STORMWATER MANAGEMENT REPORT

for

Belmont Hill School
350 Prospect St, Belmont, MA 02478

Prepared For:

Belmont Hill School
350 Prospect St
Belmont, MA 02478

Prepared By:

Langan Engineering and Environmental Services, Inc.
100 Cambridge Street, Suite 1310
Boston, MA 02114

Hilary Holmes, P.E.
hholmes@langan.com

Frank Holmes, P.E.
Massachusetts Licensed Professional Engineer No. 40203
fholmes@langan.com

June 3, 2022
Revised November 30, 2022
Revised March 3, 2023
Langan Project No. 151021202

LANGAN

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

FIGURES

DRAWINGS

Appendices

LANGAN

EXECUTIVE SUMMARY

The stormwater management report has been prepared in support of the proposed development at the Belmont Hill School.

Project Description

The proposed development consists of three separate areas: an area north and west of Prospect St and Park Ave (hereafter referred to as the "East Campus"), the open space and parking areas where Marsh Street meets Prospect Street ("Upper Lot / Front Lawn") and the parking and back of house area between the Jordan Athletics Building and Marsh St ("Jordan Lot").

The work in the East Campus area is a new development that includes new parking facilities, a maintenance building and landscape improvements.

The work in the Upper Lot / Front Yard is a redevelopment of the existing parking and pedestrian walkways to improve operation.

The work in the Jordan Lot is a new development that includes renovated and additional parking areas as well as a new curb cut to improve vehicular circulation.

Regulatory Authority

Stormwater management methodologies proposed for the site are in compliance with The Town of Belmont Checklist for Stormwater Management and Erosion Control Checklist (10/21/13), and the Stormwater Management and Erosion Control Bylaw (§ 60-325 of the Belmont General Bylaws) and associated regulations adopted September 29, 2014. The Belmont Office of Community Development is the permit granting authority.

The following activities are part of the proposed project and are regulated under the Stormwater Management and Erosion Control Bylaw: connection of a pipe or other appurtenance to the Belmont Municipal Separate Stormwater System (MS4) and land disturbance of more than 2,500 square feet of total area.

This submittal includes the following:

- A completed Stormwater Management and Erosion Control Permit Application (submitted with this report)
- A Stormwater Management and Erosion Control Plan (attached separately)

- The Checklist for Stormwater Management and Erosion Control Plan (Appendix A)
- An Operation and Maintenance Plan (Appendix I)

The stormwater management report has been designed in accordance with the most recent versions of the town of Belmont Stormwater Management Rules and Regulations, Massachusetts Department of Environmental Protection (MassDEP) Stormwater Handbook, and the U.S. Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES).

Stormwater Management

There is currently one stormwater management BMP within the limits of the proposed project – a subsurface detention basin under the main athletics parking lot.

The project will result in an increase in impervious area of 1.801 acres. This area consists of traditional pavement, permeable pavement (1.562 ac) and a new maintenance building

To mitigate the impacts of this development, the project proposes two additional subsurface infiltration facilities and several areas of permeable pavement to treat and infiltrate runoff. Additionally, the project includes several proprietary water quality structures for pretreatment and primary treatment of stormwater. Combined, these practices provide rate control, volume control, groundwater recharge and water quality control to meet or exceed all requirements of the Town of Belmont Stormwater Management and Erosion Control Bylaw and Regulations. As required in the Town Checklist, the following report documents compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook.

Summary

It is the opinion of this office and the findings of this report that the proposed stormwater system, as designed, will effectively manage quality and quantity of stormwater runoff for the proposed development in accordance with the Town of Belmont and the MassDEP's regulations.

1.1 General

This stormwater management report has been prepared in support of the proposed development at the Belmont Hill School. The proposed development includes the development of existing residential vacant parcels into a parking facility, a maintenance facility and open space in the East Campus, a redevelopment of parking and open space in the Upper Lot / Front Yard and a development of parking facilities in the Jordan Lot. This report addresses the engineering design of stormwater conveyance and management systems for the project site.

The development results in an increase in impervious area in the East Campus and the Jordan Lot. The redevelopment of the Upper Lot / Front Yard results in a decrease in impervious area.

Table 1.1.1: Impervious Area – East Campus

	Existing Condition Impervious Area		Proposed Condition Impervious Area	
Impervious Area	0.829 ac	13.4%	1.157 ac	18.7%
Permeable Pavement	0.000 ac	00.0%	1.264 ac	20.5%
Permeable Area	5.353 ac	86.6%	3.761 ac	60.8%

Table 1.1.2: Impervious Area –Upper Lot / Front Yard

	Existing Condition Impervious Area		Proposed Condition Impervious Area	
Impervious Area	0.484 ac	42.4%	0.483 ac	42.3%
Permeable Area	0.658 ac	47.6%	0.659 ac	57.7%

Table 1.1.3: Impervious Area – Jordan Lot

	Existing Condition Impervious Area		Proposed Condition Impervious Area	
Impervious Area	0.348 ac	38.8%	0.26 ac	29.0%
Permeable Pavement	0.000 ac	00.0%	0.298 ac	33.1%
Permeable Area	0.550 ac	61.2%	0.340 ac	37.9%

1.2 Site Location

The East Campus site is bound by Park Avenue to the west, Prospect Street to the south, and residential abutters to the north and east. The site is 6.182 acres, comprised of six parcels: 12 Park Avenue, 20 Park Avenue, 315 Prospect Street, 305 Prospect Street, 301 Prospect Street and 283 Prospect Street.

The Upper Lot / Front Yard area is a ~1.14 acre portion of the Belmont Hill School Campus consisting of the existing campus frontage where Marsh St meets Prospect.

The Jordan Lot area is a ~0.90 acre portion of the Belmont Hill School Campus located between the Jordan Athletics Building and Marsh Street.

1.3 Existing Conditions

The existing East Campus site includes five residential properties and one vacant residential lot. The runoff from the site discharges to three separate areas: a portion of the site discharges to Park Avenue drainage network, a portion to Prospect Street and a portion drains to a wetland area to the east of the site. The eastern portion of the site includes a wetland resource area. There are no flood zones or identified protected habitats on the site.

Runoff from both the Jordan Lot and Upper Lot / Front Yard areas flows to a 30-inch storm sewer in an easement that runs south through the campus. Flow from these areas enters the 30-inch trunk line at three locations: catchbasins in Marsh Street, the outfall from an existing stormwater management facility in the main campus parking lot and catchbasins in the parking lot downstream of the existing stormwater management facility. All three of these locations have been used as points of analysis to show no adverse impact to any segment of the trunk line.

The catchbasins in Marsh St are designated as Design Point D. The existing stormwater management facility is designated Design Point E. The trunk line downstream of the stormwater BMP is designated Design Point F. Outflow from both Design Point D and Design E are routed to Design Point F.

The Upper Lot / Front Yard area consists of parking lot and open space. Runoff from the eastern portion of this area flows into Marsh Street, to Design Point D. Runoff from the western portion of this area flows overland to catchbasins in the main parking lot. These catchbasins connect to the drainage trunk line at Design Point F.

The Jordan Lot area consists of parking lot, back-of-house operations space and open space. The runoff from western portion of this area flows into Marsh Street, to Design Point D. Runoff from the eastern portion of this area flows to the existing stormwater management facility (Design Point E) via an existing stormwater catchment network.

See Figures 1 and 2 for plan view of the project sites.

1.4 Project Description

The East Campus development will demolish the house and pavement at 283 Prospect Street for new paved parking, a new maintenance building, open space and site improvements including drainage, stormwater management facilities, utilities and landscaping.

The Upper Lot / Front Yard proposed redevelopment maintains the same land use with new configurations to support campus operations. The proposed site includes parking area and open space.

The Jordan Lot proposed development maintains the same land use with new configurations to support campus operations. The proposed site includes permeable pavement parking area and open space.

The development areas will have stormwater management facilities including pervious pavement, subsurface detention/infiltration facilities and proprietary water quality structures. The Upper Lot / Front Yard area is considered redevelopment and no new stormwater infrastructure is proposed for this are.

1.5 FEMA

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map there are no flood zone areas on the development site.

1.6 Soil Conditions

According to the USDA Natural Resources Conservation Service (NRCS) Web Soil Survey, the site soil type is comprised of Narragansett-Hollis-Rock outcrop complex, Narragansett silt loam, Canton-Charlton-Urban land complex, Newport-Urban land complex, and Udorthents (see figures at the end of this report).

Soils are classified into hydrologic soil groups (HSG) to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The HSGs, which are A, B, C

and D, are one element used to determine runoff curve numbers and analyzing stormwater characteristics of a site.

> *Group A: Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.*
>
> *Group B: Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.*
>
> *Group C: Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.*
>
> *Group D: Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.*

The Web Soil Survey has classified most of the site soils as hydrologic soil groups A and D. Our geotechnical investigations of the site support the NRCS classifications so we have modeled the site soils as hydrologic soil groups A and D to match the NRCS Web Soil Survey data. Some soils are not classified into hydrologic soil groups (HSG) by NRCS. The Udorthents on this site are previously disturbed soils and not classified. We have modeled these unclassified soils to be HSG A based on our understanding of the history of the site and our on-site evaluation of the subsurface conditions.

Table 1.6.1: Site Soils

Map Unit Symbol	Map Unit Name	HSG Rating
106C	Narragansett-Hollis-Rock outcrop complex, 3 to 15 percent slopes	A
416B	Narragansett silt loam, 3 to 8 percent slopes, very stony	A
627C	Newport-Urban land complex, 3 to 15 percent slopes	D
629C	Canton-Charlton-Urban land complex, 3 to 15 percent slopes	A
654	Udorthents, loamy	A (assumed)
655	Udorthents, wet substratum	A (assumed)

Subsurface explorations have been completed by Langan. Langan performed an exploratory program of eight test pits and seven infiltration tests in the East Campus area and nine test pits and eight infiltration tests across the Jordan Lot and Upper Lot / Front Yard areas.

Our investigation results showed that the East Campus site generally consists of a layer of topsoil or fill (underlain by a layer of buried topsoil) underlain by a layer of sandy silt, a layer of sand, and bedrock. Groundwater was not encountered during our subsurface exploration.

Our investigation results showed that the Jordan Lot and Upper Lot / Front Yard areas generally consist of fill or a layer of topsoil over fill. Fill was encountered at the ground surface or below the topsoil in all test pits. Where encountered, the fill is underlain by either a layer of buried topsoil, silt, or sand. Bedrock was not encountered in any of the test pits. Groundwater was encountered in one test pit.

Table 1.6.2: Selected Site Soils Infiltration Rates

Location (Test ID)	Field Saturated Hydraulic Conductivity	Material Type
TP-3 (IT-3)	0.588 in/hr	Gray coarse to fine SAND, some silt, trace coarse to fine gravel, trace cobbles, trace boulders (moist)
TP-5 (IT-8)	0.391 in/hr	Gray coarse to fine SAND, some silt, trace coarse to fine gravel, trace cobbles, trace boulders (moist)
TP-7 (IT-7)	0.800 in/hr	Gray coarse to fine SAND, some silt, some coarse to fine gravel, trace cobbles, trace boulders (moist)
TP-207 (IT-207)	0.180 in/hr	Brown coarse to fine SAND, some silt, some coarse to fine gravel, trace cobbles, trace boulders, trace ceramic fragments, trace plastic fragments, trace roots (moist)

The infiltration tests in the table above are the tests used in the design of the stormwater BMPs later in this report. Field infiltration tests were performed with constant head infiltration testing methods using the Guelph Permeameter in general accordance with ASTM D 5126. Additional tests results are presented in the full geotechnical report. Please reference Appendix K for a full report with test pit locations, observations, and soil testing.

No soils have a rapid infiltration rate.

2.0 STORMWATER MANAGEMENT CRITERIA

2.1 Stormwater Management Regulations

The purpose of the Stormwater Management Plan is to provide long-term protection of natural resources in and around the site. This is achieved by implementing stormwater quality and quantity control measures designed to reduce pollutant discharge from the site, maintain a level of stormwater recharge, and control discharge rates.

The following regulations and guidelines where referenced for this project:

- Massachusetts Stormwater Handbook (2008)
- U.S. Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Stormwater Permit for Construction Activities (EPA, Federal Register, December 8, 1999 as amended).

- Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, Department of Environmental Protection, Bureau of Resource Protection (May 2003)
- U.S. EPA's NPDES Small Municipal Separate Storm Sewer Systems (MS4) General Permit (EPA, 2016).
- Massachusetts Department of Transportation Project Development and Design Guide, Chapter 8 Drainage and Erosion Control (2006)
- Town of Belmont Stormwater Management and Erosion Control By-Law (2021)

2.2 MassDEP Stormwater Performance Standards

A summary of MassDEP Stormwater Performance Standards as well as a method of ensuring compliance with each standard are summarized below:

1. No new stormwater conveyances may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

   Response: New stormwater conveyances include treatment practices to prevent untreated stormwater discharges. Some proposed treatment train features include pervious pavement, subsurface infiltration facilities and proprietary water quality treatment structures. Permanent erosion control measures include rip rap outlet protection. These measures, explained in further detail in Section 4 and 7 and Appendices D, E, F and H of this report, are intended to treat stormwater discharge to and reduce erosion in wetlands or waters of the Commonwealth.

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

   Response: The development of this site, as discussed in Section 3 and Appendices B and C of this report, will result in an overall decrease of peak discharge rates from the existing condition.

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

from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

Response: This project proposes to increase the groundwater recharge volume in the proposed condition as compared to the existing condition. Supporting calculations regarding groundwater recharge volume can be found in Section 5 and Appendix C of this report.

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:

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

Response: Runoff generated from the proposed project will meet the water quality requirements of this standard using a variety of on-site treatment practices to exceed the 80% TSS removal requirement. Proposed treatment train features include catch basins with hoods and deep sumps, water quality units, and subsurface infiltration system. TSS Removal Worksheets can be found in Appendix D of this report.

Stormwater Operations & Maintenance Measures are included in Appendix H of this report.

5. For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific

structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

Response: The proposed development does not include a Land Use with a Higher Potential Pollutant Load (LUHPPL).

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

Response: The project is not located within a Zone II or IWPA and does not discharge near to a critical area.

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.

Response: The work in the East Campus and in the Jordan Lot does not meet the criteria for a redevelopment project. The work in the Upper Lot / Front Yard has been designed to reduce impervious are and is considered 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.

   All redevelopment projects shall fully comply with Standard 8.

   Response: Soil erosion and sediment control plans have been developed for this project and can be found in the drawings attached to this report. The plans have been designed in accordance with the Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas.

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

   Response: Stormwater Operations & Maintenance Plans are included in Appendix H.

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

    Response: The stormwater management system for this site does not include any illicit connections to the stormwater system. An illicit discharge compliance statement is included in Appendix I of this report.

2.3 Town of Belmont Stormwater Management and Erosion Control Rules & Regulations

Sanitary Sewer and Storm Drain Connections

The project includes both new storm drain and sanitary sewer drain connections.

A. Submittal Requirements
   A permit application will be filed with this report. Construction drawings showing the required design details are submitted with this report.
B. Design and Installation Requirements
   A New connection to the storm drain system is proposed at the new driveway proposed at #20 Park Ave. A new connection to the sanitary sewer network is proposed at the current location of the driveway of #283 Prospect St. The rest of the stormwater infrastructure will utilize existing connections to the stormwater network or be daylighted within the property.

The existing sanitary sewer connection at #20 Park Ave will be abandoned in conformance Town of Belmont requirements.

C. Inspections

Storm Drainage Note 8 and Utilities Note 17 on sheet CS-002 Notes & Legend require inspection of sanitary and storm sewer connections in conformance with Town of Belmont requirements.

Land Disturbance

A. Applicability

This section is applicable because the total land disturbance from this project is greater than 2,500 square feet and involves the storage or permanent placement of more than 100 cubic yards of excavated material or fill.

B. Submittal Requirements

A permit application will be filed with this report. Construction drawings showing the required design details are submitted with this report. The Town of Belmont Checklist for Stormwater Management and Erosion Control Plan is attached to this report as Appendix A. An Operation and Maintenance Plan is attached to this report as Appendix H.

C. In Lieu Fees

The proposed design satisfies the Bylaw and Regulations and no in-lieu fees are proposed at this time.

D. Operation and Maintenance Plan

An Operation and Maintenance Plan meeting Town of Belmont requirements is attached to this report as Appendix H.

E. Design Criteria

a. Stormwater Management Standards and Handbook

This Stormwater Management Report documents how each of the Mass DEP's standards are met for the proposed project. See Section 2.2, above, for a summary of the Mass DEP standards and how they are met.

b. Erosions and Sediment Controls

Construction period erosion and sediment controls have been designed to prevent any adverse impact during disturbance and construction activities. These measures are identified in Section 8 of this report and are shown in the Erosion Control Plans submitted with this report.

c. Changes to Existing Conditions of Abutting Properties

This report identifies potential changes to the existing condition of abutting properties. Section 3 of this report includes calculation results showing that the post-development discharge volume is equal to or less

than the pre-development discharge volume from the 2-year, 10-year, 25-year, and 100-year 24-hour storms for each design point. These calculations use Northeast Regional Climate Center rainfall data and SCS TR-20 methodologies.

This project included infiltration practices with potential to impact groundwater mounding. Groundwater mounding calculations are provided in Section 5 and Appendix G of this report. These calculations show that the mounding does not reach the bottom of the infiltration system, nor does it have an adverse impact on adjacent infrastructure.

d. Impact on Streams, Wetlands or Storm Sewers

The project does not include direct impact to any streams, wetlands of buffer zones. One stormwater outfall discharges to a wooded area upstream of a wetland buffer area. Outlet protection calculations are included in Section 7 and Appendix F of this report to show that the discharge from this outfall will be adequately controlled to prevent erosion and adverse impact downstream.

3.0 STORMWATER QUANTITY

3.1 Design Criteria

Peak flow rates and flow volumes at all points of discharge from the site were analyzed to compare proposed discharge rates with the existing condition.

The storms analyzed include the following:

- A 2-year, 24-hour storm consisting of 3.22 inches of rainfall
- A 10-year, 24-hour storm consisting of 4.87 inches of rainfall
- A 25-year, 24-hour storm consisting of 6.17 inches of rainfall
- A 100-year, 24-hour storm consisting of 8.85 inches of rainfall

These events are based on the Northeast Regional Climate Center (NRCC) Extreme Precipitation Tables for Type III, 24-hour storm events.

3.2 Design Methodology

The peak runoff discharges for the existing and proposed conditions were analyzed in HydroCAD, a modeling program, using Soil Conservation Service (SCS) TR-20 methodology, which outlines procedures for calculating peak rates of runoff resulting from precipitation events, and procedures for developing runoff hydrographs. Values for area, curve number, and time of concentration were calculated for the existing and proposed conditions.

The curve number "CN" is a land-sensitive coefficient that dictates the relationship between total rainfall depth and direct storm runoff. The soils within the watershed are divided into hydrologic soil groups (A, B, C and D) as previously described.

The time of concentration, Tc, is defined as the time for runoff to travel from the hydraulically most distant point in the watershed to a point of interest. Values of time of concentration were determined for existing and proposed conditions based on land cover and slope of the flow path, using methods outlined in the SCS methodology.

For this study, a 24-hour SCS Type III standard rainfall distribution was used to determine the peak flow rate to all points of discharge from the site.

3.3 Existing Runoff Discharges

The site has been broken into seven watersheds, with corresponding design points, as shown on the EX-WS map included in the drawings section of this report. The existing watersheds analyzed in this report were delineated into Watersheds A, B, C, D, E and F as described below:

Design Point A is where runoff from the site runs to the gutter of Park Avenue before reaching the municipal stormwater network. Tributary to this design point is Drainage Area A (1.826 ac), the northwestern portion of the East Campus.

Design Point B is where runoff from the site flows overland to a wooded area east of the East Campus. This wooded area includes a wetland resource area. Tributary to this design point is Drainage Area B (3.794 ac), the eastern portion of the East Campus.

Design Point C is the point where runoff from the site runs to the gutter of Prospect Street before reaching the municipal stormwater network. Tributary to this design point is Drainage Area C (0.562 ac), the sidewalk and Prospect Street frontage area of the East Campus.

Design Point D is where runoff from the site runs to the gutter of Marsh Street before reaching the municipal stormwater network. Tributary to this design point is Sub-drainage Area D1 (0.435 ac), the western portion of the Jordan Lot, and Sub-drainage Area D2 (0.582 ac), the eastern portion of the Upper Lot / Front Yard Area.

Design Point E is where runoff reaches an existing stormwater detention BMP in the main parking lot before entering the municipal stormwater network. Tributary to this design points are Sub-drainage Areas E1 (0.290 ac) and E2 (0.173 ac), the eastern portion of the Jordan Lot area.

Design Point F is where runoff from the site reaches the municipal stormwater network via catchbasins in the parking lot, without being routed to the existing stormwater BMP. Runoff from Design Point D and Design Point E are routed to Design Point F because those design points connect to the same 30" drainage trunk line as Design Point F. Runoff from all three design points joins here before leaving the site. In addition to runoff from DP-D and DP-E, runoff from Drainage Area F (0.560 ac) is routed to DP-F. This drainage area includes the western portion of the Upper Lot / Front Yard Area.

See Appendix B for calculations of each of the drainage areas.

3.4 Proposed Runoff Discharges

The proposed watershed analysis remains within the previously defined limits of the existing drainage areas. The drainage areas discharge to the same design points as in the existing condition but have been divided into sub-drainage areas to model the proposed stormwater management best management practices. The proposed conditions drainage areas are shown on the PR-WS map included in the drawings section of this report. The existing watersheds analyzed in this report were delineated into Watersheds A, B, C, D and E as described below:

Drainage Area A (1.808 ac) has been subdivided into A1 and A2. Sub-drainage Area A1 includes the proposed pervious pavement parking lot designated as "Permeable Pavement A1". Sub-drainage Area A2 flows directly into the municipal storm system in Park Avenue. Both these watersheds connect to Design Point A.

Drainage Area B (3.834 ac), has been subdivided into B1, B2, B3, B4, B5 and B6. Sub-drainage Area B1 includes the pervious pavement parking lot designated as "Permeable Pavement B1". Sub-drainage Area B2 includes the existing residential building to remain and surrounding landscaped area. Watershed B3 includes the maintenance yard and building and flows through the proposed subsurface infiltration facility "Infiltration BMP B3". Sub-drainage Area B4 is a pervious pavement driveway designated as "Permeable

Pavement B4". Sub-drainage area B5 includes the landscaped areas east of the development. Sub-drainage area B6 is the swale in the middle of the parking lot (sub-drainage area B1). Runoff from these areas discharge to Design Point B.

Drainage Area C (0.540 ac) is the area northeast of Prospect Street that drains to the Prospect Street municipal drainage system. This area includes sidewalk and landscaped areas along the parcel frontage.

Drainage Area D (0.582 ac) is the western portion of the Upper Lot / Front Yard area that drains overland into Marsh Street.

Drainage Area E (0.898 ac) has been split into E1, E2, and E3. These drainage areas all route to the existing subsurface stormwater detention facility. E1 contains the new curb cut and driveway and is routed to a water quality structure (WQS-201) for treatment before being routed to the existing BMP. E2 is a portion of the existing parking lot, landscaped area and drive aisle that is being reconfigured and drains to the existing BMP. E3 contains the pervious pavement in the Jordan parking lot with emergency overflow routed to the existing BMP.

Drainage Area F (0.560 ac) is the eastern portion of the Upper Lot / Front Yard area from which runoff flows overland into the main parking lot that enters the 30-inch storm sewer via existing catchbasins, downstream of the existing subsurface detention system.

The project has been designed so that post-construction peak flow rates do not exceed pre-construction peak flow rates, as required by MassDEP Stormwater Standard 2. See Table 3.4.1 below for the peak flow runoff rate comparison.

See Appendix C for calculations of each of the drainage areas, and for the routing of hydrographs from the drainage area through stormwater best management practices.

Table 3.4.1: Peak Flow Runoff Rate Comparison, Existing vs. Proposed Conditions (cfs)

Design Point	Condition	2-year	10-year	25-year	100-year
A	Pre (cfs)	1.31	3.13	4.73	8.24
	Post (cfs)	1.29	2.99	4.47	7.70
	Delta	-2%	-4%	-5%	-7%
B	Pre (cfs)	0.04	0.82	2.34	7.12
	Post (cfs)	0.01	0.81	2.25	6.45
	Delta	-75%	-1%	-4%	-9%
C	Pre (cfs)	0.01	0.13	0.39	1.18
	Post (cfs)	0.00	0.11	0.33	1.06
	Delta	-100%	-15%	-15%	--10%
D	Pre (cfs)	0.57	1.65	2.65	4.91
	Post (cfs)	0.44	1.11	1.72	3.05
	Delta	-23%	-33%	-35%	-5%
E	Pre (cfs)	0.34	0.62	0.87	1.62
	Post (cfs)	0.28	0.60	0.87	1.45
	Delta	-18%	-3%	-0%	-10%
F	Pre (cfs)	2.00	4.21	6.15	10.55
	Post (cfs)	1.79	3.65	5.21	8.54
	Delta	-11%	-13%	-15%	-19%

The project has been designed so that post-construction peak volumes do not exceed pre-construction peak volumes, as required by the town of Belmont. See Table 3.4.2 below for the peak volume comparison.

Table 3.4.2: Runoff Volume Comparison, Existing vs. Proposed Conditions (acre-ft.)

Design Point	Condition	2-year	10-year	25-year	100-year
A	Pre (cf)	0.143	0.319	0.477	0.829
	Post (cf)	0.127	0.278	0.412	0.710
	Delta	-11%	-13%	-14%	-14%
B	Pre (cf)	0.024	0.156	0.319	0.769
	Post (cf)	0.008	0.091	0.195	0.473
	Delta	-67%	-42%	-39%	-38%
C	Pre (cf)	0.004	0.023	0.047	0.114
	Post (cf)	0.003	0.020	0.042	0.104
	Delta	-25%	-13%	-11%	-9%
D	Pre (cf)	0.058	0.142	0.221	0.404
	Post (cf)	0.041	0.094	0.143	0.252
	Delta	-29%	-34%	-35%	-38%
E	Pre (cf)	0.025	0.052	0.079	0.145
	Post (cf)	0.025	0.052	0.075	0.126
	Delta	-0%	-0%	-5%	-13%
F	Pre (cf)	0.169	0.350	0.514	0.883
	Post (cf)	0.149	0.298	0.426	0.706
	Delta	-12%	-15%	-17%	-20%

4.0 STORMWATER QUALITY

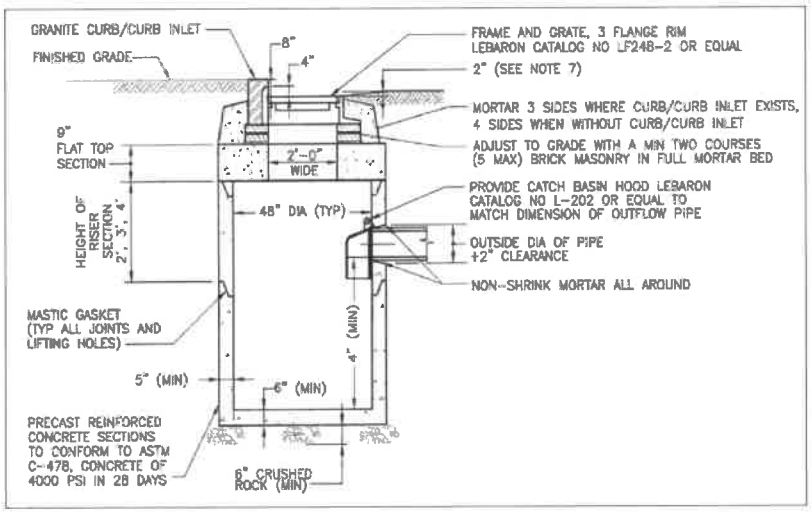
4.1 Stormwater Quality Improvements

The stormwater management system has been designed in accordance with the MassDEP Stormwater Handbook, the Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, the Town of Belmont Stormwater Management and Erosion Control By-Law, and to the greatest extent practicable the Massachusetts Small MS4 General Permit.

The WQV has been calculated using 1/2 inch over all new impervious areas, with the exception of roof areas.

The site utilizes a number of stormwater best management practices to provide stormwater quality and attenuation. Below are the BMPs used in the proposed design:

- Catch basins with deep sumps: Catch basins on the site are to be constructed with sumps (minimum 4 feet) to prevent discharge of sediments.



Source: Massachusetts Stormwater Handbook Volume 2

- Underground Infiltration System: Provides TSS, nitrogen, phosphorous, heavy metal, and pathogen removal while encouraging groundwater recharge and reduced risk of flooding.

- Proprietary Separators (Water Quality Units): Provides TSS removal and oil water separation.

- Porous Pavement: Provides TSS, nitrogen, phosphorous, heavy metal, and pathogen removal while encouraging groundwater recharge and reduced risk of flooding.

The underground infiltration system has been designed to treat the water quality volume through infiltration. This system is designed to infiltrate the larger of the required water quality volume or recharge volume (discussed in Section 5). This system has a Proprietary Separator at the inlet location to provide pretreatment.

The Proprietary Separators that are used as pretreatment and as primary treatment are designed to treat a water quality flow rate. This flow rate is calculated from the water quality volume.

The Porous Pavement practices provide water quality treatment by filtering the runoff through the porous pavement layer and infiltration of the runoff through the bottom of the practice. The depth of stone reservoir under the pavement is designed to infiltrate the larger of the required water quality volume or recharge volume (discussed in Section 5).

All stormwater BMPs have been designed to treat a water quality volume equal to ½" across impervious surface in the drainage area or a water quality flow volume converted from the required water quality volume. See calculation below.

Table 4.1.1: Water Quality Volume Required

Stormwater BMP	Drainage Areas	Impervious Area	Water Quality Volume Required	Water Quality Volume Provided
Permeable Pavement A1	A1, A2	23,853 sf	994 cf	6,774 cf
Permeable Pavement B1	B1, B6	40,648 sf	1,694 cf	22,284 cf
Infiltration BMP B3	B3	19,608 sf	817 cf	2,897 cf
Permeable Pavement B4	B4	6,600 sf	275 cf	3,960 cf
Permeable Pavement E3	E3	16,988 sf	707 cf	11,700 cf

Table 4.1.2: Water Quality Flow Required

Stormwater BMP	Water Quality Flow Required	Water Quality Flow Provided
WQS-101 (B3)	0.26 cfs	3.00 cfs
WQS-201 (E1)	0.04 cfs	0.84 cfs
WQS-301 (F)	0.35 cfs	0.84 cfs

No water quality volume treatment is provided in sub-drainage areas B2, C and E2 because they do not increase impervious area and are considered redevelopment areas.

No water quality treatment is provided in sub-drainage area D because this area is considered redevelopment.

The measures described above have been sized to meet the 80% removal rate as required by the Standard 4: Water Quality of the MassDEP Checklist for Stormwater Report. TSS removal treatment train calculations, Water Quality Flow calculations and Proprietary Separator data sheets are provided in Appendix D.

4.2 Additional Stormwater Quality Features

In addition to the water quality improvements described above, the following water-quality control measures will be provided:

- Operations & Maintenance Plan: Comprehensive Operations and Maintenance programs have been developed for the proposed site. These programs include regular pavement sweeping, catch basin cleaning, and enclosure and maintenance of all dumpsters and material storage areas. Refer to Appendix H

5.0 GROUNDWATER RECHARGE

5.1 Design Criteria

Groundwater recharge volumes have also been addressed for the site. Required volumes were calculated for each watershed based on the MA Stormwater Handbook guidelines.

5.2 Retention and Infiltration Sizing

The underground infiltration systems, and porous pavement have been designed in accordance with Volume 3 Chapter 1 of the Massachusetts Stormwater Manual. These systems meet and surpass required recharge volume as seen in tables 5.3.1, 5.3.2, 5.3.3, and the calculations below. Additionally these practices have been designed to provide the required infiltration volume within the required 72 hour drawdown time (see Table 5.3.4).

All calculations assume infiltration rates based on infiltration testing conducted on the site. These test results are presented in Table 1.6.1 in this report and in the Geotechnical Report.

See table 5.3.3 for assumed infiltration rates utilized. See Appendix J for the geotechnical report with the infiltration rates.

Total Required Recharge Volume (Rv) for East Campus

Rv = Required Recharge Volume

F = Target Depth Factor associated with Hydrologic Soil Group (HSG)

$A_{Imp,}$= Total Impervious cover associated with HSG

$Rv = \sum(F) \times (A_{Imp})$

Capture Area Adjustment

Not all impervious area is able to be routed to the proposed stormwater infiltration practices. The proposed infiltration practices are oversized by a Capture Area Adjustment Factor in order to provide sufficient infiltration for impervious areas not routed to them. See below for adjustment factor calculation.

Capture Area Adjustment Factor = Total Impervious Area /Impervious Area Draining to Infiltration BMPs

Table 5.3.1: Capture Area Adjustment

BMP	Impervious Area Draining to Infiltration BMPs		Total Impervious Area*	Catchment Area Adjustment Factor
Permeable Pavement A1	0.259 ac	2.178	2.979	1.37
Permeable Pavement B1	0.927 ac			
Infiltration BMP B3	0.450 ac			
Permeable Pavement B4	0.152 ac			
Permeable Pavement E3	0.390 ac			

*The Upper Lot / Front Yard is excluded because it is a redevelopment area and no infiltration BMPs are proposed.

Table 5.3.2: Required Recharge Volumes

BMP	A_{Imp} (HSG A) F = 0.6"	A_{Imp} (HSG D) F = 0.1"	Required Recharge Volume (unadjusted)	Required Recharge Volume (adjusted)
Permeable Pavement A1	0 sf	12,133 sf	101 cf	139 cf
Permeable Pavement B1	22,939 sf	17,418 sf	1,292 cf	1,770 cf
Infiltration BMP B3	19,608 sf	0 sf	980 cf	1,343 cf
Permeable Pavement B4	6,600 sf	0 sf	330 cf	452 cf
Permeable Pavement E3	16,988 sf	0 sf	849 cf	1,164 cf
Non-Captured Areas A2, B2, B6, C, E1, E2*	25,503 sf	8,549 sf	1346 cf	N/A
Total				4,868 cf

*The Upper Lot / Front Yard area (sub-drainage areas F and D) is excluded because it is a redevelopment area and no infiltration BMPs are proposed.

Table 5.3.3: Provided Recharge Volumes

BMP	Bottom Area	Depth of storage below outlet	Provided Recharge Volume	Required Recharge Volume (adjusted)
Permeable Pavement A1	11,290 sf	-	6,774 cf	*139 cf*
Permeable Pavement B1	37,140 sf	-	22,284 cf	*1,770 cf*
Infiltration BMP B3	1,989 sf	1.90 ft	2,897 cf	*1,343 cf*
Permeable Pavement B4	6,600 sf	-	3,960 cf	*452 cf*
Permeable Pavement E3	13,000 sf	-	11,700 cf	*1,164 cf*
Total			47,615 cf	*4,868 cf*

Total Required Recharge Volume (Rv) for the Project
Rv = 4,868 cubic feet
Total Provided Recharge Volume (Rv) for the Project
Rv = 43,726 cubic feet

Table 5.3.3: Drawdown Rates

BMP	Provided Recharge Volume	Bottom Area (See Table 4.3.1)	K - Saturated Hydraulic Conductivity	Drawdown Time
A1	6,774 cf	11,290 sf	0.588 in/hr	12.2 hr
B1	22,284 cf	37,140 sf	0.391 in/hr	18.4 hr
B3	2,897 cf	1,989 sf	0.800 in/hr	21.8 hr
B4	3,960 cf	6,600 sf	0.800 in/hr	9.0 hr
E3	11,700 cf	13,000 sf	0.180 in/hr	60 hr

$$Time_{drawdown} = \frac{Rv}{(K)(Bottom\ Area)}$$

5.3 Groundwater Mounding Analysis

Groundwater Mounding Analysis has been completed for each infiltration practice utilizing the Hantush (1967) method for the 10-year, 24 hour storm event. This analysis shows that the top of the groundwater mound is below the bottom of each infiltration practice.

See Appendix G for calculations.

6.0 STORM DRAINAGE COLLECTION SYSTEM DESIGN

6.1 Design Criteria

The proposed subsurface storm drainage collection system is designed to convey the 25-year design storm event to the discharge locations while maintaining an HGL a minimum of 1 foot below the proposed grade.

6.2 Design Methodology

The storm drainage system was analyzed using the Rational Method for estimating runoff for a 25-year design storm event. The site was divided into subareas, each contributing runoff to an individual catch basin, inlet or roof drain. A value for area, time of concentration, and runoff coefficient was calculated for each contributing subarea. See Appendix F.

Values of time of concentration were chosen based on land cover and flow path slope from the hydraulically most distant point in the subarea to the appropriate inlet. A minimum 5 minute inlet time was assumed for each subarea.

The average runoff coefficient, is the weighted average of the land uses within the drainage area. The runoff coefficient is an empirical coefficient representing the ratio of runoff to the rate of rainfall. The following runoff coefficients were used when calculating the average runoff coefficient for each drainage area.

CONDITION	C
Grass/Landscaping	0.30
Paved/Impervious	0.90

Rainfall intensities were taken from the intensity-duration-frequency curve for Massachusetts as presented in National Weather Service (NOAA) Precipitation Frequency Data Server (PFDS). Storm drainage pipes were then sized based on calculated flows using Manning's Equation and were verified by solving for the hydraulic grade line. Starting hydraulic grade lines for the epipe networks were set to the calculated maximum water elevations in the respective subsurface infiltration systems for the 25-year-design storm event creating a conservative tail water condition.

6.3 Storm Drainage Collection Summary

The runoff from the development will be collected using a conventional roof drains, catch basin, and manholes.

See Appendix E for full calculations.

7.0 OUTLET PROTECTION

7.1 Design Criteria and Methodology

The outlet protection for pipe outlets are designed based on the pipe diameter, tailwater condition, and 25-year design storm peak flow and velocity. A preformed scour hole with a level spreader is designed for the pipe outlet from the East Campus subsurface infiltration system that discharges towards the wetland area on the east side of the site. The preformed scour hole is an excavated hole or depression which is lined with rock riprap of a stable size to prevent scouring.

The pipe flows and velocity was obtained from the storm drainage collection system design described in Section 6 of this report. Sizing of the preformed scour hole uses the methodology found in the Storm Drainage Systems, Outlet Protection section of the ConnDOT Drainage Manual, which is based on the Federal Highway Administration Report No. FHWA-RD-75-508, "Culvert Outlet Protection Design: Computer Program Documentation."

See Appendix F for full calculation.

8.0 CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN

8.1 Introduction

The following sections describe the potential pollutant sources, controls to reduce the pollutants, construction sequence, and construction and earth movement schedules related to the project's soil disturbance. The Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan was developed to comply with standards set in the Environmental Protection Agency's (EPA) 2022 Construction General Permit (CGP). The Erosion and Sedimentation Control Plans (CE series) can be found in the construction drawings, submits separately.

8.2 Construction Period Pollution Prevention Controls

Best Management Practices (BMPs) will be utilized as Construction Period Pollution Prevention Controls to reduce potential pollutants and prevent any off-site discharge. The objectives of the BMPs for construction activity are to minimize the disturbed areas, stabilize any disturbed areas, control the site perimeter and retain sediment. The contractor will minimize the area disturbed by construction activities to reduce the potential for soil erosion and stormwater pollution problems. In addition, good housekeeping measures will be followed for the day-to-day operation of the construction

site under the control of the contractor to minimize the impact of construction. This section describes the control practices that will be in place during construction activities.

8.2.1 Natural Buffers

All work is outside the 100 foot wetland buffer zone. In order to minimize disturbed areas, work will be completed within well-defined work limits. These work limits are shown on the construction plans. The Contractor will be responsible to make sure that all of their workers and any subcontractors know the proper work limits and do not extend their work into the undisturbed areas. The protective controls are described in more detail in the following sections.

8.2.2 Perimeter Controls

Perimeter controls for this project will consist of the installation of a perimeter silt fence and compost filter tube. The silt fence will prevent sediment laden storm runoff from leaving the construction site or disturbed area. Perimeter controls will be installed before earth disturbing activities, pavement, and concrete slab removal.

8.2.3 Sediment Track-out Control

Stabilized construction entrance and stabilized construction pads shall be established on site within the drive aisles and throughout the construction area. The construction entrances are constructed in accordance with local regulatory criteria. The entrances are located within the perimeter silt fence.

8.2.4 Stockpiled Soil or Sediment

Soils to be removed will be loaded directly into dump trucks and removed from the site, or soil stockpile areas will be established on-site. The stockpile areas will be surrounded by poly wrapped haybale berms and compost filter tube and silt fencing, as identified on the referenced drawings and stabilized if unused for more than 14-days (e.g., hydroseed with an appropriate annual or winter rye seed mix and tackifier). The initial stockpile area will be established at the outset of the construction activities on site. As construction progresses, stockpile areas may be relocated as needed but must maintain the erosion and sediment control protection described above.

8.2.5 Dust Control

Dust control will be accomplished by use of vegetative cover, mulch, spray-on

adhesives, tillage, water sprinkling, dust barriers, or stone. Dust control will be applied on an as-needed basis, specifically when dry or windy weather increases site-wide dust kick-up.

8.2.6 Minimize Disturbance of Steep Slopes

There are existing or proposed steep slopes at the site. In these areas the contractor will install soil erosion control blankets and provide soil roughening. soil erosion control blankets will be installed upon completion of grading.

8.2.7 Soil Compaction

Areas of sensitive vegetation will be accessible only to lightly loaded landscape equipment or hand-operated equipment and tools. Upon completion of grading, construction equipment and activities are to be avoided within areas designed for infiltration.

8.2.8 Storm Drain Inlet Protection

At-grade inlets and curb inlets will be provided with inlet protection throughout the construction activities until final stabilization is achieved. This inlet protection will be installed at the onset of the construction activities. The inlet protection shall consist of a silt filter bag which is placed under the grate. Straw bales or filter tubes may be placed around catch basins after the initial grading to filter and divert sediment until final paving is complete.

8.2.9 Dewatering

Based on the proposed construction activities, the depths of proposed excavations, and the known ground water table elevation, dewatering practices are not anticipated to be required.

8.2.10 Site Stabilization

During construction, any area of exposed soils that will be left idle for more than 30 days shall be stabilized with a layer of mulch hay or other means. For areas that are not meant to remain actively utilized, stabilization procedures will occur on the following schedule in compliance with Section 2.2.14 of the CGP:

- Initiate the installation of stabilization measures immediately in any areas of exposed soil where construction activities have permanently ceased or will be temporarily inactive for 14 or more calendar days.
- Complete the installation of stabilization measures as soon as practicable,

but no later than 14 calendar days after stabilization has been initiated.

All exposed soil finish grade surfaces shall be immediately landscaped and stabilized, loamed, seeded, and mulched with a layer of mulch hay. All disturbed areas must be graded, loamed, and seeded prior to November 1st of each year. Outside of the growing season, beyond November 15th of any construction year, exposed soil finish grade surfaces shall be stabilized with a layer of mulch hay, straw, tackifier or biodegradable erosion control blanket until climate conditions allow for seeding.

All temporary erosion and sedimentation controls will be removed after final site stabilization.

8.3 Pollution Prevention Standards

Potential sources of pollution during construction are:

- sediment from exposed soils and dewatering
- construction material debris
- human waste
- concrete washout
- diesel, gasoline, and hydraulic and engine oil

All sources of soil erosion pollution or construction pollution to stormwater bodies will be mitigated with the use of silt fence, compost filter tubes, and construction fencing around the construction area. To prevent prohibited non-stormwater discharge the good housekeeping practices must be followed.

8.3.1 Spill Prevention and Response

The Contractor will be responsible for preventing spills in accordance with the project specifications and applicable federal, state and local regulations. The Contractor will identify a properly trained site employee, involved with the day-to-day site operations to be the spill prevention and cleanup coordinator. The name(s) of the responsible spill personnel will be posted on-site.

Each employee will be instructed that all spills are to be reported to the spill prevention and cleanup coordinator. The supervisor will assess the incident and initiate proper containment and response procedures immediately upon notification. Workers should avoid direct contact with spilled materials during the containment procedures.

Primary notification of a spill should be made to the local Fire Department and Police Departments. Secondary notification will be to the certified cleanup contractor if deemed necessary by fire and police personnel. The third level of notification (within 1 hour) is to the DEP or municipality's Licensed Site Professional (LSP). The specific cleanup contractor to be used will be identified by the Contractor prior to commencement of construction activities.

8.3.2 Designated Washout Areas

Concrete waste will be placed in designated dumpster (or comparable structure) and concrete washout will occur in designated containment areas outside of wetland resource areas and buffer zones.

8.3.3 Proper Equipment, Vehicle Fueling, and Maintenance Practices

On-site vehicles will be monitored for leaks and receive regular preventative maintenance off-site to reduce the risk of leakage. To ensure that leaks on stored equipment do not contaminate the site, oil-absorbing mats will be placed under oil-containing equipment during storage. Refueling will occur outside wetland resource areas and buffers. Any petroleum products will be stored in tightly sealed containers that are clearly labeled with spill control pads/socks placed under/around their perimeters.

8.3.4 Equipment and Vehicle Washing

No equipment, vehicles, and machines will be washed on-site.

8.3.5 Spill Control Equipment

Spill control and containment equipment will be kept in the work area. Materials and equipment necessary for spill cleanup will be kept either in the work area or in an otherwise accessible on-site location. Equipment and materials will include, but not be limited to, absorbent booms and mats, brooms, dust pans, mops, rags, gloves, goggles, sand, plastic and metal containers specifically for this purpose. It is the responsibility of the contractor to ensure the inventory will be readily accessible and maintained.

8.3.6 Spill Containment and Clean-Up Measures

Spills will be contained with granular sorbent material, sand, sorbent pads, booms or all of the above to prevent spreading. Certified cleanup contractors should complete spill cleanup. The material manufacturer's recommended methods for

spill cleanup will be clearly posted and on-site personnel will be made aware of the procedures and the location of the information and cleanup supplies.

8.3.7 Hazardous Materials Spill Report

The contractor will report and record any spill. The spill report will present a description of the release, including the quantity and type of material, date of the spill, circumstances leading to the release, location of spill, response actions and personnel, documentation of notifications and corrective measures implemented to prevent reoccurrence.

This document does not relieve the Contractor of the Federal reporting requirements of 40 CFR Part 110, 40 CFR Part 117, 40 CFR Part 302 and the State requirements specified under the Massachusetts Contingency Plan (M.C.P) relating to spills or other releases of oils or hazardous substances. Where a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117 or 40 CFR Part 302, occurs during a twenty-four (24) hour period, the Contractor is required to comply with the response requirements of the above mentioned regulations. Spills of oil or hazardous material in excess of the reportable quantity will be reported to the National Response Center (NRC).

8.4 Operation and Maintenance of Erosion Control

The erosion control measures will be installed as detailed on the drawings (CE series). If there is a failure to the controls the contractor, under the supervision of the engineer, will be required to stop work until the failure is repaired. Periodically throughout the work, whenever the engineer deems it necessary, the sediment that has been deposited against the controls will be removed to ensure that the controls are working properly.

8.5 Inspection Schedule

During construction, the erosion and sedimentation controls will be inspected as detailed on the drawings and in the SWPPP. Once the Contractor is selected, an on-site inspector will be selected to work closely to make sure that erosion and sedimentation controls are in place and working properly.

The Owner must schedule the following site inspections with the Conservation Commission:

1. Initial Site Inspection: prior to approval of any Plan.
2. Project Progress Inspections: observe and document project progress at certain

milestones.

a) Erosion and sediment control measures are in place and stabilized;
b) Site Clearing has been substantially completed;
c) Rough Grading has been substantially completed;
d) Final Grading has been substantially completed;
e) Close of the Construction Season;
f) Final Landscaping (permanent stabilization)
g) Project final completion.

3. Owner Inspections: weekly inspections and prior to and following any storm events with over 0.25" of precipitation.
4. Bury Inspection: prior to backfilling of drainage piping or stormwater conveyance structures.
5. Final Inspection: after construction is completed.

9.0 CONCLUSION

The proposed stormwater management system has been designed in accordance with the Massachusetts Stormwater Management Handbook and the Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas. The system incorporates stormwater quality measures and maintains or decreases the existing rate of runoff for all storm events analyzed.

We believe based on the findings of this report that the proposed stormwater system, as designed, will effectively manage quality and quantity of stormwater runoff for the proposed redevelopment.

10.0 REFERENCES

1. Stormwater Management Handbook, Massachusetts Department of Environmental Protection, 2008.

2. Hydrology Handbook for Conservation Commissioners, Massachusetts Department of Environmental Protection, 2002.

3. Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, Department of Environmental Protection, Bureau of Resource Protection, May 2003.

4. Precipitation Frequency Data Server (PFDS) National Weather Service (NOAA), April 21, 2017.

5. Extreme Precipitation in New York & New England Web Tool, Cornell, 2022

6. USGS Web Soil Survey, United States National Resources Conservation Service, 2016.

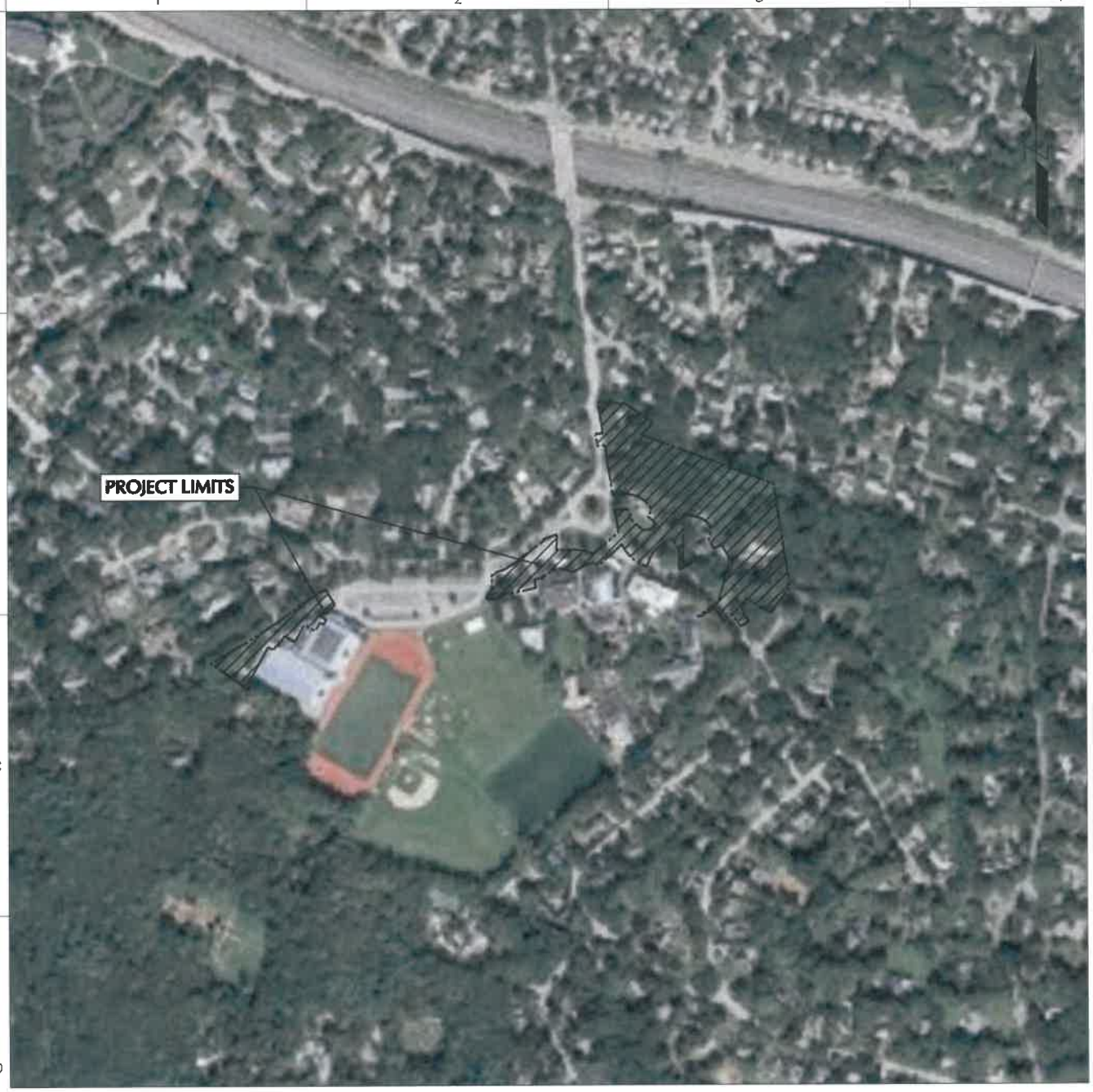
7. Urban Hydrology for Small Watersheds, Technical Release 55, United States Department of Agriculture, Soil Conservation Service, June 1986.

8. Massachusetts Small MS4 General Permit 2016 Final Permit, effective July 1, 2018.

9. Project Development and Design Guide, Chapter 8 Drainage and Erosion Control, Massachusetts Department of Transportation, 2006.

10. Stormwater Management and Erosion Control Rules and Regulations, Town of Belmont, September 2014

11. Stormwater Management and Erosion Control By-Law, Town of Belmont

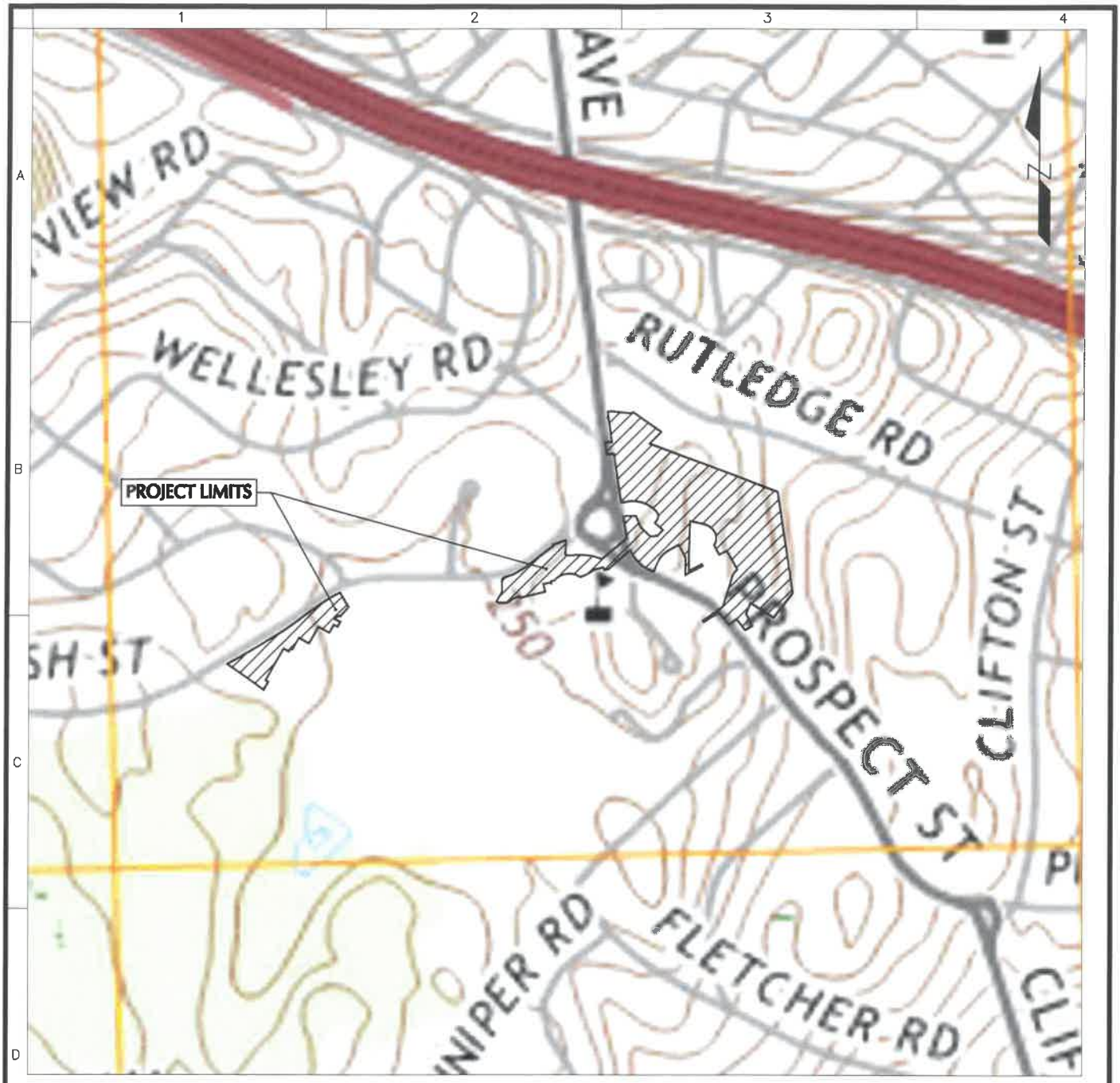


500 0 250 500

SCALE: 1 INCH = 500 FEET

LANGAN Langan Engineering and Environmental Services, Inc. www.langan.com	Project BELMONT HILL SCHOOL BELMONT MIDDLESEX COUNTY MASSACHUSETTS	Drawing Title Aerial Locus Map	Project No. 151021201 Date Drawn By K. Hebard Checked By H. Holmes	Figure Fig.01

Date: 6/3/2022 Time: 15:31 User: khebard Style Table: Langan.stb Layout: Fig.01 Document Code: FG01-151021201-0101-GR101-0101



NOTES:

1. BOUNDARY OBTAINED FROM SURVEY TITLED "EXISTING CONDITIONS PLAN OF PROPERTY" BY MCCLURE DATED DECEMBER 10, 2020.
2. BASEMAP OBTAINED FROM USGS HISTORICAL TOPOGRAPHIC MAPS, EAST BROOKFIELD, MA AND LEICESTER, MA PUBLISHED IN 1969.

500 0 250 500

SCALE: 1 INCH = 500 FEET

LANGAN Langan Engineering and Environmental Services, Inc. www.langan.com	Project BELMONT HILL SCHOOL BELMONT MIDDLESEX COUNTY MASSACHUSETTS	Drawing Title USGS Locus Map	Project No. 151021201 Date Drawn By K. Hebard Checked By H. Holmes	Figure Fig.02

Date: 6/3/2022 Time: 15:33 User: khebard Style Table: Langan.stb Layout: Fig.02 Document Code: FG02-151021201-0101-GR101-0101

APPENDIX A

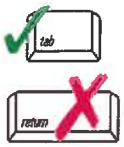
Checklists for Stormwater Report

LANGAN

TOWN OF BELMONT
Checklist for Stormwater Management and Erosion Control Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Management and Erosion Control Report must be submitted with the building permit application for a project that is covered by the Town of Belmont Stormwater Management and Erosion Control Bylaw. The following checklist is NOT a substitute for the Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management and Erosion Control documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Report must include:

- The Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Report shall also document compliance with the Stormwater Management and Erosion Control Bylaw recognizing the bylaw contains provisions that could be more strict or broader in scope than the Stormwater Management Standards.

To ensure that the Report is complete, applicants are required to fill in the Report Checklist by checking the box to indicate that the specified information has been included in the Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Management and Erosion Control Checklist and Certification must be

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue a permit that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

TOWN OF BELMONT
Checklist for Stormwater Management and Erosion Control Report

B. Report 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 Report. The checklist is also intended to provide the reviewing authority with a summary of the components necessary for a comprehensive Report that addresses the ten Stormwater Standards.

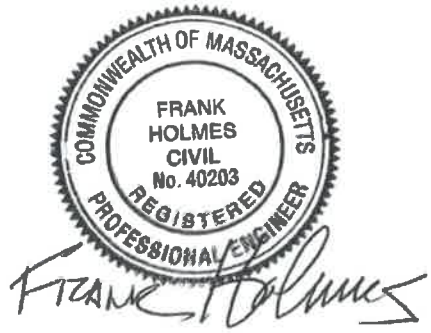
Note: Because stormwater requirements vary from project to project, it is possible that a complete Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not 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 Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Management and Erosion Control Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan, 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



Signature and Date

TOWN OF BELMONT
Checklist for Stormwater Management and Erosion Control Report

60-325 - Stormwater Management and Erosion Control Bylaw (excerpt)

F Stormwater Management and Erosion Control

F (1) Regulated Activities

A Stormwater Management and Erosion Control Permit shall be required prior to undertaking any land disturbance that involves:

(a) An alteration that will result in land disturbances of 2,500 square feet of total area or more, or that is part of a common plan for development that will disturb 2,500 square feet or more;
(b) An alteration that will increase the amount of a lot's impervious surface area to more than 25% of the lot's total area; or
(c) Storage or permanent placement of more than 100 cubic yards of excavated material, fill, snow or ice.

F (3) General Requirements

(a) An Operation and Maintenance Plan shall be submitted to the OCD for approval prior to the issuance of a Stormwater Management and Erosion Control Permit. The Operation and Maintenance Plan shall be designed to ensure compliance with the Stormwater Management and Erosion Control Permit, this Bylaw, and the Massachusetts Surface Water Quality Standards, 314 CMR 4.00, in all seasons and throughout the life of the system.

(b) As-built drawings showing all stormwater management systems shall be submitted to the OCD at the completion of a project.

(c) The OCD may require the applicant to contribute to the cost of design, construction, and maintenance of a public or shared stormwater facility in lieu of an onsite stormwater facility where the OCD determines that there are not sufficient site conditions for onsite Best Management Practices that will satisfy the design criteria set forth in Section 34.6.4.1 of this Bylaw and the performance standards set forth in the regulations promulgated under this Bylaw. Funds so contributed may be used to design, construct, and maintain stormwater projects that will improve the quality and quantity of surface waters in Belmont by treating and recharging stormwater from existing impervious surfaces that is now discharged to said waters with inadequate treatment or recharge. The amount of any required contribution to the fund shall be determined by the OCD pursuant to standards established in the Regulations adopted pursuant to this Bylaw.

F (4) Design Criteria (The Report shall consider all of the design criteria below)

All Development shall satisfy the following design criteria:

(a) Compliance with all applicable provisions of the Stormwater Management Standards, regardless of the proximity of the development to resource areas or their buffer zones, as defined by the *Wetlands Protection Act, M.G.L.* c. 131, § 40 and its implementing regulations.
(b) Erosion and sediment controls must be implemented to prevent adverse impacts during disturbance and construction activities.
(c) There shall be no change to the existing conditions of abutting properties from any increase in volume of stormwater runoff or from erosion, silting, flooding, sedimentation or impacts to wetlands, ground water levels or wells.
(d) When any proposed discharge may have an impact upon streams, wetlands and/or storm sewers, the OCD may require minimization or elimination of this impact based on site conditions and existing stormwater system capacity.

TOWN OF BELMONT
Checklist for Stormwater Management and Erosion Control Report

Checklist

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

- [X] New development
- [ ] Redevelopment
- [X] Mix of New Development and Redevelopment

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:

- [X] No disturbance to any Wetland Resource Areas
- [X] Site Design Practices
- [ ] Reduced Impervious Area (Redevelopment Only)
- [ ] Minimizing disturbance to existing trees and shrubs
- [ ] LID Site Design Credit Requested:
  - [ ] Credit 1
  - [ ] Credit 2
  - [ ] Credit 3
- [X] 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
- [X] Other (describe): Porous Pavement

Standard 1: No New Untreated Discharges

- [X] No new untreated discharges
- [X] Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

TOWN OF BELMONT
Checklist for Stormwater Management and Erosion Control Report

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

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.

☒ Any potential change to the existing conditions of abutting properties from any increase in volume of stormwater runoff have been identified in the Report

☒ The Report provides calculations demonstrating that the post-development discharge volume is equal to or less than the pre-development discharge volume from the 2-year and the 10-year 24-hour storms.

☒ The Report provides a quantitative impact of discharge volumes from the 100-year 24-hour storm. If this evaluation shows that increased off-site flooding result from the discharge volumes from the 100-year 24-hour storms, BMPs also are described in the Report that the applicant will implement and maintained to attenuate these discharges.

☐ Any potential change to the existing conditions of abutting properties from erosion, silting, flooding, or sedimentation have been identified in the Report.

☒ The Report describes the practices and controls that the Applicant will implement and maintain to prevent adverse impacts from erosion, silting, flooding, or sedimentation.

☒ Any potential impacts to wetlands have been identified in the Report.

☒ The Report describes the practices and controls that the Applicant will implement and maintain to prevent adverse impacts to wetlands.

Additional Requirements for Projects other than One and Two Family Developments:

☒ Any potential impacts to ground water levels or wells have been identified in the Report, including quantitative projections of changes in the seasonal high water table and quantitative projections of storm-related short-term mounding calculations associated with infiltration BMPs for a 24-hour 10 year design storm.

☒ The Report describes the practices and controls that the Applicant will implement and maintain (if required) to prevent adverse impacts to ground water levels or wells for a 24-hour 10 year design storm.

Requirements Specific to Section F (4)(d)

☒ Is stormwater from the pre-development site discharged directly to (check all that apply):

- ☐ A surface water body (specify the water body)
- ☒ The Belmont MS4 (storm sewers)
- ☐ Another MS4 (specify the MS4)
- ☒ Other (specify) Overland flow to woodland area north of Prospect St. This area includes a wetland resource area.

☒ Will stormwater from the post-development site be discharges directly to (check all that apply):

- ☐ A surface water body (specify the water body)
- ☒ The Belmont MS4 (storm sewers)
- ☐ Another MS4 (specify the MS4)
- ☒ Other (specify) Overland flow to woodland area north of Prospect St. This area includes a wetland resource area.

☒ Any potential impacts upon streams, wetlands and/or storm sewers have been identified in the Report. (Explain in Report narrative)

- ☒ These will be prevented with mitigating measures that the Applicant will implement and maintain (explain in Report narrative)
- ☐ These will be prevented without mitigating measures (explain in Report narrative)

☒ The Report describes the practices and controls that the Applicant will implement and maintain to prevent any adverse impacts to streams, wetlands and/or storm sewers.

Additional Requirements for Projects other than One and Two Family Developments:

☐ If the discharge is to an MS4, a certification that the discharge meets Massachusetts Surface Water Quality Standards and any applicable approved Total Maximum Daily Load (TMDL) waste load allocation is included in the Report.

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.

TOWN OF BELMONT
Checklist for Stormwater Management and Erosion Control Report

☐ 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.

☒ 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

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.

☒ The BMP is sized (and calculations provided) based on:

☒ The ½" or 1" Water Quality Volume or

☒ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☒ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

☐ Limited Project

☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.

☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area

☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff

☐ Bike Path and/or Foot Path

☐ Redevelopment Project

☒ Redevelopment portion of mix of new and redevelopment.

☒ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ Adverse impacts due to erosion, sedimentation, or both during disturbance and construction activities are prevented:

☒ With erosion and sediment controls that the Applicant will implemented and maintain (explain in Report narrative)

☐ Without erosion and sediment controls (explain in Report narrative)

TOWN OF BELMONT
Checklist for Stormwater Management and Erosion Control Report

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

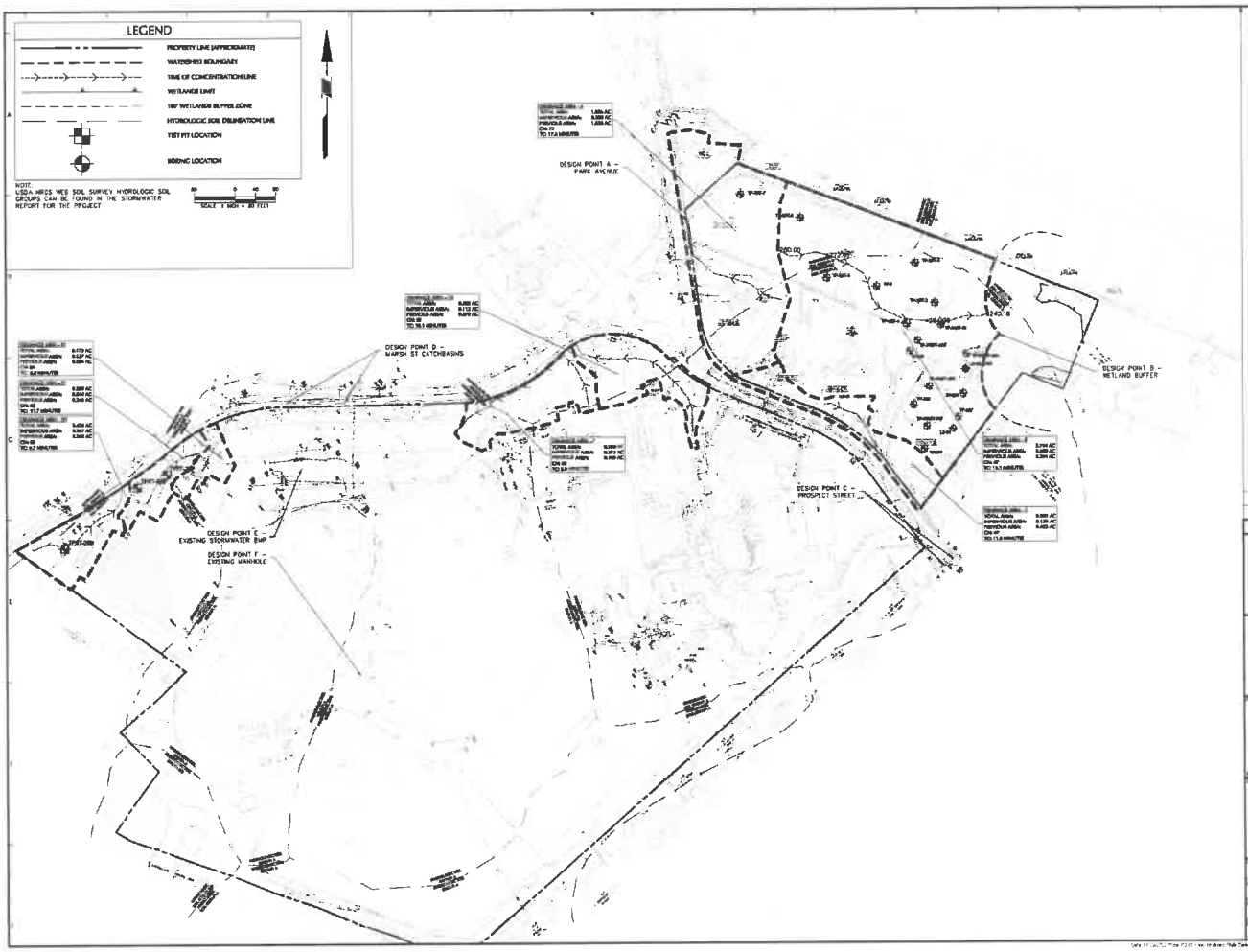
☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

APPENDIX B

Existing Stormwater Discharge Calculations

LANGAN



Date	Description	No
11/23/22	Peer Review Comments	01

Revisions

LANGAN

Langan Engineering and Environmental Services Inc.
120 Cambridge Street, Suite 1310
Boston, MA
T 617.924.9100 F 617.924.9101 www.langan.com

Belmont Hill School

BELMONT
MASSACHUSETTS

Drawing Title
EXISTING DRAINAGE AREA PLAN

Project No. 170031301
Date 06/03/2022
Drawn By E. Hilsdorf
Checked By M. Holmes

Drawing No. EX-WS

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	Massachusetts
Location	
Longitude	71.182 degrees West
Latitude	42.407 degrees North
Elevation	0 feet
Date/Time	Mon, 18 Oct 2021 14:04:51 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.53	0.70	0.87	1.10	**1yr**	0.75	1.04	1.28	1.63	2.08	2.67	2.91	**1yr**	2.37	2.80	3.27	3.96	4.63	**1yr**
2yr	0.35	0.54	0.67	0.88	1.11	1.40	**2yr**	0.96	1.28	1.62	2.03	2.56	3.22	3.57	**2yr**	2.85	3.43	3.93	4.67	5.33	**2yr**
5yr	0.42	0.65	0.81	1.09	1.39	1.77	**5yr**	1.20	1.61	2.06	2.59	3.25	4.07	4.54	**5yr**	3.60	4.36	4.98	5.94	6.66	**5yr**
10yr	0.47	0.74	0.93	1.27	1.65	2.12	**10yr**	1.42	1.91	2.47	3.11	3.90	4.87	5.44	**10yr**	4.31	5.23	5.97	7.13	7.89	**10yr**
25yr	0.56	0.89	1.13	1.56	2.07	2.67	**25yr**	1.78	2.40	3.13	3.96	4.96	6.17	6.93	**25yr**	5.46	6.67	7.57	9.07	9.87	**25yr**
50yr	0.63	1.01	1.30	1.82	2.46	3.22	**50yr**	2.12	2.85	3.78	4.78	5.97	7.39	8.33	**50yr**	6.54	8.01	9.07	10.89	11.71	**50yr**
100yr	0.72	1.17	1.51	2.14	2.92	3.85	**100yr**	2.52	3.39	4.53	5.74	7.17	8.85	10.01	**100yr**	7.84	9.63	10.88	13.08	13.89	**100yr**
200yr	0.83	1.36	1.76	2.52	3.48	4.61	**200yr**	3.00	4.04	5.43	6.89	8.60	10.61	12.04	**200yr**	9.39	11.58	13.04	15.71	16.48	**200yr**
500yr	1.01	1.66	2.16	3.14	4.39	5.85	**500yr**	3.79	5.08	6.91	8.78	10.95	13.49	15.38	**500yr**	11.94	14.79	16.59	20.04	20.68	**500yr**

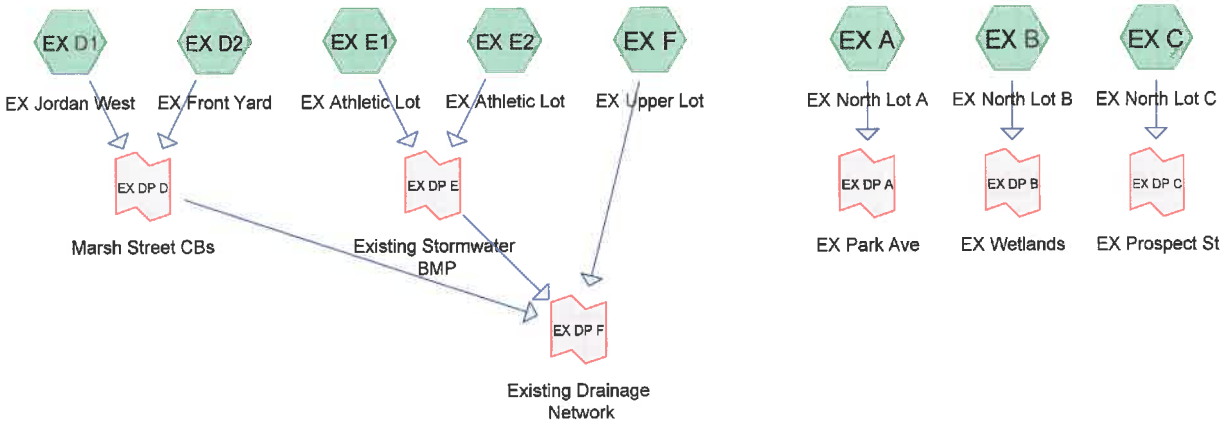
Lower Confidence Limits

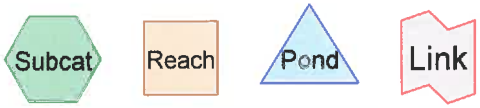
	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.24	0.38	0.46	0.62	0.76	0.84	**1yr**	0.65	0.82	1.14	1.44	1.77	2.43	2.50	**1yr**	2.15	2.40	2.91	3.51	4.09	**1yr**
2yr	0.33	0.51	0.63	0.85	1.05	1.26	**2yr**	0.91	1.23	1.44	1.91	2.47	3.11	3.44	**2yr**	2.75	3.31	3.80	4.51	5.16	**2yr**
5yr	0.39	0.60	0.75	1.02	1.30	1.50	**5yr**	1.12	1.47	1.73	2.24	2.88	3.74	4.16	**5yr**	3.31	4.00	4.57	5.44	6.13	**5yr**
10yr	0.44	0.67	0.83	1.16	1.50	1.72	**10yr**	1.29	1.68	1.94	2.53	3.24	4.32	4.79	**10yr**	3.82	4.61	5.24	6.25	6.97	**10yr**
25yr	0.50	0.77	0.95	1.36	1.79	2.04	**25yr**	1.54	1.99	2.29	2.96	3.78	5.19	5.77	**25yr**	4.60	5.54	6.30	7.48	8.24	**25yr**
50yr	0.56	0.85	1.06	1.52	2.05	2.33	**50yr**	1.77	2.28	2.58	3.35	4.25	5.96	6.62	**50yr**	5.27	6.37	7.21	8.54	9.35	**50yr**
100yr	0.62	0.94	1.18	1.71	2.34	2.65	**100yr**	2.02	2.60	2.92	3.57	4.77	6.86	7.59	**100yr**	6.07	7.30	8.28	9.72	10.61	**100yr**
200yr	0.70	1.05	1.34	1.93	2.70	3.03	**200yr**	2.33	2.96	3.31	3.98	5.38	7.89	8.70	**200yr**	6.98	8.36	9.49	11.04	12.01	**200yr**
500yr	0.82	1.22	1.57	2.28	3.24	3.61	**500yr**	2.80	3.53	3.90	4.61	6.32	9.48	10.38	**500yr**	8.39	9.98	11.37	13.02	14.14	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.31	0.48	0.59	0.79	0.97	1.14	**1yr**	0.84	1.11	1.33	1.77	2.25	2.85	3.14	**1yr**	2.53	3.02	3.50	4.27	5.01	**1yr**
2yr	0.36	0.56	0.69	0.94	1.16	1.36	**2yr**	1.00	1.33	1.57	2.07	2.68	3.33	3.72	**2yr**	2.95	3.57	4.09	4.86	5.53	**2yr**
5yr	0.45	0.70	0.86	1.18	1.51	1.79	**5yr**	1.30	1.75	2.05	2.65	3.37	4.42	4.97	**5yr**	3.91	4.78	5.41	6.46	7.19	**5yr**
10yr	0.55	0.84	1.04	1.45	1.88	2.21	**10yr**	1.62	2.16	2.56	3.21	4.05	5.48	6.22	**10yr**	4.85	5.98	6.70	8.04	8.80	**10yr**
25yr	0.71	1.08	1.34	1.92	2.52	2.90	**25yr**	2.18	2.84	3.40	4.14	5.15	7.28	8.39	**25yr**	6.44	8.07	8.90	10.75	11.51	**25yr**
50yr	0.86	1.31	1.63	2.34	3.15	3.59	**50yr**	2.72	3.51	4.21	5.03	6.19	9.03	10.53	**50yr**	7.99	10.13	11.02	13.43	14.12	**50yr**
100yr	1.05	1.59	1.99	2.87	3.93	4.43	**100yr**	3.40	4.33	5.23	6.42	7.43	11.21	13.23	**100yr**	9.92	12.72	13.66	16.80	17.34	**100yr**
200yr	1.28	1.92	2.43	3.52	4.91	5.47	**200yr**	4.24	5.35	6.50	7.85	8.91	13.94	16.64	**200yr**	12.34	16.00	16.95	21.02	21.32	**200yr**
500yr	1.66	2.47	3.18	4.62	6.57	7.22	**500yr**	5.67	7.06	8.68	10.26	11.35	18.59	22.56	**500yr**	16.45	21.70	22.54	28.34	28.05	**500yr**

Powered by ACIS
Northeast Regional Climate Center





Routing Diagram for Belmont Hill School - Existing Conditions
Prepared by Langan Engineering, Printed 11/22/2022

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.661	98	Impervious (EX A, EX B, EX C, EX D1, EX D2, EX E1, EX E2, EX F)
4.317	32	Woods/grass comb., Good, HSG A (EX A, EX B, EX C, EX D1, EX D2, EX E1, EX E2, EX F)
2.244	79	Woods/grass comb., Good, HSG D (EX A, EX B, EX D1, EX D2, EX F)
8.222	**58**	**TOTAL AREA**

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentEX A: EX North Lot A Runoff Area=1.826 ac 10.95% Impervious Runoff Depth=0.94"
Flow Length=275' Tc=17.6 min CN=72 Runoff=1.31 cfs 0.143 af

SubcatchmentEX B: EX North Lot B Runoff Area=3.794 ac 13.18% Impervious Runoff Depth=0.08"
Flow Length=475' Tc=16.3 min CN=47 Runoff=0.04 cfs 0.024 af

SubcatchmentEX C: EX North Lot C Runoff Area=0.562 ac 22.95% Impervious Runoff Depth=0.08"
Flow Length=174' Tc=11.8 min CN=47 Runoff=0.01 cfs 0.004 af

SubcatchmentEX D1: EX Jordan West Runoff Area=0.435 ac 38.39% Impervious Runoff Depth=0.53"
Flow Length=216' Tc=9.7 min CN=63 Runoff=0.17 cfs 0.019 af

SubcatchmentEX D2: EX Front Yard Runoff Area=0.582 ac 19.24% Impervious Runoff Depth=0.79"
Flow Length=333' Tc=10.1 min CN=69 Runoff=0.41 cfs 0.038 af

SubcatchmentEX E1: EX Athletic Lot Runoff Area=0.290 ac 15.17% Impervious Runoff Depth=0.01"
Flow Length=100' Slope=0.0900 '/' Tc=11.7 min CN=42 Runoff=0.00 cfs 0.000 af

SubcatchmentEX E2: EX Athletic Lot Runoff Area=0.173 ac 79.19% Impervious Runoff Depth=1.70"
Tc=6.0 min CN=84 Runoff=0.34 cfs 0.024 af

SubcatchmentEX F: EX Upper Lot Runoff Area=0.560 ac 66.43% Impervious Runoff Depth=1.85"
Tc=6.0 min CN=86 Runoff=1.19 cfs 0.086 af

Link EX DP A: EX Park Ave Inflow=1.31 cfs 0.143 af
Primary=1.31 cfs 0.143 af

Link EX DP B: EX Wetlands Inflow=0.04 cfs 0.024 af
Primary=0.04 cfs 0.024 af

Link EX DP C: EX Prospect St Inflow=0.01 cfs 0.004 af
Primary=0.01 cfs 0.004 af

Link EX DP D: Marsh Street CBs Inflow=0.57 cfs 0.058 af
Primary=0.57 cfs 0.058 af

Link EX DP E: Existing Stormwater BMP Inflow=0.34 cfs 0.025 af
Primary=0.34 cfs 0.025 af

Link EX DP F: Existing Drainage Network Inflow=2.00 cfs 0.169 af
Primary=2.00 cfs 0.169 af

Total Runoff Area = 8.222 ac Runoff Volume = 0.340 af Average Runoff Depth = 0.50"
79.80% Pervious = 6.561 ac 20.20% Impervious = 1.661 ac

Summary for Subcatchment EX A: EX North Lot A

Runoff = 1.31 cfs @ 12.27 hrs, Volume= 0.143 af, Depth= 0.94"
Routed to Link EX DP A : EX Park Ave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.200	98	Impervious
	0.366	32	Woods/grass comb., Good, HSG A
	1.260	79	Woods/grass comb., Good, HSG D
	1.826	72	Weighted Average
	1.626		89.05% Pervious Area
	0.200		10.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.5	85	0.0117	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
0.3	70	0.0360	3.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	120	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.6	275	Total			

Summary for Subcatchment EX B: EX North Lot B

Runoff = 0.04 cfs @ 14.92 hrs, Volume= 0.024 af, Depth= 0.08"
Routed to Link EX DP B : EX Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.500	98	Impervious
	2.783	32	Woods/grass comb., Good, HSG A
	0.511	79	Woods/grass comb., Good, HSG D
	3.794	47	Weighted Average
	3.294		86.82% Pervious Area
	0.500		13.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.1200	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
4.8	254	0.0305	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	121	0.1580	1.99		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.3	475	Total			

Summary for Subcatchment EX C: EX North Lot C

Runoff = 0.01 cfs @ 14.85 hrs, Volume= 0.004 af, Depth= 0.08"
Routed to Link EX DP C : EX Prospect St

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.129	98	Impervious
	0.433	32	Woods/grass comb., Good, HSG A
	0.000	79	Woods/grass comb., Good, HSG D
	0.562	47	Weighted Average
	0.433		77.05% Pervious Area
	0.129		22.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	71	0.0535	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	48	0.0730	1.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	35	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.8	174	Total			

Summary for Subcatchment EX D1: EX Jordan West

Runoff = 0.17 cfs @ 12.17 hrs, Volume= 0.019 af, Depth= 0.53"
Routed to Link EX DP D : Marsh Street CBs

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.167	98	Impervious
	0.214	32	Woods/grass comb., Good, HSG A
	0.054	79	Woods/grass comb., Good, HSG D
	0.000	32	Woods/grass comb., Good, HSG A
	0.435	63	Weighted Average
	0.268		61.61% Pervious Area
	0.167		38.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	32	0.0200	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
1.1	184	0.0190	2.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.7	216	Total			

Summary for Subcatchment EX D2: EX Front Yard

Runoff = 0.41 cfs @ 12.16 hrs, Volume= 0.038 af, Depth= 0.79"
Routed to Link EX DP D : Marsh Street CBs

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.112	98	Impervious
	0.167	32	Woods/grass comb., Good, HSG A
	0.303	79	Woods/grass comb., Good, HSG D
	0.000	32	Woods/grass comb., Good, HSG A
	0.582	69	Weighted Average
	0.470		80.76% Pervious Area
	0.112		19.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	48	0.0250	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
0.1	10	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.5	221	0.0440	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	54	0.0261	3.28		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.1	333	Total			

Summary for Subcatchment EX E1: EX Athletic Lot

Runoff = 0.00 cfs @ 21.44 hrs, Volume= 0.000 af, Depth= 0.01"
Routed to Link EX DP E : Existing Stormwater BMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.044	98	Impervious
	0.149	32	Woods/grass comb., Good, HSG A
	0.000	79	Woods/grass comb., Good, HSG D
	0.097	32	Woods/grass comb., Good, HSG A
	0.290	42	Weighted Average
	0.246		84.83% Pervious Area
	0.044		15.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0900	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"

Summary for Subcatchment EX E2: EX Athletic Lot

Runoff = 0.34 cfs @ 12.09 hrs, Volume= 0.024 af, Depth= 1.70"
Routed to Link EX DP E : Existing Stormwater BMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.137	98	Impervious
	0.000	32	Woods/grass comb., Good, HSG A
	0.000	79	Woods/grass comb., Good, HSG D
	0.036	32	Woods/grass comb., Good, HSG A
	0.173	84	Weighted Average
	0.036		20.81% Pervious Area
	0.137		79.19% Impervious Area

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

Summary for Subcatchment EX F: EX Upper Lot

Runoff = 1.19 cfs @ 12.09 hrs, Volume= 0.086 af, Depth= 1.85"
Routed to Link EX DP F : Existing Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.372	98	Impervious
	0.000	32	Woods/grass comb., Good, HSG A
	0.116	79	Woods/grass comb., Good, HSG D
	0.072	32	Woods/grass comb., Good, HSG A
	0.560	86	Weighted Average
	0.188		33.57% Pervious Area
	0.372		66.43% Impervious Area

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

Summary for Link EX DP A: EX Park Ave

Inflow Area = 1.826 ac, 10.95% Impervious, Inflow Depth = 0.94" for 2-yr 24-hr event
Inflow = 1.31 cfs @ 12.27 hrs, Volume= 0.143 af
Primary = 1.31 cfs @ 12.27 hrs, Volume= 0.143 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP B: EX Wetlands

Inflow Area = 3.794 ac, 13.18% Impervious, Inflow Depth = 0.08" for 2-yr 24-hr event
Inflow = 0.04 cfs @ 14.92 hrs, Volume= 0.024 af
Primary = 0.04 cfs @ 14.92 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP C: EX Prospect St

Inflow Area = 0.562 ac, 22.95% Impervious, Inflow Depth = 0.08" for 2-yr 24-hr event
Inflow = 0.01 cfs @ 14.85 hrs, Volume= 0.004 af
Primary = 0.01 cfs @ 14.85 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP D: Marsh Street CBs

Inflow Area = 1.017 ac, 27.43% Impervious, Inflow Depth = 0.68" for 2-yr 24-hr event
Inflow = 0.57 cfs @ 12.17 hrs, Volume= 0.058 af
Primary = 0.57 cfs @ 12.17 hrs, Volume= 0.058 af, Atten= 0%, Lag= 0.0 min
Routed to Link EX DP F : Existing Drainage Network

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP E: Existing Stormwater BMP

Inflow Area = 0.463 ac, 39.09% Impervious, Inflow Depth = 0.64" for 2-yr 24-hr event
Inflow = 0.34 cfs @ 12.09 hrs, Volume= 0.025 af
Primary = 0.34 cfs @ 12.09 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min
Routed to Link EX DP F : Existing Drainage Network

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP F: Existing Drainage Network

Inflow Area = 2.040 ac, 40.78% Impervious, Inflow Depth = 0.99" for 2-yr 24-hr event
Inflow = 2.00 cfs @ 12.11 hrs, Volume= 0.169 af
Primary = 2.00 cfs @ 12.11 hrs, Volume= 0.169 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentEX A: EX North Lot A Runoff Area=1.826 ac 10.95% Impervious Runoff Depth=2.10"
Flow Length=275' Tc=17.6 min CN=72 Runoff=3.13 cfs 0.319 af

SubcatchmentEX B: EX North Lot B Runoff Area=3.794 ac 13.18% Impervious Runoff Depth=0.49"
Flow Length=475' Tc=16.3 min CN=47 Runoff=0.82 cfs 0.156 af

SubcatchmentEX C: EX North Lot C Runoff Area=0.562 ac 22.95% Impervious Runoff Depth=0.49"
Flow Length=174' Tc=11.8 min CN=47 Runoff=0.13 cfs 0.023 af

SubcatchmentEX D1: EX Jordan West Runoff Area=0.435 ac 38.39% Impervious Runoff Depth=1.43"
Flow Length=216' Tc=9.7 min CN=63 Runoff=0.59 cfs 0.052 af

SubcatchmentEX D2: EX Front Yard Runoff Area=0.582 ac 19.24% Impervious Runoff Depth=1.86"
Flow Length=333' Tc=10.1 min CN=69 Runoff=1.07 cfs 0.090 af

SubcatchmentEX E1: EX Athletic Lot Runoff Area=0.290 ac 15.17% Impervious Runoff Depth=0.28"
Flow Length=100' Slope=0.0900 '/' Tc=11.7 min CN=42 Runoff=0.02 cfs 0.007 af

SubcatchmentEX E2: EX Athletic Lot Runoff Area=0.173 ac 79.19% Impervious Runoff Depth=3.15"
Tc=6.0 min CN=84 Runoff=0.62 cfs 0.045 af

SubcatchmentEX F: EX Upper Lot Runoff Area=0.560 ac 66.43% Impervious Runoff Depth=3.35"
Tc=6.0 min CN=86 Runoff=2.12 cfs 0.156 af

Link EX DP A: EX Park Ave Inflow=3.13 cfs 0.319 af
Primary=3.13 cfs 0.319 af

Link EX DP B: EX Wetlands Inflow=0.82 cfs 0.156 af
Primary=0.82 cfs 0.156 af

Link EX DP C: EX Prospect St Inflow=0.13 cfs 0.023 af
Primary=0.13 cfs 0.023 af

Link EX DP D: Marsh Street CBs Inflow=1.65 cfs 0.142 af
Primary=1.65 cfs 0.142 af

Link EX DP E: Existing Stormwater BMP Inflow=0.62 cfs 0.052 af
Primary=0.62 cfs 0.052 af

Link EX DP F: Existing Drainage Network Inflow=4.21 cfs 0.350 af
Primary=4.21 cfs 0.350 af

Total Runoff Area = 8.222 ac Runoff Volume = 0.848 af Average Runoff Depth = 1.24"
79.80% Pervious = 6.561 ac 20.20% Impervious = 1.661 ac

Summary for Subcatchment EX A: EX North Lot A

Runoff = 3.13 cfs @ 12.25 hrs, Volume= 0.319 af, Depth= 2.10"
Routed to Link EX DP A : EX Park Ave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.200	98	Impervious
	0.366	32	Woods/grass comb., Good, HSG A
	1.260	79	Woods/grass comb., Good, HSG D
	1.826	72	Weighted Average
	1.626		89.05% Pervious Area
	0.200		10.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.5	85	0.0117	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
0.3	70	0.0360	3.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	120	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.6	275	Total			

Summary for Subcatchment EX B: EX North Lot B

Runoff = 0.82 cfs @ 12.43 hrs, Volume= 0.156 af, Depth= 0.49"
Routed to Link EX DP B : EX Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.500	98	Impervious
	2.783	32	Woods/grass comb., Good, HSG A
	0.511	79	Woods/grass comb., Good, HSG D
	3.794	47	Weighted Average
	3.294		86.82% Pervious Area
	0.500		13.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.1200	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
4.8	254	0.0305	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	121	0.1580	1.99		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.3	475	Total			

Summary for Subcatchment EX C: EX North Lot C

Runoff = 0.13 cfs @ 12.36 hrs, Volume= 0.023 af, Depth= 0.49"
Routed to Link EX DP C : EX Prospect St

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.129	98	Impervious
	0.433	32	Woods/grass comb., Good, HSG A
	0.000	79	Woods/grass comb., Good, HSG D
	0.562	47	Weighted Average
	0.433		77.05% Pervious Area
	0.129		22.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	71	0.0535	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	48	0.0730	1.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	35	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.8	174	Total			

Summary for Subcatchment EX D1: EX Jordan West

Runoff = 0.59 cfs @ 12.15 hrs, Volume= 0.052 af, Depth= 1.43"
Routed to Link EX DP D : Marsh Street CBs

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.167	98	Impervious
	0.214	32	Woods/grass comb., Good, HSG A
	0.054	79	Woods/grass comb., Good, HSG D
	0.000	32	Woods/grass comb., Good, HSG A
	0.435	63	Weighted Average
	0.268		61.61% Pervious Area
	0.167		38.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	32	0.0200	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
1.1	184	0.0190	2.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.7	216	Total			

Summary for Subcatchment EX D2: EX Front Yard

Runoff = 1.07 cfs @ 12.15 hrs, Volume= 0.090 af, Depth= 1.86"
Routed to Link EX DP D : Marsh Street CBs

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.112	98	Impervious
	0.167	32	Woods/grass comb., Good, HSG A
	0.303	79	Woods/grass comb., Good, HSG D
	0.000	32	Woods/grass comb., Good, HSG A
	0.582	69	Weighted Average
	0.470		80.76% Pervious Area
	0.112		19.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	48	0.0250	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
0.1	10	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.5	221	0.0440	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	54	0.0261	3.28		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.1	333	Total			

Summary for Subcatchment EX E1: EX Athletic Lot

Runoff = 0.02 cfs @ 12.49 hrs, Volume= 0.007 af, Depth= 0.28"
Routed to Link EX DP E : Existing Stormwater BMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.044	98	Impervious
	0.149	32	Woods/grass comb., Good, HSG A
	0.000	79	Woods/grass comb., Good, HSG D
	0.097	32	Woods/grass comb., Good, HSG A
	0.290	42	Weighted Average
	0.246		84.83% Pervious Area
	0.044		15.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0900	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"

Summary for Subcatchment EX E2: EX Athletic Lot

Runoff = 0.62 cfs @ 12.09 hrs, Volume= 0.045 af, Depth= 3.15"
Routed to Link EX DP E : Existing Stormwater BMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.137	98	Impervious
	0.000	32	Woods/grass comb., Good, HSG A
	0.000	79	Woods/grass comb., Good, HSG D
	0.036	32	Woods/grass comb., Good, HSG A
	0.173	84	Weighted Average
	0.036		20.81% Pervious Area
	0.137		79.19% Impervious Area

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

Summary for Subcatchment EX F: EX Upper Lot

Runoff = 2.12 cfs @ 12.09 hrs, Volume= 0.156 af, Depth= 3.35"
Routed to Link EX DP F : Existing Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.372	98	Impervious
	0.000	32	Woods/grass comb., Good, HSG A
	0.116	79	Woods/grass comb., Good, HSG D
	0.072	32	Woods/grass comb., Good, HSG A
	0.560	86	Weighted Average
	0.188		33.57% Pervious Area
	0.372		66.43% Impervious Area

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

Summary for Link EX DP A: EX Park Ave

Inflow Area = 1.826 ac, 10.95% Impervious, Inflow Depth = 2.10" for 10-yr 24-hr event
Inflow = 3.13 cfs @ 12.25 hrs, Volume= 0.319 af
Primary = 3.13 cfs @ 12.25 hrs, Volume= 0.319 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP B: EX Wetlands

Inflow Area = 3.794 ac, 13.18% Impervious, Inflow Depth = 0.49" for 10-yr 24-hr event
Inflow = 0.82 cfs @ 12.43 hrs, Volume= 0.156 af
Primary = 0.82 cfs @ 12.43 hrs, Volume= 0.156 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP C: EX Prospect St

Inflow Area = 0.562 ac, 22.95% Impervious, Inflow Depth = 0.49" for 10-yr 24-hr event
Inflow = 0.13 cfs @ 12.36 hrs, Volume= 0.023 af
Primary = 0.13 cfs @ 12.36 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP D: Marsh Street CBs

Inflow Area = 1.017 ac, 27.43% Impervious, Inflow Depth = 1.68" for 10-yr 24-hr event
Inflow = 1.65 cfs @ 12.15 hrs, Volume= 0.142 af
Primary = 1.65 cfs @ 12.15 hrs, Volume= 0.142 af, Atten= 0%, Lag= 0.0 min
Routed to Link EX DP F : Existing Drainage Network

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP E: Existing Stormwater BMP

Inflow Area = 0.463 ac, 39.09% Impervious, Inflow Depth = 1.35" for 10-yr 24-hr event
Inflow = 0.62 cfs @ 12.09 hrs, Volume= 0.052 af
Primary = 0.62 cfs @ 12.09 hrs, Volume= 0.052 af, Atten= 0%, Lag= 0.0 min
Routed to Link EX DP F : Existing Drainage Network

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP F: Existing Drainage Network

Inflow Area = 2.040 ac, 40.78% Impervious, Inflow Depth = 2.06" for 10-yr 24-hr event
Inflow = 4.21 cfs @ 12.11 hrs, Volume= 0.350 af
Primary = 4.21 cfs @ 12.11 hrs, Volume= 0.350 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentEX A: EX North Lot A Runoff Area=1.826 ac 10.95% Impervious Runoff Depth=3.13"
Flow Length=275' Tc=17.6 min CN=72 Runoff=4.73 cfs 0.477 af

SubcatchmentEX B: EX North Lot B Runoff Area=3.794 ac 13.18% Impervious Runoff Depth=1.01"
Flow Length=475' Tc=16.3 min CN=47 Runoff=2.34 cfs 0.319 af

SubcatchmentEX C: EX North Lot C Runoff Area=0.562 ac 22.95% Impervious Runoff Depth=1.01"
Flow Length=174' Tc=11.8 min CN=47 Runoff=0.39 cfs 0.047 af

SubcatchmentEX D1: EX Jordan West Runoff Area=0.435 ac 38.39% Impervious Runoff Depth=2.30"
Flow Length=216' Tc=9.7 min CN=63 Runoff=0.99 cfs 0.083 af

SubcatchmentEX D2: EX Front Yard Runoff Area=0.582 ac 19.24% Impervious Runoff Depth=2.85"
Flow Length=333' Tc=10.1 min CN=69 Runoff=1.66 cfs 0.138 af

SubcatchmentEX E1: EX Athletic Lot Runoff Area=0.290 ac 15.17% Impervious Runoff Depth=0.67"
Flow Length=100' Slope=0.0900 '/' Tc=11.7 min CN=42 Runoff=0.10 cfs 0.016 af

SubcatchmentEX E2: EX Athletic Lot Runoff Area=0.173 ac 79.19% Impervious Runoff Depth=4.36"
Tc=6.0 min CN=84 Runoff=0.85 cfs 0.063 af

SubcatchmentEX F: EX Upper Lot Runoff Area=0.560 ac 66.43% Impervious Runoff Depth=4.57"
Tc=6.0 min CN=86 Runoff=2.86 cfs 0.213 af

Link EX DP A: EX Park Ave Inflow=4.73 cfs 0.477 af
Primary=4.73 cfs 0.477 af

Link EX DP B: EX Wetlands Inflow=2.34 cfs 0.319 af
Primary=2.34 cfs 0.319 af

Link EX DP C: EX Prospect St Inflow=0.39 cfs 0.047 af
Primary=0.39 cfs 0.047 af

Link EX DP D: Marsh Street CBs Inflow=2.65 cfs 0.221 af
Primary=2.65 cfs 0.221 af

Link EX DP E: Existing Stormwater BMP Inflow=0.87 cfs 0.079 af
Primary=0.87 cfs 0.079 af

Link EX DP F: Existing Drainage Network Inflow=6.15 cfs 0.514 af
Primary=6.15 cfs 0.514 af

Total Runoff Area = 8.222 ac Runoff Volume = 1.357 af Average Runoff Depth = 1.98"
79.80% Pervious = 6.561 ac 20.20% Impervious = 1.661 ac

Summary for Subcatchment EX A: EX North Lot A

Runoff = 4.73 cfs @ 12.25 hrs, Volume= 0.477 af, Depth= 3.13"
Routed to Link EX DP A : EX Park Ave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.200	98	Impervious
	0.366	32	Woods/grass comb., Good, HSG A
	1.260	79	Woods/grass comb., Good, HSG D
	1.826	72	Weighted Average
	1.626		89.05% Pervious Area
	0.200		10.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.5	85	0.0117	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
0.3	70	0.0360	3.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	120	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.6	275	Total			

Summary for Subcatchment EX B: EX North Lot B

Runoff = 2.34 cfs @ 12.30 hrs, Volume= 0.319 af, Depth= 1.01"
Routed to Link EX DP B : EX Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.500	98	Impervious
	2.783	32	Woods/grass comb., Good, HSG A
	0.511	79	Woods/grass comb., Good, HSG D
	3.794	47	Weighted Average
	3.294		86.82% Pervious Area
	0.500		13.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.1200	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
4.8	254	0.0305	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	121	0.1580	1.99		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.3	475	Total			

Summary for Subcatchment EX C: EX North Lot C

Runoff = 0.39 cfs @ 12.21 hrs, Volume= 0.047 af, Depth= 1.01"
Routed to Link EX DP C : EX Prospect St

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.129	98	Impervious
	0.433	32	Woods/grass comb., Good, HSG A
	0.000	79	Woods/grass comb., Good, HSG D
	0.562	47	Weighted Average
	0.433		77.05% Pervious Area
	0.129		22.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	71	0.0535	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	48	0.0730	1.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	35	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.8	174	Total			

Summary for Subcatchment EX D1: EX Jordan West

Runoff = 0.99 cfs @ 12.15 hrs, Volume= 0.083 af, Depth= 2.30"
Routed to Link EX DP D : Marsh Street CBs

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.167	98	Impervious
	0.214	32	Woods/grass comb., Good, HSG A
	0.054	79	Woods/grass comb., Good, HSG D
	0.000	32	Woods/grass comb., Good, HSG A
	0.435	63	Weighted Average
	0.268		61.61% Pervious Area
	0.167		38.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	32	0.0200	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
1.1	184	0.0190	2.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.7	216	Total			

Summary for Subcatchment EX D2: EX Front Yard

Runoff = 1.66 cfs @ 12.15 hrs, Volume= 0.138 af, Depth= 2.85"
Routed to Link EX DP D : Marsh Street CBs

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.112	98	Impervious
	0.167	32	Woods/grass comb., Good, HSG A
	0.303	79	Woods/grass comb., Good, HSG D
	0.000	32	Woods/grass comb., Good, HSG A
	0.582	69	Weighted Average
	0.470		80.76% Pervious Area
	0.112		19.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	48	0.0250	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
0.1	10	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.5	221	0.0440	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	54	0.0261	3.28		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.1	333	Total			

Summary for Subcatchment EX E1: EX Athletic Lot

Runoff = 0.10 cfs @ 12.33 hrs, Volume= 0.016 af, Depth= 0.67"
Routed to Link EX DP E : Existing Stormwater BMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.044	98	Impervious
	0.149	32	Woods/grass comb., Good, HSG A
	0.000	79	Woods/grass comb., Good, HSG D
	0.097	32	Woods/grass comb., Good, HSG A
	0.290	42	Weighted Average
	0.246		84.83% Pervious Area
	0.044		15.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0900	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"

Summary for Subcatchment EX E2: EX Athletic Lot

Runoff = 0.85 cfs @ 12.09 hrs, Volume= 0.063 af, Depth= 4.36"
Routed to Link EX DP E : Existing Stormwater BMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.137	98	Impervious
	0.000	32	Woods/grass comb., Good, HSG A
	0.000	79	Woods/grass comb., Good, HSG D
	0.036	32	Woods/grass comb., Good, HSG A
	0.173	84	Weighted Average
	0.036		20.81% Pervious Area
	0.137		79.19% Impervious Area

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

Summary for Subcatchment EX F: EX Upper Lot

Runoff = 2.86 cfs @ 12.09 hrs, Volume= 0.213 af, Depth= 4.57"
Routed to Link EX DP F : Existing Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.372	98	Impervious
	0.000	32	Woods/grass comb., Good, HSG A
	0.116	79	Woods/grass comb., Good, HSG D
	0.072	32	Woods/grass comb., Good, HSG A
	0.560	86	Weighted Average
	0.188		33.57% Pervious Area
	0.372		66.43% Impervious Area

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

Summary for Link EX DP A: EX Park Ave

Inflow Area = 1.826 ac, 10.95% Impervious, Inflow Depth = 3.13" for 25-yr 24-hr event
Inflow = 4.73 cfs @ 12.25 hrs, Volume= 0.477 af
Primary = 4.73 cfs @ 12.25 hrs, Volume= 0.477 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP B: EX Wetlands

Inflow Area = 3.794 ac, 13.18% Impervious, Inflow Depth = 1.01" for 25-yr 24-hr event
Inflow = 2.34 cfs @ 12.30 hrs, Volume= 0.319 af
Primary = 2.34 cfs @ 12.30 hrs, Volume= 0.319 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP C: EX Prospect St

Inflow Area = 0.562 ac, 22.95% Impervious, Inflow Depth = 1.01" for 25-yr 24-hr event
Inflow = 0.39 cfs @ 12.21 hrs, Volume= 0.047 af
Primary = 0.39 cfs @ 12.21 hrs, Volume= 0.047 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP D: Marsh Street CBs

Inflow Area = 1.017 ac, 27.43% Impervious, Inflow Depth = 2.61" for 25-yr 24-hr event
Inflow = 2.65 cfs @ 12.15 hrs, Volume= 0.221 af
Primary = 2.65 cfs @ 12.15 hrs, Volume= 0.221 af, Atten= 0%, Lag= 0.0 min
Routed to Link EX DP F : Existing Drainage Network

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP E: Existing Stormwater BMP

Inflow Area = 0.463 ac, 39.09% Impervious, Inflow Depth = 2.05" for 25-yr 24-hr event
Inflow = 0.87 cfs @ 12.10 hrs, Volume= 0.079 af
Primary = 0.87 cfs @ 12.10 hrs, Volume= 0.079 af, Atten= 0%, Lag= 0.0 min
Routed to Link EX DP F : Existing Drainage Network

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP F: Existing Drainage Network

Inflow Area = 2.040 ac, 40.78% Impervious, Inflow Depth = 3.02" for 25-yr 24-hr event
Inflow = 6.15 cfs @ 12.11 hrs, Volume= 0.514 af
Primary = 6.15 cfs @ 12.11 hrs, Volume= 0.514 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentEX A: EX North Lot A Runoff Area=1.826 ac 10.95% Impervious Runoff Depth=5.45"
Flow Length=275' Tc=17.6 min CN=72 Runoff=8.24 cfs 0.829 af

SubcatchmentEX B: EX North Lot B Runoff Area=3.794 ac 13.18% Impervious Runoff Depth=2.43"
Flow Length=475' Tc=16.3 min CN=47 Runoff=7.12 cfs 0.769 af

SubcatchmentEX C: EX North Lot C Runoff Area=0.562 ac 22.95% Impervious Runoff Depth=2.43"
Flow Length=174' Tc=11.8 min CN=47 Runoff=1.18 cfs 0.114 af

SubcatchmentEX D1: EX Jordan West Runoff Area=0.435 ac 38.39% Impervious Runoff Depth=4.35"
Flow Length=216' Tc=9.7 min CN=63 Runoff=1.92 cfs 0.158 af

SubcatchmentEX D2: EX Front Yard Runoff Area=0.582 ac 19.24% Impervious Runoff Depth=5.08"
Flow Length=333' Tc=10.1 min CN=69 Runoff=2.99 cfs 0.246 af

SubcatchmentEX E1: EX Athletic Lot Runoff Area=0.290 ac 15.17% Impervious Runoff Depth=1.86"
Flow Length=100' Slope=0.0900 '/' Tc=11.7 min CN=42 Runoff=0.42 cfs 0.045 af

SubcatchmentEX E2: EX Athletic Lot Runoff Area=0.173 ac 79.19% Impervious Runoff Depth=6.91"
Tc=6.0 min CN=84 Runoff=1.32 cfs 0.100 af

SubcatchmentEX F: EX Upper Lot Runoff Area=0.560 ac 66.43% Impervious Runoff Depth=7.16"
Tc=6.0 min CN=86 Runoff=4.38 cfs 0.334 af

Link EX DP A: EX Park Ave Inflow=8.24 cfs 0.829 af
Primary=8.24 cfs 0.829 af

Link EX DP B: EX Wetlands Inflow=7.12 cfs 0.769 af
Primary=7.12 cfs 0.769 af

Link EX DP C: EX Prospect St Inflow=1.18 cfs 0.114 af
Primary=1.18 cfs 0.114 af

Link EX DP D: Marsh Street CBs Inflow=4.91 cfs 0.404 af
Primary=4.91 cfs 0.404 af

Link EX DP E: Existing Stormwater BMP Inflow=1.62 cfs 0.145 af
Primary=1.62 cfs 0.145 af

Link EX DP F: Existing Drainage Network Inflow=10.55 cfs 0.883 af
Primary=10.55 cfs 0.883 af

Total Runoff Area = 8.222 ac Runoff Volume = 2.595 af Average Runoff Depth = 3.79"
79.80% Pervious = 6.561 ac 20.20% Impervious = 1.661 ac

Summary for Subcatchment EX A: EX North Lot A

Runoff = 8.24 cfs @ 12.24 hrs, Volume= 0.829 af, Depth= 5.45"
Routed to Link EX DP A : EX Park Ave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.200	98	Impervious
	0.366	32	Woods/grass comb., Good, HSG A
	1.260	79	Woods/grass comb., Good, HSG D
	1.826	72	Weighted Average
	1.626		89.05% Pervious Area
	0.200		10.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.5	85	0.0117	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
0.3	70	0.0360	3.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	120	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.6	275	Total			

Summary for Subcatchment EX B: EX North Lot B

Runoff = 7.12 cfs @ 12.25 hrs, Volume= 0.769 af, Depth= 2.43"
Routed to Link EX DP B : EX Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.500	98	Impervious
	2.783	32	Woods/grass comb., Good, HSG A
	0.511	79	Woods/grass comb., Good, HSG D
	3.794	47	Weighted Average
	3.294		86.82% Pervious Area
	0.500		13.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.1200	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
4.8	254	0.0305	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	121	0.1580	1.99		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.3	475	Total			

Summary for Subcatchment EX C: EX North Lot C

Runoff = 1.18 cfs @ 12.18 hrs, Volume= 0.114 af, Depth= 2.43"
Routed to Link EX DP C : EX Prospect St

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.129	98	Impervious
	0.433	32	Woods/grass comb., Good, HSG A
	0.000	79	Woods/grass comb., Good, HSG D
	0.562	47	Weighted Average
	0.433		77.05% Pervious Area
	0.129		22.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	71	0.0535	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	48	0.0730	1.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	35	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.8	174	Total			

Summary for Subcatchment EX D1: EX Jordan West

Runoff = 1.92 cfs @ 12.14 hrs, Volume= 0.158 af, Depth= 4.35"
Routed to Link EX DP D : Marsh Street CBs

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.167	98	Impervious
	0.214	32	Woods/grass comb., Good, HSG A
	0.054	79	Woods/grass comb., Good, HSG D
	0.000	32	Woods/grass comb., Good, HSG A
	0.435	63	Weighted Average
	0.268		61.61% Pervious Area
	0.167		38.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	32	0.0200	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
1.1	184	0.0190	2.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.7	216	Total			

Summary for Subcatchment EX D2: EX Front Yard

Runoff = 2.99 cfs @ 12.15 hrs, Volume= 0.246 af, Depth= 5.08"
Routed to Link EX DP D : Marsh Street CBs

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.112	98	Impervious
	0.167	32	Woods/grass comb., Good, HSG A
	0.303	79	Woods/grass comb., Good, HSG D
	0.000	32	Woods/grass comb., Good, HSG A
	0.582	69	Weighted Average
	0.470		80.76% Pervious Area
	0.112		19.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	48	0.0250	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
0.1	10	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.5	221	0.0440	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	54	0.0261	3.28		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.1	333	Total			

Summary for Subcatchment EX E1: EX Athletic Lot

Runoff = 0.42 cfs @ 12.20 hrs, Volume= 0.045 af, Depth= 1.86"
Routed to Link EX DP E : Existing Stormwater BMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.044	98	Impervious
	0.149	32	Woods/grass comb., Good, HSG A
	0.000	79	Woods/grass comb., Good, HSG D
	0.097	32	Woods/grass comb., Good, HSG A
	0.290	42	Weighted Average
	0.246		84.83% Pervious Area
	0.044		15.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	100	0.0900	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"

Summary for Subcatchment EX E2: EX Athletic Lot

Runoff = 1.32 cfs @ 12.09 hrs, Volume= 0.100 af, Depth= 6.91"
Routed to Link EX DP E : Existing Stormwater BMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.137	98	Impervious
	0.000	32	Woods/grass comb., Good, HSG A
	0.000	79	Woods/grass comb., Good, HSG D
	0.036	32	Woods/grass comb., Good, HSG A
	0.173	84	Weighted Average
	0.036		20.81% Pervious Area
	0.137		79.19% Impervious Area

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

Summary for Subcatchment EX F: EX Upper Lot

Runoff = 4.38 cfs @ 12.09 hrs, Volume= 0.334 af, Depth= 7.16"
Routed to Link EX DP F : Existing Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.372	98	Impervious
	0.000	32	Woods/grass comb., Good, HSG A
	0.116	79	Woods/grass comb., Good, HSG D
	0.072	32	Woods/grass comb., Good, HSG A
	0.560	86	Weighted Average
	0.188		33.57% Pervious Area
	0.372		66.43% Impervious Area

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

Summary for Link EX DP A: EX Park Ave

Inflow Area = 1.826 ac, 10.95% Impervious, Inflow Depth = 5.45" for 100-yr 24-hr event
Inflow = 8.24 cfs @ 12.24 hrs, Volume= 0.829 af
Primary = 8.24 cfs @ 12.24 hrs, Volume= 0.829 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP B: EX Wetlands

Inflow Area = 3.794 ac, 13.18% Impervious, Inflow Depth = 2.43" for 100-yr 24-hr event
Inflow = 7.12 cfs @ 12.25 hrs, Volume= 0.769 af
Primary = 7.12 cfs @ 12.25 hrs, Volume= 0.769 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP C: EX Prospect St

Inflow Area = 0.562 ac, 22.95% Impervious, Inflow Depth = 2.43" for 100-yr 24-hr event
Inflow = 1.18 cfs @ 12.18 hrs, Volume= 0.114 af
Primary = 1.18 cfs @ 12.18 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP D: Marsh Street CBs

Inflow Area = 1.017 ac, 27.43% Impervious, Inflow Depth = 4.77" for 100-yr 24-hr event
Inflow = 4.91 cfs @ 12.14 hrs, Volume= 0.404 af
Primary = 4.91 cfs @ 12.14 hrs, Volume= 0.404 af, Atten= 0%, Lag= 0.0 min
Routed to Link EX DP F : Existing Drainage Network

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP E: Existing Stormwater BMP

Inflow Area = 0.463 ac, 39.09% Impervious, Inflow Depth = 3.75" for 100-yr 24-hr event
Inflow = 1.62 cfs @ 12.10 hrs, Volume= 0.145 af
Primary = 1.62 cfs @ 12.10 hrs, Volume= 0.145 af, Atten= 0%, Lag= 0.0 min
Routed to Link EX DP F : Existing Drainage Network

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link EX DP F: Existing Drainage Network

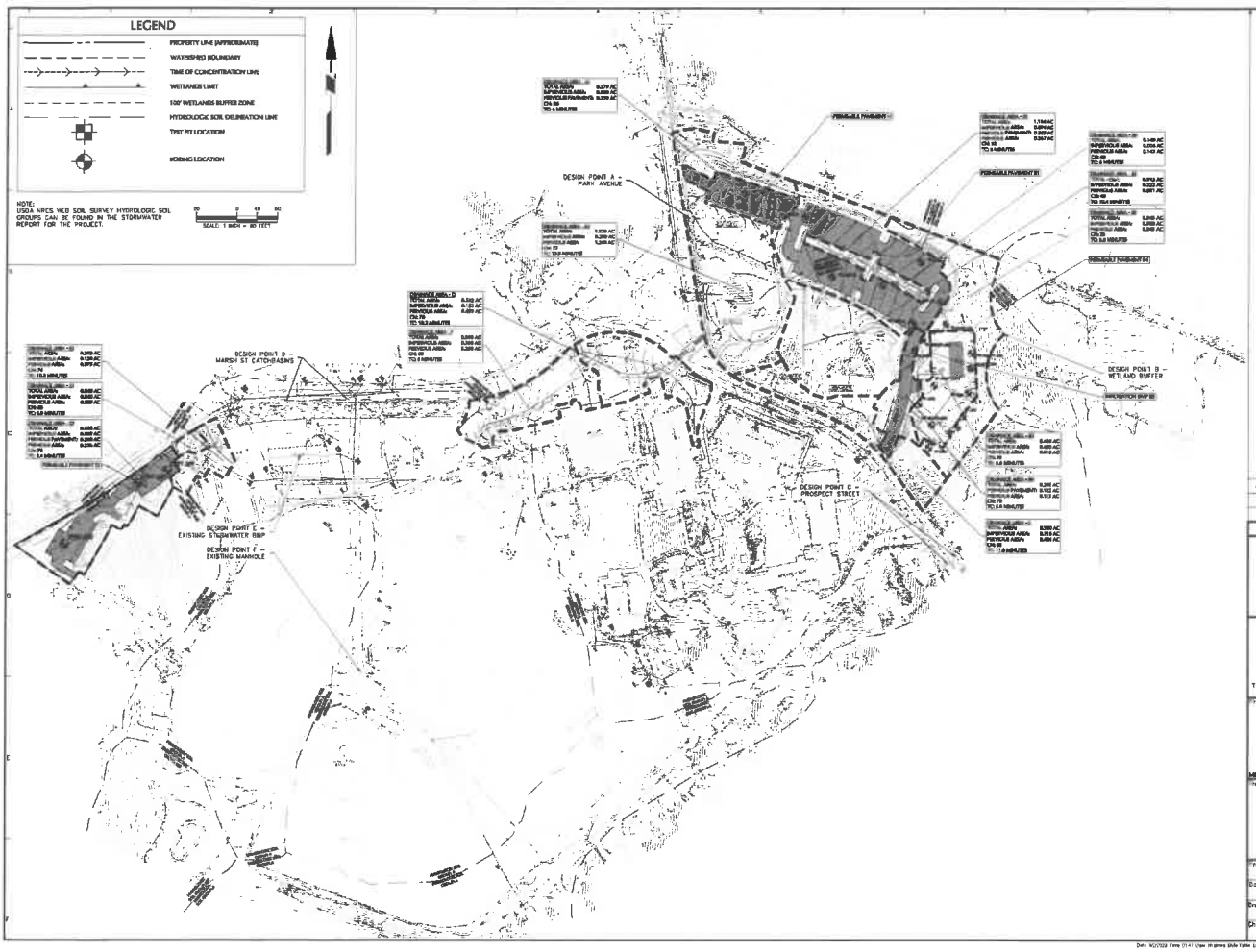
Inflow Area = 2.040 ac, 40.78% Impervious, Inflow Depth = 5.19" for 100-yr 24-hr event
Inflow = 10.55 cfs @ 12.11 hrs, Volume= 0.883 af
Primary = 10.55 cfs @ 12.11 hrs, Volume= 0.883 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

APPENDIX C

Proposed Stormwater Discharge Calculations

LANGAN



Date	Description	No.
10/03/22	Peer Review Comments	01
4/04/23	Peer Review Comments	02

Revisions

LANGAN
Langan Engineering and Environmental Services, Inc.
100 Cambridge Street, Suite 1310
Boston, MA
T: 617.924.3100 F: 617.924.3101 www.langan.com

Project
Belmont Hill School
BELMONT
MIDDLESEX COUNTY MASSACHUSETTS

Drawing Title
PROPOSED DRAINAGE AREA PLAN

Project No.	151021301
Date	06/03/2022
Drawn By	N. Holland
Checked By	N. Holland
Drawing No.	PR-WS

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	Massachusetts
Location	
Longitude	71.182 degrees West
Latitude	42.407 degrees North
Elevation	0 feet
Date/Time	Mon, 18 Oct 2021 14:04:51 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.53	0.70	0.87	1.10	**1yr**	0.75	1.04	1.28	1.63	2.08	2.67	2.91	**1yr**	2.37	2.80	3.27	3.96	4.63	**1yr**
2yr	0.35	0.54	0.67	0.88	1.11	1.40	**2yr**	0.96	1.28	1.62	2.03	2.56	3.22	3.57	**2yr**	2.85	3.43	3.93	4.67	5.33	**2yr**
5yr	0.42	0.65	0.81	1.09	1.39	1.77	**5yr**	1.20	1.61	2.06	2.59	3.25	4.07	4.54	**5yr**	3.60	4.36	4.98	5.94	6.66	**5yr**
10yr	0.47	0.74	0.93	1.27	1.65	2.12	**10yr**	1.42	1.91	2.47	3.11	3.90	4.87	5.44	**10yr**	4.31	5.23	5.97	7.13	7.89	**10yr**
25yr	0.56	0.89	1.13	1.56	2.07	2.67	**25yr**	1.78	2.40	3.13	3.96	4.96	6.17	6.93	**25yr**	5.46	6.67	7.57	9.07	9.87	**25yr**
50yr	0.63	1.01	1.30	1.82	2.46	3.22	**50yr**	2.12	2.85	3.78	4.78	5.97	7.39	8.33	**50yr**	6.54	8.01	9.07	10.89	11.71	**50yr**
100yr	0.72	1.17	1.51	2.14	2.92	3.85	**100yr**	2.52	3.39	4.53	5.74	7.17	8.85	10.01	**100yr**	7.84	9.63	10.88	13.08	13.89	**100yr**
200yr	0.83	1.36	1.76	2.52	3.48	4.61	**200yr**	3.00	4.04	5.43	6.89	8.60	10.61	12.04	**200yr**	9.39	11.58	13.04	15.71	16.48	**200yr**
500yr	1.01	1.66	2.16	3.14	4.39	5.85	**500yr**	3.79	5.08	6.91	8.78	10.95	13.49	15.38	**500yr**	11.94	14.79	16.59	20.04	20.68	**500yr**

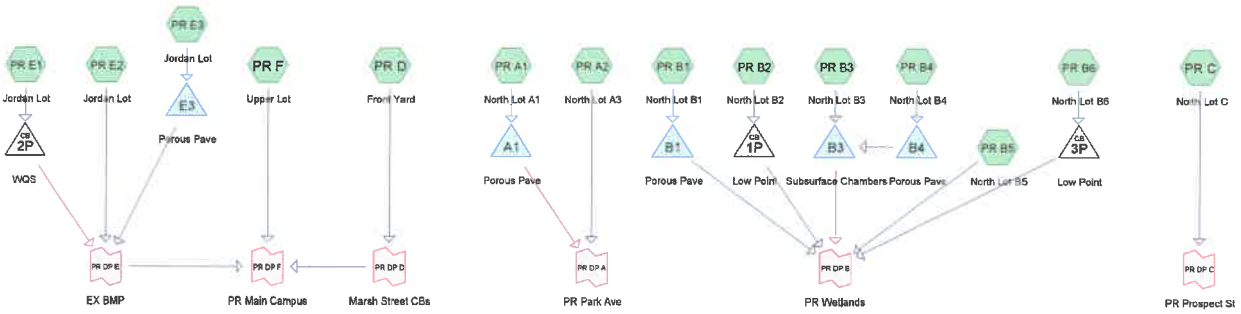
Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.24	0.38	0.46	0.62	0.76	0.84	**1yr**	0.65	0.82	1.14	1.44	1.77	2.43	2.50	**1yr**	2.15	2.40	2.91	3.51	4.09	**1yr**
2yr	0.33	0.51	0.63	0.85	1.05	1.26	**2yr**	0.91	1.23	1.44	1.91	2.47	3.11	3.44	**2yr**	2.75	3.31	3.80	4.51	5.16	**2yr**
5yr	0.39	0.60	0.75	1.02	1.30	1.50	**5yr**	1.12	1.47	1.73	2.24	2.88	3.74	4.16	**5yr**	3.31	4.00	4.57	5.44	6.13	**5yr**
10yr	0.44	0.67	0.83	1.16	1.50	1.72	**10yr**	1.29	1.68	1.94	2.53	3.24	4.32	4.79	**10yr**	3.82	4.61	5.24	6.25	6.97	**10yr**
25yr	0.50	0.77	0.95	1.36	1.79	2.04	**25yr**	1.54	1.99	2.29	2.96	3.78	5.19	5.77	**25yr**	4.60	5.54	6.30	7.48	8.24	**25yr**
50yr	0.56	0.85	1.06	1.52	2.05	2.33	**50yr**	1.77	2.28	2.58	3.35	4.25	5.96	6.62	**50yr**	5.27	6.37	7.21	8.54	9.35	**50yr**
100yr	0.62	0.94	1.18	1.71	2.34	2.65	**100yr**	2.02	2.60	2.92	3.57	4.77	6.86	7.59	**100yr**	6.07	7.30	8.28	9.72	10.61	**100yr**
200yr	0.70	1.05	1.34	1.93	2.70	3.03	**200yr**	2.33	2.96	3.31	3.98	5.38	7.89	8.70	**200yr**	6.98	8.36	9.49	11.04	12.01	**200yr**
500yr	0.82	1.22	1.57	2.28	3.24	3.61	**500yr**	2.80	3.53	3.90	4.61	6.32	9.48	10.38	**500yr**	8.39	9.98	11.37	13.02	14.14	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.31	0.48	0.59	0.79	0.97	1.14	**1yr**	0.84	1.11	1.33	1.77	2.25	2.85	3.14	**1yr**	2.53	3.02	3.50	4.27	5.01	**1yr**
2yr	0.36	0.56	0.69	0.94	1.16	1.36	**2yr**	1.00	1.33	1.57	2.07	2.68	3.33	3.72	**2yr**	2.95	3.57	4.09	4.86	5.53	**2yr**
5yr	0.45	0.70	0.86	1.18	1.51	1.79	**5yr**	1.30	1.75	2.05	2.65	3.37	4.42	4.97	**5yr**	3.91	4.78	5.41	6.46	7.19	**5yr**
10yr	0.55	0.84	1.04	1.45	1.88	2.21	**10yr**	1.62	2.16	2.56	3.21	4.05	5.48	6.22	**10yr**	4.85	5.98	6.70	8.04	8.80	**10yr**
25yr	0.71	1.08	1.34	1.92	2.52	2.90	**25yr**	2.18	2.84	3.40	4.14	5.15	7.28	8.39	**25yr**	6.44	8.07	8.90	10.75	11.51	**25yr**
50yr	0.86	1.31	1.63	2.34	3.15	3.59	**50yr**	2.72	3.51	4.21	5.03	6.19	9.03	10.53	**50yr**	7.99	10.13	11.02	13.43	14.12	**50yr**
100yr	1.05	1.59	1.99	2.87	3.93	4.43	**100yr**	3.40	4.33	5.23	6.42	7.43	11.21	13.23	**100yr**	9.92	12.72	13.66	16.80	17.34	**100yr**
200yr	1.28	1.92	2.43	3.52	4.91	5.47	**200yr**	4.24	5.35	6.50	7.85	8.91	13.94	16.64	**200yr**	12.34	16.00	16.95	21.02	21.32	**200yr**
500yr	1.66	2.47	3.18	4.62	6.57	7.22	**500yr**	5.67	7.06	8.68	10.26	11.35	18.59	22.56	**500yr**	16.45	21.70	22.54	28.34	28.05	**500yr**

Powered by ACIS
Northeast Regional Climate Center



Subcat Reach Pond Link

Routing Diagram for Belmont Hill School - Proposed Conditions
Prepared by Langan Engineering, Printed 3/2/2023
HydroCAD® 10.20-2f s/n 08223 © 2022 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.808	98	Impervious (PR A1, PR A2, PR B1, PR B2, PR B3, PR B6, PR C, PR D, PR E1, PR E2, PR F)
1.562	98	Permeable Pavement (PR A1, PR B1, PR B4, PR E3)
0.092	98	Roof (PR E3)
3.018	32	Woods/grass comb., Good, HSG A (PR A2, PR B1, PR B2, PR B3, PR B4, PR B5, PR B6, PR C, PR D, PR E1, PR E2, PR E3, PR F)
1.742	79	Woods/grass comb., Good, HSG D (PR A2, PR B1, PR B5, PR B6, PR D, PR E3, PR F)
8.222	**70**	**TOTAL AREA**

Time span=0.00-100.00 hrs, dt=0.05 hrs, 2001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentPR A1: North Lot A1 Runoff Area=0.279 ac 100.00% Impervious Runoff Depth=2.99"
Tc=6.0 min CN=98 Runoff=0.85 cfs 0.069 af

SubcatchmentPR A2: North Lot A3 Runoff Area=1.529 ac 17.59% Impervious Runoff Depth=1.00"
Flow Length=230' Tc=13.9 min CN=73 Runoff=1.29 cfs 0.127 af

SubcatchmentPR B1: North Lot B1 Runoff Area=1.194 ac 77.64% Impervious Runoff Depth=2.37"
Tc=6.0 min CN=92 Runoff=3.17 cfs 0.236 af

SubcatchmentPR B2: North Lot B2 Runoff Area=0.913 ac 24.32% Impervious Runoff Depth=0.09"
Flow Length=160' Tc=10.4 min CN=48 Runoff=0.01 cfs 0.007 af

SubcatchmentPR B3: North Lot B3 Runoff Area=0.468 ac 96.15% Impervious Runoff Depth=2.66"
Tc=6.0 min CN=95 Runoff=1.35 cfs 0.104 af

SubcatchmentPR B4: North Lot B4 Runoff Area=0.265 ac 57.36% Impervious Runoff Depth=0.84"
Tc=6.0 min CN=70 Runoff=0.23 cfs 0.019 af

SubcatchmentPR B5: North Lot B5 Runoff Area=0.845 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=230' Tc=8.8 min CN=35 Runoff=0.00 cfs 0.000 af

SubcatchmentPR B6: North Lot B6 Runoff Area=0.149 ac 4.03% Impervious Runoff Depth=0.11"
Tc=6.0 min CN=49 Runoff=0.00 cfs 0.001 af

SubcatchmentPR C: North Lot C Runoff Area=0.540 ac 21.48% Impervious Runoff Depth=0.06"
Flow Length=171' Tc=11.8 min CN=46 Runoff=0.00 cfs 0.003 af

SubcatchmentPR D: Front Yard Runoff Area=0.582 ac 21.13% Impervious Runoff Depth=0.84"
Flow Length=328' Tc=10.2 min CN=70 Runoff=0.44 cfs 0.041 af

SubcatchmentPR E1: Jordan Lot Runoff Area=0.049 ac 81.63% Impervious Runoff Depth=1.85"
Tc=6.0 min CN=86 Runoff=0.10 cfs 0.008 af

SubcatchmentPR E2: Jordan Lot Runoff Area=0.203 ac 63.05% Impervious Runoff Depth=1.05"
Flow Length=100' Tc=10.8 min CN=74 Runoff=0.20 cfs 0.018 af

SubcatchmentPR E3: Jordan Lot Runoff Area=0.646 ac 60.37% Impervious Runoff Depth=1.17"
Flow Length=177' Tc=9.4 min CN=76 Runoff=0.75 cfs 0.063 af

SubcatchmentPR F: Upper Lot Runoff Area=0.560 ac 64.29% Impervious Runoff Depth=1.77"
Tc=6.0 min CN=85 Runoff=1.14 cfs 0.083 af

Pond 1P: Low Point Peak Elev=264.51' Inflow=0.01 cfs 0.007 af
Outflow=0.01 cfs 0.007 af

Pond 2P: WQS Peak Elev=249.16' Inflow=0.10 cfs 0.008 af
Outflow=0.10 cfs 0.008 af

Pond 3P: Low Point Peak Elev=264.50' Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Pond A1: Porous Pave Peak Elev=0.21' Storage=723 cf Inflow=0.85 cfs 0.069 af
Discarded=0.17 cfs 0.070 af Primary=0.00 cfs 0.000 af Outflow=0.17 cfs 0.070 af

Pond B1: Porous Pave Peak Elev=0.31' Storage=3,468 cf Inflow=3.17 cfs 0.236 af
Outflow=0.39 cfs 0.236 af

Pond B3: Subsurface Chambers Peak Elev=259.65' Storage=2,472 cf Inflow=1.35 cfs 0.104 af
Discarded=0.06 cfs 0.104 af Primary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.104 af

Pond B4: Porous Pave Peak Elev=0.03' Storage=54 cf Inflow=0.23 cfs 0.019 af
Outflow=0.12 cfs 0.019 af

Pond E3: Porous Pave Peak Elev=0.30' Storage=1,174 cf Inflow=0.75 cfs 0.063 af
Discarded=0.06 cfs 0.063 af Primary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.063 af

Link PR DP A: PR Park Ave Inflow=1.29 cfs 0.127 af
Primary=1.29 cfs 0.127 af

Link PR DP B: PR Wetlands Inflow=0.01 cfs 0.008 af
Primary=0.01 cfs 0.008 af

Link PR DP C: PR Prospect St Inflow=0.00 cfs 0.003 af
Primary=0.00 cfs 0.003 af

Link PR DP D: Marsh Street CBs Inflow=0.44 cfs 0.041 af
Primary=0.44 cfs 0.041 af

Link PR DP E: EX BMP Inflow=0.28 cfs 0.025 af
Primary=0.28 cfs 0.025 af

Link PR DP F: PR Main Campus Inflow=1.79 cfs 0.149 af
Primary=1.79 cfs 0.149 af

Total Runoff Area = 8.222 ac Runoff Volume = 0.777 af Average Runoff Depth = 1.13"
57.89% Pervious = 4.760 ac 42.11% Impervious = 3.462 ac

Summary for Subcatchment PR A1: North Lot A1

Runoff = 0.85 cfs @ 12.09 hrs, Volume= 0.069 af, Depth= 2.99"
Routed to Pond A1 : Porous Pave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.259	98	Permeable Pavement
*	0.020	98	Impervious
	0.279	98	Weighted Average
	0.279		100.00% Impervious Area

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

Summary for Subcatchment PR A2: North Lot A3

Runoff = 1.29 cfs @ 12.21 hrs, Volume= 0.127 af, Depth= 1.00"
Routed to Link PR DP A : PR Park Ave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.269	98	Impervious
	0.316	32	Woods/grass comb., Good, HSG A
	0.944	79	Woods/grass comb., Good, HSG D
	1.529	73	Weighted Average
	1.260		82.41% Pervious Area
	0.269		17.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	100	0.0320	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
2.0	120	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.9	230	Total			

Summary for Subcatchment PR B1: North Lot B1

Runoff = 3.17 cfs @ 12.09 hrs, Volume= 0.236 af, Depth= 2.37"
Routed to Pond B1 : Porous Pave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.074	98	Impervious
*	0.853	98	Permeable Pavement
	0.051	32	Woods/grass comb., Good, HSG A
	0.216	79	Woods/grass comb., Good, HSG D
	1.194	92	Weighted Average
	0.267		22.36% Pervious Area
	0.927		77.64% Impervious Area

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

Summary for Subcatchment PR B2: North Lot B2

Runoff = 0.01 cfs @ 13.88 hrs, Volume= 0.007 af, Depth= 0.09"
Routed to Pond 1P : Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.222	98	Impervious
	0.691	32	Woods/grass comb., Good, HSG A
	0.000	79	Woods/grass comb., Good, HSG D
	0.913	48	Weighted Average
	0.691		75.68% Pervious Area
	0.222		24.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0550	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
0.9	60	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.4	160	Total			

Summary for Subcatchment PR B3: North Lot B3

Runoff = 1.35 cfs @ 12.09 hrs, Volume= 0.104 af, Depth= 2.66"
Routed to Pond B3 : Subsurface Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.450	98	Impervious
	0.018	32	Woods/grass comb., Good, HSG A
	0.468	95	Weighted Average
	0.018		3.85% Pervious Area
	0.450		96.15% Impervious Area

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

Summary for Subcatchment PR B4: North Lot B4

Runoff = 0.23 cfs @ 12.10 hrs, Volume= 0.019 af, Depth= 0.84"
Routed to Pond B4 : Porous Pave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.152	98	Permeable Pavement
	0.113	32	Woods/grass comb., Good, HSG A
	0.265	70	Weighted Average
	0.113		42.64% Pervious Area
	0.152		57.36% Impervious Area

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

Summary for Subcatchment PR B5: North Lot B5

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link PR DP B : PR Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

Area (ac)	CN	Description
0.787	32	Woods/grass comb., Good, HSG A
0.058	79	Woods/grass comb., Good, HSG D
0.845	35	Weighted Average
0.845		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
1.7	180	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.8	230	Total			

Summary for Subcatchment PR B6: North Lot B6

Runoff = 0.00 cfs @ 13.64 hrs, Volume= 0.001 af, Depth= 0.11"
Routed to Pond 3P : Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.006	98	Impervious
	0.096	32	Woods/grass comb., Good, HSG A
	0.047	79	Woods/grass comb., Good, HSG D
	0.149	49	Weighted Average
	0.143		95.97% Pervious Area
	0.006		4.03% Impervious Area

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

Summary for Subcatchment PR C: North Lot C

Runoff = 0.00 cfs @ 15.10 hrs, Volume= 0.003 af, Depth= 0.06"
Routed to Link PR DP C : PR Prospect St

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.116	98	Impervious
	0.424	32	Woods/grass comb., Good, HSG A
	0.540	46	Weighted Average
	0.424		78.52% Pervious Area
	0.116		21.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	71	0.0535	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	50	0.0730	1.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	30	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.8	171	Total			

Summary for Subcatchment PR D: Front Yard

Runoff = 0.44 cfs @ 12.16 hrs, Volume= 0.041 af, Depth= 0.84"
Routed to Link PR DP D : Marsh Street CBs

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.123	98	Impervious
	0.167	32	Woods/grass comb., Good, HSG A
	0.292	79	Woods/grass comb., Good, HSG D
	0.582	70	Weighted Average
	0.459		78.87% Pervious Area
	0.123		21.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	48	0.0250	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
0.1	10	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	75	0.0267	1.14		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.4	120	0.0440	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	55	0.0261	3.28		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.2	328	Total			

Summary for Subcatchment PR E1: Jordan Lot

Runoff = 0.10 cfs @ 12.09 hrs, Volume= 0.008 af, Depth= 1.85"
Routed to Pond 2P : WQS

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.040	98	Impervious
	0.009	32	Woods/grass comb., Good, HSG A
	0.049	86	Weighted Average
	0.009		18.37% Pervious Area
	0.040		81.63% Impervious Area

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

Summary for Subcatchment PR E2: Jordan Lot

Runoff = 0.20 cfs @ 12.16 hrs, Volume= 0.018 af, Depth= 1.05"
Routed to Link PR DP E : EX BMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.128	98	Impervious
	0.075	32	Woods/grass comb., Good, HSG A
	0.203	74	Weighted Average
	0.075		36.95% Pervious Area
	0.128		63.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	55	0.0360	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
0.3	45	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.8	100	Total			

Summary for Subcatchment PR E3: Jordan Lot

Runoff = 0.75 cfs @ 12.14 hrs, Volume= 0.063 af, Depth= 1.17"
Routed to Pond E3 : Porous Pave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.298	98	Permeable Pavement
	0.202	32	Woods/grass comb., Good, HSG A
	0.054	79	Woods/grass comb., Good, HSG D
*	0.092	98	Roof
	0.646	76	Weighted Average
	0.256		39.63% Pervious Area
	0.390		60.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	55	0.0550	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
0.5	122	0.0450	4.31		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.4	177	Total			

Summary for Subcatchment PR F: Upper Lot

Runoff = 1.14 cfs @ 12.09 hrs, Volume= 0.083 af, Depth= 1.77"
Routed to Link PR DP F : PR Main Campus

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr 24-hr Rainfall=3.22"

	Area (ac)	CN	Description
*	0.360	98	Impervious
	0.131	79	Woods/grass comb., Good, HSG D
	0.069	32	Woods/grass comb., Good, HSG A
	0.560	85	Weighted Average
	0.200		35.71% Pervious Area
	0.360		64.29% Impervious Area

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

Summary for Pond 1P: Low Point

[57] Hint: Peaked at 264.51' (Flood elevation advised)

Inflow Area = 0.913 ac, 24.32% Impervious, Inflow Depth = 0.09" for 2-yr 24-hr event
Inflow = 0.01 cfs @ 13.88 hrs, Volume= 0.007 af
Outflow = 0.01 cfs @ 13.88 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.1 min
Primary = 0.01 cfs @ 13.88 hrs, Volume= 0.007 af
Routed to Link PR DP B : PR Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Peak Elev= 264.51' @ 13.88 hrs

Device	Routing	Invert	Outlet Devices
#1	Device 2	264.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	260.00'	**12.0" Round Culvert** L= 132.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.00' / 258.50' S= 0.0114 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.01 cfs @ 13.88 hrs HW=264.51' TW=0.00' (Dynamic Tailwater)
↑—**2=Culvert** (Passes 0.01 cfs of 5.94 cfs potential flow)
↑—**1=Orifice/Grate** (Weir Controls 0.01 cfs @ 0.27 fps)

Summary for Pond 2P: WQS

[57] Hint: Peaked at 249.16' (Flood elevation advised)

Inflow Area = 0.049 ac, 81.63% Impervious, Inflow Depth = 1.85" for 2-yr 24-hr event
Inflow = 0.10 cfs @ 12.09 hrs, Volume= 0.008 af
Outflow = 0.10 cfs @ 12.09 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min
Primary = 0.10 cfs @ 12.09 hrs, Volume= 0.008 af
Routed to Link PR DP E : EX BMP

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 249.16' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	249.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.10 cfs @ 12.09 hrs HW=249.15' TW=0.00' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Orifice Controls 0.10 cfs @ 1.34 fps)

Summary for Pond 3P: Low Point

[57] Hint: Peaked at 264.50' (Flood elevation advised)

Inflow Area = 0.149 ac, 4.03% Impervious, Inflow Depth = 0.11" for 2-yr 24-hr event
Inflow = 0.00 cfs @ 13.64 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 13.63 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 13.63 hrs, Volume= 0.001 af
Routed to Link PR DP B : PR Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 264.50' @ 13.63 hrs

Device	Routing	Invert	Outlet Devices
#1	Device 2	264.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	260.00'	**12.0" Round Culvert**

L= 132.0' CMP, square edge headwall, Ke= 0.500
Inlet / Outlet Invert= 260.00' / 258.50' S= 0.0114 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 13.63 hrs HW=264.50' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.00 cfs of 5.93 cfs potential flow)
└─**1=Orifice/Grate** (Weir Controls 0.00 cfs @ 0.16 fps)

Summary for Pond A1: Porous Pave

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=94)

Inflow Area = 0.279 ac,100.00% Impervious, Inflow Depth = 2.99" for 2-yr 24-hr event
Inflow = 0.85 cfs @ 12.09 hrs, Volume= 0.069 af
Outflow = 0.17 cfs @ 12.51 hrs, Volume= 0.070 af, Atten= 80%, Lag= 25.6 min
Discarded = 0.17 cfs @ 12.51 hrs, Volume= 0.070 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link PR DP A : PR Park Ave

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 0.21' @ 12.51 hrs Surf.Area= 11,290 sf Storage= 723 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 22.5 min (778.8 - 756.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	6,774 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 22,580 cf Overall x 30.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	11,290	0	0
2.00	11,290	22,580	22,580

Device	Routing	Invert	Outlet Devices
#0	Primary	2.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	0.00'	**0.588 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = -2.00'

Discarded OutFlow Max=0.17 cfs @ 12.51 hrs HW=0.21' (Free Discharge)
└─**1=Exfiltration** (Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Dynamic Tailwater)

Summary for Pond B1: Porous Pave

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=67)

Inflow Area = 1.194 ac, 77.64% Impervious, Inflow Depth = 2.37" for 2-yr 24-hr event
Inflow = 3.17 cfs @ 12.09 hrs, Volume= 0.236 af
Outflow = 0.39 cfs @ 12.71 hrs, Volume= 0.236 af, Atten= 88%, Lag= 37.1 min
Discarded = 0.39 cfs @ 12.71 hrs, Volume= 0.236 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 0.31' @ 12.71 hrs Surf.Area= 37,140 sf Storage= 3,468 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 65.9 min (863.5 - 797.5)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	22,284 cf	**Gravel Reservoir (Prismatic)** Listed below (Recalc) 74,280 cf Overall x 30.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	37,140	0	0
2.00	37,140	74,280	74,280

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**0.391 in/hr Exfiltration - TP8 over Surface area** Conductivity to Groundwater Elevation = -2.00'

Discarded OutFlow Max=0.39 cfs @ 12.71 hrs HW=0.31' (Free Discharge)
↑—**1=Exfiltration - TP8** (Controls 0.39 cfs)

Summary for Pond B3: Subsurface Chambers

Inflow Area = 0.733 ac, 82.13% Impervious, Inflow Depth = 1.70" for 2-yr 24-hr event
Inflow = 1.35 cfs @ 12.09 hrs, Volume= 0.104 af
Outflow = 0.06 cfs @ 14.99 hrs, Volume= 0.104 af, Atten= 96%, Lag= 174.4 min
Discarded = 0.06 cfs @ 14.99 hrs, Volume= 0.104 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link PR DP B : PR Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 259.65' @ 14.99 hrs Surf.Area= 1,990 sf Storage= 2,472 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 433.6 min (1,214.4 - 780.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	258.00'	1,403 cf	**27.62'W x 72.03'L x 3.56'H Field A** 7,091 cf Overall - 3,585 cf Embedded = 3,506 cf x 40.0% Voids
#2A	258.33'	3,406 cf	**ACF R-Tank SD 3** x 522 Inside #1 Inside= 15.7"W x 26.8"H => 2.78 sf x 2.35'L = 6.5 cf Outside= 15.7"W x 26.8"H => 2.93 sf x 2.35'L = 6.9 cf 522 Chambers in 18 Rows
		4,808 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	258.08'	**12.0" Round Outlet Pipe** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 258.08' / 257.29' S= 0.0255 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	259.90'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.40 0.40 1.60 Width (feet) 1.50 1.50 4.00 4.00
#3	Discarded	258.00'	**0.800 in/hr Exfiltration - TP3 over Surface area** Conductivity to Groundwater Elevation = 255.00'

Discarded OutFlow Max=0.06 cfs @ 14.99 hrs HW=259.65' (Free Discharge)
└**3=Exfiltration - TP3** (Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=258.00' TW=0.00' (Dynamic Tailwater)
└**1=Outlet Pipe** (Controls 0.00 cfs)
└**2=Custom Weir/Orifice** (Controls 0.00 cfs)

Summary for Pond B4: Porous Pave

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=113)

Inflow Area = 0.265 ac, 57.36% Impervious, Inflow Depth = 0.84" for 2-yr 24-hr event
Inflow = 0.23 cfs @ 12.10 hrs, Volume= 0.019 af
Outflow = 0.12 cfs @ 12.31 hrs, Volume= 0.019 af, Atten= 46%, Lag= 12.1 min
Discarded = 0.12 cfs @ 12.31 hrs, Volume= 0.019 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 0.03' @ 12.31 hrs Surf.Area= 6,600 sf Storage= 54 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.6 min (876.9 - 875.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	3,960 cf	**Gravel Reservoir (Prismatic)** Listed below (Recalc) 13,200 cf Overall x 30.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	6,600	0	0
2.00	6,600	13,200	13,200

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**0.800 in/hr Exfiltration - TP8 over Surface area** Conductivity to Groundwater Elevation = -2.00'

Discarded OutFlow Max=0.12 cfs @ 12.31 hrs HW=0.03' (Free Discharge)
↑—**1=Exfiltration - TP8** (Controls 0.12 cfs)

Summary for Pond E3: Porous Pave

Inflow Area = 0.646 ac, 60.37% Impervious, Inflow Depth = 1.17" for 2-yr 24-hr event
Inflow = 0.75 cfs @ 12.14 hrs, Volume= 0.063 af
Outflow = 0.06 cfs @ 14.28 hrs, Volume= 0.063 af, Atten= 92%, Lag= 127.9 min
Discarded = 0.06 cfs @ 14.28 hrs, Volume= 0.063 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link PR DP E : EX BMP

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 0.30' @ 14.28 hrs Surf.Area= 13,000 sf Storage= 1,174 cf

Plug-Flow detention time= 197.7 min calculated for 0.063 af (100% of inflow)
Center-of-Mass det. time= 197.7 min (1,056.1 - 858.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	11,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 39,000 cf Overall x 30.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	13,000	0	0
3.00	13,000	39,000	39,000

Device	Routing	Invert	Outlet Devices
#0	Primary	3.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	0.00'	**0.180 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = -2.00'

Discarded OutFlow Max=0.06 cfs @ 14.28 hrs HW=0.30' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Dynamic Tailwater)

Summary for Link PR DP A: PR Park Ave

Inflow Area = 1.808 ac, 30.31% Impervious, Inflow Depth = 0.84" for 2-yr 24-hr event
Inflow = 1.29 cfs @ 12.21 hrs, Volume= 0.127 af
Primary = 1.29 cfs @ 12.21 hrs, Volume= 0.127 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP B: PR Wetlands

Inflow Area = 3.834 ac, 45.83% Impervious, Inflow Depth = 0.03" for 2-yr 24-hr event
Inflow = 0.01 cfs @ 13.84 hrs, Volume= 0.008 af
Primary = 0.01 cfs @ 13.84 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP C: PR Prospect St

Inflow Area = 0.540 ac, 21.48% Impervious, Inflow Depth = 0.06" for 2-yr 24-hr event
Inflow = 0.00 cfs @ 15.10 hrs, Volume= 0.003 af
Primary = 0.00 cfs @ 15.10 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP D: Marsh Street CBs

Inflow Area = 0.582 ac, 21.13% Impervious, Inflow Depth = 0.84" for 2-yr 24-hr event
Inflow = 0.44 cfs @ 12.16 hrs, Volume= 0.041 af
Primary = 0.44 cfs @ 12.16 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min
Routed to Link PR DP F : PR Main Campus

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP E: EX BMP

Inflow Area = 0.898 ac, 62.14% Impervious, Inflow Depth = 0.34" for 2-yr 24-hr event
Inflow = 0.28 cfs @ 12.14 hrs, Volume= 0.025 af
Primary = 0.28 cfs @ 12.14 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min
Routed to Link PR DP F : PR Main Campus

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP F: PR Main Campus

Inflow Area = 2.040 ac, 51.03% Impervious, Inflow Depth = 0.88" for 2-yr 24-hr event
Inflow = 1.79 cfs @ 12.11 hrs, Volume= 0.149 af
Primary = 1.79 cfs @ 12.11 hrs, Volume= 0.149 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Time span=0.00-100.00 hrs, dt=0.05 hrs, 2001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentPR A1: North Lot A1 Runoff Area=0.279 ac 100.00% Impervious Runoff Depth=4.63"
Tc=6.0 min CN=98 Runoff=1.30 cfs 0.108 af

SubcatchmentPR A2: North Lot A3 Runoff Area=1.529 ac 17.59% Impervious Runoff Depth=2.18"
Flow Length=230' Tc=13.9 min CN=73 Runoff=2.99 cfs 0.278 af

SubcatchmentPR B1: North Lot B1 Runoff Area=1.194 ac 77.64% Impervious Runoff Depth=3.96"
Tc=6.0 min CN=92 Runoff=5.15 cfs 0.394 af

SubcatchmentPR B2: North Lot B2 Runoff Area=0.913 ac 24.32% Impervious Runoff Depth=0.54"
Flow Length=160' Tc=10.4 min CN=48 Runoff=0.25 cfs 0.041 af

SubcatchmentPR B3: North Lot B3 Runoff Area=0.468 ac 96.15% Impervious Runoff Depth=4.29"
Tc=6.0 min CN=95 Runoff=2.12 cfs 0.167 af

SubcatchmentPR B4: North Lot B4 Runoff Area=0.265 ac 57.36% Impervious Runoff Depth=1.94"
Tc=6.0 min CN=70 Runoff=0.58 cfs 0.043 af

SubcatchmentPR B5: North Lot B5 Runoff Area=0.845 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=230' Tc=8.8 min CN=35 Runoff=0.01 cfs 0.005 af

SubcatchmentPR B6: North Lot B6 Runoff Area=0.149 ac 4.03% Impervious Runoff Depth=0.59"
Tc=6.0 min CN=49 Runoff=0.05 cfs 0.007 af

SubcatchmentPR C: North Lot C Runoff Area=0.540 ac 21.48% Impervious Runoff Depth=0.45"
Flow Length=171' Tc=11.8 min CN=46 Runoff=0.10 cfs 0.020 af

SubcatchmentPR D: Front Yard Runoff Area=0.582 ac 21.13% Impervious Runoff Depth=1.94"
Flow Length=328' Tc=10.2 min CN=70 Runoff=1.11 cfs 0.094 af

SubcatchmentPR E1: Jordan Lot Runoff Area=0.049 ac 81.63% Impervious Runoff Depth=3.35"
Tc=6.0 min CN=86 Runoff=0.19 cfs 0.014 af

SubcatchmentPR E2: Jordan Lot Runoff Area=0.203 ac 63.05% Impervious Runoff Depth=2.26"
Flow Length=100' Tc=10.8 min CN=74 Runoff=0.45 cfs 0.038 af

SubcatchmentPR E3: Jordan Lot Runoff Area=0.646 ac 60.37% Impervious Runoff Depth=2.43"
Flow Length=177' Tc=9.4 min CN=76 Runoff=1.61 cfs 0.131 af

SubcatchmentPR F: Upper Lot Runoff Area=0.560 ac 64.29% Impervious Runoff Depth=3.25"
Tc=6.0 min CN=85 Runoff=2.07 cfs 0.152 af

Pond 1P: Low Point Peak Elev=264.55' Inflow=0.25 cfs 0.041 af
Outflow=0.25 cfs 0.041 af

Pond 2P: WQS Peak Elev=249.21' Inflow=0.19 cfs 0.014 af
Outflow=0.19 cfs 0.014 af

Pond 3P: Low Point Peak Elev=264.52' Inflow=0.05 cfs 0.007 af
Outflow=0.05 cfs 0.007 af

Pond A1: Porous Pave Peak Elev=0.40' Storage=1,365 cf Inflow=1.30 cfs 0.108 af
Discarded=0.18 cfs 0.108 af Primary=0.00 cfs 0.000 af Outflow=0.18 cfs 0.108 af

Pond B1: Porous Pave Peak Elev=0.61' Storage=6,806 cf Inflow=5.15 cfs 0.394 af
Outflow=0.44 cfs 0.395 af

Pond B3: Subsurface Chambers Peak Elev=260.13' Storage=3,282 cf Inflow=2.12 cfs 0.167 af
Discarded=0.06 cfs 0.130 af Primary=0.54 cfs 0.037 af Outflow=0.60 cfs 0.167 af

Pond B4: Porous Pave Peak Elev=0.22' Storage=429 cf Inflow=0.58 cfs 0.043 af
Outflow=0.14 cfs 0.043 af

Pond E3: Porous Pave Peak Elev=0.81' Storage=3,178 cf Inflow=1.61 cfs 0.131 af
Discarded=0.08 cfs 0.131 af Primary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.131 af

Link PR DP A: PR Park Ave Inflow=2.99 cfs 0.278 af
Primary=2.99 cfs 0.278 af

Link PR DP B: PR Wetlands Inflow=0.81 cfs 0.091 af
Primary=0.81 cfs 0.091 af

Link PR DP C: PR Prospect St Inflow=0.10 cfs 0.020 af
Primary=0.10 cfs 0.020 af

Link PR DP D: Marsh Street CBs Inflow=1.11 cfs 0.094 af
Primary=1.11 cfs 0.094 af

Link PR DP E: EX BMP Inflow=0.60 cfs 0.052 af
Primary=0.60 cfs 0.052 af

Link PR DP F: PR Main Campus Inflow=3.65 cfs 0.298 af
Primary=3.65 cfs 0.298 af

Total Runoff Area = 8.222 ac Runoff Volume = 1.491 af Average Runoff Depth = 2.18"
57.89% Pervious = 4.760 ac 42.11% Impervious = 3.462 ac

Summary for Subcatchment PR A1: North Lot A1

Runoff = 1.30 cfs @ 12.09 hrs, Volume= 0.108 af, Depth= 4.63"
Routed to Pond A1 : Porous Pave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.259	98	Permeable Pavement
*	0.020	98	Impervious
	0.279	98	Weighted Average
	0.279		100.00% Impervious Area

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

Summary for Subcatchment PR A2: North Lot A3

Runoff = 2.99 cfs @ 12.20 hrs, Volume= 0.278 af, Depth= 2.18"
Routed to Link PR DP A : PR Park Ave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.269	98	Impervious
	0.316	32	Woods/grass comb., Good, HSG A
	0.944	79	Woods/grass comb., Good, HSG D
	1.529	73	Weighted Average
	1.260		82.41% Pervious Area
	0.269		17.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	100	0.0320	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
2.0	120	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.9	230	Total			

Summary for Subcatchment PR B1: North Lot B1

Runoff = 5.15 cfs @ 12.09 hrs, Volume= 0.394 af, Depth= 3.96"
Routed to Pond B1 : Porous Pave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.074	98	Impervious
*	0.853	98	Permeable Pavement
	0.051	32	Woods/grass comb., Good, HSG A
	0.216	79	Woods/grass comb., Good, HSG D
	1.194	92	Weighted Average
	0.267		22.36% Pervious Area
	0.927		77.64% Impervious Area

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

Summary for Subcatchment PR B2: North Lot B2

Runoff = 0.25 cfs @ 12.28 hrs, Volume= 0.041 af, Depth= 0.54"
Routed to Pond 1P : Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.222	98	Impervious
	0.691	32	Woods/grass comb., Good, HSG A
	0.000	79	Woods/grass comb., Good, HSG D
	0.913	48	Weighted Average
	0.691		75.68% Pervious Area
	0.222		24.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0550	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
0.9	60	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.4	160	Total			

Summary for Subcatchment PR B3: North Lot B3

Runoff = 2.12 cfs @ 12.09 hrs, Volume= 0.167 af, Depth= 4.29"
Routed to Pond B3 : Subsurface Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.450	98	Impervious
	0.018	32	Woods/grass comb., Good, HSG A
	0.468	95	Weighted Average
	0.018		3.85% Pervious Area
	0.450		96.15% Impervious Area

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

Summary for Subcatchment PR B4: North Lot B4

Runoff = 0.58 cfs @ 12.10 hrs, Volume= 0.043 af, Depth= 1.94"
Routed to Pond B4 : Porous Pave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.152	98	Permeable Pavement
	0.113	32	Woods/grass comb., Good, HSG A
	0.265	70	Weighted Average
	0.113		42.64% Pervious Area
	0.152		57.36% Impervious Area

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

Summary for Subcatchment PR B5: North Lot B5

Runoff = 0.01 cfs @ 15.39 hrs, Volume= 0.005 af, Depth= 0.07"
Routed to Link PR DP B : PR Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

Area (ac)	CN	Description
0.787	32	Woods/grass comb., Good, HSG A
0.058	79	Woods/grass comb., Good, HSG D
0.845	35	Weighted Average
0.845		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
1.7	180	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.8	230	Total			

Summary for Subcatchment PR B6: North Lot B6

Runoff = 0.05 cfs @ 12.15 hrs, Volume= 0.007 af, Depth= 0.59"
Routed to Pond 3P : Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.006	98	Impervious
	0.096	32	Woods/grass comb., Good, HSG A
	0.047	79	Woods/grass comb., Good, HSG D
	0.149	49	Weighted Average
	0.143		95.97% Pervious Area
	0.006		4.03% Impervious Area

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

Summary for Subcatchment PR C: North Lot C

Runoff = 0.10 cfs @ 12.39 hrs, Volume= 0.020 af, Depth= 0.45"
Routed to Link PR DP C : PR Prospect St

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.116	98	Impervious
	0.424	32	Woods/grass comb., Good, HSG A
	0.540	46	Weighted Average
	0.424		78.52% Pervious Area
	0.116		21.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	71	0.0535	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	50	0.0730	1.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	30	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.8	171	Total			

Summary for Subcatchment PR D: Front Yard

Runoff = 1.11 cfs @ 12.15 hrs, Volume= 0.094 af, Depth= 1.94"
Routed to Link PR DP D : Marsh Street CBs

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.123	98	Impervious
	0.167	32	Woods/grass comb., Good, HSG A
	0.292	79	Woods/grass comb., Good, HSG D
	0.582	70	Weighted Average
	0.459		78.87% Pervious Area
	0.123		21.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	48	0.0250	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
0.1	10	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	75	0.0267	1.14		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.4	120	0.0440	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	55	0.0261	3.28		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.2	328	Total			

Summary for Subcatchment PR E1: Jordan Lot

Runoff = 0.19 cfs @ 12.09 hrs, Volume= 0.014 af, Depth= 3.35"
Routed to Pond 2P : WQS

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.040	98	Impervious
	0.009	32	Woods/grass comb., Good, HSG A
	0.049	86	Weighted Average
	0.009		18.37% Pervious Area
	0.040		81.63% Impervious Area

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

Summary for Subcatchment PR E2: Jordan Lot

Runoff = 0.45 cfs @ 12.16 hrs, Volume= 0.038 af, Depth= 2.26"
Routed to Link PR DP E : EX BMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.128	98	Impervious
	0.075	32	Woods/grass comb., Good, HSG A
	0.203	74	Weighted Average
	0.075		36.95% Pervious Area
	0.128		63.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	55	0.0360	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
0.3	45	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.8	100	Total			

Summary for Subcatchment PR E3: Jordan Lot

Runoff = 1.61 cfs @ 12.14 hrs, Volume= 0.131 af, Depth= 2.43"
Routed to Pond E3 : Porous Pave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.298	98	Permeable Pavement
	0.202	32	Woods/grass comb., Good, HSG A
	0.054	79	Woods/grass comb., Good, HSG D
*	0.092	98	Roof
	0.646	76	Weighted Average
	0.256		39.63% Pervious Area
	0.390		60.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	55	0.0550	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
0.5	122	0.0450	4.31		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.4	177	Total			

Summary for Subcatchment PR F: Upper Lot

Runoff = 2.07 cfs @ 12.09 hrs, Volume= 0.152 af, Depth= 3.25"
Routed to Link PR DP F : PR Main Campus

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr 24-hr Rainfall=4.87"

	Area (ac)	CN	Description
*	0.360	98	Impervious
	0.131	79	Woods/grass comb., Good, HSG D
	0.069	32	Woods/grass comb., Good, HSG A
	0.560	85	Weighted Average
	0.200		35.71% Pervious Area
	0.360		64.29% Impervious Area

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

Summary for Pond 1P: Low Point

[57] Hint: Peaked at 264.55' (Flood elevation advised)

Inflow Area = 0.913 ac, 24.32% Impervious, Inflow Depth = 0.54" for 10-yr 24-hr event
Inflow = 0.25 cfs @ 12.28 hrs, Volume= 0.041 af
Outflow = 0.25 cfs @ 12.28 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min
Primary = 0.25 cfs @ 12.28 hrs, Volume= 0.041 af
Routed to Link PR DP B : PR Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Peak Elev= 264.55' @ 12.28 hrs

Device	Routing	Invert	Outlet Devices
#1	Device 2	264.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	260.00'	**12.0" Round Culvert** L= 132.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.00' / 258.50' S= 0.0114 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.25 cfs @ 12.28 hrs HW=264.55' TW=0.00' (Dynamic Tailwater)
↑—**2=Culvert** (Passes 0.25 cfs of 5.96 cfs potential flow)
↑—**1=Orifice/Grate** (Weir Controls 0.25 cfs @ 0.75 fps)

Summary for Pond 2P: WQS

[57] Hint: Peaked at 249.21' (Flood elevation advised)

Inflow Area = 0.049 ac, 81.63% Impervious, Inflow Depth = 3.35" for 10-yr 24-hr event
Inflow = 0.19 cfs @ 12.09 hrs, Volume= 0.014 af
Outflow = 0.19 cfs @ 12.09 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min
Primary = 0.19 cfs @ 12.09 hrs, Volume= 0.014 af
Routed to Link PR DP E : EX BMP

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 249.21' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	249.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.18 cfs @ 12.09 hrs HW=249.21' TW=0.00' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Orifice Controls 0.18 cfs @ 1.55 fps)

Summary for Pond 3P: Low Point

[57] Hint: Peaked at 264.52' (Flood elevation advised)

Inflow Area = 0.149 ac, 4.03% Impervious, Inflow Depth = 0.59" for 10-yr 24-hr event
Inflow = 0.05 cfs @ 12.15 hrs, Volume= 0.007 af
Outflow = 0.05 cfs @ 12.15 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min
Primary = 0.05 cfs @ 12.15 hrs, Volume= 0.007 af
Routed to Link PR DP B : PR Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 264.52' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Device 2	264.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	260.00'	**12.0" Round Culvert**

L= 132.0' CMP, square edge headwall, Ke= 0.500
Inlet / Outlet Invert= 260.00' / 258.50' S= 0.0114 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.05 cfs @ 12.15 hrs HW=264.52' TW=0.00' (Dynamic Tailwater)
↑—**2=Culvert** (Passes 0.05 cfs of 5.94 cfs potential flow)
↑—**1=Orifice/Grate** (Weir Controls 0.05 cfs @ 0.45 fps)

Summary for Pond A1: Porous Pave

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=76)

Inflow Area = 0.279 ac,100.00% Impervious, Inflow Depth = 4.63" for 10-yr 24-hr event
Inflow = 1.30 cfs @ 12.09 hrs, Volume= 0.108 af
Outflow = 0.18 cfs @ 12.60 hrs, Volume= 0.108 af, Atten= 86%, Lag= 30.6 min
Discarded = 0.18 cfs @ 12.60 hrs, Volume= 0.108 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link PR DP A : PR Park Ave

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 0.40' @ 12.60 hrs Surf.Area= 11,290 sf Storage= 1,365 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 45.7 min (794.1 - 748.5)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	6,774 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 22,580 cf Overall x 30.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	11,290	0	0
2.00	11,290	22,580	22,580

Device	Routing	Invert	Outlet Devices
#0	Primary	2.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	0.00'	**0.588 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = -2.00'

Discarded OutFlow Max=0.18 cfs @ 12.60 hrs HW=0.40' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.18 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Dynamic Tailwater)

Summary for Pond B1: Porous Pave

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=29)

Inflow Area = 1.194 ac, 77.64% Impervious, Inflow Depth = 3.96" for 10-yr 24-hr event
Inflow = 5.15 cfs @ 12.09 hrs, Volume= 0.394 af
Outflow = 0.44 cfs @ 13.04 hrs, Volume= 0.395 af, Atten= 91%, Lag= 57.3 min
Discarded = 0.44 cfs @ 13.04 hrs, Volume= 0.395 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 0.61' @ 13.04 hrs Surf.Area= 37,140 sf Storage= 6,806 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 130.8 min (914.3 - 783.5)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	22,284 cf	**Gravel Reservoir (Prismatic)** Listed below (Recalc) 74,280 cf Overall x 30.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	37,140	0	0
2.00	37,140	74,280	74,280

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**0.391 in/hr Exfiltration - TP8 over Surface area** Conductivity to Groundwater Elevation = -2.00'

Discarded OutFlow Max=0.44 cfs @ 13.04 hrs HW=0.61' (Free Discharge)
↑—**1=Exfiltration - TP8** (Controls 0.44 cfs)

Summary for Pond B3: Subsurface Chambers

Inflow Area = 0.733 ac, 82.13% Impervious, Inflow Depth = 2.74" for 10-yr 24-hr event
Inflow = 2.12 cfs @ 12.09 hrs, Volume= 0.167 af
Outflow = 0.60 cfs @ 12.43 hrs, Volume= 0.167 af, Atten= 71%, Lag= 20.3 min
Discarded = 0.06 cfs @ 12.43 hrs, Volume= 0.130 af
Primary = 0.54 cfs @ 12.43 hrs, Volume= 0.037 af
Routed to Link PR DP B : PR Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 260.13' @ 12.43 hrs Surf.Area= 1,990 sf Storage= 3,282 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 392.7 min (1,161.6 - 768.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	258.00'	1,403 cf	**27.62'W x 72.03'L x 3.56'H Field A** 7,091 cf Overall - 3,585 cf Embedded = 3,506 cf x 40.0% Voids
#2A	258.33'	3,406 cf	**ACF R-Tank SD 3** x 522 Inside #1 Inside= 15.7"W x 26.8"H => 2.78 sf x 2.35'L = 6.5 cf Outside= 15.7"W x 26.8"H => 2.93 sf x 2.35'L = 6.9 cf 522 Chambers in 18 Rows
		4,808 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	258.08'	**12.0" Round Outlet Pipe** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 258.08' / 257.29' S= 0.0255 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	259.90'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.40 0.40 1.60 Width (feet) 1.50 1.50 4.00 4.00
#3	Discarded	258.00'	**0.800 in/hr Exfiltration - TP3 over Surface area** Conductivity to Groundwater Elevation = 255.00'

Discarded OutFlow Max=0.06 cfs @ 12.43 hrs HW=260.13' (Free Discharge)
↑—**3=Exfiltration - TP3** (Controls 0.06 cfs)

Primary OutFlow Max=0.54 cfs @ 12.43 hrs HW=260.13' TW=0.00' (Dynamic Tailwater)
↑—**1=Outlet Pipe** (Passes 0.54 cfs of 4.71 cfs potential flow)
↑—**2=Custom Weir/Orifice** (Weir Controls 0.54 cfs @ 1.57 fps)

Summary for Pond B4: Porous Pave

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=97)

Inflow Area = 0.265 ac, 57.36% Impervious, Inflow Depth = 1.94" for 10-yr 24-hr event
Inflow = 0.58 cfs @ 12.10 hrs, Volume= 0.043 af
Outflow = 0.14 cfs @ 12.53 hrs, Volume= 0.043 af, Atten= 77%, Lag= 26.2 min
Discarded = 0.14 cfs @ 12.53 hrs, Volume= 0.043 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 0.22' @ 12.53 hrs Surf.Area= 6,600 sf Storage= 429 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 19.0 min (868.1 - 849.1)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	3,960 cf	**Gravel Reservoir (Prismatic)** Listed below (Recalc) 13,200 cf Overall x 30.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	6,600	0	0
2.00	6,600	13,200	13,200

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**0.800 in/hr Exfiltration - TP8 over Surface area** Conductivity to Groundwater Elevation = -2.00'

Discarded OutFlow Max=0.14 cfs @ 12.53 hrs HW=0.22' (Free Discharge)
↑**1=Exfiltration - TP8** (Controls 0.14 cfs)

Summary for Pond E3: Porous Pave

Inflow Area = 0.646 ac, 60.37% Impervious, Inflow Depth = 2.43" for 10-yr 24-hr event
Inflow = 1.61 cfs @ 12.14 hrs, Volume= 0.131 af
Outflow = 0.08 cfs @ 15.74 hrs, Volume= 0.131 af, Atten= 95%, Lag= 216.0 min
Discarded = 0.08 cfs @ 15.74 hrs, Volume= 0.131 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link PR DP E : EX BMP

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 0.81' @ 15.74 hrs Surf.Area= 13,000 sf Storage= 3,178 cf

Plug-Flow detention time= 455.4 min calculated for 0.131 af (100% of inflow)
Center-of-Mass det. time= 455.7 min (1,292.4 - 836.7)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	11,700 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 39,000 cf Overall x 30.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	13,000	0	0
3.00	13,000	39,000	39,000

Device	Routing	Invert	Outlet Devices
#0	Primary	3.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	0.00'	**0.180 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = -2.00'

Discarded OutFlow Max=0.08 cfs @ 15.74 hrs HW=0.81' (Free Discharge)
↑**1=Exfiltration** (Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Dynamic Tailwater)

Summary for Link PR DP A: PR Park Ave

Inflow Area = 1.808 ac, 30.31% Impervious, Inflow Depth = 1.84" for 10-yr 24-hr event
Inflow = 2.99 cfs @ 12.20 hrs, Volume= 0.278 af
Primary = 2.99 cfs @ 12.20 hrs, Volume= 0.278 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP B: PR Wetlands

Inflow Area = 3.834 ac, 45.83% Impervious, Inflow Depth = 0.28" for 10-yr 24-hr event
Inflow = 0.81 cfs @ 12.41 hrs, Volume= 0.091 af
Primary = 0.81 cfs @ 12.41 hrs, Volume= 0.091 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP C: PR Prospect St

Inflow Area = 0.540 ac, 21.48% Impervious, Inflow Depth = 0.45" for 10-yr 24-hr event
Inflow = 0.10 cfs @ 12.39 hrs, Volume= 0.020 af
Primary = 0.10 cfs @ 12.39 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP D: Marsh Street CBs

Inflow Area = 0.582 ac, 21.13% Impervious, Inflow Depth = 1.94" for 10-yr 24-hr event
Inflow = 1.11 cfs @ 12.15 hrs, Volume= 0.094 af
Primary = 1.11 cfs @ 12.15 hrs, Volume= 0.094 af, Atten= 0%, Lag= 0.0 min
Routed to Link PR DP F : PR Main Campus

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP E: EX BMP

Inflow Area = 0.898 ac, 62.14% Impervious, Inflow Depth = 0.69" for 10-yr 24-hr event
Inflow = 0.60 cfs @ 12.14 hrs, Volume= 0.052 af
Primary = 0.60 cfs @ 12.14 hrs, Volume= 0.052 af, Atten= 0%, Lag= 0.0 min
Routed to Link PR DP F : PR Main Campus

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP F: PR Main Campus

Inflow Area = 2.040 ac, 51.03% Impervious, Inflow Depth = 1.75" for 10-yr 24-hr event
Inflow = 3.65 cfs @ 12.11 hrs, Volume= 0.298 af
Primary = 3.65 cfs @ 12.11 hrs, Volume= 0.298 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Time span=0.00-100.00 hrs, dt=0.05 hrs, 2001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentPR A1: North Lot A1 Runoff Area=0.279 ac 100.00% Impervious Runoff Depth=5.93"
Tc=6.0 min CN=98 Runoff=1.65 cfs 0.138 af

SubcatchmentPR A2: North Lot A3 Runoff Area=1.529 ac 17.59% Impervious Runoff Depth=3.23"
Flow Length=230' Tc=13.9 min CN=73 Runoff=4.47 cfs 0.412 af

SubcatchmentPR B1: North Lot B1 Runoff Area=1.194 ac 77.64% Impervious Runoff Depth=5.24"
Tc=6.0 min CN=92 Runoff=6.70 cfs 0.521 af

SubcatchmentPR B2: North Lot B2 Runoff Area=0.913 ac 24.32% Impervious Runoff Depth=1.08"
Flow Length=160' Tc=10.4 min CN=48 Runoff=0.72 cfs 0.082 af

SubcatchmentPR B3: North Lot B3 Runoff Area=0.468 ac 96.15% Impervious Runoff Depth=5.58"
Tc=6.0 min CN=95 Runoff=2.71 cfs 0.218 af

SubcatchmentPR B4: North Lot B4 Runoff Area=0.265 ac 57.36% Impervious Runoff Depth=2.94"
Tc=6.0 min CN=70 Runoff=0.89 cfs 0.065 af

SubcatchmentPR B5: North Lot B5 Runoff Area=0.845 ac 0.00% Impervious Runoff Depth=0.29"
Flow Length=230' Tc=8.8 min CN=35 Runoff=0.06 cfs 0.020 af

SubcatchmentPR B6: North Lot B6 Runoff Area=0.149 ac 4.03% Impervious Runoff Depth=1.15"
Tc=6.0 min CN=49 Runoff=0.16 cfs 0.014 af

SubcatchmentPR C: North Lot C Runoff Area=0.540 ac 21.48% Impervious Runoff Depth=0.94"
Flow Length=171' Tc=11.8 min CN=46 Runoff=0.33 cfs 0.042 af

SubcatchmentPR D: Front Yard Runoff Area=0.582 ac 21.13% Impervious Runoff Depth=2.94"
Flow Length=328' Tc=10.2 min CN=70 Runoff=1.72 cfs 0.143 af

SubcatchmentPR E1: Jordan Lot Runoff Area=0.049 ac 81.63% Impervious Runoff Depth=4.57"
Tc=6.0 min CN=86 Runoff=0.25 cfs 0.019 af

SubcatchmentPR E2: Jordan Lot Runoff Area=0.203 ac 63.05% Impervious Runoff Depth=3.33"
Flow Length=100' Tc=10.8 min CN=74 Runoff=0.67 cfs 0.056 af

SubcatchmentPR E3: Jordan Lot Runoff Area=0.646 ac 60.37% Impervious Runoff Depth=3.53"
Flow Length=177' Tc=9.4 min CN=76 Runoff=2.34 cfs 0.190 af

SubcatchmentPR F: Upper Lot Runoff Area=0.560 ac 64.29% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=85 Runoff=2.81 cfs 0.208 af

Pond 1P: Low Point Peak Elev=264.61' Inflow=0.72 cfs 0.082 af
Outflow=0.72 cfs 0.082 af

Pond 2P: WQS Peak Elev=249.24' Inflow=0.25 cfs 0.019 af
Outflow=0.25 cfs 0.019 af

Pond 3P: Low Point Peak Elev=264.54' Inflow=0.16 cfs 0.014 af
Outflow=0.16 cfs 0.014 af

Pond A1: Porous Pave Peak Elev=0.56' Storage=1,908 cf Inflow=1.65 cfs 0.138 af
Discarded=0.20 cfs 0.138 af Primary=0.00 cfs 0.000 af Outflow=0.20 cfs 0.138 af

Pond B1: Porous Pave Peak Elev=0.87' Storage=9,735 cf Inflow=6.70 cfs 0.521 af
Outflow=0.48 cfs 0.521 af

Pond B3: Subsurface Chambers Peak Elev=260.33' Storage=3,622 cf Inflow=2.71 cfs 0.218 af
Discarded=0.07 cfs 0.139 af Primary=1.43 cfs 0.078 af Outflow=1.49 cfs 0.218 af

Pond B4: Porous Pave Peak Elev=0.43' Storage=843 cf Inflow=0.89 cfs 0.065 af
Outflow=0.15 cfs 0.065 af

Pond E3: Porous Pave Peak Elev=1.29' Storage=5,038 cf Inflow=2.34 cfs 0.190 af
Discarded=0.09 cfs 0.190 af Primary=0.00 cfs 0.000 af Outflow=0.09 cfs 0.190 af

Link PR DP A: PR Park Ave Inflow=4.47 cfs 0.412 af
Primary=4.47 cfs 0.412 af

Link PR DP B: PR Wetlands Inflow=2.25 cfs 0.195 af
Primary=2.25 cfs 0.195 af

Link PR DP C: PR Prospect St Inflow=0.33 cfs 0.042 af
Primary=0.33 cfs 0.042 af

Link PR DP D: Marsh Street CBs Inflow=1.72 cfs 0.143 af
Primary=1.72 cfs 0.143 af

Link PR DP E: EX BMP Inflow=0.87 cfs 0.075 af
Primary=0.87 cfs 0.075 af

Link PR DP F: PR Main Campus Inflow=5.21 cfs 0.426 af
Primary=5.21 cfs 0.426 af

Total Runoff Area = 8.222 ac Runoff Volume = 2.128 af Average Runoff Depth = 3.11"
57.89% Pervious = 4.760 ac 42.11% Impervious = 3.462 ac

Summary for Subcatchment PR A1: North Lot A1

Runoff = 1.65 cfs @ 12.09 hrs, Volume= 0.138 af, Depth= 5.93"
Routed to Pond A1 : Porous Pave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.259	98	Permeable Pavement
*	0.020	98	Impervious
	0.279	98	Weighted Average
	0.279		100.00% Impervious Area

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

Summary for Subcatchment PR A2: North Lot A3

Runoff = 4.47 cfs @ 12.20 hrs, Volume= 0.412 af, Depth= 3.23"
Routed to Link PR DP A : PR Park Ave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.269	98	Impervious
	0.316	32	Woods/grass comb., Good, HSG A
	0.944	79	Woods/grass comb., Good, HSG D
	1.529	73	Weighted Average
	1.260		82.41% Pervious Area
	0.269		17.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	100	0.0320	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
2.0	120	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.9	230	Total			

Summary for Subcatchment PR B1: North Lot B1

Runoff = 6.70 cfs @ 12.09 hrs, Volume= 0.521 af, Depth= 5.24"
Routed to Pond B1 : Porous Pave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.074	98	Impervious
*	0.853	98	Permeable Pavement
	0.051	32	Woods/grass comb., Good, HSG A
	0.216	79	Woods/grass comb., Good, HSG D
	1.194	92	Weighted Average
	0.267		22.36% Pervious Area
	0.927		77.64% Impervious Area

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

Summary for Subcatchment PR B2: North Lot B2

Runoff = 0.72 cfs @ 12.19 hrs, Volume= 0.082 af, Depth= 1.08"
Routed to Pond 1P : Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.222	98	Impervious
	0.691	32	Woods/grass comb., Good, HSG A
	0.000	79	Woods/grass comb., Good, HSG D
	0.913	48	Weighted Average
	0.691		75.68% Pervious Area
	0.222		24.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0550	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
0.9	60	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.4	160	Total			

Summary for Subcatchment PR B3: North Lot B3

Runoff = 2.71 cfs @ 12.09 hrs, Volume= 0.218 af, Depth= 5.58"
Routed to Pond B3 : Subsurface Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.450	98	Impervious
	0.018	32	Woods/grass comb., Good, HSG A
	0.468	95	Weighted Average
	0.018		3.85% Pervious Area
	0.450		96.15% Impervious Area

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

Summary for Subcatchment PR B4: North Lot B4

Runoff = 0.89 cfs @ 12.09 hrs, Volume= 0.065 af, Depth= 2.94"
Routed to Pond B4 : Porous Pave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.152	98	Permeable Pavement
	0.113	32	Woods/grass comb., Good, HSG A
	0.265	70	Weighted Average
	0.113		42.64% Pervious Area
	0.152		57.36% Impervious Area

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

Summary for Subcatchment PR B5: North Lot B5

Runoff = 0.06 cfs @ 12.49 hrs, Volume= 0.020 af, Depth= 0.29"
Routed to Link PR DP B : PR Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

Area (ac)	CN	Description
0.787	32	Woods/grass comb., Good, HSG A
0.058	79	Woods/grass comb., Good, HSG D
0.845	35	Weighted Average
0.845		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
1.7	180	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.8	230	Total			

Summary for Subcatchment PR B6: North Lot B6

Runoff = 0.16 cfs @ 12.11 hrs, Volume= 0.014 af, Depth= 1.15"
Routed to Pond 3P : Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.006	98	Impervious
	0.096	32	Woods/grass comb., Good, HSG A
	0.047	79	Woods/grass comb., Good, HSG D
	0.149	49	Weighted Average
	0.143		95.97% Pervious Area
	0.006		4.03% Impervious Area

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

Summary for Subcatchment PR C: North Lot C

Runoff = 0.33 cfs @ 12.22 hrs, Volume= 0.042 af, Depth= 0.94"
Routed to Link PR DP C : PR Prospect St

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.116	98	Impervious
	0.424	32	Woods/grass comb., Good, HSG A
	0.540	46	Weighted Average
	0.424		78.52% Pervious Area
	0.116		21.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	71	0.0535	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	50	0.0730	1.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	30	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.8	171	Total			

Summary for Subcatchment PR D: Front Yard

Runoff = 1.72 cfs @ 12.15 hrs, Volume= 0.143 af, Depth= 2.94"
Routed to Link PR DP D : Marsh Street CBs

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.123	98	Impervious
	0.167	32	Woods/grass comb., Good, HSG A
	0.292	79	Woods/grass comb., Good, HSG D
	0.582	70	Weighted Average
	0.459		78.87% Pervious Area
	0.123		21.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	48	0.0250	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
0.1	10	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	75	0.0267	1.14		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.4	120	0.0440	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	55	0.0261	3.28		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.2	328	Total			

Summary for Subcatchment PR E1: Jordan Lot

Runoff = 0.25 cfs @ 12.09 hrs, Volume= 0.019 af, Depth= 4.57"
Routed to Pond 2P : WQS

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.040	98	Impervious
	0.009	32	Woods/grass comb., Good, HSG A
	0.049	86	Weighted Average
	0.009		18.37% Pervious Area
	0.040		81.63% Impervious Area

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

Summary for Subcatchment PR E2: Jordan Lot

Runoff = 0.67 cfs @ 12.15 hrs, Volume= 0.056 af, Depth= 3.33"
Routed to Link PR DP E : EX BMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.128	98	Impervious
	0.075	32	Woods/grass comb., Good, HSG A
	0.203	74	Weighted Average
	0.075		36.95% Pervious Area
	0.128		63.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	55	0.0360	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
0.3	45	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.8	100	Total			

Summary for Subcatchment PR E3: Jordan Lot

Runoff = 2.34 cfs @ 12.14 hrs, Volume= 0.190 af, Depth= 3.53"
Routed to Pond E3 : Porous Pave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.298	98	Permeable Pavement
	0.202	32	Woods/grass comb., Good, HSG A
	0.054	79	Woods/grass comb., Good, HSG D
*	0.092	98	Roof
	0.646	76	Weighted Average
	0.256		39.63% Pervious Area
	0.390		60.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	55	0.0550	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
0.5	122	0.0450	4.31		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.4	177	Total			

Summary for Subcatchment PR F: Upper Lot

Runoff = 2.81 cfs @ 12.09 hrs, Volume= 0.208 af, Depth= 4.46"
Routed to Link PR DP F : PR Main Campus

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr 24-hr Rainfall=6.17"

	Area (ac)	CN	Description
*	0.360	98	Impervious
	0.131	79	Woods/grass comb., Good, HSG D
	0.069	32	Woods/grass comb., Good, HSG A
	0.560	85	Weighted Average
	0.200		35.71% Pervious Area
	0.360		64.29% Impervious Area

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

Summary for Pond 1P: Low Point

[57] Hint: Peaked at 264.61' (Flood elevation advised)

Inflow Area = 0.913 ac, 24.32% Impervious, Inflow Depth = 1.08" for 25-yr 24-hr event
Inflow = 0.72 cfs @ 12.19 hrs, Volume= 0.082 af
Outflow = 0.72 cfs @ 12.19 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.0 min
Primary = 0.72 cfs @ 12.19 hrs, Volume= 0.082 af
Routed to Link PR DP B : PR Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Peak Elev= 264.61' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Device 2	264.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	260.00'	**12.0" Round Culvert** L= 132.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.00' / 258.50' S= 0.0114 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.72 cfs @ 12.19 hrs HW=264.61' TW=0.00' (Dynamic Tailwater)
↑—**2=Culvert** (Passes 0.72 cfs of 6.00 cfs potential flow)
↑—**1=Orifice/Grate** (Weir Controls 0.72 cfs @ 1.07 fps)

Summary for Pond 2P: WQS

[57] Hint: Peaked at 249.24' (Flood elevation advised)

Inflow Area = 0.049 ac, 81.63% Impervious, Inflow Depth = 4.57" for 25-yr 24-hr event
Inflow = 0.25 cfs @ 12.09 hrs, Volume= 0.019 af
Outflow = 0.25 cfs @ 12.09 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min
Primary = 0.25 cfs @ 12.09 hrs, Volume= 0.019 af
Routed to Link PR DP E : EX BMP

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 249.24' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	249.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.24 cfs @ 12.09 hrs HW=249.24' TW=0.00' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Orifice Controls 0.24 cfs @ 1.67 fps)

Summary for Pond 3P: Low Point

[57] Hint: Peaked at 264.54' (Flood elevation advised)

Inflow Area = 0.149 ac, 4.03% Impervious, Inflow Depth = 1.15" for 25-yr 24-hr event
Inflow = 0.16 cfs @ 12.11 hrs, Volume= 0.014 af
Outflow = 0.16 cfs @ 12.11 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min
Primary = 0.16 cfs @ 12.11 hrs, Volume= 0.014 af
Routed to Link PR DP B : PR Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 264.54' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Device 2	264.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	260.00'	**12.0" Round Culvert**

L= 132.0' CMP, square edge headwall, Ke= 0.500
Inlet / Outlet Invert= 260.00' / 258.50' S= 0.0114 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.15 cfs @ 12.11 hrs HW=264.54' TW=0.00' (Dynamic Tailwater)
↑—**2=Culvert** (Passes 0.15 cfs of 5.95 cfs potential flow)
↑—**1=Orifice/Grate** (Weir Controls 0.15 cfs @ 0.63 fps)

Summary for Pond A1: Porous Pave

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=63)

Inflow Area = 0.279 ac,100.00% Impervious, Inflow Depth = 5.93" for 25-yr 24-hr event
Inflow = 1.65 cfs @ 12.09 hrs, Volume= 0.138 af
Outflow = 0.20 cfs @ 12.67 hrs, Volume= 0.138 af, Atten= 88%, Lag= 35.3 min
Discarded = 0.20 cfs @ 12.67 hrs, Volume= 0.138 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link PR DP A : PR Park Ave

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 0.56' @ 12.67 hrs Surf.Area= 11,290 sf Storage= 1,908 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 65.5 min (810.2 - 744.7)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	6,774 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 22,580 cf Overall x 30.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	11,290	0	0
2.00	11,290	22,580	22,580

Device	Routing	Invert	Outlet Devices
#0	Primary	2.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	0.00'	**0.588 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = -2.00'

Discarded OutFlow Max=0.20 cfs @ 12.67 hrs HW=0.56' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.20 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Dynamic Tailwater)

Summary for Pond B1: Porous Pave

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=2)

Inflow Area = 1.194 ac, 77.64% Impervious, Inflow Depth = 5.24" for 25-yr 24-hr event
Inflow = 6.70 cfs @ 12.09 hrs, Volume= 0.521 af
Outflow = 0.48 cfs @ 13.35 hrs, Volume= 0.521 af, Atten= 93%, Lag= 76.0 min
Discarded = 0.48 cfs @ 13.35 hrs, Volume= 0.521 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 0.87' @ 13.35 hrs Surf.Area= 37,140 sf Storage= 9,735 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 182.3 min (958.6 - 776.3)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	22,284 cf	**Gravel Reservoir (Prismatic)** Listed below (Recalc) 74,280 cf Overall x 30.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	37,140	0	0
2.00	37,140	74,280	74,280

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**0.391 in/hr Exfiltration - TP8 over Surface area** Conductivity to Groundwater Elevation = -2.00'

Discarded OutFlow Max=0.48 cfs @ 13.35 hrs HW=0.87' (Free Discharge)
↑**1=Exfiltration - TP8** (Controls 0.48 cfs)

Summary for Pond B3: Subsurface Chambers

Inflow Area = 0.733 ac, 82.13% Impervious, Inflow Depth = 3.56" for 25-yr 24-hr event
Inflow = 2.71 cfs @ 12.09 hrs, Volume= 0.218 af
Outflow = 1.49 cfs @ 12.22 hrs, Volume= 0.218 af, Atten= 45%, Lag= 8.0 min
Discarded = 0.07 cfs @ 12.22 hrs, Volume= 0.139 af
Primary = 1.43 cfs @ 12.22 hrs, Volume= 0.078 af
Routed to Link PR DP B : PR Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 260.33' @ 12.22 hrs Surf.Area= 1,990 sf Storage= 3,622 cf

Plug-Flow detention time= 330.5 min calculated for 0.218 af (100% of inflow)
Center-of-Mass det. time= 330.8 min (1,093.7 - 762.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	258.00'	1,403 cf	**27.62'W x 72.03'L x 3.56'H Field A** 7,091 cf Overall - 3,585 cf Embedded = 3,506 cf x 40.0% Voids
#2A	258.33'	3,406 cf	**ACF R-Tank SD 3** x 522 Inside #1 Inside= 15.7"W x 26.8"H => 2.78 sf x 2.35'L = 6.5 cf Outside= 15.7"W x 26.8"H => 2.93 sf x 2.35'L = 6.9 cf 522 Chambers in 18 Rows
		4,808 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	258.08'	**12.0" Round Outlet Pipe** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 258.08' / 257.29' S= 0.0255 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	259.90'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.40 0.40 1.60 Width (feet) 1.50 1.50 4.00 4.00
#3	Discarded	258.00'	**0.800 in/hr Exfiltration - TP3 over Surface area** Conductivity to Groundwater Elevation = 255.00'

Discarded OutFlow Max=0.07 cfs @ 12.22 hrs HW=260.32' (Free Discharge)
└**3=Exfiltration - TP3** (Controls 0.07 cfs)

Primary OutFlow Max=1.39 cfs @ 12.22 hrs HW=260.32' TW=0.00' (Dynamic Tailwater)
└**1=Outlet Pipe** (Passes 1.39 cfs of 4.99 cfs potential flow)
└**2=Custom Weir/Orifice** (Weir Controls 1.39 cfs @ 1.99 fps)

Summary for Pond B4: Porous Pave

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=81)

Inflow Area = 0.265 ac, 57.36% Impervious, Inflow Depth = 2.94" for 25-yr 24-hr event
Inflow = 0.89 cfs @ 12.09 hrs, Volume= 0.065 af
Outflow = 0.15 cfs @ 12.61 hrs, Volume= 0.065 af, Atten= 83%, Lag= 31.0 min
Discarded = 0.15 cfs @ 12.61 hrs, Volume= 0.065 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 0.43' @ 12.61 hrs Surf.Area= 6,600 sf Storage= 843 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 41.6 min (878.4 - 836.9)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	3,960 cf	**Gravel Reservoir (Prismatic)** Listed below (Recalc) 13,200 cf Overall x 30.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	6,600	0	0
2.00	6,600	13,200	13,200

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**0.800 in/hr Exfiltration - TP8 over Surface area** Conductivity to Groundwater Elevation = -2.00'

Discarded OutFlow Max=0.15 cfs @ 12.61 hrs HW=0.43' (Free Discharge)
↑**1=Exfiltration - TP8** (Controls 0.15 cfs)

Summary for Pond E3: Porous Pave

Inflow Area = 0.646 ac, 60.37% Impervious, Inflow Depth = 3.53" for 25-yr 24-hr event
Inflow = 2.34 cfs @ 12.14 hrs, Volume= 0.190 af
Outflow = 0.09 cfs @ 16.13 hrs, Volume= 0.190 af, Atten= 96%, Lag= 239.8 min
Discarded = 0.09 cfs @ 16.13 hrs, Volume= 0.190 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link PR DP E : EX BMP

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 1.29' @ 16.13 hrs Surf.Area= 13,000 sf Storage= 5,038 cf

Plug-Flow detention time= 624.0 min calculated for 0.190 af (100% of inflow)
Center-of-Mass det. time= 624.5 min (1,450.4 - 826.0)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	11,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 39,000 cf Overall x 30.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	13,000	0	0
3.00	13,000	39,000	39,000

Device	Routing	Invert	Outlet Devices
#0	Primary	3.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	0.00'	**0.180 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = -2.00'

Discarded OutFlow Max=0.09 cfs @ 16.13 hrs HW=1.29' (Free Discharge)
↑**1=Exfiltration** (Controls 0.09 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Dynamic Tailwater)

Summary for Link PR DP A: PR Park Ave

Inflow Area = 1.808 ac, 30.31% Impervious, Inflow Depth = 2.73" for 25-yr 24-hr event
Inflow = 4.47 cfs @ 12.20 hrs, Volume= 0.412 af
Primary = 4.47 cfs @ 12.20 hrs, Volume= 0.412 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP B: PR Wetlands

Inflow Area = 3.834 ac, 45.83% Impervious, Inflow Depth = 0.61" for 25-yr 24-hr event
Inflow = 2.25 cfs @ 12.21 hrs, Volume= 0.195 af
Primary = 2.25 cfs @ 12.21 hrs, Volume= 0.195 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP C: PR Prospect St

Inflow Area = 0.540 ac, 21.48% Impervious, Inflow Depth = 0.94" for 25-yr 24-hr event
Inflow = 0.33 cfs @ 12.22 hrs, Volume= 0.042 af
Primary = 0.33 cfs @ 12.22 hrs, Volume= 0.042 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP D: Marsh Street CBs

Inflow Area = 0.582 ac, 21.13% Impervious, Inflow Depth = 2.94" for 25-yr 24-hr event
Inflow = 1.72 cfs @ 12.15 hrs, Volume= 0.143 af
Primary = 1.72 cfs @ 12.15 hrs, Volume= 0.143 af, Atten= 0%, Lag= 0.0 min
Routed to Link PR DP F : PR Main Campus

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP E: EX BMP

Inflow Area = 0.898 ac, 62.14% Impervious, Inflow Depth = 1.00" for 25-yr 24-hr event
Inflow = 0.87 cfs @ 12.13 hrs, Volume= 0.075 af
Primary = 0.87 cfs @ 12.13 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min
Routed to Link PR DP F : PR Main Campus

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP F: PR Main Campus

Inflow Area = 2.040 ac, 51.03% Impervious, Inflow Depth = 2.51" for 25-yr 24-hr event
Inflow = 5.21 cfs @ 12.11 hrs, Volume= 0.426 af
Primary = 5.21 cfs @ 12.11 hrs, Volume= 0.426 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Time span=0.00-100.00 hrs, dt=0.05 hrs, 2001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentPR A1: North Lot A1 Runoff Area=0.279 ac 100.00% Impervious Runoff Depth=8.61"
Tc=6.0 min CN=98 Runoff=2.37 cfs 0.200 af

SubcatchmentPR A2: North Lot A3 Runoff Area=1.529 ac 17.59% Impervious Runoff Depth=5.57"
Flow Length=230' Tc=13.9 min CN=73 Runoff=7.70 cfs 0.710 af

SubcatchmentPR B1: North Lot B1 Runoff Area=1.194 ac 77.64% Impervious Runoff Depth=7.89"
Tc=6.0 min CN=92 Runoff=9.86 cfs 0.785 af

SubcatchmentPR B2: North Lot B2 Runoff Area=0.913 ac 24.32% Impervious Runoff Depth=2.55"
Flow Length=160' Tc=10.4 min CN=48 Runoff=2.14 cfs 0.194 af

SubcatchmentPR B3: North Lot B3 Runoff Area=0.468 ac 96.15% Impervious Runoff Depth=8.25"
Tc=6.0 min CN=95 Runoff=3.93 cfs 0.322 af

SubcatchmentPR B4: North Lot B4 Runoff Area=0.265 ac 57.36% Impervious Runoff Depth=5.20"
Tc=6.0 min CN=70 Runoff=1.58 cfs 0.115 af

SubcatchmentPR B5: North Lot B5 Runoff Area=0.845 ac 0.00% Impervious Runoff Depth=1.11"
Flow Length=230' Tc=8.8 min CN=35 Runoff=0.55 cfs 0.078 af

SubcatchmentPR B6: North Lot B6 Runoff Area=0.149 ac 4.03% Impervious Runoff Depth=2.67"
Tc=6.0 min CN=49 Runoff=0.43 cfs 0.033 af

SubcatchmentPR C: North Lot C Runoff Area=0.540 ac 21.48% Impervious Runoff Depth=2.32"
Flow Length=171' Tc=11.8 min CN=46 Runoff=1.06 cfs 0.104 af

SubcatchmentPR D: Front Yard Runoff Area=0.582 ac 21.13% Impervious Runoff Depth=5.20"
Flow Length=328' Tc=10.2 min CN=70 Runoff=3.05 cfs 0.252 af

SubcatchmentPR E1: Jordan Lot Runoff Area=0.049 ac 81.63% Impervious Runoff Depth=7.16"
Tc=6.0 min CN=86 Runoff=0.38 cfs 0.029 af

SubcatchmentPR E2: Jordan Lot Runoff Area=0.203 ac 63.05% Impervious Runoff Depth=5.69"
Flow Length=100' Tc=10.8 min CN=74 Runoff=1.14 cfs 0.096 af

SubcatchmentPR E3: Jordan Lot Runoff Area=0.646 ac 60.37% Impervious Runoff Depth=5.94"
Flow Length=177' Tc=9.4 min CN=76 Runoff=3.90 cfs 0.320 af

SubcatchmentPR F: Upper Lot Runoff Area=0.560 ac 64.29% Impervious Runoff Depth=7.04"
Tc=6.0 min CN=85 Runoff=4.32 cfs 0.328 af

Pond 1P: Low Point Peak Elev=264.72' Inflow=2.14 cfs 0.194 af
Outflow=2.14 cfs 0.194 af

Pond 2P: WQS Peak Elev=249.31' Inflow=0.38 cfs 0.029 af
Outflow=0.38 cfs 0.029 af

Pond 3P: Low Point Peak Elev=264.58' Inflow=0.43 cfs 0.033 af
Outflow=0.43 cfs 0.033 af

Pond A1: Porous Pave Peak Elev=0.93' Storage=3,133 cf Inflow=2.37 cfs 0.200 af
Discarded=0.22 cfs 0.200 af Primary=0.00 cfs 0.000 af Outflow=0.22 cfs 0.200 af

Pond B1: Porous Pave Peak Elev=1.47' Storage=16,403 cf Inflow=9.86 cfs 0.785 af
Outflow=0.58 cfs 0.785 af

Pond B3: Subsurface Chambers Peak Elev=260.54' Storage=3,972 cf Inflow=3.93 cfs 0.322 af
Discarded=0.07 cfs 0.154 af Primary=3.47 cfs 0.168 af Outflow=3.54 cfs 0.322 af

Pond B4: Porous Pave Peak Elev=0.93' Storage=1,849 cf Inflow=1.58 cfs 0.115 af
Outflow=0.18 cfs 0.115 af

Pond E3: Porous Pave Peak Elev=2.38' Storage=9,275 cf Inflow=3.90 cfs 0.320 af
Discarded=0.12 cfs 0.320 af Primary=0.00 cfs 0.000 af Outflow=0.12 cfs 0.320 af

Link PR DP A: PR Park Ave Inflow=7.70 cfs 0.710 af
Primary=7.70 cfs 0.710 af

Link PR DP B: PR Wetlands Inflow=6.45 cfs 0.473 af
Primary=6.45 cfs 0.473 af

Link PR DP C: PR Prospect St Inflow=1.06 cfs 0.104 af
Primary=1.06 cfs 0.104 af

Link PR DP D: Marsh Street CBs Inflow=3.05 cfs 0.252 af
Primary=3.05 cfs 0.252 af

Link PR DP E: EX BMP Inflow=1.45 cfs 0.126 af
Primary=1.45 cfs 0.126 af

Link PR DP F: PR Main Campus Inflow=8.54 cfs 0.706 af
Primary=8.54 cfs 0.706 af

Total Runoff Area = 8.222 ac Runoff Volume = 3.567 af Average Runoff Depth = 5.21"
57.89% Pervious = 4.760 ac 42.11% Impervious = 3.462 ac

Summary for Subcatchment PR A1: North Lot A1

Runoff = 2.37 cfs @ 12.09 hrs, Volume= 0.200 af, Depth= 8.61"
Routed to Pond A1 : Porous Pave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.259	98	Permeable Pavement
*	0.020	98	Impervious
	0.279	98	Weighted Average
	0.279		100.00% Impervious Area

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

Summary for Subcatchment PR A2: North Lot A3

Runoff = 7.70 cfs @ 12.19 hrs, Volume= 0.710 af, Depth= 5.57"
Routed to Link PR DP A : PR Park Ave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.269	98	Impervious
	0.316	32	Woods/grass comb., Good, HSG A
	0.944	79	Woods/grass comb., Good, HSG D
	1.529	73	Weighted Average
	1.260		82.41% Pervious Area
	0.269		17.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	100	0.0320	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
2.0	120	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	10	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.9	230	Total			

Summary for Subcatchment PR B1: North Lot B1

Runoff = 9.86 cfs @ 12.09 hrs, Volume= 0.785 af, Depth= 7.89"
Routed to Pond B1 : Porous Pave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.074	98	Impervious
*	0.853	98	Permeable Pavement
	0.051	32	Woods/grass comb., Good, HSG A
	0.216	79	Woods/grass comb., Good, HSG D
	1.194	92	Weighted Average
	0.267		22.36% Pervious Area
	0.927		77.64% Impervious Area

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

Summary for Subcatchment PR B2: North Lot B2

Runoff = 2.14 cfs @ 12.16 hrs, Volume= 0.194 af, Depth= 2.55"
Routed to Pond 1P : Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.222	98	Impervious
	0.691	32	Woods/grass comb., Good, HSG A
	0.000	79	Woods/grass comb., Good, HSG D
	0.913	48	Weighted Average
	0.691		75.68% Pervious Area
	0.222		24.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0550	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
0.9	60	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.4	160	Total			

Summary for Subcatchment PR B3: North Lot B3

Runoff = 3.93 cfs @ 12.09 hrs, Volume= 0.322 af, Depth= 8.25"
Routed to Pond B3 : Subsurface Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.450	98	Impervious
	0.018	32	Woods/grass comb., Good, HSG A
	0.468	95	Weighted Average
	0.018		3.85% Pervious Area
	0.450		96.15% Impervious Area

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

Summary for Subcatchment PR B4: North Lot B4

Runoff = 1.58 cfs @ 12.09 hrs, Volume= 0.115 af, Depth= 5.20"
Routed to Pond B4 : Porous Pave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.152	98	Permeable Pavement
	0.113	32	Woods/grass comb., Good, HSG A
	0.265	70	Weighted Average
	0.113		42.64% Pervious Area
	0.152		57.36% Impervious Area

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

Summary for Subcatchment PR B5: North Lot B5

Runoff = 0.55 cfs @ 12.20 hrs, Volume= 0.078 af, Depth= 1.11"
Routed to Link PR DP B : PR Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

Area (ac)	CN	Description
0.787	32	Woods/grass comb., Good, HSG A
0.058	79	Woods/grass comb., Good, HSG D
0.845	35	Weighted Average
0.845		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
1.7	180	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.8	230	Total			

Summary for Subcatchment PR B6: North Lot B6

Runoff = 0.43 cfs @ 12.10 hrs, Volume= 0.033 af, Depth= 2.67"
Routed to Pond 3P : Low Point

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.006	98	Impervious
	0.096	32	Woods/grass comb., Good, HSG A
	0.047	79	Woods/grass comb., Good, HSG D
	0.149	49	Weighted Average
	0.143		95.97% Pervious Area
	0.006		4.03% Impervious Area

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

Summary for Subcatchment PR C: North Lot C

Runoff = 1.06 cfs @ 12.19 hrs, Volume= 0.104 af, Depth= 2.32"
Routed to Link PR DP C : PR Prospect St

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.116	98	Impervious
	0.424	32	Woods/grass comb., Good, HSG A
	0.540	46	Weighted Average
	0.424		78.52% Pervious Area
	0.116		21.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	71	0.0535	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	50	0.0730	1.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	30	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.8	171	Total			

Summary for Subcatchment PR D: Front Yard

Runoff = 3.05 cfs @ 12.15 hrs, Volume= 0.252 af, Depth= 5.20"
Routed to Link PR DP D : Marsh Street CBs

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.123	98	Impervious
	0.167	32	Woods/grass comb., Good, HSG A
	0.292	79	Woods/grass comb., Good, HSG D
	0.582	70	Weighted Average
	0.459		78.87% Pervious Area
	0.123		21.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	48	0.0250	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.22"
0.1	10	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	75	0.0267	1.14		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.4	120	0.0440	1.47		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	55	0.0261	3.28		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.2	328	Total			

Summary for Subcatchment PR E1: Jordan Lot

Runoff = 0.38 cfs @ 12.09 hrs, Volume= 0.029 af, Depth= 7.16"
Routed to Pond 2P : WQS

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.040	98	Impervious
	0.009	32	Woods/grass comb., Good, HSG A
	0.049	86	Weighted Average
	0.009		18.37% Pervious Area
	0.040		81.63% Impervious Area

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

Summary for Subcatchment PR E2: Jordan Lot

Runoff = 1.14 cfs @ 12.15 hrs, Volume= 0.096 af, Depth= 5.69"
Routed to Link PR DP E : EX BMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.128	98	Impervious
	0.075	32	Woods/grass comb., Good, HSG A
	0.203	74	Weighted Average
	0.075		36.95% Pervious Area
	0.128		63.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	55	0.0360	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
0.3	45	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.8	100	Total			

Summary for Subcatchment PR E3: Jordan Lot

Runoff = 3.90 cfs @ 12.13 hrs, Volume= 0.320 af, Depth= 5.94"
Routed to Pond E3 : Porous Pave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.298	98	Permeable Pavement
	0.202	32	Woods/grass comb., Good, HSG A
	0.054	79	Woods/grass comb., Good, HSG D
*	0.092	98	Roof
	0.646	76	Weighted Average
	0.256		39.63% Pervious Area
	0.390		60.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	55	0.0550	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.22"
0.5	122	0.0450	4.31		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.4	177	Total			

Summary for Subcatchment PR F: Upper Lot

Runoff = 4.32 cfs @ 12.09 hrs, Volume= 0.328 af, Depth= 7.04"
Routed to Link PR DP F : PR Main Campus

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr 24-hr Rainfall=8.85"

	Area (ac)	CN	Description
*	0.360	98	Impervious
	0.131	79	Woods/grass comb., Good, HSG D
	0.069	32	Woods/grass comb., Good, HSG A
	0.560	85	Weighted Average
	0.200		35.71% Pervious Area
	0.360		64.29% Impervious Area

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

Summary for Pond 1P: Low Point

[57] Hint: Peaked at 264.72' (Flood elevation advised)

Inflow Area = 0.913 ac, 24.32% Impervious, Inflow Depth = 2.55" for 100-yr 24-hr event
Inflow = 2.14 cfs @ 12.16 hrs, Volume= 0.194 af
Outflow = 2.14 cfs @ 12.16 hrs, Volume= 0.194 af, Atten= 0%, Lag= 0.0 min
Primary = 2.14 cfs @ 12.16 hrs, Volume= 0.194 af
Routed to Link PR DP B : PR Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Peak Elev= 264.72' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Device 2	264.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	260.00'	**12.0" Round Culvert** L= 132.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.00' / 258.50' S= 0.0114 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.10 cfs @ 12.16 hrs HW=264.72' TW=0.00' (Dynamic Tailwater)
↑—**2=Culvert** (Passes 2.10 cfs of 6.06 cfs potential flow)
↑—**1=Orifice/Grate** (Weir Controls 2.10 cfs @ 1.53 fps)

Summary for Pond 2P: WQS

[57] Hint: Peaked at 249.31' (Flood elevation advised)

Inflow Area = 0.049 ac, 81.63% Impervious, Inflow Depth = 7.16" for 100-yr 24-hr event
Inflow = 0.38 cfs @ 12.09 hrs, Volume= 0.029 af
Outflow = 0.38 cfs @ 12.09 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min
Primary = 0.38 cfs @ 12.09 hrs, Volume= 0.029 af
Routed to Link PR DP E : EX BMP

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 249.31' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	249.00'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.37 cfs @ 12.09 hrs HW=249.30' TW=0.00' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Orifice Controls 0.37 cfs @ 1.87 fps)

Summary for Pond 3P: Low Point

[57] Hint: Peaked at 264.58' (Flood elevation advised)

Inflow Area = 0.149 ac, 4.03% Impervious, Inflow Depth = 2.67" for 100-yr 24-hr event
Inflow = 0.43 cfs @ 12.10 hrs, Volume= 0.033 af
Outflow = 0.43 cfs @ 12.10 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.0 min
Primary = 0.43 cfs @ 12.10 hrs, Volume= 0.033 af
Routed to Link PR DP B : PR Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 264.58' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Device 2	264.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	260.00'	**12.0" Round Culvert**

L= 132.0' CMP, square edge headwall, Ke= 0.500
Inlet / Outlet Invert= 260.00' / 258.50' S= 0.0114 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.43 cfs @ 12.10 hrs HW=264.58' TW=0.00' (Dynamic Tailwater)
↑—**2=Culvert** (Passes 0.43 cfs of 5.98 cfs potential flow)
↑—**1=Orifice/Grate** (Weir Controls 0.43 cfs @ 0.90 fps)

Summary for Pond A1: Porous Pave

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=36)

Inflow Area = 0.279 ac,100.00% Impervious, Inflow Depth = 8.61" for 100-yr 24-hr event
Inflow = 2.37 cfs @ 12.09 hrs, Volume= 0.200 af
Outflow = 0.22 cfs @ 12.90 hrs, Volume= 0.200 af, Atten= 91%, Lag= 49.1 min
Discarded = 0.22 cfs @ 12.90 hrs, Volume= 0.200 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link PR DP A : PR Park Ave

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 0.93' @ 12.90 hrs Surf.Area= 11,290 sf Storage= 3,133 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 106.5 min (846.5 - 740.0)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	6,774 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 22,580 cf Overall x 30.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	11,290	0	0
2.00	11,290	22,580	22,580

Device	Routing	Invert	Outlet Devices
#0	Primary	2.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	0.00'	**0.588 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = -2.00'

Discarded OutFlow Max=0.22 cfs @ 12.90 hrs HW=0.93' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.22 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Dynamic Tailwater)

Summary for Pond B1: Porous Pave

Inflow Area = 1.194 ac, 77.64% Impervious, Inflow Depth = 7.89" for 100-yr 24-hr event
Inflow = 9.86 cfs @ 12.09 hrs, Volume= 0.785 af
Outflow = 0.58 cfs @ 13.82 hrs, Volume= 0.785 af, Atten= 94%, Lag= 104.2 min
Discarded = 0.58 cfs @ 13.82 hrs, Volume= 0.785 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 1.47' @ 13.82 hrs Surf.Area= 37,140 sf Storage= 16,403 cf

Plug-Flow detention time= 276.8 min calculated for 0.784 af (100% of inflow)
Center-of-Mass det. time= 277.0 min (1,043.4 - 766.5)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	22,284 cf	**Gravel Reservoir (Prismatic)** Listed below (Recalc) 74,280 cf Overall x 30.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	37,140	0	0
2.00	37,140	74,280	74,280

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**0.391 in/hr Exfiltration - TP8 over Surface area** Conductivity to Groundwater Elevation = -2.00'

Discarded OutFlow Max=0.58 cfs @ 13.82 hrs HW=1.47' (Free Discharge)
↑**1=Exfiltration - TP8** (Controls 0.58 cfs)

Summary for Pond B3: Subsurface Chambers

Inflow Area = 0.733 ac, 82.13% Impervious, Inflow Depth = 5.27" for 100-yr 24-hr event
Inflow = 3.93 cfs @ 12.09 hrs, Volume= 0.322 af
Outflow = 3.54 cfs @ 12.13 hrs, Volume= 0.322 af, Atten= 10%, Lag= 2.4 min
Discarded = 0.07 cfs @ 12.13 hrs, Volume= 0.154 af
Primary = 3.47 cfs @ 12.13 hrs, Volume= 0.168 af
Routed to Link PR DP B : PR Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 260.54' @ 12.13 hrs Surf.Area= 1,990 sf Storage= 3,972 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 257.7 min (1,012.7 - 755.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	258.00'	1,403 cf	**27.62'W x 72.03'L x 3.56'H Field A** 7,091 cf Overall - 3,585 cf Embedded = 3,506 cf x 40.0% Voids
#2A	258.33'	3,406 cf	**ACF R-Tank SD 3** x 522 Inside #1 Inside= 15.7"W x 26.8"H => 2.78 sf x 2.35'L = 6.5 cf Outside= 15.7"W x 26.8"H => 2.93 sf x 2.35'L = 6.9 cf

522 Chambers in 18 Rows

4,808 cf Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	258.08'	**12.0" Round Outlet Pipe** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 258.08' / 257.29' S= 0.0255 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	259.90'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.40 0.40 1.60 Width (feet) 1.50 1.50 4.00 4.00
#3	Discarded	258.00'	**0.800 in/hr Exfiltration - TP3 over Surface area** Conductivity to Groundwater Elevation = 255.00'

Discarded OutFlow Max=0.07 cfs @ 12.13 hrs HW=260.53' (Free Discharge)
↑—**3=Exfiltration - TP3** (Controls 0.07 cfs)

Primary OutFlow Max=3.39 cfs @ 12.13 hrs HW=260.53' TW=0.00' (Dynamic Tailwater)
↑—**1=Outlet Pipe** (Passes 3.39 cfs of 5.28 cfs potential flow)
↑—**2=Custom Weir/Orifice** (Weir Controls 3.39 cfs @ 2.22 fps)

Summary for Pond B4: Porous Pave

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=51)

Inflow Area = 0.265 ac, 57.36% Impervious, Inflow Depth = 5.20" for 100-yr 24-hr event
Inflow = 1.58 cfs @ 12.09 hrs, Volume= 0.115 af
Outflow = 0.18 cfs @ 12.87 hrs, Volume= 0.115 af, Atten= 89%, Lag= 46.8 min
Discarded = 0.18 cfs @ 12.87 hrs, Volume= 0.115 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 0.93' @ 12.87 hrs Surf.Area= 6,600 sf Storage= 1,849 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 91.2 min (911.6 - 820.4)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	3,960 cf	**Gravel Reservoir (Prismatic)** Listed below (Recalc) 13,200 cf Overall x 30.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	6,600	0	0
2.00	6,600	13,200	13,200

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**0.800 in/hr Exfiltration - TP8 over Surface area** Conductivity to Groundwater Elevation = -2.00'

Discarded OutFlow Max=0.18 cfs @ 12.87 hrs HW=0.93' (Free Discharge)
↑—**1=Exfiltration - TP8** (Controls 0.18 cfs)

Summary for Pond E3: Porous Pave

Inflow Area = 0.646 ac, 60.37% Impervious, Inflow Depth = 5.94" for 100-yr 24-hr event
Inflow = 3.90 cfs @ 12.13 hrs, Volume= 0.320 af
Outflow = 0.12 cfs @ 16.82 hrs, Volume= 0.320 af, Atten= 97%, Lag= 281.4 min
Discarded = 0.12 cfs @ 16.82 hrs, Volume= 0.320 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link PR DP E : EX BMP

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 2.38' @ 16.82 hrs Surf.Area= 13,000 sf Storage= 9,275 cf

Plug-Flow detention time= 894.0 min calculated for 0.320 af (100% of inflow)
Center-of-Mass det. time= 894.5 min (1,705.6 - 811.1)

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	11,700 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 39,000 cf Overall x 30.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	13,000	0	0
3.00	13,000	39,000	39,000

Device	Routing	Invert	Outlet Devices
#0	Primary	3.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	0.00'	**0.180 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = -2.00'

Discarded OutFlow Max=0.12 cfs @ 16.82 hrs HW=2.38' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=0.00' (Dynamic Tailwater)

Summary for Link PR DP A: PR Park Ave

Inflow Area = 1.808 ac, 30.31% Impervious, Inflow Depth = 4.71" for 100-yr 24-hr event
Inflow = 7.70 cfs @ 12.19 hrs, Volume= 0.710 af
Primary = 7.70 cfs @ 12.19 hrs, Volume= 0.710 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP B: PR Wetlands

Inflow Area = 3.834 ac, 45.83% Impervious, Inflow Depth = 1.48" for 100-yr 24-hr event
Inflow = 6.45 cfs @ 12.14 hrs, Volume= 0.473 af
Primary = 6.45 cfs @ 12.14 hrs, Volume= 0.473 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP C: PR Prospect St

Inflow Area = 0.540 ac, 21.48% Impervious, Inflow Depth = 2.32" for 100-yr 24-hr event
Inflow = 1.06 cfs @ 12.19 hrs, Volume= 0.104 af
Primary = 1.06 cfs @ 12.19 hrs, Volume= 0.104 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP D: Marsh Street CBs

Inflow Area = 0.582 ac, 21.13% Impervious, Inflow Depth = 5.20" for 100-yr 24-hr event
Inflow = 3.05 cfs @ 12.15 hrs, Volume= 0.252 af
Primary = 3.05 cfs @ 12.15 hrs, Volume= 0.252 af, Atten= 0%, Lag= 0.0 min
Routed to Link PR DP F : PR Main Campus

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP E: EX BMP

Inflow Area = 0.898 ac, 62.14% Impervious, Inflow Depth = 1.68" for 100-yr 24-hr event
Inflow = 1.45 cfs @ 12.13 hrs, Volume= 0.126 af
Primary = 1.45 cfs @ 12.13 hrs, Volume= 0.126 af, Atten= 0%, Lag= 0.0 min
Routed to Link PR DP F : PR Main Campus

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Summary for Link PR DP F: PR Main Campus

Inflow Area = 2.040 ac, 51.03% Impervious, Inflow Depth = 4.15" for 100-yr 24-hr event
Inflow = 8.54 cfs @ 12.11 hrs, Volume= 0.706 af
Primary = 8.54 cfs @ 12.11 hrs, Volume= 0.706 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Pond B3: Subsurface Chambers - Chamber Wizard Field A

Chamber Model = ACF R-Tank SD 3 (ACF EnvironmentalR-Tank SD)
Inside= 15.7"W x 26.8"H => 2.78 sf x 2.35'L = 6.5 cf
Outside= 15.7"W x 26.8"H => 2.93 sf x 2.35'L = 6.9 cf

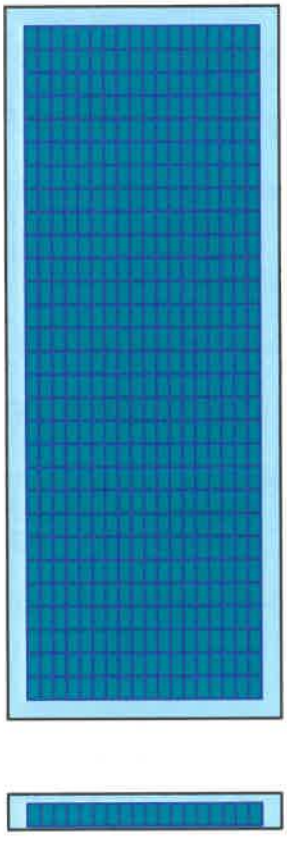
29 Chambers/Row x 2.35' Long = 68.03' Row Length +24.0" End Stone x 2 = 72.03' Base Length
18 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 27.62' Base Width
4.0" Stone Base + 26.8" Chamber Height + 12.0" Stone Cover = 3.56' Field Height

522 Chambers x 6.5 cf = 3,405.8 cf Chamber Storage
522 Chambers x 6.9 cf = 3,585.1 cf Displacement

7,091.4 cf Field - 3,585.1 cf Chambers = 3,506.3 cf Stone x 40.0% Voids = 1,402.5 cf Stone Storage

Chamber Storage + Stone Storage = 4,808.4 cf = 0.110 af
Overall Storage Efficiency = 67.8%
Overall System Size = 72.03' x 27.62' x 3.56'

522 Chambers
262.6 cy Field
129.9 cy Stone



Stage-Area-Storage for Pond B3: Subsurface Chambers

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
258.00	**1,990**	0
258.05	1,990	40
258.10	1,990	80
258.15	1,990	119
258.20	1,990	159
258.25	1,990	199
258.30	1,990	239
258.35	1,990	293
258.40	1,990	377
258.45	1,990	461
258.50	1,990	545
258.55	1,990	629
258.60	1,990	713
258.65	1,990	797
258.70	1,990	881
258.75	1,990	965
258.80	1,990	1,049
258.85	1,990	1,133
258.90	1,990	1,217
258.95	1,990	1,301
259.00	1,990	1,385
259.05	1,990	1,469
259.10	1,990	1,553
259.15	1,990	1,637
259.20	1,990	1,721
259.25	1,990	1,805
259.30	1,990	1,889
259.35	1,990	1,973
259.40	1,990	2,057
259.45	1,990	2,141
259.50	1,990	2,225
259.55	1,990	2,309
259.60	1,990	2,393
259.65	1,990	2,477
259.70	1,990	2,561
259.75	1,990	2,645
259.80	1,990	2,729
259.85	1,990	2,813
259.90	1,990	2,897
259.95	1,990	2,981
260.00	1,990	3,065
260.05	1,990	3,149
260.10	1,990	3,233
260.15	1,990	3,317
260.20	1,990	3,401
260.25	1,990	3,485
260.30	1,990	3,569
260.35	1,990	3,653
260.40	1,990	3,737
260.45	1,990	3,821
260.50	1,990	3,905

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
260.55	1,990	3,989
260.60	1,990	4,041
260.65	1,990	4,081
260.70	1,990	4,121
260.75	1,990	4,160
260.80	1,990	4,200
260.85	1,990	4,240
260.90	1,990	4,280
260.95	1,990	4,319
261.00	1,990	4,359
261.05	1,990	4,399
261.10	1,990	4,439
261.15	1,990	4,479
261.20	1,990	4,518
261.25	1,990	4,558
261.30	1,990	4,598
261.35	1,990	4,638
261.40	1,990	4,678
261.45	1,990	4,717
261.50	1,990	4,757
261.55	1,990	**4,797**

APPENDIX D

Stormwater Quality Calculations

LANGAN

LANGAN

TSS Removal Calculation Worksheet

100 Cambridge Street
Boston, MA 02114

Project Name:	Belmont Hill School	Sheet:	1 of 5
Project Number:	151021201	Date:	30-May-2022
Location:	Belmont, MA	Computed by:	KJH
Discharge Point:	DP-A, DP-B	Checked by:	HH
Drainage Area(s):	A-2, B-1, B-4, E-3		

A BMP*	B TSS Removal Rate*	C Starting TSS Load**	D Amount Removed (C*D)	E Remaining Load (D-E)
Porous Pavement	80%	1.00	0.80	0.20
	0%	0.20	0.00	0.20
	0%	0.20	0.00	0.20
	0%	0.20	0.00	0.20
	0%	0.20	0.00	0.20

* BMP and TSS Removal Rate Values from the MassDEP Stormwater Handbook Vol. 1
** Equals remaining load from previous BMP (E)

Treatment Train TSS Removal =	**80%**

LANGAN

TSS Removal Calculation Worksheet

100 Cambridge Street
Boston, MA 02114

Project Name: Belmont Hill School
Project Number: 151021201
Location: Belmont, MA
Discharge Point: DP-B
Drainage Area(s): B-3 (pretreatment)

Sheet: 2 of 5
Date: 30-May-2022
Computed by: KJH
Checked by: HH

A	B	C	D	E
BMP*	TSS Removal Rate*	Starting TSS Load**	Amount Removed (C*D)	Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	25%	1.00	0.25	0.75
Proprietary Structure - First Defense***	80%	0.75	0.60	0.15
	0%	0.15	0.00	0.15
	0%	0.15	0.00	0.15
	0%	0.15	0.00	0.15

* BMP and TSS Removal Rate Values from the MassDEP Stormwater Handbook Vol. 1
** Equals remaining load from previous BMP (E)
***Proprietary Pretreatment Structures are sized to treat Water Quality Flow. See attached water quality flow calculations. Removal rates for propriety devices are from approved studies and/or manufacturer data. See attached data sheets.

Treatment Train TSS Removal = 85%

LANGAN

TSS Removal Calculation Worksheet

100 Cambridge Street
Boston, MA 02114

Project Name:	Belmont Hill School	Sheet:	4 of 5
Project Number:	151021201	Date:	30-May-2022
Location:	Belmont, MA	Computed by:	KJH
Discharge Point:	DP-B	Checked by:	HH
Drainage Area(s):	B-3		

A	B	C	D	E
BMP*	TSS Removal Rate*	Starting TSS Load**	Amount Removed (C*D)	Remaining Load (D-E)
Subsurface Infiltration Chambers	80%	1.00	0.80	0.20
	0%	0.20	0.00	0.20
	0%	0.20	0.00	0.20
	0%	0.20	0.00	0.20
	0%	0.20	0.00	0.20

* BMP and TSS Removal Rate Values from the MassDEP Stormwater Handbook Vol. 1
** Equals remaining load from previous BMP (E)
***Proprietary Pretreatment Structures are sized to treat Water Quality Flow. See attached water quality flow calculations. Removal rates for propriety devices are from approved studies and/or manufacturer data. See attached data sheets.

Treatment Train TSS Removal = 80%

LANGAN

TSS Removal Calculation Worksheet

100 Cambridge Street
Boston, MA 02114

Project Name:	Belmont Hill School	Sheet:	5 of 5
Project Number:	151021201	Date:	30-May-2022
Location:	Belmont, MA	Computed by:	KJH
Discharge Point:	DP-E	Checked by:	HH
Drainage Area(s):	E-1		

A	B	C	D	E
BMP*	TSS Removal Rate*	Starting TSS Load**	Amount Removed (C*D)	Remaining Load (D-E)
Proprietary Water Quality Unit - First Defense***	80%	1.00	0.80	0.20
	0%	0.20	0.00	0.20
	0%	0.20	0.00	0.20
	0%	0.20	0.00	0.20
	0%	0.20	0.00	0.20

* BMP and TSS Removal Rate Values from the MassDEP Stormwater Handbook Vol. 1
** Equals remaining load from previous BMP (E)
***Proprietary Pretreatment Structures are sized to treat Water Quality Flow. See attached water quality flow calculations. Removal rates for propriety devices are from approved studies and/or manufacturer data. See attached data sheets.

Treatment Train TSS Removal =	**80%**

Hydro International

Downstream Defender®

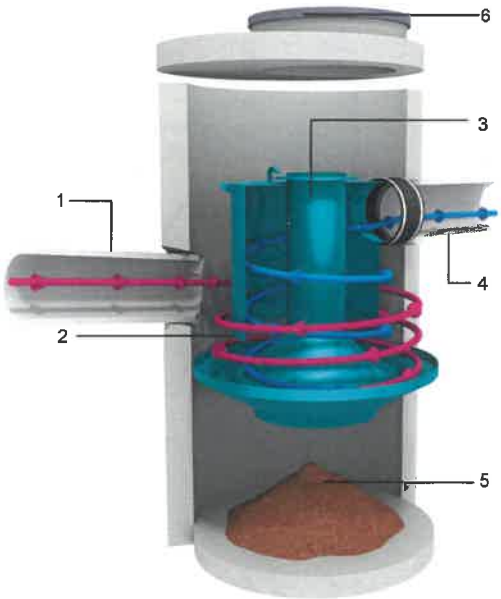
Advanced Hydrodynamic Separator

Product Summary

Exceptional Pollutant Capture in a Compact Profile

Downstream Defender is an advanced hydrodynamic vortex separator that provides impressive and reliable removal of fine and coarse particles, hydrocarbons, and floatable debris from surface water runoff, delivering high levels of stormwater treatment over a wide range of flow rates.

Available in a range of sizes, it can function as either pretreatment or as a stand-alone device, providing engineers and contractors with a flexible, cost-effective stormwater management option.



Product Profile

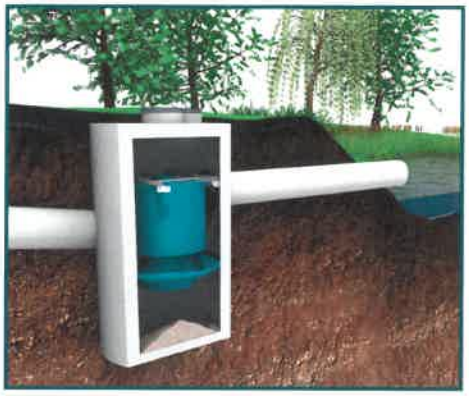
1. Inlet to Precast Vortex Chamber
2. Cylindrical Baffle
3. Center Shaft
4. Outlet Pipe
5. Sediment Storage Sump
6. Access Lid

Applications

- Areas requiring a minimum of 50% TSS removal
- Highways, parking lots, industrial areas and urban developments
- Pre-treatment to ponds, storage systems, green infrastructure
- Areas where high solids and trash capture are a must

How it Works

Tangential Inlet for Superior Vortex Action



Polluted stormwater is introduced tangentially into the side of the precast vortex chamber to establish rotational flow. A cylindrical baffle with an inner center shaft creates an outer (magenta arrow) and inner (blue arrow) spiraling column of flow and ensures maximum residence time for pollutant travel between the inlet and outlet.

Oil, trash and other floating pollutants are captured and stored on the surface of the outer spiraling column. Low energy vortex motion directs sediment into the protected sump region. Only after following a long three-dimensional flow path is the treated stormwater discharged from the outlet pipe.

Benefits

Tight & Mighty

- Save space and money: treat high peak flows in as little as half of the footprint of other structural BMP systems.
- Cut headloss: Low headloss means more site flexibility and provides engineers with design options for shallower sites.
- Increase Pollutant Capture: Carefully designed internal components isolate the pollution storage areas, ensuring that what is captured is retained, even during high flows.
- Adapt to Your Site: accommodate a change in outlet pipe direction to suit site-specific requirements.

Stormwater Solutions

→ hydro-int.com/downstreamdefender

Sizing & Design

The Downstream Defender can be used to meet a wide range of stormwater treatment objectives. It is available in 5 precast models that fit easily into the drainage network (**Table 1**). Selection and layout of the appropriate Downstream Defender model depends on site hydraulics, site constraints and local regulations. Both online (**Fig.3a**) and offline (**Fig.3b**) configurations are common.

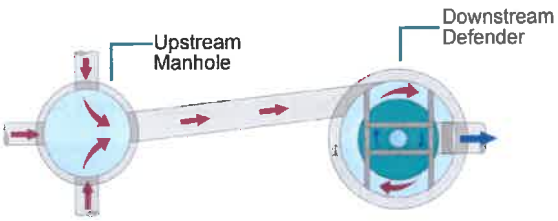


Fig.3a The Downstream Defender in an online configuration.

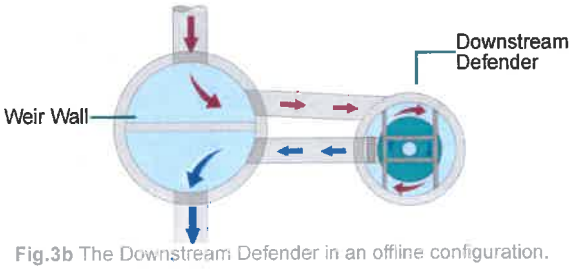


Fig.3b The Downstream Defender in an offline configuration.

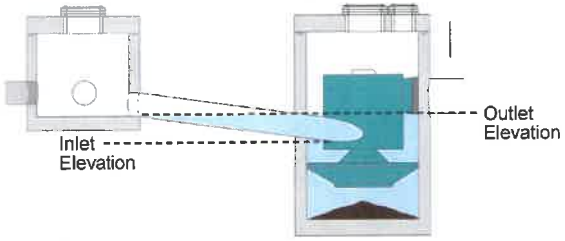


Fig.2 The Downstream Defender® has a submerged inlet that reduces headloss and improves efficiency of pollutant capture.

Online Sizing Tool

This simple online tool will recommend the best separator, model size and online or offline arrangement based on site-specific data entered by the user.

Go to hydro-int.com/sizing to access the tool.

Model Number and Diameter		Peak Treatment Flow Rate		Maximum Pipe Diameter		Oil Storage Capacity		Sediment Storage Capacity		Minimum Distance from Outlet Invert to Top of Rim		Standard Height from Outlet Invert to Sump Floor	
(ft)	(m)	(cfs)	(L/s)	(in)	(mm)	(gal)	(L)	(yd^3)	(m^3)	(ft)	(m)	(ft)	(m)
4	1.2	3.0	85	12	300	70	265	0.70	0.53	2.8	0.85	4.1	1.25
6	1.8	8.0	227	18	450	216	818	2.10	1.61	3.2	0.98	5.9	1.80
8	2.4	15.0	425	24	600	540	2,044	4.65	3.56	4.2	1.28	7.7	2.35
10	3.0	25.0	708	30	750	1,050	3,975	8.70	6.65	5.0	1.52	9.4	2.85
12*	3.7	38.0	1,076	36	900	1,770	6,700	14.70	11.24	5.6	1.71	11.2	3.41

**Not available in all areas. Contact Hydro International for details.*

Maintenance

Easy access through the center shaft of the system makes for quick, simple sump cleanout. Trash and floatables can be removed from the surface with a net.

To ensure optimal performance, recommend Hydro International to your clients as the preferred service and maintenance provider.

Hydro International

Hydro International, 94 Hutchins Drive, Portland, ME 04102
Tel: (207) 756-6200
Email: stormwaterinquiry@hydro-int.com
Web: www.hydro-int.com/downstreamdefender

DD_SS_C_2111

Download Drawings!

→ hydro-int.com/dd-drawings

Access the Operation & Maintenance Manual

→ hydro-int.com/dd-om

First Defense® High Capacity

A Simple Solution for your Trickiest Sites

Verified by NJCAT and NJDEP

Product Profile

The First Defense® High Capacity is an enhanced vortex separator that combines an effective stormwater treatment chamber with an integral peak flow bypass. It efficiently removes sediment total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® High Capacity is available in several model configurations to accommodate a wide range of pipe sizes, peak flows and depth constraints (**Table 1**, next page).

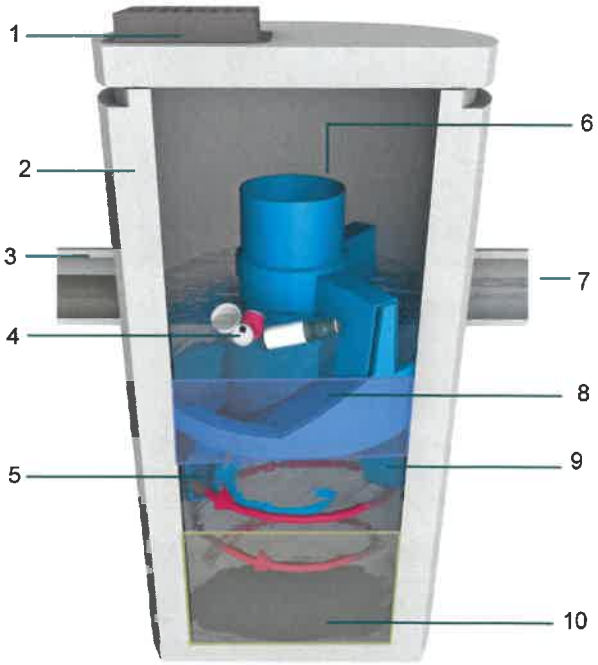
Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for "offline" arrangements using separate junction manholes
- Proven to prevent pollutant washout at up to 450% of its treatment flow
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

Fig.1 The First Defense® High Capacity has internal components designed to efficiently capture pollutants and prevent washout at peak flows.



Components

1. Inlet Grate (optional)
2. Precast chamber
3. Inlet Pipe (optional)
4. Floatables Draw Off Slot (not pictured)
5. Inlet Chute
6. Internal Bypass
7. Outlet pipe
8. Oil and Floatables Storage
9. Outlet chute
10. Sediment Storage Sump

How it Works

The First Defense® High Capacity has internal components designed to remove and retain gross debris, total suspended solids (TSS) and hydrocarbons (**Fig.1**).

Contaminated stormwater runoff enters the inlet chute from a surface grate and/or inlet pipe. The inlet chute introduces flow into the chamber tangentially to create a low energy vortex flow regime (magenta arrow) that directs sediment into the sump while oils, floating trash and debris rise to the surface.

Treated stormwater exits through a submerged outlet chute located opposite to the direction of the rotating flow (blue arrow). Enhanced vortex separation is provided by forcing the rotating flow within the vessel to follow the longest path possible rather than directly from inlet to outlet.

Higher flows bypass the treatment chamber to prevent turbulence and washout of captured pollutants. An internal bypass conveys infrequent peak flows directly to the outlet eliminating the need for, and expense of, external bypass control structures. A floatables draw off slot functions to convey floatables into the treatment chamber prior to bypass.

Hydro International, 94 Hutchins Drive, Portland, ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212
Email: stormwaterinquiry@hydro-int.com Web: www.hydro-int.com

First Defense® High Capacity

Sizing & Design

This adaptable online treatment system works easily with large pipes, multiple inlet pipes, inlet grates and now, contains a high capacity bypass for the conveyance of large peak flows. Designed with site flexibility in mind, the First Defense® High Capacity allows engineers to maximize available site space without compromising treatment level.

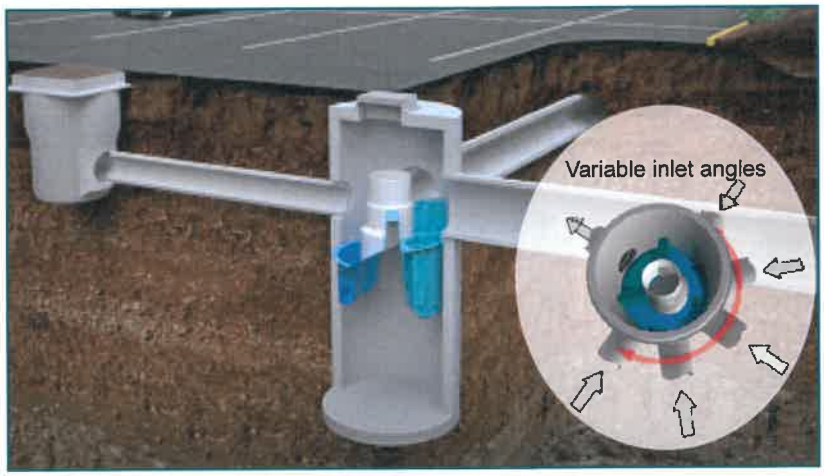


Fig 2. Works with multiple inlet pipes and grates

Inspection and Maintenance

Nobody maintains our systems better than we do. To ensure optimal, ongoing device performance, be sure to recommend Hydro International as a preferred service and maintenance provider to your clients.

Call **1 (800) 848-2706** to schedule an inspection and cleanout or learn more at **hydro-int.com/service**

Sizing Calculator for Engineers

This simple online tool will recommend the best separatror, model size and online/offline arrangement based on site-specific data entered by the user.

Go to hydro-int.com/sizing to access the tool.

Fig 3. Maintenance is done with a vactor truck

Table 1. First Defense® High Capacity Design Criteria.

First Defense® High Capacity Model Number	Diameter	Typical TSS Treatment Flow Rates		Peak Online Flow Rate	Maximum Pipe Diameter[1]	Oil Storage Capacity	Typical Sediment Storage Capacity[2]	Minimum Distance from Outlet Invert to Top of Rim[3]	Standard Distance from Outlet Invert to Sump Floor
		NJDEP Certified	110µm						
	(ft / m)	(cfs / L/s)	(cfs / L/s)	(cfs / L/s)	(in / mm)	(gal / L)	(yd^3 / m^3)	(ft / m)	(ft / m)
FD-3HC	3 / 0.9	0.84 / 23.7	1.06 / 30.0	15 / 424	18 / 457	125 / 473	0.4 / 0.3	2.0 - 3.5 / 0.6 - 1.0	3.71 / 1.13
FD-4HC	4 / 1.2	1.50 / 42.4	1.88 / 53.2	18 / 510	24 / 600	191 / 723	0.7 / 0.5	2.3 - 3.9 / 0.7 - 1.2	4.97 / 1.5
FD-5HC	5 / 1.5	2.34 / 66.2	2.94 / 83.2	20 / 566	24 / 600	300 / 1135	1.1 / .84	2.5 - 4.5 / 0.7 - 1.3	5.19 / 1.5
FD-6HC	6 / 1.8	3.38 / 95.7	4.23 / 119.8	32 / 906	30 / 750	496 / 1,878	1.6 / 1.2	3.0 - 5.1 / 0.9 - 1.6	5.97 / 1.8
FD-8HC	8 / 2.4	6.00 / 169.9	7.52 / 212.9	50 / 1,415	48 / 1219	1120 / 4239	2.8 / 2.1	3.0 - 6.0 / 0.9 -1.8	7.40 / 2.2

[1]Contact Hydro International when larger pipe sizes are required.
[2]Contact Hydro International when custom sediment storage capacity is required.
[3]Minimum distance for models depends on pipe diameter.

Hydro International, 94 Hutchins Drive, Portland, ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212
Email: stormwaterinquiry@hydro-int.com Web: www.hydro-int.com

Stormwater Solutions
hydro-int.com/firstdefensehc
FDHCSS1703

Technical Abstract
First Defense® - High Capacity

NJCAT Verified 80% TSS Removal for 50 to 150 µm Particle Size Range

Introduction

Hydro International has a state-of-the-art hydraulics and test facility that is used both to develop products and to evaluate performance. Through controlled testing using industry standard test protocols, Hydro's treatment products are evaluated under varying hydraulic and sediment load conditions. With a known drainage area or water quality flow rate, these test results are used to benchmark treatment objectives and to select the correct model size.

A common stormwater treatment goal for manufactured treatment devices is to reduce the Total Suspended Solids (TSS) concentration by at least 80%. To comply with this goal, a silica-based test sand with known particle size gradation (PSD) and density is injected into the treatment system at different flow rates. With known TSS concentrations and particle sizes before and after treatment, efficiency curves are plotted and used to predict TSS reductions for a range of particle sizes.

OK110 Silica Test Sand

U.S. Silica OK110 is a common test sand that has been used by the industry but is no longer available. However, its PSD can be modelled from a blend of silica sands having a wide range of particle sizes. This abstract summarizes test results based on a particle size range similar to OK110 for the First Defense® High Capacity (FDHC). All test protocols and results have been independently verified by the New Jersey Corporation for Advanced Technology (NJCAT). The full report can be viewed at: FDHC_PSD_Removal_Verification_Report_9-16.pdf

First Defense High Capacity (FDHC)

The FDHC (Figure 1) has patented flow modifying internal components that create a gentle swirling flow path within the Vortex Chamber. The rotating flow creates low energy vortex forces that supplement gravitational settling forces to enhance separation of pollutants.

The internal components are fit into precast manholes to collect runoff as part of typical drainage network system. During rain events, flow enters either from a surface inlet grate or inlet pipe. As flow enters the manhole, components divert flow and pollutants into a Vortex Chamber beneath a separation module, that includes both Inlet\Outlet Chutes and Bypass Weirs. The internal Bypass Weirs divert peak flows over the separation module and away from the Vortex Chamber where pollutants are collecting. This prevents high velocities from re-suspending captured pollutants during infrequent but large storm events.

Capable of providing high pollutant removals for a wide range of flow rates and pipe sizes, the FDHC can be installed ether online or offline depending on pipes and peak flows. Its efficiency and simplicity make it economical to install and maintain.

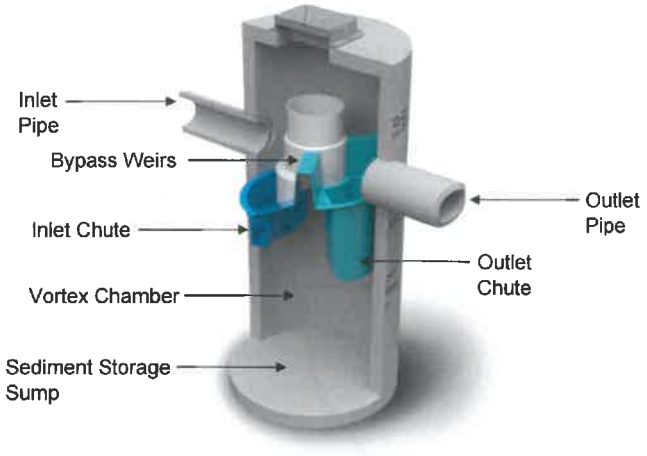


Figure 1 - First Defense High Capacity

Laboratory Testing Arrangement

The laboratory setup (Figure 2) consisted of a recirculating closed loop system with an 8-inch (200 mm) submersible Flygt pump that conveyed water from a 23,000 gal (87,064 L) reservoir through a PVC pipe network to the 4-ft (1.2m) FDHC. The flow rate of the pump was controlled by a GE Fuji Electric AF-300 P11 Adjustable Frequency Drive and measured by an EMCO Flow Systems 4411e Electromagnetic Flow Transmitter. Test sand was injected into the incoming flow stream using a volumetric screw feeder situated 10-ft prior to entering the test unit.

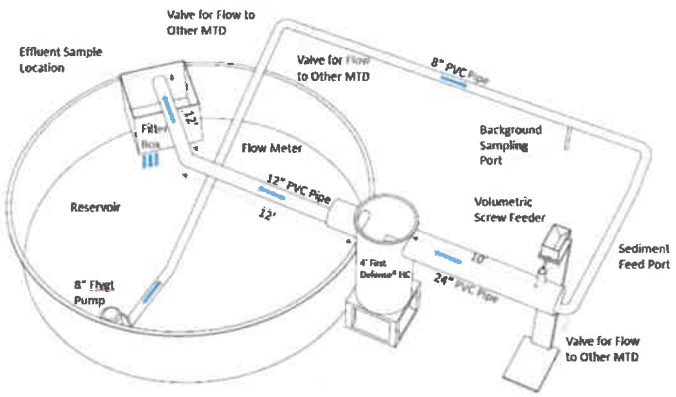


Figure 2 - Set-up of the Portland, Maine hydraulic testing facility

Test Sediment

The feed sediment injected into the inlet during removal efficiency testing was a blend of commercially available silica sands ranging from 2 µm to 1,000 µm. The PSD of the test sediment was analyzed by an independent laboratory in accordance with ASTM D 422-63.

First Defense® - High Capacity

To evaluate the performance consistent with OK110 test sand, results were analyzed from the particle sizes range of 50 µm to 150 µm (D_{50}=108µm). A comparison between the 50 – 150 µm range and OK110 gradation is shown in Figure 3. The 50 – 150 µm test sand gradation is overall finer than OK110 between 50 µm and 100 µm. For example, the test sand had 15% finer than 75 µm compared to the OK110 PSD that had only 3% less than 75 microns. Given that finer particles are more difficult to remove, performance results for 50 to 150 µm PSD is considered conservative.

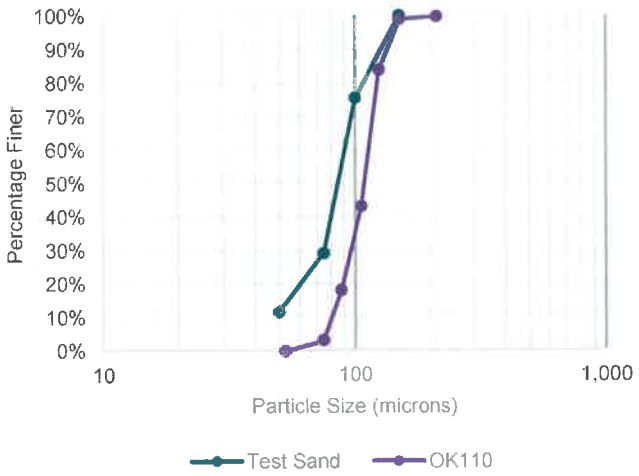


Figure 3 - Particle Size Distribution Comparison

Removal Efficiency Testing

Removal efficiency testing with the feed sediment was conducted in accordance with Section 5 of the NJDEP Laboratory Protocol for Manufactured Treatment Devices. Five flow rates ranging from 0.38 cfs to 1.88 cfs were tested to assess the performance trend.

The test sediment was fed into the flow stream at a rate that was equivalent to 200 mg/L. The average influent TSS concentration was calculated using the total sediment mass and volume of water added during dosing. The influent concentration for each particle size band was calculated using the percentage of particles in each particle size band and known average inlet concentration. Three time-spaced effluent grab samples were composited and analyzed using laser diffraction (ISO 13320) to evaluate the effluent particle sizes.

Table 1 – 50 – 150 µm Particle Size Range Test Results

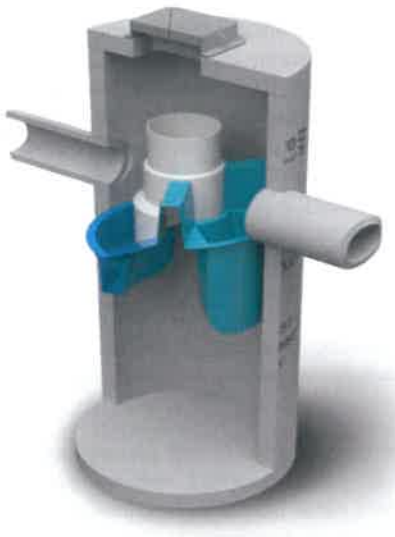
Flow	Inlet Mass	Outlet Mass	Removal
cfs (L/s)	grams	grams	%
0.38 (10.8)	1,554.6	107.1	93.1
0.75 (21.2)	1,761.0	150.8	91.4
1.13 (32.0)	1,872.8	127.2	93.2
1.5 (42.5)	2,203.2	226.7	89.7
1.88 (53.2)	2,366.6	303.8	87.2

The average effluent sediment concentration of the three composited samples was also measured for each flow rate in accordance with ASTM D3977-97. The effluent concentration for each particle size band was then calculated using the average effluent composite concentration and percentage of particles in each particle size band.

Percent removed at each of the five tested flow rates is shown in Table 1. Inlet concentrations of the OK110 particle size range varied from 79-84 mg/L compared to 4-8.5 mg/L at the outlet. As expected, the highest concentration measured at the outlet was at the highest tested flow rate of 1.88 cfs (53.2 L/s). In general, the 4-ft FDHC removed greater than 85% of the OK110 particle size range for all tested flow rates. Table 2 provides "Treatment Flow Rates" for the available models.

Table 2 – FDHC Treatment Flow Rate for > 85% OK110

Model:	FD-3HC	FD-4HC	FD-5HC	FD-6HC	FD-8HC
Size:	3 ft (900 mm)	4 ft (1.2 m)	5 ft (1.5 m)	6 ft (1.8 m)	8 ft (2.4m)
cfs:	1.06	1.88	2.94	4.23	7.52
L/s:	30.02	53.2	83.3	119.8	212.9



For design purposes the selected model's Treatment Flow Rate must be equal or greater to the site's required Water Quality Flow Rate. The peak flow rate and maximum pipe size must be considered to determine whether an online or offline configuration is appropriate. Full removal curves are available on request.

Refer First Defense product information brochure or visit www.hydro-int.com/us for more information

Hydro International. 94 Hutchins Drive. Portland. ME 04102
Tel: 207.756.6200 Fax: 207.756.6212
Email: stormwaterinquiry@hydro-int.com Web: www.hydro-int.com

Stormwater Solutions

Stormwater Quality Flow Calculations

Calculation
Stormwater Quality Volume (WQV)
Stormwater Quality Flow (WQF)

Design Guideline
Massachusetts Stormwater Handbook / MS4 Watershed
MassDEP & Ubran Hydrology for Small Watersheds TR-55

Subwatershed:	**B3**
Water Quality Structures:	**WQS-101**
Structure Model	**Downstream Defender (4')**

Watershed Characteristics

Total Watershed Area	0.450	ac			
Impervious Area, A_{imp}	0.450	ac	>>>	0.0007	mi^2
Time of Concentration , T_c	6	min	>>>	0.1	hr

Water Quality Volume (WQV)

$WQV = (Q_{WQV})*(A_{Imp})$

Water Quality Depth, Q_{WQV}	0.5	in			
Impervious Area, A_{imp}	0.45	ac			
Water Quality Volume, WQV	0.02	**ac-ft**	>>>	817	ft^3

Water Quality Flow (WQF)

$WQF = (q_u)* (A_{Imp})*(Q_{WQV})$
q_u = Unit Peak Discharge (csm/in)
A = drainage area (mi^2)

Water Quality Depth, Q_{WQV}	0.5	in
CN =	98	
Tc =	0.100	hr
Ia =	0.041	
P =	0.7	in
Ia / P =	0.058	
Unit Peak Discharge, q_u	752	csm/in
Water Quality Flow, WQF =	0.26	**cfs**
WQF < maximum flow rate for 80% TSS Removal?	YES	

Determine qu, using *MassDEP Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices*
Figure 1 or 2 for Ia/P = 0.058 for 1/2" Q_{WQV}

Belmont Hill School 350 Prospect St, Belmont, MA 02478	BY	KH	DATE	5/31/2022	PROJ NO. 151021201
Maintenance Facility	REV	HH	DATE	3/1/2023	SHEET

Stormwater Quality Flow Calculations

Calculation
Stormwater Quality Volume (WQV)
Stormwater Quality Flow (WQF)

Design Guideline
Massachusetts Stormwater Handbook / MS4 Watershed
MassDEP & Ubran Hydrology for Small Watersheds TR-55

Subwatershed:	**E1**
Water Quality Structures:	**WQS-201**
Structure Model	**FD-3HC**

Watershed Characteristics

Total Watershed Area	0.046	ac			
Impervious Area, A_{imp}	0.038	ac	>>>	0.0001	mi^2
Time of Concentration , T_c	6	min	>>>	0.1	hr

Water Quality Volume (WQV)

$WQV = (Q_{WQV})*(A_{Imp})$

Water Quality Depth, Q_{WQV}	0.5	in			
Impervious Area, A_{imp}	0.04	ac			
Water Quality Volume, WQV	0.00	**ac-ft**	>>>	69	ft^3

Water Quality Flow (WQF)

$WQF = (q_u)* (A_{Imp})*(Q_{WQV})$
q_u = Unit Peak Discharge (csm/in)
A = drainage area (mi^2)

Water Quality Depth, Q_{WQV}	0.5	in
CN =	98	
Tc =	0.100	hr
Ia =	0.041	
P =	0.7	in
Ia / P =	0.058	
Unit Peak Discharge, q_u	752	csm/in

Water Quality Flow, WQF =	0.04	**cfs**
WQF < maximum flow rate for 80% TSS Removal?	YES	

Determine qu, using *MassDEP Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices*
Figure 1 or 2 for Ia/P = 0.058 for 1/2" Q_{WQV}

Belmont Hill School 350 Prospect St, Belmont, MA 02478	BY	KH	DATE	5/31/2022	PROJ NO. 151021201
Maintenance Facility	CKD	HH	DATE		SHEET

Stormwater Quality Flow Calculations

Calculation
Stormwater Quality Volume (WQV)
Stormwater Quality Flow (WQF)

Design Guideline
Massachusetts Stormwater Handbook / MS4 Watershed
MassDEP & Ubran Hydrology for Small Watersheds TR-55

Subwatershed:	**MAIN ATHLETIC LOT - F**
Water Quality Structures:	**WQS-301**
Structure Model	**FD-3HC**

Watershed Characteristics

Total Watershed Area	0.889	ac			
Impervious Area, A_{imp}	0.657	ac	>>>	0.001	mi^2
Time of Concentration , T_c	9	min	>>>	0.155	hr

Water Quality Volume (WQV)

$WQV = (Q_{WQV})*(A_{Imp})$

Water Quality Depth, Q_{WQV}	0.5	in			
Impervious Area, A_{imp}	0.66	ac			
Water Quality Volume, WQV	0.03	**ac-ft**	>>>	1,192	ft^3

Water Quality Flow (WQF)

$WQF = (q_u)* (A_{Imp})*(Q_{WQV})$
q_u = Unit Peak Discharge (csm/in)
A = drainage area (mi^2)

Water Quality Depth, Q_{WQV}	0.5	in
CN =	98	
Tc =	0.155	hr
Ia =	0.041	
P =	0.7	in
Ia / P =	0.058	
Unit Peak Discharge, q_u	694	csm/in
Water Quality Flow, WQF =	0.35	**cfs**
WQF < maximum flow rate for 80% TSS Removal?	YES	

Determine qu, using *MassDEP Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices*
Figure 1 or 2 for Ia/P = 0.058 for 1/2" Q_{WQV}

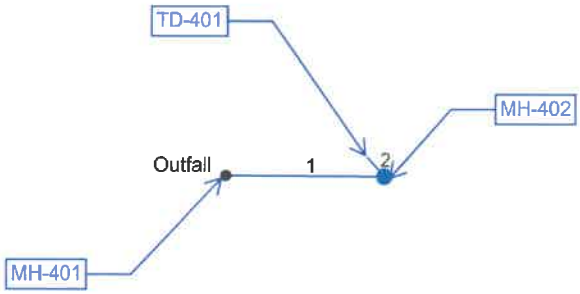
Belmont Hill School 350 Prospect St, Belmont, MA 02478	BY	KH	DATE	11/11/2022	PROJ NO. 151021201
Maintenance Facility	CKD	HH	DATE		SHEET

APPENDIX E

Stormwater Collection System Calculations

LANGAN

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Storm Network A.stm	Number of lines: 2	Date: 1/27/2023

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
2	1	6.680	-131.314	MH	0.00	0.24	0.90	5.0	267.15	1.50	267.25	12	Cir	0.012	1.00	268.36	PIPE-59
1	End	41.391	0.264	MH	0.00	0.00	0.00	0.0	264.84	0.99	265.25	12	Cir	0.012	1.00	270.25	PIPE-59 (2)

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
2	TD-401	Manhole	268.36	Cir	0.00	0.00	12	Cir	267.25			
1	MH-402	Manhole	270.25	Cir	4.00	4.00	12	Cir	265.25	12	Cir	267.15

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
2	PIPE-59	1.81	12	Cir	6.680	267.15	267.25	1.497	267.58	267.82	n/a	267.82	1	Manhole
1	PIPE-59 (2)	1.81	12	Cir	41.391	264.84	265.25	0.991	265.32	265.82	n/a	265.82	End	Manhole

Project File: Storm Network A.stm | Number of lines: 2 | Run Date: 1/27/2023

NOTES: Return period = 25 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
2	1	6.680	0.24	0.24	0.90	0.22	0.22	5.0	5.0	8.2	1.81	4.72	4.75	12	1.50	267.15	267.25	267.58	267.82	270.25	268.36	PIPE-59
1	End	41.391	0.00	0.24	0.00	0.00	0.22	0.0	5.0	8.2	1.81	3.84	4.35	12	0.99	264.84	265.25	265.32	265.82	270.34	270.25	PIPE-59 (2)

Project File: Storm Network A.stm | Number of lines: 2 | Run Date: 1/27/2023

NOTES:Intensity = 102.61 / (Inlet time + 16.50) ^ 0.82; Return period =Yrs. 25 ; c = cir e = ellip b = box

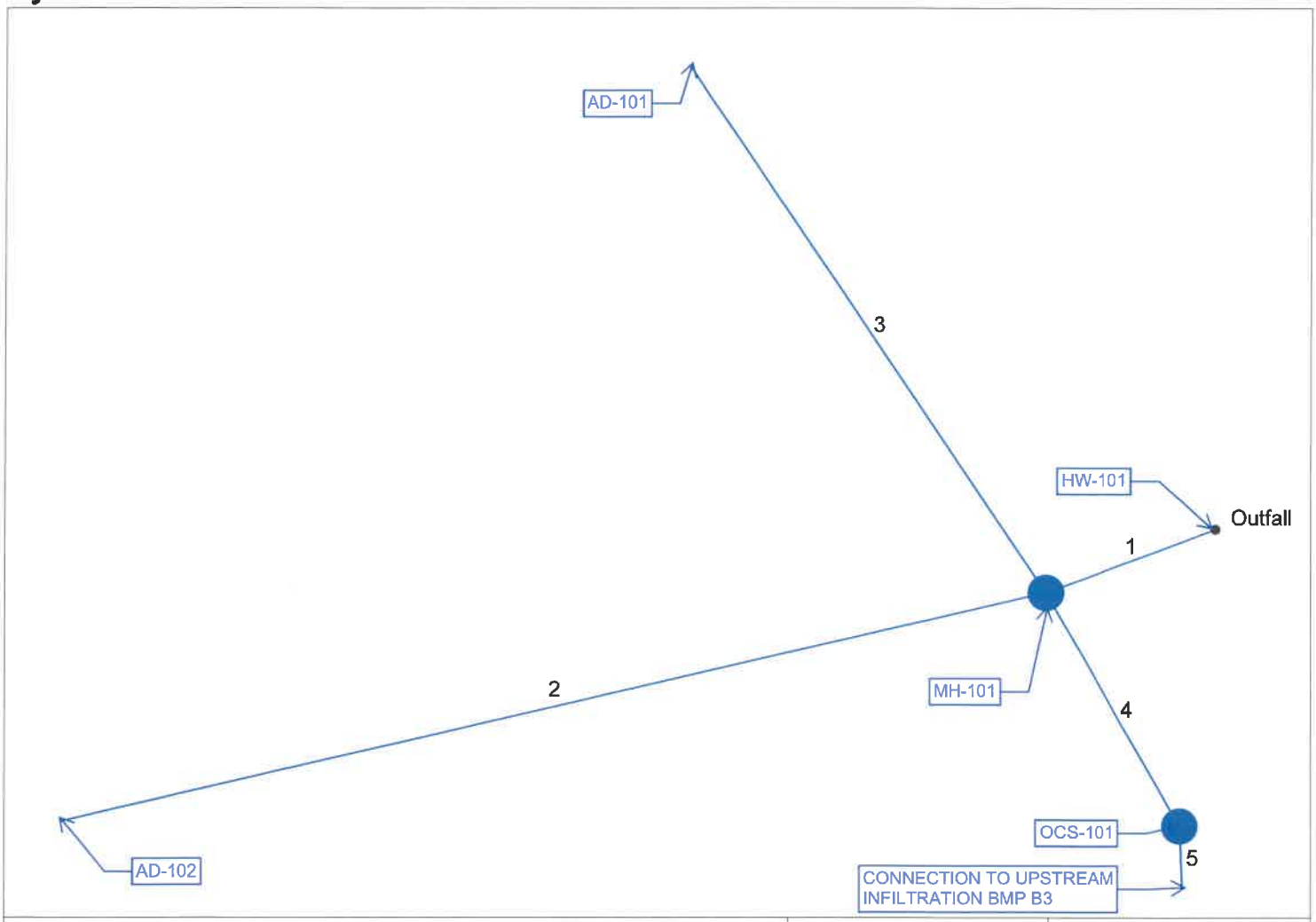
Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
2	12	1.81	267.15	267.58	0.43*	0.32	5.61	0.24	267.82	0.000	6.680	267.25	267.82	0.57**	0.47	3.90	0.24	268.06	0.000	0.000	n/a	1.00	n/a
1	12	1.81	264.84	265.32	0.48	0.38	4.81	0.24	265.56	0.000	41.391	265.25	265.82	0.57**	0.46	3.89	0.24	266.06	0.000	0.000	n/a	1.00	n/a

Project File: Storm Network A.stm | Number of lines: 2 | Run Date: 1/27/2023

Notes: * depth assumed; ** Critical depth. ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Storm Network B-2.stm	Number of lines: 5	Date: 3/1/2023

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	20.538	159.419	MH	0.00	0.00	0.00	0.0	255.00	2.43	255.50	24	Cir	0.012	1.00	264.00	PIPE-8
2	1	115.379	7.465	None	0.00	0.91	0.30	5.0	260.00	1.30	261.50	12	Cir	0.012	1.00	265.50	PIPE-69
3	1	72.638	76.488	None	0.00	1.04	0.77	5.0	258.10	1.24	259.00	18	Cir	0.012	1.00	263.50	PIPE-11
4	1	30.716	-98.960	MH	0.00	0.00	0.00	0.0	257.29	2.57	258.08	12	Cir	0.012	0.51	265.60	PIPE-7 (1)
5	4	7.109	26.922	MH	1.43	0.00	0.00	0.0	258.08	3.52	258.33	12	Cir	0.012	1.00	259.44	PIPE-7

Project File: Storm Network B-2.stm | Number of lines: 5 | Date: 3/1/2023

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH-101	Manhole	264.00	Cir	4.00	4.00	24	Cir	255.50	12 18 12	Cir Cir Cir	260.00 258.10 257.29
2	AD-102	None	265.50	n/a	n/a	n/a	12	Cir	261.50			
3	AD-101	None	263.50	n/a	n/a	n/a	18	Cir	259.00			
4	OCS-101	Manhole	265.60	Cir	4.00	4.00	12	Cir	258.08	12	Cir	258.08
5	INFITLRATION SYSTEM O	Manhole	259.44	Cir	0.00	0.00	12	Cir	258.33			

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	PIPE-8	10.07	24	Cir	20.538	255.00	255.50	2.435	257.00	256.93	0.27	257.20	End	Manhole
2	PIPE-69	2.25	12	Cir	115.379	260.00	261.50	1.300	260.51	262.14	0.28	262.14	1	None
3	PIPE-11	6.60	18	Cir	72.638	258.10	259.00	1.239	258.87	259.99	0.44	259.99	1	None
4	PIPE-7 (1)	1.43	12	Cir	30.716	257.29	258.08	2.572	257.62	258.59	n/a	258.59	1	Manhole
5	PIPE-7	1.43	12	Cir	7.109	258.08	258.33	3.517	258.59	258.84	n/a	258.84	4	Manhole

Project File: Storm Network B-2.stm | Number of lines: 5 | Run Date: 3/1/2023

NOTES: Return period = 25 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	20.538	0.00	1.95	0.00	0.00	1.07	0.0	5.7	8.0	10.07	38.23	3.70	24	2.43	255.00	255.50	257.00	256.93	257.17	264.00	PIPE-8
2	1	115.379	0.91	0.91	0.30	0.27	0.27	5.0	5.0	8.2	2.25	4.40	4.93	12	1.30	260.00	261.50	260.51	262.14	264.00	265.50	PIPE-69
3	1	72.638	1.04	1.04	0.77	0.80	0.80	5.0	5.0	8.2	6.60	12.66	6.28	18	1.24	258.10	259.00	258.87	259.99	264.00	263.50	PIPE-11
4	1	30.716	0.00	0.00	0.00	0.00	0.00	0.0	0.1	0.0	1.43	6.19	4.99	12	2.57	257.29	258.08	257.62	258.59	264.00	265.60	PIPE-7 (1)
5	4	7.109	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.43	7.23	3.59	12	3.52	258.08	258.33	258.59	258.84	265.60	259.44	PIPE-7

Project File: Storm Network B-2.stm | Number of lines: 5 | Run Date: 3/1/2023

NOTES:Intensity = 102.61 / (Inlet time + 16.50) ^ 0.82; Return period =Yrs. 25 ; c = cir e = ellip b = box

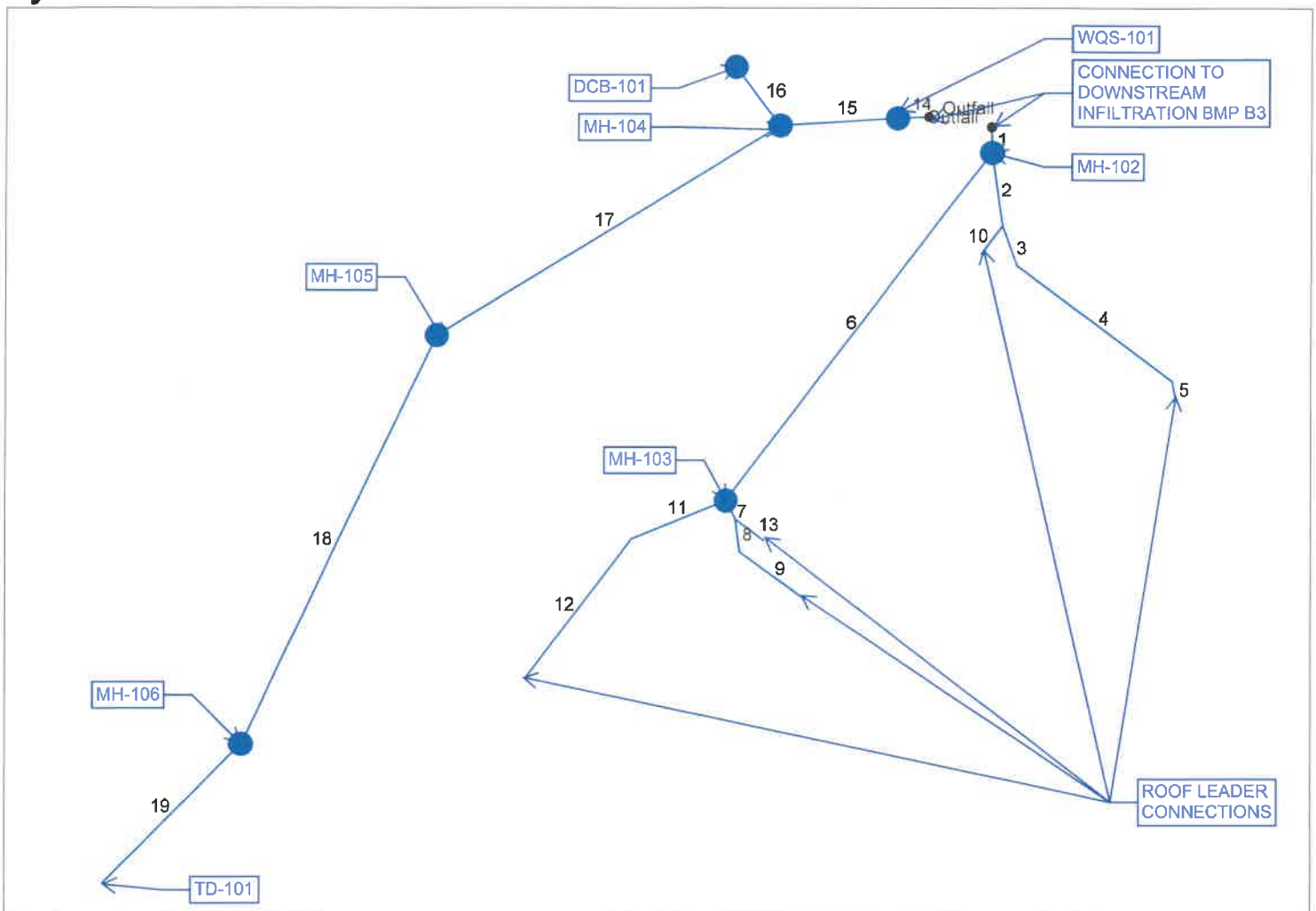
Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
1	24	10.07	255.00	257.00	2.00	3.14	3.20	0.16	257.16	0.169	20.538	255.50	256.93	1.43	2.40	4.20	0.27	257.20	0.230	0.199	0.041	1.00	0.27
2	12	2.25	260.00	260.51	0.51*	0.40	5.63	0.28	260.79	0.000	115.379	261.50	262.14	0.64**	0.53	4.23	0.28	262.42	0.000	0.000	n/a	1.00	0.28
3	18	6.60	258.10	258.87	0.77*	0.91	7.24	0.44	259.31	0.000	72.638	259.00	259.99	0.99**	1.24	5.32	0.44	260.43	0.000	0.000	n/a	1.00	0.44
4	12	1.43	257.29	257.62	0.33*	0.22	6.40	0.20	257.82	0.000	30.716	258.08	258.59	0.51**	0.40	3.59	0.20	258.79	0.000	0.000	n/a	0.51	n/a
5	12	1.43	258.08	258.59	0.51*	0.40	3.59	0.20	258.79	0.000	7.109	258.33	258.84	0.51**	0.40	3.59	0.20	259.04	0.000	0.000	n/a	1.00	n/a

Project File: Storm Network B-2.stm | Number of lines: 5 | Run Date: 3/1/2023

Notes: * depth assumed; ** Critical depth. ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Storm Network B.stm	Number of lines: 19	Date: 3/1/2023

Storm Sewers v2022.00

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	4.438	88.331	MH	0.00	0.00	0.00	0.0	259.60	2.25	259.70	12	Cir	0.012	0.67	265.37	PIPE-44
2	1	13.088	-6.363	MH	0.00	0.00	0.00	0.0	262.00	2.83	262.37	6	Cir	0.012	0.75	262.91	PIPE-50 (1)
3	2	7.281	-11.952	MH	0.00	0.00	0.00	0.0	262.37	1.79	262.50	6	Cir	0.012	0.60	263.04	PIPE-50
4	3	33.899	-33.066	MH	0.00	0.00	0.00	0.0	262.50	1.47	263.00	6	Cir	0.012	0.72	263.54	PIPE-49
5	4	2.951	42.458	None	0.00	0.03	0.90	5.0	263.00	3.39	263.10	6	Cir	0.012	1.00	264.14	PIPE-48
6	1	76.465	38.607	MH	0.00	0.00	0.00	0.0	259.89	0.99	260.65	12	Cir	0.012	0.92	265.45	PIPE-43
7	6	3.673	-63.767	MH	0.00	0.00	0.00	0.0	261.15	11.71	261.58	6	Cir	0.012	0.50	262.11	PIPE-47 (1)
8	7	5.657	18.954	MH	0.00	0.00	0.00	0.0	261.58	7.42	262.00	6	Cir	0.012	0.75	262.54	PIPE-47
9	8	13.609	-45.000	None	0.00	0.02	0.90	5.0	262.00	7.35	263.00	6	Cir	0.012	1.00	264.04	PIPE-46
10	2	5.974	44.970	None	0.00	0.02	0.90	5.0	262.00	16.74	263.00	6	Cir	0.012	1.00	264.04	PIPE-10
11	6	17.820	30.451	MH	0.00	0.00	0.00	0.0	261.15	1.96	261.50	6	Cir	0.012	0.56	262.04	PIPE-9
12	11	30.500	-30.451	None	0.00	0.02	0.90	5.0	261.50	1.64	262.00	6	Cir	0.012	1.00	263.04	PIPE-39
13	7	6.205	-26.046	None	0.00	0.02	0.90	5.0	261.15	13.70	262.00	6	Cir	0.012	1.00	263.04	PIPE-45
14	End	5.430	177.380	MH	0.00	0.00	0.00	0.0	258.33	1.66	258.42	15	Cir	0.012	0.15	264.70	PIPE-3
15	14	20.438	-0.575	MH	0.00	0.00	0.00	0.0	258.42	1.03	258.63	15	Cir	0.012	0.86	264.65	PIPE-2
16	15	12.799	56.061	MH	0.00	0.31	0.90	5.0	260.47	1.02	260.60	12	Cir	0.012	1.00	264.50	PIPE-4
17	15	69.920	-28.587	MH	0.00	0.00	0.00	0.0	258.85	0.50	259.20	12	Cir	0.012	0.60	264.60	PIPE-63 (1)
18	17	79.310	-32.793	MH	0.00	0.00	0.00	0.0	259.35	0.50	259.75	12	Cir	0.012	0.37	264.27	PIPE-62
19	18	34.301	18.789	MH	0.00	0.14	0.90	5.0	259.75	0.99	260.09	12	Cir	0.012	1.00	260.79	PIPE-65

Project File: Storm Network B.stm | Number of lines: 19 | Date: 3/1/2023

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH-102	Manhole	265.37	Cir	4.00	4.00	12	Cir	259.70	6 12	Cir Cir	262.00 259.89
2	WYE-101	Manhole	262.91	Cir	0.00	0.00	6	Cir	262.37	6 6	Cir Cir	262.37 262.00
3	BEND-101	Manhole	263.04	Cir	0.00	0.00	6	Cir	262.50	6	Cir	262.50
4	BEND-102	Manhole	263.54	Cir	0.00	0.00	6	Cir	263.00	6	Cir	263.00
5	RL-102	None	264.14	n/a	n/a	n/a	6	Cir	263.10			
6	MH-103	Manhole	265.45	Cir	4.00	4.00	12	Cir	260.65	6 6	Cir Cir	261.15 261.15
7	WYE-102	Manhole	262.11	Cir	0.00	0.00	6	Cir	261.58	6 6	Cir Cir	261.58 261.15
8	BEND-103	Manhole	262.54	Cir	0.00	0.00	6	Cir	262.00	6	Cir	262.00
9	RL-105	None	264.04	n/a	n/a	n/a	6	Cir	263.00			
10	RL-101	None	264.04	n/a	n/a	n/a	6	Cir	263.00			
11	BEND-104	Manhole	262.04	Cir	0.00	0.00	6	Cir	261.50	6	Cir	261.50
12	RL-107	None	263.04	n/a	n/a	n/a	6	Cir	262.00			
13	RL-103	None	263.04	n/a	n/a	n/a	6	Cir	262.00			
14	DOWNSTREAM DEFENDE	Manhole	264.70	Cir	4.00	4.00	15	Cir	258.42	15	Cir	258.42
15	MH-104	Manhole	264.65	Cir	4.00	4.00	15	Cir	258.63	12 12	Cir Cir	260.47 258.85
16	DCB-101	Manhole	264.50	Cir	4.00	4.00	12	Cir	260.60			
17	MH-106	Manhole	264.60	Cir	4.00	4.00	12	Cir	259.20	12	Cir	259.35
18	MH-107	Manhole	264.27	Cir	4.00	4.00	12	Cir	259.75	12	Cir	259.75
19	TD-101	Manhole	260.79	Cir	0.00	0.00	12	Cir	260.09			

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	PIPE-44	0.73	12	Cir	4.438	259.60	259.70	2.253	259.96	260.06	n/a	260.06 j	End	Manhole
2	PIPE-50 (1)	0.36	6	Cir	13.088	262.00	262.37	2.827	262.21	262.68	n/a	262.68	1	Manhole
3	PIPE-50	0.22	6	Cir	7.281	262.37	262.50	1.785	262.68	262.73	n/a	262.73 j	2	Manhole
4	PIPE-49	0.22	6	Cir	33.899	262.50	263.00	1.475	262.73	263.24	n/a	263.24	3	Manhole
5	PIPE-48	0.22	6	Cir	2.951	263.00	263.10	3.388	263.24	263.34	n/a	263.34	4	None
6	PIPE-43	0.43	12	Cir	76.465	259.89	260.65	0.994	260.12	260.92	0.09	260.92	1	Manhole
7	PIPE-47 (1)	0.29	6	Cir	3.673	261.15	261.58	11.706	261.28	261.85	0.06	261.85	6	Manhole
8	PIPE-47	0.15	6	Cir	5.657	261.58	262.00	7.425	261.85	262.19	n/a	262.19 j	7	Manhole
9	PIPE-46	0.15	6	Cir	13.609	262.00	263.00	7.348	262.19	263.19	n/a	263.19	8	None
10	PIPE-10	0.15	6	Cir	5.974	262.00	263.00	16.739	262.68	263.19	n/a	263.19 j	2	None
11	PIPE-9	0.14	6	Cir	17.820	261.15	261.50	1.964	261.29	261.69	0.04	261.69	6	Manhole
12	PIPE-39	0.15	6	Cir	30.500	261.50	262.00	1.639	261.69	262.19	n/a	262.19	11	None
13	PIPE-45	0.15	6	Cir	6.205	261.15	262.00	13.698	261.85	262.19	n/a	262.19 j	7	None
14	PIPE-3	3.05	15	Cir	5.430	258.33	258.42	1.658	258.83	259.12	0.04	259.12	End	Manhole
15	PIPE-2	3.07	15	Cir	20.438	258.42	258.63	1.027	259.12	259.33	n/a	259.33	14	Manhole
16	PIPE-4	2.30	12	Cir	12.799	260.47	260.60	1.016	261.02	261.25	0.28	261.25	15	Manhole
17	PIPE-63 (1)	0.99	12	Cir	69.920	258.85	259.20	0.501	259.33	259.62	0.09	259.62	15	Manhole
18	PIPE-62	1.02	12	Cir	79.310	259.35	259.75	0.504	259.77	260.17	n/a	260.17	17	Manhole
19	PIPE-65	1.04	12	Cir	34.301	259.75	260.09	0.991	260.17	260.52	0.16	260.52	18	Manhole

Project File: Storm Network B.stm | Number of lines: 19 | Run Date: 3/1/2023

NOTES: Return period = 25 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	4.438	0.00	0.11	0.00	0.00	0.10	0.0	8.3	7.3	0.73	5.79	2.88	12	2.25	259.60	259.70	259.96	260.06	260.71	265.37	PIPE-44
2	1	13.088	0.00	0.05	0.00	0.00	0.05	0.0	5.6	8.0	0.36	1.02	3.82	6	2.83	262.00	262.37	262.21	262.68	265.37	262.91	PIPE-50 (1)
3	2	7.281	0.00	0.03	0.00	0.00	0.03	0.0	5.5	8.1	0.22	0.81	2.08	6	1.79	262.37	262.50	262.68	262.73	262.91	263.04	PIPE-50
4	3	33.899	0.00	0.03	0.00	0.00	0.03	0.0	5.0	8.2	0.22	0.74	2.45	6	1.47	262.50	263.00	262.73	263.24	263.04	263.54	PIPE-49
5	4	2.951	0.03	0.03	0.90	0.03	0.03	5.0	5.0	8.2	0.22	1.12	2.43	6	3.39	263.00	263.10	263.24	263.34	263.54	264.14	PIPE-48
6	1	76.465	0.00	0.06	0.00	0.00	0.05	0.0	6.1	7.9	0.43	3.85	2.86	12	0.99	259.89	260.65	260.12	260.92	265.37	265.45	PIPE-43
7	6	3.673	0.00	0.04	0.00	0.00	0.04	0.0	5.4	8.1	0.29	2.08	5.07	6	11.71	261.15	261.58	261.28	261.85	265.45	262.11	PIPE-47 (1)
8	7	5.657	0.00	0.02	0.00	0.00	0.02	0.0	5.3	8.2	0.15	1.66	1.74	6	7.42	261.58	262.00	261.85	262.19	262.11	262.54	PIPE-47
9	8	13.609	0.02	0.02	0.90	0.02	0.02	5.0	5.0	8.2	0.15	1.65	2.15	6	7.35	262.00	263.00	262.19	263.19	262.54	264.04	PIPE-46
10	2	5.974	0.02	0.02	0.90	0.02	0.02	5.0	5.0	8.2	0.15	2.49	1.45	6	16.74	262.00	263.00	262.68	263.19	262.91	264.04	PIPE-10
11	6	17.820	0.00	0.02	0.00	0.00	0.02	0.0	5.7	8.0	0.14	0.85	2.68	6	1.96	261.15	261.50	261.29	261.69	265.45	262.04	PIPE-9
12	11	30.500	0.02	0.02	0.90	0.02	0.02	5.0	5.0	8.2	0.15	0.78	2.16	6	1.64	261.50	262.00	261.69	262.19	262.04	263.04	PIPE-39
13	7	6.205	0.02	0.02	0.90	0.02	0.02	5.0	5.0	8.2	0.15	2.25	1.45	6	13.70	261.15	262.00	261.85	262.19	262.11	263.04	PIPE-45
14	End	5.430	0.00	0.45	0.00	0.00	0.41	0.0	7.5	7.5	3.05	9.01	5.46	15	1.66	258.33	258.42	258.83	259.12	259.71	264.70	PIPE-3
15	14	20.438	0.00	0.45	0.00	0.00	0.41	0.0	7.3	7.6	3.07	7.09	4.31	15	1.03	258.42	258.63	259.12	259.33	264.70	264.65	PIPE-2
16	15	12.799	0.31	0.31	0.90	0.28	0.28	5.0	5.0	8.2	2.30	3.89	4.71	12	1.02	260.47	260.60	261.02	261.25	264.65	264.50	PIPE-4
17	15	69.920	0.00	0.14	0.00	0.00	0.13	0.0	6.4	7.8	0.99	2.73	2.90	12	0.50	258.85	259.20	259.33	259.62	264.65	264.60	PIPE-63 (1)
18	17	79.310	0.00	0.14	0.00	0.00	0.13	0.0	5.4	8.1	1.02	2.74	3.23	12	0.50	259.35	259.75	259.77	260.17	264.60	264.27	PIPE-62
19	18	34.301	0.14	0.14	0.90	0.13	0.13	5.0	5.0	8.2	1.04	3.84	3.26	12	0.99	259.75	260.09	260.17	260.52	264.27	260.79	PIPE-65

Project File: Storm Network B.stm | Number of lines: 19 | Run Date: 3/1/2023

NOTES:Intensity = 102.61 / (Inlet time + 16.50) ^ 0.82; Return period =Yrs. 25 ; c = cir e = ellip b = box

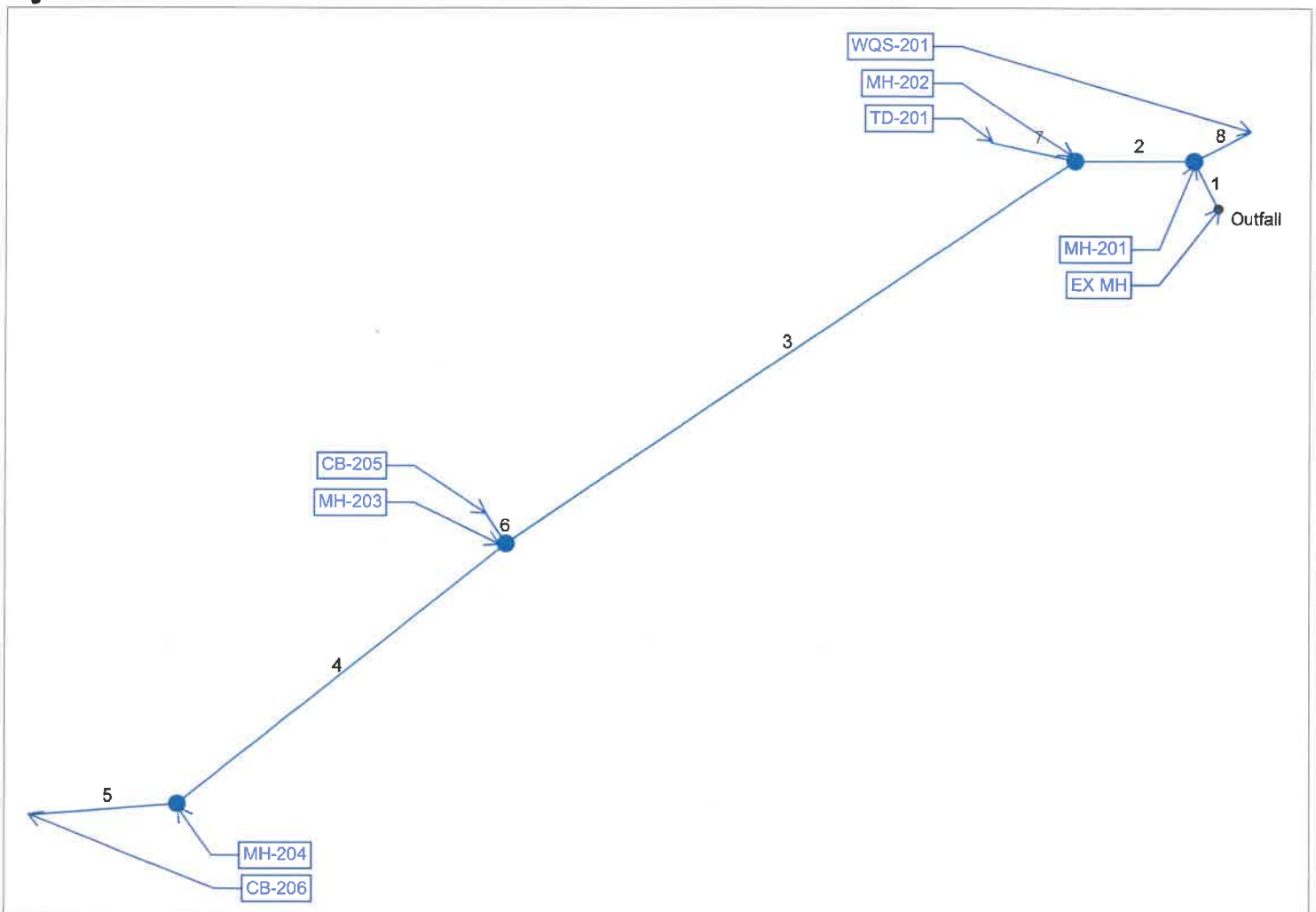
Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
1	12	0.73	259.60	259.96	0.36	0.25	2.85	0.13	260.09	0.000	4.438	259.70	260.06 j	0.35**	0.25	2.90	0.13	260.19	0.000	0.000	n/a	0.67	0.09
2	6	0.36	262.00	262.21	0.21*	0.08	4.75	0.13	262.34	0.000	13.088	262.37	262.68	0.31**	0.13	2.88	0.13	262.80	0.000	0.000	n/a	0.75	n/a
3	6	0.22	262.37	262.68	0.31	0.09	1.74	0.09	262.77	0.000	7.281	262.50	262.73 j	0.23**	0.09	2.42	0.09	262.83	0.000	0.000	n/a	0.60	0.05
4	6	0.22	262.50	262.73	0.23	0.09	2.46	0.09	262.83	0.000	33.899	263.00	263.24	0.24**	0.09	2.43	0.09	263.33	0.000	0.000	n/a	0.72	n/a
5	6	0.22	263.00	263.24	0.24	0.09	2.43	0.09	263.33	0.000	2.951	263.10	263.34	0.24**	0.09	2.43	0.09	263.43	0.000	0.000	n/a	1.00	n/a
6	12	0.43	259.89	260.12	0.23*	0.13	3.23	0.10	260.21	0.000	76.465	260.65	260.92	0.27**	0.17	2.49	0.10	261.02	0.000	0.000	n/a	0.92	0.09
7	6	0.29	261.15	261.28	0.13*	0.04	7.47	0.11	261.39	0.000	3.673	261.58	261.85	0.27**	0.11	2.67	0.11	261.96	0.000	0.000	n/a	0.50	0.06
8	6	0.15	261.58	261.85	0.27	0.07	1.34	0.07	261.92	0.000	5.657	262.00	262.19 j	0.19**	0.07	2.14	0.07	262.26	0.000	0.000	n/a	0.75	n/a
9	6	0.15	262.00	262.19	0.19	0.07	2.16	0.07	262.26	0.000	13.609	263.00	263.19	0.19**	0.07	2.14	0.07	263.26	0.000	0.000	n/a	1.00	n/a
10	6	0.15	262.00	262.68	0.50	0.07	0.76	0.01	262.68	0.060	5.974	263.00	263.19 j	0.19**	0.07	2.14	0.07	263.26	0.616	0.338	n/a	1.00	n/a
11	6	0.14	261.15	261.29	0.14*	0.04	3.23	0.07	261.36	0.000	17.820	261.50	261.69	0.19**	0.07	2.13	0.07	261.76	0.000	0.000	n/a	0.56	0.04
12	6	0.15	261.50	261.69	0.19	0.07	2.18	0.07	261.76	0.000	30.500	262.00	262.19	0.19**	0.07	2.14	0.07	262.26	0.000	0.000	n/a	1.00	n/a
13	6	0.15	261.15	261.85	0.50	0.07	0.76	0.01	261.86	0.060	6.205	262.00	262.19 j	0.19**	0.07	2.14	0.07	262.26	0.616	0.338	n/a	1.00	n/a
14	15	3.05	258.33	258.83	0.50*	0.46	6.63	0.29	259.12	0.000	5.430	258.42	259.12	0.70**	0.71	4.30	0.29	259.41	0.000	0.000	n/a	0.15	0.04
15	15	3.07	258.42	259.12	0.70	0.71	4.32	0.29	259.41	0.000	20.438	258.63	259.33	0.70**	0.71	4.31	0.29	259.62	0.000	0.000	n/a	0.86	n/a
16	12	2.30	260.47	261.02	0.55*	0.45	5.16	0.28	261.31	0.000	12.799	260.60	261.25	0.65**	0.54	4.27	0.28	261.53	0.000	0.000	n/a	1.00	0.28
17	12	0.99	258.85	259.33	0.48	0.31	2.61	0.16	259.49	0.000	69.920	259.20	259.62	0.42**	0.31	3.18	0.16	259.77	0.000	0.000	n/a	0.60	0.09
18	12	1.02	259.35	259.77	0.42*	0.32	3.23	0.16	259.93	0.000	79.310	259.75	260.17	0.42**	0.32	3.22	0.16	260.34	0.000	0.000	n/a	0.37	n/a
19	12	1.04	259.75	260.17	0.42	0.32	3.27	0.16	260.34	0.000	34.301	260.09	260.52	0.43**	0.32	3.24	0.16	260.68	0.000	0.000	n/a	1.00	0.16

Project File: Storm Network B.stm | Number of lines: 19 | Run Date: 3/1/2023

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Storm Network E.stm	Number of lines: 8	Date: 3/2/2023

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	12.704	-117.017	MH	0.00	0.00	0.00	0.0	248.10	2.36	248.40	12	Cir	0.012	1.00	252.75	PIPE-30
2	1	28.445	-62.605	MH	0.00	0.00	0.00	0.0	249.10	1.05	249.40	12	Cir	0.012	0.62	256.69	PIPE-29 (1)
3	2	164.652	-34.573	MH	0.00	0.00	0.00	0.0	249.50	4.46	256.85	12	Cir	0.012	1.00	261.39	PIPE-27
4	3	100.833	-4.576	MH	0.00	0.00	0.00	0.0	256.95	1.44	258.40	12	Cir	0.012	0.62	262.55	PIPE-26
5	4	35.654	34.520	None	0.00	0.19	0.54	5.0	258.50	3.65	259.80	12	Cir	0.012	1.00	262.80	PIPE-25
6	3	8.470	90.000	None	0.00	0.26	0.67	5.0	256.95	3.54	257.25	12	Cir	0.012	1.00	260.75	PIPE-28
7	2	20.531	12.144	MH	0.00	0.20	0.74	5.0	251.80	0.97	252.00	12	Cir	0.012	1.00	251.80	PIPE-20
8	1	15.092	90.000	None	0.00	0.18	0.77	5.0	248.55	1.33	248.75	12	Cir	0.012	1.00	252.75	PIPE-68

Project File: Storm Network E.stm | Number of lines: 8 | Date: 3/2/2023

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	MH-201	Manhole	252.75	Cir	4.00	4.00	12	Cir	248.40	12 12	Cir Cir	249.10 248.55
2	MH-202	Manhole	256.69	Cir	4.00	4.00	12	Cir	249.40	12 12	Cir Cir	249.50 251.80
3	MH-203	Manhole	261.39	Cir	4.00	4.00	12	Cir	256.85	12 12	Cir Cir	256.95 256.95
4	MH-204	Manhole	262.55	Cir	4.00	4.00	12	Cir	258.40	12	Cir	258.50
5	CB-206	None	262.80	n/a	n/a	n/a	12	Cir	259.80			
6	CB-205	None	260.75	n/a	n/a	n/a	12	Cir	257.25			
7	TD-201	Manhole	251.80	Cir	0.00	0.00	12	Cir	252.00			
8	FIRST DEFENSE WQS-201	None	252.75	n/a	n/a	n/a	12	Cir	248.75			

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	PIPE-30	4.14	12	Cir	12.704	248.10	248.40	2.361	248.96	249.26	0.52	249.26	End	Manhole
2	PIPE-29 (1)	3.14	12	Cir	28.445	249.10	249.40	1.055	249.77	250.16	n/a	250.16	1	Manhole
3	PIPE-27	2.11	12	Cir	164.652	249.50	256.85	4.464	250.16	257.47	n/a	257.47 j	2	Manhole
4	PIPE-26	0.83	12	Cir	100.833	256.95	258.40	1.438	257.47	258.78	n/a	258.78 j	3	Manhole
5	PIPE-25	0.85	12	Cir	35.654	258.50	259.80	3.646	258.78	260.18	n/a	260.18	4	None
6	PIPE-28	1.44	12	Cir	8.470	256.95	257.25	3.542	257.47	257.76	n/a	257.76 j	3	None
7	PIPE-20	1.22	12	Cir	20.531	251.80	252.00	0.974	252.19	252.47	0.18	252.47	2	Manhole
8	PIPE-68	1.14	12	Cir	15.092	248.55	248.75	1.325	249.26	249.20	n/a	249.20 j	1	None

Project File: Storm Network E.stm | Number of lines: 8 | Run Date: 3/2/2023

NOTES: Return period = 25 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	12.704	0.00	0.83	0.00	0.00	0.56	0.0	8.2	7.4	4.14	5.93	5.77	12	2.36	248.10	248.40	248.96	249.26	254.91	252.75	PIPE-30
2	1	28.445	0.00	0.65	0.00	0.00	0.42	0.0	8.1	7.4	3.14	3.96	5.25	12	1.05	249.10	249.40	249.77	250.16	252.75	256.69	PIPE-29 (1)
3	2	164.652	0.00	0.45	0.00	0.00	0.28	0.0	7.1	7.6	2.11	8.15	3.99	12	4.46	249.50	256.85	250.16	257.47	256.69	261.39	PIPE-27
4	3	100.833	0.00	0.19	0.00	0.00	0.10	0.0	5.6	8.1	0.83	4.63	2.51	12	1.44	256.95	258.40	257.47	258.78	261.39	262.55	PIPE-26
5	4	35.654	0.19	0.19	0.54	0.10	0.10	5.0	5.0	8.2	0.85	7.37	3.86	12	3.65	258.50	259.80	258.78	260.18	262.55	262.80	PIPE-25
6	3	8.470	0.26	0.26	0.67	0.17	0.17	5.0	5.0	8.2	1.44	7.26	3.54	12	3.54	256.95	257.25	257.47	257.76	261.39	260.75	PIPE-28
7	2	20.531	0.20	0.20	0.74	0.15	0.15	5.0	5.0	8.2	1.22	3.81	3.86	12	0.97	251.80	252.00	252.19	252.47	256.69	251.80	PIPE-20
8	1	15.092	0.18	0.18	0.77	0.14	0.14	5.0	5.0	8.2	1.14	4.44	2.63	12	1.33	248.55	248.75	249.26	249.20	252.75	252.75	PIPE-68

Project File: Storm Network E.stm | Number of lines: 8 | Run Date: 3/2/2023

NOTES:Intensity = 102.61 / (inlet time + 16.50) ^ 0.82; Return period =Yrs. 25 ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	12	4.14	248.10	248.96	0.86	0.72	5.77	0.52	249.48	0.000	12.704	248.40	249.26	0.86**	0.72	5.77	0.52	249.78	0.000	0.000	n/a	1.00	0.52
2	12	3.14	249.10	249.77	0.67*	0.56	5.59	0.37	250.15	0.000	28.445	249.40	250.16	0.76**	0.64	4.91	0.37	250.53	0.000	0.000	n/a	0.62	n/a
3	12	2.11	249.50	250.16	0.66	0.51	3.85	0.26	250.42	0.000	164.65	256.85	257.47 j	0.62**	0.51	4.13	0.26	257.74	0.000	0.000	n/a	1.00	0.26
4	12	0.83	256.95	257.47	0.52	0.27	2.01	0.14	257.61	0.000	100.83	258.40	258.78 j	0.38**	0.27	3.02	0.14	258.92	0.000	0.000	n/a	0.62	0.09
5	12	0.85	258.50	258.78	0.28	0.18	4.69	0.14	258.92	0.000	35.654	259.80	260.18	0.38**	0.28	3.04	0.14	260.33	0.000	0.000	n/a	1.00	n/a
6	12	1.44	256.95	257.47	0.52	0.40	3.48	0.20	257.67	0.000	8.470	257.25	257.76 j	0.51**	0.40	3.59	0.20	257.96	0.000	0.000	n/a	1.00	n/a
7	12	1.22	251.80	252.19	0.39*	0.28	4.31	0.18	252.37	0.000	20.531	252.00	252.47	0.47**	0.36	3.41	0.18	252.65	0.000	0.000	n/a	1.00	0.18
8	12	1.14	248.55	249.26	0.71	0.34	1.92	0.17	249.43	0.000	15.092	248.75	249.20 j	0.45**	0.34	3.34	0.17	249.37	0.000	0.000	n/a	1.00	n/a

Project File: Storm Network E.stm | Number of lines: 8 | Run Date: 3/2/2023

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

APPENDIX F

Outlet Protection Calculations

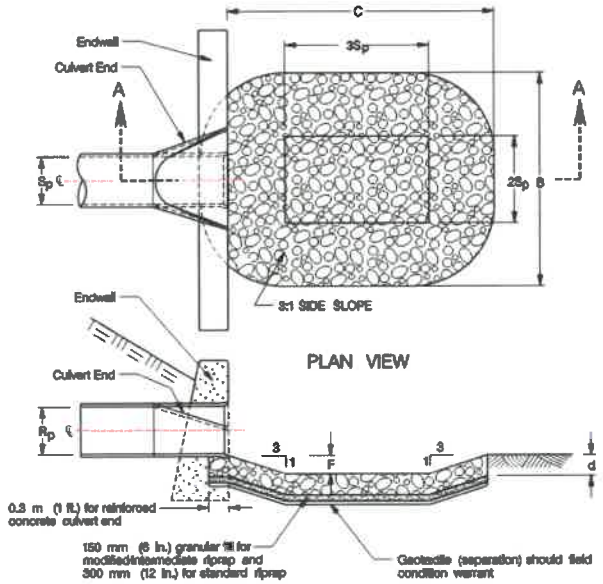
25YR Event - Riprap Outlet Protection Calculations[1]

Outfall Number	FES-100
Outfall Parameters	
Discharge Destination	East Campus
Outfall Do (in)	24
Outfall Do (ft)	2
Q, Flow 25yr (cfs)	10.07
V, Velocity 25yr (ft/s)	3.20
Tailwater, TW (ft)	1.00
Type A (TW< D/2) or B (Is TW >= D/2)	PFSH

Preformed Scour Hole (PFSH) Dimensions (Type 1)	
Outfall Do + 0.5 ft, E (ft)	2.5
Hole Depth 0.5Do, F (ft) (1 ft min.)	1.3
Hole Length, 3E (ft)	7.5
Hole Width, 2E (ft)	5.0
Overall Length, C (ft)	15
Overall Width, B (ft)	13
Calculated D50 (ft)	0.1
Calculated D50 (in)	1
Recommended Design D50 (in)	6
Riprap Thickness (ft)	1.5

Note:

1. Calculations based on methodology found in Connecticut DOT Drainage Manual



SECTION A–A

LEGEND

S_p = { Max. inside pipe span (non-circular sections); Inside pipe diameter (circular sections)

R_p = { Max. inside pipe rise (non-circular sections); Inside pipe diameter (circular sections)

d = { 300 mm (12 in.) Modified Riprap; 450 mm (18 in.) Intermediate Riprap; 900 mm (36 in.) Standard Riprap

Type 1 F = 0.5 R_p

Type 2 F = R_p

C = $3S_p$ + 6F

B = $2S_p$ + 6F

APPENDIX G

Groundwater Mounding Calculations

LANGAN

Groundwater Mounding Analysis Summary

LANGAN

Project Name:	Belmont Hill School
Project Number:	151021201
Location:	Belmont, MA
Date:	3/2/2023
Computed By:	MPG
Checked by:	HH

	BASIN DRAIN TIME CALCULATIONS						GROUNDWATER MOUNDING							
SW BMP Location & Description	Storage Volume[1] (cf)	Bottom Surface Area (sf)	Infiltration Rate (in/hr)	Reference Test	Drain Time[2] (hrs)	< 72 hrs	BMP 1/2 Length (ft)	BMP 1/2 Width (ft)	Max GW Mounding (ft)	Groundwater Elevation[3] (ft)	Reference Boring	BMP Bottom Elevation (ft)	Top Elev. of Mounding (ft)	BMP Bottom Elevation Higher than Top Elevation of Mounding?
East Campus Parking Lot Porous Pavement A1	4,704	11,290	0.59	*IT-7*	8.5	YES	110	30	2.79	264.50	*TP-7*	268.17	267.29	YES
East Campus Parking Lot Porous Pavement B1	17,206	37,140	0.39	*IT-8*	14.2	YES	170	70	3.08	259.00	*TP-1*	263.42	262.08	YES
East Campus Parking Lot Porous Pavement B1 (Higher Infiltration Rate)	17,206	37,140	1.37	*IT-8*	4.1	YES	170	70	3.12	259.00	*TP-1*	263.42	262.12	YES
East Campus Maintenance Lot Chambers B3	5,663	1,989	0.80	*IT-3*	42.7	YES	36	13.8	11.49	245.00	*LB-02*	258.00	256.49	YES
East Campus Maintenance Lot Chambers B3 (Higher Infiltration Rate)	5,663	1,989	1.28	*IT-3*	26.7	YES	36	13.8	11.49	245.00	*LB-02*	258.00	256.49	YES
Permeable Pavement B4	1,873	6,600	0.80	*IT-3*	4.3	YES	125	12	1.88	245.00	*LB-02*	260.67	246.88	YES
Main Campus Jordan Parking Lot Permeable Pavement E3	5,706	13,000	0.18	*IT-207*	29.3	YES	150	21	2.92	242.50	*TP-201*	252.33	245.42	YES

Notes:
1. Storage Volume based on discarded exfiltration volume for 10-year, 24-hour storm.
2. Drain Time = Storage Volume/(Bottom Surface Infiltration Area x Design Permeability Rate).
3. Observed groundwater elevation or elevation of deepest excavation if no groundwater was encountered and there was no other indication of seasonal high water elevation observed.
4. BMP Bottom Elevation is the bottom elevation of stone reservior or base. For sloping BMPs the lowest elevation was used.

Groundwater Mounding Analysis - A1

Project name: Belmont Hill School
Project Number:
Date: 3/2/2023
Computed By: MG
Checked By: HH

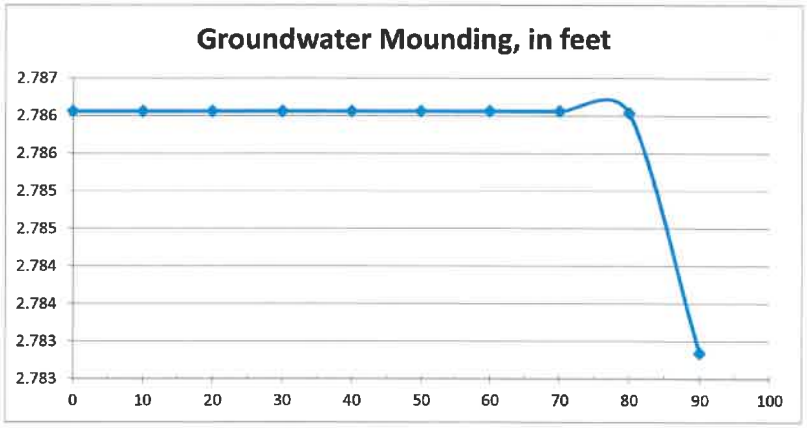
Input Values

0.59	R	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
0.59	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
110.000	x	1/2 length of basin (x direction, in feet)
30.000	y	1/2 width of basin (y direction, in feet)
8.50	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

12.786	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
2.786	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
2.786	0
2.786	10
2.786	20
2.786	30
2.786	40
2.786	50
2.786	60
2.786	70
2.786	80
2.783	90

Re-Calculate Now



Disclaimer

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

Groundwater Mounding Analysis - B1

Project name: Belmont Hill School
Project Number:
Date: 3/2/2023
Computed By: MG
Checked By: HH

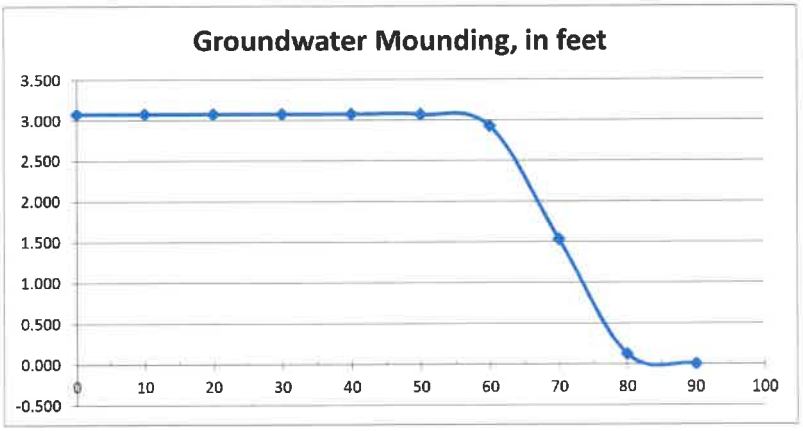
Input Values

0.39	R	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
0.39	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
70.000	x	1/2 length of basin (x direction, in feet)
170.000	y	1/2 width of basin (y direction, in feet)
14.20	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

13.077	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
3.077	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
3.077	0
3.077	10
3.077	20
3.077	30
3.077	40
3.071	50
2.927	60
1.539	70
0.125	80
0.004	90

Re-Calculate Now



Disclaimer

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

Groundwater Mounding Analysis - B1 (with higher infiltration rate)

Project name: Belmont Hill School
Project Number:
Date: 3/2/2023
Computed By: MG
Checked By: HH

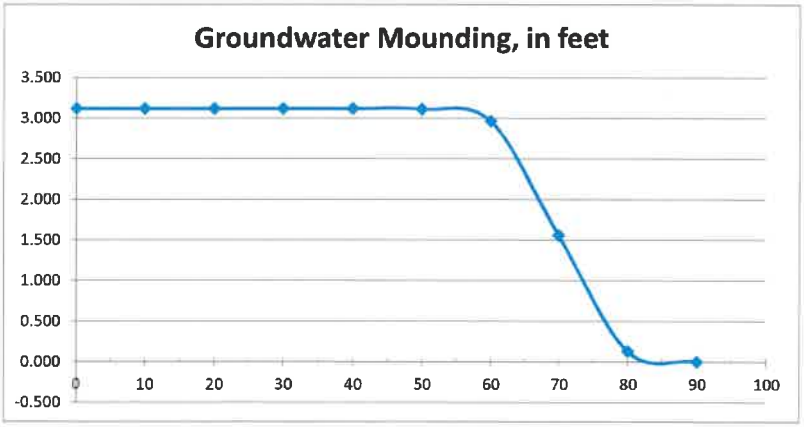
Input Values

1.37	R	Recharge rate (permeability rate) (in/hr)
		Specific yield, Sy (dimensionless)
0.150	Sy	default value is 0.15; max value is 0.2 provided that a lab test data is submitted
		Horizontal hydraulic conductivity (in/hr)
1.37	Kh	Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
70.000	x	1/2 length of basin (x direction, in feet)
170.000	y	1/2 width of basin (y direction, in feet)
4.10	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

13.121	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
3.121	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
3.121	0
3.121	10
3.121	20
3.121	30
3.120	40
3.115	50
2.965	60
1.561	70
0.130	80
0.004	90

Re-Calculate Now



Disclaimer

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

Groundwater Mounding Analysis - B3

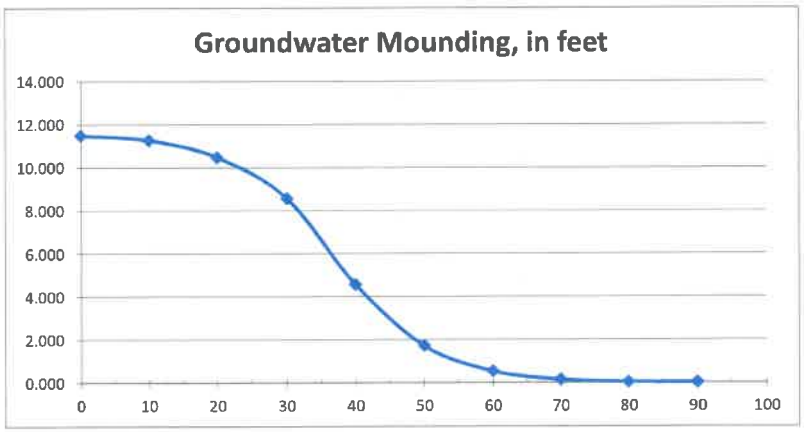
Project name: Belmont Hill School
Project Number:
Date: 3/2/2023
Computed By: MG
Checked By: HH

Input Values

0.80	R	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
0.80	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
36.000	x	1/2 length of basin (x direction, in feet)
13.800	y	1/2 width of basin (y direction, in feet)
42.70	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)
21.486	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
11.486	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
11.486	0
11.267	10
10.471	20
8.562	30
4.555	40
1.712	50
0.527	60
0.139	70
0.035	80
0.011	90

Re-Calculate Now



Disclaimer

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

Groundwater Mounding Analysis - B3 (with higher infiltration rate)

Project name: Belmont Hill School
Project Number:
Date: 3/2/2023
Computed By: MG
Checked By: HH

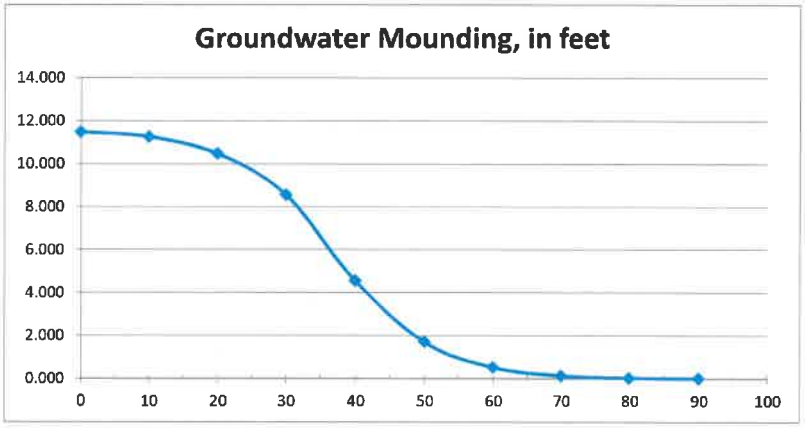
Input Values

1.28	R	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
1.28	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
36.000	x	1/2 length of basin (x direction, in feet)
13.800	y	1/2 width of basin (y direction, in feet)
26.70	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

21.489	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
11.489	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
11.489	0
11.270	10
10.473	20
8.564	30
4.556	40
1.713	50
0.528	60
0.140	70
0.035	80
0.011	90

Re-Calculate Now



Disclaimer

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

Groundwater Mounding Analysis - B4

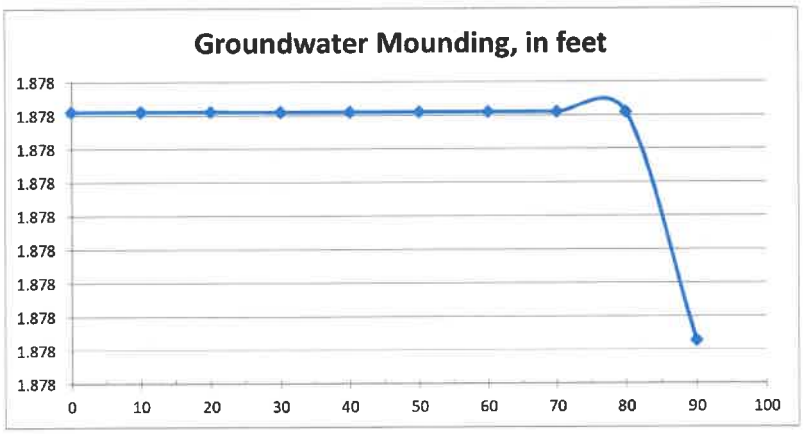
Project name: Belmont Hill School
Project Number:
Date: 3/2/2023
Computed By: MG
Checked By: HH

Input Values

0.80	R	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
0.80	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
125.000	x	1/2 length of basin (x direction, in feet)
12.000	y	1/2 width of basin (y direction, in feet)
4.30	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)
11.878	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
1.878	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.878	0
1.878	10
1.878	20
1.878	30
1.878	40
1.878	50
1.878	60
1.878	70
1.878	80
1.878	90

Re-Calculate Now



Disclaimer

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

Groundwater Mounding Analysis - E3

Project name: Belmont Hill School
Project Number:
Date: 3/2/2023
Computed By: MG
Checked By: HH

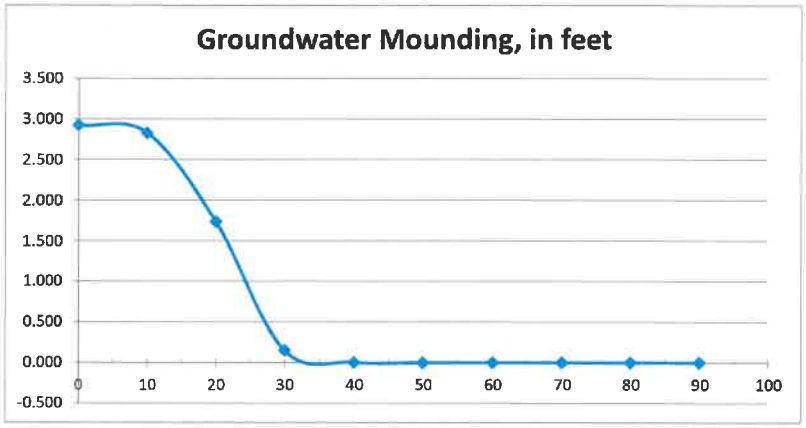
Input Values

0.18	R	Recharge rate (permeability rate) (in/hr)
		Specific yield, Sy (dimensionless)
0.150	Sy	default value is 0.15; max value is 0.2 provided that a lab test data is submitted
		Horizontal hydraulic conductivity (in/hr)
0.18	Kh	Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
21.000	x	1/2 length of basin (x direction, in feet)
150.000	y	1/2 width of basin (y direction, in feet)
29.30	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

12.924	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
2.924	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
2.924	0
2.831	10
1.736	20
0.151	30
0.005	40
0.001	50
0.001	60
0.001	70
0.001	80
0.001	90

Re-Calculate Now



Disclaimer

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

APPENDIX H

Long Term Pollution Prevention,
Operations and Maintenance Plan

LANGAN