STORMWATER MANAGEMENT REPORT

for

West Windsor–Plainsboro School District

Additions and Renovations to West Windsor-Plainsboro High School South
Block 17.13, Lot 2

Township of West Windsor
Mercer County, New Jersey

Prepared by:

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I. INTRODUCTION

This project was designed to accommodate the stormwater runoff conditions that occur as a result of the building additions and the expansion of the existing parking lot and drop off areas at West Windsor-Plainsboro High School South. The construction will increase the existing parking lot from 296 parking spaces to 305 parking spaces, two future building additions and an expanded student drop off area. The subject site is located on Clarksville-Grovers Mill Road (C.R. # 638) in the Township of West Windsor, Mercer County, New Jersey and is identified as Block 17.13, Lot 2 on the Township of West Windsor Tax Map. The subject site is currently operating as a High School.

The scope of this study focuses on the overall drainage conditions resulting from the proposed site improvements. For the purpose of this report, the stormwater management design will only focus on the proposed improvements. The proposed development will disturb over an acre of land and result in an increase of 1.57 acres of impervious surface.

The primary design constraints for this project are based on requirements established in the Township of West Windsor Design Standards, Mercer County Design Standards, Delaware Raritan Canal Commission (DRCC) and N.J.A.C. 7:8. More specifically, the stormwater management design will serve to maintain existing drainage patterns to the maximum extent practical and reduce proposed runoff rates when compared to pre-development runoff rates. The proposed project will disturb over 1 acre and proposed impervious coverage will be increased by more than ¼ acre; therefore, the project meets the definition of a “major development” under N.J.A.C. 7:8.

II. EXISTING SITE CONDITIONS

The subject site consists of approximately 50.51 acres. The area of proposed improvement is located within the northern portion of the property at the intersection of Clarksville-Grovers Mill Road (C.R. # 638) and Princeton-Hightstown Road (C.R. # 571). The area for the building additions and student drop off area is already developed. The northern parking lot will expand into an existing grass field. The plan proposes for an above ground infiltration basin along Clarksville Road. The proposed improvements impacting impervious surface on the site will be limited to an area of approximately 8.40 acres, which is the area of study this report will focus on. This area currently consists of 4.452 acres of impervious surface area, including roof area.

Based on the Mercer County Soil Survey, the soil types native to the site include:

SOIL TYPE	SOIL TYPE NAME	HYDRAULIC SOIL GROUP
GKAWOB	Glassboro adnd Woodstown sandy loams, 0 to 5 percent slopes	A/D
MBYB	Mattapex and Bertie loams, 0 to 5 percent slopes	C
OrthA	Orthello silt loams, 0 to 2 percent slopes, northern coastal plain	C/D
Port A	Portsmouth variant silt loam, 0 to 2 percent slopes	B/D
SacA	Sassafras sandy loam, 0 to 2 percent slopes, northern coastal plain	B
SacB	Sassafras sandy loam, 2 to 5 percent slopes, northern coastal plain	B
SacC	Sassafras sandy loam, 5 to 1o percent slopes, northern coastal plain	B

The site has been evaluated using the TR-55 'Urban Hydrology for Small Watersheds' standards. The disturbed area on this site has two drainage sheds; the northern portion beyond the parking lot which drains to Princeton Hightstown Road. The main drainage area will convey stormwater to the central study point which is part of the existing internal stormwater system. Both drainage areas ultimately discharge to the Canoe Brook. Below is a description of the drainage sub-watershed areas as depicted on the Existing Drainage Area Map:

Central Study Point: This study point represents the location where all runoff from the drainage area is collected via an existing stormwater sewer infrastructure and discharged into an existing manhole and a 24 inch CMP pipe. This point is where the peak flow generated by the development will be evaluated and runoff will be controlled to ensure that the max capacity of the pipe will not be exceeded. This study point has been analyzed to show compliance with the applicable NJDEP, Mercer County, DRCC and West Windsor Township regulations.

Northern Study Point: This study points represents the drainage area which discharges uncontrolled out to the County stormwater conveyance system on Princeton-Hightstown Road (C.R. # 571). Impervious and pervious areas contribute to this drainage area.

III. PROPOSED SITE CONDITIONS

The proposed site improvements will result in an overall increase in impervious coverage of 1.571 acres. The proposed design serves to match the existing drainage patterns to the maximum extent practical. The school district has a future high school expansion plan that includes the potential of a third addition that will connect the front two proposed additions. Although it is unknown when this will be happening, we have included this area (16,807SF) in the sizing of the basin which is also included in the 1.571 acres of increased impervious coverage. The site has been evaluated using the TR-55 'Urban Hydrology for Small Watersheds' standards and with the following proposed drainage sub-watershed areas as depicted on the Proposed Drainage Area Map.

Northern Study Point: This study points represents the drainage area which flows uncontrolled to the County conveyance stormwater system on Princeton-Hightstown Road (C.R. #571). As part of this construction project, the total impervious and pervious areas consisting of sidewalk, pavement and grassed areas contributing to this drainage area will be reduced. The peak runoff rates and volumes have been reduced because the total area and amount of impervious surface in the drainage area thus the drainage area meets all of the requirements.

Central Study Point: This study area consists of the developed area in the subject site located within the north and northwestern portion of the property including the proposed parking areas, student drop off area, sidewalks and future building additions. The construction plans show two proposed building additions but the proposed drainage area map shows three. The two shown on the plan will be constructed as phase 2 of this project. There is no time line or definite plan to install the third building addition as of now. The impervious area generated by the third building addition was included in the calculations as a precaution. Runoff generated by the parking lot, and landscape/grass open space areas will be collected by various on-site inlets, routed through an aboveground infiltration basin, and ultimately discharges back into the existing 24-inch pipe and stormwater system. This existing 24-inch CMP pipe runs under the existing high school. There are two small grass areas with a size of 8,421 square feet that are not treated prior to construction and will not be treated post construction. This area has been included in flow calculation for the 24-inch CMP pipe and labeled as bypass. A minimum time of concentration of 10 minutes has been utilized for impervious coverages within this drainage area.

IV. DESIGN METHODOLOGY

The design intention of the proposed stormwater management facilities for this project is to provide measures as required to address applicable aspects of the Township of West Windsor Design Standards, Mercer County Design Standards, DRCC, New Jersey Soil Erosion and Sediment Control Standards, and N.J.A.C 7:8. In order to prepare the stormwater management design for the subject project, an initial investigation of the property was performed. On-site review of the tract was performed by Van Cleef Engineering Associates to verify existing site conditions and land cover characteristics.

Based upon our review of the existing site conditions and the Site Survey prepared by Van Cleef Engineering Associate, the Drainage Area Maps for the existing and proposed site conditions, as defined within this report, were established. A Grading Plan was developed for the proposed site improvements with consideration to the existing drainage patterns to the maximum extent practicable. The project was designed to ensure runoff from the proposed development would meet the required peak flow rate reductions of 50%, 75% and 80% for the 2-year, 10-year, and 100-year storm events respectively.

Stormwater runoff generated by the proposed improvements will be collected via a series of inlets, and underground pipes and conveyed into an aboveground infiltration basin and then discharged to the Central Study Point discussed above. The storm sewer design accommodates the 25-yr design storm utilizing the Rational Method under free flowing conditions. Associated calculations are included in the Appendix of this report.

Based upon the scope of the project, the development is classified as a major development; and therefore, the project has been designed to meet the stormwater runoff quantity set forth by the Township of West Windsor Design Standards, Mercer County Design Standards, DRCC, and NJAC 7:8. The following items are addressed within this report:

- Erosion control and runoff quantity standards
- Stormwater runoff quality standards
- Calculation of stormwater runoff
- Standards for structural stormwater management measures

Runoff volumes for the site were modeled utilizing HydroCAD by HydroCAD Software Solutions LLC using the Urban Hydrology for Small Watershed TR55 method for the applicable design storms. The 2-, 10- and 100-year quantity design storms are based upon the New Jersey 24-Hour Rainfall Frequency Data for Mercer County as published by the USDA NRCS utilizing a

NOAA Curve C rainfall distribution. Curve number calculations have been included within the Appendix and are based upon The Hydrologic Soil Groups as identified by the Mercer County Soil Survey. Mercer County Stormwater regulations state that all disturbed lands to be modeled as poor condition or if the landuse is an urban or residential district it should be modeled as the next hydrologic group after development (i.e. a "B" soil would convert to a "C" soil). The landuse modified in the model as Mercer County regulations require. A minimum time of concentration of ten (10) minutes was utilized for impervious areas. The existing and proposed time of concentration calculations were calculated using the guidance provided within the May 2010 update of Chapter 15 of the National Engineering Handbook. Pervious and impervious areas were modeled separately as suggested in the NJDEP Stormwater Management Best Management Practices Manual.

Stormwater Quality standards were met capturing and infiltrating all of the runoff generated from the NJDEP Water Quality Storm (1.25 inches in 2 hours). The infiltration rate measured at the proposed basin location is 0.417 in/hr. The NJDEP Stormwater BMP Manual states that an infiltration basin must have an in-situ permeability greater than 1 inch per hour. The in-situ saoil between the bottom of the basin and the top of the seasonal high water table has a permeability less than 1 in/hour so a portion of the soil will be removed and replaced with K5 sand (approximately 4,500 square feet). K5 sand has a permeability of 10 in/hour after you include the recommended NJDEP BMP Manual safety factor. The volume of the NJDEP Water Quality Storm runoff collected in the basin is 23,208 cubic feet. It will take 6.2 hours to drain 23,208 cf of water through 4,500 sf of sand. The allowable drainage time of 72 hours.

V. RUNOFF RATE REDUCTION PERFORMANCE

The following is a comparison of overall pre- and post- development runoff rates for the proposed project disturbance area as required by N.J.A.C. 7:8:

Existing vs. Proposed Runoff Rates to Study Point 1				
	Existing Runoff (cfs)	Allowable Runoff (cfs)	Proposed Runoff (cfs)	% of Reduction
2 Year	16.69	8.34	4.97	70.61%
10 Year	27.82	20.86	7.86	70.60%
100 Year	50.26	40.20	11.04	76.36%

The proposed aboveground infiltration basin will convey through a proposed stormwater pipe and discharge to the existing 24-inch stormwater pipe at the Central Study Point. The connection between the aboveground infiltration basin and the 24" diameter corrugated metal pipe has a slope of 0.59%. The existing pipe will be extended 25-feet to relocated the existing manhole out from under the proposed building. According to Manning's equation, a 24-inch diameter pipe made of corrugated metal pipe at 0.59% slope has a maximum capacity of 10.26 cfs.

Manning's Equation: $q = ((k_n / n) R_h^{2/3} S^{1/2}) A$

q = flow (cfs)

kn = 1.486

n = Mannings Coefficient of Roughness (0.022 for CMP)

Rh = Hydraulic Radius = Area/Wetter Perimeter. Hydraulic Radius of a full pipe = 2 * radius

S = Slope (ft/ft)

VCEA attempted to design the system to have the peak flow at the point of study be less than 10.26 cfs. Due to existing physical constraints, VCEA was unable to do that for the 100 year storm. The flow at the point of study for the 100 year storm is 11.04 cfs. VCEA is able to achieve a higher flow through the existing storm sewer system by allowing the existing stormwater pipe to surcharge slightly just downstream of the point of study. Using the Hazen-Williams Equation

Hazen Williams Equation: $h_{100ft} = 0.2083 (100 / c)^{1.852} q^{1.852} / d_h^{4.8655}$

h_{100ft} = friction head loss in feet of water per 100 feet of pipe (fth20/100 ft pipe)

c = Hazen-Williams roughness constant

q = volume flow (gal/min)

dh = inside hydraulic diameter (inches)

To achieve a 11.08 cfs in 24" diameter CMP pipe, you need 0.763 ft of head. The bottom invert of the pipe is 90.46. The elevation of the water when the pipe is full at the bottom of the pipe is 92.46. The elevation of the water when is surcharges is 93.22. The elevation of the lowest outlet in the outlet structure of the basin is 93.96. While the water will back up in the pipeline upstream during the 100 year storm, it will not back up into the basin, the basin will also flow under gravity flow conditions. Also, VCEA would like to know, that the existing stormwater system currently works this way to a much greater extreme. Currently, the 100 year storm is

modeled to generate a peak flow 50.26 cfs which is far greater than the allowed 10.26 cfs through the CMP pipe. The only reason the existing system does not back up out of the inlets is that the system becomes pressurized and generates flows required to move the stormwater through the pipes with any localized flooding.

VI. GROUNDWATER RECHARGE

The subject property is classified as a "major development" by the standards set forth by N.J.A.C. 7:8. Impervious coverage on site has been increased and there is a post-development annual recharge deficit of 59,672 cubic feet. This site will utilize an infiltration basin to infiltrate runoff and will provide an annual recharge volume of 147,070 cubic feet at an effective depth of 0.5 feet. We will utilize a depth of water 1.4 feet which will produce an annual recharge volume of 147,070 cubic feet, thus meeting groundwater recharge requirements. The annual Groundwater Recharge Analysis (GSR-32) spreadsheet is included in the appendix of this report.

VIII. TEMPORARY SEDIMENT BASIN

The proposed basin will be utilized as a temporary sediment basin with a temporary riser during construction. Per the NJ Soil Erosion and Sediment Control Standards, Section 24, "Standard for Sediment Basin," The minimum width shall be determined using the following equation:

Width = 10 x $(Q_5)^{1/2}$
Width = 10 x $(28.3)^{1/2}$
Width = 53.2 feet

The sediment storage capacity plus two-year storm runoff off volume was determined using the following equation:

V = (DA)(A)(DR)(TE)(1/γ_s)(2,000 lbs/tons)(1/43,560 sq. ft/ac.)
V = (8.223)(1)(0.83)(90)(1/85)(2,000)(1/43,560)
V = 0.33 acre feet

2-year runoff volume = 0.955 ac-ft
Total sediment + runoff volume = 1.29 ac-ft

Basin volume at elevation 95.67 = 1.29 ac-ft

VII. STABILITY ANALYSIS

Per the NJ Soil Erosion and Sediment Control Standards, Section 21, "Standard for Off-Site Stability," compliance has been met for the proposed discharge of stormwater/infiltration basin. Study Point 1, the runoff will be discharged into an existing stormwater drainage system. Downstream flows during every storm event have also been analyzed to Study Point 1 and have been determined to meet the 50%, 75%, and 80% reductions for the 2-year, 10-year and 100-year storm events respectively, therefore meeting the conditions of the NJ SESC Standards Section 21-1.

The emergency spillway has been designed in accordance with Appendix A10 of NJ Soil Erosion and Sediment Control Standards. Two simulations were run for the emergency spillway. One with only the orifice turned off and one with the orifice and top of box turned off to simulate blockages. The maximum stormwater elevation rises above the emergency spillway with both the top of the box and orifice turned off. The peak elevation of the water during the 100-year storm with only the orifice turned off is 98.30. The 2.2 cfs discharge in the emergency condition over the 21-foot spillway width will have a velocity of 0.95 feet per second with a maximum depth of 0.11 feet. Per Appendix A10, the spillway is permitted to have a maximum velocity of 2.5 feet per second. The spillways hydrograph routings are located in the appendix of this report.

VIII. CONCLUSION

The proposed project has been designed in a manner that will not adversely impact the existing drainage patterns, adjacent roadways or adjacent parcels. The stormwater runoff rates for the 2, 10, and 100-year design storms have been designed to meet the required reductions rates. The stormwater runoff rates for the project disturbance area for the 2, 10, and 100-year design storms meet or exceed the reduction criteria set forth by N.J.A.C. 7:8 under free flow conditions. With that stated, it is evident that the proposed development meets all regulatory requirements and will not have a negative impact on any existing stormwater management systems within the vicinity of the subject parcel.

APPENDIX

SOIL SURVEY

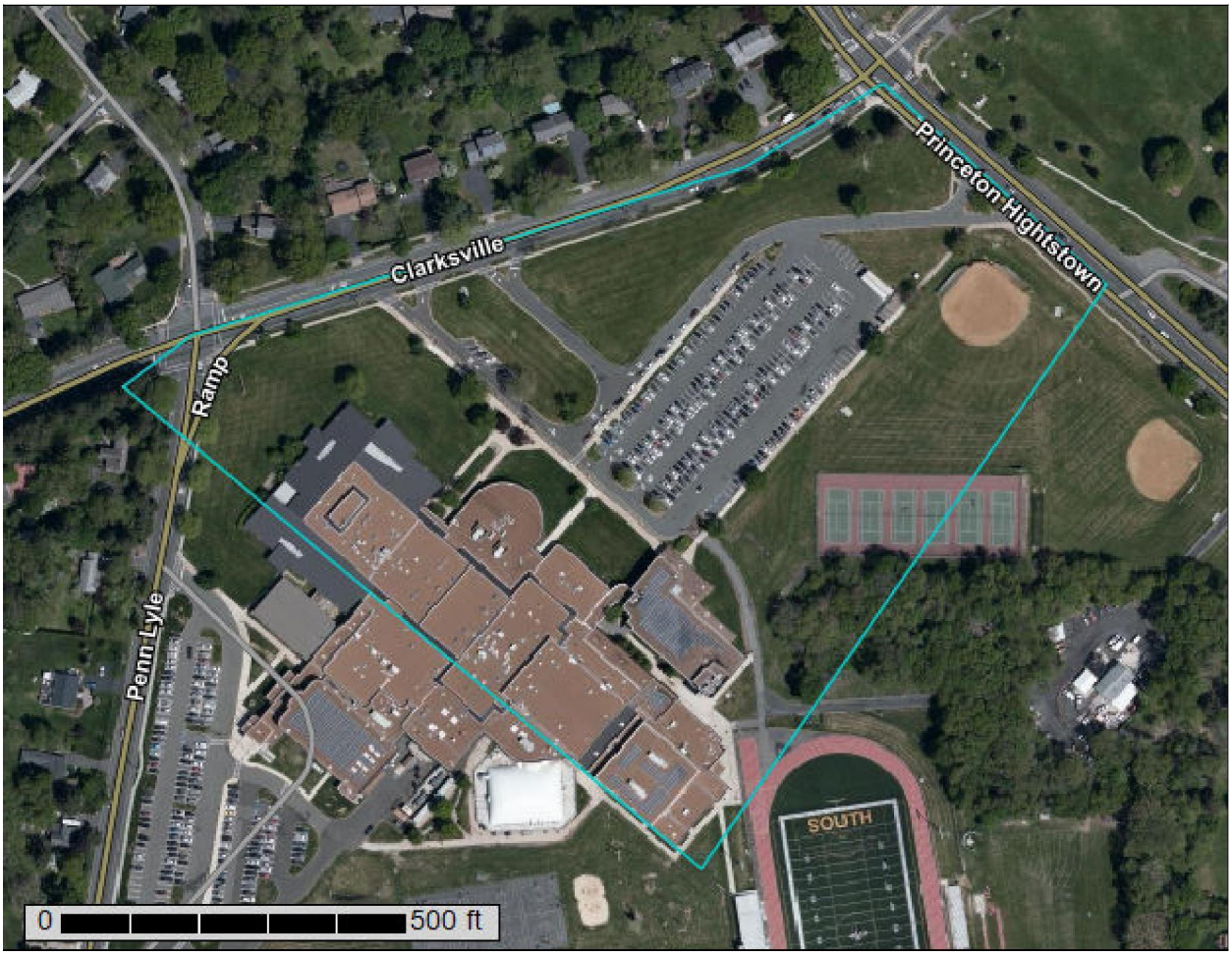
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Mercer County, New Jersey



February 6, 2020

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

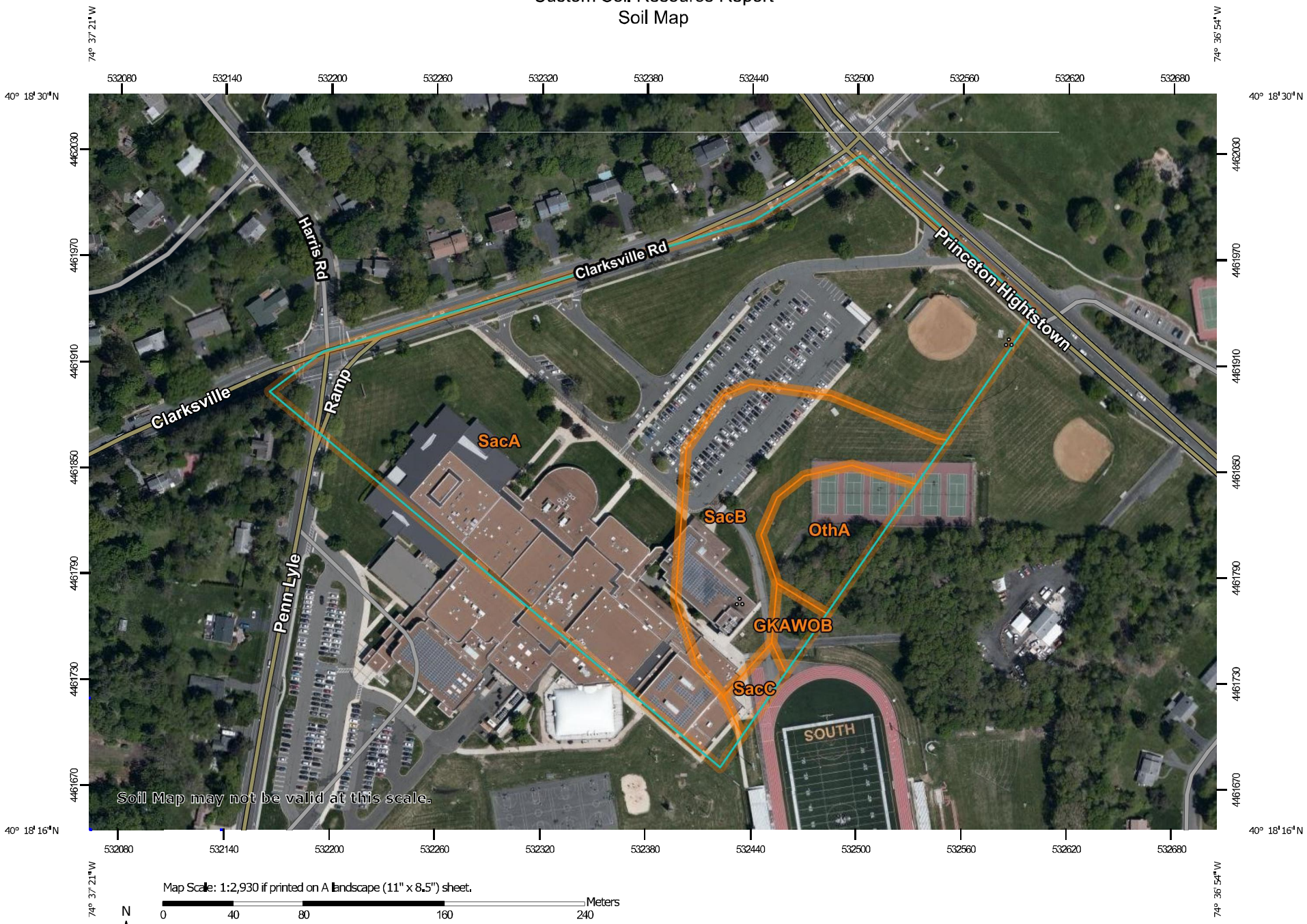
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Mercer County, New Jersey
Survey Area Data: Version 15, Sep 16, 2019

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

Date(s) aerial images were photographed: May 2, 2019—Jul 9, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
GKAWOB	Glassboro and Woodstown sandy loams, 0 to 5 percent slopes	0.2	1.1%
OthA	Othello silt loams, 0 to 2 percent slopes, northern coastal plain	1.1	5.9%
SacA	Sassafras sandy loam, 0 to 2 percent slopes, Northern Coastal Plain	13.9	76.5%
SacB	Sassafras sandy loam, 2 to 5 percent slopes, Northern Coastal Plain	2.8	15.4%
SacC	Sassafras sandy loam, 5 to 10 percent slopes, Northern Coastal Plain	0.2	1.1%
Totals for Area of Interest		**18.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor

components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Mercer County, New Jersey

GKAWOB—Glassboro and Woodstown sandy loams, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 1jg7f
Elevation: 0 to 130 feet
Mean annual precipitation: 28 to 59 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 161 to 231 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Glassboro and similar soils: 45 percent
Woodstown and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Glassboro

Setting

Landform: Flats
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy fluviomarine deposits

Typical profile

A - 0 to 10 inches: sandy loam
BA - 10 to 13 inches: sandy loam
Bg - 13 to 18 inches: sandy loam
Btg - 18 to 26 inches: sandy loam
C - 26 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A/D
Hydric soil rating: No

Description of Woodstown

Setting

Landform: Drainageways

Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Old alluvium and/or sandy marine deposits

Typical profile

Ap - 0 to 11 inches: sandy loam
BA - 11 to 17 inches: sandy loam
Bt - 17 to 23 inches: sandy loam
BC - 23 to 30 inches: sandy loam
C - 30 to 48 inches: sandy loam
2C - 48 to 60 inches: stratified loamy sand to sandy loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 6.00 in/hr)
Depth to water table: About 18 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Mullica, rarely flooded

Percent of map unit: 5 percent
Landform: Flood plains, drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Downer

Percent of map unit: 5 percent
Landform: Knolls, low hills
Landform position (three-dimensional): Nose slope, interfluve
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Fallsington

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave

Across-slope shape: Concave
Hydric soil rating: Yes

OthA—Othello silt loams, 0 to 2 percent slopes, northern coastal plain

Map Unit Setting

National map unit symbol: 2thwm
Elevation: 0 to 300 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 46 to 64 degrees F
Frost-free period: 190 to 250 days
Farmland classification: Farmland of statewide importance, if drained

Map Unit Composition

Othello, drained, and similar soils: 50 percent
Othello, undrained, and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Othello, Drained

Setting

Landform: Swales, flats, depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Dip, talf
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Parent material: Silty eolian deposits over fluviomarine deposits

Typical profile

Ap - 0 to 9 inches: silt loam
Btg - 9 to 29 inches: silt loam
2BCg - 29 to 34 inches: sandy loam
2Cg - 34 to 80 inches: loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)
Depth to water table: About 10 to 20 inches
Frequency of flooding: None
Frequency of ponding: Rare
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Description of Othello, Undrained

Setting

Landform: Drainageways, swales, flats, depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Dip, talf
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Parent material: Silty eolian deposits over fluviomarine deposits

Typical profile

Oe - 0 to 2 inches: peat
A - 2 to 4 inches: silt loam
Eg - 4 to 10 inches: silt loam
Btg - 10 to 29 inches: silt loam
2BCg - 29 to 35 inches: sandy loam
2Cg - 35 to 80 inches: loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)
Depth to water table: About 0 to 10 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Fallsington, undrained

Percent of map unit: 8 percent
Landform: Flats, depressions, drainageways, swales
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Talf, dip
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Kentuck, undrained

Percent of map unit: 7 percent
Landform: Flats, depressions, swales
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf, dip

Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Mattapex

Percent of map unit: 5 percent
Landform: Swales, broad interstream divides, flats, depressions
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Dip, talf
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

SacA—Sassafras sandy loam, 0 to 2 percent slopes, Northern Coastal Plain

Map Unit Setting

National map unit symbol: 2thx8
Elevation: 0 to 470 feet
Mean annual precipitation: 41 to 49 inches
Mean annual air temperature: 53 to 58 degrees F
Frost-free period: 190 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Sassafras and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sassafras

Setting

Landform: Fluviomarine terraces, flats
Landform position (three-dimensional): Riser, rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy fluviomarine deposits

Typical profile

Ap - 0 to 12 inches: sandy loam
Bt1 - 12 to 18 inches: sandy loam
Bt2 - 18 to 28 inches: sandy clay loam
BC - 28 to 40 inches: loamy sand
C1 - 40 to 58 inches: sand
C2 - 58 to 80 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Fallsington, drained

Percent of map unit: 4 percent
Landform: Depressions, flats, swales, broad interstream divides
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Dip, talf
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

Woodstown

Percent of map unit: 4 percent
Landform: Fluviomarine terraces, flats
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Downer

Percent of map unit: 4 percent
Landform: Knolls, fluviomarine terraces, flats
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, riser, rise
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Ingleside

Percent of map unit: 4 percent
Landform: Fluviomarine terraces, flats
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Aura

Percent of map unit: 4 percent
Landform: Low hills, fluviomarine terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, nose slope, riser

Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

SacB—Sassafras sandy loam, 2 to 5 percent slopes, Northern Coastal Plain

Map Unit Setting

National map unit symbol: 2thxd
Elevation: 0 to 470 feet
Mean annual precipitation: 41 to 49 inches
Mean annual air temperature: 53 to 58 degrees F
Frost-free period: 190 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Sassafras and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sassafras

Setting

Landform: Fluviomarine terraces, flats
Landform position (three-dimensional): Riser, rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy fluviomarine deposits

Typical profile

Ap - 0 to 12 inches: sandy loam
Bt1 - 12 to 18 inches: sandy loam
Bt2 - 18 to 28 inches: sandy clay loam
BC - 28 to 40 inches: loamy sand
C1 - 40 to 58 inches: sand
C2 - 58 to 80 inches: sand

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Woodstown
Percent of map unit: 4 percent
Landform: Fluviomarine terraces, broad interstream divides, depressions, flats
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Tread, talf, dip
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Downer
Percent of map unit: 4 percent
Landform: Knolls, fluviomarine terraces, flats
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, riser, rise
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Fallsington, drained
Percent of map unit: 4 percent
Landform: Swales, flats, depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Dip, talf
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Ingleside
Percent of map unit: 4 percent
Landform: Flats
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Aura
Percent of map unit: 4 percent
Landform: Low hills, fluviomarine terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, nose slope, riser
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

SacC—Sassafras sandy loam, 5 to 10 percent slopes, Northern Coastal Plain

Map Unit Setting

National map unit symbol: 2thxs
Elevation: 0 to 470 feet
Mean annual precipitation: 41 to 49 inches
Mean annual air temperature: 53 to 58 degrees F
Frost-free period: 190 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Sassafras and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sassafras

Setting

Landform: Fluviomarine terraces, flats
Landform position (three-dimensional): Riser, rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy fluviomarine deposits

Typical profile

Ap - 0 to 9 inches: sandy loam
Bt1 - 9 to 18 inches: sandy loam
Bt2 - 18 to 28 inches: sandy clay loam
BC - 28 to 40 inches: loamy sand
C1 - 40 to 58 inches: sand
C2 - 58 to 80 inches: sand

Properties and qualities

Slope: 5 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Downer

Percent of map unit: 4 percent
Landform: Knolls, fluviomarine terraces, flats
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, riser, rise
Down-slope shape: Convex, linear
Across-slope shape: Linear
Hydric soil rating: No

Woodstown

Percent of map unit: 4 percent
Landform: Fluviomarine terraces, broad interstream divides, depressions, flats
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Tread, talf, dip
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Ingleside

Percent of map unit: 4 percent
Landform: Flats
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Aura

Percent of map unit: 4 percent
Landform: Low hills, fluviomarine terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope, riser
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Fallsington, drained

Percent of map unit: 4 percent
Landform: Flats, depressions, swales
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Talf, dip
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: Yes

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

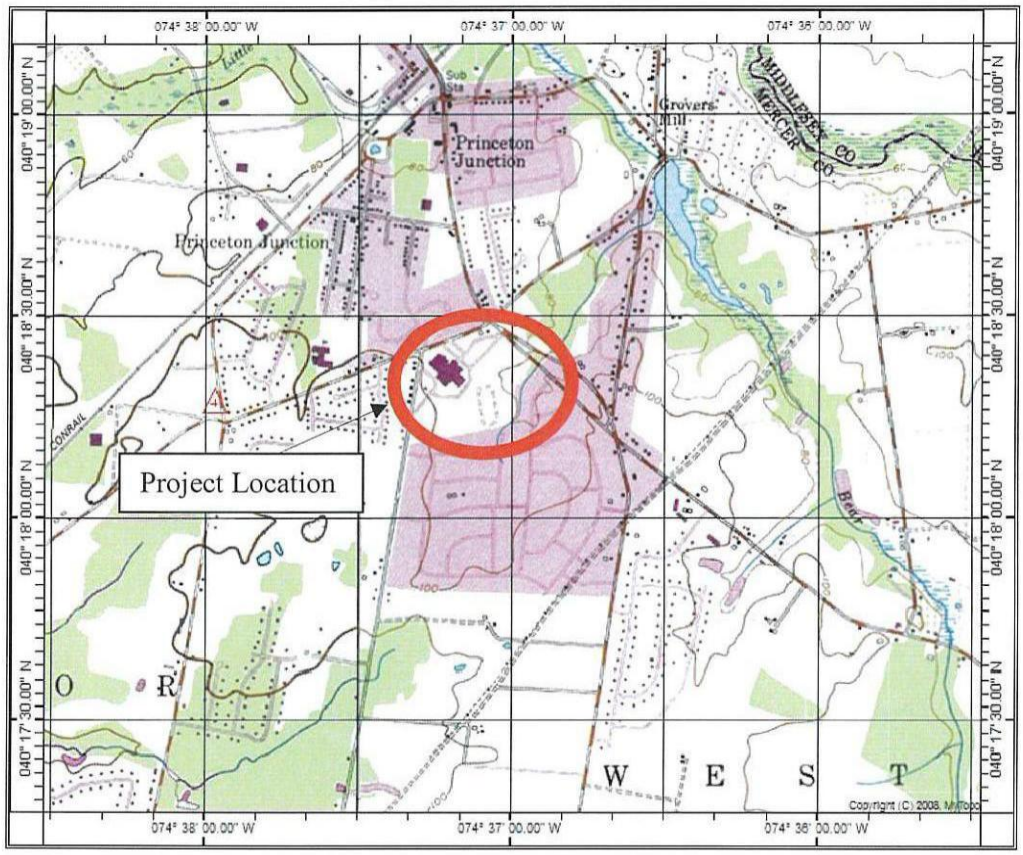
United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

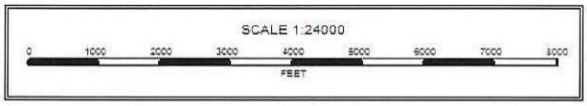
United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

USGS MAP

TAX MAP

Van Cleef
ENGINEERING ASSOCIATES



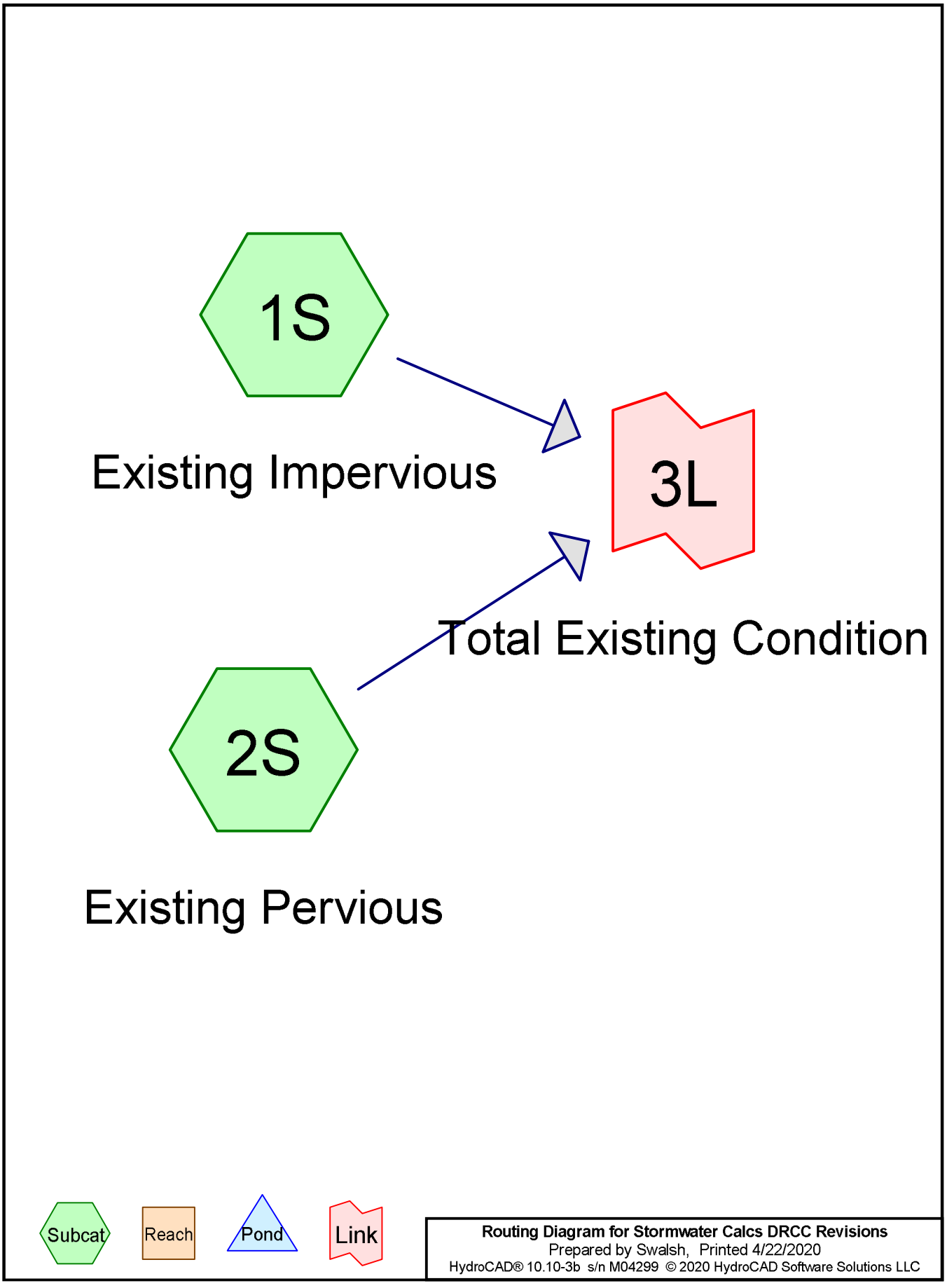


HIGH SCHOOL SOUTH LOCATION MAP: USGS WEST WINDSOR QUAD

Van Cleef
ENGINEERING ASSOCIATES

HIGH SCHOOL SOUTH LOCATION MAP: TAX MAP

EXISTING CONDITION
HYDROGRAPH SUMMARY REPORTS
NJ WATER QUALITY
2-100 YEAR STORM EVENTS



Routing Diagram for Stormwater Calcs DRCC Revisions
Prepared by Swalsh, Printed 4/22/2020

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2YR STM	NOAA 24-hr	C	Default	24.00	1	3.30	2
2	10YR STM	NOAA 24-hr	C	Default	24.00	1	5.00	2
3	100YR STM	NOAA 24-hr	C	Default	24.00	1	8.30	2
4	NJDEP Water Quality Storm	NJ DEP 2-hr		Default	2.00	1	1.25	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.895	74	>75% Grass cover, Good, HSG C (2S)
4.452	98	Paved parking & roofs (1S)
7.347	**89**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
2.895	HSG C	2S
0.000	HSG D	
4.452	Other	1S
7.347		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	2.895	0.000	0.000	2.895	>75% Grass cover, Good	2S
0.000	0.000	0.000	0.000	4.452	4.452	Paved parking & roofs	1S
0.000	**0.000**	**2.895**	**0.000**	**4.452**	**7.347**	**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	1S	0.00	0.00	154.0	0.0330	0.011	18.0	0.0	0.0
2	1S	0.00	0.00	114.0	0.0021	0.020	24.0	0.0	0.0
3	2S	0.00	0.00	34.0	0.0062	0.011	12.0	0.0	0.0
4	2S	0.00	0.00	266.0	0.0096	0.011	15.0	0.0	0.0
5	2S	0.00	0.00	94.0	0.0035	0.020	24.0	0.0	0.0

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Impervious Runoff Area=4.452 ac 100.00% Impervious Runoff Depth=3.07"
Flow Length=656' Tc=10.0 min CN=98 Runoff=13.29 cfs 1.138 af

Subcatchment 2S: Existing Pervious Runoff Area=2.895 ac 0.00% Impervious Runoff Depth=1.10"
Flow Length=736' Tc=10.0 min CN=74 Runoff=3.43 cfs 0.266 af

Link 3L: Total Existing Condition Inflow=16.69 cfs 1.404 af
Primary=16.69 cfs 1.404 af

Total Runoff Area = 7.347 ac Runoff Volume = 1.404 af Average Runoff Depth = 2.29"
39.40% Pervious = 2.895 ac 60.60% Impervious = 4.452 ac

Summary for Subcatchment 1S: Existing Impervious

[47] Hint: Peak is 197% of capacity of segment #4

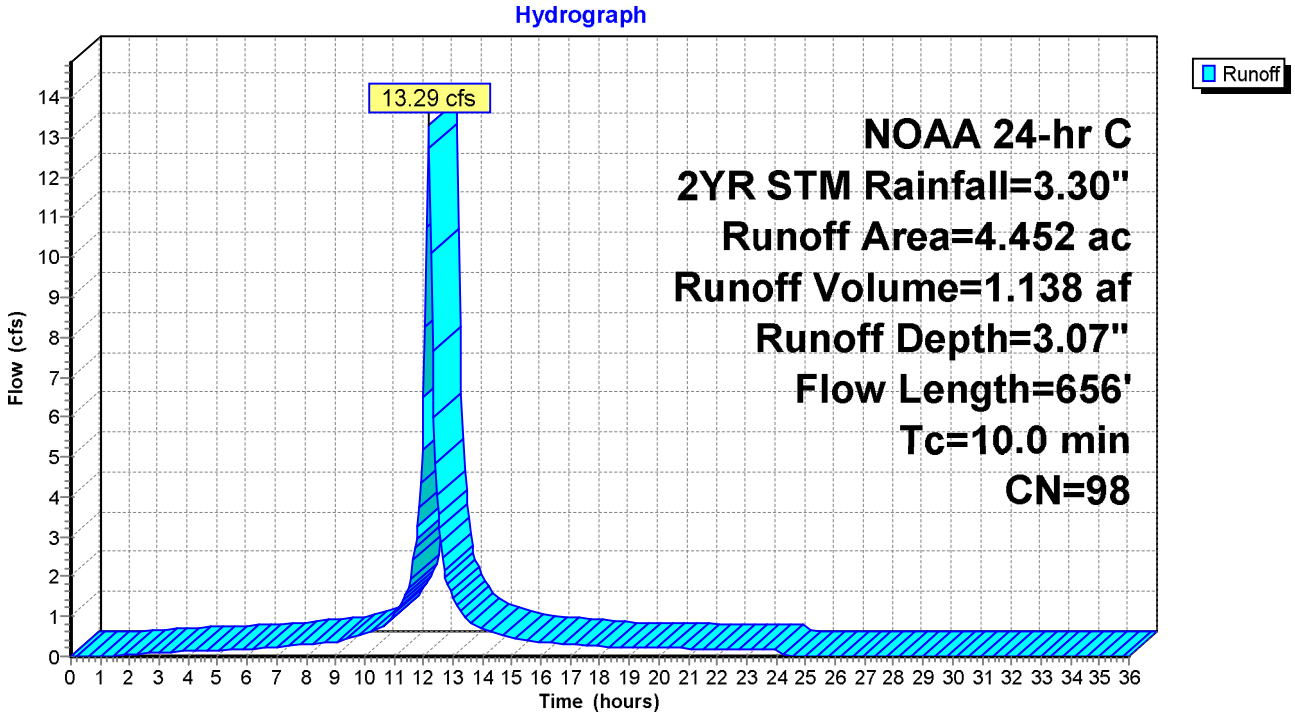
Runoff = 13.29 cfs @ 12.17 hrs, Volume= 1.138 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2YR STM Rainfall=3.30"

Area (ac)	CN	Description
4.452	98	Paved parking & roofs
4.452		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	150	0.0267	1.70		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 3.30"
1.7	238	0.0137	2.38		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
0.2	154	0.0330	12.76	22.55	**Pipe Channel, Circulat Channel (pipe)** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.9	114	0.0021	2.14	6.74	**Pipe Channel, Circular Channel (pipe)** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.020 Corrugated PE, corrugated interior
5.7					**Direct Entry, To make it 10 minutes**
10.0	656	Total			

Subcatchment 1S: Existing Impervious



Summary for Subcatchment 2S: Existing Pervious

[47] Hint: Peak is 103% of capacity of segment #2

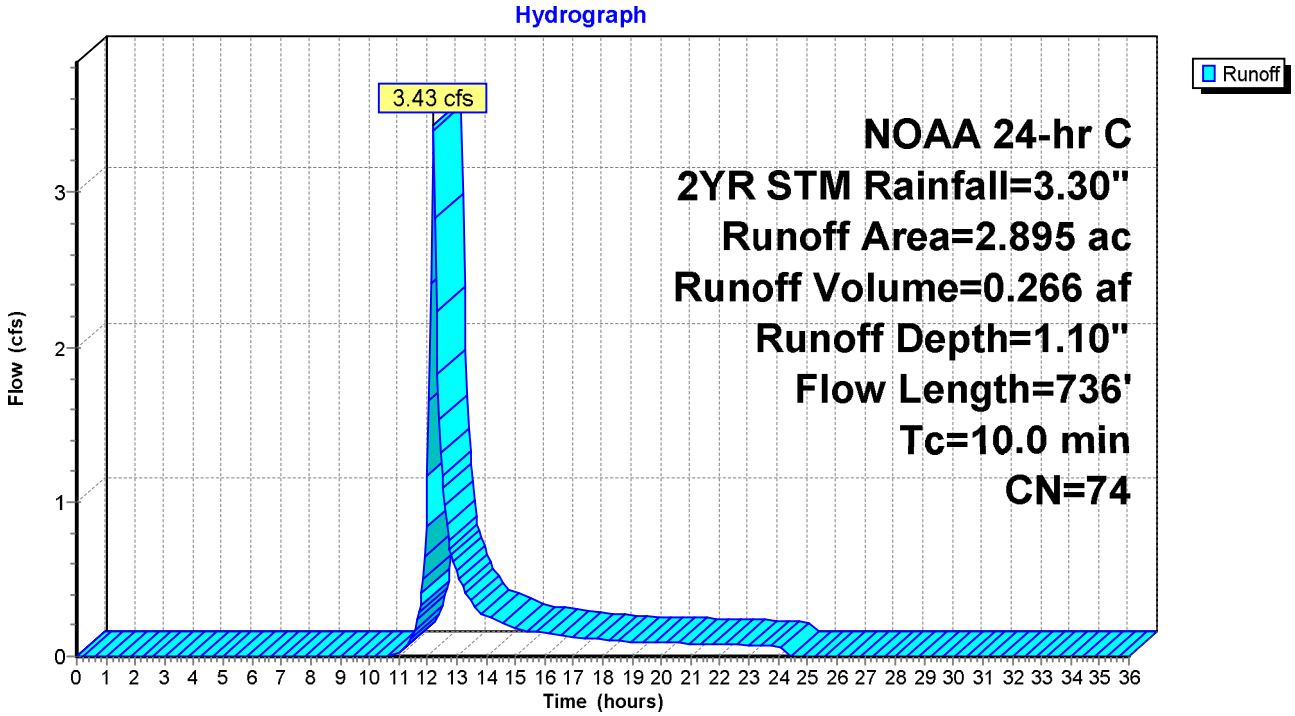
Runoff = 3.43 cfs @ 12.19 hrs, Volume= 0.266 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2YR STM Rainfall=3.30"

Area (ac)	CN	Description
2.895	74	>75% Grass cover, Good, HSG C
2.895		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	24	0.0101	0.10		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.30"
0.1	34	0.0062	4.22	3.32	**Pipe Channel, Pipe** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.7	266	0.0096	6.10	7.48	**Pipe Channel, Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
0.6	94	0.0035	2.77	8.70	**Pipe Channel, Pipe** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.020 Corrugated PE, corrugated interior
3.3	200		1.00		**Direct Entry, Grass Shallow Concentrated Flow**
0.8	118		2.60		**Direct Entry, Gutter Shallow Concentrated Flow**
0.5					**Direct Entry, To make 10 minutes**
10.0	736	Total			

Subcatchment 2S: Existing Pervious

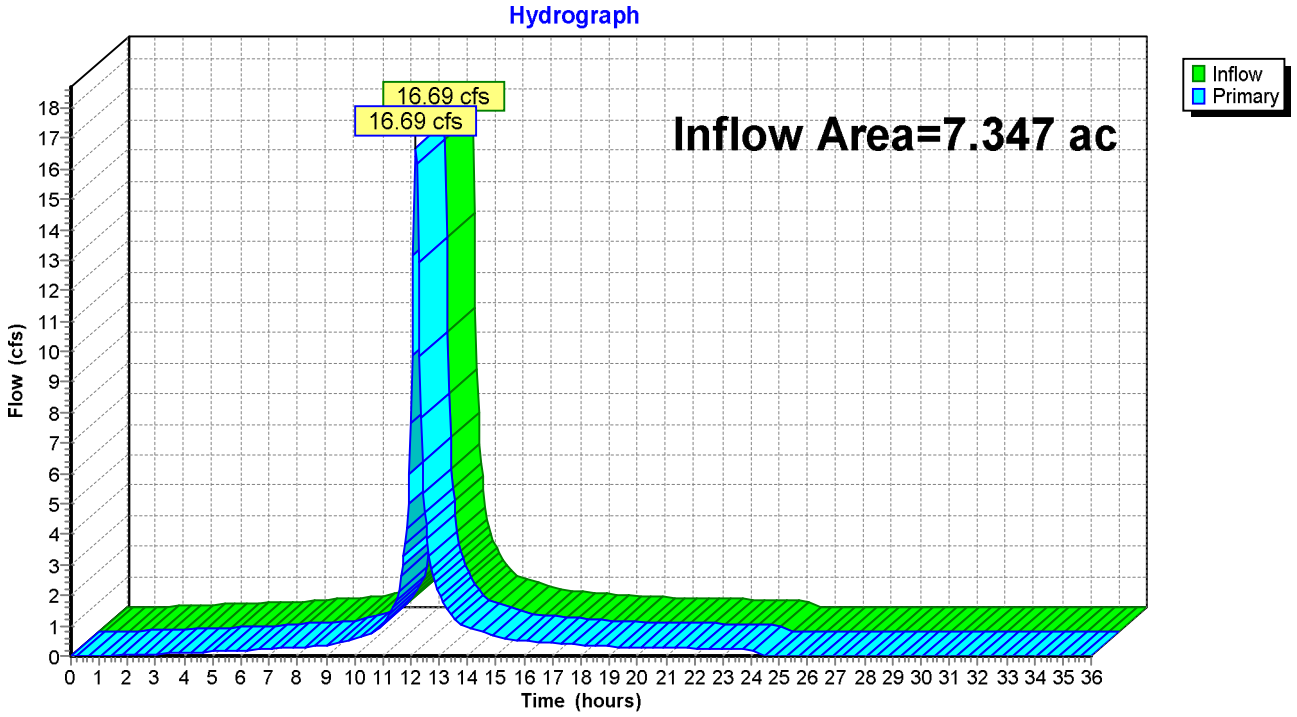


Summary for Link 3L: Total Existing Condition

Inflow Area = 7.347 ac, 60.60% Impervious, Inflow Depth = 2.29" for 2YR STM event
Inflow = 16.69 cfs @ 12.17 hrs, Volume= 1.404 af
Primary = 16.69 cfs @ 12.17 hrs, Volume= 1.404 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link 3L: Total Existing Condition



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Impervious Runoff Area=4.452 ac 100.00% Impervious Runoff Depth=4.76"
Flow Length=656' Tc=10.0 min CN=98 Runoff=20.27 cfs 1.767 af

Subcatchment 2S: Existing Pervious Runoff Area=2.895 ac 0.00% Impervious Runoff Depth=2.36"
Flow Length=736' Tc=10.0 min CN=74 Runoff=7.56 cfs 0.570 af

Link 3L: Total Existing Condition Inflow=27.82 cfs 2.338 af
Primary=27.82 cfs 2.338 af

Total Runoff Area = 7.347 ac Runoff Volume = 2.338 af Average Runoff Depth = 3.82"
39.40% Pervious = 2.895 ac 60.60% Impervious = 4.452 ac

Summary for Subcatchment 1S: Existing Impervious

[47] Hint: Peak is 301% of capacity of segment #4

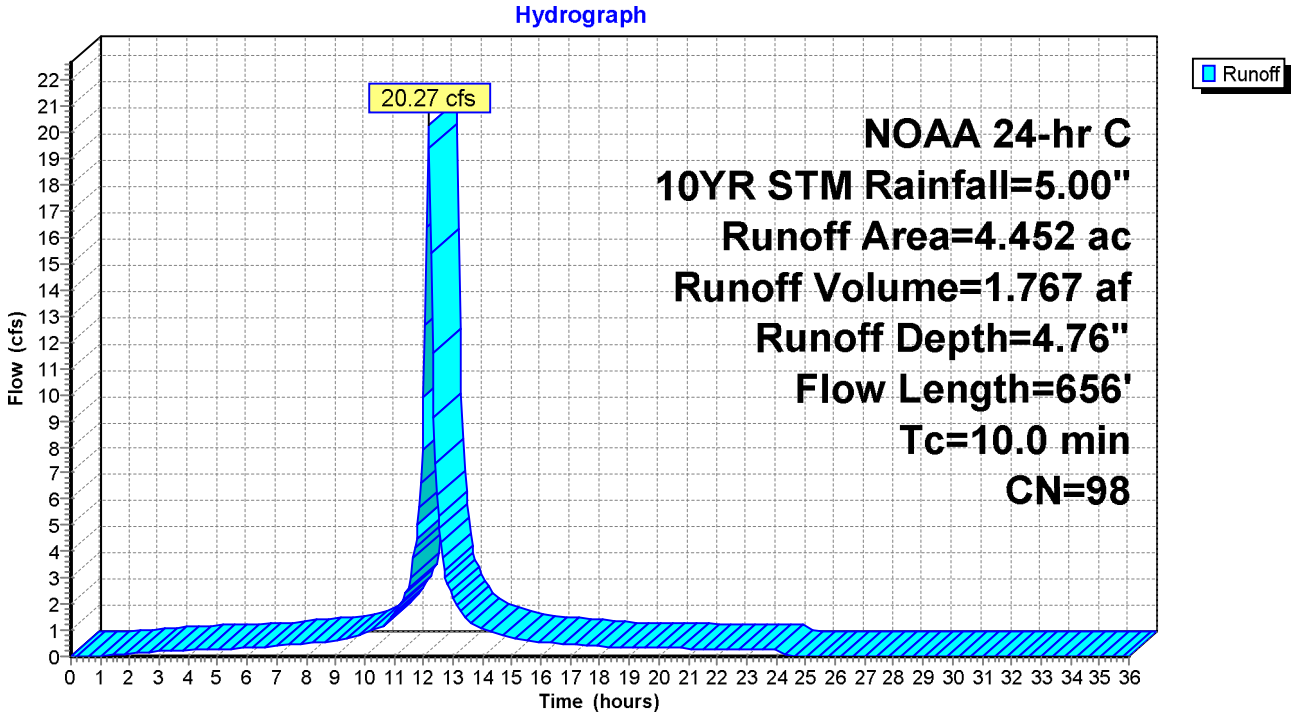
Runoff = 20.27 cfs @ 12.17 hrs, Volume= 1.767 af, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10YR STM Rainfall=5.00"

Area (ac)	CN	Description
4.452	98	Paved parking & roofs
4.452		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	150	0.0267	1.70		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 3.30"
1.7	238	0.0137	2.38		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
0.2	154	0.0330	12.76	22.55	**Pipe Channel, Circulat Channel (pipe)** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.9	114	0.0021	2.14	6.74	**Pipe Channel, Circular Channel (pipe)** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.020 Corrugated PE, corrugated interior
5.7					**Direct Entry, To make it 10 minutes**
10.0	656	Total			

Subcatchment 1S: Existing Impervious



Summary for Subcatchment 2S: Existing Pervious

[47] Hint: Peak is 228% of capacity of segment #2
[47] Hint: Peak is 101% of capacity of segment #3

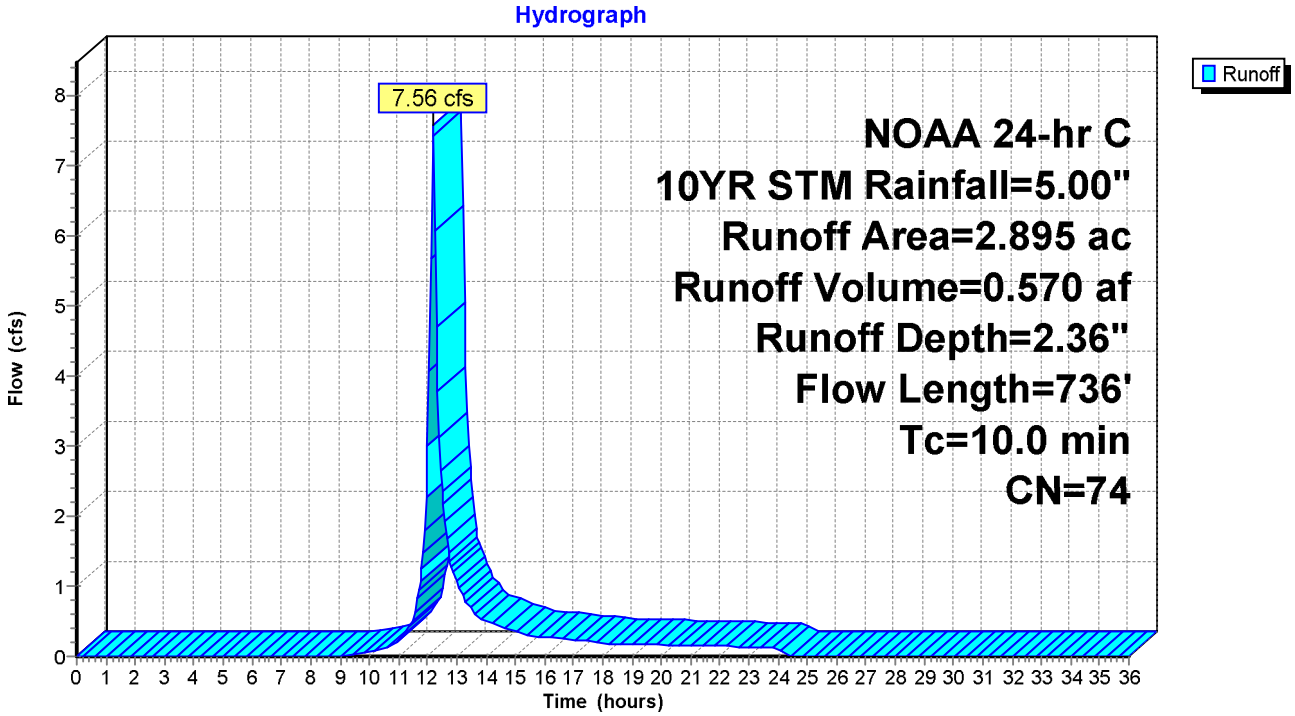
Runoff = 7.56 cfs @ 12.18 hrs, Volume= 0.570 af, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10YR STM Rainfall=5.00"

Area (ac)	CN	Description
2.895	74	>75% Grass cover, Good, HSG C
2.895		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	24	0.0101	0.10		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.30"
0.1	34	0.0062	4.22	3.32	**Pipe Channel, Pipe** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.7	266	0.0096	6.10	7.48	**Pipe Channel, Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
0.6	94	0.0035	2.77	8.70	**Pipe Channel, Pipe** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.020 Corrugated PE, corrugated interior
3.3	200		1.00		**Direct Entry, Grass Shallow Concentrated Flow**
0.8	118		2.60		**Direct Entry, Gutter Shallow Concentrated Flow**
0.5					**Direct Entry, To make 10 minutes**
10.0	736	Total			

Subcatchment 2S: Existing Pervious

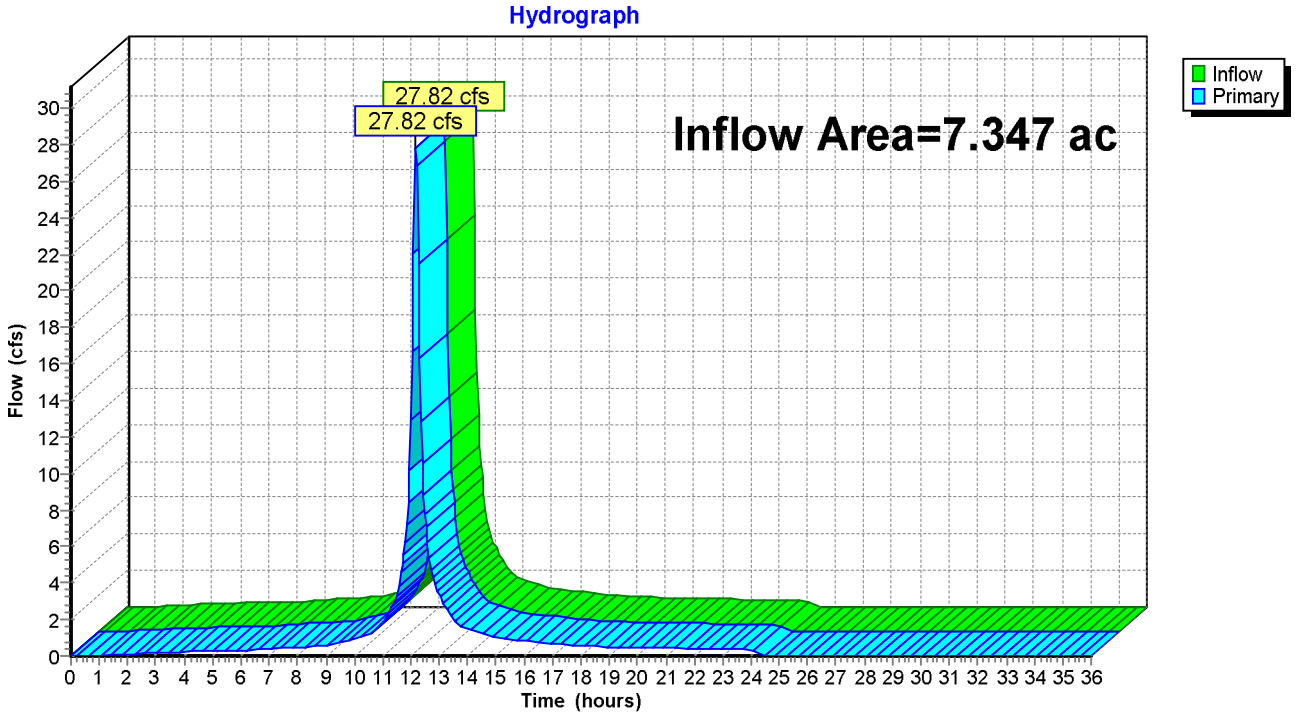


Summary for Link 3L: Total Existing Condition

Inflow Area = 7.347 ac, 60.60% Impervious, Inflow Depth = 3.82" for 10YR STM event
Inflow = 27.82 cfs @ 12.17 hrs, Volume= 2.338 af
Primary = 27.82 cfs @ 12.17 hrs, Volume= 2.338 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link 3L: Total Existing Condition



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Impervious Runoff Area=4.452 ac 100.00% Impervious Runoff Depth=8.06"
Flow Length=656' Tc=10.0 min CN=98 Runoff=33.77 cfs 2.990 af

Subcatchment 2S: Existing Pervious Runoff Area=2.895 ac 0.00% Impervious Runoff Depth=5.19"
Flow Length=736' Tc=10.0 min CN=74 Runoff=16.51 cfs 1.253 af

Link 3L: Total Existing Condition Inflow=50.26 cfs 4.244 af
Primary=50.26 cfs 4.244 af

Total Runoff Area = 7.347 ac Runoff Volume = 4.244 af Average Runoff Depth = 6.93"
39.40% Pervious = 2.895 ac 60.60% Impervious = 4.452 ac

Summary for Subcatchment 1S: Existing Impervious

[47] Hint: Peak is 150% of capacity of segment #3
[47] Hint: Peak is 501% of capacity of segment #4

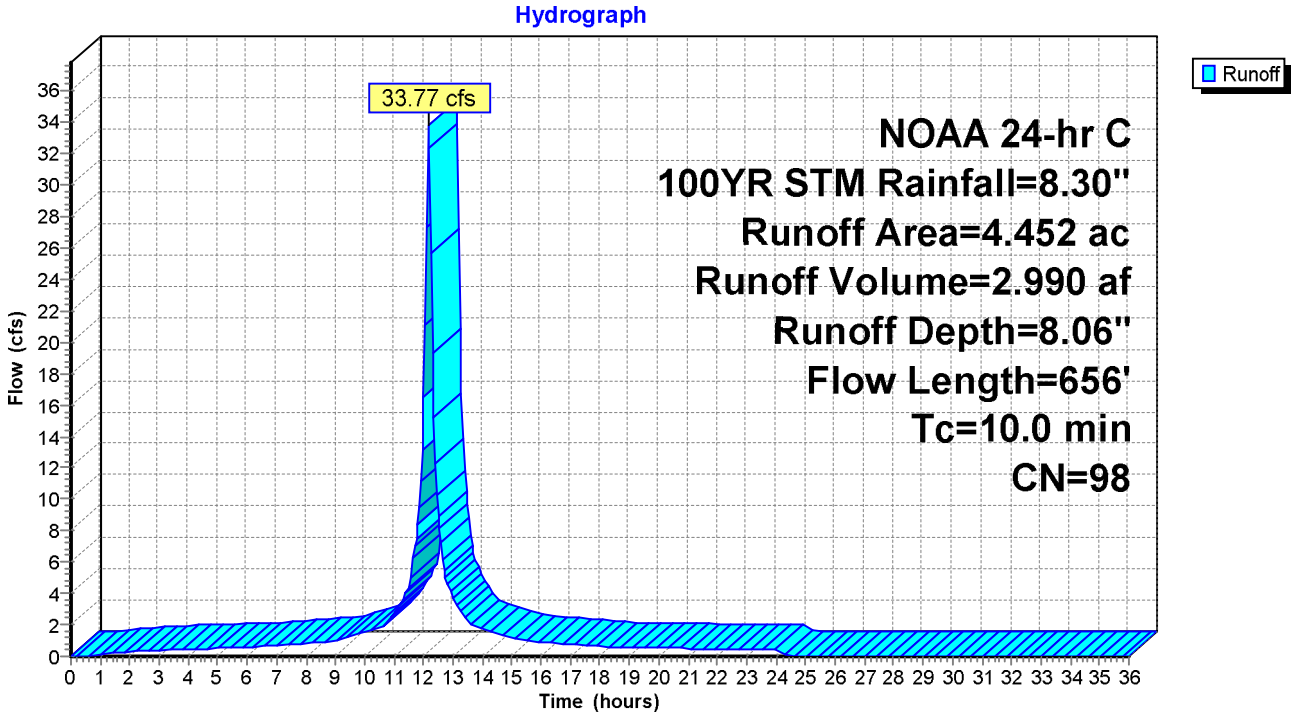
Runoff = 33.77 cfs @ 12.17 hrs, Volume= 2.990 af, Depth= 8.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100YR STM Rainfall=8.30"

Area (ac)	CN	Description
4.452	98	Paved parking & roofs
4.452		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	150	0.0267	1.70		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 3.30"
1.7	238	0.0137	2.38		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
0.2	154	0.0330	12.76	22.55	**Pipe Channel, Circulat Channel (pipe)** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.9	114	0.0021	2.14	6.74	**Pipe Channel, Circular Channel (pipe)** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.020 Corrugated PE, corrugated interior
5.7					**Direct Entry, To make it 10 minutes**
10.0	656	Total			

Subcatchment 1S: Existing Impervious



Summary for Subcatchment 2S: Existing Pervious

[47] Hint: Peak is 498% of capacity of segment #2
[47] Hint: Peak is 221% of capacity of segment #3
[47] Hint: Peak is 190% of capacity of segment #4

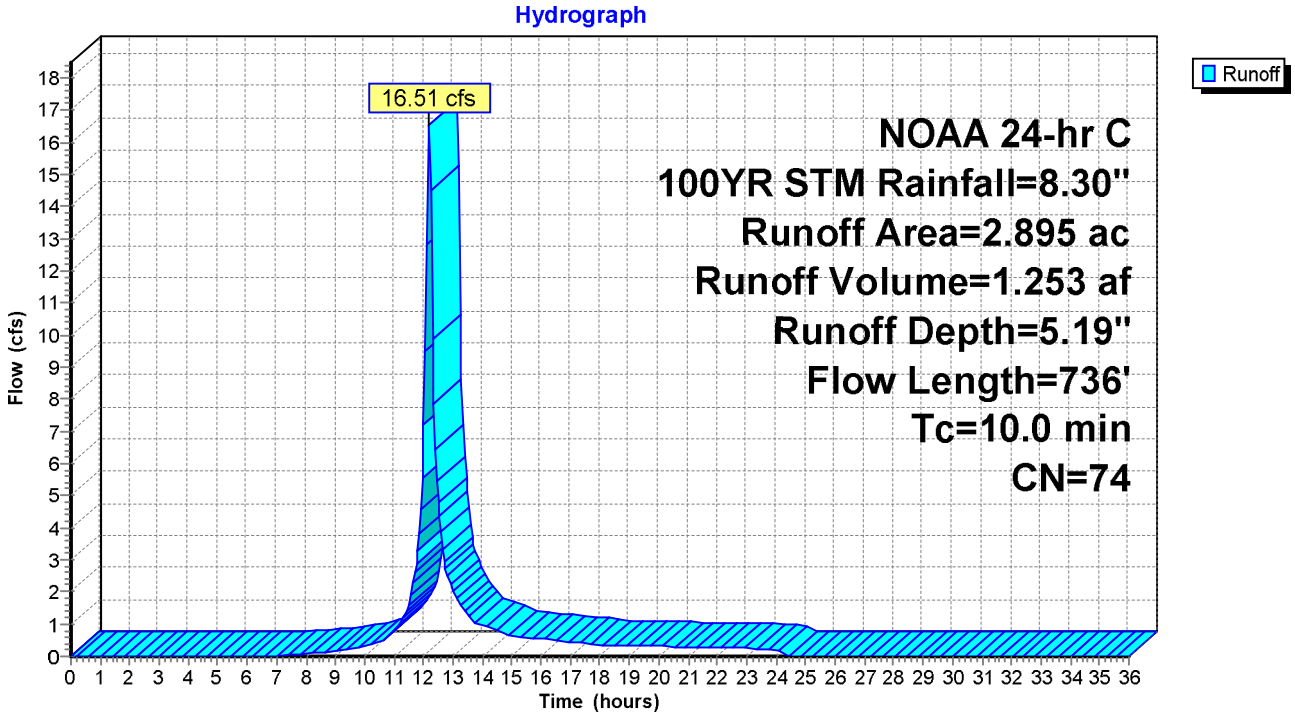
Runoff = 16.51 cfs @ 12.17 hrs, Volume= 1.253 af, Depth= 5.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100YR STM Rainfall=8.30"

Area (ac)	CN	Description
2.895	74	>75% Grass cover, Good, HSG C
2.895		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	24	0.0101	0.10		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.30"
0.1	34	0.0062	4.22	3.32	**Pipe Channel, Pipe** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.7	266	0.0096	6.10	7.48	**Pipe Channel, Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
0.6	94	0.0035	2.77	8.70	**Pipe Channel, Pipe** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.020 Corrugated PE, corrugated interior
3.3	200		1.00		**Direct Entry, Grass Shallow Concentrated Flow**
0.8	118		2.60		**Direct Entry, Gutter Shallow Concentrated Flow**
0.5					**Direct Entry, To make 10 minutes**
10.0	736	Total			

Subcatchment 2S: Existing Pervious

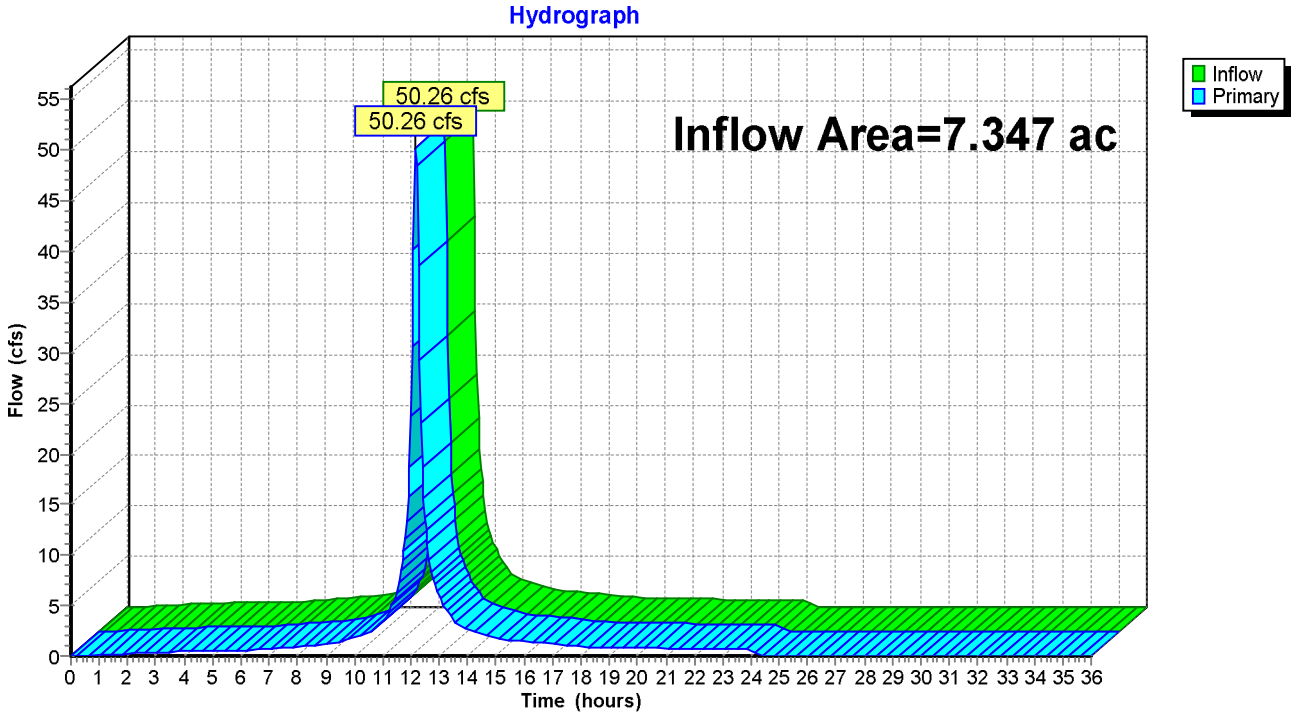


Summary for Link 3L: Total Existing Condition

Inflow Area = 7.347 ac, 60.60% Impervious, Inflow Depth = 6.93" for 100YR STM event
Inflow = 50.26 cfs @ 12.17 hrs, Volume= 4.244 af
Primary = 50.26 cfs @ 12.17 hrs, Volume= 4.244 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link 3L: Total Existing Condition



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Impervious Runoff Area=4.452 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=656' Tc=10.0 min CN=98 Runoff=11.47 cfs 0.384 af

Subcatchment 2S: Existing Pervious Runoff Area=2.895 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=736' Tc=10.0 min CN=74 Runoff=0.38 cfs 0.018 af

Link 3L: Total Existing Condition Inflow=11.63 cfs 0.402 af
Primary=11.63 cfs 0.402 af

Total Runoff Area = 7.347 ac Runoff Volume = 0.402 af Average Runoff Depth = 0.66"
39.40% Pervious = 2.895 ac 60.60% Impervious = 4.452 ac

Summary for Subcatchment 1S: Existing Impervious

[47] Hint: Peak is 170% of capacity of segment #4

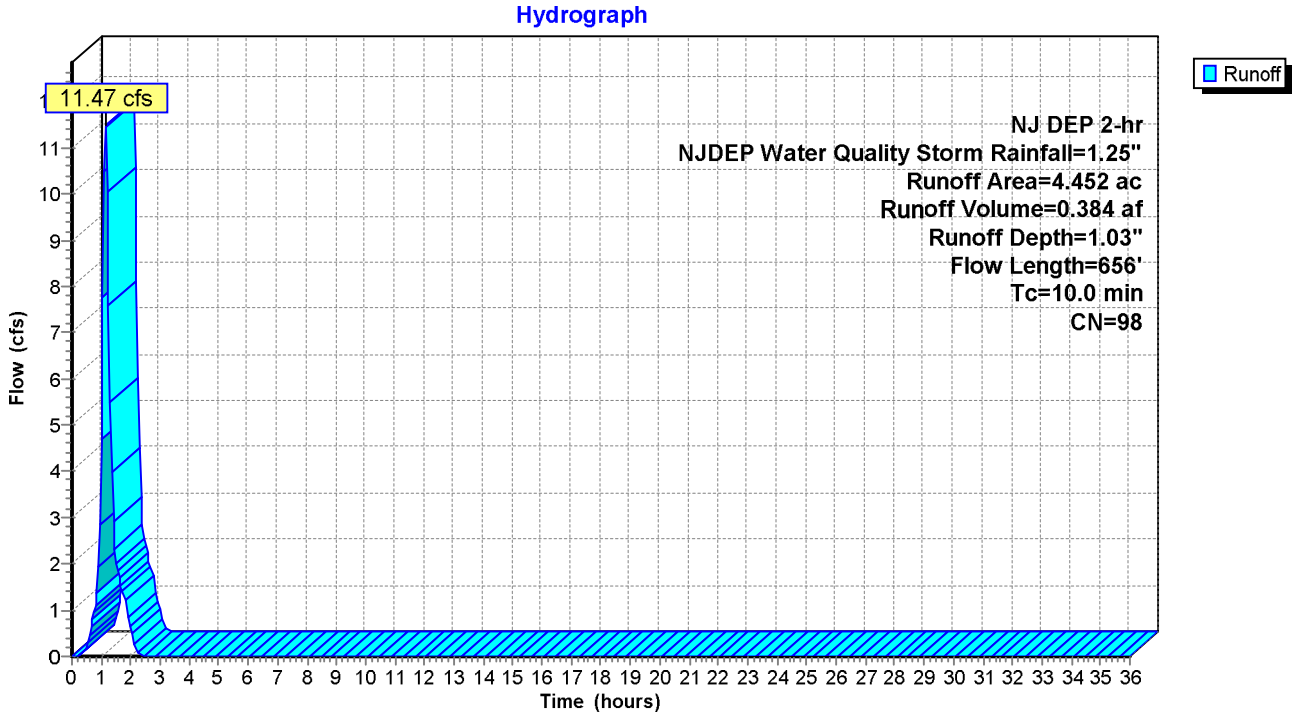
Runoff = 11.47 cfs @ 1.15 hrs, Volume= 0.384 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP Water Quality Storm Rainfall=1.25"

Area (ac)	CN	Description
4.452	98	Paved parking & roofs
4.452		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	150	0.0267	1.70		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 3.30"
1.7	238	0.0137	2.38		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
0.2	154	0.0330	12.76	22.55	**Pipe Channel, Circulat Channel (pipe)** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.9	114	0.0021	2.14	6.74	**Pipe Channel, Circular Channel (pipe)** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.020 Corrugated PE, corrugated interior
5.7					**Direct Entry, To make it 10 minutes**
10.0	656	Total			

Subcatchment 1S: Existing Impervious



Summary for Subcatchment 2S: Existing Pervious

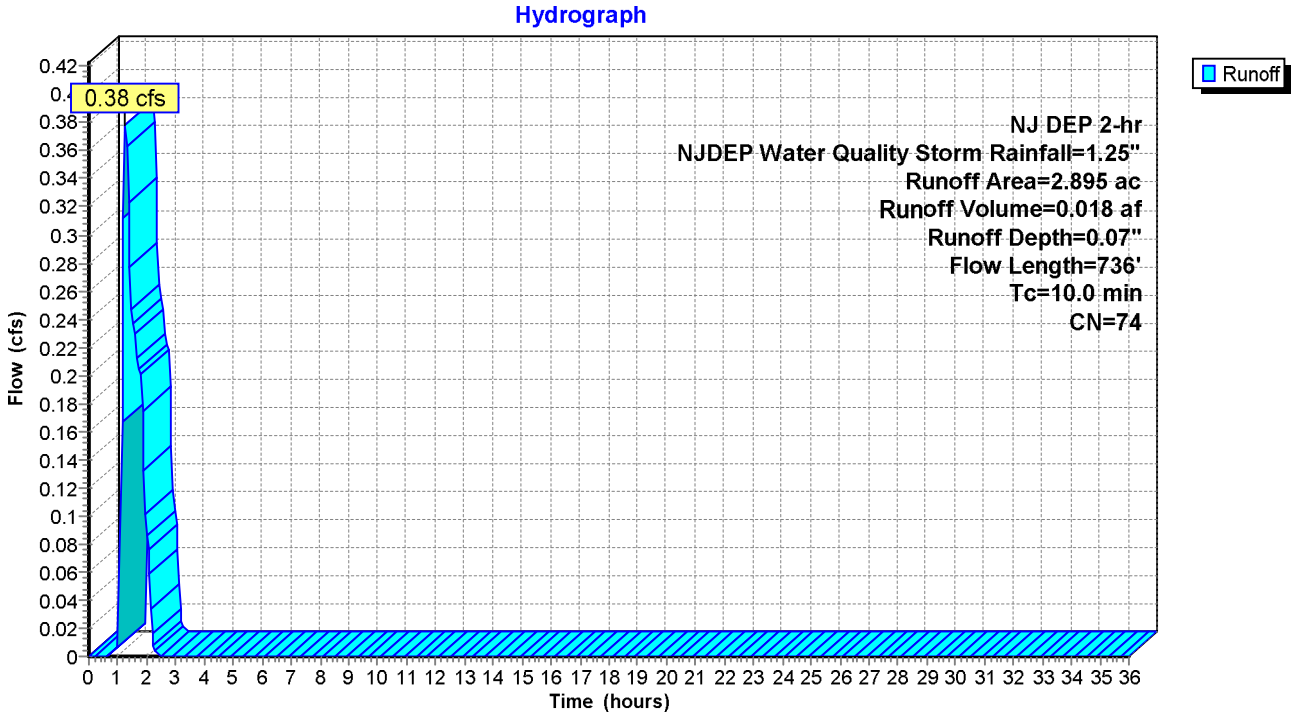
Runoff = 0.38 cfs @ 1.27 hrs, Volume= 0.018 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP Water Quality Storm Rainfall=1.25"

Area (ac)	CN	Description
2.895	74	>75% Grass cover, Good, HSG C
2.895		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	24	0.0101	0.10		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.30"
0.1	34	0.0062	4.22	3.32	**Pipe Channel, Pipe** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.7	266	0.0096	6.10	7.48	**Pipe Channel, Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
0.6	94	0.0035	2.77	8.70	**Pipe Channel, Pipe** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.020 Corrugated PE, corrugated interior
3.3	200		1.00		**Direct Entry, Grass Shallow Concentrated Flow**
0.8	118		2.60		**Direct Entry, Gutter Shallow Concentrated Flow**
0.5					**Direct Entry, To make 10 minutes**
10.0	736	Total			

Subcatchment 2S: Existing Pervious

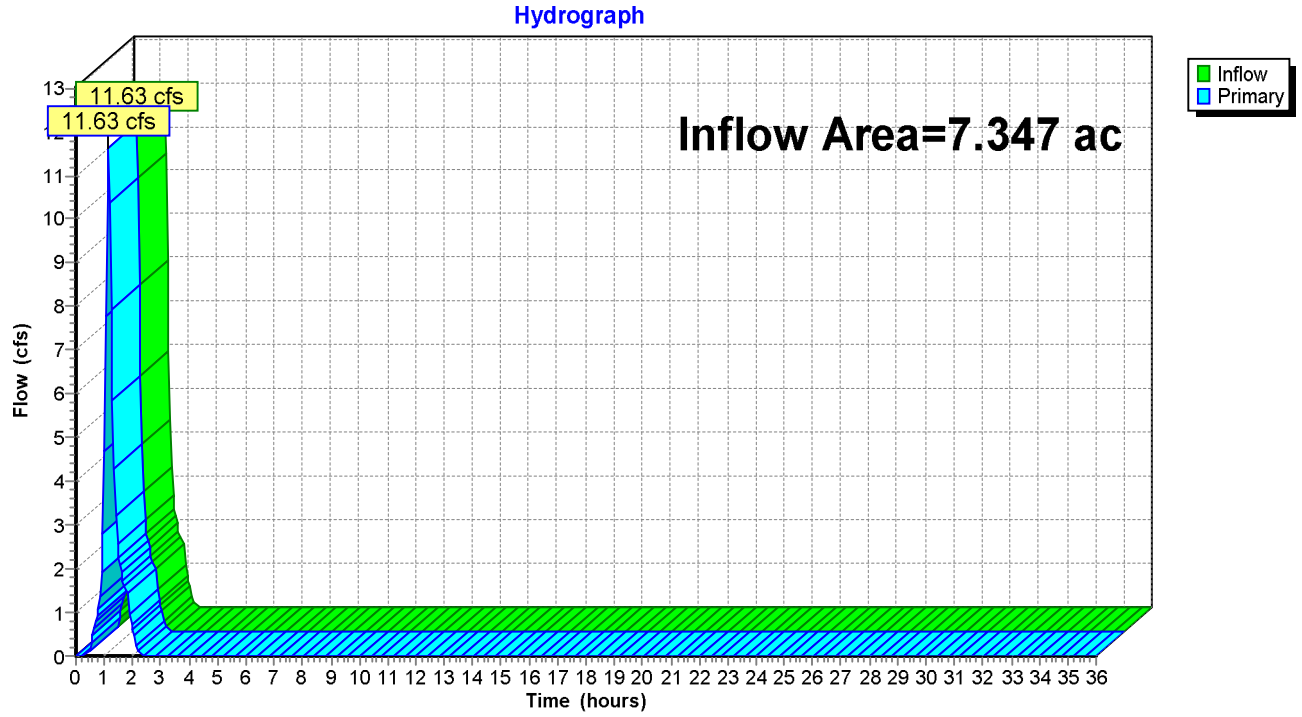


Summary for Link 3L: Total Existing Condition

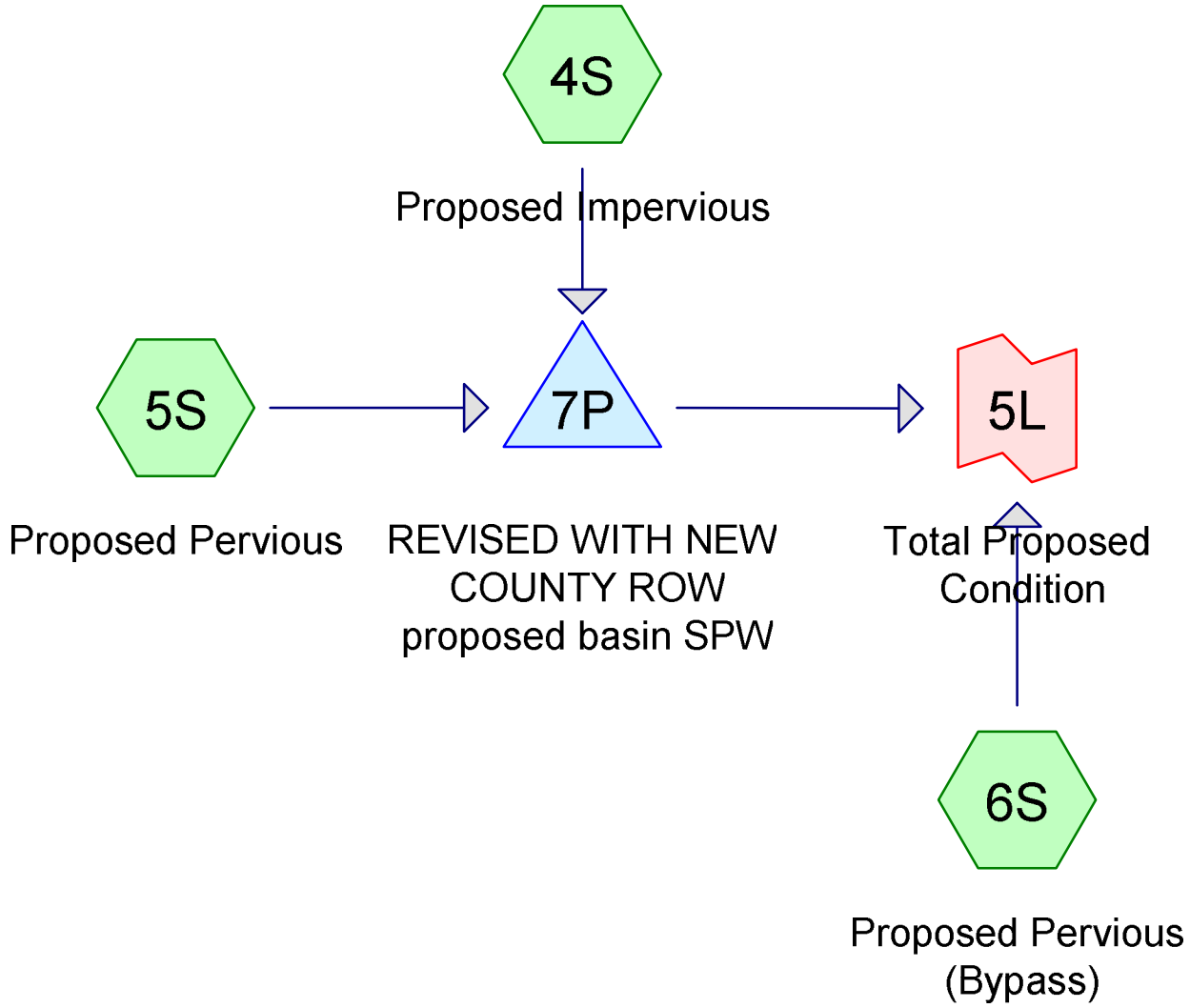
Inflow Area = 7.347 ac, 60.60% Impervious, Inflow Depth = 0.66" for NJDEP Water Quality Storm event
Inflow = 11.63 cfs @ 1.15 hrs, Volume= 0.402 af
Primary = 11.63 cfs @ 1.15 hrs, Volume= 0.402 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link 3L: Total Existing Condition



PROPOSED CONDITION
HYDROGRAPH SUMMARY REPORTS
NJ WATER QUALITY &
2-100 YEAR STORM EVENTS



Subcat Reach Pond Link

Routing Diagram for Stormwater Calcs DRCC Revisions
Prepared by Swalsh, Printed 4/22/2020

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2YR STM	NOAA 24-hr	C	Default	24.00	1	3.30	2
2	10YR STM	NOAA 24-hr	C	Default	24.00	1	5.00	2
3	100YR STM	NOAA 24-hr	C	Default	24.00	1	8.30	2
4	NJDEP Water Quality Storm	NJ DEP 2-hr		Default	2.00	1	1.25	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.375	74	>75% Grass cover, Good, HSG C (5S, 6S)
6.023	98	Paved parking & roofs (4S)
8.398	**91**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
2.375	HSG C	5S, 6S
0.000	HSG D	
6.023	Other	4S
8.398		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	2.375	0.000	0.000	2.375	>75% Grass cover, Good	5S, 6S
0.000	0.000	0.000	0.000	6.023	6.023	Paved parking & roofs	4S
0.000	**0.000**	**2.375**	**0.000**	**6.023**	**8.398**	**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	4S	0.00	0.00	314.0	0.0300	0.011	24.0	0.0	0.0
2	5S	0.00	0.00	163.0	0.0300	0.011	12.0	0.0	0.0
3	5S	0.00	0.00	105.0	0.0030	0.011	12.0	0.0	0.0
4	5S	0.00	0.00	12.0	0.0030	0.011	12.0	0.0	0.0
5	5S	0.00	0.00	112.0	0.0030	0.011	12.0	0.0	0.0
6	5S	0.00	0.00	73.0	0.0030	0.011	12.0	0.0	0.0
7	5S	0.00	0.00	51.0	0.0030	0.011	12.0	0.0	0.0
8	6S	0.00	0.00	50.0	0.0100	0.011	12.0	0.0	0.0

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 4S: Proposed Impervious Runoff Area=6.023 ac 100.00% Impervious Runoff Depth=3.07"
Flow Length=673' Tc=10.0 min CN=98 Runoff=17.98 cfs 1.539 af

Subcatchment 5S: Proposed Pervious Runoff Area=2.200 ac 0.00% Impervious Runoff Depth=1.10"
Flow Length=666' Tc=10.0 min CN=74 Runoff=2.61 cfs 0.202 af

Subcatchment 6S: Proposed Pervious (Bypass) Runoff Area=0.175 ac 0.00% Impervious Runoff Depth=1.10"
Flow Length=134' Tc=8.0 min CN=74 Runoff=0.23 cfs 0.016 af

Pond 7P: REVISED WITH NEW COUNTY ROW Peak Elev=94.93' Storage=41,307 cf Inflow=20.56 cfs 1.742 af
Outflow=4.91 cfs 1.208 af

Link 5L: Total Proposed Condition Inflow=4.97 cfs 1.224 af
Primary=4.97 cfs 1.224 af

Total Runoff Area = 8.398 ac Runoff Volume = 1.758 af Average Runoff Depth = 2.51"
28.28% Pervious = 2.375 ac 71.72% Impervious = 6.023 ac

Summary for Subcatchment 4S: Proposed Impervious

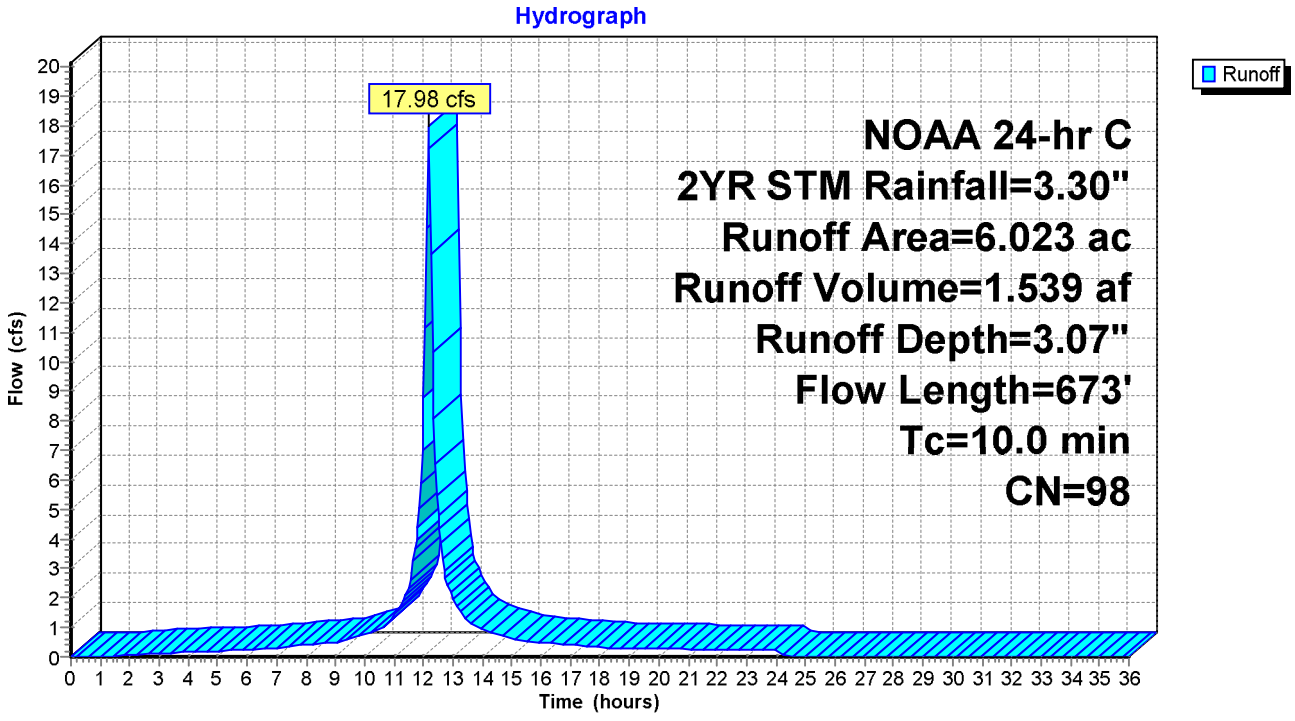
Runoff = 17.98 cfs @ 12.17 hrs, Volume= 1.539 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2YR STM Rainfall=3.30"

Area (ac)	CN	Description
6.023	98	Paved parking & roofs
6.023		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	150	0.0180	1.45		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 3.30"
0.4	314	0.0300	14.74	46.31	**Pipe Channel, Pipe Flow** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
1.7	209		2.00		**Direct Entry, shallow concentrated flow**
6.2					**Direct Entry, To make it to 10 minutes**
10.0	673	Total			

Subcatchment 4S: Proposed Impervious



Summary for Subcatchment 5S: Proposed Pervious

[47] Hint: Peak is 113% of capacity of segment #3
[47] Hint: Peak is 113% of capacity of segment #4
[47] Hint: Peak is 113% of capacity of segment #5
[47] Hint: Peak is 113% of capacity of segment #6
[47] Hint: Peak is 113% of capacity of segment #7

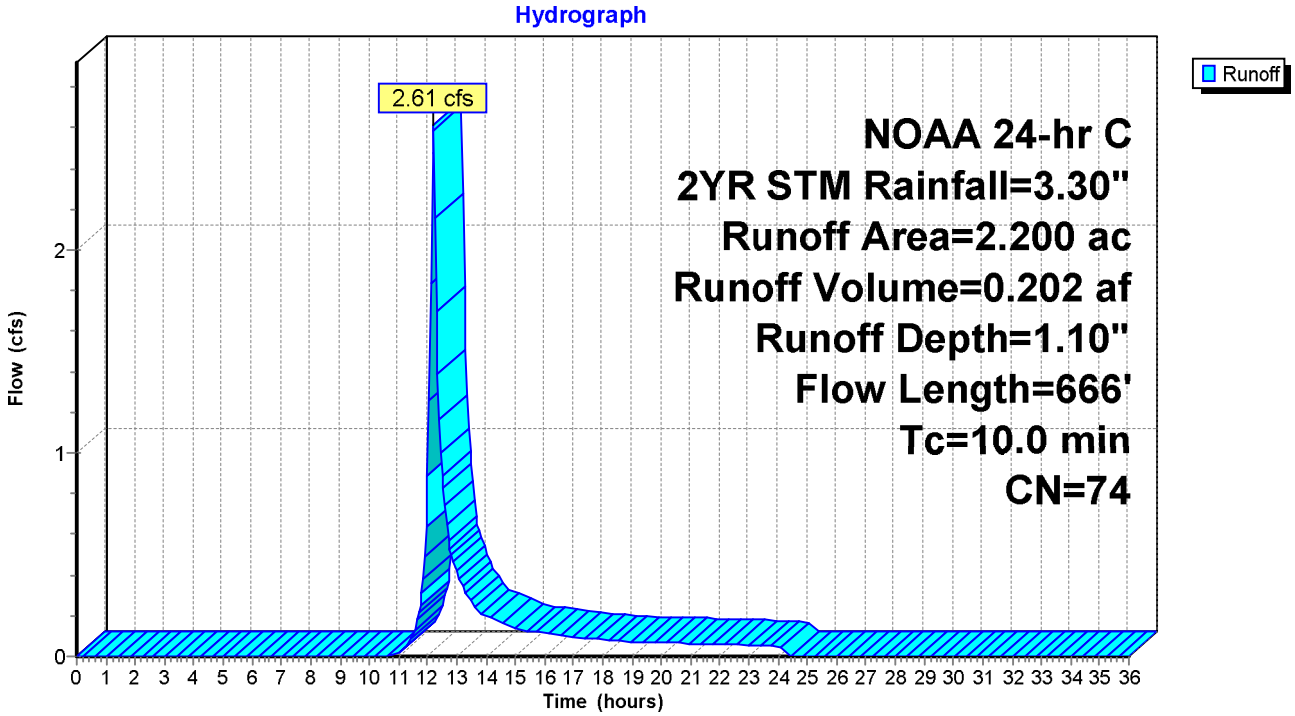
Runoff = 2.61 cfs @ 12.19 hrs, Volume= 0.202 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2YR STM Rainfall=3.30"

Area (ac)	CN	Description
2.200	74	>75% Grass cover, Good, HSG C
2.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	41	0.0292	0.17		**Sheet Flow, Sheet FLow** Grass: Short n= 0.150 P2= 3.30"
0.3	163	0.0300	9.29	7.29	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.6	105	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.1	12	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.6	112	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.4	73	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.3	51	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
1.5	109		1.20		**Direct Entry, Grass Shallow Concentrated Flow**
2.1					**Direct Entry, To make it to 10 minutes**
10.0	666	Total			

Subcatchment 5S: Proposed Pervious



Summary for Subcatchment 6S: Proposed Pervious (Bypass)

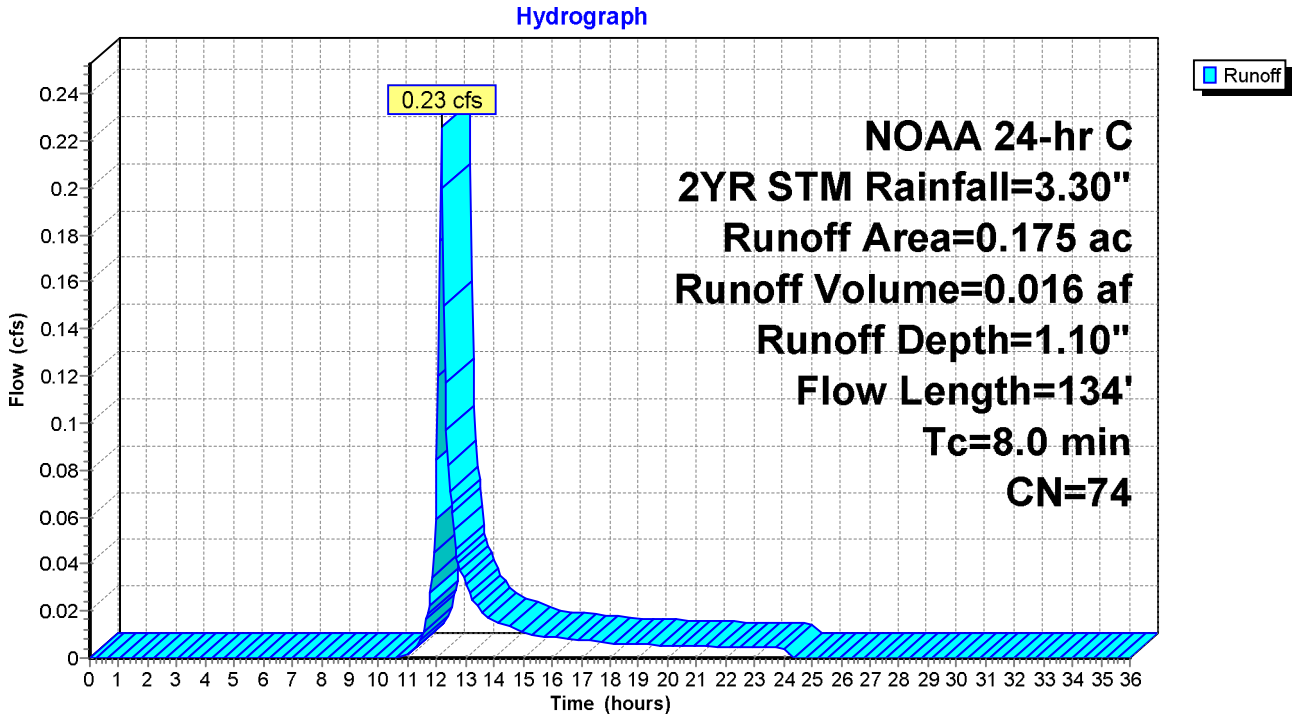
Runoff = 0.23 cfs @ 12.16 hrs, Volume= 0.016 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2YR STM Rainfall=3.30"

Area (ac)	CN	Description
0.175	74	>75% Grass cover, Good, HSG C
0.175		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	84	0.0238	0.18		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.30"
0.2	50	0.0100	5.36	4.21	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
8.0	134	Total			

Subcatchment 6S: Proposed Pervious (Bypass)



Summary for Pond 7P: REVISED WITH NEW COUNTY ROW proposed basin SPW

Inflow Area = 8.223 ac, 73.25% Impervious, Inflow Depth = 2.54" for 2YR STM event
Inflow = 20.56 cfs @ 12.17 hrs, Volume= 1.742 af
Outflow = 4.91 cfs @ 12.57 hrs, Volume= 1.208 af, Atten= 76%, Lag= 24.1 min
Primary = 4.91 cfs @ 12.57 hrs, Volume= 1.208 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 94.93' @ 12.57 hrs Surf.Area= 18,761 sf Storage= 41,307 cf

Plug-Flow detention time= 254.3 min calculated for 1.208 af (69% of inflow)
Center-of-Mass det. time= 154.6 min (927.6 - 773.0)

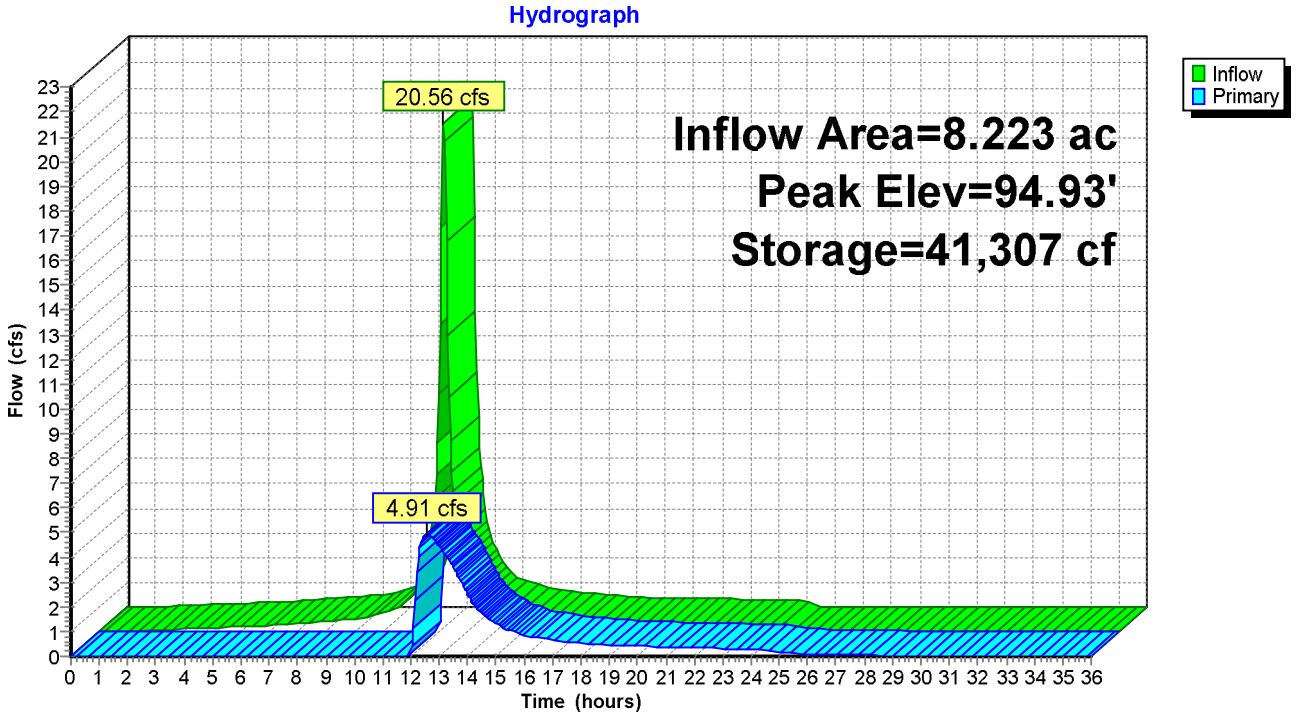
Volume	Invert	Avail.Storage	Storage Description
#1	92.70'	222,466 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.70	18,219	0	0
93.00	18,336	5,483	5,483
94.00	18,576	18,456	23,939
95.00	18,775	18,676	42,615
96.00	21,216	19,996	62,610
97.00	24,095	22,656	85,266
98.00	27,044	25,570	110,835
99.00	30,100	28,572	139,407
100.00	33,263	31,682	171,089
101.00	69,492	51,378	222,466

Device	Routing	Invert	Outlet Devices
#1	Primary	93.96'	**29.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	100.00'	**21.0' long x 28.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Primary	97.70'	**48.0" x 48.0" Horiz. Top of Box** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.91 cfs @ 12.57 hrs HW=94.93' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 4.91 cfs @ 4.06 fps)
- **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **3=Top of Box** (Controls 0.00 cfs)

Pond 7P: REVISED WITH NEW COUNTY ROW proposed basin SPW

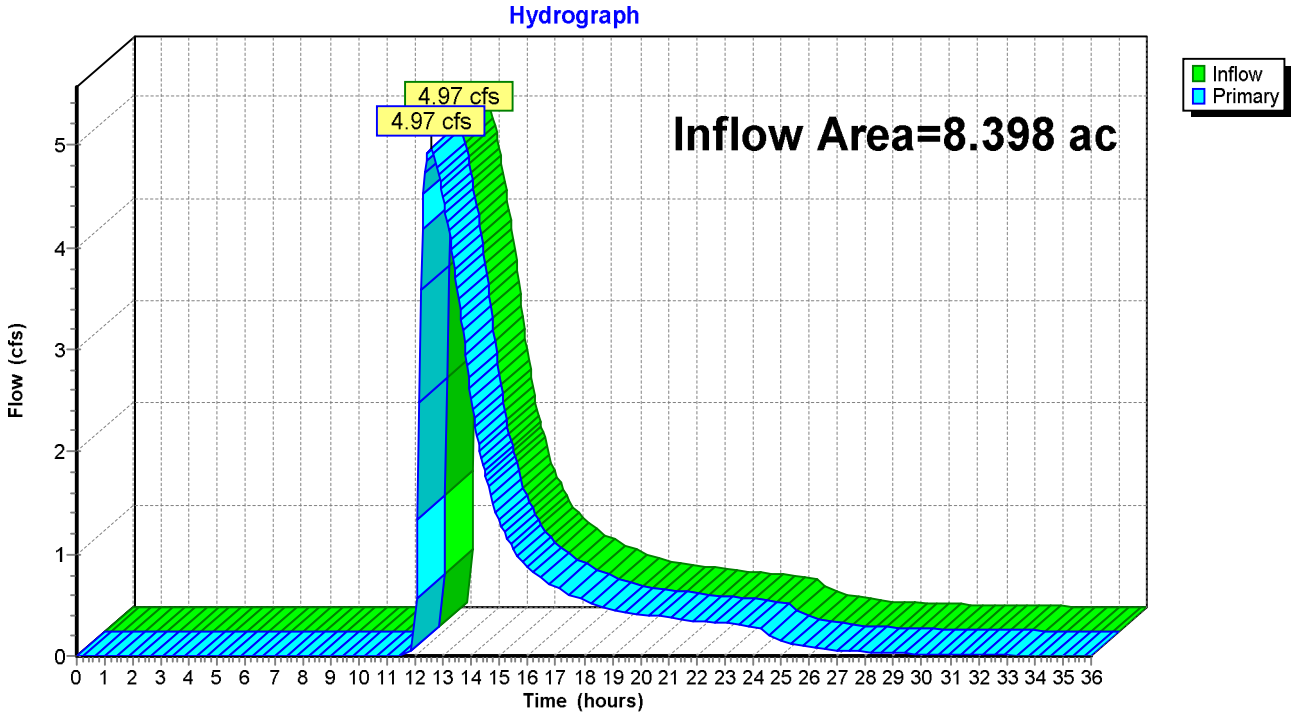


Summary for Link 5L: Total Proposed Condition

Inflow Area = 8.398 ac, 71.72% Impervious, Inflow Depth > 1.75" for 2YR STM event
Inflow = 4.97 cfs @ 12.56 hrs, Volume= 1.224 af
Primary = 4.97 cfs @ 12.56 hrs, Volume= 1.224 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link 5L: Total Proposed Condition



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 4S: Proposed Impervious Runoff Area=6.023 ac 100.00% Impervious Runoff Depth=4.76"
Flow Length=673' Tc=10.0 min CN=98 Runoff=27.42 cfs 2.391 af

Subcatchment 5S: Proposed Pervious Runoff Area=2.200 ac 0.00% Impervious Runoff Depth=2.36"
Flow Length=666' Tc=10.0 min CN=74 Runoff=5.74 cfs 0.433 af

Subcatchment 6S: Proposed Pervious (Bypass) Runoff Area=0.175 ac 0.00% Impervious Runoff Depth=2.36"
Flow Length=134' Tc=8.0 min CN=74 Runoff=0.50 cfs 0.034 af

Pond 7P: REVISED WITH NEW COUNTY ROW Peak Elev=95.98' Storage=62,261 cf Inflow=33.16 cfs 2.824 af
Outflow=7.74 cfs 2.290 af

Link 5L: Total Proposed Condition Inflow=7.86 cfs 2.325 af
Primary=7.86 cfs 2.325 af

Total Runoff Area = 8.398 ac Runoff Volume = 2.859 af Average Runoff Depth = 4.08"
28.28% Pervious = 2.375 ac 71.72% Impervious = 6.023 ac

Summary for Subcatchment 4S: Proposed Impervious

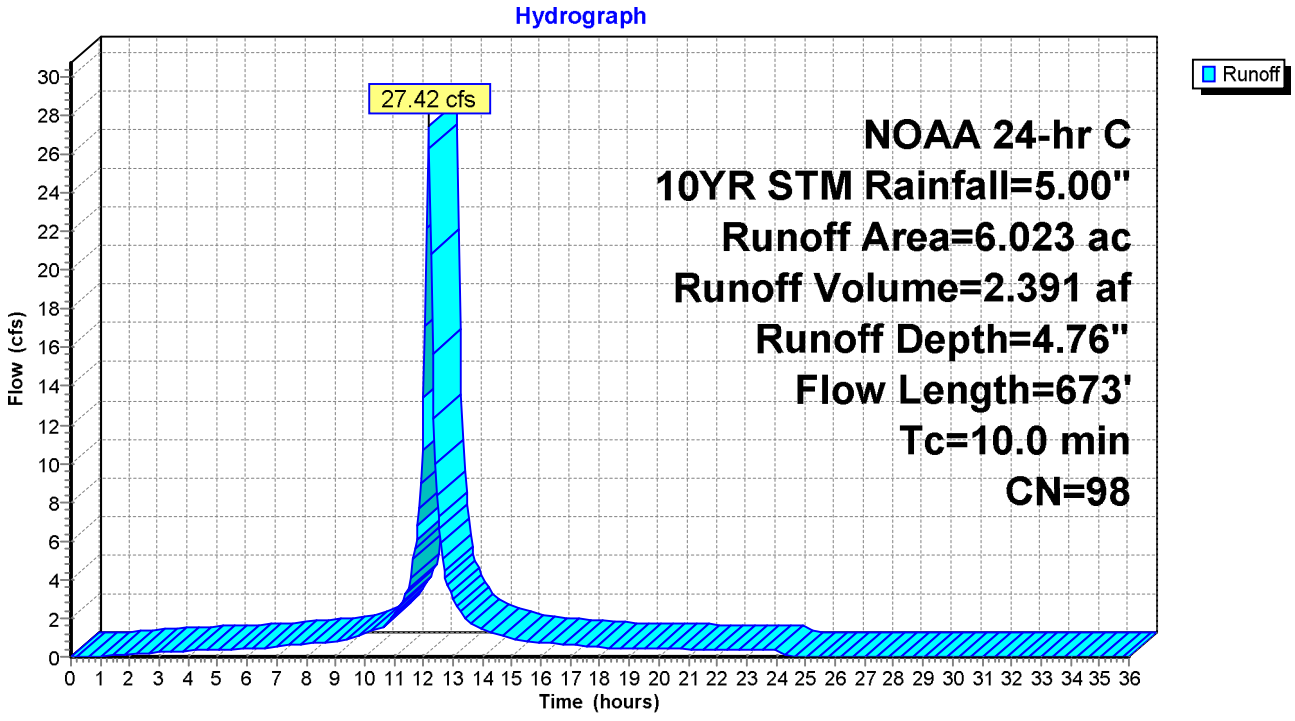
Runoff = 27.42 cfs @ 12.17 hrs, Volume= 2.391 af, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10YR STM Rainfall=5.00"

Area (ac)	CN	Description
6.023	98	Paved parking & roofs
6.023		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	150	0.0180	1.45		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 3.30"
0.4	314	0.0300	14.74	46.31	**Pipe Channel, Pipe Flow** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
1.7	209		2.00		**Direct Entry, shallow concentrated flow**
6.2					**Direct Entry, To make it to 10 minutes**
10.0	673	Total			

Subcatchment 4S: Proposed Impervious



Summary for Subcatchment 5S: Proposed Pervious

[47] Hint: Peak is 249% of capacity of segment #3
[47] Hint: Peak is 249% of capacity of segment #4
[47] Hint: Peak is 249% of capacity of segment #5
[47] Hint: Peak is 249% of capacity of segment #6
[47] Hint: Peak is 249% of capacity of segment #7

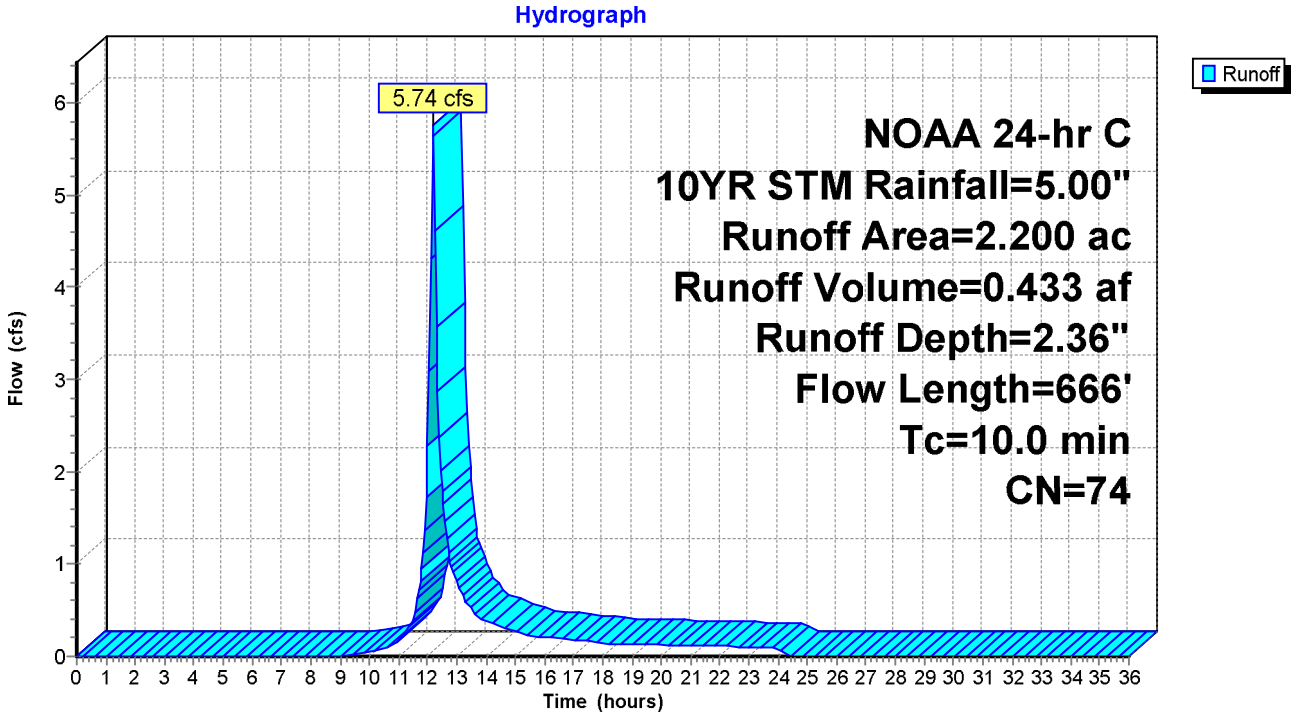
Runoff = 5.74 cfs @ 12.18 hrs, Volume= 0.433 af, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10YR STM Rainfall=5.00"

Area (ac)	CN	Description
2.200	74	>75% Grass cover, Good, HSG C
2.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	41	0.0292	0.17		**Sheet Flow, Sheet FLow** Grass: Short n= 0.150 P2= 3.30"
0.3	163	0.0300	9.29	7.29	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.6	105	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.1	12	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.6	112	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.4	73	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.3	51	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
1.5	109		1.20		**Direct Entry, Grass Shallow Concentrated Flow**
2.1					**Direct Entry, To make it to 10 minutes**
10.0	666	Total			

Subcatchment 5S: Proposed Pervious



Summary for Subcatchment 6S: Proposed Pervious (Bypass)

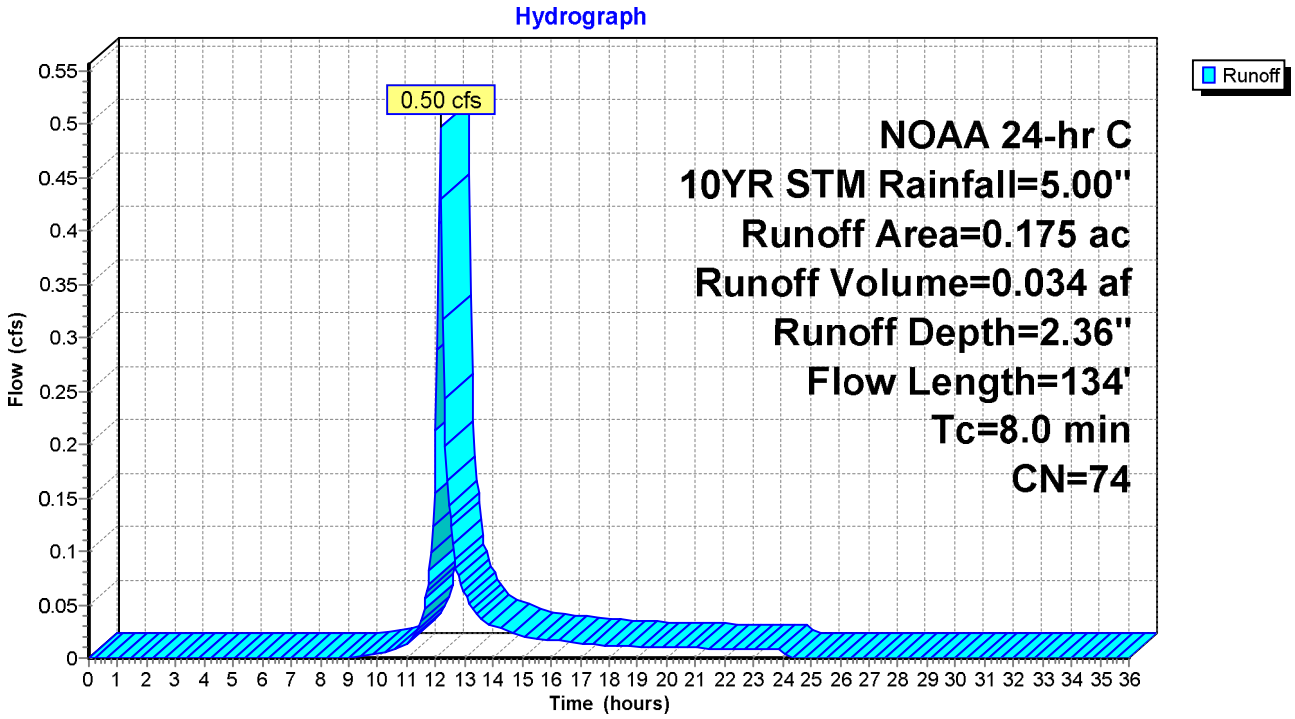
Runoff = 0.50 cfs @ 12.15 hrs, Volume= 0.034 af, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10YR STM Rainfall=5.00"

Area (ac)	CN	Description
0.175	74	>75% Grass cover, Good, HSG C
0.175		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	84	0.0238	0.18		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.30"
0.2	50	0.0100	5.36	4.21	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
8.0	134	Total			

Subcatchment 6S: Proposed Pervious (Bypass)



Summary for Pond 7P: REVISED WITH NEW COUNTY ROW proposed basin SPW

Inflow Area = 8.223 ac, 73.25% Impervious, Inflow Depth = 4.12" for 10YR STM event
Inflow = 33.16 cfs @ 12.17 hrs, Volume= 2.824 af
Outflow = 7.74 cfs @ 12.58 hrs, Volume= 2.290 af, Atten= 77%, Lag= 24.5 min
Primary = 7.74 cfs @ 12.58 hrs, Volume= 2.290 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 95.98' @ 12.58 hrs Surf.Area= 21,176 sf Storage= 62,261 cf

Plug-Flow detention time= 214.8 min calculated for 2.287 af (81% of inflow)
Center-of-Mass det. time= 137.3 min (904.0 - 766.7)

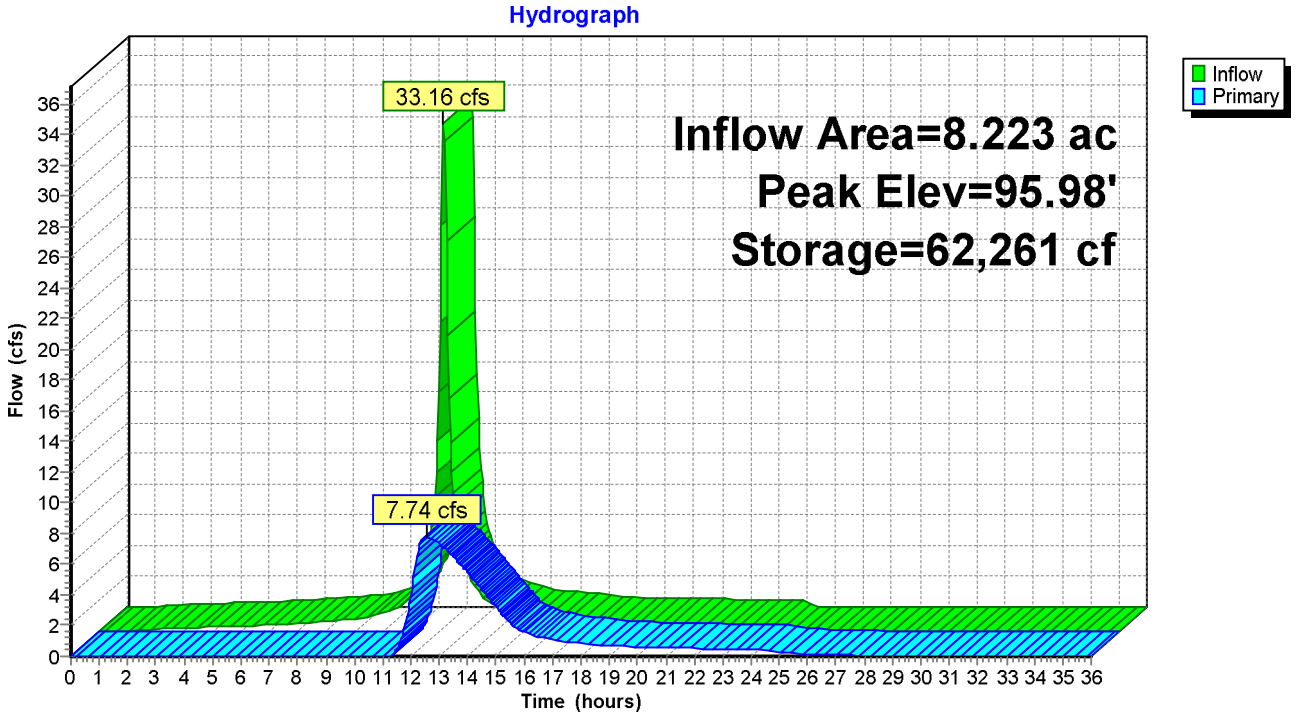
Volume	Invert	Avail.Storage	Storage Description
#1	92.70'	222,466 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.70	18,219	0	0
93.00	18,336	5,483	5,483
94.00	18,576	18,456	23,939
95.00	18,775	18,676	42,615
96.00	21,216	19,996	62,610
97.00	24,095	22,656	85,266
98.00	27,044	25,570	110,835
99.00	30,100	28,572	139,407
100.00	33,263	31,682	171,089
101.00	69,492	51,378	222,466

Device	Routing	Invert	Outlet Devices
#1	Primary	93.96'	**29.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	100.00'	**21.0' long x 28.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Primary	97.70'	**48.0" x 48.0" Horiz. Top of Box** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.74 cfs @ 12.58 hrs HW=95.98' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 7.74 cfs @ 6.41 fps)
- **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **3=Top of Box** (Controls 0.00 cfs)

Pond 7P: REVISED WITH NEW COUNTY ROW proposed basin SPW

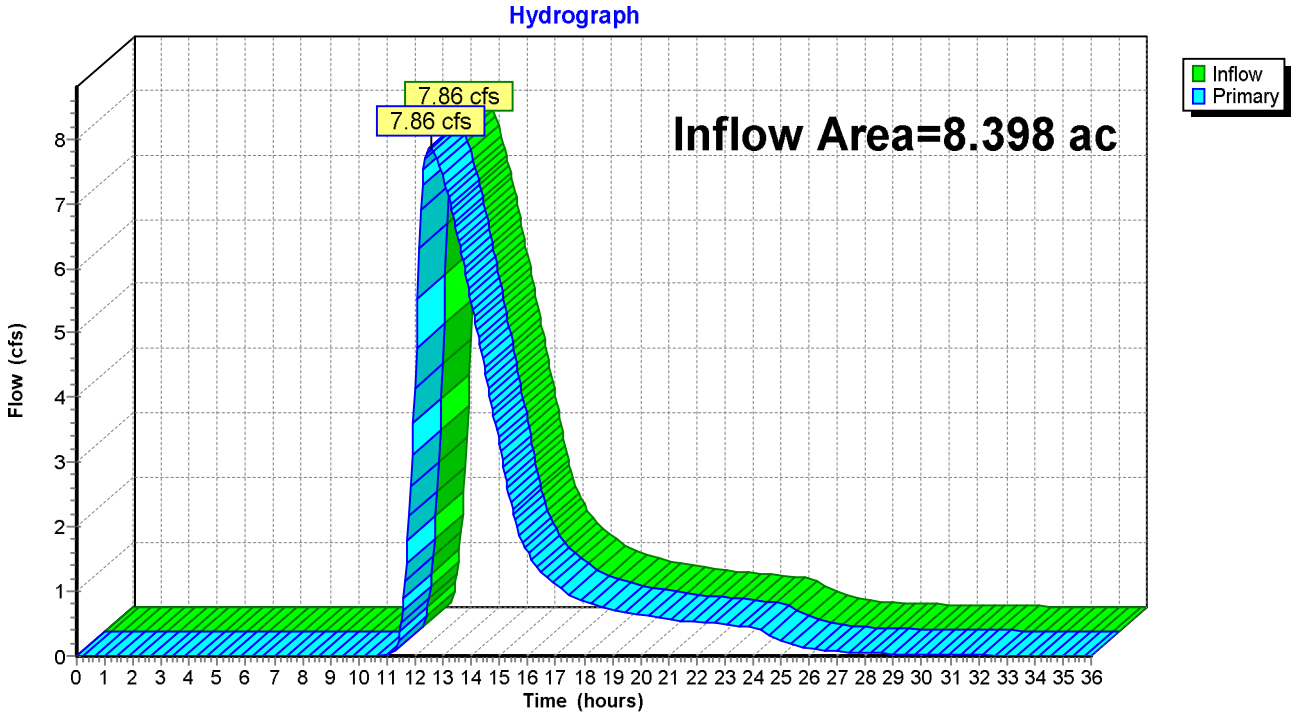


Summary for Link 5L: Total Proposed Condition

Inflow Area = 8.398 ac, 71.72% Impervious, Inflow Depth > 3.32" for 10YR STM event
Inflow = 7.86 cfs @ 12.54 hrs, Volume= 2.325 af
Primary = 7.86 cfs @ 12.54 hrs, Volume= 2.325 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link 5L: Total Proposed Condition



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 4S: Proposed Impervious Runoff Area=6.023 ac 100.00% Impervious Runoff Depth=8.06"
Flow Length=673' Tc=10.0 min CN=98 Runoff=45.68 cfs 4.045 af

Subcatchment 5S: Proposed Pervious Runoff Area=2.200 ac 0.00% Impervious Runoff Depth=5.19"
Flow Length=666' Tc=10.0 min CN=74 Runoff=12.55 cfs 0.952 af

Subcatchment 6S: Proposed Pervious (Bypass) Runoff Area=0.175 ac 0.00% Impervious Runoff Depth=5.19"
Flow Length=134' Tc=8.0 min CN=74 Runoff=1.08 cfs 0.076 af

Pond 7P: REVISED WITH NEW COUNTY ROW Peak Elev=97.67' Storage=102,171 cf Inflow=58.22 cfs 4.998 af
Outflow=10.83 cfs 4.464 af

Link 5L: Total Proposed Condition Inflow=11.04 cfs 4.540 af
Primary=11.04 cfs 4.540 af

Total Runoff Area = 8.398 ac Runoff Volume = 5.074 af Average Runoff Depth = 7.25"
28.28% Pervious = 2.375 ac 71.72% Impervious = 6.023 ac

Summary for Subcatchment 4S: Proposed Impervious

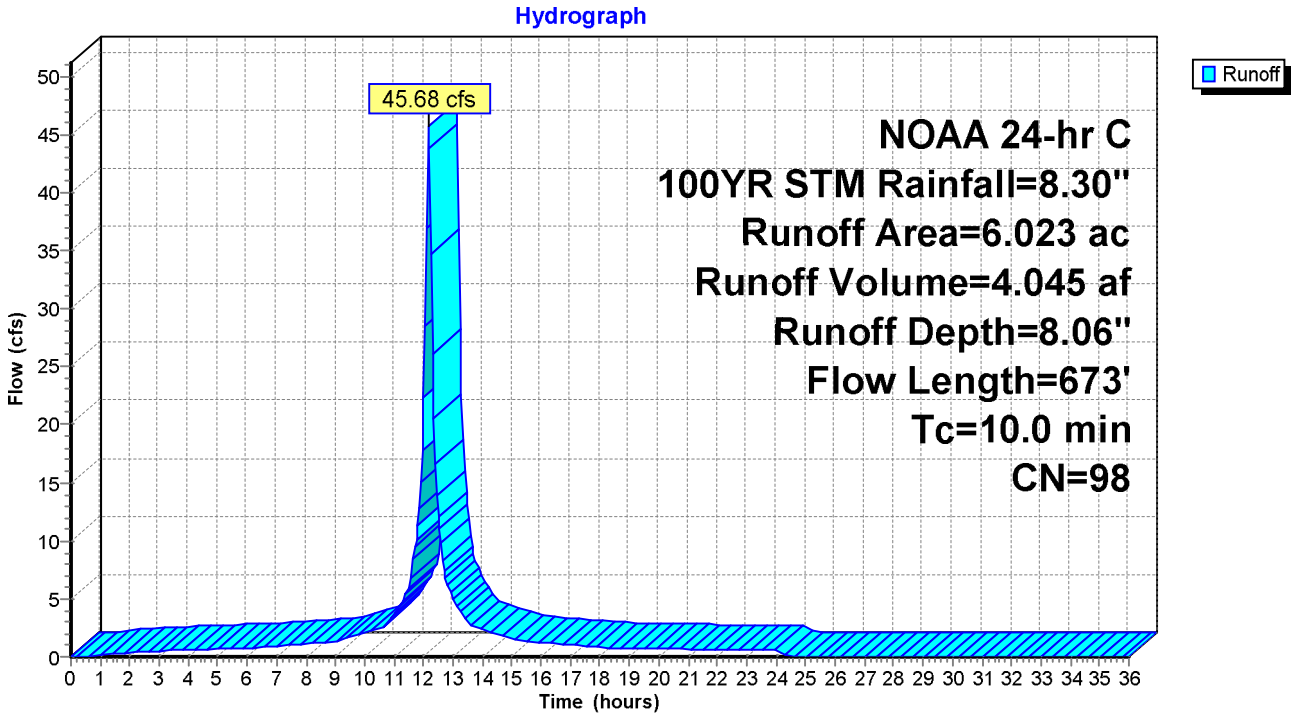
Runoff = 45.68 cfs @ 12.17 hrs, Volume= 4.045 af, Depth= 8.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100YR STM Rainfall=8.30"

Area (ac)	CN	Description
6.023	98	Paved parking & roofs
6.023		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	150	0.0180	1.45		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 3.30"
0.4	314	0.0300	14.74	46.31	**Pipe Channel, Pipe Flow** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
1.7	209		2.00		**Direct Entry, shallow concentrated flow**
6.2					**Direct Entry, To make it to 10 minutes**
10.0	673	Total			

Subcatchment 4S: Proposed Impervious



Summary for Subcatchment 5S: Proposed Pervious

[47] Hint: Peak is 172% of capacity of segment #2
[47] Hint: Peak is 544% of capacity of segment #3
[47] Hint: Peak is 544% of capacity of segment #4
[47] Hint: Peak is 544% of capacity of segment #5
[47] Hint: Peak is 544% of capacity of segment #6
[47] Hint: Peak is 544% of capacity of segment #7

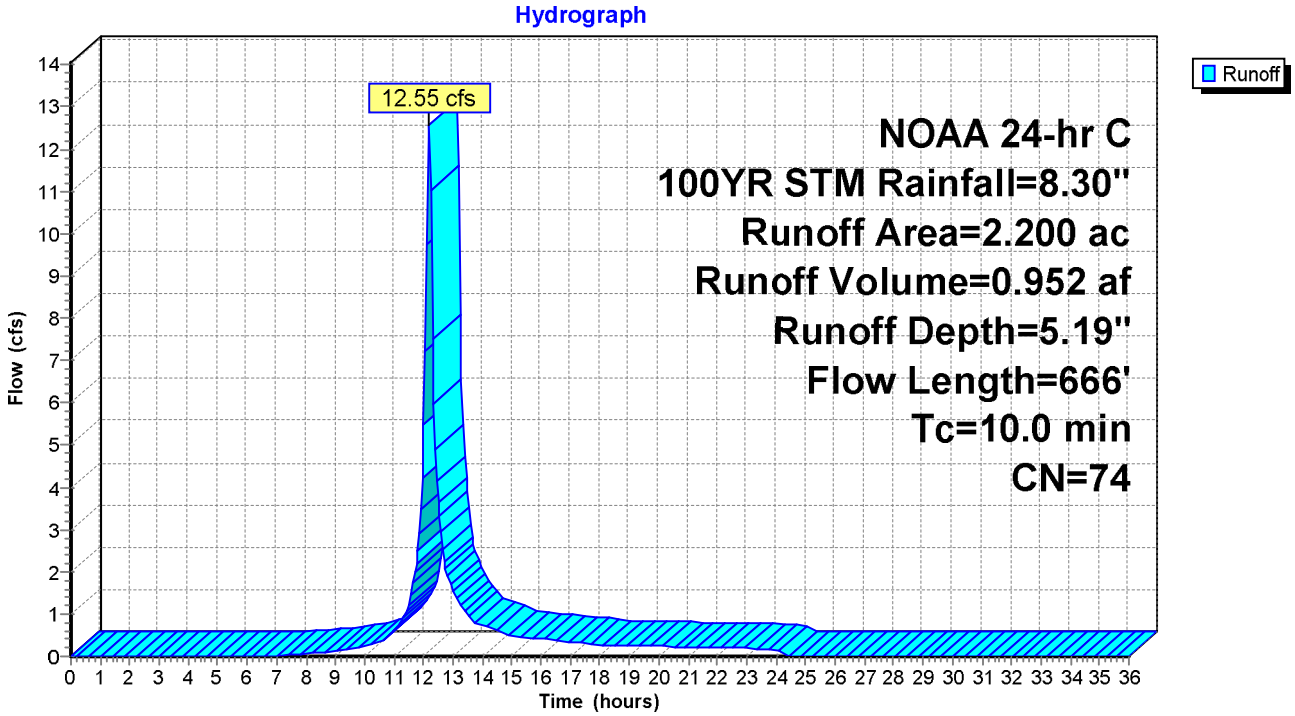
Runoff = 12.55 cfs @ 12.17 hrs, Volume= 0.952 af, Depth= 5.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100YR STM Rainfall=8.30"

Area (ac)	CN	Description
2.200	74	>75% Grass cover, Good, HSG C
2.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	41	0.0292	0.17		**Sheet Flow, Sheet FLow** Grass: Short n= 0.150 P2= 3.30"
0.3	163	0.0300	9.29	7.29	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.6	105	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.1	12	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.6	112	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.4	73	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.3	51	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
1.5	109		1.20		**Direct Entry, Grass Shallow Concentrated Flow**
2.1					**Direct Entry, To make it to 10 minutes**
10.0	666	Total			

Subcatchment 5S: Proposed Pervious



Summary for Subcatchment 6S: Proposed Pervious (Bypass)

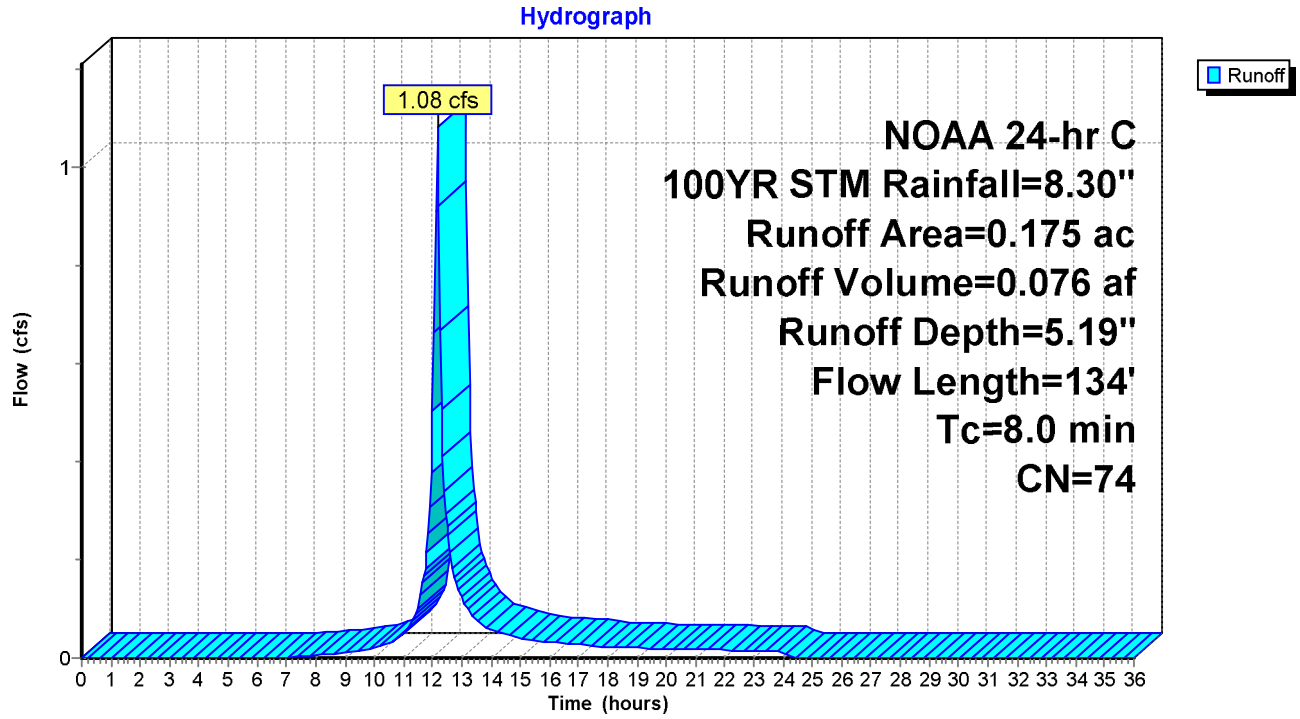
Runoff = 1.08 cfs @ 12.15 hrs, Volume= 0.076 af, Depth= 5.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100YR STM Rainfall=8.30"

Area (ac)	CN	Description
0.175	74	>75% Grass cover, Good, HSG C
0.175		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	84	0.0238	0.18		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.30"
0.2	50	0.0100	5.36	4.21	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
8.0	134	Total			

Subcatchment 6S: Proposed Pervious (Bypass)



Summary for Pond 7P: REVISED WITH NEW COUNTY ROW proposed basin SPW

Inflow Area = 8.223 ac, 73.25% Impervious, Inflow Depth = 7.29" for 100YR STM event
Inflow = 58.22 cfs @ 12.17 hrs, Volume= 4.998 af
Outflow = 10.83 cfs @ 12.66 hrs, Volume= 4.464 af, Atten= 81%, Lag= 29.2 min
Primary = 10.83 cfs @ 12.66 hrs, Volume= 4.464 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 97.67' @ 12.66 hrs Surf.Area= 26,082 sf Storage= 102,171 cf

Plug-Flow detention time= 189.7 min calculated for 4.464 af (89% of inflow)
Center-of-Mass det. time= 134.8 min (894.5 - 759.6)

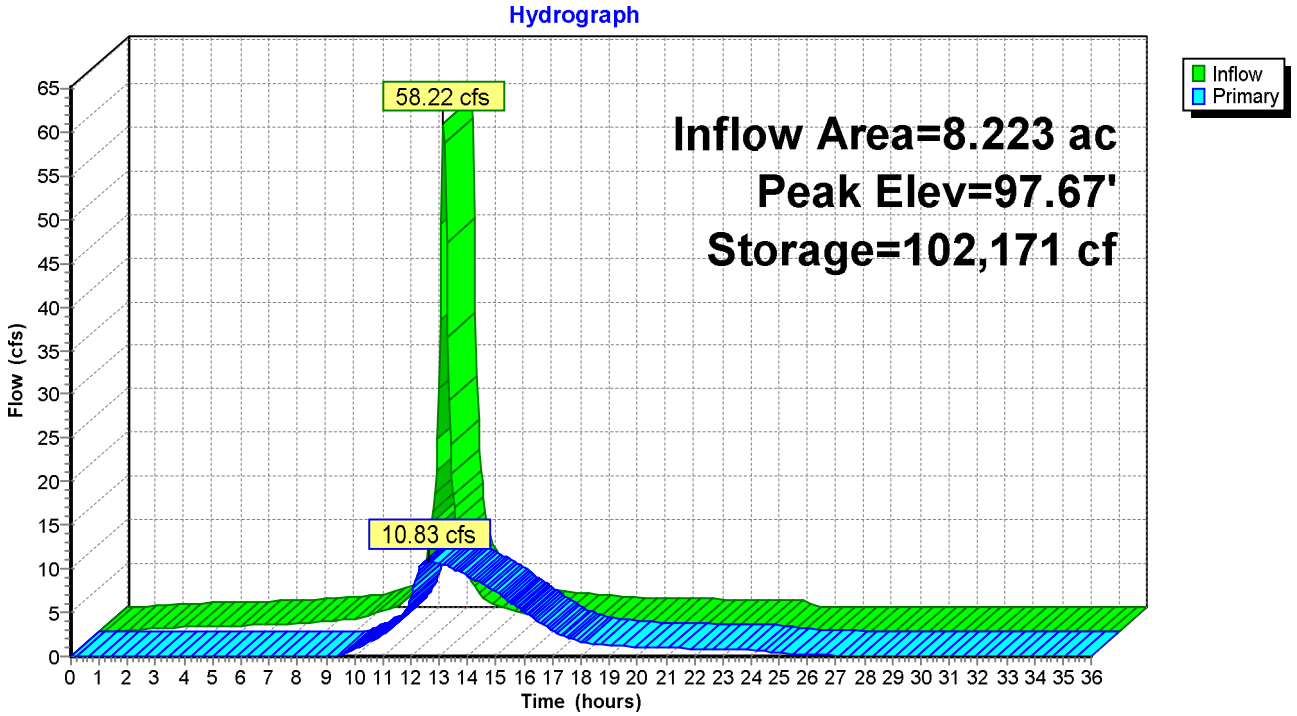
Volume	Invert	Avail.Storage	Storage Description
#1	92.70'	222,466 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.70	18,219	0	0
93.00	18,336	5,483	5,483
94.00	18,576	18,456	23,939
95.00	18,775	18,676	42,615
96.00	21,216	19,996	62,610
97.00	24,095	22,656	85,266
98.00	27,044	25,570	110,835
99.00	30,100	28,572	139,407
100.00	33,263	31,682	171,089
101.00	69,492	51,378	222,466

Device	Routing	Invert	Outlet Devices
#1	Primary	93.96'	**29.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	100.00'	**21.0' long x 28.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Primary	97.70'	**48.0" x 48.0" Horiz. Top of Box** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=10.82 cfs @ 12.66 hrs HW=97.67' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 10.82 cfs @ 8.96 fps)
- **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **3=Top of Box** (Controls 0.00 cfs)

Pond 7P: REVISED WITH NEW COUNTY ROW proposed basin SPW

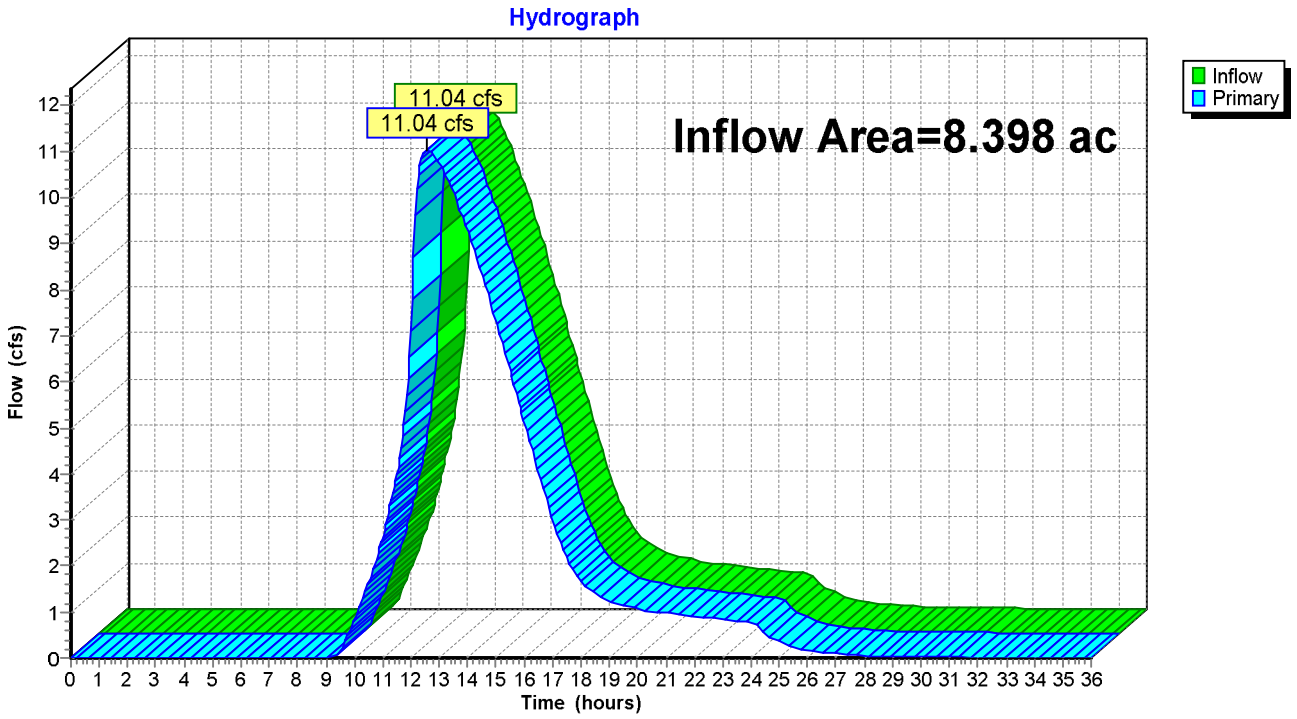


Summary for Link 5L: Total Proposed Condition

Inflow Area = 8.398 ac, 71.72% Impervious, Inflow Depth > 6.49" for 100YR STM event
Inflow = 11.04 cfs @ 12.57 hrs, Volume= 4.540 af
Primary = 11.04 cfs @ 12.57 hrs, Volume= 4.540 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link 5L: Total Proposed Condition



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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 4S: Proposed Impervious Runoff Area=6.023 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=673' Tc=10.0 min CN=98 Runoff=15.52 cfs 0.519 af

Subcatchment 5S: Proposed Pervious Runoff Area=2.200 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=666' Tc=10.0 min CN=74 Runoff=0.29 cfs 0.014 af

Subcatchment 6S: Proposed Pervious (Bypass) Runoff Area=0.175 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=134' Tc=8.0 min CN=74 Runoff=0.02 cfs 0.001 af

Pond 7P: REVISED WITH NEW COUNTY ROW Peak Elev=93.96' Storage=23,208 cf Inflow=15.64 cfs 0.533 af
Outflow=0.00 cfs 0.000 af

Link 5L: Total Proposed Condition Inflow=0.02 cfs 0.001 af
Primary=0.02 cfs 0.001 af

Total Runoff Area = 8.398 ac Runoff Volume = 0.534 af Average Runoff Depth = 0.76"
28.28% Pervious = 2.375 ac 71.72% Impervious = 6.023 ac

Summary for Subcatchment 4S: Proposed Impervious

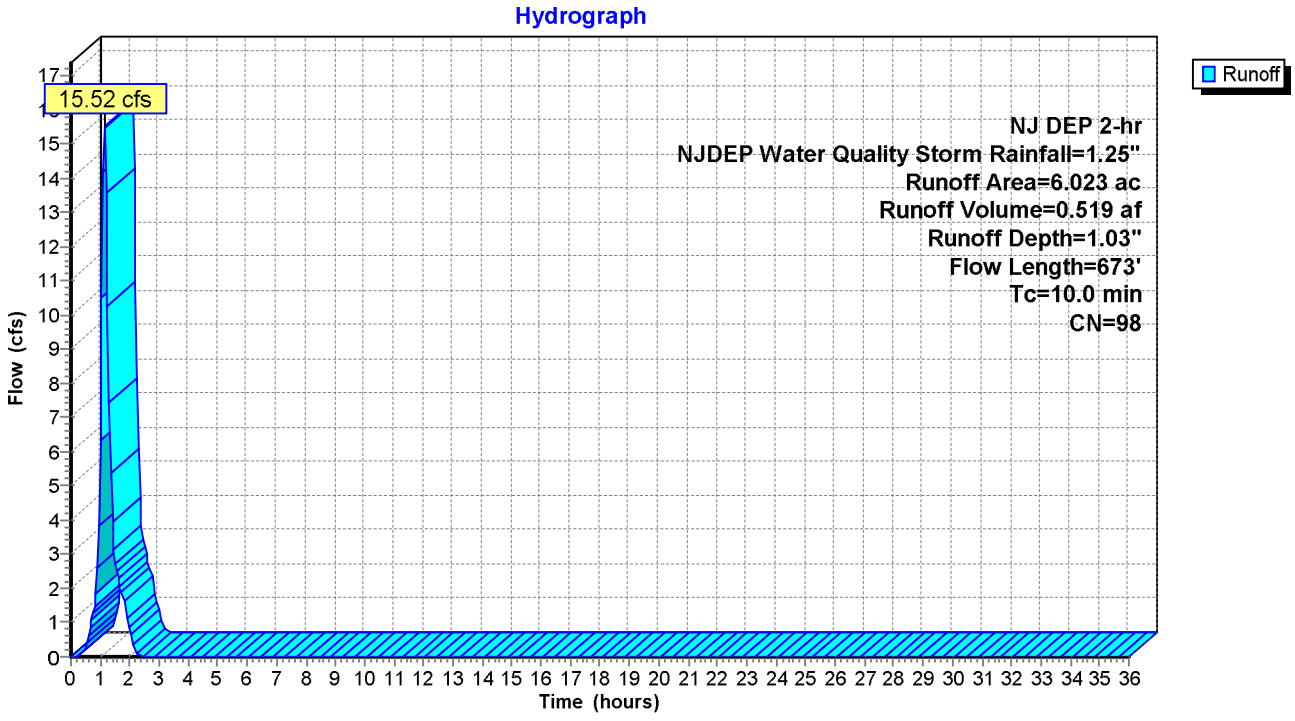
Runoff = 15.52 cfs @ 1.15 hrs, Volume= 0.519 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP Water Quality Storm Rainfall=1.25"

Area (ac)	CN	Description
6.023	98	Paved parking & roofs
6.023		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	150	0.0180	1.45		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 3.30"
0.4	314	0.0300	14.74	46.31	**Pipe Channel, Pipe Flow** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
1.7	209		2.00		**Direct Entry, shallow concentrated flow**
6.2					**Direct Entry, To make it to 10 minutes**
10.0	673	Total			

Subcatchment 4S: Proposed Impervious



Summary for Subcatchment 5S: Proposed Pervious

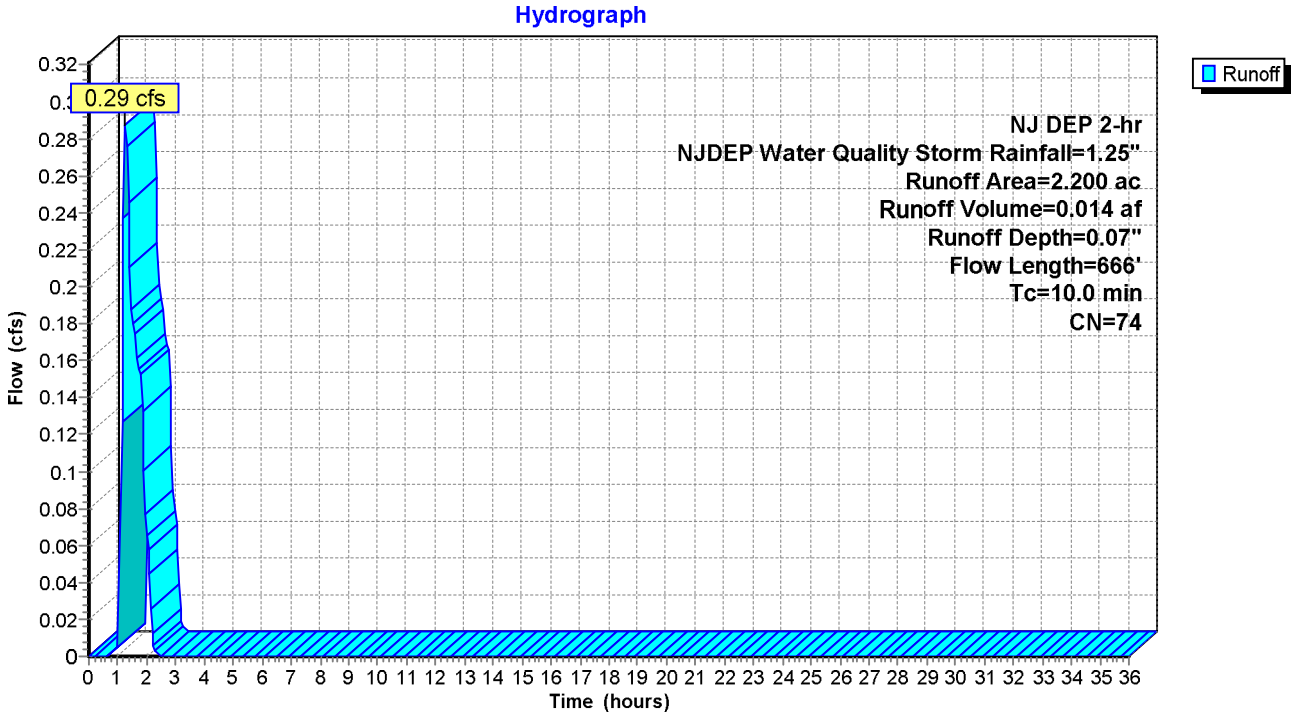
Runoff = 0.29 cfs @ 1.27 hrs, Volume= 0.014 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP Water Quality Storm Rainfall=1.25"

Area (ac)	CN	Description
2.200	74	>75% Grass cover, Good, HSG C
2.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	41	0.0292	0.17		**Sheet Flow, Sheet FLow** Grass: Short n= 0.150 P2= 3.30"
0.3	163	0.0300	9.29	7.29	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.6	105	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.1	12	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.6	112	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.4	73	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.3	51	0.0030	2.94	2.31	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
1.5	109		1.20		**Direct Entry, Grass Shallow Concentrated Flow**
2.1					**Direct Entry, To make it to 10 minutes**
10.0	666	Total			

Subcatchment 5S: Proposed Pervious



Summary for Subcatchment 6S: Proposed Pervious (Bypass)

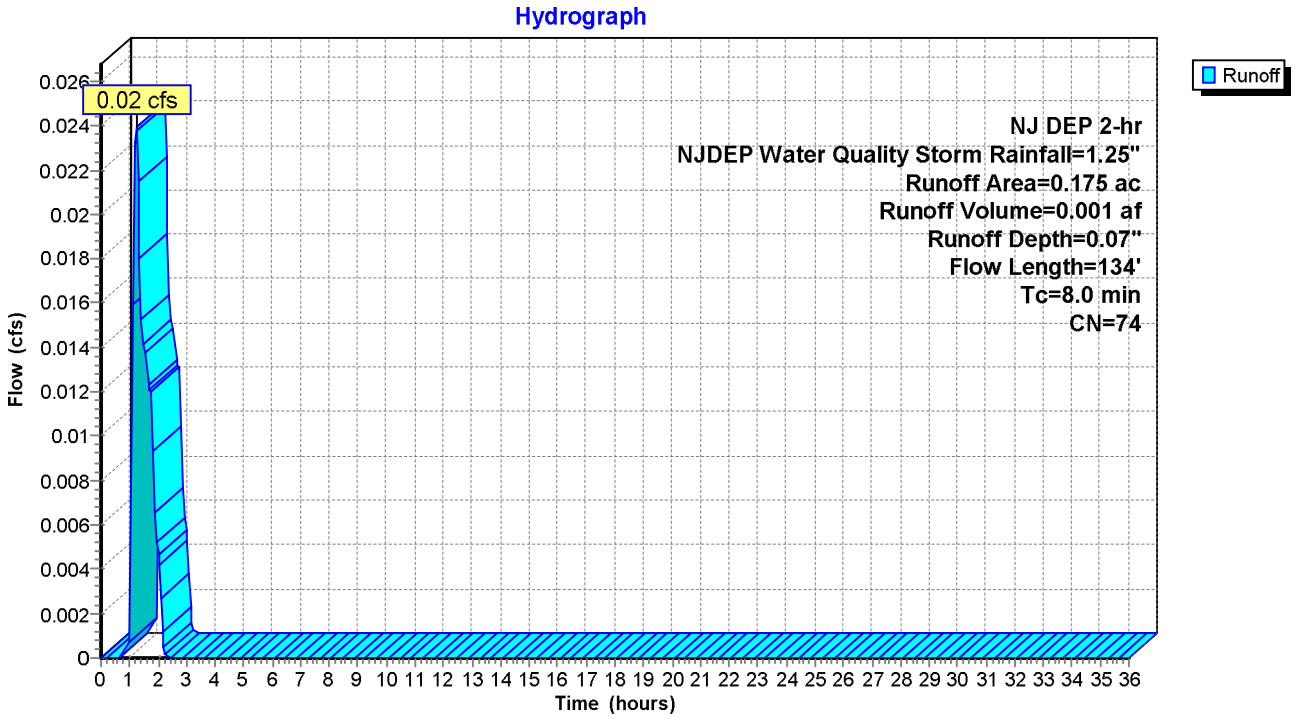
Runoff = 0.02 cfs @ 1.23 hrs, Volume= 0.001 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP Water Quality Storm Rainfall=1.25"

Area (ac)	CN	Description
0.175	74	>75% Grass cover, Good, HSG C
0.175		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	84	0.0238	0.18		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.30"
0.2	50	0.0100	5.36	4.21	**Pipe Channel, Pipe Flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
8.0	134	Total			

Subcatchment 6S: Proposed Pervious (Bypass)



Summary for Pond 7P: REVISED WITH NEW COUNTY ROW proposed basin SPW

Inflow Area = 8.223 ac, 73.25% Impervious, Inflow Depth = 0.78" for NJDEP Water Quality Storm event
Inflow = 15.64 cfs @ 1.15 hrs, Volume= 0.533 af
Outflow = 0.00 cfs @ 2.51 hrs, Volume= 0.000 af, Atten= 100%, Lag= 81.7 min
Primary = 0.00 cfs @ 2.51 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 93.96' @ 2.51 hrs Surf.Area= 18,567 sf Storage= 23,208 cf

Plug-Flow detention time= 312.2 min calculated for 0.000 af (0% of inflow)
Center-of-Mass det. time= 264.6 min (339.0 - 74.4)

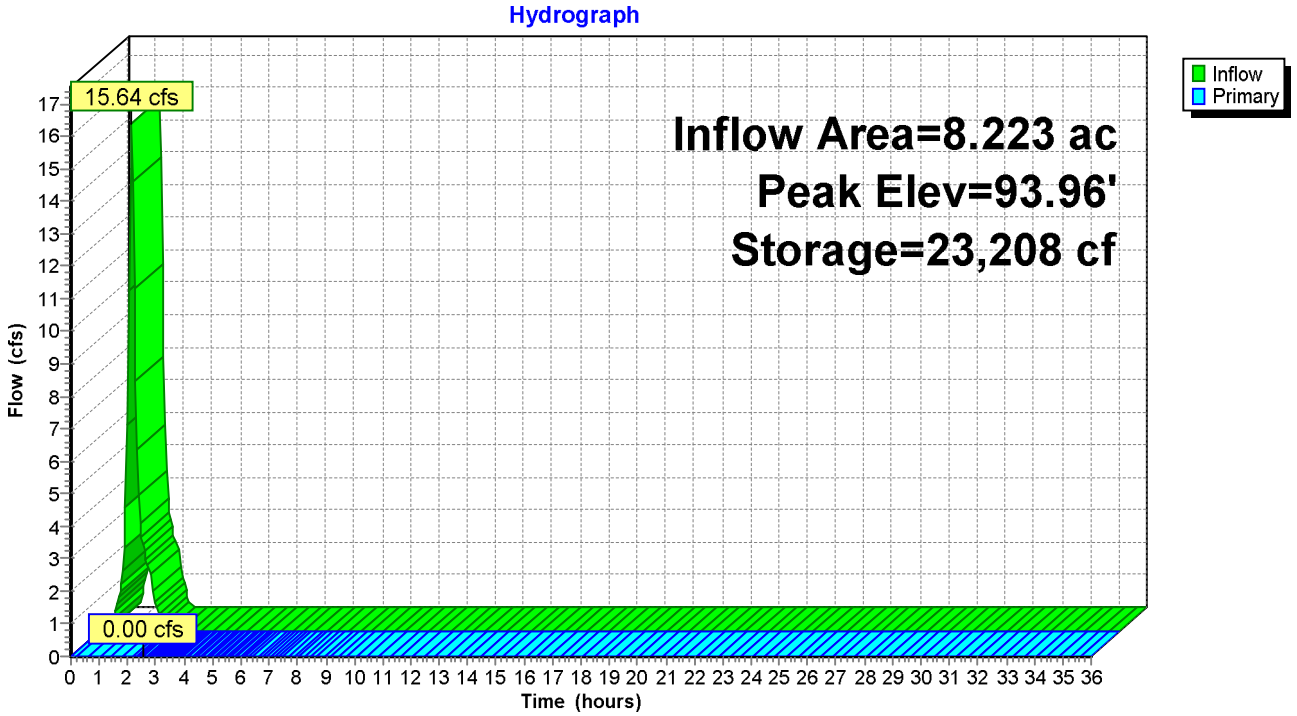
Volume	Invert	Avail.Storage	Storage Description
#1	92.70'	222,466 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.70	18,219	0	0
93.00	18,336	5,483	5,483
94.00	18,576	18,456	23,939
95.00	18,775	18,676	42,615
96.00	21,216	19,996	62,610
97.00	24,095	22,656	85,266
98.00	27,044	25,570	110,835
99.00	30,100	28,572	139,407
100.00	33,263	31,682	171,089
101.00	69,492	51,378	222,466

Device	Routing	Invert	Outlet Devices
#1	Primary	93.96'	**29.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	100.00'	**21.0' long x 28.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Primary	97.70'	**48.0" x 48.0" Horiz. Top of Box** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 2.51 hrs HW=93.96' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.08 fps)
- **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **3=Top of Box** (Controls 0.00 cfs)

Pond 7P: REVISED WITH NEW COUNTY ROW proposed basin SPW

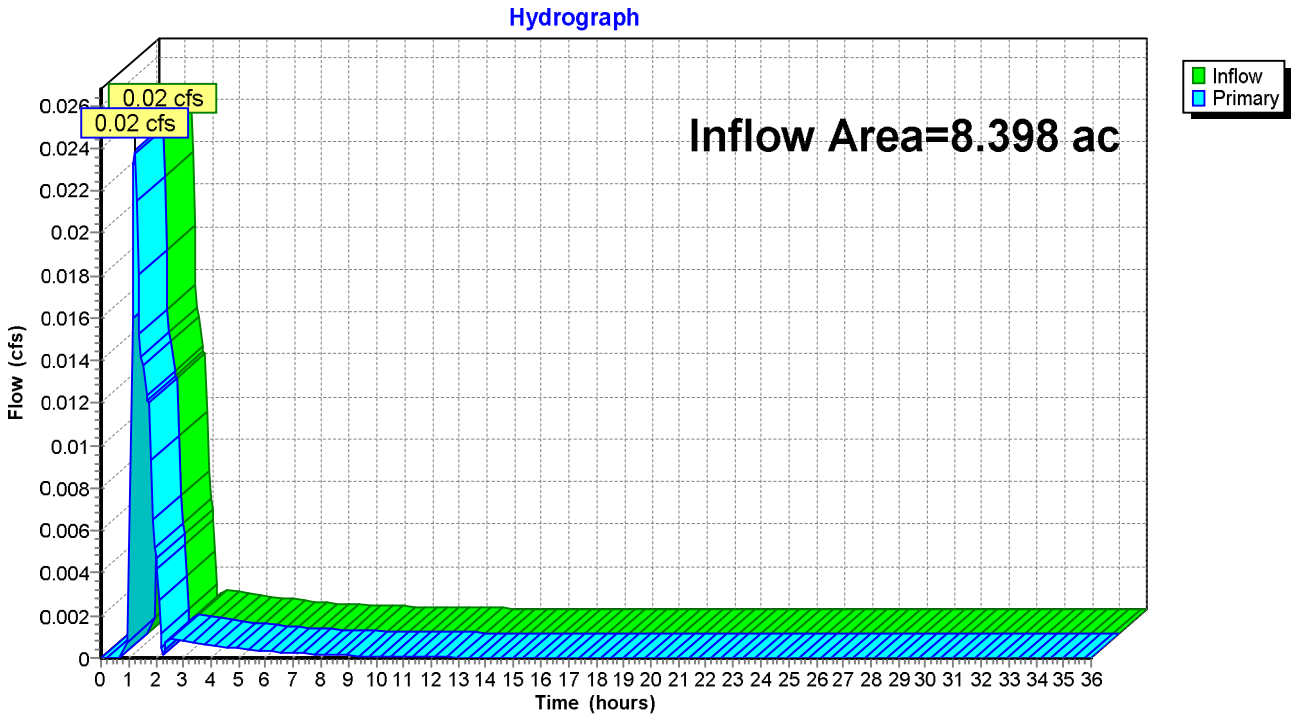


Summary for Link 5L: Total Proposed Condition

Inflow Area = 8.398 ac, 71.72% Impervious, Inflow Depth = 0.00" for NJDEP Water Quality Storm event
Inflow = 0.02 cfs @ 1.23 hrs, Volume= 0.001 af
Primary = 0.02 cfs @ 1.23 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link 5L: Total Proposed Condition



STORMWATER QUALITY CALCS

4/20/2020

WATER QUALITY CALCULATIONS

High School South
West Windsor Plainsboro Regional School District
Block 17.13, Lot 2
VCEA Job # 1808WW.01

West Windsor Plainsboro Regional School District
321 Village Rd E,
West Windsor, NJ 08550

Net New Impervious Coverage	**1.57**	**Acres**	
New Building	**1.07**	**Acres**	
New Roadway/Parking Lot	**0.50**	**Acres**	
Description	**Area**	**Required TSS Removal**	**Area*Required**
New Pavement	0.50	80	40.00
Existing Reconstructed Pavement	3.08	50	154
Total			**194.00**
Proposed Condition	**Area**	**Provided**	**A*P**
Sand Bottom Infitration	3.50	80	280.00
		Provided	**280.0**

Required Treatment for entire site = **54%**

Provided Treatment greater than required, therefore water quality standard is met

Average TSS Removal Rate **80%**

Composite Porous & Infiltration Basin TSS Removal Calculation

Infiltration Basin TSS Removal	80	%

Calculation Excludes Buildings and sidewalks since these are considered clean surfaces.

STORMWATER BASIN REPORT
SOIL INVESTIGATION AND PERMEABILITY REPORT

SOIL INVESTIGATION AND PERMEABILITY REPORT

WEST WINDSOR-PLAINSBORO HIGH SCHOOL SOUTH

PROPOSED EXPANSION

PRINCETON JUNCTION, MERCER CO., NEW JERSEY

PREPARED FOR:

MR. HERBERT SEEBURGER, P.E.
VAN CLEEF ENGINEERING ASSOCIATES, LLC
4 AAA DRIVE, SUITE 103
HAMILTON, NJ 08691

OCTOBER 3, 2019
REVISED APRIL 15, 2020

WILLIAM F. MERCURIO, P.E.
NEW JERSEY PROFESSIONAL ENGINEER
LICENSE NUMBER GE29247

VCEA PROJECT NUMBER: 18-08-WW-01

d:\projects\18-08-ww-01 hs south expansion\soils report\soil investigation report-rev2.docx

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1.0 NJ STORMWATER STANDARDS

The NJDEP Stormwater Management rules, N.J.A.C. 7:8 specify stormwater management standards that are mandatory for new major development. The New Jersey Stormwater BMP Manual was developed to provide guidance to address the standards in the Stormwater Management Rules, N.J.A.C. 7:8. The BMP manual provides examples and testing methods to meet the standards contained in the rule. The testing methods referenced in the BMP manual are one way of achieving the standards. The BMP Manual was developed by the New Jersey Department of Environmental Protection, in coordination with the New Jersey Department of Agriculture, the New Jersey Department of Community Affairs, the New Jersey Department of Transportation, municipal engineers, county engineers, consulting firms, contractors, and environmental organizations.

2.0 SOILS INVESTIGATION

2.1 SOIL PROFILE PITS

In order to identify the subsurface conditions within the anticipated stormwater management areas, Van Cleef Engineering Associates' (VCEA) subcontractor, F.S. Lutzky, Inc. of Hillsborough, New Jersey, performed a subsurface investigation on July 17 and 18, 2019 using a John Deere backhoe. The investigation included excavating four (4) soil profile pits. These soil profile pits are identified as SP-1 through SP-4. The soil profile pit locations are shown on the attached Soil Investigation Location Plan– Figure 1.

VCEA performed the soils investigation for the proposed infiltration basins in accordance with NJDEP N.J.A.C. 7:8 Stormwater Management (June 2016) and the NJ Stormwater BMP Manual (November 2016).

2.2 SOIL BORINGS 2019

In order to determine the subsurface conditions at the proposed expansion, VCEA's subcontractor, Sano Drilling, Inc. of Sewell, New Jersey, performed a subsurface investigation on July 9, 2019 using a truck mounted drill rig. The investigation included advancing seven (7) Standard Penetration Test (SPT) borings. These borings are identified as B-1 through B-7. The borings were drilled to a maximum depth of 20 feet below the existing ground surface utilizing the hollow stem auger drilling method. The boring locations are shown on the attached Soil Investigation Location Plan– Figure 1.

During the execution of the soil boring work, a field engineer from VCEA was present to monitor the drilling work, receive samples, prepare boring logs, and record all pertinent data. Detailed logs are presented in Appendix B of this report.

2.3 SOIL BORINGS 2020

In order to identify the subsurface conditions within the anticipated stormwater management basin, VCEA's subcontractor, Sano Drilling, Inc. of Sewell, New Jersey, performed a subsurface investigation on March 18, 2020 using a track mounted drill

rig. The investigation included advancing two (2) Standard Penetration Test (SPT) borings. These borings are identified as B-101 and B-102. The borings were drilled to depths of 13 and 14 feet, respectively, below the existing ground surface utilizing the hollow stem auger drilling method. Since the seasonal high water table (SHWT) at B-101 was encountered in the 12 to 14-foot SPT sample at 13 feet. The augers were only advanced to a depth of 13 feet in order to run the percolation test at the same depth as the SHWT. The boring locations are shown on the attached Soil Investigation Location Plan– Figure 1.

VCEA performed the soils investigation for the proposed infiltration basins in accordance with NJDEP N.J.A.C. 7:8 Stormwater Management (June 2016) and the NJ Stormwater BMP Manual (November 2016).

3.0 SOIL CLASSIFICATION

The soils encountered during this investigation are consistent with the soil mapping from the USDA-NRCS Web Soil Survey of Mercer County, New Jersey. The USDA-NRCS Web Soil Survey Map is attached as Figure 2.

Sassafras Sandy Loams
According to the Soil Survey, soil profile pits **SP-1** through **SP-6** were performed at the locations mapped as the Sassafras Sandy Loams (SacA and SacB). The Sassafras sandy loams consist of deep, well drained soils that formed from loamy fluviomarine deposits. Permeability in these soils is moderate.

4.0 GENERAL SITE GEOLOGY

The general site geology information was obtained from the "Engineering Soil Survey of New Jersey, Report Number 34, Mercer County," prepared by Rutgers, The State University of New Jersey, May 1955.

The soils at this site are mapped with the symbol "AM-4" designating a discontinuous mantle of alluvial material deposited during the Quaternary period. The soils are an assorted material composed of silt with minor amounts of intermixed sand and gravel. The silty soil overlies coarser, stratified material consisting of intermixed sand and gravel with occasional boulders in some places. The depth to bedrock is usually greater than 10 feet.

5.0 SEASONAL HIGH WATER TABLE

The depth to a seasonal high water table (SHWT) as evidenced by redoximorphic features (drainage mottling) and depth to observed seepage (groundwater) is provided in Table 1.0 below.

Table 1.0

Soil Profile Pit No.	Surface Elevation (Feet)	SHWT Depth (Feet)	SHWT Elevation (Feet)	Groundwater Depth (Feet)	Groundwater Elevation (Feet)
SP-1	101.0	N/E	--	N/E	--
SP-2	101.0	N/E	--	N/E	--
SP-3	96.0	6.0	90.0	N/E	--
SP-4	93.0	3.0	90.0	6.0	87.0
SP-5	103.0	13.0	90.0	N/E	--
SP-6	105.0	N/E	--	N/E	--
B-1	100.0	10.0	90.0	13.0	87.0
B-2	99.0	9.0	90.0	13.0	86.0
B-3	99.0	9.0	90.0	13.0	86.0
B-4	99.0	9.0	90.0	13.0	86.0
B-5	101.0	10.0	91.0	13.0	87.0
B-6	100.0	10.0	90.0	13.0	87.0
B-7	100.0	10.0	90.0	13.0	87.0
B-101	See SP-5				
B-102	See SP-6				

Based on the data from our subsurface investigations and local geology, VCEA believes the depths to SHWT and groundwater in the soil profile pits and borings to be representative of the site conditions. VCEA recommends using the SHWT of EL 90.0 identified in the soil profile pits and soil borings for stormwater management design.

5.0 Permeability Testing

5.1 2019

VCEA performed four (4) in-situ percolation tests (SP-1 through SP-4) on July 17 and 18, 2019. All percolation tests were performed in accordance with section B1 – Percolation Test, Addendum to Appendix E of the NJ Stormwater BMP Manual (November 2016). In order to perform the percolation test, a separate test pit was excavated then a post hole digger was used to excavate an 10-inch diameter hole 1.0 feet (12 inches) deep.

At the time this investigation was performed the size and location of the proposed stormwater basin had not been determined.

5.2 2020

Based on the square footage of the proposed stormwater basin, compliance with NJDEP Stormwater Management standards required performing three (3) soil profile pits and/or borings and three (3) permeability tests.

Once the proposed stormwater basin location was determined, only SP-2 was located within the footprint. Therefore, two (2) additional tests within the proposed stormwater basin were needed to meet NJDEP Stormwater Management testing requirements.

VCEA performed the two (2) additional borings and in-situ percolation tests on March 18 and 19, 2020. A 4 ¼ inch ID (8 inch OD) hollow stem auger was advanced to the required testing depth for soil borings SP-5 and SP-6. The depth of test represents the bottom of the test hole. All testing was performed in accordance with section B1 – Percolation Test, Addendum to Appendix E of the NJ Stormwater BMP Manual (November 2016). Table 2.0 below presents the permeability rates at each percolation test location.

Table 2.0

Soil Profile Pit No.	Test Depth (inches)	Test Elevation (Feet)	In-Situ Rate (in/hr)	Soil Permeability Class	Hydraulic Soil Group
SP-1	24	99.0	0.417	K3	C
SP-2	24	99.0	0.417	K3	C
SP-3	12	95.0	0.417	K3	C
SP-4	12	92.0	0.417	K3	C
SP-5	156	90.0	0.733	K3	C
SP-6	168	91.0	0.440	K3	C

6.0 GENERAL

The scope of our services did not include any environmental assessment or investigation for the presence or absence of hazardous, radioactive or toxic materials in the soil, groundwater, or surface water within or beyond the site studied.

APPENDIX A

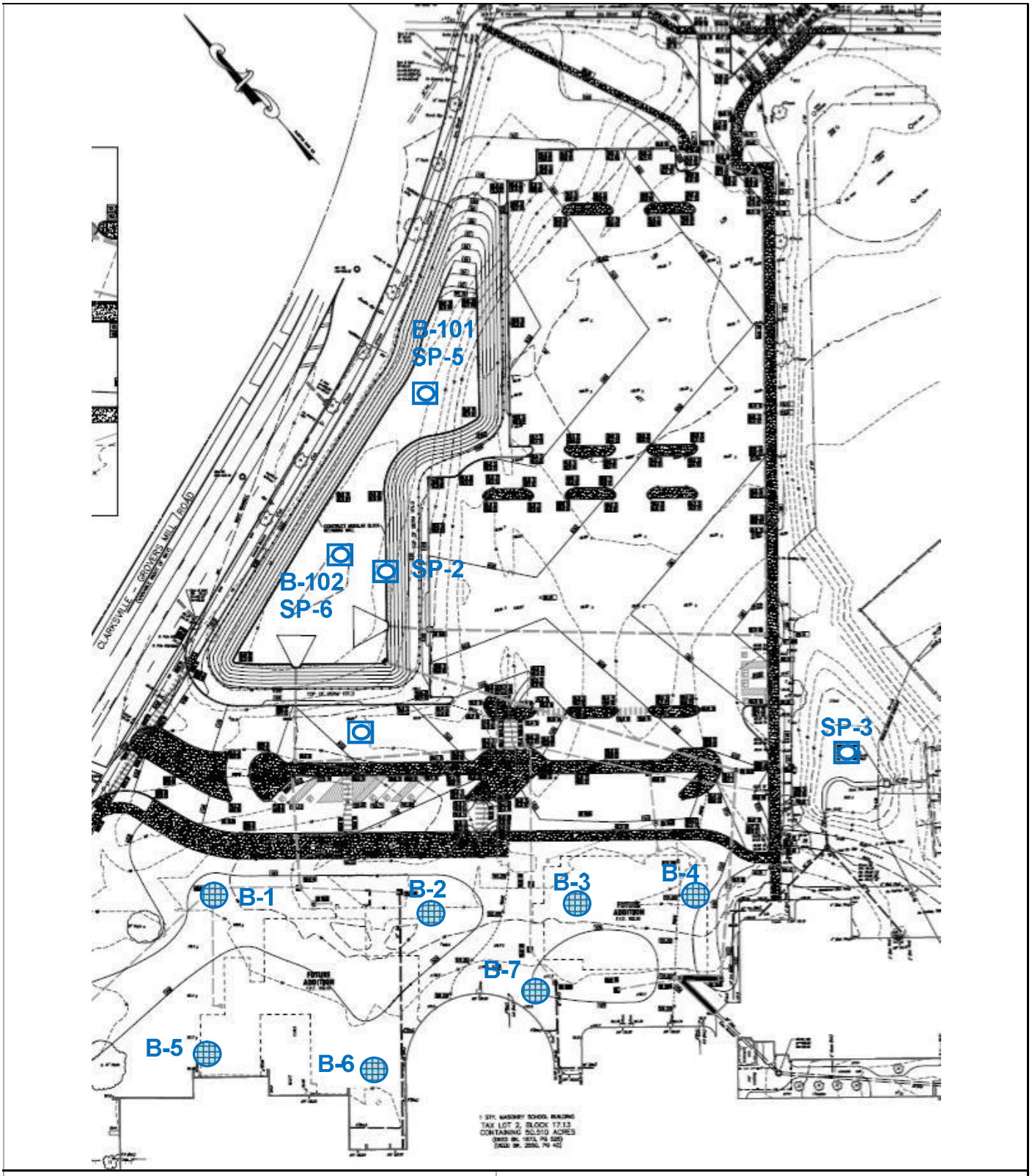

FIGURE 1	Soil Investigation Location Plan
Thomas R. Grover Middle School Proposed Additions & Improvements West Windsor Twp., Mercer County, NJ	Van Cleef ENGINEERING ASSOCIATES, LLC

LEGEND

SP-1 = Soil Profile Pit and Perc Test

= Test Boring Location

SCALE	DATE	DRAWN BY	FILE NO.
As Shown	April 2020	ETD	18-09-WW.01

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FIGURE 2	USDA-NRCS Web Soil Survey Map
West Windsor-Plainsboro School District High School South Expansion Princeton Junction, Mercer County, NJ	Van Cleef ENGINEERING ASSOCIATES, LLC

LEGEND

SacA, B and C = Sassafras sandy loam
OthA = Othello silt loam
GKAWOB = Glassboro and Woodstown sandy loam
PortA = Portsmouth variant silt loam
MBYB = Mattapex and Bertie loams
SadB = Sassafras gravely sandy loam

SCALE	DATE	DRAWN BY	FILE NO.
As Shown	April 2020	ETD	18-08-WW-01

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APPENDIX B

Van Cleef ENGINEERING ASSOCIATES, LLC

Soil Profile Description Sheet

Test Pit #: **SP-1**

Project Name: High School South Addition

Date: 7/17/2019

Project Number: 18-08-WW.01

Tested by: E. DeRicco

Surface Elevation: 101 +/-

Soil mapped: Sassafras sandy loam (SacA)

Soil classified: Sandy loam

Depth to Redoximorphic Features: N/E

Depth to Seeps: N/E

Horizon	Depth (inches)	Color	Texture	Rock Fragments		Structure			Soil Consistence	Redoximorphic Features				Boundary
				Size	Quantity (%)	Grade	Size	Type		Color(s)	Abundance	Size	Contrast	
Ap	0-12	10YR 4/4	sandy loam			1	f-m	g	very friable					clear/smooth
Bt1	12-18	10YR 5/6	sandy loam			1	m	sbk	friable					gradual/wavy
Bt2	18-28	10YR 5/8	sandy clay loam	f-c	10	2	m	sbk	friable					diffuse/wavy
BC	28-40	10YR 5/6	loamy sand	f-c	10	1	m	sbk	friable					diffuse/wavy
C1	40-58	10YR 5/8	loamy sand	f-c	10	1	m	m	very friable					diffuse/wavy
C2	58-84	7.5YR 5/8	loamy sand	f-c	20	1	m	sg	very friable					

Notes:

Perc test run at 24" (EL 99)

Percolation Testing (NJ Storwater BMP, Appendix E)

Date	Time	Note
7/17/2019	1030	Start presoak
7/18/2019	1320	No water reamining
7/18/2019	1321	Start test
7/18/2019	1351	0.5
7/18/2019	1421	0.5
7/18/2019	1451	0.5
7/18/2019	1521	0.5
7/18/2019	1551	0.5
		PASS

From Table 2

K= 25/60 K= 0.417 in/hr

Legend

Structure

Grade	*Size*	*Type*	
0-Structureless	vf-very fine	abk-angular blocky	sbk-subangular blocky
1-Weak	f-fine	gr-granular	sg-single-grained
2-Moderate	m-medium	m-massive	
3-Strong	co-coarse	pl-platy	
	vc-very coarse	pr-prismatic	

$$K = \frac{a}{p_m} in/hr \quad \text{[Equation 1]}$$

Where p_m = percolation rate in **minutes per inch**

a = parameter from the Table 2 (depending on the bottom width of the percolation hole)

Table 2: Parameter 'a' Values for Equation 1

Bottom Width (inch)	Parameter 'a'
8	22
9	23.5
10	25
11	26.3
12	27.5

Soil Profile Description Sheet

Test Pit #: **SP-2**

Project Name: High School South Addition

Date: 7/17/2019

Project Number: 18-08-WW.01

Tested by: E. DeRicco

Surface Elevation: 101 +/-

Soil mapped: Sassafras sandy loam (SacA)

Soil classified: Sandy loam

Depth to Redoximorphic Features: N/E

Depth to Seeps: N/E

Horizon	Depth (inches)	Color	Texture	Rock Fragments		Structure			Soil Consistence	Redoximorphic Features				Boundary
				Size	Quantity (%)	Grade	Size	Type		Color(s)	Abundance	Size	Contrast	
Ap	0-12	10YR 4/4	sandy loam			1	f-m	g	very friable					clear/smooth
Bt1	12-18	10YR 5/6	sandy loam			1	m	sbk	friable					gradual/wavy
Bt2	18-24	10YR 5/8	sandy clay loam	f-c	10	2	m	sbk	friable					diffuse/wavy
BC	24-39	10YR 5/6	loamy sand	f-c	10	1	m-c	sbk	friable					diffuse/wavy
C1	39-57	10YR 5/8	loamy sand	f-c	10	1	m	m	very friable					diffuse/wavy
C2	57-84	7.5YR 5/8	loamy sand	f-c	20	1	m	sg	very friable					

Notes:

Perc test run at 24" (EL 99)

Percolation Testing (NJ Storwater BMP, Appendix E)

Date	Time	Note
7/17/2019	1034	Start presoak
7/18/2019	1324	No water reamining
7/18/2019	1325	Start test
7/18/2019	1355	0.5
7/18/2019	1425	0.5
7/18/2019	1455	0.5
7/18/2019	1525	0.5
7/18/2019	1555	0.5
		PASS

From Table 2

K= 25/60 K= 0.417 in/hr

Legend

Structure

Grade	*Size*		*Type*	
0-Structureless	vf-very fine	abk-angular blocky		sbk-subangular blocky
1-Weak	f-fine	gr-granular		sg-single-grained
2-Moderate	m-medium	m-massive		
3-Strong	co-coarse	pl-platy		
	vc-very coarse	pr-prismatic		

$$K = \frac{a}{p_m} in/hr \quad \text{[Equation 1]}$$

Where p_m = percolation rate in **minutes per inch**

a = parameter from the Table 2 (depending on the bottom width of the percolation hole)

Table 2: Parameter 'a' Values for Equation 1

Bottom Width (inch)	Parameter 'a'
8	22
9	23.5
10	25
11	26.3
12	27.5

Soil Profile Description Sheet

Test Pit #: **SP-3**

Project Name: High School South Addition

Date: 7/17/2019

Project Number: 18-08-WW.01

Tested by: E. DeRicco

Surface Elevation: 96 +/-

Soil mapped: Sassafras sandy loam (SacB)

Soil classified: Sandy loam

Depth to Redoximorphic Features: 72"

Depth to Seeps: N/E

Horizon	Depth (inches)	Color	Texture	Rock Fragments		Structure			Soil Consistence	Redoximorphic Features				Boundary
				Size	Quantity (%)	Grade	Size	Type		Color(s)	Abundance	Size	Contrast	
Ap	0-7	10YR 4/4	sandy loam			1	f-m	g	very friable					clear/smooth
Bt1	12-16	10YR 5/6	sandy loam			1	m	sbk	friable					gradual/wavy
Bt2	16-24	10YR 5/8	sandy clay loam	f-c	10	2	m	sbk	friable					diffuse/wavy
BC	24-38	10YR 5/6	loamy sand	f-c	10	1	m-c	sbk	friable					diffuse/wavy
C1	38-58	10YR 5/8	sand	f-c	10	1	m	m	very friable					diffuse/wavy
C2	58-80	7.5YR 5/8	sand	f-c	20	1	m	sg	very friable	2.5Y 7/2	many	med	prom	

Notes:

Perc test run at 12" (EL 95)

Percolation Testing (NJ Storwater BMP, Appendix E)

Date	Time	Note
7/17/2019	1039	Start presoak
7/18/2019	1329	No water reamining
7/18/2019	1330	Start test
7/18/2019	1400	0.5
7/18/2019	1430	0.5
7/18/2019	1500	0.5
7/18/2019	1530	0.5
7/18/2019	1600	0.5
		PASS

From Table 2

K= 25/60 K= 0.417 in/hr

Legend

Structure

Grade	*Size*		*Type*	
0-Structureless	vf-very fine	abk-angular blocky		sbk-subangular blocky
1-Weak	f-fine	gr-granular		sg-single-grained
2-Moderate	m-medium	m-massive		
3-Strong	co-coarse	pl-platy		
	vc-very coarse	pr-prismatic		

$$K = \frac{a}{p_m} in/hr \quad \text{[Equation 1]}$$

Where p_m = percolation rate in **minutes per inch**

a = parameter from the Table 2 (depending on the bottom width of the percolation hole)

Table 2: Parameter 'a' Values for Equation 1

Bottom Width (inch)	Parameter 'a'
8	22
9	23.5
10	25
11	26.3
12	27.5

Van Cleef ENGINEERING ASSOCIATES, LLC

Soil Profile Description Sheet

Test Pit #: **SP-4**

Project Name: High School South Addition

Date: 7/17/2019

Project Number: 18-08-WW.01

Tested by: E. DeRicco

Surface Elevation: 93 +/-

Soil mapped: Sassafras sandy loam (SacA)

Soil classified: Sandy loam

Depth to Redoximorphic Features: 36"

Depth to Seeps: 72"

Horizon	Depth (inches)	Color	Texture	Rock Fragments		Structure			Soil Consistence	Redoximorphic Features				Boundary
				Size	Quantity (%)	Grade	Size	Type		Color(s)	Abundance	Size	Contrast	
Ap	0-10	10YR 4/4	sandy loam			1	f-m	g	very friable					clear/smooth
Bt1	10-17	10YR 5/6	sandy loam			1	m	sbk	friable					gradual/wavy
Bt2	17-29	10YR 5/8	sandy clay loam			2	m	sbk	friable					diffuse/wavy
BC	29-36	10YR 5/6	loamy sand			1	m-c	sbk	friable					diffuse/wavy
C1	36-58	10YR 5/8	loamy sand			1	m	m	very friable	2.5Y 7/2	many	med	prom	diffuse/wavy
C2	58-80	7.5YR 5/8	loamy sand			1	m	sg	very friable	2.5Y 7/2	many	med	prom	

Notes:

Perc test run at 12" (EL 92)

Percolation Testing (NJ Storwater BMP, Appendix E)

Date	Time	Note
7/17/2019	1044	Start presoak
7/18/2019	1334	No water reamining
7/18/2019	1335	Start test
7/18/2019	1405	0.5
7/18/2019	1435	0.5
7/18/2019	1505	0.5
7/18/2019	1535	0.5
7/18/2019	1605	0.5
		PASS

From Table 2

K= 25/60 K= 0.417 in/hr

Legend

Structure

Grade	*Size*	*Type*	
0-Structureless	vf-very fine	abk-angular blocky	sbk-subangular blocky
1-Weak	f-fine	gr-granular	sg-single-grained
2-Moderate	m-medium	m-massive	
3-Strong	co-coarse	pl-platy	
	vc-very coarse	pr-prismatic	

$$K = \frac{a}{p_m} in/hr$$ [Equation 1]

Where p_m = percolation rate in **minutes per inch**

a = parameter from the Table 2 (depending on the bottom width of the percolation hole)

Table 2: Parameter 'a' Values for Equation 1

Bottom Width (inch)	Parameter 'a'
8	22
9	23.5
10	25
11	26.3
12	27.5

Van Cleef ENGINEERING ASSOCIATES, LLC

Soil Profile Description Sheet

Test Pit #: **SP-5**
B-101

Project Name: High School South Addition

Date: 3/18/2020

Project Number: 18-08-WW.01

Tested by: E. DeRicco

Surface Elevation: 103 +/-

Soil mapped: Sassafras sandy loam (SacA)

Soil classified: Sandy loam

Depth to Redoximorphic Features: 156"

Depth to Seeps: N/E

Horizon	Depth (inches)	Color	Texture	Rock Fragments		Structure			Soil Consistence	Redoximorphic Features				Boundary
				Size	Quantity (%)	Grade	Size	Type		Color(s)	Abundance	Size	Contrast	
Ap	0-8	10YR 4/4	sandy loam			1	f-m	g	very friable					clear/smooth
Bt1	8-18	10YR 5/6	sandy loam			1	m	sbk	friable					gradual/wavy
Bt2	18-24	10YR 5/8	sandy clay loam	f-c	10	2	m	sbk	friable					diffuse/wavy
BC	24-39	10YR 5/6	loamy sand	f-c	10	1	m-c	sbk	friable					diffuse/wavy
C1	39-57	10YR 5/8	loamy sand	f-c	10	1	m	m	very friable					diffuse/wavy
C2	57-122	7.5YR 5/8	loamy sand	f-c	10	1	m	sg	very friable					diffuse/wavy
C3	122-168	7.5YR 5/8	loamy sand	f-c	10	1	m	sg	very friable	2.5Y 7/2	many	med	prom	

Notes:

Perc test run at 156" (EL 90)

Percolation Testing (NJ Storwater BMP, Appendix E)

Date	Time	Note
3/18/2020	0934	Start presoak
3/19/2020	0936	No water reamining
3/19/2020	0940	Start test
3/19/2020	1010	1.00
3/19/2020	1040	1.00
3/19/2020	1110	1.00
3/19/2020	1140	1.00
3/19/2020	1210	1.00
		PASS

From Table 2

K= 22/30 K= 0.733 in/hr

Legend

Structure

Grade	*Size*	*Type*	
0-Structureless	vf-very fine	abk-angular blocky	sbk-subangular blocky
1-Weak	f-fine	gr-granular	sg-single-grained
2-Moderate	m-medium	m-massive	
3-Strong	co-coarse	pl-platy	
	vc-very coarse	pr-prismatic	

$$K = \frac{a}{p_m} in/hr \quad \text{[Equation 1]}$$

Where p_m = percolation rate in **minutes per inch**
a = parameter from the Table 2 (depending on the bottom width of the percolation hole)

Table 2: Parameter 'a' Values for Equation 1

Bottom Width (inch)	Parameter 'a'
8	22
9	23.5
10	25
11	26.3
12	27.5

Soil Profile Description Sheet

Test Pit #: **SP-6**
B-101

Project Name: High School South Addition
Date: 3/18/2020

Project Number: 18-08-WW.01
Tested by: E. DeRicco

Surface Elevation: 105 +/-

Soil mapped: Sassafras sandy loam (SacA)

Soil classified: Sandy loam

Depth to Redoximorphic Features: N/E
Depth to Seeps: N/E

Horizon	Depth (inches)	Color	Texture	Rock Fragments		Structure			Soil Consistence	Redoximorphic Features				Boundary
				Size	Quantity (%)	Grade	Size	Type		Color(s)	Abundance	Size	Contrast	
Ap	0-8	10YR 4/4	sandy loam			1	f-m	g	very friable					clear/smooth
Bt1	8-18	10YR 5/6	sandy loam			1	m	sbk	friable					gradual/wavy
Bt2	18-27	10YR 5/8	sandy clay loam	f-c	10	2	m	sbk	friable					diffuse/wavy
BC	27-40	10YR 5/6	loamy sand	f-c	10	1	m	sbk	friable					diffuse/wavy
C1	40-58	10YR 5/8	loamy sand	f-c	10	1	m	m	very friable					diffuse/wavy
C2	58-96	7.5YR 5/8	loamy sand	f-c	10	1	m	sg	very friable					diffuse/wavy
C3	96-168	7.5YR 5/8	loamy sand	f-c	10	1	m	sg	very friable					

Notes:

Perc test run at 168" (EL 91)

Percolation Testing (NJ Storwater BMP, Appendix E)

Date	Time	Note
7/17/2019	1037	Start presoak
7/18/2019	1038	No water reamining
7/18/2019	1045	Start test
7/18/2019	1115	0.6
7/18/2019	1145	0.6
7/18/2019	1215	0.6
7/18/2019	1245	0.6
7/18/2019	1315	0.6
		PASS

From Table 2

K= 25/50 K= 0.440 in/hr

Legend

Structure

Grade	*Size*	*Type*	
0-Structureless	vf-very fine	abk-angular blocky	sbk-subangular blocky
1-Weak	f-fine	gr-granular	sg-single-grained
2-Moderate	m-medium	m-massive	
3-Strong	co-coarse	pl-platy	
	vc-very coarse	pr-prismatic	

$$K = \frac{a}{p_m} in/hr \quad \text{[Equation 1]}$$

Where p_m = percolation rate in **minutes per inch**
a = parameter from the Table 2 (depending on the bottom width of the percolation hole)

Table 2: Parameter 'a' Values for Equation 1

Bottom Width (inch)	Parameter 'a'
8	22
9	23.5
10	25
11	26.3
12	27.5

BORING LOG

Boring # B-1

Drilling Contractor: Sano Drilling, Inc.
Drilling Rig Operator: N. Parisano
Drilling Method: 3 1/4" HSA
Casing Size/Type: /
Drilling Equipment: Mobile B-57
CW Representative: E. DeRicco
Dates: Started: 7/9/2019
Completed: 7/9/2019
Ground Surface Elevation (ft): ± 100

Van Cleef ENGINEERING ASSOCIATES, LLC

Project: West Windsor-Plainsboro High School South
Project Number: 18-08-WW-01
Project Location: 346 Clarksville Road, Princeton Junction, NJ
Boring Location: See Test Boring Location Plan

GROUNDWATER OBSERVATIONS	DEPTH (FEET)
▽ Encountered: 7/9/2019	13
▼ Completion: 7/9/2019	13
▼ 24 Hour Reading:	

Depth (ft)	Soil Samples: Sample No.	Recovery (ft)	Pen. Resist. (blows / 6 in.)	N Value	Rock Core: Run No.	Rec (%)	RQD (%)	Graphic Symbol	STRATUM	MATERIAL DESCRIPTION	Elevation	Water Cont. (%)	REMARKS
			3							6 inches TOPSOIL.			
	S1		5-10-10	15						Brown coarse to fine SAND, little coarse to fine Gravel, little Silt. (SM)			
	S2		10-10-10-10	20						Orange brown coarse to fine SAND, some Silt, little medium to fine Gravel. (SM)			
5	S3		4-6-6-8	12						Same, some coarse to fine Gravel.	95		
	S4		11-8-8-7	16						Brown coarse to fine SAND, little Silt, trace medium to fine Gravel. (SM)			ALLUVIAL SAND
	S5		11-9-13-11	22					A	Orange brown coarse to fine SAND, some Silt, little coarse to fine Gravel. (SM)			
10											90		Soil mottling @ 10.0'
	S6		9-9-11-11	20						Same.		▼	
15										Bottom of Boring at 15'	85		
20											80		

BORING LOG

Boring # B-2

Drilling Contractor: Sano Drilling, Inc.
Drilling Rig Operator: N. Parisano
Drilling Method: 3 1/4" HSA
Casing Size/Type: /
Drilling Equipment: Mobile B-57
CW Representative: E. DeRicco
Dates: Started: 7/9/2019
Completed: 7/9/2019
Ground Surface Elevation (ft): ± 99

Van Cleef ENGINEERING ASSOCIATES, LLC

Project: West Windsor-Plainsboro High School South
Project Number: 18-08-WW-01
Project Location: 346 Clarksville Road, Princeton Junction, NJ
Boring Location: See Test Boring Location Plan

GROUNDWATER OBSERVATIONS	DEPTH (FEET)
▽ Encountered: 7/9/2019	13
▼ Completion: 7/9/2019	13
▼ 24 Hour Reading:	

Depth (ft)	Soil Samples: Sample No.	Recovery (ft)	Pen. Resist. (blows / 6 in.)	N Value	Rock Core: Run No.	Rec (%)	RQD (%)	Graphic Symbol	STRATUM	MATERIAL DESCRIPTION	Elevation	Water Cont. (%)	REMARKS
			8							6 inches TOPSOIL.			
	S1		10-8-11	18						Orange brown medium to fine SAND, some Silt, little coarse to fine Gravel. (SM)			
	S2		11-8-8-11	16						Same.			
5	S3		7-10-8-7	18						Orange brown coarse to fine SAND, little medium to fine Gravel, little Silt. (SM)	95		
	S4		2-5-3-3	8						Same.			ALLUVIAL SAND
	S5		2-2-2-4	4					A	Orange brown coarse to fine SAND, little Silt, trace medium to fine Gravel. (SM)	90		Soil mottling @ 9.0'
10												▼	
	S6		5-10-9-10	19						Brown coarse to fine SAND, some coarse to fine Gravel, little Silt. (SM)	85		
15										Bottom of Boring at 15'			
											80		
20													

BORING LOG

Boring # B-3

Drilling Contractor: Sano Drilling, Inc.
Drilling Rig Operator: N. Parisano
Drilling Method: 3 1/4" HSA
Casing Size/Type: /
Drilling Equipment: Mobile B-57
CW Representative: E. DeRicco
Dates: Started: 7/9/2019
Completed: 7/9/2019
Ground Surface Elevation (ft): ± 99

Van Cleef ENGINEERING ASSOCIATES, LLC

Project: West Windsor-Plainsboro High School South
Project Number: 18-08-WW-01
Project Location: 346 Clarksville Road, Princeton Junction, NJ
Boring Location: See Test Boring Location Plan

GROUNDWATER OBSERVATIONS	DEPTH (FEET)
▽ Encountered: 7/9/2019	13
▼ Completion: 7/9/2019	13
▼ 24 Hour Reading:	

Depth (ft)	Soil Samples: Sample No.	Recovery (ft)	Pen. Resist. (blows / 6 in.)	N Value	Rock Core: Run No.	Rec (%)	RQD (%)	Graphic Symbol	STRATUM	MATERIAL DESCRIPTION	Elevation	Water Cont. (%)	REMARKS
	S1		2-7-8-10	15						Brown coarse to fine SAND, some Silt, trace coarse to fine Gravel. (SM)			
	S2		7-8-11-11	19						Same.			
5	S3		5-5-6-7	11					A	Same, Dark brown.	95		ALLUVIAL SAND
	S4		8-9-7-13	16						Same, Light gray to orange brown.			
	S5		7-4-5-6	9						Light gray to orange brown coarse to fine SAND, little Silt. (SP)	90		Soil mottling @ 9.0'
10	S6		4-5-5-4	10					A	Same.			ALLUVIAL SAND
												▼	
	S7		3-5-6-6	11						Same.	85		
15										Bottom of Boring at 15'			
											80		
20													

BORING LOG

Boring # B-4

Drilling Contractor: Sano Drilling, Inc.
Drilling Rig Operator: N. Parisano
Drilling Method: 3 1/4" HSA
Casing Size/Type: /
Drilling Equipment: Mobile B-57
CW Representative: E. DeRicco
Dates: Started: 7/9/2019
Completed: 7/9/2019
Ground Surface Elevation (ft): ± 99

Van Cleef ENGINEERING ASSOCIATES, LLC

Project: West Windsor-Plainsboro High School South
Project Number: 18-08-WW-01
Project Location: 346 Clarksville Road, Princeton Junction, NJ
Boring Location: See Test Boring Location Plan

GROUNDWATER OBSERVATIONS	DEPTH (FEET)
▽ Encountered: 7/9/2019	13
▼ Completion: 7/9/2019	13
▼ 24 Hour Reading:	

Depth (ft)	Soil Samples: Sample No.	Recovery (ft)	Pen. Resist. (blows / 6 in.)	N Value	Rock Core: Run No.	Rec (%)	RQD (%)	Graphic Symbol	STRATUM	MATERIAL DESCRIPTION	Elevation	Water Cont. (%)	REMARKS
	S1		2-28-42-14	70						Light gray to brown coarse to fine SAND, some coarse to fine Gravel, little Silt. (SM)			
	S2		15-14-13-12	27						Orange brown coarse to fine SAND, some Silt, trace medium to fine Gravel. (SM)	95		
5	S3		7-5-4-4	9						Same.			
	S4		7-8-7-7	15					A	Same.			ALLUVIAL SAND
	S5		7-9-10-10	19						Same.	90		Soil mottling @ 9.0'
10												▼	
	S6		1-3-3-4	6						Yellow brown coarse to fine SAND, little fine Gravel, trace Silt. (SP)	85		
15									A				ALLUVIAL SAND
	S7		3-3-3-4	6						Same.	80		
20										Bottom of Boring at 20'			

BORING LOG

Boring # B-5

Drilling Contractor: Sano Drilling, Inc.
Drilling Rig Operator: N. Parisano
Drilling Method: 3 1/4" HSA
Casing Size/Type: /
Drilling Equipment: Mobile B-57
CW Representative: E. DeRicco
Dates: Started: 7/9/2019
Completed: 7/9/2019
Ground Surface Elevation (ft): ± 101

Van Cleef ENGINEERING ASSOCIATES, LLC

Project: West Windsor-Plainsboro High School South
Project Number: 18-08-WW-01
Project Location: 346 Clarksville Road, Princeton Junction, NJ
Boring Location: See Test Boring Location Plan

GROUNDWATER OBSERVATIONS	DEPTH (FEET)
▽ Encountered: 7/9/2019	14
▼ Completion: 7/9/2019	14
▼ 24 Hour Reading:	

Depth (ft)	Soil Samples: Sample No.	Recovery (ft)	Pen. Resist. (blows / 6 in.)	N Value	Rock Core: Run No.	Rec (%)	RQD (%)	Graphic Symbol	STRATUM	MATERIAL DESCRIPTION	Elevation	Water Cont. (%)	REMARKS
										6 inches TOPSOIL.			
	S1		2-5-7-7	12						Brown coarse to fine SAND, little medium to fine Gravel, little Silt. (SM)	100		
	S2		9-8-6-6	14						Gray brown coarse to fine SAND, some Silt. (SM)			
5	S3		4-10-14-12	24						Orange brown coarse to fine SAND, little coarse to fine Gravel, little Silt. (SM)			
	S4		14-14-14-9	28						Same, some coarse to fine Gravel.	95		
	S5		5-6-6-5	12						Orange brown coarse to fine SAND, little Silt, trace fine Gravel. (SM)			
10									A				Soil mottling @ 10.0' ALLUVIAL SAND
	S6		2-3-5-3	8						Same.	90	▼	
15													
	S7		3-3-3-4	6						Same.	85		
20										Bottom of Boring at 20'			
											80		

BORING LOG

Boring # B-6

Drilling Contractor: Sano Drilling, Inc.
Drilling Rig Operator: N. Parisano
Drilling Method: 3 1/4" HSA
Casing Size/Type: /
Drilling Equipment: Mobile B-57
CW Representative: E. DeRicco
Dates: Started: 7/9/2019
Completed: 7/9/2019
Ground Surface Elevation (ft): ± 100

Van Cleef ENGINEERING ASSOCIATES, LLC

Project: West Windsor-Plainsboro High School South
Project Number: 18-08-WW-01
Project Location: 346 Clarksville Road, Princeton Junction, NJ
Boring Location: See Test Boring Location Plan

GROUNDWATER OBSERVATIONS	DEPTH (FEET)
▽ Encountered: 7/9/2019	13
▼ Completion: 7/9/2019	13
▼ 24 Hour Reading:	

Depth (ft)	Soil Samples: Sample No.	Recovery (ft)	Pen. Resist. (blows / 6 in.)	N Value	Rock Core: Run No.	Rec (%)	RQD (%)	Graphic Symbol	STRATUM	MATERIAL DESCRIPTION	Elevation	Water Cont. (%)	REMARKS
			1							6 inches TOPSOIL.			
	S1		3-8-7	11						Brown coarse to fine SAND, little Silt, trace coarse to fine Gravel. (SM)			
	S2		6-5-6-6	11						Orange brown coarse to fine SAND, some Silt. (SM)			
5	S3		6-6-7-8	13						Orange brown coarse to fine SAND, little coarse to fine Gravel, little Silt. (SM)	95		
	S4		9-9-8-9	17					A	Same, some coarse to fine Gravel.			ALLUVIAL SAND
	S5		5-9-6-5	15						Orange brown coarse to fine SAND, little Silt, trace fine Gravel. (SM)			
10											90		Soil mottling @ 10.0'
	S6		3-3-3-4	6						Same.		▼	
15										Bottom of Boring at 15'	85		
20											80		

BORING LOG

Boring # B-7

Drilling Contractor: Sano Drilling, Inc.
Drilling Rig Operator: N. Parisano
Drilling Method: 3 1/4" HSA
Casing Size/Type: /
Drilling Equipment: Mobile B-57
CW Representative: E. DeRicco
Dates: Started: 7/9/2019
Completed: 7/9/2019
Ground Surface Elevation (ft): ± 100

Van Cleef ENGINEERING ASSOCIATES, LLC

Project: West Windsor-Plainsboro High School South
Project Number: 18-08-WW-01
Project Location: 346 Clarksville Road, Princeton Junction, NJ
Boring Location: See Test Boring Location Plan

GROUNDWATER OBSERVATIONS	DEPTH (FEET)
▽ Encountered: 7/9/2019	13
▼ Completion: 7/9/2019	13
▼ 24 Hour Reading:	

Depth (ft)	Soil Samples: Sample No.	Recovery (ft)	Pen. Resist. (blows / 6 in.)	N Value	Rock Core: Run No.	Rec (%)	RQD (%)	Graphic Symbol	STRATUM	MATERIAL DESCRIPTION	Elevation	Water Cont. (%)	REMARKS
			2							6 inches TOPSOIL.			
	S1		7-11-12	18						Orange brown medium to fine SAND, some Silt, little coarse to fine Gravel. (SM)			
	S2		19-14-11-9	25						Brown medium to fine SAND, some Silt, trace medium to fine Gravel. (SM)			
5	S3		6-6-6-6	12						Same.	95		
	S4		4-5-9-8	14					A	Orange to red brown coarse to fine SAND, little Silt, trace medium to fine Gravel. (SM)			ALLUVIAL SAND
	S5		5-5-5-6	10						Same.			
10											90		Soil mottling @ 10.0'
	S6		2-3-4-6	7						Orange brown coarse to fine SAND, little Silt, trace coarse to fine Gravel. (SM)		▼	
15										Bottom of Boring at 15'	85		
20											80		

BORING LOG

Boring # B-101

Drilling Contractor: Sano Drilling, Inc.
Drilling Rig Operator: R. Moyer
Drilling Method: 4 1/4" ID HSA
Casing Size/Type: /
Drilling Equipment: Diedrich D-50
CW Representative: E. DeRicco
Dates: Started: 3/18/2020
Completed: 3/18/2020
Ground Surface Elevation (ft): ± 103

Van Cleef ENGINEERING ASSOCIATES, LLC

Project: West Windsor-Plainsboro High School South
Project Number: 18-08-WW-01
Project Location: 346 Clarksville Road, Princeton Junction, NJ
Boring Location: See Test Boring Location Plan

GROUNDWATER OBSERVATIONS	DEPTH (FEET)
▽ Encountered:	N/E
▼ Completion:	
▼ 24 Hour Reading:	

Depth (ft)	Soil Samples: Sample No.	Recovery (ft)	Pen. Resist. (blows / 6 in.)	N Value	Rock Core: Run No.	Rec (%)	RQD (%)	Graphic Symbol	STRATUM	MATERIAL DESCRIPTION	Elevation	Water Cont. (%)	REMARKS
			1							6 inches TOPSOIL.			
	S1		2-2-4	4						Orange brown medium to fine SAND, some Silt, trace fine Gravel. (SM)			
	S2		4-5-5-6	10						Same.	100		
5	S3		3-3-3-2	6					A	Same.			ALLUVIAL SAND
	S4		5-8-10-10	18						Brown medium to fine SAND and Clayey Silt, trace fine Gravel. (SM)			
	S5		3-3-3-4	6						Same.	95		
10	S6		5-8-8-6	16						Orange brown medium to fine SAND, little Silt, trace fine Gravel. (SP)			
	S7		7-8-8-9	16					A	Same.	90		ALLUVIAL SAND Soil mottling @ 13.0'
										Bottom of Boring at 14'			
15													
											85		
20													

BORING LOG

Boring # B-102

Drilling Contractor: Sano Drilling, Inc.
Drilling Rig Operator: R. Moyer
Drilling Method: 4 1/4" ID HSA
Casing Size/Type: /
Drilling Equipment: Diedrich D-50
CW Representative: E. DeRicco
Dates: Started: 3/18/2020
Completed: 3/18/2020
Ground Surface Elevation (ft): ± 105

Van Cleef ENGINEERING ASSOCIATES, LLC

Project: West Windsor-Plainsboro High School South
Project Number: 18-08-WW-01
Project Location: 346 Clarksville Road, Princeton Junction, NJ
Boring Location: See Test Boring Location Plan

GROUNDWATER OBSERVATIONS	DEPTH (FEET)
▽ Encountered:	N/E
▼ Completion:	
▼ 24 Hour Reading:	

Depth (ft)	Soil Samples: Sample No.	Recovery (ft)	Pen. Resist. (blows / 6 in.)	N Value	Rock Core: Run No.	Rec (%)	RQD (%)	Graphic Symbol	STRATUM	MATERIAL DESCRIPTION	Elevation	Water Cont. (%)	REMARKS
			1							6 inches TOPSOIL.			
	S1		1-1-1	2						Orange brown medium to fine SAND, some Silt, trace fine Gravel. (SM)			
	S2		2-5-8-8	13						Same.			
5	S3		10-12-13-10	25					A	Brown medium to fine SAND, some Clayey Silt. (SM)	100		ALLUVIAL SAND
	S4		10-10-9-8	19						Same.			
	S5		7-9-11-7	20						Orange brown medium to fine SAND, little medium to fine Gravel, little Clayey Silt. (SP)			
10	S6		9-8-8-9	16					A	Same, trace fine Gravel.	95		ALLUVIAL SAND
	S7		7-6-6-5	12						Same.			
15										Bottom of Boring at 14'	90		
20											85		

STORMWATER CONVEYANCE CALCULATIONS

Stormwater Collection System Calculations

Project: High School South
Job #: 1808WW.01
Location: West Windsor Township, Mercer County, NJ
Design Storm: 25 year

Computed By: HJS
Checked By: HJS
Date: 2/18/2020
Revised 4/20/20

NOTES:
1) Design method used is Rational Method
2) Refer to Weighted Runoff Coefficient table for calculation of incremental areas and C values

PIPE SECTION		SUBCATCHMENT AREA	INCREMENTAL		CUMULATIVE	TIME OF CONCENTRATION			I	PEAK RUNOFF		PIPING INPUT			PIPING DATA			
FROM	TO	Area (Acres)	"C"	A x C Ac	A x C (acres)	Tc to Inlet (min)	Tc in Pipe (min.)	Final Tc (min)	(In/Hr)	Q to Inlet (CFS)	Q cum. for Pipe (CFS)	Dia. (In)	Length (Ft)	Man. "n"	Slope (ft/ft)	Pipe Capacity (cfs)	Full Pipe Velocity (fps)	Actual Pipe Velocity (fps)
12a	11	0.00	0.00	0.00	0.60	0.00	0.31	10.47	6.80	0.00	4.08	18	78.0	0.010	0.0030	7.48	4.23	4.41
9A	9	0.85	0.50	0.43	0.43	10.00	0.46	10.00	6.80	2.92	2.92	12	163.0	0.010	0.0100	4.63	5.90	6.44
9B	9	0.18	0.98	0.18	0.18	10.00	0.36	10.00	6.80	1.22	1.22	10	102.0	0.010	0.0080	2.55	4.68	4.60
9	8	0.16	0.98	0.16	0.77	10.00	0.19	10.46	6.80	1.09	5.24	24	105.0	0.010	0.0100	29.40	9.36	5.42
4	5	0.89	0.98	0.87	0.87	10.00	0.06	10.00	6.80	5.92	5.92	18	30.0	0.010	0.0100	13.65	7.73	7.24
5	6	0.11	0.98	0.11	0.98	10.00	0.11	10.06	6.80	0.75	6.66	18	50.0	0.010	0.0100	13.65	7.73	7.68
6	12A	0.06	0.98	0.06	1.04	10.00	0.16	10.17	6.80	0.41	7.07	18	108.0	0.010	0.0210	19.78	11.20	9.61
7	8	0.02	0.98	0.02	0.02	10.00	0.17	10.00	6.80	0.14	0.14	18	78.0	0.010	0.0100	13.65	7.73	0.69
8A	8	0.77	0.98	0.75	0.75	10.00	0.03	10.00	6.80	5.10	5.10	24	17.0	0.010	0.0130	33.52	10.68	5.53
10	10A	0.44	0.98	0.43	2.04	10.00	0.03	10.86	6.68	2.87	13.63	24	12.0	0.010	0.0060	22.77	7.25	7.80
10A	13a	0.39	0.98	0.38	2.42	10.00	0.10	10.89	6.68	2.54	16.17	24	75.0	0.010	0.0190	40.53	12.91	11.67
16a	16	0.19	0.98	0.19	0.19	10.00	0.22	10.00	6.80	1.29	1.29	12	75.0	0.010	0.0089	4.37	5.57	4.33
16	15	0.11	0.98	0.11	0.30	10.00	0.27	10.22	6.80	0.75	2.04	12	53.0	0.010	0.0030	2.54	3.24	3.69
15	14	0.38	0.98	0.37	0.67	10.00	1.42	10.49	6.80	2.52	4.56	18	360.0	0.010	0.0030	7.48	4.23	4.57
14	17	1.61	0.98	1.58	2.25	10.00	0.84	11.91	6.44	10.18	14.49	24	260.0	0.010	0.0030	16.10	5.13	5.78
11	18A	0.00	0.00	0.00	0.60	0.00	0.09	10.78	6.68	0.00	4.01	24	70.0	0.010	0.0190	40.53	12.91	5.19
12	12a	0.27	0.98	0.26	0.60	10.00	0.23	10.24	6.80	1.77	4.08	18	95.0	0.010	0.0080	12.21	6.91	5.67
12b	12	0.26	0.98	0.25	0.25	10.00	0.12	10.00	6.80	1.70	1.70	12	39.0	0.010	0.0080	4.14	5.27	4.83
13	12	0.09	0.98	0.09	0.09	10.00	0.24	10.00	6.80	0.61	0.61	12	94.0	0.010	0.0127	5.22	6.65	3.00
17	18	0.40	0.98	0.39	2.64	10.00	0.04	12.75	6.20	2.42	16.37	24	35.0	0.010	0.0220	43.61	13.89	12.24
1	1A	0.08	0.00	0.00	1.23	10.00	0.23	11.23	6.56	0.00	8.07	24	72.0	0.010	0.0030	16.10	5.13	5.14
20	1	0.00	0.50	0.00	1.23	10.00	0.29	10.94	6.68	0.00	8.22	24	90.0	0.010	0.0030	16.10	5.13	5.18
19	20	1.25	0.98	1.23	1.23	10.00	0.94	10.00	6.80	8.36	8.36	24	290.0	0.010	0.0030	16.10	5.13	5.22
3	21	0.00	0.00	0.00	1.31	10.00	0.54	11.56	6.44	0.00	8.44	24	107.0	0.022	0.0060	10.35	3.30	3.77
2	3	0.16	0.50	0.08	0.08	10.00	0.14	10.00	6.80	0.54	0.54	12	50.0	0.010	0.0100	4.63	5.90	2.66
1A	3	0.00	0.00	0.00	1.23	0.00	0.10	11.46	6.56	0.00	8.07	24	32.0	0.010	0.0030	16.10	5.13	5.14
8	10	0.09	0.80	0.07	1.61	10.00	0.21	10.65	6.68	0.47	10.75	24	85.0	0.010	0.0050	20.79	6.62	6.74

Subcatchment area for pipe sections downstream of basin is an assumed value to generate the dischage flow from the 25 year storm.

RIPRAP APRON DATA SHEET

Van Cleef ENGINEERING ASSOCIATES

RIPRAP APRON DATA SHEET

PROJECT NAME: Phase 1 of Improvements at HSS
STORM FREQENCIES: 25 year

JOB #: 1808WW.01
DATE: 19-Feb-20
REV:
BY: HS

OUTLET STRUCT.	YEAR STORM	Q (cfs)	q (cfs/ft)	PIPE HEIGHT (in)	PIPE WIDTH (in)	TAILWATER (ft)	La (ft)	Wa (ft)	d50 (in)	Thickness (in)
Tw<1/2 Do or =0.2Tw										
19	**25**	**19.90**	**9.95**	**24**	**24**	**0.40**	**26.7**	**32.7**	**12.7**	25.5
19a	**25**	**16.53**	**8.27**	**24**	**24**	**0.40**	**24.5**	**30.5**	**10.0**	19.9
Tw>1/2 Do										

Calculations represent minimum requirements. See Plans for actual apron dimensions

Flows represent worst case 100 year flows.

A. Horizontal Riprap Apron (fig. 12-1, 12-2)

Apron Dimensions – unconfined outlet

1. The length and width of the apron shall be determined from the formulas:

TW < ½ D_o $\quad La = 1.8\left(\frac{q}{Do^{0.5}}\right) + 7Do \quad Wa = 3Wo + La$

TW ≥ ½ D_o $\quad La = 3\left(\frac{q}{Do^{0.5}}\right) \quad Wa = 3Wo + 0.4La$

where $q = \frac{Q}{Wo}$

Where D_o is the maximum inside culvert height in feet, W_o is the maximum inside culvert width in feet, q is the unit discharge, = Q/W_o in cfs per foot for the conduit design storm or the 25 year storm, whichever is greater and L_a is the length of the apron determined from the formula and W_o is the culvert width.

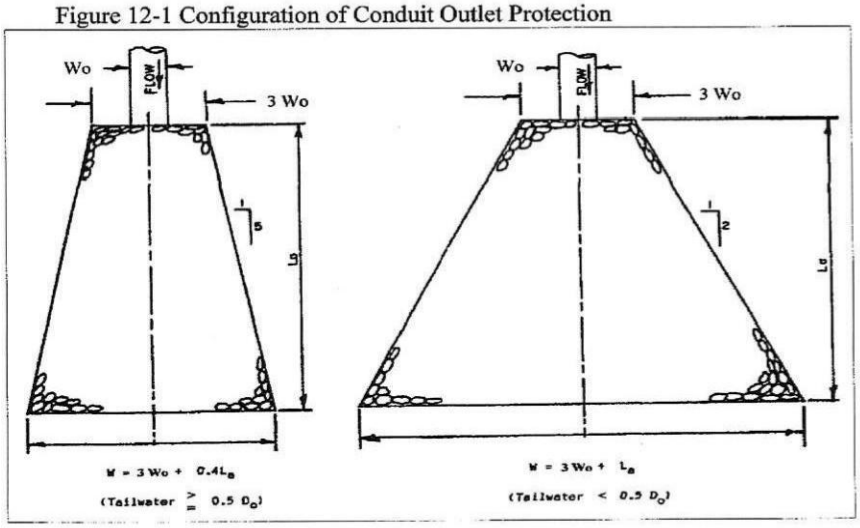
The width of the apron at the culvert outlet shall be at least 3 times the culvert width.

For Horizontal Apron: $d_{50} = \frac{0.02}{Tw} q^{1.33}$ where $q = \frac{Q}{Wo}$

For areas where Tw cannot be computed, use Tw = 0.2 D_o

Where q and D_o are as defined under apron dimensions and T_W is tailwater depth above the invert of culvert in feet.

Figure 12-1 Configuration of Conduit Outlet Protection



EMERGENCY SPILLWAY CALCS

Summary for Pond 7P: REVISED WITH NEW COUNTY ROW proposed basin SPW

Inflow Area = 8.223 ac, 73.25% Impervious, Inflow Depth = 7.29" for 100YR STM event
Inflow = 58.22 cfs @ 12.17 hrs, Volume= 4.998 af
Outflow = 2.23 cfs @ 14.84 hrs, Volume= 1.070 af, Atten= 96%, Lag= 160.0 min
Primary = 2.23 cfs @ 14.84 hrs, Volume= 1.070 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 100.11' @ 14.84 hrs Surf.Area= 37,362 sf Storage= 175,084 cf

Plug-Flow detention time= 599.6 min calculated for 1.070 af (21% of inflow)
Center-of-Mass det. time= 344.3 min (1,103.9 - 759.6)

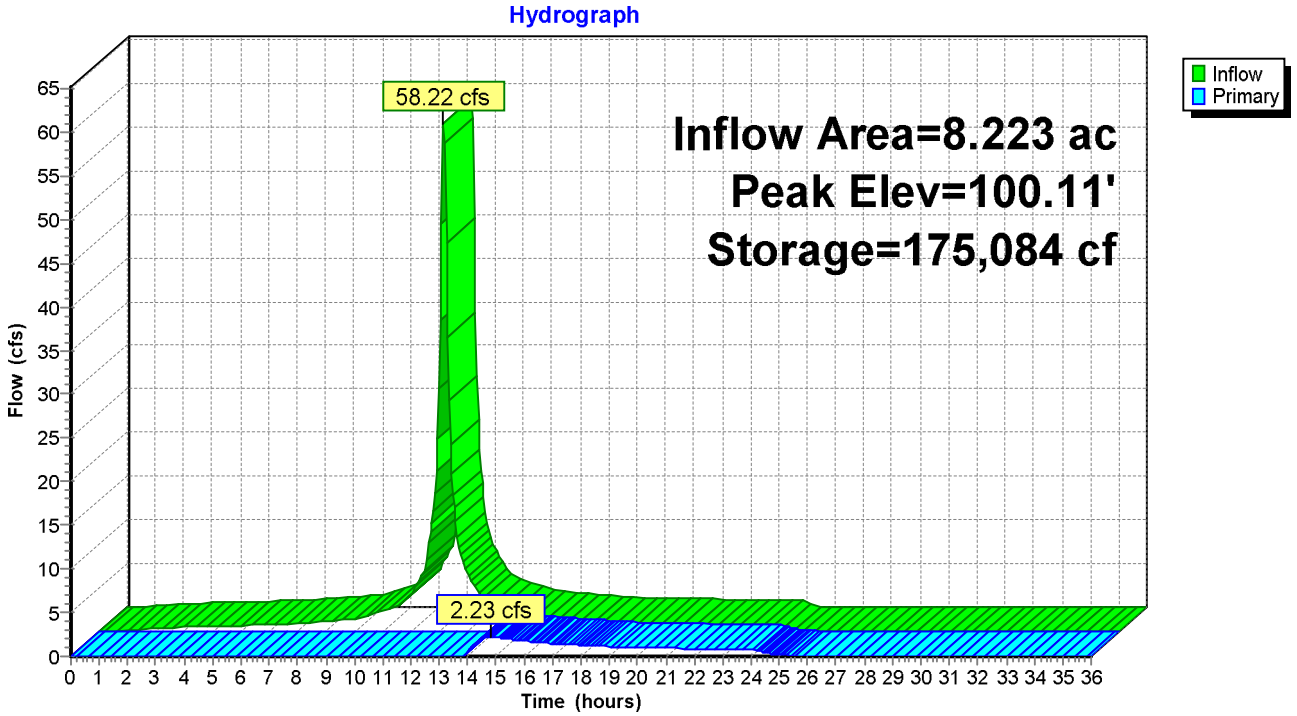
Volume	Invert	Avail.Storage	Storage Description
#1	92.70'	222,466 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.70	18,219	0	0
93.00	18,336	5,483	5,483
94.00	18,576	18,456	23,939
95.00	18,775	18,676	42,615
96.00	21,216	19,996	62,610
97.00	24,095	22,656	85,266
98.00	27,044	25,570	110,835
99.00	30,100	28,572	139,407
100.00	33,263	31,682	171,089
101.00	69,492	51,378	222,466

Device	Routing	Invert	Outlet Devices
#1	Primary	93.96'	**29.0" W x 6.0" H Vert. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	100.00'	**21.0' long x 28.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Primary	97.70'	**48.0" x 48.0" Horiz. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.14 cfs @ 14.84 hrs HW=100.11' (Free Discharge)
- **1=Orifice/Grate** (Controls 0.00 cfs)
- **2=Broad-Crested Rectangular Weir** (Weir Controls 2.14 cfs @ 0.90 fps)
- **3=Orifice/Grate** (Controls 0.00 cfs)

Pond 7P: REVISED WITH NEW COUNTY ROW proposed basin SPW



Summary for Pond 7P: REVISED WITH NEW COUNTY ROW proposed basin SPW

Inflow Area = 8.223 ac, 73.25% Impervious, Inflow Depth = 7.29" for 100YR STM event
Inflow = 58.22 cfs @ 12.17 hrs, Volume= 4.998 af
Outflow = 24.64 cfs @ 12.37 hrs, Volume= 2.637 af, Atten= 58%, Lag= 12.2 min
Primary = 24.64 cfs @ 12.37 hrs, Volume= 2.637 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 98.30' @ 12.37 hrs Surf.Area= 27,975 sf Storage= 119,216 cf

Plug-Flow detention time= 272.4 min calculated for 2.637 af (53% of inflow)
Center-of-Mass det. time= 144.8 min (904.4 - 759.6)

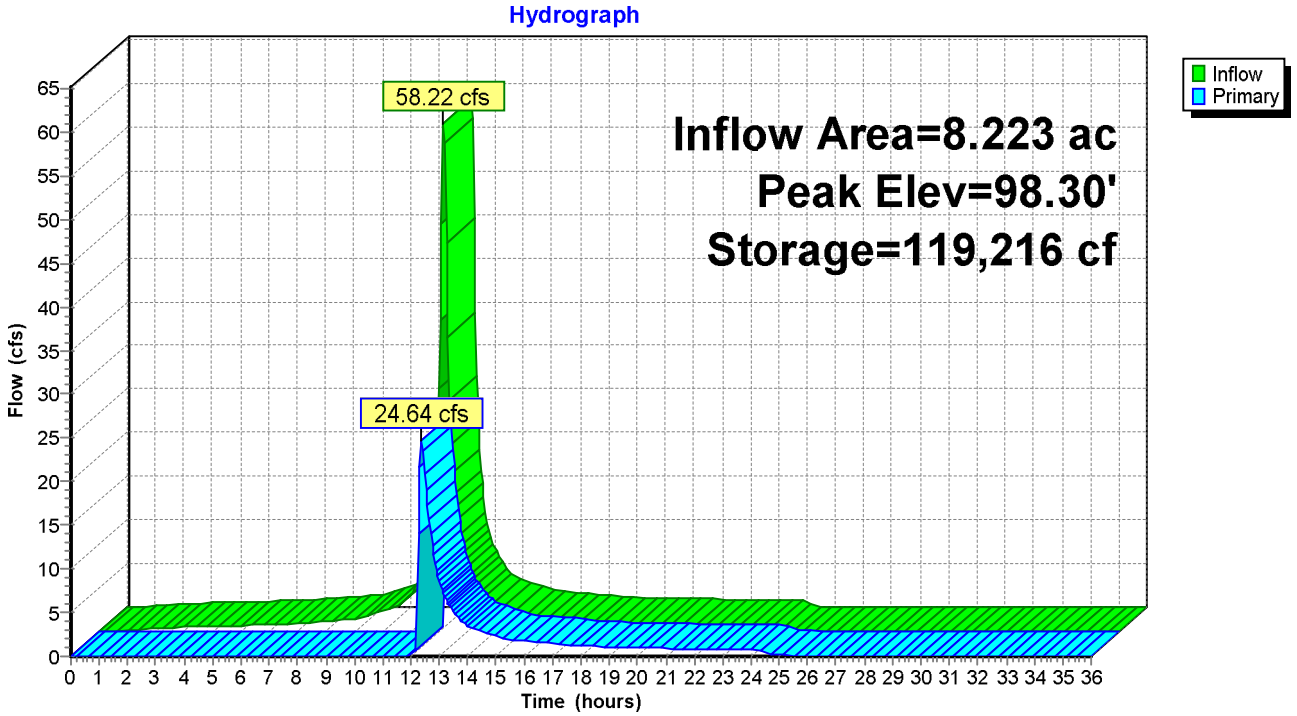
Volume	Invert	Avail.Storage	Storage Description
#1	92.70'	222,466 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.70	18,219	0	0
93.00	18,336	5,483	5,483
94.00	18,576	18,456	23,939
95.00	18,775	18,676	42,615
96.00	21,216	19,996	62,610
97.00	24,095	22,656	85,266
98.00	27,044	25,570	110,835
99.00	30,100	28,572	139,407
100.00	33,263	31,682	171,089
101.00	69,492	51,378	222,466

Device	Routing	Invert	Outlet Devices
#1	Primary	93.96'	**29.0" W x 6.0" H Vert. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	100.00'	**21.0' long x 28.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Primary	97.70'	**48.0" x 48.0" Horiz. Top of Box** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=24.24 cfs @ 12.37 hrs HW=98.30' (Free Discharge)
- **1=Orifice/Grate** (Controls 0.00 cfs)
- **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **3=Top of Box** (Weir Controls 24.24 cfs @ 2.53 fps)

Pond 7P: REVISED WITH NEW COUNTY ROW proposed basin SPW



BASIN SUMMARY FORM

New Jersey Department of Agriculture

Hydrologic Modeling Database – Data Entry Form

Project Site Details

Chpt. 251 Application Number:

Start Date (if known): TBD

Street Address:346 Clarksville Road

County: Mercer

Municipality: West Windsor Township

Block: 17.13

Lot: 2

NJDEP Anderson Landuse Code (4 digits): 1110

Landuse description: High School

Site Centroid Location (NJ State Plane Feet): [1]

Northing: 536,435.13 Easting: 458,894.35

Project Contact Details

Applicant: West Windsor Plainsboro Regional School District

Address: 321 Village Road East

Phone: 609-716-5000

Email: christopher.russo@ww-p.org

Post Construction Operation & Maintenance:[2]

Party Name: Thomas Daly

Address: 321 Village Road East

Phone: 609-716-5000

Email: thomas.daly@ww-p.org

Party type (HOA, government, private, etc): Municipal

New Jersey Department of Agriculture

Hydrologic Modeling Database – Data Entry Form

Basin Details:[3]

Basin Centroid (NJ State Plane Feet):[4]

Northing: 536,904.22 Easting: 458,970.22

Basin Type: detention + infiltration

Construction: excavated

Status phase:[5] Design ☒ As-built ☐

Dam Height (ft) 8 top width (ft) 10

Dam Classification: iii

Drainage Area(s) to Basin [note- include any bypass areas][6]

Drainage Area Name	Drainage Area (acres)	Post-Development CN#	Percent Impervious	Time of Concentration (min)
impervious	6.02	98	100	10
open space	2.20	69	0	10

Basin Outlet Structure(s)[7]

ID: Outlet Control Structure

End of Pipe Location:[8] Northing: 536,881.64 Easting: 458,958.55

Discharge Type[9] (weir, orifice, etc)	Dimensions (diameter, length)	Elevation (USGS)	Discharge [10]Coefficient	Equation Used[11]
orifice	2.33'x0.50'	93.96	0.6	Q=CoAv(2gh/k)Nb

New Jersey Department of Agriculture

Hydrologic Modeling Database – Data Entry Form

Basin Outlet Structure(s)

ID:

End of Pipe Location: Northing: Easting:

Discharge Type (weir, orifice, etc)	Dimensions (diameter, length)	Elevation (USGS)	Discharge Coefficient	Equation Used

Basin Stage-Discharge Rating Table[12]

Elevation (USGS Feet)	Storage (Acre-Ft)	Total Outlet Structure Discharge (cfs)
92.70	0	0.00
94.10	0.592	0.41
94.30	0.678	1.54
94.70	0.850	4.03
95.10	1.022	5.47
95.90	1.389	7.56
96.50	1.689	8.80
97.30	2.126	10.22
97.70	2.361	10.87

New Jersey Department of Agriculture

Hydrologic Modeling Database – Data Entry Form

NJDEP BMP Water Quality Structures[13]

Type (rain garden, green roof, seepage pit etc)	Size	Size Units (cu ft, sq ft etc)	Northing (SPF)	Easting (SPF)
sand filter	15,125	sq ft	536,904	458,970
choose an item				
choose an item				
choose an item				
choose an item				

Explanatory Notes-

[1] Approximate location of center of site, coordinates in state plane feet
[2] Indicate who will be responsible for permanent operation and maintenance
[3] Additional Basin Detail Pages can be used for more than one basin in a project.
[4] Approximate location of center of basin, coordinates in state plane feet
[5] Indicate "design" for basins not yet constructed
[6] Drainage areas which are modified by construction, but not directed to the basin should still be listed and described
[7] "Outlet structure" means the control box, outlet headwall, FES etc. This does not refer to an individual control on the structure such as a weir or orifice. There are two tables for more than one outlet structure
[8] Approximate location of terminal discharge end of basin outfall, coordinates instate plane feet
[9] Indicate the type of outlet – weir, orifice, hydro brake, etc.
[10] Discharge Coefficient specific to the type of outlet control i.e., 0.6 for circular orifice
[11] List the discharge equation for each outlet (weir, orifice etc) used
[12] For basins with dead storage below the primary outlet, indicate 0 cfs discharge until the lowest outlet is reached. Routing table should begin at the lowest basin elevation.
[13] Describe NJDEP BMP Manual water quality devices such as seepage pits, rain gardens etc. Size is appropriate for device – cubic feet, square feet or linear feet. Location of device using state plane feet coordinates.

GROUNDWATER RECHARGE

New Jersey Groundwater Recharge Spreadsheet
Version 2.0
November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
MERCER CO., WEST WINDSOR TWP	44.9	1.43

Project Name:	WW-P High School South
Description:	Detension Basin
Analysis Date:	02/10/20

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	2	Open space	Sassafras	13.2	95,936
2	0.895	Open space	Sassafras	13.2	42,931
3	4.452	Impervious areas	Sassafras	0.0	-
4	0.724	Open space	Sassafras	13.2	34,729
5	0.367	Impervious areas	Sassafras	0.0	-
6					
7					
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	8.4			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				5.7	173,596

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	1.155	Open space	Sassafras	13.2	55,403
2	0.175	Open space	Sassafras	13.2	8,394
3	6.063	Impervious areas	Sassafras	0.0	-
4	1.045	Open space	Sassafras	13.2	50,126
5		Impervious areas	Sassafras		
6					
7			Fallsington		
8	0				
9	0				
10	0				
11	0		Sassafras		
12	0				
13	0		Sassafras		
14	0				
15	0				
Total =	8.4			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				3.7	113,924

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft) 264,104
Post-Development Annual Recharge Deficit=	*59,672*	(cubic feet)

Recharge Efficiency Parameters Calculations (area averages)

RWC=	3.61	(in)	DRWC=	3.61	(in)
ERWC =	1.03	(in)	EDRWC=	1.03	(in)

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

Project Name	Description	Analysis Date	BMP or LID Type
WW-P High School South	Detension Basin	02/10/20	

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	4500.0	sq.ft
BMP Effective Depth, this is the design variable	dBMP	6.0	in
Upper level of the BMP surface (negative if above ground)	dBMPu	-16.8	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	0.0	in
Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined	SegBMP	3	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.81	in
ERWC Modified to consider dEXC	EDRWC	0.81	in
Empty Portion of RWC under Infilt. BMP	RERWC	0.63	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.11	in
Inches of Rainfall to capture	Pdesign	0.17	in
Recharge Provided Avg. over Imp. Area		6.7	in
Runoff Captured Avg. over imp. Area		7.6	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.02	unitless
BMP Volume	VBMP	2,250	cu.ft

CALCULATION CHECK MESSAGES

Volume Balance-> Solve Problem to satisfy Annual Recharge
dBMP Check---> OK
dEXC Check---> OK
BMP Location---> OK

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	59,672	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	262,393	sq.ft
Root Zone Water Capacity	RWC	2.83	in
RWC Modified to consider dEXC	DRWC	2.83	in
Climatic Factor	C-factor	1.43	no units
Average Annual P	Pavg	44.9	in
Recharge Requirement over Imp. Area	dr	2.7	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		147,040	cu.ft
Avg BMP Recharge Efficiency		88.7%	Represents % Infiltration Recharged
%Rainfall became Runoff		77.7%	%
%Runoff Infiltrated		21.7%	%
%Runoff Recharged		19.1%	%
%Rainfall Recharged		14.9%	%

OTHER NOTES

Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensetive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses

How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP.
To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration clik the "Default Vdef & Aimp" button.

GROUNDWATER MOUNDING

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
0.8340	*R*	**Recharge (infiltration) rate (feet/day)**
0.150	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
4.17	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
154.000	x	**1/2 length of basin (x direction, in feet)**
51.000	y	**1/2 width of basin (y direction, in feet)**
1.667	t	**duration of infiltration period (days)**
2.500	hi(0)	**initial thickness of saturated zone (feet)**

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00

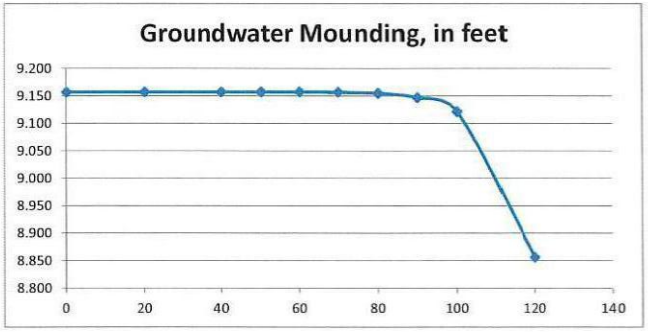
hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

11.657	h(max)	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
9.157	Δh(max)	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
9.157	0
9.157	20
9.157	40
9.157	50
9.157	60
9.157	70
9.155	80
9.147	90
9.121	100
8.856	120

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

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use consistent units (e.g. feet & days or inches & hours)

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1.667	t	duration of infiltration period (days)
2.500	hi(0)	initial thickness of saturated zone (feet)

11.657	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
9.157	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)

Conversion Table

inch/hour	feet/day
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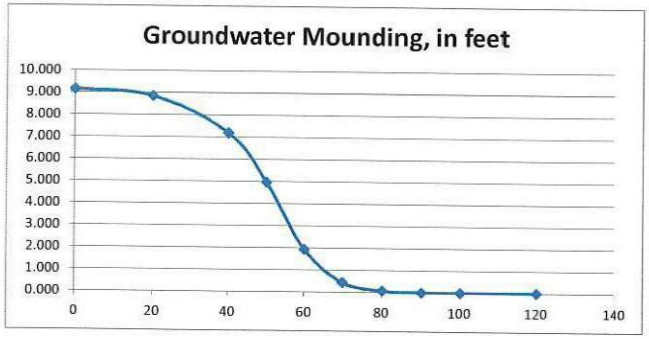
2.00	4.00

hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
9.157	0
8.845	20
7.184	40
4.967	50
1.939	60
0.450	70
0.076	80
0.012	90
0.004	100
0.003	120

Re-Calculate Now



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STORMWATER MANAGEMENT OPERATION AND MAINTENANCE MANUAL

Stormwater Management Operation and Maintenance Manual

for

West Windsor Plainsboro Regional School District

Additions and Renovations at WW-P High School South
Block 17.13, Lot 2

Township of West Windsor
Mercer County, New Jersey

Van Cleef
ENGINEERING ASSOCIATES
www.vcea.org

4 AAA Drive, Suite 103
Hamilton, New Jersey 08691
(609)-689-1100

Herbert J. Seeburger, N.J.P.E.# 24GE04748700

FEBRUARY 2020
VCEA #1808WW

TABLE OF CONTENTS

I. INTRODUCTION

The purpose of this report is to provide guidelines and information regarding the required maintenance for the infiltration basin to be constructed in association with the development of Block 17.13, Lot 2 in the Township of West Windsor, Mercer County, New Jersey. The project will consist of two additions to the existing high school, parking lot expansion and new student drop off at West Windsor-Plainsboro High School South. The parking lot expansion will provide 9 additional parking spaces, new lighting, a surface infiltration basin and all associated site improvements. The subject site is located on at 346 Clarksville Road in the Township of West Windsor, Mercer County, New Jersey and is identified as Block 17.13, Lot 2 on the Township of West Windsor Tax Map. The subject site is currently being used as a high school. The stormwater management facilities will contribute toward the safe conveyance, storage, treatment and discharge of runoff generated by the proposed development. Every stormwater management system, whether at grade or below grade, requires that basic periodic maintenance to be performed in order to maintain the proper functioning and operation of the system. This report will outline these procedures, further discuss responsibilities and highlight those responsible for performing said maintenance.

II. DESCRIPTION OF FACILITY

The proposed overall stormwater management system has been designed with a pipe network conveying runoff to a sand infiltration basin. These facilities will require periodic inspections and maintenance. The following information can be considered a guideline for their continued maintenance, including suggested inspection scheduling, as well as performance objectives.

III. RESPONSIBILITY FOR OPERATIONS

Responsibility for operation, maintenance, repair and safety of stormwater management facilities, including periodic removal and disposal of accumulated particulate material and debris, shall remain with the property owner and all successors in title unless assumed by a governmental agency. For purposes of this manual, the stormwater management facility shall consist of all components including the storm sewer pipe network, infiltration basins and associated site features that convey stormwater runoff. The responsible party shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and deed as necessary.

In the event that the stormwater management facility becomes a danger to public safety or public health, or if it is in need of maintenance, the school district shall so notify the responsible person in writing. Upon receipt of that notice the responsible person shall have fourteen (14) days to effect maintenance and repair of the facility in a manner that is approved by the municipal engineer or a designee. If for reasons of safety there is need for immediate action, the responsible personal shall act forthwith to remove the danger. If the responsible person fails or refuses to perform such maintenance and repair, the municipality may immediately proceed to do so and shall be reimbursed for the cost thereof by the responsible person or entity.

Responsible Parties

System Owner:	West Windsor Plainsboro Regional School District Director of Buildings and Grounds 505 Village Road West West Windsor, NJ 08550 (609) 716-5000 x 5351
Design Engineer:	Van Cleef Engineering Associates 4 AAA Drive, Suite 103 Hamilton, NJ 08691 Attn: Herbert Seeburger, PE (609) 689-1100

IV. ABOVE GROUND DETENTION BASINS

A. Inspections

A consulting professional engineer should inspect the stormwater facility annually to ensure that the infiltration basin, and storm sewer pipe network is operating as designed. The inspection shall reveal whether or not there are accumulated sediments within the basins, structures or the associated pipe network. An inspection report should be provided to the owner with recommendations on whether or not sediment removal is required. Debris and other general nuisance materials should also be removed from all areas at this time.

Property Owners/Tenants or their maintenance designee should also inspect the above ground detention facility components once per month and after storm events exceeding one (1) inch of rainfall to remove accumulated floating debris and ensure proper functioning of the outlet control structure. If removal of accumulated debris is necessary, it shall be accomplished at this time.

B. Maintenance and Repair

Maintenance procedures are required to maintain the intended operation and safe condition of the stormwater management facility by reducing the occurrence of problems and malfunctions. To be effective, maintenance shall be performed on a regular basis and include such routine procedures as training of staff, periodic inspections, silt and debris removal and disposal, control of mosquitoes and other insects, and review of maintenance and inspection work to identify where the maintenance program could be more effective.

Repair procedures are required to correct a problem or malfunction at a stormwater management facility and to restore the facility's intended operation and safe condition. Based upon the severity of the

problem, repairs shall be performed on an as-needed or emergency basis and includes such procedures as structural repairs, mosquito control, removal of debris, sediment and trash which threaten discharge capacity, erosion repair and snow and ice removal.

In general, there are two types of maintenance considerations: aesthetic maintenance and functional maintenance. They are described as follows:

- **Aesthetic Maintenance**

Aesthetic Maintenance is obviously more important for high profile, above ground facilities than for underground facilities. In general, policing of the grounds and parking lots will prevent foreign debris and floating materials from entering into the system and shall be conducted on an as needed basis.

Collection and removal of surface debris should be performed in association with the lawn and grounds maintenance schedule and that should be accomplished twice monthly (or as necessary) to project a clean, healthy, community image.

Leaf debris and snow removal are also concerns for facilities in the Northeast and protection from accumulated leaf matter and expeditious snow removal are encouraged.

If visual inspection reveals the accumulation of unwanted sediments within the manhole/inlet structure or the adjoining pipe network, it shall be removed with either conventional methods (broom, shovel and pail), or by mechanical means (high power vacuum). The degree of accumulation shall dictate which methods to realistically employ.

The facility shall be inspected for accumulated sediments and those sediments shall be removed (regardless of their depth) on an annual basis.

- **Functional Maintenance**

Functional maintenance is necessary to keep the stormwater management system operating properly at all times. Functional maintenance has two components; preventative maintenance and corrective maintenance.

Preventative maintenance refers to procedures that are performed on a regularly scheduled basis to keep the BMP in proper working order. Preventive maintenance tasks include: surface debris removal (twice monthly) and removal of accumulated sediments within manhole or inlet structures (once annually or as necessary).

Corrective Maintenance is that which is required on an emergency or non-routine basis to correct problems and to restore the intended operation and safe functioning of the stormwater

management system. Prompt response to maintenance problems is essential to providing minimal disruption of the functioning SWM system.

C. *General Maintenance Summary*

- Inspections to be performed by a consulting engineer on an annual basis.
- Inspections to be performed by the property owner and/or a maintenance designee on a monthly basis and/or after a considerable storm event.
- Detention basin manhole access and debris removal to be performed on an annual basis and/or as inspection routine dictates.
- Surface debris, including garbage, leaf matter and snow removal are encouraged as necessary to maintain a safe condition.
- Annual inspection reports shall be provided to the Township Engineer by April 1st of each year.

V. *INFILTRATION BASIN – MAINTENANCE SUMMARY AND TASKS*

Infiltration basins are designed to provide primarily Water Quality Control. This management measure involves employing an infiltration basin to achieve 80% Total Suspended Solid (TSS) removal from stormwater that is discharged from the property. It is imperative that the sand bedding is maintained per manufactures recommendations to ensure it will function properly.

Infiltration basins operate similar to an Extended Detention Basin in that they receive runoff from the upstream conveyance systems (pipes and/or swales) and impound that water in a designated storage area "basin" while discharging only a percentage of the runoff received to mimic the required reduction below the pre-development runoff conditions. Similar to the stormwater collection system, each basin is designed based on the amount of runoff produced within its drainage area, and the available water storage capacity at that basin.

Unique to the Infiltration Basin is it primarily only controls the more frequent water quality design storm – the first 1.25 inches of runoff falling in a two-hour period, or less. The impounded water is treated for water quality by infiltration through the soil/sand layers and subgrade where microbes provide treatment.

Significant increases in impervious coverage (roofs, pavement, sidewalks, etc.) within any drainage area are not to be undertaken without a proper Engineering analysis to insure there is adequate capacity within the basin to prevent downstream flooding conditions, and any permit conditions imposed upon the original project are not violated. These basins operate without significant owner management as long as each outlet structure's devices are kept free and clear of obstructions that would limit the flow they produce. No equipment or material storage, construction, or re-grading is permitted within a designated infiltration basin.

Maintenance measures for the infiltration basin shall include, but not be limited to:

A. Inspection for blocking, clogging or accumulation of sediments in the basin's interior.

B. Mowing and/or trimming of vegetation must be performed on a regular schedule based on specific site conditions.

C. The sand bottom and the spillway must be inspected at least annually for erosion and scour.

D. The bottom sand layer should be inspected at least monthly as well as after every storm exceeding one inch of rainfall. If the water fails to infiltrate 72 hours after the end of the storm, corrective measures must be taken. Annual tilling by light equipment can assist in maintaining infiltration capacity and break up clogged surfaces.

VI. ESTIMATED MAINTANCE COSTS AND TASKS

Task Identification	Task Frequency	Task Estimated Cost
Inspection by licensed professional consulting engineer	Once (1) per year	$1000.00
Inspection by property owner and/or maintenance designee	Once (1) per month (or after a storm event exceeding 1 inch of rainfall)	$500.00
Debris removal from stormwater conveyance system (inlets, pipes, manholes, flared end sections, basin and outlet control structure)	Once (1) per year	$2,000.00
Surface debris removal (garbage & organic matter) including leaves in the Fall and snow in the Winter	Twice (2) per month (or on needed basis)	$1,000.00
Grass Mowing	Twice (2) per month (or on needed basis)	$500.00

West Windsor Plainsboro Regional School District
WW-P High School South
346 Clarksville Road, West Windsor, NJ 08550
Block 17.13 Lot 2

STORMWATER MANAGEMENT MAINTENANCE RECORD

(Attach additional forms, photos, receipts and reports as maybe required.)

Record for period _____

Check If Completed	Description of Maintenance Item	Date Complete	Completed By Initial/Signature
	Visual Inspection of Drainage Structures and where possible subsurface piping.		
	Visual Inspection of all Outfalls.		
	Removal of Silt, Litter and Debris from areas outlined above.		
	Repair or Replacement of Failing Components (if required)		
	Tilling of Infiltration Basin sand bottom		

Notes for additional / follow-up work required:

_____

_____

_____

DRAINAGE AREA MAPS

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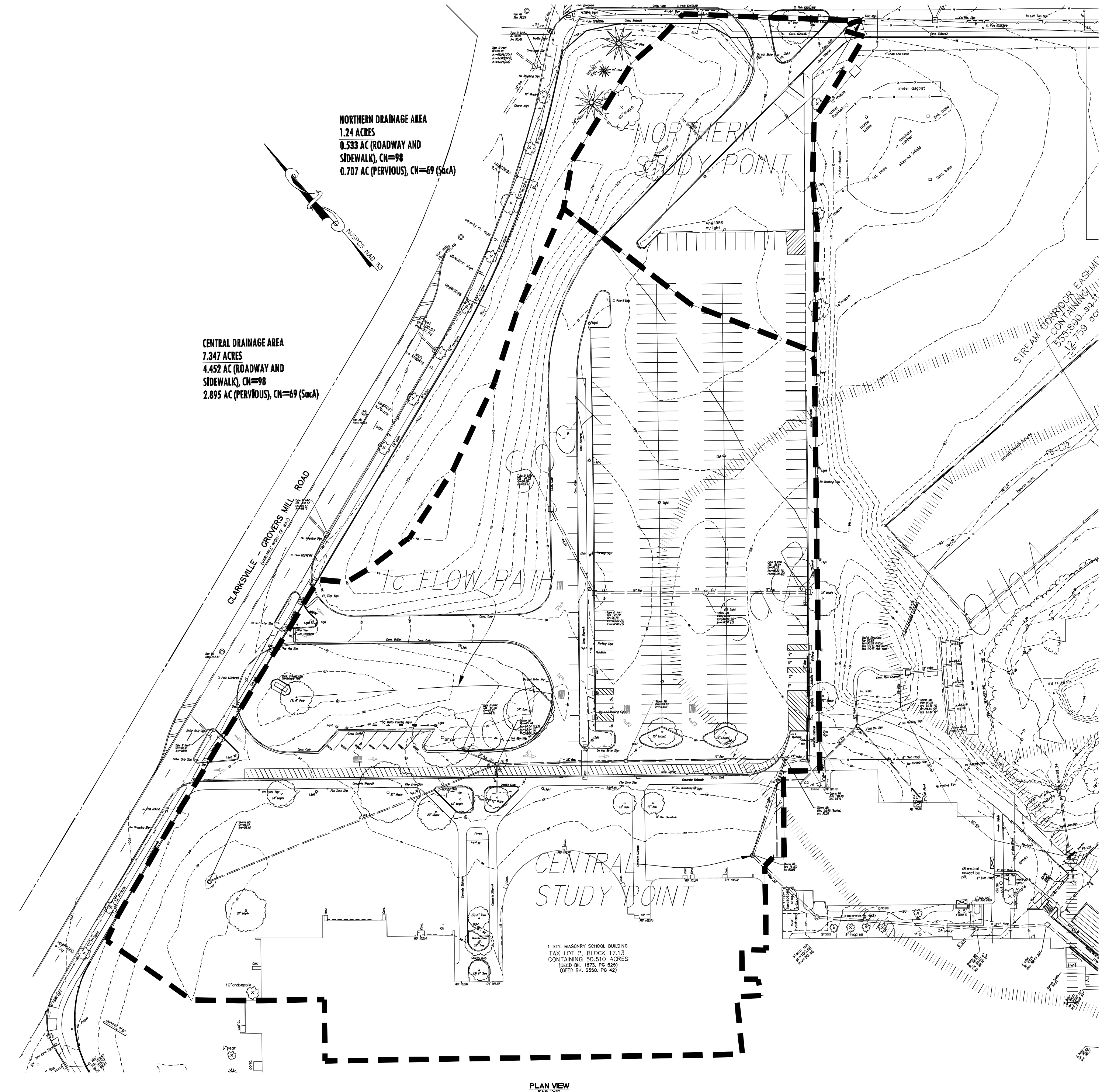

LEGEND

EXISTING		PROPOSED
	SANITARY SEWER	
	STORM SEWER	
	FLARED END SECTION	
	DRAINAGE INLET	
	DRAINAGE MANHOLE	
	HEADWALL	
	SANITARY SEWER MANHOLE	
	FIRE HYDRANT	
	SIGN	
	UTILITY POLE	
	VALVE	
W	WATER MAIN	W
G	GAS MAIN	G
E	ELECTRIC LINE	E
T	TELEPHONE LINE	T
100	CONTOUR ELEVATION	100
X 100.50TC 100.00BC	SPOT ELEVATION AT CURB	X TC 100.50 BC 100.00
X 100.00	SPOT ELEVATION ON GROUND OR PAVEMENT	X 100.00
	CONCRETE CURB	

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2. "TOPOGRAPHIC AND WETLANDS SURVEY FOR THE WEST WINDSOR- PLAINSBORO HIGH SCHOOL SOUTH, BLOCK 17.13, LOT 2 , 155 & 156" AS PREPARED BY VAN CLEEF ENGINEERING ASSOCIATES DATED NOV. 9, 1018.
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GRAPHIC SCALE
(IN FEET)
1 inch = 20 ft.

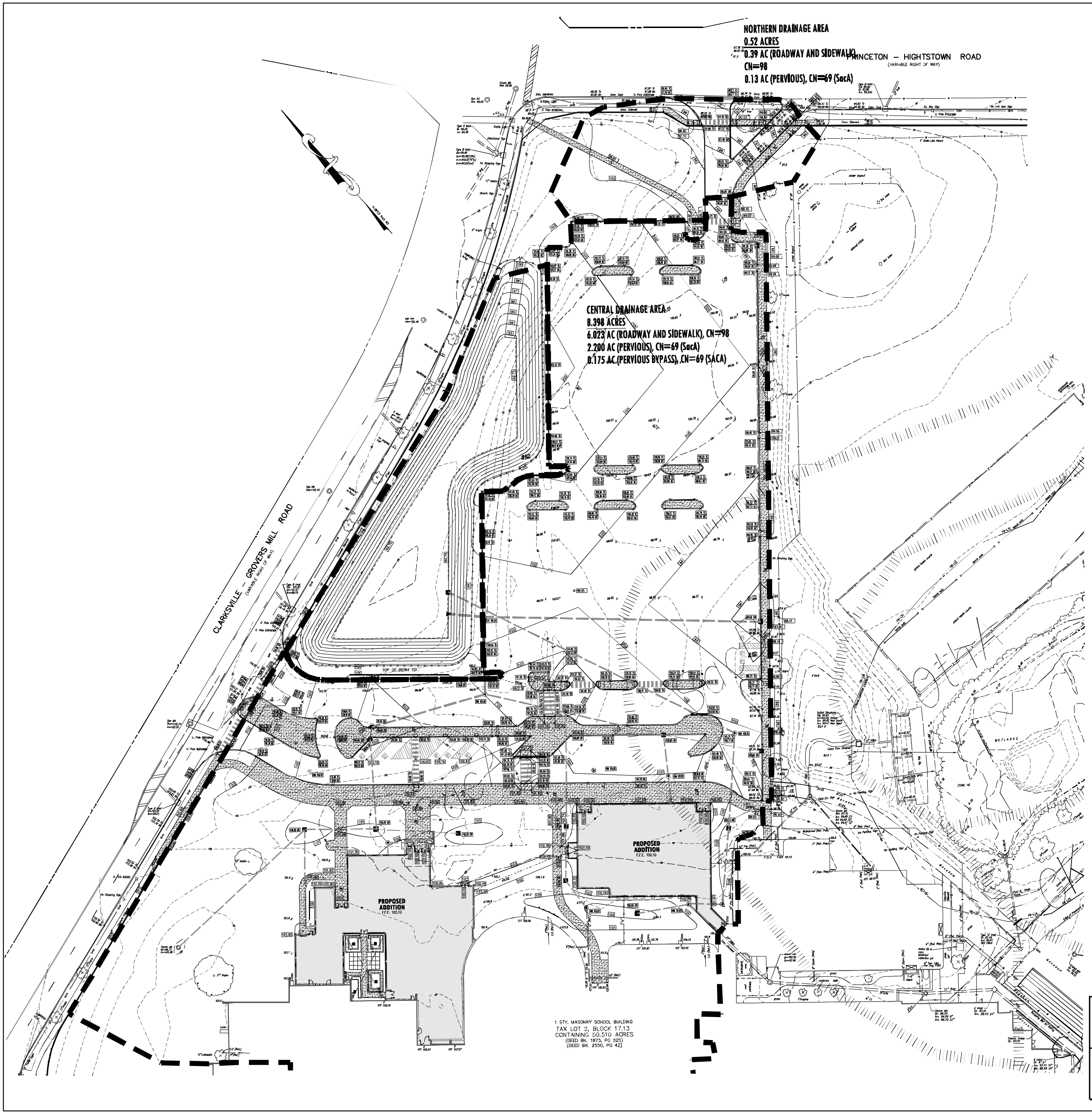
Van Cleef ENGINEERING ASSOCIATES
Consulting Civil Engineering
Environmental Engineering
Municipal Engineering
Land Surveying
Professional Planning
Landscape Architecture
SOUTHCENTRAL NEW JERSEY OFFICE
4 AAA DRIVE, SUITE 103, HAMILTON, NJ 08691
EMAIL: VCENJ@VCEA.ORG WEB: WWW.VCEA.ORG
OFFICES THROUGHOUT NJ, EASTERN PA, AND DE

BY: ______ DATE
HERBERT J. SEEBURGER, JR. N.J. PROFESSIONAL ENGINEER NO. 24GE04748700

NJDCA Electronic Release Stamp

JOHN J. VERZ, AIA, CSBA
WILLIAM D. HOPKINS II, AIA, LEED AP
GEORGE R. DUTHIE JR., AIA, PP
Architects Date 1/25/18
FVHD
Corporate: 1515 Lower Ferry Road, Trenton - New Jersey 08628
Pennsylvania: 140 Whitaker Avenue, Mont Clare - Pennsylvania 19453
FVHDPC.COM

Project Name	
Project Owner Name	West Windsor - Plainsboro Regional School District
Project Location	West Windsor Township, Mercer County, New Jersey
Project Number	
Project Date	
Checked By	
Drawn By	R.R.F.
Scale	AS NOTED
Drawing Name	EXISTING DRAINGE AREA MAP
Revisions (No. / Date / Description)	
Drawing Number	C100



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CONSTRUCTION NOTES:

1. CONTRACTOR TO PROVIDE SECURE STAGING AREA ON-SITE. LOCATION TO BE AGREED UPON BY SCHOOL.
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3. CONTRACTOR TO PROVIDE EMERGENCY ACCESS TO SCHOOL AT ALL TIMES.
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9. CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING THE EXISTING INFRASTRUCTURE. CONTRACTOR SHALL BE RESPONSIBLE FOR REPLACING ANY AND ALL OF THE EXISTING INFRASTRUCTURE THE CONTRACTOR DAMAGED DURING THE PROJECT.
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17. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SURVEY WORK REQUIRED TO STAKE OUT SITE FEATURES DURING CONSTRUCTION.

Dig Safely. 1-800-272-1000 — LLAME ANTES DE EXCAVAR 811

2019 N.J.D.O.T. STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION AS AMENDED OR SUPPLEMENTED SHALL GOVERN THE CONSTRUCTION OF THIS PROJECT

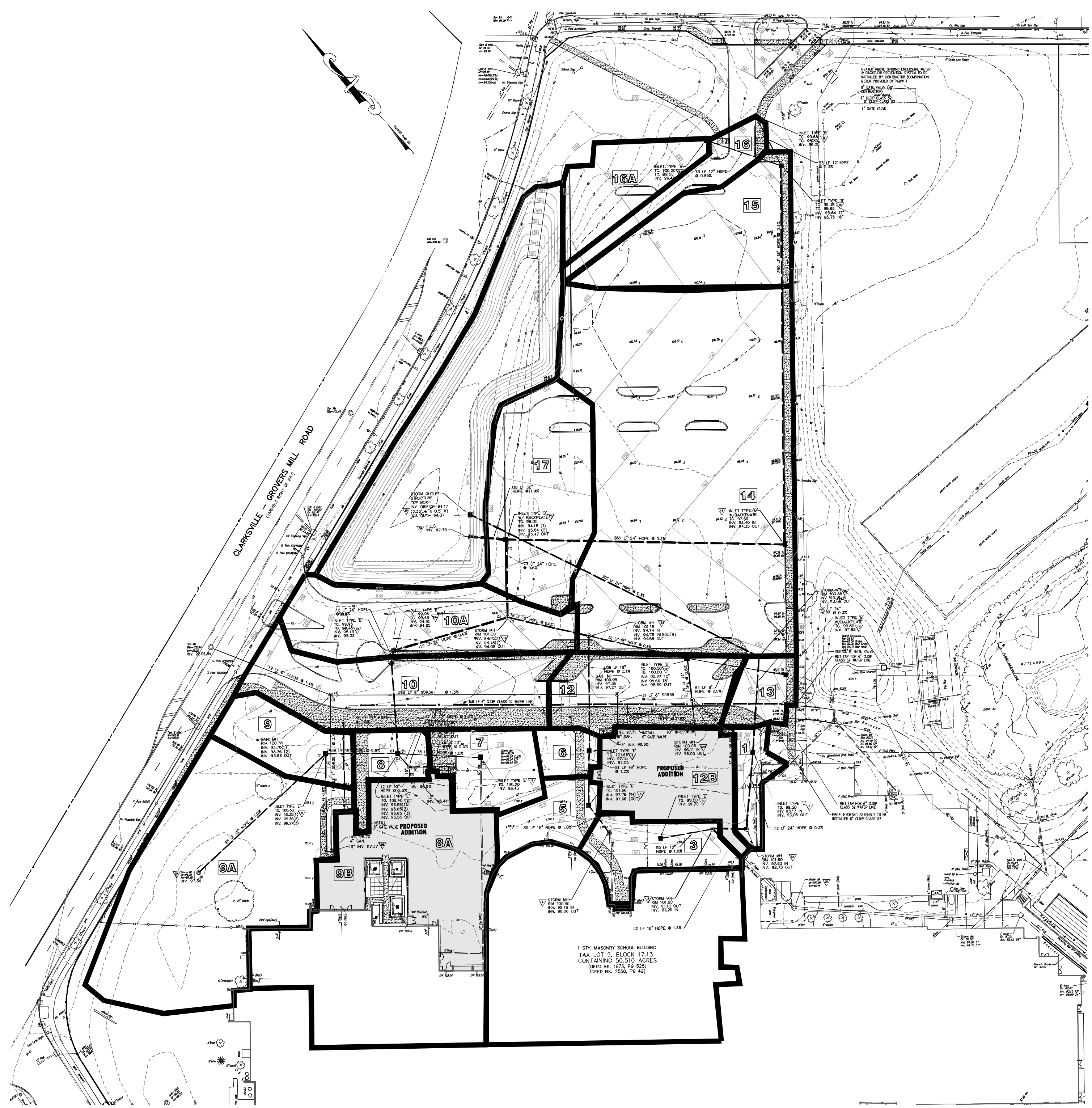
GRAPHIC SCALE (IN FEET) 1 inch = 30 ft.

BY: HERBERT J. SEEBURGER, JR. N.J. PROFESSIONAL ENGINEER NO. 24GE04748700 — DATE

NJDCA Electronic Release Stamp

JOHN J. VEISZ, AIA, CSBA NJ-21AI00866900 | PA-RA010819B
WILLIAM D. HOPKINS III, AIA, LEED AP NJ-21AI01704000 | PA-RA012520X
GEORGE R. DUTHIE JR., AIA, PP NJ-21AI01299200
Architect — Date 2/20/20
Fraytak Veisz Hopkins Duthie PC
Corporate: 1515 Lower Ferry Road, Trenton - New Jersey 08628
Pennsylvania: 140 Whitaker Avenue, Mont Clare - Pennsylvania 19453
FVHDPC.COM

Project Name	Additions and Renovations to West Windsor - Plainsboro High School South
Project Owner Name	West Windsor - Plainsboro Regional School District
Project Location	346 Clarksville Rd., West Windsor, New Jersey 08550
Project Number	5063L / 1808WW
Project Date	02.20.2020
Checked By	GRD
Drawn By	R.R.F.
Scale	1"=30'
Drawing Name	PHASING PLAN
Revisions	No. / Date / Description
Drawing Number	C102



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811 Know what's below. Call before you dig. or 1-800-272-1000
TO LOCATE UNDERGROUND UTILITIES
Dig Safely.

NEW JERSEY UNA LLAMADA
LLAME ANTES DE EXCAVAR
811 OR 1-800-272-1000
EXCAVE CON SEGURIDAD

2019 N.J.D.O.T. STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION AS AMENDED OR SUPPLEMENTED SHALL GOVERN THE CONSTRUCTION OF THIS PROJECT

GRAPHIC SCALE
30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.

Van Cleef ENGINEERING ASSOCIATES
SOUTHCENTRAL NEW JERSEY OFFICE
With Offices in New Jersey, Pennsylvania & Delaware
Consulting Civil Engineering
Bridge Design
Highway Design
Construction Inspection
Geotechnical Engineering
Water / Wastewater
Municipal Engineering
Land Surveying
Professional Planning
Landscape Architecture
NJ LLC CERT. No. 24GA28132800

BY: ______________________ DATE
HERBERT J. SEEBURGER, JR. N.J. PROFESSIONAL ENGINEER NO. 24GE04748700

NJDCA Electronic Release Stamp

JOHN J. VEISZ, AIA, CSBA
NJ-21AI00646900 | PA-RA0108198
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NJ-21AI01706000 | PA-RA012520X
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Architect
Date 2/20/20

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Project Owner Name
West Windsor - Plainsboro Regional School District

Project Location
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5063L / 1808WW

Project Date
02.20.2020

Checked By
GRD

Drawn By
R.R.F.

Scale
1"=30'

Drawing Name
INLET DRAIN. MAP

Revisions

No.	Date	Description

Drawing Number