STORMWATER MANAGEMENT REPORT

prepared for

Marmalade Restaurant
Preliminary and Final Site Plan
Lawrence Township
Mercer County, New Jersey

Lots 58-60 & 68-70 in Block 6301

September 20, 2021

Prepared by
Hopewell Valley Engineering, P.C.
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HVE Project No. 1107570A

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Digitally signed by
Russell M Smith
Date: 2021.09.23
08:14:04 -04'00'

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Project Description and Methodology

The applicant proposes to redevelop the existing garage and gravel parking area into a restaurant and paved parking area. The existing building is currently vacant and the parking area has a compacted gravel surface.

The project will renovate the existing building into a restaurant. The existing parking lot will be paved and expanded to provide parking for a total of sixty (60) vehicles. A subsurface stormwater basin will be constructed under the parking area.

The soil survey identifies the underlying soils as Urban Land (UR). The soil is classified as Hydrologic Soil Group (HSG) "B".

The Delaware and Raritan Canal Commission (DRCC) and Lawrence Township (LT) regulations require the water quality treatment be provided for all new (DRCC and LT) and reconstructed (DRCC only) impervious surfaces. The project will use green infrastructure MTD (Filterra Bioretention Systems) to provide the required 80% TSS removal for the paved parking area (0.69 Ac of impervious surface).

Stormwater control was analyzed in accordance with the following:

A. Hydrologic Soil Condition
   - Existing = "Good" condition
   - Developed = "Poor" condition for disturbed areas

B. Design Storms
   - Water Quality (NJDEP design storm)
   - 2 yr. storm, Region C, 24 hour (Allowable Discharge = 50% of pre-developed flow)
   - 10 yr. storm, Region C, 24 hour (Allowable Discharge = 75% of pre-developed flow)
   - 100 yr. storm, Region C, 24 hour (Allowable Discharge = 80% of pre-developed flow)
   - Separate hydrographs for pervious and impervious areas will be used in the developed condition

The proposed subsurface basin under the parking area will consist of 30" diameter HDPE pipes and will be used for quantity control of the design storms. Three (3) Filterra Bioretention units will be installed to provide the required 80% TSS removal of the run-off from the parking lot impervious cover.

Stormwater soil testing was completed onsite on 10/09/19 by Bayer-Risse Engineering (BRE) to determine the field permeability for the underlying soils as required to design a groundwater recharge system. The NJDEP BMP Manual requires the minimum field permeability rate be 1.0 inch/hour and that a factor of safety of 2 be used in the design. BRE completed a well permeameter test and found that the permeability rate was 0.4 in/hr. Since this rate is more than 50% lower then what is recommended in the BMP manual, the onsite soils are not suitable for

recharge and a conforming system cannot be designed. A waiver of groundwater recharge requirements is required as permitted at 7:8 – 5.4(a) iv. since adverse impacts could result from the recharge due to slow permeability rate.

The extent of the existing and proposed drainage areas is shown on the enclosed drainage area plans in Appendixes A and B at the end of this report.

REFERENCE:
NEW JERSEY 2015 HIGH RESOLUTION ORTHOPHOTOGRAPHY, https: //njgin.state.nj.us/ ACCESSED 9/17/19

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Date:	09/17/19
Scale:	1"=200'
Job No:	1107570A
Drawing:	AM01570A

SITE AERIAL IMAGE

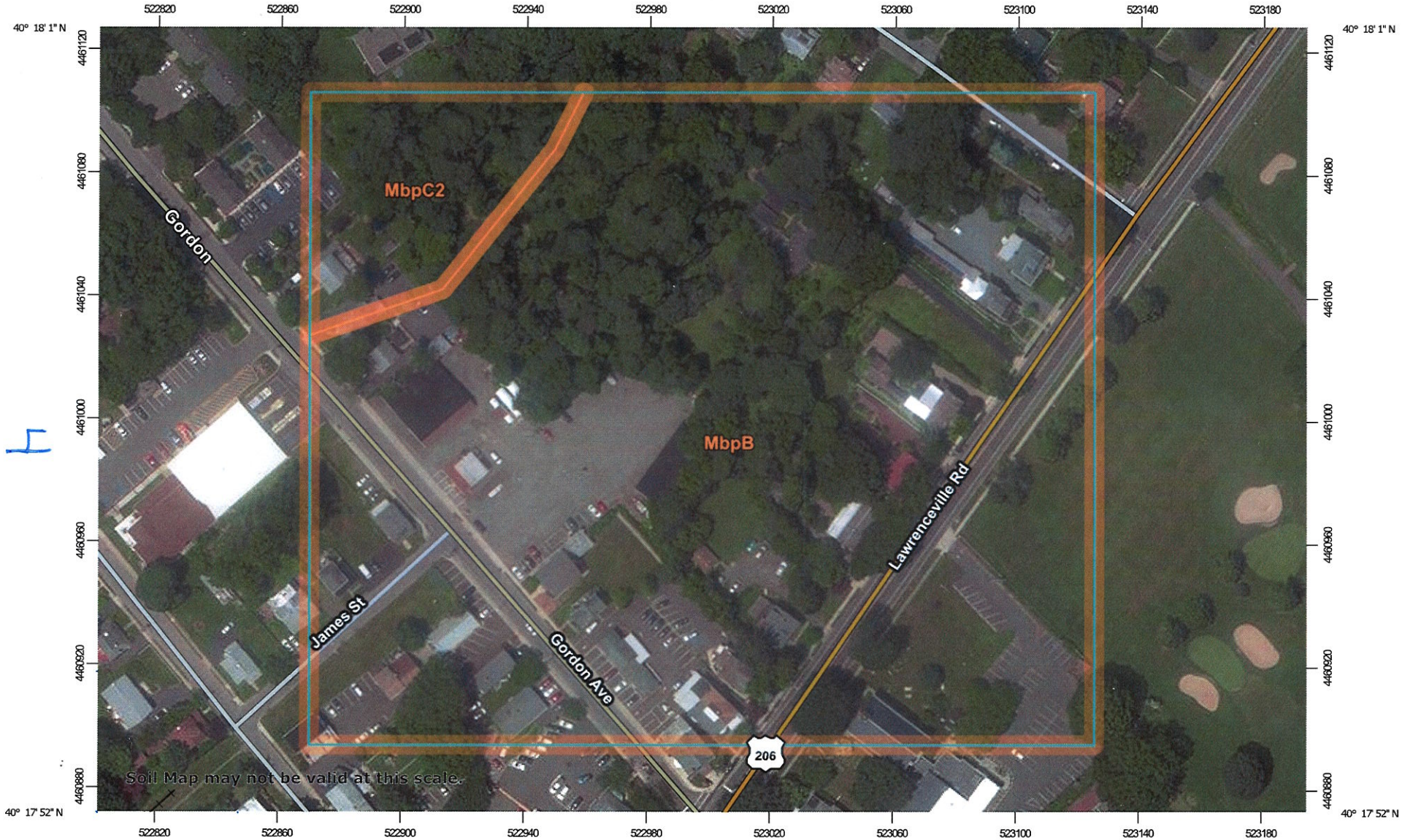
FOR

MARMALADE RESTAURANT
BLOCK 6301 LOTS 58-60 AND 68-70

SITUATE IN

LAWRENCE TOWNSHIP, MERCER COUNTY, NEW JERSEY

Soil Map—Mercer County, New Jersey
(Marmalade Rest Site Plan)



Map Scale: 1:1,800 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N 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: Mercer County, New Jersey
Survey Area Data: Version 14, Sep 15, 2018

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

Date(s) aerial images were photographed: Jun 20, 2014—Jul 5, 2014

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
MbpB	Matapeake loam, 2 to 5 percent slopes	12.3	91.4%
MbpC2	Matapeake loam, 5 to 10 percent slopes, eroded	1.2	8.6%
Totals for Area of Interest		**13.4**	**100.0%**

HSG
'B'
'B'

Stormwater Basin Routing Summary				
Storm (YR.)	**Peak Existing Q (cfs) at Study Point**	**Peak Proposed Q (cfs)**	**Allowable Discharge Q (CFS)** Existing Q to Design Point x Reduction Factors = Allowable	**Det. Basin Outflow Q & Max. Water Elev. (cfs/ft)**
Water Quality Storm	-	-	See Water Quality Design Section	0.32/121.98
2	2.33	3.11	2.33 x 0.50 = 1.17	1.14/122.30
10	4.09	4.84	4.09 x 0.75 = 3.07	2.98/122.68
100	7.52	8.21	7.52 x 0.80 = 6.02	6.02/123.20

EXISTING HYDROGRAPH CALCULATIONS

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	Impervious Adjustment %UC	Adjusted CN
Open Space- Good condition; grass c	61	.030			61.00
Impervious Areas	98	.150			98.00
Gravel Areas	85	.710			85.00
COMPOSITE AREA & WEIGHTED CN --->		.890			86.38 (86)

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Shallow

Hydraulic Length	145.00 ft
Slope	.003000 ft/ft
Paved	
Avg.Velocity	1.11 ft/sec

Segment #1 Time: .0362 hrs

Segment #2: Tc: TR-55 Sheet

Mannings n	.0110
Hydraulic Length	170.00 ft
2yr, 24hr P	3.3000 in
Slope	.034000 ft/ft
Avg.Velocity	1.92 ft/sec

Segment #2 Time: .0246 hrs

==========
Total Tc: .0608 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs
==========

DESIGN STORMS SUMMARY

Design Storm File,ID = TR55 Mercer Cty

Storm Tag Name = 2

Data Type, File, ID = Synthetic Storm Region C 24hr
Storm Frequency = 2 yr
Total Rainfall Depth= 3.3000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm Region C 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 5.0000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100

Data Type, File, ID = Synthetic Storm Region C 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 8.3000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 1

Data Type, File, ID = Time-Depth Curve NJDEP Water Qual
Storm Frequency = 1 yr
Total Rainfall Depth= 1.2500 in
Duration Multiplier = 1
Resulting Duration = 1.9999 hrs
Resulting Start Time= .0000 hrs Step= .0833 hrs End= 1.9999 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 1.9999 hrs Rain Depth = 1.2500 in
Rain Dir = F:\1107570A\Design\
Rain File -ID = - NJDEP Water Qual
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107570A\Design\
HYG File - ID = Existing.HYG - EXISTING 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .890 acres Runoff CN= 86

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 1.1107 hrs
Computed Peak Flow = .99 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 1.1000 hrs
Peak Flow, Interpolated Output = .98 cfs
==========

DRAINAGE AREA

ID:EXISTING
CN = 86
Area = .890 acres
S = 1.6279 in
0.2S = .3256 in

Cumulative Runoff

.3348 in
.025 ac-ft

HYG Volume... .025 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: EXISTING)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 12.11 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.3000 in
Rain Dir = F:\1107570A\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107570A\Design\
HYG File - ID = Existing.HYG - EXISTING 2
Tc (Min. Tc) = .0833 hrs
Drainage Area = .890 acres Runoff CN= 86

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 12.1174 hrs
Computed Peak Flow = 2.33 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 2.29 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:EXISTING
CN = 86
Area = .890 acres
S = 1.6279 in
0.2S = .3256 in

Cumulative Runoff

1.9223 in
.143 ac-ft

HYG Volume... .143 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: EXISTING)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 12.11 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.0000 in
Rain Dir = F:\1107570A\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107570A\Design\
HYG File - ID = Existing.HYG - EXISTING 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .890 acres Runoff CN= 86

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 12.1063 hrs
Computed Peak Flow = 4.09 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 4.04 cfs
==========

DRAINAGE AREA

ID:EXISTING
CN = 86
Area = .890 acres
S = 1.6279 in
0.2S = .3256 in

Cumulative Runoff

3.4670 in
.257 ac-ft

HYG Volume... .257 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: EXISTING)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 12.11 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 8.3000 in
Rain Dir = F:\1107570A\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107570A\Design\
HYG File - ID = Existing.HYG - EXISTING 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .890 acres Runoff CN= 86

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 12.1063 hrs
Computed Peak Flow = 7.51 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 7.44 cfs
==========

DRAINAGE AREA

ID:EXISTING
CN = 86
Area = .890 acres
S = 1.6279 in
0.2S = .3256 in

Cumulative Runoff

6.6225 in
.491 ac-ft

HYG Volume... .491 ac-ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08330 hrs (ID: EXISTING)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 12.11 cfs
Unit peak time Tp = .05553 hrs
Unit receding limb, Tr = .22213 hrs
Total unit time, Tb = .27767 hrs

PROPOSED HYDROGRAPH

CALCULATIONS

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Gravel Areas	85	.070			85.00
OS (poor) - Grass	79	.070			79.00
COMPOSITE AREA & WEIGHTED CN --->		.140			82.00 (82)

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.2400	
Hydraulic Length	45.00	ft
2yr, 24hr P	3.3000	in
Slope	.020000	ft/ft
Avg.Velocity	.10	ft/sec

Segment #1 Time: .1236 hrs

==========
Total Tc: .1236 hrs
==========

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 1.9999 hrs Rain Depth = 1.2500 in
Rain Dir = F:\1107570A\Design\
Rain File -ID = - NJDEP Water Qual
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107570A\Design\
HYG File - ID = work_pad.hyg - PERVIOUS 1
Tc = .1236 hrs
Drainage Area = .140 acres Runoff CN= 82

==========
Computational Time Increment = .01649 hrs
Computed Peak Time = 1.1375 hrs
Computed Peak Flow = .08 cfs

Time Increment for HYG File = .1000 hrs
Peak Time, Interpolated Output = 1.1000 hrs
Peak Flow, Interpolated Output = .07 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:PERVIOUS
CN = 82
Area = .140 acres
S = 2.1951 in
0.2S = .4390 in

Cumulative Runoff

.2188 in
111 cu.ft

HYG Volume... 111 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .12364 hrs (ID: PERVIOUS)
Computational Incr, Tm = .01649 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.28 cfs
Unit peak time Tp = .08243 hrs
Unit receding limb, Tr = .32971 hrs
Total unit time, Tb = .41214 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.3100 in
Rain Dir = F:\1107570A\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107570A\Design\
HYG File - ID = work_pad.hyg - PERVIOUS 2
Tc = .1236 hrs
Drainage Area = .140 acres Runoff CN= 82

==========
Computational Time Increment = .01649 hrs
Computed Peak Time = 12.1335 hrs
Computed Peak Flow = .29 cfs

Time Increment for HYG File = .1000 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = .26 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:PERVIOUS
CN = 82
Area = .140 acres
S = 2.1951 in
0.2S = .4390 in

Cumulative Runoff

1.6270 in
827 cu.ft

HYG Volume... 825 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .12364 hrs (ID: PERVIOUS)
Computational Incr, Tm = .01649 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.28 cfs
Unit peak time Tp = .08243 hrs
Unit receding limb, Tr = .32971 hrs
Total unit time, Tb = .41214 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.0100 in
Rain Dir = F:\1107570A\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107570A\Design\
HYG File - ID = work_pad.hyg - PERVIOUS 10
Tc = .1236 hrs
Drainage Area = .140 acres Runoff CN= 82

==========
Computational Time Increment = .01649 hrs
Computed Peak Time = 12.1335 hrs
Computed Peak Flow = .54 cfs

Time Increment for HYG File = .1000 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = .50 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:PERVIOUS
CN = 82
Area = .140 acres
S = 2.1951 in
0.2S = .4390 in

Cumulative Runoff

3.0880 in
1569 cu.ft

HYG Volume... 1567 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .12364 hrs (ID: PERVIOUS)
Computational Incr, Tm = .01649 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.28 cfs
Unit peak time Tp = .08243 hrs
Unit receding limb, Tr = .32971 hrs
Total unit time, Tb = .41214 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 8.3300 in
Rain Dir = F:\1107570A\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107570A\Design\
HYG File - ID = work_pad.hyg - PERVIOUS 100
Tc = .1236 hrs
Drainage Area = .140 acres Runoff CN= 82

==========
Computational Time Increment = .01649 hrs
Computed Peak Time = 12.1335 hrs
Computed Peak Flow = 1.04 cfs

Time Increment for HYG File = .1000 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = .97 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:PERVIOUS
CN = 82
Area = .140 acres
S = 2.1951 in
0.2S = .4390 in

Cumulative Runoff

6.1736 in
3137 cu.ft

HYG Volume... 3136 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .12364 hrs (ID: PERVIOUS)
Computational Incr, Tm = .01649 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 1.28 cfs
Unit peak time Tp = .08243 hrs
Unit receding limb, Tr = .32971 hrs
Total unit time, Tb = .41214 hrs

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Impervious (parking)	98	.690			98.00
Impervious (Bldg, patio and walks)	98	.100			98.00
COMPOSITE AREA & WEIGHTED CN --->		.790			98.00 (98)

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.0110	
Hydraulic Length	145.00	ft
2yr, 24hr P	3.3000	in
Slope	.015000	ft/ft
Avg.Velocity	1.34	ft/sec

Segment #1 Time: .0300 hrs

Total Tc: .0300 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .0833 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 1.9999 hrs Rain Depth = 1.2500 in
Rain Dir = F:\1107570A\Design\
Rain File -ID = - NJDEP Water Qual
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107570A\Design\
HYG File - ID = work_pad.hyg - IMPERVIOUS 1
Tc (Min. Tc) = .0833 hrs
Drainage Area = .790 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 1.0888 hrs
Computed Peak Flow = 2.36 cfs

Time Increment for HYG File = .1000 hrs
Peak Time, Interpolated Output = 1.1000 hrs
Peak Flow, Interpolated Output = 2.33 cfs
==========

DRAINAGE AREA

ID:IMPERVIOUS
CN = 98
Area = .790 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

1.0346 in
2967 cu.ft

HYG Volume... 3051 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08333 hrs (ID: IMPERVIOUS)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 10.74 cfs
Unit peak time Tp = .05555 hrs
Unit receding limb, Tr = .22221 hrs
Total unit time, Tb = .27777 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.3100 in
Rain Dir = F:\1107570A\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107570A\Design\
HYG File - ID = work_pad.hyg - IMPERVIOUS 2
Tc (Min. Tc) = .0833 hrs
Drainage Area = .790 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 12.1106 hrs
Computed Peak Flow = 2.87 cfs

Time Increment for HYG File = .1000 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 2.85 cfs
==========

DRAINAGE AREA

ID:IMPERVIOUS
CN = 98
Area = .790 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

3.0771 in
8824 cu.ft

HYG Volume... 8824 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08333 hrs (ID: IMPERVIOUS)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 10.74 cfs
Unit peak time Tp = .05555 hrs
Unit receding limb, Tr = .22221 hrs
Total unit time, Tb = .27777 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.0100 in
Rain Dir = F:\1107570A\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107570A\Design\
HYG File - ID = work_pad.hyg - IMPERVIOUS 10
Tc (Min. Tc) = .0833 hrs
Drainage Area = .790 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 12.1106 hrs
Computed Peak Flow = 4.38 cfs

Time Increment for HYG File = .1000 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 4.34 cfs
==========

DRAINAGE AREA

ID:IMPERVIOUS
CN = 98
Area = .790 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

4.7732 in
13688 cu.ft

HYG Volume... 13688 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08333 hrs (ID: IMPERVIOUS)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 10.74 cfs
Unit peak time Tp = .05555 hrs
Unit receding limb, Tr = .22221 hrs
Total unit time, Tb = .27777 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 8.3300 in
Rain Dir = F:\1107570A\Design\
Rain File -ID = - Region C 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = F:\1107570A\Design\
HYG File - ID = work_pad.hyg - IMPERVIOUS 100
Tc (Min. Tc) = .0833 hrs
Drainage Area = .790 acres Runoff CN= 98

==========
Computational Time Increment = .01111 hrs
Computed Peak Time = 12.1106 hrs
Computed Peak Flow = 7.30 cfs

Time Increment for HYG File = .1000 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 7.24 cfs
==========

DRAINAGE AREA

ID:IMPERVIOUS
CN = 98
Area = .790 acres
S = .2041 in
0.2S = .0408 in

Cumulative Runoff

8.0900 in
23200 cu.ft

HYG Volume... 23199 cu.ft (area under HYG curve)

***** SCS UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .08333 hrs (ID: IMPERVIOUS)
Computational Incr, Tm = .01111 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 10.74 cfs
Unit peak time Tp = .05555 hrs
Unit receding limb, Tr = .22221 hrs
Total unit time, Tb = .27777 hrs

SUMMARY FOR HYDROGRAPH ADDITION
at Node: BASIN IN

HYG Directory: F:\1107570A\Design\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
IMPER FLOW	IMPERVIOUS	work_pad.hyg	IMPERVIOUS	1
PERVIOUS FLOW	PERVIOUS	work_pad.hyg	PERVIOUS	1

INFLOWS TO: BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time hrs	Peak Flow cfs
work_pad.hyg	IMPERVIOUS	1	3051	1.1000	2.33
work_pad.hyg	PERVIOUS	1	111	1.1000	.07

TOTAL FLOW INTO: BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time hrs	Peak Flow cfs
work_pad.hyg	BASIN IN	1	3162	1.1000	2.40

TOTAL NODE INFLOW...
HYG file = F:\1107570A\Design\work_pad.hyg
HYG ID = BASIN IN
HYG Tag = 1

Peak Discharge = 2.40 cfs
Time to Peak = 1.1000 hrs
HYG Volume = 3162 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
.3000	.00	.02	.07	.14	.18
.8000	.28	.61	1.90	2.40	1.07
1.3000	.52	.35	.33	.27	.25
1.8000	.19	.09	.08	.01	.00

SUMMARY FOR HYDROGRAPH ADDITION
at Node: BASIN IN

HYG Directory: F:\1107570A\Design\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
IMPER FLOW	IMPERVIOUS	work_pad.hyg	IMPERVIOUS	2
PERVIOUS FLOW	PERVIOUS	work_pad.hyg	PERVIOUS	2

INFLOWS TO: BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time hrs	Peak Flow cfs
work_pad.hyg	IMPERVIOUS	2	8824	12.1000	2.85
work_pad.hyg	PERVIOUS	2	825	12.1000	.26

TOTAL FLOW INTO: BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time hrs	Peak Flow cfs
work_pad.hyg	BASIN IN	2	9649	12.1000	3.11

TOTAL NODE INFLOW...
HYG file = F:\1107570A\Design\work_pad.hyg
HYG ID = BASIN IN
HYG Tag = 2

Peak Discharge = 3.11 cfs
Time to Peak = 12.1000 hrs
HYG Volume = 9649 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
1.2000	.00	.00	.00	.00	.00
1.7000	.01	.01	.01	.01	.01
2.2000	.01	.01	.01	.01	.01
2.7000	.01	.01	.02	.02	.02
3.2000	.02	.02	.02	.02	.02
3.7000	.02	.02	.02	.02	.02
4.2000	.02	.02	.02	.03	.03
4.7000	.03	.03	.03	.03	.03
5.2000	.03	.03	.03	.03	.03
5.7000	.03	.03	.03	.03	.03
6.2000	.03	.04	.04	.04	.04
6.7000	.04	.04	.04	.04	.04
7.2000	.05	.05	.05	.05	.05
7.7000	.05	.05	.05	.05	.06
8.2000	.06	.06	.06	.06	.06
8.7000	.06	.06	.07	.07	.07
9.2000	.07	.08	.08	.09	.09
9.7000	.09	.10	.10	.11	.11
10.2000	.12	.12	.12	.13	.14
10.7000	.16	.17	.19	.21	.23
11.2000	.26	.29	.32	.35	.52
11.7000	.58	.77	1.08	1.83	3.11
12.2000	1.55	.94	.67	.60	.42
12.7000	.37	.34	.30	.27	.24
13.2000	.22	.20	.19	.17	.15
13.7000	.15	.14	.14	.13	.13
14.2000	.12	.12	.12	.11	.11
14.7000	.10	.10	.09	.09	.08
15.2000	.08	.08	.08	.08	.08
15.7000	.08	.08	.07	.07	.07
16.2000	.07	.07	.07	.07	.07

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
16.7000	.07	.06	.06	.06	.06
17.2000	.06	.06	.06	.06	.05
17.7000	.05	.05	.05	.05	.05
18.2000	.05	.05	.05	.05	.05
18.7000	.05	.05	.05	.05	.05
19.2000	.05	.04	.04	.04	.04
19.7000	.04	.04	.04	.04	.04
20.2000	.04	.04	.04	.04	.04
20.7000	.04	.04	.04	.04	.04
21.2000	.04	.04	.04	.04	.04
21.7000	.04	.04	.04	.04	.04
22.2000	.04	.04	.04	.04	.04
22.7000	.03	.03	.03	.03	.03
23.2000	.03	.03	.03	.03	.03
23.7000	.03	.03	.03	.04	.01
24.2000	.00				

SUMMARY FOR HYDROGRAPH ADDITION
at Node: BASIN IN

HYG Directory: F:\1107570A\Design\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
IMPER FLOW	IMPERVIOUS	work_pad.hyg	IMPERVIOUS	10
PERVIOUS FLOW	PERVIOUS	work_pad.hyg	PERVIOUS	10

INFLOWS TO: BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time hrs	Peak Flow cfs
work_pad.hyg	IMPERVIOUS	10	13688	12.1000	4.34
work_pad.hyg	PERVIOUS	10	1567	12.1000	.50

TOTAL FLOW INTO: BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time hrs	Peak Flow cfs
work_pad.hyg	BASIN IN	10	15255	12.1000	4.84

TOTAL NODE INFLOW...
HYG file = F:\1107570A\Design\work_pad.hyg
HYG ID = BASIN IN
HYG Tag = 10

Peak Discharge = 4.84 cfs
Time to Peak = 12.1000 hrs
HYG Volume = 15255 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
.8000	.00	.00	.00	.01	.01
1.3000	.01	.01	.01	.02	.02
1.8000	.02	.02	.02	.02	.02
2.3000	.03	.03	.03	.03	.03
2.8000	.03	.03	.03	.03	.03
3.3000	.04	.04	.04	.04	.04
3.8000	.04	.04	.04	.04	.04
4.3000	.04	.04	.05	.05	.05
4.8000	.05	.05	.05	.05	.05
5.3000	.05	.05	.05	.05	.05
5.8000	.05	.05	.06	.06	.06
6.3000	.06	.06	.06	.07	.07
6.8000	.07	.07	.07	.07	.08
7.3000	.08	.08	.08	.08	.09
7.8000	.09	.09	.09	.09	.09
8.3000	.10	.10	.10	.10	.10
8.8000	.11	.11	.11	.12	.12
9.3000	.13	.13	.14	.15	.15
9.8000	.16	.17	.17	.18	.19
10.3000	.19	.20	.21	.23	.25
10.8000	.28	.30	.33	.37	.42
11.3000	.47	.51	.55	.82	.91
11.8000	1.21	1.69	2.86	4.84	2.43
12.3000	1.46	1.04	.94	.66	.57
12.8000	.52	.47	.42	.37	.34
13.3000	.32	.29	.26	.24	.23
13.8000	.22	.21	.21	.20	.19
14.3000	.19	.18	.17	.16	.16
14.8000	.15	.14	.14	.13	.13
15.3000	.13	.12	.12	.12	.12
15.8000	.12	.11	.11	.11	.11

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
16.3000	.11	.11	.10	.10	.10
16.8000	.10	.10	.09	.09	.09
17.3000	.09	.09	.09	.08	.08
17.8000	.08	.08	.08	.07	.07
18.3000	.07	.07	.07	.07	.07
18.8000	.07	.07	.07	.07	.07
19.3000	.07	.07	.07	.07	.07
19.8000	.07	.07	.07	.07	.06
20.3000	.06	.06	.06	.06	.06
20.8000	.06	.06	.06	.06	.06
21.3000	.06	.06	.06	.06	.06
21.8000	.06	.06	.06	.06	.06
22.3000	.06	.05	.05	.05	.05
22.8000	.05	.05	.05	.05	.05
23.3000	.05	.05	.05	.05	.05
23.8000	.05	.05	.06	.01	.00

SUMMARY FOR HYDROGRAPH ADDITION
at Node: BASIN IN

HYG Directory: F:\1107570A\Design\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
IMPER FLOW	IMPERVIOUS	work_pad.hyg	IMPERVIOUS	100
PERVIOUS FLOW	PERVIOUS	work_pad.hyg	PERVIOUS	100

INFLOWS TO: BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time hrs	Peak Flow cfs
work_pad.hyg	IMPERVIOUS	100	23199	12.1000	7.24
work_pad.hyg	PERVIOUS	100	3136	12.1000	.97

TOTAL FLOW INTO: BASIN IN

HYG file	HYG ID	HYG tag	Volume cu.ft	Peak Time hrs	Peak Flow cfs
work_pad.hyg	BASIN IN	100	26335	12.1000	8.21

TOTAL NODE INFLOW...
HYG file = F:\1107570A\Design\work_pad.hyg
HYG ID = BASIN IN
HYG Tag = 100

Peak Discharge = 8.21 cfs
Time to Peak = 12.1000 hrs
HYG Volume = 26335 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
.5000	.00	.01	.01	.02	.02
1.0000	.02	.03	.03	.03	.04
1.5000	.04	.04	.05	.05	.05
2.0000	.05	.05	.06	.06	.06
2.5000	.06	.06	.06	.07	.07
3.0000	.07	.07	.07	.07	.07
3.5000	.08	.08	.08	.08	.08
4.0000	.08	.08	.08	.08	.09
4.5000	.09	.09	.09	.09	.09
5.0000	.09	.09	.09	.10	.10
5.5000	.10	.10	.10	.10	.10
6.0000	.10	.11	.11	.11	.11
6.5000	.12	.12	.12	.13	.13
7.0000	.13	.14	.14	.14	.15
7.5000	.15	.15	.15	.16	.16
8.0000	.16	.17	.17	.17	.18
8.5000	.18	.18	.19	.19	.19
9.0000	.20	.21	.22	.23	.24
9.5000	.25	.26	.27	.28	.30
10.0000	.31	.32	.33	.34	.35
10.5000	.36	.40	.44	.49	.53
11.0000	.57	.65	.73	.81	.89
11.5000	.96	1.41	1.57	2.08	2.89
12.0000	4.88	8.21	4.14	2.48	1.77
12.5000	1.58	1.11	.96	.88	.79
13.0000	.71	.63	.58	.53	.49
13.5000	.44	.40	.38	.37	.36
14.0000	.35	.33	.32	.31	.30
14.5000	.29	.28	.27	.25	.24
15.0000	.23	.22	.21	.21	.21
15.5000	.20	.20	.20	.20	.19

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
16.0000	.19	.19	.18	.18	.18
16.5000	.17	.17	.17	.16	.16
17.0000	.16	.16	.15	.15	.15
17.5000	.14	.14	.14	.13	.13
18.0000	.13	.13	.12	.12	.12
18.5000	.12	.12	.12	.12	.12
19.0000	.12	.12	.12	.12	.11
19.5000	.11	.11	.11	.11	.11
20.0000	.11	.11	.11	.11	.11
20.5000	.11	.11	.10	.10	.10
21.0000	.10	.10	.10	.10	.10
21.5000	.10	.10	.10	.10	.10
22.0000	.09	.09	.09	.09	.09
22.5000	.09	.09	.09	.09	.09
23.0000	.09	.09	.09	.08	.08
23.5000	.08	.08	.08	.08	.08
24.0000	.10	.02	.00		

STORMWATER BASIN
DESIGN DATA

File.... F:\1107570A\Design\Detention Basin Ph 2 DRCC.ppw

COMPUTED VOLUMES FOR A PIPE

US Invert Elev.= 121.00 ft
DS Invert Elev.= 120.82 ft
Barrel Length = 95.00 ft
Computed Slope = .001895 ft/ft
Diameter = 2.5000 ft
# of Barrels = 11.00

Slice Width = .10 ft
Vertical Incr. = .10 ft

Elevation (ft)	Perpendicular DS Depth (ft)	DS Area (sq.ft)	Wetted Length (ft)	Filled Length (ft)	Perpendicular US Depth (ft)	US Area (sq.ft)	Total Volume (cu.ft)
120.82	.00	.0000	.00	.00	.00	.0000	0
120.92	.10	.0657	52.78	.00	.00	.0000	15
121.02	.20	.1837	95.00	.00	.02	.0059	86
121.12	.30	.3334	95.00	.00	.12	.0864	211
121.22	.40	.5066	95.00	.00	.22	.2117	369
121.32	.50	.6985	95.00	.00	.32	.3666	552
121.42	.60	.9055	95.00	.00	.42	.5440	753
121.52	.70	1.1247	95.00	.00	.52	.7392	971
121.62	.80	1.3537	95.00	.00	.62	.9489	1201
121.72	.90	1.5905	95.00	.00	.72	1.1702	1441
121.82	1.00	1.8331	95.00	.00	.82	1.4010	1688
121.92	1.10	2.0798	95.00	.00	.92	1.6391	1942
122.02	1.20	2.3289	95.00	.00	1.02	1.8826	2200
122.12	1.30	2.5789	95.00	.00	1.12	2.1300	2460
122.22	1.40	2.8280	95.00	.00	1.22	2.3794	2721
122.32	1.50	3.0747	95.00	.00	1.32	2.6293	2981
122.42	1.60	3.3173	95.00	.00	1.42	2.8781	3239
122.52	1.70	3.5541	95.00	.00	1.52	3.1241	3491
122.62	1.80	3.7832	95.00	.00	1.62	3.3657	3738
122.72	1.90	4.0024	95.00	.00	1.72	3.6011	3976
122.82	2.00	4.2095	95.00	.00	1.82	3.8283	4203
122.92	2.10	4.4014	95.00	.00	1.92	4.0453	4418
123.02	2.20	4.5748	95.00	.00	2.02	4.2495	4616
123.12	2.30	4.7245	95.00	.00	2.12	4.4381	4794
123.22	2.40	4.8427	95.00	.00	2.22	4.6071	4947
123.32	2.50	4.9087	95.00	.00	2.32	4.7513	5063
123.42	2.50	4.9087	95.00	52.78	2.42	4.8615	5121
123.50	2.50	4.9087	95.00	95.00	2.50	4.9087	5130

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 120.82 ft
Increment = .10 ft
Max. Elev.= 123.50 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Orifice-Circular	1	--->	TW	120.820	123.500
Weir-Rectangular	2	--->	TW	122.000	123.500

TW SETUP, DS Channel

OUTLET STRUCTURE INPUT DATA

Structure ID = 1
Structure Type = Orifice-Circular

# of Openings = 1
Invert Elev. = 120.82 ft
Diameter = .2900 ft
Orifice Coeff. = .600

Structure ID = 2
Structure Type = Weir-Rectangular

# of Openings = 1
Crest Elev. = 122.00 ft
Weir Length = 1.50 ft
Weir Coeff. = 3.330000

Weir TW effects (Use adjustment equation)

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 40
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .00 cfs
Max. Q tolerance = .00 cfs

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
120.82	.00	Free Outfall		None contributing
120.92	.02	Free Outfall		1
121.02	.06	Free Outfall		1
121.12	.13	Free Outfall		1
121.22	.16	Free Outfall		1
121.32	.19	Free Outfall		1
121.42	.21	Free Outfall		1
121.52	.24	Free Outfall		1
121.62	.26	Free Outfall		1
121.72	.28	Free Outfall		1
121.82	.29	Free Outfall		1
121.92	.31	Free Outfall		1
122.00	.32	Free Outfall		1 +2
122.02	.34	Free Outfall		1 +2
122.12	.55	Free Outfall		1 +2
122.22	.86	Free Outfall		1 +2
122.32	1.24	Free Outfall		1 +2
122.42	1.67	Free Outfall		1 +2
122.52	2.14	Free Outfall		1 +2
122.62	2.65	Free Outfall		1 +2
122.72	3.18	Free Outfall		1 +2
122.82	3.74	Free Outfall		1 +2
122.92	4.31	Free Outfall		1 +2
123.02	4.90	Free Outfall		1 +2
123.12	5.50	Free Outfall		1 +2
123.22	6.11	Free Outfall		1 +2
123.32	6.73	Free Outfall		1 +2
123.42	7.35	Free Outfall		1 +2
123.50	7.85	Free Outfall		1 +2

LEVEL POOL ROUTING DATA

HYG Dir = F:\1107570A\Design\
Inflow HYG file = work_pad.hyg - BASIN IN 2
Outflow HYG file = work_pad.hyg - BASIN OUT 2

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 120.86 ft
Starting Volume = 6 cu.ft
Starting Outflow = .01 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .01 cfs
Time Increment = .1000 hrs

Elevation ft	Outflow cfs	Storage cu.ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
120.82	.00	0	.00	.00	.00
120.92	.02	15	.00	.02	.10
121.02	.06	86	.00	.06	.54
121.12	.13	211	.00	.13	1.30
121.22	.16	369	.00	.16	2.21
121.32	.19	552	.00	.19	3.25
121.42	.21	753	.00	.21	4.40
121.52	.24	971	.00	.24	5.63
121.62	.26	1201	.00	.26	6.93
121.72	.28	1441	.00	.28	8.28
121.82	.29	1688	.00	.29	9.67
121.92	.31	1942	.00	.31	11.10
122.00	.32	2149	.00	.32	12.26
122.02	.34	2200	.00	.34	12.56
122.12	.55	2460	.00	.55	14.22
122.22	.86	2721	.00	.86	15.98
122.32	1.24	2981	.00	1.24	17.80
122.42	1.67	3239	.00	1.67	19.66
122.52	2.14	3491	.00	2.14	21.54
122.62	2.65	3738	.00	2.65	23.41

LEVEL POOL ROUTING DATA

HYG Dir = F:\1107570A\Design\
Inflow HYG file = work_pad.hyg - BASIN IN 2
Outflow HYG file = work_pad.hyg - BASIN OUT 2

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	120.86 ft
Starting Volume	=	6 cu.ft
Starting Outflow	=	.01 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.01 cfs
Time Increment	=	.1000 hrs

Elevation ft	Outflow cfs	Storage cu.ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
122.72	3.18	3976	.00	3.18	25.27
122.82	3.74	4203	.00	3.74	27.09
122.92	4.31	4418	.00	4.31	28.86
123.02	4.90	4616	.00	4.90	30.55
123.12	5.50	4794	.00	5.50	32.14
123.22	6.11	4947	.00	6.11	33.60
123.32	6.73	5063	.00	6.73	34.86
123.42	7.35	5121	.00	7.35	35.80
123.50	7.85	5130	.00	7.85	36.35

STORMWATER BASIN

ROUTING CALCULATIONS

MASTER DESIGN STORM SUMMARY

Network Storm Collection: TR55

Return Event	Total Depth in	Rainfall Type	RNF ID
2	3.3100	Synthetic Curve	Region C 24hr
10	5.0100	Synthetic Curve	Region C 24hr
100	8.3300	Synthetic Curve	Region C 24hr
1	1.2500	Time-Depth Curve	NJDEP Water Qual

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol cu.ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage cu.ft
BASIN	IN POND	2	9649		12.1000	3.11		
BASIN	IN POND	10	15255		12.1000	4.84		
BASIN	IN POND	100	26335		12.1000	8.21		
BASIN	IN POND	1	3162		1.1000	2.40		
BASIN	OUT POND	2	9653		12.3000	1.14	122.30	2918
BASIN	OUT POND	10	15259		12.2000	2.98	122.68	3885
BASIN	OUT POND	100	26339		12.2000	6.02	123.20	4923
BASIN	OUT POND	1	3166		1.5000	.32	121.98	2089
IMPERVIOUS	AREA	2	8824		12.1000	2.85		
IMPERVIOUS	AREA	10	13688		12.1000	4.34		
IMPERVIOUS	AREA	100	23199		12.1000	7.24		
IMPERVIOUS	AREA	1	3051		1.1000	2.33		

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol cu.ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage cu.ft
*OUTFALL	JCT	2	9654		12.3000	1.14		
*OUTFALL	JCT	10	15260		12.2000	2.98		
*OUTFALL	JCT	100	26340		12.2000	6.02		
*OUTFALL	JCT	1	3167		1.5000	.32		
PERVIOUS	AREA	2	825		12.1000	.26		
PERVIOUS	AREA	10	1567		12.1000	.50		
PERVIOUS	AREA	100	3136		12.1000	.97		
PERVIOUS	AREA	1	111		1.1000	.07		

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\1107570A\Design\
Inflow HYG file = work_pad.hyg - BASIN IN 1
Outflow HYG file = work_pad.hyg - BASIN OUT 1

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	120.82 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.1000 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	2.40 cfs	at	1.1000 hrs
Peak Outflow	=	.32 cfs	at	1.5000 hrs
Peak Elevation	=	121.98 ft		
Peak Storage	=	2088 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	3162
- Infiltration	=	0
- HYG Vol OUT	=	3159
- Retained Vol	=	2
Unrouted Vol	=	0 cu.ft (.000% of Inflow Volume)

POND ROUTED TOTAL OUTFLOW HYG...
HYG file = F:\1107570A\Design\work_pad.hyg
HYG ID = BASIN OUT
HYG Tag = 1

Peak Discharge =	.32 cfs
Time to Peak =	1.5000 hrs
HYG Volume =	3159 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
.3000	.00	.00	.02	.04	.06
.8000	.09	.14	.20	.27	.31
1.3000	.32	.32	.32	.32	.32
1.8000	.32	.31	.31	.30	.29
2.3000	.29	.28	.27	.26	.26
2.8000	.25	.24	.23	.22	.22
3.3000	.21	.20	.19	.18	.17
3.8000	.16	.15	.14	.12	.10
4.3000	.09	.07	.06	.05	.04
4.8000	.03	.02	.02	.01	.01
5.3000	.01	.00	.00		

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\1107570A\Design\
Inflow HYG file = work_pad.hyg - BASIN IN 2
Outflow HYG file = work_pad.hyg - BASIN OUT 2

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	120.82 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.1000 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	3.11 cfs	at	12.1000 hrs
Peak Outflow	=	1.14 cfs	at	12.3000 hrs
Peak Elevation	=	122.30 ft		
Peak Storage	=	2918 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	9649
- Infiltration	=	0
- HYG Vol OUT	=	9647
- Retained Vol	=	3
Unrouted Vol	=	0 cu.ft (.000% of Inflow Volume)

POND ROUTED TOTAL OUTFLOW HYG...
HYG file = F:\1107570A\Design\work_pad.hyg
HYG ID = BASIN OUT
HYG Tag = 2

Peak Discharge =	1.14 cfs
Time to Peak =	12.3000 hrs
HYG Volume =	9647 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
1.2000	.00	.00	.00	.00	.00
1.7000	.00	.00	.00	.01	.01
2.2000	.01	.01	.01	.01	.01
2.7000	.01	.01	.01	.01	.01
3.2000	.02	.02	.02	.02	.02
3.7000	.02	.02	.02	.02	.02
4.2000	.02	.02	.02	.02	.02
4.7000	.02	.02	.02	.03	.03
5.2000	.03	.03	.03	.03	.03
5.7000	.03	.03	.03	.03	.03
6.2000	.03	.03	.03	.03	.03
6.7000	.04	.04	.04	.04	.04
7.2000	.04	.04	.04	.04	.05
7.7000	.05	.05	.05	.05	.05
8.2000	.05	.05	.05	.06	.06
8.7000	.06	.06	.06	.06	.06
9.2000	.06	.07	.07	.07	.07
9.7000	.08	.08	.08	.09	.09
10.2000	.09	.10	.10	.11	.11
10.7000	.12	.13	.13	.14	.14
11.2000	.15	.16	.17	.18	.19
11.7000	.21	.23	.25	.28	.42
12.2000	1.07	1.14	1.00	.85	.73
12.7000	.61	.53	.48	.43	.39
13.2000	.35	.33	.32	.32	.31
13.7000	.31	.31	.30	.30	.30
14.2000	.29	.29	.28	.28	.27
14.7000	.27	.26	.26	.25	.25
15.2000	.24	.24	.23	.23	.22
15.7000	.22	.21	.21	.20	.19
16.2000	.19	.18	.18	.17	.16

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
16.7000	.16	.15	.14	.14	.13
17.2000	.13	.12	.11	.10	.09
17.7000	.09	.08	.08	.07	.07
18.2000	.06	.06	.06	.06	.05
18.7000	.05	.05	.05	.05	.05
19.2000	.05	.05	.05	.05	.05
19.7000	.05	.04	.04	.04	.04
20.2000	.04	.04	.04	.04	.04
20.7000	.04	.04	.04	.04	.04
21.2000	.04	.04	.04	.04	.04
21.7000	.04	.04	.04	.04	.04
22.2000	.04	.04	.04	.04	.04
22.7000	.04	.04	.04	.04	.03
23.2000	.03	.03	.03	.03	.03
23.7000	.03	.03	.03	.03	.03
24.2000	.02	.02	.01	.01	.01
24.7000	.00	.00			

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\1107570A\Design\
Inflow HYG file = work_pad.hyg - BASIN IN 10
Outflow HYG file = work_pad.hyg - BASIN OUT 10

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	120.82 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.1000 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	4.84 cfs	at	12.1000 hrs
Peak Outflow	=	2.98 cfs	at	12.2000 hrs
Peak Elevation	=	122.68 ft		
Peak Storage	=	3885 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	15255
- Infiltration	=	0
- HYG Vol OUT	=	15253
- Retained Vol	=	2
Unrouted Vol	=	0 cu.ft (.000% of Inflow Volume)

POND ROUTED TOTAL OUTFLOW HYG...
HYG file = F:\1107570A\Design\work_pad.hyg
HYG ID = BASIN OUT
HYG Tag = 10

Peak Discharge = 2.98 cfs
Time to Peak = 12.2000 hrs
HYG Volume = 15253 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
.8000	.00	.00	.00	.00	.00
1.3000	.01	.01	.01	.01	.01
1.8000	.01	.02	.02	.02	.02
2.3000	.02	.02	.02	.02	.02
2.8000	.03	.03	.03	.03	.03
3.3000	.03	.03	.03	.03	.04
3.8000	.04	.04	.04	.04	.04
4.3000	.04	.04	.04	.04	.04
4.8000	.04	.05	.05	.05	.05
5.3000	.05	.05	.05	.05	.05
5.8000	.05	.05	.05	.05	.05
6.3000	.06	.06	.06	.06	.06
6.8000	.06	.06	.06	.07	.07
7.3000	.07	.07	.07	.07	.08
7.8000	.08	.08	.08	.08	.08
8.3000	.09	.09	.09	.09	.09
8.8000	.10	.10	.10	.10	.10
9.3000	.11	.11	.12	.12	.13
9.8000	.13	.13	.13	.14	.14
10.3000	.14	.15	.15	.16	.16
10.8000	.17	.18	.18	.19	.20
11.3000	.21	.22	.23	.25	.27
11.8000	.29	.32	.76	2.16	2.98
12.3000	2.40	1.80	1.42	1.14	.92
12.8000	.78	.68	.60	.53	.49
13.3000	.45	.41	.38	.35	.33
13.8000	.32	.32	.32	.32	.31
14.3000	.31	.31	.30	.30	.30
14.8000	.29	.29	.29	.28	.28
15.3000	.27	.27	.27	.26	.26
15.8000	.25	.25	.25	.24	.24

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
16.3000	.23	.23	.22	.22	.21
16.8000	.21	.20	.20	.20	.19
17.3000	.19	.18	.17	.17	.16
17.8000	.16	.15	.15	.14	.14
18.3000	.13	.13	.12	.11	.11
18.8000	.10	.10	.09	.09	.08
19.3000	.08	.08	.08	.08	.07
19.8000	.07	.07	.07	.07	.07
20.3000	.07	.07	.07	.07	.07
20.8000	.07	.06	.06	.06	.06
21.3000	.06	.06	.06	.06	.06
21.8000	.06	.06	.06	.06	.06
22.3000	.06	.06	.06	.06	.06
22.8000	.05	.05	.05	.05	.05
23.3000	.05	.05	.05	.05	.05
23.8000	.05	.05	.05	.05	.04
24.3000	.03	.02	.02	.01	.01
24.8000	.01	.00	.00		

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\1107570A\Design\
Inflow HYG file = work_pad.hyg - BASIN IN 100
Outflow HYG file = work_pad.hyg - BASIN OUT 100

Pond Node Data = BASIN
Pond Volume Data = BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	120.82 ft
Starting Volume	=	0 cu.ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.1000 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	8.21 cfs	at	12.1000 hrs
Peak Outflow	=	6.02 cfs	at	12.2000 hrs
Peak Elevation	=	123.20 ft		
Peak Storage	=	4923 cu.ft		

MASS BALANCE (cu.ft)

+ Initial Vol	=	0
+ HYG Vol IN	=	26335
- Infiltration	=	0
- HYG Vol OUT	=	26333
- Retained Vol	=	2
Unrouted Vol	=	0 cu.ft (.000% of Inflow Volume)

POND ROUTED TOTAL OUTFLOW HYG...
HYG file = F:\1107570A\Design\work_pad.hyg
HYG ID = BASIN OUT
HYG Tag = 100

Peak Discharge = 6.02 cfs
Time to Peak = 12.2000 hrs
HYG Volume = 26333 cu.ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
.5000	.00	.00	.00	.01	.01
1.0000	.01	.02	.02	.02	.03
1.5000	.03	.03	.03	.04	.04
2.0000	.04	.04	.05	.05	.05
2.5000	.05	.05	.06	.06	.06
3.0000	.06	.06	.06	.07	.07
3.5000	.07	.07	.07	.07	.07
4.0000	.07	.08	.08	.08	.08
4.5000	.08	.08	.08	.08	.08
5.0000	.09	.09	.09	.09	.09
5.5000	.09	.09	.09	.10	.10
6.0000	.10	.10	.10	.10	.10
6.5000	.11	.11	.11	.11	.12
7.0000	.12	.12	.12	.13	.13
7.5000	.13	.13	.13	.13	.14
8.0000	.14	.14	.14	.14	.15
8.5000	.15	.15	.15	.16	.16
9.0000	.16	.16	.17	.17	.17
9.5000	.18	.18	.19	.19	.20
10.0000	.20	.20	.21	.22	.22
10.5000	.23	.23	.24	.24	.25
11.0000	.26	.27	.28	.30	.31
11.5000	.32	.50	.83	1.24	1.83
12.0000	2.94	5.32	6.02	4.02	2.86
12.5000	2.21	1.77	1.42	1.19	1.04
13.0000	.92	.82	.75	.68	.62
13.5000	.56	.52	.49	.46	.44
14.0000	.42	.40	.38	.36	.35
14.5000	.34	.33	.33	.32	.32
15.0000	.32	.32	.31	.31	.31
15.5000	.31	.31	.30	.30	.30

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .1000 hrs
Time on left represents time for first value in each row.

Time hrs					
16.0000	.30	.29	.29	.29	.28
16.5000	.28	.28	.28	.27	.27
17.0000	.27	.26	.26	.26	.25
17.5000	.25	.25	.24	.24	.24
18.0000	.23	.23	.23	.22	.22
18.5000	.21	.21	.21	.20	.20
19.0000	.20	.19	.19	.19	.18
19.5000	.18	.17	.17	.17	.16
20.0000	.16	.16	.15	.15	.15
20.5000	.14	.14	.14	.14	.13
21.0000	.13	.13	.13	.12	.12
21.5000	.12	.11	.11	.11	.11
22.0000	.10	.10	.10	.10	.10
22.5000	.10	.10	.10	.09	.09
23.0000	.09	.09	.09	.09	.09
23.5000	.09	.09	.09	.09	.08
24.0000	.09	.08	.07	.06	.04
24.5000	.04	.03	.02	.02	.01
25.0000	.01	.01	.00	.00	

STORM SEWER

CALCULATIONS

DRAINAGE COMPUTATION SHEET
Rational Method

Hopewell Valley Engineering, P.C.
1600 Reed Road, Suite A
Pennington, NJ 08534

Sheet 1 of 1

PROJECT: Marmalade Rest
JOB #: 11075704
MUNICIPALITY: Lawrence Twp

STORM FREQUENCY: 100 YR
PIPE n = 0.010 (HDPE-Smooth Int + PVC)

CALC BY: RMS
DATE: July 1, 2021

FROM STRUCTURE NUMBER	TO STRUCTURE NUMBER	INCREMENTS OF AREA - ACRES (A)	COEFFICIENT OF RUNOFF C	EQUIVALENT AREA (C*A) (100% ACRES)	TOTAL AREA (ΣCA) (100 ACRES)	TIME OF CONCENTRATION (MIN)	INTENSITY (IN. PER HR.) (I)	FLOW VOLUME (CFS) (Q=CIA)	TYPE STRUCTURE	DIAMETER OF PIPE (IN.)	SLOPE %	CAPACITY OF SEWER (CFS)	FULL VELOCITY (FT. PER SEC.)	ACTUAL VELOCITY (FT. PER . SEC.)	LENGTH OF PIPE (FT.)	TIME OF FLOW	REMARKS
					INLET / PIPE	INLET / PIPE	INLET / PIPE	INLET / PIPE									
1	Basin	0.57	0.96	.55	.55 / .55	6 / 6	9.1 / 9.1	5.0 / 5.0	"B" Inlet	15	0.4	5.3	4.3	4.9	42		
3	2	.005	1.0	.005	.005 / .005	6 / 6	9.1 / 9.1	.05 / .05	4" TD	4	2.0	0.35	4.0	2.8	32	0.2	Trench Drain on Patio (4")
2	Basin	0.3	.84	0.25	0.25 / 0.255	6 / 6.2	9.1 / 9.0	2.3 / 2.3	"A" Inlet	15	0.25	4.2	3.4		150		
Bldg	Basin	0.06								6	1.0	PVC					Roof Drain from Bldg - Use 1997 IPC Table 1106.3 attached for a 2,638 SF roof

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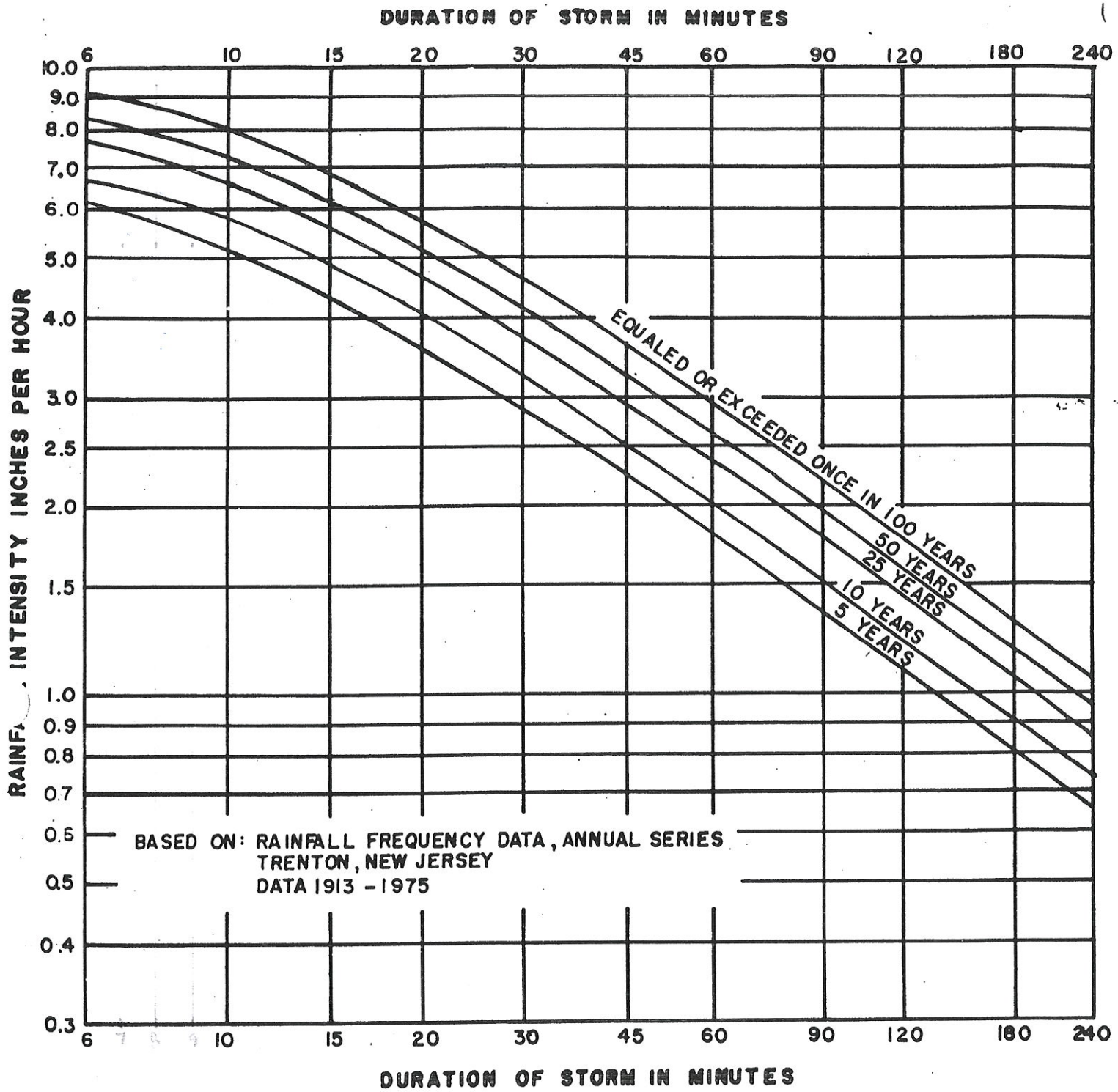
FIG. 2.1-2(B-1) RAINFALL INTENSITY CURVES



STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
FLOOD PLAIN MANAGEMENT 1976

FIG 2.1-2(B-1) RAINFALL INTENSITY CURVES

TABLE 1106.2
SIZE OF VERTICAL CONDUCTORS AND LEADERS

DIAMETER OF LEADER (Inches)[a]	HORIZONTALLY PROJECTED ROOF AREA (square feet) Rainfall rate (inches per hour)											
	1	2	3	4	5	6	7	8	9	10	11	12
2	2,880	1,440	960	720	575	480	410	360	320	290	260	240
3	8,800	4,400	2,930	2,200	1,760	1,470	1,260	1,100	980	880	800	730
4	18,400	9,200	6,130	4,600	3,680	3,070	2,630	2,300	2,045	1,840	1,675	1,530
5	34,600	17,300	11,530	8,650	6,920	5,765	4,945	4,325	3,845	3,460	3,145	2,880
6	54,000	27,000	17,995	13,500	10,800	9,000	7,715	6,750	6,000	5,400	4,910	4,500
8	116,000	58,000	38,660	29,000	23,200	19,315	16,570	14,500	12,890	11,600	10,545	9,660

For **SI:** 1 inch = 25.4 mm, 1 square foot = 0.0929 m^2.

[a] Sizes indicated are the diameter of circular piping. This table is applicable to piping of other shapes provided the cross-sectional shape fully encloses a circle of the diameter indicated in this table.

Roof = 2,630 SF OK

TABLE 1106.3
SIZE OF HORIZONTAL STORM DRAINAGE PIPING

SIZE OF HORIZONTAL PIPING (Inches)	HORIZONTALLY PROJECTED ROOF AREA (square feet) Rainfall rate (inches per hour)					
	1	2	3	4	5	6
$\frac{1}{8}$ unit vertical in 12 units horizontal (1-percent slope)						
3	3,288	1,644	1,096	822	657	548
4	7,520	3,760	2,506	1,800	1,504	1,253
5	13,360	6,680	4,453	3,340	2,672	2,227
6	21,400	10,700	7,133	5,350	4,280	3,566
8	46,000	23,000	15,330	11,500	9,200	7,600
10	82,800	41,400	27,600	20,700	16,580	13,800
12	133,200	66,600	44,400	33,300	26,650	22,200
15	218,000	109,000	72,800	59,500	47,600	39,650
$\frac{1}{4}$ unit vertical in 12 units horizontal (2-percent slope)						
3	4,640	2,320	1,546	1,160	928	773
4	10,600	5,300	3,533	2,650	2,120	1,766
5	18,880	9,440	6,293	4,720	3,776	3,146
6	30,200	15,100	10,066	7,550	6,040	5,033
8	65,200	32,600	21,733	16,300	13,040	10,866
10	116,800	58,400	38,950	29,200	23,350	19,450
12	188,000	94,000	62,600	47,000	37,600	31,350
15	336,000	168,000	112,000	84,000	67,250	56,000
$\frac{1}{2}$ unit vertical in 12 units horizontal (4-percent slope)						
3	6,576	3,288	2,295	1,644	1,310	1,096
4	15,040	7,520	5,010	3,760	3,010	2,500
5	26,720	13,360	8,900	6,680	5,320	4,450
6	42,800	21,400	13,700	10,700	8,580	7,140
8	92,000	46,000	30,650	23,000	18,400	15,320
10	171,600	85,800	55,200	41,400	33,150	27,600
12	266,400	133,200	88,800	66,600	53,200	44,400
15	476,000	238,000	158,800	119,000	95,300	79,250

For **SI:** 1 inch = 25.4 mm, 1 square foot = 0.0929 m^2.

6" @ 1%

APPENDIX B

RATES OF RAINFALL FOR VARIOUS CITIES

Rainfall rates, in inches per hour, are based on a storm of one-hour duration and a 100-year return period. The rainfall rates shown in the appendix are derived from Figure 1106.1 (SEE ATTACHED)

Alabama:
- Birmingham 3.8
- Huntsville 3.6
- Mobile 4.6
- Montgomery 4.2

Alaska:
- Fairbanks 1.0
- Juneau 0.6

Arizona:
- Flagstaff 2.4
- Nogales 3.1
- Phoenix 2.5
- Yuma 1.6

Arkansas:
- Fort Smith 3.6
- Little Rock 3.7
- Texarkana 3.8

California:
- Barstow 1.4
- Crescent City 1.5
- Fresno 1.1
- Los Angeles 2.1
- Needles 1.6
- Placerville 1.5
- San Fernando 2.3
- San Francisco 1.5
- Yreka 1.4

Colorado:
- Craig 1.5
- Denver 2.4
- Durango 1.8
- Grand Junction 1.7
- Lamar 3.0
- Pueblo 2.5

Connecticut:
- Hartford 2.7
- New Haven 2.8
- Putnam 2.6

Delaware:
- Georgetown 3.0
- Wilmington 3.1

District of Columbia:
- Washington 3.2

Florida:
- Jacksonville 4.3
- Key West 4.3
- Miami 4.7
- Pensacola 4.6
- Tampa 4.5

Georgia:
- Atlanta 3.7
- Dalton 3.4
- Macon 3.9
- Savannah 4.3
- Thomasville 4.3

Hawaii:
- Hilo 6.2
- Honolulu 3.0
- Wailuku 3.0

Idaho:
- Boise 0.9
- Lewiston 1.1
- Pocatello 1.2

Illinois:
- Cairo 3.3
- Chicago 3.0
- Peoria 3.3
- Rockford 3.2
- Springfield 3.3

Indiana:
- Evansville 3.2
- Fort Wayne 2.9
- Indianapolis 3.1

Iowa:
- Davenport 3.3
- Des Moines 3.4
- Dubuque 3.3
- Sioux City 3.6

Kansas:
- Atwood 3.3
- Dodge City 3.3
- Topeka 3.7
- Wichita 3.7

Kentucky:
- Ashland 3.0
- Lexington 3.1
- Louisville 3.2
- Middlesboro 3.2
- Paducah 3.3

Louisiana:
- Alexandria 4.2
- Lake Providence 4.0
- New Orleans 4.8
- Shreveport 3.9

Maine:
- Bangor 2.2
- Houlton 2.1
- Portland 2.4

Maryland:
- Baltimore 3.2
- Hagerstown 2.8
- Oakland 2.7
- Salisbury 3.1

Massachusetts:
- Boston 2.5
- Pittsfield 2.8
- Worcester 2.7

Michigan:
- Alpena 2.5
- Detroit 2.7
- Grand Rapids 2.6
- Lansing 2.8
- Marquette 2.4
- Sault Ste. Marie 2.2

Minnesota:
- Duluth 2.8
- Grand Marais 2.3
- Minneapolis 3.1
- Moorhead 3.2
- Worthington 3.5

Mississippi:
- Biloxi 4.7
- Columbus 3.9
- Corinth 3.6
- Natchez 4.4
- Vicksburg 4.1

Missouri:
- Columbia 3.2
- Kansas City 3.6
- Springfield 3.4
- St. Louis 3.2

Montana:
- Ekalaka 2.5
- Havre 1.6
- Helena 1.5
- Kalispell 1.2
- Missoula 1.3

Nebraska:
- North Platte 3.3
- Omaha 3.8
- Scottsbluff 3.1
- Valentine 3.2

Nevada:
- Elko 1.0
- Ely 1.1
- Las Vegas 1.4
- Reno 1.1

New Hampshire:
- Berlin 2.5
- Concord 2.5
- Keene 2.4

New Jersey:
- Atlantic City 2.9
- Newark 3.1
- Trenton 3.1

New Mexico:
- Albuquerque 2.0
- Hobbs 3.0
- Raton 2.5
- Roswell 2.6
- Silver City 1.9

New York:
- Albany 2.5
- Binghamton 2.3
- Buffalo 2.3
- Kingston 2.7
- New York 3.0
- Rochester 2.2

North Carolina:
- Asheville 4.1
- Charlotte 3.7
- Greensboro 3.4
- Wilmington 4.2

North Dakota:
- Bismarck 2.8
- Devils Lake 2.9
- Fargo 3.1
- Williston 2.6

Ohio:
- Cincinnati 2.9
- Cleveland 2.6
- Columbus 2.8
- Toledo 2.8

Oklahoma:
- Altus 3.7
- Boise City 3.3
- Durant 3.8
- Oklahoma City 3.8

Oregon:
- Baker 0.9
- Coos Bay 1.5
- Eugene 1.3
- Portland 1.2

Pennsylvania:
- Erie 2.6
- Harrisburg 2.8
- Philadelphia 3.1
- Pittsburgh 2.6
- Scranton 2.7

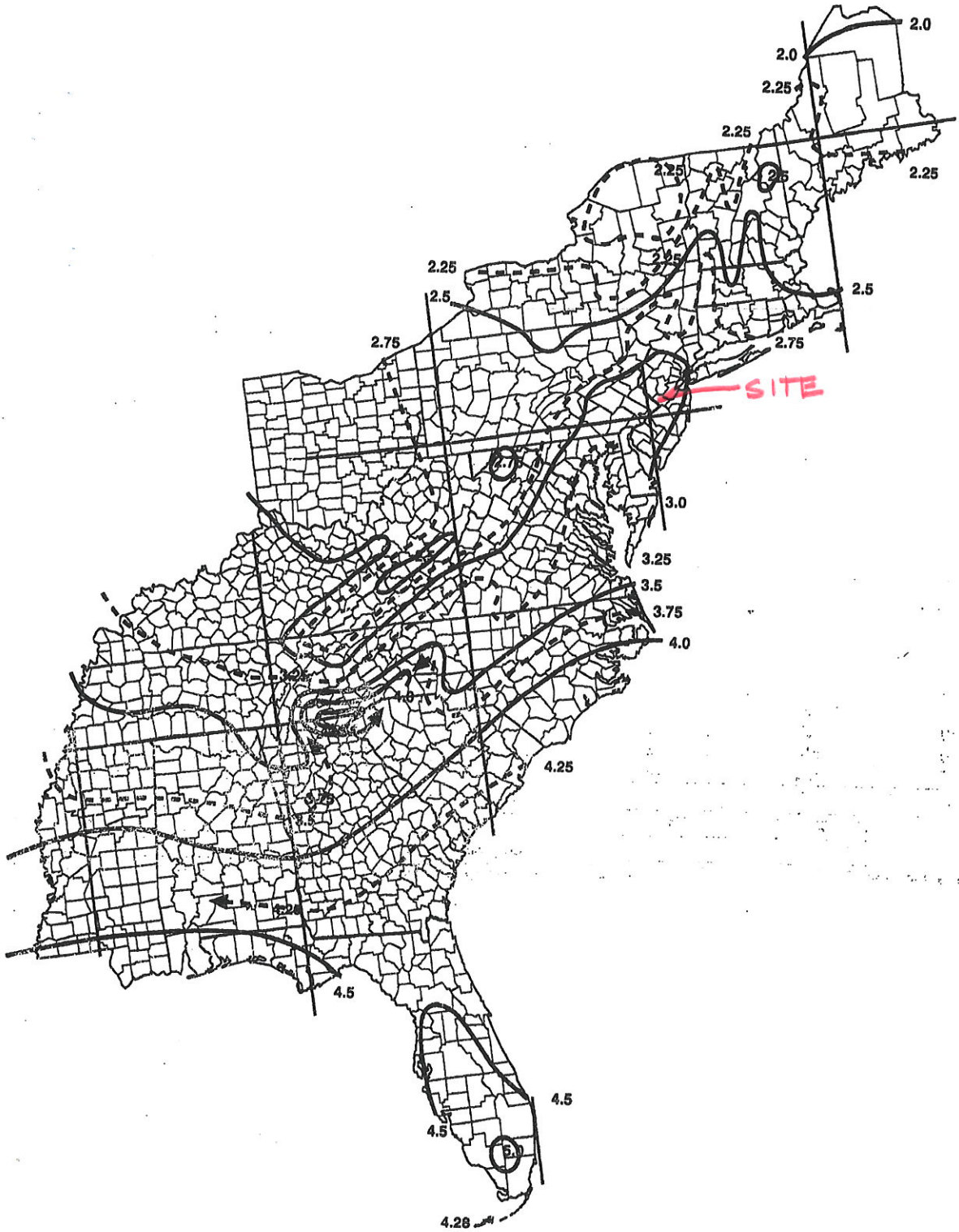


FIGURE 1106.1
100-YEAR, 1-HOUR RAINFALL (Inches)
EASTERN UNITED STATES

For SI: 1 inch = 25.4 mm.

Source: National Weather Service, National Oceanic and Atmospheric Administration, Washington, DC.

WATER QUALITY CALCULATIONS

Water Quality Treatment Design

Water quality treatment for all new and reconstructed impervious surfaces that produce "dirty" runoff will be provided by three (3) Filterra HC Bioretention systems (80% TSS removal). These systems are NJDEP approved "green infrastructure" and attached is the February 12, 2021 NJDEP certification letter.

A total of 0.69 Ac. of new and reconstructed impervious areas (paved parking area) will be treated by the Filterra units.

The Filterra units will be installed in the parking lot upstream of the stormwater inlets as required by the manufacturer. The unit details and design criteria have been attached.

CONTECH ENGINEERED SOLUTIONS

filterra®

Filterra HC Standard Flow Based Sizing

Sizing Basis:

The sizing for the Filterra HC system under NJDEP regulations is based on the methodolgy outlined in Chapter 5 of the NJDEP BMP Manual. The NRCS Runoff Equation in the handbook is utilized to determine a water quality flow rate for the drainage area in question. To validate the sizing, the following parameters were assumed:

Sample Parameters:

Design Storm =	1.25" in 2 hrs	(As outlined in the NJDEP SWM Handbook)
Filterra HC Media Flow Rate =	300"/hr	
Site Drainage Area =	0.319 ac	
Percent Impervious =	100%	
Time of Concentration =	10 min	
Allowable Ponding in Filterra HC =	9"	
Filterra HC Model Size Analyzed =	13x7	(Treats 0.632 cfs at 300"/hr)

Design Summary:

Using the NRCS Method, the required treatment flow rate for this drainage area is 0.82 cfs. Utilizing the HydroCAD Software, a matching hydrograph can be derived (Figure 1).

This storm can then be routed through an appropriately sized Filterra HC unit, for this example, a 13x7. Because the Filterra HC system can provide up to 9" of ponding, some flow attentuation is possible and the Filterra HC system is able to accommodate a portion of the water quality volume in the head space and release it at the system's design flow rate. The hydrograph in Figure 2 illustrates this concept. In this example, the 69 cf stored represents the upper portion of the hydrograph between 0.63 cfs and 0.82 cfs.

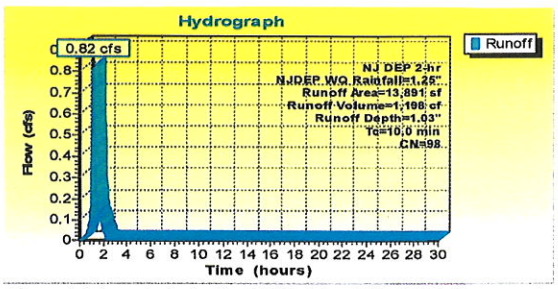


Figure 1. Inflow rate during the 1.25" in 2 hrs, NJDEP WQ Storm event.

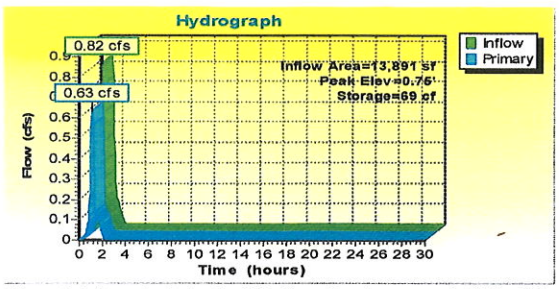


Figure 2. Inflow rate during the WQ Storm Event compared with the Filterra outflow rate, accounting for 9" ponding within the unit.

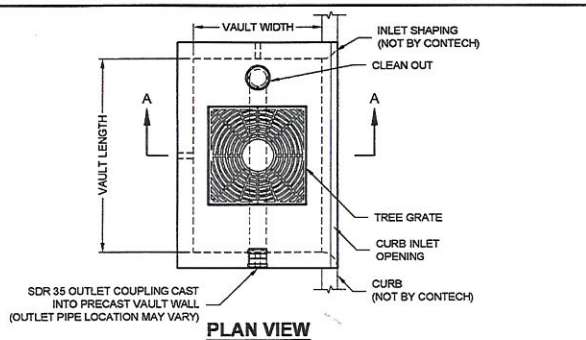
This approach is scalable and can be completed for all Filterra HC sizes. Table 1 identifies the allowable impervious drainage area to each Filterra HC unit based on this methodology. Addtionally, for drainage areas that are not fully impervious, a new table can be generated based on site specific constraints. Please contact your Contech Representative for more information.

Table 1. Filterra HC Sizing based on the New Jersey BMP Manual.

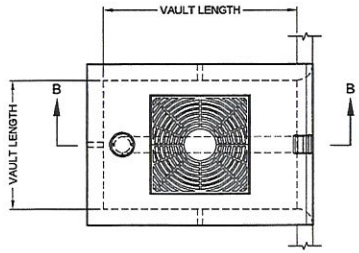
System Size	Treatment Flow Rate at 300"/hr	Allowable Impervious Drainage Area w/ 9" of Ponding (CN=98)	Outlet Pipe Size
(ft)	(cfs)	(ac)	(in)
4x4	0.111	0.056	6" SDR-35 PVC
4x6 / 6x4	0.167	0.084	6" SDR-35 PVC
4.5x7.83 / 7.83x4.5	0.245	0.123	6" SDR-35 PVC
6x6	0.25	0.126	6" SDR-35 PVC
6x8 / 8x6	0.333	0.168	6" SDR-35 PVC
6x10 / 10x6	0.417	0.210	6" SDR-35 PVC
6x12 / 12x6	0.500	0.252	6" SDR-35 PVC
7x13 / 13x7	0.632	0.319	6" SDR-35 PVC
14x8	0.778	0.392	6" SDR-35 PVC
16x8	0.889	0.449	6" SDR-35 PVC
18x8	1.000	0.505	6" SDR-35 PVC
20x8	1.111	0.561	6" SDR-35 PVC
22x8	1.222	0.617	6" SDR-35 PVC

Notes:

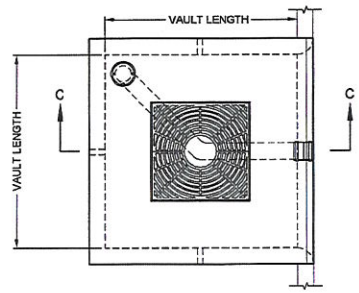
1. Boxes are standard depth from rim to outlet: 3.33' for Standard Offline
2. Vault sizes 8x14 and larger available on case-by-case basis. Please contact Contech for individual project design assistance.
3. A standard PVC pipe coupling is cast into the wall for easy connection to discharge piping
4. Dimensions shown are internal.
5. Contact Contech for site specific sizing or other box configurations.



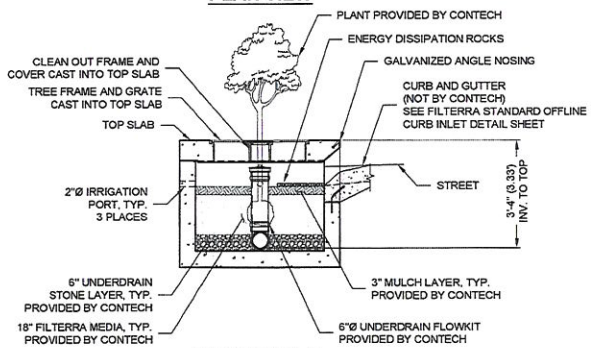
PLAN VIEW



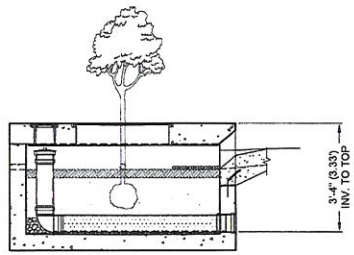
PLAN VIEW



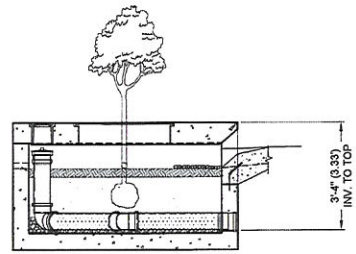
PLAN VIEW



SECTION A-A



SECTION B-B



SECTION C-C

FT-HC LONG SIDE INLET CONFIGURATION

DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (L x W)	OUTLET PIPE DIA	TREE GRATE QTY & SIZE
FT0604-HC	N/A CA	6 x 4	6 x 4	6" SDR 35	(1) 3' x 3'
FT05504-HC	CA ONLY	6.5 x 4	6.5 x 4	6" SDR 35	(1) 3' x 3'
FT078045-HC	DE, MD, NJ, PA, VA, WV ONLY	7.83 x 4.5	7.83 x 4.5	6" SDR 35	(1) 3' x 3'
FT0804-HC	N/A DE, MD, NJ, PA, VA, WV	8 x 4	8 x 4	6" SDR 35	(1) 3' x 3'
FT0806-HC	ALL	8 x 6	8 x 6	6" SDR 35	(1) 4' x 4'
FT1006-HC	ALL	10 x 6	10 x 6	6" SDR 35	(1) 4' x 4'
FT1206-HC	ALL	12 x 6	12 x 6	6" SDR 35	(2) 4' x 4'
FT1307-HC	ALL	13 x 7	13 x 7	6" SDR 35	(2) 4' x 4'
FT1408-HC	CALL CONTECH	14 x 8	14 x 8	6" SDR 35	(2) 4' x 4'
FT1509-HC	CALL CONTECH	15 x 9	15 x 9	6" SDR 35	(2) 4' x 4'
FT1608-HC	CALL CONTECH	16 x 8	16 x 8	6" SDR 35	(2) 4' x 4'
FT1808-HC	CALL CONTECH	18 x 8	18 x 8	6" SDR 35	(2) 4' x 4'
FT2008-HC	CALL CONTECH	20 x 8	20 x 8	6" SDR 35	(3) 4' x 4'
FT2208-HC	CALL CONTECH	22 x 8	22 x 8	6" SDR 35	(3) 4' x 4'

N/A = NOT AVAILABLE

FT-HC SHORT SIDE INLET CONFIGURATION

DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (W x L)	OUTLET PIPE DIA	TREE GRATE QTY & SIZE
FT0406-HC	N/A CA	4 x 6	4 x 6	6" SDR 35	(1) 3' x 3'
FT04065-HC	CA ONLY	4 x 6.5	4 x 6.5	6" SDR 35	(1) 3' x 3'
FT0408-HC	N/A DE, MD, NJ, PA, VA, WV	4 x 8	4 x 8	6" SDR 35	(1) 3' x 3'
FT045078-HC	DE, MD, NJ, PA, VA, WV ONLY	4.5 x 7.83	4.5 x 7.83	6" SDR 35	(1) 3' x 3'
FT0608-HC	ALL	6 x 8	6 x 8	6" SDR 35	(1) 4' x 4'
FT0610-HC	ALL	6 x 10	6 x 10	6" SDR 35	(1) 4' x 4'
FT0612-HC	ALL	6 x 12	6 x 12	6" SDR 35	(2) 4' x 4'
FT0713-HC	ALL	7 x 13	7 x 13	6" SDR 35	(2) 4' x 4'

N/A = NOT AVAILABLE

FT-HC SQUARE INLET CONFIGURATION

DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (W x L)	OUTLET PIPE DIA	TREE GRATE QTY & SIZE
FT0404-HC	ALL	4 x 4	4 x 4	6" SDR 35	(1) 3' x 3'
FT0606-HC	ALL	6 x 6	6 x 6	6" SDR 35	(1) 3' x 3'

N/A = NOT AVAILABLE

INTERNAL PIPE CONFIGURATION MAY VARY DEPENDING UPON OUTLET LOCATION.

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

FILTERRA HC OFFLINE (FT-HC)
CONFIGURATION DETAIL

07

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER QUALITY
Bureau of Stormwater Permitting
401 East State Street
P.O. Box 420 Mail Code 401-02B
Trenton, NJ 08625-0420
Tel. (609) 633-7021 • Fax (609) 777-0432
www.nj.gov/dep/dwq/bnpc_home.htm

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

SHAWN M. LATOURETTE
Acting Commissioner

February 12, 2021

Derek M. Berg
Director – Stormwater Regulatory Management - East
Contech Engineered Solutions LLC
71 US Route 1, Suite F
Scarborough, ME 04074

Re: MTD Lab Certification
Filterra® HC Bioretention System
Off-line Installation Approved

TSS Removal Rate 80%

Dear Mr. Berg:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Contech Engineered Solutions LLC has requested a Laboratory Certification for the Filterra® HC Bioretention System (Filterra® HC.)

The project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix (dated January 2021) for this device is published online at http://www.njcat.org/uploads/newDocs/NJCATFilterraTechnologyVerificationReportFinal._.pdf.

The NJDEP certifies the use of the Filterra® HC stormwater treatment unit by Contech Engineered Solutions LLC at a TSS removal rate of 80% when designed, operated, and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5. The MTFR is calculated based on a verified loading rate of 3.12 gpm/ft^2 of effective filtration treatment area.

2. The Filterra® HC stormwater treatment unit shall be installed using the same configuration reviewed by NJCAT, and sized in accordance with the criteria specified in item 7 below.

3. This device cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. Additional design criteria for MTDs can be found in the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual, which can be found online at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the Filterra® HC. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at https://www.conteches.com/Portals/0/Documents/Maintenance%20Guides/Filterra%20HC%20OM%20Packet.pdf for any changes to the maintenance requirements.

6. For an MTD to be considered "green infrastructure" (GI) in accordance with the March 2, 2020 amendments to the Stormwater Management rules at N.J.A.C. 7:8, the MTD must meet the GI definition noted at amended N.J.A.C. 7:8-1.2. Specifically, the MTD shall (1) treat stormwater runoff through infiltration into subsoil; and/or (2) treat stormwater runoff through filtration by vegetation or soil; or (3) store stormwater runoff for reuse.

   The Filterra® HC filters stormwater runoff through an engineered biofiltration soil media and, thus, meets the definition of GI. Filterra® HC can be configured with or without a precast vault. Installations that will not include a precast vault will additionally need to comply the NJDEP Stormwater BMP Manual conditions regarding separation from the seasonal high water table and, if infiltration is proposed as an outlet, minimum vertical saturated hydraulic conductivity of the subsoil. Installations without a precast vault that do not rely on infiltration are required to maintain at least a one-foot separation from the seasonal high water table measured from the lowest point of the system. Installations without a precast vault that utilize infiltration are required to have the most hydraulically restrictive soil layer below the MTD meet the minimum tested vertical saturated hydraulic conductivity of one inch per hour and have at least two feet of separation from the seasonal high water table measured from the lowest point of the system.

7. Sizing Requirement:

The example below demonstrates the sizing procedure for the Filterra® HC:

Example: A 0.25-acre impervious site is to be treated to 80% TSS removal using the Filterra® HC. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs.

The selection of the appropriate model of Filterra® HC is based upon both the maximum inflow drainage area and the MTFR. It is necessary to calculate the required model using both methods and to use the largest model determined by the two methods.

Inflow Drainage Area Evaluation:

The drainage area to the Filterra® HC in this example is 0.25 acres. Included in Table 1 below, all of the Filterra® HC models are designed with a maximum allowable drainage area greater than 0.25 acres. Specifically, the Filterra® HC with a 4'x4' media bay and a maximum allowable drainage area of 0.40 acres would be the smallest model able to treat runoff without exceeding the maximum allowable drainage area.

Maximum Treatment Flow Rate (MTFR) Evaluation:

The site runoff (Q) was based on the following:
time of concentration = 10 minutes
i = 3.2 in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
c = 0.99 (runoff coefficient for impervious)
$Q = ciA = 0.99 \times 3.2 \times 0.25 = 0.79$ cfs

Given the site runoff is 0.79 cfs and based on the MTFR's listed in Table 1 below, the Filterra® HC with a 16'x8' media bay and an MTFR of 0.889 cfs would be the smallest model that could be used to treat the impervious area without exceeding the MTFR. If using more than one unit for treating runoff, the units should be configured such that the flowrate to each unit does not exceed the design MTFR for each unit and ensuring the entire 0.25 acre area is treated.

The MTFR evaluation results will be used since that method results in the highest minimum configuration determined by the two methods.

The sizing table corresponding to the available system models is noted below:

Table 1. Filterra® HC MTFRs and Maximum Allowable Drainage Areas

	Available Filterra® Media Bay Sizes (feet)	Effective Filtration Treatment Area (ft^2)	Treatment Flow Rate (cfs)	Maximum Allowable Drainage Area (ac)
Standard Configuration Filterra and Filterra Bioscape Vaults	4x4	16	0.111	0.40
	4x6 or 6x4	24	0.167	0.60
	4.5x7.83 or 7.83x4.5 (Nominal 4x8/8x4)	35.24	0.245	0.89
	6x6	36	0.250	0.91
	6x8 or 8x6	48	0.333	1.21
	6x10 or 10x6	60	0.417	1.51
	6x12 or 12x6	72	0.500	1.81
	7x13 or 13x7	91	0.632	2.29
	14x8	112	0.778	2.82
	16x8	128	0.889	3.22
	18x8	144	1.000	3.62
	20x8	160	1.111	4.03
	22x8	176	1.222	4.43
Peak Diversion Filterra Vaults	4x4	16	0.111	0.40
	4.5x5.83 (Nominal 4x6)	26.24	0.182	0.66
	6x4	24	0.167	0.60
	6x6	36	0.250	0.91
	6x8	48	0.333	1.21
	6x10 or 10x6	60	0.417	1.51
	7x10	70	0.486	1.76
	8x10.5	84	0.583	2.11
	8x12.5	100	0.694	2.52
	Custom and or Filterra Bioscape	Media Area in ft^2	0.00694 * (Media Area in ft^2)	0.0252 * (Media Area in ft^2)

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact me at (609) 633-7021.

Sincerely,

Gabriel Mahon

Gabriel Mahon, Chief
Bureau of Stormwater Permitting

Attachment: Maintenance Plan
cc: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP – Water & Land Management
Nancy Kempel, NJDEP– BSTP
Keith Stampfel, NJDEP – DLRP
Dennis Contois, NJDEP – DLRP

NJDEP NONSTRUCTURAL STRATEGIES POINTS SYSTEM SPREADSHEET

NJDEP Nonstructural Strategies Points System (NSPS)

Version: January 31, 2006

Note: Input Values in Yellow Cells Only

Project:	Marmalade Restaurant Redevelopment Site Plan
Date:	July, 2021
User:	RMS
Notes:	

Step 1 - Provide Basic Major Development Site Information

A. Specify Total Area in Acres of Development Site Described in Steps 2 and 3 = 0.9 **Acres**

B. Specify by Percent the Various Planning Areas Located within the Development Site:

State Plan Planning Area:	PA-1	PA-2	PA-3	PA-4	PA-4B	PA-5	Total % Area
Percent of Each Planning Area within Site:		100.0%					100.0%

Note: See User's Guide for Equivalent Zones within Designated Centers and the NJ Meadowlands, Pinelands, and Highlands Districts

Step 2 - Describe Existing or Pre-Developed Site Conditions

A. Specify Existing Land Use/Land Cover Descriptions and Areas:

Site Segment	Land Use/Land Cover Description	Specify Land Use/Land Cover in Acres for Each HSG				Use/Cover Subtotals	Points
		HSG A	HSG B	HSG C	HSG D		
1	Wetlands and Undisturbed Stream Buffers					0.0	0
2	Lawn and Open Space		0.1			0.1	25
3	Brush and Shrub					0.0	0
4	Meadow, Pasture, Grassland, or Range					0.0	0
5	Row Crop					0.0	0
6	Small Grain and Legumes					0.0	0
7	Woods - Indigenous					0.0	0
8	Woods - Planted					0.0	0
9	Woods and Grass Combination					0.0	0
10	Ponds, Lakes, and Other Open Water					0.0	0
11	Gravel and Dirt					0.0	0
12	Porous and Permeable Paving					0.0	0
13	Directly Connected Impervious		0.9			0.9	0
14	Unconnected Impervious with Small D/S Pervious					0.0	0
15	Unconnected Impervious with Large D/S Pervious					0.0	0
	HSG Subtotals (Acres):	0.0	0.9	0.0	0.0	**Total Area:**	0.9
	HSG Subtotals (%):	0.0%	100.0%	0.0%	0.0%	**Total % Area:**	100.0%

Points Subtotal: 25

Total Existing Site Points: 25

Step 3 - Describe Proposed or Post-Developed Site Conditions

A. Specify Proposed Land Use/Land Cover Descriptions and Areas:

Site Segment	Land Use/Land Cover Description	Specify Land Use/Land Cover in Acres for Each HSG				Use/Cover Subtotals	Points
		HSG A	HSG B	HSG C	HSG D		
1	Wetlands and Undisturbed Stream Buffers					0.0	0
2	Lawn and Open Space		0.1			0.1	25
3	Brush and Shrub					0.0	0
4	Meadow, Pasture, Grassland, or Range					0.0	0
5	Row Crop					0.0	0
6	Small Grain and Legumes					0.0	0
7	Woods - Indigenous					0.0	0
8	Woods - Planted					0.0	0
9	Woods and Grass Combination					0.0	0
10	Ponds, Lakes, and Other Open Water					0.0	0
11	Gravel and Dirt					0.0	0
12	Porous and Permeable Paving					0.0	0
13	Directly Connected Impervious		0.9			0.9	0
14	Unconnected Impervious with Small D/S Pervious					0.0	0
15	Unconnected Impervious with Large D/S Pervious					0.0	0
	HSG Subtotals (Acres):	0.0	0.9	0.0	0.0	**Total Area:**	0.9
	HSG Subtotals (%):	0.0%	100.0%	0.0%	0.0%	**Total % Area:**	100.0%

Points Subtotal: 25

B. Compare Proposed Impervious Coverage with Maximum Allowable Impervious Coverage:

Total Directly Connected Impervious Coverage =	92%	% of Site
Total Unconnected Impervious Coverage with Small D/S Pervious =	0%	% of Site
Total Unconnected Impervious Coverage with Large D/S Pervious =	0%	% of Site
Total Site Impervious Coverage =	92%	% of Site
Effective Site Impervious Coverage =	92%	% of Site
Specify Source of Maximum Allowable Impervious Coverage:	Table	(None or Table)
Allowable Site Impervious Cover from Maximum Impervious Cover Table:	85%	

Note: See Maximum Impervious Cover Table Worksheet for Details

Points Subtotal: 0

C. Compare Proposed Site Disturbance with Maximum Allowable Site Disturbance:

Total Proposed Site Disturbance =		% of Site
Maximum Allowable Site Disturbance by Municipal Ordinance =		% of Site

Points Subtotal: 0

D. Describe Proposed Runoff Conveyance System:

Total Length of Runoff Conveyance System =		Feet
Length of Vegetated Runoff Conveyance System =		Feet
% of Total Runoff Conveyance System That is Vegetated =	0%	

Points Subtotal: 0

E. Residential Lot Clustering:

Percent of Total Site Area that will be Clustered =		% of Site
Minimum Standard Lot Size as Per Zoning (Note: 1/2 Acre or Greater) =		Acres
Maximum Proposed Cluster Lot Size (Note:1/4 Acre or Less) =		Acres
Percent of Clustered Portion of Site to be Preserved as Vegetated Open Space =		% of Clustered Site Portion

Points Subtotal: 0

F. Will the Following be Utilized to Minimize Soil Compaction?

Proposed Lawn Areas will be Graded with Lightweight Construction Equipment:	No	(Yes or No)
Percent of Proposed Lawn Areas to be Graded with Such Equipment:		% of Lawn Areas

Points Subtotal: 0

G. Are Any of the Following Stormwater Management Standards Met Using Only Nonstructural Strategies and Measures?

Groundwater Recharge Standards (NJAC 7:8-5.4-a-2):	No	(Yes or No)
Stormwater Runoff Quality Standards (NJAC 7:8-5.5):	No	(Yes or No)
Stormwater Runoff Quantity Standards (NJAC 7:8-5.4-a-3):	No	(Yes or No)

Points Subtotal: 0

Note: If the Answers to All Three Questions at G Above are "Yes", Adequate Nonstructural Measures have been Utilized.

Total Proposed Site Points: 25

Ratio of Proposed to Existing Site Points: 100%

Required Site Points Ratio: 79%

Nonstructural Point System Results: Proposed Nonstructural Measures are Adequate

APPENDIX A

STORMWATER SOIL TEST RESULTS

Soil Log SL 1009-1 **October 9, 2019**

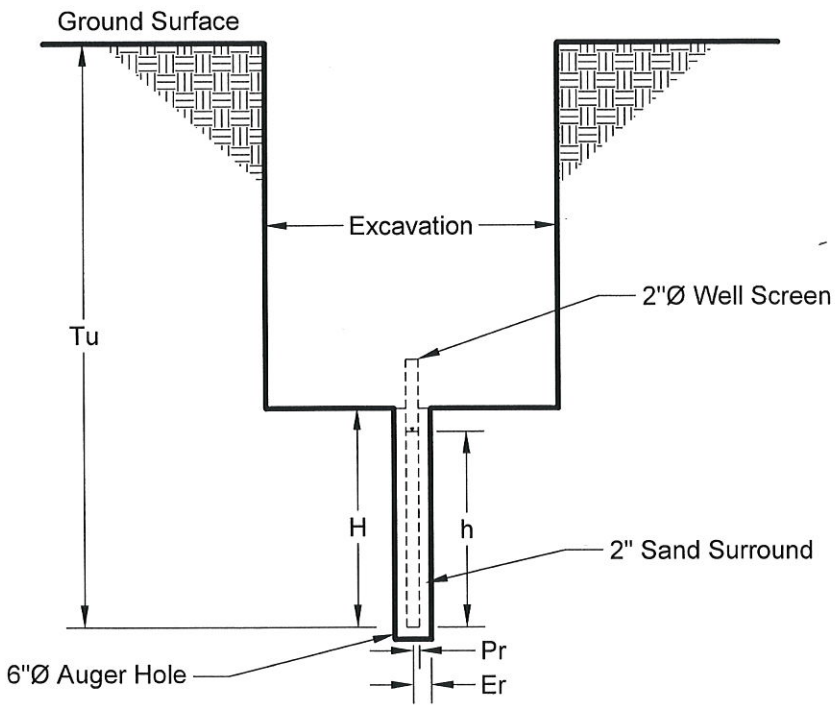
0-4"	Topsoil with fine/medium roots.
4-76"	10 YR5/6 Yellowish Brown Clay Loam; subangular blocky, friable; <10% gravel; no mottling, no seepage.
76-156"	5 YR4/6 Yellowish Red Loam; subangular blocky, friable; 10% gravel; no mottling, no seepage.
>156"	Machine Refusal

Well Permeameter Test performed at 96" below ground surface
Permeability Test Result K_{10} = 0.4 in/hr

WELL PERMEAMETER TEST EVALUATION: CONDITION I

REFERENCE: US Department of the Interior, Bureau of Reclamation Procedure for "Performing Field Permeability Testing by the Well Permeameter Method", USBR 7300-89

Condition I				
Depth of Test Hole, H (in)	36	V = A*h (in^3)		870.4
Height of water, h (in)	30.8	Measured infiltration rate		
Pipe Radius, Pr (in)	1		(in^3/min)	15.62
Effective Radius of Hole, Er (in)	3		(gal/min)	0.07
Depth of Test Hole from Surface, T_u (in)	96		(ft^3/min)	0.01
Volume of Water Used for Test (gal)	8	$qV/(2Pi*h^2)$		0.003
		h/r		10.27
Duration of Test (min)	120	Viscosity of water (@ 10°C)		1.30
Average head (in)	30.8	$Sqr(1+(h/r)^2)$		10.32
Area of pipe (in^2)	3.14	$ln((h/r)+Sqr(1+(h/r)^2)$		3.02
Area of hole (in^2)	28.26	$Sqr(1+(h/r)^2)/(h/r)$		1.00
		1/(h/r)		0.10
		Permability Rate K_{10} =		**0.4 in/hr**



REVISION DESCRIPTION	DATE	APPROVED

Marmalade Restaurant Stormwater Permeability Testing
Well Permeameter Test: Condition I

Hopewell Valley Engineering *Block 61.03, Lot 62* *Lawrence Township, Mercer County, New Jersey* *Gordon Ave*

DRAWN BY:	DESIGNED BY:	CHECKED BY:	DWG NO.	BRE JOB#:	SCALE:	DATE:	SHEET:
WMJ	MBA	THB	WP-1	19-2086	As Noted	October 24, 2019	1 of 1

THEODORE H. BAYER, P.E.
New Jersey Professional Engineer License No. GE33806

BAYER-RISSE ENGINEERING, INC.
78 ROUTE 173 WEST, SUITE 6
HAMPTON, NEW JERSEY 08827
PHONE 908-735-2255 FAX. 908-735-5838
Certificate of Authorization No. 24GA27943900

APPENDIX B

EXISTING DRAINAGE AREA PLAN

APPENDIX C

PROPOSED DRAINAGE AREA PLAN