DRAINAGE ANALYSIS

SEDIMENT AND EROSION CONTROL PLAN

"Lilac Place"
76 Portsmouth Ave.
Exeter, NH 03833
Tax Map 137, Lots 4 & 75

Prepared for:

Green & Company
11 Lafayette Road
North Hampton, NH 03862

DANIEL
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MEDITZ
No.18152

11/05/2024

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JBE Project No. 24029

EXECUTIVE SUMMARY

Green & Company proposes to construct a mixed-use commercial and residential development on the subject parcel as shown on the design plans with access from Portsmouth Ave. & Haven Lane in Exeter, NH.

In general, the Town of Exeter has similar drainage regulations to the AOT Bureau, with the additional stipulation that runoff from impervious surfaces shall be treated to achieve at least 80% removal of total suspended solids and 60% removal of both total nitrogen and total phosphorous for all impervious surfaces with the exception of residential roofs, which typically do not require treatment per NHDES. Through the use of several stormwater management devices including bioretention ponds, focal points, Jellyfish systems, and underground detention chambers, we are able to meet all applicable regulations for this project.

A drainage analysis of the entire site as well as offsite contributing watershed area was conducted for the purpose of estimating the peak rate of stormwater runoff and to subsequently design adequate drainage structures so that the above-mentioned requirements could be met. Two models were compiled, one for this area in its existing (pre-construction) condition, and a second for the area in its proposed (post-construction) condition. The analysis was conducted using data for the 2 Year – 24 Hour (3.70"), 10 Year – 24 Hour (5.65"), 25 Year – 24 Hour (7.18"), and 50 Year – 24 Hour (8.61") storm events using the USDA SCS TR-20 method within the HydroCAD Stormwater Modeling System environment. These rainfall data were taken from the Extreme Precipitation Tables developed by the Northeast Regional Climate Center (NRCC) and the extreme precipitation estimates were increased by 15% due to the project's location in a Coastal/Great Bay Community. A summary of the existing and proposed conditions peak rates of runoff toward the six analysis points in units of cubic feet per second (cfs) is as follows:

Analysis Point	2 Year		10 Year		25 Year		50 Year	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Analysis Point #1	16.45	15.64	28.02	26.11	37.33	34.82	46.04	45.92
Analysis Point #2	6.42	6.39	7.42	7.34	8.17	8.14	8.89	8.89
Analysis Point #3	10.87	10.82	19.20	19.01	25.75	25.40	31.85	31.81
Analysis Point #4	0.87	0.18	1.33	0.28	1.70	0.35	2.04	0.42
Analysis Point #5	0.37	0.01	0.57	0.02	0.73	0.03	0.87	0.04
Analysis Point #6	0.45	0.42	0.76	0.73	1.01	0.97	1.24	1.20

The post-development 2-Year 24-Hour combined peak rate of runoff from all proposed stormwater management features is 1.26 cfs. Furthermore, 6,266 SF of residential roof and approximately 7,000 SF of grassed area is not directed toward a stormwater BMP post-construction. Put into a subcatchment with a 6 minute time of concentration, this contributes another 0.77 cfs of flow during the 2-year 24-hour storm event. This adds up to 1.26+0.77= **2.03 cfs** total flow from the developed area alone toward the downstream Squamscott River. A project meets channel protection requirements if 2-year 24-hour combined flow toward a downstream waterbody from the developed area for a project is less than 2 cfs, with "allowances… made for scientific uncertainty and mathematical rounding". (Env-Wq 1507.05(c)). 2.03 cfs easily rounds down to 2.0 cfs and realistically the peak flow rate will be lower, as rainfall estimates have been increased by 15% due to the project's location in a Coastal/Great Bay community. Therefore, this project meets the channel protection requirements of both the Town of Exeter and the AOT Bureau.

The use of Best Management Practices per the NHDES Stormwater Manual have been applied to the design of this stormwater management system and will be observed during all stages of construction. All land disturbed during construction will be stabilized within thirty days of groundbreaking and abutting property owners will suffer minimal adversity resultant to this development.

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1.0 RAINFALL CHARACTERISTICS

This drainage report includes an existing conditions analysis of the area involved in the proposed development, as well as a proposed condition, or post-construction analysis, of the same area. These analyses were accomplished using the USDA SCS TR-20 Method within the HydroCAD 10.20-3c Stormwater Modeling System and a time span of 0-48 hours was utilized. The curve numbers were developed using the SCS TR-55 Runoff Curve numbers for Urban Areas. A Type III SCS 24-hour rainfall distribution was utilized in analyzing the data for the the 2 Year – 24 Hour (3.70”), 10 Year – 24 Hour (5.65”), 25 Year – 24 Hour (7.18"), and 50 Year – 24 Hour (8.61") storm events using the USDA SCS TR-20 method within the HydroCAD Stormwater Modeling System environment. These rainfall data were taken from the Extreme Precipitation Tables developed by the Northeast Regional Climate Center (NRCC) and the extreme precipitation estimates were increased by 15% due to the project’s location in a Coastal/Great Bay Community.

Peak rates of runoff will be reduced from the existing condition and channel protection as well as groundwater recharge requirements will be met, thereby minimizing any potential for a negative impact on wetlands or abutting properties. This is accomplished through treatment of stormwater runoff and attenuation of peak flows and volumes resulting from storm events.

2.0 EXISTING CONDITIONS ANALYSIS

In the existing condition, the front of the site is developed and consists of an Auto Parts business while the rear of the site is wooded. A deep gully separates these two parts of the subject parcel. Runoff from the area of proposed development as well as upstream contributing watershed area, collectively referred to from this point forward as the “study area”, was considered in this analysis.

The existing topography as well as existing drainage features divide the study area into 6 subcatchments, draining toward six analysis points. Subcatchment 1S consists of the bulk of the existing Auto Parts development, as well as the majority of on-site woods and some offsite contributing watershed. Subcatchment 1S drains directly toward Analysis Point 1, which is the ultimate discharge point from most of the subject parcel toward the Squamscott River, far downstream.

Subcatchment 2S consists of the back parking lot and roof of the neighboring Thirsty Moose as well as some on-site wooded area. This subcatchment drains directly to Analysis Point 2. Analysis Point 2 is a stormwater collection point at the beginning of the aforemented deep gully separating the front, developed and the back, wooded sections of the subject parcel. This was modelled as an Analysis Point in order to ensure that runoff from the proposed development does not negatively impact the existing Thirsty Moose site. From Analysis Point 2, runoff follows a series of reaches, labelled as 2Sa, 2Sb, and 2Sc, toward downstream Analysis Point 1.

Subcatchment 3S consists of some wooded and wetland area in the southwestern periphery of the subject parcel as well as significant offsite contributing watershed area. This drains toward Analysis Point 3, which is modelled as a pond due to existing closed contours. Due to the existence of a 15” CMP outlet near AP2, it is assumed that a 15” CMP inlet exists for the pond modelled as AP3 and is either buried or hidden. As noted on the project plans, the contractor shall uncover this inlet during construction and notify the engineer of record if it is not found. However, the culvert is modelled in both the existing and proposed conditions analyses as we assume that it does in fact exist. We need to model this analysis point in order to verify that we are not increasing peak flows or flood stages in the existing pond, which would negatively impact the proposed development and surrounding commercial sites if so. Discharge from the pond modelled as Analysis Point 3 is routed through the aforementioned culvert toward Analysis Point 2, and therefore ultimately toward Analysis Point 1 as previously explained.

Subcatchment 4S represents the far front area of the existing Auto Parts site, which is mostly paved and drains directly into Portsmouth Avenue. The edge of pavement for Portsmouth Avenue is modelled as Analysis Point 3, downstream of Subcatchment 4S.

Subcatchment 5S consists of the northeastern half of the existing Auto Parts store roof, which drains on to the abutting Verani Realty business, modelled as Analysis Point 5. Runoff from Analysis Point 5 is routed toward Reach 2Rb and ultimately toward downstream Analysis Point 1.

Finally Subcatchment 6S consists of a stretch of Haven Lane as well as existing abutting house lots that drain toward an existing catch basin, modelled as Analysis Point 6. This catch basin is scheduled to be relocated for the proposed development. The closed drainage system that this catch basin is a part of outlets far enough north of the development site that it will not impact the proposed development, but this subcatchment needed to be modelled in order to ensure that we are reducing peak rates of runoff into the closed drainage system and therefore the closed drainage system will not be negatively impacted by the proposed development.

Existing soil types were determined through a Site Specific Soil Survey conducted by a Certified Soil Scientist. Several different soil types were identified, with Hydrologic Soil Groupings of C and D. The soil types where infiltration systems are proposed are primarily Scitico silt loam (HSG C, SSSM symbol 33) and Boxford somewhat poorly drained (SSSM symbol 953). of Soil Scientists of Northern New England (SSSNNE), Scitico soils have a saturated hydraulic conductivity (Ksat) range of 0.0-0.2 inches per hour in both the B and C horizons, and Boxford soils have a Ksat range of 0.1-0.2 inches per hour in the B horizon and 0.00 to 0.2 inches per hour in the C horizon. Soil types per the Site-Specific Soil Survey were used for onsite areas and soil types per NRCS Web Soil Survey were used for offsite areas, which includes some areas represented as HSG B.

Ostensibly these values indicate little to no capacity for infiltration. For this reason, infiltration testing was performed on site using a Compact Constant Head Permeameter (CCHP, also known as an amoozemeter) on October 24, 2024 in order to verify the actual infiltration rate of the in-situ soils. An auger was used in order to dig test holes to the C horizon and three tests were performed in each of three locations throughout the subject parcel for a total of nine tests. These three locations corresponded with the locations of test pits 6001, 6007, and 6010.

Standard size auger holes, 4 cm in diameter were dug to the C horizon in order to obtain an accurate permeability reading below the bottom of the proposed infiltration systems. Water was then discharged through the soil and the drop in water level on the tube in which the water was stored before being discharged was recorded at several time intervals. The comparison between the drop in water level and the elapsed time from the start of the test was used to calculate the Ksat value. For example, if the water level dropped 3 cm after 5 minutes and 5 cm after 10 minutes, this was recorded and used as data to calculate the Ksat using the formulas listed in the data spreadsheets in the appendix of this report. The Ksat values from each time increment were then averaged to determine the mean Ksat, and average of the mean Ksat values between the three tests at each location was divided by a factor of safety of two in order to determine the saturated hydraulic conductivity to use for design purposes.

One outlier was recorded – A much higher mean Ksat was recorded for the first test near test pit 6010 than on the other two. This occurred because the amoozemeter was perched on top of a 2-foot high bucket, so there was too much head differential between the amoozemeter and the bottom of the test hole. For the remainder of the tests, the amoozemeter was kept at or near grade, but the results of this one test were discarded from the mean Ksat calculation.

The results of the permeability testing are as summarized below:

Test	Ksat (in/hr)
TP 6010 – Test #1	*4.92 (discarded)*
TP 6010 – Test #2	1.50
TP 6010 – Test #3	2.54
TP 6010 – Mean Ksat	**2.0**
TP 6007 – Test #1	1.78
TP 6007 – Test #2	3.40
TP 6007 – Test #3	3.61
TP 6007 – Mean Ksat	**2.9**
TP 6001 – Test #1	3.41
TP 6001 – Test #2	3.07
TP 6001 – Test #3	3.48
TP 6001 – Mean Ksat	**3.3**

A further breakdown of the data used to arrive at the final Ksat values is included in the appendix of this report. Applying a factor of safety of two, this comes out to a saturated hydraulic conductivity of **1.5 in/hr** to use for test pit 6010, **1.45 in/hr** to use for the test pit 6007, and **1.65 in/hr** to use for test pit 6001.

3.0 PROPOSED CONDITIONS ANALYSIS

If a stormwater management system were not implemented, the addition of the proposed impervious surfaces would cause an increase in the curve number (C_n) and a decrease in the time of concentration (T_c), the net result of which would be a potential increase in peak rates of runoff from the site. A stormwater management system was designed so that peak rates of runoff would decrease toward the six analysis points and so that all other applicable regulations would be met. The proposed development divides the subject parcel into 19 subcatchments, all draining toward the same four analysis points as previously described. Subcatchments 1S-6S are functionally the same as in the existing conditions analysis in terms of their hydrologic routing, but their outlines, areas, and surface covers are altered due to the grading associated with the proposed development.

Beyond this, pond node numbers have been arbitrarily assigned for each of the proposed stormwater management devices, and a corresponding subcatchment for the land that drains to it has been developed if applicable as well. The same reaches from the existing conditions analysis have been maintained in the proposed conditions analysis, and additional reaches have been added to model overland flow from the outfall points of proposed stormwater management devices toward existing reaches or analysis points. In total, four chamber systems, two focal points, two "Jellyfish" treatment devices, a detention pond, and three bioretention systems with pre-treatment have been designed for stormwater runoff from the proposed development.

As a result of the implementation of this stormwater management system, peak flow rates are reduced toward all six analysis points during all analyzed storm events in the proposed condition as compared with the existing condition. Additionally, channel protection requirements of both the Town of Exeter and the AOT Bureau are met as explained in the executive summary. Groundwater recharge volume requirements are met as well. A GRV worksheet is available in the appendix of the report to demonstrate this. Each stormwater management device treats either the water quality volume or water quality flow of runoff directed toward it as required. All post-construction impervious surfaces on the subject parcel with the exception of some residential roofs are directed toward a treatment device, where residential roof runoff is considered to be clean per NHDES and therefore does not require treatment.

Additionally, through the implementation of this stormwater management system, the pollutant removal requirements of the Town of Exeter are met. Some impervious surfaces are directed toward bioretention systems with sediment forebays. Bioretention systems remove 90% total suspended solids and 65% of both total nitrogen and total phosphorous directed toward them per the NH Stormwater Manual. Furthermore, focal points provide similar TSS removal to a bioretention system as well as 75% TN and 76% TP when a 1” runoff depth is treated with one, according to the EPA. The Jellyfish is another device that provides similar or better pollutant removal as compared with a bioretention system. Therefore, the proposed project exceeds the Town of Exeter’s requirement to provide 80% TSS and 60% TN and TP removal for runoff from impervious surfaces. Pollutant removal efficiency information is contained within the appendix of this report.

5.0 CONCLUSION

This proposed site development will have minimal adverse effect on abutting infrastructures, properties, and downstream wetlands by way of stormwater runoff or siltation. Appropriate steps will be taken to eliminate erosion and sedimentation; these will be accomplished through the construction of the aforementioned stormwater management system as well as site grading, rip rap, and temporary erosion control measures including but not limited to silt fence, erosion control blankets, culvert inlet protection check dams, and a stabilized construction entrance. Best Management Practices developed by the State of New Hampshire have been utilized in the design of this stormwater management system and their application will be enforced throughout the construction process.

This project results in more than 100,000 S.F. of disturbance and therefore it will require a NHDES Alteration of Terrain Permit.

Respectfully Submitted,
JONES & BEACH ENGINEERS, INC.

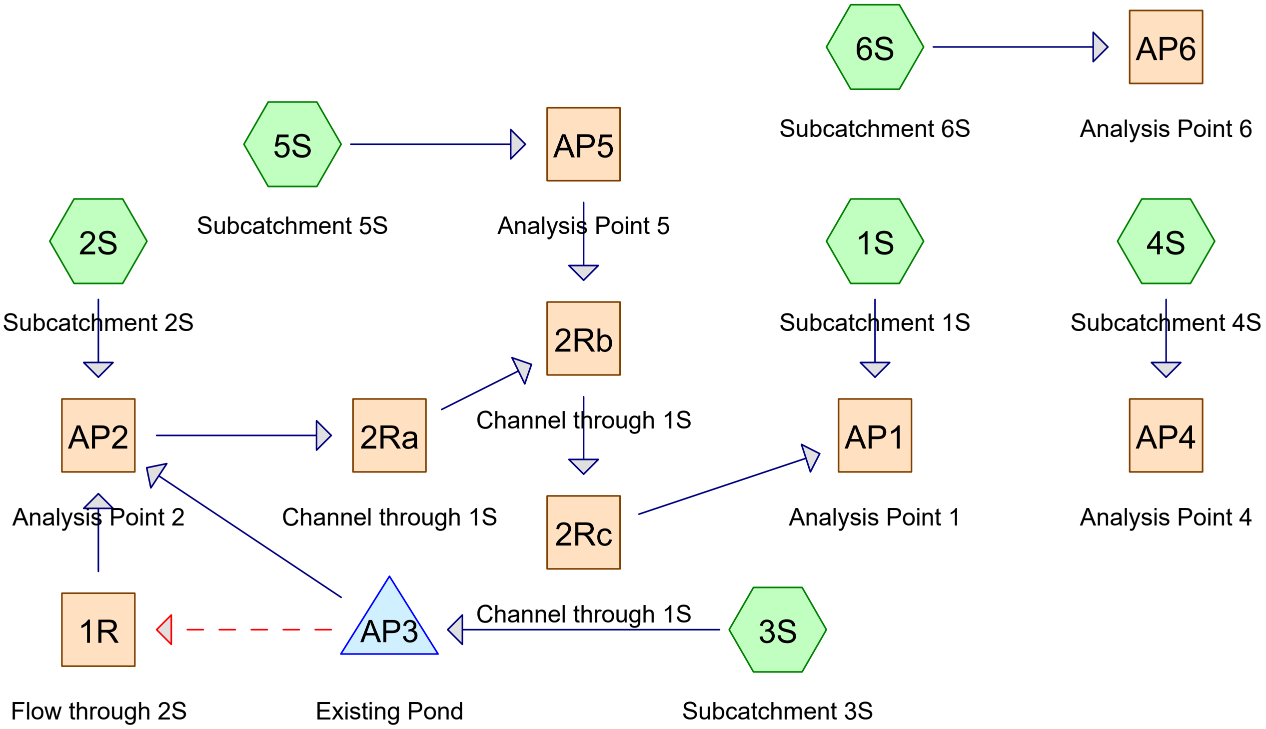
Daniel Meditz

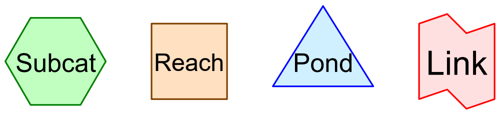
Daniel Meditz, P.E
Project Engineer

APPENDIX I

EXISTING CONDITIONS DRAINAGE ANALYSIS

Summary 2 YEAR
Complete 10 YEAR
Complete 25 YEAR
Summary 50 YEAR





Routing Diagram for 24029 EX CONDITION
Prepared by Jones & Beach Engineers Inc, Printed 11/4/2024
HydroCAD® 10.20-3c s/n 00762 © 2023 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.728	83	1/4 acre lots, 38% imp, HSG C (1S, 3S)
0.549	74	>75% Grass cover, Good, HSG C (1S, 2S, 3S, 6S)
0.247	98	Paved parking, HSG C (4S)
0.022	98	Paved roads w/curbs & sewers, HSG B (1S)
4.559	98	Paved roads w/curbs & sewers, HSG C (1S, 2S, 3S, 6S)
0.741	98	Roofs, HSG C (1S, 2S, 3S, 5S, 6S)
0.119	98	Water Surface, 0% imp, HSG D (3S)
0.076	55	Woods, Good, HSG B (1S)
6.903	70	Woods, Good, HSG C (1S, 2S, 3S)
1.018	77	Woods, Good, HSG D (1S, 3S)
15.961	**82**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.098	HSG B	1S
14.727	HSG C	1S, 2S, 3S, 4S, 5S, 6S
1.137	HSG D	1S, 3S
0.000	Other	
15.961		**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: Subcatchment1S Runoff Area=358,038 sf 25.16% Impervious Runoff Depth=1.65"
Flow Length=919' Tc=21.9 min CN=78 Runoff=10.18 cfs 1.131 af

Subcatchment2S: Subcatchment2S Runoff Area=17,152 sf 51.10% Impervious Runoff Depth=2.19"
Flow Length=142' Tc=13.6 min CN=85 Runoff=0.79 cfs 0.072 af

Subcatchment3S: Subcatchment3S Runoff Area=296,381 sf 51.37% Impervious Runoff Depth=2.28"
Flow Length=604' Tc=26.3 min CN=86 Runoff=10.87 cfs 1.291 af

Subcatchment4S: Subcatchment4S Runoff Area=10,753 sf 100.00% Impervious Runoff Depth=3.47"
Tc=6.0 min CN=98 Runoff=0.87 cfs 0.071 af

Subcatchment5S: Subcatchment5S Runoff Area=4,596 sf 100.00% Impervious Runoff Depth=3.47"
Tc=6.0 min CN=98 Runoff=0.37 cfs 0.030 af

Subcatchment6S: Subcatchment6S Runoff Area=8,360 sf 56.70% Impervious Runoff Depth=2.45"
Flow Length=173' Tc=12.2 min CN=88 Runoff=0.45 cfs 0.039 af

Reach 1R: Flow through 2S Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=236.0' S=0.0233 '/' Capacity=430.82 cfs Outflow=0.00 cfs 0.000 af

Reach 2Ra: Channel through 1S Avg. Flow Depth=0.54' Max Vel=3.24 fps Inflow=6.42 cfs 1.363 af
n=0.040 L=136.0' S=0.0294 '/' Capacity=1,586.21 cfs Outflow=6.42 cfs 1.363 af

Reach 2Rb: Channel through 1S Avg. Flow Depth=0.15' Max Vel=2.10 fps Inflow=6.49 cfs 1.393 af
n=0.040 L=153.0' S=0.0392 '/' Capacity=4,170.50 cfs Outflow=6.49 cfs 1.393 af

Reach 2Rc: Channel through 1S Avg. Flow Depth=0.20' Max Vel=1.60 fps Inflow=6.49 cfs 1.393 af
n=0.040 L=303.0' S=0.0165 '/' Capacity=2,705.34 cfs Outflow=6.49 cfs 1.393 af

Reach AP1: Analysis Point 1 Inflow=16.45 cfs 2.524 af
Outflow=16.45 cfs 2.524 af

Reach AP2: Analysis Point 2 Inflow=6.42 cfs 1.363 af
Outflow=6.42 cfs 1.363 af

Reach AP4: Analysis Point 4 Inflow=0.87 cfs 0.071 af
Outflow=0.87 cfs 0.071 af

Reach AP5: Analysis Point 5 Inflow=0.37 cfs 0.030 af
Outflow=0.37 cfs 0.030 af

Reach AP6: Analysis Point 6 Inflow=0.45 cfs 0.039 af
Outflow=0.45 cfs 0.039 af

Pond AP3: Existing Pond Peak Elev=31.38' Storage=6,854 cf Inflow=10.87 cfs 1.291 af
Primary=6.18 cfs 1.291 af Secondary=0.00 cfs 0.000 af Outflow=6.18 cfs 1.291 af

Total Runoff Area = 15.961 ac Runoff Volume = 2.634 af Average Runoff Depth = 1.98"
61.00% Pervious = 9.736 ac 39.00% Impervious = 6.225 ac

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: Subcatchment1S Runoff Area=358,038 sf 25.16% Impervious Runoff Depth=3.27"
Flow Length=919' Tc=21.9 min CN=78 Runoff=20.42 cfs 2.241 af

Subcatchment2S: Subcatchment2S Runoff Area=17,152 sf 51.10% Impervious Runoff Depth=3.97"
Flow Length=142' Tc=13.6 min CN=85 Runoff=1.41 cfs 0.130 af

Subcatchment3S: Subcatchment3S Runoff Area=296,381 sf 51.37% Impervious Runoff Depth=4.08"
Flow Length=604' Tc=26.3 min CN=86 Runoff=19.20 cfs 2.312 af

Subcatchment4S: Subcatchment4S Runoff Area=10,753 sf 100.00% Impervious Runoff Depth=5.41"
Tc=6.0 min CN=98 Runoff=1.33 cfs 0.111 af

Subcatchment5S: Subcatchment5S Runoff Area=4,596 sf 100.00% Impervious Runoff Depth=5.41"
Tc=6.0 min CN=98 Runoff=0.57 cfs 0.048 af

Subcatchment6S: Subcatchment6S Runoff Area=8,360 sf 56.70% Impervious Runoff Depth=4.29"
Flow Length=173' Tc=12.2 min CN=88 Runoff=0.76 cfs 0.069 af

Reach 1R: Flow through 2S Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=236.0' S=0.0233 '/' Capacity=430.82 cfs Outflow=0.00 cfs 0.000 af

Reach 2Ra: Channel through 1S Avg. Flow Depth=0.59' Max Vel=3.37 fps Inflow=7.42 cfs 2.442 af
n=0.040 L=136.0' S=0.0294 '/' Capacity=1,586.21 cfs Outflow=7.42 cfs 2.442 af

Reach 2Rb: Channel through 1S Avg. Flow Depth=0.17' Max Vel=2.22 fps Inflow=7.62 cfs 2.490 af
n=0.040 L=153.0' S=0.0392 '/' Capacity=4,170.50 cfs Outflow=7.61 cfs 2.490 af

Reach 2Rc: Channel through 1S Avg. Flow Depth=0.22' Max Vel=1.70 fps Inflow=7.61 cfs 2.490 af
n=0.040 L=303.0' S=0.0165 '/' Capacity=2,705.34 cfs Outflow=7.61 cfs 2.490 af

Reach AP1: Analysis Point 1 Inflow=28.02 cfs 4.731 af
Outflow=28.02 cfs 4.731 af

Reach AP2: Analysis Point 2 Inflow=7.42 cfs 2.442 af
Outflow=7.42 cfs 2.442 af

Reach AP4: Analysis Point 4 Inflow=1.33 cfs 0.111 af
Outflow=1.33 cfs 0.111 af

Reach AP5: Analysis Point 5 Inflow=0.57 cfs 0.048 af
Outflow=0.57 cfs 0.048 af

Reach AP6: Analysis Point 6 Inflow=0.76 cfs 0.069 af
Outflow=0.76 cfs 0.069 af

Pond AP3: Existing Pond Peak Elev=33.12' Storage=22,218 cf Inflow=19.20 cfs 2.312 af
Primary=7.01 cfs 2.312 af Secondary=0.00 cfs 0.000 af Outflow=7.01 cfs 2.312 af

Total Runoff Area = 15.961 ac Runoff Volume = 4.911 af Average Runoff Depth = 3.69"
61.00% Pervious = 9.736 ac 39.00% Impervious = 6.225 ac

Summary for Subcatchment 1S: Subcatchment 1S

Runoff = 20.42 cfs @ 12.30 hrs, Volume= 2.241 af, Depth= 3.27"
Routed to Reach AP1 : Analysis Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
3,301	55	Woods, Good, HSG B
960	98	Paved roads w/curbs & sewers, HSG B
16,400	98	Roofs, HSG C
61,667	98	Paved roads w/curbs & sewers, HSG C
10,167	74	>75% Grass cover, Good, HSG C
207,826	70	Woods, Good, HSG C
29,047	83	1/4 acre lots, 38% imp, HSG C
28,670	77	Woods, Good, HSG D
358,038	78	Weighted Average
267,973		74.84% Pervious Area
90,065		25.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0183	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.69"
2.8	114	0.0183	0.68		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.9	88	0.0227	0.75		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	56	0.0357	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	73	0.0274	0.83		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.7	136	0.0735	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	99	0.0392	8.51	312.68	**Trap/Vee/Rect Channel Flow, Assumed 1.5' flow depth - Channel** Bot.W=20.00' D=1.50' Z= 4.0 & 2.0 '/' Top.W=29.00' n= 0.040 Winding stream, pools & shoals
0.9	303	0.0165	5.52	202.86	**Trap/Vee/Rect Channel Flow, Assumed 1.5' flow depth - Channel** Bot.W=20.00' D=1.50' Z= 4.0 & 2.0 '/' Top.W=29.00' n= 0.040 Winding stream, pools & shoals
21.9	919	Total			

Summary for Subcatchment 2S: Subcatchment 2S

Runoff = 1.41 cfs @ 12.19 hrs, Volume= 0.130 af, Depth= 3.97"
Routed to Reach AP2 : Analysis Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
7,339	98	Paved roads w/curbs & sewers, HSG C
1,425	98	Roofs, HSG C
923	74	>75% Grass cover, Good, HSG C
7,465	70	Woods, Good, HSG C
17,152	85	Weighted Average
8,388		48.90% Pervious Area
8,764		51.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0172	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.69"
0.9	37	0.0172	0.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	19	0.1053	1.62		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	36	0.2222	2.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.6	142	Total			

Summary for Subcatchment 3S: Subcatchment 3S

Runoff = 19.20 cfs @ 12.36 hrs, Volume= 2.312 af, Depth= 4.08"
Routed to Pond AP3 : Existing Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
125,302	98	Paved roads w/curbs & sewers, HSG C
9,379	98	Roofs, HSG C
9,203	74	>75% Grass cover, Good, HSG C
85,401	70	Woods, Good, HSG C
46,241	83	1/4 acre lots, 38% imp, HSG C
15,690	77	Woods, Good, HSG D
5,165	98	Water Surface, 0% imp, HSG D
296,381	86	Weighted Average
144,128		48.63% Pervious Area
152,253		51.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.5	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.69"
3.5	119	0.0126	0.56		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	74	0.0270	0.82		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.6	107	0.0187	0.68		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.7	180	0.0111	0.53		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	74	0.0270	0.82		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
26.3	604	Total			

Summary for Subcatchment 4S: Subcatchment 4S

Runoff = 1.33 cfs @ 12.09 hrs, Volume= 0.111 af, Depth= 5.41"
Routed to Reach AP4 : Analysis Point 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
10,753	98	Paved parking, HSG C
10,753		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minute minimum Tc per TR-55**

Summary for Subcatchment 5S: Subcatchment 5S

Runoff = 0.57 cfs @ 12.09 hrs, Volume= 0.048 af, Depth= 5.41"
Routed to Reach AP5 : Analysis Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
4,596	98	Roofs, HSG C
4,596		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minute minimum Tc per TR-55**

Summary for Subcatchment 6S: Subcatchment 6S

Runoff = 0.76 cfs @ 12.16 hrs, Volume= 0.069 af, Depth= 4.29"
Routed to Reach AP6 : Analysis Point 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
4,261	98	Paved roads w/curbs & sewers, HSG C
479	98	Roofs, HSG C
3,620	74	>75% Grass cover, Good, HSG C
8,360	88	Weighted Average
3,620		43.30% Pervious Area
4,740		56.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	50	0.0041	0.08		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.69"
1.7	47	0.0041	0.45		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	76	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.2	173	Total			

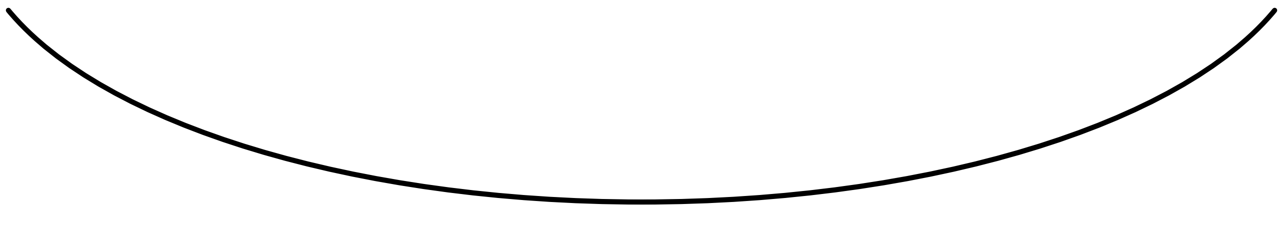
Summary for Reach 1R: Flow through 2S

Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Reach AP2 : Analysis Point 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 74.7 sf, Capacity= 430.82 cfs

112.00' x 1.00' deep Parabolic Channel, n= 0.030 Earth, grassed & winding
Length= 236.0' Slope= 0.0233 '/'
Inlet Invert= 35.50', Outlet Invert= 30.00'



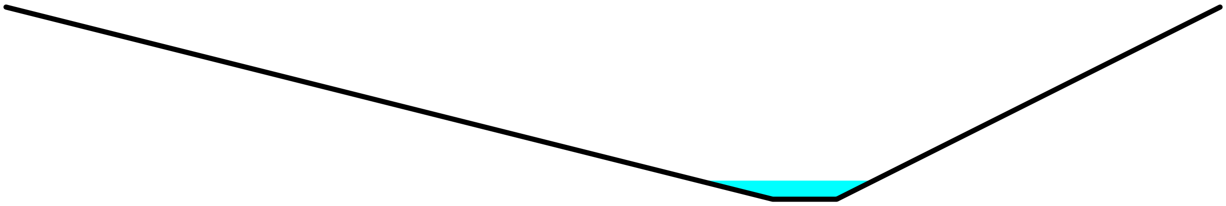
Summary for Reach 2Ra: Channel through 1S

```
Inflow Area =         7.198 ac, 51.36% Impervious, Inflow Depth =  4.07"   for 10-Year Storm event
Inflow      =        7.42 cfs @  12.44 hrs, Volume=          2.442 af
Outflow     =        7.42 cfs @  12.45 hrs, Volume=          2.442 af, Atten= 0%, Lag= 0.5 min
     Routed to Reach 2Rb : Channel through 1S
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 3.37 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.77 fps, Avg. Travel Time= 1.3 min

Peak Storage= 299 cf @ 12.45 hrs
Average Depth at Peak Storage= 0.59' , Surface Width= 5.51'
Bank-Full Depth= 6.00' Flow Area= 120.0 sf, Capacity= 1,586.21 cfs

2.00' x 6.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 4.0 2.0 '/' Top Width= 38.00'
Length= 136.0' Slope= 0.0294 '/'
Inlet Invert= 24.00', Outlet Invert= 20.00'



Summary for Reach 2Rb: Channel through 1S

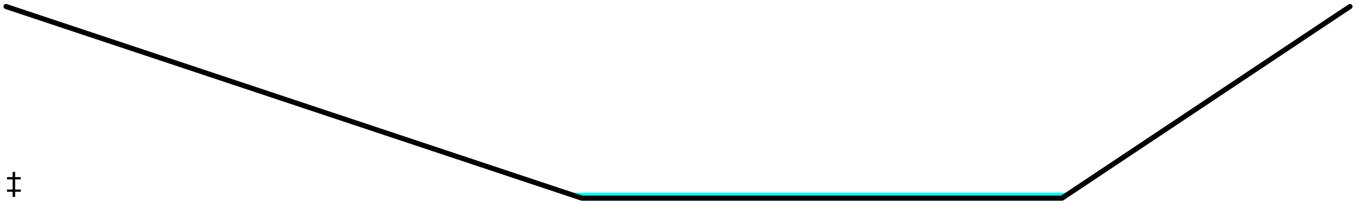
[61] Hint: Exceeded Reach 2Ra outlet invert by 0.17' @ 12.30 hrs

```
Inflow Area =         7.303 ac, 52.06% Impervious, Inflow Depth =  4.09"   for 10-Year Storm event
Inflow      =        7.62 cfs @  12.27 hrs, Volume=          2.490 af
Outflow     =        7.61 cfs @  12.28 hrs, Volume=          2.490 af, Atten= 0%, Lag= 0.9 min
     Routed to Reach 2Rc : Channel through 1S
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.22 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.25 fps, Avg. Travel Time= 2.0 min

Peak Storage= 525 cf @ 12.28 hrs
Average Depth at Peak Storage= 0.17' , Surface Width= 21.00'
Bank-Full Depth= 6.00' Flow Area= 228.0 sf, Capacity= 4,170.50 cfs

20.00' x 6.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 4.0 2.0 '/' Top Width= 56.00'
Length= 153.0' Slope= 0.0392 '/'
Inlet Invert= 20.00', Outlet Invert= 14.00'



Summary for Reach 2Rc: Channel through 1S

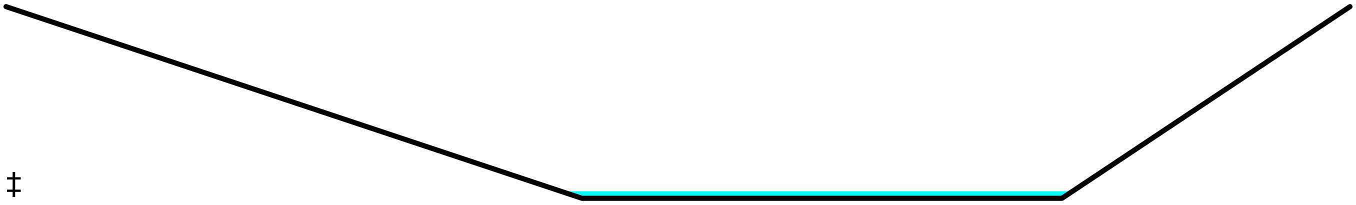
[62] Hint: Exceeded Reach 2Rb OUTLET depth by 0.06' @ 14.65 hrs

Inflow Area = 7.303 ac, 52.06% Impervious, Inflow Depth = 4.09" for 10-Year Storm event
Inflow = 7.61 cfs @ 12.28 hrs, Volume= 2.490 af
Outflow = 7.61 cfs @ 12.33 hrs, Volume= 2.490 af, Atten= 0%, Lag= 3.0 min
Routed to Reach AP1 : Analysis Point 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 1.70 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 5.9 min

Peak Storage= 1,356 cf @ 12.33 hrs
Average Depth at Peak Storage= 0.22' , Surface Width= 21.30'
Bank-Full Depth= 6.00' Flow Area= 228.0 sf, Capacity= 2,705.34 cfs

20.00' x 6.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 4.0 2.0 '/' Top Width= 56.00'
Length= 303.0' Slope= 0.0165 '/'
Inlet Invert= 14.00', Outlet Invert= 9.00'



Summary for Reach AP1: Analysis Point 1

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

Inflow Area = 15.523 ac, 37.81% Impervious, Inflow Depth = 3.66" for 10-Year Storm event
Inflow = 28.02 cfs @ 12.31 hrs, Volume= 4.731 af
Outflow = 28.02 cfs @ 12.31 hrs, Volume= 4.731 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP2: Analysis Point 2

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

```
Inflow Area =       7.198 ac, 51.36% Impervious,  Inflow Depth =  4.07"   for  10-Year Storm event
Inflow      =       7.42 cfs @  12.44 hrs,  Volume=          2.442 af
Outflow     =       7.42 cfs @  12.44 hrs,  Volume=          2.442 af,  Atten= 0%,  Lag= 0.0 min
   Routed to Reach 2Ra : Channel through 1S
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP4: Analysis Point 4

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

```
Inflow Area =       0.247 ac,100.00% Impervious,  Inflow Depth =  5.41"   for  10-Year Storm event
Inflow      =       1.33 cfs @  12.09 hrs,  Volume=          0.111 af
Outflow     =       1.33 cfs @  12.09 hrs,  Volume=          0.111 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP5: Analysis Point 5

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

```
Inflow Area =       0.106 ac,100.00% Impervious,  Inflow Depth =  5.41"   for  10-Year Storm event
Inflow      =       0.57 cfs @  12.09 hrs,  Volume=          0.048 af
Outflow     =       0.57 cfs @  12.09 hrs,  Volume=          0.048 af,  Atten= 0%,  Lag= 0.0 min
   Routed to Reach 2Rb : Channel through 1S
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP6: Analysis Point 6

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

```
Inflow Area =       0.192 ac, 56.70% Impervious,  Inflow Depth =  4.29"   for  10-Year Storm event
Inflow      =       0.76 cfs @  12.16 hrs,  Volume=          0.069 af
Outflow     =       0.76 cfs @  12.16 hrs,  Volume=          0.069 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Pond AP3: Existing Pond

15" CMP culvert inlet is buried. Contractor to uncover culvert inlet.

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[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=46)

Inflow Area = 6.804 ac, 51.37% Impervious, Inflow Depth = 4.08" for 10-Year Storm event
Inflow = 19.20 cfs @ 12.36 hrs, Volume= 2.312 af
Outflow = 7.01 cfs @ 12.86 hrs, Volume= 2.312 af, Atten= 63%, Lag= 30.2 min
Primary = 7.01 cfs @ 12.86 hrs, Volume= 2.312 af
Routed to Reach AP2 : Analysis Point 2
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 1R : Flow through 2S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 33.12' @ 12.86 hrs Surf.Area= 13,489 sf Storage= 22,218 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 18.9 min (837.6 - 818.7)

Volume	Invert	Avail.Storage	Storage Description
#1	26.00'	104,430 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
26.00	1	1.0	0	0	1
28.00	37	24.0	29	29	53
30.00	2,236	218.0	1,707	1,736	3,797
32.00	7,294	444.0	9,046	10,782	15,721
34.00	19,719	933.0	26,004	36,786	69,323
35.50	43,192	1,107.0	46,047	82,834	97,611
36.00	43,192	1,107.0	21,596	104,430	98,164

Device	Routing	Invert	Outlet Devices
#1	Primary	26.00'	**15.0" Round Culvert** L= 156.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 26.00' / 24.09' S= 0.0122 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 1.23 sf
#2	Secondary	35.50'	**24.0' long + 3.0 '/' SideZ x 24.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=7.01 cfs @ 12.86 hrs HW=33.12' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 7.01 cfs @ 5.71 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=26.00' TW=35.50' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: Subcatchment1S Runoff Area=358,038 sf 25.16% Impervious Runoff Depth=4.64"
Flow Length=919' Tc=21.9 min CN=78 Runoff=28.84 cfs 3.177 af

Subcatchment2S: Subcatchment2S Runoff Area=17,152 sf 51.10% Impervious Runoff Depth=5.42"
Flow Length=142' Tc=13.6 min CN=85 Runoff=1.90 cfs 0.178 af

Subcatchment3S: Subcatchment3S Runoff Area=296,381 sf 51.37% Impervious Runoff Depth=5.54"
Flow Length=604' Tc=26.3 min CN=86 Runoff=25.75 cfs 3.141 af

Subcatchment4S: Subcatchment4S Runoff Area=10,753 sf 100.00% Impervious Runoff Depth=6.94"
Tc=6.0 min CN=98 Runoff=1.70 cfs 0.143 af

Subcatchment5S: Subcatchment5S Runoff Area=4,596 sf 100.00% Impervious Runoff Depth=6.94"
Tc=6.0 min CN=98 Runoff=0.73 cfs 0.061 af

Subcatchment6S: Subcatchment6S Runoff Area=8,360 sf 56.70% Impervious Runoff Depth=5.77"
Flow Length=173' Tc=12.2 min CN=88 Runoff=1.01 cfs 0.092 af

Reach 1R: Flow through 2S Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=236.0' S=0.0233 '/' Capacity=430.82 cfs Outflow=0.00 cfs 0.000 af

Reach 2Ra: Channel through 1S Avg. Flow Depth=0.61' Max Vel=3.46 fps Inflow=8.17 cfs 3.319 af
n=0.040 L=136.0' S=0.0294 '/' Capacity=1,586.21 cfs Outflow=8.17 cfs 3.319 af

Reach 2Rb: Channel through 1S Avg. Flow Depth=0.18' Max Vel=2.30 fps Inflow=8.54 cfs 3.380 af
n=0.040 L=153.0' S=0.0392 '/' Capacity=4,170.50 cfs Outflow=8.53 cfs 3.380 af

Reach 2Rc: Channel through 1S Avg. Flow Depth=0.23' Max Vel=1.77 fps Inflow=8.53 cfs 3.380 af
n=0.040 L=303.0' S=0.0165 '/' Capacity=2,705.34 cfs Outflow=8.51 cfs 3.380 af

Reach AP1: Analysis Point 1 Inflow=37.33 cfs 6.557 af
Outflow=37.33 cfs 6.557 af

Reach AP2: Analysis Point 2 Inflow=8.17 cfs 3.319 af
Outflow=8.17 cfs 3.319 af

Reach AP4: Analysis Point 4 Inflow=1.70 cfs 0.143 af
Outflow=1.70 cfs 0.143 af

Reach AP5: Analysis Point 5 Inflow=0.73 cfs 0.061 af
Outflow=0.73 cfs 0.061 af

Reach AP6: Analysis Point 6 Inflow=1.01 cfs 0.092 af
Outflow=1.01 cfs 0.092 af

Pond AP3: Existing Pond Peak Elev=33.99' Storage=36,586 cf Inflow=25.75 cfs 3.141 af
Primary=7.39 cfs 3.141 af Secondary=0.00 cfs 0.000 af Outflow=7.39 cfs 3.141 af

Total Runoff Area = 15.961 ac Runoff Volume = 6.792 af Average Runoff Depth = 5.11"
61.00% Pervious = 9.736 ac 39.00% Impervious = 6.225 ac

Summary for Subcatchment 1S: Subcatchment 1S

Runoff = 28.84 cfs @ 12.30 hrs, Volume= 3.177 af, Depth= 4.64"
Routed to Reach AP1 : Analysis Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
3,301	55	Woods, Good, HSG B
960	98	Paved roads w/curbs & sewers, HSG B
16,400	98	Roofs, HSG C
61,667	98	Paved roads w/curbs & sewers, HSG C
10,167	74	>75% Grass cover, Good, HSG C
207,826	70	Woods, Good, HSG C
29,047	83	1/4 acre lots, 38% imp, HSG C
28,670	77	Woods, Good, HSG D
358,038	78	Weighted Average
267,973		74.84% Pervious Area
90,065		25.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0183	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.69"
2.8	114	0.0183	0.68		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.9	88	0.0227	0.75		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	56	0.0357	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	73	0.0274	0.83		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.7	136	0.0735	1.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	99	0.0392	8.51	312.68	**Trap/Vee/Rect Channel Flow, Assumed 1.5' flow depth - Channel** Bot.W=20.00' D=1.50' Z= 4.0 & 2.0 '/' Top.W=29.00' n= 0.040 Winding stream, pools & shoals
0.9	303	0.0165	5.52	202.86	**Trap/Vee/Rect Channel Flow, Assumed 1.5' flow depth - Channel** Bot.W=20.00' D=1.50' Z= 4.0 & 2.0 '/' Top.W=29.00' n= 0.040 Winding stream, pools & shoals
21.9	919	Total			

Summary for Subcatchment 2S: Subcatchment 2S

Runoff = 1.90 cfs @ 12.18 hrs, Volume= 0.178 af, Depth= 5.42"
Routed to Reach AP2 : Analysis Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
7,339	98	Paved roads w/curbs & sewers, HSG C
1,425	98	Roofs, HSG C
923	74	>75% Grass cover, Good, HSG C
7,465	70	Woods, Good, HSG C
17,152	85	Weighted Average
8,388		48.90% Pervious Area
8,764		51.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	50	0.0172	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.69"
0.9	37	0.0172	0.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	19	0.1053	1.62		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	36	0.2222	2.36		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.6	142	Total			

Summary for Subcatchment 3S: Subcatchment 3S

Runoff = 25.75 cfs @ 12.35 hrs, Volume= 3.141 af, Depth= 5.54"
Routed to Pond AP3 : Existing Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
125,302	98	Paved roads w/curbs & sewers, HSG C
9,379	98	Roofs, HSG C
9,203	74	>75% Grass cover, Good, HSG C
85,401	70	Woods, Good, HSG C
46,241	83	1/4 acre lots, 38% imp, HSG C
15,690	77	Woods, Good, HSG D
5,165	98	Water Surface, 0% imp, HSG D
296,381	86	Weighted Average
144,128		48.63% Pervious Area
152,253		51.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.5	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.69"
3.5	119	0.0126	0.56		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	74	0.0270	0.82		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.6	107	0.0187	0.68		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.7	180	0.0111	0.53		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	74	0.0270	0.82		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
26.3	604	Total			

Summary for Subcatchment 4S: Subcatchment 4S

Runoff = 1.70 cfs @ 12.09 hrs, Volume= 0.143 af, Depth= 6.94"
Routed to Reach AP4 : Analysis Point 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
10,753	98	Paved parking, HSG C
10,753		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minute minimum Tc per TR-55**

Summary for Subcatchment 5S: Subcatchment 5S

Runoff = 0.73 cfs @ 12.09 hrs, Volume= 0.061 af, Depth= 6.94"
Routed to Reach AP5 : Analysis Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
4,596	98	Roofs, HSG C
4,596		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minute minimum Tc per TR-55**

Summary for Subcatchment 6S: Subcatchment 6S

Runoff = 1.01 cfs @ 12.16 hrs, Volume= 0.092 af, Depth= 5.77"
Routed to Reach AP6 : Analysis Point 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
4,261	98	Paved roads w/curbs & sewers, HSG C
479	98	Roofs, HSG C
3,620	74	>75% Grass cover, Good, HSG C
8,360	88	Weighted Average
3,620		43.30% Pervious Area
4,740		56.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	50	0.0041	0.08		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.69"
1.7	47	0.0041	0.45		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	76	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.2	173	Total			

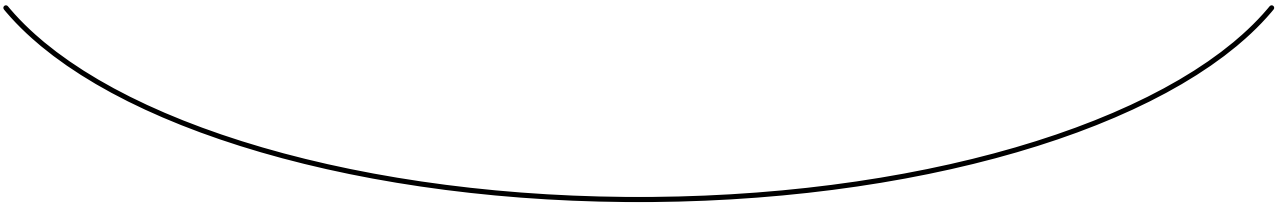
Summary for Reach 1R: Flow through 2S

Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Reach AP2 : Analysis Point 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 74.7 sf, Capacity= 430.82 cfs

112.00' x 1.00' deep Parabolic Channel, n= 0.030 Earth, grassed & winding
Length= 236.0' Slope= 0.0233 '/'
Inlet Invert= 35.50', Outlet Invert= 30.00'



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Summary for Reach 2Ra: Channel through 1S

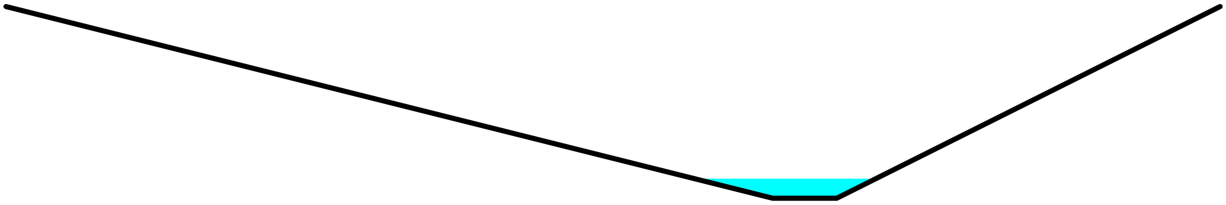
[90] Warning: Qout>Qin may require smaller dt or Finer Routing

```
Inflow Area =        7.198 ac, 51.36% Impervious,  Inflow Depth =   5.53"    for  25-Year Storm event
Inflow      =        8.17 cfs @   12.25 hrs,  Volume=           3.319 af
Outflow     =        8.17 cfs @   12.25 hrs,  Volume=           3.319 af,  Atten= 0%,  Lag= 0.5 min
    Routed to Reach 2Rb : Channel through 1S
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 3.46 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.93 fps, Avg. Travel Time= 1.2 min

Peak Storage= 321 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.61' , Surface Width= 5.68'
Bank-Full Depth= 6.00' Flow Area= 120.0 sf, Capacity= 1,586.21 cfs

2.00' x 6.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 4.0 2.0 '/' Top Width= 38.00'
Length= 136.0' Slope= 0.0294 '/'
Inlet Invert= 24.00', Outlet Invert= 20.00'



Summary for Reach 2Rb: Channel through 1S

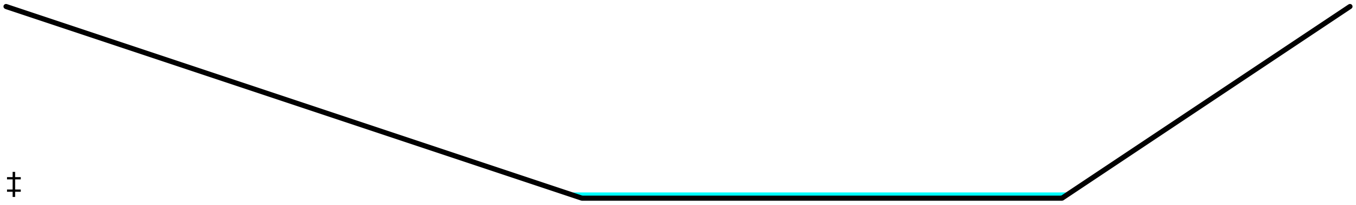
[61] Hint: Exceeded Reach 2Ra outlet invert by 0.18' @ 12.25 hrs

```
Inflow Area =        7.303 ac, 52.06% Impervious,  Inflow Depth =   5.55"    for  25-Year Storm event
Inflow      =        8.54 cfs @   12.22 hrs,  Volume=           3.380 af
Outflow     =        8.53 cfs @   12.24 hrs,  Volume=           3.380 af,  Atten= 0%,  Lag= 1.1 min
    Routed to Reach 2Rc : Channel through 1S
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.30 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.30 fps, Avg. Travel Time= 2.0 min

Peak Storage= 567 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.18' , Surface Width= 21.08'
Bank-Full Depth= 6.00' Flow Area= 228.0 sf, Capacity= 4,170.50 cfs

20.00' x 6.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 4.0 2.0 '/' Top Width= 56.00'
Length= 153.0' Slope= 0.0392 '/'
Inlet Invert= 20.00', Outlet Invert= 14.00'



Summary for Reach 2Rc: Channel through 1S

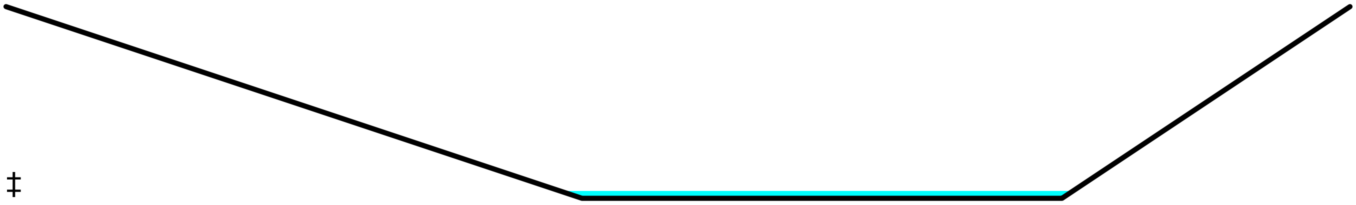
[62] Hint: Exceeded Reach 2Rb OUTLET depth by 0.06' @ 15.65 hrs

Inflow Area = 7.303 ac, 52.06% Impervious, Inflow Depth = 5.55" for 25-Year Storm event
Inflow = 8.53 cfs @ 12.24 hrs, Volume= 3.380 af
Outflow = 8.51 cfs @ 12.27 hrs, Volume= 3.380 af, Atten= 0%, Lag= 2.1 min
Routed to Reach AP1 : Analysis Point 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 1.77 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.91 fps, Avg. Travel Time= 5.6 min

Peak Storage= 1,459 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.23' , Surface Width= 21.40'
Bank-Full Depth= 6.00' Flow Area= 228.0 sf, Capacity= 2,705.34 cfs

20.00' x 6.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 4.0 2.0 '/' Top Width= 56.00'
Length= 303.0' Slope= 0.0165 '/'
Inlet Invert= 14.00', Outlet Invert= 9.00'



Summary for Reach AP1: Analysis Point 1

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

Inflow Area = 15.523 ac, 37.81% Impervious, Inflow Depth = 5.07" for 25-Year Storm event
Inflow = 37.33 cfs @ 12.30 hrs, Volume= 6.557 af
Outflow = 37.33 cfs @ 12.30 hrs, Volume= 6.557 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP2: Analysis Point 2

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

Inflow Area = 7.198 ac, 51.36% Impervious, Inflow Depth = 5.53" for 25-Year Storm event
Inflow = 8.17 cfs @ 12.25 hrs, Volume= 3.319 af
Outflow = 8.17 cfs @ 12.25 hrs, Volume= 3.319 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 2Ra : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP4: Analysis Point 4

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

Inflow Area = 0.247 ac,100.00% Impervious, Inflow Depth = 6.94" for 25-Year Storm event
Inflow = 1.70 cfs @ 12.09 hrs, Volume= 0.143 af
Outflow = 1.70 cfs @ 12.09 hrs, Volume= 0.143 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP5: Analysis Point 5

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

Inflow Area = 0.106 ac,100.00% Impervious, Inflow Depth = 6.94" for 25-Year Storm event
Inflow = 0.73 cfs @ 12.09 hrs, Volume= 0.061 af
Outflow = 0.73 cfs @ 12.09 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 2Rb : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP6: Analysis Point 6

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

Inflow Area = 0.192 ac, 56.70% Impervious, Inflow Depth = 5.77" for 25-Year Storm event
Inflow = 1.01 cfs @ 12.16 hrs, Volume= 0.092 af
Outflow = 1.01 cfs @ 12.16 hrs, Volume= 0.092 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Pond AP3: Existing Pond

15" CMP culvert inlet is buried. Contractor to uncover culvert inlet.

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[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=47)

```
Inflow Area =        6.804 ac,  51.37% Impervious,  Inflow Depth =   5.54"    for  25-Year Storm event
Inflow      =       25.75 cfs @   12.35 hrs,  Volume=           3.141 af
Outflow     =        7.39 cfs @   12.95 hrs,  Volume=           3.141 af,  Atten= 71%,  Lag= 36.1 min
Primary     =        7.39 cfs @   12.95 hrs,  Volume=           3.141 af
    Routed to Reach AP2 : Analysis Point 2
Secondary =          0.00 cfs @    0.00 hrs,  Volume=           0.000 af
    Routed to Reach 1R : Flow through 2S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 33.99' @ 12.95 hrs   Surf.Area= 19,640 sf   Storage= 36,586 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 32.0 min ( 842.2 - 810.2 )

Volume        Invert     Avail.Storage   Storage Description
   #1         26.00'        104,430 cf   Custom Stage Data (Irregular)Listed below (Recalc)

 Elevation          Surf.Area       Perim.          Inc.Store         Cum.Store            Wet.Area
    (feet)             (sq-ft)       (feet)        (cubic-feet)      (cubic-feet)             (sq-ft)
     26.00                  1          1.0                  0                 0                   1
     28.00                 37         24.0                 29                29                  53
     30.00              2,236        218.0              1,707             1,736               3,797
     32.00              7,294        444.0              9,046            10,782              15,721
     34.00             19,719        933.0             26,004            36,786              69,323
     35.50             43,192      1,107.0             46,047            82,834              97,611
     36.00             43,192      1,107.0             21,596           104,430              98,164

Device   Routing            Invert   Outlet Devices
    #1   Primary            26.00'   15.0"  Round Culvert
                                     L= 156.0'   CMP, projecting, no headwall,  Ke= 0.900
                                     Inlet / Outlet Invert= 26.00' / 24.09'   S= 0.0122 '/'   Cc= 0.900
                                     n= 0.025  Corrugated metal,  Flow Area= 1.23 sf
    #2   Secondary          35.50'   24.0' long  + 3.0 '/' SideZ  x 24.0' breadth Broad-Crested Rectangular Weir
                                     Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60
                                     Coef. (English)  2.68  2.70  2.70  2.64  2.63  2.64  2.64  2.63

Primary OutFlow Max=7.39 cfs @ 12.95 hrs  HW=33.99'  TW=0.00'   (Dynamic Tailwater)
└─1=Culvert  (Barrel Controls 7.39 cfs @ 6.02 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=26.00'  TW=35.50'   (Dynamic Tailwater)
└─2=Broad-Crested Rectangular Weir( Controls 0.00 cfs)
```

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: Subcatchment1S Runoff Area=358,038 sf 25.16% Impervious Runoff Depth=5.96"
Flow Length=919' Tc=21.9 min CN=78 Runoff=36.81 cfs 4.081 af

Subcatchment2S: Subcatchment2S Runoff Area=17,152 sf 51.10% Impervious Runoff Depth=6.80"
Flow Length=142' Tc=13.6 min CN=85 Runoff=2.36 cfs 0.223 af

Subcatchment3S: Subcatchment3S Runoff Area=296,381 sf 51.37% Impervious Runoff Depth=6.92"
Flow Length=604' Tc=26.3 min CN=86 Runoff=31.85 cfs 3.926 af

Subcatchment4S: Subcatchment4S Runoff Area=10,753 sf 100.00% Impervious Runoff Depth=8.37"
Tc=6.0 min CN=98 Runoff=2.04 cfs 0.172 af

Subcatchment5S: Subcatchment5S Runoff Area=4,596 sf 100.00% Impervious Runoff Depth=8.37"
Tc=6.0 min CN=98 Runoff=0.87 cfs 0.074 af

Subcatchment6S: Subcatchment6S Runoff Area=8,360 sf 56.70% Impervious Runoff Depth=7.17"
Flow Length=173' Tc=12.2 min CN=88 Runoff=1.24 cfs 0.115 af

Reach 1R: Flow through 2S Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=236.0' S=0.0233 '/' Capacity=430.82 cfs Outflow=0.00 cfs 0.000 af

Reach 2Ra: Channel through 1S Avg. Flow Depth=0.64' Max Vel=3.54 fps Inflow=8.89 cfs 4.149 af
n=0.040 L=136.0' S=0.0294 '/' Capacity=1,586.21 cfs Outflow=8.87 cfs 4.149 af

Reach 2Rb: Channel through 1S Avg. Flow Depth=0.19' Max Vel=2.39 fps Inflow=9.35 cfs 4.223 af
n=0.040 L=153.0' S=0.0392 '/' Capacity=4,170.50 cfs Outflow=9.34 cfs 4.223 af

Reach 2Rc: Channel through 1S Avg. Flow Depth=0.25' Max Vel=1.83 fps Inflow=9.34 cfs 4.223 af
n=0.040 L=303.0' S=0.0165 '/' Capacity=2,705.34 cfs Outflow=9.31 cfs 4.223 af

Reach AP1: Analysis Point 1 Inflow=46.04 cfs 8.303 af
Outflow=46.04 cfs 8.303 af

Reach AP2: Analysis Point 2 Inflow=8.89 cfs 4.149 af
Outflow=8.89 cfs 4.149 af

Reach AP4: Analysis Point 4 Inflow=2.04 cfs 0.172 af
Outflow=2.04 cfs 0.172 af

Reach AP5: Analysis Point 5 Inflow=0.87 cfs 0.074 af
Outflow=0.87 cfs 0.074 af

Reach AP6: Analysis Point 6 Inflow=1.24 cfs 0.115 af
Outflow=1.24 cfs 0.115 af

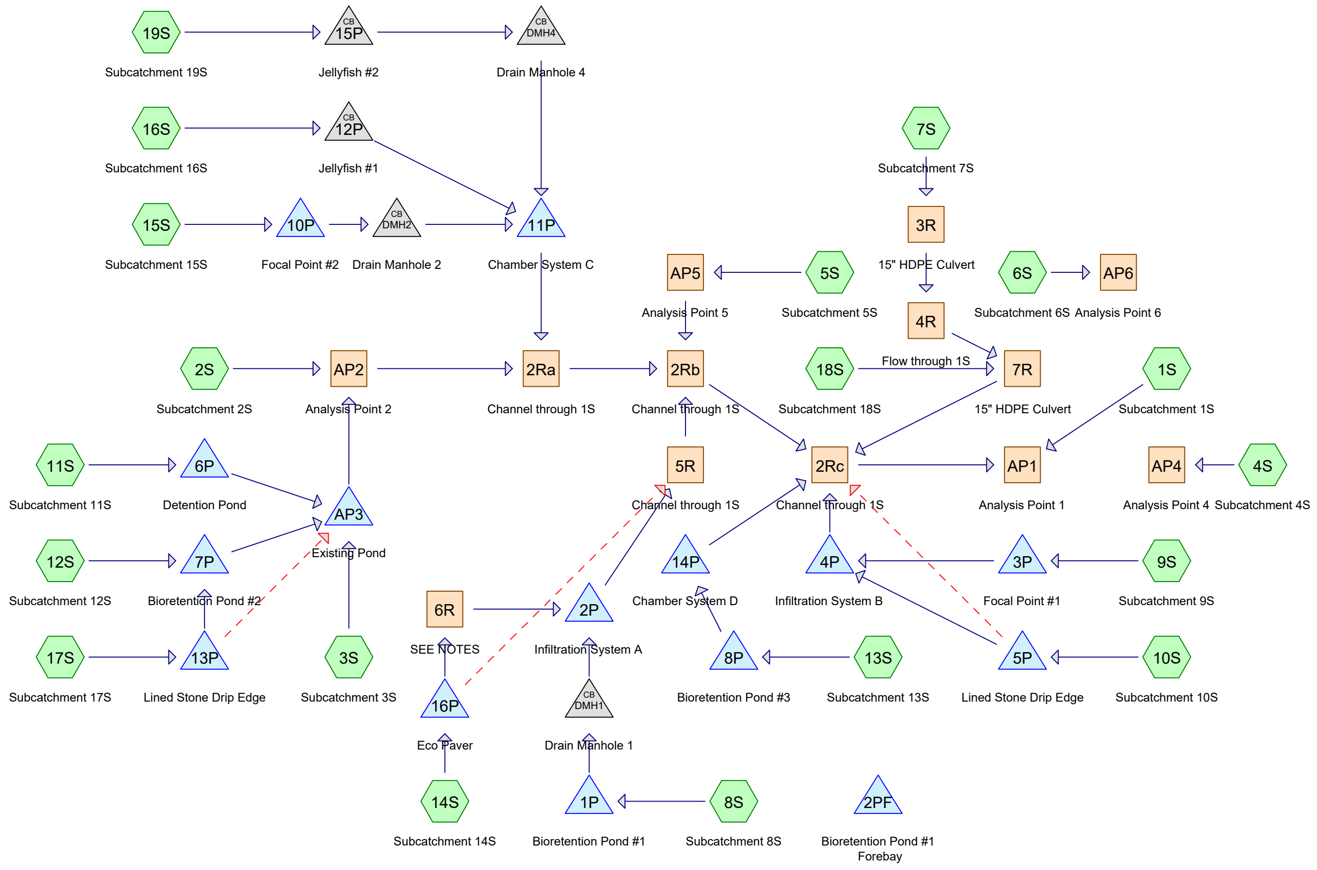
Pond AP3: Existing Pond Peak Elev=34.60' Storage=51,115 cf Inflow=31.85 cfs 3.926 af
Primary=7.65 cfs 3.926 af Secondary=0.00 cfs 0.000 af Outflow=7.65 cfs 3.926 af

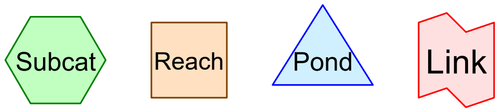
Total Runoff Area = 15.961 ac Runoff Volume = 8.590 af Average Runoff Depth = 6.46"
61.00% Pervious = 9.736 ac 39.00% Impervious = 6.225 ac

APPENDIX II

PROPOSED CONDITIONS DRAINAGE ANALYSIS

Summary 2 YEAR
Complete 10 YEAR
Complete 25 YEAR
Summary 50 YEAR





Routing Diagram for 24029 PR CONDITION
Prepared by Jones & Beach Engineers Inc, Printed 11/4/2024
HydroCAD® 10.20-3c s/n 00762 © 2023 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.728	83	1/4 acre lots, 38% imp, HSG C (1S, 3S, 7S, 18S)
1.483	74	>75% Grass cover, Good, HSG C (1S, 2S, 3S, 5S, 6S, 7S, 8S, 9S, 11S, 12S, 13S, 15S, 16S, 18S, 19S)
0.737	98	Paved parking, HSG C (4S, 12S, 13S, 15S, 16S)
0.022	98	Paved roads w/curbs & sewers, HSG B (1S)
5.007	98	Paved roads w/curbs & sewers, HSG C (1S, 2S, 3S, 6S, 7S, 8S, 9S, 19S)
1.536	98	Roofs, HSG C (1S, 2S, 3S, 6S, 8S, 9S, 10S, 11S, 12S, 13S, 14S, 15S, 16S, 17S, 19S)
0.007	98	Water Surface, 0% imp, HSG C (10S, 17S)
0.119	98	Water Surface, 0% imp, HSG D (3S)
0.076	55	Woods, Good, HSG B (1S)
4.229	70	Woods, Good, HSG C (1S, 2S, 3S, 7S, 11S)
1.018	77	Woods, Good, HSG D (1S, 3S)
15.961	**85**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.098	HSG B	1S
14.727	HSG C	1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S, 12S, 13S, 14S, 15S, 16S, 17S, 18S, 19S
1.137	HSG D	1S, 3S
0.000	Other	
15.961		**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: Subcatchment1S Runoff Area=210,582 sf 31.09% Impervious Runoff Depth=1.80"
Flow Length=588' Tc=13.2 min CN=80 Runoff=7.97 cfs 0.724 af

Subcatchment2S: Subcatchment2S Runoff Area=16,051 sf 68.26% Impervious Runoff Depth=2.64"
Flow Length=125' Tc=10.9 min CN=90 Runoff=0.94 cfs 0.081 af

Subcatchment3S: Subcatchment3S Runoff Area=282,964 sf 53.81% Impervious Runoff Depth=2.28"
Flow Length=604' Tc=26.3 min CN=86 Runoff=10.38 cfs 1.232 af

Subcatchment4S: Subcatchment4S Runoff Area=2,236 sf 100.00% Impervious Runoff Depth=3.47"
Tc=6.0 min CN=98 Runoff=0.18 cfs 0.015 af

Subcatchment5S: Subcatchment5S Runoff Area=310 sf 0.00% Impervious Runoff Depth=1.38"
Tc=6.0 min CN=74 Runoff=0.01 cfs 0.001 af

Subcatchment6S: Subcatchment6S Runoff Area=8,122 sf 55.43% Impervious Runoff Depth=2.36"
Flow Length=149' Tc=12.0 min CN=87 Runoff=0.42 cfs 0.037 af

Subcatchment7S: Subcatchment7S Runoff Area=24,490 sf 13.93% Impervious Runoff Depth=1.45"
Flow Length=212' Tc=15.9 min CN=75 Runoff=0.68 cfs 0.068 af

Subcatchment8S: Subcatchment8S Runoff Area=38,380 sf 84.08% Impervious Runoff Depth=3.03"
Tc=6.0 min CN=94 Runoff=2.90 cfs 0.223 af

Subcatchment9S: Subcatchment9S Runoff Area=6,117 sf 89.23% Impervious Runoff Depth=3.14"
Tc=6.0 min CN=95 Runoff=0.47 cfs 0.037 af

Subcatchment10S: Subcatchment10S Runoff Area=1,015 sf 81.48% Impervious Runoff Depth=3.47"
Tc=6.0 min CN=98 Runoff=0.08 cfs 0.007 af

Subcatchment11S: Subcatchment11S Runoff Area=13,311 sf 42.66% Impervious Runoff Depth=2.11"
Tc=6.0 min CN=84 Runoff=0.74 cfs 0.054 af

Subcatchment12S: Subcatchment12S Runoff Area=7,530 sf 64.63% Impervious Runoff Depth=2.64"
Tc=6.0 min CN=90 Runoff=0.51 cfs 0.038 af

Subcatchment13S: Subcatchment13S Runoff Area=20,822 sf 79.61% Impervious Runoff Depth=2.93"
Tc=6.0 min CN=93 Runoff=1.54 cfs 0.117 af

Subcatchment14S: Subcatchment14S Runoff Area=3,343 sf 100.00% Impervious Runoff Depth=3.47"
Tc=6.0 min CN=98 Runoff=0.27 cfs 0.022 af

Subcatchment15S: Subcatchment15S Runoff Area=16,422 sf 79.03% Impervious Runoff Depth=2.93"
Tc=6.0 min CN=93 Runoff=1.21 cfs 0.092 af

Subcatchment16S: Subcatchment16S Runoff Area=10,113 sf 92.02% Impervious Runoff Depth=3.24"
Tc=6.0 min CN=96 Runoff=0.80 cfs 0.063 af

Subcatchment17S: Subcatchment17S Runoff Area=892 sf 88.79% Impervious Runoff Depth=3.47"
Tc=6.0 min CN=98 Runoff=0.07 cfs 0.006 af

Subcatchment18S: Subcatchment18S Runoff Area=23,376 sf 30.41% Impervious Runoff Depth=1.87"
Tc=10.0 min CN=81 Runoff=1.02 cfs 0.084 af

Subcatchment19S: Subcatchment19S Runoff Area=9,205 sf 93.91% Impervious Runoff Depth=3.35"
Tc=6.0 min CN=97 Runoff=0.73 cfs 0.059 af

Reach 2Ra: Channel through 1S Avg. Flow Depth=0.55' Max Vel=3.25 fps Inflow=6.49 cfs 1.615 af
n=0.040 L=136.0' S=0.0294 '/' Capacity=1,586.21 cfs Outflow=6.49 cfs 1.615 af

Reach 2Rb: Channel through 1S Avg. Flow Depth=0.15' Max Vel=2.10 fps Inflow=6.50 cfs 1.867 af
n=0.040 L=153.0' S=0.0392 '/' Capacity=4,170.50 cfs Outflow=6.50 cfs 1.867 af

Reach 2Rc: Channel through 1S Avg. Flow Depth=0.22' Max Vel=1.72 fps Inflow=7.94 cfs 2.135 af
n=0.040 L=303.0' S=0.0165 '/' Capacity=2,705.34 cfs Outflow=7.92 cfs 2.133 af

Reach 3R: 15" HDPE Culvert Avg. Flow Depth=0.31' Max Vel=2.89 fps Inflow=0.68 cfs 0.068 af
15.0" Round Pipe n=0.012 L=47.0' S=0.0053 '/' Capacity=5.10 cfs Outflow=0.68 cfs 0.068 af

Reach 4R: Flow through 1S Avg. Flow Depth=0.24' Max Vel=1.65 fps Inflow=0.68 cfs 0.068 af
n=0.030 L=200.0' S=0.0125 '/' Capacity=14.80 cfs Outflow=0.67 cfs 0.068 af

Reach 5R: Channel through 1S Avg. Flow Depth=0.02' Max Vel=0.82 fps Inflow=0.18 cfs 0.251 af
n=0.040 L=77.0' S=0.0779 '/' Capacity=498.13 cfs Outflow=0.18 cfs 0.251 af

Reach 6R: SEE NOTES Inflow=0.23 cfs 0.022 af
Outflow=0.23 cfs 0.022 af

Reach 7R: 15" HDPE Culvert Avg. Flow Depth=0.22' Max Vel=10.34 fps Inflow=1.53 cfs 0.151 af
15.0" Round Pipe n=0.012 L=20.0' S=0.1000 '/' Capacity=22.13 cfs Outflow=1.53 cfs 0.151 af

Reach AP1: Analysis Point 1 Inflow=15.64 cfs 2.857 af
Outflow=15.64 cfs 2.857 af

Reach AP2: Analysis Point 2 Inflow=6.39 cfs 1.410 af
Outflow=6.39 cfs 1.410 af

Reach AP4: Analysis Point 4 Inflow=0.18 cfs 0.015 af
Outflow=0.18 cfs 0.015 af

Reach AP5: Analysis Point 5 Inflow=0.01 cfs 0.001 af
Outflow=0.01 cfs 0.001 af

Reach AP6: Analysis Point 6 Inflow=0.42 cfs 0.037 af
Outflow=0.42 cfs 0.037 af

Pond 1P: Bioretention Pond #1 Peak Elev=33.02' Storage=2,733 cf Inflow=2.90 cfs 0.223 af
Outflow=0.64 cfs 0.210 af

```
Pond 2P: Infiltration System A              Peak Elev=32.16'  Storage=3,746 cf   Inflow=0.87 cfs  0.824 af
                           Discarded=0.16 cfs  0.486 af   Primary=0.18 cfs  0.251 af   Outflow=0.34 cfs  0.738 af

Pond 2PF: Bioretention Pond #1 Forebay                                        Peak Elev=0.00'  Storage=0 cf


Pond 3P: Focal Point #1                        Peak Elev=29.57'  Storage=40 cf   Inflow=0.47 cfs  0.037 af
                                                                               Outflow=0.49 cfs  0.037 af

Pond 4P: Infiltration System B               Peak Elev=24.83'  Storage=949 cf   Inflow=0.57 cfs  0.043 af
                           Discarded=0.04 cfs  0.043 af   Primary=0.00 cfs  0.000 af   Outflow=0.04 cfs  0.043 af

Pond 5P: Lined Stone Drip Edge              Peak Elev=29.06'  Storage=0.000 af   Inflow=0.08 cfs  0.007 af
                          Primary=0.08 cfs  0.007 af   Secondary=0.00 cfs  0.000 af   Outflow=0.08 cfs  0.007 af

Pond 6P: Detention Pond                      Peak Elev=35.94'  Storage=993 cf   Inflow=0.74 cfs  0.054 af
                                                                               Outflow=0.13 cfs  0.053 af

Pond 7P: Bioretention Pond #2                Peak Elev=32.82'  Storage=202 cf   Inflow=0.59 cfs  0.044 af
                                                                               Outflow=0.40 cfs  0.044 af

Pond 8P: Bioretention Pond #3                Peak Elev=31.01'  Storage=551 cf   Inflow=1.54 cfs  0.117 af
                                                                               Outflow=0.80 cfs  0.117 af

Pond 10P: Focal Point #2                       Peak Elev=38.14'  Storage=59 cf   Inflow=1.21 cfs  0.092 af
                                                                               Outflow=1.22 cfs  0.092 af

Pond 11P: Chamber System C                  Peak Elev=33.43'  Storage=6,134 cf   Inflow=2.75 cfs  0.214 af
                                                                               Outflow=0.11 cfs  0.205 af

Pond 12P: Jellyfish #1                                          Peak Elev=34.04'   Inflow=0.80 cfs  0.063 af
                              15.0"  Round Culvert  n=0.012  L=20.0'  S=0.0075 '/'   Outflow=0.80 cfs  0.063 af

Pond 13P: Lined Stone Drip Edge             Peak Elev=35.06'  Storage=0.000 af   Inflow=0.07 cfs  0.006 af
                          Primary=0.07 cfs  0.006 af   Secondary=0.00 cfs  0.000 af   Outflow=0.07 cfs  0.006 af

Pond 14P: Chamber System D                  Peak Elev=27.25'  Storage=1,496 cf   Inflow=0.80 cfs  0.117 af
                                                                               Outflow=0.44 cfs  0.116 af

Pond 15P: Jellyfish #2                                          Peak Elev=33.72'   Inflow=0.73 cfs  0.059 af
                              15.0"  Round Culvert  n=0.012  L=16.0'  S=0.0094 '/'   Outflow=0.73 cfs  0.059 af

Pond 16P: Eco Paver                            Peak Elev=28.75'  Storage=81 cf   Inflow=0.27 cfs  0.022 af
                          Primary=0.23 cfs  0.022 af   Secondary=0.00 cfs  0.000 af   Outflow=0.23 cfs  0.022 af

Pond AP3: Existing Pond                     Peak Elev=31.38'  Storage=6,856 cf   Inflow=10.82 cfs  1.329 af
                             15.0"  Round Culvert  n=0.025  L=156.0'  S=0.0122 '/'   Outflow=6.18 cfs  1.329 af

Pond DMH1: Drain Manhole 1                                      Peak Elev=32.16'   Inflow=0.64 cfs  0.784 af
                              18.0"  Round Culvert  n=0.012  L=52.0'  S=0.0067 '/'   Outflow=0.64 cfs  0.784 af
```

Pond DMH2: Drain Manhole 2 Peak Elev=34.96' Inflow=1.22 cfs 0.092 af
18.0" Round Culvert n=0.012 L=14.0' S=0.0143 '/' Outflow=1.22 cfs 0.092 af

Pond DMH4: Drain Manhole 4 Peak Elev=33.46' Inflow=0.73 cfs 0.059 af
15.0" Round Culvert n=0.012 L=23.0' S=0.0087 '/' Outflow=0.73 cfs 0.059 af

Total Runoff Area = 15.961 ac Runoff Volume = 2.957 af Average Runoff Depth = 2.22"
50.14% Pervious = 8.003 ac 49.86% Impervious = 7.959 ac

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: Subcatchment1S Runoff Area=210,582 sf 31.09% Impervious Runoff Depth=3.47"
Flow Length=588' Tc=13.2 min CN=80 Runoff=15.43 cfs 1.397 af

Subcatchment2S: Subcatchment2S Runoff Area=16,051 sf 68.26% Impervious Runoff Depth=4.51"
Flow Length=125' Tc=10.9 min CN=90 Runoff=1.57 cfs 0.138 af

Subcatchment3S: Subcatchment3S Runoff Area=282,964 sf 53.81% Impervious Runoff Depth=4.08"
Flow Length=604' Tc=26.3 min CN=86 Runoff=18.33 cfs 2.207 af

Subcatchment4S: Subcatchment4S Runoff Area=2,236 sf 100.00% Impervious Runoff Depth=5.41"
Tc=6.0 min CN=98 Runoff=0.28 cfs 0.023 af

Subcatchment5S: Subcatchment5S Runoff Area=310 sf 0.00% Impervious Runoff Depth=2.89"
Tc=6.0 min CN=74 Runoff=0.02 cfs 0.002 af

Subcatchment6S: Subcatchment6S Runoff Area=8,122 sf 55.43% Impervious Runoff Depth=4.18"
Flow Length=149' Tc=12.0 min CN=87 Runoff=0.73 cfs 0.065 af

Subcatchment7S: Subcatchment7S Runoff Area=24,490 sf 13.93% Impervious Runoff Depth=2.99"
Flow Length=212' Tc=15.9 min CN=75 Runoff=1.45 cfs 0.140 af

Subcatchment8S: Subcatchment8S Runoff Area=38,380 sf 84.08% Impervious Runoff Depth=4.95"
Tc=6.0 min CN=94 Runoff=4.61 cfs 0.363 af

Subcatchment9S: Subcatchment9S Runoff Area=6,117 sf 89.23% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=95 Runoff=0.74 cfs 0.059 af

Subcatchment10S: Subcatchment10S Runoff Area=1,015 sf 81.48% Impervious Runoff Depth=5.41"
Tc=6.0 min CN=98 Runoff=0.13 cfs 0.011 af

Subcatchment11S: Subcatchment11S Runoff Area=13,311 sf 42.66% Impervious Runoff Depth=3.87"
Tc=6.0 min CN=84 Runoff=1.34 cfs 0.099 af

Subcatchment12S: Subcatchment12S Runoff Area=7,530 sf 64.63% Impervious Runoff Depth=4.51"
Tc=6.0 min CN=90 Runoff=0.85 cfs 0.065 af

Subcatchment13S: Subcatchment13S Runoff Area=20,822 sf 79.61% Impervious Runoff Depth=4.84"
Tc=6.0 min CN=93 Runoff=2.47 cfs 0.193 af

Subcatchment14S: Subcatchment14S Runoff Area=3,343 sf 100.00% Impervious Runoff Depth=5.41"
Tc=6.0 min CN=98 Runoff=0.41 cfs 0.035 af

Subcatchment15S: Subcatchment15S Runoff Area=16,422 sf 79.03% Impervious Runoff Depth=4.84"
Tc=6.0 min CN=93 Runoff=1.95 cfs 0.152 af

Subcatchment16S: Subcatchment16S Runoff Area=10,113 sf 92.02% Impervious Runoff Depth=5.18"
Tc=6.0 min CN=96 Runoff=1.24 cfs 0.100 af

Subcatchment17S: Subcatchment17S Runoff Area=892 sf 88.79% Impervious Runoff Depth=5.41"
Tc=6.0 min CN=98 Runoff=0.11 cfs 0.009 af

Subcatchment18S: Subcatchment18S Runoff Area=23,376 sf 30.41% Impervious Runoff Depth=3.57"
Tc=10.0 min CN=81 Runoff=1.93 cfs 0.159 af

Subcatchment19S: Subcatchment19S Runoff Area=9,205 sf 93.91% Impervious Runoff Depth=5.30"
Tc=6.0 min CN=97 Runoff=1.14 cfs 0.093 af

Reach 2Ra: Channel through 1S Avg. Flow Depth=0.59' Max Vel=3.38 fps Inflow=7.47 cfs 2.838 af
n=0.040 L=136.0' S=0.0294 '/' Capacity=1,586.21 cfs Outflow=7.47 cfs 2.838 af

Reach 2Rb: Channel through 1S Avg. Flow Depth=0.18' Max Vel=2.27 fps Inflow=8.18 cfs 3.166 af
n=0.040 L=153.0' S=0.0392 '/' Capacity=4,170.50 cfs Outflow=8.18 cfs 3.165 af

Reach 2Rc: Channel through 1S Avg. Flow Depth=0.27' Max Vel=1.94 fps Inflow=10.89 cfs 3.657 af
n=0.040 L=303.0' S=0.0165 '/' Capacity=2,705.34 cfs Outflow=10.81 cfs 3.656 af

Reach 3R: 15" HDPE Culvert Avg. Flow Depth=0.46' Max Vel=3.57 fps Inflow=1.45 cfs 0.140 af
15.0" Round Pipe n=0.012 L=47.0' S=0.0053 '/' Capacity=5.10 cfs Outflow=1.45 cfs 0.140 af

Reach 4R: Flow through 1S Avg. Flow Depth=0.35' Max Vel=2.03 fps Inflow=1.45 cfs 0.140 af
n=0.030 L=200.0' S=0.0125 '/' Capacity=14.80 cfs Outflow=1.44 cfs 0.140 af

Reach 5R: Channel through 1S Avg. Flow Depth=0.05' Max Vel=1.44 fps Inflow=0.76 cfs 0.326 af
n=0.040 L=77.0' S=0.0779 '/' Capacity=498.13 cfs Outflow=0.76 cfs 0.326 af

Reach 6R: SEE NOTES Inflow=0.36 cfs 0.035 af
Outflow=0.36 cfs 0.035 af

Reach 7R: 15" HDPE Culvert Avg. Flow Depth=0.32' Max Vel=12.69 fps Inflow=3.12 cfs 0.299 af
15.0" Round Pipe n=0.012 L=20.0' S=0.1000 '/' Capacity=22.13 cfs Outflow=3.12 cfs 0.299 af

Reach AP1: Analysis Point 1 Inflow=26.11 cfs 5.052 af
Outflow=26.11 cfs 5.052 af

Reach AP2: Analysis Point 2 Inflow=7.34 cfs 2.518 af
Outflow=7.34 cfs 2.518 af

Reach AP4: Analysis Point 4 Inflow=0.28 cfs 0.023 af
Outflow=0.28 cfs 0.023 af

Reach AP5: Analysis Point 5 Inflow=0.02 cfs 0.002 af
Outflow=0.02 cfs 0.002 af

Reach AP6: Analysis Point 6 Inflow=0.73 cfs 0.065 af
Outflow=0.73 cfs 0.065 af

Pond 1P: Bioretention Pond #1 Peak Elev=34.17' Storage=5,443 cf Inflow=4.61 cfs 0.363 af
Outflow=0.94 cfs 0.351 af

Pond 2P: Infiltration System A Peak Elev=32.36' Storage=3,920 cf Inflow=1.05 cfs 0.916 af
Discarded=0.17 cfs 0.505 af Primary=0.76 cfs 0.326 af Outflow=0.93 cfs 0.831 af

Pond 2PF: Bioretention Pond #1 Forebay Peak Elev=0.00' Storage=0 cf

Pond 3P: Focal Point #1 Peak Elev=29.60' Storage=42 cf Inflow=0.74 cfs 0.059 af
Outflow=0.75 cfs 0.059 af

Pond 4P: Infiltration System B Peak Elev=25.96' Storage=1,625 cf Inflow=0.87 cfs 0.070 af
Discarded=0.05 cfs 0.070 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.070 af

Pond 5P: Lined Stone Drip Edge Peak Elev=29.08' Storage=0.000 af Inflow=0.13 cfs 0.011 af
Primary=0.13 cfs 0.011 af Secondary=0.00 cfs 0.000 af Outflow=0.13 cfs 0.011 af

Pond 6P: Detention Pond Peak Elev=36.29' Storage=1,910 cf Inflow=1.34 cfs 0.099 af
Outflow=0.19 cfs 0.098 af

Pond 7P: Bioretention Pond #2 Peak Elev=34.59' Storage=360 cf Inflow=0.96 cfs 0.074 af
Outflow=0.69 cfs 0.074 af

Pond 8P: Bioretention Pond #3 Peak Elev=32.03' Storage=1,366 cf Inflow=2.47 cfs 0.193 af
Outflow=0.90 cfs 0.193 af

Pond 10P: Focal Point #2 Peak Elev=38.22' Storage=67 cf Inflow=1.95 cfs 0.152 af
Outflow=1.95 cfs 0.152 af

Pond 11P: Chamber System C Peak Elev=34.23' Storage=10,303 cf Inflow=4.32 cfs 0.345 af
Outflow=0.14 cfs 0.321 af

Pond 12P: Jellyfish #1 Peak Elev=34.23' Inflow=1.24 cfs 0.100 af
15.0" Round Culvert n=0.012 L=20.0' S=0.0075 '/' Outflow=1.24 cfs 0.100 af

Pond 13P: Lined Stone Drip Edge Peak Elev=35.08' Storage=0.000 af Inflow=0.11 cfs 0.009 af
Primary=0.11 cfs 0.009 af Secondary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.009 af

Pond 14P: Chamber System D Peak Elev=27.91' Storage=2,292 cf Inflow=0.90 cfs 0.193 af
Outflow=0.55 cfs 0.193 af

Pond 15P: Jellyfish #2 Peak Elev=34.23' Inflow=1.14 cfs 0.093 af
15.0" Round Culvert n=0.012 L=16.0' S=0.0094 '/' Outflow=1.14 cfs 0.093 af

Pond 16P: Eco Paver Peak Elev=28.87' Storage=109 cf Inflow=0.41 cfs 0.035 af
Primary=0.36 cfs 0.035 af Secondary=0.00 cfs 0.000 af Outflow=0.36 cfs 0.035 af

Pond AP3: Existing Pond Peak Elev=33.10' Storage=21,993 cf Inflow=19.01 cfs 2.380 af
15.0" Round Culvert n=0.025 L=156.0' S=0.0122 '/' Outflow=7.00 cfs 2.380 af

Pond DMH1: Drain Manhole 1 Peak Elev=32.37' Inflow=0.94 cfs 0.881 af
18.0" Round Culvert n=0.012 L=52.0' S=0.0067 '/' Outflow=0.94 cfs 0.881 af

Pond DMH2: Drain Manhole 2 Peak Elev=35.13' Inflow=1.95 cfs 0.152 af
18.0" Round Culvert n=0.012 L=14.0' S=0.0143 '/' Outflow=1.95 cfs 0.152 af

Pond DMH4: Drain Manhole 4 Peak Elev=34.23' Inflow=1.14 cfs 0.093 af
15.0" Round Culvert n=0.012 L=23.0' S=0.0087 '/' Outflow=1.14 cfs 0.093 af

Total Runoff Area = 15.961 ac Runoff Volume = 5.310 af Average Runoff Depth = 3.99"
50.14% Pervious = 8.003 ac 49.86% Impervious = 7.959 ac

Summary for Subcatchment 1S: Subcatchment 1S

Runoff = 15.43 cfs @ 12.18 hrs, Volume= 1.397 af, Depth= 3.47"
Routed to Reach AP1 : Analysis Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
3,301	55	Woods, Good, HSG B
960	98	Paved roads w/curbs & sewers, HSG B
16,077	98	Roofs, HSG C
46,575	98	Paved roads w/curbs & sewers, HSG C
16,368	74	>75% Grass cover, Good, HSG C
93,752	70	Woods, Good, HSG C
4,879	83	1/4 acre lots, 38% imp, HSG C
28,670	77	Woods, Good, HSG D
210,582	80	Weighted Average
145,116		68.91% Pervious Area
65,466		31.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	34	0.0294	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.69"
4.6	16	0.0204	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.69"
0.2	82	0.0294	5.69	55.51	**Trap/Vee/Rect Channel Flow, Assumed 1.5' flow depth - Channe** Bot.W=2.00' D=1.50' Z= 4.0 & 2.0 '/' Top.W=11.00' n= 0.040 Winding stream, pools & shoals
0.3	153	0.0392	8.51	312.68	**Trap/Vee/Rect Channel Flow, Assumed 1.5' flow depth - Channe** Bot.W=20.00' D=1.50' Z= 4.0 & 2.0 '/' Top.W=29.00' n= 0.040 Winding stream, pools & shoals
0.9	303	0.0165	5.52	202.86	**Trap/Vee/Rect Channel Flow, Assumed 1.5' flow depth - Channe** Bot.W=20.00' D=1.50' Z= 4.0 & 2.0 '/' Top.W=29.00' n= 0.040 Winding stream, pools & shoals
13.2	588	Total			

Summary for Subcatchment 2S: Subcatchment 2S

Runoff = 1.57 cfs @ 12.15 hrs, Volume= 0.138 af, Depth= 4.51"
Routed to Reach AP2 : Analysis Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
7,339	98	Paved roads w/curbs & sewers, HSG C
3,618	98	Roofs, HSG C
2,694	74	>75% Grass cover, Good, HSG C
2,400	70	Woods, Good, HSG C
16,051	90	Weighted Average
5,094		31.74% Pervious Area
10,957		68.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	35	0.0225	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.69"
1.9	15	0.0225	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.69"
0.7	47	0.0274	1.16		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	28	0.2143	3.24		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.9	125	Total			

Summary for Subcatchment 3S: Subcatchment 3S

Runoff = 18.33 cfs @ 12.36 hrs, Volume= 2.207 af, Depth= 4.08"
Routed to Pond AP3 : Existing Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
125,302	98	Paved roads w/curbs & sewers, HSG C
9,379	98	Roofs, HSG C
7,425	74	>75% Grass cover, Good, HSG C
73,762	70	Woods, Good, HSG C
46,241	83	1/4 acre lots, 38% imp, HSG C
15,690	77	Woods, Good, HSG D
5,165	98	Water Surface, 0% imp, HSG D
282,964	86	Weighted Average
130,711		46.19% Pervious Area
152,253		53.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.5	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.69"
3.5	119	0.0126	0.56		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	74	0.0270	0.82		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.6	107	0.0187	0.68		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.7	180	0.0111	0.53		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	74	0.0270	0.82		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
26.3	604	Total			

Summary for Subcatchment 4S: Subcatchment 4S

Runoff = 0.28 cfs @ 12.09 hrs, Volume= 0.023 af, Depth= 5.41"
Routed to Reach AP4 : Analysis Point 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
2,236	98	Paved parking, HSG C
2,236		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minute minimum Tc per TR-55**

Summary for Subcatchment 5S: Subcatchment 5S

Runoff = 0.02 cfs @ 12.09 hrs, Volume= 0.002 af, Depth= 2.89"
Routed to Reach AP5 : Analysis Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
310	74	>75% Grass cover, Good, HSG C
310		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minute minimum Tc per TR-55**

Summary for Subcatchment 6S: Subcatchment 6S

Runoff = 0.73 cfs @ 12.16 hrs, Volume= 0.065 af, Depth= 4.18"
Routed to Reach AP6 : Analysis Point 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
4,023	98	Paved roads w/curbs & sewers, HSG C
479	98	Roofs, HSG C
3,620	74	>75% Grass cover, Good, HSG C
8,122	87	Weighted Average
3,620		44.57% Pervious Area
4,502		55.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	50	0.0041	0.08		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.69"
1.7	47	0.0041	0.45		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	52	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.0	149	Total			

Summary for Subcatchment 7S: Subcatchment 7S

Runoff = 1.45 cfs @ 12.22 hrs, Volume= 0.140 af, Depth= 2.99"
Routed to Reach 3R : 15" HDPE Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
1,350	98	Paved roads w/curbs & sewers, HSG C
3,607	74	>75% Grass cover, Good, HSG C
14,109	70	Woods, Good, HSG C
5,424	83	1/4 acre lots, 38% imp, HSG C
24,490	75	Weighted Average
21,079		86.07% Pervious Area
3,411		13.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0183	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.69"
0.2	7	0.0183	0.68		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.6	91	0.0134	0.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	58	0.0134	0.81		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	6	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
15.9	212	Total			

Summary for Subcatchment 8S: Subcatchment 8S

Runoff = 4.61 cfs @ 12.09 hrs, Volume= 0.363 af, Depth= 4.95"
Routed to Pond 1P : Bioretention Pond #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
23,203	98	Paved roads w/curbs & sewers, HSG C
6,109	74	>75% Grass cover, Good, HSG C
9,068	98	Roofs, HSG C
38,380	94	Weighted Average
6,109		15.92% Pervious Area
32,271		84.08% Impervious Area

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

Summary for Subcatchment 9S: Subcatchment 9S

Runoff = 0.74 cfs @ 12.09 hrs, Volume= 0.059 af, Depth= 5.06"
Routed to Pond 3P : Focal Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
4,645	98	Paved roads w/curbs & sewers, HSG C
659	74	>75% Grass cover, Good, HSG C
813	98	Roofs, HSG C
6,117	95	Weighted Average
659		10.77% Pervious Area
5,458		89.23% Impervious Area

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

Summary for Subcatchment 10S: Subcatchment 10S

Runoff = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af, Depth= 5.41"
Routed to Pond 5P : Lined Stone Drip Edge

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
827	98	Roofs, HSG C
188	98	Water Surface, 0% imp, HSG C
1,015	98	Weighted Average
188		18.52% Pervious Area
827		81.48% Impervious Area

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

Summary for Subcatchment 11S: Subcatchment 11S

Runoff = 1.34 cfs @ 12.09 hrs, Volume= 0.099 af, Depth= 3.87"
Routed to Pond 6P : Detention Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
5,679	98	Roofs, HSG C
7,431	74	>75% Grass cover, Good, HSG C
201	70	Woods, Good, HSG C
13,311	84	Weighted Average
7,632		57.34% Pervious Area
5,679		42.66% Impervious Area

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

Summary for Subcatchment 12S: Subcatchment 12S

Runoff = 0.85 cfs @ 12.09 hrs, Volume= 0.065 af, Depth= 4.51"
Routed to Pond 7P : Bioretention Pond #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
1,411	98	Roofs, HSG C
3,456	98	Paved parking, HSG C
2,663	74	>75% Grass cover, Good, HSG C
7,530	90	Weighted Average
2,663		35.37% Pervious Area
4,867		64.63% Impervious Area

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

Summary for Subcatchment 13S: Subcatchment 13S

Runoff = 2.47 cfs @ 12.09 hrs, Volume= 0.193 af, Depth= 4.84"
Routed to Pond 8P : Bioretention Pond #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
2,582	98	Roofs, HSG C
13,994	98	Paved parking, HSG C
4,246	74	>75% Grass cover, Good, HSG C
20,822	93	Weighted Average
4,246		20.39% Pervious Area
16,576		79.61% Impervious Area

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

Summary for Subcatchment 14S: Subcatchment 14S

Runoff = 0.41 cfs @ 12.09 hrs, Volume= 0.035 af, Depth= 5.41"
Routed to Pond 16P : Eco Paver

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
3,343	98	Roofs, HSG C
3,343		100.00% Impervious Area

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

Summary for Subcatchment 15S: Subcatchment 15S

Runoff = 1.95 cfs @ 12.09 hrs, Volume= 0.152 af, Depth= 4.84"
Routed to Pond 10P : Focal Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
6,876	98	Roofs, HSG C
6,102	98	Paved parking, HSG C
3,444	74	>75% Grass cover, Good, HSG C
16,422	93	Weighted Average
3,444		20.97% Pervious Area
12,978		79.03% Impervious Area

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

Summary for Subcatchment 16S: Subcatchment 16S

Runoff = 1.24 cfs @ 12.09 hrs, Volume= 0.100 af, Depth= 5.18"
Routed to Pond 12P : Jellyfish #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
2,984	98	Roofs, HSG C
6,322	98	Paved parking, HSG C
807	74	>75% Grass cover, Good, HSG C
10,113	96	Weighted Average
807		7.98% Pervious Area
9,306		92.02% Impervious Area

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

Summary for Subcatchment 17S: Subcatchment 17S

Runoff = 0.11 cfs @ 12.09 hrs, Volume= 0.009 af, Depth= 5.41"
Routed to Pond 13P : Lined Stone Drip Edge

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
792	98	Roofs, HSG C
100	98	Water Surface, 0% imp, HSG C
892	98	Weighted Average
100		11.21% Pervious Area
792		88.79% Impervious Area

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

Summary for Subcatchment 18S: Subcatchment 18S

Runoff = 1.93 cfs @ 12.14 hrs, Volume= 0.159 af, Depth= 3.57"
Routed to Reach 7R : 15" HDPE Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
4,667	74	>75% Grass cover, Good, HSG C
18,709	83	1/4 acre lots, 38% imp, HSG C
23,376	81	Weighted Average
16,267		69.59% Pervious Area
7,109		30.41% Impervious Area

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

Summary for Subcatchment 19S: Subcatchment 19S

Runoff = 1.14 cfs @ 12.09 hrs, Volume= 0.093 af, Depth= 5.30"
Routed to Pond 15P : Jellyfish #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.65"

Area (sf)	CN	Description
561	74	>75% Grass cover, Good, HSG C
2,984	98	Roofs, HSG C
5,660	98	Paved roads w/curbs & sewers, HSG C
9,205	97	Weighted Average
561		6.09% Pervious Area
8,644		93.91% Impervious Area

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

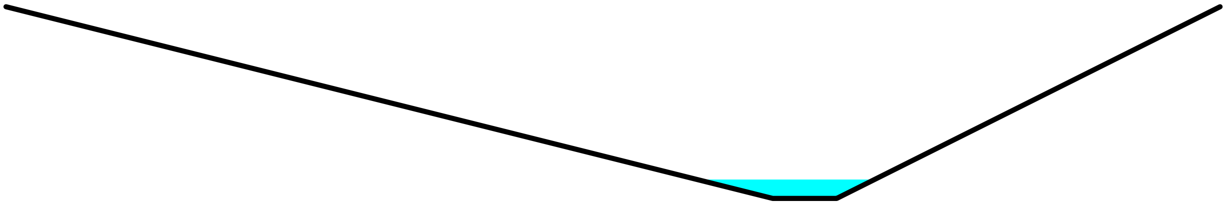
Summary for Reach 2Ra: Channel through 1S

Inflow Area = 8.184 ac, 57.64% Impervious, Inflow Depth > 4.16" for 10-Year Storm event
Inflow = 7.47 cfs @ 12.45 hrs, Volume= 2.838 af
Outflow = 7.47 cfs @ 12.46 hrs, Volume= 2.838 af, Atten= 0%, Lag= 0.5 min
Routed to Reach 2Rb : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 3.38 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.34 fps, Avg. Travel Time= 1.7 min

Peak Storage= 301 cf @ 12.46 hrs
Average Depth at Peak Storage= 0.59' , Surface Width= 5.53'
Bank-Full Depth= 6.00' Flow Area= 120.0 sf, Capacity= 1,586.21 cfs

2.00' x 6.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 4.0 2.0 '/' Top Width= 38.00'
Length= 136.0' Slope= 0.0294 '/'
Inlet Invert= 24.00', Outlet Invert= 20.00'



Summary for Reach 2Rb: Channel through 1S

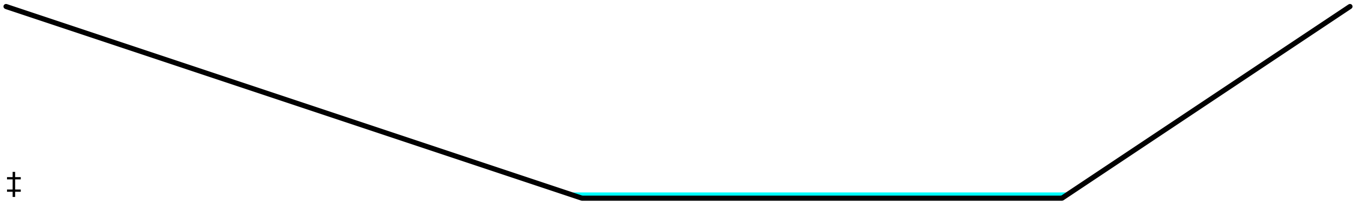
[61] Hint: Exceeded Reach 2Ra outlet invert by 0.18' @ 12.60 hrs
[62] Hint: Exceeded Reach 5R OUTLET depth by 0.16' @ 12.25 hrs

Inflow Area = 9.149 ac, 60.50% Impervious, Inflow Depth > 4.15" for 10-Year Storm event
Inflow = 8.18 cfs @ 12.59 hrs, Volume= 3.166 af
Outflow = 8.18 cfs @ 12.60 hrs, Volume= 3.165 af, Atten= 0%, Lag= 0.9 min
Routed to Reach 2Rc : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.27 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.20 fps, Avg. Travel Time= 2.1 min

Peak Storage= 551 cf @ 12.60 hrs
Average Depth at Peak Storage= 0.18' , Surface Width= 21.05'
Bank-Full Depth= 6.00' Flow Area= 228.0 sf, Capacity= 4,170.50 cfs

20.00' x 6.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 4.0 2.0 '/' Top Width= 56.00'
Length= 153.0' Slope= 0.0392 '/'
Inlet Invert= 20.00', Outlet Invert= 14.00'



Summary for Reach 2Rc: Channel through 1S

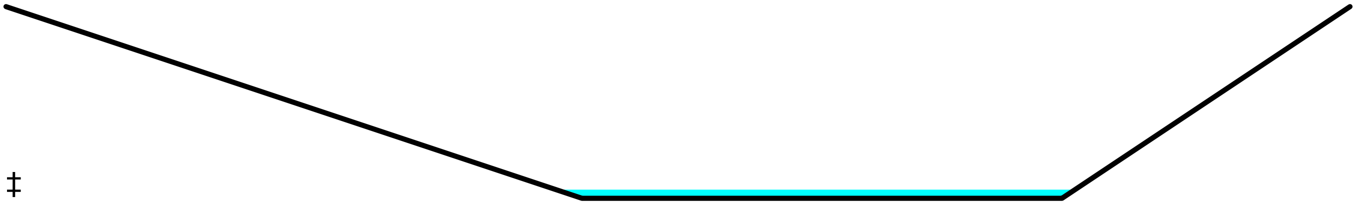
[62] Hint: Exceeded Reach 2Rb OUTLET depth by 0.10' @ 12.25 hrs

Inflow Area = 10.889 ac, 57.86% Impervious, Inflow Depth > 4.03" for 10-Year Storm event
Inflow = 10.89 cfs @ 12.20 hrs, Volume= 3.657 af
Outflow = 10.81 cfs @ 12.23 hrs, Volume= 3.656 af, Atten= 1%, Lag= 1.7 min
Routed to Reach AP1 : Analysis Point 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 1.94 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 0.82 fps, Avg. Travel Time= 6.1 min

Peak Storage= 1,688 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.27' , Surface Width= 21.61'
Bank-Full Depth= 6.00' Flow Area= 228.0 sf, Capacity= 2,705.34 cfs

20.00' x 6.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 4.0 2.0 '/' Top Width= 56.00'
Length= 303.0' Slope= 0.0165 '/'
Inlet Invert= 14.00', Outlet Invert= 9.00'



Summary for Reach 3R: 15" HDPE Culvert

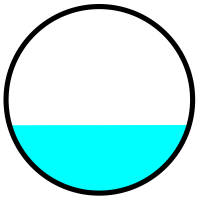
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 0.562 ac, 13.93% Impervious, Inflow Depth = 2.99" for 10-Year Storm event
Inflow = 1.45 cfs @ 12.22 hrs, Volume= 0.140 af
Outflow = 1.45 cfs @ 12.22 hrs, Volume= 0.140 af, Atten= 0%, Lag= 0.1 min
Routed to Reach 4R : Flow through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 3.57 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.38 fps, Avg. Travel Time= 0.6 min

Peak Storage= 19 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.46' , Surface Width= 1.20'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 5.10 cfs

15.0" Round Pipe
n= 0.012
Length= 47.0' Slope= 0.0053 '/'
Inlet Invert= 34.75', Outlet Invert= 34.50'



Summary for Reach 4R: Flow through 1S

[61] Hint: Exceeded Reach 3R outlet invert by 0.35' @ 12.25 hrs

Inflow Area = 0.562 ac, 13.93% Impervious, Inflow Depth = 2.99" for 10-Year Storm event
Inflow = 1.45 cfs @ 12.22 hrs, Volume= 0.140 af
Outflow = 1.44 cfs @ 12.25 hrs, Volume= 0.140 af, Atten= 1%, Lag= 1.5 min
Routed to Reach 7R : 15" HDPE Culvert

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.03 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.75 fps, Avg. Travel Time= 4.4 min

Peak Storage= 142 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.35' , Surface Width= 3.08'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 14.80 cfs

1.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 7.00'
Length= 200.0' Slope= 0.0125 '/'
Inlet Invert= 34.50', Outlet Invert= 32.00'

Summary for Reach 5R: Channel through 1S

Inflow Area = 0.958 ac, 85.36% Impervious, Inflow Depth > 4.08" for 10-Year Storm event
Inflow = 0.76 cfs @ 12.60 hrs, Volume= 0.326 af
Outflow = 0.76 cfs @ 12.61 hrs, Volume= 0.326 af, Atten= 0%, Lag= 0.6 min
Routed to Reach 2Rb : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 1.44 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 1.6 min

Peak Storage= 41 cf @ 12.61 hrs
Average Depth at Peak Storage= 0.05' , Surface Width= 10.52'
Bank-Full Depth= 2.00' Flow Area= 40.0 sf, Capacity= 498.13 cfs

10.00' x 2.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 5.0 '/' Top Width= 30.00'
Length= 77.0' Slope= 0.0779 '/'
Inlet Invert= 26.00', Outlet Invert= 20.00'


‡

Summary for Reach 6R: SEE NOTES

If 16P is routed directly to downstream 2P, 16P appears to overflow due to unrealistic tailwater conditions. In reality, the water from the infiltration chambers will not seep into the upstream Eco-Pavers underneath the unit decks. Therefore, a reach needs to be inserted into the model to separate the two devices.

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

Inflow Area = 0.077 ac,100.00% Impervious, Inflow Depth = 5.41" for 10-Year Storm event
Inflow = 0.36 cfs @ 12.14 hrs, Volume= 0.035 af
Outflow = 0.36 cfs @ 12.14 hrs, Volume= 0.035 af, Atten= 0%, Lag= 0.0 min
Routed to Pond 2P : Infiltration System A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach 7R: 15" HDPE Culvert

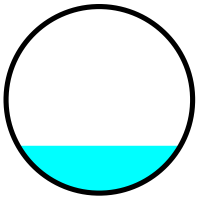
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 4R OUTLET depth by 0.02' @ 8.50 hrs

Inflow Area = 1.099 ac, 21.98% Impervious, Inflow Depth = 3.27" for 10-Year Storm event
Inflow = 3.12 cfs @ 12.17 hrs, Volume= 0.299 af
Outflow = 3.12 cfs @ 12.17 hrs, Volume= 0.299 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 2Rc : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 12.69 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 4.58 fps, Avg. Travel Time= 0.1 min

Peak Storage= 5 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.32' , Surface Width= 1.09'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 22.13 cfs

15.0" Round Pipe
n= 0.012
Length= 20.0' Slope= 0.1000 '/'
Inlet Invert= 32.00', Outlet Invert= 30.00'



Summary for Reach AP1: Analysis Point 1

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

```
Inflow Area =      15.724 ac, 49.63% Impervious,  Inflow Depth >  3.86"   for  10-Year Storm event
Inflow      =      26.11 cfs @  12.19 hrs,  Volume=          5.052 af
Outflow     =      26.11 cfs @  12.19 hrs,  Volume=          5.052 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP2: Analysis Point 2

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

```
Inflow Area =       7.363 ac, 54.42% Impervious,  Inflow Depth =  4.10"   for  10-Year Storm event
Inflow      =       7.34 cfs @  12.45 hrs,  Volume=          2.518 af
Outflow     =       7.34 cfs @  12.45 hrs,  Volume=          2.518 af,  Atten= 0%,  Lag= 0.0 min
     Routed to Reach 2Ra : Channel through 1S
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP4: Analysis Point 4

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

```
Inflow Area =       0.051 ac,100.00% Impervious,  Inflow Depth =  5.41"   for  10-Year Storm event
Inflow      =       0.28 cfs @  12.09 hrs,  Volume=          0.023 af
Outflow     =       0.28 cfs @  12.09 hrs,  Volume=          0.023 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP5: Analysis Point 5

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

Inflow Area = 0.007 ac, 0.00% Impervious, Inflow Depth = 2.89" for 10-Year Storm event
Inflow = 0.02 cfs @ 12.09 hrs, Volume= 0.002 af
Outflow = 0.02 cfs @ 12.09 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 2Rb : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP6: Analysis Point 6

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

Inflow Area = 0.186 ac, 55.43% Impervious, Inflow Depth = 4.18" for 10-Year Storm event
Inflow = 0.73 cfs @ 12.16 hrs, Volume= 0.065 af
Outflow = 0.73 cfs @ 12.16 hrs, Volume= 0.065 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Pond 1P: Bioretention Pond #1

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=4)

Inflow Area = 0.881 ac, 84.08% Impervious, Inflow Depth = 4.95" for 10-Year Storm event
Inflow = 4.61 cfs @ 12.09 hrs, Volume= 0.363 af
Outflow = 0.94 cfs @ 12.51 hrs, Volume= 0.351 af, Atten= 80%, Lag= 25.6 min
Primary = 0.94 cfs @ 12.51 hrs, Volume= 0.881 af
Routed to Pond DMH1 : Drain Manhole 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 34.17' @ 12.52 hrs Surf.Area= 2,839 sf Storage= 5,443 cf

Plug-Flow detention time= 103.2 min calculated for 0.351 af (97% of inflow)
Center-of-Mass det. time= 83.0 min (853.1 - 770.1)

Volume	Invert	Avail.Storage	Storage Description
#1	28.74'	6,702 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
28.74	926	197.0	0.0	0	0	926
28.75	926	197.0	40.0	4	4	928
29.74	926	197.0	40.0	367	370	1,123
29.75	926	197.0	15.0	1	372	1,125
31.24	926	197.0	15.0	207	579	1,419
31.25	926	197.0	5.0	0	579	1,420
31.49	926	197.0	5.0	11	590	1,468
31.50	926	197.0	100.0	9	600	1,470
32.00	1,235	215.0	100.0	538	1,138	2,069
34.00	2,697	268.0	100.0	3,838	4,976	4,162
34.24	2,900	274.0	100.0	671	5,648	4,429
34.25	3,983	264.0	100.0	34	5,682	4,857
34.50	4,183	269.0	100.0	1,021	6,702	5,080

Device	Routing	Invert	Outlet Devices
#1	Primary	28.75'	**18.0" Round Culvert** L= 36.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 28.75' / 28.55' S= 0.0056 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	28.75'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	34.10'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.92 cfs @ 12.51 hrs HW=34.17' TW=32.34' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.92 cfs of 9.08 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.57 cfs @ 6.51 fps)
  └─**3=Orifice/Grate** (Weir Controls 0.36 cfs @ 0.85 fps)

Summary for Pond 2P: Infiltration System A

[80] Warning: Exceeded Pond DMH1 by 0.07' @ 26.30 hrs (1.72 cfs 0.730 af)

Inflow Area = 0.958 ac, 85.36% Impervious, Inflow Depth > 11.47" for 10-Year Storm event
Inflow = 1.05 cfs @ 12.51 hrs, Volume= 0.916 af
Outflow = 0.93 cfs @ 12.60 hrs, Volume= 0.831 af, Atten= 11%, Lag= 5.5 min
Discarded = 0.17 cfs @ 12.60 hrs, Volume= 0.505 af
Primary = 0.76 cfs @ 12.60 hrs, Volume= 0.326 af
Routed to Reach 5r : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 32.36' @ 12.60 hrs Surf.Area= 1,008 sf Storage= 3,920 cf

Plug-Flow detention time= 211.6 min calculated for 0.830 af (91% of inflow)
Center-of-Mass det. time= 93.8 min (1,703.2 - 1,609.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	28.00'	0 cf	**24.00'W x 42.00'L x 5.67'H Field A** 5,715 cf Overall - 5,715 cf Embedded = 0 cf x 40.0% Voids
#2A	28.00'	4,500 cf	**Shea Leaching Chamber 8x14x5.7**x 9 Inside #1 Inside= 84.0"W x 60.0"H => 38.46 sf x 13.00'L = 500.0 cf Outside= 96.0"W x 68.0"H => 45.36 sf x 14.00'L = 635.0 cf 9 Chambers in 3 Rows
		4,500 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	28.00'	**1.450 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 26.91' Phase-In= 0.10'
#2	Primary	32.00'	**12.0" Round Culvert X 2.00** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 32.00' / 31.90' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.17 cfs @ 12.60 hrs HW=32.36' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.17 cfs)

Primary OutFlow Max=0.76 cfs @ 12.60 hrs HW=32.36' TW=26.05' (Dynamic Tailwater)
↑—**2=Culvert** (Barrel Controls 0.76 cfs @ 2.26 fps)

Summary for Pond 2PF: Bioretention Pond #1 Forebay

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1	32.25'	674 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
32.25	41	83.0	0	0	41
34.00	650	138.0	498	498	1,027
34.25	756	143.0	176	674	1,145

Summary for Pond 3P: Focal Point #1

[90] Warning: Qout>Qin may require smaller dt or Finer Routing
[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=2)

Inflow Area = 0.140 ac, 89.23% Impervious, Inflow Depth = 5.06" for 10-Year Storm event
Inflow = 0.74 cfs @ 12.09 hrs, Volume= 0.059 af
Outflow = 0.75 cfs @ 12.09 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.3 min
Primary = 0.75 cfs @ 12.09 hrs, Volume= 0.059 af
Routed to Pond 4P : Infiltration System B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 29.60' @ 12.09 hrs Surf.Area= 103 sf Storage= 42 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.1 min (766.2 - 765.1)

Volume	Invert	Avail.Storage	Storage Description
#1	26.75'	11 cf	**5.00'W x 5.00'L x 2.25'H Focal Point** 56 cf Overall x 20.0% Voids
#2	29.00'	69 cf	**Surface Bowl (Prismatic)**Listed below (Recalc)
		80 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
29.00	25	0	0
30.00	113	69	69

Device	Routing	Invert	Outlet Devices
#1	Primary	26.00'	**12.0" Round Culvert** L= 13.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 26.00' / 25.50' S= 0.0385 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	26.75'	**100.000 in/hr Exfiltration over Surface area** Phase-In= 0.10'
#3	Device 1	29.50'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.73 cfs @ 12.09 hrs HW=29.60' TW=24.79' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.73 cfs of 5.26 cfs potential flow)
  ├─**2=Exfiltration** (Exfiltration Controls 0.24 cfs)
  └─**3=Orifice/Grate** (Weir Controls 0.49 cfs @ 1.04 fps)

Summary for Pond 4P: Infiltration System B

Inflow Area = 0.164 ac, 88.12% Impervious, Inflow Depth = 5.11" for 10-Year Storm event
Inflow = 0.87 cfs @ 12.09 hrs, Volume= 0.070 af
Outflow = 0.05 cfs @ 13.69 hrs, Volume= 0.070 af, Atten= 94%, Lag= 95.9 min
Discarded = 0.05 cfs @ 13.69 hrs, Volume= 0.070 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 2rc : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 25.96' @ 13.69 hrs Surf.Area= 672 sf Storage= 1,625 cf

Plug-Flow detention time= 358.1 min calculated for 0.070 af (100% of inflow)
Center-of-Mass det. time= 358.5 min (1,121.7 - 763.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	23.25'	0 cf	**16.00'W x 42.00'L x 4.67'H Field A** 3,138 cf Overall - 3,138 cf Embedded = 0 cf x 40.0% Voids
#2A	23.25'	2,400 cf	**Shea Leaching Chamber 8x14x4.7**x 6 Inside #1 Inside= 84.0"W x 48.0"H => 30.77 sf x 13.00'L = 400.0 cf Outside= 96.0"W x 56.0"H => 37.36 sf x 14.00'L = 523.0 cf

	6 Chambers in 2 Rows
2,400 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.25'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 22.17' Phase-In= 0.10'
#2	Primary	26.80'	**12.0" Round Culvert** L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 26.80' / 26.70' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Discarded OutFlow Max=0.05 cfs @ 13.69 hrs HW=25.96' (Free Discharge)
└─**1=Exfiltration** (Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=23.25' TW=14.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.00 cfs)

Summary for Pond 5P: Lined Stone Drip Edge

[44] Hint: Outlet device #1 is below defined storage

Inflow Area = 0.023 ac, 81.48% Impervious, Inflow Depth = 5.41" for 10-Year Storm event
Inflow = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af
Outflow = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.5 min
Primary = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af
Routed to Pond 4P : Infiltration System B
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 2Rc : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 29.08' @ 12.09 hrs Surf.Area= 0.003 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.3 min (746.4 - 746.1)

Volume	Invert	Avail.Storage	Storage Description
#1	29.01'	0.001 af	**2.00'W x 63.00'L x 1.01'H Prismatoid** 0.003 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	29.00'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	30.00'	**63.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.12 cfs @ 12.09 hrs HW=29.08' TW=24.80' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Weir Controls 0.12 cfs @ 0.95 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.01' TW=14.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 6P: Detention Pond

Inflow Area = 0.306 ac, 42.66% Impervious, Inflow Depth = 3.87" for 10-Year Storm event
Inflow = 1.34 cfs @ 12.09 hrs, Volume= 0.099 af
Outflow = 0.19 cfs @ 12.62 hrs, Volume= 0.098 af, Atten= 86%, Lag= 31.8 min
Primary = 0.19 cfs @ 12.62 hrs, Volume= 0.098 af
Routed to Pond AP3 : Existing Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 36.29' @ 12.62 hrs Surf.Area= 2,810 sf Storage= 1,910 cf

Plug-Flow detention time= 145.7 min calculated for 0.098 af (99% of inflow)
Center-of-Mass det. time= 144.0 min (949.7 - 805.8)

Volume	Invert	Avail.Storage	Storage Description
#1	35.50'	3,320 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
35.50	2,056	0	0
36.00	2,529	1,146	1,146
36.75	3,267	2,174	3,320

Device	Routing	Invert	Outlet Devices
#1	Primary	35.50'	**12.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 35.50' / 35.40' S= 0.0167 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	35.50'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	36.50'	**6.0' long + 3.0 '/' SideZ x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.19 cfs @ 12.62 hrs HW=36.29' TW=32.93' (Dynamic Tailwater)
├─**1=Culvert** (Passes 0.19 cfs of 1.64 cfs potential flow)
│ └─**2=Orifice/Grate** (Orifice Controls 0.19 cfs @ 3.91 fps)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 7P: Bioretention Pond #2

```
Inflow Area =        0.193 ac,  67.19% Impervious,  Inflow Depth =   4.60"    for  10-Year Storm event
Inflow      =       0.96 cfs @  12.09 hrs,  Volume=          0.074 af
Outflow     =       0.69 cfs @  12.17 hrs,  Volume=          0.074 af,  Atten= 29%,  Lag= 5.1 min
Primary     =       0.69 cfs @  12.17 hrs,  Volume=          0.074 af
   Routed to Pond AP3 : Existing Pond
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 34.59' @ 12.17 hrs Surf.Area= 518 sf Storage= 360 cf

Plug-Flow detention time= 15.3 min calculated for 0.074 af (100% of inflow)
Center-of-Mass det. time= 14.4 min (796.1 - 781.7)

Volume	Invert	Avail.Storage	Storage Description
#1	31.74'	983 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
31.74	490	111.0	0.0	0	0	490
31.75	490	111.0	40.0	2	2	491
32.74	490	111.0	40.0	194	196	601
32.75	490	111.0	15.0	1	197	602
34.24	490	111.0	15.0	110	306	768
34.25	490	111.0	5.0	0	306	769
34.49	490	111.0	5.0	6	312	795
34.50	490	111.0	100.0	5	317	796
35.00	664	121.0	100.0	287	605	990
35.50	853	130.0	100.0	378	983	1,180

Device	Routing	Invert	Outlet Devices
#1	Primary	31.75'	**12.0" Round Culvert** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 31.75' / 31.60' S= 0.0187 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	31.75'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	35.20'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.68 cfs @ 12.17 hrs HW=34.53' TW=30.62' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 0.68 cfs of 4.51 cfs potential flow)
  ↑—**2=Orifice/Grate** (Orifice Controls 0.68 cfs @ 7.79 fps)
   └—**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 8P: Bioretention Pond #3

```
Inflow Area =        0.478 ac,  79.61% Impervious,  Inflow Depth =   4.84"    for  10-Year Storm event
Inflow      =       2.47 cfs @  12.09 hrs,  Volume=          0.193 af
Outflow     =       0.90 cfs @  12.34 hrs,  Volume=          0.193 af,  Atten= 63%,  Lag= 15.3 min
Primary     =       0.90 cfs @  12.34 hrs,  Volume=          0.193 af
   Routed to Pond 14P : Chamber System D
```

```
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 32.03' @ 12.34 hrs   Surf.Area= 1,052 sf   Storage= 1,366 cf

Plug-Flow detention time= 10.8 min calculated for 0.193 af (100% of inflow)
Center-of-Mass det. time= 10.0 min ( 784.7 - 774.7 )

Volume     Invert   Avail.Storage  Storage Description
  #1       27.24'       2,651 cf   Custom Stage Data (Irregular)Listed below (Recalc)

Elevation      Surf.Area   Perim.  Voids      Inc.Store      Cum.Store      Wet.Area
   (feet)        (sq-ft)   (feet)    (%)   (cubic-feet)   (cubic-feet)       (sq-ft)
    27.24            238     86.0    0.0              0              0           238
    27.25            238     86.0   40.0              1              1           239
    28.24            238     86.0   40.0             94             95           324
    28.25            238     86.0   15.0              0             96           325
    29.74            238     86.0   15.0             53            149           453
    29.75            238     86.0    5.0              0            149           454
    29.99            238     86.0    5.0              3            152           475
    30.00            238     86.0  100.0              2            154           475
    32.00          1,037    181.0  100.0          1,181          1,335         2,511
    33.00          1,616    202.0  100.0          1,316          2,651         3,180

Device  Routing        Invert  Outlet Devices
  #1    Primary        27.25'  12.0"  Round Culvert
                               L= 7.0'   CPP, projecting, no headwall,  Ke= 0.900
                               Inlet / Outlet Invert= 27.25' / 27.00'   S= 0.0357 '/'   Cc= 0.900
                               n= 0.012,  Flow Area= 0.79 sf
  #2    Device 1       27.25'  4.0" Vert. Orifice/Grate   C= 0.600   Limited to weir flow at low heads
  #3    Device 1       32.50'  18.0" Horiz. Orifice/Grate   C= 0.600
                               Limited to weir flow at low heads

Primary OutFlow Max=0.90 cfs @ 12.34 hrs  HW=32.03'  TW=27.24'   (Dynamic Tailwater)
└─1=Culvert  (Passes 0.90 cfs of 6.18 cfs potential flow)
    ├─2=Orifice/Grate  (Orifice Controls 0.90 cfs @ 10.34 fps)
    └─3=Orifice/Grate  ( Controls 0.00 cfs)
```

Summary for Pond 10P: Focal Point #2

```
[90] Warning: Qout>Qin may require smaller dt or Finer Routing
[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=3)

Inflow Area =      0.377 ac,  79.03% Impervious,  Inflow Depth =  4.84"   for  10-Year Storm event
Inflow      =      1.95 cfs @  12.09 hrs,  Volume=        0.152 af
Outflow     =      1.95 cfs @  12.09 hrs,  Volume=        0.152 af,  Atten= 0%,  Lag= 0.2 min
Primary     =      1.95 cfs @  12.09 hrs,  Volume=        0.152 af
   Routed to Pond DMH2 : Drain Manhole 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
```

Peak Elev= 38.22' @ 12.09 hrs Surf.Area= 173 sf Storage= 67 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.9 min (775.6 - 774.7)

Volume	Invert	Avail.Storage	Storage Description
#1	35.50'	27 cf	**4.00'W x 15.00'L x 2.25'H Focal Point** 135 cf Overall x 20.0% Voids
#2	37.75'	77 cf	**Surface Bowl (Prismatic)**Listed below (Recalc)
		104 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
37.75	60	0	0
38.00	86	18	18
38.50	148	59	77

Device	Routing	Invert	Outlet Devices
#1	Primary	34.75'	**12.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 34.75' / 34.50' S= 0.0250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	35.50'	**100.000 in/hr Exfiltration over Surface area** Phase-In= 0.10'
#3	Device 1	38.00'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.91 cfs @ 12.09 hrs HW=38.21' TW=35.12' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 1.91 cfs of 5.14 cfs potential flow)
  ↑—**2=Exfiltration** (Exfiltration Controls 0.40 cfs)
  └—**3=Orifice/Grate** (Weir Controls 1.51 cfs @ 1.51 fps)

Summary for Pond 11P: Chamber System C

[80] Warning: Exceeded Pond 12P by 0.26' @ 24.35 hrs (0.25 cfs 0.009 af)
[80] Warning: Exceeded Pond DMH4 by 1.18' @ 17.80 hrs (3.47 cfs 0.874 af)

Inflow Area = 0.820 ac, 86.54% Impervious, Inflow Depth = 5.05" for 10-Year Storm event
Inflow = 4.32 cfs @ 12.09 hrs, Volume= 0.345 af
Outflow = 0.14 cfs @ 15.63 hrs, Volume= 0.321 af, Atten= 97%, Lag= 212.6 min
Primary = 0.14 cfs @ 15.63 hrs, Volume= 0.321 af
Routed to Reach 2Ra : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 34.23' @ 15.63 hrs Surf.Area= 5,824 sf Storage= 10,303 cf

Plug-Flow detention time= 811.6 min calculated for 0.321 af (93% of inflow)
Center-of-Mass det. time= 773.0 min (1,537.9 - 765.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	32.25'	0 cf	**32.00'W x 182.00'L x 4.67'H Field A** 27,198 cf Overall - 27,198 cf Embedded = 0 cf x 40.0% Voids
#2A	32.25'	20,800 cf	**Shea Leaching Chamber 8x14x4.7**x 52 Inside #1 Inside= 84.0"W x 48.0"H => 30.77 sf x 13.00'L = 400.0 cf Outside= 96.0"W x 56.0"H => 37.36 sf x 14.00'L = 523.0 cf 52 Chambers in 4 Rows
		20,800 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	31.58'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 31.58' / 31.40' S= 0.0090 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	32.25'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 2	32.25'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.14 cfs @ 15.63 hrs HW=34.23' TW=24.26' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 0.14 cfs of 4.38 cfs potential flow)
↑—**2=Orifice/Grate** (Orifice Controls 0.14 cfs @ 6.63 fps)
↑—**3=Orifice/Grate** (Passes 0.14 cfs of 0.57 cfs potential flow)

Summary for Pond 12P: Jellyfish #1

Inflow Area = 0.232 ac, 92.02% Impervious, Inflow Depth = 5.18" for 10-Year Storm event
Inflow = 1.24 cfs @ 12.09 hrs, Volume= 0.100 af
Outflow = 1.24 cfs @ 12.09 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.0 min
Primary = 1.24 cfs @ 12.09 hrs, Volume= 0.100 af
Routed to Pond 11P : Chamber System C

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 34.23' @ 15.63 hrs
Flood Elev= 36.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	33.55'	**15.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 33.55' / 33.40' S= 0.0075 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=1.21 cfs @ 12.09 hrs HW=34.18' TW=33.37' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 1.21 cfs @ 2.86 fps)

Summary for Pond 13P: Lined Stone Drip Edge

Inflow Area = 0.020 ac, 88.79% Impervious, Inflow Depth = 5.41" for 10-Year Storm event
Inflow = 0.11 cfs @ 12.09 hrs, Volume= 0.009 af
Outflow = 0.11 cfs @ 12.09 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.4 min
Primary = 0.11 cfs @ 12.09 hrs, Volume= 0.009 af
Routed to Pond 7P : Bioretention Pond #2
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond AP3 : Existing Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 35.08' @ 12.09 hrs Surf.Area= 0.002 ac Storage= 0.000 af

Plug-Flow detention time= 1.0 min calculated for 0.009 af (100% of inflow)
Center-of-Mass det. time= 1.1 min (747.1 - 746.1)

Volume	Invert	Avail.Storage	Storage Description
#1	35.00'	0.001 af	**2.00'W x 48.00'L x 1.01'H Prismatoid** 0.002 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	35.00'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	36.00'	**63.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.11 cfs @ 12.09 hrs HW=35.08' TW=34.00' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Weir Controls 0.11 cfs @ 0.91 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=35.00' TW=26.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Summary for Pond 14P: Chamber System D

Inflow Area = 0.478 ac, 79.61% Impervious, Inflow Depth = 4.84" for 10-Year Storm event
Inflow = 0.90 cfs @ 12.34 hrs, Volume= 0.193 af
Outflow = 0.55 cfs @ 13.12 hrs, Volume= 0.193 af, Atten= 39%, Lag= 46.8 min
Primary = 0.55 cfs @ 13.12 hrs, Volume= 0.193 af
Routed to Reach 2Rc : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 27.91' @ 13.12 hrs Surf.Area= 1,344 sf Storage= 2,292 cf

Plug-Flow detention time= 58.1 min calculated for 0.193 af (100% of inflow)
Center-of-Mass det. time= 57.4 min (842.1 - 784.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	26.00'	0 cf	**24.00'W x 56.00'L x 3.67'H Field A** 4,932 cf Overall - 4,932 cf Embedded = 0 cf x 40.0% Voids
#2A	26.00'	3,600 cf	**Shea Leaching Chamber 8x14x3.7**x 12 Inside #1 Inside= 84.0"W x 36.0"H => 23.08 sf x 13.00'L = 300.0 cf Outside= 96.0"W x 44.0"H => 29.36 sf x 14.00'L = 411.0 cf 12 Chambers in 3 Rows
		3,600 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	25.33'	**12.0" Round Culvert** L= 16.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 25.33' / 25.10' S= 0.0144 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	26.00'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.55 cfs @ 13.12 hrs HW=27.91' TW=14.24' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.55 cfs of 4.30 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.55 cfs @ 6.35 fps)

Summary for Pond 15P: Jellyfish #2

Inflow Area = 0.211 ac, 93.91% Impervious, Inflow Depth = 5.30" for 10-Year Storm event
Inflow = 1.14 cfs @ 12.09 hrs, Volume= 0.093 af
Outflow = 1.14 cfs @ 12.09 hrs, Volume= 0.093 af, Atten= 0%, Lag= 0.0 min
Primary = 1.14 cfs @ 12.09 hrs, Volume= 0.093 af
Routed to Pond DMH4 : Drain Manhole 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 34.23' @ 15.63 hrs
Flood Elev= 36.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	33.25'	**15.0" Round Culvert** L= 16.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 33.25' / 33.10' S= 0.0094 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=1.11 cfs @ 12.09 hrs HW=33.88' TW=33.63' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.11 cfs @ 2.62 fps)

Summary for Pond 16P: Eco Paver

Inflow Area = 0.077 ac,100.00% Impervious, Inflow Depth = 5.41" for 10-Year Storm event
Inflow = 0.41 cfs @ 12.09 hrs, Volume= 0.035 af
Outflow = 0.36 cfs @ 12.14 hrs, Volume= 0.035 af, Atten= 14%, Lag= 3.0 min
Primary = 0.36 cfs @ 12.14 hrs, Volume= 0.035 af
Routed to Reach 6R : SEE NOTES
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 5R : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 28.87' @ 12.14 hrs Surf.Area= 576 sf Storage= 109 cf

Plug-Flow detention time= 16.0 min calculated for 0.035 af (100% of inflow)
Center-of-Mass det. time= 15.5 min (761.6 - 746.1)

Volume	Invert	Avail.Storage	Storage Description
#1	28.40'	233 cf	**6.00'W x 96.00'L x 1.01'H Prismatoid** 582 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	28.40'	**6.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 28.40' / 28.00' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#2	Device 1	28.40'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	29.40'	**96.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.35 cfs @ 12.14 hrs HW=28.87' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.35 cfs @ 1.84 fps)
↑—**2=Orifice/Grate** (Passes 0.35 cfs of 0.45 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=28.40' TW=26.00' (Dynamic Tailwater)
↑—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond AP3: Existing Pond

15" CMP culvert inlet is buried. Contractor to uncover culvert inlet.

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[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=34)

Inflow Area = 6.995 ac, 53.69% Impervious, Inflow Depth = 4.08" for 10-Year Storm event
Inflow = 19.01 cfs @ 12.35 hrs, Volume= 2.380 af
Outflow = 7.00 cfs @ 12.86 hrs, Volume= 2.380 af, Atten= 63%, Lag= 30.5 min
Primary = 7.00 cfs @ 12.86 hrs, Volume= 2.380 af
Routed to Reach AP2 : Analysis Point 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 33.10' @ 12.86 hrs Surf.Area= 13,383 sf Storage= 21,993 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 18.5 min (841.9 - 823.4)

Volume	Invert	Avail.Storage	Storage Description
#1	26.00'	104,430 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
26.00	1	1.0	0	0	1
28.00	37	24.0	29	29	53
30.00	2,236	218.0	1,707	1,736	3,797
32.00	7,294	444.0	9,046	10,782	15,721
34.00	19,719	933.0	26,004	36,786	69,323
35.50	43,192	1,107.0	46,047	82,834	97,611
36.00	43,192	1,107.0	21,596	104,430	98,164

Device	Routing	Invert	Outlet Devices
#1	Primary	26.00'	**15.0" Round Culvert** L= 156.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 26.00' / 24.09' S= 0.0122 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 1.23 sf

Primary OutFlow Max=7.00 cfs @ 12.86 hrs HW=33.10' TW=0.00' (Dynamic Tailwater)
↰**1=Culvert** (Barrel Controls 7.00 cfs @ 5.71 fps)

Summary for Pond DMH1: Drain Manhole 1

[80] Warning: Exceeded Pond 1P by 1.22' @ 27.85 hrs (0.46 cfs 0.884 af)

Inflow Area = 0.881 ac, 84.08% Impervious, Inflow Depth > 12.00" for 10-Year Storm event
Inflow = 0.94 cfs @ 12.51 hrs, Volume= 0.881 af
Outflow = 0.94 cfs @ 12.51 hrs, Volume= 0.881 af, Atten= 0%, Lag= 0.0 min
Primary = 0.94 cfs @ 12.51 hrs, Volume= 0.881 af
Routed to Pond 2P : Infiltration System A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 32.37' @ 12.59 hrs
Flood Elev= 35.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	28.45'	**18.0" Round Culvert** L= 52.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 28.45' / 28.10' S= 0.0067 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=0.94 cfs @ 12.51 hrs HW=32.34' TW=32.32' (Dynamic Tailwater)
↰**1=Culvert** (Inlet Controls 0.94 cfs @ 0.53 fps)

Summary for Pond DMH2: Drain Manhole 2

Inflow Area = 0.377 ac, 79.03% Impervious, Inflow Depth = 4.84" for 10-Year Storm event
Inflow = 1.95 cfs @ 12.09 hrs, Volume= 0.152 af
Outflow = 1.95 cfs @ 12.09 hrs, Volume= 0.152 af, Atten= 0%, Lag= 0.0 min
Primary = 1.95 cfs @ 12.09 hrs, Volume= 0.152 af
Routed to Pond 11P : Chamber System C

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 35.13' @ 12.09 hrs
Flood Elev= 38.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	34.40'	**18.0" Round Culvert** L= 14.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 34.40' / 34.20' S= 0.0143 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=1.91 cfs @ 12.09 hrs HW=35.12' TW=33.38' (Dynamic Tailwater)
↰**1=Culvert** (Barrel Controls 1.91 cfs @ 3.34 fps)

Summary for Pond DMH4: Drain Manhole 4

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=67)
[80] Warning: Exceeded Pond 15P by 0.52' @ 24.40 hrs (0.88 cfs 0.049 af)

Inflow Area = 0.211 ac, 93.91% Impervious, Inflow Depth = 5.30" for 10-Year Storm event
Inflow = 1.14 cfs @ 12.09 hrs, Volume= 0.093 af
Outflow = 1.14 cfs @ 12.09 hrs, Volume= 0.093 af, Atten= 0%, Lag= 0.0 min
Primary = 1.14 cfs @ 12.09 hrs, Volume= 0.093 af
Routed to Pond 11P : Chamber System C

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 34.23' @ 15.63 hrs
Flood Elev= 37.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	33.00'	**15.0" Round Culvert** L= 23.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 33.00' / 32.80' S= 0.0087 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=1.11 cfs @ 12.09 hrs HW=33.63' TW=33.37' (Dynamic Tailwater)
↰**1=Culvert** (Outlet Controls 1.11 cfs @ 2.61 fps)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: Subcatchment1S Runoff Area=210,582 sf 31.09% Impervious Runoff Depth=4.86"
Flow Length=588' Tc=13.2 min CN=80 Runoff=21.47 cfs 1.958 af

Subcatchment2S: Subcatchment2S Runoff Area=16,051 sf 68.26% Impervious Runoff Depth=6.00"
Flow Length=125' Tc=10.9 min CN=90 Runoff=2.06 cfs 0.184 af

Subcatchment3S: Subcatchment3S Runoff Area=282,964 sf 53.81% Impervious Runoff Depth=5.54"
Flow Length=604' Tc=26.3 min CN=86 Runoff=24.58 cfs 2.998 af

Subcatchment4S: Subcatchment4S Runoff Area=2,236 sf 100.00% Impervious Runoff Depth=6.94"
Tc=6.0 min CN=98 Runoff=0.35 cfs 0.030 af

Subcatchment5S: Subcatchment5S Runoff Area=310 sf 0.00% Impervious Runoff Depth=4.20"
Tc=6.0 min CN=74 Runoff=0.03 cfs 0.002 af

Subcatchment6S: Subcatchment6S Runoff Area=8,122 sf 55.43% Impervious Runoff Depth=5.65"
Flow Length=149' Tc=12.0 min CN=87 Runoff=0.97 cfs 0.088 af

Subcatchment7S: Subcatchment7S Runoff Area=24,490 sf 13.93% Impervious Runoff Depth=4.31"
Flow Length=212' Tc=15.9 min CN=75 Runoff=2.09 cfs 0.202 af

Subcatchment8S: Subcatchment8S Runoff Area=38,380 sf 84.08% Impervious Runoff Depth=6.47"
Tc=6.0 min CN=94 Runoff=5.93 cfs 0.475 af

Subcatchment9S: Subcatchment9S Runoff Area=6,117 sf 89.23% Impervious Runoff Depth=6.58"
Tc=6.0 min CN=95 Runoff=0.95 cfs 0.077 af

Subcatchment10S: Subcatchment10S Runoff Area=1,015 sf 81.48% Impervious Runoff Depth=6.94"
Tc=6.0 min CN=98 Runoff=0.16 cfs 0.013 af

Subcatchment11S: Subcatchment11S Runoff Area=13,311 sf 42.66% Impervious Runoff Depth=5.31"
Tc=6.0 min CN=84 Runoff=1.81 cfs 0.135 af

Subcatchment12S: Subcatchment12S Runoff Area=7,530 sf 64.63% Impervious Runoff Depth=6.00"
Tc=6.0 min CN=90 Runoff=1.12 cfs 0.086 af

Subcatchment13S: Subcatchment13S Runoff Area=20,822 sf 79.61% Impervious Runoff Depth=6.35"
Tc=6.0 min CN=93 Runoff=3.19 cfs 0.253 af

Subcatchment14S: Subcatchment14S Runoff Area=3,343 sf 100.00% Impervious Runoff Depth=6.94"
Tc=6.0 min CN=98 Runoff=0.53 cfs 0.044 af

Subcatchment15S: Subcatchment15S Runoff Area=16,422 sf 79.03% Impervious Runoff Depth=6.35"
Tc=6.0 min CN=93 Runoff=2.52 cfs 0.199 af

Subcatchment16S: Subcatchment16S Runoff Area=10,113 sf 92.02% Impervious Runoff Depth=6.70"
Tc=6.0 min CN=96 Runoff=1.58 cfs 0.130 af

Subcatchment17S: Subcatchment17S Runoff Area=892 sf 88.79% Impervious Runoff Depth=6.94"
Tc=6.0 min CN=98 Runoff=0.14 cfs 0.012 af

Subcatchment18S: Subcatchment18S Runoff Area=23,376 sf 30.41% Impervious Runoff Depth=4.97"
Tc=10.0 min CN=81 Runoff=2.67 cfs 0.222 af

Subcatchment19S: Subcatchment19S Runoff Area=9,205 sf 93.91% Impervious Runoff Depth=6.82"
Tc=6.0 min CN=97 Runoff=1.45 cfs 0.120 af

Reach 2Ra: Channel through 1S Avg. Flow Depth=0.62' Max Vel=3.47 fps Inflow=8.28 cfs 3.814 af
n=0.040 L=136.0' S=0.0294 '/' Capacity=1,586.21 cfs Outflow=8.29 cfs 3.814 af

Reach 2Rb: Channel through 1S Avg. Flow Depth=0.21' Max Vel=2.54 fps Inflow=10.88 cfs 4.296 af
n=0.040 L=153.0' S=0.0392 '/' Capacity=4,170.50 cfs Outflow=10.88 cfs 4.296 af

Reach 2Rc: Channel through 1S Avg. Flow Depth=0.32' Max Vel=2.18 fps Inflow=14.86 cfs 4.973 af
n=0.040 L=303.0' S=0.0165 '/' Capacity=2,705.34 cfs Outflow=14.81 cfs 4.971 af

Reach 3R: 15" HDPE Culvert Avg. Flow Depth=0.56' Max Vel=3.94 fps Inflow=2.09 cfs 0.202 af
15.0" Round Pipe n=0.012 L=47.0' S=0.0053 '/' Capacity=5.10 cfs Outflow=2.09 cfs 0.202 af

Reach 4R: Flow through 1S Avg. Flow Depth=0.41' Max Vel=2.24 fps Inflow=2.09 cfs 0.202 af
n=0.030 L=200.0' S=0.0125 '/' Capacity=14.80 cfs Outflow=2.07 cfs 0.202 af

Reach 5R: Channel through 1S Avg. Flow Depth=0.11' Max Vel=2.33 fps Inflow=2.76 cfs 0.480 af
n=0.040 L=77.0' S=0.0779 '/' Capacity=498.13 cfs Outflow=2.78 cfs 0.480 af

Reach 6R: SEE NOTES Inflow=0.44 cfs 0.044 af
Outflow=0.44 cfs 0.044 af

Reach 7R: 15" HDPE Culvert Avg. Flow Depth=0.38' Max Vel=14.02 fps Inflow=4.42 cfs 0.424 af
15.0" Round Pipe n=0.012 L=20.0' S=0.1000 '/' Capacity=22.13 cfs Outflow=4.42 cfs 0.424 af

Reach AP1: Analysis Point 1 Inflow=34.82 cfs 6.929 af
Outflow=34.82 cfs 6.929 af

Reach AP2: Analysis Point 2 Inflow=8.14 cfs 3.416 af
Outflow=8.14 cfs 3.416 af

Reach AP4: Analysis Point 4 Inflow=0.35 cfs 0.030 af
Outflow=0.35 cfs 0.030 af

Reach AP5: Analysis Point 5 Inflow=0.03 cfs 0.002 af
Outflow=0.03 cfs 0.002 af

Reach AP6: Analysis Point 6 Inflow=0.97 cfs 0.088 af
Outflow=0.97 cfs 0.088 af

Pond 1P: Bioretention Pond #1 Peak Elev=34.33' Storage=6,010 cf Inflow=5.93 cfs 0.475 af
Outflow=2.80 cfs 0.461 af

Pond 2P: Infiltration System A Peak Elev=32.76' Storage=4,288 cf Inflow=3.14 cfs 1.088 af
Discarded=0.18 cfs 0.522 af Primary=2.76 cfs 0.480 af Outflow=2.95 cfs 1.002 af

Pond 2PF: Bioretention Pond #1 Forebay Peak Elev=0.00' Storage=0 cf

Pond 3P: Focal Point #1 Peak Elev=29.63' Storage=44 cf Inflow=0.95 cfs 0.077 af
Outflow=0.95 cfs 0.077 af

Pond 4P: Infiltration System B Peak Elev=26.84' Storage=2,152 cf Inflow=1.11 cfs 0.091 af
Discarded=0.07 cfs 0.090 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.091 af

Pond 5P: Lined Stone Drip Edge Peak Elev=29.10' Storage=0.000 af Inflow=0.16 cfs 0.013 af
Primary=0.16 cfs 0.013 af Secondary=0.00 cfs 0.000 af Outflow=0.16 cfs 0.013 af

Pond 6P: Detention Pond Peak Elev=36.53' Storage=2,635 cf Inflow=1.81 cfs 0.135 af
Outflow=0.31 cfs 0.135 af

Pond 7P: Bioretention Pond #2 Peak Elev=34.85' Storage=507 cf Inflow=1.26 cfs 0.098 af
Outflow=0.72 cfs 0.098 af

Pond 8P: Bioretention Pond #3 Peak Elev=32.58' Storage=2,029 cf Inflow=3.19 cfs 0.253 af
Outflow=1.31 cfs 0.253 af

Pond 10P: Focal Point #2 Peak Elev=38.27' Storage=73 cf Inflow=2.52 cfs 0.199 af
Outflow=2.53 cfs 0.199 af

Pond 11P: Chamber System C Peak Elev=34.88' Storage=13,693 cf Inflow=5.56 cfs 0.449 af
Outflow=0.17 cfs 0.398 af

Pond 12P: Jellyfish #1 Peak Elev=34.88' Inflow=1.58 cfs 0.130 af
15.0" Round Culvert n=0.012 L=20.0' S=0.0075 '/' Outflow=1.58 cfs 0.130 af

Pond 13P: Lined Stone Drip Edge Peak Elev=35.09' Storage=0.000 af Inflow=0.14 cfs 0.012 af
Primary=0.14 cfs 0.012 af Secondary=0.00 cfs 0.000 af Outflow=0.14 cfs 0.012 af

Pond 14P: Chamber System D Peak Elev=28.34' Storage=2,809 cf Inflow=1.31 cfs 0.253 af
Outflow=0.62 cfs 0.253 af

Pond 15P: Jellyfish #2 Peak Elev=34.88' Inflow=1.45 cfs 0.120 af
15.0" Round Culvert n=0.012 L=16.0' S=0.0094 '/' Outflow=1.45 cfs 0.120 af

Pond 16P: Eco Paver Peak Elev=28.99' Storage=137 cf Inflow=0.53 cfs 0.044 af
Primary=0.44 cfs 0.044 af Secondary=0.00 cfs 0.000 af Outflow=0.44 cfs 0.044 af

Pond AP3: Existing Pond Peak Elev=33.98' Storage=36,312 cf Inflow=25.40 cfs 3.231 af
15.0" Round Culvert n=0.025 L=156.0' S=0.0122 '/' Outflow=7.39 cfs 3.231 af

Pond DMH1: Drain Manhole 1 Peak Elev=32.92' Inflow=2.80 cfs 1.044 af
18.0" Round Culvert n=0.012 L=52.0' S=0.0067 '/' Outflow=2.80 cfs 1.044 af

Pond DMH2: Drain Manhole 2 Peak Elev=35.25' Inflow=2.53 cfs 0.199 af
18.0" Round Culvert n=0.012 L=14.0' S=0.0143 '/' Outflow=2.53 cfs 0.199 af

Pond DMH4: Drain Manhole 4 Peak Elev=34.88' Inflow=1.45 cfs 0.120 af
15.0" Round Culvert n=0.012 L=23.0' S=0.0087 '/' Outflow=1.45 cfs 0.120 af

Total Runoff Area = 15.961 ac Runoff Volume = 7.231 af Average Runoff Depth = 5.44"
50.14% Pervious = 8.003 ac 49.86% Impervious = 7.959 ac

Summary for Subcatchment 1S: Subcatchment 1S

Runoff = 21.47 cfs @ 12.18 hrs, Volume= 1.958 af, Depth= 4.86"
Routed to Reach AP1 : Analysis Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
3,301	55	Woods, Good, HSG B
960	98	Paved roads w/curbs & sewers, HSG B
16,077	98	Roofs, HSG C
46,575	98	Paved roads w/curbs & sewers, HSG C
16,368	74	>75% Grass cover, Good, HSG C
93,752	70	Woods, Good, HSG C
4,879	83	1/4 acre lots, 38% imp, HSG C
28,670	77	Woods, Good, HSG D
210,582	80	Weighted Average
145,116		68.91% Pervious Area
65,466		31.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	34	0.0294	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.69"
4.6	16	0.0204	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.69"
0.2	82	0.0294	5.69	55.51	**Trap/Vee/Rect Channel Flow, Assumed 1.5' flow depth - Channel** Bot.W=2.00' D=1.50' Z= 4.0 & 2.0 '/' Top.W=11.00' n= 0.040 Winding stream, pools & shoals
0.3	153	0.0392	8.51	312.68	**Trap/Vee/Rect Channel Flow, Assumed 1.5' flow depth - Channel** Bot.W=20.00' D=1.50' Z= 4.0 & 2.0 '/' Top.W=29.00' n= 0.040 Winding stream, pools & shoals
0.9	303	0.0165	5.52	202.86	**Trap/Vee/Rect Channel Flow, Assumed 1.5' flow depth - Channel** Bot.W=20.00' D=1.50' Z= 4.0 & 2.0 '/' Top.W=29.00' n= 0.040 Winding stream, pools & shoals
13.2	588	Total			

Summary for Subcatchment 2S: Subcatchment 2S

Runoff = 2.06 cfs @ 12.15 hrs, Volume= 0.184 af, Depth= 6.00"
Routed to Reach AP2 : Analysis Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
7,339	98	Paved roads w/curbs & sewers, HSG C
3,618	98	Roofs, HSG C
2,694	74	>75% Grass cover, Good, HSG C
2,400	70	Woods, Good, HSG C
16,051	90	Weighted Average
5,094		31.74% Pervious Area
10,957		68.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	35	0.0225	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.69"
1.9	15	0.0225	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.69"
0.7	47	0.0274	1.16		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	28	0.2143	3.24		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.9	125	Total			

Summary for Subcatchment 3S: Subcatchment 3S

Runoff = 24.58 cfs @ 12.35 hrs, Volume= 2.998 af, Depth= 5.54"
Routed to Pond AP3 : Existing Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
125,302	98	Paved roads w/curbs & sewers, HSG C
9,379	98	Roofs, HSG C
7,425	74	>75% Grass cover, Good, HSG C
73,762	70	Woods, Good, HSG C
46,241	83	1/4 acre lots, 38% imp, HSG C
15,690	77	Woods, Good, HSG D
5,165	98	Water Surface, 0% imp, HSG D
282,964	86	Weighted Average
130,711		46.19% Pervious Area
152,253		53.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.5	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.69"
3.5	119	0.0126	0.56		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	74	0.0270	0.82		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.6	107	0.0187	0.68		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.7	180	0.0111	0.53		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.5	74	0.0270	0.82		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
26.3	604	Total			

Summary for Subcatchment 4S: Subcatchment 4S

Runoff = 0.35 cfs @ 12.09 hrs, Volume= 0.030 af, Depth= 6.94"
Routed to Reach AP4 : Analysis Point 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
2,236	98	Paved parking, HSG C
2,236		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minute minimum Tc per TR-55**

Summary for Subcatchment 5S: Subcatchment 5S

Runoff = 0.03 cfs @ 12.09 hrs, Volume= 0.002 af, Depth= 4.20"
Routed to Reach AP5 : Analysis Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
310	74	>75% Grass cover, Good, HSG C
310		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 6 minute minimum Tc per TR-55**

Summary for Subcatchment 6S: Subcatchment 6S

Runoff = 0.97 cfs @ 12.16 hrs, Volume= 0.088 af, Depth= 5.65"
Routed to Reach AP6 : Analysis Point 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
4,023	98	Paved roads w/curbs & sewers, HSG C
479	98	Roofs, HSG C
3,620	74	>75% Grass cover, Good, HSG C
8,122	87	Weighted Average
3,620		44.57% Pervious Area
4,502		55.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	50	0.0041	0.08		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.69"
1.7	47	0.0041	0.45		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	52	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.0	149	Total			

Summary for Subcatchment 7S: Subcatchment 7S

Runoff = 2.09 cfs @ 12.22 hrs, Volume= 0.202 af, Depth= 4.31"
Routed to Reach 3R : 15" HDPE Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
1,350	98	Paved roads w/curbs & sewers, HSG C
3,607	74	>75% Grass cover, Good, HSG C
14,109	70	Woods, Good, HSG C
5,424	83	1/4 acre lots, 38% imp, HSG C
24,490	75	Weighted Average
21,079		86.07% Pervious Area
3,411		13.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	50	0.0183	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.69"
0.2	7	0.0183	0.68		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.6	91	0.0134	0.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	58	0.0134	0.81		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.0	6	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
15.9	212	Total			

Summary for Subcatchment 8S: Subcatchment 8S

Runoff = 5.93 cfs @ 12.09 hrs, Volume= 0.475 af, Depth= 6.47"
Routed to Pond 1P : Bioretention Pond #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
23,203	98	Paved roads w/curbs & sewers, HSG C
6,109	74	>75% Grass cover, Good, HSG C
9,068	98	Roofs, HSG C
38,380	94	Weighted Average
6,109		15.92% Pervious Area
32,271		84.08% Impervious Area

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

Summary for Subcatchment 9S: Subcatchment 9S

Runoff = 0.95 cfs @ 12.09 hrs, Volume= 0.077 af, Depth= 6.58"
Routed to Pond 3P : Focal Point #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
4,645	98	Paved roads w/curbs & sewers, HSG C
659	74	>75% Grass cover, Good, HSG C
813	98	Roofs, HSG C
6,117	95	Weighted Average
659		10.77% Pervious Area
5,458		89.23% Impervious Area

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

Summary for Subcatchment 10S: Subcatchment 10S

Runoff = 0.16 cfs @ 12.09 hrs, Volume= 0.013 af, Depth= 6.94"
Routed to Pond 5P : Lined Stone Drip Edge

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
827	98	Roofs, HSG C
188	98	Water Surface, 0% imp, HSG C
1,015	98	Weighted Average
188		18.52% Pervious Area
827		81.48% Impervious Area

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

Summary for Subcatchment 11S: Subcatchment 11S

Runoff = 1.81 cfs @ 12.09 hrs, Volume= 0.135 af, Depth= 5.31"
Routed to Pond 6P : Detention Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
5,679	98	Roofs, HSG C
7,431	74	>75% Grass cover, Good, HSG C
201	70	Woods, Good, HSG C
13,311	84	Weighted Average
7,632		57.34% Pervious Area
5,679		42.66% Impervious Area

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

Summary for Subcatchment 12S: Subcatchment 12S

Runoff = 1.12 cfs @ 12.09 hrs, Volume= 0.086 af, Depth= 6.00"
Routed to Pond 7P : Bioretention Pond #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
1,411	98	Roofs, HSG C
3,456	98	Paved parking, HSG C
2,663	74	>75% Grass cover, Good, HSG C
7,530	90	Weighted Average
2,663		35.37% Pervious Area
4,867		64.63% Impervious Area

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

Summary for Subcatchment 13S: Subcatchment 13S

Runoff = 3.19 cfs @ 12.09 hrs, Volume= 0.253 af, Depth= 6.35"
Routed to Pond 8P : Bioretention Pond #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
2,582	98	Roofs, HSG C
13,994	98	Paved parking, HSG C
4,246	74	>75% Grass cover, Good, HSG C
20,822	93	Weighted Average
4,246		20.39% Pervious Area
16,576		79.61% Impervious Area

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

Summary for Subcatchment 14S: Subcatchment 14S

Runoff = 0.53 cfs @ 12.09 hrs, Volume= 0.044 af, Depth= 6.94"
Routed to Pond 16P : Eco Paver

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
3,343	98	Roofs, HSG C
3,343		100.00% Impervious Area

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

Summary for Subcatchment 15S: Subcatchment 15S

Runoff = 2.52 cfs @ 12.09 hrs, Volume= 0.199 af, Depth= 6.35"
Routed to Pond 10P : Focal Point #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
6,876	98	Roofs, HSG C
6,102	98	Paved parking, HSG C
3,444	74	>75% Grass cover, Good, HSG C
16,422	93	Weighted Average
3,444		20.97% Pervious Area
12,978		79.03% Impervious Area

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

Summary for Subcatchment 16S: Subcatchment 16S

Runoff = 1.58 cfs @ 12.09 hrs, Volume= 0.130 af, Depth= 6.70"
Routed to Pond 12P : Jellyfish #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
2,984	98	Roofs, HSG C
6,322	98	Paved parking, HSG C
807	74	>75% Grass cover, Good, HSG C
10,113	96	Weighted Average
807		7.98% Pervious Area
9,306		92.02% Impervious Area

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

Summary for Subcatchment 17S: Subcatchment 17S

Runoff = 0.14 cfs @ 12.09 hrs, Volume= 0.012 af, Depth= 6.94"
Routed to Pond 13P : Lined Stone Drip Edge

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
792	98	Roofs, HSG C
100	98	Water Surface, 0% imp, HSG C
892	98	Weighted Average
100		11.21% Pervious Area
792		88.79% Impervious Area

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

Summary for Subcatchment 18S: Subcatchment 18S

Runoff = 2.67 cfs @ 12.14 hrs, Volume= 0.222 af, Depth= 4.97"
Routed to Reach 7R : 15" HDPE Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
4,667	74	>75% Grass cover, Good, HSG C
18,709	83	1/4 acre lots, 38% imp, HSG C
23,376	81	Weighted Average
16,267		69.59% Pervious Area
7,109		30.41% Impervious Area

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

Summary for Subcatchment 19S: Subcatchment 19S

Runoff = 1.45 cfs @ 12.09 hrs, Volume= 0.120 af, Depth= 6.82"
Routed to Pond 15P : Jellyfish #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=7.18"

Area (sf)	CN	Description
561	74	>75% Grass cover, Good, HSG C
2,984	98	Roofs, HSG C
5,660	98	Paved roads w/curbs & sewers, HSG C
9,205	97	Weighted Average
561		6.09% Pervious Area
8,644		93.91% Impervious Area

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

Summary for Reach 2Ra: Channel through 1S

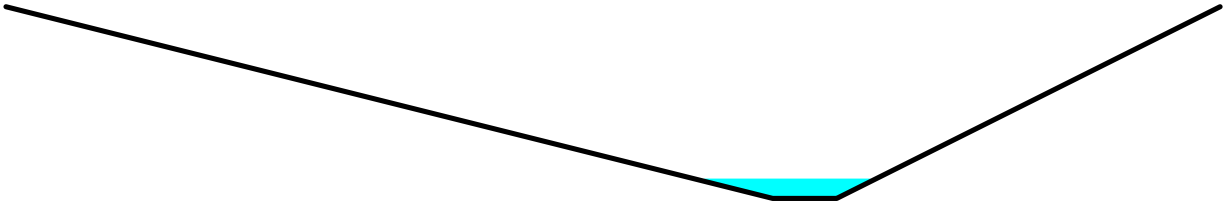
[90] Warning: Qout>Qin may require smaller dt or Finer Routing

```
Inflow Area =          8.184 ac,  57.64% Impervious,  Inflow Depth >   5.59"    for  25-Year Storm event
Inflow       =         8.28 cfs @   12.19 hrs,  Volume=            3.814 af
Outflow      =         8.29 cfs @   12.20 hrs,  Volume=            3.814 af,  Atten= 0%,  Lag= 0.7 min
    Routed to Reach 2Rb : Channel through 1S
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 3.47 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.44 fps, Avg. Travel Time= 1.6 min

Peak Storage= 324 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.62' , Surface Width= 5.71'
Bank-Full Depth= 6.00' Flow Area= 120.0 sf, Capacity= 1,586.21 cfs

2.00' x 6.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 4.0 2.0 '/' Top Width= 38.00'
Length= 136.0' Slope= 0.0294 '/'
Inlet Invert= 24.00', Outlet Invert= 20.00'



Summary for Reach 2Rb: Channel through 1S

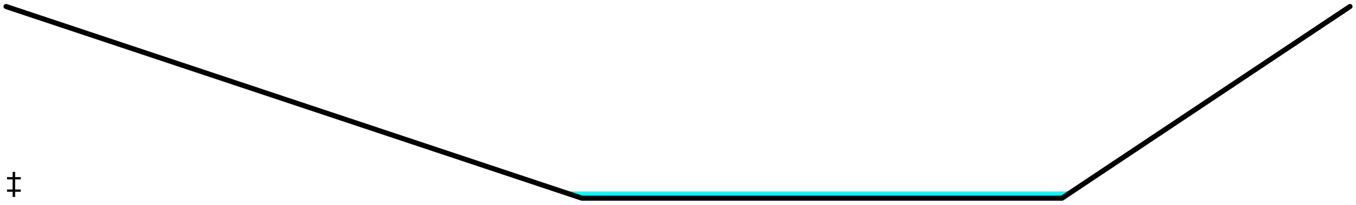
[90] Warning: Qout>Qin may require smaller dt or Finer Routing
[61] Hint: Exceeded Reach 2Ra outlet invert by 0.21' @ 12.30 hrs
[62] Hint: Exceeded Reach 5R OUTLET depth by 0.17' @ 12.10 hrs

```
Inflow Area =          9.149 ac,  60.50% Impervious,  Inflow Depth >   5.64"    for  25-Year Storm event
Inflow       =        10.88 cfs @   12.32 hrs,  Volume=            4.296 af
Outflow      =        10.88 cfs @   12.32 hrs,  Volume=            4.296 af,  Atten= 0%,  Lag= 0.4 min
    Routed to Reach 2Rc : Channel through 1S
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.54 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.23 fps, Avg. Travel Time= 2.1 min

Peak Storage= 654 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 21.24'
Bank-Full Depth= 6.00' Flow Area= 228.0 sf, Capacity= 4,170.50 cfs

20.00' x 6.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 4.0 2.0 '/' Top Width= 56.00'
Length= 153.0' Slope= 0.0392 '/'
Inlet Invert= 20.00', Outlet Invert= 14.00'



Summary for Reach 2Rc: Channel through 1S

[62] Hint: Exceeded Reach 2Rb OUTLET depth by 0.12' @ 12.20 hrs

Inflow Area = 10.889 ac, 57.86% Impervious, Inflow Depth > 5.48" for 25-Year Storm event
Inflow = 14.86 cfs @ 12.29 hrs, Volume= 4.973 af
Outflow = 14.81 cfs @ 12.31 hrs, Volume= 4.971 af, Atten= 0%, Lag= 1.5 min
Routed to Reach AP1 : Analysis Point 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.18 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 5.9 min

Peak Storage= 2,055 cf @ 12.31 hrs
Average Depth at Peak Storage= 0.32' , Surface Width= 21.94'
Bank-Full Depth= 6.00' Flow Area= 228.0 sf, Capacity= 2,705.34 cfs

20.00' x 6.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 4.0 2.0 '/' Top Width= 56.00'
Length= 303.0' Slope= 0.0165 '/'
Inlet Invert= 14.00', Outlet Invert= 9.00'

Summary for Reach 3R: 15" HDPE Culvert

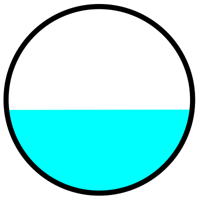
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 0.562 ac, 13.93% Impervious, Inflow Depth = 4.31" for 25-Year Storm event
Inflow = 2.09 cfs @ 12.22 hrs, Volume= 0.202 af
Outflow = 2.09 cfs @ 12.22 hrs, Volume= 0.202 af, Atten= 0%, Lag= 0.1 min
Routed to Reach 4R : Flow through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 3.94 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.50 fps, Avg. Travel Time= 0.5 min

Peak Storage= 25 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.56' , Surface Width= 1.24'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 5.10 cfs

15.0" Round Pipe
n= 0.012
Length= 47.0' Slope= 0.0053 '/'
Inlet Invert= 34.75', Outlet Invert= 34.50'



Summary for Reach 4R: Flow through 1S

[61] Hint: Exceeded Reach 3R outlet invert by 0.41' @ 12.25 hrs

Inflow Area = 0.562 ac, 13.93% Impervious, Inflow Depth = 4.31" for 25-Year Storm event
Inflow = 2.09 cfs @ 12.22 hrs, Volume= 0.202 af
Outflow = 2.07 cfs @ 12.24 hrs, Volume= 0.202 af, Atten= 1%, Lag= 1.3 min
Routed to Reach 7R : 15" HDPE Culvert

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.24 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 0.82 fps, Avg. Travel Time= 4.1 min

Peak Storage= 186 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.41' , Surface Width= 3.48'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 14.80 cfs

1.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 7.00'
Length= 200.0' Slope= 0.0125 '/'
Inlet Invert= 34.50', Outlet Invert= 32.00'

Summary for Reach 5R: Channel through 1S

[90] Warning: Qout>Qin may require smaller dt or Finer Routing

```
Inflow Area =         0.958 ac,  85.36% Impervious,  Inflow Depth >   6.02"    for  25-Year Storm event
Inflow       =         2.76 cfs @   12.32 hrs,  Volume=             0.480 af
Outflow      =         2.78 cfs @   12.32 hrs,  Volume=             0.480 af,  Atten= 0%,  Lag= 0.2 min
    Routed to Reach 2Rb : Channel through 1S
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 2.33 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 0.83 fps, Avg. Travel Time= 1.6 min

Peak Storage= 91 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.11' , Surface Width= 11.12'
Bank-Full Depth= 2.00' Flow Area= 40.0 sf, Capacity= 498.13 cfs

10.00' x 2.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 5.0 '/' Top Width= 30.00'
Length= 77.0' Slope= 0.0779 '/'
Inlet Invert= 26.00', Outlet Invert= 20.00'

Summary for Reach 6R: SEE NOTES

If 16P is routed directly to downstream 2P, 16P appears to overflow due to unrealistic tailwater conditions. In reality, the water from the infiltration chambers will not seep into the upstream Eco-Pavers underneath the unit decks. Therefore, a reach needs to be inserted into the model to separate the two devices.

---

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

```
Inflow Area =         0.077 ac,100.00% Impervious,  Inflow Depth =   6.94"    for  25-Year Storm event
Inflow       =         0.44 cfs @   12.14 hrs,  Volume=             0.044 af
Outflow      =         0.44 cfs @   12.14 hrs,  Volume=             0.044 af,  Atten= 0%,  Lag= 0.0 min
    Routed to Pond 2P : Infiltration System A
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach 7R: 15" HDPE Culvert

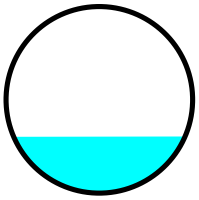
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Hint: Exceeded Reach 4R OUTLET depth by 0.02' @ 7.45 hrs

Inflow Area = 1.099 ac, 21.98% Impervious, Inflow Depth = 4.63" for 25-Year Storm event
Inflow = 4.42 cfs @ 12.17 hrs, Volume= 0.424 af
Outflow = 4.42 cfs @ 12.17 hrs, Volume= 0.424 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 2Rc : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 14.02 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 4.95 fps, Avg. Travel Time= 0.1 min

Peak Storage= 6 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.38' , Surface Width= 1.15'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 22.13 cfs

15.0" Round Pipe
n= 0.012
Length= 20.0' Slope= 0.1000 '/'
Inlet Invert= 32.00', Outlet Invert= 30.00'



Summary for Reach AP1: Analysis Point 1

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

Inflow Area = 15.724 ac, 49.63% Impervious, Inflow Depth > 5.29" for 25-Year Storm event
Inflow = 34.82 cfs @ 12.20 hrs, Volume= 6.929 af
Outflow = 34.82 cfs @ 12.20 hrs, Volume= 6.929 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP2: Analysis Point 2

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

Inflow Area = 7.363 ac, 54.42% Impervious, Inflow Depth = 5.57" for 25-Year Storm event
Inflow = 8.14 cfs @ 12.18 hrs, Volume= 3.416 af
Outflow = 8.14 cfs @ 12.18 hrs, Volume= 3.416 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 2Ra : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Summary for Reach AP4: Analysis Point 4

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

Inflow Area =         0.051 ac,100.00% Impervious,  Inflow Depth =  6.94"   for  25-Year Storm event
Inflow      =        0.35 cfs @   12.09 hrs,  Volume=           0.030 af
Outflow     =        0.35 cfs @   12.09 hrs,  Volume=           0.030 af,  Atten= 0%,  Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
```

Summary for Reach AP5: Analysis Point 5

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

Inflow Area =         0.007 ac,   0.00% Impervious,  Inflow Depth =  4.20"   for  25-Year Storm event
Inflow      =        0.03 cfs @   12.09 hrs,  Volume=           0.002 af
Outflow     =        0.03 cfs @   12.09 hrs,  Volume=           0.002 af,  Atten= 0%,  Lag= 0.0 min
    Routed to Reach 2Rb : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
```

Summary for Reach AP6: Analysis Point 6

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

Inflow Area =         0.186 ac,  55.43% Impervious,  Inflow Depth =  5.65"   for  25-Year Storm event
Inflow      =        0.97 cfs @   12.16 hrs,  Volume=           0.088 af
Outflow     =        0.97 cfs @   12.16 hrs,  Volume=           0.088 af,  Atten= 0%,  Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
```

Summary for Pond 1P: Bioretention Pond #1

```
Inflow Area =         0.881 ac,  84.08% Impervious,  Inflow Depth =  6.47"   for  25-Year Storm event
Inflow      =        5.93 cfs @   12.09 hrs,  Volume=           0.475 af
Outflow     =        2.80 cfs @   12.26 hrs,  Volume=           0.461 af,  Atten= 53%,  Lag= 10.4 min
Primary     =        2.80 cfs @   12.26 hrs,  Volume=           1.044 af
    Routed to Pond DMH1 : Drain Manhole 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 34.33' @ 12.26 hrs   Surf.Area= 4,048 sf   Storage= 6,010 cf

Plug-Flow detention time= 91.6 min calculated for 0.461 af (97% of inflow)
Center-of-Mass det. time= 74.2 min ( 838.2 - 764.0 )

Volume       Invert    Avail.Storage  Storage Description
  #1         28.74'         6,702 cf  Custom Stage Data (Irregular)Listed below (Recalc)
```

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
28.74	926	197.0	0.0	0	0	926
28.75	926	197.0	40.0	4	4	928
29.74	926	197.0	40.0	367	370	1,123
29.75	926	197.0	15.0	1	372	1,125
31.24	926	197.0	15.0	207	579	1,419
31.25	926	197.0	5.0	0	579	1,420
31.49	926	197.0	5.0	11	590	1,468
31.50	926	197.0	100.0	9	600	1,470
32.00	1,235	215.0	100.0	538	1,138	2,069
34.00	2,697	268.0	100.0	3,838	4,976	4,162
34.24	2,900	274.0	100.0	671	5,648	4,429
34.25	3,983	264.0	100.0	34	5,682	4,857
34.50	4,183	269.0	100.0	1,021	6,702	5,080

Device	Routing	Invert	Outlet Devices
#1	Primary	28.75'	**18.0" Round Culvert** L= 36.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 28.75' / 28.55' S= 0.0056 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	28.75'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	34.10'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

```
Primary OutFlow Max=2.77 cfs @ 12.26 hrs  HW=34.33'  TW=32.88'   (Dynamic Tailwater)
└─1=Culvert  (Passes 2.77 cfs of 8.08 cfs potential flow)
   ├─2=Orifice/Grate (Orifice Controls 0.51 cfs @ 5.79 fps)
   └─3=Orifice/Grate (Weir Controls 2.26 cfs @ 1.57 fps)
```

Summary for Pond 2P: Infiltration System A

[80] Warning: Exceeded Pond DMH1 by 0.07' @ 25.45 hrs (1.74 cfs 1.048 af)

```
Inflow Area =       0.958 ac,  85.36% Impervious,  Inflow Depth > 13.63"    for  25-Year Storm event
Inflow      =      3.14 cfs @   12.25 hrs,  Volume=          1.088 af
Outflow     =      2.95 cfs @   12.32 hrs,  Volume=          1.002 af,  Atten= 6%,  Lag= 4.0 min
Discarded  =       0.18 cfs @   12.32 hrs,  Volume=          0.522 af
Primary     =      2.76 cfs @   12.32 hrs,  Volume=          0.480 af
   Routed to Reach 5r : Channel through 1S
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 32.76' @ 12.32 hrs Surf.Area= 1,008 sf Storage= 4,288 cf

Plug-Flow detention time= 183.0 min calculated for 1.001 af (92% of inflow)
Center-of-Mass det. time= 77.2 min (1,622.6 - 1,545.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	28.00'	0 cf	**24.00'W x 42.00'L x 5.67'H Field A** 5,715 cf Overall - 5,715 cf Embedded = 0 cf x 40.0% Voids
#2A	28.00'	4,500 cf	**Shea Leaching Chamber 8x14x5.7**x 9 Inside #1 Inside= 84.0"W x 60.0"H => 38.46 sf x 13.00'L = 500.0 cf Outside= 96.0"W x 68.0"H => 45.36 sf x 14.00'L = 635.0 cf 9 Chambers in 3 Rows
		4,500 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	28.00'	**1.450 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 26.91' Phase-In= 0.10'
#2	Primary	32.00'	**12.0" Round Culvert X 2.00** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 32.00' / 31.90' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.18 cfs @ 12.32 hrs HW=32.76' (Free Discharge)
↳**1=Exfiltration** (Controls 0.18 cfs)

Primary OutFlow Max=2.72 cfs @ 12.32 hrs HW=32.76' TW=26.11' (Dynamic Tailwater)
↳**2=Culvert** (Barrel Controls 2.72 cfs @ 2.96 fps)

Summary for Pond 2PF: Bioretention Pond #1 Forebay

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1	32.25'	674 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
32.25	41	83.0	0	0	41
34.00	650	138.0	498	498	1,027
34.25	756	143.0	176	674	1,145

Summary for Pond 3P: Focal Point #1

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=5)

Inflow Area = 0.140 ac, 89.23% Impervious, Inflow Depth = 6.58" for 25-Year Storm event
Inflow = 0.95 cfs @ 12.09 hrs, Volume= 0.077 af
Outflow = 0.95 cfs @ 12.09 hrs, Volume= 0.077 af, Atten= 0%, Lag= 0.2 min
Primary = 0.95 cfs @ 12.09 hrs, Volume= 0.077 af
Routed to Pond 4P : Infiltration System B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 29.63' @ 12.09 hrs Surf.Area= 105 sf Storage= 44 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.1 min (760.5 - 759.4)

Volume	Invert	Avail.Storage	Storage Description
#1	26.75'	11 cf	**5.00'W x 5.00'L x 2.25'H Focal Point**
			56 cf Overall x 20.0% Voids
#2	29.00'	69 cf	**Surface Bowl (Prismatic)**Listed below (Recalc)
		80 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
29.00	25	0	0
30.00	113	69	69

Device	Routing	Invert	Outlet Devices
#1	Primary	26.00'	**12.0" Round Culvert**
			L= 13.0' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 26.00' / 25.50' S= 0.0385 '/' Cc= 0.900
			n= 0.012, Flow Area= 0.79 sf
#2	Device 1	26.75'	**100.000 in/hr Exfiltration over Surface area** Phase-In= 0.10'
#3	Device 1	29.50'	**18.0" Horiz. Orifice/Grate** C= 0.600
			Limited to weir flow at low heads

Primary OutFlow Max=0.93 cfs @ 12.09 hrs HW=29.63' TW=25.35' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.93 cfs of 5.28 cfs potential flow)
 ├─**2=Exfiltration** (Exfiltration Controls 0.24 cfs)
 └─**3=Orifice/Grate** (Weir Controls 0.69 cfs @ 1.16 fps)

Summary for Pond 4P: Infiltration System B

Inflow Area =	0.164 ac, 88.12% Impervious, Inflow Depth = 6.64" for 25-Year Storm event				
Inflow =	1.11 cfs @	12.09 hrs,	Volume=	0.091 af	
Outflow =	0.07 cfs @	13.59 hrs,	Volume=	0.091 af,	Atten= 94%, Lag= 90.2 min
Discarded =	0.07 cfs @	13.59 hrs,	Volume=	0.090 af	
Primary =	0.00 cfs @	13.59 hrs,	Volume=	0.000 af	

Routed to Reach 2rc : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 26.84' @ 13.59 hrs Surf.Area= 672 sf Storage= 2,152 cf

Plug-Flow detention time= 398.0 min calculated for 0.091 af (100% of inflow)
Center-of-Mass det. time= 397.7 min (1,155.7 - 757.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	23.25'	0 cf	**16.00'W x 42.00'L x 4.67'H Field A**
			3,138 cf Overall - 3,138 cf Embedded = 0 cf x 40.0% Voids
#2A	23.25'	2,400 cf	**Shea Leaching Chamber 8x14x4.7**x 6 Inside #1
			Inside= 84.0"W x 48.0"H => 30.77 sf x 13.00'L = 400.0 cf
			Outside= 96.0"W x 56.0"H => 37.36 sf x 14.00'L = 523.0 cf

6 Chambers in 2 Rows

2,400 cf Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.25'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 22.17' Phase-In= 0.10'
#2	Primary	26.80'	**12.0" Round Culvert** L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 26.80' / 26.70' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Discarded OutFlow Max=0.07 cfs @ 13.59 hrs HW=26.84' (Free Discharge)
└─**1=Exfiltration** (Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 13.59 hrs HW=26.84' TW=14.24' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 0.00 cfs @ 0.51 fps)

Summary for Pond 5P: Lined Stone Drip Edge

[44] Hint: Outlet device #1 is below defined storage

Inflow Area = 0.023 ac, 81.48% Impervious, Inflow Depth = 6.94" for 25-Year Storm event
Inflow = 0.16 cfs @ 12.09 hrs, Volume= 0.013 af
Outflow = 0.16 cfs @ 12.09 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.4 min
Primary = 0.16 cfs @ 12.09 hrs, Volume= 0.013 af
Routed to Pond 4P : Infiltration System B
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 2Rc : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 29.10' @ 12.09 hrs Surf.Area= 0.003 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.4 min (743.0 - 742.6)

Volume	Invert	Avail.Storage	Storage Description
#1	29.01'	0.001 af	**2.00'W x 63.00'L x 1.01'H Prismatoid** 0.003 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	29.00'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	30.00'	**63.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.16 cfs @ 12.09 hrs HW=29.10' TW=25.38' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Weir Controls 0.16 cfs @ 1.02 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=29.01' TW=14.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 6P: Detention Pond

Inflow Area = 0.306 ac, 42.66% Impervious, Inflow Depth = 5.31" for 25-Year Storm event
Inflow = 1.81 cfs @ 12.09 hrs, Volume= 0.135 af
Outflow = 0.31 cfs @ 12.56 hrs, Volume= 0.135 af, Atten= 83%, Lag= 28.4 min
Primary = 0.31 cfs @ 12.56 hrs, Volume= 0.135 af
Routed to Pond AP3 : Existing Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 36.53' @ 12.56 hrs Surf.Area= 3,054 sf Storage= 2,635 cf

Plug-Flow detention time= 154.3 min calculated for 0.135 af (100% of inflow)
Center-of-Mass det. time= 152.0 min (948.9 - 796.9)

Volume	Invert	Avail.Storage	Storage Description
#1	35.50'	3,320 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
35.50	2,056	0	0
36.00	2,529	1,146	1,146
36.75	3,267	2,174	3,320

Device	Routing	Invert	Outlet Devices
#1	Primary	35.50'	**12.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 35.50' / 35.40' S= 0.0167 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	35.50'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	36.50'	**6.0' long + 3.0 '/' SideZ x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.31 cfs @ 12.56 hrs HW=36.53' TW=33.58' (Dynamic Tailwater)
├─**1=Culvert** (Passes 0.23 cfs of 2.46 cfs potential flow)
│ └─**2=Orifice/Grate** (Orifice Controls 0.23 cfs @ 4.59 fps)
└─**3=Broad-Crested Rectangular Weir** (Weir Controls 0.09 cfs @ 0.43 fps)

Summary for Pond 7P: Bioretention Pond #2

Inflow Area = 0.193 ac, 67.19% Impervious, Inflow Depth = 6.10" for 25-Year Storm event
Inflow = 1.26 cfs @ 12.09 hrs, Volume= 0.098 af
Outflow = 0.72 cfs @ 12.19 hrs, Volume= 0.098 af, Atten= 43%, Lag= 6.3 min
Primary = 0.72 cfs @ 12.19 hrs, Volume= 0.098 af
Routed to Pond AP3 : Existing Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 34.85' @ 12.21 hrs Surf.Area= 608 sf Storage= 507 cf

Plug-Flow detention time= 17.9 min calculated for 0.098 af (100% of inflow)
Center-of-Mass det. time= 17.0 min (791.9 - 774.8)

Volume	Invert	Avail.Storage	Storage Description
#1	31.74'	983 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
31.74	490	111.0	0.0	0	0	490
31.75	490	111.0	40.0	2	2	491
32.74	490	111.0	40.0	194	196	601
32.75	490	111.0	15.0	1	197	602
34.24	490	111.0	15.0	110	306	768
34.25	490	111.0	5.0	0	306	769
34.49	490	111.0	5.0	6	312	795
34.50	490	111.0	100.0	5	317	796
35.00	664	121.0	100.0	287	605	990
35.50	853	130.0	100.0	378	983	1,180

Device	Routing	Invert	Outlet Devices
#1	Primary	31.75'	**12.0" Round Culvert** L= 8.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 31.75' / 31.60' S= 0.0187 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	31.75'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	35.20'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.72 cfs @ 12.19 hrs HW=34.84' TW=31.50' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 0.72 cfs of 4.80 cfs potential flow)
  ↑—**2=Orifice/Grate** (Orifice Controls 0.72 cfs @ 8.23 fps)
  └—**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 8P: Bioretention Pond #3

Inflow Area = 0.478 ac, 79.61% Impervious, Inflow Depth = 6.35" for 25-Year Storm event
Inflow = 3.19 cfs @ 12.09 hrs, Volume= 0.253 af
Outflow = 1.31 cfs @ 12.31 hrs, Volume= 0.253 af, Atten= 59%, Lag= 13.3 min
Primary = 1.31 cfs @ 12.31 hrs, Volume= 0.253 af
Routed to Pond 14P : Chamber System D

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 32.58' @ 12.31 hrs Surf.Area= 1,358 sf Storage= 2,029 cf

Plug-Flow detention time= 13.4 min calculated for 0.253 af (100% of inflow)
Center-of-Mass det. time= 13.3 min (781.5 - 768.1)

Volume	Invert	Avail.Storage	Storage Description
#1	27.24'	2,651 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
27.24	238	86.0	0.0	0	0	238
27.25	238	86.0	40.0	1	1	239
28.24	238	86.0	40.0	94	95	324
28.25	238	86.0	15.0	0	96	325
29.74	238	86.0	15.0	53	149	453
29.75	238	86.0	5.0	0	149	454
29.99	238	86.0	5.0	3	152	475
30.00	238	86.0	100.0	2	154	475
32.00	1,037	181.0	100.0	1,181	1,335	2,511
33.00	1,616	202.0	100.0	1,316	2,651	3,180

Device	Routing	Invert	Outlet Devices
#1	Primary	27.25'	**12.0" Round Culvert** L= 7.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 27.25' / 27.00' S= 0.0357 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	27.25'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	32.50'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

```
Primary OutFlow Max=1.29 cfs @ 12.31 hrs  HW=32.58'  TW=27.43'   (Dynamic Tailwater)
└─1=Culvert  (Passes 1.29 cfs of 6.56 cfs potential flow)
    ├─2=Orifice/Grate  (Orifice Controls 0.95 cfs @ 10.92 fps)
    └─3=Orifice/Grate  (Weir Controls 0.34 cfs @ 0.92 fps)
```

Summary for Pond 10P: Focal Point #2

[90] Warning: Qout>Qin may require smaller dt or Finer Routing
[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=13)

```
Inflow Area =       0.377 ac,  79.03% Impervious,  Inflow Depth =   6.35"   for  25-Year Storm event
Inflow      =       2.52 cfs @   12.09 hrs,  Volume=          0.199 af
Outflow     =       2.53 cfs @   12.09 hrs,  Volume=          0.199 af,  Atten= 0%,  Lag= 0.2 min
Primary     =       2.53 cfs @   12.09 hrs,  Volume=          0.199 af
   Routed to Pond DMH2 : Drain Manhole 2
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 38.27' @ 12.09 hrs Surf.Area= 179 sf Storage= 73 cf

Plug-Flow detention time= 0.9 min calculated for 0.199 af (100% of inflow)
Center-of-Mass det. time= 0.9 min (769.1 - 768.1)

Volume	Invert	Avail.Storage	Storage Description
#1	35.50'	27 cf	**4.00'W x 15.00'L x 2.25'H Focal Point** 135 cf Overall x 20.0% Voids
#2	37.75'	77 cf	**Surface Bowl (Prismatic)**Listed below (Recalc)
		104 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
37.75	60	0	0
38.00	86	18	18
38.50	148	59	77

Device	Routing	Invert	Outlet Devices
#1	Primary	34.75'	**12.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 34.75' / 34.50' S= 0.0250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	35.50'	**100.000 in/hr Exfiltration over Surface area** Phase-In= 0.10'
#3	Device 1	38.00'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

```
Primary OutFlow Max=2.47 cfs @ 12.09 hrs  HW=38.26'  TW=35.24'   (Dynamic Tailwater)
└─1=Culvert  (Passes 2.47 cfs of 5.18 cfs potential flow)
   ├─2=Exfiltration  (Exfiltration Controls 0.41 cfs)
   └─3=Orifice/Grate  (Weir Controls 2.06 cfs @ 1.67 fps)
```

Summary for Pond 11P: Chamber System C

[80] Warning: Exceeded Pond 12P by 0.90' @ 24.15 hrs (2.20 cfs 0.228 af)
[80] Warning: Exceeded Pond DMH2 by 0.03' @ 24.35 hrs (0.00 cfs 0.000 af)
[80] Warning: Exceeded Pond DMH4 by 1.66' @ 21.05 hrs (4.74 cfs 1.089 af)

Inflow Area = 0.820 ac, 86.54% Impervious, Inflow Depth = 6.57" for 25-Year Storm event
Inflow = 5.56 cfs @ 12.09 hrs, Volume= 0.449 af
Outflow = 0.17 cfs @ 15.88 hrs, Volume= 0.398 af, Atten= 97%, Lag= 227.6 min
Primary = 0.17 cfs @ 15.88 hrs, Volume= 0.398 af
Routed to Reach 2Ra : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 34.88' @ 15.88 hrs Surf.Area= 5,824 sf Storage= 13,693 cf

Plug-Flow detention time= 865.1 min calculated for 0.398 af (89% of inflow)
Center-of-Mass det. time= 812.3 min (1,571.8 - 759.6)

```
Volume      Invert    Avail.Storage   Storage Description
  #1A       32.25'            0 cf    32.00'W x 182.00'L x 4.67'H Field A
                                      27,198 cf Overall - 27,198 cf Embedded = 0 cf  x 40.0% Voids
  #2A       32.25'       20,800 cf    Shea Leaching Chamber  8x14x4.7x 52  Inside #1
                                      Inside= 84.0"W x 48.0"H => 30.77 sf x 13.00'L = 400.0 cf
                                      Outside= 96.0"W x 56.0"H => 37.36 sf x 14.00'L = 523.0 cf
                                      52 Chambers in 4 Rows
                         20,800 cf    Total Available Storage
```

Storage Group A created with Chamber Wizard

```
Device   Routing       Invert   Outlet Devices
  #1     Primary       31.58'   12.0"  Round Culvert
                                L= 20.0'   CPP, projecting, no headwall,  Ke= 0.900
                                Inlet / Outlet Invert= 31.58' / 31.40'   S= 0.0090 '/'   Cc= 0.900
                                n= 0.012,  Flow Area= 0.79 sf
  #2     Device 1      32.25'   2.0" Vert. Orifice/Grate   C= 0.600   Limited to weir flow at low heads
  #3     Device 2      32.25'   4.0" Vert. Orifice/Grate   C= 0.600   Limited to weir flow at low heads
```

```
Primary OutFlow Max=0.17 cfs @ 15.88 hrs  HW=34.88'  TW=24.29'   (Dynamic Tailwater)
└─1=Culvert  (Passes 0.17 cfs of 5.00 cfs potential flow)
   └─2=Orifice/Grate (Orifice Controls 0.17 cfs @ 7.69 fps)
      └─3=Orifice/Grate (Passes 0.17 cfs of 0.66 cfs potential flow)
```

Summary for Pond 12P: Jellyfish #1

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=28)

```
Inflow Area =      0.232 ac,  92.02% Impervious,  Inflow Depth =   6.70"    for  25-Year Storm event
Inflow      =      1.58 cfs @   12.09 hrs,  Volume=          0.130 af
Outflow     =      1.58 cfs @   12.09 hrs,  Volume=          0.130 af,  Atten= 0%,  Lag= 0.0 min
Primary     =      1.58 cfs @   12.09 hrs,  Volume=          0.130 af
   Routed to Pond 11P : Chamber System C
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 34.88' @ 15.88 hrs
Flood Elev= 36.90'

```
Device   Routing       Invert   Outlet Devices
  #1     Primary       33.55'   15.0"  Round Culvert
                                L= 20.0'   CPP, projecting, no headwall,  Ke= 0.900
                                Inlet / Outlet Invert= 33.55' / 33.40'   S= 0.0075 '/'   Cc= 0.900
                                n= 0.012,  Flow Area= 1.23 sf
```

```
Primary OutFlow Max=1.54 cfs @ 12.09 hrs  HW=34.27'  TW=33.73'   (Dynamic Tailwater)
└─1=Culvert  (Barrel Controls 1.54 cfs @ 3.01 fps)
```

Summary for Pond 13P: Lined Stone Drip Edge

Inflow Area = 0.020 ac, 88.79% Impervious, Inflow Depth = 6.94" for 25-Year Storm event
Inflow = 0.14 cfs @ 12.09 hrs, Volume= 0.012 af
Outflow = 0.14 cfs @ 12.09 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.3 min
Primary = 0.14 cfs @ 12.09 hrs, Volume= 0.012 af
Routed to Pond 7P : Bioretention Pond #2
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond AP3 : Existing Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 35.09' @ 12.09 hrs Surf.Area= 0.002 ac Storage= 0.000 af

Plug-Flow detention time= 1.7 min calculated for 0.012 af (100% of inflow)
Center-of-Mass det. time= 1.0 min (743.6 - 742.6)

Volume	Invert	Avail.Storage	Storage Description
#1	35.00'	0.001 af	**2.00'W x 48.00'L x 1.01'H Prismatoid** 0.002 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	35.00'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	36.00'	**63.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.14 cfs @ 12.09 hrs HW=35.09' TW=34.63' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Weir Controls 0.14 cfs @ 0.98 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=35.00' TW=26.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Summary for Pond 14P: Chamber System D

Inflow Area = 0.478 ac, 79.61% Impervious, Inflow Depth = 6.35" for 25-Year Storm event
Inflow = 1.31 cfs @ 12.31 hrs, Volume= 0.253 af
Outflow = 0.62 cfs @ 13.45 hrs, Volume= 0.253 af, Atten= 53%, Lag= 68.4 min
Primary = 0.62 cfs @ 13.45 hrs, Volume= 0.253 af
Routed to Reach 2Rc : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 28.34' @ 13.45 hrs Surf.Area= 1,344 sf Storage= 2,809 cf

Plug-Flow detention time= 60.4 min calculated for 0.253 af (100% of inflow)
Center-of-Mass det. time= 59.8 min (841.3 - 781.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	26.00'	0 cf	**24.00'W x 56.00'L x 3.67'H Field A** 4,932 cf Overall - 4,932 cf Embedded = 0 cf x 40.0% Voids
#2A	26.00'	3,600 cf	**Shea Leaching Chamber 8x14x3.7**x 12 Inside #1 Inside= 84.0"W x 36.0"H => 23.08 sf x 13.00'L = 300.0 cf Outside= 96.0"W x 44.0"H => 29.36 sf x 14.00'L = 411.0 cf 12 Chambers in 3 Rows
		3,600 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	25.33'	**12.0" Round Culvert** L= 16.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 25.33' / 25.10' S= 0.0144 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	26.00'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.62 cfs @ 13.45 hrs HW=28.34' TW=14.24' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.62 cfs of 4.73 cfs potential flow)
  ↑**2=Orifice/Grate** (Orifice Controls 0.62 cfs @ 7.10 fps)

Summary for Pond 15P: Jellyfish #2

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=45)

Inflow Area = 0.211 ac, 93.91% Impervious, Inflow Depth = 6.82" for 25-Year Storm event
Inflow = 1.45 cfs @ 12.09 hrs, Volume= 0.120 af
Outflow = 1.45 cfs @ 12.09 hrs, Volume= 0.120 af, Atten= 0%, Lag= 0.0 min
Primary = 1.45 cfs @ 12.09 hrs, Volume= 0.120 af
Routed to Pond DMH4 : Drain Manhole 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 34.88' @ 15.88 hrs
Flood Elev= 36.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	33.25'	**15.0" Round Culvert** L= 16.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 33.25' / 33.10' S= 0.0094 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=1.42 cfs @ 12.09 hrs HW=34.08' TW=33.90' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 1.42 cfs @ 1.64 fps)

Summary for Pond 16P: Eco Paver

Inflow Area = 0.077 ac,100.00% Impervious, Inflow Depth = 6.94" for 25-Year Storm event
Inflow = 0.53 cfs @ 12.09 hrs, Volume= 0.044 af
Outflow = 0.44 cfs @ 12.14 hrs, Volume= 0.044 af, Atten= 17%, Lag= 3.5 min
Primary = 0.44 cfs @ 12.14 hrs, Volume= 0.044 af
Routed to Reach 6R : SEE NOTES
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 5R : Channel through 1S

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 28.99' @ 12.14 hrs Surf.Area= 576 sf Storage= 137 cf

Plug-Flow detention time= 13.7 min calculated for 0.044 af (100% of inflow)
Center-of-Mass det. time= 14.0 min (756.6 - 742.6)

Volume	Invert	Avail.Storage	Storage Description
#1	28.40'	233 cf	**6.00'W x 96.00'L x 1.01'H Prismatoid** 582 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	28.40'	**6.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 28.40' / 28.00' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#2	Device 1	28.40'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	29.40'	**96.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.43 cfs @ 12.14 hrs HW=28.99' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.43 cfs @ 2.21 fps)
  └**2=Orifice/Grate** (Passes 0.43 cfs of 0.55 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=28.40' TW=26.00' (Dynamic Tailwater)
└**3=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Summary for Pond AP3: Existing Pond

15" CMP culvert inlet is buried. Contractor to uncover culvert inlet.

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[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=39)

Inflow Area = 6.995 ac, 53.69% Impervious, Inflow Depth = 5.54" for 25-Year Storm event
Inflow = 25.40 cfs @ 12.35 hrs, Volume= 3.231 af
Outflow = 7.39 cfs @ 12.96 hrs, Volume= 3.231 af, Atten= 71%, Lag= 36.4 min
Primary = 7.39 cfs @ 12.96 hrs, Volume= 3.231 af
Routed to Reach AP2 : Analysis Point 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 33.98' @ 12.96 hrs Surf.Area= 19,533 sf Storage= 36,312 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 31.5 min (847.0 - 815.5)

Volume	Invert	Avail.Storage	Storage Description
#1	26.00'	104,430 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
26.00	1	1.0	0	0	1
28.00	37	24.0	29	29	53
30.00	2,236	218.0	1,707	1,736	3,797
32.00	7,294	444.0	9,046	10,782	15,721
34.00	19,719	933.0	26,004	36,786	69,323
35.50	43,192	1,107.0	46,047	82,834	97,611
36.00	43,192	1,107.0	21,596	104,430	98,164

Device	Routing	Invert	Outlet Devices
#1	Primary	26.00'	**15.0" Round Culvert** L= 156.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 26.00' / 24.09' S= 0.0122 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 1.23 sf

Primary OutFlow Max=7.39 cfs @ 12.96 hrs HW=33.98' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 7.39 cfs @ 6.02 fps)

Summary for Pond DMH1: Drain Manhole 1

[80] Warning: Exceeded Pond 1P by 0.82' @ 26.50 hrs (0.38 cfs 0.733 af)

Inflow Area = 0.881 ac, 84.08% Impervious, Inflow Depth > 14.22" for 25-Year Storm event
Inflow = 2.80 cfs @ 12.26 hrs, Volume= 1.044 af
Outflow = 2.80 cfs @ 12.26 hrs, Volume= 1.044 af, Atten= 0%, Lag= 0.0 min
Primary = 2.80 cfs @ 12.26 hrs, Volume= 1.044 af
Routed to Pond 2P : Infiltration System A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 32.92' @ 12.30 hrs
Flood Elev= 35.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	28.45'	**18.0" Round Culvert** L= 52.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 28.45' / 28.10' S= 0.0067 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=2.78 cfs @ 12.26 hrs HW=32.88' TW=32.71' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.78 cfs @ 1.57 fps)

Summary for Pond DMH2: Drain Manhole 2

Inflow Area = 0.377 ac, 79.03% Impervious, Inflow Depth = 6.35" for 25-Year Storm event
Inflow = 2.53 cfs @ 12.09 hrs, Volume= 0.199 af
Outflow = 2.53 cfs @ 12.09 hrs, Volume= 0.199 af, Atten= 0%, Lag= 0.0 min
Primary = 2.53 cfs @ 12.09 hrs, Volume= 0.199 af
Routed to Pond 11P : Chamber System C

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 35.25' @ 12.09 hrs
Flood Elev= 38.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	34.40'	**18.0" Round Culvert** L= 14.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 34.40' / 34.20' S= 0.0143 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=2.47 cfs @ 12.09 hrs HW=35.24' TW=33.75' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 2.47 cfs @ 3.50 fps)

Summary for Pond DMH4: Drain Manhole 4

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=6)
[80] Warning: Exceeded Pond 15P by 1.19' @ 24.15 hrs (3.43 cfs 0.398 af)

Inflow Area = 0.211 ac, 93.91% Impervious, Inflow Depth = 6.82" for 25-Year Storm event
Inflow = 1.45 cfs @ 12.09 hrs, Volume= 0.120 af
Outflow = 1.45 cfs @ 12.09 hrs, Volume= 0.120 af, Atten= 0%, Lag= 0.0 min
Primary = 1.45 cfs @ 12.09 hrs, Volume= 0.120 af
Routed to Pond 11P : Chamber System C

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 34.88' @ 15.88 hrs
Flood Elev= 37.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	33.00'	**15.0" Round Culvert** L= 23.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 33.00' / 32.80' S= 0.0087 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=1.42 cfs @ 12.09 hrs HW=33.90' TW=33.73' (Dynamic Tailwater)
↑**1=Culvert** (Outlet Controls 1.42 cfs @ 2.11 fps)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: Subcatchment1S Runoff Area=210,582 sf 31.09% Impervious Runoff Depth=6.20"
Flow Length=588' Tc=13.2 min CN=80 Runoff=27.16 cfs 2.497 af

Subcatchment2S: Subcatchment2S Runoff Area=16,051 sf 68.26% Impervious Runoff Depth=7.41"
Flow Length=125' Tc=10.9 min CN=90 Runoff=2.52 cfs 0.227 af

Subcatchment3S: Subcatchment3S Runoff Area=282,964 sf 53.81% Impervious Runoff Depth=6.92"
Flow Length=604' Tc=26.3 min CN=86 Runoff=30.41 cfs 3.748 af

Subcatchment4S: Subcatchment4S Runoff Area=2,236 sf 100.00% Impervious Runoff Depth=8.37"
Tc=6.0 min CN=98 Runoff=0.42 cfs 0.036 af

Subcatchment5S: Subcatchment5S Runoff Area=310 sf 0.00% Impervious Runoff Depth=5.47"
Tc=6.0 min CN=74 Runoff=0.04 cfs 0.003 af

Subcatchment6S: Subcatchment6S Runoff Area=8,122 sf 55.43% Impervious Runoff Depth=7.04"
Flow Length=149' Tc=12.0 min CN=87 Runoff=1.20 cfs 0.109 af

Subcatchment7S: Subcatchment7S Runoff Area=24,490 sf 13.93% Impervious Runoff Depth=5.60"
Flow Length=212' Tc=15.9 min CN=75 Runoff=2.71 cfs 0.262 af

Subcatchment8S: Subcatchment8S Runoff Area=38,380 sf 84.08% Impervious Runoff Depth=7.89"
Tc=6.0 min CN=94 Runoff=7.16 cfs 0.579 af

Subcatchment9S: Subcatchment9S Runoff Area=6,117 sf 89.23% Impervious Runoff Depth=8.01"
Tc=6.0 min CN=95 Runoff=1.15 cfs 0.094 af

Subcatchment10S: Subcatchment10S Runoff Area=1,015 sf 81.48% Impervious Runoff Depth=8.37"
Tc=6.0 min CN=98 Runoff=0.19 cfs 0.016 af

Subcatchment11S: Subcatchment11S Runoff Area=13,311 sf 42.66% Impervious Runoff Depth=6.68"
Tc=6.0 min CN=84 Runoff=2.26 cfs 0.170 af

Subcatchment12S: Subcatchment12S Runoff Area=7,530 sf 64.63% Impervious Runoff Depth=7.41"
Tc=6.0 min CN=90 Runoff=1.36 cfs 0.107 af

Subcatchment13S: Subcatchment13S Runoff Area=20,822 sf 79.61% Impervious Runoff Depth=7.77"
Tc=6.0 min CN=93 Runoff=3.86 cfs 0.309 af

Subcatchment14S: Subcatchment14S Runoff Area=3,343 sf 100.00% Impervious Runoff Depth=8.37"
Tc=6.0 min CN=98 Runoff=0.63 cfs 0.054 af

Subcatchment15S: Subcatchment15S Runoff Area=16,422 sf 79.03% Impervious Runoff Depth=7.77"
Tc=6.0 min CN=93 Runoff=3.05 cfs 0.244 af

Subcatchment16S: Subcatchment16S Runoff Area=10,113 sf 92.02% Impervious Runoff Depth=8.13"
Tc=6.0 min CN=96 Runoff=1.91 cfs 0.157 af

```
Subcatchment17S: Subcatchment17S      Runoff Area=892 sf   88.79% Impervious   Runoff Depth=8.37"
                                                Tc=6.0 min   CN=98   Runoff=0.17 cfs  0.014 af

Subcatchment18S: Subcatchment18S   Runoff Area=23,376 sf   30.41% Impervious   Runoff Depth=6.32"
                                               Tc=10.0 min   CN=81   Runoff=3.36 cfs  0.283 af

Subcatchment19S: Subcatchment19S    Runoff Area=9,205 sf   93.91% Impervious   Runoff Depth=8.25"
                                                Tc=6.0 min   CN=97   Runoff=1.74 cfs  0.145 af

Reach 2Ra: Channel through 1S          Avg. Flow Depth=0.64'   Max Vel=3.55 fps   Inflow=9.04 cfs  4.731 af
                  n=0.040   L=136.0'   S=0.0294 '/'   Capacity=1,586.21 cfs   Outflow=9.01 cfs  4.731 af

Reach 2Rb: Channel through 1S         Avg. Flow Depth=0.25'   Max Vel=2.79 fps   Inflow=14.49 cfs  5.306 af
                  n=0.040   L=153.0'   S=0.0392 '/'   Capacity=4,170.50 cfs   Outflow=14.25 cfs  5.306 af

Reach 2Rc: Channel through 1S         Avg. Flow Depth=0.38'   Max Vel=2.43 fps   Inflow=20.18 cfs  6.173 af
                  n=0.040   L=303.0'   S=0.0165 '/'   Capacity=2,705.34 cfs   Outflow=19.79 cfs  6.171 af

Reach 3R: 15" HDPE Culvert             Avg. Flow Depth=0.65'   Max Vel=4.21 fps   Inflow=2.71 cfs  0.262 af
       15.0"  Round Pipe   n=0.012   L=47.0'   S=0.0053 '/'   Capacity=5.10 cfs   Outflow=2.71 cfs  0.262 af

Reach 4R: Flow through 1S              Avg. Flow Depth=0.47'   Max Vel=2.39 fps   Inflow=2.71 cfs  0.262 af
                     n=0.030   L=200.0'   S=0.0125 '/'   Capacity=14.80 cfs   Outflow=2.68 cfs  0.262 af

Reach 5R: Channel through 1S           Avg. Flow Depth=0.17'   Max Vel=2.99 fps   Inflow=5.60 cfs  0.573 af
                     n=0.040   L=77.0'   S=0.0779 '/'   Capacity=498.13 cfs   Outflow=5.48 cfs  0.572 af

Reach 6R: SEE NOTES                                                               Inflow=0.51 cfs  0.054 af
                                                                                 Outflow=0.51 cfs  0.054 af

Reach 7R: 15" HDPE Culvert            Avg. Flow Depth=0.43'   Max Vel=15.03 fps   Inflow=5.65 cfs  0.545 af
      15.0"  Round Pipe   n=0.012   L=20.0'   S=0.1000 '/'   Capacity=22.13 cfs   Outflow=5.65 cfs  0.545 af

Reach AP1: Analysis Point 1                                                      Inflow=45.92 cfs  8.668 af
                                                                                Outflow=45.92 cfs  8.668 af

Reach AP2: Analysis Point 2                                                       Inflow=8.89 cfs  4.267 af
                                                                                 Outflow=8.89 cfs  4.267 af

Reach AP4: Analysis Point 4                                                       Inflow=0.42 cfs  0.036 af
                                                                                 Outflow=0.42 cfs  0.036 af

Reach AP5: Analysis Point 5                                                       Inflow=0.04 cfs  0.003 af
                                                                                 Outflow=0.04 cfs  0.003 af

Reach AP6: Analysis Point 6                                                       Inflow=1.20 cfs  0.109 af
                                                                                 Outflow=1.20 cfs  0.109 af

Pond 1P: Bioretention Pond #1                 Peak Elev=34.46'  Storage=6,552 cf   Inflow=7.16 cfs  0.579 af
                                                                                 Outflow=5.01 cfs  0.566 af
```

Pond 2P: Infiltration System A Peak Elev=33.38' Storage=4,500 cf Inflow=5.51 cfs 1.189 af
Discarded=0.20 cfs 0.532 af Primary=5.60 cfs 0.573 af Outflow=5.80 cfs 1.104 af

Pond 2PF: Bioretention Pond #1 Forebay Peak Elev=0.00' Storage=0 cf

Pond 3P: Focal Point #1 Peak Elev=29.65' Storage=46 cf Inflow=1.15 cfs 0.094 af
Outflow=1.15 cfs 0.094 af

Pond 4P: Infiltration System B Peak Elev=27.09' Storage=2,305 cf Inflow=1.35 cfs 0.110 af
Discarded=0.07 cfs 0.097 af Primary=0.28 cfs 0.013 af Outflow=0.35 cfs 0.110 af

Pond 5P: Lined Stone Drip Edge Peak Elev=29.11' Storage=0.000 af Inflow=0.19 cfs 0.016 af
Primary=0.19 cfs 0.016 af Secondary=0.00 cfs 0.000 af Outflow=0.19 cfs 0.016 af

Pond 6P: Detention Pond Peak Elev=36.62' Storage=2,888 cf Inflow=2.26 cfs 0.170 af
Outflow=0.82 cfs 0.170 af

Pond 7P: Bioretention Pond #2 Peak Elev=35.16' Storage=714 cf Inflow=1.53 cfs 0.121 af
Outflow=0.74 cfs 0.121 af

Pond 8P: Bioretention Pond #3 Peak Elev=32.71' Storage=2,213 cf Inflow=3.86 cfs 0.309 af
Outflow=2.46 cfs 0.309 af

Pond 10P: Focal Point #2 Peak Elev=38.31' Storage=78 cf Inflow=3.05 cfs 0.244 af
Outflow=3.05 cfs 0.244 af

Pond 11P: Chamber System C Peak Elev=35.51' Storage=16,928 cf Inflow=6.70 cfs 0.547 af
Outflow=0.19 cfs 0.464 af

Pond 12P: Jellyfish #1 Peak Elev=35.51' Inflow=1.91 cfs 0.157 af
15.0" Round Culvert n=0.012 L=20.0' S=0.0075 '/' Outflow=1.91 cfs 0.157 af

Pond 13P: Lined Stone Drip Edge Peak Elev=35.16' Storage=0.000 af Inflow=0.17 cfs 0.014 af
Primary=0.17 cfs 0.014 af Secondary=0.00 cfs 0.000 af Outflow=0.17 cfs 0.014 af

Pond 14P: Chamber System D Peak Elev=28.79' Storage=3,352 cf Inflow=2.46 cfs 0.309 af
Outflow=0.68 cfs 0.309 af

Pond 15P: Jellyfish #2 Peak Elev=35.51' Inflow=1.74 cfs 0.145 af
15.0" Round Culvert n=0.012 L=16.0' S=0.0094 '/' Outflow=1.74 cfs 0.145 af

Pond 16P: Eco Paver Peak Elev=29.12' Storage=165 cf Inflow=0.63 cfs 0.054 af
Primary=0.51 cfs 0.054 af Secondary=0.00 cfs 0.000 af Outflow=0.51 cfs 0.054 af

Pond AP3: Existing Pond Peak Elev=34.61' Storage=51,274 cf Inflow=31.81 cfs 4.039 af
15.0" Round Culvert n=0.025 L=156.0' S=0.0122 '/' Outflow=7.65 cfs 4.040 af

Pond DMH1: Drain Manhole 1 Peak Elev=33.90' Inflow=5.01 cfs 1.136 af
18.0" Round Culvert n=0.012 L=52.0' S=0.0067 '/' Outflow=5.01 cfs 1.136 af

```
Pond DMH2: Drain Manhole 2                                        Peak Elev=35.51'   Inflow=3.05 cfs  0.244 af
                               18.0"  Round Culvert  n=0.012  L=14.0'  S=0.0143 '/'   Outflow=3.05 cfs  0.244 af

Pond DMH4: Drain Manhole 4                                        Peak Elev=35.51'   Inflow=1.74 cfs  0.145 af
                               15.0"  Round Culvert  n=0.012  L=23.0'  S=0.0087 '/'   Outflow=1.74 cfs  0.145 af
```

Total Runoff Area = 15.961 ac Runoff Volume = 9.056 af Average Runoff Depth = 6.81"
50.14% Pervious = 8.003 ac 49.86% Impervious = 7.959 ac

APPENDIX III

Test Pit Logs

GES

GOVE ENVIRONMENTAL SERVICES, INC.

TEST PIT DATA

Project 76 Portsmouth Ave, Exeter, NH
Client Green & Co.
GES Project No. 2024047
MM/DD/YY Staff 07-2-2024 James Gove, CSS#004

Test Pit No.	**6001**	Soils Series: Boxford
ESHWT::	16”	Landscape: Forested
Termination @	60”	Slope: B
Refusal:	No	Parent Material: Marine
Obs. Water:	None	Hydrologic Soil Group: C

Horizon	Color (Munsell)	Texture	Structure-Consistence-Redox
A 0-7”	10YR3/2	silt loam	granular-friable-none
Bw 7-16”	10YR4/4	silt loam	granular-friable-none
Cd 16-60”	2.5Y5/3	silty clay loam	blocky-firm-5% Conc.

Test Pit No.	**6003**	Soils Series: Boxford
ESHWT::	18”	Landscape: Forested
Termination @	68”	Slope: B
Refusal:	No	Parent Material: Marine
Obs. Water:	None	Hydrologic Soil Group: C

Horizon	Color (Munsell)	Texture	Structure-Consistence-Redox
A 0-7”	10YR3/2	silt loam	granular-friable-none
Bw 7-18”	10YR4/4	silt loam	granular-friable-none
Cd 18-68”	2.5Y5/3	silty clay loam	blocky-firm-5% Conc.

8 Continental Dr Bldg 2 Unit H, Exeter, NH 03833-7526
Ph (603) 778 0644 / *Fax* (603) 778 0654
info@gesinc.biz
www.gesinc.biz

Test Pit No.	**6007**	Soils Series: Scitico
ESHWT::	5”	Landscape: Forested
Termination @	60”	Slope: C
Refusal:	No	Parent Material: Marine
Obs. Water:	None	Hydrologic Soil Group: C

Horizon	Color (Munsell)	Texture	Structure-Consistence-Redox
A 0-5”	10YR3/2	silt loam	blocky-friable-none
Cd 5-60”	2.5Y5/3	silty clay loam	blocky-firm-5% Conc.

Test Pit No.	**6010**	Soils Series: Scitico
ESHWT::	10”	Landscape: Forested
Termination @	40”	Slope: B
Refusal:	No	Parent Material: Marine
Obs. Water:	None	Hydrologic Soil Group: C

Horizon	Color (Munsell)	Texture	Structure-Consistence-Redox
A 0-10”	10YR3/2	silt loam	granular-friable-none
Cd 10-40”	2.5Y5/32	silty clay loam	blocky-firm-5% Conc.

Test Pit No.	**6016**	Soils Series: Eldridge
ESHWT::	26”	Landscape: Forested
Termination @	60”	Slope: B
Refusal:	No	Parent Material: Marine
Obs. Water:	None	Hydrologic Soil Group: C

Horizon	Color (Munsell)	Texture	Structure-Consistence-Redox
A 0-9”	10YR3/2	sand	granular-friable-none
Bw1 9-26”	10YR5/8	sand	massive-friable-none
Bw1 26-31	10YR5/8	sand	massive-friable-10% Conc.
Cd 31-60”	2.5Y5/3	silty clay loam	blocky-firm-10% Conc.

Test Pit No.	**6017**	Soils Series: Eldridge
ESHWT::	19”	Landscape: Forested
Termination @	55”	Slope: B
Refusal:	No	Parent Material: Marine
Obs. Water:	None	Hydrologic Soil Group: C

Horizon	Color (Munsell)	Texture	Structure-Consistence-Redox
A 0-6”	10YR3/2	loamy sand	granular-friable-none
Bw 6-19”	10YR4/4	loamy sand	granular-friable-none
Cd 19-55”	2.5Y5/3	silty clay loam	blocky-firm-5% Conc.

Test Pit No.	**SB**	Soils Series: Boxford
ESHWT::	20”	Landscape: Forested
Termination @	70”	Slope: B
Refusal:	No	Parent Material: Marine
Obs. Water:	None	Hydrologic Soil Group: C

Horizon	Color (Munsell)	Texture	Structure-Consistence-Redox
A 0-6”	10YR3/2	silt loam	granular-friable-none
Bw 6-20”	10YR4/6	silt loam	granular-friable-none
Cd 20-70”	2.5Y5/3	silty clay loam	blocky-firm-10% Conc.

STATE OF NEW HAMPSHIRE
JAMES
P.
GOVE
NO. 004
CERTIFIED SOIL SCIENTIST

APPENDIX IV

Site Specific Soil Survey Soil Note and Map

This map product is within the technical standards of the National Cooperative Soil Survey. It is a special purpose product, intended for infiltration requirements by the NH DES Alteration of Terrain Bureau. It was produced by a professional soil scientist, and is not a product of the USDA Natural Resources Conservation Service. There is a report that accompanies this map.

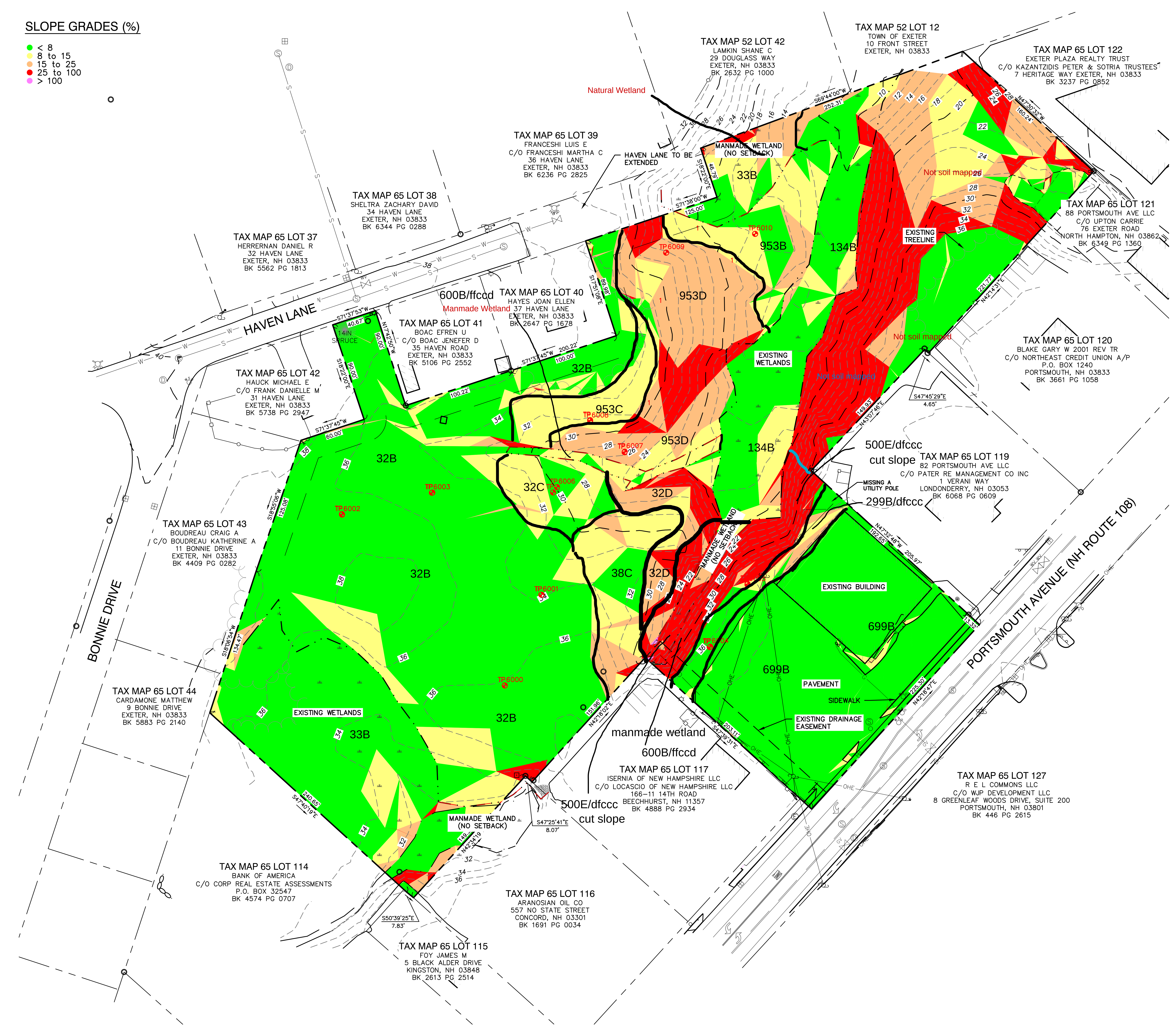
The site specific soil map was produced 10-22-2024, and was prepared by James P. Gove, CSS # 004, Gove Environmental Services, Inc.

SOIL IDENTIFICATION LEGEND

Map Unit Symbol	Map Unit Name	HISS Symbol	Hydrologic Soil Group
32	Boxford silt loam	353	C
33	Scitico silt loam	553	C
38	Eldridge loamy sand	343	C
134	Maybid mucky silt loam	653	D
953	Boxford somewhat poorly drained	453	C
299/dfccc	Udorthents, smoothed	363	C
500/dfccc	Udorthents, loamy	363	C
600/ffccd	Endoaquents, loamy	563	D
699	Urban Land	n/a	n/a

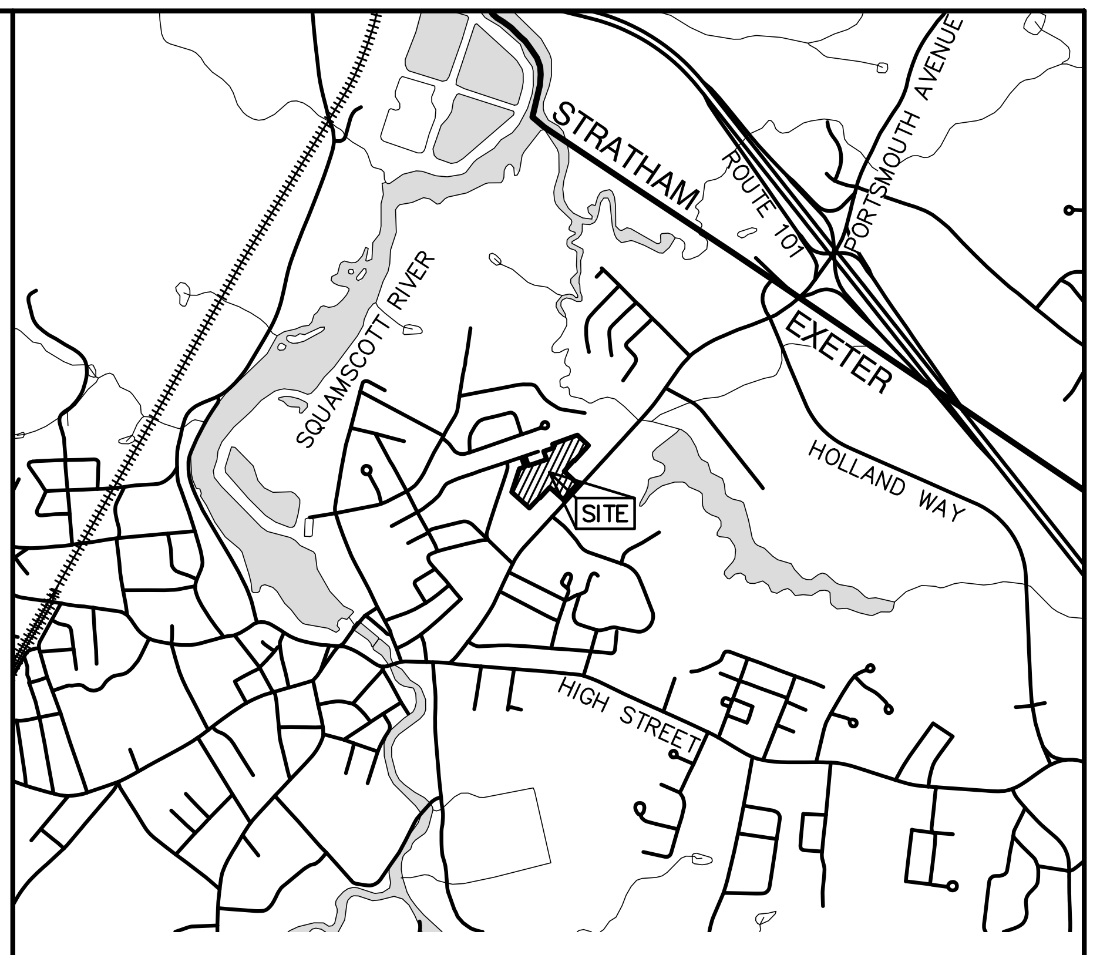
SLOPE PHASE:

0-8%	B	8-15%	C	15-25%	D
25%-50%	E	50%+	F		



PLAN REFERENCES

1. "PLAN OF DRAINAGE EASEMENT, EXETER, NH, PREPARED FOR EXETER HOSPITAL" BY KIMBALL CHASE, DATED MAY 23, 1988. R.C.R.D. PLAN #D–18012.
2. "LOT LINE CHANGE FOR GARY W. BLAKE, EXETER, NH" BY PARKER SURVEY ASSOC., INC., DATED JANUARY 12, 1984. R.C.R.D. PLAN #C–12104.
3. "SUBDIVISION OF LAND FOR JOHN W. FLYNN, EXETER, NH" BY KIMBALL CHASE COMPANY, INC., DATED FEBUARY 11, 1988. R.C.R.D. PLAN #D–17605.
4. "BOUNDARY AND TOPOGRAPHIC PLAN FOR STAR ENTERPRISE, EXETER, NH" BY STORCH ASSOCIATES, DATED JUNE 15, 1999. R.C.R.D. PLAN #D–22270.
5. "EASEMENT PLAN FOR COLLISHAW – FOY AGENCY INC., EXETER, NH" BY CORNERSTONE ASSOCIATES INC., DATED OCTOBER 31, 1995. R.C.R.D. PLAN #C–24287.
6. "PLAN OF LAND FOR HENRY & ROBERTA A. SHEPARD AND CHARLES A. & EVA S. KOIRTH, EXETER, NH" BY JOHN W. DURGIN CIVIL ENGINEERS, DATED JULY 17, 1963. PLAN #108.
7. "PLAN OF LOTS, PROPERTY OF J. EVERETT TOWLE, EXETER, NH" BY ARTHUR W. DUDLEY, C.E., DATED 1924. PLAN #0671.
8. "PROPOSED SEWER EASEMENT, ACROSS LAND OF JEAN & SUE E. PULVER, EXETER, NH" BY JOHN W. DURGIN CIVIL ENGINEERS, DATED JULY 1952. NR–PLAN.
9. "PLAN OF COUNTRY CLUB ESTATES FOR DOUGLAS E. HUNTER, EXETER, NH" BY CHESTER A. LEACH, C.E., DATED JUNE 14, 1950. NR–PLAN #01481.
10. "A PORTION OF THE LAND OF JEAN AND SUE PULVER, EXETER, NH" BY LEACH AND HUNTER, DATED OCTOBER 4, 1949. NR–PLAN #01721.
11. "PLOT OF LAND FOR CARROLS DEVELOPMENT CORP & CHICAGO TITLE COMPANY, EXETER, NH" BY UNITED SURVEYORS & ENGRS., DATED MARCH 20, 1970. R.C.R.D. PLAN #1726.
12. "PLAN OF LAND FOR JEAN A. & SUE E PULVER, EXETER, NH" BY JOHN W. DURGIN CIVIL ENGINEERS, DATED AUGUST 1951. NR–PLAN #01823.
13. "PLAN OF LAND FOR JEAN A. & SUE E. PULVER, EXETER, NH" BY JOHN W. DURGIN CIVIL ENGINEERS, DATED AUGUST 1951. NR–PLAN #02551.
14. "PART OF COUNTRY CLUB ESTATES, SCALE: 1 IN = 40 FT" BY JOHN W. DURGIN CIVIL ENGINEERS, DATED AUGUST 4TH, 1955. NR–PLAN #02552.
15. "PLOT PLAN FOR HENRY SHEPARD & CHARLES KOIRTH, EXETER, NH" BY T.A. NOWAK, DATED APRIL 1958. NR–PLAN #02680.
16. "SUBDIVISION OF LAND, SIMONS TO ROCKINGHAM NATIONAL BANK, EXETER, NH" BY JOHN W. DURGIN CIVIL ENGINEERS, DATED MAY 2, 1972. R.C.R.D. PLAN #D–2924.
17. "PLAN OF LOTS FOR JEAN A. & SUE E. PULVER, EXETER, NH" BY JOHN W. DURGIN CIVIL ENGINEERS, DATED MAY, 1950. NR–R.C.R.D. #10339.
18. "THE STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION, RIGHT OF WAY PLANS, PROPOSED FEDERAL AID PROJECT, FEDERAL PROJECT NO.: STP–X–5153(005), NH PROJECT NO.10025B, NH ROUTE 108" BY NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION. NR–PLAN #3447.



LOCUS SCALE: 1"=2000'

EXISTING CONDITIONS NOTES:

1. UNDERGROUND FACILITIES, UTILITIES AND STRUCTURES HAVE BEEN PLOTTED FROM FIELD OBSERVATION AND THEIR LOCATION MUST BE CONSIDERED APPROXIMATE ONLY. NEITHER JONES & BEACH ENGINEERS, INC., NOR ANY OF THEIR EMPLOYEES TAKE RESPONSIBILITY FOR THE LOCATION OF ANY UNDERGROUND STRUCTURES OR UTILITIES NOT SHOWN THAT MAY EXIST. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO HAVE ALL UNDERGROUND STRUCTURES AND/OR UTILITIES LOCATED PRIOR TO EXCAVATION WORK BY CALLING 1–888–DIG–SAFE (1–888–344–7233).
2. VERTICAL DATUM: XXXXXX. HORIZONTAL DATUM: XXXXXX
3. BASE ELEVATION WAS ESTABLISHED THROUGH MULTIPLE GPS POST PROCESS OBSERVATIONS AND WAS REDUCED TO THE NAVD88 DATUM BY THE NATIONAL GEODETIC SURVEY OPUS SOFTWARE.
4. SUBJECT PROPERTY LOCATED WITHIN FEDERALLY DESIGNATED FLOOD HAZARD ZONE. REFERENCE FEMA COMMUNITY PANEL NO. 33015C0406E, DATED 5/16/2005.
5. THE LIMITS OF JURISDICTIONAL WETLANDS WERE DELINEATED BY (FILL IN NAME)(ZZZ) DURING SPRING, 2010, USING (EQUIPMENT) AND IN ACCORDANCE WITH THE FOLLOWING GUIDANCE DOCUMENTS:

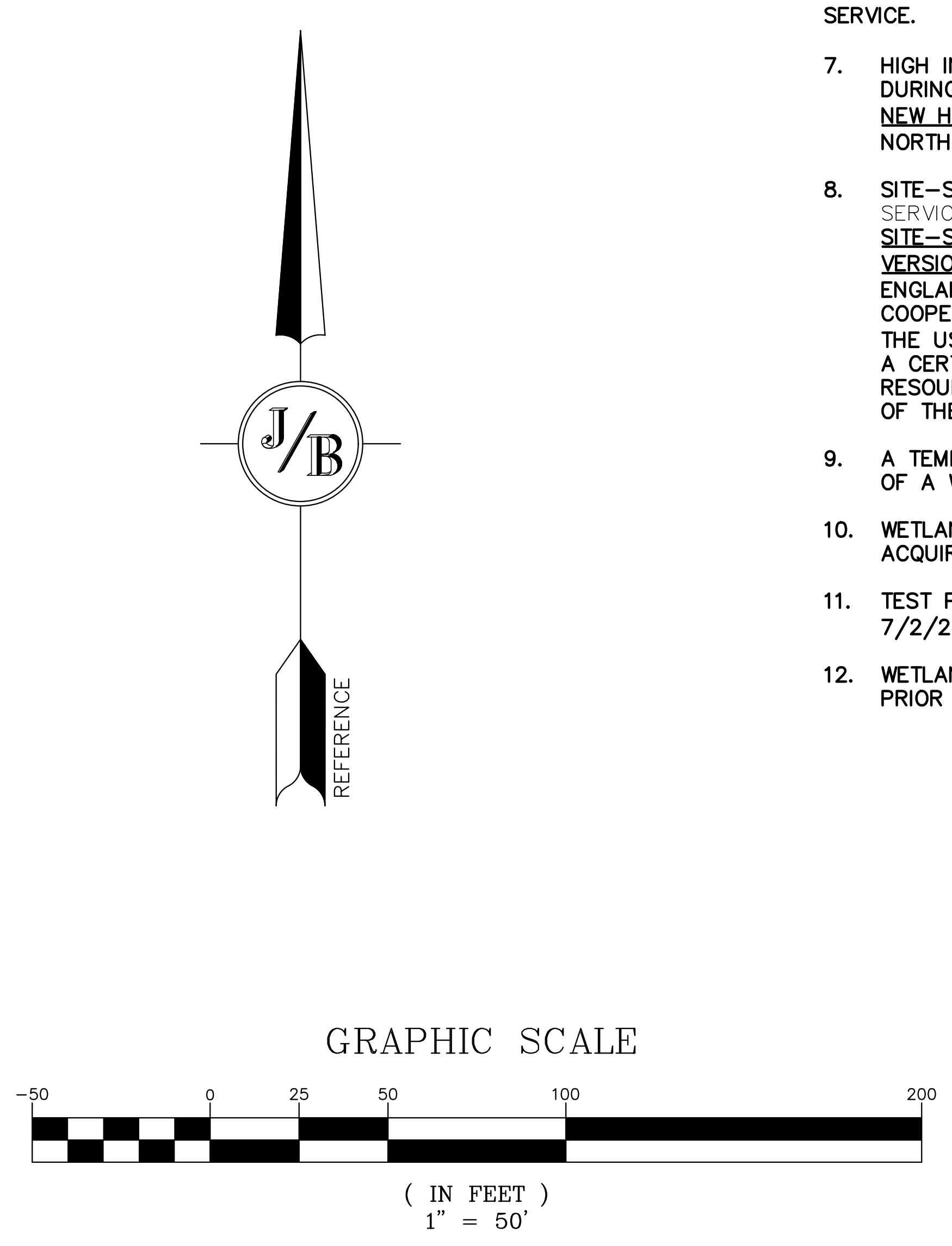
   a. THE CORPS OF ENGINEERS FEDERAL MANUAL FOR IDENTIFYING AND DELINEATING JURISDICTIONAL WETLANDS.

   b. THE NORTH CENTRAL & NORTHEAST REGIONAL SUPPLEMENT TO THE FEDERAL MANUAL.

   c. THE CURRENT VERSION OF THE FIELD INDICATORS FOR IDENTIFYING HYDRIC SOILS IN NEW ENGLAND, AS PUBLISHED BY THE NEW ENGLAND INTERSTATE WATER POLLUTION CONTROL COMMISSION AND/OR THE CURRENT VERSION OF THE FIELD INDICATORS OF HYDRIC SOILS IN THE UNITED STATES, AS PUBLISHED BY THE USDA, NRCS, AS APPROPRIATE.

   d. THE CURRENT NATIONAL LIST OF PLANT SPECIES THAT OCCUR IN WETLANDS, AS PUBLISHED BY THE US FISH AND WILDLIFE SERVICE.

7. HIGH INTENSITY SOIL MAPPING WAS PERFORMED BY (FILL IN NAME)(ZZZ) DURING SPRING, 2010, TO THE STANDARDS OF HIGH INTENSITY SOIL MAPS FOR NEW HAMPSHIRE: STANDARDS (2002: SOCIETY OF SOIL SCIENTISTS OF NORTHERN NEW ENGLAND).
8. SITE–SPECIFIC SOIL MAPPING WAS PERFORMED BY GOVE ENVIRONMENTAL SERVICES, INC. DURING SPRING, 2010, AND IS BASED ON THE STANDARDS OF SITE–SPECIFIC SOIL MAPPING STANDARDS FOR NEW HAMPSHIRE AND VERMONT, VERSION 2.0 (1999: SOCIETY OF SOIL SCIENTISTS OF NORTHERN NEW ENGLAND). THE MAP IS WITHIN THE TECHNICAL STANDARDS OF THE NATIONAL COOPERATIVE SOIL SURVEY. IT IS A SPECIAL PURPOSE PRODUCT INTENDED FOR THE USE(S) REQUIRING THE SITE SPECIFIC SOIL SURVEY AND IS PRODUCED BY A CERTIFIED SOIL SCIENTIST. IT IS NOT A PRODUCT OF THE USDA NATURAL RESOURCES CONSERVATION SERVICE. A NARRATIVE REPORT IS A COMPONENT OF THE MAP.
9. A TEMPORARY CULVERT AND ROADBED SHALL BE IN PLACE PRIOR TO ANY USE OF A WETLAND CROSSING.
10. WETLAND IMPACTS SHALL NOT OCCUR UNTIL ALL PERMITS HAVE BEEN ACQUIRED AND IMPACT MITIGATION REQUIREMENTS HAVE BEEN SATISFIED.
11. TEST PITS PERFORMED BY JAMES GOVE, GOVE ENVIRONMENTAL SERVICES, INC., 7/2/24.
12. WETLAND BOUNDARIES AND CONSTRUCTION LIMITS ARE TO BE CLEARLY MARKED PRIOR TO THE START OF CONSTRUCTION.



PROJECT PARCEL
TOWN OF EXETER
TAX MAP 65, LOT 118

APPLICANT
GREEN & COMPANY
11 LAFAYETTE RD
PO BOX 1297
NORTH HAMPTON, NH 03862

TOTAL LOT AREA
291,630 SQ. FT.
6.7 ACRES

Design: MLS | Draft: GDR | Date: 3/15/24
Checked: WGM | Scale: 1"=50' | Project No.: 24029
Drawing Name: 24029-CONCEPT-6.dwg

THIS PLAN SHALL NOT BE MODIFIED WITHOUT WRITTEN PERMISSION FROM JONES & BEACH ENGINEERS, INC. (JBE). ANY ALTERATIONS, AUTHORIZED OR OTHERWISE, SHALL BE AT THE USER'S SOLE RISK AND WITHOUT LIABILITY TO JBE.

3	8/19/24	PLAN SET	KDR
2	7/29/24	CONCEPT 3	KDR
1	6/6/24	REVISED PER CLIENT	PSL
0	4/11/24	ISSUED FOR REVIEW	PSL
REV.	DATE	REVISION	BY

Designed and Produced in NH
J/B Jones & Beach Engineers, Inc.
Civil Engineering Services
85 Portsmouth Ave.
PO Box 219
Stratham, NH 03885
603-772-4746
E-MAIL: JBE@JONESANDBEACH.COM

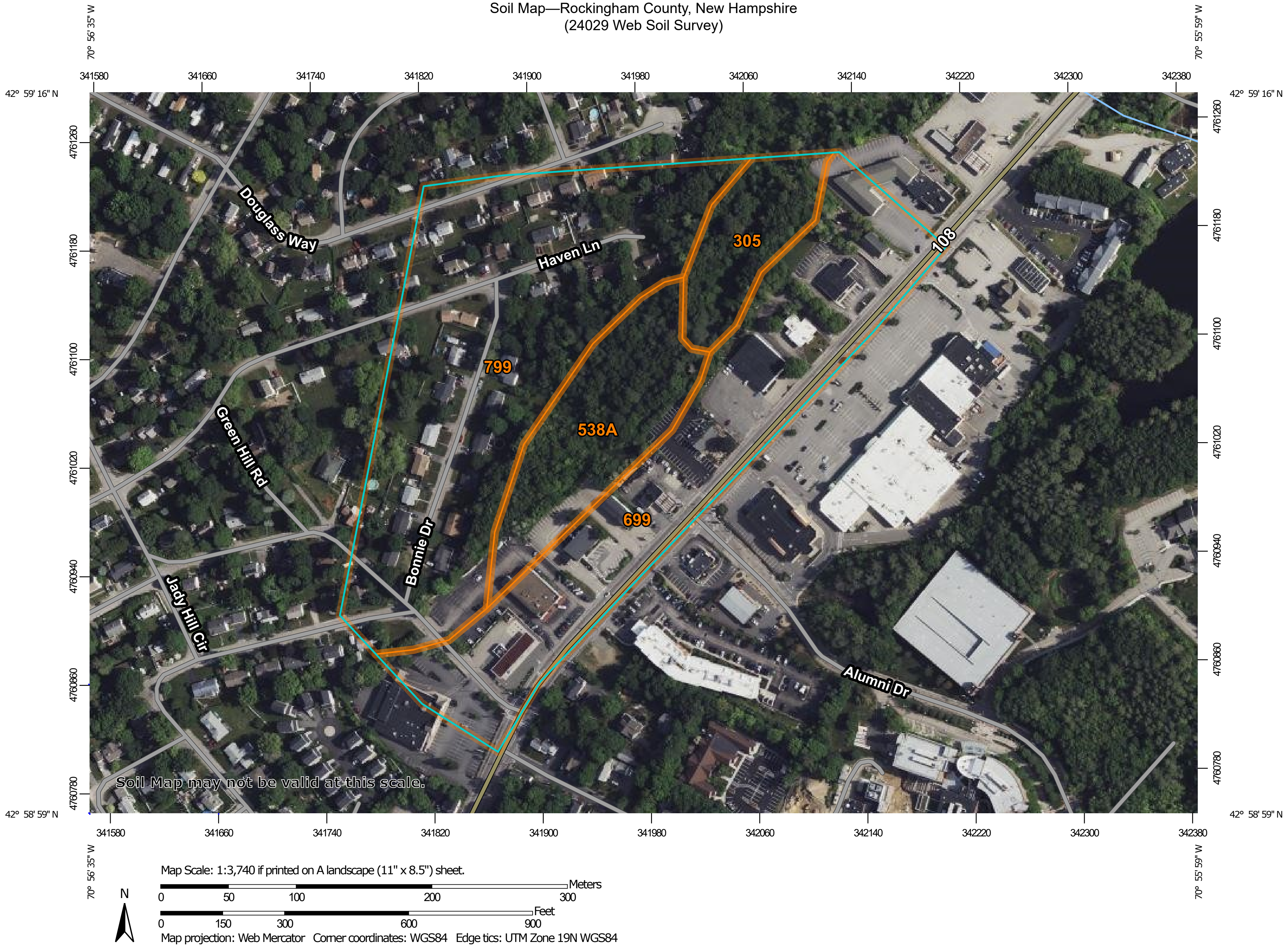
Plan Name: EXISTING CONDITIONS PLAN
Project: NAME OF PROJECT
76 PORTSMOUTH AVE, EXETER, NH
Owner of Record: RAP REALTY MANCHESTER LLC
50 ATLANTIC AVE, SEABROOK, NH

DRAWING No.
C1
SHEET 2 OF12
JBE PROJECT NO. 24029

APPENDIX V

NRCS Soil Map

Soil Map—Rockingham County, New Hampshire
(24029 Web Soil Survey)



Map Scale: 1:3,740 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Rockingham County, New Hampshire
Survey Area Data: Version 27, Sep 3, 2024

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

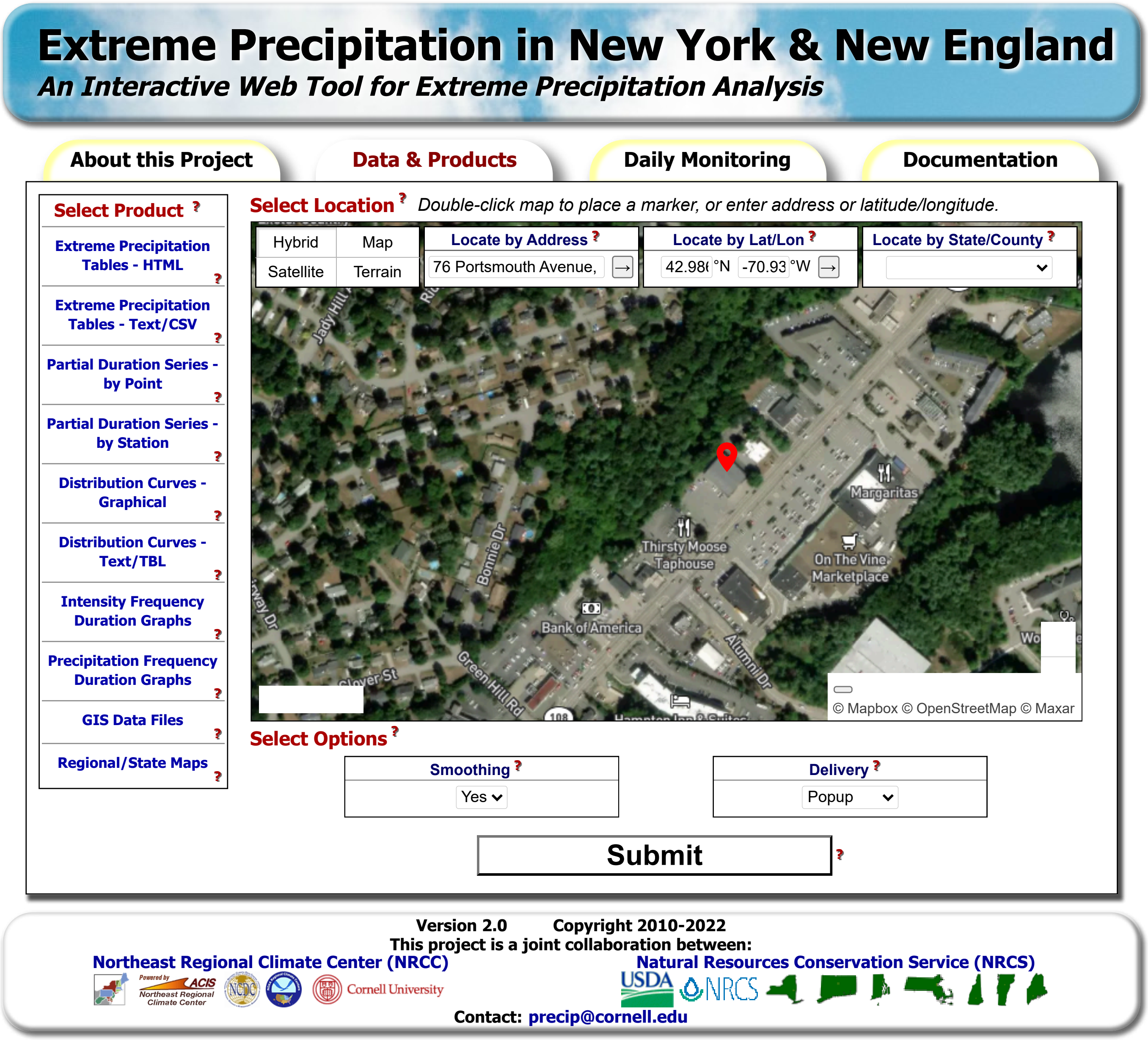
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
305	Lim-Pootatuck complex	2.1	7.5%
538A	Squamscott fine sandy loam, 0 to 5 percent slopes	3.8	13.9%
699	Urban land	9.4	33.8%
799	Urban land-Canton complex, 3 to 15 percent slopes	12.4	44.8%
Totals for Area of Interest		**27.8**	**100.0%**

APPENDIX VI

Extreme Precipitation Estimates



Extreme Precipitation in New York & New England

An Interactive Web Tool for Extreme Precipitation Analysis

Select Product ?

Select Location ? *Double-click map to place a marker, or enter address or latitude/longitude.*

Locate by Address: 76 Portsmouth Avenue,

Locate by Lat/Lon: 42.98(°N -70.93 °W

Select Options ?

Smoothing ?: Yes

Delivery ?: Popup

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This project is a joint collaboration between:

Northeast Regional Climate Center (NRCC) Natural Resources Conservation Service (NRCS)

Contact: precip@cornell.edu

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Metadata for Point

Smoothing	Yes
State	
Location	
Latitude	42.986 degrees North
Longitude	70.937 degrees West
Elevation	10 feet
Date/Time	Tue Oct 22 2024 11:45:48 GMT-0400 (Eastern Daylight Time)

Added 15% to precipitation estimates due to location in Great Bay / Coastal Community
1 Year: 2.68*1.15 = 3.08 in
2 Year: 3.22*1.15 = 3.70 in
10 Year: 4.91*1.15 = 5.65 in
25 Year: 6.24*1.15 = 7.18 in
50 Year: 7.49*1.15 = 8.61 in

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7d
1yr	0.26	0.40	0.50	0.66	0.82	1.04	**1yr**	0.71	0.99	1.22	1.57	2.05	2.68	2.91	**1yr**	2.37	2.80	3.21	3.
2yr	0.32	0.50	0.62	0.82	1.02	1.30	**2yr**	0.88	1.18	1.52	1.94	2.49	3.22	3.57	**2yr**	2.85	3.43	3.94	4.
5yr	0.37	0.58	0.73	0.98	1.25	1.62	**5yr**	1.08	1.47	1.90	2.45	3.16	4.09	4.59	**5yr**	3.62	4.41	5.05	5.
10yr	0.41	0.65	0.83	1.12	1.46	1.90	**10yr**	1.26	1.73	2.25	2.92	3.78	4.91	5.56	**10yr**	4.34	5.34	6.09	7.
25yr	0.48	0.77	0.98	1.35	1.79	2.36	**25yr**	1.55	2.15	2.80	3.67	4.79	6.24	7.15	**25yr**	5.52	6.88	7.80	9.
50yr	0.54	0.87	1.11	1.56	2.10	2.79	**50yr**	1.81	2.54	3.33	4.38	5.74	7.49	8.66	**50yr**	6.63	8.33	9.42	11
100yr	0.61	0.98	1.27	1.80	2.45	3.30	**100yr**	2.12	3.00	3.96	5.24	6.88	9.00	10.49	**100yr**	7.96	10.09	11.37	13
200yr	0.69	1.12	1.45	2.08	2.87	3.90	**200yr**	2.48	3.55	4.70	6.24	8.23	10.81	12.71	**200yr**	9.56	12.23	13.73	16
500yr	0.82	1.34	1.75	2.54	3.55	4.86	**500yr**	3.06	4.43	5.88	7.87	10.44	13.77	16.39	**500yr**	12.19	15.76	17.62	20

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7d
1yr	0.24	0.37	0.45	0.60	0.74	0.89	**1yr**	0.64	0.87	0.95	1.26	1.55	2.28	2.54	**1yr**	2.02	2.44	2.89	3.
2yr	0.32	0.49	0.60	0.81	1.00	1.19	**2yr**	0.87	1.16	1.37	1.82	2.33	3.11	3.50	**2yr**	2.75	3.36	3.85	4.
5yr	0.36	0.55	0.68	0.93	1.19	1.42	**5yr**	1.03	1.39	1.62	2.12	2.74	3.82	4.28	**5yr**	3.38	4.11	4.72	5.
10yr	0.39	0.61	0.75	1.05	1.35	1.63	**10yr**	1.17	1.59	1.82	2.40	3.07	4.41	4.97	**10yr**	3.90	4.78	5.49	6.
25yr	0.45	0.69	0.86	1.23	1.61	1.95	**25yr**	1.39	1.90	2.12	2.78	3.58	4.90	6.06	**25yr**	4.34	5.82	6.68	7.
50yr	0.50	0.77	0.95	1.37	1.85	2.24	**50yr**	1.59	2.19	2.36	3.12	4.01	5.54	7.02	**50yr**	4.91	6.75	7.76	9.
100yr	0.57	0.85	1.07	1.55	2.12	2.57	**100yr**	1.83	2.51	2.65	3.48	4.48	6.25	8.12	**100yr**	5.53	7.81	9.00	10
200yr	0.63	0.95	1.20	1.74	2.43	2.95	**200yr**	2.10	2.88	2.95	3.88	4.99	7.01	9.65	**200yr**	6.21	9.28	10.45	12
500yr	0.74	1.11	1.42	2.07	2.94	3.56	**500yr**	2.54	3.48	3.42	4.48	5.80	8.14	11.77	**500yr**	7.20	11.32	12.71	14

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7d
1yr	0.28	0.44	0.54	0.72	0.89	1.08	**1yr**	0.76	1.06	1.26	1.71	2.17	2.97	3.10	**1yr**	2.63	2.98	3.57	4.
2yr	0.33	0.51	0.63	0.86	1.05	1.26	**2yr**	0.91	1.23	1.48	1.95	2.49	3.40	3.66	**2yr**	3.01	3.52	4.05	4.
5yr	0.40	0.62	0.77	1.05	1.34	1.61	**5yr**	1.16	1.58	1.87	2.49	3.17	4.37	4.92	**5yr**	3.87	4.73	5.40	6.
10yr	0.47	0.73	0.90	1.26	1.63	1.97	**10yr**	1.41	1.93	2.26	3.03	3.82	5.44	6.16	**10yr**	4.81	5.92	6.76	7.
25yr	0.59	0.89	1.11	1.58	2.08	2.56	**25yr**	1.80	2.50	2.93	3.93	4.90	7.66	8.32	**25yr**	6.78	8.00	9.07	10
50yr	0.68	1.04	1.30	1.86	2.51	3.11	**50yr**	2.17	3.04	3.56	4.79	5.94	9.60	10.45	**50yr**	8.49	10.05	11.36	13
100yr	0.81	1.22	1.53	2.21	3.02	3.78	**100yr**	2.61	3.69	4.33	5.86	7.21	12.03	13.14	**100yr**	10.65	12.64	14.21	16
200yr	0.95	1.42	1.80	2.61	3.64	4.60	**200yr**	3.14	4.50	5.28	7.17	8.73	15.14	16.17	**200yr**	13.40	15.55	17.81	20
500yr	1.18	1.75	2.25	3.27	4.65	5.96	**500yr**	4.01	5.83	6.86	9.37	11.28	20.53	21.82	**500yr**	18.17	20.98	23.97	27

APPENDIX VII

Rip Rap Design Calculations

RIP RAP CALCULATIONS

"Lilac Place"
76 Portsmouth Avenue
Exeter, NH

Jones & Beach Engineers, Inc.
P.O. Box 219
Stratham, NH 03885
2-Nov-24

Rip Rap equations were obtained from the *Stormwater Management and Erosion Control Handbook for Urban and Developing Areas in New Hampshire.*
Aprons are sized for the 10-Year storm event.

TAILWATER < HALF THE D_o

$L_a = (1.8 \times Q) / D_0^{3/2} + (7 \times D_o)$

$W = L_a + (3 \times D_o)$ or defined channel width

$d_{50} = (0.02 \times Q^{4/3}) / (T_w \times D_0)$

Culvert or Catch Basin (Sta. No.)	Tailwater (Feet) T_w	Discharge (C.F.S.) Q	Diameter of Pipe D_o	Length of Rip Rap L_a (feet)	Width of Rip Rap W (feet)	d_{50}-Median Stone Rip Rap d50 (feet)
2P Outlet Pipe	0.43	2.78	1.414	12.9	17	0.13
3R - 15" HDPE	0.56	2.09	1.25	11.4	15	0.08
6P Outlet Pipe	0.22	0.14	1	7.3	10	0.01
7P Outlet Pipe	0.25	0.71	1	8.3	11	0.05
7R - 15" HDPE	0.38	4.42	1.25	14.4	18	0.31
14P - 12" HDPE	0.25	0.62	1	8.1	11	0.04
4P - 12" HDPE	0	0	1	7.0	10	#DIV/0!
11P - 12" HDPE	0.15	0.17	1	7.3	10	0.01

2P: Two 12" culverts in parallel. Effective diameter = sqrt((2(pi(0.5^2))/pi)*2 = Square root of 2 = approx 1.414
4P: 25-Year storm is fully infiltrated. No discharge through outlet pipe as modelled.

TAILWATER > HALF THE D_o

$L_a = (3.0 \times Q) / D_0^{3/2} + (7 \times D_o)$

$W = (0.4 \times L_a) + (3 \times D_o)$ or defined channel width

$d_{50} = (0.02 \times Q^{4/3}) / (T_w \times D_0)$

Culvert or Catch Basin (Sta. No.)	Tailwater (Feet) T_w	Discharge (C.F.S.) Q	Diameter of Pipe D_o	Length of Rip Rap L_a (feet)	Width of Rip Rap W (feet)	d_{50}-Median Stone Rip Rap d50 (feet)
N/A				#DIV/0!	#DIV/0!	#DIV/0!

Table 7-24 -- Recommended Rip Rap Gradation Ranges

d_{50} Size = 0.25 Feet 3 Inches

% of Weight Smaller Than the Given d_{50} Size	Size of Stone (Inches)	
	From	To
100%	5	6
85%	4	5
50%	3	5
15%	1	2

Table 7-24 -- Recommended Rip Rap Gradation Ranges

d_{50} Size = 0.5 Feet 6 Inches

% of Weight Smaller Than the Given d_{50} Size	Size of Stone (Inches)	
	From	To
100%	9	12
85%	8	11
50%	6	9
15%	2	3

APPENDIX VIII

BMP and GRV Worksheets

NEW HAMPSHIRE DEPARTMENT OF
Environmental Services

FILTRATION PRACTICE DESIGN CRITERIA
(Env-Wq 1508.07)

Type/Node Name: **Bioretention Pond #1 / 1P**

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable.

Yes		Check if you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.07(a).	
0.88	ac	A = Area draining to the practice	
0.74	ac	A_I = Impervious area draining to the practice	
0.84	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.81	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.71	ac-in	WQV= 1” x Rv x A	
2,580	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12”)	
645	cf	25% x WQV (check calc for sediment forebay volume)	
1,935	cf	75% x WQV (check calc for surface sand filter volume)	
Sediment Forebay		Method of Pretreatment? (not required for clean or roof runoff)	
674	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**$\geq$ 25%WQV**
Calculate time to drain if system IS NOT underdrained:			
	sf	A_{SA} = Surface area of the practice	
	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
	Yes/No	If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided? (Use the calculations below)	
-	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	**$\leq$ 72-hrs**
Calculate time to drain if system IS underdrained:			
32.95	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
0.84	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
1.71	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	**$\leq$ 72-hrs**
29.75	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
28.75	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
34.17	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
30.50	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
1.00	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	**$\geq$ 1'**
(0.75)	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	**$\geq$ 1'**
(4.42)	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	**$\geq$ 1'**
34.46	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
34.50	ft	Elevation of the top of the practice	
YES		50 peak elevation $\leq$ Elevation of the top of the practice	**← yes**
If a surface sand filter or underground sand filter is proposed:			
YES	ac	Drainage Area check.	**< 10 ac**
	cf	V = Volume of storage[3] (attach a stage-storage table)	**$\geq$ 75%WQV**
	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course specification.	
	Yes/No	Access grate provided?	**← yes**

If a bioretention area is proposed:

YES	ac	Drainage Area no larger than 5 ac?	← **yes**
4,854	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ WQV**
18.0	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet	D6	Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	**≥ 3:1**
Sheet	D6	Note what sheet in the plan set contains the planting plans and surface cover	

If porous pavement is proposed:

		Type of pavement proposed (Concrete? Asphalt? Pavers? Etc.)	
	acres	A_{SA} = Surface area of the pervious pavement	
	:1	Ratio of the contributing area to the pervious surface area	**≤ 5:1**
	inches	D_{FC} = Filter course thickness	**12", or 18" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course spec.	**mod. 304.1 (see spec)**

1. Rate of the limiting layer (either the filter course or the underlying soil). $\text{Ksat}_{\text{design}}$ includes factor of safey. See Env-Wq 1504.14 for guidance on determining the infiltration rate.

2. See lines 34, 40 and 48 for required depths of filter media.

3. Volume without depending on infiltration. The volume includes the storage above the filter (but below the invert of the outlet stucture, if any), the filter media voids, and the pretreatment area. The storage above the filter media shall not include the volume above the outlet structure, if any.

Designer's Notes:

Nearest test pit is TP 6001. 16" to SHWT and dug to 60" without encountering ledge.

Existing high contour = 35.5. SHWT = 35.5-16/12 = 34.17; Bottom of pit = 35.5-5 = 30.5

Stage-Area-Storage for Pond 1P: Bioretention Pond #1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
28.74	926	0
28.84	926	37
28.94	926	74
29.04	926	111
29.14	926	148
29.24	926	185
29.34	926	222
29.44	926	259
29.54	926	296
29.64	926	333
29.74	926	370
29.84	926	384
29.94	926	398
30.04	926	412
30.14	926	426
30.24	926	440
30.34	926	454
30.44	926	468
30.54	926	482
30.64	926	495
30.74	926	509
30.84	926	523
30.94	926	537
31.04	926	551
31.14	926	565
31.24	926	579
31.34	926	583
31.44	926	588
31.54	949	637
31.64	1,008	735
31.74	1,069	839
31.84	1,131	949
31.94	1,196	1,065
32.04	1,259	1,188
32.14	1,319	1,317
32.24	1,381	1,452
32.34	1,444	1,593
32.44	1,508	1,741
32.54	1,574	1,895
32.64	1,641	2,055
32.74	1,710	2,223
32.84	1,780	2,397
32.94	1,852	2,579
33.04	1,925	2,768
33.14	1,999	2,964
33.24	2,075	3,168
33.34	2,152	3,379
33.44	2,231	3,598
33.54	2,311	3,825
33.64	2,392	4,061
33.74	2,475	4,304
33.84	2,559	4,556
33.94	2,645	4,816
34.04	2,730	5,085
34.14	2,815	5,362
34.24	2,900	5,648
34.34	4,054	6,043
34.44	**4,135**	**6,453**

Overflow el. = 34.1
Vol. below = 5,224 cf
by interpolation
Required WQV =
2,580 cf
Storage provided =
5224-370 = 4,854 cf
> 2,580 cf minimum

Bottom of filter course = 29.75
Vol. below = 370 cf

Volume below E(WQV) = Volume
below filter course + WQV =
370+2580 = 2,950 cf
E(WQV) = 32.95 by interpolation

Stage-Discharge for Pond 1P: Bioretention Pond #1

Elevation (feet)	Primary (cfs)
28.74	0.00
28.79	0.00
28.84	0.02
28.89	0.04
28.94	0.08
28.99	0.11
29.04	0.15
29.09	0.17
29.14	0.20
29.19	0.22
29.24	0.24
29.29	0.26
29.34	0.27
29.39	0.29
29.44	0.30
29.49	0.32
29.54	0.33
29.59	0.34
29.64	0.36
29.69	0.37
29.74	0.38
29.79	0.39
29.84	0.40
29.89	0.41
29.94	0.43
29.99	0.44
30.04	0.45
30.09	0.46
30.14	0.46
30.19	0.47
30.24	0.48
30.29	0.49
30.34	0.50
30.39	0.51
30.44	0.52
30.49	0.53
30.54	0.54
30.59	0.54
30.64	0.55
30.69	0.56
30.74	0.57
30.79	0.58
30.84	0.58
30.89	0.59
30.94	0.60
30.99	0.61
31.04	0.61
31.09	0.62
31.14	0.63
31.19	0.63
31.24	0.64
31.29	0.65
31.34	0.65
31.39	0.66
31.44	0.67
31.49	0.67
31.54	0.68
31.59	0.69
31.64	0.69
31.69	0.70
31.74	0.71
31.79	0.71
31.84	0.72
31.89	0.72
31.94	0.73
31.99	0.74
32.04	0.74
32.09	0.75
32.14	0.75
32.19	0.76
32.24	0.77
32.29	0.77
32.34	0.78
32.39	0.78
32.44	0.79
32.49	0.79
32.54	0.80
32.59	0.81
32.64	0.81
32.69	0.82
32.74	0.82
32.79	0.83
32.84	0.83
32.89	0.84
32.94	0.84
32.99	0.85
33.04	0.85
33.09	0.86
33.14	0.86
33.19	0.87
33.24	0.87
33.29	0.88
33.34	0.88
33.39	0.89
33.44	0.89
33.49	0.90
33.54	0.90
33.59	0.91
33.64	0.91
33.69	0.92
33.74	0.92
33.79	0.93
33.84	0.93
33.89	0.94
33.94	0.94
33.99	0.95
34.04	0.95
34.09	0.96
34.14	1.12
34.19	1.52
34.24	2.05
34.29	2.68
34.34	3.39
34.39	4.19
34.44	5.06
34.49	**6.00**

E(WQV) = 32.95
Q(WQV) = 0.84 cfs

FILTRATION PRACTICE DESIGN CRITERIA
(Env-Wq 1508.07)

Type/Node Name: **Bioretention Pond #2 / 7P**

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable.

Yes		Check if you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.07(a).	
0.19	ac	A = Area draining to the practice	
0.13	ac	A_I = Impervious area draining to the practice	
0.67	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.65	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.13	ac-in	WQV= 1” x Rv x A	
459	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12”)	
115	cf	25% x WQV (check calc for sediment forebay volume)	
344	cf	75% x WQV (check calc for surface sand filter volume)	
Pre-Tx		Method of Pretreatment? (not required for clean or roof runoff)	
	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**≥ 25%WQV**
Calculate time to drain if system IS NOT underdrained:			
	sf	A_{SA} = Surface area of the practice	
	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
	Yes/No	If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided? (Use the calculations below)	
-	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	**≤ 72-hrs**
Calculate time to drain if system IS underdrained:			
35.07	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
0.74	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
0.34	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	**≤ 72-hrs**
32.75	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
31.75	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
33.67	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
30.00	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
1.00	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	**≥ 1'**
2.75	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	**≥ 1'**
(0.92)	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	**≥ 1'**
35.16	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
35.50	ft	Elevation of the top of the practice	
YES		50 peak elevation ≤ Elevation of the top of the practice	**← yes**
If a surface sand filter or underground sand filter is proposed:			
YES	ac	Drainage Area check.	**< 10 ac**
	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ 75%WQV**
	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course specification.	
	Yes/No	Access grate provided?	**← yes**

If a bioretention area is proposed:

YES	ac	Drainage Area no larger than 5 ac?	**← yes**
541	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ WQV**
18.0	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet	D6	Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	**≥ 3:1**
Sheet	D6	Note what sheet in the plan set contains the planting plans and surface cover	

If porous pavement is proposed:

		Type of pavement proposed (Concrete? Asphalt? Pavers? Etc.)	
	acres	A_{SA} = Surface area of the pervious pavement	
	:1	Ratio of the contributing area to the pervious surface area	**≤ 5:1**
	inches	D_{FC} = Filter course thickness	**12", or 18" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course spec.	**mod. 304.1 (see spec)**

1. Rate of the limiting layer (either the filter course or the underlying soil). $Ksat_{design}$ includes factor of safey. See Env-Wq 1504.14 for guidance on determining the infiltration rate.

2. See lines 34, 40 and 48 for required depths of filter media.

3. Volume without depending on infiltration. The volume includes the storage above the filter (but below the invert of the outlet stucture, if any), the filter media voids, and the pretreatment area. The storage above the filter media shall not include the volume above the outlet structure, if any.

Designer's Notes:

Nearest test pit is TP 6001. 16" to SHWT and dug to 60" without encountering ledge.

Existing high contour = 35. SHWT = 35-16/12 = 33.67; Bottom of pit = 35-5 = 30

Stage-Area-Storage for Pond 7P: Bioretention Pond #2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
31.74	490	0
31.79	490	10
31.84	490	20
31.89	490	29
31.94	490	39
31.99	490	49
32.04	490	59
32.09	490	69
32.14	490	78
32.19	490	88
32.24	490	98
32.29	490	108
32.34	490	118
32.39	490	127
32.44	490	137
32.49	490	147
32.54	490	157
32.59	490	167
32.64	490	176
32.69	490	186
32.74	490	196
32.79	490	200
32.84	490	203
32.89	490	207
32.94	490	211
32.99	490	214
33.04	490	218
33.09	490	222
33.14	490	225
33.19	490	229
33.24	490	233
33.29	490	236
33.34	490	240
33.39	490	244
33.44	490	247
33.49	490	251
33.54	490	255
33.59	490	258
33.64	490	262
33.69	490	266
33.74	490	270
33.79	490	273
33.84	490	277
33.89	490	281
33.94	490	284
33.99	490	288
34.04	490	292
34.09	490	295
34.14	490	299
34.19	490	303
34.24	490	306
34.29	490	307
34.34	490	309
34.39	490	310
34.44	490	311
34.49	490	312
34.54	503	337
34.59	519	363
34.64	536	389
34.69	553	416
34.74	570	444
34.79	588	473
34.84	605	503
34.89	623	534
34.94	642	566
34.99	660	598
35.04	678	632
35.09	696	666
35.14	715	701
35.19	733	737
35.24	752	774
35.29	771	813
35.34	790	852
35.39	809	892
35.44	829	932
35.49	**849**	**974**

Volume below E(WQV) = Volume below filter course + WQV = 196+459 = 655 cf
E(WQV) = 35.07 by interpolation

Overflow el. = 35.2
Vol. below = 737 cf
Required WQV = 655 cf
Storage provided = 737-196 = 541 cf
> 459 cf minimum

Bottom of filter course = 32.75
Vol. below = 196 cf

Stage-Discharge for Pond 7P: Bioretention Pond #2

Elevation (feet)	Primary (cfs)
31.74	0.00
31.76	0.00
31.78	0.00
31.80	0.01
31.82	0.01
31.84	0.02
31.86	0.03
31.88	0.04
31.90	0.05
31.92	0.06
31.94	0.08
31.96	0.09
31.98	0.10
32.00	0.12
32.02	0.13
32.04	0.15
32.06	0.16
32.08	0.17
32.10	0.18
32.12	0.19
32.14	0.20
32.16	0.21
32.18	0.22
32.20	0.22
32.22	0.23
32.24	0.24
32.26	0.25
32.28	0.25
32.30	0.26
32.32	0.27
32.34	0.27
32.36	0.28
32.38	0.29
32.40	0.29
32.42	0.30
32.44	0.30
32.46	0.31
32.48	0.32
32.50	0.32
32.52	0.33
32.54	0.33
32.56	0.34
32.58	0.34
32.60	0.35
32.62	0.35
32.64	0.36
32.66	0.36
32.68	0.37
32.70	0.37
32.72	0.38
32.74	0.38
32.76	0.39
32.78	0.39
32.80	0.39
32.82	0.40
32.84	0.40
32.86	0.41
32.88	0.41
32.90	0.42
32.92	0.42
32.94	0.43
32.96	0.43
32.98	0.43
33.00	0.44
33.02	0.44
33.04	0.45
33.06	0.45
33.08	0.45
33.10	0.46
33.12	0.46
33.14	0.46
33.16	0.47
33.18	0.47
33.20	0.48
33.22	0.48
33.24	0.48
33.26	0.49
33.28	0.49
33.30	0.49
33.32	0.50
33.34	0.50
33.36	0.50
33.38	0.51
33.40	0.51
33.42	0.52
33.44	0.52
33.46	0.52
33.48	0.53
33.50	0.53
33.52	0.53
33.54	0.54
33.56	0.54
33.58	0.54
33.60	0.55
33.62	0.55
33.64	0.55
33.66	0.55
33.68	0.56
33.70	0.56
33.72	0.56
33.74	0.57
33.76	0.57
33.78	0.57
33.80	0.58
33.82	0.58
33.84	0.58
33.86	0.59
33.88	0.59
33.90	0.59
33.92	0.59
33.94	0.60
33.96	0.60
33.98	0.60
34.00	0.61
34.02	0.61
34.04	0.61
34.06	0.62
34.08	0.62
34.10	0.62
34.12	0.62
34.14	0.63
34.16	0.63
34.18	0.63
34.20	0.63
34.22	0.64
34.24	0.64
34.26	0.64
34.28	0.65
34.30	0.65
34.32	0.65
34.34	0.65
34.36	0.66
34.38	0.66
34.40	0.66
34.42	0.66
34.44	0.67
34.46	0.67
34.48	0.67
34.50	0.68
34.52	0.68
34.54	0.68
34.56	0.68
34.58	0.69
34.60	0.69
34.62	0.69
34.64	0.69
34.66	0.70
34.68	0.70
34.70	0.70
34.72	0.70
34.74	0.71
34.76	0.71
34.78	0.71
34.80	0.71
34.82	0.72
34.84	0.72
34.86	0.72
34.88	0.72
34.90	0.73
34.92	0.73
34.94	0.73
34.96	0.73
34.98	0.74
35.00	0.74
35.02	0.74
35.04	0.74
35.06	0.74
35.08	0.75
35.10	0.75
35.12	0.75
35.14	0.75
35.16	0.76
35.18	0.76
35.20	0.76
35.22	0.81
35.24	0.89
35.26	0.99
35.28	1.12
35.30	1.26
35.32	1.42
35.34	1.58
35.36	1.77
35.38	1.96
35.40	2.16
35.42	2.38
35.44	2.60
35.46	2.83
35.48	3.08
35.50	**3.33**

E(WQV) = 35.07
Q(WQV) = 0.74 cfs

NEW HAMPSHIRE DEPARTMENT OF
Environmental Services

FILTRATION PRACTICE DESIGN CRITERIA
(Env-Wq 1508.07)

Type/Node Name: **Bioretention Pond #3 / 8P**

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable.

Yes		Check if you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.07(a).	
0.48	ac	A = Area draining to the practice	
0.38	ac	A_I = Impervious area draining to the practice	
0.80	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.77	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.37	ac-in	WQV= 1" x Rv x A	
1,330	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
332	cf	25% x WQV (check calc for sediment forebay volume)	
997	cf	75% x WQV (check calc for surface sand filter volume)	
Pre-Tx		Method of Pretreatment? (not required for clean or roof runoff)	
	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**$\geq$ 25%WQV**
Calculate time to drain if system IS NOT underdrained:			
	sf	A_{SA} = Surface area of the practice	
	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
	Yes/No	If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided? (Use the calculations below)	
-	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	**$\leq$ 72-hrs**
Calculate time to drain if system IS underdrained:			
32.08	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
0.90	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
0.82	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	**$\leq$ 72-hrs**
28.25	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
27.25	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
32.08	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
27.50	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
1.00	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	**$\geq$ 1'**
0.75	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	**$\geq$ 1'**
(3.83)	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	**$\geq$ 1'**
32.71	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
33.00	ft	Elevation of the top of the practice	
YES		50 peak elevation $\leq$ Elevation of the top of the practice	**← yes**
If a surface sand filter or underground sand filter is proposed:			
YES	ac	Drainage Area check.	**< 10 ac**
	cf	V = Volume of storage[3] (attach a stage-storage table)	**$\geq$ 75%WQV**
	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course specification.	
	Yes/No	Access grate provided?	**← yes**

If a bioretention area is proposed:

YES	ac	Drainage Area no larger than 5 ac?	← yes
1,814	cf	V = Volume of storage[3] (attach a stage-storage table)	≥ WQV
18.0	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet	D6	Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	≥ 3:1
Sheet	D6	Note what sheet in the plan set contains the planting plans and surface cover	

If porous pavement is proposed:

		Type of pavement proposed (Concrete? Asphalt? Pavers? Etc.)	
	acres	A_{SA} = Surface area of the pervious pavement	
	:1	Ratio of the contributing area to the pervious surface area	**≤ 5:1**
	inches	D_{FC} = Filter course thickness	**12", or 18" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course spec.	**mod. 304.1 (see spec)**

1. Rate of the limiting layer (either the filter course or the underlying soil). $Ksat_{design}$ includes factor of safey. See Env-Wq 1504.14 for guidance on determining the infiltration rate.

2. See lines 34, 40 and 48 for required depths of filter media.

3. Volume without depending on infiltration. The volume includes the storage above the filter (but below the invert of the outlet stucture, if any), the filter media voids, and the pretreatment area. The storage above the filter media shall not include the volume above the outlet structure, if any.

Designer's Notes:

Nearest test pit is TP 6007. 5" to SHWT and dug to 60" without encountering ledge.

Existing high contour = 32.5. SHWT = 32.5-5/12 = 32.08; Bottom of pit = 35-5 = 27.5

Stage-Area-Storage for Pond 8P: Bioretention Pond #3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
27.24	238	0
27.34	238	10
27.44	238	19
27.54	238	29
27.64	238	38
27.74	238	48
27.84	238	57
27.94	238	67
28.04	238	76
28.14	238	86
28.24	238	95
28.34	238	99
28.44	238	102
28.54	238	106
28.64	238	109
28.74	238	113
28.84	238	117
28.94	238	120
29.04	238	124
29.14	238	127
29.24	238	131
29.34	238	134
29.44	238	138
29.54	238	142
29.64	238	145
29.74	238	149
29.84	238	150
29.94	238	151
30.04	248	164
30.14	276	190
30.24	304	219
30.34	334	251
30.44	365	286
30.54	398	324
30.64	432	366
30.74	468	411
30.84	505	459
30.94	543	512
31.04	583	568
31.14	624	628
31.24	667	693
31.34	711	762
31.44	757	835
31.54	803	913
31.64	852	996
31.74	901	1,084
31.84	952	1,176
31.94	1,005	1,274
32.04	1,058	1,377
32.14	1,110	1,486
32.24	1,164	1,599
32.34	1,220	1,718
32.44	1,276	1,843
32.54	1,334	1,974
32.64	1,393	2,110
32.74	1,453	2,252
32.84	1,515	2,401
32.94	**1,578**	**2,555**

Overflow el. = 32.5
Vol. below = 1909 cf
Required WQV = 1330 cf
Storage provided =
1909-95 = 1,814 cf
> 1,330 cf minimum

Bottom of filter course = 28.25
Vol. below = 95 cf

Volume below E(WQV)
= Volume below filter
course + WQV =
95+1330 = 1,425 cf
E(WQV) = 32.08 by
interpolation

Stage-Discharge for Pond 8P: Bioretention Pond #3

Elevation (feet)	Primary (cfs)
27.24	0.00
27.29	0.00
27.34	0.02
27.39	0.04
27.44	0.08
27.49	0.11
27.54	0.15
27.59	0.17
27.64	0.20
27.69	0.22
27.74	0.24
27.79	0.26
27.84	0.27
27.89	0.29
27.94	0.30
27.99	0.32
28.04	0.33
28.09	0.34
28.14	0.36
28.19	0.37
28.24	0.38
28.29	0.39
28.34	0.40
28.39	0.41
28.44	0.43
28.49	0.44
28.54	0.45
28.59	0.46
28.64	0.46
28.69	0.47
28.74	0.48
28.79	0.49
28.84	0.50
28.89	0.51
28.94	0.52
28.99	0.53
29.04	0.54
29.09	0.54
29.14	0.55
29.19	0.56
29.24	0.57
29.29	0.58
29.34	0.58
29.39	0.59
29.44	0.60
29.49	0.61
29.54	0.61
29.59	0.62
29.64	0.63
29.69	0.63
29.74	0.64
29.79	0.65
29.84	0.65
29.89	0.66
29.94	0.67
29.99	0.67
30.04	0.68
30.09	0.69
30.14	0.69
30.19	0.70
30.24	0.71
30.29	0.71
30.34	0.72
30.39	0.72
30.44	0.73
30.49	0.74
30.54	0.74
30.59	0.75
30.64	0.75
30.69	0.76
30.74	0.77
30.79	0.77
30.84	0.78
30.89	0.78
30.94	0.79
30.99	0.79
31.04	0.80
31.09	0.81
31.14	0.81
31.19	0.82
31.24	0.82
31.29	0.83
31.34	0.83
31.39	0.84
31.44	0.84
31.49	0.85
31.54	0.85
31.59	0.86
31.64	0.86
31.69	0.87
31.74	0.87
31.79	0.88
31.84	0.88
31.89	0.89
31.94	0.89
31.99	0.90
32.04	0.90
32.09	0.91
32.14	0.91
32.19	0.92
32.24	0.92
32.29	0.93
32.34	0.93
32.39	0.94
32.44	0.94
32.49	0.95
32.54	1.07
32.59	1.37
32.64	1.77
32.69	2.24
32.74	2.78
32.79	3.38
32.84	4.03
32.89	4.74
32.94	5.48
32.99	**6.28**

E(WQV) = 32.08
Q(WQV) = 0.90 cfs

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

GENERAL CALCULATIONS - WQV and WQF
(optional worksheet)

This worksheet may be useful when designing a BMP **that does not fit into one of the specific worksheets already provided** (i.e. for a technology which is not a stormwater wetland, infiltration practice, etc.)

Water Quality Volume (WQV)

0.14	ac	A = Area draining to the practice
0.12	ac	A_I = Impervious area draining to the practice
0.89	decimal	I = Percent impervious area draining to the practice, in decimal form
0.85	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)
0.12	ac-in	WQV= 1” x Rv x A
434	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12”)

Water Quality Flow (WQF)

1	inches	P = Amount of rainfall. For WQF in NH, P = 1".
0.85	inches	Q = Water quality depth. Q = WQV/A
99	unitless	CN = Unit peak discharge curve number. CN =1000/(10+5P+10Q–10*[Q^2 + 1.25*Q*P] $^{0.5}$)
0.1	inches	S = Potential maximum retention. S = (1000/CN) - 10
0.027	inches	Ia = Initial abstraction. Ia = 0.2S
6.0	minutes	T_c = Time of Concentration
700.0	cfs/mi^2/in	q_u is the unit peak discharge. Obtain this value from TR-55 exhibits 4-II and 4-III.
0.131	cfs	WQF = q_u x WQV. Conversion: to convert "cfs/mi^2/in * ac-in" to "cfs" multiply by 1mi^2/640ac.

Designer's Notes:

For sizing of Focal Point #1 (Pond 3P) in conjunction with Focal Point design worksheet

DESIGN WORKSHEET

FOCALPOINT

NEW HAMPSHIRE AOT PROJECTS

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1. **Determine FocalPoint bed area (minimum 174 sf/acre of impervious area - ex: 0.2 acres = 35 sf) See step 2 to determine if minimum size is appropriate.**
   - Tributary impervious area: = 0.125 ac **(A)**
   - Tributary pervious area: = 0.015 ac **(B)**
   - Minimum FocalPoint bed area required: **= ((A x 1.0) + (B x 0.4)) * 174** = 22.8 sf
   - FocalPoint bed area provided: = 25 sf
   - Dimensions of proposed FocalPoint: = 5 ft x 5 ft

2. **Model a Type II & III 24-hr rainfall event that generates the water quality volume to demonstrate that the entire storm volume is treated prior to activation of the overflow (typically set at 6 - 12 in above the mulch). Note: a 1.2 - 1.3 in rainfall event usually generates 1.0 in of runoff.**
   Contact ACF for a sample HydroCAD node.
   - Water quality volume (WQv) goal: = 434 ft^3
   - Type II & III 24-hr rainfall depth to generate WQv: = 1.30 in
   - Temporary storage depth provided: = 6 in
     (typically 6 - 12 in)
   - Temporary storage volume provided at above depth: = 35 ft^3
   - Peak ponding depth from Type III 24-hr storm event: = 1.68 in

3. **Size the Harco PVC domed overflow riser.**
   Note: ACF recommends installation of a Fabco domed overflow filter kit for overflow protection.
   - Domed overflow riser diameter: = 18 in
   - Rim elevation of overflow riser: = 29.5
     (typically 6 - 12 in above mulch surface)
   - 6 in invert in elevation from FocalPoint: = 26.0
     (typically 3 ft below mulch surface)
   - 12 in invert out elevation: = 26.0

4. **Flood control - peak flow attenuation of major storms**
   The treated flow and bypass flow can be routed to a detention system such as an open pond or a subsurface solution like an expanded R-Tank system. (contact ACF for additional information on designing expanded R-Tank systems)

5. **Prepare a landscape plan for the FocalPoint bed area** ☑

6. **Design review and installation oversight by manufacturer's representative**
   - The design has been reviewed by ACF Environmental ☑
   - Engineer will coordinate installation inspection with ACF Environmental ☑

DESIGNING WITH FOCALPOINT IN NEW HAMPSHIRE

The New Hampshire Department of Environmental Services has approved the FocalPoint (High Performance Modular Biofiltration System) for use on AoT site development projects in the State of New Hampshire.

SIZING CRITERIA SUMMARY

- The surface area of the media within FocalPoint must be a minimum of 174 sf per 1.0 acre of impervious area (26 sf per 0.15 acres). The thickness of the media is to be no less than 1.5 ft (18 in).
- The system must be modelled in HydroCAD (or similar TR-55 modeling software) to demonstrate that the entire volume of a 1.22 in Type II or III 24-hr storm is treated prior to activation of the bypass/overflow (typically set at 6 - 12 in above the mulch surface). Note: A 1.22 in rainfall event typically generates 1.0 in of runoff.
- The R-Tank modular underdrain can be expanded beyond the footprint of the FocalPoint media bed for expanded infiltration and peak flow attenuation/detention post treatment.

FOCALPOINT SYSTEMS:

FOCALPOINT ACCESSORIES:

Pretreatment - Rain Guardian Turret

Pretreatment - Rain Guardian Foxhole

Pretreatment - PreTx

Bypass protection - Domed overflow with filter insert

For additional information please visit: www.acfenvironmental.com

Summary for Pond 3P: Focal Point #1

```
[90] Warning: Qout>Qin may require smaller dt or Finer Routing
[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=8)

Inflow Area =      0.140 ac, 89.23% Impervious, Inflow Depth =  0.83"   for FP1 WQF event
Inflow      =      0.13 cfs @  12.09 hrs, Volume=         0.010 af
Outflow     =      0.15 cfs @  12.12 hrs, Volume=         0.010 af, Atten= 0%, Lag= 1.6 min
Primary     =      0.15 cfs @  12.12 hrs, Volume=         0.010 af
   Routed to Pond 4P : Infiltration System B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 29.14' @ 12.11 hrs  Surf.Area= 63 sf  Storage= 16 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.8 min ( 813.8 - 813.0 )
```

29.14-29 = 0.14ft *
(12 in/ft) = 1.68 in

Volume	Invert	Avail.Storage	Storage Description
#1	26.75'	11 cf	**5.00'W x 5.00'L x 2.25'H Focal Point** 56 cf Overall x 20.0% Voids
#2	29.00'	69 cf	**Surface Bowl (Prismatic)**Listed below (Recalc)
		80 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
29.00	25	0	0
30.00	113	69	69

Device	Routing	Invert	Outlet Devices
#1	Primary	26.00'	**12.0" Round Culvert** L= 13.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 26.00' / 25.50' S= 0.0385 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	26.75'	**100.000 in/hr Exfiltration over Surface area** Phase-In= 0.10'
#3	Device 1	29.50'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

```
Primary OutFlow Max=0.14 cfs @ 12.12 hrs  HW=29.10'  TW=23.44'  (Dynamic Tailwater)
└─1=Culvert  (Passes 0.14 cfs of 4.82 cfs potential flow)
   ├─2=Exfiltration  (Exfiltration Controls 0.14 cfs)
   └─3=Orifice/Grate  ( Controls 0.00 cfs)
```

Stage-Area-Storage for Pond 3P: Focal Point #1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
26.75	25	0
26.80	25	0
26.85	25	1
26.90	25	1
26.95	25	1
27.00	25	1
27.05	25	2
27.10	25	2
27.15	25	2
27.20	25	2
27.25	25	3
27.30	25	3
27.35	25	3
27.40	25	3
27.45	25	3
27.50	25	4
27.55	25	4
27.60	25	4
27.65	25	4
27.70	25	5
27.75	25	5
27.80	25	5
27.85	25	6
27.90	25	6
27.95	25	6
28.00	25	6
28.05	25	7
28.10	25	7
28.15	25	7
28.20	25	7
28.25	25	8
28.30	25	8
28.35	25	8
28.40	25	8
28.45	25	8
28.50	25	9
28.55	25	9
28.60	25	9
28.65	25	9
28.70	25	10
28.75	25	10
28.80	25	10
28.85	25	11
28.90	25	11
28.95	25	11
29.00	50	11
29.05	54	13
29.10	59	14
29.15	63	16
29.20	68	18
29.25	72	20
29.30	76	23
29.35	81	25
29.40	85	28
29.45	90	31
29.50	94	35
29.55	98	38
29.60	103	42
29.65	107	46
29.70	112	50
29.75	116	55
29.80	120	59
29.85	125	64
29.90	129	69
29.95	134	75
30.00	**138**	**80**

Overflow el. = 29.5
Volume below = 35 cf

Peak el. = 29.14
Volume stored = 16 cf

NEW HAMPSHIRE
DEPARTMENT OF
**Environmental
Services**

GENERAL CALCULATIONS - WQV and WQF
(optional worksheet)

This worksheet may be useful when designing a BMP **that does not fit into one of the specific worksheets already provided** (i.e. for a technology which is not a stormwater wetland, infiltration practice, etc.)

Water Quality Volume (WQV)

0.38	ac	A = Area draining to the practice
0.30	ac	A_I = Impervious area draining to the practice
0.79	decimal	I = Percent impervious area draining to the practice, in decimal form
0.76	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)
0.29	ac-in	WQV= 1” x Rv x A
1,042	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12”)

Water Quality Flow (WQF)

1	inches	P = Amount of rainfall. For WQF in NH, P = 1".
0.76	inches	Q = Water quality depth. Q = WQV/A
98	unitless	CN = Unit peak discharge curve number. CN =1000/(10+5P+10Q–10*[Q^2 + 1.25*Q*P] $^{0.5}$)
0.2	inches	S = Potential maximum retention. S = (1000/CN) - 10
0.048	inches	Ia = Initial abstraction. Ia = 0.2S
6.0	minutes	T_c = Time of Concentration
700.0	cfs/mi^2/in	q_u is the unit peak discharge. Obtain this value from TR-55 exhibits 4-II and 4-III.
0.314	cfs	WQF = q_u x WQV. Conversion: to convert "cfs/mi^2/in * ac-in" to "cfs" multiply by 1mi^2/640ac.

Designer's Notes:
For sizing of Focal Point #2 (Pond 11P) in conjunction with Focal Point design worksheet

DESIGN WORKSHEET

FOCALPOINT

NEW HAMPSHIRE AOT PROJECTS

1. **Determine FocalPoint bed area (minimum 174 sf/acre of impervious area - ex: 0.2 acres = 35 sf) See step 2 to determine if minimum size is appropriate.**
   - Tributary impervious area: = 0.298 ac **(A)**
   - Tributary pervious area: = 0.079 ac **(B)**
   - Minimum FocalPoint bed area required: **= ((A x 1.0) + (B x 0.4)) * 174** = 57 sf
   - FocalPoint bed area provided: = 60 sf
   - Dimensions of proposed FocalPoint: = 10 ft x 6 ft

2. **Model a Type II & III 24-hr rainfall event that generates the water quality volume to demonstrate that the entire storm volume is treated prior to activation of the overflow (typically set at 6 - 12 in above the mulch). Note: a 1.2 - 1.3 in rainfall event usually generates 1.0 in of runoff.**
   Contact ACF for a sample HydroCAD node.
   - Water quality volume (WQv) goal: = 1,042 ft^3
   - Type II & III 24-hr rainfall depth to generate WQv: = 1.33 in
   - Temporary storage depth provided: = 3 in (typically 6 - 12 in)
   - Temporary storage volume provided at above depth: = 45 ft^3
   - Peak ponding depth from Type III 24-hr storm event: = 2.04 in

3. **Size the Harco PVC domed overflow riser.**
   Note: ACF recommends installation of a Fabco domed overflow filter kit for overflow protection.
   - Domed overflow riser diameter: = 18 in
   - Rim elevation of overflow riser: = 38.00 (typically 6 - 12 in above mulch surface)
   - 6 in invert in elevation from FocalPoint: = 34.75 (typically 3 ft below mulch surface)
   - 12 in invert out elevation: = 34.75

4. **Flood control - peak flow attenuation of major storms**
   The treated flow and bypass flow can be routed to a detention system such as an open pond or a subsurface solution like an expanded R-Tank system. (contact ACF for additional information on designing expanded R-Tank systems)

5. **Prepare a landscape plan for the FocalPoint bed area** ☑

6. **Design review and installation oversight by manufacturer's representative**
   - The design has been reviewed by ACF Environmental ☑
   - Engineer will coordinate installation inspection with ACF Environmental ☑

DESIGNING WITH FOCALPOINT IN NEW HAMPSHIRE

The New Hampshire Department of Environmental Services has approved the FocalPoint (High Performance Modular Biofiltration System) for use on AoT site development projects in the State of New Hampshire.

SIZING CRITERIA SUMMARY

- The surface area of the media within FocalPoint must be a minimum of 174 sf per 1.0 acre of impervious area (26 sf per 0.15 acres). The thickness of the media is to be no less than 1.5 ft (18 in).
- The system must be modelled in HydroCAD (or similar TR-55 modeling software) to demonstrate that the entire volume of a 1.22 in Type II or III 24-hr storm is treated prior to activation of the bypass/overflow (typically set at 6 - 12 in above the mulch surface). Note: A 1.22 in rainfall event typically generates 1.0 in of runoff.
- The R-Tank modular underdrain can be expanded beyond the footprint of the FocalPoint media bed for expanded infiltration and peak flow attenuation/detention post treatment.

FOCALPOINT SYSTEMS:

FOCALPOINT ACCESSORIES:

Pretreatment - Rain Guardian Turret

Pretreatment - Rain Guardian Foxhole

Pretreatment - PreTx

Bypass protection - Domed overflow with filter insert

For additional information please visit: www.acfenvironmental.com

Contact Rob Woodman - Senior Stormwater Engineer
Cell: 207.272.4431 | Email: rwoodman@acfenv.com

Summary for Pond 10P: Focal Point #2

[90] Warning: Qout>Qin may require smaller dt or Finer Routing
[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=6)

```
Inflow Area =       0.377 ac,  79.03% Impervious,  Inflow Depth =  0.72"    for  FP2 WQF event
Inflow      =       0.31 cfs @  12.09 hrs,  Volume=         0.023 af
Outflow     =       0.32 cfs @  12.12 hrs,  Volume=         0.023 af,  Atten= 0%,  Lag= 1.7 min
Primary     =       0.32 cfs @  12.12 hrs,  Volume=         0.023 af
    Routed to Pond DMH2 : Drain Manhole 2
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 37.92' @ 12.12 hrs Surf.Area= 138 sf Storage= 39 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.8 min (828.1 - 827.3)

37.92-37.75 = 0.17 ft *
(12 in/ft) = 2.04 in

Volume	Invert	Avail.Storage	Storage Description
#1	35.50'	27 cf	**4.00'W x 15.00'L x 2.25'H Focal Point** 135 cf Overall x 20.0% Voids
#2	37.75'	77 cf	**Surface Bowl (Prismatic)**Listed below (Recalc)
		104 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
37.75	60	0	0
38.00	86	18	18
38.50	148	59	77

Device	Routing	Invert	Outlet Devices
#1	Primary	34.75'	**12.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 34.75' / 34.50' S= 0.0250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	35.50'	**100.000 in/hr Exfiltration over Surface area** Phase-In= 0.10'
#3	Device 1	38.00'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.30 cfs @ 12.12 hrs HW=37.85' TW=34.67' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.30 cfs of 4.81 cfs potential flow)
  ↑**2=Exfiltration** (Exfiltration Controls 0.30 cfs)
  3=Orifice/Grate (Controls 0.00 cfs)

Stage-Area-Storage for Pond 10P: Focal Point #2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
35.50	60	0
35.55	60	1
35.60	60	1
35.65	60	2
35.70	60	2
35.75	60	3
35.80	60	4
35.85	60	4
35.90	60	5
35.95	60	5
36.00	60	6
36.05	60	7
36.10	60	7
36.15	60	8
36.20	60	8
36.25	60	9
36.30	60	10
36.35	60	10
36.40	60	11
36.45	60	11
36.50	60	12
36.55	60	13
36.60	60	13
36.65	60	14
36.70	60	14
36.75	60	15
36.80	60	16
36.85	60	16
36.90	60	17
36.95	60	17
37.00	60	18
37.05	60	19
37.10	60	19
37.15	60	20
37.20	60	20
37.25	60	21
37.30	60	22
37.35	60	22
37.40	60	23
37.45	60	23
37.50	60	24
37.55	60	25
37.60	60	25
37.65	60	26
37.70	60	26
37.75	120	27
37.80	125	30
37.85	130	34
37.90	136	37
37.95	141	41
38.00	146	45
38.05	152	50
38.10	158	54
38.15	165	60
38.20	171	65
38.25	177	71
38.30	183	77
38.35	189	83
38.40	196	90
38.45	202	97
38.50	**208**	**104**

Peak el. = 37.92
Volume stored = 39 cf

Overflow el. = 38.0
Volume below = 45 cf

NEW HAMPSHIRE
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GENERAL CALCULATIONS - WQV and WQF
(optional worksheet)

This worksheet may be useful when designing a BMP **that does not fit into one of the specific worksheets already provided** (i.e. for a technology which is not a stormwater wetland, infiltration practice, etc.)

Water Quality Volume (WQV)

0.23	ac	A = Area draining to the practice
0.21	ac	A_I = Impervious area draining to the practice
0.92	decimal	I = Percent impervious area draining to the practice, in decimal form
0.88	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)
0.20	ac-in	WQV= 1” x Rv x A
740	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12”)

Water Quality Flow (WQF)

1	inches	P = Amount of rainfall. For WQF in NH, P = 1".
0.88	inches	Q = Water quality depth. Q = WQV/A
99	unitless	CN = Unit peak discharge curve number. CN =1000/(10+5P+10Q–10*[Q^2 + 1.25*Q*P] $^{0.5}$)
0.1	inches	S = Potential maximum retention. S = (1000/CN) - 10
0.022	inches	Ia = Initial abstraction. Ia = 0.2S
6.0	minutes	T_c = Time of Concentration
700.0	cfs/mi^2/in	q_u is the unit peak discharge. Obtain this value from TR-55 exhibits 4-II and 4-III.
0.223	cfs	WQF = q_u x WQV. Conversion: to convert "cfs/mi^2/in * ac-in" to "cfs" multiply by 1mi^2/640ac.

Designer's Notes:
For sizing of Jellyfish #1 (12P). See detail sheet within plan set.

NEW HAMPSHIRE
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GENERAL CALCULATIONS - WQV and WQF
(optional worksheet)

This worksheet may be useful when designing a BMP **that does not fit into one of the specific worksheets already provided** (i.e. for a technology which is not a stormwater wetland, infiltration practice, etc.)

Water Quality Volume (WQV)

0.21	ac	A = Area draining to the practice
0.20	ac	A_I = Impervious area draining to the practice
0.94	decimal	I = Percent impervious area draining to the practice, in decimal form
0.90	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)
0.19	ac-in	WQV= 1” x Rv x A
686	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12”)

Water Quality Flow (WQF)

1	inches	P = Amount of rainfall. For WQF in NH, P = 1".
0.90	inches	Q = Water quality depth. Q = WQV/A
99	unitless	CN = Unit peak discharge curve number. CN =1000/(10+5P+10Q–10*[Q^2 + 1.25*Q*P] $^{0.5}$)
0.1	inches	S = Potential maximum retention. S = (1000/CN) - 10
0.019	inches	Ia = Initial abstraction. Ia = 0.2S
6.0	minutes	T_c = Time of Concentration
700.0	cfs/mi^2/in	q_u is the unit peak discharge. Obtain this value from TR-55 exhibits 4-II and 4-III.
0.207	cfs	WQF = q_u x WQV. Conversion: to convert "cfs/mi^2/in * ac-in" to "cfs" multiply by 1mi^2/640ac.

Designer's Notes:

For sizing of Jellyfish #1 (15P). See detail sheet within plan set.

NEW HAMPSHIRE
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GROUNDWATER RECHARGE VOLULME (GRV) CALCULATION
(Env-Wq 1507.04)

	ac	Area of HSG A soil that was replaced by impervious cover	0.40"
	ac	Area of HSG B soil that was replaced by impervious cover	0.25"
1.81	ac	Area of HSG C soil that was replaced by impervious cover	0.10"
	ac	Area of HSG D soil or impervious cover that was replaced by impervious cover	0.0"
0.10	inches	Rd = Weighted groundwater recharge depth	
0.1809	ac-in	GRV = AI * Rd	
657	cf	GRV conversion (ac-in x 43,560 sf/ac x 1ft/12”)	

Provide calculations below showing that the project meets the groundwater recharge requirements (Env-Wq 1507.04):

Chamber System A: 3,600 cf storage below overflow & designed for infiltration

Chamber System B: 2,130 cf storage below overflow & designed for infiltration

GRV provided = 3600+2130 = 5,730 cf >>> 657 cf required

Stage-Area-Storage for Pond 2P: Infiltration System A

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
28.00	**1,008**	0
28.10	1,008	90
28.20	1,008	180
28.30	1,008	270
28.40	1,008	360
28.50	1,008	450
28.60	1,008	540
28.70	1,008	630
28.80	1,008	720
28.90	1,008	810
29.00	1,008	900
29.10	1,008	990
29.20	1,008	1,080
29.30	1,008	1,170
29.40	1,008	1,260
29.50	1,008	1,350
29.60	1,008	1,440
29.70	1,008	1,530
29.80	1,008	1,620
29.90	1,008	1,710
30.00	1,008	1,800
30.10	1,008	1,890
30.20	1,008	1,980
30.30	1,008	2,070
30.40	1,008	2,160
30.50	1,008	2,250
30.60	1,008	2,340
30.70	1,008	2,430
30.80	1,008	2,520
30.90	1,008	2,610
31.00	1,008	2,700
31.10	1,008	2,790
31.20	1,008	2,880
31.30	1,008	2,970
31.40	1,008	3,060
31.50	1,008	3,150
31.60	1,008	3,240
31.70	1,008	3,330
31.80	1,008	3,420
31.90	1,008	3,510
32.00	1,008	3,600
32.10	1,008	3,690
32.20	1,008	3,780
32.30	1,008	3,870
32.40	1,008	3,960
32.50	1,008	4,050
32.60	1,008	4,140
32.70	1,008	4,230
32.80	1,008	4,320
32.90	1,008	4,410
33.00	1,008	**4,500**
33.10	1,008	4,500
33.20	1,008	4,500
33.30	1,008	4,500
33.40	1,008	4,500
33.50	1,008	4,500
33.60	1,008	4,500

Overflow el. = 32.0
3,600 cf GRV below

Stage-Area-Storage for Pond 4P: Infiltration System B

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
23.25	**672**	0
23.30	672	30
23.35	672	60
23.40	672	90
23.45	672	120
23.50	672	150
23.55	672	180
23.60	672	210
23.65	672	240
23.70	672	270
23.75	672	300
23.80	672	330
23.85	672	360
23.90	672	390
23.95	672	420
24.00	672	450
24.05	672	480
24.10	672	510
24.15	672	540
24.20	672	570
24.25	672	600
24.30	672	630
24.35	672	660
24.40	672	690
24.45	672	720
24.50	672	750
24.55	672	780
24.60	672	810
24.65	672	840
24.70	672	870
24.75	672	900
24.80	672	930
24.85	672	960
24.90	672	990
24.95	672	1,020
25.00	672	1,050
25.05	672	1,080
25.10	672	1,110
25.15	672	1,140
25.20	672	1,170
25.25	672	1,200
25.30	672	1,230
25.35	672	1,260
25.40	672	1,290
25.45	672	1,320
25.50	672	1,350
25.55	672	1,380
25.60	672	1,410
25.65	672	1,440
25.70	672	1,470
25.75	672	1,500
25.80	672	1,530
25.85	672	1,560
25.90	672	1,590
25.95	672	1,620
26.00	672	1,650
26.05	672	1,680
26.10	672	1,710
26.15	672	1,740
26.20	672	1,770
26.25	672	1,800
26.30	672	1,830
26.35	672	1,860
26.40	672	1,890
26.45	672	1,920
26.50	672	1,950
26.55	672	1,980
26.60	672	2,010
26.65	672	2,040
26.70	672	2,070
26.75	672	2,100
26.80	672	2,130
26.85	672	2,160
26.90	672	2,190
26.95	672	2,220
27.00	672	2,250
27.05	672	2,280
27.10	672	2,310
27.15	672	2,340
27.20	672	2,370
27.25	672	**2,400**
27.30	672	**2,400**
27.35	672	2,400
27.40	672	2,400
27.45	672	2,400
27.50	672	2,400
27.55	672	2,400
27.60	672	2,400
27.65	672	2,400
27.70	672	2,400
27.75	672	2,400
27.80	672	2,400
27.85	672	2,400
27.90	672	2,400

Overflow el. = 26.8
2,130 cf GRV below

APPENDIX IX

Infiltration Testing Data

AMOOZEMETER DATA SHEET

JONES&BEA H
ENGINEERS C.

Project #: 24029
Test Pit #: 6010
Permeameter Test #: 1/3
Date: 10/24/24
Location: Exeter
Soil Map Unit Series: Scitico
Horizon: B / [✓ C] (circle one)

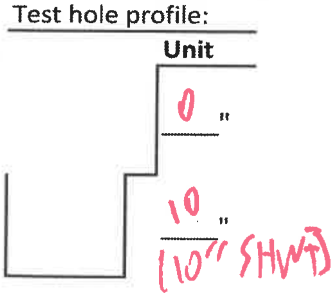
Outflow Chamber(s) Used (circle one) :
Associated Conversion Factor:

Small ("1 on") (= 20.0cm^2) [✓ **Both ("2 on")** (= 105.0 cm^2)]

Used constant for One tube – '2 on' was producing unrealistic results (typ.)

Data Collection Interval (circle one) :

30 Sec. [✓ **1 Min.**] **2 Min.**



Test hole profile:
Unit
0 "
10 "
(10" SHWT)

Calculation Formulas:

D = (AxB)/C
E = D x 0.001056
F = E / 2.54

Notes: Mulitply "D" by 0.001056 for a conversion from cm^3/hr to cm/hr
Multiply "E" by 0.393701 for conversion fro cm/hr to in/hr

AMOOZEMETER DATA SHEET

JONES&BEACH
ENGINEERS, INC.

Project #: 24029
Test Pit #: 6010
Permeameter Test #: 2/3
Date: 10/24/24
Location: Exeter
Soil Map Unit Series: Scitico
Horizon: B / [✓ C] (circle one)

Outflow Chamber(s) Used (circle one) :
Associated Conversion Factor:

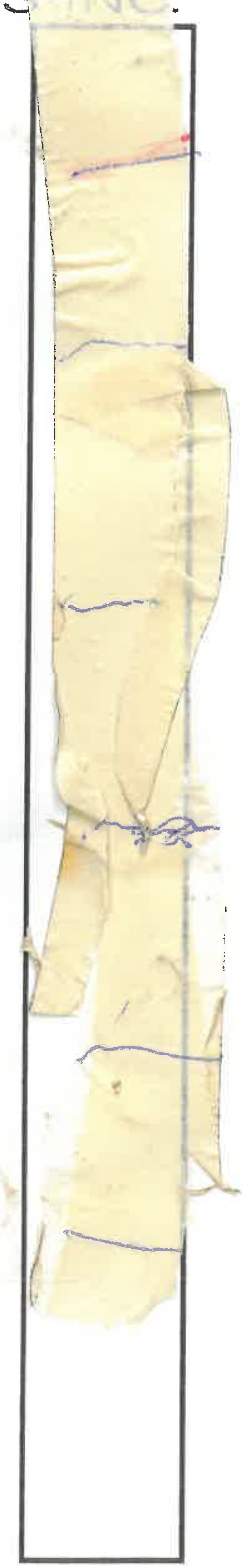
Small ("1 on") **(= 20.0cm^2)** [✓ **Both ("2 on")** **(= 105.0 cm^2)**]

Used constant for one tube - 2 on' was producing unrealistic results (typ.)

Data Collection Interval (circle one) :

30 Sec. [✓ **1 Min.**] **2 Min.**

Test hole profile:



Calculation Formulas:

D = (AxB)/C
E = D x 0.001056
F = E / 2.54

Notes: Mulitply "D" by 0.001056 for a conversion from cm^3/hr to cm/hr
Multiply "E" by 0.393701 for conversion fro cm/hr to in/hr

AMOOZEMETER DATA SHEET

JONES&BEACH ENGINEERS INC.

Project #: 24029
Test Pit #: 601
Permeameter Test #: 3/3
Date: 10/24/24
Location: Exeter
Soil Map Unit Series: Suited
Horizon: B / [✓ C] (circle one)

Outflow Chamber(s) Used (circle one) :
Associated Conversion Factor:

Small ("1 on")
(= 20.0cm^2)

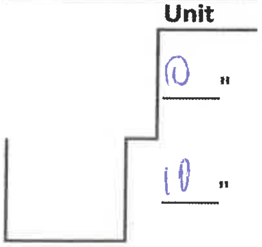
Both ("2 on")
(= 105.0 cm^2)

Used constant for One tube - 1/2 on' was producing unrealistic results (typ.)

Data Collection Interval (circle one) :

30 Sec. **1 Min.** **2 Min.**

Test hole profile:



Calculation Formulas:

D = (AxB)/C
E = D x 0.001056
F = E / 2.54

Notes: Mulitply "D" by 0.001056 for a conversion from cm^3/hr to cm/hr
Multiply "E" by 0.393701 for conversion fro cm/hr to in/hr

AMOOZEMETER DATA SHEET

JONES&BEACH
ENGINEERS INC.

Project #: 24029
Test Pit #: 6007
Permeameter Test #: 1/3
Date: 10/29/24
Location: Exeter
Soil Map Unit Series: Scitico
Horizon: B / [✓ C] (circle one)

Outflow Chamber(s) Used (circle one) :
Associated Conversion Factor:

Small ("1 on") (= 20.0cm^2)   [✓ **Both ("2 on")** (= 105.0 cm^2)]

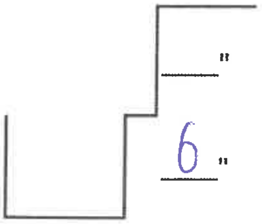
Used constant for one tube - "2 on" was producing unrealistic results (typ.)

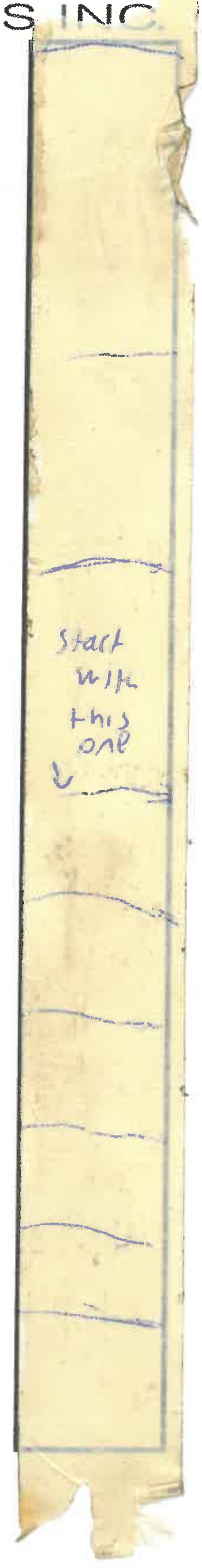
Data Collection Interval (circle one) :

[✓ **30 Sec.**]   **1 Min.**   **2 Min.**

Test hole profile:

Unit





Calculation Formulas:

D = (AxB)/C
E = D x 0.001056
F = E / 2.54

Notes: Mulitply "D" by 0.001056 for a conversion from cm^3/hr to cm/hr
Multiply "E" by 0.393701 for conversion fro cm/hr to in/hr

AMOOZEMETER DATA SHEET

JONES&BEACH
ENGINEERS INC

Project #: 24029
Test Pit #: 6007
Permeameter Test #: 2/3
Date: 10/24/24
Location: Exeter
Soil Map Unit Series: Boxford
Horizon: B / [✓ C] (circle one)

Outflow Chamber(s) Used (circle one) :
Associated Conversion Factor:

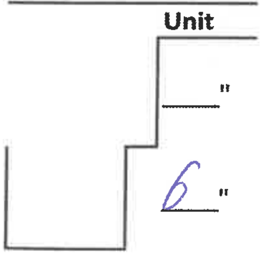
Small ("1 on") (= $20.0cm^2$) [✓ **Both ("2 on")** (= 105.0 cm^2)]

Used constant for one tube - '2 on' was producing unrealistic results (typ.)

Data Collection Interval (circle one) :

[✓ **30 Sec.**] **1 Min.** **2 Min.**

Test hole profile:



Calculation Formulas:

D = (AxB)/C
E = D x 0.001056
F = E / 2.54

Notes: Mulitply "D" by 0.001056 for a conversion from cm^3/hr to cm/hr
Multiply "E" by 0.393701 for conversion fro cm/hr to in/hr

AMOOZEMETER DATA SHEET

JONES&BEACH
ENGINEERS

Project #: 24029
Test Pit #: 6007
Permeameter Test #: 3/3
Date: 10/24/24
Location: Exeter
Soil Map Unit Series: Boxford
Horizon: B / [✓ C] (circle one)

◆

Outflow Chamber(s) Used (circle one) :
Associated Conversion Factor:

Small ("1 on") **(= 20.0cm^2)**

[✓ **Both ("2 on")** **(= 105.0 cm^2)**]

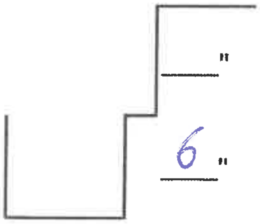
Used constant for one tube - '2 on' was producing unrealistic results (typ.)

Data Collection Interval (circle one) :

[✓ **30 Sec.**] **1 Min.** **2 Min.**

Test hole profile:

Unit



Calculation Formulas:

D = (AxB)/C
E = D x 0.001056
F = E / 2.54

Notes: Mulitply "D" by 0.001056 for a conversion from cm^3/hr to cm/hr
Multiply "E" by 0.393701 for conversion fro cm/hr to in/hr

AMOOZEMETER DATA SHEET

Project #: 24029
Test Pit #: 6001
Permeameter Test #: 1/3
Date: 10/24/24
Location: Bethel
Soil Map Unit Series: Boxford
Horizon: B / [✓ C] (circle one)

Outflow Chamber(s) Used (circle one) :
Associated Conversion Factor:

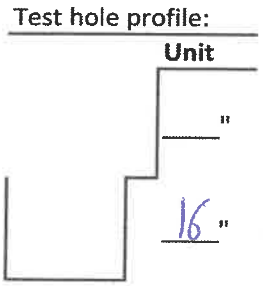
Small ("1 on") **(= 20.0cm^2)**

[✓ **Both ("2 on")** **(= 105.0 cm^2)**]

Used constant for one tube - '2 on' was producing unrealistic results (typ.)

Data Collection Interval (circle one) :

[✓ **30 Sec.**] **1 Min.** **2 Min.**



Calculation Formulas:

D = (AxB)/C
E = D x 0.001056
F = E / 2.54

Notes: Mulitply "D" by 0.001056 for a conversion from cm^3/hr to cm/hr
Multiply "E" by 0.393701 for conversion fro cm/hr to in/hr

AMOOZEMETER DATA SHEET

JONES&BEACH
ENGINEERS INC.

Project #: 24029
Test Pit #: 6001
Permeameter Test #: 2/3
Date: 10/24/24
Location: Exeter
Soil Map Unit Series: Boxford
Horizon: B / [✓ C] (circle one)

Outflow Chamber(s) Used (circle one) :
Associated Conversion Factor:

Small ("1 on") **(= 20.0cm^2)**

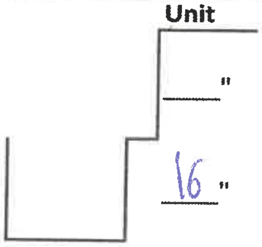
Both ("2 on") **(= 105.0 cm^2)**

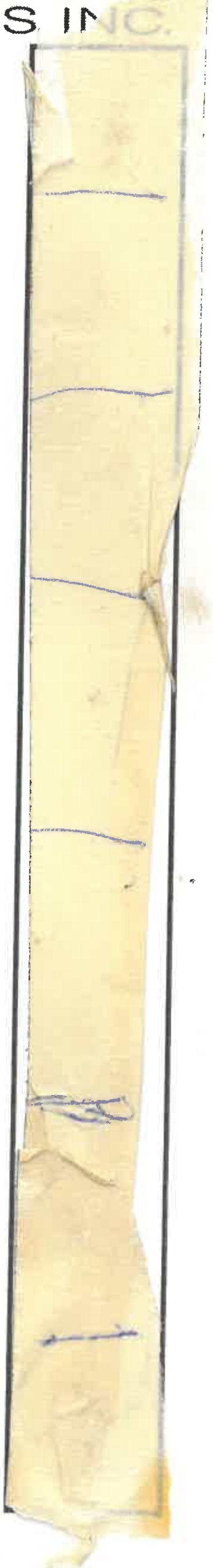
Used constant for one tube - '2 on' was producing unrealistic results (typ.)

Data Collection Interval (circle one) :

[✓ **30 Sec.**] **1 Min.** **2 Min.**

Test hole profile:





Calculation Formulas:

D = (AxB)/C
E = D x 0.001056
F = E / 2.54

Notes: Mulitply "D" by 0.001056 for a conversion from cm^3/hr to cm/hr
Multiply "E" by 0.393701 for conversion fro cm/hr to in/hr

AMOOZEMETER DATA SHEET

JONES&BEACH
ENGINEERS INC.

Project #: 24029
Test Pit #: 6001
Permeameter Test #: 3/3
Date: 10/24/24
Location: Exeter
Soil Map Unit Series: Boxford
Horizon: B / [✓ C] (circle one)

Outflow Chamber(s) Used (circle one) :
Associated Conversion Factor:

Small ("1 on")
(= 20.0cm^2)

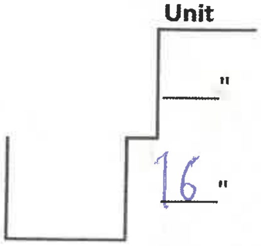
Both ("2 on")
(= 105.0 cm^2)

Used constant for one tube - '2 on' was producing unrealistic results (typ.)

Data Collection Interval (circle one) :

[✓ **30 Sec.**] **1 Min.** **2 Min.**

Test hole profile:



Calculation Formulas:

D = (AxB)/C

E = D x 0.001056

F = E / 2.54

Notes: Mulitply "D" by 0.001056 for a conversion from cm^3/hr to cm/hr

Multiply "E" by 0.393701 for conversion fro cm/hr to in/hr

TP 6010 - Test #1

Height	Constant	Time		Outflow	Rate (K_{sat})	
cm	cm^2	Minutes	Hours	cm^3/hr	cm/hr	in/hr
0						
12	20	1	0.016667	14400.0	15.2064	5.9868
19.2	20	2	0.033333	11520.0	12.1651	4.7894
24	20	3	0.05	9600.0	10.1376	3.9912

Outlier due to experimental error - Discard this test

Mean	**4.9225**
σ (Std. Dev.)	**0.8201**

Constant	20	cm^2
Glover Coefficient:	0.001056	1/cm^2

Calculations:

Constant = 20 cm^2 for one tube, 105 cm^2 for two tubes two tubes used)

Hours = Minutes / 60

Outflow = (Height*Constant)/Hours

Ksat = Outflow*Glover Coefficient

Average of Tests 2&3 = 2.0 iph

With factor of safety of two = **1.0** iph

TP 6010 - Test #2

Height	Constant	Time		Outflow	Rate (K_{sat})	
cm	cm^2	Minutes	Hours	cm^3/hr	cm/hr	in/hr
0						
2.8	20	1	0.016667	3360.0	3.5482	1.3969
6.1	20	2	0.033333	3660.0	3.8650	1.5216
9.3	20	3	0.05	3720.0	3.9283	1.5466
12.4	20	4	0.066667	3720.0	3.9283	1.5466
15	20	5	0.083333	3600.0	3.8016	1.4967

Constant	20 cm^2
Glover Coefficient:	0.001056 1/cm^2

Mean	**1.5017**
σ (Std. Dev.)	**0.0655**

Calculations:

Constant = 20 cm^2 for one tube, 105 cm^2 for two tubes (two tubes used)

Hours = Minutes / 60

Outflow = (Height*Constant)/Hours

Ksat = Outflow*Glover Coefficient

Average of Tests 2&3 = 2.0 iph

With factor of safety of two = **1.0** iph

TP 6010 - Test 3

Height	Constant	Time		Outflow	Rate (K_{sat})	
cm	cm^2	Minutes	Hours	cm^3/hr	cm/hr	in/hr
0						
5.8	20	1	0.016667	6960.0	7.3498	2.8936
11.3	20	2	0.033333	6780.0	7.1597	2.8188
17.1	20	3	0.05	6840.0	7.2230	2.8437
21.4	20	4	0.066667	6420.0	6.7795	2.6691
15	20	5	0.083333	3600.0	3.8016	1.4967

Mean	**2.5444**
σ (Std. Dev.)	**0.0311**

Constant	20	cm^2
Glover Coefficient:	0.001056	1/cm^2

Calculations:

Constant = 20 cm^2 for one tube, 105 cm^2 for two tubes (two tubes used)

Hours = Minutes / 60

Outflow = (Height*Constant)/Hours

Ksat = Outflow*Glover Coefficient

Average of Tests 2&3 = 2.0 iph

With factor of safety of two = **1.0** iph

TP 6007 - Test 1

Height	Constant	Time		Outflow	Rate (K_{sat})	
cm	cm^2	Minutes	Hours	cm^3/hr	cm/hr	in/hr
0						
2	20	0.5	0.008333	4800.0	5.0688	1.9956
3.7	20	1	0.016667	4440.0	4.6886	1.8459
5.4	20	1.5	0.025	4320.0	4.5619	1.7960
6.6	20	2	0.033333	3960.0	4.1818	1.6464
8.1	20	2.5	0.041667	3888.0	4.1057	1.6164

Mean	**1.7801**
σ (Std. Dev.)	**0.0848**

Constant	20	cm^2
Glover Coefficient:	0.001056	$1/cm^2$

Calculations:

Constant = 20 cm^2 for one tube, 105 cm^2 for two tubes (two tubes used)

Hours = Minutes / 60

Outflow = (Height*Constant)/Hours

Ksat = Outflow*Glover Coefficient

Average mean Ksat =	2.9	iph
With factor of safety of two =	**1.45**	iph

TP 6007 - Test 2

Height	Constant	Time		Outflow	Rate (K_{sat})	
cm	cm^2	Minutes	Hours	cm^3/hr	cm/hr	in/hr
0						
3.8	20	0.5	0.008333	9120.0	9.6307	3.7916
7.5	20	1	0.016667	9000.0	9.5040	3.7417
9.8	20	1.5	0.025	7840.0	8.2790	3.2595
12.5	20	2	0.033333	7500.0	7.9200	3.1181
15.6	20	2.5	0.041667	7488.0	7.9073	3.1131

Mean	**3.4048**
σ (Std. Dev.)	**0.2400**

Constant	20	cm^2
Glover Coefficient:	0.001056	$1/cm^2$

Calculations:

Constant = 20 cm^2 for one tube, 105 cm^2 for two tubes (two tubes used)

Hours = Minutes / 60

Outflow = (Height*Constant)/Hours

Ksat = Outflow*Glover Coefficient

Average mean Ksat = 2.9 iph

With factor of safety of two = **1.45** iph

TP 6007 - Test 3

Height	Constant	Time		Outflow	Rate (K_{sat})	
cm	cm^2	Minutes	Hours	cm^3/hr	cm/hr	in/hr
0						
3.9	20	0.5	0.008333	9360.0	9.8842	3.8914
7.1	20	1	0.016667	8520.0	8.9971	3.5422
10.6	20	1.5	0.025	8480.0	8.9549	3.5255
14.4	20	2	0.033333	8640.0	9.1238	3.5921
17.5	20	2.5	0.041667	8400.0	8.8704	3.4923

Mean	**3.6087**
σ (Std. Dev.)	**0.1687**

Constant	20	cm^2
Glover Coefficient:	0.001056	$1/cm^2$

Calculations:

Constant = 20 cm^2 for one tube, 105 cm^2 for two tubes (two tubes used)

Hours = Minutes / 60

Outflow = (Height*Constant)/Hours

Ksat = Outflow*Glover Coefficient

Average mean Ksat =	2.9	iph
With factor of safety of two =	**1.45**	iph

TP 6001 - Test 1

Height	Constant	Time		Outflow	Rate (K_{sat})	
cm	cm^2	Minutes	Hours	cm^3/hr	cm/hr	in/hr
0						
3.9	20	0.5	0.008333	9360.0	9.8842	3.8914
6.7	20	1	0.016667	8040.0	8.4902	3.3426
9.8	20	1.5	0.025	7840.0	8.2790	3.2595
13.1	20	2	0.033333	7860.0	8.3002	3.2678
16.5	20	2.5	0.041667	7920.0	8.3635	3.2927

Mean	**3.4108**
σ (Std. Dev.)	**0.2804**

Constant	20	cm^2
Glover Coefficient:	0.001056	$1/cm^2$

Calculations:

Constant = 20 cm^2 for one tube, 105 cm^2 for two tubes (two tubes used)

Hours = Minutes / 60

Outflow = (Height*Constant)/Hours

Ksat = Outflow*Glover Coefficient

Average mean Ksat = 3.3 iph

With factor of safety of two = **1.65** iph

TP 6001 - Test 2

Height	Constant	Time		Outflow	Rate (K_{sat})	
cm	cm^2	Minutes	Hours	cm^3/hr	cm/hr	in/hr
0						
3	20	0.5	0.008333	7200.0	7.6032	2.9934
5.8	20	1	0.016667	6960.0	7.3498	2.8936
9.1	20	1.5	0.025	7280.0	7.6877	3.0266
13	20	2	0.033333	7800.0	8.2368	3.2428
16.1	20	2.5	0.041667	7728.0	8.1608	3.2129

Mean	**3.0739**
σ (Std. Dev.)	**0.0565**

Constant	20	cm^2
Glover Coefficient:	0.001056	$1/cm^2$

Calculations:

Constant = 20 cm^2 for one tube, 105 cm^2 for two tubes (two tubes used)

Hours = Minutes / 60

Outflow = (Height*Constant)/Hours

Ksat = Outflow*Glover Coefficient

Average mean Ksat = 3.3 iph

With factor of safety of two = **1.65** iph

TP 6001 - Test 3

Height	Constant	Time		Outflow	Rate (K_{sat})	
cm	cm^2	Minutes	Hours	cm^3/hr	cm/hr	in/hr
0						
3.8	20	0.5	0.008333	9120.0	9.6307	3.7916
6.8	20	1	0.016667	8160.0	8.6170	3.3925
10.1	20	1.5	0.025	8080.0	8.5325	3.3592
13.7	20	2	0.033333	8220.0	8.6803	3.4174
17.2	20	2.5	0.041667	8256.0	8.7183	3.4324

Mean	**3.4786**
σ (Std. Dev.)	**0.1965**

Constant	20	cm^2
Glover Coefficient:	0.001056	$1/cm^2$

Calculations:

Constant = 20 cm^2 for one tube, 105 cm^2 for two tubes (two tubes used)

Hours = Minutes / 60

Outflow = (Height*Constant)/Hours

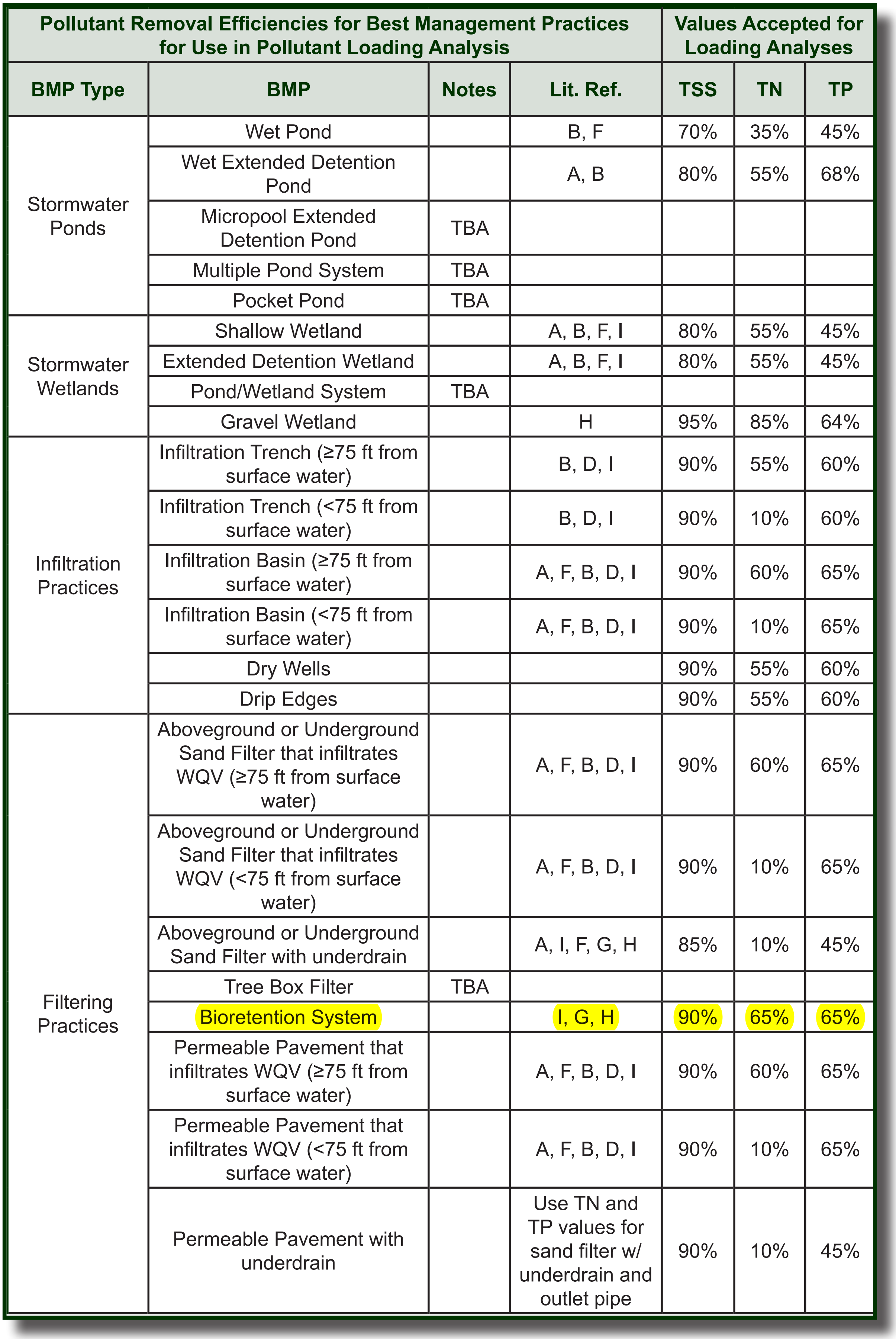
Ksat = Outflow*Glover Coefficient

Average mean Ksat = 3.3 iph

With factor of safety of two = **1.65** iph

APPENDIX X

BMP Pollutant Removal Information



Pollutant Removal Efficiencies for Best Management Practices for Use in Pollutant Loading Analysis				Values Accepted for Loading Analyses		
BMP Type	**BMP**	**Notes**	**Lit. Ref.**	**TSS**	**TN**	**TP**
Stormwater Ponds	Wet Pond		B, F	70%	35%	45%
	Wet Extended Detention Pond		A, B	80%	55%	68%
	Micropool Extended Detention Pond	TBA				
	Multiple Pond System	TBA				
	Pocket Pond	TBA				
Stormwater Wetlands	Shallow Wetland		A, B, F, I	80%	55%	45%
	Extended Detention Wetland		A, B, F, I	80%	55%	45%
	Pond/Wetland System	TBA				
	Gravel Wetland		H	95%	85%	64%
Infiltration Practices	Infiltration Trench (≥75 ft from surface water)		B, D, I	90%	55%	60%
	Infiltration Trench (<75 ft from surface water)		B, D, I	90%	10%	60%
	Infiltration Basin (≥75 ft from surface water)		A, F, B, D, I	90%	60%	65%
	Infiltration Basin (<75 ft from surface water)		A, F, B, D, I	90%	10%	65%
	Dry Wells			90%	55%	60%
	Drip Edges			90%	55%	60%
Filtering Practices	Aboveground or Underground Sand Filter that infiltrates WQV (≥75 ft from surface water)		A, F, B, D, I	90%	60%	65%
	Aboveground or Underground Sand Filter that infiltrates WQV (<75 ft from surface water)		A, F, B, D, I	90%	10%	65%
	Aboveground or Underground Sand Filter with underdrain		A, I, F, G, H	85%	10%	45%
	Tree Box Filter	TBA				
	Bioretention System		I, G, H	90%	65%	65%
	Permeable Pavement that infiltrates WQV (≥75 ft from surface water)		A, F, B, D, I	90%	60%	65%
	Permeable Pavement that infiltrates WQV (<75 ft from surface water)		A, F, B, D, I	90%	10%	65%
	Permeable Pavement with underdrain		Use TN and TP values for sand filter w/ underdrain and outlet pipe	90%	10%	45%

Pollutant Removal Efficiencies for Best Management Practices for Use in Pollutant Loading Analysis				Values Accepted for Loading Analyses		
BMP Type	**BMP**	**Notes**	**Lit. Ref.**	**TSS**	**TN**	**TP**
Treatment Swales	Flow Through Treatment Swale	TBA				
Vegetated Buffers	Vegetated Buffers		A, B, I	73%	40%	45%
Pre-Treatment Practices	Sediment Forebay	TBA				
	Vegetated Filter Strip		A, B, I	73%	40%	45%
	Vegetated Swale		A, B, C, F, H, I	65%	20%	25%
	Flow-Through Device - Hydrodynamic Separator		A, B, G, H	35%	10%	5%
	Flow-Through Device - ADS Underground Multichamber Water Quality Unit (WQU)		G, H	72%	10%	9%
	Other Flow-Through Devices	TBA				
	Off-line Deep Sump Catch Basin		J, K, L, M	15%	5%	5%

REGION 1
BOSTON, MA 02109

Dated by Signature

MEMORANDUM

SUBJECT: FocalPoint Crediting Direction

FROM: Damien Houlihan, Stormwater Permits Section
Water Division

TO: Robert J. Woodman
Director - Engineering and Green Stormwater Infrastructure
Ferguson Waterworks

On June 7, 2021, Ferguson Waterworks (Ferguson) submitted a request to EPA Region 1 regarding the use of the FocalPoint biofiltration system (also known also as the High Performance Modular Biofiltration System, hereinafter “FocalPoint biofiltration system”). Based on the review of documents submitted by Ferguson, EPA Region 1 finds that entities wishing to deploy the FocalPoint biofiltration system may calculate phosphorus and nitrogen reductions under the 2016 Massachusetts Municipal Separate Storm Sewer Permit (MA MS4 Permit) and the 2017 New Hampshire Municipal Separate Storm Sewer Permit (NH MS4 Permit) using the performance quantification for Enhanced Biofiltration found on Table 3-20 and Figure 3-15 of Attachment 3 to Appendix F of the MA MS4 permit and Table 3-20 and Figure 3-15 of Attachment 3 to Appendix F of the NH MS4 permit (also attached to this document for reference) provided the following standard FocalPoint design requirements and other conditions are met:

1. Ferguson’s FocalPoint biofiltration systems are to be designed with pretreatment to remove coarse sediment and debris before they reach and prematurely close the filter bed. Pretreatment measures must be designed to dissipate velocities and spread water out over a 2 to 4 ft width.
2. Ferguson’s FocalPoint biofiltration systems are to be designed with a minimum and maximum surface ponding depths of 3 inches and 18 inches, respectively.
3. Ferguson’s FocalPoint biofiltration systems are to be separated or otherwise isolated from the groundwater table to ensure that groundwater does not inundate the filter bed either using an impermeable liner or physical separation.
4. Ferguson’s FocalPoint biofiltration systems are to be designed such that the system bed area is sized to be a minimum of 174 square feet per acre of tributary area. Stormwater modelling software shall be used to demonstrate that the runoff volume goal is treated prior to bypass.
5. System maintenance of Ferguson’s FocalPoint biofiltration systems should occur once every 6 months, at a minimum, and filter media and pretreatment measures shall be replaced such that the performance of the systems are maintained as originally designed.

6. Stormwater quality monitoring must be used to ensure system performance has not declined over time. EPA recommends this monitoring commence once the filter bed media reaches two (2) years in age to ensure system performance has not declined. All monitoring data must be submitted to EPA by the entity claiming pollution reduction credit for the FocalPoint biofiltration system and filter media shall be replaced if monitoring data shows a decline in performance from original design.

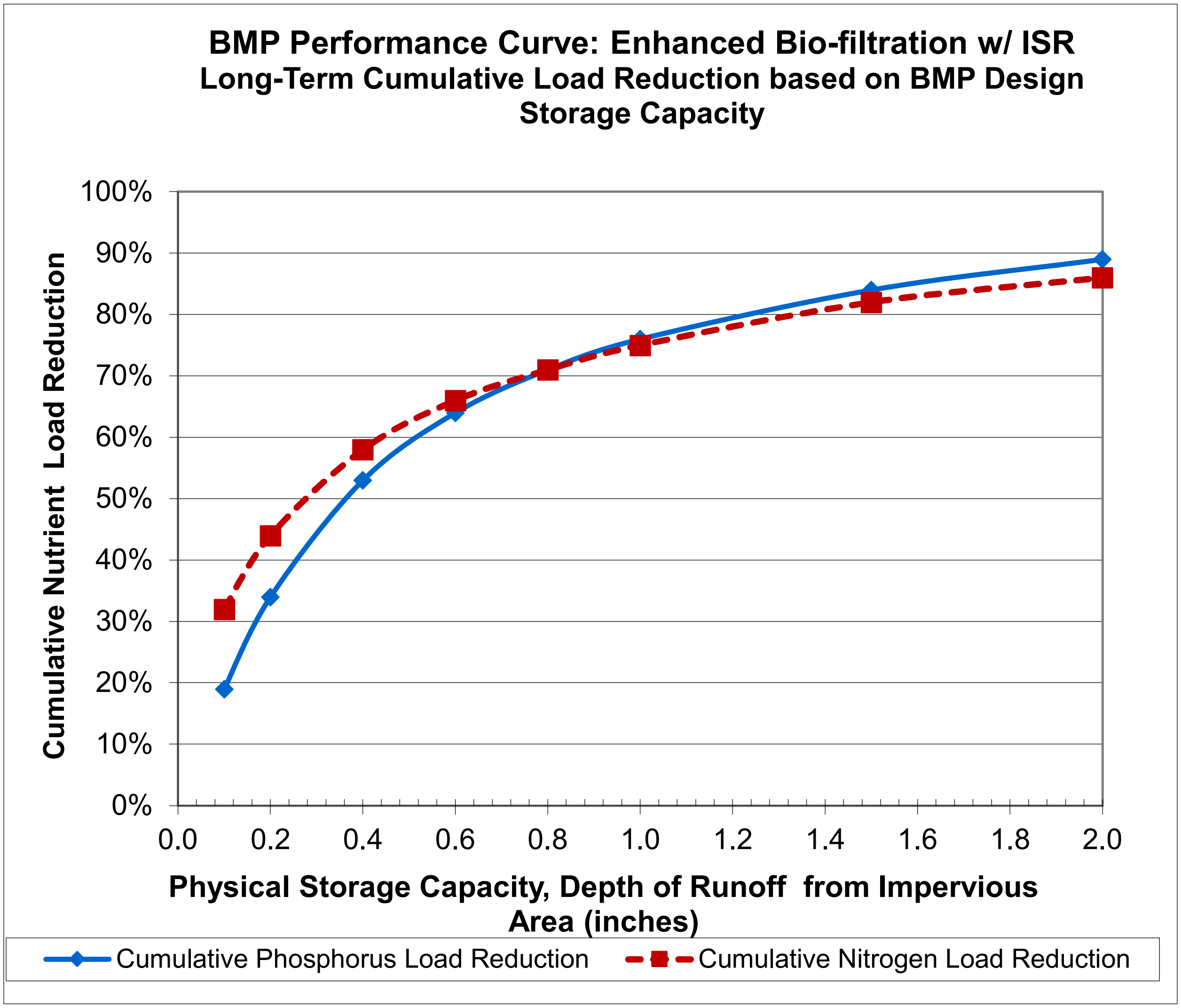
This pollution reduction crediting of the FocalPoint biofiltration system is consistent with the Alternative Methods request process contained in Attachment 3 to Appendix F in the MA MS4 Permit and Attachment 3 to Appendix F of the NH MS4 Permit and may be used unless EPA Region 1 requires an alternative pollution reduction crediting methodology based on new or additional modeling of high-flow-rate filtering systems in a future NPDES permit. All stormwater quality monitoring data shall be submitted to EPA consistent with the requirements of the MA MS4 Permit or the NH MS4 Permit.

Table 3- 20: Enhanced Bio-filtration* with Internal Storage Reservoir (ISR) BMP Performance Table

Enhanced Bio-filtration* w/ ISR BMP Performance Table: Long-Term Phosphorus & Nitrogen Load Reduction								
BMP Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative Phosphorus Load Reduction	19%	34%	53%	64%	71%	76%	84%	89%
Cumulative Nitrogen Load Reduction	32%	44%	58%	66%	71%	75%	82%	86%

***Filter media augmented with phosphorus sorbing materials to enhance phosphorus removal.**

Figure 3-15: BMP Performance Curve: Enhanced Bio-filtration with Internal Storage Reservoir (ISR) BMP Performance Table



APPENDIX XI

Stormwater Operations and Maintenance Manual

JONES&BEACH
ENGINEERS INC.
85 Portsmouth Avenue, PO Box 219, Stratham, NH 03885
603.772.4746 - JonesandBeach.com

STORMWATER MANAGEMENT OPERATIONS AND MAINTENANCE MANUAL

"Lilac Place"
76 Portsmouth Ave.
Exeter, NH 03833
Tax Map 137, Lots 4 & 75

Prepared for:

Green & Company
11 Lafayette Road
North Hampton, NH 03862

Prepared by:
Jones & Beach Engineers, Inc.
85 Portsmouth Avenue
P.O. Box 219
Stratham, NH 03885
(603) 772-4746
November 4, 2024
JBE Project No. 24029

Inspection and Maintenance of Facilities and Property

A. Maintenance of Common Facilities or Property

1. The Condominium Association, future owners and assigns are responsible to perform the maintenance obligations or hire a Professional Engineer to review the site on an annual basis for maintenance and certification of the stormwater system. The Association, future owners and assigns shall keep receipts and records of all maintenance companies hired throughout the year to submit along with the following form. The annual report and certification shall be submitted with three copies to the Town Planner by January 31st of each year.

B. General Inspection and Maintenance Requirements

1. Permanent stormwater and sediment and erosion control facilities to be maintained on the site include, but are not limited to, the following:

    a. Paved surfaces
    b. Vegetation and landscaping
    c. Sediment Forebays
    d. Bioretention systems
    e. Drain Manholes
    f. Stone Drip Edges
    g. Culverts
    h. Rip-Rap Outlet Protection Aprons
    i. Detention Pond
    j. Convergent Pre-Tx Pre-treatment units
    k. Focal Points
    l. Contech Jellyfish
    m. Shea Concrete Galley Chambers
    n. Eco-Paver Patio

2. Maintenance of permanent measures shall follow the following schedule:

    a. Normal winter pavement maintenance including plowing and snow removal. Pavement sweeping at the end of every winter, preferably before the start of the spring rain season.

    b. **Annual inspection** of the site for erosion, destabilization, settling, and sloughing. Any needed repairs are to be conducted immediately. **Annual inspection** of site's vegetation and landscaping. Any areas that are bare shall be reseeded and mulched with hay or, if the case is extreme, loamed and seeded or sodded to ensure adequate vegetative cover. Landscape specimens shall be replaced in kind, if they are found to be dead or dying.

    c. Cleaning Criteria for all Sedimentation Forebays: Sediment shall be removed from the sedimentation chamber (forebay) when it accumulates to a depth of more than 12 inches (30 cm) or 10 percent of the pretreatment volume. The sedimentation forebay shall be cleaned of vegetation if persistent standing water and wetland vegetation becomes dominant. The cleaning interval is once every year. A dry sedimentation forebay is the optimal condition while in practice this condition is rarely achieved. The sedimentation chamber, forebay, and treatment cell outlet devices shall be cleaned when drawdown times exceed 60 to 72 hours. Materials can be removed with heavy construction equipment; however, this equipment shall not track on the wetland surface. Revegetate disturbed areas as necessary. Removed sediments shall be dewatered (if necessary) and disposed of in an acceptable manner.

d. Bioretention Systems:

- Visually inspect monthly and repair erosion. Use small stones to stabilize erosion along drainage paths.
- Check the pH once a year if grass is not surviving. Apply an alkaline product, such as limestone, if needed.
- Re-seed any bare areas by hand as needed.
- Immediately after the completion of cell construction, water grass for 14 consecutive days unless there is sufficient natural rainfall.
- Once a month (more frequently in the summer), the land owner or Association shall visually inspect vegetation for disease or pest problems and treat as required.
- During times of extended drought, look for physical features of stress. Water in the early morning as needed.
- Weed regularly, if needed.
- After rainstorms, inspect the cell and make sure that drainage paths are clear and that ponding water dissipates over 4-6 hours. (Water may pond for longer times during the winter and early spring.)
- Twice annually, inspect the outlet control structures to ensure that they are not clogged and correct any clogging found as needed.
- Any debris and sediment accumulations shall be removed from the outlet structures, overflow risers, and emergency spillways and disposed of properly.
- Inspect outlet structure for deterioration and or clogging.
- If erosion is evident on the berm or emergency spillway, stabilize the affected area by seeding. Trees must not be allowed to grow in these areas.
- KEEP IN MIND, THE BIORETENTION CELL IS NOT A POND. IT SHALL NOT PROVIDE A BREEDING GROUND FOR MOSQUITOES. MOSQUITOES NEED AT LEAST FOUR (4) DAYS OF STANDING WATER TO DEVELOP AS LARVA.

e. **Annual inspection** of drain manholes to determine if they need to be cleaned. Manholes shall be cleaned of any material upon inspection. Manholes can be cleaned either manually or by specially designed equipment including, but not limited to, bucket loaders and vacuum pumps. Before any materials can be disposed, it is necessary to perform a detailed chemical analysis to determine if the materials meet the EPA criteria for hazardous waste. This will help determine how the materials shall be stored, treated, and disposed.

f. Stone drip edges:

Some units feature stone drip edges to collect roof runoff into a pipe in order to direct it into the stone areas underneath the unit decks. These practices shall be lined and are not intended for infiltration. The following course of action will help assure that the roof drip edges are maintained to preserve its effectiveness.

In the spring and fall, visually inspect the area around the edges and repair any erosion. Use small stones to stabilize erosion along drainage paths. Inspect stone area to ensure that it has not been displaced, undermined, or otherwise damaged. Displaced rock shall be replaced, or additional rock added in order to maintain the structure(s) in their undamaged state. Woody vegetation shall not be allowed to become established in stone areas, and/or any debris removed from the void spaces between the stones

g. **Inspection** of culvert inlets and outlets at least **once per month** during the rainy season (March to November). Any debris is to be removed and disposed of properly.

h. Rock riprap shall be **inspected annually** in order to ensure that it has not been displaced, undermined, or otherwise damaged. Displaced rock shall be replaced, or additional rock added in order to maintain the structure(s) in their undamaged state. Woody vegetation must not be allowed to become established in riprap areas, and/or any debris removed from the void spaces between the rocks. If the riprap is adjacent to a stream or other waterbody, the water shall be kept clear of obstructions, debris, and sediment deposits

i. Detention Pond: Regularly mow this BMP. If the detention pond does not drain within 72 hours following a rainfall event, then a Professional Engineer shall assess the condition of the facility to determine measures required to restore function, including but not limited to removal of accumulated sediments or reconstruction of the basin.

j. Convergent Pre-T Pre-treatment Units: See attached inspection and maintenance guidance document.

k. Focal Point: See attachment inspection and maintenance guidance document.

l. Contech Jellyfish: See attached inspection and maintenance guidance document.

m. Shea Concrete Galley Chambers: Shea Concrete Galley Chambers: Once annually, open the inspection ports and visually inspect the condition of the stone base. If more than 12” of sediment is observed, plug the outlet and flush the system thoroughly. Pump water into system until at least 1” of standing water covers the system bottom. Repeat at both inspection ports and pump out back-flush water. Capture sediment-laden water for proper disposal according to local state, and EPA regulation. Additionally, vacuum all adjacent manhole structures.

n. Eco-Paver Patios:

The following recommendations will help assure that the permeable pavers are maintained to preserve their hydrologic effectiveness.

- Sanding for winter traction is prohibited. Deicing is permitted (NaCl, $MgCl_2$, or equivalent). Reduced salt application is possible and can be a cost savings for winter maintenance. Nontoxic, organic deicers, applied either as blended, magnesium chloride-based liquid products or as pretreated salt, are preferable.
- The paver surface shall be vacuumed 1 time per year, and at any additional times sediment is spilled, eroded, or tracked onto the surface.
- Planted areas adjacent to pervious pavers shall be well maintained to prevent soil washout onto the pavers. If any bare spots or eroded areas are observed within the planted areas, they shall be replanted and/or stabilized at once.
- Immediately clean any soil deposited on pavers. Superficial dirt does not necessarily clog the paver voids. However, dirt that is ground in repeatedly by tires can lead to clogging. Therefore, trucks or other heavy vehicles shall be prevented from tracking or spilling dirt onto the pavers.
- Do not allow construction staging, soil/mulch storage, etc. on unprotected paver surface. Contractor to laydown tarps, plywood or removable item and take care not to track material onto unprotected pavement.
- Written and verbal communication to the porous paver's future owner must make clear the paver's special purpose and special maintenance requirements such as those listed here.

See attached sample forms as a guideline.

Any inquiries in regards to the design, function, and/or maintenance of any one of the above-mentioned facilities or tasks shall be directed to the project engineer:

Jones & Beach Engineers, Inc.
85 Portsmouth Avenue
P.O. Box 219
Stratham, NH 03885

T#: (603) 772-4746
F#: (603) 772-0227

Commitment to maintenance requirements

I agree to complete and/or observe all of the required maintenance practices and their respective schedules as outlined above.

____

Signature

____

Print Name

____

Title

____

Date

Annual Operations and Maintenance Report

The Condominium Association, future owners and assigns are responsible to perform the maintenance obligations or hire a Professional Engineer to review the site on an annual basis for maintenance and certification of the stormwater system. The Association, future owners and assigns shall keep receipts and records of all maintenance companies hired throughout the year to submit along with the following form. The annual report and certification shall be submitted with three copies to the Town Planner by January 31st of each year.

Construction Activity	**Date of Inspection**	**Who Inspected**	**Findings of Inspector**
Paved Surfaces			
Vegetation and Landscaping			
Sediment Forebay			
Bioretention Pond #1			
Bioretention Pond #2			

Bioretention Pond #3			
Drain Manhole #1			
Drain Manhole #2			
Drain Manhole #3			
Drain Manhole #4			
Drain Manhole #5			
Stone Drip Edge			

Culvert inlet #1			
Culvert inlet #2			
Culvert inlet #3			
Culvert outlet #1			
Culvert outlet #3			
Culvert outlet #3			

Culvert outlet #4			
Culvert outlet #5			
Culvert outlet #6			
Culvert outlet #7			
Rip Rap Outlet Protection Apron #1			
Rip Rap Outlet Protection Apron #2			

Rip Rap Outlet Protection Apron #3			
Rip Rap Outlet Protection Apron #4			
Rip Rap Outlet Protection Apron #5			
Rip Rap Outlet Protection Apron #6			
Rip Rap Outlet Protection Apron #7			
Detention Pond			

Pre-Tx #1			
Pre-Tx #2			
Focal Point #1			
Focal Point #2			
Jellyfish #1			
Jellyfish #2			
Shea Concrete Galley Chamber System A			

Shea Concrete Galley Chamber System B			
Shea Concrete Galley Chamber System C			
Shea Concrete Galley Chamber System D			
Eco-Paver Patio			
Other (please note):			

Regular Inspection and Maintenance Guidance for Bioretention Systems / Tree Filters

Maintenance of bioretention systems and tree filters can typically be performed as part of standard landscaping. Regular inspection and maintenance is critical to the effective operation of bioretention systems and tree filters to insure they remain clear of leaves and debris and free draining. This page provides guidance on maintenance activities that are typically required for these systems, along with the suggested frequency for each activity. Individual systems may have more, or less, frequent maintenance needs, depending on a variety of factors including the occurrence of large storm events, overly wet or dry (I.E., drought), regional hydrologic conditions, and the upstream land use.

ACTIVITIES

The most common maintenance activity is the removal of leaves from the system and bypass structure. Visual inspections are routine for system maintenance. This includes looking for standing water, accumulated leaves, holes in the soil media, signs of plant distress, and debris and sediment accumulation in the system. Mulch and/or vegetation coverage is integral to the performance of the system, including infiltration rate and nutrient uptake. Vegetation care is important to system productivity and health.

ACTIVITY	FREQUENCY
A record should be kept of the time to drain for the system completely after a storm event. The system should drain completely within 72 hours.	After every major storm in the first few months, then biannually.
Check to insure the filter surface remains well draining after storm event. **Remedy**: If filter bed is clogged, draining poorly, or standing water covers more than 15% of the surface 48 hours after a precipitation event, then remove top few inches of discolored material. Till or rake remaining material as needed.	
Check inlets and outlets for leaves and debris. **Remedy**: Rake in and around the system to clear it of debris. Also, clear the inlet and overflow if obstructed.	Quarterly initially, biannually, frequency adjusted as needed after 3 inspections
Check for animal burrows and short circuiting in the system **Remedy**: Soil erosion from short circuiting or animal boroughs should be repaired when they occur. The holes should be filled and lightly compacted.	
Check to insure the filter bed does not contain more than 2 inches accumulated material **Remedy**: Remove sediment as necessary. If 2 inches or more of filter bed has been removed, replace media with either mulch or a (50% sand, 20% woodchips, 20% compost, 10% soil) mixture.	
During extended periods without rainfall, inspect plants for signs of distress. **Remedy**: Plants should be watered until established (typical only for first few months) or as needed thereafter.	
Inspect inlets and outlets to ensure good condition and no evidence of deterioration. Check to see if high-flow bypass is functioning. **Remedy**: Repair or replace any damaged structural parts, inlets, outlets, sidewalls.	Annually
Check for robust vegetation coverage throughout the system. **Remedy**: If at least 50% vegetation coverage is not established after 2 years, reinforcement planting should be performed.	
Check for dead or dying plants, and general long term plant health. **Remedy**: This vegetation should be cut and removed from the system. If woody vegetation is present, care should be taken to remove dead or decaying plant Material. Separation of Herbaceous vegetation rootstock should occur when overcrowding is observed.	As needed

1/15/2011, University of New Hampshire Stormwater Center

CHECKLIST FOR INSPECTION OF BIORETENTION SYSTEM / TREE FILTERS

Location: Inspector:

Date: Time: Site Conditions:

Date Since Last Rain Event:

Inspection Items	Satisfactory (S) or Unsatisfactory (U)	Comments/Corrective Action
1. Initial Inspection After Planting and Mulching		
Plants are stable, roots not exposed	**S U**	
Surface is at design level, typically 4” below overpass	**S U**	
Overflow bypass / inlet (if available) is functional	**S U**	
2. Debris Cleanup (2 times a year minimum, Spring & Fall)		
Litter, leaves, and dead vegetation removed from the system	**S U**	
Prune perennial vegetation	**S U**	
3. Standing Water (1 time a year, After large storm events)		
No evidence of standing water after 72 hours	**S U**	
4. Short Circuiting & Erosion (1 time a year, After large storm events)		
No evidence of animal burrows or other holes	**S U**	
No evidence of erosion	**S U**	
5. Drought Conditions (As needed)		
Water plants as needed	**S U**	
Dead or dying plants		
6. Overflow Bypass / Inlet Inspection (1 time a year, After large storm events)		
No evidence of blockage or accumulated leaves	**S U**	
Good condition, no need for repair	**S U**	
7. Vegetation Coverage (once a year)		
50% coverage established throughout system by first year	**S U**	
Robust coverage by year 2 or later	**S U**	
8. Mulch Depth (if applicable)(once every 2 years)		
Mulch at original design depth after tilling or replacement	**S U**	
9. Vegetation Health (once every 3 years)		
Dead or decaying plants removed from the system	**S U**	
10. Tree Pruning (once every 3 years)		
Prune dead, diseased, or crossing branches	**S U**	

Corrective Action Needed	Due Date
1.	
2.	
3.	

1/15/2011, University of New Hampshire Stormwater Center

Deicing Log

Date Applied	Type of Deicing Material	Amount Applied

CONTROL OF INVASIVE PLANTS

During maintenance activities, check for the presence of invasive plants and remove in a safe manner as described on the following pages. They should be controlled as described on the following pages.

Background:

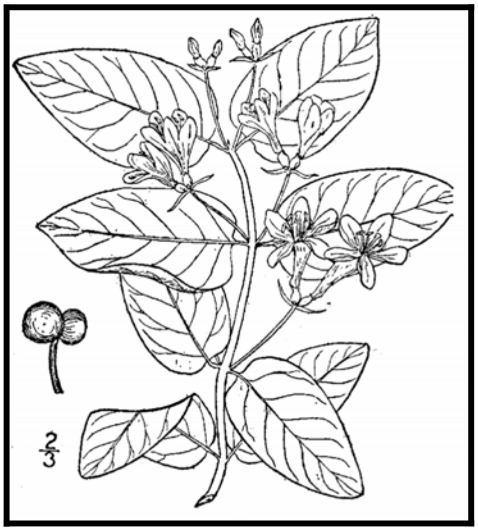
Invasive plants are introduced, alien, or non-native plants, which have been moved by people from their native habitat to a new area. Some exotic plants are imported for human use such as landscaping, erosion control, or food crops. They also can arrive as "hitchhikers" among shipments of other plants, seeds, packing materials, or fresh produce. Some exotic plants become invasive and cause harm by:

- becoming weedy and overgrown;
- killing established shade trees;
- obstructing pipes and drainage systems;
- forming dense beds in water;
- lowering water levels in lakes, streams, and wetlands;
- destroying natural communities;
- promoting erosion on stream banks and hillsides; and
- resisting control except by hazardous chemical.

UNIVERSITY of NEW HAMPSHIRE
COOPERATIVE EXTENSION

Methods for Disposing Non-Native Invasive Plants

Prepared by the Invasives Species Outreach Group, volunteers interested in helping people control invasive plants. Assistance provided by the Piscataquog Land Conservancy and the NH Invasives Species Committee. Edited by Karen Bennett, Extension Forestry Professor and Specialist.



Tatarian honeysuckle
Lonicera tatarica
USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions.* Vol. 3: 282.

Non-native invasive plants crowd out natives in natural and managed landscapes. They cost taxpayers billions of dollars each year from lost agricultural and forest crops, decreased biodiversity, impacts to natural resources and the environment, and the cost to control and eradicate them.

Invasive plants grow well even in less than desirable conditions such as sandy soils along roadsides, shaded wooded areas, and in wetlands. In ideal conditions, they grow and spread even faster. There are many ways to remove these non-native invasives, but once removed, care is needed to dispose the removed plant material so the plants don't grow where disposed.

Knowing how a particular plant reproduces indicates its method of spread and helps determine the appropriate disposal method. Most are spread by seed and are dispersed by wind, water, animals, or people. Some reproduce by vegetative means from pieces of stems or roots forming new plants. Others spread through both seed and vegetative means.

Because movement and disposal of viable plant parts is restricted (see NH Regulations), viable invasive parts can't be brought to most transfer stations in the state. Check with your transfer station to see if there is an approved, designated area for invasives disposal. This fact sheet gives recommendations for rendering plant parts non-viable.

Control of invasives is beyond the scope of this fact sheet. For information about control visit www.nhinvasives.org or contact your UNH Cooperative Extension office.

New Hampshire Regulations

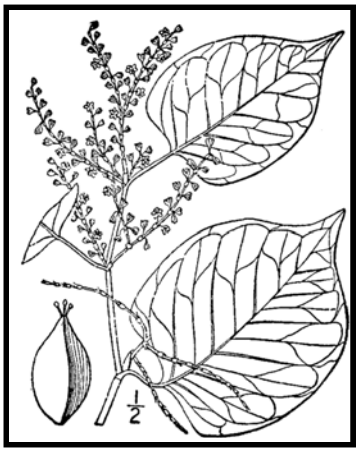
Prohibited invasive species shall only be disposed of in a manner that renders them nonliving and nonviable. (Agr. 3802.04)

No person shall collect, transport, import, export, move, buy, sell, distribute, propagate or transplant any living and viable portion of any plant species, which includes all of their cultivars and varieties, listed in Table 3800.1 of the New Hampshire prohibited invasive species list. (Agr 3802.01)

How and When to Dispose of Invasives?

To prevent seed from spreading remove invasive plants before seeds are set (produced). Some plants continue to grow, flower and set seed even after pulling or cutting. Seeds can remain viable in the ground for many years. If the plant has flowers or seeds, place the flowers and seeds in a heavy plastic bag "head first" at the weeding site and transport to the disposal site. The following are general descriptions of disposal methods. See the chart for recommendations by species.

Burning: Large woody branches and trunks can be used as firewood or burned in piles. For outside burning, a written fire permit from the local forest fire warden is required unless the ground is covered in snow. Brush larger than 5 inches in diameter can't be burned. Invasive plants with easily airborne seeds like black swallow-wort with mature seed pods (indicated by their brown color) shouldn't be burned as the seeds may disperse by the hot air created by the fire.



Japanese knotweed
Polygonum cuspidatum
USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions.* Vol. 1: 676.

Bagging (solarization): Use this technique with softer-tissue plants. Use heavy black or clear plastic bags (contractor grade), making sure that no parts of the plants poke through. Allow the bags to sit in the sun for several weeks and on dark pavement for the best effect.

Tarping and Drying: Pile material on a sheet of plastic and cover with a tarp, fastening the tarp to the ground and monitoring it for escapes. Let the material dry for several weeks, or until it is clearly nonviable.

Chipping: Use this method for woody plants that don't reproduce vegetatively.

Burying: This is risky, but can be done with watchful diligence. Lay thick plastic in a deep pit before placing the cut up plant material in the hole. Place the material away from the edge of the plastic before covering it with more heavy plastic. Eliminate as much air as possible and toss in soil to weight down the material in the pit. Note that the top of the buried material should be at least three feet underground. Japanese knotweed should be at least 5 feet underground!

Drowning: Fill a large barrel with water and place soft-tissue plants in the water. Check after a few weeks and look for rotted plant material (roots, stems, leaves, flowers). Well-rotted plant material may be composted. A word of caution- seeds may still be viable after using this method. Do this before seeds are set. This method isn't used often. Be prepared for an awful stink!

Composting: Invasive plants can take root in compost. Don't compost any invasives unless you know there is no viable (living) plant material left. Use one of the above techniques (bagging, tarping, drying, chipping, or drowning) to render the plants nonviable before composting. Closely examine the plant before composting and avoid composting seeds.

Be diligent looking for seedlings for *years* in areas where removal and disposal took place.

Suggested Disposal Methods for Non-Native Invasive Plants

This table provides information concerning the disposal of removed invasive plant material. If the infestation is treated with herbicide and left in place, these guidelines don't apply. Don't bring invasives to a local transfer station, unless there is a designated area for their disposal, or they have been rendered non-viable. This listing includes wetland and upland plants from the New Hampshire Prohibited Invasive Species List. The disposal of aquatic plants isn't addressed.

Woody Plants	Method of Reproducing	Methods of Disposal
Norway maple *(Acer platanoides)* European barberry *(Berberis vulgaris)* Japanese barberry *(Berberis thunbergii)* autumn olive *(Elaeagnus umbellata)* burning bush *(Euonymus alatus)* Morrow's honeysuckle *(Lonicera morrowii)* Tatarian honeysuckle *(Lonicera tatarica)* showy bush honeysuckle *(Lonicera x bella)* common buckthorn *(Rhamnus cathartica)* glossy buckthorn *(Frangula alnus)*	**Fruit and Seeds** ↕	**Prior to fruit/seed ripening** Seedlings and small plants ▪ Pull or cut and leave on site with roots exposed. No special care needed. Larger plants ▪ Use as firewood. ▪ Make a brush pile. ▪ Chip. ▪ Burn.
		After fruit/seed is ripe Don't remove from site. ▪ Burn. ▪ Make a covered brush pile. ▪ Chip once all fruit has dropped from branches. ▪ Leave resulting chips on site and monitor.
oriental bittersweet *(Celastrus orbiculatus)* multiflora rose *(Rosa multiflora)*	**Fruits, Seeds, Plant Fragments** ↕	**Prior to fruit/seed ripening** Seedlings and small plants ▪ Pull or cut and leave on site with roots exposed. No special care needed. Larger plants ▪ Make a brush pile. ▪ Burn.
		After fruit/seed is ripe Don't remove from site. ▪ Burn. ▪ Make a covered brush pile. ▪ Chip – only after material has fully dried (1 year) and all fruit has dropped from branches. Leave resulting chips on site and monitor.

Non-Woody Plants	Method of Reproducing	Methods of Disposal
garlic mustard *(Alliaria petiolata)* spotted knapweed *(Centaurea maculosa)* ▪ Sap of related knapweed can cause skin irritation and tumors. Wear gloves when handling. black swallow-wort *(Cynanchum nigrum)* ▪ May cause skin rash. Wear gloves and long sleeves when handling. pale swallow-wort *(Cynanchum rossicum)* giant hogweed *(Heracleum mantegazzianum)* ▪ Can cause major skin rash. Wear gloves and long sleeves when handling. dame's rocket *(Hesperis matronalis)* perennial pepperweed *(Lepidium latifolium)* purple loosestrife *(Lythrum salicaria)* Japanese stilt grass *(Microstegium vimineum)* mile-a-minute weed *(Polygonum perfoliatum)*	**Fruits and Seeds**	**Prior to flowering** Depends on scale of infestation Small infestation ▪ Pull or cut plant and leave on site with roots exposed. Large infestation ▪ Pull or cut plant and pile. (You can pile onto or cover with plastic sheeting). ▪ Monitor. Remove any re-sprouting material.
		During and following flowering Do nothing until the following year or remove flowering heads and bag and let rot. Small infestation ▪ Pull or cut plant and leave on site with roots exposed. Large infestation ▪ Pull or cut plant and pile remaining material. (You can pile onto plastic or cover with plastic sheeting). ▪ Monitor. Remove any re-sprouting material.
common reed (*Phragmites australis*) Japanese knotweed *(Polygonum cuspidatum)* Bohemian knotweed *(Polygonum x bohemicum)*	**Fruits, Seeds, Plant Fragments** Primary means of spread in these species is by plant parts. Although all care should be given to preventing the dispersal of seed during control activities, the presence of seed doesn't materially influence disposal activities.	**Small infestation** ▪ Bag all plant material and let rot. ▪ Never pile and use resulting material as compost. ▪ Burn. **Large infestation** ▪ Remove material to unsuitable habitat (dry, hot and sunny or dry and shaded location) and scatter or pile. ▪ Monitor and remove any sprouting material. ▪ Pile, let dry, and burn.

January 2010

APPENDIX XII

Pre- and Post-Construction Watershed Plans

OFFSITE TOPOGRAPHY SHOWN HEREON IS FROM NH GRANIT LIDAR. NO OFF-SITE FIELD SURVEY HAS BEEN PERFORMED EXCEPT IN THE RIGHT OF WAY.

THIS AREA DRAINS TO WETLANDS ON THE SUBJECT PARCEL BUT NOT THE AREA PROPOSED TO BE DEVELOPED, SO IT IS EXCLUDED FROM THE PROJECT WATERSHED.

PROJECT PARCEL
TOWN OF EXETER
TAX MAP 65, LOT 118

APPLICANT
GREEN & COMPANY
11 LAFAYETTE RD
PO BOX 1297
NORTH HAMPTON, NH 03862

TOTAL LOT AREA
291,630 SQ. FT.
6.7 ACRES

Design: DJM	Draft: DJM	Date: 10/21/24
Checked: PSL	Scale: AS SHOWN	Project No.: 24029
Drawing Name: 24029-WATERSHED.dwg		

THIS PLAN SHALL NOT BE MODIFIED WITHOUT WRITTEN PERMISSION FROM JONES & BEACH ENGINEERS, INC. (JBE). ANY ALTERATIONS, AUTHORIZED OR OTHERWISE, SHALL BE AT THE USER'S SOLE RISK AND WITHOUT LIABILITY TO JBE.

DANIEL JAMES MEDITZ
No.18152
11/05/2024

0	11/4/24	ISSUED FOR REVIEW	DJM
REV.	DATE	REVISION	BY

Designed and Produced in NH
J/B Jones & Beach Engineers, Inc.
Civil Engineering Services
85 Portsmouth Ave.
PO Box 219
Stratham, NH 03885
603-772-4746
E-MAIL: JBE@JONESANDBEACH.COM

Plan Name: EXISTING WATERSHED PLAN
Project: MIXED USE DEVELOPMENT
76 PORTSMOUTH AVE, EXETER, NH
Owner of Record: RAP REALTY MANCHESTER LLC
50 ATLANTIC AVE, SEABROOK, NH

DRAWING No.
W1
SHEET 1 OF 2
JBE PROJECT NO. 24029

THIS AREA DRAINS TO WETLANDS ON THE SUBJECT PARCEL BUT NOT THE AREA PROPOSED TO BE DEVELOPED, SO IT IS EXCLUDED FROM THE PROJECT WATERSHED.

OFFSITE TOPOGRAPHY SHOWN HEREON IS FROM NH GRANIT LIDAR. NO OFF–SITE FIELD SURVEY HAS BEEN PERFORMED EXCEPT IN THE RIGHT OF WAY.

PROJECT PARCEL
TOWN OF EXETER
TAX MAP 65, LOT 118

APPLICANT
GREEN & COMPANY
11 LAFAYETTE RD
PO BOX 1297
NORTH HAMPTON, NH 03862

TOTAL LOT AREA
291,630 SQ. FT.
6.7 ACRES

Design: DJM	Draft: DJM	Date: 10/21/24	
Checked: PSL	Scale: AS SHOWN	Project No.: 24029	
Drawing Name: 24029-WATERSHED.dwg			

THIS PLAN SHALL NOT BE MODIFIED WITHOUT WRITTEN PERMISSION FROM JONES & BEACH ENGINEERS, INC. (JBE). ANY ALTERATIONS, AUTHORIZED OR OTHERWISE, SHALL BE AT THE USER'S SOLE RISK AND WITHOUT LIABILITY TO JBE.

DANIEL JAMES MEDITZ
No.18152
11/05/2024

REV.	DATE	REVISION	BY
0	11/4/24	ISSUED FOR REVIEW	DJM

Designed and Produced in NH

J/B Jones & Beach Engineers, Inc.

Civil Engineering Services

85 Portsmouth Ave.
PO Box 219
Stratham, NH 03885
603-772-4746
E-MAIL: JBE@JONESANDBEACH.COM

Plan Name:	PROPOSED WATERSHED PLAN
Project:	MIXED USE DEVELOPMENT 76 PORTSMOUTH AVE, EXETER, NH
Owner of Record:	RAP REALTY MANCHESTER LLC 50 ATLANTIC AVE, SEABROOK, NH

DRAWING No.
W2
SHEET 2 OF 2
JBE PROJECT NO. 24029