STORMWATER MANAGEMENT REPORT

VOLUME I

PROJECT SITE:
SALMON HEALTH AND RETIREMENT COMMUNITY
ARCPUD SPECIAL PERMIT
VILLAGE STREET
MEDWAY, MASSACHUSETTS 02053

PREPARED FOR:
CONTINUING CARE MANAGEMENT, LLC
1 LYMAN STREET
WESTBOROUGH, MASSACHUSETTS 01581

PREPARED BY:

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INTRODUCTION

Coneco Engineers & Scientists, Incorporated (Coneco) has completed a drainage analysis of the subject site, located at 259, 261, 261R, and 263 Village Street in Medway, Massachusetts, the results of which are contained herein. The purpose of this analysis is to quantitatively understand the impacts of the proposed development of the project site on the existing hydrologic conditions and to mitigate said impacts through the implementation of a stormwater management system that utilizes best management practices and is supported by an operations and maintenance plan as well as a long term pollution prevention plan.

STORMWATER MANAGEMENT SYSTEM OVERVIEW

The proposed stormwater management system consists of conventional curb and gutter drainage for the roadways including a series of catch basins, drain manholes and pipe which convey stormwater runoff from the roadway areas to a water quality device before entering the proposed infiltration system which will ultimately discharge any remaining runoff upstream of the bordering vegetated wetlands. Roof runoff from the proposed campus building and the majority of the residential units will be recharged through individual subsurface infiltration chambers. These chambers have been designed to accommodate flows from the 100-year storm event.

As previously mentioned the proposed roadway drainage discharges upstream of the bordering vegetated wetlands via a flared end and level spreader. The catch basins will have 4 foot deep sumps and oil/gas hoods. The deep sumps are intended to remove sediment, and the hoods are intended to remove oil and gas from the stormwater prior to release. The level spreaders have flared end inlets, a depressed center and a level outer rim. The depressed center promotes the removal of any residual sediment while the level outer rim dissipates the energy of the effluent by diminishing the velocity and eliminating the point discharge.

From an environmentally sensitive perspective, the aforementioned measures result in a low impact design that enhances the introduction of surface water into the ground while preserving the natural hydrologic conditions.

METHODOLOGY

Drainage calculations are performed to demonstrate that there is no increase in the rate of runoff from the subject site due to the proposed project. The rate of runoff is compared at a common point, referred to as the design point, for both the pre and post development condition (or the existing and proposed condition in the case of a redevelopment project). The hydrologic and hydraulic model created to analyze the pre and post development condition was developed using the Soil Conservation Service (SCS) Technical Release No. 20 (TR 20, SCS unit hydrograph procedures), SCS Technical Release No. 55 (TR 55, Time of Concentration (T_c) and Curve Number (CN)), SCS Technical Release No. 40 (TR 40, rainfall intensity) and the stormwater detention facilities were modeled using the SCS Storage Indication Method.

Time of Concentration (T_c) - is the time required for stormwater runoff to travel from the most hydraulically distant point in a drainage area or subcatchment to the design point. The T_c is calculated based upon slope, distance, surface cover and type of flow. A longer time of concentration will generally result in a smaller rate of runoff.

Curve Number (CN) - represents the amount of runoff expected from a particular segment of the drainage area. A higher curve number will be less permeable and therefore a larger rate of runoff. The CN is based upon three factors: soil type, soil cover, and cover condition. The soil type is graded A to D; A soil is the post permeable, D is the least. The soil cover (e.g. - vegetated, developed, farmland or impervious) ranges from 30-98, with more permeable soil covers having a lower value. The final factor is the condition of the vegetated soil cover (good, fair or poor), where vegetated cover in good condition is the most permeable and allows the least runoff.

The Hydrologic Soil Group (HSG) for the drainage areas was determined from the Soil Conservation Service Soil Survey of Norfolk County, Massachusetts. The soil survey contains maps which depict the extent of the various soil types. A soil type overlay plan is attached as Figure 6.

Design Software - To assist in the analysis, software entitled HydroCAD, Version 10.0 (developed by HydroCAD Software Solutions, L.L.C.) was utilized. The HydroCAD program calculates the runoff based on rainfall events and watershed characteristics, and produces a runoff hydrograph (a runoff rate versus time curve). If applicable, stage-storage-discharge curves for a specific detention facility are calculated.

Peak Attenuation - The peak rate of runoff at the design points was calculated for the existing and proposed conditions for the 2, 10, 25 and 100-year, 24-hour storm events. The peak rate of runoff was compared for each storm event to determine if there was an increase from the pre to post development condition.

Runoff Volume - The total volume of runoff for the entire site was calculated for the existing and proposed conditions for the 2, 10, 25 and 100-year, 24-hour storm events. The volume of runoff was compared for each storm event to determine if there was an increase from the pre to post development condition.

EXISTING CONDITIONS

Coneco compiled existing and proposed drainage areas from an existing topographic survey. A site visit was conducted to evaluate the existing drainage patterns and watershed areas for the site and the areas surrounding the site, which is located at 259, 261, 261R, and 263 Village Street in Medway, Massachusetts (Assessors Map 69 Lots 13-1, 14, 15-1, and 21). The site is situated on the south side of Village Street between Brookside Road and Charles River Road and is bounded on the west and south by the Charles River. The site is approximately 56.9 acres in size and consists of undeveloped land. Topography generally slopes from northeast to southwest at grades of approximately 0.5 to 10 percent.

There are no Areas of Critical Environmental Concern, Estimated Habitats of Rare Wildlife, or Priority Habitats of Rare Species located on-site. Two Certified Vernal Pools are found near the Charles River on the western side of the site. There are four Bordering Vegetated Wetlands totaling 13.0 acres of land found on site. The total length of Bordering Vegetated Wetlands line is approximately 10,344 linear feet. The site also contains 2,992 linear feet of the bank along the Charles River. The smaller of the two Certified Vernal Pools encompasses 6,055 s.f. of land area, has a 378 linear foot edge and is located approximately 600 feet south of Village Street and 320 feet east of the Charles River. The larger of the two Certified Vernal Pools encompasses 11,436 s.f. of land area, has a 462 linear foot edge and is located approximately 830 feet south of Village Street and 440 feet east of the Charles River. The wetlands lines were delineated by BSC Group on December 11, 12, and 18, 2014. These resource areas were identified in an ANRAD dated February 12, 2015, last revised May 5, 2015 by Coneco and approved via ORAD issued by the Medway Conservation Commission dated 5/21/2015. Both the ANRAD and ORAD are associated with the MassDEP File Number 2016-0845.

The Soil Conservation Service map for the area indicates that the site is made of seven soil types. Please refer to Table 1 for a summary of these soils.

Table 1

Existing Soil Classifications

SOIL MAP UNIT	*NORFOLK COUNTY SOIL SURVEY MAP UNIT NAME AND DESCRIPTION*	*HYDROLOGIC SOIL GROUP*
4	Rippowam silt loam, 0 to 3 percent slopes	D
5	Saco silt loam, 0 to 3 percent slopes	D
31A	Walpole sandy loam, 0 to 3 percent slopes	D
70A	Ridgebury fine sandy loam, 0 to 5 percent slopes	D
245B	Merrimac fine sandy loam, 3 to 8 percent slopes	A
260B	Sudbury fine sandy loam, 2 to 8 percent slopes	B
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C

PROPOSED CONDITIONS

The proposed development consists of the construction of an Adult Retirement Community Planned Residential District (ARCPUD) consisting of a four story main residence building which has 40 memory care, 60 assisted living and 54 independent living residential units and 15 attached cottages (two bedroom) as well as 48 two bedroom and 8 three bedroom detached cottages, a two story medical office building, and a pavilion. The associated roadways, parking, site utilities, lighting, grading and drainage are also part of the project.

These changes significantly increase the overall impervious area found at the site. However, the proposed stormwater management system has been designed to capture, treat and infiltrate the generated stormwater runoff and meet all 10 of the stormwater standards.

STORMWATER MANAGEMENT STANDARDS REVIEW

As part of this drainage analysis, Coneco has performed an in-depth review of the subject site for conformance with the Massachusetts Department of Environmental Protection's Stormwater Management Standards. The following is a summary of our findings relative to our review of each of the standards. Please note that the actual text of each standard is italicized for clarity.

STANDARD 1: No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

The stormwater runoff from the roadway system shall be treated prior to release with deep sump catch basins with hoods. The deep sump will provide an area for sediment to settle out and the hood will provide oil and gas separation. Prior to discharge to the basins, the stormwater runoff will be directed through water quality units. Outlets have been designed to reduce erosion and eliminate scouring within the wetland areas. A plunge pool shall be installed at each discharge point. The plunge pool and level spreader will spread out the runoff over a larger area which slows down the velocity and therefore reduces scour. The plunge pool will be lined with riprap and be depressed to form a pool which will enhance sediment removal prior to discharge.

STANDARD 2: *Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.*

The existing and proposed site conditions were analyzed for the 2, 10, 25 and 100-year 24-hour storm events using the aforementioned methodology (please refer to appendices A and B of this report for HydroCAD output support data). Based on these results, there is no increase in peak discharges for all storm events (refer to Table 2).

Table 2

Peak Rate of Runoff

Design Point: Offsite West

Storm Frequency (in years)	*Existing Conditions*		*Proposed Conditions*		*Percent Decrease From Existing*	
	Peak Runoff (CFS)	*Total Volume (CF)*	*Peak Runoff (CFS)*	*Total Volume (CF)*	*Peak Runoff (CFS)*	*Total Volume (CF)*
2	*0.46*	*2,291*	*0.40*	*1,481*	*13.0%*	*21.1%*
10	*1.51*	*6,000*	*1.12*	*3,598*	*25.8%*	*30.0%*
25	*2.18*	*8,389*	*1.57*	*4,925*	*28.0%*	*32.3%*
100	*3.29*	*12,346*	*2.29*	*7,093*	*30.4%*	*34.6%*

Design Point: Charles River

Storm Frequency (in years)	*Existing Conditions*		*Proposed Conditions*		*Percent Decrease From Existing*	
	Peak Runoff (CFS)	*Total Volume (CF)*	*Peak Runoff (CFS)*	*Total Volume (CF)*	*Peak Runoff (CFS)*	*Total Volume (CF)*
2	*39.16*	*211,274*	*38.69*	*205,509*	*1.2%*	*2.7%*
10	*86.05*	*444,528*	*82.69*	*428,317*	*2.6%*	*3.6%*
25	*113.68*	*584,111*	*110.50*	*561,285*	*1.7%*	*3.9%*
100	*157.20*	*806,433*	*153.28*	*769,985*	*2.6%*	*4.5%*

CLOSED DRAINAGE SYSTEM CALCULATIONS

Rational Method – Sizing pipes for the 25 year storm

The closed drainage system calculations determine the rate of runoff, the time of concentration and the rainfall intensity for the drainage subcatchment. The calculations were performed for a 25-year storm event. The following standards were used:

1. The Rational Formula (Q =CIA) was used to determine the flow to each structure.

   Q = Flow cubic feet per second (CFS)
   C = Runoff coefficients
   I = Rainfall Intensity (inches per hour)
   A = Drainage Area (acres)

2. The runoff coefficients used are as follows:

   Impervious (pavement and roofs) = 0.85
   Grassed/Landscape = 0.40

3. The intensity for each area was determined by the Steel Formula for a 25-year frequency storm. The Steel Formula is:

   I = k/(t+b)
   I = Intensity
   k = 230 (25 yr)
   t = Time of Concentration
   b = 30 (25 yr)

4. The times of concentration were calculated using a spreadsheet which calculates flow time in the pipe with the Manning equation. A minimum time of concentration of five (5) minutes was utilized.

5. The Manning's formula was utilized to calculate the capacity of the individual pipes in the closed drainage system. The Manning's formula is:

   $Q = (Ap)\ (1.486/n)\ (s^{1/2})\ (h^{2/3})$
   Q = Flow in CFS
   Ap = Cross-sectional area of the pipe (square feet)
   n = Roughness coefficient
   s = slope of the pipe (ft/ft)
   h = hydraulic radius = area/wetted perimeter (sf/ft)

The closed drainage system as designed is capable of handling the design flow as calculated, as well as maintaining a design velocity of between 2.0 feet per second (fps) and 10.0 fps. Two feet per second is considered "self cleansing velocity", and will prevent the pipes from accumulating sediment. Ten feet per second is considered a safe maximum velocity, to reduce scouring of the pipes. Please refer to Appendix C for the closed drainage system pipe sizing calculation spreadsheet.

STANDARD 3: Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development *techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.*

Standard 3 requires that a certain volume of water be recharged to the site depending on existing soil types and square feet of total impervious area over each soil type. Please refer to Table 3 for a summary of the required recharge.

Table 3

Recharge to Groundwater

Hydrologic Group	*Volume of Recharge (inches/SF)*	*Total Impervious Area (SF)*	*Required Recharge Volume (CF)*
A	0.60	57,688	2,884
B	0.35	301,626	8,797
C	0.25	50,370	1,049
D	0.10	114,789	957
		Total Volume to Recharge on Site:	**13,688 CF**

Therefore, the on-site infiltration system must be designed with a minimum infiltration capacity of 13,688 cubic feet if all impervious on site is directed to a recharge system. The proposed design directs 94.5% of the impervious on site to recharge facilities resulting in a minimum infiltration capacity requirement of 14,489 cubic feet. As shown in the attached recharge calculations, this volume is solely by Infiltration Trench 18A (32,018 cf). The remaining infiltration trenches provide an additional infiltration capacity of 63,644 cf. Basin 1 provided 15,894 cf of infiltration capacity and Basin 3 provides 20,933 cf of infiltration capacity. The resultant onsite infiltration capacity of 132,489 cf well exceeds the required 14,489 cf.

Coneco has used the Simple Dynamic method for analyzing the infiltration BMPs. Please refer to Appendix C for this information as well as 72 hour drawdown calculation.

It should be noted that the proposed Infiltration BMPs do not adversely impact nearby wetland resource areas.

STANDARD 4: Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:

a) Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;

b) *Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and*

c) *Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

TREATMENT OF SUSPENDED SOLIDS:

Catch basins will be equipped with hoods and four-foot sumps to limit sediment, oils, and grease from being discharged to the drainage system. The Water Quality Units will further reduce total suspended solids (TSS) entering the vegetated detention basins, achieving an 80% removal rate. Please refer to Table 4 – Total Suspended Solids Removal worksheet attached herein for this information.

Runoff from roofs will be considered clean which require no treatment. All other impervious areas will be collected in the closed drainage system which is routed through the proprietary treatment device and detention basin.

Please refer to Table 4 for a TSS removal summary.

Please note that a Long Term Pollution Prevention Plan has been developed as part of the analysis and can be found in Appendix D.

Table 4

Total Suspended Solids Removal

Outlet: HW-1

BMP	*TSS Removal Rate*	*Starting TSS Load*	*TSS Removed*	*Remaining TSS Load*
Deep Sump Hooded Catch Basins	0.25	1.00	0.25	0.75
Stormceptor (1)	0.52	0.75	0.39	0.36
Grassed Swale	0.50	0.36	0.18	0.18
		Total Suspended Solids Removed:		**82%**

Outlet: FES-2

BMP	TSS Removal Rate	Starting TSS Load	TSS Removed	Remaining TSS Load
Deep Sump Hooded Catch Basins	0.25	1.00	0.25	0.75
Stormceptor (2)	0.52	0.75	0.39	0.36
Infiltration	0.80	0.36	0.29	0.07
		Total Suspended Solids Removed:		**93%**

Outlet: HW-2

BMP	TSS Removal Rate	Starting TSS Load	TSS Removed	Remaining TSS Load
Deep Sump Hooded Catch Basins	0.25	1.00	0.25	0.75
Stormceptor (3)	0.52	0.75	0.39	0.36
Infiltration	0.80	0.36	0.29	0.07
		Total Suspended Solids Removed:		**93%**

Outlet: FES-6

BMP	TSS Removal Rate	Starting TSS Load	TSS Removed	Remaining TSS Load
Deep Sump Hooded Catch Basins	0.25	1.00	0.25	0.75
Stormceptor	0.52	0.75	0.39	0.36
Infiltration	0.80	0.36	0.29	0.07
		Total Suspended Solids Removed:		**93%**

WATER QUALITY VOLUME:

See Appendix C for required water quality volume calculations based on impervious area.

Water Quality Volume = Total impervious area of post-development project x 0.5 inches.

Water Quality Volume = 524,473 sf impervious area x 0.5 inches/12 inches per foot = 21,853 cubic feet

STANDARD 5: *For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.*

The project site is not a land use with higher potential pollutant loads, per the regulations.

STANDARD 6: *Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.*

The project site is not within the Zone II or Interim Wellhead Protection Area of a public water supply and does not discharge near or to any other critical area. See Figure 5, Critical Areas.

STANDARD 7: *A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.*

The project is not considered a redevelopment project per the regulations and is therefore required to meet all 10 Stormwater Management Standards.

STANDARD 8: *A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.*

Please refer to Appendix E for the Erosion & Sedimentation Control Plan for to be implemented during the construction phase of this project.

A Stormwater Pollution Prevention Plan (SWPPP) will be prepared before the disturbance of any earth commences on the project site. The SWPPP will be prepared by others per EPA NPDES NOI guidelines and submitted under a separate cover.

STANDARD 9: A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

Please refer to Appendix F for the Operation and Maintenance Plan for the proposed Stormwater Management System.

STANDARD 10: All illicit discharges to the stormwater management system are prohibited.

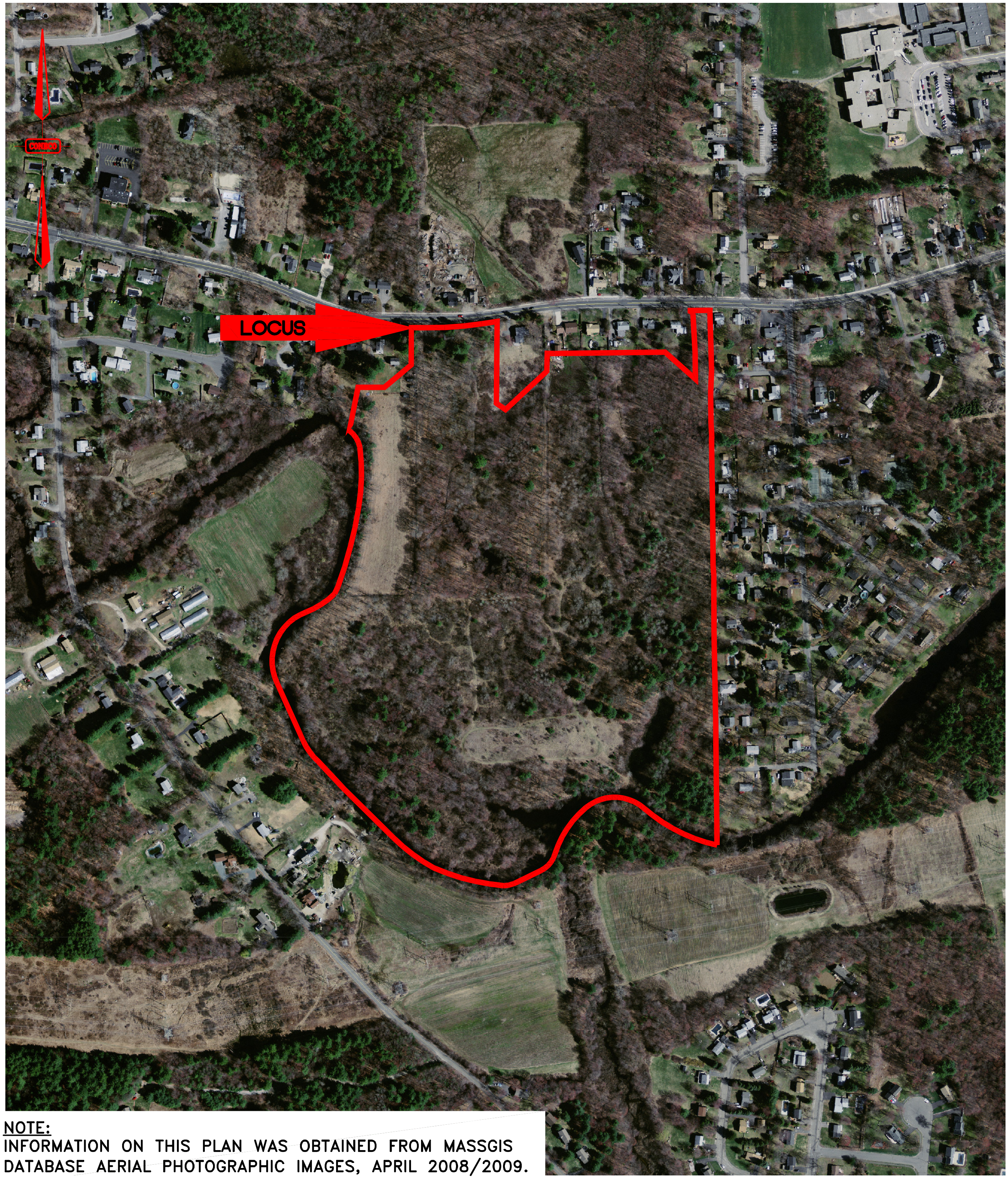
To our knowledge, no illicit discharges are made to the stormwater management system. Please refer to Appendix G for the Illicit Discharge Compliance Statement.

CONCLUSION/SUMMARY:

Based on the HydroCAD analysis for the 2, 10, 25 and 100-year storm events, the peak rate of runoff have decreased from the existing to the proposed condition. Furthermore, effluent water quality has been enhanced and widespread infiltration has been introduced to previously uncontrolled areas thereby promoting/preserving the natural hydrologic conditions. In addition to these improvements, all 10 of the DEP Stormwater Standards have been met.

FIGURE 1

AERIAL MAP



NOTE:
INFORMATION ON THIS PLAN WAS OBTAINED FROM MASSGIS DATABASE AERIAL PHOTOGRAPHIC IMAGES, APRIL 2008/2009.

259, 261, 261R, AND 263 VILLAGE STREET, MEDWAY, MA 02053

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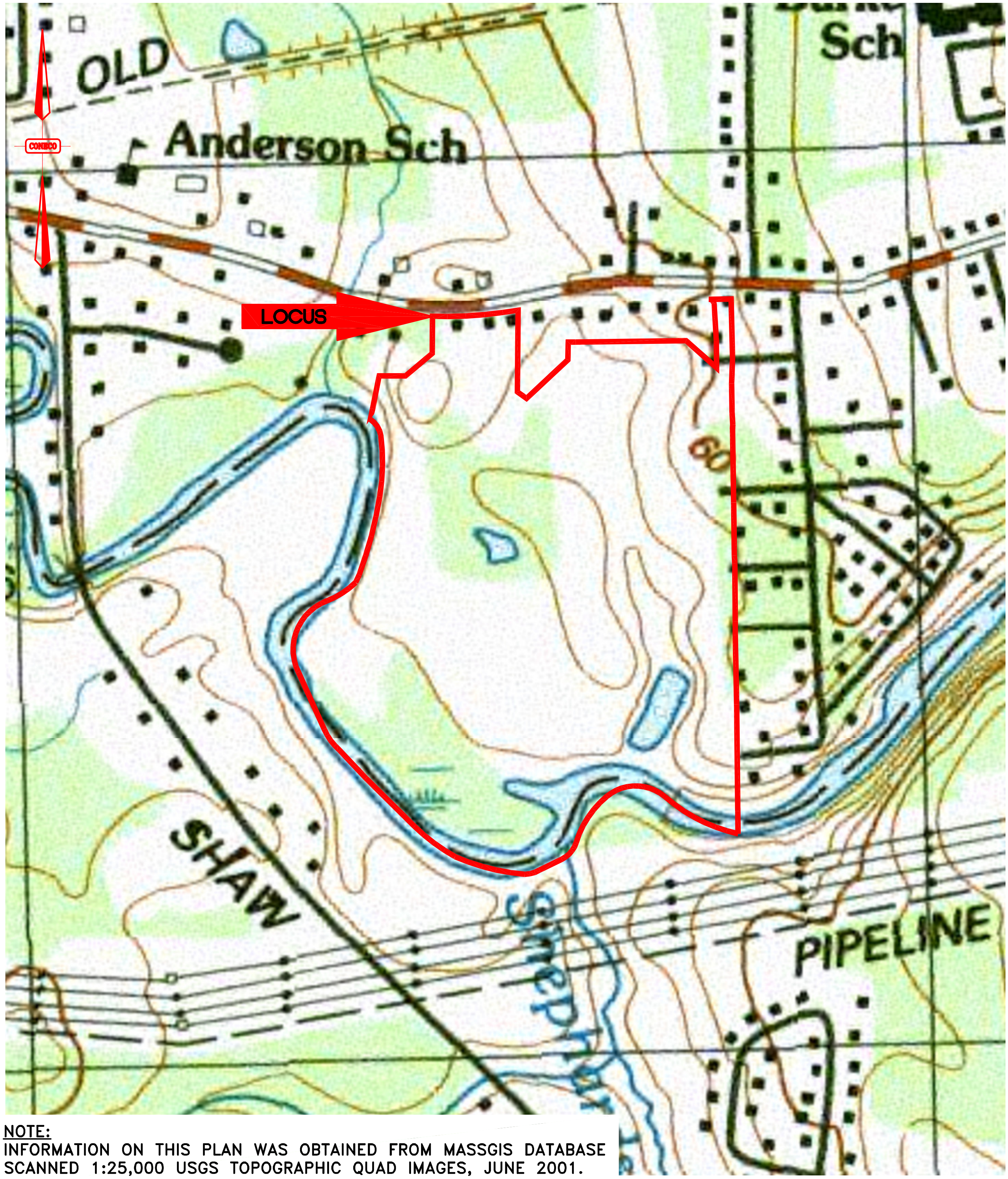
PREPARED FOR: CONTINUING CARE MANAGEMENT, LLC	PLAN SET: REPORT FIGURES
SCALE 1" = 500'	DATE 6/12/2015
PROJECT NO. 8548.0	TITLE: FIGURE 1 AERIAL MAP

FIGURE 2

USGS TOPOGRAPHIC MAP

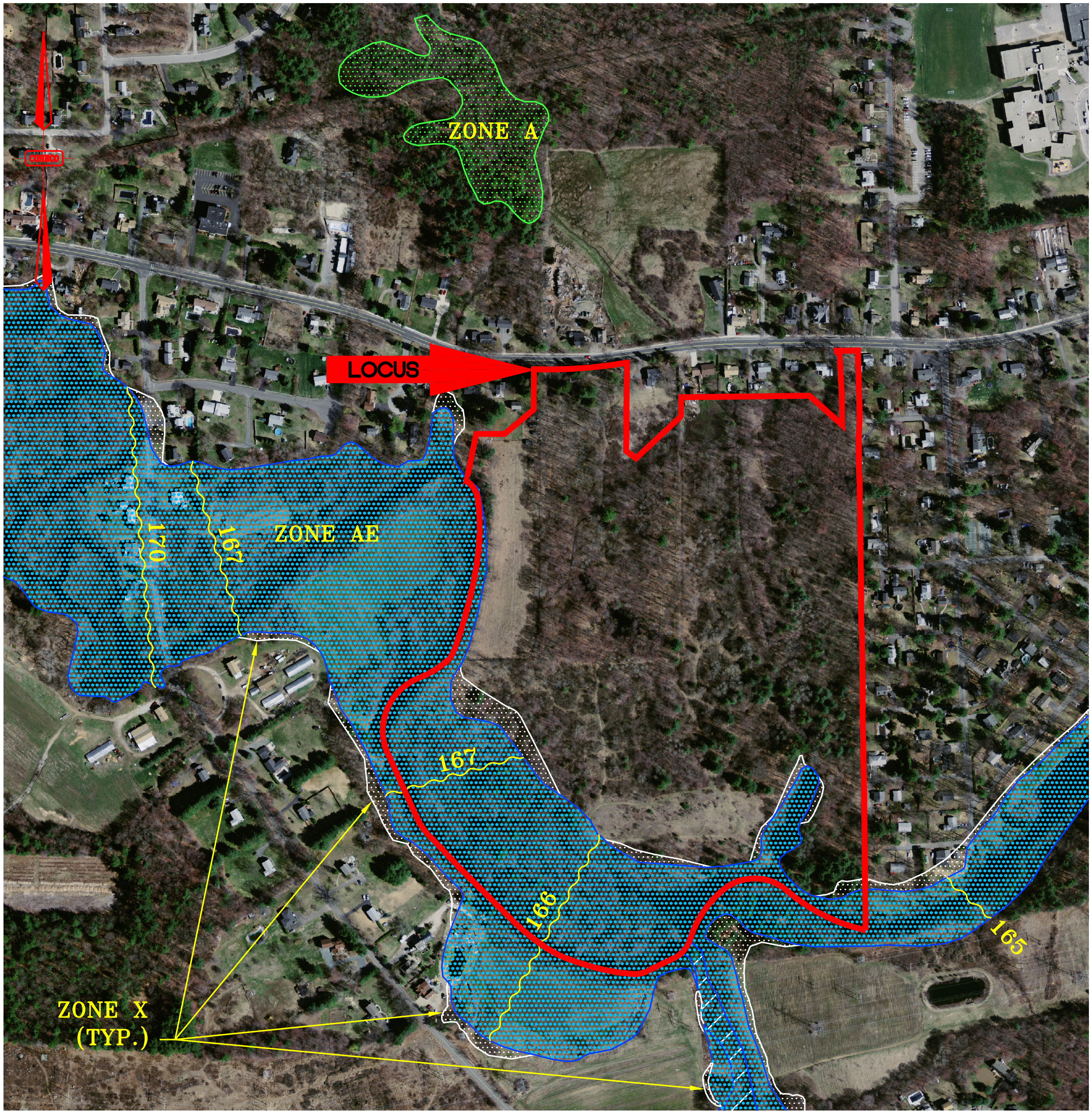


NOTE:
INFORMATION ON THIS PLAN WAS OBTAINED FROM MASSGIS DATABASE SCANNED 1:25,000 USGS TOPOGRAPHIC QUAD IMAGES, JUNE 2001.

259, 261, 261R, AND 263 VILLAGE STREET, MEDWAY, MA 02053				
CONECO Engineers & Scientists 4 FIRST STREET, BRIDGEWATER, MASSACHUSETTS 02324 PHONE 508-697-3191 OR 800-548-3355; FAX 508-697-5996 WEBSITE: www.coneco.com	PREPARED FOR: CONTINUING CARE MANAGEMENT, LLC		PLAN SET: REPORT FIGURES	
	SCALE 1" = 500'	DATE 6/12/2015	PROJECT NO. 8548.0	TITLE: FIGURE 2 USGS TOPOGRAPHIC MAP

FIGURE 3

FIRM – FLOOD INSURANCE RATE MAP



FLOOD ZONE X, AREAS BETWEEN THE LIMITS OF 100-YEAR AND 500-YEAR FLOODS

FLOODWAY AREAS IN ZONE AE

FLOOD ZONE AE, AREAS OF 100-YEAR FLOOD, BASE FLOOD ELEVATIONS DETERMINED

FLOOD ZONE A, AREAS OF 100-YEAR FLOOD, BASE FLOOD ELEVATIONS NOT DETERMINED

NOTE:
FLOOD BOUNDARY INFORMATION ON THIS PLAN WAS FOUND ON FEMA FLOOD INSURANCE RATE MAP NORFOLK COMMUNITY MAP NO. 25021C0143E, EFFECTIVE JULY 17, 2012.

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PLAN SET: REPORT FIGURES

SCALE 1" = 500'

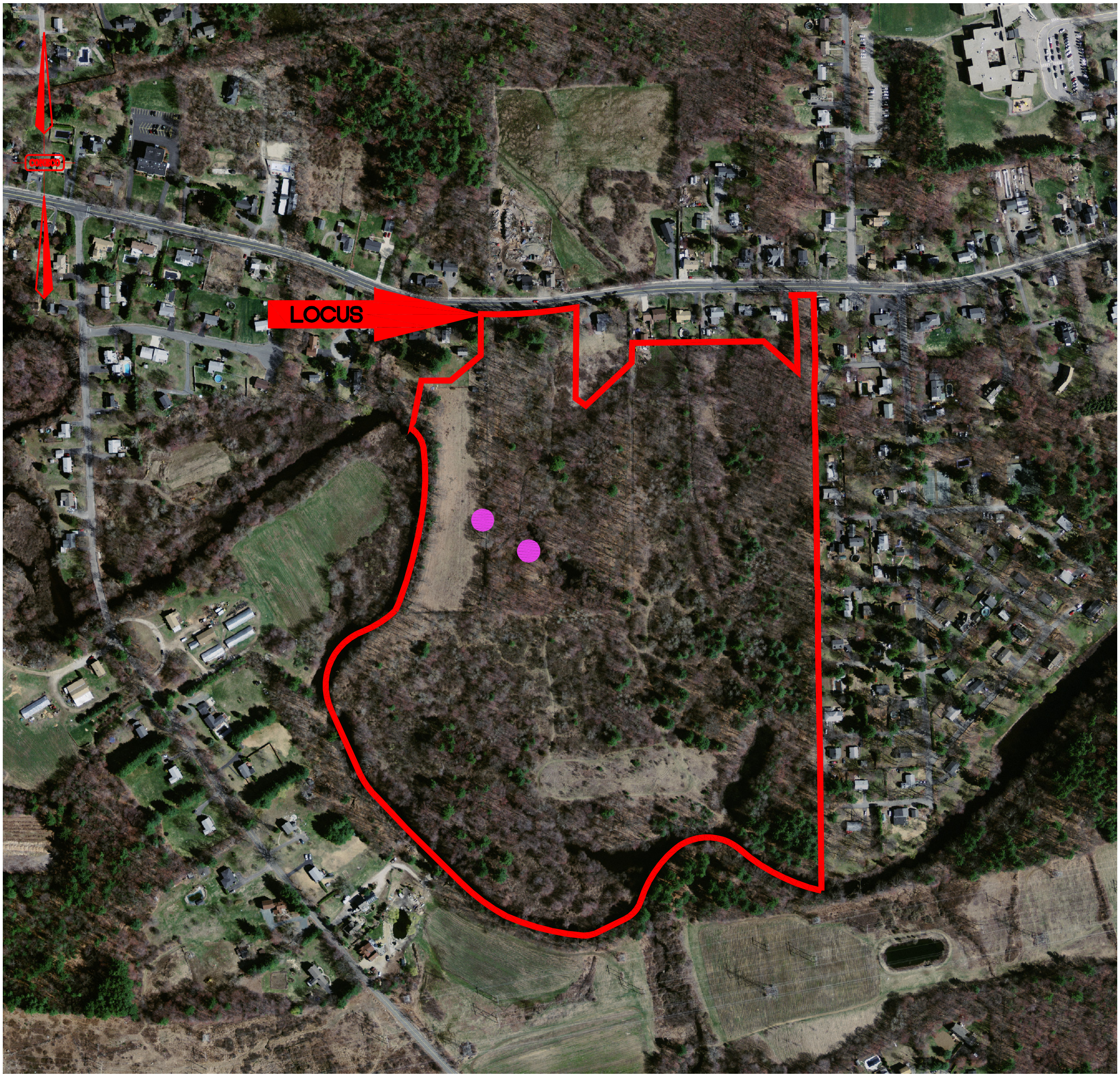
DATE 6/12/2015

PROJECT NO. 8548.0

TITLE: FIGURE 3 FLOOD INSURANCE RATE MAP

FIGURE 4

NATURAL HERITAGE & ENDANGERED SPECIES HABITATS



PRIORITY HABITAT OF RARE SPECIES

ESTIMATED HABITATS OF RARE WILDLIFE

CERTIFIED VERNAL POOLS

NOTES:
1. AREAS OF ESTIMATED AND PRIORITY HABITATS OF RARE WILDLIFE CAME FROM MASSGIS DATABASE LAST UPDATED OCTOBER 2008.
2. CERTIFIED VERNAL POOL LOCATIONS WERE TAKEN FROM MASSGIS DATABASE ON FEBRUARY 5, 2015. THIS DATA IS UPDATED CONTINUALLY AND SHOWN CONDITIONS MAY VARY FROM THIS DATA.
3. THERE ARE NO AREAS ESTIMATED OR PRIORITY HABITATS OF RARE WILDLIFE ON THE PROJECT SITE.

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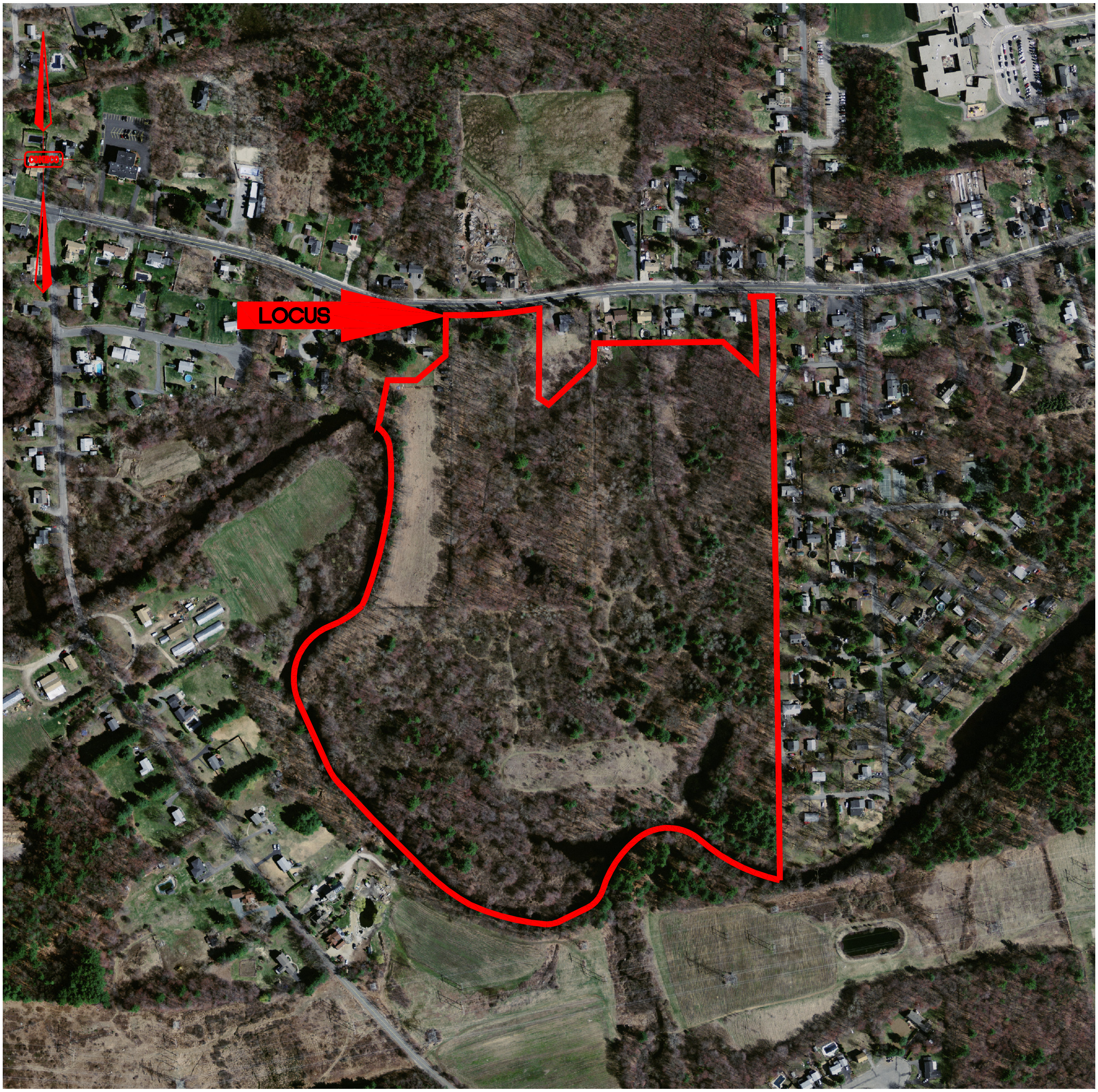
PLAN SET: REPORT FIGURES

SCALE	DATE	PROJECT NO.	TITLE:
1" = 500'	6/12/2015	8548.0	FIGURE 4 NATURAL HERITAGE & ENDANGERED SPECIES HABITATS

FIGURE 5

CRITICAL AREAS



AREAS OF CRITICAL ENVIRONMENTAL CONCERN

WELLHEAD PROTECTION AREAS(ZONE II & IWPA)

NOTES:

1. AREAS OF CRITICAL ENVIRONMENTAL CONCERN WERE TAKEN FROM MASSGIS DATABASE, LAST UPDATED APRIL 2009.
2. THERE ARE NO AREAS OF CRTICAL ENVIRONMENTAL CONCERN ON THE PROJECT SITE.
3. WELLHEAD PROTECTION AREAS WERE TAKEN FROM MASSGIS DATEBASE, LAST UPDATED JULY 2014.
4. THERE ARE NO WELLHEAD PROTECTION AREAS ON THIS PROJECT SITE.

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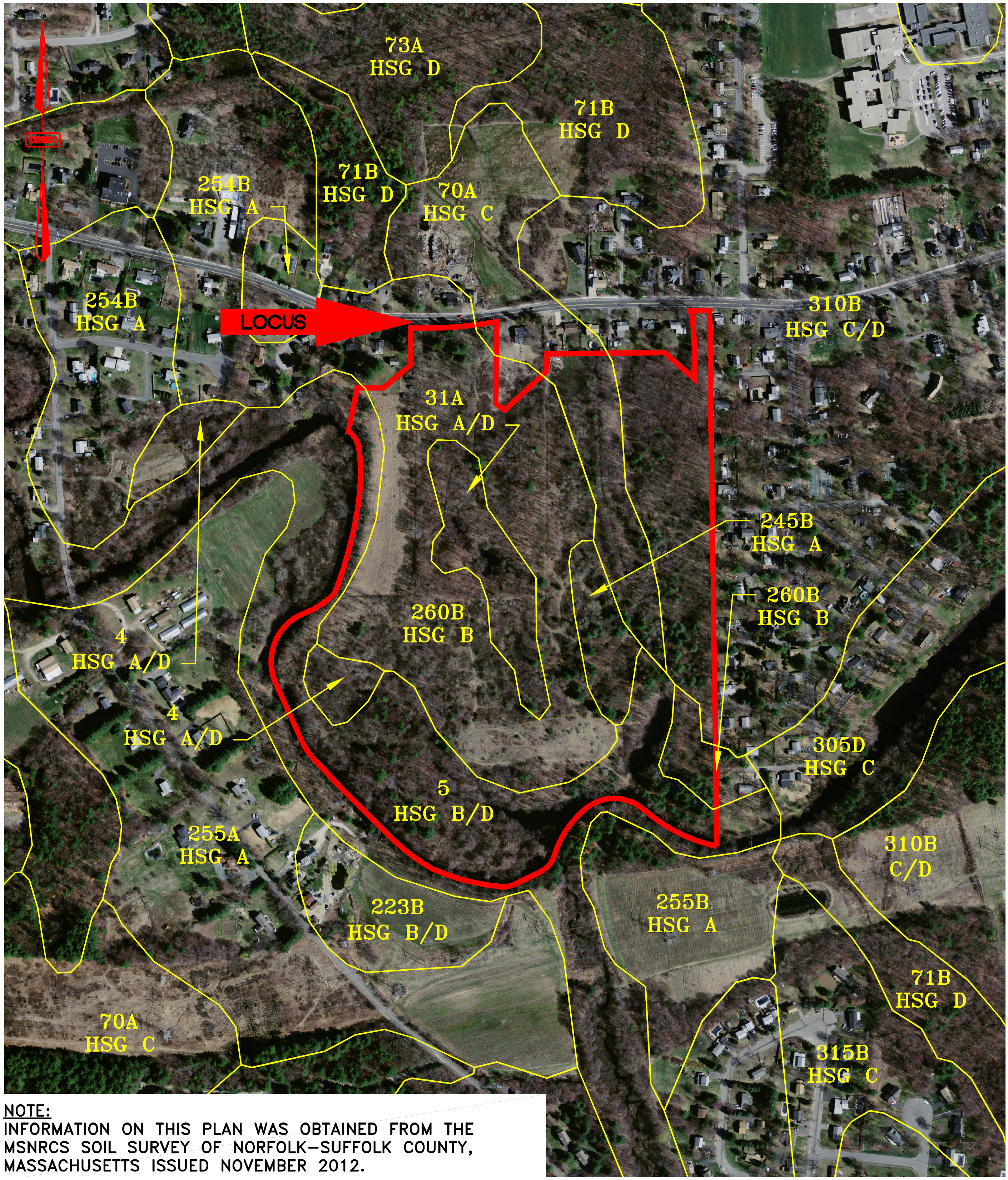
SCALE 1" = 500'	DATE 6/12/2015	PROJECT NO. 8548.0	TITLE: FIGURE 5 CRITICAL AREAS

FIGURE 6

SOIL SURVEY MAP – NORFOLK COUNTY



NOTE:
INFORMATION ON THIS PLAN WAS OBTAINED FROM THE MSNRCS SOIL SURVEY OF NORFOLK-SUFFOLK COUNTY, MASSACHUSETTS ISSUED NOVEMBER 2012.

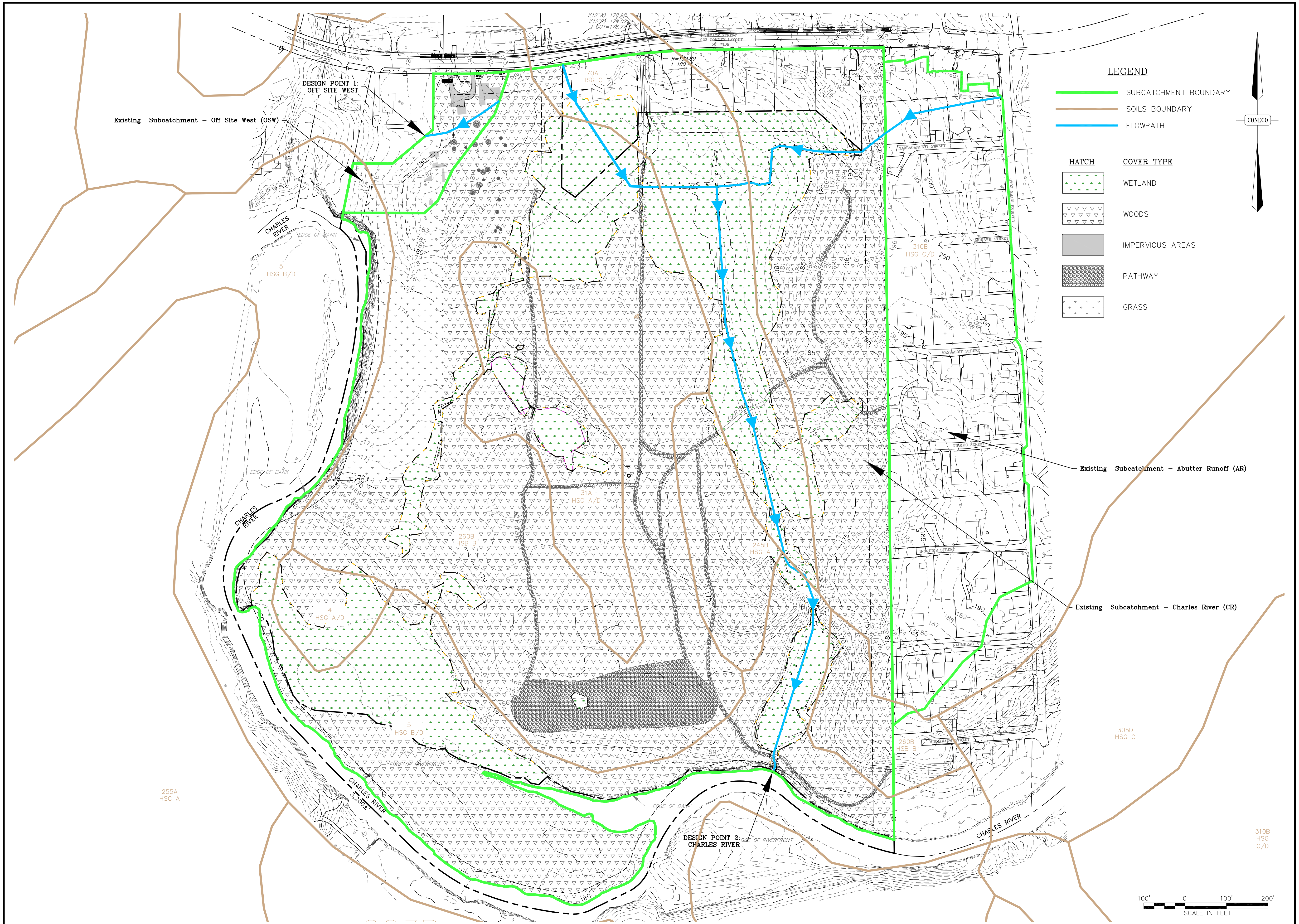
259, 261, 261R, AND 263 VILLAGE STREET, MEDWAY, MA 02053

CONECO
Engineers & Scientists
4 FIRST STREET, BRIDGEWATER, MASSACHUSETTS 02324
PHONE 508-697-3191 OR 800-548-3355; FAX 508-697-5996
WEBSITE: www.coneco.com

PREPARED FOR: CONTINUING CARE MANAGEMENT, LLC	PLAN SET: REPORT FIGURES
SCALE 1" = 500'	DATE 6/12/2015
PROJECT NO. 8548.0	TITLE: FIGURE 6 SOIL SURVEY MAP

FIGURE 7

EXISTING DRAINAGE AREAS



REVISIONS

NO.	DATE	DESCRIPTION	DR/CK

PREPARED FOR:
CONTINUING CARE MANAGEMENT, LLC
1 LYMAN STREET
WESTBOROUGH, MASSACHUSETTS 01581

DRAWING:
EXISTING CONDITIONS

PROJECT:
SALMON HEALTH AND RETIREMENT COMMUNITY
259, 261, 261R AND 263 VILLAGE STREET
MEDWAY, MASSACHUSETTS 02053

PLAN SET:
REPORT FIGURES

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DATE	6/12/2015
DESIGNED: JEN	CHECKED: TLD
DRAFTED: DJD	IN CHARGE: SMO
SCALE:	1"=100'
PROJECT NO.	8548.0
SHEET NO.	7 OF 08

FIGURE 8

PROPOSED DRAINAGE AREAS

REVISIONS

NO.	DATE	DESCRIPTION	DR/CK

PREPARED FOR:
CONTINUING CARE MANAGEMENT, LLC
1 LYMAN STREET
WESTBOROUGH, MASSACHUSETTS 01581

DRAWING:
PROPOSED CONDITIONS

PROJECT:
SALMON HEALTH AND RETIREMENT COMMUNITY
259, 261, 261R AND 263 VILLAGE STREET
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DATE	6/12/2015
DESIGNED: JEN	CHECKED: TLD
DRAFTED: DJD	IN CHARGE: SMO
SCALE:	1:100_XREF
PROJECT NO.	8548.0
SHEET NO.	8 OF 08

APPENDIX A

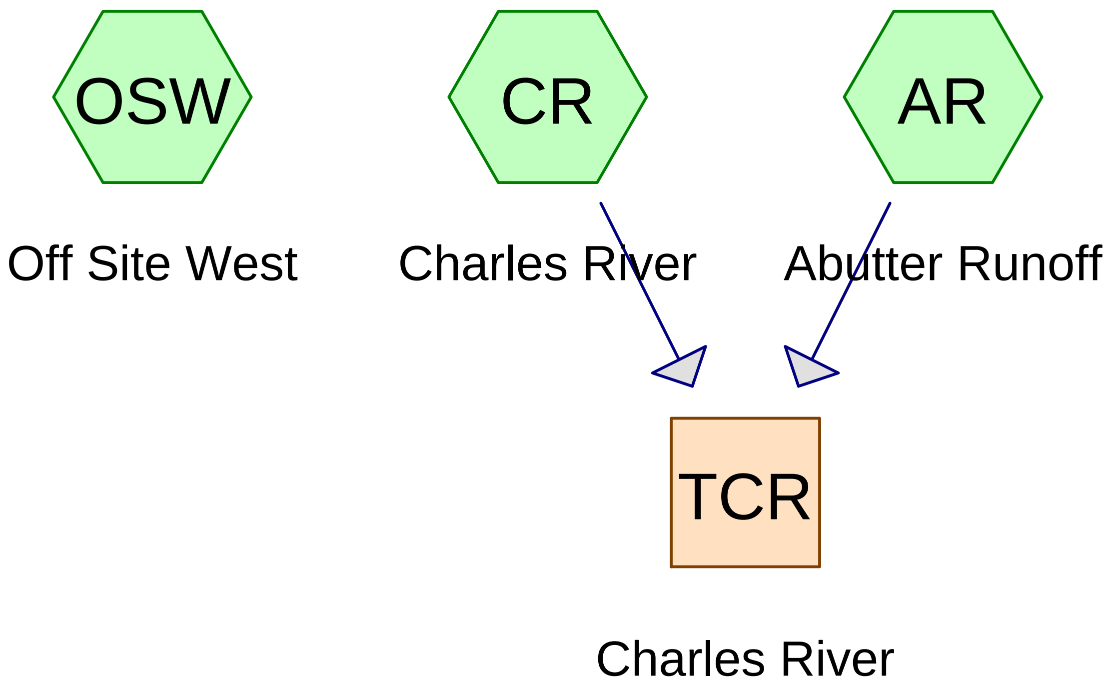
EXISTING HYDROLOGICAL CONDITIONS

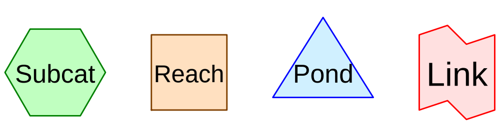
2-YEAR STORM EVENT

10-YEAR STORM EVENT

25-YEAR STORM EVENT

100-YEAR STORM EVENT





Routing Diagram for 8548.0 - Salmon Senior Community - Medway - Existing Conditions - REV1
Prepared by Microsoft, Printed 10/8/2015
HydroCAD® 10.00 s/n 03074 © 2013 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
21,633	70	1/2 acre lots, 25% imp, HSG B (AR, CR)
54,729	80	1/2 acre lots, 25% imp, HSG C (CR)
508,869	85	1/2 acre lots, 25% imp, HSG D (AR, CR)
123,178	61	>75% Grass cover, Good, HSG B (CR, OSW)
39,663	80	>75% Grass cover, Good, HSG D (CR, OSW)
4,799	72	Path, HSG A (CR)
83,393	82	Path, HSG B (CR)
1,145	87	Path, HSG C (CR)
14,267	89	Path, HSG D (CR)
6,183	98	Unconnected pavement, HSG B (CR, OSW)
4,151	98	Water Surface, HSG B (CR)
10,807	98	Water Surface, HSG C (CR)
48,913	98	Water Surface, HSG D (CR)
3,253	78	Wetland, HSG A (CR)
105,317	78	Wetland, HSG B (CR)
147,803	78	Wetlands, HSG C (CR)
235,351	78	Wetlands, HSG D (CR)
91,344	30	Woods, Good, HSG A (CR)
668,542	55	Woods, Good, HSG B (CR, OSW)
36,399	70	Woods, Good, HSG C (CR)
744,147	77	Woods, Good, HSG D (CR)
2,953,886	**72**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
99,396	HSG A	CR
1,012,397	HSG B	AR, CR, OSW
250,883	HSG C	CR
1,591,210	HSG D	AR, CR, OSW
0	Other	
2,953,886		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	21,633	54,729	508,869	0	585,231	1/2 acre lots, 25% imp	
0	123,178	0	39,663	0	162,841	>75% Grass cover, Good	
4,799	83,393	1,145	14,267	0	103,604	Path	
0	6,183	0	0	0	6,183	Unconnected pavement	
0	4,151	10,807	48,913	0	63,871	Water Surface	
3,253	105,317	0	0	0	108,570	Wetland	
0	0	147,803	235,351	0	383,154	Wetlands	
91,344	668,542	36,399	744,147	0	1,540,432	Woods, Good	
99,396	**1,012,397**	**250,883**	**1,591,210**	**0**	**2,953,886**	**TOTAL AREA**	

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

Subcatchment AR: Abutter Runoff Runoff Area=449,581 sf 25.00% Impervious Runoff Depth>1.62"
Flow Length=2,271' Tc=32.8 min CN=85 Runoff=11.52 cfs 60,817 cf

Subcatchment CR: Charles River Runoff Area=2,444,000 sf 4.00% Impervious Runoff Depth>0.74"
Flow Length=2,023' Tc=29.7 min CN=70 Runoff=27.64 cfs 150,457 cf

Subcatchment OSW: Off Site West Runoff Area=60,305 sf 10.16% Impervious Runoff Depth>0.46"
Flow Length=200' Tc=13.9 min UI Adjusted CN=63 Runoff=0.46 cfs 2,291 cf

Reach TCR: Charles River Inflow=39.16 cfs 211,274 cf
Outflow=39.16 cfs 211,274 cf

Total Runoff Area = 2,953,886 sf Runoff Volume = 213,565 cf Average Runoff Depth = 0.87"
92.68% Pervious = 2,737,524 sf 7.32% Impervious = 216,362 sf

Summary for Subcatchment AR: Abutter Runoff

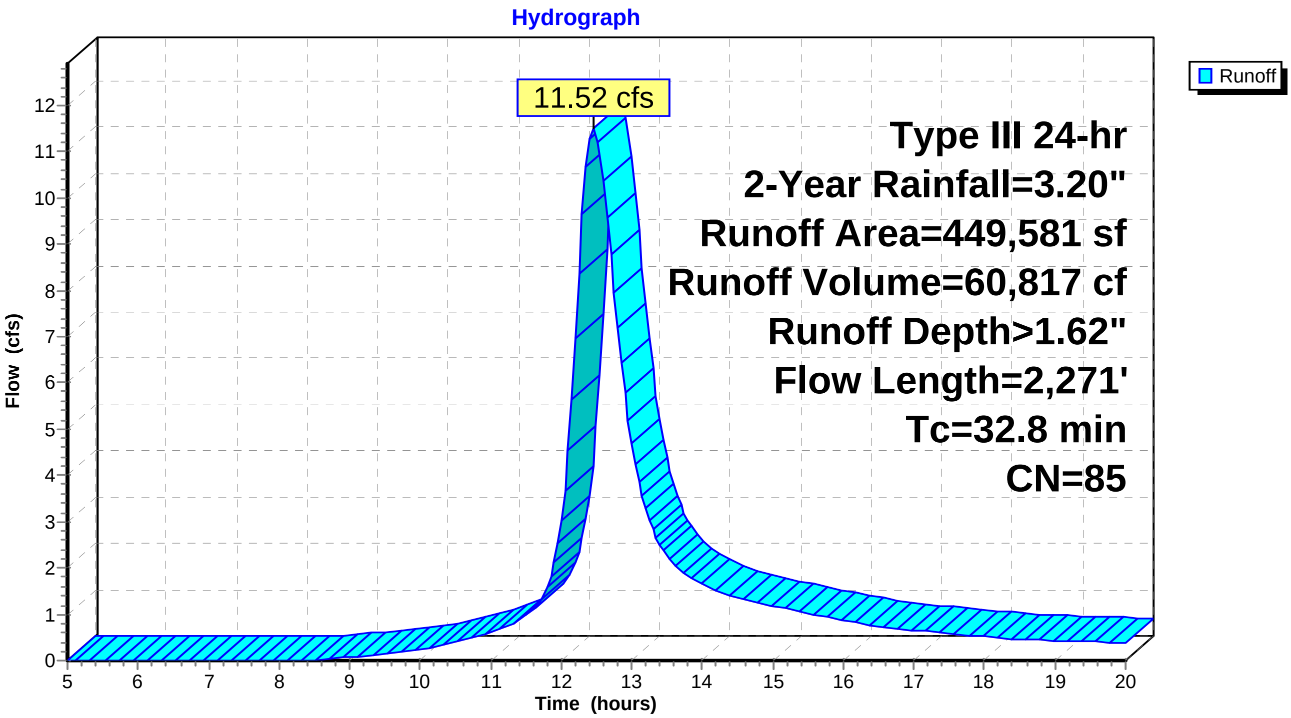
Runoff = 11.52 cfs @ 12.46 hrs, Volume= 60,817 cf, Depth> 1.62"

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

Area (sf)	CN	Description
1,629	70	1/2 acre lots, 25% imp, HSG B
447,952	85	1/2 acre lots, 25% imp, HSG D
449,581	85	Weighted Average
337,186		75.00% Pervious Area
112,395		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow, Sheet AB** Woods: Light underbrush n= 0.400 P2= 3.20"
1.5	252	0.0320	2.88		**Shallow Concentrated Flow, Wooded BC** Unpaved Kv= 16.1 fps
0.2	63	0.1111	5.37		**Shallow Concentrated Flow, Wooded CD** Unpaved Kv= 16.1 fps
21.6	1,862	0.0080	1.44		**Shallow Concentrated Flow, Wetland/Strea/Pond DE** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River EF** Unpaved Kv= 16.1 fps
32.8	2,271	Total			

Subcatchment AR: Abutter Runoff



Summary for Subcatchment CR: Charles River

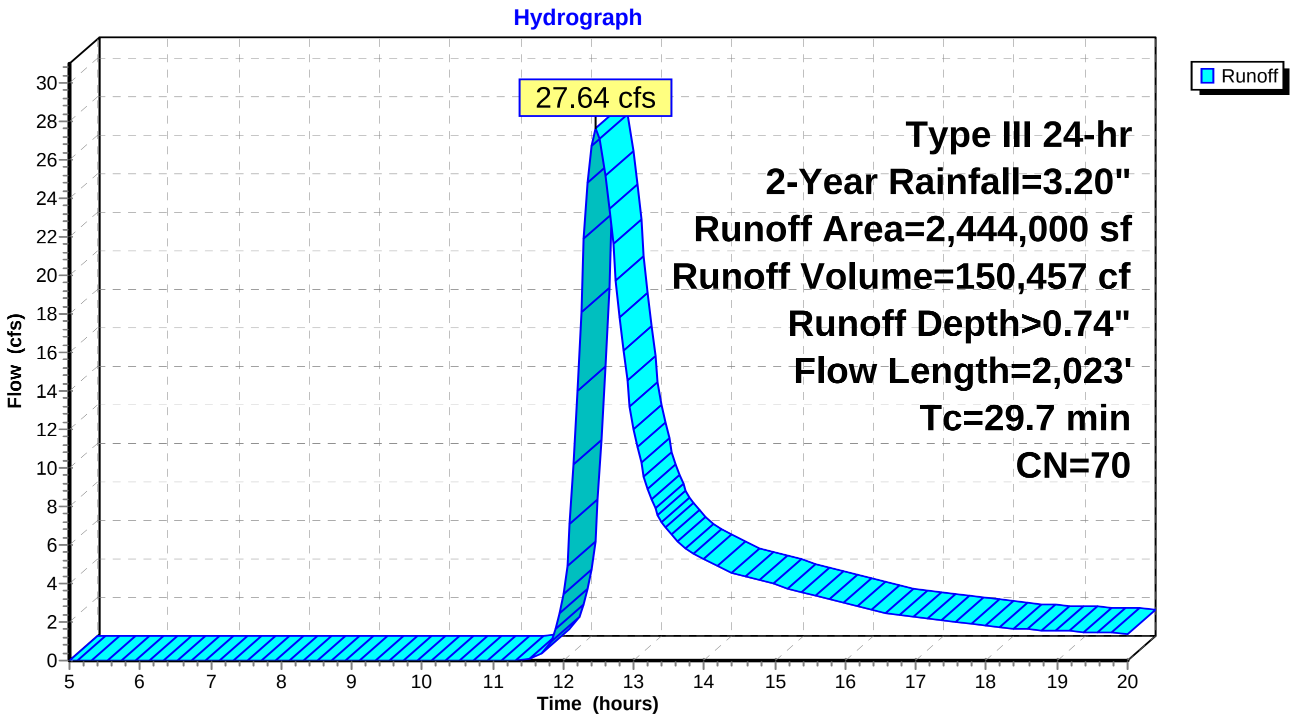
Runoff = 27.64 cfs @ 12.47 hrs, Volume= 150,457 cf, Depth> 0.74"

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

	Area (sf)	CN	Description
	91,344	30	Woods, Good, HSG A
*	3,253	78	Wetland, HSG A
*	4,799	72	Path, HSG A
	646,180	55	Woods, Good, HSG B
	99,421	61	>75% Grass cover, Good, HSG B
*	105,317	78	Wetland, HSG B
*	83,393	82	Path, HSG B
	4,151	98	Water Surface, HSG B
	55	98	Unconnected pavement, HSG B
	36,399	70	Woods, Good, HSG C
*	147,803	78	Wetlands, HSG C
*	1,145	87	Path, HSG C
	10,807	98	Water Surface, HSG C
	744,147	77	Woods, Good, HSG D
	31,605	80	>75% Grass cover, Good, HSG D
*	235,351	78	Wetlands, HSG D
*	14,267	89	Path, HSG D
	48,913	98	Water Surface, HSG D
	20,004	70	1/2 acre lots, 25% imp, HSG B
	54,729	80	1/2 acre lots, 25% imp, HSG C
	60,917	85	1/2 acre lots, 25% imp, HSG D
	2,444,000	70	Weighted Average
	2,346,162		96.00% Pervious Area
	97,839		4.00% Impervious Area
	55		0.06% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, Sheet A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
3.1	330	0.0120	1.76		**Shallow Concentrated Flow, Wooded B-C** Unpaved Kv= 16.1 fps
18.5	1,599	0.0080	1.44		**Shallow Concentrated Flow, Wetland/Stream/Pond C-D** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River D-E** Unpaved Kv= 16.1 fps
29.7	2,023	Total			

Subcatchment CR: Charles River



Summary for Subcatchment OSW: Off Site West

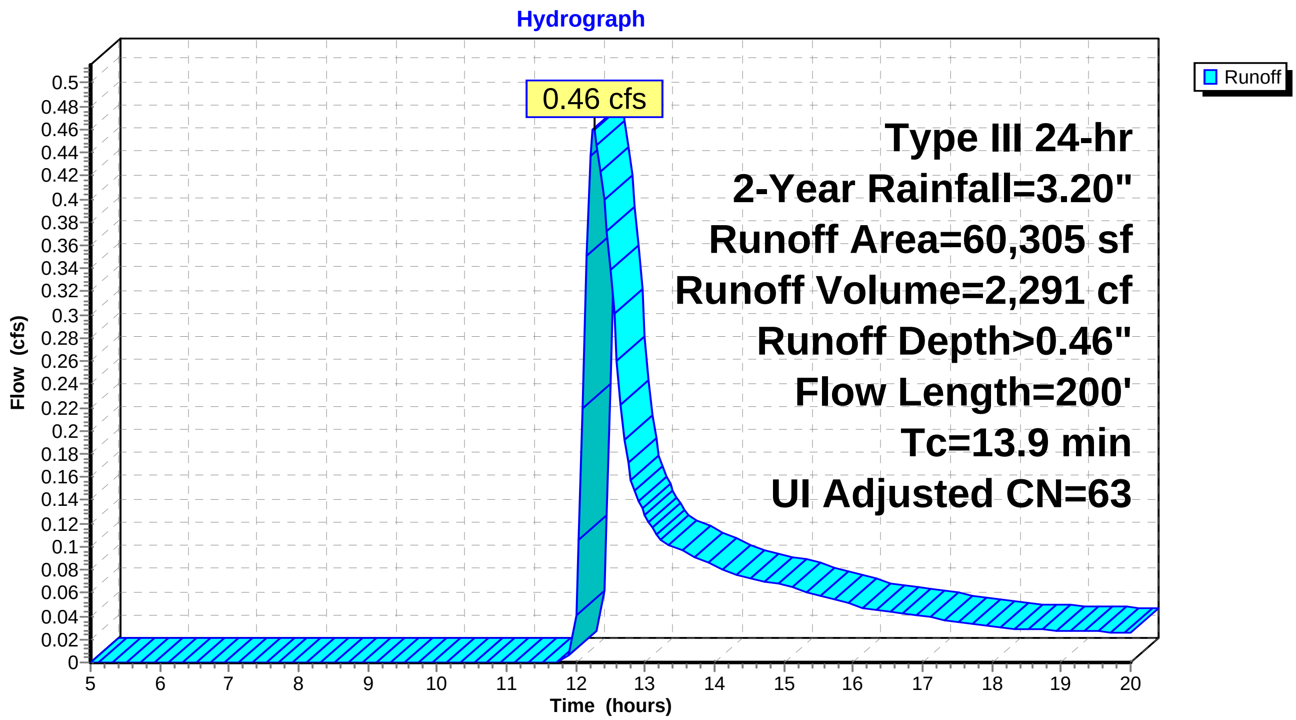
Runoff = 0.46 cfs @ 12.26 hrs, Volume= 2,291 cf, Depth> 0.46"

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

Area (sf)	CN	Adj	Description
22,362	55		Woods, Good, HSG B
23,757	61		>75% Grass cover, Good, HSG B
6,128	98		Unconnected pavement, HSG B
8,058	80		>75% Grass cover, Good, HSG D
60,305	65	63	Weighted Average, UI Adjusted
54,177			89.84% Pervious Area
6,128			10.16% Impervious Area
6,128			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	98	0.0050	1.14		**Shallow Concentrated Flow, Wooded B-C** Unpaved Kv= 16.1 fps
0.2	52	0.0500	3.60		**Shallow Concentrated Flow, Wooded C-D** Unpaved Kv= 16.1 fps
13.9	200	Total			

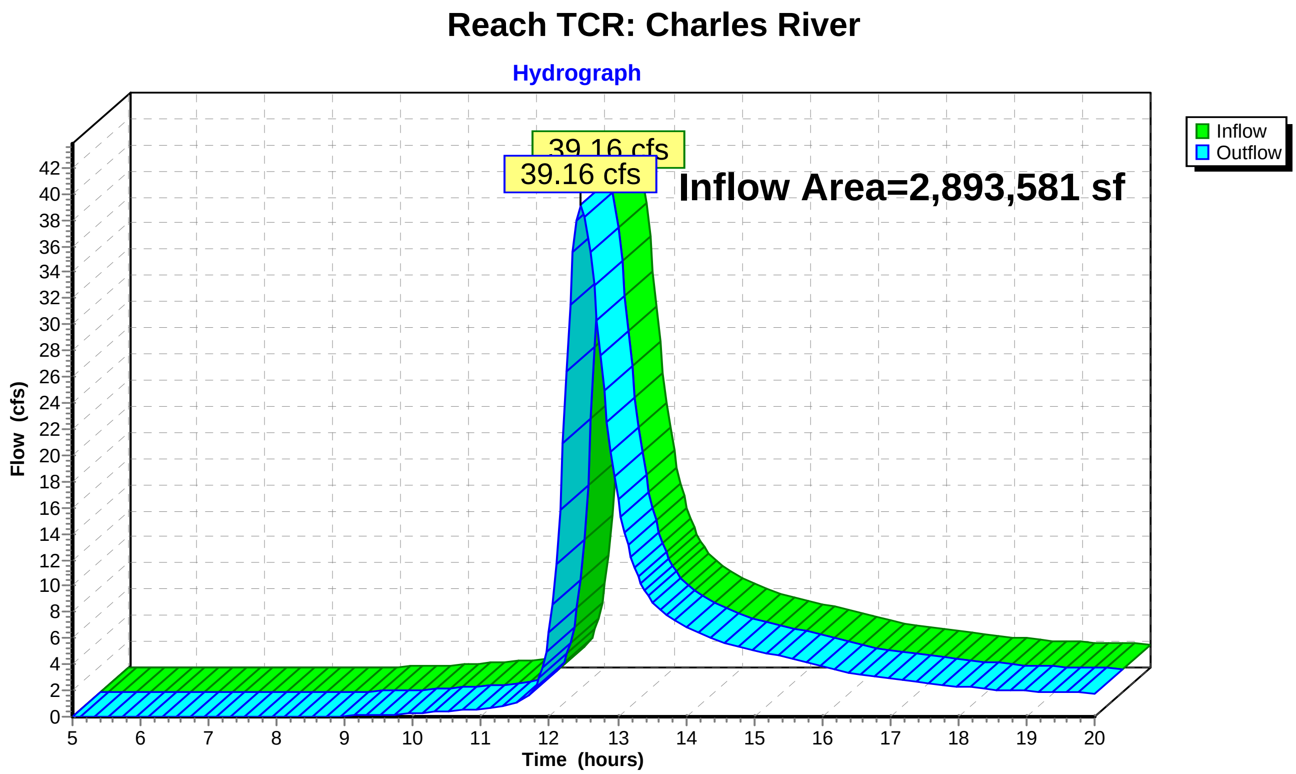
Subcatchment OSW: Off Site West



Summary for Reach TCR: Charles River

Inflow Area = 2,893,581 sf, 7.27% Impervious, Inflow Depth > 0.88" for 2-Year event
Inflow = 39.16 cfs @ 12.47 hrs, Volume= 211,274 cf
Outflow = 39.16 cfs @ 12.47 hrs, Volume= 211,274 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



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

Subcatchment AR: Abutter Runoff Runoff Area=449,581 sf 25.00% Impervious Runoff Depth>2.88"
Flow Length=2,271' Tc=32.8 min CN=85 Runoff=20.17 cfs 107,880 cf

Subcatchment CR: Charles River Runoff Area=2,444,000 sf 4.00% Impervious Runoff Depth>1.65"
Flow Length=2,023' Tc=29.7 min CN=70 Runoff=65.88 cfs 336,648 cf

Subcatchment OSW: Off Site West Runoff Area=60,305 sf 10.16% Impervious Runoff Depth>1.19"
Flow Length=200' Tc=13.9 min UI Adjusted CN=63 Runoff=1.51 cfs 6,000 cf

Reach TCR: Charles River Inflow=86.05 cfs 444,528 cf
Outflow=86.05 cfs 444,528 cf

Total Runoff Area = 2,953,886 sf Runoff Volume = 450,528 cf Average Runoff Depth = 1.83"
92.68% Pervious = 2,737,524 sf 7.32% Impervious = 216,362 sf

Summary for Subcatchment AR: Abutter Runoff

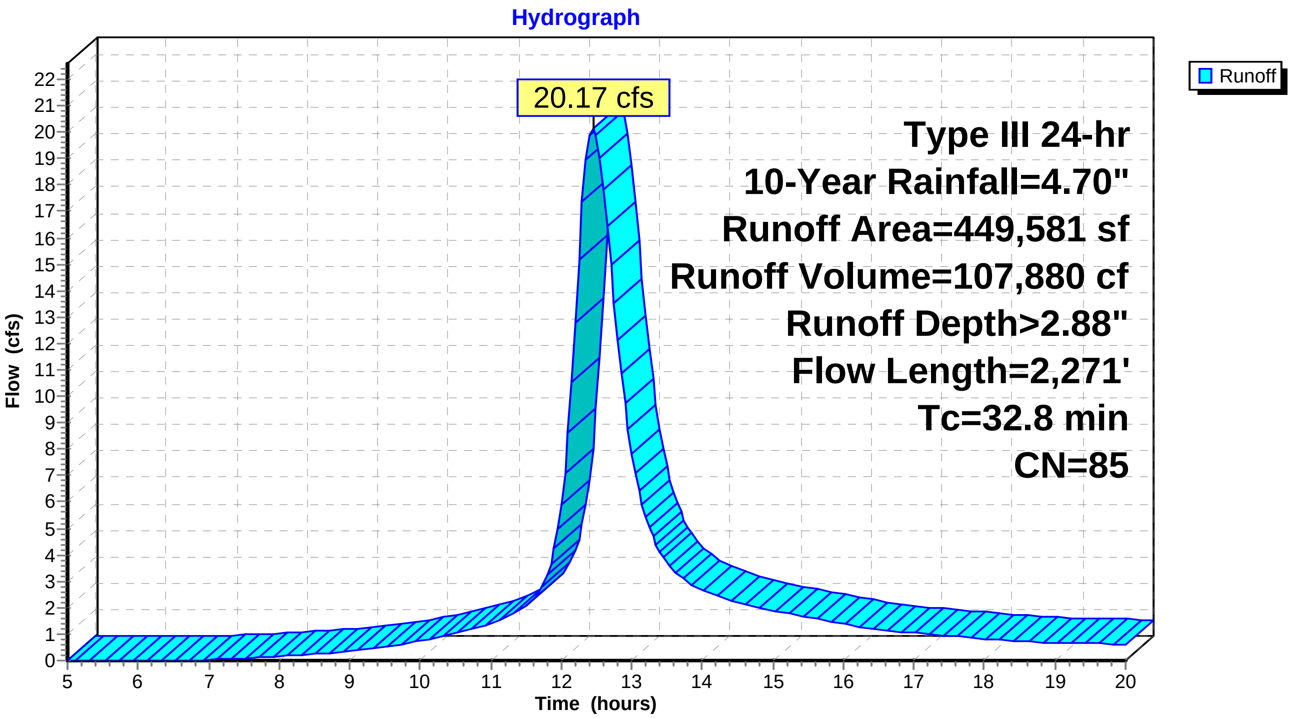
Runoff = 20.17 cfs @ 12.45 hrs, Volume= 107,880 cf, Depth> 2.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
1,629	70	1/2 acre lots, 25% imp, HSG B
447,952	85	1/2 acre lots, 25% imp, HSG D
449,581	85	Weighted Average
337,186		75.00% Pervious Area
112,395		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow, Sheet AB** Woods: Light underbrush n= 0.400 P2= 3.20"
1.5	252	0.0320	2.88		**Shallow Concentrated Flow, Wooded BC** Unpaved Kv= 16.1 fps
0.2	63	0.1111	5.37		**Shallow Concentrated Flow, Wooded CD** Unpaved Kv= 16.1 fps
21.6	1,862	0.0080	1.44		**Shallow Concentrated Flow, Wetland/Strea/Pond DE** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River EF** Unpaved Kv= 16.1 fps
32.8	2,271	Total			

Subcatchment AR: Abutter Runoff



Summary for Subcatchment CR: Charles River

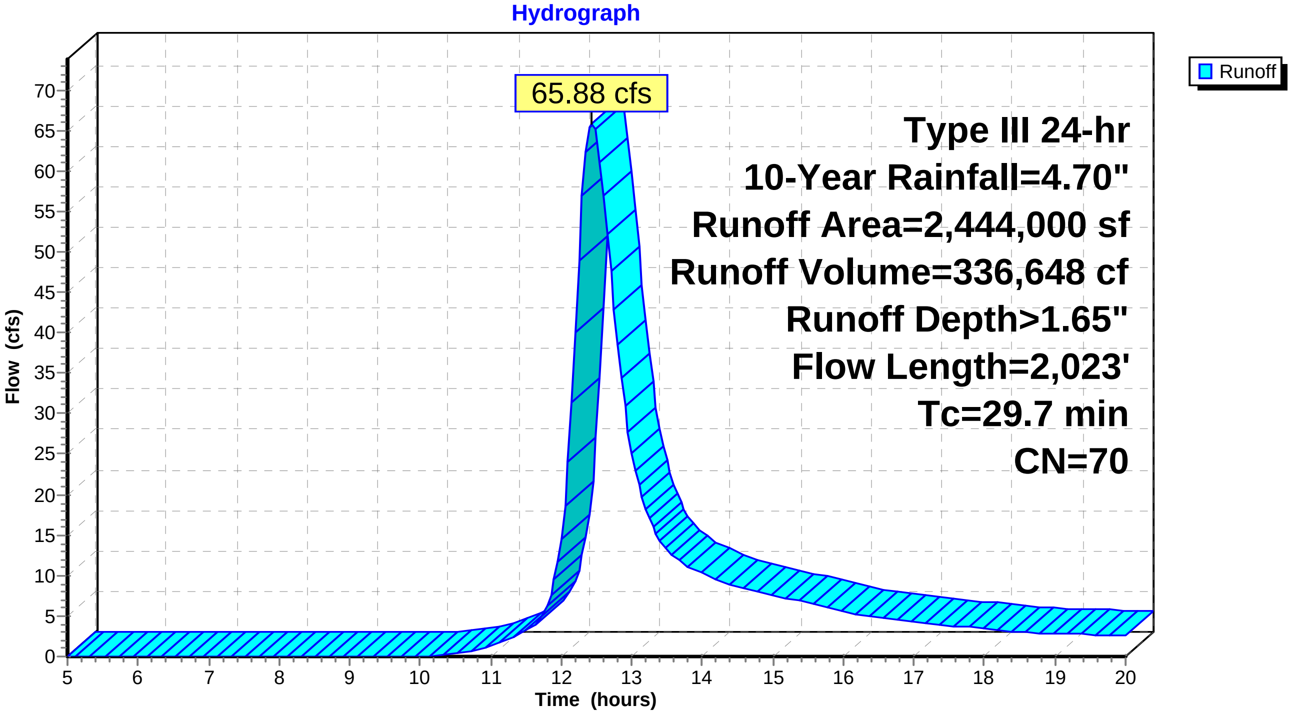
Runoff = 65.88 cfs @ 12.44 hrs, Volume= 336,648 cf, Depth> 1.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
	91,344	30	Woods, Good, HSG A
*	3,253	78	Wetland, HSG A
*	4,799	72	Path, HSG A
	646,180	55	Woods, Good, HSG B
	99,421	61	>75% Grass cover, Good, HSG B
*	105,317	78	Wetland, HSG B
*	83,393	82	Path, HSG B
	4,151	98	Water Surface, HSG B
	55	98	Unconnected pavement, HSG B
	36,399	70	Woods, Good, HSG C
*	147,803	78	Wetlands, HSG C
*	1,145	87	Path, HSG C
	10,807	98	Water Surface, HSG C
	744,147	77	Woods, Good, HSG D
	31,605	80	>75% Grass cover, Good, HSG D
*	235,351	78	Wetlands, HSG D
*	14,267	89	Path, HSG D
	48,913	98	Water Surface, HSG D
	20,004	70	1/2 acre lots, 25% imp, HSG B
	54,729	80	1/2 acre lots, 25% imp, HSG C
	60,917	85	1/2 acre lots, 25% imp, HSG D
	2,444,000	70	Weighted Average
	2,346,162		96.00% Pervious Area
	97,839		4.00% Impervious Area
	55		0.06% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, Sheet A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
3.1	330	0.0120	1.76		**Shallow Concentrated Flow, Wooded B-C** Unpaved Kv= 16.1 fps
18.5	1,599	0.0080	1.44		**Shallow Concentrated Flow, Wetland/Stream/Pond C-D** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River D-E** Unpaved Kv= 16.1 fps
29.7	2,023	Total			

Subcatchment CR: Charles River



Summary for Subcatchment OSW: Off Site West

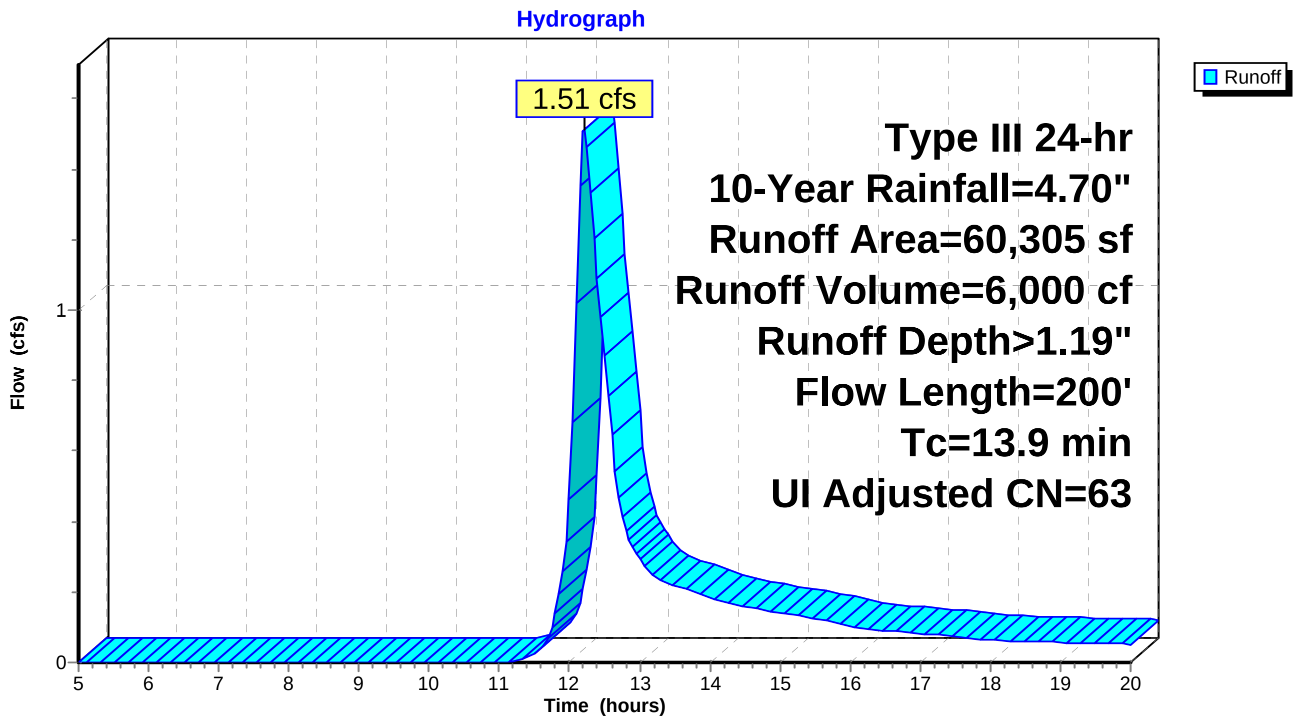
Runoff = 1.51 cfs @ 12.21 hrs, Volume= 6,000 cf, Depth> 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Adj	Description
22,362	55		Woods, Good, HSG B
23,757	61		>75% Grass cover, Good, HSG B
6,128	98		Unconnected pavement, HSG B
8,058	80		>75% Grass cover, Good, HSG D
60,305	65	63	Weighted Average, UI Adjusted
54,177			89.84% Pervious Area
6,128			10.16% Impervious Area
6,128			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	98	0.0050	1.14		**Shallow Concentrated Flow, Wooded B-C** Unpaved Kv= 16.1 fps
0.2	52	0.0500	3.60		**Shallow Concentrated Flow, Wooded C-D** Unpaved Kv= 16.1 fps
13.9	200	Total			

Subcatchment OSW: Off Site West

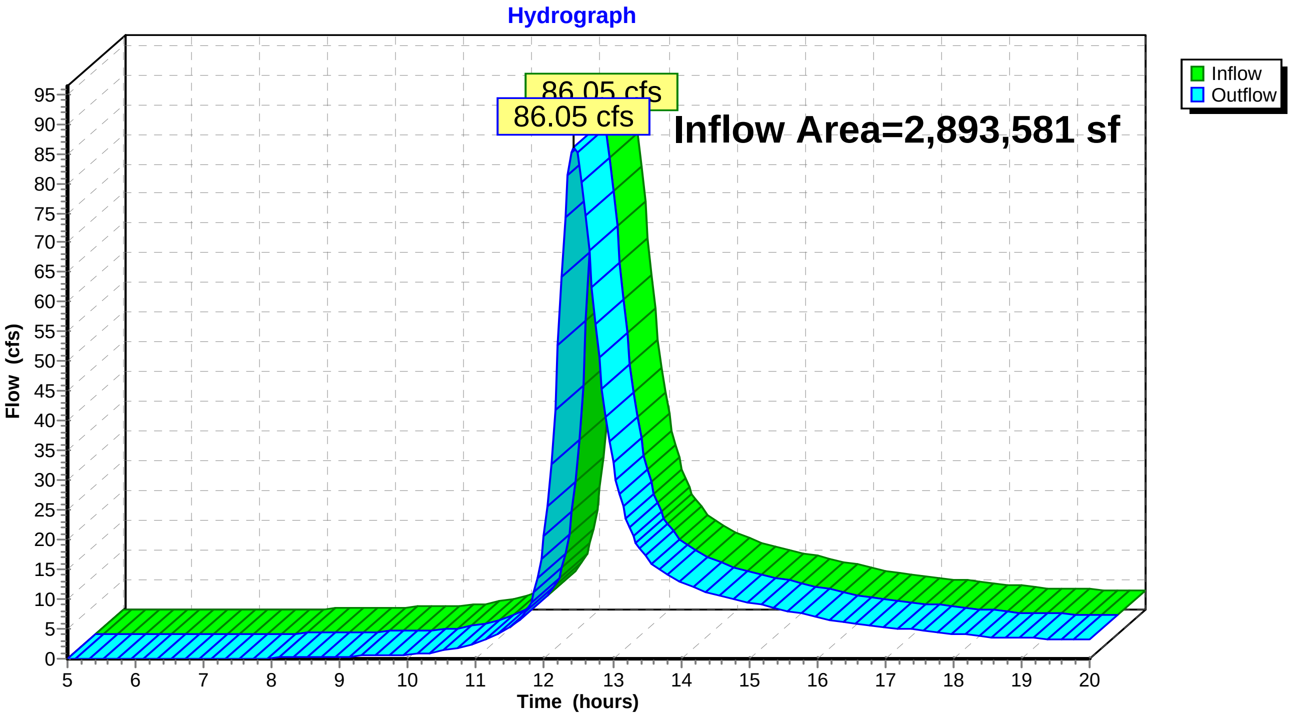


Summary for Reach TCR: Charles River

Inflow Area = 2,893,581 sf, 7.27% Impervious, Inflow Depth > 1.84" for 10-Year event
Inflow = 86.05 cfs @ 12.44 hrs, Volume= 444,528 cf
Outflow = 86.05 cfs @ 12.44 hrs, Volume= 444,528 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TCR: Charles River



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

Subcatchment AR: Abutter Runoff Runoff Area=449,581 sf 25.00% Impervious Runoff Depth>3.58"
Flow Length=2,271' Tc=32.8 min CN=85 Runoff=24.87 cfs 134,096 cf

Subcatchment CR: Charles River Runoff Area=2,444,000 sf 4.00% Impervious Runoff Depth>2.21"
Flow Length=2,023' Tc=29.7 min CN=70 Runoff=88.84 cfs 450,015 cf

Subcatchment OSW: Off Site West Runoff Area=60,305 sf 10.16% Impervious Runoff Depth>1.67"
Flow Length=200' Tc=13.9 min UI Adjusted CN=63 Runoff=2.18 cfs 8,389 cf

Reach TCR: Charles River Inflow=113.68 cfs 584,111 cf
Outflow=113.68 cfs 584,111 cf

Total Runoff Area = 2,953,886 sf Runoff Volume = 592,500 cf Average Runoff Depth = 2.41"
92.68% Pervious = 2,737,524 sf 7.32% Impervious = 216,362 sf

Summary for Subcatchment AR: Abutter Runoff

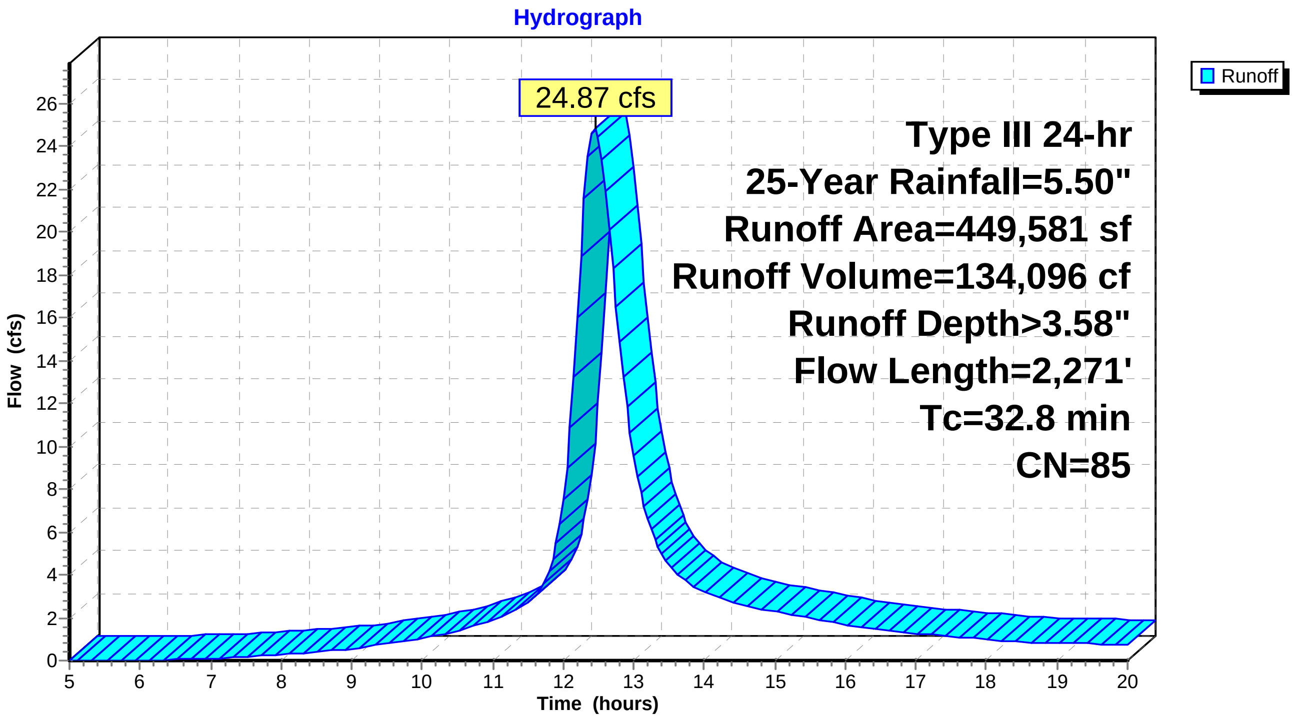
Runoff = 24.87 cfs @ 12.45 hrs, Volume= 134,096 cf, Depth> 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
1,629	70	1/2 acre lots, 25% imp, HSG B
447,952	85	1/2 acre lots, 25% imp, HSG D
449,581	85	Weighted Average
337,186		75.00% Pervious Area
112,395		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow, Sheet AB** Woods: Light underbrush n= 0.400 P2= 3.20"
1.5	252	0.0320	2.88		**Shallow Concentrated Flow, Wooded BC** Unpaved Kv= 16.1 fps
0.2	63	0.1111	5.37		**Shallow Concentrated Flow, Wooded CD** Unpaved Kv= 16.1 fps
21.6	1,862	0.0080	1.44		**Shallow Concentrated Flow, Wetland/Strea/Pond DE** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River EF** Unpaved Kv= 16.1 fps
32.8	2,271	Total			

Subcatchment AR: Abutter Runoff



Summary for Subcatchment CR: Charles River

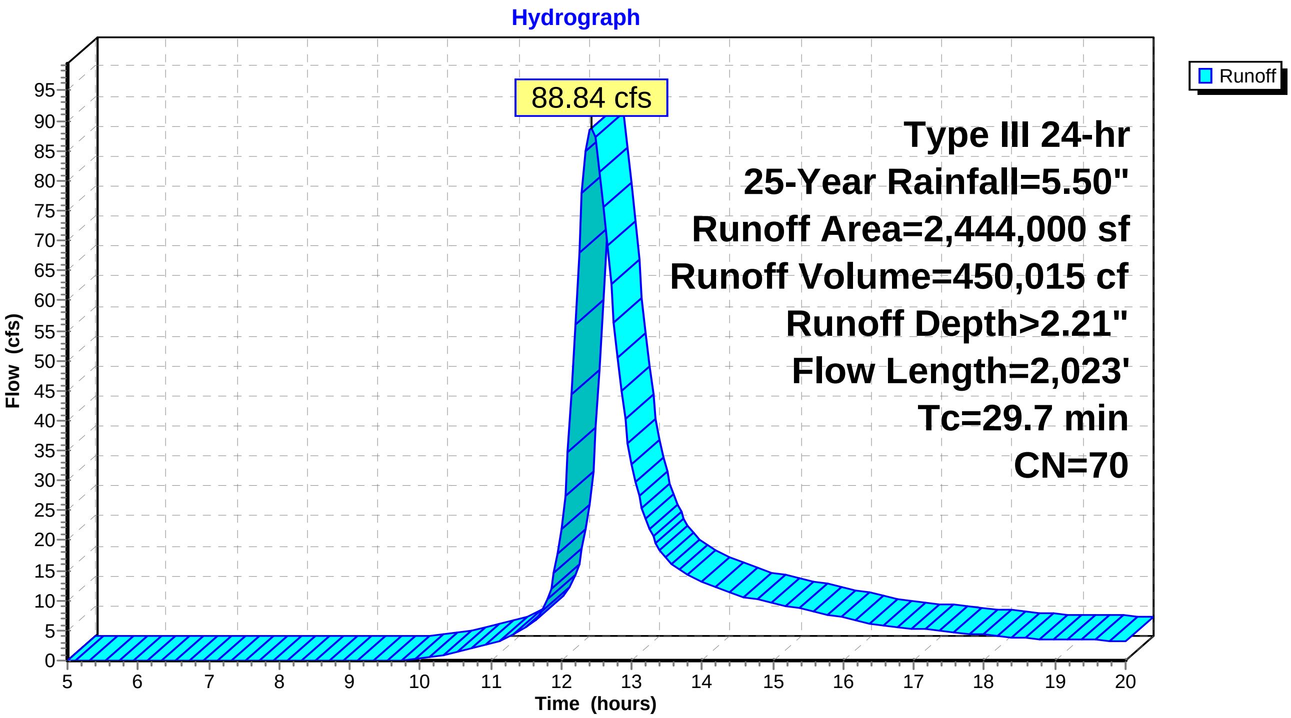
Runoff = 88.84 cfs @ 12.43 hrs, Volume= 450,015 cf, Depth> 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
	91,344	30	Woods, Good, HSG A
*	3,253	78	Wetland, HSG A
*	4,799	72	Path, HSG A
	646,180	55	Woods, Good, HSG B
	99,421	61	>75% Grass cover, Good, HSG B
*	105,317	78	Wetland, HSG B
*	83,393	82	Path, HSG B
	4,151	98	Water Surface, HSG B
	55	98	Unconnected pavement, HSG B
	36,399	70	Woods, Good, HSG C
*	147,803	78	Wetlands, HSG C
*	1,145	87	Path, HSG C
	10,807	98	Water Surface, HSG C
	744,147	77	Woods, Good, HSG D
	31,605	80	>75% Grass cover, Good, HSG D
*	235,351	78	Wetlands, HSG D
*	14,267	89	Path, HSG D
	48,913	98	Water Surface, HSG D
	20,004	70	1/2 acre lots, 25% imp, HSG B
	54,729	80	1/2 acre lots, 25% imp, HSG C
	60,917	85	1/2 acre lots, 25% imp, HSG D
	2,444,000	70	Weighted Average
	2,346,162		96.00% Pervious Area
	97,839		4.00% Impervious Area
	55		0.06% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, Sheet A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
3.1	330	0.0120	1.76		**Shallow Concentrated Flow, Wooded B-C** Unpaved Kv= 16.1 fps
18.5	1,599	0.0080	1.44		**Shallow Concentrated Flow, Wetland/Stream/Pond C-D** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River D-E** Unpaved Kv= 16.1 fps
29.7	2,023	Total			

Subcatchment CR: Charles River



Summary for Subcatchment OSW: Off Site West

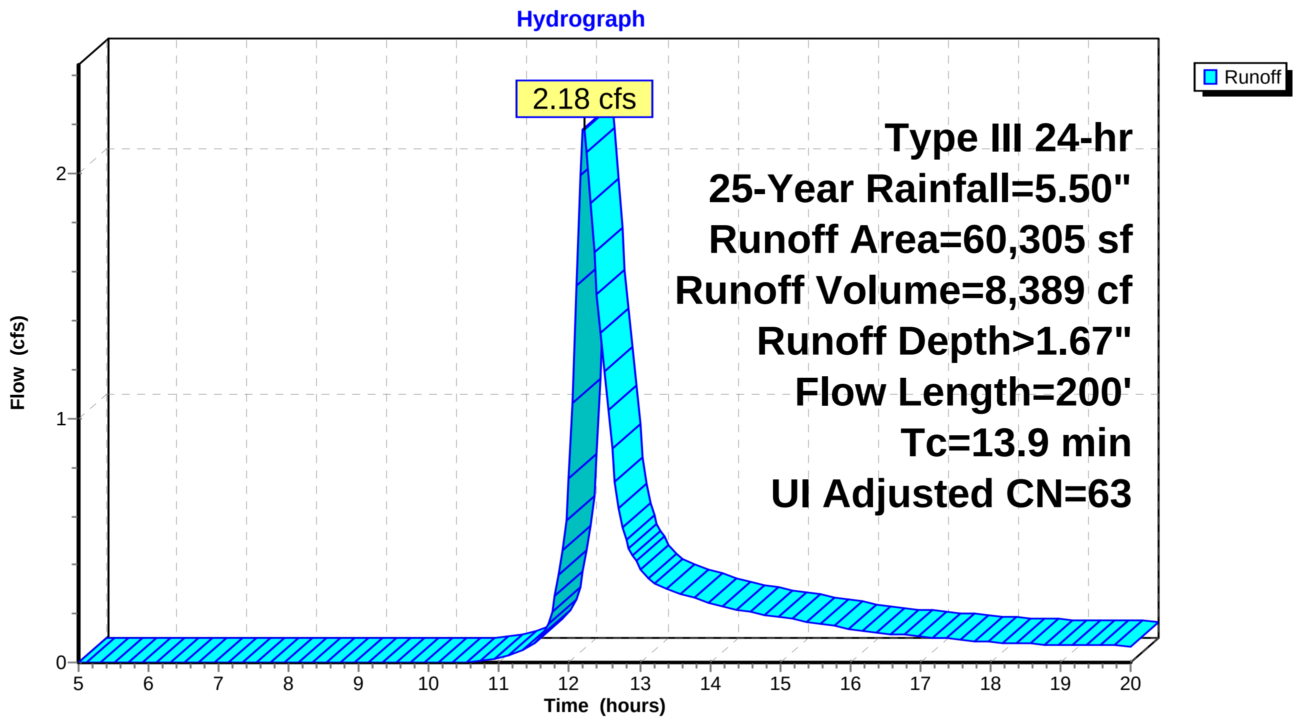
Runoff = 2.18 cfs @ 12.21 hrs, Volume= 8,389 cf, Depth> 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Adj	Description
22,362	55		Woods, Good, HSG B
23,757	61		>75% Grass cover, Good, HSG B
6,128	98		Unconnected pavement, HSG B
8,058	80		>75% Grass cover, Good, HSG D
60,305	65	63	Weighted Average, UI Adjusted
54,177			89.84% Pervious Area
6,128			10.16% Impervious Area
6,128			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	98	0.0050	1.14		**Shallow Concentrated Flow, Wooded B-C** Unpaved Kv= 16.1 fps
0.2	52	0.0500	3.60		**Shallow Concentrated Flow, Wooded C-D** Unpaved Kv= 16.1 fps
13.9	200	Total			

Subcatchment OSW: Off Site West

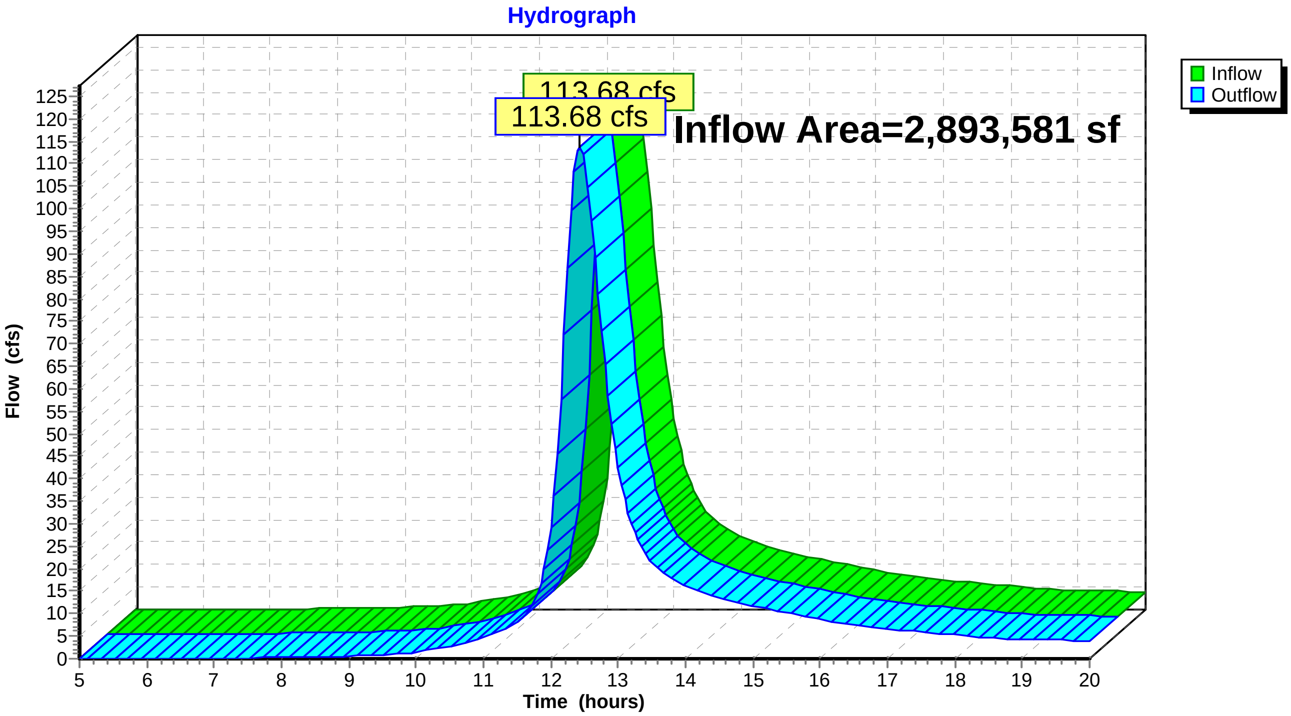


Summary for Reach TCR: Charles River

Inflow Area = 2,893,581 sf, 7.27% Impervious, Inflow Depth > 2.42" for 25-Year event
Inflow = 113.68 cfs @ 12.43 hrs, Volume= 584,111 cf
Outflow = 113.68 cfs @ 12.43 hrs, Volume= 584,111 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TCR: Charles River



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

Subcatchment AR: Abutter Runoff Runoff Area=449,581 sf 25.00% Impervious Runoff Depth>4.65"
Flow Length=2,271' Tc=32.8 min CN=85 Runoff=31.93 cfs 174,253 cf

Subcatchment CR: Charles River Runoff Area=2,444,000 sf 4.00% Impervious Runoff Depth>3.10"
Flow Length=2,023' Tc=29.7 min CN=70 Runoff=125.32 cfs 632,180 cf

Subcatchment OSW: Off Site West Runoff Area=60,305 sf 10.16% Impervious Runoff Depth>2.46"
Flow Length=200' Tc=13.9 min UI Adjusted CN=63 Runoff=3.29 cfs 12,346 cf

Reach TCR: Charles River Inflow=157.20 cfs 806,433 cf
Outflow=157.20 cfs 806,433 cf

Total Runoff Area = 2,953,886 sf Runoff Volume = 818,779 cf Average Runoff Depth = 3.33"
92.68% Pervious = 2,737,524 sf 7.32% Impervious = 216,362 sf

Summary for Subcatchment AR: Abutter Runoff

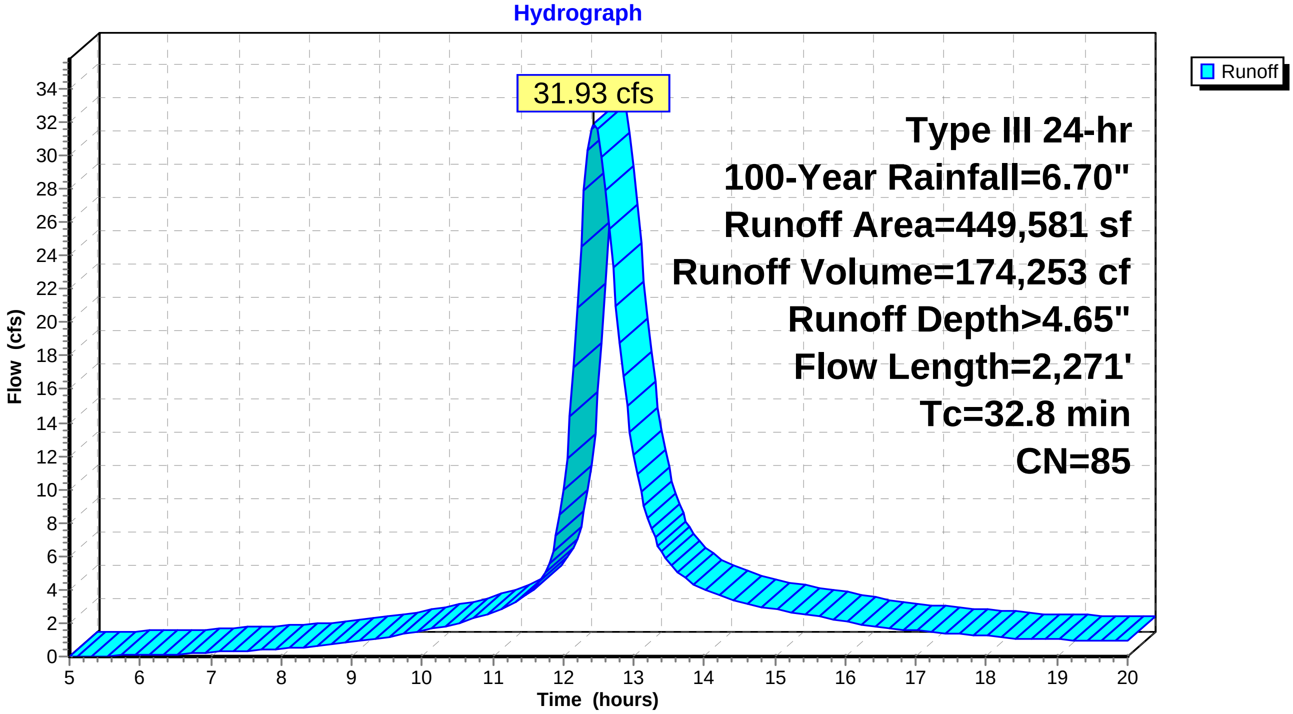
Runoff = 31.93 cfs @ 12.44 hrs, Volume= 174,253 cf, Depth> 4.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
1,629	70	1/2 acre lots, 25% imp, HSG B
447,952	85	1/2 acre lots, 25% imp, HSG D
449,581	85	Weighted Average
337,186		75.00% Pervious Area
112,395		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow, Sheet AB** Woods: Light underbrush n= 0.400 P2= 3.20"
1.5	252	0.0320	2.88		**Shallow Concentrated Flow, Wooded BC** Unpaved Kv= 16.1 fps
0.2	63	0.1111	5.37		**Shallow Concentrated Flow, Wooded CD** Unpaved Kv= 16.1 fps
21.6	1,862	0.0080	1.44		**Shallow Concentrated Flow, Wetland/Strea/Pond DE** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River EF** Unpaved Kv= 16.1 fps
32.8	2,271	Total			

Subcatchment AR: Abutter Runoff



Summary for Subcatchment CR: Charles River

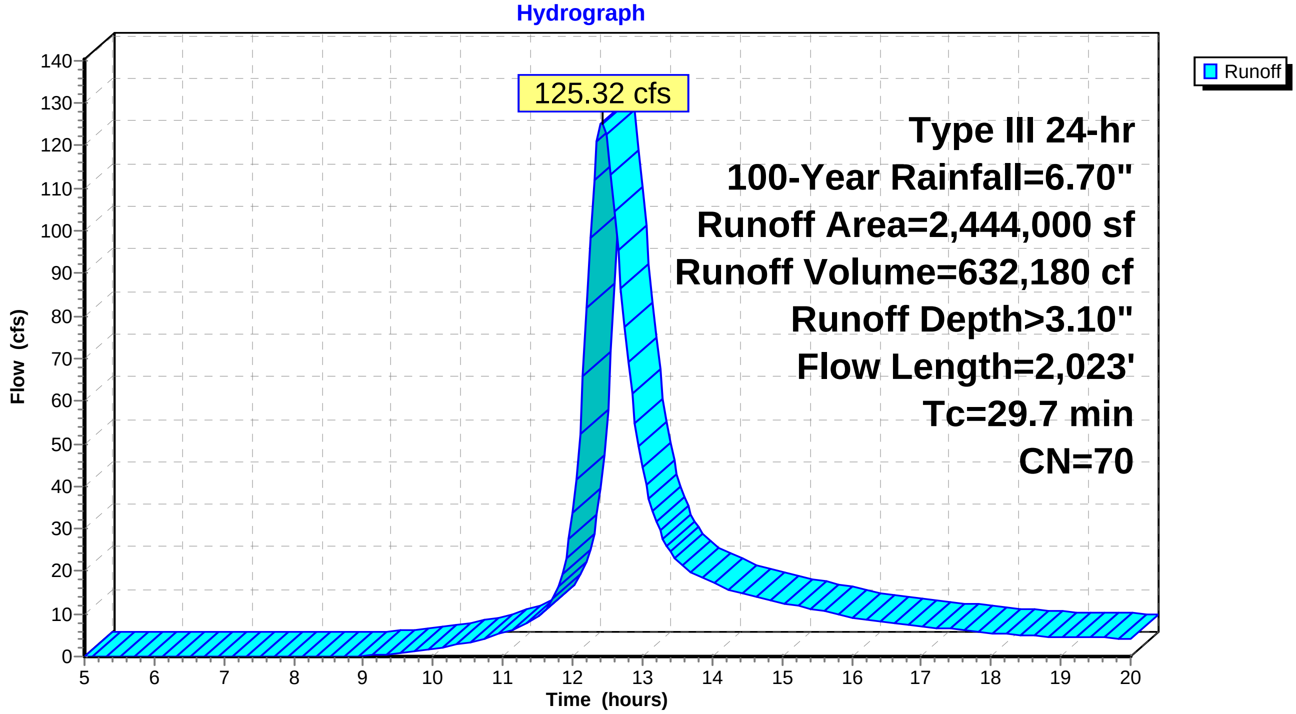
Runoff = 125.32 cfs @ 12.42 hrs, Volume= 632,180 cf, Depth> 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
	91,344	30	Woods, Good, HSG A
*	3,253	78	Wetland, HSG A
*	4,799	72	Path, HSG A
	646,180	55	Woods, Good, HSG B
	99,421	61	>75% Grass cover, Good, HSG B
*	105,317	78	Wetland, HSG B
*	83,393	82	Path, HSG B
	4,151	98	Water Surface, HSG B
	55	98	Unconnected pavement, HSG B
	36,399	70	Woods, Good, HSG C
*	147,803	78	Wetlands, HSG C
*	1,145	87	Path, HSG C
	10,807	98	Water Surface, HSG C
	744,147	77	Woods, Good, HSG D
	31,605	80	>75% Grass cover, Good, HSG D
*	235,351	78	Wetlands, HSG D
*	14,267	89	Path, HSG D
	48,913	98	Water Surface, HSG D
	20,004	70	1/2 acre lots, 25% imp, HSG B
	54,729	80	1/2 acre lots, 25% imp, HSG C
	60,917	85	1/2 acre lots, 25% imp, HSG D
	2,444,000	70	Weighted Average
	2,346,162		96.00% Pervious Area
	97,839		4.00% Impervious Area
	55		0.06% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, Sheet A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
3.1	330	0.0120	1.76		**Shallow Concentrated Flow, Wooded B-C** Unpaved Kv= 16.1 fps
18.5	1,599	0.0080	1.44		**Shallow Concentrated Flow, Wetland/Stream/Pond C-D** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River D-E** Unpaved Kv= 16.1 fps
29.7	2,023	Total			

Subcatchment CR: Charles River



Summary for Subcatchment OSW: Off Site West

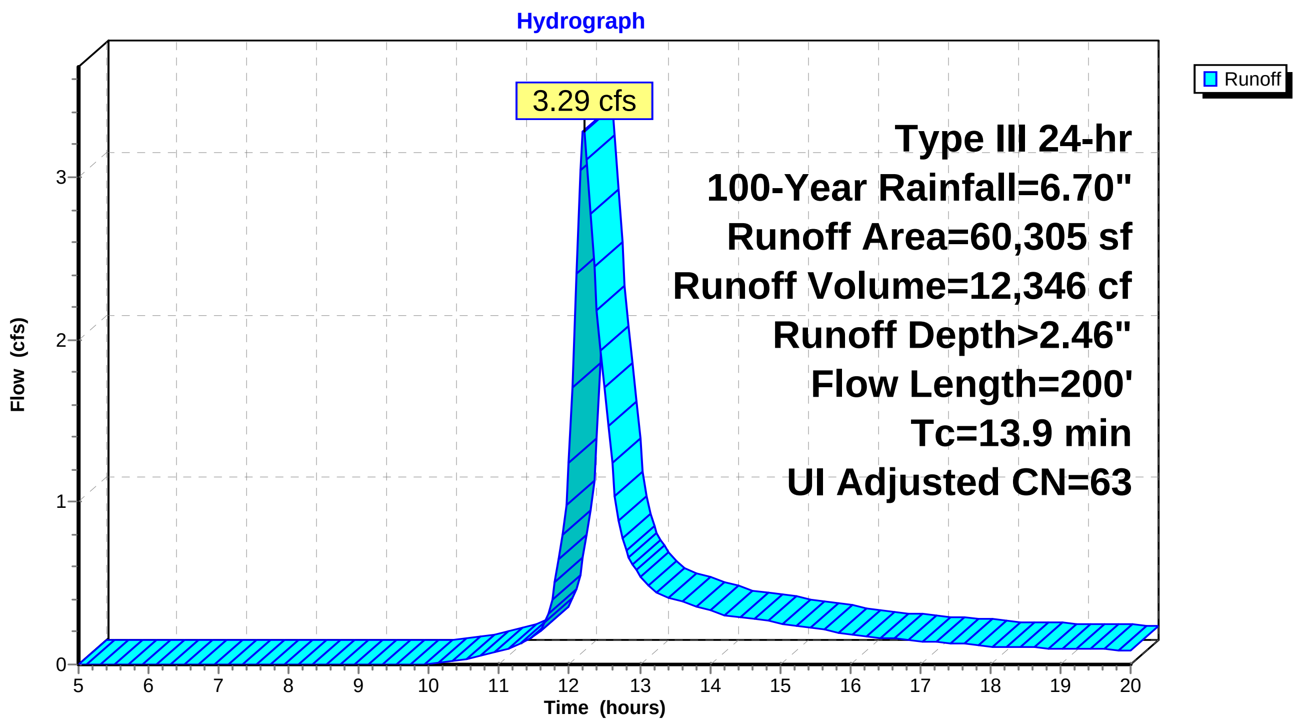
Runoff = 3.29 cfs @ 12.20 hrs, Volume= 12,346 cf, Depth> 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Adj	Description
22,362	55		Woods, Good, HSG B
23,757	61		>75% Grass cover, Good, HSG B
6,128	98		Unconnected pavement, HSG B
8,058	80		>75% Grass cover, Good, HSG D
60,305	65	63	Weighted Average, UI Adjusted
54,177			89.84% Pervious Area
6,128			10.16% Impervious Area
6,128			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	98	0.0050	1.14		**Shallow Concentrated Flow, Wooded B-C** Unpaved Kv= 16.1 fps
0.2	52	0.0500	3.60		**Shallow Concentrated Flow, Wooded C-D** Unpaved Kv= 16.1 fps
13.9	200	Total			

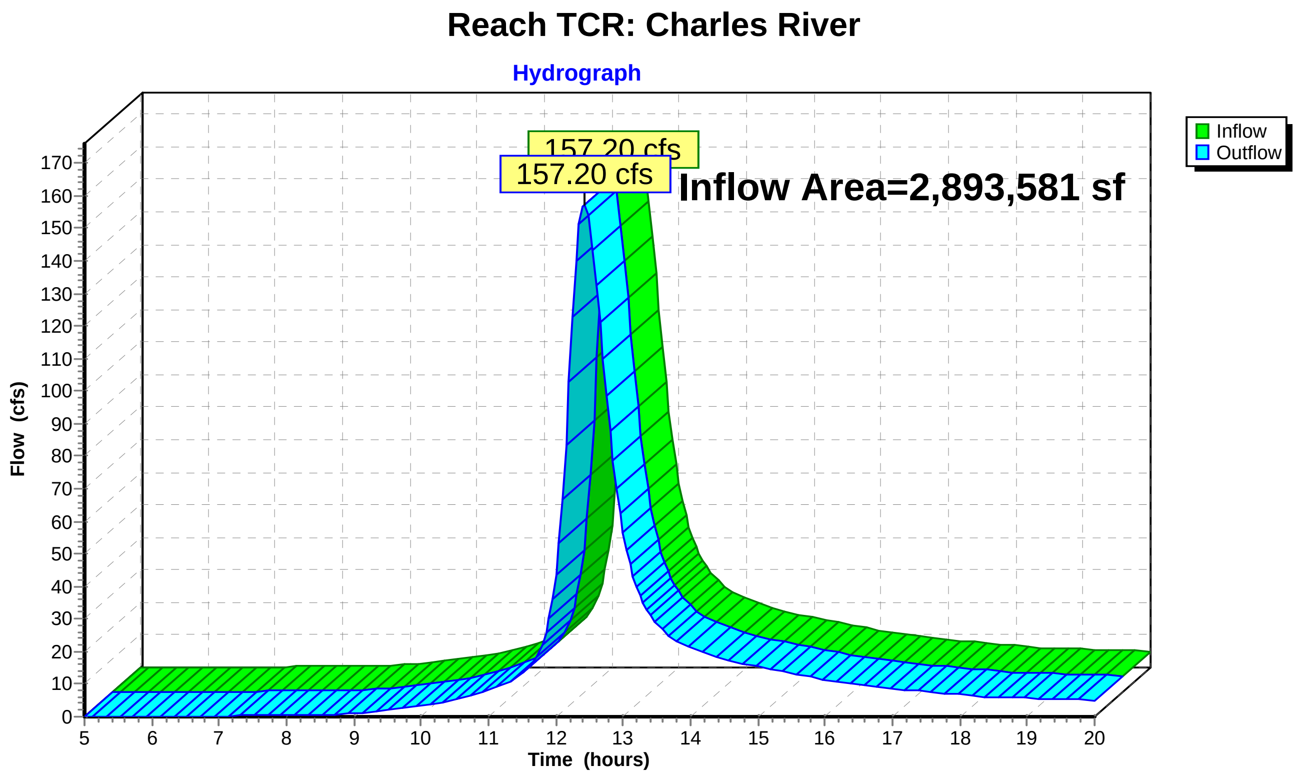
Subcatchment OSW: Off Site West



Summary for Reach TCR: Charles River

Inflow Area = 2,893,581 sf, 7.27% Impervious, Inflow Depth > 3.34" for 100-Year event
Inflow = 157.20 cfs @ 12.42 hrs, Volume= 806,433 cf
Outflow = 157.20 cfs @ 12.42 hrs, Volume= 806,433 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



APPENDIX B

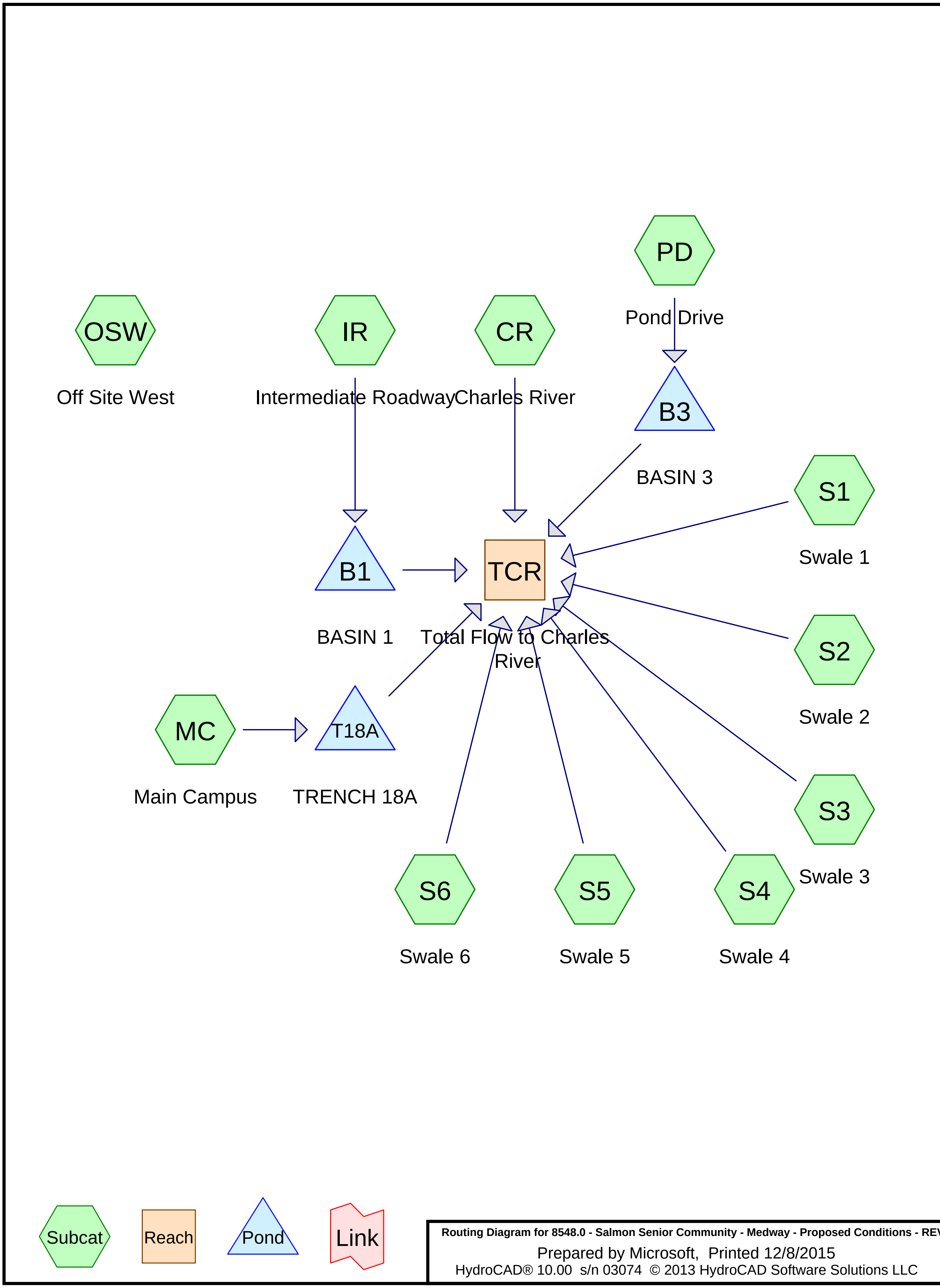
PROPOSED HYDROLOGICAL CONDITIONS

2-YEAR STORM EVENT

10-YEAR STORM EVENT

25-YEAR STORM EVENT

100-YEAR STORM EVENT



Routing Diagram for 8548.0 - Salmon Senior Community - Medway - Proposed Conditions - REV3
Prepared by Microsoft, Printed 12/8/2015
HydroCAD® 10.00 s/n 03074 © 2013 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
33,600	98	(PD)
21,261	70	1/2 acre lots, 25% imp, HSG B (CR, S6)
54,729	80	1/2 acre lots, 25% imp, HSG C (CR)
508,871	85	1/2 acre lots, 25% imp, HSG D (CR, S1, S2, S3, S4, S5, S6)
28,093	39	>75% Grass cover, Good, HSG A (CR, MC)
330,299	61	>75% Grass cover, Good, HSG B (CR, IR, MC, OSW, PD, S6)
758	74	>75% Grass cover, Good, HSG C (CR)
166,557	80	>75% Grass cover, Good, HSG D (CR, IR, MC, OSW, PD, S1, S2, S3, S4, S5, S6)
13,560	98	Cottages (IR)
2,704	80	Path in Resource, HSG B (CR)
6,129	80	Path in Resource, HSG C (CR)
9,556	80	Path in Resource, HSG D (CR)
1,048	80	Path(cover unknown) (OSW)
205	72	Path, HSG A (CR)
10,318	82	Path, HSG B (CR)
3,310	87	Path, HSG C (CR)
27,701	89	Path, HSG D (CR, PD)
30,503	98	Paved roads w/curbs & sewers, HSG A (MC)
130,655	98	Paved roads w/curbs & sewers, HSG B (IR, MC, PD)
87,268	98	Paved roads w/curbs & sewers, HSG D (IR, MC, PD)
3,642	60	Permeable Parking Area (OSW)
185	98	Unconnected pavement, HSG B (OSW)
4,112	98	Water Surface, HSG B (CR)
10,807	98	Water Surface, HSG C (CR)
45,917	98	Water Surface, HSG D (CR)
3,253	78	Wetland, HSG A (CR)
103,465	78	Wetlands, HSG B (CR)
141,675	78	Wetlands, HSG C (CR)
227,701	78	Wetlands, HSG D (CR)
10,067	30	Woods, Good, HSG A (CR)
204,538	55	Woods, Good, HSG B (CR, OSW)
33,426	70	Woods, Good, HSG C (CR)
438,769	77	Woods, Good, HSG D (CR)
34,660	98	impervious (CR)
2,729,342	**78**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
72,121	HSG A	CR, MC
807,537	HSG B	CR, IR, MC, OSW, PD, S6
250,834	HSG C	CR
1,512,340	HSG D	CR, IR, MC, OSW, PD, S1, S2, S3, S4, S5, S6
86,510	Other	CR, IR, OSW, PD
2,729,342		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	0	0	0	33,600	33,600	
0	21,261	54,729	508,871	0	584,861	1/2 acre lots, 25% imp
28,093	330,299	758	166,557	0	525,707	>75% Grass cover, Good
0	0	0	0	13,560	13,560	Cottages
205	10,318	3,310	27,701	0	41,534	Path
0	2,704	6,129	9,556	0	18,389	Path in Resource
0	0	0	0	1,048	1,048	Path(cover unknown)
30,503	130,655	0	87,268	0	248,426	Paved roads w/curbs & sewers
0	0	0	0	3,642	3,642	Permeable Parking Area
0	185	0	0	0	185	Unconnected pavement
0	4,112	10,807	45,917	0	60,836	Water Surface
3,253	0	0	0	0	3,253	Wetland
0	103,465	141,675	227,701	0	472,841	Wetlands
10,067	204,538	33,426	438,769	0	686,800	Woods, Good
0	0	0	0	34,660	34,660	impervious
72,121	**807,537**	**250,834**	**1,512,340**	**86,510**	**2,729,342**	**TOTAL AREA**

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	IR	0.00	0.00	593.0	0.0050	0.013	12.0	0.0	0.0
2	IR	0.00	0.00	46.0	0.0050	0.013	4.0	0.0	0.0
3	MC	0.00	0.00	211.0	0.0050	0.013	12.0	0.0	0.0
4	MC	0.00	0.00	397.0	0.0050	0.013	18.0	0.0	0.0
5	MC	0.00	0.00	490.0	0.0050	0.013	24.0	0.0	0.0
6	MC	0.00	0.00	42.0	0.0050	0.013	4.0	0.0	0.0
7	PD	0.00	0.00	30.0	0.0050	0.013	12.0	0.0	0.0
8	PD	0.00	0.00	982.0	0.0050	0.013	18.0	0.0	0.0
9	PD	0.00	0.00	195.0	0.0050	0.013	24.0	0.0	0.0
10	PD	0.00	0.00	62.0	0.0050	0.013	6.0	0.0	0.0
11	S1	0.00	0.00	39.0	0.0050	0.011	18.0	0.0	0.0
12	S2	0.00	0.00	151.0	0.0050	0.013	18.0	0.0	0.0
13	S3	0.00	0.00	69.0	0.0050	0.011	18.0	0.0	0.0
14	S4	0.00	0.00	117.0	0.0050	0.011	24.0	0.0	0.0
15	S5	0.00	0.00	79.0	0.0050	0.011	18.0	0.0	0.0
16	S6	0.00	0.00	145.0	0.0200	0.013	12.0	0.0	0.0
17	B1	174.00	173.50	36.0	0.0139	0.010	4.0	0.0	0.0
18	B3	168.00	166.94	53.0	0.0200	0.010	6.0	0.0	0.0
19	T18A	174.00	174.00	5.0	0.0000	0.010	24.0	0.0	0.0

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

Subcatchment CR: Charles River Runoff Area=1,730,442 sf 7.48% Impervious Runoff Depth>0.94"
Flow Length=2,022' Tc=29.7 min CN=74 Runoff=25.88 cfs 134,993 cf

Subcatchment IR: Intermediate Roadway Runoff Area=69,032 sf 72.77% Impervious Runoff Depth>1.86"
Flow Length=1,790' Tc=17.9 min CN=88 Runoff=2.60 cfs 10,724 cf

Subcatchment MC: Main Campus Runoff Area=267,248 sf 56.20% Impervious Runoff Depth>1.36"
Flow Length=1,577' Tc=12.0 min CN=81 Runoff=8.55 cfs 30,208 cf

Subcatchment OSW: Off Site West Runoff Area=31,028 sf 0.60% Impervious Runoff Depth>0.57"
Flow Length=178' Tc=7.7 min CN=66 Runoff=0.40 cfs 1,481 cf

Subcatchment PD: Pond Drive Runoff Area=117,451 sf 81.01% Impervious Runoff Depth>2.40"
Flow Length=1,713' Tc=12.9 min CN=94 Runoff=6.16 cfs 23,495 cf

Subcatchment S1: Swale 1 Runoff Area=63,590 sf 22.91% Impervious Runoff Depth>1.63"
Flow Length=2,308' Tc=28.2 min CN=85 Runoff=1.75 cfs 8,616 cf

Subcatchment S2: Swale 2 Runoff Area=87,615 sf 19.27% Impervious Runoff Depth>1.56"
Flow Length=2,149' Tc=23.3 min CN=84 Runoff=2.50 cfs 11,361 cf

Subcatchment S3: Swale 3 Runoff Area=76,368 sf 21.22% Impervious Runoff Depth>1.56"
Flow Length=1,792' Tc=21.2 min CN=84 Runoff=2.27 cfs 9,910 cf

Subcatchment S4: Swale 4 Runoff Area=211,878 sf 23.60% Impervious Runoff Depth>1.63"
Flow Length=1,691' Tc=17.8 min CN=85 Runoff=7.06 cfs 28,813 cf

Subcatchment S5: Swale 5 Runoff Area=29,404 sf 17.08% Impervious Runoff Depth>1.49"
Flow Length=840' Tc=13.1 min CN=83 Runoff=1.00 cfs 3,653 cf

Subcatchment S6: Swale 6 Runoff Area=45,286 sf 21.22% Impervious Runoff Depth>1.49"
Flow Length=769' Tc=14.5 min CN=83 Runoff=1.49 cfs 5,624 cf

Reach TCR: Total Flow to Charles River Inflow=38.69 cfs 205,509 cf
Outflow=38.69 cfs 205,509 cf

Pond B1: BASIN 1 Peak Elev=177.25' Storage=5,126 cf Inflow=2.60 cfs 10,724 cf
Discarded=0.27 cfs 8,579 cf Primary=0.00 cfs 0 cf Outflow=0.27 cfs 8,579 cf

Pond B3: BASIN 3 Peak Elev=175.90' Storage=13,711 cf Inflow=6.16 cfs 23,495 cf
Discarded=0.34 cfs 12,507 cf Primary=0.00 cfs 0 cf Outflow=0.34 cfs 12,507 cf

Pond T18A: TRENCH 18A Peak Elev=174.29' Storage=15,618 cf Inflow=8.55 cfs 30,208 cf
Discarded=0.48 cfs 16,033 cf Primary=0.28 cfs 2,540 cf Outflow=0.76 cfs 18,573 cf

Total Runoff Area = 2,729,342 sf Runoff Volume = 268,878 cf Average Runoff Depth = 1.18"
80.31% Pervious = 2,191,860 sf 19.69% Impervious = 537,482 sf

Summary for Subcatchment CR: Charles River

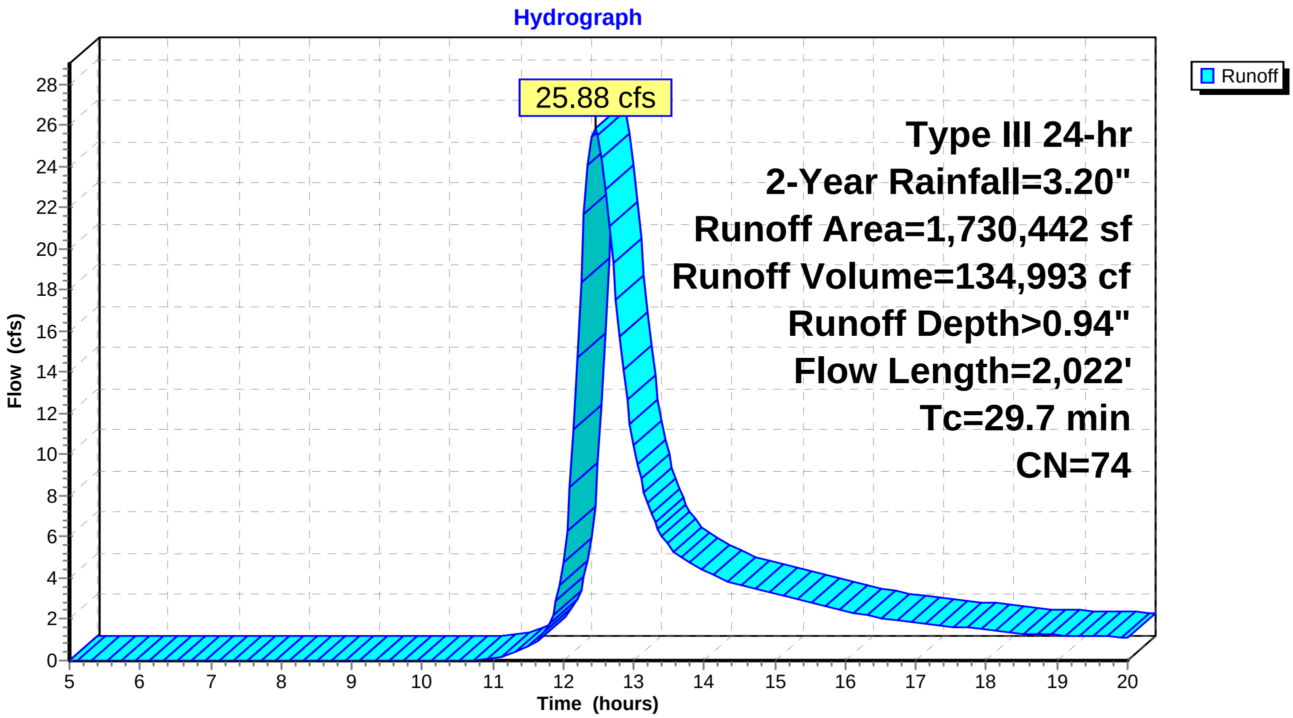
Runoff = 25.88 cfs @ 12.45 hrs, Volume= 134,993 cf, Depth> 0.94"

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

	Area (sf)	CN	Description
	10,067	30	Woods, Good, HSG A
	5,689	39	>75% Grass cover, Good, HSG A
*	3,253	78	Wetland, HSG A
*	205	72	Path, HSG A
	201,555	55	Woods, Good, HSG B
	211,820	61	>75% Grass cover, Good, HSG B
*	103,465	78	Wetlands, HSG B
*	10,318	82	Path, HSG B
*	2,704	80	Path in Resource, HSG B
	4,112	98	Water Surface, HSG B
	33,426	70	Woods, Good, HSG C
	758	74	>75% Grass cover, Good, HSG C
*	141,675	78	Wetlands, HSG C
*	3,310	87	Path, HSG C
*	6,129	80	Path in Resource, HSG C
	10,807	98	Water Surface, HSG C
	438,769	77	Woods, Good, HSG D
	61,238	80	>75% Grass cover, Good, HSG D
*	227,701	78	Wetlands, HSG D
*	27,658	89	Path, HSG D
*	9,556	80	Path in Resource, HSG D
	45,917	98	Water Surface, HSG D
	20,004	70	1/2 acre lots, 25% imp, HSG B
	54,729	80	1/2 acre lots, 25% imp, HSG C
	60,917	85	1/2 acre lots, 25% imp, HSG D
*	34,660	98	impervious
	1,730,442	74	Weighted Average
	1,601,034		92.52% Pervious Area
	129,409		7.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, Sheet A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
3.1	329	0.0120	1.76		**Shallow Concentrated Flow, Wetland B-C** Unpaved Kv= 16.1 fps
18.5	1,599	0.0080	1.44		**Shallow Concentrated Flow, Wetland/Stream/Pond C-D** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River D-E** Unpaved Kv= 16.1 fps
29.7	2,022	Total			

Subcatchment CR: Charles River



Summary for Subcatchment IR: Intermediate Roadway

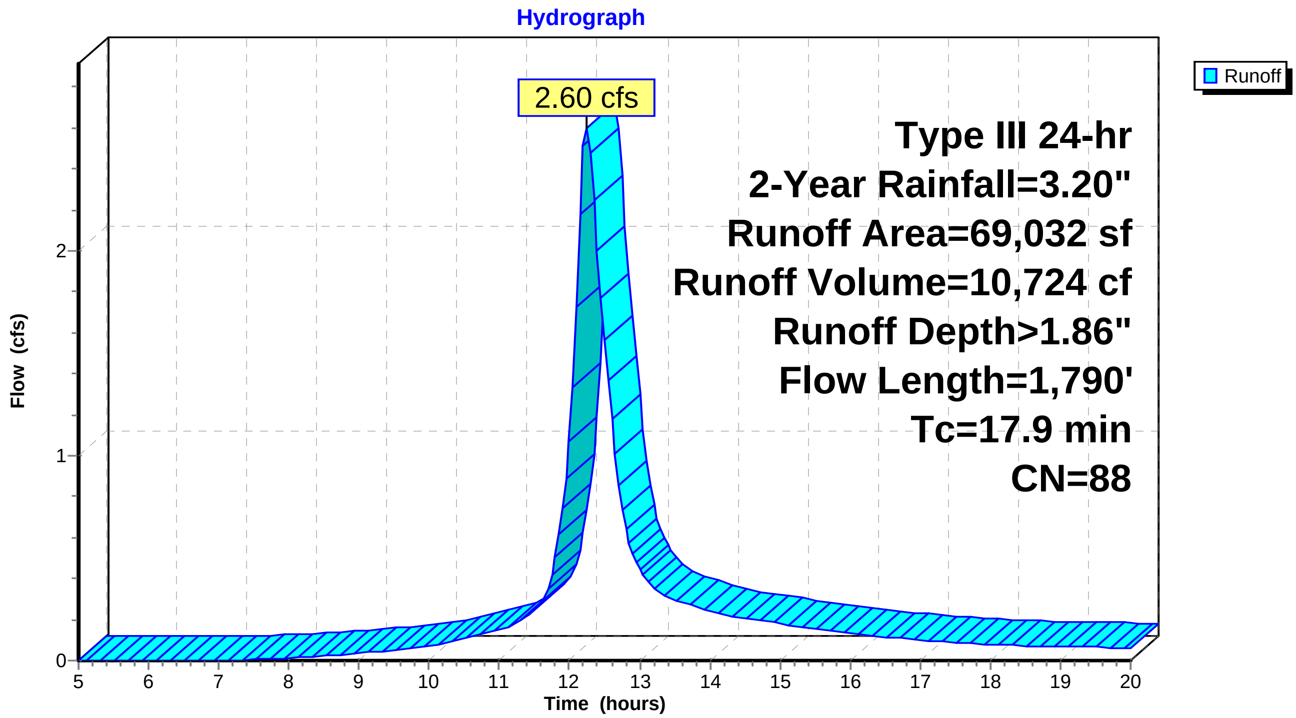
Runoff = 2.60 cfs @ 12.25 hrs, Volume= 10,724 cf, Depth> 1.86"

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

	Area (sf)	CN	Description
	17,093	61	>75% Grass cover, Good, HSG B
	1,704	80	>75% Grass cover, Good, HSG D
	28,466	98	Paved roads w/curbs & sewers, HSG B
	8,209	98	Paved roads w/curbs & sewers, HSG D
*	13,560	98	Cottages
	69,032	88	Weighted Average
	18,797		27.23% Pervious Area
	50,235		72.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Sheet A-B** Grass: Short n= 0.150 P2= 3.20"
0.1	9	0.0200	2.28		**Shallow Concentrated Flow, Grass B-C** Unpaved Kv= 16.1 fps
0.3	47	0.0200	2.87		**Shallow Concentrated Flow, Paved C-D** Paved Kv= 20.3 fps
3.1	593	0.0050	3.21	2.52	**Pipe Channel, Pipe D-E** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.3	153		8.02		**Lake or Reservoir, Basin E-F** Mean Depth= 2.00'
0.5	46	0.0050	1.54	0.13	**Pipe Channel, Pipe F-E** 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.013 Corrugated PE, smooth interior
1.4	149	0.0130	1.84		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
2.4	333	0.0200	2.28		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
4.2	410	0.0100	1.61		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
17.9	1,790	Total			

Subcatchment IR: Intermediate Roadway



Summary for Subcatchment MC: Main Campus

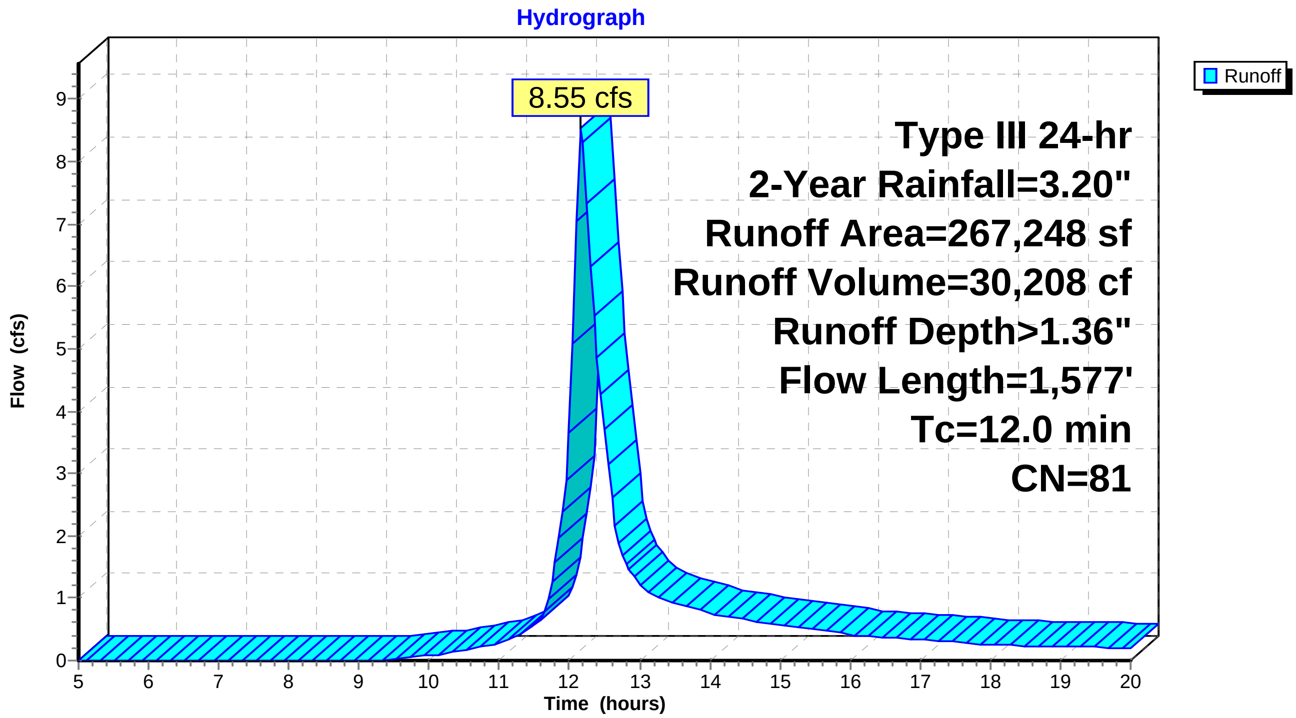
Runoff = 8.55 cfs @ 12.17 hrs, Volume= 30,208 cf, Depth> 1.36"

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

Area (sf)	CN	Description
22,404	39	>75% Grass cover, Good, HSG A
82,752	61	>75% Grass cover, Good, HSG B
11,890	80	>75% Grass cover, Good, HSG D
30,503	98	Paved roads w/curbs & sewers, HSG A
96,592	98	Paved roads w/curbs & sewers, HSG B
23,107	98	Paved roads w/curbs & sewers, HSG D
267,248	81	Weighted Average
117,046		43.80% Pervious Area
150,202		56.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	43	0.0200	0.14		**Sheet Flow, Sheet Grass A-B** Grass: Short n= 0.150 P2= 3.20"
0.1	7	0.0200	0.81		**Sheet Flow, Sheet-Pave B-C** Smooth surfaces n= 0.011 P2= 3.20"
1.3	217	0.0200	2.87		**Shallow Concentrated Flow, Paved C-D** Paved Kv= 20.3 fps
1.1	211	0.0050	3.21	2.52	**Pipe Channel, Pipe D-E** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
1.6	397	0.0050	4.20	7.43	**Pipe Channel, Pipe E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
1.6	490	0.0050	5.09	16.00	**Pipe Channel, Pipe F-G** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
0.0	24		8.97		**Lake or Reservoir, Lake G-H** Mean Depth= 2.50'
0.5	42	0.0050	1.54	0.13	**Pipe Channel, Pipe F-G** 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.013 Corrugated PE, smooth interior
0.8	146	0.0400	3.22		**Shallow Concentrated Flow, Unpaved I-J** Unpaved Kv= 16.1 fps
12.0	1,577	Total			

Subcatchment MC: Main Campus



Summary for Subcatchment OSW: Off Site West

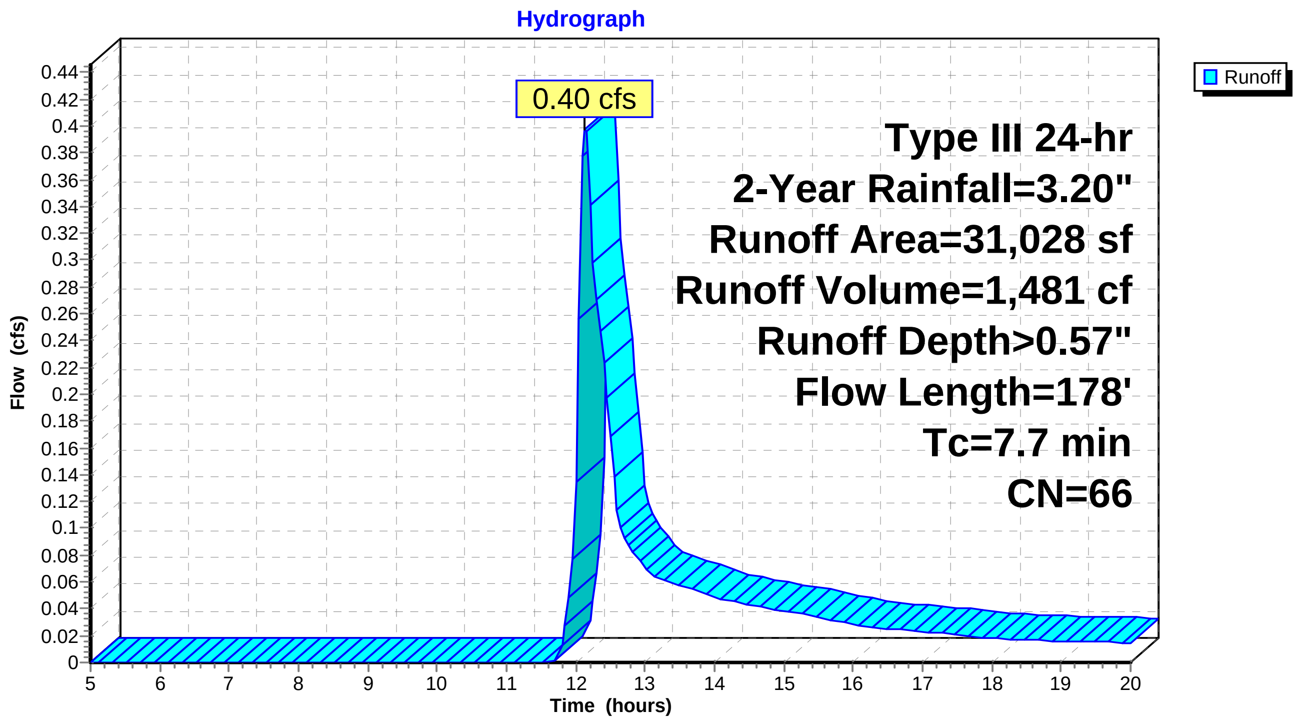
Runoff = 0.40 cfs @ 12.14 hrs, Volume= 1,481 cf, Depth> 0.57"

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

	Area (sf)	CN	Description
	2,983	55	Woods, Good, HSG B
	15,112	61	>75% Grass cover, Good, HSG B
*	1,048	80	Path(cover unknown)
	185	98	Unconnected pavement, HSG B
	8,058	80	>75% Grass cover, Good, HSG D
*	3,642	60	Permeable Parking Area
	31,028	66	Weighted Average
	30,843		99.40% Pervious Area
	185		0.60% Impervious Area
	185		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	128	0.0540	3.74		**Shallow Concentrated Flow, Wooded/Path/Wooded B-C** Unpaved Kv= 16.1 fps
7.7	178	Total			

Subcatchment OSW: Off Site West



Summary for Subcatchment PD: Pond Drive

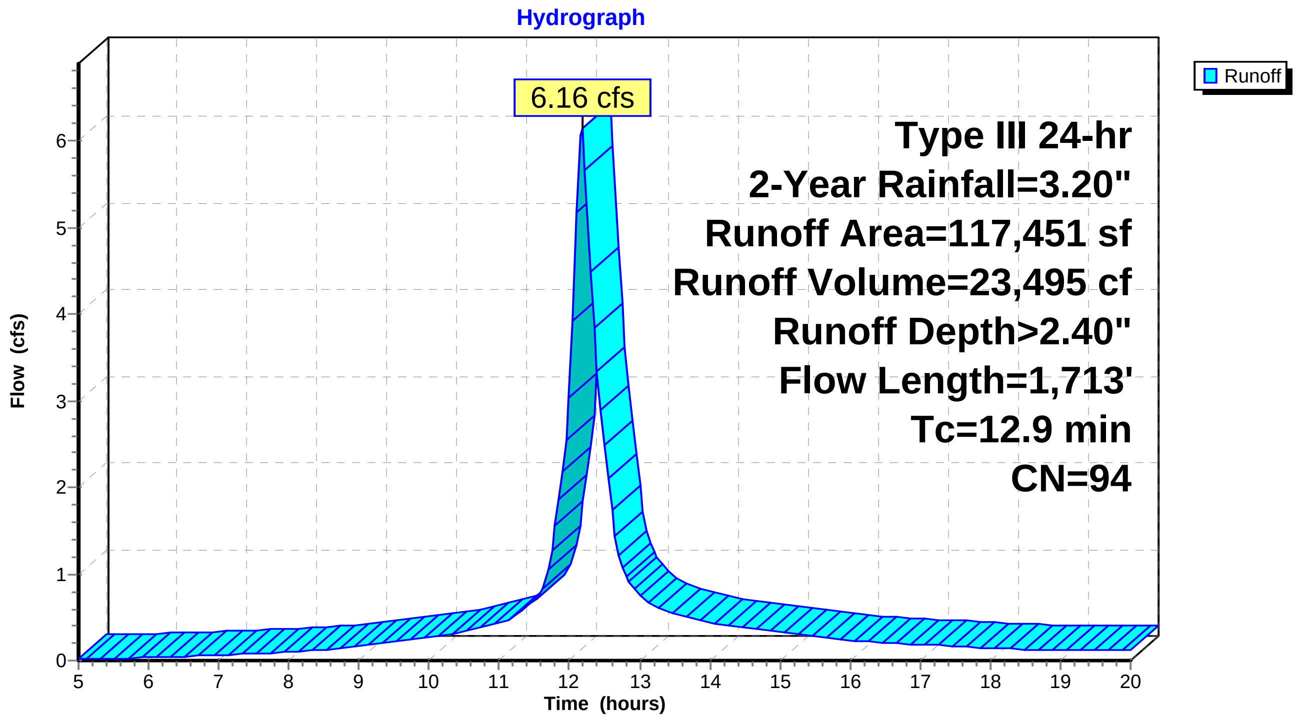
Runoff = 6.16 cfs @ 12.17 hrs, Volume= 23,495 cf, Depth> 2.40"

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

	Area (sf)	CN	Description
	1,964	61	>75% Grass cover, Good, HSG B
	5,597	98	Paved roads w/curbs & sewers, HSG B
	20,295	80	>75% Grass cover, Good, HSG D
*	43	89	Path, HSG D
	55,952	98	Paved roads w/curbs & sewers, HSG D
*	33,600	98	
	117,451	94	Weighted Average
	22,302		18.99% Pervious Area
	95,149		81.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	42	0.0200	0.14		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
0.2	8	0.0200	0.83		**Sheet Flow, Sheet BC** Smooth surfaces n= 0.011 P2= 3.20"
0.7	127	0.0200	2.87		**Shallow Concentrated Flow, Paved CD** Paved Kv= 20.3 fps
0.2	30	0.0050	3.21	2.52	**Pipe Channel, Pipe DE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
3.9	982	0.0050	4.20	7.43	**Pipe Channel, Pipe EF** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
0.6	195	0.0050	5.09	16.00	**Pipe Channel, Pipe FG** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
0.2	77		8.02		**Lake or Reservoir, Basin GH** Mean Depth= 2.00'
0.5	62	0.0050	2.02	0.40	**Pipe Channel, Pipe HI** 6.0" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.013 Corrugated PE, smooth interior
0.7	89	0.0200	2.28		**Shallow Concentrated Flow, Unpaved IJ** Unpaved Kv= 16.1 fps
0.8	57	0.0050	1.14		**Shallow Concentrated Flow, Unpaved JK** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Upaved KL** Unpaved Kv= 16.1 fps
12.9	1,713	Total			

Subcatchment PD: Pond Drive



Summary for Subcatchment S1: Swale 1

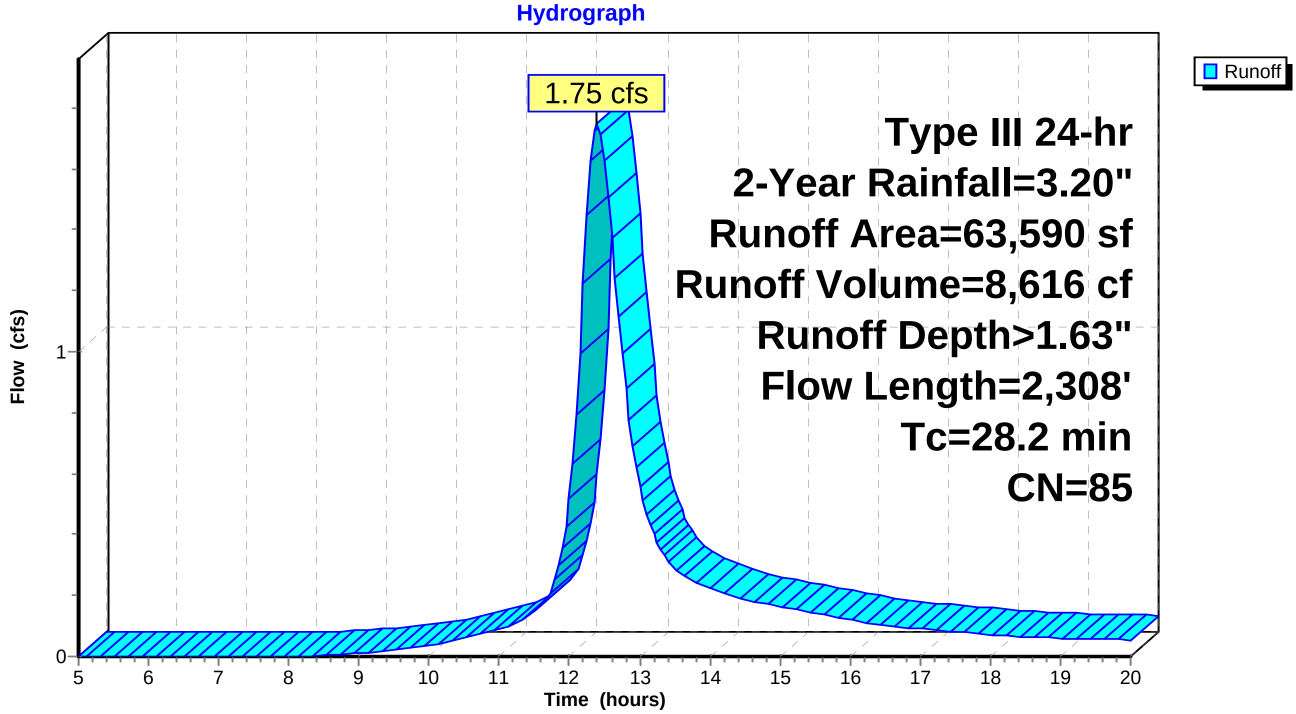
Runoff = 1.75 cfs @ 12.40 hrs, Volume= 8,616 cf, Depth> 1.63"

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

Area (sf)	CN	Description
5,311	80	>75% Grass cover, Good, HSG D
58,279	85	1/2 acre lots, 25% imp, HSG D
63,590	85	Weighted Average
49,020		77.09% Pervious Area
14,570		22.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0350	0.19		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.8	313	0.0333	2.94		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
0.1	39	0.0050	4.97	8.78	**Pipe Channel, Pipe CD** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
21.6	1,862	0.0080	1.44		**Shallow Concentrated Flow, Wetland/Stream/Pond DE** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River EF** Unpaved Kv= 16.1 fps
28.2	2,308	Total			

Subcatchment S1: Swale 1



Summary for Subcatchment S2: Swale 2

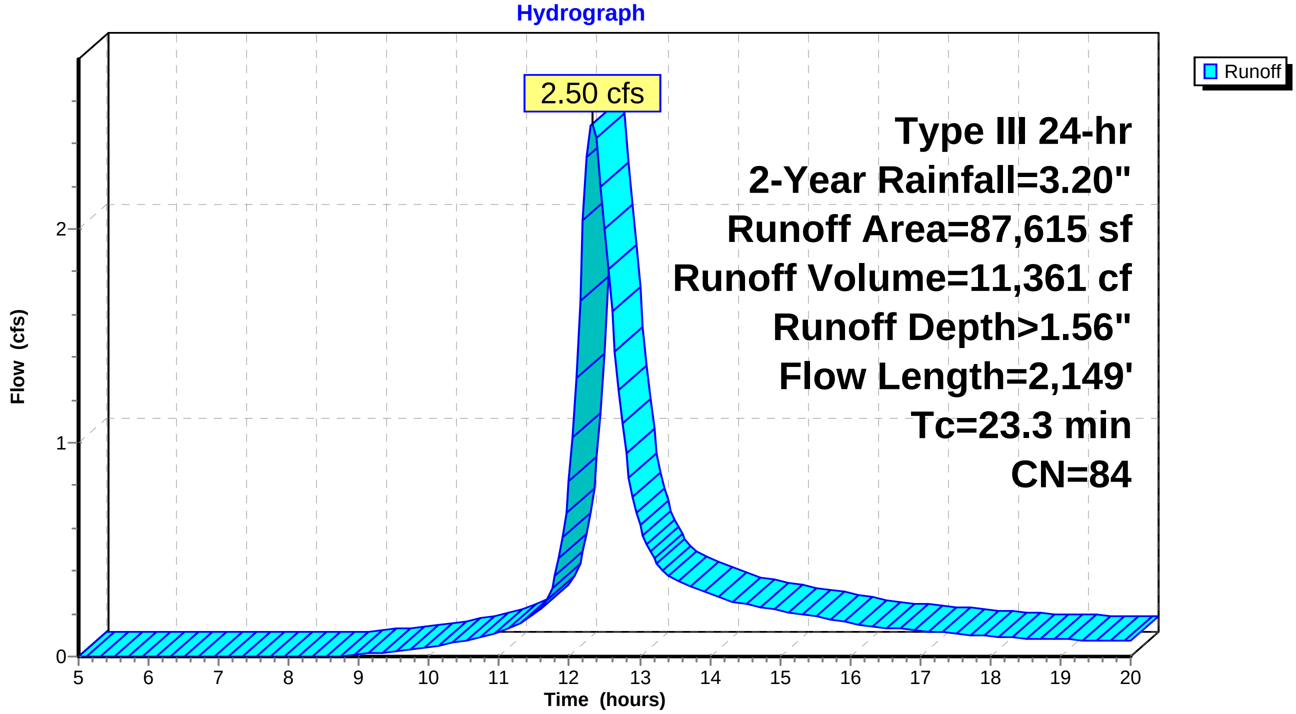
Runoff = 2.50 cfs @ 12.33 hrs, Volume= 11,361 cf, Depth> 1.56"

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

Area (sf)	CN	Description
20,096	80	>75% Grass cover, Good, HSG D
67,519	85	1/2 acre lots, 25% imp, HSG D
87,615	84	Weighted Average
70,735		80.73% Pervious Area
16,880		19.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.2	259	0.0480	3.53		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
1.6	215	0.0200	2.28		**Shallow Concentrated Flow, Swale CD** Unpaved Kv= 16.1 fps
0.6	151	0.0050	4.20	7.43	**Pipe Channel, Pipe DE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
0.8	169	0.0470	3.49		**Shallow Concentrated Flow, Grass/Wetland EF** Unpaved Kv= 16.1 fps
14.6	1,261	0.0080	1.44		**Shallow Concentrated Flow, Stream/Pond FG** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River** Unpaved Kv= 16.1 fps
23.3	2,149	Total			

Subcatchment S2: Swale 2



Summary for Subcatchment S3: Swale 3

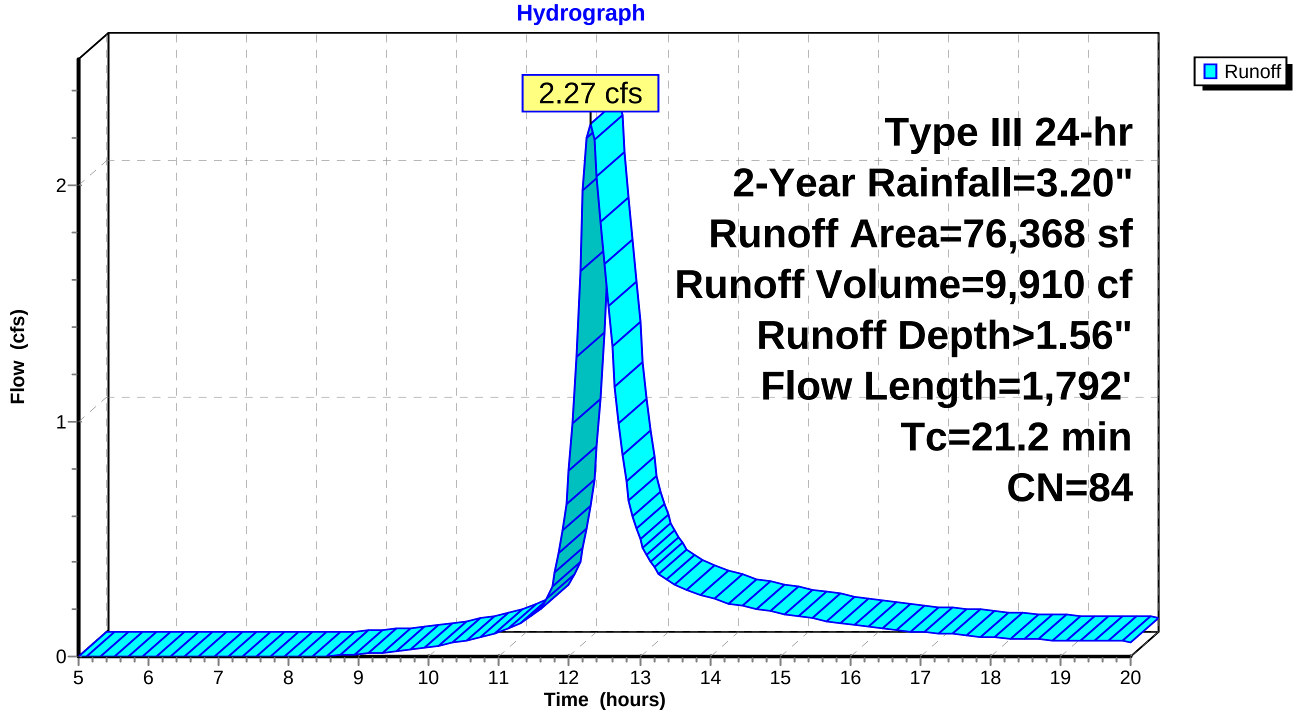
Runoff = 2.27 cfs @ 12.30 hrs, Volume= 9,910 cf, Depth> 1.56"

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

Area (sf)	CN	Description
11,535	80	>75% Grass cover, Good, HSG D
64,833	85	1/2 acre lots, 25% imp, HSG D
76,368	84	Weighted Average
60,160		78.78% Pervious Area
16,208		21.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.0	100	0.0100	1.61		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
2.4	452	0.0376	3.12		**Shallow Concentrated Flow, Grass CD** Unpaved Kv= 16.1 fps
0.5	77	0.0286	2.72		**Shallow Concentrated Flow, Swale DE** Unpaved Kv= 16.1 fps
0.2	69	0.0050	4.97	8.78	**Pipe Channel, Pipe EF** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
1.5	305	0.0433	3.35		**Shallow Concentrated Flow, Grass/Wetland FG** Unpaved Kv= 16.1 fps
8.0	695	0.0080	1.44		**Shallow Concentrated Flow, Stream/Pond GH** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River HI** Unpaved Kv= 16.1 fps
21.2	1,792	Total			

Subcatchment S3: Swale 3



Summary for Subcatchment S4: Swale 4

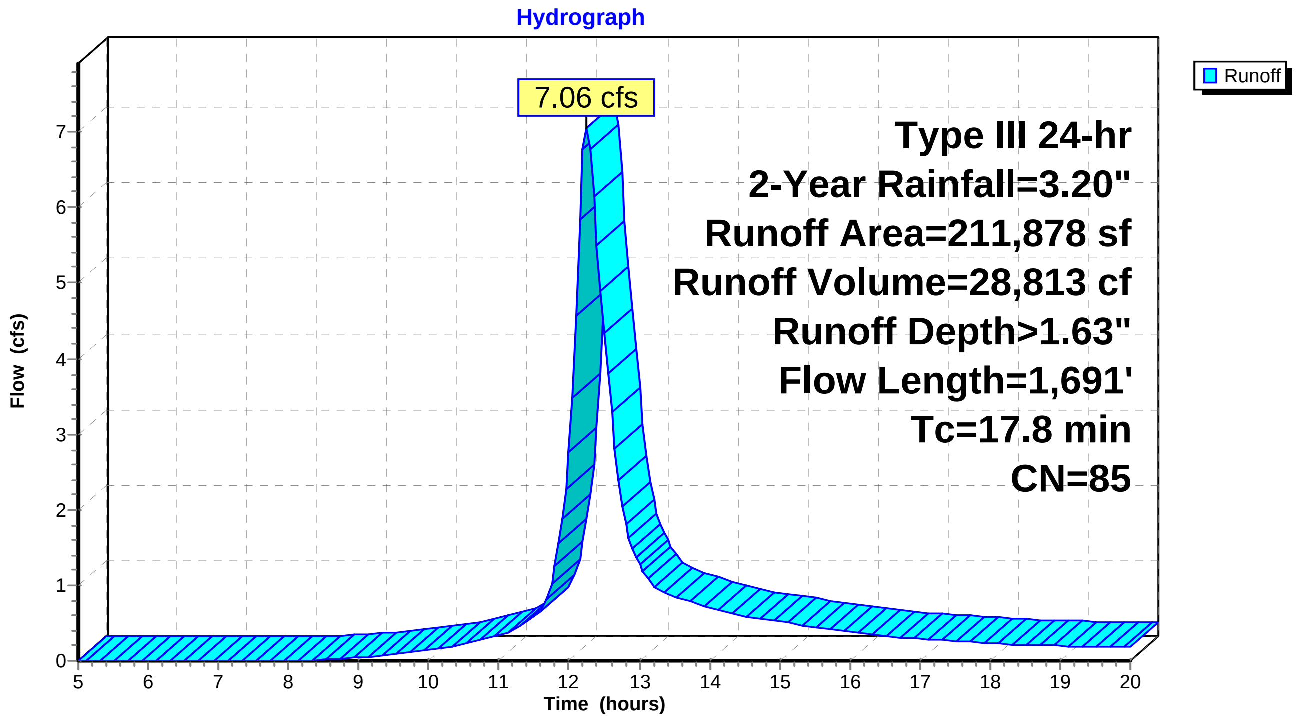
Runoff = 7.06 cfs @ 12.25 hrs, Volume= 28,813 cf, Depth> 1.63"

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

Area (sf)	CN	Description
11,826	80	>75% Grass cover, Good, HSG D
200,052	85	1/2 acre lots, 25% imp, HSG D
211,878	85	Weighted Average
161,865		76.40% Pervious Area
50,013		23.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
3.2	557	0.0333	2.94		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
0.7	162	0.0500	3.60		**Shallow Concentrated Flow, Swale CD** Unpaved Kv= 16.1 fps
0.3	117	0.0050	6.02	18.90	**Pipe Channel, Pipe DE** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.9	168	0.0353	3.02		**Shallow Concentrated Flow, Grass/Wetland EF** Unpaved Kv= 16.1 fps
6.9	593	0.0080	1.44		**Shallow Concentrated Flow, Stream/Pond FG** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River** Unpaved Kv= 16.1 fps
17.8	1,691	Total			

Subcatchment S4: Swale 4



Summary for Subcatchment S5: Swale 5

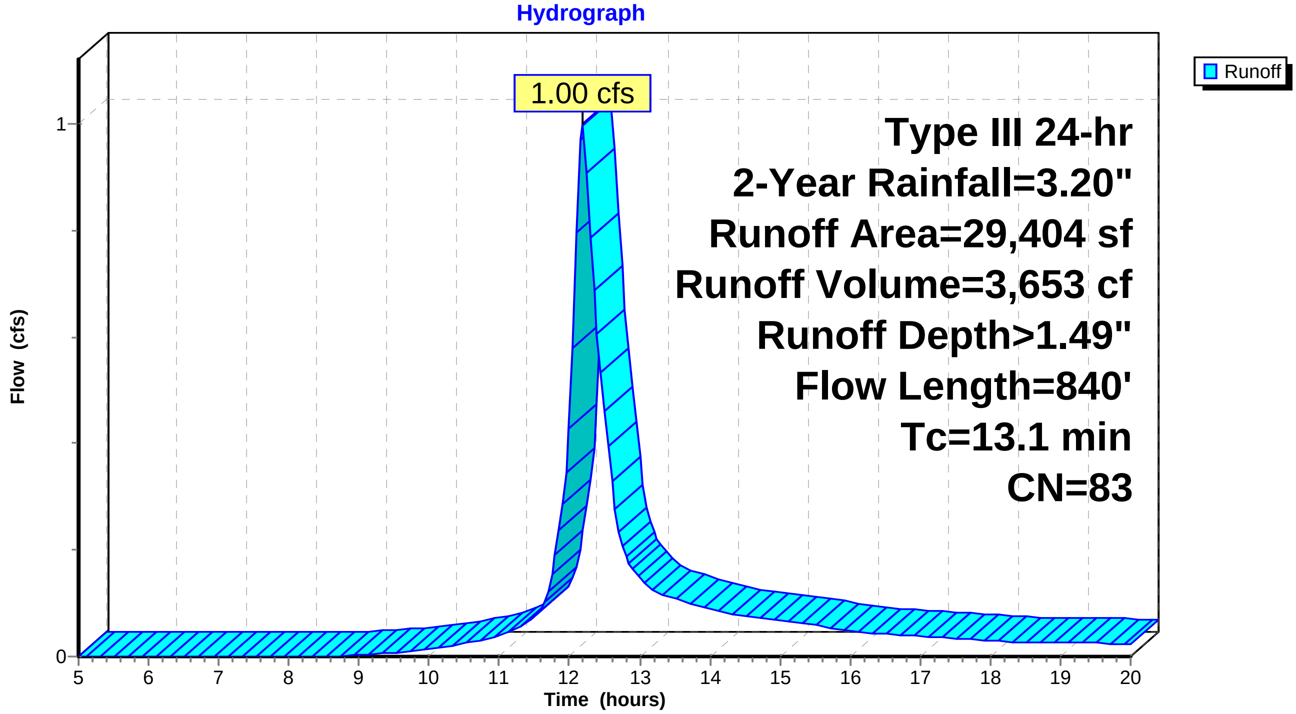
Runoff = 1.00 cfs @ 12.19 hrs, Volume= 3,653 cf, Depth> 1.49"

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

Area (sf)	CN	Description
9,317	80	>75% Grass cover, Good, HSG D
20,087	85	1/2 acre lots, 25% imp, HSG D
29,404	83	Weighted Average
24,382		82.92% Pervious Area
5,022		17.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.0	220	0.0500	3.60		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
0.5	89	0.0333	2.94		**Shallow Concentrated Flow, Swale CD** Unpaved Kv= 16.1 fps
0.3	79	0.0050	4.97	8.78	**Pipe Channel, Pipe DE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.1	43	0.1628	6.50		**Shallow Concentrated Flow, Grass/Wetland EF** Unpaved Kv= 16.1 fps
3.6	315	0.0080	1.44		**Shallow Concentrated Flow, Stream/Pond FG** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River** Unpaved Kv= 16.1 fps
13.1	840	Total			

Subcatchment S5: Swale 5



Summary for Subcatchment S6: Swale 6

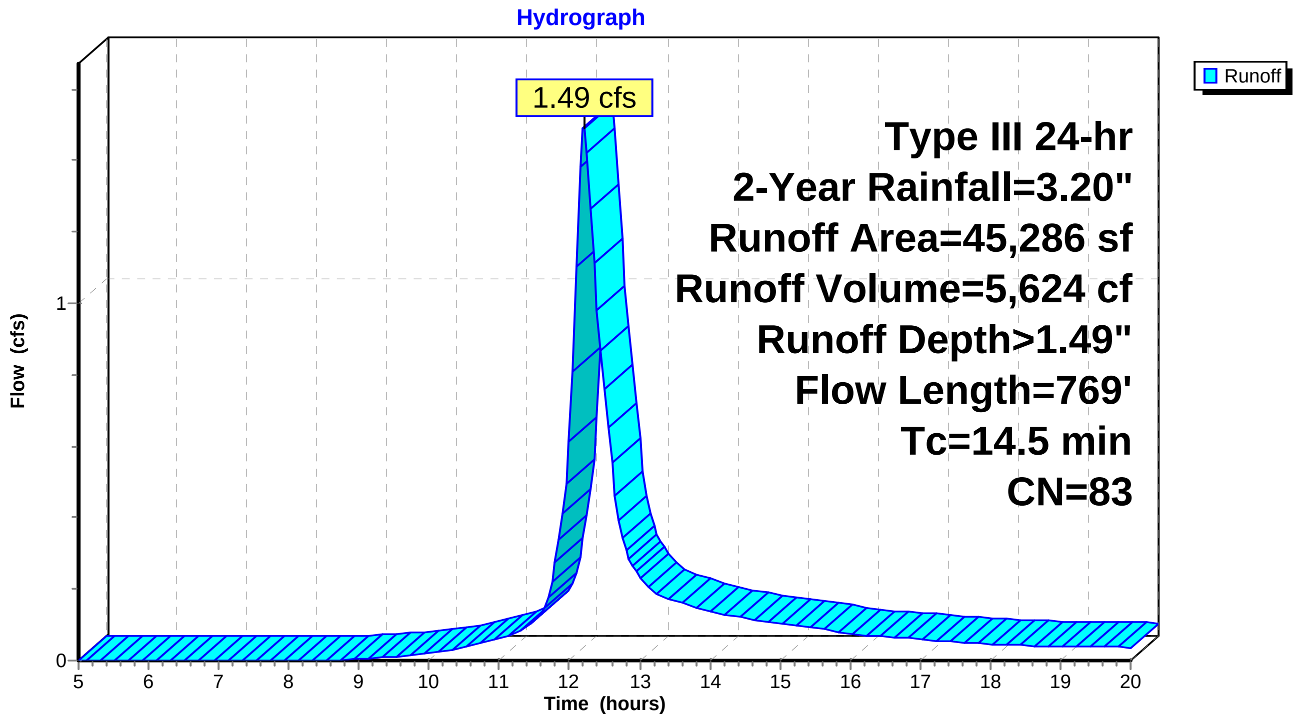
Runoff = 1.49 cfs @ 12.21 hrs, Volume= 5,624 cf, Depth> 1.49"

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

Area (sf)	CN	Description
1,558	61	>75% Grass cover, Good, HSG B
1,257	70	1/2 acre lots, 25% imp, HSG B
5,287	80	>75% Grass cover, Good, HSG D
37,184	85	1/2 acre lots, 25% imp, HSG D
45,286	83	Weighted Average
35,676		78.78% Pervious Area
9,610		21.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0050	0.09		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.5	282	0.0360	3.05		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
2.0	125	0.0040	1.02		**Shallow Concentrated Flow, Swale CD** Unpaved Kv= 16.1 fps
0.4	145	0.0200	6.42	5.04	**Pipe Channel, Pipe DE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.8	167	0.0480	3.53		**Shallow Concentrated Flow, Grass EF** Unpaved Kv= 16.1 fps
14.5	769	Total			

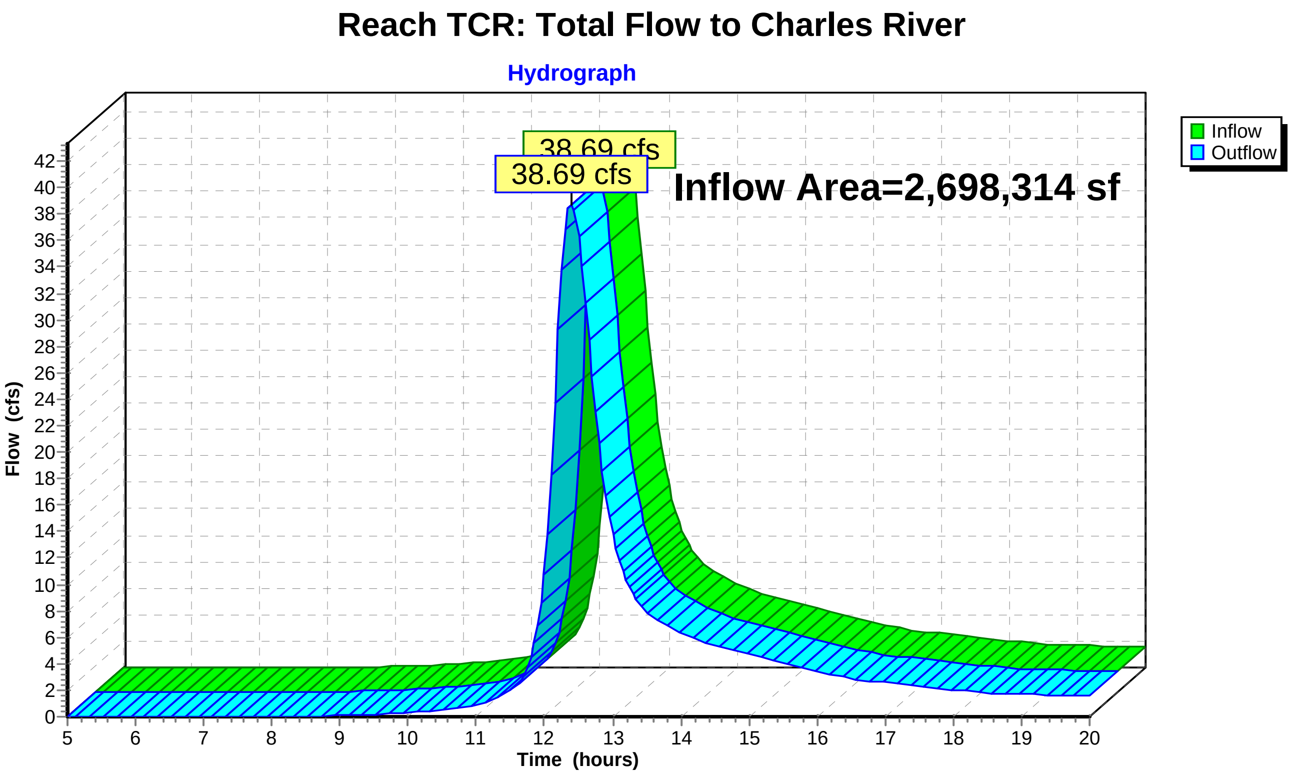
Subcatchment S6: Swale 6



Summary for Reach TCR: Total Flow to Charles River

Inflow Area = 2,698,314 sf, 19.91% Impervious, Inflow Depth > 0.91" for 2-Year event
Inflow = 38.69 cfs @ 12.39 hrs, Volume= 205,509 cf
Outflow = 38.69 cfs @ 12.39 hrs, Volume= 205,509 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



Summary for Pond B1: BASIN 1

Inflow Area = 69,032 sf, 72.77% Impervious, Inflow Depth > 1.86" for 2-Year event
Inflow = 2.60 cfs @ 12.25 hrs, Volume= 10,724 cf
Outflow = 0.27 cfs @ 13.71 hrs, Volume= 8,579 cf, Atten= 89%, Lag= 87.7 min
Discarded = 0.27 cfs @ 13.71 hrs, Volume= 8,579 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 177.25' @ 13.71 hrs Surf.Area= 4,915 sf Storage= 5,126 cf

Plug-Flow detention time= 173.9 min calculated for 8,579 cf (80% of inflow)
Center-of-Mass det. time= 121.8 min (912.8 - 790.9)

Volume	Invert	Avail.Storage	Storage Description
#1	176.00'	33,722 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

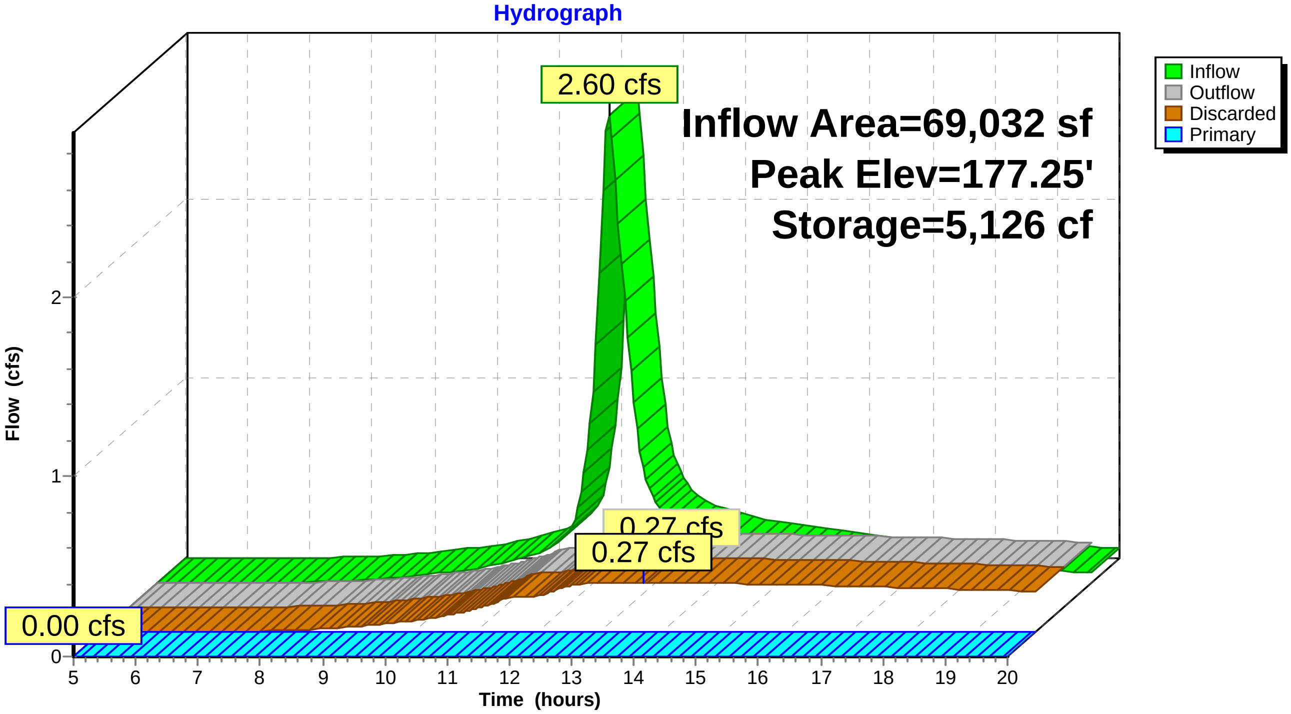
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
176.00	3,342	0	0
177.00	4,577	3,960	3,960
178.00	5,952	5,265	9,224
179.00	7,387	6,670	15,894
180.00	8,885	8,136	24,030
181.00	10,500	9,693	33,722

Device	Routing	Invert	Outlet Devices
#1	Primary	174.00'	**4.0" Round Culvert** L= 36.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 174.00' / 173.50' S= 0.0139 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf
#2	Device 1	179.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	179.25'	**1.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	179.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	179.90'	**20.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#6	Discarded	176.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.27 cfs @ 13.71 hrs HW=177.25' (Free Discharge)
└─**6=Exfiltration** (Exfiltration Controls 0.27 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=176.00' (Free Discharge)
├─**1=Culvert** (Passes 0.00 cfs of 0.48 cfs potential flow)
│ ├─**2=Orifice/Grate** (Controls 0.00 cfs)
│ ├─**3=Orifice/Grate** (Controls 0.00 cfs)
│ └─**4=Orifice/Grate** (Controls 0.00 cfs)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B1: BASIN 1



Summary for Pond B3: BASIN 3

Inflow Area = 117,451 sf, 81.01% Impervious, Inflow Depth > 2.40" for 2-Year event
Inflow = 6.16 cfs @ 12.17 hrs, Volume= 23,495 cf
Outflow = 0.34 cfs @ 14.90 hrs, Volume= 12,507 cf, Atten= 94%, Lag= 163.9 min
Discarded = 0.34 cfs @ 14.90 hrs, Volume= 12,507 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 175.90' @ 14.90 hrs Surf.Area= 6,026 sf Storage= 13,711 cf

Plug-Flow detention time= 190.8 min calculated for 12,464 cf (53% of inflow)
Center-of-Mass det. time= 108.7 min (872.2 - 763.4)

Volume	Invert	Avail.Storage	Storage Description
#1	173.00'	49,214 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

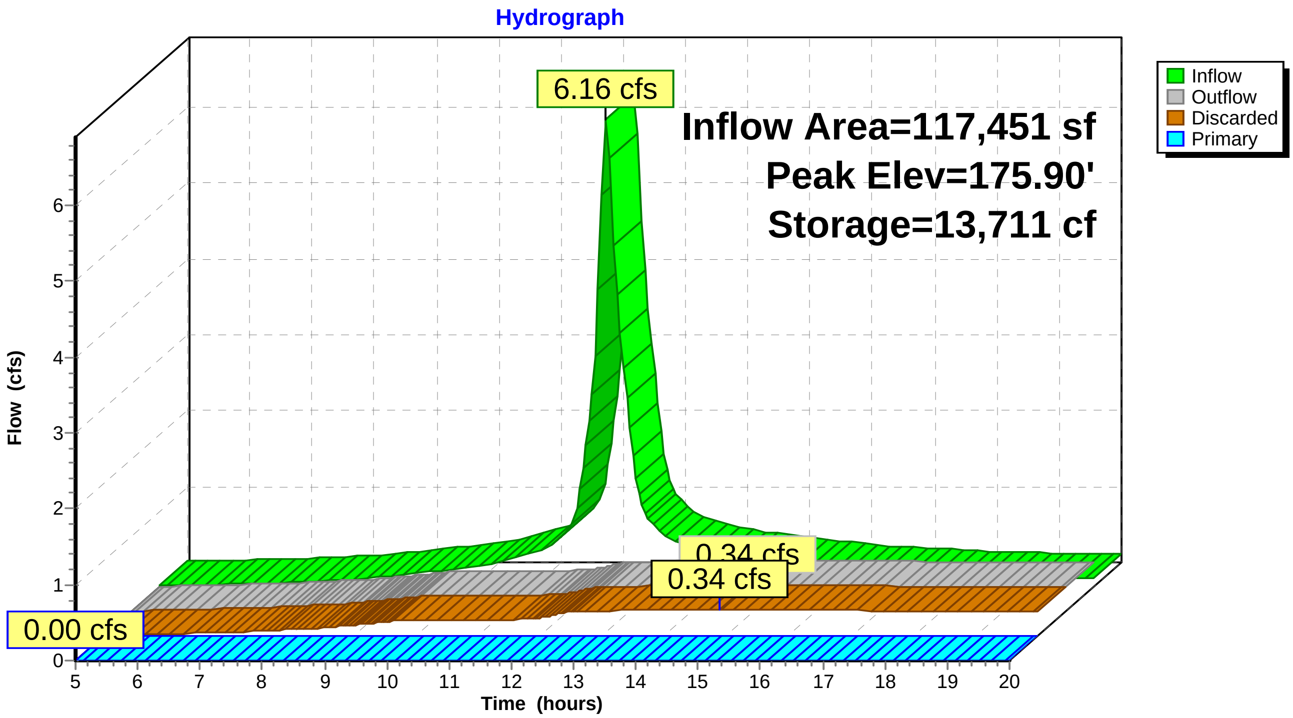
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
173.00	3,533	0	0	3,533
174.00	4,314	3,917	3,917	4,345
175.00	5,173	4,737	8,654	5,238
176.00	6,120	5,640	14,294	6,222
177.00	7,172	6,639	20,933	7,312
178.00	8,628	7,889	28,822	8,802
179.00	10,102	9,355	38,177	10,315
180.00	12,000	11,037	49,214	12,250

Device	Routing	Invert	Outlet Devices
#1	Primary	168.00'	**6.0" Round Culvert** L= 53.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 168.00' / 166.94' S= 0.0200 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#2	Device 1	177.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	178.50'	**24.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	178.90'	**20.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#5	Discarded	173.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.34 cfs @ 14.90 hrs HW=175.90' (Free Discharge)
└─**5=Exfiltration** (Exfiltration Controls 0.34 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=173.00' (Free Discharge)
├─**1=Culvert** (Passes 0.00 cfs of 1.82 cfs potential flow)
│ ├─**2=Orifice/Grate** (Controls 0.00 cfs)
│ └─**3=Orifice/Grate** (Controls 0.00 cfs)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B3: BASIN 3



Summary for Pond T18A: TRENCH 18A

Inflow Area = 267,248 sf, 56.20% Impervious, Inflow Depth > 1.36" for 2-Year event
Inflow = 8.55 cfs @ 12.17 hrs, Volume= 30,208 cf
Outflow = 0.76 cfs @ 14.00 hrs, Volume= 18,573 cf, Atten= 91%, Lag= 109.5 min
Discarded = 0.48 cfs @ 11.50 hrs, Volume= 16,033 cf
Primary = 0.28 cfs @ 14.00 hrs, Volume= 2,540 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 174.29' @ 14.00 hrs Surf.Area= 8,648 sf Storage= 15,618 cf

Plug-Flow detention time= 187.2 min calculated for 18,573 cf (61% of inflow)
Center-of-Mass det. time= 110.8 min (916.7 - 805.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	171.75'	11,805 cf	**44.75'W x 193.25'L x 5.75'H Field A** 49,726 cf Overall - 20,213 cf Embedded = 29,513 cf x 40.0% Voids
#2A	172.50'	20,213 cf	**Cultec R-900HD** x 162 Inside #1 Effective Size= 72.7"W x 48.0"H => 17.61 sf x 7.00'L = 123.3 cf Overall Size= 78.0"W x 48.0"H x 9.25'L with 2.25' Overlap Row Length Adjustment= +2.25' x 17.61 sf x 6 rows
		32,018 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	174.00'	**24.0" Round Culvert** L= 5.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 174.00' / 174.00' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#2	Discarded	171.75'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.48 cfs @ 11.50 hrs HW=171.81' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.48 cfs)

Primary OutFlow Max=0.28 cfs @ 14.00 hrs HW=174.29' (Free Discharge)
└─**1=Culvert** (Barrel Controls 0.28 cfs @ 1.55 fps)

Pond T18A: TRENCH 18A - Chamber Wizard Field A

Chamber Model = Cultec R-900HD
Effective Size= 72.7"W x 48.0"H => 17.61 sf x 7.00'L = 123.3 cf
Overall Size= 78.0"W x 48.0"H x 9.25'L with 2.25' Overlap
Row Length Adjustment= +2.25' x 17.61 sf x 6 rows

78.0" Wide + 9.0" Spacing = 87.0" C-C Row Spacing

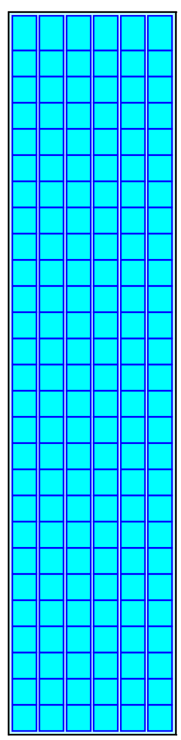
27 Chambers/Row x 7.00' Long +2.25' Row Adjustment = 191.25' Row Length +12.0" End Stone x 2 = 193.25' Base Length
6 Rows x 78.0" Wide + 9.0" Spacing x 5 + 12.0" Side Stone x 2 = 44.75' Base Width
9.0" Base + 48.0" Chamber Height + 12.0" Cover = 5.75' Field Height

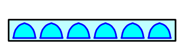
162 Chambers x 123.3 cf +2.25' Row Adjustment x 17.61 sf x 6 Rows = 20,212.9 cf Chamber Storage

49,725.6 cf Field - 20,212.9 cf Chambers = 29,512.7 cf Stone x 40.0% Voids = 11,805.1 cf Stone Storage

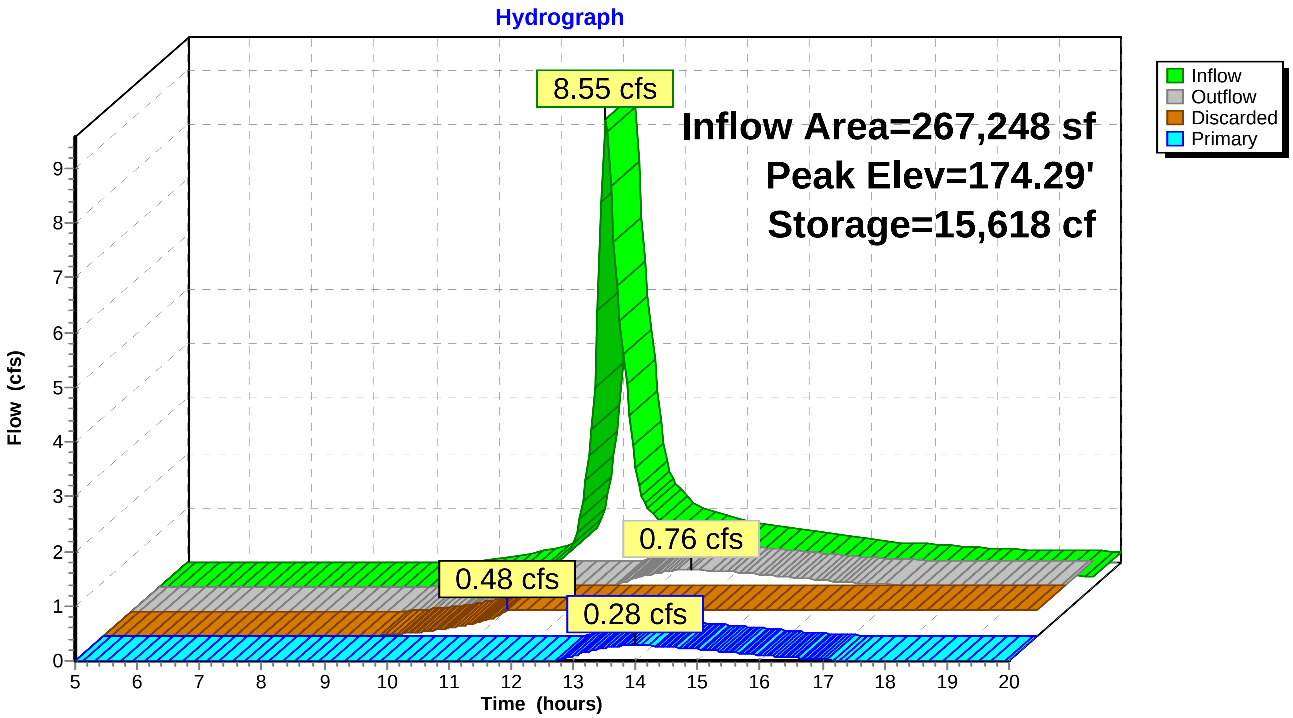
Chamber Storage + Stone Storage = 32,018.0 cf = 0.735 af
Overall Storage Efficiency = 64.4%

162 Chambers
1,841.7 cy Field
1,093.1 cy Stone





Pond T18A: TRENCH 18A



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

Subcatchment CR: Charles River Runoff Area=1,730,442 sf 7.48% Impervious Runoff Depth>1.95"
Flow Length=2,022' Tc=29.7 min CN=74 Runoff=55.58 cfs 281,158 cf

Subcatchment IR: Intermediate Roadway Runoff Area=69,032 sf 72.77% Impervious Runoff Depth>3.18"
Flow Length=1,790' Tc=17.9 min CN=88 Runoff=4.35 cfs 18,291 cf

Subcatchment MC: Main Campus Runoff Area=267,248 sf 56.20% Impervious Runoff Depth>2.54"
Flow Length=1,577' Tc=12.0 min CN=81 Runoff=15.99 cfs 56,516 cf

Subcatchment OSW: Off Site West Runoff Area=31,028 sf 0.60% Impervious Runoff Depth>1.39"
Flow Length=178' Tc=7.7 min CN=66 Runoff=1.12 cfs 3,598 cf

Subcatchment PD: Pond Drive Runoff Area=117,451 sf 81.01% Impervious Runoff Depth>3.78"
Flow Length=1,713' Tc=12.9 min CN=94 Runoff=9.48 cfs 37,021 cf

Subcatchment S1: Swale 1 Runoff Area=63,590 sf 22.91% Impervious Runoff Depth>2.88"
Flow Length=2,308' Tc=28.2 min CN=85 Runoff=3.06 cfs 15,281 cf

Subcatchment S2: Swale 2 Runoff Area=87,615 sf 19.27% Impervious Runoff Depth>2.80"
Flow Length=2,149' Tc=23.3 min CN=84 Runoff=4.45 cfs 20,413 cf

Subcatchment S3: Swale 3 Runoff Area=76,368 sf 21.22% Impervious Runoff Depth>2.80"
Flow Length=1,792' Tc=21.2 min CN=84 Runoff=4.03 cfs 17,804 cf

Subcatchment S4: Swale 4 Runoff Area=211,878 sf 23.60% Impervious Runoff Depth>2.89"
Flow Length=1,691' Tc=17.8 min CN=85 Runoff=12.36 cfs 51,081 cf

Subcatchment S5: Swale 5 Runoff Area=29,404 sf 17.08% Impervious Runoff Depth>2.71"
Flow Length=840' Tc=13.1 min CN=83 Runoff=1.81 cfs 6,650 cf

Subcatchment S6: Swale 6 Runoff Area=45,286 sf 21.22% Impervious Runoff Depth>2.71"
Flow Length=769' Tc=14.5 min CN=83 Runoff=2.70 cfs 10,237 cf

Reach TCR: Total Flow to Charles River Inflow=82.69 cfs 428,317 cf
Outflow=82.69 cfs 428,317 cf

Pond B1: BASIN 1 Peak Elev=178.11' Storage=9,905 cf Inflow=4.35 cfs 18,291 cf
Discarded=0.34 cfs 11,508 cf Primary=0.00 cfs 0 cf Outflow=0.34 cfs 11,508 cf

Pond B3: BASIN 3 Peak Elev=177.29' Storage=23,064 cf Inflow=9.48 cfs 37,021 cf
Discarded=0.43 cfs 16,040 cf Primary=0.10 cfs 1,215 cf Outflow=0.53 cfs 17,255 cf

Pond T18A: TRENCH 18A Peak Elev=175.31' Storage=22,404 cf Inflow=15.99 cfs 56,516 cf
Discarded=0.48 cfs 18,288 cf Primary=5.36 cfs 24,477 cf Outflow=5.84 cfs 42,765 cf

Total Runoff Area = 2,729,342 sf Runoff Volume = 518,051 cf Average Runoff Depth = 2.28"
80.31% Pervious = 2,191,860 sf 19.69% Impervious = 537,482 sf

Summary for Subcatchment CR: Charles River

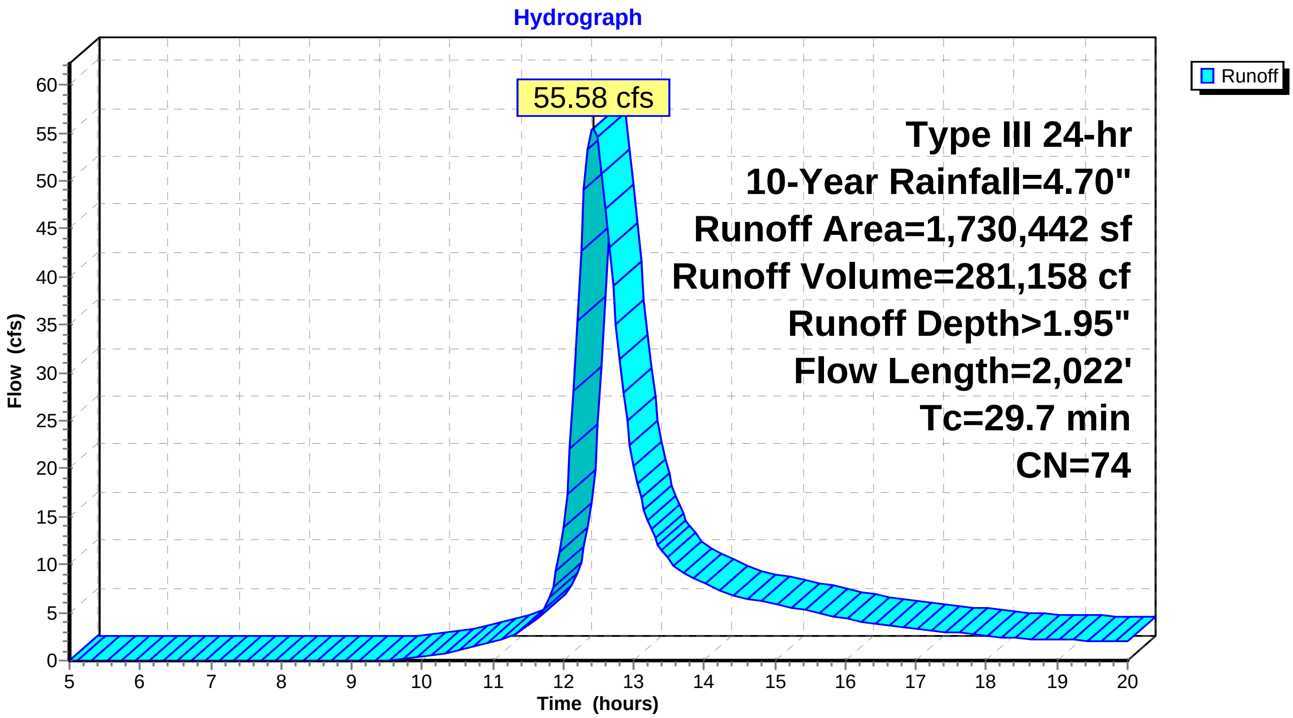
Runoff = 55.58 cfs @ 12.43 hrs, Volume= 281,158 cf, Depth> 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
	10,067	30	Woods, Good, HSG A
	5,689	39	>75% Grass cover, Good, HSG A
*	3,253	78	Wetland, HSG A
*	205	72	Path, HSG A
	201,555	55	Woods, Good, HSG B
	211,820	61	>75% Grass cover, Good, HSG B
*	103,465	78	Wetlands, HSG B
*	10,318	82	Path, HSG B
*	2,704	80	Path in Resource, HSG B
	4,112	98	Water Surface, HSG B
	33,426	70	Woods, Good, HSG C
	758	74	>75% Grass cover, Good, HSG C
*	141,675	78	Wetlands, HSG C
*	3,310	87	Path, HSG C
*	6,129	80	Path in Resource, HSG C
	10,807	98	Water Surface, HSG C
	438,769	77	Woods, Good, HSG D
	61,238	80	>75% Grass cover, Good, HSG D
*	227,701	78	Wetlands, HSG D
*	27,658	89	Path, HSG D
*	9,556	80	Path in Resource, HSG D
	45,917	98	Water Surface, HSG D
	20,004	70	1/2 acre lots, 25% imp, HSG B
	54,729	80	1/2 acre lots, 25% imp, HSG C
	60,917	85	1/2 acre lots, 25% imp, HSG D
*	34,660	98	impervious
	1,730,442	74	Weighted Average
	1,601,034		92.52% Pervious Area
	129,409		7.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, Sheet A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
3.1	329	0.0120	1.76		**Shallow Concentrated Flow, Wetland B-C** Unpaved Kv= 16.1 fps
18.5	1,599	0.0080	1.44		**Shallow Concentrated Flow, Wetland/Stream/Pond C-D** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River D-E** Unpaved Kv= 16.1 fps
29.7	2,022	Total			

Subcatchment CR: Charles River



Summary for Subcatchment IR: Intermediate Roadway

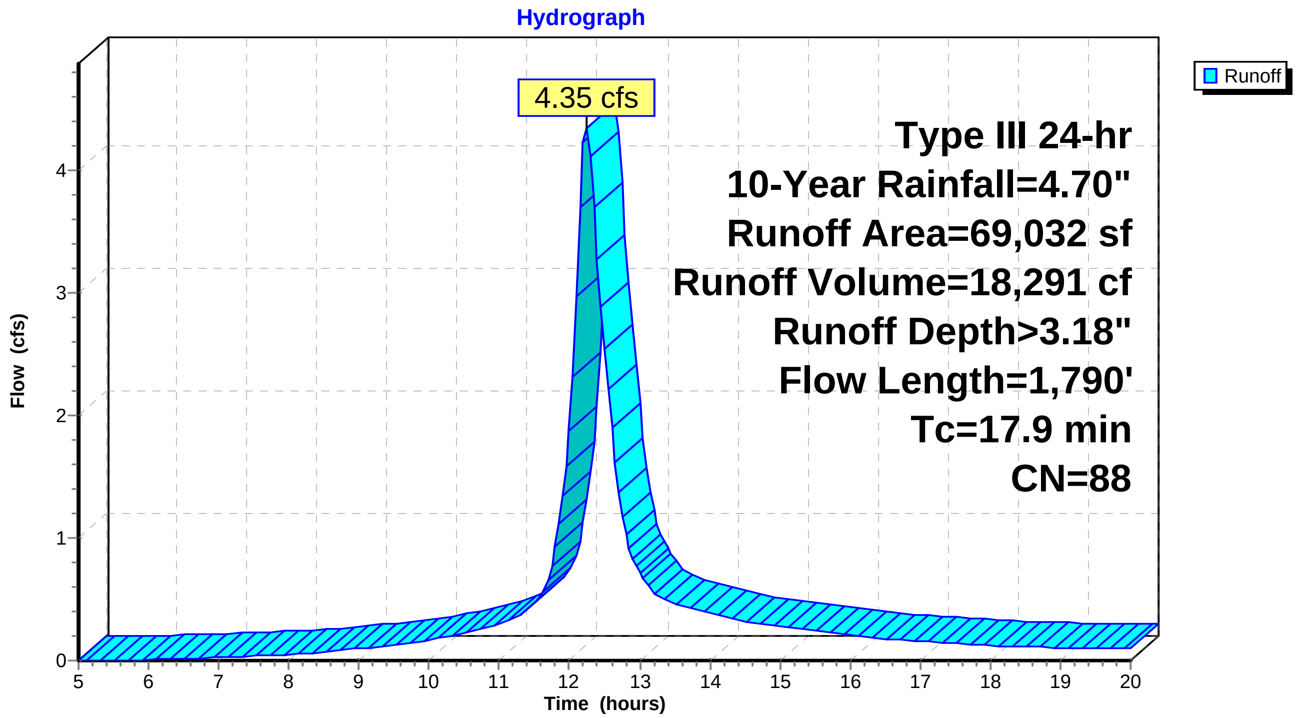
Runoff = 4.35 cfs @ 12.24 hrs, Volume= 18,291 cf, Depth> 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
	17,093	61	>75% Grass cover, Good, HSG B
	1,704	80	>75% Grass cover, Good, HSG D
	28,466	98	Paved roads w/curbs & sewers, HSG B
	8,209	98	Paved roads w/curbs & sewers, HSG D
*	13,560	98	Cottages
	69,032	88	Weighted Average
	18,797		27.23% Pervious Area
	50,235		72.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Sheet A-B** Grass: Short n= 0.150 P2= 3.20"
0.1	9	0.0200	2.28		**Shallow Concentrated Flow, Grass B-C** Unpaved Kv= 16.1 fps
0.3	47	0.0200	2.87		**Shallow Concentrated Flow, Paved C-D** Paved Kv= 20.3 fps
3.1	593	0.0050	3.21	2.52	**Pipe Channel, Pipe D-E** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.3	153		8.02		**Lake or Reservoir, Basin E-F** Mean Depth= 2.00'
0.5	46	0.0050	1.54	0.13	**Pipe Channel, Pipe F-E** 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.013 Corrugated PE, smooth interior
1.4	149	0.0130	1.84		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
2.4	333	0.0200	2.28		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
4.2	410	0.0100	1.61		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
17.9	1,790	Total			

Subcatchment IR: Intermediate Roadway



Summary for Subcatchment MC: Main Campus

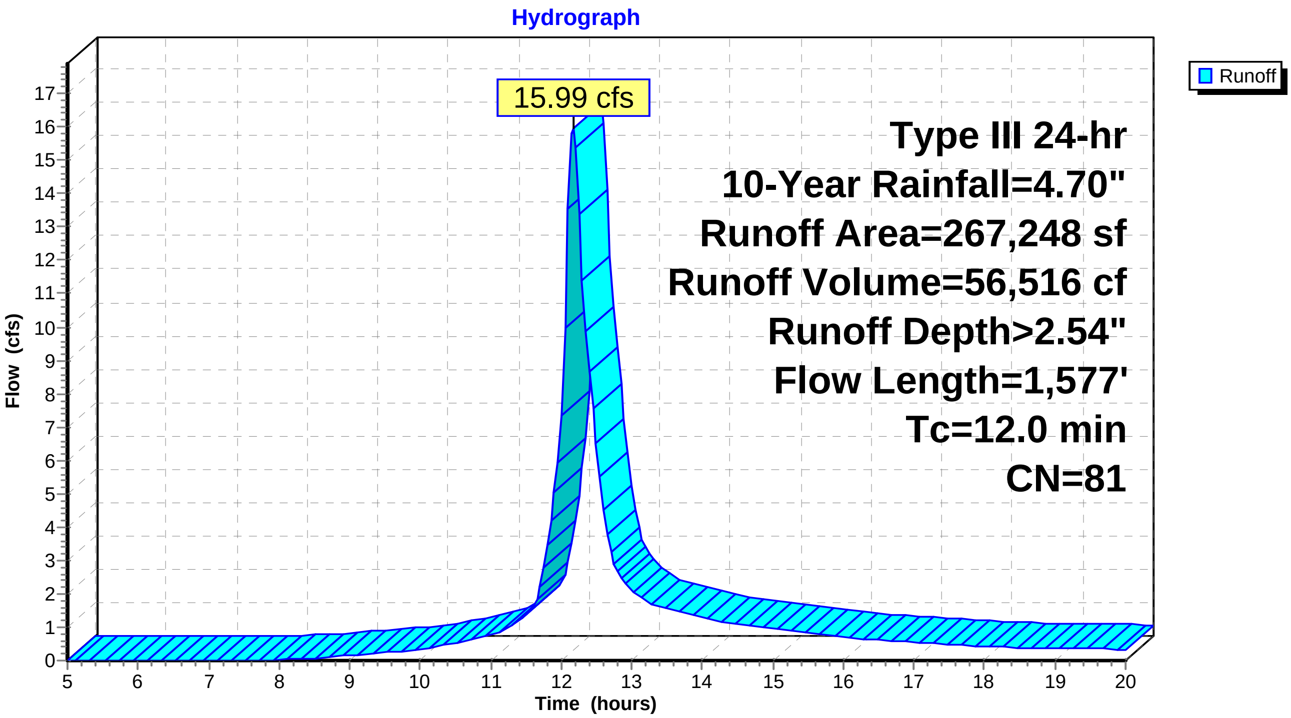
Runoff = 15.99 cfs @ 12.17 hrs, Volume= 56,516 cf, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
22,404	39	>75% Grass cover, Good, HSG A
82,752	61	>75% Grass cover, Good, HSG B
11,890	80	>75% Grass cover, Good, HSG D
30,503	98	Paved roads w/curbs & sewers, HSG A
96,592	98	Paved roads w/curbs & sewers, HSG B
23,107	98	Paved roads w/curbs & sewers, HSG D
267,248	81	Weighted Average
117,046		43.80% Pervious Area
150,202		56.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	43	0.0200	0.14		**Sheet Flow, Sheet Grass A-B** Grass: Short n= 0.150 P2= 3.20"
0.1	7	0.0200	0.81		**Sheet Flow, Sheet-Pave B-C** Smooth surfaces n= 0.011 P2= 3.20"
1.3	217	0.0200	2.87		**Shallow Concentrated Flow, Paved C-D** Paved Kv= 20.3 fps
1.1	211	0.0050	3.21	2.52	**Pipe Channel, Pipe D-E** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
1.6	397	0.0050	4.20	7.43	**Pipe Channel, Pipe E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
1.6	490	0.0050	5.09	16.00	**Pipe Channel, Pipe F-G** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
0.0	24		8.97		**Lake or Reservoir, Lake G-H** Mean Depth= 2.50'
0.5	42	0.0050	1.54	0.13	**Pipe Channel, Pipe F-G** 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.013 Corrugated PE, smooth interior
0.8	146	0.0400	3.22		**Shallow Concentrated Flow, Unpaved I-J** Unpaved Kv= 16.1 fps
12.0	1,577	Total			

Subcatchment MC: Main Campus



Summary for Subcatchment OSW: Off Site West

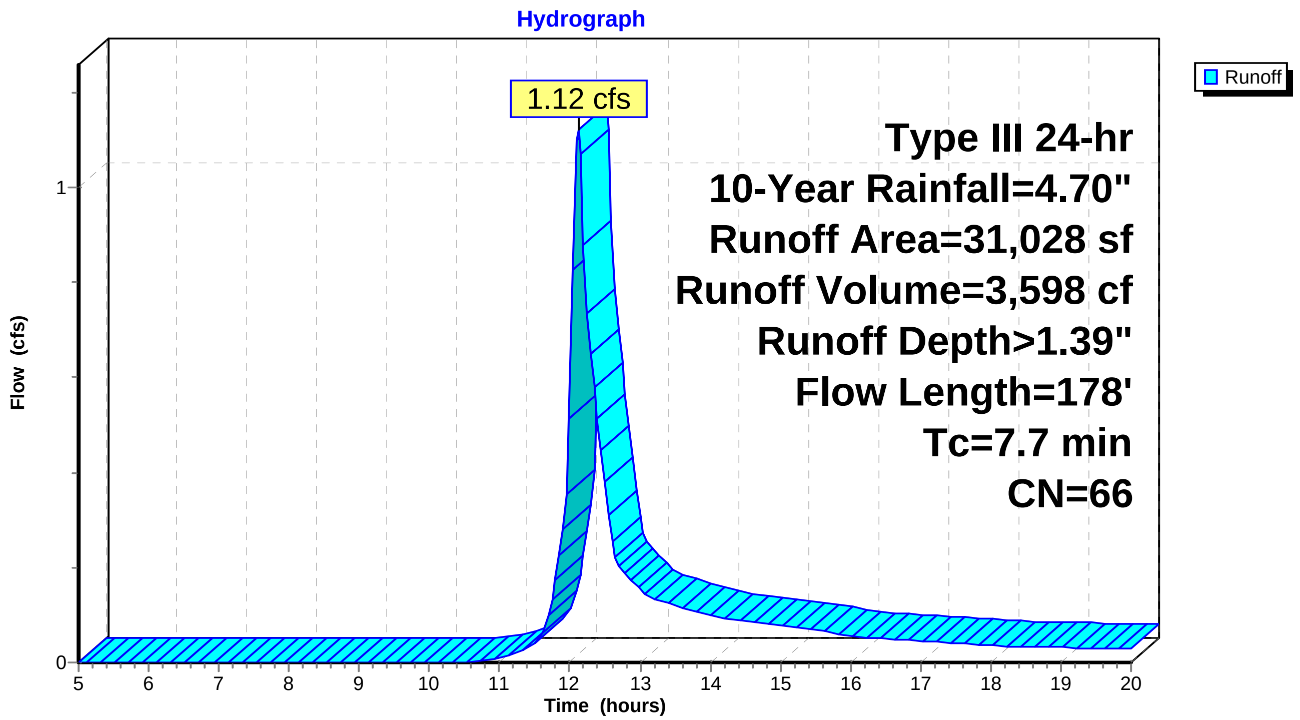
Runoff = 1.12 cfs @ 12.12 hrs, Volume= 3,598 cf, Depth> 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
	2,983	55	Woods, Good, HSG B
	15,112	61	>75% Grass cover, Good, HSG B
*	1,048	80	Path(cover unknown)
	185	98	Unconnected pavement, HSG B
	8,058	80	>75% Grass cover, Good, HSG D
*	3,642	60	Permeable Parking Area
	31,028	66	Weighted Average
	30,843		99.40% Pervious Area
	185		0.60% Impervious Area
	185		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	128	0.0540	3.74		**Shallow Concentrated Flow, Wooded/Path/Wooded B-C** Unpaved Kv= 16.1 fps
7.7	178	Total			

Subcatchment OSW: Off Site West



Summary for Subcatchment PD: Pond Drive

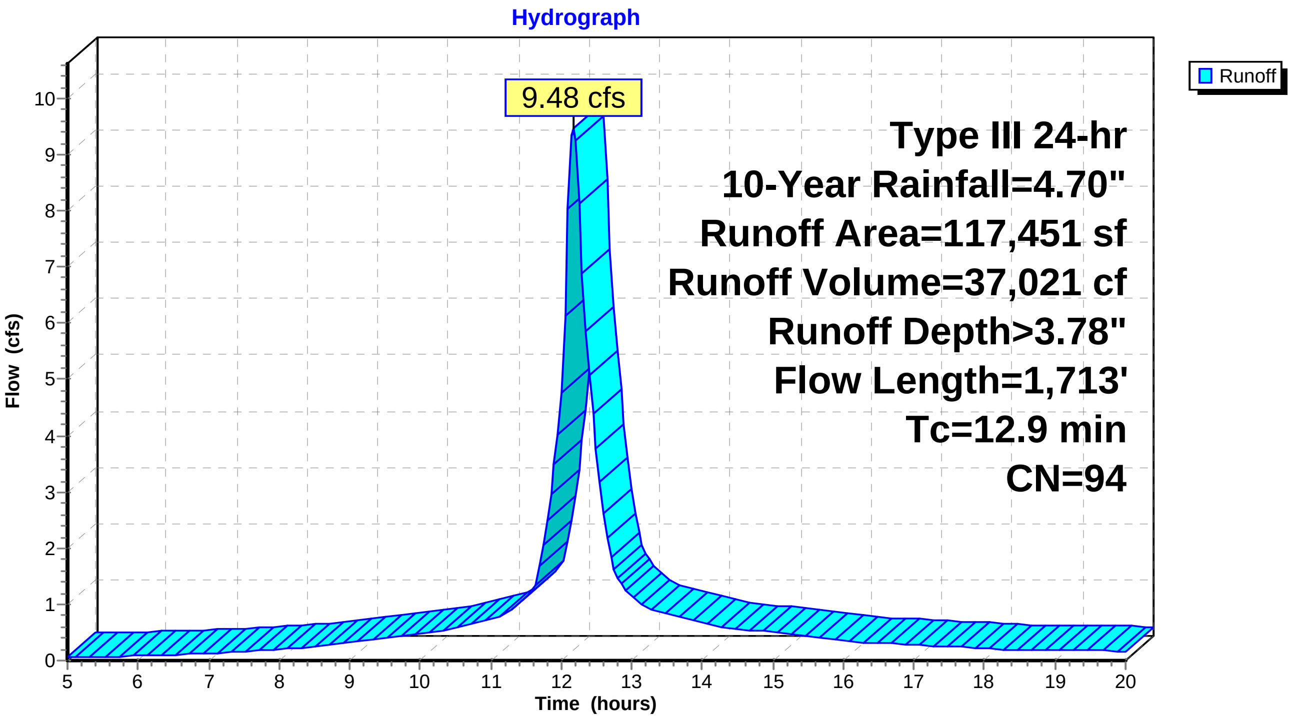
Runoff = 9.48 cfs @ 12.17 hrs, Volume= 37,021 cf, Depth> 3.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
	1,964	61	>75% Grass cover, Good, HSG B
	5,597	98	Paved roads w/curbs & sewers, HSG B
	20,295	80	>75% Grass cover, Good, HSG D
*	43	89	Path, HSG D
	55,952	98	Paved roads w/curbs & sewers, HSG D
*	33,600	98	
	117,451	94	Weighted Average
	22,302		18.99% Pervious Area
	95,149		81.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	42	0.0200	0.14		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
0.2	8	0.0200	0.83		**Sheet Flow, Sheet BC** Smooth surfaces n= 0.011 P2= 3.20"
0.7	127	0.0200	2.87		**Shallow Concentrated Flow, Paved CD** Paved Kv= 20.3 fps
0.2	30	0.0050	3.21	2.52	**Pipe Channel, Pipe DE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
3.9	982	0.0050	4.20	7.43	**Pipe Channel, Pipe EF** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
0.6	195	0.0050	5.09	16.00	**Pipe Channel, Pipe FG** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
0.2	77		8.02		**Lake or Reservoir, Basin GH** Mean Depth= 2.00'
0.5	62	0.0050	2.02	0.40	**Pipe Channel, Pipe HI** 6.0" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.013 Corrugated PE, smooth interior
0.7	89	0.0200	2.28		**Shallow Concentrated Flow, Unpaved IJ** Unpaved Kv= 16.1 fps
0.8	57	0.0050	1.14		**Shallow Concentrated Flow, Unpaved JK** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Upaved KL** Unpaved Kv= 16.1 fps
12.9	1,713	Total			

Subcatchment PD: Pond Drive



Summary for Subcatchment S1: Swale 1

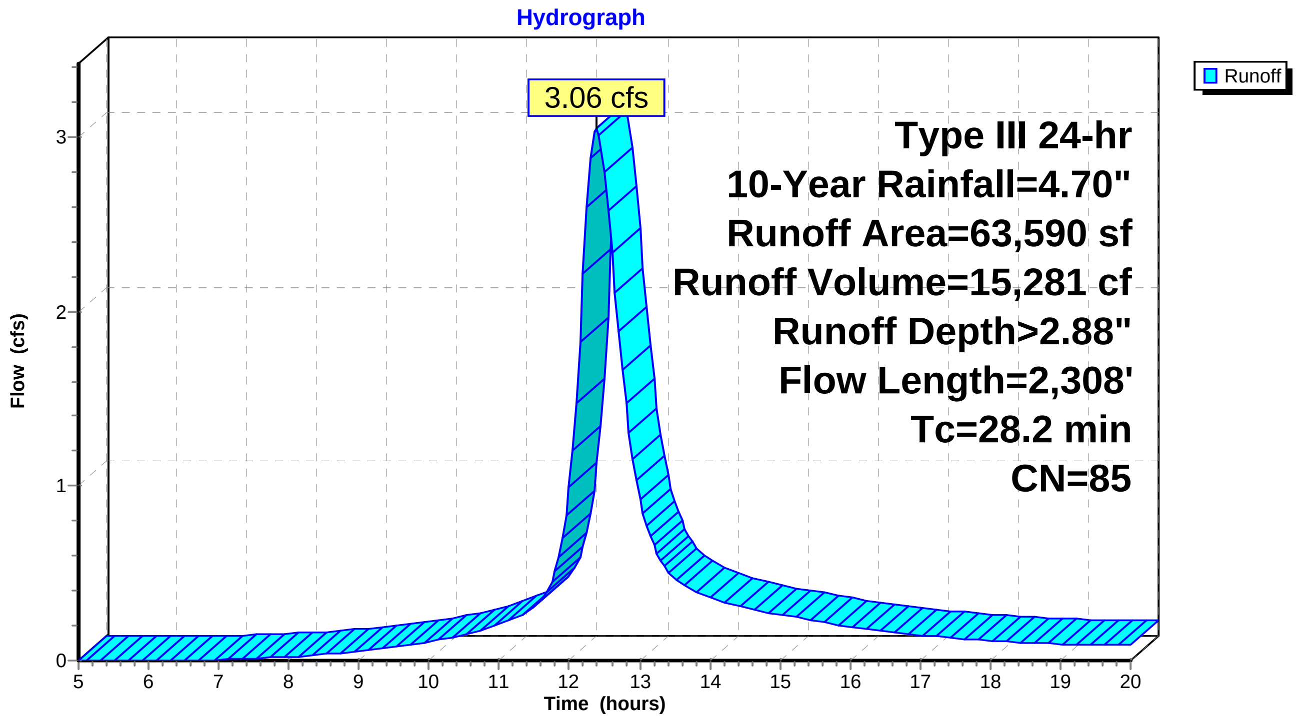
Runoff = 3.06 cfs @ 12.39 hrs, Volume= 15,281 cf, Depth> 2.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
5,311	80	>75% Grass cover, Good, HSG D
58,279	85	1/2 acre lots, 25% imp, HSG D
63,590	85	Weighted Average
49,020		77.09% Pervious Area
14,570		22.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0350	0.19		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.8	313	0.0333	2.94		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
0.1	39	0.0050	4.97	8.78	**Pipe Channel, Pipe CD** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
21.6	1,862	0.0080	1.44		**Shallow Concentrated Flow, Wetland/Stream/Pond DE** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River EF** Unpaved Kv= 16.1 fps
28.2	2,308	Total			

Subcatchment S1: Swale 1



Summary for Subcatchment S2: Swale 2

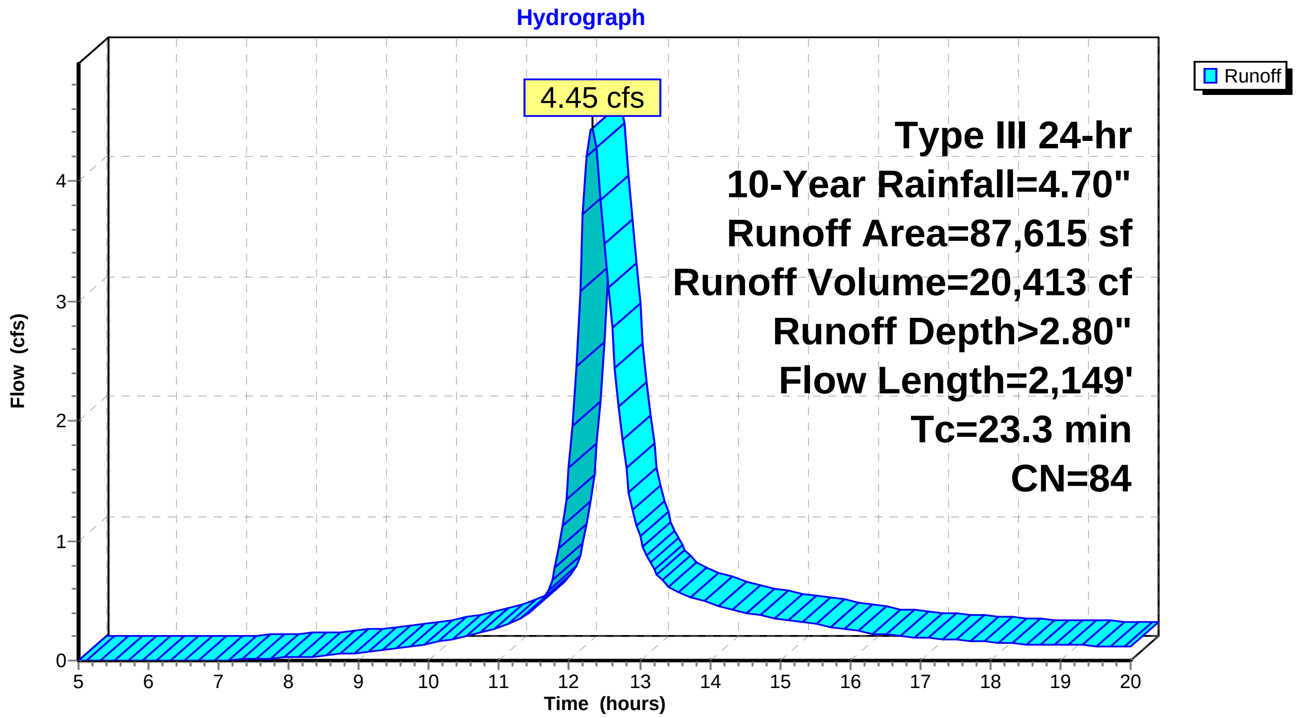
Runoff = 4.45 cfs @ 12.32 hrs, Volume= 20,413 cf, Depth> 2.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
20,096	80	>75% Grass cover, Good, HSG D
67,519	85	1/2 acre lots, 25% imp, HSG D
87,615	84	Weighted Average
70,735		80.73% Pervious Area
16,880		19.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.2	259	0.0480	3.53		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
1.6	215	0.0200	2.28		**Shallow Concentrated Flow, Swale CD** Unpaved Kv= 16.1 fps
0.6	151	0.0050	4.20	7.43	**Pipe Channel, Pipe DE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
0.8	169	0.0470	3.49		**Shallow Concentrated Flow, Grass/Wetland EF** Unpaved Kv= 16.1 fps
14.6	1,261	0.0080	1.44		**Shallow Concentrated Flow, Stream/Pond FG** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River** Unpaved Kv= 16.1 fps
23.3	2,149	Total			

Subcatchment S2: Swale 2



Summary for Subcatchment S3: Swale 3

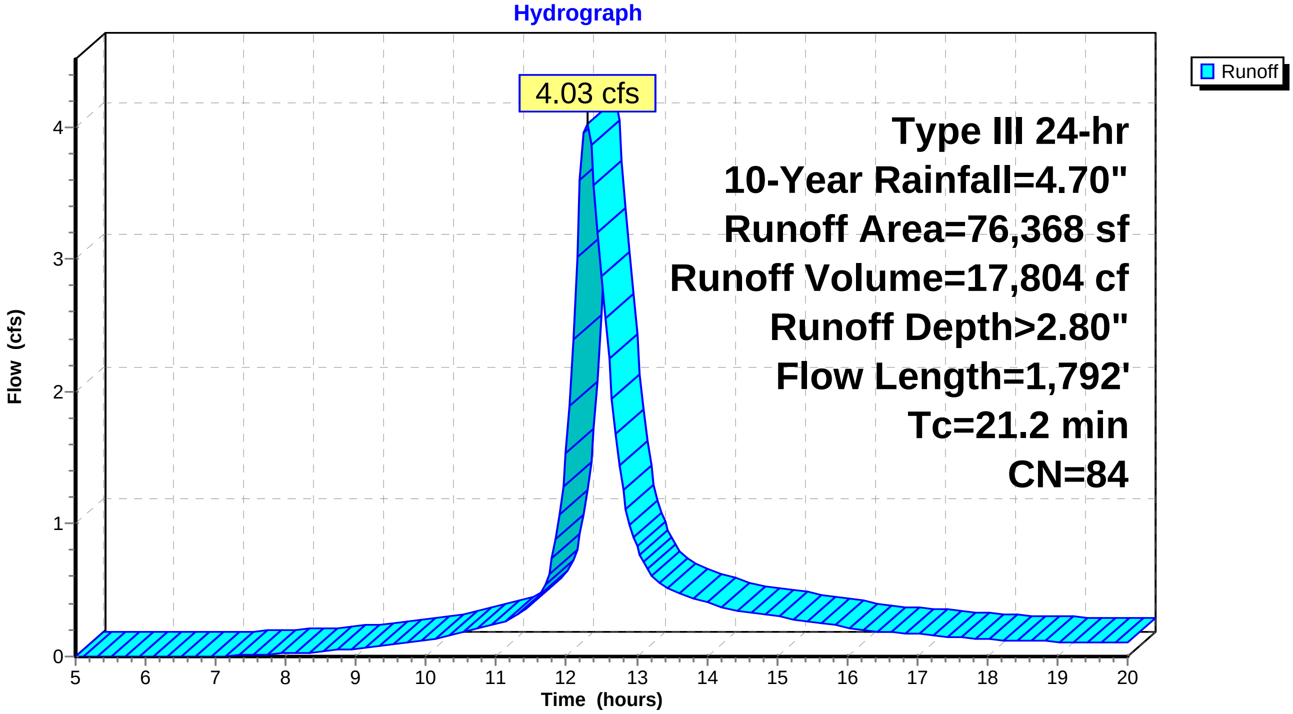
Runoff = 4.03 cfs @ 12.29 hrs, Volume= 17,804 cf, Depth> 2.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
11,535	80	>75% Grass cover, Good, HSG D
64,833	85	1/2 acre lots, 25% imp, HSG D
76,368	84	Weighted Average
60,160		78.78% Pervious Area
16,208		21.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.0	100	0.0100	1.61		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
2.4	452	0.0376	3.12		**Shallow Concentrated Flow, Grass CD** Unpaved Kv= 16.1 fps
0.5	77	0.0286	2.72		**Shallow Concentrated Flow, Swale DE** Unpaved Kv= 16.1 fps
0.2	69	0.0050	4.97	8.78	**Pipe Channel, Pipe EF** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
1.5	305	0.0433	3.35		**Shallow Concentrated Flow, Grass/Wetland FG** Unpaved Kv= 16.1 fps
8.0	695	0.0080	1.44		**Shallow Concentrated Flow, Stream/Pond GH** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River HI** Unpaved Kv= 16.1 fps
21.2	1,792	Total			

Subcatchment S3: Swale 3



Summary for Subcatchment S4: Swale 4

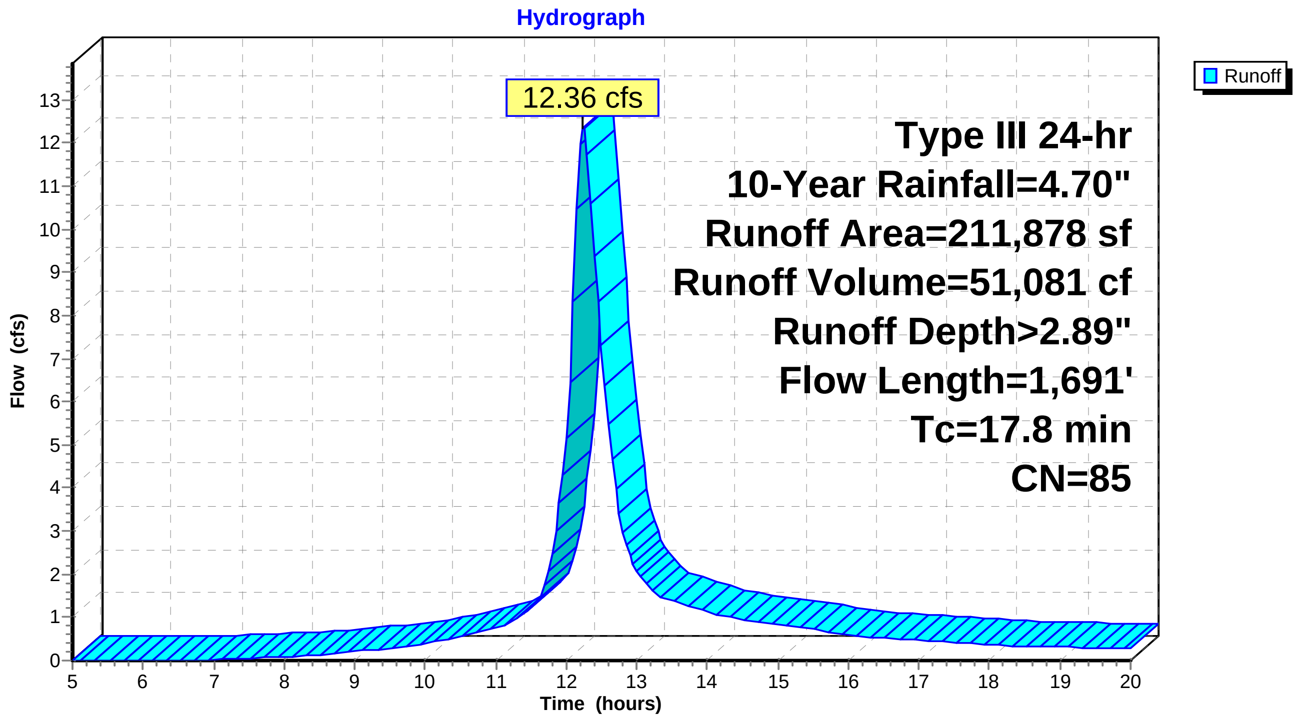
Runoff = 12.36 cfs @ 12.24 hrs, Volume= 51,081 cf, Depth> 2.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
11,826	80	>75% Grass cover, Good, HSG D
200,052	85	1/2 acre lots, 25% imp, HSG D
211,878	85	Weighted Average
161,865		76.40% Pervious Area
50,013		23.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
3.2	557	0.0333	2.94		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
0.7	162	0.0500	3.60		**Shallow Concentrated Flow, Swale CD** Unpaved Kv= 16.1 fps
0.3	117	0.0050	6.02	18.90	**Pipe Channel, Pipe DE** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.9	168	0.0353	3.02		**Shallow Concentrated Flow, Grass/Wetland EF** Unpaved Kv= 16.1 fps
6.9	593	0.0080	1.44		**Shallow Concentrated Flow, Stream/Pond FG** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River** Unpaved Kv= 16.1 fps
17.8	1,691	Total			

Subcatchment S4: Swale 4



Summary for Subcatchment S5: Swale 5

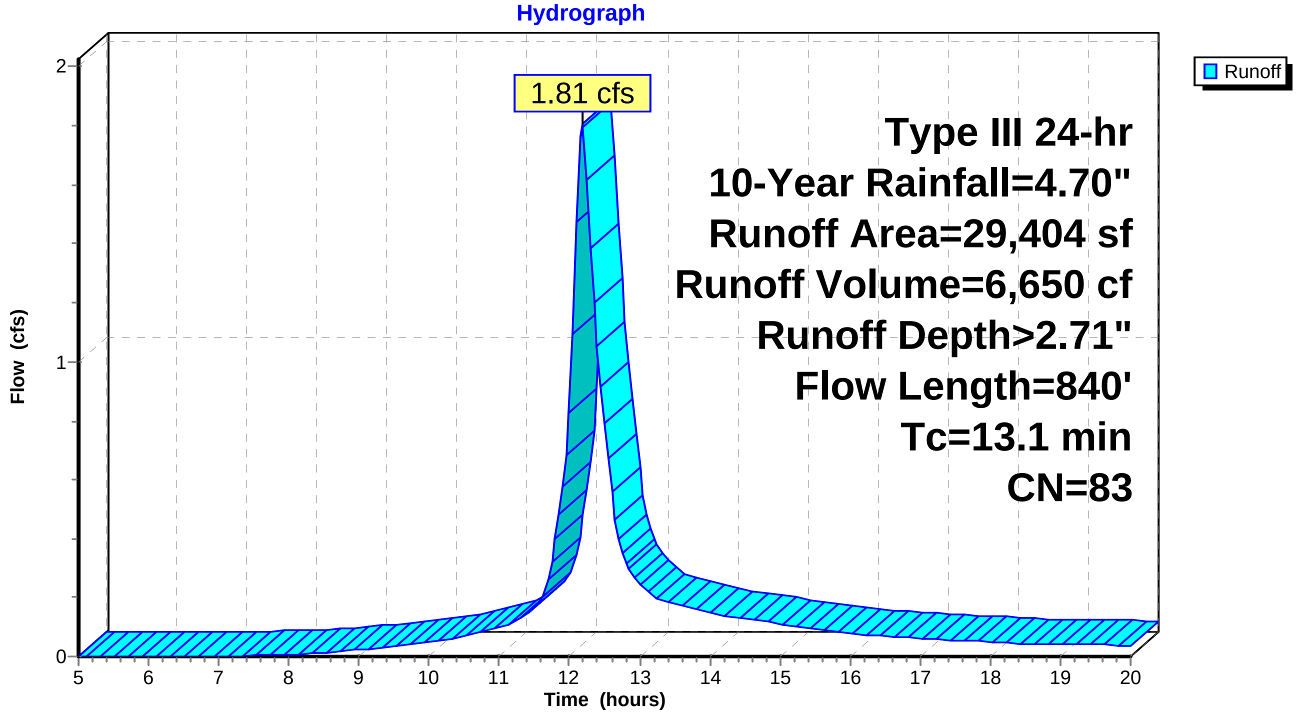
Runoff = 1.81 cfs @ 12.18 hrs, Volume= 6,650 cf, Depth> 2.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
9,317	80	>75% Grass cover, Good, HSG D
20,087	85	1/2 acre lots, 25% imp, HSG D
29,404	83	Weighted Average
24,382		82.92% Pervious Area
5,022		17.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.0	220	0.0500	3.60		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
0.5	89	0.0333	2.94		**Shallow Concentrated Flow, Swale CD** Unpaved Kv= 16.1 fps
0.3	79	0.0050	4.97	8.78	**Pipe Channel, Pipe DE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.1	43	0.1628	6.50		**Shallow Concentrated Flow, Grass/Wetland EF** Unpaved Kv= 16.1 fps
3.6	315	0.0080	1.44		**Shallow Concentrated Flow, Stream/Pond FG** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River** Unpaved Kv= 16.1 fps
13.1	840	Total			

Subcatchment S5: Swale 5



Summary for Subcatchment S6: Swale 6

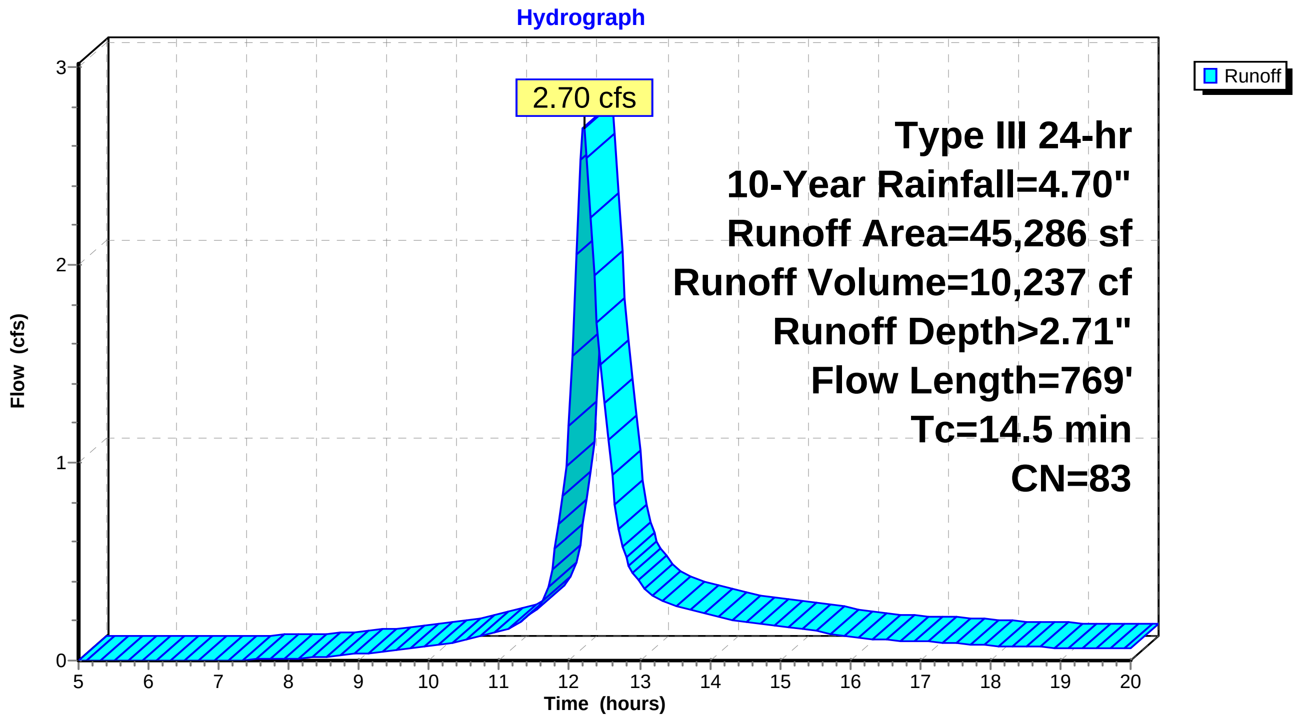
Runoff = 2.70 cfs @ 12.20 hrs, Volume= 10,237 cf, Depth> 2.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
1,558	61	>75% Grass cover, Good, HSG B
1,257	70	1/2 acre lots, 25% imp, HSG B
5,287	80	>75% Grass cover, Good, HSG D
37,184	85	1/2 acre lots, 25% imp, HSG D
45,286	83	Weighted Average
35,676		78.78% Pervious Area
9,610		21.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0050	0.09		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.5	282	0.0360	3.05		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
2.0	125	0.0040	1.02		**Shallow Concentrated Flow, Swale CD** Unpaved Kv= 16.1 fps
0.4	145	0.0200	6.42	5.04	**Pipe Channel, Pipe DE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.8	167	0.0480	3.53		**Shallow Concentrated Flow, Grass EF** Unpaved Kv= 16.1 fps
14.5	769	Total			

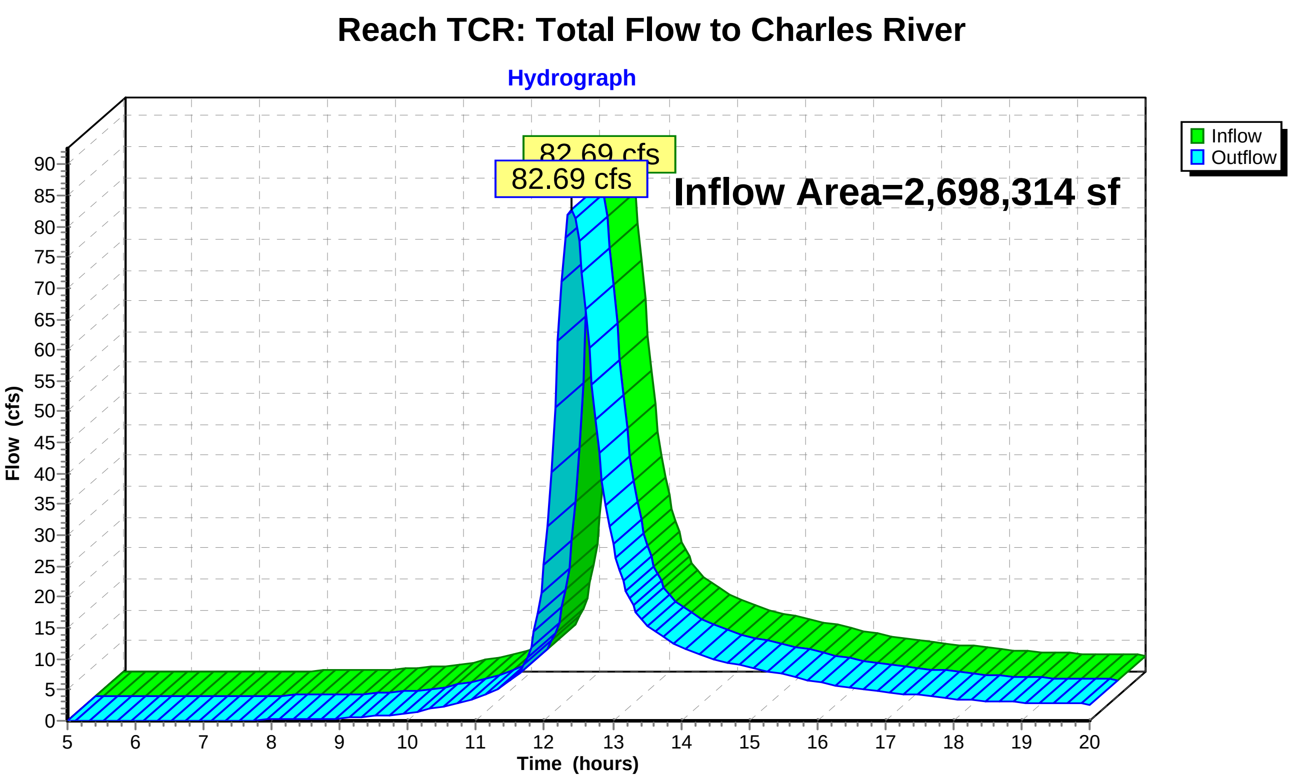
Subcatchment S6: Swale 6



Summary for Reach TCR: Total Flow to Charles River

Inflow Area = 2,698,314 sf, 19.91% Impervious, Inflow Depth > 1.90" for 10-Year event
Inflow = 82.69 cfs @ 12.39 hrs, Volume= 428,317 cf
Outflow = 82.69 cfs @ 12.39 hrs, Volume= 428,317 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



Summary for Pond B1: BASIN 1

Inflow Area = 69,032 sf, 72.77% Impervious, Inflow Depth > 3.18" for 10-Year event
Inflow = 4.35 cfs @ 12.24 hrs, Volume= 18,291 cf
Outflow = 0.34 cfs @ 14.30 hrs, Volume= 11,508 cf, Atten= 92%, Lag= 123.7 min
Discarded = 0.34 cfs @ 14.30 hrs, Volume= 11,508 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 178.11' @ 14.30 hrs Surf.Area= 6,114 sf Storage= 9,905 cf

Plug-Flow detention time= 188.0 min calculated for 11,508 cf (63% of inflow)
Center-of-Mass det. time= 116.2 min (894.5 - 778.3)

Volume	Invert	Avail.Storage	Storage Description
#1	176.00'	33,722 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

