

DRAINAGE REPORT

**201 Elm Street & 6 Monroe Street
(Map 66 - Lot 61 & Map 55 - Lot 24)
Amesbury, Massachusetts 01913**



344 North Main Street | Andover • MA 01810
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APPLICANT:

**Rivers Edge Development, LLC
201 Elm Street
Amesbury, MA 01913**

SUBMITTED TO:

**City of Amesbury
39 S Hunt Road
Amesbury, MA 01913**

ISSUED:

April 22, 2025

REVISED:

June 2, 2025

CDCI FILE #: 25-10704

DRAINAGE REPORT

Drainage Narrative

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100-Yr Storm Event Summary

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DRAINAGE REPORT

201 Elm Street and 6 Monroe Street
Amesbury, Massachusetts

TAB 1

DRAINAGE REPORT

201 Elm Street and 6 Monroe Street
Amesbury, Massachusetts

REVISION #1 (06/02/25)

Revision #1 of this drainage report has been prepared to address a review letter from Stantec dated May 23, 2025. Specific revisions include update to the HydroCAD analysis, pre- and post-watershed plans, and the Long Term Operations & Maintenance Plan. Any revisions to the drainage report below are provided in red type.

PROJECT DESCRIPTION

The applicant proposes redeveloping two parcels located at 201 Elm Street and 6 Monroe Street (Map 66/ Lot 61 & Map 55/ Lot 24) in Amesbury, MA. The project includes a subdivision of the combined parcels into three residential lots and the following improvements:

- Renovation and minor addition to the existing historic house at 201 Elm Street, originally constructed in 1731.
- Construction of a new two-family dwelling with associated driveway access and utilities.
- Construction of a single-family dwelling with associated driveway access and utilities.

SITE DESCRIPTION

The total combined lot area is approximately 0.84-AC and is located within the R-8 Zoning District. The site currently contains a historic house surrounded primarily by wooded areas. No wetland resource areas are located on or near the site.

The site slopes from a high of approximately 132-FT at the northwest side of the lot to a low of approximately 98-FT near the intersection of Elm Street and Monroe Street.

According to the Natural Resource Conservation Service Soil Survey, on-site soils consist of Merrimac Fine Sandy Loam (245B) and Paxton Fine Sandy Loam (307E). Test pits were conducted by this office in February 2025 to determine soil texture and estimated seasonal high groundwater elevations. Test pit logs are provided under Tab 5 of this report.

REGULATORY STORMWATER MANAGEMENT COMPLIANCE

City of Amesbury Zoning Ordinance

Under Site Plan Review, Section XI.C.8.e.1, of the City of Amesbury Zoning Ordinance, post-development peak rates of surface runoff must not exceed pre-development rates. The project has been designed to comply with this standard for the 2-, 10-, 25-, and 100-year storm events.

Per Section XI.C.8.p of the City of Amesbury Zoning Ordinance, the design and construction of stormwater management must comply with Section 7 (Design Standards) of the Amesbury Subdivision Rules and Regulations.

City of Amesbury Subdivision Rules and Regulations

Under Section 7.10 (Drainage), the design of the stormwater management systems shall comply with the 2016 MS4 regulations and the 2008 Massachusetts Stormwater Handbook. Under the 2016 MS4, the project is below the 1-AC disturbance threshold, and as such, is not subject to the MS4 stormwater design criteria (see Exhibit 1).

Additionally, according to MassDEP Stormwater Regulations, the project is exempt from the Stormwater Management Standards as it involves the construction of:

- A single-family dwelling
- A two-family dwelling (structure with fewer than four units) (see Exhibit 2)

DRAINAGE REPORT

201 Elm Street and 6 Monroe Street
Amesbury, Massachusetts

However, the proposed drainage system has been designed to comply with the Redevelopment Standards outlined in Section 7.10.B.4 of the Amesbury Subdivision Rules and Regulations. See stormwater calculations under Tab 5 of this report.

DRAINAGE ANALYSIS

The proposed development was analyzed as a single sub-catchment, consisting of both on-site and as well as off-site runoff flowing through the project site. The entire sub-watershed eventually discharges into the City's closed drainage system located in Elm Street and Monroe Street.

To mitigate peak flows, each dwelling incorporates roof drywells to infiltrate stormwater runoff. As demonstrated in the table below, the impact of the proposed improvements results in no increase in peak discharge for all major storm events.

Design Point 1

Peak Flow:

	2-YR (3.1-IN)	10-YR (4.5-IN)	25-YR (5.3-IN)	100-YR (6.5-IN)
Pre-Development	2.2-CFS	4.3-CFS	5.7-CFS	8.0-CFS
Post-Development	2.1-CFS	4.1-CFS	5.4-CFS	7.7-CFS

METHODOLOGY

Drainage calculations were performed using the computer program HydroCAD by HydroCAD Software Solutions, LLC based upon Technical Release 20 (TR-20), developed by the NRCS. Drainage calculations were prepared for the 2-YR, 10-YR, 25-YR, and 100-YR Type III 24-hour storm events. Rainfall data corresponds with National Weather Service Technical Paper 40 (TP-40) used in Technical Release 55 (TR-55). Curve numbers were generated using the information provided in TR-55 and the SCS Soils Survey.

new development is defined as any construction activities or land alteration resulting in total earth disturbances equal to or greater than 1 acre (or activities that are part of a larger common plan of development disturbing greater than 1 acre) on an area that has not previously been developed to include impervious cover.

redevelopment is defined as any construction, land alteration, or improvement of impervious surfaces resulting in total earth disturbances equal to or greater than 1 acre (or activities that are part of a larger common plan of development disturbing greater than 1 acre) that does not meet the definition of new development (see above).

- a. Permittees shall develop, implement, and enforce a program to address post-construction stormwater runoff from all new development and redevelopment sites that disturb one or more acres and discharge into the permittees MS4 at a minimum. Permittees authorized under the MS4-2003 permit shall continue to implement and enforce their program and modify as necessary to meet the requirements of this part.
 - i. The permittee's new development/ redevelopment program shall include sites less than one acre if the site is part of a larger common plan of development or redevelopment which disturbs one or more acre.
 - ii. The permittee shall develop or modify, as appropriate, an ordinance or other regulatory mechanism within two (2) years of the effective date of the permit to contain provisions that are at least as stringent as the following:
 1. Low Impact Development (LID) site planning and design strategies must be used to the maximum extent feasible.
 2. The design of treatment and infiltration practices should follow the guidance in Volume 2 of the Massachusetts Stormwater Handbook, as amended, or other federally or State approved¹⁰ BMP design guidance.
 3. Stormwater management systems on new development sites shall be designed to:
 - a) Not allow new stormwater conveyances to discharge untreated stormwater in accordance with Massachusetts Stormwater Handbook Standard 1;
 - b) Control peak runoff rates in accordance with Massachusetts Stormwater Handbook Standard 2¹¹;
 - c) Recharge groundwater in accordance with Massachusetts Stormwater Handbook Standard 3¹²;
 - d) Eliminate or reduce the discharge of pollutants from land uses with higher pollutant loads as defined in the Massachusetts Stormwater Handbook in accordance with Massachusetts Stormwater Handbook Standard 5;
 - e) Protect Zone II or Interim Wellhead Protection Areas of public water supplies in accordance with Massachusetts Stormwater Handbook Standard 6¹³;

¹⁰ State approved includes any state in the United States, including, but not limited to, approved guidance by the Commonwealth of Massachusetts

¹¹ Requirement necessary for Section 401 water quality certification by Massachusetts

¹² Requirement necessary for Section 401 water quality certification by Massachusetts

¹³ Requirement necessary for Section 401 water quality certification by Massachusetts

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.

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.

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.

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.

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

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

Applicability

Except as expressly provided herein, stormwater runoff from all industrial, commercial, institutional, office, residential and transportation projects including site preparation, construction and redevelopment, and all point source stormwater discharges from said projects shall be managed according to the Stormwater Management Standards.

The Stormwater Management Standards shall not apply to:

(1) A single-family house;

(2) Housing development and redevelopment projects comprised of detached single-family dwellings on four or fewer lots provided that there are no stormwater discharges that may potentially affect a critical area;

- (3) Multi-family housing development and redevelopment projects with four or fewer units, including condominiums, cooperatives, apartment buildings and townhouses, provided that there are no stormwater discharges that may potentially affect a critical area; and
- (4) Emergency repairs to roads or their drainage systems.

The Stormwater Management Standards shall apply to the maximum extent practicable to the following:

- (1) Housing development and redevelopment projects comprised of detached single-family dwellings on four or fewer lots that have a stormwater discharge that may potentially affect a critical area;
- (2) Multi-family housing development and redevelopment projects, with four or fewer units, including condominiums, cooperatives, apartment buildings, and townhouses, that have a stormwater discharge that may potentially affect a critical area;
- (3) Housing development and redevelopment projects comprised of detached single-family dwellings on five to nine lots, provided there is no stormwater discharge that may potentially affect a critical area;
- (4) Multi-family housing development and redevelopment projects with five to nine units, including condominiums, cooperatives, apartment buildings, and townhouses, provided there is no stormwater discharge that may potentially affect a critical area;
- (5) Marinas and boat yards, provided that the hull maintenance, painting and service areas are protected from exposure to rain, snow, snow melt, and stormwater runoff; and
- (6) Footpaths, bikepaths and other paths for pedestrian and/or nonmotorized vehicle access.

Critical areas include Outstanding Resource Waters as designated in 314 CMR 4.00, Special Resource Waters as designated in 314 CMR 4.00, recharge areas for public water supplies as defined in 310 CMR 22.02 (Zone Is, Zone IIs and Interim Wellhead Protection Areas for groundwater sources and Zone As for surface water sources), bathing beaches as defined in 105 CMR 445.000, cold-water fisheries as defined in 310 CMR 10.04 and 314 CMR 9.02, and shellfish growing areas as defined in 310 CMR 10.04 and 314 CMR 9.02.

For phased projects, the determination of whether the Stormwater Management Standards apply is made on the entire project as a whole including all phases. When proposing a development or redevelopment project subject to the Stormwater Management Standards, proponents shall consider environmentally sensitive site design that incorporates low impact development techniques in addition to stormwater best management practices.

Project proponents seeking to demonstrate compliance with some or all of the Stormwater Management Standards to the maximum extent practicable shall demonstrate that:

- (1) They have made all reasonable efforts to meet each of the Standards;
- (2) They have made a complete evaluation of possible stormwater management measures, including environmentally sensitive site design, low impact development techniques that minimize land disturbance and impervious surfaces, structural stormwater best management practices, pollution prevention, erosion and sedimentation control, and proper operation and maintenance of stormwater best management practices; and
- (3) If full compliance with the Standards cannot be achieved, they are implementing the highest practicable level of stormwater management.

The Stormwater Management Standards (Standards 4, 5, 6, 8, and 9) require project proponents to develop a construction-period erosion, sedimentation, and pollution prevention plan and long-term pollution prevention and operation and maintenance plans. The level of detail in these plans should reflect the complexity of the project and the nature and extent of the impacts that may arise both during and after construction. For small residential projects that are subject to jurisdiction under the Wetlands Protection Act and that are required to meet the Stormwater Management Standards only to the maximum extent practicable, the issuing authority has broad discretion to tailor this requirement to the specific stormwater

DRAINAGE REPORT

201 Elm Street and 6 Monroe Street
Amesbury, Massachusetts

TAB 2



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PROJECT:

201 ELM STREET

AMESBURY, MA 01913

PREPARED FOR:

**RIVERS EDGE
DEVELOPMENT LLC**

**88 ELM STREET
AMESBURY, MA 01913**

**FIGURE 1:
ORTHO**

PREPARED BY: TJS
SCALE: 1"=250'
CDCI FILE #: 25-10704
DATE: FEBRUARY 14, 2025



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PROJECT:

201 ELM STREET

AMESBURY, MA 01913

PREPARED FOR:

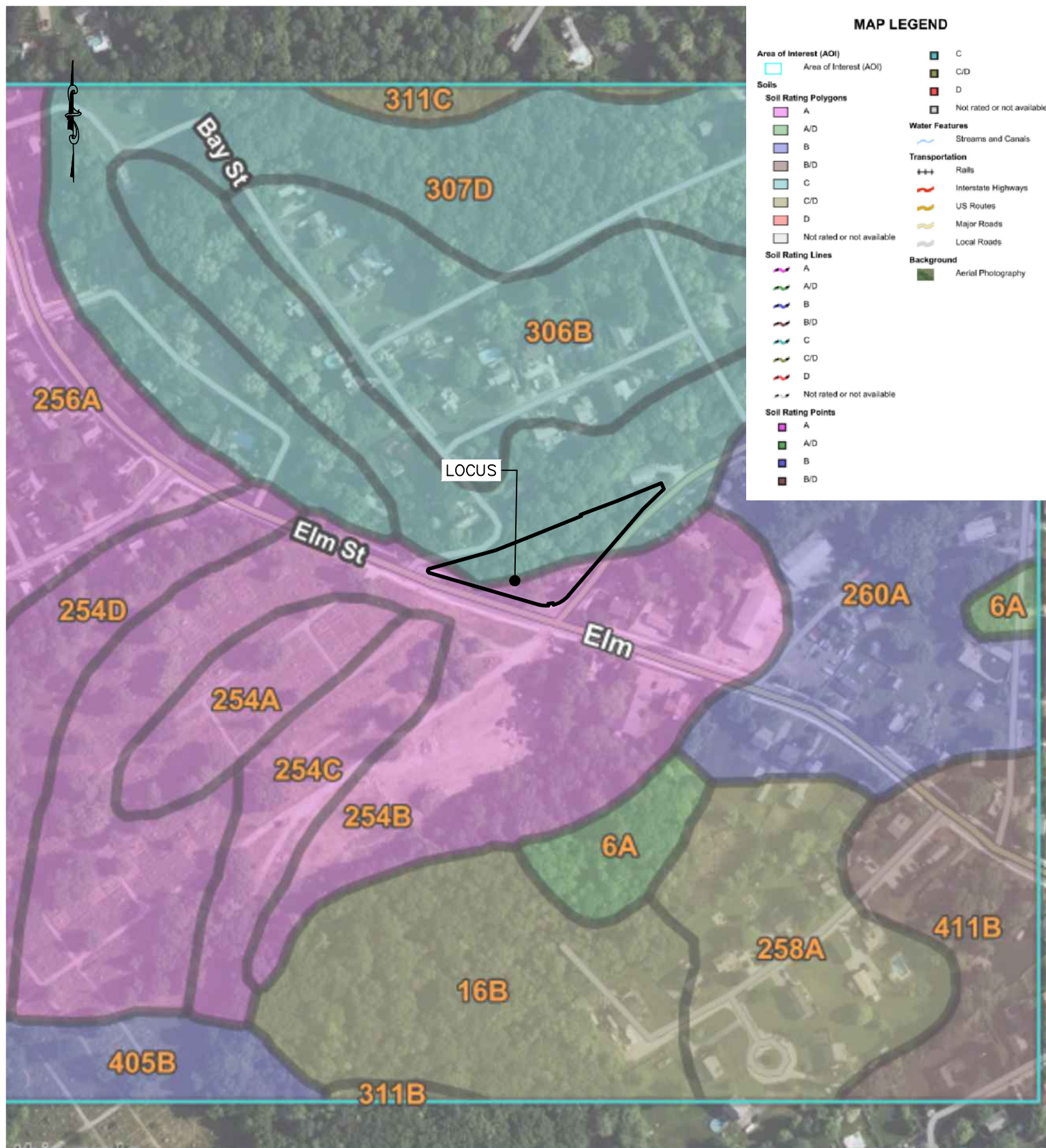
**RIVERS EDGE
DEVELOPMENT LLC**

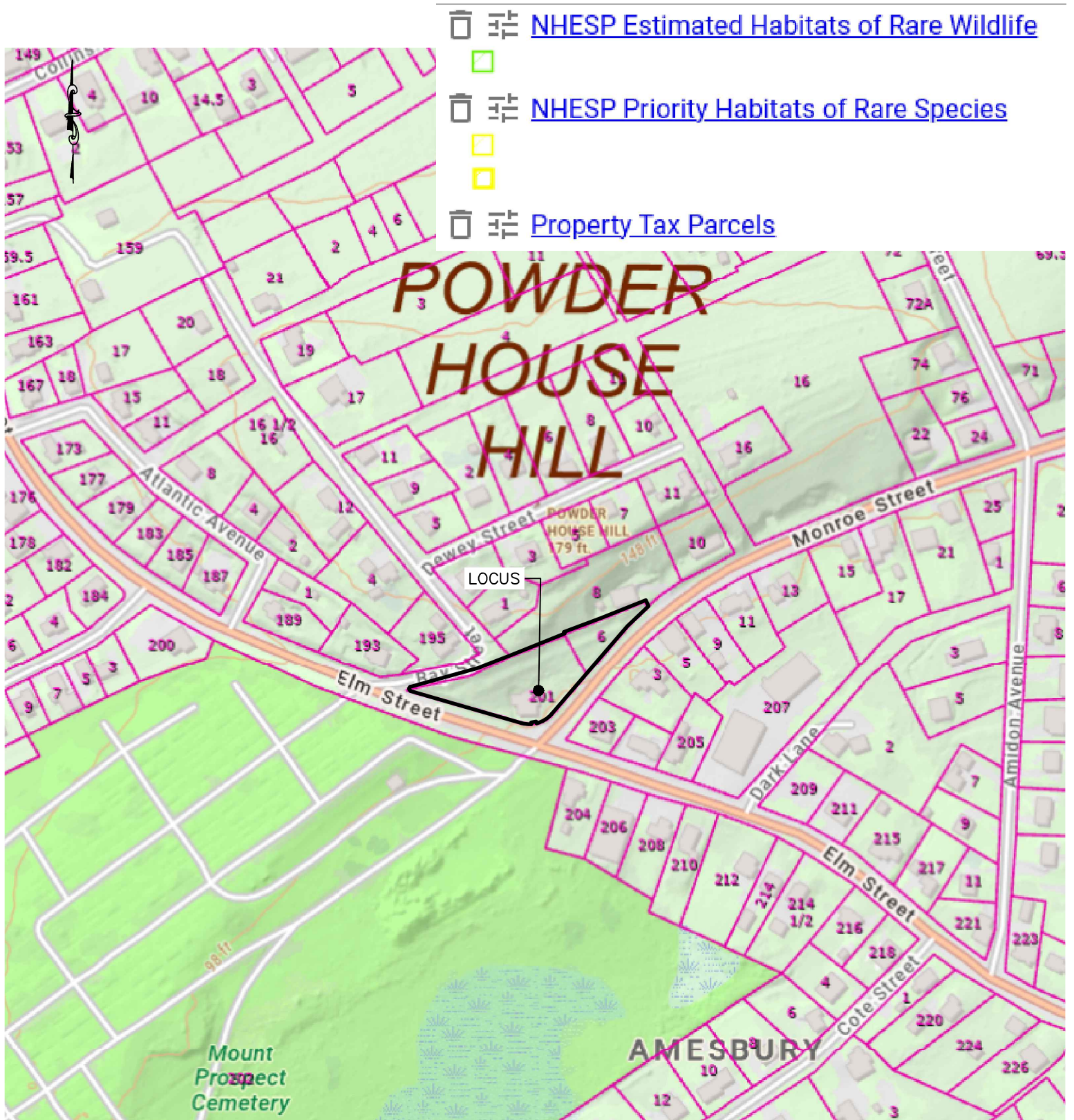
**88 ELM STREET
AMESBURY, MA 01913**

**FIGURE 2:
USGS**

**PREPARED BY: TJS
SCALE: 1"=500'
CDCI FILE #: 25-10704
DATE: FEBRUARY 14, 2025**



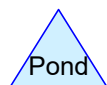
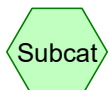
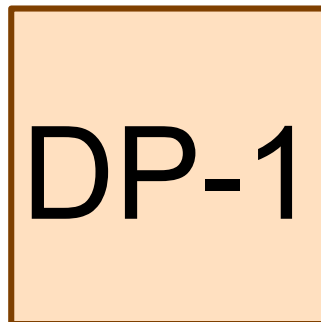
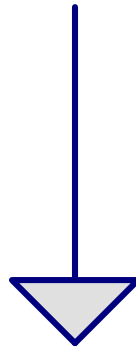
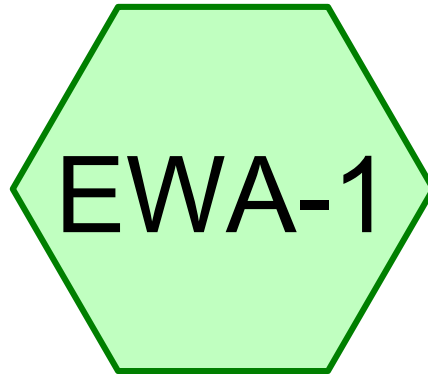




DRAINAGE REPORT

201 Elm Street and 6 Monroe Street
Amesbury, Massachusetts

TAB 3



Pre-Development 5-31-25

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Page 2

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC	P2 (inches)
1	2-Year	Type III 24-hr		Default	24.00	1	3.20	2	3.20
2	10-Year	Type III 24-hr		Default	24.00	1	4.50	2	3.20
3	25-Year	Type III 24-hr		Default	24.00	1	5.30	2	3.20
4	100-Year	Type III 24-hr		Default	24.00	1	6.50	2	3.20

Pre-Development 5-31-25

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.16	49	50-75% Grass cover, Fair, HSG A (EWA-1)
0.12	79	50-75% Grass cover, Fair, HSG C (EWA-1)
0.30	74	>75% Grass cover, Good, HSG C (EWA-1)
0.01	96	Gravel surface, HSG A (EWA-1)
0.05	98	Paved parking, HSG A (EWA-1)
0.17	98	Paved parking, HSG C (EWA-1)
0.06	98	Roofs, HSG C (EWA-1)
0.04	98	Unconnected roofs, HSG A (EWA-1)
0.02	30	Woods, Good, HSG A (EWA-1)
0.95	70	Woods, Good, HSG C (EWA-1)
1.88	74	TOTAL AREA

Pre-Development 5-31-25

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.28	HSG A	EWA-1
0.00	HSG B	
1.60	HSG C	EWA-1
0.00	HSG D	
0.00	Other	
1.88		TOTAL AREA

Pre-Development 5-31-25*Type III 24-hr 2-Year Rainfall=3.20", P2=3.20"*

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Page 5

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEWA-1:

Runoff Area=1.88 ac 17.02% Impervious Runoff Depth=1.04"

Tc=6.0 min CN=74 Runoff=2.2 cfs 0.16 af

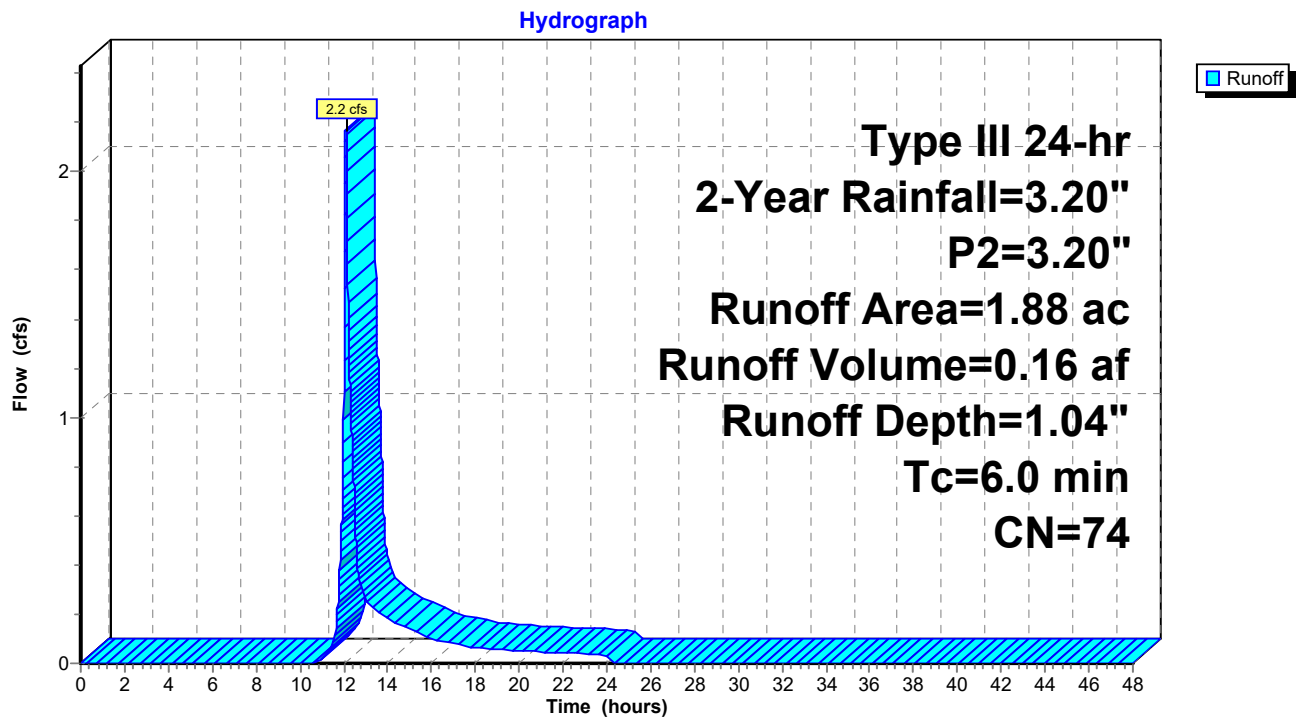
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Inflow=2.2 cfs 0.16 af

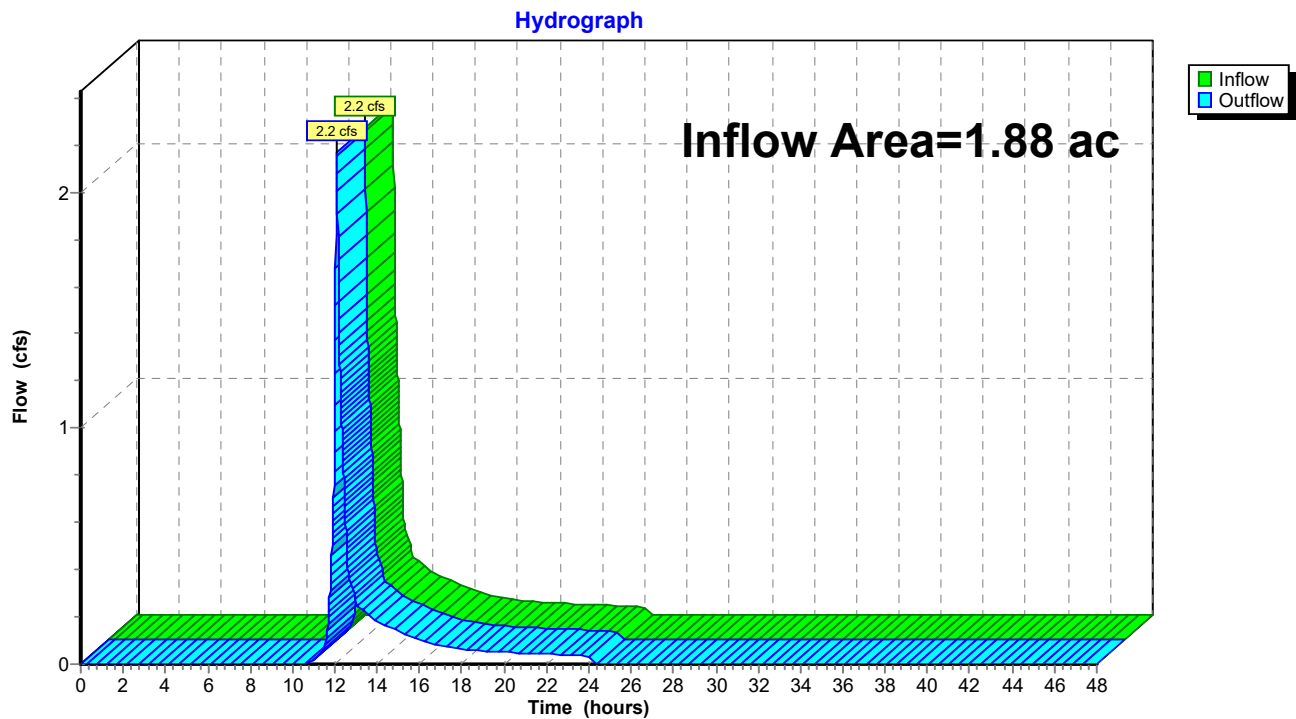
Outflow=2.2 cfs 0.16 af

Total Runoff Area = 1.88 ac Runoff Volume = 0.16 af Average Runoff Depth = 1.04"
82.98% Pervious = 1.56 ac 17.02% Impervious = 0.32 ac

Subcatchment EWA-1:



Reach DP-1:



Pre-Development 5-31-25*Type III 24-hr 10-Year Rainfall=4.50", P2=3.20"*

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Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEWA-1:

Runoff Area=1.88 ac 17.02% Impervious Runoff Depth=1.97"

Tc=6.0 min CN=74 Runoff=4.3 cfs 0.31 af

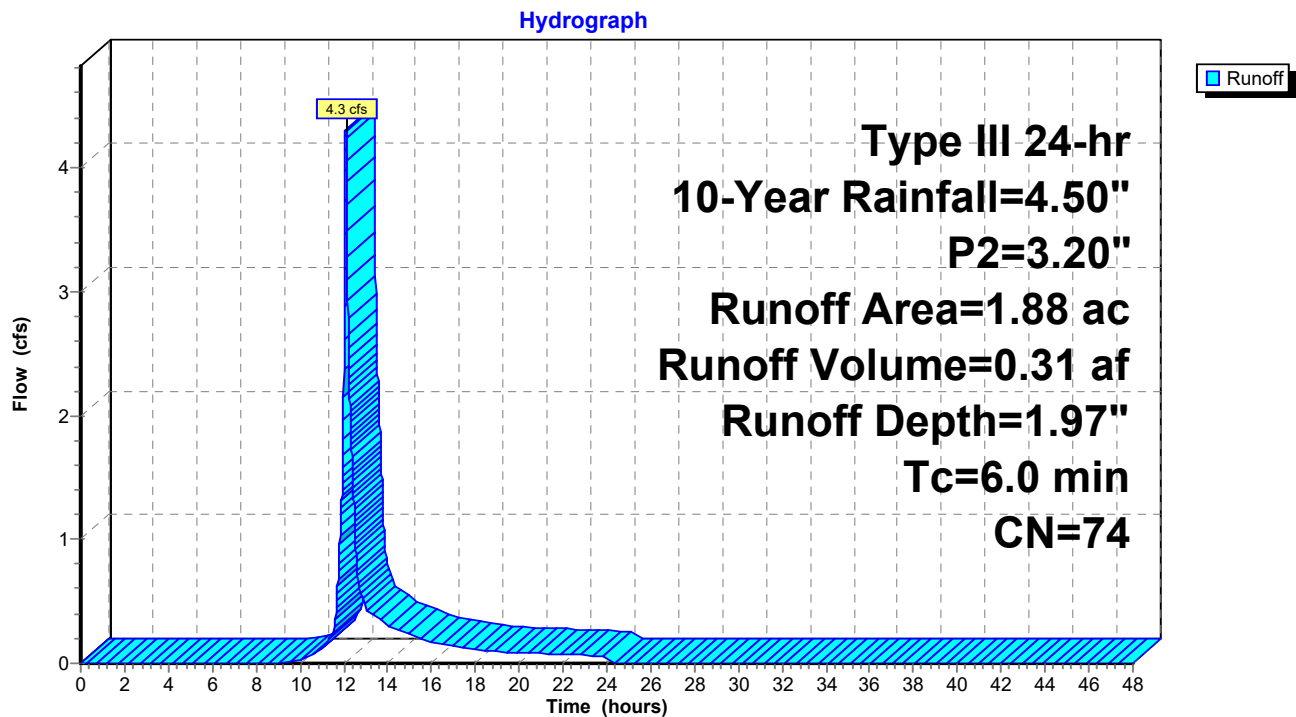
Reach DP-1:

Inflow=4.3 cfs 0.31 af

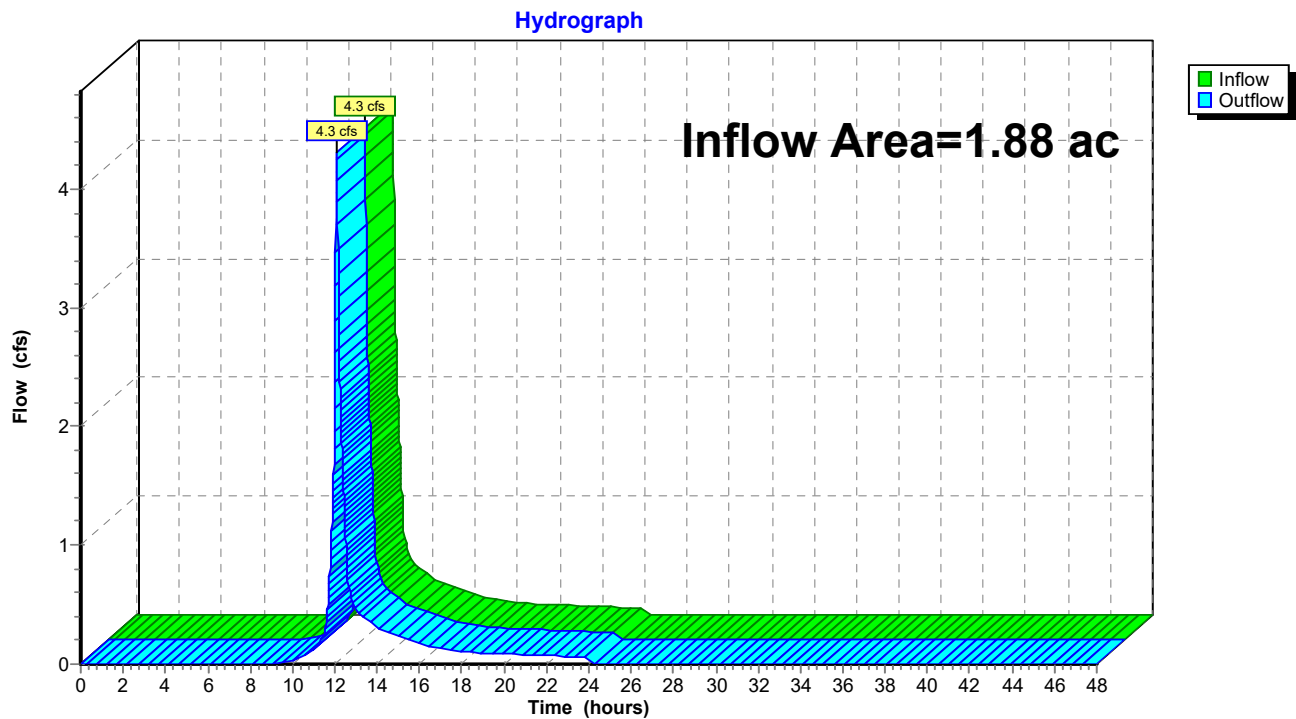
Outflow=4.3 cfs 0.31 af

Total Runoff Area = 1.88 ac Runoff Volume = 0.31 af Average Runoff Depth = 1.97"
82.98% Pervious = 1.56 ac 17.02% Impervious = 0.32 ac

Subcatchment EWA-1:



Reach DP-1:



Pre-Development 5-31-25*Type III 24-hr 25-Year Rainfall=5.30", P2=3.20"*

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEWA-1:

Runoff Area=1.88 ac 17.02% Impervious Runoff Depth=2.61"

Tc=6.0 min CN=74 Runoff=5.7 cfs 0.41 af

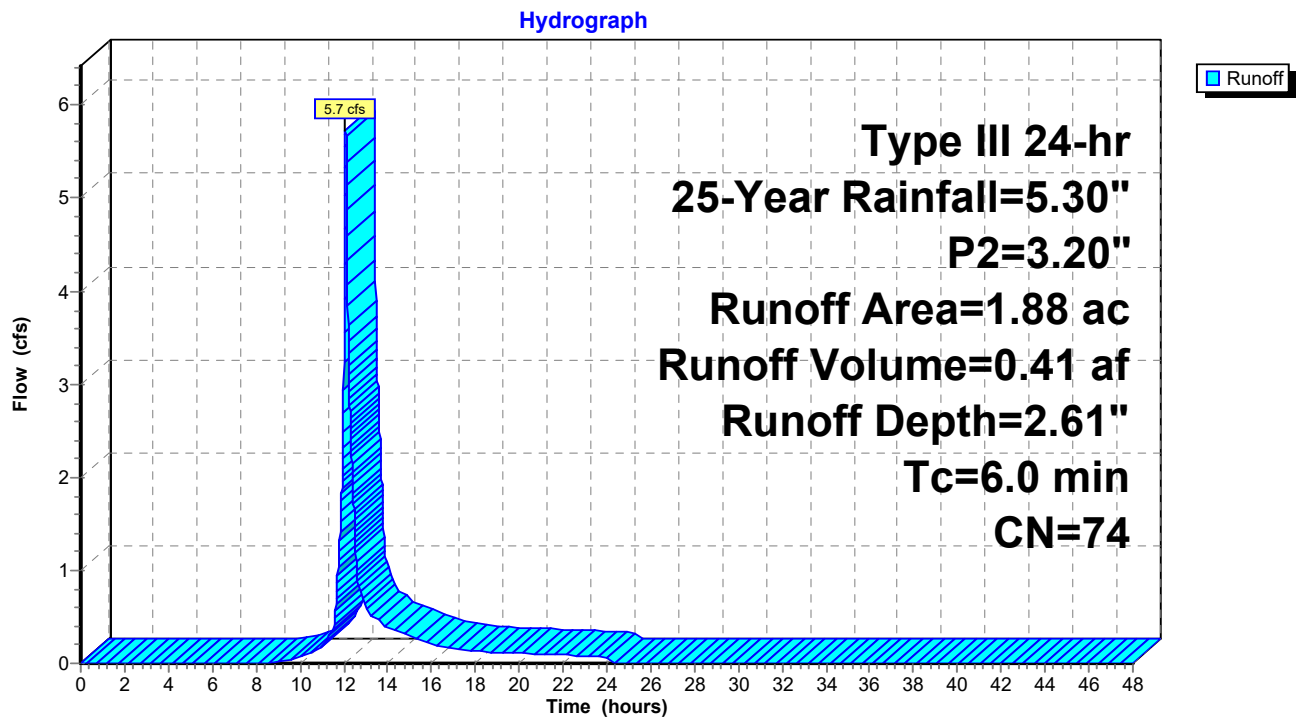
Reach DP-1:

Inflow=5.7 cfs 0.41 af

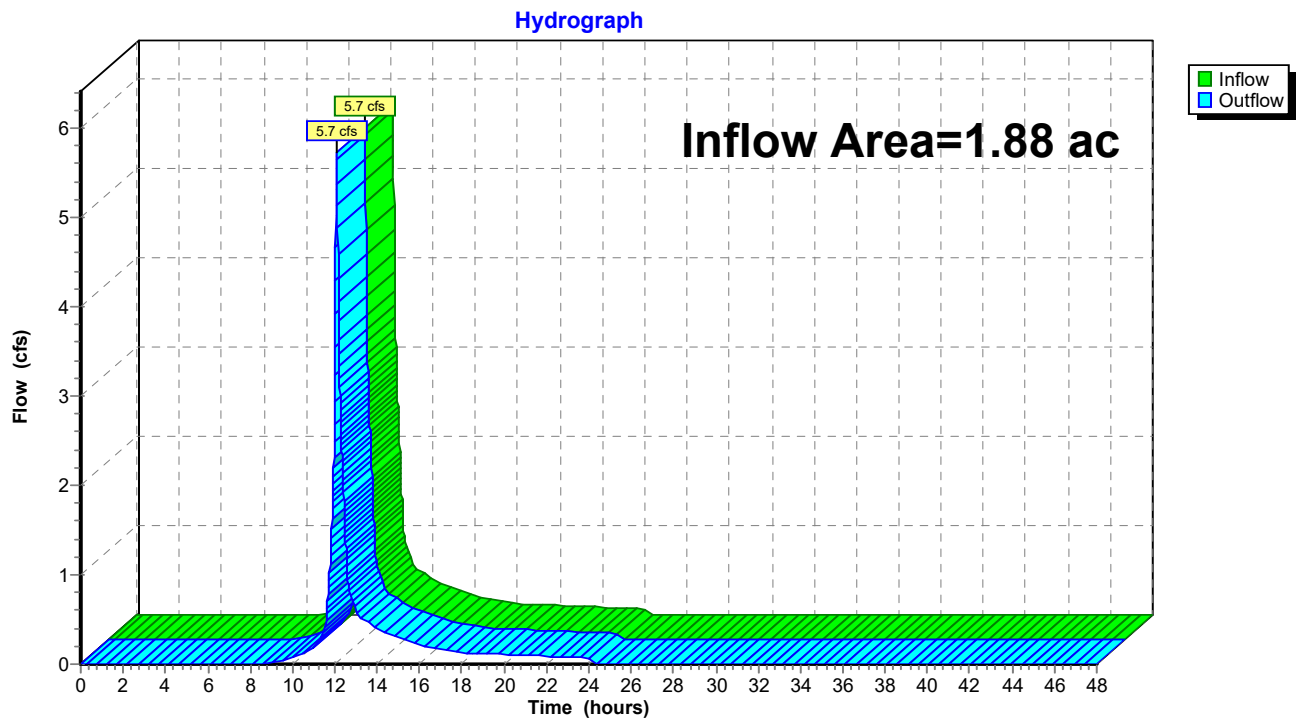
Outflow=5.7 cfs 0.41 af

Total Runoff Area = 1.88 ac Runoff Volume = 0.41 af Average Runoff Depth = 2.61"
82.98% Pervious = 1.56 ac 17.02% Impervious = 0.32 ac

Subcatchment EWA-1:



Reach DP-1:



Pre-Development 5-31-25*Type III 24-hr 100-Year Rainfall=6.50", P2=3.20"*

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Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEWA-1:

Runoff Area=1.88 ac 17.02% Impervious Runoff Depth=3.61"

Tc=6.0 min CN=74 Runoff=8.0 cfs 0.57 af

Reach DP-1:

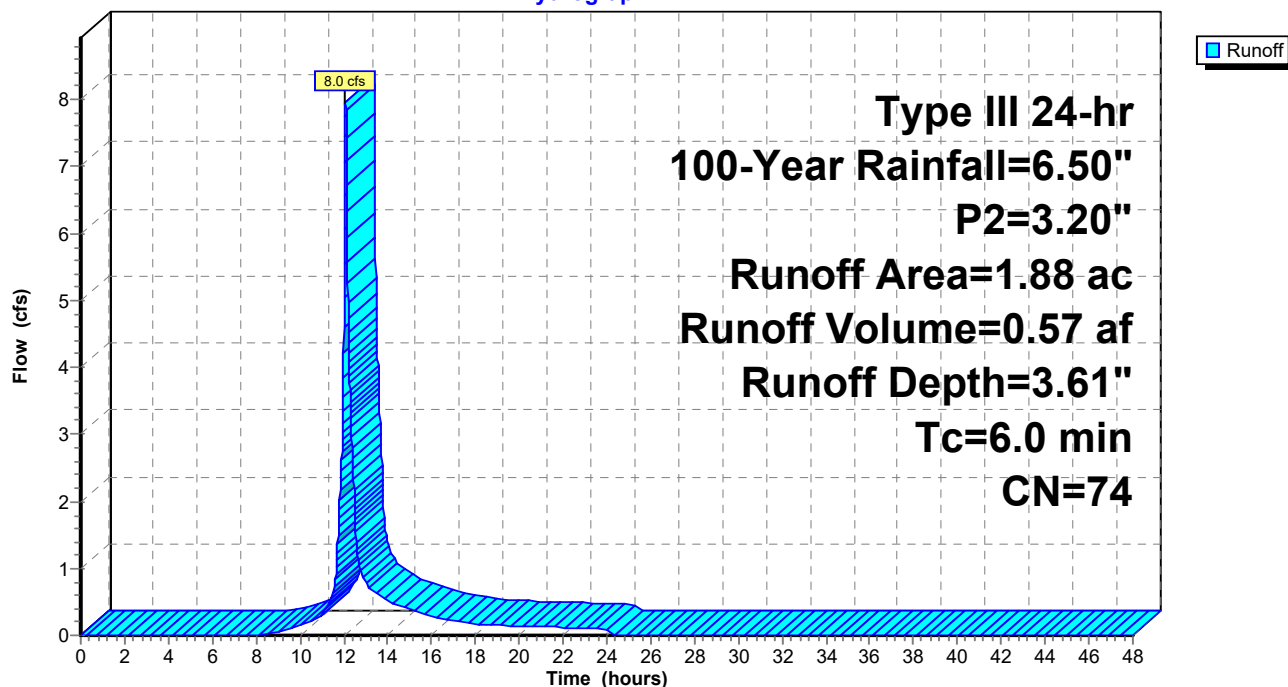
Inflow=8.0 cfs 0.57 af

Outflow=8.0 cfs 0.57 af

Total Runoff Area = 1.88 ac Runoff Volume = 0.57 af Average Runoff Depth = 3.61"
82.98% Pervious = 1.56 ac 17.02% Impervious = 0.32 ac

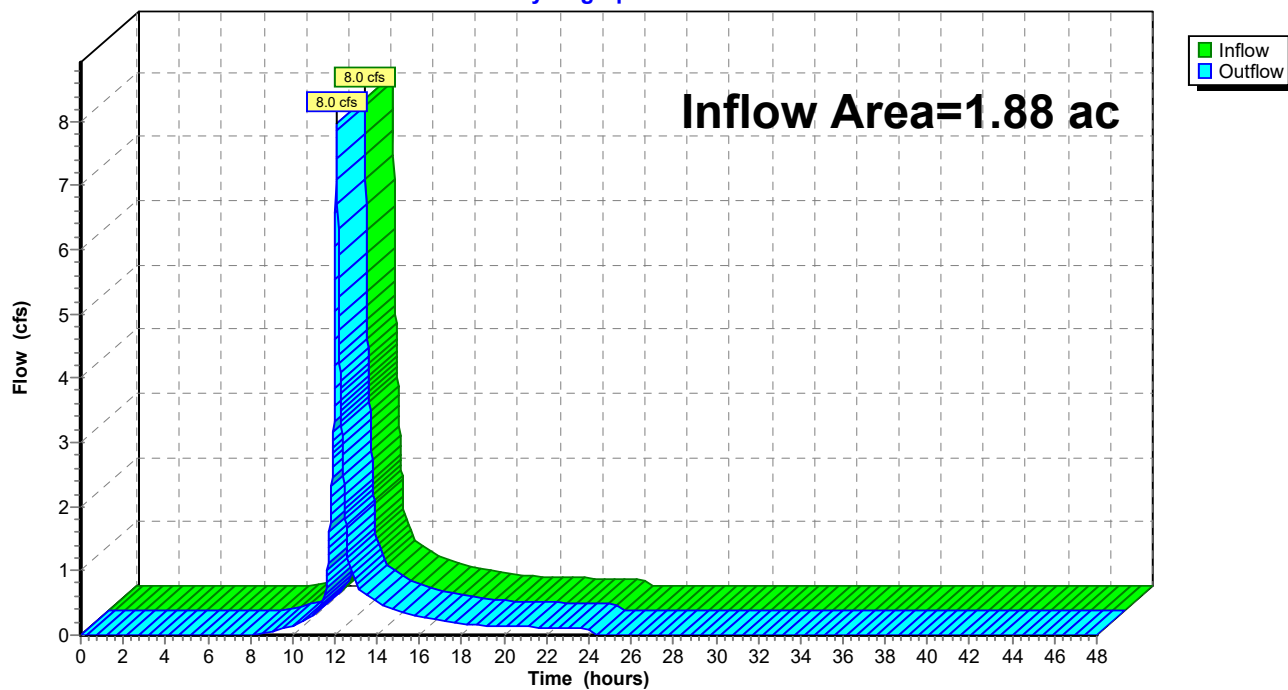
Subcatchment EWA-1:

Hydrograph



Reach DP-1:

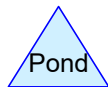
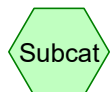
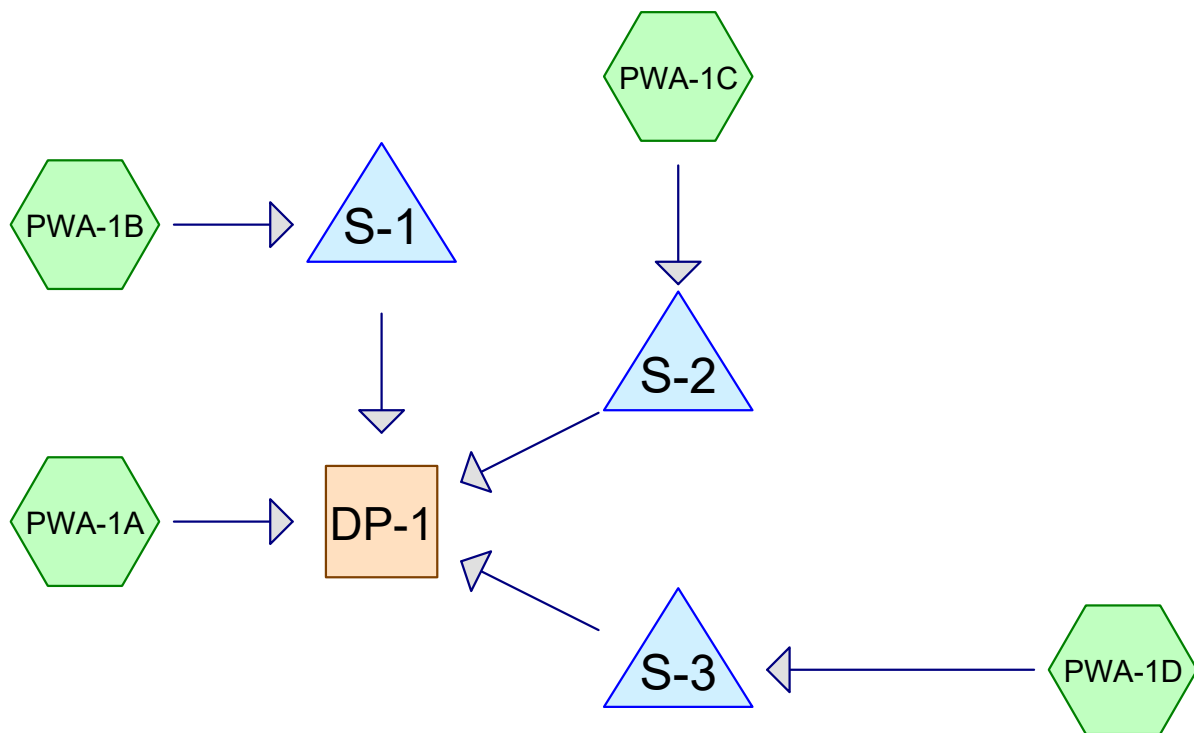
Hydrograph



DRAINAGE REPORT

201 Elm Street and 6 Monroe Street
Amesbury, Massachusetts

TAB 4



Post-Development 5-31-25

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Page 1

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.20	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.50	2
3	25-Year	Type III 24-hr		Default	24.00	1	5.30	2
4	100-Year	Type III 24-hr		Default	24.00	1	6.50	2

Post-Development 5-31-25

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Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.28	HSG A	PWA-1A, PWA-1B
0.00	HSG B	
1.60	HSG C	PWA-1A, PWA-1C, PWA-1D
0.00	HSG D	
0.00	Other	
1.88		TOTAL AREA

Post-Development 5-31-25*Type III 24-hr 2-Year Rainfall=3.20"*

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPWA-1A: Runoff Area=1.74 ac 21.84% Impervious Runoff Depth=1.09"
Tc=6.0 min UI Adjusted CN=75 Runoff=2.1 cfs 0.16 af

SubcatchmentPWA-1B: Runoff Area=0.05 ac 100.00% Impervious Runoff Depth=2.97"
Tc=6.0 min CN=98 Runoff=0.2 cfs 0.01 af

SubcatchmentPWA-1C: Runoff Area=0.05 ac 100.00% Impervious Runoff Depth=2.97"
Tc=6.0 min CN=98 Runoff=0.2 cfs 0.01 af

SubcatchmentPWA-1D: Runoff Area=0.04 ac 100.00% Impervious Runoff Depth=2.97"
Tc=6.0 min CN=98 Runoff=0.1 cfs 0.01 af

Reach DP-1: To ROW Inflow=2.1 cfs 0.16 af
Outflow=2.1 cfs 0.16 af

Pond S-1: S-1 Peak Elev=98.34' Storage=179 cf Inflow=0.2 cfs 0.01 af
Discarded=0.0 cfs 0.01 af Primary=0.0 cfs 0.00 af Outflow=0.0 cfs 0.01 af

Pond S-2: S-2 Peak Elev=96.81' Storage=70 cf Inflow=0.2 cfs 0.01 af
Outflow=0.1 cfs 0.01 af

Pond S-3: S-3 Peak Elev=101.59' Storage=83 cf Inflow=0.1 cfs 0.01 af
Discarded=0.0 cfs 0.01 af Primary=0.0 cfs 0.00 af Outflow=0.0 cfs 0.01 af

Total Runoff Area = 1.88 ac Runoff Volume = 0.19 af Average Runoff Depth = 1.23"
72.34% Pervious = 1.36 ac 27.66% Impervious = 0.52 ac

Post-Development 5-31-25*Type III 24-hr 10-Year Rainfall=4.50"*

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPWA-1A: Runoff Area=1.74 ac 21.84% Impervious Runoff Depth=2.05"
Tc=6.0 min UI Adjusted CN=75 Runoff=4.1 cfs 0.30 af

SubcatchmentPWA-1B: Runoff Area=0.05 ac 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=0.2 cfs 0.02 af

SubcatchmentPWA-1C: Runoff Area=0.05 ac 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=0.2 cfs 0.02 af

SubcatchmentPWA-1D: Runoff Area=0.04 ac 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=0.2 cfs 0.01 af

Reach DP-1: To ROW Inflow=4.1 cfs 0.30 af
Outflow=4.1 cfs 0.30 af

Pond S-1: S-1 Peak Elev=99.05' Storage=248 cf Inflow=0.2 cfs 0.02 af
Discarded=0.0 cfs 0.02 af Primary=0.1 cfs 0.00 af Outflow=0.1 cfs 0.02 af

Pond S-2: S-2 Peak Elev=97.22' Storage=139 cf Inflow=0.2 cfs 0.02 af
Outflow=0.1 cfs 0.02 af

Pond S-3: S-3 Peak Elev=102.38' Storage=142 cf Inflow=0.2 cfs 0.01 af
Discarded=0.0 cfs 0.01 af Primary=0.0 cfs 0.00 af Outflow=0.0 cfs 0.01 af

Total Runoff Area = 1.88 ac Runoff Volume = 0.35 af Average Runoff Depth = 2.22"
72.34% Pervious = 1.36 ac 27.66% Impervious = 0.52 ac

Post-Development 5-31-25*Type III 24-hr 25-Year Rainfall=5.30"*

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPWA-1A: Runoff Area=1.74 ac 21.84% Impervious Runoff Depth=2.69"
Tc=6.0 min UI Adjusted CN=75 Runoff=5.4 cfs 0.39 af

SubcatchmentPWA-1B: Runoff Area=0.05 ac 100.00% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=98 Runoff=0.3 cfs 0.02 af

SubcatchmentPWA-1C: Runoff Area=0.05 ac 100.00% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=98 Runoff=0.3 cfs 0.02 af

SubcatchmentPWA-1D: Runoff Area=0.04 ac 100.00% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=98 Runoff=0.2 cfs 0.02 af

Reach DP-1: To ROW Inflow=5.4 cfs 0.39 af
Outflow=5.4 cfs 0.39 af

Pond S-1: S-1 Peak Elev=99.10' Storage=248 cf Inflow=0.3 cfs 0.02 af
Discarded=0.0 cfs 0.02 af Primary=0.2 cfs 0.00 af Outflow=0.2 cfs 0.02 af

Pond S-2: S-2 Peak Elev=97.53' Storage=185 cf Inflow=0.3 cfs 0.02 af
Outflow=0.1 cfs 0.02 af

Pond S-3: S-3 Peak Elev=103.05' Storage=178 cf Inflow=0.2 cfs 0.02 af
Discarded=0.0 cfs 0.02 af Primary=0.0 cfs 0.00 af Outflow=0.0 cfs 0.02 af

Total Runoff Area = 1.88 ac Runoff Volume = 0.45 af Average Runoff Depth = 2.87"
72.34% Pervious = 1.36 ac 27.66% Impervious = 0.52 ac

Post-Development 5-31-25*Type III 24-hr 100-Year Rainfall=6.50"*

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPWA-1A: Runoff Area=1.74 ac 21.84% Impervious Runoff Depth=3.71"
Tc=6.0 min UI Adjusted CN=75 Runoff=7.4 cfs 0.54 af

SubcatchmentPWA-1B: Runoff Area=0.05 ac 100.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=0.3 cfs 0.03 af

SubcatchmentPWA-1C: Runoff Area=0.05 ac 100.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=0.3 cfs 0.03 af

SubcatchmentPWA-1D: Runoff Area=0.04 ac 100.00% Impervious Runoff Depth=6.26"
Tc=6.0 min CN=98 Runoff=0.2 cfs 0.02 af

Reach DP-1: To ROW Inflow=7.7 cfs 0.54 af
Outflow=7.7 cfs 0.54 af

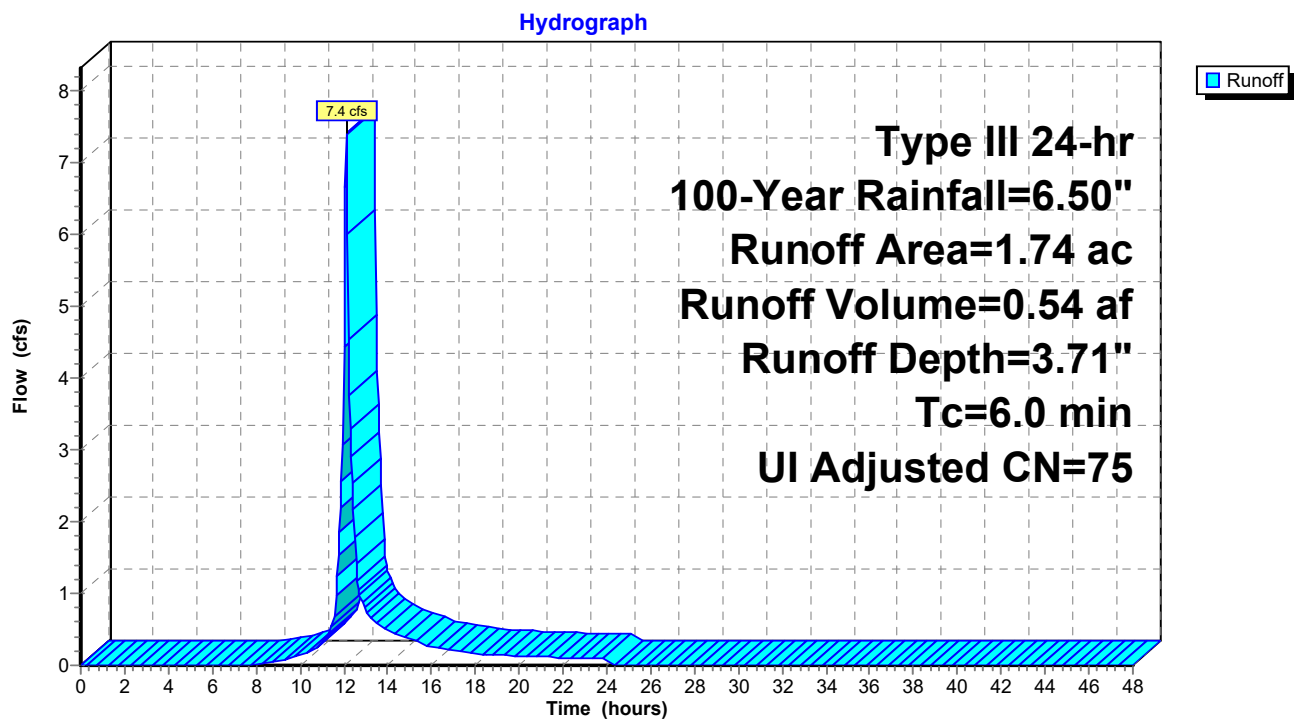
Pond S-1: S-1 Peak Elev=99.12' Storage=248 cf Inflow=0.3 cfs 0.03 af
Discarded=0.0 cfs 0.02 af Primary=0.3 cfs 0.01 af Outflow=0.3 cfs 0.03 af

Pond S-2: S-2 Peak Elev=98.18' Storage=254 cf Inflow=0.3 cfs 0.03 af
Outflow=0.1 cfs 0.03 af

Pond S-3: S-3 Peak Elev=103.74' Storage=213 cf Inflow=0.2 cfs 0.02 af
Discarded=0.1 cfs 0.02 af Primary=0.1 cfs 0.00 af Outflow=0.1 cfs 0.02 af

Total Runoff Area = 1.88 ac Runoff Volume = 0.61 af Average Runoff Depth = 3.90"
72.34% Pervious = 1.36 ac 27.66% Impervious = 0.52 ac

Subcatchment PWA-1A:



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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment PWA-1B:

Runoff = 0.3 cfs @ 12.09 hrs, Volume= 0.03 af, Depth= 6.26"
Routed to Pond S-1 : S-1

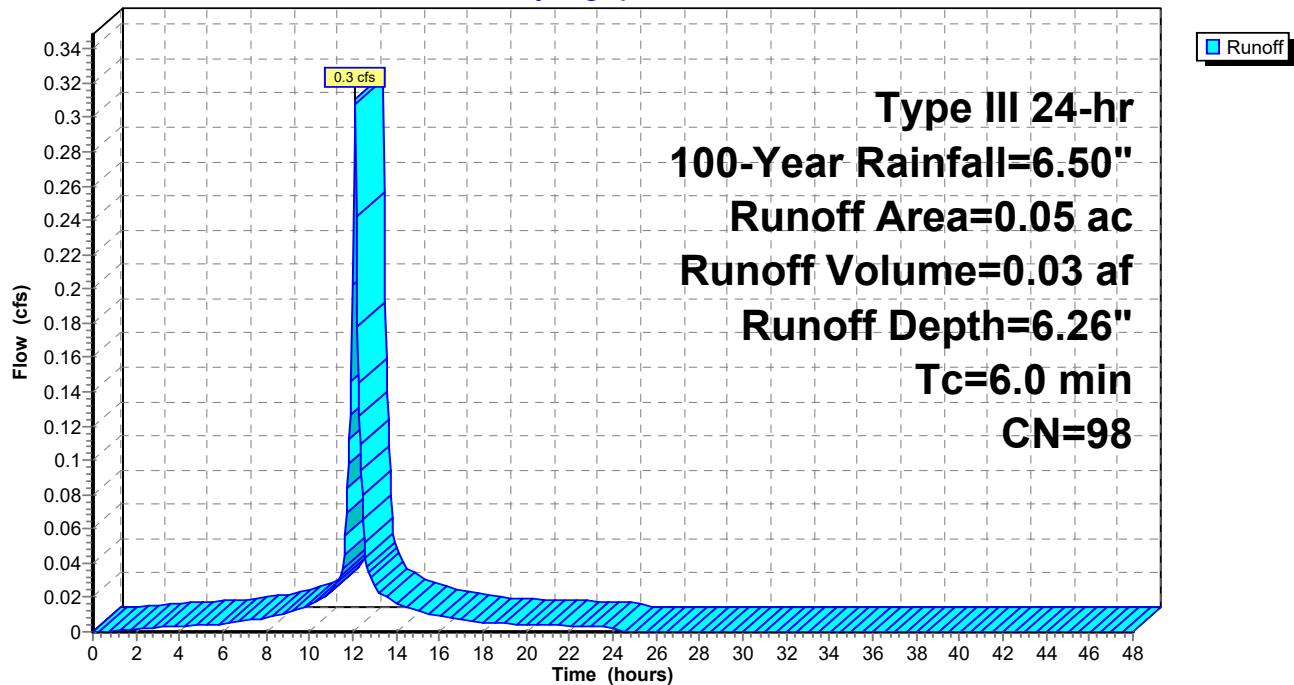
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (ac)	CN	Description
0.05	98	Roofs, HSG A
0.05		100.00% Impervious Area

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

Subcatchment PWA-1B:

Hydrograph



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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment PWA-1C:

Runoff = 0.3 cfs @ 12.09 hrs, Volume= 0.03 af, Depth= 6.26"
Routed to Pond S-2 : S-2

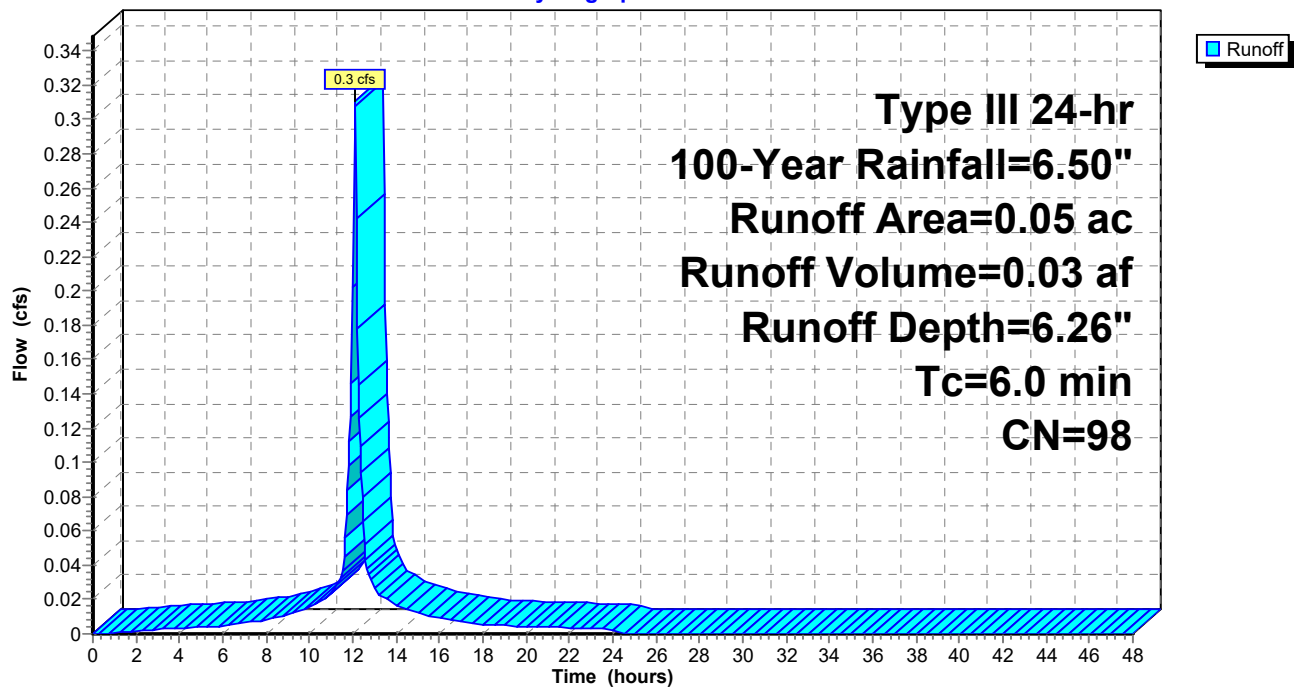
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (ac)	CN	Description
0.05	98	Roofs, HSG C
0.05		100.00% Impervious Area

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

Subcatchment PWA-1C:

Hydrograph



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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment PWA-1D:

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 0.02 af, Depth= 6.26"
Routed to Pond S-3 : S-3

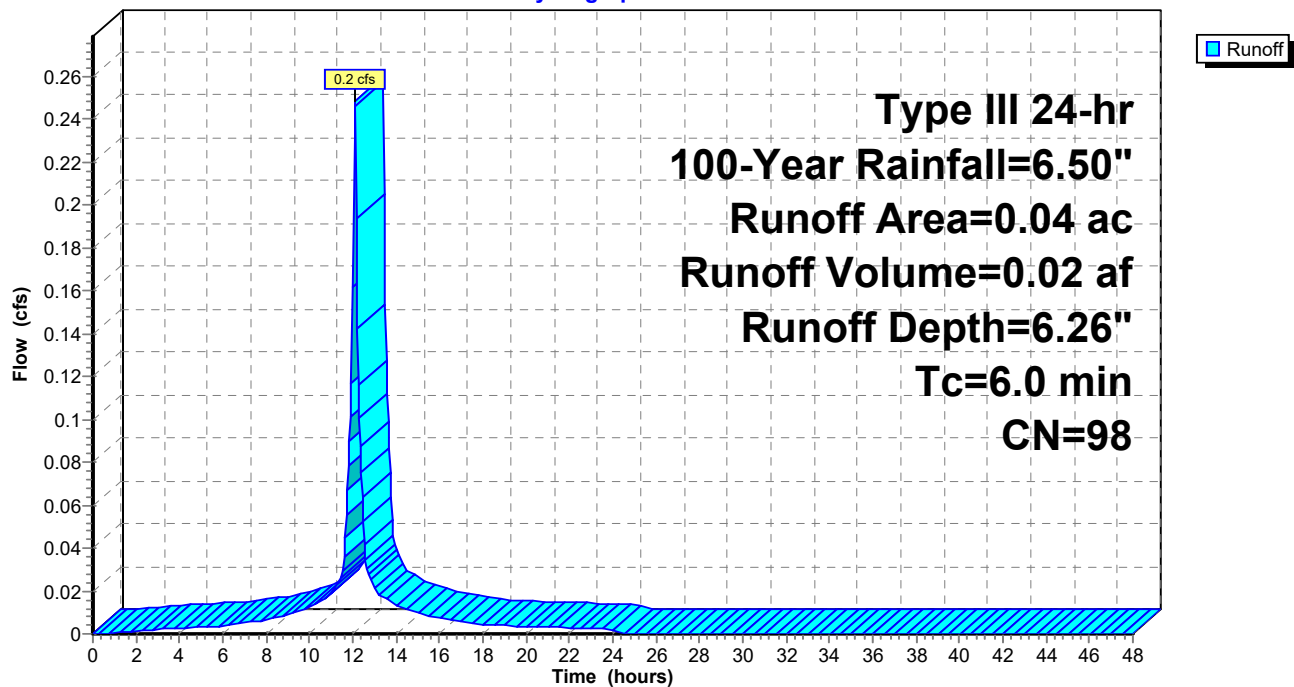
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (ac)	CN	Description
0.04	98	Roofs, HSG C
0.04		100.00% Impervious Area

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

Subcatchment PWA-1D:

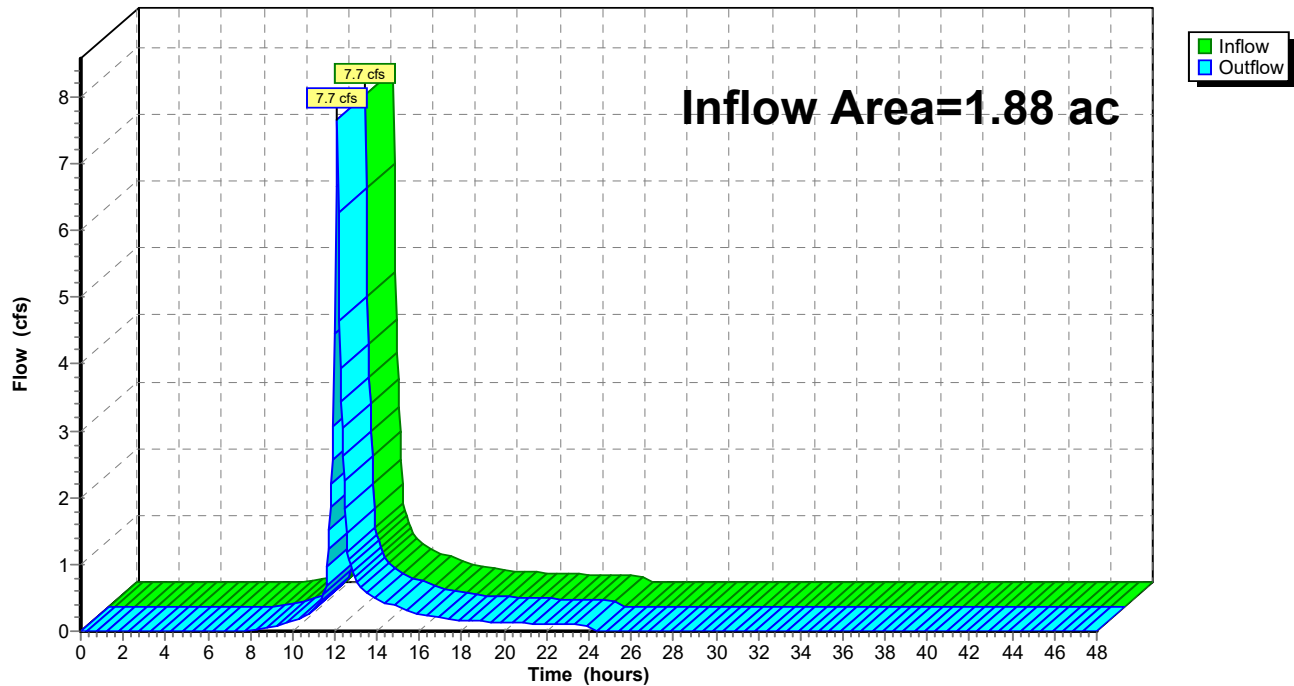
Hydrograph



Summary for Reach DP-1: To ROW

Inflow Area = 1.88 ac, 27.66% Impervious, Inflow Depth = 3.47" for 100-Year event
Inflow = 7.7 cfs @ 12.10 hrs, Volume= 0.54 af
Outflow = 7.7 cfs @ 12.10 hrs, Volume= 0.54 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach DP-1: To ROW**Hydrograph**

Post-Development 5-31-25

Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Pond S-1: S-1

Inflow Area = 0.05 ac, 100.00% Impervious, Inflow Depth = 6.26" for 100-Year event
 Inflow = 0.3 cfs @ 12.09 hrs, Volume= 0.03 af
 Outflow = 0.3 cfs @ 12.13 hrs, Volume= 0.03 af, Atten= 5%, Lag= 2.6 min
 Discarded = 0.0 cfs @ 12.10 hrs, Volume= 0.02 af
 Primary = 0.3 cfs @ 12.13 hrs, Volume= 0.01 af
 Routed to Reach DP-1 : To ROW

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 99.12' @ 12.13 hrs Surf.Area= 241 sf Storage= 248 cf

Plug-Flow detention time= 79.0 min calculated for 0.03 af (100% of inflow)
 Center-of-Mass det. time= 79.0 min (823.0 - 744.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	97.00'	162 cf	13.00'W x 18.50'L x 2.04'H Field A 491 cf Overall - 87 cf Embedded = 404 cf x 40.0% Voids
#2A	97.50'	87 cf	Cultec C-100HD x 6 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 3 rows
		248 cf	Total Available Storage

Storage Group A created with Chamber Wizard

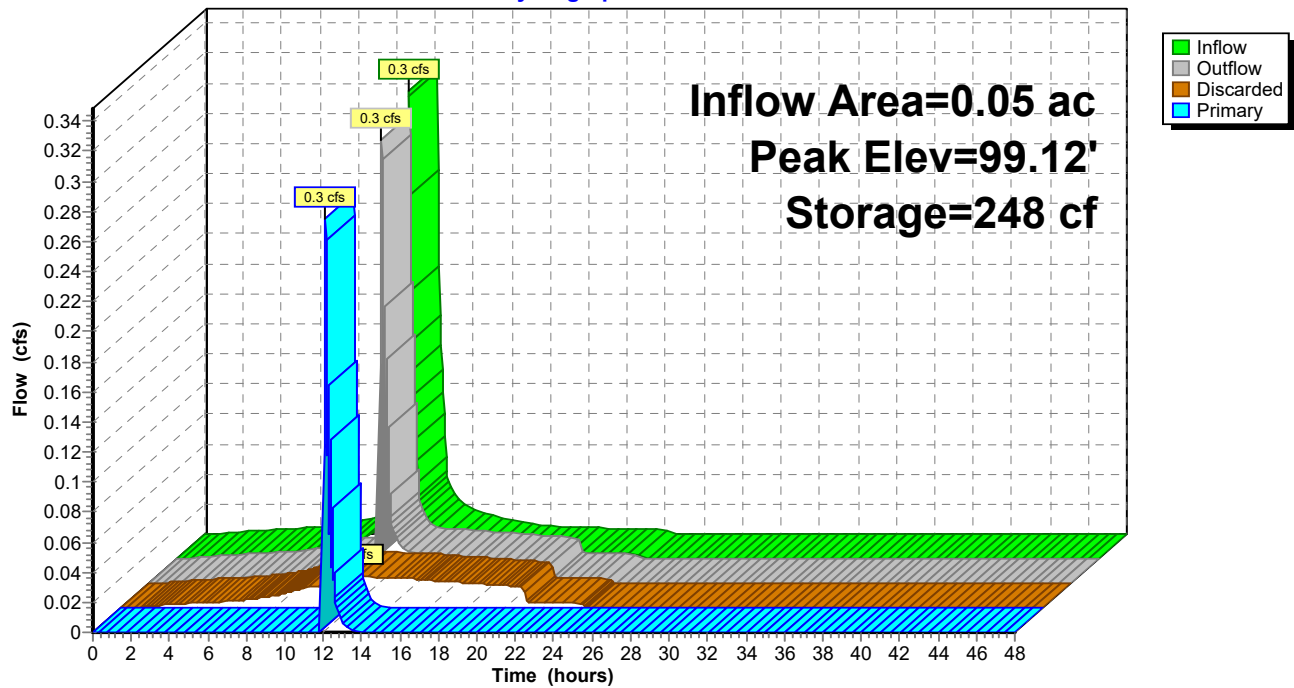
Device	Routing	Invert	Outlet Devices
#1	Discarded	97.00'	2.400 in/hr Exfiltration over Wetted area
#2	Primary	99.00'	6.0" x 6.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 12.10 hrs HW=99.11' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.3 cfs @ 12.13 hrs HW=99.12' (Free Discharge)
 ↑ **2=Orifice/Grate** (Weir Controls 0.3 cfs @ 1.11 fps)

Pond S-1: S-1

Hydrograph



Post-Development 5-31-25

Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Pond S-2: S-2

Inflow Area = 0.05 ac, 100.00% Impervious, Inflow Depth = 6.26" for 100-Year event
 Inflow = 0.3 cfs @ 12.09 hrs, Volume= 0.03 af
 Outflow = 0.1 cfs @ 12.46 hrs, Volume= 0.03 af, Atten= 75%, Lag= 22.5 min
 Discarded = 0.1 cfs @ 12.46 hrs, Volume= 0.03 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 98.18' @ 12.46 hrs Surf.Area= 257 sf Storage= 254 cf

Plug-Flow detention time= 18.6 min calculated for 0.03 af (100% of inflow)
 Center-of-Mass det. time= 18.6 min (762.6 - 744.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	96.20'	175 cf	9.50'W x 27.00'L x 2.04'H Field A 524 cf Overall - 86 cf Embedded = 438 cf x 40.0% Voids
#2A	96.70'	86 cf	Cultec C-100HD x 6 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 2 rows
		261 cf	Total Available Storage

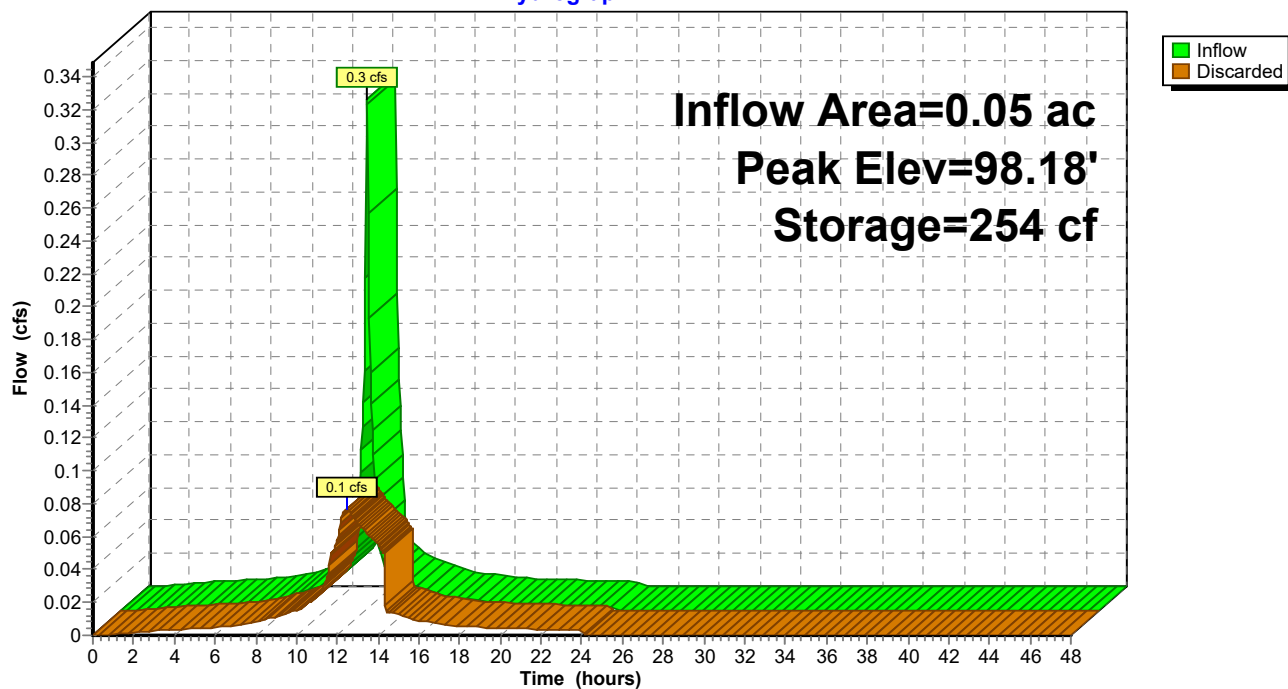
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	96.20'	8.270 in/hr Exfiltration over Wetted area

Discarded OutFlow Max=0.1 cfs @ 12.46 hrs HW=98.18' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Pond S-2: S-2

Hydrograph



Post-Development 5-31-25

Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Pond S-3: S-3

Inflow Area = 0.04 ac, 100.00% Impervious, Inflow Depth = 6.26" for 100-Year event
 Inflow = 0.2 cfs @ 12.09 hrs, Volume= 0.02 af
 Outflow = 0.1 cfs @ 12.30 hrs, Volume= 0.02 af, Atten= 46%, Lag= 13.0 min
 Discarded = 0.1 cfs @ 12.31 hrs, Volume= 0.02 af
 Primary = 0.1 cfs @ 12.30 hrs, Volume= 0.00 af
 Routed to Reach DP-1 : To ROW

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 103.74' @ 12.31 hrs Surf.Area= 126 sf Storage= 213 cf

Plug-Flow detention time= 25.1 min calculated for 0.02 af (100% of inflow)
 Center-of-Mass det. time= 25.1 min (769.0 - 744.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.20'	155 cf	9.00'W x 14.00'L x 3.54'H Field A 446 cf Overall - 58 cf Embedded = 388 cf x 40.0% Voids
#2A	101.20'	58 cf	Cultec R-150XLHD x 2 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 2 rows
		213 cf	Total Available Storage

Storage Group A created with Chamber Wizard

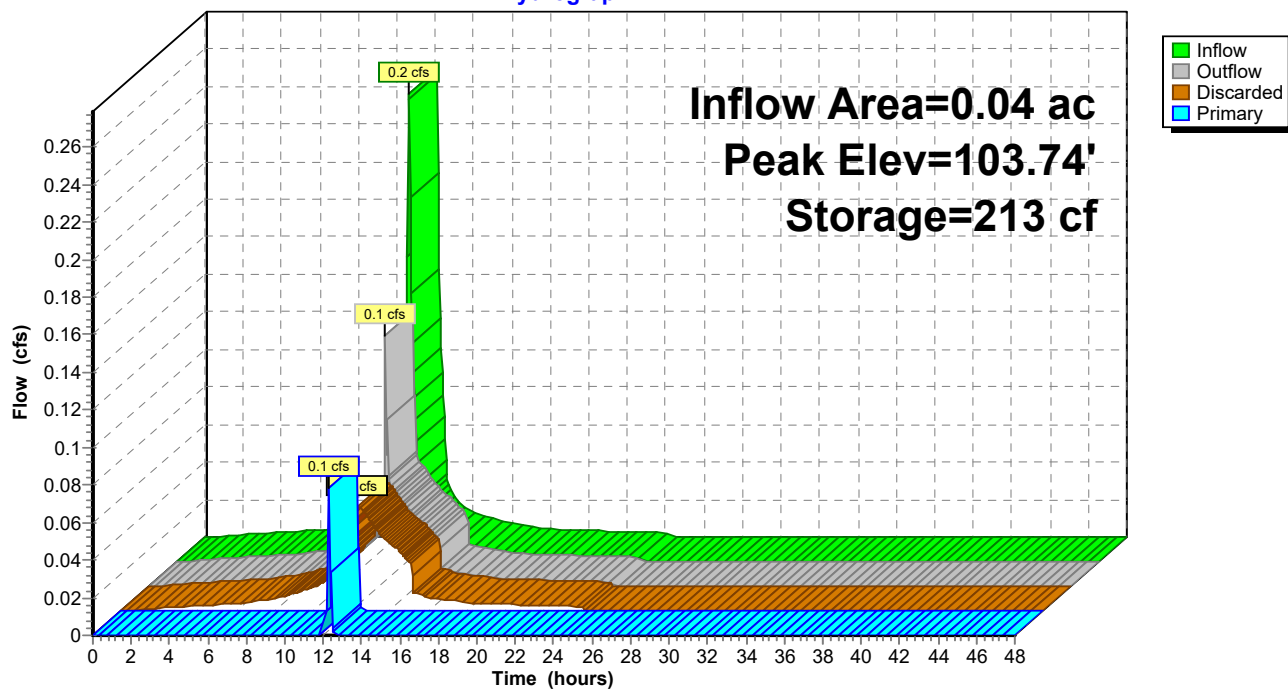
Device	Routing	Invert	Outlet Devices
#1	Discarded	100.20'	8.270 in/hr Exfiltration over Wetted area
#2	Primary	103.70'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.1 cfs @ 12.31 hrs HW=103.73' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.1 cfs @ 12.30 hrs HW=103.74' (Free Discharge)
 ↑ **2=Orifice/Grate** (Weir Controls 0.1 cfs @ 0.62 fps)

Pond S-3: S-3

Hydrograph



Post-Development 5-31-25*Type III 24-hr 100-Year Rainfall=6.50"*

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Stage-Area-Storage for Pond S-1: S-1

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
97.00	241	0
97.05	244	5
97.10	247	10
97.15	250	14
97.20	253	19
97.25	256	24
97.30	259	29
97.35	263	34
97.40	266	38
97.45	269	43
97.50	272	48
97.55	275	57
97.60	278	65
97.65	281	73
97.70	285	81
97.75	288	90
97.80	291	98
97.85	294	106
97.90	297	114
97.95	300	122
98.00	304	130
98.05	307	138
98.10	310	145
98.15	313	153
98.20	316	160
98.25	319	167
98.30	322	174
98.35	326	180
98.40	329	186
98.45	332	191
98.50	335	196
98.55	338	201
98.60	341	206
98.65	344	211
98.70	348	215
98.75	351	220
98.80	354	225
98.85	357	230
98.90	360	235
98.95	363	240
99.00	367	244
99.05	369	248
99.10	369	248

Post-Development 5-31-25

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Type III 24-hr 100-Year Rainfall=6.50"

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Stage-Area-Storage for Pond S-2: S-2

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
96.20	257	0	97.24	332	142
96.22	258	2	97.26	334	145
96.24	259	4	97.28	335	149
96.26	261	6	97.30	337	152
96.28	262	8	97.32	338	155
96.30	264	10	97.34	340	158
96.32	265	12	97.36	341	161
96.34	267	14	97.38	343	164
96.36	268	16	97.40	344	167
96.38	270	18	97.42	346	170
96.40	271	21	97.44	347	173
96.42	273	23	97.46	348	176
96.44	274	25	97.48	350	179
96.46	275	27	97.50	351	181
96.48	277	29	97.52	353	184
96.50	278	31	97.54	354	187
96.52	280	33	97.56	356	189
96.54	281	35	97.58	357	192
96.56	283	37	97.60	359	194
96.58	284	39	97.62	360	197
96.60	286	41	97.64	362	199
96.62	287	43	97.66	363	201
96.64	289	45	97.68	365	203
96.66	290	47	97.70	366	205
96.68	292	49	97.72	367	207
96.70	293	51	97.74	369	209
96.72	294	55	97.76	370	211
96.74	296	58	97.78	372	213
96.76	297	62	97.80	373	216
96.78	299	65	97.82	375	218
96.80	300	69	97.84	376	220
96.82	302	72	97.86	378	222
96.84	303	76	97.88	379	224
96.86	305	79	97.90	381	226
96.88	306	82	97.92	382	228
96.90	308	86	97.94	384	230
96.92	309	89	97.96	385	232
96.94	311	93	97.98	386	234
96.96	312	96	98.00	388	236
96.98	313	99	98.02	389	238
97.00	315	103	98.04	391	240
97.02	316	106	98.06	392	242
97.04	318	110	98.08	394	244
97.06	319	113	98.10	395	246
97.08	321	116	98.12	397	248
97.10	322	120	98.14	398	250
97.12	324	123	98.16	400	252
97.14	325	126	98.18	401	255
97.16	327	129	98.20	403	257
97.18	328	133	98.22	404	259
97.20	330	136	98.24	405	261
97.22	331	139			

Post-Development 5-31-25*Type III 24-hr 100-Year Rainfall=6.50"*

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Stage-Area-Storage for Pond S-3: S-3

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
100.20	126	0	102.80	246	166
100.25	128	3	102.85	248	169
100.30	131	5	102.90	250	171
100.35	133	8	102.95	253	174
100.40	135	10	103.00	255	176
100.45	138	13	103.05	257	179
100.50	140	15	103.10	259	181
100.55	142	18	103.15	262	184
100.60	144	20	103.20	264	186
100.65	147	23	103.25	266	189
100.70	149	25	103.30	269	191
100.75	151	28	103.35	271	194
100.80	154	30	103.40	273	196
100.85	156	33	103.45	276	199
100.90	158	35	103.50	278	201
100.95	161	38	103.55	280	204
101.00	163	40	103.60	282	206
101.05	165	43	103.65	285	209
101.10	167	45	103.70	287	211
101.15	170	48			
101.20	172	50			
101.25	174	55			
101.30	177	59			
101.35	179	63			
101.40	181	67			
101.45	184	71			
101.50	186	75			
101.55	188	79			
101.60	190	83			
101.65	193	87			
101.70	195	91			
101.75	197	95			
101.80	200	99			
101.85	202	103			
101.90	204	107			
101.95	207	111			
102.00	209	115			
102.05	211	118			
102.10	213	122			
102.15	216	126			
102.20	218	129			
102.25	220	133			
102.30	223	137			
102.35	225	140			
102.40	227	143			
102.45	230	147			
102.50	232	150			
102.55	234	153			
102.60	236	156			
102.65	239	158			
102.70	241	161			
102.75	243	163			

DRAINAGE REPORT

201 Elm Street and 6 Monroe Street
Amesbury, Massachusetts

TAB 5

Project: 201 Elm Street
Location: Amesbury, MA
Client: River's Edge Development, LLC

Project Number: 25-10704
Prepared By: MAC
Date: April 18, 2025
Rev: 31-May-25

CITY OF AMESBURY ZONING ORDINANCE

Section XI.C.8.e.1: Stormwater Runoff

	2-Year	10-Year	25-Year	100-Year
Design Point 1	(3.2-IN)	(4.5-IN)	(5.3-IN)	(6.5-IN)
Pre-Development Conditions:	2.2	4.3	5.7	8.0
Post Development Conditions:	2.1	4.1	5.4	7.7

Conclusion: The Stormwater Management System conforms to the City of Amesbury Zoning Ordinance.

CITY OF AMESBURY SUBDIVISION RULES AND REGULATIONS

Redevelopment Requirements (7.10.B.4)

ii)

Retain volume of runoff equivalent to, or greater than, 0.80-inch multiplied by the total post-construction impervious surface area on the site

Existing Total Impervious Area: 0.33 AC

Proposed Total Impervious Area: 0.52 AC

Net Increase: 0.19 AC

Required Recharge Volume: $0.19\text{-AC} \times 43,560\text{-SF} \times (0.80\text{-IN} / 12\text{-IN/FT}) = \mathbf{552\text{-CF}}$

Total Recharge Provided:

S-1: 248 CF

S-2: 261 CF

S-3: 213 CF

Total Required Recharge Volume:	552 CF
---------------------------------	--------

Total Provided Recharge Volume	722 CF
--------------------------------	---------------

MSC

(CONT) #24-10619

#4
0-6 10YR 3/2 LOAM GRAN. F.R.A.
6-18 10YR 5/8 SANDY LOAM " "
18-92 10YR 6/6 SAND " "
SHUT @ 86" ROOTS @ 42" NO WATER OBS.
NO REFUSAL

#1
0-10 10YR 3/2 LOAM GRAN. F.R.A.
10-30 7.5YR 5/8 SANDY LOAM " "
30-90 10YR 5/6 LOAMY SAND " "
SHUT @ 78" ROOTS @ 40" NO WATER OBS.
NO REFUSAL

MSC

2-7-25 CDCI #24-10619
201 Elm St Amesbury, MA.
TEST PITS

#2
0-8 10YR 5/8 SANDY LOAM GRAN. F.R.A.
8-22 10YR 5/6 LOAMY SAND " "
22-78 10YR 6/6 SAND " "
78-96 10YR 6/4 SAND " "

SHUT @ 72" OBS. WATER @ 92" ROOTS @ 60"
NO REFUSAL

#3
0-6 10YR 3/2 LOAM " "
6-12 10YR 5/8 SANDY LOAM " "
12-24 10YR 5/6 LOAMY SAND " "
24-96 10YR 6/6 SAND " "

SHUT @ 84" ROOTS @ 58" NO WATER
NO REFUSAL

LONG TERM OPERATIONS AND MAINTENANCE PROGRAM

FOR LOT 1

This Long-Term Operations and Maintenance Program Plan has been prepared in accordance with the Stormwater Management Policy issued by the Department of Environmental Protection (DEP). Upon a period beginning twelve months after the completion of the driveway, all structural BMP's shall be inspected twice annually, once in April and once in November. The inspection shall be performed as indicated below:

Subsurface Infiltration System (Cultec Chamber)

Infiltration systems are prone to clogging and failure, so it is imperative to develop and implement aggressive maintenance plans and schedules. Inspections and preventive maintenance must be performed at least twice a year. Drainage pipes shall be inspected and cleaned of sediment at least every five (5) years, or in accordance to manufacture's specifications, or as required to maintain adequate functionality of the stormwater conveyance system. All sediments shall be properly handled and disposed of in accordance with local, state and federal guidelines and regulations. The subsurface infiltration system shall be inspected twice annually, once in April and once in November. Any and all debris and/or sediments shall be removed from the units and be disposed of at an approved offsite location in accordance with all applicable local, state, and federal regulations. See attached Cultec Operations and Maintenance Guidelines.

Drip Line Trench

Inspections and preventive maintenance must be performed at least twice a year. Visual inspection of the drip line area shall be performed at least twice a year (spring and fall). Check for erosion, sediment buildup, vegetation overgrowth or signs of ponding. Inspect gravel trench and top surface twice a year to ensure no clogging with organic material or debris. If gravel trench becomes clogged or ineffective, remove upper 6" of material and replace with clean gravel and fabric. Check the drain pipe connection to subsurface system every 2-3 years or after a major storm to confirm pipe connection is stable and functioning. Jet flushing may be needed if clogging is suspected.

Permeable Pavers

Inspections and preventative maintenance must be performed twice a year, or in accordance with manufacturer's specifications. Inspect for sediment buildup, clogging, plant growth, loose or damaged pavers. Replenish joint infill with clean ASTM No. 8, No.89, or No.9 aggregate if joints are no longer infiltrating effectively. Use hand held bristle broom to sweep as needed to keep the surface clear of debris.

Long-Term Pollution Prevention Plan:

- Good housekeeping practices: The lot will be maintained by the individual homeowner, including snow removal, de-icing, and BMP inspection/maintenance.
- Provisions for storing materials and waste products: No materials or waste products will be stored on-site.
- Vehicle washing controls: Vehicle washing is not anticipated at the site.
- Provisions for maintenance of lawns, gardens, and other landscaped areas: The owner will provide long-term maintenance for the landscaped areas.
- Requirements for storage and use of fertilizers, herbicides, and pesticides: At this time there would be no foreseeable need for fertilizers, herbicides, and pesticides.

- Pet Waste Removal: Solid pet waste is to be disposed of alongside other solid waste. Solid pet waste shall be removed from the property using a receptacle like an enclosed bag to retrieve and dispose of the waste.
- Driveway sweeping schedules: Removal of any accumulated sand, grit, and debris from driveway shall be completed shortly after snow melts for the season.

Owner / Responsible Party (During Construction):

River's Edge Development, LLC
ethan.petersohn1@gmail.com
88 Elm Street
Salisbury, MA 01952

Owner / Responsible Party (After Construction):

The homeowner shall be responsible for the continued long-term O&M.

System Map:

See Site Development Plans for 201 Elm Street & 6 Monroe Street, Amesbury, MA, with an issue date of February 24, 2025 for the location of all stormwater management facilities.

LONG TERM OPERATIONS AND MAINTENANCE PROGRAM FOR LOT 2

This Long-Term Operations and Maintenance Program Plan has been prepared in accordance with the Stormwater Management Policy issued by the Department of Environmental Protection (DEP). Upon a period beginning twelve months after the completion of the driveway, all structural BMP's shall be inspected twice annually, once in April and once in November. The inspection shall be performed as indicated below:

Subsurface Infiltration System (Cultec Chamber)

Infiltration systems are prone to clogging and failure, so it is imperative to develop and implement aggressive maintenance plans and schedules. Inspections and preventive maintenance must be performed at least twice a year. Drainage pipes shall be inspected and cleaned of sediment at least every five (5) years, or in accordance to manufacture's specifications, or as required to maintain adequate functionality of the stormwater conveyance system. All sediments shall be properly handled and disposed of in accordance with local, state and federal guidelines and regulations. The subsurface infiltration system shall be inspected twice annually, once in April and once in November. Any and all debris and/or sediments shall be removed from the units and be disposed of at an approved offsite location in accordance with all applicable local, state, and federal regulations. See attached Cultec Operations and Maintenance Guidelines.

Permeable Pavers

Inspections and preventative maintenance must be performed twice a year, or in accordance with manufacturer's specifications. Inspect for sediment buildup, clogging, plant growth, loose or damaged pavers. Replenish joint infill with clean ASTM No. 8, No.89, or No.9 aggregate if joints are no longer infiltrating effectively. Use hand held bristle broom to sweep as needed to keep the surface clear of debris.

Long-Term Pollution Prevention Plan:

- Good housekeeping practices: The lot will be maintained by the individual homeowner, including snow removal, de-icing, and BMP inspection/maintenance.
- Provisions for storing materials and waste products: No materials or waste products will be stored on-site.
- Vehicle washing controls: Vehicle washing is not anticipated at the site.
- Provisions for maintenance of lawns, gardens, and other landscaped areas: The owner will provide long-term maintenance for the landscaped areas.
- Requirements for storage and use of fertilizers, herbicides, and pesticides: At this time there would be no foreseeable need for fertilizers, herbicides, and pesticides.
- Pet Waste Removal: Solid pet waste is to be disposed of alongside other solid waste. Solid pet waste shall be removed from the property using a receptacle like an enclosed bag to retrieve and dispose of the waste. Under no circumstances shall solid pet waste be left behind.

Owner / Responsible Party (During Construction):

River's Edge Development, LLC
ethan.petersohn1@gmail.com
88 Elm Street
Salisbury, MA 01952

Owner / Responsible Party (After Construction):

The Homeowners Association shall be responsible for continued long-term O&M.

System Map:

See Site Development Plans for 201 Elm Street & 6 Monroe Street, Amesbury, MA, with an issue date of February 24, 2025 for the location of all stormwater management facilities.

LONG TERM OPERATIONS AND MAINTENANCE PROGRAM **FOR LOT 3**

This Long-Term Operations and Maintenance Program Plan has been prepared in accordance with the Stormwater Management Policy issued by the Department of Environmental Protection (DEP). Upon a period beginning twelve months after the completion of the driveway, all structural BMP's shall be inspected twice annually, once in April and once in November. The inspection shall be performed as indicated below:

Subsurface Infiltration System (Cultec Chamber)

Infiltration systems are prone to clogging and failure, so it is imperative to develop and implement aggressive maintenance plans and schedules. Inspections and preventive maintenance must be performed at least twice a year. Drainage pipes shall be inspected and cleaned of sediment at least every five (5) years, or in accordance to manufacture's specifications, or as required to maintain adequate functionality of the stormwater conveyance system. All sediments shall be properly handled and disposed of in accordance with local, state and federal guidelines and regulations. The subsurface infiltration system shall be inspected twice annually, once in April and once in November. Any and all debris and/or sediments shall be removed from the units and be disposed of at an approved offsite location in accordance with all applicable local, state, and federal regulations. See attached Cultec Operations and Maintenance Guidelines.

Permeable Pavers

Inspections and preventative maintenance must be performed twice a year, or in accordance with manufacturer's specifications. Inspect for sediment buildup, clogging, plant growth, loose or damaged pavers. Replenish joint infill with clean ASTM No. 8, No.89, or No.9 aggregate if joints are no longer infiltrating effectively. Use hand held bristle broom to sweep as needed to keep the surface clear of debris.

Long-Term Pollution Prevention Plan:

- Good housekeeping practices: The lot will be maintained by the individual homeowner, including snow removal, de-icing, and BMP inspection/maintenance.
- Provisions for storing materials and waste products: No materials or waste products will be stored on-site.
- Vehicle washing controls: Vehicle washing is not anticipated at the site.
- Provisions for maintenance of lawns, gardens, and other landscaped areas: The owner will provide long-term maintenance for the landscaped areas.
- Requirements for storage and use of fertilizers, herbicides, and pesticides: At this time there would be no foreseeable need for fertilizers, herbicides, and pesticides.
- Pet Waste Removal: Solid pet waste is to be disposed of alongside other solid waste. Solid pet waste shall be removed from the property using a receptacle like an enclosed bag to retrieve and dispose of the waste. Under no circumstances shall solid pet waste be left behind.

Owner / Responsible Party (During Construction):

River's Edge Development, LLC
ethan.petersohn1@gmail.com
88 Elm Street
Salisbury, MA 01952

Owner / Responsible Party (After Construction):

The homeowner shall be responsible for the continued long-term O&M.

System Map:

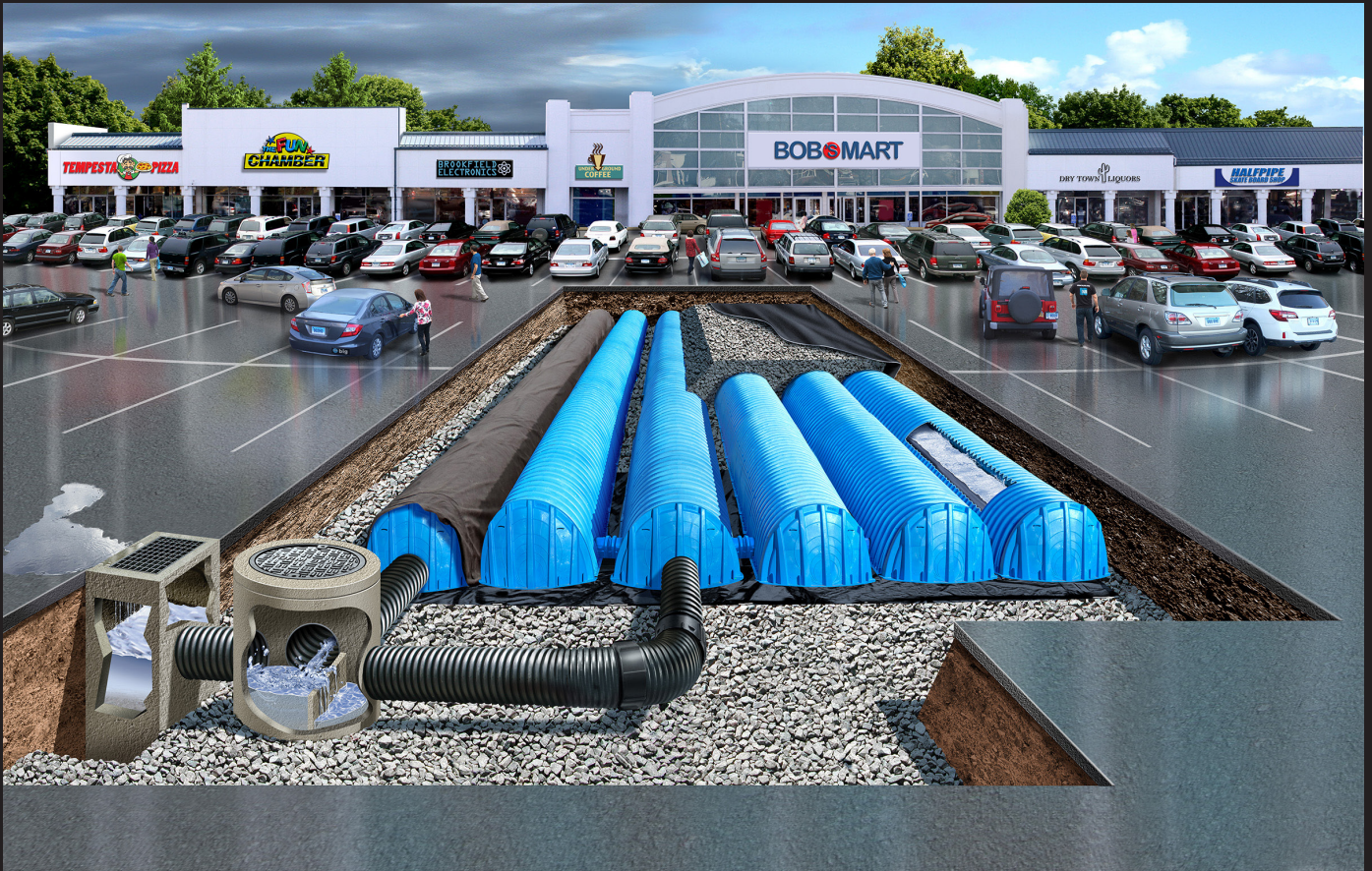
See Site Development Plans for 201 Elm Street & 6 Monroe Street, Amesbury, MA, with an issue date of February 24, 2025 for the location of all stormwater management facilities.

O&M Annual Inspection Log

[illegible]

CONTACTOR® & RECHARGER®

STORMWATER MANAGEMENT SOLUTIONS



OPERATION & MAINTENANCE GUIDELINES FOR CULTEC STORMWATER MANAGEMENT SYSTEMS



STORMWATER MANAGEMENT SOLUTIONS



OPERATIONS AND MAINTENANCE GUIDELINES

Published by

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For general information on our other products and services, please contact our offices within the United States at (800)428-5832, (203)775-4416 ext. 202, or e-mail us at CT-CustomerService@cultec.com.

For technical support, please call (203)775-4416 ext. 203 or e-mail CT-Tech@cultec.com.

Visit www.cultec.com/downloads.html for Product Downloads and CAD details.

Doc ID: CLT057 11-23

November 2023

*These instructions are for single-layer traffic applications only. For multi-layer applications, contact CULTEC.
All illustrations and photos shown herein are examples of typical situations. Be sure to follow the engineer's drawings.
Actual designs may vary.*

This manual contains guidelines recommended by CULTEC and may be used in conjunction with, but not to supersede, local regulations or regulatory authorities. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Introduction

The CULTEC Subsurface Stormwater Management System is a high-density polyethylene (HDPE) chamber system arranged in parallel rows surrounded by washed stone. The CULTEC chambers create arch-shaped voids within the washed stone to provide stormwater detention, retention, infiltration, and reclamation. Filter fabric is placed between the native soil and stone interface to prevent the intrusion of fines into the system. In order to minimize the amount of sediment which may enter the CULTEC system, a sediment collection device (stormwater pretreatment device) is recommended upstream from the CULTEC chamber system. Examples of pretreatment devices include, but are not limited to, an appropriately sized catch basin with sump, pretreatment catchment device, oil grit separator, or baffled distribution box. Manufactured pretreatment devices may also be used in accordance with CULTEC chambers. Installation, operation, and maintenance of these devices shall be in accordance with manufacturer's recommendations. Almost all of the sediment entering the stormwater management system will be collected within the pretreatment device.

Best Management Practices allow for the maintenance of the preliminary collection systems prior to feeding the CULTEC chambers. The pretreatment structures shall be inspected for any debris that will restrict inlet flow rates. Outfall structures, if any, such as outlet control must also be inspected for any obstructions that would restrict outlet flow rates. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Operation and Maintenance Requirements

I. Operation

CULTEC stormwater management systems shall be operated to receive only stormwater run-off in accordance with applicable local regulations. CULTEC subsurface stormwater management chambers operate at peak performance when installed in series with pretreatment. Pretreatment of suspended solids is superior to treatment of solids once they have been introduced into the system. The use of pretreatment is adequate as long as the structure is maintained and the site remains stable with finished impervious surfaces such as parking lots, walkways, and pervious areas are properly maintained. If there is to be an unstable condition, such as improvements to buildings or parking areas, all proper silt control measures shall be implemented according to local regulations.

II. Inspection and Maintenance Options

- A. The CULTEC system may be equipped with an inspection port located on the inlet row. The inspection port is a circular cast box placed in a rectangular concrete collar. When the lid is removed, a 6-inch (150 mm) pipe with a screw-in plug will be exposed. Remove the plug. This will provide access to the CULTEC Chamber row below. From the surface, through this access, the sediment may be measured at this location. A stadia rod may be used to measure the depth of sediment if any in this row. If the depth of sediment is in excess of 3 inches (76 mm), then this row should be cleaned with high pressure water through a culvert cleaning nozzle. This would be carried out through an upstream manhole or through the CULTEC StormFilter Unit (or other pretreatment device). CCTV inspection of this row can be deployed through this access port to determine if any sediment has accumulated in the inlet row.
- B. If the CULTEC bed is not equipped with an inspection port, then access to the inlet row will be through an upstream manhole or the CULTEC StormFilter.
 1. **Manhole Access**

This inspection should only be carried out by persons trained in confined space entry and sewer inspection services. After the manhole cover has been removed a gas detector must be lowered into the manhole to ensure that there are not high concentrations of toxic gases present. The inspector should be lowered into the manhole with the proper safety equipment as per OSHA requirements. The inspector may be able to observe sediment from this location. If this is not possible, the inspector will need to deploy a CCTV robot to permit viewing of the sediment.

2. StormFilter Access

Remove the manhole cover to allow access to the unit. Typically a 30-inch (750 mm) pipe is used as a riser from the StormFilter to the surface. As in the case with manhole access, this access point requires a technician trained in confined space entry with proper gas detection equipment. This individual must be equipped with the proper safety equipment for entry into the StormFilter. The technician will be lowered onto the StormFilter unit. The hatch on the unit must be removed. Inside the unit are two filters which may be removed according to StormFilter maintenance guidelines. Once these filters are removed the inspector can enter the StormFilter unit to launch the CCTV camera robot.

- C. The inlet row of the CULTEC system is placed on a polyethylene liner to prevent scouring of the washed stone beneath this row. This also facilitates the flushing of this row with high pressure water through a culvert cleaning nozzle. The nozzle is deployed through a manhole or the StormFilter and extended to the end of the row. The water is turned on and the inlet row is back-flushed into the manhole or StormFilter. This water is to be removed from the manhole or StormFilter using a vacuum truck.

III. Maintenance Guidelines

The following guidelines shall be adhered to for the operation and maintenance of the CULTEC stormwater management system:

- A. The owner shall keep a maintenance log which shall include details of any events which would have an effect on the system's operational capacity.
- B. The operation and maintenance procedure shall be reviewed periodically and changed to meet site conditions.
- C. Maintenance of the stormwater management system shall be performed by qualified workers and shall follow applicable occupational health and safety requirements.
- D. Debris removed from the stormwater management system shall be disposed of in accordance with applicable laws and regulations.

IV. Suggested Maintenance Schedules

A. Minor Maintenance

The following suggested schedule shall be followed for routine maintenance during the regular operation of the stormwater system:

Frequency	Action
Monthly in first year	Check inlets and outlets for clogging and remove any debris, as required.
Spring and Fall	Check inlets and outlets for clogging and remove any debris, as required.
One year after commissioning and every third year following	Check inlets and outlets for clogging and remove any debris, as required.

B. Major Maintenance

The following suggested maintenance schedule shall be followed to maintain the performance of the CULTEC stormwater management chambers. Additional work may be necessary due to insufficient performance and other issues that might be found during the inspection of the stormwater management chambers. (See table on next page)

	Frequency	Action
Inlets and Outlets	Every 3 years	Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
	Spring and Fall	Check inlet and outlets for clogging and remove any debris as required.
CULTEC Stormwater Chambers	2 years after commissioning	- Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. - Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
	9 years after commissioning every 9 years following	- Clean stormwater management chambers and feed connectors of any debris. - Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. - Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
	45 years after commissioning	- Clean stormwater management chambers and feed connectors of any debris. - Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. - Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. - Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. - Attain the appropriate approvals as required. - Establish a new operation and maintenance schedule.
Surrounding Site	Monthly in 1 st year	Check for depressions in areas over and surrounding the stormwater management system.
	Spring and Fall	Check for depressions in areas over and surrounding the stormwater management system.
	Yearly	Confirm that no unauthorized modifications have been performed to the site.

For additional information concerning the maintenance of CULTEC Subsurface Stormwater Management Chambers, please contact CULTEC at 1-800-428-5832.

BMP OPERATION & MAINTENANCE LOG

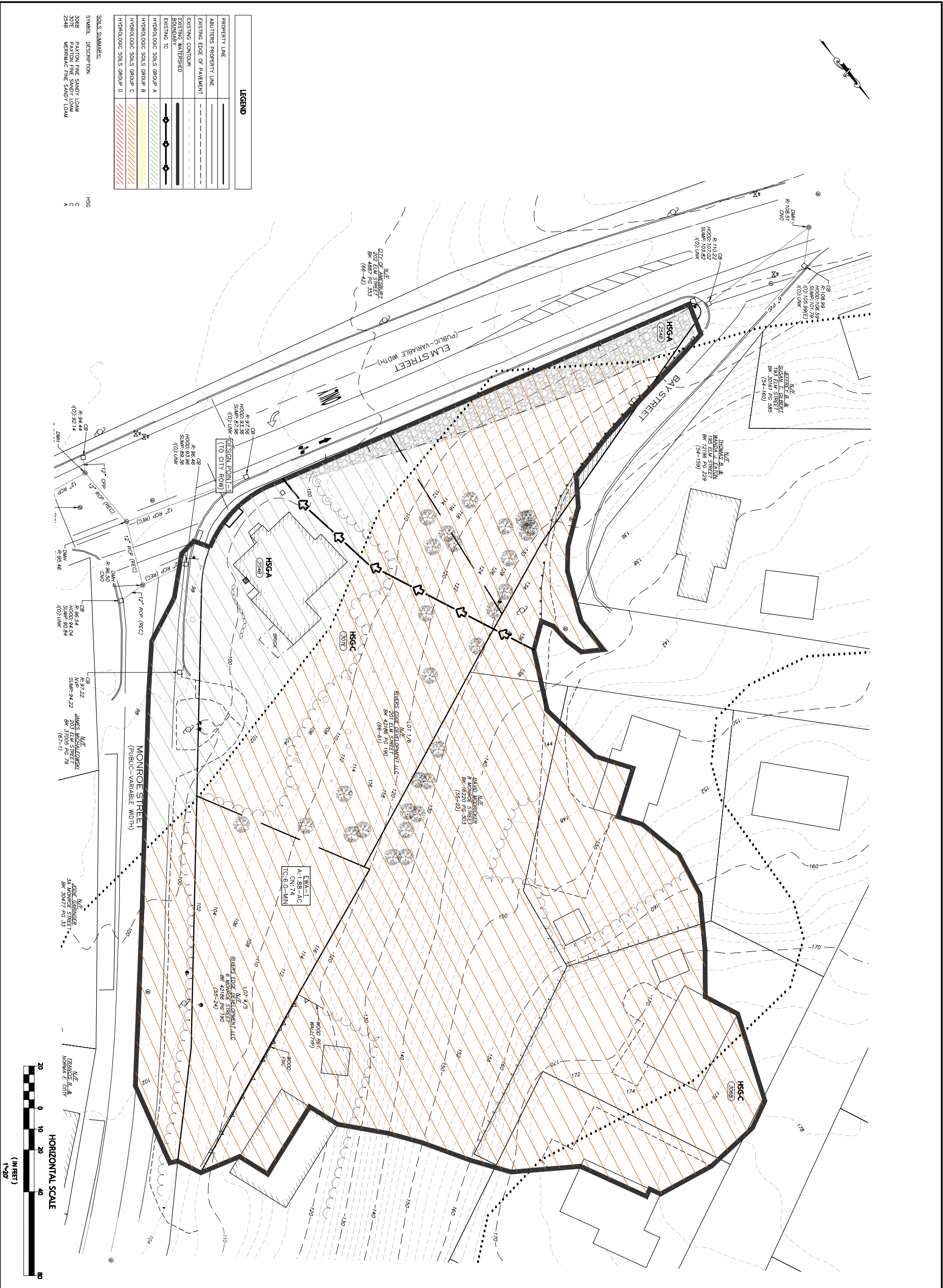
Project Name: _____

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed



LEGEND	
PROPERTY LINE	---
ADJUTERS PROPERTY LINE	---
EXISTING EDGE OF PAVEMENT	---
EXISTING CONTOUR	---
EXISTING WATERSHED	---
BOUNDARY	---
EXISTING TO	---
HYDROLOGIC SOILS GROUP A	---
HYDROLOGIC SOILS GROUP B	---
HYDROLOGIC SOILS GROUP C	---
HYDROLOGIC SOILS GROUP D	---

SOILS SUMMARY:	
SYMBOL	DESCRIPTION
306B	PAVING FINE SANDY LOAM
306C	PAVING FINE SANDY LOAM
254B	MEADOW FINE SANDY LOAM

HSB	306B
C	306C
A	254B



PROJECT:

201 ELM STREET
AMESBURY, MA 01913

DATE ISSUED:

APRIL 16, 2025

PROJECT #:

25-10704

PREPARED BY:

MAC

OWNER / APPLICANT:

RIVERS EDGE
DEVELOPMENT LLC
88 ELM STREET
AMESBURY, MA 01913

PROFESSIONAL ENGINEER FOR

CIVIL DESIGN CONSULTANTS, INC.

ISSUED FOR REVIEW

DATE: 06/02/25

DRAWING TITLE:

EXISTING
WATERSHED PLAN

DRAWING #:

EWVP



06/02/25

REV. TO ADDRESS REVIEW COMMENTS

DATE

DESCRIPTION

REVISIONS

OWNER / APPLICANT:

RIVERS EDGE DEVELOPMENT, LLC

PROJECT:

201 ELM STREET & 6 MONROE STREET

AMESBURY, MA 01913

DATE ISSUED:

MARCH 5, 2025

PROJECT #:

25-10704

PREPARED BY:

MAC

PROFESSIONAL ENGINEER FOR CIVIL DESIGN

CONSULTANTS, INC.

DRAWING TITLE:

PROPOSED WATERSHED PLAN

DRAWING #:

PWVP