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March 13, 2020

Town of Millbury
Planning Board
127 Elm Street
Millbury, Massachusetts 01527

Attn: Mr. Richard Gosselin, Chairman
T: (508) 865-4754

Re: Stormwater Management Permit
Millbury Jr/Sr High School Track and Field Renovations
Third Party Stormwater Design Review
Gale JN 716383

Dear Mr. Gosselin:

Gale Associates, Inc. (Gale) is submitting this letter on behalf of our client, Millbury Public Schools, in response to the third-party review letter, dated February 20, 2020 by Stantec Consulting Services, Inc., (Stantec) attached, regarding the Notice of Intent and accompanying Stormwater Management Permit dated January 24, 2020 related to the above referenced project.

Below you will find Stantec's comments in plain text and Gale's responses in **bold** text.

Recommendations and Comments for the Board's Consideration

Comment No. 1
To assist in our review, we recommend the "Grading and Drainage Plans" (3 sheets) include all inverts of the drainage structures, flow arrows and identify drainage structures/piping to be removed or retained. We also request hatching to further identify/evaluate the existing underground utilities.

Gale's Response:

Acknowledged. All drainage structures on sheets C201, C202, C202 A and C203A now include inverts and flow arrows. Please see the enclosed permit set dated 3/13/2020.

Comment No. 2
Post conditions *Time of Concentration* (Tc) path at PWS-2 and PWS-5a need to be shown on the post-development conditions map to verify values provided in the Stormwater Report and the HydroCAD analysis.

Gale's Response:

PWS-2 is comprised of the track and the multi-purpose rectangular synthetic turf field. PWS-5a is the synthetic turf softball field. Although synthetic turf is highly permeable, the synthetic turf field area is given a CN of 98 to model the area as a pond. Runoff from the turf field area and surrounding walkways enters the turf base stone directly, so it is given an assumed time of concentration of 6.0 minutes.

Comment No. 3
We recommend additional test pits be performed within the footprint of the permeable pavers within the proposed parking lot to verify estimated seasonal high groundwater elevation and soil texture.

Gale's Response:

Test pit 7 (included with the Stormwater Management Report) was within the footprint of the proposed permeable pavers and groundwater is estimated to be at elevation 422. The proposed elevation at the permeable pavers is at 427.70. The invert of the stone base of the pavers is 425.70, which would provide just under 4 feet of groundwater separation.

Regardless, we have removed infiltration at the permeable pavers in the HydroCAD model so that the pavers are only being used to claim water quality and 4 feet of separation is not required. Gale proposes one (1) additional test pit at the area of the proposed permeable pavers prior to the start of construction to confirm 2 feet of groundwater separation required by Standard 3. Peak flow rates are still reduced at design point 1, as demonstrated in the revised table, below.

Analysis Point	Design Storm	Existing Runoff (CFS)	Proposed Runoff (CFS)
DP-1	2-yr	7.06	**6.55**
	10-yr	14.90	**13.51**
	25-yr	19.43	**17.35**
	100-yr	26.47	**22.89**
DP-2	2-yr	2.48	0.72
	10-yr	5.31	2.42
	25-yr	6.93	3.5
	100-yr	9.44	5.27
DP-3	2-yr	1.21	0.37
	10-yr	3.07	1.05
	25-yr	4.19	1.47
	100-yr	5.96	2.15

Comment No. 4
Proposed drainage areas on the watershed map and impervious areas are not in agreement with the values provided in the stormwater report and the HydroCAD analysis.

Gale's Response:

Acknowledged. The Proposed Watershed Map, HydroCAD model and Stormwater Report narrative have all been revised and are enclosed.

Comment No. 5
We recommend proposed roof drain connections to the drainage system be shown on the site plan.

Gale's Response:

Roof drain connections are not proposed. Roof drainage will sheet flow overland and will be dissipated within splash blocks.

Comment No. 6
Proposed erosion control measures are not shown on the site plan drawings.

Gale's Response:

Erosion control measures are shown on the Demolition and Erosion Control Plans (C003 and C004), and has been added to the layout and materials plan, enclosed. Erosion control measures will remain in place final stabilization and project acceptance by the Town.

Comment No. 7
Snow storage areas as shown on the plan appears inadequate for the impervious on site. We recommend showing additional snow storage locations be shown on the site plan and question the planting of trees within the snow storage area and permeable pavers as shown on landscape plan/sheet 1 of 2.

Gale's Response:

Acknowledged. The locations of the trees on sheets L101 have been relocated to be outside the snow storage area for the proposed southern parking lot. Sheet C101 and C103A now shows additional snow storage areas for the proposed northwestern parking lot extension.

Comment No. 8
No proposed signs are called out to indicate proposed permeable pavers. We recommend signage be added to agree with best practices identified in the Massachusetts Stormwater Handbook.

Gale's Response:

Acknowledged. Two (2) signs have been added to Sheet C102 and to Detail 6 on Sheet C513 to indicate permeable pavers.

MassDEP Stormwater Standards

Comment No. 1

No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. We note the applicant has not provided rip-rap sizing calculations at the permeable paver discharges and recommended these calculations be provided for review.

Gale's Response:

Rip-rap sizing calculations for the permeable paver discharges are enclosed with this submission. Per the calculations, Class 1 rip-rap shall be installed at each outfall, and the apron dimensions should be a minimum of 2 ft in length, and 0.68 in deep.

Comment No. 2

Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. It appears that post-development peak flow rates do not exceed pre-development peak flow rates. We do note, the Tc. CN and drainage area values are not in agreement between the narrative, watershed maps and Hydro CAD report and request these items to be addressed by GA.

Gale's Response:

Acknowledged. Per Gale's response to Comment No. 4, this has been revised.

Comment No. 3

Loss of annual recharge to groundwater should be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. Stantec recommends additional test pits be performed with the footprint of the permeable pavers within the posed parking lot to verify estimated seasonal high groundwater elevation and soil texture. In addition, we request a cross section of the turf field be provided identifying existing and proposed elevations and SHGW elevation to confirm the separation for recharge.

Gale's Response:

Regarding the test pits within the proposed permeable pavement area, please see the response to Comment No. 3, above.

Cross sections of the synthetic multipurpose rectangular field and the synthetic softball fields including existing and proposed elevations and SHGW are enclosed with this response letter.

Comment No. 4

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

a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained.
b. Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and
c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

We recommend treatment of the stormwater runoff from the parking lot expansion area to the northwest be addressed by GA.

Gale's Response:

Per Sheets C101, C103, C201, C203, and Detail 7 of C516 of the revised Permit Plan Set dated 3/13/20, the stormwater runoff is now being treated with a water quality catch basin (STC 450i or equal) which, in combination with street sweeping, shall achieve the 80% TSS removal.

Comment No. 5

For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff form such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Water Act, M.G.L. c. 21§§26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR4.00 and 314 CMR 5.00. The project is not associated with a land use with higher potential pollutant load; therefore, this standard is not applicable.

Gale's Response:

Acknowledged.

Comment No. 6

Stormwater discharges within the Zone II or interim wellhead protection area of a public water supply, and stormwater discharges near or to any other critical area, require the use of a the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Water and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "stormwater discharge" as defined in 314 CMR 3.04(2)(a) 1 or (b) to an outstanding resource water or special resource water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone 1 or Zone A are prohibited unless essential to the operation of a public water supply. The project is not within a critical area; therefore, this standard is not applicable.

Gale's Response:

Acknowledged.

Comment No. 7

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

Gale's Response:

Acknowledged.

Comment No. 8

A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented. Erosion and sedimentation control measures are identified on the General Notes Sheet. We recommend proposed erosion control measures be shown on the site plan. As noted in the Stormwater Management Report the project will be covered by a NPDES Construction General Permit and SWPPP Plan. GA has indicated these documents will be provided by the contractor prior to the start of construction.

Gale's Response:

Erosion control measures are shown on the Demolition and Erosion Control Plans (C003 and C004), enclosed and has been added to the Layout and Materials Plan.

Comment No. 9

A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed. An operation and maintenance plan were provided within the Stormwater Report. We note the Best management Practices (BMP) identified in the operation and maintenance plan do not agree with the BMP identified in the MassDEP Stormwater Management Standards.

Gale's Response:

The Operation and Maintenance Plan has been revised to reflect BMP identified in the MassDEP Stormwater Management Standards.

Comment No. 10

All illicit discharges to the stormwater management system are prohibited. GA has submitted an illicit discharge statement as part of the Stormwater Report which will require the owner's signature.

Gale's Response:

Acknowledged. A signed illicit discharge statement has been included with this submission.

Comment No. 11

Section 8 – Operation and Maintenance Plans of the Town's General Bylaws identified information required for the plan to comply with the Permit, this bylaw, and meet the Massachusetts Surface Water Quality Standards. **An operation and maintenance plan were provided within the Stormwater Report. We note the Best Management Practices (BMP) identified in the operation and maintenance plan do not agreed with the BMP identified in the MassDEP Stormwater Management Standards.**

Gale's Response:

The Operation and Maintenance Plan has been revised to reflect BMP identified in the MassDEP Stormwater Management Standards.

We trust that the above narrative, as well as the attached revised documents and calculations, satisfactorily address your comments. Please contact John Perry, at jmp@gainc.com or (781) 335-6465, with any questions.

Respectfully submitted,

GALE ASSOCIATES, INC.

Margaret J. Laracy, P.E./lad

Margaret J. Laracy, P.E.
Project Engineer

John M. Perry, P.E./lad

John M. Perry, P.E.
Chief Civil Engineer

JMP/MJL/DFN/lad

Enclosures:

- Stantec Third Party Review Letter
- Revised Proposed HydroCAD model
- Revised Operation and Maintenance Plan
- Signed Illicit Discharge Compliance Statement
- Cross Sections of Syn. Turf Fields with Elevations
- Rip-rap Sizing Calculations
- Revised Permit Plan Set dated 3/13/2020
- Revised Stormwater Management Report Narrative

CC:

- Laurie Connors Millbury Planning Board
- David Glenn, P.E. Stantec

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Stantec Consulting Services Inc.
65 Network Drive 2nd Floor, Burlington MA 01803-4511

February 20, 2020
File: 179410889

Attention: Mr. Richard Gosselin, Chairman
MILLBURY PLANNING BOARD
Municipal Office Building
127 Elm Street
Millbury, Massachusetts 01527

Reference: Stormwater Management Permit
Track and Field Renovations Project
Millbury JR/SR High School
12 Martin Street
Millbury, Massachusetts

Dear Mr. Gosselin:

Pursuant to the Board's request, Stantec Consulting Ltd. has reviewed the Site Plan submittal for *Stormwater Management Permit Track and Field Renovations Project 12 Martin Street*, a proposed improvement to the existing athletic campus in Millbury.

The following materials were received at Stantec's Burlington Office on January 27, 2020.

- Site Plan (41 Sheets), dated January 24, 2020; Application for Site Plan Approval & Stormwater Permit, dated January 24, 2020; Stormwater Management Report, dated January 24, 2020 and supporting documentation each as prepared by Gale Associates, Inc. (GA)

The Site Plan submittal was reviewed for conformance with the Town's Zoning Bylaws, the Board's Design Standards, and generally accepted engineering practice. We offer the following comments regarding the *Stormwater Management Permit Track and Field Renovations Project 12 Martin Street* submittal for the Board's consideration.

SITE VISIT

As part of the Stantec's review, Mr. David Glenn (Stantec) conducted a site visit to review existing surface features and site conditions.

STORMWATER MANAGEMENT

The Stormwater Management Report is included under a separate cover of the same name with the Site Plan submission. The report includes a narrative with attachments which addresses the Town's General Bylaw Chapter 16 – *Water, Sewer and Sewage Disposal* for Stormwater

Reference: ***Stormwater Management Permit***
Track and Field Renovations Project
Millbury JR/SR High School
12 Martin Street

Management, which includes addressing the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards.

Stantec offers the following comments and recommendations for the Board's consideration:

1. To assist in our review, we recommend the "Grading and Drainage Plans" (3 sheets) include all inverts of the drainage structures, flow arrows and identify drainage structures/piping to be removed or retained. We also request hatching be adjusted to further identify/evaluate the existing underground utilities.

2. Post conditions *Time of Concentration (T_c)* path at PWS-2 and PWS-5a need to be shown on the post-development conditions map to verify values provided in the Stormwater Report and the HydroCAD analysis.

3. We recommend additional test pits be performed within the footprint of the permeable pavers within the proposed parking lot to verify estimated seasonal high groundwater elevation and soil texture.

4. Proposed drainage areas on the watershed map and impervious areas are not in agreement with values provided in the Stormwater Report and the HydroCAD analysis.

5. We recommend proposed roof drain connections to the drainage system be shown on the site plan.

6. Proposed erosion control measures are not shown on the site plan drawings.

7. Snow storage area as shown on the plan appears inadequate for the impervious on site. We recommend additional snow storage locations be shown on the site plan and question the planting of trees within the snow storage area and permeable pavers as shown on landscape plan/sheet 1of 2

8. No proposed signs are called out to indicate proposed permeable pavers. We recommend signage be added to agree with best practices identified in the Massachusetts Stormwater Handbook.

Reference: ***Stormwater Management Permit***
Track and Field Renovations Project
Millbury JR/SR High School
12 Martin Street

MassDEP Stormwater Standards

We offer the following comments on the proposed stormwater management system, specifically for compliance with the ten performance standards as outlined in the MassDEP Stormwater Management Standards.

1. No new stormwater conveyances (e.g., outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.
   We note the applicant has not provided rip-rap sizing calculations at the permeable paver discharges and recommended these calculations be provided for review.

2. Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

   It appears the post-development peak flow rates do not exceed pre-development peak flow rates. We do note, the Tc, CN, and drainage area values are not in agreement between the narrative, watershed maps and HydroCAD report and request these items be addressed by GA.

3. Loss of annual recharge to groundwater should be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type.

   Stantec recommends additional test pits be performed within the footprint of the permeable pavers within the proposed parking lot to verify estimated seasonal high groundwater elevation and soil texture. In addition, we request a cross section of the turf field be provided identifying existing and proposed elevations and SHGW elevation to confirm the separation for recharge.

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

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

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Millbury JR/SR High School
12 Martin Street

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

We recommend treatment of the stormwater runoff from the parking lot expansion area to the northwest be addressed by GA.

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

   The project is not associated with a land use with higher potential pollutant load; therefore, this standard is not applicable.

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

Reference: ***Stormwater Management Permit***
Track and Field Renovations Project
Millbury JR/SR High School
12 Martin Street

The project is not within a critical area; therefore, this standard is not applicable.

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

   In our opinion the project is a mix of new development and redevelopment.

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

   Erosion and sedimentation control measures are identified on the General Notes Sheet. We recommend proposed erosion control measures be shown on the site plan. As noted in the Stormwater Management Report the project will be covered by a NPDES Construction General Permit and SWPPP Plan. GA has indicated these documents will be provided by the contractor prior to the start of construction.

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

   An operation and maintenance plan was provided within the Stormwater Report. We note the Best Management Practices (BMP) identified in the operation and maintenance plan do not agree with the BMP identified in the MassDEP Stormwater Management Standards.

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

    GA has submitted an illicit discharge statement as part of the Stormwater Report which will require the owner's signature

Reference: ***Stormwater Management Permit***
Track and Field Renovations Project
Millbury JR/SR High School
12 Martin Street

Section 8 – *Operation and Maintenance Plans* of the Town's *General Bylaws* identifies information required for the plan to comply with the Permit, this bylaw, and meet the Massachusetts Surface Water Quality Standards.

An operation and maintenance plan was provided within the Stormwater Report. We note the Best Management Practices (BMP) identified in the operation and maintenance plan do not agree with the BMP identified in the MassDEP Stormwater Management Standards.

If there are any questions regarding our comments and recommendations, please do not hesitate to call at 1-781-221-1134.

Regards,

STANTEC CONSULTING SERVICES INC.

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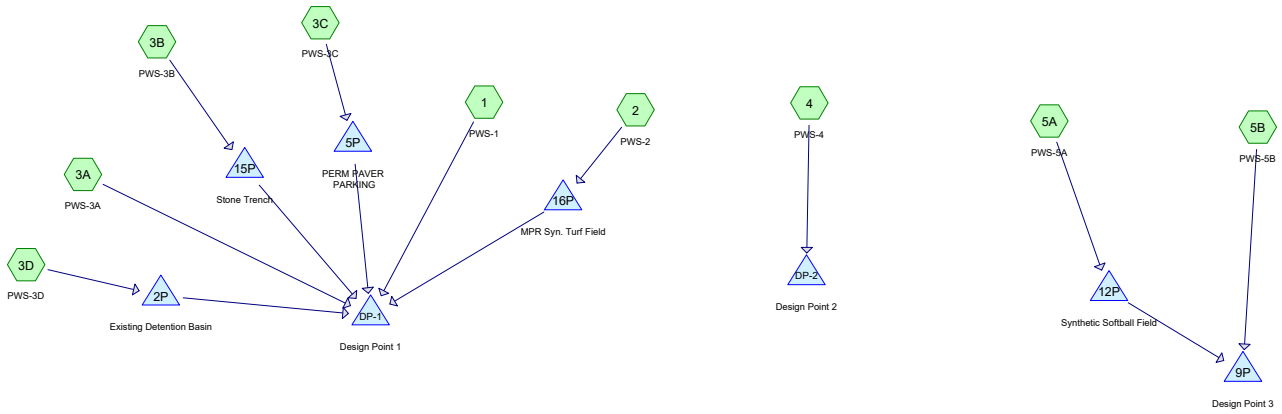
cc. Ms. Laurie Connors, Town Planner



Subcat Reach Pond Link

Drainage Diagram for Millbury Prop. HydroCAD

Prepared by {enter your company name here}, Printed 3/10/2020

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.270	39	Discus Sand (3B)
0.612	58	Woods/grass comb., Good, HSG B (4)
3.993	61	>75% Grass cover, Good, HSG B (1, 3A, 3B, 3C, 4, 5A, 5B)
0.676	61	>75% Grass cover, Good, HSG B/RIP RAP (3D)
0.005	61	Stone Trench (5A)
0.138	69	Rip Rap, HSG B (4)
0.333	77	Woods, Good, HSG D (Wetlands) (5B)
0.018	85	Gravel roads, HSG B (5A)
0.095	98	BASIN/WQS (3D)
2.021	98	MPR Syn. Turf FIeld (2)
0.508	98	Parking Lot (3C)
1.489	98	Parking Lots, Walkways, Buildings (1)
0.241	98	Parking/ Entrance (4)
0.121	98	Pavement/Concrete Slabs (5A)
0.088	98	Permeable Pavers (3C)
0.222	98	Roadway & Sidewalk (3A)
0.003	98	Shed (3B)
0.018	98	Stone Trench (3B)
1.041	98	Syn. Turf Field (5A)
1.236	98	Track (2)
0.307	98	Walkways, Bleachers, Building (3B)
13.435	81	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
5.437	HSG B	1, 3A, 3B, 3C, 3D, 4, 5A, 5B
0.000	HSG C	
0.333	HSG D	5B
7.665	Other	1, 2, 3A, 3B, 3C, 3D, 4, 5A
13.435		**TOTAL AREA**

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Fill (inches)
1	3B	0.00	0.00	157.0	0.0500	0.013	12.0	0.0	0.0
2	3B	0.00	0.00	141.0	0.0742	0.011	12.0	0.0	0.0
3	3B	0.00	0.00	95.0	0.0740	0.011	15.0	0.0	0.0
4	4	0.00	0.00	68.0	0.0424	0.012	18.0	0.0	0.0
5	5P	429.30	429.00	20.0	0.0150	0.013	6.0	0.0	0.0
6	16P	443.40	442.40	100.0	0.0100	0.013	10.0	0.0	0.0

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: PWS-1 Runoff Area=2.309 ac 64.49% Impervious Runoff Depth>4.77"
Tc=6.0 min CN=85 Runoff=12.35 cfs 0.918 af

Subcatchment 2: PWS-2 Runoff Area=3.257 ac 100.00% Impervious Runoff Depth>6.26"
Tc=6.0 min CN=98 Runoff=20.27 cfs 1.698 af

Subcatchment 3A: PWS-3A Runoff Area=0.424 ac 52.36% Impervious Runoff Depth>4.23"
Tc=6.0 min CN=80 Runoff=2.05 cfs 0.150 af

Subcatchment 3B: PWS-3B Runoff Area=1.717 ac 19.10% Impervious Runoff Depth>2.72"
Flow Length=700' Tc=9.7 min CN=65 Runoff=4.69 cfs 0.389 af

Subcatchment 3C: PWS-3C Runoff Area=0.645 ac 92.40% Impervious Runoff Depth>5.90"
Tc=6.0 min CN=95 Runoff=3.95 cfs 0.317 af

Subcatchment 3D: PWS-3D Runoff Area=0.771 ac 12.32% Impervious Runoff Depth>2.81"
Flow Length=552' Tc=6.4 min CN=66 Runoff=2.45 cfs 0.181 af

Subcatchment 4: PWS-4 Runoff Area=2.153 ac 11.19% Impervious Runoff Depth>2.71"
Flow Length=618' Tc=13.5 min CN=65 Runoff=5.27 cfs 0.487 af

Subcatchment 5A: PWS-5A Runoff Area=1.370 ac 84.82% Impervious Runoff Depth>5.67"
Tc=6.0 min CN=93 Runoff=8.23 cfs 0.648 af

Subcatchment 5B: PWS-5B Runoff Area=0.789 ac 0.00% Impervious Runoff Depth>3.00"
Flow Length=278' Slope=0.0100 '/' Tc=13.6 min CN=68 Runoff=2.15 cfs 0.197 af

Pond 2P: Existing Detention Basin Peak Elev=426.34' Storage=263 cf Inflow=2.45 cfs 0.181 af
Discarded=0.02 cfs 0.019 af Primary=2.38 cfs 0.160 af Outflow=2.40 cfs 0.178 af

Pond 5P: PERM PAVER PARKING Peak Elev=430.36' Storage=2,630 cf Inflow=3.95 cfs 0.317 af
6.0" Round Culvert x 3.00 n=0.013 L=20.0' S=0.0150 '/' Outflow=2.50 cfs 0.294 af

Pond 9P: Design Point 3 Inflow=2.15 cfs 0.216 af
Primary=2.15 cfs 0.216 af

Pond 12P: Synthetic Softball Field Peak Elev=448.94' Storage=8,432 cf Inflow=8.23 cfs 0.648 af
Discarded=1.07 cfs 0.629 af Primary=0.33 cfs 0.018 af Outflow=1.40 cfs 0.647 af

Pond 15P: Stone Trench Peak Elev=434.24' Storage=0.007 af Inflow=4.69 cfs 0.389 af
Discarded=0.03 cfs 0.004 af Primary=4.22 cfs 0.385 af Outflow=4.25 cfs 0.389 af

Pond 16P: MPR Syn. Turf Field Peak Elev=449.35' Storage=28,838 cf Inflow=20.27 cfs 1.698 af
Discarded=1.02 cfs 1.347 af Primary=0.99 cfs 0.350 af Outflow=2.01 cfs 1.697 af

Pond DP-1: Design Point 1 Inflow=22.89 cfs 2.256 af
Primary=22.89 cfs 2.256 af

Pond DP-2: Design Point 2

Inflow=5.27 cfs 0.487 af
Primary=5.27 cfs 0.487 af

Total Runoff Area = 13.435 ac Runoff Volume = 4.985 af Average Runoff Depth = 4.45"
44.99% Pervious = 6.045 ac 55.01% Impervious = 7.390 ac

Summary for Subcatchment 1: PWS-1

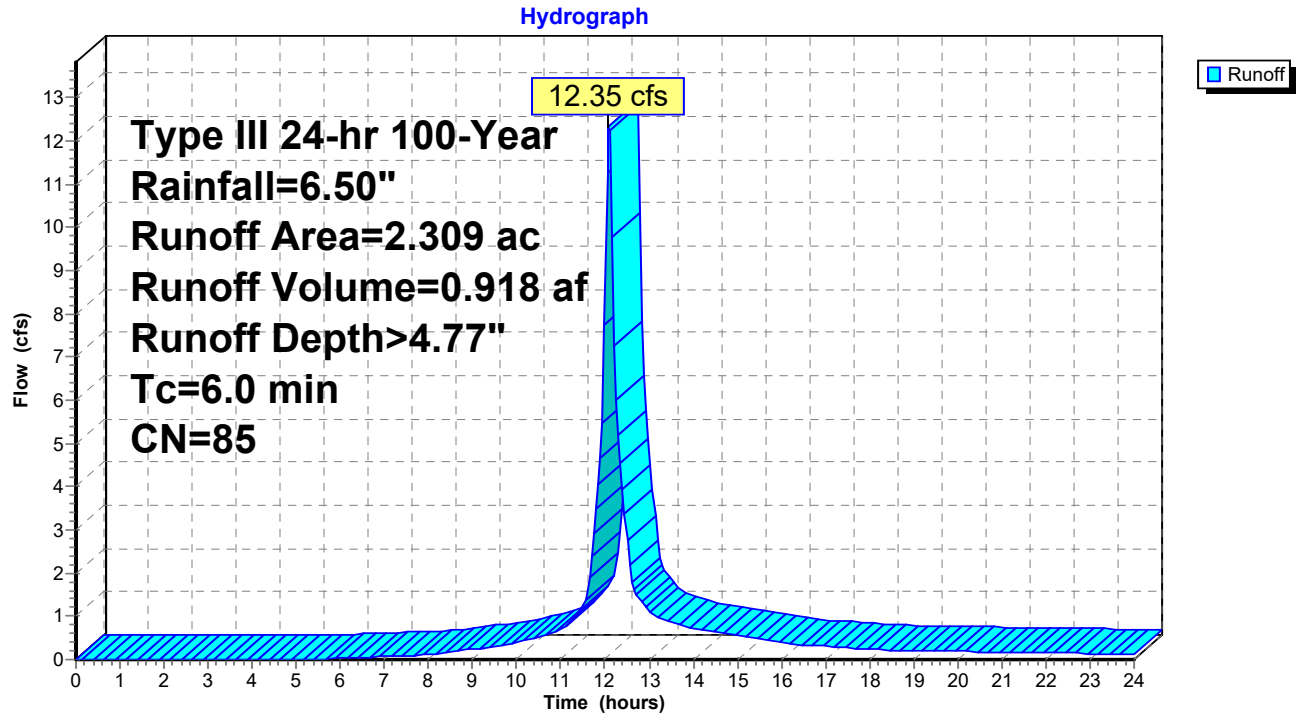
Runoff = 12.35 cfs @ 12.09 hrs, Volume= 0.918 af, Depth> 4.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

	Area (ac)	CN	Description
*	1.489	98	Parking Lots, Walkways, Buildings
	0.820	61	>75% Grass cover, Good, HSG B
	2.309	85	Weighted Average
	0.820		35.51% Pervious Area
	1.489		64.49% Impervious Area

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

Subcatchment 1: PWS-1



Summary for Subcatchment 2: PWS-2

Sythetic Turf Field, Track

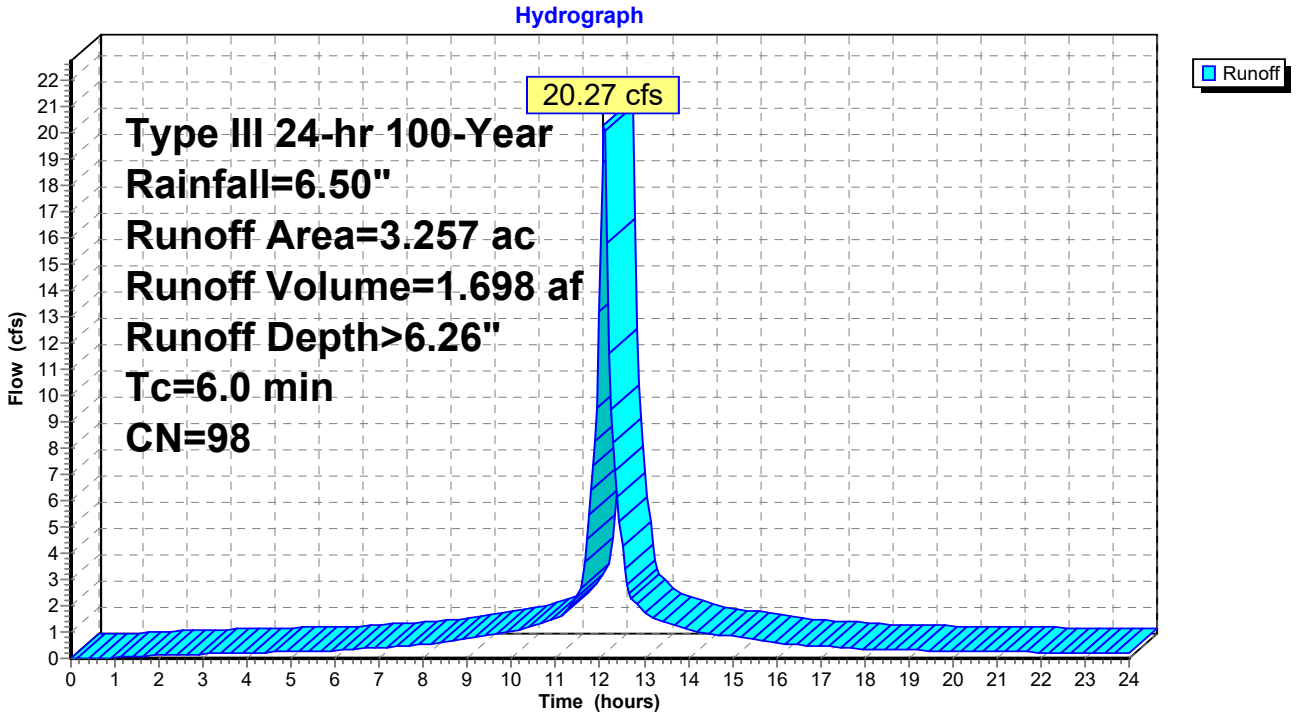
Runoff = 20.27 cfs @ 12.09 hrs, Volume= 1.698 af, Depth> 6.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

	Area (ac)	CN	Description
*	2.021	98	MPR Syn. Turf FIeld
*	1.236	98	Track
	3.257	98	Weighted Average
	3.257		100.00% Impervious Area

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

Subcatchment 2: PWS-2



Summary for Subcatchment 3A: PWS-3A

Includes roadway, existing sw system to the Northeast, area including and surrounding the bioretention area

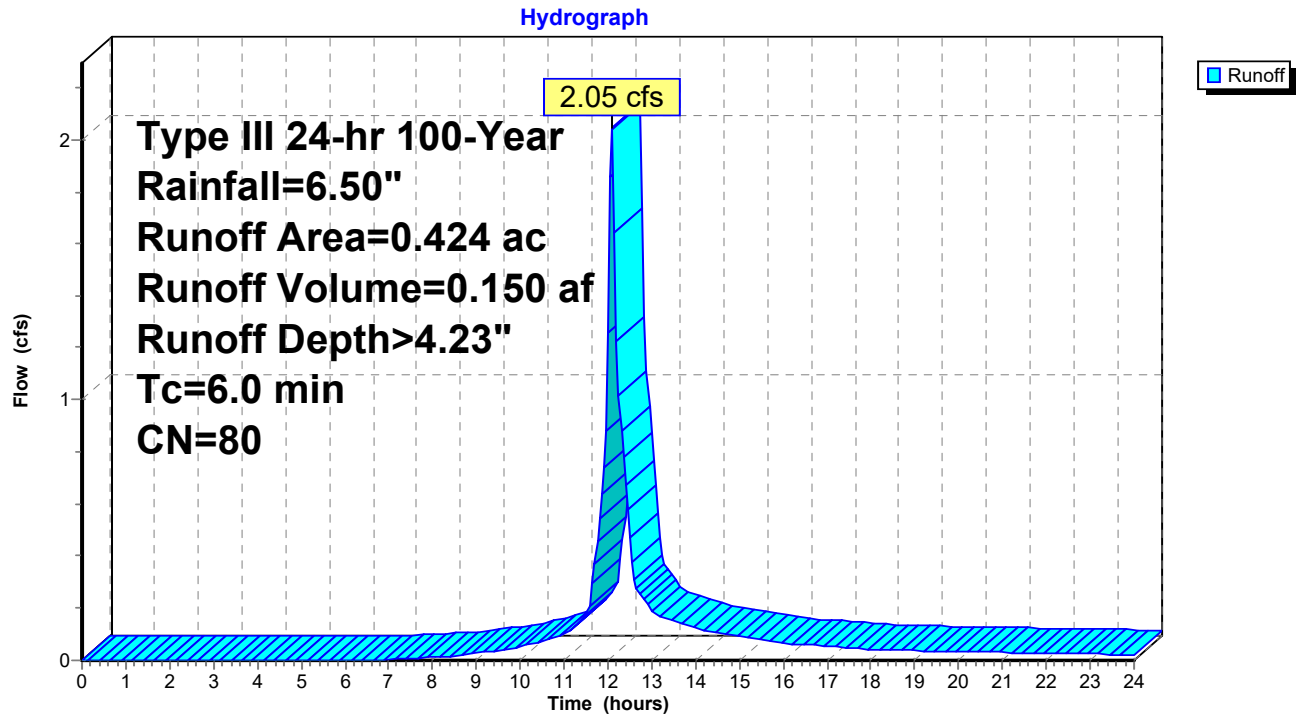
Runoff = 2.05 cfs @ 12.09 hrs, Volume= 0.150 af, Depth> 4.23"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

	Area (ac)	CN	Description
*	0.222	98	Roadway & Sidewalk
	0.202	61	>75% Grass cover, Good, HSG B
	0.424	80	Weighted Average
	0.202		47.64% Pervious Area
	0.222		52.36% Impervious Area

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

Subcatchment 3A: PWS-3A



Summary for Subcatchment 3B: PWS-3B

LAND ABOVE PARKING LOT

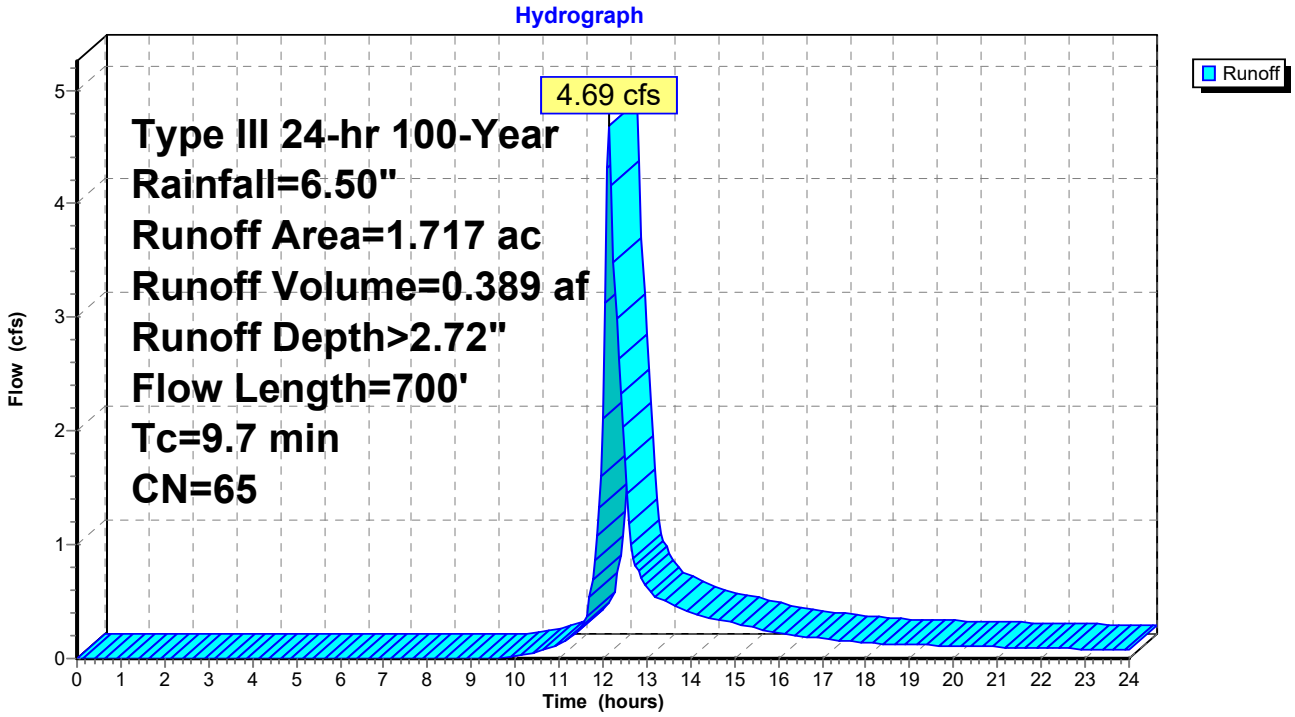
Runoff = 4.69 cfs @ 12.15 hrs, Volume= 0.389 af, Depth> 2.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

	Area (ac)	CN	Description
*	0.307	98	Walkways, Bleachers, Building
*	0.003	98	Shed
	1.119	61	>75% Grass cover, Good, HSG B
*	0.018	98	Stone Trench
*	0.270	39	Discus Sand
	1.717	65	Weighted Average
	1.389		80.90% Pervious Area
	0.328		19.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.0100	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
0.8	101	0.0180	2.16		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	156	0.0801	4.56		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	157	0.0500	10.14	7.97	**Pipe Channel, 12" HDPE Perf Pipe** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.2	141	0.0742	14.60	11.47	**Pipe Channel, 12" RCP Pipe** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.1	95	0.0740	16.92	20.77	**Pipe Channel, 15" RCP Pipe** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
9.7	700	Total			

Subcatchment 3B: PWS-3B



Summary for Subcatchment 3C: PWS-3C

PARKING LOT, SEDIMENT FOREBAYS, RAIN GARDEN

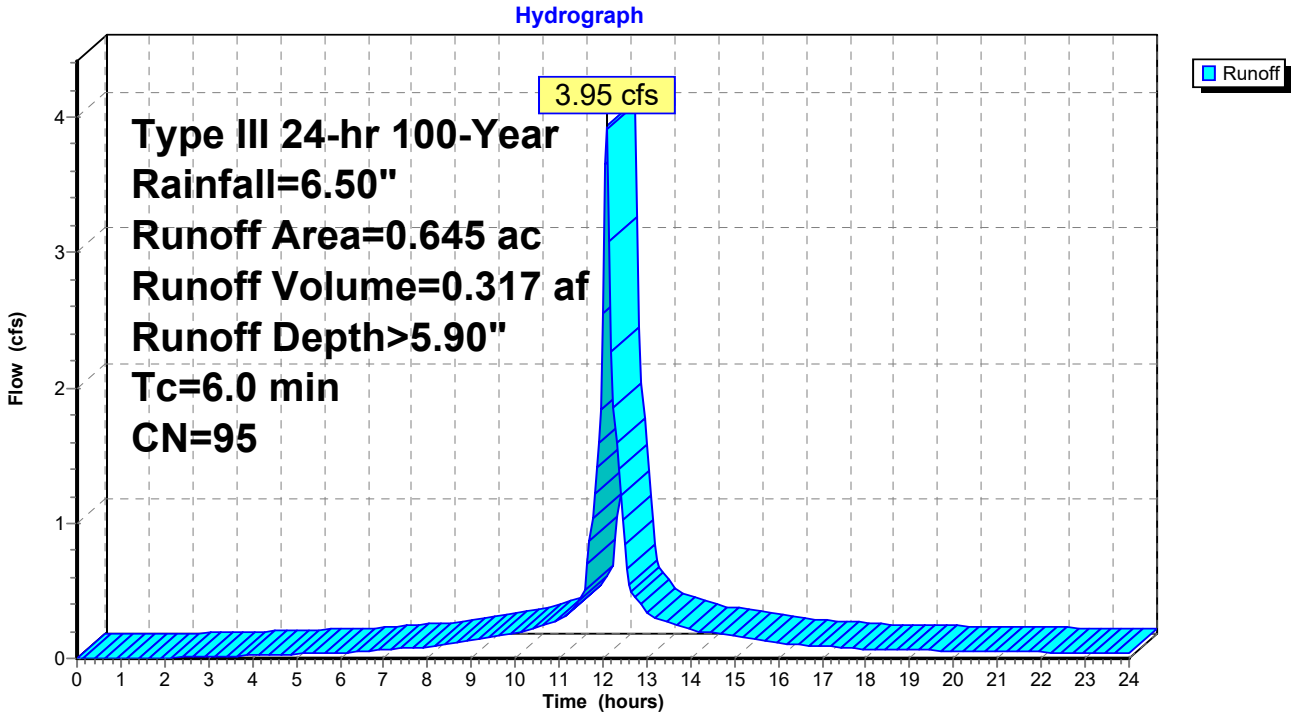
Runoff = 3.95 cfs @ 12.09 hrs, Volume= 0.317 af, Depth> 5.90"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

	Area (ac)	CN	Description
*	0.508	98	Parking Lot
	0.049	61	>75% Grass cover, Good, HSG B
*	0.088	98	Permeable Pavers
	0.645	95	Weighted Average
	0.049		7.60% Pervious Area
	0.596		92.40% Impervious Area

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

Subcatchment 3C: PWS-3C



Summary for Subcatchment 3D: PWS-3D

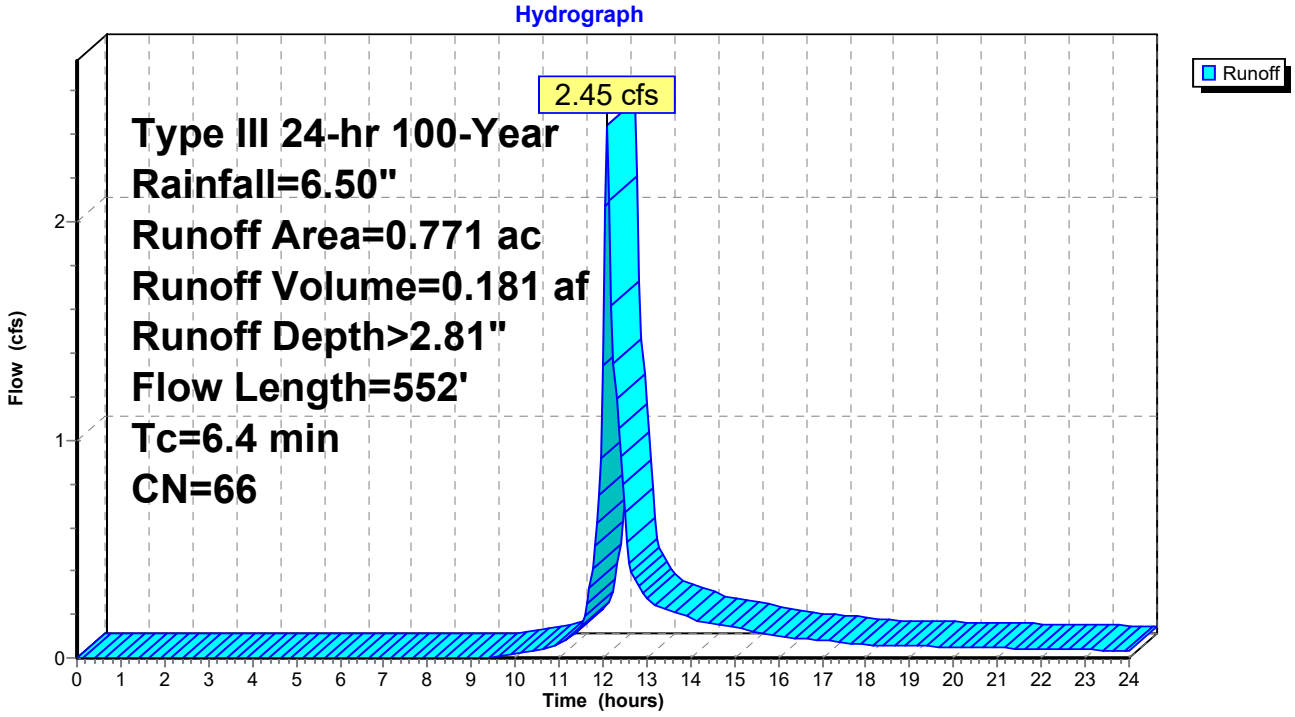
Runoff = 2.45 cfs @ 12.10 hrs, Volume= 0.181 af, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

	Area (ac)	CN	Description
*	0.676	61	>75% Grass cover, Good, HSG B/RIP RAP
*	0.095	98	BASIN/WQS
	0.771	66	Weighted Average
	0.676		87.68% Pervious Area
	0.095		12.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	50	0.0800	0.25		**Sheet Flow, INITIAL 50 FT** Grass: Short n= 0.150 P2= 3.00"
1.6	319	0.0500	3.35		**Shallow Concentrated Flow, RIP RAP/GRASS SWALE** Grassed Waterway Kv= 15.0 fps
1.5	183	0.0164	2.06		**Shallow Concentrated Flow, DETENTION POND** Unpaved Kv= 16.1 fps
6.4	552	Total			

Subcatchment 3D: PWS-3D



Summary for Subcatchment 4: PWS-4

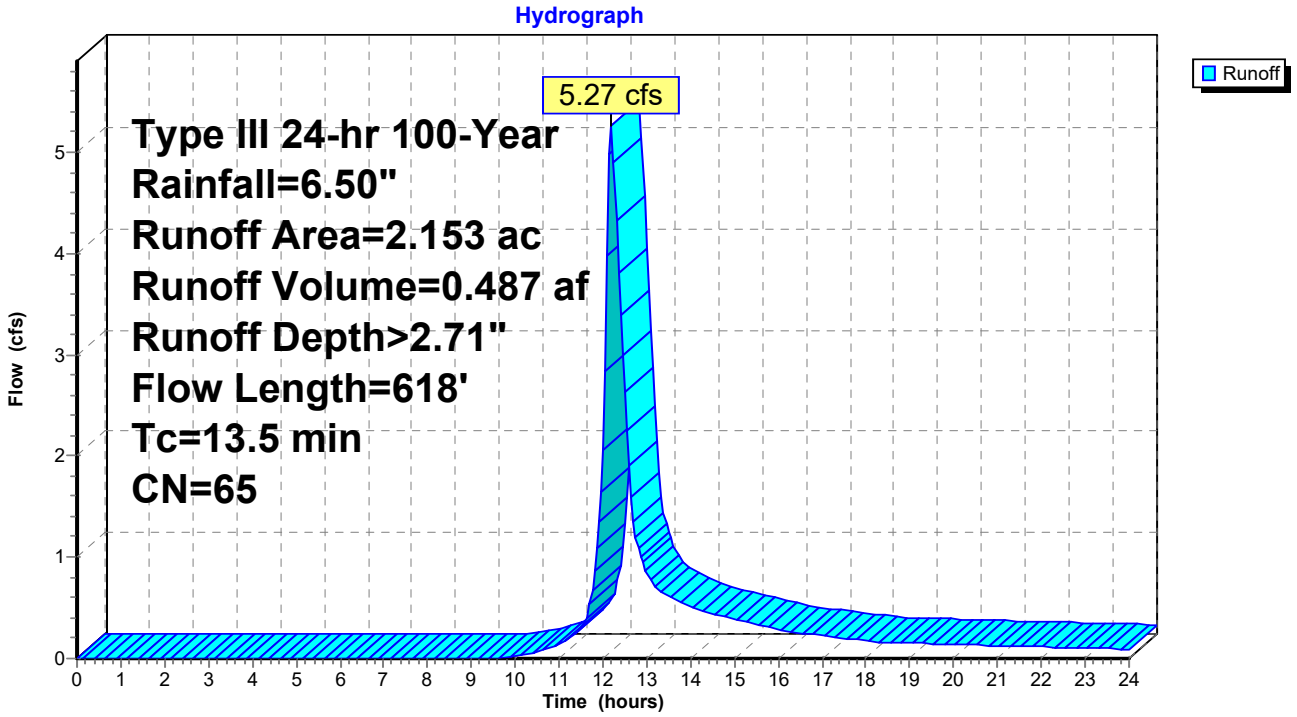
Runoff = 5.27 cfs @ 12.20 hrs, Volume= 0.487 af, Depth> 2.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

	Area (ac)	CN	Description
*	0.138	69	Rip Rap, HSG B
*	0.241	98	Parking/ Entrance
	0.612	58	Woods/grass comb., Good, HSG B
	1.162	61	>75% Grass cover, Good, HSG B
	2.153	65	Weighted Average
	1.912		88.81% Pervious Area
	0.241		11.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0062	0.09		**Sheet Flow, Initial 50'** Grass: Short n= 0.150 P2= 3.00"
1.7	126	0.0060	1.25		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	200	0.0225	2.42		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	174	0.0340	2.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	68	0.0424	13.26	23.43	**Pipe Channel, 18" Concrete Pipe** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
13.5	618	Total			

Subcatchment 4: PWS-4



Summary for Subcatchment 5A: PWS-5A

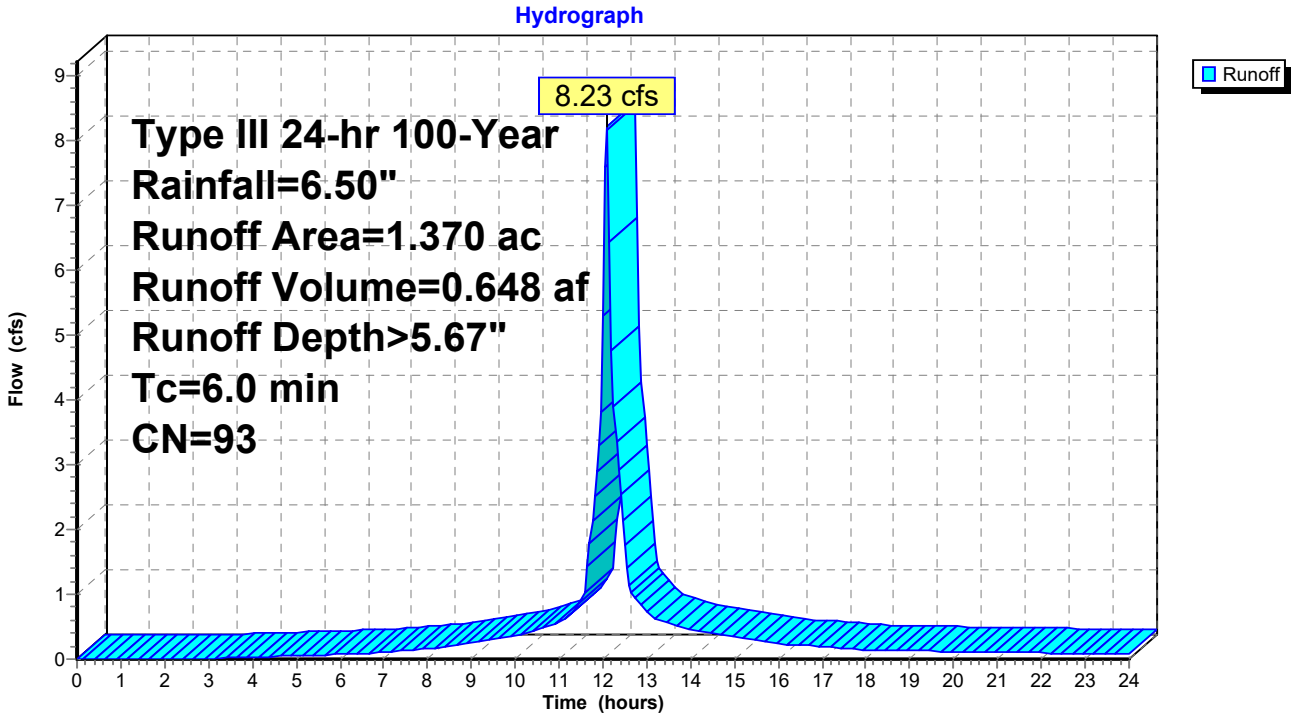
Runoff = 8.23 cfs @ 12.09 hrs, Volume= 0.648 af, Depth> 5.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

	Area (ac)	CN	Description
*	1.041	98	Syn. Turf Field
*	0.121	98	Pavement/Concrete Slabs
	0.185	61	>75% Grass cover, Good, HSG B
	0.018	85	Gravel roads, HSG B
*	0.005	61	Stone Trench
	1.370	93	Weighted Average
	0.208		15.18% Pervious Area
	1.162		84.82% Impervious Area

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

Subcatchment 5A: PWS-5A



Summary for Subcatchment 5B: PWS-5B

Wetlands, Grass ourtside limits of syn. turf field.

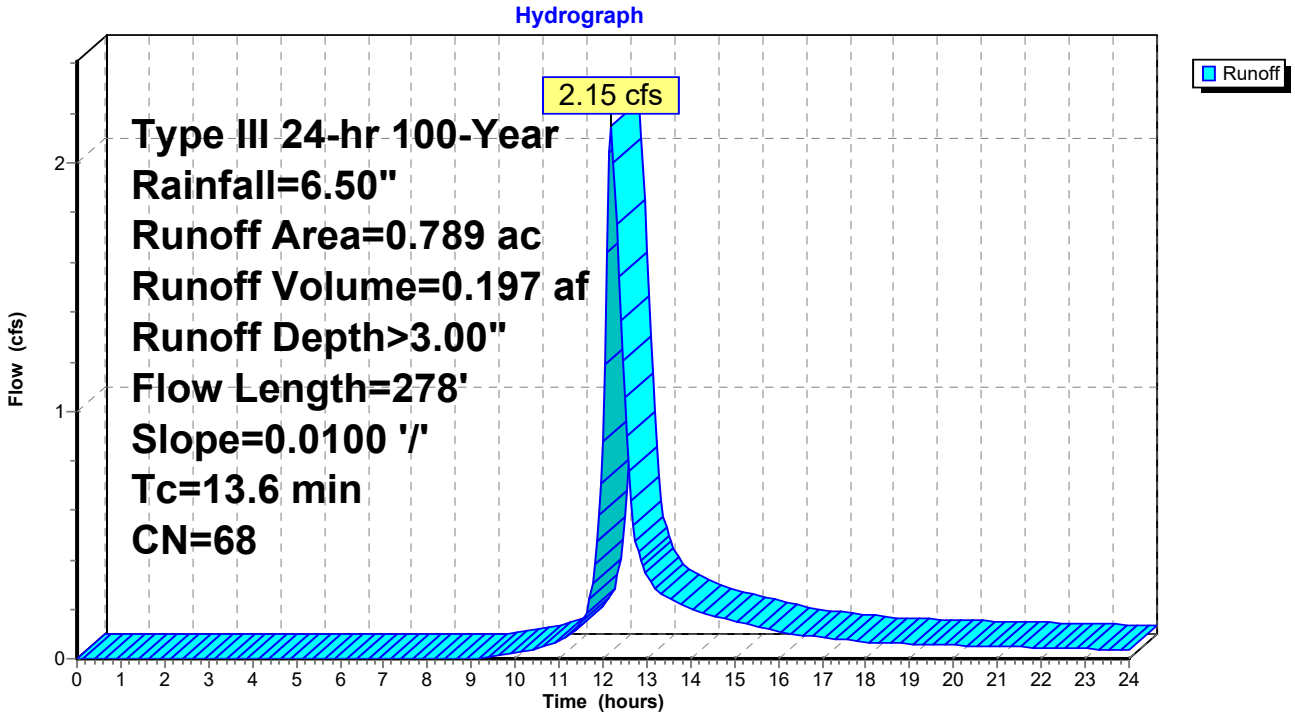
Runoff = 2.15 cfs @ 12.20 hrs, Volume= 0.197 af, Depth> 3.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

	Area (ac)	CN	Description
*	0.333	77	Woods, Good, HSG D (Wetlands)
	0.456	61	>75% Grass cover, Good, HSG B
	0.789	68	Weighted Average
	0.789		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,** Grass: Dense n= 0.240 P2= 3.00"
2.4	228	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
13.6	278	Total			

Subcatchment 5B: PWS-5B



Summary for Pond 2P: Existing Detention Basin

Inflow Area = 0.771 ac, 12.32% Impervious, Inflow Depth > 2.81" for 100-Year event
Inflow = 2.45 cfs @ 12.10 hrs, Volume= 0.181 af
Outflow = 2.40 cfs @ 12.12 hrs, Volume= 0.178 af, Atten= 2%, Lag= 0.9 min
Discarded = 0.02 cfs @ 12.12 hrs, Volume= 0.019 af
Primary = 2.38 cfs @ 12.12 hrs, Volume= 0.160 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 426.34' @ 12.12 hrs Surf.Area= 918 sf Storage= 263 cf

Plug-Flow detention time= 11.9 min calculated for 0.178 af (98% of inflow)
Center-of-Mass det. time= 4.3 min (847.5 - 843.2)

Volume	Invert	Avail.Storage	Storage Description
#1	426.00'	4,072 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
#2	425.00'	23 cf	**6.0" D x 116.0'L Pipe Storage S= 0.0050 '/'**
		4,094 cf	Total Available Storage

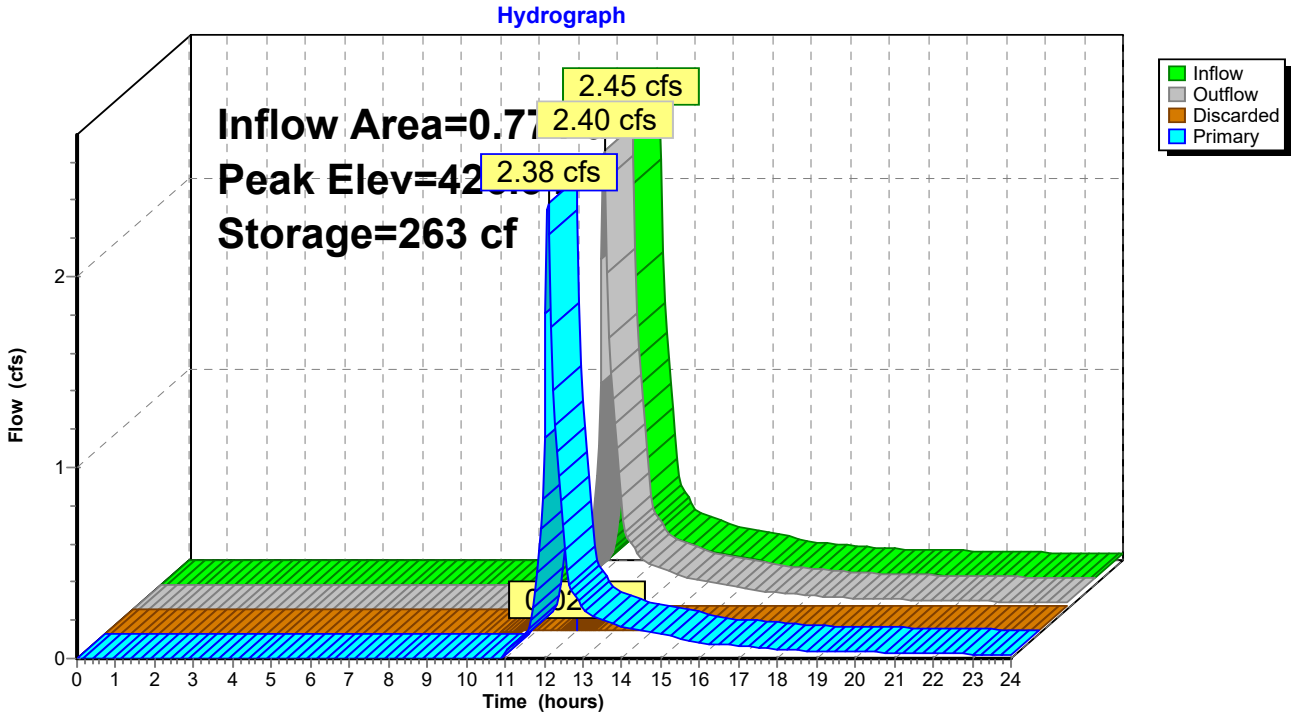
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
426.00	485	0	0
427.00	1,750	1,118	1,118
428.00	4,158	2,954	4,072

Device	Routing	Invert	Outlet Devices
#1	Primary	426.14'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 in 24.0" x 24.0" Grate Limited to weir flow at low heads
#2	Discarded	425.00'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.12 hrs HW=426.34' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=2.31 cfs @ 12.12 hrs HW=426.34' (Free Discharge)
↑**1=Orifice/Grate** (Weir Controls 2.31 cfs @ 1.46 fps)

Pond 2P: Existing Detention Basin



Summary for Pond 5P: PERM PAVER PARKING

Inflow Area = 0.645 ac, 92.40% Impervious, Inflow Depth > 5.90" for 100-Year event
Inflow = 3.95 cfs @ 12.09 hrs, Volume= 0.317 af
Outflow = 2.50 cfs @ 12.19 hrs, Volume= 0.294 af, Atten= 37%, Lag= 6.2 min
Primary = 2.50 cfs @ 12.19 hrs, Volume= 0.294 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 430.36' @ 12.19 hrs Surf.Area= 3,888 sf Storage= 2,630 cf

Plug-Flow detention time= 78.9 min calculated for 0.294 af (93% of inflow)
Center-of-Mass det. time= 39.6 min (800.8 - 761.3)

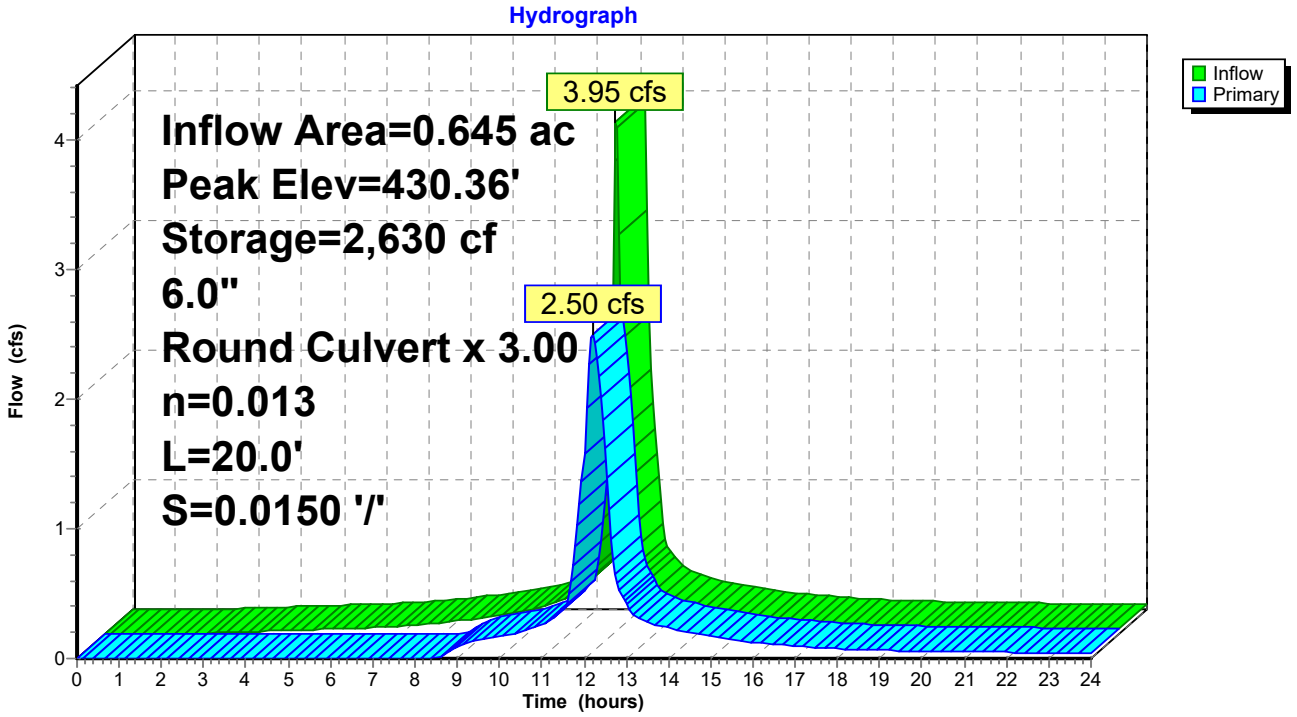
Volume	Invert	Avail.Storage	Storage Description
#1	430.70'	961 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
#2	428.70'	2,722 cf	**18.00'W x 216.00'L x 1.75'H Prismatoid** 6,804 cf Overall x 40.0% Voids
#3	429.30'	42 cf	**6.0" D x 216.0'L Pipe Storage**
		3,725 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
430.70	0	0	0
431.20	3,842	961	961

Device	Routing	Invert	Outlet Devices
#1	Primary	429.30'	**6.0" Round Culvert X 3.00** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 429.30' / 429.00' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=2.49 cfs @ 12.19 hrs HW=430.36' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 2.49 cfs @ 4.24 fps)

Pond 5P: PERM PAVER PARKING



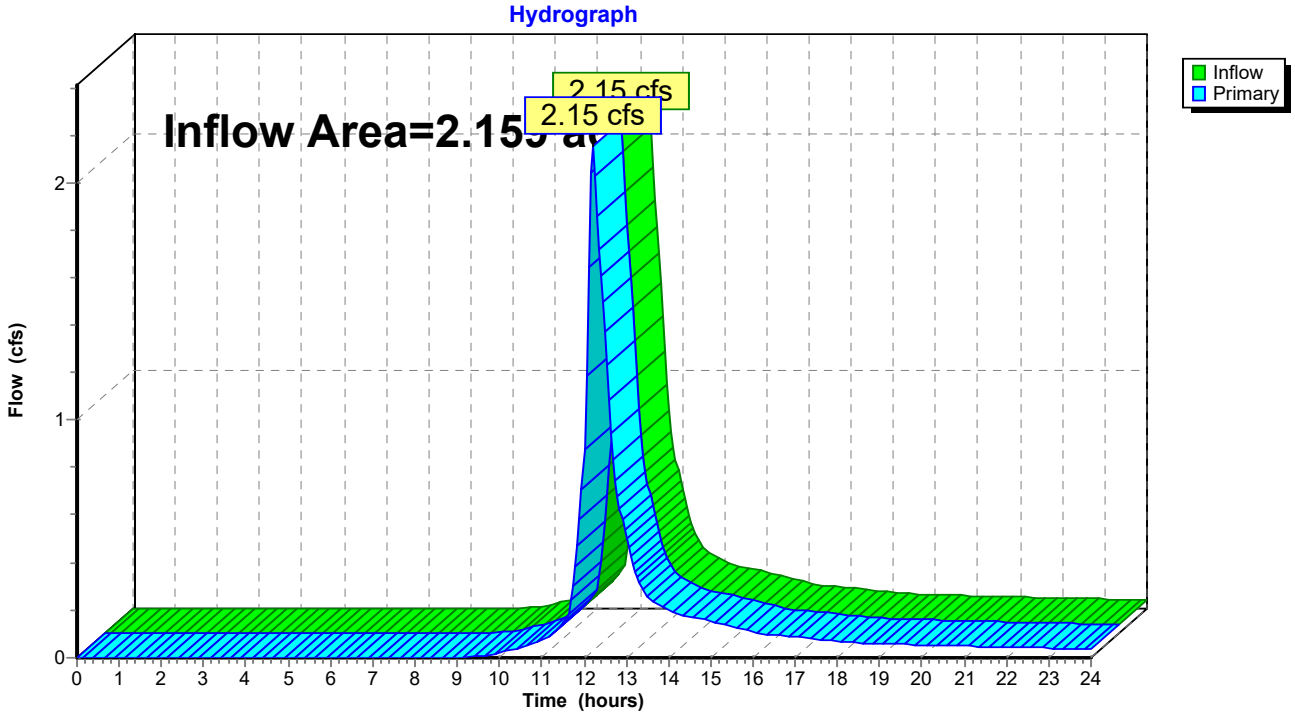
Summary for Pond 9P: Design Point 3

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

Inflow Area = 2.159 ac, 53.82% Impervious, Inflow Depth > 1.20" for 100-Year event
Inflow = 2.15 cfs @ 12.20 hrs, Volume= 0.216 af
Primary = 2.15 cfs @ 12.20 hrs, Volume= 0.216 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond 9P: Design Point 3



Summary for Pond 12P: Synthetic Softball Field

Inflow Area = 1.370 ac, 84.82% Impervious, Inflow Depth > 5.67" for 100-Year event
Inflow = 8.23 cfs @ 12.09 hrs, Volume= 0.648 af
Outflow = 1.40 cfs @ 12.55 hrs, Volume= 0.647 af, Atten= 83%, Lag= 28.0 min
Discarded = 1.07 cfs @ 11.65 hrs, Volume= 0.629 af
Primary = 0.33 cfs @ 12.55 hrs, Volume= 0.018 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 448.94' @ 12.55 hrs Surf.Area= 45,279 sf Storage= 8,432 cf

Plug-Flow detention time= 45.7 min calculated for 0.646 af (100% of inflow)
Center-of-Mass det. time= 45.4 min (815.8 - 770.3)

Volume	Invert	Avail.Storage	Storage Description
#1	448.38'	10,011 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 30,337 cf Overall x 33.0% Voids

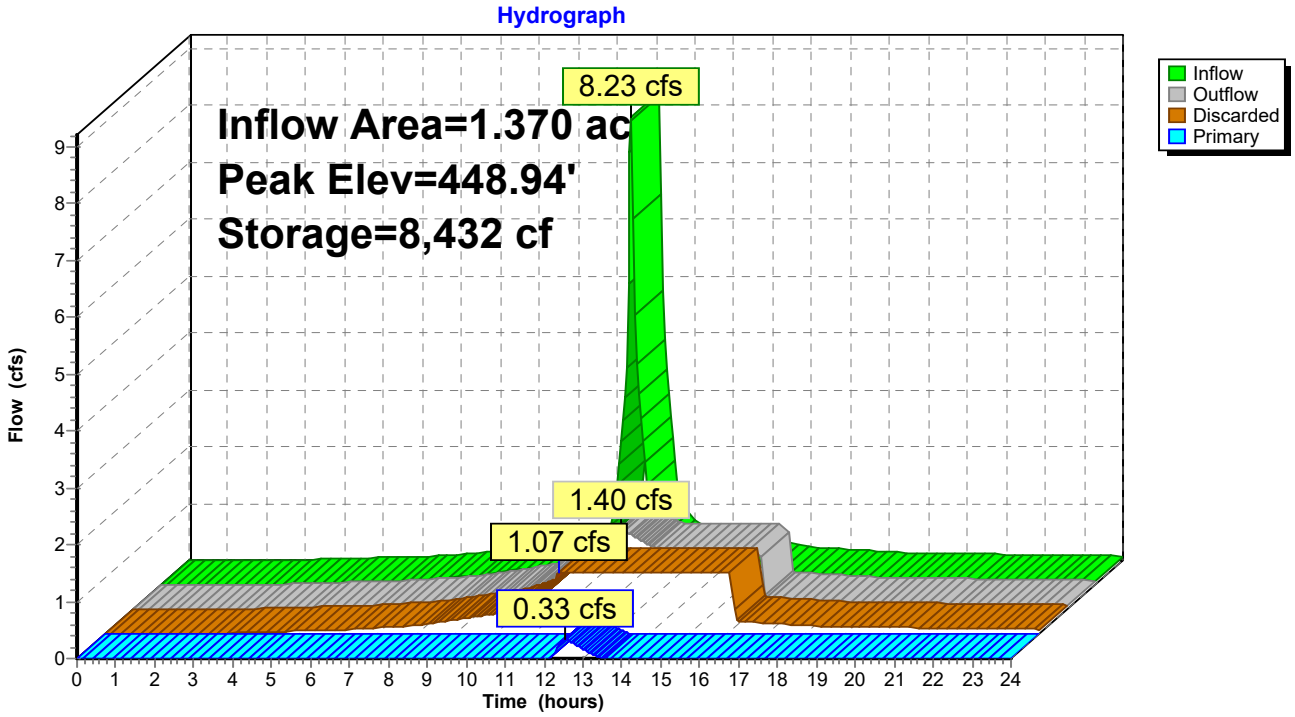
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
448.38	45,279	0	0
449.05	45,279	30,337	30,337

Device	Routing	Invert	Outlet Devices
#1	Primary	448.83'	**10.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	448.38'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.07 cfs @ 11.65 hrs HW=448.39' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 1.07 cfs)

Primary OutFlow Max=0.33 cfs @ 12.55 hrs HW=448.94' (Free Discharge)
↑**1=Orifice/Grate** (Weir Controls 0.33 cfs @ 1.11 fps)

Pond 12P: Synthetic Softball Field



Summary for Pond 15P: Stone Trench

[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 1.717 ac, 19.10% Impervious, Inflow Depth > 2.72" for 100-Year event
Inflow = 4.69 cfs @ 12.15 hrs, Volume= 0.389 af
Outflow = 4.25 cfs @ 12.20 hrs, Volume= 0.389 af, Atten= 9%, Lag= 3.2 min
Discarded = 0.03 cfs @ 12.05 hrs, Volume= 0.004 af
Primary = 4.22 cfs @ 12.20 hrs, Volume= 0.385 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 434.24' @ 12.20 hrs Surf.Area= 0.030 ac Storage= 0.007 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.3 min (848.4 - 848.1)

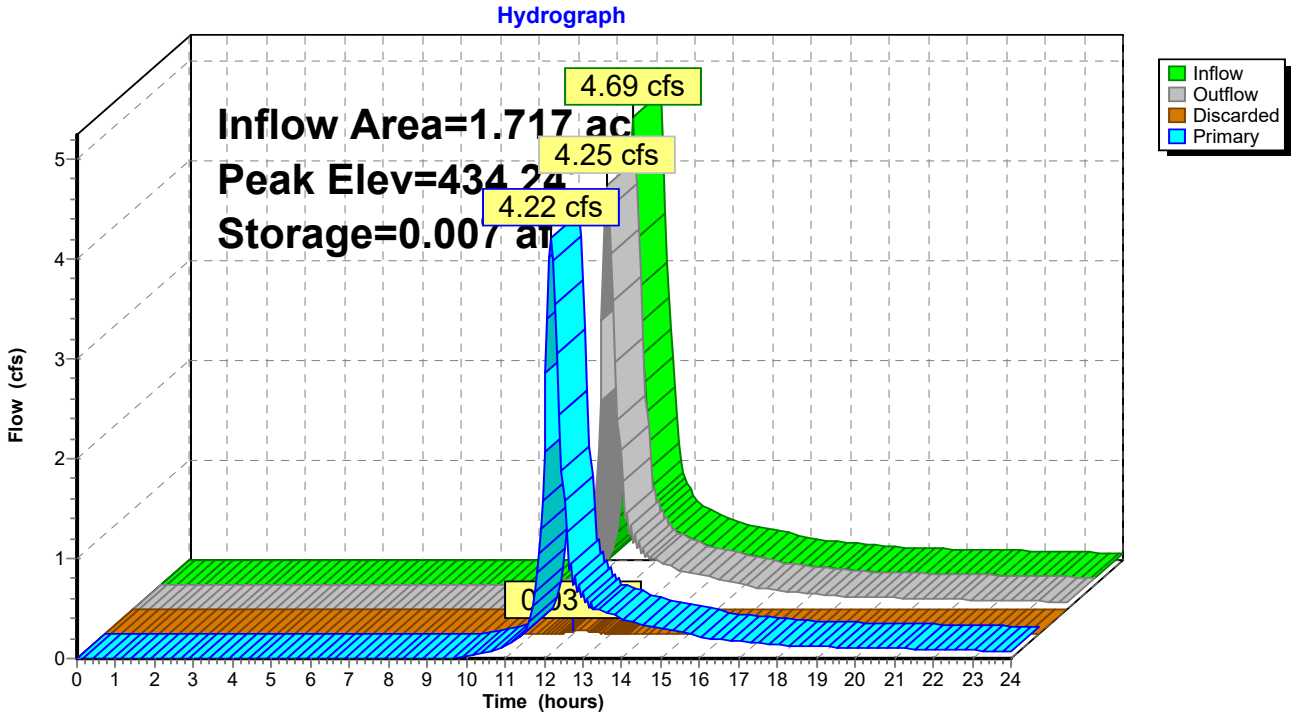
Volume	Invert	Avail.Storage	Storage Description
#1	433.50'	0.023 af	**6.00'W x 217.00'L x 2.50'H Prismatoid** 0.075 af Overall - 0.004 af Embedded = 0.071 af x 33.0% Voids
#2	434.25'	0.004 af	**12.0" D x 215.0'L Pipe Storage** Inside #1
		0.027 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	432.50'	**12.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	436.50'	**216.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	433.50'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 12.05 hrs HW=433.58' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=4.21 cfs @ 12.20 hrs HW=434.24' (Free Discharge)
├**1=Orifice/Grate** (Orifice Controls 4.21 cfs @ 5.36 fps)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 15P: Stone Trench



Summary for Pond 16P: MPR Syn. Turf Field

Inflow Area = 3.257 ac,100.00% Impervious, Inflow Depth > 6.26" for 100-Year event
Inflow = 20.27 cfs @ 12.09 hrs, Volume= 1.698 af
Outflow = 2.01 cfs @ 12.86 hrs, Volume= 1.697 af, Atten= 90%, Lag= 46.6 min
Discarded = 1.02 cfs @ 10.15 hrs, Volume= 1.347 af
Primary = 0.99 cfs @ 12.86 hrs, Volume= 0.350 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 449.35' @ 12.86 hrs Surf.Area= 200,930 sf Storage= 28,838 cf

Plug-Flow detention time= 133.1 min calculated for 1.697 af (100% of inflow)
Center-of-Mass det. time= 132.6 min (876.1 - 743.6)

Volume	Invert	Avail.Storage	Storage Description
#1	448.59'	19,465 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 58,985 cf Overall x 33.0% Voids
#2	449.26'	45,364 cf	**Freeboard within Track Area (Prismatic)** Listed below (Recalc)
		64,829 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
448.59	88,037	0	0
449.26	88,037	58,985	58,985

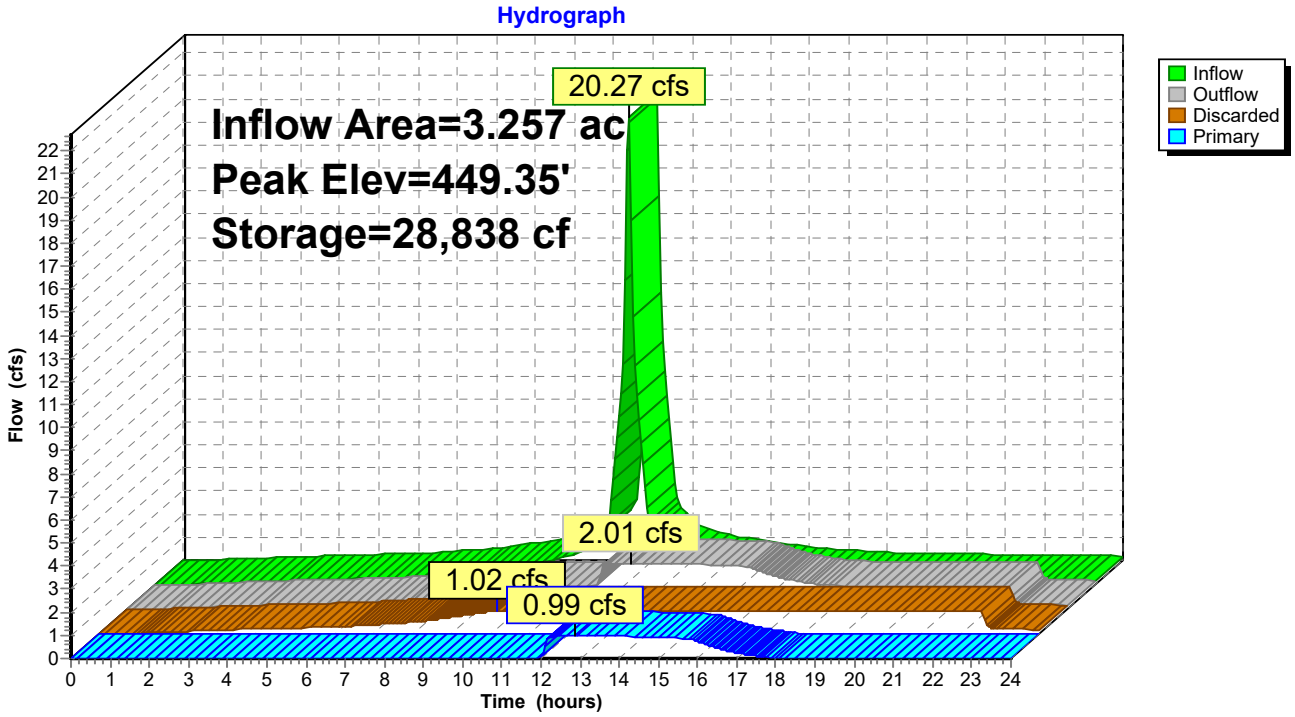
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
449.26	107,641	0	0
449.64	131,118	45,364	45,364

Device	Routing	Invert	Outlet Devices
#1	Device 2	449.00'	**8.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	443.40'	**10.0" Round Culvert** L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 443.40' / 442.40' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#3	Discarded	448.59'	**1.02 cfs Exfiltration at all elevations**

Discarded OutFlow Max=1.02 cfs @ 10.15 hrs HW=448.60' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 1.02 cfs)

Primary OutFlow Max=0.99 cfs @ 12.86 hrs HW=449.34' (Free Discharge)
└**2=Culvert** (Passes 0.99 cfs of 4.61 cfs potential flow)
└**1=Orifice/Grate** (Orifice Controls 0.99 cfs @ 2.83 fps)

Pond 16P: MPR Syn. Turf Field



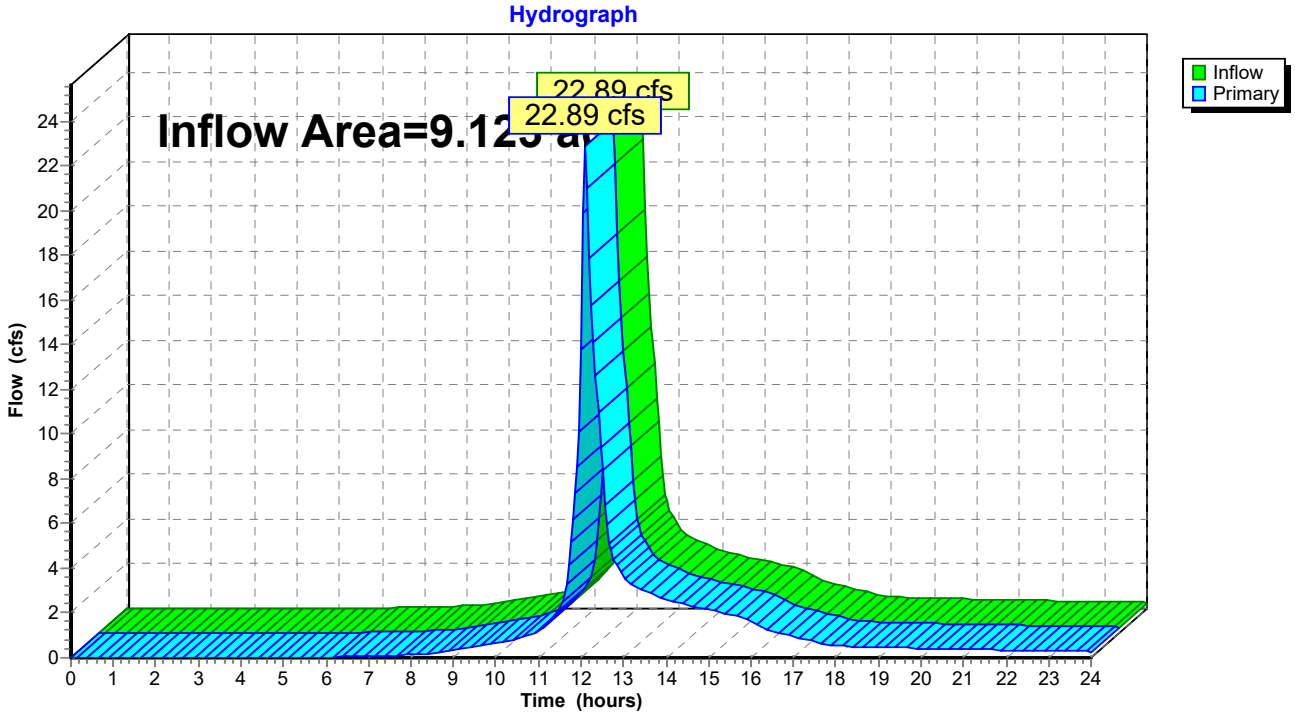
Summary for Pond DP-1: Design Point 1

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

Inflow Area = 9.123 ac, 65.63% Impervious, Inflow Depth > 2.97" for 100-Year event
Inflow = 22.89 cfs @ 12.11 hrs, Volume= 2.256 af
Primary = 22.89 cfs @ 12.11 hrs, Volume= 2.256 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond DP-1: Design Point 1



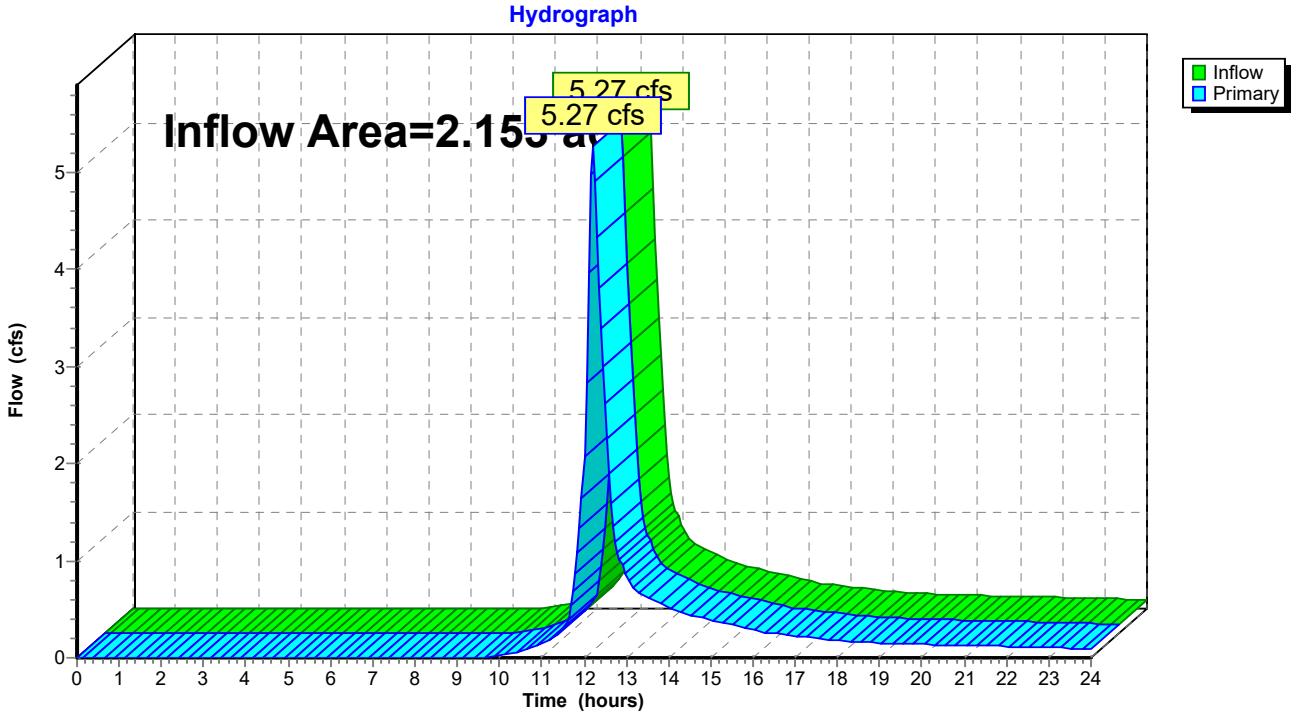
Summary for Pond DP-2: Design Point 2

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

Inflow Area = 2.153 ac, 11.19% Impervious, Inflow Depth > 2.71" for 100-Year event
Inflow = 5.27 cfs @ 12.20 hrs, Volume= 0.487 af
Primary = 5.27 cfs @ 12.20 hrs, Volume= 0.487 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond DP-2: Design Point 2



OPERATION & MAINTENANCE PLAN

TRACK AND FIELD RENOVATIONS PROJECT
MILLBURY JR/SR HIGH SCHOOL
MILLBURY, MA 01527

January 2020
Revised February 2020

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TRACK AND FIELD RENOVATIONS PROJECT
MILLBURY JR/SR HIGH SCHOOL
MILLBURY, MA 01527

January 2020
Revised February 2020

Basic Information

Project Address: 12 Martin Street, Millbury, MA 01527
Owner: Town of Millbury
Town: Millbury, MA

SECTION I: CONSTRUCTION ACTIVITIES

1. Contact the Owner in writing at least seven (7) days prior to the start of construction.
2. Place the site sign (with contact numbers) prior to any work on site.
3. Install the erosion control BMPs, as shown on the construction documents.
4. The silt fence and silt sock line shall be inspected on a weekly basis; any breaks in the line shall be repaired as soon as possible.
5. All erosion and sedimentation controls shall be in accordance with the DEP's Erosion and Sedimentation Control Guidelines and the USDA SCS Erosion and Sedimentation Control during site development.
6. All stockpile areas are to be protected by silt fence and silt socks, and shall be covered with a tarp to prevent moisture intrusion and dust concerns.
7. All disturbed areas shall be stabilized with mulch or seed immediately upon completion of construction activity. In no case, shall an area be left unstabilized for more than 14 days after the construction activity in that area has ceased.
8. All erosion control measures shall be inspected after any rainfall of 0.5" or greater.
9. All catch basins are to be ringed with silt socks and covered with a sediment filter until all up-gradient disturbed areas are stabilized.
10. All outlet orifices are to be ringed with silt socks until the detention structure or infiltration area is stabilized.
11. All slopes greater than 3:1 shall be stabilized with an erosion control blanket.
12. The contractor shall keep additional silt fence and straw bales on site to mitigate any emergency condition.
13. All proposed drainage structures (catch basins, manholes, outlet control structures and detention systems) should be cleaned at the end of construction and at any time the sediment within the structures equals 12" deep.
14. The contractor shall only disturb the minimum area necessary.
15. All illicit discharges are prohibited.

OPERATION & MAINTENANCE PLAN

TRACK AND FIELD RENOVATIONS PROJECT
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SECTION II: POST-DEVELOPMENT ACTIVITIES

PART A - GENERAL

- It shall be the responsibility of municipal employees to implement the procedures outlined herein.
- The entire project area shall be stabilized with vegetation upon completion of construction and prior to the removal of the erosion control devices.
- The closed drainage system shall be inspected every 6 months and any excess sediment within the structures or detention systems shall be properly disposed of.
- Any problems found with the drainage system shall be repaired in a timely manner.
- The Owner shall employ a qualified professional to perform frequent maintenance, as described herein.
- All maintenance personnel shall be trained annually on the operation and maintenance procedures. A training log shall be maintained for records to document the annual training of employees.
- Inspection logs are included with this O&M plan. The qualified professional shall provide the Owner with maintenance logs after each inspection or corrective action. The Owner shall keep record of these logs for at least three (3) years and shall provide copies to the Town, if requested.
- In the event that an infiltration BMP (Stone/Pipe Trenches, Permeable Pavers, Synthetic Turf Fields) fails to drain within 72-hours of a storm event, a qualified professional should be consulted to determine what corrective actions may be necessary.
- All illicit discharges are prohibited.

PART B - BMP MANAGEMENT

Each Best Management Practice shall be maintained per the below requirements:

SYNTHETIC TURF FIELD

- Perform preventative maintenance twice a year.
- Inspect cleanouts and drain manholes after every major storm during the first 3 months of operation and twice a year thereafter, and also when there are discharges.

STONE/PIPE TRENCHES

- Inspect and remove debris every 6 months and after every major storm
- Check pipes every 6 months for clogging. Remove accumulated sediment, trash, debris, leaves and grass clippings.
- Inspect the trench 24 hours or several days after a rain event to look for ponded water. If there is ponded water, it is likely that the trench is clogged.
- To rehabilitate a failed trench, all accumulated sediment must be removed and stripped from the bottom, the bottom of the trench must be scarified and tilled to induce infiltration, and all of the stone aggregate and filter fabric or media must be removed and replaced.

CONVEYANCE SWALES & OVERLAND FLOW

- Inspect swales to make sure vegetation is adequate and there are no signs of rilling and gullying. Perform inspection the first few months after construction and twice a year thereafter. Repair any rills or gullies and replace dead vegetation as necessary.
- Mow at least once per year. Do not cut grass shorter than three to four inches, and do not let grass height exceed 6 inches.
- Remove sediment and debris manually at least once a year, and periodically reseed to maintain dense growth of vegetation.
- Use of road salt or other deicers during the winter will necessitate yearly reseeding in the spring.

PERMEABLE PAVERS

- Inspection of the site should occur monthly for the first few months after construction. Then inspections can occur on an annual basis, preferably after rain events when clogging will be obvious.
- Planting beds nearby permeable pavers should be maintained to ensure clogging of does not occur. Where erosion of planting beds is taken place, vegetation should be planted to stop erosion and eroded soil removed from permeable pavers. Grassed areas around permeable pavers will be mowed, with clippings removed. Herbicides shall not be used on pavers.
- Conventional street sweepers equipped with vacuums, water, and brushes can be used to restore permeability. Vacuum sweep ideally monthly, although for most municipalities four (4) times a year is more realistic. Vacuuming is particularly important in the spring to clean up salt and sediment from the winter to restore permeability.
- No winter sanding shall be permitted on permeable pavers.
- Minimize salting on permeable pavers.

- An active street sweeping program in the site's drainage area will also help to prolong the functional life of the pavers
- Attach rollers to the bottom of snowplows to prevent them from catching on the edges of paving stones.
- Periodically add joint material to replace material that has been transported.

DEEP SUMP CATCH BASINS (STANDARD CATCH BASINS)

- Inspect and clean at annually.
- Sediment must also be removed whenever the depth of deposits is greater than one half the depth from the bottom invert.
- Use of a vacuum truck is preferred as a cleaning method.
- Rehabilitate the basin if it fails due to clogging.

PROPRIETARY SEPARATORS

- Inspect and clean in accordance with manufacturer's recommendations and requirements. Manufacturers Maintenance guidelines and logs are attached to this O&M Plan.
- At a minimum, inspect the units twice per year (spring and fall).
- The unit shall be cleaned when sediment exceeds 18-inches in the treatment chamber.
- Use of a vacuum truck is preferred as a cleaning method.