
SITE ENGINEERING REPORT

**0, 441, 481 Canal Street
& 50 John Street**

Prepared For

Heyman Properties, LLC.

Prepared by

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Issued on

February 3, 2022



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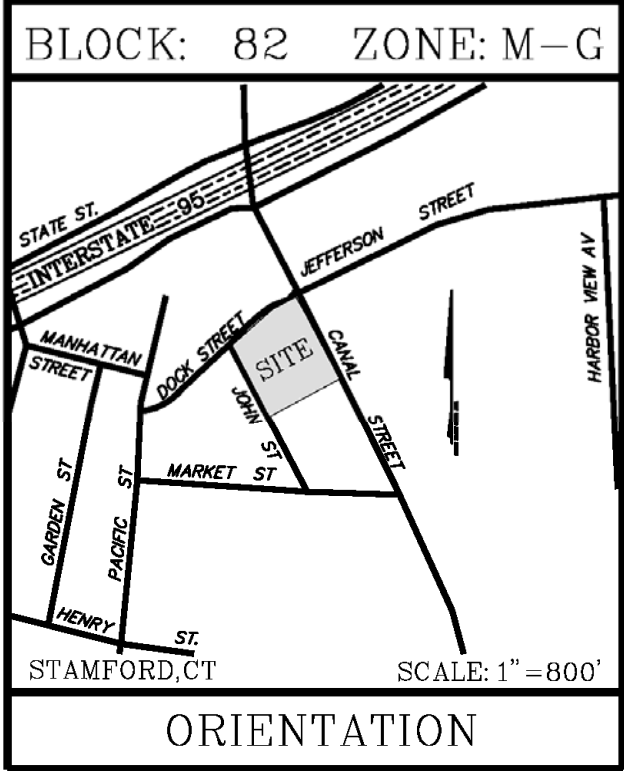
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Narrative

Project Description:

The applicant, Heyman Properties, LLC., is seeking Zoning Board approval to construct a mixed-use multi-family apartment building located on an assemblage of parcels at 0, 441, 481 Canal Street and 50 John Street, in Stamford. The site, which is to be consolidated, will be known as 441 Canal Street. It is 2.23± acres in size and is bounded by Dock Street to the north, John Street to the west, and Canal Street to the east. The property is currently in the MG Zoning District.

Existing Conditions:

The site has long been developed with a surface parking lot, public accessway paths, and a variety of commercial buildings. All buildings on the site were recently demolished. The site is made up entirely of impervious coverage. Site elevations range from elevation 8.4± on the south side of the property to elevation 4.6± at the existing concrete walk on the northwest side of the project site. The site is generally flat with slopes ranging from 1-3%. The property does not lie within the drinking water supply watershed, but a portion does lie within the regulatory 100-year floodplain (Zone AE EL.=6) as established by the Federal Emergency Management Agency (FEMA) on "Flood Insurance Rate Maps" (FIRM) for Fairfield County, Community No. 09001C0516G, Panel 516 of 626, effective date July 8, 2013 ([Appendix A](#)).

Drainage Patterns & Conveyance Systems

This report focuses on a proposed development area that spans the entire 2.23 acre site. A majority of the site flows into the storm sewers on Canal, Dock, and John Street which flow to the intersection of Dock & Canal Street. This storm drain system ultimately discharges into the canal of the East Branch of the Stamford Southwest Shoreline watershed. A portion of the western site is tributary to storm sewers in John Street that flow towards Market Street. The impervious area and the corresponding runoff will be significantly reduced under proposed conditions. Therefore, this report focuses on controlling peak flows to the two points of concerns and treating the water quality. Refer to [Appendix B](#) for existing and proposed on-site drainage basin maps.

Overall Watersheds:

The storm system at the northern area of John Street flows north into the Dock Street system that ultimately flows west towards the intersection of Dock and Canal and then outlets into the Canal. The stormwater runoff within the existing parking lot is collected via a catch basin and piped west to the storm sewer system flowing north on John Street, and eventually into the canal. The easterly portion of the existing parking lot, walkways and loading dock sheet flow into Canal Street and into the catch basin at the southeastern corner of the intersection of Canal and Dock Street. This is also tributary to the system that ultimately outlets into the canal. Runoff from a portion of the existing roofs is assumed to be piped into the Canal Street storm system, which also flows to the canal.

A portion of the John Street system flows south and connects into the Market Street system that flows west. Runoff from the pre-existing, now demolished buildings are assumed to have been tributary to the piped system in John Street which flows north towards Dock Street. Additionally, the western walkways sheet flow west into the catch basins on John Street and follow the same drainage pattern.

Soils

The USDA Natural Resources Conservation Service's Web Soil Survey indicates the soils on the subject parcel to be primarily Urban Land within Hydrologic Soils Group D. A site geotechnical report prepared by GZA investigated sites existing soil conditions in the development envelope and determined the soils are consistent with the USDA Web Soil Survey. The soils have also been determined to be contaminated and infeasible to handle any subsurface infiltration system. Therefore, no storm systems have been proposed to promote infiltration into any of the subsurface soils.

Proposed Conditions:

The project includes the construction of an approximate 71,650 SF footprint building with approximately 10,000 SF green roof, associated drive entrances, landscaped areas, sidewalks, and terraces. The project will result in decrease in impervious area of approximately 10,237 SF. It is noted that the 10,237 SF of green area created is entirely at the ground level and does not include the 10,000 SF of green roof.

Stormwater Management System

The Stormwater Management system is comprised of a green roof to treat a portion of roof of the proposed building. A portion of stormwater runoff from the proposed building will be captured and treated by a green roof system that will discharge via controlled flow roof drains to Dock Street or Canal Street. **Please note the building roof area of 22,395 SF has been assumed to be tributary to the green roof system for preliminary design purposes.** Stormwater runoff from the portion of roof that will bypass the green roof system shall be piped directly into the Dock Street or Canal Street storm system. A portion of runoff from the ground level improvements including drive entrances, terraces, planters, and the sidewalks fronting the building along John, Dock and Canal Street will sheet flow onto the adjacent roadways and be captured in catch basins. All existing storm systems are tributary to the intersection of Dock and Canal Street which outlets into the canal of the east branch.

Methodology & General Design Criteria

All drainage systems have been designed for Type III, 24-hour storm events. The project site is south of the Merritt Parkway and therefore has been designed to adequately accommodate peak runoff for all storms up to and including the 50-year design storm.

The 24-hour design storm rainfall amounts, and distributions were obtained from the latest NOAA Atlas 14 Point Precipitation Frequency Estimates and storm distributions ([Appendix A](#)).

Project Classification

The proposed development is classified as a redevelopment project with more than ½ an acre of disturbance and directly connected impervious area greater than 40%, therefore must comply with Standards I through 5 of the Stamford Drainage Manual. To comply with Standard I, this project must provide at least ½ Water Quality Volume (WQV) via non-structural practices OR infiltration best management practices (BMP's).

Proposed LID Techniques

Low impact development and site planning techniques were used to the maximum extent practicable given the existing constraints of this site. The site is in an urban area with limited space for LID practices due to setback requirements from existing and proposed buildings. LID techniques include development within areas already developed, removing surface parking, limiting the amount of disturbance around the proposed improvements, and minimizing impervious surfaces where possible. There is no increase to the developed area on the site under proposed conditions as compared to existing conditions. A green roof provides rooftop water quality improvement for the entire site as well as a disconnect for a portion of the proposed building roof.

Proposed Stormwater Treatment Practices

The design approach chosen to satisfy Standard I of the Stamford Drainage Manual is to provide the required water quality volume ($\frac{1}{2}$ WQV) via a green roof system. Each system is described in detail below.

- Green Roof #1** is located on the amenity deck of the 6th floor roof of the building. It will collect, treat, and discharge stormwater runoff via controlled flow roof drains from the amenity terrace. The system will have an average soil medium depth of 14". Stormwater collected and stored on the roof will be released by roof drains controlling the flow above the roof drain. It is noted that final roof drain specification shall be designed in the future. Controlled rooftop runoff discharges to either the existing 42" RCP in Dock Street or the 36" RCP in Canal Street.

A summary of the Water Quality required and provided by the stormwater practices is provided below:

Standard I (Retention and Treatment) Calculations						
Drainage Area ID	Description	Total Area (SF)	Impervious Area	WQV (CF)	Retention Volume Required *	Retention Volume Provided
Design Point – Intersection of Dock and Canal Street						
PR-JS	West Walkway, Terrace, Drive and Lawn	6,437	3,118	260.7	130.3	-
PR-B	Roof, Terraces, Drive Walkways & Lawn	68,220	61,302	4,881.9	2,441.0	-
PR-GR	Rooftop Amenity Space - Green Roof	22,395	22,395	1,772.9	886.5	3,500
TOTAL		97,052	86,815	69,15.5	3,457.8	3,500

* Standard I Required WQV = 1/2 WQV

Infiltration BMP's have been designed in accordance with the requirements of the Stamford Stormwater Manual.

Hydrologic Analysis of Peak Rates of Runoff

Hydrologic models have been prepared utilizing the SCS Runoff Curve Number Method from NRCS TR-55 to analyze the pre- and post-development rainfall runoff rates and volumes. Watershed areas, curve numbers (CN), and times of concentration (TC) were calculated for each contributing watershed. The study area focuses on the subject parcel and is limited to onsite property of 441 Canal Street. The pre-development drainage basin boundaries and the post-development drainage basin boundaries are shown in [Appendix B](#). The results of the HydroCad model used to analyze the pre- and post-development watershed conditions are presented in [Appendix E](#).

A comparison of the pre- and post-development peak discharge rates is provided in the table below.

Peak Flow (cfs)				
Return Period (yrs)	Study Point of Concern (Intersection of Dock and Canal Street)			
	Ex	Pr	Change	% Change
1	6.16	6.02	-0.14	-2.3%
2	7.49	7.36	-0.13	-1.7%
5	9.64	9.54	-0.10	-1.0%
10	11.45	11.37	-0.08	-0.7%
25	13.91	13.86	-0.05	-0.4%
50	15.74	15.69	-0.05	-0.3%
100	17.71	17.68	-0.03	-0.1%

Peak Flow (cfs)				
Return Period (yrs)	Study Point of Concern (Intersection of John and Market Street)			
	Ex	Pr	Change	% Change
1	0.45	0.33	-0.12	-3.8%
2	0.55	0.43	-0.12	-2.9%
5	0.71	0.59	-0.12	-1.8%
10	0.84	0.72	-0.12	-1.4%
25	1.02	0.91	-0.11	-1.0%
50	1.16	1.04	-0.12	-0.8%
100	1.30	1.19	-0.1	-0.6%

Comparison of the peak discharge rates for pre- and post-development watershed conditions demonstrates that the peak rate of runoff from the proposed development will be decreased. Therefore, the proposed development will not adversely impact the downstream or adjacent properties or receiving water bodies or courses.

Compliance with Stormwater Management Standards

The project site will be designed to meet the Stamford Stormwater Management Standards to the maximum extent practicable as summarized below:

Standard 1. Runoff and Pollutant Reduction

- A. The runoff and pollutant reduction requirements for this project are to retain ½ of the WQV on-site using Non-Structural Practices or Infiltration BMP's. The proposed Stormwater Treatment Practices include a green roof and subsurface infiltration system, each of which retain, at minimum, their required WQV. See "Proposed LID & Stormwater Treatment Practices" for a detailed description of each system, its required WQV and provided storage volume.
- B. Not Applicable. Stormwater systems retain ½ WQV.
- C. Land disturbance has been maintained to areas currently developed. With proper sediment and erosion controls and permanent stabilization of surfaces the development will not result in future site erosion.
- D. Noted
- E. The proposed stormwater treatment practices provide a minimum removal rate of 80% of the average annual post-construction load of Total Suspended Solids (TSS) and floatable debris. See TSS removal rate calculations shall be completed once system is designed. The interior garage drains will be piped to an oil/grit separator and discharge into the sanitary sewer system. Such design shall be prepared by the plumbing engineer prior to a Building permit request.
- F. The proposed development is proposed within areas previously developed which will in turn limit the amount of clearing and grading that will be necessary to employ the development while, minimizing the potential impact of erosive soils on the downstream drainage system. Steep slopes, although not significant on this project, are avoided/outside the limits of construction.

Standard 2. Peak Flow Control

- A. Stream channel protection is not required for this project as the subject development does not discharge directly or indirectly into a water body or watercourse.
- B. The proposed stormwater system is designed to adequately pass flows leading to, from and through it up to and including the 25-year design storm event as required in section 3 of the drainage manual. Refer to the HydroCAD model found in Appendix E.
- C. The post-development peak flow rates from the 1-year, 2-year, 5-year, 10-year, 25-year and 50-year, 24-hour storms are controlled to the corresponding pre-development peak discharge rates. Reference is made to the HydroCAD report found in Appendix E.
- D. Furthermore, the 15" storm pipe connections into the City storm system, has adequate capacity to pass the flow tributary to them in the 100-year storm event. Refer to the pipe conveyance calculations included in Appendix D.

-
- E. No on-site detention is proposed as an end of pipe system, although the portion of the roof that includes the green roof system will be fitted with outlet control roof drains as a part of the overall roof design.

Standard 3: Construction Erosion and Sediment Control

- A. Site plan sheet SE-4 depicts erosion control measures to be implemented to control construction related impacts. Sediment and erosion controls such as silt fencing, stone tracking pads at construction zone entrance/exit points, hay bale & insert catch basin protection, and tree protection are proposed.

Standard 4: Operation and Maintenance

- A. A Standard City of Stamford Drainage Maintenance Agreement will be executed with the Environmental Protection Board. A draft maintenance agreement has been prepared and is included in Appendix G.
- B. The construction plans will include notes describing the long-term maintenance requirements for the site-specific drainage system(s) including routine and non-route inspection and maintenance tasks to be undertaken after construction is completed as well as the schedule for implementing these tasks. This information will be added to the plan set prior to filing for a building permit.

Standard 5: Stormwater Management Report

- A. This document and its associated appendices serve as the required Stormwater Management Report.
- B. (See below)

Based on the above information, the proposed improvements are designed in accordance with the City of Stamford Stormwater Drainage Manual and will not adversely impact adjacent or downstream properties or City-owned drainage facilities.

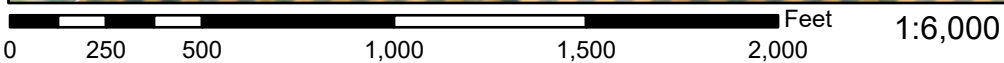
Appendix A

FEMA Flood Insurance Map
NOAA Atlas 14 Volume 10 – Precipitation Frequency
NOAA Atlas 14 Volume 10 – Rainfall Intensity
NRCS Websoil Survey

National Flood Hazard Layer FIRMMette



73°32'25"W 41°3'7"N



Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard <i>Zone D</i>
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
MAP PANELS		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Digital Data Available
		No Digital Data Available
		Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **1/6/2022 at 11:19 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



NOAA Atlas 14, Volume 10, Version 3
Location name: Stamford, Connecticut, USA*
Latitude: 41.0482°, Longitude: -73.5352°
Elevation: m/ft**
 * source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerials](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.365 (0.282-0.464)	0.425 (0.328-0.542)	0.523 (0.403-0.668)	0.605 (0.462-0.776)	0.718 (0.532-0.954)	0.804 (0.584-1.09)	0.892 (0.629-1.24)	0.988 (0.664-1.41)	1.12 (0.727-1.65)	1.23 (0.778-1.83)
10-min	0.517 (0.399-0.658)	0.602 (0.464-0.767)	0.741 (0.570-0.947)	0.857 (0.655-1.10)	1.02 (0.754-1.35)	1.14 (0.827-1.54)	1.26 (0.891-1.76)	1.40 (0.941-1.99)	1.59 (1.03-2.33)	1.74 (1.10-2.60)
15-min	0.608 (0.469-0.774)	0.708 (0.546-0.903)	0.872 (0.670-1.11)	1.01 (0.772-1.30)	1.20 (0.887-1.59)	1.34 (0.972-1.81)	1.49 (1.05-2.07)	1.65 (1.11-2.34)	1.87 (1.21-2.74)	2.05 (1.30-3.06)
30-min	0.850 (0.656-1.08)	0.991 (0.765-1.26)	1.22 (0.940-1.56)	1.42 (1.08-1.82)	1.68 (1.24-2.23)	1.88 (1.36-2.54)	2.09 (1.47-2.90)	2.31 (1.55-3.28)	2.61 (1.69-3.82)	2.85 (1.80-4.25)
60-min	1.09 (0.843-1.39)	1.27 (0.983-1.62)	1.57 (1.21-2.01)	1.82 (1.39-2.34)	2.16 (1.60-2.87)	2.42 (1.76-3.27)	2.69 (1.89-3.73)	2.97 (2.00-4.22)	3.35 (2.17-4.91)	3.65 (2.31-5.44)
2-hr	1.41 (1.10-1.79)	1.66 (1.29-2.11)	2.08 (1.61-2.64)	2.42 (1.86-3.08)	2.88 (2.15-3.81)	3.24 (2.36-4.35)	3.61 (2.55-4.99)	4.01 (2.70-5.66)	4.56 (2.97-6.64)	5.01 (3.18-7.42)
3-hr	1.63 (1.27-2.05)	1.93 (1.50-2.43)	2.42 (1.88-3.06)	2.82 (2.18-3.58)	3.38 (2.53-4.45)	3.80 (2.78-5.09)	4.24 (3.01-5.85)	4.72 (3.19-6.65)	5.40 (3.52-7.84)	5.96 (3.79-8.79)
6-hr	2.05 (1.61-2.57)	2.44 (1.91-3.06)	3.08 (2.41-3.87)	3.61 (2.81-4.56)	4.34 (3.27-5.69)	4.89 (3.61-6.52)	5.46 (3.92-7.52)	6.11 (4.15-8.56)	7.05 (4.60-10.2)	7.82 (4.99-11.5)
12-hr	2.53 (2.00-3.14)	3.02 (2.38-3.76)	3.84 (3.02-4.79)	4.51 (3.52-5.66)	5.44 (4.12-7.08)	6.13 (4.55-8.14)	6.87 (4.95-9.42)	7.71 (5.25-10.7)	8.94 (5.86-12.8)	9.96 (6.37-14.5)
24-hr	2.96 (2.35-3.65)	3.58 (2.84-4.43)	4.59 (3.64-5.70)	5.44 (4.28-6.78)	6.60 (5.03-8.56)	7.46 (5.58-9.87)	8.39 (6.10-11.5)	9.47 (6.48-13.1)	11.1 (7.29-15.8)	12.5 (7.99-18.0)
2-day	3.30 (2.64-4.05)	4.06 (3.25-4.99)	5.31 (4.23-6.54)	6.34 (5.02-7.85)	7.76 (5.96-10.0)	8.81 (6.64-11.6)	9.95 (7.30-13.6)	11.3 (7.77-15.6)	13.4 (8.84-19.0)	15.2 (9.78-21.8)
3-day	3.56 (2.86-4.36)	4.40 (3.53-5.38)	5.76 (4.60-7.07)	6.89 (5.48-8.50)	8.45 (6.51-10.9)	9.60 (7.25-12.6)	10.8 (7.98-14.8)	12.4 (8.49-16.9)	14.7 (9.68-20.6)	16.6 (10.7-23.8)
4-day	3.82 (3.07-4.65)	4.69 (3.78-5.73)	6.13 (4.91-7.50)	7.32 (5.83-9.00)	8.96 (6.92-11.5)	10.2 (7.70-13.3)	11.5 (8.46-15.6)	13.1 (9.00-17.8)	15.5 (10.2-21.7)	17.5 (11.3-25.0)
7-day	4.55 (3.68-5.51)	5.50 (4.45-6.68)	7.06 (5.68-8.59)	8.35 (6.68-10.2)	10.1 (7.84-12.9)	11.4 (8.69-14.9)	12.9 (9.49-17.3)	14.5 (10.1-19.7)	17.0 (11.3-23.8)	19.2 (12.4-27.2)
10-day	5.26 (4.28-6.36)	6.26 (5.08-7.58)	7.90 (6.39-9.58)	9.26 (7.44-11.3)	11.1 (8.64-14.1)	12.5 (9.52-16.2)	14.0 (10.3-18.7)	15.7 (10.9-21.2)	18.2 (12.1-25.3)	20.3 (13.2-28.7)
20-day	7.42 (6.07-8.91)	8.55 (6.98-10.3)	10.4 (8.45-12.5)	11.9 (9.63-14.4)	14.0 (10.9-17.5)	15.6 (11.9-19.8)	17.2 (12.7-22.6)	19.0 (13.2-25.4)	21.4 (14.3-29.5)	23.3 (15.2-32.8)
30-day	9.21 (7.56-11.0)	10.4 (8.55-12.5)	12.4 (10.1-14.9)	14.0 (11.4-16.9)	16.3 (12.7-20.3)	18.1 (13.8-22.8)	19.8 (14.5-25.7)	21.6 (15.1-28.8)	24.0 (16.1-32.9)	25.8 (16.8-36.0)
45-day	11.4 (9.40-13.6)	12.7 (10.5-15.2)	14.9 (12.2-17.8)	16.7 (13.6-20.0)	19.1 (15.0-23.6)	21.0 (16.1-26.4)	22.9 (16.8-29.4)	24.7 (17.4-32.8)	27.1 (18.2-37.0)	28.8 (18.8-40.1)
60-day	13.2 (10.9-15.7)	14.6 (12.1-17.4)	16.9 (13.9-20.2)	18.8 (15.4-22.5)	21.4 (16.8-26.4)	23.5 (18.0-29.3)	25.5 (18.7-32.6)	27.4 (19.2-36.2)	29.7 (20.0-40.5)	31.3 (20.5-43.5)

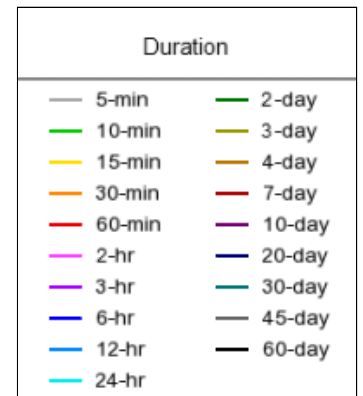
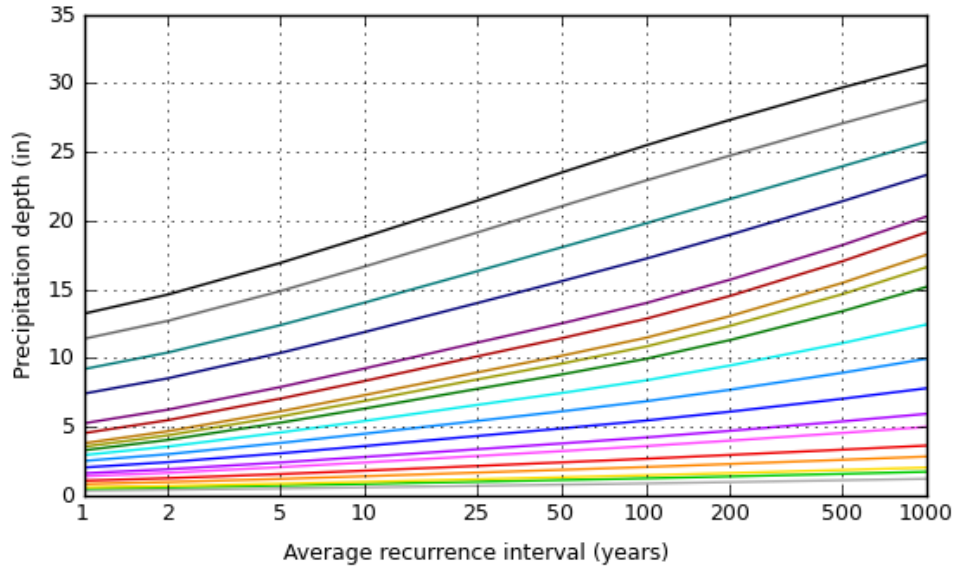
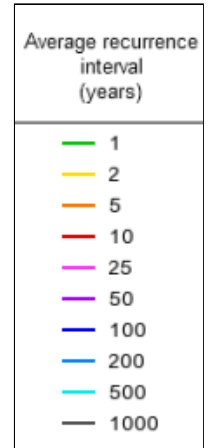
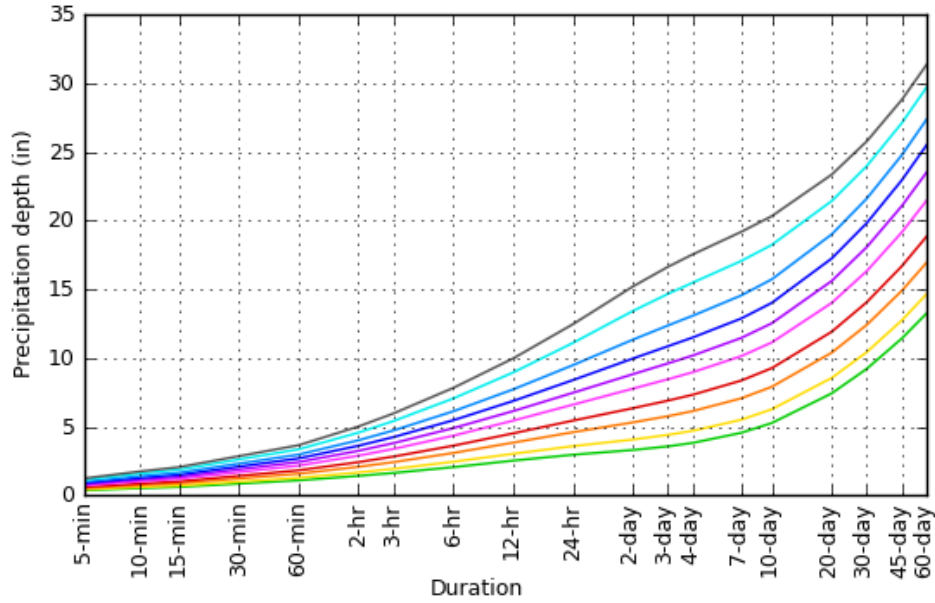
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical

PDS-based depth-duration-frequency (DDF) curves

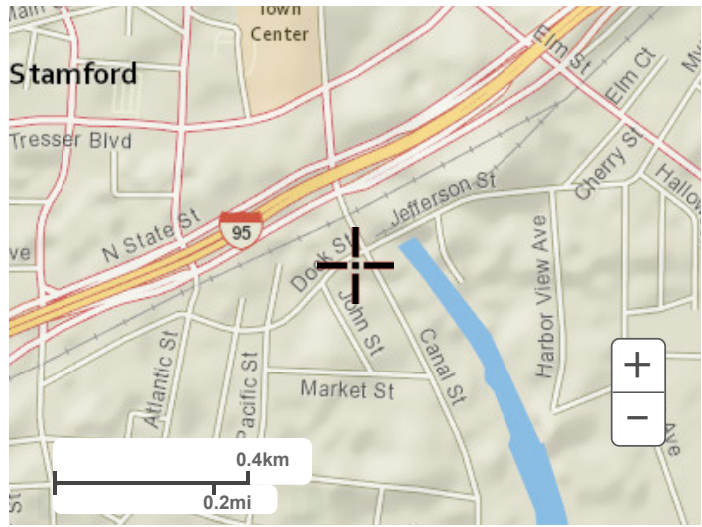
Latitude: 41.0482°, Longitude: -73.5352°



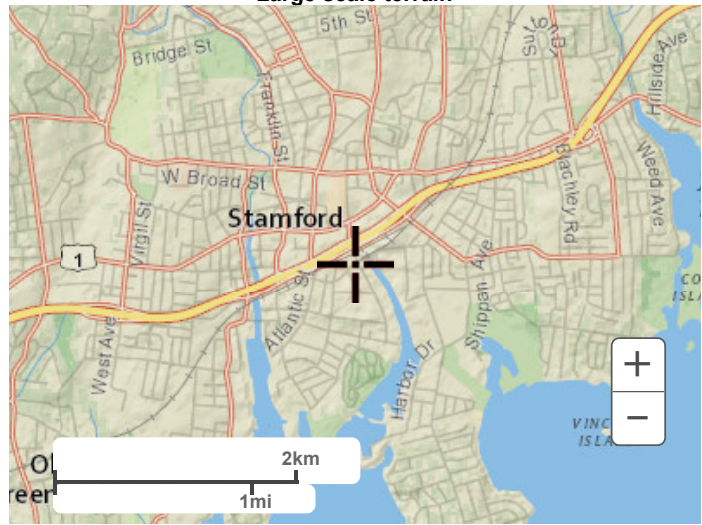
[Back to Top](#)

Maps & aerials

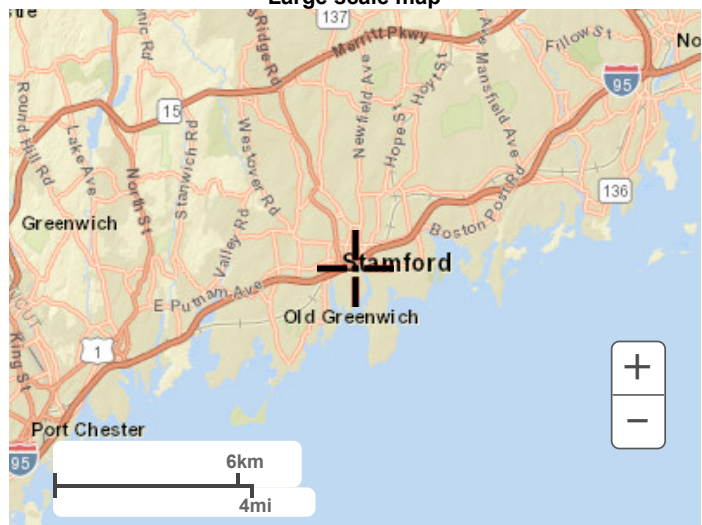
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



NOAA Atlas 14, Volume 10, Version 3
Location name: Stamford, Connecticut, USA*
Latitude: 41.0482°, Longitude: -73.5352°
Elevation: m/ft**
 * source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerials](#)

PF tabular

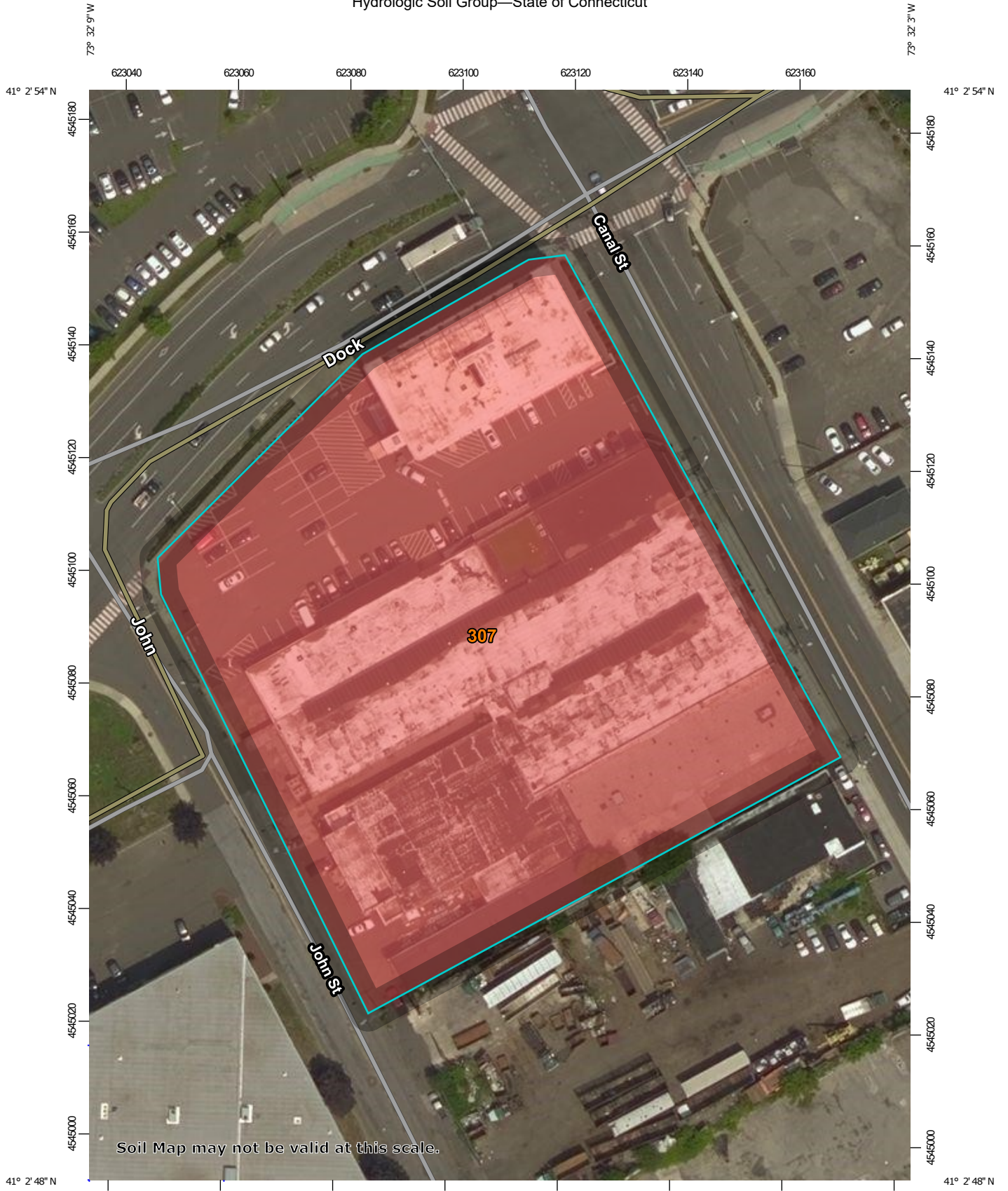
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.38 (3.38-5.57)	5.10 (3.94-6.50)	6.28 (4.84-8.02)	7.26 (5.54-9.31)	8.62 (6.38-11.4)	9.65 (7.01-13.0)	10.7 (7.55-14.9)	11.9 (7.97-16.9)	13.5 (8.72-19.7)	14.8 (9.34-22.0)
10-min	3.10 (2.39-3.95)	3.61 (2.78-4.60)	4.45 (3.42-5.68)	5.14 (3.93-6.60)	6.10 (4.52-8.11)	6.83 (4.96-9.24)	7.58 (5.35-10.6)	8.40 (5.65-12.0)	9.54 (6.18-14.0)	10.5 (6.62-15.6)
15-min	2.43 (1.88-3.10)	2.83 (2.18-3.61)	3.49 (2.68-4.46)	4.04 (3.09-5.18)	4.79 (3.55-6.36)	5.36 (3.89-7.24)	5.95 (4.19-8.28)	6.59 (4.43-9.37)	7.48 (4.85-11.0)	8.20 (5.19-12.2)
30-min	1.70 (1.31-2.16)	1.98 (1.53-2.53)	2.45 (1.88-3.12)	2.83 (2.16-3.63)	3.36 (2.49-4.46)	3.76 (2.73-5.08)	4.17 (2.94-5.80)	4.61 (3.10-6.56)	5.22 (3.38-7.65)	5.70 (3.60-8.49)
60-min	1.09 (0.843-1.39)	1.27 (0.983-1.62)	1.57 (1.21-2.01)	1.82 (1.39-2.34)	2.16 (1.60-2.87)	2.42 (1.76-3.27)	2.69 (1.89-3.73)	2.97 (2.00-4.22)	3.35 (2.17-4.91)	3.65 (2.31-5.44)
2-hr	0.706 (0.548-0.894)	0.832 (0.646-1.05)	1.04 (0.802-1.32)	1.21 (0.929-1.54)	1.44 (1.07-1.90)	1.62 (1.18-2.18)	1.80 (1.28-2.50)	2.00 (1.35-2.83)	2.28 (1.48-3.32)	2.50 (1.59-3.71)
3-hr	0.542 (0.423-0.684)	0.642 (0.500-0.810)	0.804 (0.624-1.02)	0.939 (0.725-1.19)	1.13 (0.841-1.48)	1.26 (0.926-1.70)	1.41 (1.00-1.95)	1.57 (1.06-2.21)	1.80 (1.17-2.61)	1.98 (1.26-2.93)
6-hr	0.343 (0.269-0.429)	0.408 (0.320-0.511)	0.515 (0.402-0.647)	0.603 (0.469-0.761)	0.725 (0.545-0.950)	0.816 (0.602-1.09)	0.912 (0.654-1.26)	1.02 (0.693-1.43)	1.18 (0.769-1.70)	1.31 (0.833-1.91)
12-hr	0.210 (0.166-0.261)	0.251 (0.198-0.312)	0.318 (0.250-0.397)	0.374 (0.292-0.469)	0.451 (0.342-0.588)	0.509 (0.378-0.675)	0.570 (0.411-0.782)	0.640 (0.436-0.890)	0.742 (0.486-1.06)	0.827 (0.529-1.20)
24-hr	0.123 (0.098-0.152)	0.149 (0.118-0.184)	0.191 (0.151-0.237)	0.227 (0.178-0.282)	0.275 (0.210-0.357)	0.311 (0.232-0.411)	0.349 (0.254-0.478)	0.395 (0.270-0.546)	0.462 (0.304-0.658)	0.519 (0.333-0.751)
2-day	0.069 (0.055-0.084)	0.085 (0.068-0.104)	0.111 (0.088-0.136)	0.132 (0.105-0.163)	0.162 (0.124-0.209)	0.184 (0.138-0.242)	0.207 (0.152-0.283)	0.236 (0.162-0.324)	0.279 (0.184-0.395)	0.317 (0.204-0.455)
3-day	0.049 (0.040-0.061)	0.061 (0.049-0.075)	0.080 (0.064-0.098)	0.096 (0.076-0.118)	0.117 (0.090-0.151)	0.133 (0.101-0.175)	0.151 (0.111-0.205)	0.172 (0.118-0.235)	0.204 (0.134-0.287)	0.231 (0.149-0.330)
4-day	0.040 (0.032-0.048)	0.049 (0.039-0.060)	0.064 (0.051-0.078)	0.076 (0.061-0.094)	0.093 (0.072-0.120)	0.106 (0.080-0.139)	0.120 (0.088-0.162)	0.136 (0.094-0.186)	0.161 (0.107-0.226)	0.183 (0.118-0.261)
7-day	0.027 (0.022-0.033)	0.033 (0.026-0.040)	0.042 (0.034-0.051)	0.050 (0.040-0.061)	0.060 (0.047-0.077)	0.068 (0.052-0.088)	0.077 (0.056-0.103)	0.087 (0.060-0.117)	0.101 (0.067-0.142)	0.114 (0.074-0.162)
10-day	0.022 (0.018-0.027)	0.026 (0.021-0.032)	0.033 (0.027-0.040)	0.039 (0.031-0.047)	0.046 (0.036-0.059)	0.052 (0.040-0.067)	0.058 (0.043-0.078)	0.065 (0.045-0.088)	0.076 (0.051-0.106)	0.085 (0.055-0.120)
20-day	0.015 (0.013-0.019)	0.018 (0.015-0.021)	0.022 (0.018-0.026)	0.025 (0.020-0.030)	0.029 (0.023-0.036)	0.032 (0.025-0.041)	0.036 (0.026-0.047)	0.040 (0.028-0.053)	0.045 (0.030-0.062)	0.049 (0.032-0.068)
30-day	0.013 (0.010-0.015)	0.014 (0.012-0.017)	0.017 (0.014-0.021)	0.020 (0.016-0.024)	0.023 (0.018-0.028)	0.025 (0.019-0.032)	0.027 (0.020-0.036)	0.030 (0.021-0.040)	0.033 (0.022-0.046)	0.036 (0.023-0.050)
45-day	0.011 (0.009-0.013)	0.012 (0.010-0.014)	0.014 (0.011-0.016)	0.015 (0.013-0.019)	0.018 (0.014-0.022)	0.019 (0.015-0.024)	0.021 (0.016-0.027)	0.023 (0.016-0.030)	0.025 (0.017-0.034)	0.027 (0.017-0.037)
60-day	0.009 (0.008-0.011)	0.010 (0.008-0.012)	0.012 (0.010-0.014)	0.013 (0.011-0.016)	0.015 (0.012-0.018)	0.016 (0.012-0.020)	0.018 (0.013-0.023)	0.019 (0.013-0.025)	0.021 (0.014-0.028)	0.022 (0.014-0.030)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

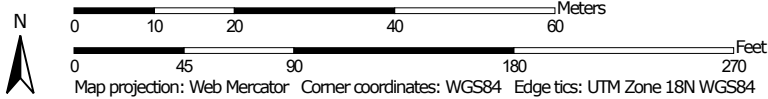
[Back to Top](#)

PF graphical

Hydrologic Soil Group—State of Connecticut



Map Scale: 1:943 if printed on A portrait (8.5" x 11") sheet.




MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils

Soil Rating Polygons





 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

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

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

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

Soil Survey Area: State of Connecticut
 Survey Area Data: Version 21, Sep 7, 2021

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

Date(s) aerial images were photographed: Jul 21, 2014—Aug 27, 2014

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
307	Urban land	D	2.3	100.0%
Totals for Area of Interest			2.3	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

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.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

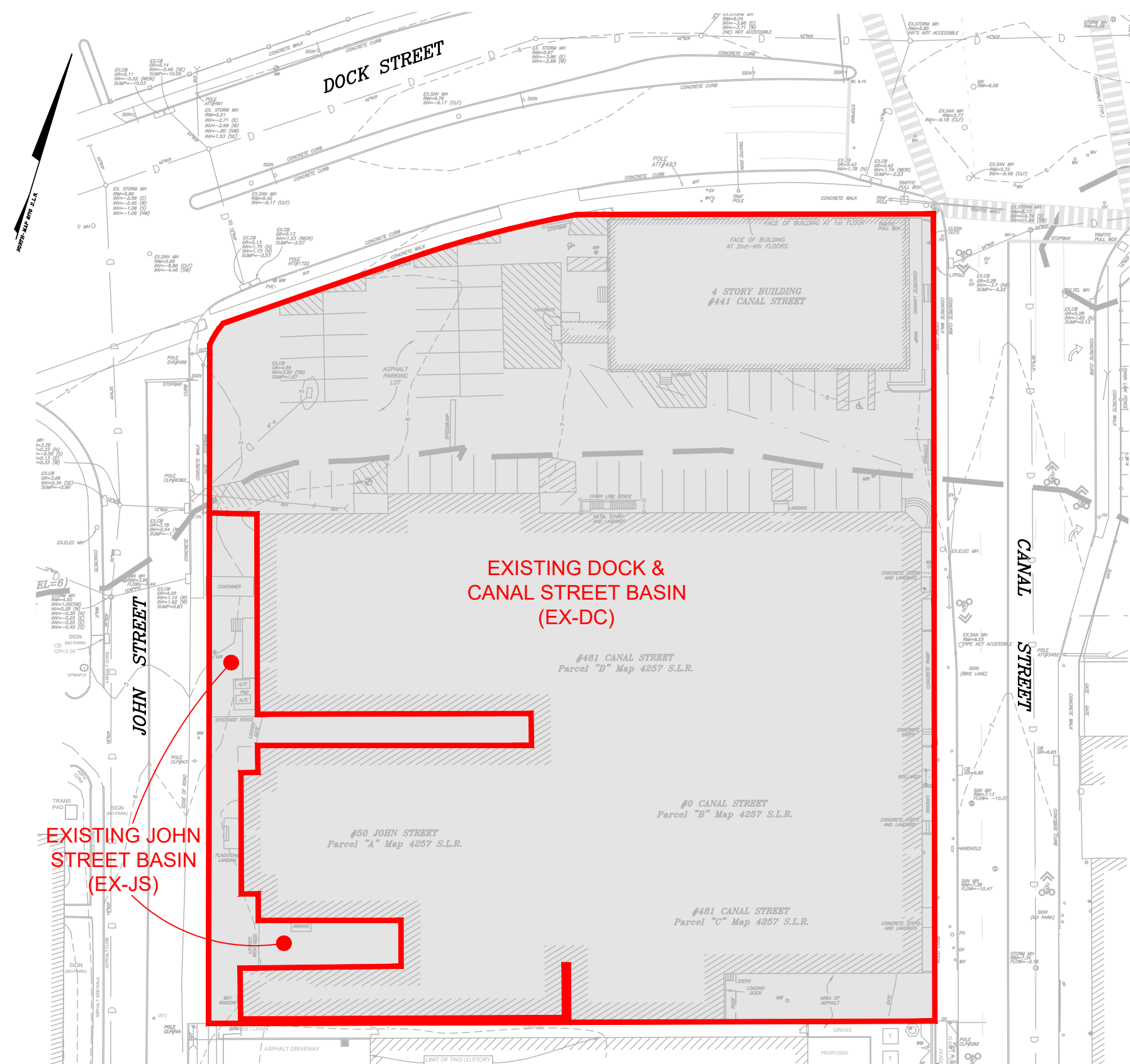
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Appendix B

Existing On-Site Drainage Basin Map
Proposed On-Site Drainage Basin Maps



LEGEND


DRAINAGE BASIN BOUNDARY

DRAINAGE BASIN SUMMARY TABLE			
BASIN	CN	SIZE (ac)	Tc (Min)
EXISTING DOCK & CANAL ST BASIN (EX-DC)	98.0	2.08	5
EXISTING JOHN STREET BASIN (EX-JS)	98.0	0.15	5

TOTAL DRAINAGE BASIN AREA = 97,052 sq. ft.

SYMBOL	AREA DESCRIPTION	AREA (sq.ft.)
	IMPERVIOUS AREA	97,052
	PERVIOUS AREA	0
TOTAL AREA =		<u>97,052±</u>

EXISTING DRAINAGE BASIN EXHIBIT
441 CANAL STREET
STAMFORD, CT

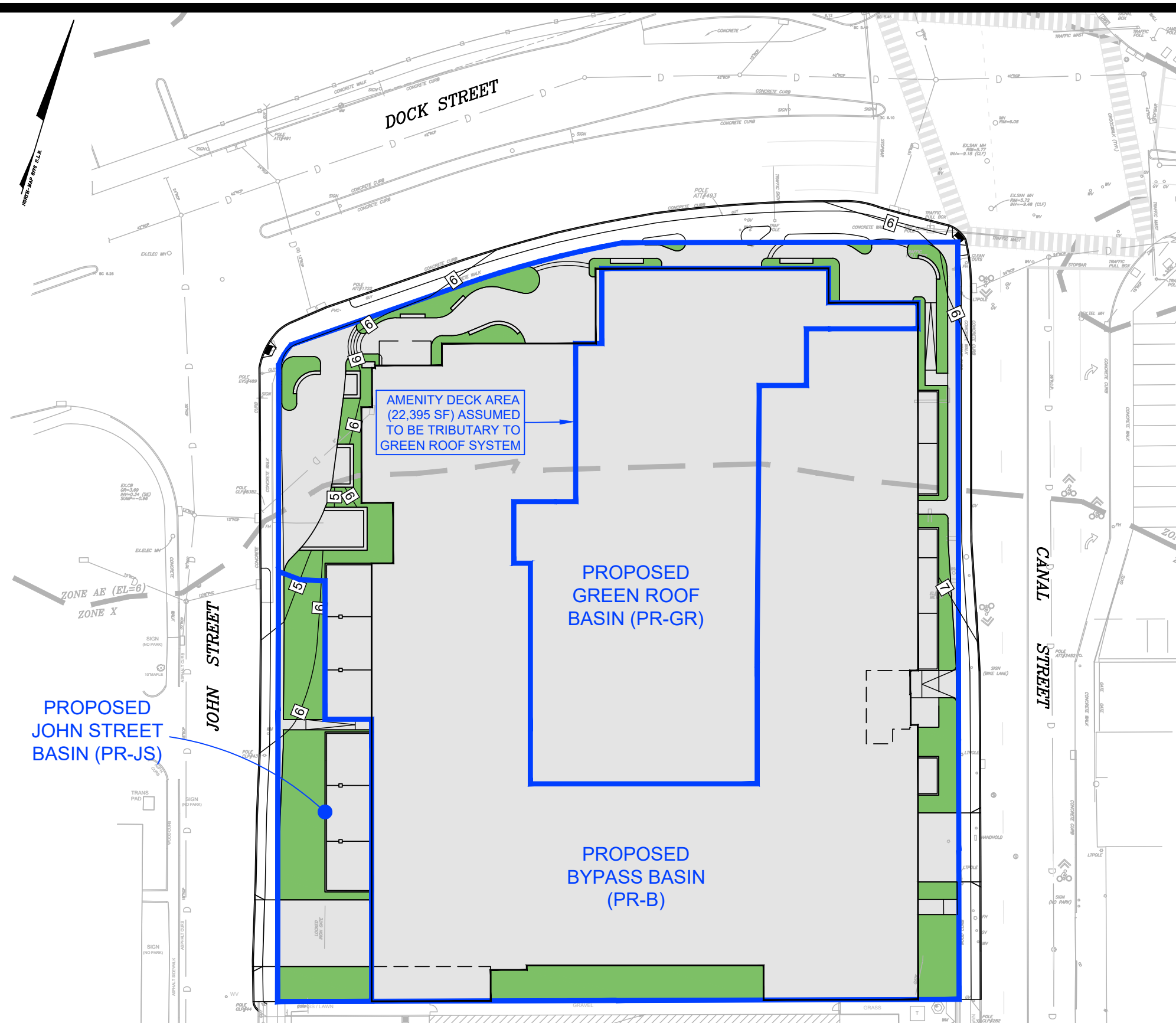


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COMM. NO.: 7300	DATE: 02/03/2022
	SCALE: 1" = 50'



LEGEND

DRAINAGE BASIN BOUNDARY

DRAINAGE BASIN SUMMARY TABLE			
BASIN	CN	SIZE (ac)	Tc (Min)
PROPOSED JOHN STREET BASIN (PR-JS)	88.7	0.14	5
PROPOSED BYPASS BASIN (PR-B)	96.2	1.57	5
PROPOSED GREEN ROOF BASIN (PR-GR)	98.0	0.52	5


TOTAL DRAINAGE BASIN AREA = 97,052 sq. ft.

SYMBOL	AREA DESCRIPTION	AREA (sq.ft.)
	IMPERVIOUS AREA	86,815
	PERVIOUS AREA	10,237
TOTAL AREA =		<u>97,052±</u>

*NOTE: IMPERVIOUS AREA DECREASE = 10,237 SQ.FT.

NOTE: AREA OF THE PROPOSED GREEN ROOF (10,000 SF) AS ASSUMED TO BE IMPERVIOUS FOR THE PURPOSES OF QUANTIFYING PROPOSED PEAK RATES OF RUNOFF FROM THE SITE. PROPOSED FLOWS NOTED HEREIN DO NOT ACCOUNT FOR ANY ATTENUATION IN PEAK RATES ASSOCIATED WITH THE GREEN ROOF.

PROPOSED DRAINAGE BASIN EXHIBIT
441 CANAL STREET
STAMFORD, CT



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COMM. NO.: 7300	DATE: 02/03/2022
SCALE: 1" = 50'	

Appendix C

LID Review Map
(to be Coordinated in Future)

Appendix D

Water Quality Volume Calculations
BMP Volume Calculations
Conveyance Calculations

Water Quality Volume Calculations

Project: 441 Canal Street Development

Project #: 7300

Date: 1/26/2022

Location: 0/441/481 Canal Street & 50 John Street

By: AJP

Checked: BPM

Site WQV - Proposed Conditions

Area=	2.228	acres
Impervious Area=	1.993	acres
I=	0.895	^a
R=	0.855	^b
WQV=	0.159	ac. ft. ^c

WQV=	6,915.51 ft.³
1/2 WQV=	3,457.75 ft.³

^a I=Percent Impervious Coverage

^b R=0.05+0.009(I); Volumetric runoff Coefficient, Equation taken from 2004 Connecticut Stormwater Quality Manual section 7.4.1

^c WQV=(1"xRxA)/12; Water Quality Volume, Equation taken from 2004 Connecticut Stormwater Quality Manual section 7.4.1

^d Note: City of Stamford Drainage Manual dated June 10, 2020, Section 2.4 Standard 1 Runoff and Pollutant Reduction Requirements Flowchart indicates to provide 1/2 WQV onsite using Non-Structural or Infiltration BMP's as the sites existing DCIA (100%) is greater than 40%.

GREEN ROOF STORAGE CALCULATIONS

Project: 441 Canal Street Development	Project #: 7300	Date: 1/26/2022
Location: 0/441/481 Canal Street & 50 John Street	By: AJP	Checked: BPM

Water Quality Volume Minimum in Green Roof

Provided Green Roof Area (sf)	10,000 sf ^a
Depth of Soil Media, D _{SM}	1.17 ft ^b
Porosity of Soil Media, P _{SM}	0.3

$$\text{Volume in Soil Media, } V_{SM} = A_{PGR} \times P_{SM} \times D_{SM}$$

Volume in Soil Media, V_{SM}	3,500 cf
1/2 WQV REQUIRED =	3,436 cf

^a Green Roof Area assumed to be 50% of the Amentity Deck (10,000 SF)
as recommended by Nick from HLW

^b Depth of Soil assumed to be 14 inches to meet the 1/2 WQV requirement.

HYDRAULIC DATA FOR RATIONAL METHOD

Project: 441 Canal Street Development	Project #: 7300	Date: 2/3/2022
Location: 0/441/481 Canal Street & 50 John Street	By: AJP	Checked: BPM

Pipe Conveyance Calculations

100 Year Storm

15" RCP Connection to City Sewer for 1/2 of Proposed Impervious Area	Basin Description				Drainage Path				Time (min)	100yr. Rainfall Intensity (in/hr)	Q = ACI (cfs)			
	Acres	C	Description	AC	Length (ft)	ΔH	Slope (%)	Description						
	0.997	0.95	Impervious	0.95										
	0.00	0.30	Pervious	0.00										
1.00		Total	0.95						5	10.7	10.13			
Q in system (cfs)	Pipe Size (in)	Pipe Length (ft)	Roughness coefficient	Material	Slope (ft/ft)	Q _{full} (cfs)	Q _{system} / Q _{full} (%)							
10.13	15	30	0.011	RCP	0.030	13.26	76.4%							

15" RCP Connection to City Sewer for 1/2 of Proposed Impervious Area	Basin Description				Drainage Path				Time (min)	100yr. Rainfall Intensity (in/hr)	Q = ACI (cfs)			
	Acres	C	Description	AC	Length (ft)	ΔH	Slope (%)	Description						
			Impervious											
			Pervious											
		Total								8.51*				
Q in system (cfs)	Pipe Size (in)	Pipe Length (ft)	Roughness coefficient	Material	Slope (ft/ft)	Q _{full} (cfs)	Q _{system} / Q _{full} (%)	*Outflow calculated during the 100-year storm for half of the proposed impervious area (43,408 SF). Supplemented via HydroCAD model catchment CA.						
8.51	15	30	0.011	RCP	0.030	13.26	64.2%							

Note: Assumed Area for Conveyance network was 1/2 of the proposed impervious area (43,408 SF) and slope of pipes shall be 3% for a conservative assumption. Calculation shall be updated once coordinated connections have been coordinated with team.

Note: Area of the proposed green roof (10,000 SF) as assumed to be impervious for the purposes of quantifying proposed peak rates of runoff from the site. Proposed flows noted herein do not account for any attenuation in peak rates associated with the green roof.

Appendix E

HydroCAD Report

441 Canal Street HydroCAD Report

EXISTING CONDITIONS



Ex. John St Basin



Ex. Dock & Canal St
Basin

PROPOSED CONDITIONS



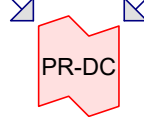
Pr. John St Basin



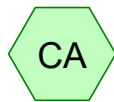
Proposed Bypass Basin



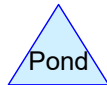
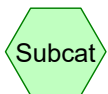
Proposed Green Roof
Basin



Dock & Canal Street
Intersection Storm
Sewer



Conveyance
Assumption



Routing Diagram for 7300 HydroCAD

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7300 HydroCAD

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Page 2

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-Year	Type III 24-hr		Default	24.00	1	2.96	2
2	2-Year	Type III 24-hr		Default	24.00	1	3.58	2
3	5-Year	Type III 24-hr		Default	24.00	1	4.59	2
4	10-Year	Type III 24-hr		Default	24.00	1	5.44	2
5	25-Year	Type III 24-hr		Default	24.00	1	6.60	2
6	50-Year	Type III 24-hr		Default	24.00	1	7.46	2
7	100-Year	Type III 24-hr		Default	24.00	1	8.39	2

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Type III 24-hr 1-Year Rainfall=2.96"

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Page 3

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CA: Conveyance	Runoff Area=43,408 sf 100.00% Impervious Runoff Depth>2.73" Tc=5.0 min CN=98.00 Runoff=2.96 cfs 9,863 cf
Subcatchment EX-DC: Ex. Dock & Canal	Runoff Area=90,398 sf 100.00% Impervious Runoff Depth>2.73" Tc=5.0 min CN=98.00 Runoff=6.16 cfs 20,540 cf
Subcatchment EX-JS: Ex. John St Basin	Runoff Area=6,654 sf 100.00% Impervious Runoff Depth>2.73" Tc=5.0 min CN=98.00 Runoff=0.45 cfs 1,512 cf
Subcatchment PR-B: Proposed Bypass	Runoff Area=68,220 sf 89.86% Impervious Runoff Depth>2.53" Tc=5.0 min CN=96.17 Runoff=4.49 cfs 14,375 cf
Subcatchment PR-GR: Proposed Green	Runoff Area=22,395 sf 100.00% Impervious Runoff Depth>2.73" Tc=5.0 min CN=98.00 Runoff=1.53 cfs 5,089 cf
Subcatchment PR-JS: Pr. John St Basin	Runoff Area=6,437 sf 48.44% Impervious Runoff Depth>1.84" Tc=5.0 min CN=88.72 Runoff=0.33 cfs 987 cf
Link PR-DC: Dock & Canal Street Intersection Storm Sewer	Inflow=6.02 cfs 19,464 cf Primary=6.02 cfs 19,464 cf

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Type III 24-hr 2-Year Rainfall=3.58"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CA: Conveyance	Runoff Area=43,408 sf 100.00% Impervious Runoff Depth>3.34" Tc=5.0 min CN=98.00 Runoff=3.60 cfs 12,096 cf
Subcatchment EX-DC: Ex. Dock & Canal	Runoff Area=90,398 sf 100.00% Impervious Runoff Depth>3.34" Tc=5.0 min CN=98.00 Runoff=7.49 cfs 25,191 cf
Subcatchment EX-JS: Ex. John St Basin	Runoff Area=6,654 sf 100.00% Impervious Runoff Depth>3.34" Tc=5.0 min CN=98.00 Runoff=0.55 cfs 1,854 cf
Subcatchment PR-B: Proposed Bypass	Runoff Area=68,220 sf 89.86% Impervious Runoff Depth>3.14" Tc=5.0 min CN=96.17 Runoff=5.51 cfs 17,854 cf
Subcatchment PR-GR: Proposed Green	Runoff Area=22,395 sf 100.00% Impervious Runoff Depth>3.34" Tc=5.0 min CN=98.00 Runoff=1.86 cfs 6,241 cf
Subcatchment PR-JS: Pr. John St Basin	Runoff Area=6,437 sf 48.44% Impervious Runoff Depth>2.40" Tc=5.0 min CN=88.72 Runoff=0.43 cfs 1,289 cf
Link PR-DC: Dock & Canal Street Intersection Storm Sewer	Inflow=7.36 cfs 24,095 cf Primary=7.36 cfs 24,095 cf

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Type III 24-hr 5-Year Rainfall=4.59"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CA: Conveyance	Runoff Area=43,408 sf 100.00% Impervious Runoff Depth>4.35" Tc=5.0 min CN=98.00 Runoff=4.63 cfs 15,739 cf
Subcatchment EX-DC: Ex. Dock & Canal	Runoff Area=90,398 sf 100.00% Impervious Runoff Depth>4.35" Tc=5.0 min CN=98.00 Runoff=9.64 cfs 32,777 cf
Subcatchment EX-JS: Ex. John St Basin	Runoff Area=6,654 sf 100.00% Impervious Runoff Depth>4.35" Tc=5.0 min CN=98.00 Runoff=0.71 cfs 2,413 cf
Subcatchment PR-B: Proposed Bypass	Runoff Area=68,220 sf 89.86% Impervious Runoff Depth>4.14" Tc=5.0 min CN=96.17 Runoff=7.16 cfs 23,545 cf
Subcatchment PR-GR: Proposed Green	Runoff Area=22,395 sf 100.00% Impervious Runoff Depth>4.35" Tc=5.0 min CN=98.00 Runoff=2.39 cfs 8,120 cf
Subcatchment PR-JS: Pr. John St Basin	Runoff Area=6,437 sf 48.44% Impervious Runoff Depth>3.35" Tc=5.0 min CN=88.72 Runoff=0.59 cfs 1,797 cf
Link PR-DC: Dock & Canal Street Intersection Storm Sewer	Inflow=9.54 cfs 31,665 cf Primary=9.54 cfs 31,665 cf

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Type III 24-hr 10-Year Rainfall=5.44"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CA: Conveyance Runoff Area=43,408 sf 100.00% Impervious Runoff Depth>5.20"
Tc=5.0 min CN=98.00 Runoff=5.50 cfs 18,807 cf

Subcatchment EX-DC: Ex. Dock & Canal Runoff Area=90,398 sf 100.00% Impervious Runoff Depth>5.20"
Tc=5.0 min CN=98.00 Runoff=11.45 cfs 39,166 cf

Subcatchment EX-JS: Ex. John St Basin Runoff Area=6,654 sf 100.00% Impervious Runoff Depth>5.20"
Tc=5.0 min CN=98.00 Runoff=0.84 cfs 2,883 cf

Subcatchment PR-B: Proposed Bypass Runoff Area=68,220 sf 89.86% Impervious Runoff Depth>4.99"
Tc=5.0 min CN=96.17 Runoff=8.53 cfs 28,347 cf

Subcatchment PR-GR: Proposed Green Runoff Area=22,395 sf 100.00% Impervious Runoff Depth>5.20"
Tc=5.0 min CN=98.00 Runoff=2.84 cfs 9,703 cf

Subcatchment PR-JS: Pr. John St Basin Runoff Area=6,437 sf 48.44% Impervious Runoff Depth>4.16"
Tc=5.0 min CN=88.72 Runoff=0.72 cfs 2,232 cf

Link PR-DC: Dock & Canal Street Intersection Storm Sewer Inflow=11.37 cfs 38,050 cf
Primary=11.37 cfs 38,050 cf

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Type III 24-hr 25-Year Rainfall=6.60"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CA: Conveyance	Runoff Area=43,408 sf 100.00% Impervious Runoff Depth>6.36" Tc=5.0 min CN=98.00 Runoff=6.68 cfs 22,996 cf
Subcatchment EX-DC: Ex. Dock & Canal	Runoff Area=90,398 sf 100.00% Impervious Runoff Depth>6.36" Tc=5.0 min CN=98.00 Runoff=13.91 cfs 47,890 cf
Subcatchment EX-JS: Ex. John St Basin	Runoff Area=6,654 sf 100.00% Impervious Runoff Depth>6.36" Tc=5.0 min CN=98.00 Runoff=1.02 cfs 3,525 cf
Subcatchment PR-B: Proposed Bypass	Runoff Area=68,220 sf 89.86% Impervious Runoff Depth>6.14" Tc=5.0 min CN=96.17 Runoff=10.41 cfs 34,911 cf
Subcatchment PR-GR: Proposed Green	Runoff Area=22,395 sf 100.00% Impervious Runoff Depth>6.36" Tc=5.0 min CN=98.00 Runoff=3.45 cfs 11,864 cf
Subcatchment PR-JS: Pr. John St Basin	Runoff Area=6,437 sf 48.44% Impervious Runoff Depth>5.28" Tc=5.0 min CN=88.72 Runoff=0.91 cfs 2,834 cf
Link PR-DC: Dock & Canal Street Intersection Storm Sewer	Inflow=13.86 cfs 46,775 cf Primary=13.86 cfs 46,775 cf

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Type III 24-hr 50-Year Rainfall=7.46"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CA: Conveyance	Runoff Area=43,408 sf 100.00% Impervious Runoff Depth>7.22" Tc=5.0 min CN=98.00 Runoff=7.56 cfs 26,103 cf
Subcatchment EX-DC: Ex. Dock & Canal	Runoff Area=90,398 sf 100.00% Impervious Runoff Depth>7.22" Tc=5.0 min CN=98.00 Runoff=15.74 cfs 54,359 cf
Subcatchment EX-JS: Ex. John St Basin	Runoff Area=6,654 sf 100.00% Impervious Runoff Depth>7.22" Tc=5.0 min CN=98.00 Runoff=1.16 cfs 4,001 cf
Subcatchment PR-B: Proposed Bypass	Runoff Area=68,220 sf 89.86% Impervious Runoff Depth>7.00" Tc=5.0 min CN=96.17 Runoff=11.79 cfs 39,783 cf
Subcatchment PR-GR: Proposed Green	Runoff Area=22,395 sf 100.00% Impervious Runoff Depth>7.22" Tc=5.0 min CN=98.00 Runoff=3.90 cfs 13,467 cf
Subcatchment PR-JS: Pr. John St Basin	Runoff Area=6,437 sf 48.44% Impervious Runoff Depth>6.12" Tc=5.0 min CN=88.72 Runoff=1.04 cfs 3,283 cf
Link PR-DC: Dock & Canal Street Intersection Storm Sewer	Inflow=15.69 cfs 53,250 cf Primary=15.69 cfs 53,250 cf

Summary for Subcatchment EX-JS: Ex. John St Basin

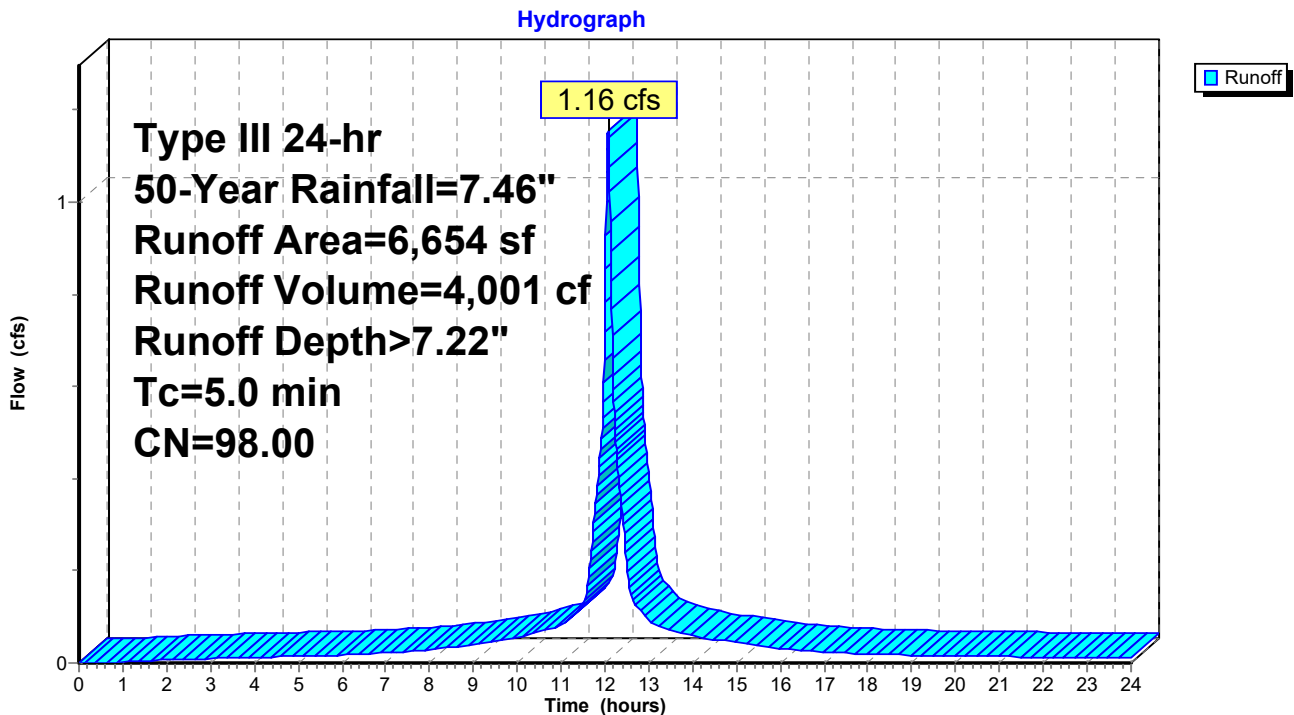
Runoff = 1.16 cfs @ 12.07 hrs, Volume= 4,001 cf, Depth> 7.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 50-Year Rainfall=7.46"

Area (sf)	CN	Description
6,654	98.00	Paved parking, HSG D
6,654		100.00% Impervious Area

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

Subcatchment EX-JS: Ex. John St Basin



Summary for Subcatchment EX-DC: Ex. Dock & Canal St Basin

Runoff = 15.74 cfs @ 12.07 hrs, Volume= 54,359 cf, Depth> 7.22"

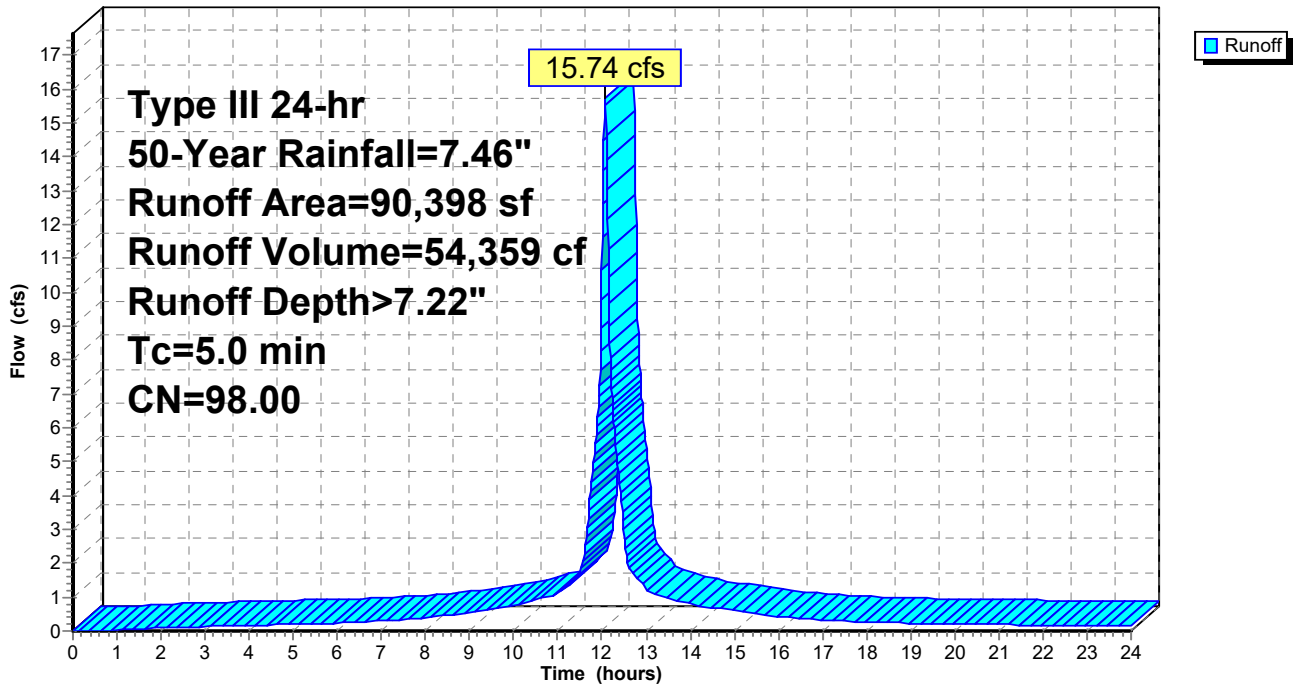
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 50-Year Rainfall=7.46"

Area (sf)	CN	Description
* 90,398	98.00	Paved parking, Building and Sidewalk, HSG D
90,398		100.00% Impervious Area

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

Subcatchment EX-DC: Ex. Dock & Canal St Basin

Hydrograph



Summary for Subcatchment PR-JS: Pr. John St Basin

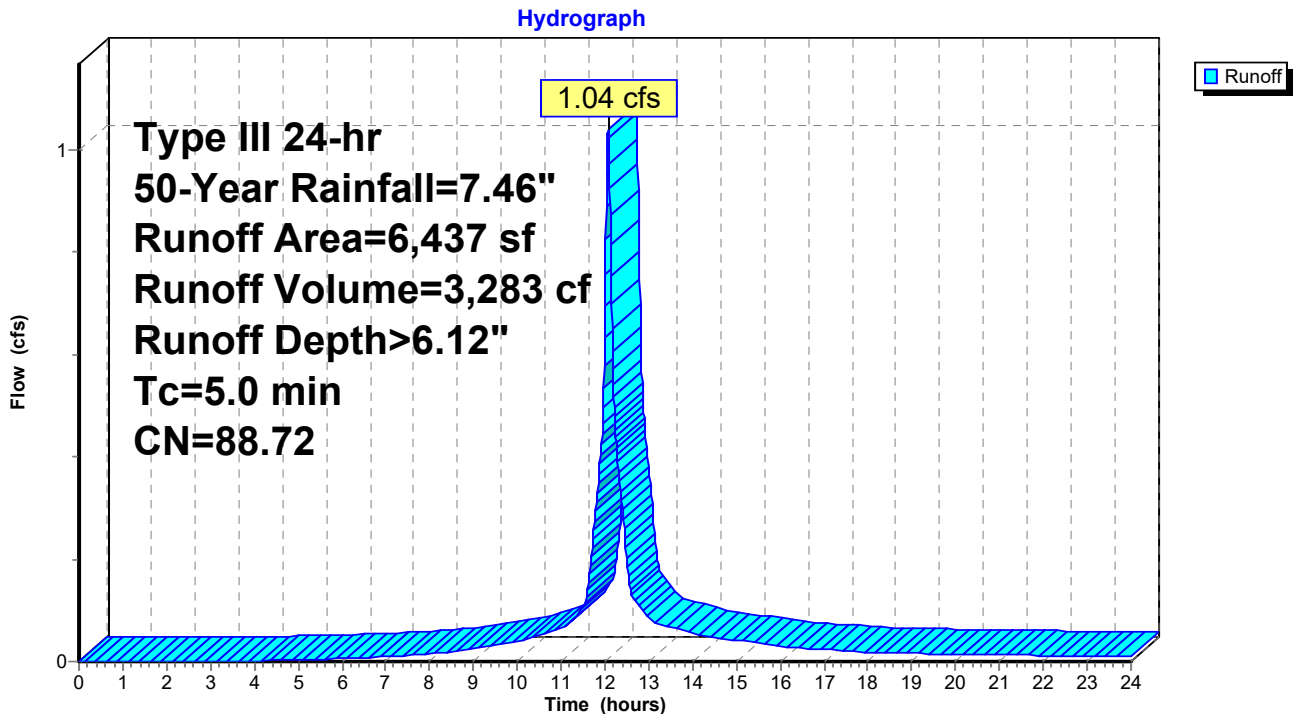
Runoff = 1.04 cfs @ 12.07 hrs, Volume= 3,283 cf, Depth> 6.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 50-Year Rainfall=7.46"

Area (sf)	CN	Description
3,118	98.00	Paved parking, HSG D
3,319	80.00	>75% Grass cover, Good, HSG D
6,437	88.72	Weighted Average
3,319		51.56% Pervious Area
3,118		48.44% Impervious Area

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

Subcatchment PR-JS: Pr. John St Basin



Summary for Subcatchment PR-B: Proposed Bypass Basin

Runoff = 11.79 cfs @ 12.07 hrs, Volume= 39,783 cf, Depth> 7.00"

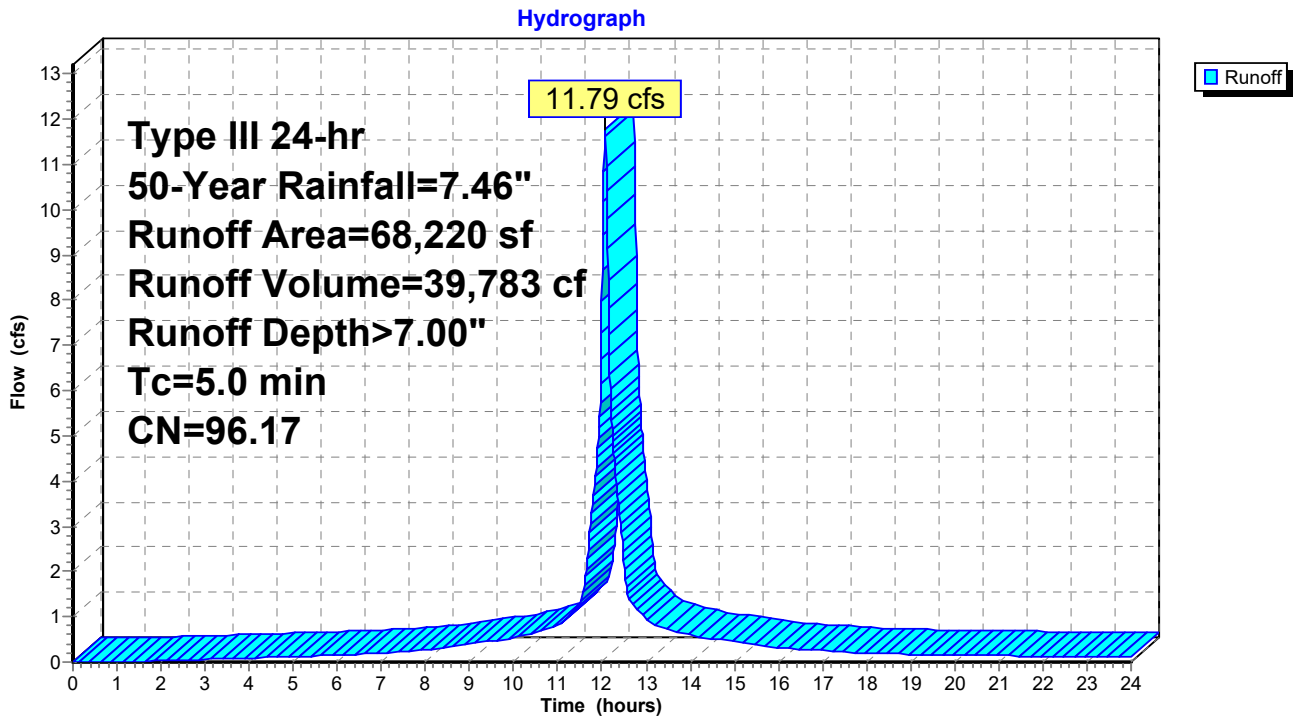
Routed to Link PR-DC : Dock & Canal Street Intersection Storm Sewer

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 50-Year Rainfall=7.46"

	Area (sf)	CN	Description
*	61,302	98.00	Proposed Building roof, walkways, and Drive entrances, HSG D
	6,918	80.00	>75% Grass cover, Good, HSG D
	68,220	96.17	Weighted Average
	6,918		10.14% Pervious Area
	61,302		89.86% Impervious Area

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

Subcatchment PR-B: Proposed Bypass Basin



Summary for Subcatchment PR-GR: Proposed Green Roof Basin

Runoff = 3.90 cfs @ 12.07 hrs, Volume= 13,467 cf, Depth> 7.22"

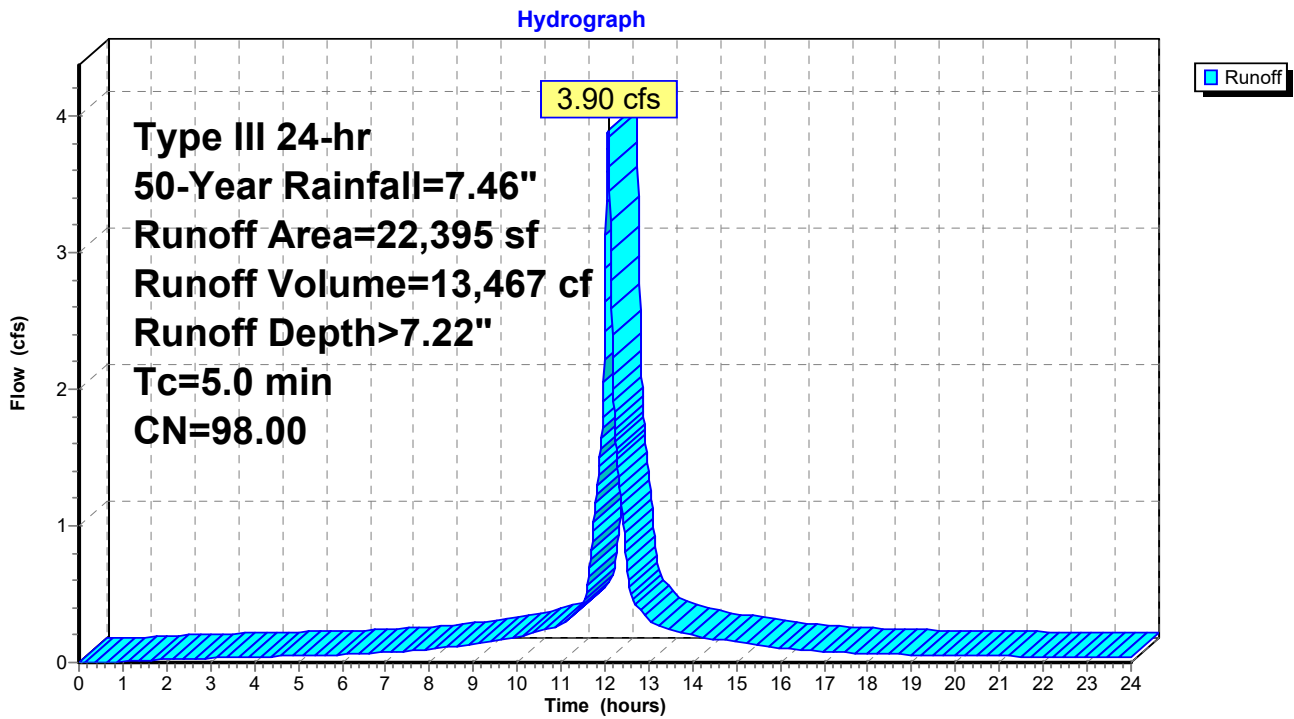
Routed to Link PR-DC : Dock & Canal Street Intersection Storm Sewer

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 50-Year Rainfall=7.46"

Area (sf)	CN	Description
* 22,395	98.00	Proposed Green roof, HSG D
22,395		100.00% Impervious Area

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

Subcatchment PR-GR: Proposed Green Roof Basin

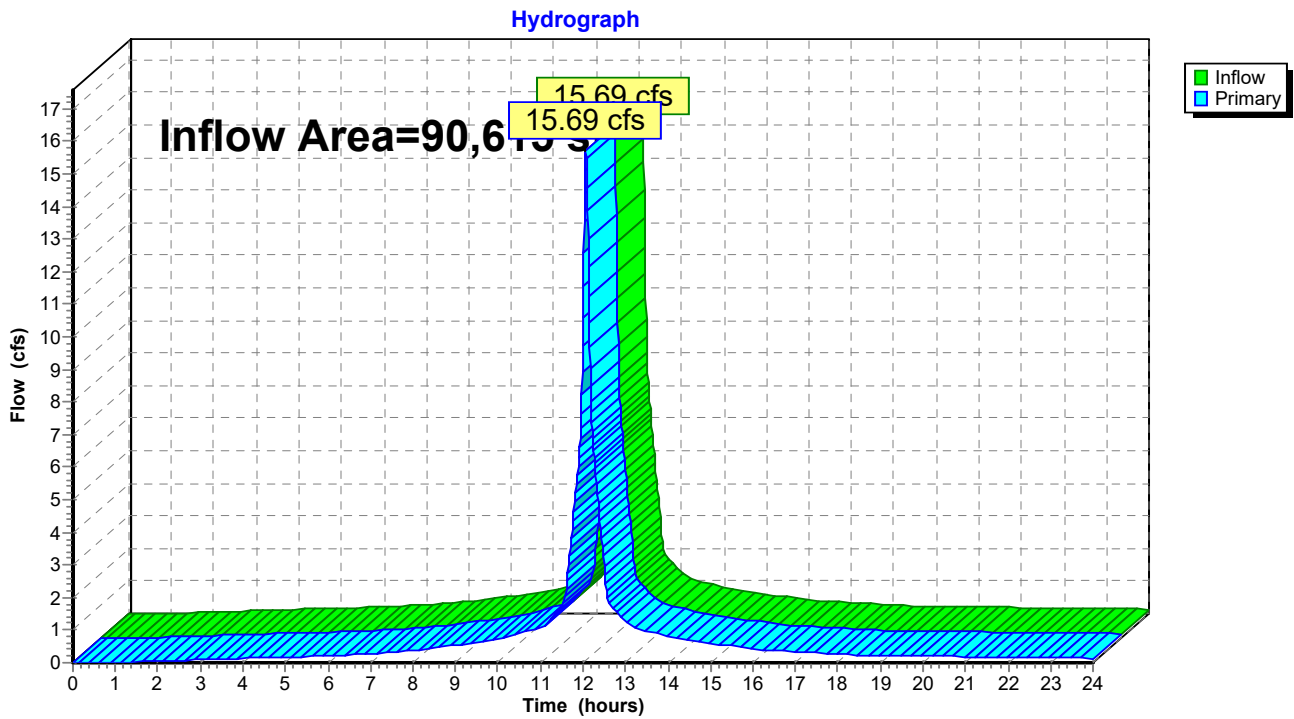


Summary for Link PR-DC: Dock & Canal Street Intersection Storm Sewer

Inflow Area = 90,615 sf, 92.37% Impervious, Inflow Depth > 7.05" for 50-Year event
Inflow = 15.69 cfs @ 12.07 hrs, Volume= 53,250 cf
Primary = 15.69 cfs @ 12.07 hrs, Volume= 53,250 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link PR-DC: Dock & Canal Street Intersection Storm Sewer



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Type III 24-hr 100-Year Rainfall=8.39"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CA: Conveyance	Runoff Area=43,408 sf 100.00% Impervious Runoff Depth>8.14" Tc=5.0 min CN=98.00 Runoff=8.51 cfs 29,462 cf
Subcatchment EX-DC: Ex. Dock & Canal	Runoff Area=90,398 sf 100.00% Impervious Runoff Depth>8.14" Tc=5.0 min CN=98.00 Runoff=17.71 cfs 61,356 cf
Subcatchment EX-JS: Ex. John St Basin	Runoff Area=6,654 sf 100.00% Impervious Runoff Depth>8.14" Tc=5.0 min CN=98.00 Runoff=1.30 cfs 4,516 cf
Subcatchment PR-B: Proposed Bypass	Runoff Area=68,220 sf 89.86% Impervious Runoff Depth>7.93" Tc=5.0 min CN=96.17 Runoff=13.29 cfs 45,054 cf
Subcatchment PR-GR: Proposed Green	Runoff Area=22,395 sf 100.00% Impervious Runoff Depth>8.14" Tc=5.0 min CN=98.00 Runoff=4.39 cfs 15,200 cf
Subcatchment PR-JS: Pr. John St Basin	Runoff Area=6,437 sf 48.44% Impervious Runoff Depth>7.03" Tc=5.0 min CN=88.72 Runoff=1.19 cfs 3,772 cf
Link PR-DC: Dock & Canal Street Intersection Storm Sewer	Inflow=17.68 cfs 60,255 cf Primary=17.68 cfs 60,255 cf

Summary for Subcatchment CA: Conveyance Assumption

Runoff = 8.51 cfs @ 12.07 hrs, Volume= 29,462 cf, Depth> 8.14"

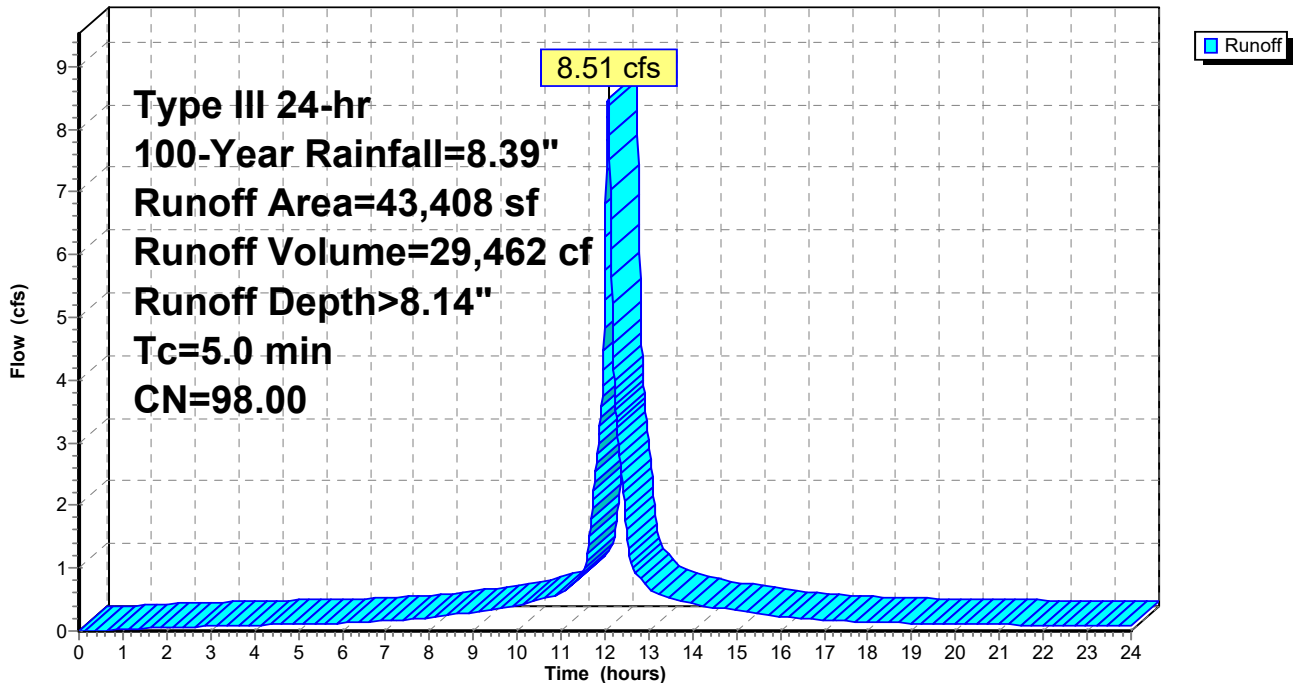
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-Year Rainfall=8.39"

Area (sf)	CN	Description
43,408	98.00	Paved parking, HSG D
43,408		100.00% Impervious Area

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

Subcatchment CA: Conveyance Assumption

Hydrograph



Appendix F

DCIA Tracking Spreadsheet



Note to user: complete all cells of this color *only*

Part 1: General Information	
Project Name	441 Canal Street Development
Project Address	0,441 & 481 Canal Street and 50 John Street
Project Applicant	Heyman Properties, LLC.
Date of Submittal	3-Feb-22
Tax Account Number	001-7720, 001-7721, 001-7722, 001-7723, 001-7724

Part 2: Project Details	
1. What type of development is this? (choose from dropdown)	Redevelopment
2. What is the total area of the project site?	97,052 ft ²
3. What is the total area of land disturbance for this project?	97,052 ft ²
4. Does project site drain to High Quality Waters, a Direct Waterfront, or within 500 ft. of Tidal Wetlands? (Yes/No)	No
5. What is the <u>current</u> DCIA for the site?	97,052 ft ²
6. Will the proposed development increase DCIA (without consideration of proposed stormwater management)? (Yes/No)	No
7. What is the <u>proposed-development</u> total impervious area for the site?	86,815 ft ²


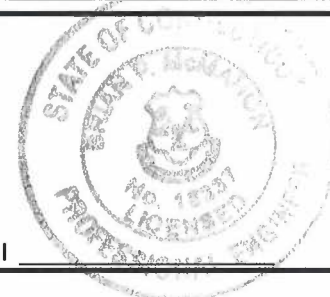
Part 3: Water Quality Target Total	
Does Standard 1 apply based on information above?	Yes
Water Quality Volume (WQV)	6915.5 ft ³
Standard 1 requirement	Retain 1/2 WQV on-site
Required retention volume	3457.8 ft ³
Provided retention volume for proposed development	3500.0 ft ³

Part 4: Proposed DCIA Tracking	
Pre-development total impervious area	97,052 ft ²
Current DCIA	97,052 ft ²
Proposed-development total impervious area	86,815 ft ²
Proposed-development DCIA (after stormwater management)	64,420 ft ²
Net change in DCIA from <u>pre-development</u> to <u>proposed-development</u>	-32,632 ft ²

Part 5: Post-Development (As-Built Certified) DCIA Tracking	
Post-development (per as-built) total impervious area	ft ²
Post-development (per as-built) DCIA (after stormwater management)	ft ²
Net change in DCIA from <u>pre-development</u> to <u>post-development</u>	ft ²

Certification Statement

I hereby certify that the information contained in this worksheet is true and correct.

Engineer's Signature  Date 2/3/2022 Engineer's Seal 

Appendix G

Operation and Maintenance Agreement

Block 150 .

AGREEMENT COVENANT

AGREEMENT made this _____ day of _____ by and between
Heyman Properties, LLC. of 0,441, & 481 Canal St and 50 John St in
the City of Stamford, County of Fairfield and State of Connecticut
(hereinafter referred to as "Owner"); and the **CITY OF STAMFORD**, a municipal
corporation lying within the County of Fairfield and State of Connecticut,
acting herein by its duly authorized Mayor, David R. Martin (hereinafter
referred to as the "CITY"), the **ENVIRONMENTAL PROTECTION BOARD OF THE CITY
OF STAMFORD**, acting herein by its duly authorized Chairman, Gary H. Stone
(hereinafter referred to as the "EPB").

WITNESSETH

WHEREAS, OWNER has commenced the planning and construction of a new
mixed-use multi-family apartment building on
land owned by it and as more particularly described on Schedule "A" annexed
hereto and made of part hereof (hereinafter referred to as the "Property");
and

WHEREAS, certain drainage facilities ("Drainage Facilities"), including
but not limited to green roof system as
more particularly described on Schedule "B" attached (the "Construction
Plans") shall be installed in connection with the aforesaid construction and
in accordance with the Construction Plans and _____ Permit
No. _____ issued by the _____ Board of the City
of Stamford (_____) issued

therefore, ("Permit") and;

WHEREAS, OWNER, the CITY and EPB share a joint concern that the Drainage Facilities be maintained in a functioning condition so as to avoid pollution of surface and groundwaters, flooding and/or improper drainage.

NOW, THEREFORE, in consideration of ten dollars and other good and valuable consideration receipt of which is hereby acknowledged by the OWNER, it is hereby agreed as follows:

- 1) OWNER shall clean the drainage facilities or cause such facilities to be cleaned by periodic removal of accumulated sediment and debris in a good and workman-like manner, at least two (2) times during every twelve (12) month period, which times shall be in the period between April and June and between October and December and more often as the City may determine to be necessary.
- 2) OWNER shall sweep, or cause to be swept, garage facilities, driveways and roadway surfaces located on the Property at least once per calendar quarter.
- 3) OWNER shall utilize only sand or calcium chloride in connection with the de-icing of areas within the Property meaning and intending that road salt (Sodium Chloride) shall not be used for said purpose.
- 4) OWNER shall repair or replace any defects or defective drainage

facilities so as to maintain the drainage facilities, at all times, in a fully functional capacity.

- 5) OWNER shall file as-built drainage plans with the EPB immediately upon the completion of work. Said plans shall be prepared by a professional engineer/surveyor registered in the State of Connecticut.
- 6) OWNER grants the CITY and/or EPB, its agents, and employees, the right to enter the Property at all reasonable times upon twenty-four (24) hours notice to the OWNER for the purpose of inspecting the Property to determine if OWNER is complying with the requirements hereunder. A representative of the Owner shall have the right to accompany the City and/or EPB on their inspection of the Property.
- 7) If, after an inspection is made pursuant to Paragraph Six (6) hereof, the CITY and/or EPB determines that the owner has failed to comply with the aforesaid undertakings, then the CITY and/or EPB shall give written notice of said determination to the then OWNER of the Property which notice shall also specify the said failure. Said notice shall be sent by registered or certified mail to the last known address of said Owner. If the Owner disputes the claim, he shall give written notice thereof to City and/or EPB within ten (10) days of receipt of said notice, and the EPB shall hold a hearing as promptly as possible to decide the merits of the disputed claim. If the claim is not disputed within

said ten (10) days, the OWNER shall have thirty (30) days from the receipt of said notice to correct said failure, unless it is impossible to cure said defect within said time, in which case, the necessary repairs shall be immediately commenced and diligently pursued to completion within a reasonable time.

- 8) If the said failure is not remedied within the time frame herein stated, the CITY and/or EPB may proceed to cure the same and charge the actual cost thereof to the OWNER of the Property.
- 9) OWNER agrees to reimburse the CITY and/or EPB for reasonable legal fees and court costs if it becomes necessary for the CITY and/or EPB to sue for reimbursement of sums expended by the CITY and/or EPB in performance of OWNER'S obligation.
- 10) OWNER agrees and covenants to indemnify and save harmless the CITY and the EPB against any and all claims, suits, actions or judgments arising out of the delay in the performance of any of their obligations pursuant to this Agreement.
- 11) OWNER agrees that this covenant and restriction shall apply to and run with the land. It shall be binding on all future owners, administrators, executors, successors and assigns.
- 12) The OWNER hereby represents to the CITY and EPB that he/she is the owner, in fee simple, of all of the property described in "Schedule A" attached hereto and made a part hereof.

- 13) OWNER agrees that this Agreement and restrictive covenant upon execution of the same, shall be recorded on the land records at the OWNER'S expense at the time that a permit is issued for the Property herein and while the OWNER is in title.
- 14) OWNER agrees not to assert the invalidity of this document.
- 15) OWNER agrees that nothing herein shall be construed to be a limitation upon the right of the EPB to assert and enforce any rights it may have under federal, state or City statute, ordinance or regulation.
- 16) This agreement shall be governed by the laws of the State of Connecticut.

IN WITNESS WHEREOF, the said parties hereto have hereunto set their hands and seals, the day and year first above written.

WITNESSED:

THE CITY OF STAMFORD

BY: _____

David R. Martin
Its duly authorized Mayor

(ACKNOWLEDGEMENT ON THE FOLLOWING PAGE)

THE ENVIRONMENTAL PROTECTION BOARD

BY: _____

Gary H. Stone
Its duly authorized Chairman

OWNER

BY: _____

OWNER

BY: _____

STATE OF CONNECTICUT}
 } ss: STAMFORD
COUNTY OF FAIRFIELD }

Date: _____

Personally appeared David R. Martin, Mayor of the City of Stamford, signer and sealer of the foregoing instrument, and acknowledged the same to be his free act and deed and the free act and deed of said City, before me.

Commissioner of the Superior Court
or Notary Public

STATE OF CONNECTICUT}
} ss: STAMFORD Date: _____
COUNTY OF FAIRFIELD }

Personally appeared Gary H. Stone, Chairman of the Environmental Protection Board of the City of Stamford, signer and sealer of the foregoing instrument, and acknowledged the same to be his free act and deed and the free act and deed of said Commission, before me.

Commissioner of the Superior Court
or Notary Public

STATE OF CONNECTICUT }
} ss: STAMFORD Date: _____
COUNTY OF FAIRFIELD }

Personally appeared _____, signer and sealer of the foregoing instrument, and acknowledge the same to be _____ free act and deed, before me.

Commissioner of the Superior Court
or Notary Public

Appendix H

Sanitary Sewer Summary

SANITARY SEWER SUMMARY

Existing City owned sanitary sewer infrastructure exists within John Street and Canal Street. There is a 30" sewer main within Canal Street and a 15" PVC sewer main within John Street both flowing in a northly direction to the Dock Street sewer system. A new 12" PVC lateral connection is proposed to connect into the 15" PVC main within John Street. Drains located within the covered portion of the parking structure will be collected via a series of drains and piped into an oil/grit separator prior to discharging into the sanitary sewer within John Street. Refer to Sanitary Site Utility Plan Sheet SE-3 for surrounding sanitary sewer system along with the proposed connection points.

It has been assumed under existing conditions that 0, 441, 481 Canal Street and 50 John Street are tributary to the 30" pipe within Canal Street. All other structures have since been removed. Per the Tax Card for 0, 481, 441 Canal and 50 John Street on file with the Tax Assessors office, the building area of 55,378 SF is classified as retail space. There is a large portion of office space on 441 Canal Street equal to 33,396 SF. Using the CT Health Code guidelines, the existing building generates a total average daily sewage flow of 8,877 GPD. Using a peak factor of 4, the peak sewage flow is 35,510 GPD (0.055 cfs). Refer to this Appendix for sanitary flow assumptions and calculations.

Under proposed conditions, the developer is seeking permission to construct a total of 33 studios, 274 one-bedroom units, 66 two-bedroom units, 28 three-bedroom units, dog salon and 6,794 square feet of retail space. We assume less than 1,000 GPD will potentially be generated from the covered parking drains if the garage is power washed with non-emulsion cleaning products. Using the CT Health Code guidelines, the proposed development would result in a total average daily sewage flow of 80,629 GPD. Using a peak factor of 4, the peak sewage flow is 322,518 GPD (0.499 cfs). Refer to Appendix H for sanitary flow assumptions and calculations.

The average daily flow to the wastewater treatment plant will increase by approximately 71,752 GPD. Redniss & Mead monitored sewer flow at structures Ex.SMH#1 and Ex.SMH#3 on March 27, 2019 (found in this Appendix) in support of the neighboring development to the south currently under construction at 523 Canal Street. This information has been used to determine if there is sufficient capacity within the sewer for the new development at 441 Canal Street. The maximum depth of flow measured in 2019 was 0.49 feet within the 15" John Street main. Assuming a factor of safety of 1.5 the John Street sewer main was at 49% capacity prior to either the 523 or 441 Canal Street redevelopments. The proposed flow of the 523 Canal Street development results in the 15" John Street sewer main reaching 54% of its capacity. The projected flow for the 441 Canal Street development will result in the 15" John Street sewer main reaching 69.4% of its capacity. The analysis demonstrates there is ample capacity within the John Street to accept discharge from this development.

The City of Stamford Water Pollution Control Authority last upgraded the Wastewater Treatment Facility (WWTF) in 2006. The WWTF upgrade was designed for an average daily flow of 24 MGD and a peak average flow of 30 MGD. The current average daily flow usage provided by the Water Pollution Control Authority is 18 MGD (provided by WPCA on November 14, 2013). The WWTF can accommodate an additional sewer capacity of 6 MGD. The project will generate an average daily flow of 322,518 GPD (or 0.323 MGD). Therefore, the WWTF has more than adequate capacity to accommodate the development.

Based on the above information, it is our opinion the City owned sanitary sewer system has sufficient capacity to accommodate the proposed development, and with proper implementation of the design drawings, the proposed development will not adversely impact the existing sanitary sewer system.

Sanitary Sewer Flow Monitoring

Project: 523 Canal Street Development **Project #:** 9657 **Date:** 3/27/2019
Location: 507/523 Canal Street & 46 John Street **By:** FRD/TMM **Checked:** TM

Structure ID:			Structure ID:		
Ex. SMH#1			Ex. SMH#3		
Rim Elevation:			Rim Elevation:		
7.06			6.78		
Invert Elevation:			Invert Elevation:		
-9.69			-7.47		
Sewer Main Size:			Sewer Main Size:		
30"			15" PVC		
Time	Reading (Depth from Rim - ft)	Depth of Flow (ft)	Time	Reading (Depth from Rim - ft)	Depth of Flow (ft)
7:30	16.20	0.55	7:35	13.88	0.37
7:45	16.20	0.55	7:50	13.88	0.37
8:00	16.18	0.57	8:05	13.86	0.39
8:15	16.18	0.57	8:20	13.86	0.39
8:30	16.18	0.57	8:35	13.86	0.39
8:45	16.16	0.59	8:50	13.88	0.37
9:00	16.16	0.59	9:05	13.88	0.37
9:15	16.18	0.57	9:20	13.88	0.37
9:30	16.20	0.55	9:35	13.88	0.37
11:15	16.34	0.41	11:20	13.82	0.43
11:30	16.32	0.43	11:35	13.82	0.43
11:45	16.26	0.49	11:50	13.84	0.41
12:00	16.26	0.49	12:05	13.82	0.43
12:15	16.26	0.49	12:20	13.80	0.45
12:30	16.24	0.51	12:35	13.80	0.45
12:45	16.24	0.51	12:50	13.82	0.43
1:00	16.24	0.51	13:05	13.84	0.41
1:15	16.26	0.49	13:20	13.86	0.39
1:30	16.28	0.47	13:35	13.86	0.39
3:10	16.28	0.47	3:15	13.80	0.45
3:25	16.30	0.45	3:30	13.80	0.45
3:40	16.28	0.47	3:45	13.80	0.45
3:55	16.26	0.49	4:00	13.76	0.49
4:10	16.26	0.49	4:15	13.80	0.45
4:25	16.25	0.50	4:30	13.82	0.43
4:40	16.24	0.51	4:45	13.78	0.47
4:55	16.24	0.51	5:00	13.80	0.45
5:10	16.20	0.55	5:15	13.80	0.45
5:25	16.20	0.55	5:30	13.80	0.45
5:40	16.21	0.54	5:45	13.80	0.45
5:55	16.20	0.55	6:00	13.80	0.45
6:10	16.20	0.55	6:15	13.80	0.45

Sanitary Sewage Analysis

Project: 441 Canal Street Development	Project #: 7300	Date: 2/3/2022
Location: 0, 441, 481 Canal Street & 50 John st	By: AJP	Checked: BPM

Existing Sanitary Sewer Flows

Source	SF	Seats	Design Flow (Gal/Day) ³	Generated Flows (Gal/Day)	ADF Factor	Peak Generated Flow (Gal/day)	Peak Generated Flows (cfs)
Retail ¹	55,378	-	0.10	5,538	4	22,151	0.034
Office ²	33,396	-	20 per 200 SF	3,340	4	13,358	0.021
Sub-total:				8,877		35,510	0.055
Total:				8,877		35,510	0.055

Notes:

1. Per Tax Assessor Card, building on 441,481,0 Canal and 50 John Street classified as Retail.
2. Per Tax Assessor Card, buildings on 441 Canal Street classified as Office.
3. Estimated GPD Sewage Flows obtained from the CT Public Health Code

Sanitary Sewage Analysis

Project: 441 Canal Street Development	Project #: 7300	Date: 2/3/2022
Location: 0 441,481 Canal Street & 50 John Street	By: AJP	Checked: BPM

Proposed Sanitary Sewer Flows

Source	Units	# of Bedrooms	Bedrooms	Expected Flow (Gal/Day)	Generated Flows (Gal/Day)	ADF Factor	Peak Generated Flow (Gal/day)	Peak Generated Flows (cfs)
Studio	33	1	33	150	4,950	4	19,800	0.031
1-Bedroom	274	1	274	150	41,100	4	164,400	0.254
2-Bedroom	66	2	132	150	19,800	4	79,200	0.123
3-Bedroom	28	3	84	150	12,600	4	50,400	0.078
Sub-total:	401		523		78,450		313,800	0.486

Source	SF	Seats (Refer to Note 2)	Design Flow (Gal/Day)	Generated Flows (Gal/Day)	ADF Factor	Peak Generated Flow (Gal/day)	Peak Generated Flows (cfs)
Retail	6,794	-	0.10	679.4	4	2,718	0.004
Dog Salon		2	250.00	500.0	4	2,000	0.003
Garage				1,000.0	4	4,000	0.006
Sub-total:				2,179.4		8,718	0.013

Total:	80,629	322,518	0.499
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Notes:

1. Retail design flow is calculated at 0.10 gpd per square foot of retail
2. Estimated GPD Sewage Flows obtained from the CT Public Health Code
3. No flow from Amenity spaces are accounted for as tenants will be using amenities
4. Potential garage flow assumes the garage is power washed with non-emulsion cleaning products.

Mannings Equation - Circular Pipe

Project: 441 Canal Street Development	Project #: 7300	Date: 1/26/2022
Location: 0, 441, 481 Canal Street & 50 John Street	By: AJP	Checked: BPM

15" Sanitary Pipe - Pipe #2 (John Street)

Calculate the maximum flow capacity using Manning's equation.

Pipe material	<input type="text" value="PVC"/>	▼	
Manning's n	0.011		
Pipe diameter, D	1.25 ft		
Area, A	1.23 ft ²		$A = \frac{\pi}{4} D^2$
Wetted perimeter, P	3.93 ft		$P = \pi D$
Hydraulic radius, R _h	0.31 ft		$R_h = \frac{A}{P}$
Slope, S	0.0018 ft/ft		
Flow, Q_{full}	3.24 cfs		$Q = \frac{1.486}{n} A R_h^{2/3} S^{1/2}$
Existing Flow, Q	1.75 cfs ¹		
Existing Flow to Flow Full, Q/Q_{full}	0.54	54.0%	
Proposed Added Flow to system, Q	0.499 cfs ²		
Proposed Total Flow to System	2.25	69.4%	

¹Estimated existing peak flow based upon monitored measured depth of flow in Ex.SMH#3. Maximum depth of flow measured = 0.49'. Factor of safety of 1.5 applied. Flow includes proposed sanitary sewer flow calculation for 523

² Refer to existing and proposed Sanitary Sewer Flow Calculations for further information.

Sanitary Sewage Analysis

Project: 523 Canal Street Development	Project #: 9657	Date: 3/27/2019
Location: 507/523 Canal Street & 46 John Street	By: TM	Checked: TM

Existing Sanitary Sewer Flows

Source	SF	Seats	Design Flow (Gal/Day) ²	Generated Flows (Gal/Day)	ADF Factor	Peak Generated Flow (Gal/day)	Peak Generated Flows (cfs)
Warehouse ¹	7,112	-	0.10	711.2	4	2,845	0.004
Sub-total:				711.2		2,845	0.004
Total:				711		2,845	0.004

Notes:

1. Per Tax Assessor Card, building on 507 Canal Street classified as Warehouse.
2. Estimated GPD Sewage Flows obtained from the CT Public Health Code
3. Industrial Building is calculated at 0.10 gpd per square foot of warehouse space

Sanitary Sewage Analysis

Project: 523 Canal Street Development	Project #: 9657	Date: 3/27/2019
Location: 507/523 Canal Street & 46 John Street	By: TM	Checked: TM

Proposed Sanitary Sewer Flows

Source	Units	# of Bedrooms	Bedrooms	Expected Flow (Gal/bed)	Generated Flows (Gal/Day)	ADF Factor	Peak Generated Flow (Gal/day)	Peak Generated Flows (cfs)
Studio	173	1	173	150	25,950	4	103,800	0.161
Sub-total:	173		173		25,950		103,800	0.161

Source	SF	Seats (Refer to Note 2)	Design Flow (Gal/Day)	Generated Flows (Gal/Day)	ADF Factor	Peak Generated Flow (Gal/day)	Peak Generated Flows (cfs)
Retail	1,602	-	0.10	160.2	4	641	0.001
Garage				1,000.0	4	4,000	0.006
Sub-total:				1,160.2		4,641	0.007

Total:	27,110	108,441	0.168
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Notes:

1. Retail design flow is calculated at 0.10 gpd per square foot of retail
2. Estimated GPD Sewage Flows obtained from the CT Public Health Code
3. No flow from Amenity spaces are accounted for as tenants will be using amenities
4. Potential garage flow assumes the garage is power washed with non-emulsion cleaning products.

Mannings Equation - Circular Pipe

Project: 523 Canal Street Development	Project #: 9657	Date: 3/27/2019
Location: 507/523 Canal Street & 46 John Street	By: VJH	Checked: TM

15" Sanitary Pipe - Pipe #2 (John Street)

Calculate the maximum flow capacity using Manning's equation.

Pipe material	<input type="text" value="PVC"/>	
Manning's n	0.011	
Pipe diameter, D	1.25 ft	
Area, A	1.23 ft ²	$A = \frac{\pi}{4} D^2$
Wetted perimeter, P	3.93 ft	$P = \pi D$
Hydraulic radius, R _h	0.31 ft	$R_h = \frac{A}{P}$
Slope, S	0.0018 ft/ft	
Flow, Q_{full}	3.24 cfs	$Q = \frac{1.486}{n} A R_h^{2/3} S^{1/2}$
Existing Flow, Q	1.58 cfs ¹	
Existing Flow to Flow Full, Q/Q_{full}	0.49	48.8%
Proposed Added Flow to system, Q	0.168 cfs ²	
Proposed Total Flow to System	1.75	54.0%

¹Estimated existing peak flow based upon monitored measured depth of flow in Ex.SMH#3. Maximum depth of flow measured = 0.49'. Factor of safety of 1.5 applied.

² Refer to existing and proposed Sanitary Sewer Flow Calculations for further information.

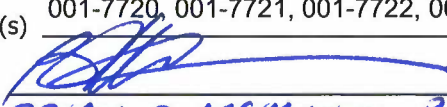
Appendix H

Checklist for Stormwater Management Report



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 Phone 203-977-4189

CHECKLISTS

Project Name: 441 Canal Street Development
 Project Address 0,441 & 481 Canal Street and 50 John Street
 Property Owner(s) Heyman Properties, LLC.
 Tax Account Number(s) 001-7720, 001-7721, 001-7722, 001-7723, 001-7724
 Engineer's Signature  Date: 02/03/2022
BRIAN P. MCMAHON, P.E.
FOR PEDNICKS AND MERRILL, INC.

All checklists must be completed and submitted. Provide a brief explanation for any items not provided. Check boxes as completed or N/A as not applicable.

✓	Existing Conditions Plan
✓	Stormwater Management Report
✓	Stormwater Management Plan / Construction Plan
	Certificate of Occupancy

Checklist for Existing Conditions Plan

I. General Information

✓	Site address
✓	Orientation, block, zone, City, street name
✓	Applicant name and legal address
✓	Surveyor name, address, contact information
✓	North arrow, bar scale, horizontal and vertical datum
✓	24" x 36" sheet size unless otherwise approved
✓	Existing conditions survey shall be prepared in accordance with the Minimum Standards for Surveys and Maps in the State of Connecticut. The class of survey shall be A-2 and T-2 and shall be represented as such on the map. The base map shall be sealed and signed by a Professional Land Surveyor licensed in the State of Connecticut.
✓	Drawing scale shall be set at 1" = 20' or 1" = 40' when possible



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II. Existing Conditions Plan Elements

	Show and label all property boundaries with linear bearing / distances and curve information
	Required zoning setbacks
	Show and label monument information
	Show and label at least one permanent benchmark on the parcel with northing, easting and elevation
	Label adjacent property ownership information
	Existing contours based on NAVD 88 (no exceptions) at 2 foot contour interval or 1 foot contour interval when slope is flatter than 2 percent at a minimum of 20 ft. beyond the property boundaries of the subject parcel
	Show spot elevations at low points, high points, and where topography is flatter than 2 percent
	All buildings and structures (label current use and finished floor elevations)
	All pavement, parking, driveways, property access points
	All roadways, streets, and rights-of-way. Label streets as public or private with street name
	All patios, decks, walkways, sidewalks, curb ramps (both adjacent to and opposite and existing roadways or intersections)
	Show and label (size, material, inverts) all existing utilities (overhead and underground) within the right-of-way and the project site (label ownership) including but not limited to water, gas and electrical services, wells, storm sewers, sanitary sewers and subsurface sewerage disposal systems.
	Show and label existing conveyance systems (swales, ditches, storm drains) including dimensions, elevations, sizes, slopes, and direction of flow
	Show and label boundaries of all easements, both public and private, with type, owner, and width
	Show and label all other existing features and improvements (e.g. light poles, mature trees of 8" (dbh) diameter or greater, vegetation, walls with top and bottom elevations, fences, pavement markings)

III. Resource Areas

N/A	Show and label limits of inland wetlands, tidal wetlands and any associated setbacks.
N/A	Show and label existing natural site features including tree canopy, outcroppings, permanent and intermittent watercourses, waterbodies, streams
N/A	Show and label limits of floodplain and floodway along with FIRM references (Community Number, Panel, Suffix, and Date) including any effective Letters of Map Revision/Amendment, zone designation and elevation.
N/A	Show and label any Conservation Easement Areas
N/A	Show and label Connecticut Coastal Jurisdiction Line (CJL)
N/A	Show and label existing steep slopes (25% and greater)



Checklist for Stormwater Management Report

I. Project Report

A. Applicant / Site Information

	Applicant name, legal address, contact information (email & phone)
	Engineers name, legal address, contact information (email & phone)
	Site address and legal description
	Current / proposed zoning and land use
	Site vicinity map (8.5" x 11")

B. Project Description and Purpose

	Project description including proposed project elements and anticipated construction schedule
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C. Existing Conditions Description

	Site area, ground cover, vegetation, features (roads, buildings, utilities, etc.)
	Site topography, slopes, drainage patterns, conveyances systems (swales, storm drains, etc.), stormwater discharge locations
	Receiving waterbody information including stormwater impairments and TMDL information (See the most recent State of Connecticut Integrated Water Quality Report)
	Site soils information including soil types, hydrologic soil group, bedrock / outcroppings, groundwater elevation, significant geologic features
	Provide NRCS Soils Mapping
	Resource protection areas (wetlands, streams, lakes, etc.), buffers, floodplains, floodways

D. Summary of Applicable General Design Criteria

N/A

	Methodology, design storm frequency
	Hydrologic design criteria
	Hydraulic design criteria
	Flood hazard areas

	Applying under "Lite" Stormwater Management: Skip to Section I (Refer to Flow Chart on page vii of the City of Stamford Stormwater Drainage Manual)
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E. Project Type in Accordance with Standard 1 Definitions

	Area of disturbance, receiving waterbody classification (High Quality, Tidal Wetlands, Direct Waterfront)
	Project type (development, redevelopment, linear development)
	Pollutant reduction standard per flowchart Section 2.4



F. Summary of LID Site Constraints

	Description of sensitive areas for protection
N/A	Mature tree inventory, which shall include 8-inch (dbh) diameter trees or greater
N/A	Steep slopes
N/A	Ledge and bedrock depth
N/A	Seasonal high groundwater elevation
N/A	Pollutant hotspots
N/A	Summary of infiltration rates

G. Summary of Proposed Stormwater Treatment Practices

	Proposed LID controls (i.e. minimize impervious, minimize DCIA, minimize disturbance, increase time of concentrations, other LID controls and strategies)
	Location, size, types
	Design criteria and references
	Stormwater treatment practice, drainage area characteristics / details

H. Summary of Compliance with Standards 1

	Required pollutant reduction criteria
	Provided pollutant reduction (WQV) by stormwater treatment practice
	Summary of compliance with Standard 1

I. Summary of Compliance with Standards 2, 3, and 4

	Description of proposed stormwater management system
	Pre-development site hydrology with delineation of each watershed area and sub-basin
	Post-development site hydrology with delineation of each watershed area and sub-basin
	Comparison table of pre- and post-development hydrology, peak flow, volume, and percent difference
	Summary table of watershed areas and sub-basin areas, time of concentration and runoff coefficients
	Summary table demonstrating the 2-year, 24-hour post development peak flow rate is less than or equal to the lowest of either: - The pre-development 1-year, 24-hour storm peak flow rate - 50 percent of the pre-development 2-year, 24-hour storm peak flow rate
	Conveyance protection, emergency outlet sizing
N/A	Hydraulic grade line summary and tail water elevation used in analysis
	Construction erosion and sediment control description, Standard 3
	Operation and Maintenance, maintenance tasks and schedule on construction plans per Standard 4



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J. Summary of Compliance with Applicable Drainage Facility Design Requirements

	Description of applicable design requirements and compliance
	Description of proposed drainage facilities and compliance

K. Stormwater Management Report

	Signed and stamped by professional engineer licensed in the State of Connecticut
	Drainage impact statement in accordance with Standard 5B.

II. **Supporting Calculations** (as appendix to Project Report)

	<u>Applying under "Lite" Stormwater Management: Skip to Section N</u>
--	--

L. Water Quality Volume / Water Quality Flow Calculations

	Calculations demonstrating the total Water Quality Volume generated by the post-development site and the required retention/treatment volume per Standard 1 in cubic feet.
	Calculations demonstrating the total Water Quality Volume retained/treated by each stormwater treatment practice and the total Water Quality Volume generated by the post-development contributing drainage area to each stormwater treatment practice

M. Stormwater Treatment Practice Sizing Calculations

	Calculations demonstrating how each stormwater treatment practice has been designed and sized in accordance with the Structural Stormwater BMP Design references in Appendix B. Calculations will vary by stormwater treatment practice, but a minimum, applicants shall provide calculations in accordance with design criteria from the Connecticut Stormwater Quality Manual.
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N. Hydrologic and Hydraulic Design Calculations

	Stream channel protection, Standard 2A
	Conveyance protection, Standard 2B
	Peak flow control (1-year, 2-year, 5-year, 10-year, 25-year, and 50-year storms), Standard 2C
	Inlet analysis
	Gutter flow (Site by site basis as requested by Engineering Bureau)
	Storm sewers and culverts (velocities, capacity, hydraulics)
	Hydraulic grade line required when pipe is flowing at full capacity <ul style="list-style-type: none"> o Provide existing and proposed summary table o Provide existing and proposed mapping, label structures
	Detention facilities (outlet structure, stage/storage, freeboard)
	Emergency outlet sizing, safely pass the 100 year storm, Standard 2D
	Outlet protection calculations, based on conveyance protection (i.e. riprap, energy dissipater)



O. Hydrologic and Hydraulic Model, Existing and Proposed

N/A

	Drainage routing diagram
	Summary
	Storage pond input

P. Downstream analysis (Site by site basis as required by the Engineering Bureau)

N/A

	Downstream analysis, Standard 2E
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III. Supporting Mapping (as appendix to Project Report)

Q. Pre-Development Drainage Basin Area Mapping

	11" x 17" or 8.5" x 11" sheet size
	Topography, drainage patterns, drainage area boundaries and sub basins, flow paths, times of concentration
	Locations of existing stormwater discharges
	Perennial and intermittent streams, wetlands, and floodplain / floodways
	NRCS soil types, locations, boring locations, infiltration testing locations
	Vegetation and groundcover
	Existing roads, buildings, driveways, parking areas, walks, patios, pools and other impervious surfaces, decks and other structures
	Location, size, type of existing structural stormwater controls, facilities and conveyance systems

R. Post-Development Drainage Basin Area Mapping

	11" x 17" or 8.5" x 11" sheet size
	Topography, drainage patterns, drainage area boundaries and sub basins, flow paths, times of concentration
	Locations of proposed stormwater discharges
	Perennial and intermittent streams, wetlands, and floodplain / floodways
	NRCS soil types, locations, boring locations, infiltration testing locations
	Vegetation, ground cover and proposed limits of clearing/disturbance
	Proposed, roads, buildings, driveways, parking areas, walks, patios, pools and other impervious surfaces, decks and other structures
	Location, size, type of proposed structural stormwater controls, facilities and conveyance systems

IV. DCIA Tracking Worksheet (as appendix to Project Report)

	DCIA Tracking Worksheet (Use form found in Appendix E)
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V. Proposed LID Review Map

	Applying under "Lite" Stormwater Management - Proposed LID Review Map <u>NOT</u> required.
--	---

A. General

	Site address
	Applicant name, legal address, contact information
	Engineers name, address, contact information
	North arrow, bar scale, horizontal and vertical datum
	Drawing scale shall be set at 1"=20' or 1"=40' when possible
	Signed and stamped by a Licensed Professional Engineer in the State of Connecticut
	11" x 17" or 24" x 36" sheet size unless otherwise approved
	Existing and proposed contours based on NAVD 88 at 2 foot contour interval or 1 foot contour interval when slope is flatter than 2 percent
	Locations of existing stormwater discharges
	Roads, buildings, driveways, parking areas, walks, patios, pools and other impervious surfaces, and decks and other structures
	Location, size, ownership of stormwater conveyance systems (swales, pipes, etc.)

B. LID Constraints:

	Boring / test pit locations
	Infiltration testing locations and results
	Vegetation and proposed limits of clearing / disturbance
	NRCS soils mapping
	Steep slopes
	Surface waters / Perennial and intermittent streams
	Resource protection areas and buffers, wetlands, floodplain / floodways
	Existing vegetation and mature trees, which shall include 8-inch (dbh) diameter trees or greater
	Poor soils (HSG C & D)
	Shallow bedrock / ledge
	Seasonal high groundwater elevation
	Other site constraints (e.g. brownfield caps)

C. Proposed Stormwater Treatment Measures:

	Location, size, type, limits, and WQV provided by each proposed stormwater treatment practices
	Drainage area to each proposed stormwater treatment practice (total area, impervious area, WQV)

D. Site Summary Table:

	Total site area, disturbed area, pre- and post-development impervious areas
	Required pollutant reduction volume (retention or detention)
	Provided pollutant reduction volume (retention or detention)



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Checklist for Stormwater Management Plan / Construction Plans

A. General

Site orientation, address and legal description
Applicant name, legal address, contact information
Engineers name, address, contact information
North arrow, bar scale, horizontal and vertical datum
Drawing scale shall be set at 1"=20' or 1"=40' when possible
Stamped by a Licensed Professional Engineer in the State of Connecticut
24" x 36" sheet size unless otherwise approved

B. Site Development Plans

City of Stamford Standard Notes
As required by the Drainage Maintenance Agreement, provide a written narrative describing the nature of the proposed development activity and the program for operation and maintenance of drainage facilities and control measures throughout the life of the project.
Existing and proposed contours based on NAVD 88 at 2 foot contour interval or 1 foot contour interval when slope is flatter than 2 percent
All required spot elevations to clearly depict positive pitch
Top and bottom elevation of all walls
Roads, buildings, driveways, parking areas, walks, patios, pools and other impervious surfaces, and decks and other structures
All utilities and easements
Location, size, maintenance access, type of proposed structural stormwater controls and facilities with elevations and inverts
Location, size, maintenance access, type of proposed non-structural stormwater controls and facilities with elevations and inverts
Location, size, type of proposed stormwater infrastructure, inlets, manholes, infiltration and detentions systems, control structures with elevations and inverts
Location, size, ownership of stormwater conveyance systems (swales, pipes, etc.) with elevations and inverts
Identify roof leaders, curtain drains and foundation drains with elevations and inverts
Proposed water quality treatment systems, size and model type
Final stabilization measures which may include slope stabilization

C. Erosion and Sedimentation Control Plan

N/A

Phasing and schedule
Construction access and staging and stock pile areas
Operation and maintenance of erosion and sedimentation controls
Tree protection
Downstream protection such as location of silt fencing
Limit of disturbance
Construction fencing



City of Stamford
 Engineering Bureau
 888 Washington Boulevard, 7th Floor Stamford, CT 06901
 Phone 203-977-4189

D. Construction Details

	Standard City of Stamford details
N/A	Infiltration system details
N/A	Control structure details
	Water quality treatment details
N/A	Infiltration testing results

Checklist for Certificate of Occupancy

	Final Improvement Location Survey
	Stormwater Management Certification Form
	Final DCIA Tracking Worksheet
	Standard City of Stamford Drainage Maintenance Agreement (Agreement Covenant)

Other Certifications at the discretion of the Engineering Bureau and/or EPB

	Wall Certification
	Landscape Certification
	Landscape Maintenance Agreement
	Waiver Covering Storm Sewer Connection
	Waiver Covering Granite Block, Depressed Curb, and Driveway Aprons
	Flood Certification