Limited Stormwater Hydrology Report

Under the Town of Deerfield Stormwater Regulations Bylaw, Stormwater Permit Application, and the DEP Stormwater Management Standards

Proposed Municipal Park & Fields

North Main Street
South Deerfield, MA

December 13, 2021

Submitted To:

Town of Deerfield
Planning Board
Municipal Offices
8 Conway Street
South Deerfield, MA 01373

Applicant:

Selectboard
Town of Deerfield
Municipal Offices
8 Conway Street
South Deerfield, MA 01373

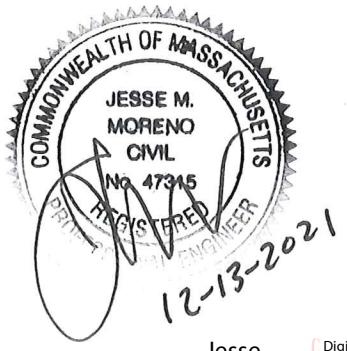

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TABLE OF CONTENTS

Section 1

Narrative, Figures, & Checklist

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Stormwater Narrative for Proposed Municipal Park & Fields North Main Street, South Deerfield, MA

EXECUTIVE SUMMARY

The Town of Deerfield Selectboard ("Applicant") proposes to construct a municipal park with two multi-purpose athletic fields, walking paths, picnic areas, and parking areas. The project infrastructure will support a future bandshell stage, a concession building with restrooms, and a covered pavilion within the property designated as Assessor's Parcel 151-1 with frontage along North Main Street in South Deerfield, Massachusetts. The vacant parcel was historically farmed and is currently owned by The Town of Deerfield. The Town voted at Town Meeting to purchase the parcel for general recreational and open space purposes under the care, custody, and control of the Selectboard.

The subject property is an 8.481 acre± parcel described by deed book 7566 and page 283. The parcel's North Main Street frontage is approximately 65 feet and is located to the East. Undeveloped forest and agricultural land abut the South and West sides of the property. Residential uses are located on the Southeast and East sides of property along North Main Street. An industrial use abuts the site directly to the North. The western property line runs along the Boston & Main Railroad tracks. Access to the property will be provided via a proposed curb cut and 22' wide driveway from North Main Street in the southeast corner of the property. Utilities consisting of water, sewer, electric and communication will connect into existing sources along North Main Street. In general, the locus parcel slopes toward the wetland resource areas and farm ditches located within the middle, western, and southern portions of the site.

EXISTING SITE DESCRIPTION

The project will be constructed on land purchased through Town Meeting vote on Map 151 Lot 1 containing approximately 8.481 acres. The subject property is located just South of the Pelican/Hardigg manufacturing facility on the West side of North Main Street. The property is undeveloped and flat consisting primarily of farm field. To the East lies residential properties and North Main Street, further east of which is Bloody Brook which flows to the south, and agricultural land. Frontier Regional High School & associated sports fields and parking are located to the South. See Figures in Section 1.2 – Locus Map.

The existing historically farmed parcel is currently harrowed yearly by the Town to turn the soil and cut down on the weedy vegetation. The soil generally consists of 10"-11" of fine sandy loam and silt loams. Groundwater is shallow and was observed 24" or shallower throughout the site. The current area of agricultural use on the property is approximately 5 acres. For cultivated cropland, infiltration rates are 40-50% of forested areas despite land being almost fully vegetated. This means that farms and pastures without trees are almost half as effective at mitigating runoff as forests. The conversion of the historic agricultural use to a park with over 250 trees and shrubs proposed will have a positive effect on the soils to mitigate, provide for biodiversity, and promote infiltration.

Wetland resource areas were located within and adjacent to the property by GZA GeoEnvironmental, Inc. during site investigations. A Request for Determination of Applicability (RDA) was filed with the Town of Deerfield Conservation Commission affirming the wetland boundaries as shown on the site plans.

- Two locations qualifying as "Bank" resources were demarcated in the southern border of the site and along the railroad tracks bordering the western property line. The banks were delineated with flags B-12 through B-21 and B-13B through B-20B.

- Bordering Vegetated Wetlands (BVW) were observed in the central portion of the site running east/west and delineated with flags A-1 through A-16 and A-1B through A-24B.

- BVW areas were also identified along the southern parcel boundary and delineated with flags B-2 through B-11.

- An Isolated Vegetated Wetland (IVW) was observed along the northern boundary and delineated with flags C-1 through C-4 and C-1B through C-4B.

- The identified wetland resource areas have a regulated 100-foot buffer zone (unless noted otherwise).

The parcel is within Zoning District "Industrial (I)." According to the July 2, 1980 FEMA Flood Insurance Rate Map for the Town of Deerfield, Massachusetts, Franklin County, Community Panel Number 2501150006B, the proposed development and stormwater features on the parcel are located within Zone C, which is defined as "areas of minimal flooding (no shading)."

The parcel drainage is part of the overall watershed consisting of the Bloody Brook, Sugarloaf Brooks and unnamed perennial streams to the West along Route 5&10 that eventually flow into the Mill River then the Connecticut River. The parcel sub catchments are split roughly 60% to the East and 40% to the West. To the West the parcel drains to an intermittent channel along the Rail Road tracks that generally flows to the South. The Central and Eastern part of the parcel flow to the South towards a constructed farm ditch along the property line that is now jurisdictional carrying drainage towards North Main Street where it travels into a 24" square box culvert and round culvert beneath North Main Street to the East. Bloody Brook runs through the heart of South Deerfield, and is listed as "impaired" in the most recent watershed report due to elevated phosphorus and e.coli levels. Land use along the brook is industrial, agricultural, commercial, and residential with reduced vegetated buffers to the brook. Possible causes of degraded water quality could include salt, manure runoff, and bank erosion. The proposed site entrance is over 200' away from the brook to provide buffer to the stream and is connected from our site via a vegetated swale which reduces the impacts to the brook.

Erosion control will be provided between the improvements and the wetland resource areas. A long term pollution prevention plan has been prepared and is contained in Section 2. The site is proposed to be permitted under "New Development" seeking compliance with State Stormwater Standards and the local Deerfield Stormwater Bylaw to the extent practicable because of the presence of high groundwater and C/D soils.

PROPOSED IMPROVEMENTS

The Applicant proposes to construct a municipal park with two multi-purpose playing fields, access, walking trails, accessible paths, picnic areas, and a parking lot for visitors. Access will be provided via the proposed curb cut from North Main Street. Water and sanitary services will be extended underground from the existing mains located along North Main Street. Dry utilities will be extended from existing overhead sources along North Main Street.

A 22 foot wide paved entrance driveway with adjacent 8' shared use path for pedestrians and bicycles along the Southern side of the property is proposed. A parking lot with circular two-way traffic is proposed with parking for 69 vehicles and two full size school buses. This includes 3 accessible spaces and 3 placeholder spaces for compact/fuel efficient and EV vehicles. The park will feature 2084 feet of 5' wide pervious asphalt/paved walking paths, 967 feet of 5' wide gravel/stone dust paths, a 410 foot long 8' wide shared use path, and a picnic area for public gatherings. Two multi-purpose athletic fields are proposed. The rear field to the west is proposed to be approximately 210 feet wide by 360 feet long to allow use by high school and teen aged children for soccer. The smaller field to the East will be approximately 140 feet wide x 225 feet long and be utilized for youth and pre-teens as well as public gatherings for outdoor concerts and meetings.

The project proposes a series of drainage improvements including open and closed-conveyance systems, low impact design, constructed stormwater wetlands, underground detention, and water quality inlets in accordance with the Town's Best Development Practices Guidebook, Green Infrastructure, and Climate Resiliency Policy.

The access driveway is cross-pitched towards the South where sidewalk scuppers are proposed to send runoff into a vegetated water quality swale with cells to promote infiltration and water uptake in vegetation. These areas will provide treatment via a gravel verge and the swale before discharge to the existing intermittent bank/ditch, 24" square box culvert, and culvert beneath North Main Street. On areas of the site to the South and West of the fields, runoff will maintain existing travel patterns through the preservation of vegetated filter strips and constructed wetlands along the rail road tracks. A walking path is proposed to meander through this area.

The parking lot area is graded towards the center where a curb less lined bio-retention cell island (or raingarden area) is proposed to pre-treat runoff before entering a constructed stormwater wetland along the South side of the property. A constructed centrifugal type water quality inlet (Stormceptor or equal) is proposed to treat the balance of the parking lot.

A majority of the paved walkway path will feature open-graded porous asphalt pavements or pavers that promote infiltration to a stone and gravel reservoir beneath. This LID practice both reduces the runoff generated when compared with conventional pavements but also increase the ability to recharge groundwater by infiltration a portion of the runoff. Between and at the edges of the athletic fields are a series of swales and french drains. Areas of the field and lawn areas will be drained generally using 24" drain basin inlets. Towards the West and Southwest of the site, constructed stormwater wetlands are utilized for runoff mitigation for the large field.

The attached Post-Development Drainage Plan contains the sub-catchments for each tributary watershed. The weighted average CN value for the post-development watershed has increased from 81 to 82 going to the Southeast (DP1/DP10) and reduced slightly from 80 to 78 going West towards the tracks (DP2/DP20) for the project.

The project will require an additional disturbance 2+ acres of land in addition to the existing 5+ acres that was historically farmed. Development and completion of a Notice of Intent (NOI) and Stormwater Pollution Prevention Plan (SWPPP) associated with the EPA's National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from Construction Activities will be required.

An open- and closed-conveyance stormwater management system is proposed to route, detain, and control the release rates of stormwater generated by the proposed improvements including the paved parking areas and future buildings. Future constructed bandshell, concession area, and pavilion will direct clean roof runoff to drip strips, vegetated filter strips, or rain barrels.

Stormwater runoff will sheet flow through the site to series of curb openings, rain gardens, dry water quality swales with pea gravel diaphragms, and sediment forebays prior to collecting within one of two constructed pocket wetlands. Outlets for the constructed pocket wetlands will maintain existing drainage patterns and flow rates toward the existing culvert along North Main Street to the East and the existing railroad right-of-way to the West. This report assumes that all downstream stormwater facilities are operational and post-construction stormwater runoff being equal to or less than existing conditions will not affect the downstream structures.

To enhance phosphorus removal on the site BMP's were chosen based upon evaluation of the following:

- Biofiltration in the raingarden – The median where the filtration is located is oriented to provide maximum solar exposure. The rain garden can employ finer grained media consisting of Biofilter Soil Composition of 50-54% (by weight) sand, 45% loam, and 1-5% steel-wool fabric (optional) for a greater phosphorus removal efficiency via absorption.

- Stormwater constructed wetlands - It is recommended to avoid the use of dry or dry extended basins in lieu of designs that favor shallow benches and wetland areas with a shallow permanent pool.

- Vegetated Water Quality Swale - Vegetated dry water quality swales offer a cost-effective solution for phosphorus removal. Swale media can be a mixture of permeable sandy soil and loam at a 50-50 composition. The swale will have a series of check dams to create cells or a series of pools to promote treatment.

For this reason, the site has proposed rain gardens, constructed stormwater wetlands, and dry water quality swales to help enhance potential removal of phosphorus from the stormwater.

Additionally, the following land uses approaches are recommended to be taken up by the Town:

- Pet Waste Collection – If pets are allowed in the park, the installation of pet waste bag stations could reduce a significant amount of pet waste to be left behind.

- Eco-friendly Deicing Methods – In the event of off season use, alternative deicing materials and the evaluation of minimum application rates can result in reduced risk of stormwater runoff contamination.

As a result, in our opinion, if the project employs the recommended land use practices, the stormwater treatment features, reclaims land that is industrial zoned, and the replanting/revegetating is installed, the project will be beneficial to the water shed. These are also consistent with the BMP performance charts withing Tetra Tech, Inc., United States EPA – Region 1, Stormwater Best Management Practices (BMP) Performance Analysis. Dec 2008.

The proposed site improvements are shown on the plans provided under separate cover entitled *"Proposed Municipal Park & Fields; North Main Street; South Deerfield, MA"* latest revision as prepared by ProTerra Design Group, LLC.

OBJECTIVE OF CALCULATIONS & METHODOLOGY

The purpose of this stormwater narrative is to examine the stormwater runoff from the proposed municipal park with two multi-purpose athletic fields, walking paths, picnic areas, and parking areas based upon the applicable performance standards contained within the Massachusetts Department of Environmental Protection Stormwater Management Handbook and within the context of the Stormwater Regulations for the Town of Deerfield (as adopted by the Planning Board/Stormwater Authority).

The goal of the calculations is to mitigate for the proposed park, multi-purpose fields, walking paths, and paved parking areas. The hydrology calculations attached show that the addition of porous pavement, vegetated filter strips, pea gravel diaphragms, water quality swales, underground detention, and constructed pocket wetlands are sufficient to ensure post-development peak runoff rates approximate pre-development peak flow. Type III 24-hour SCS design storms for the 2-year, 10-year, 25-year, and 100-year design storm events were compared for both pre-development and post-development drainage conditions per the requirements of the Town Stormwater Regulations.

The calculations provided herein show the following:

- The total impervious cover footprint is less than 15 % of lot area;

- The post-development peak discharge rate from the 2-year storm event shall be equal to or less than the pre-development rate in order to prevent stream bank erosion and channel degradation;

- The calculations attached show that post-development peak discharge rate for the 10-year & 25-year, 24-hour frequency storm event shall be equal to or less than the pre-development rate in order to protect downstream property;

- The post-development, peak discharge rate for the 100-year, 24-hour return frequency storm event is controlled to prevent extreme flooding and protect public safety;

The HydroCAD Stormwater Modeling System computer program (version 10.00-26) by Applied Microcomputer Systems, Inc. is used to develop stormwater runoff rates and volumes for the existing and proposed conditions at the project site. The HydroCAD software is a hydrograph generation and routing program similar to TR-20. The software uses Soil Conservation Service (SCS) Unit Hydrograph Methodology. This drainage analysis was developed utilizing a Type III 24-hour storm as developed by the SCS. Information regarding the equations and calculation procedures utilized in HydroCAD will be made available upon request. Drainage area maps for both pre- and post-constructed conditions have been included in this submission.

If the calculated time of concentration for a drainage basin was found to be less than six minutes, an assumed minimum time of concentration of six minutes was utilized to calculate peak flows. The Town Stormwater Bylaw dictates that sheet flow shall be limited to no more than 50 feet. Although, on most sites this limitation makes some scientific sense, this particular site is very flat and observations have exhibited little infiltration and some shallow surface ponding and sheet flows. In this particular case, the Town's bylaw limitation may over estimate the flowrate of runoff generated on this site.

The design storm frequencies and corresponding rainfall depths were compiled from the worst case of Technical Paper No. 40, "Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and 1 to 100 Years" or the Extreme Precipitation Tables contained on the Northeast Regional Climate Control Center – Cornell Data based upon a more recent evaluation of rainfall over the last 60 years. The frequency and rainfall depth rates have been estimated as follows for Franklin County, near North Main Street in South Deerfield, Massachusetts:

Storm Frequency (Years)	Rainfall Depth (Inches)
2	3.01
10	4.66
25	5.69
100	7.27

The groundwater recharge volume applied to the porous pavement area was calculated based on impervious areas over Hydrologic Soil Group D. Not all proposed stormwater generated from impervious areas will be directed toward the porous pavement area but instead will be implemented to the extent practicable due to the entire site covered by poorly drained C and D soils. Stormwater runoff generated from the 2-year design storm and above will be directed offline to the constructed pocket wetlands via area inlets or curb cuts along the edge of the parking lot or field areas. Each constructed pocket wetland was designed with a controlled release outlet structure to regulate the flows leaving the site.

SITE SURFACE WATER HYDROLOGY & SOILS

The site, as previously described, contains approximately 5+ of the 8.48± acres as historically farmed land. Based upon observations of the last year, the town has been continuing to harrow the field to keep weeds and invasives from taking hold. As such, the existing condition of the field was considered to by cultivated with residue > 20%. The woods and fringes were considered to be in "good" condition. It has been visually confirmed that water does not readily infiltrate on the surface of the fields and often collects temporarily in some areas.

A review of soil maps indicates that the Subject Property soils contain silty loamy substrate at 0-3% slope. The soils underlying the parcel, including the majority of project area, are classified as "Raynham loam." These soils were assumed a USDA Natural Resources Conservation Service (NRCS) classification as hydrologic soil group C/D. The vast majority of the land contains silt loam which is not considered prime farmland and is poorly drained. These soils are fine grained glaciofluvial deposits containing high levels of silt. See Figures in Section 1.2 – Soils Map.

A Massachusetts Soil Evaluator from ProTerra Design Group, LLC conducted (14) fourteen deep observation test pits on January 11, 2021 to verify soil classification and to determine the depth to groundwater within the project area. During the investigation the soils were generally described as "silt loam" and "very fine sandy loam." Seasonal high groundwater was observed via redoximorphic features within the test pits between 12" and 22" Observed groundwater within the test pits at this time as generally 24" to 32". Four (4) perforated pipe monitoring wells were installed in late summer/early fall of 2021 and showed observed groundwater to be between 16" and 24" from the surface confirming the observed redox features. An additional (5) five auger pits were conducted in late fall 2021 and confirmed the site wide testing conducted earlier in the year. Additional, test pits conducted by Field Consultants, have confirmed previous testing conducted.

Site soils are estimated as having dual hydrologic group C/D with those that have groundwater within 24" of grade will be considered undrained "D" group soils. Infiltration on the existing site is impaired by the thick 10" to 11" layer of plowed A horizon and the fine sandy loam/silt loam B and C layers. Field infiltration testing could not be performed in the C layer because of high groundwater and was sampled and sent to a lab. The areas of the farmed field yielded raw results under 0.17 inches per hour that are deemed not generally suitable for infiltration. Other areas of the site to the East at the entrance are a bit sandier but still were quite slow at less than 0.25 inches per hour in the lab and demonstrated to have a silt content exceeding 49%. If any factor of safety is applied to the lab results as recommended in the regulations, the rates will be well under the recommended 0.17 inches per hour for infiltrative BMP's.

The project is complicated by fine grained silty soils, flat slopes, and high groundwater that requires earthwork to establish firm foundation and topography suitable to support the improvements. The site will be raised approximately 2 to 3 feet with underdrains proposed beneath the fields and french drains along parts of the periphery to the East. A result of this activity will require the amendment of onsite soils to provide a composition suitable for the athletic fields. This will generally require blending the soils by adding sand in specific proportions with other soil amenities to increase infiltration. The target for the fields is to increase infiltration for root uptake and establish soils that infiltrate 30 to 40 % of the

runoff generated. This will provide an improvement over existing runoff conditions where a thick 10"to 11" plowed layer of silty loam topsoil inhibits infiltration of runoff. Because of the extensive blending and soil amendments, the field locations in the post-drain condition were assumed to be better draining and classified as hydrologic group C.

DESCRIPTION OF STORMWATER MANAGEMENT STANDARDS

The following is an explanation of how the proposed project contributes to proper stormwater management practices using the applicable provisions of the 2008 Massachusetts Stormwater Regulations near the project area.

No New Untreated Discharges (Standard 1) - No new stormwater system conveyances will discharge untreated runoff into or cause erosion in the adjacent resource area. Field and parking areas will direct sheet flow runoff toward porous pavement, pea gravel diaphragms, raingardens, area inlets, or riprap protected curb openings which discharge into the constructed pocket wetlands. An appropriately designed broad-crested weir spillway maintains a low runoff head height to reduce the likelihood of erosive flow leaving the constructed pocket wetlands during major storm events. Eighty-one percent removal efficiency is achieved in the treatment train by utilizing sediment forebay (pretreatment), rain gardens, constructed pocket wetlands, water quality swales, and water quality inlets. All disturbed surfaces will be covered by pavement, gravel/stone, vegetated with trees and shrubs, or seeded and mulched to prevent erosion.

Peak Rate Attenuation (Standard 2) - The peak discharge rates were calculated with the aid of a hydrograph routing program using TR-20 methodology. Disconnected impervious areas, french drains, rain gardens, and cross country drainage with water quality swales are directed to constructed pocket wetlands with sufficient detention storage to help attenuate the peak flows. Calculations show that pre and post levels are approximately the same or below at the 2-year, 10-year, 25-year, and 100-year design storm events.

Recharge (Standard 3) – The site is underlain entirely by C/D soils with depth to groundwater of 24" or less. The majority of the existing parcel has a thick 10" to 11" plowed Ap horizon which inhibits infiltration and the movement of water. The soils are saturated and field infiltration tests were not possible. Samples and lab testing was performed to measure the soils infiltrative capacity which was confirmed to be slower than 0.17 inches per hour and thus generally not suitable for construction of an infiltration BMP. However, increased recharge has been provided by analyzing the existing soil horizons and the proposed blending of silt loam/fine sandy loam soils with 60 to 80% sand required for subsoil in the areas of the constructed multi-purpose fields. The goal is to provide a 60-40 split between runoff and infiltration which is calculated to be an improvement under existing conditions. Additionally, a small 8" thick reservoir of stone is proposed beneath porous pavement walkway sections to promote and encourage infiltration.

Water Quality (Standard 4) – The proposed stormwater management system has been designed to provide the required calculated removal of the total suspended solids (TSS) on the proposed site per the Massachusetts DEP Stormwater Management Policy. A long-term pollution prevention plan has been developed and included with this report. The treatment train of sediment forebay (pre-treatment) and

constructed pocket wetlands has been designed to remove an average of 80% of the TSS from the total site stormwater runoff. Other areas are tributary to a water quality swale with 70% removal rate and the remaining site is directed to rain gardens or water quality inlets with in excess of 80% predicted removal. The above grade retention storage within the constructed pocket wetlands below the lowest outlet will provide for a water quality volume using the "½ inch rule."

Land Uses with Higher Pollutant Loads (Standard 5) –The proposed use as a park with fields and parking less than 1000 trips per day is not considered a use with high-pollutant loads.

Critical Areas (Standard 6) - The site is not located within an Area of Critical Environmental Concern (ACEC), within an Outstanding Resource Water (ORW), or within a Massachusetts DEP Zone II Wellhead Protection Area based upon MassGIS data resources. The project area is not located within a critical area per Regulations but Bloody Brook (MA34-36) is listed as a 2016 Massachusetts Category 5 Water "Waters Requiring a TMDL." Impairments within the section of Bloody Brook are identified as E.Coli, Phosphorus, Turbidity, and Dissolved Oxygen. Runoff from the proposed site drains both to the wetland resource located along the Western property line and within the ditch towards the East at North Main Street. The Eastern area of the site drains towards this Bloody Brook resource. The majority of the field area will drain to the West where there is no direct discharge to Bloody Brook. Rain gardens, dry water quality swales, and constructed stormwater wetlands were chosen as BMP's in the eastern watershed to help mitigate against the existing impairments that were noted.

Redevelopment (Standard 7) – The project strives to meet all of the applicable Stormwater Management Standards.

Construction Period Pollution Prevention Plan and Erosion and Sedimentation Control (Standard 8) – A combination of staked straw bales, mulch socks, filter-fabric fencing, mulching, constructed sediment traps and entrances be used during construction are outlined in the Operation & Maintenance Plan of Standard 9 and as shown on the accompanying plan set. Silt-laden runoff shall be directed towards vegetated areas, temporary sedimentation basins, and diversion berms/wood chip berms. Any dewatering activities will utilize a temporary stilling basin as required to promote infiltration and include methods for source control. A 10,000 gallon or greater frac tank may be employed as necessary to help settle additional suspended solids before discharge (as applicable).

Operation and Maintenance Plan (Standard 9) – An Operation and Maintenance (O&M) plan has been customized to fit the design of the Municipal Park and Fields site. Provisions to maintain runoff control devices have been assured through structural, non-structural, and construction management approaches. Please see the O&M plan appended to this report.

Prohibition of Illicit Discharges (Standard 10) – The Operation and Maintenance plan required by Standard 9 includes measures to prevent illicit discharges. An Illicit Discharge Compliance Statement shall be completed prior to the discharge of any stormwater to post-construction BMPs. A draft Illicit Discharge Compliance Statement is included in Section 2 for owner signature.

BEST MANAGEMENT PRACTICES (BMPs)

The facility design was able to meet the existing drainage conditions by providing vegetated swales, porous pavement, pea gravel diaphragms, sediment forebays, and constructed pocket wetlands with energy dissipaters to increase infiltration and reduce erosion prior to discharging to the property near the wetland resources. A general description of the devices incorporated is indicated below.

1. Water Quality Swale

A water quality swale is proposed along the southern property line to capture, convey, and treat stormwater flows prior to discharging to the existing culvert in the southeast corner of the site. Vegetation in the channel will trap any particulates from the runoff prior to discharging. The channel is graded to a gentle slope and will utilize the vegetative cover to provide some level of treatment.

2. Pea Gravel Diaphragm

A pea gravel diaphragm is proposed along the edge of parking stalls downhill into the parking island rain garden area. This BMP is constructed of a trench filled with gravel along a flat grade. Sediment within stormwater will collect and settle out as it flows into the feature. Once the voids within the stone are filled with stormwater, the pea gravel diaphragm acts as a level spreader discharging stormwater as sheet flow into the vegetated areas prior to the rain garden.

3. Porous Pavement/Pavers

Porous Pavement is proposed within the proposed walkways around the small multi-purpose field. Porous pavement will allow stormwater to percolate through the pavement surface and back into the ground. An underdrain system will collect excess stormwater and will daylight to existing farm ditches and channels. Porous pavement is used to promote volume reduction, provide treatment of the water quality volume, reduce effective imperviousness, and provide storage volume for the groundwater recharge.

4. Sediment Forebay

Sediment forebays are proposed for stormwater pretreatment at the inlet side of the constructed pocket wetlands near downhill of the parking areas. Sediment forebays are permanent BMP practices consisting of an excavated pit or bermed up area designed to slow incoming stormwater runoff and facilitating the gravity separation of suspended solids prior to discharging into another BMP structure. Clean stormwater then flows over a weir into the constructed pocket wetland.

5. Constructed Pocket Wetland

A constructed pocket wetland is a stormwater wetland system that maximizes the removal of pollutants from stormwater runoff through wetland vegetation uptake, retention, and settling. Runoff from the design storm is stored in shallow pools that support conditions suitable for growth of wetland plants. The wetland will intercept surface runoff pretreated by the sediment forebay which includes runoff generated from the proposed fields and parking areas, and impervious concrete sidewalk improvements. When filled during major storm events, the basin will overflow over a broad crested

emergency spillway weir. This will level spread the flow and allow it to continue to follow the existing drainage patterns.

6. Broad Crested Weirs

Broad crested weirs are outlets constructed at zero grade across the slope consisting of a rip-rap stone to disperse or spread concentrated flow thinly over a receiving area. These BMPs are proposed to disperse concentrated stormwater runoff before discharging to the wetland resources. Energy dissipaters consist of stone rip-rap and large stone/boulders placed along the slope of the broad crested weir outlets to disperse concentrated stormwater runoff before discharging to the wetland resource areas. Stormwater flows are slowed and spread out to reduce potential for erosion at the discharge locations.

7. Energy Dissipaters

These BMPs are proposed to disperse concentrated stormwater runoff before discharging to the woodland. Plunge pool energy dissipaters are proposed near the culvert outlet to calm the outflow before dispersing from the site into the wetland resource areas.

8. Outlet Structures / Culverts / Inlets /Pass-throughs/ Scuppers

These structures are utilized to provide controlled release, conveyance, and capture of stormwater runoff. Outlet structures are features within stormwater basins containing a series of orifices, weirs, or grates that regulate discharge rates for different design storm events. Culverts are metal, plastic, or concrete pipes utilized to convey stormwater from one location to another. Inlets are structures located at low points within a project site which collect stormwater runoff and typically direct it into a culvert. In order for proper operation of a stormwater system, these structures must be kept clear of sediment, debris, ice, snow, or other obstructions.

9. *Water Quality Inlets*

Hydrodynamic separators are stormwater management devices that use cyclonic separation to control water pollution. They are designed as flow-through structures with a settling or separation unit to remove sediment and other pollutants. Part of the Eastern most parking lot and driveway entrance will discharge to the center median area where overflow will occur in a water quality inlet prior to discharge.

SUMMARY OF HYDROLOGIC CALCULATIONS

The results of the pre- and post-construction hydrology calculations provided are summarized in the following tables. The tables correspond to the design point or study area as indicated on the drainage area maps and hydrograph routing calculations. The project aim was to study pre and post runoff for the proposed development improvement and meet MassDEP Stormwater Standards to the maximum extent practicable which include but are not limited to: adding stormwater treatment facilities and providing mitigation to reduce drainage levels to pre-development levels or better.

TOTAL RUNOFF PEAK (CFS) FROM THE SITE
TO DESIGN POINT 1/10 (Existing Culvert Southeast)

Type III SCS 24-HR STORM	EXISTING (DP#1)	PROPOSED (DP#10)	DIFFERENCE
2 - YEAR	6.18	5.15	-1.0
10 – YEAR	12.49	11.69	-0.8
25 – YEAR	16.59	15.56	-1.0
100 – YEAR	22.98	22.57	-0.4

The peak runoff flows at this design point (DP1/10) show the same or slight decreases indicating no adverse change in the proposed constructed condition versus the pre-construction condition for the 2-year, 10-year, 25-year, and 100-year design storm events. Areas of porous pavement will infiltrate stormwater into the surrounding soils, and constructed stormwater wetlands will store and control release the larger storm events prior to discharging offsite.

TOTAL RUNOFF PEAK (CFS) FROM THE SITE
TO DESIGN POINT 2/20 (Existing Ditch along Railroad West)

Type III SCS 24-HR STORM	EXISTING (DP#1)	PROPOSED (DP#10)	DIFFERENCE
2 - YEAR	2.75	1.31	-1.4
10 – YEAR	5.80	4.12	-1.7
25 – YEAR	7.81	6.00	-1.8
100 – YEAR	10.95	10.08	-0.8

The peak runoff flows at this design point (DP2/20) show the same or slight decreases indicating no adverse change in the proposed constructed condition versus the pre-construction condition for the 2-year, 10-year, 25-year, and 100-year design storm events. The areas of fields tributary to the constructed stormwater wetlands will store and control storm events prior to discharging offsite.

DESIGN ASSUMPTIONS & STIPULATIONS

The following design assumptions and stipulations were made for the drainage analysis.

- Buildings have no basements and shall be constructed per design (by others).

- Future development of the property south of the subject parcel was not considered and if development must contain its own drainage and mitigation systems.

- Future development of the property north of the subject parcel shall not increase the existing stormwater runoff rate and volume draining toward the subject parcel.

- Existing seasonal ponding that occurs to the property to the East of the subject parcel was noted prior to design development. Steps have been taken to help reduce the Town site's contributory drainage area and run on by adding french drains and drain inlets at the periphery to direct runoff away. It is noted that offsite grading on the neighboring private parcel would be necessary to fully address the existing condition.

- Careful attention and regular maintenance of the stormwater drainage system within the project including the existing ditches through the property shall occur. Drainage structures, inlets, pass-throughs, and pipes shall be maintained to keep snow, ice, and sediment clear from creating any blockage that may affect the drainage features from properly functioning.

- A NPDES Construction General Permit for land disturbance greater than 1 acre shall be completed prior to construction.

- In the event that the existing drainage structure within the North Main Street right-of-way is repaired and/or reconstructed, impacts on the subject parcel shall be evaluated.
    - For example, the structure repairs could involve the existing water surface elevation in the ditch to raise. As a result, the subject parcel site design may require modification for proper system function.

- Any addition of buildings, changes of surface cover (e.g. landscaping to gravel or pavement), or future development of the site will require re-analysis of the drainage system impacts and/or improvements.

- The plans submitted to the planning board are permitting level plans. Certain construction level details will be created along with specifications at a later date that will provide additional details to build.

CONCLUSION

The project has provided sufficient mitigation in peak runoff to offset the impacts of clearing, grading, and construction of parking improvements for the proposed park and field project. The infrastructure planned will provide sediment capture, augment existing plowed soils in the area of the fields to encourage increase infiltration, and reduce the potential for erosion through Best Management Practices (BMPs). Storm runoff volumes and flows will be maintained over existing conditions for the 2-year, 10-year, 25-year design storm events. The 100-year design flow has been evaluated and the calculations show no increase flooding over current conditions and provides for opportunity to mitigate, treat, and control the flows leaving the site.

REF: OFFICE OF GEOGRAPHIC AND ENVIRONMENTAL INFORMATION (MASSGIS), COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS; 2019 ORTHOPHOTO

N

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Hadley, MA 01035
(413)320-4918

LOCUS PLAN

PROPOSED MUNICIPAL PARK & FIELDS
NORTH MAIN STREET
SOUTH DEERFIELD, MA 01373

SCALE: 1" = 200'

DATE: DECEMBER 13, 2021

FIG. 1

REF: FEMA FLOOD INSURANCE RATE MAP; COMMUNITY PANELS 2501150006B (7/2/1980)

ZONE A – AREAS OF MINIMAL FLOODING (NO SHADING)

ZONE B – AREAS BETWEEN LIMITS OF THE 100 YEAR & 500 YEAR FLOOD

ZONE A4 – AREAS OF 100 YEAR FLOOD; BASE FLOOD ELEVATIONS AND FLOOD HAZARD FACTORS DETERMINED.

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FEMA FLOOD MAP

PROPOSED MUNICIPAL PARK & FIELDS
NORTH MAIN STREET
SOUTH DEERFIELD, MA 01373

SCALE: 1" = 300'

DATE: DECEMBER 13, 2021

FIG. 2

REF: WETLANDS DELINEATED BY A SENIOR ENVIRONMENTAL SCIENTIST FROM GZA GEOENVIRONMENTAL, INC. ON NOVEMBER 6, 2019 AND AGAIN ON AUGUST 12, 2020. FIGURE ADAPTED FROM RDA APPLICATION, WETLAND RESOURCE MAP.

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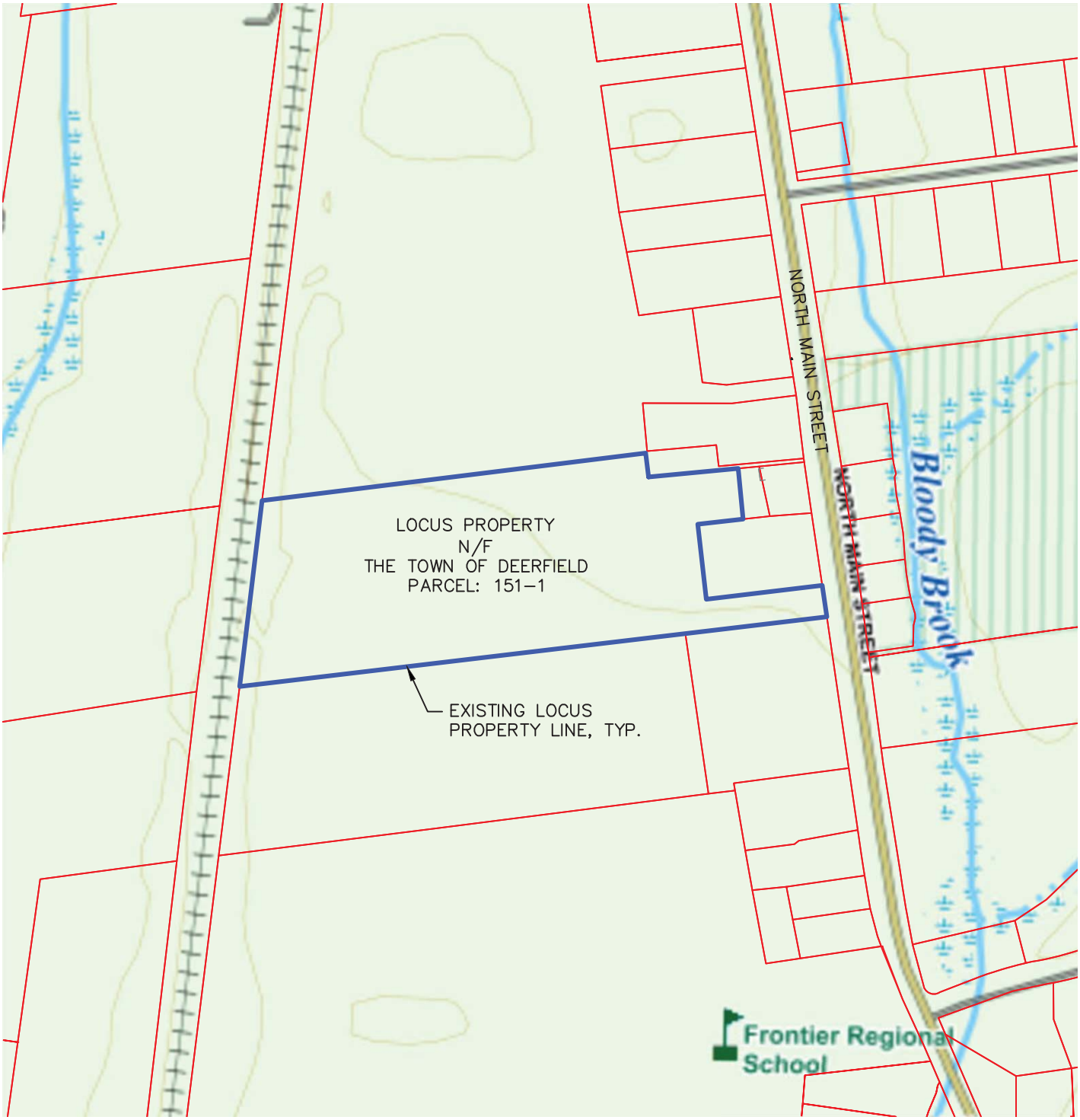
WETLAND AREA MAP

PROPOSED MUNICIPAL PARK & FIELDS
NORTH MAIN STREET
SOUTH DEERFIELD, MA 01373

SCALE: 1" = 200'

DATE: DECEMBER 13, 2021

FIG. 3



REF: MAPS.MASSGIS.STATE.US/ MASSDEP PRIORITY RESOURCE MAP, DATA LAYERS.

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PRIORITY
RESOURCE
MAP

PROPOSED MUNICIPAL PARK & FIELDS
NORTH MAIN STREET
SOUTH DEERFIELD, MA 01373

SCALE: 1" = 300'

DATE: DECEMBER 13, 2021

FIG. 4

REF: OFFICE OF GEOGRAPHIC AND ENVIRONMENTAL INFORMATION (MASSGIS), COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS; 2019 ORTHOPHOTO
SOILS REF: NRCS (NATURAL RESOURCES CONSERVATION SERVICE) CUSTOM SOIL RESOURCE REPORT FOR FRANKLIN COUNTY, MASSACHUSETTS.

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USDA NRCS
SOILS MAP

PROPOSED MUNICIPAL PARK & FIELDS
NORTH MAIN STREET
SOUTH DEERFIELD, MA 01373

SCALE: 1" = 200'
DATE: DECEMBER 13, 2021

FIG. 5

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

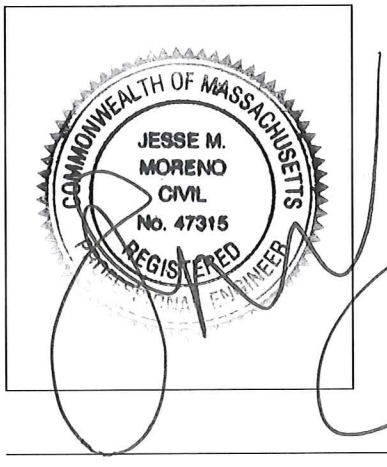
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



12-13-2021

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☐ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☒ Use of "country drainage" versus curb and gutter conveyance and pipe

☒ Bioretention Cells (includes Rain Gardens)

☒ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☒ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☒ Other (describe): Vegetated Filter Strip, Water Quality Inlet, Porous pavement/pavers for walks

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

☒ Site is comprised solely of C and D soils and/or bedrock at the land surface

☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000

☐ Solid Waste Landfill pursuant to 310 CMR 19.000

☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

TOWN OF DEERFIELD

Planning Board
8 Conway Street
South Deerfield, MA 01373
Voice: 413.665.1400
Facsimile: 413.665.1411
Web: *www.deerfieldma.us*

STORMWATER PERMIT APPLICATION

An applicant for a Stormwater Permit must file seven (7) hard copies and one (1) electronic file of a complete application for a Stormwater Permit and pay a $100.00 non-refundable application fee (payable to the Town of Deerfield). Incomplete applications will not be reviewed. A Stormwater Permit must be issued before any land disturbing activities may begin. See attached documents for details.

1. Project/Site Information

Project/Site Name: North Main Street Municipal Park & Fields

Project Address/Location: North Main Street, South Deerfield, MA (a.k.a 135 N Main St)

Assessors' Map: 151 Parcel(s): 1

Estimated area of land to be disturbed (ft^2): 7.1 acres +/-

Total area of impervious surfaces (ft^2) (paved, parking, decks, roofs, etc.):	Existing	Proposed
	0 acres	1.046 acres +/-

2. Project Type (check one)

- ☐ Residential Subdivision
- ☐ Residential development where approval is not required (ANR) and where land disturbance will be 1 acre or more
- ☐ Commercial development where land disturbance will be 12,500 ft^2 or more
- ☑ Industrial development where land disturbance will be 12,500 ft^2 or more I Zoned - Municipal Park
- ☐ Institutional development where land disturbance will be 12,500 ft^2 or more
- ☐ Seeking earth removal permit

3. Applicant Information

Name: Town of Deerfield - Selectboard

Address: 8 Conway Street, S. Deerfield, MA 01373

Telephone: 413-665-1400, Ext 111

Email: ata@town.deerfield.ma.us

Fax:

4. Owner Information (if different from Applicant)

Town of Deerfield

8 Conway Street, S.Deerfield, MA 01373

413-665-1400, Ext 105

townadmin@town.deerfield.ma.us

5. Certification

I hereby certify that the information contained herein including all attachments, is true, accurate and complete, to the best of my knowledge. Further, I grant the Deerfield Stormwater Authority and its agents permission to enter the property to review this Application and make inspections during and after construction.

Applicant's Signature 12/10/2021 *Date*

Owner's Signature 12/10/2021 *Date*

TOWN OF DEERFIELD

Planning Board
8 Conway Street
South Deerfield, MA 01373
Voice: 413.665.1400
Facsimile: 413.665.1411
Web: *www.deerfieldma.us*

Stormwater Permit Eligibility Worksheet

Introduction – *What is the purpose of the Stormwater Bylaw?*

The Town of Deerfield adopted a Stormwater Bylaw to protect the Town's waters from the harmful effects of stormwater runoff that can occur with new development and redevelopment. Stormwater from roads, homes and businesses is the leading cause of water pollution in our area and contributes to flooding. It can be prevented with low cost, highly effective practices such as rain gardens and low impact designs that cleanse the most polluted 'first flush' of storm runoff and help recharge groundwater. Low impact methods are promoted by state and federal agencies, homebuilder organizations and by the Town's Stormwater Bylaw. We recommend that you review the Stormwater Bylaw (Chapter 155) and Regulations and the Deerfield Best Development Practices Guidebook for more information at http://www.deerfieldma.us.

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Does this project require a Stormwater Permit?

Some development projects in Deerfield may require a Stormwater Permit to assure that stormwater runoff will be properly managed during construction and after development is complete. The Planning Board serves as the Town's Stormwater Authority and issues Stormwater Permits and Certificates of Completion when project construction has fulfilled the terms of the Stormwater Permit. Please complete this worksheet to determine whether the proposed project will require a Stormwater Permit.

Project/Site Name North Main Street Muncipal Park and Fields Date 12-13-2021

Applicant Name Selectboard Town of Deerfield

Street 8 Conway Street Town, State S.Deefield, MA Zip 01373

Phone (413)665-1400 x105 Fax _____ Email ata@town.deerfield.ma.us

Project Street/Location: 135 North Main Street South Deerfield

Assessors' Map: 151 Parcel(s): 1

Estimated area of land to be disturbed (ft^2): 7.1 acres+/-

Total area of impervious surfaces (ft^2) (paved, parking, decks, roofs, etc.):	Existing	Proposed
	0 acres	1.046 ac+/-

Proceed to Eligibility Worksheet on pages 2 and 3.

1. Check all that might apply to your proposed project.	Yes	No	Maybe
a) This is a **new development** or **redevelopment** project.	☑	☐	☐
b) **Increased stormwater runoff or pollutants** will flow from this parcel of land. 80% tss removal and pretreatment provided	☐	☑	☐
c) Activities on this site will **alter the drainage characteristics** of this parcel of land. Analysis shows meeting pre vs post developed rates	☐	☑	☐
d) This project is for **residential development that will disturb an area of 1 acre or more** of land.	☐	☑	☐
e) This project is for **commercial, industrial or institutional use that will disturb an area of 12,500 square feet or more.**	☑	☐	☐
f) This project will require an earth removal permit. Assume that earth removal incidental to the construction of improvements shown on SPR plans does not require separate permit	☐	☑	☐
g) This project will alter or convert land use to one with **higher potential pollutant loading** as defined in Section 155-3A(2) of the Deerfield Stormwater Bylaw.	☐	☑	☐

If you checked **"No"** to all of the above statements, **STOP. The Deerfield Stormwater Bylaw and Regulations do not apply to your project, and you do not need to obtain a Stormwater Permit.** If you checked **"Yes"** or **"Maybe"** to any of the above, you **may** be required to meet the requirements of the Deerfield Stormwater Bylaw and Regulations and obtain a Stormwater Permit. **Proceed to question 2. Please note that the Planning Board's review of the Eligibility Worksheet may result in a determination that a Stormwater Permit is required.**

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2. If you meet one of the following descriptions, you are **exempt** from Deerfield's Stormwater requirements.

a) Normal maintenance and improvement of land in agriculture;	☐
b) Conversion of land to agricultural use for crops and/or pasture;	☐
c) Timber harvesting;	☐
d) Maintenance of existing landscaping, gardens or lawn areas associated with residential dwellings;	☐
e) Construction of a single family dwelling where approval is not required under the Subdivision Control Law and where total land disturbance is less than 1 acre;	☐
f) Repair or replacement of a septic system;	☐
g) Construction of a deck, patio, retaining wall, driveway or other impervious surface expansion, shed, accessory building, swimming pool, tennis and basketball court associated with a residential dwelling;	☐
h) Construction of utilities (gas, water, electric, telephone, etc.) other than drainage, which will not permanently alter terrain, ground cover or drainage patterns;	☐

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1.4 REFERENCES

1. Commonwealth of Massachusetts, Department of Environmental Protection, Stormwater Management Standards Handbook. Volumes 1-3 February 2008 (DEP Stormwater Management Policy 2008).

2. Commonwealth of Massachusetts, Department of Environmental Protection. 310 CMR 10.00: Massachusetts Wetlands Protection Act Regulations. October 2017.

3. Commonwealth of Massachusetts, Department of Environmental Protection. 314 CMR 4.00: Massachusetts Surface Water Quality Standards. December 2013.

4. Commonwealth of Massachusetts, Department of Environmental Protection. 314 CMR 9.00: Massachusetts Water Quality Regulations. October 2014.

5. United States Department of Agriculture, Natural Resources Conservation Services Urban Hydrology for Small Watersheds, Technical Release 55 (TR-55). June 1986.

6. United States Department of Agriculture, Natural Resources Conservation Services Project Formulation Hydrology Program System, Technical Release 20 (TR-20). Oct. 2004.

7. Tetra Tech, Inc., United States EPA – Region 1, Stormwater Best Management Practices (BMP) Performance Analysis. Dec 2008.

8. PVPC, MA DEP, & USEPA – Region 1, Artificial Recharge: Evaluation and Guidance to Municipalities. Nov 1996.

9. Town of Deerfield, Massachusetts. Stormwater Regulations. Adopted April 4, 2011

10. Town of Deerfield, Massachusetts. Article 22 Zoning Bylaw – Site Plan Review. Amended June 12, 2021.

Section 2

Long-Term Pollution Prevention and Operation & Maintenance Plan

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RECOMMENDED LONG-TERM STORMWATER POLLUTION PREVENTION PLAN and OPERATION & MAINTENANCE (O&M) PLAN TO COMPLY WITH STORMWATER STANDARDS 4, 8, 9 & 10 FOR THE MUNICIPAL PARK AND FIELDS ON NORTH MAIN STREET

PROJECT OVERVIEW

The Town of Deerfield ("Applicant") proposes to construct a municipal park and athletic fields on industrial zoned town land off of North Main Street in South Deerfield. The project will be constructed on land purchased through Town Meeting vote on Map 151 Lot 1 containing approximately 8.481 acres. The subject property is located just South of the Pelican/Hardigg manufacturing facility on the West side of North Main Street. The property is undeveloped and flat consisting primarily of farm field. To the East lies residential properties and North Main Street, further east of which is Bloody Brook which flows to the south, and agricultural land. Frontier Regional High School & associated sports fields and parking are located to the South.

The project proposes a series of drainage improvements including open and closed-conveyance systems, low impact design, constructed stormwater wetlands, retention ponds, underground detention, and water quality inlets in accordance with the Town's Best Development Practices Guidebook, Green Infrastructure, and Climate Resiliency Policy.

The access driveway is cross-pitched towards the South where sidewalk scuppers are proposed to send runoff into a vegetated water quality swale with cells to promote infiltration and water uptake in vegetation. These areas will provide treatment via a gravel verge and the swale before discharge to the existing intermittent bank/ditch, 24" square box culvert, and culvert beneath North Main Street. On areas of the site to the South and West of the fields, runoff will maintain existing travel paths through the preservation of vegetated filter strips and constructed wetlands along the rail road tracks. A walking path is proposed to meander through this area.

The parking lot area is graded towards the center where a curb less lined bio-retention cell island (or raingarden area) is proposed to pre-treat runoff before entering a constructed stormwater wetland along the South side of the property. A constructed centrifugal type water quality inlet (Stormceptor or equal) is proposed to treat the balance of the parking lot.

A majority of the paved walkway path will feature open-graded porous asphalt pavements or pavers that promote infiltration to a stone and gravel reservoir beneath. This LID practice both reduces the runoff generated when compared with conventional pavements but also increase the ability to recharge groundwater by infiltration a portion of the runoff. Between and at the edges of the athletic fields are a series of swales, raingardens, and french drains. Areas of the field and lawn areas will be drained generally using 24" drain basin inlets. Towards the West and Southwest of the site, constructed stormwater wetlands are utilized for runoff mitigation for the large field.

The project will require an additional disturbance 2± acres of land in addition to the existing 5= acres that was historically farmed. Development and completion of a Notice of Intent (NOI) and Stormwater Pollution Prevention Plan (SWPPP) associated with the EPA's National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from Construction Activities will be required.

The proposed site improvements are shown on the plans provided under separate cover entitled "*Proposed Municipal Park & Fields" North Main Street; South Deerfield, MA 01373*" as prepared by ProTerra Design Group, LLC (ProTerra) with Northeast Survey Consultants, and PLACE Alliance .

OWNER AND RESPONSIBLE PARTY

Land Owner:	Responsible Parties:
Town of Deerfield 8 Conway Street S. Deerfield, MA 01373	Department of Public Works, Frontier Regional School, and the Deerfield Recreation Dept.

The Land Owner and Responsible Party are different public entities under or with direct ties to the Town of Deerfield that for the purposes of maintenance are considered a singular party. The Department of Public Works shall provide maintenance of the parking areas, utilities, and stormwater system including vegetative features if integrated (i.e. rain garden, constructed wetlands, water quality swales, drain inlets etc.) The school through a Memorandum of Understanding (MOU) will provide maintenance and mowing of the multi-purpose fields. The Deerfield Recreation Department will have the responsibility of scheduling and day-to-day operations including maintenance of landscaping and other park amenities.

CONSTRUCTION MANAGEMENT

Contractor: _____
Address: _____
_____
Phone Number: _____

A Construction Manager, Engineer, or Clerk-of-the-Works with adequate knowledge and experience on projects of similar size and scope shall be employed to oversee all site work related construction. The contractor shall incorporate appropriate techniques to control sediment and erosion pollution during construction in accordance with the Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas.

Care should be taken when constructing stormwater control structures and dewatering (if required) to install foundations. Light earthmoving equipment shall be used to excavate in the vicinity of the porous pavement areas. Use of heavy-equipment causes excessive compaction of the soils resulting in reduced infiltration capacity. At no time, shall temporary settling basins be constructed in the vicinity of the proposed porous pavement or other proposed infiltration areas in order to prevent the soils from becoming clogged with sediment.

Dewatering activities (if required) shall be directed towards a berm and filter sack to promote infiltration into the ground. If silt-laden sediment is encountered, a frac tank or temporary sediment trap

approximately 10,000-20,000 gallons in size or greater may be employed to settle pumped groundwater before discharge to the land surface.

CONSTRUCTION PHASING

The phasing of construction for construction of the park, fields, parking lot, and infrastructure shall generally follow the following sequence. Items may be completed concurrently depending on their location.

- Construction of temporary construction exit point
    - Installation of stabilized construction entrance
- Installation of temporary erosion and sediment control measures along the perimeter of the site (i.e., inlet protection, silt fence, temporary BMP's & sediment traps etc.)
- Installation of tree/protection and fencing at limit of work. Install tree trunk protection where equipment could reach nearby trees.
- Establishment of schedules for good housekeeping BMPs, locations for trash stockpile/removal, porta-potty installation, and a construction trailer as necessary
- Clearing and grubbing of vegetation within limits of work. Chip slash, trees, and branches to create mulch for use as temporary soil cover. Do not remove stumps until excavation begins in the particular phase or area.
- Excavation/Fill for mitigation areas, parking areas, fields, buildings and underground utility trenches
- Installation of water, sewer, electric, and all other underground utilities
- Installation of long-term stormwater features, piping, conveyances, etc.
- Backfill operations for fields and utility trenches
- Preparation of future building pads/areas
- Over-lot rough grading
- Construction of curb, drives, and parking areas
- Installation of new asphalt pavement and porous pavement
- Final grading
- Re-vegetation in disturbed areas for final stabilization
    - Installation of wetland replication areas
    - Installation of landscaping per landscape plan
    - Planting of stormwater features
- Remove temporary BMPs that are no longer required

EROSION & SEDIMENT CONTROL PHASING

The phasing of erosion and sediment control during construction of the park, fields, and parking areas shall generally follow the following sequence.

- Pre-Disturbance/Site Preparation
    - Install stabilized construction entrance
    - Install perimeter BMPs (i.e. silt fence, inlet protection)

  - Prepare stabilized staging area including concrete washout pit & dewatering basins/tanks
  - Limit access to areas that are not to be disturbed
  - Install tree protection and/or fencing at limit of work to protect areas not to be disturbed.
- Construction
  - Locate stockpiles in work areas upstream of temporary sediment basins and outside of tree root zones/drip lines
  - Leave disturbed area of site in a surface roughened condition when feasible
  - Close excavations as soon as possible
  - Protect and repair BMPs, as necessary
  - Perform street sweeping, as needed
- Backfill and Compacting
  - Remove temporary BMPs where appropriate
  - Remove limited stored materials and equipment from the site
- Final Stabilization
  - Install seed/mulch or landscaping as shown on the landscape plan
  - Remove all non-biodegradable temporary BMPs when applicable

EROSION CONTROL BEST MANAGEMENT PRACTICES (BMPs)

During construction, silt-laden runoff or discharge from dewatering operations (if necessary) will be prevented from exiting the construction area untreated. Siltation barriers consisting of a filter fabric silt fence, straw bales or silt socks will be erected in advance of construction along the down-gradient edge of all disturbed areas and maintained throughout the construction period. The control of dust and erosion during the construction period will be managed using a number of Best Management Practices (BMPs) described below and as shown on the Proposed Sediment and Erosion Control Plan (ES-1) of the referenced plan set.

Stabilized Construction Entrance

An apron constructed of coarse aggregate over a geotextile fabric shall cover the transition between the existing public roadway (West Street) and the new driveway/parking area. The size and construction of the entrance is shown on the SD-1 plan sheet. This entrance shall be inspected daily and maintained throughout construction activities and removed after completion.

Storm Sewer Inlet Protection

Storm sewer inlet protection is a sediment filter or an excavated impounding area around a storm drain drop inlet or curb inlet. Its purpose is to prevent sediment from entering storm drainage systems prior to permanent stabilization of the disturbed area. This practice shall be used where the drainage area to an inlet is disturbed, it is not possible to temporarily divert the storm drain outfall into a trapping device, and watertight blocking of the inlets is not advisable. It is not to be used in place of sediment trapping devices.

Temporary Sediment Traps (During Construction)

Small depressions that have stormwater runoff directed into them for increased retention time that promotes settling out of suspended solids. Tributary drainage area shall be under 1 acre. The storage volumes should be 1,800 cubic feet per acre of tributary area. During construction, total storage within the temporary sediment traps of 5,690 cubic feet is required for the limit of disturbance areas. The temporary sediment traps shall be divided into four (4) small areas to accommodate to required volume. At no time, shall temporary settling basins be constructed in the vicinity of the proposed porous pavement areas in order to prevent the soils from becoming clogged with sediment.

Silt Fence, Reinforced with Straw Bales as Required (Compost Berms & Socks can be used as alternatives)

Silt fence or silt sock is installed at the down gradient limit of work. It should be trenched into the ground 6" and staked without drooping. The woven fabric will allow the passage of stormwater while filtering out suspended solids. Straw bales give added filtering and erosion control. Every 100' two bales or silt socks shall be placed and staked perpendicular to the fence. Straw bales shall be inert straw or salt hay type.

Filter Berm

A filter berm is a temporary ridge of loose coarse gravel, stone, or crushed rock. It slows, filters, and diverts flow from an area exposed to traffic or use to retain sediment from getting into traffic areas. Berm material should be ¾" to 3" in size and free from fines (<5%.) Spacing would be approximately every 300 feet on slopes less than 5%.

Chip/Mulch Berm

Wood chip or mulch filter berms are created from trees, branches, and slash on the site. If the trees do not have value for boards or other use it can be ground on site to produce media that can be used in place of silt fence to control erosion . The berms are a minimum of 1 foot high by 3 feet wide. The berms would be installed to follow contour lines and would be spaced about 100 feet apart for less than 5% slopes . Where possible berms should be placed at least 10 feet from toe of slopes to allow for energy dissipation.

Dewatering

If dewatering is required, discharges shall be directed through a settling pool or filter bag prior to discharge and infiltration into the ground. Outflow of silt-laden runoff shall not be permitted to flow directly into resource areas. In some instances, a settling tank/frac tank will need to be employed. Upon completion of site stabilization, the BMP's and conveyance systems shall be thoroughly cleaned of silt and sediment and made ready for the proposed operation. Discharge points shall be set back from the edge of the resource areas and monitored by qualified personnel to ensure no impacts to resource areas and compliance with applicable federal and state regulations. Discharges shall be free from visible floating, suspended, and settleable solids that would impair the functions of the nearby wetlands and downstream rivers.

Concrete Washout Pit

A concrete washout pit/area must be designated to receive wash water from washing of tools and concrete mixer chutes, liquid concrete waste from dump trucks, mobile batch mixers, or pump trucks. Concrete washout activities must be conducted in a manner that does not contribute pollutants to surface waters or stormwater runoff. Concrete washout areas may be lined or unlined excavated pits in the ground, commercially manufactured prefabricated washout containers, or aboveground holding areas constructed of berms, sandbags or straw bales with a plastic liner. Although un-lined washout areas may be used, lined pits will be required to protect groundwater.

FINAL STABILIZATION

Final stabilization includes those measures taken to control pollutants in stormwater after soil disturbing activities are complete. Practices implemented to achieve final stabilization include:

- Installation of asphalt, porous, and concrete pavement
- Installation of landscaping per the landscape plan
- Installation of wetland replication and mitigation planting and seeding
- Maintenance of appropriate erosion and sediment control BMPs until final stabilization is achieved
- Removal of temporary BMPs once work is completed and final stabilization achieved

ON-GOING MAINTENANCE CONTRACT

The Owner / Responsible Party shall hire appropriate staff, contract with a maintenance company, or designate a qualified party or qualified in-house staff to complete ongoing maintenance.

LIVING DOCUMENT PROVISIONS

Due to the difficulty of identifying all sources of potential stormwater contamination and maintenance activities, this document shall be updated as necessary to reflect new procedures, technologies or requirements. Ultimately, the Responsible Party will have the authority to implement a plan and frequency of maintenance as required.

MAINTENANCE LOG

The Owner / Responsible Party shall develop and maintain a log of inspections, maintenance, repairs, and disposal (including location of disposal) during the life of the project. Records shall be maintained for at least three years and be made available to the Massachusetts Department of Environmental Protection in accordance with the provisions of the Massachusetts Stormwater Handbook. A sample of such a maintenance log is provided.

GOOD HOUSEKEEPING PRACTICES DURING CONSTRUCTION

The Owner / Responsible Party shall maintain good housekeeping practices by maintaining a clean and orderly facility to prevent potential pollution sources from coming into contact with stormwater and degrading water quality. This includes establishing protocols to reduce the possibility of mishandling materials or equipment and training employees in good housekeeping techniques.

Common areas where good housekeeping practices should be followed shall include: material storage areas, vehicle and equipment maintenance areas, and loading areas. Good housekeeping practices must include a designated and secure location for garbage. A schedule for regular pickup and disposal of garbage and waste materials during construction and routine inspections of containers for leaks and structural integrity shall be developed. After construction, no trash shall be kept on-site and shall be removed by service technicians or contractors when they leave. Portable toilets shall be installed on site and maintained throughout construction. Excess concrete and cleanout water from redi-mix vehicles shall be directed towards small excavations or constructed boxes for cleanup. Catch basins and drainage conveyance systems shall not be used for this purpose.

Dust Control (Seeding and Topsoiling)

Construction traffic must enter and exit the site at the stabilized construction entrance. The purpose is to trap dust and mud that would otherwise be carried off-site by construction traffic. Large areas of soil that are denuded of vegetation and have no protection from particles being picked up and carried by wind should be protected with a temporary cover or kept under control with water or other soil adhering products to limit wind transported particles existing the site perimeter. Water trucks or other dust control agents will be used, as needed, during construction to reduce dust generated on the site that may cause off-site damage, health hazards, and traffic safety problems.

Material Storage

Areas designated for temporary materials storage shall be surrounded on the downhill side by an erosion control barrier. This area shall be inspected daily for erosion and runoff of stored materials. At the completion of construction, the area shall be stabilized with vegetation or stone product. The areas should be located away from trees to be saved including root areas and drip lines.

Waste Disposal

A secure location shall be designated for waste storage. Regular pickup and disposal of materials shall be scheduled. Containers shall be inspected daily for leaks and structural integrity. Portable toilets shall be installed on site and maintained throughout construction.

MINIMIZING EXPOSURE

The Owner / Responsible Party shall minimize exposure of potential pollutant sources from coming into contact with precipitation and being picked up by stormwater and carried into drains and surface

waters. All materials shall be plainly labeled and stored in an appropriate container in an appropriate location. All activities which can generate sources of contaminants shall be contained.

LONG-TERM BMPS: MAINTENANCE

Prior to final completion and full occupancy of the development, a representative of the contractor and/or Engineer at the owner / responsible party's request shall properly instruct the user of the required maintenance responsibilities to maintain the effectiveness of the drainage system. The Owner / Responsible Party will implement the procedures and frequencies as they see fit under their current plan and inspect the systems as needed to maintain minimum effectiveness.

Water Quality Swales

During the construction phases of the project, the vegetated swales shall be inspected monthly and cleaned as necessary and/or after storms events with 1" of rainfall or greater. Thereafter, this structure shall be inspected every six months during the first year and at twice once per year as needed during the owner's regular maintenance of the grounds. Maintenance shall include regularly (2-3 times a year or as necessary) mowing the grass (in dry swales no less than 4-6" height – wet swales may not need to be mowed based upon established vegetation), cleaning sediment buildup (at least once per year), and reseeding bare spots. Check for signs of rilling/gullying and repair with soil and vegetation as needed.

Vegetated Filter Strip

During the construction phases of the project, the vegetated filter strip shall be inspected monthly to monitor the vegetation growth and as necessary after storm events with 1" of rainfall or greater. Thereafter, the vegetated filter strip shall be inspected every six months during the first year and at least once per year as needed during the owner's regular maintenance of the grounds. Maintenance shall include regularly mowing the grass, cleaning sediment buildup, and reseeding bare spots.

Porous Pavement/Walkways/Pavers

During the construction phases of the project, the porous walkways shall be inspected and cleaned as necessary after storm events with 1" of rainfall or greater. Thereafter, they shall be inspected and vacuum swept at least once per year or as needed during the owner's regular maintenance of the grounds. The porous pavement shall be monitored to ensure that the paving surface drains properly after storms. Cleanings shall include using power washer to dislodge trapped particles and then vacuum sweep the area. Winter sanding and salting shall be avoided on the porous areas unless absolutely necessary.

Sediment Forebay

During the construction phases of the project, the sediment forebay shall be inspected monthly and cleaned as necessary and/or after storms events with 1" of rainfall or greater. Thereafter, this structure shall be inspected at least two times per year and cleaned as necessary or as needed during the owner's regular maintenance of the grounds. A fixed vertical sediment marker shall be installed to measure the

depth of accumulated sediment. Cleanings shall include mowing the perimeter berm, removal of large vegetation and trash, removal of excess sediment accumulation, and cleaning of outlet weir. Check for signs of rilling/gullying and repair with soil and vegetation as needed.

Constructed Pocket Wetland

During the construction phases of the project, the constructed stormwater wetland (pocket wetland) shall be inspected monthly and cleaned as necessary and/or after storms events with 1" of rainfall or greater. Thereafter, this structure shall be inspected and cleaned at least twice per year (growing and non-growing seasons) for the first three years after construction or as needed during the owner's regular maintenance of the grounds. These initial inspections shall include documentation and mapping the types/distribution of the wetland plants, removal of invasive wetland species, percentage of standing water, maximum elevation of the normal pool maintained, and replacement of dead plants. Once every 5-10 years, the accumulated sediment shall be cleaned from the wetland areas.

Broad Crested Weirs / Energy Dissipaters

During the construction phases of the project, the rip-rap broad crested weirs / energy dissipaters shall be inspected monthly and cleaned as necessary and/or after storms events with 1" of rainfall or greater. Thereafter, these structures shall be cleaned at least once per year or as needed during the owner's regular maintenance of the grounds. Cleanings shall include removal of vegetation, removal of excess sediment accumulation and inspection of condition of stone and energy dissipaters.

Outlet Structures

During the construction phases of the project, the retention outlet structures shall be inspected monthly to monitor the sediment accumulation and sediment removed as necessary after storm events with 1" of rainfall or greater. Thereafter, the retention outlet structures shall be inspected and cleaned at least twice per year or as needed during the owner's regular maintenance of the grounds. Maintenance shall include cleaning the structures during dry weather typically at the same time as the constructed pocket wetland. Any obstructions, sediment, and debris that could potentially cause clogs shall be removed within the stormwater conveyance system. Inverts and orifices shall be checked and replaced as necessary to maintain hydraulic effectiveness. Any screens, trash racks, or outlet protection racks shall be cleaned of debris to maintain hydraulic effectiveness.

Curb Inlets/Stormwater Scuppers/ Pass-throughs

In addition to sediment/debris removal & street sweeping, the project is designed with cross-country drainage inlets/scuppers/pass-throughs that go through curbs and sidewalks to convey stormwater to water quality swales, zero-curbs at rain gardens, and flumes/channels to sediment traps. These areas need to be kept clean of debris and shall be monitored and maintained against snow and ice accumulation that may hinder proper function in the winter months.

Street Sweeping and Cleaning

Soils deposited on paved surfaces shall be swept or cleaned as needed to reduce the potential of sediment transport and tracking. Sweeping operations consist of scraping large quantities of sediment from pavement and/or sweeping, via hand or mechanical means to remove as much deposited sediment as possible. During construction, all streets within and immediately surrounding the construction site shall be cleaned of earth material when sediment has been deposited on the roadway and is being tracked off-site. After construction, driveways and parking areas within the site shall be swept with mechanical brush with vacuum assist and/or regenerative air type systems at least twice per year to remove sediment that potentially could clog infiltration systems or stormwater systems.

Water Quality Inlets

Swirl type hydrodynamic separators shall be inspected and accumulated debris removed by vacuum truck or clam-shell bucket in accordance with manufacturer recommended frequencies and direction. The units shall be inspected a minimum of twice per year in the fall and spring once installed for the first year and no less than once a year thereafter or as dictated by the Town's current catch basin cleaning program.

ANNUAL STORMWATER MAINTENANCE COST ESTIMATE

BMP	Frequency	Unit Cost	Subtotal
Water Quality Swales	2 visits per year	$250	$500
Vegetated Filter Strip/Wetland Replication	1 visit per year	$250	$250
Porous Pavement	1 visit per year	$500	$500
Sediment Forebay	2 visits per year	$250	$500
Basin/WQI Cleanout	1 visit per year	$750	$750
Constructed Pocket Wetland	2 visits per year	$350	$700
Outlet Structures/Scuppers/Pass-Throughs	2 visits per year	$350	$700
Broad Crested Weirs / Energy Dissipaters	1 visit per year	$500	$500
Vacuum Assist Street Sweeping	2 visits per year	$350	$700
		Total:	$5100

The annual maintenance cost does not include the owner's regular maintenance of the grounds that would consist of mowing & debris pickup.

LONG TERM STRUCTURAL BEST MANAGEMENT PRACTICE INSPECTION & MAINTENANCE MATRIX AFTER CONSTRUCTION

Note: BMP's shall be visually inspected and repaired by a qualified party in accordance with the following chart. Note these are minimum inspection criteria/frequencies and should be adjusted throughout the project lifespan as required to maintain effectiveness. Refer to maintenance standards for drainage facilities and structural best management practices in the "Recommended Long-Term Stormwater Pollution Prevention Plan."

Conventional & LID Best Management Practices	Recommended Minimum Inspection & Maintenance Frequency	Erosion/Scouring	Tree Growth Hazards	Differential Settlement/Seepage	Structural Damage/Obstructions	Trash & Debris	Removal of Accumulated Sediment	Slope Integrity	*Mow Vegetation/Poor Vegetation Coverage	Remove/Reset Filter Fabric & Stone As Required	Check - Remove & Replace mulch/media/stone	Remove/Reset Riprap as Required
Outlet Structure	*Semi-Annual*	☑		☑	☑	☑	☑					
Porous Pavement	*Annually*	☑		☑	☑	☑	☑					
Vegetated Filter Strip	*Annually*	☑			☑	☑	☑	☑	☑			☑
Overflow Weir	*Annually*	☑			☑	☑	☑	☑	☑			☑
Sediment Forebay	*Semi-Annual*	☑			☑	☑	☑	☑	☑	☑		☑
Constructed Stormwater Wetlands (Pocket Wetland)	*Semi-Annual*	☑		☑	☑	☑	☑	☑				☑
Energy Dissipaters	*Annually*	☑			☑	☑	☑			☑		☑
Water Quality Swale	*Semi-Annual*	☑	☑		☑	☑	☑	☑	☑			

Stormwater BMP Inspection and Maintenance Log

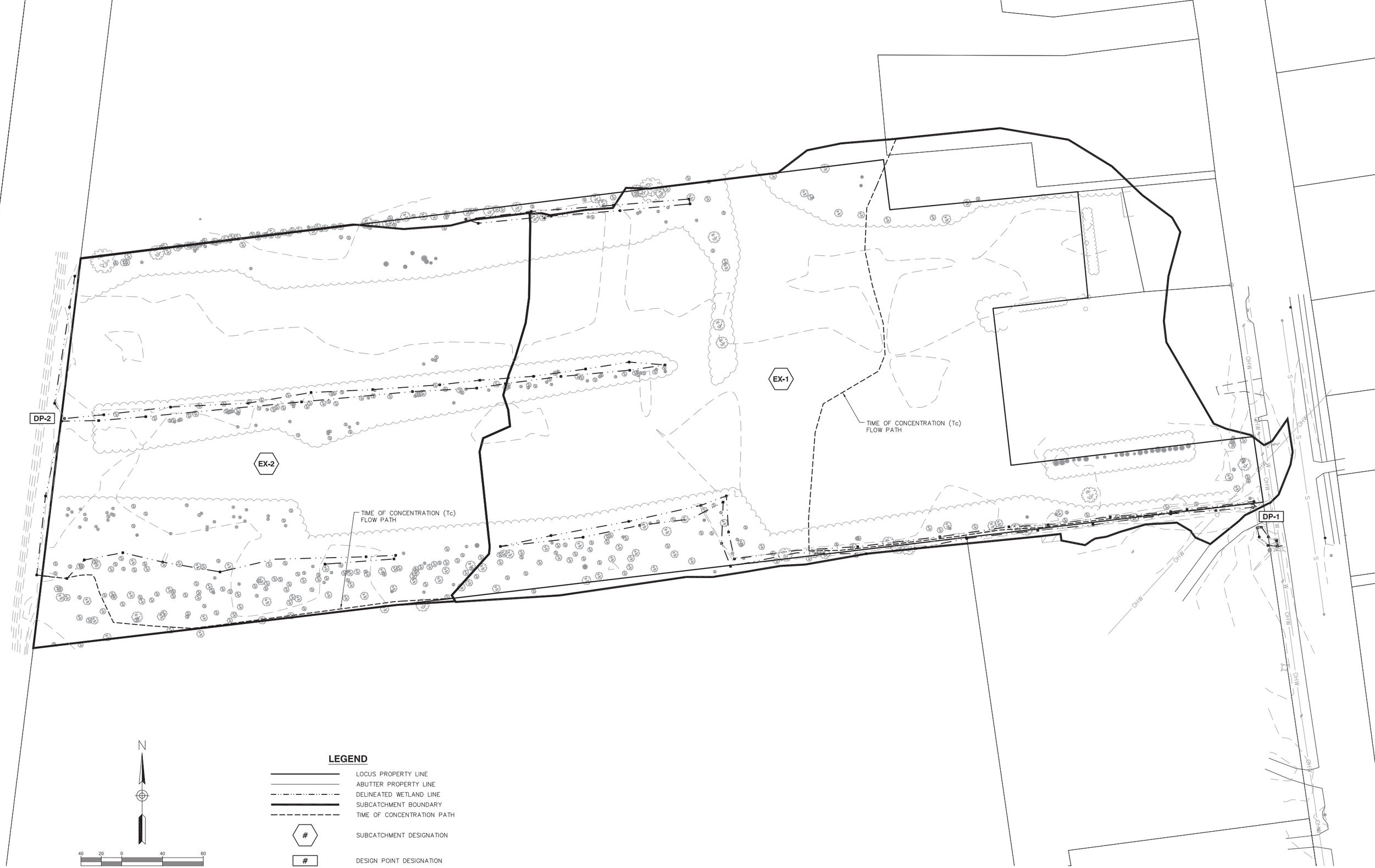
Project Name: Municipal Park & Fields North Main Street, South Deerfield, MA
SWPPP Contact: Town of Deerfield
Contact: _____
Phone: _____

Begin Date	End Date

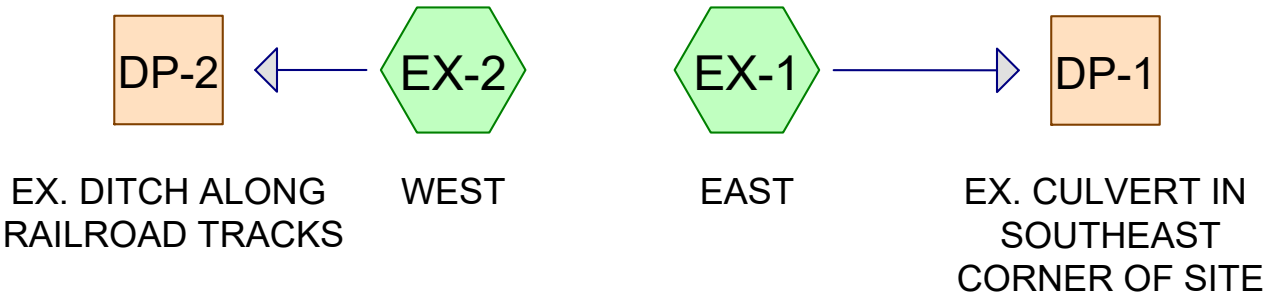
Date	BMP ID#	BMP Description	Inspected by:	Cause for Inspection	Exceptions Noted	Comments and Actions Taken

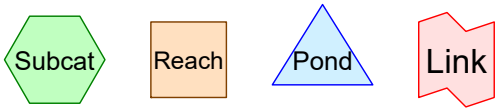
Section 3

Hydrology Model Using HydroCAD



PRE-DRAINAGE PLAN





Routing Diagram for Deerfield_PRE POST
Prepared by ProTerra Design Group, LLC, Printed 12/15/2021

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
27,421	80	>75% Grass cover, Good, HSG D (EX-1)
2,348	91	Gravel roads, HSG D (EX-1)
865	98	Paved parking, HSG D (EX-1)
4,226	98	Roofs, HSG D (EX-1)
224,829	84	Small grain, SR + CR, Good, HSG D (EX-1, EX-2)
168,553	77	Woods, Good, HSG D (EX-1, EX-2)
428,242	**81**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
428,242	HSG D	EX-1, EX-2
0	Other	
428,242		**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX-1: EAST Runoff Area=264,130 sf 1.93% Impervious Runoff Depth=1.39"
Flow Length=887' Tc=23.2 min CN=82 Runoff=6.18 cfs 30,526 cf

Subcatchment EX-2: WEST Runoff Area=164,112 sf 0.00% Impervious Runoff Depth=1.26"
Flow Length=436' Tc=38.2 min CN=80 Runoff=2.75 cfs 17,198 cf

Reach DP-1: EX. CULVERT IN SOUTHEAST CORNER OF SITE Inflow=6.18 cfs 30,526 cf
Outflow=6.18 cfs 30,526 cf

Reach DP-2: EX. DITCH ALONG RAILROAD TRACKS Inflow=2.75 cfs 17,198 cf
Outflow=2.75 cfs 17,198 cf

Total Runoff Area = 428,242 sf Runoff Volume = 47,724 cf Average Runoff Depth = 1.34"
98.81% Pervious = 423,151 sf 1.19% Impervious = 5,091 sf

Summary for Subcatchment EX-1: EAST

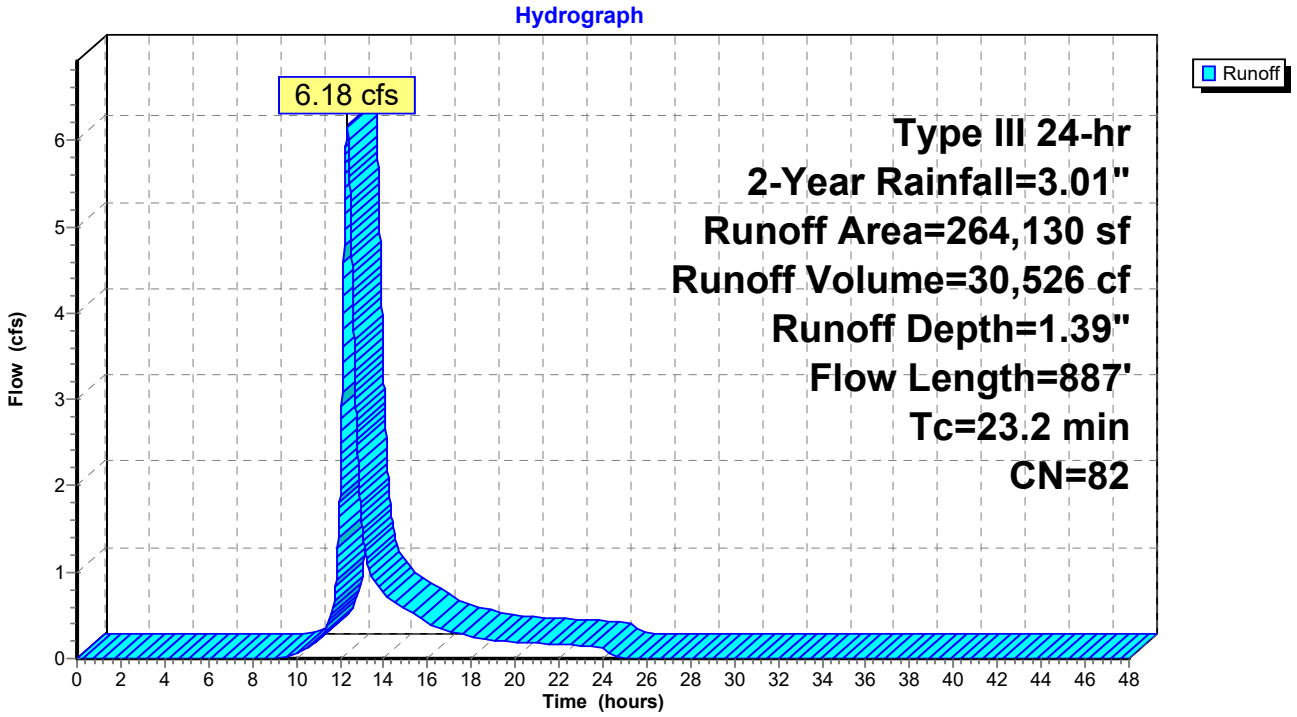
Runoff = 6.18 cfs @ 12.34 hrs, Volume= 30,526 cf, Depth= 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.01"

Area (sf)	CN	Description
4,226	98	Roofs, HSG D
865	98	Paved parking, HSG D
27,421	80	>75% Grass cover, Good, HSG D
2,348	91	Gravel roads, HSG D
144,251	84	Small grain, SR + CR, Good, HSG D
85,019	77	Woods, Good, HSG D
264,130	82	Weighted Average
259,039		98.07% Pervious Area
5,091		1.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	50	0.0100	0.05		**Sheet Flow, THRU WOODS** Woods: Light underbrush n= 0.400 P2= 3.01"
4.2	396	0.0300	1.56		**Shallow Concentrated Flow, OVER FIELD** Cultivated Straight Rows Kv= 9.0 fps
2.2	441	0.0100	3.35	22.14	**Channel Flow, OVER FARM DITCH** Area= 6.6 sf Perim= 9.4' r= 0.70' n= 0.035 Earth, dense weeds
23.2	887	Total			

Subcatchment EX-1: EAST



Summary for Subcatchment EX-2: WEST

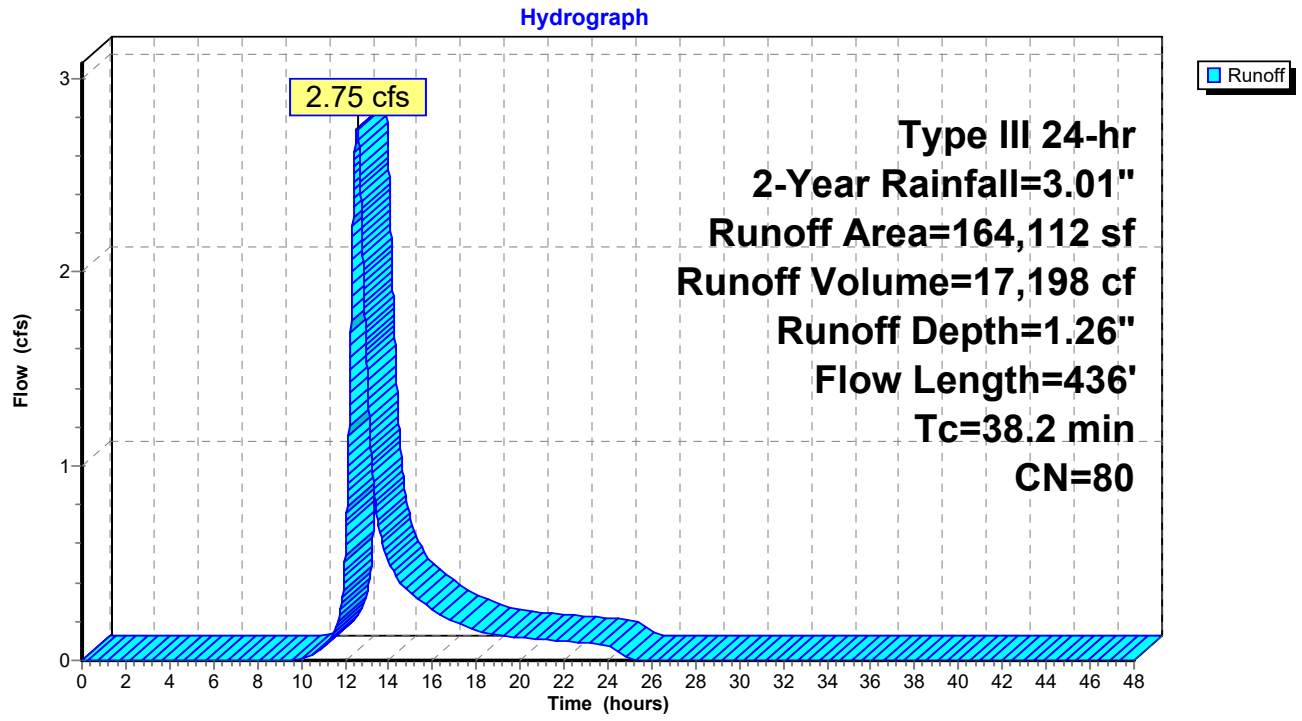
Runoff = 2.75 cfs @ 12.56 hrs, Volume= 17,198 cf, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.01"

Area (sf)	CN	Description
80,578	84	Small grain, SR + CR, Good, HSG D
83,534	77	Woods, Good, HSG D
164,112	80	Weighted Average
164,112		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	50	0.0100	0.05		**Sheet Flow, THRU WOODS** Woods: Light underbrush n= 0.400 P2= 3.01"
21.4	386	0.0036	0.30		**Shallow Concentrated Flow, OVER FIELD** Woodland Kv= 5.0 fps
38.2	436	Total			

Subcatchment EX-2: WEST

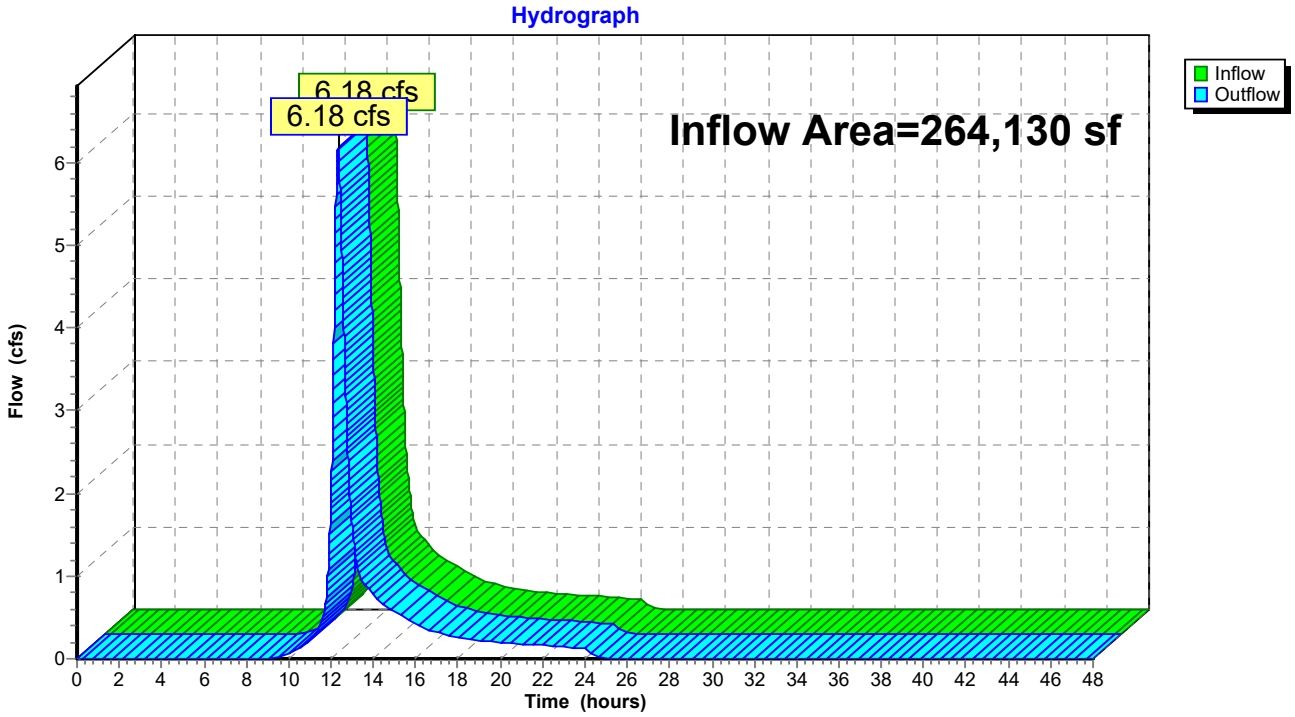


Summary for Reach DP-1: EX. CULVERT IN SOUTHEAST CORNER OF SITE

Inflow Area = 264,130 sf, 1.93% Impervious, Inflow Depth = 1.39" for 2-Year event
Inflow = 6.18 cfs @ 12.34 hrs, Volume= 30,526 cf
Outflow = 6.18 cfs @ 12.34 hrs, Volume= 30,526 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2

Reach DP-1: EX. CULVERT IN SOUTHEAST CORNER OF SITE

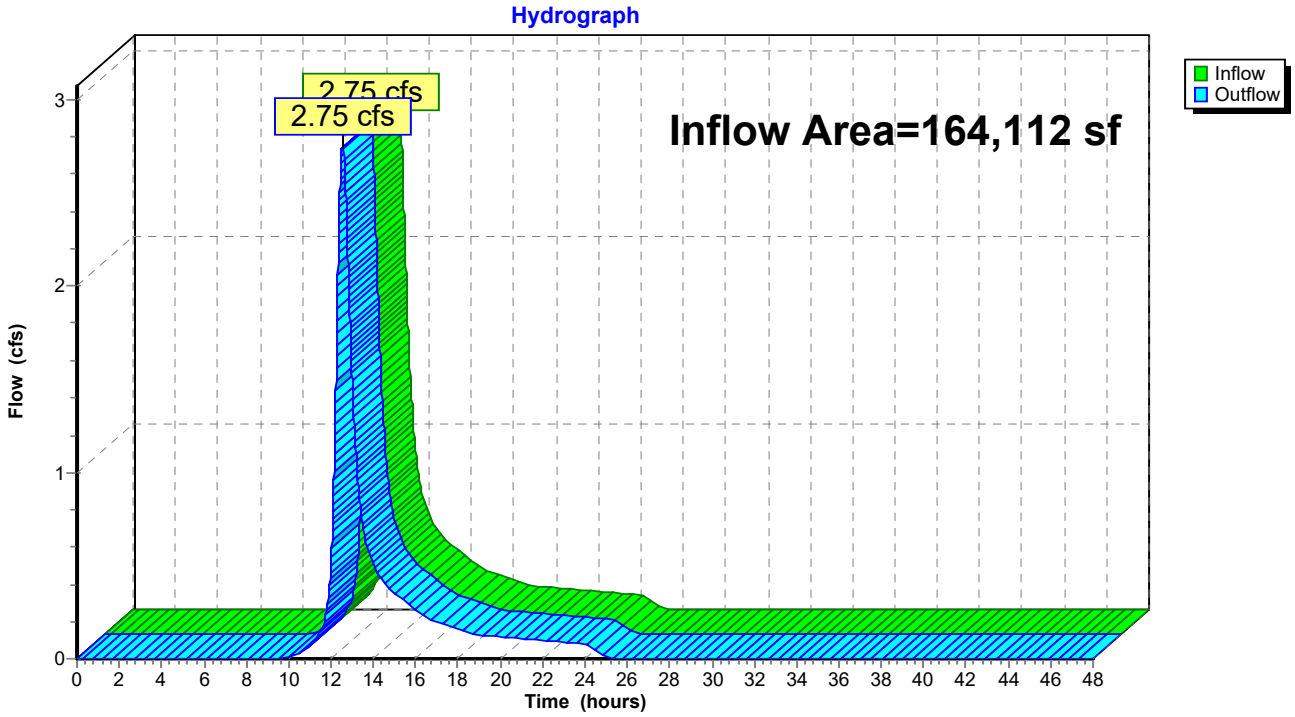


Summary for Reach DP-2: EX. DITCH ALONG RAILROAD TRACKS

Inflow Area = 164,112 sf, 0.00% Impervious, Inflow Depth = 1.26" for 2-Year event
Inflow = 2.75 cfs @ 12.56 hrs, Volume= 17,198 cf
Outflow = 2.75 cfs @ 12.56 hrs, Volume= 17,198 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2

Reach DP-2: EX. DITCH ALONG RAILROAD TRACKS



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX-1: EAST Runoff Area=264,130 sf 1.93% Impervious Runoff Depth=2.78"
Flow Length=887' Tc=23.2 min CN=82 Runoff=12.49 cfs 61,121 cf

Subcatchment EX-2: WEST Runoff Area=164,112 sf 0.00% Impervious Runoff Depth=2.60"
Flow Length=436' Tc=38.2 min CN=80 Runoff=5.80 cfs 35,536 cf

Reach DP-1: EX. CULVERT IN SOUTHEAST CORNER OF SITE Inflow=12.49 cfs 61,121 cf
Outflow=12.49 cfs 61,121 cf

Reach DP-2: EX. DITCH ALONG RAILROAD TRACKS Inflow=5.80 cfs 35,536 cf
Outflow=5.80 cfs 35,536 cf

Total Runoff Area = 428,242 sf Runoff Volume = 96,657 cf Average Runoff Depth = 2.71"
98.81% Pervious = 423,151 sf 1.19% Impervious = 5,091 sf

Summary for Subcatchment EX-1: EAST

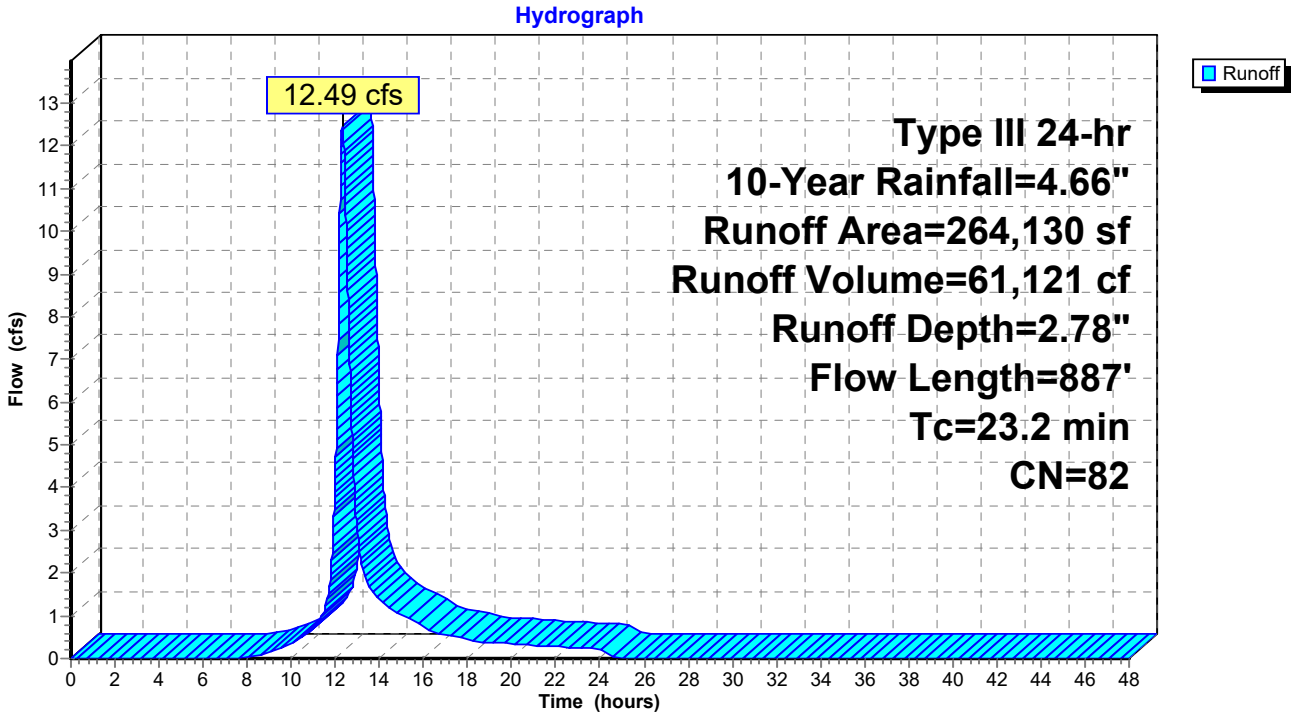
Runoff = 12.49 cfs @ 12.32 hrs, Volume= 61,121 cf, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.66"

Area (sf)	CN	Description
4,226	98	Roofs, HSG D
865	98	Paved parking, HSG D
27,421	80	>75% Grass cover, Good, HSG D
2,348	91	Gravel roads, HSG D
144,251	84	Small grain, SR + CR, Good, HSG D
85,019	77	Woods, Good, HSG D
264,130	82	Weighted Average
259,039		98.07% Pervious Area
5,091		1.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	50	0.0100	0.05		**Sheet Flow, THRU WOODS** Woods: Light underbrush n= 0.400 P2= 3.01"
4.2	396	0.0300	1.56		**Shallow Concentrated Flow, OVER FIELD** Cultivated Straight Rows Kv= 9.0 fps
2.2	441	0.0100	3.35	22.14	**Channel Flow, OVER FARM DITCH** Area= 6.6 sf Perim= 9.4' r= 0.70' n= 0.035 Earth, dense weeds
23.2	887	Total			

Subcatchment EX-1: EAST



Summary for Subcatchment EX-2: WEST

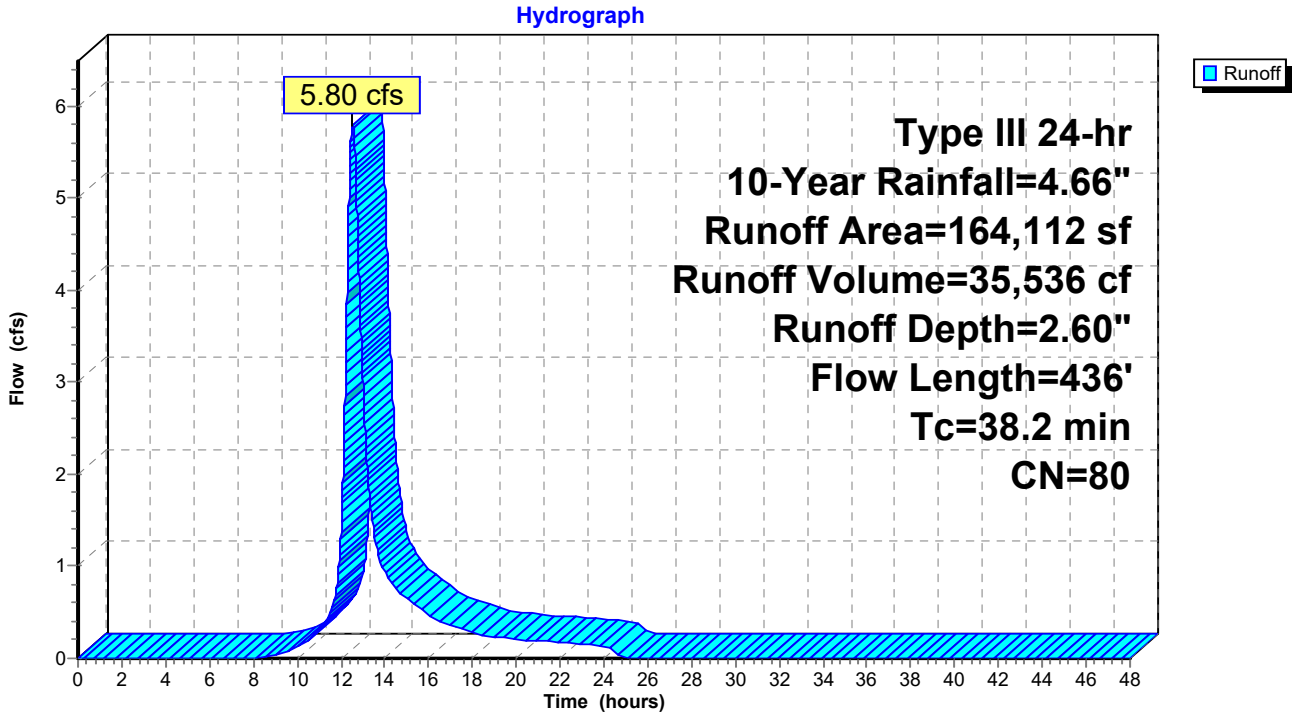
Runoff = 5.80 cfs @ 12.52 hrs, Volume= 35,536 cf, Depth= 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.66"

Area (sf)	CN	Description
80,578	84	Small grain, SR + CR, Good, HSG D
83,534	77	Woods, Good, HSG D
164,112	80	Weighted Average
164,112		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	50	0.0100	0.05		**Sheet Flow, THRU WOODS** Woods: Light underbrush n= 0.400 P2= 3.01"
21.4	386	0.0036	0.30		**Shallow Concentrated Flow, OVER FIELD** Woodland Kv= 5.0 fps
38.2	436	Total			

Subcatchment EX-2: WEST

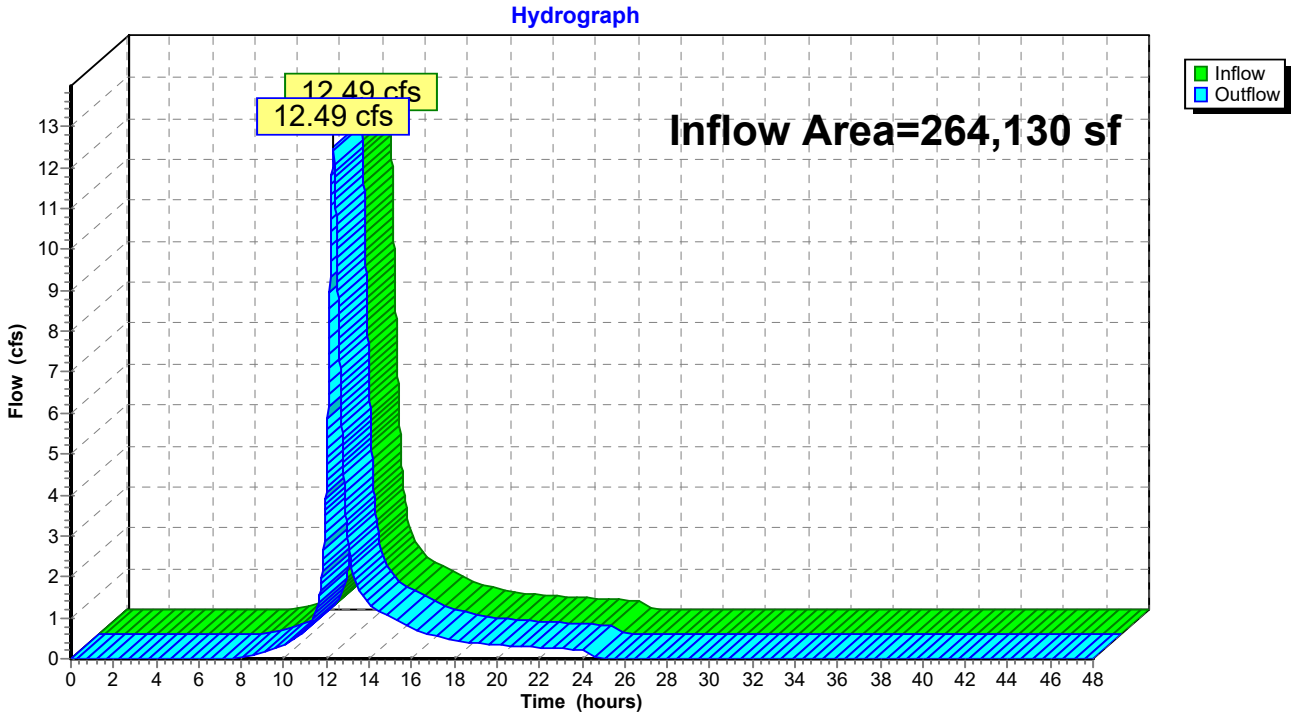


Summary for Reach DP-1: EX. CULVERT IN SOUTHEAST CORNER OF SITE

Inflow Area = 264,130 sf, 1.93% Impervious, Inflow Depth = 2.78" for 10-Year event
Inflow = 12.49 cfs @ 12.32 hrs, Volume= 61,121 cf
Outflow = 12.49 cfs @ 12.32 hrs, Volume= 61,121 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2

Reach DP-1: EX. CULVERT IN SOUTHEAST CORNER OF SITE

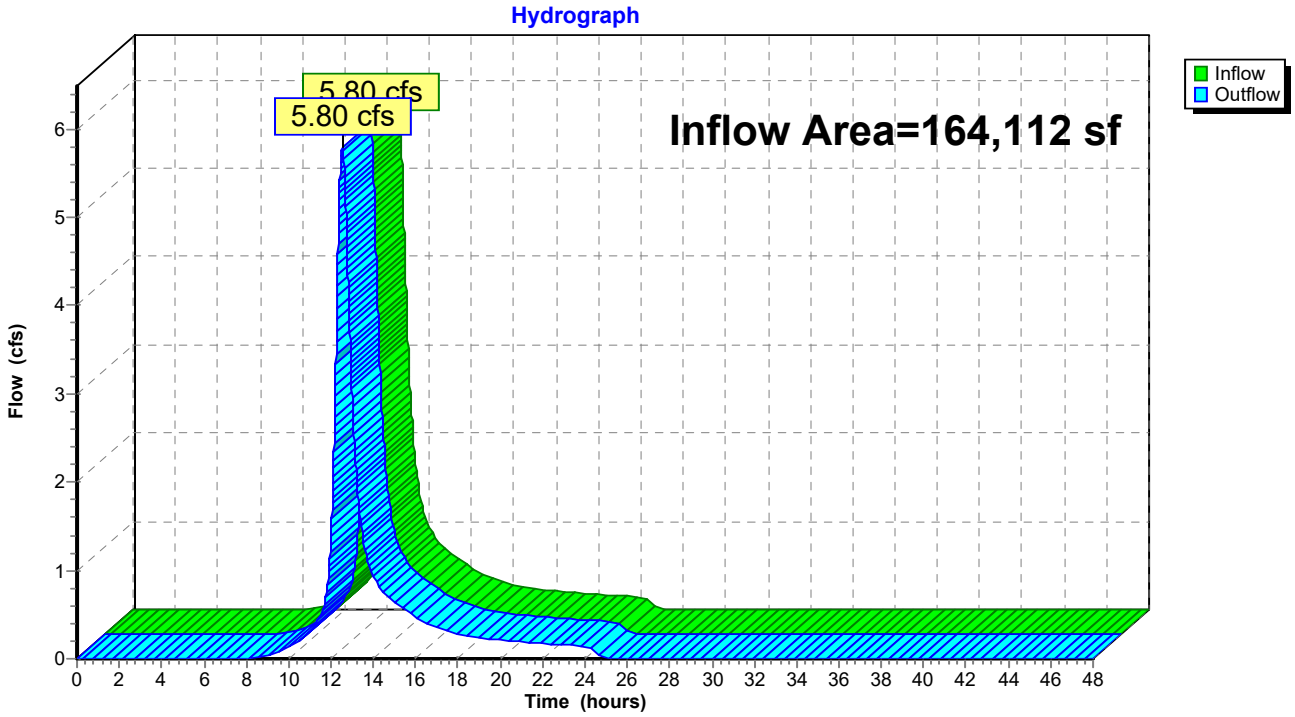


Summary for Reach DP-2: EX. DITCH ALONG RAILROAD TRACKS

Inflow Area = 164,112 sf, 0.00% Impervious, Inflow Depth = 2.60" for 10-Year event
Inflow = 5.80 cfs @ 12.52 hrs, Volume= 35,536 cf
Outflow = 5.80 cfs @ 12.52 hrs, Volume= 35,536 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2

Reach DP-2: EX. DITCH ALONG RAILROAD TRACKS



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX-1: EAST Runoff Area=264,130 sf 1.93% Impervious Runoff Depth=3.70"
Flow Length=887' Tc=23.2 min CN=82 Runoff=16.59 cfs 81,506 cf

Subcatchment EX-2: WEST Runoff Area=164,112 sf 0.00% Impervious Runoff Depth=3.50"
Flow Length=436' Tc=38.2 min CN=80 Runoff=7.81 cfs 47,904 cf

Reach DP-1: EX. CULVERT IN SOUTHEAST CORNER OF SITE Inflow=16.59 cfs 81,506 cf
Outflow=16.59 cfs 81,506 cf

Reach DP-2: EX. DITCH ALONG RAILROAD TRACKS Inflow=7.81 cfs 47,904 cf
Outflow=7.81 cfs 47,904 cf

Total Runoff Area = 428,242 sf Runoff Volume = 129,409 cf Average Runoff Depth = 3.63"
98.81% Pervious = 423,151 sf 1.19% Impervious = 5,091 sf

Summary for Subcatchment EX-1: EAST

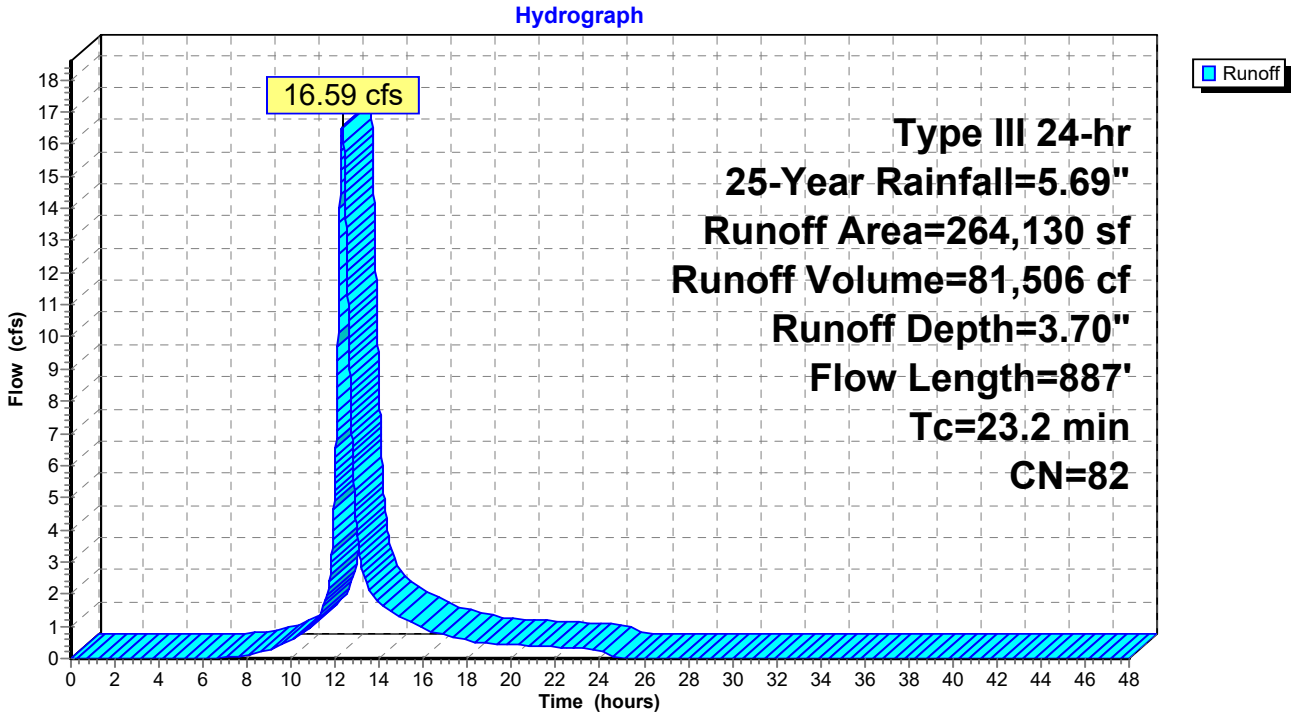
Runoff = 16.59 cfs @ 12.31 hrs, Volume= 81,506 cf, Depth= 3.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.69"

Area (sf)	CN	Description
4,226	98	Roofs, HSG D
865	98	Paved parking, HSG D
27,421	80	>75% Grass cover, Good, HSG D
2,348	91	Gravel roads, HSG D
144,251	84	Small grain, SR + CR, Good, HSG D
85,019	77	Woods, Good, HSG D
264,130	82	Weighted Average
259,039		98.07% Pervious Area
5,091		1.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	50	0.0100	0.05		**Sheet Flow, THRU WOODS** Woods: Light underbrush n= 0.400 P2= 3.01"
4.2	396	0.0300	1.56		**Shallow Concentrated Flow, OVER FIELD** Cultivated Straight Rows Kv= 9.0 fps
2.2	441	0.0100	3.35	22.14	**Channel Flow, OVER FARM DITCH** Area= 6.6 sf Perim= 9.4' r= 0.70' n= 0.035 Earth, dense weeds
23.2	887	Total			

Subcatchment EX-1: EAST



Summary for Subcatchment EX-2: WEST

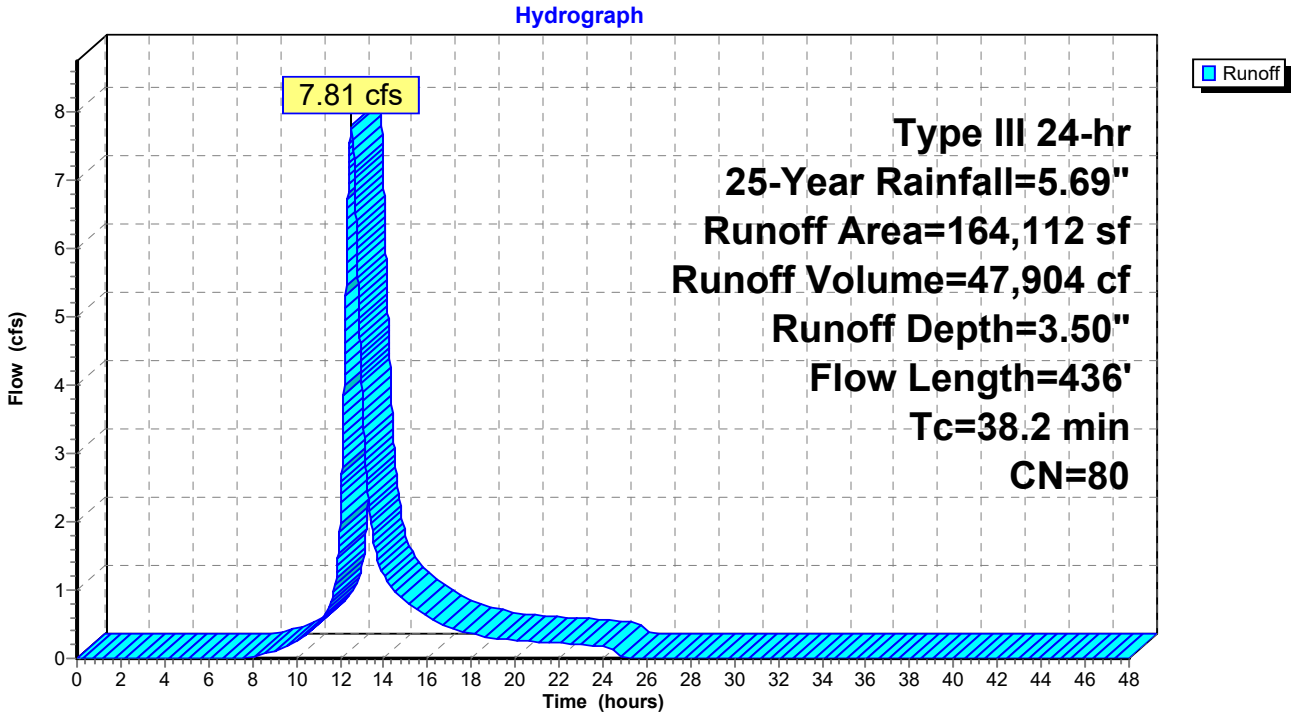
Runoff = 7.81 cfs @ 12.52 hrs, Volume= 47,904 cf, Depth= 3.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.69"

Area (sf)	CN	Description
80,578	84	Small grain, SR + CR, Good, HSG D
83,534	77	Woods, Good, HSG D
164,112	80	Weighted Average
164,112		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	50	0.0100	0.05		**Sheet Flow, THRU WOODS** Woods: Light underbrush n= 0.400 P2= 3.01"
21.4	386	0.0036	0.30		**Shallow Concentrated Flow, OVER FIELD** Woodland Kv= 5.0 fps
38.2	436	Total			

Subcatchment EX-2: WEST

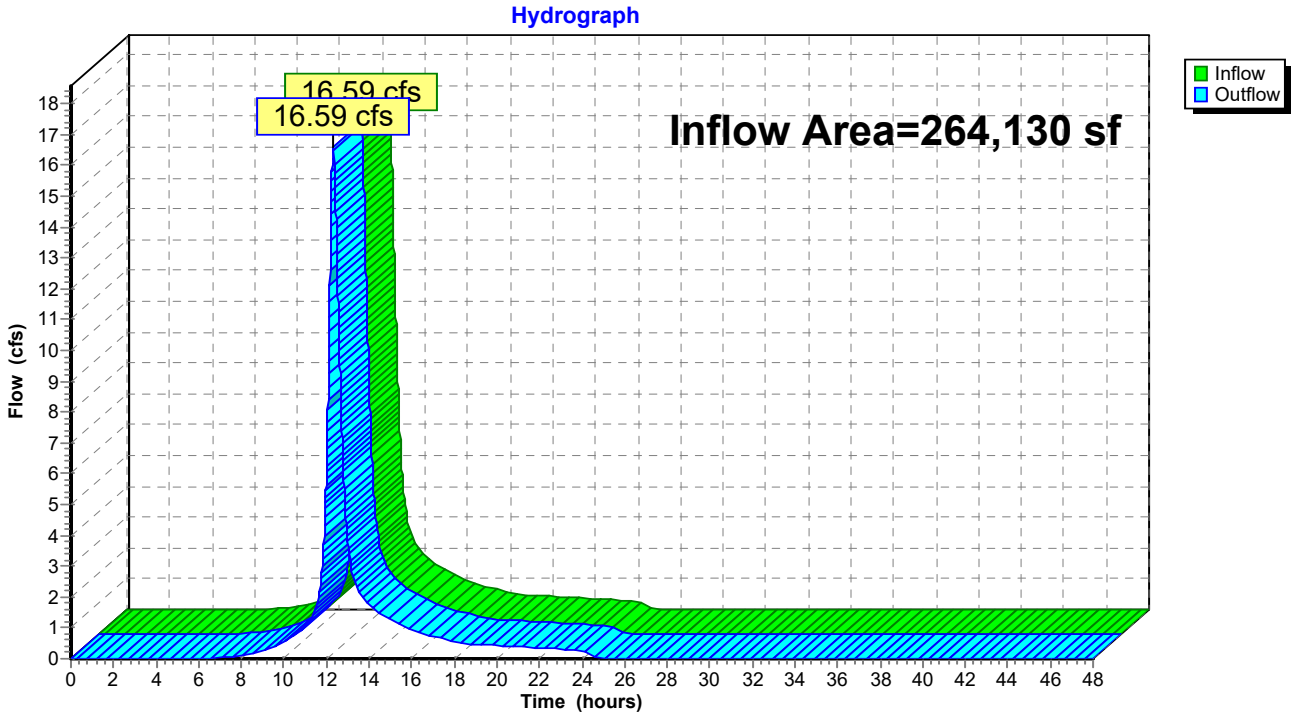


Summary for Reach DP-1: EX. CULVERT IN SOUTHEAST CORNER OF SITE

Inflow Area = 264,130 sf, 1.93% Impervious, Inflow Depth = 3.70" for 25-Year event
Inflow = 16.59 cfs @ 12.31 hrs, Volume= 81,506 cf
Outflow = 16.59 cfs @ 12.31 hrs, Volume= 81,506 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2

Reach DP-1: EX. CULVERT IN SOUTHEAST CORNER OF SITE

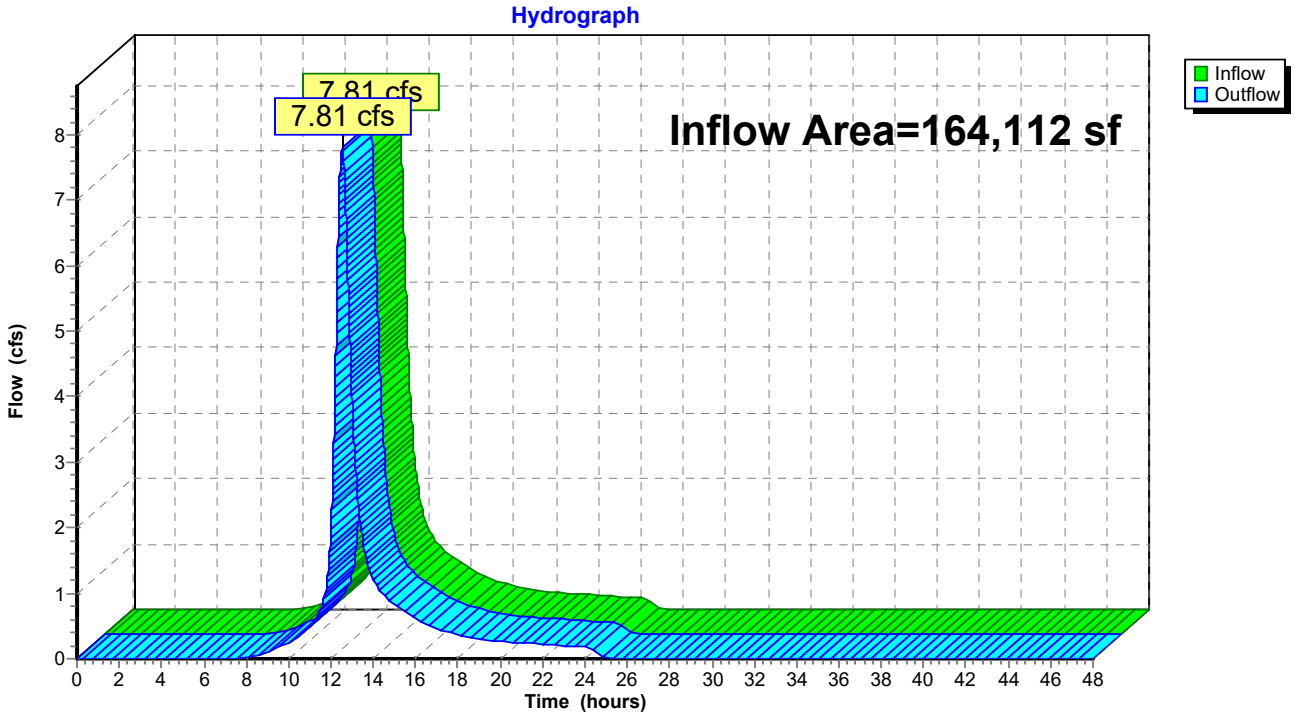


Summary for Reach DP-2: EX. DITCH ALONG RAILROAD TRACKS

Inflow Area = 164,112 sf, 0.00% Impervious, Inflow Depth = 3.50" for 25-Year event
Inflow = 7.81 cfs @ 12.52 hrs, Volume= 47,904 cf
Outflow = 7.81 cfs @ 12.52 hrs, Volume= 47,904 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2

Reach DP-2: EX. DITCH ALONG RAILROAD TRACKS



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX-1: EAST Runoff Area=264,130 sf 1.93% Impervious Runoff Depth=5.17"
Flow Length=887' Tc=23.2 min CN=82 Runoff=22.98 cfs 113,789 cf

Subcatchment EX-2: WEST Runoff Area=164,112 sf 0.00% Impervious Runoff Depth=4.94"
Flow Length=436' Tc=38.2 min CN=80 Runoff=10.95 cfs 67,617 cf

Reach DP-1: EX. CULVERT IN SOUTHEAST CORNER OF SITE Inflow=22.98 cfs 113,789 cf
Outflow=22.98 cfs 113,789 cf

Reach DP-2: EX. DITCH ALONG RAILROAD TRACKS Inflow=10.95 cfs 67,617 cf
Outflow=10.95 cfs 67,617 cf

Total Runoff Area = 428,242 sf Runoff Volume = 181,407 cf Average Runoff Depth = 5.08"
98.81% Pervious = 423,151 sf 1.19% Impervious = 5,091 sf

Summary for Subcatchment EX-1: EAST

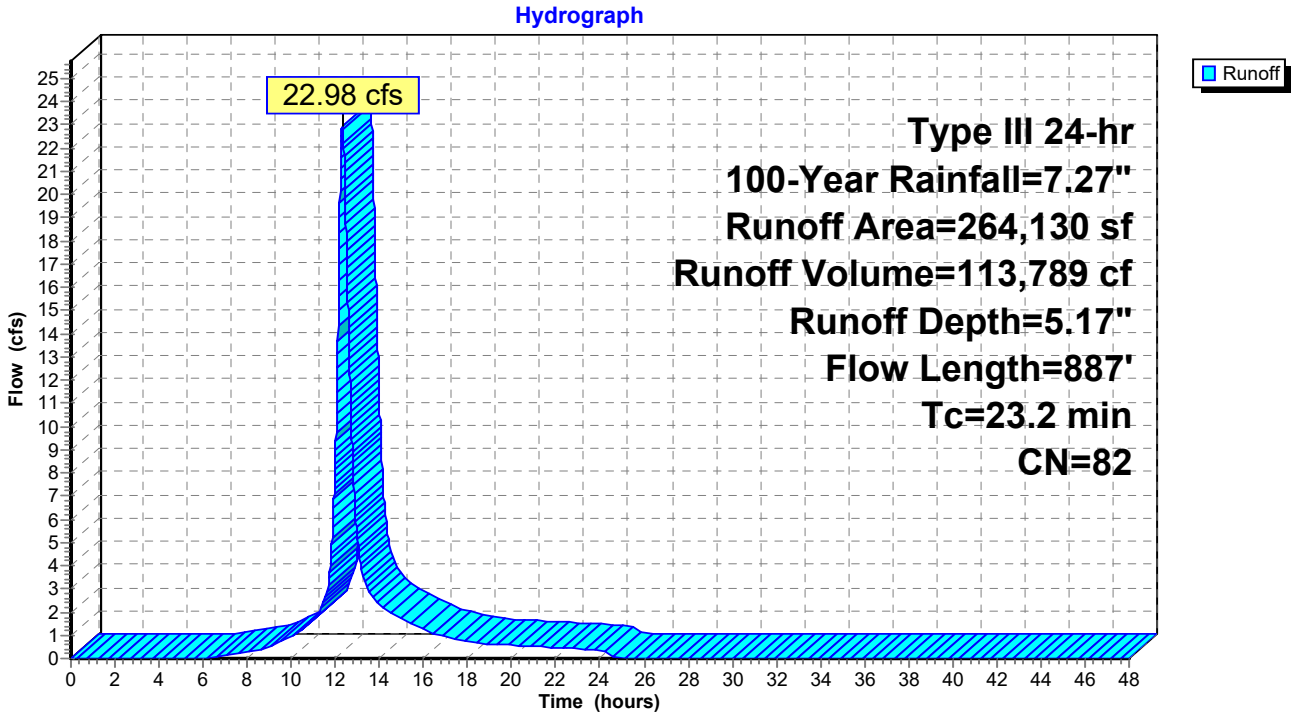
Runoff = 22.98 cfs @ 12.30 hrs, Volume= 113,789 cf, Depth= 5.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.27"

Area (sf)	CN	Description
4,226	98	Roofs, HSG D
865	98	Paved parking, HSG D
27,421	80	>75% Grass cover, Good, HSG D
2,348	91	Gravel roads, HSG D
144,251	84	Small grain, SR + CR, Good, HSG D
85,019	77	Woods, Good, HSG D
264,130	82	Weighted Average
259,039		98.07% Pervious Area
5,091		1.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	50	0.0100	0.05		**Sheet Flow, THRU WOODS** Woods: Light underbrush n= 0.400 P2= 3.01"
4.2	396	0.0300	1.56		**Shallow Concentrated Flow, OVER FIELD** Cultivated Straight Rows Kv= 9.0 fps
2.2	441	0.0100	3.35	22.14	**Channel Flow, OVER FARM DITCH** Area= 6.6 sf Perim= 9.4' r= 0.70' n= 0.035 Earth, dense weeds
23.2	887	Total			

Subcatchment EX-1: EAST



Summary for Subcatchment EX-2: WEST

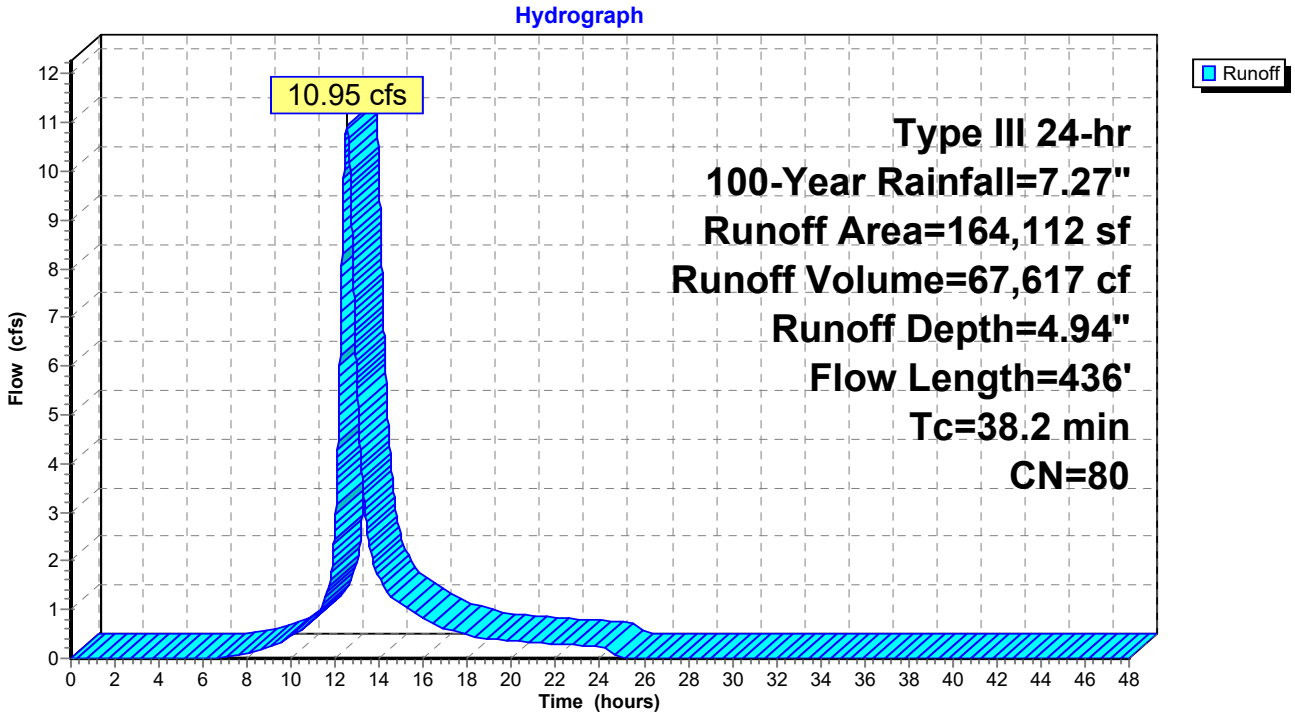
Runoff = 10.95 cfs @ 12.52 hrs, Volume= 67,617 cf, Depth= 4.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.27"

Area (sf)	CN	Description
80,578	84	Small grain, SR + CR, Good, HSG D
83,534	77	Woods, Good, HSG D
164,112	80	Weighted Average
164,112		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	50	0.0100	0.05		**Sheet Flow, THRU WOODS** Woods: Light underbrush n= 0.400 P2= 3.01"
21.4	386	0.0036	0.30		**Shallow Concentrated Flow, OVER FIELD** Woodland Kv= 5.0 fps
38.2	436	Total			

Subcatchment EX-2: WEST

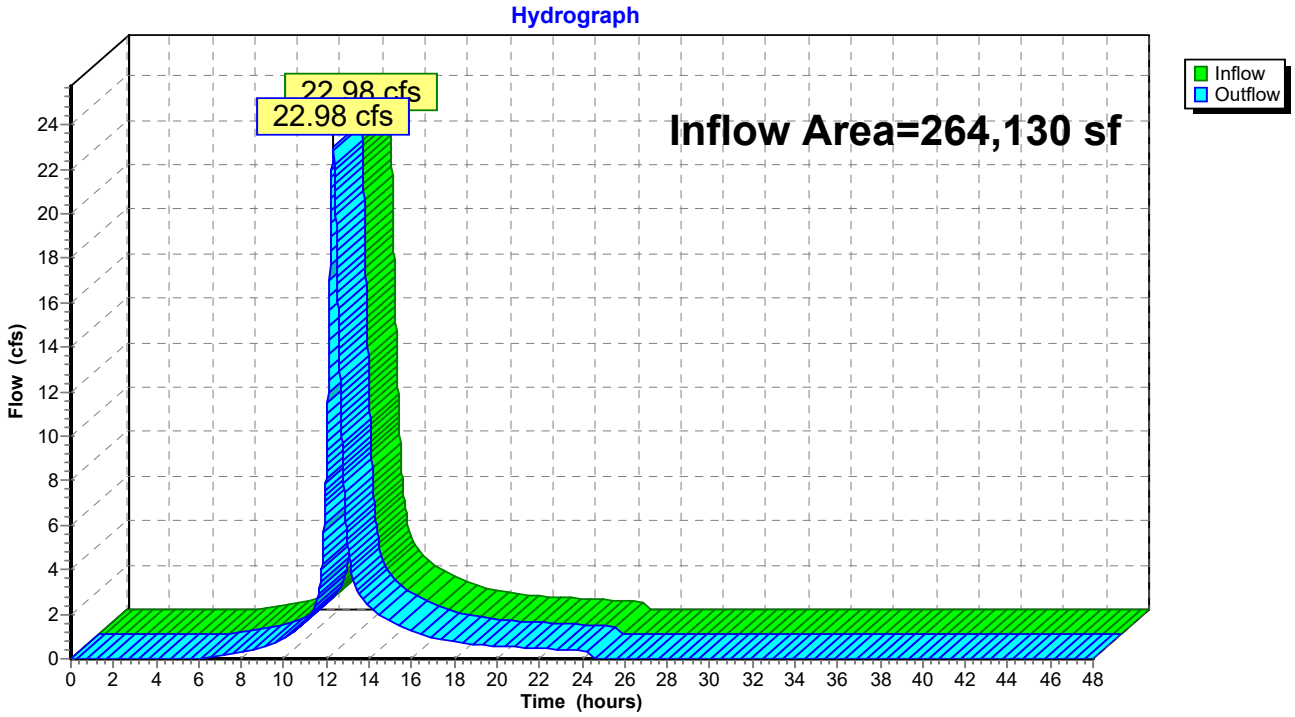


Summary for Reach DP-1: EX. CULVERT IN SOUTHEAST CORNER OF SITE

Inflow Area = 264,130 sf, 1.93% Impervious, Inflow Depth = 5.17" for 100-Year event
Inflow = 22.98 cfs @ 12.30 hrs, Volume= 113,789 cf
Outflow = 22.98 cfs @ 12.30 hrs, Volume= 113,789 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2

Reach DP-1: EX. CULVERT IN SOUTHEAST CORNER OF SITE

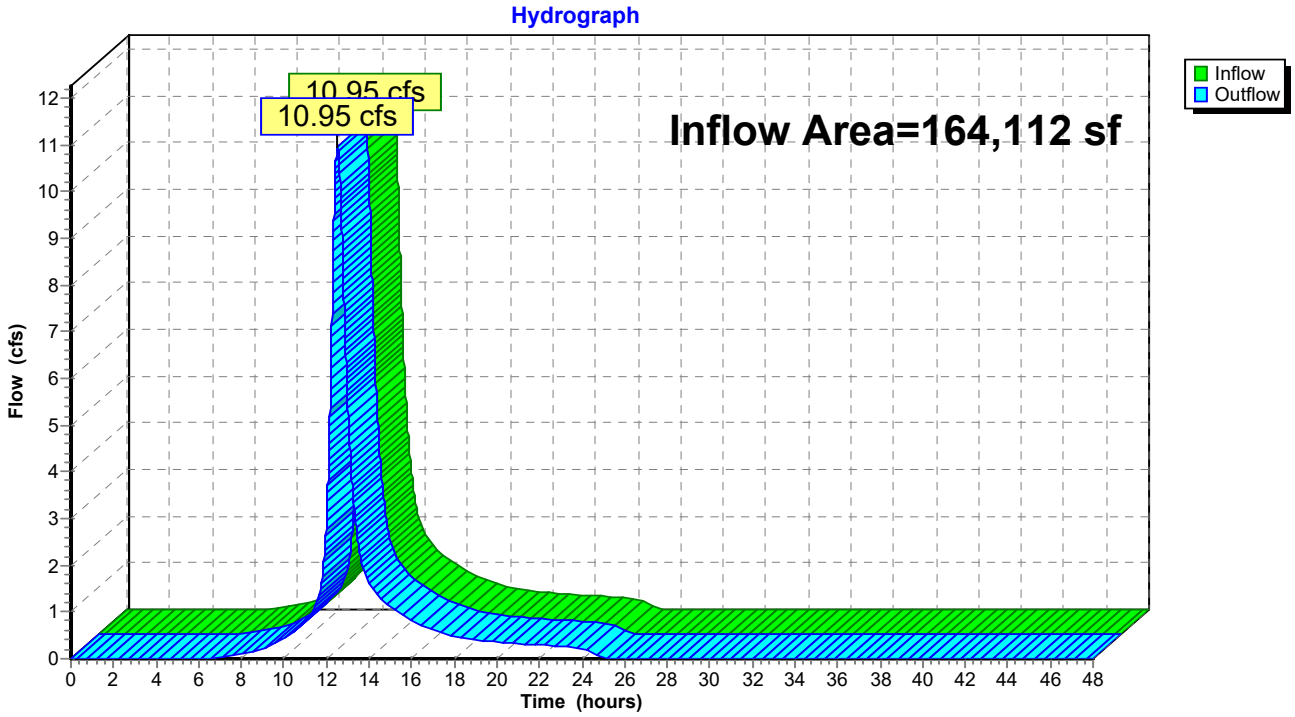


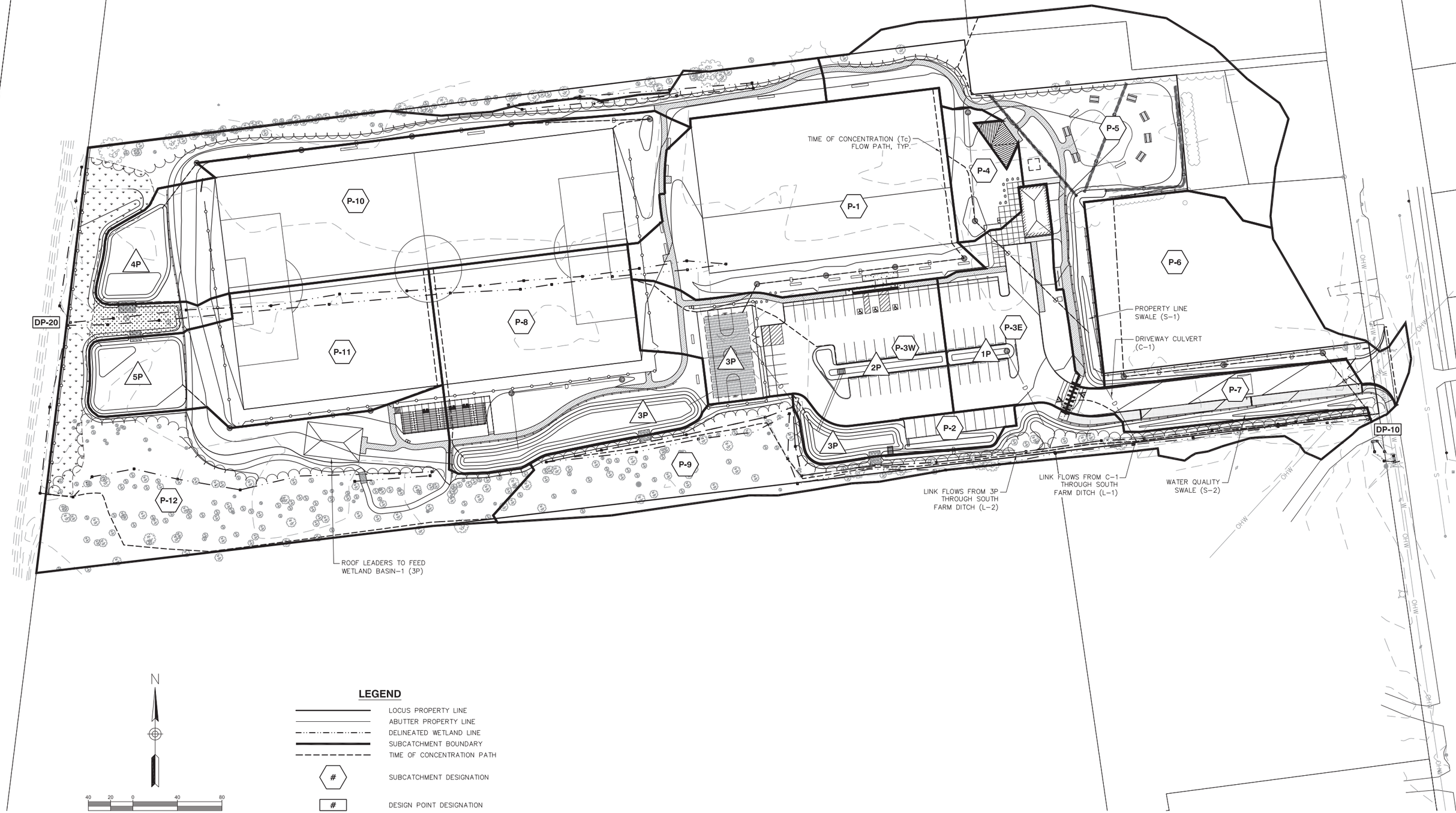
Summary for Reach DP-2: EX. DITCH ALONG RAILROAD TRACKS

Inflow Area = 164,112 sf, 0.00% Impervious, Inflow Depth = 4.94" for 100-Year event
Inflow = 10.95 cfs @ 12.52 hrs, Volume= 67,617 cf
Outflow = 10.95 cfs @ 12.52 hrs, Volume= 67,617 cf, Atten= 0%, Lag= 0.0 min

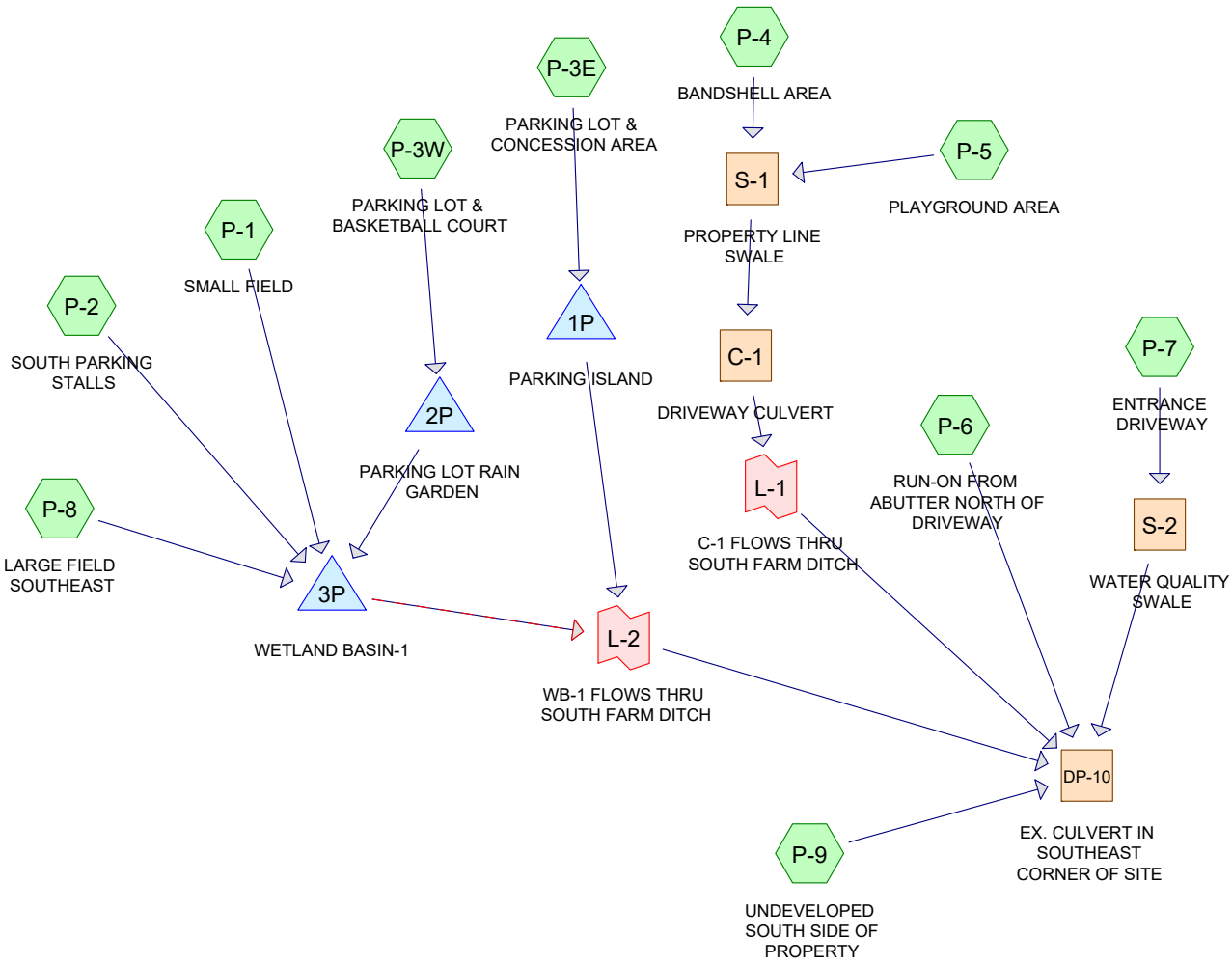
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2

Reach DP-2: EX. DITCH ALONG RAILROAD TRACKS





POST-DRAINAGE PLAN



Subcat Reach Pond Link

Routing Diagram for Deerfield_PRE POST
Prepared by ProTerra Design Group, LLC, Printed 12/15/2021

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
111,742	80	>75% Grass cover, Good, HSG D (P-1, P-2, P-3E, P-3W, P-4, P-5, P-6, P-7, P-8, P-9)
2,359	91	Gravel roads, HSG D (P-6, P-8)
50,761	98	Paved parking, HSG D (P-1, P-2, P-3E, P-3W, P-4, P-5, P-6, P-7, P-8, P-9)
7,668	98	Roofs, HSG D (P-3E, P-5, P-6, P-8)
50,400	74	Soccer Field, Good, HSG C (P-1, P-8)
42,971	77	Woods, Good, HSG D (P-5, P-6, P-9)
265,901	**82**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
50,400	HSG C	P-1, P-8
215,501	HSG D	P-1, P-2, P-3E, P-3W, P-4, P-5, P-6, P-7, P-8, P-9
0	Other	
265,901		**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P-1: SMALL FIELD Runoff Area=44,152 sf 0.99% Impervious Runoff Depth=1.02"
Flow Length=483' Tc=14.1 min CN=76 Runoff=0.89 cfs 3,759 cf

Subcatchment P-2: SOUTH PARKING Runoff Area=6,480 sf 28.63% Impervious Runoff Depth=1.60"
Flow Length=36' Slope=0.0800 '/' Tc=6.0 min CN=85 Runoff=0.28 cfs 862 cf

Subcatchment P-3E: PARKING LOT & Runoff Area=17,305 sf 74.80% Impervious Runoff Depth=2.26"
Tc=8.3 min CN=93 Runoff=0.95 cfs 3,264 cf

Subcatchment P-3W: PARKING LOT & Runoff Area=27,044 sf 76.83% Impervious Runoff Depth=2.36"
Flow Length=219' Tc=8.3 min CN=94 Runoff=1.53 cfs 5,318 cf

Subcatchment P-4: BANDSHELL AREA Runoff Area=5,817 sf 8.60% Impervious Runoff Depth=1.39"
Flow Length=209' Tc=9.6 min CN=82 Runoff=0.19 cfs 672 cf

Subcatchment P-5: PLAYGROUND AREA Runoff Area=52,838 sf 10.88% Impervious Runoff Depth=1.32"
Flow Length=212' Tc=18.5 min CN=81 Runoff=1.29 cfs 5,817 cf

Subcatchment P-6: RUN-ON FROM Runoff Area=31,494 sf 14.32% Impervious Runoff Depth=1.45"
Flow Length=404' Tc=13.7 min CN=83 Runoff=0.96 cfs 3,818 cf

Subcatchment P-7: ENTRANCE DRIVEWAY Runoff Area=11,213 sf 75.56% Impervious Runoff Depth=2.36"
Flow Length=75' Tc=6.0 min CN=94 Runoff=0.68 cfs 2,205 cf

Subcatchment P-8: LARGE FIELD Runoff Area=37,585 sf 7.36% Impervious Runoff Depth=1.14"
Flow Length=174' Tc=12.1 min CN=78 Runoff=0.91 cfs 3,558 cf

Subcatchment P-9: UNDEVELOPED SOUTH Runoff Area=31,973 sf 1.32% Impervious Runoff Depth=1.14"
Flow Length=730' Tc=11.8 min CN=78 Runoff=0.78 cfs 3,027 cf

Reach C-1: DRIVEWAY CULVERT Avg. Flow Depth=0.39' Max Vel=4.24 fps Inflow=1.40 cfs 6,490 cf
15.0" Round Pipe n=0.013 L=73.3' S=0.0102 '/' Capacity=6.53 cfs Outflow=1.40 cfs 6,490 cf

Reach DP-10: EX. CULVERT IN SOUTHEAST CORNER OF SITE Inflow=5.15 cfs 30,213 cf
Outflow=5.15 cfs 30,213 cf

Reach S-1: PROPERTY LINE SWALE Avg. Flow Depth=0.29' Max Vel=1.03 fps Inflow=1.42 cfs 6,490 cf
n=0.035 L=155.0' S=0.0066 '/' Capacity=3.02 cfs Outflow=1.40 cfs 6,490 cf

Reach S-2: WATER QUALITY SWALE Avg. Flow Depth=0.24' Max Vel=1.61 fps Inflow=0.68 cfs 2,205 cf
n=0.030 L=205.0' S=0.0118 '/' Capacity=14.38 cfs Outflow=0.66 cfs 2,205 cf

Pond 1P: PARKING ISLAND Peak Elev=209.77' Storage=347 cf Inflow=0.95 cfs 3,264 cf
Outflow=0.94 cfs 2,960 cf

Pond 2P: PARKING LOT RAIN GARDEN Peak Elev=209.79' Storage=765 cf Inflow=1.53 cfs 5,318 cf
Outflow=1.50 cfs 4,682 cf

Pond 3P: WETLAND BASIN-1 Peak Elev=209.05' Storage=5,119 cf Inflow=3.40 cfs 12,862 cf
Primary=1.76 cfs 11,714 cf Secondary=0.00 cfs 0 cf Outflow=1.76 cfs 11,714 cf

Link L-1: C-1 FLOWS THRU SOUTH FARM DITCH delayed by 1.1 min Inflow=1.40 cfs 6,490 cf
Primary=1.40 cfs 6,490 cf

Link L-2: WB-1 FLOWS THRU SOUTH FARM DITCH delayed by 2.3 min Inflow=2.14 cfs 14,674 cf
Primary=2.14 cfs 14,674 cf

Total Runoff Area = 265,901 sf Runoff Volume = 32,301 cf Average Runoff Depth = 1.46"
78.03% Pervious = 207,472 sf 21.97% Impervious = 58,429 sf

Summary for Subcatchment P-1: SMALL FIELD

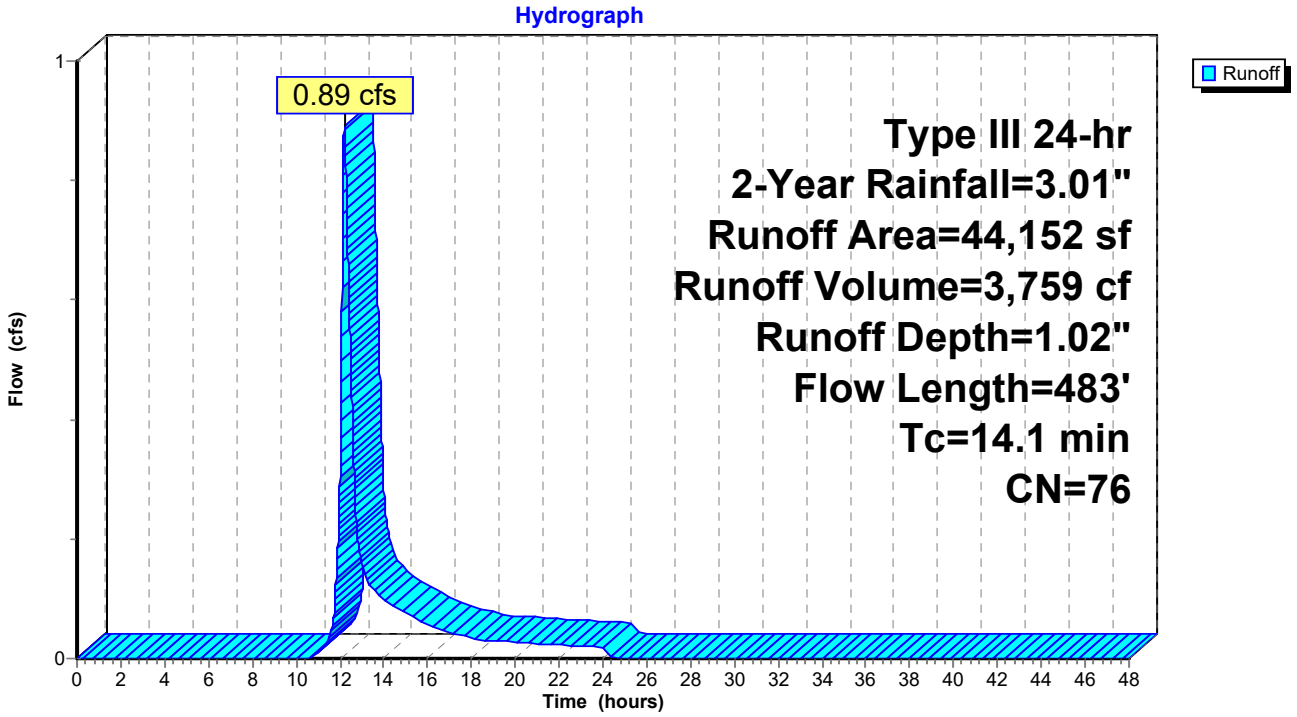
Runoff = 0.89 cfs @ 12.21 hrs, Volume= 3,759 cf, Depth= 1.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.01"

	Area (sf)	CN	Description
	435	98	Paved parking, HSG D
	12,217	80	>75% Grass cover, Good, HSG D
*	31,500	74	Soccer Field, Good, HSG C
	44,152	76	Weighted Average
	43,717		99.01% Pervious Area
	435		0.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER SOCCER FIELD** Grass: Dense n= 0.240 P2= 3.01"
0.9	90	0.0100	1.61		**Shallow Concentrated Flow, OVER SOCCER FIELD** Unpaved Kv= 16.1 fps
0.1	17	0.0500	3.60		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.9	326	0.0050	2.84	1.55	**Pipe Channel, SOUTH COLLECTOR** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
14.1	483	Total			

Subcatchment P-1: SMALL FIELD



Summary for Subcatchment P-2: SOUTH PARKING STALLS

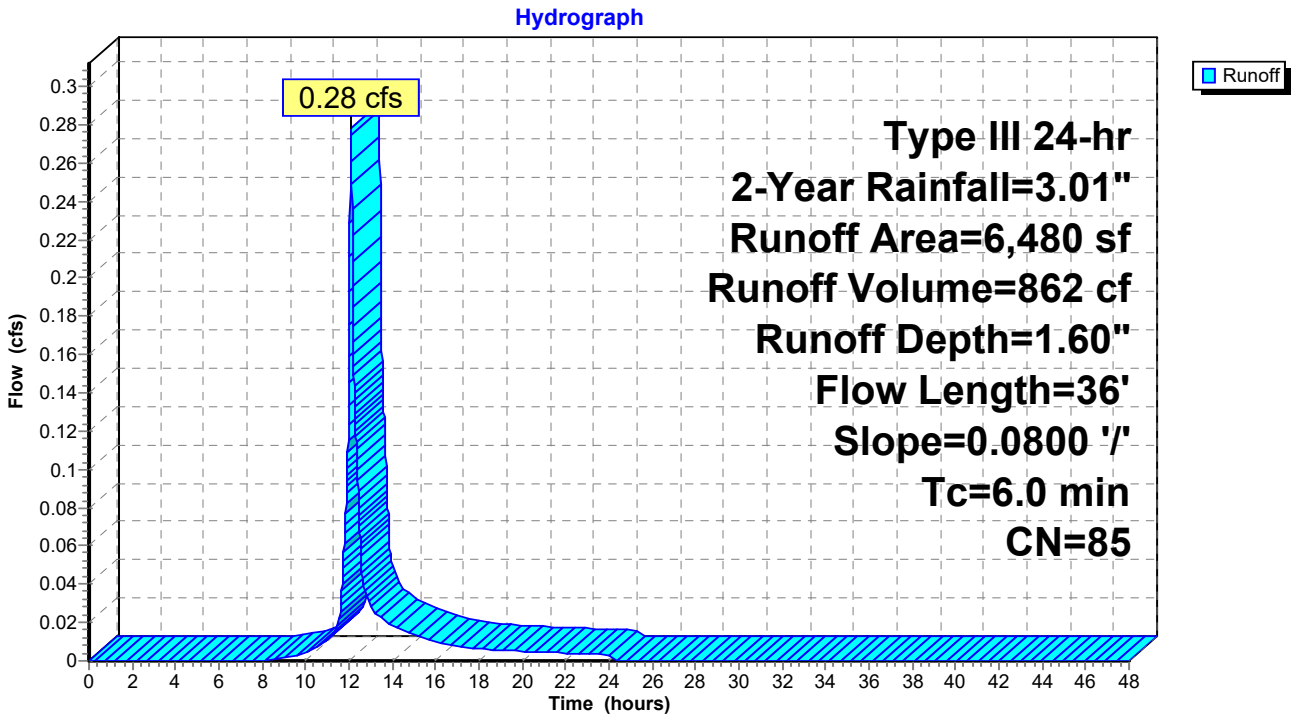
Runoff = 0.28 cfs @ 12.09 hrs, Volume= 862 cf, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.01"

Area (sf)	CN	Description
1,855	98	Paved parking, HSG D
4,625	80	>75% Grass cover, Good, HSG D
6,480	85	Weighted Average
4,625		71.37% Pervious Area
1,855		28.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	36	0.0800	0.16		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
3.7	36	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-2: SOUTH PARKING STALLS



Summary for Subcatchment P-3E: PARKING LOT & CONCESSION AREA

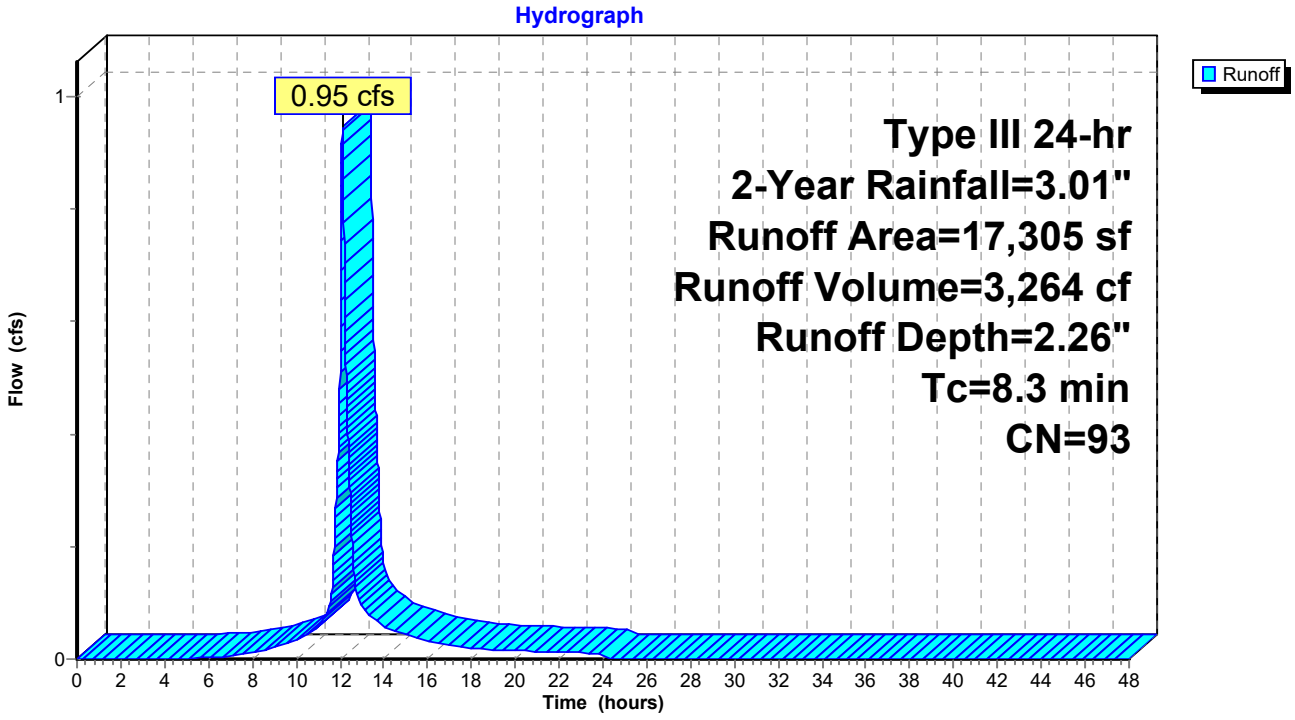
Runoff = 0.95 cfs @ 12.11 hrs, Volume= 3,264 cf, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.01"

Area (sf)	CN	Description
1,125	98	Roofs, HSG D
11,820	98	Paved parking, HSG D
4,360	80	>75% Grass cover, Good, HSG D
17,305	93	Weighted Average
4,360		25.20% Pervious Area
12,945		74.80% Impervious Area

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

Subcatchment P-3E: PARKING LOT & CONCESSION AREA



Summary for Subcatchment P-3W: PARKING LOT & BASKETBALL COURT

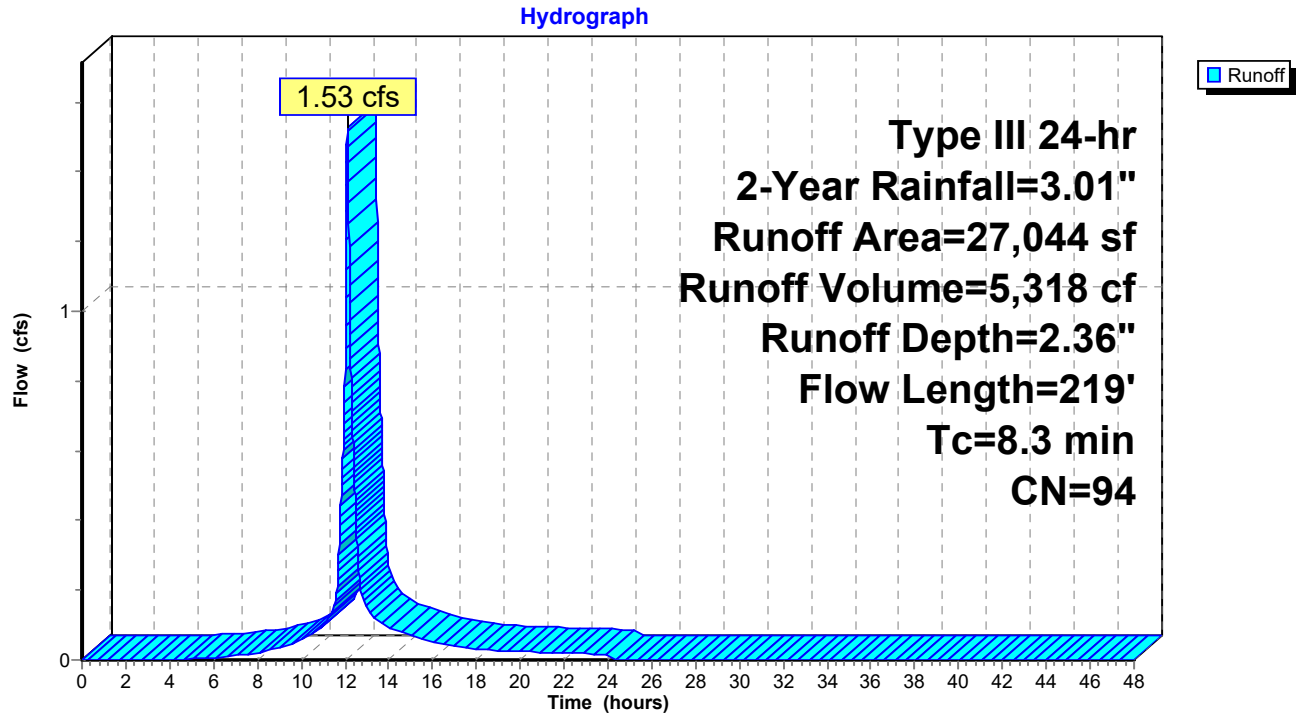
Runoff = 1.53 cfs @ 12.11 hrs, Volume= 5,318 cf, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.01"

Area (sf)	CN	Description
20,777	98	Paved parking, HSG D
6,267	80	>75% Grass cover, Good, HSG D
27,044	94	Weighted Average
6,267		23.17% Pervious Area
20,777		76.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	47	0.0280	0.11		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
0.8	103	0.0165	2.07		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
0.5	69	0.0125	2.27		**Shallow Concentrated Flow, OVER PVMT** Paved Kv= 20.3 fps
8.3	219	Total			

Subcatchment P-3W: PARKING LOT & BASKETBALL COURT



Summary for Subcatchment P-4: BANDSHELL AREA

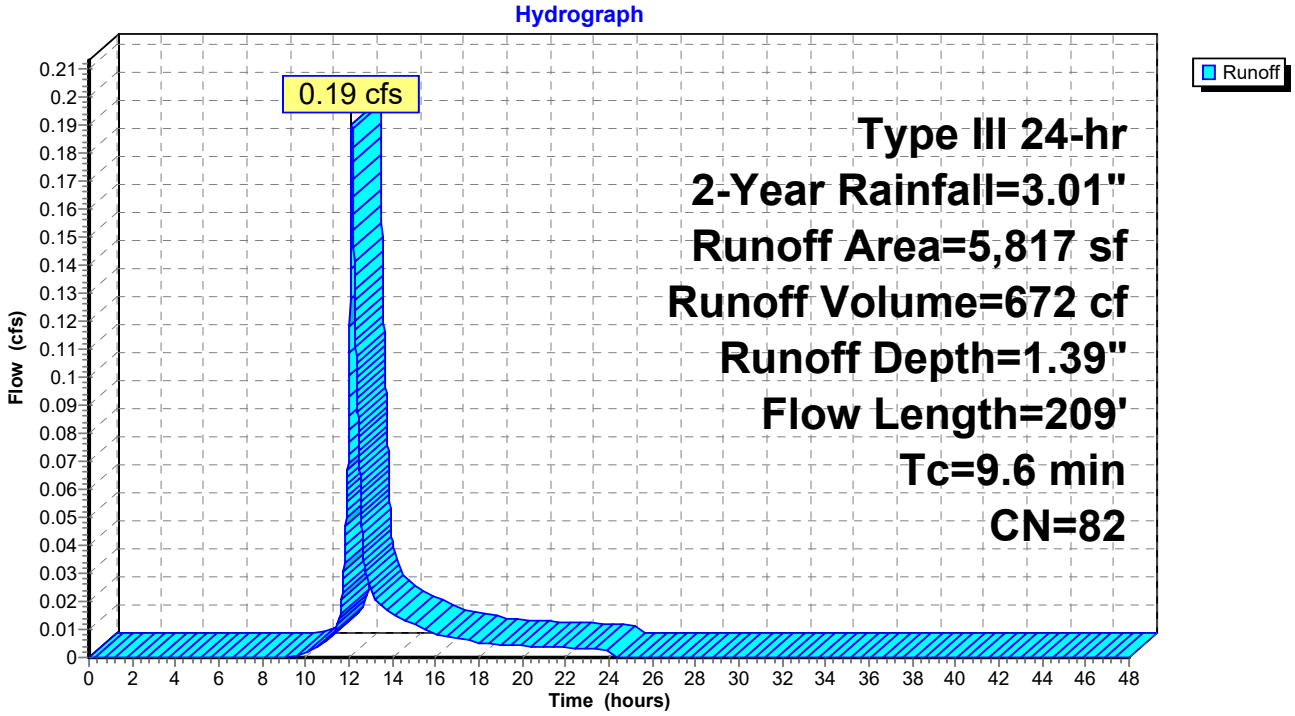
Runoff = 0.19 cfs @ 12.14 hrs, Volume= 672 cf, Depth= 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.01"

Area (sf)	CN	Description
500	98	Paved parking, HSG D
5,317	80	>75% Grass cover, Good, HSG D
5,817	82	Weighted Average
5,317		91.40% Pervious Area
500		8.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0200	0.10		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
0.1	19	0.0380	3.14		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.0	140	0.0050	2.45	0.85	**Pipe Channel, BANDSHELL COLLECTOR** 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.013 Corrugated PE, smooth interior
9.6	209	Total			

Subcatchment P-4: BANDSHELL AREA



Summary for Subcatchment P-5: PLAYGROUND AREA

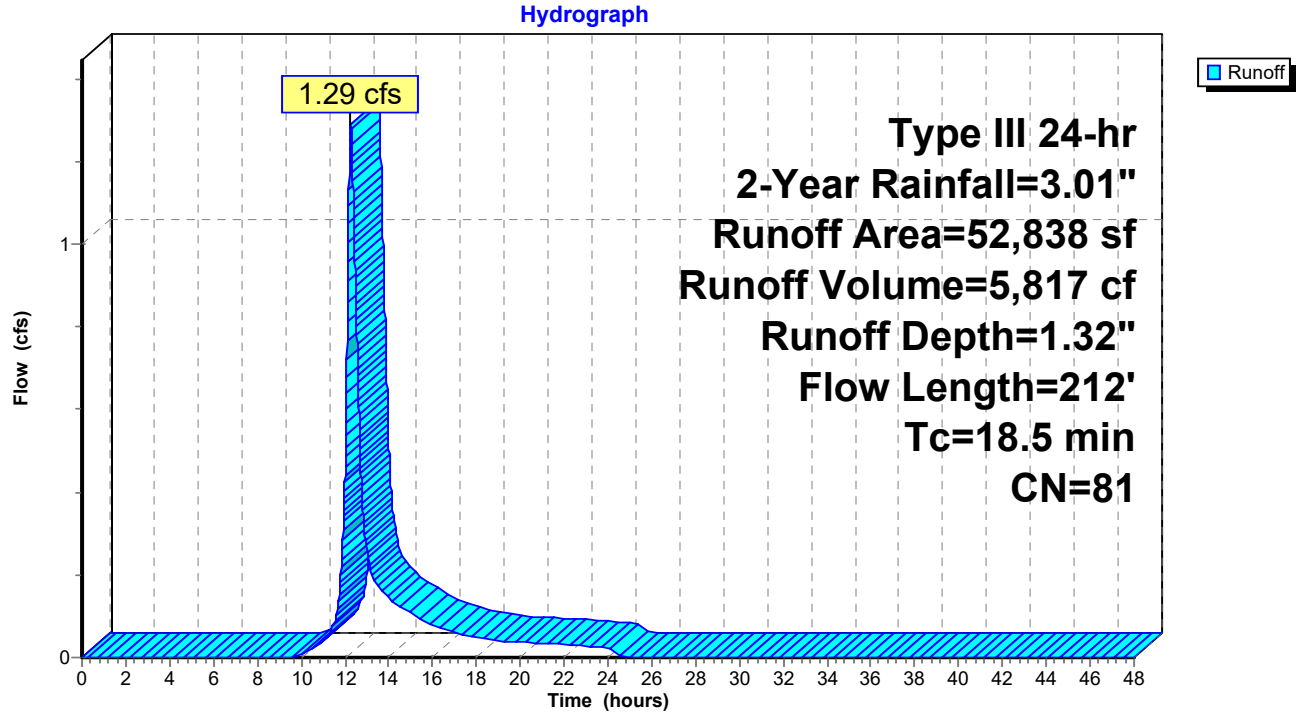
Runoff = 1.29 cfs @ 12.27 hrs, Volume= 5,817 cf, Depth= 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.01"

Area (sf)	CN	Description
2,417	98	Roofs, HSG D
3,330	98	Paved parking, HSG D
29,631	80	>75% Grass cover, Good, HSG D
17,460	77	Woods, Good, HSG D
52,838	81	Weighted Average
47,091		89.12% Pervious Area
5,747		10.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	50	0.0100	0.05		**Sheet Flow, THRU WOODS** Woods: Light underbrush n= 0.400 P2= 3.01"
0.4	42	0.0100	1.61		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.3	120	0.0050	1.54	0.13	**Pipe Channel, THRU FRENCH DRAIN** 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.013 Corrugated PE, smooth interior
18.5	212	Total			

Subcatchment P-5: PLAYGROUND AREA



Summary for Subcatchment P-6: RUN-ON FROM ABUTTER NORTH OF DRIVEWAY

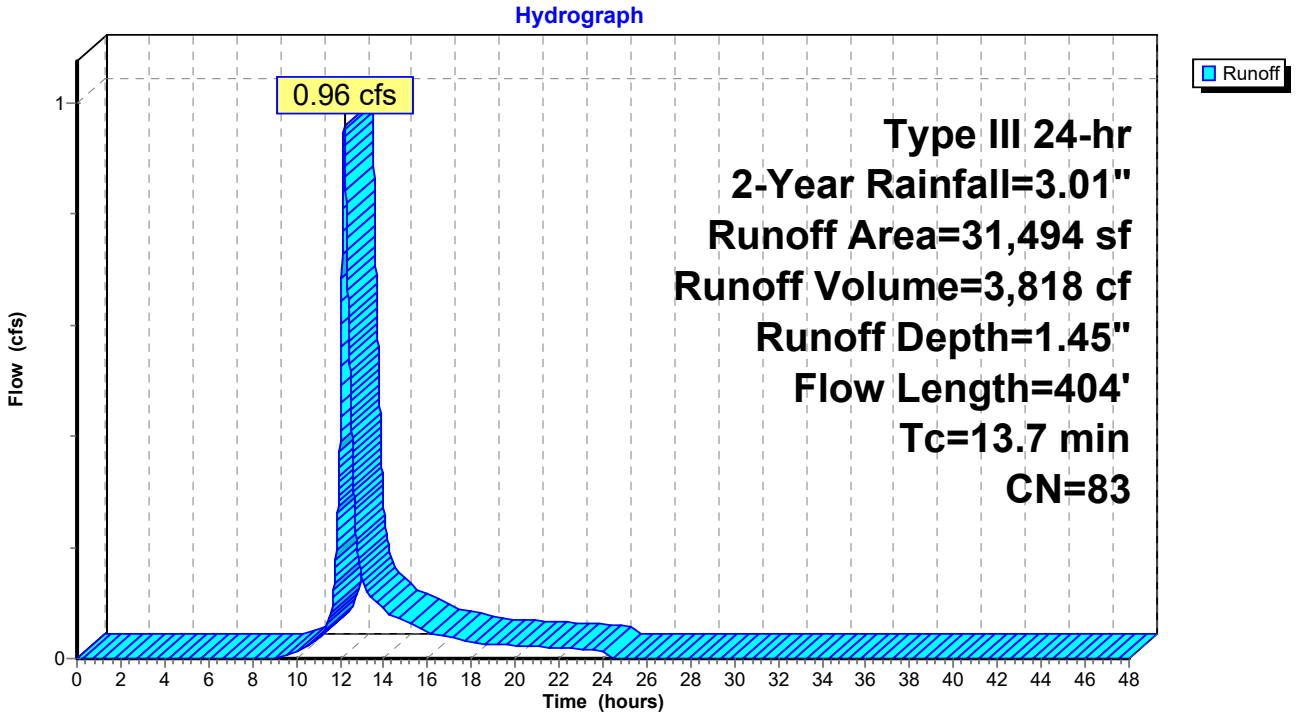
Runoff = 0.96 cfs @ 12.19 hrs, Volume= 3,818 cf, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.01"

Area (sf)	CN	Description
2,626	98	Roofs, HSG D
1,883	98	Paved parking, HSG D
23,946	80	>75% Grass cover, Good, HSG D
2,348	91	Gravel roads, HSG D
691	77	Woods, Good, HSG D
31,494	83	Weighted Average
26,985		85.68% Pervious Area
4,509		14.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
1.1	110	0.0100	1.61		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.4	244	0.0050	2.84	1.55	**Pipe Channel,** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
13.7	404	Total			

Subcatchment P-6: RUN-ON FROM ABUTTER NORTH OF DRIVEWAY



Summary for Subcatchment P-7: ENTRANCE DRIVEWAY

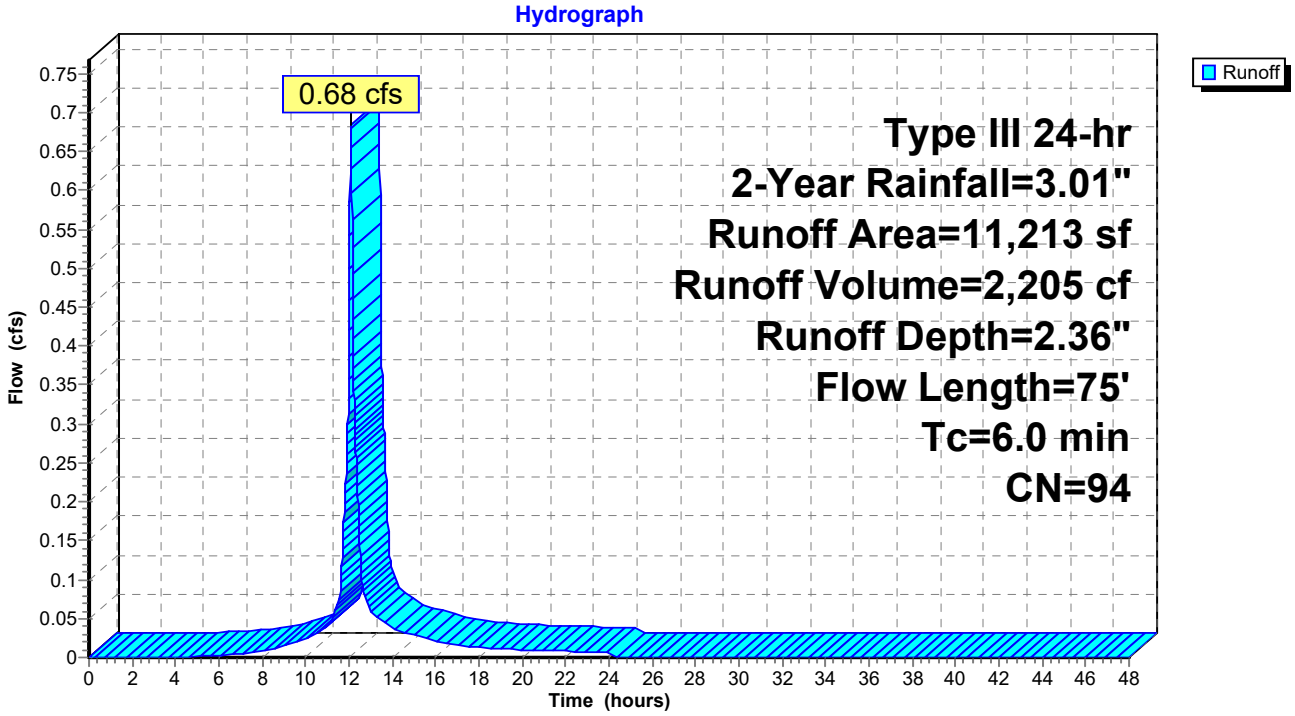
Runoff = 0.68 cfs @ 12.08 hrs, Volume= 2,205 cf, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.01"

Area (sf)	CN	Description
8,472	98	Paved parking, HSG D
2,741	80	>75% Grass cover, Good, HSG D
11,213	94	Weighted Average
2,741		24.44% Pervious Area
8,472		75.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	44	0.0275	1.29		**Sheet Flow, OVER PVMT** Smooth surfaces n= 0.011 P2= 3.01"
0.1	22	0.0150	2.49		**Shallow Concentrated Flow, OVER PVMT** Paved Kv= 20.3 fps
0.0	9	0.0200	6.42	3.21	**Trap/Vee/Rect Channel Flow, THRU SW CHASE** Bot.W=1.00' D=0.50' n= 0.013 Concrete, trowel finish
0.7	75	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-7: ENTRANCE DRIVEWAY



Summary for Subcatchment P-8: LARGE FIELD SOUTHEAST

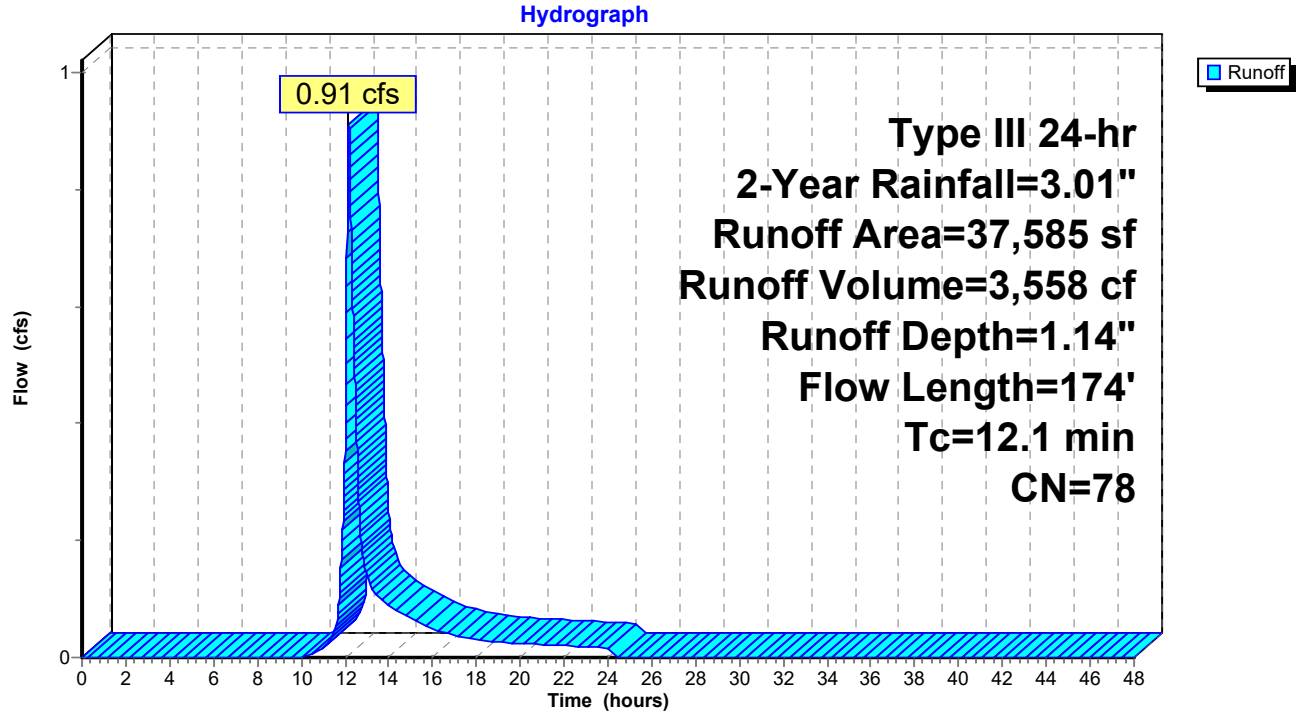
Runoff = 0.91 cfs @ 12.17 hrs, Volume= 3,558 cf, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.01"

	Area (sf)	CN	Description
	1,500	98	Roofs, HSG D
	1,267	98	Paved parking, HSG D
	15,907	80	>75% Grass cover, Good, HSG D
	11	91	Gravel roads, HSG D
*	18,900	74	Soccer Field, Good, HSG C
	37,585	78	Weighted Average
	34,818		92.64% Pervious Area
	2,767		7.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER SOCCER FIELD** Grass: Dense n= 0.240 P2= 3.01"
0.6	55	0.0100	1.61		**Shallow Concentrated Flow, OVER SOCCER FIELD** Unpaved Kv= 16.1 fps
0.3	69	0.0650	4.10		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
12.1	174	Total			

Subcatchment P-8: LARGE FIELD SOUTHEAST



Summary for Subcatchment P-9: UNDEVELOPED SOUTH SIDE OF PROPERTY

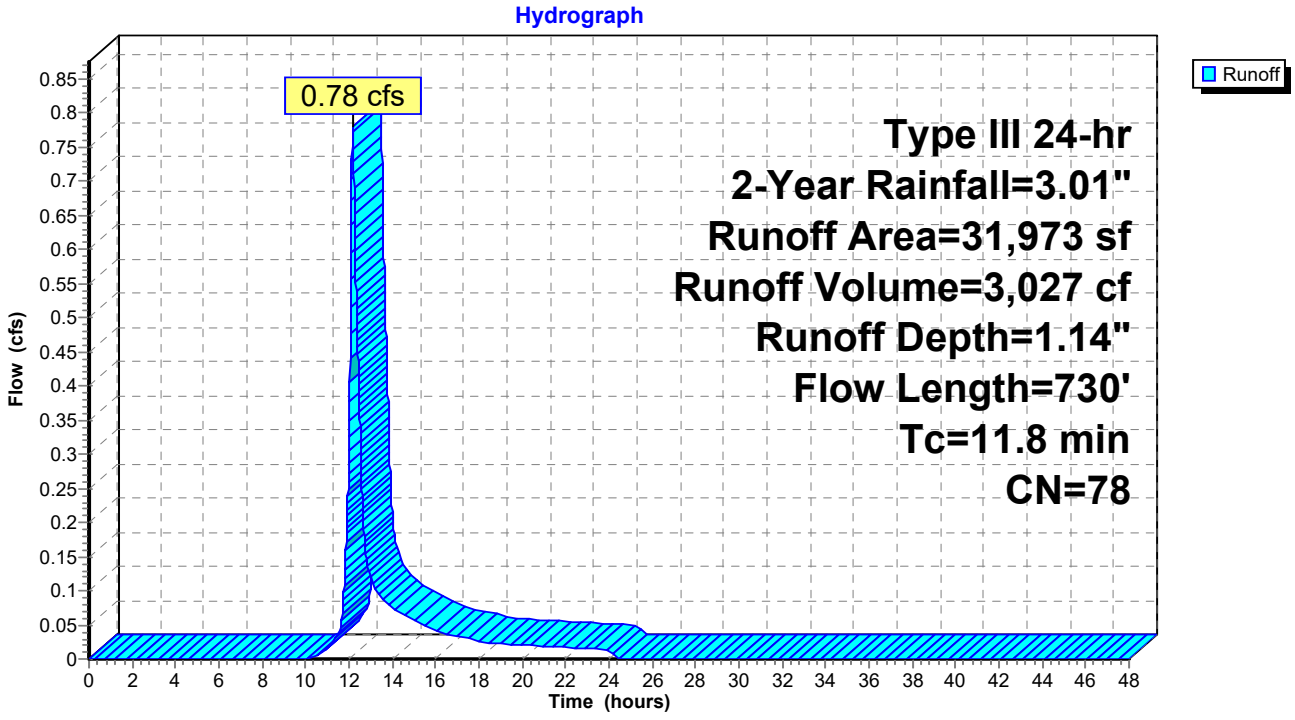
Runoff = 0.78 cfs @ 12.17 hrs, Volume= 3,027 cf, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.01"

Area (sf)	CN	Description
422	98	Paved parking, HSG D
6,731	80	>75% Grass cover, Good, HSG D
24,820	77	Woods, Good, HSG D
31,973	78	Weighted Average
31,551		98.68% Pervious Area
422		1.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0200	0.10		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
0.1	38	0.0700	4.26		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
3.2	642	0.0100	3.35	22.14	**Channel Flow, OVER FARM DITCH** Area= 6.6 sf Perim= 9.4' r= 0.70' n= 0.035 Earth, dense weeds
11.8	730	Total			

Subcatchment P-9: UNDEVELOPED SOUTH SIDE OF PROPERTY



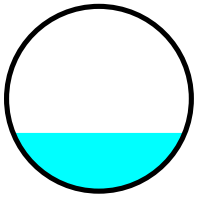
Summary for Reach C-1: DRIVEWAY CULVERT

Inflow Area = 58,655 sf, 10.65% Impervious, Inflow Depth = 1.33" for 2-Year event
Inflow = 1.40 cfs @ 12.28 hrs, Volume= 6,490 cf
Outflow = 1.40 cfs @ 12.29 hrs, Volume= 6,490 cf, Atten= 0%, Lag= 0.2 min

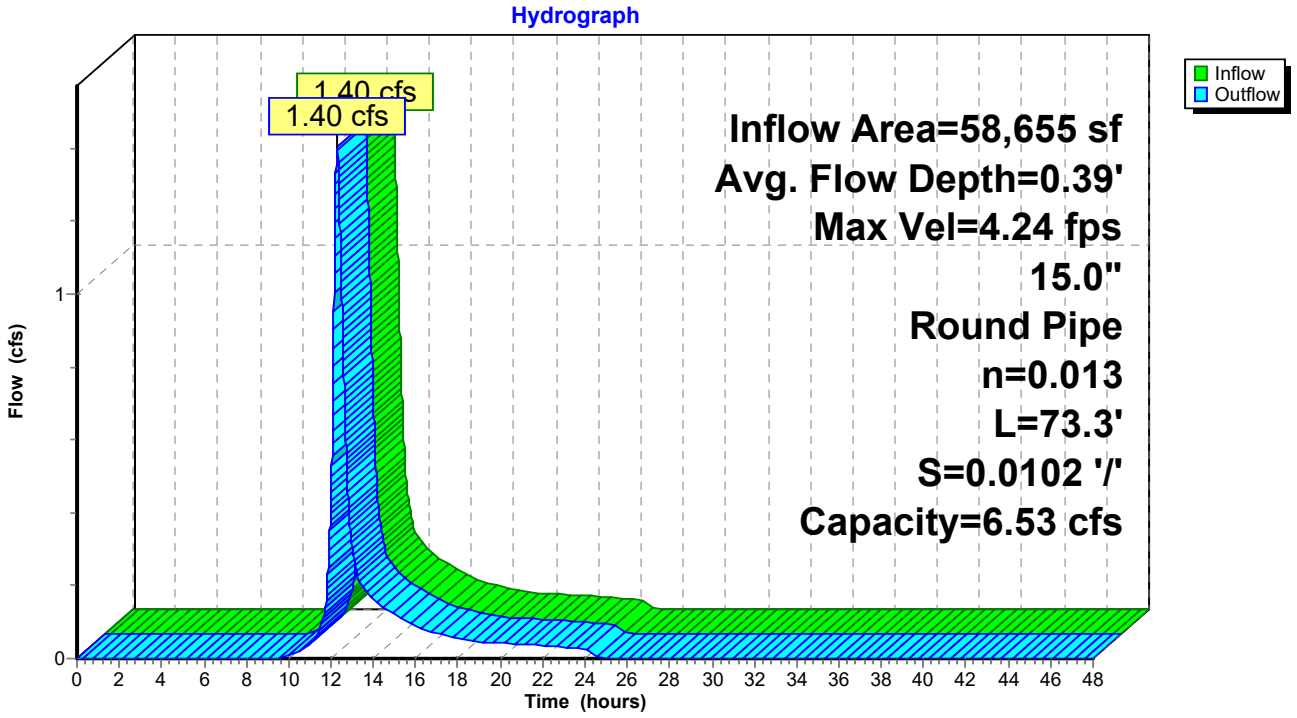
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 4.24 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.62 fps, Avg. Travel Time= 0.8 min

Peak Storage= 24 cf @ 12.29 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 6.53 cfs

15.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 73.3' Slope= 0.0102 '/'
Inlet Invert= 208.75', Outlet Invert= 208.00'



Reach C-1: DRIVEWAY CULVERT

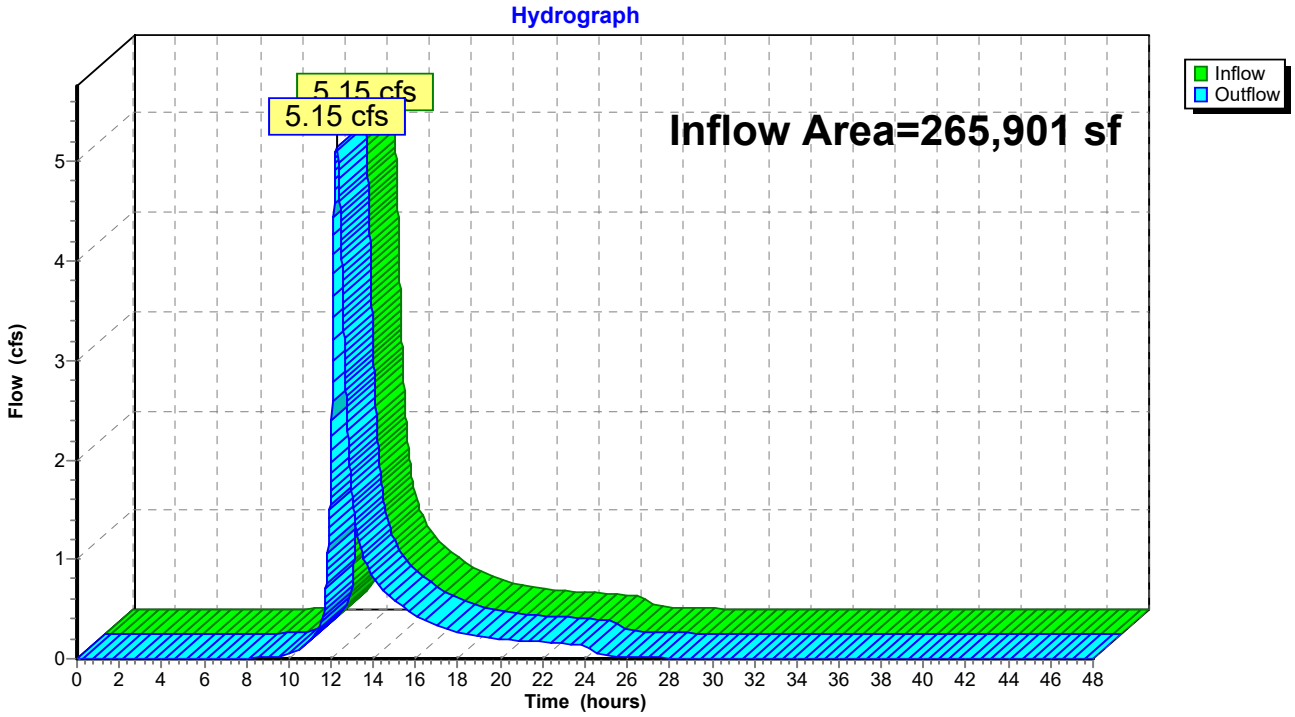


Summary for Reach DP-10: EX. CULVERT IN SOUTHEAST CORNER OF SITE

Inflow Area = 265,901 sf, 21.97% Impervious, Inflow Depth = 1.36" for 2-Year event
Inflow = 5.15 cfs @ 12.25 hrs, Volume= 30,213 cf
Outflow = 5.15 cfs @ 12.25 hrs, Volume= 30,213 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2

Reach DP-10: EX. CULVERT IN SOUTHEAST CORNER OF SITE



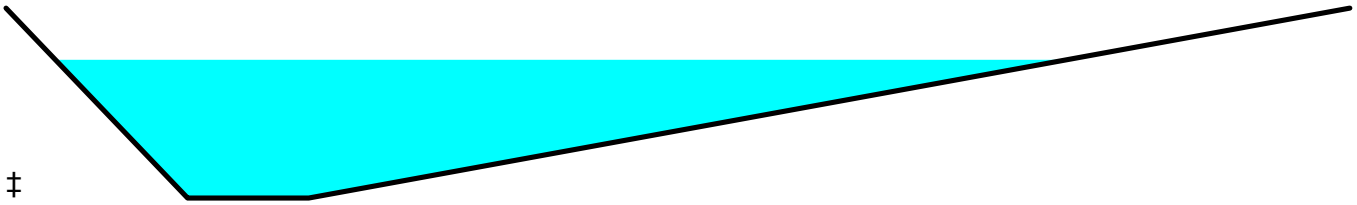
Summary for Reach S-1: PROPERTY LINE SWALE

Inflow Area = 58,655 sf, 10.65% Impervious, Inflow Depth = 1.33" for 2-Year event
Inflow = 1.42 cfs @ 12.25 hrs, Volume= 6,490 cf
Outflow = 1.40 cfs @ 12.28 hrs, Volume= 6,490 cf, Atten= 1%, Lag= 2.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.03 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 6.3 min

Peak Storage= 211 cf @ 12.28 hrs
Average Depth at Peak Storage= 0.29'
Bank-Full Depth= 0.40' Flow Area= 2.4 sf, Capacity= 3.02 cfs

Custom cross-section, Length= 155.0' Slope= 0.0066 '/'
Constant n= 0.035 Earth, dense weeds
Inlet Invert= 209.78', Outlet Invert= 208.75'

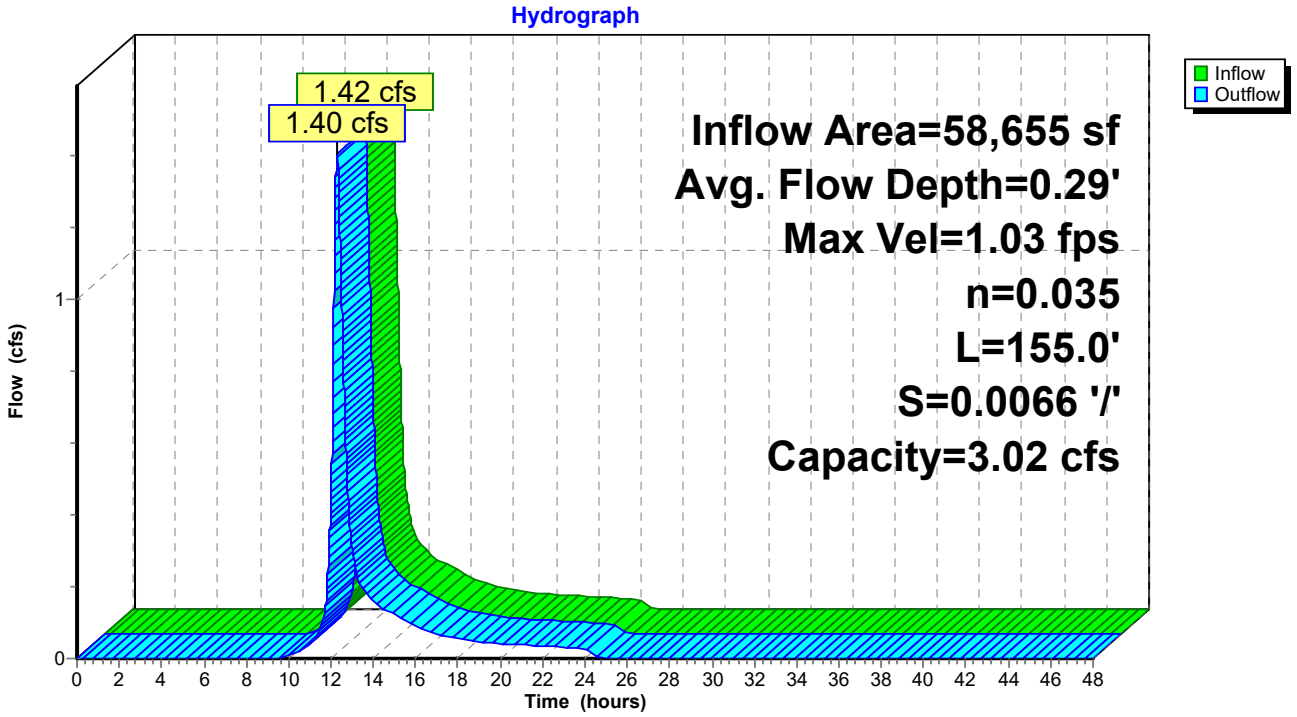


‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
-2.00	209.30	0.00
-0.50	208.90	0.40
0.50	208.90	0.40
9.10	209.30	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	1.0	0	0.00
0.40	2.4	11.2	375	3.02

Reach S-1: PROPERTY LINE SWALE



Summary for Reach S-2: WATER QUALITY SWALE

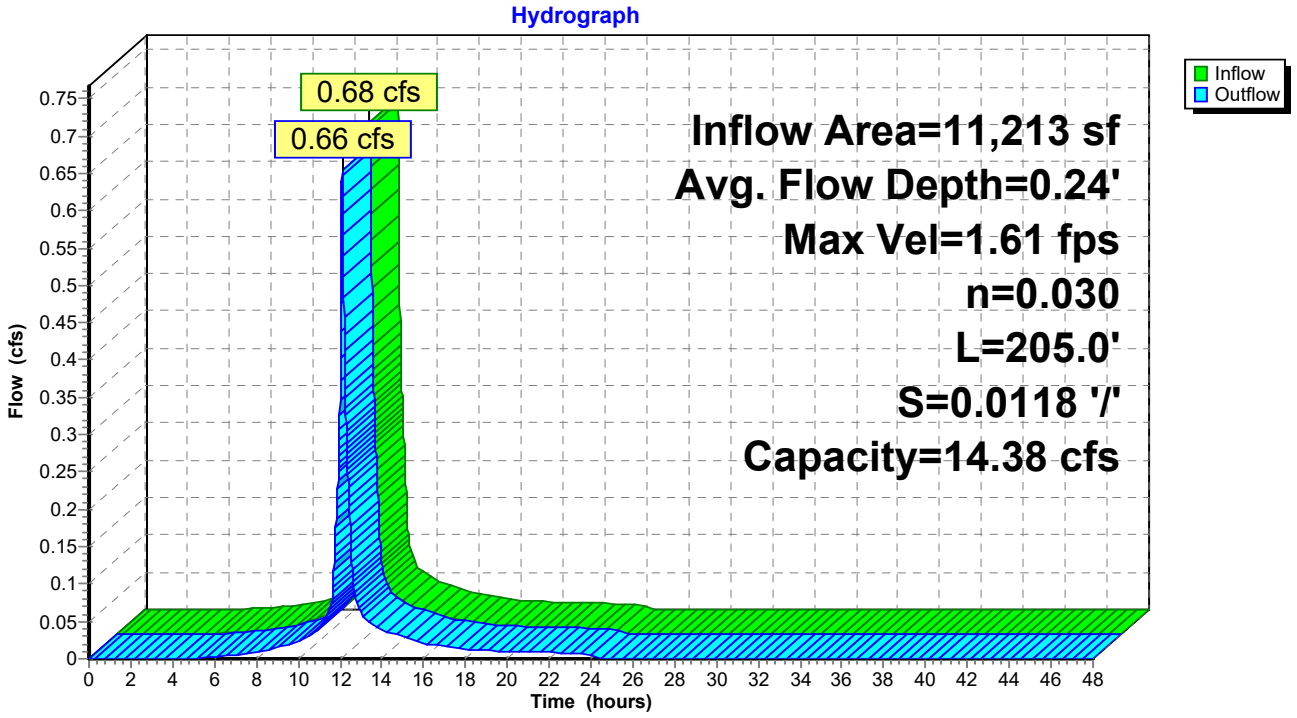
Inflow Area = 11,213 sf, 75.56% Impervious, Inflow Depth = 2.36" for 2-Year event
Inflow = 0.68 cfs @ 12.08 hrs, Volume= 2,205 cf
Outflow = 0.66 cfs @ 12.11 hrs, Volume= 2,205 cf, Atten= 4%, Lag= 1.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.61 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.49 fps, Avg. Travel Time= 7.0 min

Peak Storage= 84 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 14.38 cfs

1.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 7.00'
Length= 205.0' Slope= 0.0118 '/'
Inlet Invert= 209.00', Outlet Invert= 206.58'

Reach S-2: WATER QUALITY SWALE



Summary for Pond 1P: PARKING ISLAND

Inflow Area = 17,305 sf, 74.80% Impervious, Inflow Depth = 2.26" for 2-Year event
Inflow = 0.95 cfs @ 12.11 hrs, Volume= 3,264 cf
Outflow = 0.94 cfs @ 12.12 hrs, Volume= 2,960 cf, Atten= 0%, Lag= 0.6 min
Primary = 0.94 cfs @ 12.12 hrs, Volume= 2,960 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 209.77' @ 12.12 hrs Surf.Area= 645 sf Storage= 347 cf

Plug-Flow detention time= 72.7 min calculated for 2,960 cf (91% of inflow)
Center-of-Mass det. time= 26.6 min (823.5 - 796.9)

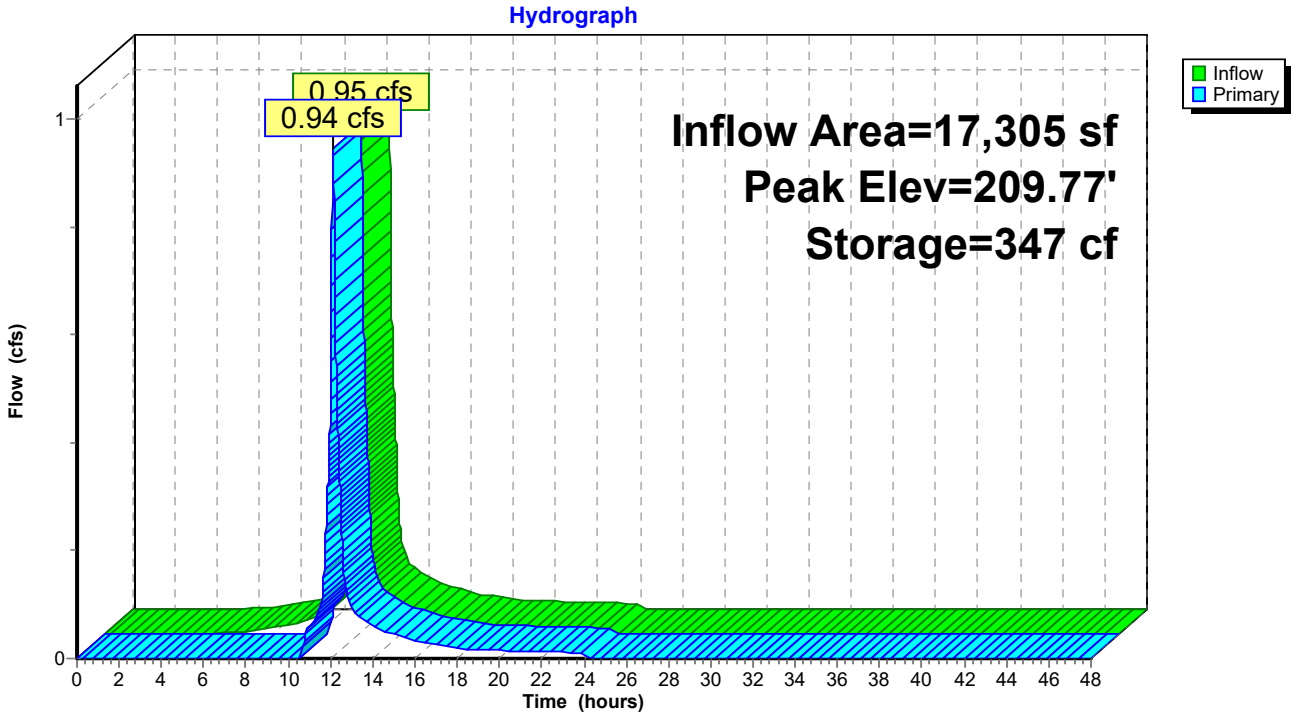
Volume	Invert	Avail.Storage	Storage Description
#1	209.00'	591 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
209.00	268	0	0
209.25	384	82	82
209.50	506	111	193
209.75	635	143	335
210.00	769	176	511
210.10	825	80	591

Device	Routing	Invert	Outlet Devices
#1	Primary	208.32'	**10.0" Round Culvert** L= 64.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.32' / 208.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Device 1	209.70'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.94 cfs @ 12.12 hrs HW=209.77' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.94 cfs of 2.09 cfs potential flow)
↑**2=Orifice/Grate** (Weir Controls 0.94 cfs @ 0.86 fps)

Pond 1P: PARKING ISLAND



Summary for Pond 2P: PARKING LOT RAIN GARDEN

Inflow Area = 27,044 sf, 76.83% Impervious, Inflow Depth = 2.36" for 2-Year event
Inflow = 1.53 cfs @ 12.11 hrs, Volume= 5,318 cf
Outflow = 1.50 cfs @ 12.13 hrs, Volume= 4,682 cf, Atten= 2%, Lag= 1.0 min
Primary = 1.50 cfs @ 12.13 hrs, Volume= 4,682 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 209.79' @ 12.13 hrs Surf.Area= 1,428 sf Storage= 765 cf

Plug-Flow detention time= 89.6 min calculated for 4,682 cf (88% of inflow)
Center-of-Mass det. time= 34.6 min (825.8 - 791.3)

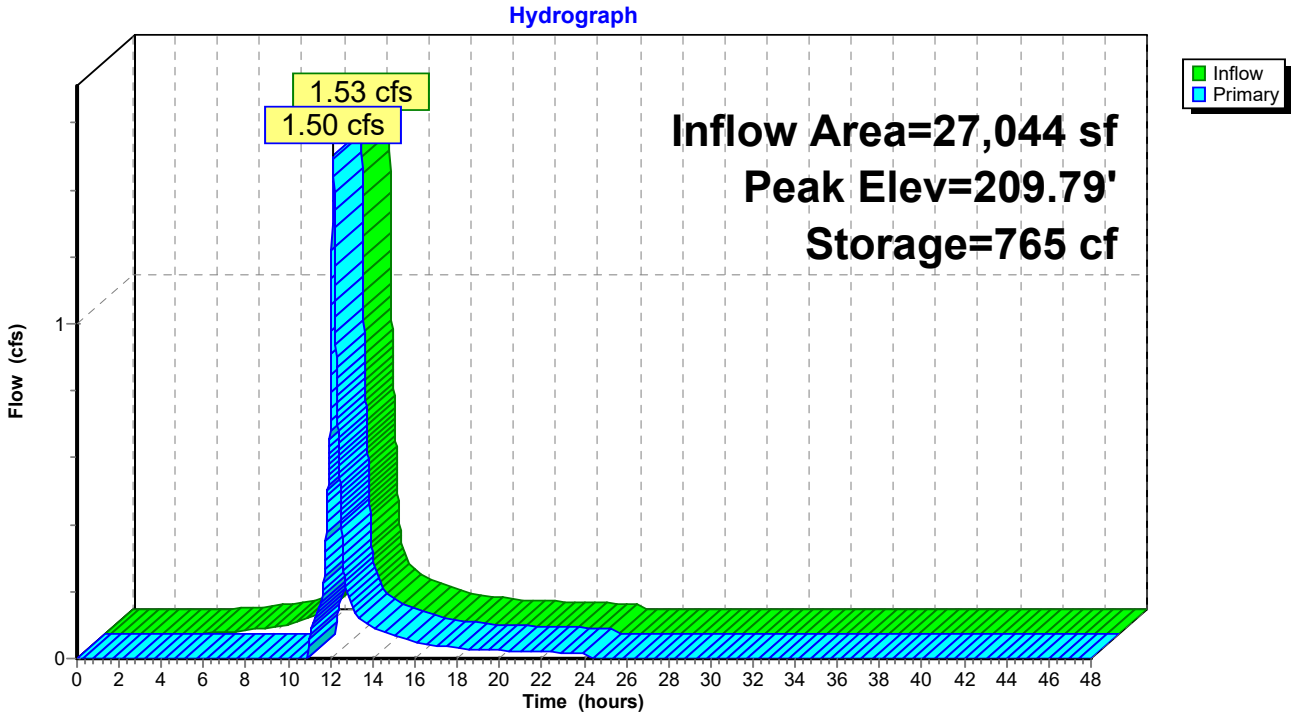
Volume	Invert	Avail.Storage	Storage Description
#1	209.00'	1,254 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
209.00	529	0	0
209.25	746	159	159
209.50	1,114	233	392
209.75	1,380	312	704
210.00	1,653	379	1,083
210.10	1,765	171	1,254

Device	Routing	Invert	Outlet Devices
#1	Primary	208.56'	**12.0" Round Culvert X 2.00** L= 52.8' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.56' / 208.30' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	209.70'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.50 cfs @ 12.13 hrs HW=209.79' TW=208.83' (Dynamic Tailwater)
↑**1=Culvert** (Passes 1.50 cfs of 5.45 cfs potential flow)
↑**2=Orifice/Grate** (Weir Controls 1.50 cfs @ 1.00 fps)

Pond 2P: PARKING LOT RAIN GARDEN



Summary for Pond 3P: WETLAND BASIN-1

Inflow Area = 115,261 sf, 22.41% Impervious, Inflow Depth = 1.34" for 2-Year event
Inflow = 3.40 cfs @ 12.15 hrs, Volume= 12,862 cf
Outflow = 1.76 cfs @ 12.42 hrs, Volume= 11,714 cf, Atten= 48%, Lag= 16.3 min
Primary = 1.76 cfs @ 12.42 hrs, Volume= 11,714 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 208.30' Surf.Area= 4,952 sf Storage= 1,230 cf
Peak Elev= 209.05' @ 12.42 hrs Surf.Area= 6,177 sf Storage= 5,119 cf (3,889 cf above start)

Plug-Flow detention time= 171.6 min calculated for 10,482 cf (82% of inflow)
Center-of-Mass det. time= 74.5 min (921.5 - 847.0)

Volume	Invert	Avail.Storage	Storage Description
#1	207.50'	6,191 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
#2A	208.10'	0 cf	**39.06'W x 73.72'L x 2.69'H Field A** 7,756 cf Overall - 3,995 cf Embedded = 3,761 cf x 0.0% Voids
#3A	208.35'	3,795 cf	**ACF R-Tank HD 1** x 899 Inside #2 Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf 899 Chambers in 29 Rows
#4	208.35'	123 cf	**15.0" Round Pipe Storage** L= 100.0'
#5	207.50'	8,004 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
		18,112 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
207.50	503	0	0
208.00	756	315	315
208.50	1,031	447	762
209.00	1,332	591	1,352
209.50	1,812	786	2,138
210.00	2,398	1,053	3,191
210.50	2,997	1,349	4,540
210.75	3,302	787	5,327
211.00	3,610	864	6,191

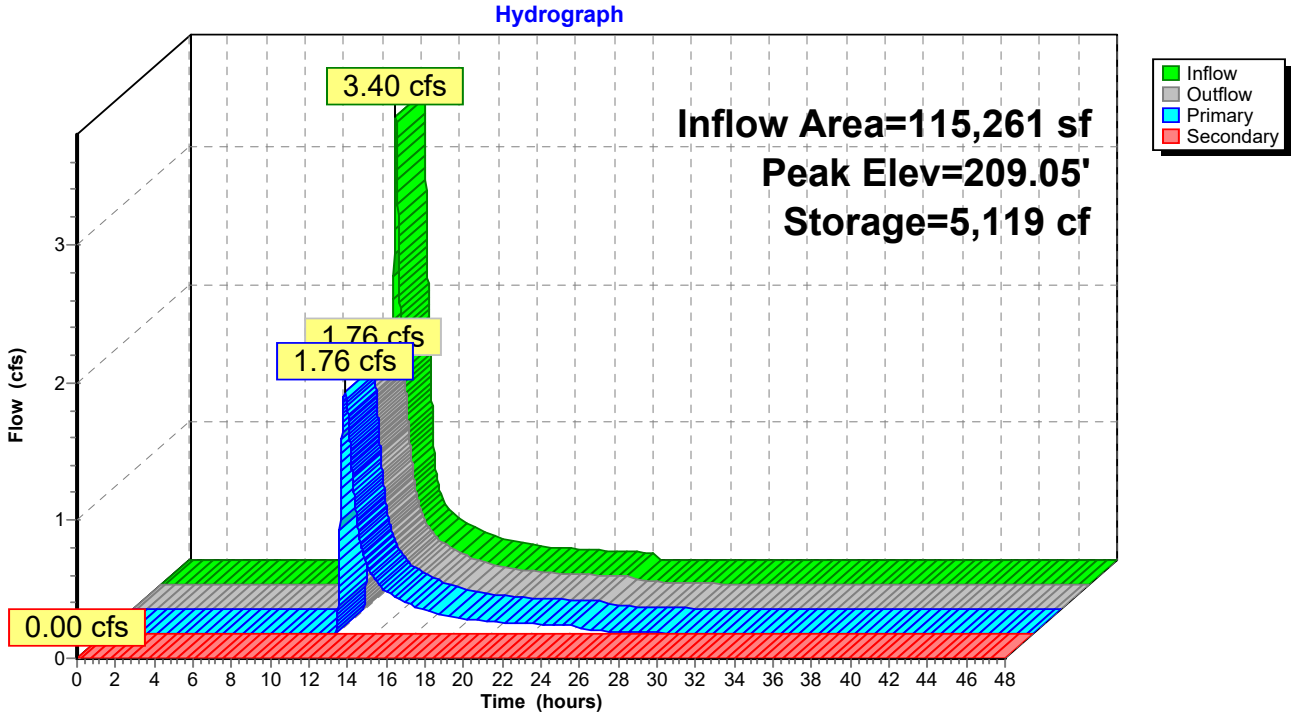
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
207.50	515	0	0
208.00	905	355	355
208.50	1,316	555	910
209.00	1,741	764	1,675
210.00	2,633	2,187	3,862
210.50	3,101	1,434	5,295
210.75	6,067	1,146	6,441
211.00	6,433	1,563	8,004

Device	Routing	Invert	Outlet Devices
#1	Secondary	209.75'	**10.0' long x 9.5' breadth Broad-Crested Rectangular Weir X 2.00** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 Coef. (English) 2.48 2.55 2.70 2.69 2.68 2.69 2.67 2.64 2.64 2.64 2.64 2.64 2.64 2.65 2.65 2.66
#2	Primary	208.55'	**12.0" Round Culvert X 2.00** L= 110.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.55' / 208.00' S= 0.0050 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#3	Device 2	208.38'	**12.0" W x 3.0" H Vert. WQV Orifice X 4.00** C= 0.600
#4	Device 2	209.05'	**12.0" W x 3.0" H Vert. 2-YR Orifice X 4.00** C= 0.600
#5	Device 2	209.43'	**12.0" W x 3.0" H Vert. 10-YR Orifice X 4.00** C= 0.600
#6	Device 2	209.64'	**48.0" x 48.0" Horiz. 25-YR Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.76 cfs @ 12.42 hrs HW=209.05' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Barrel Controls 1.76 cfs @ 3.24 fps)
  └─**3=WQV Orifice** (Passes < 3.37 cfs potential flow)
  └─**4=2-YR Orifice** (Passes < 0.00 cfs potential flow)
  └─**5=10-YR Orifice** (Controls 0.00 cfs)
  └─**6=25-YR Orifice** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=208.30' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: WETLAND BASIN-1

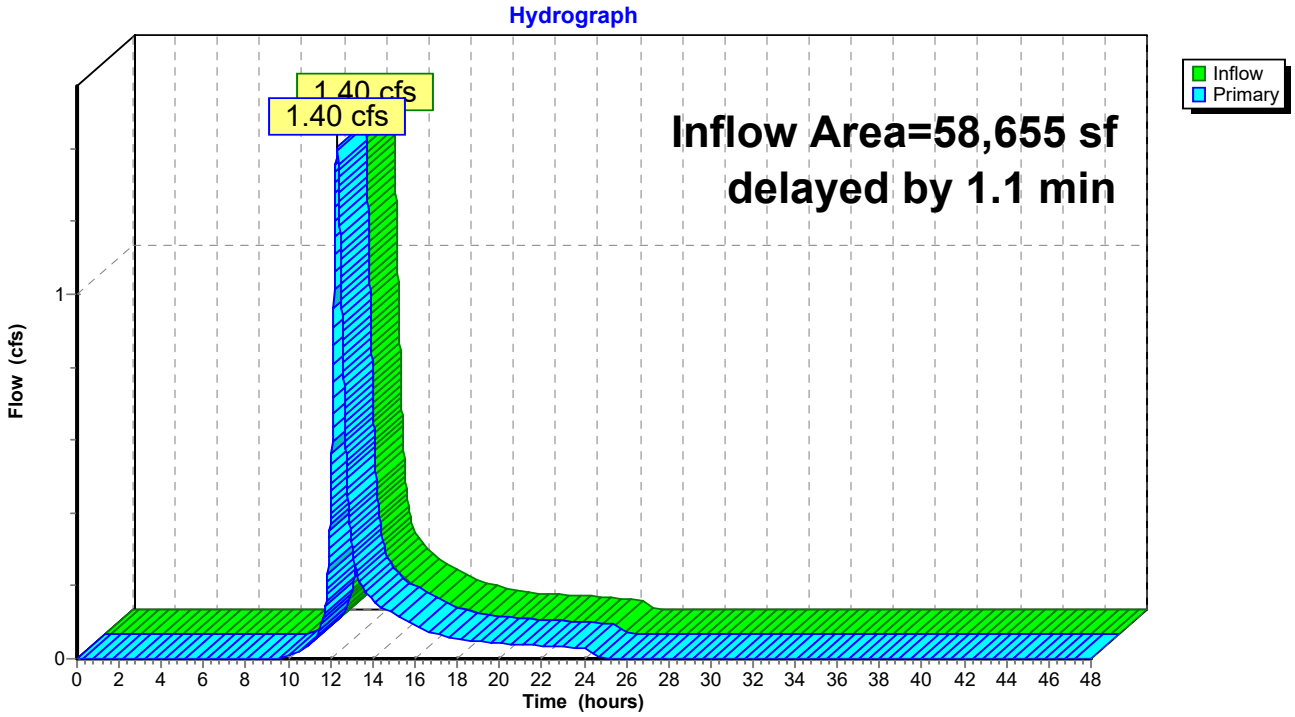


Summary for Link L-1: C-1 FLOWS THRU SOUTH FARM DITCH

Inflow Area = 58,655 sf, 10.65% Impervious, Inflow Depth = 1.33" for 2-Year event
Inflow = 1.40 cfs @ 12.29 hrs, Volume= 6,490 cf
Primary = 1.40 cfs @ 12.31 hrs, Volume= 6,490 cf, Atten= 0%, Lag= 1.1 min

Primary outflow = Inflow delayed by 1.1 min, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link L-1: C-1 FLOWS THRU SOUTH FARM DITCH

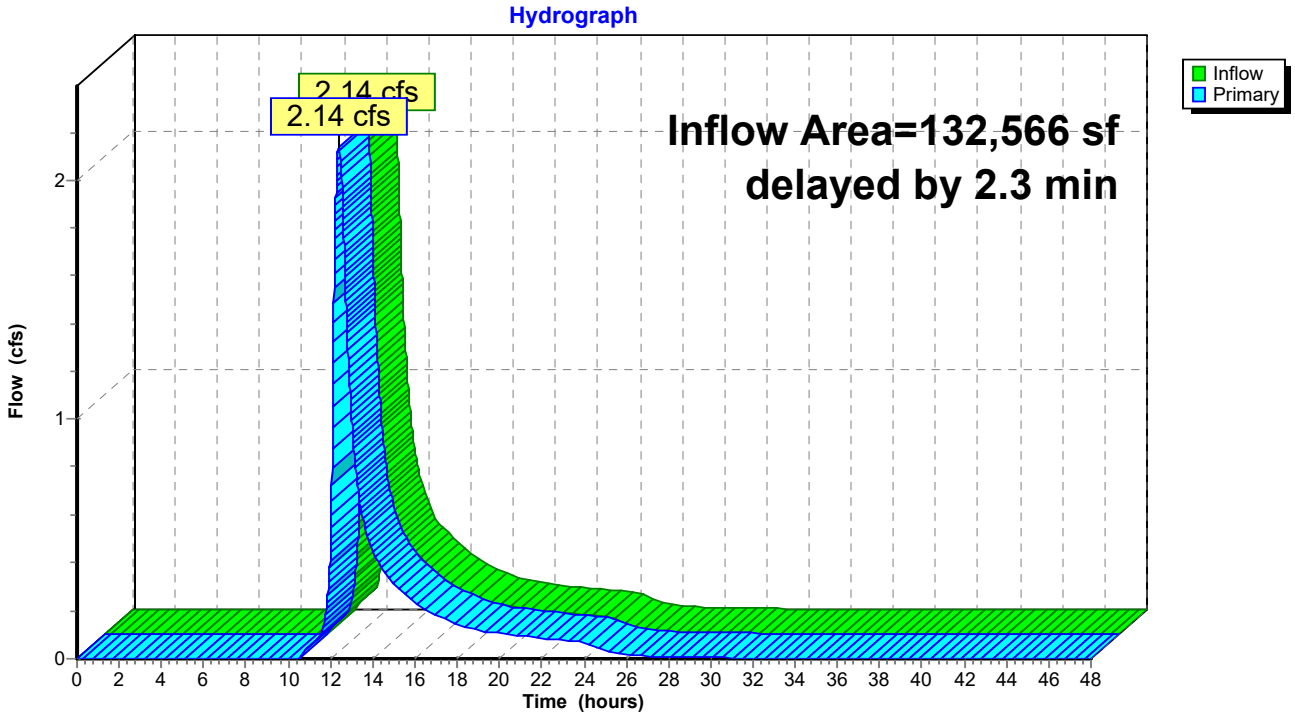


Summary for Link L-2: WB-1 FLOWS THRU SOUTH FARM DITCH

Inflow Area = 132,566 sf, 29.25% Impervious, Inflow Depth > 1.33" for 2-Year event
Inflow = 2.14 cfs @ 12.36 hrs, Volume= 14,674 cf
Primary = 2.14 cfs @ 12.40 hrs, Volume= 14,674 cf, Atten= 0%, Lag= 2.3 min

Primary outflow = Inflow delayed by 2.3 min, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link L-2: WB-1 FLOWS THRU SOUTH FARM DITCH



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P-1: SMALL FIELD Runoff Area=44,152 sf 0.99% Impervious Runoff Depth=2.26"
Flow Length=483' Tc=14.1 min CN=76 Runoff=2.07 cfs 8,309 cf

Subcatchment P-2: SOUTH PARKING Runoff Area=6,480 sf 28.63% Impervious Runoff Depth=3.06"
Flow Length=36' Slope=0.0800 '/' Tc=6.0 min CN=85 Runoff=0.53 cfs 1,650 cf

Subcatchment P-3E: PARKING LOT & Runoff Area=17,305 sf 74.80% Impervious Runoff Depth=3.86"
Tc=8.3 min CN=93 Runoff=1.57 cfs 5,573 cf

Subcatchment P-3W: PARKING LOT & Runoff Area=27,044 sf 76.83% Impervious Runoff Depth=3.97"
Flow Length=219' Tc=8.3 min CN=94 Runoff=2.50 cfs 8,953 cf

Subcatchment P-4: BANDSHELL AREA Runoff Area=5,817 sf 8.60% Impervious Runoff Depth=2.78"
Flow Length=209' Tc=9.6 min CN=82 Runoff=0.38 cfs 1,346 cf

Subcatchment P-5: PLAYGROUND AREA Runoff Area=52,838 sf 10.88% Impervious Runoff Depth=2.69"
Flow Length=212' Tc=18.5 min CN=81 Runoff=2.66 cfs 11,831 cf

Subcatchment P-6: RUN-ON FROM Runoff Area=31,494 sf 14.32% Impervious Runoff Depth=2.87"
Flow Length=404' Tc=13.7 min CN=83 Runoff=1.90 cfs 7,528 cf

Subcatchment P-7: ENTRANCE DRIVEWAY Runoff Area=11,213 sf 75.56% Impervious Runoff Depth=3.97"
Flow Length=75' Tc=6.0 min CN=94 Runoff=1.12 cfs 3,712 cf

Subcatchment P-8: LARGE FIELD Runoff Area=37,585 sf 7.36% Impervious Runoff Depth=2.43"
Flow Length=174' Tc=12.1 min CN=78 Runoff=2.01 cfs 7,597 cf

Subcatchment P-9: UNDEVELOPED SOUTH Runoff Area=31,973 sf 1.32% Impervious Runoff Depth=2.43"
Flow Length=730' Tc=11.8 min CN=78 Runoff=1.72 cfs 6,463 cf

Reach C-1: DRIVEWAY CULVERT Avg. Flow Depth=0.58' Max Vel=5.16 fps Inflow=2.90 cfs 13,177 cf
15.0" Round Pipe n=0.013 L=73.3' S=0.0102 '/' Capacity=6.53 cfs Outflow=2.90 cfs 13,177 cf

Reach DP-10: EX. CULVERT IN SOUTHEAST CORNER OF SITE Inflow=11.69 cfs 60,873 cf
Outflow=11.69 cfs 60,873 cf

Reach S-1: PROPERTY LINE SWALE Avg. Flow Depth=0.39' Max Vel=1.24 fps Inflow=2.93 cfs 13,177 cf
n=0.035 L=155.0' S=0.0066 '/' Capacity=3.02 cfs Outflow=2.90 cfs 13,177 cf

Reach S-2: WATER QUALITY SWALE Avg. Flow Depth=0.31' Max Vel=1.84 fps Inflow=1.12 cfs 3,712 cf
n=0.030 L=205.0' S=0.0118 '/' Capacity=14.38 cfs Outflow=1.08 cfs 3,712 cf

Pond 1P: PARKING ISLAND Peak Elev=209.80' Storage=365 cf Inflow=1.57 cfs 5,573 cf
Outflow=1.57 cfs 5,269 cf

Pond 2P: PARKING LOT RAIN GARDEN Peak Elev=209.83' Storage=818 cf Inflow=2.50 cfs 8,953 cf
Outflow=2.47 cfs 8,317 cf

Pond 3P: WETLAND BASIN-1 Peak Elev=209.43' Storage=7,482 cf Inflow=6.73 cfs 25,873 cf
Primary=4.36 cfs 24,725 cf Secondary=0.00 cfs 0 cf Outflow=4.36 cfs 24,725 cf

Link L-1: C-1 FLOWS THRU SOUTH FARM DITCH delayed by 1.1 min Inflow=2.90 cfs 13,177 cf
Primary=2.90 cfs 13,177 cf

Link L-2: WB-1 FLOWS THRU SOUTH FARM DITCH delayed by 2.3 min Inflow=5.15 cfs 29,994 cf
Primary=5.15 cfs 29,993 cf

Total Runoff Area = 265,901 sf Runoff Volume = 62,962 cf Average Runoff Depth = 2.84"
78.03% Pervious = 207,472 sf 21.97% Impervious = 58,429 sf

Summary for Subcatchment P-1: SMALL FIELD

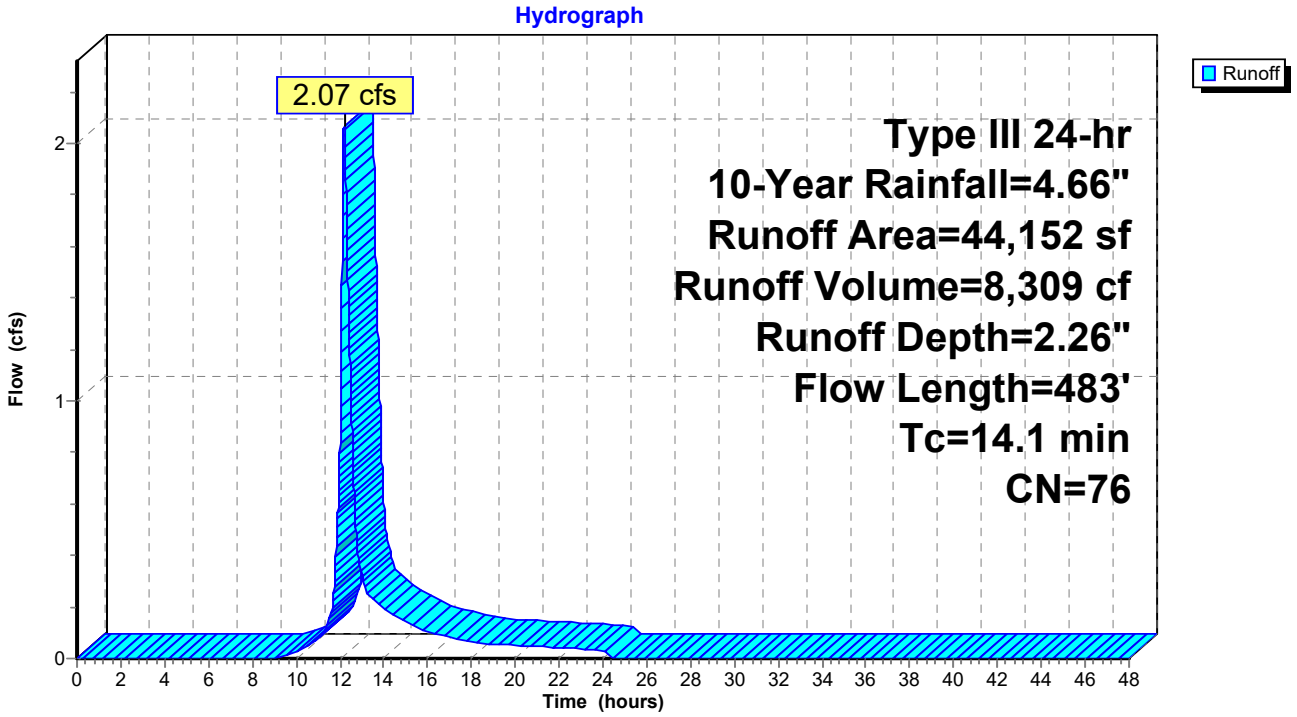
Runoff = 2.07 cfs @ 12.20 hrs, Volume= 8,309 cf, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.66"

	Area (sf)	CN	Description
	435	98	Paved parking, HSG D
	12,217	80	>75% Grass cover, Good, HSG D
*	31,500	74	Soccer Field, Good, HSG C
	44,152	76	Weighted Average
	43,717		99.01% Pervious Area
	435		0.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER SOCCER FIELD** Grass: Dense n= 0.240 P2= 3.01"
0.9	90	0.0100	1.61		**Shallow Concentrated Flow, OVER SOCCER FIELD** Unpaved Kv= 16.1 fps
0.1	17	0.0500	3.60		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.9	326	0.0050	2.84	1.55	**Pipe Channel, SOUTH COLLECTOR** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
14.1	483	Total			

Subcatchment P-1: SMALL FIELD



Summary for Subcatchment P-2: SOUTH PARKING STALLS

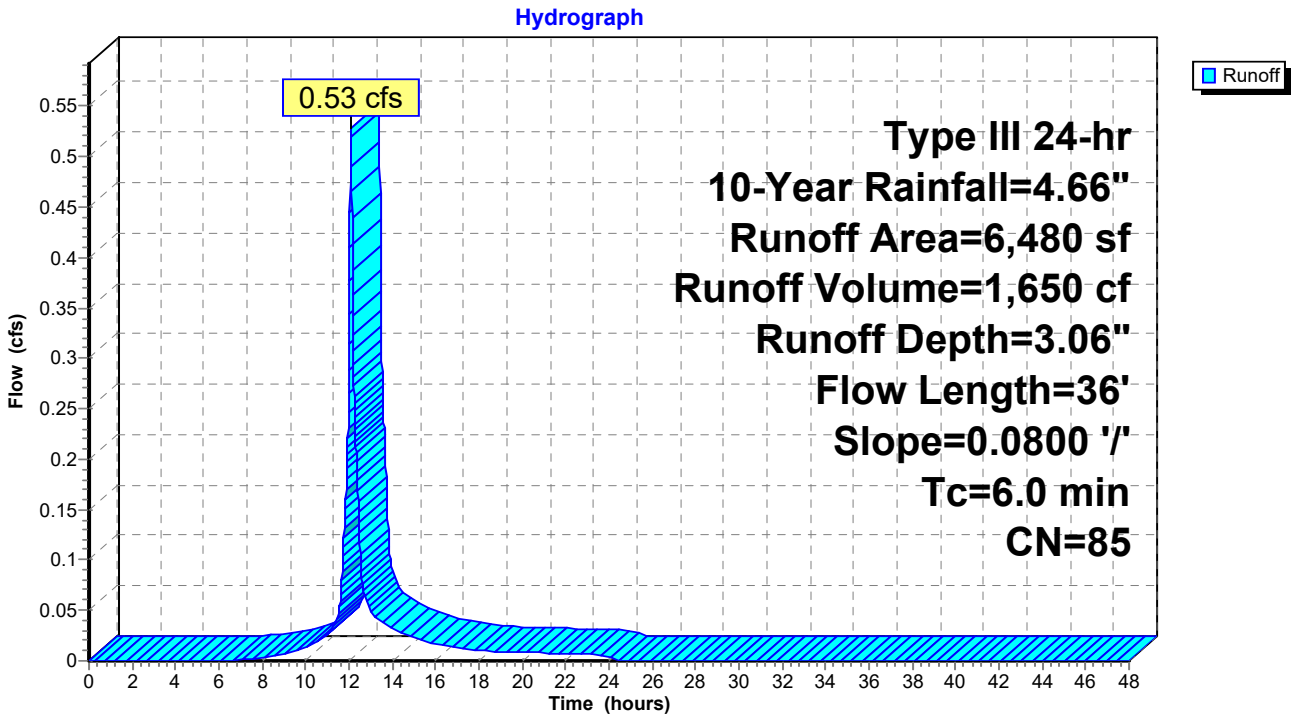
Runoff = 0.53 cfs @ 12.09 hrs, Volume= 1,650 cf, Depth= 3.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.66"

Area (sf)	CN	Description
1,855	98	Paved parking, HSG D
4,625	80	>75% Grass cover, Good, HSG D
6,480	85	Weighted Average
4,625		71.37% Pervious Area
1,855		28.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	36	0.0800	0.16		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
3.7	36	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-2: SOUTH PARKING STALLS



Summary for Subcatchment P-3E: PARKING LOT & CONCESSION AREA

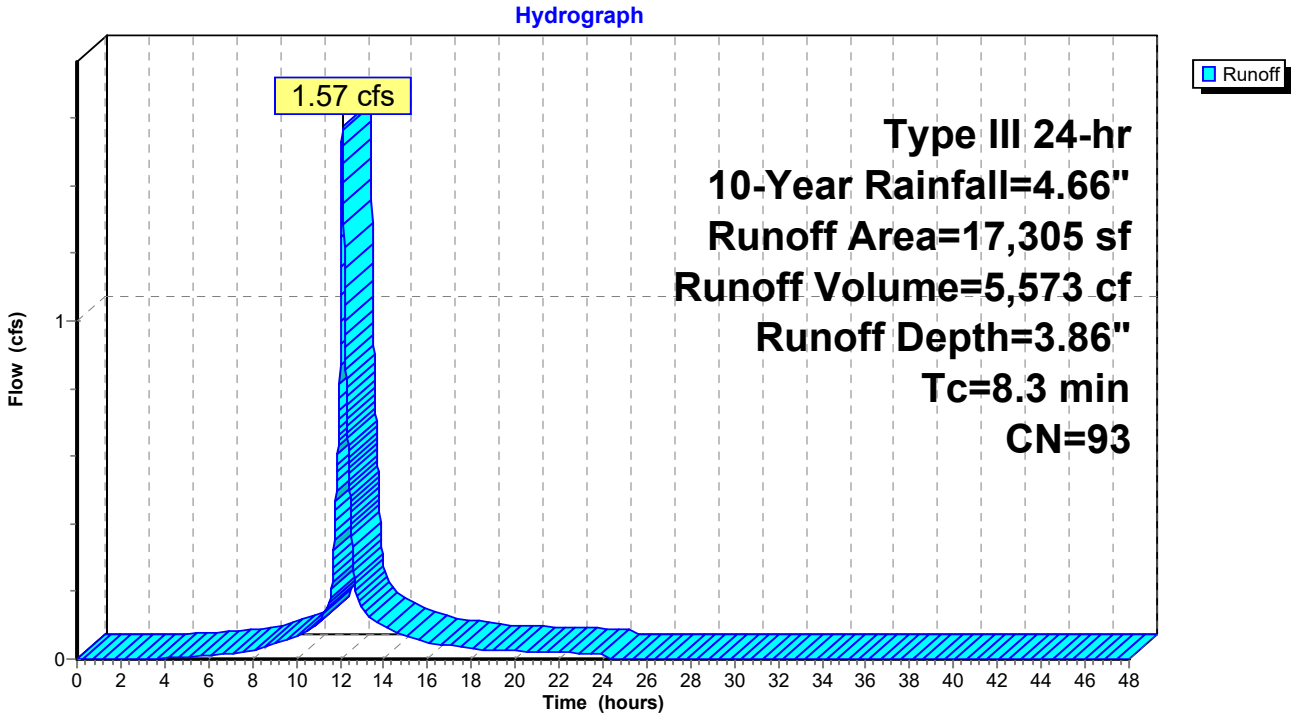
Runoff = 1.57 cfs @ 12.11 hrs, Volume= 5,573 cf, Depth= 3.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.66"

Area (sf)	CN	Description
1,125	98	Roofs, HSG D
11,820	98	Paved parking, HSG D
4,360	80	>75% Grass cover, Good, HSG D
17,305	93	Weighted Average
4,360		25.20% Pervious Area
12,945		74.80% Impervious Area

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

Subcatchment P-3E: PARKING LOT & CONCESSION AREA



Summary for Subcatchment P-3W: PARKING LOT & BASKETBALL COURT

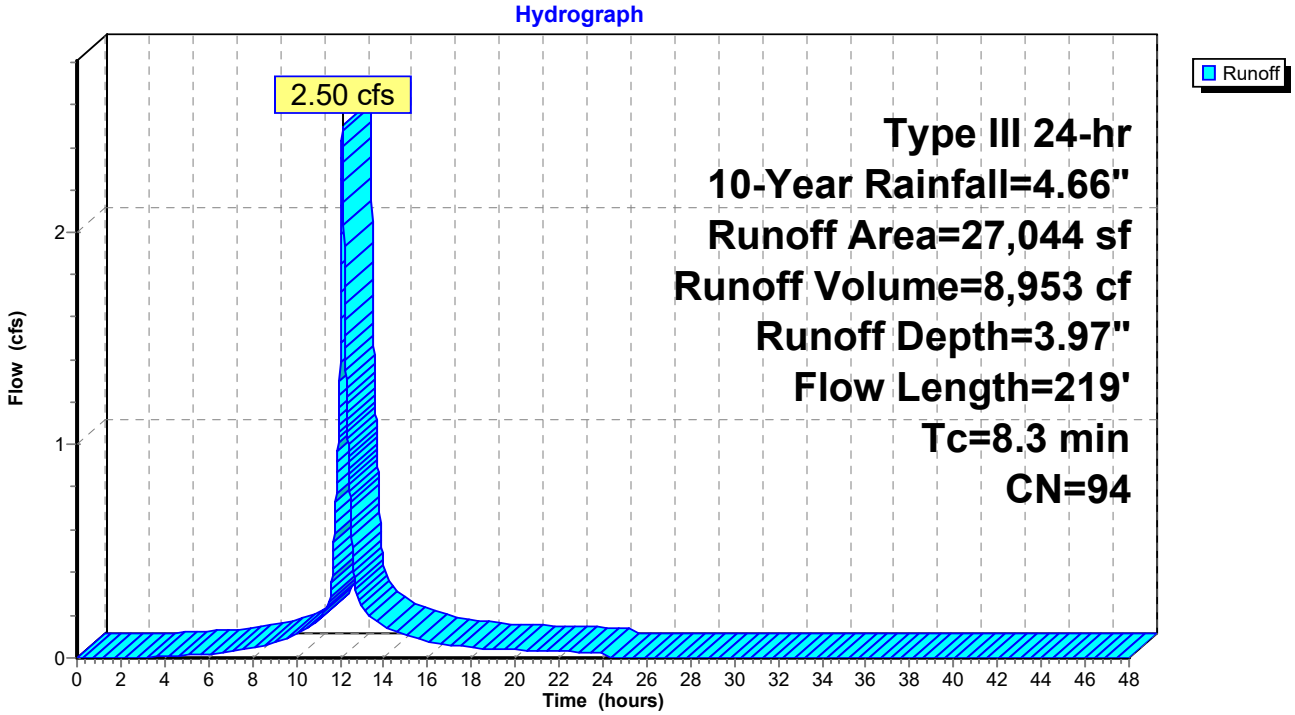
Runoff = 2.50 cfs @ 12.11 hrs, Volume= 8,953 cf, Depth= 3.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.66"

Area (sf)	CN	Description
20,777	98	Paved parking, HSG D
6,267	80	>75% Grass cover, Good, HSG D
27,044	94	Weighted Average
6,267		23.17% Pervious Area
20,777		76.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	47	0.0280	0.11		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
0.8	103	0.0165	2.07		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
0.5	69	0.0125	2.27		**Shallow Concentrated Flow, OVER PVMT** Paved Kv= 20.3 fps
8.3	219	Total			

Subcatchment P-3W: PARKING LOT & BASKETBALL COURT



Summary for Subcatchment P-4: BANDSHELL AREA

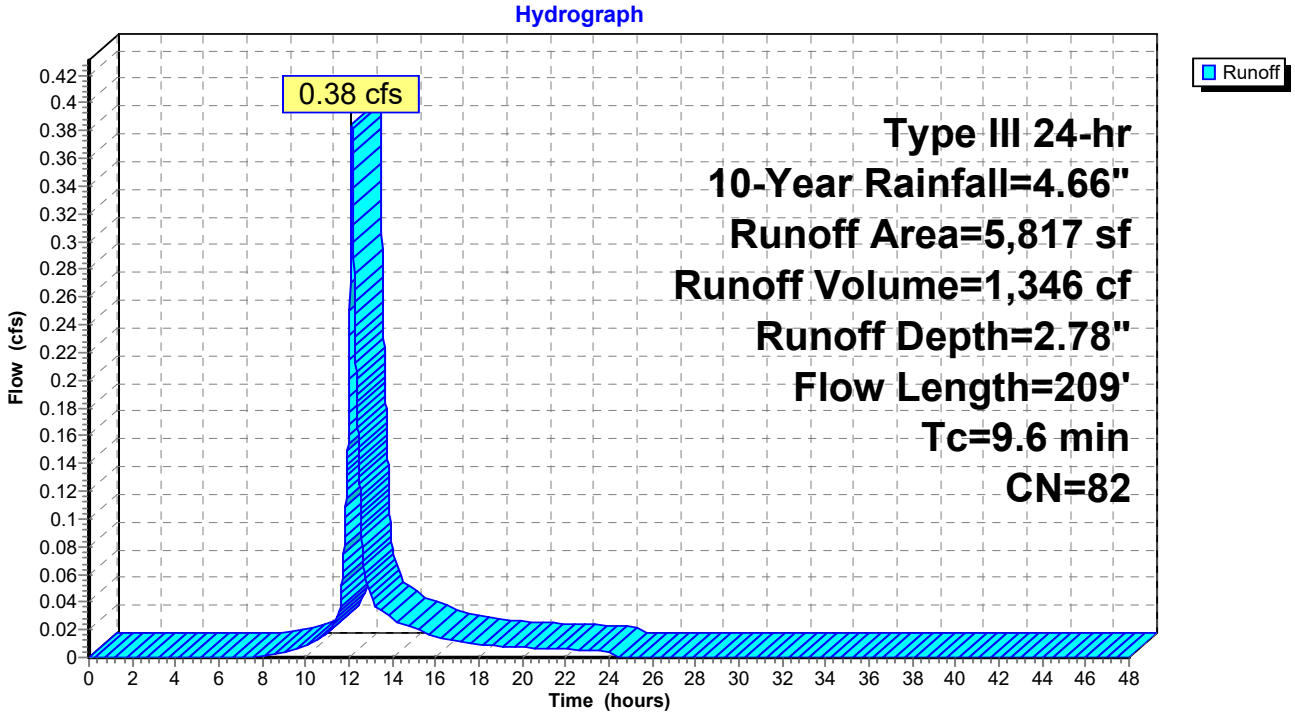
Runoff = 0.38 cfs @ 12.13 hrs, Volume= 1,346 cf, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.66"

Area (sf)	CN	Description
500	98	Paved parking, HSG D
5,317	80	>75% Grass cover, Good, HSG D
5,817	82	Weighted Average
5,317		91.40% Pervious Area
500		8.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0200	0.10		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
0.1	19	0.0380	3.14		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.0	140	0.0050	2.45	0.85	**Pipe Channel, BANDSHELL COLLECTOR** 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.013 Corrugated PE, smooth interior
9.6	209	Total			

Subcatchment P-4: BANDSHELL AREA



Summary for Subcatchment P-5: PLAYGROUND AREA

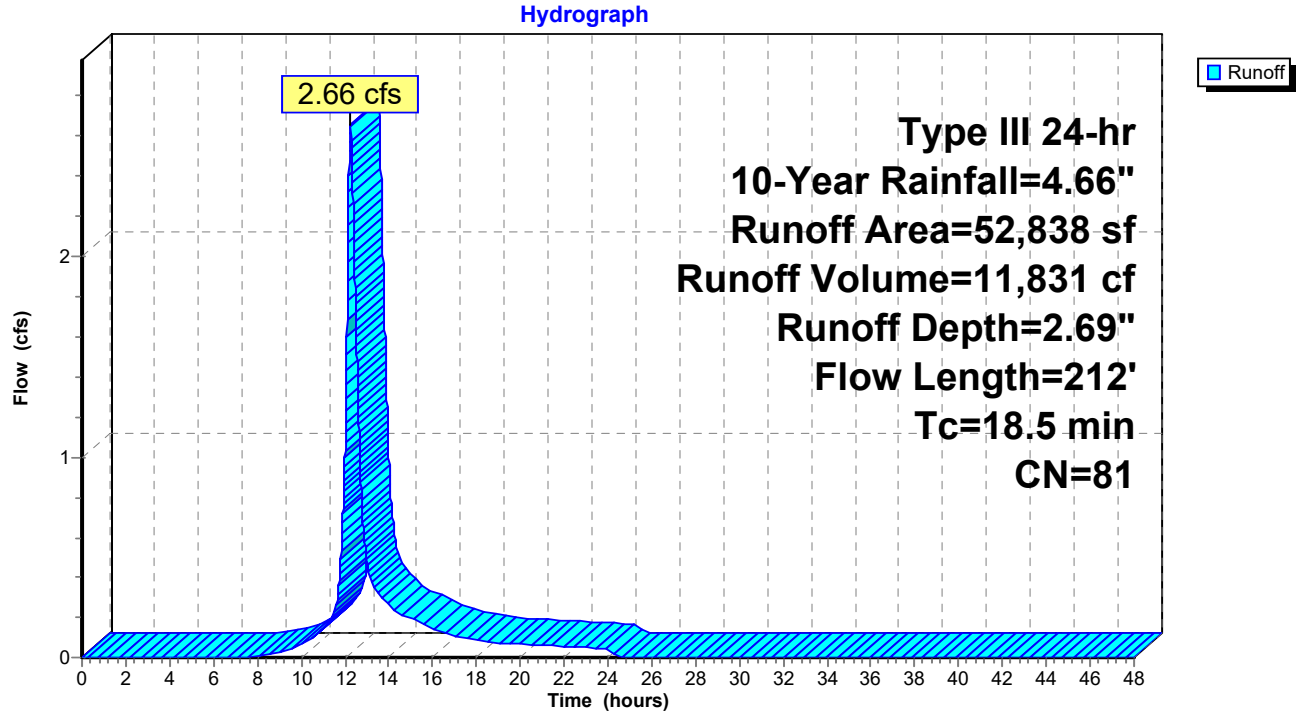
Runoff = 2.66 cfs @ 12.25 hrs, Volume= 11,831 cf, Depth= 2.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.66"

Area (sf)	CN	Description
2,417	98	Roofs, HSG D
3,330	98	Paved parking, HSG D
29,631	80	>75% Grass cover, Good, HSG D
17,460	77	Woods, Good, HSG D
52,838	81	Weighted Average
47,091		89.12% Pervious Area
5,747		10.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	50	0.0100	0.05		**Sheet Flow, THRU WOODS** Woods: Light underbrush n= 0.400 P2= 3.01"
0.4	42	0.0100	1.61		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.3	120	0.0050	1.54	0.13	**Pipe Channel, THRU FRENCH DRAIN** 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.013 Corrugated PE, smooth interior
18.5	212	Total			

Subcatchment P-5: PLAYGROUND AREA



Summary for Subcatchment P-6: RUN-ON FROM ABUTTER NORTH OF DRIVEWAY

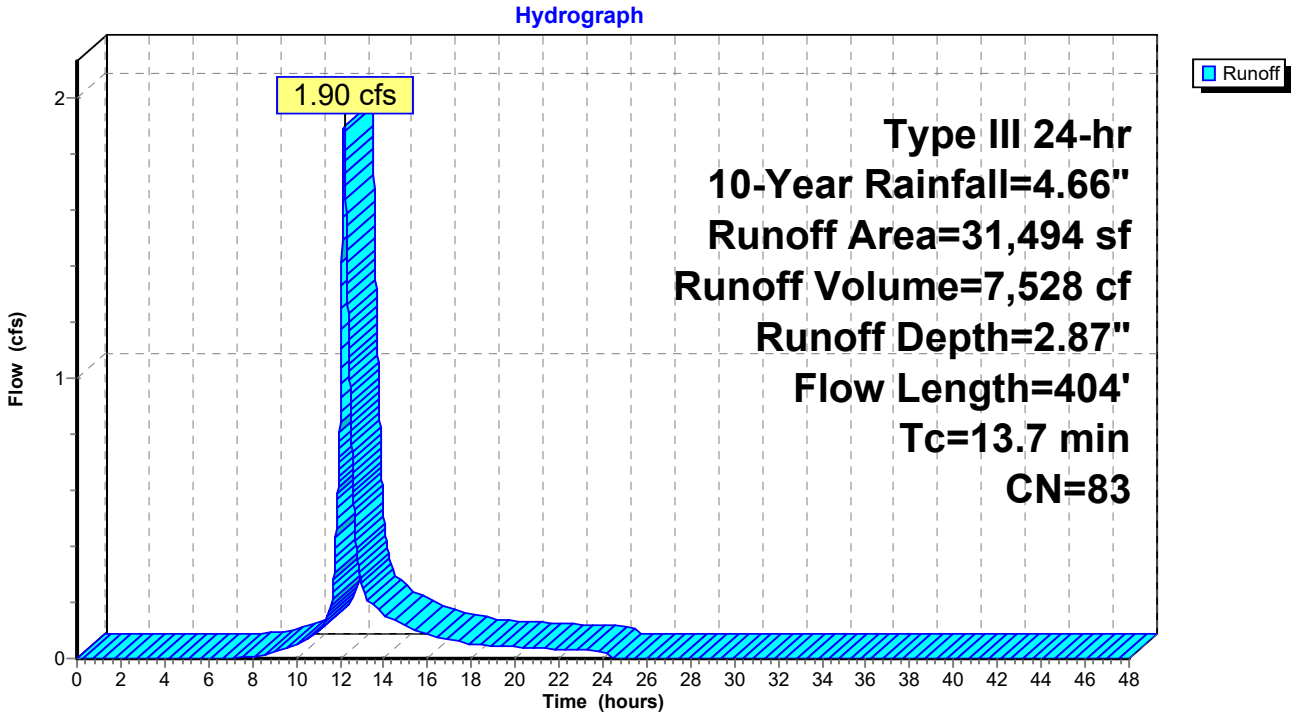
Runoff = 1.90 cfs @ 12.19 hrs, Volume= 7,528 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.66"

Area (sf)	CN	Description
2,626	98	Roofs, HSG D
1,883	98	Paved parking, HSG D
23,946	80	>75% Grass cover, Good, HSG D
2,348	91	Gravel roads, HSG D
691	77	Woods, Good, HSG D
31,494	83	Weighted Average
26,985		85.68% Pervious Area
4,509		14.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
1.1	110	0.0100	1.61		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.4	244	0.0050	2.84	1.55	**Pipe Channel,** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
13.7	404	Total			

Subcatchment P-6: RUN-ON FROM ABUTTER NORTH OF DRIVEWAY



Summary for Subcatchment P-7: ENTRANCE DRIVEWAY

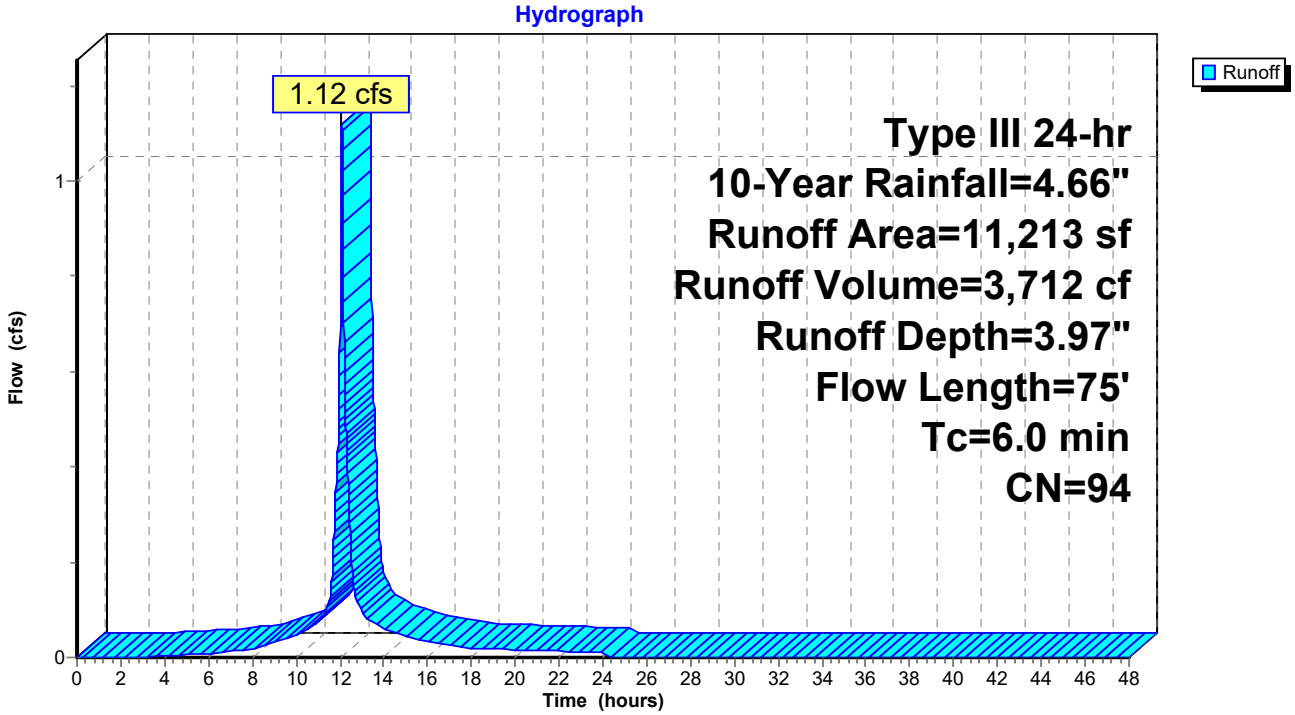
Runoff = 1.12 cfs @ 12.08 hrs, Volume= 3,712 cf, Depth= 3.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.66"

Area (sf)	CN	Description
8,472	98	Paved parking, HSG D
2,741	80	>75% Grass cover, Good, HSG D
11,213	94	Weighted Average
2,741		24.44% Pervious Area
8,472		75.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	44	0.0275	1.29		**Sheet Flow, OVER PVMT** Smooth surfaces n= 0.011 P2= 3.01"
0.1	22	0.0150	2.49		**Shallow Concentrated Flow, OVER PVMT** Paved Kv= 20.3 fps
0.0	9	0.0200	6.42	3.21	**Trap/Vee/Rect Channel Flow, THRU SW CHASE** Bot.W=1.00' D=0.50' n= 0.013 Concrete, trowel finish
0.7	75	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-7: ENTRANCE DRIVEWAY



Summary for Subcatchment P-8: LARGE FIELD SOUTHEAST

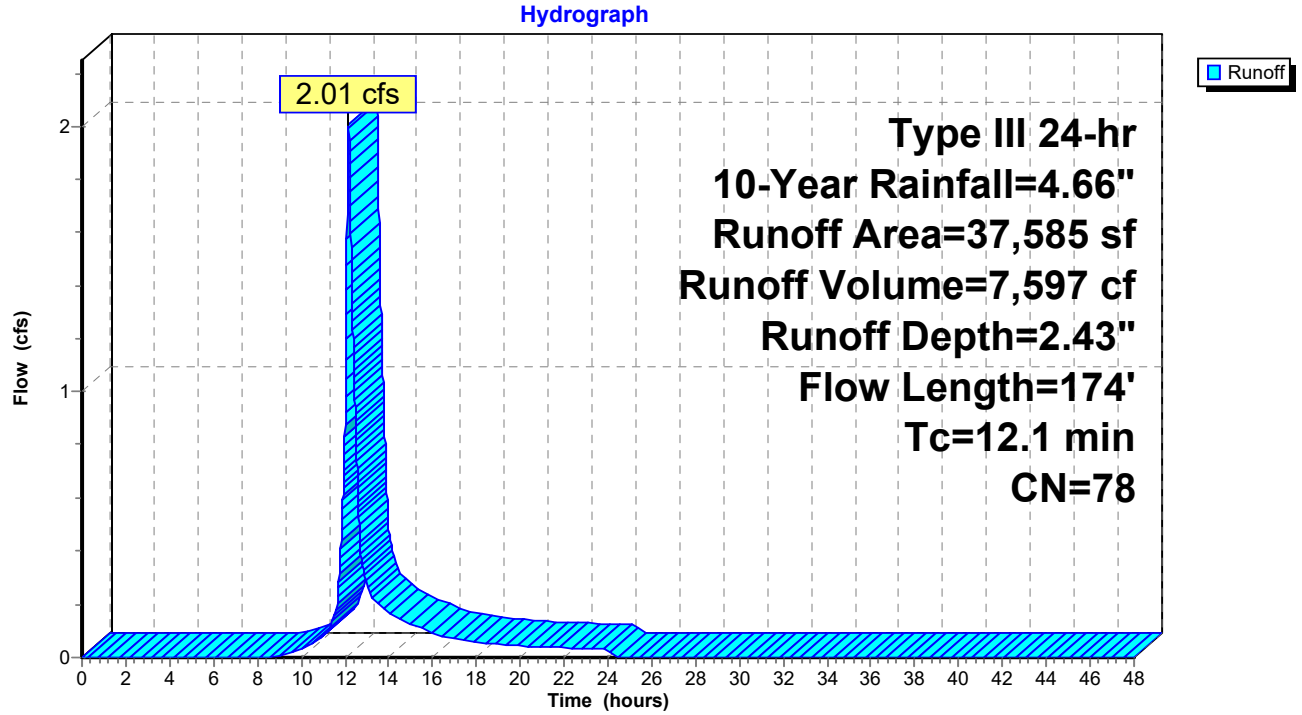
Runoff = 2.01 cfs @ 12.17 hrs, Volume= 7,597 cf, Depth= 2.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.66"

	Area (sf)	CN	Description
	1,500	98	Roofs, HSG D
	1,267	98	Paved parking, HSG D
	15,907	80	>75% Grass cover, Good, HSG D
	11	91	Gravel roads, HSG D
*	18,900	74	Soccer Field, Good, HSG C
	37,585	78	Weighted Average
	34,818		92.64% Pervious Area
	2,767		7.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER SOCCER FIELD** Grass: Dense n= 0.240 P2= 3.01"
0.6	55	0.0100	1.61		**Shallow Concentrated Flow, OVER SOCCER FIELD** Unpaved Kv= 16.1 fps
0.3	69	0.0650	4.10		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
12.1	174	Total			

Subcatchment P-8: LARGE FIELD SOUTHEAST



Summary for Subcatchment P-9: UNDEVELOPED SOUTH SIDE OF PROPERTY

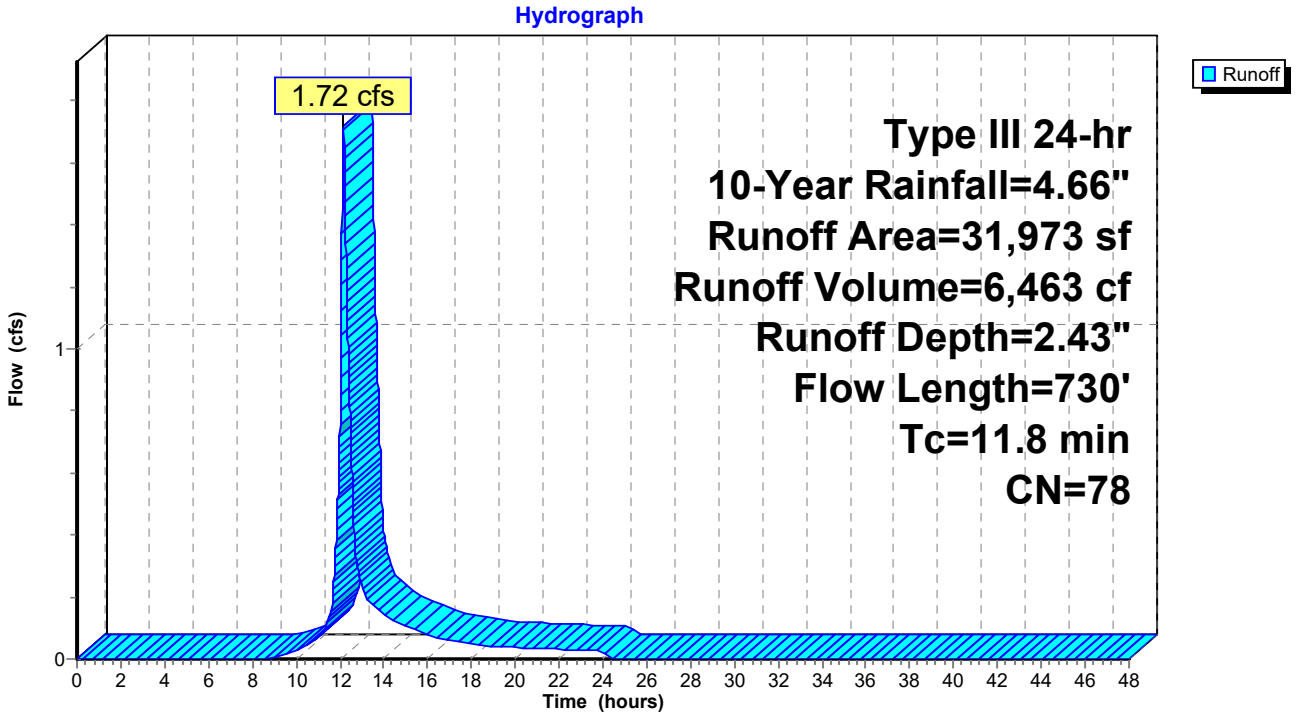
Runoff = 1.72 cfs @ 12.16 hrs, Volume= 6,463 cf, Depth= 2.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.66"

Area (sf)	CN	Description
422	98	Paved parking, HSG D
6,731	80	>75% Grass cover, Good, HSG D
24,820	77	Woods, Good, HSG D
31,973	78	Weighted Average
31,551		98.68% Pervious Area
422		1.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0200	0.10		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
0.1	38	0.0700	4.26		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
3.2	642	0.0100	3.35	22.14	**Channel Flow, OVER FARM DITCH** Area= 6.6 sf Perim= 9.4' r= 0.70' n= 0.035 Earth, dense weeds
11.8	730	Total			

Subcatchment P-9: UNDEVELOPED SOUTH SIDE OF PROPERTY



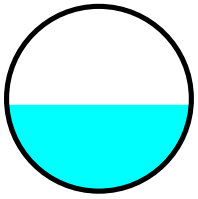
Summary for Reach C-1: DRIVEWAY CULVERT

Inflow Area = 58,655 sf, 10.65% Impervious, Inflow Depth = 2.70" for 10-Year event
Inflow = 2.90 cfs @ 12.27 hrs, Volume= 13,177 cf
Outflow = 2.90 cfs @ 12.27 hrs, Volume= 13,177 cf, Atten= 0%, Lag= 0.2 min

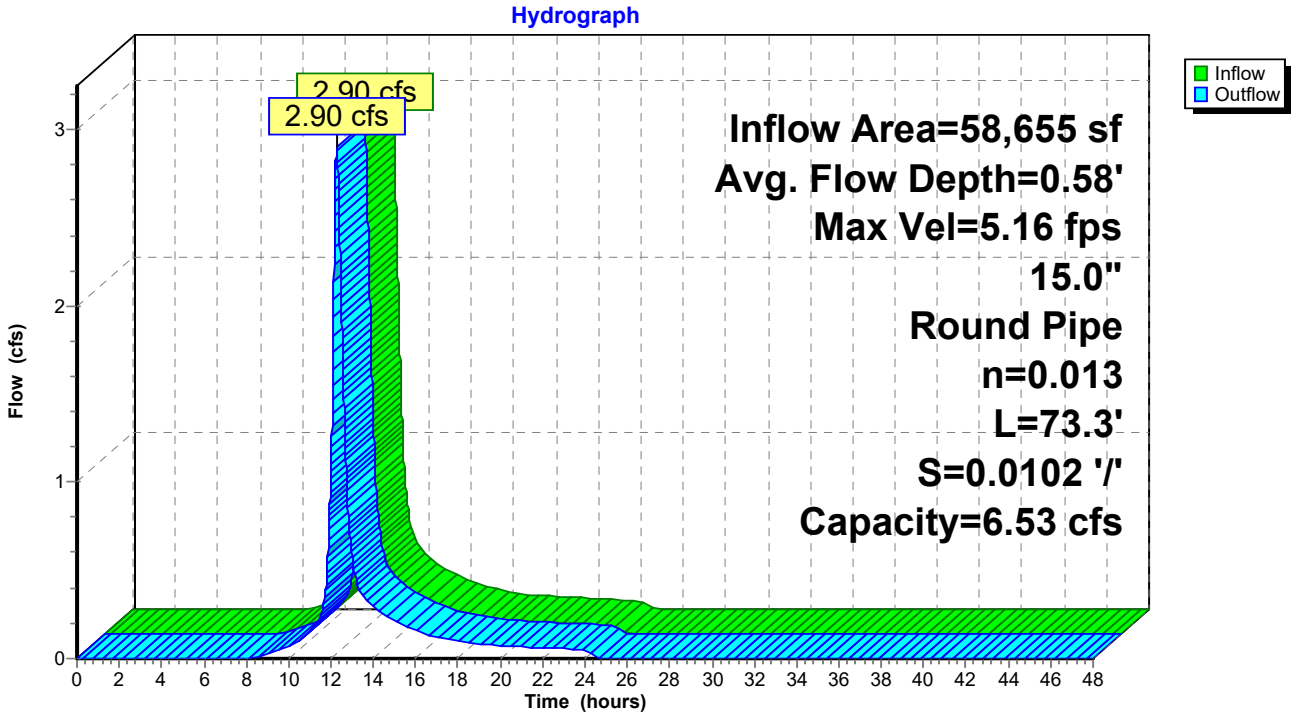
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 5.16 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.91 fps, Avg. Travel Time= 0.6 min

Peak Storage= 41 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 6.53 cfs

15.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 73.3' Slope= 0.0102 '/'
Inlet Invert= 208.75', Outlet Invert= 208.00'



Reach C-1: DRIVEWAY CULVERT

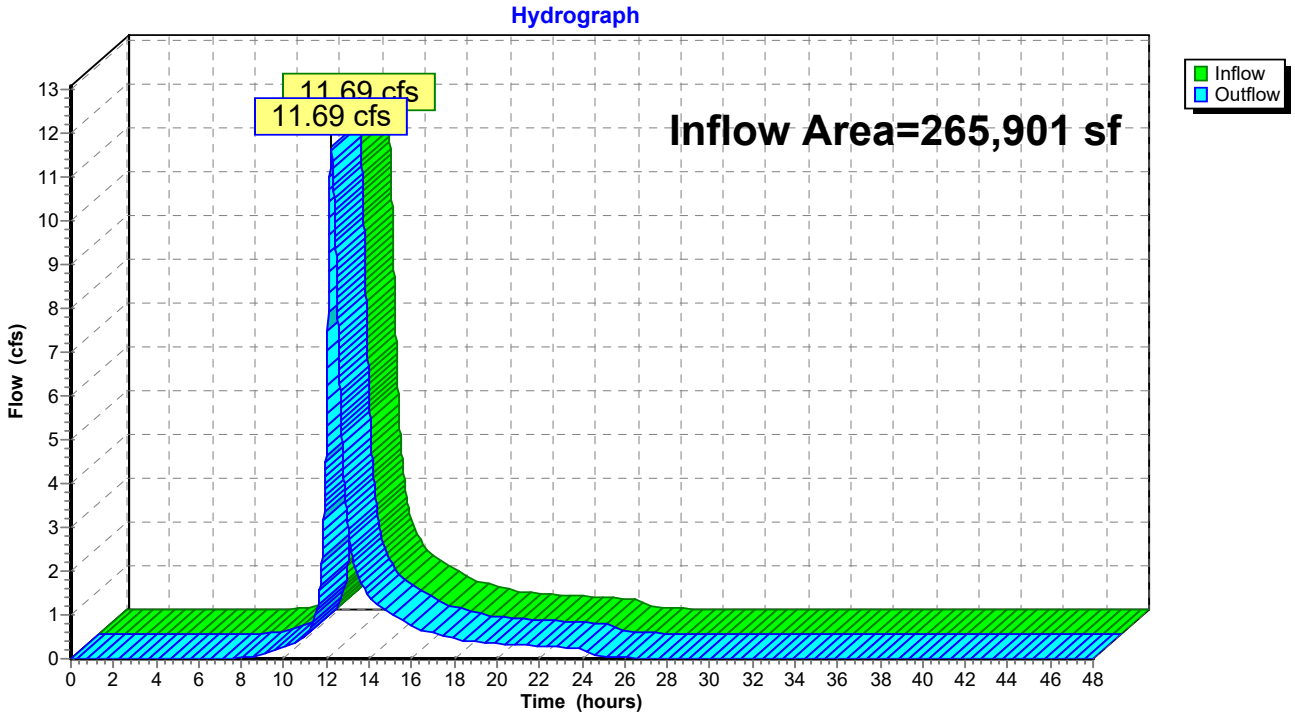


Summary for Reach DP-10: EX. CULVERT IN SOUTHEAST CORNER OF SITE

Inflow Area = 265,901 sf, 21.97% Impervious, Inflow Depth = 2.75" for 10-Year event
Inflow = 11.69 cfs @ 12.22 hrs, Volume= 60,873 cf
Outflow = 11.69 cfs @ 12.22 hrs, Volume= 60,873 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2

Reach DP-10: EX. CULVERT IN SOUTHEAST CORNER OF SITE



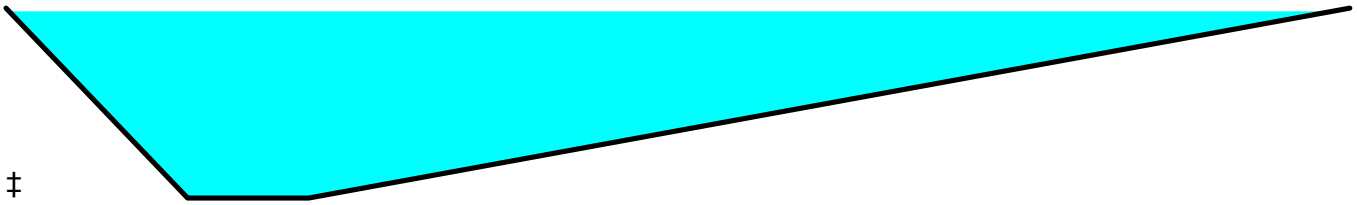
Summary for Reach S-1: PROPERTY LINE SWALE

Inflow Area = 58,655 sf, 10.65% Impervious, Inflow Depth = 2.70" for 10-Year event
Inflow = 2.93 cfs @ 12.24 hrs, Volume= 13,177 cf
Outflow = 2.90 cfs @ 12.27 hrs, Volume= 13,177 cf, Atten= 1%, Lag= 2.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.24 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.48 fps, Avg. Travel Time= 5.4 min

Peak Storage= 363 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 0.40' Flow Area= 2.4 sf, Capacity= 3.02 cfs

Custom cross-section, Length= 155.0' Slope= 0.0066 '/'
Constant n= 0.035 Earth, dense weeds
Inlet Invert= 209.78', Outlet Invert= 208.75'

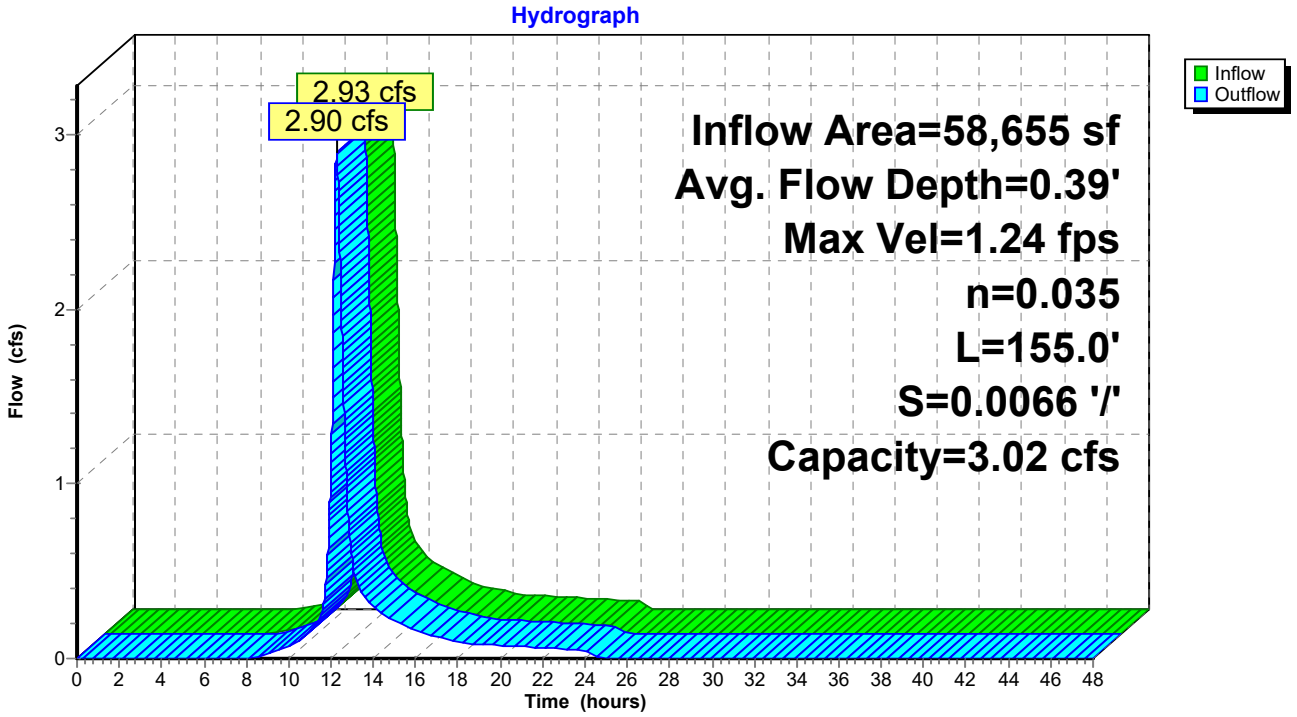


‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
-2.00	209.30	0.00
-0.50	208.90	0.40
0.50	208.90	0.40
9.10	209.30	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	1.0	0	0.00
0.40	2.4	11.2	375	3.02

Reach S-1: PROPERTY LINE SWALE



Summary for Reach S-2: WATER QUALITY SWALE

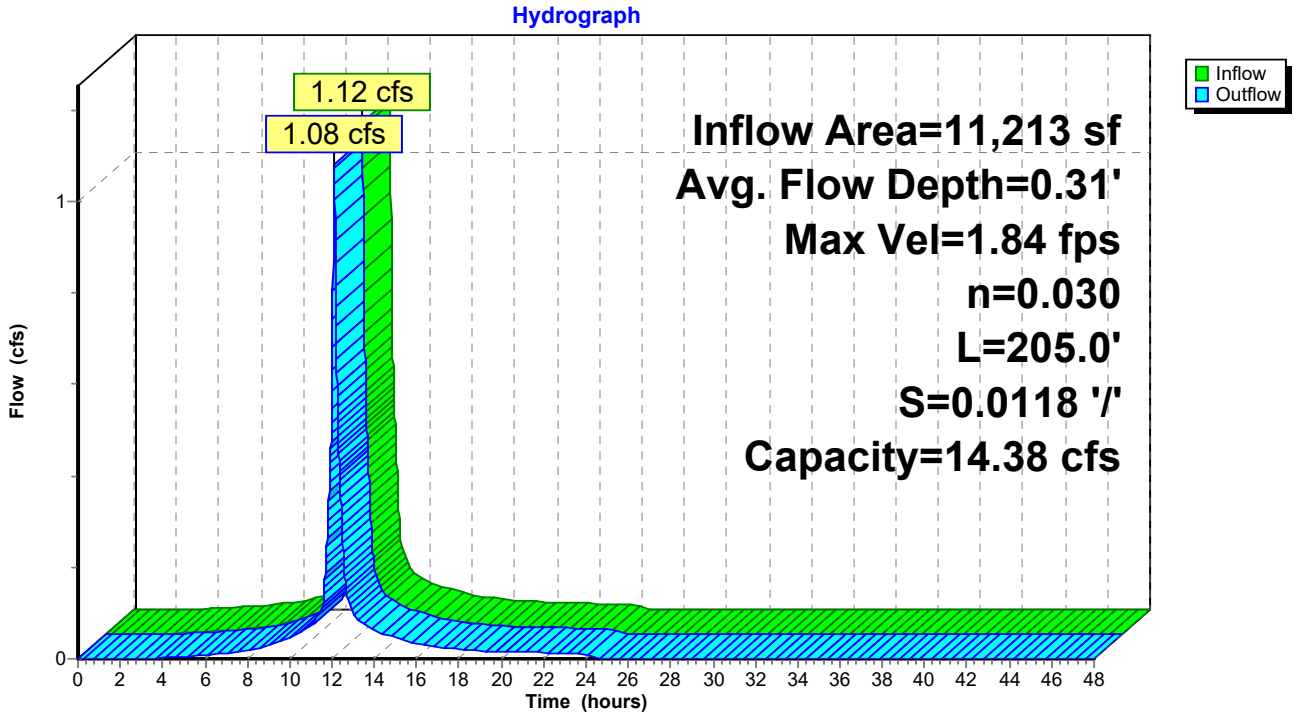
Inflow Area = 11,213 sf, 75.56% Impervious, Inflow Depth = 3.97" for 10-Year event
Inflow = 1.12 cfs @ 12.08 hrs, Volume= 3,712 cf
Outflow = 1.08 cfs @ 12.11 hrs, Volume= 3,712 cf, Atten= 3%, Lag= 1.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.84 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 6.0 min

Peak Storage= 120 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 14.38 cfs

1.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 7.00'
Length= 205.0' Slope= 0.0118 '/'
Inlet Invert= 209.00', Outlet Invert= 206.58'

Reach S-2: WATER QUALITY SWALE



Summary for Pond 1P: PARKING ISLAND

Inflow Area = 17,305 sf, 74.80% Impervious, Inflow Depth = 3.86" for 10-Year event
Inflow = 1.57 cfs @ 12.11 hrs, Volume= 5,573 cf
Outflow = 1.57 cfs @ 12.12 hrs, Volume= 5,269 cf, Atten= 0%, Lag= 0.5 min
Primary = 1.57 cfs @ 12.12 hrs, Volume= 5,269 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 209.80' @ 12.12 hrs Surf.Area= 660 sf Storage= 365 cf

Plug-Flow detention time= 51.2 min calculated for 5,267 cf (95% of inflow)
Center-of-Mass det. time= 20.7 min (803.3 - 782.5)

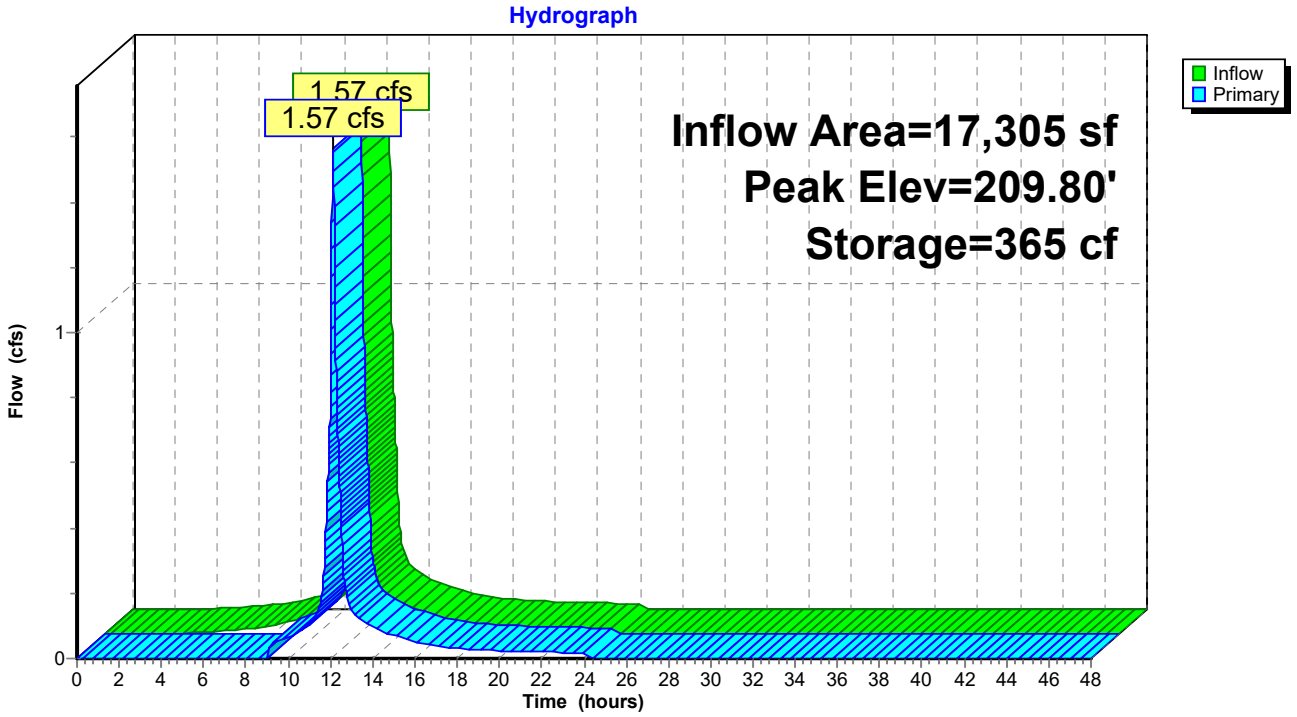
Volume	Invert	Avail.Storage	Storage Description
#1	209.00'	591 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
209.00	268	0	0
209.25	384	82	82
209.50	506	111	193
209.75	635	143	335
210.00	769	176	511
210.10	825	80	591

Device	Routing	Invert	Outlet Devices
#1	Primary	208.32'	**10.0" Round Culvert** L= 64.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.32' / 208.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Device 1	209.70'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.57 cfs @ 12.12 hrs HW=209.80' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 1.57 cfs of 2.12 cfs potential flow)
↑**2=Orifice/Grate** (Weir Controls 1.57 cfs @ 1.02 fps)

Pond 1P: PARKING ISLAND



Summary for Pond 2P: PARKING LOT RAIN GARDEN

Inflow Area = 27,044 sf, 76.83% Impervious, Inflow Depth = 3.97" for 10-Year event
Inflow = 2.50 cfs @ 12.11 hrs, Volume= 8,953 cf
Outflow = 2.47 cfs @ 12.13 hrs, Volume= 8,317 cf, Atten= 1%, Lag= 0.9 min
Primary = 2.47 cfs @ 12.13 hrs, Volume= 8,317 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 209.83' @ 12.13 hrs Surf.Area= 1,468 sf Storage= 818 cf

Plug-Flow detention time= 65.2 min calculated for 8,316 cf (93% of inflow)
Center-of-Mass det. time= 27.4 min (805.0 - 777.6)

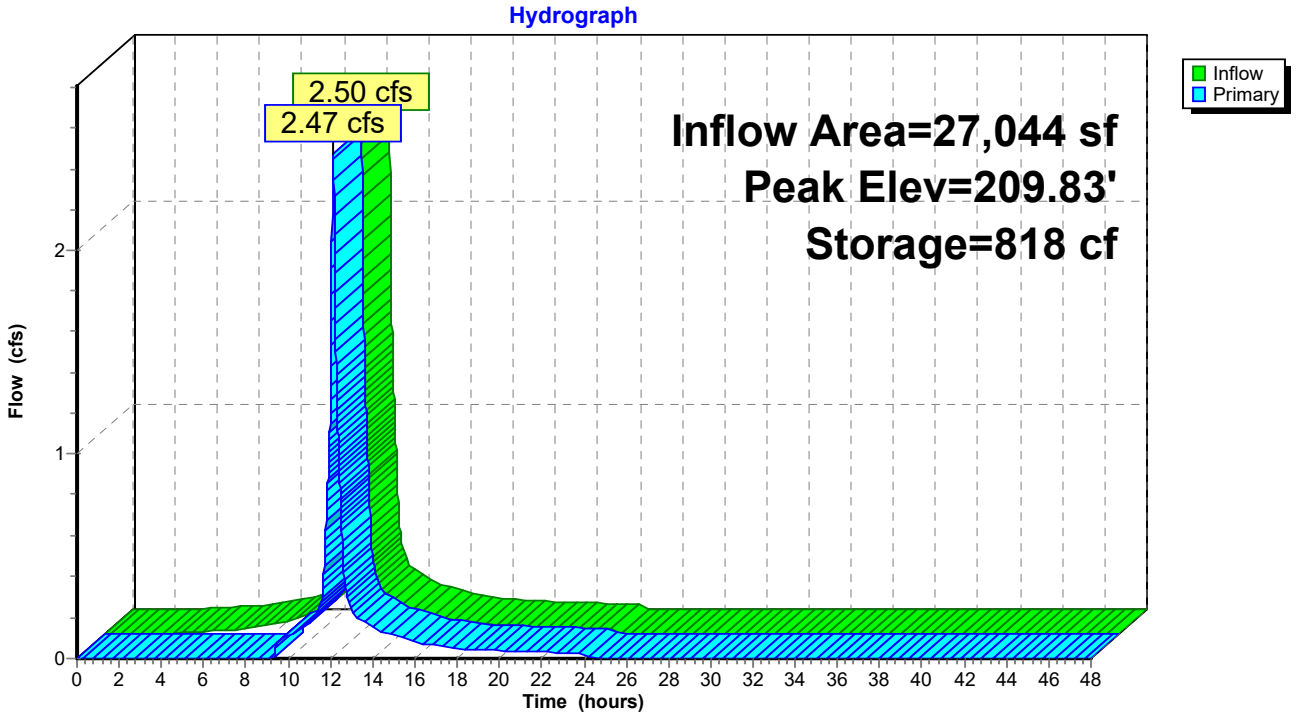
Volume	Invert	Avail.Storage	Storage Description
#1	209.00'	1,254 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
209.00	529	0	0
209.25	746	159	159
209.50	1,114	233	392
209.75	1,380	312	704
210.00	1,653	379	1,083
210.10	1,765	171	1,254

Device	Routing	Invert	Outlet Devices
#1	Primary	208.56'	**12.0" Round Culvert X 2.00** L= 52.8' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.56' / 208.30' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	209.70'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.47 cfs @ 12.13 hrs HW=209.83' TW=209.22' (Dynamic Tailwater)
↑**1=Culvert** (Passes 2.47 cfs of 5.54 cfs potential flow)
↑**2=Orifice/Grate** (Weir Controls 2.47 cfs @ 1.18 fps)

Pond 2P: PARKING LOT RAIN GARDEN



Summary for Pond 3P: WETLAND BASIN-1

Inflow Area = 115,261 sf, 22.41% Impervious, Inflow Depth = 2.69" for 10-Year event
Inflow = 6.73 cfs @ 12.15 hrs, Volume= 25,873 cf
Outflow = 4.36 cfs @ 12.33 hrs, Volume= 24,725 cf, Atten= 35%, Lag= 10.5 min
Primary = 4.36 cfs @ 12.33 hrs, Volume= 24,725 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 208.30' Surf.Area= 4,952 sf Storage= 1,230 cf
Peak Elev= 209.43' @ 12.33 hrs Surf.Area= 6,837 sf Storage= 7,482 cf (6,252 cf above start)

Plug-Flow detention time= 106.2 min calculated for 23,490 cf (91% of inflow)
Center-of-Mass det. time= 51.8 min (878.5 - 826.7)

Volume	Invert	Avail.Storage	Storage Description
#1	207.50'	6,191 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
#2A	208.10'	0 cf	**39.06'W x 73.72'L x 2.69'H Field A** 7,756 cf Overall - 3,995 cf Embedded = 3,761 cf x 0.0% Voids
#3A	208.35'	3,795 cf	**ACF R-Tank HD 1** x 899 Inside #2 Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf 899 Chambers in 29 Rows
#4	208.35'	123 cf	**15.0" Round Pipe Storage** L= 100.0'
#5	207.50'	8,004 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
		18,112 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
207.50	503	0	0
208.00	756	315	315
208.50	1,031	447	762
209.00	1,332	591	1,352
209.50	1,812	786	2,138
210.00	2,398	1,053	3,191
210.50	2,997	1,349	4,540
210.75	3,302	787	5,327
211.00	3,610	864	6,191

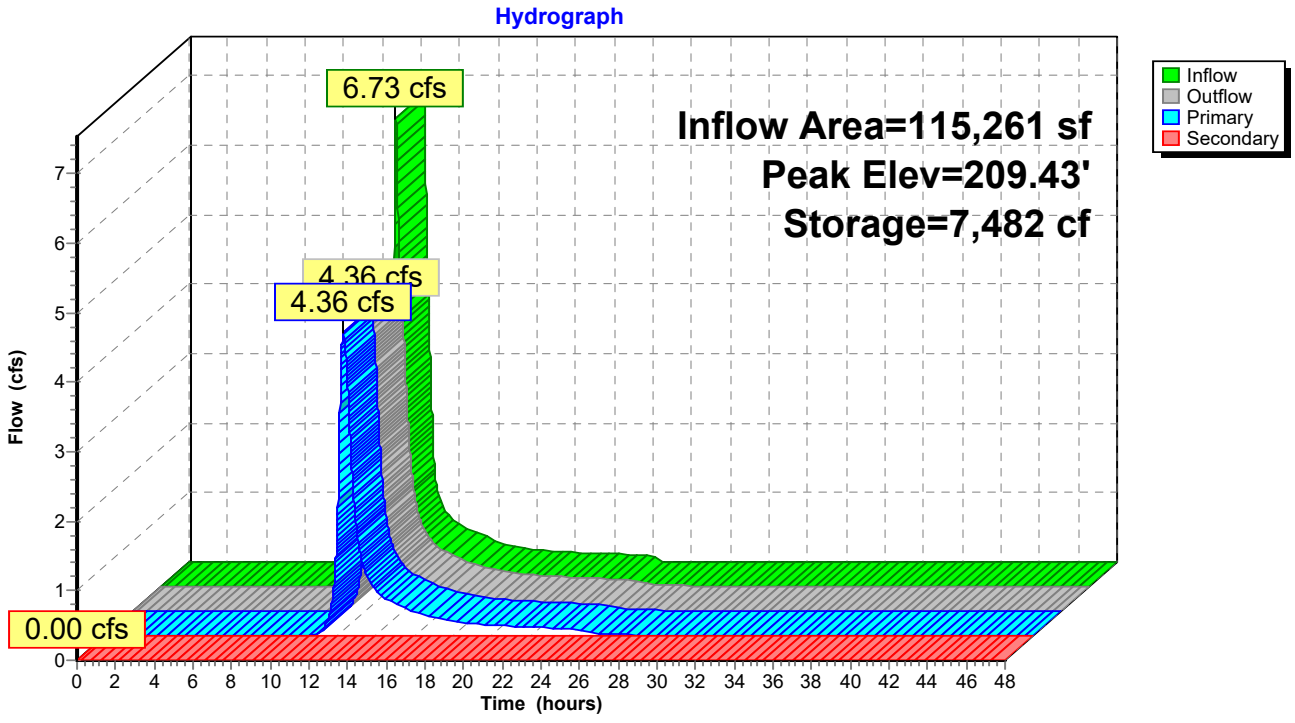
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
207.50	515	0	0
208.00	905	355	355
208.50	1,316	555	910
209.00	1,741	764	1,675
210.00	2,633	2,187	3,862
210.50	3,101	1,434	5,295
210.75	6,067	1,146	6,441
211.00	6,433	1,563	8,004

Device	Routing	Invert	Outlet Devices
#1	Secondary	209.75'	**10.0' long x 9.5' breadth Broad-Crested Rectangular Weir X 2.00** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 Coef. (English) 2.48 2.55 2.70 2.69 2.68 2.69 2.67 2.64 2.64 2.64 2.64 2.64 2.64 2.65 2.65 2.66
#2	Primary	208.55'	**12.0" Round Culvert X 2.00** L= 110.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.55' / 208.00' S= 0.0050 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#3	Device 2	208.38'	**12.0" W x 3.0" H Vert. WQV Orifice X 4.00** C= 0.600
#4	Device 2	209.05'	**12.0" W x 3.0" H Vert. 2-YR Orifice X 4.00** C= 0.600
#5	Device 2	209.43'	**12.0" W x 3.0" H Vert. 10-YR Orifice X 4.00** C= 0.600
#6	Device 2	209.64'	**48.0" x 48.0" Horiz. 25-YR Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.36 cfs @ 12.33 hrs HW=209.43' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Barrel Controls 4.36 cfs @ 3.95 fps)
  ├─**3=WQV Orifice** (Passes < 4.49 cfs potential flow)
  ├─**4=2-YR Orifice** (Passes < 2.41 cfs potential flow)
  ├─**5=10-YR Orifice** (Passes < 0.00 cfs potential flow)
  └─**6=25-YR Orifice** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=208.30' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: WETLAND BASIN-1

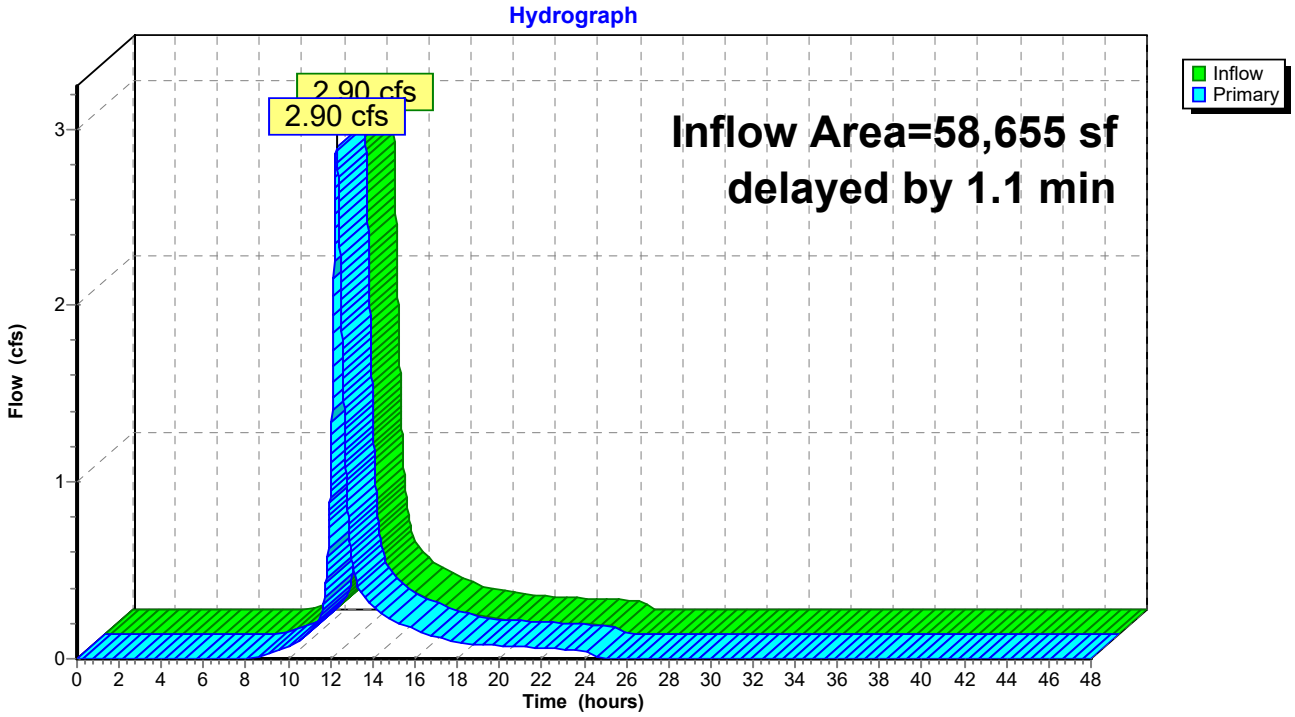


Summary for Link L-1: C-1 FLOWS THRU SOUTH FARM DITCH

Inflow Area = 58,655 sf, 10.65% Impervious, Inflow Depth = 2.70" for 10-Year event
Inflow = 2.90 cfs @ 12.27 hrs, Volume= 13,177 cf
Primary = 2.90 cfs @ 12.29 hrs, Volume= 13,177 cf, Atten= 0%, Lag= 1.1 min

Primary outflow = Inflow delayed by 1.1 min, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link L-1: C-1 FLOWS THRU SOUTH FARM DITCH

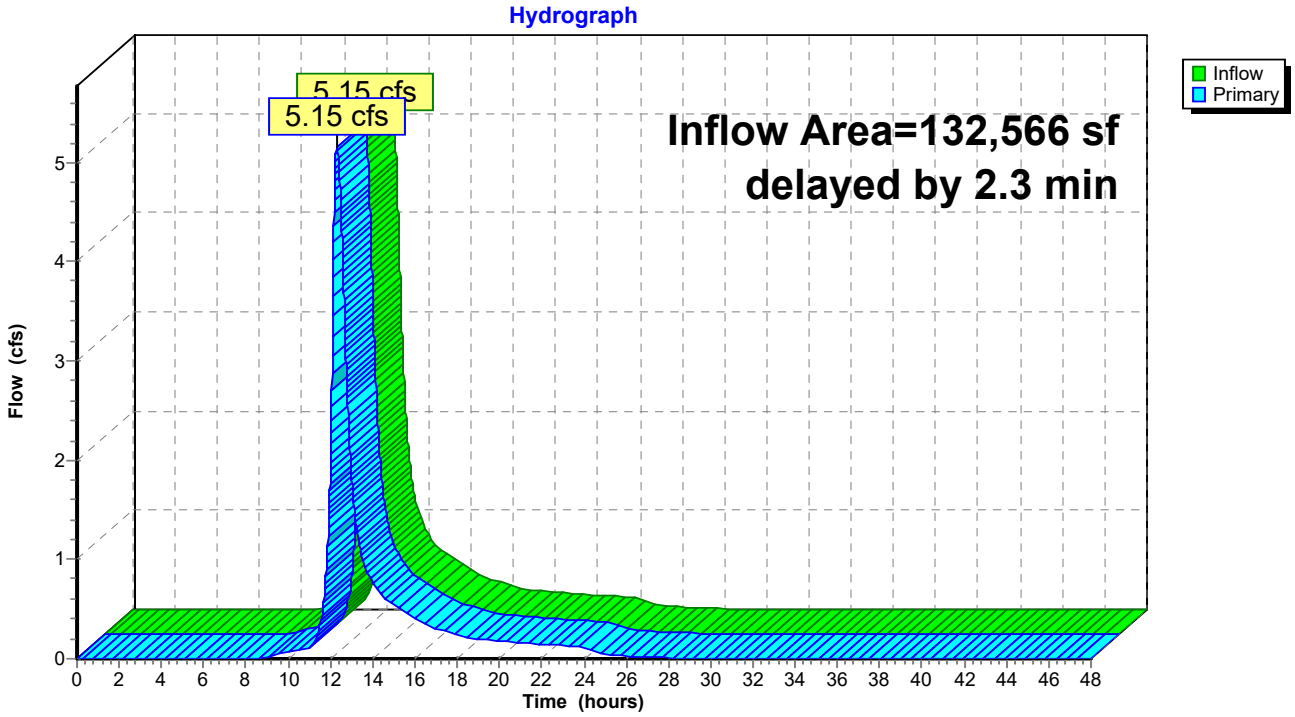


Summary for Link L-2: WB-1 FLOWS THRU SOUTH FARM DITCH

Inflow Area = 132,566 sf, 29.25% Impervious, Inflow Depth = 2.72" for 10-Year event
Inflow = 5.15 cfs @ 12.27 hrs, Volume= 29,994 cf
Primary = 5.15 cfs @ 12.31 hrs, Volume= 29,993 cf, Atten= 0%, Lag= 2.3 min

Primary outflow = Inflow delayed by 2.3 min, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link L-2: WB-1 FLOWS THRU SOUTH FARM DITCH



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P-1: SMALL FIELD Runoff Area=44,152 sf 0.99% Impervious Runoff Depth=3.11"
Flow Length=483' Tc=14.1 min CN=76 Runoff=2.87 cfs 11,458 cf

Subcatchment P-2: SOUTH PARKING Runoff Area=6,480 sf 28.63% Impervious Runoff Depth=4.01"
Flow Length=36' Slope=0.0800 '/' Tc=6.0 min CN=85 Runoff=0.69 cfs 2,166 cf

Subcatchment P-3E: PARKING LOT & Runoff Area=17,305 sf 74.80% Impervious Runoff Depth=4.88"
Tc=8.3 min CN=93 Runoff=1.96 cfs 7,033 cf

Subcatchment P-3W: PARKING LOT & Runoff Area=27,044 sf 76.83% Impervious Runoff Depth=4.99"
Flow Length=219' Tc=8.3 min CN=94 Runoff=3.10 cfs 11,245 cf

Subcatchment P-4: BANDSHELL AREA Runoff Area=5,817 sf 8.60% Impervious Runoff Depth=3.70"
Flow Length=209' Tc=9.6 min CN=82 Runoff=0.51 cfs 1,795 cf

Subcatchment P-5: PLAYGROUND AREA Runoff Area=52,838 sf 10.88% Impervious Runoff Depth=3.60"
Flow Length=212' Tc=18.5 min CN=81 Runoff=3.56 cfs 15,862 cf

Subcatchment P-6: RUN-ON FROM Runoff Area=31,494 sf 14.32% Impervious Runoff Depth=3.80"
Flow Length=404' Tc=13.7 min CN=83 Runoff=2.51 cfs 9,985 cf

Subcatchment P-7: ENTRANCE DRIVEWAY Runoff Area=11,213 sf 75.56% Impervious Runoff Depth=4.99"
Flow Length=75' Tc=6.0 min CN=94 Runoff=1.39 cfs 4,663 cf

Subcatchment P-8: LARGE FIELD Runoff Area=37,585 sf 7.36% Impervious Runoff Depth=3.31"
Flow Length=174' Tc=12.1 min CN=78 Runoff=2.74 cfs 10,356 cf

Subcatchment P-9: UNDEVELOPED SOUTH Runoff Area=31,973 sf 1.32% Impervious Runoff Depth=3.31"
Flow Length=730' Tc=11.8 min CN=78 Runoff=2.35 cfs 8,810 cf

Reach C-1: DRIVEWAY CULVERT Avg. Flow Depth=0.69' Max Vel=5.55 fps Inflow=3.87 cfs 17,657 cf
15.0" Round Pipe n=0.013 L=73.3' S=0.0102 '/' Capacity=6.53 cfs Outflow=3.87 cfs 17,657 cf

Reach DP-10: EX. CULVERT IN SOUTHEAST CORNER OF SITE Inflow=15.56 cfs 81,284 cf
Outflow=15.56 cfs 81,284 cf

Reach S-1: PROPERTY LINE SWALE Avg. Flow Depth=0.45' Max Vel=1.32 fps Inflow=3.92 cfs 17,657 cf
n=0.035 L=155.0' S=0.0066 '/' Capacity=3.02 cfs Outflow=3.87 cfs 17,657 cf

Reach S-2: WATER QUALITY SWALE Avg. Flow Depth=0.34' Max Vel=1.95 fps Inflow=1.39 cfs 4,663 cf
n=0.030 L=205.0' S=0.0118 '/' Capacity=14.38 cfs Outflow=1.34 cfs 4,663 cf

Pond 1P: PARKING ISLAND Peak Elev=209.81' Storage=376 cf Inflow=1.96 cfs 7,033 cf
Outflow=1.95 cfs 6,729 cf

Pond 2P: PARKING LOT RAIN GARDEN Peak Elev=209.85' Storage=848 cf Inflow=3.10 cfs 11,245 cf
Outflow=3.07 cfs 10,609 cf

Pond 3P: WETLAND BASIN-1 Peak Elev=209.64' Storage=8,921 cf Inflow=8.92 cfs 34,590 cf
Primary=5.73 cfs 33,441 cf Secondary=0.00 cfs 0 cf Outflow=5.73 cfs 33,441 cf

Link L-1: C-1 FLOWS THRU SOUTH FARM DITCH delayed by 1.1 min Inflow=3.87 cfs 17,657 cf
Primary=3.87 cfs 17,657 cf

Link L-2: WB-1 FLOWS THRU SOUTH FARM DITCH delayed by 2.3 min Inflow=6.74 cfs 40,170 cf
Primary=6.74 cfs 40,170 cf

Total Runoff Area = 265,901 sf Runoff Volume = 83,373 cf Average Runoff Depth = 3.76"
78.03% Pervious = 207,472 sf 21.97% Impervious = 58,429 sf

Summary for Subcatchment P-1: SMALL FIELD

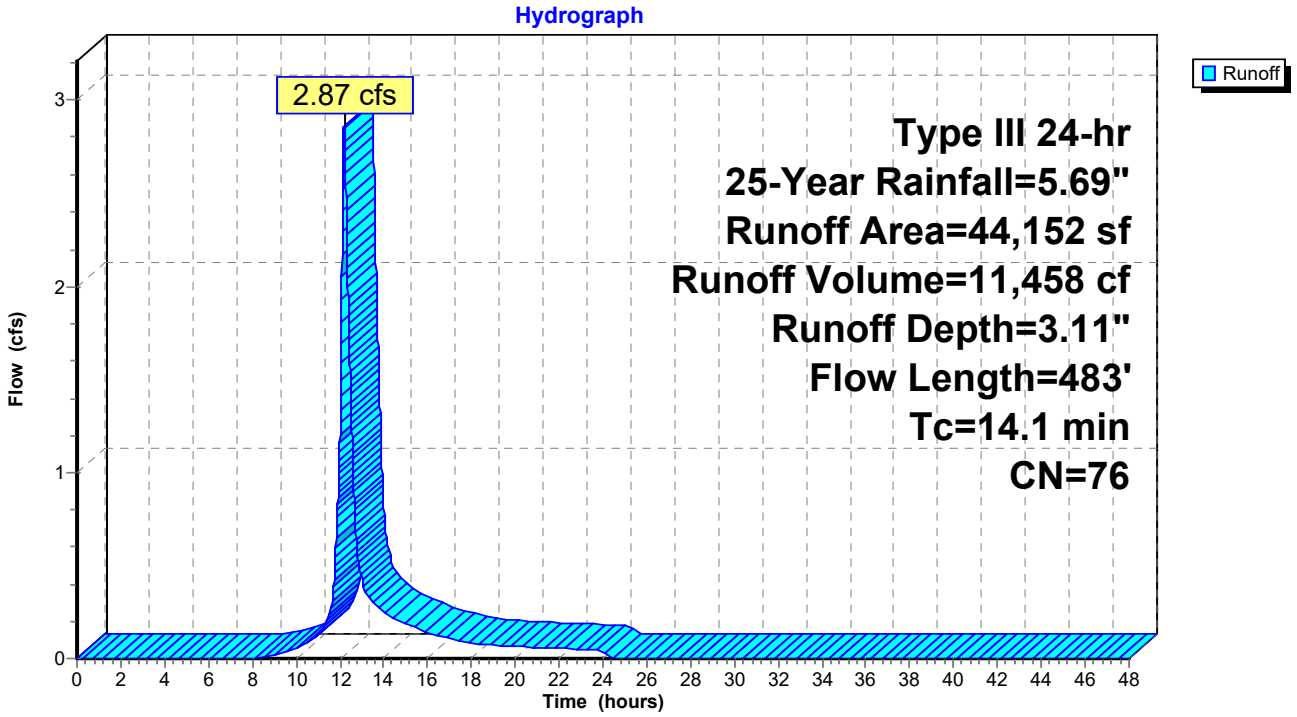
Runoff = 2.87 cfs @ 12.20 hrs, Volume= 11,458 cf, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.69"

	Area (sf)	CN	Description
	435	98	Paved parking, HSG D
	12,217	80	>75% Grass cover, Good, HSG D
*	31,500	74	Soccer Field, Good, HSG C
	44,152	76	Weighted Average
	43,717		99.01% Pervious Area
	435		0.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER SOCCER FIELD** Grass: Dense n= 0.240 P2= 3.01"
0.9	90	0.0100	1.61		**Shallow Concentrated Flow, OVER SOCCER FIELD** Unpaved Kv= 16.1 fps
0.1	17	0.0500	3.60		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.9	326	0.0050	2.84	1.55	**Pipe Channel, SOUTH COLLECTOR** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
14.1	483	Total			

Subcatchment P-1: SMALL FIELD



Summary for Subcatchment P-2: SOUTH PARKING STALLS

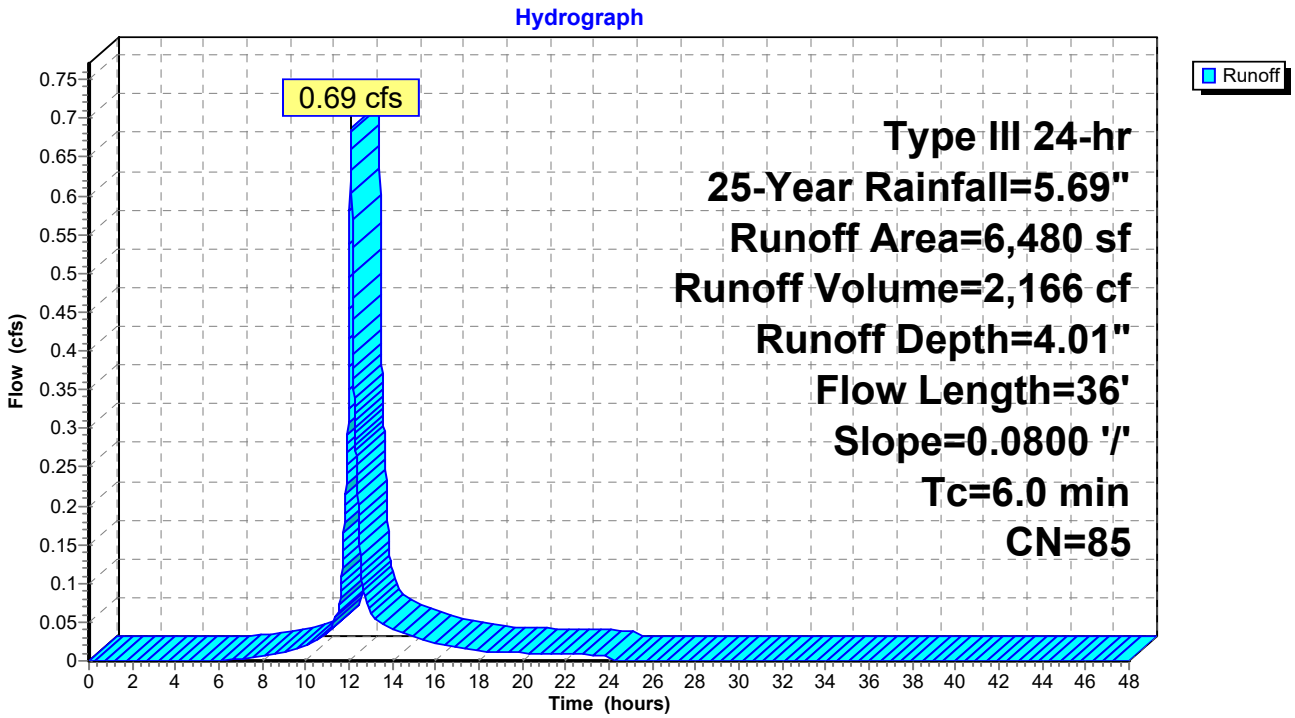
Runoff = 0.69 cfs @ 12.09 hrs, Volume= 2,166 cf, Depth= 4.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.69"

Area (sf)	CN	Description
1,855	98	Paved parking, HSG D
4,625	80	>75% Grass cover, Good, HSG D
6,480	85	Weighted Average
4,625		71.37% Pervious Area
1,855		28.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	36	0.0800	0.16		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
3.7	36	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-2: SOUTH PARKING STALLS



Summary for Subcatchment P-3E: PARKING LOT & CONCESSION AREA

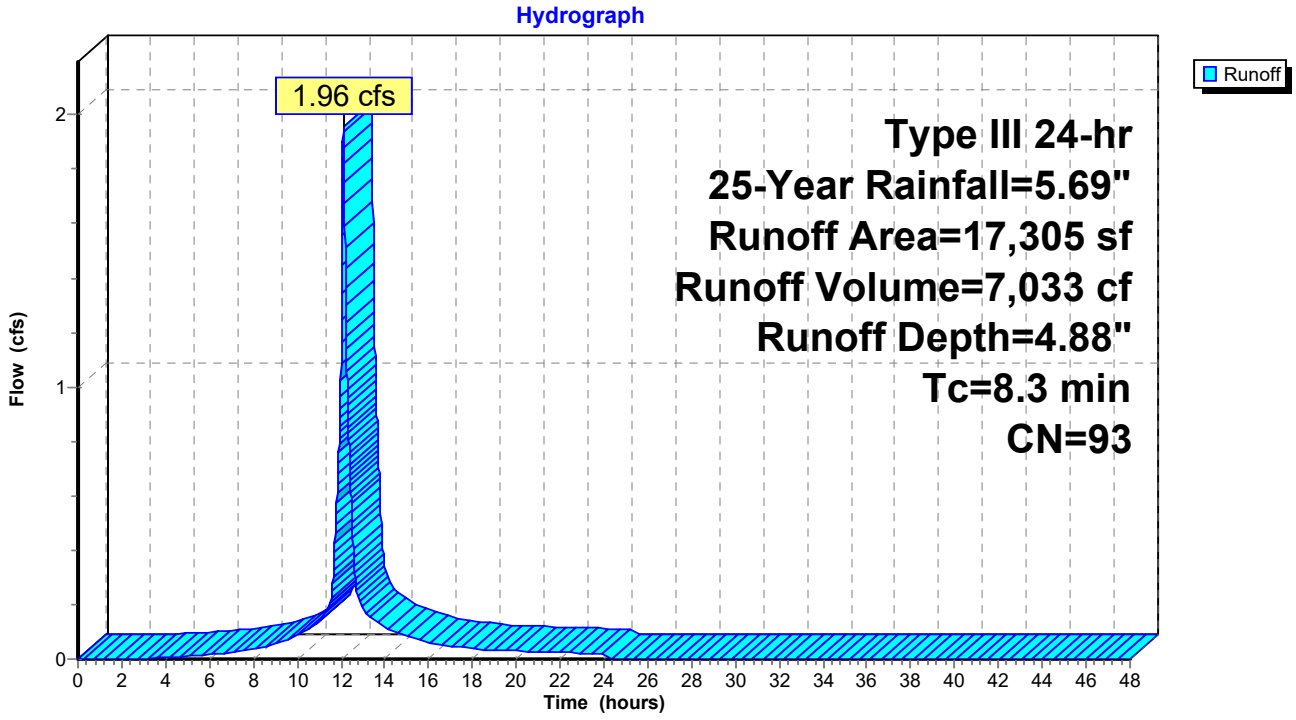
Runoff = 1.96 cfs @ 12.11 hrs, Volume= 7,033 cf, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.69"

Area (sf)	CN	Description
1,125	98	Roofs, HSG D
11,820	98	Paved parking, HSG D
4,360	80	>75% Grass cover, Good, HSG D
17,305	93	Weighted Average
4,360		25.20% Pervious Area
12,945		74.80% Impervious Area

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

Subcatchment P-3E: PARKING LOT & CONCESSION AREA



Summary for Subcatchment P-3W: PARKING LOT & BASKETBALL COURT

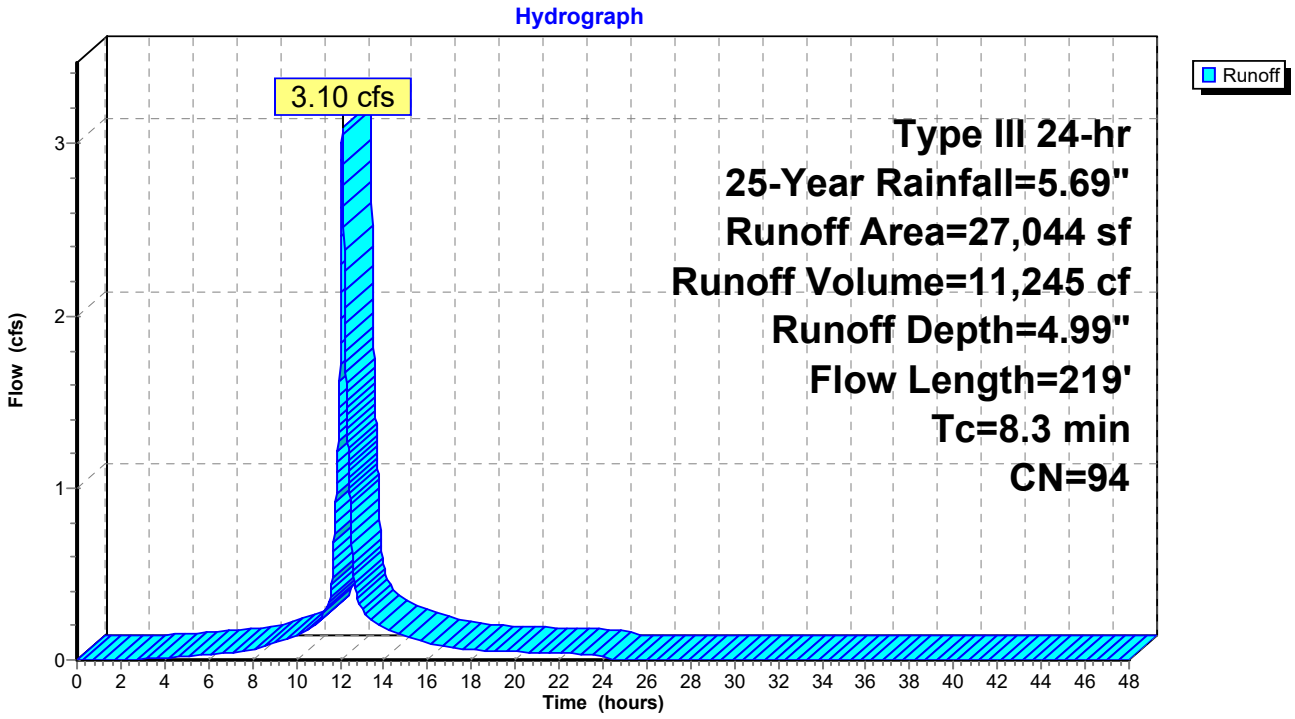
Runoff = 3.10 cfs @ 12.11 hrs, Volume= 11,245 cf, Depth= 4.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.69"

Area (sf)	CN	Description
20,777	98	Paved parking, HSG D
6,267	80	>75% Grass cover, Good, HSG D
27,044	94	Weighted Average
6,267		23.17% Pervious Area
20,777		76.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	47	0.0280	0.11		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
0.8	103	0.0165	2.07		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
0.5	69	0.0125	2.27		**Shallow Concentrated Flow, OVER PVMT** Paved Kv= 20.3 fps
8.3	219	Total			

Subcatchment P-3W: PARKING LOT & BASKETBALL COURT



Summary for Subcatchment P-4: BANDSHELL AREA

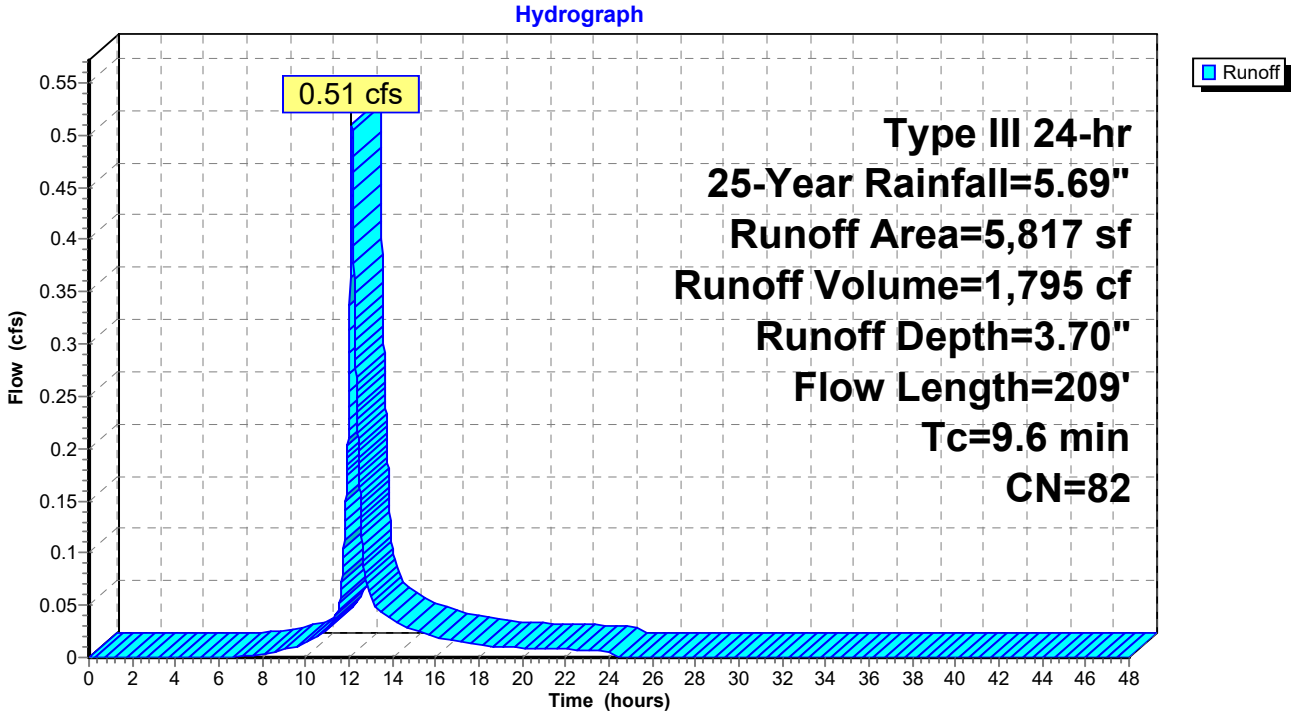
Runoff = 0.51 cfs @ 12.13 hrs, Volume= 1,795 cf, Depth= 3.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.69"

Area (sf)	CN	Description
500	98	Paved parking, HSG D
5,317	80	>75% Grass cover, Good, HSG D
5,817	82	Weighted Average
5,317		91.40% Pervious Area
500		8.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0200	0.10		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
0.1	19	0.0380	3.14		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.0	140	0.0050	2.45	0.85	**Pipe Channel, BANDSHELL COLLECTOR** 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.013 Corrugated PE, smooth interior
9.6	209	Total			

Subcatchment P-4: BANDSHELL AREA



Summary for Subcatchment P-5: PLAYGROUND AREA

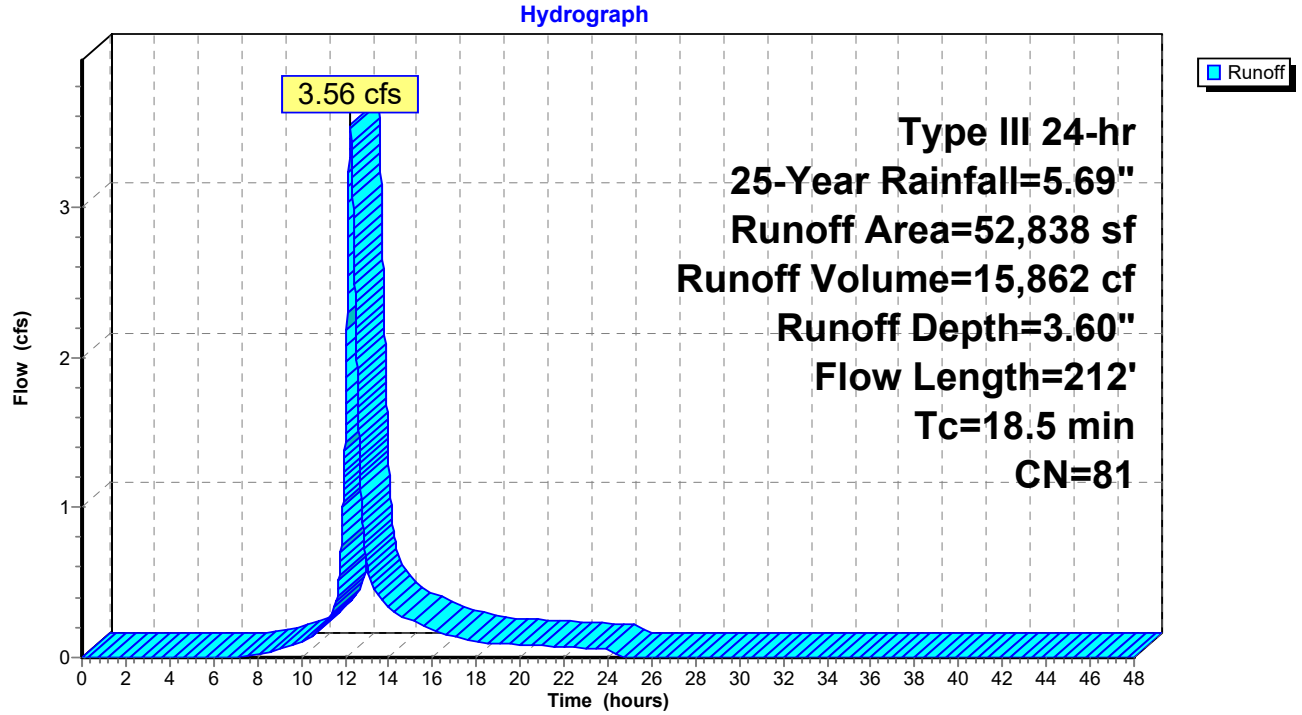
Runoff = 3.56 cfs @ 12.25 hrs, Volume= 15,862 cf, Depth= 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.69"

Area (sf)	CN	Description
2,417	98	Roofs, HSG D
3,330	98	Paved parking, HSG D
29,631	80	>75% Grass cover, Good, HSG D
17,460	77	Woods, Good, HSG D
52,838	81	Weighted Average
47,091		89.12% Pervious Area
5,747		10.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	50	0.0100	0.05		**Sheet Flow, THRU WOODS** Woods: Light underbrush n= 0.400 P2= 3.01"
0.4	42	0.0100	1.61		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.3	120	0.0050	1.54	0.13	**Pipe Channel, THRU FRENCH DRAIN** 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.013 Corrugated PE, smooth interior
18.5	212	Total			

Subcatchment P-5: PLAYGROUND AREA



Summary for Subcatchment P-6: RUN-ON FROM ABUTTER NORTH OF DRIVEWAY

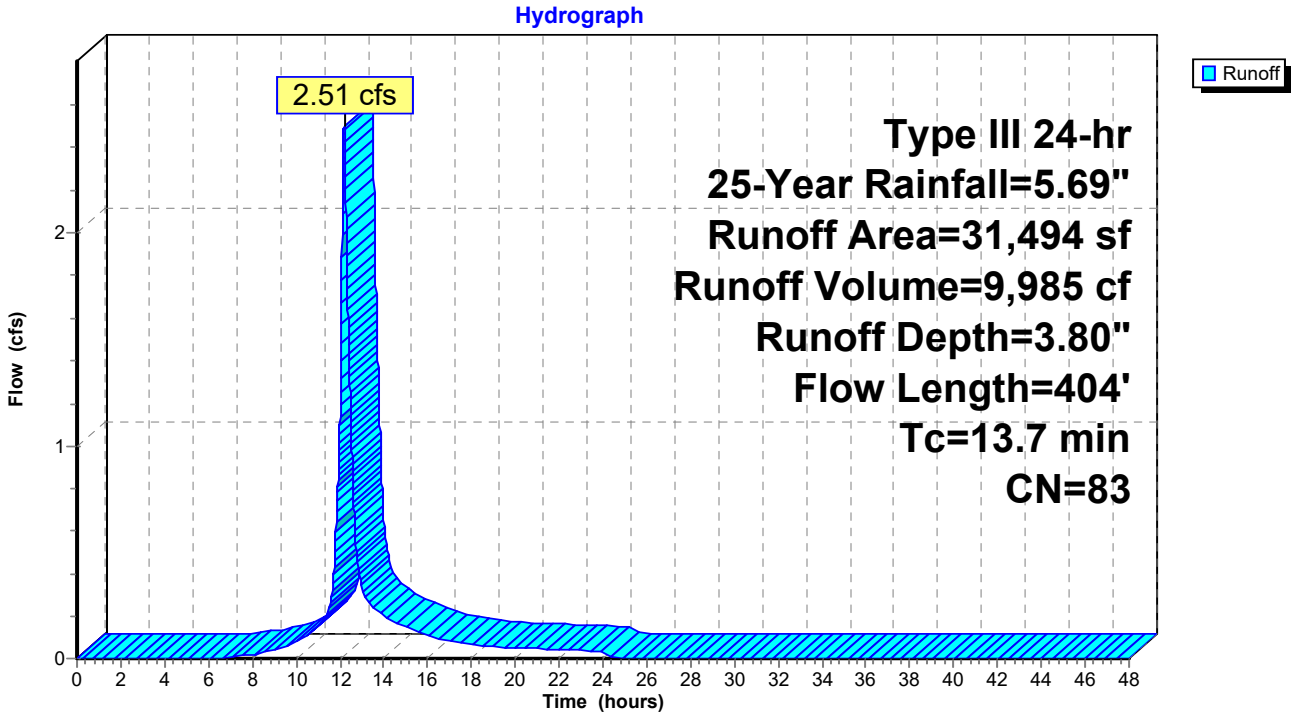
Runoff = 2.51 cfs @ 12.19 hrs, Volume= 9,985 cf, Depth= 3.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.69"

Area (sf)	CN	Description
2,626	98	Roofs, HSG D
1,883	98	Paved parking, HSG D
23,946	80	>75% Grass cover, Good, HSG D
2,348	91	Gravel roads, HSG D
691	77	Woods, Good, HSG D
31,494	83	Weighted Average
26,985		85.68% Pervious Area
4,509		14.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
1.1	110	0.0100	1.61		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.4	244	0.0050	2.84	1.55	**Pipe Channel,** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
13.7	404	Total			

Subcatchment P-6: RUN-ON FROM ABUTTER NORTH OF DRIVEWAY



Summary for Subcatchment P-7: ENTRANCE DRIVEWAY

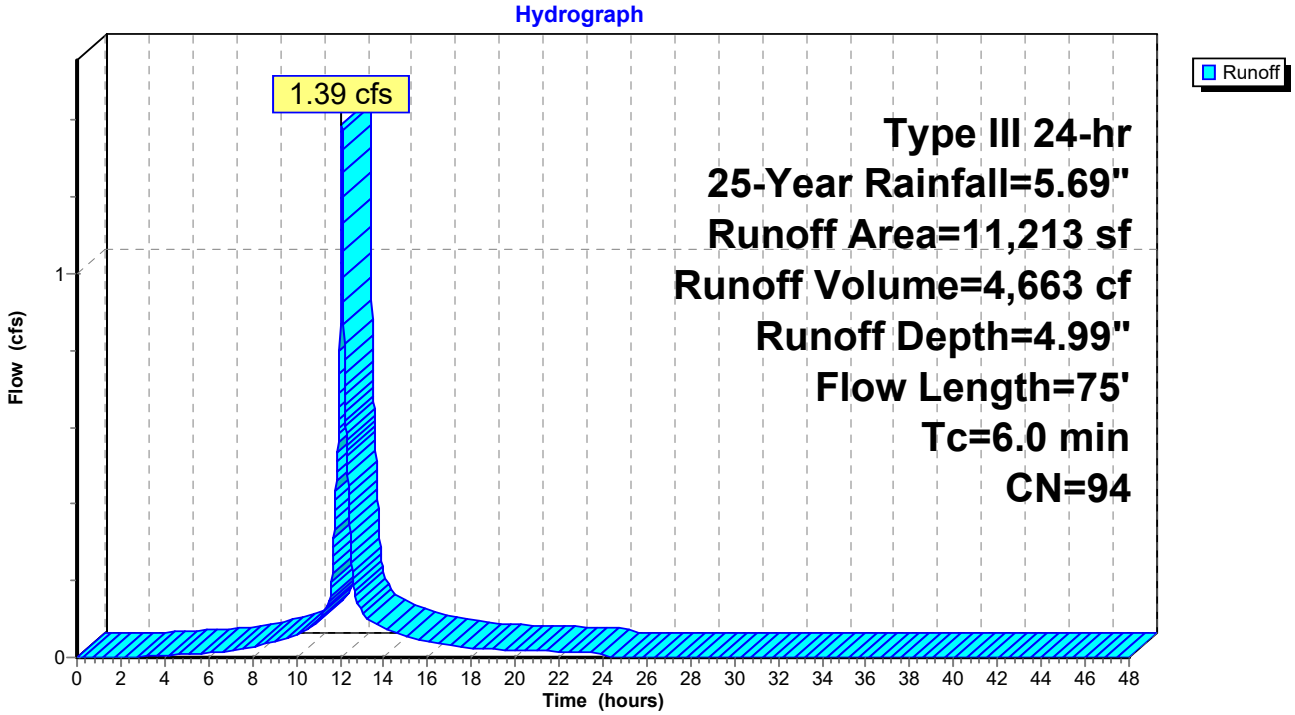
Runoff = 1.39 cfs @ 12.08 hrs, Volume= 4,663 cf, Depth= 4.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.69"

Area (sf)	CN	Description
8,472	98	Paved parking, HSG D
2,741	80	>75% Grass cover, Good, HSG D
11,213	94	Weighted Average
2,741		24.44% Pervious Area
8,472		75.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	44	0.0275	1.29		**Sheet Flow, OVER PVMT** Smooth surfaces n= 0.011 P2= 3.01"
0.1	22	0.0150	2.49		**Shallow Concentrated Flow, OVER PVMT** Paved Kv= 20.3 fps
0.0	9	0.0200	6.42	3.21	**Trap/Vee/Rect Channel Flow, THRU SW CHASE** Bot.W=1.00' D=0.50' n= 0.013 Concrete, trowel finish
0.7	75	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-7: ENTRANCE DRIVEWAY



Summary for Subcatchment P-8: LARGE FIELD SOUTHEAST

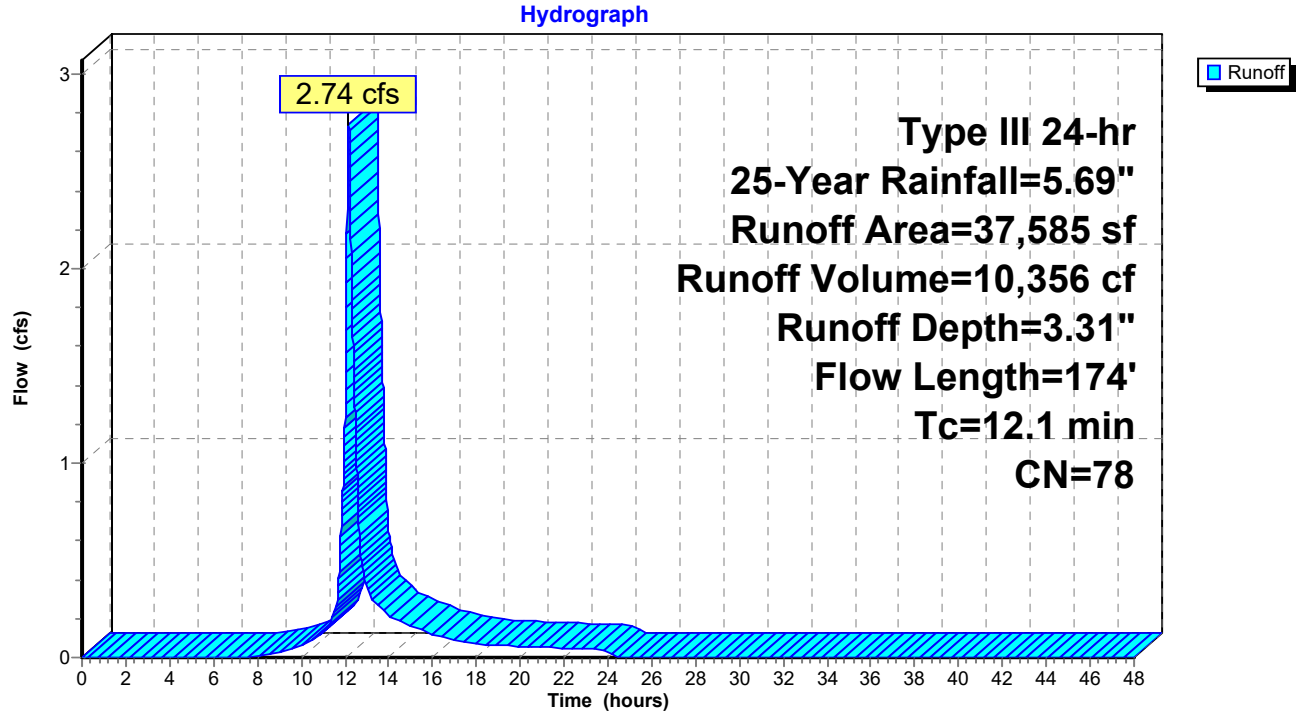
Runoff = 2.74 cfs @ 12.17 hrs, Volume= 10,356 cf, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.69"

	Area (sf)	CN	Description
	1,500	98	Roofs, HSG D
	1,267	98	Paved parking, HSG D
	15,907	80	>75% Grass cover, Good, HSG D
	11	91	Gravel roads, HSG D
*	18,900	74	Soccer Field, Good, HSG C
	37,585	78	Weighted Average
	34,818		92.64% Pervious Area
	2,767		7.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER SOCCER FIELD** Grass: Dense n= 0.240 P2= 3.01"
0.6	55	0.0100	1.61		**Shallow Concentrated Flow, OVER SOCCER FIELD** Unpaved Kv= 16.1 fps
0.3	69	0.0650	4.10		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
12.1	174	Total			

Subcatchment P-8: LARGE FIELD SOUTHEAST



Summary for Subcatchment P-9: UNDEVELOPED SOUTH SIDE OF PROPERTY

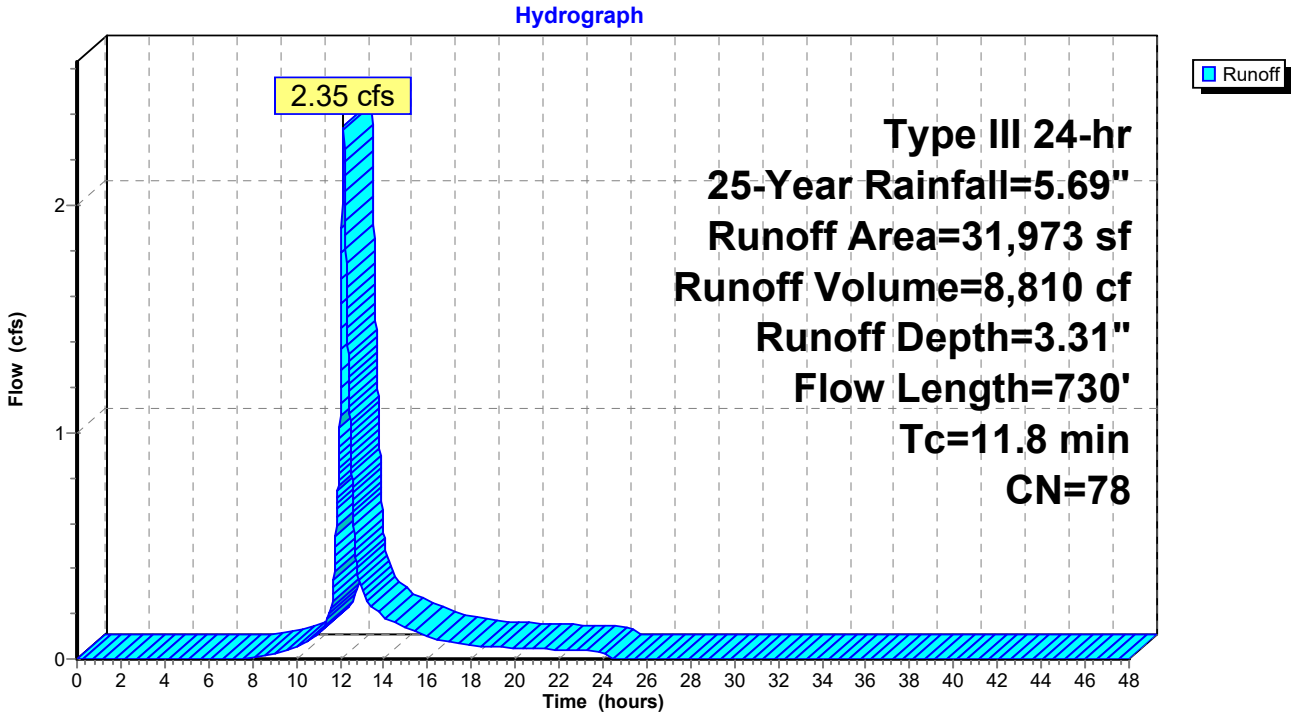
Runoff = 2.35 cfs @ 12.16 hrs, Volume= 8,810 cf, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.69"

Area (sf)	CN	Description
422	98	Paved parking, HSG D
6,731	80	>75% Grass cover, Good, HSG D
24,820	77	Woods, Good, HSG D
31,973	78	Weighted Average
31,551		98.68% Pervious Area
422		1.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0200	0.10		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
0.1	38	0.0700	4.26		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
3.2	642	0.0100	3.35	22.14	**Channel Flow, OVER FARM DITCH** Area= 6.6 sf Perim= 9.4' r= 0.70' n= 0.035 Earth, dense weeds
11.8	730	Total			

Subcatchment P-9: UNDEVELOPED SOUTH SIDE OF PROPERTY



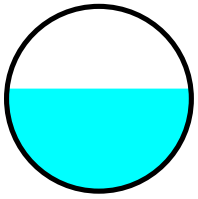
Summary for Reach C-1: DRIVEWAY CULVERT

Inflow Area = 58,655 sf, 10.65% Impervious, Inflow Depth = 3.61" for 25-Year event
Inflow = 3.87 cfs @ 12.27 hrs, Volume= 17,657 cf
Outflow = 3.87 cfs @ 12.27 hrs, Volume= 17,657 cf, Atten= 0%, Lag= 0.2 min

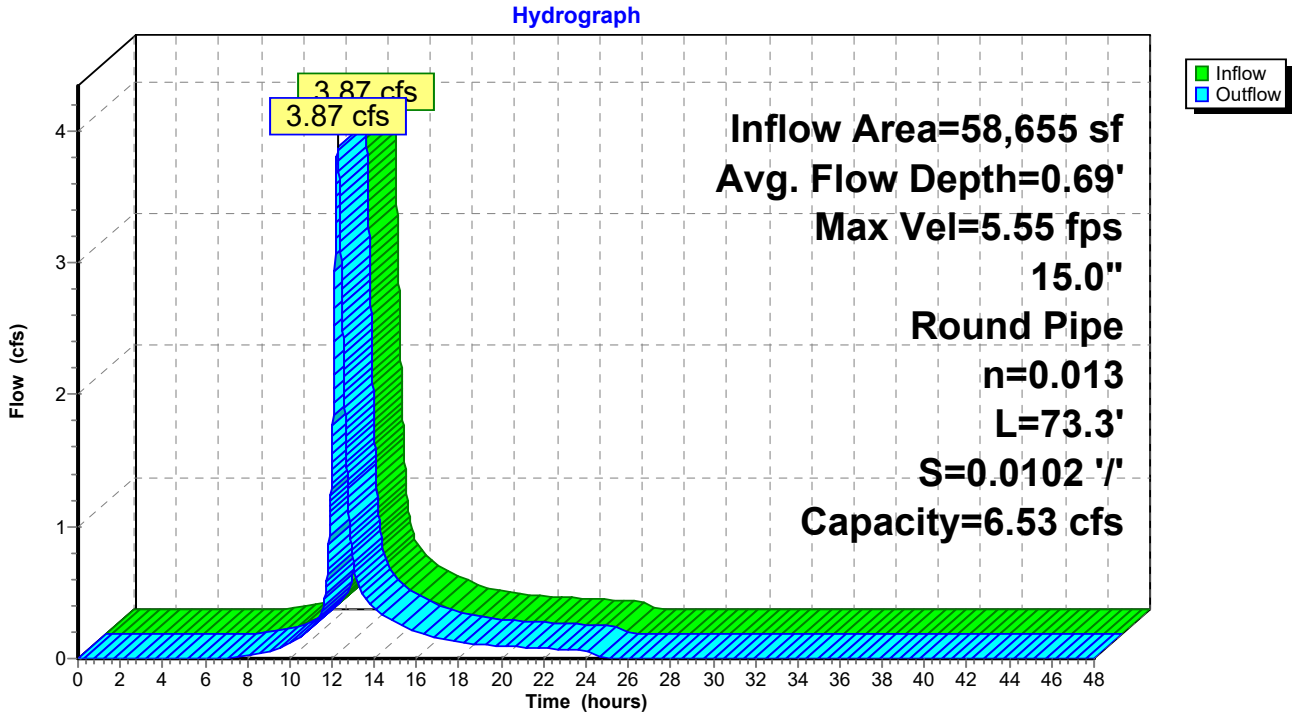
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 5.55 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.04 fps, Avg. Travel Time= 0.6 min

Peak Storage= 51 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.69'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 6.53 cfs

15.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 73.3' Slope= 0.0102 '/'
Inlet Invert= 208.75', Outlet Invert= 208.00'



Reach C-1: DRIVEWAY CULVERT

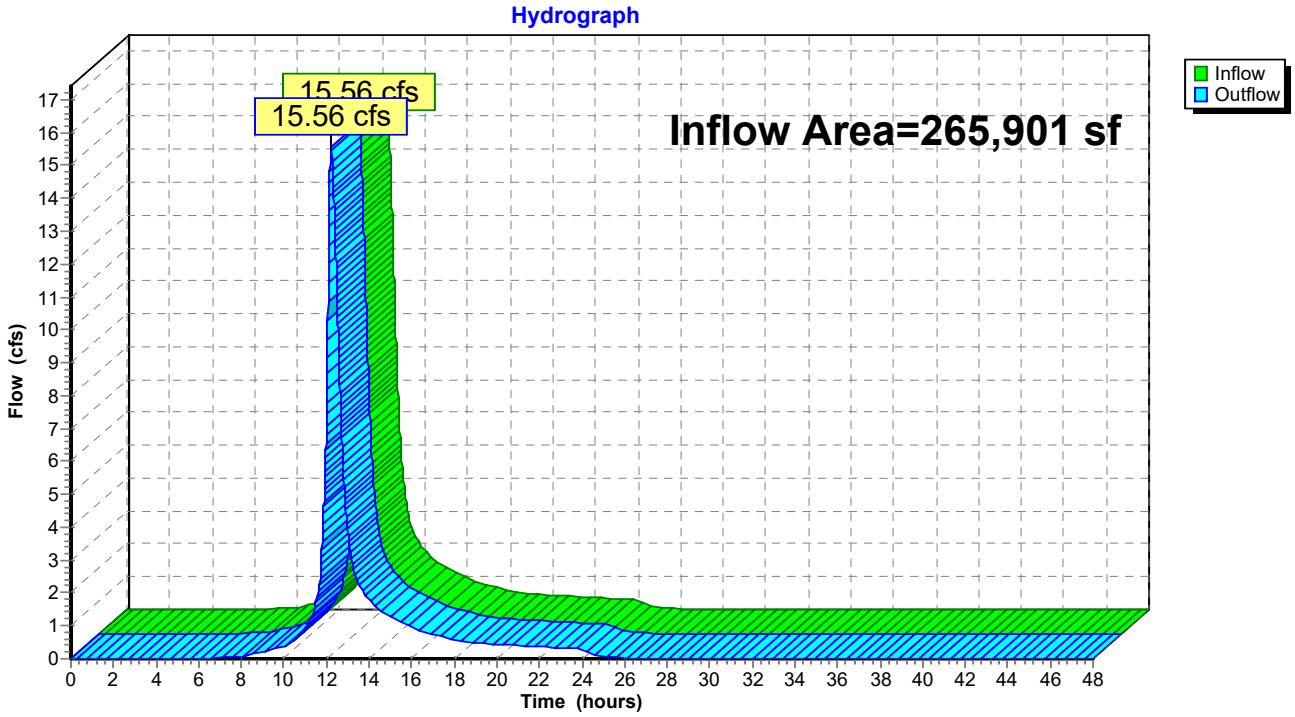


Summary for Reach DP-10: EX. CULVERT IN SOUTHEAST CORNER OF SITE

Inflow Area = 265,901 sf, 21.97% Impervious, Inflow Depth = 3.67" for 25-Year event
Inflow = 15.56 cfs @ 12.22 hrs, Volume= 81,284 cf
Outflow = 15.56 cfs @ 12.22 hrs, Volume= 81,284 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2

Reach DP-10: EX. CULVERT IN SOUTHEAST CORNER OF SITE



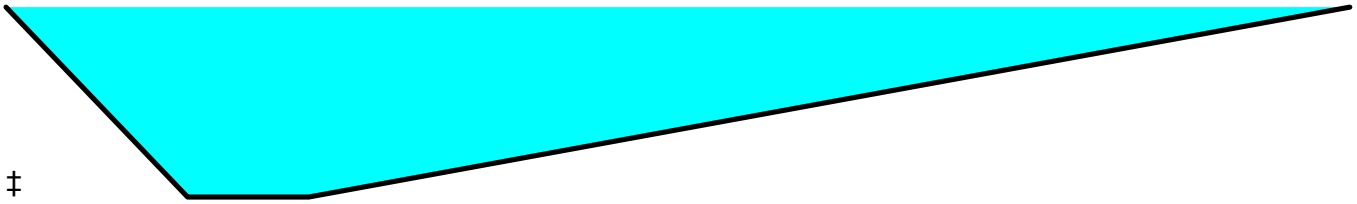
Summary for Reach S-1: PROPERTY LINE SWALE

Inflow Area = 58,655 sf, 10.65% Impervious, Inflow Depth = 3.61" for 25-Year event
Inflow = 3.92 cfs @ 12.23 hrs, Volume= 17,657 cf
Outflow = 3.87 cfs @ 12.27 hrs, Volume= 17,657 cf, Atten= 1%, Lag= 1.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.32 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.51 fps, Avg. Travel Time= 5.1 min

Peak Storage= 454 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 0.40' Flow Area= 2.4 sf, Capacity= 3.02 cfs

Custom cross-section, Length= 155.0' Slope= 0.0066 '/'
Constant n= 0.035 Earth, dense weeds
Inlet Invert= 209.78', Outlet Invert= 208.75'

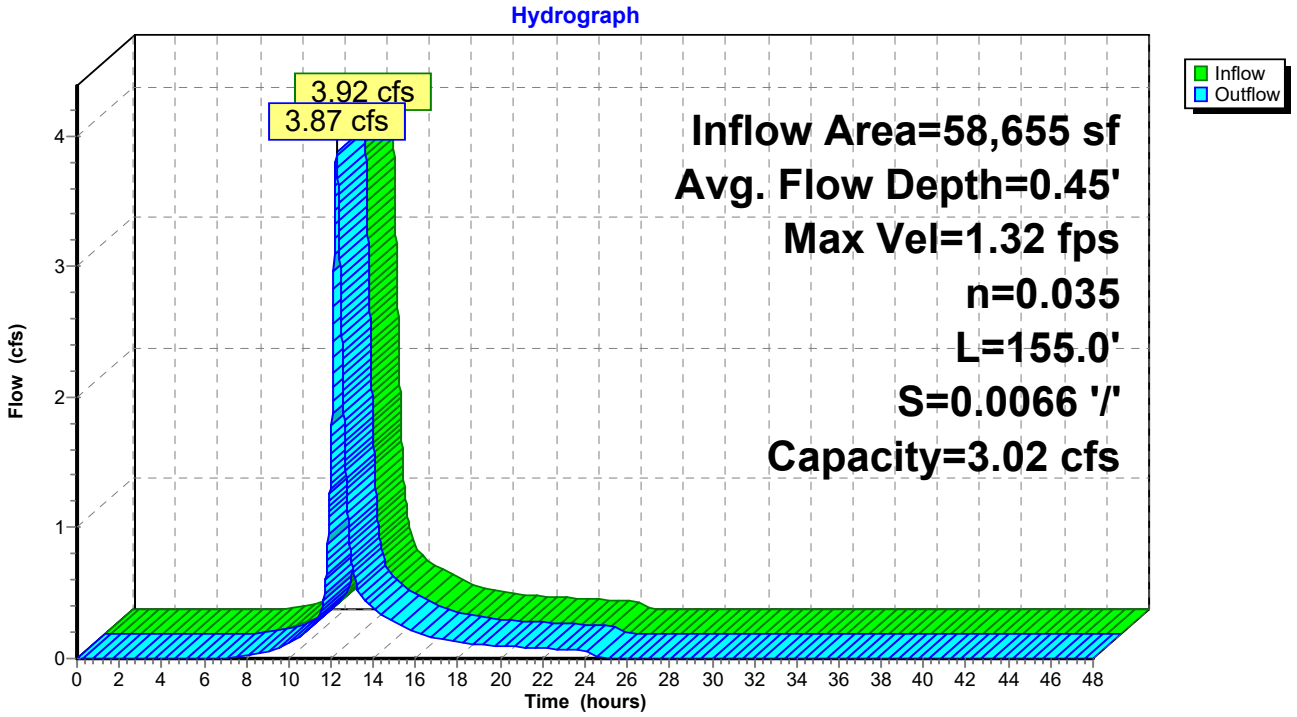


‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
-2.00	209.30	0.00
-0.50	208.90	0.40
0.50	208.90	0.40
9.10	209.30	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	1.0	0	0.00
0.40	2.4	11.2	375	3.02

Reach S-1: PROPERTY LINE SWALE



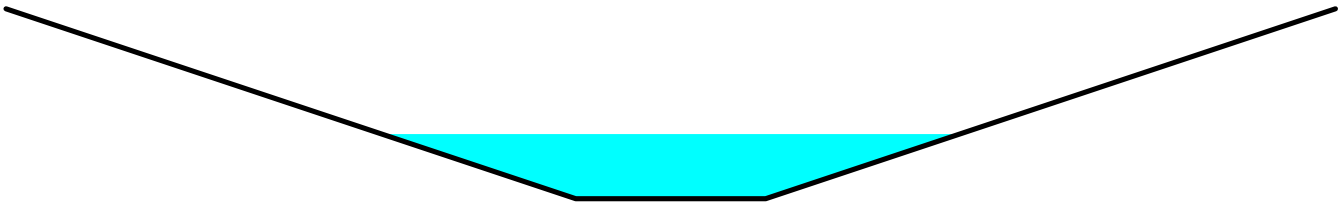
Summary for Reach S-2: WATER QUALITY SWALE

Inflow Area = 11,213 sf, 75.56% Impervious, Inflow Depth = 4.99" for 25-Year event
Inflow = 1.39 cfs @ 12.08 hrs, Volume= 4,663 cf
Outflow = 1.34 cfs @ 12.10 hrs, Volume= 4,663 cf, Atten= 3%, Lag= 1.2 min

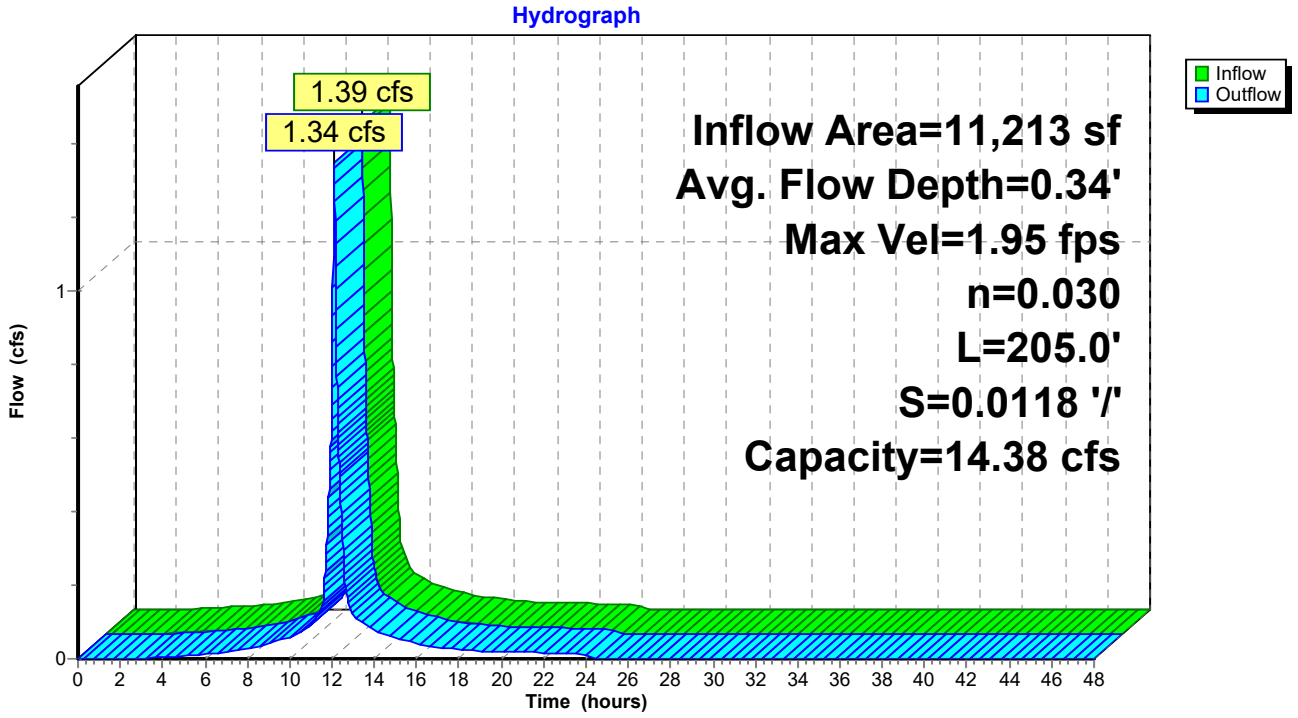
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.95 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 5.6 min

Peak Storage= 141 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.34'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 14.38 cfs

1.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 7.00'
Length= 205.0' Slope= 0.0118 '/'
Inlet Invert= 209.00', Outlet Invert= 206.58'



Reach S-2: WATER QUALITY SWALE



Summary for Pond 1P: PARKING ISLAND

Inflow Area = 17,305 sf, 74.80% Impervious, Inflow Depth = 4.88" for 25-Year event
Inflow = 1.96 cfs @ 12.11 hrs, Volume= 7,033 cf
Outflow = 1.95 cfs @ 12.12 hrs, Volume= 6,729 cf, Atten= 0%, Lag= 0.5 min
Primary = 1.95 cfs @ 12.12 hrs, Volume= 6,729 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 209.81' @ 12.12 hrs Surf.Area= 668 sf Storage= 376 cf

Plug-Flow detention time= 43.5 min calculated for 6,727 cf (96% of inflow)
Center-of-Mass det. time= 18.4 min (795.1 - 776.6)

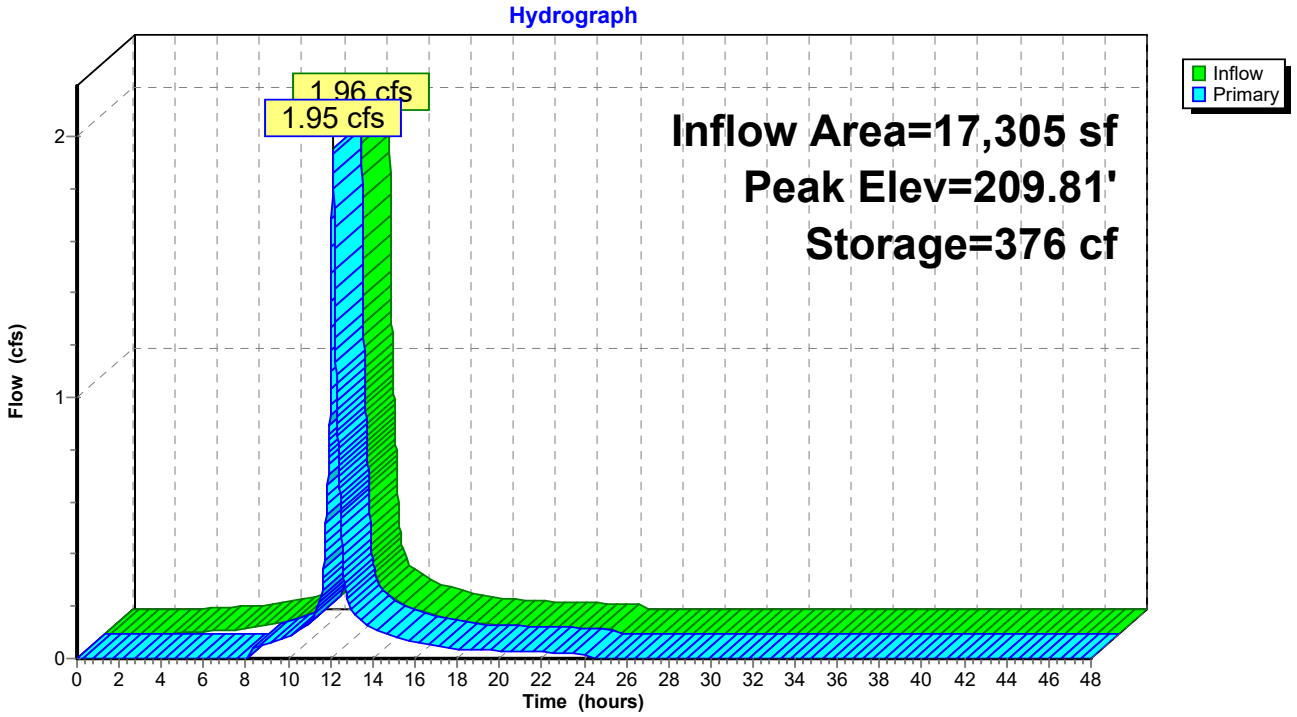
Volume	Invert	Avail.Storage	Storage Description
#1	209.00'	591 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
209.00	268	0	0
209.25	384	82	82
209.50	506	111	193
209.75	635	143	335
210.00	769	176	511
210.10	825	80	591

Device	Routing	Invert	Outlet Devices
#1	Primary	208.32'	**10.0" Round Culvert** L= 64.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.32' / 208.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Device 1	209.70'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.95 cfs @ 12.12 hrs HW=209.81' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 1.95 cfs of 2.14 cfs potential flow)
↑**2=Orifice/Grate** (Weir Controls 1.95 cfs @ 1.09 fps)

Pond 1P: PARKING ISLAND



Summary for Pond 2P: PARKING LOT RAIN GARDEN

Inflow Area = 27,044 sf, 76.83% Impervious, Inflow Depth = 4.99" for 25-Year event
Inflow = 3.10 cfs @ 12.11 hrs, Volume= 11,245 cf
Outflow = 3.07 cfs @ 12.13 hrs, Volume= 10,609 cf, Atten= 1%, Lag= 0.8 min
Primary = 3.07 cfs @ 12.13 hrs, Volume= 10,609 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 209.85' @ 12.13 hrs Surf.Area= 1,490 sf Storage= 848 cf

Plug-Flow detention time= 56.2 min calculated for 10,609 cf (94% of inflow)
Center-of-Mass det. time= 24.5 min (796.5 - 772.1)

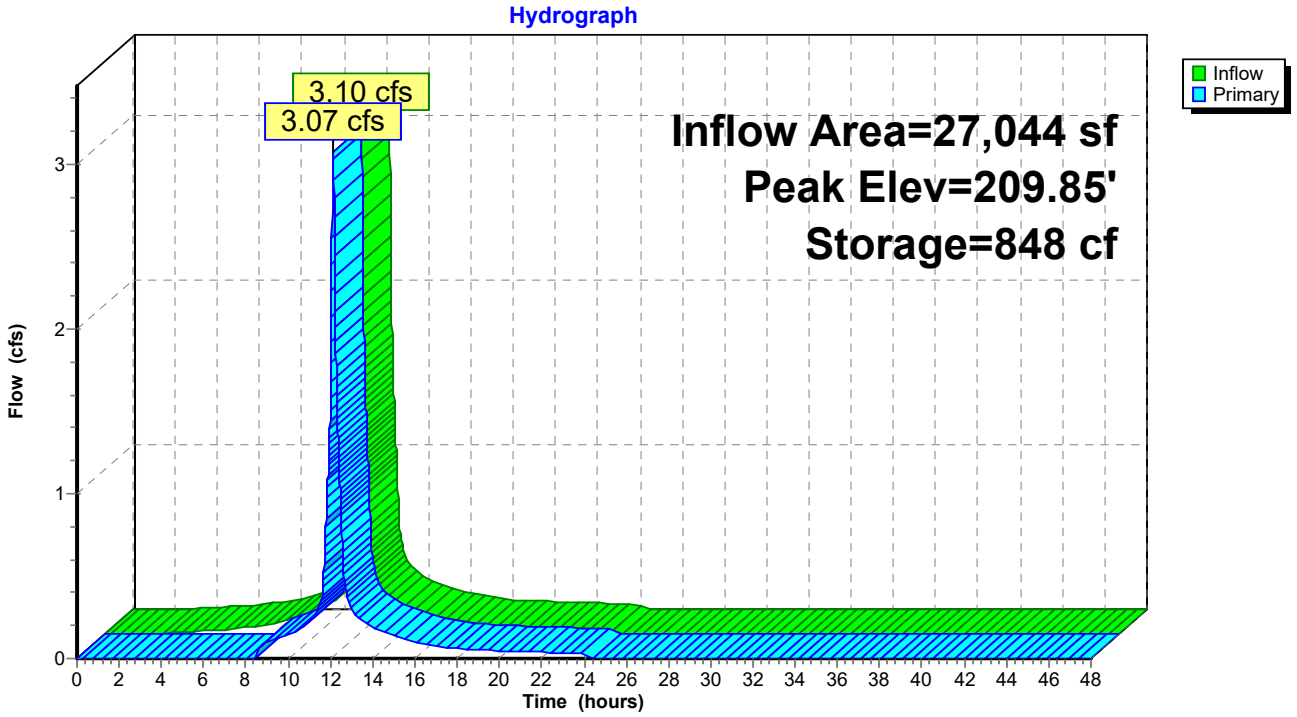
Volume	Invert	Avail.Storage	Storage Description
#1	209.00'	1,254 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
209.00	529	0	0
209.25	746	159	159
209.50	1,114	233	392
209.75	1,380	312	704
210.00	1,653	379	1,083
210.10	1,765	171	1,254

Device	Routing	Invert	Outlet Devices
#1	Primary	208.56'	**12.0" Round Culvert X 2.00** L= 52.8' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.56' / 208.30' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	209.70'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.06 cfs @ 12.13 hrs HW=209.85' TW=209.39' (Dynamic Tailwater)
↑**1=Culvert** (Passes 3.06 cfs of 4.96 cfs potential flow)
↑**2=Orifice/Grate** (Weir Controls 3.06 cfs @ 1.27 fps)

Pond 2P: PARKING LOT RAIN GARDEN



Summary for Pond 3P: WETLAND BASIN-1

Inflow Area = 115,261 sf, 22.41% Impervious, Inflow Depth = 3.60" for 25-Year event
Inflow = 8.92 cfs @ 12.15 hrs, Volume= 34,590 cf
Outflow = 5.73 cfs @ 12.33 hrs, Volume= 33,441 cf, Atten= 36%, Lag= 10.6 min
Primary = 5.73 cfs @ 12.33 hrs, Volume= 33,441 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 208.30' Surf.Area= 4,952 sf Storage= 1,230 cf
Peak Elev= 209.64' @ 12.33 hrs Surf.Area= 7,177 sf Storage= 8,921 cf (7,691 cf above start)

Plug-Flow detention time= 89.6 min calculated for 32,211 cf (93% of inflow)
Center-of-Mass det. time= 46.0 min (864.4 - 818.4)

Volume	Invert	Avail.Storage	Storage Description
#1	207.50'	6,191 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
#2A	208.10'	0 cf	**39.06'W x 73.72'L x 2.69'H Field A** 7,756 cf Overall - 3,995 cf Embedded = 3,761 cf x 0.0% Voids
#3A	208.35'	3,795 cf	**ACF R-Tank HD 1** x 899 Inside #2 Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf 899 Chambers in 29 Rows
#4	208.35'	123 cf	**15.0" Round Pipe Storage** L= 100.0'
#5	207.50'	8,004 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
		18,112 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
207.50	503	0	0
208.00	756	315	315
208.50	1,031	447	762
209.00	1,332	591	1,352
209.50	1,812	786	2,138
210.00	2,398	1,053	3,191
210.50	2,997	1,349	4,540
210.75	3,302	787	5,327
211.00	3,610	864	6,191

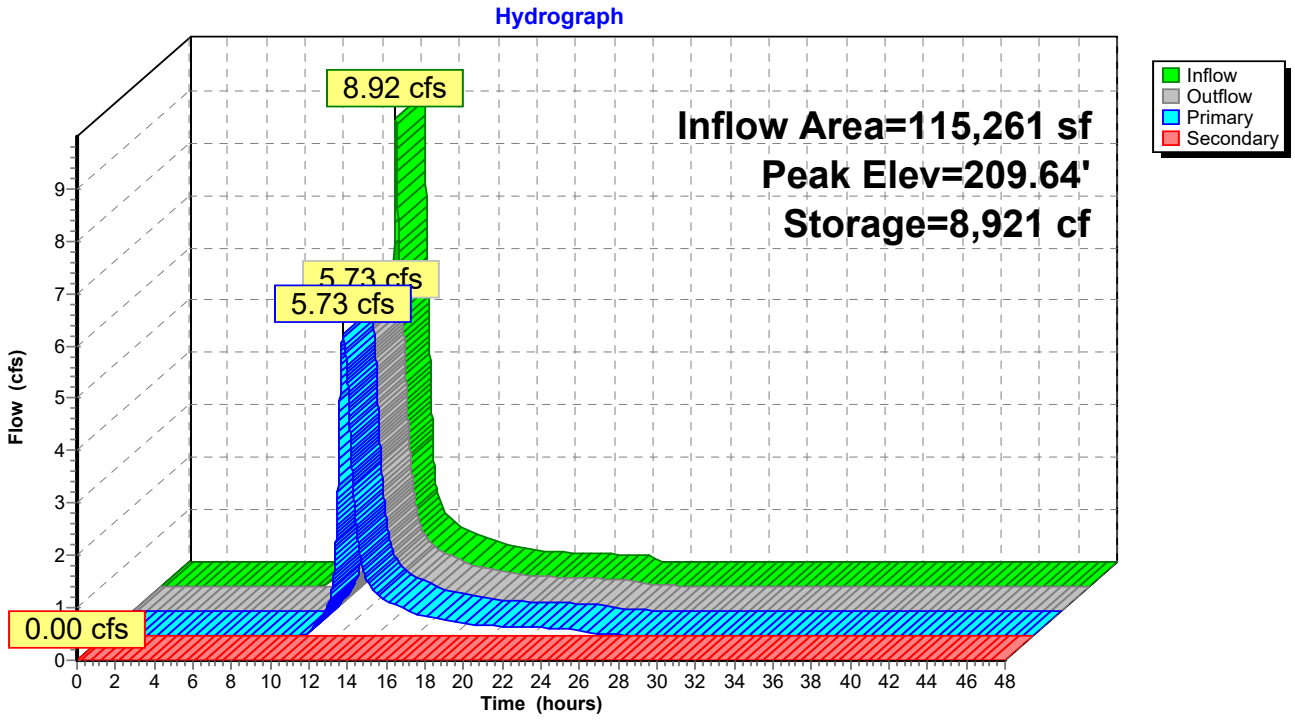
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
207.50	515	0	0
208.00	905	355	355
208.50	1,316	555	910
209.00	1,741	764	1,675
210.00	2,633	2,187	3,862
210.50	3,101	1,434	5,295
210.75	6,067	1,146	6,441
211.00	6,433	1,563	8,004

Device	Routing	Invert	Outlet Devices
#1	Secondary	209.75'	**10.0' long x 9.5' breadth Broad-Crested Rectangular Weir X 2.00** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 Coef. (English) 2.48 2.55 2.70 2.69 2.68 2.69 2.67 2.64 2.64 2.64 2.64 2.64 2.65 2.65 2.66
#2	Primary	208.55'	**12.0" Round Culvert X 2.00** L= 110.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.55' / 208.00' S= 0.0050 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#3	Device 2	208.38'	**12.0" W x 3.0" H Vert. WQV Orifice X 4.00** C= 0.600
#4	Device 2	209.05'	**12.0" W x 3.0" H Vert. 2-YR Orifice X 4.00** C= 0.600
#5	Device 2	209.43'	**12.0" W x 3.0" H Vert. 10-YR Orifice X 4.00** C= 0.600
#6	Device 2	209.64'	**48.0" x 48.0" Horiz. 25-YR Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.73 cfs @ 12.33 hrs HW=209.64' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Barrel Controls 5.73 cfs @ 4.15 fps)
  ├─**3=WQV Orifice** (Passes < 5.01 cfs potential flow)
  ├─**4=2-YR Orifice** (Passes < 3.29 cfs potential flow)
  ├─**5=10-YR Orifice** (Passes < 1.28 cfs potential flow)
  └─**6=25-YR Orifice** (Passes < 0.02 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=208.30' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: WETLAND BASIN-1

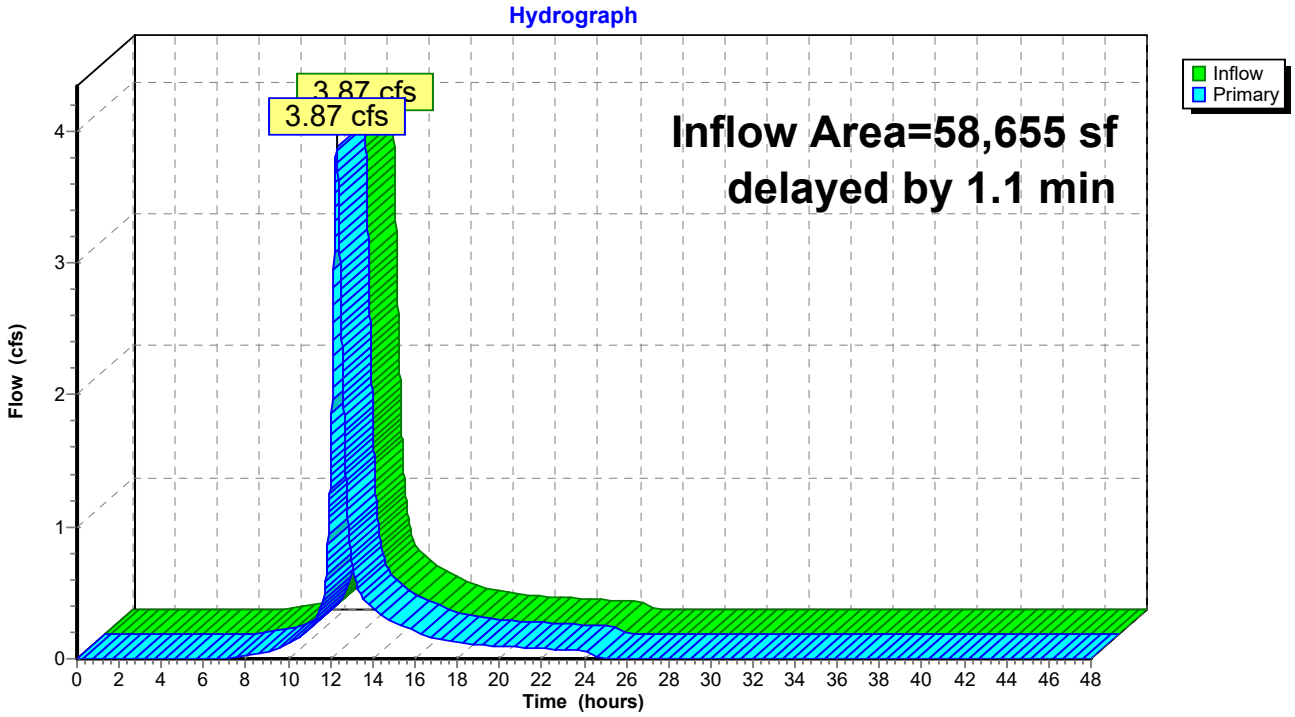


Summary for Link L-1: C-1 FLOWS THRU SOUTH FARM DITCH

Inflow Area = 58,655 sf, 10.65% Impervious, Inflow Depth = 3.61" for 25-Year event
Inflow = 3.87 cfs @ 12.27 hrs, Volume= 17,657 cf
Primary = 3.87 cfs @ 12.29 hrs, Volume= 17,657 cf, Atten= 0%, Lag= 1.1 min

Primary outflow = Inflow delayed by 1.1 min, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link L-1: C-1 FLOWS THRU SOUTH FARM DITCH

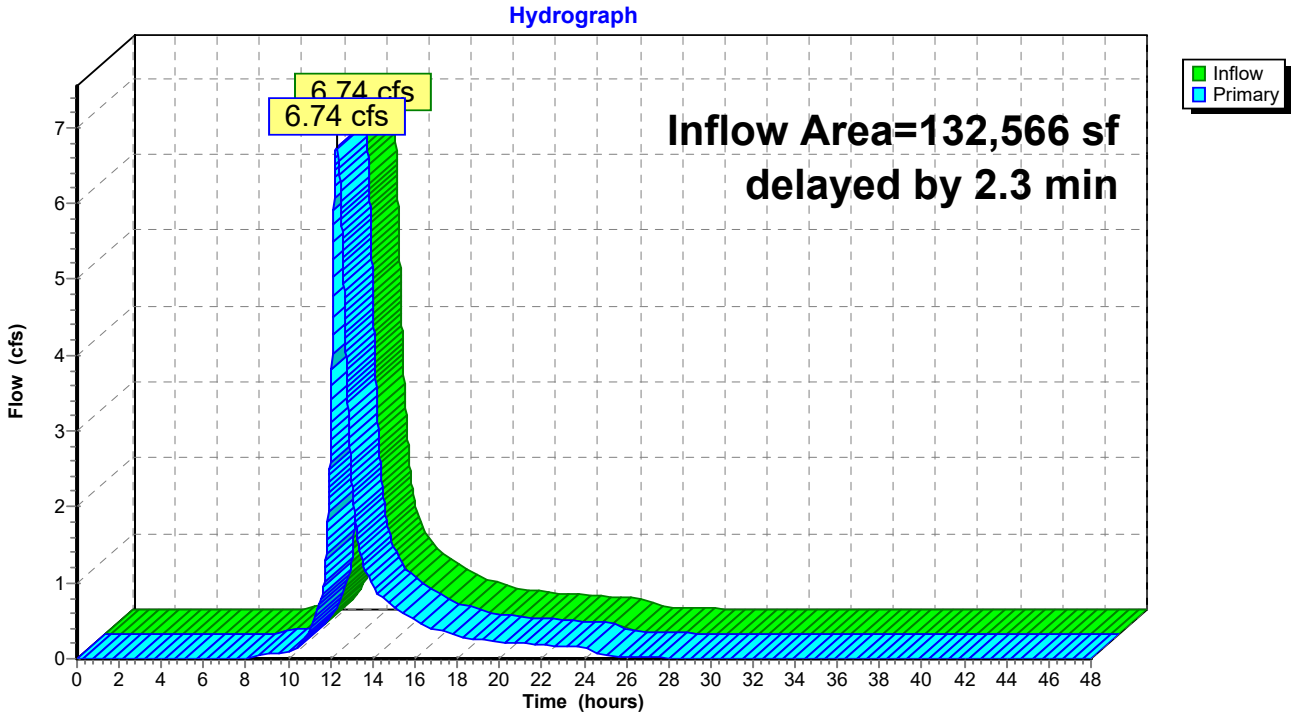


Summary for Link L-2: WB-1 FLOWS THRU SOUTH FARM DITCH

Inflow Area = 132,566 sf, 29.25% Impervious, Inflow Depth = 3.64" for 25-Year event
Inflow = 6.74 cfs @ 12.26 hrs, Volume= 40,170 cf
Primary = 6.74 cfs @ 12.30 hrs, Volume= 40,170 cf, Atten= 0%, Lag= 2.3 min

Primary outflow = Inflow delayed by 2.3 min, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link L-2: WB-1 FLOWS THRU SOUTH FARM DITCH



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P-1: SMALL FIELD Runoff Area=44,152 sf 0.99% Impervious Runoff Depth=4.50"
Flow Length=483' Tc=14.1 min CN=76 Runoff=4.13 cfs 16,551 cf

Subcatchment P-2: SOUTH PARKING Runoff Area=6,480 sf 28.63% Impervious Runoff Depth=5.51"
Flow Length=36' Slope=0.0800 '/' Tc=6.0 min CN=85 Runoff=0.93 cfs 2,976 cf

Subcatchment P-3E: PARKING LOT & Runoff Area=17,305 sf 74.80% Impervious Runoff Depth=6.44"
Tc=8.3 min CN=93 Runoff=2.55 cfs 9,285 cf

Subcatchment P-3W: PARKING LOT & Runoff Area=27,044 sf 76.83% Impervious Runoff Depth=6.56"
Flow Length=219' Tc=8.3 min CN=94 Runoff=4.02 cfs 14,776 cf

Subcatchment P-4: BANDSHELL AREA Runoff Area=5,817 sf 8.60% Impervious Runoff Depth=5.17"
Flow Length=209' Tc=9.6 min CN=82 Runoff=0.71 cfs 2,506 cf

Subcatchment P-5: PLAYGROUND AREA Runoff Area=52,838 sf 10.88% Impervious Runoff Depth=5.06"
Flow Length=212' Tc=18.5 min CN=81 Runoff=4.95 cfs 22,266 cf

Subcatchment P-6: RUN-ON FROM Runoff Area=31,494 sf 14.32% Impervious Runoff Depth=5.28"
Flow Length=404' Tc=13.7 min CN=83 Runoff=3.45 cfs 13,865 cf

Subcatchment P-7: ENTRANCE DRIVEWAY Runoff Area=11,213 sf 75.56% Impervious Runoff Depth=6.56"
Flow Length=75' Tc=6.0 min CN=94 Runoff=1.80 cfs 6,126 cf

Subcatchment P-8: LARGE FIELD Runoff Area=37,585 sf 7.36% Impervious Runoff Depth=4.72"
Flow Length=174' Tc=12.1 min CN=78 Runoff=3.90 cfs 14,785 cf

Subcatchment P-9: UNDEVELOPED SOUTH Runoff Area=31,973 sf 1.32% Impervious Runoff Depth=4.72"
Flow Length=730' Tc=11.8 min CN=78 Runoff=3.34 cfs 12,577 cf

Reach C-1: DRIVEWAY CULVERT Avg. Flow Depth=0.87' Max Vel=5.95 fps Inflow=5.39 cfs 24,772 cf
15.0" Round Pipe n=0.013 L=73.3' S=0.0102 '/' Capacity=6.53 cfs Outflow=5.39 cfs 24,772 cf

Reach DP-10: EX. CULVERT IN SOUTHEAST CORNER OF SITE Inflow=22.57 cfs 113,625 cf
Outflow=22.57 cfs 113,625 cf

Reach S-1: PROPERTY LINE SWALE Avg. Flow Depth=0.53' Max Vel=1.40 fps Inflow=5.45 cfs 24,772 cf
n=0.035 L=155.0' S=0.0066 '/' Capacity=3.02 cfs Outflow=5.39 cfs 24,772 cf

Reach S-2: WATER QUALITY SWALE Avg. Flow Depth=0.39' Max Vel=2.09 fps Inflow=1.80 cfs 6,126 cf
n=0.030 L=205.0' S=0.0118 '/' Capacity=14.38 cfs Outflow=1.75 cfs 6,126 cf

Pond 1P: PARKING ISLAND Peak Elev=209.93' Storage=458 cf Inflow=2.55 cfs 9,285 cf
Outflow=2.27 cfs 8,981 cf

Pond 2P: PARKING LOT RAIN GARDEN Peak Elev=209.99' Storage=1,073 cf Inflow=4.02 cfs 14,776 cf
Outflow=3.92 cfs 14,140 cf

Pond 3P: WETLAND BASIN-1 Peak Elev=209.90' Storage=10,481 cf Inflow=11.83 cfs 48,452 cf
Primary=6.46 cfs 45,401 cf Secondary=2.90 cfs 1,903 cf Outflow=9.26 cfs 47,303 cf

Link L-1: C-1 FLOWS THRU SOUTH FARM DITCH delayed by 1.1 min Inflow=5.39 cfs 24,772 cf
Primary=5.39 cfs 24,772 cf

Link L-2: WB-1 FLOWS THRU SOUTH FARM DITCH delayed by 2.3 min Inflow=10.87 cfs 56,284 cf
Primary=10.84 cfs 56,284 cf

Total Runoff Area = 265,901 sf Runoff Volume = 115,714 cf Average Runoff Depth = 5.22"
78.03% Pervious = 207,472 sf 21.97% Impervious = 58,429 sf

Summary for Subcatchment P-1: SMALL FIELD

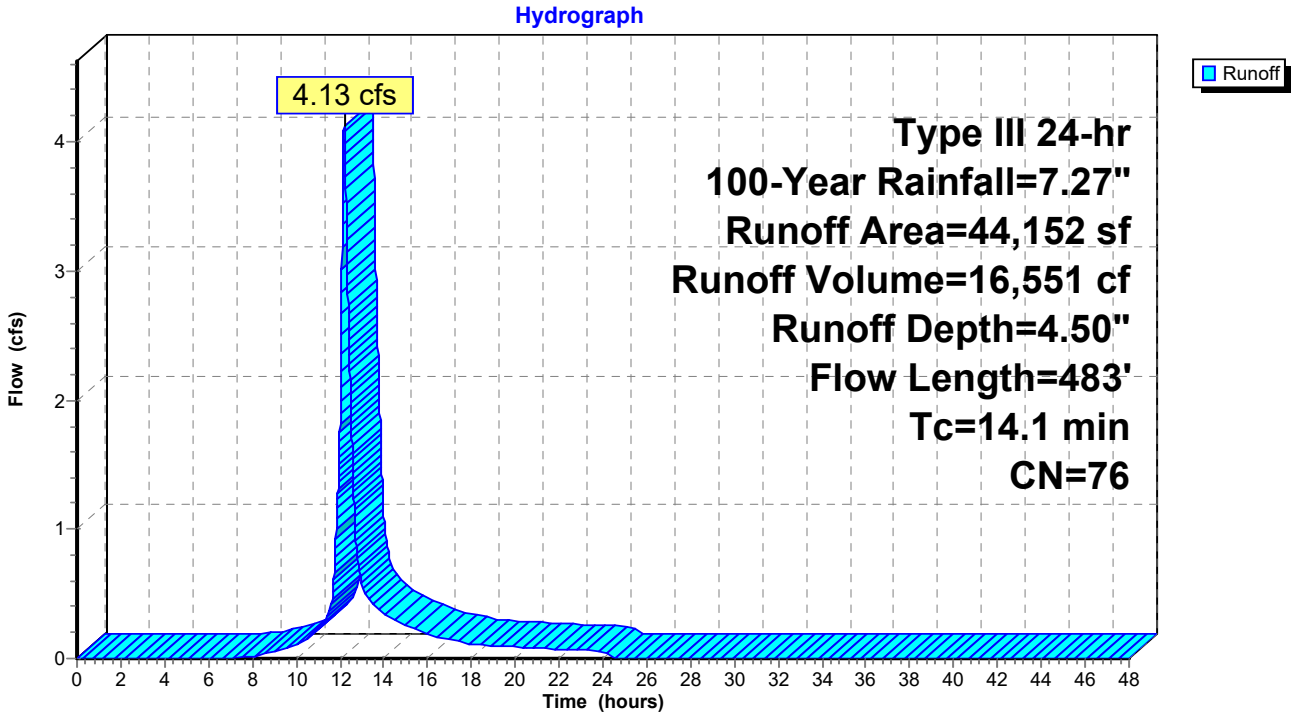
Runoff = 4.13 cfs @ 12.19 hrs, Volume= 16,551 cf, Depth= 4.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.27"

	Area (sf)	CN	Description
	435	98	Paved parking, HSG D
	12,217	80	>75% Grass cover, Good, HSG D
*	31,500	74	Soccer Field, Good, HSG C
	44,152	76	Weighted Average
	43,717		99.01% Pervious Area
	435		0.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER SOCCER FIELD** Grass: Dense n= 0.240 P2= 3.01"
0.9	90	0.0100	1.61		**Shallow Concentrated Flow, OVER SOCCER FIELD** Unpaved Kv= 16.1 fps
0.1	17	0.0500	3.60		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.9	326	0.0050	2.84	1.55	**Pipe Channel, SOUTH COLLECTOR** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
14.1	483	Total			

Subcatchment P-1: SMALL FIELD



Summary for Subcatchment P-2: SOUTH PARKING STALLS

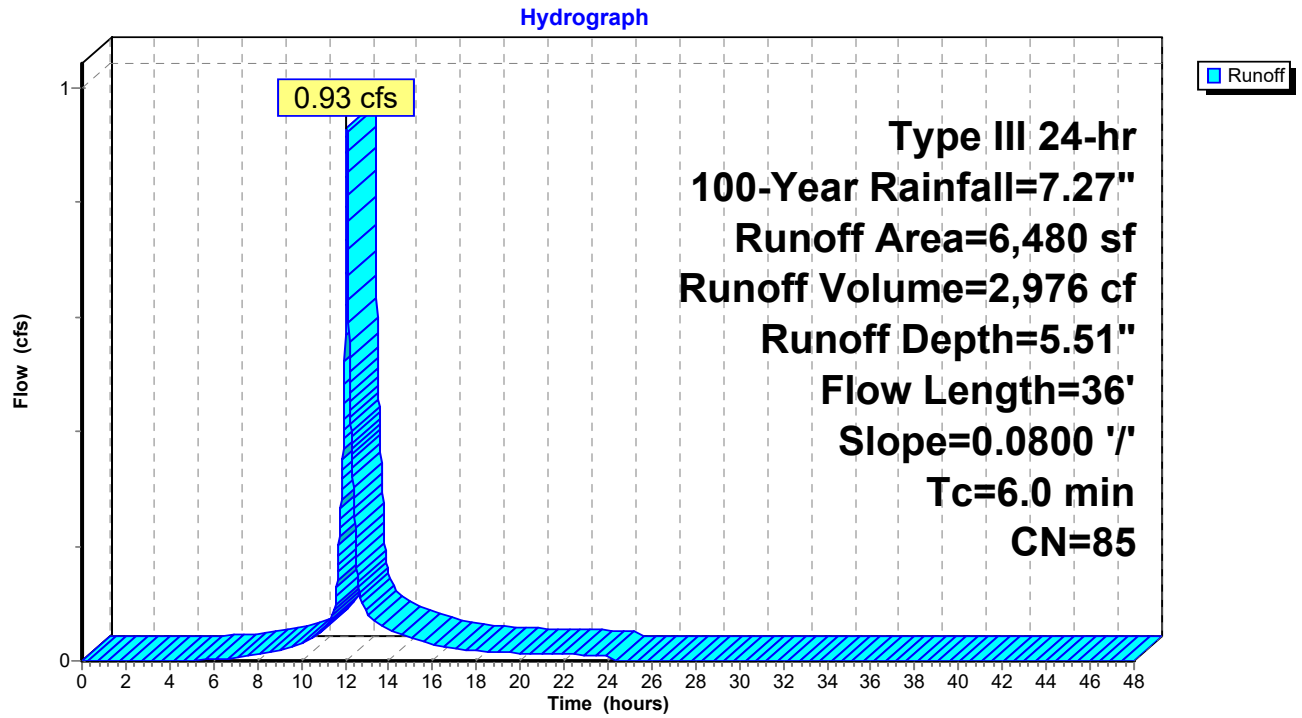
Runoff = 0.93 cfs @ 12.09 hrs, Volume= 2,976 cf, Depth= 5.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.27"

Area (sf)	CN	Description
1,855	98	Paved parking, HSG D
4,625	80	>75% Grass cover, Good, HSG D
6,480	85	Weighted Average
4,625		71.37% Pervious Area
1,855		28.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	36	0.0800	0.16		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
3.7	36	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-2: SOUTH PARKING STALLS



Summary for Subcatchment P-3E: PARKING LOT & CONCESSION AREA

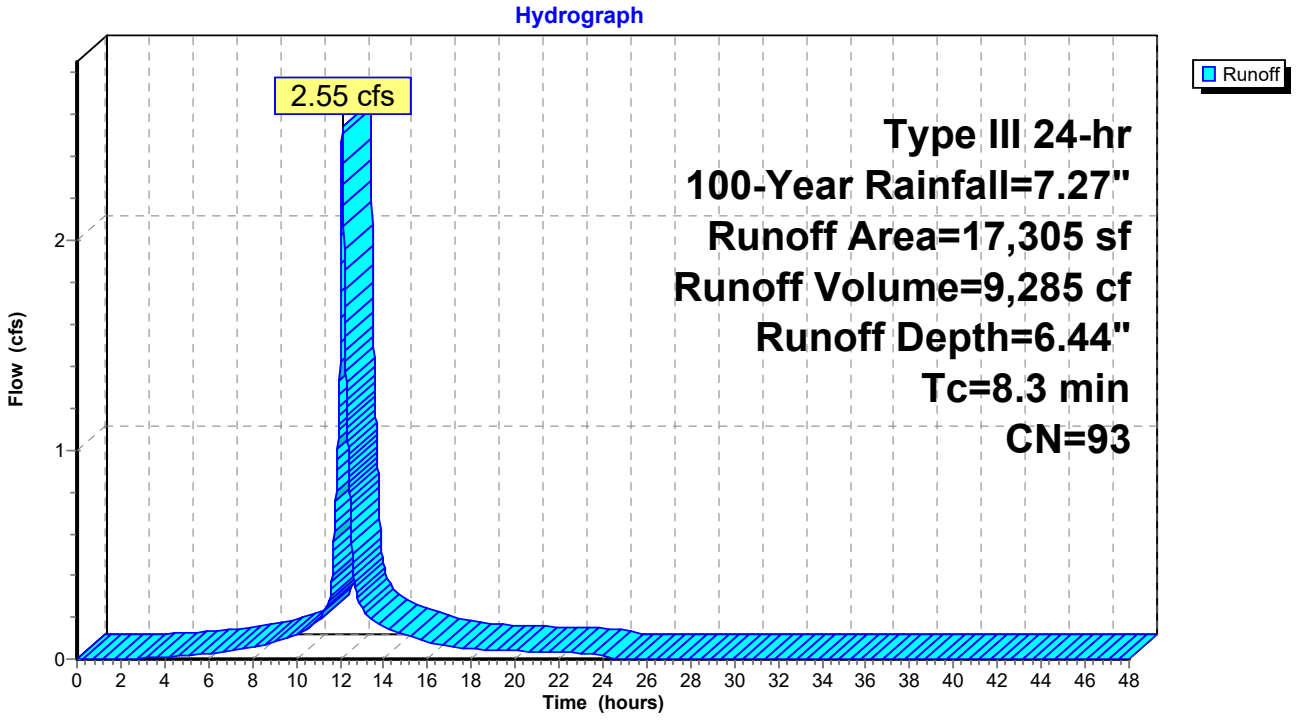
Runoff = 2.55 cfs @ 12.11 hrs, Volume= 9,285 cf, Depth= 6.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.27"

Area (sf)	CN	Description
1,125	98	Roofs, HSG D
11,820	98	Paved parking, HSG D
4,360	80	>75% Grass cover, Good, HSG D
17,305	93	Weighted Average
4,360		25.20% Pervious Area
12,945		74.80% Impervious Area

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

Subcatchment P-3E: PARKING LOT & CONCESSION AREA



Summary for Subcatchment P-3W: PARKING LOT & BASKETBALL COURT

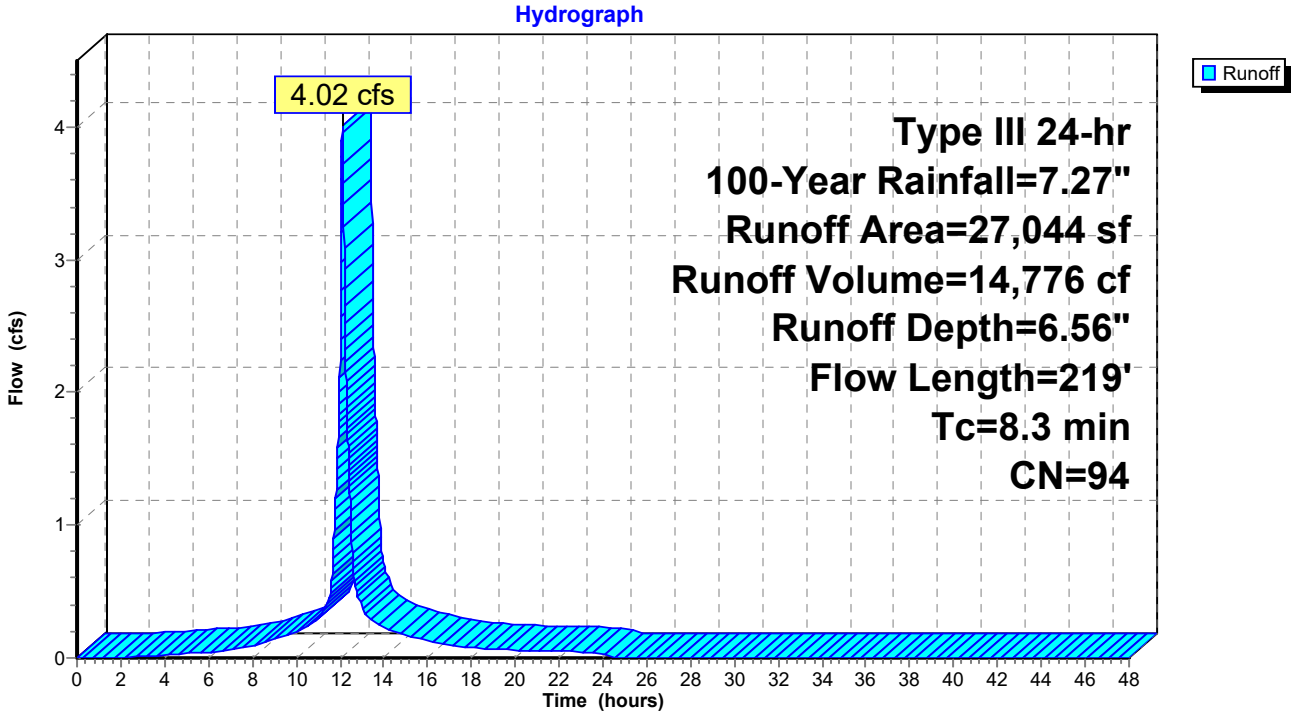
Runoff = 4.02 cfs @ 12.11 hrs, Volume= 14,776 cf, Depth= 6.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.27"

Area (sf)	CN	Description
20,777	98	Paved parking, HSG D
6,267	80	>75% Grass cover, Good, HSG D
27,044	94	Weighted Average
6,267		23.17% Pervious Area
20,777		76.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	47	0.0280	0.11		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
0.8	103	0.0165	2.07		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
0.5	69	0.0125	2.27		**Shallow Concentrated Flow, OVER PVMT** Paved Kv= 20.3 fps
8.3	219	Total			

Subcatchment P-3W: PARKING LOT & BASKETBALL COURT



Summary for Subcatchment P-4: BANDSHELL AREA

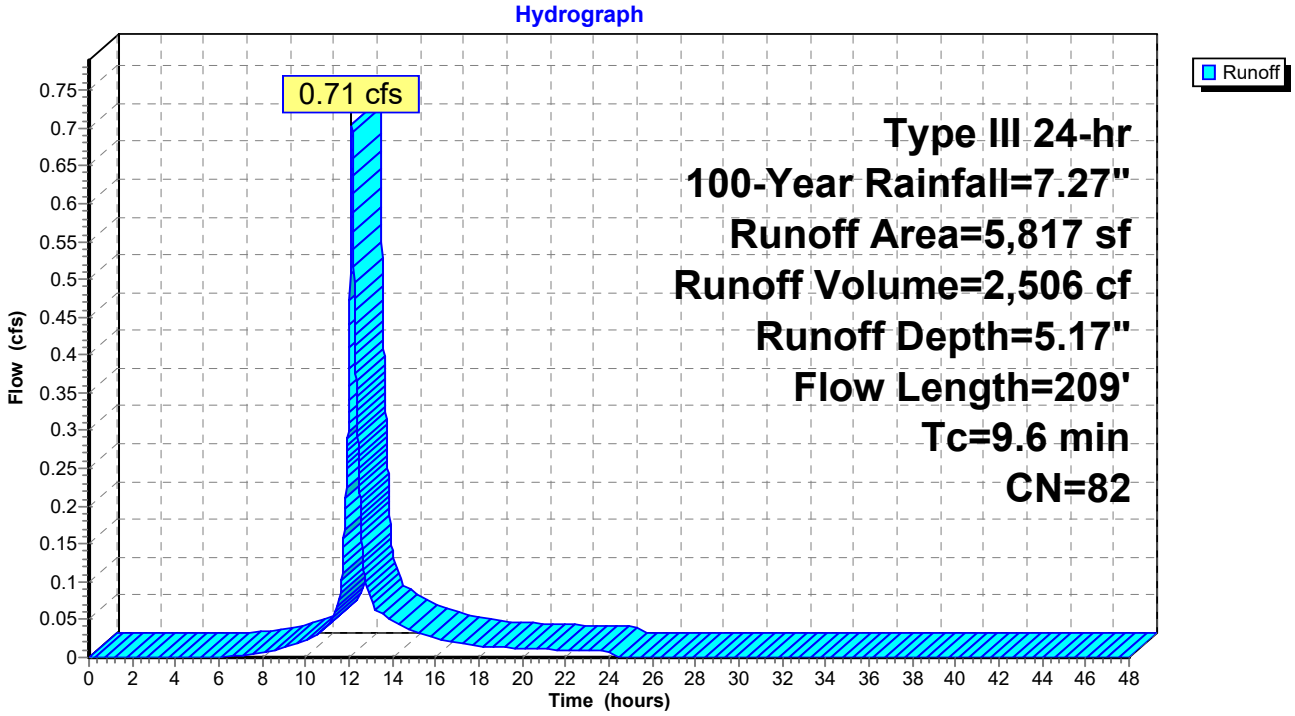
Runoff = 0.71 cfs @ 12.13 hrs, Volume= 2,506 cf, Depth= 5.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.27"

Area (sf)	CN	Description
500	98	Paved parking, HSG D
5,317	80	>75% Grass cover, Good, HSG D
5,817	82	Weighted Average
5,317		91.40% Pervious Area
500		8.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0200	0.10		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
0.1	19	0.0380	3.14		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.0	140	0.0050	2.45	0.85	**Pipe Channel, BANDSHELL COLLECTOR** 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.013 Corrugated PE, smooth interior
9.6	209	Total			

Subcatchment P-4: BANDSHELL AREA



Summary for Subcatchment P-5: PLAYGROUND AREA

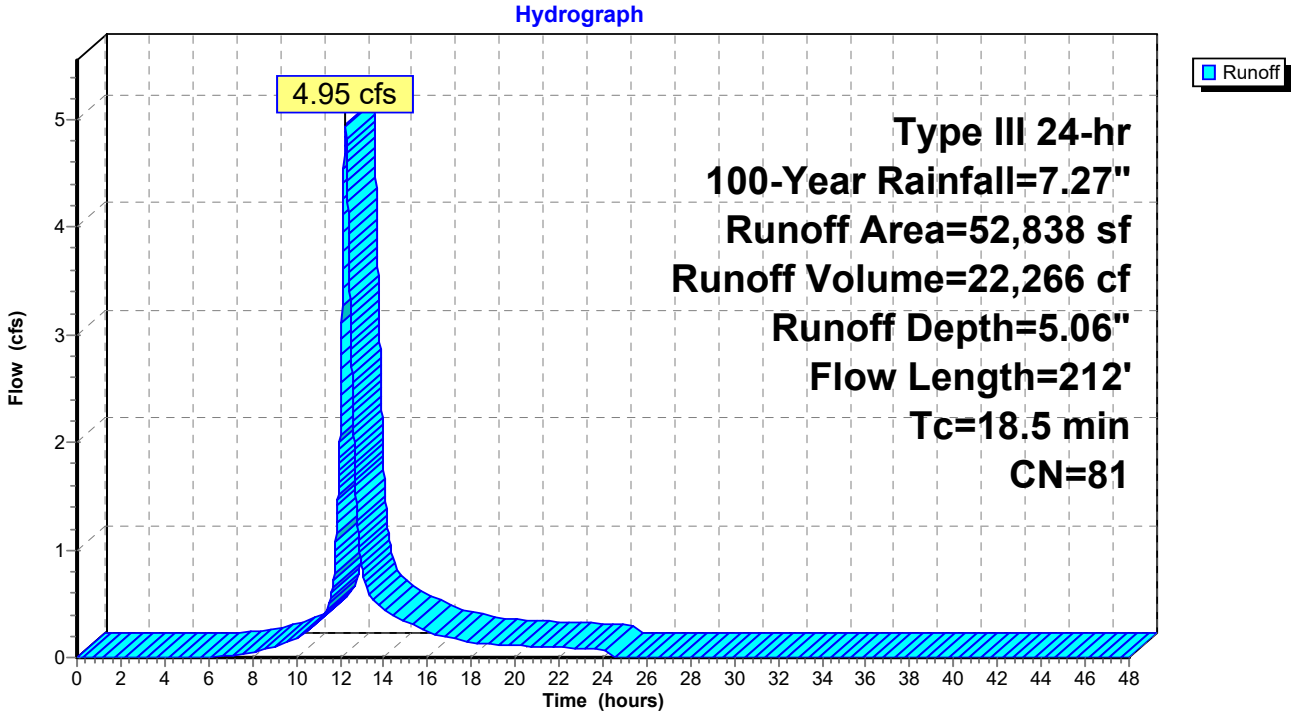
Runoff = 4.95 cfs @ 12.25 hrs, Volume= 22,266 cf, Depth= 5.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.27"

Area (sf)	CN	Description
2,417	98	Roofs, HSG D
3,330	98	Paved parking, HSG D
29,631	80	>75% Grass cover, Good, HSG D
17,460	77	Woods, Good, HSG D
52,838	81	Weighted Average
47,091		89.12% Pervious Area
5,747		10.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	50	0.0100	0.05		**Sheet Flow, THRU WOODS** Woods: Light underbrush n= 0.400 P2= 3.01"
0.4	42	0.0100	1.61		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.3	120	0.0050	1.54	0.13	**Pipe Channel, THRU FRENCH DRAIN** 4.0" Round Area= 0.1 sf Perim= 1.0' r= 0.08' n= 0.013 Corrugated PE, smooth interior
18.5	212	Total			

Subcatchment P-5: PLAYGROUND AREA



Summary for Subcatchment P-6: RUN-ON FROM ABUTTER NORTH OF DRIVEWAY

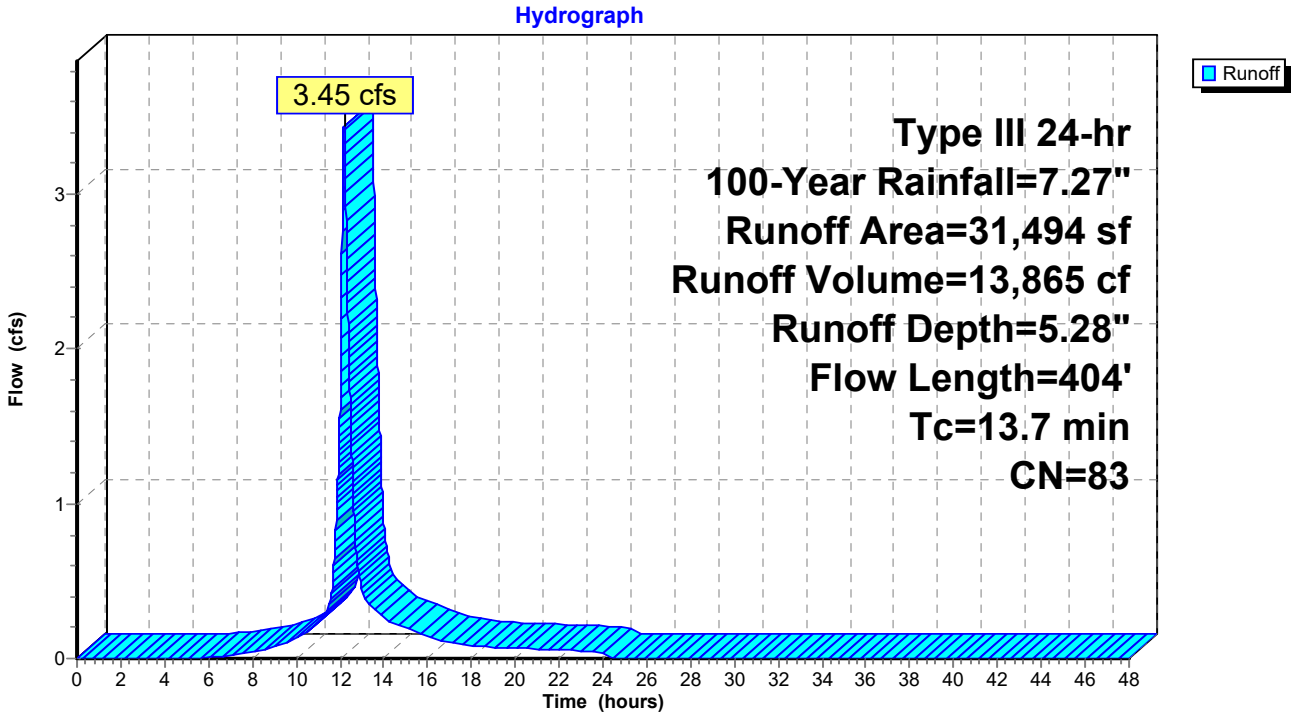
Runoff = 3.45 cfs @ 12.19 hrs, Volume= 13,865 cf, Depth= 5.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.27"

Area (sf)	CN	Description
2,626	98	Roofs, HSG D
1,883	98	Paved parking, HSG D
23,946	80	>75% Grass cover, Good, HSG D
2,348	91	Gravel roads, HSG D
691	77	Woods, Good, HSG D
31,494	83	Weighted Average
26,985		85.68% Pervious Area
4,509		14.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
1.1	110	0.0100	1.61		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.4	244	0.0050	2.84	1.55	**Pipe Channel,** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
13.7	404	Total			

Subcatchment P-6: RUN-ON FROM ABUTTER NORTH OF DRIVEWAY



Summary for Subcatchment P-7: ENTRANCE DRIVEWAY

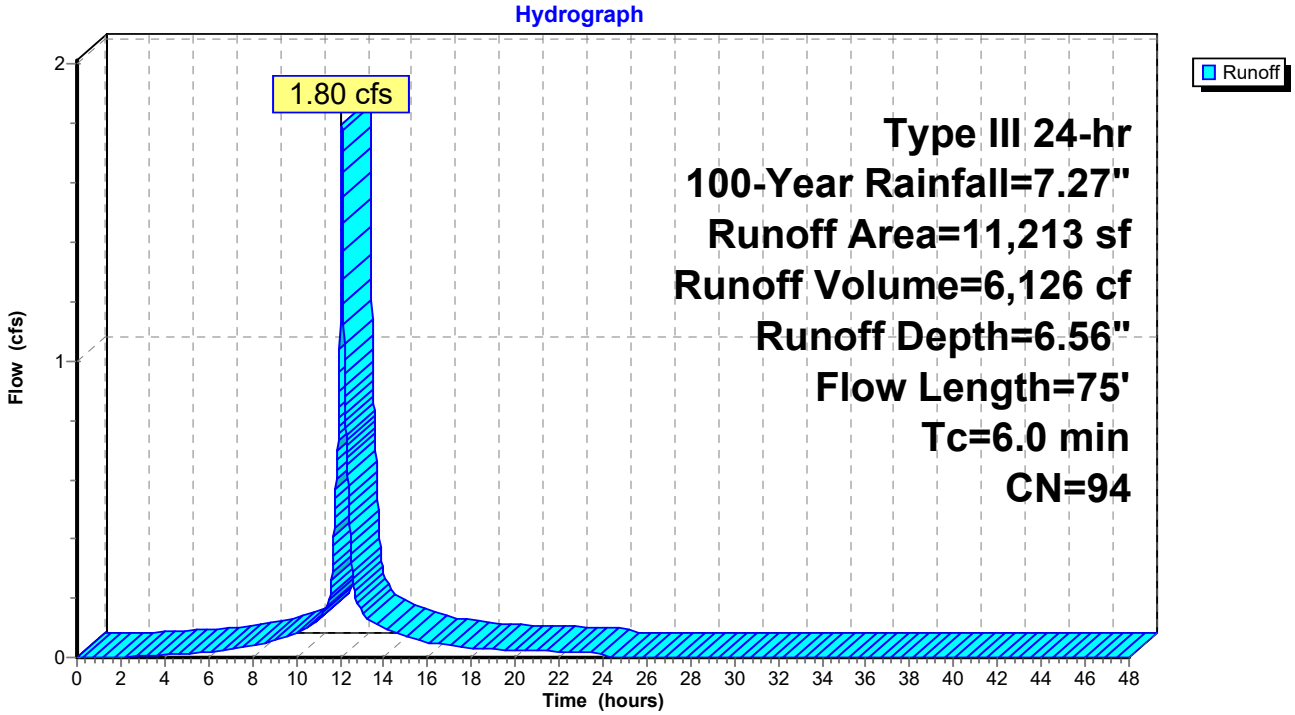
Runoff = 1.80 cfs @ 12.08 hrs, Volume= 6,126 cf, Depth= 6.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.27"

Area (sf)	CN	Description
8,472	98	Paved parking, HSG D
2,741	80	>75% Grass cover, Good, HSG D
11,213	94	Weighted Average
2,741		24.44% Pervious Area
8,472		75.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	44	0.0275	1.29		**Sheet Flow, OVER PVMT** Smooth surfaces n= 0.011 P2= 3.01"
0.1	22	0.0150	2.49		**Shallow Concentrated Flow, OVER PVMT** Paved Kv= 20.3 fps
0.0	9	0.0200	6.42	3.21	**Trap/Vee/Rect Channel Flow, THRU SW CHASE** Bot.W=1.00' D=0.50' n= 0.013 Concrete, trowel finish
0.7	75	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P-7: ENTRANCE DRIVEWAY



Summary for Subcatchment P-8: LARGE FIELD SOUTHEAST

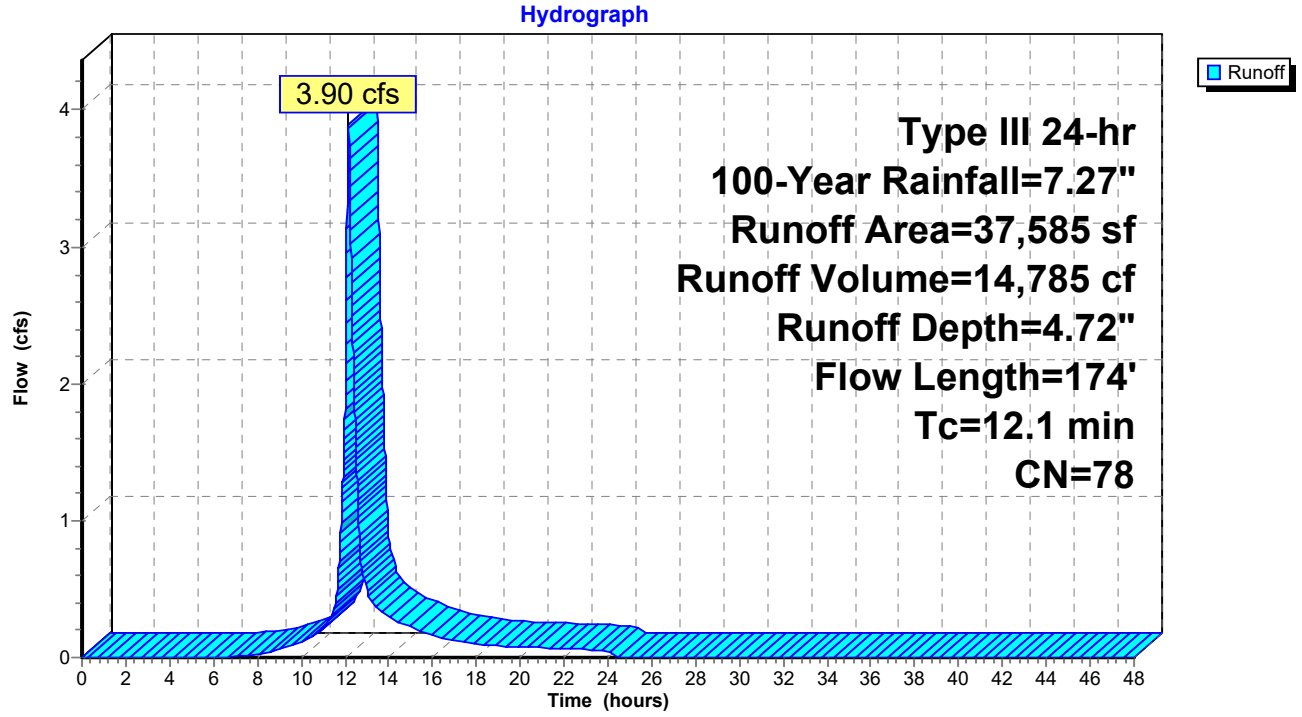
Runoff = 3.90 cfs @ 12.17 hrs, Volume= 14,785 cf, Depth= 4.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.27"

	Area (sf)	CN	Description
	1,500	98	Roofs, HSG D
	1,267	98	Paved parking, HSG D
	15,907	80	>75% Grass cover, Good, HSG D
	11	91	Gravel roads, HSG D
*	18,900	74	Soccer Field, Good, HSG C
	37,585	78	Weighted Average
	34,818		92.64% Pervious Area
	2,767		7.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER SOCCER FIELD** Grass: Dense n= 0.240 P2= 3.01"
0.6	55	0.0100	1.61		**Shallow Concentrated Flow, OVER SOCCER FIELD** Unpaved Kv= 16.1 fps
0.3	69	0.0650	4.10		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
12.1	174	Total			

Subcatchment P-8: LARGE FIELD SOUTHEAST



Summary for Subcatchment P-9: UNDEVELOPED SOUTH SIDE OF PROPERTY

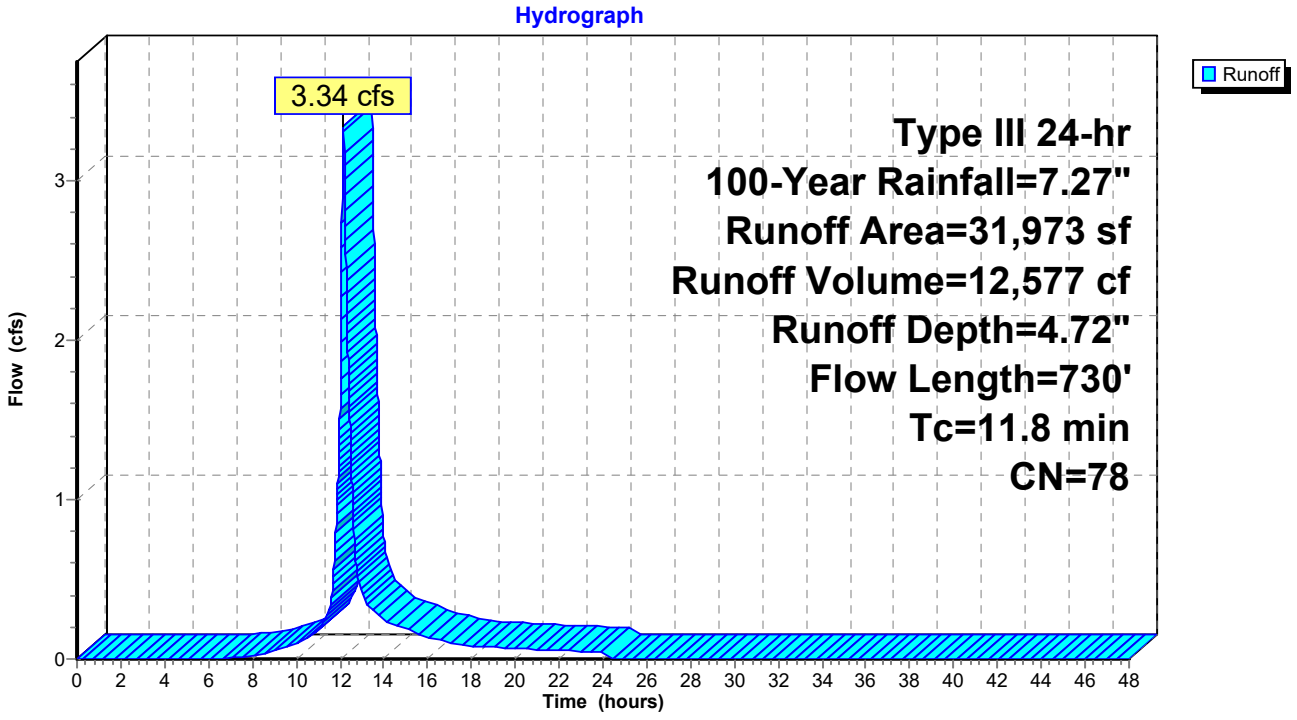
Runoff = 3.34 cfs @ 12.16 hrs, Volume= 12,577 cf, Depth= 4.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.27"

Area (sf)	CN	Description
422	98	Paved parking, HSG D
6,731	80	>75% Grass cover, Good, HSG D
24,820	77	Woods, Good, HSG D
31,973	78	Weighted Average
31,551		98.68% Pervious Area
422		1.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0200	0.10		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
0.1	38	0.0700	4.26		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
3.2	642	0.0100	3.35	22.14	**Channel Flow, OVER FARM DITCH** Area= 6.6 sf Perim= 9.4' r= 0.70' n= 0.035 Earth, dense weeds
11.8	730	Total			

Subcatchment P-9: UNDEVELOPED SOUTH SIDE OF PROPERTY



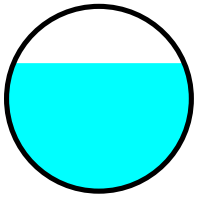
Summary for Reach C-1: DRIVEWAY CULVERT

Inflow Area = 58,655 sf, 10.65% Impervious, Inflow Depth = 5.07" for 100-Year event
Inflow = 5.39 cfs @ 12.26 hrs, Volume= 24,772 cf
Outflow = 5.39 cfs @ 12.27 hrs, Volume= 24,772 cf, Atten= 0%, Lag= 0.2 min

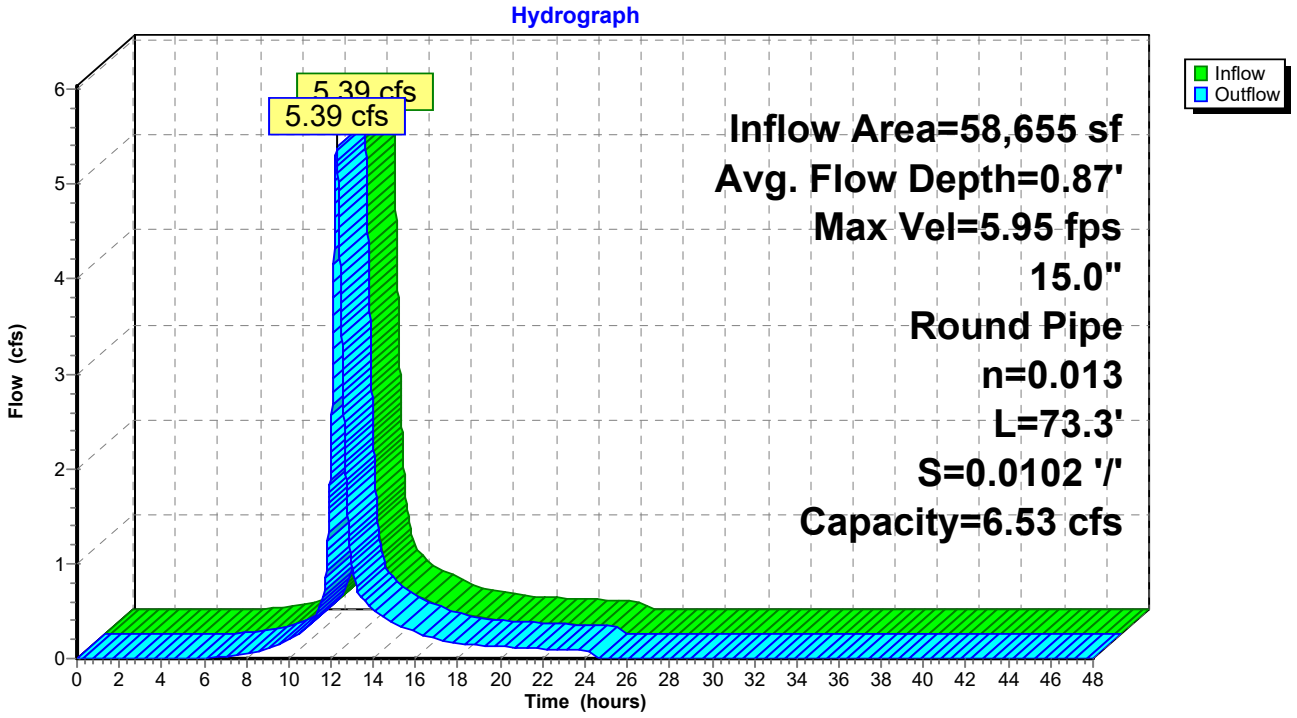
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 5.95 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.20 fps, Avg. Travel Time= 0.6 min

Peak Storage= 66 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.87'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 6.53 cfs

15.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 73.3' Slope= 0.0102 '/'
Inlet Invert= 208.75', Outlet Invert= 208.00'



Reach C-1: DRIVEWAY CULVERT

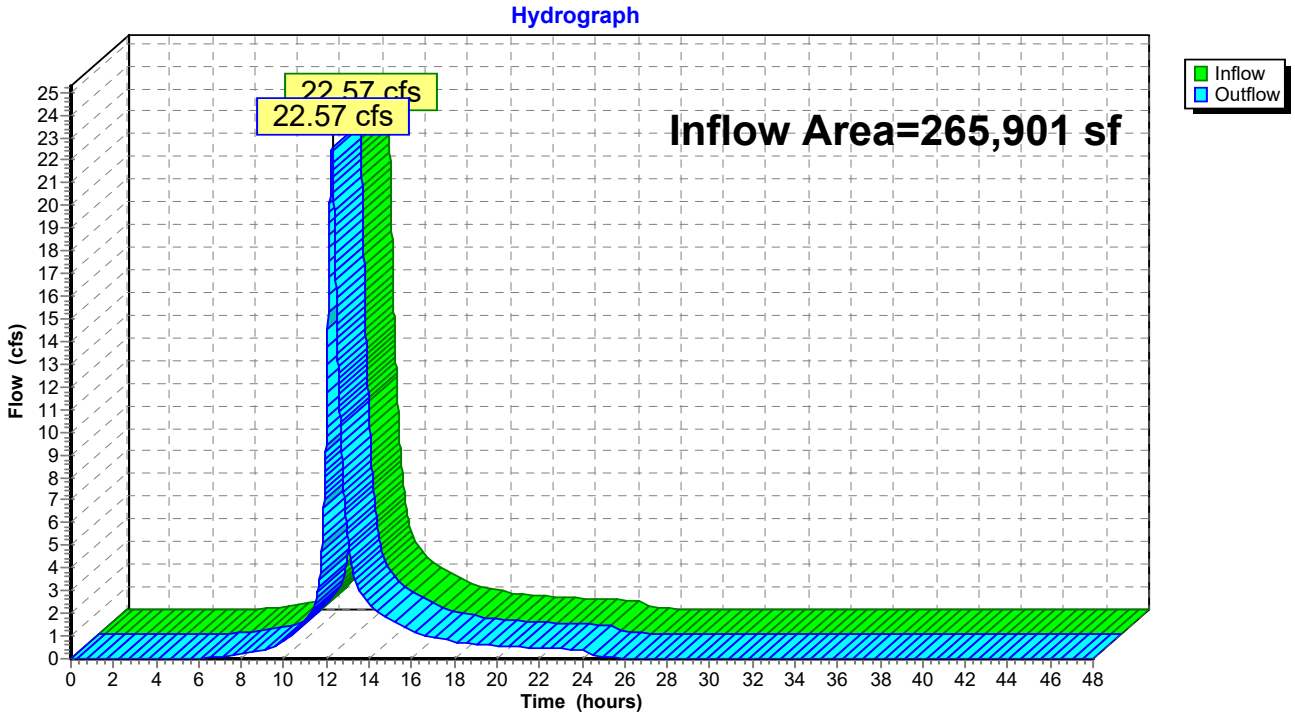


Summary for Reach DP-10: EX. CULVERT IN SOUTHEAST CORNER OF SITE

Inflow Area = 265,901 sf, 21.97% Impervious, Inflow Depth = 5.13" for 100-Year event
Inflow = 22.57 cfs @ 12.26 hrs, Volume= 113,625 cf
Outflow = 22.57 cfs @ 12.26 hrs, Volume= 113,625 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2

Reach DP-10: EX. CULVERT IN SOUTHEAST CORNER OF SITE



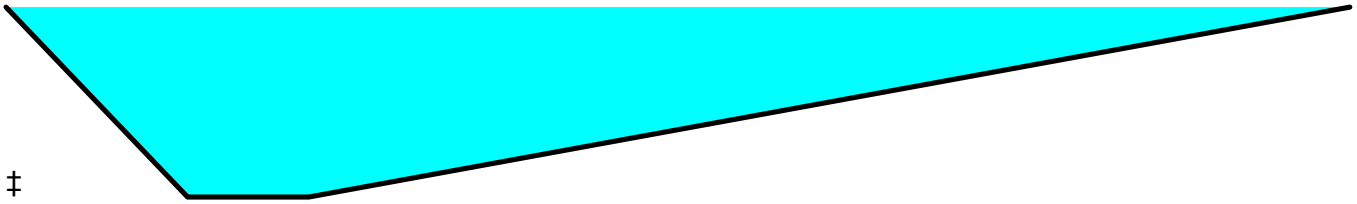
Summary for Reach S-1: PROPERTY LINE SWALE

Inflow Area = 58,655 sf, 10.65% Impervious, Inflow Depth = 5.07" for 100-Year event
Inflow = 5.45 cfs @ 12.23 hrs, Volume= 24,772 cf
Outflow = 5.39 cfs @ 12.26 hrs, Volume= 24,772 cf, Atten= 1%, Lag= 1.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.40 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.54 fps, Avg. Travel Time= 4.8 min

Peak Storage= 596 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 0.40' Flow Area= 2.4 sf, Capacity= 3.02 cfs

Custom cross-section, Length= 155.0' Slope= 0.0066 '/'
Constant n= 0.035 Earth, dense weeds
Inlet Invert= 209.78', Outlet Invert= 208.75'

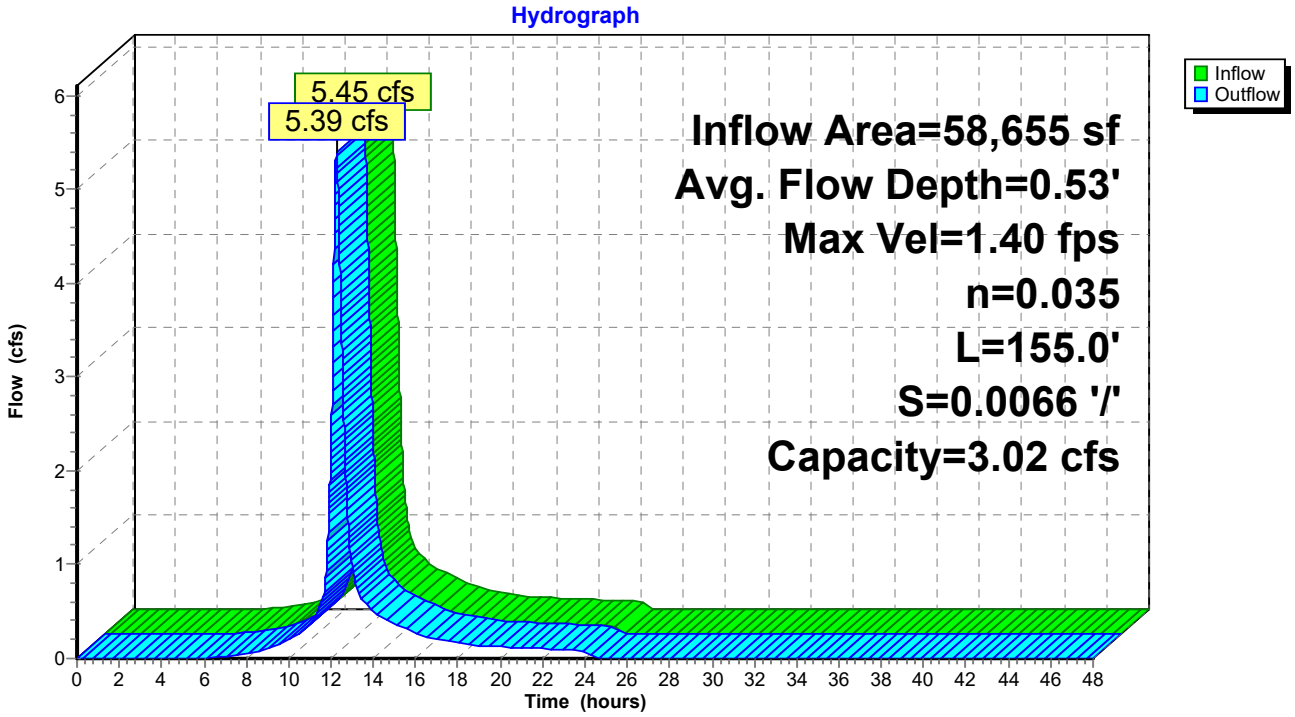


‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
-2.00	209.30	0.00
-0.50	208.90	0.40
0.50	208.90	0.40
9.10	209.30	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	1.0	0	0.00
0.40	2.4	11.2	375	3.02

Reach S-1: PROPERTY LINE SWALE



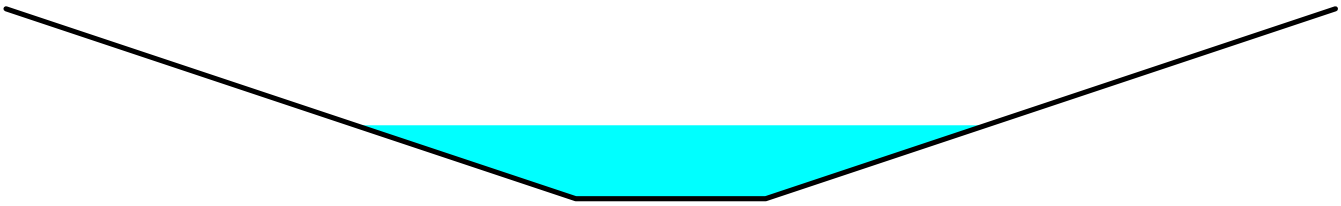
Summary for Reach S-2: WATER QUALITY SWALE

Inflow Area = 11,213 sf, 75.56% Impervious, Inflow Depth = 6.56" for 100-Year event
Inflow = 1.80 cfs @ 12.08 hrs, Volume= 6,126 cf
Outflow = 1.75 cfs @ 12.10 hrs, Volume= 6,126 cf, Atten= 3%, Lag= 1.2 min

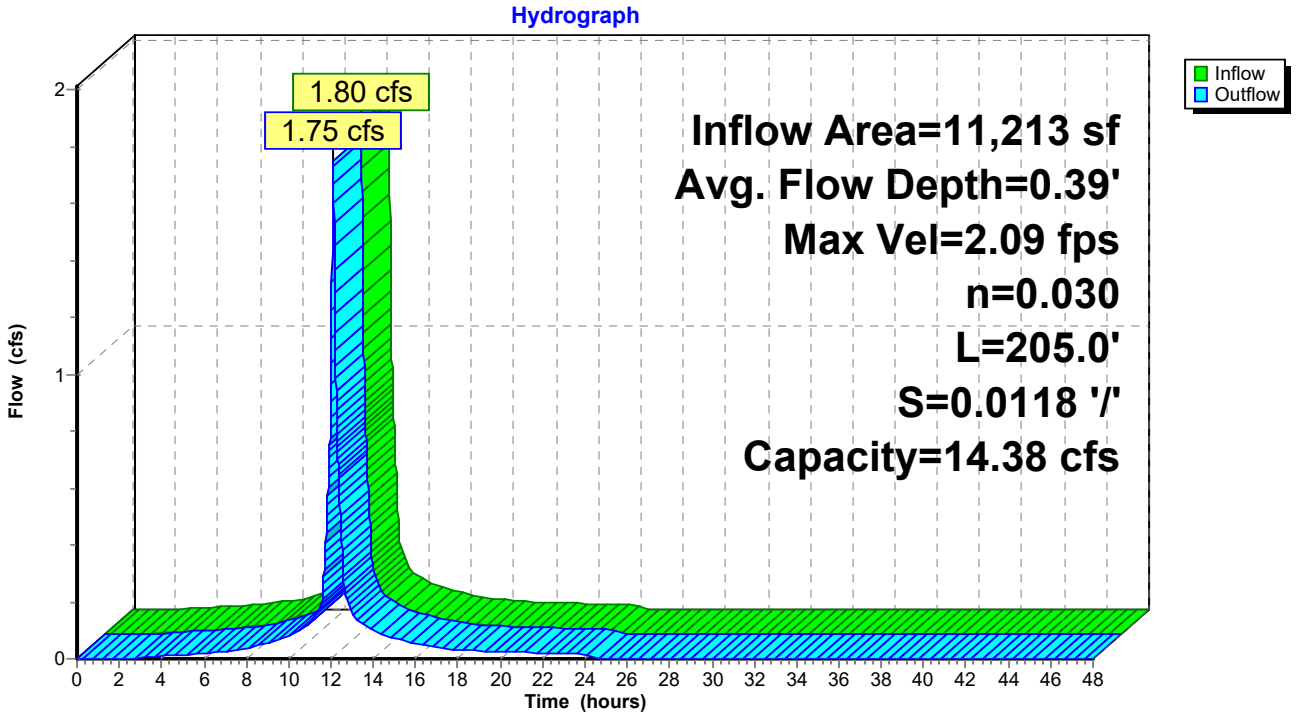
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.09 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 5.2 min

Peak Storage= 171 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 14.38 cfs

1.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 7.00'
Length= 205.0' Slope= 0.0118 '/'
Inlet Invert= 209.00', Outlet Invert= 206.58'



Reach S-2: WATER QUALITY SWALE



Summary for Pond 1P: PARKING ISLAND

Inflow Area = 17,305 sf, 74.80% Impervious, Inflow Depth = 6.44" for 100-Year event
Inflow = 2.55 cfs @ 12.11 hrs, Volume= 9,285 cf
Outflow = 2.27 cfs @ 12.16 hrs, Volume= 8,981 cf, Atten= 11%, Lag= 2.9 min
Primary = 2.27 cfs @ 12.16 hrs, Volume= 8,981 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 209.93' @ 12.16 hrs Surf.Area= 731 sf Storage= 458 cf

Plug-Flow detention time= 35.7 min calculated for 8,979 cf (97% of inflow)
Center-of-Mass det. time= 15.9 min (785.8 - 769.9)

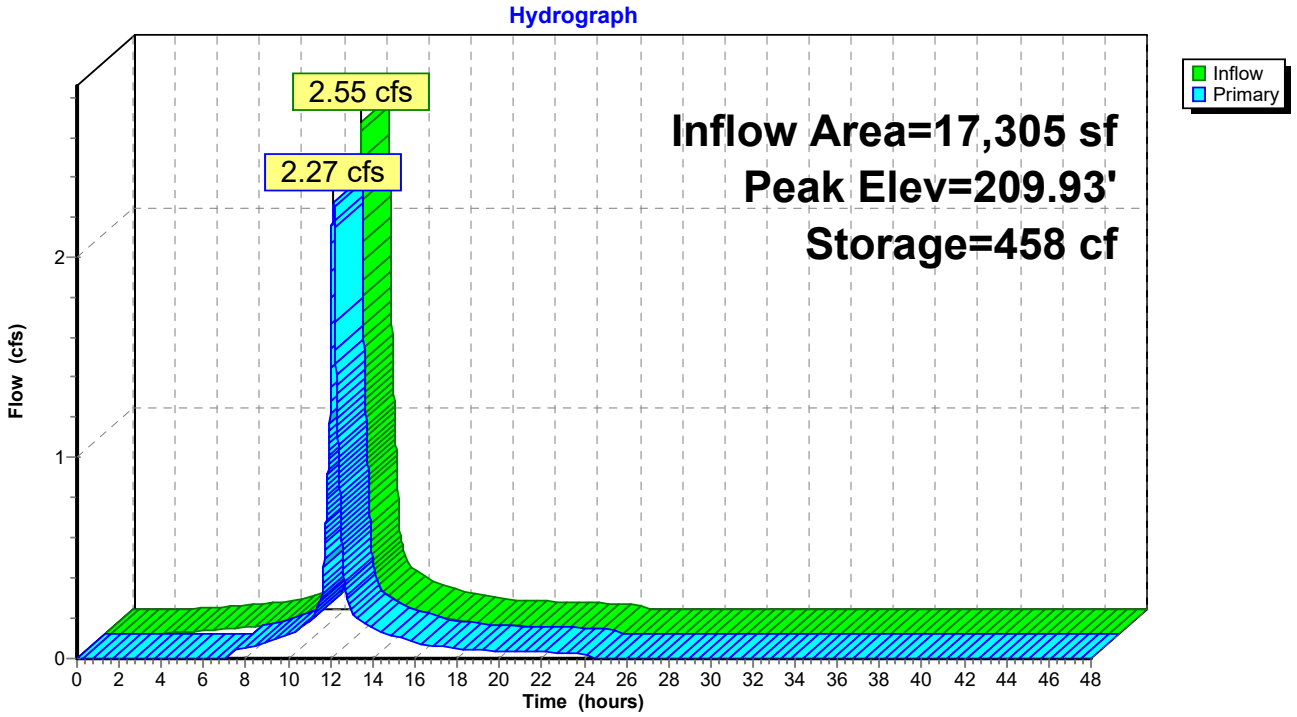
Volume	Invert	Avail.Storage	Storage Description
#1	209.00'	591 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
209.00	268	0	0
209.25	384	82	82
209.50	506	111	193
209.75	635	143	335
210.00	769	176	511
210.10	825	80	591

Device	Routing	Invert	Outlet Devices
#1	Primary	208.32'	**10.0" Round Culvert** L= 64.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.32' / 208.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#2	Device 1	209.70'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.27 cfs @ 12.16 hrs HW=209.93' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 2.27 cfs @ 4.16 fps)
↑**2=Orifice/Grate** (Passes 2.27 cfs of 5.76 cfs potential flow)

Pond 1P: PARKING ISLAND



Summary for Pond 2P: PARKING LOT RAIN GARDEN

Inflow Area = 27,044 sf, 76.83% Impervious, Inflow Depth = 6.56" for 100-Year event
Inflow = 4.02 cfs @ 12.11 hrs, Volume= 14,776 cf
Outflow = 3.92 cfs @ 12.11 hrs, Volume= 14,140 cf, Atten= 2%, Lag= 0.0 min
Primary = 3.92 cfs @ 12.11 hrs, Volume= 14,140 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 209.99' @ 12.27 hrs Surf.Area= 1,647 sf Storage= 1,073 cf

Plug-Flow detention time= 46.8 min calculated for 14,137 cf (96% of inflow)
Center-of-Mass det. time= 21.5 min (787.3 - 765.8)

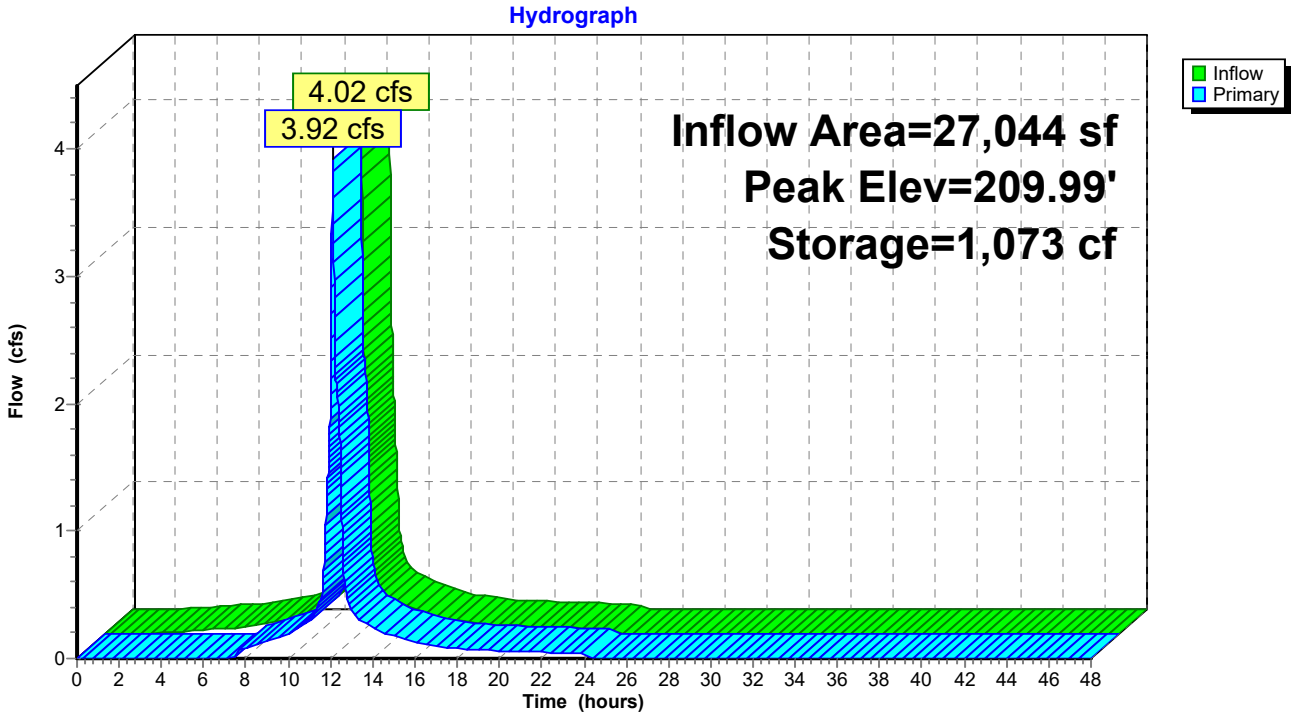
Volume	Invert	Avail.Storage	Storage Description
#1	209.00'	1,254 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
209.00	529	0	0
209.25	746	159	159
209.50	1,114	233	392
209.75	1,380	312	704
210.00	1,653	379	1,083
210.10	1,765	171	1,254

Device	Routing	Invert	Outlet Devices
#1	Primary	208.56'	**12.0" Round Culvert X 2.00** L= 52.8' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.56' / 208.30' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	209.70'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.92 cfs @ 12.11 hrs HW=209.88' TW=209.57' (Dynamic Tailwater)
↑**1=Culvert** (Passes 3.92 cfs of 4.04 cfs potential flow)
↑**2=Orifice/Grate** (Weir Controls 3.92 cfs @ 1.38 fps)

Pond 2P: PARKING LOT RAIN GARDEN



Summary for Pond 3P: WETLAND BASIN-1

Inflow Area = 115,261 sf, 22.41% Impervious, Inflow Depth = 5.04" for 100-Year event
Inflow = 11.83 cfs @ 12.13 hrs, Volume= 48,452 cf
Outflow = 9.26 cfs @ 12.27 hrs, Volume= 47,303 cf, Atten= 22%, Lag= 8.5 min
Primary = 6.46 cfs @ 12.39 hrs, Volume= 45,401 cf
Secondary = 2.90 cfs @ 12.27 hrs, Volume= 1,903 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 208.30' Surf.Area= 4,952 sf Storage= 1,230 cf
Peak Elev= 209.90' @ 12.27 hrs Surf.Area= 7,705 sf Storage= 10,481 cf (9,251 cf above start)

Plug-Flow detention time= 73.4 min calculated for 46,064 cf (95% of inflow)
Center-of-Mass det. time= 40.1 min (849.2 - 809.0)

Volume	Invert	Avail.Storage	Storage Description
#1	207.50'	6,191 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
#2A	208.10'	0 cf	**39.06'W x 73.72'L x 2.69'H Field A** 7,756 cf Overall - 3,995 cf Embedded = 3,761 cf x 0.0% Voids
#3A	208.35'	3,795 cf	**ACF R-Tank HD 1** x 899 Inside #2 Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf 899 Chambers in 29 Rows
#4	208.35'	123 cf	**15.0" Round Pipe Storage** L= 100.0'
#5	207.50'	8,004 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
		18,112 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
207.50	503	0	0
208.00	756	315	315
208.50	1,031	447	762
209.00	1,332	591	1,352
209.50	1,812	786	2,138
210.00	2,398	1,053	3,191
210.50	2,997	1,349	4,540
210.75	3,302	787	5,327
211.00	3,610	864	6,191

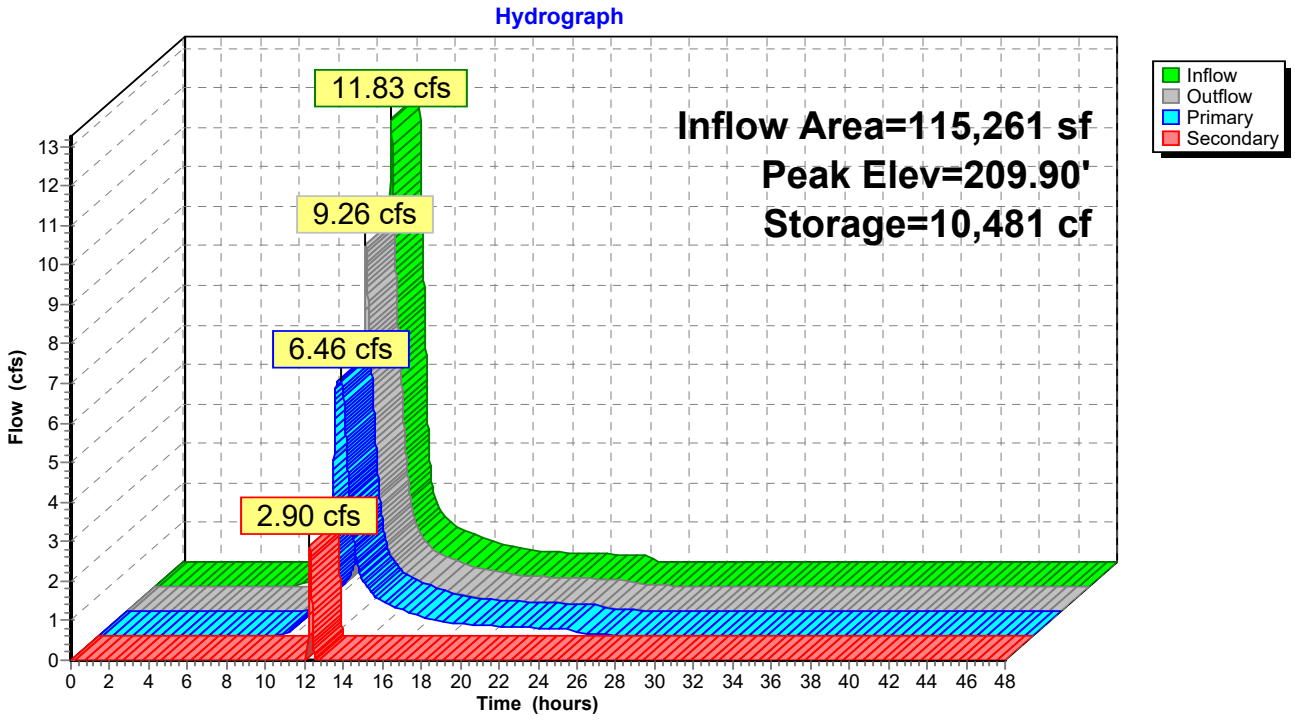
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
207.50	515	0	0
208.00	905	355	355
208.50	1,316	555	910
209.00	1,741	764	1,675
210.00	2,633	2,187	3,862
210.50	3,101	1,434	5,295
210.75	6,067	1,146	6,441
211.00	6,433	1,563	8,004

Device	Routing	Invert	Outlet Devices
#1	Secondary	209.75'	**10.0' long x 9.5' breadth Broad-Crested Rectangular Weir X 2.00** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 Coef. (English) 2.48 2.55 2.70 2.69 2.68 2.69 2.67 2.64 2.64 2.64 2.64 2.64 2.64 2.65 2.65 2.66
#2	Primary	208.55'	**12.0" Round Culvert X 2.00** L= 110.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.55' / 208.00' S= 0.0050 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#3	Device 2	208.38'	**12.0" W x 3.0" H Vert. WQV Orifice X 4.00** C= 0.600
#4	Device 2	209.05'	**12.0" W x 3.0" H Vert. 2-YR Orifice X 4.00** C= 0.600
#5	Device 2	209.43'	**12.0" W x 3.0" H Vert. 10-YR Orifice X 4.00** C= 0.600
#6	Device 2	209.64'	**48.0" x 48.0" Horiz. 25-YR Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=6.46 cfs @ 12.39 hrs HW=209.85' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Barrel Controls 6.46 cfs @ 4.15 fps)
  ├─**3=WQV Orifice** (Passes < 5.45 cfs potential flow)
  ├─**4=2-YR Orifice** (Passes < 3.94 cfs potential flow)
  ├─**5=10-YR Orifice** (Passes < 2.57 cfs potential flow)
  └─**6=25-YR Orifice** (Passes < 4.86 cfs potential flow)

Secondary OutFlow Max=2.90 cfs @ 12.27 hrs HW=209.90' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 2.90 cfs @ 0.96 fps)

Pond 3P: WETLAND BASIN-1

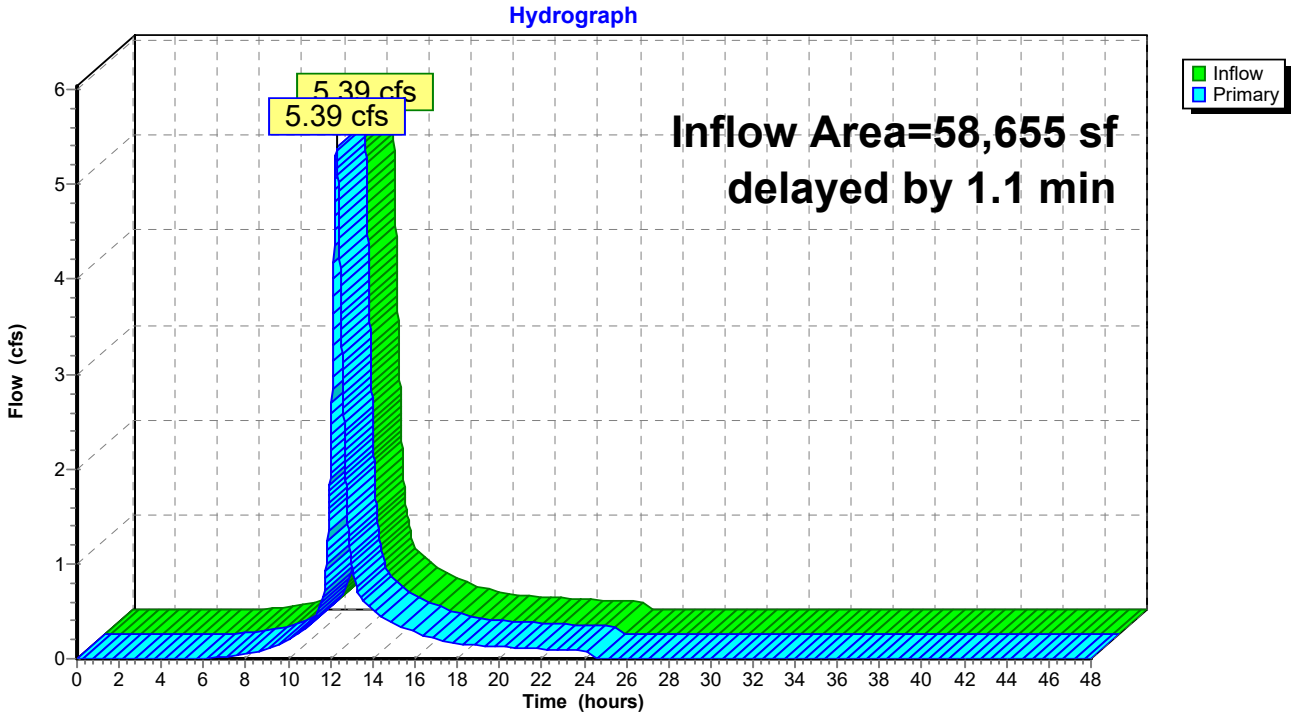


Summary for Link L-1: C-1 FLOWS THRU SOUTH FARM DITCH

Inflow Area = 58,655 sf, 10.65% Impervious, Inflow Depth = 5.07" for 100-Year event
Inflow = 5.39 cfs @ 12.27 hrs, Volume= 24,772 cf
Primary = 5.39 cfs @ 12.28 hrs, Volume= 24,772 cf, Atten= 0%, Lag= 1.1 min

Primary outflow = Inflow delayed by 1.1 min, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link L-1: C-1 FLOWS THRU SOUTH FARM DITCH

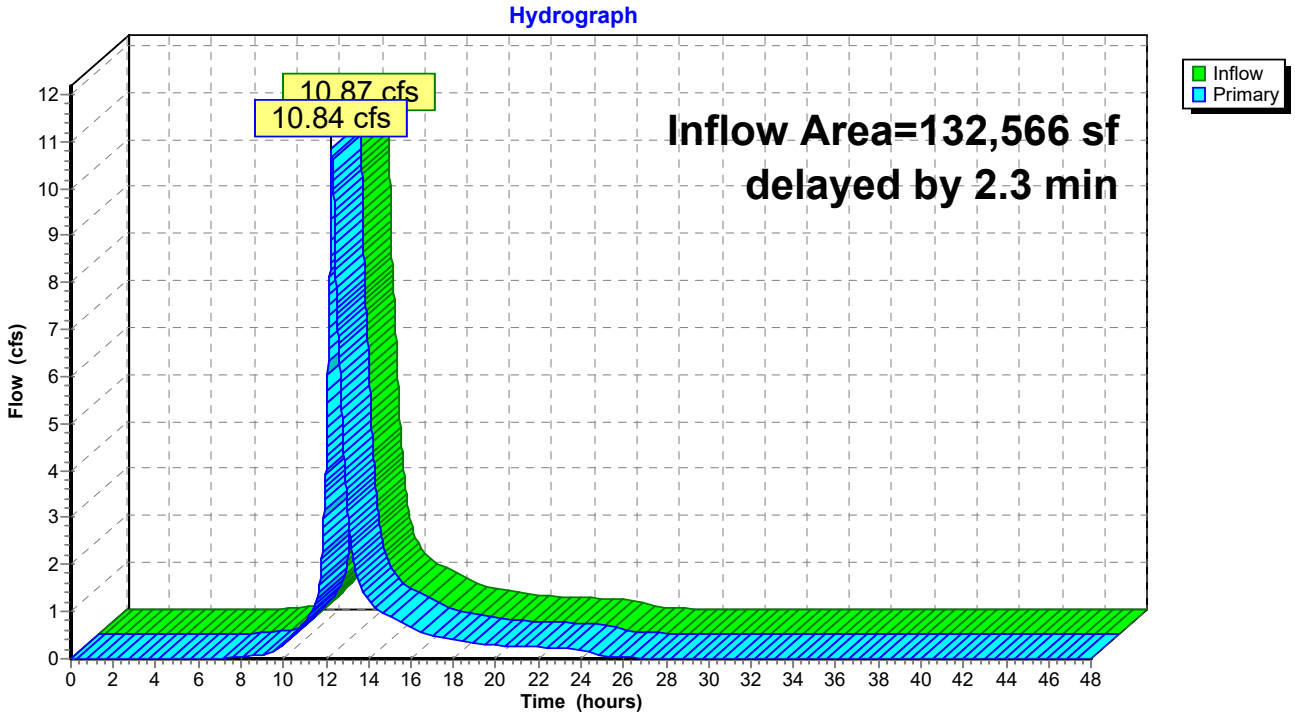


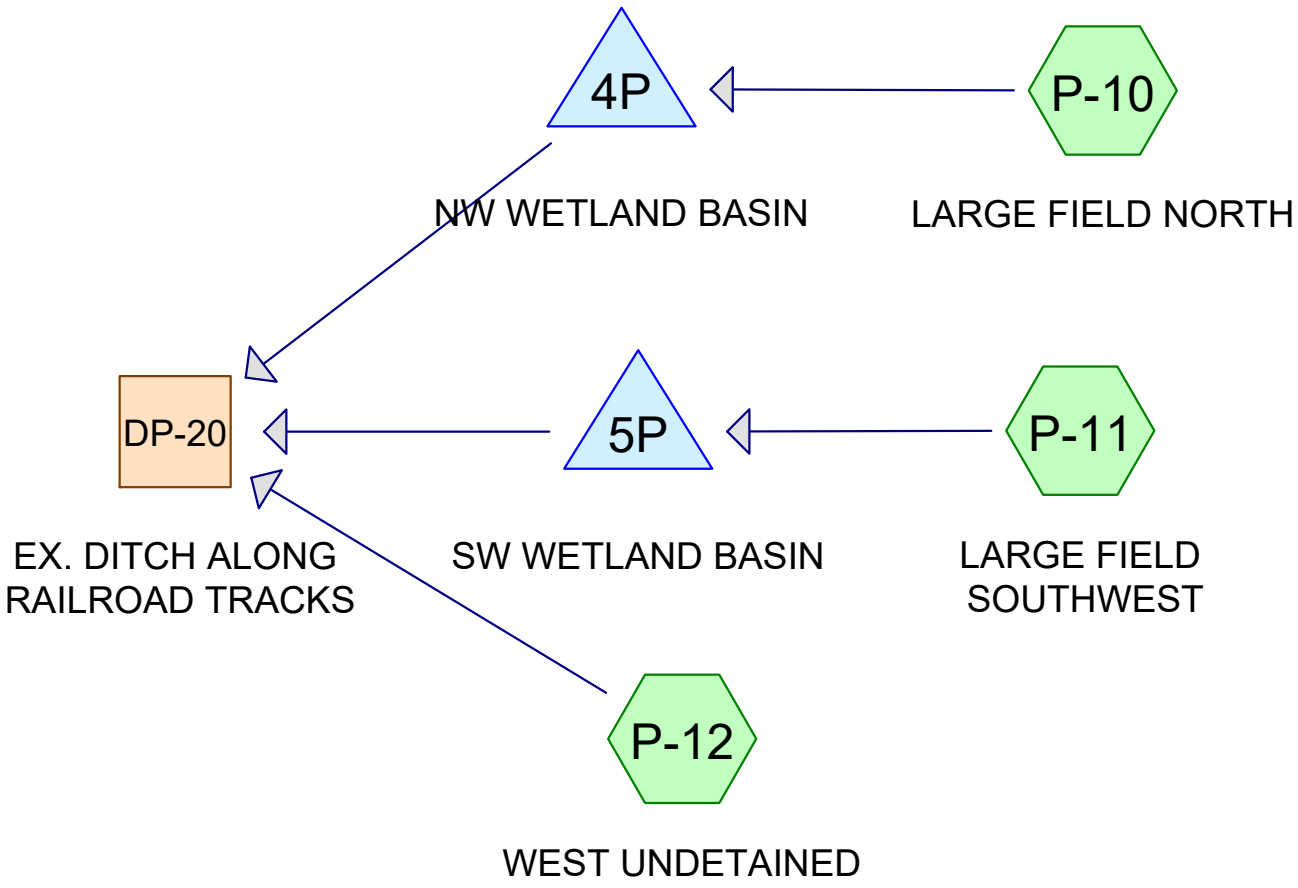
Summary for Link L-2: WB-1 FLOWS THRU SOUTH FARM DITCH

Inflow Area = 132,566 sf, 29.25% Impervious, Inflow Depth = 5.09" for 100-Year event
Inflow = 10.87 cfs @ 12.23 hrs, Volume= 56,284 cf
Primary = 10.84 cfs @ 12.27 hrs, Volume= 56,284 cf, Atten= 0%, Lag= 2.4 min

Primary outflow = Inflow delayed by 2.3 min, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link L-2: WB-1 FLOWS THRU SOUTH FARM DITCH





Subcat Reach Pond Link

Routing Diagram for Deerfield_PRE POST
Prepared by ProTerra Design Group, LLC, Printed 12/15/2021

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
62,919	80	>75% Grass cover, Good, HSG D (P-10, P-11, P-12)
4,824	91	Gravel roads, HSG D (P-10, P-11, P-12)
1,599	98	Paved parking, HSG D (P-10, P-12)
56,700	74	Soccer Field, Good, HSG C (P-10, P-11)
36,299	77	Woods, Good, HSG D (P-12)
162,341	**78**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
56,700	HSG C	P-10, P-11
105,641	HSG D	P-10, P-11, P-12
0	Other	
162,341		**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P-10: LARGE FIELD NORTH Runoff Area=58,148 sf 0.61% Impervious Runoff Depth=1.02"
Flow Length=600' Tc=14.8 min CN=76 Runoff=1.15 cfs 4,951 cf

Subcatchment P-11: LARGE FIELD Runoff Area=31,004 sf 0.00% Impervious Runoff Depth=1.02"
Flow Length=354' Tc=13.5 min CN=76 Runoff=0.64 cfs 2,640 cf

Subcatchment P-12: WEST UNDETAINED Runoff Area=73,189 sf 1.70% Impervious Runoff Depth=1.20"
Flow Length=436' Tc=38.2 min CN=79 Runoff=1.16 cfs 7,293 cf

Reach DP-20: EX. DITCH ALONG RAILROAD TRACKS Inflow=1.31 cfs 12,109 cf
Outflow=1.31 cfs 12,109 cf

Pond 4P: NW WETLAND BASIN Peak Elev=209.39' Storage=3,176 cf Inflow=1.15 cfs 4,951 cf
Outflow=0.16 cfs 4,816 cf

Pond 5P: SW WETLAND BASIN Peak Elev=209.14' Storage=3,028 cf Inflow=0.64 cfs 2,640 cf
Outflow=0.00 cfs 0 cf

Total Runoff Area = 162,341 sf Runoff Volume = 14,884 cf Average Runoff Depth = 1.10"
99.02% Pervious = 160,742 sf 0.98% Impervious = 1,599 sf

Summary for Subcatchment P-10: LARGE FIELD NORTH

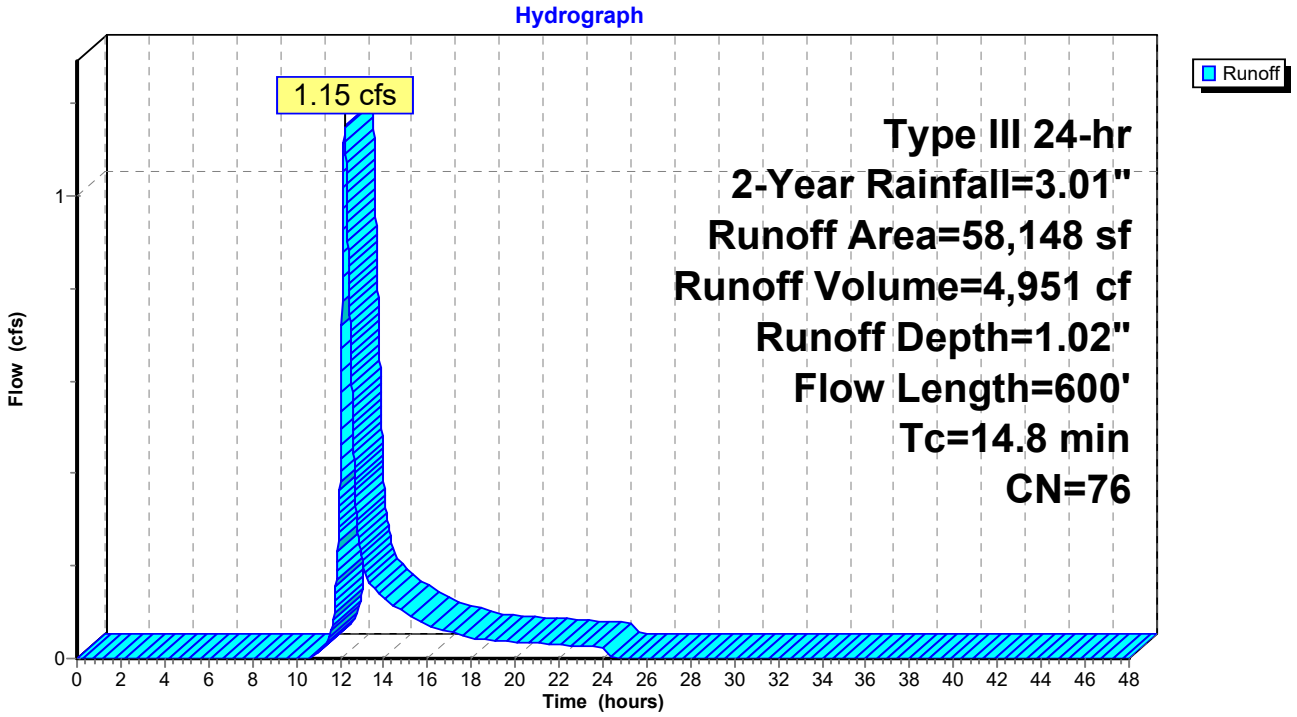
Runoff = 1.15 cfs @ 12.22 hrs, Volume= 4,951 cf, Depth= 1.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.01"

	Area (sf)	CN	Description
	354	98	Paved parking, HSG D
	19,470	80	>75% Grass cover, Good, HSG D
	524	91	Gravel roads, HSG D
*	37,800	74	Soccer Field, Good, HSG C
	58,148	76	Weighted Average
	57,794		99.39% Pervious Area
	354		0.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
0.6	55	0.0100	1.61		**Shallow Concentrated Flow, OVER SOCCER FIELD** Unpaved Kv= 16.1 fps
0.3	35	0.0200	2.28		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
2.7	460	0.0050	2.84	1.55	**Pipe Channel, NORTH COLLECTOR** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
14.8	600	Total			

Subcatchment P-10: LARGE FIELD NORTH



Summary for Subcatchment P-11: LARGE FIELD SOUTHWEST

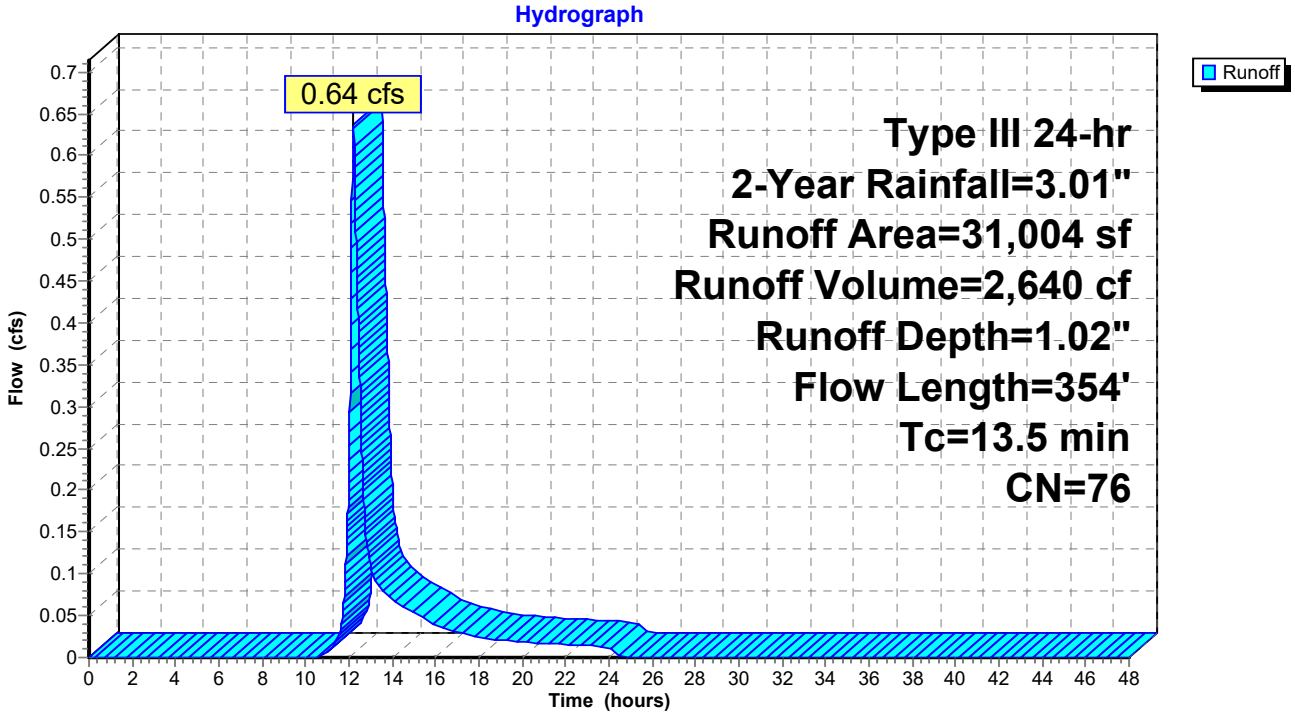
Runoff = 0.64 cfs @ 12.20 hrs, Volume= 2,640 cf, Depth= 1.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.01"

	Area (sf)	CN	Description
	11,749	80	>75% Grass cover, Good, HSG D
	355	91	Gravel roads, HSG D
*	18,900	74	Soccer Field, Good, HSG C
	31,004	76	Weighted Average
	31,004		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER SOCCER FIELD** Grass: Dense n= 0.240 P2= 3.01"
0.6	55	0.0100	1.61		**Shallow Concentrated Flow, OVER SOCCER FIELD** Unpaved Kv= 16.1 fps
0.6	64	0.0125	1.80		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.1	185	0.0050	2.84	1.55	**Pipe Channel, SOUTHWEST COLLECTOR** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
13.5	354	Total			

Subcatchment P-11: LARGE FIELD SOUTHWEST



Summary for Subcatchment P-12: WEST UNDETAINED

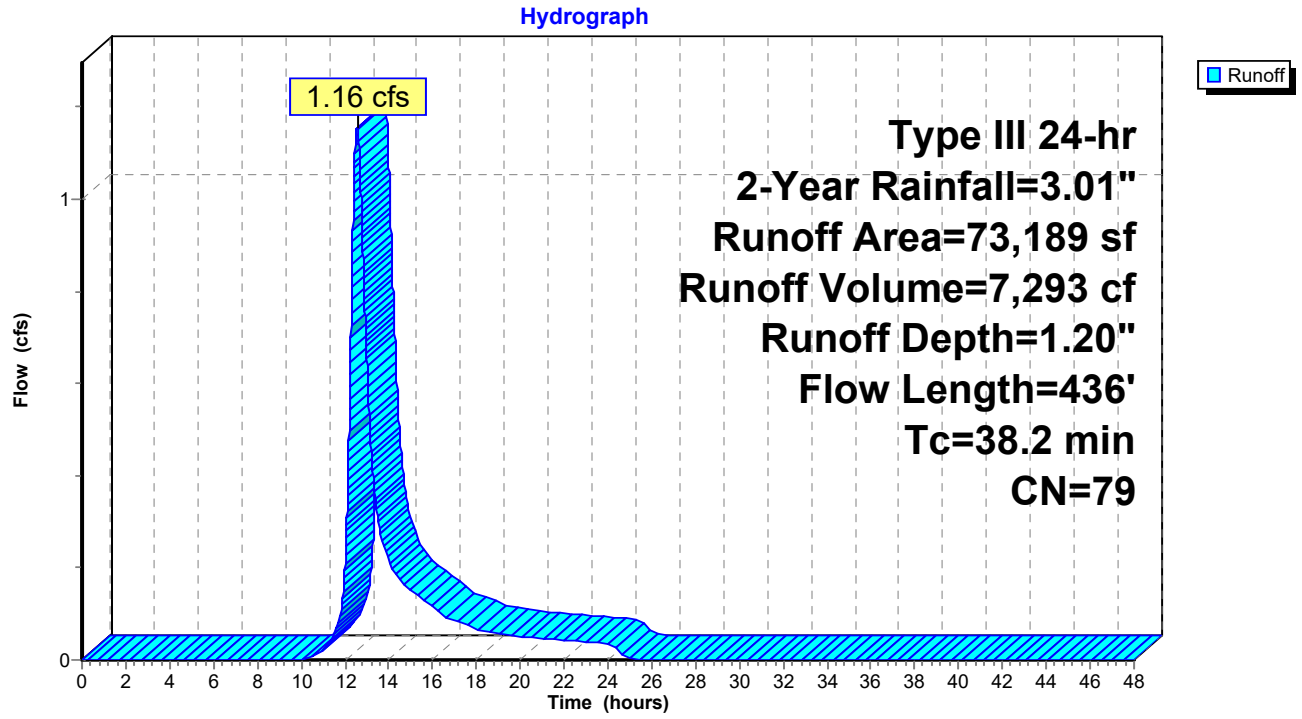
Runoff = 1.16 cfs @ 12.56 hrs, Volume= 7,293 cf, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.01"

Area (sf)	CN	Description
1,245	98	Paved parking, HSG D
31,700	80	>75% Grass cover, Good, HSG D
3,945	91	Gravel roads, HSG D
36,299	77	Woods, Good, HSG D
73,189	79	Weighted Average
71,944		98.30% Pervious Area
1,245		1.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	50	0.0100	0.05		**Sheet Flow, THRU WOODS** Woods: Light underbrush n= 0.400 P2= 3.01"
21.4	386	0.0036	0.30		**Shallow Concentrated Flow, THRU WOODS** Woodland Kv= 5.0 fps
38.2	436	Total			

Subcatchment P-12: WEST UNDETAINED

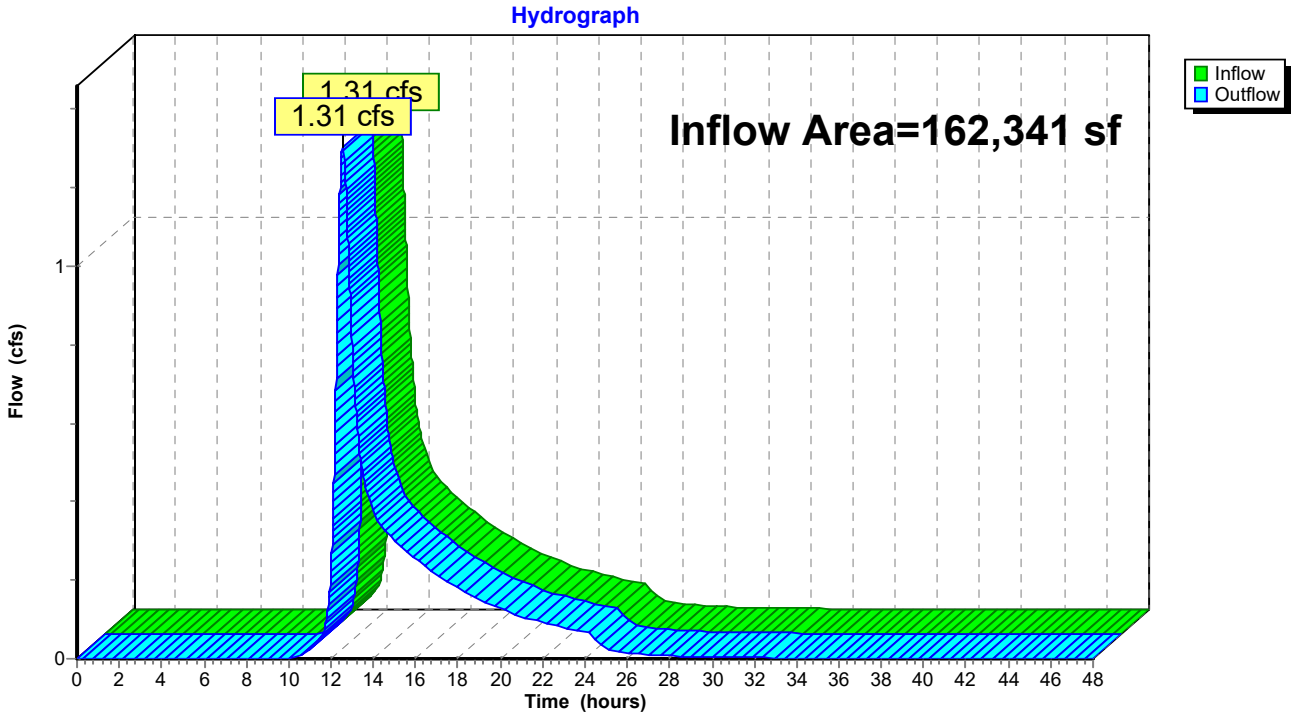


Summary for Reach DP-20: EX. DITCH ALONG RAILROAD TRACKS

Inflow Area = 162,341 sf, 0.98% Impervious, Inflow Depth > 0.90" for 2-Year event
Inflow = 1.31 cfs @ 12.56 hrs, Volume= 12,109 cf
Outflow = 1.31 cfs @ 12.56 hrs, Volume= 12,109 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2

Reach DP-20: EX. DITCH ALONG RAILROAD TRACKS



Summary for Pond 4P: NW WETLAND BASIN

Inflow Area = 58,148 sf, 0.61% Impervious, Inflow Depth = 1.02" for 2-Year event
Inflow = 1.15 cfs @ 12.22 hrs, Volume= 4,951 cf
Outflow = 0.16 cfs @ 13.36 hrs, Volume= 4,816 cf, Atten= 86%, Lag= 68.8 min
Primary = 0.16 cfs @ 13.36 hrs, Volume= 4,816 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 208.75' Surf.Area= 1,990 sf Storage= 1,071 cf
Peak Elev= 209.39' @ 13.36 hrs Surf.Area= 3,769 sf Storage= 3,176 cf (2,105 cf above start)

Plug-Flow detention time= 352.1 min calculated for 3,744 cf (76% of inflow)
Center-of-Mass det. time= 185.0 min (1,052.4 - 867.4)

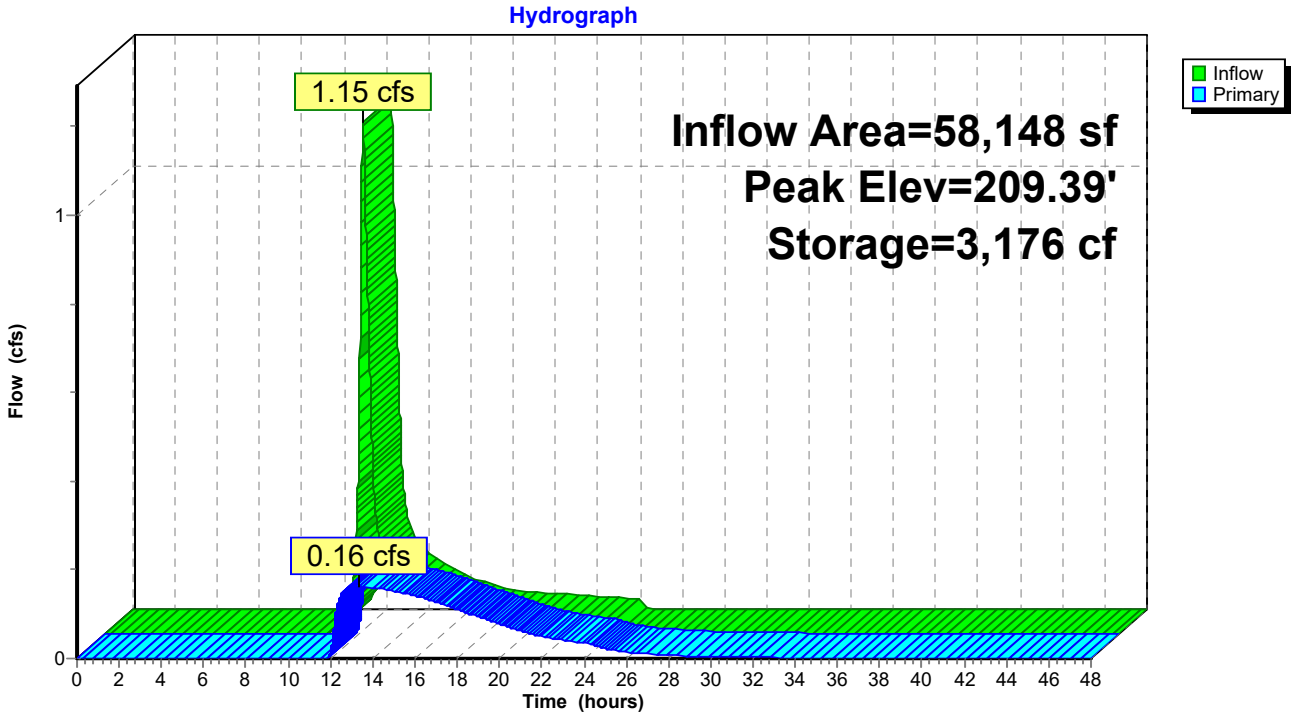
Volume	Invert	Avail.Storage	Storage Description
#1	208.00'	9,960 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
208.00	866	0	0
208.75	1,990	1,071	1,071
209.00	3,481	684	1,755
210.00	4,215	3,848	5,603
210.50	4,603	2,205	7,807
210.95	4,964	2,153	9,960

Device	Routing	Invert	Outlet Devices
#1	Primary	209.81'	**15.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Primary	208.50'	**12.0" Round Culvert** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.50' / 208.00' S= 0.0278 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	208.80'	**3.0" Vert. WQV Orifice** C= 0.600
#4	Device 2	209.39'	**12.0" Horiz. 2-YR Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.16 cfs @ 13.36 hrs HW=209.39' TW=0.00' (Dynamic Tailwater)
- **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **2=Culvert** (Passes 0.16 cfs of 2.38 cfs potential flow)
  - **3=WQV Orifice** (Orifice Controls 0.16 cfs @ 3.29 fps)
  - **4=2-YR Orifice** (Weir Controls 0.00 cfs @ 0.15 fps)

Pond 4P: NW WETLAND BASIN



Summary for Pond 5P: SW WETLAND BASIN

Inflow Area = 31,004 sf, 0.00% Impervious, Inflow Depth = 1.02" for 2-Year event
Inflow = 0.64 cfs @ 12.20 hrs, Volume= 2,640 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 208.33' Surf.Area= 1,823 sf Storage= 388 cf
Peak Elev= 209.14' @ 24.76 hrs Surf.Area= 4,417 sf Storage= 3,028 cf (2,640 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

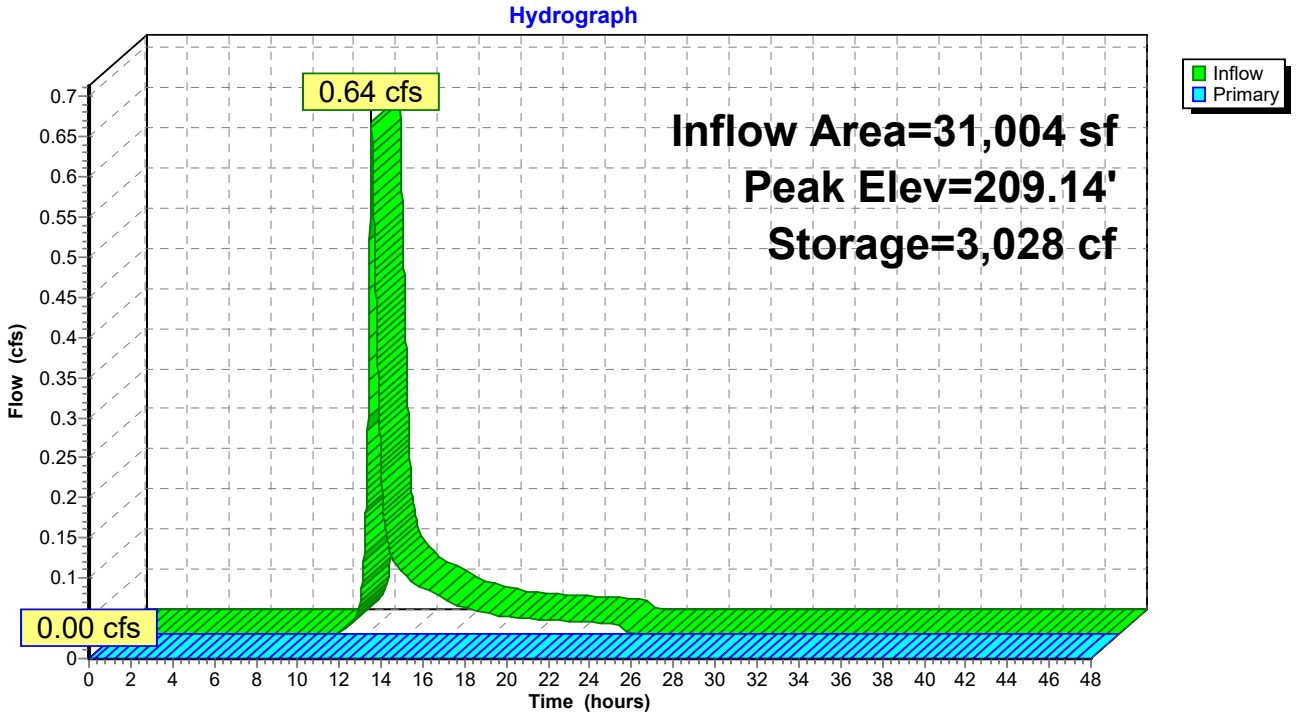
Volume	Invert	Avail.Storage	Storage Description
#1	208.00'	10,538 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
208.00	526	0	0
208.33	1,823	388	388
209.00	4,279	2,044	2,432
210.00	5,284	4,782	7,213
210.60	5,797	3,324	10,538

Device	Routing	Invert	Outlet Devices
#1	Primary	209.50'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Primary	208.50'	**12.0" Round Culvert** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.50' / 208.00' S= 0.0278 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	209.14'	**3.0" Vert. 2-YR Orifice** C= 0.600
#4	Device 2	209.40'	**12.0" Horiz. 10-YR Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=208.33' TW=0.00' (Dynamic Tailwater)
- **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **2=Culvert** (Controls 0.00 cfs)
  - **3=2-YR Orifice** (Controls 0.00 cfs)
  - **4=10-YR Orifice** (Controls 0.00 cfs)

Pond 5P: SW WETLAND BASIN



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P-10: LARGE FIELD NORTH Runoff Area=58,148 sf 0.61% Impervious Runoff Depth=2.26"
Flow Length=600' Tc=14.8 min CN=76 Runoff=2.67 cfs 10,943 cf

Subcatchment P-11: LARGE FIELD Runoff Area=31,004 sf 0.00% Impervious Runoff Depth=2.26"
Flow Length=354' Tc=13.5 min CN=76 Runoff=1.48 cfs 5,834 cf

Subcatchment P-12: WEST UNDETAINED Runoff Area=73,189 sf 1.70% Impervious Runoff Depth=2.51"
Flow Length=436' Tc=38.2 min CN=79 Runoff=2.50 cfs 15,317 cf

Reach DP-20: EX. DITCH ALONG RAILROAD TRACKS Inflow=4.12 cfs 29,212 cf
Outflow=4.12 cfs 29,212 cf

Pond 4P: NW WETLAND BASIN Peak Elev=209.67' Storage=4,246 cf Inflow=2.67 cfs 10,943 cf
Outflow=1.71 cfs 10,806 cf

Pond 5P: SW WETLAND BASIN Peak Elev=209.40' Storage=4,222 cf Inflow=1.48 cfs 5,834 cf
Outflow=0.09 cfs 3,090 cf

Total Runoff Area = 162,341 sf Runoff Volume = 32,094 cf Average Runoff Depth = 2.37"
99.02% Pervious = 160,742 sf 0.98% Impervious = 1,599 sf

Summary for Subcatchment P-10: LARGE FIELD NORTH

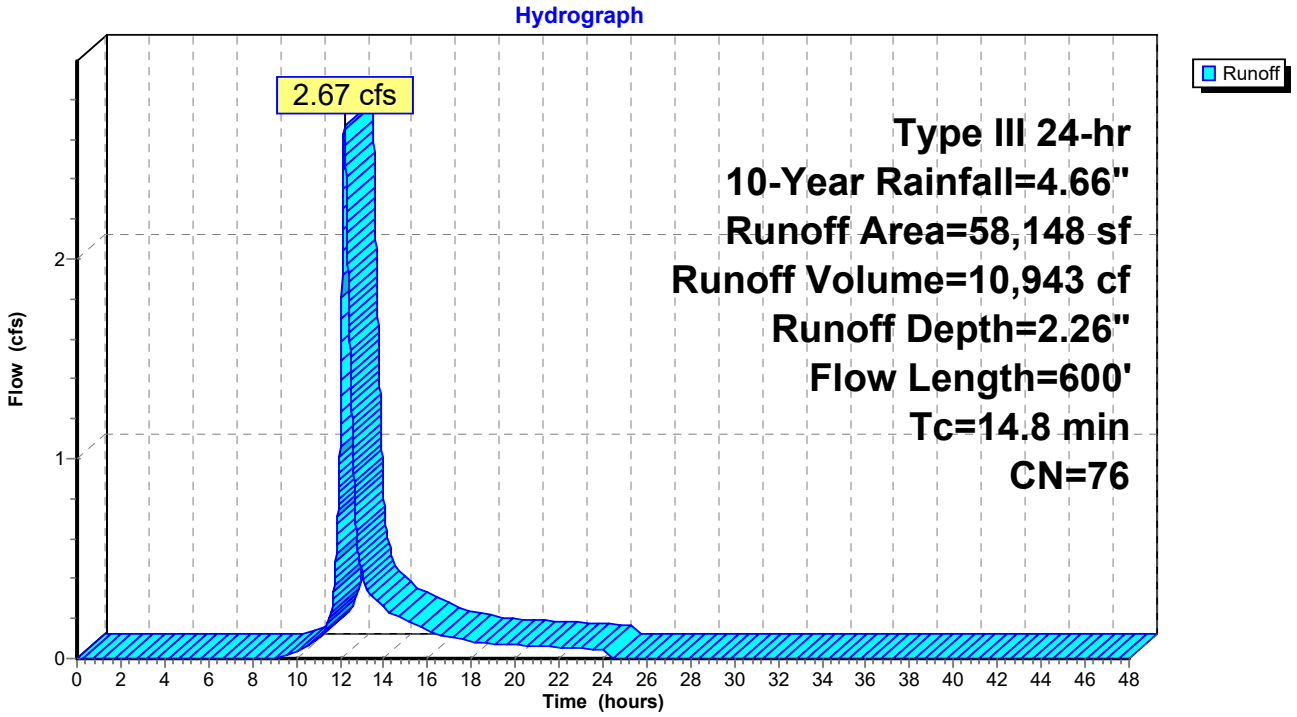
Runoff = 2.67 cfs @ 12.21 hrs, Volume= 10,943 cf, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.66"

	Area (sf)	CN	Description
	354	98	Paved parking, HSG D
	19,470	80	>75% Grass cover, Good, HSG D
	524	91	Gravel roads, HSG D
*	37,800	74	Soccer Field, Good, HSG C
	58,148	76	Weighted Average
	57,794		99.39% Pervious Area
	354		0.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
0.6	55	0.0100	1.61		**Shallow Concentrated Flow, OVER SOCCER FIELD** Unpaved Kv= 16.1 fps
0.3	35	0.0200	2.28		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
2.7	460	0.0050	2.84	1.55	**Pipe Channel, NORTH COLLECTOR** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
14.8	600	Total			

Subcatchment P-10: LARGE FIELD NORTH



Summary for Subcatchment P-11: LARGE FIELD SOUTHWEST

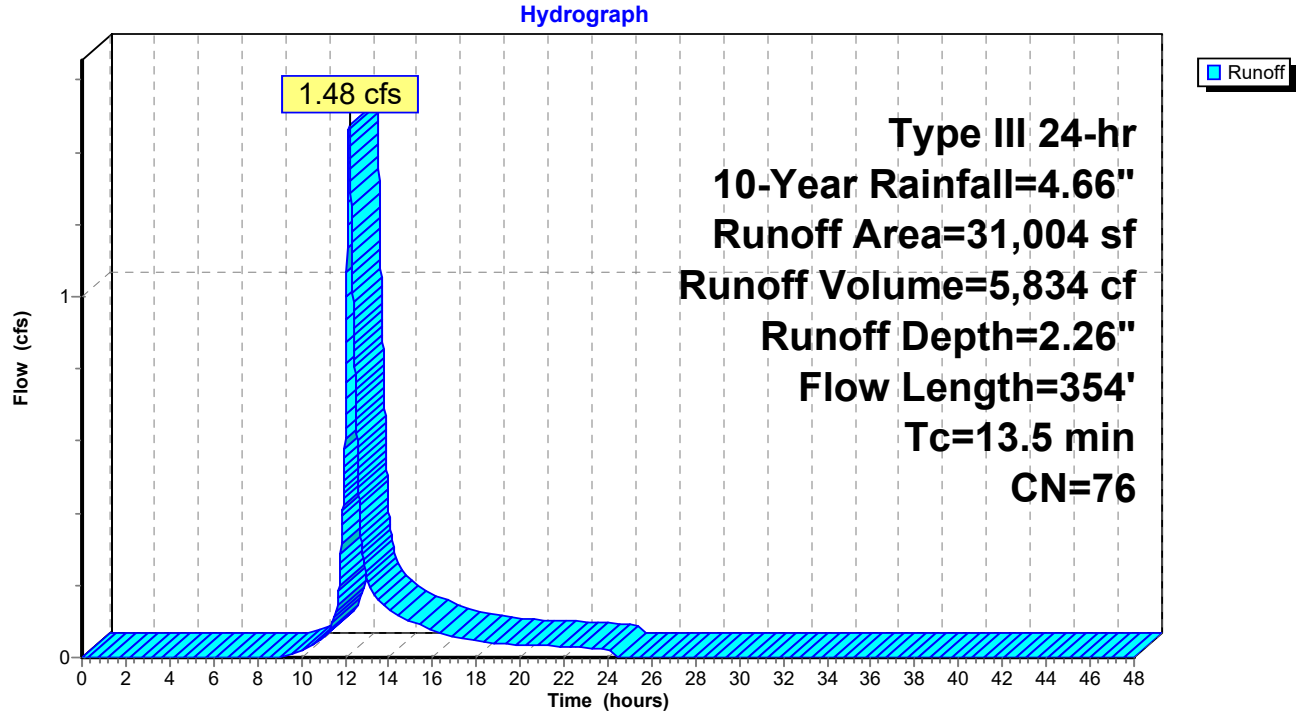
Runoff = 1.48 cfs @ 12.19 hrs, Volume= 5,834 cf, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.66"

	Area (sf)	CN	Description
	11,749	80	>75% Grass cover, Good, HSG D
	355	91	Gravel roads, HSG D
*	18,900	74	Soccer Field, Good, HSG C
	31,004	76	Weighted Average
	31,004		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER SOCCER FIELD** Grass: Dense n= 0.240 P2= 3.01"
0.6	55	0.0100	1.61		**Shallow Concentrated Flow, OVER SOCCER FIELD** Unpaved Kv= 16.1 fps
0.6	64	0.0125	1.80		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.1	185	0.0050	2.84	1.55	**Pipe Channel, SOUTHWEST COLLECTOR** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
13.5	354	Total			

Subcatchment P-11: LARGE FIELD SOUTHWEST



Summary for Subcatchment P-12: WEST UNDETAINED

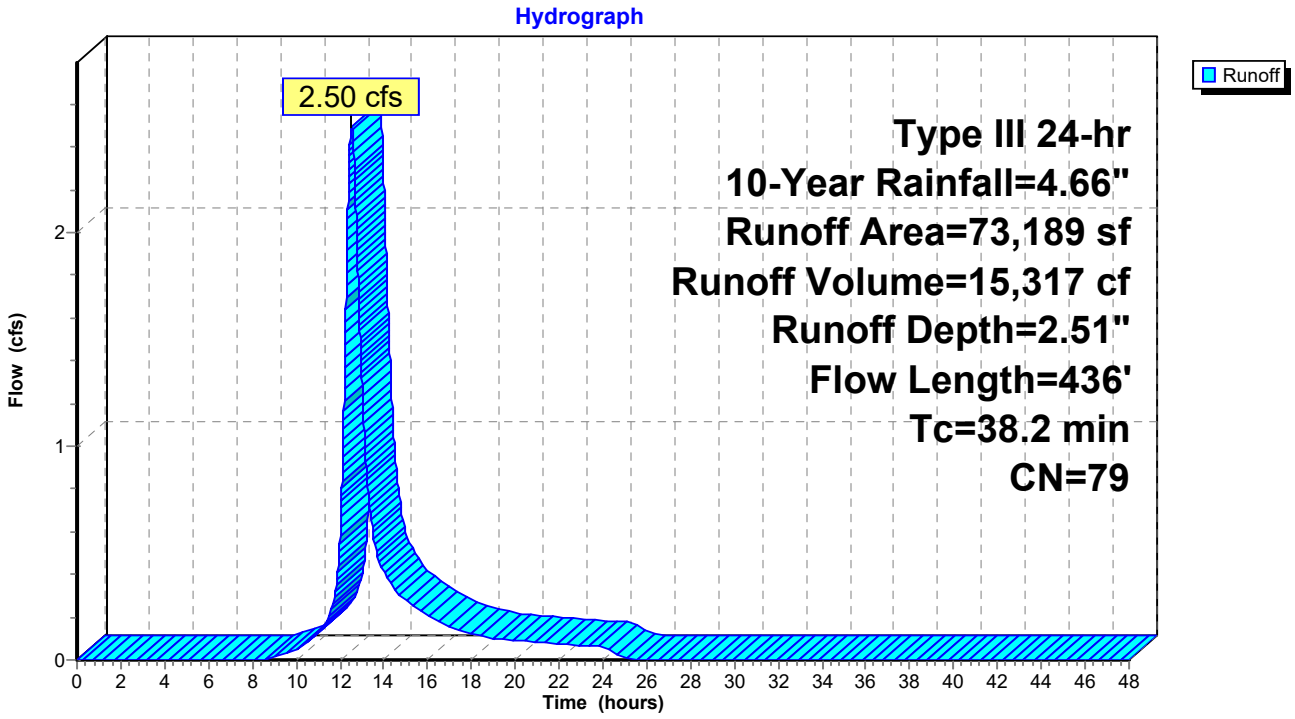
Runoff = 2.50 cfs @ 12.52 hrs, Volume= 15,317 cf, Depth= 2.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.66"

Area (sf)	CN	Description
1,245	98	Paved parking, HSG D
31,700	80	>75% Grass cover, Good, HSG D
3,945	91	Gravel roads, HSG D
36,299	77	Woods, Good, HSG D
73,189	79	Weighted Average
71,944		98.30% Pervious Area
1,245		1.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	50	0.0100	0.05		**Sheet Flow, THRU WOODS** Woods: Light underbrush n= 0.400 P2= 3.01"
21.4	386	0.0036	0.30		**Shallow Concentrated Flow, THRU WOODS** Woodland Kv= 5.0 fps
38.2	436	Total			

Subcatchment P-12: WEST UNDETAINED

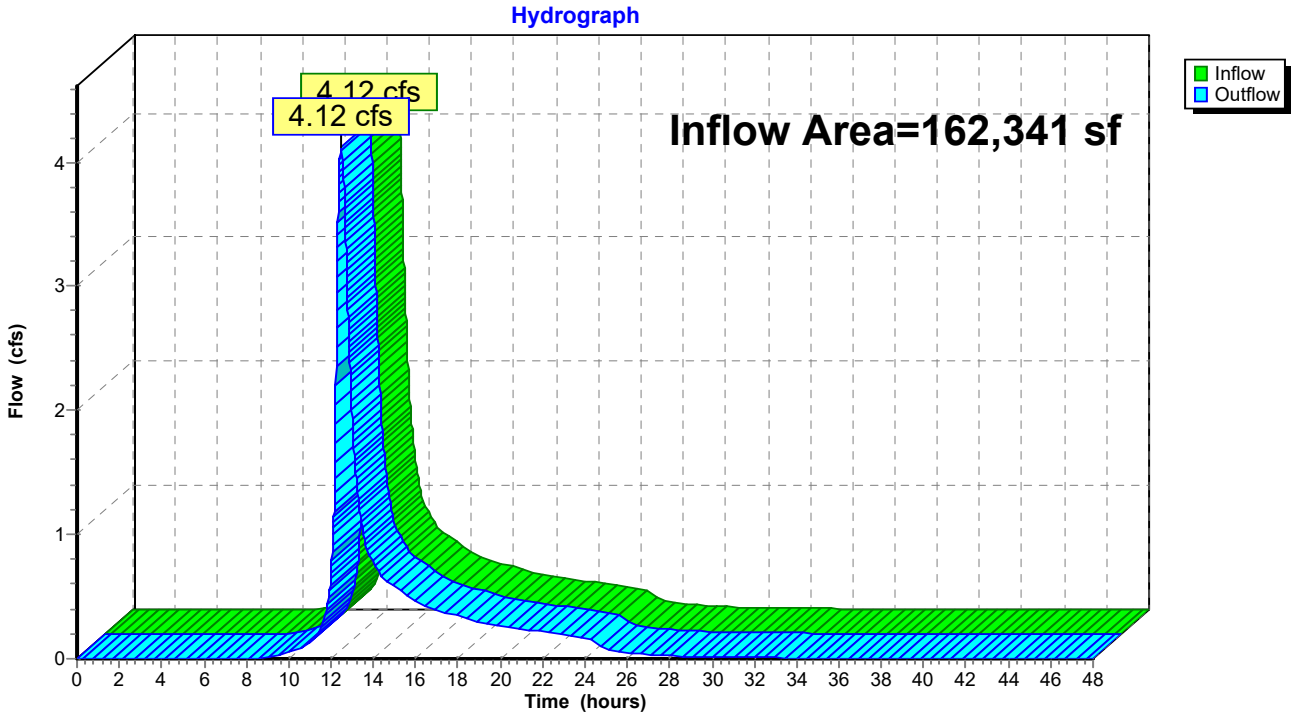


Summary for Reach DP-20: EX. DITCH ALONG RAILROAD TRACKS

Inflow Area = 162,341 sf, 0.98% Impervious, Inflow Depth > 2.16" for 10-Year event
Inflow = 4.12 cfs @ 12.48 hrs, Volume= 29,212 cf
Outflow = 4.12 cfs @ 12.48 hrs, Volume= 29,212 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2

Reach DP-20: EX. DITCH ALONG RAILROAD TRACKS



Summary for Pond 4P: NW WETLAND BASIN

Inflow Area = 58,148 sf, 0.61% Impervious, Inflow Depth = 2.26" for 10-Year event
Inflow = 2.67 cfs @ 12.21 hrs, Volume= 10,943 cf
Outflow = 1.71 cfs @ 12.42 hrs, Volume= 10,806 cf, Atten= 36%, Lag= 12.7 min
Primary = 1.71 cfs @ 12.42 hrs, Volume= 10,806 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 208.75' Surf.Area= 1,990 sf Storage= 1,071 cf
Peak Elev= 209.67' @ 12.42 hrs Surf.Area= 3,972 sf Storage= 4,246 cf (3,175 cf above start)

Plug-Flow detention time= 201.0 min calculated for 9,735 cf (89% of inflow)
Center-of-Mass det. time= 122.4 min (966.3 - 843.8)

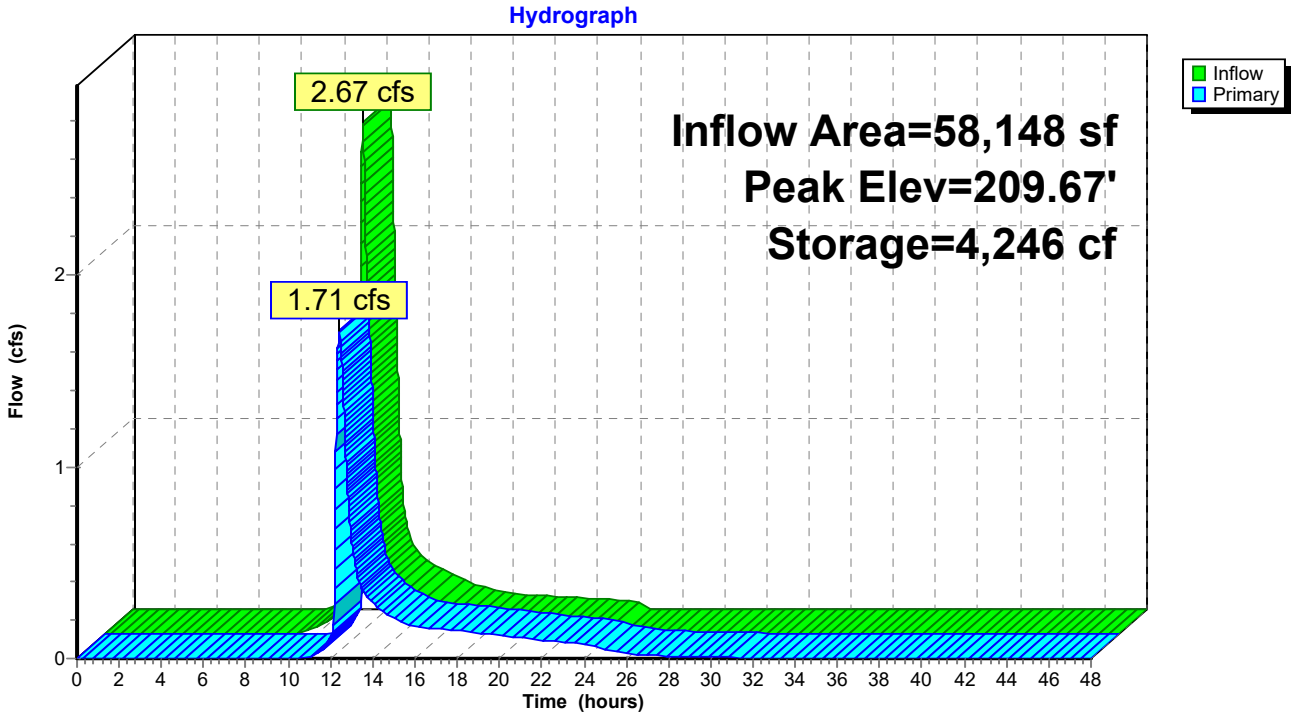
Volume	Invert	Avail.Storage	Storage Description
#1	208.00'	9,960 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
208.00	866	0	0
208.75	1,990	1,071	1,071
209.00	3,481	684	1,755
210.00	4,215	3,848	5,603
210.50	4,603	2,205	7,807
210.95	4,964	2,153	9,960

Device	Routing	Invert	Outlet Devices
#1	Primary	209.81'	**15.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Primary	208.50'	**12.0" Round Culvert** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.50' / 208.00' S= 0.0278 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	208.80'	**3.0" Vert. WQV Orifice** C= 0.600
#4	Device 2	209.39'	**12.0" Horiz. 2-YR Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.71 cfs @ 12.42 hrs HW=209.67' TW=0.00' (Dynamic Tailwater)
- **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **2=Culvert** (Passes 1.71 cfs of 3.09 cfs potential flow)
  - **3=WQV Orifice** (Orifice Controls 0.20 cfs @ 4.15 fps)
  - **4=2-YR Orifice** (Weir Controls 1.51 cfs @ 1.73 fps)

Pond 4P: NW WETLAND BASIN



Summary for Pond 5P: SW WETLAND BASIN

Inflow Area = 31,004 sf, 0.00% Impervious, Inflow Depth = 2.26" for 10-Year event
Inflow = 1.48 cfs @ 12.19 hrs, Volume= 5,834 cf
Outflow = 0.09 cfs @ 15.53 hrs, Volume= 3,090 cf, Atten= 94%, Lag= 200.7 min
Primary = 0.09 cfs @ 15.53 hrs, Volume= 3,090 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 208.33' Surf.Area= 1,823 sf Storage= 388 cf
Peak Elev= 209.40' @ 15.53 hrs Surf.Area= 4,681 sf Storage= 4,222 cf (3,834 cf above start)

Plug-Flow detention time= 516.3 min calculated for 2,702 cf (46% of inflow)
Center-of-Mass det. time= 342.5 min (1,185.1 - 842.6)

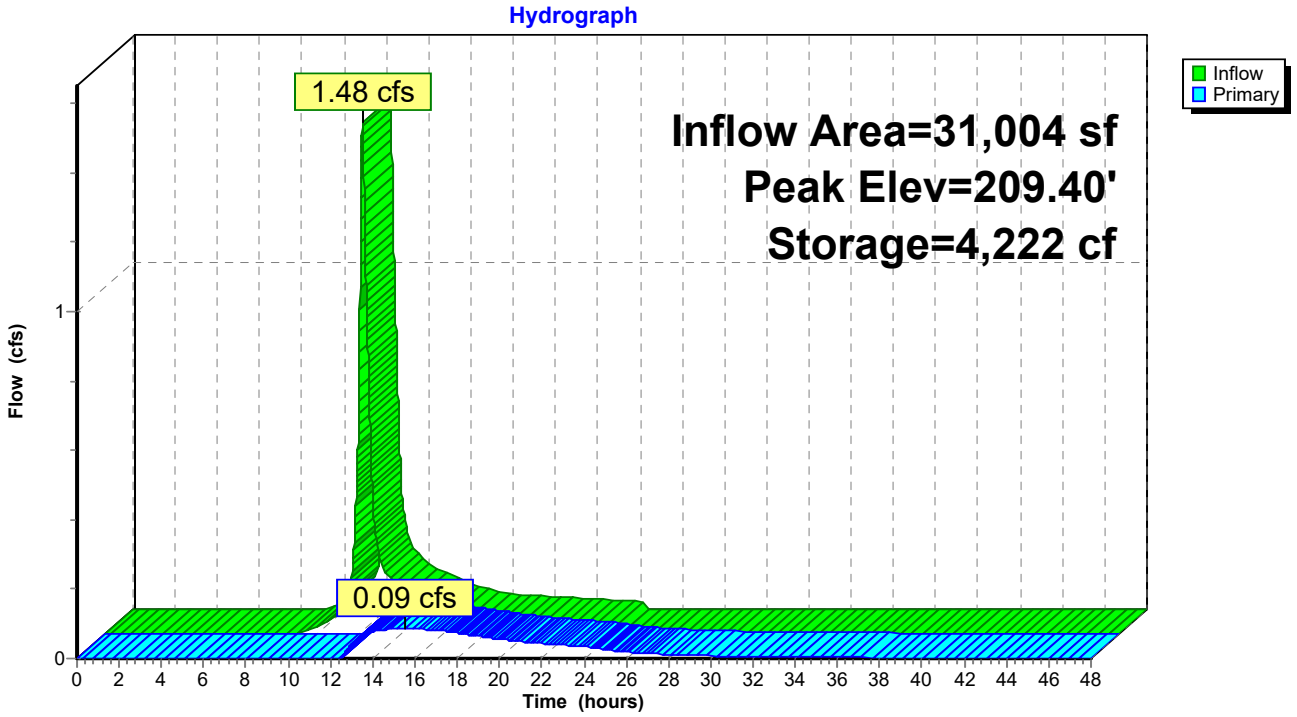
Volume	Invert	Avail.Storage	Storage Description
#1	208.00'	10,538 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
208.00	526	0	0
208.33	1,823	388	388
209.00	4,279	2,044	2,432
210.00	5,284	4,782	7,213
210.60	5,797	3,324	10,538

Device	Routing	Invert	Outlet Devices
#1	Primary	209.50'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Primary	208.50'	**12.0" Round Culvert** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.50' / 208.00' S= 0.0278 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	209.14'	**3.0" Vert. 2-YR Orifice** C= 0.600
#4	Device 2	209.40'	**12.0" Horiz. 10-YR Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.09 cfs @ 15.53 hrs HW=209.40' TW=0.00' (Dynamic Tailwater)
- **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **2=Culvert** (Passes 0.09 cfs of 2.40 cfs potential flow)
  - **3=2-YR Orifice** (Orifice Controls 0.09 cfs @ 1.77 fps)
  - **4=10-YR Orifice** (Controls 0.00 cfs)

Pond 5P: SW WETLAND BASIN



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P-10: LARGE FIELD NORTH Runoff Area=58,148 sf 0.61% Impervious Runoff Depth=3.11"
Flow Length=600' Tc=14.8 min CN=76 Runoff=3.70 cfs 15,091 cf

Subcatchment P-11: LARGE FIELD Runoff Area=31,004 sf 0.00% Impervious Runoff Depth=3.11"
Flow Length=354' Tc=13.5 min CN=76 Runoff=2.05 cfs 8,046 cf

Subcatchment P-12: WEST UNDETAINED Runoff Area=73,189 sf 1.70% Impervious Runoff Depth=3.40"
Flow Length=436' Tc=38.2 min CN=79 Runoff=3.39 cfs 20,762 cf

Reach DP-20: EX. DITCH ALONG RAILROAD TRACKS Inflow=6.00 cfs 41,014 cf
Outflow=6.00 cfs 41,014 cf

Pond 4P: NW WETLAND BASIN Peak Elev=209.81' Storage=4,805 cf Inflow=3.70 cfs 15,091 cf
Outflow=2.67 cfs 14,953 cf

Pond 5P: SW WETLAND BASIN Peak Elev=209.48' Storage=4,625 cf Inflow=2.05 cfs 8,046 cf
Outflow=0.37 cfs 5,299 cf

Total Runoff Area = 162,341 sf Runoff Volume = 43,899 cf Average Runoff Depth = 3.24"
99.02% Pervious = 160,742 sf 0.98% Impervious = 1,599 sf

Summary for Subcatchment P-10: LARGE FIELD NORTH

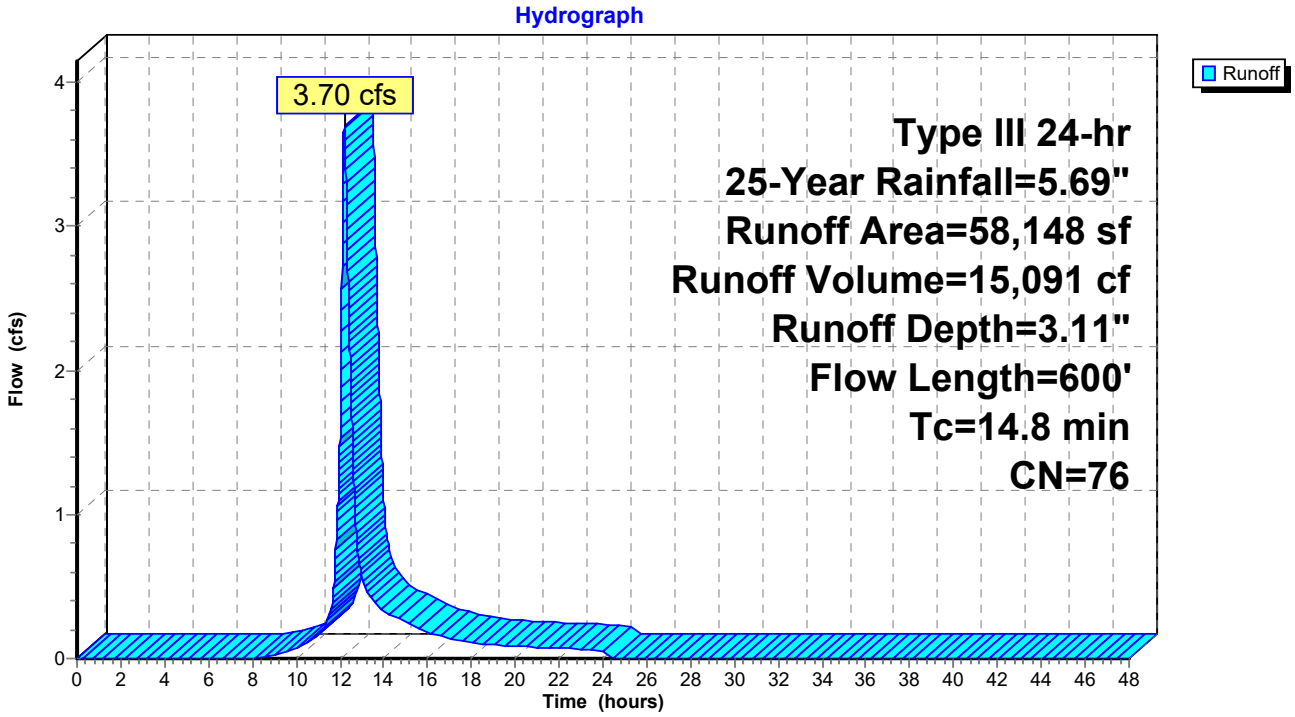
Runoff = 3.70 cfs @ 12.20 hrs, Volume= 15,091 cf, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.69"

	Area (sf)	CN	Description
	354	98	Paved parking, HSG D
	19,470	80	>75% Grass cover, Good, HSG D
	524	91	Gravel roads, HSG D
*	37,800	74	Soccer Field, Good, HSG C
	58,148	76	Weighted Average
	57,794		99.39% Pervious Area
	354		0.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
0.6	55	0.0100	1.61		**Shallow Concentrated Flow, OVER SOCCER FIELD** Unpaved Kv= 16.1 fps
0.3	35	0.0200	2.28		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
2.7	460	0.0050	2.84	1.55	**Pipe Channel, NORTH COLLECTOR** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
14.8	600	Total			

Subcatchment P-10: LARGE FIELD NORTH



Summary for Subcatchment P-11: LARGE FIELD SOUTHWEST

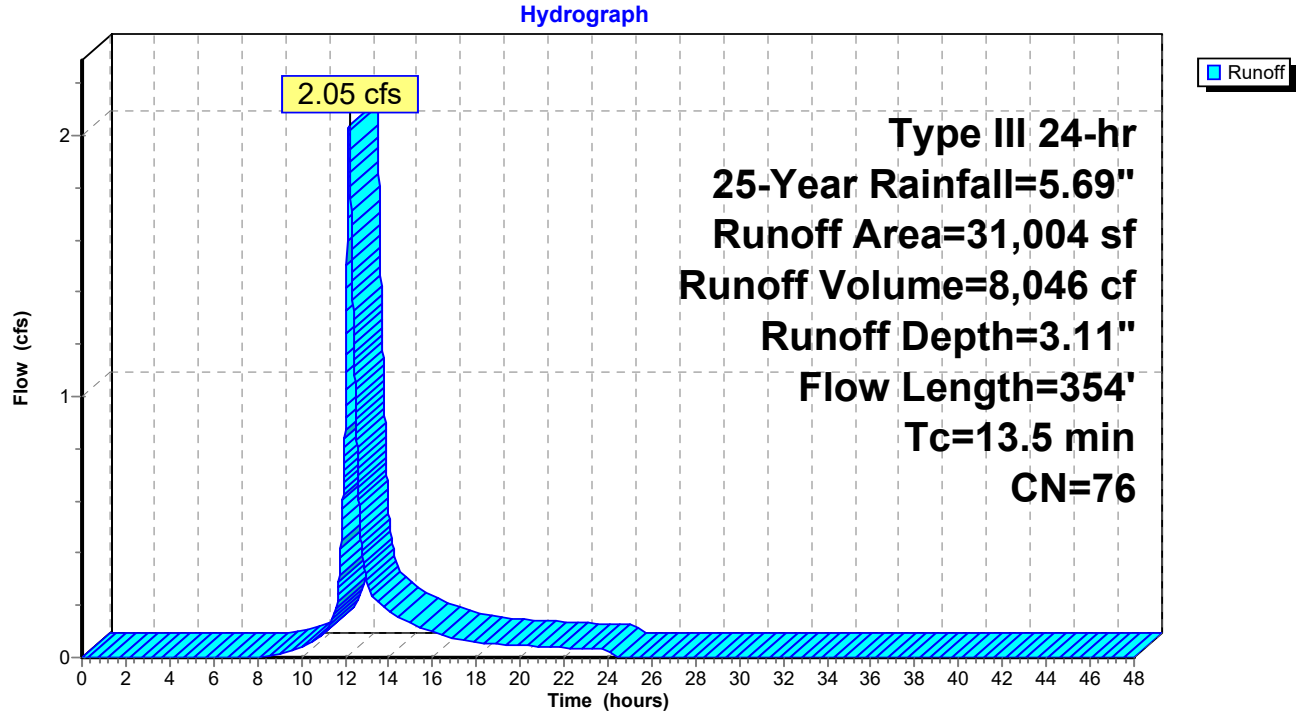
Runoff = 2.05 cfs @ 12.19 hrs, Volume= 8,046 cf, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.69"

	Area (sf)	CN	Description
	11,749	80	>75% Grass cover, Good, HSG D
	355	91	Gravel roads, HSG D
*	18,900	74	Soccer Field, Good, HSG C
	31,004	76	Weighted Average
	31,004		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER SOCCER FIELD** Grass: Dense n= 0.240 P2= 3.01"
0.6	55	0.0100	1.61		**Shallow Concentrated Flow, OVER SOCCER FIELD** Unpaved Kv= 16.1 fps
0.6	64	0.0125	1.80		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.1	185	0.0050	2.84	1.55	**Pipe Channel, SOUTHWEST COLLECTOR** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
13.5	354	Total			

Subcatchment P-11: LARGE FIELD SOUTHWEST



Summary for Subcatchment P-12: WEST UNDETAINED

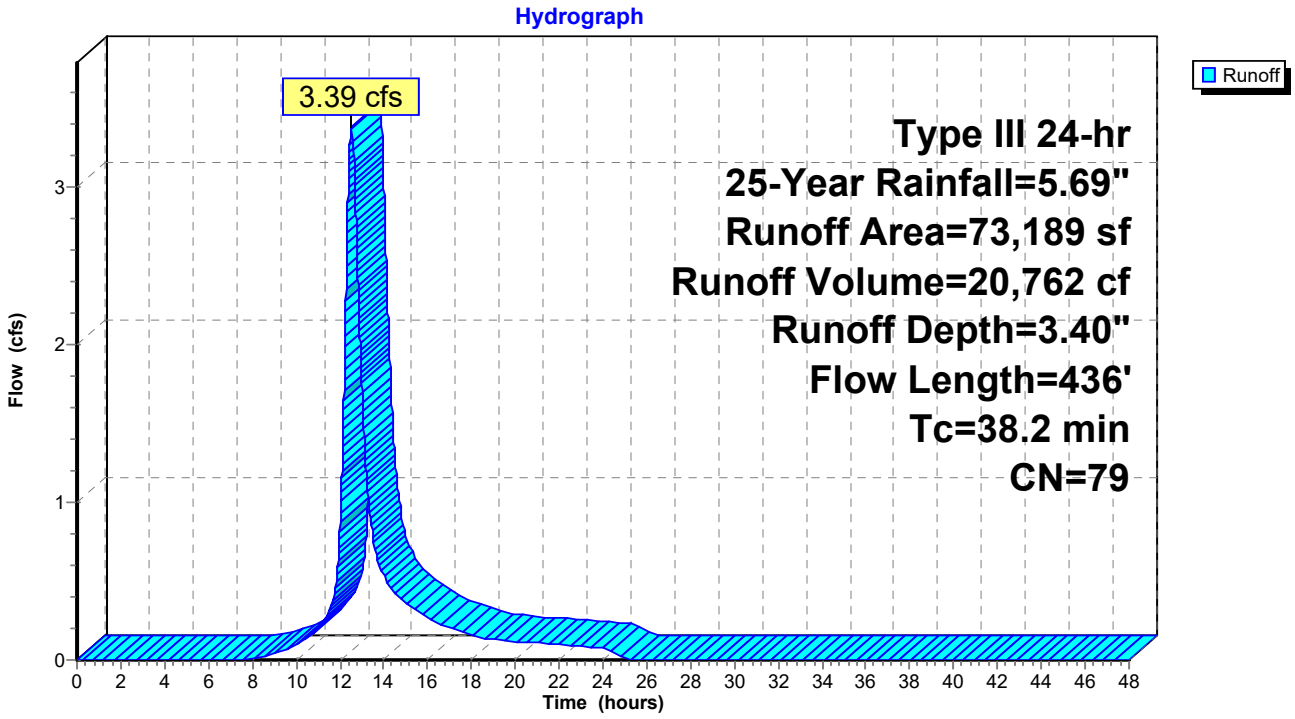
Runoff = 3.39 cfs @ 12.52 hrs, Volume= 20,762 cf, Depth= 3.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.69"

Area (sf)	CN	Description
1,245	98	Paved parking, HSG D
31,700	80	>75% Grass cover, Good, HSG D
3,945	91	Gravel roads, HSG D
36,299	77	Woods, Good, HSG D
73,189	79	Weighted Average
71,944		98.30% Pervious Area
1,245		1.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	50	0.0100	0.05		**Sheet Flow, THRU WOODS** Woods: Light underbrush n= 0.400 P2= 3.01"
21.4	386	0.0036	0.30		**Shallow Concentrated Flow, THRU WOODS** Woodland Kv= 5.0 fps
38.2	436	Total			

Subcatchment P-12: WEST UNDETAINED

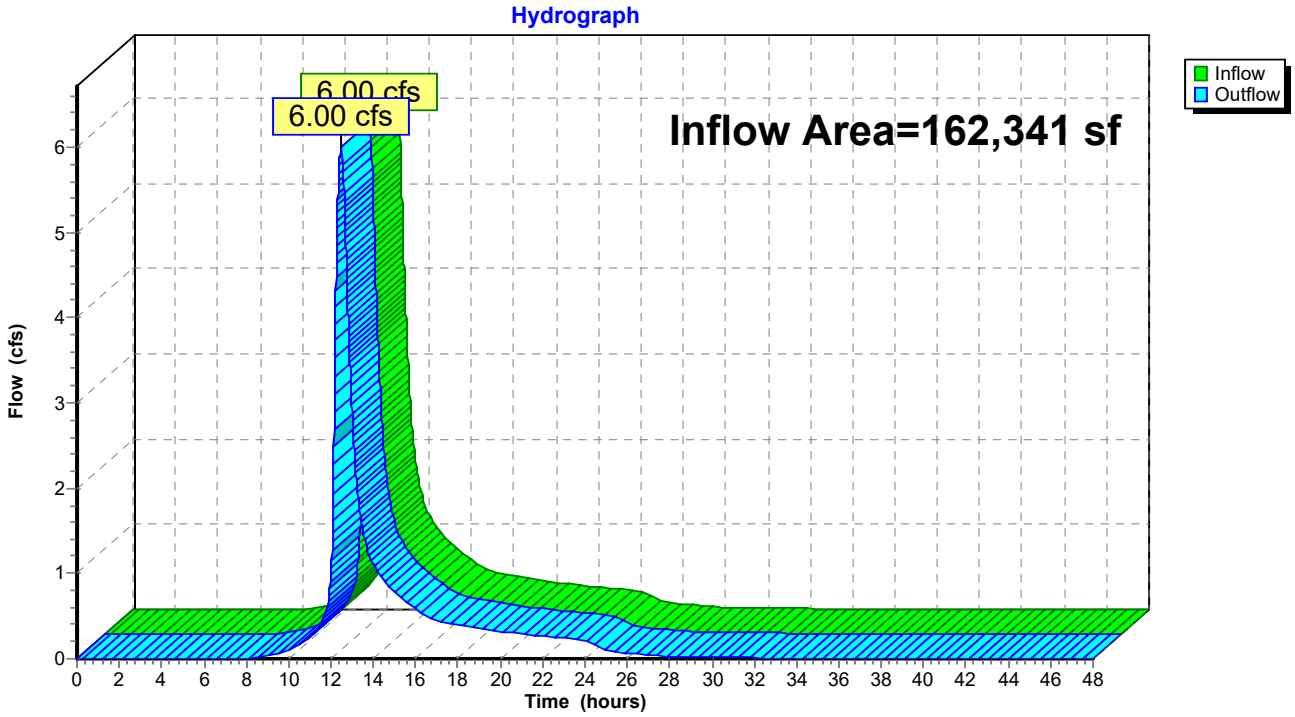


Summary for Reach DP-20: EX. DITCH ALONG RAILROAD TRACKS

Inflow Area = 162,341 sf, 0.98% Impervious, Inflow Depth > 3.03" for 25-Year event
Inflow = 6.00 cfs @ 12.51 hrs, Volume= 41,014 cf
Outflow = 6.00 cfs @ 12.51 hrs, Volume= 41,014 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2

Reach DP-20: EX. DITCH ALONG RAILROAD TRACKS



Summary for Pond 4P: NW WETLAND BASIN

Inflow Area = 58,148 sf, 0.61% Impervious, Inflow Depth = 3.11" for 25-Year event
Inflow = 3.70 cfs @ 12.20 hrs, Volume= 15,091 cf
Outflow = 2.67 cfs @ 12.36 hrs, Volume= 14,953 cf, Atten= 28%, Lag= 9.6 min
Primary = 2.67 cfs @ 12.36 hrs, Volume= 14,953 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 208.75' Surf.Area= 1,990 sf Storage= 1,071 cf
Peak Elev= 209.81' @ 12.36 hrs Surf.Area= 4,074 sf Storage= 4,805 cf (3,734 cf above start)

Plug-Flow detention time= 161.4 min calculated for 13,882 cf (92% of inflow)
Center-of-Mass det. time= 103.2 min (937.7 - 834.5)

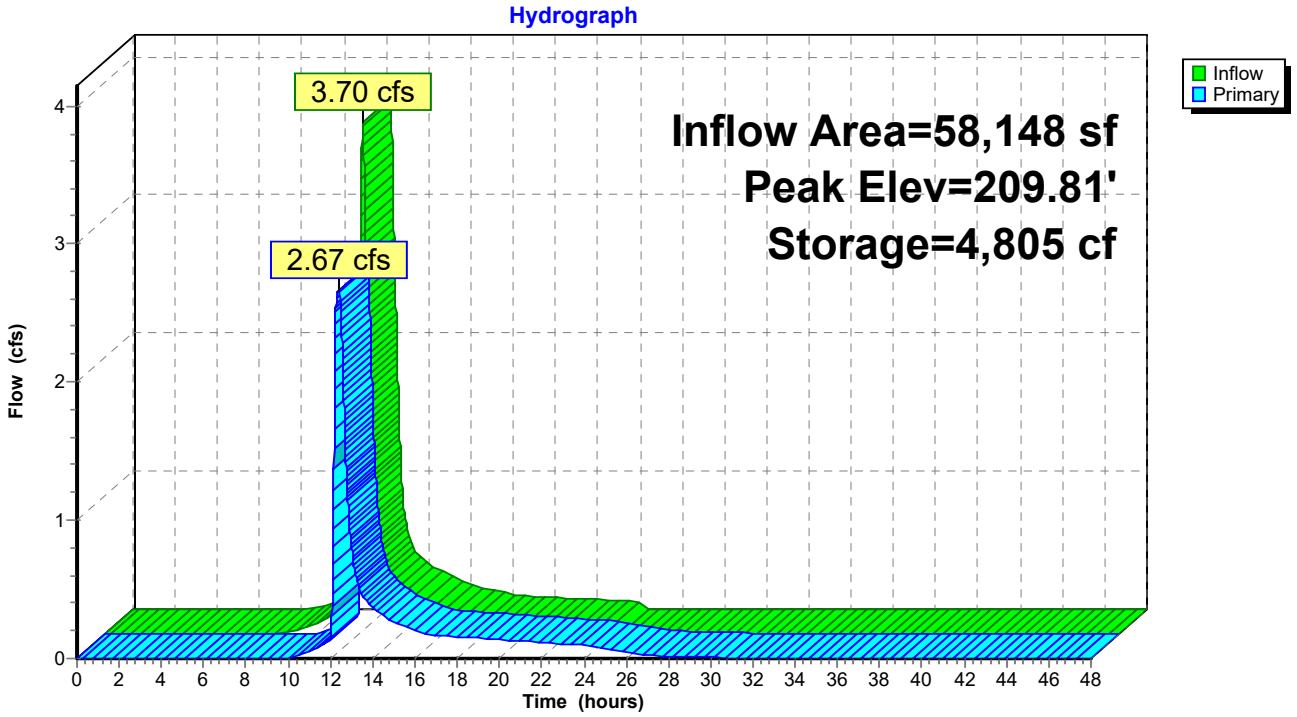
Volume	Invert	Avail.Storage	Storage Description
#1	208.00'	9,960 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
208.00	866	0	0
208.75	1,990	1,071	1,071
209.00	3,481	684	1,755
210.00	4,215	3,848	5,603
210.50	4,603	2,205	7,807
210.95	4,964	2,153	9,960

Device	Routing	Invert	Outlet Devices
#1	Primary	209.81'	**15.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Primary	208.50'	**12.0" Round Culvert** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.50' / 208.00' S= 0.0278 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	208.80'	**3.0" Vert. WQV Orifice** C= 0.600
#4	Device 2	209.39'	**12.0" Horiz. 2-YR Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.67 cfs @ 12.36 hrs HW=209.81' TW=0.00' (Dynamic Tailwater)
- **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **2=Culvert** (Passes 2.67 cfs of 3.40 cfs potential flow)
  - **3=WQV Orifice** (Orifice Controls 0.22 cfs @ 4.52 fps)
  - **4=2-YR Orifice** (Orifice Controls 2.44 cfs @ 3.11 fps)

Pond 4P: NW WETLAND BASIN



Summary for Pond 5P: SW WETLAND BASIN

Inflow Area = 31,004 sf, 0.00% Impervious, Inflow Depth = 3.11" for 25-Year event
Inflow = 2.05 cfs @ 12.19 hrs, Volume= 8,046 cf
Outflow = 0.37 cfs @ 12.82 hrs, Volume= 5,299 cf, Atten= 82%, Lag= 38.2 min
Primary = 0.37 cfs @ 12.82 hrs, Volume= 5,299 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 208.33' Surf.Area= 1,823 sf Storage= 388 cf
Peak Elev= 209.48' @ 12.82 hrs Surf.Area= 4,766 sf Storage= 4,625 cf (4,238 cf above start)

Plug-Flow detention time= 367.1 min calculated for 4,911 cf (61% of inflow)
Center-of-Mass det. time= 235.4 min (1,068.8 - 833.3)

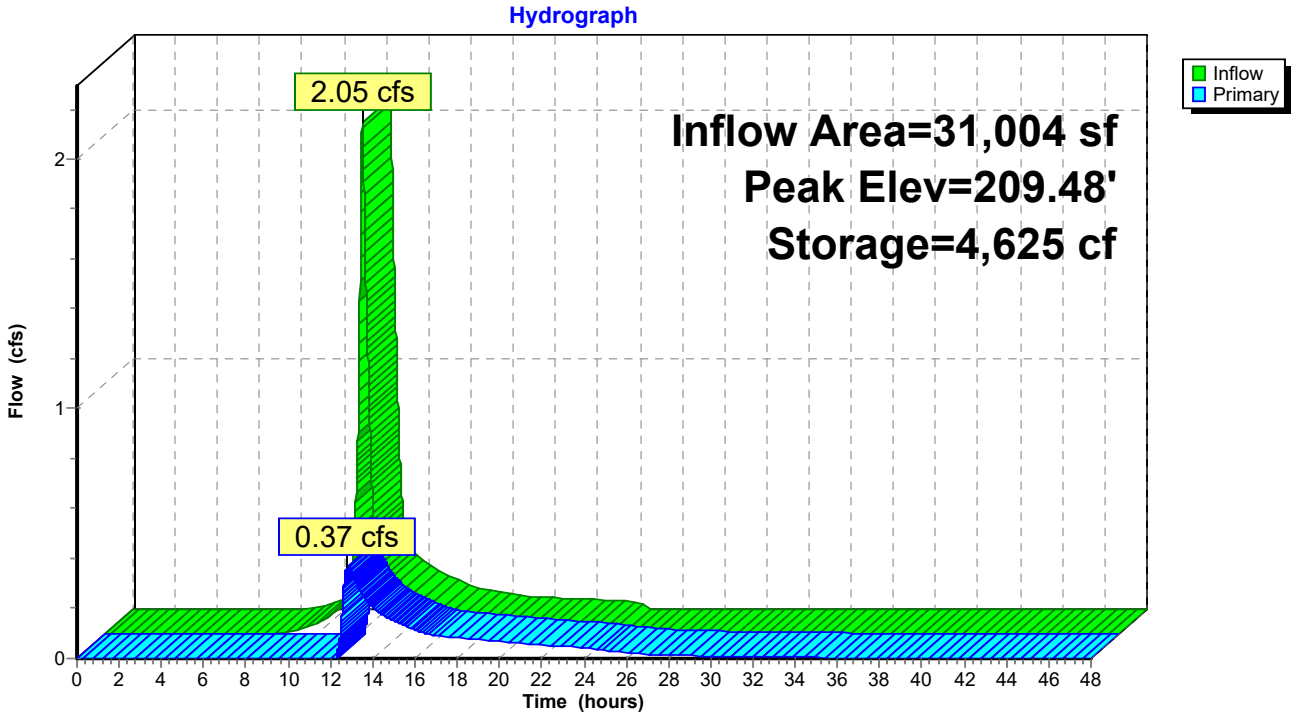
Volume	Invert	Avail.Storage	Storage Description
#1	208.00'	10,538 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
208.00	526	0	0
208.33	1,823	388	388
209.00	4,279	2,044	2,432
210.00	5,284	4,782	7,213
210.60	5,797	3,324	10,538

Device	Routing	Invert	Outlet Devices
#1	Primary	209.50'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Primary	208.50'	**12.0" Round Culvert** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.50' / 208.00' S= 0.0278 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	209.14'	**3.0" Vert. 2-YR Orifice** C= 0.600
#4	Device 2	209.40'	**12.0" Horiz. 10-YR Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.37 cfs @ 12.82 hrs HW=209.48' TW=0.00' (Dynamic Tailwater)
- **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **2=Culvert** (Passes 0.37 cfs of 2.65 cfs potential flow)
  - **3=2-YR Orifice** (Orifice Controls 0.11 cfs @ 2.26 fps)
  - **4=10-YR Orifice** (Weir Controls 0.25 cfs @ 0.95 fps)

Pond 5P: SW WETLAND BASIN



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P-10: LARGE FIELD NORTH Runoff Area=58,148 sf 0.61% Impervious Runoff Depth=4.50"
Flow Length=600' Tc=14.8 min CN=76 Runoff=5.34 cfs 21,798 cf

Subcatchment P-11: LARGE FIELD Runoff Area=31,004 sf 0.00% Impervious Runoff Depth=4.50"
Flow Length=354' Tc=13.5 min CN=76 Runoff=2.95 cfs 11,623 cf

Subcatchment P-12: WEST UNDETAINED Runoff Area=73,189 sf 1.70% Impervious Runoff Depth=4.83"
Flow Length=436' Tc=38.2 min CN=79 Runoff=4.78 cfs 29,472 cf

Reach DP-20: EX. DITCH ALONG RAILROAD TRACKS Inflow=10.08 cfs 60,003 cf
Outflow=10.08 cfs 60,003 cf

Pond 4P: NW WETLAND BASIN Peak Elev=209.94' Storage=5,357 cf Inflow=5.34 cfs 21,798 cf
Outflow=4.78 cfs 21,659 cf

Pond 5P: SW WETLAND BASIN Peak Elev=209.59' Storage=5,145 cf Inflow=2.95 cfs 11,623 cf
Outflow=1.69 cfs 8,873 cf

Total Runoff Area = 162,341 sf Runoff Volume = 62,892 cf Average Runoff Depth = 4.65"
99.02% Pervious = 160,742 sf 0.98% Impervious = 1,599 sf

Summary for Subcatchment P-10: LARGE FIELD NORTH

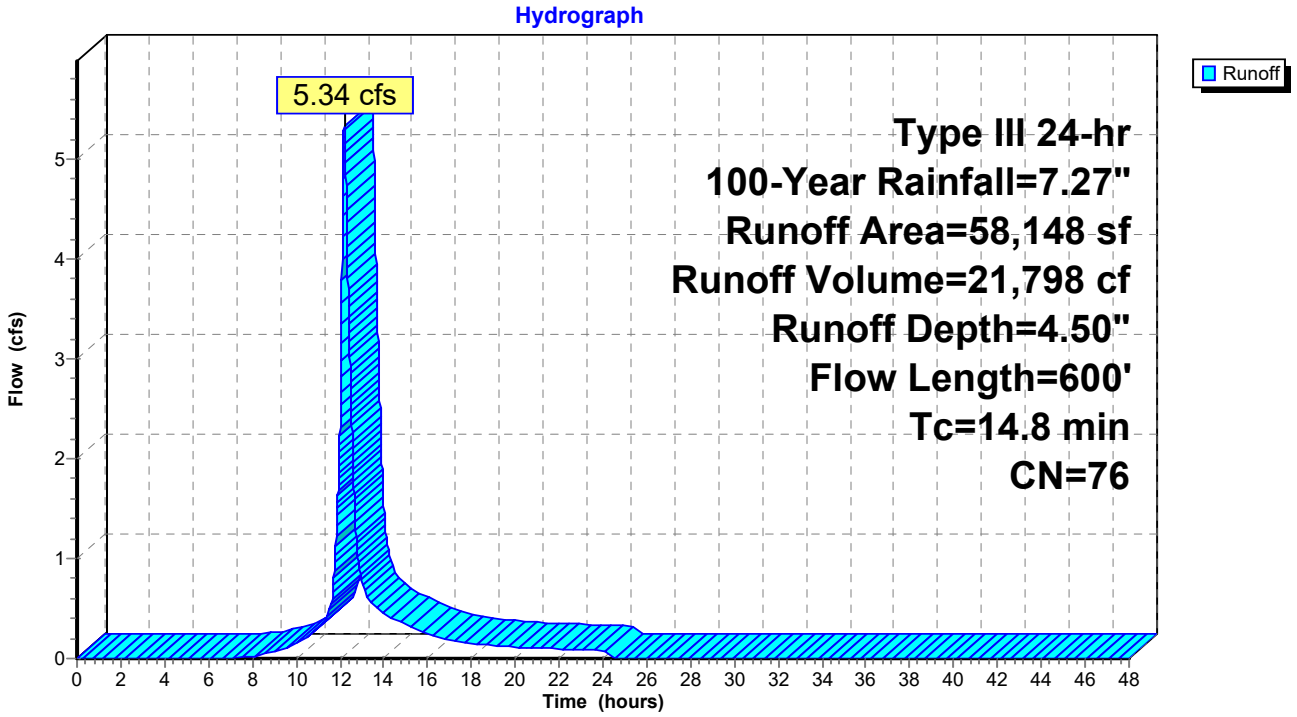
Runoff = 5.34 cfs @ 12.20 hrs, Volume= 21,798 cf, Depth= 4.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.27"

	Area (sf)	CN	Description
	354	98	Paved parking, HSG D
	19,470	80	>75% Grass cover, Good, HSG D
	524	91	Gravel roads, HSG D
*	37,800	74	Soccer Field, Good, HSG C
	58,148	76	Weighted Average
	57,794		99.39% Pervious Area
	354		0.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER GRASS** Grass: Dense n= 0.240 P2= 3.01"
0.6	55	0.0100	1.61		**Shallow Concentrated Flow, OVER SOCCER FIELD** Unpaved Kv= 16.1 fps
0.3	35	0.0200	2.28		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
2.7	460	0.0050	2.84	1.55	**Pipe Channel, NORTH COLLECTOR** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
14.8	600	Total			

Subcatchment P-10: LARGE FIELD NORTH



Summary for Subcatchment P-11: LARGE FIELD SOUTHWEST

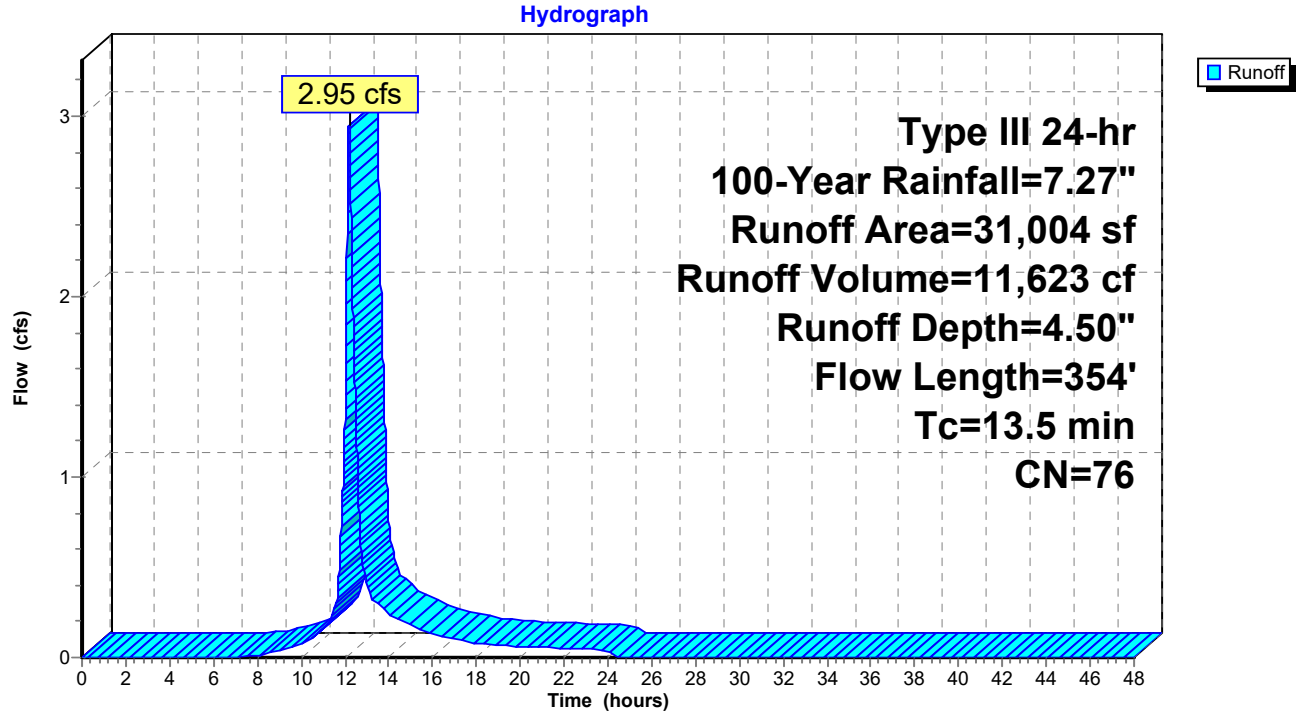
Runoff = 2.95 cfs @ 12.19 hrs, Volume= 11,623 cf, Depth= 4.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.27"

	Area (sf)	CN	Description
	11,749	80	>75% Grass cover, Good, HSG D
	355	91	Gravel roads, HSG D
*	18,900	74	Soccer Field, Good, HSG C
	31,004	76	Weighted Average
	31,004		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.2	50	0.0100	0.07		**Sheet Flow, OVER SOCCER FIELD** Grass: Dense n= 0.240 P2= 3.01"
0.6	55	0.0100	1.61		**Shallow Concentrated Flow, OVER SOCCER FIELD** Unpaved Kv= 16.1 fps
0.6	64	0.0125	1.80		**Shallow Concentrated Flow, OVER GRASS** Unpaved Kv= 16.1 fps
1.1	185	0.0050	2.84	1.55	**Pipe Channel, SOUTHWEST COLLECTOR** 10.0" Round Area= 0.5 sf Perim= 2.6' r= 0.21' n= 0.013 Corrugated PE, smooth interior
13.5	354	Total			

Subcatchment P-11: LARGE FIELD SOUTHWEST



Summary for Subcatchment P-12: WEST UNDETAINED

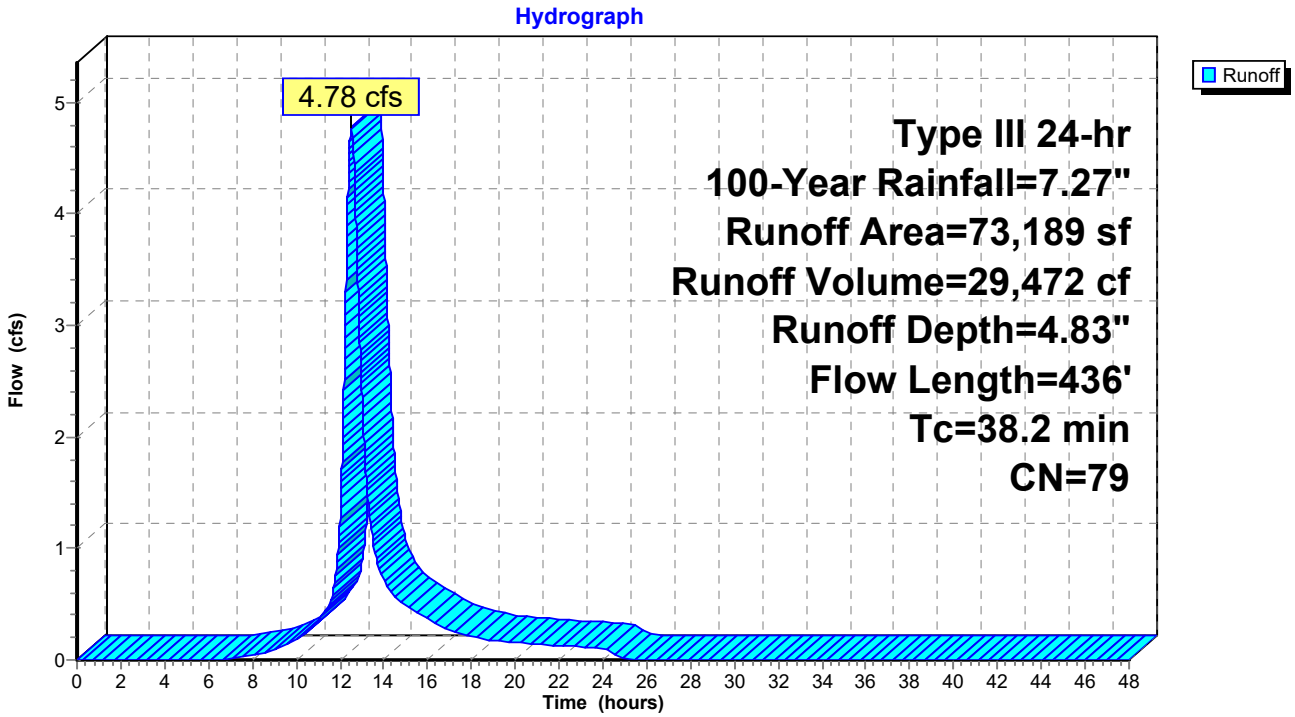
Runoff = 4.78 cfs @ 12.52 hrs, Volume= 29,472 cf, Depth= 4.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.27"

Area (sf)	CN	Description
1,245	98	Paved parking, HSG D
31,700	80	>75% Grass cover, Good, HSG D
3,945	91	Gravel roads, HSG D
36,299	77	Woods, Good, HSG D
73,189	79	Weighted Average
71,944		98.30% Pervious Area
1,245		1.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	50	0.0100	0.05		**Sheet Flow, THRU WOODS** Woods: Light underbrush n= 0.400 P2= 3.01"
21.4	386	0.0036	0.30		**Shallow Concentrated Flow, THRU WOODS** Woodland Kv= 5.0 fps
38.2	436	Total			

Subcatchment P-12: WEST UNDETAINED

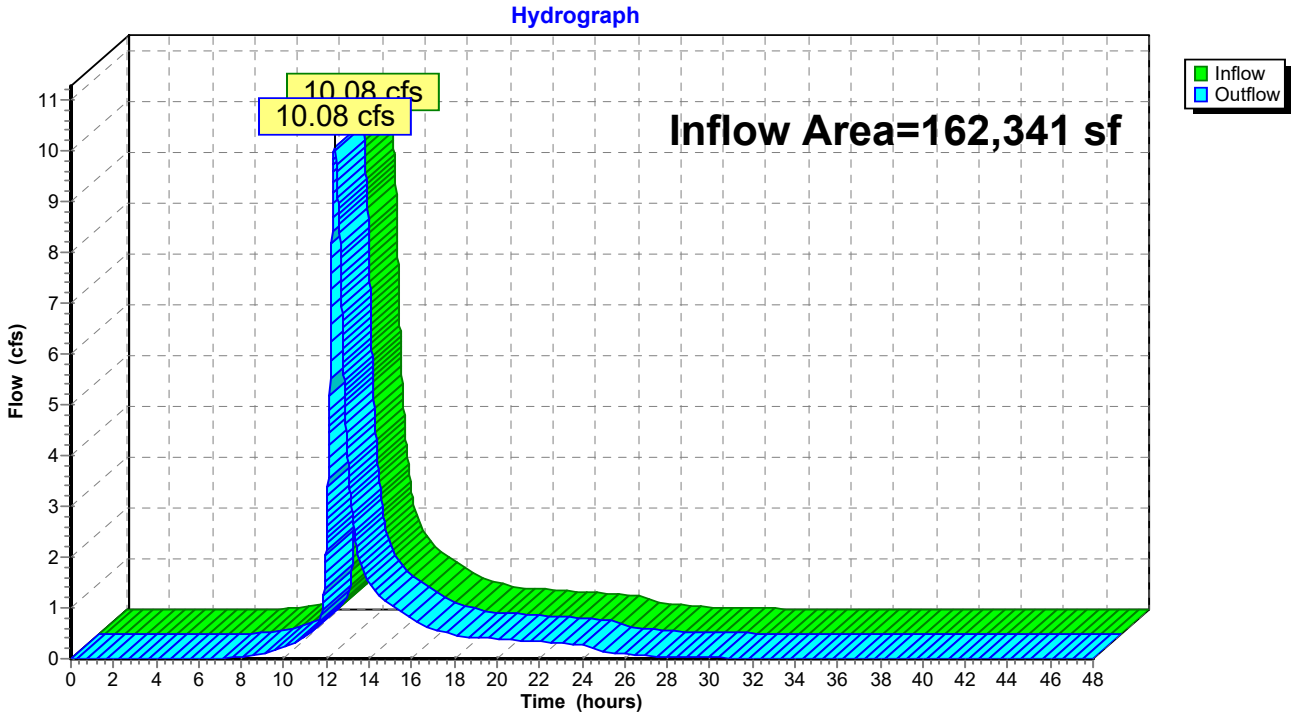


Summary for Reach DP-20: EX. DITCH ALONG RAILROAD TRACKS

Inflow Area = 162,341 sf, 0.98% Impervious, Inflow Depth > 4.44" for 100-Year event
Inflow = 10.08 cfs @ 12.39 hrs, Volume= 60,003 cf
Outflow = 10.08 cfs @ 12.39 hrs, Volume= 60,003 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2

Reach DP-20: EX. DITCH ALONG RAILROAD TRACKS



Summary for Pond 4P: NW WETLAND BASIN

Inflow Area = 58,148 sf, 0.61% Impervious, Inflow Depth = 4.50" for 100-Year event
Inflow = 5.34 cfs @ 12.20 hrs, Volume= 21,798 cf
Outflow = 4.78 cfs @ 12.28 hrs, Volume= 21,659 cf, Atten= 10%, Lag= 4.6 min
Primary = 4.78 cfs @ 12.28 hrs, Volume= 21,659 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 208.75' Surf.Area= 1,990 sf Storage= 1,071 cf
Peak Elev= 209.94' @ 12.28 hrs Surf.Area= 4,172 sf Storage= 5,357 cf (4,286 cf above start)

Plug-Flow detention time= 127.5 min calculated for 20,588 cf (94% of inflow)
Center-of-Mass det. time= 85.3 min (909.3 - 824.0)

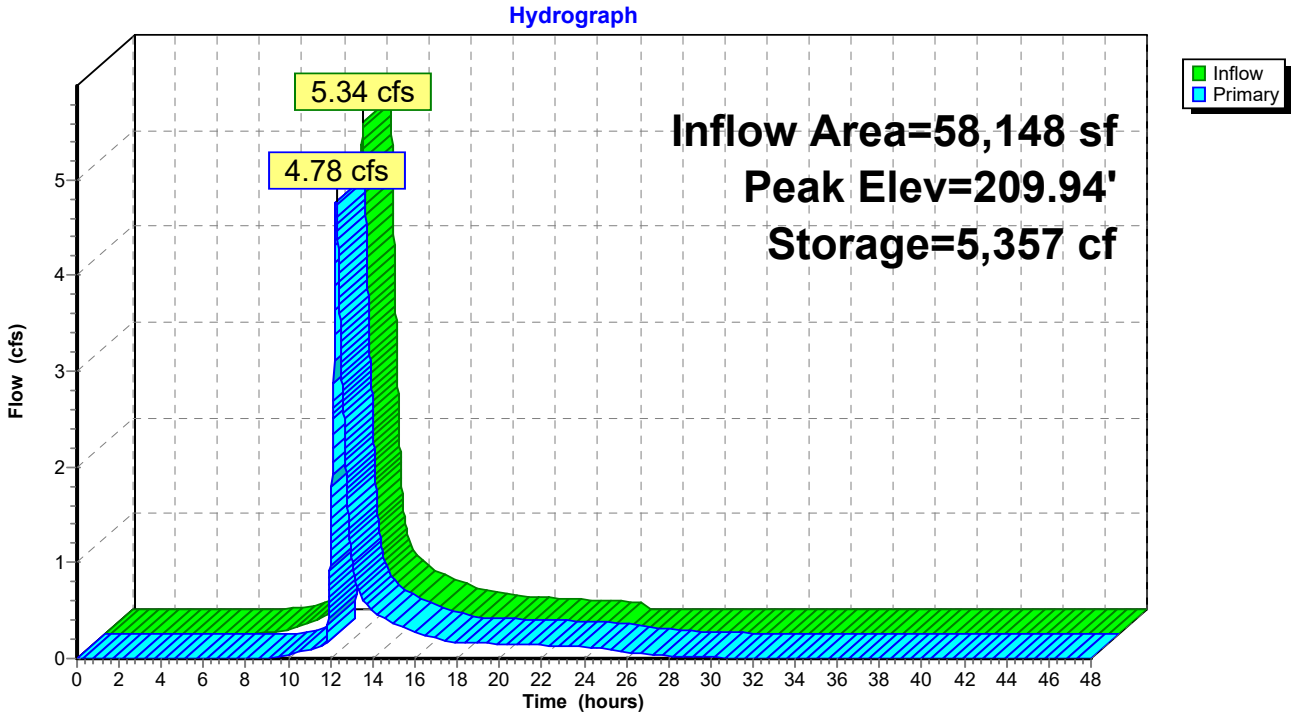
Volume	Invert	Avail.Storage	Storage Description
#1	208.00'	9,960 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
208.00	866	0	0
208.75	1,990	1,071	1,071
209.00	3,481	684	1,755
210.00	4,215	3,848	5,603
210.50	4,603	2,205	7,807
210.95	4,964	2,153	9,960

Device	Routing	Invert	Outlet Devices
#1	Primary	209.81'	**15.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Primary	208.50'	**12.0" Round Culvert** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.50' / 208.00' S= 0.0278 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	208.80'	**3.0" Vert. WQV Orifice** C= 0.600
#4	Device 2	209.39'	**12.0" Horiz. 2-YR Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.78 cfs @ 12.28 hrs HW=209.94' TW=0.00' (Dynamic Tailwater)
- **1=Broad-Crested Rectangular Weir** (Weir Controls 1.73 cfs @ 0.88 fps)
- **2=Culvert** (Passes 3.05 cfs of 3.67 cfs potential flow)
  - **3=WQV Orifice** (Orifice Controls 0.24 cfs @ 4.85 fps)
  - **4=2-YR Orifice** (Orifice Controls 2.81 cfs @ 3.58 fps)

Pond 4P: NW WETLAND BASIN



Summary for Pond 5P: SW WETLAND BASIN

Inflow Area = 31,004 sf, 0.00% Impervious, Inflow Depth = 4.50" for 100-Year event
Inflow = 2.95 cfs @ 12.19 hrs, Volume= 11,623 cf
Outflow = 1.69 cfs @ 12.41 hrs, Volume= 8,873 cf, Atten= 43%, Lag= 13.5 min
Primary = 1.69 cfs @ 12.41 hrs, Volume= 8,873 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Starting Elev= 208.33' Surf.Area= 1,823 sf Storage= 388 cf
Peak Elev= 209.59' @ 12.41 hrs Surf.Area= 4,875 sf Storage= 5,145 cf (4,758 cf above start)

Plug-Flow detention time= 261.4 min calculated for 8,484 cf (73% of inflow)
Center-of-Mass det. time= 160.3 min (983.1 - 822.8)

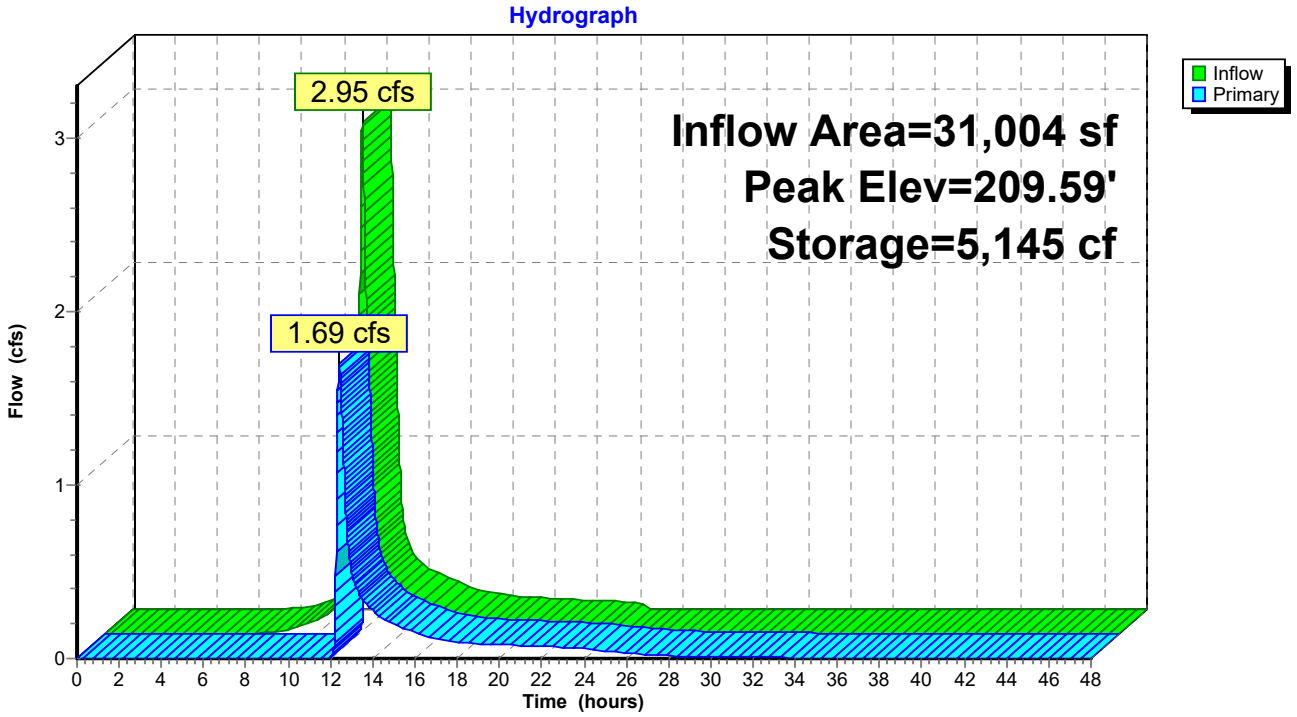
Volume	Invert	Avail.Storage	Storage Description
#1	208.00'	10,538 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
208.00	526	0	0
208.33	1,823	388	388
209.00	4,279	2,044	2,432
210.00	5,284	4,782	7,213
210.60	5,797	3,324	10,538

Device	Routing	Invert	Outlet Devices
#1	Primary	209.50'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Primary	208.50'	**12.0" Round Culvert** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 208.50' / 208.00' S= 0.0278 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	209.14'	**3.0" Vert. 2-YR Orifice** C= 0.600
#4	Device 2	209.40'	**12.0" Horiz. 10-YR Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.69 cfs @ 12.41 hrs HW=209.59' TW=0.00' (Dynamic Tailwater)
- **1=Broad-Crested Rectangular Weir** (Weir Controls 0.69 cfs @ 0.74 fps)
- **2=Culvert** (Passes 1.01 cfs of 2.91 cfs potential flow)
  - **3=2-YR Orifice** (Orifice Controls 0.14 cfs @ 2.76 fps)
  - **4=10-YR Orifice** (Weir Controls 0.87 cfs @ 1.44 fps)

Pond 5P: SW WETLAND BASIN



Section 4

Stormwater Management Calculations

LARGE FIELD NORTH (P-10)

(Water Quality Volume)

$WQV = WQD * Imperv_{(area)}$

WQV = Water Quality Volume

WQD = Water Quality Depth

$Imperv_{(area)}$ = Proposed Tributary Impervious Area to Treatment Train

WQD Based on Status of Tributary Area

WQD = 0.50 IN (for Non-Critical Areas)

WQD = 1.00 IN (for Critical Areas)

Project Input

Critical Area = NO

$Imperv_{(area)}$ = 354 SF

WQD = 0.50 IN

WQV = 14.8 CF

Volume provided in the basin below the lowest outlet above the GW elevation = **107 CF**
(See HydroCAD calculations)

107 > 14.8 THEREFORE OK

PARKING LOT & CONCESSION AREA (P-3E)

(Water Quality Volume)

$WQV = WQD * Imperv_{(area)}$

WQV = Water Quality Volume

WQD = Water Quality Depth

$Imperv_{(area)}$ = Proposed Tributary Impervious Area to Treatment Train

WQD Based on Status of Tributary Area

WQD = 0.50 IN (for Non-Critical Areas)

WQD = 1.00 IN (for Critical Areas)

Project Input

Critical Area = NO

$Imperv_{(area)}$ = 12,945 SF

WQD = 0.50 IN

WQV = 539.4 CF Treated by Stormceptor 450i

PARKING LOT & BASKETBALL COURT (P-3W)

(Water Quality Volume)

$WQV = WQD * Imperv_{(area)}$

WQV = Water Quality Volume

WQD = Water Quality Depth

$Imperv_{(area)}$ = Proposed Tributary Impervious Area to Treatment Train

WQD Based on Status of Tributary Area

WQD = 0.50 IN (for Non-Critical Areas)

WQD = 1.00 IN (for Critical Areas)

Project Input

Critical Area = NO

$Imperv_{(area)}$ = 20,777 SF

WQD = 0.50 IN

WQV = 865.7 CF Treated by Rain Garden

WETLAND BASIN-1 (3P)
Impervious from P-1, P-2, & P-8

(Water Quality Volume)

$WQV = WQD * Imperv_{(area)}$

WQV = Water Quality Volume

WQD = Water Quality Depth

$Imperv_{(area)}$ = Proposed Tributary Impervious Area to Treatment Train

WQD Based on Status of Tributary Area

WQD = 0.50 IN (for Non-Critical Areas)

WQD = 1.00 IN (for Critical Areas)

Project Input

Critical Area = NO

$Imperv_{(area)}$ = 5,057 SF

WQD = 0.50 IN

WQV = 210.7 CF

Volume provided in the basin below the lowest outlet above the GW elevation = **250 CF**
(See HydroCAD calculations)

250 > 210.7 THEREFORE OK

Broad-Crested Overflow Design - Wetland Basin-1 (3P)

Top of Berm Elevation =	211.00	
Weir Elevation =	209.75	
Q_{weir} = 100-Year Developed Flow Rate =	11.83	cfs
Pond Bottom Elevation =	207.50	

$$Q = (2/3) * C_{BROAD} * L * SQRT(2*g) * H^{3/2}$$

Adjust L to achieve Q

Where:

C_{BROAD} =	0.50		
L=	10.0	ft	**(2) 10' wide weirs are provided**
g =	32.2	ft/sec^2	
H =	1.3	ft	
Q=	37.4	**OK**	

The HydroCAD calculated flow height through the weir is 209.90 during the 100-YR event; therefore, 1' of freeboard is provided within the basin.

Broad-Crested Overflow Design - NW Wetland Basin (4P)

Top of Berm Elevation =	210.95	
Weir Elevation =	209.81	
Q_{weir} = 100-Year Developed Flow Rate =	5.34	cfs
Pond Bottom Elevation =	208.00	

$$Q = (2/3) * C_{BROAD} * L * SQRT(2*g) * H^{3/2}$$

Adjust L to achieve Q

Where:

C_{BROAD} =	0.50	
L=	15.0	ft
g =	32.2	ft/sec^2
H =	1.1	ft
Q=	48.8	**OK**

The HydroCAD calculated flow height through the weir is 209.94 during the 100-YR event; therefore, 1' of freeboard is provided within the basin.

Broad-Crested Overflow Design - SW Wetland Basin (5P)

Top of Berm Elevation =	210.60	
Weir Elevation =	209.50	
Q_{weir} = 100-Year Developed Flow Rate =	2.95	cfs
Pond Bottom Elevation =	208.00	

$$Q = (2/3) * C_{BROAD} * L * SQRT(2*g) * H^{3/2}$$

Adjust L to achieve Q

Where:

C_{BROAD} =	0.50	
L=	10.0	ft
g =	32.2	ft/sec^2
H =	1.1	ft
Q=	30.9	**OK**

The HydroCAD calculated flow height through the weir is 209.59 during the 100-YR event; therefore, 1' of freeboard is provided within the basin.

	Onsite Imperv Area*	TSS	Imperv Area * TSS	
P-1	0	80	0	Constucted Wetland
P-2	1,855	80	148400	Constucted Wetland
P-3E	12,312	85	1046520	Stormceptor
P-3W	19,590	90	1763100	Rain Garden
P-4	500	0	0	
P-5	1,191	0	0	
P-6	0	0	0	
P-7	8,472	70	593040	Water Quality Swale
P-8	1,500	80	120000	Constucted Wetland
P-9	422	80	33760	Constucted Wetland
P-10	0	0	0	
P-11	0	0	0	
P-12	0	0	0	
Total	45,842		3704820	
		Weighted TSS =	81	

*** Impervious Areas do not include the porous pavements used for the sidewalks or offsite runon areas.**

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Constructed Stormwater Wetlands (3 Total)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Constructed Stormwater Wetland	**0.80**	**1.00**	**0.80**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**

Total TSS Removal = **80%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Proposed Municipal Park & Fields**

Prepared By: **BLM**

Date: **12/13/2021**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Parking Lot Rain Garden

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Rain Garden	0.90	1.00	0.90	0.10
	0.00	0.10	0.00	0.10
	0.00	0.10	0.00	0.10
	0.00	0.10	0.00	0.10
	0.00	0.10	0.00	0.10

Total TSS Removal = 90%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Proposed Municipal Park & Fields
Prepared By: BLM
Date: 12/13/2021

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Water Quality Swale

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Water Quality Swale - Dry	**0.70**	**1.00**	**0.70**	**0.30**
	0.00	**0.30**	**0.00**	**0.30**
	0.00	**0.30**	**0.00**	**0.30**
	0.00	**0.30**	**0.00**	**0.30**
	0.00	**0.30**	**0.00**	**0.30**

Total TSS Removal = **70%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Proposed Municipal Park & Fields**
Prepared By: **BLM**
Date: **12/13/2021**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Brief Stormceptor Sizing Report - Deerfield P3-E

Project Information & Location			
Project Name	Deerfield Park & Fields	**Project Number**	49340
City	Deerfield	**State/ Province**	Massachusetts
Country	United States of America	**Date**	12/2021
Designer Information		**EOR Information (optional)**	
Name	Jesse Moreno	**Name**	
Company	ProTerra Design Group, LLC	**Company**	
Phone #	413-320-4918	**Phone #**	
Email	jmoreno@proterra-design.com	**Email**	

Stormwater Treatment Recommendation
The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Deerfield P3-E
Target TSS Removal (%)	85
TSS Removal (%) Provided	92
Recommended Stormceptor Model	STC 450i

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary		
Stormceptor Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**
STC 450i	92	98
STC 900	96	100
STC 1200	96	100
STC 1800	96	100
STC 2400	97	100
STC 3600	97	100
STC 4800	98	100
STC 6000	98	100
STC 7200	99	100
STC 11000	99	100
STC 13000	99	100
STC 16000	99	100

Stormceptor®

CONTECH ENGINEERED SOLUTIONS
A FORTERRA COMPANY

Sizing Details

Drainage Area	
Total Area (acres)	0.3
Imperviousness %	95.0

Rainfall	
Station Name	KNIGHTVILLE DAM
State/Province	Massachusetts
Station ID #	3985
Years of Records	14
Latitude	42°10'12"N
Longitude	72°31'12"W

Water Quality Objective	
TSS Removal (%)	85.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Storage	
Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cfs)	

Particle Size Distribution (PSD)
The selected PSD defines TSS removal

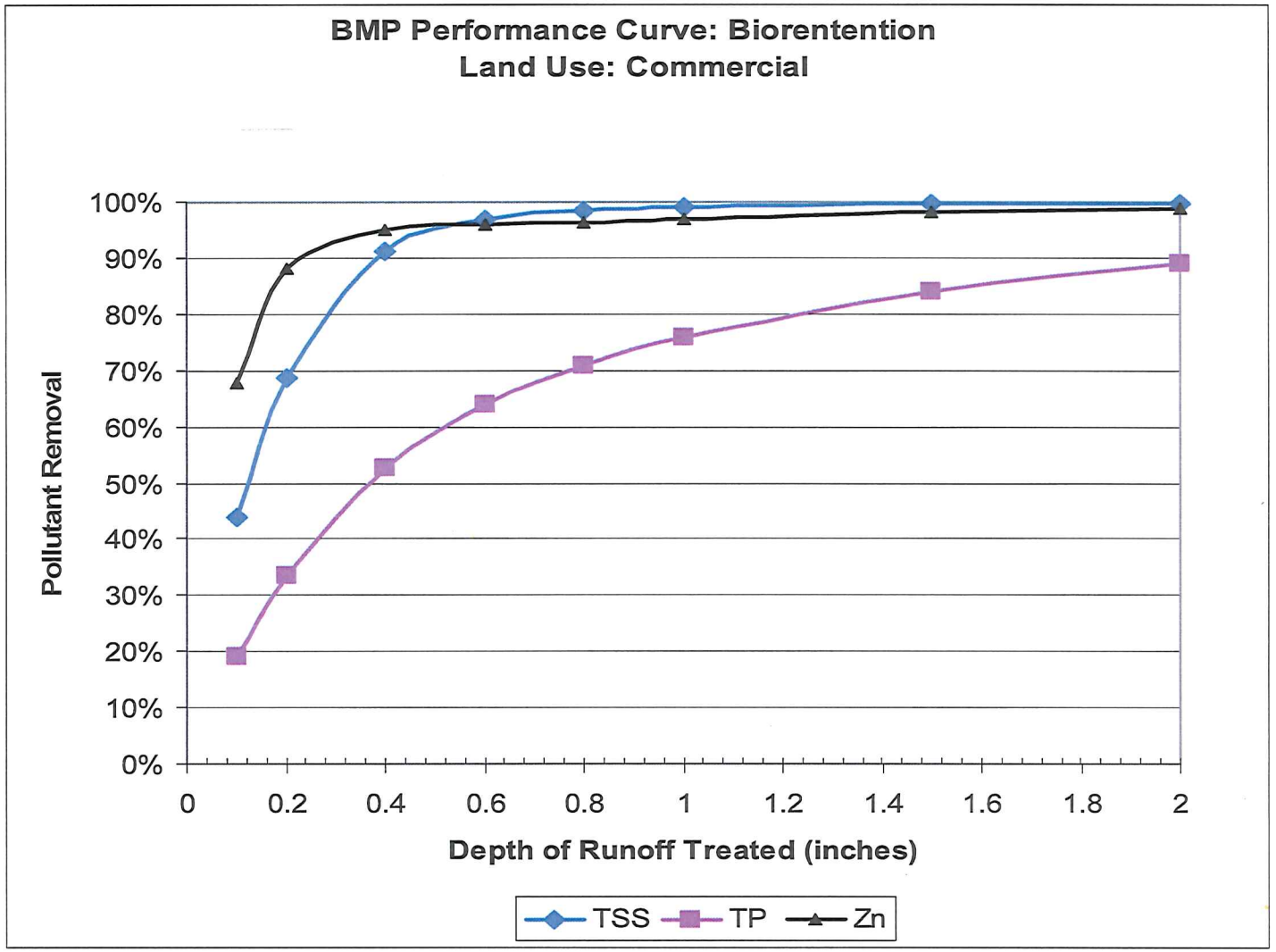
OK-110

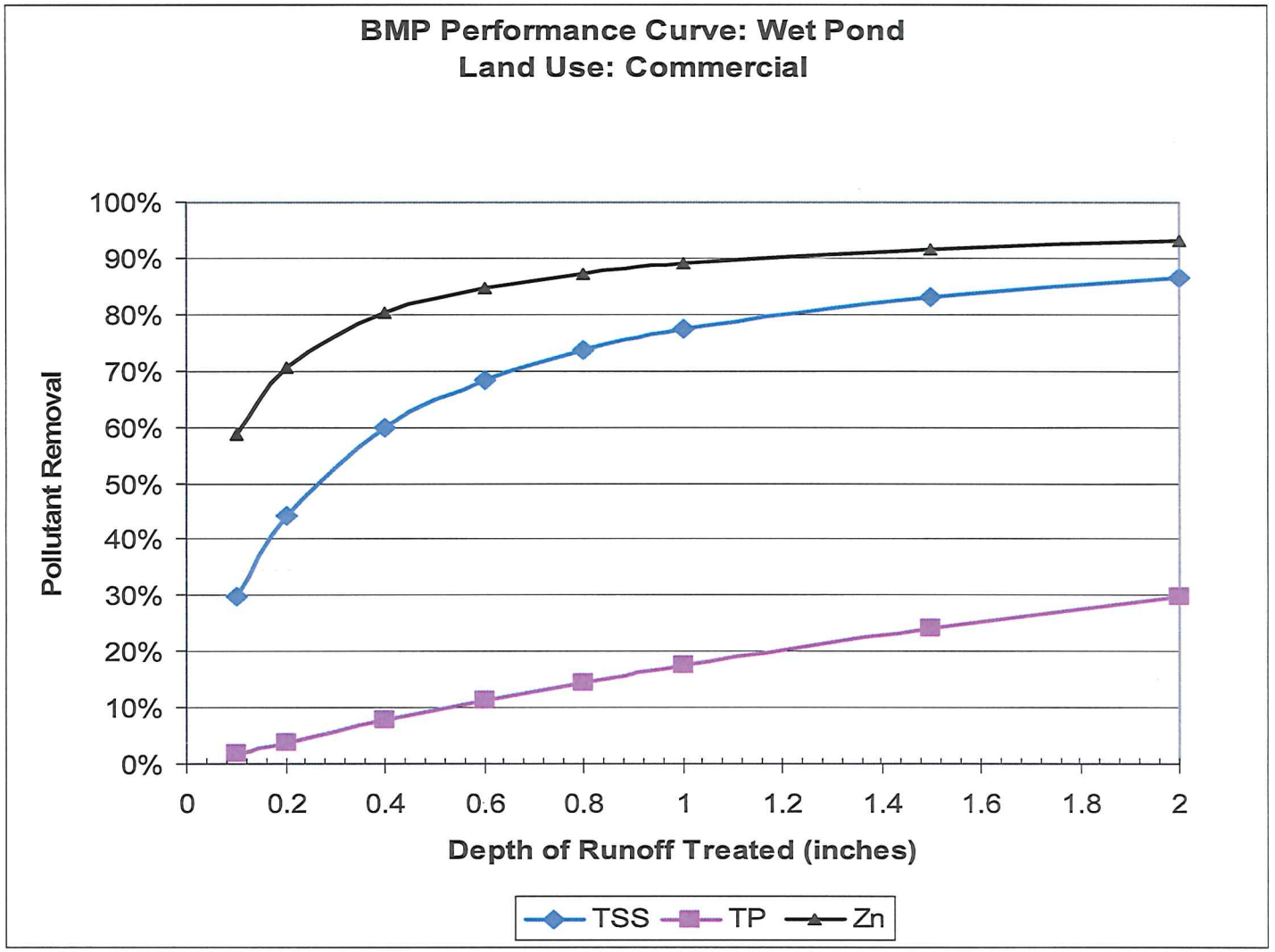
Particle Diameter (microns)	Distribution %	Specific Gravity
1.0	0.0	2.65
53.0	3.0	2.65
75.0	15.0	2.65
88.0	25.0	2.65
106.0	41.0	2.65
125.0	15.0	2.65
150.0	1.0	2.65
212.0	0.0	2.65

Notes

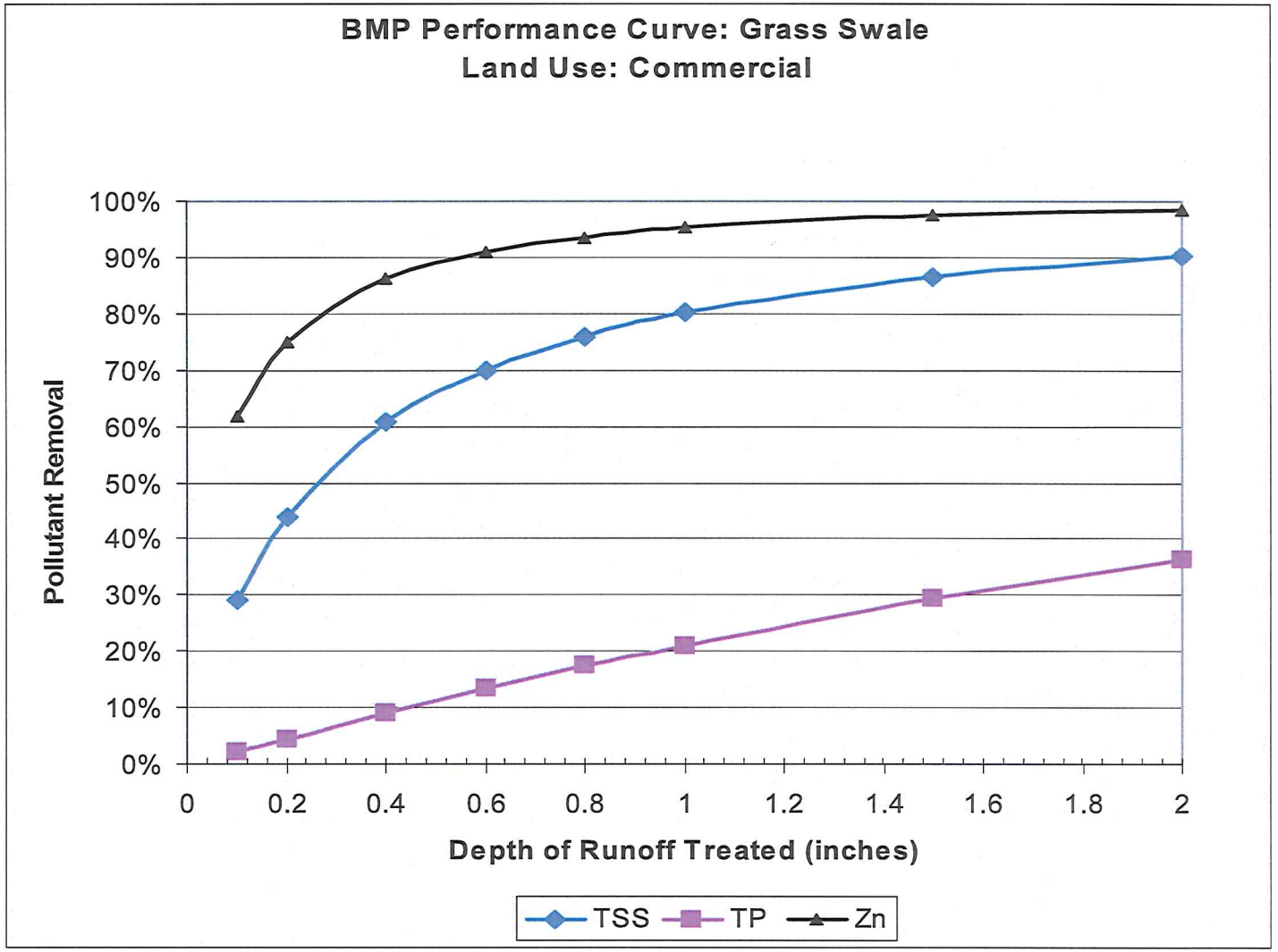
• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
• For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX


BMP Performance Curve: Biorentention
Land Use: Commercial
Pollutant Removal
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Depth of Runoff Treated (inches)
TSS
TP
Zn


BMP Performance Curve: Wet Pond
Land Use: Commercial
Pollutant Removal
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Depth of Runoff Treated (inches)
TSS
TP
Zn

BMP Performance Curve: Grass Swale

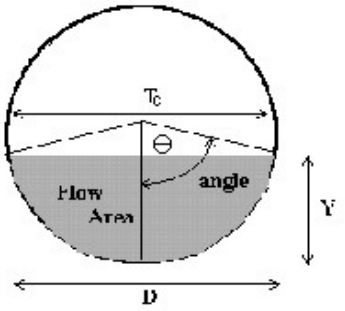


CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

MHFD-Culvert, Version 4.00 (May 2020)

Project: Proposed Municipal Park & Fields

Pipe ID: 6" PVC Pipe Capacity



Design Information (Input)			
Pipe Invert Slope	So =	0.0050	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	6.00	inches
Design discharge	Q =	0.39	cfs

Full-Flow Capacity (Calculated)			
Full-flow area	Af =	0.20	sq ft
Full-flow wetted perimeter	Pf =	1.57	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	0.40	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	2.22	radians
Flow area	An =	0.17	sq ft
Top width	Tn =	0.40	ft
Wetted perimeter	Pn =	1.11	ft
Flow depth	Yn =	0.40	ft
Flow velocity	Vn =	2.31	fps
Discharge	Qn =	0.39	cfs
Percent of Full Flow	Flow =	98.0%	of full flow
Normal Depth Froude Number	Fr_n =	0.62	subcritical

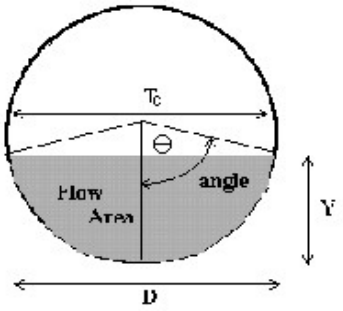
Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	1.84	radians
Critical flow area	Ac =	0.13	sq ft
Critical top width	Tc =	0.48	ft
Critical flow depth	Yc =	0.32	ft
Critical flow velocity	Vc =	2.97	fps
Critical Depth Froude Number	Fr_c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

MHFD-Culvert, Version 4.00 (May 2020)

Project: Proposed Municipal Park & Fields

Pipe ID: 8" PVC Pipe Capacity



Design Information (Input)			
Pipe Invert Slope	So =	0.0050	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	8.00	inches
Design discharge	Q =	0.85	cfs

Full-Flow Capacity (Calculated)			
Full-flow area	Af =	0.35	sq ft
Full-flow wetted perimeter	Pf =	2.09	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	0.86	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	2.25	radians
Flow area	An =	0.30	sq ft
Top width	Tn =	0.52	ft
Wetted perimeter	Pn =	1.50	ft
Flow depth	Yn =	0.54	ft
Flow velocity	Vn =	2.80	fps
Discharge	Qn =	0.85	cfs
Percent of Full Flow	Flow =	99.2%	of full flow
Normal Depth Froude Number	Fr_n =	0.65	subcritical

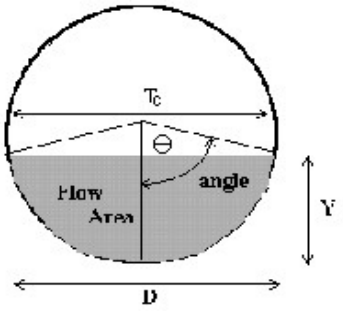
Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	1.89	radians
Critical flow area	Ac =	0.24	sq ft
Critical top width	Tc =	0.63	ft
Critical flow depth	Yc =	0.44	ft
Critical flow velocity	Vc =	3.51	fps
Critical Depth Froude Number	Fr_c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

MHFD-Culvert, Version 4.00 (May 2020)

Project: Proposed Municipal Park & Fields

Pipe ID: 10" PVC Pipe Capacity



Design Information (Input)			
Pipe Invert Slope	So =	0.0050	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	10.00	inches
Design discharge	Q =	1.55	cfs

Full-Flow Capacity (Calculated)			
Full-flow area	Af =	0.55	sq ft
Full-flow wetted perimeter	Pf =	2.62	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	1.55	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	2.26	radians
Flow area	An =	0.48	sq ft
Top width	Tn =	0.64	ft
Wetted perimeter	Pn =	1.88	ft
Flow depth	Yn =	0.68	ft
Flow velocity	Vn =	3.25	fps
Discharge	Qn =	1.55	cfs
Percent of Full Flow	Flow =	99.8%	of full flow
Normal Depth Froude Number	Fr_n =	0.66	subcritical

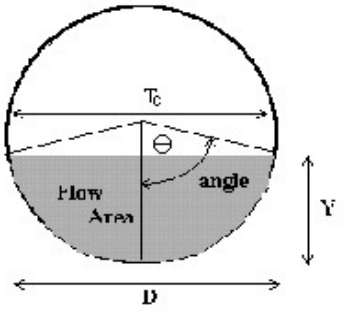
Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	1.92	radians
Critical flow area	Ac =	0.39	sq ft
Critical top width	Tc =	0.78	ft
Critical flow depth	Yc =	0.56	ft
Critical flow velocity	Vc =	3.99	fps
Critical Depth Froude Number	Fr_c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

MHFD-Culvert, Version 4.00 (May 2020)

Project: Proposed Municipal Park & Fields

Pipe ID: 12" PVC Pipe Capacity



Design Information (Input)			
Pipe Invert Slope	So =	0.0050	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	12.00	inches
Design discharge	Q =	2.52	cfs

Full-Flow Capacity (Calculated)			
Full-flow area	Af =	0.79	sq ft
Full-flow wetted perimeter	Pf =	3.14	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	2.53	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	2.26	radians
Flow area	An =	0.69	sq ft
Top width	Tn =	0.77	ft
Wetted perimeter	Pn =	2.26	ft
Flow depth	Yn =	0.82	ft
Flow velocity	Vn =	3.67	fps
Discharge	Qn =	2.52	cfs
Percent of Full Flow	Flow =	99.8%	of full flow
Normal Depth Froude Number	Fr_n =	0.69	subcritical

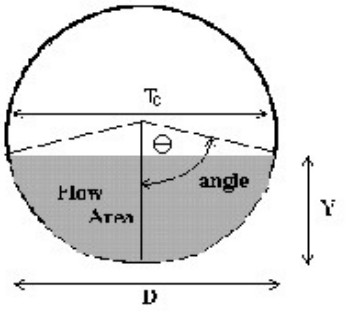
Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	1.94	radians
Critical flow area	Ac =	0.57	sq ft
Critical top width	Tc =	0.93	ft
Critical flow depth	Yc =	0.68	ft
Critical flow velocity	Vc =	4.43	fps
Critical Depth Froude Number	Fr_c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

MHFD-Culvert, Version 4.00 (May 2020)

Project: Proposed Municipal Park & Fields

Pipe ID: Bandshell Area P-4 (100-YR Flow)



Design Information (Input)			
Pipe Invert Slope	So =	0.0050	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	8.00	inches
Design discharge	Q =	0.71	cfs

Full-Flow Capacity (Calculated)			
Full-flow area	Af =	0.35	sq ft
Full-flow wetted perimeter	Pf =	2.09	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	0.86	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.97	radians
Flow area	An =	0.26	sq ft
Top width	Tn =	0.61	ft
Wetted perimeter	Pn =	1.31	ft
Flow depth	Yn =	0.46	ft
Flow velocity	Vn =	2.74	fps
Discharge	Qn =	0.71	cfs
Percent of Full Flow	Flow =	82.9%	of full flow
Normal Depth Froude Number	Fr_n =	0.74	subcritical

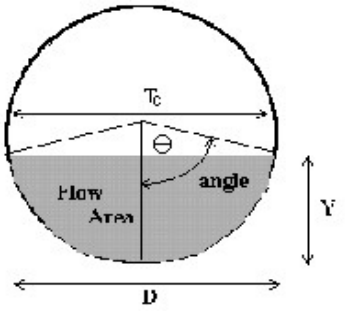
Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	1.77	radians
Critical flow area	Ac =	0.22	sq ft
Critical top width	Tc =	0.65	ft
Critical flow depth	Yc =	0.40	ft
Critical flow velocity	Vc =	3.27	fps
Critical Depth Froude Number	Fr_c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

MHFD-Culvert, Version 4.00 (May 2020)

Project: Proposed Municipal Park & Fields

Pipe ID: Driveway Culvert C-1 (100-YR Flow)



Design Information (Input)			
Pipe Invert Slope	So =	0.0102	ft/ft
Pipe Manning's n-value	n =	0.0130	
Pipe Diameter	D =	15.00	inches
Design discharge	Q =	5.39	cfs

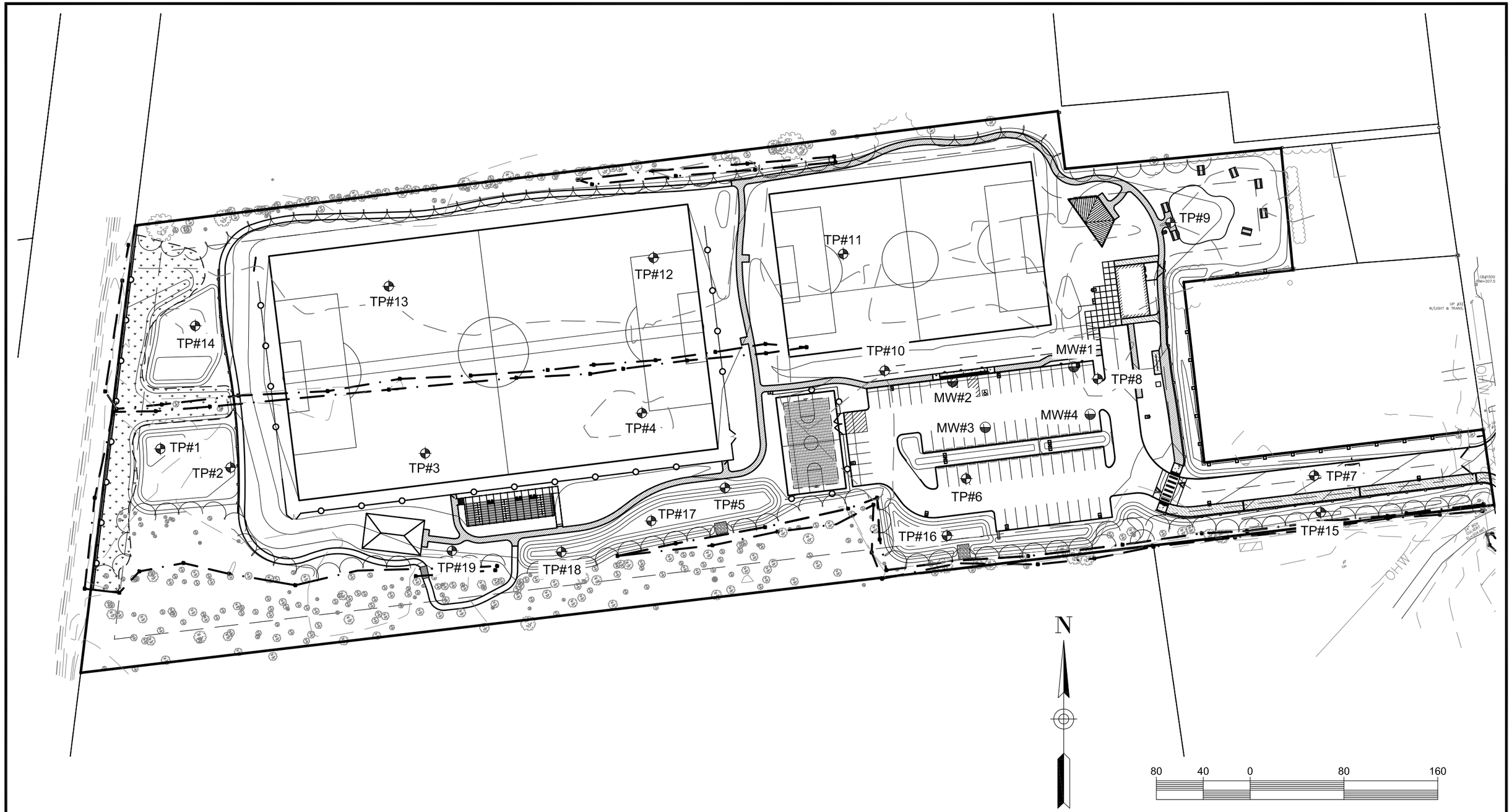
Full-Flow Capacity (Calculated)			
Full-flow area	Af =	1.23	sq ft
Full-flow wetted perimeter	Pf =	3.93	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	6.54	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.96	radians
Flow area	An =	0.91	sq ft
Top width	Tn =	1.15	ft
Wetted perimeter	Pn =	2.45	ft
Flow depth	Yn =	0.86	ft
Flow velocity	Vn =	5.95	fps
Discharge	Qn =	5.39	cfs
Percent of Full Flow	Flow =	82.4%	of full flow
Normal Depth Froude Number	Fr_n =	1.18	supercritical

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	2.10	radians
Critical flow area	Ac =	0.99	sq ft
Critical top width	Tc =	1.08	ft
Critical flow depth	Yc =	0.94	ft
Critical flow velocity	Vc =	5.44	fps
Critical Depth Froude Number	Fr_c =	1.00	

Section 5

Soil Data



ProTerra DESIGN GROUP, LLC 4 Bay Road Building A, Suite 200 Hadley, MA 01035 (413)320-4918	APPLICANT: **TOWN OF DEERFIELD** **NORTH MAIN STREET** **SOUTH DEERFIELD, MA 01373**	**TEST PIT LOCATION PLAN**	REVISIONS A ISSUED FOR REVIEW DESIGNED BY: JMM/TEJ DRAWN BY: STZ DATE: 12/14/21 SCALE:	JOB #: 21-006 REV. #: 0 **TP**

Soil Suitability Assessment

Site Address: North Main Street Map/Lot: 151/1 Date: 1-11-2021

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 1 (Hole #) | 1/11/21 (Date) | 8:45am (Time) | 30 overcast (Weather) | (Latitude) | (Longitude:)

1. Land Use: old ag field (e.g., woodland, agricultural field, vacant lot, etc.) | grass (Vegetation) | 0 | 0-3

Description of Location:

2. Soil Parent Material: silty glaciolacustrine deposits | (Landform) | (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body ____ feet | Drainage Way ____ feet | Wetlands ____ feet | Property Line ____ feet | Drinking Water Well ____ feet | Other ____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☒ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 36" Depth Weeping from Pit 52" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-7	Ap	silt loam	10YR 3/2				0	0	Blocky	friable	
7-20	B	silt loam	5YR 5/1	12"	2.5 TR 4/6	20%	0	0	Blocky	friable	
20-66"+	C	very fine sandy loam	10YR 5/2		2.5 YR 4/2	20%	0	0	Blocky	friable	sand lens

Soil Suitability Assessment

Site Address:_____ Map/Lot:_____ Date:_____

Additional Notes:

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 2 (Hole #) 1/11/21 (Date) _____ (Time) _____ (Weather) _____ (Latitude) _____ Longitude:

1. Land Use: old ag field (e.g., woodland, agricultural field, vacant lot, etc.) _____ Vegetation _____ Surface Stones (e.g., cobbles, stones, boulders, etc.) 0-3 Slope (%)

Description of Location: 100' east of RR

2. Soil Parent Material: silty glaciolacustrine deposits _____ Landform _____ Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable

Materials Present: ☐ Yes ☒ No If Yes: ☒ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 30" Depth Weeping from Pit 55" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-12"	Ap	silt loam	10 YR 3/2				0	0	Blocky	friable	
12-29	B	silt loam		16"	2.5 YR 4/6	20%	0	0	Blocky	friable	
29"+	C	very fine sandy loam				20%	0	0	Blocky	friable	lens

Soil Suitability Assessment

Site Address:_____ Map/Lot:_____ Date:_____

Deep Observation Hole Number: 3 (Hole #) | 1/11/2021 | 845am | 30, overcast (Weather) | (Latitude)

1. Land Use: Old ag field (e.g., woodland, agricultural field, vacant lot, etc.) | (Vegetation) | none (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-3 (Slope (%))

   Description of Location: _____

2. Soil Parent Material: Silty glaciolacustrine deposits | (Landform) | (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Wetlands _____ feet | Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes xNo If Yes: X Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: X☐ Yes ☐ No If yes: 30" Depth Weeping from Pit 74" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-11	AP	Silty loam	10 YR 3/2				0	0	blocky		
11-23	B	Silty loam	5 YR 5/1	15"	2 YR 5/6-Low 2 YR 5/2	20%	0	0	blocky		
23-76"+	C	Very fine sandy loam	10 YR 5/2			20%	0	0	blocky	lens	

Soil Suitability Assessment

Site Address:_____ Map/Lot:_____ Date:_____

Deep Observation Hole Number: 4 (Hole #) 1/11/21 (Date) _____ (Time) _____ (Weather) _____ (Latitude) _____ (Longitude:)

1. Land Use _____ (e.g., woodland, agricultural field, vacant lot, etc.) _____ Vegetation _____ Surface Stones (e.g., cobbles, stones, boulders, etc.) _____ Slope (%)

   Description of Location: _____

2. Soil Parent Material: _____ _____ Landform _____ Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet

   Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☒ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 28" Depth Weeping from Pit 70" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-12	Ap	Silty loam	10 YR 3/2				0	0	blocky	friable	
12-24	B	Silty loam	5 YR 5/1	16”	2 YR 5/6-Low 2 YR 5/2	20%	0	0	blocky	friable	
24-	C	Very fine sandy loam	10 YR 5/2			20%	0	0	blocky	Tight/firm	lens

Additional Notes:
smearing. Collapsed side wall

Soil Suitability Assessment

Site Address:_____ Map/Lot:_____ Date:_____

Deep Observation Hole Number: 5 (Hole #) 1/11/21 (Date) _____ (Time) _____ (Weather) _____ (Latitude) _____ Longitude:

1. Land Use Old ag field (e.g., woodland, agricultural field, vacant lot, etc.) _____ Vegetation _____ Surface Stones (e.g., cobbles, stones, boulders, etc.) _____ Slope (%)

   Description of Location: _____

2. Soil Parent Material: silty glaciolacustrine deposits _____ Landform _____ Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet

   Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☒ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 34" Depth Weeping from Pit 96" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-14	Ap	Silty loam	10 YR 3/2				0	0	blocky	friable	
14-24	B	Silty loam	5 YR 5/1	16"		20%	0	0	blocky	friable	
24+	C	Very fine sandy loam	10 YR 5/2			20%	0	0	blocky	Tight/firm	lens

Soil Suitability Assessment

Site Address:_____ Map/Lot:_____ Date:_____

Deep Observation Hole Number: 6 (Hole #) 1/11/21 (Date) 11:00 (Time) _____ (Weather) _____ (Latitude) _____ (Longitude:)

1. Land Use: Ag field (e.g., woodland, agricultural field, vacant lot, etc.) _____ (Vegetation) none (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 0-3 (Slope (%))

Description of Location: _____

2. Soil Parent Material: Silty glaciolacustrine deposit _____ (Landform) _____ (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body _____ feet; Drainage Way _____ feet; Wetlands _____ feet; Property Line _____ feet; Drinking Water Well _____ feet; Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☒ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 38" Depth Weeping from Pit 79" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-19	A	Silty loam	10 YR 3/2				0	0	blocky	friable	
13-16	B	Silty loam	10 YR 4/4	16"	High	20%	0	0	blocky	friable	
16-36	C1	Silty loam	10 YR 5/2				0	0	blocky	friable	
36-52	C2	Loamy sand	10 YR 4/3				0	0	singluar	loose	
52+	C3	Very fine sandy loam					0	0	blocky	Tight/firm	

Additional Notes:

Soil Suitability Assessment

Site Address:_____ Map/Lot:_____ Date:_____

Deep Observation Hole Number: 7 (Hole #) 1/11/21 (Date) _____ (Time) _____ (Weather) _____ (Latitude) _____ (Longitude:)

1. Land Use Ag field (e.g., woodland, agricultural field, vacant lot, etc.) _____ (Vegetation) _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) _____ (Slope (%))

Description of Location: _____

2. Soil Parent Material: _____ _____ (Landform) _____ (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet

Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-21	A	Silty loam	10 YR 3/2				0	0	blocky	Friable	Roots
21-39	C1	Silty loam	10 YR 5/2	21	High/low	20%	0	0	Blocky	friable	Cannot see any in A(redox)
39-70	C2	Loamy sand	10 YR 4/3		High/low		0	0	singular	loose	

Additional Notes:
no B-C, adjacent to ditch line. 64” C layer sample III

Soil Suitability Assessment

Site Address:_____ Map/Lot:_____ Date:_____

Deep Observation Hole Number: 8 (Hole #) 1/11/21 (Date) _____ (Time) _____ (Weather) _____ (Latitude) _____ (Longitude:)

1. Land Use Ag field (e.g., woodland, agricultural field, vacant lot, etc.) _____ (Vegetation) _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.) 0-3 (Slope (%)

Description of Location: _____

2. Soil Parent Material: Silty glaciolacustrine deposit _____ (Landform) _____ (Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☒ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: 44" Depth Weeping from Pit 64" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-14	Ap	Silty loam	10 YR 3/2				0	0	blocky	friable	
14-18	B	Silty loam	10 YR 4/4				0	0	blocky	friable	
18-37	C1	Silty loam	10 YR 5/2	22"	High/low	20%	0	0	blocky	friable	
37-60	C2	Loamy sand	10 YR 4/3		High/low		0	0	singular	loose	saturated
60"+	C3	Very fine sandy loam			High/low		0	0	blocky	Tight/firm	saturated

Additional Notes: _____

Soil Suitability Assessment

Site Address:_____ Map/Lot:_____ Date:_____

Deep Observation Hole Number: 9 (Hole #) 1/11/21 (Date) _____ (Time) _____ (Weather) _____ (Latitude) _____ (Longitude:)

1. Land Use Ag field (e.g., woodland, agricultural field, vacant lot, etc.) _____ (Vegetation) _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) _____ (Slope (%))

Description of Location: _____

2. Soil Parent Material: Silty glaciolacustrine deposits _____ (Landform) _____ (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 28" Depth Weeping from Pit 64" wall caved in Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-6	A	Silty loam	10 YR 3/2				0	0	blocky	friable	
6-12	Bw	Silty loam	10 YR 5/4				0	0	blocky	friable	
12-29	C1	Silty loam	10 YR 5/2	20"	high	20%	0	0	blocky	friable	
29-40	C2	Loamy sand	10 YR 4/3		high	20%	0	0	singular	loose	saturated
40-96"+	C3	Very fine sandy loam	10 YR 5/2		High/low	20%	0	0	blocky	Tight/fimr	

Additional Notes:
unique hole

Soil Suitability Assessment

Site Address:_____ Map/Lot:_____ Date:_____

Deep Observation Hole Number: 10 (Hole #) 1/11/21 (Date) _____ (Time) _____ (Weather) _____ (Latitude) _____ (Longitude:)

1. Land Use Ag field (e.g., woodland, agricultural field, vacant lot, etc.) _____ (Vegetation) _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.) 0-3 (Slope (%)

Description of Location: _____

2. Soil Parent Material: Silty glaciolacustrine deposits _____ (Landform) _____ (Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☒ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 40" Depth Weeping from Pit 120" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-3	O	fiberous					0	0		friable	
3-7	Ap	Silty loam	10 YR 3/2			20%	0	0	blocky	friable	
7-11	B	Silty loam	5 YR 5/1	13"	2 YR 5/6	20%	0	0	blocky	friable	
11-52	C1	Fine sandy loam	10 YR 5/2		2 YR 5/2	20%	0	0	blocky	Tight/firm	
52-120"+	C2	V.Fine sandy loam	10 YR 4/2		High and low	20%	0	0	blocky	More loose	saturated

Additional Notes:
C2 looser than C1

Soil Suitability Assessment

Site Address:_____ Map/Lot:_____ Date:_____

Deep Observation Hole Number: 11 (Hole #) 1/11/21 (Date) _____ (Time) _____ (Weather) _____ (Latitude) _____ (Longitude:)

1. Land Use Ag field (e.g., woodland, agricultural field, vacant lot, etc.) _____ (Vegetation) _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) _____ (Slope (%))

Description of Location: 500'-600' east RR

2. Soil Parent Material: Silty glaciolacustrine deposits _____ (Landform) _____ (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☒ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 23" Depth Weeping from Pit yes Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-12	Ap	Silty loam	10 YR 3/2				0	0	blocky	friable	
12-21	B	Silty loam	5 YR 5/1	15"	2 YR 5/6	20%	0	0	blocky	friable	
21-77"+	C	Very fine sandy loam	10 YR 5/2		2 YR 5/2	20%	0	0	blocky	Firm/tight	Stratified w/Sand

Additional Notes:

Soil Suitability Assessment

Site Address:_____ Map/Lot:_____ Date:_____

Deep Observation Hole Number: 12 (Hole #) | 1/11/21 (Date) | 11:00 (Time) | 30' (Weather) | _____ (Latitude) | _____ (Longitude:)

1. Land Use: Ag field (e.g., woodland, agricultural field, vacant lot, etc.) | _____ (Vegetation) | _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | _____ (Slope (%))

Description of Location: Mid parcel-North side of property

2. Soil Parent Material: Silty glaciolacustrine deposits | _____ (Landform) | _____ (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Wetlands _____ feet | Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☒ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 32" Depth Weeping from Pit 56" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-12	Ap	Silty loam	10 YR 3/2				0	0	blocky	friable	
12-17	B	Silty loam	5 YR 5/1	16"	2 YR 5/6	20%	0	0	blocky	friable	
17-56"+	C	Very fine sandy loam	10 YR 5/2		2 YR 5/2	20%	0	0	blocky	Firm/tight	Lens of sand. stratified

Additional Notes:
4"-6" top frozen. Smearing on side walls. Walls collapsing. plowed

Soil Suitability Assessment

Site Address:_____ Map/Lot:_____ Date:_____

Deep Observation Hole Number: 13 (Hole #) | 1/11/21 (Date) | 10:30 am (Time) | 30 (Weather) | _____ (Latitude) | _____ (Longitude:)

1. Land Use: Old ag field (e.g., woodland, agricultural field, vacant lot, etc.) | _____ (Vegetation) | _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | _____ (Slope (%))

Description of Location: Approx.. 100' east of RR track and driveway ditch

2. Soil Parent Material: Silty glaciolacustrine deposits | _____ (Landform) | _____ (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Wetlands _____ feet | Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☒ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 45" Depth Weeping from Pit 76" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-13	Ap	Silty loam	10 YR 3/2				0	0	blocky	friable	
13-20	B	Silty loam	5 YR 5/1	14"	2 YR 5/6	20%	0	0	blocky	friable	
20-76"+	C	Very fine sandy loam	10 YR 5/2		2 YR 5/2	20%	0	0	blocky	Firm/tight	Stratified, sand lens

Additional Notes:
top 4-6" frozen. Aold ag field, plowed. Smearing side wall collapsed

Soil Suitability Assessment

Site Address:_____ Map/Lot:_____ Date:_____

Deep Observation Hole Number: 14 (Hole #) 1/11/21 (Date) _____ (Time) _____ (Weather) _____ (Latitude) _____ (Longitude:)

1. Land Use: Ag field (e.g., woodland, agricultural field, vacant lot, etc.) _____ (Vegetation) _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 0-3 (Slope (%))

   Description of Location: 50' east RR

2. Soil Parent Material: Silty glaciolacustrine deposits _____ (Landform) _____ (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body _____ feet; Drainage Way _____ feet; Wetlands _____ feet; Property Line _____ feet; Drinking Water Well _____ feet; Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-17	Ap*	Silty loam	10 YR 3/2				0	0	blocky	friable	
17-25	B	Silty loam	5 YR 5/1	18"	2 YR 5/6	20%	0	0	blocky	friable	
25-72"+	C	Very fine sand loam	10 YR 5/2		2 YR 5/2	20%	0	0	blocky	Firm/tight	

Additional Notes:
A- could have been top soil added at end of field. Smearing and side wall collapse

Deerfield Town Park & Fields

Supplementary Test Pits via hand auger 11/19/21

HA TP #15 (entrance)

0-10”Ap

10-20”+ B, Silt Loam, 10YR 4/4

>20” FSL/SIL

Water at 20” in hole

HA TP #16 (basin south of parking lot)

0-14”Ap

14-25”+ B, Silt Loam, 10YR 4/4

>25” FSL/SIL

Mottles at 14”+

HA TP #17 (basin south of large field)

0-14”Ap

14-22”+B, Silt Loam, 10YR 4/6

>22” FSL/SIL

Mottles at 18” +

HA TP #18 (basin south of large field)

0-12”Ap

12-22”+B, Silt Loam, 10YR 4/6

>22” FSL/SIL

Mottles at 14” +

No standing water at grade in vicinity of TP.

HA TP#19 (basin south of large field)

0-12”Ap

12-24”+B, Silt Loam, 10YR 4/6

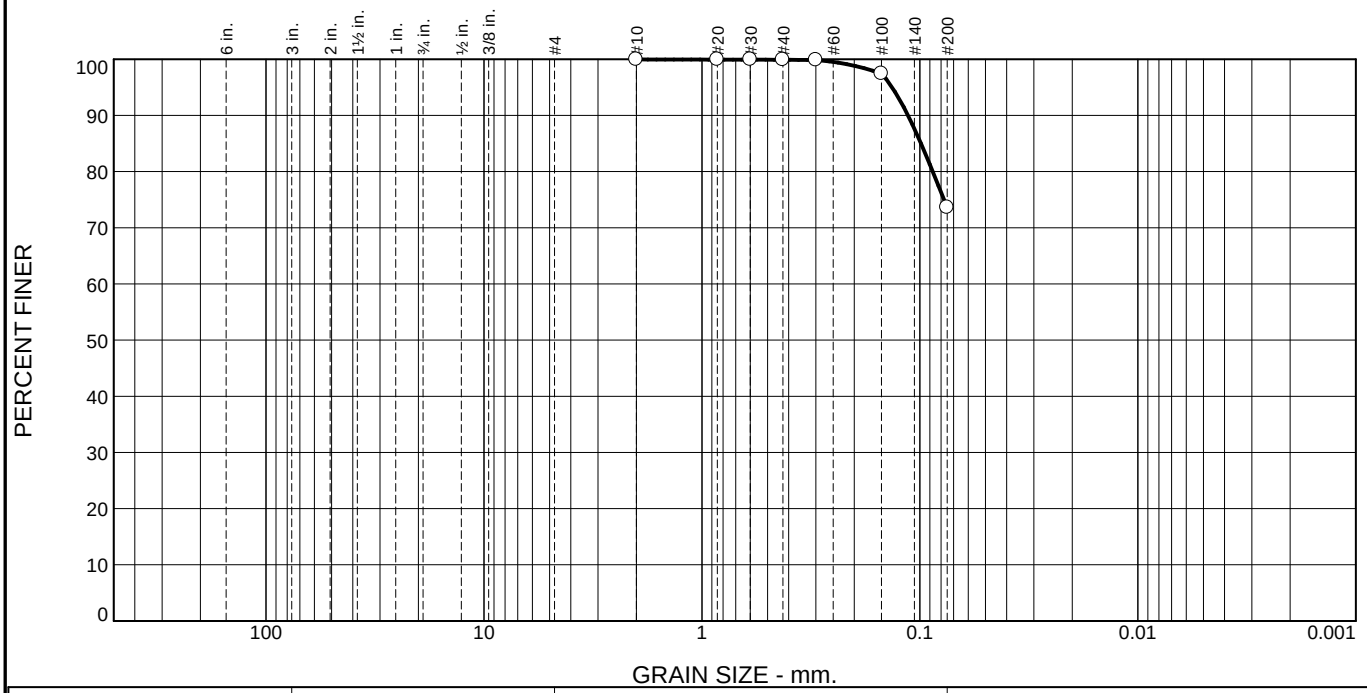
>24” FSL/SIL

Mottles at 12”+

Monitoring Wells (Installed 9-14-21 – Sunny 70 deg. No Rain previous 24 hours)

Name	Location	Depth to Obs. Water (in.)	Ht. of Well (AGL) in.	Depth to GW Obs. (in.)
MW#1	*East side of northern parking stalls*	*37*	*13*	*24*
MW#2	*West side of northern parking stalls*	*32.5*	*13*	*19.5*
MW#3	*Central near rain garden/island*	*23*	*7*	*16*
MW#4	*East of rain garden near island/WQI*	*39*	*19*	*20*

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
				0.1	26.3	73.6	

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.9		
#30	99.9		
#40	99.9		
#50	99.9		
#100	97.5		
#200	73.6		

* (no specification provided)

Material Description

Dark brown silt with sand

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** -

Coefficients

D_{90}= 0.1134 D_{85}= 0.0989 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 1/14/2021 **Date Tested:** 1/18/2021

Tested By: Matt Watson

Checked By: Rob Faria

Title: Lab Manager

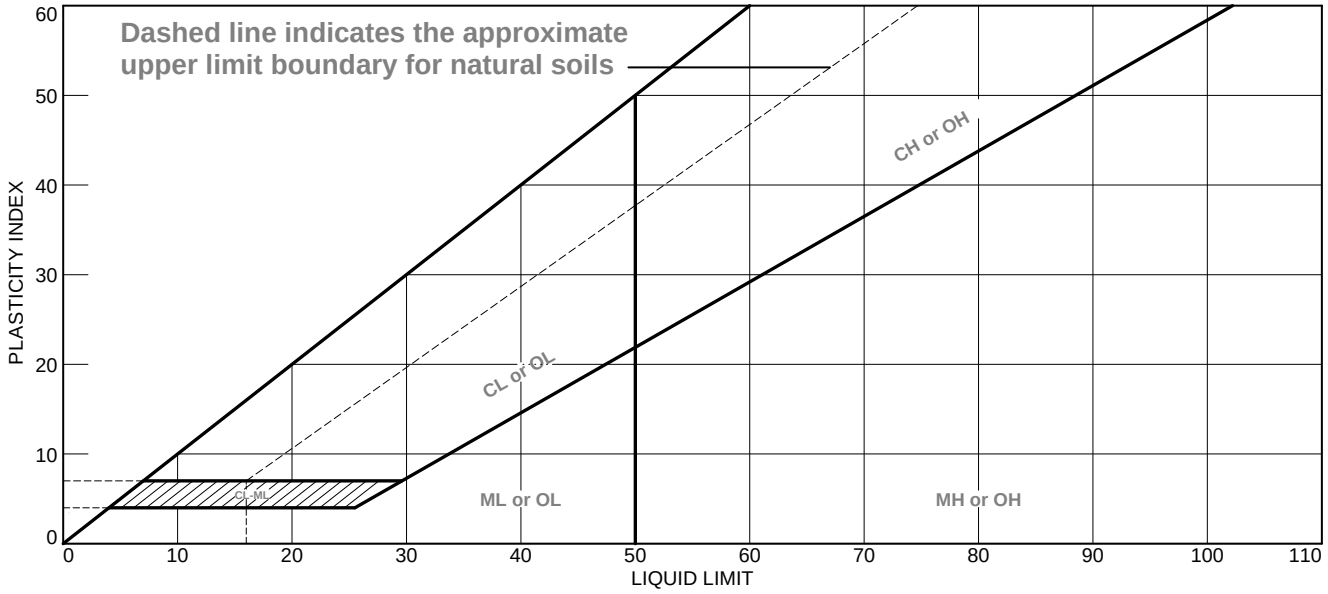
Location: TP#7
Sample Number: 3521-019 **Depth:** 64" C Layer **Date Sampled:** 1/14/2021

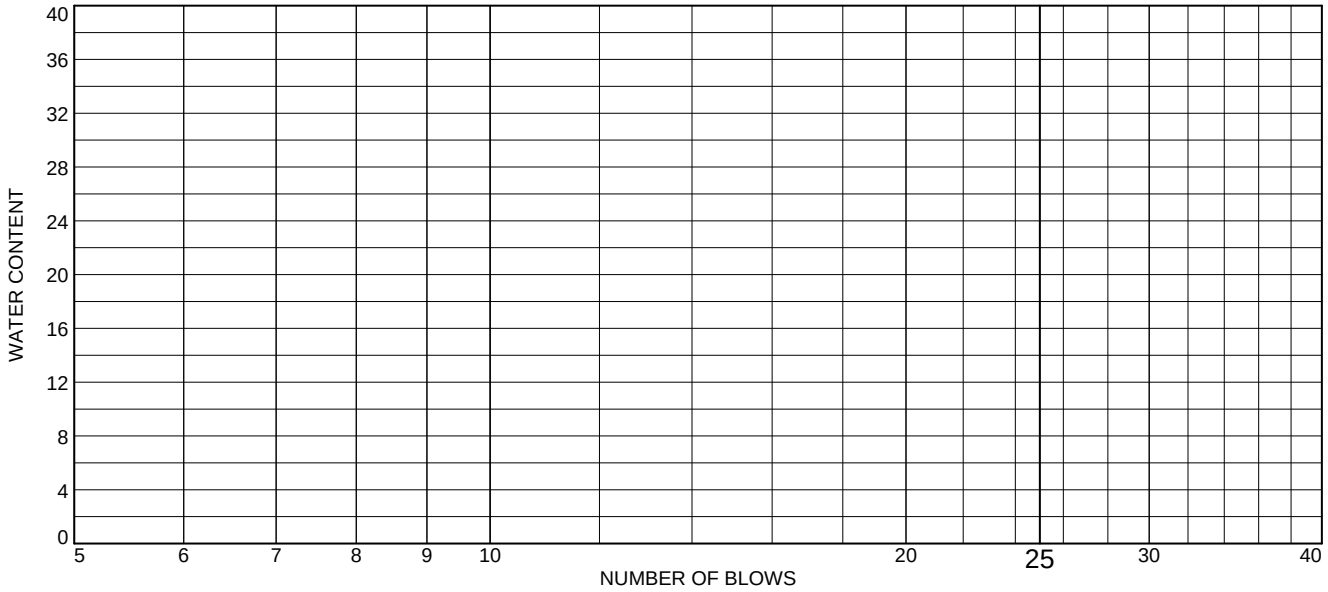
JOHN TURNER CONSULTING

Client: ProTerra Design Group LLC
Project: Deerfield Town Fields - North Main Street - S. Deerfield, MA

Project No: 21-07-011 **Figure** 019A

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dark brown silt with sand	NV	NP	NP	99.9	73.6	ML

Project No. 21-07-011 **Client:** ProTerra Design Group LLC

Project: Deerfield Town Fields - North Main Street - S. Deerfield, MA

Location: TP#7
Sample Number: 3521-019 **Depth:** 64" C Layer

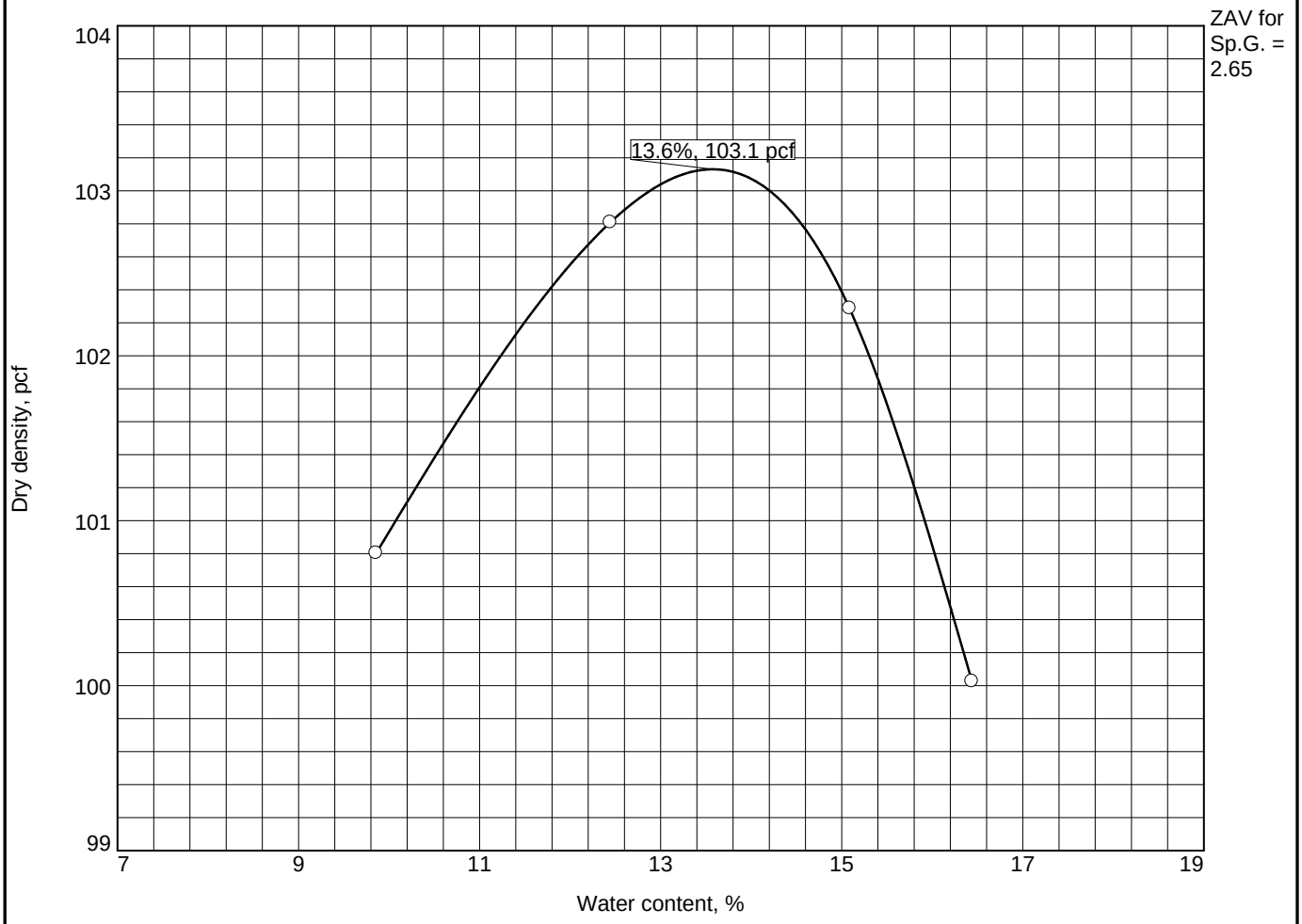
JOHN TURNER CONSULTING

Remarks:
●Non-plastic

Figure 019C

Tested By: Matt Watson **Checked By:** Rob Faria

Moisture Density Report For Curve No. 3521-019



Test specification: ASTM D 1557-12 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
64" C Layer	ML	-	-	2.65	NV	NP	0.0	73.6

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 103.1 pcf Optimum moisture = 13.6 %	Dark brown silt with sand

Project No. 21-07-011 **Client:** ProTerra Design Group LLC

Project: Deerfield Town Fields - North Main Street - S. Deerfield, MA

Date: 1/18/2021

○ **Location:** TP#7 **Sample Number:** 3521-019

Remarks:

JOHN TURNER CONSULTING

Figure 019B

Tested By: Matt Watson **Checked By:** Rob Faria

JOHN TURNER
CONSULTING

Summary of Permeability of Soil
ASTM D2434

CLIENT: ProTerra Design Group, LLC

PROJECT: Deerfield Town Fields
North Main St.
S. Deerfield, MA

DATE: February 1, 2021

REPORT #: 21-07-011-029P

Saturation Duration: 24 Hours

Water Temperature: 23.1°C

Sample # 21-029 - TP#7

Tested By: Jeff Young

Sample Area (A): 16.12 in^2

Sample Height (L): 7.42 in

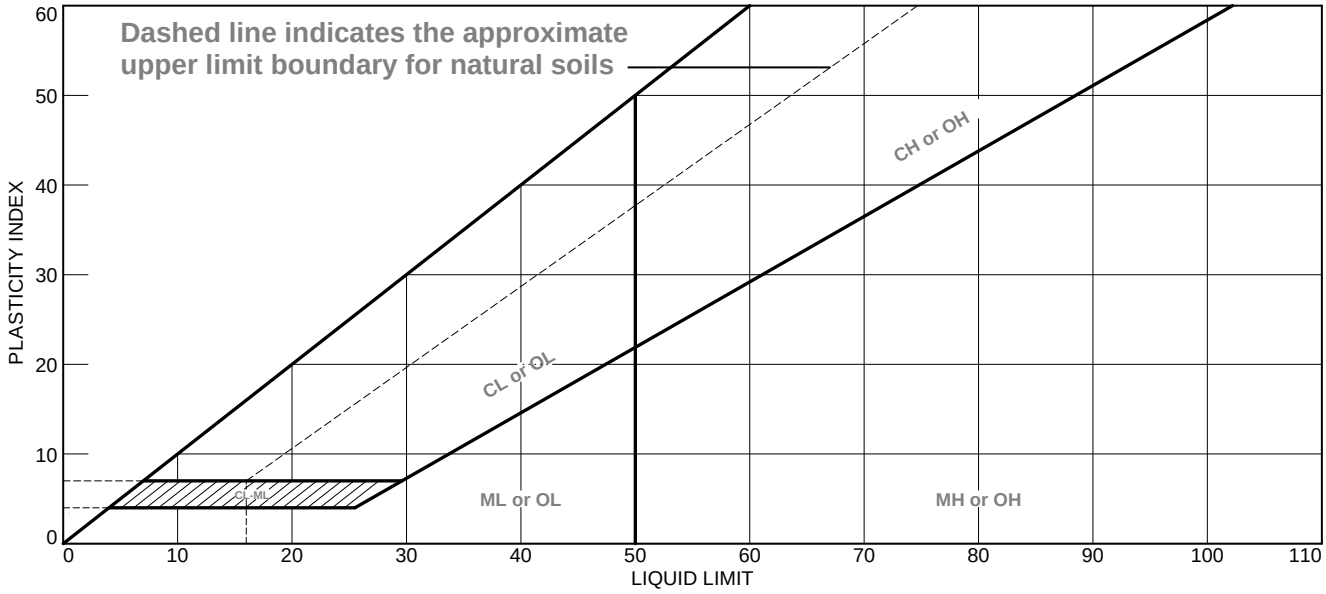
Sample Volume: 119.61 in^3

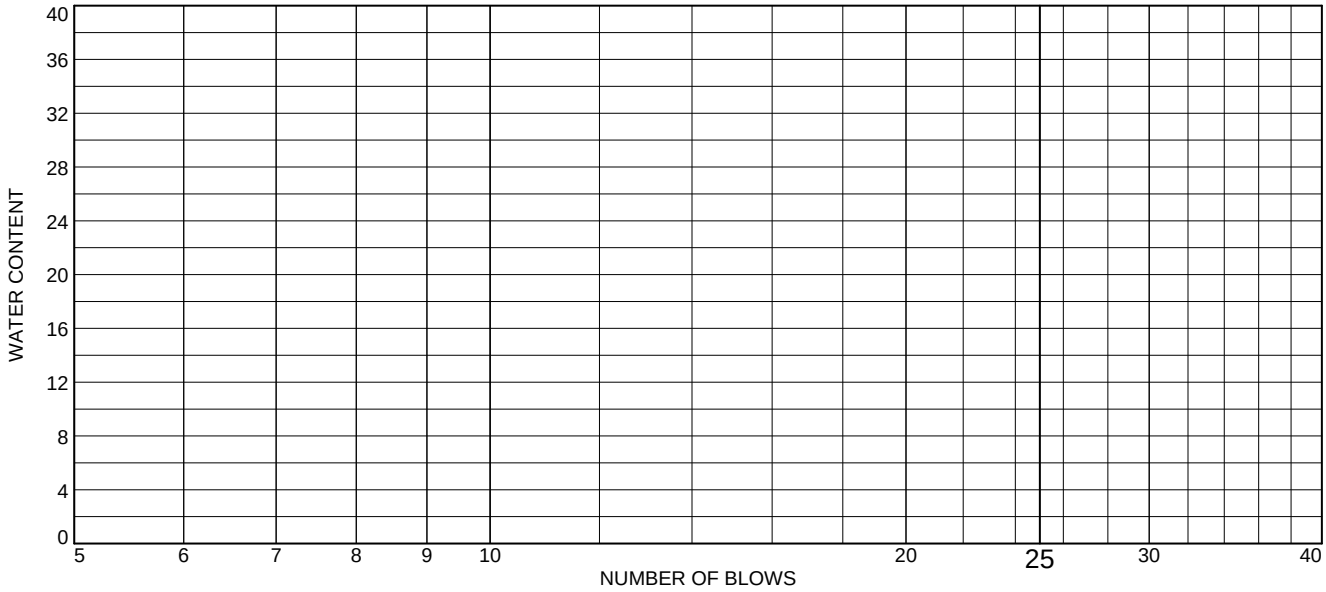
Head Difference (H): 52.25 in

Specimen #	Interval Duration:	Volume of Water Collected	Coefficient of Permeability
21-029 (1)	1 Hour	20.64 mL	$1.82x10^{-1}$ in/hr
21-029 (2)	1 Hour	28.22 mL	$2.49x10^{-1}$ in/hr
21-029 (3)	1 Hour	22.46 mL	$1.98x10^{-1}$ in/hr

REMARKS: The test was run at 92% of optimal compaction as determined by ASTM D1557

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Medium brown grayish silty sand	NV	NP	NP	100.0	49.3	SM

Project No. 21-07-011 **Client:** ProTerra Design Group LLC

Project: Deerfield Town Fields - North Main Street - S. Deerfield, MA

Location: TP #10
Sample Number: 3521-020 **Depth:** 8'-10- C Layer

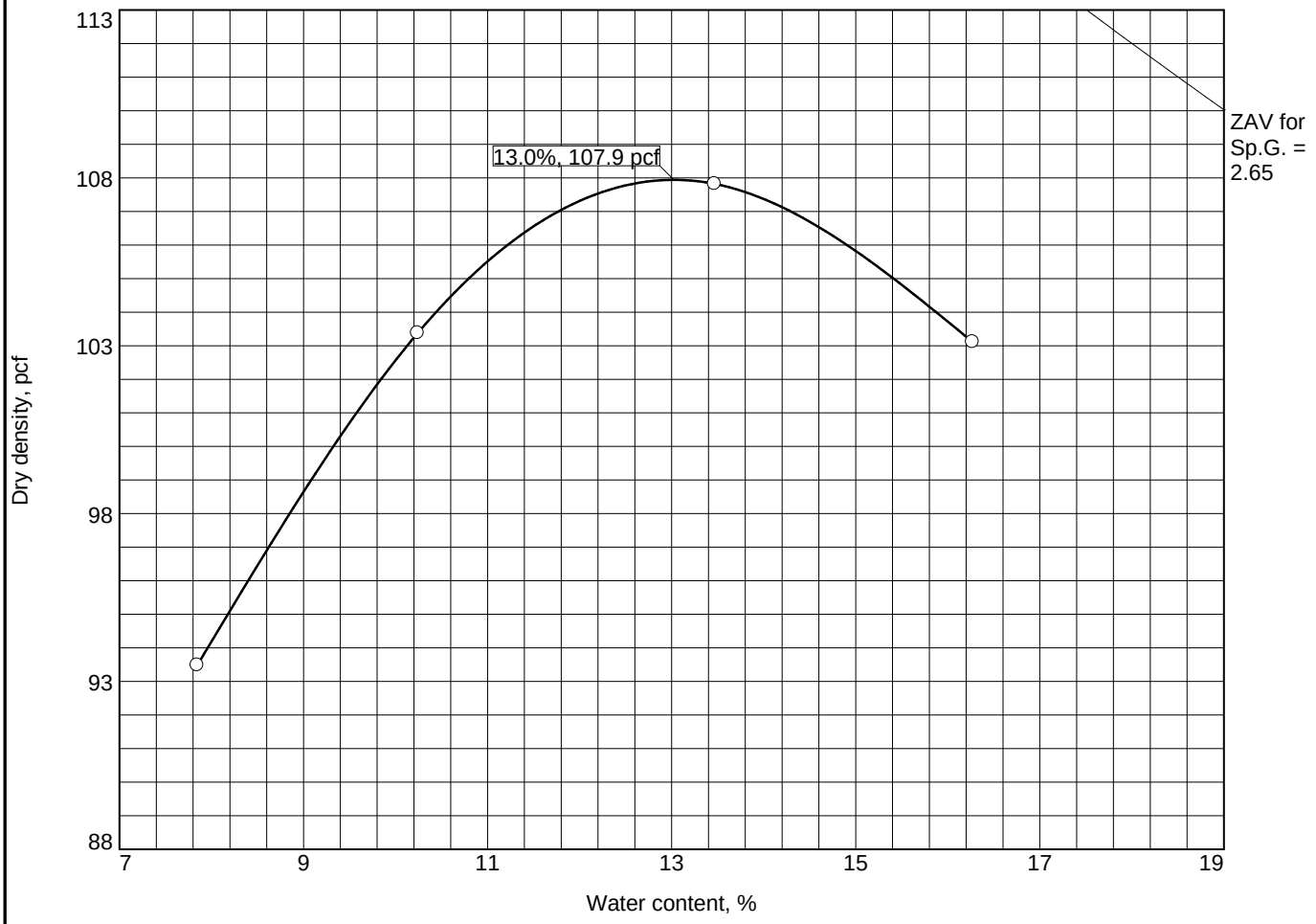
JOHN TURNER CONSULTING

Remarks:

Figure 020C

Tested By: Matt Watson **Checked By:** Rob Faria

Moisture Density Report For Curve No. 3521-020



Test specification: ASTM D 1557-12 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
8'-10- C Layer	SM	-	-	2.65	NV	NP	0.0	49.3

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 107.9 pcf Optimum moisture = 13.0 %	Medium brown grayish silty sand

Project No. 21-07-011 **Client:** ProTerra Design Group LLC

Project: Deerfield Town Fields - North Main Street - S. Deerfield, MA

Date: 1/18/2021

○ **Location:** TP #10 **Sample Number:** 3521-020

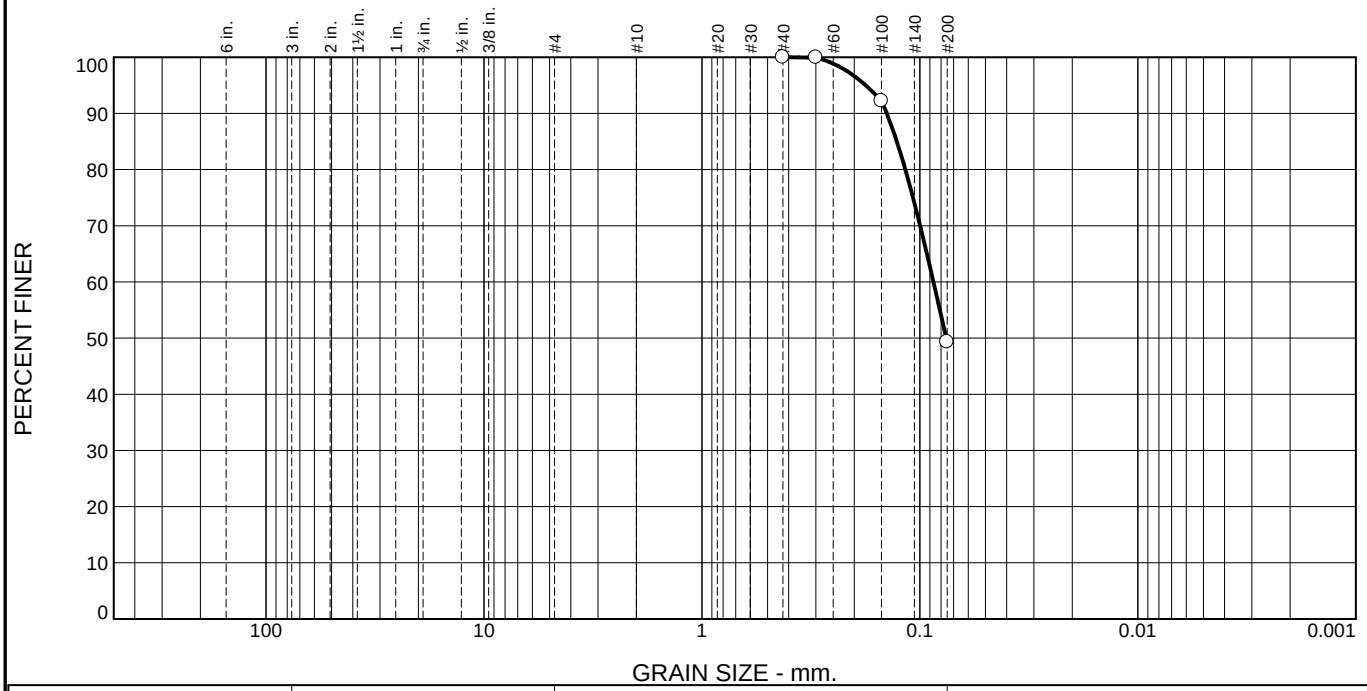
Remarks:

JOHN TURNER CONSULTING

Figure 020B

Tested By: Matt Watson **Checked By:** Rob Faria

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	50.7	49.3	

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#40	100.0		
#50	99.9		
#100	92.2		
#200	49.3		

* (no specification provided)

Material Description

Medium brown grayish silty sand

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** -

Coefficients

D_{90}= 0.1417 D_{85}= 0.1275 D_{60}= 0.0866
D_{50}= 0.0757 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 1/14/2021 **Date Tested:** 1/18/2020

Tested By: Matt Watson

Checked By: Rob Faria

Title: Lab Manager

Location: TP #10 **Date Sampled:** 1/14/2021

Sample Number: 3521-020 **Depth:** 8'-10- C Layer

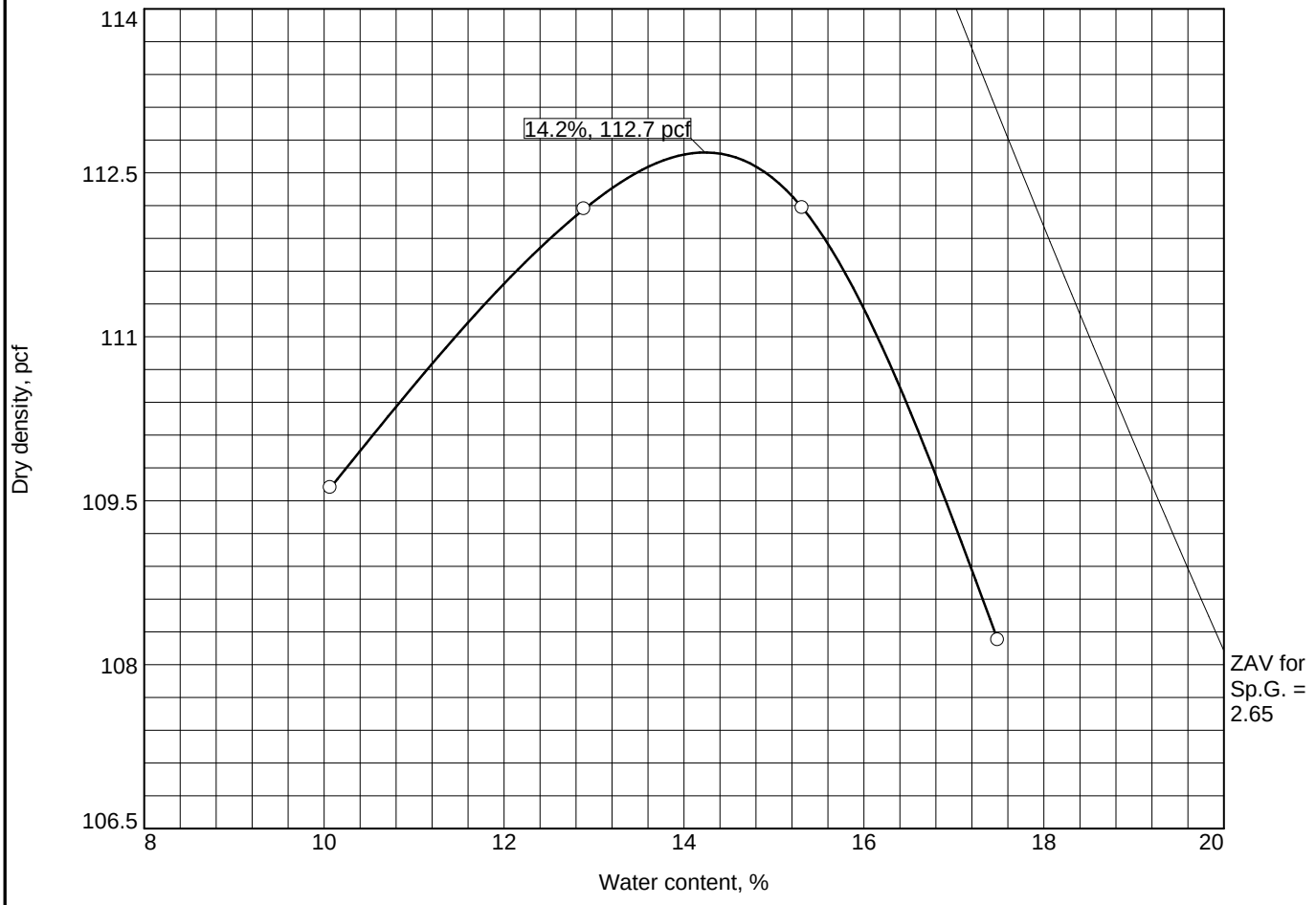
JOHN TURNER CONSULTING

Client: ProTerra Design Group LLC

Project: Deerfield Town Fields - North Main Street - S. Deerfield, MA

Project No: 21-07-011 **Figure** 020A

Moisture Density Report For Curve No. 3521-21



Test specification: ASTM D 1557-12 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
C Layer	ML	-	-	2.65	NV	NP	0.0	69.8

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 112.7 pcf Optimum moisture = 14.2 %	Dark brown sandy silt

Project No. 21-07-011 **Client:** ProTerra Design Group LLC

Project: Deerfield Town Fields - North Main Street - S. Deerfield, MA

Date: 1/18/2021

○ **Location:** TP #10 **Sample Number:** 3521-021

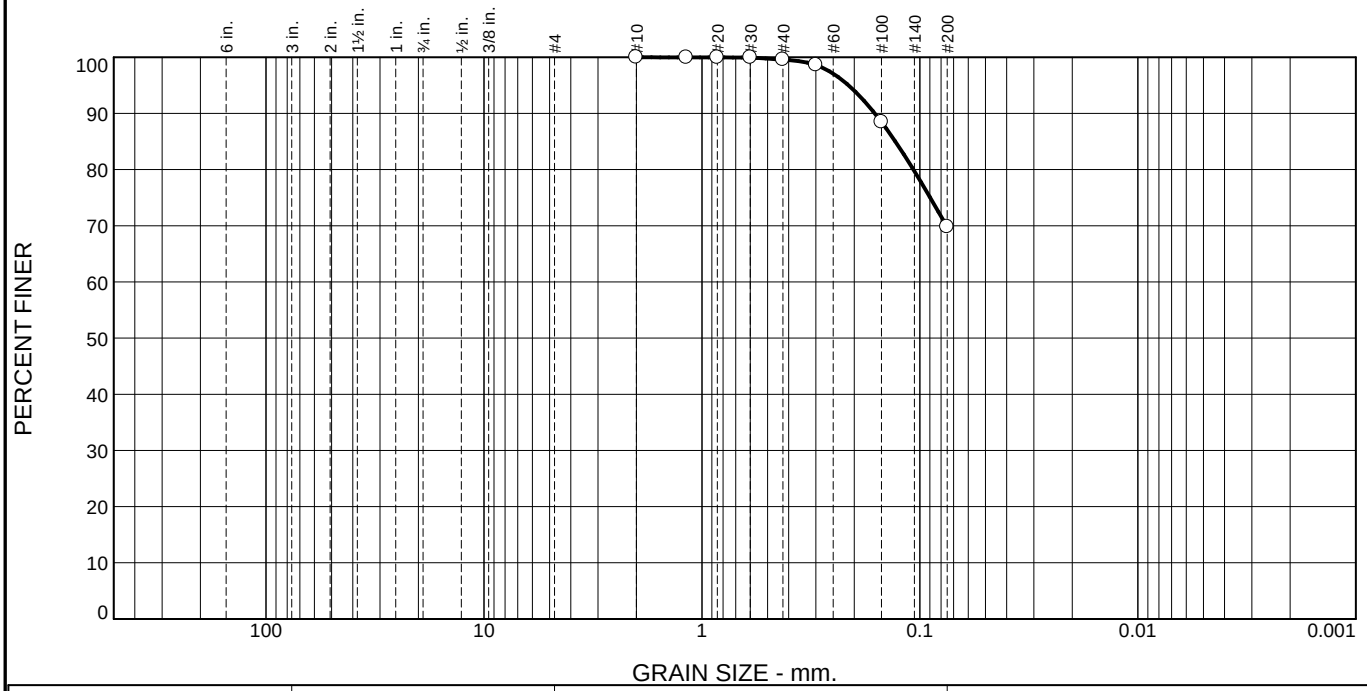
JOHN TURNER CONSULTING

Remarks:

Figure 021B

Tested By: Matt Watson **Checked By:** Rob Faria

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.4	29.8	69.8	

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#16	100.0		
#20	100.0		
#30	99.9		
#40	99.6		
#50	98.6		
#100	88.5		
#200	69.8		

* (no specification provided)

Material Description

Dark brown sandy silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** -

Coefficients

D_{90}= 0.1610 D_{85}= 0.1296 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 1/14/2021 **Date Tested:** 1/18/2021

Tested By: Matt Watson

Checked By: Rob Faria

Title: Lab Manager

Location: TP #10 **Date Sampled:** 1/14/2021

Sample Number: 3521-021 **Depth:** C Layer

JOHN TURNER CONSULTING

Client: ProTerra Design Group LLC

Project: Deerfield Town Fields - North Main Street - S. Deerfield, MA

Project No: 21-07-011 **Figure** 021A

JOHN TURNER
CONSULTING

Summary of Permeability of Soil
ASTM D2434

CLIENT: ProTerra Design Group, LLC

PROJECT: Deerfield Town Fields
North Main St.
S. Deerfield, MA

DATE: February 1, 2021

REPORT #: 21-07-011-030P

Saturation Duration: 24 Hours

Water Temperature: 23.3°C

Sample # 21-030 - TP#10 C Layer

Tested By: Jeff Young

Sample Area (A): 16.12 in^2

Sample Height (L): 7.48 in

Sample Volume: 120.58 in^3

Head Difference (H): 52.25 in

Specimen #	Interval Duration:	Volume of Water Collected	Coefficient of Permeability
21-030 (1)	1 Hour	18.36 mL	$1.63x10^{-1}$ in/hr
21-030 (2)	1 Hour	14.11 mL	$1.25x10^{-1}$ in/hr
21-030 (3)	1 Hour	15.47 mL	$1.37x10^{-1}$ in/hr

REMARKS: The test was run at 92% of optimal compaction as determined by ASTM D1557

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 Franklin County, Massachusetts

November 26, 2021

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,990 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 25 50 100 150

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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: Franklin County, Massachusetts
Survey Area Data: Version 16, Sep 2, 2021

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

Date(s) aerial images were photographed: Sep 29, 2013—Oct 16, 2016

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.

Franklin County, Massachusetts

30A—Raynham silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2qk83
Elevation: 30 to 1,040 feet
Mean annual precipitation: 37 to 51 inches
Mean annual air temperature: 37 to 59 degrees F
Frost-free period: 135 to 182 days
Farmland classification: Not prime farmland

Map Unit Composition

Raynham and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Raynham

Setting

Landform: Terraces, depressions
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty glaciolacustrine deposits

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 7 inches: silt loam
Bg - 7 to 12 inches: silt loam
Bw - 12 to 16 inches: very fine sandy loam
B'g - 16 to 31 inches: very fine sandy loam
Cg - 31 to 38 inches: silt loam
C1 - 38 to 53 inches: stratified silt loam to silty clay loam
C2 - 53 to 65 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 4 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very high (about 12.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Ecological site: F145XY004CT - Wet Lake Plain
Hydric soil rating: Yes

Minor Components

Scio

Percent of map unit: 5 percent
Landform: Terraces, plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Enosburg

Percent of map unit: 2 percent
Landform: Terraces, deltas, plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Walpole

Percent of map unit: 2 percent
Landform: Outwash plains, deltas, outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Amostown

Percent of map unit: 2 percent
Landform: Deltas, terraces, lake plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser, talf
Down-slope shape: Linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Sudbury

Percent of map unit: 2 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Birdsall

Percent of map unit: 2 percent
Landform: Stream terraces, depressions
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

258A—Amostown fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9c6g
Elevation: 130 to 480 feet
Mean annual precipitation: 37 to 51 inches
Mean annual air temperature: 37 to 59 degrees F
Frost-free period: 135 to 182 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Amostown and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Amostown

Setting

Landform: Lake plains, terraces, deltas
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser, talf
Down-slope shape: Linear
Across-slope shape: Convex, linear
Parent material: Loamy glaciofluvial deposits over glaciolacustrine deposits

Typical profile

Ap - 0 to 9 inches: fine sandy loam
Bw1 - 9 to 15 inches: fine sandy loam
Bw2 - 15 to 24 inches: fine sandy loam
2C1 - 24 to 30 inches: stratified very fine sandy loam to silt loam
2C2 - 30 to 65 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 13 to 17 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: F145XY005MA - Moist Lake Plain
Hydric soil rating: No

Minor Components

Scio

Percent of map unit: 9 percent
Landform: Terraces, plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Sudbury

Percent of map unit: 6 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Ninigret

Percent of map unit: 6 percent
Landform: Outwash terraces, outwash plains
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Deerfield

Percent of map unit: 2 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Pollux

Percent of map unit: 2 percent
Landform: Terraces, deltas, plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

656—Udorthents-Urban land complex

Map Unit Setting

National map unit symbol: 9c8s
Elevation: 100 to 1,670 feet

Mean annual precipitation: 37 to 53 inches
Mean annual air temperature: 33 to 59 degrees F
Frost-free period: 127 to 182 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 50 percent
Urban land: 45 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Landform position (two-dimensional): Summit
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Human reworked till and/or alluvium and/or glaciofluvial deposits

Typical profile

^A - 0 to 6 inches: fine sandy loam
^C1 - 6 to 23 inches: stratified loamy very fine sand to fine sandy loam
^C2 - 23 to 42 inches: stratified loamy very fine sand to fine sandy loam
^C3 - 42 to 46 inches: fine sand
^C4 - 46 to 65 inches: loamy fine sand

Properties and qualities

Slope: 0 to 15 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.60 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 5 percent
Landform: Terraces, outwash plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
30A	Raynham silt loam, 0 to 3 percent slopes	7.1	92.4%
258A	Amostown fine sandy loam, 0 to 3 percent slopes	0.6	7.6%
656	Udorthents-Urban land complex	0.0	0.0%
Totals for Area of Interest		**7.7**	**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

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
30A	Raynham silt loam, 0 to 3 percent slopes	C/D	7.1	92.4%
258A	Amostown fine sandy loam, 0 to 3 percent slopes	C/D	0.6	7.6%
656	Udorthents-Urban land complex	A	0.0	0.0%
Totals for Area of Interest			**7.7**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Parent Material Name

Parent material name is a term for the general physical, chemical, and mineralogical composition of the unconsolidated material, mineral or organic, in which the soil forms. Mode of deposition and/or weathering may be implied by the name.

The soil surveyor uses parent material to develop a model used for soil mapping. Soil scientists and specialists in other disciplines use parent material to help interpret soil boundaries and project performance of the material below the soil. Many soil properties relate to parent material. Among these properties are proportions of sand, silt, and clay; chemical content; bulk density; structure; and the kinds and amounts of rock fragments. These properties affect interpretations and may be criteria used to separate soil series. Soil properties and landscape information may imply the kind of parent material.

For each soil in the database, one or more parent materials may be identified. One is marked as the representative or most commonly occurring. The representative parent material name is presented here.

Table—Parent Material Name

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
30A	Raynham silt loam, 0 to 3 percent slopes	silty glaciolacustrine deposits	7.1	92.4%
258A	Amostown fine sandy loam, 0 to 3 percent slopes	loamy glaciofluvial deposits over glaciolacustrine deposits	0.6	7.6%
656	Udorthents-Urban land complex	human reworked till and/or alluvium and/or glaciofluvial deposits	0.0	0.0%
Totals for Area of Interest			**7.7**	**100.0%**

Rating Options—Parent Material Name

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower