: HWY 99 -21"**                  Avg. Flow Depth=0.58'  Max Vel=4.65 fps  Inflow=3.205 cfs  47,761 cf
         21.0" Round Pipe  n=0.015  L=74.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=3.204 cfs  47,761 cf

**Reach 10R: HWY 99 - 21"**                Avg. Flow Depth=0.59'  Max Vel=4.53 fps  Inflow=3.204 cfs  47,761 cf
         21.0" Round Pipe  n=0.015  L=325.0'  S=0.0093 '/'  Capacity=13.216 cfs  Outflow=3.195 cfs  47,761 cf

**Reach 11R: Brutscher - 18"**             Avg. Flow Depth=0.05'  Max Vel=1.45 fps  Inflow=0.026 cfs  1,922 cf
         18.0" Round Pipe  n=0.015  L=300.0'  S=0.0203 '/'  Capacity=12.960 cfs  Outflow=0.026 cfs  1,918 cf

**Reach 12R: HWY 99 - 21"**                Avg. Flow Depth=0.28'  Max Vel=3.09 fps  Inflow=0.783 cfs  13,234 cf
         21.0" Round Pipe  n=0.015  L=199.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=0.781 cfs  13,232 cf

**Reach 13R: HWY 99 - 21"**                Avg. Flow Depth=0.57'  Max Vel=4.65 fps  Inflow=3.190 cfs  49,012 cf
         21.0" Round Pipe  n=0.015  L=235.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=3.182 cfs  49,009 cf

**Reach 14R: HWY 99 - 21"**               Avg. Flow Depth=0.57'  Max Vel=4.65 fps  Inflow=3.182 cfs  49,009 cf
         21.0" Round Pipe  n=0.015  L=74.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=3.180 cfs  49,008 cf

**Reach 15R: HWY 99 - 21"**               Avg. Flow Depth=0.58'  Max Vel=4.52 fps  Inflow=3.180 cfs  49,008 cf
         21.0" Round Pipe  n=0.015  L=325.0'  S=0.0093 '/'  Capacity=13.216 cfs  Outflow=3.172 cfs  49,003 cf

**Pond 1P: Stormwater Planter**                 Peak Elev=222.47'  Storage=155 cf  Inflow=0.049 cfs  744 cf
                                                              Outflow=0.026 cfs  664 cf

**Pond 2P: Stormwater Pond**                Peak Elev=223.19'  Storage=3,728 cf  Inflow=0.285 cfs  4,352 cf
                                                              Outflow=0.018 cfs  1,258 cf

**Faifield Inn 2020-006**
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*Type IA 24-hr  1/2 of 2 year Rainfall=1.25"*
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## Summary for Subcatchment 1S: Existing Site - West

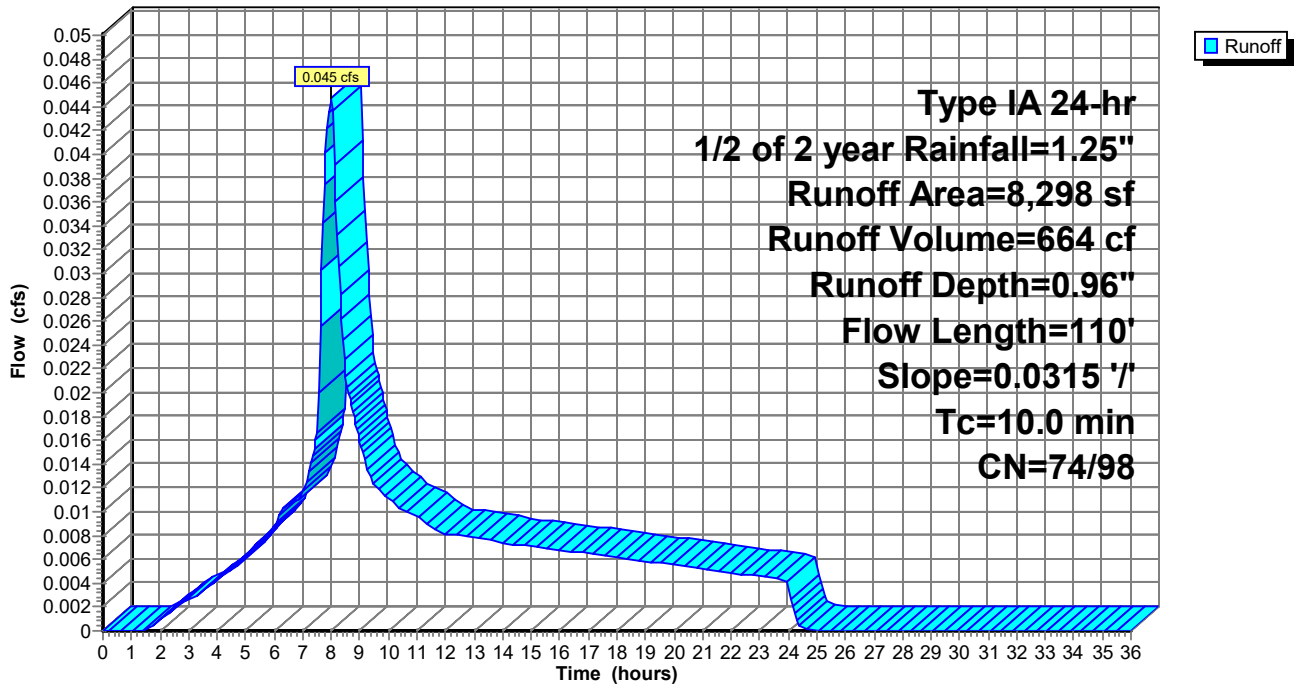Runoff     =       0.045 cfs @     7.98 hrs,  Volume=          664 cf,  Depth=  0.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  1/2 of 2 year Rainfall=1.25"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 7,660 | 98 | Impervious Surfaces |
| * | 638 | 74 | Landscaping |
| | 8,298 | 96 | Weighted Average |
| | 638 | 74 | 7.69% Pervious Area |
| | 7,660 | 98 | 92.31% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 0.3 | 20 | 0.0315 | 1.08 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces   n= 0.011   P2= 2.60" |
| 0.4 | 90 | 0.0315 | 3.60 | | **Shallow Concentrated Flow, Parking Lot** |
| | | | | | Paved   Kv= 20.3 fps |
| 0.7 | 110 | Total,  Increased to minimum Tc = 10.0 min | | | |

### Subcatchment 1S: Existing Site - West



**Hydrograph**

Type IA 24-hr
1/2 of 2 year Rainfall=1.25"
Runoff Area=8,298 sf
Runoff Volume=664 cf
Runoff Depth=0.96"
Flow Length=110'
Slope=0.0315 '/'
Tc=10.0 min
CN=74/98

## Summary for Subcatchment 2S: Existing Site - East

Runoff      =      0.019 cfs @  17.58 hrs,  Volume=          960 cf,  Depth=  0.15"
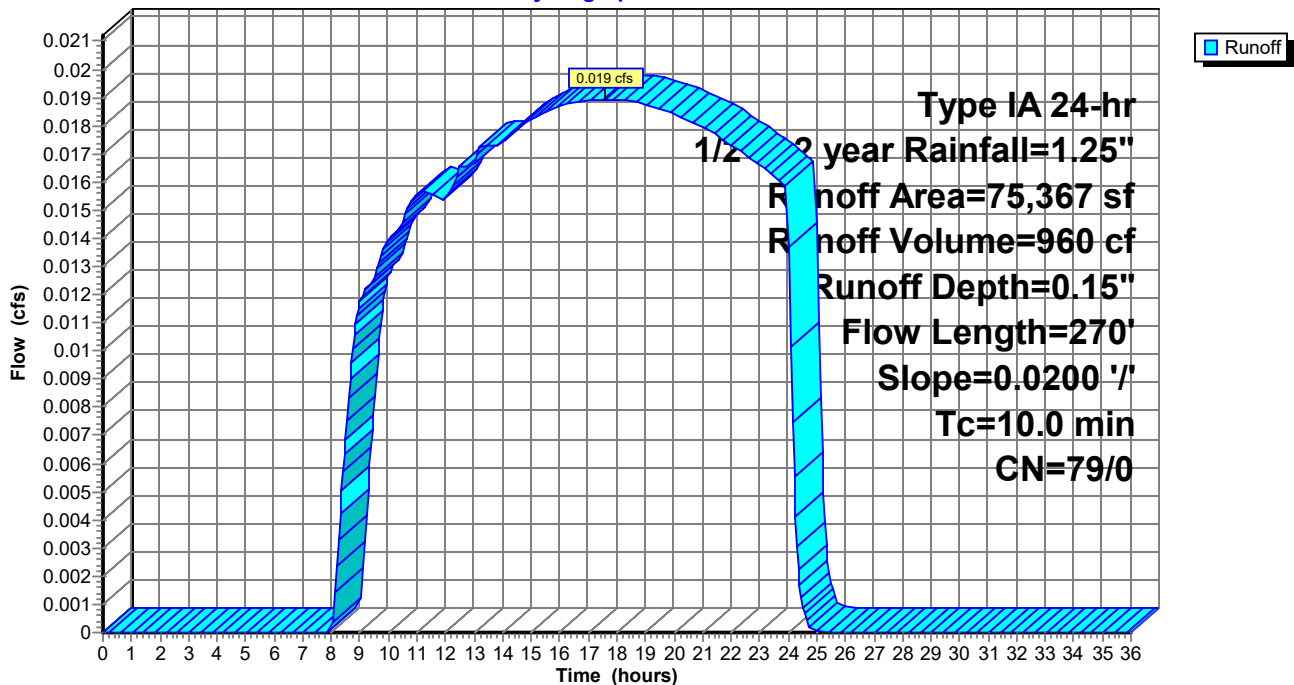
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  1/2 of 2 year Rainfall=1.25"

| Area (sf) | CN | Description |
|---|---|---|
| 75,367 | 79 | 50-75% Grass cover, Fair, HSG C |
| 75,367 | 79 | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.4 | 20 | 0.0200 | 0.08 | | **Sheet Flow, Sheet** |
| | | | | | Grass: Dense   n= 0.240  P2= 2.60" |
| 4.2 | 250 | 0.0200 | 0.99 | | **Shallow Concentrated Flow, SCF** |
| | | | | | Short Grass Pasture   Kv= 7.0 fps |
| 8.6 | 270 | Total, Increased to minimum Tc = 10.0 min | | | |

### Subcatchment 2S: Existing Site - East

**Hydrograph**



**Type IA 24-hr**
**1/2 of 2 year Rainfall=1.25"**
**Runoff Area=75,367 sf**
**Runoff Volume=960 cf**
**Runoff Depth=0.15"**
**Flow Length=270'**
**Slope=0.0200 '/'**
**Tc=10.0 min**
**CN=79/0**

**Faifield Inn 2020-006**
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*Type IA 24-hr  1/2 of 2 year Rainfall=1.25"*
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## Summary for Subcatchment 3S: Proposed Site - West

Runoff      =        0.049 cfs @    7.98 hrs,  Volume=            744 cf,  Depth= 0.79"
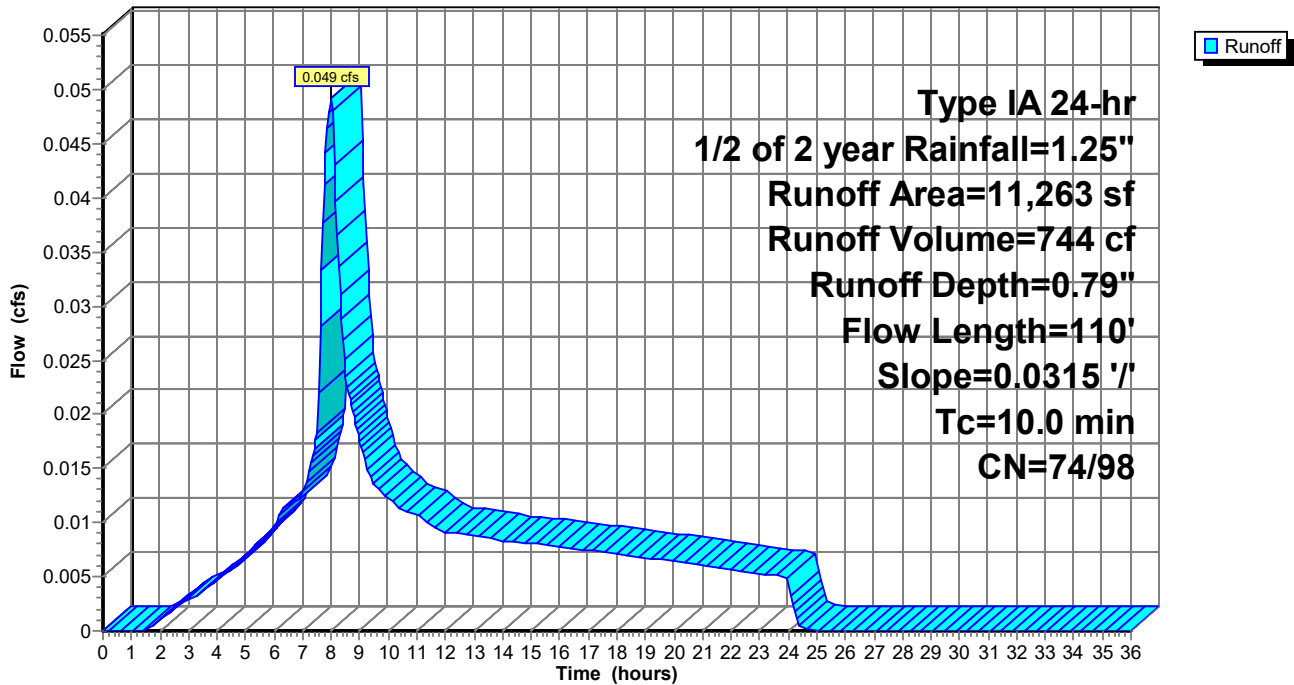
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  1/2 of 2 year Rainfall=1.25"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 8,428 | 98 | Parking Lot |
| * | 2,835 | 74 | Landscaping |
| | 11,263 | 92 | Weighted Average |
| | 2,835 | 74 | 25.17% Pervious Area |
| | 8,428 | 98 | 74.83% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 0.3 | 20 | 0.0315 | 1.08 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces   n= 0.011   P2= 2.60" |
| 0.4 | 90 | 0.0315 | 3.60 | | **Shallow Concentrated Flow, Parking Lot** |
| | | | | | Paved   Kv= 20.3 fps |
| 0.7 | 110 | Total,  Increased to minimum Tc = 10.0 min | | | |

### Subcatchment 3S: Proposed Site - West

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*Type IA 24-hr  1/2 of 2 year Rainfall=1.25"*
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## Summary for Subcatchment 4S: Proposed Site - East

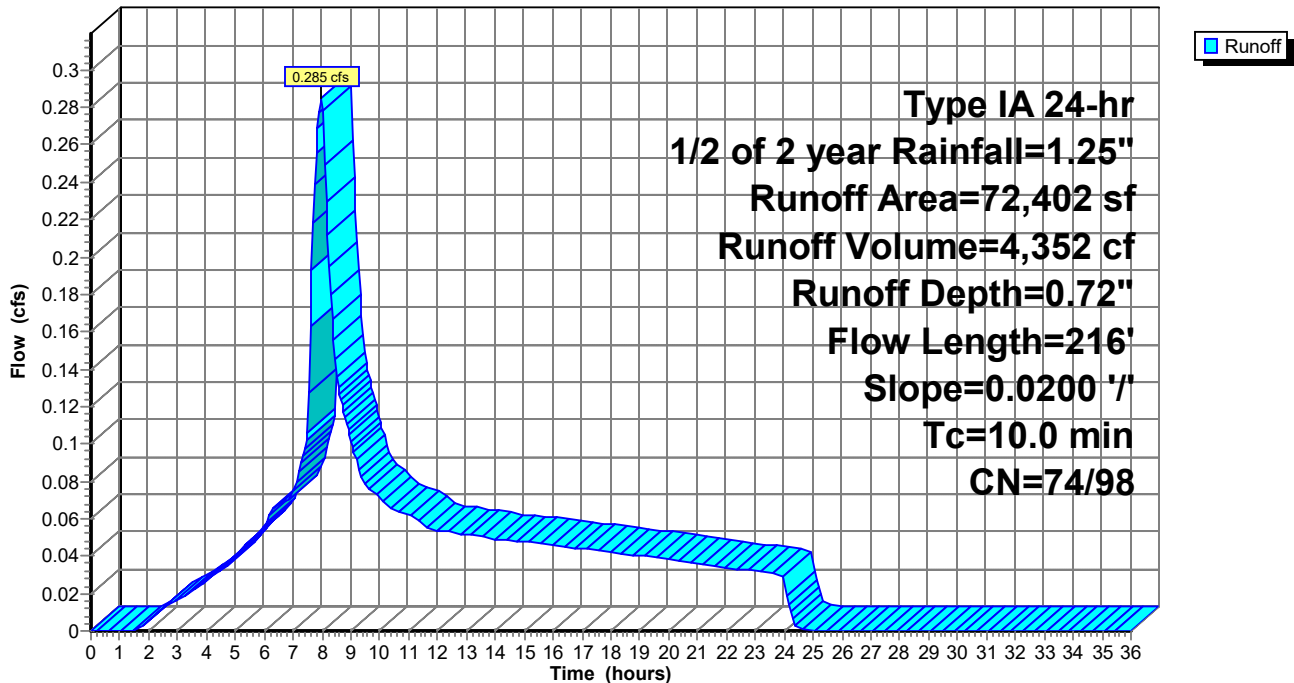Runoff    =    0.285 cfs @    7.98 hrs,  Volume=    4,352 cf,  Depth= 0.72"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  1/2 of 2 year Rainfall=1.25"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 10,847 | 98 | Building |
| * | 29,742 | 98 | Asphalt |
| * | 8,202 | 98 | Concrete |
| * | 23,611 | 74 | Landscaping |
| | 72,402 | 90 | Weighted Average |
| | 23,611 | 74 | 32.61% Pervious Area |
| | 48,791 | 98 | 67.39% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 0.4 | 20 | 0.0200 | 0.90 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces  n= 0.011  P2= 2.60" |
| 1.1 | 196 | 0.0200 | 2.87 | | **Shallow Concentrated Flow, Parking Lot to CB** |
| | | | | | Paved  Kv= 20.3 fps |
| 1.5 | 216 | | Total, Increased to minimum Tc = 10.0 min | | |

### Subcatchment 4S: Proposed Site - East

**Hydrograph**



Type IA 24-hr
1/2 of 2 year Rainfall=1.25"
Runoff Area=72,402 sf
Runoff Volume=4,352 cf
Runoff Depth=0.72"
Flow Length=216'
Slope=0.0200 '/'
Tc=10.0 min
CN=74/98

## Summary for Subcatchment 5S: Existing Area

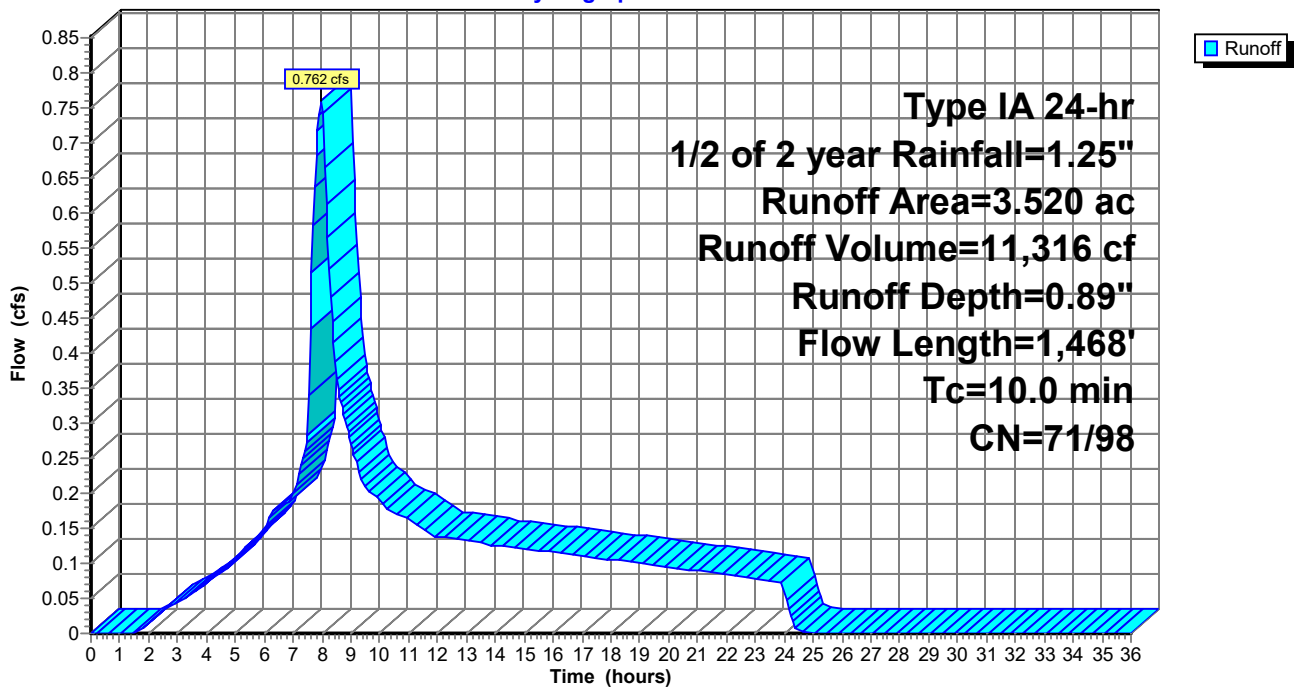Runoff      =       0.762 cfs @    7.98 hrs,  Volume=          11,316 cf,  Depth= 0.89"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  1/2 of 2 year Rainfall=1.25"

| Area (ac) | CN | Description |
|---|---|---|
| 3.520 | 94 | Urban commercial, 85% imp, HSG C |
| 0.528 | 71 | 15.00% Pervious Area |
| 2.992 | 98 | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.3 | 100 | 0.0210 | 1.26 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces  n= 0.011  P2= 2.60" |
| 2.1 | 368 | 0.0210 | 2.94 | | **Shallow Concentrated Flow,** |
| | | | | | Paved  Kv= 20.3 fps |
| 6.4 | 1,000 | 0.0130 | 2.60 | 3.192 | **Pipe Channel, Pipe** |
| | | | | | 15.0"  Round  Area= 1.2 sf  Perim= 3.9'  r= 0.31' |
| | | | | | n= 0.030  Corrugated metal |
| 9.8 | 1,468 | | Total,  Increased to minimum Tc = 10.0 min | | |

## Subcatchment 5S: Existing Area



**Hydrograph**

Type IA 24-hr
1/2 of 2 year Rainfall=1.25"
Runoff Area=3.520 ac
Runoff Volume=11,316 cf
Runoff Depth=0.89"
Flow Length=1,468'
Tc=10.0 min
CN=71/98

## Summary for Subcatchment 6S: Existing Area

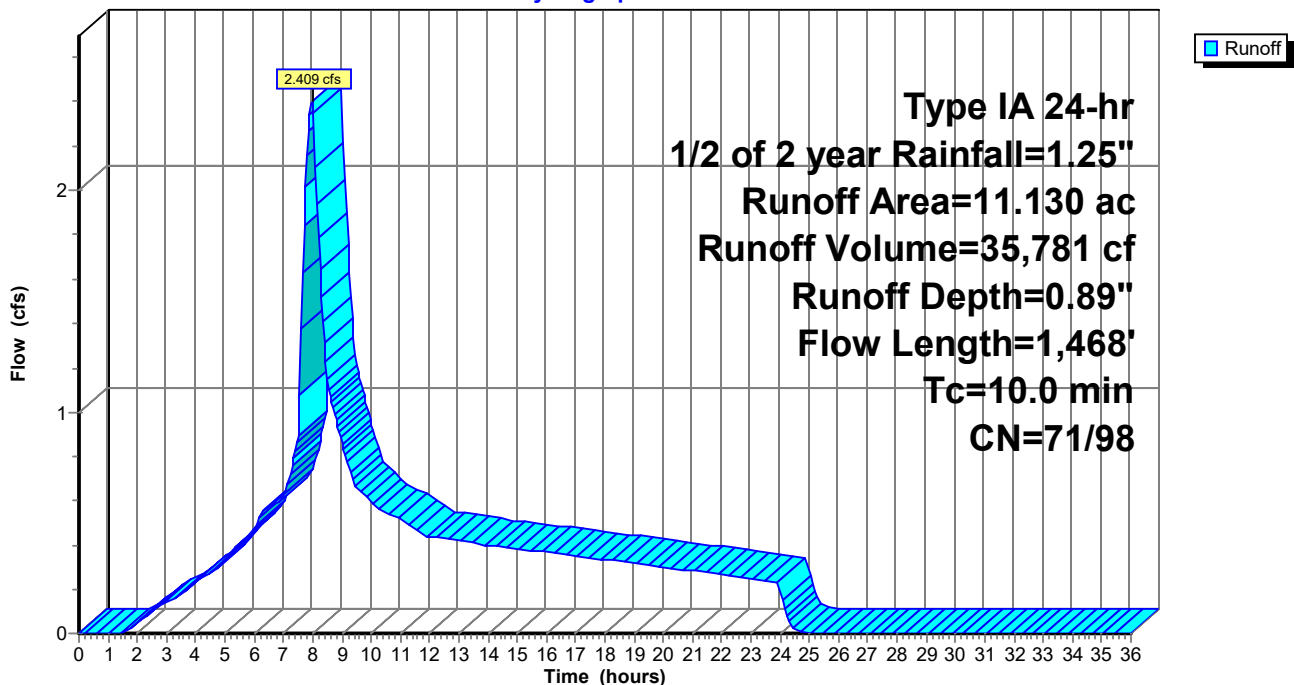Runoff      =        2.409 cfs @     7.98 hrs,  Volume=          35,781 cf,  Depth= 0.89"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  1/2 of 2 year Rainfall=1.25"

| Area (ac) | CN | Description |
|---|---|---|
| 11.130 | 94 | Urban commercial, 85% imp, HSG C |
| 1.670 | 71 | 15.00% Pervious Area |
| 9.460 | 98 | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.3 | 100 | 0.0210 | 1.26 | | **Sheet Flow, Sheet**<br>Smooth surfaces  n= 0.011  P2= 2.60" |
| 2.1 | 368 | 0.0210 | 2.94 | | **Shallow Concentrated Flow,**<br>Paved  Kv= 20.3 fps |
| 6.4 | 1,000 | 0.0130 | 2.60 | 3.192 | **Pipe Channel, Pipe**<br>15.0" Round  Area= 1.2 sf  Perim= 3.9'  r= 0.31'<br>n= 0.030  Corrugated metal |
| 9.8 | 1,468 | | | | Total,  Increased to minimum Tc = 10.0 min |

## Subcatchment 6S: Existing Area

**Hydrograph**

**Faifield Inn 2020-006**
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*Type IA 24-hr  1/2 of 2 year Rainfall=1.25"*
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## Summary for Subcatchment 7S: Existing Area

Runoff     =        0.762 cfs @     7.98 hrs,  Volume=          11,316 cf,  Depth= 0.89"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
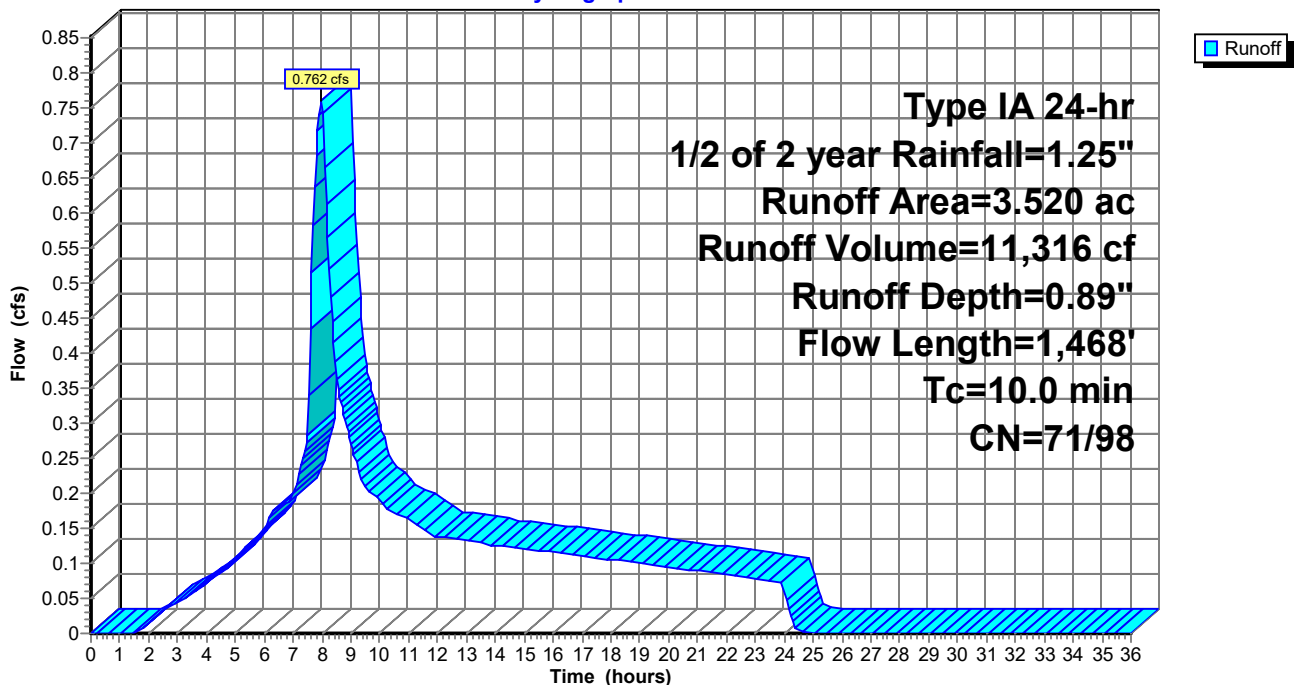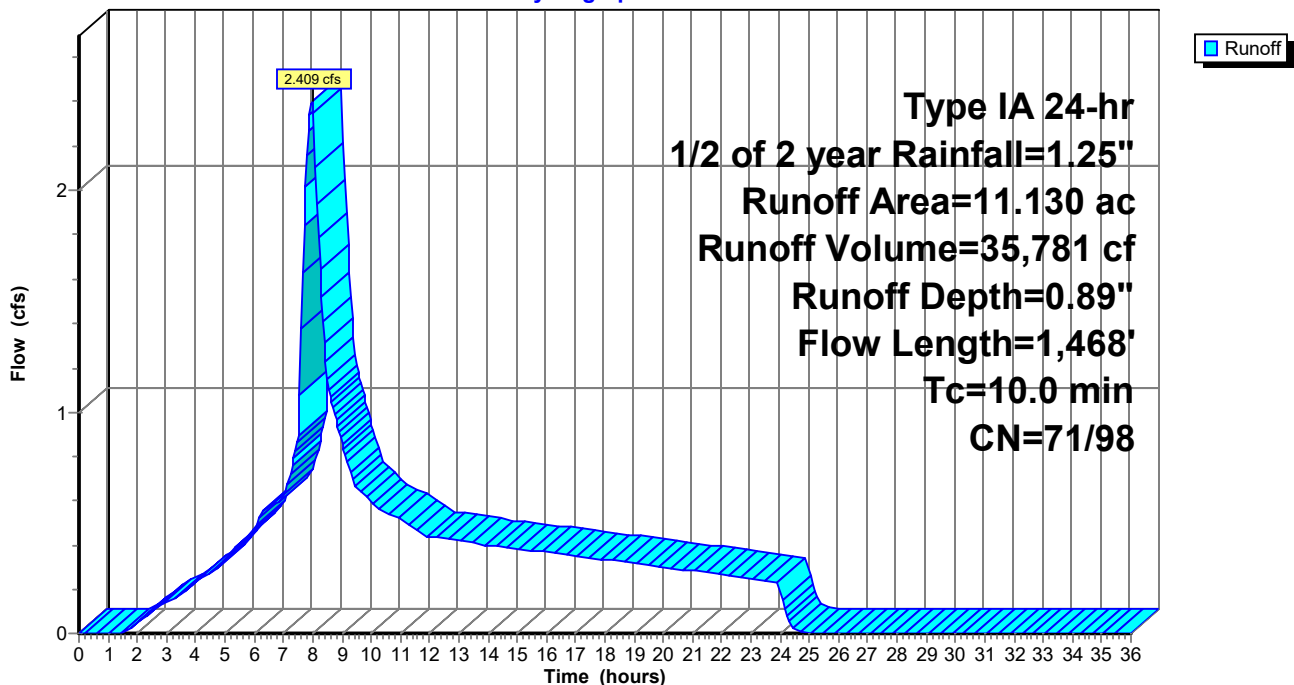Type IA 24-hr  1/2 of 2 year Rainfall=1.25"

| Area (ac) | CN | Description |
|---|---|---|
| 3.520 | 94 | Urban commercial, 85% imp, HSG C |
| 0.528 | 71 | 15.00% Pervious Area |
| 2.992 | 98 | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.3 | 100 | 0.0210 | 1.26 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces  n= 0.011  P2= 2.60" |
| 2.1 | 368 | 0.0210 | 2.94 | | **Shallow Concentrated Flow,** |
| | | | | | Paved  Kv= 20.3 fps |
| 6.4 | 1,000 | 0.0130 | 2.60 | 3.192 | **Pipe Channel, Pipe** |
| | | | | | 15.0" Round  Area= 1.2 sf  Perim= 3.9'  r= 0.31' |
| | | | | | n= 0.030  Corrugated metal |
| 9.8 | 1,468 | Total, Increased to minimum Tc = 10.0 min | | | |

### Subcatchment 7S: Existing Area

**Hydrograph**



Type IA 24-hr
1/2 of 2 year Rainfall=1.25"
Runoff Area=3.520 ac
Runoff Volume=11,316 cf
Runoff Depth=0.89"
Flow Length=1,468'
Tc=10.0 min
CN=71/98

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*Type IA 24-hr  1/2 of 2 year Rainfall=1.25"*
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## Summary for Subcatchment 8S: Existing Area

Runoff    =       2.409 cfs @    7.98 hrs,  Volume=          35,781 cf,  Depth= 0.89"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  1/2 of 2 year Rainfall=1.25"

| Area (ac) | CN | Description |
|---|---|---|
| 11.130 | 94 | Urban commercial, 85% imp, HSG C |
| 1.670 | 71 | 15.00% Pervious Area |
| 9.460 | 98 | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.3 | 100 | 0.0210 | 1.26 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces  n= 0.011  P2= 2.60" |
| 2.1 | 368 | 0.0210 | 2.94 | | **Shallow Concentrated Flow,** |
| | | | | | Paved  Kv= 20.3 fps |
| 6.4 | 1,000 | 0.0130 | 2.60 | 3.192 | **Pipe Channel, Pipe** |
| | | | | | 15.0" Round  Area= 1.2 sf  Perim= 3.9'  r= 0.31' |
| | | | | | n= 0.030  Corrugated metal |
| 9.8 | 1,468 | | | | Total,  Increased to minimum Tc = 10.0 min |

## Subcatchment 8S: Existing Area

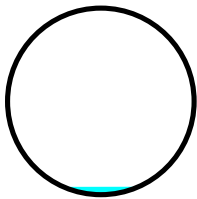**Hydrograph**

## Summary for Reach 6R: Brutscher - 18"

Inflow Area =         8,298 sf, 92.31% Impervious,  Inflow Depth =   0.96"    for  1/2 of 2 year event
Inflow      =      0.045 cfs @    7.98 hrs,  Volume=            664 cf
Outflow     =      0.044 cfs @    8.00 hrs,  Volume=            664 cf,  Atten= 1%,  Lag= 1.2 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.71 fps,  Min. Travel Time= 2.9 min
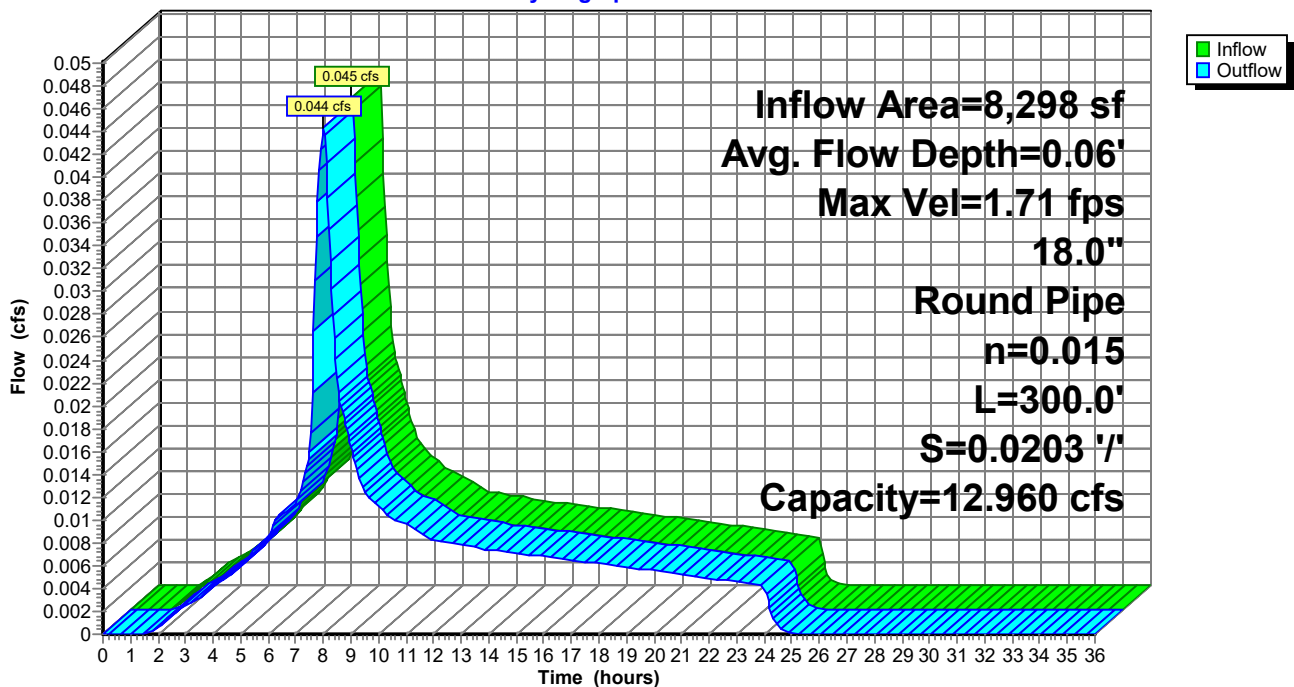Avg. Velocity = 0.99 fps,  Avg. Travel Time= 5.1 min

Peak Storage= 8 cf @ 8.00 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 1.50'  Flow Area= 1.8 sf,  Capacity= 12.960 cfs

18.0"  Round Pipe
n= 0.015
Length= 300.0'   Slope= 0.0203 '/'
Inlet Invert= 212.78',  Outlet Invert= 206.70'

### Reach 6R: Brutscher - 18"

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*Type IA 24-hr  1/2 of 2 year Rainfall=1.25"*
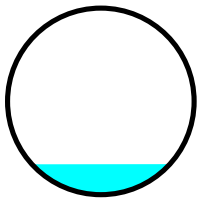Printed  3/2/2020
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## Summary for Reach 7R: HWY 99 - 21"

Inflow Area =          161,629 sf, 85.38% Impervious, Inflow Depth =   0.89"   for  1/2 of 2 year event
Inflow      =      0.806 cfs @    7.98 hrs,  Volume=          11,980 cf
Outflow     =      0.804 cfs @    7.99 hrs,  Volume=          11,980 cf,  Atten= 0%,  Lag= 0.4 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.12 fps,  Min. Travel Time= 1.1 min
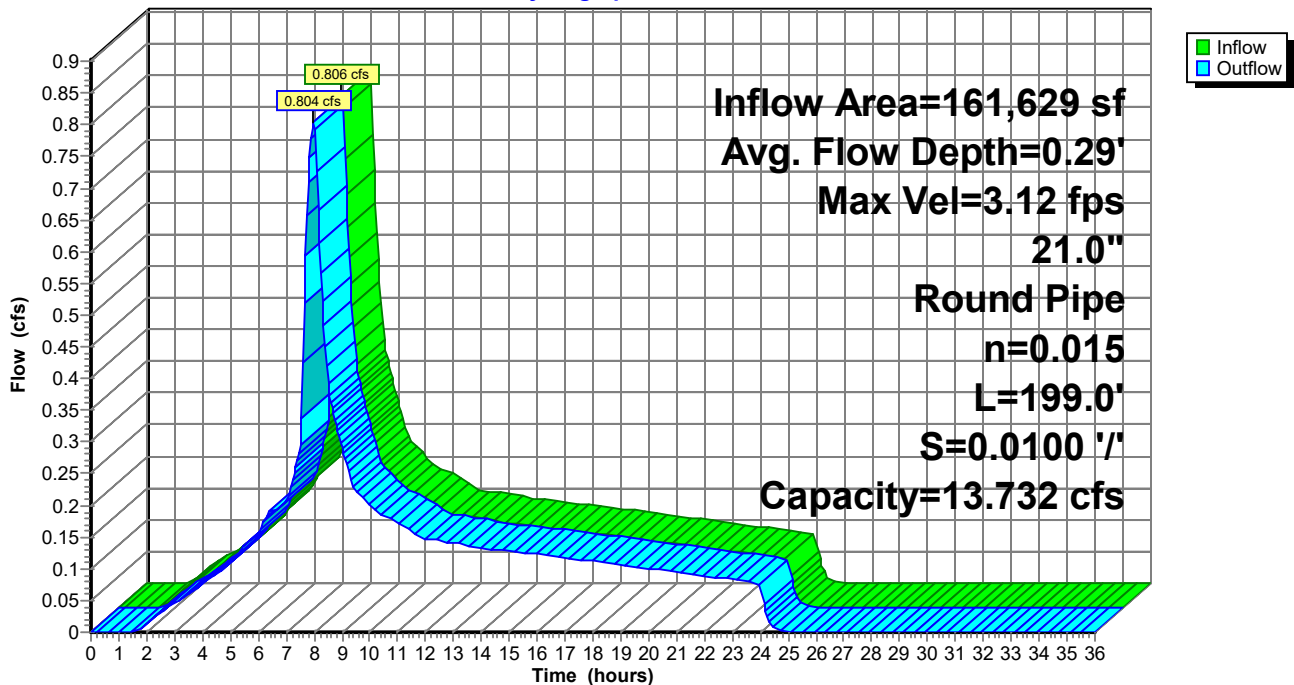Avg. Velocity = 1.72 fps,  Avg. Travel Time= 1.9 min

Peak Storage= 51 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.29'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 199.0'   Slope= 0.0100 '/'
Inlet Invert= 206.61',  Outlet Invert= 204.62'

### Reach 7R: HWY 99 - 21"

**Hydrograph**

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*Type IA 24-hr  1/2 of 2 year Rainfall=1.25"*
Printed  3/2/2020
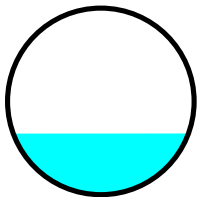Page 14

## Summary for Reach 8R: HWY 99 - 21"

Inflow Area =         646,452 sf, 85.09% Impervious, Inflow Depth =   0.89"    for  1/2 of 2 year event
Inflow       =      3.213 cfs @    7.98 hrs,  Volume=            47,761 cf
Outflow     =      3.205 cfs @    7.99 hrs,  Volume=            47,761 cf,  Atten= 0%,  Lag= 0.3 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.65 fps,  Min. Travel Time= 0.8 min
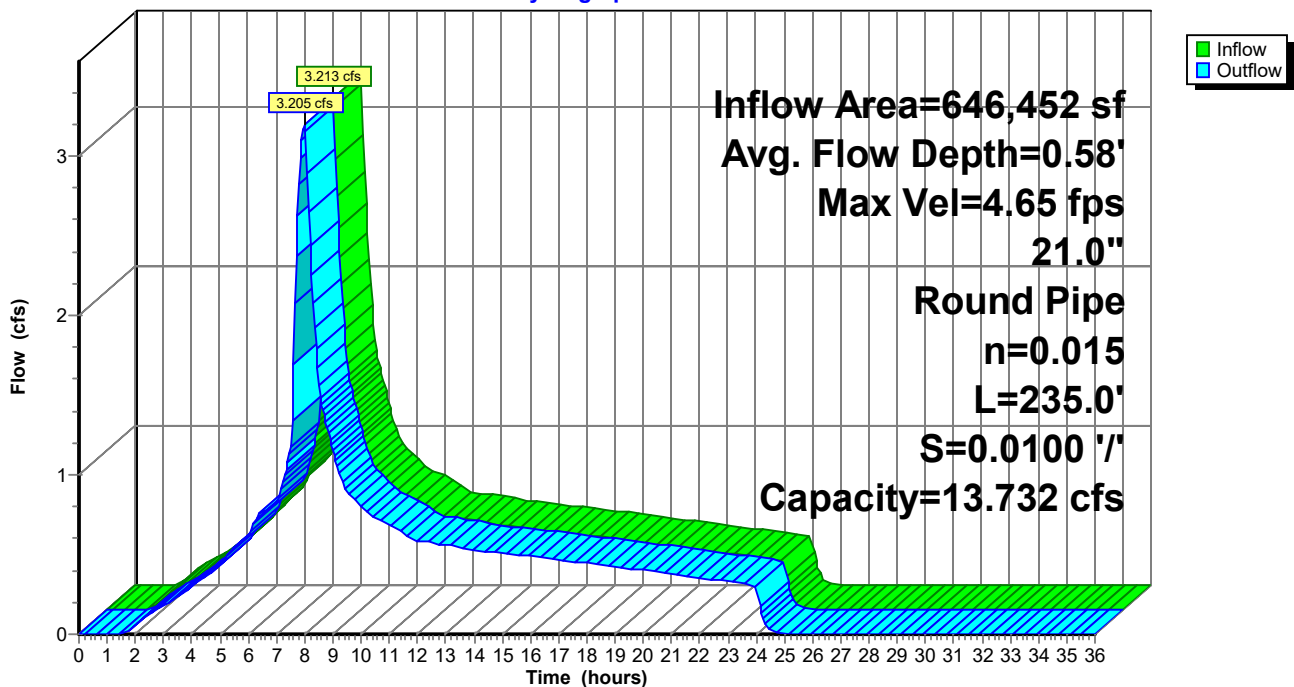Avg. Velocity = 2.57 fps,  Avg. Travel Time= 1.5 min

Peak Storage= 162 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 235.0'   Slope= 0.0100 '/'
Inlet Invert= 204.62',  Outlet Invert= 202.27'

### Reach 8R: HWY 99 - 21"



**Hydrograph**

Inflow Area=646,452 sf
Avg. Flow Depth=0.58'
Max Vel=4.65 fps
21.0"
Round Pipe
n=0.015
L=235.0'
S=0.0100 '/'
Capacity=13.732 cfs

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Page 15
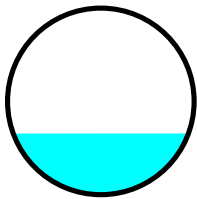
## Summary for Reach 9R: HWY 99 -21"

Inflow Area =        646,452 sf, 85.09% Impervious, Inflow Depth =  0.89"    for  1/2 of 2 year event
Inflow      =      3.205 cfs @    7.99 hrs, Volume=          47,761 cf
Outflow    =      3.204 cfs @    7.99 hrs, Volume=          47,761 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.65 fps,  Min. Travel Time= 0.3 min
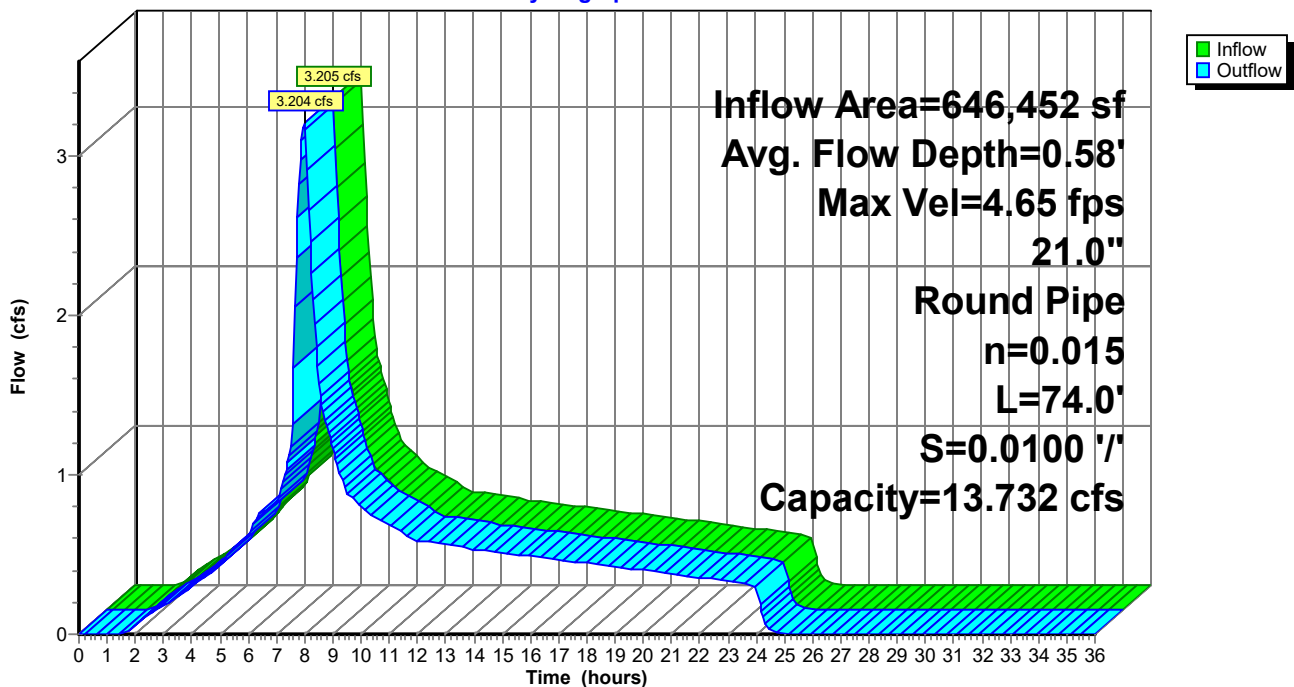Avg. Velocity = 2.57 fps,  Avg. Travel Time= 0.5 min

Peak Storage= 51 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 74.0'   Slope= 0.0100 '/'
Inlet Invert= 202.27',  Outlet Invert= 201.53'



### Reach 9R: HWY 99 -21"



**Inflow Area=646,452 sf**
**Avg. Flow Depth=0.58'**
**Max Vel=4.65 fps**
**21.0"**
**Round Pipe**
**n=0.015**
**L=74.0'**
**S=0.0100 '/'**
**Capacity=13.732 cfs**

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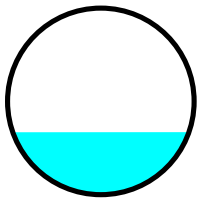Page 16

## Summary for Reach 10R: HWY 99 - 21"

Inflow Area =        646,452 sf, 85.09% Impervious,  Inflow Depth =  0.89"    for  1/2 of 2 year event
Inflow      =      3.204 cfs @    7.99 hrs,  Volume=          47,761 cf
Outflow     =      3.195 cfs @    8.00 hrs,  Volume=          47,761 cf,  Atten= 0%,  Lag= 0.7 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.53 fps,  Min. Travel Time= 1.2 min
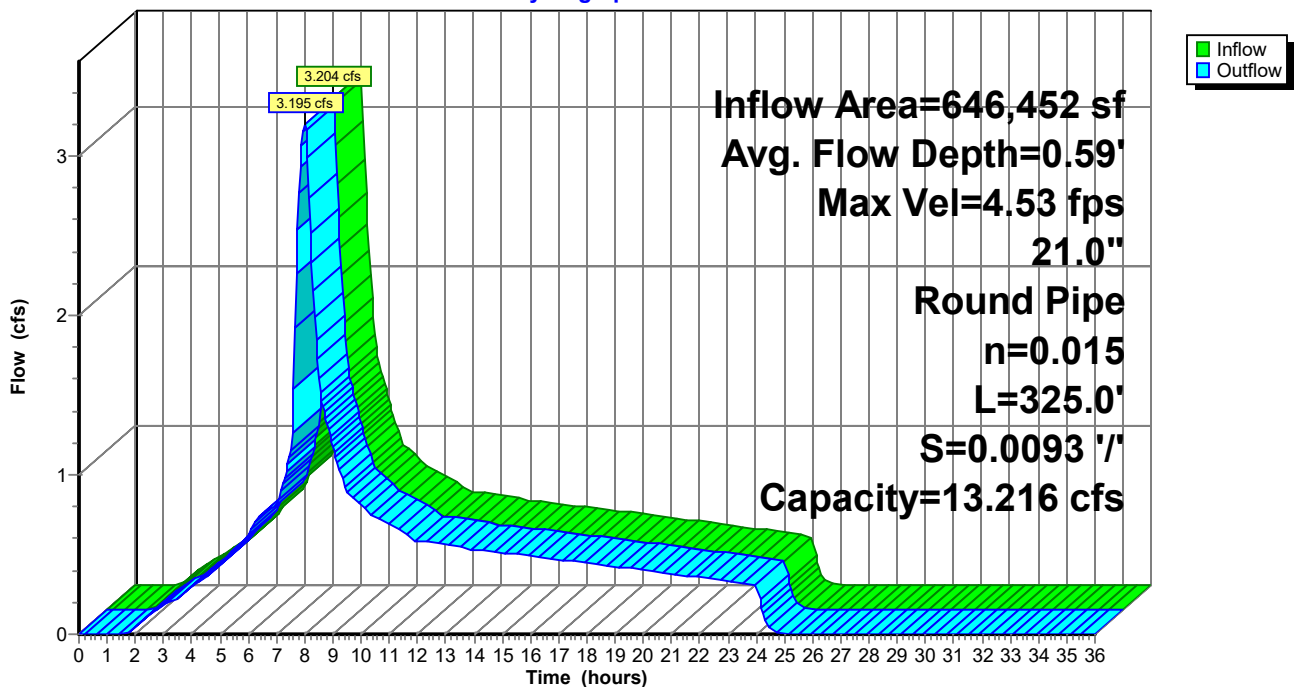Avg. Velocity = 2.48 fps,  Avg. Travel Time= 2.2 min

Peak Storage= 229 cf @ 8.00 hrs
Average Depth at Peak Storage= 0.59'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.216 cfs

21.0"  Round Pipe
n= 0.015  Concrete sewer w/manholes & inlets
Length= 325.0'   Slope= 0.0093 '/'
Inlet Invert= 201.43',  Outlet Invert= 198.42'

### Reach 10R: HWY 99 - 21"



**Hydrograph**

Inflow Area=646,452 sf
Avg. Flow Depth=0.59'
Max Vel=4.53 fps
21.0"
Round Pipe
n=0.015
L=325.0'
S=0.0093 '/'
Capacity=13.216 cfs

■ Inflow
■ Outflow

3.204 cfs
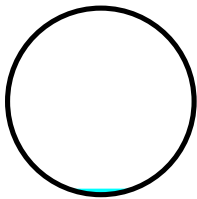3.195 cfs

## Summary for Reach 11R: Brutscher - 18"

Inflow Area =          83,665 sf, 68.39% Impervious,  Inflow Depth >  0.28"    for  1/2 of 2 year event
Inflow     =      0.026 cfs @    8.43 hrs,  Volume=              1,922 cf
Outflow    =      0.026 cfs @    8.47 hrs,  Volume=              1,918 cf,  Atten= 0%,  Lag= 2.5 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.45 fps,  Min. Travel Time= 3.4 min
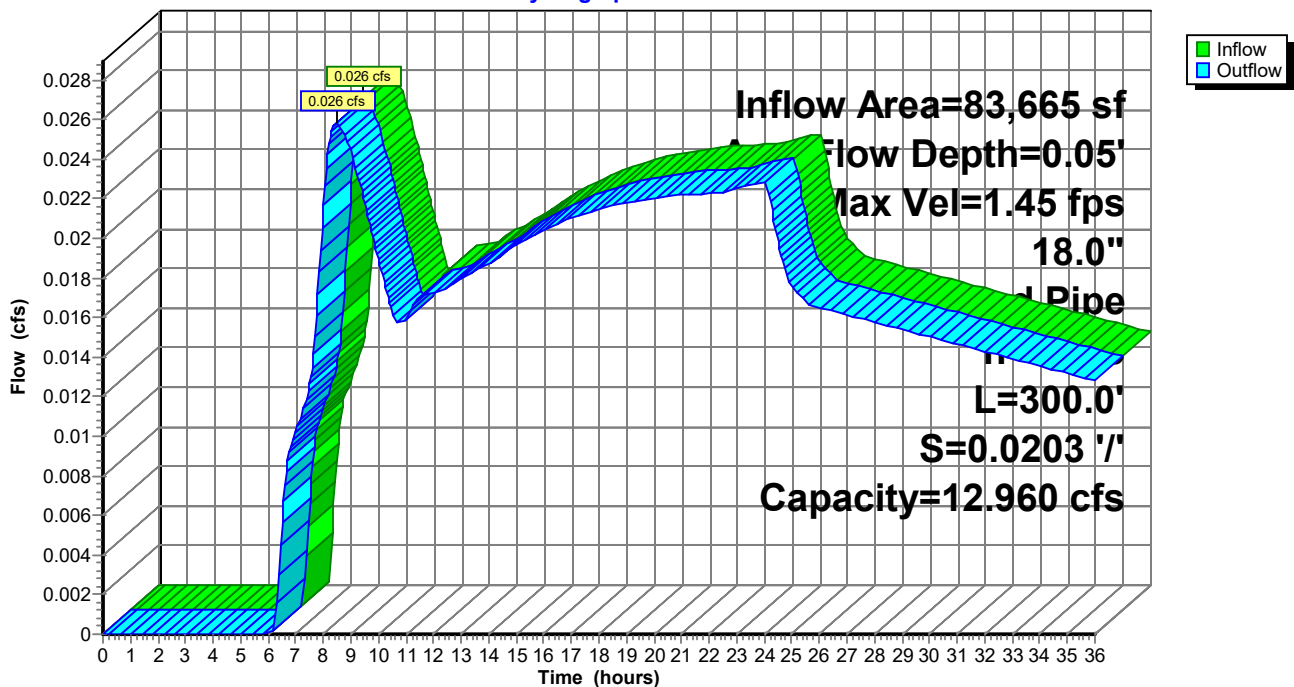Avg. Velocity = 1.29 fps,  Avg. Travel Time= 3.9 min

Peak Storage= 5 cf @ 8.47 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 1.50'  Flow Area= 1.8 sf,  Capacity= 12.960 cfs

18.0"  Round Pipe
n= 0.015
Length= 300.0'   Slope= 0.0203 '/'
Inlet Invert= 212.78',  Outlet Invert= 206.70'

### Reach 11R: Brutscher - 18"



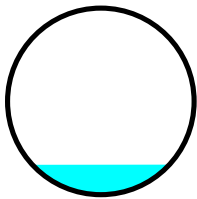**Hydrograph**

## Summary for Reach 12R: HWY 99 - 21"

Inflow Area =          236,996 sf, 79.14% Impervious, Inflow Depth >  0.67"    for  1/2 of 2 year event
Inflow      =        0.783 cfs @     7.98 hrs,  Volume=              13,234 cf
Outflow     =        0.781 cfs @     7.99 hrs,  Volume=              13,232 cf,  Atten= 0%,  Lag= 0.4 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.09 fps,  Min. Travel Time= 1.1 min
Avg. Velocity = 1.52 fps,  Avg. Travel Time= 2.2 min

Peak Storage= 50 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 199.0'   Slope= 0.0100 '/'
Inlet Invert= 206.61',  Outlet Invert= 204.62'

### Reach 12R: HWY 99 - 21"

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## Summary for Reach 13R: HWY 99 - 21"

Inflow Area =        721,819 sf,  83.07% Impervious,  Inflow Depth >  0.81"    for  1/2 of 2 year event
Inflow      =     3.190 cfs @     7.98 hrs,  Volume=            49,012 cf
Outflow    =     3.182 cfs @     7.99 hrs,  Volume=            49,009 cf,  Atten= 0%,  Lag= 0.3 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.65 fps,  Min. Travel Time= 0.8 min
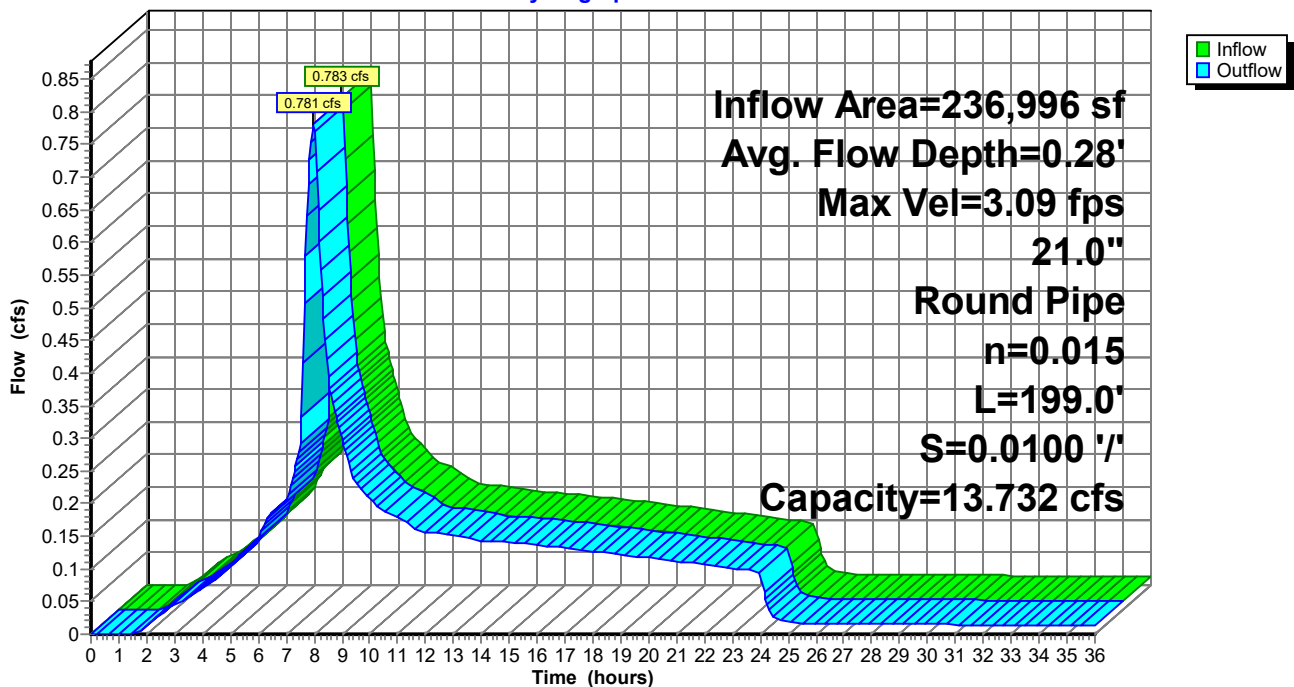Avg. Velocity = 2.12 fps,  Avg. Travel Time= 1.9 min

Peak Storage= 161 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.57'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 235.0'   Slope= 0.0100 '/'
Inlet Invert= 204.62',  Outlet Invert= 202.27'

### Reach 13R: HWY 99 - 21"

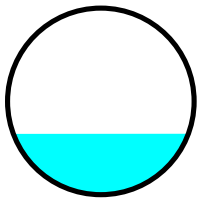**Hydrograph**

## Summary for Reach 14R: HWY 99 - 21"

Inflow Area =        721,819 sf, 83.07% Impervious,  Inflow Depth >  0.81"   for  1/2 of 2 year event
Inflow      =      3.182 cfs @    7.99 hrs,  Volume=          49,009 cf
Outflow    =      3.180 cfs @    7.99 hrs,  Volume=          49,008 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.65 fps,  Min. Travel Time= 0.3 min
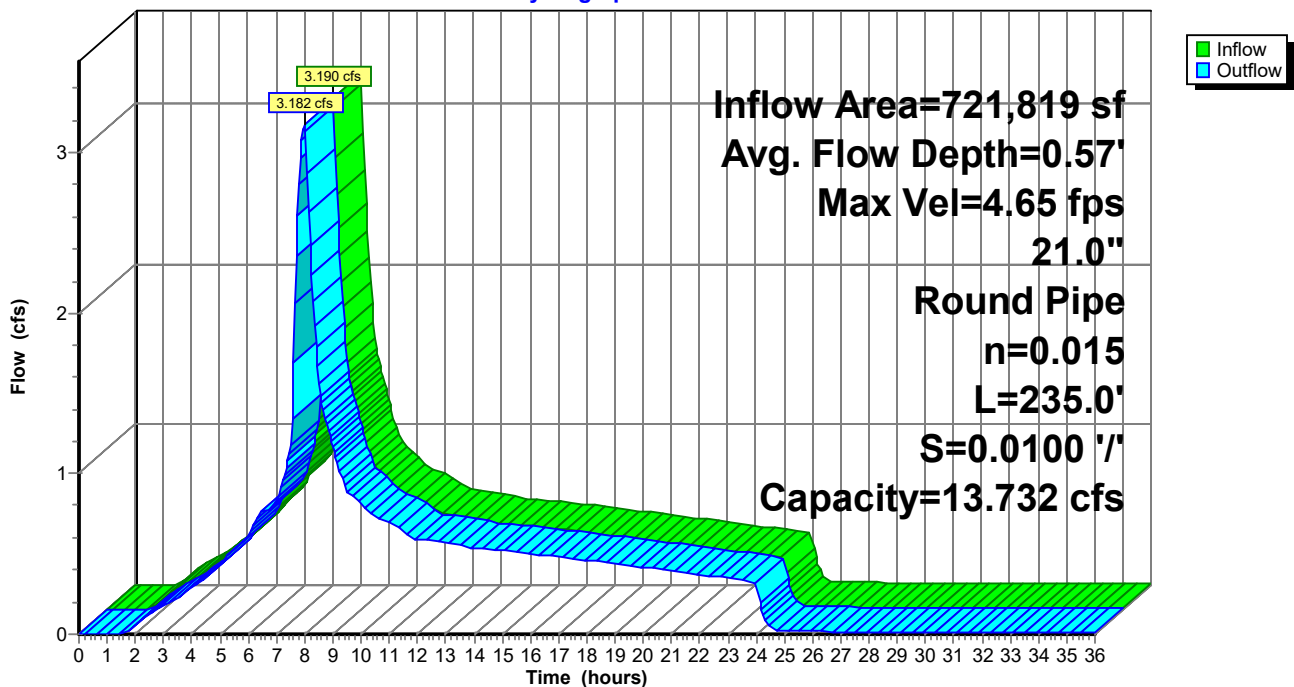Avg. Velocity = 2.12 fps,  Avg. Travel Time= 0.6 min

Peak Storage= 51 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.57'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 74.0'   Slope= 0.0100 '/'
Inlet Invert= 202.27',  Outlet Invert= 201.53'



### Reach 14R: HWY 99 - 21"

**Hydrograph**



- Inflow
- Outflow

Inflow Area=721,819 sf
Avg. Flow Depth=0.57'
Max Vel=4.65 fps
21.0"
Round Pipe
n=0.015
L=74.0'
S=0.0100 '/'
Capacity=13.732 cfs

3.182 cfs
3.180 cfs

Flow (cfs)

Time (hours)

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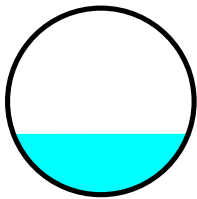Page 21

## Summary for Reach 15R: HWY 99 - 21"

Inflow Area =       721,819 sf, 83.07% Impervious, Inflow Depth >  0.81"   for  1/2 of 2 year event
Inflow      =     3.180 cfs @    7.99 hrs,  Volume=          49,008 cf
Outflow    =     3.172 cfs @    8.00 hrs,  Volume=          49,003 cf, Atten= 0%,  Lag= 0.7 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.52 fps,  Min. Travel Time= 1.2 min
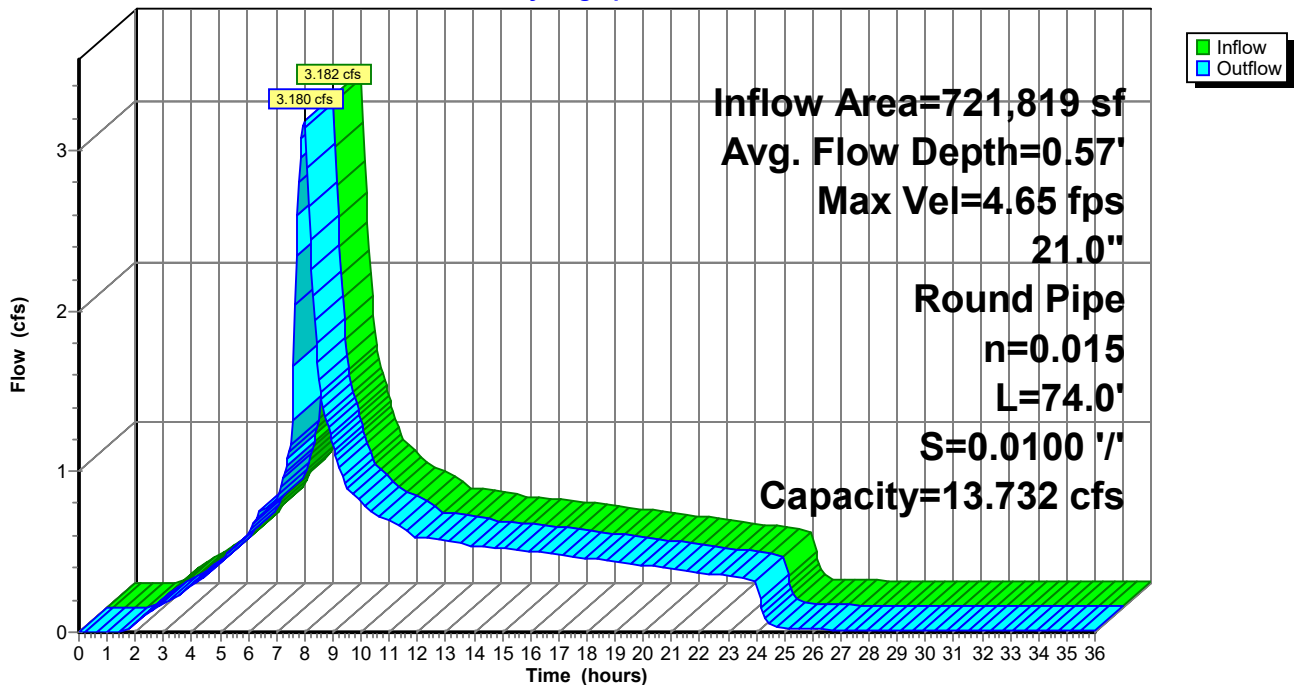Avg. Velocity = 2.06 fps,  Avg. Travel Time= 2.6 min

Peak Storage= 228 cf @ 8.00 hrs
Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.216 cfs

21.0"  Round Pipe
n= 0.015  Concrete sewer w/manholes & inlets
Length= 325.0'   Slope= 0.0093 '/'
Inlet Invert= 201.43',  Outlet Invert= 198.42'
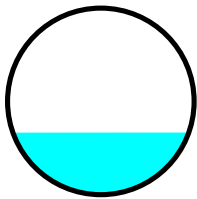
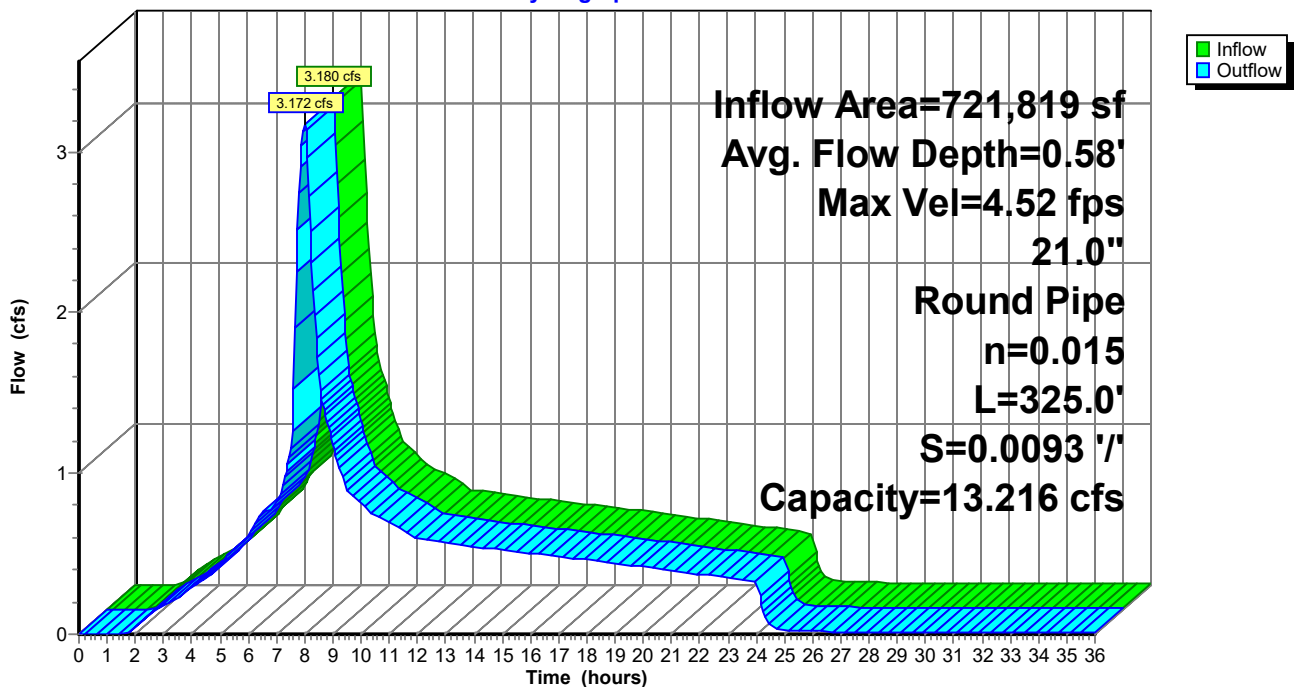### Reach 15R: HWY 99 - 21"

## Summary for Pond 1P: Stormwater Planter

Inflow Area =        11,263 sf, 74.83% Impervious,  Inflow Depth =  0.79"    for  1/2 of 2 year event
Inflow     =     0.049 cfs @    7.98 hrs,  Volume=        744 cf
Outflow    =     0.026 cfs @    8.43 hrs,  Volume=        664 cf,  Atten= 48%,  Lag= 26.8 min
Primary    =     0.026 cfs @    8.43 hrs,  Volume=        664 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 222.47' @ 8.43 hrs   Surf.Area= 160 sf   Storage= 155 cf

Plug-Flow detention time= 152.6 min calculated for 664 cf (89% of inflow)
Center-of-Mass det. time= 78.7 min ( 794.7 - 716.0 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 221.50' | 560 cf | **16.00'W x 10.00'L x 3.50'H Prismatoid** |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 222.00' | **1.2" Horiz. Orifice/Grate**  C= 0.600   Limited to weir flow at low heads |
| #2 | Primary | 223.51' | **0.8" Vert. Orifice/Grate**  C= 0.600 |
| #3 | Primary | 224.40' | **1.0" Vert. Orifice/Grate**  C= 0.600 |
| #4 | Primary | 224.50' | **6.0" Vert. Orifice/Grate**  C= 0.600 |

**Primary OutFlow**  Max=0.026 cfs @ 8.43 hrs  HW=222.47'   (Free Discharge)
┬─**1=Orifice/Grate** (Orifice Controls 0.026 cfs @ 3.29 fps)
├─**2=Orifice/Grate** ( Controls 0.000 cfs)
├─**3=Orifice/Grate** ( Controls 0.000 cfs)
└─**4=Orifice/Grate** ( Controls 0.000 cfs)

## Pond 1P: Stormwater Planter



Inflow Area=11,263 sf
Peak Elev=222.47'
Storage=155 cf
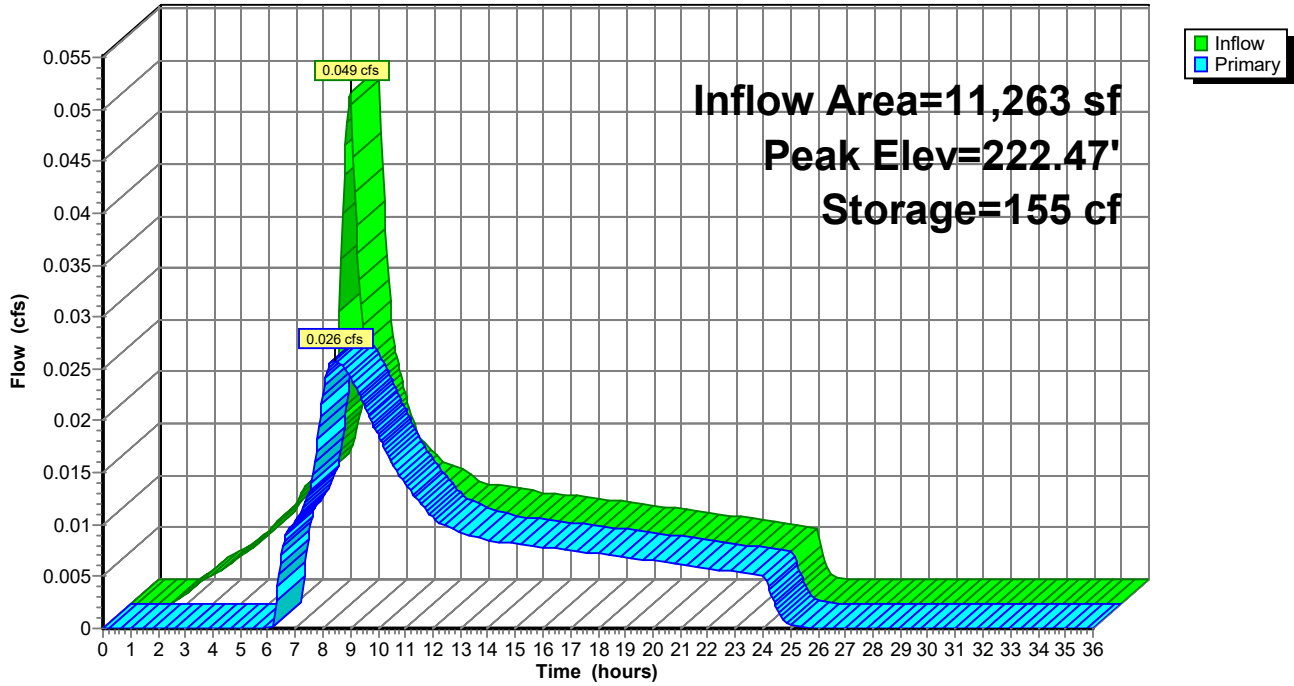
## Summary for Pond 2P: Stormwater Pond

Inflow Area =         72,402 sf,  67.39% Impervious,  Inflow Depth =  0.72"    for  1/2 of 2 year event
Inflow      =      0.285 cfs @    7.98 hrs,  Volume=          4,352 cf
Outflow     =      0.018 cfs @   24.11 hrs,  Volume=            1,258 cf,  Atten= 94%,  Lag= 968.0 min
Primary     =      0.018 cfs @   24.11 hrs,  Volume=            1,258 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 223.19' @ 24.11 hrs   Surf.Area= 2,212 sf   Storage= 3,728 cf

Plug-Flow detention time= 1,072.2 min calculated for 1,256 cf (29% of inflow)
Center-of-Mass det. time= 738.5 min ( 1,458.3 - 719.8 )

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---------------------|
| #1 | 221.50' | 8,848 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|------------------|-------------------|------------------------|------------------------|
| 221.50 | 2,212 | 0 | 0 |
| 225.50 | 2,212 | 8,848 | 8,848 |

| Device | Routing | Invert | Outlet Devices |
|--------|---------|--------|----------------|
| #1 | Primary | 222.50' | **0.9" Vert. Orifice/Grate**   C= 0.600 |
| #2 | Primary | 223.15' | **0.5" Vert. Orifice/Grate**   C= 0.600 |
| #3 | Primary | 223.50' | **1.5" Vert. Orifice/Grate**   C= 0.600 |
| #4 | Primary | 224.35' | **1.9" Vert. Orifice/Grate**   C= 0.600 |
| #5 | Primary | 225.25' | **24.0" x 24.0" Horiz. Orifice/Grate**   C= 0.600 |
|    |         |         | Limited to weir flow at low heads |

**Primary OutFlow**  Max=0.018 cfs @ 24.11 hrs  HW=223.19'   (Free Discharge)
├─**1=Orifice/Grate** (Orifice Controls 0.017 cfs @ 3.88 fps)
├─**2=Orifice/Grate** (Orifice Controls 0.001 cfs @ 0.64 fps)
├─**3=Orifice/Grate** ( Controls 0.000 cfs)
├─**4=Orifice/Grate** ( Controls 0.000 cfs)
└─**5=Orifice/Grate** ( Controls 0.000 cfs)

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## Pond 2P: Stormwater Pond



**Hydrograph**

Inflow Area=72,402 sf
Peak Elev=223.19'
Storage=3,728 cf

Inflow
Primary

0.285 cfs

0.018 cfs

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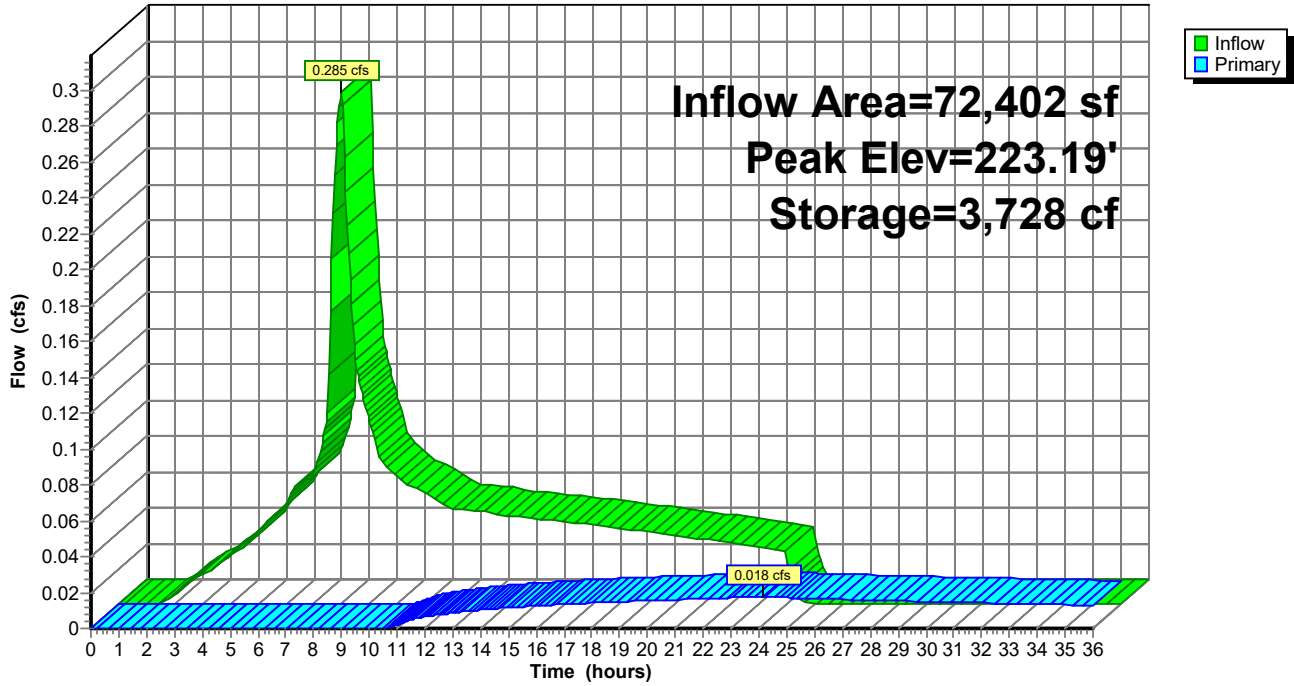
Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind method  -  Pond routing by Stor-Ind method

**Subcatchment 1S: Existing Site - West**      Runoff Area=8,298 sf  92.31% Impervious  Runoff Depth=2.14"
Flow Length=110'  Slope=0.0315 '/'  Tc=10.0 min  CN=74/98  Runoff=0.098 cfs  1,482 cf

**Subcatchment 2S: Existing Site - East**      Runoff Area=75,367 sf  0.00% Impervious  Runoff Depth=0.84"
Flow Length=270'  Slope=0.0200 '/'  Tc=10.0 min  CN=79/0  Runoff=0.253 cfs  5,260 cf

**Subcatchment 3S: Proposed Site - West**      Runoff Area=11,263 sf  74.83% Impervious  Runoff Depth=1.85"
Flow Length=110'  Slope=0.0315 '/'  Tc=10.0 min  CN=74/98  Runoff=0.111 cfs  1,739 cf

**Subcatchment 4S: Proposed Site - East**      Runoff Area=72,402 sf  67.39% Impervious  Runoff Depth=1.73"
Flow Length=216'  Slope=0.0200 '/'  Tc=10.0 min  CN=74/98  Runoff=0.654 cfs  10,429 cf

**Subcatchment 5S: Existing Area**      Runoff Area=3.520 ac  85.00% Impervious  Runoff Depth=2.00"
Flow Length=1,468'  Tc=10.0 min  CN=71/98  Runoff=1.660 cfs  25,604 cf

**Subcatchment 6S: Existing Area**      Runoff Area=11.130 ac  85.00% Impervious  Runoff Depth=2.00"
Flow Length=1,468'  Tc=10.0 min  CN=71/98  Runoff=5.249 cfs  80,957 cf

**Subcatchment 7S: Existing Area**      Runoff Area=3.520 ac  85.00% Impervious  Runoff Depth=2.00"
Flow Length=1,468'  Tc=10.0 min  CN=71/98  Runoff=1.660 cfs  25,604 cf

**Subcatchment 8S: Existing Area**      Runoff Area=11.130 ac  85.00% Impervious  Runoff Depth=2.00"
Flow Length=1,468'  Tc=10.0 min  CN=71/98  Runoff=5.249 cfs  80,957 cf

**Reach 6R: Brutscher - 18"**      Avg. Flow Depth=0.09'  Max Vel=2.16 fps  Inflow=0.098 cfs  1,482 cf
18.0" Round Pipe  n=0.015  L=300.0'  S=0.0203 '/'  Capacity=12.960 cfs  Outflow=0.097 cfs  1,482 cf

**Reach 7R: HWY 99 - 21"**      Avg. Flow Depth=0.42'  Max Vel=3.92 fps  Inflow=1.757 cfs  27,086 cf
21.0" Round Pipe  n=0.015  L=199.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=1.753 cfs  27,086 cf

**Reach 8R: HWY 99 - 21"**      Avg. Flow Depth=0.88'  Max Vel=5.73 fps  Inflow=7.002 cfs  108,043 cf
21.0" Round Pipe  n=0.015  L=235.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=6.989 cfs  108,043 cf

**Reach 9R: HWY 99 -21"**      Avg. Flow Depth=0.88'  Max Vel=5.73 fps  Inflow=6.989 cfs  108,043 cf
21.0" Round Pipe  n=0.015  L=74.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=6.986 cfs  108,043 cf

**Reach 10R: HWY 99 - 21"**      Avg. Flow Depth=0.90'  Max Vel=5.57 fps  Inflow=6.986 cfs  108,043 cf
21.0" Round Pipe  n=0.015  L=325.0'  S=0.0093 '/'  Capacity=13.216 cfs  Outflow=6.970 cfs  108,043 cf

**Reach 11R: Brutscher - 18"**      Avg. Flow Depth=0.09'  Max Vel=2.20 fps  Inflow=0.103 cfs  7,935 cf
18.0" Round Pipe  n=0.015  L=300.0'  S=0.0203 '/'  Capacity=12.960 cfs  Outflow=0.103 cfs  7,930 cf

**Reach 12R: HWY 99 - 21"**      Avg. Flow Depth=0.42'  Max Vel=3.89 fps  Inflow=1.709 cfs  33,534 cf
21.0" Round Pipe  n=0.015  L=199.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=1.706 cfs  33,530 cf

**Reach 13R: HWY 99 - 21"**      Avg. Flow Depth=0.88'  Max Vel=5.72 fps  Inflow=6.954 cfs  114,487 cf
21.0" Round Pipe  n=0.015  L=235.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=6.941 cfs  114,482 cf

**Reach 14R: HWY 99 - 21"**          Avg. Flow Depth=0.88'  Max Vel=5.72 fps  Inflow=6.941 cfs  114,482 cf
    21.0"  Round Pipe   n=0.015   L=74.0'   S=0.0100 '/'   Capacity=13.732 cfs   Outflow=6.938 cfs  114,480 cf

**Reach 15R: HWY 99 - 21"**          Avg. Flow Depth=0.90'  Max Vel=5.56 fps  Inflow=6.938 cfs  114,480 cf
    21.0"  Round Pipe   n=0.015   L=325.0'   S=0.0093 '/'   Capacity=13.216 cfs   Outflow=6.922 cfs  114,473 cf

**Pond 1P: Stormwater Planter**          Peak Elev=223.50'  Storage=319 cf   Inflow=0.111 cfs  1,739 cf
                                         Outflow=0.046 cfs  1,659 cf

**Pond 2P: Stormwater Pond**          Peak Elev=224.32'  Storage=6,239 cf   Inflow=0.654 cfs  10,429 cf
                                      Outflow=0.087 cfs  6,276 cf

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## Summary for Subcatchment 1S: Existing Site - West

Runoff     =        0.098 cfs @     7.98 hrs,  Volume=            1,482 cf,  Depth= 2.14"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  2yr Rainfall=2.50"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 7,660 | 98 | Impervious Surfaces |
| * | 638 | 74 | Landscaping |
| | 8,298 | 96 | Weighted Average |
| | 638 | 74 | 7.69% Pervious Area |
| | 7,660 | 98 | 92.31% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 0.3 | 20 | 0.0315 | 1.08 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces   n= 0.011   P2= 2.60" |
| 0.4 | 90 | 0.0315 | 3.60 | | **Shallow Concentrated Flow, Parking Lot** |
| | | | | | Paved   Kv= 20.3 fps |
| 0.7 | 110 | Total, Increased to minimum Tc = 10.0 min | | | |

### Subcatchment 1S: Existing Site - West

**Hydrograph**

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## Summary for Subcatchment 2S: Existing Site - East

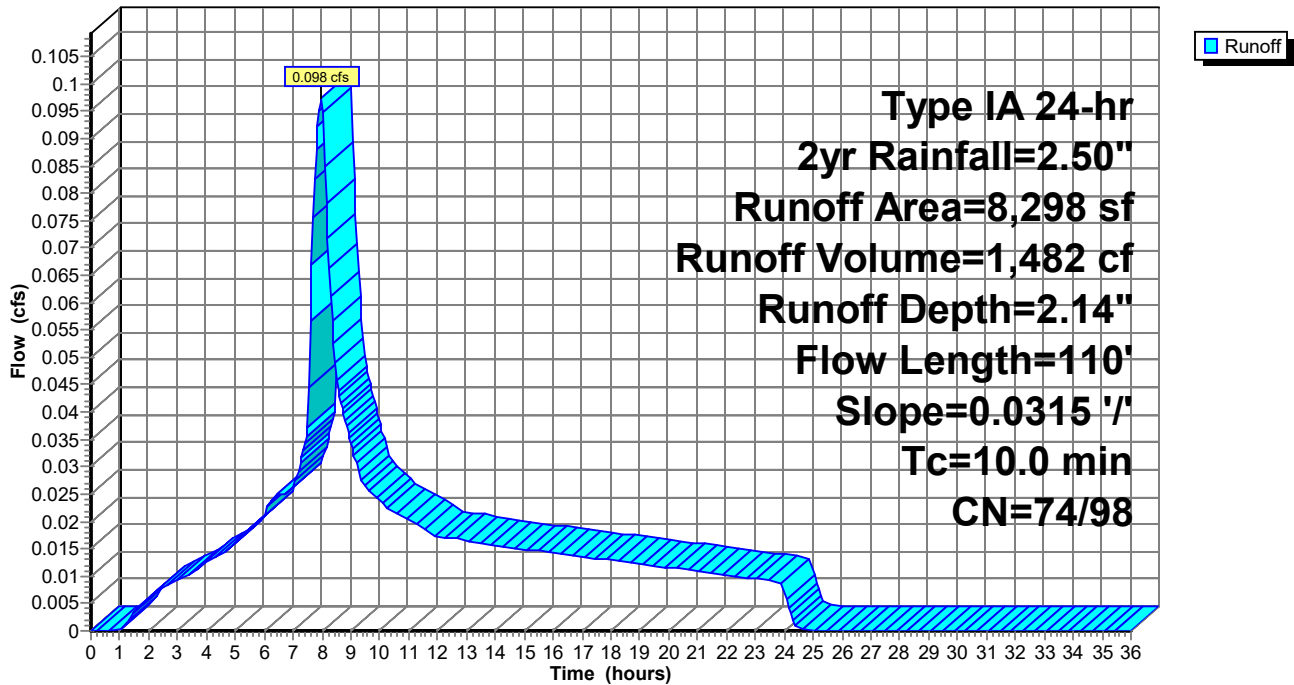Runoff    =      0.253 cfs @    8.02 hrs,  Volume=            5,260 cf,  Depth=  0.84"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  2yr Rainfall=2.50"

| Area (sf) | CN | Description |
|---|---|---|
| 75,367 | 79 | 50-75% Grass cover, Fair, HSG C |
| 75,367 | 79 | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.4 | 20 | 0.0200 | 0.08 | | **Sheet Flow, Sheet** |
| | | | | | Grass: Dense   n= 0.240   P2= 2.60" |
| 4.2 | 250 | 0.0200 | 0.99 | | **Shallow Concentrated Flow, SCF** |
| | | | | | Short Grass Pasture   Kv= 7.0 fps |
| 8.6 | 270 | | | | Total,  Increased to minimum Tc = 10.0 min |

### Subcatchment 2S: Existing Site - East



**Hydrograph**

Type IA 24-hr
2yr Rainfall=2.50"
Runoff Area=75,367 sf
Runoff Volume=5,260 cf
Runoff Depth=0.84"
Flow Length=270'
Slope=0.0200 '/'
Tc=10.0 min
CN=79/0

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*Type IA 24-hr  2yr Rainfall=2.50"*
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## Summary for Subcatchment 3S: Proposed Site - West

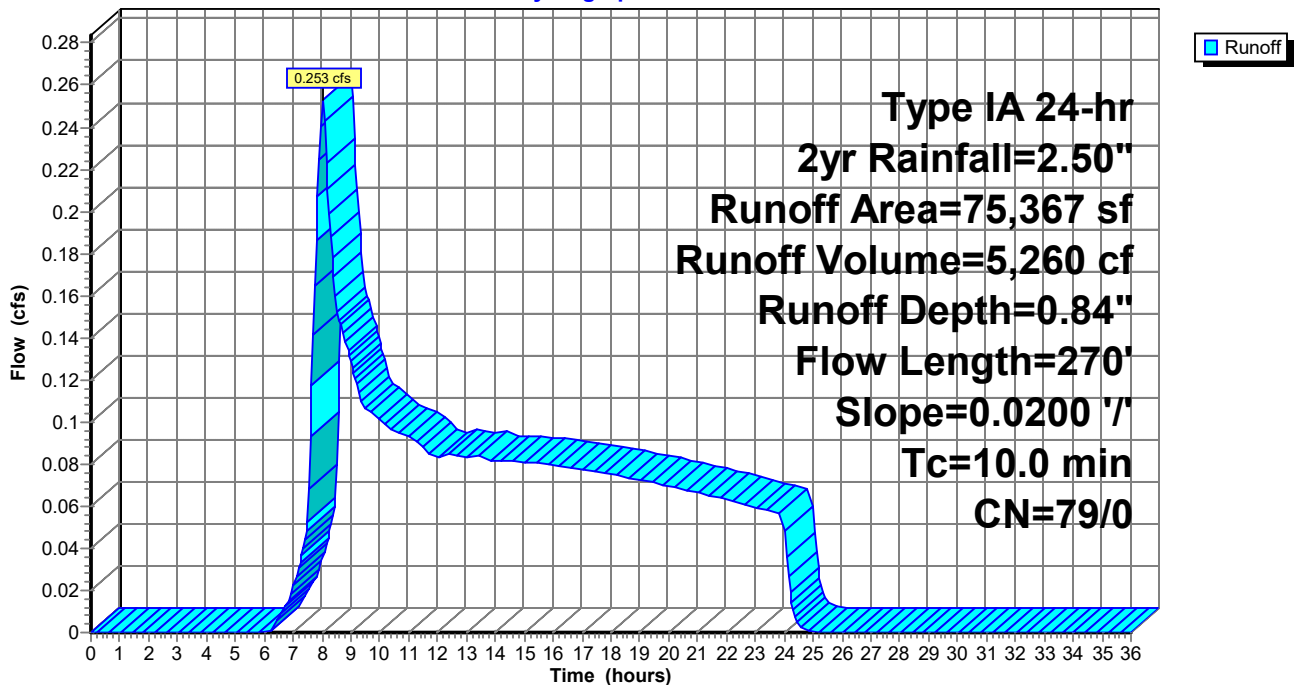Runoff     =       0.111 cfs @    7.98 hrs,  Volume=            1,739 cf,  Depth=  1.85"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  2yr Rainfall=2.50"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 8,428 | 98 | Parking Lot |
| * | 2,835 | 74 | Landscaping |
| | 11,263 | 92 | Weighted Average |
| | 2,835 | 74 | 25.17% Pervious Area |
| | 8,428 | 98 | 74.83% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 0.3 | 20 | 0.0315 | 1.08 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces   n= 0.011   P2= 2.60" |
| 0.4 | 90 | 0.0315 | 3.60 | | **Shallow Concentrated Flow, Parking Lot** |
| | | | | | Paved   Kv= 20.3 fps |
| 0.7 | 110 | Total,  Increased to minimum Tc = 10.0 min | | | |

### Subcatchment 3S: Proposed Site - West

**Hydrograph**



Type IA 24-hr
2yr Rainfall=2.50"
Runoff Area=11,263 sf
Runoff Volume=1,739 cf
Runoff Depth=1.85"
Flow Length=110'
Slope=0.0315 '/'
Tc=10.0 min
CN=74/98

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## Summary for Subcatchment 4S: Proposed Site - East

Runoff    =    0.654 cfs @    7.98 hrs, Volume=    10,429 cf, Depth= 1.73"
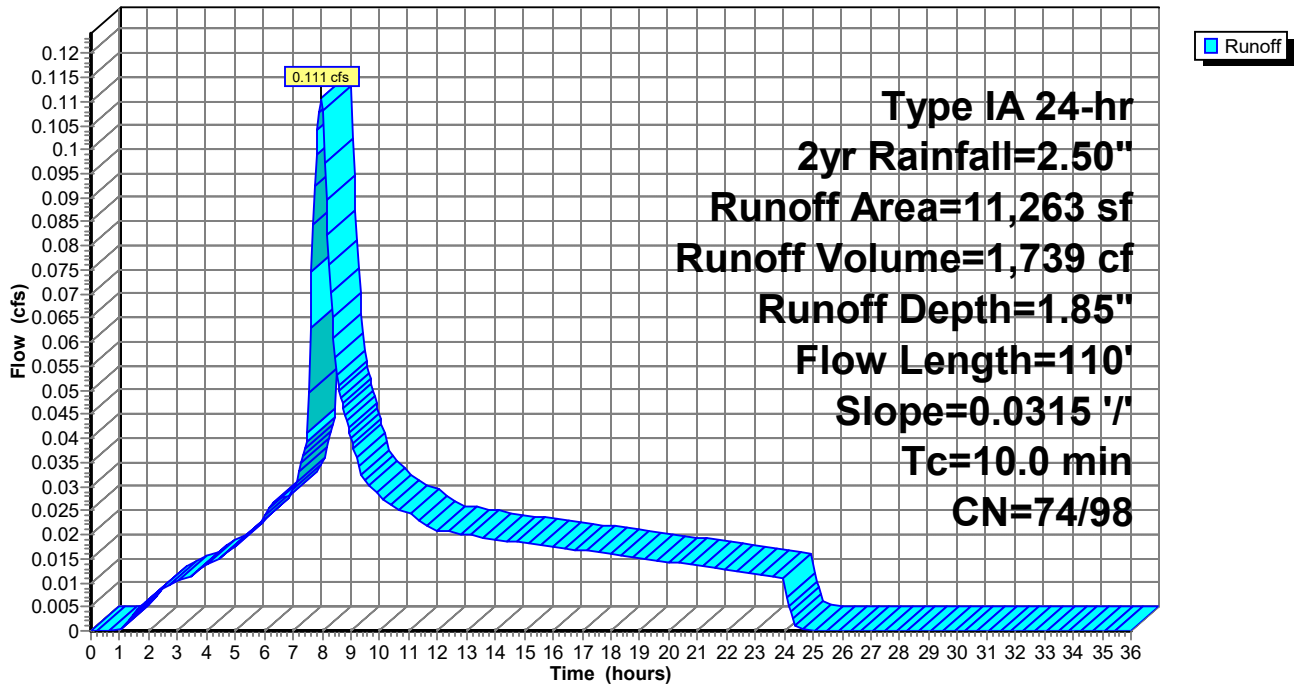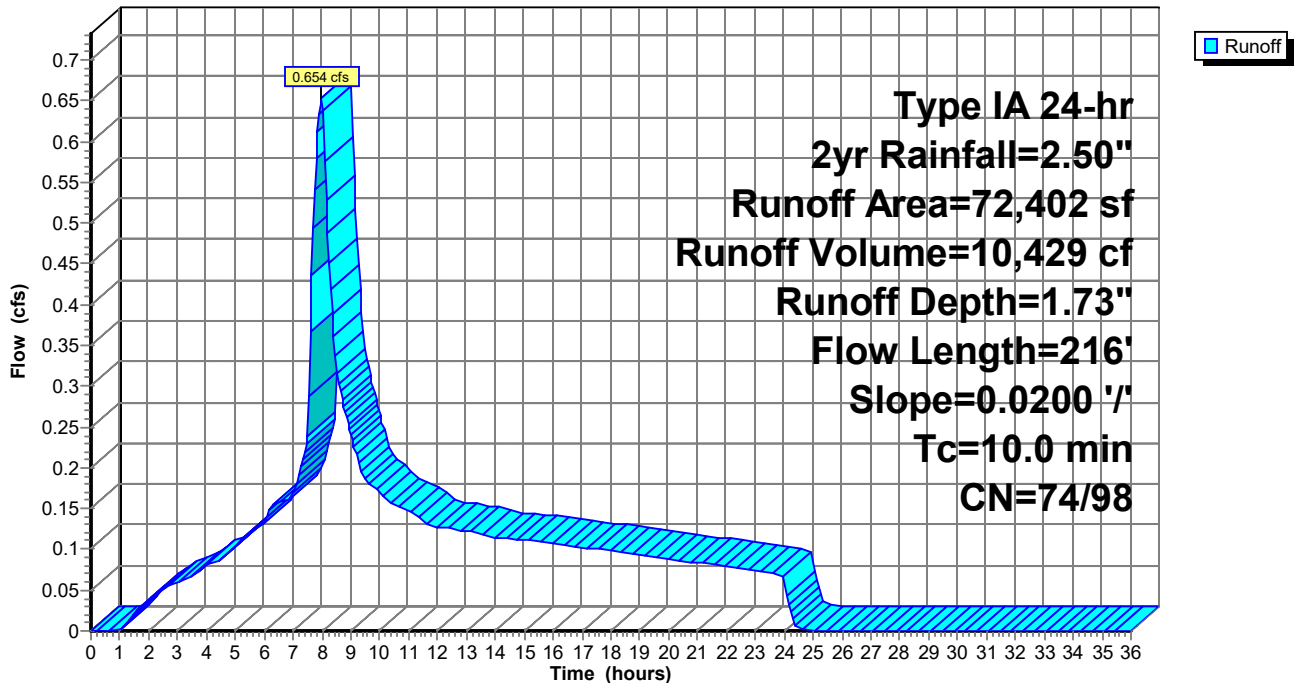
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  2yr Rainfall=2.50"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 10,847 | 98 | Building |
| * | 29,742 | 98 | Asphalt |
| * | 8,202 | 98 | Concrete |
| * | 23,611 | 74 | Landscaping |
| | 72,402 | 90 | Weighted Average |
| | 23,611 | 74 | 32.61% Pervious Area |
| | 48,791 | 98 | 67.39% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 0.4 | 20 | 0.0200 | 0.90 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces   n= 0.011   P2= 2.60" |
| 1.1 | 196 | 0.0200 | 2.87 | | **Shallow Concentrated Flow, Parking Lot to CB** |
| | | | | | Paved   Kv= 20.3 fps |
| 1.5 | 216 | | Total, Increased to minimum Tc = 10.0 min | | |

### Subcatchment 4S: Proposed Site - East



**Hydrograph**

Type IA 24-hr
2yr Rainfall=2.50"
Runoff Area=72,402 sf
Runoff Volume=10,429 cf
Runoff Depth=1.73"
Flow Length=216'
Slope=0.0200 '/'
Tc=10.0 min
CN=74/98

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*Type IA 24-hr  2yr Rainfall=2.50"*
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## Summary for Subcatchment 5S: Existing Area

Runoff      =        1.660 cfs @     7.98 hrs,  Volume=            25,604 cf,  Depth=  2.00"
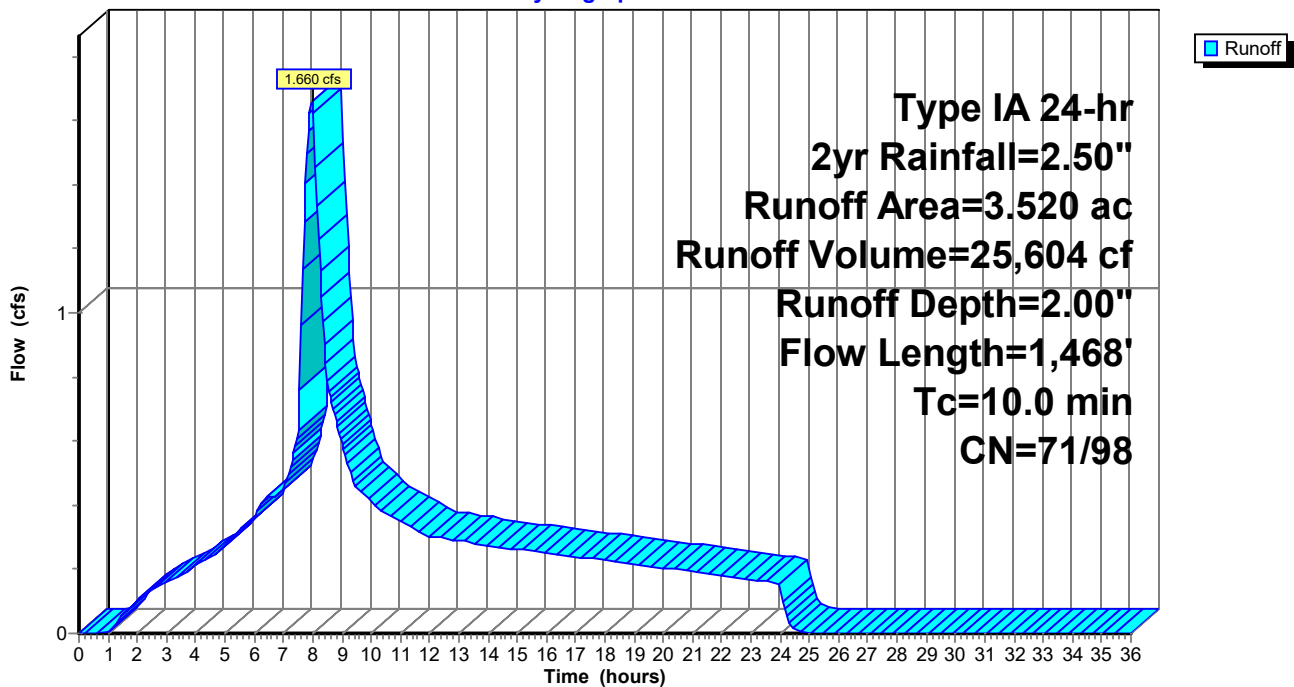
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  2yr Rainfall=2.50"

| Area (ac) | CN | Description |
|---|---|---|
| 3.520 | 94 | Urban commercial, 85% imp, HSG C |
| 0.528 | 71 | 15.00% Pervious Area |
| 2.992 | 98 | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.3 | 100 | 0.0210 | 1.26 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces  n= 0.011  P2= 2.60" |
| 2.1 | 368 | 0.0210 | 2.94 | | **Shallow Concentrated Flow,** |
| | | | | | Paved  Kv= 20.3 fps |
| 6.4 | 1,000 | 0.0130 | 2.60 | 3.192 | **Pipe Channel, Pipe** |
| | | | | | 15.0" Round  Area= 1.2 sf  Perim= 3.9'  r= 0.31' |
| | | | | | n= 0.030  Corrugated metal |
| 9.8 | 1,468 | | Total, Increased to minimum Tc = 10.0 min | | |

## Subcatchment 5S: Existing Area

**Hydrograph**



Type IA 24-hr
2yr Rainfall=2.50"
Runoff Area=3.520 ac
Runoff Volume=25,604 cf
Runoff Depth=2.00"
Flow Length=1,468'
Tc=10.0 min
CN=71/98

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*Type IA 24-hr  2yr Rainfall=2.50"*
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## Summary for Subcatchment 6S: Existing Area

Runoff      =       5.249 cfs @     7.98 hrs,  Volume=          80,957 cf,  Depth= 2.00"
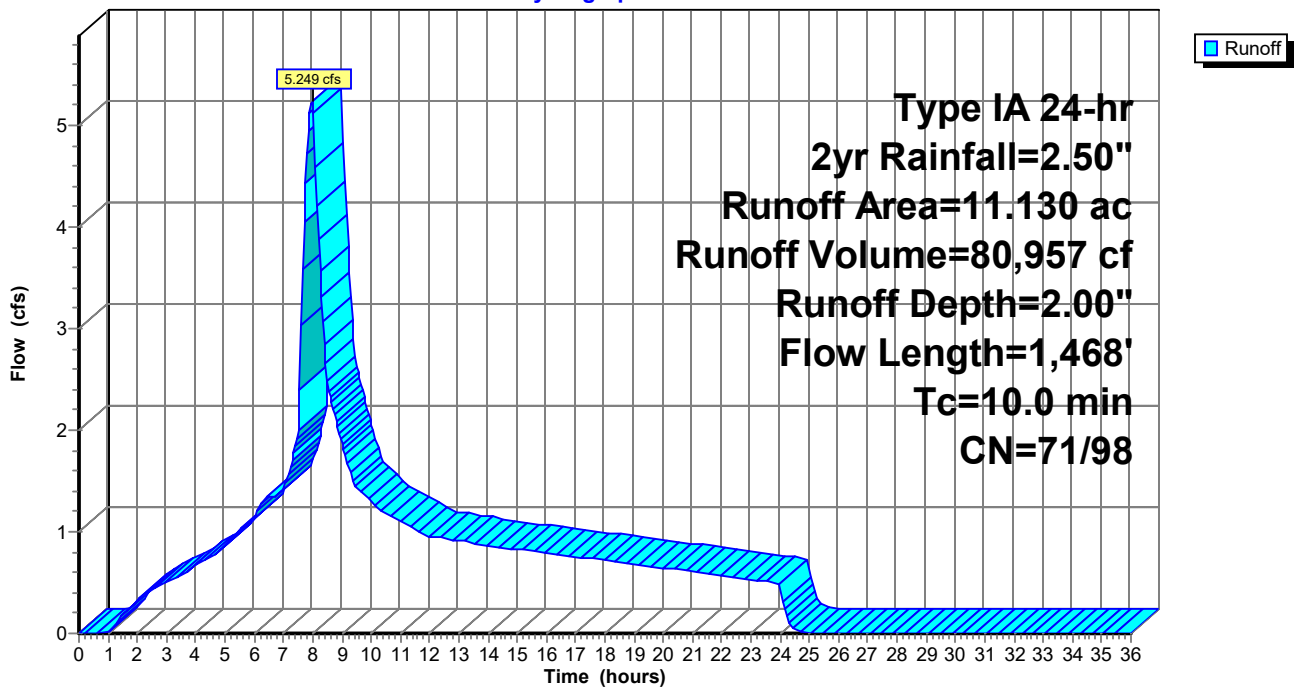
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  2yr Rainfall=2.50"

| Area (ac) | CN | Description |
|---|---|---|
| 11.130 | 94 | Urban commercial, 85% imp, HSG C |
| 1.670 | 71 | 15.00% Pervious Area |
| 9.460 | 98 | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.3 | 100 | 0.0210 | 1.26 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces  n= 0.011   P2= 2.60" |
| 2.1 | 368 | 0.0210 | 2.94 | | **Shallow Concentrated Flow,** |
| | | | | | Paved   Kv= 20.3 fps |
| 6.4 | 1,000 | 0.0130 | 2.60 | 3.192 | **Pipe Channel, Pipe** |
| | | | | | 15.0" Round  Area= 1.2 sf  Perim= 3.9'  r= 0.31' |
| | | | | | n= 0.030  Corrugated metal |
| 9.8 | 1,468 | | Total,  Increased to minimum Tc = 10.0 min | | |

## Subcatchment 6S: Existing Area

**Hydrograph**



Type IA 24-hr
2yr Rainfall=2.50"
Runoff Area=11.130 ac
Runoff Volume=80,957 cf
Runoff Depth=2.00"
Flow Length=1,468'
Tc=10.0 min
CN=71/98

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## Summary for Subcatchment 7S: Existing Area

Runoff    =    1.660 cfs @    7.98 hrs,  Volume=    25,604 cf,  Depth= 2.00"
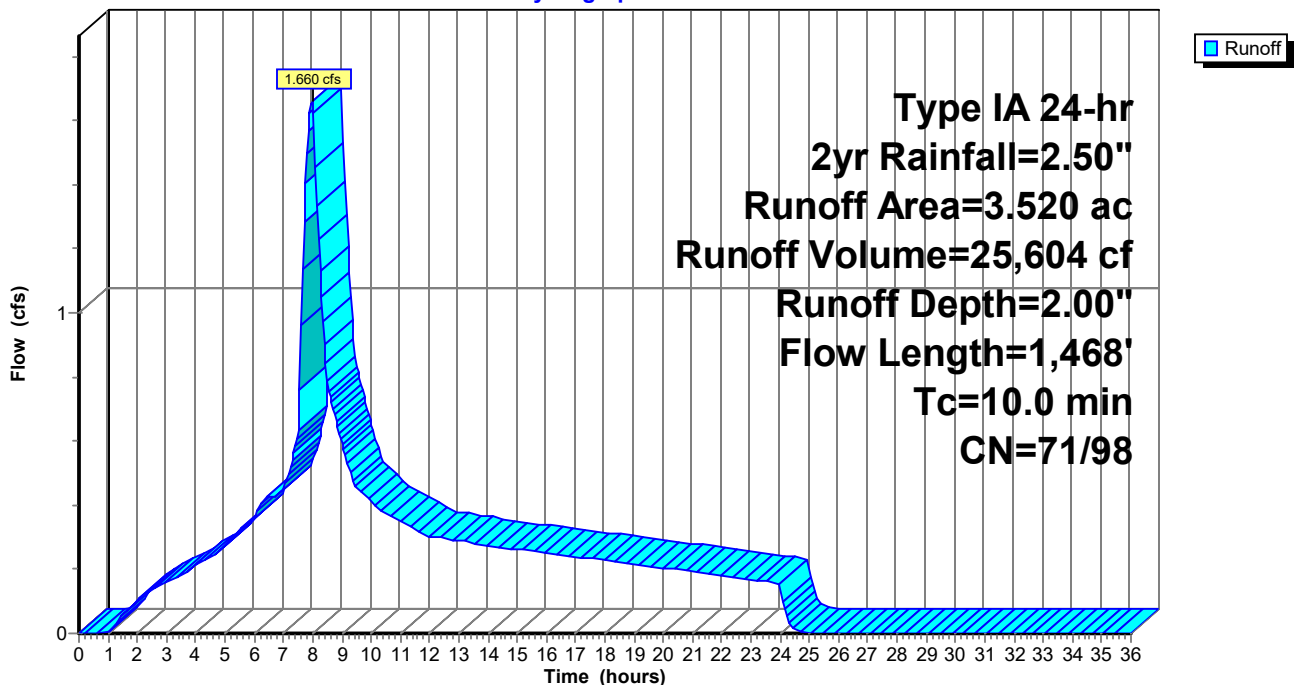
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  2yr Rainfall=2.50"

| Area (ac) | CN | Description |
|---|---|---|
| 3.520 | 94 | Urban commercial, 85% imp, HSG C |
| 0.528 | 71 | 15.00% Pervious Area |
| 2.992 | 98 | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.3 | 100 | 0.0210 | 1.26 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces  n= 0.011  P2= 2.60" |
| 2.1 | 368 | 0.0210 | 2.94 | | **Shallow Concentrated Flow,** |
| | | | | | Paved   Kv= 20.3 fps |
| 6.4 | 1,000 | 0.0130 | 2.60 | 3.192 | **Pipe Channel, Pipe** |
| | | | | | 15.0"  Round  Area= 1.2 sf  Perim= 3.9'  r= 0.31' |
| | | | | | n= 0.030  Corrugated metal |
| 9.8 | 1,468 | | Total, | Increased to minimum Tc = 10.0 min | |

### Subcatchment 7S: Existing Area

**Hydrograph**



Type IA 24-hr
2yr Rainfall=2.50"
Runoff Area=3.520 ac
Runoff Volume=25,604 cf
Runoff Depth=2.00"
Flow Length=1,468'
Tc=10.0 min
CN=71/98

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## Summary for Subcatchment 8S: Existing Area

Runoff     =        5.249 cfs @     7.98 hrs,  Volume=           80,957 cf,  Depth= 2.00"
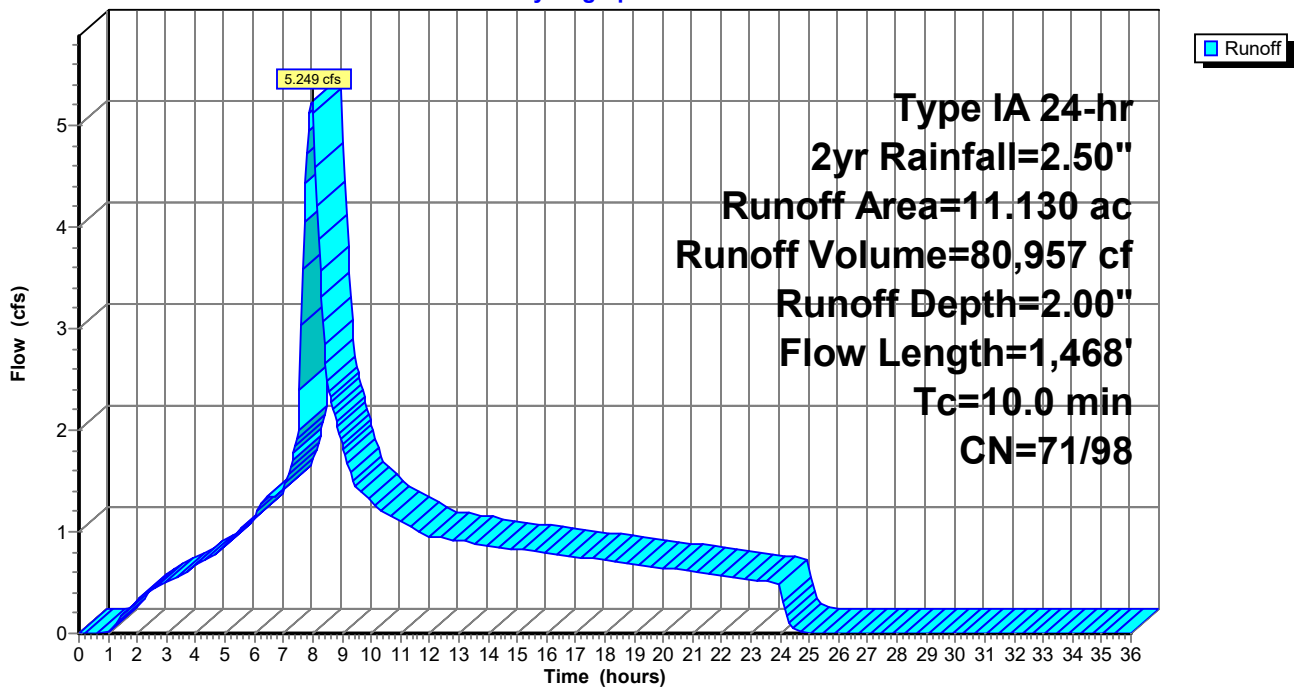
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  2yr Rainfall=2.50"

| Area (ac) | CN | Description |
|---|---|---|
| 11.130 | 94 | Urban commercial, 85% imp, HSG C |
| 1.670 | 71 | 15.00% Pervious Area |
| 9.460 | 98 | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.3 | 100 | 0.0210 | 1.26 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces  n= 0.011  P2= 2.60" |
| 2.1 | 368 | 0.0210 | 2.94 | | **Shallow Concentrated Flow,** |
| | | | | | Paved   Kv= 20.3 fps |
| 6.4 | 1,000 | 0.0130 | 2.60 | 3.192 | **Pipe Channel, Pipe** |
| | | | | | 15.0" Round  Area= 1.2 sf  Perim= 3.9'  r= 0.31' |
| | | | | | n= 0.030  Corrugated metal |
| 9.8 | 1,468 | Total, Increased to minimum Tc = 10.0 min | | | |

## Subcatchment 8S: Existing Area

**Hydrograph**



Type IA 24-hr
2yr Rainfall=2.50"
Runoff Area=11.130 ac
Runoff Volume=80,957 cf
Runoff Depth=2.00"
Flow Length=1,468'
Tc=10.0 min
CN=71/98

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*Type IA 24-hr  2yr Rainfall=2.50"*
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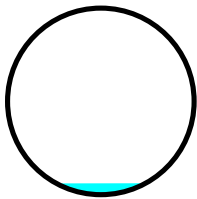Page 36

## Summary for Reach 6R: Brutscher - 18"

Inflow Area =          8,298 sf, 92.31% Impervious, Inflow Depth =  2.14"    for  2yr event
Inflow     =     0.098 cfs @    7.98 hrs, Volume=          1,482 cf
Outflow    =     0.097 cfs @    7.99 hrs, Volume=          1,482 cf, Atten= 1%, Lag= 0.8 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.16 fps,  Min. Travel Time= 2.3 min
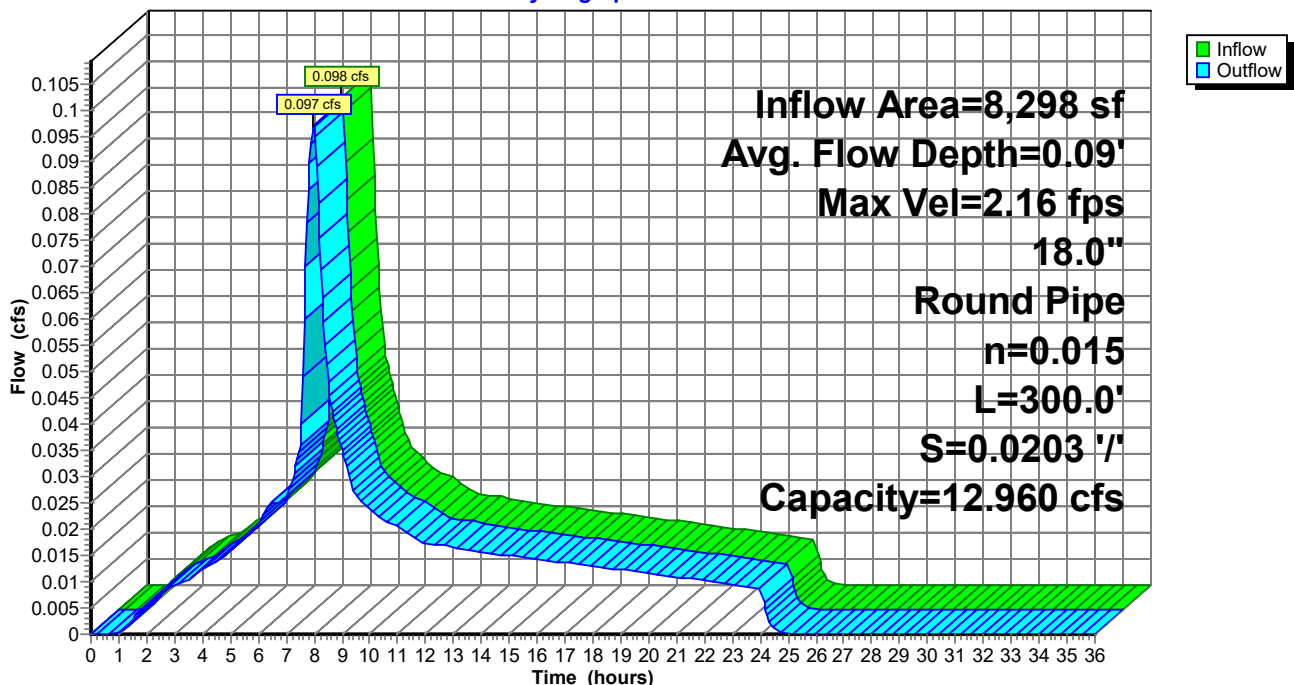Avg. Velocity = 1.23 fps,  Avg. Travel Time= 4.1 min

Peak Storage= 13 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 1.50'  Flow Area= 1.8 sf,  Capacity= 12.960 cfs

18.0"  Round Pipe
n= 0.015
Length= 300.0'   Slope= 0.0203 '/'
Inlet Invert= 212.78',  Outlet Invert= 206.70'

### Reach 6R: Brutscher - 18"



**Hydrograph**

Inflow Area=8,298 sf
Avg. Flow Depth=0.09'
Max Vel=2.16 fps
18.0"
Round Pipe
n=0.015
L=300.0'
S=0.0203 '/'
Capacity=12.960 cfs

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*Type IA 24-hr  2yr Rainfall=2.50"*
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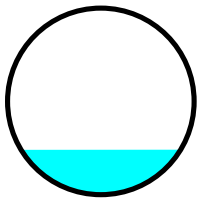
## Summary for Reach 7R: HWY 99 - 21"

Inflow Area =         161,629 sf, 85.38% Impervious, Inflow Depth =   2.01"    for  2yr event
Inflow      =      1.757 cfs @     7.98 hrs, Volume=            27,086 cf
Outflow     =      1.753 cfs @     7.98 hrs, Volume=            27,086 cf, Atten= 0%,  Lag= 0.3 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.92 fps,  Min. Travel Time= 0.8 min
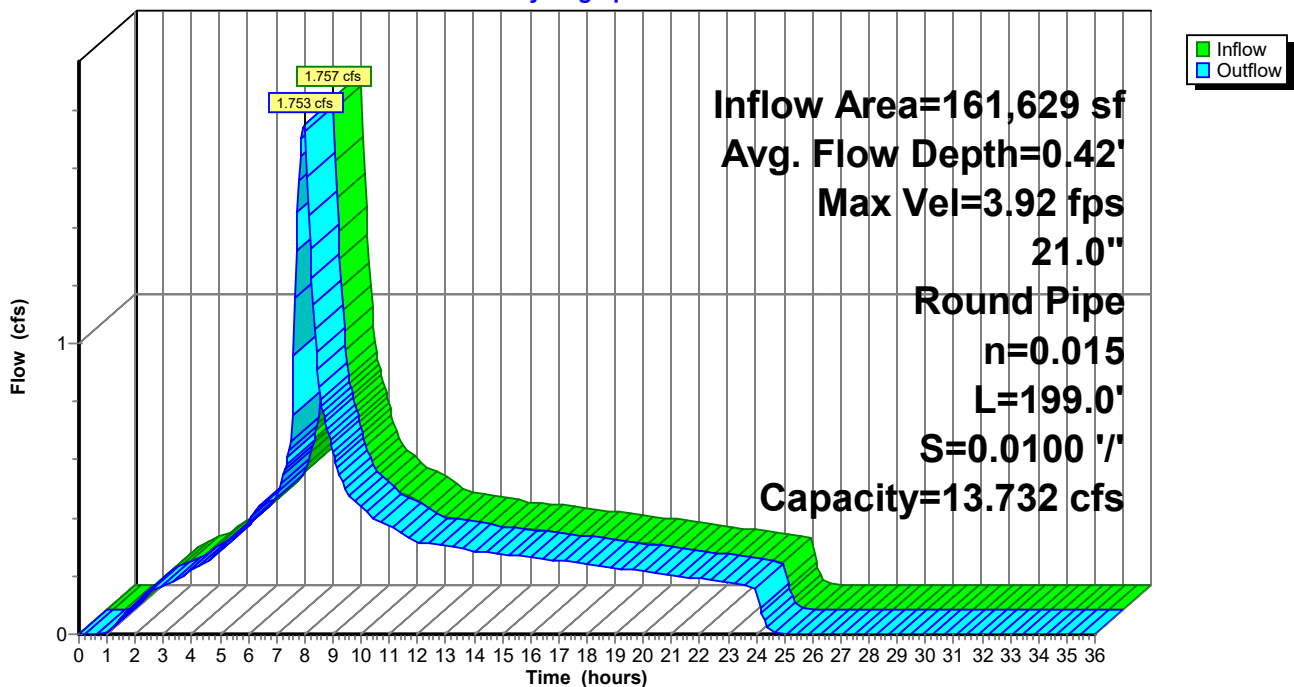Avg. Velocity = 2.18 fps,  Avg. Travel Time= 1.5 min

Peak Storage= 89 cf @ 7.98 hrs
Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 199.0'   Slope= 0.0100 '/'
Inlet Invert= 206.61',  Outlet Invert= 204.62'

### Reach 7R: HWY 99 - 21"

**Hydrograph**



Inflow Area=161,629 sf
Avg. Flow Depth=0.42'
Max Vel=3.92 fps
21.0"
Round Pipe
n=0.015
L=199.0'
S=0.0100 '/'
Capacity=13.732 cfs

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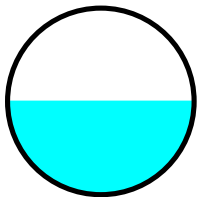Page 38

## Summary for Reach 8R: HWY 99 - 21"

Inflow Area =        646,452 sf,  85.09% Impervious,  Inflow Depth =  2.01"    for  2yr event
Inflow      =      7.002 cfs @    7.98 hrs,  Volume=         108,043 cf
Outflow     =      6.989 cfs @    7.98 hrs,  Volume=         108,043 cf,  Atten= 0%,  Lag= 0.3 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.73 fps,  Min. Travel Time= 0.7 min
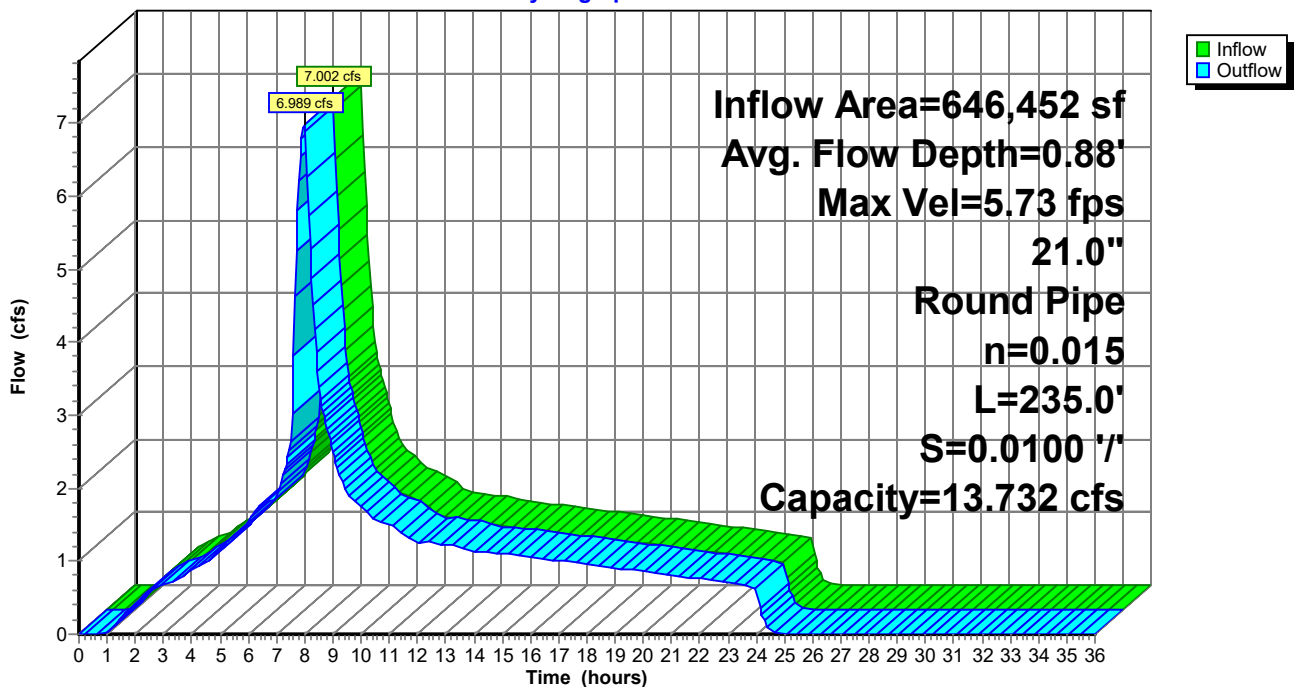Avg. Velocity = 3.25 fps,  Avg. Travel Time= 1.2 min

Peak Storage= 286 cf @ 7.98 hrs
Average Depth at Peak Storage= 0.88'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 235.0'   Slope= 0.0100 '/'
Inlet Invert= 204.62',  Outlet Invert= 202.27'



### Reach 8R: HWY 99 - 21"

**Hydrograph**



Inflow Area=646,452 sf
Avg. Flow Depth=0.88'
Max Vel=5.73 fps
21.0"
Round Pipe
n=0.015
L=235.0'
S=0.0100 '/'
Capacity=13.732 cfs

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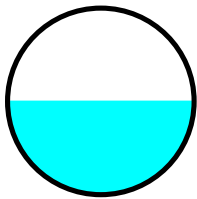Printed  3/2/2020
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## Summary for Reach 9R: HWY 99 -21"

Inflow Area =         646,452 sf, 85.09% Impervious,  Inflow Depth =  2.01"    for  2yr event
Inflow      =     6.989 cfs @    7.98 hrs,  Volume=         108,043 cf
Outflow     =     6.986 cfs @    7.99 hrs,  Volume=         108,043 cf,  Atten= 0%,  Lag= 0.1 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.73 fps,  Min. Travel Time= 0.2 min
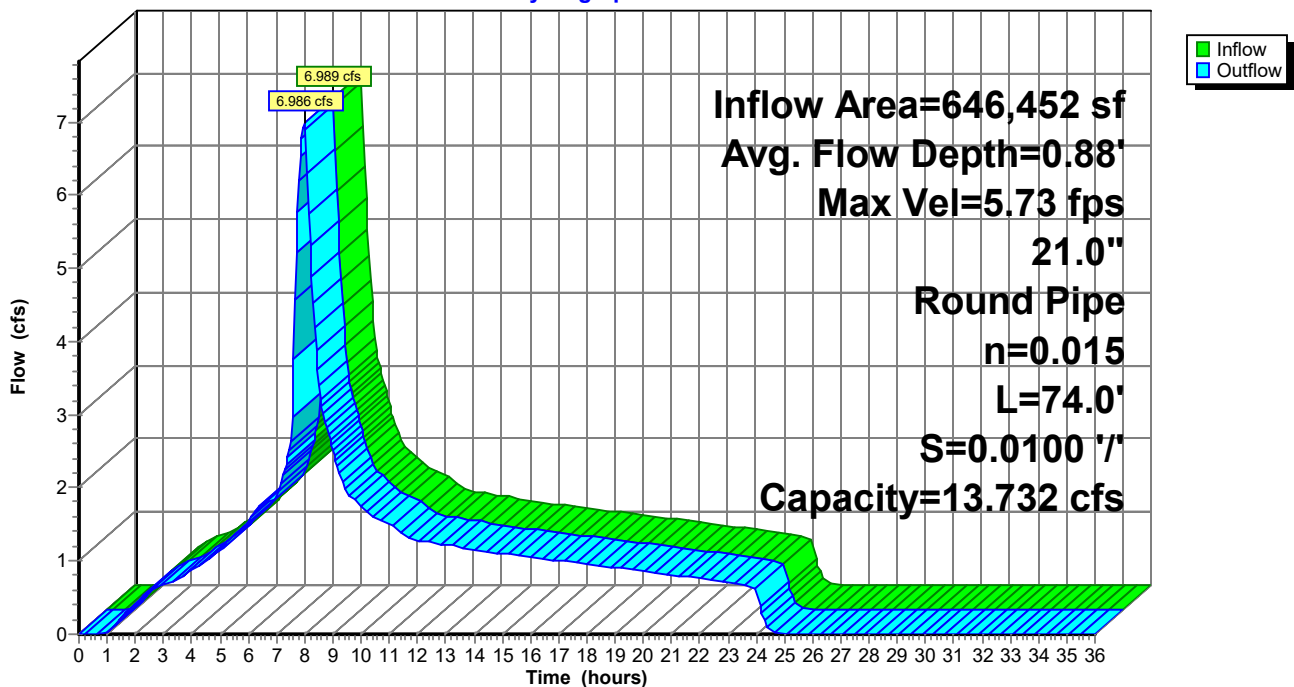Avg. Velocity = 3.24 fps,  Avg. Travel Time= 0.4 min

Peak Storage= 90 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.88'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 74.0'   Slope= 0.0100 '/'
Inlet Invert= 202.27',  Outlet Invert= 201.53'

### Reach 9R: HWY 99 -21"

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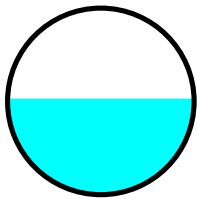Printed  3/2/2020
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## Summary for Reach 10R: HWY 99 - 21"

Inflow Area =      646,452 sf, 85.09% Impervious,  Inflow Depth =  2.01"   for  2yr event
Inflow     =    6.986 cfs @    7.99 hrs,  Volume=        108,043 cf
Outflow    =    6.970 cfs @    8.00 hrs,  Volume=        108,043 cf,  Atten= 0%,  Lag= 0.5 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.57 fps,  Min. Travel Time= 1.0 min
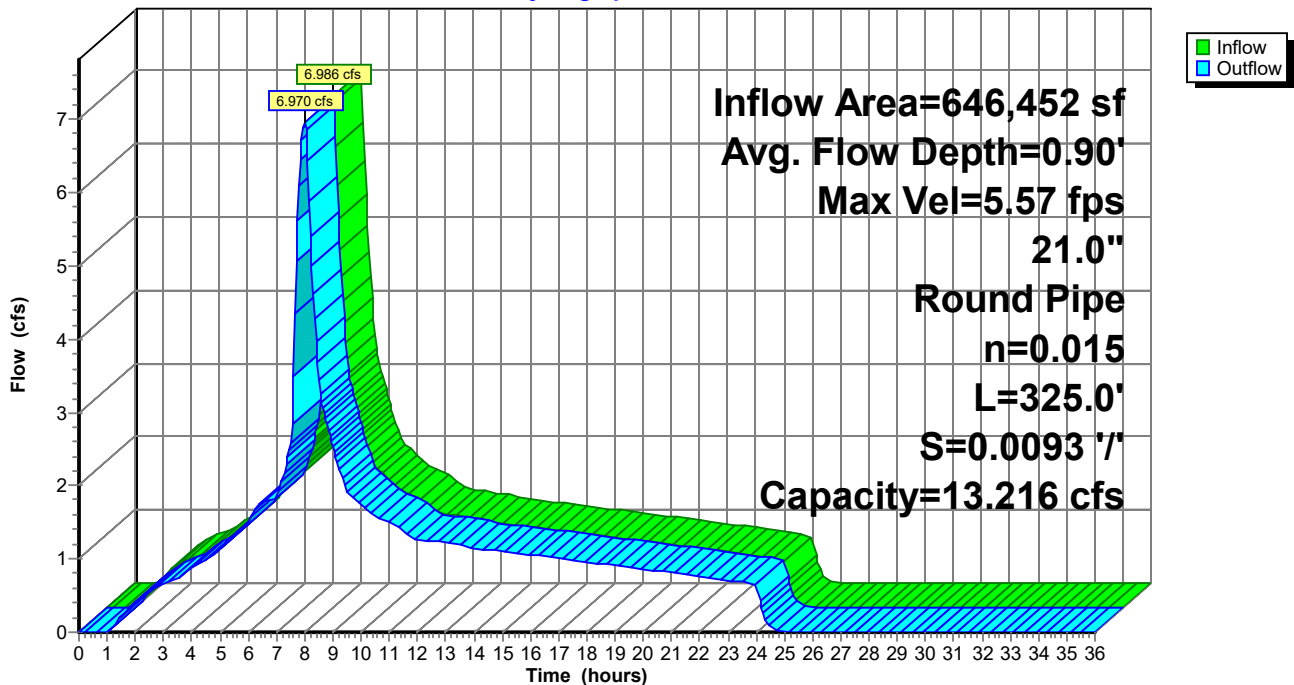Avg. Velocity = 3.13 fps,  Avg. Travel Time= 1.7 min

Peak Storage= 407 cf @ 8.00 hrs
Average Depth at Peak Storage= 0.90'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.216 cfs

21.0"  Round Pipe
n= 0.015  Concrete sewer w/manholes & inlets
Length= 325.0'   Slope= 0.0093 '/'
Inlet Invert= 201.43',  Outlet Invert= 198.42'

### Reach 10R: HWY 99 - 21"



**Hydrograph**

Inflow Area=646,452 sf
Avg. Flow Depth=0.90'
Max Vel=5.57 fps
21.0"
Round Pipe
n=0.015
L=325.0'
S=0.0093 '/'
Capacity=13.216 cfs
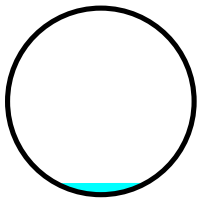
## Summary for Reach 11R: Brutscher - 18"

Inflow Area =            83,665 sf, 68.39% Impervious,  Inflow Depth >  1.14"    for  2yr event
Inflow      =        0.103 cfs @  18.00 hrs,  Volume=              7,935 cf
Outflow     =        0.103 cfs @  18.02 hrs,  Volume=              7,930 cf,  Atten= 0%,  Lag= 1.4 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.20 fps,  Min. Travel Time= 2.3 min
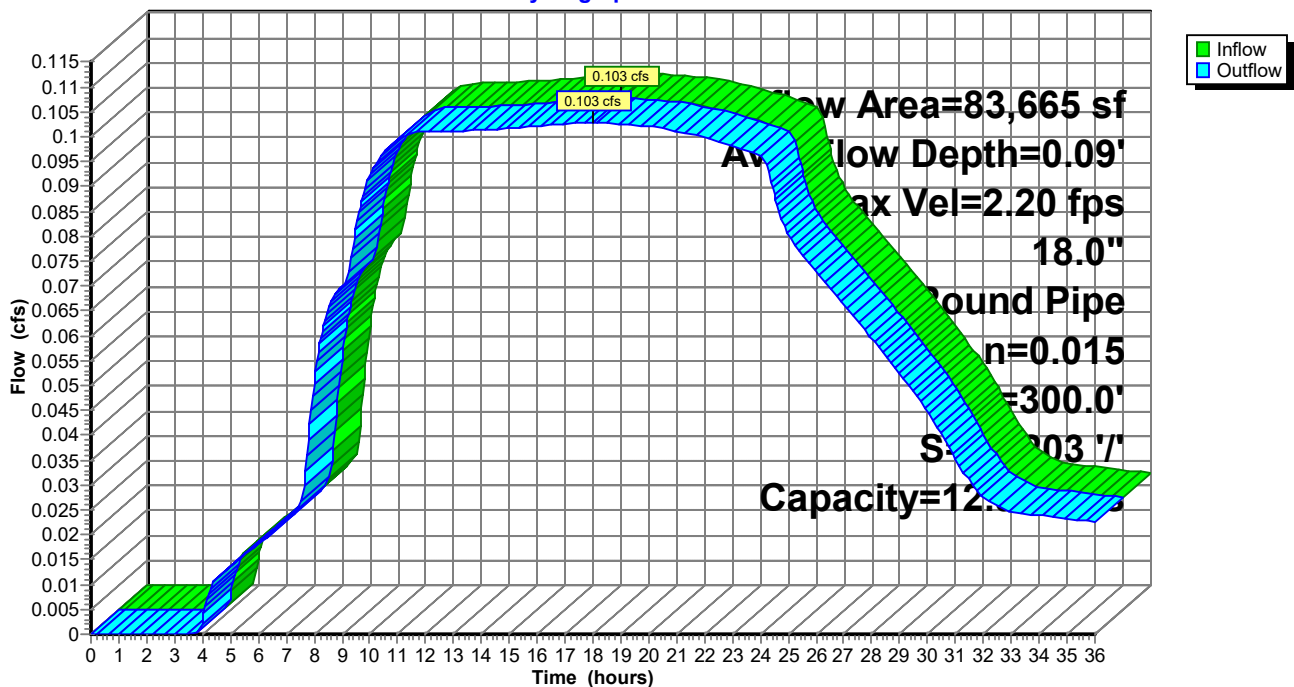Avg. Velocity = 1.88 fps,  Avg. Travel Time= 2.7 min

Peak Storage= 14 cf @ 18.02 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 1.50'  Flow Area= 1.8 sf,  Capacity= 12.960 cfs

18.0"  Round Pipe
n= 0.015
Length= 300.0'   Slope= 0.0203 '/'
Inlet Invert= 212.78',  Outlet Invert= 206.70'



### Reach 11R: Brutscher - 18"

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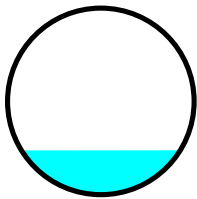Printed  3/2/2020
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## Summary for Reach 12R: HWY 99 - 21"

Inflow Area =        236,996 sf, 79.14% Impervious, Inflow Depth >  1.70"    for  2yr event
Inflow     =      1.709 cfs @    7.98 hrs, Volume=          33,534 cf
Outflow    =      1.706 cfs @    7.99 hrs, Volume=          33,530 cf, Atten= 0%,  Lag= 0.3 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.89 fps,  Min. Travel Time= 0.9 min
Avg. Velocity = 2.03 fps,  Avg. Travel Time= 1.6 min

Peak Storage= 87 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 199.0'   Slope= 0.0100 '/'
Inlet Invert= 206.61',  Outlet Invert= 204.62'

### Reach 12R: HWY 99 - 21"

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## Summary for Reach 13R: HWY 99 - 21"

Inflow Area =          721,819 sf,  83.07% Impervious,  Inflow Depth >   1.90"    for  2yr event
Inflow      =        6.954 cfs @    7.98 hrs,  Volume=            114,487 cf
Outflow    =        6.941 cfs @    7.99 hrs,  Volume=            114,482 cf,  Atten= 0%,  Lag= 0.3 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.72 fps,  Min. Travel Time= 0.7 min
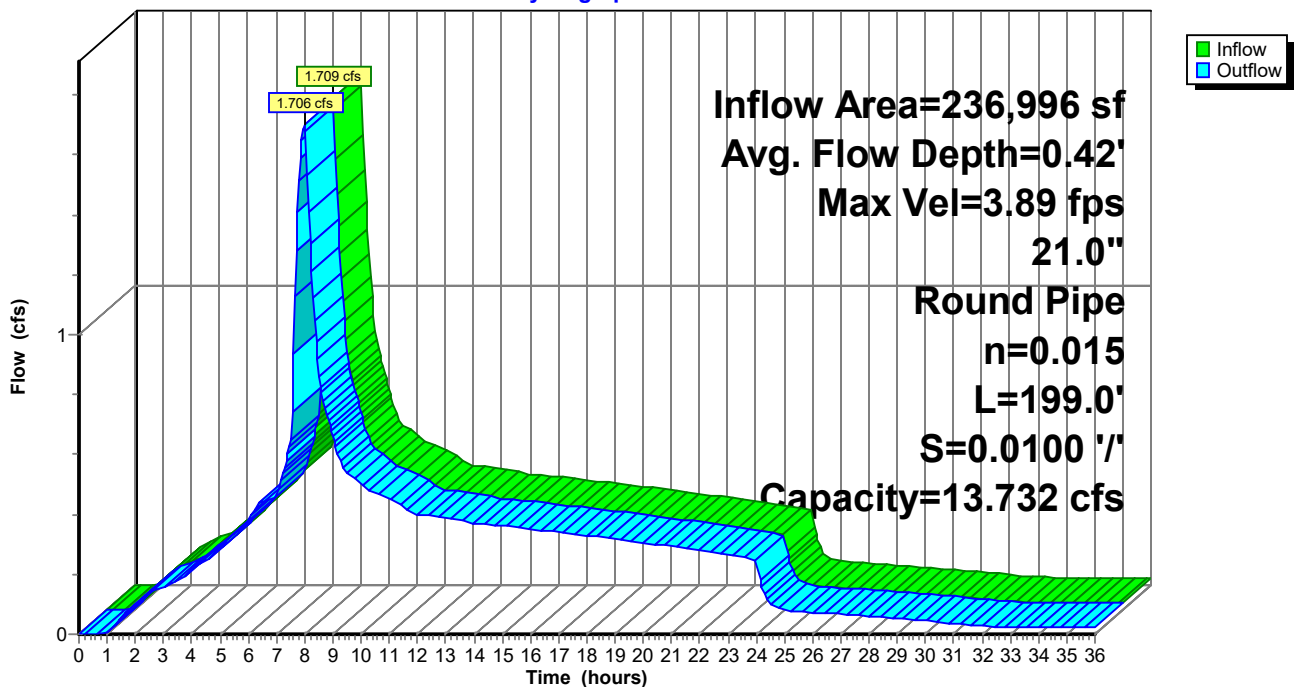Avg. Velocity = 2.74 fps,  Avg. Travel Time= 1.4 min

Peak Storage= 285 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.88'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 235.0'   Slope= 0.0100 '/'
Inlet Invert= 204.62',  Outlet Invert= 202.27'

### Reach 13R: HWY 99 - 21"



**Hydrograph**

Inflow Area=721,819 sf
Avg. Flow Depth=0.88'
Max Vel=5.72 fps
21.0"
Round Pipe
n=0.015
L=235.0'
S=0.0100 '/'
Capacity=13.732 cfs

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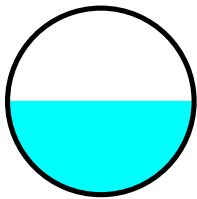Printed  3/2/2020
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## Summary for Reach 14R: HWY 99 - 21"

Inflow Area =        721,819 sf,  83.07% Impervious,  Inflow Depth >  1.90"    for  2yr event
Inflow      =      6.941 cfs @     7.99 hrs,  Volume=          114,482 cf
Outflow     =      6.938 cfs @     7.99 hrs,  Volume=          114,480 cf,  Atten= 0%,  Lag= 0.1 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.72 fps,  Min. Travel Time= 0.2 min
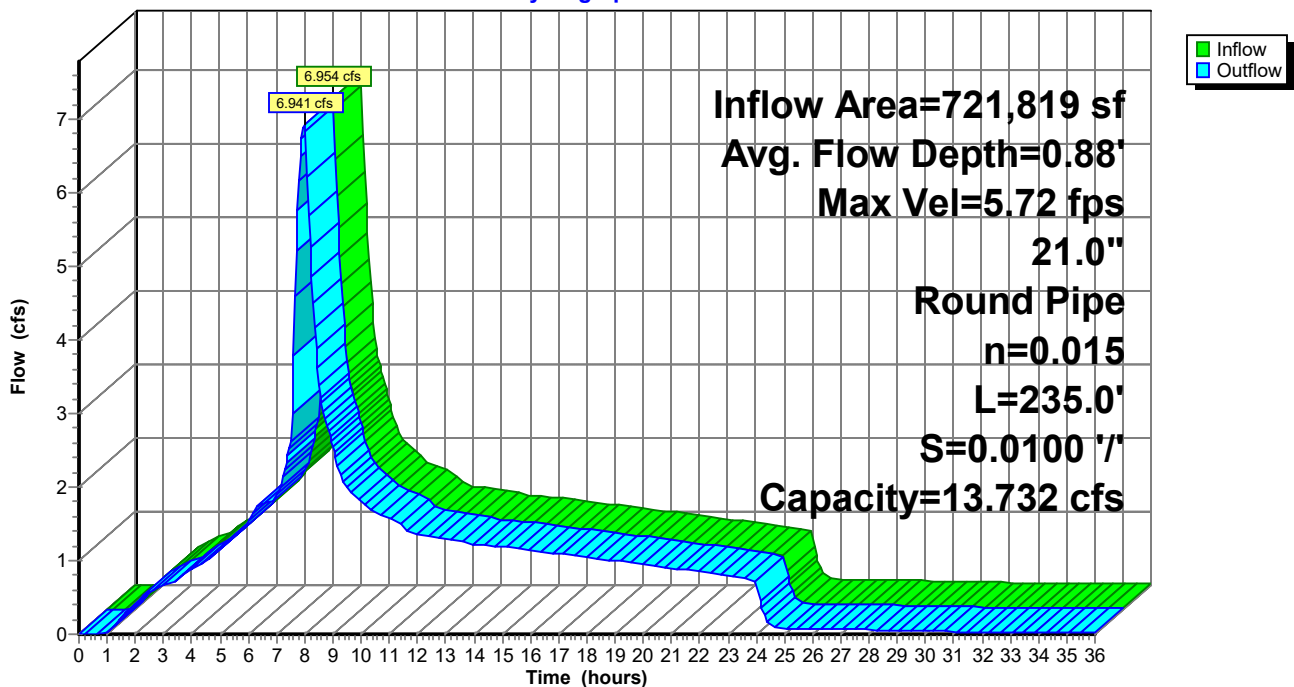Avg. Velocity = 2.74 fps,  Avg. Travel Time= 0.4 min

Peak Storage= 90 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.88'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 74.0'   Slope= 0.0100 '/'
Inlet Invert= 202.27',  Outlet Invert= 201.53'

### Reach 14R: HWY 99 - 21"

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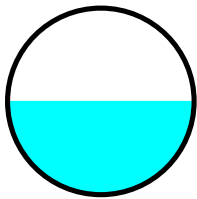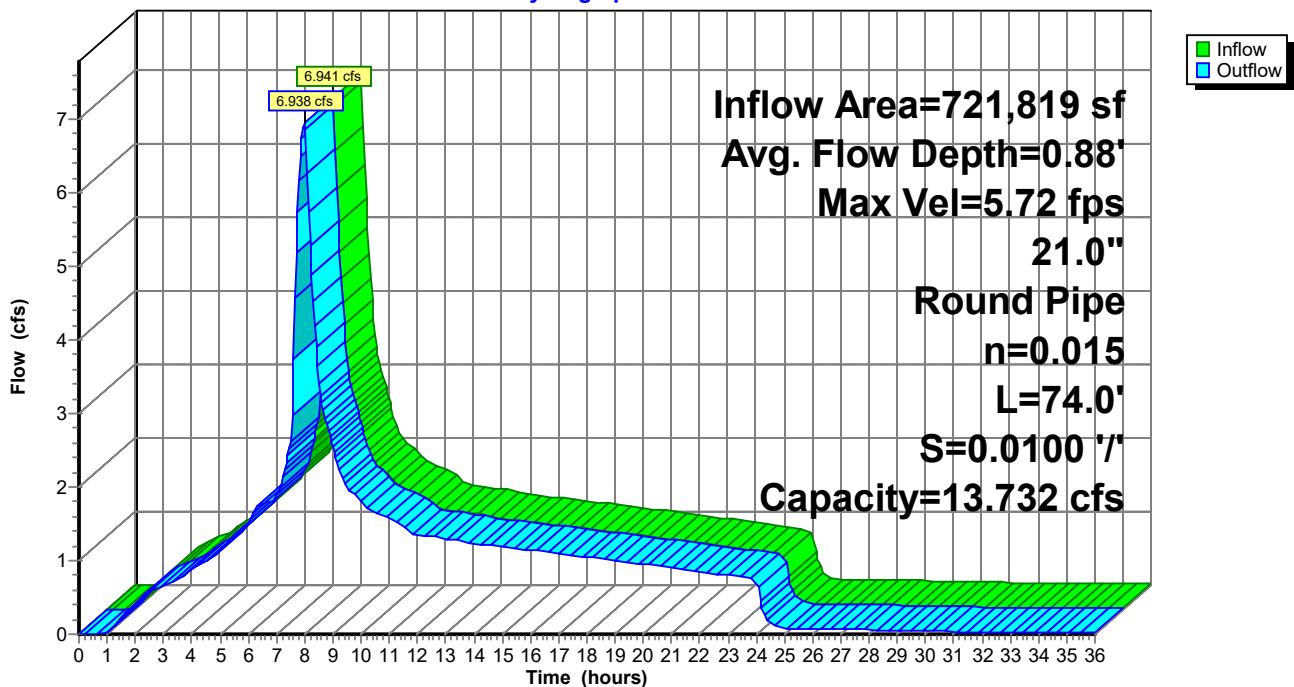Printed  3/2/2020
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## Summary for Reach 15R: HWY 99 - 21"

Inflow Area =        721,819 sf,  83.07% Impervious,  Inflow Depth >  1.90"    for  2yr event
Inflow      =      6.938 cfs @     7.99 hrs,  Volume=          114,480 cf
Outflow     =      6.922 cfs @     8.00 hrs,  Volume=          114,473 cf,  Atten= 0%,  Lag= 0.5 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.56 fps,  Min. Travel Time= 1.0 min
Avg. Velocity = 2.67 fps,  Avg. Travel Time= 2.0 min

Peak Storage= 405 cf @ 8.00 hrs
Average Depth at Peak Storage= 0.90'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.216 cfs

21.0"  Round Pipe
n= 0.015  Concrete sewer w/manholes & inlets
Length= 325.0'   Slope= 0.0093 '/'
Inlet Invert= 201.43',  Outlet Invert= 198.42'

### Reach 15R: HWY 99 - 21"

**Hydrograph**



Inflow Area=721,819 sf
Avg. Flow Depth=0.90'
Max Vel=5.56 fps
21.0"
Round Pipe
n=0.015
L=325.0'
S=0.0093 '/'
Capacity=13.216 cfs
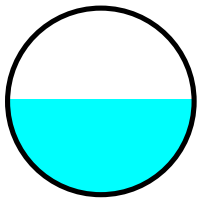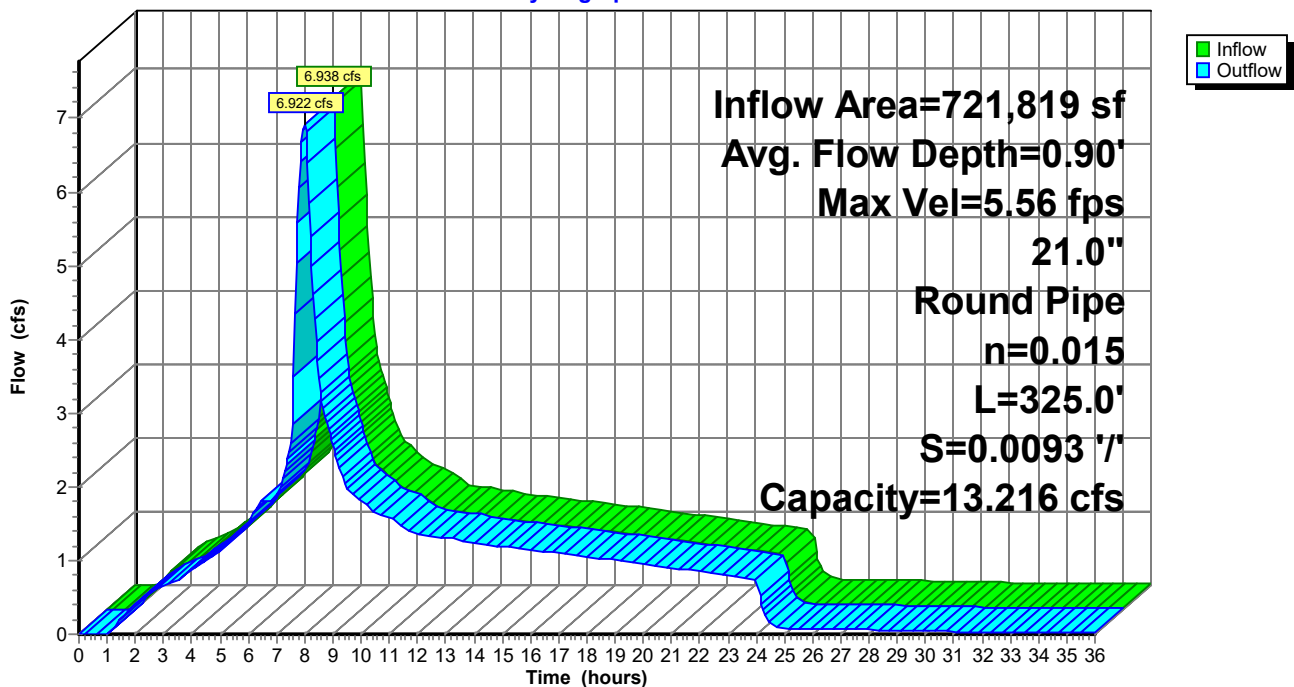
## Summary for Pond 1P: Stormwater Planter

Inflow Area =        11,263 sf, 74.83% Impervious, Inflow Depth =  1.85"   for  2yr event
Inflow     =    0.111 cfs @   7.98 hrs,  Volume=         1,739 cf
Outflow   =    0.046 cfs @   8.74 hrs,  Volume=         1,659 cf,  Atten= 58%,  Lag= 45.8 min
Primary   =    0.046 cfs @   8.74 hrs,  Volume=         1,659 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 223.50' @ 8.74 hrs  Surf.Area= 160 sf  Storage= 319 cf

Plug-Flow detention time= 110.0 min calculated for 1,659 cf (95% of inflow)
Center-of-Mass det. time= 76.2 min ( 773.9 - 697.7 )

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---------------------|
| #1 | 221.50' | 560 cf | **16.00'W x 10.00'L x 3.50'H Prismatoid** |

| Device | Routing | Invert | Outlet Devices |
|--------|---------|--------|----------------|
| #1 | Primary | 222.00' | **1.2" Horiz. Orifice/Grate**  C= 0.600  Limited to weir flow at low heads |
| #2 | Primary | 223.51' | **0.8" Vert. Orifice/Grate**  C= 0.600 |
| #3 | Primary | 224.40' | **1.0" Vert. Orifice/Grate**  C= 0.600 |
| #4 | Primary | 224.50' | **6.0" Vert. Orifice/Grate**  C= 0.600 |

**Primary OutFlow**  Max=0.046 cfs @ 8.74 hrs  HW=223.50'  (Free Discharge)
┬—**1=Orifice/Grate** (Orifice Controls 0.046 cfs @ 5.89 fps)
├—**2=Orifice/Grate** ( Controls 0.000 cfs)
├—**3=Orifice/Grate** ( Controls 0.000 cfs)
└—**4=Orifice/Grate** ( Controls 0.000 cfs)

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## Pond 1P: Stormwater Planter



**Hydrograph**

Inflow Area=11,263 sf
Peak Elev=223.50'
Storage=319 cf

Legend: Inflow (green), Primary (blue)

0.111 cfs

0.046 cfs

Flow (cfs) vs Time (hours)

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Page 48
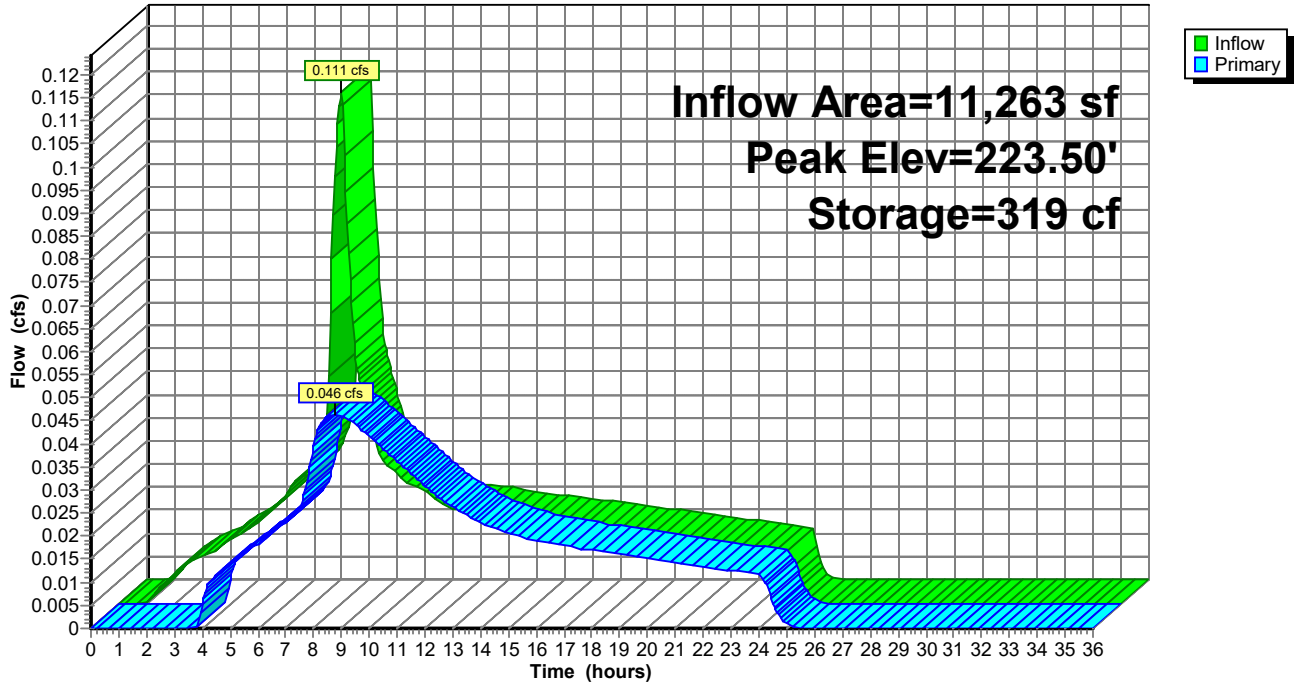
## Summary for Pond 2P: Stormwater Pond

Inflow Area = 72,402 sf, 67.39% Impervious, Inflow Depth = 1.73"  for 2yr event
Inflow  =  0.654 cfs @  7.98 hrs, Volume=  10,429 cf
Outflow  =  0.087 cfs @  20.33 hrs, Volume=  6,276 cf, Atten= 87%, Lag= 740.8 min
Primary  =  0.087 cfs @  20.33 hrs, Volume=  6,276 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 224.32' @ 20.33 hrs  Surf.Area= 2,212 sf  Storage= 6,239 cf

Plug-Flow detention time= 768.0 min calculated for 6,276 cf (60% of inflow)
Center-of-Mass det. time= 534.7 min ( 1,239.8 - 705.1 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 221.50' | 8,848 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 221.50 | 2,212 | 0 | 0 |
| 225.50 | 2,212 | 8,848 | 8,848 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 222.50' | **0.9" Vert. Orifice/Grate**  C= 0.600 |
| #2 | Primary | 223.15' | **0.5" Vert. Orifice/Grate**  C= 0.600 |
| #3 | Primary | 223.50' | **1.5" Vert. Orifice/Grate**  C= 0.600 |
| #4 | Primary | 224.35' | **1.9" Vert. Orifice/Grate**  C= 0.600 |
| #5 | Primary | 225.25' | **24.0" x 24.0" Horiz. Orifice/Grate**  C= 0.600 |
| | | | Limited to weir flow at low heads |

**Primary OutFlow** Max=0.087 cfs @ 20.33 hrs  HW=224.32'  (Free Discharge)
├─**1=Orifice/Grate** (Orifice Controls 0.028 cfs @ 6.43 fps)
├─**2=Orifice/Grate** (Orifice Controls 0.007 cfs @ 5.16 fps)
├─**3=Orifice/Grate** (Orifice Controls 0.051 cfs @ 4.19 fps)
├─**4=Orifice/Grate** ( Controls 0.000 cfs)
└─**5=Orifice/Grate** ( Controls 0.000 cfs)

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## Pond 2P: Stormwater Pond



**Inflow Area=72,402 sf**
**Peak Elev=224.32'**
**Storage=6,239 cf**

**Faifield Inn 2020-006**
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*Type IA 24-hr  10yr Rainfall=3.50"*
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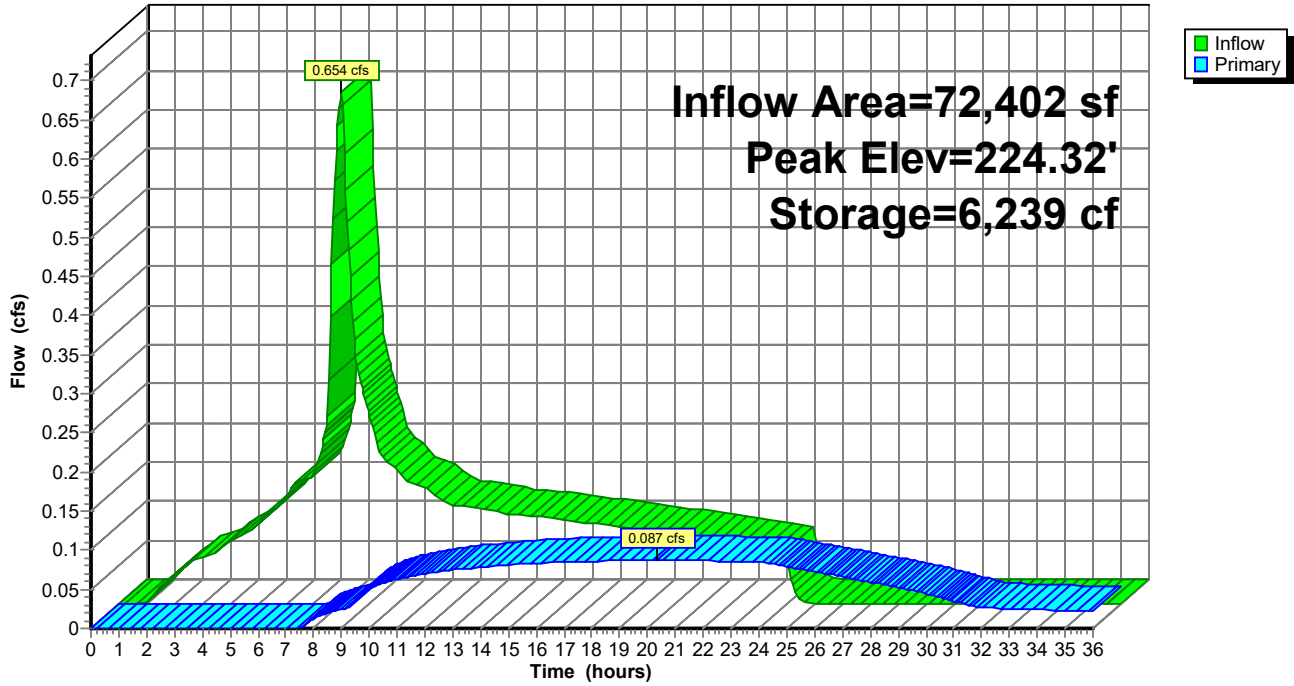
Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind method  -  Pond routing by Stor-Ind method

**Subcatchment 1S: Existing Site - West**         Runoff Area=8,298 sf  92.31% Impervious  Runoff Depth=3.11"
        Flow Length=110'  Slope=0.0315 '/'  Tc=10.0 min  CN=74/98  Runoff=0.140 cfs  2,151 cf

**Subcatchment 2S: Existing Site - East**         Runoff Area=75,367 sf  0.00% Impervious  Runoff Depth=1.57"
        Flow Length=270'  Slope=0.0200 '/'  Tc=10.0 min  CN=79/0  Runoff=0.565 cfs  9,835 cf

**Subcatchment 3S: Proposed Site - West**         Runoff Area=11,263 sf  74.83% Impervious  Runoff Depth=2.76"
        Flow Length=110'  Slope=0.0315 '/'  Tc=10.0 min  CN=74/98  Runoff=0.165 cfs  2,587 cf

**Subcatchment 4S: Proposed Site - East**         Runoff Area=72,402 sf  67.39% Impervious  Runoff Depth=2.61"
        Flow Length=216'  Slope=0.0200 '/'  Tc=10.0 min  CN=74/98  Runoff=0.994 cfs  15,721 cf

**Subcatchment 5S: Existing Area**         Runoff Area=3.520 ac  85.00% Impervious  Runoff Depth=2.94"
        Flow Length=1,468'  Tc=10.0 min  CN=71/98  Runoff=2.422 cfs  37,516 cf

**Subcatchment 6S: Existing Area**         Runoff Area=11.130 ac  85.00% Impervious  Runoff Depth=2.94"
        Flow Length=1,468'  Tc=10.0 min  CN=71/98  Runoff=7.657 cfs  118,623 cf

**Subcatchment 7S: Existing Area**         Runoff Area=3.520 ac  85.00% Impervious  Runoff Depth=2.94"
        Flow Length=1,468'  Tc=10.0 min  CN=71/98  Runoff=2.422 cfs  37,516 cf

**Subcatchment 8S: Existing Area**         Runoff Area=11.130 ac  85.00% Impervious  Runoff Depth=2.94"
        Flow Length=1,468'  Tc=10.0 min  CN=71/98  Runoff=7.657 cfs  118,623 cf

**Reach 6R: Brutscher - 18"**         Avg. Flow Depth=0.11'  Max Vel=2.41 fps  Inflow=0.140 cfs  2,151 cf
        18.0" Round Pipe  n=0.015  L=300.0'  S=0.0203 '/'  Capacity=12.960 cfs  Outflow=0.140 cfs  2,151 cf

**Reach 7R: HWY 99 - 21"**         Avg. Flow Depth=0.51'  Max Vel=4.37 fps  Inflow=2.561 cfs  39,667 cf
        21.0" Round Pipe  n=0.015  L=199.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=2.556 cfs  39,667 cf

**Reach 8R: HWY 99 - 21"**         Avg. Flow Depth=1.12'  Max Vel=6.25 fps  Inflow=10.213 cfs  158,289 cf
        21.0" Round Pipe  n=0.015  L=235.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=10.195 cfs  158,289 cf

**Reach 9R: HWY 99 -21"**         Avg. Flow Depth=1.12'  Max Vel=6.25 fps  Inflow=10.195 cfs  158,289 cf
        21.0" Round Pipe  n=0.015  L=74.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=10.190 cfs  158,289 cf

**Reach 10R: HWY 99 - 21"**         Avg. Flow Depth=1.15'  Max Vel=6.06 fps  Inflow=10.190 cfs  158,289 cf
        21.0" Round Pipe  n=0.015  L=325.0'  S=0.0093 '/'  Capacity=13.216 cfs  Outflow=10.168 cfs  158,289 cf

**Reach 11R: Brutscher - 18"**         Avg. Flow Depth=0.13'  Max Vel=2.74 fps  Inflow=0.213 cfs  13,931 cf
        18.0" Round Pipe  n=0.015  L=300.0'  S=0.0203 '/'  Capacity=12.960 cfs  Outflow=0.213 cfs  13,926 cf

**Reach 12R: HWY 99 - 21"**         Avg. Flow Depth=0.51'  Max Vel=4.34 fps  Inflow=2.509 cfs  51,442 cf
        21.0" Round Pipe  n=0.015  L=199.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=2.503 cfs  51,437 cf

**Reach 13R: HWY 99 - 21"**         Avg. Flow Depth=1.12'  Max Vel=6.24 fps  Inflow=10.158 cfs  170,060 cf
        21.0" Round Pipe  n=0.015  L=235.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=10.140 cfs  170,055 cf

**Reach 14R: HWY 99 - 21"**          Avg. Flow Depth=1.12'  Max Vel=6.24 fps  Inflow=10.140 cfs  170,055 cf
   21.0"  Round Pipe   n=0.015   L=74.0'   S=0.0100 '/'   Capacity=13.732 cfs   Outflow=10.135 cfs  170,053 cf

**Reach 15R: HWY 99 - 21"**          Avg. Flow Depth=1.15'  Max Vel=6.05 fps  Inflow=10.135 cfs  170,053 cf
   21.0"  Round Pipe   n=0.015   L=325.0'   S=0.0093 '/'   Capacity=13.216 cfs   Outflow=10.112 cfs  170,046 cf

**Pond 1P: Stormwater Planter**          Peak Elev=224.39'  Storage=462 cf   Inflow=0.165 cfs  2,587 cf
                                                             Outflow=0.074 cfs  2,507 cf

**Pond 2P: Stormwater Pond**          Peak Elev=224.89'  Storage=7,489 cf   Inflow=0.994 cfs  15,721 cf
                                                             Outflow=0.173 cfs  11,424 cf

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*Type IA 24-hr  10yr Rainfall=3.50"*
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## Summary for Subcatchment 1S: Existing Site - West

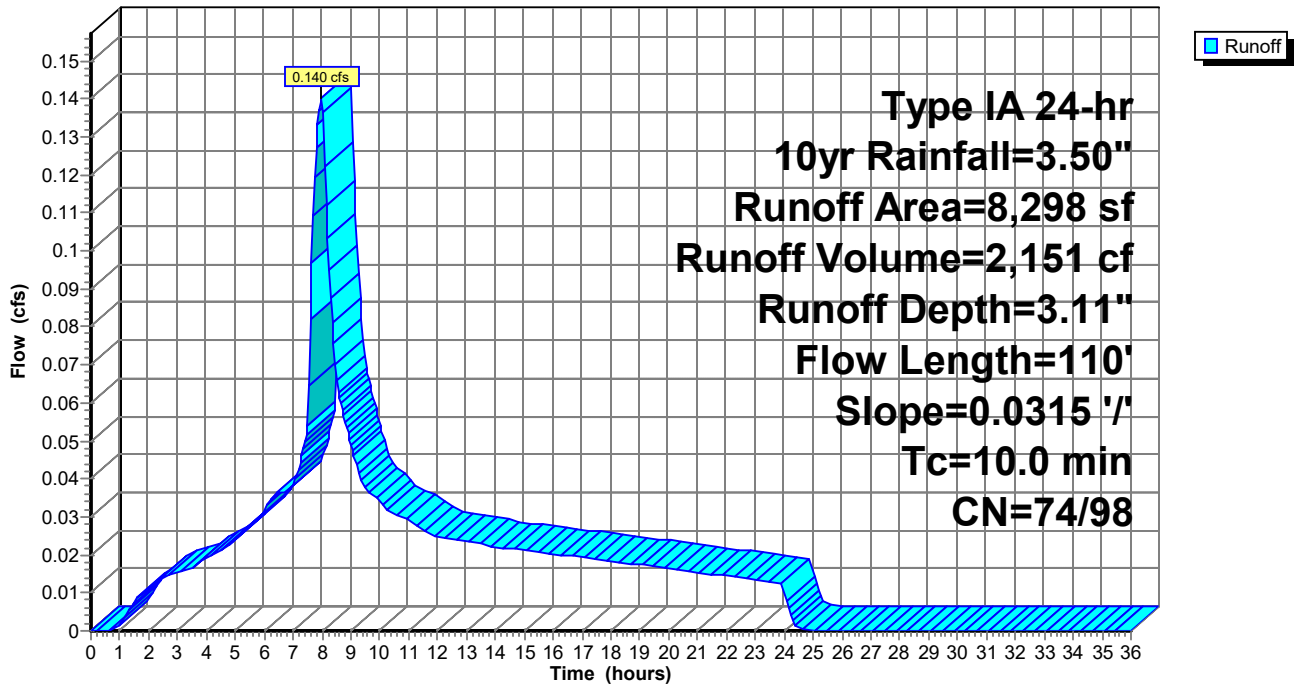Runoff     =      0.140 cfs @    7.98 hrs,  Volume=          2,151 cf,  Depth=  3.11"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  10yr Rainfall=3.50"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 7,660 | 98 | Impervious Surfaces |
| * | 638 | 74 | Landscaping |
| | 8,298 | 96 | Weighted Average |
| | 638 | 74 | 7.69% Pervious Area |
| | 7,660 | 98 | 92.31% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 0.3 | 20 | 0.0315 | 1.08 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces   n= 0.011   P2= 2.60" |
| 0.4 | 90 | 0.0315 | 3.60 | | **Shallow Concentrated Flow, Parking Lot** |
| | | | | | Paved   Kv= 20.3 fps |
| 0.7 | 110 | | Total, Increased to minimum Tc = 10.0 min | | |

### Subcatchment 1S: Existing Site - West

**Hydrograph**



Type IA 24-hr
10yr Rainfall=3.50"
Runoff Area=8,298 sf
Runoff Volume=2,151 cf
Runoff Depth=3.11"
Flow Length=110'
Slope=0.0315 '/'
Tc=10.0 min
CN=74/98

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*Type IA 24-hr  10yr Rainfall=3.50"*
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## Summary for Subcatchment 2S: Existing Site - East

Runoff     =       0.565 cfs @    8.00 hrs,  Volume=              9,835 cf,  Depth=  1.57"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  10yr Rainfall=3.50"

| Area (sf) | CN | Description |
|---|---|---|
| 75,367 | 79 | 50-75% Grass cover, Fair, HSG C |
| 75,367 | 79 | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.4 | 20 | 0.0200 | 0.08 | | **Sheet Flow, Sheet** |
| | | | | | Grass: Dense   n= 0.240  P2= 2.60" |
| 4.2 | 250 | 0.0200 | 0.99 | | **Shallow Concentrated Flow, SCF** |
| | | | | | Short Grass Pasture   Kv= 7.0 fps |
| 8.6 | 270 | | | | Total,  Increased to minimum Tc = 10.0 min |

### Subcatchment 2S: Existing Site - East

**Hydrograph**

## Summary for Subcatchment 3S: Proposed Site - West

Runoff  =  0.165 cfs @  7.98 hrs,  Volume=  2,587 cf,  Depth= 2.76"
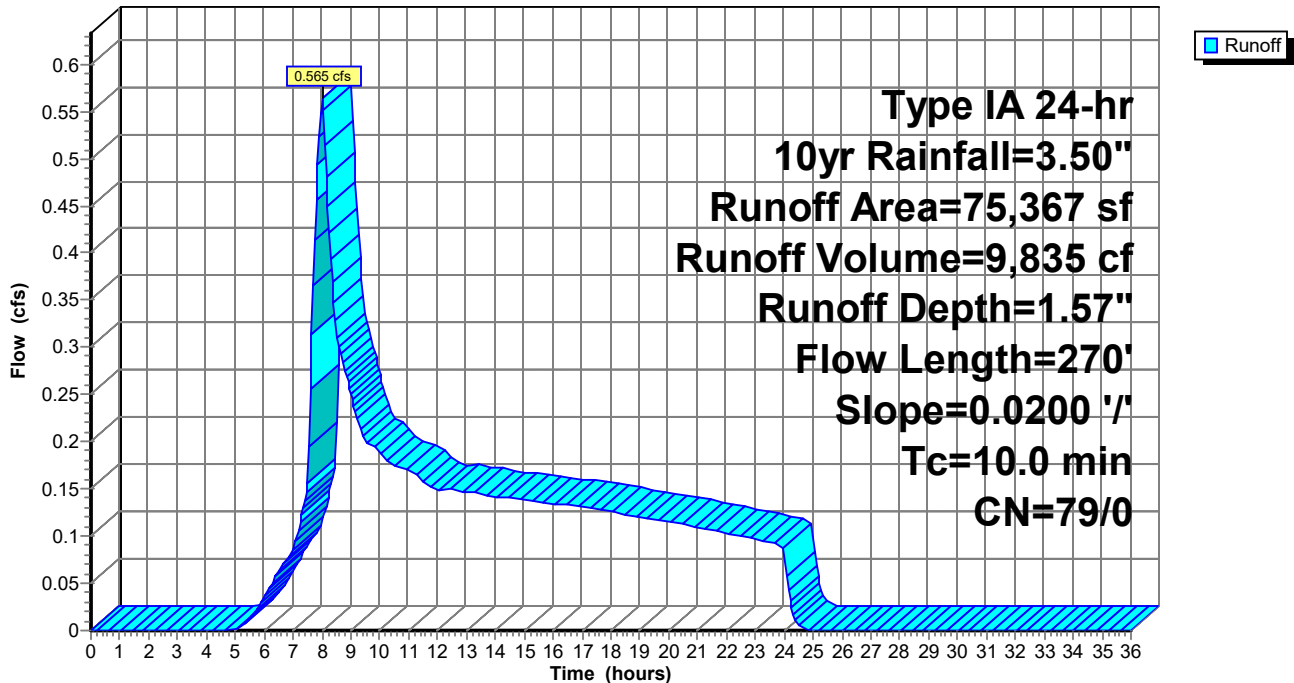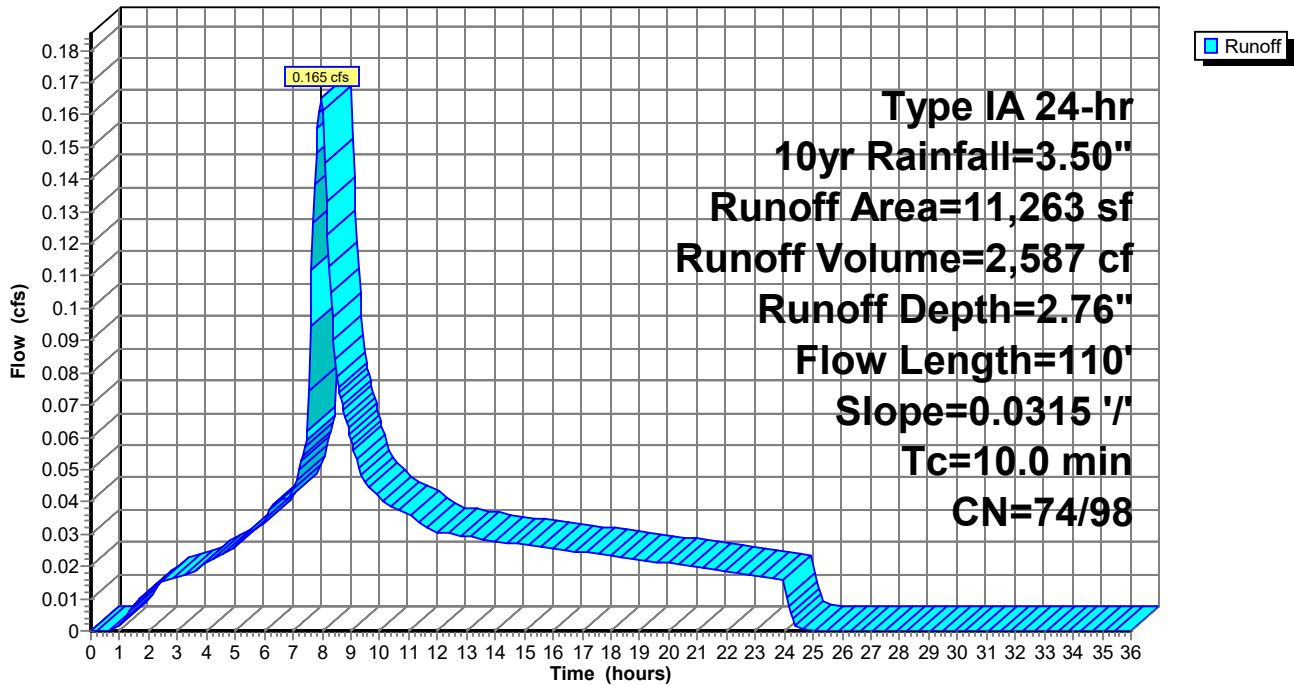
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  10yr Rainfall=3.50"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 8,428 | 98 | Parking Lot |
| * | 2,835 | 74 | Landscaping |
| | 11,263 | 92 | Weighted Average |
| | 2,835 | 74 | 25.17% Pervious Area |
| | 8,428 | 98 | 74.83% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 0.3 | 20 | 0.0315 | 1.08 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces  n= 0.011  P2= 2.60" |
| 0.4 | 90 | 0.0315 | 3.60 | | **Shallow Concentrated Flow, Parking Lot** |
| | | | | | Paved  Kv= 20.3 fps |
| 0.7 | 110 | | Total, Increased to minimum Tc = 10.0 min | | |

### Subcatchment 3S: Proposed Site - West

**Hydrograph**

### Summary for Subcatchment 4S: Proposed Site - East

Runoff      =        0.994 cfs @      7.98 hrs,  Volume=            15,721 cf,  Depth=  2.61"
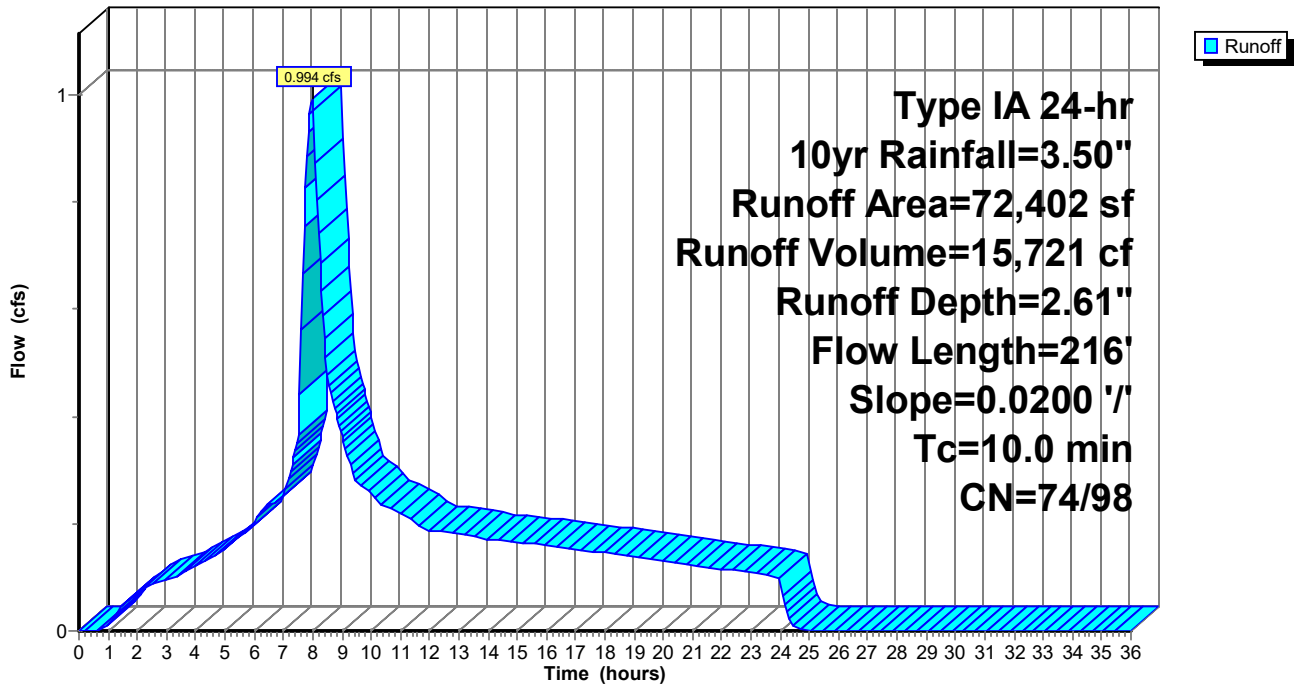
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  10yr Rainfall=3.50"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 10,847 | 98 | Building |
| * | 29,742 | 98 | Asphalt |
| * | 8,202 | 98 | Concrete |
| * | 23,611 | 74 | Landscaping |
| | 72,402 | 90 | Weighted Average |
| | 23,611 | 74 | 32.61% Pervious Area |
| | 48,791 | 98 | 67.39% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 0.4 | 20 | 0.0200 | 0.90 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces   n= 0.011   P2= 2.60" |
| 1.1 | 196 | 0.0200 | 2.87 | | **Shallow Concentrated Flow, Parking Lot to CB** |
| | | | | | Paved   Kv= 20.3 fps |
| 1.5 | 216 | | Total,  Increased to minimum Tc = 10.0 min | | |

### Subcatchment 4S: Proposed Site - East

**Hydrograph**



Type IA 24-hr
10yr Rainfall=3.50"
Runoff Area=72,402 sf
Runoff Volume=15,721 cf
Runoff Depth=2.61"
Flow Length=216'
Slope=0.0200 '/'
Tc=10.0 min
CN=74/98

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*Type IA 24-hr  10yr Rainfall=3.50"*
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## Summary for Subcatchment 5S: Existing Area

Runoff      =       2.422 cfs @     7.98 hrs,  Volume=          37,516 cf,  Depth= 2.94"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  10yr Rainfall=3.50"

| Area (ac) | CN | Description |
|---|---|---|
| 3.520 | 94 | Urban commercial, 85% imp, HSG C |
| 0.528 | 71 | 15.00% Pervious Area |
| 2.992 | 98 | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.3 | 100 | 0.0210 | 1.26 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces  n= 0.011  P2= 2.60" |
| 2.1 | 368 | 0.0210 | 2.94 | | **Shallow Concentrated Flow,** |
| | | | | | Paved   Kv= 20.3 fps |
| 6.4 | 1,000 | 0.0130 | 2.60 | 3.192 | **Pipe Channel, Pipe** |
| | | | | | 15.0"  Round  Area= 1.2 sf  Perim= 3.9'  r= 0.31' |
| | | | | | n= 0.030  Corrugated metal |
| 9.8 | 1,468 | | | | Total,  Increased to minimum Tc = 10.0 min |

## Subcatchment 5S: Existing Area

**Hydrograph**

## Summary for Subcatchment 6S: Existing Area

Runoff    =        7.657 cfs @    7.98 hrs,  Volume=        118,623 cf,  Depth= 2.94"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
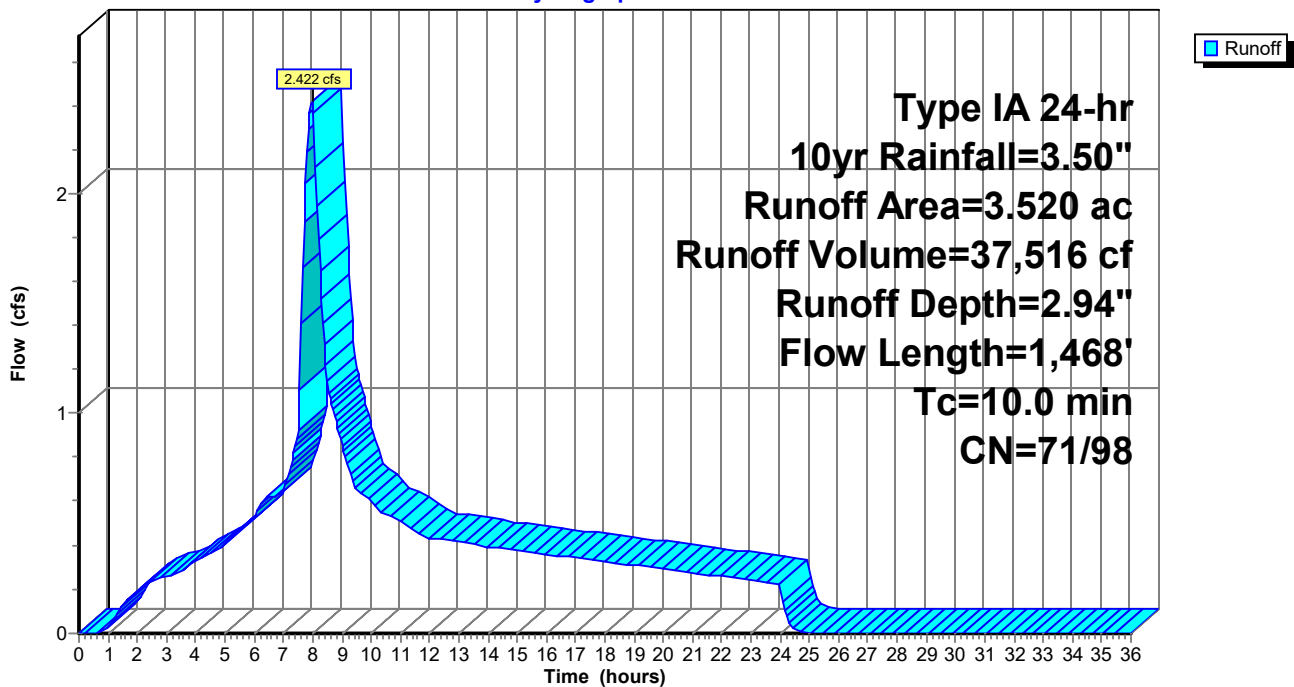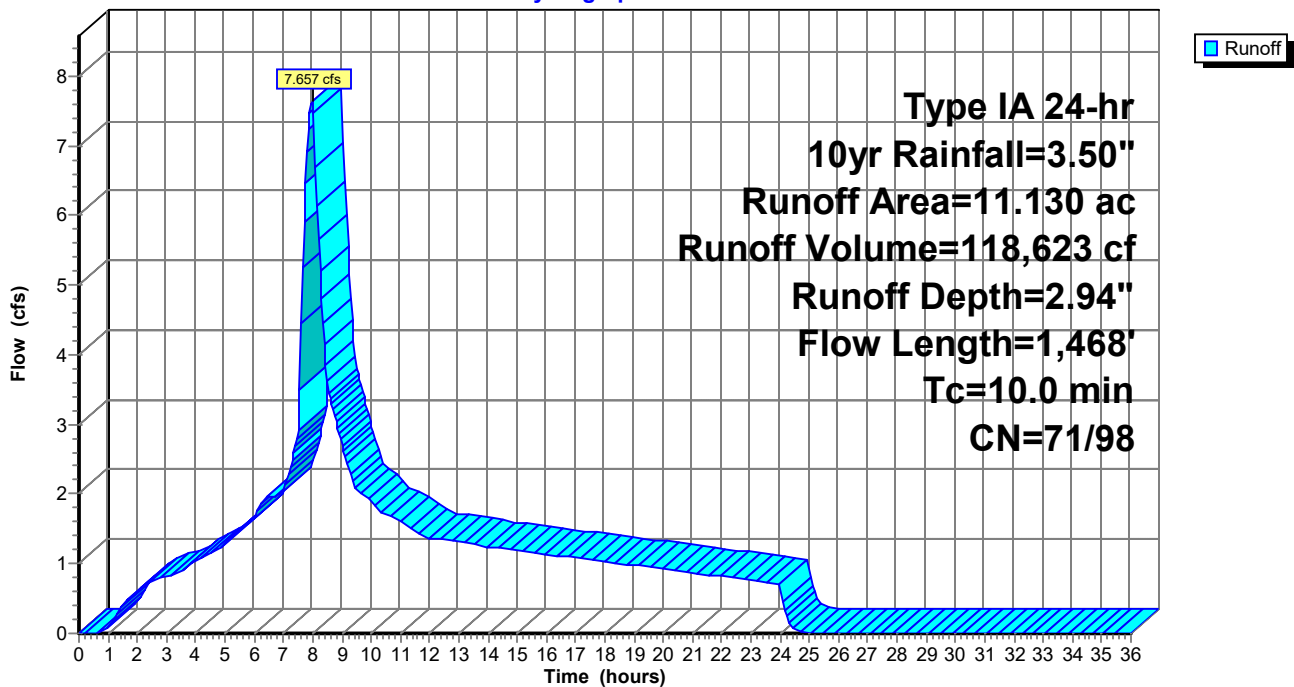Type IA 24-hr  10yr Rainfall=3.50"

| Area (ac) | CN | Description |
|---|---|---|
| 11.130 | 94 | Urban commercial, 85% imp, HSG C |
| 1.670 | 71 | 15.00% Pervious Area |
| 9.460 | 98 | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.3 | 100 | 0.0210 | 1.26 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces  n= 0.011  P2= 2.60" |
| 2.1 | 368 | 0.0210 | 2.94 | | **Shallow Concentrated Flow,** |
| | | | | | Paved  Kv= 20.3 fps |
| 6.4 | 1,000 | 0.0130 | 2.60 | 3.192 | **Pipe Channel, Pipe** |
| | | | | | 15.0" Round  Area= 1.2 sf  Perim= 3.9'  r= 0.31' |
| | | | | | n= 0.030  Corrugated metal |
| 9.8 | 1,468 | | | | Total,  Increased to minimum Tc = 10.0 min |

### Subcatchment 6S: Existing Area



**Hydrograph**

Type IA 24-hr
10yr Rainfall=3.50"
Runoff Area=11.130 ac
Runoff Volume=118,623 cf
Runoff Depth=2.94"
Flow Length=1,468'
Tc=10.0 min
CN=71/98

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*Type IA 24-hr  10yr Rainfall=3.50"*
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## Summary for Subcatchment 7S: Existing Area

Runoff      =        2.422 cfs @      7.98 hrs,  Volume=          37,516 cf,  Depth= 2.94"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
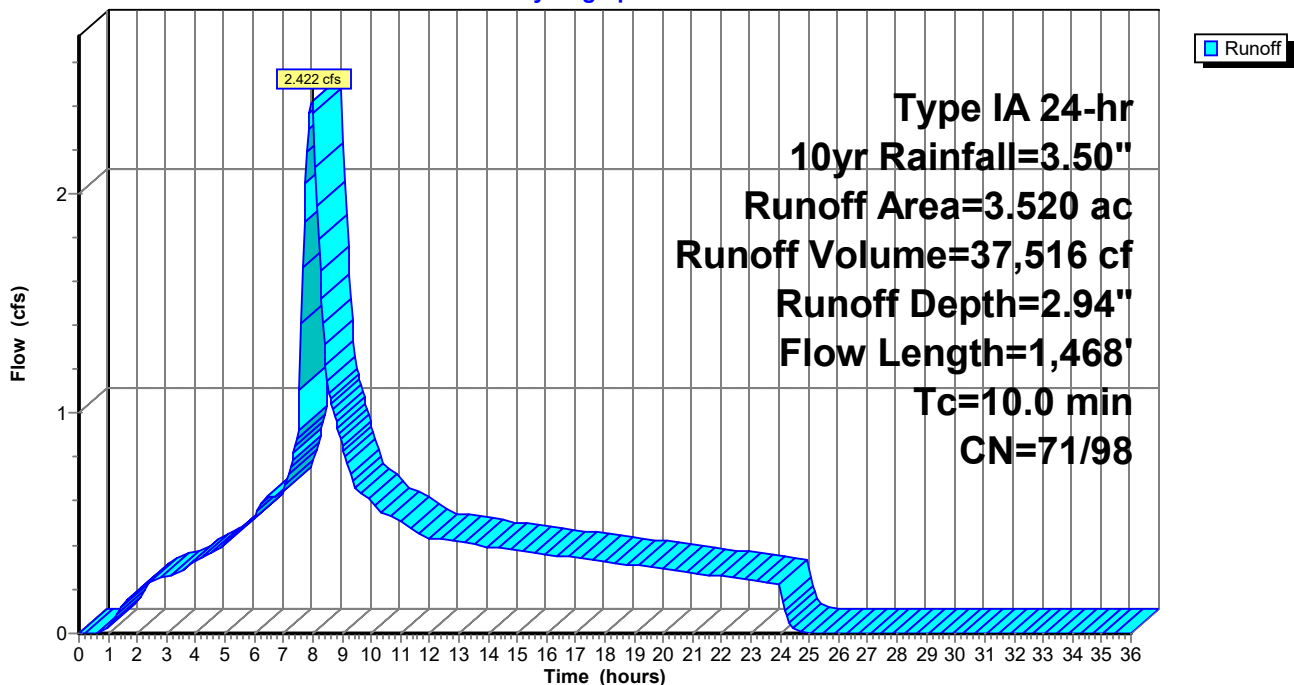Type IA 24-hr  10yr Rainfall=3.50"

| Area (ac) | CN | Description |
|---|---|---|
| 3.520 | 94 | Urban commercial, 85% imp, HSG C |
| 0.528 | 71 | 15.00% Pervious Area |
| 2.992 | 98 | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.3 | 100 | 0.0210 | 1.26 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces  n= 0.011  P2= 2.60" |
| 2.1 | 368 | 0.0210 | 2.94 | | **Shallow Concentrated Flow,** |
| | | | | | Paved  Kv= 20.3 fps |
| 6.4 | 1,000 | 0.0130 | 2.60 | 3.192 | **Pipe Channel, Pipe** |
| | | | | | 15.0" Round  Area= 1.2 sf  Perim= 3.9'  r= 0.31' |
| | | | | | n= 0.030  Corrugated metal |
| 9.8 | 1,468 | | Total, Increased to minimum Tc = 10.0 min | | |

### Subcatchment 7S: Existing Area

**Hydrograph**

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## Summary for Subcatchment 8S: Existing Area

Runoff     =        7.657 cfs @     7.98 hrs,  Volume=          118,623 cf,  Depth=  2.94"
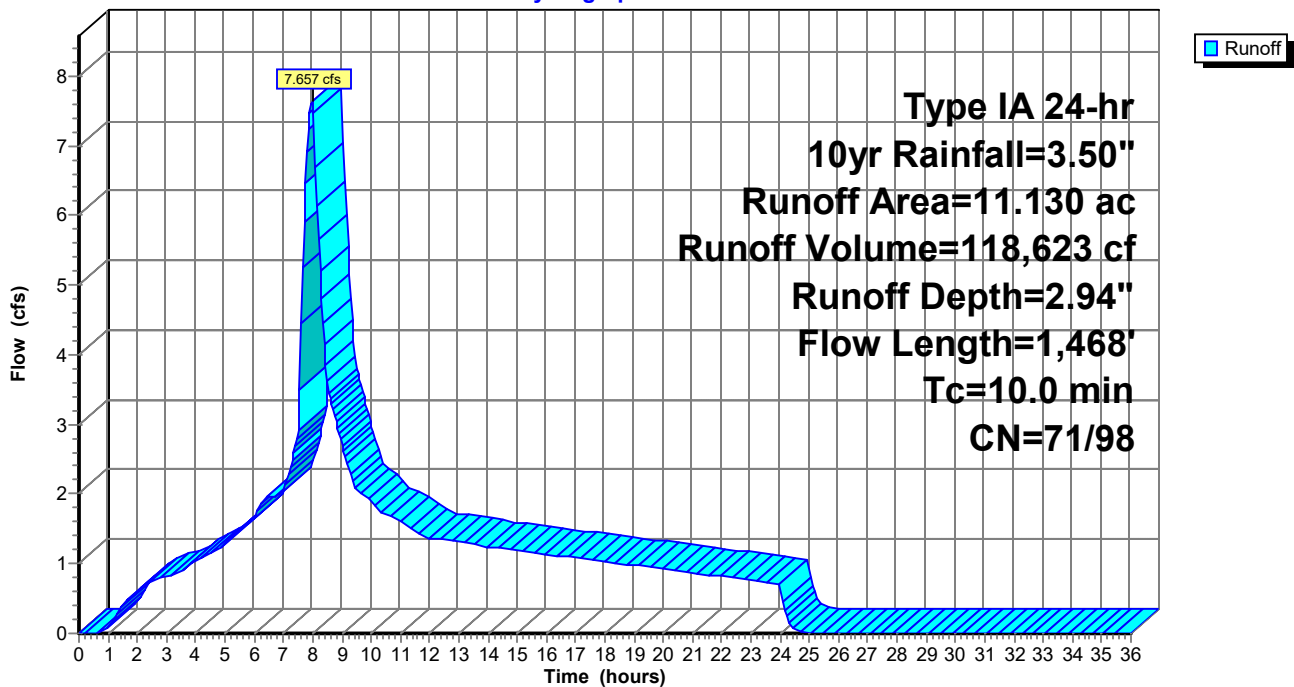
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  10yr Rainfall=3.50"

| Area (ac) | CN | Description |
|---|---|---|
| 11.130 | 94 | Urban commercial, 85% imp, HSG C |
| 1.670 | 71 | 15.00% Pervious Area |
| 9.460 | 98 | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.3 | 100 | 0.0210 | 1.26 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces  n= 0.011  P2= 2.60" |
| 2.1 | 368 | 0.0210 | 2.94 | | **Shallow Concentrated Flow,** |
| | | | | | Paved   Kv= 20.3 fps |
| 6.4 | 1,000 | 0.0130 | 2.60 | 3.192 | **Pipe Channel, Pipe** |
| | | | | | 15.0" Round  Area= 1.2 sf  Perim= 3.9'  r= 0.31' |
| | | | | | n= 0.030  Corrugated metal |
| 9.8 | 1,468 | | | | Total,  Increased to minimum Tc = 10.0 min |

## Subcatchment 8S: Existing Area

**Hydrograph**



Type IA 24-hr
10yr Rainfall=3.50"
Runoff Area=11.130 ac
Runoff Volume=118,623 cf
Runoff Depth=2.94"
Flow Length=1,468'
Tc=10.0 min
CN=71/98

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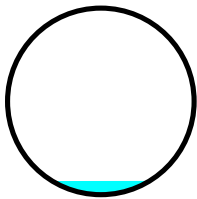## Summary for Reach 6R: Brutscher - 18"

Inflow Area =          8,298 sf,  92.31% Impervious,  Inflow Depth =   3.11"    for  10yr event
Inflow      =      0.140 cfs @    7.98 hrs,  Volume=          2,151 cf
Outflow     =      0.140 cfs @    7.99 hrs,  Volume=          2,151 cf,  Atten= 1%,  Lag= 0.7 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.41 fps,  Min. Travel Time= 2.1 min
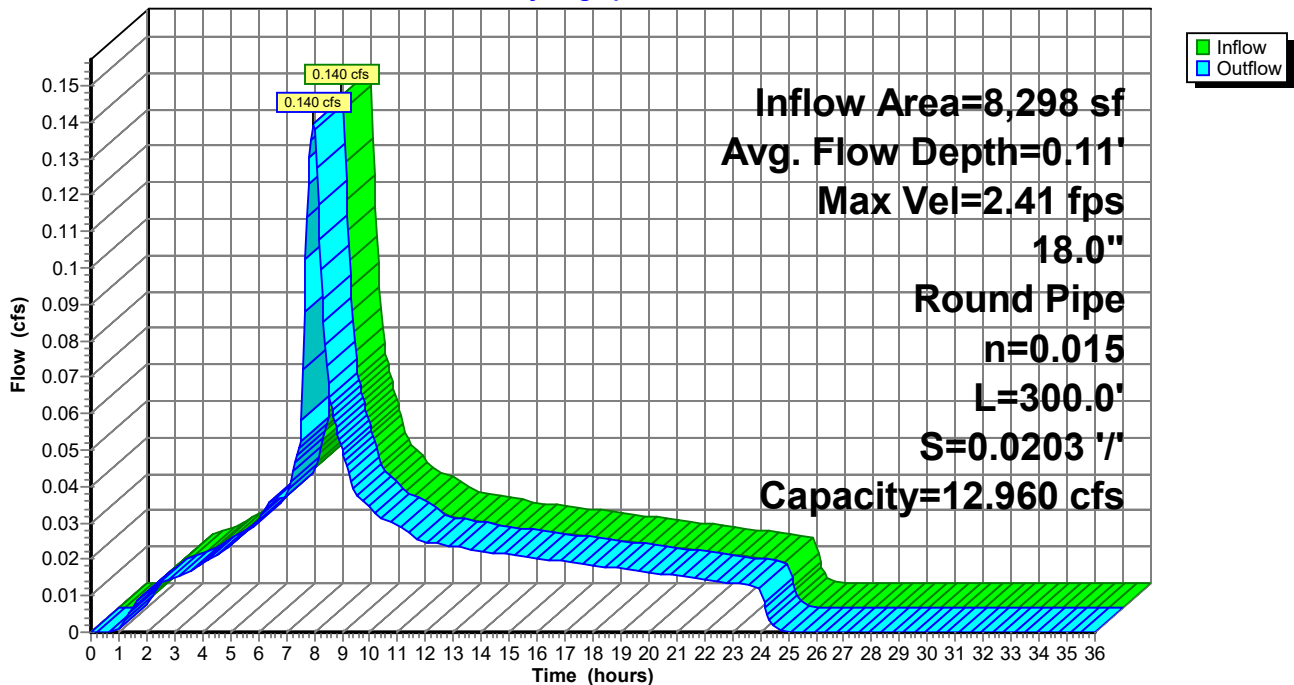Avg. Velocity = 1.36 fps,  Avg. Travel Time= 3.7 min

Peak Storage= 17 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 1.50'  Flow Area= 1.8 sf,  Capacity= 12.960 cfs

18.0"  Round Pipe
n= 0.015
Length= 300.0'   Slope= 0.0203 '/'
Inlet Invert= 212.78',  Outlet Invert= 206.70'

### Reach 6R: Brutscher - 18"



**Hydrograph**

Inflow Area=8,298 sf
Avg. Flow Depth=0.11'
Max Vel=2.41 fps
18.0"
Round Pipe
n=0.015
L=300.0'
S=0.0203 '/'
Capacity=12.960 cfs

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*Type IA 24-hr  10yr Rainfall=3.50"*
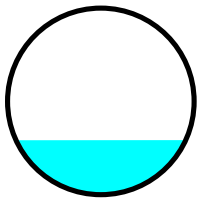Printed  3/2/2020
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## Summary for Reach 7R: HWY 99 - 21"

Inflow Area =          161,629 sf, 85.38% Impervious, Inflow Depth =  2.95"    for  10yr event
Inflow      =     2.561 cfs @    7.98 hrs, Volume=          39,667 cf
Outflow    =     2.556 cfs @    7.98 hrs, Volume=          39,667 cf, Atten= 0%,  Lag= 0.3 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.37 fps,  Min. Travel Time= 0.8 min
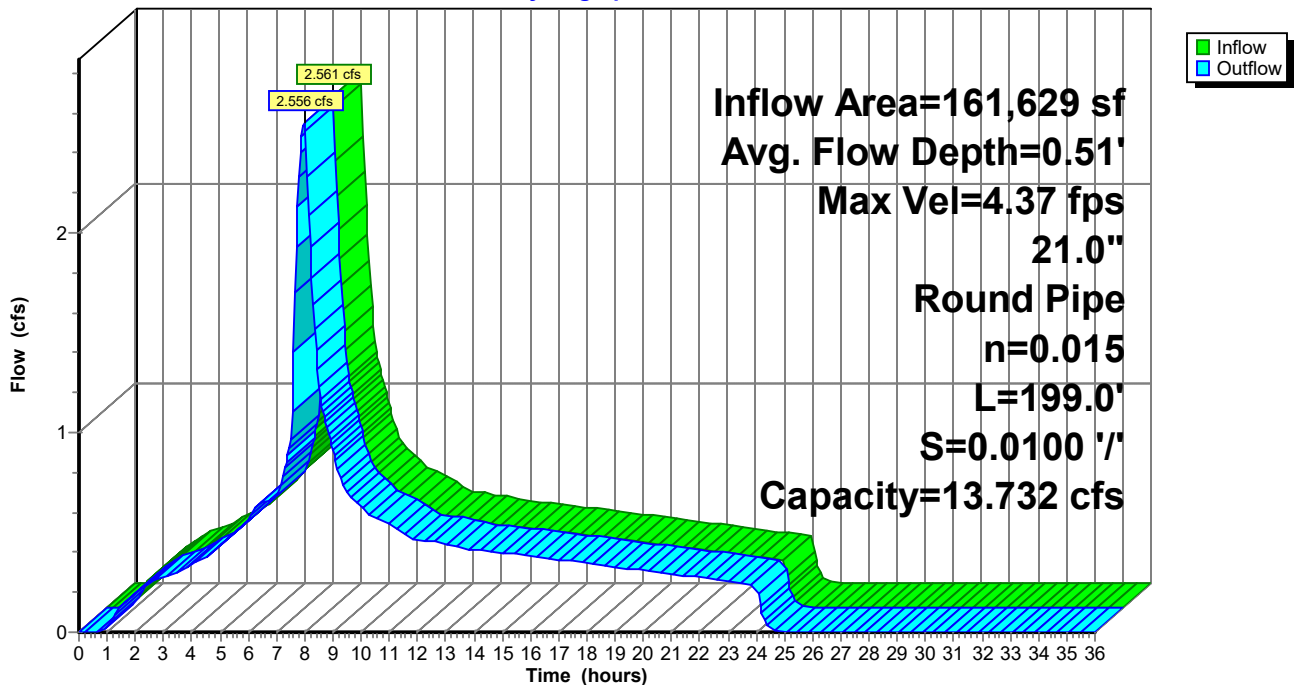Avg. Velocity = 2.43 fps,  Avg. Travel Time= 1.4 min

Peak Storage= 116 cf @ 7.98 hrs
Average Depth at Peak Storage= 0.51'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 199.0'   Slope= 0.0100 '/'
Inlet Invert= 206.61',  Outlet Invert= 204.62'

### Reach 7R: HWY 99 - 21"



**Hydrograph**

Inflow Area=161,629 sf
Avg. Flow Depth=0.51'
Max Vel=4.37 fps
21.0"
Round Pipe
n=0.015
L=199.0'
S=0.0100 '/'
Capacity=13.732 cfs

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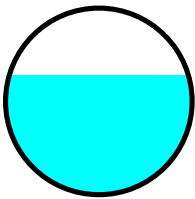Printed  3/2/2020
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## Summary for Reach 8R: HWY 99 - 21"

Inflow Area =        646,452 sf, 85.09% Impervious, Inflow Depth =  2.94"   for  10yr event
Inflow     =      10.213 cfs @    7.98 hrs, Volume=          158,289 cf
Outflow    =      10.195 cfs @    7.98 hrs, Volume=          158,289 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.25 fps,  Min. Travel Time= 0.6 min
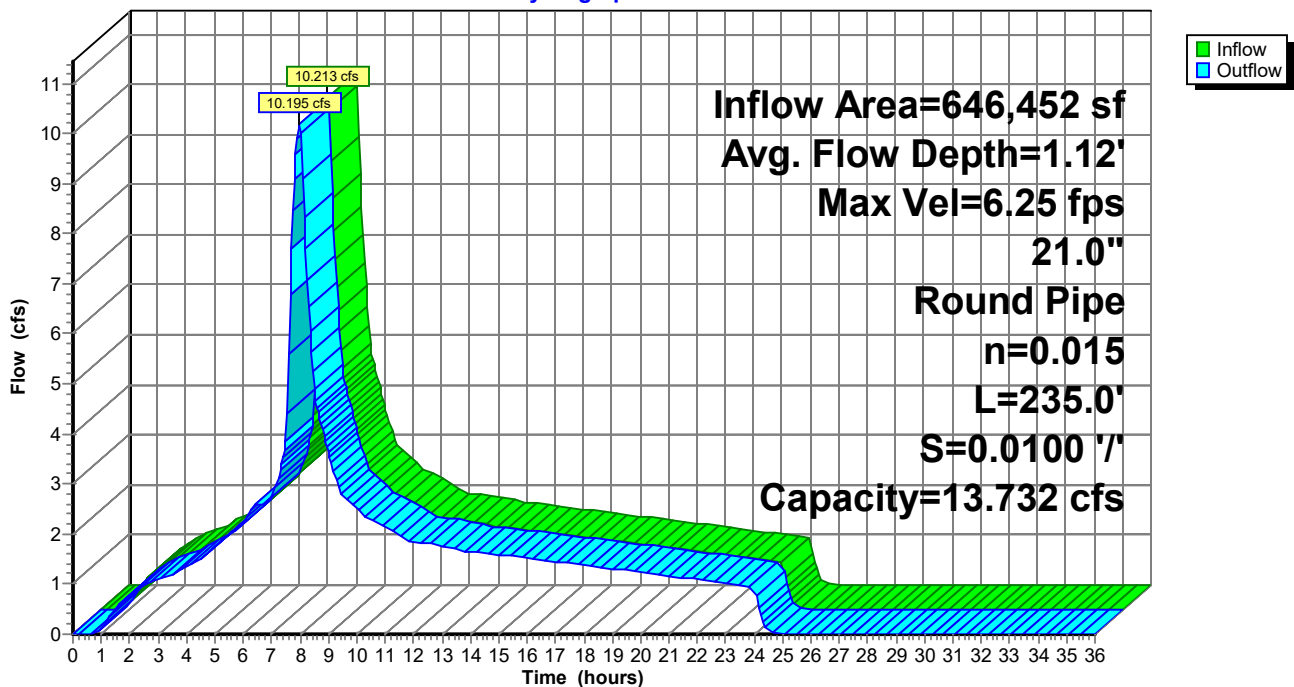Avg. Velocity = 3.61 fps,  Avg. Travel Time= 1.1 min

Peak Storage= 383 cf @ 7.98 hrs
Average Depth at Peak Storage= 1.12'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 235.0'   Slope= 0.0100 '/'
Inlet Invert= 204.62',  Outlet Invert= 202.27'

### Reach 8R: HWY 99 - 21"

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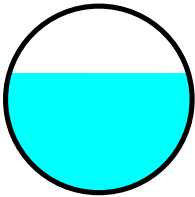Printed  3/2/2020
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## Summary for Reach 9R: HWY 99 -21"

Inflow Area =         646,452 sf, 85.09% Impervious, Inflow Depth =  2.94"    for  10yr event
Inflow      =     10.195 cfs @     7.98 hrs,  Volume=         158,289 cf
Outflow    =     10.190 cfs @     7.99 hrs,  Volume=         158,289 cf,  Atten= 0%,  Lag= 0.1 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.25 fps,  Min. Travel Time= 0.2 min
Avg. Velocity = 3.61 fps,  Avg. Travel Time= 0.3 min

Peak Storage= 121 cf @ 7.99 hrs
Average Depth at Peak Storage= 1.12'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 74.0'   Slope= 0.0100 '/'
Inlet Invert= 202.27',  Outlet Invert= 201.53'

### Reach 9R: HWY 99 -21"

**Hydrograph**



Inflow Area=646,452 sf
Avg. Flow Depth=1.12'
Max Vel=6.25 fps
21.0"
Round Pipe
n=0.015
L=74.0'
S=0.0100 '/'
Capacity=13.732 cfs

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## Summary for Reach 10R: HWY 99 - 21"

Inflow Area =        646,452 sf, 85.09% Impervious, Inflow Depth =  2.94"   for  10yr event
Inflow     =      10.190 cfs @    7.99 hrs,  Volume=           158,289 cf
Outflow    =      10.168 cfs @    7.99 hrs,  Volume=           158,289 cf, Atten= 0%,  Lag= 0.5 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.06 fps,  Min. Travel Time= 0.9 min
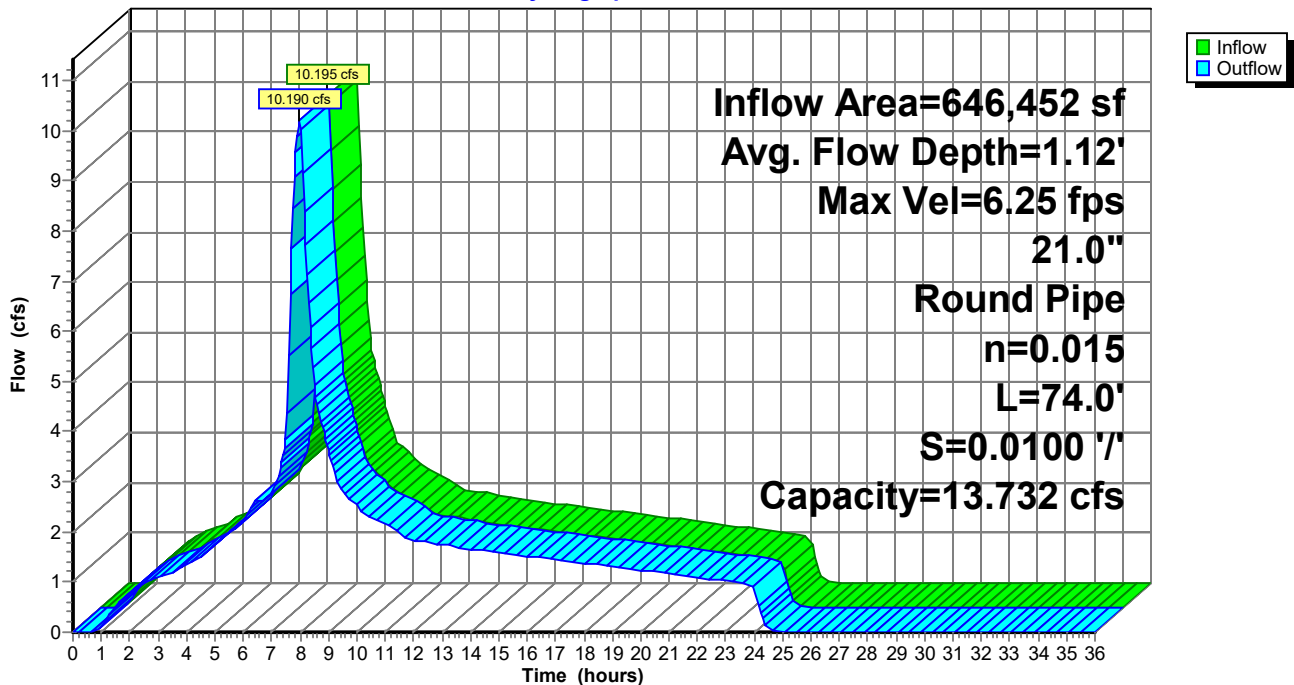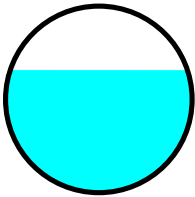Avg. Velocity = 3.47 fps,  Avg. Travel Time= 1.6 min

Peak Storage= 545 cf @ 7.99 hrs
Average Depth at Peak Storage= 1.15'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.216 cfs

21.0"  Round Pipe
n= 0.015  Concrete sewer w/manholes & inlets
Length= 325.0'   Slope= 0.0093 '/'
Inlet Invert= 201.43',  Outlet Invert= 198.42'

### Reach 10R: HWY 99 - 21"



**Hydrograph**

Inflow Area=646,452 sf
Avg. Flow Depth=1.15'
Max Vel=6.06 fps
21.0"
Round Pipe
n=0.015
L=325.0'
S=0.0093 '/'
Capacity=13.216 cfs

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## Summary for Reach 11R: Brutscher - 18"

Inflow Area =              83,665 sf, 68.39% Impervious,  Inflow Depth >  2.00"    for  10yr event
Inflow       =       0.213 cfs @   11.71 hrs,  Volume=              13,931 cf
Outflow      =       0.213 cfs @   11.73 hrs,  Volume=              13,926 cf,  Atten= 0%,  Lag= 1.3 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.74 fps,  Min. Travel Time= 1.8 min
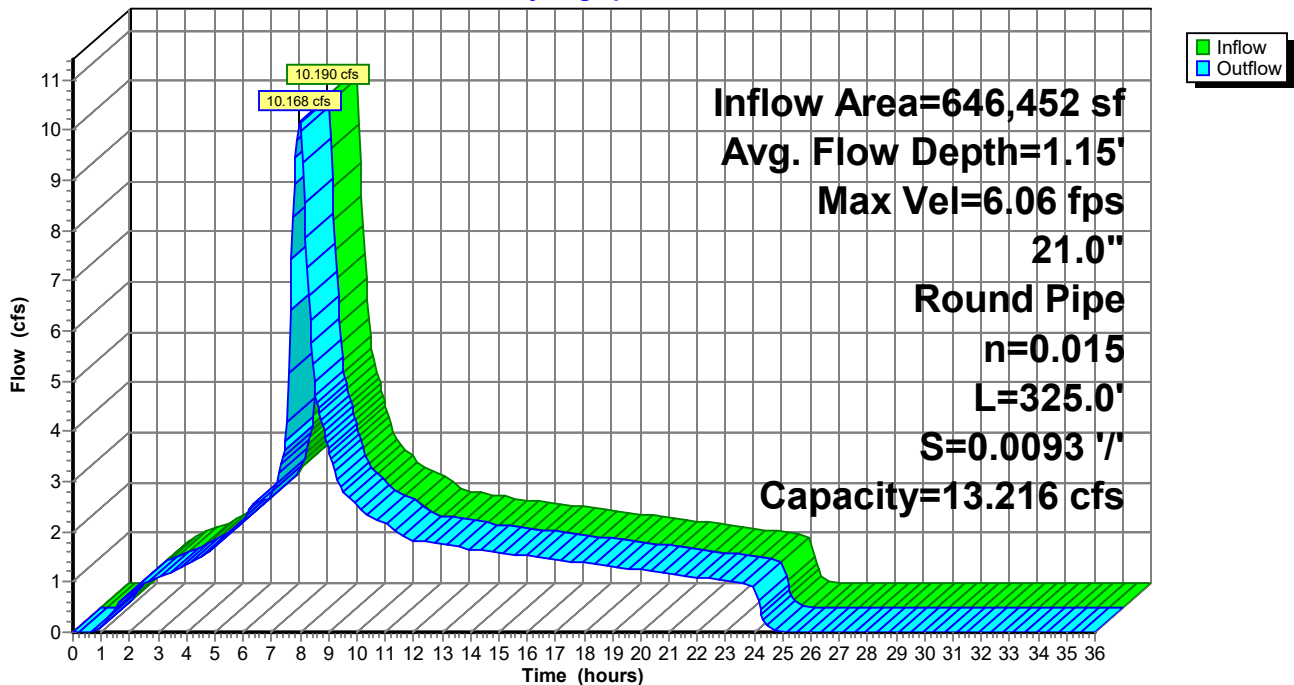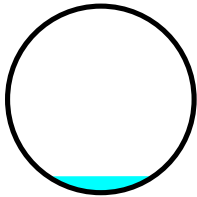Avg. Velocity = 2.15 fps,  Avg. Travel Time= 2.3 min

Peak Storage= 23 cf @ 11.73 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 1.50'  Flow Area= 1.8 sf,  Capacity= 12.960 cfs

18.0"  Round Pipe
n= 0.015
Length= 300.0'   Slope= 0.0203 '/'
Inlet Invert= 212.78',  Outlet Invert= 206.70'



### Reach 11R: Brutscher - 18"



**Hydrograph**

Inflow Area=83,665 sf
Avg. Flow Depth=0.13'
Max Vel=2.74 fps
18.0"
Round Pipe
n=0.015
L=300.0'
0.0203 '/'
Capacity= cfs

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## Summary for Reach 12R: HWY 99 - 21"

Inflow Area =         236,996 sf, 79.14% Impervious,  Inflow Depth >  2.60"    for  10yr event
Inflow      =      2.509 cfs @    7.98 hrs,  Volume=             51,442 cf
Outflow     =      2.503 cfs @    7.99 hrs,  Volume=             51,437 cf,  Atten= 0%,  Lag= 0.3 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.34 fps,  Min. Travel Time= 0.8 min
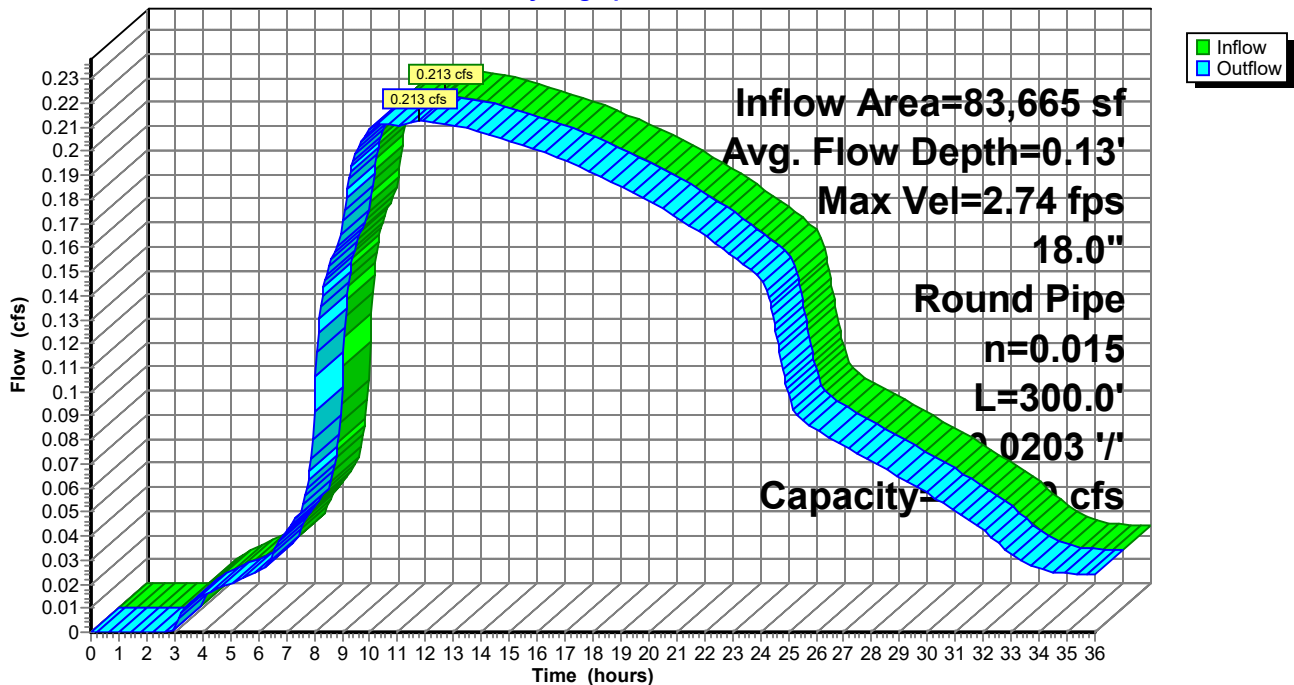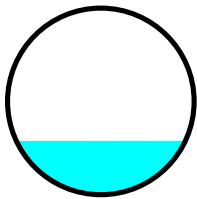Avg. Velocity = 2.28 fps,  Avg. Travel Time= 1.5 min

Peak Storage= 115 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.51'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 199.0'   Slope= 0.0100 '/'
Inlet Invert= 206.61',  Outlet Invert= 204.62'



### Reach 12R: HWY 99 - 21"



**Hydrograph**

Inflow Area=236,996 sf
Avg. Flow Depth=0.51'
Max Vel=4.34 fps
21.0"
Round Pipe
n=0.015
L=199.0'
S=0.0100 '/'
Capacity=13.732 cfs

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## Summary for Reach 13R: HWY 99 - 21"

Inflow Area =          721,819 sf, 83.07% Impervious,  Inflow Depth >  2.83"   for  10yr event
Inflow      =      10.158 cfs @     7.98 hrs,  Volume=          170,060 cf
Outflow    =      10.140 cfs @     7.99 hrs,  Volume=          170,055 cf,  Atten= 0%,  Lag= 0.3 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.24 fps,  Min. Travel Time= 0.6 min
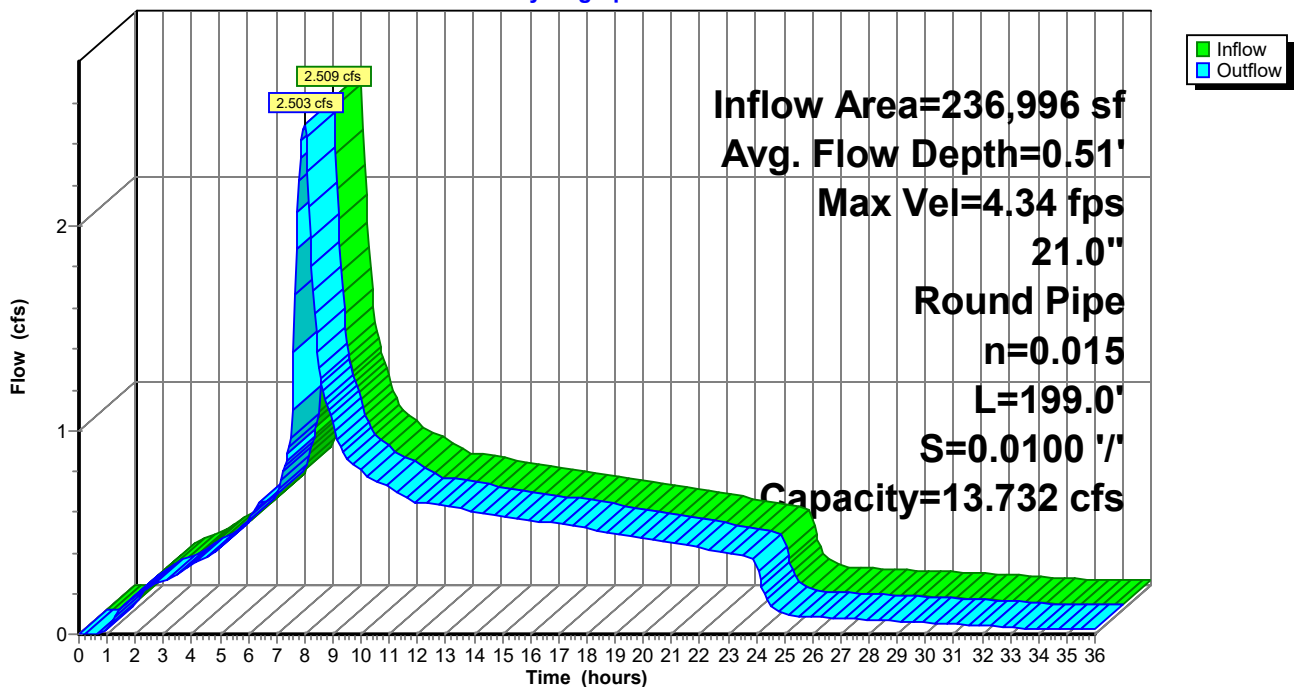Avg. Velocity = 3.06 fps,  Avg. Travel Time= 1.3 min

Peak Storage= 381 cf @ 7.99 hrs
Average Depth at Peak Storage= 1.12'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 235.0'   Slope= 0.0100 '/'
Inlet Invert= 204.62',  Outlet Invert= 202.27'



### Reach 13R: HWY 99 - 21"



**Hydrograph**

Inflow Area=721,819 sf
Avg. Flow Depth=1.12'
Max Vel=6.24 fps
21.0"
Round Pipe
n=0.015
L=235.0'
S=0.0100 '/'
Capacity=13.732 cfs

■ Inflow
■ Outflow

10.158 cfs
10.140 cfs

Flow (cfs)

Time (hours)

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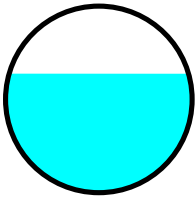
## Summary for Reach 14R: HWY 99 - 21"

Inflow Area =          721,819 sf,  83.07% Impervious,  Inflow Depth >  2.83"    for  10yr event
Inflow      =      10.140 cfs @    7.99 hrs,  Volume=          170,055 cf
Outflow     =      10.135 cfs @    7.99 hrs,  Volume=          170,053 cf,  Atten= 0%,  Lag= 0.1 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.24 fps,  Min. Travel Time= 0.2 min
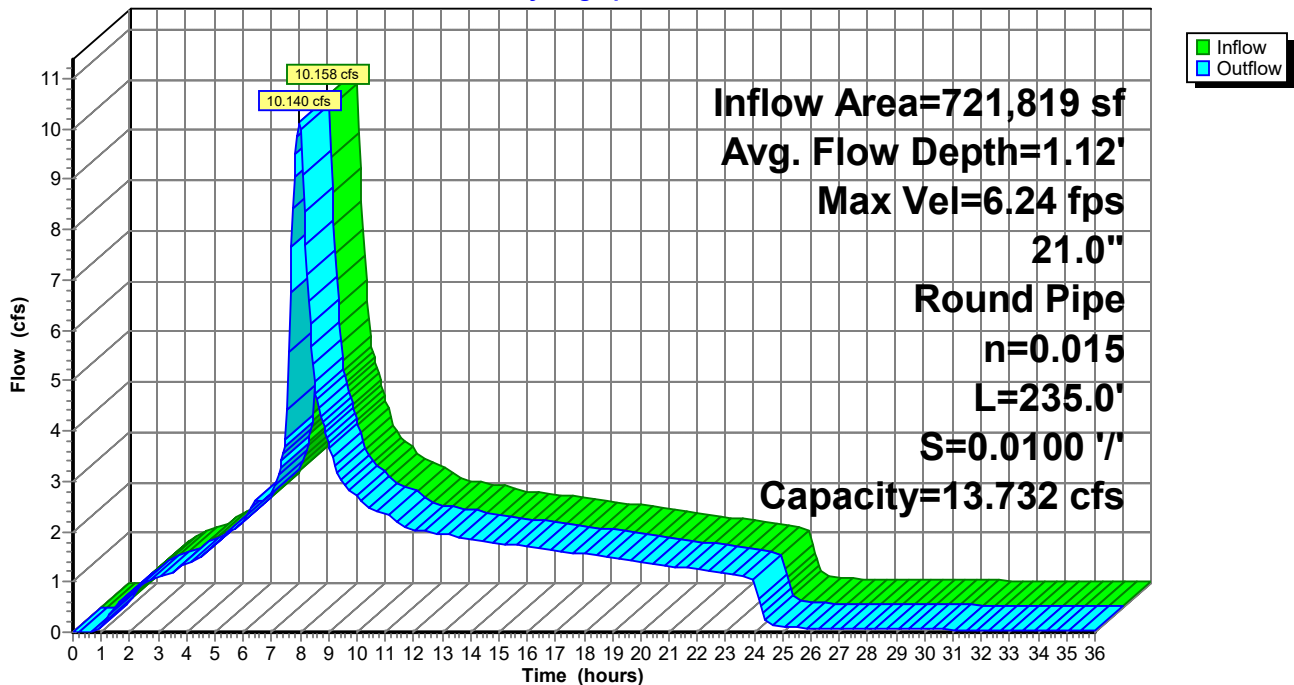Avg. Velocity = 3.06 fps,  Avg. Travel Time= 0.4 min

Peak Storage= 120 cf @ 7.99 hrs
Average Depth at Peak Storage= 1.12'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 74.0'   Slope= 0.0100 '/'
Inlet Invert= 202.27',  Outlet Invert= 201.53'

### Reach 14R: HWY 99 - 21"

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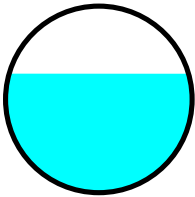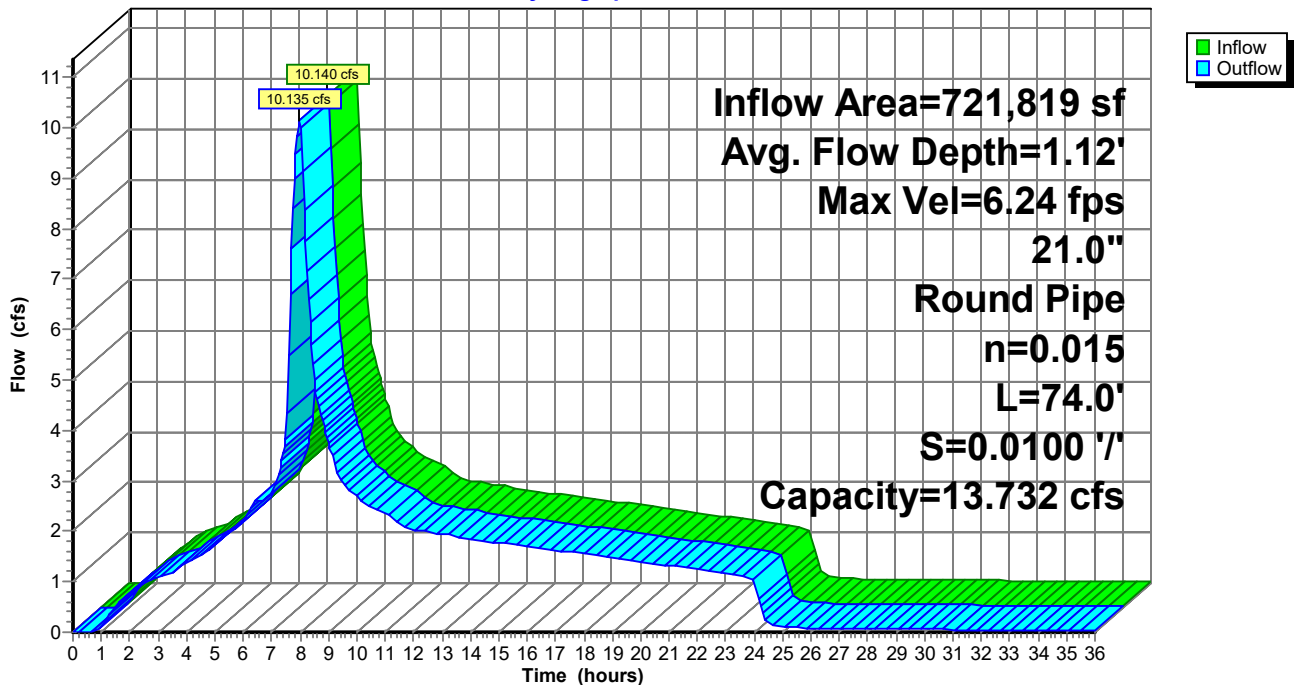Printed  3/2/2020
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## Summary for Reach 15R: HWY 99 - 21"

Inflow Area =       721,819 sf, 83.07% Impervious,  Inflow Depth >  2.83"   for  10yr event
Inflow     =     10.135 cfs @    7.99 hrs,  Volume=        170,053 cf
Outflow    =     10.112 cfs @    8.00 hrs,  Volume=        170,046 cf,  Atten= 0%,  Lag= 0.5 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.05 fps,  Min. Travel Time= 0.9 min
Avg. Velocity = 2.98 fps,  Avg. Travel Time= 1.8 min

Peak Storage= 543 cf @ 8.00 hrs
Average Depth at Peak Storage= 1.15'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.216 cfs

21.0"  Round Pipe
n= 0.015  Concrete sewer w/manholes & inlets
Length= 325.0'   Slope= 0.0093 '/'
Inlet Invert= 201.43',  Outlet Invert= 198.42'

### Reach 15R: HWY 99 - 21"



Hydrograph

Inflow Area=721,819 sf
Avg. Flow Depth=1.15'
Max Vel=6.05 fps
21.0"
Round Pipe
n=0.015
L=325.0'
S=0.0093 '/'
Capacity=13.216 cfs

■ Inflow
■ Outflow

10.135 cfs
10.112 cfs
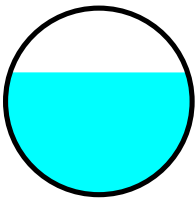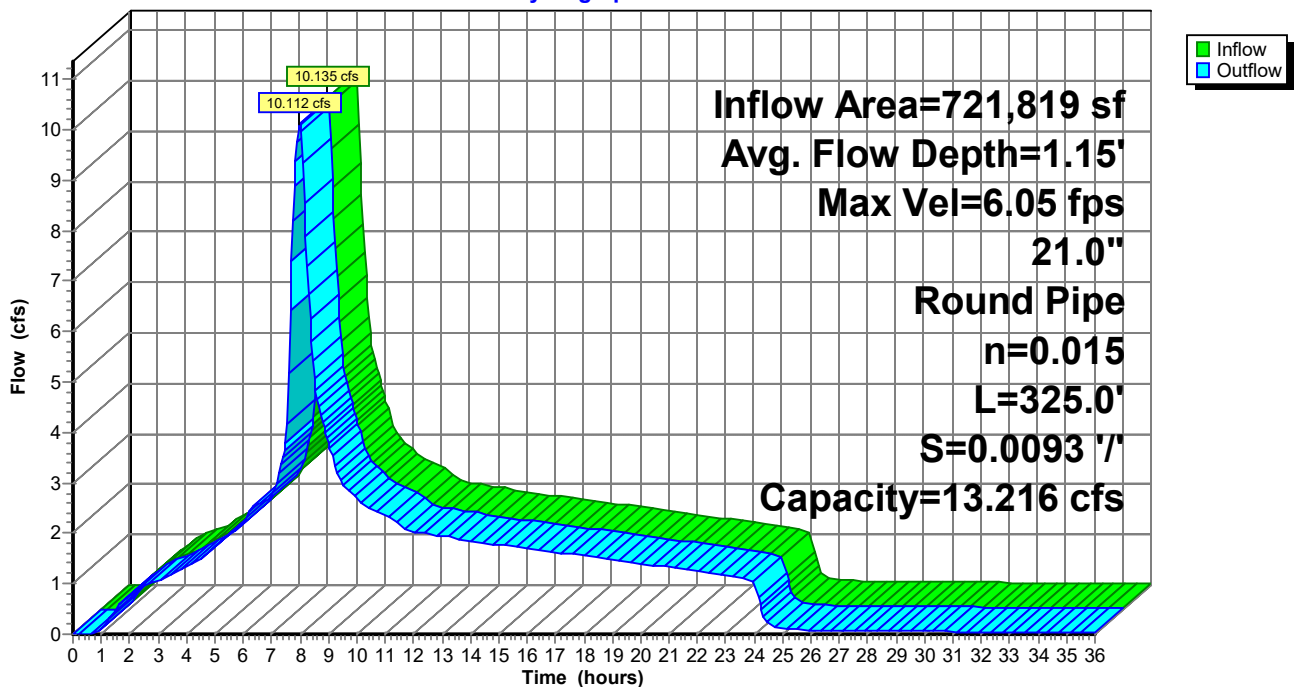
## Summary for Pond 1P: Stormwater Planter

Inflow Area =          11,263 sf,  74.83% Impervious,  Inflow Depth =  2.76"    for  10yr event
Inflow      =     0.165 cfs @    7.98 hrs,  Volume=            2,587 cf
Outflow     =     0.074 cfs @    8.60 hrs,  Volume=            2,507 cf,  Atten= 55%,  Lag= 37.1 min
Primary     =     0.074 cfs @    8.60 hrs,  Volume=            2,507 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 224.39' @ 8.60 hrs   Surf.Area= 160 sf   Storage= 462 cf

Plug-Flow detention time= 104.1 min calculated for 2,507 cf (97% of inflow)
Center-of-Mass det. time= 80.9 min ( 771.2 - 690.3 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 221.50' | 560 cf | **16.00'W x 10.00'L x 3.50'H Prismatoid** |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 222.00' | **1.2" Horiz. Orifice/Grate**   C= 0.600   Limited to weir flow at low heads |
| #2 | Primary | 223.51' | **0.8" Vert. Orifice/Grate**   C= 0.600 |
| #3 | Primary | 224.40' | **1.0" Vert. Orifice/Grate**   C= 0.600 |
| #4 | Primary | 224.50' | **6.0" Vert. Orifice/Grate**   C= 0.600 |

**Primary OutFlow**  Max=0.074 cfs @ 8.60 hrs  HW=224.39'  (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 0.058 cfs @ 7.44 fps)
└─**2=Orifice/Grate** (Orifice Controls 0.015 cfs @ 4.42 fps)
└─**3=Orifice/Grate** ( Controls 0.000 cfs)
└─**4=Orifice/Grate** ( Controls 0.000 cfs)

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## Pond 1P: Stormwater Planter



Hydrograph

Inflow Area=11,263 sf
Peak Elev=224.39'
Storage=462 cf

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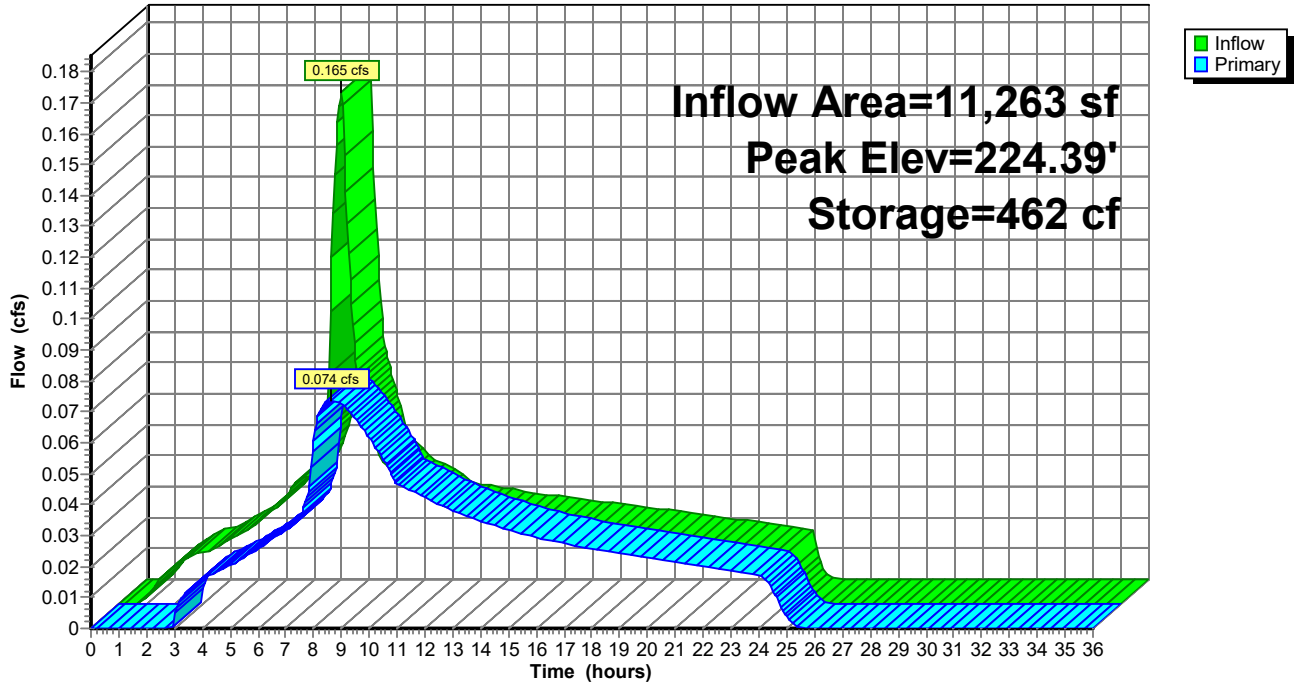
## Summary for Pond 2P: Stormwater Pond

Inflow Area =      72,402 sf, 67.39% Impervious, Inflow Depth =  2.61"   for  10yr event
Inflow    =     0.994 cfs @    7.98 hrs, Volume=        15,721 cf
Outflow   =     0.173 cfs @  13.74 hrs, Volume=        11,424 cf, Atten= 83%, Lag= 345.4 min
Primary   =     0.173 cfs @  13.74 hrs, Volume=        11,424 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 224.89' @ 13.74 hrs   Surf.Area= 2,212 sf   Storage= 7,489 cf

Plug-Flow detention time= 601.8 min calculated for 11,408 cf (73% of inflow)
Center-of-Mass det. time= 429.5 min ( 1,127.8 - 698.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 221.50' | 8,848 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 221.50 | 2,212 | 0 | 0 |
| 225.50 | 2,212 | 8,848 | 8,848 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 222.50' | **0.9" Vert. Orifice/Grate**   C= 0.600 |
| #2 | Primary | 223.15' | **0.5" Vert. Orifice/Grate**   C= 0.600 |
| #3 | Primary | 223.50' | **1.5" Vert. Orifice/Grate**   C= 0.600 |
| #4 | Primary | 224.35' | **1.9" Vert. Orifice/Grate**   C= 0.600 |
| #5 | Primary | 225.25' | **24.0" x 24.0" Horiz. Orifice/Grate**   C= 0.600<br>Limited to weir flow at low heads |

**Primary OutFlow** Max=0.173 cfs @ 13.74 hrs  HW=224.89'   (Free Discharge)
┌─**1=Orifice/Grate** (Orifice Controls 0.033 cfs @ 7.38 fps)
├─**2=Orifice/Grate** (Orifice Controls 0.009 cfs @ 6.31 fps)
├─**3=Orifice/Grate** (Orifice Controls 0.068 cfs @ 5.54 fps)
├─**4=Orifice/Grate** (Orifice Controls 0.064 cfs @ 3.25 fps)
└─**5=Orifice/Grate** ( Controls 0.000 cfs)
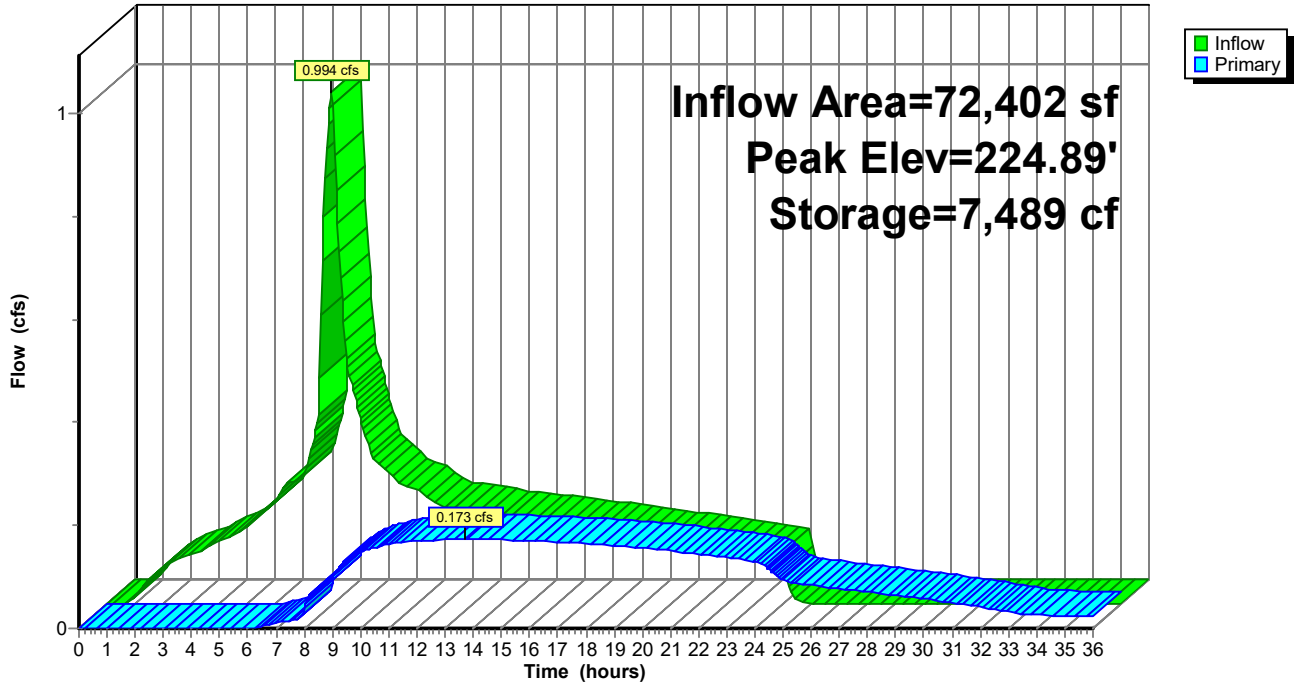
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## Pond 2P: Stormwater Pond



**Hydrograph**

Inflow Area=72,402 sf
Peak Elev=224.89'
Storage=7,489 cf

Legend: Inflow / Primary

0.994 cfs

0.173 cfs

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Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind method  -  Pond routing by Stor-Ind method

**Subcatchment 1S: Existing Site - West**      Runoff Area=8,298 sf  92.31% Impervious   Runoff Depth=3.60"
Flow Length=110'  Slope=0.0315 '/'  Tc=10.0 min  CN=74/98  Runoff=0.162 cfs  2,488 cf

**Subcatchment 2S: Existing Site - East**      Runoff Area=75,367 sf  0.00% Impervious   Runoff Depth=1.96"
Flow Length=270'  Slope=0.0200 '/'  Tc=10.0 min  CN=79/0  Runoff=0.739 cfs  12,332 cf

**Subcatchment 3S: Proposed Site - West**      Runoff Area=11,263 sf  74.83% Impervious   Runoff Depth=3.22"
Flow Length=110'  Slope=0.0315 '/'  Tc=10.0 min  CN=74/98  Runoff=0.193 cfs  3,021 cf

**Subcatchment 4S: Proposed Site - East**      Runoff Area=72,402 sf  67.39% Impervious   Runoff Depth=3.06"
Flow Length=216'  Slope=0.0200 '/'  Tc=10.0 min  CN=74/98  Runoff=1.171 cfs  18,449 cf

**Subcatchment 5S: Existing Area**      Runoff Area=3.520 ac  85.00% Impervious   Runoff Depth=3.41"
Flow Length=1,468'  Tc=10.0 min  CN=71/98  Runoff=2.808 cfs  43,565 cf

**Subcatchment 6S: Existing Area**      Runoff Area=11.130 ac  85.00% Impervious   Runoff Depth=3.41"
Flow Length=1,468'  Tc=10.0 min  CN=71/98  Runoff=8.878 cfs  137,749 cf

**Subcatchment 7S: Existing Area**      Runoff Area=3.520 ac  85.00% Impervious   Runoff Depth=3.41"
Flow Length=1,468'  Tc=10.0 min  CN=71/98  Runoff=2.808 cfs  43,565 cf

**Subcatchment 8S: Existing Area**      Runoff Area=11.130 ac  85.00% Impervious   Runoff Depth=3.41"
Flow Length=1,468'  Tc=10.0 min  CN=71/98  Runoff=8.878 cfs  137,749 cf

**Reach 6R: Brutscher - 18"**      Avg. Flow Depth=0.12'  Max Vel=2.52 fps   Inflow=0.162 cfs  2,488 cf
18.0" Round Pipe  n=0.015  L=300.0'  S=0.0203 '/'  Capacity=12.960 cfs  Outflow=0.161 cfs  2,488 cf

**Reach 7R: HWY 99 - 21"**      Avg. Flow Depth=0.55'  Max Vel=4.55 fps   Inflow=2.969 cfs  46,053 cf
21.0" Round Pipe  n=0.015  L=199.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=2.963 cfs  46,053 cf

**Reach 8R: HWY 99 - 21"**      Avg. Flow Depth=1.25'  Max Vel=6.42 fps   Inflow=11.841 cfs  183,802 cf
21.0" Round Pipe  n=0.015  L=235.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=11.820 cfs  183,802 cf

**Reach 9R: HWY 99 -21"**      Avg. Flow Depth=1.25'  Max Vel=6.42 fps   Inflow=11.820 cfs  183,802 cf
21.0" Round Pipe  n=0.015  L=74.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=11.814 cfs  183,802 cf

**Reach 10R: HWY 99 - 21"**      Avg. Flow Depth=1.29'  Max Vel=6.21 fps   Inflow=11.814 cfs  183,802 cf
21.0" Round Pipe  n=0.015  L=325.0'  S=0.0093 '/'  Capacity=13.216 cfs  Outflow=11.787 cfs  183,802 cf

**Reach 11R: Brutscher - 18"**      Avg. Flow Depth=0.15'  Max Vel=2.98 fps   Inflow=0.281 cfs  17,016 cf
18.0" Round Pipe  n=0.015  L=300.0'  S=0.0203 '/'  Capacity=12.960 cfs  Outflow=0.281 cfs  17,011 cf

**Reach 12R: HWY 99 - 21"**      Avg. Flow Depth=0.55'  Max Vel=4.54 fps   Inflow=2.941 cfs  60,576 cf
21.0" Round Pipe  n=0.015  L=199.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=2.935 cfs  60,571 cf

**Reach 13R: HWY 99 - 21"**      Avg. Flow Depth=1.25'  Max Vel=6.42 fps   Inflow=11.812 cfs  198,320 cf
21.0" Round Pipe  n=0.015  L=235.0'  S=0.0100 '/'  Capacity=13.732 cfs  Outflow=11.790 cfs  198,315 cf

**Reach 14R: HWY 99 - 21"**          Avg. Flow Depth=1.25'   Max Vel=6.42 fps   Inflow=11.790 cfs  198,315 cf
    21.0"  Round Pipe   n=0.015   L=74.0'   S=0.0100 '/'   Capacity=13.732 cfs   Outflow=11.785 cfs  198,313 cf

**Reach 15R: HWY 99 - 21"**          Avg. Flow Depth=1.29'   Max Vel=6.21 fps   Inflow=11.785 cfs  198,313 cf
    21.0"  Round Pipe   n=0.015   L=325.0'   S=0.0093 '/'   Capacity=13.216 cfs   Outflow=11.757 cfs  198,306 cf

**Pond 1P: Stormwater Planter**          Peak Elev=224.62'  Storage=499 cf   Inflow=0.193 cfs  3,021 cf
                                                       Outflow=0.133 cfs  2,941 cf

**Pond 2P: Stormwater Pond**          Peak Elev=225.26'  Storage=8,316 cf   Inflow=1.171 cfs  18,449 cf
                                                       Outflow=0.233 cfs  14,075 cf

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*Type IA 24-hr  25yr Rainfall=4.00"*
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## Summary for Subcatchment 1S: Existing Site - West

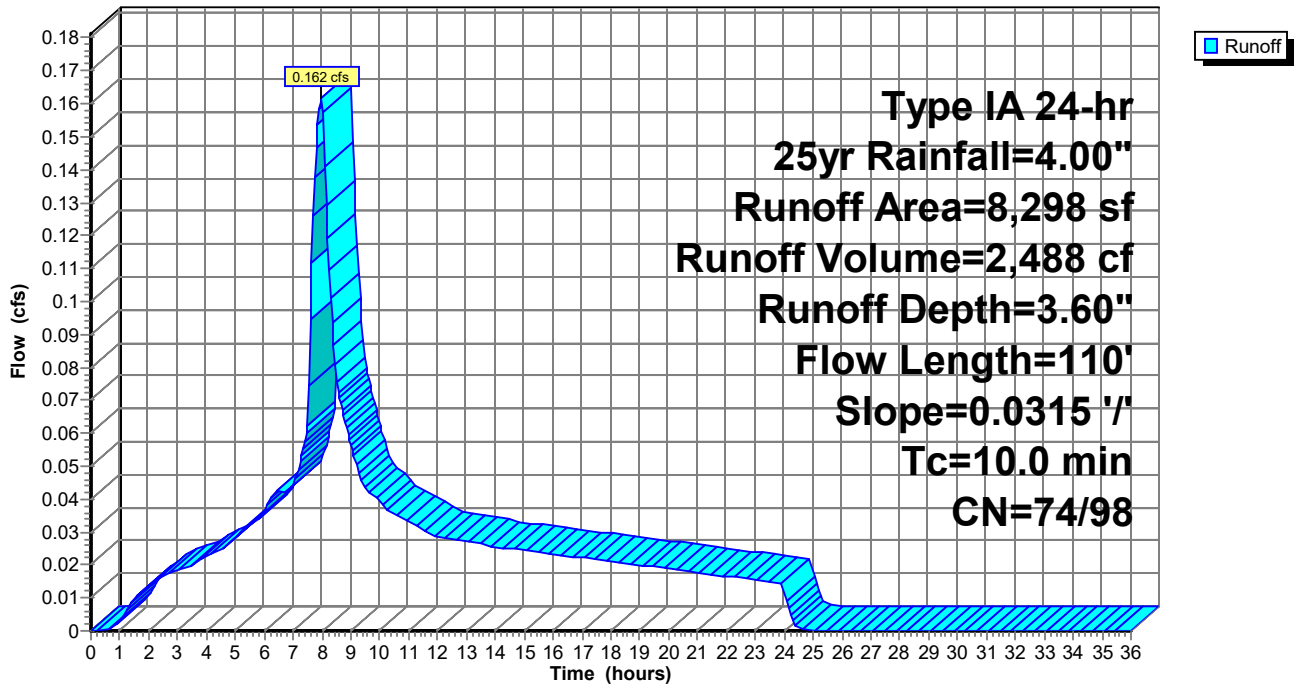Runoff     =       0.162 cfs @    7.98 hrs,  Volume=          2,488 cf,  Depth= 3.60"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  25yr Rainfall=4.00"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 7,660 | 98 | Impervious Surfaces |
| * | 638 | 74 | Landscaping |
| | 8,298 | 96 | Weighted Average |
| | 638 | 74 | 7.69% Pervious Area |
| | 7,660 | 98 | 92.31% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 0.3 | 20 | 0.0315 | 1.08 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces   n= 0.011  P2= 2.60" |
| 0.4 | 90 | 0.0315 | 3.60 | | **Shallow Concentrated Flow, Parking Lot** |
| | | | | | Paved   Kv= 20.3 fps |
| 0.7 | 110 | Total, | Increased to minimum Tc = 10.0 min | | |

### Subcatchment 1S: Existing Site - West

**Hydrograph**



Type IA 24-hr
25yr Rainfall=4.00"
Runoff Area=8,298 sf
Runoff Volume=2,488 cf
Runoff Depth=3.60"
Flow Length=110'
Slope=0.0315 '/'
Tc=10.0 min
CN=74/98

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*Type IA 24-hr  25yr Rainfall=4.00"*
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## Summary for Subcatchment 2S: Existing Site - East

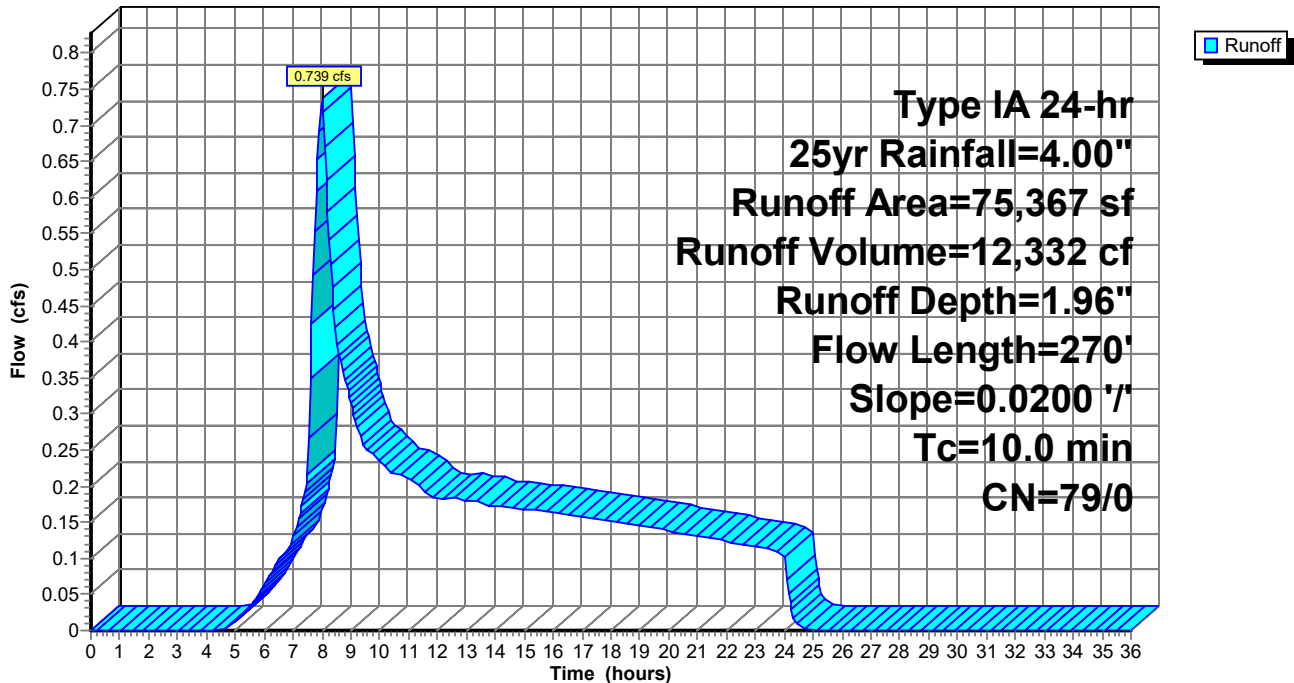Runoff      =        0.739 cfs @    8.00 hrs,  Volume=            12,332 cf,  Depth=  1.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  25yr Rainfall=4.00"

| Area (sf) | CN | Description |
|---|---|---|
| 75,367 | 79 | 50-75% Grass cover, Fair, HSG C |
| 75,367 | 79 | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.4 | 20 | 0.0200 | 0.08 | | **Sheet Flow, Sheet** |
| | | | | | Grass: Dense   n= 0.240   P2= 2.60" |
| 4.2 | 250 | 0.0200 | 0.99 | | **Shallow Concentrated Flow, SCF** |
| | | | | | Short Grass Pasture   Kv= 7.0 fps |
| 8.6 | 270 | | Total,  Increased to minimum Tc = 10.0 min | | |

### Subcatchment 2S: Existing Site - East

**Hydrograph**

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## Summary for Subcatchment 3S: Proposed Site - West

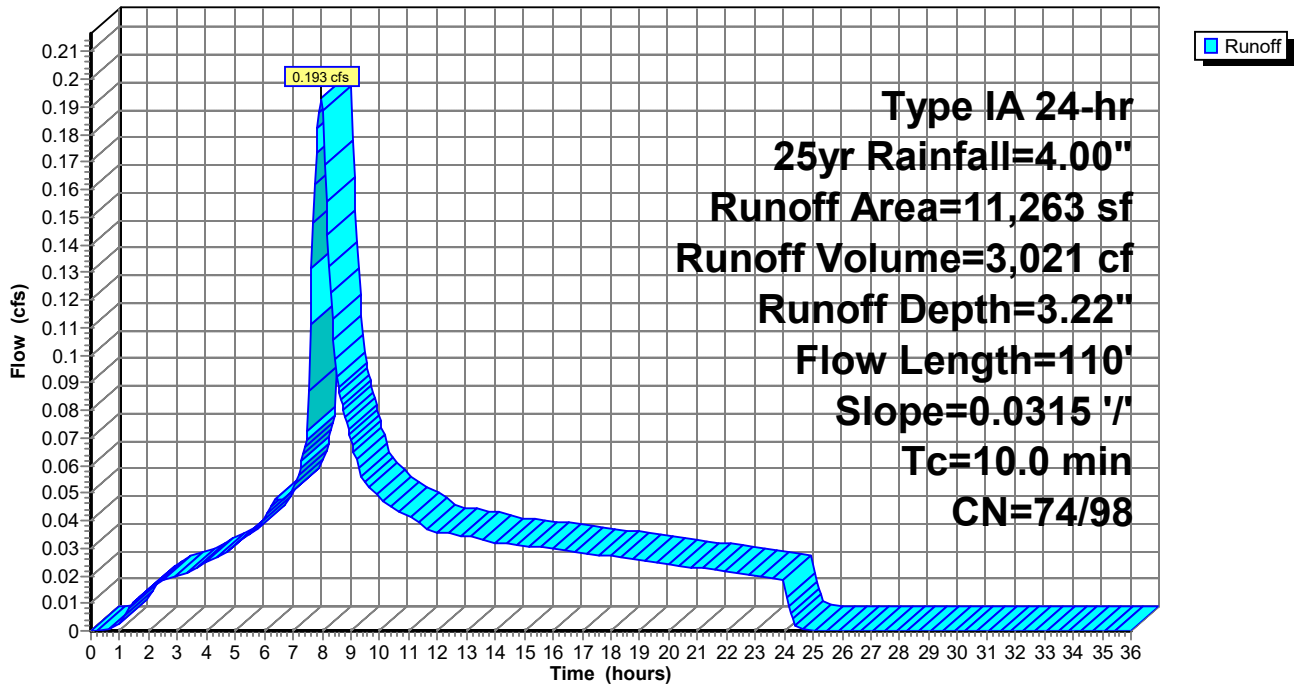Runoff      =        0.193 cfs @      7.98 hrs,  Volume=            3,021 cf,  Depth= 3.22"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  25yr Rainfall=4.00"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 8,428 | 98 | Parking Lot |
| * | 2,835 | 74 | Landscaping |
| | 11,263 | 92 | Weighted Average |
| | 2,835 | 74 | 25.17% Pervious Area |
| | 8,428 | 98 | 74.83% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 0.3 | 20 | 0.0315 | 1.08 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces   n= 0.011   P2= 2.60" |
| 0.4 | 90 | 0.0315 | 3.60 | | **Shallow Concentrated Flow, Parking Lot** |
| | | | | | Paved   Kv= 20.3 fps |
| 0.7 | 110 | Total,  Increased to minimum Tc = 10.0 min | | | |

### Subcatchment 3S: Proposed Site - West

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## Summary for Subcatchment 4S: Proposed Site - East

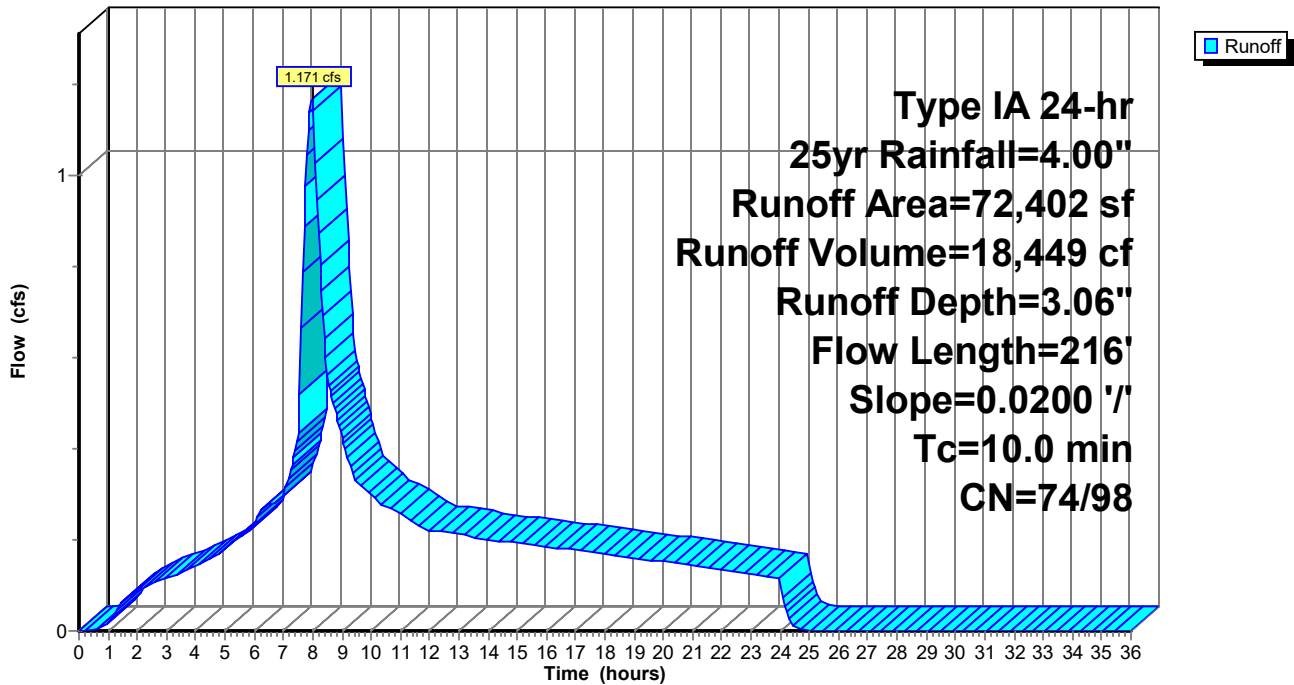Runoff      =      1.171 cfs @      7.98 hrs,  Volume=            18,449 cf,  Depth=  3.06"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  25yr Rainfall=4.00"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 10,847 | 98 | Building |
| * | 29,742 | 98 | Asphalt |
| * | 8,202 | 98 | Concrete |
| * | 23,611 | 74 | Landscaping |
| | 72,402 | 90 | Weighted Average |
| | 23,611 | 74 | 32.61% Pervious Area |
| | 48,791 | 98 | 67.39% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 0.4 | 20 | 0.0200 | 0.90 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces   n= 0.011   P2= 2.60" |
| 1.1 | 196 | 0.0200 | 2.87 | | **Shallow Concentrated Flow, Parking Lot to CB** |
| | | | | | Paved   Kv= 20.3 fps |
| 1.5 | 216 | Total, Increased to minimum Tc = 10.0 min | | | |

### Subcatchment 4S: Proposed Site - East



Type IA 24-hr
25yr Rainfall=4.00"
Runoff Area=72,402 sf
Runoff Volume=18,449 cf
Runoff Depth=3.06"
Flow Length=216'
Slope=0.0200 '/'
Tc=10.0 min
CN=74/98

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*Type IA 24-hr  25yr Rainfall=4.00"*
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## Summary for Subcatchment 5S: Existing Area

Runoff      =       2.808 cfs @     7.98 hrs,  Volume=          43,565 cf,  Depth= 3.41"
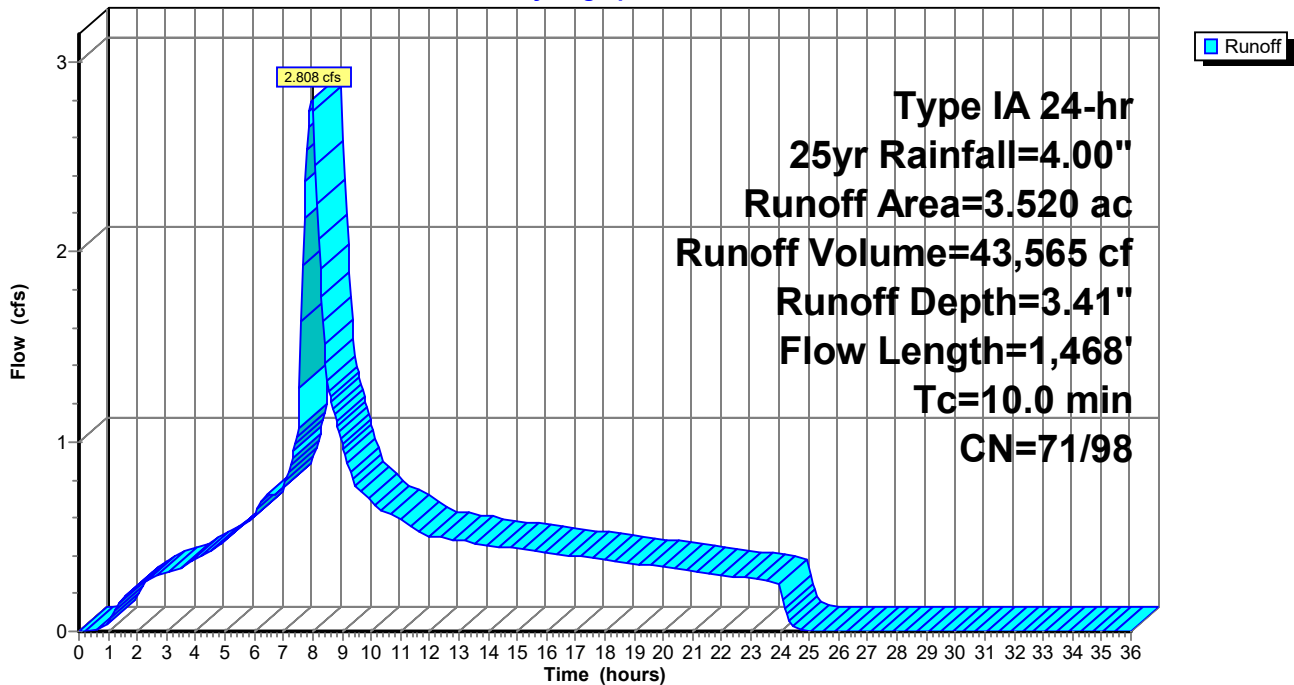
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  25yr Rainfall=4.00"

| Area (ac) | CN | Description |
|---|---|---|
| 3.520 | 94 | Urban commercial, 85% imp, HSG C |
| 0.528 | 71 | 15.00% Pervious Area |
| 2.992 | 98 | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.3 | 100 | 0.0210 | 1.26 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces  n= 0.011  P2= 2.60" |
| 2.1 | 368 | 0.0210 | 2.94 | | **Shallow Concentrated Flow,** |
| | | | | | Paved  Kv= 20.3 fps |
| 6.4 | 1,000 | 0.0130 | 2.60 | 3.192 | **Pipe Channel, Pipe** |
| | | | | | 15.0" Round  Area= 1.2 sf  Perim= 3.9'  r= 0.31' |
| | | | | | n= 0.030  Corrugated metal |
| 9.8 | 1,468 | | Total,  Increased to minimum Tc = 10.0 min | | |

## Subcatchment 5S: Existing Area

**Hydrograph**

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*Type IA 24-hr  25yr Rainfall=4.00"*
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## Summary for Subcatchment 6S: Existing Area

Runoff     =       8.878 cfs @     7.98 hrs,  Volume=          137,749 cf,  Depth= 3.41"
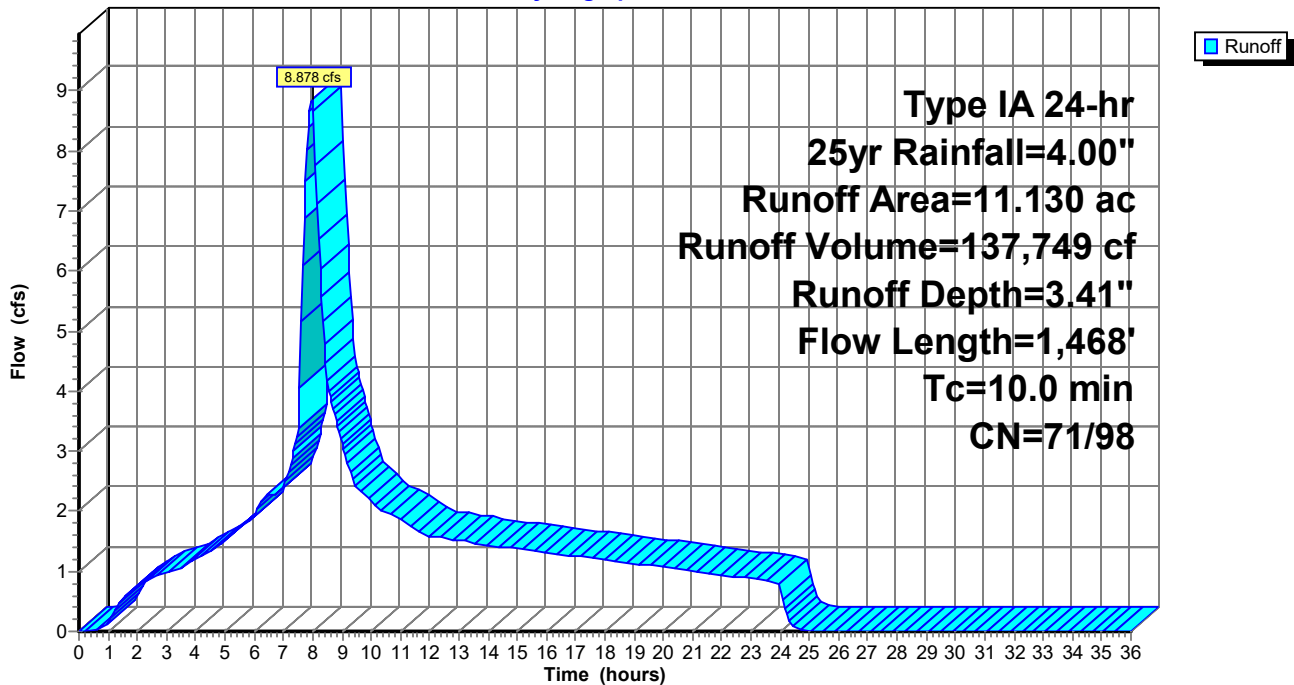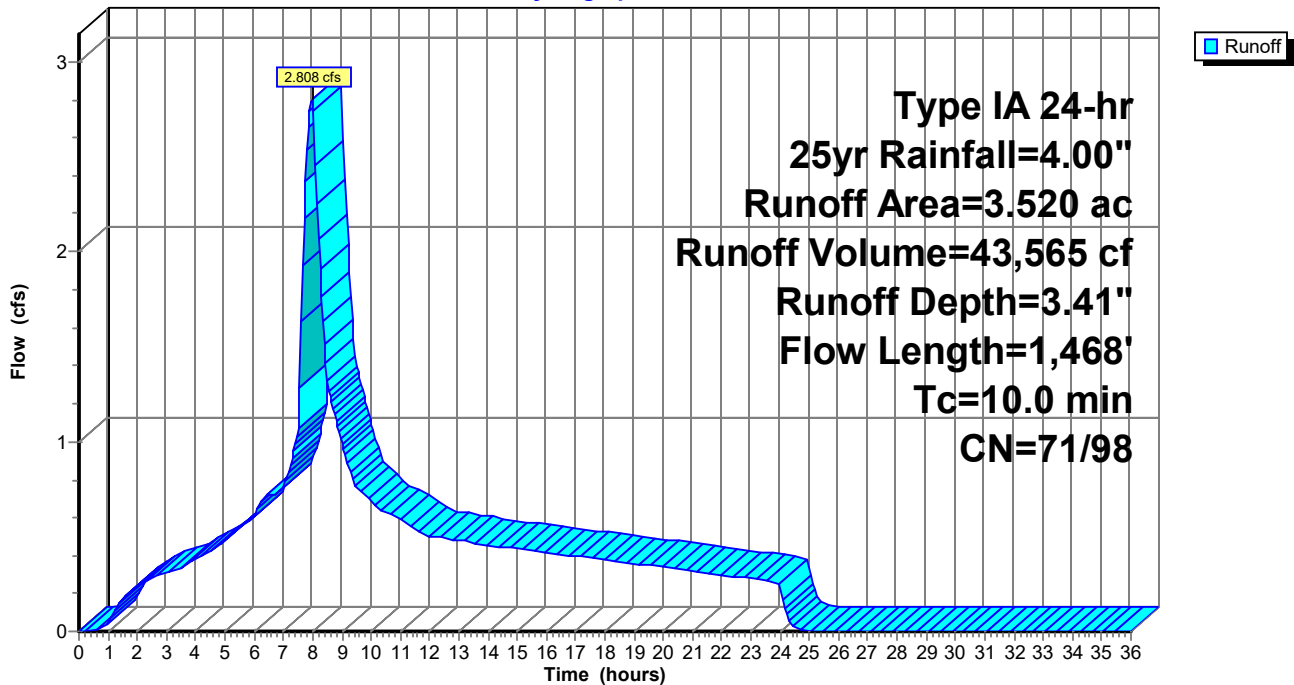
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  25yr Rainfall=4.00"

| Area (ac) | CN | Description |
|---|---|---|
| 11.130 | 94 | Urban commercial, 85% imp, HSG C |
| 1.670 | 71 | 15.00% Pervious Area |
| 9.460 | 98 | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.3 | 100 | 0.0210 | 1.26 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces   n= 0.011   P2= 2.60" |
| 2.1 | 368 | 0.0210 | 2.94 | | **Shallow Concentrated Flow,** |
| | | | | | Paved   Kv= 20.3 fps |
| 6.4 | 1,000 | 0.0130 | 2.60 | 3.192 | **Pipe Channel, Pipe** |
| | | | | | 15.0" Round  Area= 1.2 sf  Perim= 3.9'  r= 0.31' |
| | | | | | n= 0.030  Corrugated metal |
| 9.8 | 1,468 | Total, Increased to minimum Tc = 10.0 min | | | |

## Subcatchment 6S: Existing Area



**Hydrograph**

Type IA 24-hr
25yr Rainfall=4.00"
Runoff Area=11.130 ac
Runoff Volume=137,749 cf
Runoff Depth=3.41"
Flow Length=1,468'
Tc=10.0 min
CN=71/98

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*Type IA 24-hr  25yr Rainfall=4.00"*
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## Summary for Subcatchment 7S: Existing Area

Runoff     =       2.808 cfs @     7.98 hrs,  Volume=          43,565 cf,  Depth= 3.41"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  25yr Rainfall=4.00"

| Area (ac) | CN | Description |
|---|---|---|
| 3.520 | 94 | Urban commercial, 85% imp, HSG C |
| 0.528 | 71 | 15.00% Pervious Area |
| 2.992 | 98 | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.3 | 100 | 0.0210 | 1.26 | | **Sheet Flow, Sheet** Smooth surfaces  n= 0.011  P2= 2.60" |
| 2.1 | 368 | 0.0210 | 2.94 | | **Shallow Concentrated Flow,** Paved  Kv= 20.3 fps |
| 6.4 | 1,000 | 0.0130 | 2.60 | 3.192 | **Pipe Channel, Pipe** 15.0" Round  Area= 1.2 sf  Perim= 3.9'  r= 0.31' n= 0.030  Corrugated metal |
| 9.8 | 1,468 | | | | Total,  Increased to minimum Tc = 10.0 min |

## Subcatchment 7S: Existing Area

**Hydrograph**



Type IA 24-hr
25yr Rainfall=4.00"
Runoff Area=3.520 ac
Runoff Volume=43,565 cf
Runoff Depth=3.41"
Flow Length=1,468'
Tc=10.0 min
CN=71/98

## Summary for Subcatchment 8S: Existing Area

Runoff    =      8.878 cfs @    7.98 hrs,  Volume=        137,749 cf,  Depth= 3.41"
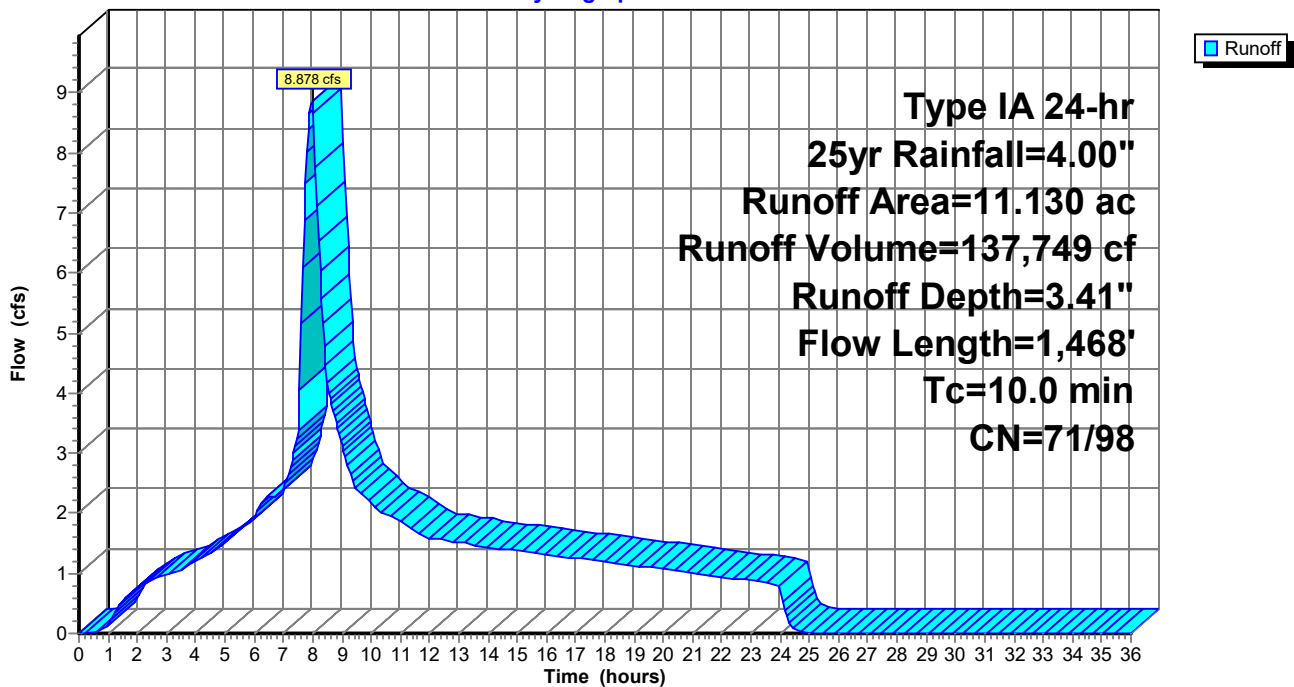
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr  25yr Rainfall=4.00"

| Area (ac) | CN | Description |
|---|---|---|
| 11.130 | 94 | Urban commercial, 85% imp, HSG C |
| 1.670 | 71 | 15.00% Pervious Area |
| 9.460 | 98 | 85.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 1.3 | 100 | 0.0210 | 1.26 | | **Sheet Flow, Sheet** |
| | | | | | Smooth surfaces  n= 0.011  P2= 2.60" |
| 2.1 | 368 | 0.0210 | 2.94 | | **Shallow Concentrated Flow,** |
| | | | | | Paved  Kv= 20.3 fps |
| 6.4 | 1,000 | 0.0130 | 2.60 | 3.192 | **Pipe Channel, Pipe** |
| | | | | | 15.0" Round  Area= 1.2 sf  Perim= 3.9'  r= 0.31' |
| | | | | | n= 0.030  Corrugated metal |
| 9.8 | 1,468 | | | | Total,  Increased to minimum Tc = 10.0 min |

### Subcatchment 8S: Existing Area



**Hydrograph**

Type IA 24-hr
25yr Rainfall=4.00"
Runoff Area=11.130 ac
Runoff Volume=137,749 cf
Runoff Depth=3.41"
Flow Length=1,468'
Tc=10.0 min
CN=71/98

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*Type IA 24-hr  25yr Rainfall=4.00"*
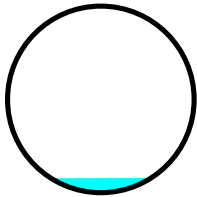Printed  3/2/2020
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## Summary for Reach 6R: Brutscher - 18"

Inflow Area =          8,298 sf, 92.31% Impervious,  Inflow Depth =   3.60"    for  25yr event
Inflow       =      0.162 cfs @    7.98 hrs,  Volume=          2,488 cf
Outflow     =      0.161 cfs @    7.99 hrs,  Volume=          2,488 cf,  Atten= 1%,  Lag= 0.7 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.52 fps,  Min. Travel Time= 2.0 min
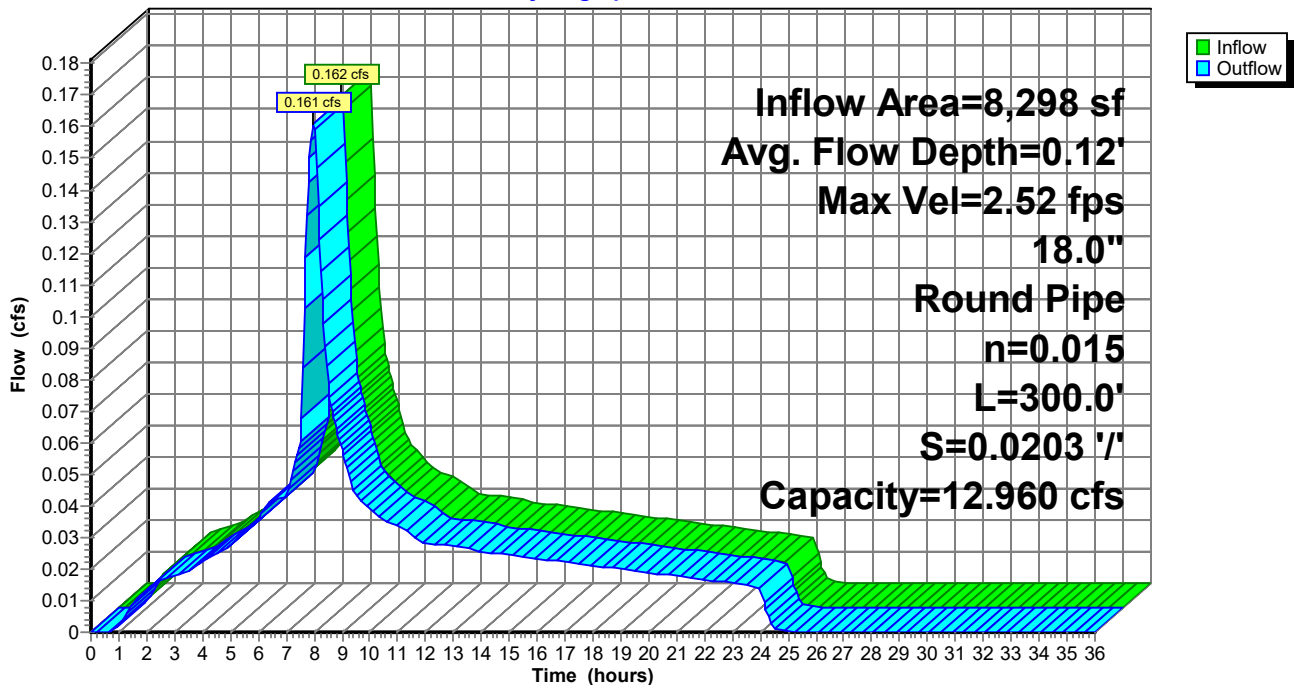Avg. Velocity = 1.42 fps,  Avg. Travel Time= 3.5 min

Peak Storage= 19 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 1.50'  Flow Area= 1.8 sf,  Capacity= 12.960 cfs

18.0"  Round Pipe
n= 0.015
Length= 300.0'   Slope= 0.0203 '/'
Inlet Invert= 212.78',  Outlet Invert= 206.70'

### Reach 6R: Brutscher - 18"



**Hydrograph**

Inflow Area=8,298 sf
Avg. Flow Depth=0.12'
Max Vel=2.52 fps
18.0"
Round Pipe
n=0.015
L=300.0'
S=0.0203 '/'
Capacity=12.960 cfs

Legend: Inflow, Outflow

0.162 cfs
0.161 cfs

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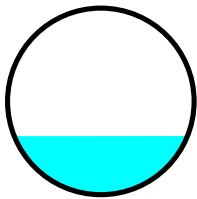
## Summary for Reach 7R: HWY 99 - 21"

Inflow Area =          161,629 sf, 85.38% Impervious, Inflow Depth =  3.42"   for  25yr event
Inflow     =     2.969 cfs @    7.98 hrs, Volume=          46,053 cf
Outflow    =     2.963 cfs @    7.98 hrs, Volume=          46,053 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.55 fps,  Min. Travel Time= 0.7 min
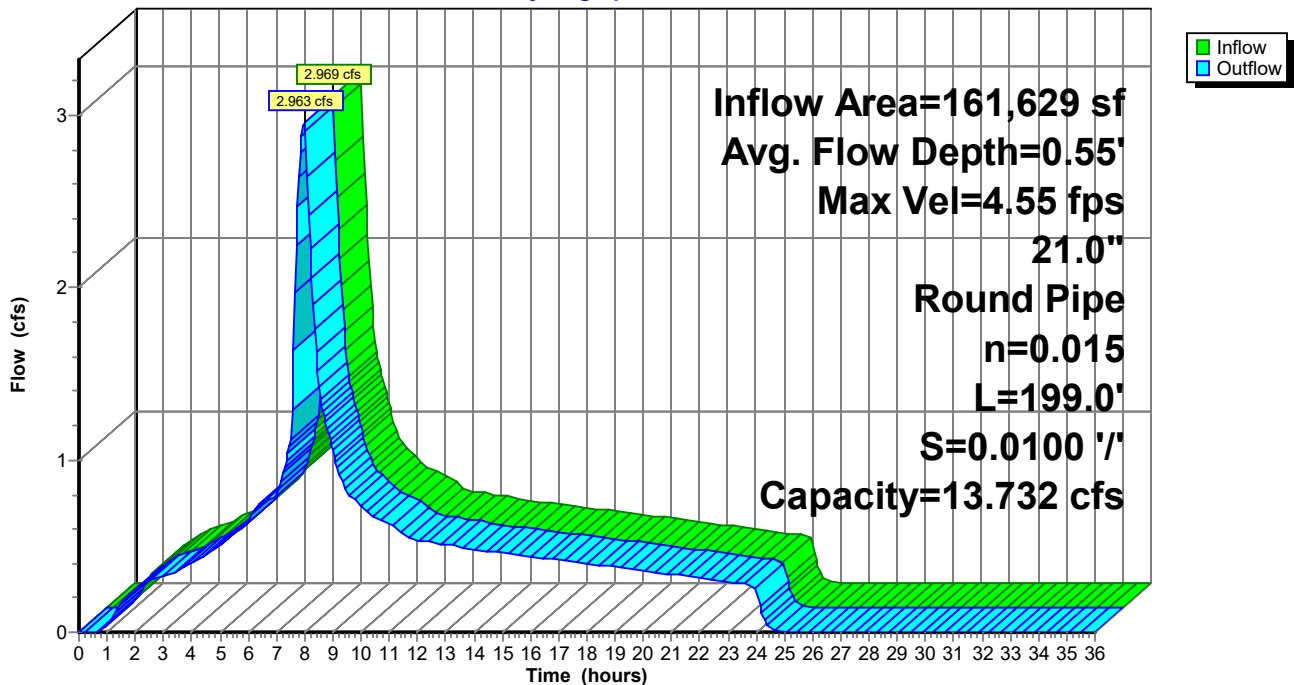Avg. Velocity = 2.54 fps,  Avg. Travel Time= 1.3 min

Peak Storage= 129 cf @ 7.98 hrs
Average Depth at Peak Storage= 0.55'
Bank-Full Depth= 1.75' Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 199.0'   Slope= 0.0100 '/'
Inlet Invert= 206.61',  Outlet Invert= 204.62'



### Reach 7R: HWY 99 - 21"



**Hydrograph**

Inflow Area=161,629 sf
Avg. Flow Depth=0.55'
Max Vel=4.55 fps
21.0"
Round Pipe
n=0.015
L=199.0'
S=0.0100 '/'
Capacity=13.732 cfs

- Inflow
- Outflow

2.969 cfs
2.963 cfs

Flow (cfs)

Time (hours)

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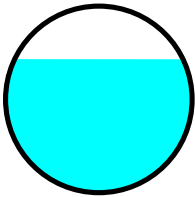Page 86

## Summary for Reach 8R: HWY 99 - 21"

Inflow Area =          646,452 sf, 85.09% Impervious, Inflow Depth =  3.41"    for  25yr event
Inflow      =      11.841 cfs @    7.98 hrs, Volume=          183,802 cf
Outflow     =      11.820 cfs @    7.98 hrs, Volume=          183,802 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.42 fps,  Min. Travel Time= 0.6 min
Avg. Velocity = 3.76 fps,  Avg. Travel Time= 1.0 min
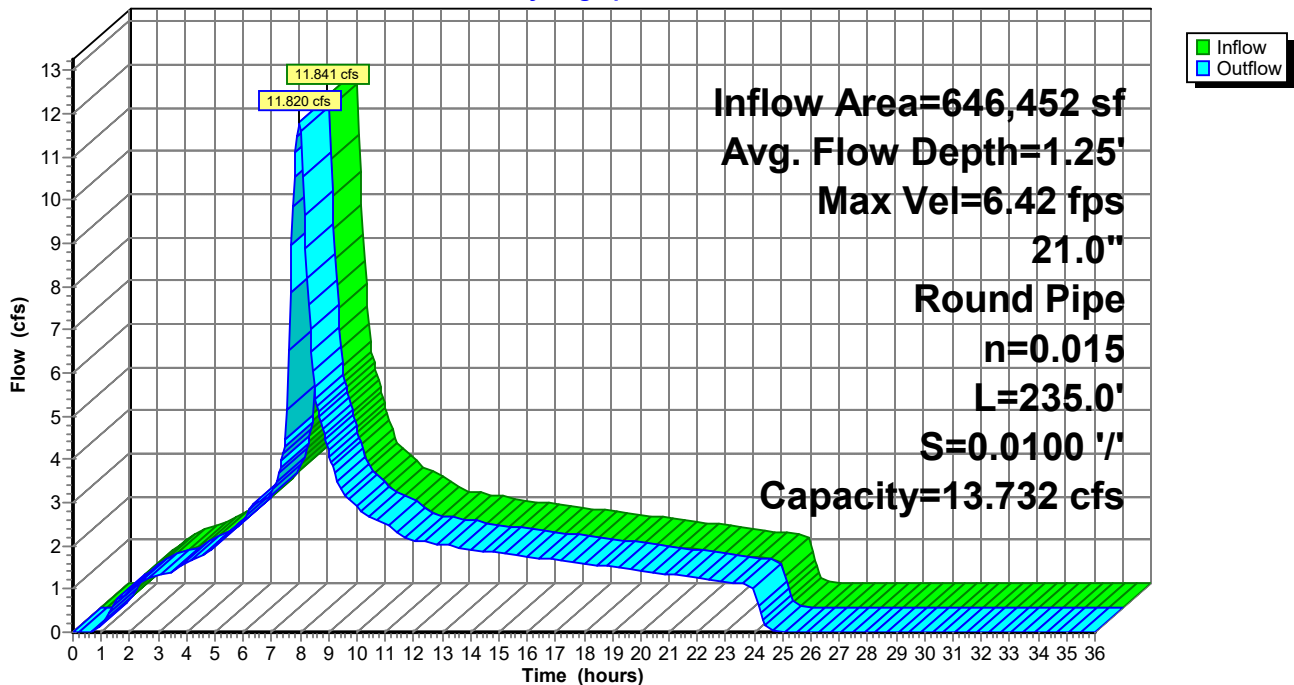
Peak Storage= 433 cf @ 7.98 hrs
Average Depth at Peak Storage= 1.25'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 235.0'   Slope= 0.0100 '/'
Inlet Invert= 204.62',  Outlet Invert= 202.27'



### Reach 8R: HWY 99 - 21"

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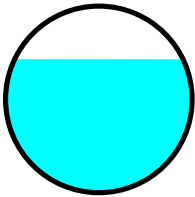Printed  3/2/2020
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## Summary for Reach 9R: HWY 99 -21"

Inflow Area =        646,452 sf, 85.09% Impervious, Inflow Depth =   3.41"    for  25yr event
Inflow      =     11.820 cfs @    7.98 hrs, Volume=        183,802 cf
Outflow     =     11.814 cfs @    7.99 hrs, Volume=        183,802 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.42 fps,  Min. Travel Time= 0.2 min
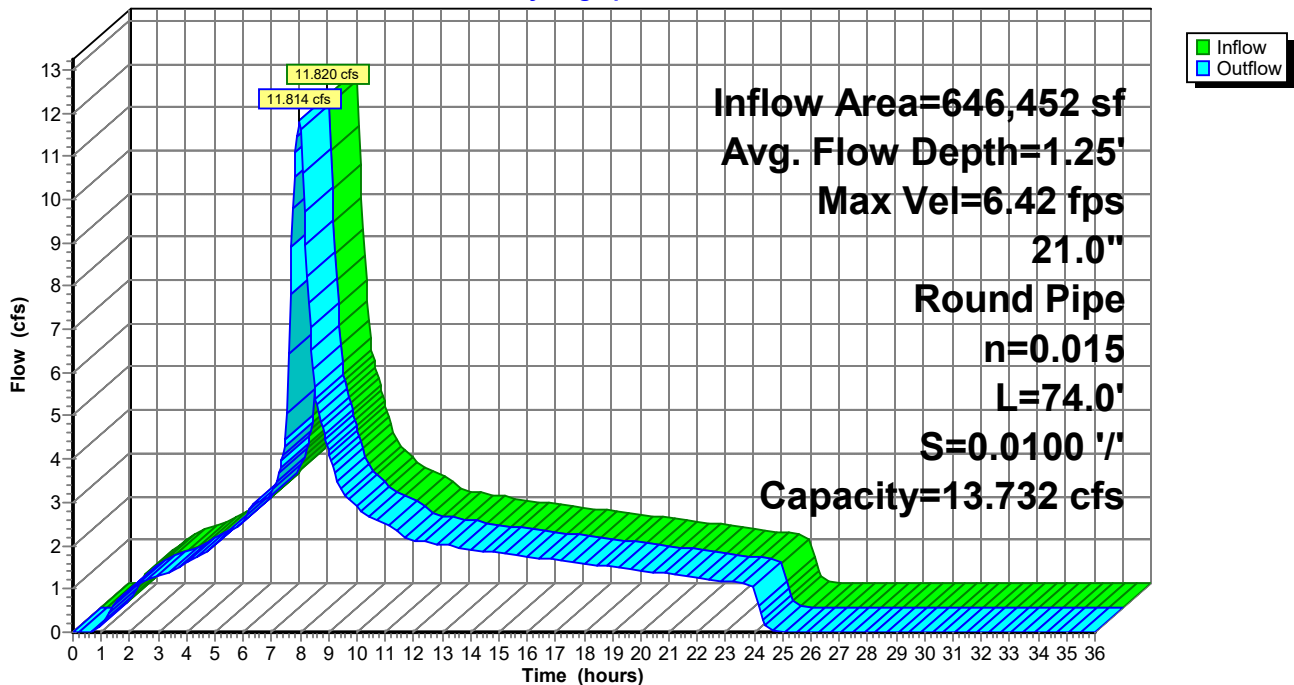Avg. Velocity = 3.75 fps,  Avg. Travel Time= 0.3 min

Peak Storage= 136 cf @ 7.99 hrs
Average Depth at Peak Storage= 1.25'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 74.0'   Slope= 0.0100 '/'
Inlet Invert= 202.27',  Outlet Invert= 201.53'



### Reach 9R: HWY 99 -21"

**Faifield Inn 2020-006**
Prepared by HBH Consulting Engineers
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*Type IA 24-hr  25yr Rainfall=4.00"*
Printed  3/2/2020
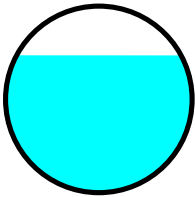Page 88

## Summary for Reach 10R: HWY 99 - 21"

Inflow Area =          646,452 sf, 85.09% Impervious, Inflow Depth =  3.41"    for  25yr event
Inflow      =      11.814 cfs @    7.99 hrs, Volume=           183,802 cf
Outflow     =      11.787 cfs @    7.99 hrs, Volume=           183,802 cf, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.21 fps,  Min. Travel Time= 0.9 min
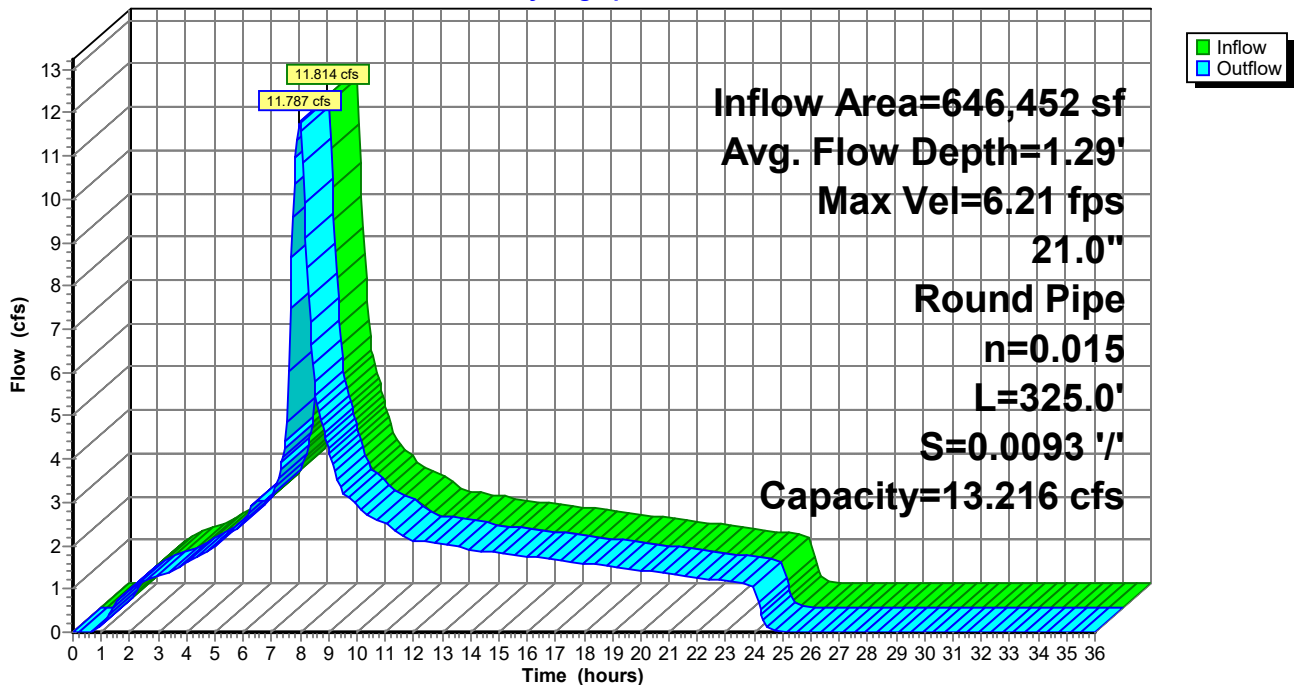Avg. Velocity = 3.61 fps,  Avg. Travel Time= 1.5 min

Peak Storage= 617 cf @ 7.99 hrs
Average Depth at Peak Storage= 1.29'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.216 cfs

21.0"  Round Pipe
n= 0.015  Concrete sewer w/manholes & inlets
Length= 325.0'   Slope= 0.0093 '/'
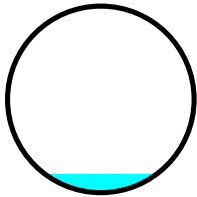Inlet Invert= 201.43',  Outlet Invert= 198.42'

### Reach 10R: HWY 99 - 21"

**Faifield Inn 2020-006**
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*Type IA 24-hr  25yr Rainfall=4.00"*
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## Summary for Reach 11R: Brutscher - 18"

| | | |
|---|---|---|
| Inflow Area = | 83,665 sf, 68.39% Impervious, Inflow Depth > 2.44" | for 25yr event |
| Inflow = | 0.281 cfs @ 11.54 hrs, Volume= | 17,016 cf |
| Outflow = | 0.281 cfs @ 11.56 hrs, Volume= | 17,011 cf, Atten= 0%, Lag= 1.2 min |

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.98 fps,  Min. Travel Time= 1.7 min
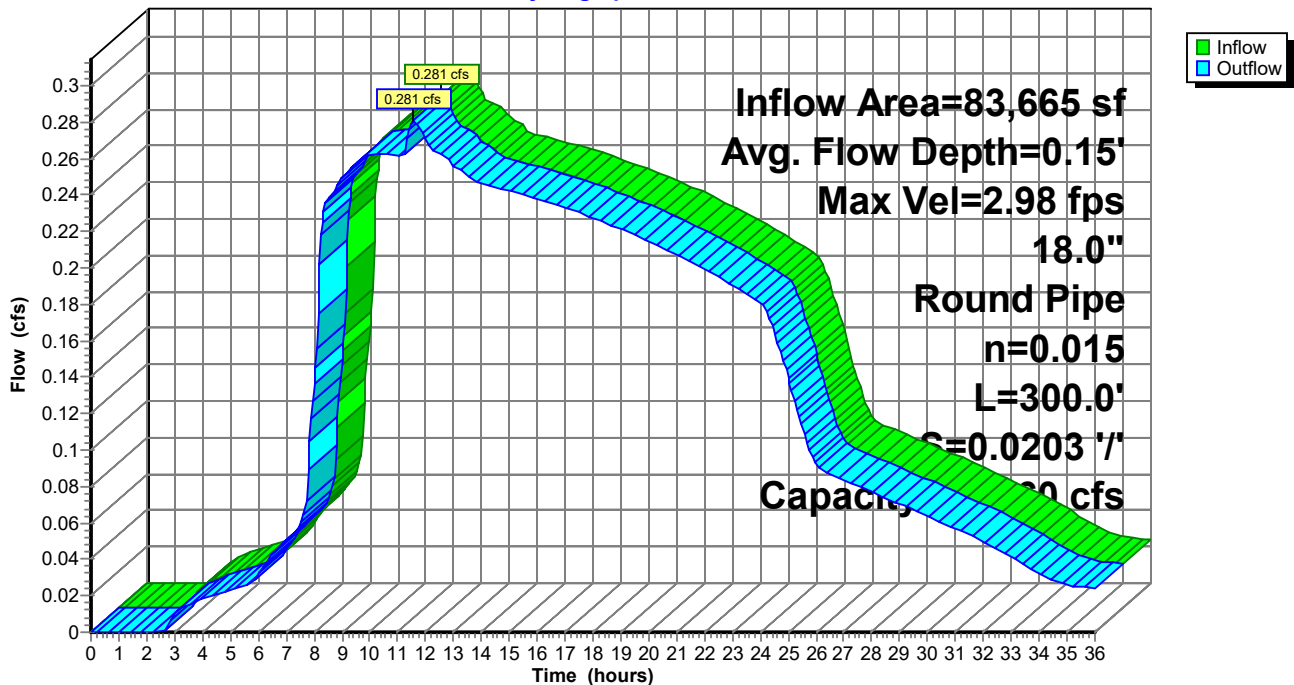Avg. Velocity = 2.27 fps,  Avg. Travel Time= 2.2 min

Peak Storage= 28 cf @ 11.56 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 1.50'  Flow Area= 1.8 sf,  Capacity= 12.960 cfs

18.0"  Round Pipe
n= 0.015
Length= 300.0'   Slope= 0.0203 '/'
Inlet Invert= 212.78',  Outlet Invert= 206.70'

### Reach 11R: Brutscher - 18"



**Hydrograph**

Inflow Area=83,665 sf
Avg. Flow Depth=0.15'
Max Vel=2.98 fps
18.0"
Round Pipe
n=0.015
L=300.0'
S=0.0203 '/'
Capacity=     cfs

**Faifield Inn 2020-006**
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*Type IA 24-hr  25yr Rainfall=4.00"*
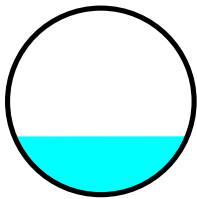Printed  3/2/2020
Page 90

## Summary for Reach 12R: HWY 99 - 21"

Inflow Area =        236,996 sf, 79.14% Impervious, Inflow Depth >  3.07"    for  25yr event
Inflow      =      2.941 cfs @     7.98 hrs, Volume=            60,576 cf
Outflow     =      2.935 cfs @     7.99 hrs, Volume=            60,571 cf, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.54 fps,  Min. Travel Time= 0.7 min
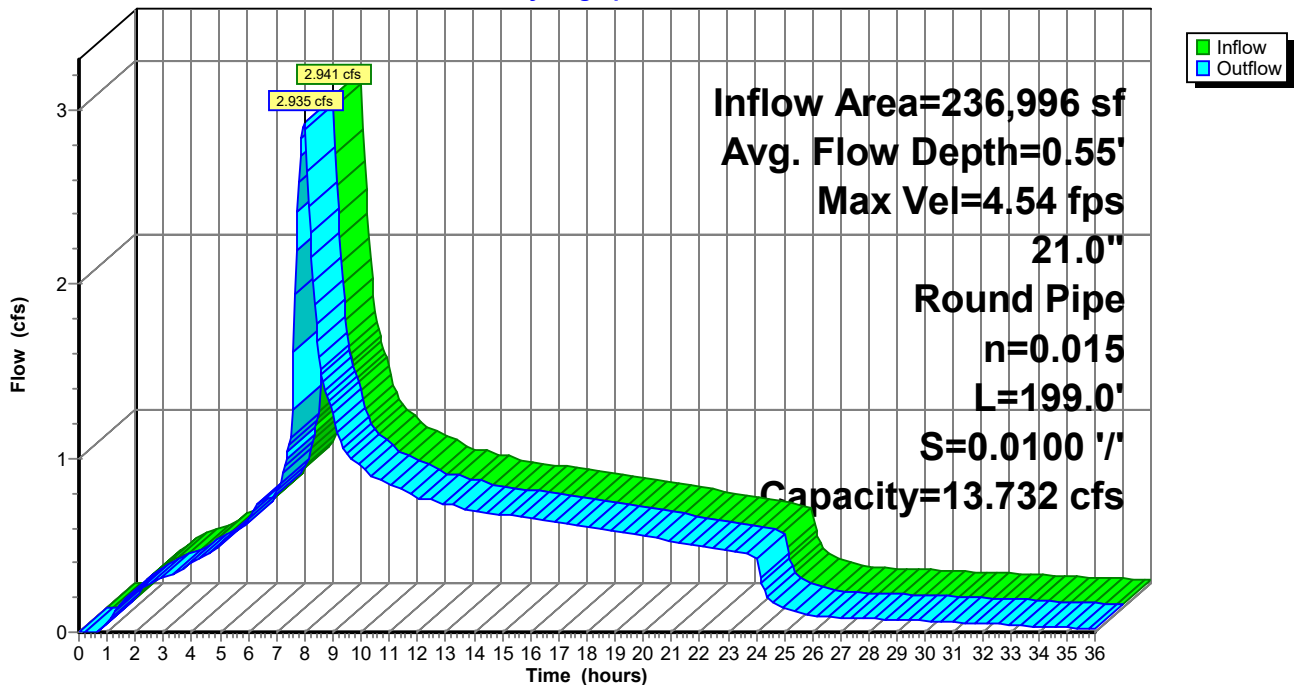Avg. Velocity = 2.39 fps,  Avg. Travel Time= 1.4 min

Peak Storage= 129 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.55'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 199.0'   Slope= 0.0100 '/'
Inlet Invert= 206.61',  Outlet Invert= 204.62'



### Reach 12R: HWY 99 - 21"



Hydrograph

Inflow Area=236,996 sf
Avg. Flow Depth=0.55'
Max Vel=4.54 fps
21.0"
Round Pipe
n=0.015
L=199.0'
S=0.0100 '/'
Capacity=13.732 cfs

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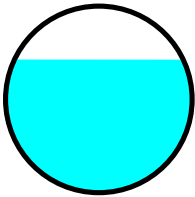Printed  3/2/2020
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## Summary for Reach 13R: HWY 99 - 21"

Inflow Area =        721,819 sf, 83.07% Impervious, Inflow Depth >  3.30"   for  25yr event
Inflow      =      11.812 cfs @    7.98 hrs, Volume=          198,320 cf
Outflow     =      11.790 cfs @    7.98 hrs, Volume=          198,315 cf, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.42 fps,  Min. Travel Time= 0.6 min
Avg. Velocity = 3.19 fps,  Avg. Travel Time= 1.2 min

Peak Storage= 432 cf @ 7.98 hrs
Average Depth at Peak Storage= 1.25'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 235.0'   Slope= 0.0100 '/'
Inlet Invert= 204.62',  Outlet Invert= 202.27'

### Reach 13R: HWY 99 - 21"

**Faifield Inn 2020-006**
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*Type IA 24-hr  25yr Rainfall=4.00"*
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## Summary for Reach 14R: HWY 99 - 21"

Inflow Area =         721,819 sf, 83.07% Impervious, Inflow Depth >  3.30"    for  25yr event
Inflow      =      11.790 cfs @    7.98 hrs,  Volume=            198,315 cf
Outflow     =      11.785 cfs @    7.99 hrs,  Volume=            198,313 cf,  Atten= 0%,  Lag= 0.1 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.42 fps,  Min. Travel Time= 0.2 min
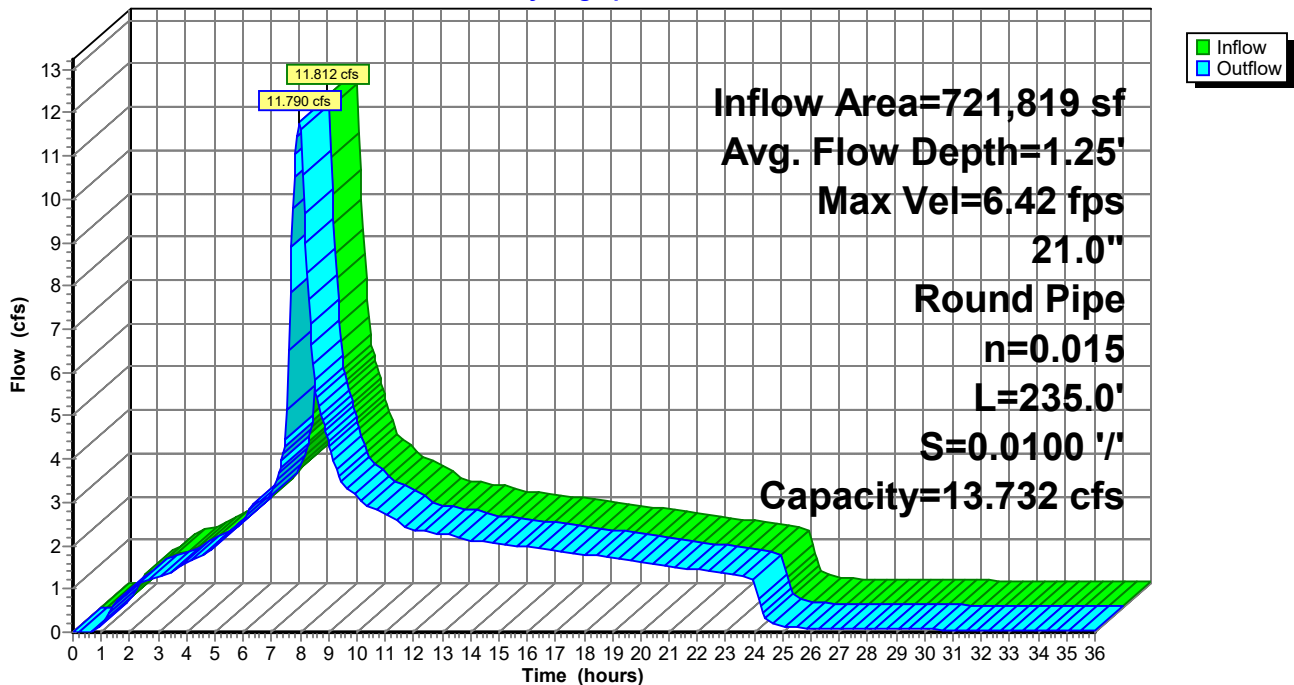Avg. Velocity = 3.19 fps,  Avg. Travel Time= 0.4 min

Peak Storage= 136 cf @ 7.99 hrs
Average Depth at Peak Storage= 1.25'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.732 cfs

21.0"  Round Pipe
n= 0.015
Length= 74.0'   Slope= 0.0100 '/'
Inlet Invert= 202.27',  Outlet Invert= 201.53'

### Reach 14R: HWY 99 - 21"

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*Type IA 24-hr  25yr Rainfall=4.00"*
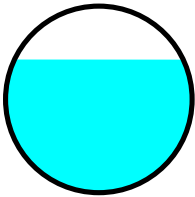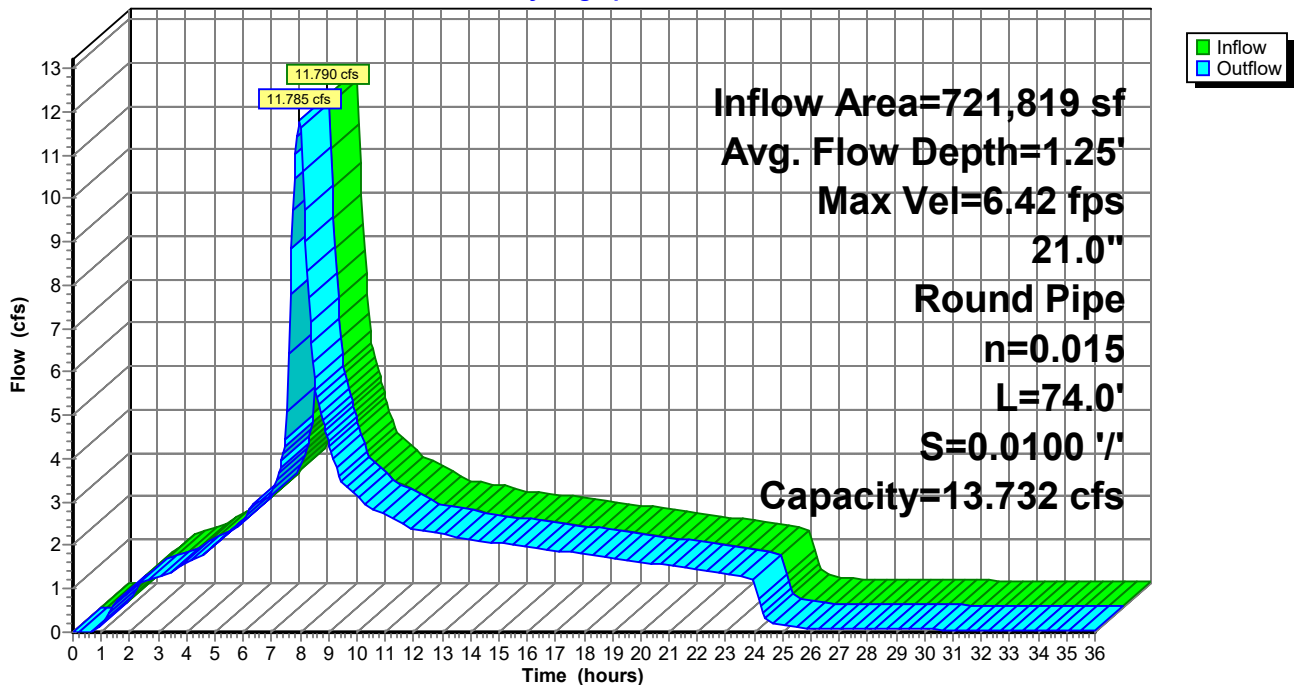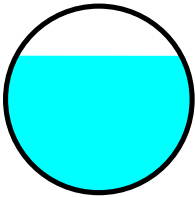Printed  3/2/2020
Page 93

## Summary for Reach 15R: HWY 99 - 21"

Inflow Area =         721,819 sf, 83.07% Impervious,  Inflow Depth >  3.30"    for  25yr event
Inflow    =     11.785 cfs @    7.99 hrs,  Volume=          198,313 cf
Outflow    =     11.757 cfs @    8.00 hrs,  Volume=          198,306 cf,  Atten= 0%,  Lag= 0.5 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.21 fps,  Min. Travel Time= 0.9 min
Avg. Velocity = 3.11 fps,  Avg. Travel Time= 1.7 min

Peak Storage= 615 cf @ 8.00 hrs
Average Depth at Peak Storage= 1.29'
Bank-Full Depth= 1.75'  Flow Area= 2.4 sf,  Capacity= 13.216 cfs

21.0"  Round Pipe
n= 0.015  Concrete sewer w/manholes & inlets
Length= 325.0'   Slope= 0.0093 '/'
Inlet Invert= 201.43',  Outlet Invert= 198.42'

### Reach 15R: HWY 99 - 21"



**Hydrograph**

Inflow Area=721,819 sf
Avg. Flow Depth=1.29'
Max Vel=6.21 fps
21.0"
Round Pipe
n=0.015
L=325.0'
S=0.0093 '/'
Capacity=13.216 cfs

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*Type IA 24-hr  25yr Rainfall=4.00"*
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Page 94
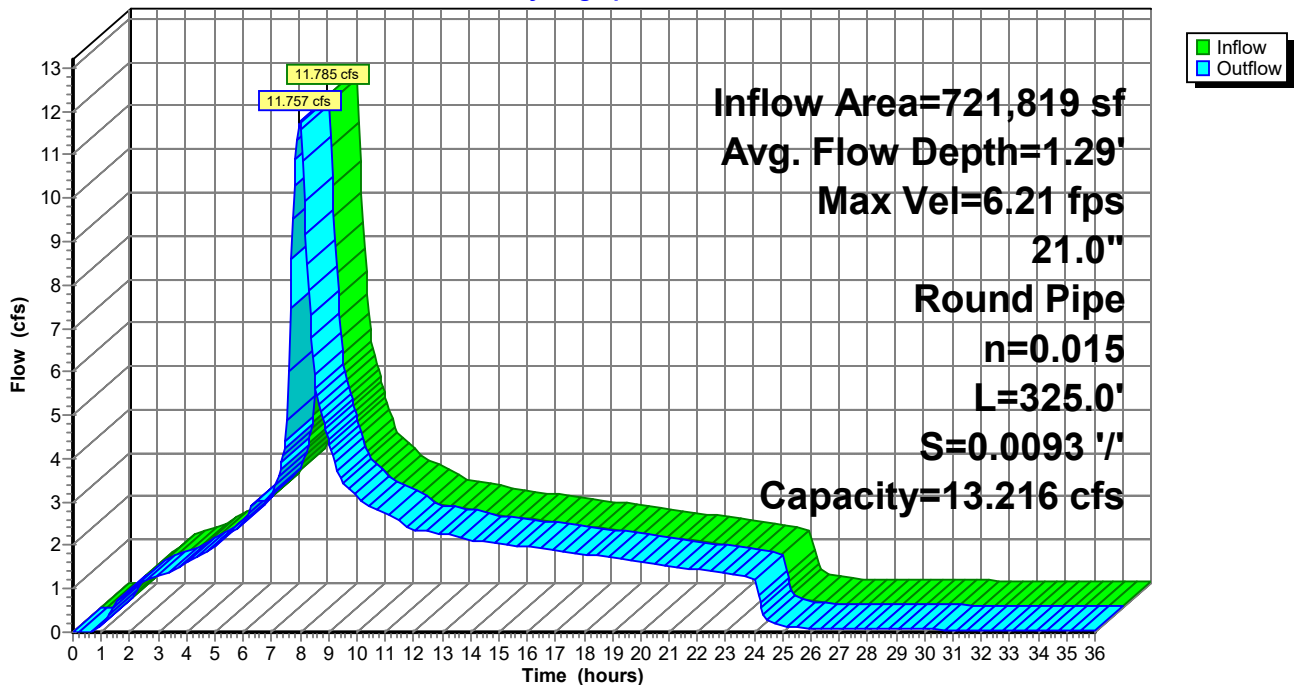
### Summary for Pond 1P: Stormwater Planter

| | | | | | |
|---|---|---|---|---|---|
| Inflow Area = | | 11,263 sf, 74.83% Impervious, Inflow Depth = 3.22" for 25yr event | | | |
| Inflow | = | 0.193 cfs @ | 7.98 hrs, Volume= | 3,021 cf | |
| Outflow | = | 0.133 cfs @ | 8.26 hrs, Volume= | 2,941 cf, Atten= 31%, Lag= 16.5 min | |
| Primary | = | 0.133 cfs @ | 8.26 hrs, Volume= | 2,941 cf | |

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 224.62' @ 8.26 hrs   Surf.Area= 160 sf   Storage= 499 cf

Plug-Flow detention time= 100.8 min calculated for 2,937 cf (97% of inflow)
Center-of-Mass det. time= 81.1 min ( 768.6 - 687.6 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 221.50' | 560 cf | **16.00'W x 10.00'L x 3.50'H Prismatoid** |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 222.00' | **1.2" Horiz. Orifice/Grate**  C= 0.600   Limited to weir flow at low heads |
| #2 | Primary | 223.51' | **0.8" Vert. Orifice/Grate**  C= 0.600 |
| #3 | Primary | 224.40' | **1.0" Vert. Orifice/Grate**  C= 0.600 |
| #4 | Primary | 224.50' | **6.0" Vert. Orifice/Grate**  C= 0.600 |

**Primary OutFlow** Max=0.133 cfs @ 8.26 hrs  HW=224.62'  (Free Discharge)
├─**1=Orifice/Grate** (Orifice Controls 0.061 cfs @ 7.79 fps)
├─**2=Orifice/Grate** (Orifice Controls 0.017 cfs @ 5.00 fps)
├─**3=Orifice/Grate** (Orifice Controls 0.011 cfs @ 2.03 fps)
└─**4=Orifice/Grate** (Orifice Controls 0.043 cfs @ 1.18 fps)

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*Type IA 24-hr  25yr Rainfall=4.00"*
Printed  3/2/2020
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## Pond 1P: Stormwater Planter



Hydrograph

Inflow Area=11,263 sf
Peak Elev=224.62'
Storage=499 cf
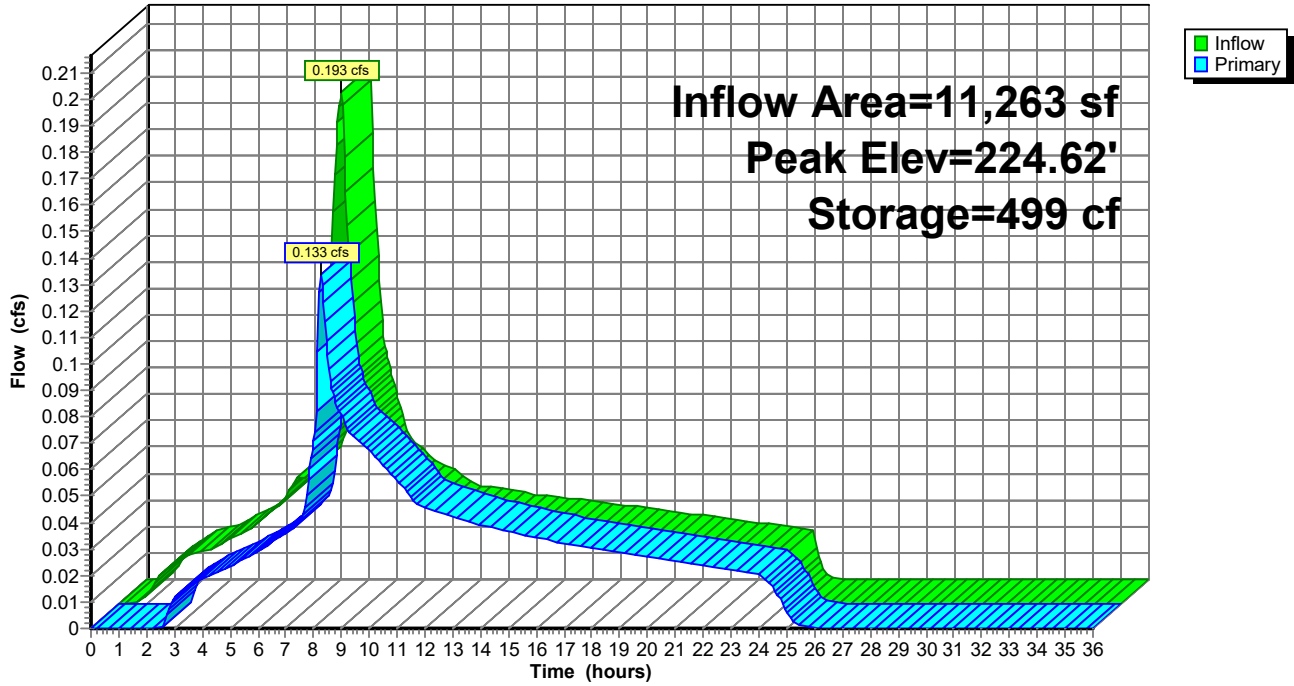
## Summary for Pond 2P: Stormwater Pond

Inflow Area =          72,402 sf, 67.39% Impervious,  Inflow Depth =  3.06"    for  25yr event
Inflow       =      1.171 cfs @    7.98 hrs,  Volume=          18,449 cf
Outflow     =      0.233 cfs @   11.60 hrs,  Volume=          14,075 cf,  Atten= 80%,  Lag= 217.4 min
Primary     =      0.233 cfs @   11.60 hrs,  Volume=          14,075 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 225.26' @ 11.60 hrs   Surf.Area= 2,212 sf   Storage= 8,316 cf

Plug-Flow detention time= 563.7 min calculated for 14,075 cf (76% of inflow)
Center-of-Mass det. time= 410.0 min ( 1,105.5 - 695.5 )

| Volume | Invert | Avail.Storage | Storage Description |
|--------|--------|---------------|---------------------|
| #1 | 221.50' | 8,848 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|------------------|-------------------|------------------------|------------------------|
| 221.50 | 2,212 | 0 | 0 |
| 225.50 | 2,212 | 8,848 | 8,848 |

| Device | Routing | Invert | Outlet Devices |
|--------|---------|--------|----------------|
| #1 | Primary | 222.50' | **0.9" Vert. Orifice/Grate**   C= 0.600 |
| #2 | Primary | 223.15' | **0.5" Vert. Orifice/Grate**   C= 0.600 |
| #3 | Primary | 223.50' | **1.5" Vert. Orifice/Grate**   C= 0.600 |
| #4 | Primary | 224.35' | **1.9" Vert. Orifice/Grate**   C= 0.600 |
| #5 | Primary | 225.25' | **24.0" x 24.0" Horiz. Orifice/Grate**   C= 0.600 |
|    |         |         | Limited to weir flow at low heads |

**Primary OutFlow**  Max=0.232 cfs @ 11.60 hrs  HW=225.26'   (Free Discharge)
├─**1=Orifice/Grate** (Orifice Controls 0.035 cfs @ 7.94 fps)
├─**2=Orifice/Grate** (Orifice Controls 0.009 cfs @ 6.96 fps)
├─**3=Orifice/Grate** (Orifice Controls 0.077 cfs @ 6.27 fps)
├─**4=Orifice/Grate** (Orifice Controls 0.086 cfs @ 4.39 fps)
└─**5=Orifice/Grate** (Weir Controls 0.024 cfs @ 0.32 fps)

**Faifield Inn 2020-006**
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*Type IA 24-hr  25yr Rainfall=4.00"*
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## Pond 2P: Stormwater Pond



**Hydrograph**

Inflow Area=72,402 sf
Peak Elev=225.26'
Storage=8,316 cf

ATTACHMENT B

THIS IS NOT THE STAMPED SURVEYOR'S DRAWING
THE STAMPED SURVEYORS DRAWING WILL BE
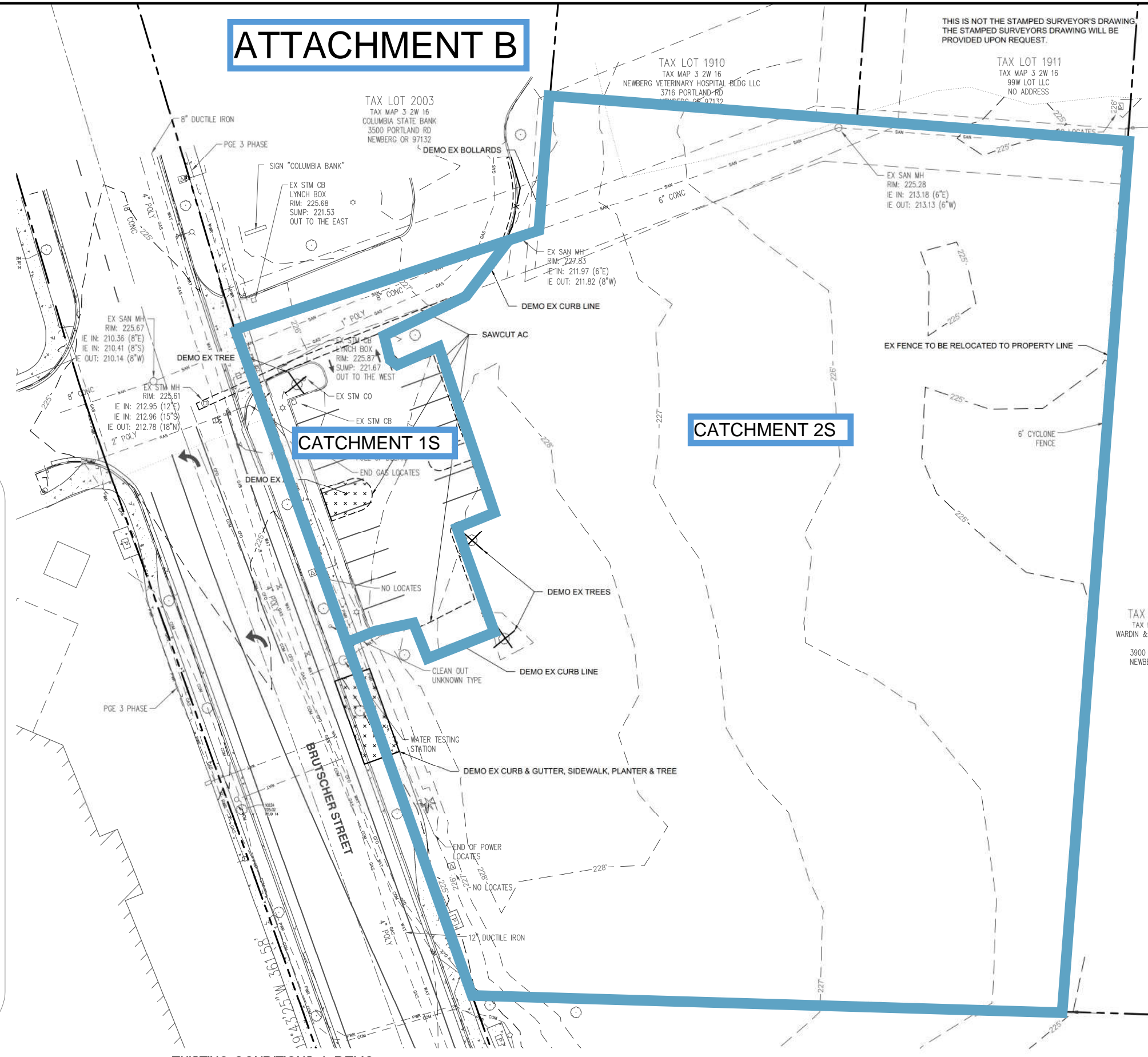PROVIDED UPON REQUEST.

SEE SURVEYOR'S STAMPED DRAWING
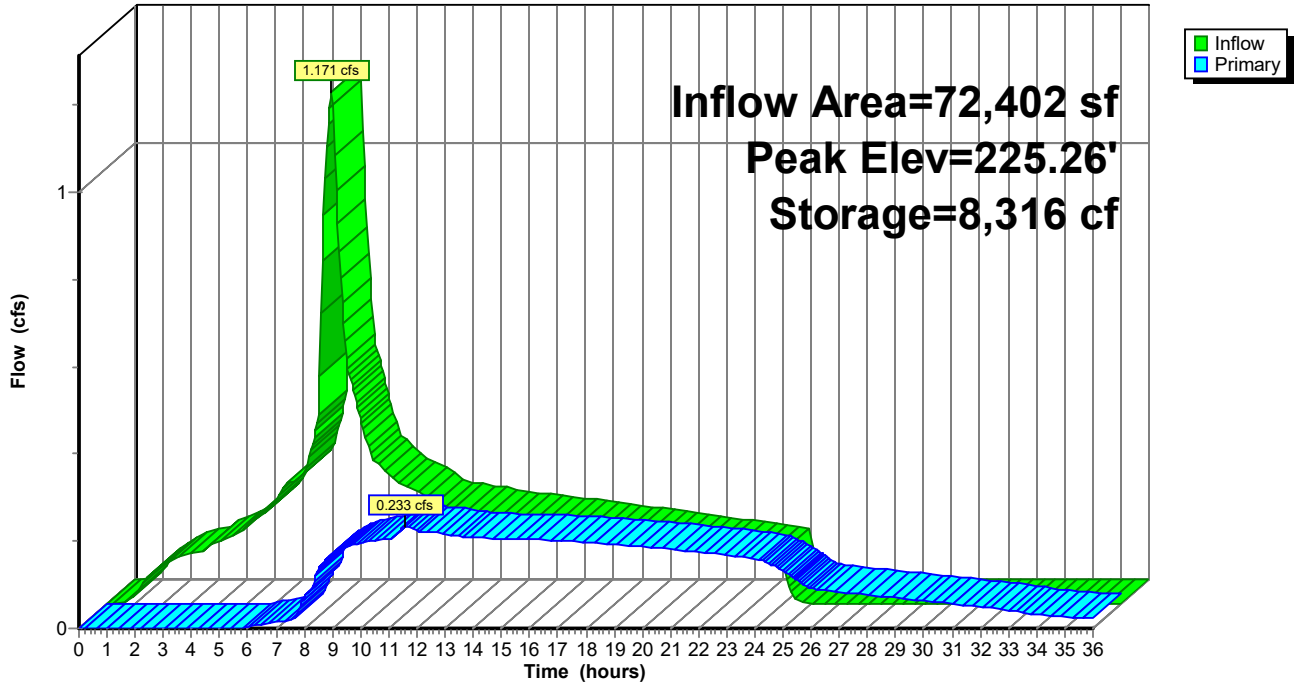
**NOTES:**

1. UTILITIES SHOWN ARE BASED ON UNDERGROUND UTILITY LOCATE MARKINGS AS PROVIDED BY OTHERS, PROVIDED PER UTILITY LOCATE TICKET NUMBER 17176043. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND LOCATES REPRESENT THE ONLY UTILITIES IN THE AREA. CONTRACTORS ARE RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BEGINNING CONSTRUCTION.

2. FIELD WORK WAS CONDUCTED JULY 25-26, 2017 AND FEBRUARY 07, 2020.

3. VERTICAL DATUM: ELEVATIONS ARE BASED ON NAVD88 DERIVED FROM THE TRIMBLE NOW VRS.

4. HORIZONTAL DATUM: A LOCAL DATUM PLANE DERIVED FROM OREGON STATE PLANE NORTH 3601 NAD83 (2011) EPOCH 2010.0000 PROJECT MEAN COMBINED GROUND SCALE FACTOR 1.000109534 AT A CALCULATED CENTRAL PROJECT POINT WITH INTERNATIONAL FOOT GRID VALUES OF A NORTHING OF 607,562.07, AND A EASTING OF 7,573,991.16, AND MERIDIAN CONVERGENCE ANGLE OF −1°43'53" AT THE CENTRAL POINT. OREGON STATE PLANE DATUM IS DERIVED BY TRIMBLE VRS NOW NETWORK.

5. CONTOUR INTERVAL IS 1 FOOT.

6. TREES WITH DIAMETER OF 6" AND GREATER ARE SHOWN. TREE DIAMETERS WERE MEASURED UTILIZING A DIAMETER TAPE AT BREAST HEIGHT. TREE INFORMATION IS SUBJECT TO CHANGE UPON ARBORIST INSPECTION.

**LEGEND**

| EXISTING | | EXISTING | |
|---|---|---|---|
| DECIDUOUS TREE | | STORM SEWER CLEAN OUT | |
| CONIFEROUS TREE | | STORM SEWER CATCH BASIN | |
| FIRE HYDRANT | | STORM SEWER AREA DRAIN | |
| WATER BLOWOFF | | STORM SEWER MANHOLE | |
| WATER METER | | GAS METER | |
| WATER VALVE | | GAS VALVE | |
| DOUBLE CHECK VALVE | | GUY WIRE ANCHOR | |
| AIR RELEASE VALVE | | UTILITY POLE | |
| SANITARY SEWER CLEAN OUT | | POWER VAULT | |
| SANITARY SEWER MANHOLE | | POWER JUNCTION BOX | |
| SIGN | | POWER PEDESTAL | |
| STREET LIGHT | | COMMUNICATIONS VAULT | |
| MAILBOX | | COMMUNICATIONS JUNCTION BOX | |
| | | COMMUNICATIONS RISER | |

EXISTING

RIGHT-OF-WAY LINE
BOUNDARY LINE
PROPERTY LINE
CENTERLINE
DITCH
CURB
EDGE OF PAVEMENT
EASEMENT
FENCE LINE
GRAVEL EDGE
POWER LINE
OVERHEAD WIRE
COMMUNICATIONS LINE
FIBER OPTIC LINE
GAS LINE
STORM SEWER LINE
SANITARY SEWER LINE
WATER LINE

CATCHMENT 1S

CATCHMENT 2S

TAX LOT 2003
TAX MAP 3 2W 16
COLUMBIA STATE BANK
3500 PORTLAND RD
NEWBERG OR 97132

TAX LOT 1910
TAX MAP 3 2W 16
NEWBERG VETERINARY HOSPITAL BLDG LLC
3716 PORTLAND RD
NEWBERG OR 97132

TAX LOT 1911
TAX MAP 3 2W 16
99W LOT LLC
NO ADDRESS

EX SAN MH
RIM: 225.28
IE IN: 213.18 (6"E)
IE OUT: 213.13 (6"W)

EX SAN MH
RIM: 227.83
IE IN: 211.97 (6"E)
IE OUT: 211.82 (8"W)

EX SAN MH
RIM: 225.67
IE IN: 210.36 (8"E)
IE IN: 210.41 (8"S)
IE OUT: 210.14 (8"W)

EX STM MH
RIM: 225.61
IE IN: 212.95 (12"E)
IE IN: 212.96 (15"S)
IE OUT: 212.78 (18"N)

EX STM CB
LYNCH BOX
RIM: 225.68
SUMP: 221.53
OUT TO THE EAST

EX STM CB
LYNCH BOX
RIM: 225.87
SUMP: 221.67
OUT TO THE WEST

SIGN "COLUMBIA BANK"
DEMO EX BOLLARDS
DEMO EX CURB LINE
SAWCUT AC
EX STM CO
EX STM CB
DEMO EX TREE
DEMO EX
END GAS LOCATES
NO LOCATES
DEMO EX TREES
CLEAN OUT UNKNOWN TYPE
DEMO EX CURB LINE
WATER TESTING STATION
DEMO EX CURB & GUTTER, SIDEWALK, PLANTER & TREE
END OF POWER LOCATES
NO LOCATES
EX FENCE TO BE RELOCATED TO PROPERTY LINE
6" CYCLONE FENCE

8" DUCTILE IRON
PGE 3 PHASE
6" CONC
1" POLY
2" POLY
4" POLY
12" DUCTILE IRON
PGE 3 PHASE

BRUTSCHER STREET

EXISTING CONDITIONS + DEMO
SCALE: 1" = 20'

GRAPHIC SCALE
( IN FEET )
1 inch = 20 ft.

IF THIS LINE IS NOT 1 INCH
SCALE IS NOT AS SHOWN

HBH
CONSULTING ENGINEERS
501 E First Street
Newberg, Oregon 97132
503/554-9553  fax 503/537-9554
email: mail@hbh-consulting.com

Designed By: ARB  Drawn By: ARB  Checked By: ARC  Submittal No.: PRELIMINARY
L:\2020-006\4-Design\DWG\1 - Cover, Notes, Existing & Demo.dwg

HAWKINS COMPANIES LLC
855 BROAD ST, SUITE 300, BOISE ID 83702

NEWBERG FAIRFIELD INN
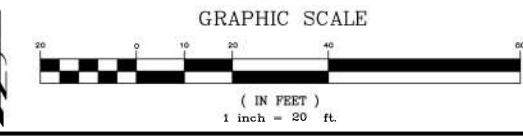PARCELS 3216, 1900, + 2002, NEWBERG OR 97132
EXISTING CONDITIONS + DEMO

G3
Sheet No.
3 of 11
Date: 3/2/2020
2020-006

ATTACHMENT C

CATCHMENT 5S (7S)
3.52 ACRES

7R (12R)

8R (13R)

9R (14R)

6R (11R)

10R (15R)

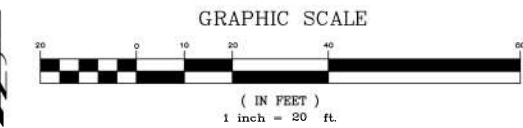CATCHMENT 6S (8S)
11.13 ACRES

PROJECT SITE
CATCHMENTS 1S-4S

Google Earth

ATTACHMENT D

CATCHMENT 3S

CATCHMENT 4S

164 SF STORMWATER FACILITY
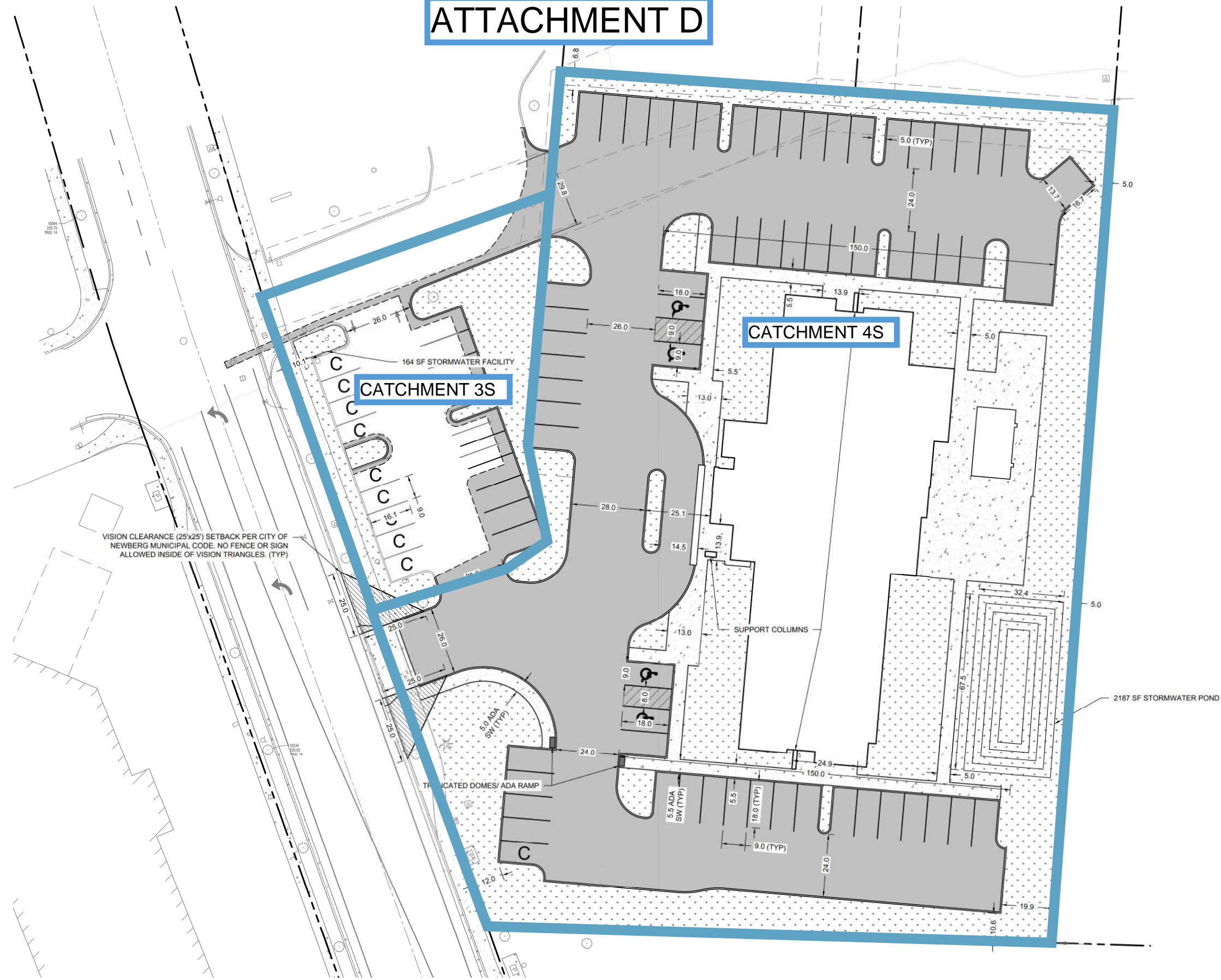
VISION CLEARANCE (25'x25') SETBACK PER CITY OF
NEWBERG MUNICIPAL CODE. NO FENCE OR SIGN
ALLOWED INSIDE OF VISION TRIANGLES. (TYP)

SUPPORT COLUMNS

2187 SF STORMWATER POND

5.0 ADA
SW (TYP)

TRUNCATED DOMES/ ADA RAMP

5.5 ADA
SW (TYP)

5.5 (TYP)

18.0 (TYP)

9.0 (TYP)

24.0

5.0 (TYP)

150.0

24.0

13.7

18.0

5.0

5.5

13.9

5.0

18.0

9.0

26.0

9.0

5.5

13.0

28.0

25.1

14.5

13.9

13.0

32.4

5.0

67.5

5.0

24.9

150.0

12.0

19.9

10.6

29.8

26.0

10.1

16.1

9.0

25.0

25.0

25.0

25.0

6.8

SITE PLAN

SCALE: 1" = 20'

GRAPHIC SCALE

( IN FEET )
1 inch = 20 ft.

REGISTERED PROFESSIONAL
ENGINEER
PRELIMINARY
ANTON
A. CHERNISHOV
OREGON
EXPIRES  12/31/2019

BY

DESCRIPTION

DATE

REV

IF THIS LINE IS NOT 1 INCH
SCALE IS NOT AS SHOWN

C1
4 of 11

3/2/2020
2020-006