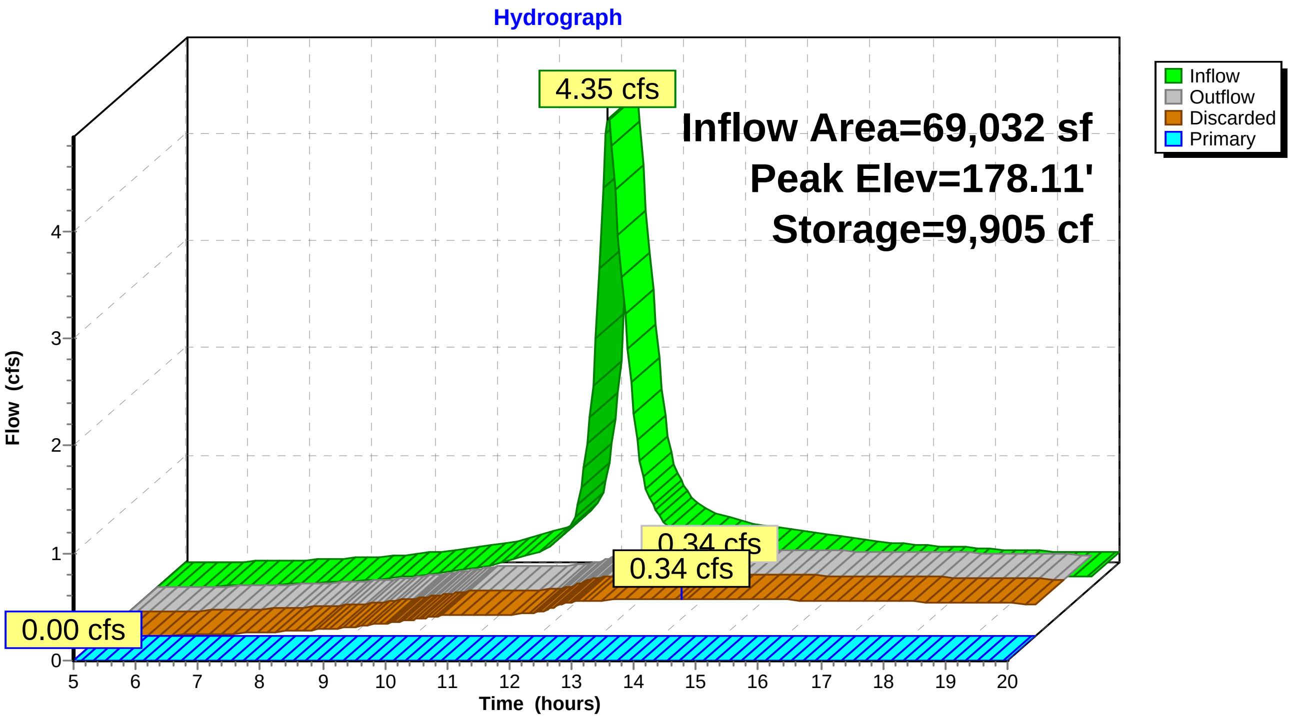
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
176.00	3,342	0	0
177.00	4,577	3,960	3,960
178.00	5,952	5,265	9,224
179.00	7,387	6,670	15,894
180.00	8,885	8,136	24,030
181.00	10,500	9,693	33,722

Device	Routing	Invert	Outlet Devices
#1	Primary	174.00'	**4.0" Round Culvert** L= 36.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 174.00' / 173.50' S= 0.0139 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf
#2	Device 1	179.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	179.25'	**1.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	179.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	179.90'	**20.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#6	Discarded	176.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.34 cfs @ 14.30 hrs HW=178.11' (Free Discharge)
└─**6=Exfiltration** (Exfiltration Controls 0.34 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=176.00' (Free Discharge)
├─**1=Culvert** (Passes 0.00 cfs of 0.48 cfs potential flow)
│ ├─**2=Orifice/Grate** (Controls 0.00 cfs)
│ ├─**3=Orifice/Grate** (Controls 0.00 cfs)
│ └─**4=Orifice/Grate** (Controls 0.00 cfs)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B1: BASIN 1



Summary for Pond B3: BASIN 3

Inflow Area = 117,451 sf, 81.01% Impervious, Inflow Depth > 3.78" for 10-Year event
Inflow = 9.48 cfs @ 12.17 hrs, Volume= 37,021 cf
Outflow = 0.53 cfs @ 14.80 hrs, Volume= 17,255 cf, Atten= 94%, Lag= 157.9 min
Discarded = 0.43 cfs @ 14.80 hrs, Volume= 16,040 cf
Primary = 0.10 cfs @ 14.80 hrs, Volume= 1,215 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 177.29' @ 14.80 hrs Surf.Area= 7,579 sf Storage= 23,064 cf

Plug-Flow detention time= 202.6 min calculated for 17,250 cf (47% of inflow)
Center-of-Mass det. time= 107.7 min (862.5 - 754.8)

Volume	Invert	Avail.Storage	Storage Description
#1	173.00'	49,214 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

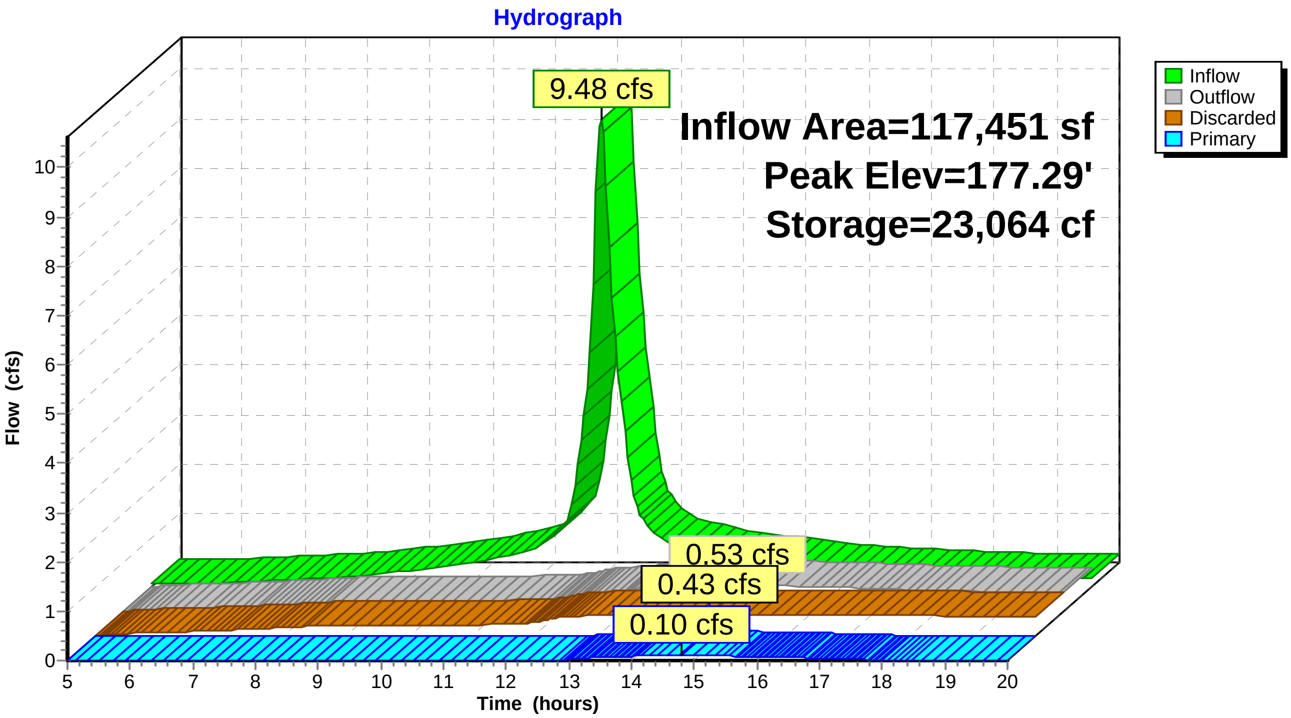
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
173.00	3,533	0	0	3,533
174.00	4,314	3,917	3,917	4,345
175.00	5,173	4,737	8,654	5,238
176.00	6,120	5,640	14,294	6,222
177.00	7,172	6,639	20,933	7,312
178.00	8,628	7,889	28,822	8,802
179.00	10,102	9,355	38,177	10,315
180.00	12,000	11,037	49,214	12,250

Device	Routing	Invert	Outlet Devices
#1	Primary	168.00'	**6.0" Round Culvert** L= 53.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 168.00' / 166.94' S= 0.0200 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#2	Device 1	177.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	178.50'	**24.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	178.90'	**20.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#5	Discarded	173.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.43 cfs @ 14.80 hrs HW=177.29' (Free Discharge)
└─**5=Exfiltration** (Exfiltration Controls 0.43 cfs)

Primary OutFlow Max=0.10 cfs @ 14.80 hrs HW=177.29' (Free Discharge)
├─**1=Culvert** (Passes 0.10 cfs of 2.42 cfs potential flow)
│ ├─**2=Orifice/Grate** (Orifice Controls 0.10 cfs @ 1.95 fps)
│ └─**3=Orifice/Grate** (Controls 0.00 cfs)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B3: BASIN 3



Summary for Pond T18A: TRENCH 18A

Inflow Area = 267,248 sf, 56.20% Impervious, Inflow Depth > 2.54" for 10-Year event
Inflow = 15.99 cfs @ 12.17 hrs, Volume= 56,516 cf
Outflow = 5.84 cfs @ 12.53 hrs, Volume= 42,765 cf, Atten= 63%, Lag= 22.0 min
Discarded = 0.48 cfs @ 10.55 hrs, Volume= 18,288 cf
Primary = 5.36 cfs @ 12.53 hrs, Volume= 24,477 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 175.31' @ 12.53 hrs Surf.Area= 8,648 sf Storage= 22,404 cf

Plug-Flow detention time= 113.1 min calculated for 42,623 cf (75% of inflow)
Center-of-Mass det. time= 54.6 min (846.3 - 791.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	171.75'	11,805 cf	**44.75'W x 193.25'L x 5.75'H Field A** 49,726 cf Overall - 20,213 cf Embedded = 29,513 cf x 40.0% Voids
#2A	172.50'	20,213 cf	**Cultec R-900HD** x 162 Inside #1 Effective Size= 72.7"W x 48.0"H => 17.61 sf x 7.00'L = 123.3 cf Overall Size= 78.0"W x 48.0"H x 9.25'L with 2.25' Overlap Row Length Adjustment= +2.25' x 17.61 sf x 6 rows
		32,018 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	174.00'	**24.0" Round Culvert** L= 5.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 174.00' / 174.00' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#2	Discarded	171.75'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.48 cfs @ 10.55 hrs HW=171.81' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.48 cfs)

Primary OutFlow Max=5.34 cfs @ 12.53 hrs HW=175.31' (Free Discharge)
└─**1=Culvert** (Barrel Controls 5.34 cfs @ 3.48 fps)

Pond T18A: TRENCH 18A - Chamber Wizard Field A

Chamber Model = Cultec R-900HD
Effective Size= 72.7"W x 48.0"H => 17.61 sf x 7.00'L = 123.3 cf
Overall Size= 78.0"W x 48.0"H x 9.25'L with 2.25' Overlap
Row Length Adjustment= +2.25' x 17.61 sf x 6 rows

78.0" Wide + 9.0" Spacing = 87.0" C-C Row Spacing

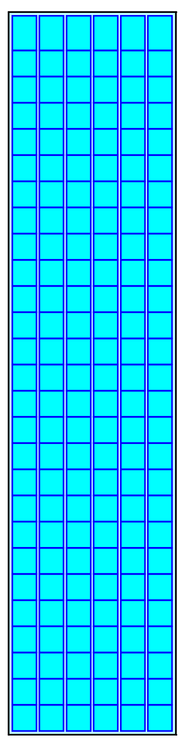
27 Chambers/Row x 7.00' Long +2.25' Row Adjustment = 191.25' Row Length +12.0" End Stone x 2 = 193.25' Base Length
6 Rows x 78.0" Wide + 9.0" Spacing x 5 + 12.0" Side Stone x 2 = 44.75' Base Width
9.0" Base + 48.0" Chamber Height + 12.0" Cover = 5.75' Field Height

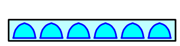
162 Chambers x 123.3 cf +2.25' Row Adjustment x 17.61 sf x 6 Rows = 20,212.9 cf Chamber Storage

49,725.6 cf Field - 20,212.9 cf Chambers = 29,512.7 cf Stone x 40.0% Voids = 11,805.1 cf Stone Storage

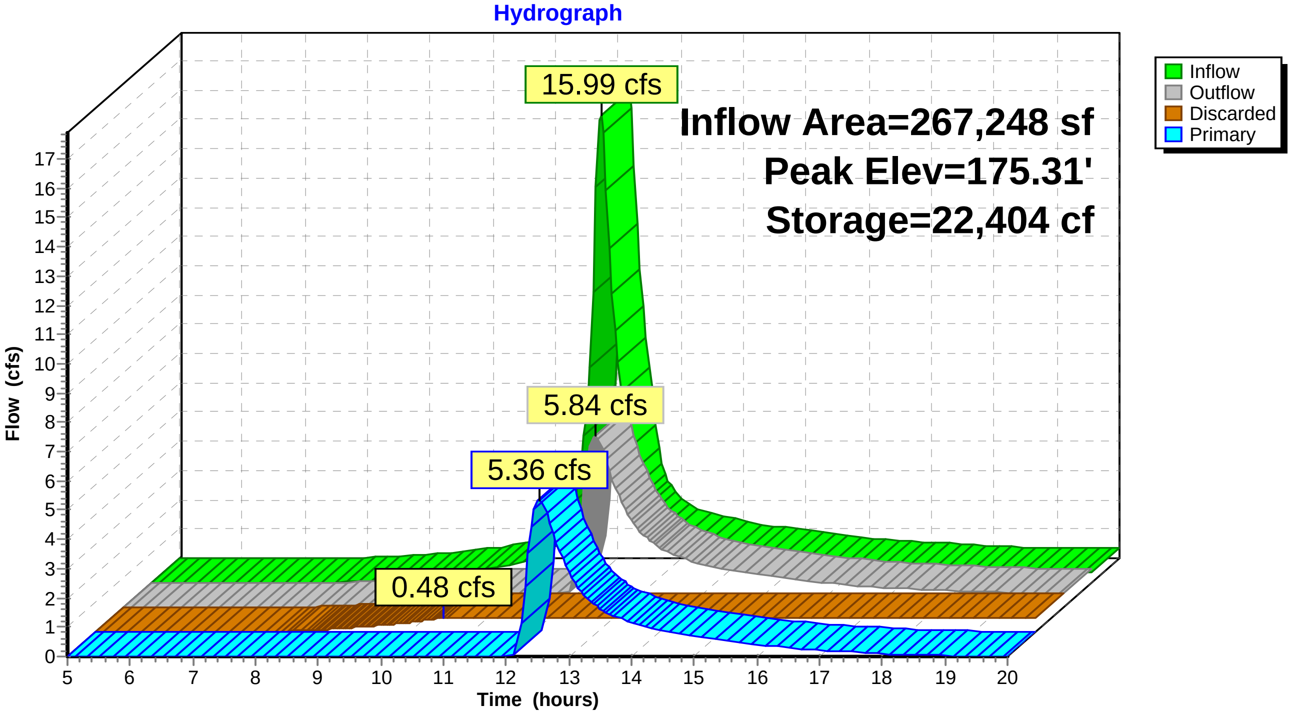
Chamber Storage + Stone Storage = 32,018.0 cf = 0.735 af
Overall Storage Efficiency = 64.4%

162 Chambers
1,841.7 cy Field
1,093.1 cy Stone





Pond T18A: TRENCH 18A



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

Subcatchment CR: Charles River Runoff Area=1,730,442 sf 7.48% Impervious Runoff Depth>2.55"
Flow Length=2,022' Tc=29.7 min CN=74 Runoff=72.90 cfs 367,757 cf

Subcatchment IR: Intermediate Roadway Runoff Area=69,032 sf 72.77% Impervious Runoff Depth>3.90"
Flow Length=1,790' Tc=17.9 min CN=88 Runoff=5.29 cfs 22,447 cf

Subcatchment MC: Main Campus Runoff Area=267,248 sf 56.20% Impervious Runoff Depth>3.21"
Flow Length=1,577' Tc=12.0 min CN=81 Runoff=20.11 cfs 71,465 cf

Subcatchment OSW: Off Site West Runoff Area=31,028 sf 0.60% Impervious Runoff Depth>1.90"
Flow Length=178' Tc=7.7 min CN=66 Runoff=1.57 cfs 4,925 cf

Subcatchment PD: Pond Drive Runoff Area=117,451 sf 81.01% Impervious Runoff Depth>4.52"
Flow Length=1,713' Tc=12.9 min CN=94 Runoff=11.23 cfs 44,250 cf

Subcatchment S1: Swale 1 Runoff Area=63,590 sf 22.91% Impervious Runoff Depth>3.58"
Flow Length=2,308' Tc=28.2 min CN=85 Runoff=3.77 cfs 18,994 cf

Subcatchment S2: Swale 2 Runoff Area=87,615 sf 19.27% Impervious Runoff Depth>3.49"
Flow Length=2,149' Tc=23.3 min CN=84 Runoff=5.51 cfs 25,479 cf

Subcatchment S3: Swale 3 Runoff Area=76,368 sf 21.22% Impervious Runoff Depth>3.49"
Flow Length=1,792' Tc=21.2 min CN=84 Runoff=4.99 cfs 22,223 cf

Subcatchment S4: Swale 4 Runoff Area=211,878 sf 23.60% Impervious Runoff Depth>3.60"
Flow Length=1,691' Tc=17.8 min CN=85 Runoff=15.23 cfs 63,483 cf

Subcatchment S5: Swale 5 Runoff Area=29,404 sf 17.08% Impervious Runoff Depth>3.40"
Flow Length=840' Tc=13.1 min CN=83 Runoff=2.25 cfs 8,335 cf

Subcatchment S6: Swale 6 Runoff Area=45,286 sf 21.22% Impervious Runoff Depth>3.40"
Flow Length=769' Tc=14.5 min CN=83 Runoff=3.35 cfs 12,832 cf

Reach TCR: Total Flow to Charles River Inflow=110.50 cfs 561,285 cf
Outflow=110.50 cfs 561,285 cf

Pond B1: BASIN 1 Peak Elev=178.55' Storage=12,700 cf Inflow=5.29 cfs 22,447 cf
Discarded=0.38 cfs 12,960 cf Primary=0.00 cfs 0 cf Outflow=0.38 cfs 12,960 cf

Pond B3: BASIN 3 Peak Elev=177.84' Storage=27,432 cf Inflow=11.23 cfs 44,250 cf
Discarded=0.48 cfs 17,638 cf Primary=0.20 cfs 4,355 cf Outflow=0.68 cfs 21,993 cf

Pond T18A: TRENCH 18A Peak Elev=175.83' Storage=25,424 cf Inflow=20.11 cfs 71,465 cf
Discarded=0.48 cfs 19,325 cf Primary=9.45 cfs 37,828 cf Outflow=9.94 cfs 57,152 cf

Total Runoff Area = 2,729,342 sf Runoff Volume = 662,190 cf Average Runoff Depth = 2.91"
80.31% Pervious = 2,191,860 sf 19.69% Impervious = 537,482 sf

Summary for Subcatchment CR: Charles River

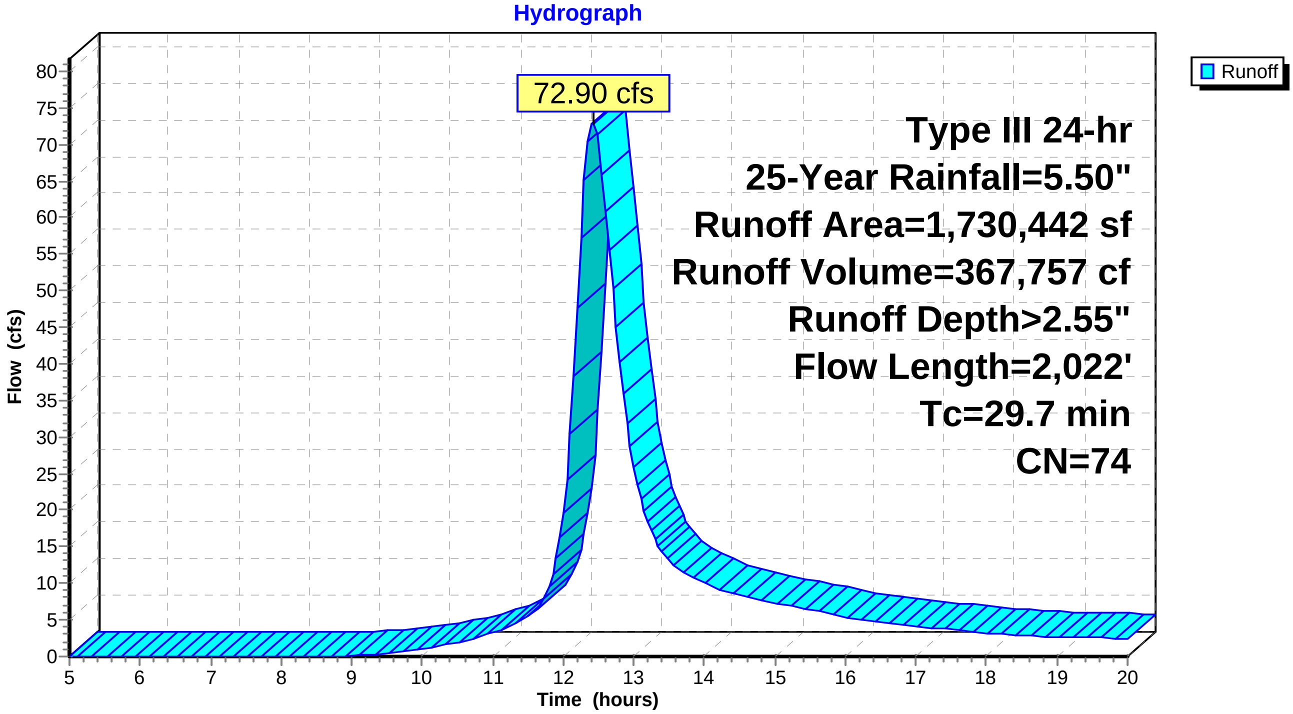
Runoff = 72.90 cfs @ 12.42 hrs, Volume= 367,757 cf, Depth> 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
	10,067	30	Woods, Good, HSG A
	5,689	39	>75% Grass cover, Good, HSG A
*	3,253	78	Wetland, HSG A
*	205	72	Path, HSG A
	201,555	55	Woods, Good, HSG B
	211,820	61	>75% Grass cover, Good, HSG B
*	103,465	78	Wetlands, HSG B
*	10,318	82	Path, HSG B
*	2,704	80	Path in Resource, HSG B
	4,112	98	Water Surface, HSG B
	33,426	70	Woods, Good, HSG C
	758	74	>75% Grass cover, Good, HSG C
*	141,675	78	Wetlands, HSG C
*	3,310	87	Path, HSG C
*	6,129	80	Path in Resource, HSG C
	10,807	98	Water Surface, HSG C
	438,769	77	Woods, Good, HSG D
	61,238	80	>75% Grass cover, Good, HSG D
*	227,701	78	Wetlands, HSG D
*	27,658	89	Path, HSG D
*	9,556	80	Path in Resource, HSG D
	45,917	98	Water Surface, HSG D
	20,004	70	1/2 acre lots, 25% imp, HSG B
	54,729	80	1/2 acre lots, 25% imp, HSG C
	60,917	85	1/2 acre lots, 25% imp, HSG D
*	34,660	98	impervious
	1,730,442	74	Weighted Average
	1,601,034		92.52% Pervious Area
	129,409		7.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, Sheet A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
3.1	329	0.0120	1.76		**Shallow Concentrated Flow, Wetland B-C** Unpaved Kv= 16.1 fps
18.5	1,599	0.0080	1.44		**Shallow Concentrated Flow, Wetland/Stream/Pond C-D** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River D-E** Unpaved Kv= 16.1 fps
29.7	2,022	Total			

Subcatchment CR: Charles River



Summary for Subcatchment IR: Intermediate Roadway

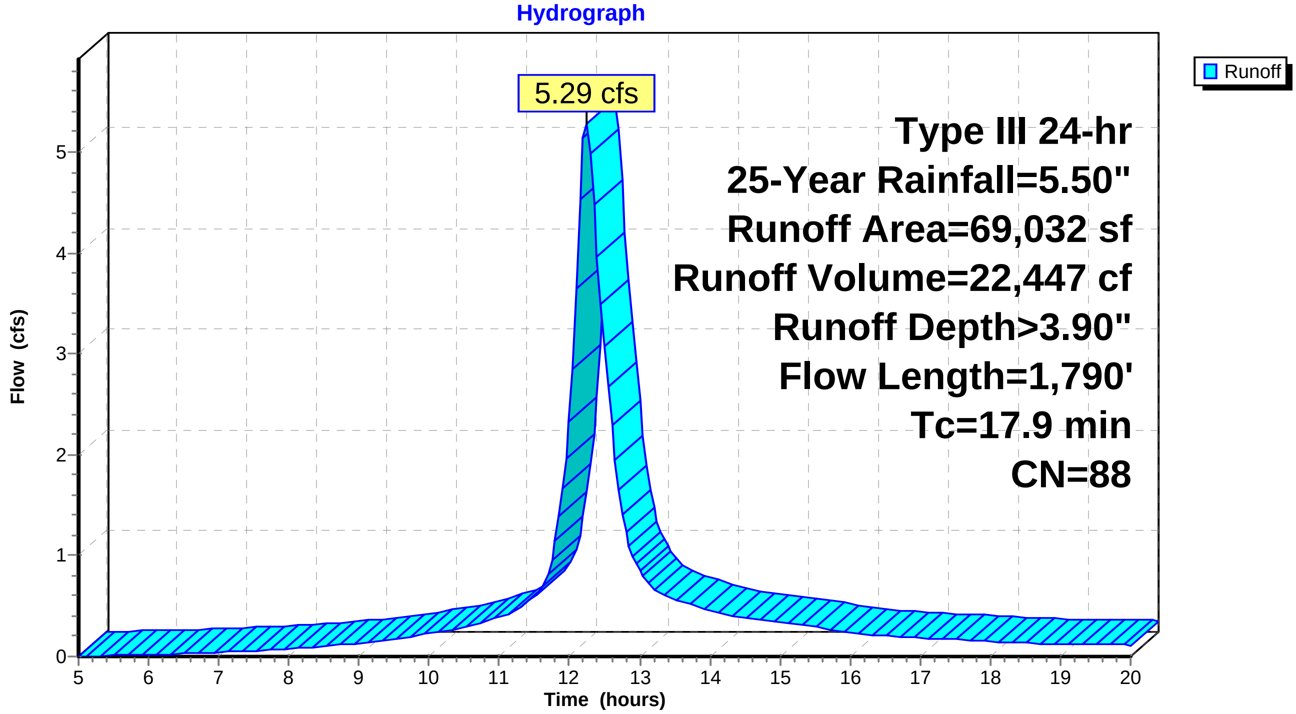
Runoff = 5.29 cfs @ 12.24 hrs, Volume= 22,447 cf, Depth> 3.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
	17,093	61	>75% Grass cover, Good, HSG B
	1,704	80	>75% Grass cover, Good, HSG D
	28,466	98	Paved roads w/curbs & sewers, HSG B
	8,209	98	Paved roads w/curbs & sewers, HSG D
*	13,560	98	Cottages
	69,032	88	Weighted Average
	18,797		27.23% Pervious Area
	50,235		72.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Sheet A-B** Grass: Short n= 0.150 P2= 3.20"
0.1	9	0.0200	2.28		**Shallow Concentrated Flow, Grass B-C** Unpaved Kv= 16.1 fps
0.3	47	0.0200	2.87		**Shallow Concentrated Flow, Paved C-D** Paved Kv= 20.3 fps
3.1	593	0.0050	3.21	2.52	**Pipe Channel, Pipe D-E** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.3	153		8.02		**Lake or Reservoir, Basin E-F** Mean Depth= 2.00'
0.5	46	0.0050	1.54	0.13	**Pipe Channel, Pipe F-E** 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.013 Corrugated PE, smooth interior
1.4	149	0.0130	1.84		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
2.4	333	0.0200	2.28		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
4.2	410	0.0100	1.61		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
17.9	1,790	Total			

Subcatchment IR: Intermediate Roadway



Summary for Subcatchment MC: Main Campus

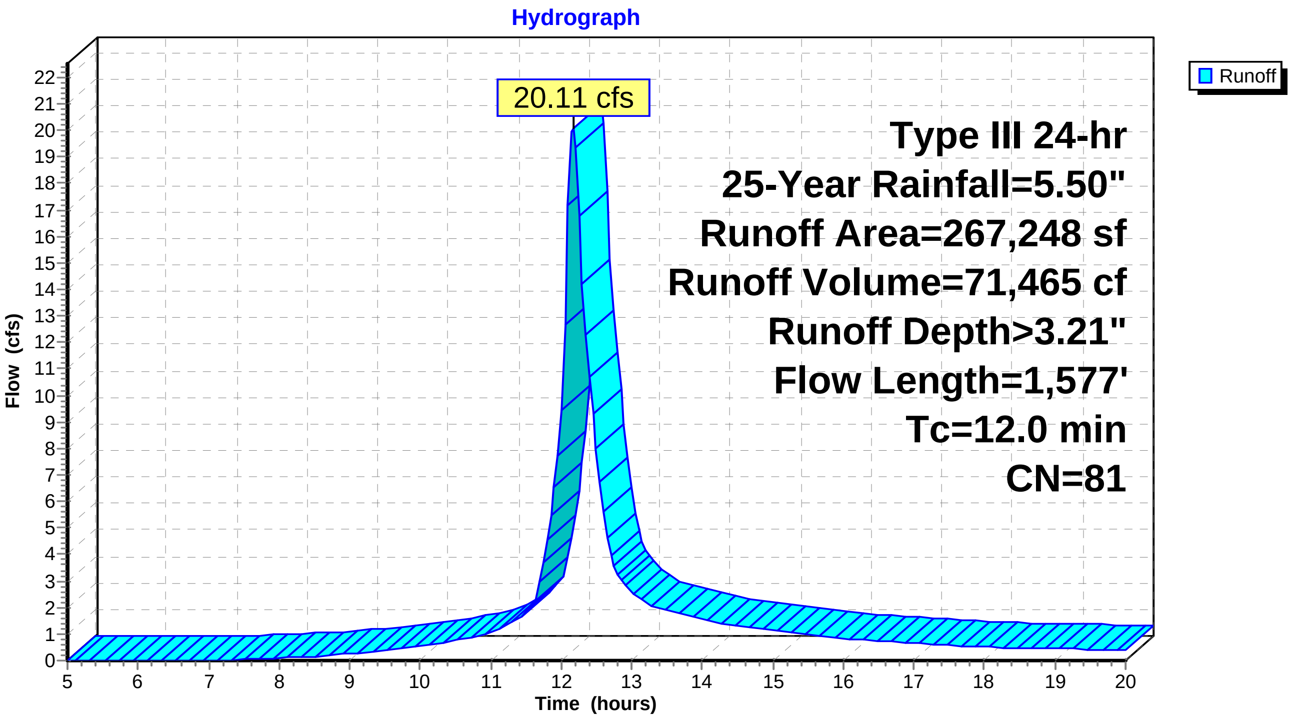
Runoff = 20.11 cfs @ 12.17 hrs, Volume= 71,465 cf, Depth> 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
22,404	39	>75% Grass cover, Good, HSG A
82,752	61	>75% Grass cover, Good, HSG B
11,890	80	>75% Grass cover, Good, HSG D
30,503	98	Paved roads w/curbs & sewers, HSG A
96,592	98	Paved roads w/curbs & sewers, HSG B
23,107	98	Paved roads w/curbs & sewers, HSG D
267,248	81	Weighted Average
117,046		43.80% Pervious Area
150,202		56.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	43	0.0200	0.14		**Sheet Flow, Sheet Grass A-B** Grass: Short n= 0.150 P2= 3.20"
0.1	7	0.0200	0.81		**Sheet Flow, Sheet-Pave B-C** Smooth surfaces n= 0.011 P2= 3.20"
1.3	217	0.0200	2.87		**Shallow Concentrated Flow, Paved C-D** Paved Kv= 20.3 fps
1.1	211	0.0050	3.21	2.52	**Pipe Channel, Pipe D-E** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
1.6	397	0.0050	4.20	7.43	**Pipe Channel, Pipe E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
1.6	490	0.0050	5.09	16.00	**Pipe Channel, Pipe F-G** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
0.0	24		8.97		**Lake or Reservoir, Lake G-H** Mean Depth= 2.50'
0.5	42	0.0050	1.54	0.13	**Pipe Channel, Pipe F-G** 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.013 Corrugated PE, smooth interior
0.8	146	0.0400	3.22		**Shallow Concentrated Flow, Unpaved I-J** Unpaved Kv= 16.1 fps
12.0	1,577	Total			

Subcatchment MC: Main Campus



Summary for Subcatchment OSW: Off Site West

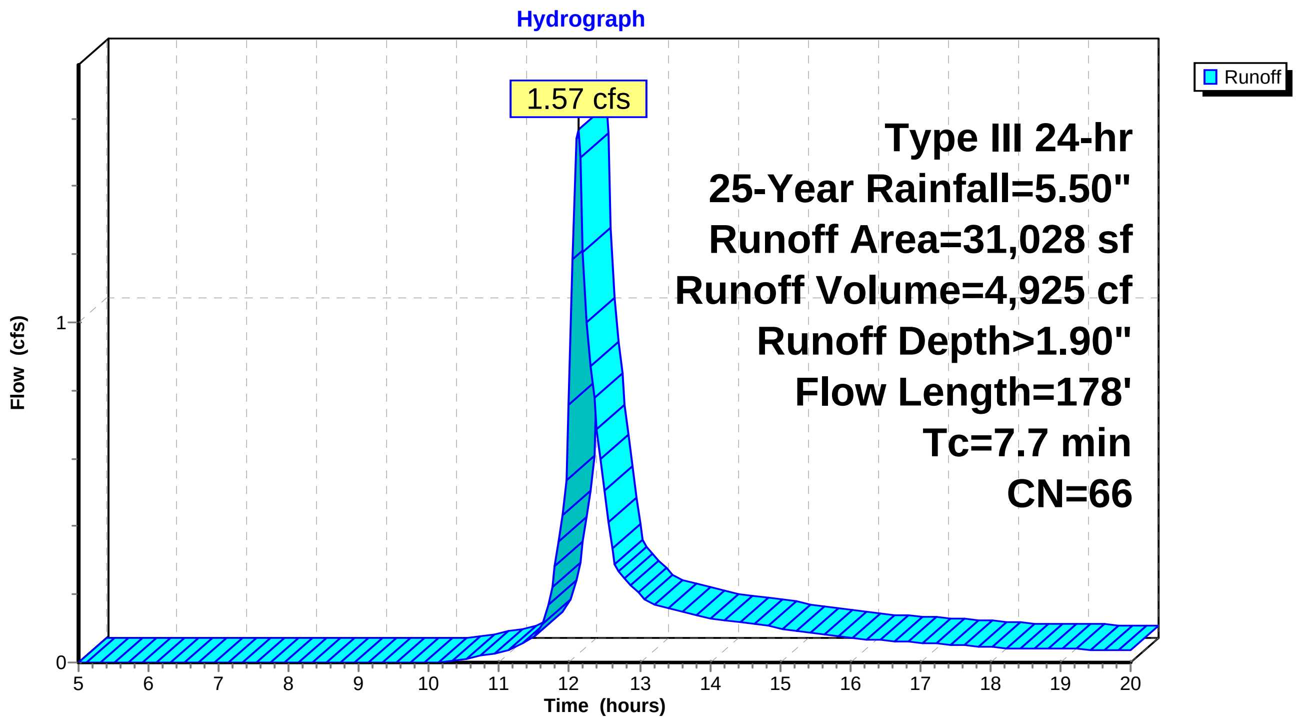
Runoff = 1.57 cfs @ 12.12 hrs, Volume= 4,925 cf, Depth> 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
	2,983	55	Woods, Good, HSG B
	15,112	61	>75% Grass cover, Good, HSG B
*	1,048	80	Path(cover unknown)
	185	98	Unconnected pavement, HSG B
	8,058	80	>75% Grass cover, Good, HSG D
*	3,642	60	Permeable Parking Area
	31,028	66	Weighted Average
	30,843		99.40% Pervious Area
	185		0.60% Impervious Area
	185		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	128	0.0540	3.74		**Shallow Concentrated Flow, Wooded/Path/Wooded B-C** Unpaved Kv= 16.1 fps
7.7	178	Total			

Subcatchment OSW: Off Site West



Summary for Subcatchment PD: Pond Drive

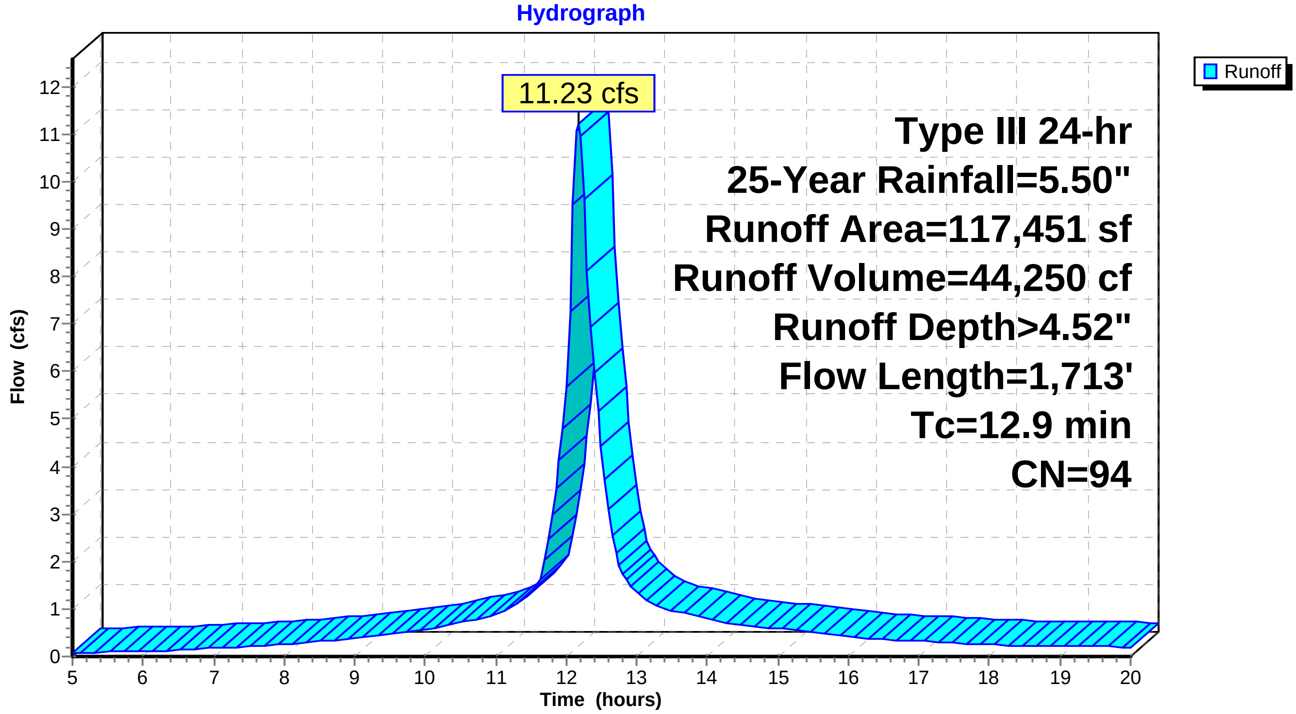
Runoff = 11.23 cfs @ 12.17 hrs, Volume= 44,250 cf, Depth> 4.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
	1,964	61	>75% Grass cover, Good, HSG B
	5,597	98	Paved roads w/curbs & sewers, HSG B
	20,295	80	>75% Grass cover, Good, HSG D
*	43	89	Path, HSG D
	55,952	98	Paved roads w/curbs & sewers, HSG D
*	33,600	98	
	117,451	94	Weighted Average
	22,302		18.99% Pervious Area
	95,149		81.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	42	0.0200	0.14		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
0.2	8	0.0200	0.83		**Sheet Flow, Sheet BC** Smooth surfaces n= 0.011 P2= 3.20"
0.7	127	0.0200	2.87		**Shallow Concentrated Flow, Paved CD** Paved Kv= 20.3 fps
0.2	30	0.0050	3.21	2.52	**Pipe Channel, Pipe DE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
3.9	982	0.0050	4.20	7.43	**Pipe Channel, Pipe EF** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
0.6	195	0.0050	5.09	16.00	**Pipe Channel, Pipe FG** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
0.2	77		8.02		**Lake or Reservoir, Basin GH** Mean Depth= 2.00'
0.5	62	0.0050	2.02	0.40	**Pipe Channel, Pipe HI** 6.0" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.013 Corrugated PE, smooth interior
0.7	89	0.0200	2.28		**Shallow Concentrated Flow, Unpaved IJ** Unpaved Kv= 16.1 fps
0.8	57	0.0050	1.14		**Shallow Concentrated Flow, Unpaved JK** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Upaved KL** Unpaved Kv= 16.1 fps
12.9	1,713	Total			

Subcatchment PD: Pond Drive



Summary for Subcatchment S1: Swale 1

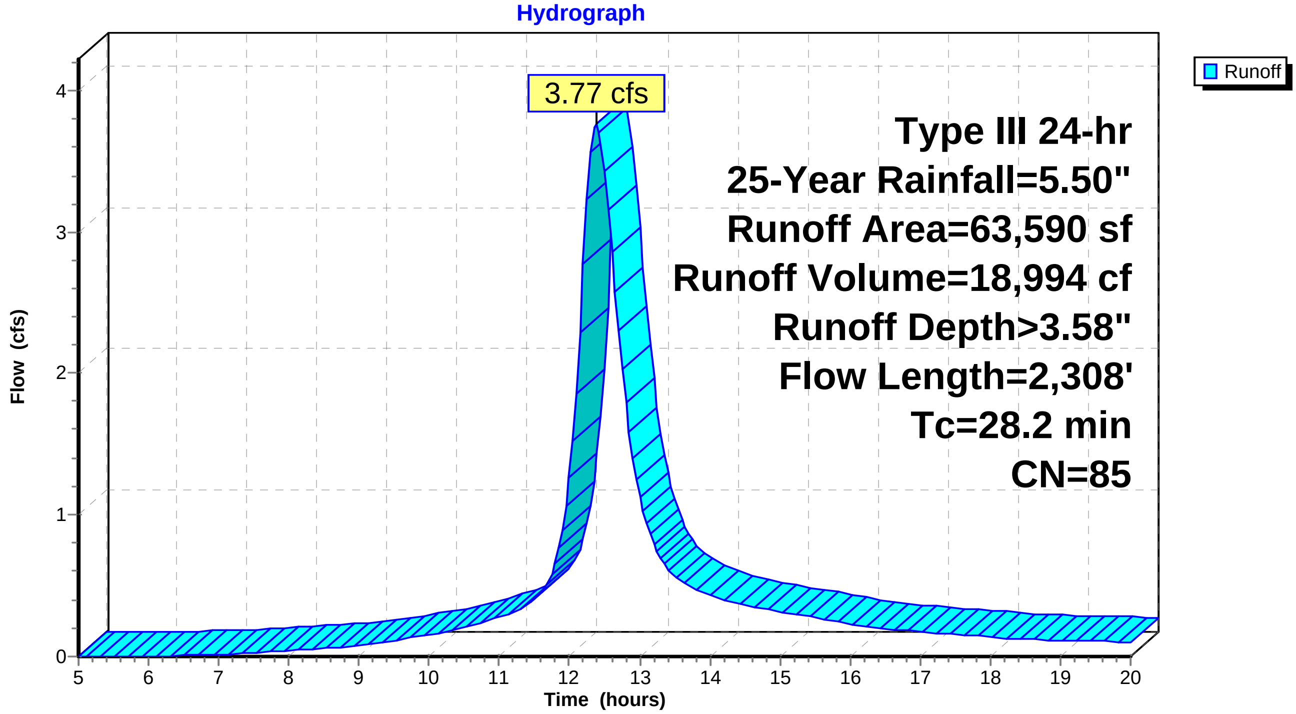
Runoff = 3.77 cfs @ 12.38 hrs, Volume= 18,994 cf, Depth> 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
5,311	80	>75% Grass cover, Good, HSG D
58,279	85	1/2 acre lots, 25% imp, HSG D
63,590	85	Weighted Average
49,020		77.09% Pervious Area
14,570		22.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0350	0.19		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.8	313	0.0333	2.94		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
0.1	39	0.0050	4.97	8.78	**Pipe Channel, Pipe CD** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
21.6	1,862	0.0080	1.44		**Shallow Concentrated Flow, Wetland/Stream/Pond DE** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River EF** Unpaved Kv= 16.1 fps
28.2	2,308	Total			

Subcatchment S1: Swale 1



Summary for Subcatchment S2: Swale 2

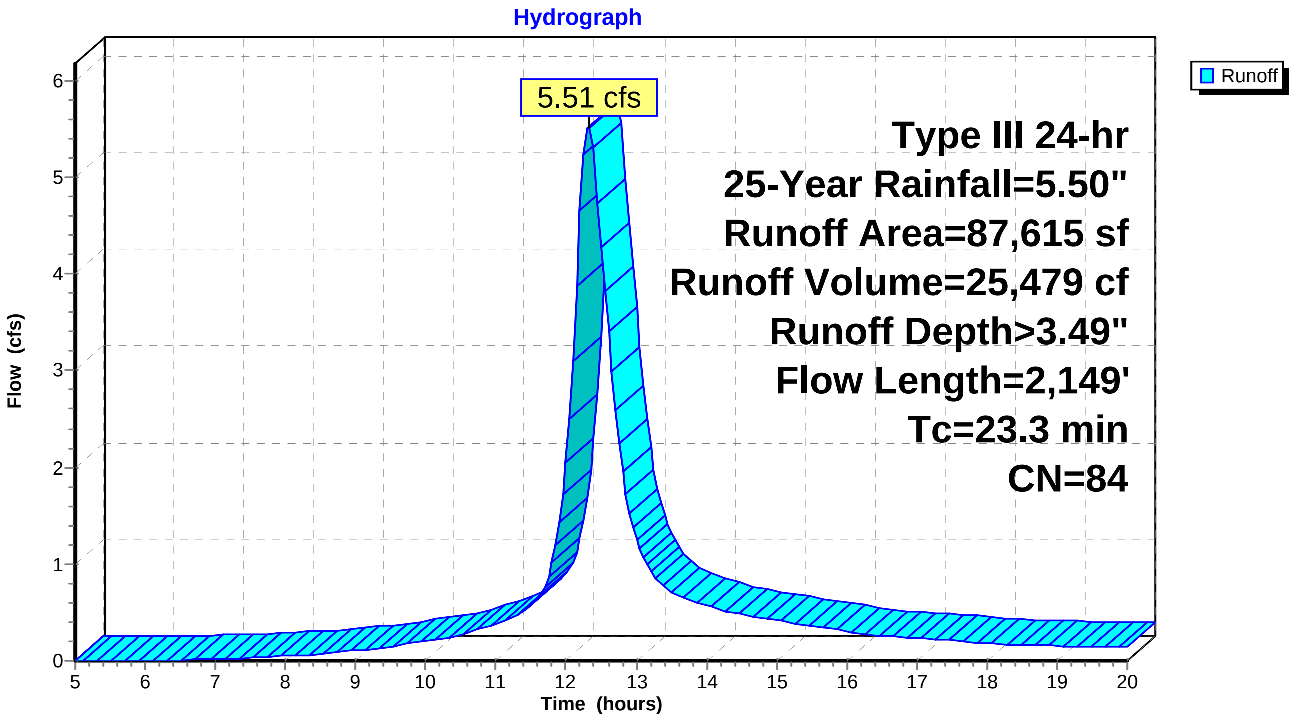
Runoff = 5.51 cfs @ 12.32 hrs, Volume= 25,479 cf, Depth> 3.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
20,096	80	>75% Grass cover, Good, HSG D
67,519	85	1/2 acre lots, 25% imp, HSG D
87,615	84	Weighted Average
70,735		80.73% Pervious Area
16,880		19.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.2	259	0.0480	3.53		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
1.6	215	0.0200	2.28		**Shallow Concentrated Flow, Swale CD** Unpaved Kv= 16.1 fps
0.6	151	0.0050	4.20	7.43	**Pipe Channel, Pipe DE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
0.8	169	0.0470	3.49		**Shallow Concentrated Flow, Grass/Wetland EF** Unpaved Kv= 16.1 fps
14.6	1,261	0.0080	1.44		**Shallow Concentrated Flow, Stream/Pond FG** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River** Unpaved Kv= 16.1 fps
23.3	2,149	Total			

Subcatchment S2: Swale 2



Summary for Subcatchment S3: Swale 3

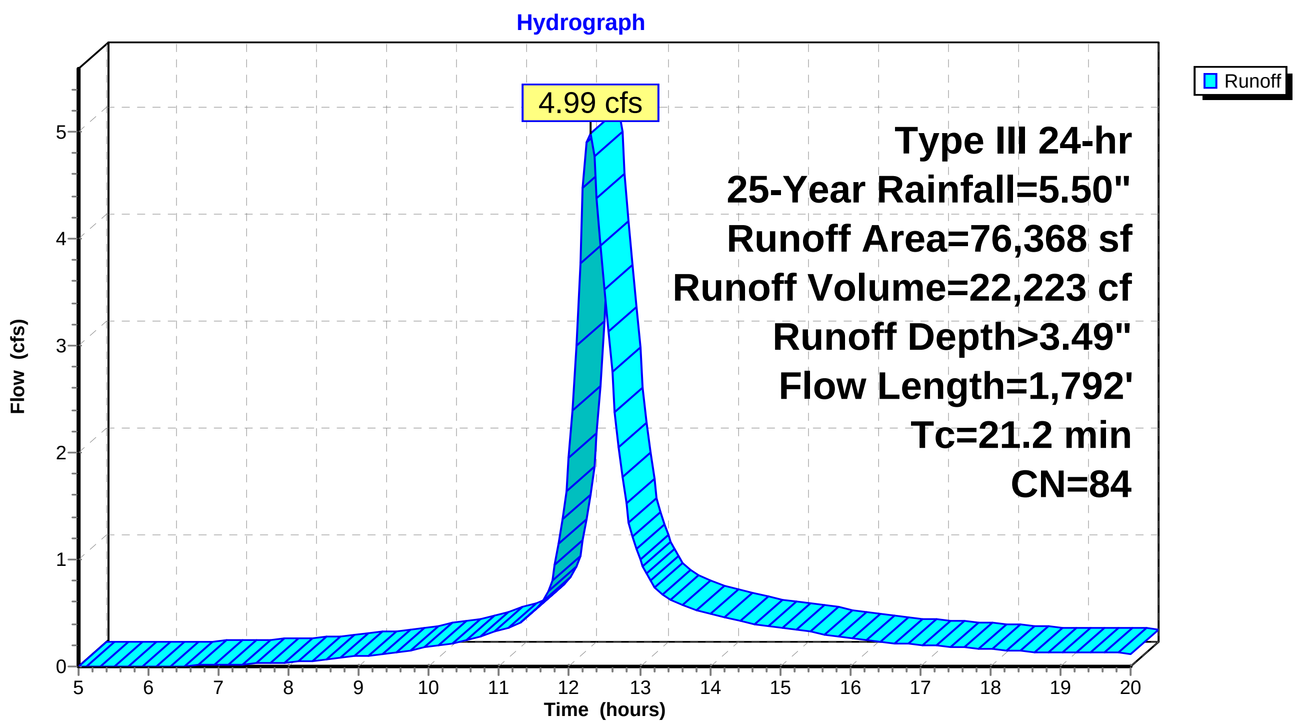
Runoff = 4.99 cfs @ 12.29 hrs, Volume= 22,223 cf, Depth> 3.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
11,535	80	>75% Grass cover, Good, HSG D
64,833	85	1/2 acre lots, 25% imp, HSG D
76,368	84	Weighted Average
60,160		78.78% Pervious Area
16,208		21.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.0	100	0.0100	1.61		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
2.4	452	0.0376	3.12		**Shallow Concentrated Flow, Grass CD** Unpaved Kv= 16.1 fps
0.5	77	0.0286	2.72		**Shallow Concentrated Flow, Swale DE** Unpaved Kv= 16.1 fps
0.2	69	0.0050	4.97	8.78	**Pipe Channel, Pipe EF** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
1.5	305	0.0433	3.35		**Shallow Concentrated Flow, Grass/Wetland FG** Unpaved Kv= 16.1 fps
8.0	695	0.0080	1.44		**Shallow Concentrated Flow, Stream/Pond GH** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River HI** Unpaved Kv= 16.1 fps
21.2	1,792	Total			

Subcatchment S3: Swale 3



Summary for Subcatchment S4: Swale 4

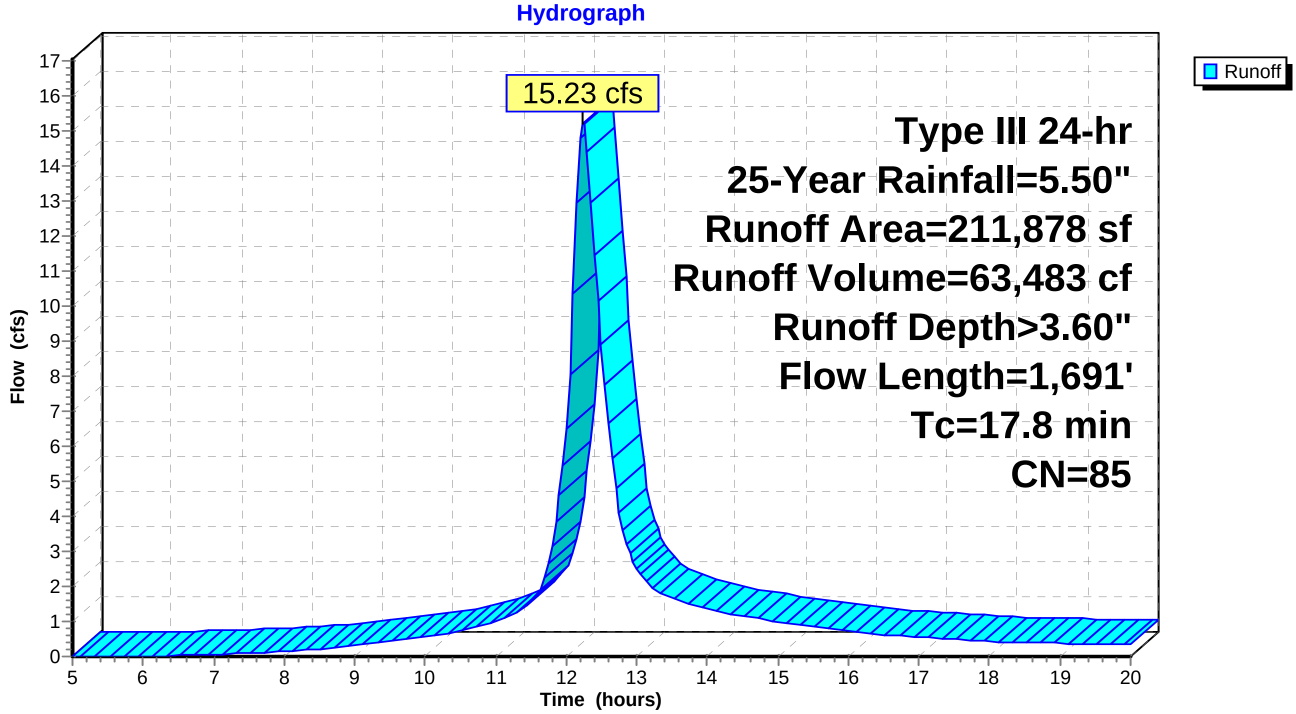
Runoff = 15.23 cfs @ 12.24 hrs, Volume= 63,483 cf, Depth> 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
11,826	80	>75% Grass cover, Good, HSG D
200,052	85	1/2 acre lots, 25% imp, HSG D
211,878	85	Weighted Average
161,865		76.40% Pervious Area
50,013		23.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
3.2	557	0.0333	2.94		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
0.7	162	0.0500	3.60		**Shallow Concentrated Flow, Swale CD** Unpaved Kv= 16.1 fps
0.3	117	0.0050	6.02	18.90	**Pipe Channel, Pipe DE** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.9	168	0.0353	3.02		**Shallow Concentrated Flow, Grass/Wetland EF** Unpaved Kv= 16.1 fps
6.9	593	0.0080	1.44		**Shallow Concentrated Flow, Stream/Pond FG** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River** Unpaved Kv= 16.1 fps
17.8	1,691	Total			

Subcatchment S4: Swale 4



Summary for Subcatchment S5: Swale 5

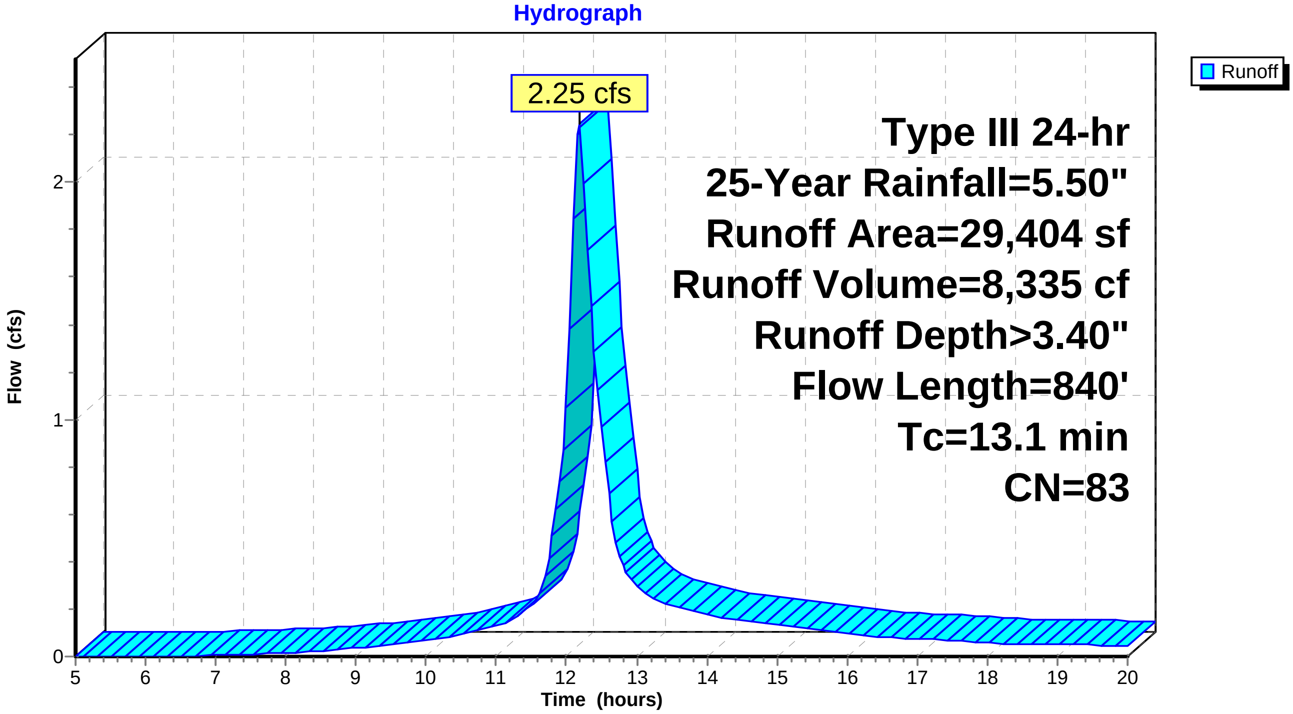
Runoff = 2.25 cfs @ 12.18 hrs, Volume= 8,335 cf, Depth> 3.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
9,317	80	>75% Grass cover, Good, HSG D
20,087	85	1/2 acre lots, 25% imp, HSG D
29,404	83	Weighted Average
24,382		82.92% Pervious Area
5,022		17.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.0	220	0.0500	3.60		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
0.5	89	0.0333	2.94		**Shallow Concentrated Flow, Swale CD** Unpaved Kv= 16.1 fps
0.3	79	0.0050	4.97	8.78	**Pipe Channel, Pipe DE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.1	43	0.1628	6.50		**Shallow Concentrated Flow, Grass/Wetland EF** Unpaved Kv= 16.1 fps
3.6	315	0.0080	1.44		**Shallow Concentrated Flow, Stream/Pond FG** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River** Unpaved Kv= 16.1 fps
13.1	840	Total			

Subcatchment S5: Swale 5



Summary for Subcatchment S6: Swale 6

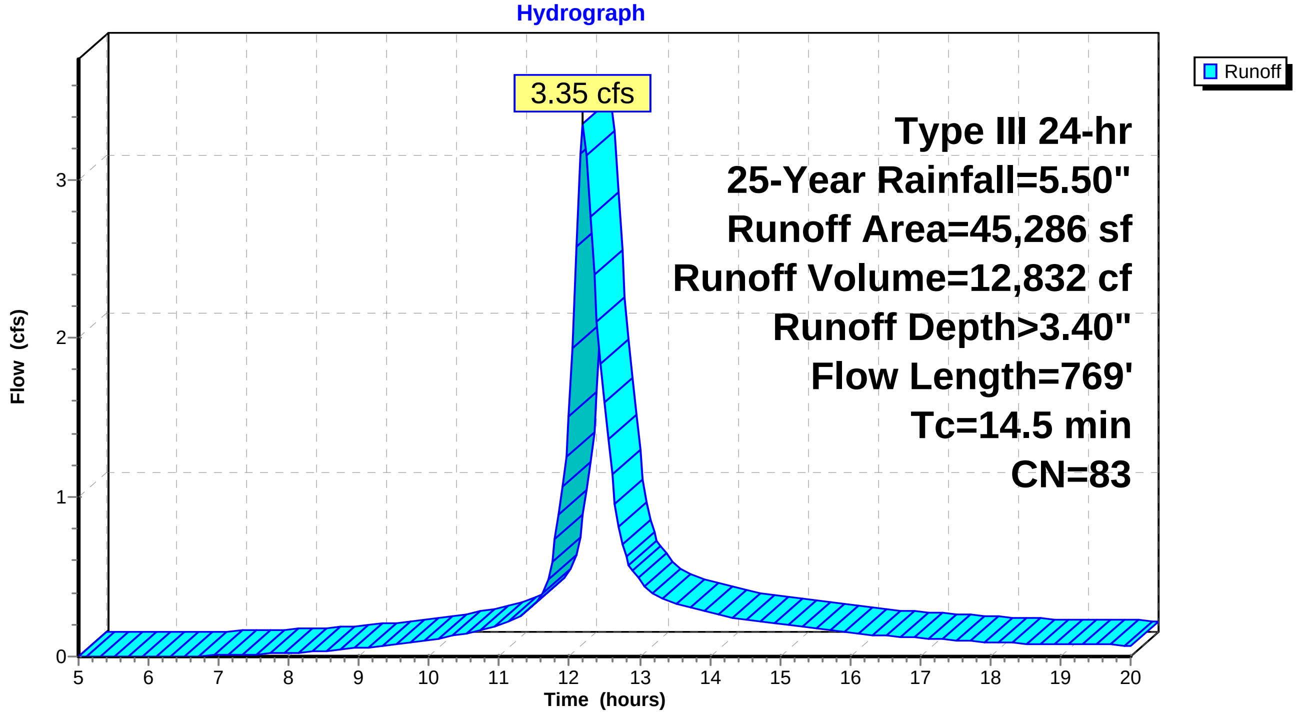
Runoff = 3.35 cfs @ 12.20 hrs, Volume= 12,832 cf, Depth> 3.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
1,558	61	>75% Grass cover, Good, HSG B
1,257	70	1/2 acre lots, 25% imp, HSG B
5,287	80	>75% Grass cover, Good, HSG D
37,184	85	1/2 acre lots, 25% imp, HSG D
45,286	83	Weighted Average
35,676		78.78% Pervious Area
9,610		21.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0050	0.09		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.5	282	0.0360	3.05		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
2.0	125	0.0040	1.02		**Shallow Concentrated Flow, Swale CD** Unpaved Kv= 16.1 fps
0.4	145	0.0200	6.42	5.04	**Pipe Channel, Pipe DE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.8	167	0.0480	3.53		**Shallow Concentrated Flow, Grass EF** Unpaved Kv= 16.1 fps
14.5	769	Total			

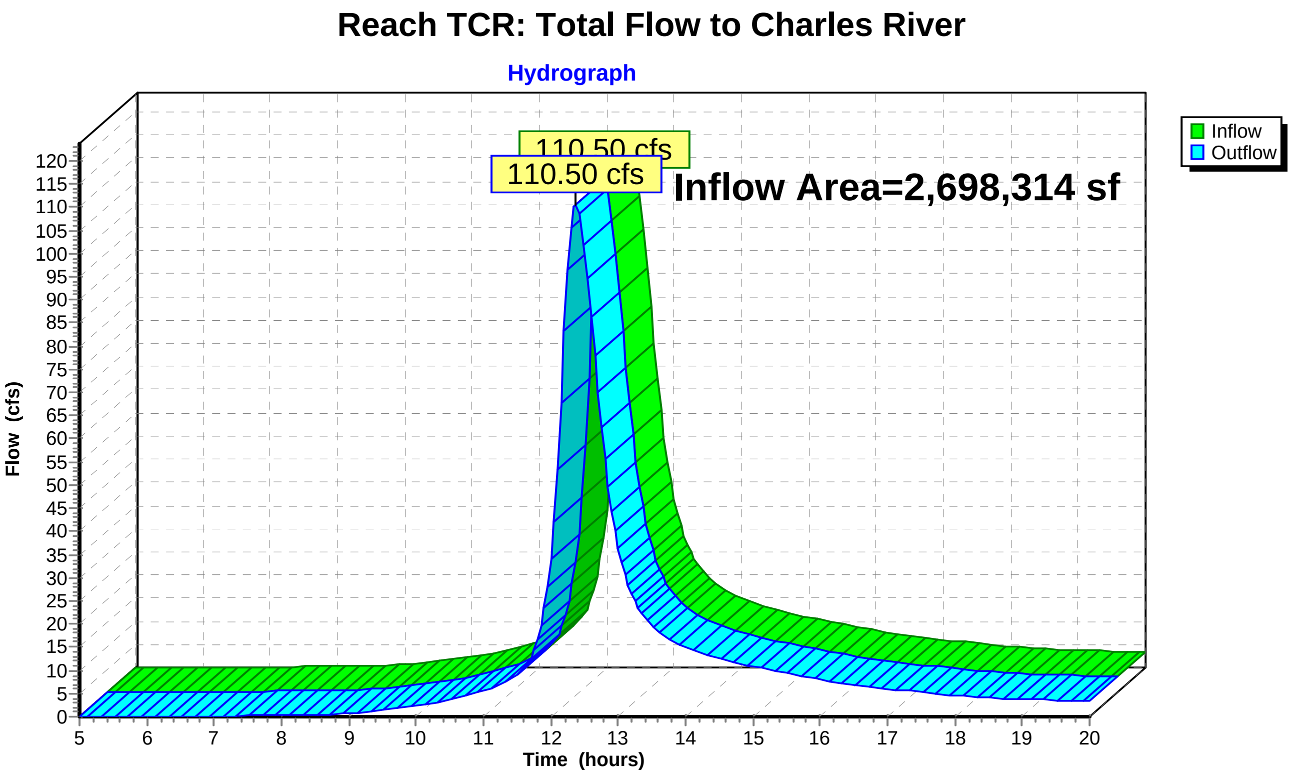
Subcatchment S6: Swale 6



Summary for Reach TCR: Total Flow to Charles River

Inflow Area = 2,698,314 sf, 19.91% Impervious, Inflow Depth > 2.50" for 25-Year event
Inflow = 110.50 cfs @ 12.38 hrs, Volume= 561,285 cf
Outflow = 110.50 cfs @ 12.38 hrs, Volume= 561,285 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



Summary for Pond B1: BASIN 1

Inflow Area = 69,032 sf, 72.77% Impervious, Inflow Depth > 3.90" for 25-Year event
Inflow = 5.29 cfs @ 12.24 hrs, Volume= 22,447 cf
Outflow = 0.38 cfs @ 14.59 hrs, Volume= 12,960 cf, Atten= 93%, Lag= 141.0 min
Discarded = 0.38 cfs @ 14.59 hrs, Volume= 12,960 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 178.55' @ 14.59 hrs Surf.Area= 6,738 sf Storage= 12,700 cf

Plug-Flow detention time= 190.4 min calculated for 12,916 cf (58% of inflow)
Center-of-Mass det. time= 114.2 min (887.7 - 773.5)

Volume	Invert	Avail.Storage	Storage Description
#1	176.00'	33,722 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

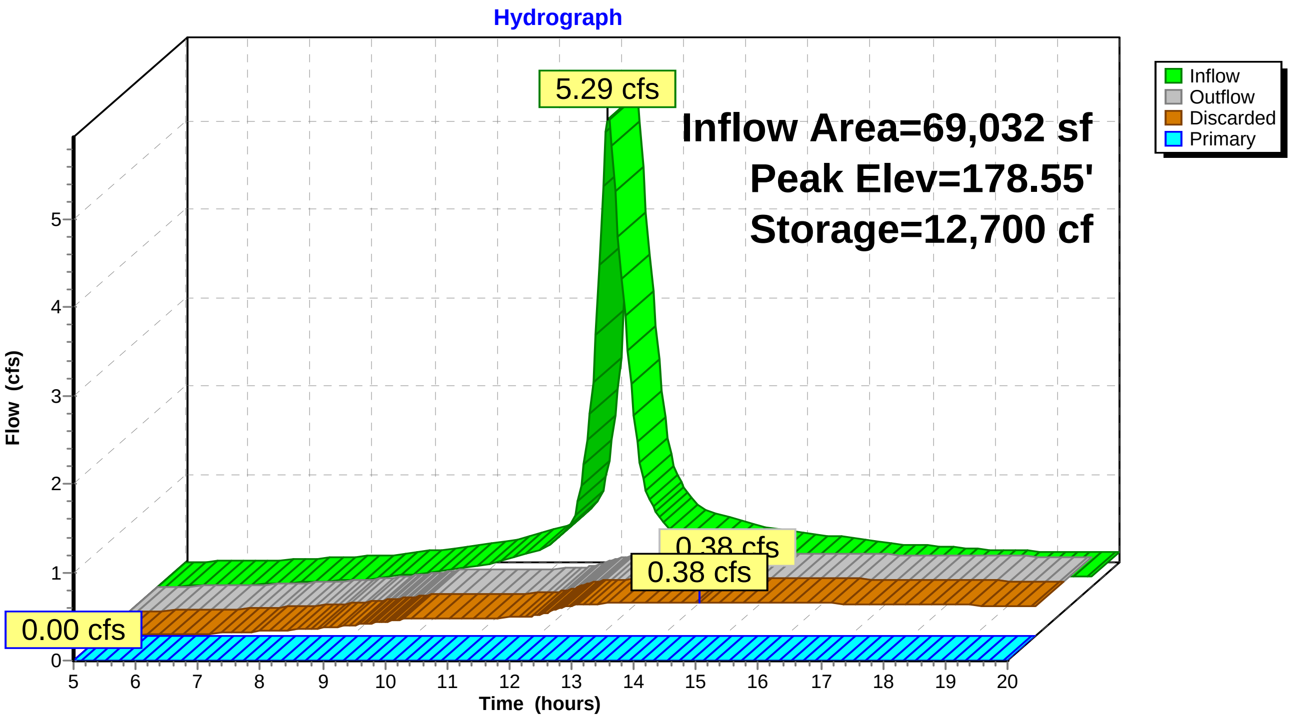
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
176.00	3,342	0	0
177.00	4,577	3,960	3,960
178.00	5,952	5,265	9,224
179.00	7,387	6,670	15,894
180.00	8,885	8,136	24,030
181.00	10,500	9,693	33,722

Device	Routing	Invert	Outlet Devices
#1	Primary	174.00'	**4.0" Round Culvert** L= 36.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 174.00' / 173.50' S= 0.0139 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf
#2	Device 1	179.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	179.25'	**1.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	179.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	179.90'	**20.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#6	Discarded	176.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.38 cfs @ 14.59 hrs HW=178.55' (Free Discharge)
└─**6=Exfiltration** (Exfiltration Controls 0.38 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=176.00' (Free Discharge)
├─**1=Culvert** (Passes 0.00 cfs of 0.48 cfs potential flow)
│ ├─**2=Orifice/Grate** (Controls 0.00 cfs)
│ ├─**3=Orifice/Grate** (Controls 0.00 cfs)
│ └─**4=Orifice/Grate** (Controls 0.00 cfs)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B1: BASIN 1



Summary for Pond B3: BASIN 3

Inflow Area = 117,451 sf, 81.01% Impervious, Inflow Depth > 4.52" for 25-Year event
Inflow = 11.23 cfs @ 12.17 hrs, Volume= 44,250 cf
Outflow = 0.68 cfs @ 14.47 hrs, Volume= 21,993 cf, Atten= 94%, Lag= 137.7 min
Discarded = 0.48 cfs @ 14.47 hrs, Volume= 17,638 cf
Primary = 0.20 cfs @ 14.47 hrs, Volume= 4,355 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 177.84' @ 14.47 hrs Surf.Area= 8,381 sf Storage= 27,432 cf

Plug-Flow detention time= 211.5 min calculated for 21,914 cf (50% of inflow)
Center-of-Mass det. time= 120.9 min (872.7 - 751.8)

Volume	Invert	Avail.Storage	Storage Description
#1	173.00'	49,214 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

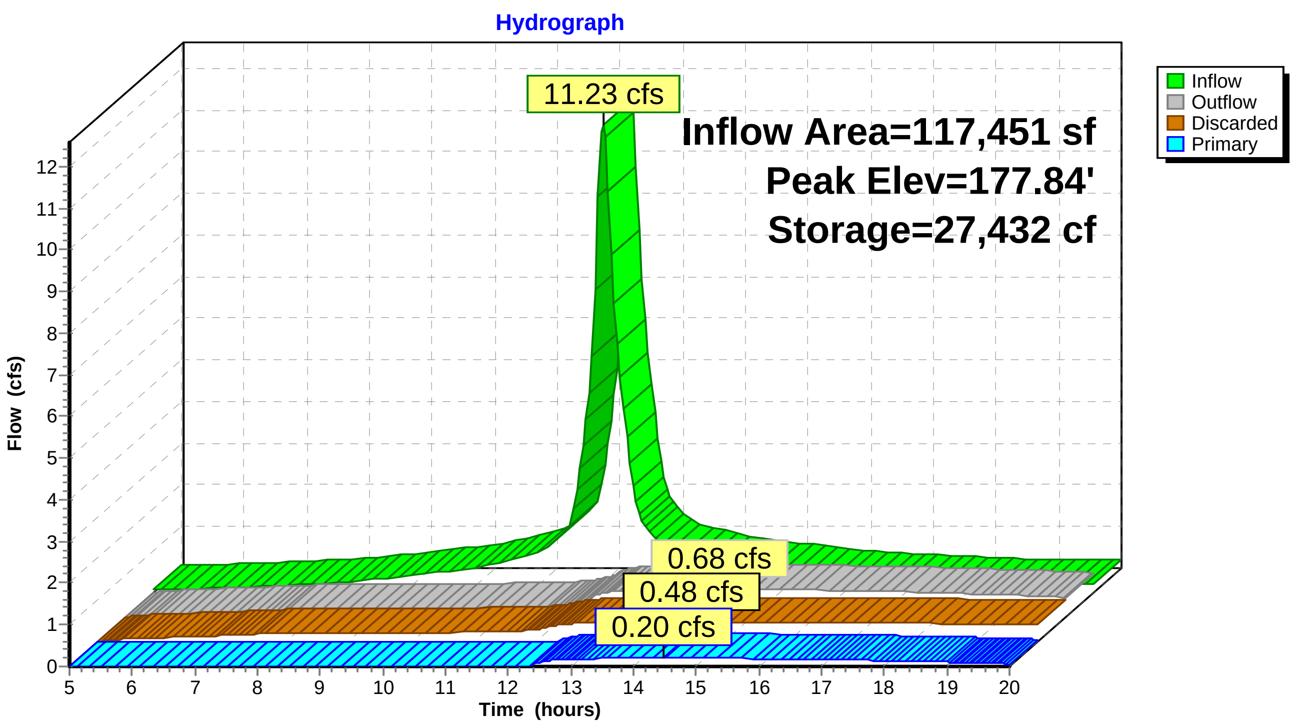
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
173.00	3,533	0	0	3,533
174.00	4,314	3,917	3,917	4,345
175.00	5,173	4,737	8,654	5,238
176.00	6,120	5,640	14,294	6,222
177.00	7,172	6,639	20,933	7,312
178.00	8,628	7,889	28,822	8,802
179.00	10,102	9,355	38,177	10,315
180.00	12,000	11,037	49,214	12,250

Device	Routing	Invert	Outlet Devices
#1	Primary	168.00'	**6.0" Round Culvert** L= 53.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 168.00' / 166.94' S= 0.0200 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#2	Device 1	177.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	178.50'	**24.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	178.90'	**20.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#5	Discarded	173.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.48 cfs @ 14.47 hrs HW=177.84' (Free Discharge)
└─**5=Exfiltration** (Exfiltration Controls 0.48 cfs)

Primary OutFlow Max=0.20 cfs @ 14.47 hrs HW=177.84' (Free Discharge)
├─**1=Culvert** (Passes 0.20 cfs of 2.48 cfs potential flow)
│ ├─**2=Orifice/Grate** (Orifice Controls 0.20 cfs @ 4.06 fps)
│ └─**3=Orifice/Grate** (Controls 0.00 cfs)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B3: BASIN 3



Summary for Pond T18A: TRENCH 18A

Inflow Area = 267,248 sf, 56.20% Impervious, Inflow Depth > 3.21" for 25-Year event
Inflow = 20.11 cfs @ 12.17 hrs, Volume= 71,465 cf
Outflow = 9.94 cfs @ 12.43 hrs, Volume= 57,152 cf, Atten= 51%, Lag= 15.8 min
Discarded = 0.48 cfs @ 10.00 hrs, Volume= 19,325 cf
Primary = 9.45 cfs @ 12.43 hrs, Volume= 37,828 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 175.83' @ 12.43 hrs Surf.Area= 8,648 sf Storage= 25,424 cf

Plug-Flow detention time= 96.7 min calculated for 57,152 cf (80% of inflow)
Center-of-Mass det. time= 44.0 min (830.3 - 786.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	171.75'	11,805 cf	**44.75'W x 193.25'L x 5.75'H Field A**
			49,726 cf Overall - 20,213 cf Embedded = 29,513 cf x 40.0% Voids
#2A	172.50'	20,213 cf	**Cultec R-900HD** x 162 Inside #1
			Effective Size= 72.7"W x 48.0"H => 17.61 sf x 7.00'L = 123.3 cf
			Overall Size= 78.0"W x 48.0"H x 9.25'L with 2.25' Overlap
			Row Length Adjustment= +2.25' x 17.61 sf x 6 rows
		32,018 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	174.00'	**24.0" Round Culvert**
			L= 5.0' CPP, mitered to conform to fill, Ke= 0.700
			Inlet / Outlet Invert= 174.00' / 174.00' S= 0.0000 '/' Cc= 0.900
			n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#2	Discarded	171.75'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.48 cfs @ 10.00 hrs HW=171.81' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.48 cfs)

Primary OutFlow Max=9.41 cfs @ 12.43 hrs HW=175.82' (Free Discharge)
└─**1=Culvert** (Barrel Controls 9.41 cfs @ 4.12 fps)

Pond T18A: TRENCH 18A - Chamber Wizard Field A

Chamber Model = Cultec R-900HD
Effective Size= 72.7"W x 48.0"H => 17.61 sf x 7.00'L = 123.3 cf
Overall Size= 78.0"W x 48.0"H x 9.25'L with 2.25' Overlap
Row Length Adjustment= +2.25' x 17.61 sf x 6 rows

78.0" Wide + 9.0" Spacing = 87.0" C-C Row Spacing

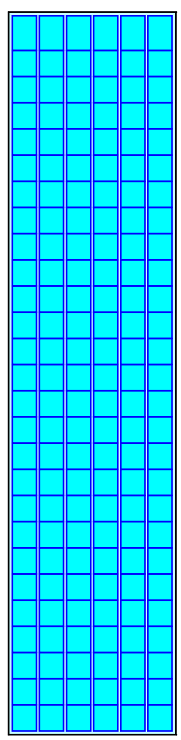
27 Chambers/Row x 7.00' Long +2.25' Row Adjustment = 191.25' Row Length +12.0" End Stone x 2 = 193.25' Base Length
6 Rows x 78.0" Wide + 9.0" Spacing x 5 + 12.0" Side Stone x 2 = 44.75' Base Width
9.0" Base + 48.0" Chamber Height + 12.0" Cover = 5.75' Field Height

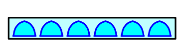
162 Chambers x 123.3 cf +2.25' Row Adjustment x 17.61 sf x 6 Rows = 20,212.9 cf Chamber Storage

49,725.6 cf Field - 20,212.9 cf Chambers = 29,512.7 cf Stone x 40.0% Voids = 11,805.1 cf Stone Storage

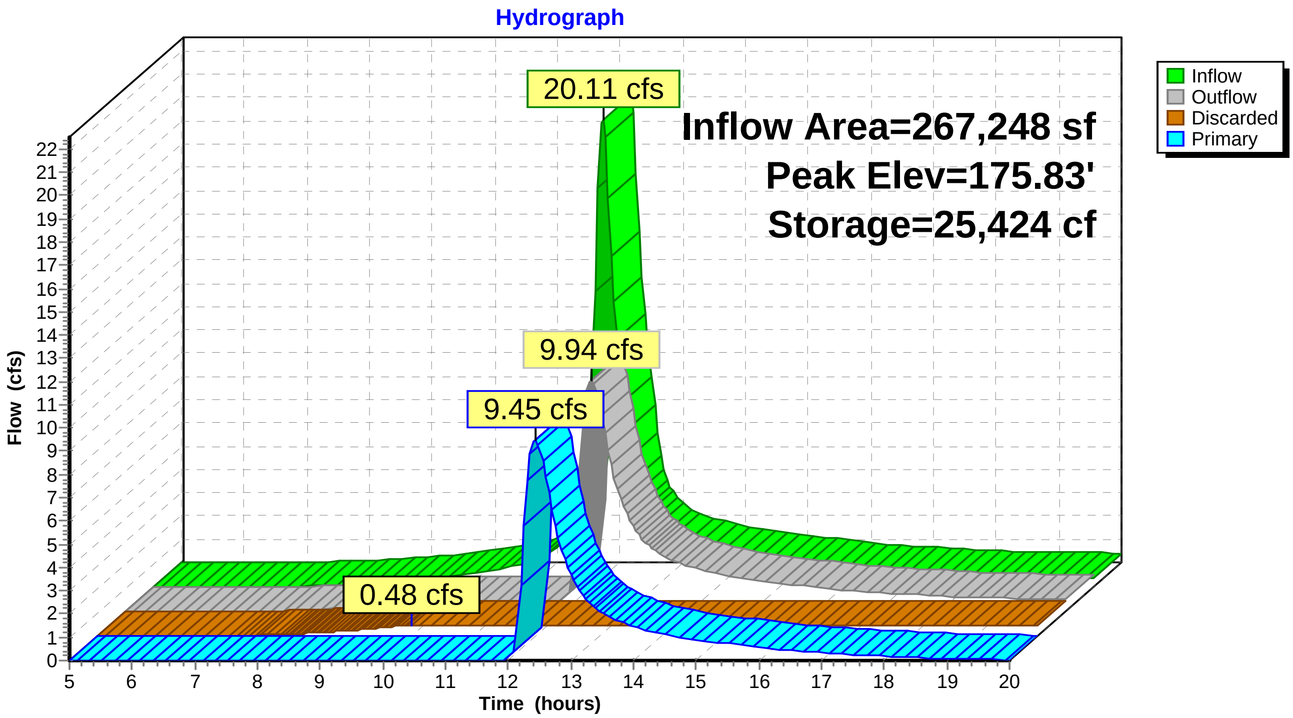
Chamber Storage + Stone Storage = 32,018.0 cf = 0.735 af
Overall Storage Efficiency = 64.4%

162 Chambers
1,841.7 cy Field
1,093.1 cy Stone





Pond T18A: TRENCH 18A



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

Subcatchment CR: Charles River Runoff Area=1,730,442 sf 7.48% Impervious Runoff Depth>3.50"
Flow Length=2,022' Tc=29.7 min CN=74 Runoff=99.87 cfs 504,842 cf

Subcatchment IR: Intermediate Roadway Runoff Area=69,032 sf 72.77% Impervious Runoff Depth>5.00"
Flow Length=1,790' Tc=17.9 min CN=88 Runoff=6.69 cfs 28,748 cf

Subcatchment MC: Main Campus Runoff Area=267,248 sf 56.20% Impervious Runoff Depth>4.25"
Flow Length=1,577' Tc=12.0 min CN=81 Runoff=26.36 cfs 94,604 cf

Subcatchment OSW: Off Site West Runoff Area=31,028 sf 0.60% Impervious Runoff Depth>2.74"
Flow Length=178' Tc=7.7 min CN=66 Runoff=2.29 cfs 7,093 cf

Subcatchment PD: Pond Drive Runoff Area=117,451 sf 81.01% Impervious Runoff Depth>5.63"
Flow Length=1,713' Tc=12.9 min CN=94 Runoff=13.85 cfs 55,085 cf

Subcatchment S1: Swale 1 Runoff Area=63,590 sf 22.91% Impervious Runoff Depth>4.66"
Flow Length=2,308' Tc=28.2 min CN=85 Runoff=4.84 cfs 24,680 cf

Subcatchment S2: Swale 2 Runoff Area=87,615 sf 19.27% Impervious Runoff Depth>4.56"
Flow Length=2,149' Tc=23.3 min CN=84 Runoff=7.11 cfs 33,259 cf

Subcatchment S3: Swale 3 Runoff Area=76,368 sf 21.22% Impervious Runoff Depth>4.56"
Flow Length=1,792' Tc=21.2 min CN=84 Runoff=6.44 cfs 29,007 cf

Subcatchment S4: Swale 4 Runoff Area=211,878 sf 23.60% Impervious Runoff Depth>4.67"
Flow Length=1,691' Tc=17.8 min CN=85 Runoff=19.54 cfs 82,477 cf

Subcatchment S5: Swale 5 Runoff Area=29,404 sf 17.08% Impervious Runoff Depth>4.46"
Flow Length=840' Tc=13.1 min CN=83 Runoff=2.92 cfs 10,930 cf

Subcatchment S6: Swale 6 Runoff Area=45,286 sf 21.22% Impervious Runoff Depth>4.46"
Flow Length=769' Tc=14.5 min CN=83 Runoff=4.35 cfs 16,826 cf

Reach TCR: Total Flow to Charles River Inflow=153.28 cfs 769,985 cf
Outflow=153.28 cfs 769,985 cf

Pond B1: BASIN 1 Peak Elev=179.13' Storage=16,904 cf Inflow=6.69 cfs 28,748 cf
Discarded=0.42 cfs 14,887 cf Primary=0.05 cfs 434 cf Outflow=0.48 cfs 15,322 cf

Pond B3: BASIN 3 Peak Elev=178.54' Storage=33,723 cf Inflow=13.85 cfs 55,085 cf
Discarded=0.54 cfs 19,821 cf Primary=0.68 cfs 8,469 cf Outflow=1.22 cfs 28,290 cf

Pond T18A: TRENCH 18A Peak Elev=176.76' Storage=29,449 cf Inflow=26.36 cfs 94,604 cf
Discarded=0.48 cfs 20,647 cf Primary=16.63 cfs 59,061 cf Outflow=17.12 cfs 79,707 cf

Total Runoff Area = 2,729,342 sf Runoff Volume = 887,552 cf Average Runoff Depth = 3.90"
80.31% Pervious = 2,191,860 sf 19.69% Impervious = 537,482 sf

Summary for Subcatchment CR: Charles River

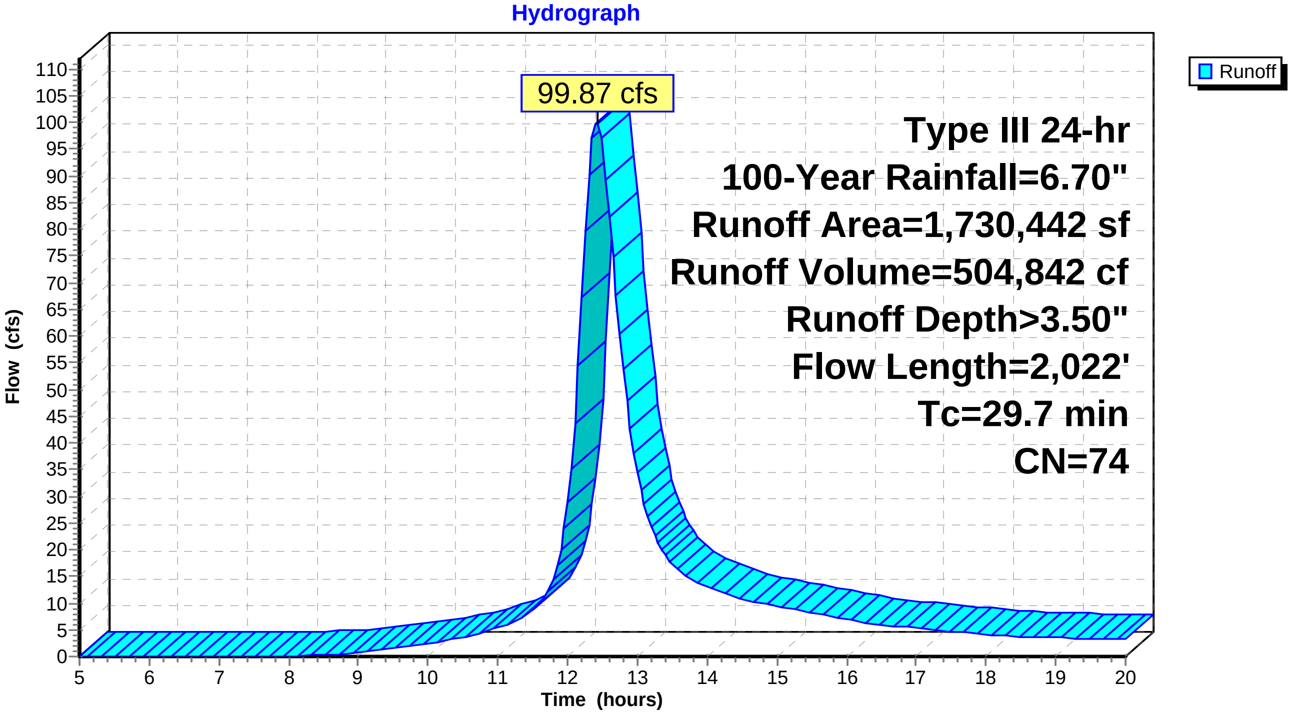
Runoff = 99.87 cfs @ 12.41 hrs, Volume= 504,842 cf, Depth> 3.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
	10,067	30	Woods, Good, HSG A
	5,689	39	>75% Grass cover, Good, HSG A
*	3,253	78	Wetland, HSG A
*	205	72	Path, HSG A
	201,555	55	Woods, Good, HSG B
	211,820	61	>75% Grass cover, Good, HSG B
*	103,465	78	Wetlands, HSG B
*	10,318	82	Path, HSG B
*	2,704	80	Path in Resource, HSG B
	4,112	98	Water Surface, HSG B
	33,426	70	Woods, Good, HSG C
	758	74	>75% Grass cover, Good, HSG C
*	141,675	78	Wetlands, HSG C
*	3,310	87	Path, HSG C
*	6,129	80	Path in Resource, HSG C
	10,807	98	Water Surface, HSG C
	438,769	77	Woods, Good, HSG D
	61,238	80	>75% Grass cover, Good, HSG D
*	227,701	78	Wetlands, HSG D
*	27,658	89	Path, HSG D
*	9,556	80	Path in Resource, HSG D
	45,917	98	Water Surface, HSG D
	20,004	70	1/2 acre lots, 25% imp, HSG B
	54,729	80	1/2 acre lots, 25% imp, HSG C
	60,917	85	1/2 acre lots, 25% imp, HSG D
*	34,660	98	impervious
	1,730,442	74	Weighted Average
	1,601,034		92.52% Pervious Area
	129,409		7.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, Sheet A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
3.1	329	0.0120	1.76		**Shallow Concentrated Flow, Wetland B-C** Unpaved Kv= 16.1 fps
18.5	1,599	0.0080	1.44		**Shallow Concentrated Flow, Wetland/Stream/Pond C-D** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River D-E** Unpaved Kv= 16.1 fps
29.7	2,022	Total			

Subcatchment CR: Charles River



Summary for Subcatchment IR: Intermediate Roadway

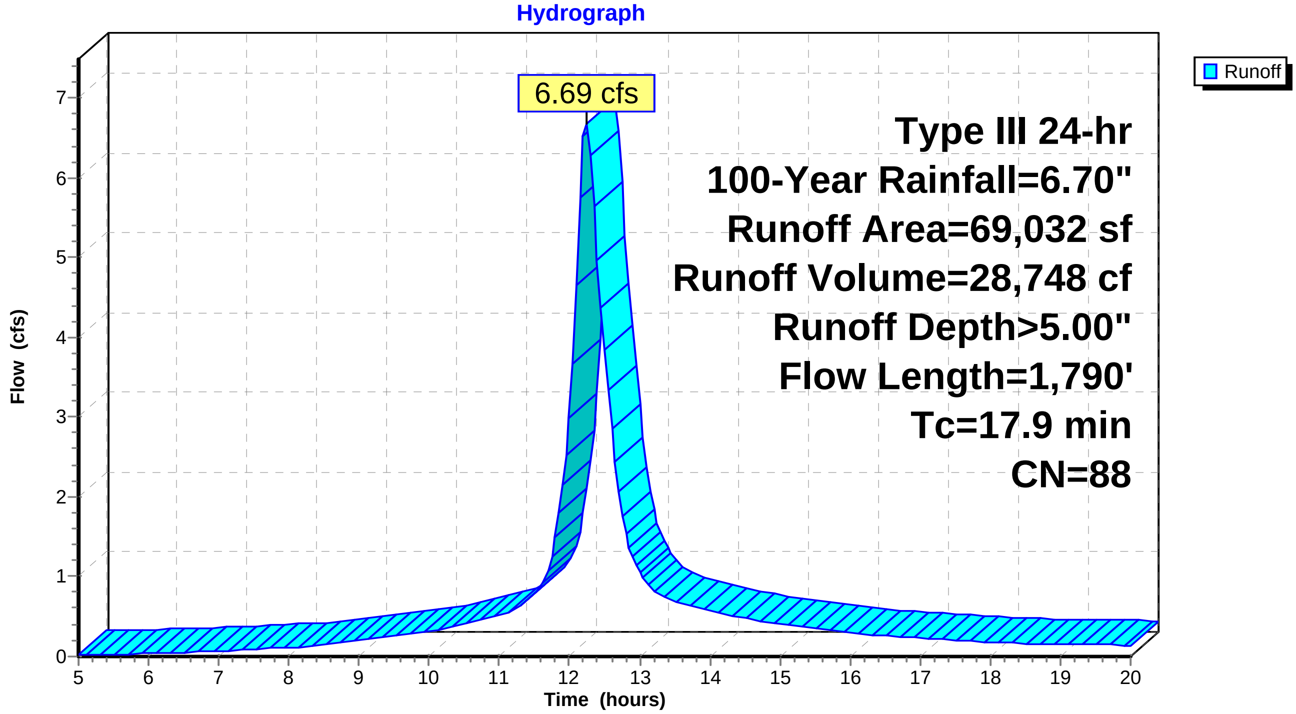
Runoff = 6.69 cfs @ 12.24 hrs, Volume= 28,748 cf, Depth> 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
	17,093	61	>75% Grass cover, Good, HSG B
	1,704	80	>75% Grass cover, Good, HSG D
	28,466	98	Paved roads w/curbs & sewers, HSG B
	8,209	98	Paved roads w/curbs & sewers, HSG D
*	13,560	98	Cottages
	69,032	88	Weighted Average
	18,797		27.23% Pervious Area
	50,235		72.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Sheet A-B** Grass: Short n= 0.150 P2= 3.20"
0.1	9	0.0200	2.28		**Shallow Concentrated Flow, Grass B-C** Unpaved Kv= 16.1 fps
0.3	47	0.0200	2.87		**Shallow Concentrated Flow, Paved C-D** Paved Kv= 20.3 fps
3.1	593	0.0050	3.21	2.52	**Pipe Channel, Pipe D-E** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.3	153		8.02		**Lake or Reservoir, Basin E-F** Mean Depth= 2.00'
0.5	46	0.0050	1.54	0.13	**Pipe Channel, Pipe F-E** 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.013 Corrugated PE, smooth interior
1.4	149	0.0130	1.84		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
2.4	333	0.0200	2.28		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
4.2	410	0.0100	1.61		**Shallow Concentrated Flow, Unpaved** Unpaved Kv= 16.1 fps
17.9	1,790	Total			

Subcatchment IR: Intermediate Roadway



Summary for Subcatchment MC: Main Campus

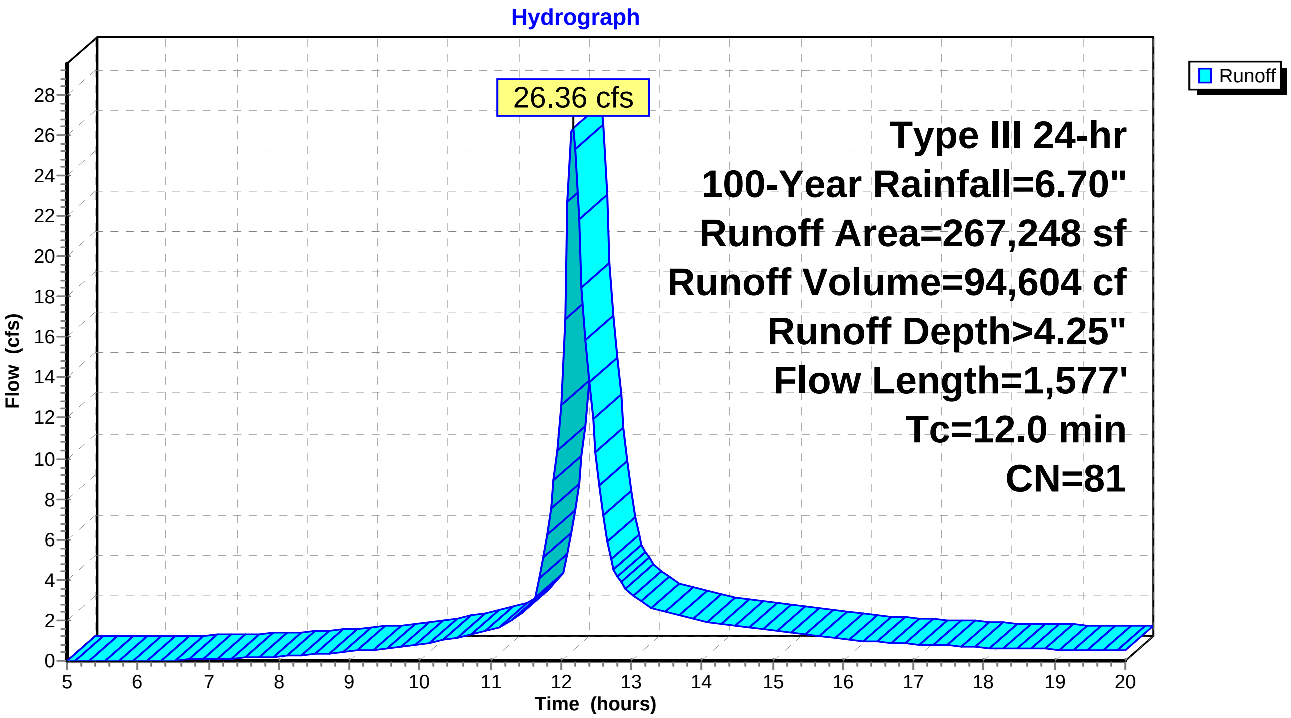
Runoff = 26.36 cfs @ 12.16 hrs, Volume= 94,604 cf, Depth> 4.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
22,404	39	>75% Grass cover, Good, HSG A
82,752	61	>75% Grass cover, Good, HSG B
11,890	80	>75% Grass cover, Good, HSG D
30,503	98	Paved roads w/curbs & sewers, HSG A
96,592	98	Paved roads w/curbs & sewers, HSG B
23,107	98	Paved roads w/curbs & sewers, HSG D
267,248	81	Weighted Average
117,046		43.80% Pervious Area
150,202		56.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	43	0.0200	0.14		**Sheet Flow, Sheet Grass A-B** Grass: Short n= 0.150 P2= 3.20"
0.1	7	0.0200	0.81		**Sheet Flow, Sheet-Pave B-C** Smooth surfaces n= 0.011 P2= 3.20"
1.3	217	0.0200	2.87		**Shallow Concentrated Flow, Paved C-D** Paved Kv= 20.3 fps
1.1	211	0.0050	3.21	2.52	**Pipe Channel, Pipe D-E** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
1.6	397	0.0050	4.20	7.43	**Pipe Channel, Pipe E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
1.6	490	0.0050	5.09	16.00	**Pipe Channel, Pipe F-G** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
0.0	24		8.97		**Lake or Reservoir, Lake G-H** Mean Depth= 2.50'
0.5	42	0.0050	1.54	0.13	**Pipe Channel, Pipe F-G** 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.013 Corrugated PE, smooth interior
0.8	146	0.0400	3.22		**Shallow Concentrated Flow, Unpaved I-J** Unpaved Kv= 16.1 fps
12.0	1,577	Total			

Subcatchment MC: Main Campus



Summary for Subcatchment OSW: Off Site West

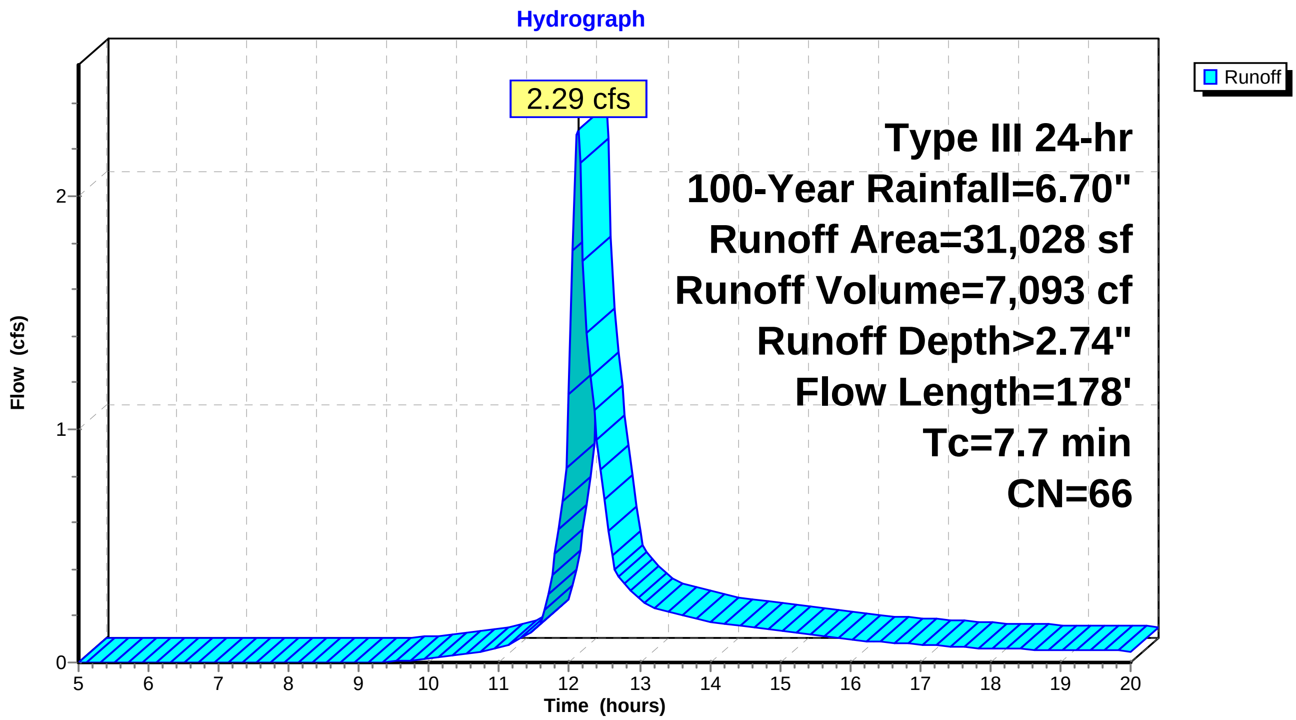
Runoff = 2.29 cfs @ 12.12 hrs, Volume= 7,093 cf, Depth> 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
	2,983	55	Woods, Good, HSG B
	15,112	61	>75% Grass cover, Good, HSG B
*	1,048	80	Path(cover unknown)
	185	98	Unconnected pavement, HSG B
	8,058	80	>75% Grass cover, Good, HSG D
*	3,642	60	Permeable Parking Area
	31,028	66	Weighted Average
	30,843		99.40% Pervious Area
	185		0.60% Impervious Area
	185		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	128	0.0540	3.74		**Shallow Concentrated Flow, Wooded/Path/Wooded B-C** Unpaved Kv= 16.1 fps
7.7	178	Total			

Subcatchment OSW: Off Site West



Summary for Subcatchment PD: Pond Drive

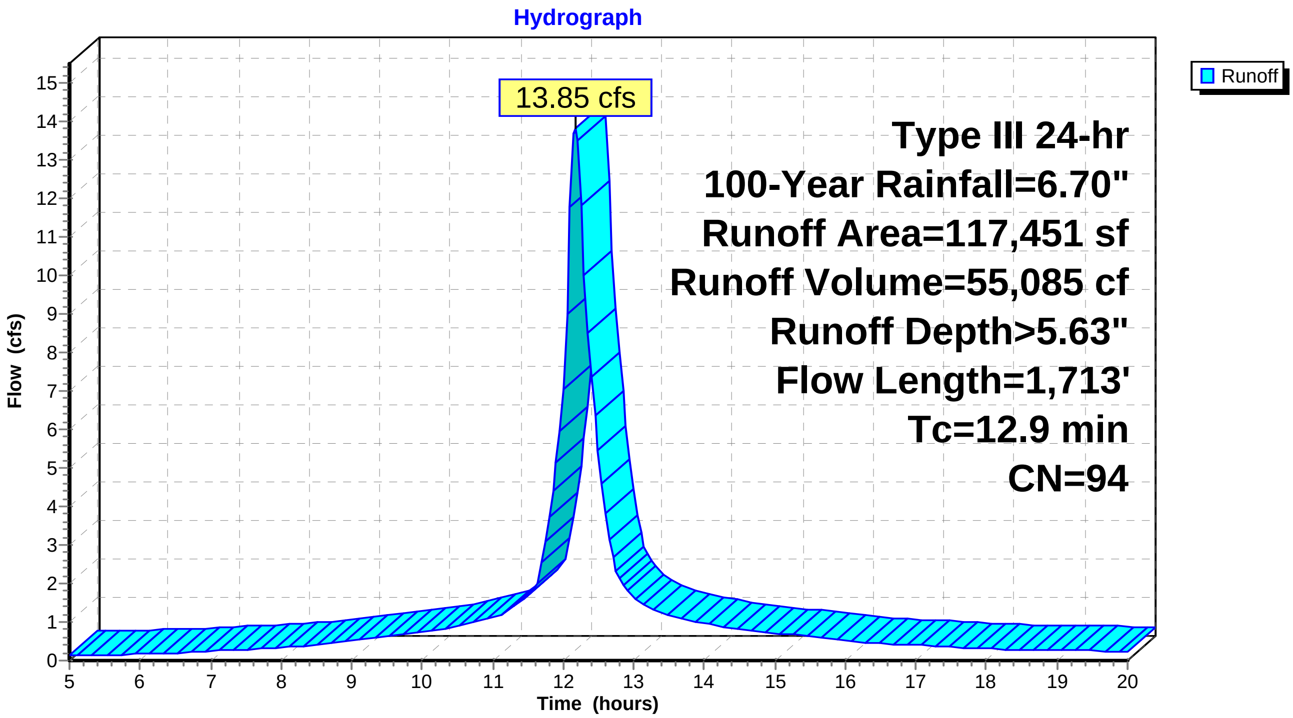
Runoff = 13.85 cfs @ 12.17 hrs, Volume= 55,085 cf, Depth> 5.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
	1,964	61	>75% Grass cover, Good, HSG B
	5,597	98	Paved roads w/curbs & sewers, HSG B
	20,295	80	>75% Grass cover, Good, HSG D
*	43	89	Path, HSG D
	55,952	98	Paved roads w/curbs & sewers, HSG D
*	33,600	98	
	117,451	94	Weighted Average
	22,302		18.99% Pervious Area
	95,149		81.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	42	0.0200	0.14		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
0.2	8	0.0200	0.83		**Sheet Flow, Sheet BC** Smooth surfaces n= 0.011 P2= 3.20"
0.7	127	0.0200	2.87		**Shallow Concentrated Flow, Paved CD** Paved Kv= 20.3 fps
0.2	30	0.0050	3.21	2.52	**Pipe Channel, Pipe DE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
3.9	982	0.0050	4.20	7.43	**Pipe Channel, Pipe EF** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
0.6	195	0.0050	5.09	16.00	**Pipe Channel, Pipe FG** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
0.2	77		8.02		**Lake or Reservoir, Basin GH** Mean Depth= 2.00'
0.5	62	0.0050	2.02	0.40	**Pipe Channel, Pipe HI** 6.0" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.013 Corrugated PE, smooth interior
0.7	89	0.0200	2.28		**Shallow Concentrated Flow, Unpaved IJ** Unpaved Kv= 16.1 fps
0.8	57	0.0050	1.14		**Shallow Concentrated Flow, Unpaved JK** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Upaved KL** Unpaved Kv= 16.1 fps
12.9	1,713	Total			

Subcatchment PD: Pond Drive



Summary for Subcatchment S1: Swale 1

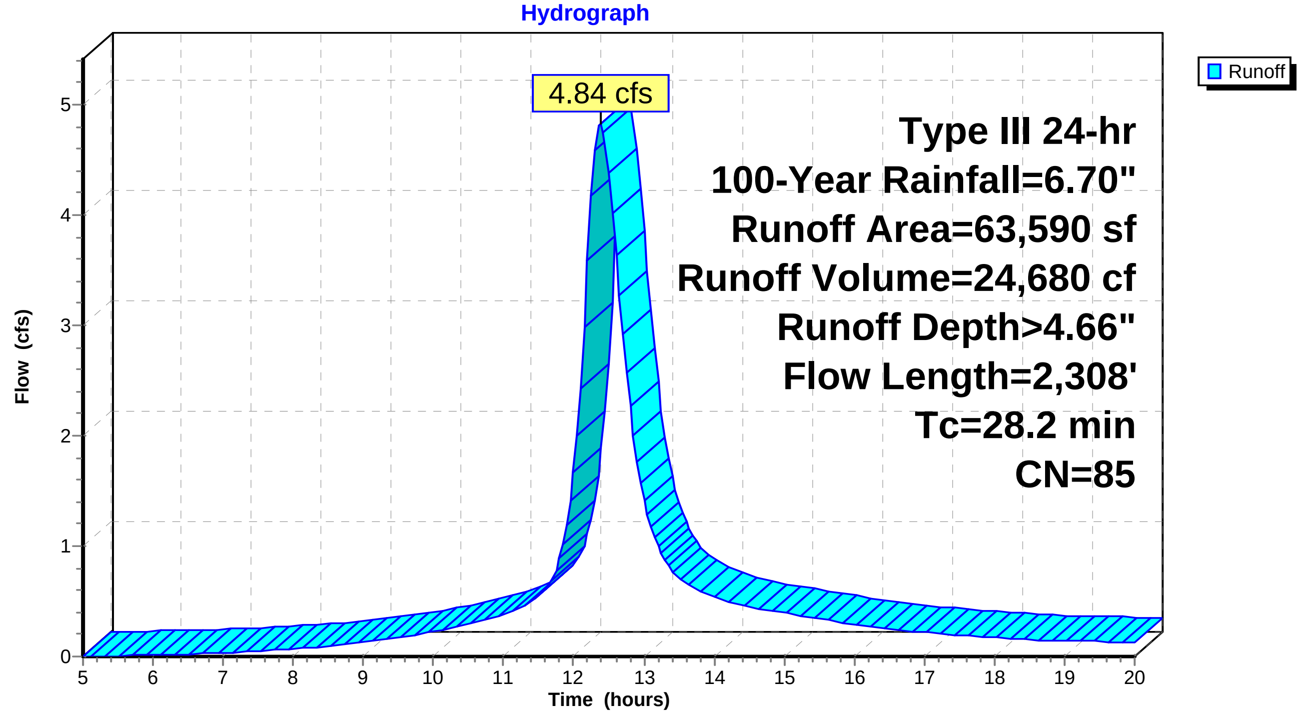
Runoff = 4.84 cfs @ 12.38 hrs, Volume= 24,680 cf, Depth> 4.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
5,311	80	>75% Grass cover, Good, HSG D
58,279	85	1/2 acre lots, 25% imp, HSG D
63,590	85	Weighted Average
49,020		77.09% Pervious Area
14,570		22.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	50	0.0350	0.19		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.8	313	0.0333	2.94		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
0.1	39	0.0050	4.97	8.78	**Pipe Channel, Pipe CD** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
21.6	1,862	0.0080	1.44		**Shallow Concentrated Flow, Wetland/Stream/Pond DE** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River EF** Unpaved Kv= 16.1 fps
28.2	2,308	Total			

Subcatchment S1: Swale 1



Summary for Subcatchment S2: Swale 2

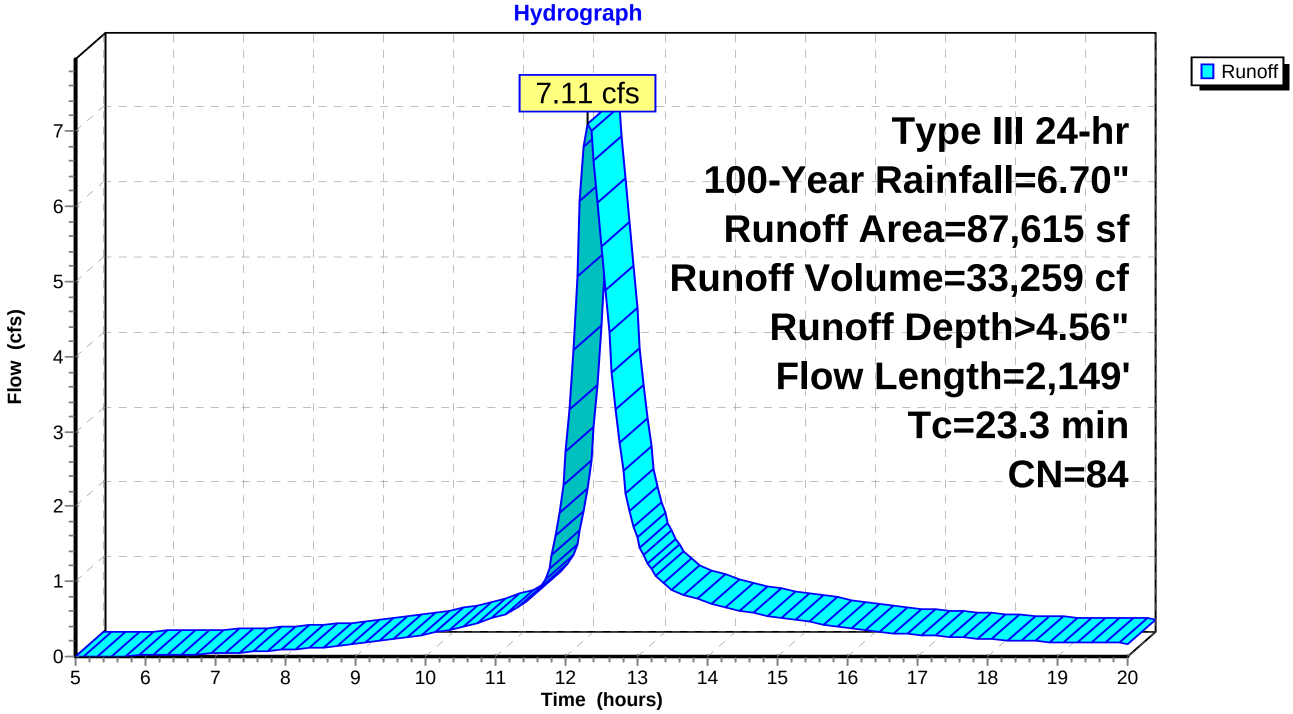
Runoff = 7.11 cfs @ 12.31 hrs, Volume= 33,259 cf, Depth> 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
20,096	80	>75% Grass cover, Good, HSG D
67,519	85	1/2 acre lots, 25% imp, HSG D
87,615	84	Weighted Average
70,735		80.73% Pervious Area
16,880		19.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.2	259	0.0480	3.53		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
1.6	215	0.0200	2.28		**Shallow Concentrated Flow, Swale CD** Unpaved Kv= 16.1 fps
0.6	151	0.0050	4.20	7.43	**Pipe Channel, Pipe DE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
0.8	169	0.0470	3.49		**Shallow Concentrated Flow, Grass/Wetland EF** Unpaved Kv= 16.1 fps
14.6	1,261	0.0080	1.44		**Shallow Concentrated Flow, Stream/Pond FG** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River** Unpaved Kv= 16.1 fps
23.3	2,149	Total			

Subcatchment S2: Swale 2



Summary for Subcatchment S3: Swale 3

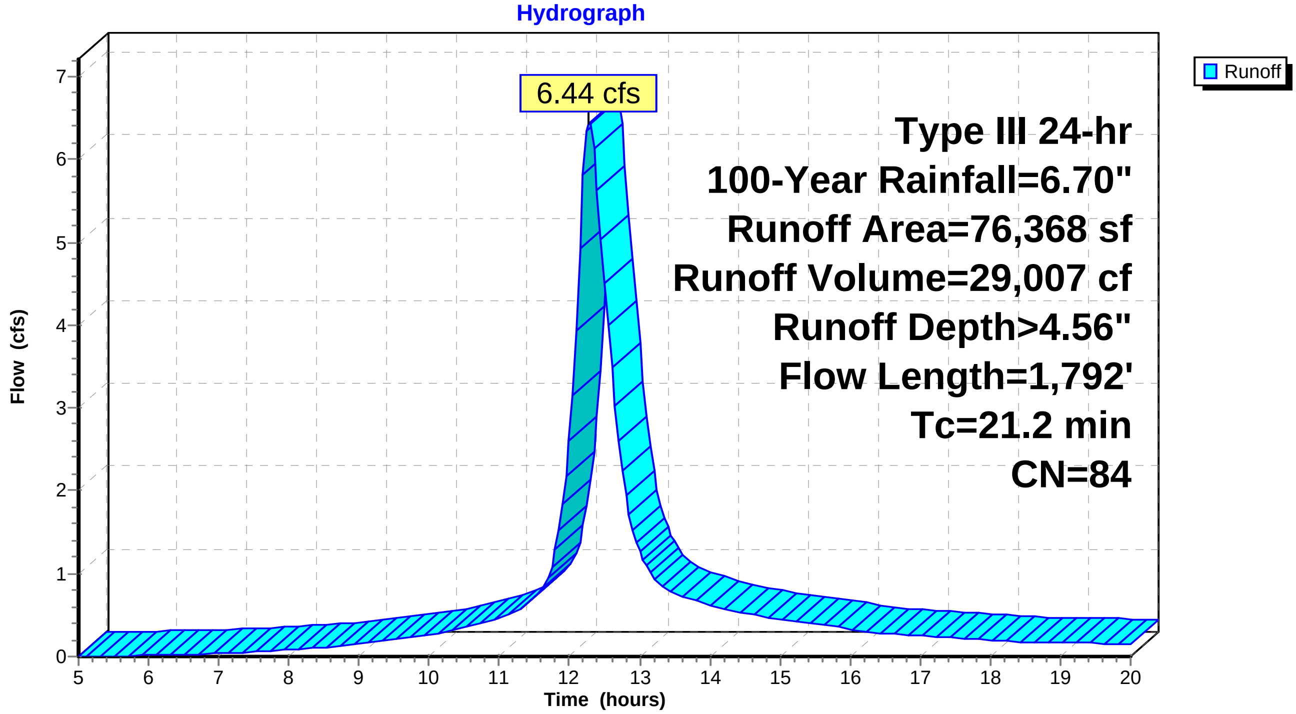
Runoff = 6.44 cfs @ 12.29 hrs, Volume= 29,007 cf, Depth> 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
11,535	80	>75% Grass cover, Good, HSG D
64,833	85	1/2 acre lots, 25% imp, HSG D
76,368	84	Weighted Average
60,160		78.78% Pervious Area
16,208		21.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.0	100	0.0100	1.61		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
2.4	452	0.0376	3.12		**Shallow Concentrated Flow, Grass CD** Unpaved Kv= 16.1 fps
0.5	77	0.0286	2.72		**Shallow Concentrated Flow, Swale DE** Unpaved Kv= 16.1 fps
0.2	69	0.0050	4.97	8.78	**Pipe Channel, Pipe EF** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
1.5	305	0.0433	3.35		**Shallow Concentrated Flow, Grass/Wetland FG** Unpaved Kv= 16.1 fps
8.0	695	0.0080	1.44		**Shallow Concentrated Flow, Stream/Pond GH** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River HI** Unpaved Kv= 16.1 fps
21.2	1,792	Total			

Subcatchment S3: Swale 3



Summary for Subcatchment S4: Swale 4

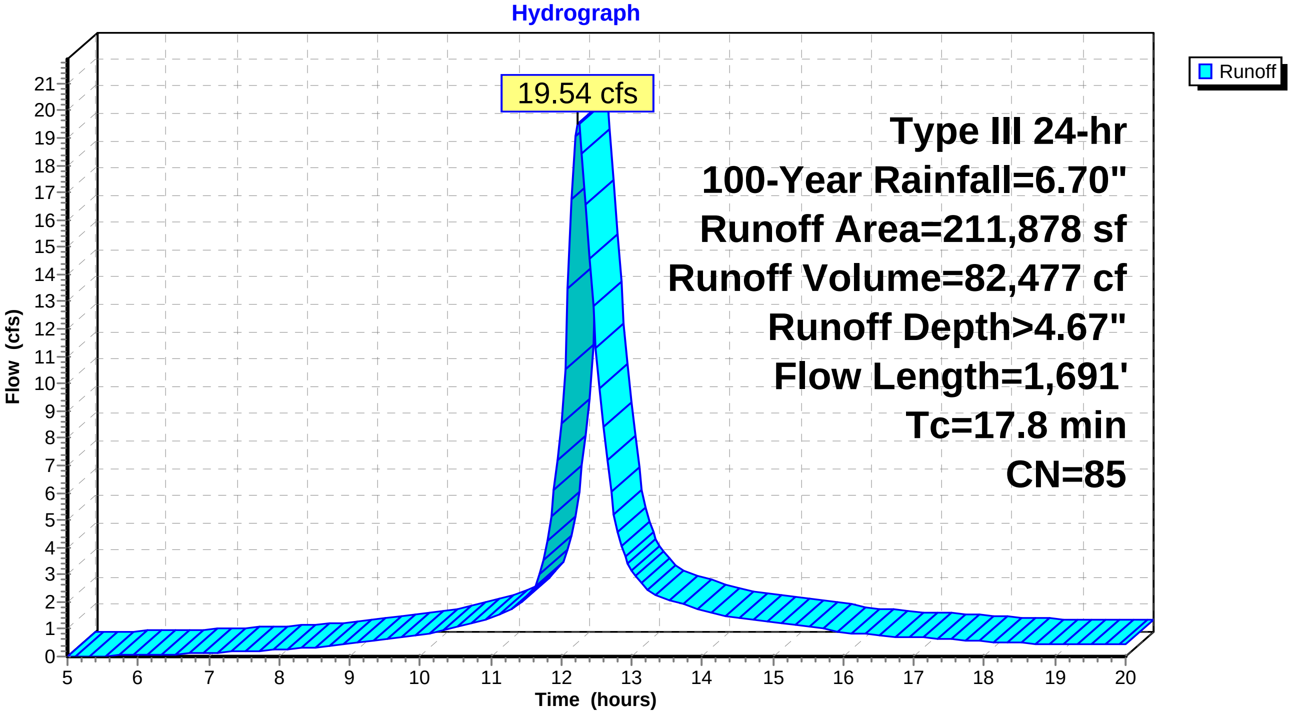
Runoff = 19.54 cfs @ 12.24 hrs, Volume= 82,477 cf, Depth> 4.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
11,826	80	>75% Grass cover, Good, HSG D
200,052	85	1/2 acre lots, 25% imp, HSG D
211,878	85	Weighted Average
161,865		76.40% Pervious Area
50,013		23.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
3.2	557	0.0333	2.94		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
0.7	162	0.0500	3.60		**Shallow Concentrated Flow, Swale CD** Unpaved Kv= 16.1 fps
0.3	117	0.0050	6.02	18.90	**Pipe Channel, Pipe DE** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.9	168	0.0353	3.02		**Shallow Concentrated Flow, Grass/Wetland EF** Unpaved Kv= 16.1 fps
6.9	593	0.0080	1.44		**Shallow Concentrated Flow, Stream/Pond FG** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River** Unpaved Kv= 16.1 fps
17.8	1,691	Total			

Subcatchment S4: Swale 4



Summary for Subcatchment S5: Swale 5

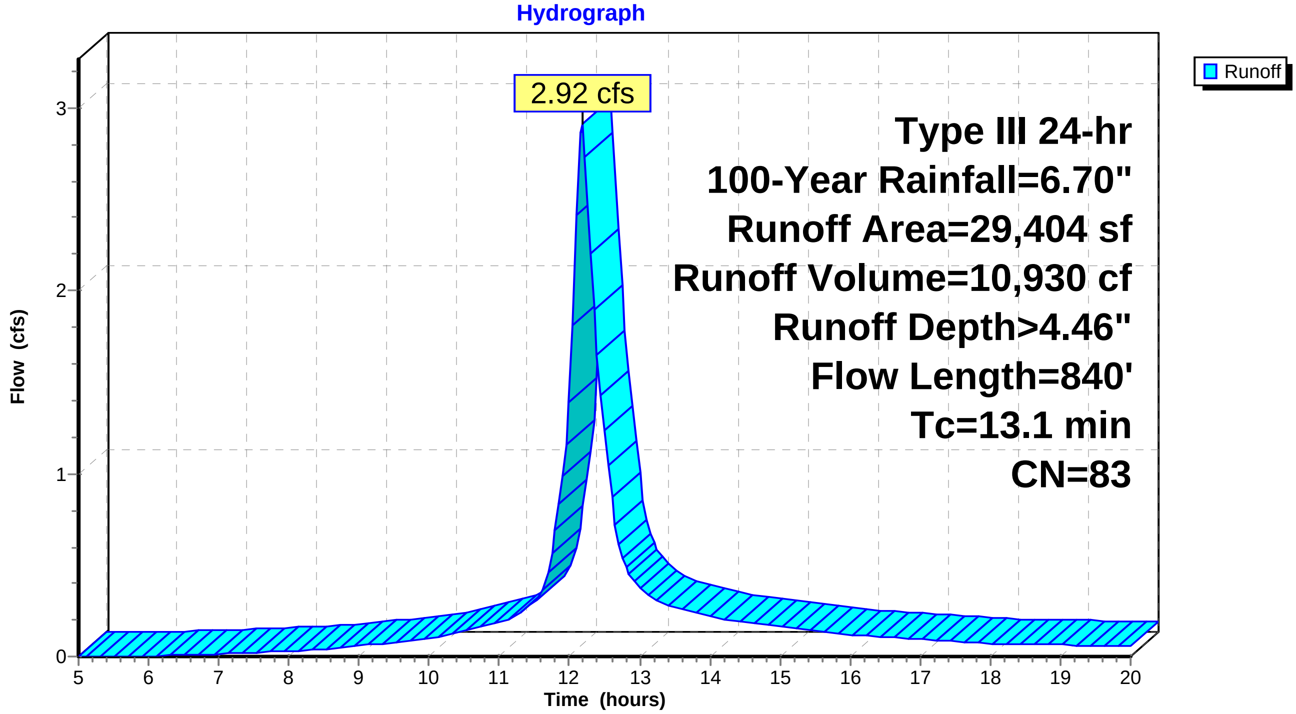
Runoff = 2.92 cfs @ 12.18 hrs, Volume= 10,930 cf, Depth> 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
9,317	80	>75% Grass cover, Good, HSG D
20,087	85	1/2 acre lots, 25% imp, HSG D
29,404	83	Weighted Average
24,382		82.92% Pervious Area
5,022		17.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.0	220	0.0500	3.60		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
0.5	89	0.0333	2.94		**Shallow Concentrated Flow, Swale CD** Unpaved Kv= 16.1 fps
0.3	79	0.0050	4.97	8.78	**Pipe Channel, Pipe DE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.1	43	0.1628	6.50		**Shallow Concentrated Flow, Grass/Wetland EF** Unpaved Kv= 16.1 fps
3.6	315	0.0080	1.44		**Shallow Concentrated Flow, Stream/Pond FG** Unpaved Kv= 16.1 fps
0.2	44	0.0900	4.83		**Shallow Concentrated Flow, Pond to River** Unpaved Kv= 16.1 fps
13.1	840	Total			

Subcatchment S5: Swale 5



Summary for Subcatchment S6: Swale 6

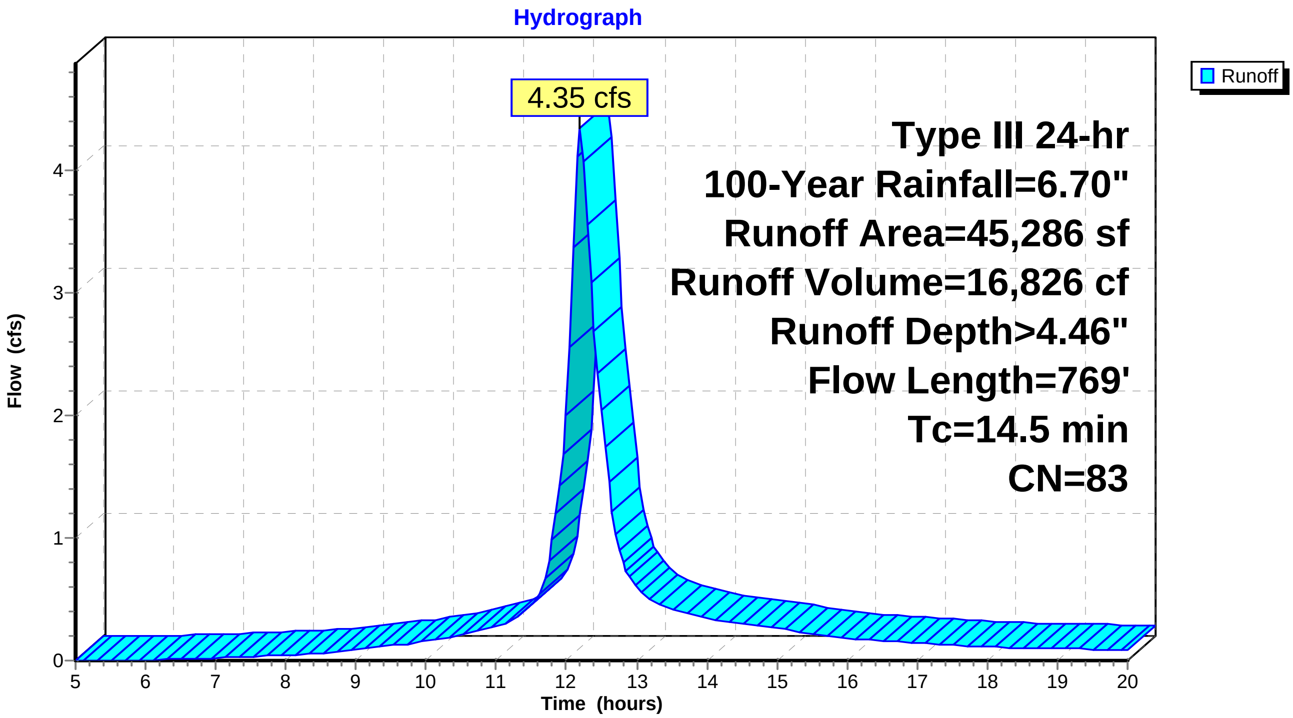
Runoff = 4.35 cfs @ 12.20 hrs, Volume= 16,826 cf, Depth> 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
1,558	61	>75% Grass cover, Good, HSG B
1,257	70	1/2 acre lots, 25% imp, HSG B
5,287	80	>75% Grass cover, Good, HSG D
37,184	85	1/2 acre lots, 25% imp, HSG D
45,286	83	Weighted Average
35,676		78.78% Pervious Area
9,610		21.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0050	0.09		**Sheet Flow, Sheet AB** Grass: Short n= 0.150 P2= 3.20"
1.5	282	0.0360	3.05		**Shallow Concentrated Flow, Grass BC** Unpaved Kv= 16.1 fps
2.0	125	0.0040	1.02		**Shallow Concentrated Flow, Swale CD** Unpaved Kv= 16.1 fps
0.4	145	0.0200	6.42	5.04	**Pipe Channel, Pipe DE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.8	167	0.0480	3.53		**Shallow Concentrated Flow, Grass EF** Unpaved Kv= 16.1 fps
14.5	769	Total			

Subcatchment S6: Swale 6

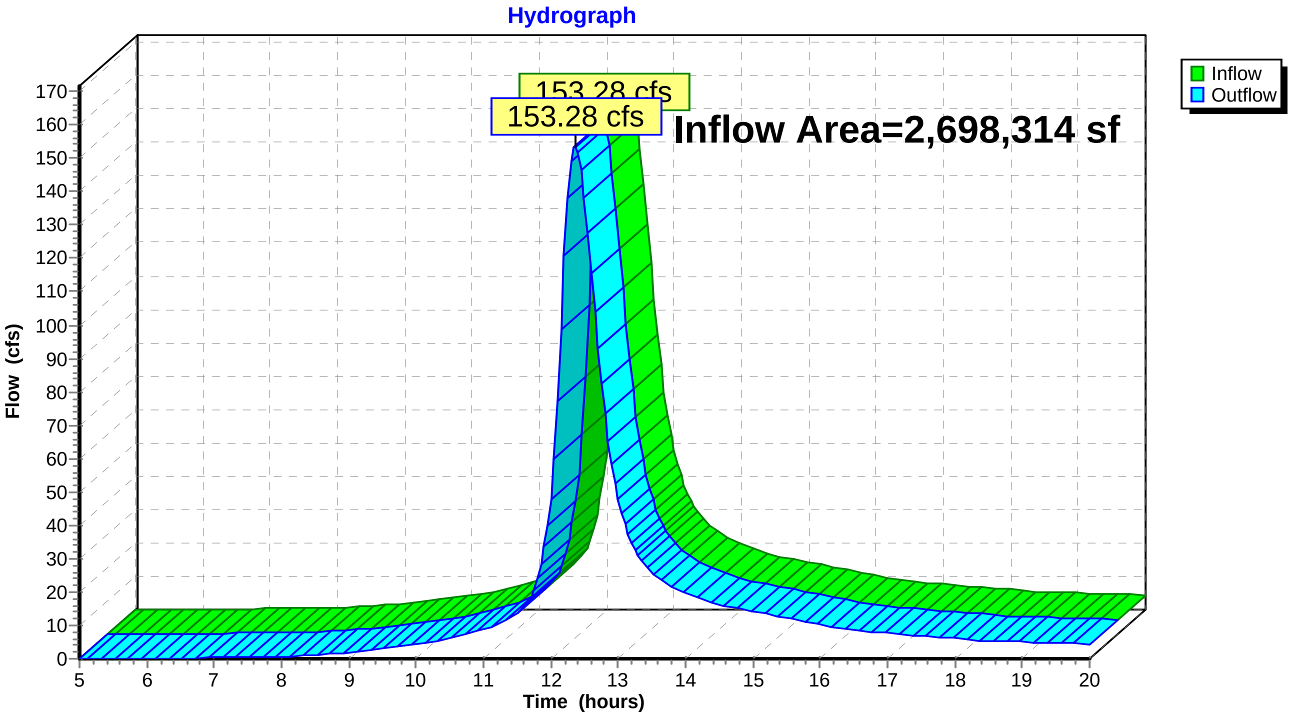


Summary for Reach TCR: Total Flow to Charles River

Inflow Area = 2,698,314 sf, 19.91% Impervious, Inflow Depth > 3.42" for 100-Year event
Inflow = 153.28 cfs @ 12.36 hrs, Volume= 769,985 cf
Outflow = 153.28 cfs @ 12.36 hrs, Volume= 769,985 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TCR: Total Flow to Charles River



Summary for Pond B1: BASIN 1

Inflow Area = 69,032 sf, 72.77% Impervious, Inflow Depth > 5.00" for 100-Year event
Inflow = 6.69 cfs @ 12.24 hrs, Volume= 28,748 cf
Outflow = 0.48 cfs @ 14.49 hrs, Volume= 15,322 cf, Atten= 93%, Lag= 135.0 min
Discarded = 0.42 cfs @ 14.49 hrs, Volume= 14,887 cf
Primary = 0.05 cfs @ 14.49 hrs, Volume= 434 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 179.13' @ 14.49 hrs Surf.Area= 7,589 sf Storage= 16,904 cf

Plug-Flow detention time= 194.6 min calculated for 15,320 cf (53% of inflow)
Center-of-Mass det. time= 111.9 min (879.9 - 767.9)

Volume	Invert	Avail.Storage	Storage Description
#1	176.00'	33,722 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

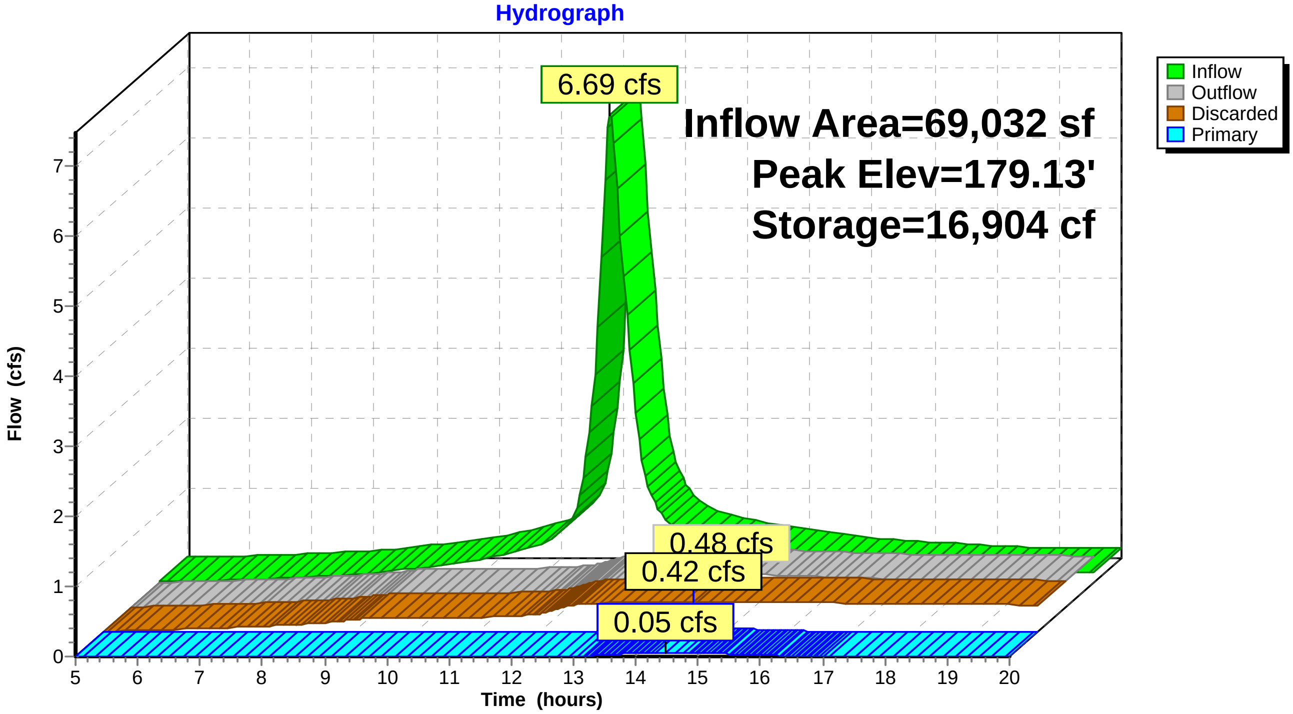
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
176.00	3,342	0	0
177.00	4,577	3,960	3,960
178.00	5,952	5,265	9,224
179.00	7,387	6,670	15,894
180.00	8,885	8,136	24,030
181.00	10,500	9,693	33,722

Device	Routing	Invert	Outlet Devices
#1	Primary	174.00'	**4.0" Round Culvert** L= 36.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 174.00' / 173.50' S= 0.0139 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf
#2	Device 1	179.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	179.25'	**1.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	179.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	179.90'	**20.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#6	Discarded	176.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.42 cfs @ 14.49 hrs HW=179.13' (Free Discharge)
└─**6=Exfiltration** (Exfiltration Controls 0.42 cfs)

Primary OutFlow Max=0.05 cfs @ 14.49 hrs HW=179.13' (Free Discharge)
├─**1=Culvert** (Passes 0.05 cfs of 0.75 cfs potential flow)
│ ├─**2=Orifice/Grate** (Orifice Controls 0.05 cfs @ 1.25 fps)
│ ├─**3=Orifice/Grate** (Controls 0.00 cfs)
│ └─**4=Orifice/Grate** (Controls 0.00 cfs)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B1: BASIN 1



Summary for Pond B3: BASIN 3

Inflow Area = 117,451 sf, 81.01% Impervious, Inflow Depth > 5.63" for 100-Year event
Inflow = 13.85 cfs @ 12.17 hrs, Volume= 55,085 cf
Outflow = 1.22 cfs @ 13.42 hrs, Volume= 28,290 cf, Atten= 91%, Lag= 75.1 min
Discarded = 0.54 cfs @ 13.42 hrs, Volume= 19,821 cf
Primary = 0.68 cfs @ 13.42 hrs, Volume= 8,469 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 178.54' @ 13.42 hrs Surf.Area= 9,415 sf Storage= 33,723 cf

Plug-Flow detention time= 217.1 min calculated for 28,186 cf (51% of inflow)
Center-of-Mass det. time= 127.6 min (876.3 - 748.7)

Volume	Invert	Avail.Storage	Storage Description
#1	173.00'	49,214 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

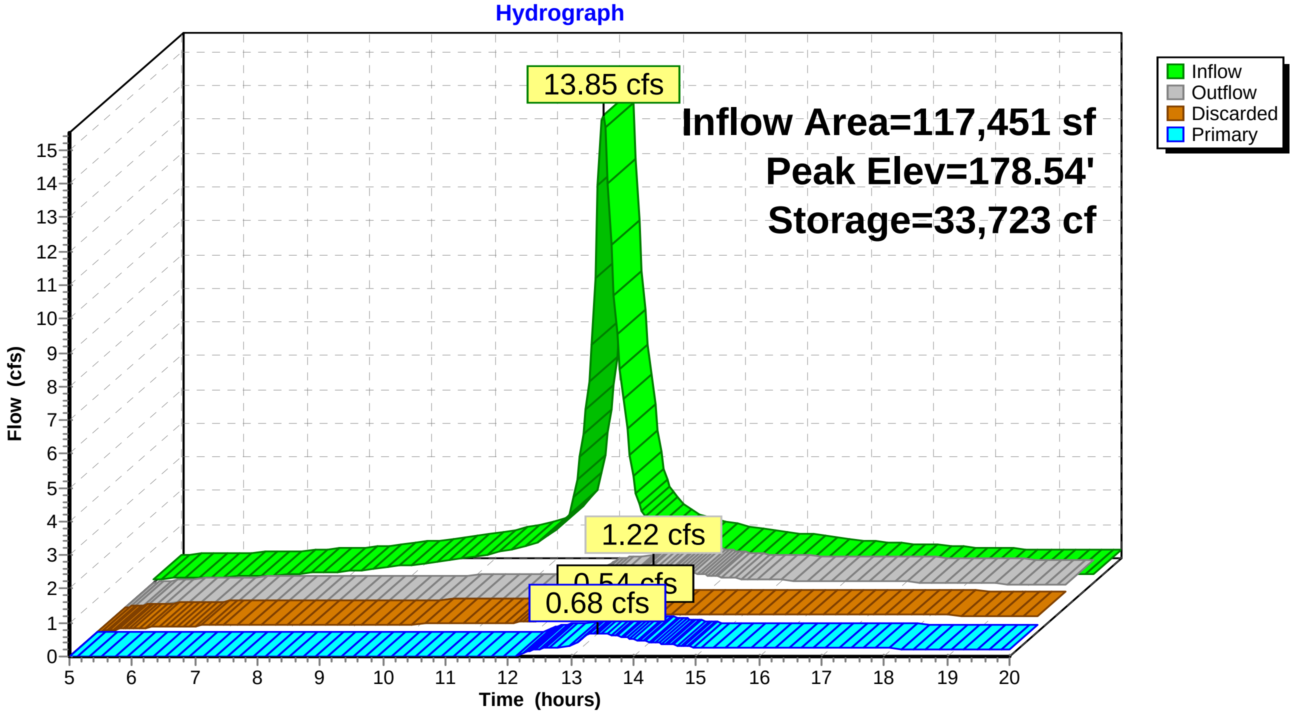
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
173.00	3,533	0	0	3,533
174.00	4,314	3,917	3,917	4,345
175.00	5,173	4,737	8,654	5,238
176.00	6,120	5,640	14,294	6,222
177.00	7,172	6,639	20,933	7,312
178.00	8,628	7,889	28,822	8,802
179.00	10,102	9,355	38,177	10,315
180.00	12,000	11,037	49,214	12,250

Device	Routing	Invert	Outlet Devices
#1	Primary	168.00'	**6.0" Round Culvert** L= 53.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 168.00' / 166.94' S= 0.0200 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#2	Device 1	177.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	178.50'	**24.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	178.90'	**20.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#5	Discarded	173.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.54 cfs @ 13.42 hrs HW=178.54' (Free Discharge)
└─**5=Exfiltration** (Exfiltration Controls 0.54 cfs)

Primary OutFlow Max=0.64 cfs @ 13.42 hrs HW=178.54' (Free Discharge)
├─**1=Culvert** (Passes 0.64 cfs of 2.57 cfs potential flow)
│ ├─**2=Orifice/Grate** (Orifice Controls 0.28 cfs @ 5.73 fps)
│ └─**3=Orifice/Grate** (Weir Controls 0.35 cfs @ 0.68 fps)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B3: BASIN 3



Summary for Pond T18A: TRENCH 18A

Inflow Area = 267,248 sf, 56.20% Impervious, Inflow Depth > 4.25" for 100-Year event
Inflow = 26.36 cfs @ 12.16 hrs, Volume= 94,604 cf
Outflow = 17.12 cfs @ 12.33 hrs, Volume= 79,707 cf, Atten= 35%, Lag= 9.9 min
Discarded = 0.48 cfs @ 9.25 hrs, Volume= 20,647 cf
Primary = 16.63 cfs @ 12.33 hrs, Volume= 59,061 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 176.76' @ 12.33 hrs Surf.Area= 8,648 sf Storage= 29,449 cf

Plug-Flow detention time= 81.4 min calculated for 79,707 cf (84% of inflow)
Center-of-Mass det. time= 36.3 min (816.0 - 779.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	171.75'	11,805 cf	**44.75'W x 193.25'L x 5.75'H Field A** 49,726 cf Overall - 20,213 cf Embedded = 29,513 cf x 40.0% Voids
#2A	172.50'	20,213 cf	**Cultec R-900HD** x 162 Inside #1 Effective Size= 72.7"W x 48.0"H => 17.61 sf x 7.00'L = 123.3 cf Overall Size= 78.0"W x 48.0"H x 9.25'L with 2.25' Overlap Row Length Adjustment= +2.25' x 17.61 sf x 6 rows
		32,018 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	174.00'	**24.0" Round Culvert** L= 5.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 174.00' / 174.00' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#2	Discarded	171.75'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.48 cfs @ 9.25 hrs HW=171.81' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.48 cfs)

Primary OutFlow Max=16.52 cfs @ 12.33 hrs HW=176.75' (Free Discharge)
└─**1=Culvert** (Barrel Controls 16.52 cfs @ 5.26 fps)

Pond T18A: TRENCH 18A - Chamber Wizard Field A

Chamber Model = Cultec R-900HD
Effective Size= 72.7"W x 48.0"H => 17.61 sf x 7.00'L = 123.3 cf
Overall Size= 78.0"W x 48.0"H x 9.25'L with 2.25' Overlap
Row Length Adjustment= +2.25' x 17.61 sf x 6 rows

78.0" Wide + 9.0" Spacing = 87.0" C-C Row Spacing

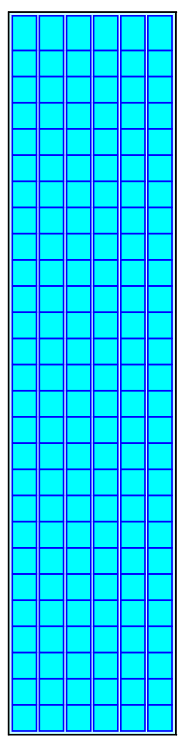
27 Chambers/Row x 7.00' Long +2.25' Row Adjustment = 191.25' Row Length +12.0" End Stone x 2 = 193.25' Base Length
6 Rows x 78.0" Wide + 9.0" Spacing x 5 + 12.0" Side Stone x 2 = 44.75' Base Width
9.0" Base + 48.0" Chamber Height + 12.0" Cover = 5.75' Field Height

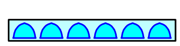
162 Chambers x 123.3 cf +2.25' Row Adjustment x 17.61 sf x 6 Rows = 20,212.9 cf Chamber Storage

49,725.6 cf Field - 20,212.9 cf Chambers = 29,512.7 cf Stone x 40.0% Voids = 11,805.1 cf Stone Storage

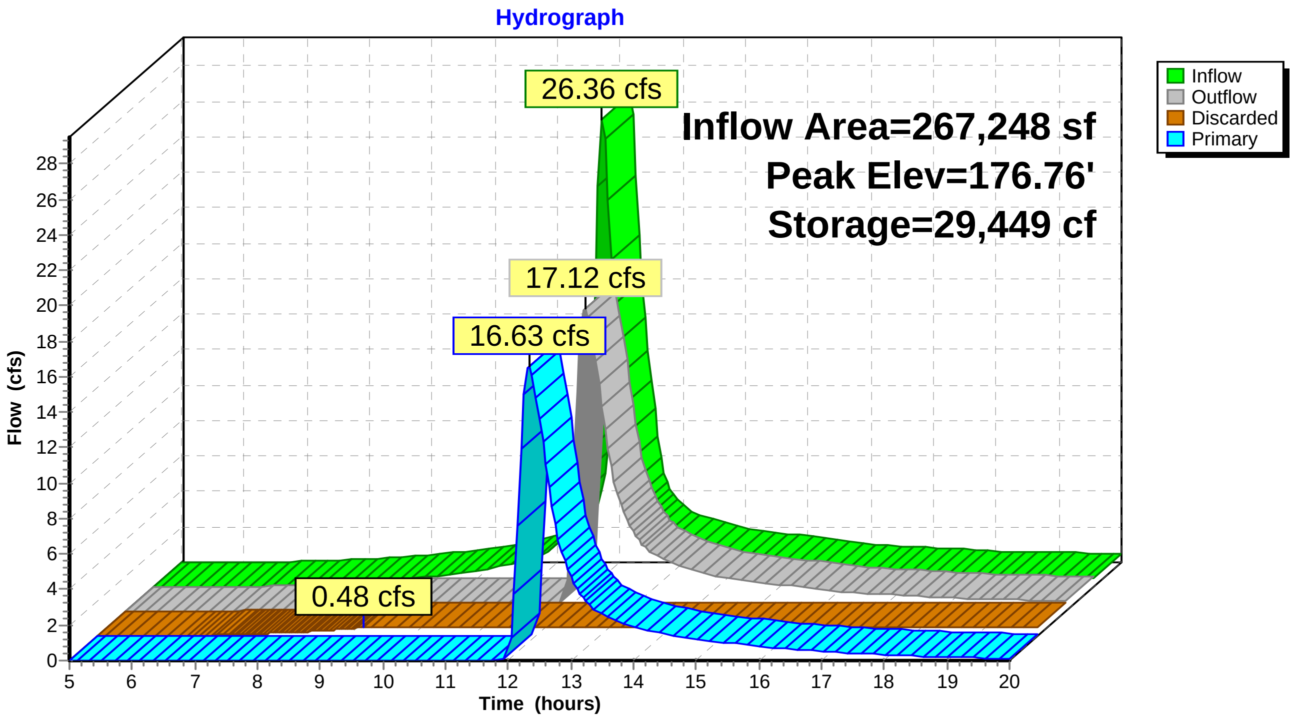
Chamber Storage + Stone Storage = 32,018.0 cf = 0.735 af
Overall Storage Efficiency = 64.4%

162 Chambers
1,841.7 cy Field
1,093.1 cy Stone





Pond T18A: TRENCH 18A



APPENDIX C

DRAINAGE SYSTEM CALCULATIONS

STANDARD 2 – PEAK RATE OF RUNOFF

STANDARD 3 – RECHARGE VOLUME

STANDARD 4 – WATER QUALITY VOLUME

WATER QUALITY VOLUME CONVERSION TO A DISCHARGE RATE

DRAWDOWN CALCULATIONS

CLOSED DRAINAGE SYSTEM/PIPE SIZING CALCULATIONS

SIMPLE DYNAMIC SIZING

SWALE SIZING

CONECO
Engineers & Scientists

Project Number:	8548.0	**Date:**	December 1, 2015
Project Name:	Salmon Health ARCPUD	**Calculations by:**	JEN
Project Address:	Village Street, Medway, MA	**Calculations date:**	December 1, 2015
Client:	Continuing Care Management	**Checked by:**	TLD
Location:	Medway, MA	**Checked Date:**	December 1, 2015

STORMWATER MANAGEMENT STANDARD 2 - PEAK RATE OF RUNOFF

Offsite West

DESIGN STORM (YEAR)	EXISTING PEAK RUNOFF (CFS)	PROPOSEDPEAK RUNOFF (CFS)	REDUCTION IN PEAK RUNOFF
2	0.46	0.40	13.0%
10	1.51	1.12	25.8%
20	2.18	1.57	28.0%
100	3.29	2.29	30.4%
	EXISTING TOTAL VOLUME (CF)	**PROPOSED TOTAL RUNOFF (CF)**	**REDUCTION IN TOTAL RUNOFF**
2	2,291	1,481	35.4%
10	6,000	3,598	40.0%
20	8,389	4,925	41.3%
100	12,346	7,093	42.5%

Charles River

DESIGN STORM (YEAR)	EXISTING PEAK RUNOFF (CFS)	PROPOSED PEAK RUNOFF (CFS)	REDUCTION IN PEAK RUNOFF
2	39.16	38.69	1.2%
10	86.05	82.69	3.9%
25	113.68	110.50	2.8%
100	157.20	153.28	2.5%
DESIGN STORM (YEAR)	**EXISTING TOTAL VOLUME (CF)**	**PROPOSED TOTAL RUNOFF (CF)**	**REDUCTION IN TOTAL RUNOFF**
2	211,274	205,509	2.7%
10	444,528	428,317	3.6%
25	584,111	561,285	3.9%
100	806,433	769,985	4.5%

CONECO
Engineers & Scientists

Project Number:	8548	**Date:**	December 1, 2015
Project Name:	Salmon Health ARCPUD	**Calculations by:**	JEN
Project Address:	Village Street, Medway, MA	**Calculations date:**	December 1, 2015
Client:	Continuing Care Management	**Checked by:**	TLD
Location:	Medway, MA	**Checked Date:**	December 1, 2015

STORMWATER MANAGEMENT STANDARD 3 - RECHARGE VOLUME

	HYDROLOGIC SOIL GROUP				TOTAL
	A	B	C	D	
IMPERVIOUS AREA (S.F.)	57,688	301,626	50,370	114,789	524,473
INCHES OF RUNOFF TO BE RECHARGED	0.60	0.35	0.25	0.10	
REQUIRED RECHARGE VOLUME (FT^3)	2,884	8,797	1,049	957	**13,688**

CAPTURE AREA ADJUSTMENT - ADJUSTED MINIMUM REQUIRED RECHARGE VOLUME

MINIMUM OF 65% OF IMPERVIOUS AREA MUST BE DIRECTED TO THE RECHARGE BMP; 65 % IS =	340,907	SF		
IMPERVIOUS SITE AREA DRAINING TO BMP =	495,468	SF	94.5%	PERCENTAGE OF IMPERVIOUS AREA DIVERTED TO INFILTRATION FACILITY
RATIO OF TOTAL IMPERVIOUS AREA TO IMPERVIOUS AREA DRAINING TO RECHARGE BMP =	1.06		= TOTAL IMPERVIOUS AREA / IMPERVIOUS AREA DRAINING TO THE RECHARGE AREA	
ADJUSTED REQUIRED RECHARGE VOLUME=	**14,489**	CF	= RATIO OF IMPERVIOUS AREA x REQUIRED RECHARGE VOLUME	
PROPOSED RECHARGE VOLUME	**121,661**	CF	TOTAL AVAILABLE RECHARGE VOLUME	

Project Number:	8548.0	**Date:**	December 1, 2015
Project Name:	Salmon Health ARCPUD	**Calculations by:**	JEN
Project Address:	Village Street, Medway, MA	**Calculations date:**	December 1, 2015
Client:	Continuing Care Management	**Checked by:**	TLD
Location:	Medway, MA	**Checked Date:**	December 1, 2015

STORMWATER MANAGEMENT STANDARD 4 - WATER QUALITY VOLUME

	DEPTH TO TREAT (IN.)	IMPERVIOUS AREA (SF)	WATER VOLUME (CF)
WATER QUALITY VOLUME	0.5	524,473	21,853
NET WATER QUALITY VOLUME			**21,853**

Project Number:	8548.0	**Date:**	December 1, 2015
Project Name:	Salmon Health ARCPUD	**Calculations by:**	Jonathan E. Novak
Project Address:	Village Street	**Calculations date:**	December 1, 2015
Client:	Continuing Care Managent	**Checked by:**	TLD
Location:	Medway, MA	**Checked Date:**	December 1, 2015

CONVERSION OF WATER QUALITY VOLUME TO A DISCHARGE RATE FOR PROPRIETAY STORMWATER TREATMENT PRACTICES

Q = (qu)(A)(WQV)

Q= FLOW RATE
qu = UNIT PEAK DISCHARGE (csm/in)
A = IMPERVIOUS SURFACE DRAINAGE AREA (sq mi)
WQV = WATER QUALITY VOLUME

STC-1

Tc =	5	min
qu =	773	
A =	0.469	Acre
WQV =	0.5	inch
Q =	0.28	CFS

STC-2

Tc =	5	min
qu =	773	
A =	0.833	Acre
WQV =	0.5	inch
Q =	0.50	CFS

STC-3

Tc =	5	min
qu =	773	
A =	3.247	Acre
WQV =	0.5	inch
Q =	1.96	CFS

STC-4

Tc =	5	min
qu =	773	
A =	1.251	Acre
WQV =	0.5	inch
Q =	0.76	CFS

CONECO Engineers & Scientists

Project Number:	8548.0	**Date:**	October 20, 2015
Project Name:	Salmon Health ARCPUD	**Calculations by:**	Damien Dmitruk
Project Address:	Village Street	**Calculations date:**	October 16, 2015
Client:	Continuing Care Managent	**Checked by:**	Jonathan E. Novak
Location:	Medway, MA	**Checked Date:**	October 16, 2015

PROPOSED DRAWDOWN FOR RECHARGE STRUCTURES

BASIN 1

A = AREA OF PROPOSED LEACHING STRUCTURE	2,970	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	16,904	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **28.3** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

BASIN 3

A = AREA OF PROPOSED LEACHING STRUCTURE	3,533	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	37,200	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **52.4** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

CONECO Engineers & Scientists

Project Number:	8548.0	**Date:**	October 20, 2015
Project Name:	Salmon Health ARCPUD	**Calculations by:**	Damien Dmitruk
Project Address:	Village Street	**Calculations date:**	October 16, 2015
Client:	Continuing Care Managent	**Checked by:**	Jonathan E. Novak
Location:	Medway, MA	**Checked Date:**	October 16, 2015

PROPOSED DRAWDOWN FOR RECHARGE STRUCTURES

INFILTRATION TRENCH 8

A = AREA OF PROPOSED LEACHING STRUCTURE	858	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	2,026	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON AHYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **11.8** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCH 9

A = AREA OF PROPOSED LEACHING STRUCTURE	280	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	605	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **10.8** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCH 10

A = AREA OF PROPOSED LEACHING STRUCTURE	590	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	1,231	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **10.4** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCH 11

A = AREA OF PROPOSED LEACHING STRUCTURE	1,207	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	2,633	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **10.9** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCH 11A

A = AREA OF PROPOSED LEACHING STRUCTURE	280	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	661	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **11.8** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

CONECO Engineers & Scientists

Project Number:	8548.0	**Date:**	October 20, 2015
Project Name:	Salmon Health ARCPUD	**Calculations by:**	Damien Dmitruk
Project Address:	Village Street	**Calculations date:**	October 16, 2015
Client:	Continuing Care Managent	**Checked by:**	Jonathan E. Novak
Location:	Medway, MA	**Checked Date:**	October 16, 2015

PROPOSED DRAWDOWN FOR RECHARGE STRUCTURES

INFILTRATION TRENCH 12

A = AREA OF PROPOSED LEACHING STRUCTURE	613	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	1,442	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **11.7** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCH 13

A = AREA OF PROPOSED LEACHING STRUCTURE	558	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	1,179	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **10.5** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCH 14

A = AREA OF PROPOSED LEACHING STRUCTURE	558	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	1,327	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **11.8** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCH 15

A = AREA OF PROPOSED LEACHING STRUCTURE	613	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	1,319	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **10.7** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCH 16

A = AREA OF PROPOSED LEACHING STRUCTURE	1,840	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	4,416	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **11.9** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

CONECO Engineers & Scientists

Project Number:	8548.0	**Date:**	October 13, 2015
Project Name:	Salmon Health ARCPUD	**Calculations by:**	Damien Dmitruk
Project Address:	Village Street	**Calculations date:**	October 5, 2015
Client:	Continuing Care Managent	**Checked by:**	Jonathan E. Novak
Location:	Medway, MA	**Checked Date:**	October 8, 2015

PROPOSED DRAWDOWN FOR RECHARGE STRUCTURES

INFILTRATION TRENCH 17

A = AREA OF PROPOSED LEACHING STRUCTURE	1,040	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	2,472	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

.WDOWN TIME $T = \frac{Rv}{K \times A}$ = **11.8** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCH 18

A = AREA OF PROPOSED LEACHING STRUCTURE	1,910	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	5,052	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

.WDOWN TIME $T = \frac{Rv}{K \times A}$ = **13.2** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCH 18A

A = AREA OF PROPOSED LEACHING STRUCTURE	8,648	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	32,018	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

.WDOWN TIME $T = \frac{Rv}{K \times A}$ = **18.4** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCH 19

A = AREA OF PROPOSED LEACHING STRUCTURE	1,964	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	4,717	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

.WDOWN TIME $T = \frac{Rv}{K \times A}$ = **12.0** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCH 20

A = AREA OF PROPOSED LEACHING STRUCTURE	3,993	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	9,653	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

.WDOWN TIME $T = \frac{Rv}{K \times A}$ = **12.0** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

CONECO Engineers & Scientists

Project Number:	8548.0	**Date:**	October 20, 2015
Project Name:	Salmon Health ARCPUD	**Calculations by:**	Damien Dmitruk
Project Address:	Village Street	**Calculations date:**	October 16, 2015
Client:	Continuing Care Managent	**Checked by:**	Jonathan E. Novak
Location:	Medway, MA	**Checked Date:**	October 16, 2015

PROPOSED DRAWDOWN FOR RECHARGE STRUCTURES

INFILTRATION TRENCH 21

A = AREA OF PROPOSED LEACHING STRUCTURE	1,065	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	2,538	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

.WDOWN TIME $T = \frac{Rv}{K \times A}$ = **11.9** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCH 22

A = AREA OF PROPOSED LEACHING STRUCTURE	860	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	2,043	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

.WDOWN TIME $T = \frac{Rv}{K \times A}$ = **11.8** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCH 22A

A = AREA OF PROPOSED LEACHING STRUCTURE	288	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	603	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

.WDOWN TIME $T = \frac{Rv}{K \times A}$ = **10.4** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCH 23

A = AREA OF PROPOSED LEACHING STRUCTURE	3,550	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	8,567	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

.WDOWN TIME $T = \frac{Rv}{K \times A}$ = **12.0** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

INFILTRATION TRENCH 24

A = AREA OF PROPOSED LEACHING STRUCTURE	352	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	762	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

.WDOWN TIME $T = \frac{Rv}{K \times A}$ = **10.8** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

CONECO
Engineers & Scientists

Project Number:	8548.0	**Date:**	October 20, 2015
Project Name:	Salmon Health ARCPUD	**Calculations by:**	Damien Dmitruk
Project Address:	Village Street	**Calculations date:**	October 16, 2015
Client:	Continuing Care Managent	**Checked by:**	Jonathan E. Novak
Location:	Medway, MA	**Checked Date:**	October 16, 2015

PROPOSED DRAWDOWN FOR RECHARGE STRUCTURES

INFILTRATION TRENCH 30

A = AREA OF PROPOSED LEACHING STRUCTURE	655	SQ. FT.
Rv = REQUIRED RECHARGE VOLUME =	1,417	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

WDOWN TIME $T = \frac{Rv}{K \times A}$ = **10.8** HOURS TO EMPTY THE RECHARGE BMP

<72 HOURS, SO DRAWDOWN IS OK

Project Number: 8548.0
Client: Continuing Care Management
Project Name: Salmon Health ARCPUD
Project Address: Village Street
Location: Medway, MA

Calculations by: JEN
Calculations Date: 10/07/15
Checked By: DJD
Checked Date: 10/07/15

CONECO Engineers & Scientists

WILLOW POND CIRCLE - 25 YEAR STORM - CLOSED SYSTEM PIPE SIZING

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW		R = hydraulic radius = area/wetted perimeter														Tc
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	L/V (MIN)
WS CB-1	LANDSCAPED	0.096		0.400								From: CB-1	Out:													
	IMPERVIOUS	0.123		0.850										HDPE	12	20	0.79	0.250	0.005	0.013	**2.52**	**3.21**	0.37	0.79	2.52	0.13
			0.219	0.653	0.143		5.00	NONE	5.00	6.57	**0.94**	To: DMH-1	In:													
WS CB-2	LANDSCAPED	0.100		0.400								From: CB-2	Out:													
	IMPERVIOUS	0.065		0.850										HDPE	12	23	0.79	0.250	0.005	0.013	**2.52**	**3.21**	0.25	0.70	2.24	0.17
			0.165	0.577	0.095		5.00	NONE	5.00	6.57	**0.63**	To: DMH-1	In:													
DMH-1 TO	**DMH-3**					0.238	5.00	0.17	5.17	6.54	**1.56**	From: DMH-1	Out:													
														HDPE	12	93	0.79	0.250	0.002	0.013	**1.59**	**2.03**	**0.98**	**1.04**	**2.11**	**0.73**
												To: DMH-3	In:													
WS CB-3	LANDSCAPED	0.037		0.400								From: CB-3	Out:													
	IMPERVIOUS	0.078		0.850										HDPE	12	21	0.79	0.250	0.010	0.013	**3.56**	**4.54**	0.15	0.60	2.74	0.13
			0.115	0.705	0.081		5.00	NONE	5.00	6.57	**0.53**	To: DMH-2	In:													
DMH-2 TO	**DMH-3**					0.081	5.00	0.13	5.13	6.55	**0.53**	From: DMH-2	Out:													
														HDPE	12	43	0.79	0.250	0.001	0.013	**1.13**	**1.43**	**0.47**	**0.84**	**1.21**	**0.59**
												To: DMH-3	In:													
WS CB-4	LANDSCAPED	0.005		0.400								From: CB-4	Out:													
	IMPERVIOUS	0.129		0.850										HDPE	12	25	0.79	0.250	0.010	0.013	**3.56**	**4.54**	0.21	0.66	3.00	0.14
			0.134	0.833	0.112		5.00	NONE	5.00	6.57	**0.73**	To: DMH-4	In:													
WS CB-5	LANDSCAPED	0.011		0.400								From: CB-5	Out:													
	IMPERVIOUS	0.074		0.850										HDPE	12	25	0.79	0.250	0.010	0.013	**3.56**	**4.54**	0.12	0.57	2.59	0.16
			0.085	0.792	0.067		5.00	NONE	5.00	6.57	**0.44**	To: DMH-4	In:													
DMH-4 TO	**DMH3**					0.179	5.00	0.16	5.16	6.54	**1.17**	From: DMH-4	Out:													
														HDPE	18	4	1.77	0.375	0.001	0.013	**3.32**	**1.88**	**0.35**	**0.77**	**1.45**	**0.05**
												To: DMH3	In:													
DMH-3 TO	**STC-1**					0.498	5.17	0.73	5.91	6.41	3.19	From: DMH-3	Out:													
														HDPE	18	81	1.77	0.375	0.001	0.013	3.32	1.88	0.96	1.03	1.95	0.69
												To: STC-1	In:													

CONECO
Engineers & Scientists

Project Number: 8548.0
Client: Continuing Care Management
Project Name: Salmon Health ARCPUD
Project Address: Village Street
Location: Medway, MA

Calculations by: DJD
Calculations Date: 06/10/15
Checked By: JEN
Checked Date: 06/10/15

WILLOW POND CIRCLE - 25 YEAR STORM - CLOSED SYSTEM PIPE SIZING

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW				R = hydraulic radius = area/wetted perimeter												Tc
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	L/V (MIN)
WS CB-8	LANDSCAPED	0.086		0.400								From: CB-8	Out:													
	IMPERVIOUS	0.110		0.850										HDPE	12	16	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.17	0.62	4.00	0.07
			0.196	0.653	0.128		5.00	NONE	5.00	6.57	**0.84**	To: DMH-11	In:													
WS CB-9	LANDSCAPED	0.069		0.400								From: CB-9	Out:													
	IMPERVIOUS	0.153		0.850										HDPE	12	19	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.21	0.66	4.25	0.07
			0.222	0.710	0.158		5.00	NONE	5.00	6.57	**1.04**	To: DMH-11	In:													
DMH-11 TO	**DMH-10**					0.286	5.00	0.07	5.07	6.56	**1.87**	From: DMH-11	Out:													
														HDPE	12	90	0.79	0.250	0.005	0.013	**2.52**	**3.21**	**0.74**	**0.96**	**3.08**	**0.49**
												To: DMH-10	In:													
DMH-10 TO	**DMH-9**					0.286	5.07	0.49	5.56	6.47	**1.85**	From: DMH-10	Out:													
														HDPE	12	129	0.79	0.250	0.005	0.013	**2.52**	**3.21**	**0.73**	**0.96**	**3.07**	**0.70**
												To: DMH-9	In:													
DMH-9 TO	**DMH-8**					0.286	5.56	0.70	6.26	6.34	1.81	From: DMH-9	Out:													
														HDPE	12	78	0.79	0.25	0.005	0.013	2.52	3.21	0.72	0.95	3.05	0.43
												To: DMH-8	In:													
DMH-8 TO	**DMH-5**					0.286	6.26	0.43	6.69	6.27	1.79	From: DMH-8	Out:													
														HDPE	12	97	0.79	0.25	0.005	0.013	2.52	3.21	0.71	0.95	3.04	0.53
												To: DMH-5	In:													

CONECO Engineers & Scientists

Project Number: 8548.0
Client: Continuing Care Management
Project Name: Salmon Health ARCPUD
Project Address: Village Street
Location: Medway, MA

Calculations by: DJD
Calculations Date: 06/10/15
Checked By: JEN
Checked Date: 06/10/15

WILLOW POND CIRCLE - 25 YEAR STORM - CLOSED SYSTEM PIPE SIZING

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW				R = hydraulic radius = area/wetted perimeter												Tc
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	L/V (MIN)
WS CB-6	LANDSCAPED IMPERVIOUS	0.117 0.224	0.341	0.400 0.850 0.696	0.237		5.00	NONE	5.00	6.57	**1.56**	From: CB-6 To: DMH-5	Out: In:	HDPE	12	13	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.31	0.75	4.78	0.05
WS CB-7	LANDSCAPED IMPERVIOUS	0.162 0.346	0.508	0.400 0.850 0.706	0.359		5.00	NONE	5.00	6.57	**2.36**	From: CB-7 To: DMH-5	Out: In:	HDPE	12	6	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.47	0.84	5.39	0.02
DMH-5 TO DMH-6						0.882	6.69	0.53	7.22	6.18	**5.45**	From: DMH-5 To: DMH-6	Out: In:	HDPE	18	66	1.77	0.375	0.005	0.013	**7.43**	**4.20**	**0.73**	**0.96**	**4.02**	**0.27**
DMH-6 TO DMH-7						0.882	7.22	0.27	7.49	6.13	5.41	From: DMH-6 To: DMH-7	Out: In:	HDPE	18	27	1.77	0.375	0.005	0.013	7.43	4.20	0.73	0.95	4.01	0.11
DMH-7 TO STC-2						0.882	7.49	0.11	7.60	6.12	5.39	From: DMH-7 To: STC-2	Out: In:	HDPE	18	42	1.77	0.375	0.005	0.013	7.43	4.20	0.73	0.95	4.01	0.17
STC-2 TO FES-1						0.882	7.60	0.17	7.78	6.09	5.37	From: STC-2 To: FES-1	Out: In:	HDPE	18	17	1.77	0.375	0.005	0.013	7.43	4.20	0.72	0.95	4.01	0.07

Project Number: 8548.0
Client: Continuing Care Management
Project Name: Salmon Health ARCPUD
Project Address: Village Street
Location: Medway, MA

Calculations by: DJD
Calculations Date: 06/10/15
Checked By: JEN
Checked Date: 06/10/15

CONECO Engineers & Scientists

WILLOW POND CIRCLE - 25 YEAR STORM - CLOSED SYSTEM PIPE SIZING

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW		R = hydraulic radius = area/wetted perimeter														Tc
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	L/V (MIN)
WS CB-34	LANDSCAPED	0.023		0.400								From: CB-34	Out:													
	IMPERVIOUS	0.048		0.850										HDPE	12	15	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.07	0.47	3.04	0.08
			0.071	0.704	0.050		5.00	NONE	5.00	6.57	**0.33**	To: DMH-36	In:													
WS CB-35	LANDSCAPED	0.026		0.400								From: CB-35	Out:													
	IMPERVIOUS	0.047		0.850										HDPE	12	9	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.07	0.48	3.05	0.05
			0.073	0.690	0.050		5.00	NONE	5.00	6.57	**0.33**	To: DMH-36	In:													
DMH-36 TO DMH-35						0.100	5.00	0.08	5.08	6.56	**0.66**	From: DMH-36	Out:													
														HDPE	12	84	0.79	0.250	0.005	0.013	**2.52**	**3.21**	**0.26**	**0.71**	**2.28**	**0.62**
												To: DMH-35	In:													
WS CB-36	LANDSCAPED	0.021		0.400								From: CB-36	Out:													
	IMPERVIOUS	0.054		0.850										HDPE	12	15	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.07	0.49	3.12	0.08
			0.075	0.724	0.054		5.00	NONE	5.00	6.57	**0.36**	To: DMH-35	In:													
WS CB-37	LANDSCAPED	0.056		0.400								From: CB-37	Out:													
	IMPERVIOUS	0.106		0.850										HDPE	12	9	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.15	0.60	3.85	0.04
			0.162	0.694	0.113		5.00	NONE	5.00	6.57	**0.74**	To: DMH-35	In:													
DMH-35 TO DMH-34						0.267	5.08	0.62	5.70	6.44	**1.72**	From: DMH-35	Out:													
														HDPE	12	19	0.79	0.250	0.005	0.013	**2.52**	**3.21**	**0.68**	**0.94**	**3.01**	**0.11**
												To: DMH-34	In:													
WS CB-33	LANDSCAPED	0.014		0.400								From: CB-33	Out:													
	IMPERVIOUS	0.021		0.850										HDPE	12	14	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.03	0.38	2.44	0.10
			0.035	0.670	0.023		5.00	NONE	5.00	6.57	**0.15**	To: DMH-34	In:													
DMH-34 TO DMH-33						0.391	5.70	0.11	5.80	6.42	**2.51**	From: DMH-34	Out:													
														HDPE	12	101	0.79	0.250	0.005	0.013	**2.52**	**3.21**	**1.00**	**1.05**	**3.36**	**0.50**
												To: DMH-33	In:													
WS CB-40	LANDSCAPED	0.110		0.400								From: CB-40	Out:													
	IMPERVIOUS	0.188		0.850										HDPE	12	24	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.27	0.71	4.57	0.09
			0.298	0.684	0.204		5.00	NONE	5.00	6.57	**1.34**	To: DMH-40	In:													
WS CB-41	LANDSCAPED	0.163		0.400								From: CB-41	Out:													
	IMPERVIOUS	0.096		0.850										HDPE	12	20	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.19	0.65	4.16	0.08
			0.259	0.567	0.147		5.00	NONE	5.00	6.57	**0.96**	To: DMH-40	In:													
DMH-40 TO DMH-39						0.351	5.00	0.09	5.09	6.56	**2.30**	From: DMH-40	Out:													
														HDPE	12	100	0.79	0.250	0.005	0.013	**2.52**	**3.21**	**0.91**	**1.02**	**3.27**	**0.51**
												To: DMH-39	In:													
DMH-39 TO DMH-38						0.351	5.09	0.51	5.60	6.46	**2.27**	From: DMH-39	Out:													
														HDPE	12	82	0.79	0.250	0.005	0.013	**2.52**	**3.21**	**0.90**	**1.02**	**3.26**	**0.42**
												To: DMH-38	In:													

CONECO Engineers & Scientists

Project Number: 8548.0
Client: Continuing Care Management
Project Name: Salmon Health ARCPUD
Project Address: Village Street
Location: Medway, MA

Calculations by: DJD
Calculations Date: 06/10/15
Checked By: JEN
Checked Date: 06/10/15

WILLOW POND CIRCLE - 25 YEAR STORM - CLOSED SYSTEM PIPE SIZING

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW		R = hydraulic radius = area/wetted perimeter														Tc
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	L/V (MIN)
WS CB-38	LANDSCAPED	0.031		0.400								From: CB-38	Out:													
	IMPERVIOUS	0.108		0.850										HDPE	12	18	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.14	0.59	3.77	0.08
			0.139	0.750	0.104		5.00	NONE	5.00	6.57	**0.68**	To: DMH-38	In:													
WS CB-39	LANDSCAPED	0.153		0.400								From: CB-39	Out:													
	IMPERVIOUS	0.223		0.850										HDPE	12	14	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.33	0.76	4.86	0.05
			0.376	0.667	0.251		5.00	NONE	5.00	6.57	**1.65**	To: DMH-38	In:													
DMH-38 TO	**DMH-37**					0.706	5.60	0.42	6.02	6.39	**4.51**	From: DMH-38	Out:													
														HDPE	18	85	1.77	0.375	0.005	0.013	**7.43**	**4.20**	**0.61**	**0.91**	**3.81**	**0.37**
												To: DMH-37	In:													
DMH-37 TO	**DMH-33**					0.706	6.02	0.37	6.39	6.32	**4.46**	From: DMH-37	Out:													
														HDPE	18	57	1.77	0.375	0.005	0.013	**7.43**	**4.20**	**0.60**	**0.90**	**3.80**	**0.25**
												To: DMH-33	In:													
DMH-33 TO	**DMH-32**					1.097	6.39	0.50	6.89	6.23	6.84	From: DMH-33	Out:													
														HDPE	18	53	1.77	0.375	0.005	0.013	7.43	4.20	0.92	1.02	4.30	0.21
												To: DMH-32	In:													
DMH-32 TO	**DMH-31**					1.097	6.89	0.21	7.10	6.20	**6.80**	From: DMH-32	Out:													
														HDPE	18	94	1.77	0.375	0.005	0.013	**7.43**	**4.20**	**0.92**	**1.02**	**4.29**	**0.37**
												To: DMH-31	In:													
WS CB-31	LANDSCAPED	0.059		0.400								From: CB-31	Out:													
	IMPERVIOUS	0.057		0.850										HDPE	12	34	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.09	0.53	3.38	0.17
			0.116	0.621	0.072		5.00	NONE	5.00	6.57	**0.47**	To: DMH-31	In:													
WS CB-32	LANDSCAPED	0.106		0.400								From: CB-32	Out:													
	IMPERVIOUS	0.121		0.850										HDPE	12	26	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.19	0.65	4.15	0.10
			0.227	0.640	0.145		5.00	NONE	5.00	6.57	**0.95**	To: DMH-31	In:													
DMH-31 TO	**DMH-30**					1.314	7.10	0.37	7.46	6.14	**8.07**	From: DMH-31	Out:													
														HDPE	24	83	3.14	0.500	0.005	0.013	**16.00**	**5.09**	**0.50**	**0.86**	**4.37**	**0.32**
												To: DMH-30	In:													
WS CB-29	LANDSCAPED	0.086		0.400								From: CB-29	Out:													
	IMPERVIOUS	0.152		0.850										HDPE	12	10	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.21	0.67	4.29	0.04
			0.238	0.687	0.164		5.00	NONE	5.00	6.57	**1.08**	To: DMH-30	In:													
WS CB-30	LANDSCAPED	0.017		0.400								From: CB-30	Out:													
	IMPERVIOUS	0.113		0.850										HDPE	12	25	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.13	0.58	3.75	0.11
			0.130	0.791	0.103		5.00	NONE	5.00	6.57	**0.68**	To: DMH-30	In:													
DMH-30 TO	**DMH-29**					1.580	7.46	0.32	7.78	6.09	**9.62**	From: DMH-30	Out:													
														HDPE	24	119	3.14	0.500	0.005	0.013	**16.00**	**5.09**	**0.60**	**0.90**	**4.60**	**0.43**
												To: DMH-29	In:													
DMH-29 TO	**DMH-28**					1.580	7.78	0.43	8.21	6.02	**9.51**	From: DMH-29	Out:													
														HDPE	24	74	3.14	0.500	0.005	0.013	**16.00**	**5.09**	**0.59**	**0.90**	**4.59**	**0.27**
												To: DMH-28	In:													

CONECO
Engineers & Scientists

Project Number: 8548.0
Client: Continuing Care Management
Project Name: Salmon Health ARCPUD
Project Address: Village Street
Location: Medway, MA

Calculations by: DJD
Calculations Date: 06/10/15
Checked By: JEN
Checked Date: 06/10/15

WILLOW POND CIRCLE - 25 YEAR STORM - CLOSED SYSTEM PIPE SIZING

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW		R = hydraulic radius = area/wetted perimeter														Tc
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	L/V (MIN)
DMH-28 TO DMH-27						1.580	8.21	0.27	8.48	5.98	**9.45**	From: DMH-28 To: DMH-27	Out: In:	HDPE	24	58	3.14	0.500	0.005	0.013	**16.00**	**5.09**	**0.59**	**0.90**	**4.58**	**0.21**
WS CB-27	LANDSCAPED IMPERVIOUS	0.222 0.101	0.323	0.400 0.850 0.541	0.175		5.00	NONE	5.00	6.57	**1.15**	From: CB-27 To: DMH-27	Out: In:	HDPE	12	14	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.23	0.68	4.37	0.05
WS CB-28	LANDSCAPED IMPERVIOUS	0.014 0.121	0.135	0.400 0.850 0.803	0.108		5.00	NONE	5.00	6.57	**0.71**	From: CB-28 To: DMH-27	Out: In:	HDPE	12	15	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.14	0.59	3.81	0.07
DMH-27 TO DMH-26						1.863	8.48	0.07	8.54	5.97	**11.12**	From: DMH-27 To: DMH-26	Out: In:	HDPE	24	95	3.14	0.500	0.005	0.013	**16.00**	**5.09**	**0.70**	**0.94**	**4.80**	**0.33**
DMH-26 TO STC-3						1.863	8.54	0.33	8.87	5.92	**11.02**	From: DMH-26 To: STC-3	Out: In:	HDPE	24	57	3.14	0.500	0.005	0.013	**16.00**	**5.09**	**0.69**	**0.94**	**4.79**	**0.20**
WS CB-10	LANDSCAPED IMPERVIOUS	0.150 0.175	0.325	0.400 0.850 0.642	0.209		5.00	NONE	5.00	6.57	**1.37**	From: CB-10 To: DMH-12	Out: In:	HDPE	12	9	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.27	0.72	4.61	0.03
DMH-12 TO DMH-13						0.209	5.00	0.03	5.03	6.57	**1.37**	From: DMH-12 To: DMH-13	Out: In:	HDPE	12	194	0.79	0.250	0.005	0.013	**2.52**	**3.21**	**0.54**	**0.88**	**2.81**	**1.15**
WS CB-11	LANDSCAPED IMPERVIOUS	0.232 0.078	0.310	0.400 0.850 0.513	0.159		5.00	NONE	5.00	6.57	**1.05**	From: CB-11 To: DMH-13	Out: In:	HDPE	12	10	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.21	0.66	4.26	0.04
WS CB-12	LANDSCAPED IMPERVIOUS	0.057 0.083	0.140	0.400 0.850 0.667	0.093		5.00	NONE	5.00	6.57	**0.61**	From: CB-12 To: DMH-13	Out: In:	HDPE	12	13	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.12	0.57	3.65	0.06
DMH-13 TO DMH-14						0.461	5.03	1.15	6.18	6.36	**2.93**	From: DMH-13 To: DMH-14	Out: In:	HDPE	18	58	1.77	0.375	0.005	0.013	**7.43**	**4.20**	**0.39**	**0.80**	**3.36**	**0.29**
DMH-14 TO DMH-18						0.461	6.18	0.29	6.47	6.31	**2.91**	From: DMH-14 To: DMH-18	Out: In:	HDPE	18	97	1.77	0.375	0.005	0.013	**7.43**	**4.20**	**0.39**	**0.80**	**3.35**	**0.48**
DMH-18 TO DMH-19						0.461	6.47	0.48	6.95	6.22	**2.87**	From: DMH-18 To: DMH-19	Out: In:	HDPE	18	63	1.77	0.375	0.005	0.013	**7.43**	**4.20**	**0.39**	**0.79**	**3.34**	**0.31**

Project Number: 8548.0
Client: Continuing Care Management
Project Name: Salmon Health ARCPUD
Project Address: Village Street
Location: Medway, MA

Calculations by: DJD
Calculations Date: 06/10/15
Checked By: JEN
Checked Date: 06/10/15

CONECO Engineers & Scientists

WILLOW POND CIRCLE - 25 YEAR STORM - CLOSED SYSTEM PIPE SIZING

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW		R = hydraulic radius = area/wetted perimeter														Tc
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	L/V (MIN)
WS CB-13	LANDSCAPED	0.015		0.400								From: CB-13	Out:													
	IMPERVIOUS	0.042		0.850										HDPE	12	12	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.05	0.45	2.89	0.07
			0.057	0.732	0.042		5.00	NONE	5.00	6.57	**0.27**	To: DMH-15	In:													
WS CB-14	LANDSCAPED	0.089		0.400								From: CB-14	Out:													
	IMPERVIOUS	0.122		0.850										HDPE	12	10	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.18	0.64	4.10	0.04
			0.211	0.660	0.139		5.00	NONE	5.00	6.57	**0.92**	To: DMH-15	In:													
DMH-15 TO	**DMH-16**					0.181	5.00	0.31	5.31	6.51	**1.18**	From: DMH-15	Out:													
														HDPE	12	52	0.79	0.250	0.005	0.013	**2.52**	**3.21**	**0.47**	**0.84**	**2.69**	**0.32**
												To: DMH-16	In:													
WS CB-15	LANDSCAPED	0.011		0.400								From: CB-15	Out:													
	IMPERVIOUS	0.070		0.850										HDPE	12	47	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.08	0.51	3.27	0.24
			0.081	0.789	0.064		5.00	NONE	5.00	6.57	**0.42**	To: DMH-16	In:													
WS CB-16	LANDSCAPED	0.023		0.400								From: CB-16	Out:													
	IMPERVIOUS	0.166		0.850										HDPE	12	11	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.20	0.65	4.19	0.04
			0.189	0.795	0.150		5.00	NONE	5.00	6.57	**0.99**	To: DMH-16	In:													
DMH-16 TO	**DMH-17**					0.395	5.31	0.32	5.64	6.45	**2.55**	From: DMH-16	Out:													
														HDPE	18	101	1.77	0.375	0.005	0.013	**7.43**	**4.20**	**0.34**	**0.77**	**3.23**	**0.52**
												To: DMH-17	In:													
WS CB-17	LANDSCAPED	0.018		0.400								From: CB-17	Out:													
	IMPERVIOUS	0.090		0.850										HDPE	12	45	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.11	0.55	3.53	0.21
			0.108	0.775	0.084		5.00	NONE	5.00	6.57	**0.55**	To: DMH-17	In:													
WS CB-18	LANDSCAPED	0.000		0.400								From: CB-18	Out:													
	IMPERVIOUS	0.072		0.850										HDPE	12	9	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.08	0.50	3.23	0.05
			0.072	0.850	0.061		5.00	NONE	5.00	6.57	**0.40**	To: DMH-17	In:													
DMH-17 TO	**DMH-19**					0.540	6.95	0.52	7.47	6.14	**3.32**	From: DMH-17	Out:													
														HDPE	18	39	1.77	0.375	0.005	0.013	**7.43**	**4.20**	**0.45**	**0.83**	**3.48**	**0.19**
												To: DMH-19	In:													
DMH-19 TO	**DMH-21**					1.001	7.47	0.31	7.79	6.09	**6.09**	From: DMH-19	Out:													
														HDPE	18	61	1.77	0.375	0.005	0.013	**7.43**	**4.20**	**0.82**	**0.99**	**4.16**	**0.24**
												To: DMH-21	In:													
WS CB-19	LANDSCAPED	0.008		0.400								From: CB-19	Out:													
	IMPERVIOUS	0.046		0.850										HDPE	12	11	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.06	0.45	2.90	0.06
			0.054	0.783	0.042		5.00	NONE	5.00	6.57	**0.28**	To: DMH-20	In:													
WS CB-20	LANDSCAPED	0.020		0.400								From: CB-20	Out:													
	IMPERVIOUS	0.089		0.850										HDPE	12	15	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.11	0.55	3.53	0.07
			0.109	0.767	0.084		5.00	NONE	5.00	6.57	**0.55**	To: DMH-20	In:													
DMH-20 TO	**DMH-21**					0.126	5.00	0.07	5.07	6.56	**0.83**	From: DMH-20	Out:													
														HDPE	12	28	0.79	0.250	0.005	0.013	**2.52**	**3.21**	**0.33**	**0.76**	**2.43**	**0.19**
												To: DMH-21	In:													

Project Number: 8548.0
Client: Continuing Care Management
Project Name: Salmon Health ARCPUD
Project Address: Village Street
Location: Medway, MA

Calculations by: DJD
Calculations Date: 06/10/15
Checked By: JEN
Checked Date: 06/10/15

WILLOW POND CIRCLE - 25 YEAR STORM - CLOSED SYSTEM PIPE SIZING

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW		R = hydraulic radius = area/wetted perimeter														
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	Tc L/V (MIN)
DMH-21 TO DMH-22						1.127	7.79	0.24	8.03	6.05	**6.82**	From: DMH-21	Out:	HDPE	18	100	1.77	0.375	0.005	0.013	**7.43**	**4.20**	**0.92**	**1.02**	**4.29**	**0.39**
												To: DMH-22	In:													
WS CB-21	LANDSCAPED	0.140		0.400								From: CB-21	Out:													
	IMPERVIOUS	0.192		0.850										HDPE	12	14	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.29	0.73	4.67	0.05
			0.332	0.660	0.219		5.00	NONE	5.00	6.57	**1.44**	To: DMH-22	In:													
WS CB-22	LANDSCAPED	0.012		0.400								From: CB-22	Out:													
	IMPERVIOUS	0.084		0.850										HDPE	12	19	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.10	0.54	3.44	0.09
			0.096	0.794	0.076		5.00	NONE	5.00	6.57	**0.50**	To: DMH-22	In:													
DMH-22 TO DMH-23						1.423	8.03	0.39	8.42	5.99	**8.52**	From: DMH-22	Out:	HDPE	24	67	3.14	0.500	0.005	0.013	**16.00**	**5.09**	**0.53**	**0.87**	**4.44**	**0.25**
												To: DMH-23	In:													
DMH-23 TO DMH-24						1.423	8.42	0.25	8.67	5.95	**8.46**	From: DMH-23	Out:	HDPE	24	162	3.14	0.500	0.005	0.013	**16.00**	**5.09**	**0.53**	**0.87**	**4.43**	**0.61**
												To: DMH-24	In:													
WS CB-23	LANDSCAPED	0.235		0.400								From: CB-23	Out:													
	IMPERVIOUS	0.081		0.850										HDPE	12	10	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.21	0.67	4.29	0.04
			0.316	0.515	0.163		5.00	NONE	5.00	6.57	**1.07**	To: DMH-24	In:													
WS CB-24	LANDSCAPED	0.010		0.400								From: CB-24	Out:													
	IMPERVIOUS	0.108		0.850										HDPE	12	28	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.12	0.57	3.67	0.13
			0.118	0.812	0.096		5.00	NONE	5.00	6.57	**0.63**	To: DMH-24	In:													
DMH-24 TO DMH-25						1.681	8.67	0.61	9.28	5.86	**9.84**	From: DMH-24	Out:	HDPE	24	141	3.14	0.500	0.005	0.013	**16.00**	**5.09**	**0.62**	**0.91**	**4.63**	**0.51**
												To: DMH-25	In:													
WS CB-25	LANDSCAPED	0.238		0.400								From: CB-25	Out:													
	IMPERVIOUS	0.081		0.850										HDPE	12	19	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.21	0.67	4.29	0.07
			0.319	0.514	0.164		5.00	NONE	5.00	6.57	**1.08**	To: DMH-25	In:													
WS CB-26	LANDSCAPED	0.009		0.400								From: CB-26	Out:													
	IMPERVIOUS	0.112		0.850										HDPE	12	18	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.13	0.58	3.71	0.08
			0.121	0.817	0.099		5.00	NONE	5.00	6.57	**0.65**	To: DMH-25	In:													
DMH-25 TO STC-3						1.944	9.28	0.51	9.79	5.78	**11.24**	From: DMH-25	Out:	HDPE	24	57	3.14	0.500	0.005	0.013	**16.00**	**5.09**	**0.70**	**0.95**	**4.81**	**0.20**
												To: STC-3	In:													
STC-3 TO TRENCH 18A						3.808	9.79	0.20	9.99	5.75	**21.90**	From: STC-3	Out:	HDPE	30	47	4.91	0.625	0.005	0.013	**29.00**	**5.91**	**0.76**	**0.97**	**5.70**	**0.14**
												To: TRENCH 18A	In:													

Project Number: 8548.0
Client: Continuing Care Management
Project Name: Salmon Health ARCPUD
Project Address: Village Street
Location: Medway, MA

Calculations by: DJD
Calculations Date: 06/10/15
Checked By: JEN
Checked Date: 06/10/15

WATERSIDE RUN - 25 YEAR STORM - CLOSED SYSTEM PIPE SIZING

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW		R = hydraulic radius = area/wetted perimeter														
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	Tc L/V (MIN)
WS CB-42	LANDSCAPED	0.000		0.400								From: CB-42	Out:													
	IMPERVIOUS	0.007		0.850										HDPE	12	10	0.79	0.250	0.020	0.013	5.04	6.42	0.01	0.26	1.64	0.10
			0.007	0.850	0.006		5.00	NONE	5.00	6.57	0.04	To: DMH-41	In:													
WS CB-43	LANDSCAPED	0.006		0.400								From: CB-43	Out:													
	IMPERVIOUS	0.029		0.850										HDPE	12	13	0.79	0.250	0.020	0.013	5.04	6.42	0.04	0.40	2.55	0.09
			0.035	0.773	0.027		5.00	NONE	5.00	6.57	0.18	To: DMH-41	In:													
DMH-41 TO DMH-42						0.033	5.00	0.10	5.10	6.55	0.22	From: DMH-41	Out:													
														HDPE	12	147	0.79	0.250	0.020	0.013	5.04	6.42	0.04	0.42	2.70	0.91
												To: DMH-42	In:													
DMH-42 TO DMH-43						0.033	5.10	0.91	6.01	6.39	0.21	From: DMH-42	Out:													
														HDPE	12	71	0.79	0.250	0.020	0.013	5.04	6.42	0.04	0.42	2.68	0.44
												To: DMH-43	In:													
DMH-43 TO DMH-44						0.033	6.01	0.44	6.45	6.31	0.21	From: DMH-43	Out:													
														HDPE	12	53	0.79	0.25	0.020	0.013	5.04	6.42	0.04	0.42	2.67	0.33
												To: DMH-44	In:													
WS CB-44	LANDSCAPED	0.052		0.400								From: CB-44	Out:													
	IMPERVIOUS	0.083		0.850										HDPE	12	15	0.79	0.250	0.020	0.013	5.04	6.42	0.12	0.56	3.62	0.07
			0.135	0.677	0.091		5.00	NONE	5.00	6.57	0.60	To: DMH-44	In:													
WS CB-45	LANDSCAPED	0.010		0.400								From: CB-45	Out:													
	IMPERVIOUS	0.055		0.850										HDPE	12	15	0.79	0.250	0.020	0.013	5.04	6.42	0.07	0.48	3.06	0.08
			0.065	0.781	0.051		5.00	NONE	5.00	6.57	0.33	To: DMH-44	In:													
DMH-44 TO DMH-45						0.175	6.45	0.33	6.78	6.25	1.09	From: DMH-44	Out:													
														HDPE	12	144	0.79	0.250	0.020	0.013	5.04	6.42	0.22	0.67	4.31	0.56
												To: DMH-45	In:													
DMH-45 TO DMH-46						0.175	6.78	0.56	7.34	6.16	1.08	From: DMH-45	Out:													
														HDPE	12	129	0.79	0.25	0.020	0.013	5.04	6.42	0.21	0.67	4.30	0.50
												To: DMH-46	In:													
WS CB-46	LANDSCAPED	0.058		0.400								From: CB-46	Out:													
	IMPERVIOUS	0.175		0.850										HDPE	12	19	0.79	0.250	0.020	0.013	5.04	6.42	0.22	0.68	4.35	0.07
			0.233	0.738	0.172		5.00	NONE	5.00	6.57	1.13	To: DMH-46	In:													
WS CB-47	LANDSCAPED	0.140		0.400								From: CB-47	Out:													
	IMPERVIOUS	0.161		0.850										HDPE	12	24	0.79	0.250	0.020	0.013	5.04	6.42	0.25	0.70	4.50	0.09
			0.301	0.641	0.193		5.00	NONE	5.00	6.57	1.27	To: DMH-46	In:													
DMH-46 TO DMH-47						0.540	7.34	0.50	7.84	6.08	3.28	From: DMH-46	Out:													
														HDPE	18	144	1.77	0.375	0.005	0.013	7.43	4.20	0.44	0.83	3.47	0.69
												To: DMH-47	In:													
DMH-47 TO DMH-48						0.540	7.84	0.69	8.53	5.97	3.22	From: DMH-47	Out:													
														HDPE	18	39	1.77	0.375	0.005	0.013	7.43	4.20	0.43	0.82	3.45	0.19
												To: DMH-48	In:													
DMH-48 TO DMH-49						0.540	8.53	0.19	8.72	5.94	3.21	From: DMH-48	Out:													
														HDPE	18	98	1.77	0.375	0.005	0.013	7.43	4.20	0.43	0.82	3.45	0.47
												To: DMH-49	In:													

CONECO
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Project Number: 8548.0
Client: Continuing Care Management
Project Name: Salmon Health ARCPUD
Project Address: Village Street
Location: Medway, MA

Calculations by: DJD
Calculations Date: 06/10/15
Checked By: JEN
Checked Date: 06/10/15

WATERSIDE RUN - 25 YEAR STORM - CLOSED SYSTEM PIPE SIZING

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW		R = hydraulic radius = area/wetted perimeter														Tc
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	L/V (MIN)
WS CB-48	LANDSCAPED	0.261		0.400								From: CB-48	Out:													
	IMPERVIOUS	0.137		0.850										HDPE	12	9	0.79	0.250	0.02	0.013	**5.04**	**6.42**	0.29	0.73	4.68	0.03
			0.398	0.555	0.221		5.00	NONE	5.00	6.57	**1.45**	To: DMH-49	In:													
WS CB-49	LANDSCAPED	0.070		0.400								From: CB-49	Out:													
	IMPERVIOUS	0.137		0.850										HDPE	12	14	0.79	0.250	0.02	0.013	**5.04**	**6.42**	0.19	0.65	4.14	0.06
			0.207	0.698	0.144		5.00	NONE	5.00	6.57	**0.95**	To: DMH-49	In:													
DMH-49 TO	**DMH-50**					0.905	8.72	0.47	9.19	5.87	**5.31**	From: DMH-49	Out:													
														HDPE	18	26	1.77	0.375	0.005	0.013	**7.43**	**4.20**	**0.72**	**0.95**	**3.99**	**0.11**
												To: DMH-50	In:													
DMH-50 TO	**DMH-51**					0.905	9.19	0.11	9.30	5.85	5.30	From: DMH-50	Out:													
														HDPE	18	173	1.77	0.375	0.005	0.013	7.43	4.20	0.71	0.95	3.99	0.72
												To: DMH-51	In:													
DMH-51 TO	**DMH-52**					0.905	9.30	0.72	10.02	5.75	5.20	From: DMH-51	Out:													
														HDPE	18	89	1.77	0.375	0.005	0.013	7.43	4.20	0.70	0.94	3.97	0.37
												To: DMH-52	In:													
WS CB-50	LANDSCAPED	0.008		0.400								From: CB-50	Out:													
	IMPERVIOUS	0.066		0.850										HDPE	12	9	0.79	0.250	0.02	0.013	**5.04**	**6.42**	0.08	0.50	3.20	0.05
			0.074	0.801	0.059		5.00	NONE	5.00	6.57	**0.39**	To: DMH-52	In:													
WS CB-51	LANDSCAPED	0.058		0.400								From: CB-51	Out:													
	IMPERVIOUS	0.064		0.850										HDPE	12	12	0.79	0.250	0.02	0.013	**5.04**	**6.42**	0.10	0.54	3.46	0.06
			0.122	0.636	0.078		5.00	NONE	5.00	6.57	**0.51**	To: DMH-52	In:													
DMH-52 TO	**DMH-53**					1.042	10.02	0.37	10.40	5.69	**5.93**	From: DMH-52	Out:													
														HDPE	18	32	1.77	0.375	0.005	0.013	**7.43**	**4.20**	**0.80**	**0.98**	**4.12**	**0.13**
												To: DMH-53	In:													
DMH-53 TO	**DMH-54**					1.042	10.40	0.13	10.53	5.68	5.91	From: DMH-53	Out:													
														HDPE	18	100	1.77	0.375	0.005	0.013	7.43	4.20	0.80	0.98	4.12	0.40
												To: DMH-54	In:													
WS CB-52	LANDSCAPED	0.045		0.400								From: CB-52	Out:													
	IMPERVIOUS	0.091		0.850										HDPE	12	12	0.79	0.250	0.02	0.013	**5.04**	**6.42**	0.12	0.57	3.67	0.05
			0.136	0.701	0.095		5.00	NONE	5.00	6.57	**0.63**	To: DMH-54	In:													
WS CB-53	LANDSCAPED	0.073		0.400								From: CB-53	Out:													
	IMPERVIOUS	0.120		0.850										HDPE	12	16	0.79	0.250	0.02	0.013	**5.04**	**6.42**	0.17	0.63	4.03	0.07
			0.193	0.680	0.131		5.00	NONE	5.00	6.57	**0.86**	To: DMH-54	In:													
DMH-54 TO	**DMH-55**					1.269	10.53	0.40	10.93	5.62	**7.13**	From: DMH-54	Out:													
														HDPE	18	66	1.77	0.375	0.005	0.013	**7.43**	**4.20**	**0.96**	**1.03**	**4.35**	**0.25**
												To: DMH-55	In:													

CONECO Engineers & Scientists

Project Number: 8548.0
Client: Continuing Care Management
Project Name: Salmon Health ARCPUD
Project Address: Village Street
Location: Medway, MA

Calculations by: DJD
Calculations Date: 06/10/15
Checked By: JEN
Checked Date: 06/10/15

WATERSIDE RUN - 25 YEAR STORM - CLOSED SYSTEM PIPE SIZING

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW		R = hydraulic radius = area/wetted perimeter														Tc
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	L/V (MIN)
WS CB-54	LANDSCAPED	0.008		0.400								From: CB-54	Out:													
	IMPERVIOUS	0.020		0.850										HDPE	12	9	0.79	0.250	0.02	0.013	**5.04**	**6.42**	0.03	0.36	2.34	0.06
			0.028	0.721	0.020		5.00	NONE	5.00	6.57	**0.13**	To: DMH-56	In:													
WS CB-55	LANDSCAPED	0.006		0.400								From: CB-55	Out:													
	IMPERVIOUS	0.005		0.850										HDPE	12	16	0.79	0.250	0.02	0.013	**5.04**	**6.42**	0.01	0.26	1.70	0.16
			0.011	0.605	0.007		5.00	NONE	5.00	6.57	**0.04**	To: DMH-56	In:													
DMH-56 TO DMH-55						0.027	5.00	0.16	5.16	6.54	**0.18**	From: DMH-56	Out:													
														HDPE	12	25	0.79	0.250	0.005	0.013	**2.52**	**3.21**	**0.07**	**0.48**	**1.55**	**0.27**
												To: DMH-55	In:													
DMH-55 TO DMH-57						1.296	10.93	0.25	11.19	5.58	7.23	From: DMH-55	Out:													
														HDPE	18	71	1.77	0.375	0.005	0.013	7.43	4.20	0.97	1.04	4.37	0.27
												To: DMH-57	In:													
WS CB-56	LANDSCAPED	0.015		0.400								From: CB-56	Out:													
	IMPERVIOUS	0.036		0.850										HDPE	12	49	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.05	0.43	2.78	0.29
			0.051	0.718	0.037		5.00	NONE	5.00	6.57	**0.24**	To: DMH-57	In:													
DMH-57 TO DMH-58						1.332	11.19	0.27	11.46	5.55	**7.39**	From: DMH-57	Out:													
														HDPE	18	91	1.77	0.375	0.005	0.013	**7.43**	**4.20**	**0.99**	**1.05**	**4.39**	**0.35**
												To: DMH-58	In:													
WS CB-57	LANDSCAPED	0.038		0.400								From: CB-57	Out:													
	IMPERVIOUS	0.103		0.850										HDPE	12	27	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.13	0.58	3.75	0.12
			0.141	0.729	0.103		5.00	NONE	5.00	6.57	**0.68**	To: DMH-58	In:													
WS CB-58	LANDSCAPED	0.004		0.400								From: CB-58	Out:													
	IMPERVIOUS	0.028		0.850										HDPE	12	10	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.03	0.39	2.50	0.07
			0.032	0.794	0.025		5.00	NONE	5.00	6.57	**0.17**	To: DMH-58	In:													
DMH-58 TO DMH-59						1.460	11.46	0.35	11.80	5.50	**8.03**	From: DMH-58	Out:													
														HDPE	24	42	3.14	0.500	0.005	0.013	**16.00**	**5.09**	**0.50**	**0.86**	**4.37**	**0.16**
												To: DMH-59	In:													
DMH-59 TO STC-4						1.460	11.80	0.16	11.96	5.48	8.00	From: DMH-59	Out:													
														HDPE	24	113	3.14	0.5	0.005	0.013	16.00	5.09	0.50	0.86	4.36	0.43
												To: STC-4	In:													
STC-4 TO FES-5						1.460	11.96	0.43	12.39	5.43	7.92	From: STC-4	Out:													
														HDPE	24	32	3.14	0.5	0.005	0.013	16.00	5.09	0.50	0.85	4.35	0.12
												To: FES-5	In:													

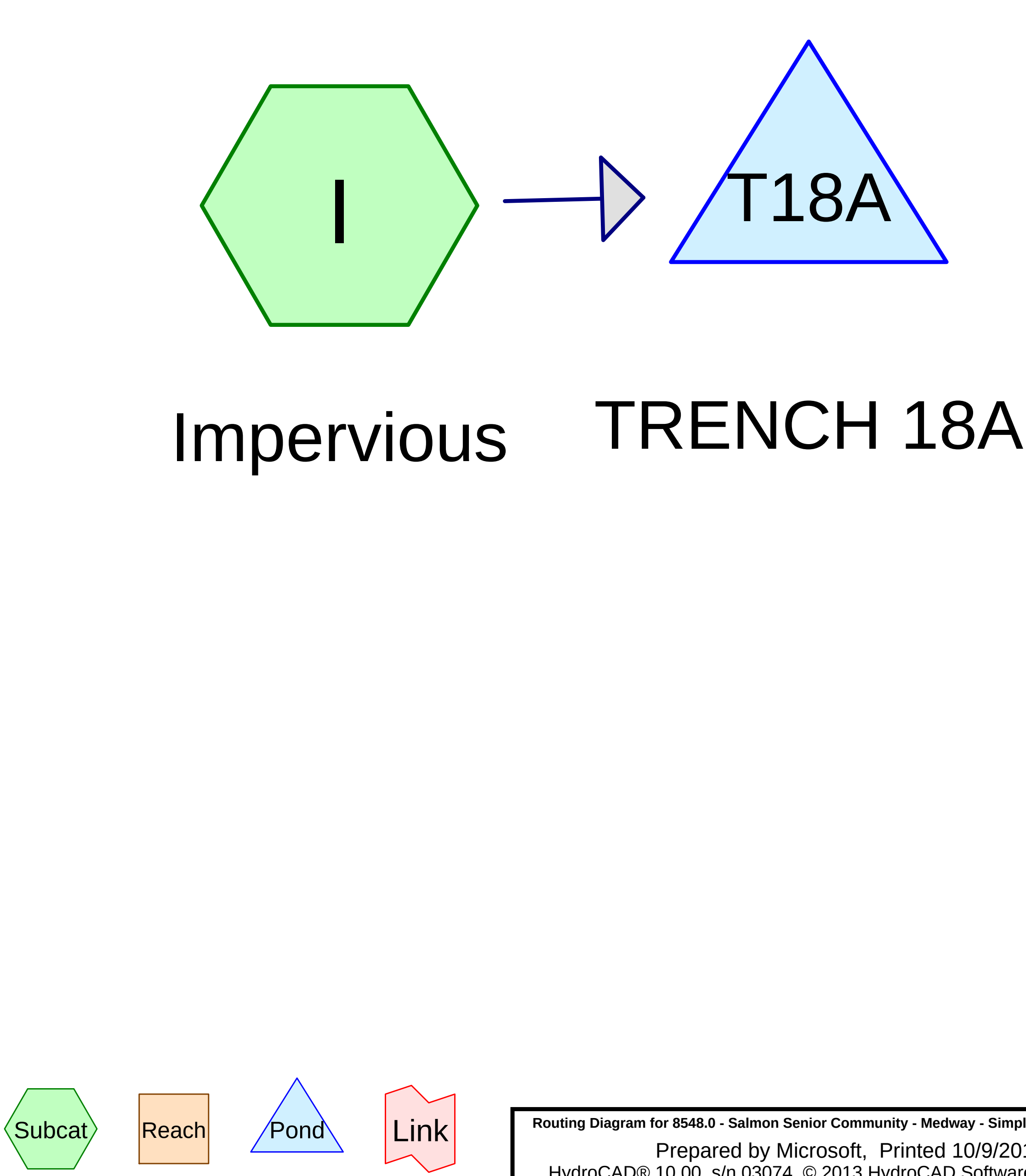
CONECO
Engineers & Scientists

Project Number: 8548.0
Client: Continuing Care Management
Project Name: Salmon Health ARCPUD
Project Address: Village Street
Location: Medway, MA

Calculations by: DJD
Calculations Date: 10/08/15
Checked By: JEN
Checked Date: 10/08/15

WATERSIDE RUN CROSSINGS - 50 YEAR STORM - CLOSED SYSTEM PIPE SIZING

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW		R = hydraulic radius = area/wetted perimeter														Tc
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	L/V (MIN)
WS DCB-2	LANDSCAPED	0.122		0.400								From: DCB-2	Out:													
	RESIDENTIAL	1.338		0.400										RCP	18	39	1.77	0.375	0.005	0.011	**8.78**	**4.97**	0.50	0.86	4.25	0.15
			1.460	0.400	0.584		6.30	NONE	6.30	7.51	**4.38**	To: HW-3	In:													
WS DCB-3	LANDSCAPED	0.461		0.400								From: DCB-3	Out:													
	RESIDENTIAL	1.550		0.400										RCP	18	8	1.77	0.375	0.005	0.011	**8.78**	**4.97**	0.67	0.93	4.63	0.03
			2.011	0.400	0.804		7.10	NONE	7.10	7.33	**5.90**	To: FES-9	In:													
WS DCB-4	LANDSCAPED	0.265		0.400								From: DCB-4	Out:													
	RESIDENTIAL	1.488		0.400										RCP	18	66	1.77	0.375	0.005	0.011	**8.78**	**4.97**	0.52	0.87	4.31	0.26
			1.753	0.400	0.701		11.30	NONE	11.30	6.53	**4.58**	To: FES-8	In:													
WS DCB-1	LANDSCAPED	0.271		0.400								From: DCB-1	Out:													
	RESIDENTIAL	4.593		0.400										RCP	24	117	3.14	0.500	0.005	0.011	**18.90**	**6.02**	0.70	0.95	5.69	0.34
			4.864	0.400	1.946		9.50	NONE	9.50	6.85	**13.33**	To: FES-7	In:													
WS DCB-5	LANDSCAPED	0.214		0.400								From: DCB-5	Out:													
	RESIDENTIAL	0.461		0.400										RCP	18	93	1.77	0.375	0.026	0.011	**20.02**	**11.33**	0.09	0.53	5.97	0.26
			0.675	0.400	0.270		8.90	NONE	8.90	6.96	**1.88**	To: HW-5	In:													
WS DCB-2	LANDSCAPED	0.157		0.400								From: DCB-2	Out:													
	RESIDENTIAL	0.880		0.400										RCP	18	66	1.77	0.375	0.020	0.011	**17.56**	**9.93**	0.15	0.60	5.96	0.18
			1.037	0.400	0.415		13.30	NONE	13.30	6.20	**2.57**	To: FES-10	In:													



Routing Diagram for 8548.0 - Salmon Senior Community - Medway - Simple Dynamic Sizing - REV 1
Prepared by Microsoft, Printed 10/9/2015
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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
495,468	98	Impervious (I)
495,468	**98**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
0	HSG D	
495,468	Other	I
495,468		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
0	0	0	0	495,468	495,468	Impervious	I
0	**0**	**0**	**0**	**495,468**	**495,468**	**TOTAL AREA**	

Time span=11.00-13.00 hrs, dt=0.05 hrs, 41 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment I: Impervious Runoff Area=495,468 sf 100.00% Impervious Runoff Depth>0.35"
Tc=0.0 min CN=98 Runoff=9.17 cfs 14,568 cf

Pond T18A: TRENCH 18A Peak Elev=171.41' Storage=11,148 cf Inflow=9.17 cfs 14,568 cf
Outflow=0.48 cfs 3,406 cf

Total Runoff Area = 495,468 sf Runoff Volume = 14,568 cf Average Runoff Depth = 0.35"
0.00% Pervious = 0 sf 100.00% Impervious = 495,468 sf

Summary for Subcatchment I: Impervious

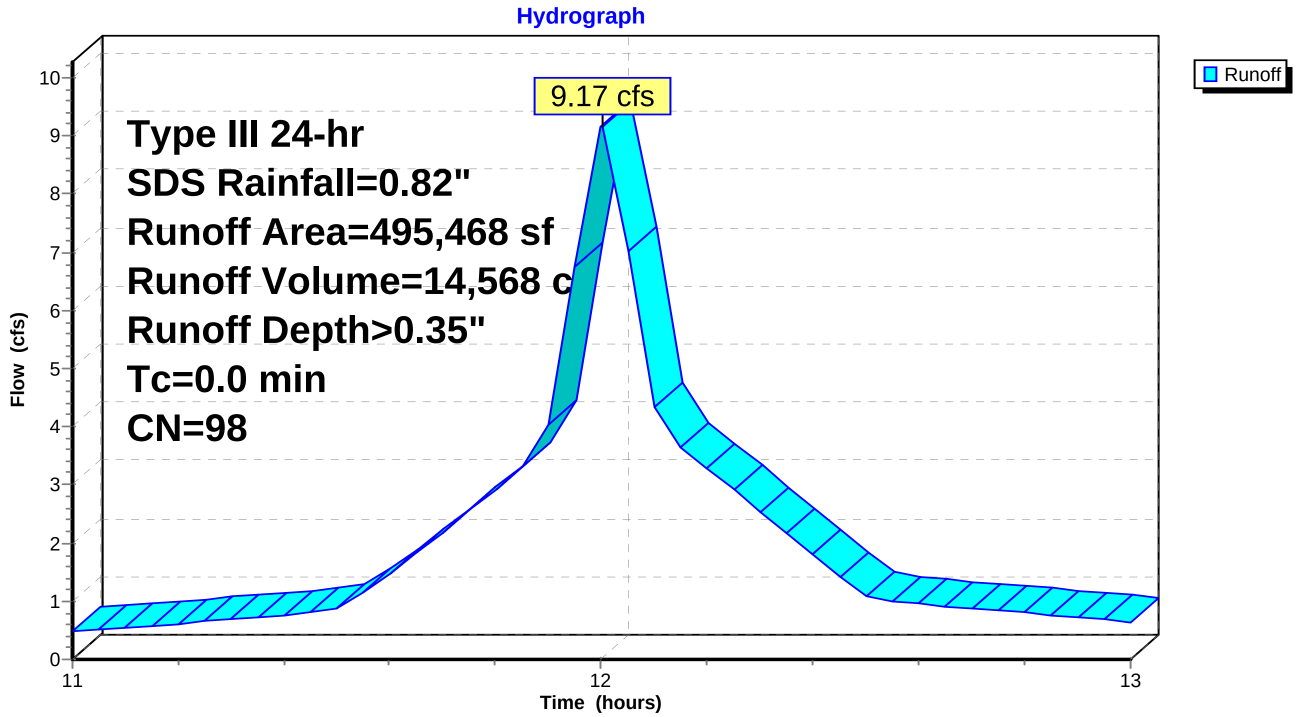
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 9.17 cfs @ 12.00 hrs, Volume= 14,568 cf, Depth> 0.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 11.00-13.00 hrs, dt= 0.05 hrs
Type III 24-hr SDS Rainfall=0.82"

	Area (sf)	CN	Description
*	495,468	98	Impervious
	495,468		100.00% Impervious Area

Subcatchment I: Impervious



Summary for Pond T18A: TRENCH 18A

[82] Warning: Early inflow requires earlier time span

Inflow Area = 495,468 sf,100.00% Impervious, Inflow Depth > 0.35" for SDS event
Inflow = 9.17 cfs @ 12.00 hrs, Volume= 14,568 cf
Outflow = 0.48 cfs @ 11.25 hrs, Volume= 3,406 cf, Atten= 95%, Lag= 0.0 min
Discarded = 0.48 cfs @ 11.25 hrs, Volume= 3,406 cf

Routing by Stor-Ind method, Time Span= 11.00-13.00 hrs, dt= 0.05 hrs
Peak Elev= 171.41' @ 13.00 hrs Surf.Area= 8,648 sf Storage= 11,148 cf

Plug-Flow detention time= 30.2 min calculated for 3,289 cf (23% of inflow)
Center-of-Mass det. time= 1.0 min (722.6 - 721.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	169.50'	11,805 cf	**44.75'W x 193.25'L x 5.75'H Field A** 49,726 cf Overall - 20,213 cf Embedded = 29,513 cf x 40.0% Voids
#2A	170.25'	20,213 cf	**Cultec R-900HD** x 162 Inside #1 Effective Size= 72.7"W x 48.0"H => 17.61 sf x 7.00'L = 123.3 cf Overall Size= 78.0"W x 48.0"H x 9.25'L with 2.25' Overlap Row Length Adjustment= +2.25' x 17.61 sf x 6 rows
		32,018 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	169.50'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.48 cfs @ 11.25 hrs HW=169.57' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.48 cfs)

Pond T18A: TRENCH 18A - Chamber Wizard Field A

Chamber Model = Cultec R-900HD
Effective Size= 72.7"W x 48.0"H => 17.61 sf x 7.00'L = 123.3 cf
Overall Size= 78.0"W x 48.0"H x 9.25'L with 2.25' Overlap
Row Length Adjustment= +2.25' x 17.61 sf x 6 rows

78.0" Wide + 9.0" Spacing = 87.0" C-C Row Spacing

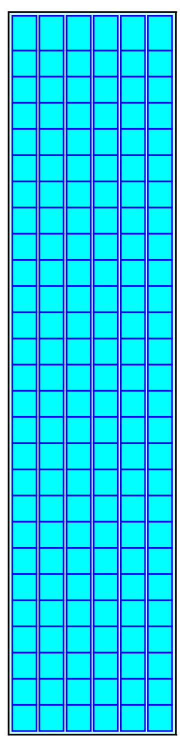
27 Chambers/Row x 7.00' Long +2.25' Row Adjustment = 191.25' Row Length +12.0" End Stone x 2 = 193.25' Base Length
6 Rows x 78.0" Wide + 9.0" Spacing x 5 + 12.0" Side Stone x 2 = 44.75' Base Width
9.0" Base + 48.0" Chamber Height + 12.0" Cover = 5.75' Field Height

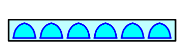
162 Chambers x 123.3 cf +2.25' Row Adjustment x 17.61 sf x 6 Rows = 20,212.9 cf Chamber Storage

49,725.6 cf Field - 20,212.9 cf Chambers = 29,512.7 cf Stone x 40.0% Voids = 11,805.1 cf Stone Storage

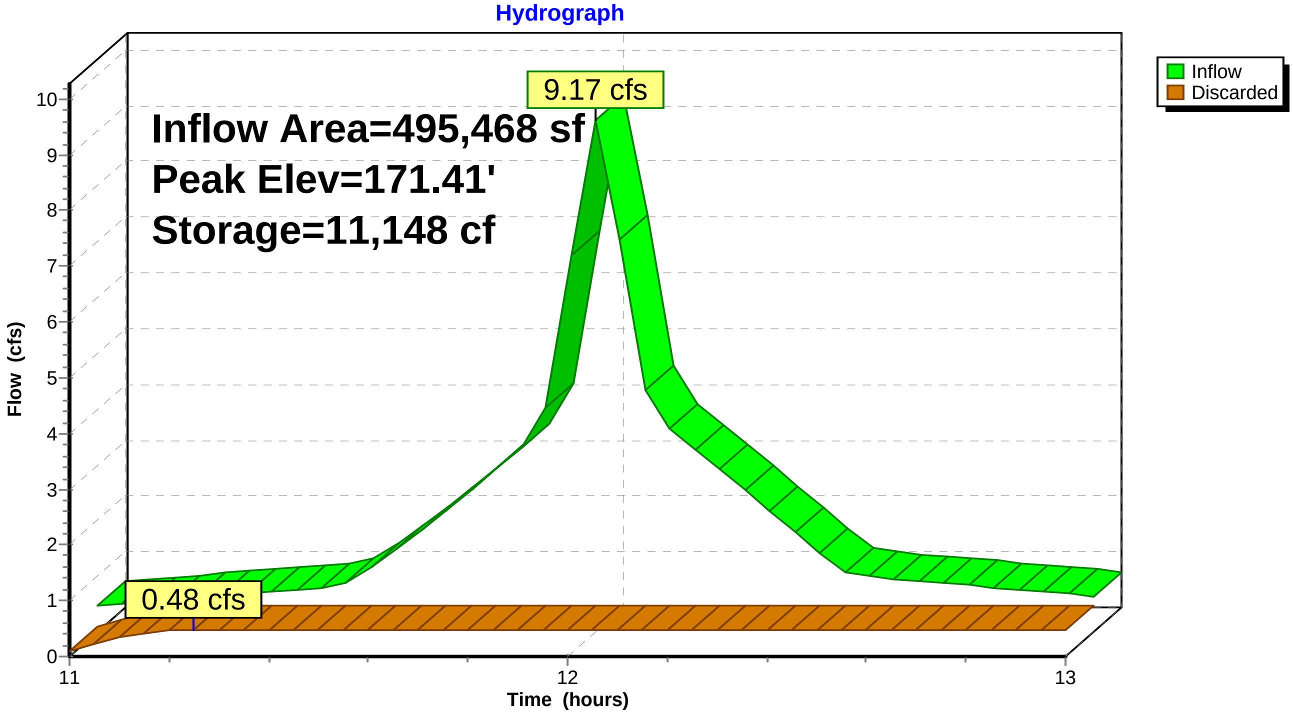
Chamber Storage + Stone Storage = 32,018.0 cf = 0.735 af
Overall Storage Efficiency = 64.4%

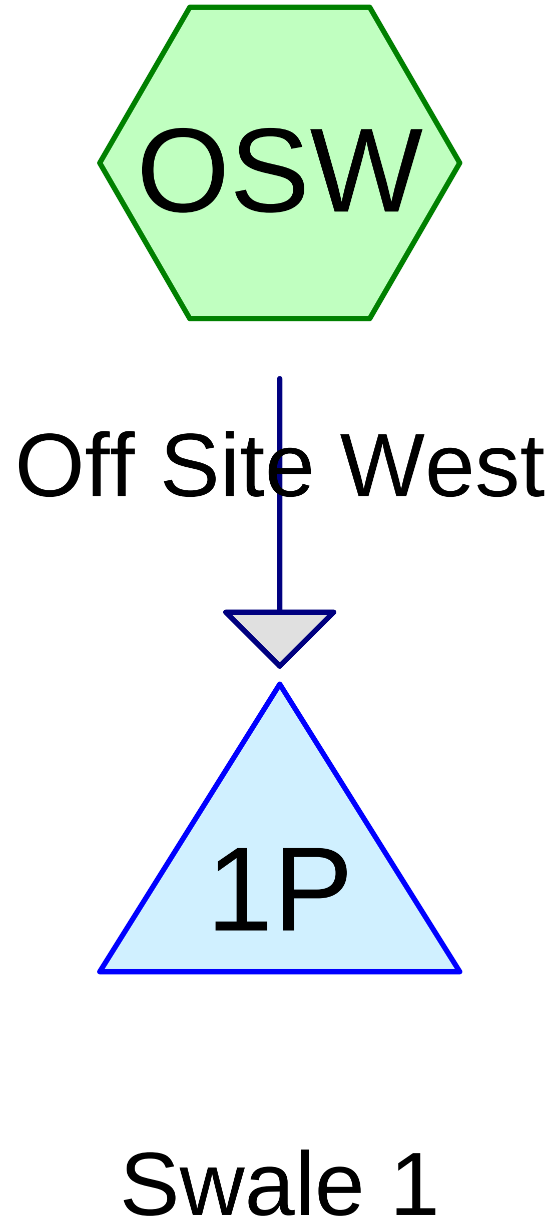
162 Chambers
1,841.7 cy Field
1,093.1 cy Stone

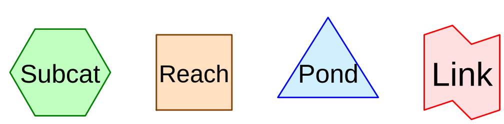




Pond T18A: TRENCH 18A







Routing Diagram for 8548.0 - Salmon Senior Community - Medway - Proposed Conditions - REV2
Prepared by Microsoft, Printed 10/19/2015
HydroCAD® 10.00 s/n 03074 © 2013 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
15,112	61	>75% Grass cover, Good, HSG B (OSW)
8,058	80	>75% Grass cover, Good, HSG D (OSW)
1,048	80	Path(cover unknown) (OSW)
3,642	60	Permeable Parking Area (OSW)
185	98	Unconnected pavement, HSG B (OSW)
2,983	55	Woods, Good, HSG B (OSW)
31,028	**66**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
18,280	HSG B	OSW
0	HSG C	
8,058	HSG D	OSW
4,690	Other	OSW
31,028		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	15,112	0	8,058	0	23,170	>75% Grass cover, Good	
0	0	0	0	1,048	1,048	Path(cover unknown)	
0	0	0	0	3,642	3,642	Permeable Parking Area	
0	185	0	0	0	185	Unconnected pavement	
0	2,983	0	0	0	2,983	Woods, Good	
0	**18,280**	**0**	**8,058**	**4,690**	**31,028**	**TOTAL AREA**	

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

Subcatchment OSW: Off Site West Runoff Area=31,028 sf 0.60% Impervious Runoff Depth>2.74"
Flow Length=178' Tc=7.7 min CN=66 Runoff=2.29 cfs 7,093 cf

Pond 1P: Swale 1 Peak Elev=176.01' Storage=5 cf Inflow=2.29 cfs 7,093 cf
Discarded=2.29 cfs 7,093 cf Primary=0.00 cfs 0 cf Outflow=2.29 cfs 7,093 cf

Total Runoff Area = 31,028 sf Runoff Volume = 7,093 cf Average Runoff Depth = 2.74"
99.40% Pervious = 30,843 sf 0.60% Impervious = 185 sf

Summary for Subcatchment OSW: Off Site West

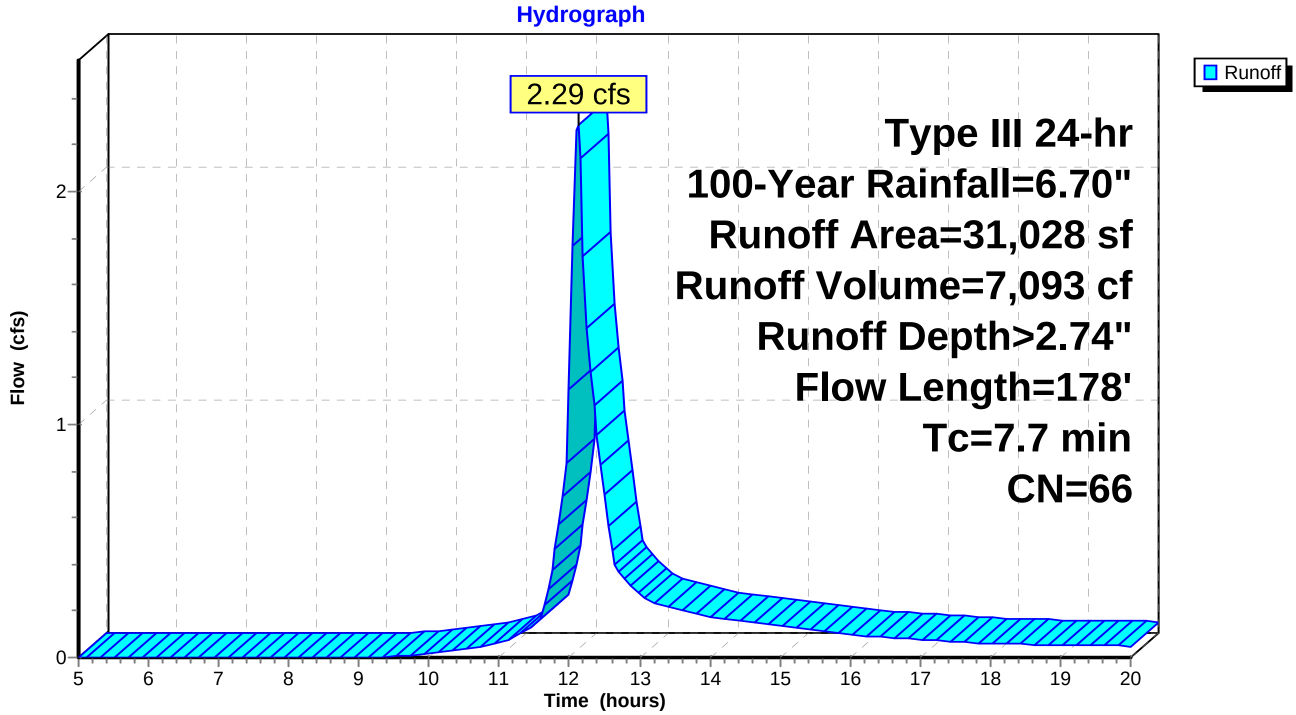
Runoff = 2.29 cfs @ 12.12 hrs, Volume= 7,093 cf, Depth> 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
	2,983	55	Woods, Good, HSG B
	15,112	61	>75% Grass cover, Good, HSG B
*	1,048	80	Path(cover unknown)
	185	98	Unconnected pavement, HSG B
	8,058	80	>75% Grass cover, Good, HSG D
*	3,642	60	Permeable Parking Area
	31,028	66	Weighted Average
	30,843		99.40% Pervious Area
	185		0.60% Impervious Area
	185		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	128	0.0540	3.74		**Shallow Concentrated Flow, Wooded/Path/Wooded B-C** Unpaved Kv= 16.1 fps
7.7	178	Total			

Subcatchment OSW: Off Site West



Summary for Pond 1P: Swale 1

Inflow Area = 31,028 sf, 0.60% Impervious, Inflow Depth > 2.74" for 100-Year event
Inflow = 2.29 cfs @ 12.12 hrs, Volume= 7,093 cf
Outflow = 2.29 cfs @ 12.12 hrs, Volume= 7,093 cf, Atten= 0%, Lag= 0.0 min
Discarded = 2.29 cfs @ 12.12 hrs, Volume= 7,093 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 176.01' @ 12.12 hrs Surf.Area= 543 sf Storage= 5 cf

Plug-Flow detention time= 0.0 min calculated for 7,070 cf (100% of inflow)
Center-of-Mass det. time= 0.0 min (804.4 - 804.4)

Volume	Invert	Avail.Storage	Storage Description
#1	176.00'	698 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

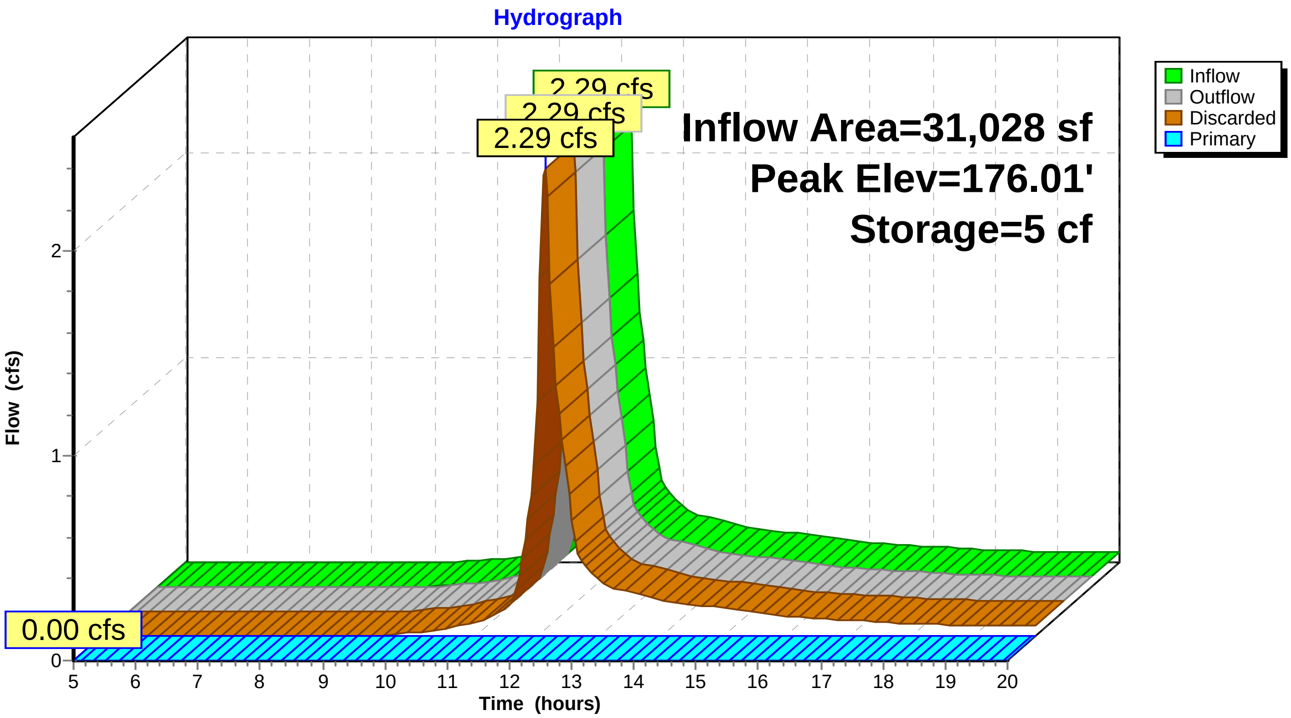
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
176.00	540	0	0
177.00	855	698	698

Device	Routing	Invert	Outlet Devices
#1	Primary	176.50'	**12.0' long x 3.0' 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 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	176.00'	**2.41 cfs Exfiltration at all elevations**

Discarded OutFlow Max=2.41 cfs @ 12.12 hrs HW=176.01' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 2.41 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=176.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

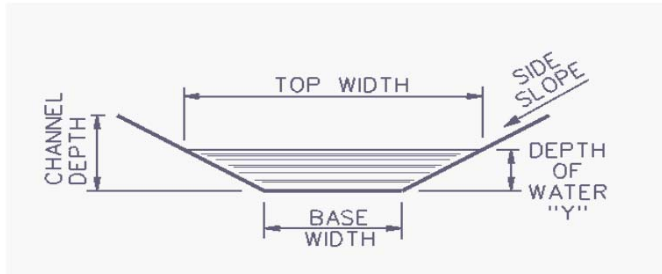
Pond 1P: Swale 1



OPEN CHANNEL DEPTH OF FLOW

For Trapezoidal, V-Type, and Rectangular Channels

Project :	SALMON HEALTH AND RETIREMENT	**By:**	DJD	**Date:**	10/19/15
Location :	VILLAGE STREET, MEDWAY, MA	**Checked:**	SMO	**Date:**	10/19/15
Descriptior	**CONVEYENCE SWALE**	**Design Storm:**	100 yr.		



INPUT

Design Flow Rate	**2.29**	cfs
Bed Slope	**0.0100**	ft/ft
Manning's n	**0.025**	**earth channel**
Channel Height	**1.00**	ft
Base Width	**6.00**	ft (Zero for V-Type)
Side Slopes	**3.00**	ft. horizontal to 1 ft. vertical (Zero for Rectangular)

Instructions:

Manning's Equation $Q = \frac{1.486}{n} x R^{2/3} x S^{1/2} x A$ is rearranged to: $AR^{2/3} = \frac{Q \times n}{1.486 \times S^{1/2}}$

AR^2/3 is referred to as a "Section Factor". The "Normal Depth" is found by equating the Section Factor calculated from Manning's Equation to the Section Factor calculated from the geometry of the channel. To find the "Normal Depth," manipulate the Assumed Depth "Y" until the Section Factors from the two calculations are equal. The resulting "Y" value is the Normal Depth.

CALCULATIONS

Assumed Depth (y) **0.190** ft Trial and Error Input Until Section Factors from Both Calculations Match

Area (A)	1.25	sf	[Basewidth + 2 x (½ [Sideslope x Assumed Depth])] x Assumed Depth
Wetted Perimeter (Pw)	7.20	ft	[Basewidth + 2 x SQRT [Assumed Depth^2 + (Sideslope x Assumed Depth)^2]
Hydraulic Radius (R)	0.17	ft	Area ÷ Wetted Perimeter

AR^2/3	**0.39**	CALCULATED FROM CHANNEL GEOMETRY Area x Hydraulic Radius^2/3
AR^2/3	**0.39**	CALCULATD FROM MANNING'S EQUATION [Flow Rate x Mannings n] ÷ [1.486 x Bed Slope^1/2]

RESULTS

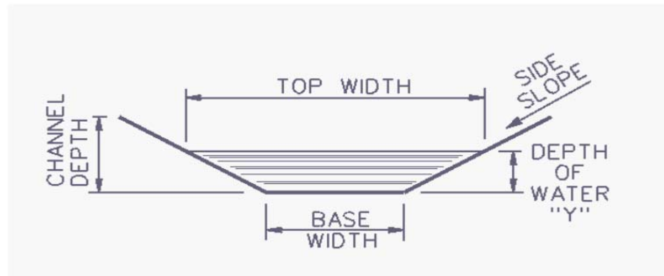
Depth of Flow	0.19 ft	
Velocity	1.85 ft/sec	Calculated From Manning's Eq
Top Width	7.14 ft	Basewidth + (Sideslopes x Depth of Flow)
Freeboard	0.81 ft	Channel Height - Depth of Flow

This Spreadsheet will find "Normal Depth" using methods described in Chapter 21.22 of F.S. Merritt, M.K. Loftin, and J.T. Ricketts, Standard Handbook For Civil Engineers, Fourth Ed., McGraw Hill, New York, 1996, and Chapters 7 & 13 of E.F. Brater and H.W. King, Handbook of Hydraulics, 6th Ed, McGraw Hill, New York, 1976.

OPEN CHANNEL DEPTH OF FLOW

For Trapezoidal, V-Type, and Rectangular Channels

Project :	SALMON HEALTH AND RETIREMENT	**By:**	DJD	**Date:**	10/19/15
Location :	VILLAGE STREET, MEDWAY, MA	**Checked:**	SMO	**Date:**	10/19/15
Descriptior	**EASTERN CONVEYENCE SWALE 1**	**Design Storm:**	100 yr.		



INPUT

Design Flow Rate	**8.05**	cfs
Bed Slope	**0.0052**	ft/ft
Manning's n	**0.027**	**grass swale**
Channel Height	**1.00**	ft
Base Width	**2.00**	ft (Zero for V-Type)
Side Slopes	**2.00**	ft. horizontal to 1 ft. vertical (Zero for Rectangular)

Instructions:

Manning's Equation $Q = \frac{1.486}{n} x R^{2/3} x S^{1/2} x A$ is rearranged to: $AR^{2/3} = \frac{Q \times n}{1.486 \times S^{1/2}}$

AR^2/3 is referred to as a "Section Factor". The "Normal Depth" is found by equating the Section Factor calculated from Manning's Equation to the Section Factor calculated from the geometry of the channel. To find the "Normal Depth," manipulate the Assumed Depth "Y" until the Section Factors from the two calculations are equal. The resulting "Y" value is the Normal Depth.

CALCULATIONS

Assumed Depth (y) **0.838** ft Trial and Error Input Until Section Factors from Both Calculations Match

Area (A)	3.08	sf	[Basewidth + 2 x (½ [Sideslope x Assumed Depth])] x Assumed Depth
Wetted Perimeter (Pw)	5.75	ft	[Basewidth + 2 x SQRT [Assumed Depth^2 + (Sideslope x Assumed Depth)^2]
Hydraulic Radius (R)	0.54	ft	Area ÷ Wetted Perimeter

AR^2/3	**2.03**	CALCULATED FROM CHANNEL GEOMETRY Area x Hydraulic Radius^2/3
AR^2/3	**2.03**	CALCULATD FROM MANNING'S EQUATION

[Flow Rate x Mannings n] ÷ [1.486 x Bed Slope^1/2]

RESULTS

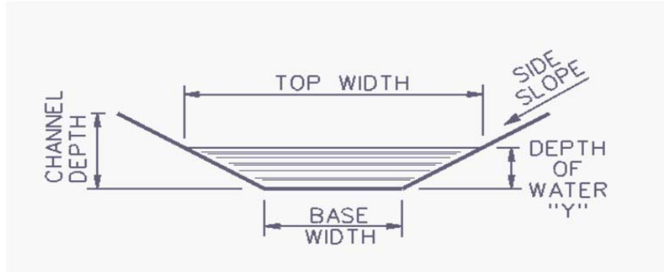
Depth of Flow	0.84 ft	
Velocity	2.63 ft/sec	Calculated From Manning's Eq
Top Width	5.35 ft	Basewidth + (Sideslopes x Depth of Flow)
Freeboard	0.16 ft	Channel Height - Depth of Flow

This Spreadsheet will find "Normal Depth" using methods described in Chapter 21.22 of F.S. Merritt, M.K. Loftin, and J.T. Ricketts, Standard Handbook For Civil Engineers, Fourth Ed., McGraw Hill, New York, 1996, and Chapters 7 & 13 of E.F. Brater and H.W. King, Handbook of Hydraulics, 6th Ed, McGraw Hill, New York, 1976.

OPEN CHANNEL DEPTH OF FLOW

For Trapezoidal, V-Type, and Rectangular Channels

Project :	SALMON HEALTH AND RETIREMENT	**By:**	DJD	**Date:**	10/19/15
Location :	VILLAGE STREET, MEDWAY, MA	**Checked:**	SMO	**Date:**	10/19/15
Descriptior	**EASTERN CONVEYENCE SWALE 2**	**Design Storm:**	100 yr.		



INPUT

Design Flow Rate	**10.66**	cfs
Bed Slope	**0.0185**	ft/ft
Manning's n	**0.027**	**grass swale**
Channel Height	**1.00**	ft
Base Width	**4.00**	ft (Zero for V-Type)
Side Slopes	**3.00**	ft. horizontal to 1 ft. vertical (Zero for Rectangular)

Instructions:

Manning's Equation $Q = \frac{1.486}{n} x R^{2/3} x S^{1/2} x A$ is rearranged to: $AR^{2/3} = \frac{Q \times n}{1.486 \times S^{1/2}}$

AR^2/3 is referred to as a "Section Factor". The "Normal Depth" is found by equating the Section Factor calculated from Manning's Equation to the Section Factor calculated from the geometry of the channel. To find the "Normal Depth," manipulate the Assumed Depth "Y" until the Section Factors from the two calculations are equal. The resulting "Y" value is the Normal Depth.

CALCULATIONS

Assumed Depth (y) **0.494** ft Trial and Error Input Until Section Factors from Both Calculations Match

Area (A)	2.71	sf	[Basewidth + 2 x (½ [Sideslope x Assumed Depth])] x Assumed Depth
Wetted Perimeter (Pw)	7.12	ft	[Basewidth + 2 x SQRT [Assumed Depth^2 + (Sideslope x Assumed Depth)^2]
Hydraulic Radius (R)	0.38	ft	Area ÷ Wetted Perimeter

AR^2/3	**1.42**	CALCULATED FROM CHANNEL GEOMETRY Area x Hydraulic Radius^2/3
AR^2/3	**1.42**	CALCULATD FROM MANNING'S EQUATION [Flow Rate x Mannings n] ÷ [1.486 x Bed Slope^1/2]

RESULTS

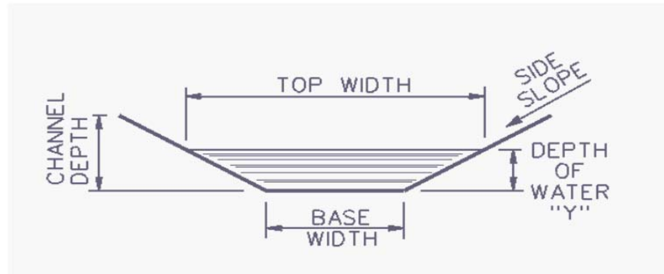
Depth of Flow	0.49 ft	
Velocity	3.94 ft/sec	Calculated From Manning's Eq
Top Width	6.96 ft	Basewidth + (Sideslopes x Depth of Flow)
Freeboard	0.51 ft	Channel Height - Depth of Flow

This Spreadsheet will find "Normal Depth" using methods described in Chapter 21.22 of F.S. Merritt, M.K. Loftin, and J.T. Ricketts, Standard Handbook For Civil Engineers, Fourth Ed., McGraw Hill, New York, 1996, and Chapters 7 & 13 of E.F. Brater and H.W. King, Handbook of Hydraulics, 6th Ed, McGraw Hill, New York, 1976.

OPEN CHANNEL DEPTH OF FLOW

For Trapezoidal, V-Type, and Rectangular Channels

Project :	SALMON HEALTH AND RETIREMENT	**By:**	DJD	**Date:**	10/19/15
Location :	VILLAGE STREET, MEDWAY, MA	**Checked:**	SMO	**Date:**	10/19/15
Descriptior	**EASTERN CONVEYENCE SWALE 3**	**Design Storm:**	100 yr.		



INPUT

Design Flow Rate	**8.16**	cfs
Bed Slope	**0.0286**	ft/ft
Manning's n	**0.027**	**grass swale**
Channel Height	**1.00**	ft
Base Width	**4.00**	ft (Zero for V-Type)
Side Slopes	**3.00**	ft. horizontal to 1 ft. vertical (Zero for Rectangular)

Instructions:

Manning's Equation $Q = \frac{1.486}{n} x R^{2/3} x S^{1/2} x A$ is rearranged to: $AR^{2/3} = \frac{Q \times n}{1.486 \times S^{1/2}}$

AR^2/3 is referred to as a "Section Factor". The "Normal Depth" is found by equating the Section Factor calculated from Manning's Equation to the Section Factor calculated from the geometry of the channel. To find the "Normal Depth," manipulate the Assumed Depth "Y" until the Section Factors from the two calculations are equal. The resulting "Y" value is the Normal Depth.

CALCULATIONS

Assumed Depth (y) **0.378** ft Trial and Error Input Until Section Factors from Both Calculations Match

Area (A)	1.94	sf	[Basewidth + 2 x (½ [Sideslope x Assumed Depth])] x Assumed Depth
Wetted Perimeter (Pw)	6.39	ft	[Basewidth + 2 x SQRT [Assumed Depth^2 + (Sideslope x Assumed Depth)^2]
Hydraulic Radius (R)	0.30	ft	Area ÷ Wetted Perimeter

AR^2/3	**0.88**	CALCULATED FROM CHANNEL GEOMETRY Area x Hydraulic Radius^2/3
AR^2/3	**0.88**	CALCULATD FROM MANNING'S EQUATION [Flow Rate x Mannings n] ÷ [1.486 x Bed Slope^1/2]

RESULTS

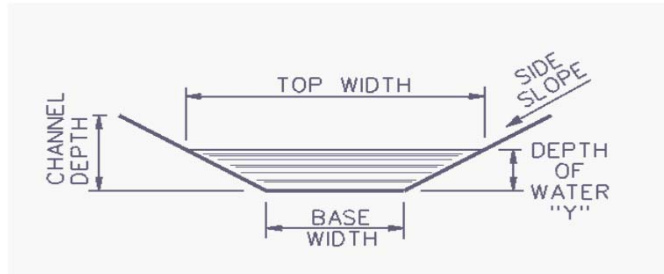
Depth of Flow	0.38 ft	
Velocity	4.21 ft/sec	Calculated From Manning's Eq
Top Width	6.27 ft	Basewidth + (Sideslopes x Depth of Flow)
Freeboard	0.62 ft	Channel Height - Depth of Flow

This Spreadsheet will find "Normal Depth" using methods described in Chapter 21.22 of F.S. Merritt, M.K. Loftin, and J.T. Ricketts, Standard Handbook For Civil Engineers, Fourth Ed., McGraw Hill, New York, 1996, and Chapters 7 & 13 of E.F. Brater and H.W. King, Handbook of Hydraulics, 6th Ed, McGraw Hill, New York, 1976.

OPEN CHANNEL DEPTH OF FLOW

For Trapezoidal, V-Type, and Rectangular Channels

Project :	SALMON HEALTH AND RETIREMENT	**By:**	DJD	**Date:**	10/19/15
Location :	VILLAGE STREET, MEDWAY, MA	**Checked:**	SMO	**Date:**	10/19/15
Descriptior	**EASTERN CONVEYENCE SWALE 4**	**Design Storm:**	100 yr.		



INPUT

Design Flow Rate	**24.15**	cfs
Bed Slope	**0.0333**	ft/ft
Manning's n	**0.027**	**grass swale**
Channel Height	**2.00**	ft
Base Width	**2.00**	ft (Zero for V-Type)
Side Slopes	**2.00**	ft. horizontal to 1 ft. vertical (Zero for Rectangular)

Instructions:

Manning's Equation $Q = \frac{1.486}{n} x R^{2/3} x S^{1/2} x A$ is rearranged to: $AR^{2/3} = \frac{Q \times n}{1.486 \times S^{1/2}}$

AR^2/3 is referred to as a "Section Factor". The "Normal Depth" is found by equating the Section Factor calculated from Manning's Equation to the Section Factor calculated from the geometry of the channel. To find the "Normal Depth," manipulate the Assumed Depth "Y" until the Section Factors from the two calculations are equal. The resulting "Y" value is the Normal Depth.

CALCULATIONS

Assumed Depth (y) **0.911** ft Trial and Error Input Until Section Factors from Both Calculations Match

Area (A)	3.48	sf	[Basewidth + 2 x (½ [Sideslope x Assumed Depth])] x Assumed Depth
Wetted Perimeter (Pw)	6.07	ft	[Basewidth + 2 x SQRT [Assumed Depth^2 + (Sideslope x Assumed Depth)^2]
Hydraulic Radius (R)	0.57	ft	Area ÷ Wetted Perimeter

AR^2/3	**2.40**	CALCULATED FROM CHANNEL GEOMETRY Area x Hydraulic Radius^2/3
AR^2/3	**2.40**	CALCULATD FROM MANNING'S EQUATION [Flow Rate x Mannings n] ÷ [1.486 x Bed Slope^1/2]

RESULTS

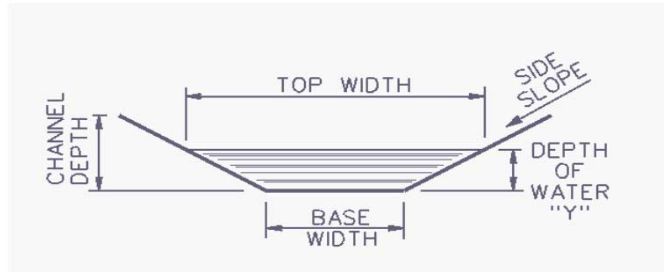
Depth of Flow	0.91 ft	
Velocity	6.95 ft/sec	Calculated From Manning's Eq
Top Width	5.64 ft	Basewidth + (Sideslopes x Depth of Flow)
Freeboard	1.09 ft	Channel Height - Depth of Flow

This Spreadsheet will find "Normal Depth" using methods described in Chapter 21.22 of F.S. Merritt, M.K. Loftin, and J.T. Ricketts, Standard Handbook For Civil Engineers, Fourth Ed., McGraw Hill, New York, 1996, and Chapters 7 & 13 of E.F. Brater and H.W. King, Handbook of Hydraulics, 6th Ed, McGraw Hill, New York, 1976.

OPEN CHANNEL DEPTH OF FLOW

For Trapezoidal, V-Type, and Rectangular Channels

Project :	SALMON HEALTH AND RETIREMENT	**By:**	DJD	**Date:**	10/19/15
Location :	VILLAGE STREET, MEDWAY, MA	**Checked:**	JEN	**Date:**	10/19/15
Descriptior	**EASTERN CONVEYENCE SWALE 5**	**Design Storm:**	100 yr.		



INPUT

Design Flow Rate	**3.30**	cfs
Bed Slope	**0.0330**	ft/ft
Manning's n	**0.027**	**grass swale**
Channel Height	**1.00**	ft
Base Width	**4.00**	ft (Zero for V-Type)
Side Slopes	**2.00**	ft. horizontal to 1 ft. vertical (Zero for Rectangular)

Instructions:

Manning's Equation $Q = \frac{1.486}{n} x R^{2/3} x S^{1/2} x A$ is rearranged to: $AR^{2/3} = \frac{Q \times n}{1.486 \times S^{1/2}}$

AR^2/3 is referred to as a "Section Factor". The "Normal Depth" is found by equating the Section Factor calculated from Manning's Equation to the Section Factor calculated from the geometry of the channel. To find the "Normal Depth," manipulate the Assumed Depth "Y" until the Section Factors from the two calculations are equal. The resulting "Y" value is the Normal Depth.

CALCULATIONS

Assumed Depth (y) **0.220** ft Trial and Error Input Until Section Factors from Both Calculations Match

Area (A)	0.98	sf	[Basewidth + 2 x (½ [Sideslope x Assumed Depth])] x Assumed Depth
Wetted Perimeter (Pw)	4.98	ft	[Basewidth + 2 x SQRT [Assumed Depth^2 + (Sideslope x Assumed Depth)^2]
Hydraulic Radius (R)	0.20	ft	Area ÷ Wetted Perimeter

AR^2/3	**0.33**	CALCULATED FROM CHANNEL GEOMETRY Area x Hydraulic Radius^2/3
AR^2/3	**0.33**	CALCULATD FROM MANNING'S EQUATION [Flow Rate x Mannings n] ÷ [1.486 x Bed Slope^1/2]

RESULTS

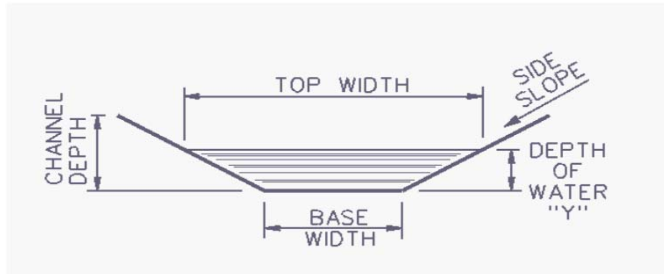
Depth of Flow	0.22 ft	
Velocity	3.38 ft/sec	Calculated From Manning's Eq
Top Width	4.88 ft	Basewidth + (Sideslopes x Depth of Flow)
Freeboard	0.78 ft	Channel Height - Depth of Flow

This Spreadsheet will find "Normal Depth" using methods described in Chapter 21.22 of F.S. Merritt, M.K. Loftin, and J.T. Ricketts, Standard Handbook For Civil Engineers, Fourth Ed., McGraw Hill, New York, 1996, and Chapters 7 & 13 of E.F. Brater and H.W. King, Handbook of Hydraulics, 6th Ed, McGraw Hill, New York, 1976.

OPEN CHANNEL DEPTH OF FLOW

For Trapezoidal, V-Type, and Rectangular Channels

Project :	SALMON HEALTH AND RETIREMENT	**By:**	DJD	**Date:**	10/19/15
Location :	VILLAGE STREET, MEDWAY, MA	**Checked:**	JEN	**Date:**	10/19/15
Descriptior	**EASTERN CONVEYENCE SWALE 6**	**Design Storm:**	100 yr.		



INPUT

Design Flow Rate	**4.47**	cfs
Bed Slope	**0.0040**	ft/ft
Manning's n	**0.027**	**grass swale**
Channel Height	**1.00**	ft
Base Width	**4.00**	ft (Zero for V-Type)
Side Slopes	**2.00**	ft. horizontal to 1 ft. vertical (Zero for Rectangular)

Instructions:

Manning's Equation $Q = \frac{1.486}{n} x R^{2/3} x S^{1/2} x A$ is rearranged to: $AR^{2/3} = \frac{Q \times n}{1.486 \times S^{1/2}}$

AR^2/3 is referred to as a "Section Factor". The "Normal Depth" is found by equating the Section Factor calculated from Manning's Equation to the Section Factor calculated from the geometry of the channel. To find the "Normal Depth," manipulate the Assumed Depth "Y" until the Section Factors from the two calculations are equal. The resulting "Y" value is the Normal Depth.

CALCULATIONS

Assumed Depth (y) **0.484** ft Trial and Error Input Until Section Factors from Both Calculations Match

Area (A)	2.40	sf	[Basewidth + 2 x (½ [Sideslope x Assumed Depth])] x Assumed Depth
Wetted Perimeter (Pw)	6.16	ft	[Basewidth + 2 x SQRT [Assumed Depth^2 + (Sideslope x Assumed Depth)^2]
Hydraulic Radius (R)	0.39	ft	Area ÷ Wetted Perimeter

AR^2/3	**1.28**	CALCULATED FROM CHANNEL GEOMETRY Area x Hydraulic Radius^2/3
AR^2/3	**1.28**	CALCULATD FROM MANNING'S EQUATION [Flow Rate x Mannings n] ÷ [1.486 x Bed Slope^1/2]

RESULTS

Depth of Flow	0.48 ft	
Velocity	1.86 ft/sec	Calculated From Manning's Eq
Top Width	5.94 ft	Basewidth + (Sideslopes x Depth of Flow)
Freeboard	0.52 ft	Channel Height - Depth of Flow

This Spreadsheet will find "Normal Depth" using methods described in Chapter 21.22 of F.S. Merritt, M.K. Loftin, and J.T. Ricketts, Standard Handbook For Civil Engineers, Fourth Ed., McGraw Hill, New York, 1996, and Chapters 7 & 13 of E.F. Brater and H.W. King, Handbook of Hydraulics, 6th Ed, McGraw Hill, New York, 1976.

APPENDIX D

LONG TERM POLLUTION PREVENTION PLAN – REQUIRED BY STANDARDS 4-6

LONG TERM POLLUTION PREVENTION PLAN

To keep the Stormwater Management System (SMS) functioning properly and to ensure that the stormwater Total Suspended Solids (TSS) are reduced, a long term pollution prevention is required. Continuing Care Management, LLC, the owner/operator of the facility, is responsible for the adherence to this long term plan. The following is a guideline of the specific requirements of the plan to maintain the long term viability of the stormwater management system.

The Stormwater Pollution Prevention Plan for the site addresses many of the items in the Long Term Pollution Prevention Plan.

Good Housekeeping Practices

Employees shall be instructed in the importance of not spilling fluids and chemicals such as oil, antifreeze, etc. onto the bare ground. All areas exposed to the weather shall be kept clean of these fluids.

Maintenance of the Grounds

Maintenance of lawns, gardens and other landscaped areas is to be performed by appropriate maintenance staff, as approved by the Owner. All materials and equipment will be stored per the above-referenced requirements. Fertilizers shall not be used within 25 feet of the wetland resource areas. Excess fertilizers shall be swept up from all impervious surfaces and not allowed to run into the drainage system.

Provisions for Storing Materials and Waste Products Inside or Under Cover

Liquid waste products shall be captured when draining from vehicles, and stored in sealed containers under cover until they are disposed of. Waste products shall be disposed of in a legal manner, at a state licensed recycling center or landfill.

Vehicle washing controls;

Vehicles shall be washed on the concrete pad which is served by the proposed trench drain and oil/grit separator. Vehicles shall not be washed if there are known contaminants being washed into the trench drain.

Requirements for routine inspections and maintenance of stormwater BMPs;

BMPs shall be inspected on a monthly basis. BMPs shall be maintained per the operations and

Spill prevention and response plans;

First responders	Phone Numbers
• Medway Fire Department	911 if emergency or (508) 533-3213
• Medway Police Department	911 if emergency or (508) 533-3212
• Mass Department of Environmental Protection	
Emergency Response	1-888-304-1133

Requirements for storage and use of fertilizers, herbicides, and pesticides;

Fertilizers shall not be used within 100 feet of the wetland resource areas. Excess fertilizers shall be swept up from all impervious surfaces and not allowed to run into the drainage system.

All fertilizer, herbicides, and pesticides shall be stored at least 100 feet away from the wetland line. If stored on site, these materials should be kept in a wrapped or sealed container, and kept under cover out of the rain and snow.

Pet waste receptacles will be placed in appropriate sites throughout the development. Residents will be responsible to remove pet waste from the facility.

Provisions for solid waste management;

Solid waste shall be collected at a minimum of once per week and disposed of in an appropriate dumpster or garbage truck. Waste shall be disposed of in a legal manner, at a state licensed recycling center or landfill.

Routine Inspections and Maintenance of SMS BMP's

Routine inspections and maintenance shall be performed in accordance with the Operations and Maintenance Plan

Spill Prevention, Control and Countermeasures

Continuing Care Management, LLC and its subsidiaries have in place a SPCC plan for all of their assets. The plan is updated periodically and/or when necessary due to changes to the existing facility. A copy is kept onsite at all times in the event of a spill.

Illicit Discharges

All non-allowable, non-stormwater discharges are prohibited from being directed to the drainage system. The following list of non-stormwater discharges are allowed to drain to the closed drainage system and has been taken from the "NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) GENERAL PERMIT FOR STORM WATER DISCHARGES FROM SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS".

"Part I, Section F. Allowable Non-Storm Water Discharges
The following non-storm water discharges are authorized provided it has been determined by the permittee that they are not significant contributors of pollutants to the MS4. If these discharges are identified as significant contributors to the MS4, they must be addressed in the Illicit Discharge Detection and Elimination minimum control measure described in Parts II, III, IV and V.

1. Water line flushing,
2. Landscape irrigation,
3. Diverted stream flows,
4. Rising ground waters,
5. Uncontaminated ground water infiltration (as defined at 40 cfr 35.2005(20)),
6. Uncontaminated pumped ground water,
7. Discharge from potable water sources,
8. Foundation drains,

9. Air conditioning condensation,
10. Irrigation water, springs,
11. Water from crawl space pumps,
12. Footing drains,
13. Lawn watering,
14. Individual resident car washing,
15. Flows from riparian habitats and wetlands,
16. Dechlorinated swimming pool discharges,
17. Street wash water, and
18. Residential building wash waters, without detergents.

Discharges or flows from firefighting activities occur during emergency situations. The permittee is not expected to evaluate firefighting discharges with regard to pollutant contributions. Therefore, these discharges are authorized as allowable non-storm water discharges, unless identified, by EPA, as significant sources of pollutants to Waters of the U.S..”

APPENDIX E

CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN - REQUIRED BY STANDARD 8

CONSTRUCTION PERIOD POLLUTION PREVENTION PLAN & EROSION & SEDIMENTATION CONTROL PLAN

The proposed development at Village Street consists of the construction of an Adult Retirement Community Planned Residential District (ARCPUD) consisting of a four story main residence building which has 40 memory care, 60 assisted living and 54 independent living residential units and 15 attached cottages (two bedroom) as well as 48 two bedroom and 8 three bedroom detached cottages, a two story medical office building, and a pavilion.

The proposed Stormwater Management system consists of a series of deep sump catch basins, roof leaders, pipes, and manholes to collect stormwater; and a series of infiltration trenches, water quality units, vegetated detention basins, and outlet control structures which both treat and control the proposed flows. Each detention basin is sized to slow down the peak flow from the 100-year storm.

Soils, Slopes, Vegetation, and Current Drainage Patterns

The Soil Conservation Service map for the area indicates that the site is made of seven soil types which include 4 – Rippowam silt loam, 0 to 3 percent slopes (Hydrologic Soil Group D), 5 – Saco silt loam, 0 to 3 percent slopes (Hydrologic Soil Group D), 31A – Walpole sandy loam, 0 to 3 percent slopes (Hydrologic Soil Group D), 70A – Ridgebury fine sandy loam, 0 to 5 percent slopes (Hydrologic Soil Group D), 245B – Merrimac fine sandy loam, 3 to 8 percent slopes (Hydrologic Soil Group A), 260B – Sudbury fine sandy loam, 2 to 8 percent slopes (Hydrologic Soil Group B), and 310B – Udorthents, Woodbridge fine sandy loam, 3 to 8 percent slopes (Hydrologic Soil Group C). The site currently consists of a wooded lot with open areas. Topography generally slopes to the southwest towards the Charles River.

Minimize Disturbed Area and Protect Natural Features and Soil

The straw bale and silt fence line defines the limit of work and that all areas outside of the clearing line are to be protected and remain undisturbed. The straw bale and silt fence line shall be installed prior to the start of construction and shall be inspected and maintained on a weekly basis and/or within 12 hours of a storm event >0.5”.

Phase Construction Activity

Construction will occur in a single phase.

Stabilize Soils

Soils will be stabilized by seeding. Stockpiled soils, such as top soil, will be stabilized with temporary seed no later than 14 days from the last construction activity in that area.

Permanent Seeding/ Sodding: Shall be performed upon completion of the area. These areas shall be inspected and maintained on a monthly basis and/or within 12 hours of a storm event >0.5”.

Temporary Seeding/ Sodding: Shall be performed within 14 days of last construction activity in the area. These areas shall be inspected and maintained on a weekly basis and/or within 12 hours of a storm event >0.5”.

Protect Slopes

Maximum allowable slopes on the project are 2:1 and these slopes will be stabilized using the methods described in the previous section.

Establish Perimeter Controls and Sediment Barriers

A straw bale and silt fence erosion control barrier will be installed along the down gradient portions of project site that are to be disturbed by construction related activities. Installation will occur prior to the start of these activities and the contractor shall be aware that areas outside the erosion control barrier are to remain undisturbed. The straw bale and silt fence line shall be inspected and maintained on a weekly basis and/or within 12 hours of a storm event >0.5".

Retain Sediment On-Site

Sediment is retained on site via the aforementioned erosion control barrier. Sediment that builds up along the erosion barrier is manually removed during the inspection. Completed slopes are stabilized immediately as described above to avoid the on-going deposition of sediment against the erosion control barrier.

Establish Stabilized Construction Exits

A stabilized construction site exit is proposed for the project site and will be put in place upon completion of the silt fence installation. Please refer to the Comprehensive Permit Plans for proposed location and installation details. In addition to the stabilized construction exit, dump trucks hauling material to and from the site will be covered with a tarpaulin and the paved street adjacent to the site entrance will be manually swept as required to remove excess mud, dirt, or rock tracked from the site. The construction exit will be inspected and maintained on a weekly basis.

Material Handling and Waste Management

All solid waste materials will be collected at a minimum of once per week and stored in a covered metal dumpster rented from a licensed solid waste management company. All trash and construction debris from the site will be deposited in the dumpster. The dumpster will be emptied as needed and the trash will be hauled to an appropriate landfill. No construction materials or stumps will be buried on-site. All personnel will be instructed regarding the correct procedure for waste disposal. All sanitary waste will be collected from the portable units a minimum of once per week by a licensed waste hauling company. More specifically, the following guidelines will be followed:

- Fertilizers will be applied only in the minimum amounts recommended by the manufacturer.
- Fertilizers will be worked into the soil to limit exposure to stormwater.
- Fertilizers shall not be used within 25 feet of the wetland resource areas. Excess fertilizers shall be swept up from all impervious surfaces and not allowed to run into the drainage system.
- Fertilizers will be stored in a covered shed and partially used bags will be transferred to a sealable bin to avoid spills.
- Any asphalt substances used onsite will be applied according to the manufacturer's recommendation.
- Sanitary waste will be collected from portable toilets a minimum of once a week to avoid overfilling.
- A covered dumpster will be used for all waste materials.
- Salt will be applied only in the minimum amounts recommended by the manufacturer.

- Salt shall not be used within 25 feet of the wetland resource areas.

Establish Proper Building Material Staging Areas

Construction materials will be stored on-site in designated material staging areas that minimize the exposure of the materials to stormwater.

Designate Concrete Truck Washout Areas

Concrete trucks will be directed to a washout area to be established outside of the 100 foot wetland buffer. Washout areas shall consist of a layer of polyurethane sheeting draped over a rectangular area built out of straw bales.

Establish Proper Equipment/Vehicle Fueling and Maintenance Practices

The following equipment/vehicle fueling and maintenance practice(s) will be implemented to control pollutants to stormwater:

- Petroleum products related to the operation of said equipment will be stored in tightly sealed containers, which will be clearly labeled.

- Spray guns will be cleaned on a disposable tarp.

Spill Prevention and Control Plan

The following guidelines will be followed to aid in the prevention and control of unanticipated spills on-site:

- Spill kits will be included with all fueling sources and maintenance activities.

- Materials and equipment necessary for spill cleanup will be kept onsite. Equipment will include, but not be limited to, brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, saw dust, and plastic and metal trash containers.

- All spills will be cleaned up immediately upon discovery. Spills large enough to reach the storm system will be reported to the Massachusetts DEP or National Response Center at 1-800-424-8802.

APPENDIX F

OPERATION AND MAINTENANCE PLAN - REQUIRED BY STANDARD 9

OPERATION AND MAINTENANCE PLAN

To keep the Stormwater Management System (SMS) functioning properly and to ensure that the Total Suspended Solids (TSS) are reduced, periodic maintenance is required. The owner/operator of the facility is responsible for the periodic maintenance requirements of the SMS. Continuing Care Management is the owner and will be the party responsible for the maintenance of the SMS. The following is a guideline of the specific maintenance schedules and tasks required to keep the SMS functioning properly.

Unscheduled Maintenance

The following inspections and maintenance activities must be completed after each rain event in excess of two-inches (2"), or after any snow or rain event accompanied by high winds:

1. Inspect the vegetated detention basins and grassed swales for debris. Remove any branches, trash or other large debris that could interfere with the proper operation of the inlet or outlet of the basins.

General Maintenance

The following inspections and maintenance activities must be completed on a regular basis as conditions warrant:

1. Maintain the grassy side slopes of the vegetated detention basins and grassed swales through regular mowing. Keep the grass between three and six inches (3"-6") in length. Remove the grass clippings to prevent them from impeding the flow of stormwater from the inlets or outlets.

2. During the fall and the spring remove any accumulated leaves from the catch basin and outlet control structure grates, rip-rap inlet and outlet aprons including flared end sections, detention basin(s), plunge pools, check dams, and level spreaders.

Quarterly Maintenance

The following inspections and maintenance activities must be completed quarterly (January 15, April 15, July 15, October 15 or other acceptable quarterly dates):

1. Sweep, vacuum, or clean the roadway area to reduce the amount of sediment entering the SMS.

2. Inspect the catch basin sumps for debris. Remove any branches, trash or other large debris that could interfere with the proper operation of the outlet of the catch basin. Remove accumulated sediment, by use of a clamshell bucket or vacuum truck, when it reaches a height of 18-inches but not less than annually.

3. Inspect the vegetated detention basins, grassed swales, outlet control structures, flared ends and plunge pools, check dams, and level spreaders for debris. Remove any branches, trash or other large debris that could interfere with the proper operation of the inlet or outlet of the basin. Remove any accumulated sediment, by the use of hand tools (shovels, rakes, wheelbarrows, etc.) when it exceeds three-inches (3") but not less than annually.

Annual Maintenance

The following inspections and maintenance activities must be completed annually (April 15 or another acceptable date):

1. Sweep, vacuum or clean the roadway area to reduce the amount of sediment entering the SMS.

2. Remove accumulated sediment from the catch basin sumps by use of a clamshell bucket or vacuum truck. Inspect the hood to ensure that it is properly secured. If excessive sediment is encountered in the catch basin sump and or the inlet to the catch basin, spot inspect infiltration systems. If more than ½" of sediment is encountered in an infiltration system, jet wash system and then remove any additional sediment from catch basin sumps.

3. Remove any accumulated sediment from plunge pools, check dams, and level spreaders by the use of a clamshell bucket or by the use of hand tools (shovels, rakes, wheelbarrows, etc.). Reset any displaced rip-rap.

4. Remove any accumulated sediment from the vegetated detention basins and grassed swales, by the use of hand tools (shovels, rakes, wheelbarrows, etc.).

Water Quality Unit Maintenance

Refer to Stormceptor® Owner's Manual found in Appendix I for operational and maintenance information on the water quality units found on site.

Continuing Care Management, LLC

SALMON HEALTH AND RETIREMENT COMMUNITY

VILLAGE STREET, MEDWAY, MASSACHUSETTS

Stormwater Management System Operation & Maintenance Checklist

Unscheduled Maintenance

The following inspections and maintenance activities must be completed after each rain event in excess of two-inches (2”), or after any snow or rain event accompanied by high winds

- Inspect the detention basins and grassed swales for debris. Remove any branches, trash or other large debris that could interfere with the proper operation of the inlets or outlets of the basins.

General Maintenance

- Mow the grass side slopes of the detention basins and grassed swales through regular mowing. Keep the grass between three and six inches (3”-6”) in length. Remove the grass clippings to prevent them from impeding the flow of stormwater from the inlets or outlets
- During the fall and the spring remove leaves from the catch basin and inlet control structure grates, rip-rap inlet and outlet aprons including flared end sections, detention basin(s), check dams, and plunge pools.

Quarterly Maintenance

- Sweep, vacuum, or clean the roadway area
- Inspect the catch basin sumps for debris. Remove any branches, trash or other large debris that could interfere with the proper operation of the outlet of the catch basin. Remove accumulated sediment, by use of a clamshell bucket or vacuum truck, when it reaches a height of 18-inches but not less than annually.
- Inspect the detention basins, grassed swales, inlet structures, check dams, and flared ends and plunge pools for debris. Remove any branches, trash or other large debris that could interfere with the proper operation of the inlet or outlet of the basin. Remove any accumulated sediment, by the use of hand tools (shovels, rakes, wheelbarrows, etc.) when it exceeds three-inches (3”) but not less than annually.

Annual Maintenance

- Sweep, vacuum, or clean the roadway area.
- Remove sediment from the catch basin sumps by use of a clamshell bucket or vacuum truck. Inspect the hood to ensure that it is properly secured. If excessive sediment is encountered in the catch basin sump and or the inlet to the catch basin, spot inspect the infiltration system. If more than ½” of sediment is encountered in infiltration system, jet wash system and then remove any additional sediment from catch basin sumps.
- Remove sediment from plunge pools, check dams, and level spreaders by the use of a clamshell bucket or by the use of hand tools (shovels, rakes, wheelbarrows, etc.). Reset any displaced rip-rap.
- Remove sediment from the detention basins and grassed swales with the use of hand tools (shovels, rakes, wheelbarrows, etc.).

Water Quality Unit Maintenance

- Refer to the Stormceptor® Owner’s Manual (Appendix I) for operational and maintenance information on the water quality units found on site.

CONTINUING CARE MANAGEMENT, LLC			
SALMON HEALTH AND RETIREMENT COMMUNITY			
VILLAGE STREET, MEDWAY, MASSACHUSETTS			
STORMWATER MANAGEMENT SYSTEM OPERATION & MAINTENANCE LOG			
DATE	**TIME**	**MAINTENANCE ACTIVITY**	**INFILTRATION/DENTENTION FACILIY MAINTAINED**

APPENDIX G

ILLICIT DISCHARGE COMPLIANCE STATEMENT- REQUIRED BY STANDARD 10

December 11, 2015

Mr. David Travalini, Chair
Medway Conservation Commission
Town Hall
155 Village \Street
Medway, Massachusetts, 02053

Re: 259, 261, 261R, and 263 Village Street, Medway, Massachusetts
Illicit Discharge Compliance Statement

Dear Mr. Travalini & Members of the Commission:

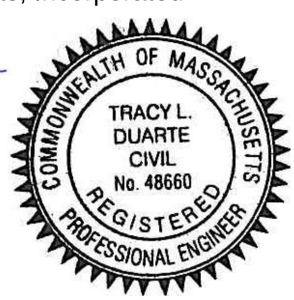
Coneco Engineers & Scientists, Incorporated (Coneco), on behalf of our client Continuing Care Management, LLC, is submitting this Illicit Discharge Compliance Statement for the above referenced property.

This Illicit Discharge Compliance Statement is to verify that to the best of our knowledge, no illicit discharges exist on the site presently, nor will they after the proposed development has been completed. The proposed stormwater management system consists of conventional curb and gutter drainage for the roadways including a series of catch basins, drain manholes and pipe which convey stormwater runoff from the roadway areas to a water quality device before entering the proposed infiltration system which will ultimately discharge any remaining runoff upstream of the bordering vegetated wetlands. Roof runoff from the proposed campus building and the majority of the residential units will be recharged through individual subsurface infiltration chambers. These chambers have been designed to accommodate flows from the 100-year storm event. Please refer to “ARCPUD Special Permit Site Plans” prepared by Coneco dated June 12, 2015, *last revised December 11, 2015* for plans showing the proposed stormwater management system. Additionally, the Long Term Pollution Prevention Plan contained herein contains measures to prevent illicit discharges.

Please don’t hesitate to contact me at 508-697-3191 (extension 123) should you have any questions and/or comments pertaining to the information contained herein or require additional information and/or further action. Thank you for your time and consideration regarding this matter.

Best Regards,
Coneco Engineers & Scientists, Incorporated

Tracy L. Duarte



Tracy L. Duarte, P.E.
Civil Engineer

APPENDIX H

SOIL LOGS

Job No.:	8548	Soil Evaluator:	Tracy L. Duarte
Client:	Continuing Care Management LLC	Witness:	N/A
Site Location:	Village Street, Medway	Excavator:	Mobile Excavating
Land Use:		Date:	April 8, 2015
Parent Material:		Weather:	Rain/ Hail 34ºF

Water Resource Conditions: Normal: ______ Above: X Below: ______

TP #15-1 Edge of Woods

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-13	A	SL	10YR 3/2		Depth	24"	Mottling	26"
13-25	B	LS	10YR 5/6		0-15 Min.	1/2"		
25-58	C	M-C LS	2.5Y 5/3		15-30 Min.	1/2"	Weeping	N/A
					30-45 Min.	1/2"		
					45-60 Min.		Standing	30"
					60-75 Min.			
					Rate	**2**	"/hr	

TP #15-2 Open

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-10	A	SL	10YR 3/2	Roots	Depth	18"	Mottling	18"
10-18	B	SL	10YR 4/6		0-15 Min.	3/4"		
18-84	C	V. Fine LS	2.5Y 5/3		15-30 Min.	1/2"	Weeping	68"
					30-45 Min.	1/2"		
					45-60 Min.	1/2"	Standing	78"
					60-75 Min.			
					Rate	**2**	"/hr	

TP #15-3 Open

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/4		Depth	18"	Mottling	N/A
12-18	B	Sand	10YR 4/6		0-15 Min.	2 3/4"		
18-74	C	Sand	2.5Y 5/3		15-30 Min.	2 1/2"	Weeping	N/A
					30-45 Min.	2 1/4"		
					45-60 Min.	2 1/4"	Standing	N/A
					60-75 Min.	2 1/4"		
					Rate	**9**	"/hr	

TP #15-4 Open

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2		Depth	14"	Mottling	26"
12-24	B	LS	10YR 4/6		0-15 Min.	3/8"		
24-68	C	LS	2.5Y 5/3	Heavy mottling throughout	15-30 Min.	3/8"	Weeping	28"
					30-45 Min.	1/4"		
					45-60 Min.	1/4"	Standing	45"
					60-75 Min.	1/4"		
					Rate	**1**	"/hr	

Job No.: 8548

Client: Continuing Care Management LLC

Site Location: Village Street, Medway

Land Use:

Parent Material:

Soil Evaluator: Tracy L. Duarte

Witness: N/A

Excavator: Mobile Excavating

Date: April 8, 2015

Weather: Rain/ Hail 34°F

Water Resource Conditions: Normal: ______ Above: X Below: ______

TP #15-5 Wooded

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-16	A	SL	10YR 2/2	Roots	Depth	30"	Mottling	30"
16-30	B	SL	10YR 4/6		0-15 Min.	1/8"		
30-72	C	V. Fine SL	2.5Y 5/3	Platey, heavy mottling throughout	15-30 Min.	1/16"	Weeping	36"
					30-45 Min.	1/16"		
					45-60 Min.	1/16"	Standing	60"
					60-75 Min.			
					Rate	**0.25**	"/hr	

TP #15-11 Wooded

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-16	A	SL	10YR 2/2	Roots	Depth	24"	Mottling	26"
16-24	B	M-C LS	10YR 5/6		0-15 Min.	3/4"		
24-70	C	Sand	2.5Y 5/3	Gravelly	15-30 Min.	3/4"	Weeping	N/A
					30-45 Min.	1/2"		
					45-60 Min.	1/2"	Standing	30"
					60-75 Min.	1/2"		
					Rate	**2**	"/hr	

TP #15-12 Brush

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-16	A	SL	10YR 2/2	Roots	Depth	18"	Mottling	N/A
16-22	B	M-C LS	10YR 5/6		0-15 Min.	4 1/2"		
22-58	C	Sand	2.5Y 5/3	Gravelly	15-30 Min.	2 1/2"	Weeping	N/A
					30-45 Min.	2 1/2"		
					45-60 Min.	2 1/2"	Standing	26"
					60-75 Min.			
					Rate	**10**	"/hr	

TP #15-14 Open

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-8	A	SL	10YR 3/4		Depth	18"	Mottling	N/A
8-18	B	Fine SL	10YR 5/6		0-15 Min.	1/2"		
18-48	C1	M-C LS	2.5Y 5/2	Gravelly	15-30 Min.	1/4"	Weeping	N/A
48-50	C2	V. Fine SL	2.5Y 5/2	Platey	30-45 Min.	1/4"		
					45-60 Min.	1/4"	Standing	26"
					60-75 Min.			
					Rate	**1**	"/hr	

Job No.:	8548	Soil Evaluator:	Tracy L. Duarte
Client:	Continuing Care Management LLC	Witness:	N/A
Site Location:	Village Street, Medway	Excavator:	Mobile Excavating
Land Use:		Date:	April 8, 2015
Parent Material:		Weather:	Rain/ Hail 34°F

Water Resource Conditions: Normal: ______ Above: X Below: ______

TP #15-15 Wooded

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-10	A	SL	10YR 3/2		Depth	6"	Mottling	24"
10-24	B	Fine SL	10YR 5/6		0-15 Min.	3/4"		
24-36	C1	M-C LS	2.5Y 5/2	Gravelly	15-30 Min.	3/4"	Weeping	16"
36-70	C2	V. Fine SL	2.5Y 5/2	Platey	30-45 Min.	3/4"		
					45-60 Min.		Standing	36"
					60-75 Min.			
					Rate	**3**	"/hr	

TP #

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
					Depth		Mottling	
					0-15 Min.			
					15-30 Min.		Weeping	
					30-45 Min.			
					45-60 Min.		Standing	
					60-75 Min.			
					Rate		"/hr	

TP #

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
					Depth		Mottling	
					0-15 Min.			
					15-30 Min.		Weeping	
					30-45 Min.			
					45-60 Min.		Standing	
					60-75 Min.			
					Rate		"/hr	

TP #

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
					Depth		Mottling	
					0-15 Min.			
					15-30 Min.		Weeping	
					30-45 Min.			
					45-60 Min.		Standing	
					60-75 Min.			
					Rate		"/hr	

Job No.:	8548	Soil Evaluator:	Tracy L. Duarte
Client:	Continuing Care Management LLC	Witness:	N/A
Site Location:	Village Street, Medway	Excavator:	Mobile Excavating
Land Use:		Date:	April 9, 2015
Parent Material:		Weather:	Rain/ 38ºF

Water Resource Conditions: Normal: ______ Above: X Below: ______

TP #15-6 Woods

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-14	A	SL	10YR 3/2	Leaf litter/ roots	Depth	32"	Mottling	32"
14-32	B	LS	10YR 5/6		0-15 Min.	3"		
32-56	C1	M-C LS	2.5Y 5/3	Heavy mottling ring at C1/C2	15-30 Min.	3"	Weeping	40"
56-82	C2	V. Fine SL	2.5Y 5/3	interface	30-45 Min.	3"		
					45-60 Min.		Standing	62"
					60-75 Min.			
					Rate	**12**	"/hr	

TP #15-7 Woods

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 2/2		Depth	20"	Mottling	18"
12-26	B	LS	10YR 5/6		0-15 Min.	3/8"		
26-66	C1	M-C LS	2.5Y 5/3	Heavy mottling/ weeping	15-30 Min.	3/8"	Weeping	42"
66-92	C2	V. Fine SL	2.5Y 5/3	Platey	30-45 Min.	3/8"		
					45-60 Min.		Standing	82"
					60-75 Min.			
					Rate	**1.33"**	"/hr	

TP #15-8 Woods

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-18	A	SL	10YR 3/2		Depth	28"	Mottling	30"
18-30	B	LS	10YR 5/6		0-15 Min.	1/2"		
30-54	C1	M-C LS	2.5Y 5/3	Heavy mottling/ weeping	15-30 Min.	1/2"	Weeping	30"
54-90	C2	V. Fine SL	2.5Y 5/3		30-45 Min.	1/2"		
					45-60 Min.		Standing	84"
					60-75 Min.			
					Rate	**2**	"/hr	

TP #15-9 Woods

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-14	A	SL	10YR 3/2	Roots	Depth	26"	Mottling	26"
14-26	B	LS	10YR 5/6		0-15 Min.	1/2"		
26-44	C1	V. Fine SL	2.5Y 5/2	Heavy mottling/ weeping	15-30 Min.	1/2"	Weeping	30"
44-88	C2	M-C LS	2.5Y 5/3	V. Gravelly	30-45 Min.	1/2"		
					45-60 Min.		Standing	70"
					60-75 Min.			
					Rate	**2**	"/hr	

Job No.: 8548
Client: Continuing Care Management LLC
Site Location: Village Street, Medway
Land Use:
Parent Material:

Soil Evaluator: Tracy L. Duarte
Witness: N/A
Excavator: Mobile Excavating
Date: April 9, 2015
Weather: Rain/ 38ºF

Water Resource Conditions: Normal: ______ Above: X Below: ______

TP #15-10 Woods

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2	Roots	Depth	24"	Mottling	36"
12-24	B	LS	10YR 4/6		0-15 Min.			
24-36	C1	M-C LS	2.5Y 5/3		15-30 Min.		Weeping	36"
36-60	C2	M-C Sand	2.5Y 5/3	Heavy mottling, 5% gravel	30-45 Min.			
60-92	C3	LS	2.5Y 5/3		45-60 Min.		Standing	80"
					60-75 Min.			
					Rate	**N/A**	"/hr	

Note: Unable to Saturate >1"/min.

TP #15-13

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2		Depth	20"	Mottling	26"
12-24	B	LS	10YR 5/6		0-15 Min.	5/8"		
24-53	C1	M-C LS	2.5Y 5/2	Heavy mottling, platey	15-30 Min.	5/8"	Weeping	40"
53-66	C2	V. Fine SL	2.5Y 5/3		30-45 Min.	5/8"		
					45-60 Min.		Standing	54"
					60-75 Min.			
					Rate	**2.5**	"/hr	

TP #15-16 Open

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2		Depth	16"	Mottling	22"
12-20	B	F. Sand	10YR 5/6		0-15 Min.	1"		
20-76	C	V. Fine SL	2.5Y 5/2	Heavy mottling/ firm in place	15-30 Min.	1"	Weeping	40"
					30-45 Min.	1"		
					45-60 Min.	1"	Standing	68"
					60-75 Min.			
					Rate	**4"**	"/hr	

TP #15-17 Woods

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2	Leaf litter/ roots	Depth	16"	Mottling	N/A
12-28	B	Fine LS	10YR 4/6		0-15 Min.	2 1/2"		
28-96	C	Fine LS	2.5Y 5/2	Platey	15-30 Min.	2 1/2"	Weeping	88"
					30-45 Min.	2 1/2"		
					45-60 Min.		Standing	94"
					60-75 Min.			
					Rate	**10**	"/hr	

Job No.: 8548

Client: Continuing Care Management LLC

Site Location: Village Street, Medway

Land Use:

Parent Material:

Soil Evaluator: Tracy L. Duarte

Witness: N/A

Excavator: Mobile Excavating

Date: April 9, 2015

Weather: Rain/ 38ºF

Water Resource Conditions: Normal: ______ Above: X Below: ______

TP #15-18 Woods

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2	Leaf litter/ roots	Depth	18"	Mottling	N/A
12-24	B	M. Sand	10YR 4/6		0-15 Min.			
24-100	C	M. Sand	2.5Y 5/3		15-30 Min.		Weeping	N/A
					30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			

Rate **N/A** "/hr

Note: Unable to Saturate >1.25"/min.

TP #

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
					Depth		Mottling	
					0-15 Min.			
					15-30 Min.		Weeping	
					30-45 Min.			
					45-60 Min.		Standing	
					60-75 Min.			

Rate "/hr

TP #

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
					Depth		Mottling	
					0-15 Min.			
					15-30 Min.		Weeping	
					30-45 Min.			
					45-60 Min.		Standing	
					60-75 Min.			

Rate "/hr

TP #

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
					Depth		Mottling	
					0-15 Min.			
					15-30 Min.		Weeping	
					30-45 Min.			
					45-60 Min.		Standing	
					60-75 Min.			

Rate "/hr

Job No.:	8548	Soil Evaluator:	Tracy L. Duarte
Client:	Continuing Care Management LLC	Witness:	N/A
Site Location:	Village Street, Medway	Excavator:	Mobile Excavating
Land Use:		Date:	April 10, 2015
Parent Material:		Weather:	Rain/ 46ºF

Water Resource Conditions: Normal: ____ Above: X Below: ____

TP #15-19 Woods

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/3		Depth	16"/32"	Mottling	N/A
12-22	B	LS	10YR 4/6		0-15 Min.	1.5" / .75"		
22-39	C1	M-C LS	2.5Y 5/2		15-30 Min.	1" / .75"	Weeping	68"
39-86	C2	Fine LS	2.5Y 5/3	5% gravel	30-45 Min.	1" / .75"		
					45-60 Min.	1" / .75"	Standing	84"
					60-75 Min.			
					Rate	**4 / 3**	"/hr	

TP #15-20 Woods

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/3	Roots, leaf litter	Depth	24"	Mottling	N/A
12-24	B	M-C LS	10YR 4/6		0-15 Min.			
24-48	C1	M-C LS	2.5Y 5/4		15-30 Min.		Weeping	N/A
48-72	C2	Sand	2.5Y 5/2		30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate	**N/A**	"/hr	

Note: Unable to Saturate >2.75"/min.

TP #15-21 Woods

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-14	A	SL	10YR 3/2		Depth	20"	Mottling	14"
14-22	B	Fine SL	10YR 5/6	Heavy weeping	0-15 Min.	1/4"		
22-38	C1	Fine SL	2.5Y 4/4	super saturated from 22" and below	15-30 Min.	1/8"	Weeping	14"
38-60	C2	Fine SL	2.5Y 5/4	5% gravel	30-45 Min.	1/8"		
				Note: Pocket of fill in east corner	45-60 Min.	1/8"	Standing	55"
				from 0-36"	60-75 Min.			
					Rate	**0.5**	"/hr	

TP #15-27 Woods

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-14	A	SL	10YR 2/2	Roots, leaf litter	Depth	18"	Mottling	26"
14-26	B	M-C LS	10YR 4/6	super saturated from 24" and below	0-15 Min.	1/4"		
26-68	C	M-C LS	2.5Y 5/4	10% gravel, heavy mottling at B/C interface	15-30 Min.	1/4"	Weeping	26"
					30-45 Min.	1/4"		
					45-60 Min.		Standing	56"
					60-75 Min.			
					Rate	**1**	"/hr	

Job No.:	8548	Soil Evaluator:	Tracy L. Duarte
Client:	Continuing Care Management LLC	Witness:	N/A
Site Location:	Village Street, Medway	Excavator:	Keith - G.B. Sons
Land Use:	Vacant Wooded Lot	Date:	November 18, 2015
Parent Material:		Weather:	Sunny 36°F

Water Resource Conditions: Normal: X Above: ____ Below: ____

TP #15-28 Swale 1

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2	Roots	Depth	N/A	Mottling	N/A
12-26	B	SL	10YR 4/6		0-15 Min.			
26-84	C	LS	2.5Y 5/3	Tight, 5% gravel	15-30 Min.		Weeping	N/A
Refusal					30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

TP #15-30 West Compensatory Storage

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-16	A	SL	10YR 3/2	Roots	Depth	N/A	Mottling	32"
16-28	B	SL	10YR 4/6		0-15 Min.			
28-56	C1	LS	2.5Y 5/3	56" Pocket of Manganese	15-30 Min.		Weeping	N/A
56-102	C2	Silt Loam	2.5Y 4/4	Mottling	30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

Job No.:	8548	Soil Evaluator:	Tracy L. Duarte
Client:	Continuing Care Management LLC	Witness:	N/A
Site Location:	Village Street, Medway	Excavator:	Keith - G.B. Sons
Land Use:	Vacant Wooded Lot	Date:	November 18, 2015
Parent Material:		Weather:	Sunny 36°F

Water Resource Conditions: Normal: X Above: ____ Below: ____

TP #15-32 East Compensatory Storage

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-18	A	SL	10YR 3/2		Depth	N/A	Mottling	24"
18-30	B	LS	10YR 4/6		0-15 Min.			
30-44	C1	C.S	2.5Y 5/3		15-30 Min.		Weeping	N/A
44-104	C2	V.F. LS	2.5Y 5/2	Platey, tight	30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

TP #15-33 Infiltration Trench 21

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-16	A	SL	10YR 3/2		Depth	N/A	Mottling	31"
16-31	B	LS	10YR 4/6		0-15 Min.			
31-62	C1	C.S	2.5Y 5/3		15-30 Min.		Weeping	N/A
62-115	C2	V.F. LS	2.5Y 5/2	Platey, tight	30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

TP #15-34 Infiltration Trench 20

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 2/2	Roots	Depth	N/A	Mottling	32"
12-30	B	M-C LS	10YR 5/6		0-15 Min.			
30-57	C1	S	2.5Y 5/3	Gravely	15-30 Min.		Weeping	N/A
57-96	C2	V.F. LS	2.5Y 5/2	Platey, tight	30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

TP #15-35 Infiltration Trench 18A

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2	Roots	Depth		Mottling	N/A
12-26	B	SL	10YR 4/6		0-15 Min.			
26-44	C1	S	2.5Y 5/3	Gravely	15-30 Min.		Weeping	N/A
44-52	C2	S	2.5Y 5/3		30-45 Min.			
52-96	C3	V.F. LS	2.5Y 5/2	Platey	45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

Job No.:	8548	Soil Evaluator:	Tracy L. Duarte
Client:	Continuing Care Management LLC	Witness:	N/A
Site Location:	Village Street, Medway	Excavator:	Keith - G.B. Sons
Land Use:	Vacant Wooded Lot	Date:	November 18, 2015
Parent Material:		Weather:	Sunny 36°F

Water Resource Conditions: Normal: X Above: ____ Below: ____

TP #15-36 Infiltration Trench 18

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2		Depth	N/A	Mottling	48"
12-36	B	SL	2.5Y4/2		0-15 Min.			
36-103	C	S	2.5Y 5/3		15-30 Min.		Weeping	N/A
					30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

TP #15-37 East Infiltration Trench 18A

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-10	A	SL	10YR 3/2		Depth	N/A	Mottling	28"
10-28	B	LS	10YR 4/6		0-15 Min.			
28-68	C1	S	2.5Y 5/3		15-30 Min.		Weeping	N/A
68-108	C2	V.F. LS	2.5Y 5/2	Platey	30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

TP #15-38 Infiltration Trench 16

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-10	A	SL	10YR 3/2	Roots	Depth	N/A	Mottling	N/A
10-34	B	LS	10YR 5/6		0-15 Min.			
34-101	C	S	2.5Y 5/3	10% gravel	15-30 Min.		Weeping	N/A
					30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

TP #15-39 Infiltration Trench 15

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2	Roots	Depth	N/A	Mottling	55"
12-28	B	LS	10YR 4/6		0-15 Min.			
28-100	C	S	2.5Y 5/3		15-30 Min.		Weeping	N/A
					30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

Job No.:	8548	Soil Evaluator:	Tracy L. Duarte
Client:	Continuing Care Management LLC	Witness:	N/A
Site Location:	Village Street, Medway	Excavator:	Keith - G.B. Sons
Land Use:	Vacant Wooded Lot	Date:	November 19, 2015
Parent Material:		Weather:	Cloudy 40°F

Water Resource Conditions: Normal: X Above: ______ Below: ______

TP #15-40 Swale 4

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2	Roots, leaf litter	Depth	N/A	Mottling	N/A
12-24	B	LS	10YR 5/6		0-15 Min.			
24-90	C	M. S	2.5Y 5/3		15-30 Min.		Weeping	N/A
					30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate	"/hr		

TP #15-41 Basin 3

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2	Roots, leaf litter	Depth	N/A	Mottling	N/A
12-26	B	LS	10YR 5/6	15% Gravel + cobbles	0-15 Min.			
26-108	C	LS	2.5Y 5/3	5% Gravel + cobbles	15-30 Min.		Weeping	N/A
					30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate	"/hr		

TP #15-42 Infiltration Trench 30

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2		Depth	N/A	Mottling	24"
12-32	B	SL	10YR 4/6	Heavy mottling 24" and below	0-15 Min.			
32-84	C	LS	2.5Y 5/4	Tight, 5% gravel + cobbles	15-30 Min.		Weeping	N/A
	Refusal				30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate	"/hr		

TP #15-43 Swale 3

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2		Depth	N/A	Mottling	36"
12-26	B	SL	10YR 5/6		0-15 Min.			
26-84	C	LS	2.5Y 5/3	Tight, heavy mottling 36" and below	15-30 Min.		Weeping	N/A
	Refusal				30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate	"/hr		

Job No.: 8548

Client: Continuing Care Management LLC

Site Location: Village Street, Medway

Land Use: Vacant Wooded Lot

Parent Material:

Soil Evaluator: Tracy L. Duarte

Witness: N/A

Excavator: Keith - G.B. Sons

Date: November 19, 2015

Weather: Cloudy 40ºF

Water Resource Conditions: Normal: X Above: Below:

TP #15-44 Swale 2

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2		Depth	N/A	Mottling	27"
12-34	B	LS	10YR 4/6		0-15 Min.			
34-91	C	LS	2.5Y 5/3	5% Gravel + cobbles	15-30 Min.		Weeping	N/A
					30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

TP #15-45 Wetland Replication South

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2	Roots, Leaf Litter	Depth	N/A	Mottling	24"
12-30	B	LS	10YR 4/6		0-15 Min.			
30-102	C	LS	2.5Y 5/3	Tight, 5% stong, 10% gravel+ cobbles	15-30 Min.		Weeping	N/A
				Heavy band of mottling 24-36"	30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

TP #15-46 Wetland Replication North

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-10	A	SL	10 YR 2/2	Roots, leaf litter	Depth	N/A	Mottling	22"
10-22	B	LS	10YR 4/6		0-15 Min.			
22-91	C	LS	2.5Y 5/3	Tight, 10% gravel + cobbles	15-30 Min.		Weeping	N/A
				few stones	30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

TP #15-47 Swale 2 South

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-10	A	SL	10YR 3/2	Roots, leaf litter	Depth	N/A	Mottling	24"
10-23	B	LS	10YR 4/6		0-15 Min.			
23-92	C	M-C LS	2.5Y 5/3	5% gravel + cobbles	15-30 Min.		Weeping	
				Heavy mottling 24"and below	30-45 Min.			
					45-60 Min.		Standing	
					60-75 Min.			
					Rate		"/hr	

Job No.:	8548	Soil Evaluator:	Tracy L. Duarte
Client:	Continuing Care Management LLC	Witness:	N/A
Site Location:	Village Street, Medway	Excavator:	Keith - G.B. Sons
Land Use:	Vacant Wooded Lot	Date:	November 19, 2015
Parent Material:		Weather:	Cloudy 40ºF

Water Resource Conditions: Normal: X Above: ____ Below: ____

TP #15-48 Swale 2 North

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-10	A	SL	10YR 3/2	Root, leaf litter	Depth	N/A	Mottling	24"
10-26	B	LS	10YR 5/6		0-15 Min.			
26-95	C	S	2.5Y 5/3	5% gravel + cobbles	15-30 Min.		Weeping	N/A
					30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

TP #15-49 Infiltration Trench 13

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2	Roots	Depth	N/A	Mottling	26"
12-29	B	LS	10YR 4/6		0-15 Min.			
29-91	C	S	2.5Y 5/3	V. Friable, Loose	15-30 Min.		Weeping	N/A
					30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

TP #15-50 Infiltration Trench 12

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-16	A	SL	10YR 3/2	Roots, leaf litter	Depth	N/A	Mottling	24"
16-36	B	LS	10YR 4/6	Heavy mottling 24" and below	0-15 Min.			
36-89	C	S	2.5Y 5/3		15-30 Min.		Weeping	N/A
					30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

TP #15-51 Infiltration Trench 14

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-10	A	SL	10YR 3/2		Depth	N/A	Mottling	40"
10-20	B	LS	10YR 5/6		0-15 Min.			
20-48	C1	M-C S	2.5Y 5/3		15-30 Min.		Weeping	N/A
48-90	C2	SL	2.5Y 5/2		30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

Job No.: 8548

Client: Continuing Care Management LLC

Site Location: Village Street, Medway

Land Use: Vacant Wooded Lot

Parent Material:

Soil Evaluator: Tracy L. Duarte

Witness: N/A

Excavator: Keith - G.B. Sons

Date: November 19, 2015

Weather: Cloudy 40ºF

Water Resource Conditions: Normal: X Above: Below:

TP #15-52 Infiltration Trench 24

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2	Roots, leaf litter	Depth	N/A	Mottling	32"
12-26	B	LS	10YR 4/6		0-15 Min.			
26-58	C1	M-C S	2.5Y 5/3		15-30 Min.		Weeping	N/A
58-102	C2	SL	2.5Y 5/2		30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

TP #15-53 Infiltration Trench 9

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-10	A	SL	10YR 3/2	Roots, leaf litter	Depth	N/A	Mottling	18"
10-24	B	LS	10YR 4/6		0-15 Min.			
24-62	C1	M-C S	2.5Y 5/3		15-30 Min.		Weeping	N/A
62-91	C2	SL	2.5Y 5/2		30-45 Min.			
				Heavy mottling throughout	45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

TP #15-54 Infiltration Trench 8

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-11	A	SL	10YR 3/2	Roots, leaf litter	Depth	N/A	Mottling	18"
11-28	B	LS	10YR 4/6		0-15 Min.			
28-65	C1	M-C S	2.5Y 5/3	Heavy mottling 18" and below	15-30 Min.		Weeping	N/A
65-90	C2	SL			30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

TP #15-55 Infiltration Trench 22A

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2	Roots, leaf litter	Depth	N/A	Mottling	40"
12-28	B	LS	10YR 4/6		0-15 Min.			
28-89	C	LS	2.5Y 5/3	5% gravel + cobbles	15-30 Min.		Weeping	N/A
					30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

Job No.:	8548	Soil Evaluator:	Tracy L. Duarte
Client:	Continuing Care Management LLC	Witness:	N/A
Site Location:	Village Street, Medway	Excavator:	Keith - G.B. Sons
Land Use:	Vacant Wooded Lot	Date:	November 19, 2015
Parent Material:		Weather:	Rainy 40°F

Water Resource Conditions: Normal: X Above: ______ Below: ______

TP #15-56 Infiltration Trench 10

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-12	A	SL	10YR 3/2	Roots, leaf litter	Depth	N/A	Mottling	18"
12-26	B	LS	10YR 4/6		0-15 Min.			
26-52	C1	M-C S	2.5Y 5/3		15-30 Min.		Weeping	N/A
52-87	C2	SL	2.5Y 5/2	Heavy mottling 18" and below	30-45 Min.			
					45-60 Min.		Standing	N/A
					60-75 Min.			
					Rate		"/hr	

APPENDIX I

STORMCEPTOR SIZING DETAILED REPORT AND OWNER'S MANUAL

Stormceptor Sizing Detailed Report

PCSWMM for Stormceptor

Project Information

Date	10/17/2015
Project Name	Salmon ARCPUD
Project Number	8548
Location	Medway, MA

Stormwater Quality Objective

This report outlines how Stormceptor System can achieve a defined water quality objective through the removal of total suspended solids (TSS). Attached to this report is the Stormceptor Sizing Summary.

Stormceptor System Recommendation

The Stormceptor System model STC 900 achieves the water quality objective removing 89% TSS for a Fine (organics, silts and sand) particle size distribution.

The Stormceptor System

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for all rainfall events, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.

Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Stormceptor is the only oil and sediment separator on the market sized to remove TSS for a wide range of particle sizes, including fine sediments (clays and silts), that are often overlooked in the design of other stormwater treatment devices.

Small storms dominate hydrologic activity, US EPA reports

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"*Most rainfall events are much smaller than design storms used for urban drainage models. In any given area, most frequently recurrent rainfall events are small (less than 1 in. of daily rainfall).*"

"Continuous simulation offers possibilities for designing and managing BMPs on an individual site-by-site basis that are not provided by other widely used simpler analysis methods. Therefore its application and use should be encouraged."

– US EPA Stormwater Best Management Practice Design Guide, Volume 1 – General Considerations, 2004

Design Methodology

Each Stormceptor system is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology from up-to-date local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective.

The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing (summary of analysis presented in Appendix 2):

- Site parameters
- Continuous historical rainfall, including duration, distribution, peaks (Figure 1)
- Interevent periods
- Particle size distribution
- Particle settling velocities (Stokes Law, corrected for drag)
- TSS load (Figure 2)
- Detention time of the system

The Stormceptor System maintains continuous positive TSS removal for all influent flow rates. Figure 3 illustrates the continuous treatment by Stormceptor throughout the full range of storm events analyzed. It is clear that large events do not significantly impact the average annual TSS removal. There is no decline in cumulative TSS removal, indicating scour does not occur as the flow rate increases.

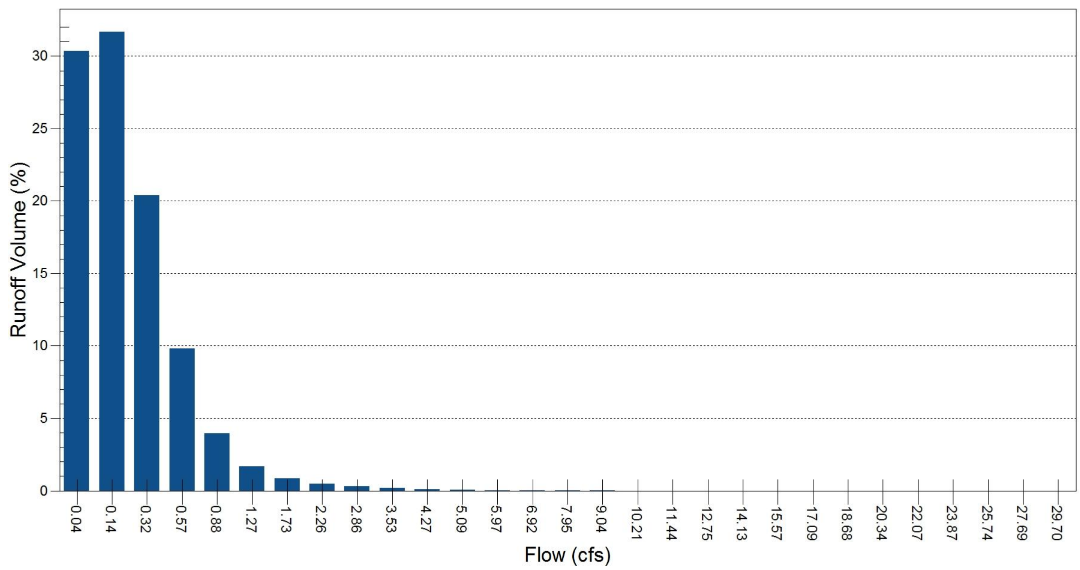


Figure 1. Runoff Volume by Flow Rate for BLUE HILL – MA 736, 1948 to 2005 for 0.81 ac, 65.2% impervious. Small frequent storm events represent the majority of annual rainfall volume. Large infrequent events have little impact on the average annual TSS removal, as they represent a small percentage of the total annual volume of runoff.

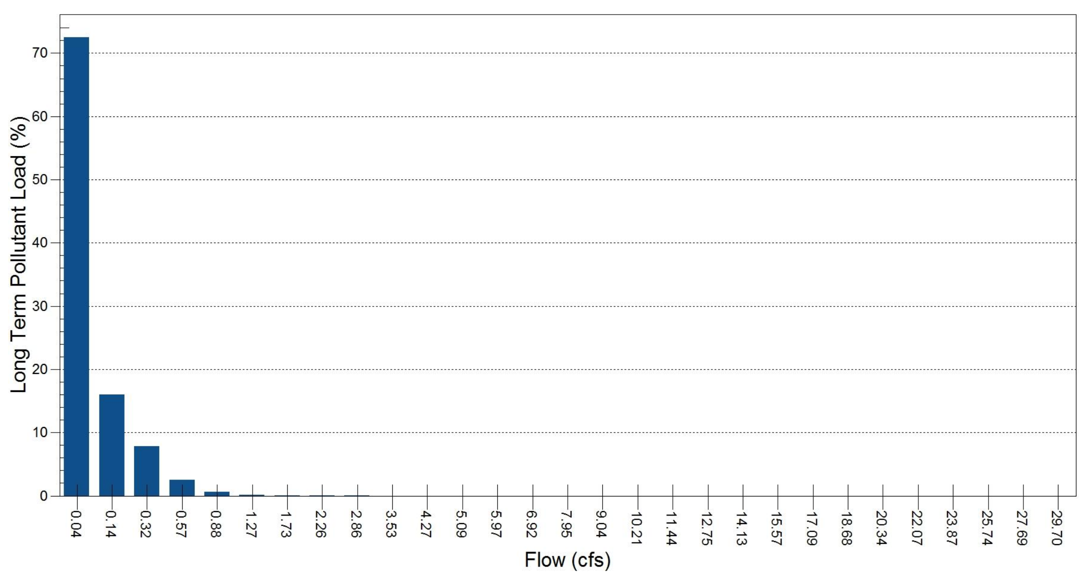
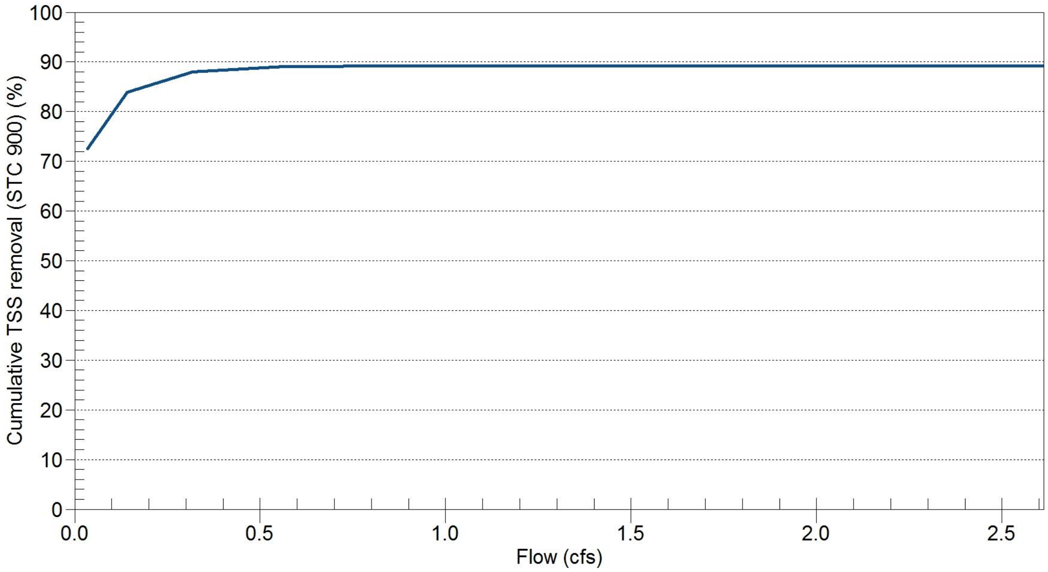


Figure 2. Long Term Pollutant Load by Flow Rate for BLUE HILL – 736, 1948 to 2005 for 0.81 ac, 65.2% impervious. The majority of the annual pollutant load is transported by small frequent storm

events. Conversely, large infrequent events carry an insignificant percentage of the total annual pollutant load.



Stormceptor Model	STC 900	Drainage Area (ac)	0.81
TSS Removal (%)	89	Impervious (%)	65.2

Figure 3. Cumulative TSS Removal by Flow Rate for BLUE HILL – 736, 1948 to 2005. Stormceptor continuously removes TSS throughout the full range of storm events analyzed. Note that large events do not significantly impact the average annual TSS removal. Therefore no decline in cumulative TSS removal indicates scour does not occur as the flow rate increases.

Appendix 1
Stormceptor Design Summary

Project Information

Date	10/17/2015
Project Name	Salmon ARCPUD
Project Number	8548
Location	Medway, MA

Designer Information

Company	Coneco Engineers & Scientist
Contact	N/A

Notes

Stormceptor 1

Drainage Area

Total Area (ac)	0.81
Imperviousness (%)	65.2

The Stormceptor System model STC 900 achieves the water quality objective removing 89% TSS for a Fine (organics, silts and sand) particle size distribution.

Rainfall

Name	BLUE HILL
State	MA
ID	736
Years of Records	1948 to 2005
Latitude	42°12'44"N
Longitude	71°6'53"W

Water Quality Objective

TSS Removal (%)	85

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	83
STC 900	**89**
STC 1200	89
STC 1800	89
STC 2400	92
STC 3600	92
STC 4800	94
STC 6000	94
STC 7200	95
STC 11000	97
STC 13000	97
STC 16000	97

Stormceptor®

Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)								
Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
20	20	1.3	0.0013					
60	20	1.8	0.0051					
150	20	2.2	0.0354					
400	20	2.65	0.2123					
2000	20	2.65	0.9417					

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in.	1 in.	3 in.
Multiple inlet pipes	3 in.	3 in.	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Rinker Materials 1 (800) 909-7763 www.rinkerstormceptor.com

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Stormceptor®

Appendix 2
Summary of Design Assumptions

SITE DETAILS

Site Drainage Area

Total Area (ac)	0.81	Imperviousness (%)	65.2

Surface Characteristics

Width (ft)	376
Slope (%)	2
Impervious Depression Storage (in.)	0.02
Pervious Depression Storage (in.)	0.2
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (in/hr)	2.44
Min. Infiltration Rate (in/hr)	0.4
Decay Rate (s^{-1})	0.00055
Regeneration Rate (s^{-1})	0.01

Maintenance Frequency

Sediment build-up reduces the storage volume for sedimentation. Frequency of maintenance is assumed for TSS removal calculations.

Maintenance Frequency (months)	12

Evaporation

Daily Evaporation Rate (inches/day)	0.1

Dry Weather Flow

Dry Weather Flow (cfs)	No

Upstream Attenuation

Stage-storage and stage-discharge relationship used to model attenuation upstream of the Stormceptor System is identified in the table below.

Storage ac-ft	Discharge cfs
0	0

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Stormceptor®

PARTICLE SIZE DISTRIBUTION

Particle Size Distribution

Removing fine particles from runoff ensures the majority of pollutants, such as heavy metals, hydrocarbons, free oils and nutrients are not discharged into natural water resources. The table below identifies the particle size distribution selected to define TSS removal for the design of the Stormceptor System.

Fine (organics, silts and sand)								
Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
20	20	1.3	0.0013					
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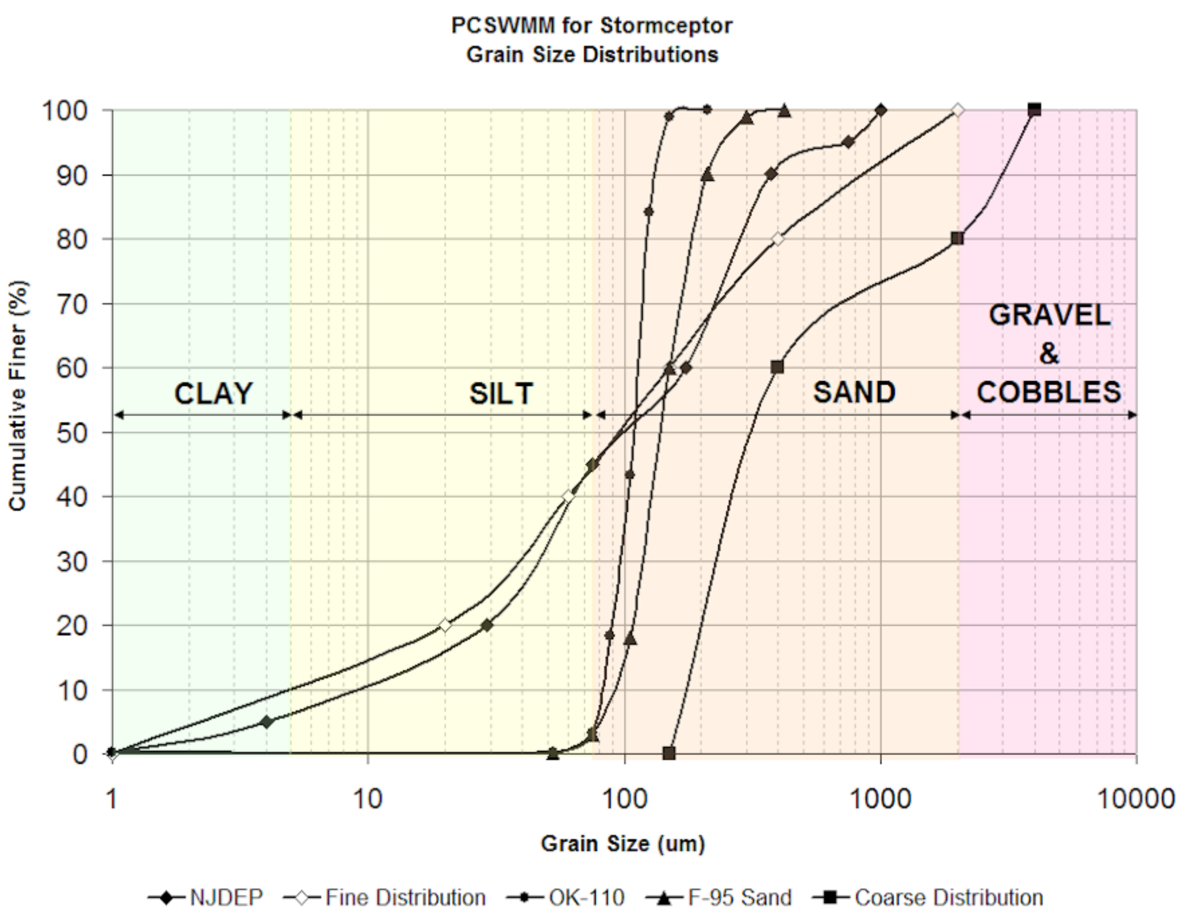

Figure 1. PCSWMM for Stormceptor standard design grain size distributions.

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TSS LOADING

TSS Loading Parameters

TSS Loading Function	Buildup / Washoff

Parameters

Target Event Mean Concentration (EMC) (mg/L)	125
Exponential Buildup Power	0.4
Exponential Washoff Exponential	0.2

HYDROLOGY ANALYSIS

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of the Stormceptor System are based on the average annual removal of TSS for the selected site parameters. The Stormceptor System is engineered to capture fine particles (silts and sands) by focusing on average annual runoff volume ensuring positive removal efficiency is maintained during all rainfall events, while preventing the opportunity for negative removal efficiency (scour).

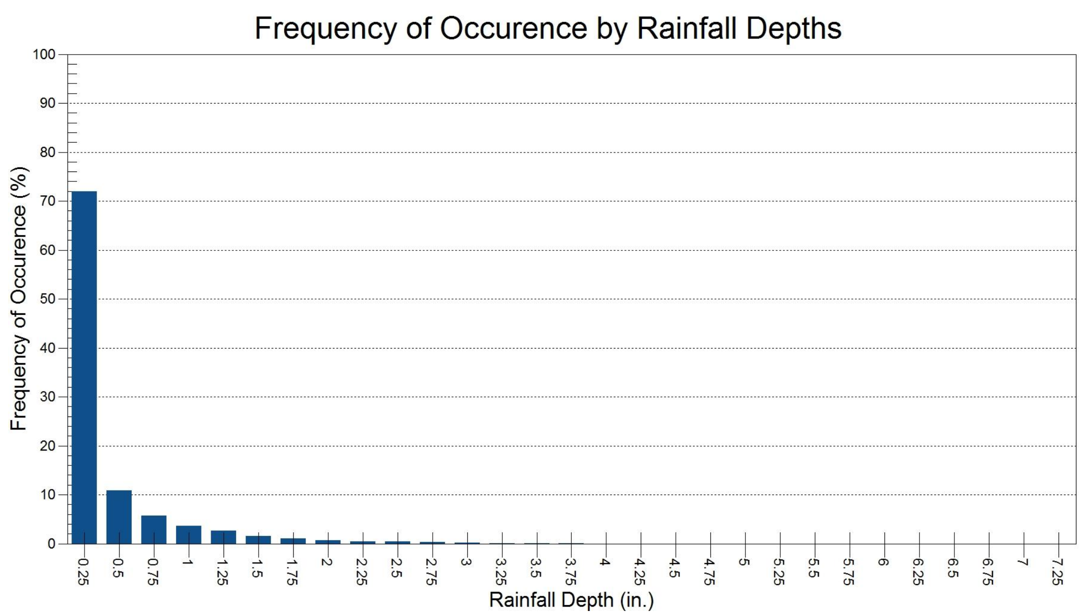
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

Rainfall Station	BLUE HILL		
Rainfall File Name	MA736.NDC	Total Number of Events	9865
Latitude	42°12'44"N	Total Rainfall (in.)	2849.7
Longitude	71°6'53"W	Average Annual Rainfall (in.)	49.1
Elevation (ft)		Total Evaporation (in.)	163.2
Rainfall Period of Record (y)	58	Total Infiltration (in.)	975.9
Total Rainfall Period (y)	58	Percentage of Rainfall that is Runoff (%)	62.4

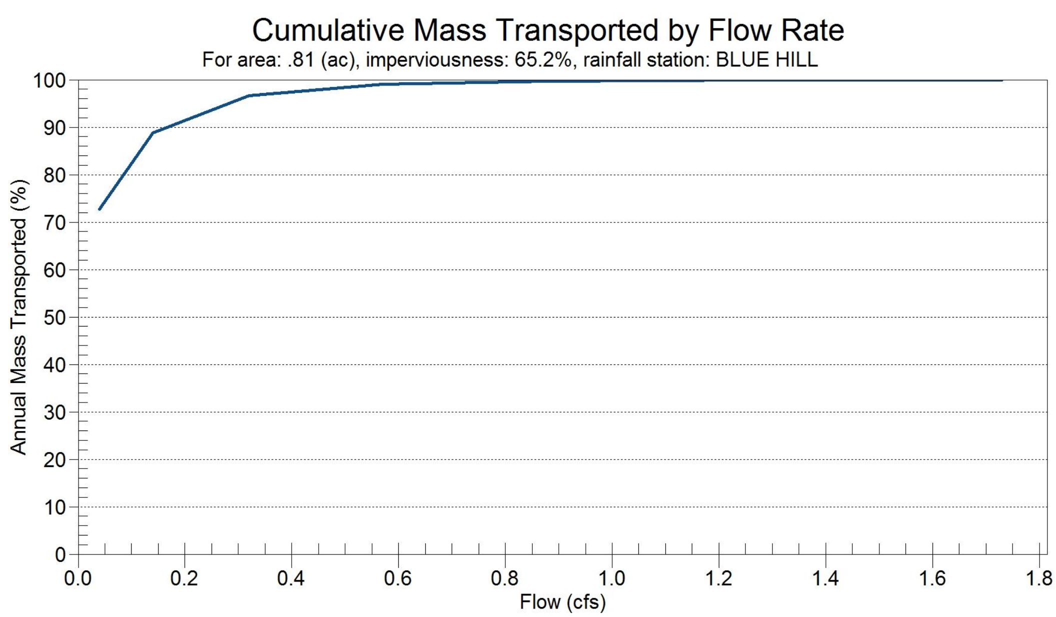
Rainfall Event Analysis

Rainfall Depth in.	No. of Events	Percentage of Total Events %	Total Volume in.	Percentage of Annual Volume %
0.25	7098	72.0	431	15.1
0.50	1076	10.9	393	13.8
0.75	563	5.7	350	12.3
1.00	360	3.6	311	10.9
1.25	257	2.6	288	10.1
1.50	151	1.5	207	7.3
1.75	102	1.0	165	5.8
2.00	70	0.7	130	4.6
2.25	42	0.4	89	3.1
2.50	41	0.4	98	3.4
2.75	27	0.3	71	2.5
3.00	21	0.2	61	2.1
3.25	13	0.1	40	1.4
3.50	10	0.1	34	1.2
3.75	5	0.1	18	0.6
4.00	2	0.0	8	0.3
4.25	1	0.0	4	0.1
4.50	4	0.0	18	0.6
4.75	4	0.0	18	0.6
5.00	0	0.0	0	0.0
5.25	1	0.0	5	0.2
5.50	3	0.0	16	0.6
5.75	2	0.0	11	0.4
6.00	4	0.0	23	0.8
6.25	0	0.0	0	0.0
6.50	0	0.0	0	0.0
6.75	1	0.0	7	0.2
7.00	1	0.0	7	0.2
7.25	2	0.0	14	0.5
7.50	0	0.0	0	0.0
7.75	1	0.0	8	0.3
8.00	1	0.0	8	0.3
8.25	0	0.0	0	0.0
>8.25	2	0.0	17	0.6



Pollutograph

Flow Rate cfs	Cumulative Mass %
0.035	72.7
0.141	88.8
0.318	96.6
0.565	99.1
0.883	99.7
1.271	99.9
1.73	100.0
2.26	100.0
2.86	100.0
3.531	100.0
4.273	100.0
5.085	100.0
5.968	100.0
6.922	100.0
7.946	100.0
9.041	100.0
10.206	100.0
11.442	100.0
12.749	100.0
14.126	100.0
15.574	100.0
17.092	100.0
18.681	100.0
20.341	100.0
22.072	100.0
23.873	100.0
25.744	100.0
27.687	100.0
29.7	100.0
31.783	100.0



Stormceptor Sizing Detailed Report

PCSWMM for Stormceptor

Project Information

Date	10/17/2015
Project Name	Salmon ARCPUD
Project Number	8548
Location	Medway, MA

Stormwater Quality Objective

This report outlines how Stormceptor System can achieve a defined water quality objective through the removal of total suspended solids (TSS). Attached to this report is the Stormceptor Sizing Summary.

Stormceptor System Recommendation

The Stormceptor System model STC 900 achieves the water quality objective removing 86% TSS for a Fine (organics, silts and sand) particle size distribution.

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- Particle size distribution
- Particle settling velocities (Stokes Law, corrected for drag)
- TSS load (Figure 2)
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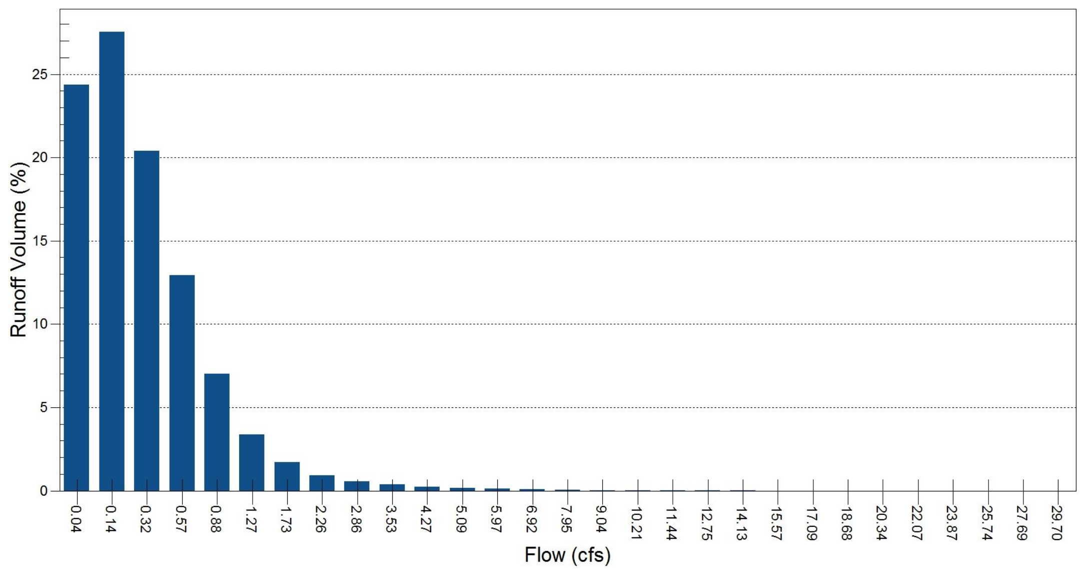


Figure 1. Runoff Volume by Flow Rate for BLUE HILL – MA 736, 1948 to 2005 for 1.27 ac, 66.1% impervious. Small frequent storm events represent the majority of annual rainfall volume. Large infrequent events have little impact on the average annual TSS removal, as they represent a small percentage of the total annual volume of runoff.

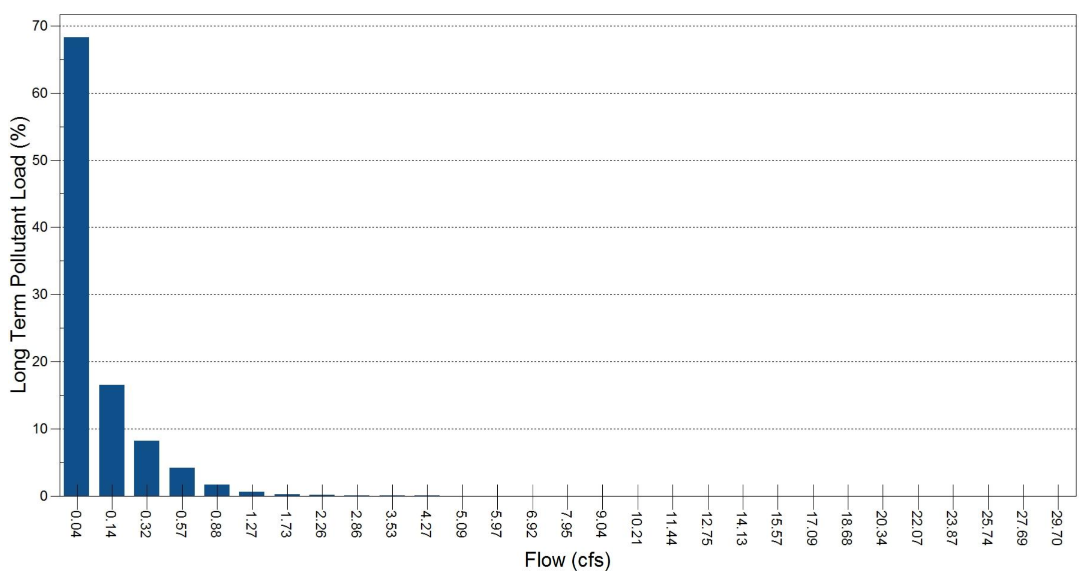
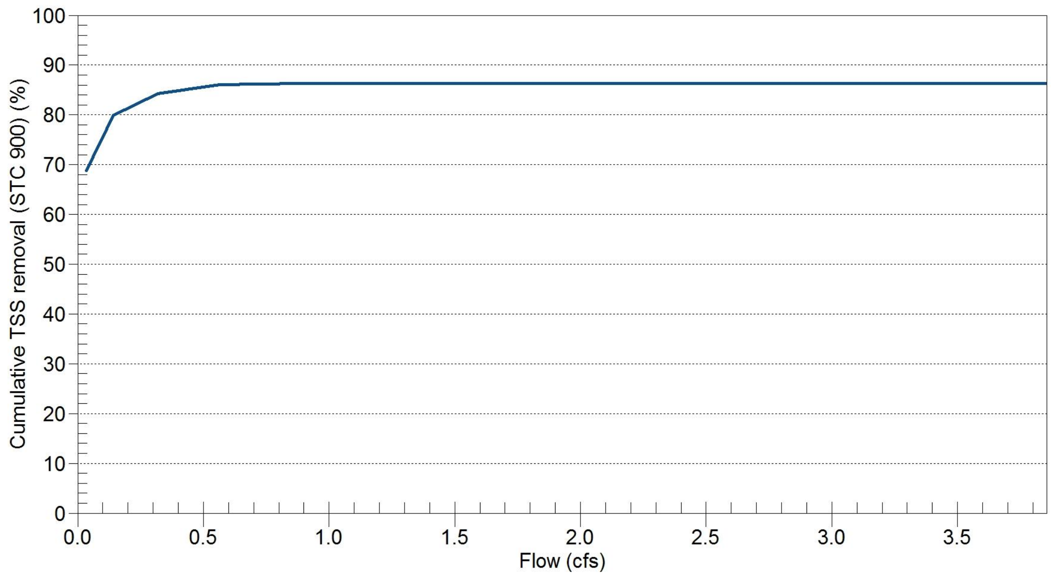


Figure 2. Long Term Pollutant Load by Flow Rate for BLUE HILL – 736, 1948 to 2005 for 1.27 ac, 66.1% impervious. The majority of the annual pollutant load is transported by small frequent storm

events. Conversely, large infrequent events carry an insignificant percentage of the total annual pollutant load.



Stormceptor Model	STC 900	Drainage Area (ac)	1.27
TSS Removal (%)	86	Impervious (%)	66.1

Figure 3. Cumulative TSS Removal by Flow Rate for BLUE HILL – 736, 1948 to 2005. Stormceptor continuously removes TSS throughout the full range of storm events analyzed.   Note that large events do not significantly impact the average annual TSS removal. Therefore no decline in cumulative TSS removal indicates scour does not occur as the flow rate increases.

Appendix 1
Stormceptor Design Summary

Project Information

Date	10/17/2015
Project Name	Salmon ARCPUD
Project Number	8548
Location	Medway, MA

Designer Information

Company	Coneco Engineers & Scientist
Contact	N/A

Notes

STC 2 - 900-1800 all remove 86%. Program will not allow a specific unit to be selected to show the appropriate STC 1200 cumulative TSS removal by Flow Rate Chart

Drainage Area

Total Area (ac)	1.27
Imperviousness (%)	66.1

The Stormceptor System model STC 900 achieves the water quality objective removing 86% TSS for a Fine (organics, silts and sand) particle size distribution.

Rainfall

Name	BLUE HILL
State	MA
ID	736
Years of Records	1948 to 2005
Latitude	42°12'44"N
Longitude	71°6'53"W

Water Quality Objective

TSS Removal (%)	80

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	79
STC 900	**86**
STC 1200	86
STC 1800	86
STC 2400	89
STC 3600	90
STC 4800	92
STC 6000	92
STC 7200	94
STC 11000	95
STC 13000	95
STC 16000	96

Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)								
Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
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- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in.	1 in.	3 in.
Multiple inlet pipes	3 in.	3 in.	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Rinker Materials 1 (800) 909-7763 www.rinkerstormceptor.com

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Appendix 2
Summary of Design Assumptions

SITE DETAILS

Site Drainage Area

Total Area (ac)	1.27	Imperviousness (%)	66.1

Surface Characteristics

Width (ft)	470
Slope (%)	2
Impervious Depression Storage (in.)	0.02
Pervious Depression Storage (in.)	0.2
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Infiltration Parameters

Horton's equation is used to estimate infiltration	
Max. Infiltration Rate (in/hr)	2.44
Min. Infiltration Rate (in/hr)	0.4
Decay Rate (s^{-1})	0.00055
Regeneration Rate (s^{-1})	0.01

Evaporation

Daily Evaporation Rate (inches/day)	0.1

Maintenance Frequency

Sediment build-up reduces the storage volume for sedimentation. Frequency of maintenance is assumed for TSS removal calculations.

Maintenance Frequency (months)	12

Dry Weather Flow

Dry Weather Flow (cfs)	No

Upstream Attenuation

Stage-storage and stage-discharge relationship used to model attenuation upstream of the Stormceptor System is identified in the table below.

Storage ac-ft	Discharge cfs
0	0

Rinker MATERIALS™

PARTICLE SIZE DISTRIBUTION

Particle Size Distribution

Removing fine particles from runoff ensures the majority of pollutants, such as heavy metals, hydrocarbons, free oils and nutrients are not discharged into natural water resources. The table below identifies the particle size distribution selected to define TSS removal for the design of the Stormceptor System.

Fine (organics, silts and sand)								
Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
20	20	1.3	0.0013					
60	20	1.8	0.0051					
150	20	2.2	0.0354					
400	20	2.65	0.2123					
2000	20	2.65	0.9417					

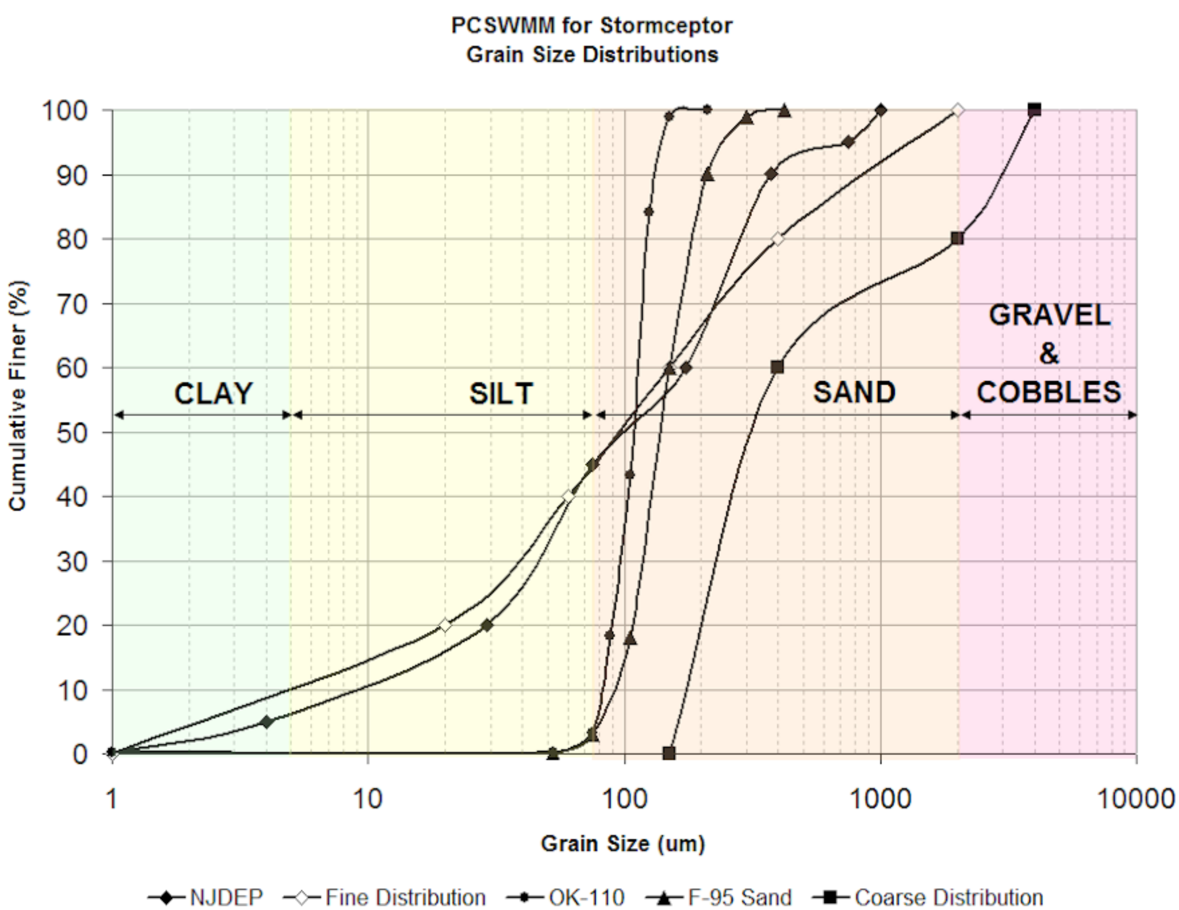

Figure 1. PCSWMM for Stormceptor standard design grain size distributions.

TSS LOADING

TSS Loading Parameters

TSS Loading Function	Buildup / Washoff

Parameters

Target Event Mean Concentration (EMC) (mg/L)	125
Exponential Buildup Power	0.4
Exponential Washoff Exponential	0.2

HYDROLOGY ANALYSIS

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of the Stormceptor System are based on the average annual removal of TSS for the selected site parameters. The Stormceptor System is engineered to capture fine particles (silts and sands) by focusing on average annual runoff volume ensuring positive removal efficiency is maintained during all rainfall events, while preventing the opportunity for negative removal efficiency (scour).

Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

Rainfall Station	BLUE HILL		
Rainfall File Name	MA736.NDC	Total Number of Events	9865
Latitude	42°12'44"N	Total Rainfall (in.)	2849.7
Longitude	71°6'53"W	Average Annual Rainfall (in.)	49.1
Elevation (ft)		Total Evaporation (in.)	168.1
Rainfall Period of Record (y)	58	Total Infiltration (in.)	951.3
Total Rainfall Period (y)	58	Percentage of Rainfall that is Runoff (%)	63.0

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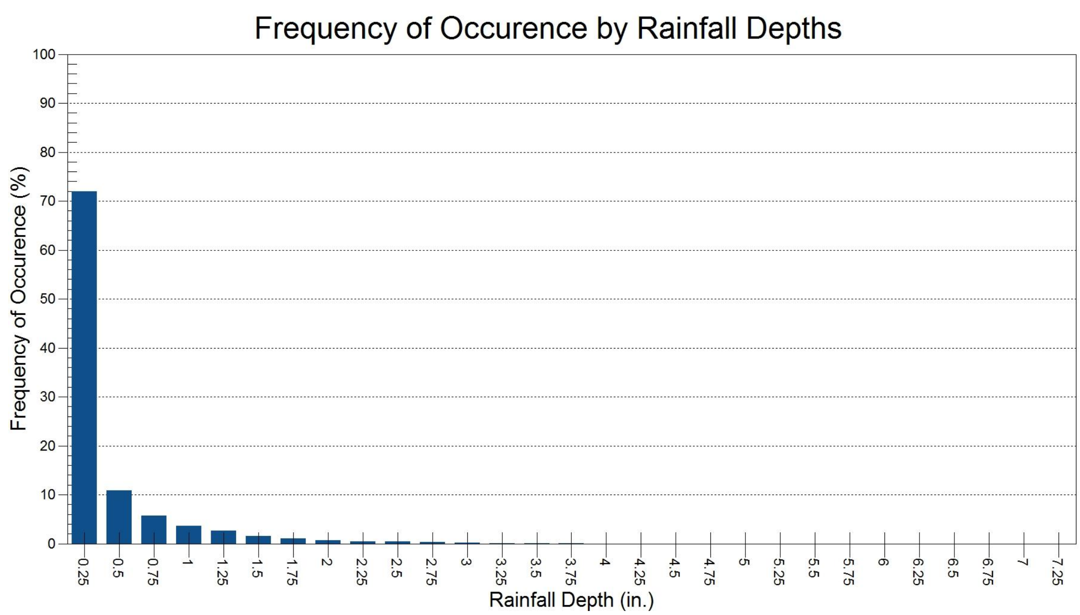
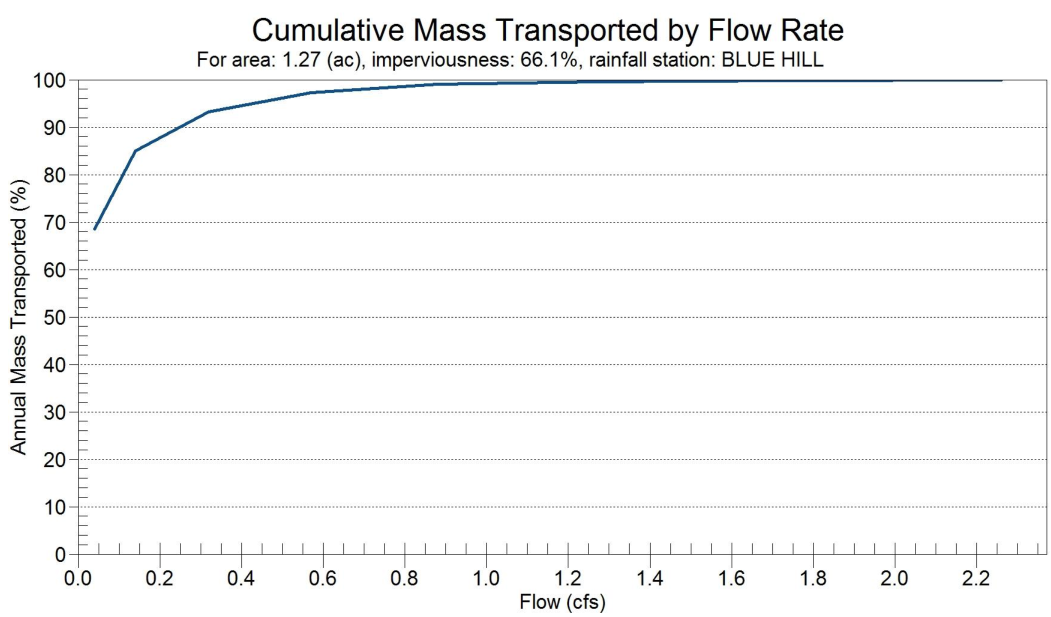
Rainfall Event Analysis

Rainfall Depth in.	No. of Events	Percentage of Total Events %	Total Volume in.	Percentage of Annual Volume %
0.25	7098	72.0	431	15.1
0.50	1076	10.9	393	13.8
0.75	563	5.7	350	12.3
1.00	360	3.6	311	10.9
1.25	257	2.6	288	10.1
1.50	151	1.5	207	7.3
1.75	102	1.0	165	5.8
2.00	70	0.7	130	4.6
2.25	42	0.4	89	3.1
2.50	41	0.4	98	3.4
2.75	27	0.3	71	2.5
3.00	21	0.2	61	2.1
3.25	13	0.1	40	1.4
3.50	10	0.1	34	1.2
3.75	5	0.1	18	0.6
4.00	2	0.0	8	0.3
4.25	1	0.0	4	0.1
4.50	4	0.0	18	0.6
4.75	4	0.0	18	0.6
5.00	0	0.0	0	0.0
5.25	1	0.0	5	0.2
5.50	3	0.0	16	0.6
5.75	2	0.0	11	0.4
6.00	4	0.0	23	0.8
6.25	0	0.0	0	0.0
6.50	0	0.0	0	0.0
6.75	1	0.0	7	0.2
7.00	1	0.0	7	0.2
7.25	2	0.0	14	0.5
7.50	0	0.0	0	0.0
7.75	1	0.0	8	0.3
8.00	1	0.0	8	0.3
8.25	0	0.0	0	0.0
>8.25	2	0.0	17	0.6



Pollutograph

Flow Rate cfs	Cumulative Mass %
0.035	68.5
0.141	85.0
0.318	93.2
0.565	97.3
0.883	99.0
1.271	99.6
1.73	99.8
2.26	99.9
2.86	100.0
3.531	100.0
4.273	100.0
5.085	100.0
5.968	100.0
6.922	100.0
7.946	100.0
9.041	100.0
10.206	100.0
11.442	100.0
12.749	100.0
14.126	100.0
15.574	100.0
17.092	100.0
18.681	100.0
20.341	100.0
22.072	100.0
23.873	100.0
25.744	100.0
27.687	100.0
29.7	100.0
31.783	100.0



Stormceptor Sizing Detailed Report
PCSWMM for Stormceptor

Project Information

Date	10/17/2015
Project Name	Salmon ARCPUD
Project Number	8548
Location	Medway, MA

Stormwater Quality Objective

This report outlines how Stormceptor System can achieve a defined water quality objective through the removal of total suspended solids (TSS). Attached to this report is the Stormceptor Sizing Summary.

Stormceptor System Recommendation

The Stormceptor System model STC 4800 achieves the water quality objective removing 80% TSS for a Fine (organics, silts and sand) particle size distribution.

The Stormceptor System

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for all rainfall events, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.

Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Stormceptor is the only oil and sediment separator on the market sized to remove TSS for a wide range of particle sizes, including fine sediments (clays and silts), that are often overlooked in the design of other stormwater treatment devices.

Small storms dominate hydrologic activity, US EPA reports

"*Early efforts in stormwater management focused on flood events ranging from the 2-yr to the 100-yr storm. Increasingly stormwater professionals have come to realize that small storms (i.e. < 1 in. rainfall) dominate watershed hydrologic parameters typically associated with water quality management issues and BMP design. These small storms are responsible for most annual urban runoff and groundwater recharge. Likewise, with the exception of eroded sediment, they are responsible for most pollutant washoff from urban surfaces. Therefore, the small storms are of most concern for the stormwater management objectives of ground water recharge, water quality resource protection and thermal impacts control.*"

"*Most rainfall events are much smaller than design storms used for urban drainage models. In any given area, most frequently recurrent rainfall events are small (less than 1 in. of daily rainfall).*"

"Continuous simulation offers possibilities for designing and managing BMPs on an individual site-by-site basis that are not provided by other widely used simpler analysis methods. Therefore its application and use should be encouraged."

– US EPA Stormwater Best Management Practice Design Guide, Volume 1 – General Considerations, 2004

Design Methodology

Each Stormceptor system is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology from up-to-date local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective.

The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing (summary of analysis presented in Appendix 2):

- Site parameters
- Continuous historical rainfall, including duration, distribution, peaks (Figure 1)
- Interevent periods
- Particle size distribution
- Particle settling velocities (Stokes Law, corrected for drag)
- TSS load (Figure 2)
- Detention time of the system

The Stormceptor System maintains continuous positive TSS removal for all influent flow rates. Figure 3 illustrates the continuous treatment by Stormceptor throughout the full range of storm events analyzed. It is clear that large events do not significantly impact the average annual TSS removal. There is no decline in cumulative TSS removal, indicating scour does not occur as the flow rate increases.

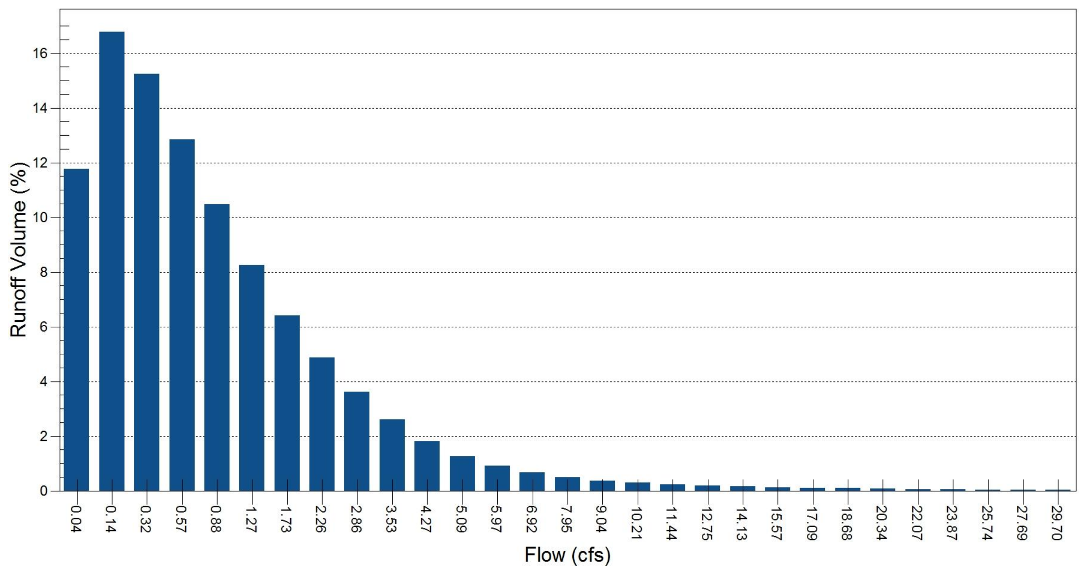


Figure 1. Runoff Volume by Flow Rate for BLUE HILL – MA 736, 1948 to 2005 for 6.14 ac, 56.2% impervious. Small frequent storm events represent the majority of annual rainfall volume. Large infrequent events have little impact on the average annual TSS removal, as they represent a small percentage of the total annual volume of runoff.

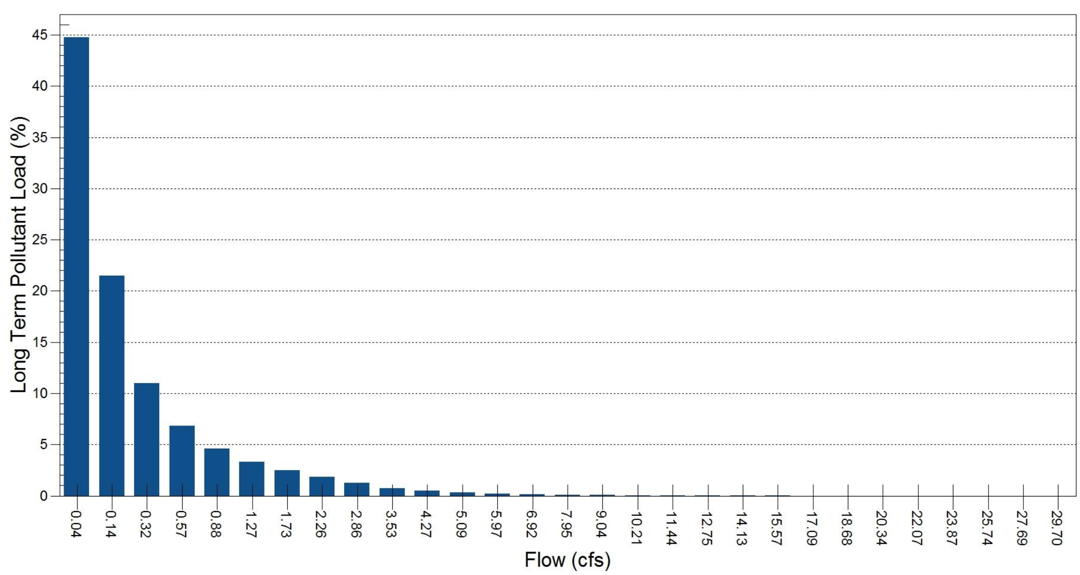
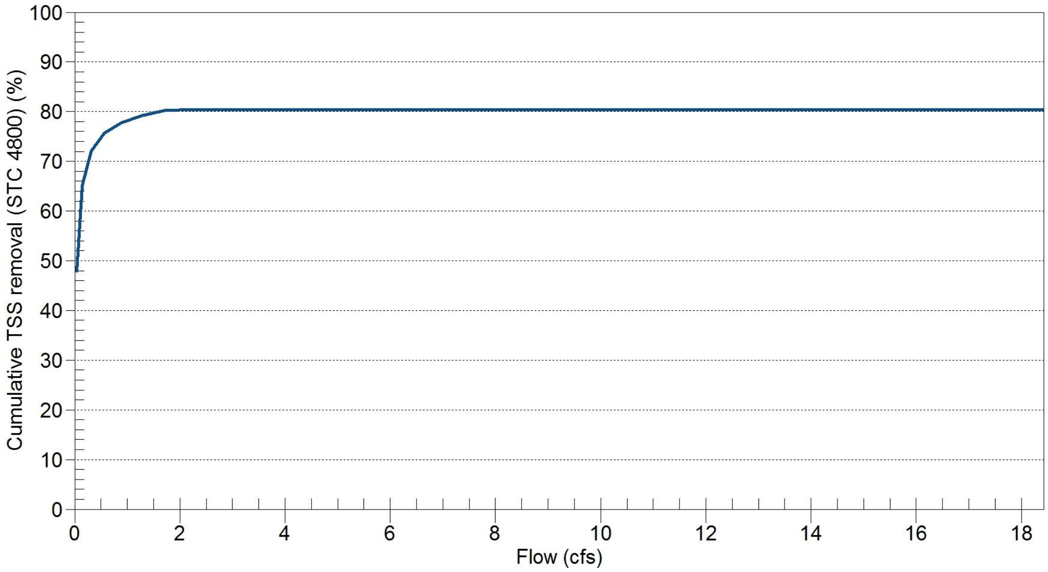


Figure 2. Long Term Pollutant Load by Flow Rate for BLUE HILL – 736, 1948 to 2005 for 6.14 ac, 56.2% impervious. The majority of the annual pollutant load is transported by small frequent storm

events. Conversely, large infrequent events carry an insignificant percentage of the total annual pollutant load.



Stormceptor Model	STC 4800	Drainage Area (ac)	6.14
TSS Removal (%)	80	Impervious (%)	56.2

Figure 3. Cumulative TSS Removal by Flow Rate for BLUE HILL – 736, 1948 to 2005. Stormceptor continuously removes TSS throughout the full range of storm events analyzed. Note that large events do not significantly impact the average annual TSS removal. Therefore no decline in cumulative TSS removal indicates scour does not occur as the flow rate increases.

Appendix 1
Stormceptor Design Summary

Project Information

Date	10/17/2015
Project Name	Salmon ARCPUD
Project Number	8548
Location	Medway, MA

Designer Information

Company	Coneco Engineers & Scientist
Contact	N/A

Notes

STC 3

Drainage Area

Total Area (ac)	6.14
Imperviousness (%)	56.2

The Stormceptor System model STC 4800 achieves the water quality objective removing 80% TSS for a Fine (organics, silts and sand) particle size distribution.

Rainfall

Name	BLUE HILL
State	MA
ID	736
Years of Records	1948 to 2005
Latitude	42°12'44"N
Longitude	71°6'53"W

Water Quality Objective

TSS Removal (%)	80

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	61
STC 900	71
STC 1200	71
STC 1800	71
STC 2400	76
STC 3600	76
STC 4800	**80**
STC 6000	81
STC 7200	84
STC 11000	87
STC 13000	88
STC 16000	89

Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)

Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
20	20	1.3	0.0013					
60	20	1.8	0.0051					
150	20	2.2	0.0354					
400	20	2.65	0.2123					
2000	20	2.65	0.9417					

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in.	1 in.	3 in.
Multiple inlet pipes	3 in.	3 in.	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Rinker Materials 1 (800) 909-7763 www.rinkerstormceptor.com

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Appendix 2
Summary of Design Assumptions

SITE DETAILS

Site Drainage Area

Total Area (ac)	6.14	Imperviousness (%)	56.2

Surface Characteristics

Width (ft)	1034
Slope (%)	2
Impervious Depression Storage (in.)	0.02
Pervious Depression Storage (in.)	0.2
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (in/hr)	2.44
Min. Infiltration Rate (in/hr)	0.4
Decay Rate (s^{-1})	0.00055
Regeneration Rate (s^{-1})	0.01

Maintenance Frequency

Sediment build-up reduces the storage volume for sedimentation. Frequency of maintenance is assumed for TSS removal calculations.

Maintenance Frequency (months)	12

Evaporation

Daily Evaporation Rate (inches/day)	0.1

Dry Weather Flow

Dry Weather Flow (cfs)	No

Upstream Attenuation

Stage-storage and stage-discharge relationship used to model attenuation upstream of the Stormceptor System is identified in the table below.

Storage ac-ft	Discharge cfs
0	0

Rinker MATERIALS™

PARTICLE SIZE DISTRIBUTION

Particle Size Distribution

Removing fine particles from runoff ensures the majority of pollutants, such as heavy metals, hydrocarbons, free oils and nutrients are not discharged into natural water resources. The table below identifies the particle size distribution selected to define TSS removal for the design of the Stormceptor System.

Fine (organics, silts and sand)								
Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
20	20	1.3	0.0013					
60	20	1.8	0.0051					
150	20	2.2	0.0354					
400	20	2.65	0.2123					
2000	20	2.65	0.9417					

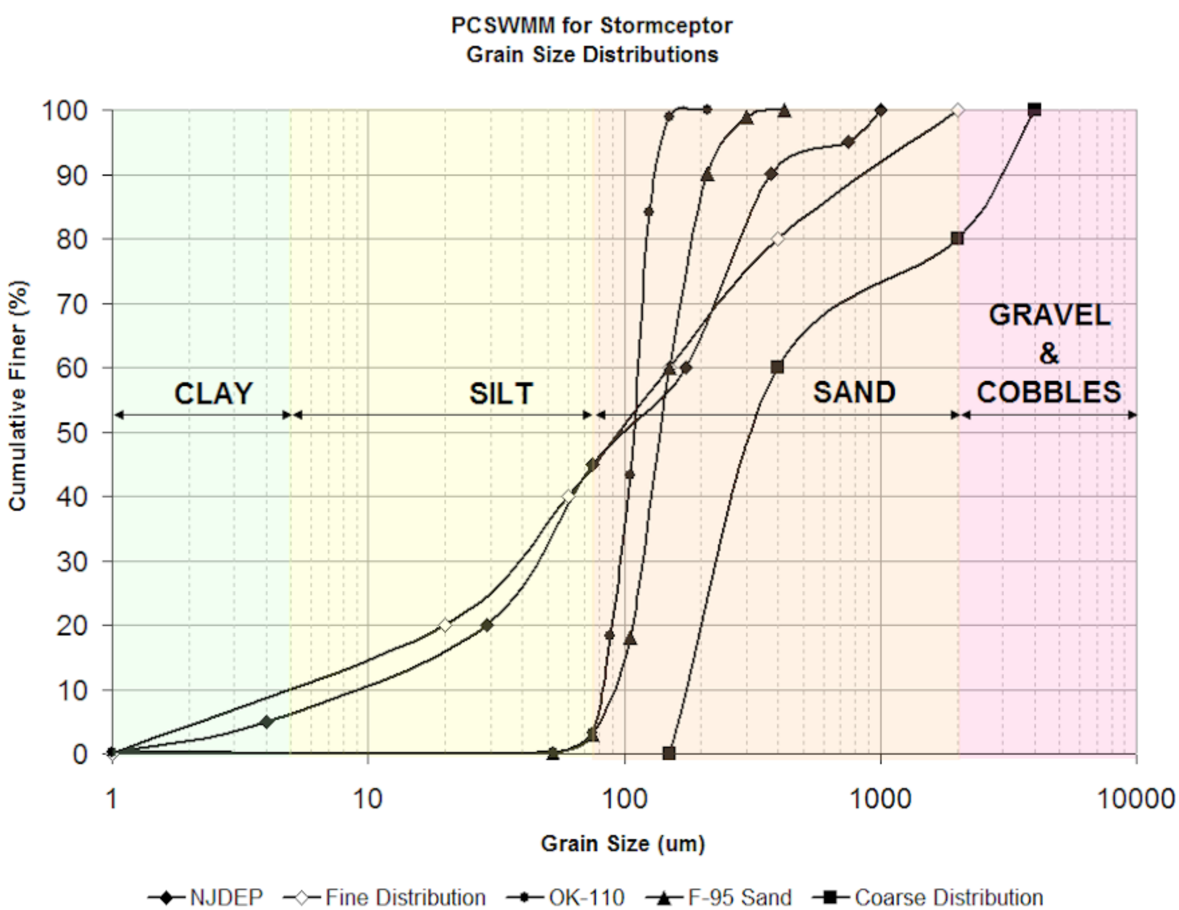


Figure 1. PCSWMM for Stormceptor standard design grain size distributions.

TSS LOADING

TSS Loading Parameters

TSS Loading Function	Buildup / Washoff

Parameters

Target Event Mean Concentration (EMC) (mg/L)	125
Exponential Buildup Power	0.4
Exponential Washoff Exponential	0.2

HYDROLOGY ANALYSIS

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of the Stormceptor System are based on the average annual removal of TSS for the selected site parameters. The Stormceptor System is engineered to capture fine particles (silts and sands) by focusing on average annual runoff volume ensuring positive removal efficiency is maintained during all rainfall events, while preventing the opportunity for negative removal efficiency (scour).

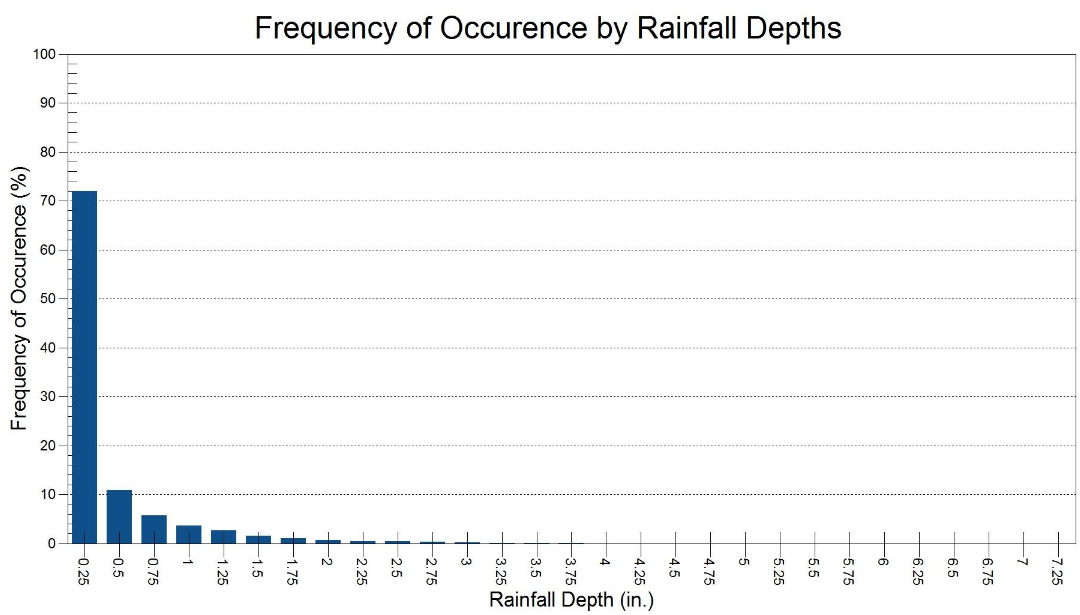
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

Rainfall Station	BLUE HILL		
Rainfall File Name	MA736.NDC	Total Number of Events	9865
Latitude	42°12'44"N	Total Rainfall (in.)	2849.7
Longitude	71°6'53"W	Average Annual Rainfall (in.)	49.1
Elevation (ft)		Total Evaporation (in.)	147.7
Rainfall Period of Record (y)	58	Total Infiltration (in.)	1233.2
Total Rainfall Period (y)	58	Percentage of Rainfall that is Runoff (%)	53.0

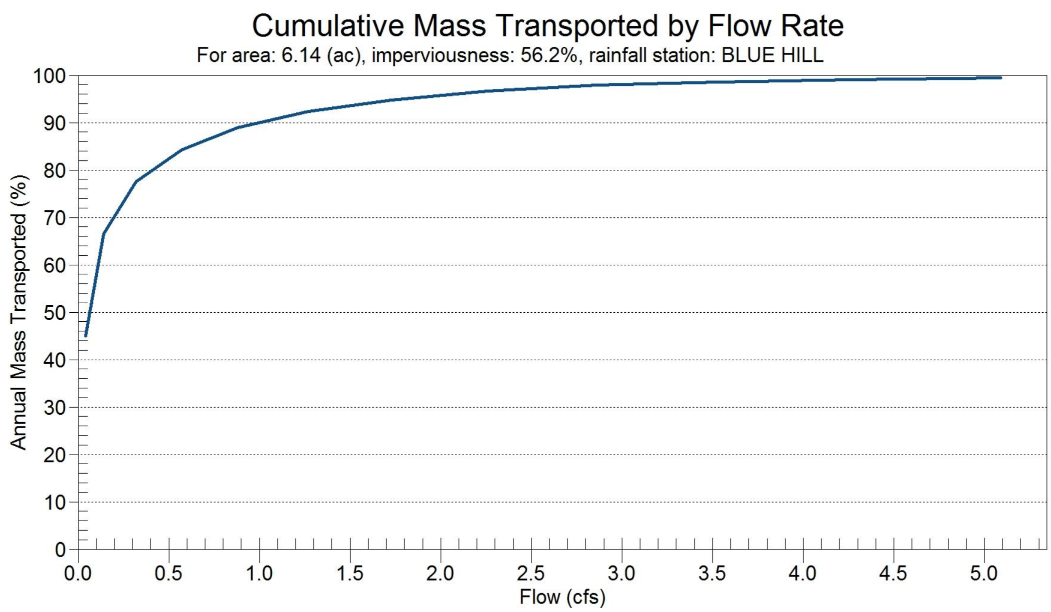
Rainfall Event Analysis

Rainfall Depth in.	No. of Events	Percentage of Total Events %	Total Volume in.	Percentage of Annual Volume %
0.25	7098	72.0	431	15.1
0.50	1076	10.9	393	13.8
0.75	563	5.7	350	12.3
1.00	360	3.6	311	10.9
1.25	257	2.6	288	10.1
1.50	151	1.5	207	7.3
1.75	102	1.0	165	5.8
2.00	70	0.7	130	4.6
2.25	42	0.4	89	3.1
2.50	41	0.4	98	3.4
2.75	27	0.3	71	2.5
3.00	21	0.2	61	2.1
3.25	13	0.1	40	1.4
3.50	10	0.1	34	1.2
3.75	5	0.1	18	0.6
4.00	2	0.0	8	0.3
4.25	1	0.0	4	0.1
4.50	4	0.0	18	0.6
4.75	4	0.0	18	0.6
5.00	0	0.0	0	0.0
5.25	1	0.0	5	0.2
5.50	3	0.0	16	0.6
5.75	2	0.0	11	0.4
6.00	4	0.0	23	0.8
6.25	0	0.0	0	0.0
6.50	0	0.0	0	0.0
6.75	1	0.0	7	0.2
7.00	1	0.0	7	0.2
7.25	2	0.0	14	0.5
7.50	0	0.0	0	0.0
7.75	1	0.0	8	0.3
8.00	1	0.0	8	0.3
8.25	0	0.0	0	0.0
>8.25	2	0.0	17	0.6



Pollutograph

Flow Rate cfs	Cumulative Mass %
0.035	45.0
0.141	66.5
0.318	77.5
0.565	84.3
0.883	88.9
1.271	92.3
1.73	94.8
2.26	96.6
2.86	97.9
3.531	98.6
4.273	99.1
5.085	99.4
5.968	99.6
6.922	99.7
7.946	99.8
9.041	99.9
10.206	99.9
11.442	100.0
12.749	100.0
14.126	100.0
15.574	100.0
17.092	100.0
18.681	100.0
20.341	100.0
22.072	100.0
23.873	100.0
25.744	100.0
27.687	100.0
29.7	100.0
31.783	100.0



Stormceptor Sizing Detailed Report

PCSWMM for Stormceptor

Project Information

Date	10/17/2015
Project Name	Salmon ARCPUD
Project Number	8548
Location	Medway, MA

Stormwater Quality Objective

This report outlines how Stormceptor System can achieve a defined water quality objective through the removal of total suspended solids (TSS). Attached to this report is the Stormceptor Sizing Summary.

Stormceptor System Recommendation

The Stormceptor System model STC 2400 achieves the water quality objective removing 85% TSS for a Fine (organics, silts and sand) particle size distribution.

The Stormceptor System

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for all rainfall events, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.

Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Stormceptor is the only oil and sediment separator on the market sized to remove TSS for a wide range of particle sizes, including fine sediments (clays and silts), that are often overlooked in the design of other stormwater treatment devices.

Small storms dominate hydrologic activity, US EPA reports

"*Early efforts in stormwater management focused on flood events ranging from the 2-yr to the 100-yr storm. Increasingly stormwater professionals have come to realize that small storms (i.e. < 1 in. rainfall) dominate watershed hydrologic parameters typically associated with water quality management issues and BMP design. These small storms are responsible for most annual urban runoff and groundwater recharge. Likewise, with the exception of eroded sediment, they are responsible for most pollutant washoff from urban surfaces. Therefore, the small storms are of most concern for the stormwater management objectives of ground water recharge, water quality resource protection and thermal impacts control.*"

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Design Methodology

Each Stormceptor system is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology from up-to-date local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective.

The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing (summary of analysis presented in Appendix 2):

- Site parameters
- Continuous historical rainfall, including duration, distribution, peaks (Figure 1)
- Interevent periods
- Particle size distribution
- Particle settling velocities (Stokes Law, corrected for drag)
- TSS load (Figure 2)
- Detention time of the system

The Stormceptor System maintains continuous positive TSS removal for all influent flow rates. Figure 3 illustrates the continuous treatment by Stormceptor throughout the full range of storm events analyzed. It is clear that large events do not significantly impact the average annual TSS removal. There is no decline in cumulative TSS removal, indicating scour does not occur as the flow rate increases.

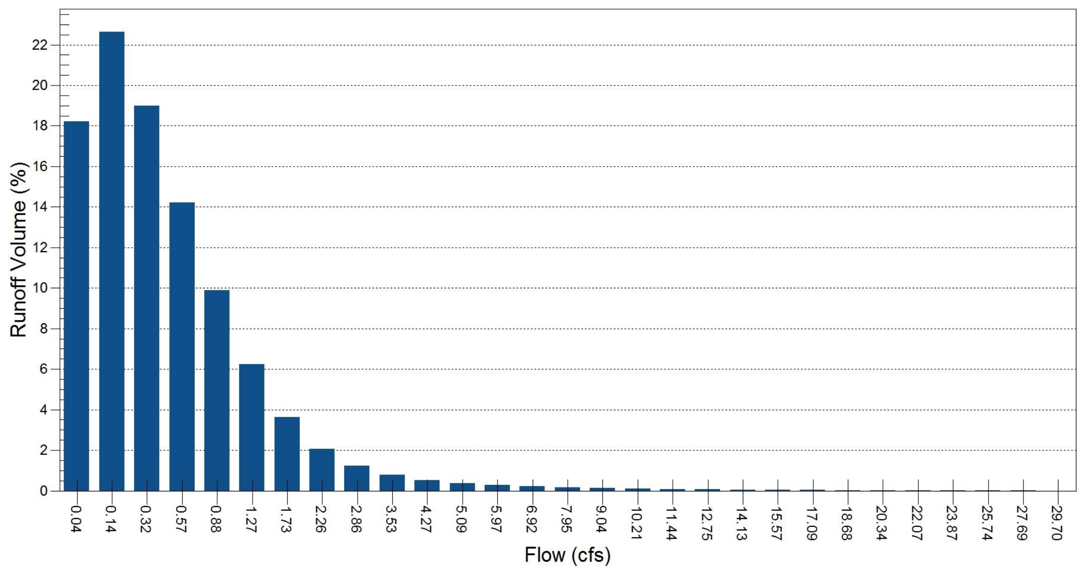


Figure 1. Runoff Volume by Flow Rate for BLUE HILL – MA 736, 1948 to 2005 for 2.81 ac, 50.2% impervious. Small frequent storm events represent the majority of annual rainfall volume. Large infrequent events have little impact on the average annual TSS removal, as they represent a small percentage of the total annual volume of runoff.

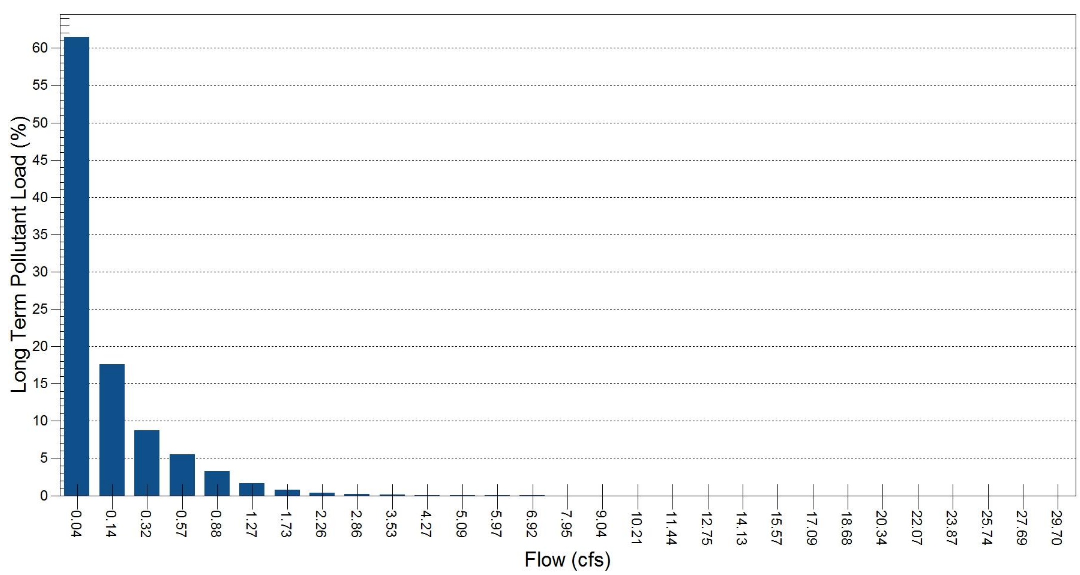
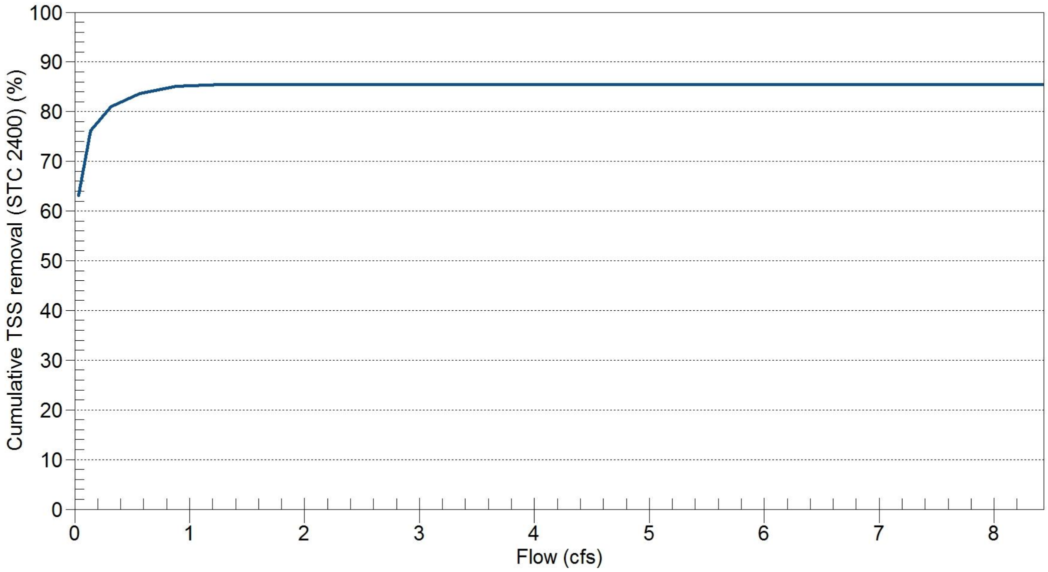


Figure 2. Long Term Pollutant Load by Flow Rate for BLUE HILL – 736, 1948 to 2005 for 2.81 ac, 50.2% impervious. The majority of the annual pollutant load is transported by small frequent storm

events. Conversely, large infrequent events carry an insignificant percentage of the total annual pollutant load.



Stormceptor Model	STC 2400	Drainage Area (ac)	2.81
TSS Removal (%)	85	Impervious (%)	50.2

Figure 3. Cumulative TSS Removal by Flow Rate for BLUE HILL – 736, 1948 to 2005. Stormceptor continuously removes TSS throughout the full range of storm events analyzed. Note that large events do not significantly impact the average annual TSS removal. Therefore no decline in cumulative TSS removal indicates scour does not occur as the flow rate increases.

Stormceptor®

Appendix 1
Stormceptor Design Summary

Project Information

Date	10/17/2015
Project Name	Salmon ARCPUD
Project Number	8548
Location	Medway, MA

Designer Information

Company	Coneco Engineers & Scientist
Contact	N/A

Notes

STC 4

Drainage Area

Total Area (ac)	2.81
Imperviousness (%)	50.2

The Stormceptor System model STC 2400 achieves the water quality objective removing 85% TSS for a Fine (organics, silts and sand) particle size distribution.

Rainfall

Name	BLUE HILL
State	MA
ID	736
Years of Records	1948 to 2005
Latitude	42°12'44"N
Longitude	71°6'53"W

Water Quality Objective

TSS Removal (%)	85

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	73
STC 900	82
STC 1200	82
STC 1800	81
STC 2400	**85**
STC 3600	86
STC 4800	89
STC 6000	89
STC 7200	91
STC 11000	93
STC 13000	93
STC 16000	94

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Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)

Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
20	20	1.3	0.0013					
60	20	1.8	0.0051					
150	20	2.2	0.0354					
400	20	2.65	0.2123					
2000	20	2.65	0.9417					

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in.	1 in.	3 in.
Multiple inlet pipes	3 in.	3 in.	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Rinker Materials 1 (800) 909-7763 www.rinkerstormceptor.com

Stormceptor®

Appendix 2
Summary of Design Assumptions

SITE DETAILS

Site Drainage Area

Total Area (ac)	2.81	Imperviousness (%)	50.2

Surface Characteristics

Width (ft)	700
Slope (%)	2
Impervious Depression Storage (in.)	0.02
Pervious Depression Storage (in.)	0.2
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (in/hr)	2.44
Min. Infiltration Rate (in/hr)	0.4
Decay Rate (s^{-1})	0.00055
Regeneration Rate (s^{-1})	0.01

Maintenance Frequency

Sediment build-up reduces the storage volume for sedimentation. Frequency of maintenance is assumed for TSS removal calculations.

Maintenance Frequency (months)	12

Evaporation

Daily Evaporation Rate (inches/day)	0.1

Dry Weather Flow

Dry Weather Flow (cfs)	No

Upstream Attenuation

Stage-storage and stage-discharge relationship used to model attenuation upstream of the Stormceptor System is identified in the table below.

Storage ac-ft	Discharge cfs
0	0

Rinker MATERIALS™

PARTICLE SIZE DISTRIBUTION

Particle Size Distribution

Removing fine particles from runoff ensures the majority of pollutants, such as heavy metals, hydrocarbons, free oils and nutrients are not discharged into natural water resources. The table below identifies the particle size distribution selected to define TSS removal for the design of the Stormceptor System.

Fine (organics, silts and sand)								
Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
20	20	1.3	0.0013					
60	20	1.8	0.0051					
150	20	2.2	0.0354					
400	20	2.65	0.2123					
2000	20	2.65	0.9417					

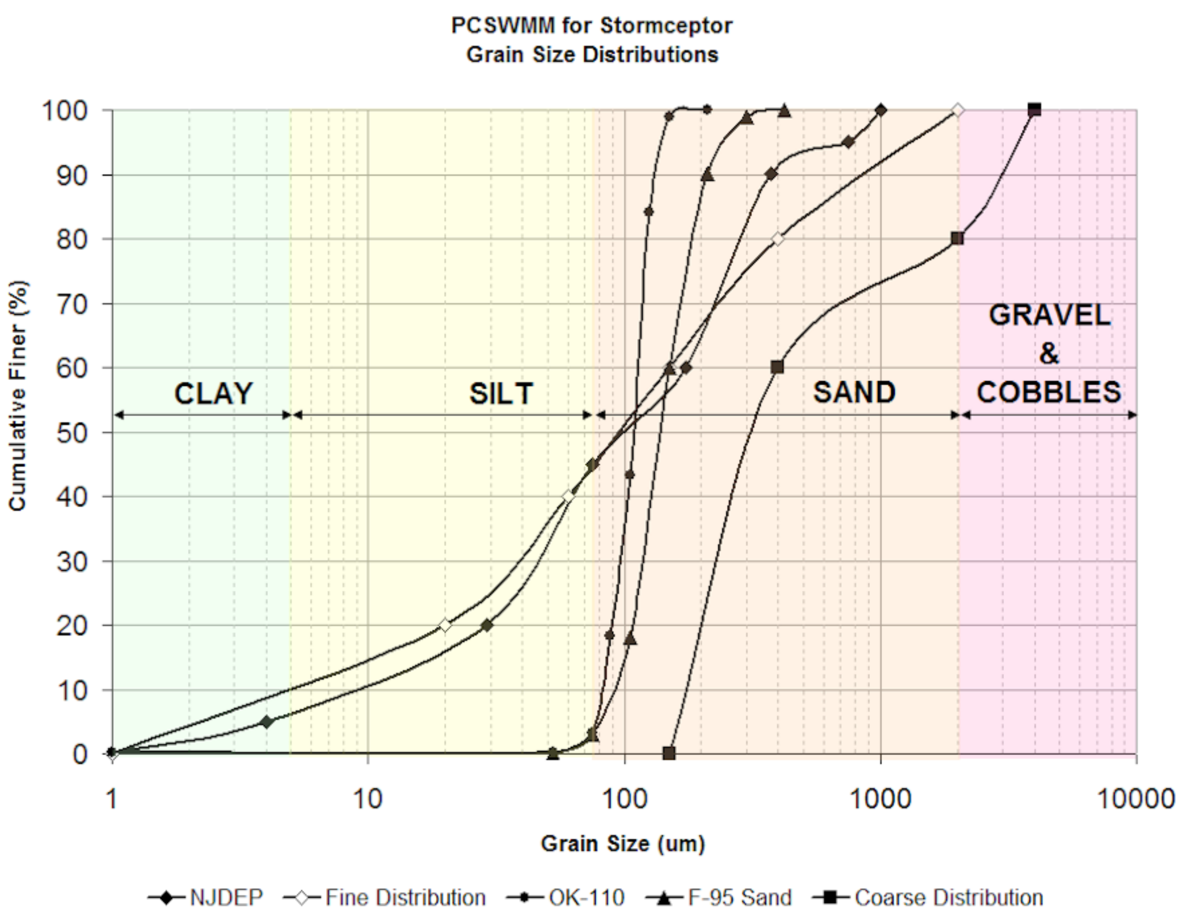


Figure 1. PCSWMM for Stormceptor standard design grain size distributions.

TSS LOADING

TSS Loading Parameters

TSS Loading Function	Buildup / Washoff

Parameters

Target Event Mean Concentration (EMC) (mg/L)	125
Exponential Buildup Power	0.4
Exponential Washoff Exponential	0.2

HYDROLOGY ANALYSIS

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of the Stormceptor System are based on the average annual removal of TSS for the selected site parameters. The Stormceptor System is engineered to capture fine particles (silts and sands) by focusing on average annual runoff volume ensuring positive removal efficiency is maintained during all rainfall events, while preventing the opportunity for negative removal efficiency (scour).

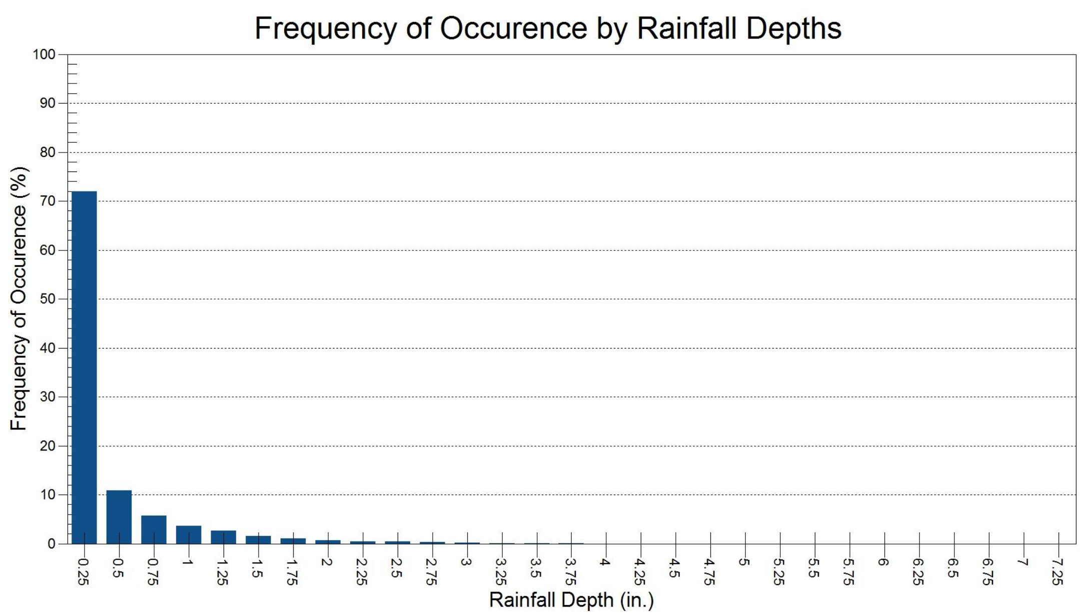
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

Rainfall Station	BLUE HILL		
Rainfall File Name	MA736.NDC	Total Number of Events	9865
Latitude	42°12'44"N	Total Rainfall (in.)	2849.7
Longitude	71°6'53"W	Average Annual Rainfall (in.)	49.1
Elevation (ft)		Total Evaporation (in.)	129.6
Rainfall Period of Record (y)	58	Total Infiltration (in.)	1401.3
Total Rainfall Period (y)	58	Percentage of Rainfall that is Runoff (%)	47.9

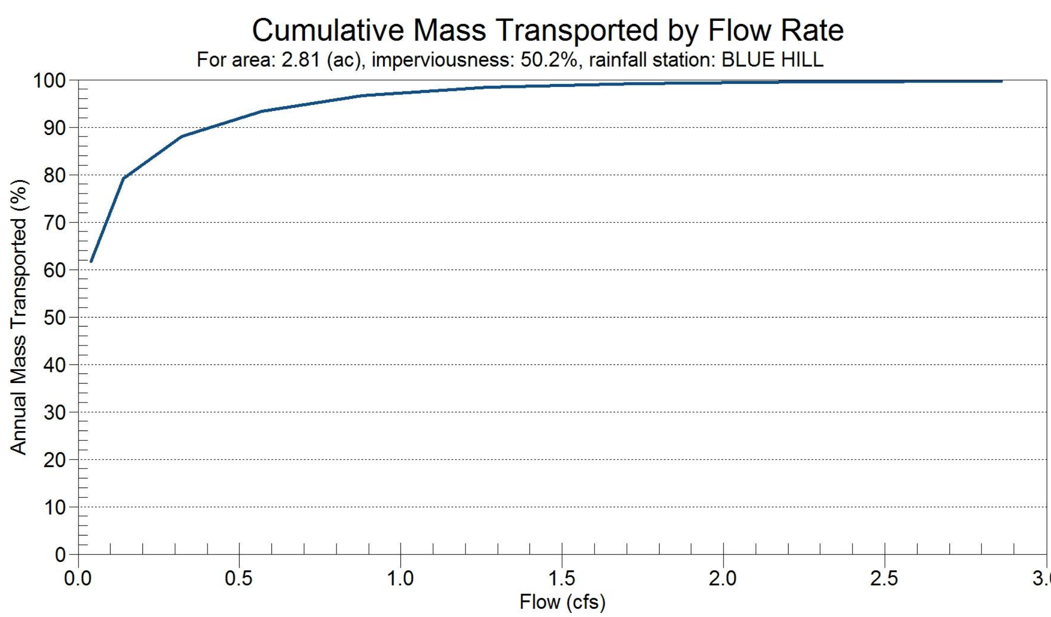
Rainfall Event Analysis

Rainfall Depth in.	No. of Events	Percentage of Total Events %	Total Volume in.	Percentage of Annual Volume %
0.25	7098	72.0	431	15.1
0.50	1076	10.9	393	13.8
0.75	563	5.7	350	12.3
1.00	360	3.6	311	10.9
1.25	257	2.6	288	10.1
1.50	151	1.5	207	7.3
1.75	102	1.0	165	5.8
2.00	70	0.7	130	4.6
2.25	42	0.4	89	3.1
2.50	41	0.4	98	3.4
2.75	27	0.3	71	2.5
3.00	21	0.2	61	2.1
3.25	13	0.1	40	1.4
3.50	10	0.1	34	1.2
3.75	5	0.1	18	0.6
4.00	2	0.0	8	0.3
4.25	1	0.0	4	0.1
4.50	4	0.0	18	0.6
4.75	4	0.0	18	0.6
5.00	0	0.0	0	0.0
5.25	1	0.0	5	0.2
5.50	3	0.0	16	0.6
5.75	2	0.0	11	0.4
6.00	4	0.0	23	0.8
6.25	0	0.0	0	0.0
6.50	0	0.0	0	0.0
6.75	1	0.0	7	0.2
7.00	1	0.0	7	0.2
7.25	2	0.0	14	0.5
7.50	0	0.0	0	0.0
7.75	1	0.0	8	0.3
8.00	1	0.0	8	0.3
8.25	0	0.0	0	0.0
>8.25	2	0.0	17	0.6



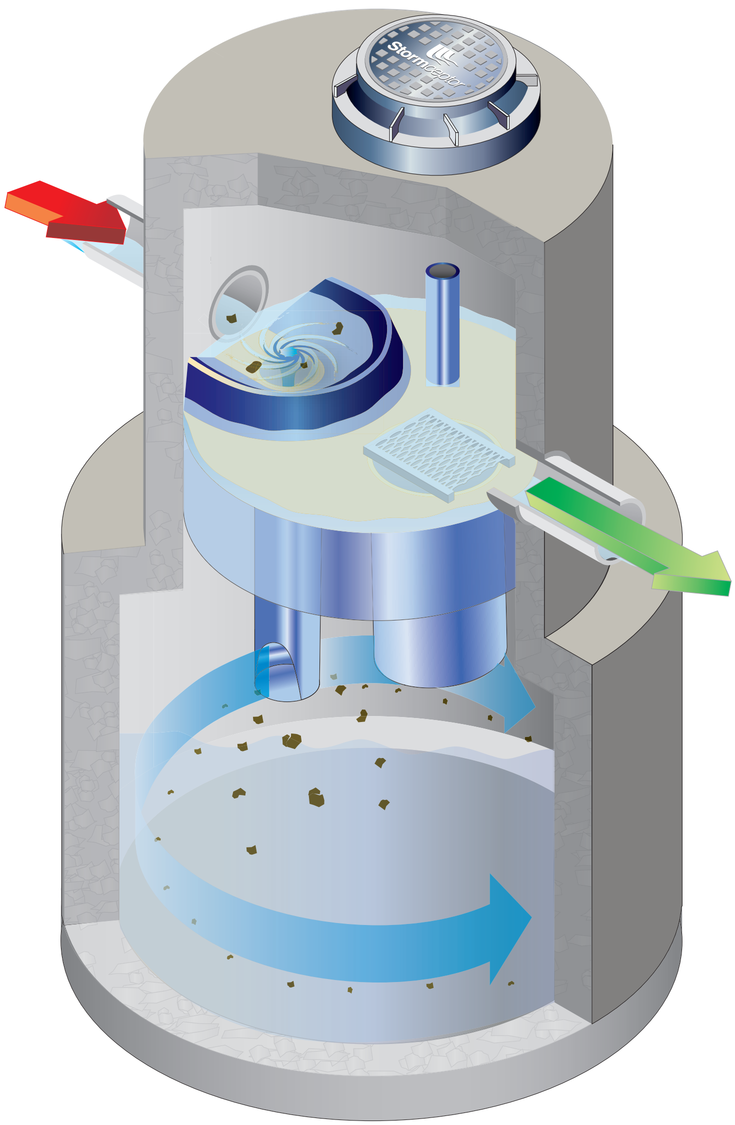
Pollutograph

Flow Rate cfs	Cumulative Mass %
0.035	61.7
0.141	79.2
0.318	88.0
0.565	93.4
0.883	96.7
1.271	98.4
1.73	99.2
2.26	99.6
2.86	99.7
3.531	99.9
4.273	99.9
5.085	100.0
5.968	100.0
6.922	100.0
7.946	100.0
9.041	100.0
10.206	100.0
11.442	100.0
12.749	100.0
14.126	100.0
15.574	100.0
17.092	100.0
18.681	100.0
20.341	100.0
22.072	100.0
23.873	100.0
25.744	100.0
27.687	100.0
29.7	100.0
31.783	100.0



Stormceptor®

Owner's Manual



Stormceptor is protected by one or more of the following patents:

Canadian Patent No. 2,137,942
Canadian Patent No. 2,175,277
Canadian Patent No. 2,180,305
Canadian Patent No. 2,180,383
Canadian Patent No. 2,206,338
Canadian Patent No. 2,327,768
U.S. Patent No. 5,753,115
U.S. Patent No. 5,849,181
U.S. Patent No. 6,068,765
U.S. Patent No. 6,371,690
U.S. Patent No. 7,582,216
U.S. Patent No. 7,666,303
Australia Patent No. 693.164
Australia Patent No. 707,133
Australia Patent No. 729,096
Australia Patent No. 779,401
Australia Patent No. 2008,279,378
Australia Patent No. 2008,288,900
Indonesia Patent No. 0007058
Japan Patent No. 3581233
Japan Patent No. 9-11476
Korean Patent No. 0519212
Malaysia Patent No. 118987
New Zealand Patent No. 314,646
New Zealand Patent No. 583,008
New Zealand Patent No. 583,583
South African Patent No. 2010/00682
South African Patent No. 2010/01796
Other Patents Pending

Table of Contents

Congratulations!

Your selection of a Stormceptor® means that you have chosen the most recognized and efficient stormwater oil/sediment separator available for protecting the environment. Stormceptor is a pollution control device often referred to as a “Hydrodynamic Separator (HDS)” or an “Oil Grit Separator (OGS)”, engineered to remove and retain pollutants from stormwater runoff to protect our lakes, rivers and streams from the harmful effects of non-point source pollution.

1 – Stormceptor Overview

Stormceptor is a patented stormwater quality structure most often utilized as a treatment component of the underground storm drain network for stormwater pollution prevention. Stormceptor is designed to remove sediment, total suspended solids (TSS), other pollutants attached to sediment, hydrocarbons and free oil from stormwater runoff. Collectively the Stormceptor provides spill protection and prevents non-point source pollution from entering downstream waterways.

Key benefits of Stormceptor include:

- Removes sediment, suspended solids, debris, nutrients, heavy metals, and hydrocarbons (oil and grease) from runoff and snowmelt.
- Will not scour or re-suspend trapped pollutants.
- Provides sediment and oil storage.
- Provides spill control for accidents, commercial and industrial developments.
- Easy to inspect and maintain (vacuum truck).
- “STORMCEPTOR” is *clearly* marked on the access cover (excluding inlet designs).
- Relatively small footprint.
- 3rd Party tested and independently verified.
- Dedicated team of experts available to provide support.

Model Types:

- STC (Standard)
- STF (Fiberglass)
- EOS (Extended Oil Storage)
- OSR (Oil and Sand Removal)
- MAX (Custom designed unit, specific to site)

Configuration Types:

- Inlet unit (accommodates inlet flow entry, and multi-pipe entry)
- In-Line (accommodates multi-pipe entry)
- Submerged Unit (accommodates the site’s tailwater conditions)
- Series Unit (combines treatment in two systems)

Please Maintain Your Stormceptor

To ensure long-term environmental protection through continued performance as originally designed for your site, **Stormceptor must be maintained**, as any stormwater treatment practice does. The need for maintenance is determined through inspection of the Stormceptor. Procedures for inspection are provided within this document. Maintenance of the Stormceptor is performed from the surface via vacuum truck.

If you require information about Stormceptor, or assistance in finding resources to facilitate inspections or maintenance of your Stormceptor please call your local Stormceptor Licensee or Imbrium® Systems.

2 – Stormceptor Operation & Components

Stormceptor is a flexibly designed underground stormwater quality treatment device that is unparalleled in its effectiveness for pollutant capture and retention using patented flow separation technology.

Stormceptor creates a non-turbulent treatment environment below the insert platform within the system. The insert diverts water into the lower chamber, allowing free oils and debris to rise, and sediment to settle under relatively low velocity conditions. These pollutants are trapped and stored below the insert and protected from large runoff events for later removal during the maintenance procedure.

With thousands of units operating worldwide, Stormceptor delivers reliable protection every day, in every storm. The patented Stormceptor design prohibits the scour and release of captured pollutants, ensuring superior water quality treatment and protection during even the most extreme storm events. Stormceptor's proven performance is backed by the longest record of lab and field verification in the industry.

Stormceptor Schematic and Component Functions

Below are schematics of two common Stormceptor configurations with key components identified and their functions briefly described.

Figure 1.

Inline Stormceptor

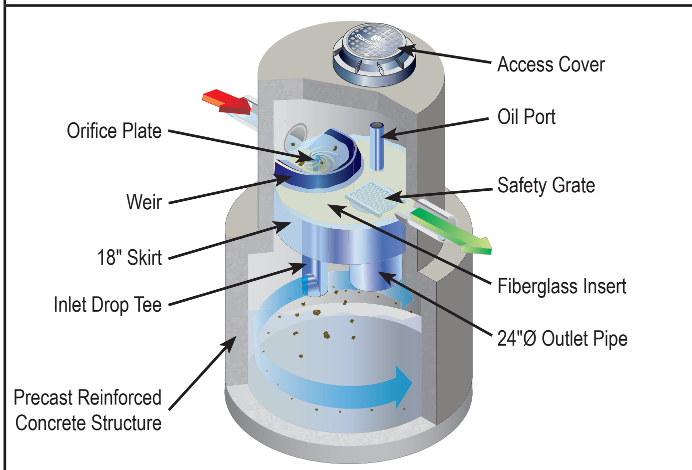
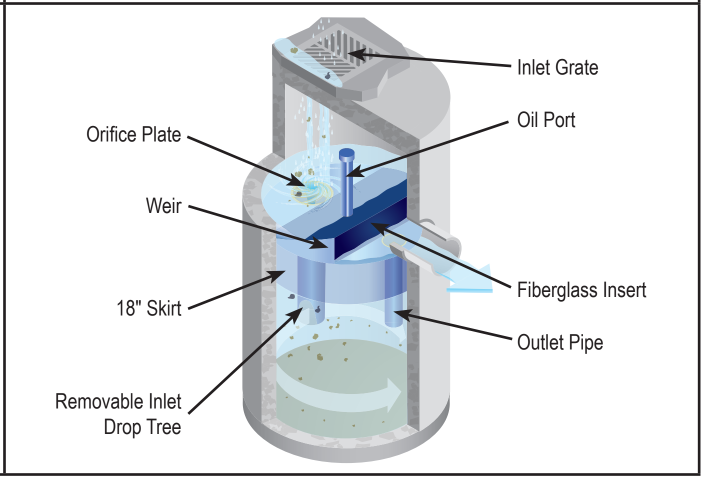


Figure 2.

Inlet Stormceptor



- **Manhole access cover** – provides access to the subsurface components
- **Precast reinforced concrete structure** – provides the vessel's watertight structural support
- **Fiberglass insert** – separates vessel into upper and lower chambers
- **Weir** – directs incoming stormwater and oil spills into the lower chamber
- **Orifice plate** – prevents scour of accumulated pollutants
- **Inlet drop tee** – conveys stormwater into the lower chamber
- **Fiberglass skirt** – provides double-wall containment of hydrocarbons
- **Outlet riser pipe** – conveys treated water to the upper chamber; primary vacuum line access port for sediment removal
- **Oil inspection port** – primary access for measuring oil depth and oil removal
- **Safety grate** – safety measure to cover riser pipe in the event of manned entry into vessel

3 – Stormceptor Identification

Stormceptor is available in both precast concrete and fiberglass vessels, with precast concrete often being the dominant material of construction.

In the Stormceptor, a patented, engineered fiberglass insert separates the structure into an upper chamber and lower chamber. The lower chamber will remain full of water, as this is where the pollutants are sequestered for later removal. Multiple Stormceptor model (STC, OSR, EOS, MAX and STF) configurations exist, each to be inspected and maintained in a similar fashion.

Each unit is easily identifiable as a Stormceptor by the trade name “Stormceptor” embossed on each access cover at the surface. To determine the location of “inlet” Stormceptor units with horizontal catch basin inlet, look down into the grate as the Stormceptor insert will be visible. The name “Stormceptor” is not embossed on inlet models due to the variability of inlet grates used/ approved across North America.

Once the location of the Stormceptor is determined, the model number may be identified by comparing the measured depth from the fiberglass insert level at the outlet pipe's invert (water level) to the bottom of the tank using **Table 1**.

In addition, starting in 1996 a metal serial number tag containing the model number has been affixed to the inside of the unit, on the fiberglass insert. If the unit does not have a serial number, or if there is any uncertainty regarding the size of the unit using depth measurements, please contact your local Stormceptor Representative for assistance.

Sizes/Models

Typical general dimensions and capacities of the standard precast STC, EOS & OSR Stormceptor models in both USA and Canada/International (excluding South East Asia and Australia) are provided in **Tables 1 and 2**. Typical rim to invert measurements are provided later in this document. The total depth for cleaning will be the sum of the depth from outlet pipe invert (generally the water level) to rim (grade) and the depth from outlet pipe invert to the precast bottom of the unit. Note that depths and capacities may vary slightly between regions.

Table 1A. (US) Stormceptor Dimensions – Insert to Base of Structure

STC Model	Insert to Base (in.)	EOS Model	Insert to Base (in.)	OSR Model	Insert to Base (in.)	Typical STF m (in.)
450	60	4-175	60	65	60	1.5 (60)
900	55	9-365	55	140	55	1.5 (61)
1200	71	12-590	71			1.8 (73)
1800	105	18-1000	105			2.9 (115)
2400	94	24-1400	94	250	94	2.3 (89)
3600	134	36-1700	134			3.2 (127)
4800	128	48-2000	128	390	128	2.9 (113)
6000	150	60-2500	150			3.5 (138)
7200	134	72-3400	134	560	134	3.3 (128)
11000*	128	110-5000*	128	780*	128	
13000*	150	130-6000*	150			
16000*	134	160-7800*	134	1125*	134	

Notes:

1. *Depth Below Pipe Inlet Invert to the Bottom of Base Slab can vary slightly by manufacturing facility, and can be modified to accommodate specific site designs, pollutant loads or site conditions. Contact your local representative for assistance.*

   **Consist of two chamber structures in series.*

Table 1B. (CA & Int'l) Stormceptor Dimensions – Insert to Base of Structure

STC Model	Insert to Base (m)
300	1.5
750	1.5
1000	1.8
1500	2.8
2000	2.8
3000	3.7
4000	3.4
5000	4.0
6000	3.7
9000*	3.4
11000*	4.0
14000*	3.7

EOS Model	Insert to Base (m)
300	1.5
750	1.5
1000	1.8
2000	2.8
3000	3.7
4000	3.4
5000	4.0
6000	3.7
9000*	3.4
10000*	4.0
14000*	3.7

OSR Model	Insert to Base (m)
300	1.7
750	1.6
2000	2.6
4000	3.6
6000	3.7
9000*	3.6
14000*	3.7

Typical STF m (in.)
1.5 (60)
1.5 (61)
1.8 (73)
2.9 (115)
2.3 (89)
3.2 (127)
2.9 (113)
3.5 (138)
3.3 (128)

Notes:

1. *Depth Below Pipe Inlet Invert to the Bottom of Base Slab can vary slightly by manufacturing facility, and can be modified to accommodate specific site designs, pollutant loads or site conditions. Contact your local representative for assistance.*

   **Consist of two chamber structures in series.*

Table 2A. (US) Storage Capacities

STC Model	Hydrocarbon Storage Capacity gal	Sediment Capacity ft³	EOS Model	Hydrocarbon Storage Capacity gal	OSR Model	Hydrocarbon Storage Capacity gal	Sediment Capacity ft³
450	86	46	**4-175**	175	**065**	115	46
900	251	89	**9-365**	365	**140**	233	58
1200	251	127	**12-590**	591			
1800	251	207	**18-1000**	1198			
2400	840	205	**24-1400**	1457	**250**	792	156
3600	840	373	**36-1700**	1773			
4800	909	543	**48-2000**	2005	**390**	1233	465
6000	909	687	**60-2500**	2514			
7200	1059	839	**72-3400**	3418	**560**	1384	690
11000*	2797	1089	**110-5000***	5023	**780***	2430	930
13000*	2797	1374	**130-6000***	6041			
16000*	3055	1677	**160-7800***	7850	**1125***	2689	1378

Notes:

1. *Hydrocarbon & Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.*

   **Consist of two chamber structures in series.*

Table 2B. (CA & Int'l) Storage Capacities

STC Model	Hydrocarbon Storage Capacity L	Sediment Capacity L	EOS Model	Hydrocarbon Storage Capacity L	OSR Model	Hydrocarbon Storage Capacity L	Sediment Capacity L
300	300	1450	**300**	662	**300**	300	1500
750	915	3000	**750**	1380	**750**	900	3000
1000	915	3800	**1000**	2235			
1500	915	6205					
2000	2890	7700	**2000**	5515	**2000**	2790	7700
3000	2890	11965	**3000**	6710			
4000	3360	16490	**4000**	7585	**4000**	4700	22200
5000	3360	20940	**5000**	9515			
6000	3930	26945	**6000**	12940	**6000**	5200	26900
9000*	10555	32980	**9000***	19010	**9000***	9300	33000
11000*	10555	37415	**10000***	22865			
14000*	11700	53890	**14000***	29715	**14000***	10500	53900

Notes:

1. *Hydrocarbon & Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.*

   **Consist of two chamber structures in series.*

4 – Stormceptor Inspection & Maintenance

Regular inspection and maintenance is a proven, cost-effective way to maximize water resource protection for all stormwater pollution control practices, and is required to insure proper functioning of the Stormceptor. Both inspection and maintenance of the Stormceptor is easily performed from the surface. Stormceptor's patented technology has no moving parts, simplifying the inspection and maintenance process.

Please refer to the following information and guidelines before conducting inspection and maintenance activities.

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess the sediment accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

When is maintenance cleaning needed?

- For optimum performance, the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, which is approximately 15% of the unit's total storage capacity (see **Table 2**). The frequency should be adjusted based on historical inspection results due to variable site pollutant loading.

- Sediment removal is easier when removed on a regular basis at or prior to the recommended maintenance sediment depths, as sediment build-up can compact making removal more difficult.
- The unit should be cleaned out immediately after an oil, fuel or chemical spill.

What conditions can compromise Stormceptor performance?

- If construction sediment and debris is not removed prior to activating the Stormceptor unit, maintenance frequency may be reduced.
- If the system is not maintained regularly and fills with sediment and debris beyond the capacity as indicated in **Table 2**, pollutant removal efficiency may be reduced.
- If an oil spill(s) exceeds the oil capacity of the system, subsequent spills may not be captured.
- If debris clogs the inlet of the system, removal efficiency of sediment and hydrocarbons may be reduced.
- If a downstream blockage occurs, a backwater condition may occur for the Stormceptor and removal efficiency of sediment and hydrocarbons may be reduced.

What training is required?

The Stormceptor is to be inspected and maintained by professional vacuum cleaning service providers with experience in the maintenance of underground tanks, sewers and catch basins. For typical inspection and maintenance activities, no specific supplemental training is required for the Stormceptor. Information provided within this Manual (provided to the site owner) contains sufficient guidance to maintain the system properly.

In unusual circumstances, such as if a damaged component needs replacement or some other condition requires manned entry into the vessel, confined space entry procedures must be followed. Only professional maintenance service providers trained in these procedures should enter the vessel. Service provider companies typically have personnel who are trained and certified in confined space entry procedures according to local, state, and federal standards.

What equipment is typically required for inspection?

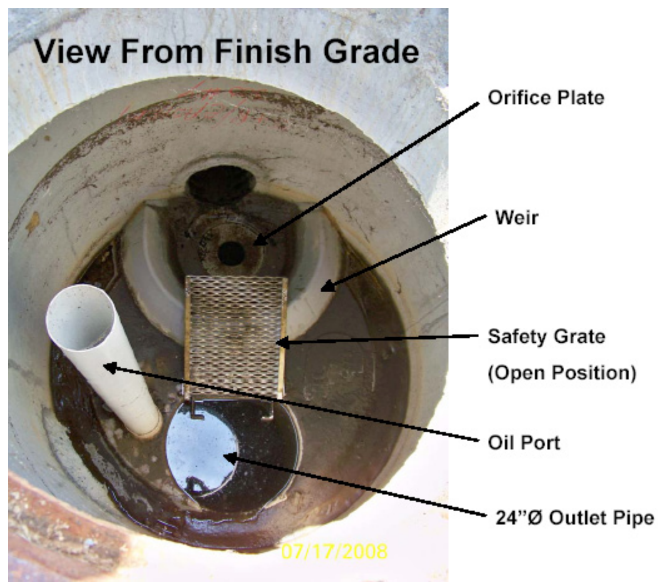
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

Recommended Stormceptor Inspection Procedure:

- Stormceptor is to be inspected from grade through a standard surface manhole access cover.
- Sediment and oil depth inspections are performed with a sediment probe and oil dipstick.
- Oil depth is measured through the oil inspection port, either a 4-inch (100 mm) or 6-inch (150 mm) diameter port.
- Sediment depth can be measured through the oil inspection port or the 24-inch (610 mm) diameter outlet riser pipe.
- Inspections also involve a visual inspection of the internal components of the system.

Figure 3.

Figure 4.



What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, and safety harness for specially trained personnel if confined space entry is required

Recommended Stormceptor Maintenance Procedure

Maintenance of Stormceptor is performed using a vacuum truck.

No entry into the unit is required for maintenance. ***DO NOT ENTER THE STORMCEPTOR CHAMBER*** unless you have the proper personal safety equipment, have been trained and are qualified to enter a confined space, as identified by local Occupational Safety and Health Regulations (e.g. 29 CFR 1910.146 or Canada Occupational Safety and Health Regulations – SOR/86-304). Without the proper equipment, training and permit, entry into confined spaces can result in serious bodily harm and potentially death. Consult local, provincial, and/or state regulations to determine the requirements for confined space entry. Be aware, and take precaution that the Stormceptor fiberglass insert may be slippery. In addition, be aware that some units do not have a safety grate to cover the outlet riser pipe that leads to the submerged, lower chamber.

- Ideally maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is to be maintained through a standard surface manhole access cover.
- Insert the oil dipstick into the oil inspection port. If oil is present, pump off the oil layer into separate containment using a small pump and tubing.
- Maintenance cleaning of accumulated sediment is performed with a vacuum truck.
    - For 6-ft (1800 mm) diameter models and larger, the vacuum hose is inserted into the lower chamber via the 24-inch (610 mm) outlet riser pipe.
    - For 4-ft (1200 mm) diameter model, the removable drop tee is lifted out, and the vacuum hose is inserted into the lower chamber via the 12-inch (305 mm) drop tee hole.

Figure 5.

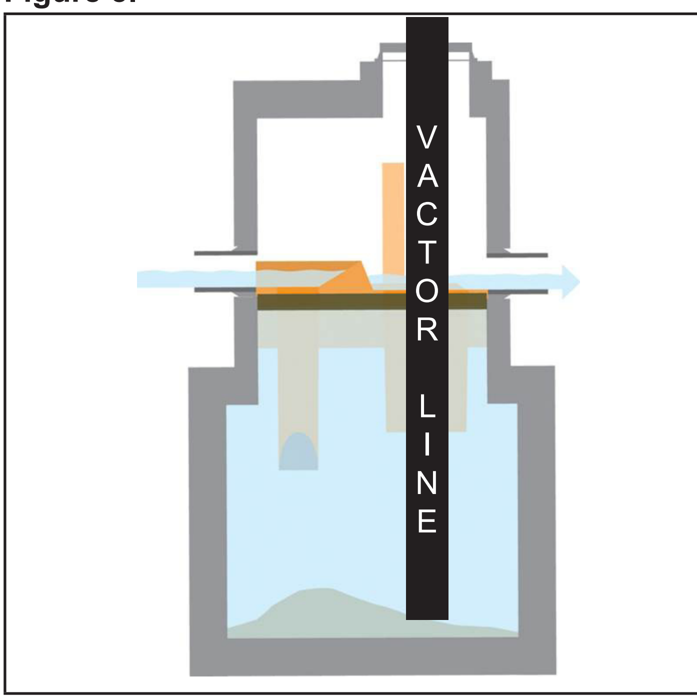
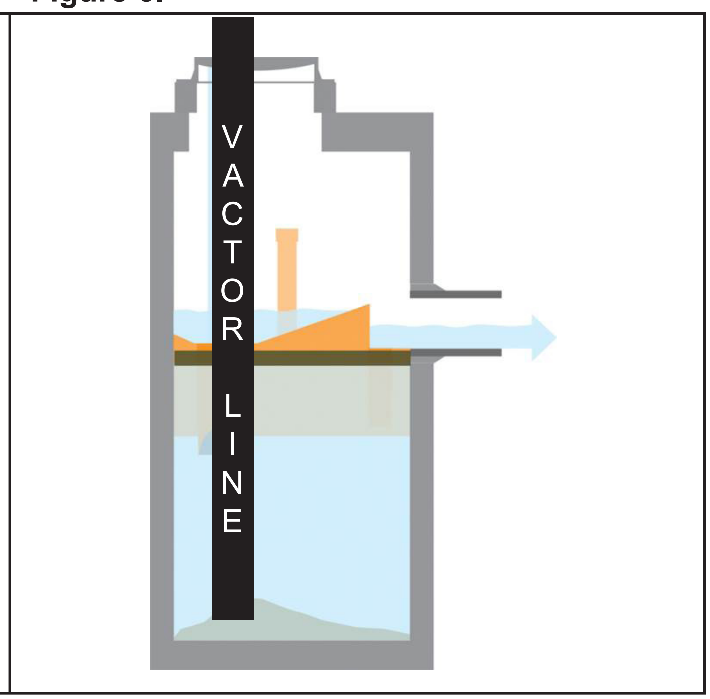


Figure 6.



- Using the vacuum hose, decant the water from the lower chamber into a separate containment tank or to the sanitary sewer, if permitted by the local regulating authority.
- Remove the sediment sludge from the bottom of the unit using the vacuum hose. For large Stormceptor units, a flexible hose is often connected to the primary vacuum line for ease of movement in the lower chamber.
- Units that have not been maintained regularly, have surpassed the maximum recommended sediment capacity, or contain damaged components may require manned entry by trained personnel using safe and proper confined space entry procedures.

Figure 7.

Figure 8.

A maintenance worker stationed at the above ground surface uses a vacuum hose to evacuate water, sediment, and debris from the system.

What is required for proper disposal?

The requirements for the disposal of material removed from Stormceptor units are similar to that of any other stormwater treatment Best Management Practices (BMP). Local guidelines should be consulted prior to disposal of the separator contents. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste. This could be site and pollutant dependent. In some cases, approval from the disposal facility operator/agency may be required.

What about oil spills?

Stormceptor is often implemented in areas where there is high potential for oil, fuel or other hydrocarbon or chemical spills. Stormceptor units should be cleaned immediately after a spill occurs by a licensed liquid waste hauler. You should also notify the appropriate regulatory agencies as required in the event of a spill.

What if I see an oil rainbow or sheen at the Stormceptor outlet?

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a hydrocarbon rainbow or sheen can be seen at very small oil concentrations (< 10 ppm). Stormceptor is effective at removing 95% of free oil, and the appearance of a sheen at the outlet with high influent oil concentrations does not mean that the unit is not working to this level of removal. In addition, if the influent oil is emulsified, the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified or dissolved oil conditions.

What factors affect the costs involved with inspection/maintenance?
The Vacuum Service Industry for stormwater drainage and sewer systems is a well-established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean Stormceptor units will vary. Inspection and maintenance costs are most often based on unit size, the number of units on a site, sediment/oil/hazardous material loads, transportation distances, tipping fees, disposal requirements and other local regulations.

What factors predict maintenance frequency?
Maintenance frequency will vary with the amount of pollution on your site (number of hydrocarbon spills, amount of sediment, site activity and use, etc.). It is recommended that the frequency of maintenance be increased or reduced based on local conditions. If the sediment load is high from an unstable site or sediment loads transported from upstream catchments, maintenance may be required semi-annually. Conversely once a site has stabilized, maintenance may be required less frequently (for example: two to seven year, site and situation dependent). Maintenance should be performed immediately after an oil spill or once the sediment depth in Stormceptor reaches the value specified in **Table 3** based on the unit size.

Table 3A. (US) Recommended Sediment Depths Indicating Maintenance

STC Model	Maintenance Sediment depth (in)	EOS Model	Maintenance Sediment depth (in)	Oil Storage Depth (in)	OSR Model	Maintenance Sediment depth (in)
450	8	**4-175**	9	24	**065**	8
900	8	**9-365**	9	24	**140**	8
1200	10	**12-590**	11	39		
1800	15					
2400	12	**24-1400**	14	68	**250**	12
3600	17	**36-1700**	19	79		
4800	15	**48-2000**	16	68	**390**	17
6000	18	**60-2500**	20	79		
7200	15	**72-3400**	17	79	**560**	17
11000*	17	**110-5000***	16	68	**780***	17
13000*	20	**130-6000***	20	79		
16000*	17	**160-7800***	17	79	**1125***	17

Note:

1. *The values above are for typical standard units.*

**Per structure.*

Table 3B. (CA & Int'l) Recommended Sediment Depths Indicating Maintenance

STC Model	Maintenance Sediment depth (mm)	EOS Model	Maintenance Sediment depth (mm)	Oil Storage Depth (mm)	OSR Model	Maintenance Sediment depth (mm)
300	225	**300**	225	610	**300**	200
750	230	**750**	230	610	**750**	200
1000	275	**1000**	275	990		
1500	400					
2000	350	**2000**	350	1727	**2000**	300
3000	475	**3000**	475	2006		
4000	400	**4000**	400	1727	**4000**	375
5000	500	**5000**	500	2006		
6000	425	**6000**	425	2006	**6000**	375
9000*	400	**9000***	400	1727	**9000***	425
11000*	500	**10000***	500	2006		
14000*	425	**14000***	425	2006	**14000***	425

Note:

1. *The values above are for typical standard units.*

   **Per structure.*

Replacement parts

Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. Therefore, inspection and maintenance activities are generally focused on pollutant removal. However, if replacements parts are necessary, they may be purchased by contacting your local Stormceptor Representative, or Imbrium Systems.

The benefits of regular inspection and maintenance are many – from ensuring maximum operation efficiency, to keeping maintenance costs low, to the continued protection of natural waterways – and provide the key to Stormceptor's long and effective service life.

Stormceptor Inspection and Maintenance Log

Stormceptor Model No: ______________________

Allowable Sediment Depth: ______________________

Serial Number: ______________________

Installation Date: ______________________

Location Description of Unit: ______________________

Other Comments: ______________________

Contact Information

Questions regarding the Stormceptor can be addressed by contacting your area Stormceptor Licensee, Imbrium Systems, or visit our website at www.stormceptor.com.

Stormceptor Licensees:

CANADA

Lafarge Canada Inc.
www.lafargepipe.com

403-292-9502 / 1-888-422-4022	Calgary, AB
780-468-5910	Edmonton, AB
204-958-6348	Winnipeg, MB, NW. ON, SK

Langley Concrete Group
www.langleyconcretegroup.com

604-502-5236	BC

Hanson Pipe & Precast Inc.
www.hansonpipeandprecast.com

519-622-7574 / 1-888-888-3222	ON

Lécuyer et Fils Ltée.
www.lecuyerbeton.com

450-454-3928 / 1-800-561-0970	QC

Strescon Limited
www.strescon.com

902-494-7400	NS, NF
506-633-8877	NB, PE

UNITED STATES

Rinker Materials
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STORMWATER MANAGEMENT REPORT

VOLUME II

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APPENDIX J

INFILTRATION TRENCH SIZING

APPENDIX J

ADDENDUM: INFILTRATION TRENCH 8