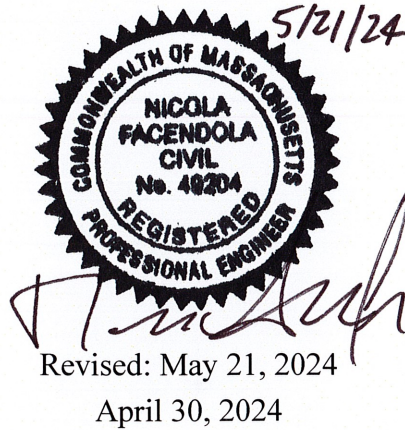


**STORMWATER REPORT**  
FOR  
SINGLE-FAMILY ATTACHED DEVELOPMENT  
61 PROGRESSIVE STREET  
WORCESTER, MASSACHUSETTS



Prepared By:  
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**LDG Project No.:**  
**2109.00**

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## **HYDROLOGIC SUMMARY**

### **METHODOLOGY**

The HydroCAD computer program (HydroCAD) was used to model the existing and proposed hydrology of the site and design a stormwater management system. HydroCAD generates flood hydrographs dependent upon the type of land use, vegetation, soil types, land slope, watershed areas and rainfall data. HydroCAD also takes into account the antecedent moisture condition of the soil. The peak rate of runoff and volume of runoff are projected for the input storm frequency events (design storms).

Rainfall data was obtained from the precipitation data for Worcester for storm frequencies of 2-, 10-, 25- and 100-year storm return from Extreme Precipitation Tables Northeast Regional Climate Center; these were then input into HydroCAD. Rainfall data is attached herein. A 24-hour type III rainfall distribution was used in the HydroCAD analysis as prescribed for New England by the USDA Soil Conservation Service (SCS).

### **EXISTING CONDITIONS**

The existing site is located at MBL34-12-30 located at 61 Progressive Street, Worcester, MA. The site contains approximately 10,000±sf. and is located within a RL-7 Residential Zoning District.

The existing site currently has a single family dwelling and two sheds, with less than 5% grades on site. The site has no structured stormwater management system with all stormwater runoff from the site draining to Progressive Street and flowing into an existing catch basin located to the North of the site in the Progressive Street right-of-way. The site is not within a FEMA Flood Zone and there are no on-site bordering vegetated wetlands.

The on-site soils as classified by the Soil Survey for Worcester County Massachusetts, Northeastern Part are documented as Paxton fine sandy loam (305B) and Udorthents, smoothed (651). A Hydrologic Soil Group C rating was utilized for the pre-and post- and post-development hydrologic analysis. The Soil Survey Map is attached herein.

### **POST-DEVELOPMENT CONDITIONS**

The Applicant proposes to develop the site and construct a three (3) unit single-family attached dwelling. Development activities will include clearing and grubbing of the entire site, construction of the proposed 3-unit structure and associated driveways, and installation of on-site utilities with water and sewer to be connected to existing City mains.

A new fully compliant stormwater management system has been designed to mitigate the impacts of the proposed site development. Runoff from the building rooftops will be directed to on-site BMPs which will include a subsurface Stormtech 740 Infiltration Chambers dedicated for roof top runoff. The Stormtech system is designed with an overflow which discharges to the surface.

Compliance with the 10 MADEP Stormwater Standards for the proposed development is detailed below.

### **STANDARD 1: Untreated Discharges**

Stormwater Management Standard 1 requires that, “No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth”.

This standard is met by the proposed development not creating any new non-treated stormwater discharges and improving an existing site with no existing stormwater management system. All surface runoff from the proposed impervious surfaces is collected by the proposed stormwater management practices, treated for suspended solids removal, infiltrated for groundwater recharge and detained for peak flow mitigation prior to discharge to designated areas that mimic existing drainage flow patterns. The development of the site is a significant improvement to the existing conditions which have stormwater runoff from grass and impervious surfaces running into the Progressive Street right-of-way untreated with no controls.

### **STANDARD 2: Peak Rate Control and Flood Prevention**

Stormwater Management Standard 2 requires that “Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for land subject to coastal storm flowage.”

This standard is met by the proposed development mitigating the post-development peak discharge rates at the designated control point for all design storm events. This is accomplished by directing rooftop runoff to a Stormtech Infiltration System. Below is a description of the control point used in the hydrologic analysis and a summary of pre- and post-development discharge rates. The development of the site is an improvement to the existing conditions which contains no peak runoff controls. The proposed development will reduce the peak rate of runoff at all the design control points. The site will also provide ample groundwater recharge.

## SUMMARY OF PEAK STORMWATER RUNOFF (CFS)

Control Point DP-1 is the property line abutting the Progressive Street right-of-way.

<b>Control Point – DP-1</b>		
Storm	Pre-Dev. Flow	Post-Dev. Flow
2-yr	0.48 cfs	0.23 cfs
10-yr	0.98 cfs	0.49 cfs
25-yr	1.39 cfs	0.70 cfs
100-yr	2.08 cfs	1.14 cfs

The net peak discharge and volume are controlled and does not increase at the control points for any of the evaluated design storms.

### **STANDARD 3: Recharge to Groundwater**

Stormwater Management Standard 3 requires that “Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures, including environmentally sensitive site design, low impact development techniques, best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from the pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.”

This standard is fulfilled by directing all rooftop runoff to a sub-surface infiltration system. The system is designed to infiltrate all storm events, besides the 100-yr storm event. In the case of a high-intensity storm event, the system is fitted with a surface overflow which convey the excess stormwater to the designated discharge point. The development of the site is a significant improvement to the existing conditions which contains no treated stormwater infiltration. The proposed development captures stormwater from the roofs and directs it to a constructed stormwater infiltration BMP with the required pre-treatment in excess of 44%. Below is a detailed calculation demonstrating full compliance with the recharge to groundwater requirements.

### GROUNDWATER RECHARGE

The total post-development impervious area including the proposed building rooftop totals 3,213± s.f. The required recharge volume is calculated as follows.

Required Recharge Volume for the Development = (3,213± s.f of impervious area) x (0.25 in of runoff for hydrologic soil group C) x (1 ft./12 in.)= 67± cu. ft.

For the site-specific soils, a permeability rate of 2.41 inches per hour was used, based on the Rawls Rate. The HydroCAD analysis provides the following results:

YEAR STORM	RECHARGE TO GROUNDWATER (Cu. Ft.)
2	566
10	871
25	1,133
100	1,612

The recharge volume requirement of 67± cu. ft. is far exceeded for each evaluated design storm. See the provided proposed HydroCAD calculations for each design storm event attached herein.

#### **STANDARD 4: 80% TSS Removal**

Stormwater Management Standard 4 requires that “Stormwater management systems must be designed to remove 80% of the average annual post-construction of Total Suspended Solids (TSS). This standard is met when:

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

This proposed 3-unit single-family attached development includes only the creation of three small residential driveways which will drain towards Progressive Street. The MADEP Stormwater Handbook Standards do not apply to small residential structures containing four or fewer units. Despite the development not being subject to the Stormwater Standards the design includes one subsurface infiltration system which will collect, treat, and fully infiltrate the runoff from the rooftop and will provide for 90% TSS Removal.

#### **STANDARD 5: Higher Potential Pollutant Loads**

Stormwater Management Standard 5 requires that “For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention, all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt and stormwater runoff, the proponent shall use the specific stormwater BMPs determined by the Department to be suitable for such use as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean

Waters Act, M.G.L. c. 2, §26-53, and the regulations promulgated thereunder at 314 CMF 3.00, 314 CMR 4.00 and 314 CMR 5.00.”

The proposed development is not classified as a use creating a Higher Potential Pollutant Load.

#### **STANDARD 6: Critical Areas**

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

The proposed development site is not located within a Critical Area as defined in the Massachusetts Stormwater Handbook.

#### **STANDARD 7: Redevelopment and Other Projects Subject to the Standards only to the Maximum Extent Practicable**

The definition of a Redevelopment Project under the definition provided in the MADEP Stormwater Handbook for Standard 7 is listed below:

“Development rehabilitation, expansion and phased projected on previously developed sites, provided that redevelopment results in no net increase in impervious area.”

The proposed development is a redevelopment site as classified by the Standard 7 Requirements.

#### **STANDARD 8: Erosion and Sediment Control**

Stormwater Management Standard 8 requires that “A plan to control construction-related impacts, including erosion sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan), must be developed and implemented.”

This standard is met by including erosion and sediment controls within the design plans. A gravel construction entrance is proposed at the access point to the site once the pavement is removed from that area of the site. 9” Silt Soxx is proposed at the limits of all site-related construction activities.

A Construction Period Pollution and Erosion & Sedimentation Control Plan has also been prepared for and is included as part of the Stormwater Report.

### **STANDARD 9: Operation and Maintenance**

Stormwater Management Standard 9 requires that, “A long-term operation and maintenance plan must be developed and implemented to ensure that stormwater management systems function as designed”.

This standard is fully met with the development and implementation of an Operation and Maintenance Plan included in Stormwater Management Report.

### **STANDARD 10: Illicit Discharges**

Stormwater Management Standard 10 requires that, “All illicit discharges to the stormwater management system are prohibited”.

This standard is fully met with the development and implementation of a Long Term Pollution Prevention Plan. This plan will outline all potential pollution sources and the appropriate measures to be taken should a spill or discharge occur. An Illicit Discharge statement has been prepared and is included herein.

### **MINIMUM STANDARD 11: STORMWATER MANAGEMENT SYSTEM OPERATION AND MAINTENANCE**

See the O&M for this development prepared by Level Design Group.

### **CONCLUSION**

The proposed development meets or exceeds the current MADEP Stormwater Management Standards and Guidelines and provides a stormwater management system that will maintain water quality while attenuating peak rates of runoff at the control points. This was achieved by directing the stormwater runoff to a sub-surface infiltration system which attenuate peak flows while maximizing groundwater recharge and providing a high level of TSS removal. An Operation and Maintenance Plan for post-construction maintenance of the Stormwater Management System has been developed and is included with this report. Additionally, an Erosion and Sediment Control Plan has been incorporated into the design plan sheet along with the site plans addressing all required design elements to ensure that the proposed development will not adversely affect the surrounding area.



## **MADEP Stormwater Checklist**



# Checklist for Stormwater Report

## B. Stormwater Checklist and Certification

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

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

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

### Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



 4/30/24  
Signature and Date

## Checklist

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

- New development
- Redevelopment
- Mix of New Development and Redevelopment



# Checklist for Stormwater Report

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## Checklist (continued)

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

- No disturbance to any Wetland Resource Areas
- Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- Reduced Impervious Area (Redevelopment Only)
- Minimizing disturbance to existing trees and shrubs
- LID Site Design Credit Requested:
  - Credit 1
  - Credit 2
  - Credit 3
- Use of "country drainage" versus curb and gutter conveyance and pipe
- Bioretention Cells (includes Rain Gardens)
- Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- Treebox Filter
- Water Quality Swale
- Grass Channel
- Green Roof
- Other (describe): \_\_\_\_\_

### Standard 1: No New Untreated Discharges

- No new untreated discharges
- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

### Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
  - Static
  - Simple Dynamic
  - Dynamic Field<sup>1</sup>
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
  - Site is comprised solely of C and D soils and/or bedrock at the land surface
  - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
  - Solid Waste Landfill pursuant to 310 CMR 19.000
  - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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<sup>1</sup> 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

### Standard 4: Water Quality

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

- Good housekeeping practices;
  - Provisions for storing materials and waste products inside or under cover;
  - Vehicle washing controls;
  - Requirements for routine inspections and maintenance of stormwater BMPs;
  - Spill prevention and response plans;
  - Provisions for maintenance of lawns, gardens, and other landscaped areas;
  - Requirements for storage and use of fertilizers, herbicides, and pesticides;
  - Pet waste management provisions;
  - Provisions for operation and management of septic systems;
  - Provisions for solid waste management;
  - Snow disposal and plowing plans relative to Wetland Resource Areas;
  - Winter Road Salt and/or Sand Use and Storage restrictions;
  - Street sweeping schedules;
  - Provisions for prevention of illicit discharges to the stormwater management system;
  - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
  - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
  - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
  - Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
    - is within the Zone II or Interim Wellhead Protection Area
    - is near or to other critical areas
    - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
    - involves runoff from land uses with higher potential pollutant loads.
  - The Required Water Quality Volume is reduced through use of the LID site Design Credits.
  - Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
  - The ½" or 1" Water Quality Volume or
  - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does **not** cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

### Standard 6: Critical Areas

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



# Checklist for Stormwater Report

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## Checklist (continued)

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

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
  - Limited Project
  - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
  - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
  - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
  - Bike Path and/or Foot Path
  - Redevelopment Project
  - Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
  - Construction Period Operation and Maintenance Plan;
  - Names of Persons or Entity Responsible for Plan Compliance;
  - Construction Period Pollution Prevention Measures;
  - Erosion and Sedimentation Control Plan Drawings;
  - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
  - Vegetation Planning;
  - Site Development Plan;
  - Construction Sequencing Plan;
  - Sequencing of Erosion and Sedimentation Controls;
  - Operation and Maintenance of Erosion and Sedimentation Controls;
  - Inspection Schedule;
  - Maintenance Schedule;
  - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- The project is **not** covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

### Standard 9: Operation and Maintenance Plan

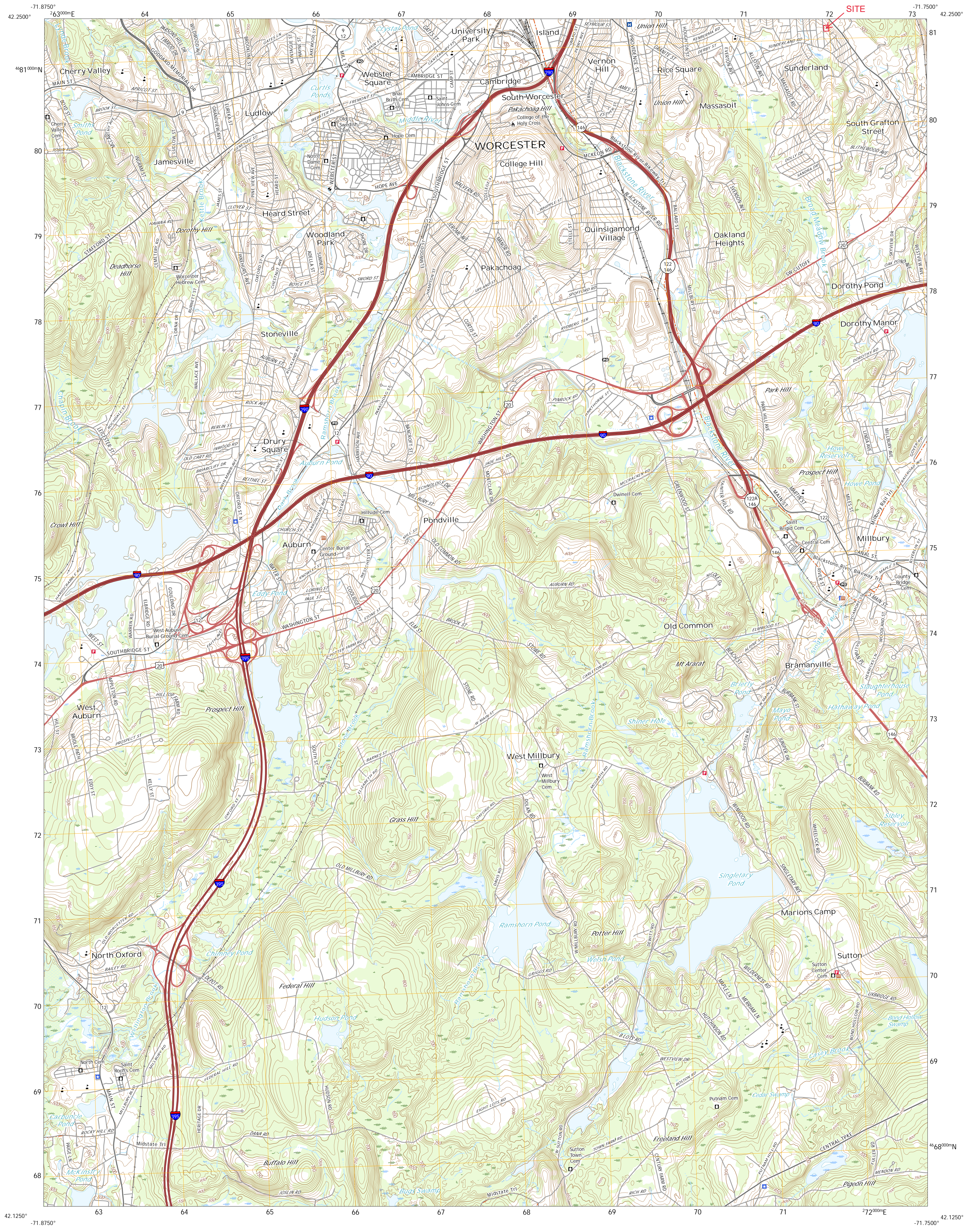
- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
  - Name of the stormwater management system owners;
  - Party responsible for operation and maintenance;
  - Schedule for implementation of routine and non-routine maintenance tasks;
  - Plan showing the location of all stormwater BMPs maintenance access areas;
  - Description and delineation of public safety features;
  - Estimated operation and maintenance budget; and
  - Operation and Maintenance Log Form.
- The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
  - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
  - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

### Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

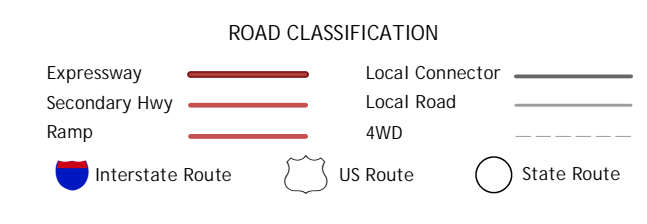
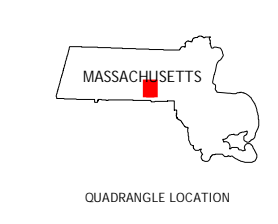
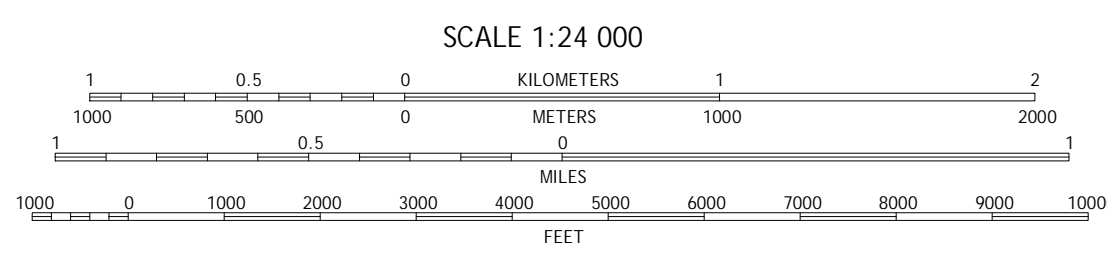
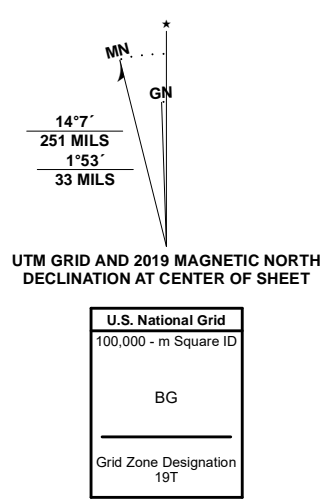


## USGS TOPOGRAPHIC QUAD



Produced by the United States Geological Survey  
North American Datum of 1983 (NAD83)  
World Geodetic System of 1984 (WGS84) Projection and  
1 000-meter grid/Universal Transverse Mercator, Zone 18T  
This map is not a legal document. Boundaries may be  
generalized for this map scale. Private lands within government  
reservations may not be shown. Obtain permission before  
entering private lands.

Imagery.....NAIP, July 2016 - September 2016  
Roads.....U.S. Census Bureau, 2018  
Names.....GNS, 1974 - 2018  
Hydrography.....National Hydrography Dataset, 2004  
Contours.....National Elevation Dataset, 1998 - 2012  
Boundaries.....Multiple sources; see metadata file 2016 - 2017  
Wetlands.....FWS National Wetlands Inventory 2008



ADJOINING QUADRANGLES

1	2	3
4	5	6
7	8	

1 Paxton  
2 Worcester North  
3 Shrewsbury  
4 Leicester  
5 Grafton  
6 Webster  
7 Oxford  
8 Uxbridge

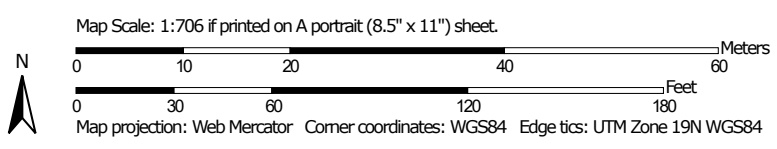


## **On-Site Soils Documentation**






































Soil Map—Worcester County, Massachusetts, Northeastern Part



Soil Map may not be valid at this scale.



## MAP LEGEND

-  Area of Interest (AOI)
-  Area of Interest (AOI)
-  Soil Map Unit Polygons
-  Soil Map Unit Lines
-  Soil Map Unit Points
- Special Point Features**
-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot
-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features
- Water Features**
-  Streams and Canals
- Transportation**
-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads
- Background**
-  Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

**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: Worcester County, Massachusetts, Northeastern Part  
 Survey Area Data: Version 18, Sep 10, 2023

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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.

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
305B	Paxton fine sandy loam, 3 to 8 percent slopes	2.6	99.7%
651	Udorthents, smoothed	0.0	0.3%
<b>Totals for Area of Interest</b>		<b>2.6</b>	<b>100.0%</b>

## FEMA FIRM Map

**NOTES TO USERS**

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where Base Flood Elevations (BFEs) and/or Floodway Data and/or Summary of Stillwater Elevations tables are contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM, users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. The FIRM does not show the exact elevation of the water surface. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

**Coastal Base Flood Elevations** shown on this map apply only to backwaters of 0.0' above Mean High Water (MHW) for the 1988 (MHW 88) FIRM and users should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was Massachusetts State Plane Mainland Zone (FIPS zone 2001). The horizontal datum was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion from the datum used in this map to the datum used in the National Geodetic Survey website at <http://www.ngs.noaa.gov>, or contact the National Geodetic Survey at the following address:

NGS Information Services  
NOAA, NWS/OS  
National Geodetic Survey  
SSM/C-3, #9202  
1315 East-West Highway  
Silver Spring, Maryland 20910-3282  
(301) 713-3242

To obtain current elevation, description, and/or location information for bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at <http://www.ngs.noaa.gov>.

**Base map** information shown on this FIRM was derived from digital orthographic information systems (MassGIS). Ortho imagery was produced at a scale of 1:5,000. Aerial photography is dated April 2005.

The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data and the profile baseline, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

**Copyright** limits shown on this map are based on the best data available at the time of publication. Because changes due to annotations or re-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the community showing the location of the community on the National Flood Insurance Program and a listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM, visit the **Map Service Center (MSC)** website at <http://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have questions about this map, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange (FMIX) at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/rifp>.

**LEGEND**

**SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**  
The 1% annual chance flood is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard are shown on this map with the following symbols and colors:  
The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

**ZONE A**  
No Base Flood Elevations determined.

**ZONE AE**  
Base Flood Elevations determined.

**ZONE AH**  
Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

**ZONE AO**  
Flood depths of 1 to 3 feet (usually areas of ponding); average flood elevations determined; areas of Special Flood Hazard also determined.

**ZONE AR**  
Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a levee system. The former flood control system is being removed to provide protection from the 1% annual chance or greater flood.

**ZONE A99**  
Areas to be protected from 1% annual chance flood by a Federal flood control project.

**ZONE V**  
Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

**ZONE VE**  
Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

**FLOODWAY AREAS IN ZONE AE**  
The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

**OTHER FLOOD AREAS**  
Areas of 0.2% annual chance flood; areas of 1% annual chance flood with wave action; and areas protected by levees from 1% annual chance flood.

**OTHER AREAS**  
Areas determined to be outside the 0.2% annual chance floodplain.

**AREAS IN WHICH FLOOD HAZARDS ARE UNDETERMINED, BUT POSSIBLE**

**COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**  
CBRS areas and OPHs are normally located within or adjacent to Special Flood Hazard Areas.

**OTHERWISE PROTECTED AREAS (OPHs)**  
OPHs are normally located within or adjacent to Special Flood Hazard Areas.

**1% Annual Chance Floodplain Boundary**

**0.2% Annual Chance Floodplain Boundary**

**Floodway boundary**

**Zone D boundary**

**CBRS and OPH boundary**

**Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.**

**Base Flood Elevation line and value; elevation in feet\***

**Base Flood Elevation value where uniform within zone; elevation in feet\***

**\*Referenced to the North American Vertical Datum of 1988**

**Cross section line**

**Transect line**

**Culvert**

**Bridge**

**Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere**

**1000-meter ticks: Massachusetts State Plane Mainland Zone (FIPS Zone 2001), Lambert Conformal Conic projection**

**1000-meter Universal Transverse Mercator grid values, zone 19N**

**Bench mark (see explanation in Notes to Users section of this FIRM panel)**

**River Mile**

**MAP REPOSITORIES**

**Refer to Map Repositories list on Map Index**

**EFFECTIVE DATE OF COUNTY-WIDE FLOOD INSURANCE RATE MAP**

**EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL**

**For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.**

**To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-877-336-2627.**

**MAP SCALE 1" = 500'**

**0 500 1000 FEET**

**0 150 300 METERS**

**FOR COMMUNITY MAP REVISION HISTORY PRIOR TO COUNTY-WIDE MAPPING, REFER TO THE COMMUNITY MAP HISTORY TABLE LOCATED IN THE FLOOD INSURANCE STUDY REPORT FOR THIS JURISDICTION.**

**TO DETERMINE IF FLOOD INSURANCE IS AVAILABLE IN THIS COMMUNITY, CONTACT YOUR INSURANCE AGENT OR CALL THE NATIONAL FLOOD INSURANCE PROGRAM AT 1-877-336-2627.**

**MAP REPOSITORIES**

**REFER TO MAP REPOSITORIES LIST ON MAP INDEX**

**EFFECTIVE DATE OF COUNTY-WIDE FLOOD INSURANCE RATE MAP**

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**MAP REPOSITORIES**

**REFER TO MAP REPOSITORIES LIST ON MAP INDEX**

**EFFECTIVE DATE OF COUNTY-WIDE FLOOD INSURANCE RATE MAP**

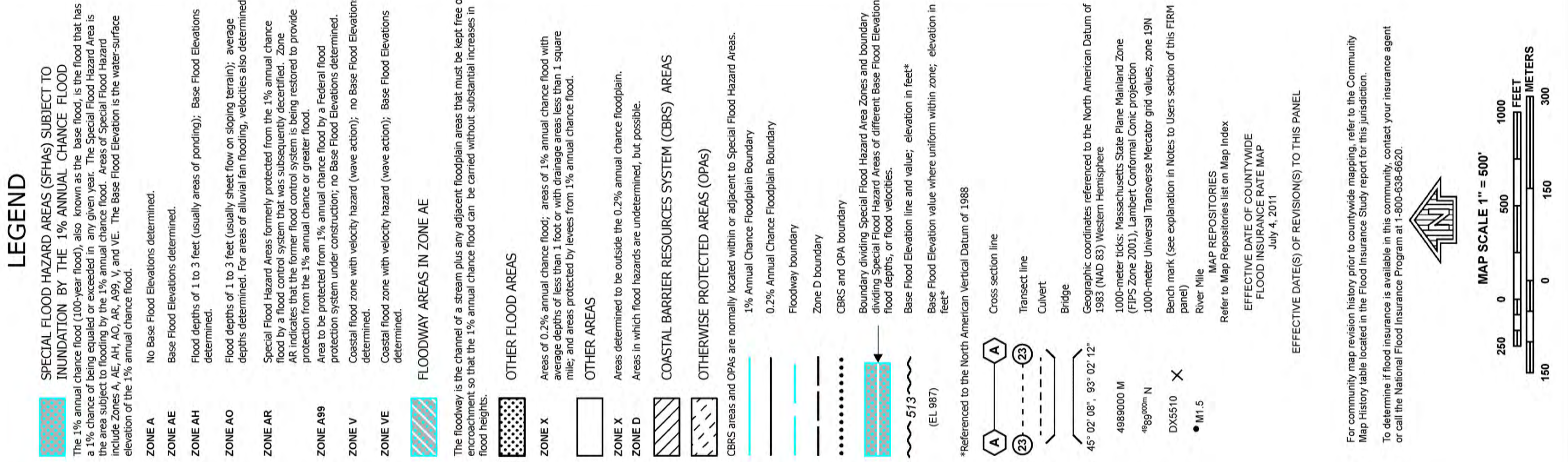
**EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL**

**FOR COMMUNITY MAP REVISION HISTORY PRIOR TO COUNTY-WIDE MAPPING, REFER TO THE COMMUNITY MAP HISTORY TABLE LOCATED IN THE FLOOD INSURANCE STUDY REPORT FOR THIS JURISDICTION.**

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**MAP REPOSITORIES**

**REFER TO MAP REPOSITORIES LIST ON MAP INDEX**



**NFIP**

**FIRM**

**FLOOD INSURANCE RATE MAP**

**WORCESTER COUNTY, MASSACHUSETTS (ALL JURISDICTIONS)**

**PANEL 807E**

**(SEE MAP INDEX FOR FIRM PANEL LAYOUT)**

**PANEL 807E OF 1075**

**CONTAINS:**

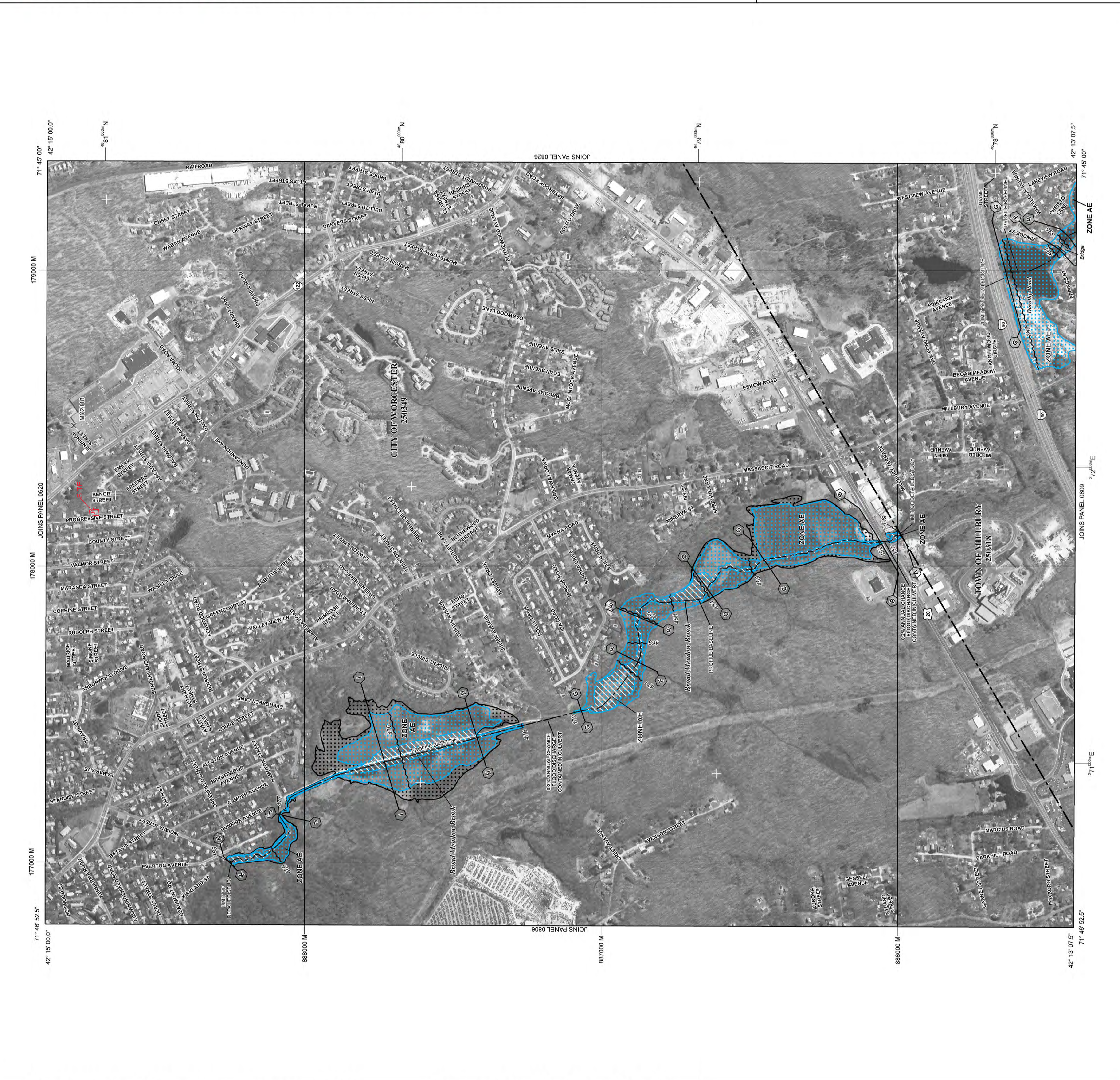
COMMUNITY	NUMBER	PANEL	SHEET
MILLBURY TOWN OF	250318	0807	E
WORCESTER CITY OF	250349	0807	E

**Notice to User:** The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

**MAP NUMBER**  
25027C0807E

**EFFECTIVE DATE**  
JULY 4, 2011

**Federal Emergency Management Agency**



**NFIP**

**FIRM**

**FLOOD INSURANCE RATE MAP**

**WORCESTER COUNTY, MASSACHUSETTS (ALL JURISDICTIONS)**

**PANEL 0807E**

**(SEE MAP INDEX FOR FIRM PANEL LAYOUT)**

**PANEL 807E OF 1075**

**CONTAINS:**

COMMUNITY	NUMBER	PANEL	SHEET
MILLBURY TOWN OF	250318	0807	E
WORCESTER CITY OF	250349	0807	E

**Notice to User:** The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

**MAP NUMBER**  
25027C0807E

**EFFECTIVE DATE**  
JULY 4, 2011

**Federal Emergency Management Agency**



## 72-Hour Drawdown Hydrographs

**2109-HCAD**

Type III 24-hr 100-Year Rainfall=8.35"

Prepared by Level Design

Printed 4/22/2024

HydroCAD® 10.00-26 s/n 04015 © 2020 HydroCAD Software Solutions LLC

**Hydrograph for Pond 102: SC-740**

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0.000	564.92	0.00	0.00	<b>0.00</b>
2.00	0.00	0.000	564.92	0.00	0.00	0.00
4.00	0.00	0.000	564.92	0.00	0.00	0.00
6.00	0.01	0.000	564.92	0.01	0.01	0.00
8.00	0.01	0.000	564.92	0.01	0.01	0.00
10.00	0.02	0.000	564.93	<b>0.02</b>	<b>0.02</b>	0.00
12.00	<b>0.28</b>	<b>0.005</b>	<b>565.84</b>	<b>0.02</b>	<b>0.02</b>	0.00
14.00	<b>0.02</b>	<b>0.015</b>	<b>567.49</b>	0.02	0.02	0.00
16.00	0.01	0.014	567.27	0.02	0.02	0.00
18.00	0.01	0.012	566.86	0.02	0.02	0.00
20.00	0.01	0.009	566.39	0.02	0.02	0.00
22.00	0.00	0.005	565.91	0.02	0.02	0.00
24.00	0.00	0.002	565.43	0.02	0.02	0.00
26.00	0.00	0.000	564.92	0.00	0.00	0.00
28.00	0.00	0.000	564.92	0.00	0.00	0.00
30.00	0.00	0.000	564.92	0.00	0.00	0.00
32.00	0.00	0.000	564.92	0.00	0.00	0.00
34.00	0.00	0.000	564.92	0.00	0.00	0.00
36.00	0.00	0.000	564.92	0.00	0.00	0.00
38.00	0.00	0.000	564.92	0.00	0.00	0.00
40.00	0.00	0.000	564.92	0.00	0.00	0.00
42.00	0.00	0.000	564.92	0.00	0.00	0.00
44.00	0.00	0.000	564.92	0.00	0.00	0.00
46.00	0.00	0.000	564.92	0.00	0.00	0.00
48.00	0.00	0.000	564.92	0.00	0.00	0.00
50.00	0.00	0.000	564.92	0.00	0.00	0.00
52.00	0.00	0.000	564.92	0.00	0.00	0.00
54.00	0.00	0.000	564.92	0.00	0.00	0.00
56.00	0.00	0.000	564.92	0.00	0.00	0.00
58.00	0.00	0.000	564.92	0.00	0.00	0.00
60.00	0.00	0.000	564.92	0.00	0.00	0.00
62.00	0.00	0.000	564.92	0.00	0.00	0.00
64.00	0.00	0.000	564.92	0.00	0.00	0.00
66.00	0.00	0.000	564.92	0.00	0.00	0.00
68.00	0.00	0.000	564.92	0.00	0.00	0.00
70.00	0.00	0.000	564.92	0.00	0.00	0.00
72.00	0.00	0.000	564.92	0.00	0.00	0.00

## **Illicit Discharge Statement**

# Illicit Discharge Statement

FOR:

3-UNIT SINGLE FAMILY ATTACHED DEVELOPMENT  
61 PROGRESSIVE STREET, WORCESTER, MA

DEVELOPED BY:

GOLD STAR BUILDERS, INC.  
WORCESTER, MASSACHUSETTS

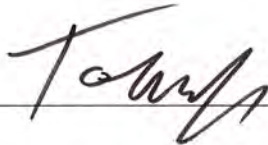
All illicit discharges to the Stormwater Management System are prohibited. The Stormwater Management System is the system for conveying, treating, and infiltrating stormwater. Illicit discharges to Stormwater Management Systems are discharges that are not entirely comprised of stormwater, but do not include discharges from the following activities or facilities:

- Firefighting
- Water Line Flushing
- Potable Water Sources
- Landscape Irrigation
- Potable Water Sources
- Uncontaminated Groundwater
- Air-conditioning Condensation
- Dechlorinated Water from Swimming Pools
- Water used for street washing
- Water used for clean residential buildings without detergents
- Foundation Drains

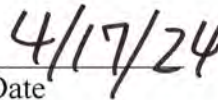
The site will be operated and maintained in accordance with the Operation and Maintenance Plan dated April 30, 2024 prepared by Level Design Group, LLC.

I, Tony Nguyen (*Applicant*) do hereby agree to comply with requirements set forth within the Illicit Discharge Statement and will not knowingly discharge illicit materials to the stormwater management system once it is brought online **upon** completion of construction.

Name:



Date





## Operation and Maintenance Plan



**OPERATION AND MAINTENANCE PLAN**  
FOR  
SINGLE-FAMILY ATTACHED DEVELOPMENT  
61 PROGRESSIVE STREET  
WORCESTER, MASSACHUSETTS

April 30, 2024

Prepared By:  
**Level Design Group, L.L.C.**  
**249 South Street, Unit 1**  
**Plainville, MA 02762**

Prepared For:  
GOLDSTAR BUILDERS, INC.  
6 JACQUES STREET  
WORCESTER, MA 01603

***LDG Project No.:***  
***2109.00***

The proposed Stormwater Management System is designed to function properly provided that routine maintenance is performed. It is the responsibility during construction and until purchase of the units that the Owner and Developer, Gold Star Builders, Inc (or any other future Owner), shall be responsible for the long- term maintenance to provide the required maintenance outlined in this plan for the site infiltration system as well as the remainder of the on-site storm drainage system.

Upon completion of construction, maintenance of driveways, off-site catch basins, and the stormwater appurtenances are required to ensure that sedimentation and pollution is controlled and that storm water infiltration capacity is sustained during the life of the system. The system maintenance will be the responsibility of the Site Owner(s). To ensure the proper functioning of these facilities the following maintenance practices will be used:

### **DRIVEWAYS & PARKING AREAS**

Driveways and Parking Areas are to be swept monthly to remove sand which has accumulated. Sand shall be removed from the site and legally disposed of. Leaves and debris which accumulates within the Driveways and Parking Areas during the summer and fall months shall be collected and legally disposed of.

#### *Winter Maintenance & Snow Removal*

Snow removal within Driveways and Parking Area shall be stockpiled outside of the traveled driveways. These areas should be located within or adjacent to the parking surface and should drain to the stormwater management system. Under no circumstances shall snow be directed onto abutting parcels or into the rain gardens.

*Estimated Yearly Cost \$400.00 (not including cost for snow plowing)*

### **GUTTERS AND DOWNSPOUTS**

#### *Summer & Fall Maintenance*

Leaves and debris which accumulates within the gutters during the summer and fall shall be collected and legally disposed of. Excessive water shall not be introduced to clean the gutters and the downspouts, and materials shall be collected so as not to clog the subsurface basin.

*Estimated Yearly Cost \$100.00*

## **SUBSURFACE INFILTRATION BASIN**

Once the system has gone online, inspections should occur after every storm event accumulating greater than 1 inch of rainfall for the first year to ensure proper stabilization and function. Attention should be paid to how long water remains standing in the chambers after a storm. Thereafter, the system should be inspected at least twice per year. Observations and measurements shall be made from the observation ports provided. Important items to check for include: differential settlement, cracking, erosion or leakage. If the system appears to be clogged or not functioning properly at any time, the system is to be flushed in accordance with the 10 year maintenance procedure listed below. Sediment should be removed from the system as necessary. Removal procedures should not take place until the pipes in the system are thoroughly dry. A vacuum truck is usually the most effective and convenient method. If the sediment has traveled past the reach of the vacuum truck the system shall be thoroughly flushed with water, a fire hose or the like is typically the most effective method of flushing.

The system shall be monitored at several intervals during and after a small and large rainfall event to ensure runoff is detained. Inlet and outlet pipes shall be kept free of obstructions. Any material obstructing the pipes shall be removed and legally disposed of.

*Estimated Yearly Cost \$200.00*

## **PUBLIC SAFETY FEATURES**

Many of the Public Safety Features of the Stormwater Management System are incorporated into its design. The stormwater management features are located below the surface which provides a greater level of safety over surface basins.

Despite all the well-designed safety features within the Stormwater Management System all components of the system must be properly maintained to be effective. All maintenance procedures detailed above must be done on schedule and documented. Standing, stagnant water provides mosquito-breeding habitat and increases the potential for disease transmission. All stormwater systems and rain gardens are designed to fully infiltrate within 72 hours after a storm even which will prevent standing water from becoming a safety hazard. Routine monitoring for and management of mosquito-breeding conditions by qualified maintenance staff is required during the peak breeding season between April and September ensure that unforeseen conditions do not develop.

While risks can be mitigated through proper design and maintenance, it is impossible to entirely eliminate risk. Therefore, public education regarding stormwater management facilities and their inherent risks is valuable and should be a part of every community's activity. Residents of the





units shall be given an overview of the Stormwater System and which areas to avoid. Public participation also increases the level of maintenance as community members can notify staff if a component of the stormwater system is not functioning properly.

**STORMWATER MANAGEMENT OPERATIONS AND MAINTENANCE LOG**

It is the responsibility of the developer to provide for maintenance of the parking areas and the storm drainage system until the site is turned over to the condominium association which will be created prior to the sale of any units. The log form below is a template and shall be reproduced as needed. Copies of all log forms shall be kept on file for a minimum of three years from the date of inspection.

<b>Name of Inspector:</b>
<b>Date and Time of Inspection:</b>
<b>Weather Conditions:</b>

<b>Stormwater BMP</b>	<b>Observations</b>	<b>Action Required</b>

**3-Unit Attached Single Family Development  
61 Progressive Street, Worcester, MA**

**OPERATION, INSPECTION AND MAINTENANCE REPORT FORM**

TO BE COMPLETED AS REQUIRED IN THE OPERATION AND MAINTENANCE REPORT

INSPECTOR: \_\_\_\_\_

DATE: \_\_\_\_\_

INSPECTOR'S QUALIFICATIONS:

\_\_\_\_\_  
\_\_\_\_\_

CONDITION OF TEMPORARY HAYBALES AND SILT FENCE CONTROL MEASURES IN PLACE:

\_\_\_\_\_  
\_\_\_\_\_

DAYS SINCE LAST RAINFALL: \_\_\_\_\_

AMOUNT OF LAST RAINFALL: \_\_\_\_\_ INCHES

SITE STORMWATER MEASURES					
AREA OF THE SITE	DATE SINCE LAST	DATE OF NEXT	STABILIZED? (YES/NO)	INSPECTED	CONDITION

ADDITIONAL REPAIRS OR MAINTENANCE REQUIRED/RECCOMENDED:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

TO BE PERFORMED BY: \_\_\_\_\_

ON OR BEFORE: \_\_\_\_\_

**3-Unit Attached Single Family Development  
61 Progressive Street, Worcester, MA  
INSPECTION AND MAINTENANCE REPORT FORM  
TEMPORARY AND PERMANENT STRUCTURAL CONTROLS**

DATE: \_\_\_\_\_

**DIVERSION SWALES AND SEDIMENT BASIN / TRAPS**

<b>SOIL STABILIZATION MEASURES</b>					
FROM	TO	BASIN/TRAP AND SWALE LOCATION	IS FILL STABILIZED?	CONDITIONS OF OUTLETS	IS THERE EVIDENCE OF WASHOUT OR OVERTOPPING?

MAINTENANCE REQUIRED FOR DIVERSION SWALES AND/OR BASINS AND TRAPS:

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---

TO BE PERFORMED BY: \_\_\_\_\_

ON OR BEFORE: \_\_\_\_\_





## **Long Term Pollution Prevention Plan**



**LONG TERM POLLUTION PREVENTION PLANS**  
FOR  
SINGLE-FAMILY ATTACHED DEVELOPMENT  
61 PROGRESSIVE STREET  
WORCESTER, MASSACHUSETTS

April 30, 2024

Prepared By:  
**Level Design Group, L.L.C.**  
**249 South Street, Unit 1**  
**Plainville, MA 02762**

Prepared For:  
GOLDSTAR BUILDERS, INC.  
6 JACQUES STREET  
WORCESTER, MA 01603

***LDG Project No.:***  
***2109.00***



### **GOOD HOUSEKEEPING PRACTICES**

It is the responsibility of the site operator, Goldstar Builders, Inc., to provide the required maintenance outlined in this plan. The Owner shall utilize good housekeeping practices as outlined in the Operation and Maintenance Plan required for the maintenance of the Stormwater Management System.

### **PROVISIONS FOR STORAGE OF MATERIALS AND WASTE PRODUCTS INSIDE OR UNDER COVER**

The storage of hazardous materials and waste will not be allowed outdoors. All hazardous materials, such as waste oil, fuel, etc. shall be stored indoors and hauled by Massachusetts licensed haulers of the specified materials.

### **VEHICLE WASHING CONTROLS**

Outdoor vehicle washing is not allowed at this site.

### **REQUIREMENTS FOR ROUTINE INSPECTION AND MAINTENANCE OF STORMWATER BMPs**

The Owner / Operator shall keep Maintenance Log Sheets of scheduled tasks as outlined in the Stormwater Management System Operation and Maintenance Plan.

### **SPILL PREVENTION AND RESPONSE PLANS**

The risk of significant spills requiring action at this site is limited and will most likely be associated with motor vehicle use or maintenance. A Spill Prevention, Control, and Countermeasure (SPCC) Plan for the site covering all potential pollution sources from the sales and maintenance of large trucks. All personnel working with potentially hazardous materials shall be educated on the requirements of the site SPCC Plan. In the event of a significant spill contact:

Massachusetts Department of Environmental Protection 24-hour emergency response notification line – (888) 304-1133

### **PROVISIONS FOR MAINTENANCE OF LAWNS, GARDENS, AND OTHER LANDSCAPED AREAS**

The use of chemical fertilizers is to be limited to the maximum extent practicable. If chemical fertilizers are to be used, they must be worked into the soil to prevent washouts and stormwater contamination of fertilizers.

**REQUIREMENTS FOR STORAGE AND USE OF FERTILIZERS, HERBICIDES, AND PESTICIDES**

If fertilizers, herbicides, and pesticides are to be used and stored on site they are to be stored in their original containers and keep in a dry, safe area where children do not have access to.

**PROVISIONS SOLID WASTE MANAGEMENT**

Solid waste management systems shall be inspected and maintained in accordance with state, local, and federal solid waste management regulations.

**EMERGENCY AND REGULATORY CONTACTS**

Worcester Fire Department:	911 / (508) 799-3473
Worcester Police Department:	911 / (508) 799-8466
Massachusetts Department of Environmental Protection - Southeast Regional Office:	(508) 946-2700
United State Environmental Protection Agency:	(617) 918-1111





**CONSTRUCTION PERIOD  
POLLUTION PREVENTION AND  
EROSION & SEDIMENT CONTROL PLAN**  
FOR  
SINGLE-FAMILY ATTACHED DEVELOPMENT  
61 PROGRESSIVE STREET  
WORCESTER, MASSACHUSETTS

April 30, 2024

Prepared By:  
**Level Design Group, L.L.C.**  
**249 South Street, Unit 1**  
**Plainville, MA 02762**

Prepared For:  
GOLDSTAR BUILDERS, INC.  
6 JACQUES STREET  
WORCESTER, MA 01603

***LDG Project No.:***  
***2109.00***

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### INTRODUCTION

This Construction Period Pollution Prevention and Erosion & Sediment Control Plan (CPPPESCP) is prepared in accordance Massachusetts Department of Environmental Protection (MADEP) Stormwater Guidelines. The construction activities include development of a 3-unit single family attached dwelling. Construction activities associated with the proposed building include the site grading, utilities and storm water management system. This CPPPESCP must be retained on-site during construction and available for the viewing of permitting authorities as appropriate during construction, as specified in the CPPPESCP.

The total area to be disturbed for overall site development includes approximately 10,000± sf., including the new building, driveways, drainage, utilities, landscaping and associated grading.

## **SECTION 1 – SITE & ACTIVITY DESCRIPTION**

### **1.1 PROJECT SITE OPERATOR**

Gold Star Builders, Inc.

### **1.2 SITE AND PROJECT DESCRIPTION**

#### **PRE-DEVELOPMENT CONDITIONS**

The existing site is located at MBL34-12-30 located at 61 Progressive Street, Worcester, MA. The site contains approximately 10,000±sf. and is located within a RL-7 Residential Zoning District.

The existing site currently has a single family dwelling and two sheds, with less than 5% grades on site. The site has no structured stormwater management system with all stormwater runoff from the site draining to Progressive Street and flowing into an existing catch basin located to the North of the site in the Progressive Street right-of-way. The site is not within a FEMA Flood Zone and there are no on-site bordering vegetated wetlands.

The on-site soils as classified by the Soil Survey for Worcester County Massachusetts, Northeastern Part are documented as Paxton fine sandy loam (305B) and Udorthents, smoothed (651). A Hydrologic Soil Group C rating was utilized for the pre-and post- and post-development hydrologic analysis. The Soil Survey Map is attached herein.

#### **POST-DEVELOPMENT CONDITIONS**

The Applicant proposes to develop the site and construct a three (3) unit single-family attached dwelling. Development activities will include clearing and grubbing of the entire site, construction of the proposed 3-unit structure and associated driveways, and installation of on-site utilities with water and sewer to be connected to existing City mains.

A new fully compliant stormwater management system has been designed to mitigate the impacts of the proposed site development. Runoff from the building rooftops will be directed to on-site BMPs which will include a subsurface Stormtech 740 Infiltration Chambers dedicated for roof top runoff. The Stormtech system is designed with an overflow which discharges to the surface.

### 1.3 CONSTRUCTION SEQUENCING

1. Install Erosion and Sediment Controls;
2. Remove Existing Pavement and Structures in Designated Areas / Clear and Grub Site;
3. Rough grade site;
4. Install stormwater management system within outdoor storage area;
5. Place binder coat pavement and bring drainage system online;
6. Construct Building Foundation;
7. Place binder coat pavement and bring second drainage system online;
8. Fine grade site and loam and seed all disturbed areas;
9. Install Landscaping;
10. Place top coat pavement;
11. Project close out.

### 1.4 ESTIMATED DISTURBANCE

The total area expected to be disturbed by excavation, grading, or other construction activities is approximately 10,000± sf. The area includes required for excavation, building construction, utility installation, and site grading for the new parking areas and driveways.

### 1.5 APPROVED STATE OR LOCAL PLANS

The project requires Approval from the City of Worcester Zoning Board and Conservation Commission. This CPPPESCP will be modified accordingly once all approvals are obtained.



## **SECTION 2 – CONTROLS TO REDUCE POLLUTANTS**

### **2.1 POLLUTION CONTROL & STABILIZATION MEASURES**

The area which will be disturbed during construction activities will hereafter be referred to as the ‘Site’. Areas where no earthwork is proposed shall be protected from disturbance with construction fencing, or other physical demarcation in the field to prevent unnecessary disturbance. Once Site earthwork begins, it should progress without delay until disturbed areas are stabilized. Soil shall be stockpiled outside of the resource areas and their associated buffer zone and be surrounded by staked or ballasted hay bales. If the stockpile will not be disturbed for 30 days or more, temporary seeding shall be spread over it within 7 days of the last disturbance.

The scope of the proposed project renders permanent stabilization more practical than temporary measures. Disturbed areas not proposed to be paved or occupied by the building shall be loamed and seeded upon completion of the subgrade and any utility excavation. Diversion swales shall be installed around the perimeter of the site to collect stormwater runoff during construction. The swales are to be constructed during the “rough grading” phase of the site work. The diversion swales are to be constructed in a manner where they do not intercept ground water and shall discharge to the on-site settling dewatering basin.

Completion of sub-grade driveway shall be followed immediately by the placement of the pavement binder course (finished paving may be delayed to prevent damage during other activities). Stabilization must be in place within 14 days of a temporary or permanent stop of construction activity, unless precluded by snow cover or if work is scheduled to restart within 21 days.

### **2.2 CONSTRUCTION RECORDS**

A record of the dates of key site activities shall be kept on the note pages provided in Appendix A of this document. The record shall include the following:

1. Dates when the site is cleared and grubbed.
2. Dates when major grading activities occur.
3. Dates when construction activities temporarily or permanently cease on a portion of the site.
4. Dates when stabilization measures are initiated.

### **2.3 STRUCTURAL PRACTICES**

The erosion control plan shows 9” Silt Soxx along the property lines. The erosion control line is to be inspected by Level Design Group, LLC after installation and prior to site work commencing on site.

## 2.4 STORM WATER MANAGEMENT

A new fully compliant stormwater management system has been designed to mitigate the impacts of the proposed site development. Runoff from the building rooftops will be directed to an on-site BMP which will include a subsurface Stormtech 740 Infiltration Chambers dedicated for roof top runoff, to mitigate and treat runoff. The Stormtech system is designed to fully infiltrate all storm events, but is fitted with an overflow which discharges to the surface.

## 2.5 DISCHARGE OF SOLID MATERIALS

A construction dumpster or other suitable receptacle shall be provided on-site for solid waste accumulation to preclude its entry into storm water systems.

Appropriate portable toilets shall be available at the site from the time when construction commences until the end of construction.

## 2.6 SEDIMENT TRACKING AND DUST CONTROL

Trucks are expected to arrive and leave the site with construction materials. The exit is to be established to control both dust and the tracking of soils onto public ways. After binder coat pavement has been placed all vehicles entering and exiting the site will be required to travel over the stabilized entrance/exit. If sediment accumulation is evident truck will be required to be rinsed off prior to exiting the site. Dust shall be controlled with limited amounts of water; calcium chloride shall not be utilized.

## 2.7 CONSTRUCTION WASTE STORAGE

A construction dumpster will be available at all times on-site throughout the construction process. If the need to store construction waste arises during construction the Project Site Operator will notify the City of Worcester Building Inspector in writing as to what materials are to be stored and what controls will be put in place to minimize exposure of the materials to storm water.

## 2.8 POLLUTANT SOURCES FROM NON-CONSTRUCTION AREAS

There are no anticipated pollutant sources from areas other than the proposed construction.

## 2.9 CONSTRUCTION DEWATERING

If constructed dewatering is required a dewatering stilling basin will be constructed outside of the 100-buffer zone to any bordering vegetated wetlands. The basin shall not be excavated into the groundwater table where it would intercept groundwater.

## **SECTION 3 – MAINTENANCE OF CONTROLS**

### **3.1 STANDARD MAINTENANCE**

The Erosion and Sedimentation Controls, Storm Water Management Controls and Other Controls implemented as part of the work should be expected to require maintenance.

If any of the perimeter controls are displaced from its intended location they shall be replaced and re-set to maintain a continuous barrier. At the completion of the project, all adjacent off-site catch basins shall be inspected for sediment in the sumps, and the sediment shall be removed, if present.

The control of dust will require frequent maintenance efforts to dampen disturbed areas as they are exposed or dry out. The crushed stone blanket to control the tracking of sediment onto the roadway leaving the site from the truck tires is expected to require periodic replacement as the voids become 80% full.

Portable toilets shall be maintained according to applicable local state and federal regulations, and the recommendations of the service employed for the maintenance.

Loamed and seeded areas may require periodic irrigation depending upon weather conditions during the several weeks after planting. The site shall not be considered stabilized until the seeded areas are well established.

### **3.2 MODIFICATIONS OR ADDITIONAL BMPs**

Any modifications to this CPPPESCP or additional required BMPs that appear to be necessary must be approved by the Design Engineer. Approved changes must be completed prior to the next storm event when practicable. If implementation before the next storm event is impracticable, the event must be recorded in the CPPPESCP and alternative BMPs must be implemented as soon as possible.

## **SECTION 4 - INSPECTIONS**

Bi-weekly inspections, no more than 14 days apart, shall be performed on the pollution prevention controls, and the conditions of the site environs relating to erosion, dust, mud tracking, and materials storage. These inspections shall begin the first week of site construction and continue throughout the project until all areas are permanently stabilized, including seeded areas becoming well established. The EPA, MADEP and other state and local agencies may visit the site and ask to inspect these logs along with this CPPPESCP. Inspections are also required within 24 hours of a major storm event, producing a total rainfall greater than 0.5 inches. All inspection must be followed by a report made on the pages bound in Appendix A. This report is to be kept on the site.

Inspections are to be made by qualified personnel. All site inspections will be performed by Level Design Group, L.L.C. personnel, whom prepared this CPPPESCP, and were responsible for the design and permitting of the project.

Inspections shall include all of the specified Erosion and Sedimentation Controls, Storm Water Management Controls and Other Controls. The report shall describe the scope of the inspection, the name and qualifications of the person making the inspection and the date of the inspection. Notes shall be taken describing the condition of disturbed areas and areas recently stabilized to assess the adequacy of the controls and/or the success of the permanent stabilization measures. Comments shall be entered regarding any major rainfall events and the success or problems with the control measures. Records of repairs or improvements shall also be made.

Any problems identified during the inspection shall be rectified by maintaining or repairing the controls specified in this CPPPESCP. If the controls are in good repair, but failing to effectively control pollution, this CPPPESCP must be revised within seven days of an unsatisfactory inspection, and noted in the inspection report.

## **SECTION 5 - NON-STORM WATER DISCHARGES**

This CPPPESCP does not provide for the discharge of any flows other than storm water, with the exception of firefighting water, which is excluded from the regulations.

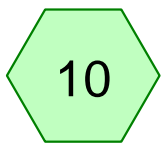
The proponent and contractor shall develop a spill management plan for and hazardous materials that may be stored on-site or employed during work in or around the buffer adjacent to the wetlands. Specifically, the proponent should be prepared to effectively deal with spillage of fuel or hydraulic fluids from equipment. A quick-absorbent material, such as Speedy Dry® or equivalent, will be stored in a dry readily available area, and used in the event petroleum-based fluids are spilled or leaked. The spent material is then to be containerized and disposed of properly. An emergency fuel boom or absorbent pads shall be readily available in case any such spill threatens the wetlands or surrounding waterways

No storage of hazardous materials shall take place within 50-feet of any installed and active drainage structure. If such storage takes place on a temporary basis, oil and sediment rolls shall be placed around such structure to prevent the movement of such materials into the structure.



# **HydroCAD Analysis – Existing Conditions**

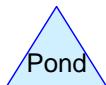
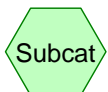
## **2, 10, 25, & 100-Year Storms**



Pre-1



Progressive Street



**2109-HCAD**

Prepared by Level Design

HydroCAD® 10.00-26 s/n 04015 © 2020 HydroCAD Software Solutions LLC

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*Type III 24-hr 2-Year Rainfall=3.88"*

Printed 5/21/2024

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points

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

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 10: Pre-1**

Runoff Area=10,000 sf 15.44% Impervious Runoff Depth=1.79"

Tc=6.0 min CN=78 Runoff=0.48 cfs 0.034 af

**Link DP-1: Progressive Street**

Inflow=0.48 cfs 0.034 af

Primary=0.48 cfs 0.034 af



**2109-HCAD**

*Type III 24-hr 10-Year Rainfall=6.06"*

Prepared by Level Design

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points

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

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 10: Pre-1**

Runoff Area=10,000 sf 15.44% Impervious Runoff Depth=3.63"

Tc=6.0 min CN=78 Runoff=0.98 cfs 0.069 af

**Link DP-1: Progressive Street**

Inflow=0.98 cfs 0.069 af

Primary=0.98 cfs 0.069 af

**2109-HCAD**

*Type III 24-hr 25-Year Rainfall=7.80"*

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points

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

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 10: Pre-1**

Runoff Area=10,000 sf 15.44% Impervious Runoff Depth=5.21"

Tc=6.0 min CN=78 Runoff=1.39 cfs 0.100 af

**Link DP-1: Progressive Street**

Inflow=1.39 cfs 0.100 af

Primary=1.39 cfs 0.100 af

**2109-HCAD***Type III 24-hr 100-Year Rainfall=10.70"*

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points

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

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 10: Pre-1**

Runoff Area=10,000 sf 15.44% Impervious Runoff Depth=7.93"

Tc=6.0 min CN=78 Runoff=2.08 cfs 0.152 af

**Link DP-1: Progressive Street**

Inflow=2.08 cfs 0.152 af

Primary=2.08 cfs 0.152 af

**2109-HCAD**

Type III 24-hr 100-Year Rainfall=10.70"

Prepared by Level Design

Printed 5/21/2024

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**Summary for Subcatchment 10: Pre-1**

Runoff = 2.08 cfs @ 12.09 hrs, Volume= 0.152 af, Depth= 7.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=10.70"

Area (sf)	CN	Description
8,456	74	>75% Grass cover, Good, HSG C
1,544	98	Impervious, HSG C
10,000	78	Weighted Average
8,456		84.56% Pervious Area
1,544		15.44% Impervious Area

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

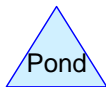
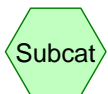
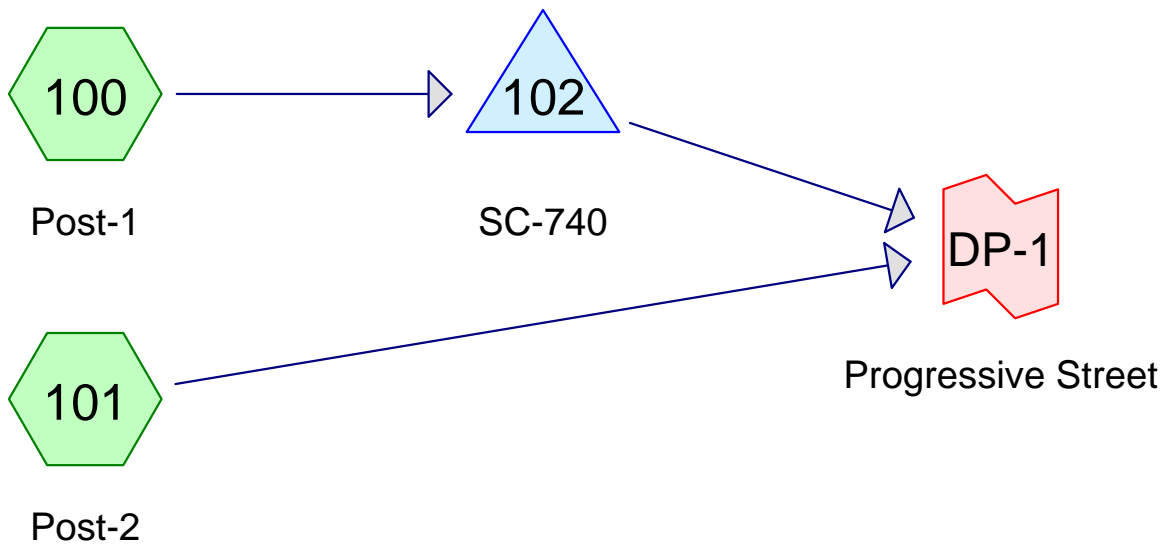
**Summary for Link DP-1: Progressive Street**

Inflow Area = 0.230 ac, 15.44% Impervious, Inflow Depth = 7.93" for 100-Year event

Inflow = 2.08 cfs @ 12.09 hrs, Volume= 0.152 af

Primary = 2.08 cfs @ 12.09 hrs, Volume= 0.152 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs



**2109-HCAD**

Prepared by Level Design

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*Type III 24-hr 2-Year Rainfall=3.88"*

Printed 5/21/2024

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 100: Post-1**

Runoff Area=2,360 sf 100.00% Impervious Runoff Depth=3.65"  
Tc=6.0 min CN=98 Runoff=0.20 cfs 0.016 af

**Subcatchment 101: Post-2**

Runoff Area=7,640 sf 11.16% Impervious Runoff Depth=1.72"  
Tc=6.0 min CN=77 Runoff=0.35 cfs 0.025 af

**Pond 102: SC-740**

Peak Elev=565.85' Storage=0.005 af Inflow=0.20 cfs 0.016 af  
Discarded=0.02 cfs 0.016 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.016 af

**Link DP-1: Progressive Street**

Inflow=0.35 cfs 0.025 af  
Primary=0.35 cfs 0.025 af

**2109-HCAD***Type III 24-hr 10-Year Rainfall=6.06"*

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 100: Post-1**

Runoff Area=2,360 sf 100.00% Impervious Runoff Depth=5.82"  
Tc=6.0 min CN=98 Runoff=0.32 cfs 0.026 af

**Subcatchment 101: Post-2**

Runoff Area=7,640 sf 11.16% Impervious Runoff Depth=3.53"  
Tc=6.0 min CN=77 Runoff=0.73 cfs 0.052 af

**Pond 102: SC-740**

Peak Elev=566.53' Storage=0.010 af Inflow=0.32 cfs 0.026 af  
Discarded=0.02 cfs 0.026 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.026 af

**Link DP-1: Progressive Street**

Inflow=0.73 cfs 0.052 af  
Primary=0.73 cfs 0.052 af

**2109-HCAD***Type III 24-hr 25-Year Rainfall=7.80"*

Prepared by Level Design

Printed 5/21/2024

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 100: Post-1**

Runoff Area=2,360 sf 100.00% Impervious Runoff Depth=7.56"  
Tc=6.0 min CN=98 Runoff=0.41 cfs 0.034 af

**Subcatchment 101: Post-2**

Runoff Area=7,640 sf 11.16% Impervious Runoff Depth=5.09"  
Tc=6.0 min CN=77 Runoff=1.04 cfs 0.074 af

**Pond 102: SC-740**

Peak Elev=567.22' Storage=0.014 af Inflow=0.41 cfs 0.034 af  
Discarded=0.02 cfs 0.034 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.034 af

**Link DP-1: Progressive Street**

Inflow=1.04 cfs 0.074 af  
Primary=1.04 cfs 0.074 af



**2109-HCAD***Type III 24-hr 100-Year Rainfall=10.70"*

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 100: Post-1**

Runoff Area=2,360 sf 100.00% Impervious Runoff Depth=10.46"  
Tc=6.0 min CN=98 Runoff=0.57 cfs 0.047 af

**Subcatchment 101: Post-2**

Runoff Area=7,640 sf 11.16% Impervious Runoff Depth=7.80"  
Tc=6.0 min CN=77 Runoff=1.57 cfs 0.114 af

**Pond 102: SC-740**

Peak Elev=570.04' Storage=0.019 af Inflow=0.57 cfs 0.047 af  
Discarded=0.02 cfs 0.045 af Primary=0.16 cfs 0.003 af Outflow=0.18 cfs 0.047 af

**Link DP-1: Progressive Street**

Inflow=1.57 cfs 0.117 af  
Primary=1.57 cfs 0.117 af

**2109-HCAD**

Type III 24-hr 100-Year Rainfall=10.70"

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**Summary for Subcatchment 100: Post-1**

Runoff = 0.57 cfs @ 12.08 hrs, Volume= 0.047 af, Depth=10.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=10.70"

Area (sf)	CN	Description
2,360	98	Roofs, HSG C
2,360		100.00% Impervious Area

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

**Summary for Subcatchment 101: Post-2**

Runoff = 1.57 cfs @ 12.09 hrs, Volume= 0.114 af, Depth= 7.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=10.70"

Area (sf)	CN	Description
853	98	Impervious, HSG C
6,787	74	>75% Grass cover, Good, HSG C
7,640	77	Weighted Average
6,787		88.84% Pervious Area
853		11.16% Impervious Area

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

**Summary for Pond 102: SC-740**

Inflow Area = 0.054 ac, 100.00% Impervious, Inflow Depth = 10.46" for 100-Year event  
 Inflow = 0.57 cfs @ 12.08 hrs, Volume= 0.047 af  
 Outflow = 0.18 cfs @ 12.53 hrs, Volume= 0.047 af, Atten= 68%, Lag= 26.8 min  
 Discarded = 0.02 cfs @ 10.30 hrs, Volume= 0.045 af  
 Primary = 0.16 cfs @ 12.53 hrs, Volume= 0.003 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Peak Elev= 570.04' @ 12.53 hrs Surf.Area= 0.010 ac Storage= 0.019 af

Plug-Flow detention time= 261.1 min calculated for 0.047 af (100% of inflow)  
Center-of-Mass det. time= 261.1 min ( 999.0 - 737.9 )

**2109-HCAD**

Type III 24-hr 100-Year Rainfall=10.70"

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Volume	Invert	Avail.Storage	Storage Description
#1A	564.92'	0.011 af	<b>13.00'W x 34.10'L x 3.50'H Field A</b> 0.036 af Overall - 0.008 af Embedded = 0.027 af x 40.0% Voids
#2A	565.42'	0.008 af	<b>ADS_StormTech SC-740 +Cap</b> x 8 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 8 Chambers in 2 Rows
		0.019 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	564.92'	<b>2.410 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'
#2	Primary	570.00'	<b>24.00" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Discarded OutFlow** Max=0.02 cfs @ 10.30 hrs HW=564.97' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

**Primary OutFlow** Max=0.16 cfs @ 12.53 hrs HW=570.04' TW=0.00' (Dynamic Tailwater)

↑**2=Orifice/Grate** (Weir Controls 0.16 cfs @ 0.64 fps)

**Summary for Link DP-1: Progressive Street**

Inflow Area = 0.230 ac, 32.13% Impervious, Inflow Depth = 6.10" for 100-Year event  
 Inflow = 1.57 cfs @ 12.09 hrs, Volume= 0.117 af  
 Primary = 1.57 cfs @ 12.09 hrs, Volume= 0.117 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs