



HOWARD STEIN HUDSON

Engineers + Planners

## SUPPLEMENTAL DATA REPORT

# Proposed Building Addition

15 Adams Street

Burlington, Massachusetts



Prepared by:

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# Contents

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Existing Conditions..... 2

Proposed Conditions..... 2

Zoning ..... 3

Hydrology ..... 4

Stormwater Management Standards ..... 4

**Standard 1: No new untreated discharges..... 4**

**Standard 2: Post-development peak discharge rates not to exceed pre-development peak discharge rates ..... 5**

**Standard 3: Minimize or eliminate loss of annual recharge to groundwater..... 6**

**Standard 4: Stormwater management system to remove 80% of the average annual load of Total Suspended Solids (TSS) ..... 6**

**Standard 5: Land uses with higher potential pollutant loads ..... 7**

**Standard 6: Stormwater discharges to critical areas..... 7**

**Standard 7: Redevelopment projects ..... 7**

**Standard 8: Control construction-related impacts..... 7**

**Standard 9: Long-term operation and maintenance plan..... 7**

**Standard 10: No illicit discharges ..... 7**

Erosion and Sediment Control Notes..... 13

General Construction Sequence..... 13



## Existing Conditions

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The subject site is comprised of approximately 6.4 acres in the General Industrial (IG) zoning district and is commonly known as 15 Adams Street (Assessor's Map 59 Block 14 Lot 0). The parcel is located on the north side of Adams Street between Lowell Street and North Street. It is currently improved with a one-story 40,111 (gross) square foot structure with warehouse and office uses.

Site access is currently available through a driveway off Adams Street. The driveway goes around all sides of the building, allowing traffic circulation around the building with parking on all sides of the building.

The front and eastern portion of the site slopes southeast to Adams Street. The remaining portion of the site flows to an offsite wetland to the southwest of the site.

The site abuts commercial uses to the north, east and south of the site and abuts vacant land to the west of the site.

The site is currently improved with overhead electric that enters the project site from a utility pole along the front property line. A gas line enters from the front of the site along Adams Street as it wraps around the southern side of the building and connects to the front. An eight (8) inch sewer connection exists in the front of the site along Adams Street where it runs to a manhole in the western side of the building.

Amenities on-site include two loading docks, various storage trailers, as well as sixty (60) existing parking spaces, including two (2) handicapped space. A concrete walk exists directly in front of the building under an overhang.

### Proposed Conditions

The proposed addition will add a total of 12,277 square feet of warehouse space to the site. Currently material is stored outside and in conex boxes on site. One loading dock will be added on the eastern side, with one overhead door at grade on the western side.

Site utilities will remain untouched, with the exception of relocating an existing fire hydrant to accommodate a loading dock.

Site topography has been designed to mimic the existing conditions to maximum extent practicable, while also allowing adequate drainage and improving the overall design. The southern portion of the site will remain untouched. Runoff from the northern portion of the site and the addition will flow to catch basins, which will then flow to a new forebay and infiltration basin before flowing overland toward the offsite wetland as it did in predeveloped conditions.

A stormwater management system has been proposed as further outlined in the Hydrology section of the report.



# Zoning

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General Industrial (IG)

<u>Dimensional Requirements</u>	<u>Required</u>	<u>Existing</u>	<u>Proposed</u>
Minimum Lot Area	40,000 sf	278,784 sf	278,784 sf
Minimum Lot Width	NA	NA	NA
Minimum Lot Depth	NA	NA	NA
Minimum Lot Frontage	150 ft	61.35 ft	61.35 ft
Minimum Front Yard	25 ft	247 ft	247 ft
Minimum Side Yard	15 ft	90 ft	90 ft
Minimum Rear Yard	15 ft	395 ft	189 ft
Maximum Building Coverage	25%	14%	19%
Maximum Building Stories	3	2	2
Maximum Building Height	30 ft	<30 ft	<30ft
Maximum Floor Area Ratio	0.15	0.14	0.188* with traffic

study



## Hydrology

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All stormwater that currently falls onto the existing site travels to two (2) different locations, as noted by the Predevelopment Drainage Map. For this analysis, only the area that is being disturbed was analyzed. Subcatchment 1S flows southwest to an offsite wetland. The remainder of the site flows to Adams Street and will continue to flow that direction in the post development design.

The proposed hydrology splits the development portion of the site into two (2) different subcatchments, as demonstrated in the Postdevelopment Drainage Map. Subcatchment 1S flows to two deep sump hooded catch basins, that flow to a forebay, then to the infiltration basin. The basin overflow then travels overland through upland to the wetland. Subcatchment 1S contains the majority of the parking lot in rear of the building, as well as the roof of the addition. Subcatchment 2S flows west overland to the offsite wetland and includes mostly woods and a portion of the parking lot that is not being disturbed.

The post development hydrology has been designed to improve flow and volumes from the redevelopment site.

## Stormwater Management Standards

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### Standard 1: No new untreated discharges

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The Massachusetts Stormwater Handbook requires that the project demonstrates that no new stormwater conveyances (e.g. outfalls) discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

There is no new untreated discharge flowing directly to wetlands or waters of the Commonwealth.



## Standard 2: Post-development peak discharge rates not to exceed pre-development peak discharge rates

Post-development peak discharge rates do not exceed the pre-development peak discharge rates for all storm events. The project is improving the water quality leaving the site from the parking area from predeveloped conditions, in which there is only one deep sump hooded catch basin to reduce TSS.

Storm Event (AP1)	2-year	10-year	25-year	100-year
Pre-development rates (cfs)	0.91	4.28	6.95	13.00
Volume (af)	0.108	0.359	0.561	1.024
Post-development rates (cfs)	0.72	3.15	5.25	9.41
Volume (af)	0.081	0.356	0.576	1.070
Rate reductions (cfs)	-0.19	-1.13	-1.70	-3.59
Volume Change (af)	-0.027	-0.003	0.015	0.046
Storm Event (AP2)	2-year	10-year	25-year	100-year
Pre-development rates (cfs)	0.17	0.44	0.63	1.04
Volume (af)	0.012	0.030	0.043	0.071
Post-development rates (cfs)	0.19	0.39	0.52	0.79
Volume (af)	0.013	0.027	0.036	0.056
Rate reductions (cfs)	0.02	-0.05	-0.11	-0.25
Volume Change (af)	0.001	-0.003	-0.004	-0.015



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## Standard 3: Minimize or eliminate loss of annual recharge to groundwater

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Roof area = 12,277sf

Increase parking impervious = 922 sf

Total increase in impervious area = 13,198 sf

1 in. (1 ft/12 in) (13,198 sf) = 1,100 cf

Volume provided by infiltration system = **1,838 cf** (below outlet elevation 193.00)

**1,838 cf of Recharge Volume Provided**

**1,838 cf > 1,100 cf**

Drawdown Within 72 Hours

Infiltration System = 1,838 cf / [(1.02 in/hr)(1 ft/12 in) (1,563 sf)]=**13.89 hours < 72 hours, OK**

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## Standard 4: Stormwater management system to remove 80% of the average annual load of Total Suspended Solids (TSS)

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The stormwater management system is designed to capture and infiltrate clean roof runoff from the proposed building. This standard is being met to the maximum extent practicable under redevelopment standards. All other areas of the site have been designed to mimic existing flow paths and are therefore not being captured by treatment devices.



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## Standard 5: Land uses with higher potential pollutant loads

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The development is not considered a land use that generally produces higher potential pollutant loads.

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## Standard 6: Stormwater discharges to critical areas

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The proposed stormwater system does not discharge to a critical area.

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## Standard 7: Redevelopment projects

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The project is not considered a redevelopment project by reducing overall impervious surface.

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## Standard 8: Control construction-related impacts

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The project will install erosion and sediment controls prior to any earthwork activity. Erosion control barriers will be placed down slope from the proposed construction to prevent erosion and sedimentation into the surrounding areas.

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## Standard 9: Long-term operation and maintenance plan

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See Appendix A for the operation and maintenance requirements of the stormwater management system.

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## Standard 10: No illicit discharges

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An illicit discharge compliance statement will be provided by the property owner under separate cover.





# Appendix A: Operation and Maintenance Plan

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**Forebay**

**System Owner: Filter Sales and Service Inc**

For the first 3 months after construction, the subsurface infiltration system should be inspected after every storm greater than 1” for standing water for periods in excess of 72 hours. Therein after, the subsurface infiltration system should be inspected biannually. If standing water is observed for longer than 72 hours, a pump should be placed in the basin and discharged through the outlet pipe. After the system is dewatered, it should be observed by a Professional Engineer. A Professional Engineer should provide an opinion as to why the infiltration system is not draining and provide recommendations to restore infiltration capacity to the system.

Date	Inspector	Condition	Maintenance Performed*

\*Evidence of maintenance (ie. receipts) must be provided.



### Deep Sump Catch basins

(Per DEP Stormwater Structural BMP's Vol 2)

Inspect or clean deep sump basins at least four times per year and at the end of the foliage and snow removal seasons. Sediments must also be removed four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin. If handling runoff from land uses with higher potential pollutant loads or discharging runoff near or to a critical area, more frequent cleaning may be necessary. Clamshell buckets are typically used to remove sediment in Massachusetts. However, vacuum trucks are preferable, because they remove more trapped sediment and supernatant than clamshells. Vacuuming is also a speedier process and is less likely to snap the cast iron hood within the deep sump catch basin.

Date	Inspector	Condition	Maintenance Performed*

\*Evidence of maintenance (ie. receipts) must be provided



**Infiltration Basin**

**System Owner: Filter Sales and Service Inc**

For the first 3 months after construction, the infiltration basin should be inspected after every storm greater than 1” for standing water for periods in excess of 72 hours, rilling or gullyng, and to ensure that vegetation in the swale is adequate. Therein after, inspect the swale twice per year for slope integrity, soil moisture, vegetative health, soil stability, soil compaction, soil erosion, ponding, and sediment accumulation.

Regular maintenance should include mowing, fertilizing, liming, watering, pruning, weeding, and pest control. Do not cut grass shorter than three to four inches. Keep grass height under 6 inches to maintain the design depth necessary. Do not mow excessively because it may increase the design flow velocity.

Manually remove sediment and debris at least once per year. Re-seed periodically to maintain the dense growth of grass vegetation. Take care to protect swale from snow removal procedures.

Date	Inspector	Condition	Maintenance Performed*

\*Evidence of maintenance (ie. receipts) must be provided.



# Appendix B: Erosion and Sediment Control Notes and General Construction Sequence

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## Erosion and Sediment Control Notes

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1. Erosion and sediment control measures must be installed prior to the start of construction and maintained and upgraded as necessary during construction by the contractor. It is the contractor's responsibility to inspect and install additional control measures as needed during construction.
2. All catch basins receiving drainage from the project site must be provided with a catch basin filter.
3. Stabilization of all re-graded and soil stockpile areas must be maintained during all phases of construction.
4. Sediment removed from erosion and sediment control devices must be properly removed and disposed. All damaged controls must be removed and replaced.
5. The contractor is responsible for implementing the erosion and sediment control plan. This includes the installation and maintenance of control measures, informing all parties engaged on the construction site of the requirements and objectives of the plan, and notifying the proper city agency of any transfer of this responsibility.
6. The contractor shall be responsible for controlling wind erosion and dust throughout the life of his contract. Dust control may include, but is not limited to, sprinkling of water on exposed soils and street sweeping adjacent roadways.
7. If final grading is to be delayed for more than 21 days after land disturbance activities cease, temporary vegetation or mulch shall be used to stabilize soils within 14 days of the last disturbance.
8. If a disturbed area will be exposed for greater than one year, permanent grasses or other approved cover must be installed.
9. The contractor must keep on-site at all times additional silt fence and hay bales for the installation at the direction of the engineer or the city to mitigate any emergency condition.
10. The construction fencing and erosion and sediment controls as shown may not be practical during all stages of construction. Earthwork activity on-site must be done in a manner such that runoff is directed to a sediment control device or infiltrated to the ground.
11. Demolition and construction debris must be properly contained and disposed of.
12. Disposal of all demolished materials is the responsibility of the contractor and must be hauled off-site in accordance with all federal, state and local requirements.

## General Construction Sequence

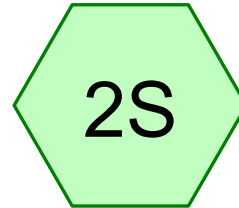
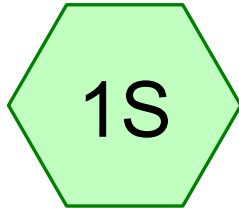
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1. Install erosion and sediment controls prior to starting any earthworks activity.
2. Mark limit of work and trees to remain.
3. Demolish existing improvements and remove in coordination with state and local regulations.
4. Begin clearing and grubbing.
5. Begin utility installations.
6. Construct building foundation.
7. Install site furnishings.
8. Install pavement.
9. Install landscaping.
10. Erosion and sediment controls shall be maintained until permanent cover is established.



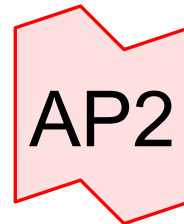
# Appendix C: HydroCAD

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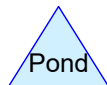
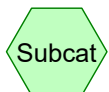
Predevelopment flow to wetland

Pavement to AP2



ANALYSIS POINT #1

ANALYSIS POINT #2





**21076 pre**

Prepared by Howard Stein Hudson

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Page 2

**Rainfall Events Listing (selected events)**

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 Year	Type III 24-hr		Default	24.00	1	3.20	2
2	10 Year	Type III 24-hr		Default	24.00	1	5.10	2
3	25 Year	Type III 24-hr		Default	24.00	1	6.30	2
4	100 Year	Type III 24-hr		Default	24.00	1	8.70	2

**Area Listing (all nodes)**

Area (acres)	CN	Description (subcatchment-numbers)
0.118	61	>75% Grass cover, Good, HSG B (2S)
0.542	98	Paved parking, HSG B (1S, 2S)
0.035	98	Roofs, HSG B (1S)
0.355	30	Woods, Good, HSG A (1S)
1.187	55	Woods, Good, HSG B (1S)
0.964	55	Woods, Good, HSG B Urban (1S)
0.305	77	Woods, Good, HSG D (1S)
<b>3.506</b>	<b>62</b>	<b>TOTAL AREA</b>

**Soil Listing (all nodes)**

Area (acres)	Soil Group	Subcatchment Numbers
0.355	HSG A	1S
2.846	HSG B	1S, 2S
0.000	HSG C	
0.305	HSG D	1S
0.000	Other	
<b>3.506</b>		<b>TOTAL AREA</b>

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*Type III 24-hr 2 Year Rainfall=3.20"*

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Page 5

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

**Subcatchment 1S: Predevelopmentflow** Runoff Area=145,308 sf 15.72% Impervious Runoff Depth>0.39"  
Flow Length=457' Tc=11.0 min CN=61 Runoff=0.91 cfs 0.108 af

**Subcatchment 2S: Pavement to AP2** Runoff Area=7,423 sf 30.80% Impervious Runoff Depth>0.84"  
Tc=6.0 min CN=72 Runoff=0.17 cfs 0.012 af

**Link AP1: ANALYSIS POINT #1** Inflow=0.91 cfs 0.108 af  
Primary=0.91 cfs 0.108 af

**Link AP2: ANALYSIS POINT #2** Inflow=0.17 cfs 0.012 af  
Primary=0.17 cfs 0.012 af

**Total Runoff Area = 3.506 ac Runoff Volume = 0.119 af Average Runoff Depth = 0.41"**  
**83.54% Pervious = 2.929 ac 16.46% Impervious = 0.577 ac**

**Summary for Subcatchment 1S: Predevelopment flow to wetland**

Runoff = 0.91 cfs @ 12.22 hrs, Volume= 0.108 af, Depth> 0.39"  
 Routed to Link AP1 : ANALYSIS POINT #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
15,475	30	Woods, Good, HSG A
51,703	55	Woods, Good, HSG B
13,277	77	Woods, Good, HSG D
21,308	98	Paved parking, HSG B
* 42,007	55	Woods, Good, HSG B Urban
1,538	98	Roofs, HSG B
145,308	61	Weighted Average
122,462		84.28% Pervious Area
22,846		15.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.2600	0.19		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	51	0.2500	2.50		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
6.3	356	0.0360	0.95		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
11.0	457	Total			

**Summary for Subcatchment 2S: Pavement to AP2**

Runoff = 0.17 cfs @ 12.10 hrs, Volume= 0.012 af, Depth> 0.84"  
 Routed to Link AP2 : ANALYSIS POINT #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
2,286	98	Paved parking, HSG B
5,137	61	>75% Grass cover, Good, HSG B
7,423	72	Weighted Average
5,137		69.20% Pervious Area
2,286		30.80% Impervious Area

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

**Summary for Link AP1: ANALYSIS POINT #1**

Inflow Area = 3.336 ac, 15.72% Impervious, Inflow Depth > 0.39" for 2 Year event  
Inflow = 0.91 cfs @ 12.22 hrs, Volume= 0.108 af  
Primary = 0.91 cfs @ 12.22 hrs, Volume= 0.108 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Summary for Link AP2: ANALYSIS POINT #2**

Inflow Area = 0.170 ac, 30.80% Impervious, Inflow Depth > 0.84" for 2 Year event  
Inflow = 0.17 cfs @ 12.10 hrs, Volume= 0.012 af  
Primary = 0.17 cfs @ 12.10 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

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

**Subcatchment 1S: Predevelopmentflow** Runoff Area=145,308 sf 15.72% Impervious Runoff Depth>1.29"  
Flow Length=457' Tc=11.0 min CN=61 Runoff=4.28 cfs 0.359 af

**Subcatchment 2S: Pavement to AP2** Runoff Area=7,423 sf 30.80% Impervious Runoff Depth>2.10"  
Tc=6.0 min CN=72 Runoff=0.44 cfs 0.030 af

**Link AP1: ANALYSIS POINT #1** Inflow=4.28 cfs 0.359 af  
Primary=4.28 cfs 0.359 af

**Link AP2: ANALYSIS POINT #2** Inflow=0.44 cfs 0.030 af  
Primary=0.44 cfs 0.030 af

**Total Runoff Area = 3.506 ac Runoff Volume = 0.389 af Average Runoff Depth = 1.33"**  
**83.54% Pervious = 2.929 ac 16.46% Impervious = 0.577 ac**

**Summary for Subcatchment 1S: Predevelopment flow to wetland**

Runoff = 4.28 cfs @ 12.17 hrs, Volume= 0.359 af, Depth> 1.29"  
 Routed to Link AP1 : ANALYSIS POINT #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 10 Year Rainfall=5.10"

Area (sf)	CN	Description
15,475	30	Woods, Good, HSG A
51,703	55	Woods, Good, HSG B
13,277	77	Woods, Good, HSG D
21,308	98	Paved parking, HSG B
* 42,007	55	Woods, Good, HSG B Urban
1,538	98	Roofs, HSG B
145,308	61	Weighted Average
122,462		84.28% Pervious Area
22,846		15.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.2600	0.19		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	51	0.2500	2.50		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
6.3	356	0.0360	0.95		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
11.0	457	Total			

**Summary for Subcatchment 2S: Pavement to AP2**

Runoff = 0.44 cfs @ 12.10 hrs, Volume= 0.030 af, Depth> 2.10"  
 Routed to Link AP2 : ANALYSIS POINT #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 10 Year Rainfall=5.10"

Area (sf)	CN	Description
2,286	98	Paved parking, HSG B
5,137	61	>75% Grass cover, Good, HSG B
7,423	72	Weighted Average
5,137		69.20% Pervious Area
2,286		30.80% Impervious Area

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



**Summary for Link AP1: ANALYSIS POINT #1**

Inflow Area = 3.336 ac, 15.72% Impervious, Inflow Depth > 1.29" for 10 Year event  
Inflow = 4.28 cfs @ 12.17 hrs, Volume= 0.359 af  
Primary = 4.28 cfs @ 12.17 hrs, Volume= 0.359 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Summary for Link AP2: ANALYSIS POINT #2**

Inflow Area = 0.170 ac, 30.80% Impervious, Inflow Depth > 2.10" for 10 Year event  
Inflow = 0.44 cfs @ 12.10 hrs, Volume= 0.030 af  
Primary = 0.44 cfs @ 12.10 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

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

**Subcatchment 1S: Predevelopmentflow** Runoff Area=145,308 sf 15.72% Impervious Runoff Depth>2.02"  
Flow Length=457' Tc=11.0 min CN=61 Runoff=6.95 cfs 0.561 af

**Subcatchment 2S: Pavement to AP2** Runoff Area=7,423 sf 30.80% Impervious Runoff Depth>3.01"  
Tc=6.0 min CN=72 Runoff=0.63 cfs 0.043 af

**Link AP1: ANALYSIS POINT #1** Inflow=6.95 cfs 0.561 af  
Primary=6.95 cfs 0.561 af

**Link AP2: ANALYSIS POINT #2** Inflow=0.63 cfs 0.043 af  
Primary=0.63 cfs 0.043 af

**Total Runoff Area = 3.506 ac Runoff Volume = 0.603 af Average Runoff Depth = 2.07"**  
**83.54% Pervious = 2.929 ac 16.46% Impervious = 0.577 ac**

**Summary for Subcatchment 1S: Predevelopment flow to wetland**

Runoff = 6.95 cfs @ 12.16 hrs, Volume= 0.561 af, Depth> 2.02"  
 Routed to Link AP1 : ANALYSIS POINT #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 25 Year Rainfall=6.30"

Area (sf)	CN	Description
15,475	30	Woods, Good, HSG A
51,703	55	Woods, Good, HSG B
13,277	77	Woods, Good, HSG D
21,308	98	Paved parking, HSG B
* 42,007	55	Woods, Good, HSG B Urban
1,538	98	Roofs, HSG B
145,308	61	Weighted Average
122,462		84.28% Pervious Area
22,846		15.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.2600	0.19		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	51	0.2500	2.50		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
6.3	356	0.0360	0.95		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
11.0	457	Total			

**Summary for Subcatchment 2S: Pavement to AP2**

Runoff = 0.63 cfs @ 12.09 hrs, Volume= 0.043 af, Depth> 3.01"  
 Routed to Link AP2 : ANALYSIS POINT #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 25 Year Rainfall=6.30"

Area (sf)	CN	Description
2,286	98	Paved parking, HSG B
5,137	61	>75% Grass cover, Good, HSG B
7,423	72	Weighted Average
5,137		69.20% Pervious Area
2,286		30.80% Impervious Area

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

**Summary for Link AP1: ANALYSIS POINT #1**

Inflow Area = 3.336 ac, 15.72% Impervious, Inflow Depth > 2.02" for 25 Year event  
Inflow = 6.95 cfs @ 12.16 hrs, Volume= 0.561 af  
Primary = 6.95 cfs @ 12.16 hrs, Volume= 0.561 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Summary for Link AP2: ANALYSIS POINT #2**

Inflow Area = 0.170 ac, 30.80% Impervious, Inflow Depth > 3.01" for 25 Year event  
Inflow = 0.63 cfs @ 12.09 hrs, Volume= 0.043 af  
Primary = 0.63 cfs @ 12.09 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

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

**Subcatchment 1S: Predevelopmentflow** Runoff Area=145,308 sf 15.72% Impervious Runoff Depth>3.68"  
Flow Length=457' Tc=11.0 min CN=61 Runoff=13.00 cfs 1.024 af

**Subcatchment 2S: Pavement to AP2** Runoff Area=7,423 sf 30.80% Impervious Runoff Depth>4.97"  
Tc=6.0 min CN=72 Runoff=1.04 cfs 0.071 af

**Link AP1: ANALYSIS POINT #1** Inflow=13.00 cfs 1.024 af  
Primary=13.00 cfs 1.024 af

**Link AP2: ANALYSIS POINT #2** Inflow=1.04 cfs 0.071 af  
Primary=1.04 cfs 0.071 af

**Total Runoff Area = 3.506 ac Runoff Volume = 1.094 af Average Runoff Depth = 3.74"**  
**83.54% Pervious = 2.929 ac 16.46% Impervious = 0.577 ac**

**Summary for Subcatchment 1S: Predevelopment flow to wetland**

Runoff = 13.00 cfs @ 12.16 hrs, Volume= 1.024 af, Depth> 3.68"  
 Routed to Link AP1 : ANALYSIS POINT #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 100 Year Rainfall=8.70"

Area (sf)	CN	Description
15,475	30	Woods, Good, HSG A
51,703	55	Woods, Good, HSG B
13,277	77	Woods, Good, HSG D
21,308	98	Paved parking, HSG B
* 42,007	55	Woods, Good, HSG B Urban
1,538	98	Roofs, HSG B
145,308	61	Weighted Average
122,462		84.28% Pervious Area
22,846		15.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.2600	0.19		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	51	0.2500	2.50		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
6.3	356	0.0360	0.95		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
11.0	457	Total			

**Summary for Subcatchment 2S: Pavement to AP2**

Runoff = 1.04 cfs @ 12.09 hrs, Volume= 0.071 af, Depth> 4.97"  
 Routed to Link AP2 : ANALYSIS POINT #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 100 Year Rainfall=8.70"

Area (sf)	CN	Description
2,286	98	Paved parking, HSG B
5,137	61	>75% Grass cover, Good, HSG B
7,423	72	Weighted Average
5,137		69.20% Pervious Area
2,286		30.80% Impervious Area

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

**Summary for Link AP1: ANALYSIS POINT #1**

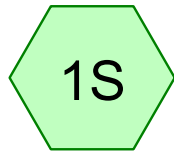
Inflow Area = 3.336 ac, 15.72% Impervious, Inflow Depth > 3.68" for 100 Year event  
Inflow = 13.00 cfs @ 12.16 hrs, Volume= 1.024 af  
Primary = 13.00 cfs @ 12.16 hrs, Volume= 1.024 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

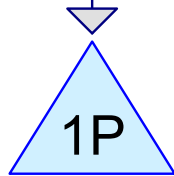
**Summary for Link AP2: ANALYSIS POINT #2**

Inflow Area = 0.170 ac, 30.80% Impervious, Inflow Depth > 4.97" for 100 Year event  
Inflow = 1.04 cfs @ 12.09 hrs, Volume= 0.071 af  
Primary = 1.04 cfs @ 12.09 hrs, Volume= 0.071 af, Atten= 0%, Lag= 0.0 min

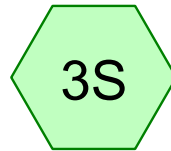
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



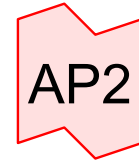
Predevelopment flow to  
detention pond



INFILTRATION POND



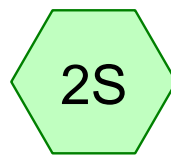
Pavement to AP2



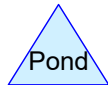
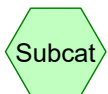
ANALYSIS POINT #2



ANALYSIS POINT #1



Flow to wetland





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Page 2

**Rainfall Events Listing (selected events)**

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 Year	Type III 24-hr		Default	24.00	1	3.20	2
2	10 Year	Type III 24-hr		Default	24.00	1	5.10	2
3	25 Year	Type III 24-hr		Default	24.00	1	6.30	2
4	100 Year	Type III 24-hr		Default	24.00	1	8.70	2

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Page 3

**Area Listing (all nodes)**

Area (acres)	CN	Description (subcatchment-numbers)
0.282	61	>75% Grass cover, Good, HSG B (1S, 2S, 3S)
0.196	61	>75% Grass cover, Good, HSG B pond (1S)
0.023	80	>75% Grass cover, Good, HSG D (2S)
0.607	98	Paved parking, HSG B (1S, 2S, 3S)
0.282	98	Roofs, HSG B (1S)
0.585	60	Woods, Fair, HSG B urban (2S)
0.355	30	Woods, Good, HSG A (1S, 2S)
0.894	55	Woods, Good, HSG B (1S, 2S)
0.282	77	Woods, Good, HSG D (2S)
<b>3.506</b>	<b>67</b>	<b>TOTAL AREA</b>

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**Soil Listing (all nodes)**

Area (acres)	Soil Group	Subcatchment Numbers
0.355	HSG A	1S, 2S
2.846	HSG B	1S, 2S, 3S
0.000	HSG C	
0.305	HSG D	2S
0.000	Other	
<b>3.506</b>		<b>TOTAL AREA</b>

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Page 5

**Pipe Listing (all nodes)**

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1P	191.60	191.00	60.0	0.0100	0.013	0.0	12.0	0.0

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Type III 24-hr 2 Year Rainfall=3.20"

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Page 6

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

**Subcatchment 1S: Predevelopment flow to** Runoff Area=55,123 sf 49.43% Impervious Runoff Depth>0.84"  
Tc=6.0 min CN=72 Runoff=1.26 cfs 0.089 af

**Subcatchment 2S: Flow to wetland** Runoff Area=92,898 sf 9.43% Impervious Runoff Depth>0.46"  
Flow Length=534' Tc=12.8 min CN=63 Runoff=0.72 cfs 0.081 af

**Subcatchment 3S: Pavement to AP2** Runoff Area=4,710 sf 57.37% Impervious Runoff Depth>1.43"  
Tc=6.0 min CN=82 Runoff=0.19 cfs 0.013 af

**Pond 1P: INFILTRATION POND** Peak Elev=192.96' Storage=2,150 cf Inflow=1.26 cfs 0.089 af  
Discarded=0.07 cfs 0.049 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.049 af

**Link AP1: ANALYSIS POINT #1** Inflow=0.72 cfs 0.081 af  
Primary=0.72 cfs 0.081 af

**Link AP2: ANALYSIS POINT #2** Inflow=0.19 cfs 0.013 af  
Primary=0.19 cfs 0.013 af

**Total Runoff Area = 3.506 ac Runoff Volume = 0.183 af Average Runoff Depth = 0.63"**  
**74.66% Pervious = 2.618 ac 25.34% Impervious = 0.889 ac**

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Type III 24-hr 2 Year Rainfall=3.20"

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Page 7

**Summary for Subcatchment 1S: Predevelopment flow to detention pond**

Runoff = 1.26 cfs @ 12.10 hrs, Volume= 0.089 af, Depth> 0.84"  
 Routed to Pond 1P : INFILTRATION POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
12,277	98	Roofs, HSG B
14,969	98	Paved parking, HSG B
* 8,543	61	>75% Grass cover, Good, HSG B pond
12,822	30	Woods, Good, HSG A
2,882	55	Woods, Good, HSG B
1,917	61	>75% Grass cover, Good, HSG B
1,713	61	>75% Grass cover, Good, HSG B
55,123	72	Weighted Average
27,877		50.57% Pervious Area
27,246		49.43% Impervious Area

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

**Summary for Subcatchment 2S: Flow to wetland**

Runoff = 0.72 cfs @ 12.23 hrs, Volume= 0.081 af, Depth> 0.46"  
 Routed to Link AP1 : ANALYSIS POINT #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
* 25,483	60	Woods, Fair, HSG B urban
8,756	98	Paved parking, HSG B
36,068	55	Woods, Good, HSG B
3,746	61	>75% Grass cover, Good, HSG B
12,267	77	Woods, Good, HSG D
2,653	30	Woods, Good, HSG A
2,915	61	>75% Grass cover, Good, HSG B
1,010	80	>75% Grass cover, Good, HSG D
92,898	63	Weighted Average
84,142		90.57% Pervious Area
8,756		9.43% Impervious Area

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Type III 24-hr 2 Year Rainfall=3.20"

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Page 8

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.1800	0.16		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	107	0.1500	1.94		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
6.8	377	0.0340	0.92		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
12.8	534	Total			

**Summary for Subcatchment 3S: Pavement to AP2**

Runoff = 0.19 cfs @ 12.09 hrs, Volume= 0.013 af, Depth> 1.43"  
Routed to Link AP2 : ANALYSIS POINT #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
2,702	98	Paved parking, HSG B
2,008	61	>75% Grass cover, Good, HSG B
4,710	82	Weighted Average
2,008		42.63% Pervious Area
2,702		57.37% Impervious Area

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

**Summary for Pond 1P: INFILTRATION POND**

Inflow Area = 1.265 ac, 49.43% Impervious, Inflow Depth > 0.84" for 2 Year event  
 Inflow = 1.26 cfs @ 12.10 hrs, Volume= 0.089 af  
 Outflow = 0.07 cfs @ 15.55 hrs, Volume= 0.049 af, Atten= 94%, Lag= 206.6 min  
 Discarded = 0.07 cfs @ 15.55 hrs, Volume= 0.049 af  
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af  
 Routed to Link AP1 : ANALYSIS POINT #1  
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af  
 Routed to Link AP1 : ANALYSIS POINT #1

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 192.96' @ 15.55 hrs Surf.Area= 2,933 sf Storage= 2,150 cf

Plug-Flow detention time= 217.3 min calculated for 0.049 af (55% of inflow)  
 Center-of-Mass det. time= 128.6 min ( 951.9 - 823.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	192.00'	16,011 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

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Type III 24-hr 2 Year Rainfall=3.20"

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Page 9

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
192.00	1,563	0	0
194.00	4,427	5,990	5,990
196.00	5,594	10,021	16,011

Device	Routing	Invert	Outlet Devices
#1	Primary	191.60'	<b>12.0" Round Culvert</b> L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 191.60' / 191.00' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	193.00'	<b>6.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#3	Device 1	194.80'	<b>2.0" x 2.0" Horiz. Orifice/Grate X 6.00 columns</b> X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#4	Secondary	195.00'	<b>10.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#5	Discarded	192.00'	<b>1.020 in/hr Exfiltration over Surface area</b> Conductivity to Groundwater Elevation = 182.50'

**Discarded OutFlow** Max=0.07 cfs @ 15.55 hrs HW=192.96' (Free Discharge)

↳ **5=Exfiltration** ( Controls 0.07 cfs)

**Primary OutFlow** Max=0.00 cfs @ 5.00 hrs HW=192.00' TW=0.00' (Dynamic Tailwater)

↳ **1=Culvert** (Passes 0.00 cfs of 0.62 cfs potential flow)

↳ **2=Orifice/Grate** ( Controls 0.00 cfs)

↳ **3=Orifice/Grate** ( Controls 0.00 cfs)

**Secondary OutFlow** Max=0.00 cfs @ 5.00 hrs HW=192.00' TW=0.00' (Dynamic Tailwater)

↳ **4=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

### Summary for Link AP1: ANALYSIS POINT #1

Inflow Area = 3.398 ac, 24.32% Impervious, Inflow Depth > 0.29" for 2 Year event

Inflow = 0.72 cfs @ 12.23 hrs, Volume= 0.081 af

Primary = 0.72 cfs @ 12.23 hrs, Volume= 0.081 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

### Summary for Link AP2: ANALYSIS POINT #2

Inflow Area = 0.108 ac, 57.37% Impervious, Inflow Depth > 1.43" for 2 Year event

Inflow = 0.19 cfs @ 12.09 hrs, Volume= 0.013 af

Primary = 0.19 cfs @ 12.09 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



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Type III 24-hr 10 Year Rainfall=5.10"

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Page 10

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

**Subcatchment 1S: Predevelopment flow to** Runoff Area=55,123 sf 49.43% Impervious Runoff Depth>2.10"  
 Tc=6.0 min CN=72 Runoff=3.28 cfs 0.222 af

**Subcatchment 2S: Flow to wetland** Runoff Area=92,898 sf 9.43% Impervious Runoff Depth>1.43"  
 Flow Length=534' Tc=12.8 min CN=63 Runoff=2.91 cfs 0.254 af

**Subcatchment 3S: Pavement to AP2** Runoff Area=4,710 sf 57.37% Impervious Runoff Depth>2.97"  
 Tc=6.0 min CN=82 Runoff=0.39 cfs 0.027 af

**Pond 1P: INFILTRATION POND** Peak Elev=193.56' Storage=4,196 cf Inflow=3.28 cfs 0.222 af  
 Discarded=0.10 cfs 0.064 af Primary=0.53 cfs 0.102 af Secondary=0.00 cfs 0.000 af Outflow=0.63 cfs 0.166 af

**Link AP1: ANALYSIS POINT #1** Inflow=3.15 cfs 0.356 af  
 Primary=3.15 cfs 0.356 af

**Link AP2: ANALYSIS POINT #2** Inflow=0.39 cfs 0.027 af  
 Primary=0.39 cfs 0.027 af

**Total Runoff Area = 3.506 ac Runoff Volume = 0.502 af Average Runoff Depth = 1.72"**  
**74.66% Pervious = 2.618 ac 25.34% Impervious = 0.889 ac**

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Type III 24-hr 10 Year Rainfall=5.10"

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Page 11

**Summary for Subcatchment 1S: Predevelopment flow to detention pond**

Runoff = 3.28 cfs @ 12.10 hrs, Volume= 0.222 af, Depth> 2.10"  
 Routed to Pond 1P : INFILTRATION POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 10 Year Rainfall=5.10"

Area (sf)	CN	Description
12,277	98	Roofs, HSG B
14,969	98	Paved parking, HSG B
* 8,543	61	>75% Grass cover, Good, HSG B pond
12,822	30	Woods, Good, HSG A
2,882	55	Woods, Good, HSG B
1,917	61	>75% Grass cover, Good, HSG B
1,713	61	>75% Grass cover, Good, HSG B
55,123	72	Weighted Average
27,877		50.57% Pervious Area
27,246		49.43% Impervious Area

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

**Summary for Subcatchment 2S: Flow to wetland**

Runoff = 2.91 cfs @ 12.20 hrs, Volume= 0.254 af, Depth> 1.43"  
 Routed to Link AP1 : ANALYSIS POINT #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 10 Year Rainfall=5.10"

Area (sf)	CN	Description
* 25,483	60	Woods, Fair, HSG B urban
8,756	98	Paved parking, HSG B
36,068	55	Woods, Good, HSG B
3,746	61	>75% Grass cover, Good, HSG B
12,267	77	Woods, Good, HSG D
2,653	30	Woods, Good, HSG A
2,915	61	>75% Grass cover, Good, HSG B
1,010	80	>75% Grass cover, Good, HSG D
92,898	63	Weighted Average
84,142		90.57% Pervious Area
8,756		9.43% Impervious Area

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Type III 24-hr 10 Year Rainfall=5.10"

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Page 12

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.1800	0.16		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	107	0.1500	1.94		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
6.8	377	0.0340	0.92		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
12.8	534	Total			

**Summary for Subcatchment 3S: Pavement to AP2**

Runoff = 0.39 cfs @ 12.09 hrs, Volume= 0.027 af, Depth> 2.97"  
Routed to Link AP2 : ANALYSIS POINT #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 Year Rainfall=5.10"

Area (sf)	CN	Description
2,702	98	Paved parking, HSG B
2,008	61	>75% Grass cover, Good, HSG B
4,710	82	Weighted Average
2,008		42.63% Pervious Area
2,702		57.37% Impervious Area

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

**Summary for Pond 1P: INFILTRATION POND**

Inflow Area = 1.265 ac, 49.43% Impervious, Inflow Depth > 2.10" for 10 Year event  
 Inflow = 3.28 cfs @ 12.10 hrs, Volume= 0.222 af  
 Outflow = 0.63 cfs @ 12.57 hrs, Volume= 0.166 af, Atten= 81%, Lag= 28.6 min  
 Discarded = 0.10 cfs @ 12.57 hrs, Volume= 0.064 af  
 Primary = 0.53 cfs @ 12.57 hrs, Volume= 0.102 af  
 Routed to Link AP1 : ANALYSIS POINT #1  
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af  
 Routed to Link AP1 : ANALYSIS POINT #1

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 193.56' @ 12.57 hrs Surf.Area= 3,803 sf Storage= 4,196 cf

Plug-Flow detention time= 129.9 min calculated for 0.166 af (75% of inflow)  
 Center-of-Mass det. time= 67.8 min ( 870.5 - 802.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	192.00'	16,011 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

**21076 post**

Type III 24-hr 10 Year Rainfall=5.10"

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Page 13

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
192.00	1,563	0	0
194.00	4,427	5,990	5,990
196.00	5,594	10,021	16,011

Device	Routing	Invert	Outlet Devices
#1	Primary	191.60'	<b>12.0" Round Culvert</b> L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 191.60' / 191.00' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	193.00'	<b>6.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#3	Device 1	194.80'	<b>2.0" x 2.0" Horiz. Orifice/Grate X 6.00 columns</b> X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#4	Secondary	195.00'	<b>10.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#5	Discarded	192.00'	<b>1.020 in/hr Exfiltration over Surface area</b> Conductivity to Groundwater Elevation = 182.50'

**Discarded OutFlow** Max=0.10 cfs @ 12.57 hrs HW=193.56' (Free Discharge)

↳ **5=Exfiltration** ( Controls 0.10 cfs)

**Primary OutFlow** Max=0.53 cfs @ 12.57 hrs HW=193.56' TW=0.00' (Dynamic Tailwater)

↳ **1=Culvert** (Passes 0.53 cfs of 4.28 cfs potential flow)

↳ **2=Orifice/Grate** (Orifice Controls 0.53 cfs @ 2.69 fps)

↳ **3=Orifice/Grate** ( Controls 0.00 cfs)

**Secondary OutFlow** Max=0.00 cfs @ 5.00 hrs HW=192.00' TW=0.00' (Dynamic Tailwater)

↳ **4=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

### Summary for Link AP1: ANALYSIS POINT #1

Inflow Area = 3.398 ac, 24.32% Impervious, Inflow Depth > 1.26" for 10 Year event  
 Inflow = 3.15 cfs @ 12.21 hrs, Volume= 0.356 af  
 Primary = 3.15 cfs @ 12.21 hrs, Volume= 0.356 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

### Summary for Link AP2: ANALYSIS POINT #2

Inflow Area = 0.108 ac, 57.37% Impervious, Inflow Depth > 2.97" for 10 Year event  
 Inflow = 0.39 cfs @ 12.09 hrs, Volume= 0.027 af  
 Primary = 0.39 cfs @ 12.09 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**21076 post**

Type III 24-hr 25 Year Rainfall=6.30"

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Page 14

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

**Subcatchment 1S: Predevelopment flow to** Runoff Area=55,123 sf 49.43% Impervious Runoff Depth>3.01"  
Tc=6.0 min CN=72 Runoff=4.71 cfs 0.318 af

**Subcatchment 2S: Flow to wetland** Runoff Area=92,898 sf 9.43% Impervious Runoff Depth>2.19"  
Flow Length=534' Tc=12.8 min CN=63 Runoff=4.60 cfs 0.389 af

**Subcatchment 3S: Pavement to AP2** Runoff Area=4,710 sf 57.37% Impervious Runoff Depth>4.01"  
Tc=6.0 min CN=82 Runoff=0.52 cfs 0.036 af

**Pond 1P: INFILTRATION POND** Peak Elev=194.01' Storage=6,032 cf Inflow=4.71 cfs 0.318 af  
Discarded=0.12 cfs 0.071 af Primary=0.82 cfs 0.188 af Secondary=0.00 cfs 0.000 af Outflow=0.94 cfs 0.259 af

**Link AP1: ANALYSIS POINT #1** Inflow=5.25 cfs 0.576 af  
Primary=5.25 cfs 0.576 af

**Link AP2: ANALYSIS POINT #2** Inflow=0.52 cfs 0.036 af  
Primary=0.52 cfs 0.036 af

**Total Runoff Area = 3.506 ac Runoff Volume = 0.742 af Average Runoff Depth = 2.54"**  
**74.66% Pervious = 2.618 ac 25.34% Impervious = 0.889 ac**

**21076 post**

Type III 24-hr 25 Year Rainfall=6.30"

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Page 15

**Summary for Subcatchment 1S: Predevelopment flow to detention pond**

Runoff = 4.71 cfs @ 12.09 hrs, Volume= 0.318 af, Depth> 3.01"  
Routed to Pond 1P : INFILTRATION POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 Year Rainfall=6.30"

Area (sf)	CN	Description
12,277	98	Roofs, HSG B
14,969	98	Paved parking, HSG B
* 8,543	61	>75% Grass cover, Good, HSG B pond
12,822	30	Woods, Good, HSG A
2,882	55	Woods, Good, HSG B
1,917	61	>75% Grass cover, Good, HSG B
1,713	61	>75% Grass cover, Good, HSG B
<hr/>		
55,123	72	Weighted Average
27,877		50.57% Pervious Area
27,246		49.43% Impervious Area

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

**Summary for Subcatchment 2S: Flow to wetland**

Runoff = 4.60 cfs @ 12.19 hrs, Volume= 0.389 af, Depth> 2.19"  
Routed to Link AP1 : ANALYSIS POINT #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 Year Rainfall=6.30"

Area (sf)	CN	Description
* 25,483	60	Woods, Fair, HSG B urban
8,756	98	Paved parking, HSG B
36,068	55	Woods, Good, HSG B
3,746	61	>75% Grass cover, Good, HSG B
12,267	77	Woods, Good, HSG D
2,653	30	Woods, Good, HSG A
2,915	61	>75% Grass cover, Good, HSG B
1,010	80	>75% Grass cover, Good, HSG D
<hr/>		
92,898	63	Weighted Average
84,142		90.57% Pervious Area
8,756		9.43% Impervious Area

**21076 post**

Type III 24-hr 25 Year Rainfall=6.30"

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Page 16

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.1800	0.16		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	107	0.1500	1.94		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
6.8	377	0.0340	0.92		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
12.8	534	Total			

**Summary for Subcatchment 3S: Pavement to AP2**

Runoff = 0.52 cfs @ 12.09 hrs, Volume= 0.036 af, Depth> 4.01"  
Routed to Link AP2 : ANALYSIS POINT #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25 Year Rainfall=6.30"

Area (sf)	CN	Description
2,702	98	Paved parking, HSG B
2,008	61	>75% Grass cover, Good, HSG B
4,710	82	Weighted Average
2,008		42.63% Pervious Area
2,702		57.37% Impervious Area

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

**Summary for Pond 1P: INFILTRATION POND**

Inflow Area = 1.265 ac, 49.43% Impervious, Inflow Depth > 3.01" for 25 Year event  
 Inflow = 4.71 cfs @ 12.09 hrs, Volume= 0.318 af  
 Outflow = 0.94 cfs @ 12.55 hrs, Volume= 0.259 af, Atten= 80%, Lag= 27.5 min  
 Discarded = 0.12 cfs @ 12.55 hrs, Volume= 0.071 af  
 Primary = 0.82 cfs @ 12.55 hrs, Volume= 0.188 af  
 Routed to Link AP1 : ANALYSIS POINT #1  
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af  
 Routed to Link AP1 : ANALYSIS POINT #1

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 194.01' @ 12.55 hrs Surf.Area= 4,433 sf Storage= 6,032 cf

Plug-Flow detention time= 114.0 min calculated for 0.259 af (82% of inflow)  
 Center-of-Mass det. time= 63.4 min ( 858.0 - 794.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	192.00'	16,011 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

**21076 post**

Type III 24-hr 25 Year Rainfall=6.30"

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Page 17

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
192.00	1,563	0	0
194.00	4,427	5,990	5,990
196.00	5,594	10,021	16,011

Device	Routing	Invert	Outlet Devices
#1	Primary	191.60'	<b>12.0" Round Culvert</b> L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 191.60' / 191.00' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	193.00'	<b>6.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#3	Device 1	194.80'	<b>2.0" x 2.0" Horiz. Orifice/Grate X 6.00 columns</b> X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#4	Secondary	195.00'	<b>10.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#5	Discarded	192.00'	<b>1.020 in/hr Exfiltration over Surface area</b> Conductivity to Groundwater Elevation = 182.50'

**Discarded OutFlow** Max=0.12 cfs @ 12.55 hrs HW=194.01' (Free Discharge)

↳ **5=Exfiltration** ( Controls 0.12 cfs)

**Primary OutFlow** Max=0.82 cfs @ 12.55 hrs HW=194.01' TW=0.00' (Dynamic Tailwater)

↳ **1=Culvert** (Passes 0.82 cfs of 4.86 cfs potential flow)

↳ **2=Orifice/Grate** (Orifice Controls 0.82 cfs @ 4.20 fps)

↳ **3=Orifice/Grate** ( Controls 0.00 cfs)

**Secondary OutFlow** Max=0.00 cfs @ 5.00 hrs HW=192.00' TW=0.00' (Dynamic Tailwater)

↳ **4=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

### Summary for Link AP1: ANALYSIS POINT #1

Inflow Area = 3.398 ac, 24.32% Impervious, Inflow Depth > 2.04" for 25 Year event  
 Inflow = 5.25 cfs @ 12.20 hrs, Volume= 0.576 af  
 Primary = 5.25 cfs @ 12.20 hrs, Volume= 0.576 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

### Summary for Link AP2: ANALYSIS POINT #2

Inflow Area = 0.108 ac, 57.37% Impervious, Inflow Depth > 4.01" for 25 Year event  
 Inflow = 0.52 cfs @ 12.09 hrs, Volume= 0.036 af  
 Primary = 0.52 cfs @ 12.09 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



**21076 post**

Type III 24-hr 100 Year Rainfall=8.70"

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Page 18

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

**Subcatchment 1S: Predevelopment flow to** Runoff Area=55,123 sf 49.43% Impervious Runoff Depth>4.97"  
Tc=6.0 min CN=72 Runoff=7.70 cfs 0.525 af

**Subcatchment 2S: Flow to wetland** Runoff Area=92,898 sf 9.43% Impervious Runoff Depth>3.91"  
Flow Length=534' Tc=12.8 min CN=63 Runoff=8.35 cfs 0.695 af

**Subcatchment 3S: Pavement to AP2** Runoff Area=4,710 sf 57.37% Impervious Runoff Depth>6.16"  
Tc=6.0 min CN=82 Runoff=0.79 cfs 0.056 af

**Pond 1P: INFILTRATION POND** Peak Elev=194.89' Storage=10,155 cf Inflow=7.70 cfs 0.525 af  
Discarded=0.14 cfs 0.087 af Primary=1.90 cfs 0.375 af Secondary=0.00 cfs 0.000 af Outflow=2.04 cfs 0.462 af

**Link AP1: ANALYSIS POINT #1** Inflow=9.41 cfs 1.070 af  
Primary=9.41 cfs 1.070 af

**Link AP2: ANALYSIS POINT #2** Inflow=0.79 cfs 0.056 af  
Primary=0.79 cfs 0.056 af

**Total Runoff Area = 3.506 ac Runoff Volume = 1.275 af Average Runoff Depth = 4.36"**  
**74.66% Pervious = 2.618 ac 25.34% Impervious = 0.889 ac**

**21076 post**

Type III 24-hr 100 Year Rainfall=8.70"

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Page 19

**Summary for Subcatchment 1S: Predevelopment flow to detention pond**

Runoff = 7.70 cfs @ 12.09 hrs, Volume= 0.525 af, Depth> 4.97"  
 Routed to Pond 1P : INFILTRATION POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 100 Year Rainfall=8.70"

Area (sf)	CN	Description
12,277	98	Roofs, HSG B
14,969	98	Paved parking, HSG B
* 8,543	61	>75% Grass cover, Good, HSG B pond
12,822	30	Woods, Good, HSG A
2,882	55	Woods, Good, HSG B
1,917	61	>75% Grass cover, Good, HSG B
1,713	61	>75% Grass cover, Good, HSG B
55,123	72	Weighted Average
27,877		50.57% Pervious Area
27,246		49.43% Impervious Area

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

**Summary for Subcatchment 2S: Flow to wetland**

Runoff = 8.35 cfs @ 12.18 hrs, Volume= 0.695 af, Depth> 3.91"  
 Routed to Link AP1 : ANALYSIS POINT #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 100 Year Rainfall=8.70"

Area (sf)	CN	Description
* 25,483	60	Woods, Fair, HSG B urban
8,756	98	Paved parking, HSG B
36,068	55	Woods, Good, HSG B
3,746	61	>75% Grass cover, Good, HSG B
12,267	77	Woods, Good, HSG D
2,653	30	Woods, Good, HSG A
2,915	61	>75% Grass cover, Good, HSG B
1,010	80	>75% Grass cover, Good, HSG D
92,898	63	Weighted Average
84,142		90.57% Pervious Area
8,756		9.43% Impervious Area

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Type III 24-hr 100 Year Rainfall=8.70"

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Page 20

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.1800	0.16		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	107	0.1500	1.94		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
6.8	377	0.0340	0.92		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
12.8	534	Total			

**Summary for Subcatchment 3S: Pavement to AP2**

Runoff = 0.79 cfs @ 12.09 hrs, Volume= 0.056 af, Depth> 6.16"  
Routed to Link AP2 : ANALYSIS POINT #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 Year Rainfall=8.70"

Area (sf)	CN	Description
2,702	98	Paved parking, HSG B
2,008	61	>75% Grass cover, Good, HSG B
4,710	82	Weighted Average
2,008		42.63% Pervious Area
2,702		57.37% Impervious Area

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

**Summary for Pond 1P: INFILTRATION POND**

Inflow Area = 1.265 ac, 49.43% Impervious, Inflow Depth > 4.97" for 100 Year event  
 Inflow = 7.70 cfs @ 12.09 hrs, Volume= 0.525 af  
 Outflow = 2.04 cfs @ 12.47 hrs, Volume= 0.462 af, Atten= 74%, Lag= 23.0 min  
 Discarded = 0.14 cfs @ 12.47 hrs, Volume= 0.087 af  
 Primary = 1.90 cfs @ 12.47 hrs, Volume= 0.375 af  
 Routed to Link AP1 : ANALYSIS POINT #1  
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af  
 Routed to Link AP1 : ANALYSIS POINT #1

Routing by Dyn-Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 194.89' @ 12.47 hrs Surf.Area= 4,946 sf Storage= 10,155 cf

Plug-Flow detention time= 109.7 min calculated for 0.460 af (88% of inflow)  
 Center-of-Mass det. time= 72.7 min ( 855.8 - 783.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	192.00'	16,011 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

**21076 post**

Type III 24-hr 100 Year Rainfall=8.70"

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Page 21

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
192.00	1,563	0	0
194.00	4,427	5,990	5,990
196.00	5,594	10,021	16,011

Device	Routing	Invert	Outlet Devices
#1	Primary	191.60'	<b>12.0" Round Culvert</b> L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 191.60' / 191.00' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	193.00'	<b>6.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#3	Device 1	194.80'	<b>2.0" x 2.0" Horiz. Orifice/Grate X 6.00 columns</b> X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads
#4	Secondary	195.00'	<b>10.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#5	Discarded	192.00'	<b>1.020 in/hr Exfiltration over Surface area</b> Conductivity to Groundwater Elevation = 182.50'

**Discarded OutFlow** Max=0.14 cfs @ 12.47 hrs HW=194.89' (Free Discharge)↳ **5=Exfiltration** ( Controls 0.14 cfs)**Primary OutFlow** Max=1.88 cfs @ 12.47 hrs HW=194.89' TW=0.00' (Dynamic Tailwater)↳ **1=Culvert** (Passes 1.88 cfs of 5.82 cfs potential flow)↳ **2=Orifice/Grate** (Orifice Controls 1.21 cfs @ 6.16 fps)↳ **3=Orifice/Grate** (Weir Controls 0.67 cfs @ 0.96 fps)**Secondary OutFlow** Max=0.00 cfs @ 5.00 hrs HW=192.00' TW=0.00' (Dynamic Tailwater)↳ **4=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)**Summary for Link AP1: ANALYSIS POINT #1**

Inflow Area = 3.398 ac, 24.32% Impervious, Inflow Depth > 3.78" for 100 Year event  
 Inflow = 9.41 cfs @ 12.19 hrs, Volume= 1.070 af  
 Primary = 9.41 cfs @ 12.19 hrs, Volume= 1.070 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Summary for Link AP2: ANALYSIS POINT #2**

Inflow Area = 0.108 ac, 57.37% Impervious, Inflow Depth > 6.16" for 100 Year event  
 Inflow = 0.79 cfs @ 12.09 hrs, Volume= 0.056 af  
 Primary = 0.79 cfs @ 12.09 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs