ALLEN & MAJOR ASSOCIATES, INC.

DRAINAGE REPORT

Strada Mixed Used Building
252-262 Main Street
Reading, Massachusetts

APPLICANT:
BLVD Reading, LLC
1 Sylvan Street
Peabody, MA 01960

PREPARED BY:
Allen & Major Associates, Inc.
100 Commerce Way, Suite 5
Woburn, Massachusetts 01801
E.O.R. Carlton Quinn PE

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ISSUED:
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Introduction

The purpose of this drainage report is to provide an overview of the proposed stormwater management system (SMS) for the new development located at 252-262 Main Street in Reading. The report will show by means of narrative, calculations and exhibits that the proposed stormwater management system will meet or exceed the Massachusetts Department of Environmental Protection (MassDEP) stormwater standards, and the town Stormwater Management Regulations.

The proposed site improvements include the demolishing of three buildings, clearing of existing vegetation and constructing one mixed-use building. Other improvements to the site include construction of surface parking, landscaping and underground utilities servicing the site. The project will be serviced by connecting existing utilities off Main Street and Pinevale Street.

The proposed SMS incorporates structural and non-structural Best Management Practices (BMPs) to provide stormwater peak flow mitigation, quality treatment, and conveyance.

The SMS includes catch basins, water quality units, drain manholes, roof drains, underground piping, underground infiltration chambers, and an Operation & Maintenance Plan.

Site Categorization for Stormwater Regulations

The proposed site improvements at 252-262 Main Steet are considered a new development under the DEP Stormwater Management Standards due to the net increase in impervious area. A new development project is required to meet all of Stormwater Management Standards listed within the MA DEP Stormwater Handbook.

Site Location and Access

The site consists of three lots with 247 feet of frontage on Main Street entirely within the town of Reading. The site is currently accessed by three curb cuts on Main Street.

Existing Site Conditions

The site currently includes two residential houses, and a retail building. Most of the site is currently wooded, except for the access driveway to the commercial building & a driveway to the north of the site that serves the residential property. The site also has a retaining wall that runs along the frontage that varies in height from one to four-feet tall. The site topography slopes west towards the rear and east towards Main Street from a high point located at the center of the site.

The surface drainage flows were analyzed at three Study Points. Study Point #1 summarizes off-site flows generated from the western area of the site that flow north off site to transition into gutter line flow to the drainage system on Pinevale Avenue. Study Point #2 summarizes off site flows towards the catch basin on Main Street. This catchment area sits in the eastern side of the site. Once flow has left the site it becomes concentrated in the gutter line and then directly to the drainage system. Study Point #3 has been delineated as the existing wetlands towards the south of the site. Copies of the existing watershed plan, showing the boundaries of each catchment area, are provided in the rear pocket of this report.

Existing Soil Conditions

The on-site soils were identified using the USDA Natural Resources Conservation Services (NRCS) Soil Survey for Middlesex County. The site is primarily soil type 602 – Urban Land. These soil types are assumed to be A-type soils because of the landform (outwash terraces/plans) as well as the surrounding soil types. There are a copy of the stormwater test pits and boring logs taken at this site, provided in the appendix of this report.

A copy of the NRCS Custom Soil Resource Report is included in the appendix of this report.

FEMA Floodplain/Environmental Due Diligence

There are no portions of the site located within the FEMA Zone "AE" Special Flood Hazard Area Subject to Inundation by the 1% Annual Chance Flood (100-year floodplain). The official Flood Insurance Rate Map (FIRM) effective date June 4, 2010, community panel 312 of 656. Map number 25017C0313E. See section 3 of this report for a copy of the FEMA FIRM.

Environmentally Sensitive Zones

The Commonwealth of Massachusetts asserts control over numerous protected and regulated areas including: Areas of Critical Environmental Concern (ACEC); Outstanding Resource Waters (ORWs); Priority and Protected Habitat for rare and endangered species, and areas protected under the Wetlands Protection Act. The subject property is not located within any of these regulated areas.

Drainage Analysis Methodology

A peak rate of runoff will be determined using techniques and data found in the following:

1. <u>Urban Hydrology for Small Watersheds</u> – Technical Release 55 by the United States Department of Agriculture Soils Conservation Service, June 1986. Runoff curve numbers and 24-hour precipitation values were obtained from this reference.
2. <u>HydroCAD © Stormwater Modeling System</u> by HydroCAD Software Solutions LLC, version 10.00-24. The HydroCAD program was used to generate runoff hydrographs for the watershed areas, to determine discharge/ stage/storage characteristics for the stormwater BMPs, to perform drainage routing and to combine the results of the runoff hydrographs. HydroCAD uses the TR-20 methodology of the SCS Unit Hydrograph procedure (SCS-UH).

3. Soil Survey of Middlesex County Massachusetts by United States Department of Agriculture, NRCS. Soil types and boundaries were obtained from this reference.

Proposed Conditions – Peak Rate of Runoff

The stormwater runoff analysis of the existing and proposed conditions includes an estimate of the peak rate of runoff from various rainfall events. Peak runoff rates were developed using TR55 Urban Hydrology for Small Watersheds, developed by the U.S. Department of Commerce, Engineering Division and the HydroCAD computer program. Further, the analysis has been prepared in accordance with the MassDEP and the town requirements and standard engineering practices. The peak rate of runoff has been estimated for each watershed during the 2, 10, 25, and 100-year storm events.

The proposed stormwater management system for the site consists of catch basins, water quality units, drain manholes, roof drains, underground piping, area drains, underground infiltration chambers These systems have been designed in accordance with the MA DEP Stormwater Management Policy to recharge groundwater and reduce rate of runoff from the parcel.

The proposed Underground Infiltration System #1 (UIS#1) collects flows from a portion of the proposed parking lot (Sub-catchment P-1B). The proposed Underground Infiltration System #2 (UIS#2) collects water from the roof, portions of the parking lot and the amenities area (Sub-catchment areas R-1, P-1A & P-1C). The two systems have an emergency overflow pipe which outlets the existing drainage system on the public R.O.W. These infiltration systems were designed to contain flow for the 25-year storm, as requested by the town of Reading Engineering department. This will help mitigate extra flow to the existing drainage structures on Pinevale/Main Street and promote infiltration.

Study Point 3 (Flow off-site to the existing wetlands) which captures storm runoff from Sub-catchment 3, which is mostly landscape cover. The peak rate/volume for this study point has been minimized compared to the existing conditions.

The stormwater runoff model indicates that the proposed site development reduces the rate of runoff during all storm events at the identified points of analysis. The following tables provide a summary of the estimated peak rate, in Cubic Feet per Second (CFS) and total runoff volume, in cubic feet (CF) at each of the three Study Points for each of the design storm events. The HydroCAD worksheets are included in Section 4 and 5 of this report.

STUDY POINT #1: (Flow Off-Site to Drainage System)

	2-Year	10-Year	25-Year	100-Year
Existing Flow (CFS)	0.36	0.94	1.34	1.99
Proposed Flow (CFS)	0.02	0.13	0.21	1.43
Decrease (CFS)	**0.34**	**0.81**	**1.13**	**0.56**
Existing Volume (CF)	1,328	3,262	4,649	6,934
Proposed Volume (CF)	136	458	716	4,511
Change (CF)	**1,192**	**2,804**	**3,933**	**2,423**

STUDY POINT #2: (Flow Off-Site to Drainage System)

	2-Year	10-Year	25-Year	100-Year
Existing Flow (CFS)	0.72	1.90	2.73	4.07
Proposed Flow (CFS)	0.05	0.19	0.30	1.48
Decrease (CFS)	**0.67**	**1.71**	**2.43**	**2.59**
Existing Volume (CF)	2,631	6,530	9,336	13,970
Proposed Volume (CF)	236	690	1,041	4,987
Change (CF)	**2,395**	**5,840**	**8,295**	**8,983**

STUDY POINT #3: (Flow to Wetlands)

	2-Year	10-Year	25-Year	100-Year
Existing Flow (CFS)	0.03	0.24	0.41	0.71
Proposed Flow (CFS)	0.00	0.00	0.00	0.01
Decrease (CFS)	**0.03**	**0.24**	**0.41**	**0.70**
Existing Volume (CF)	254	928	1,482	2,462
Proposed Volume (CF)	0	13	30	67
Change (CF)	**254**	**915**	**1,452**	**2,395**

TOTAL

	2-Year	10-Year	25-Year	100-Year
Existing Flow (CFS)	1.11	3.08	4.48	6.77
Proposed Flow (CFS)	0.07	0.32	0.51	2.92
Decrease (CFS)	**1.06**	**2.76**	**3.97**	**3.85**
Existing Volume (CF)	4,213	10,720	15,467	23,366
Proposed Volume (CF)	372	1,161	1,786	9,565
Change (CF)	**3,841**	**9,559**	**13,681**	**13,801**

MASSDEP Stormwater Performance Standards

The MA DEP Stormwater Management Policy was developed to improve water quality by implementing performance standards for stormwater management. The intent is to implement the stormwater management standards through the review of Notice of Intent filings by the issuing authority (Conservation Commission or DEP). The following section outlines how the proposed Stormwater Management System meets the standards set forth by the Policy.

BMP's implemented in the design include –

- Deep Sump Catch Basins
- Subsurface Structures
- Water Quality Units

Stormwater Best Management Practices (BMP's) have been incorporated into the design of the project to mitigate the anticipated pollutant loading. An Operations and Maintenance Plan has been developed for the project, which addresses the long-term maintenance requirements of the proposed system.

Temporary erosion and sedimentation controls will be incorporated into the construction phase of the project. These temporary controls may include straw bale and/or silt fence barriers, inlet sediment traps, slope stabilization, and stabilized construction entrances.

The Massachusetts Department of Environmental Protection has established ten (10) Stormwater Management Standards. A project that meets or exceeds the standards is presumed to satisfy the regulatory requirements regarding stormwater management. The Standards are enumerated below as well as descriptions and supporting calculations as to how the Project will comply with the Standards:

1. *No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*

   The proposed development will not introduce any new outfalls with direct discharge to a wetland area or waters of the Commonwealth of Massachusetts. All discharges will be treated for water quality and the rate will not be increased over existing conditions.

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

   The proposed development has been designed so that the post-development peak discharge rates do not exceed the predevelopment peak discharge rates. A summary of the existing and proposed discharge rates is included within this document.

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

   The existing annual recharge for the site has been approximated in the proposed condition. There are proposed subsurface infiltration systems designed to meet this requirement. Stormwater runoff generated from the impervious areas of the proposed development are routed through these infiltration BMPs. The proposed Recharge Volume is based on the Static Method per the MA DEP Stormwater Management Standards, Volume 3, Chapter 1.

   See the appendix located at section 6 of this report for stormwater recharge calculations.

4. *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This standard is met when:*
   - *Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;*
   - *Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and*
   - *Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

   Standard #4 is met when structural stormwater best management practices are sized to capture and treat the required water quality volume and pretreatment is provided in accordance with the Massachusetts Stormwater Handbook. Standard #4 also requires that suitable source control measures are identified in the Long-term Pollution Prevention Plan. The water quality volume for the site redevelopment is captured and treated using underground infiltration systems with isolator rows and water quality units.

The implemented BMPs have been designed to treat the contributing water quality volume. These water quality calculations can be seen within the appendix of this report.

The proposed stormwater management system has been designed to remove 80% of the average annual post-construction load for each treatment train. The TSS removal calculations can be seen within the appendix of this report.

The TSS removal efficiencies for the proprietary separator are based on the values assigned under the Technology Acceptance and Reciprocity Partnership (TARP) testing protocol. The TARP is a workgroup of the Environmental Council of States that was originally comprised of California, Illinois, Maryland, Massachusetts, New Jersey, New York, Pennsylvania and Virginia. TARP is recognized in the MA DEP Stormwater Management Handbook as a valid source for assigning TSS removal efficiencies for proprietary separators.

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

   The site is not considered a land use with higher potential pollutant loads.

6. *Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account*

site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

The project site does not discharge stormwater within a Zone II or Interim Wellhead Protection Area or near a critical area. Critical Areas are Outstanding Resource Waters as designated in 314 CMR 4.00, Special Resource Waters as designated in 314 CMR 4.00, recharge areas for public water supplies as defined in 310 CMR 22.02, bathing beaches as defined in 105 CMR 445.000, cold-water fisheries as defined in 314 CMR 9.02 and 310 CMR 10.04, and shellfish growing areas as defined in 314 CMR 9.02 and 310 CMR 10.04.

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

   The proposed project is not considered a re-development project under the Stormwater Management Handbook guidelines as there is an increase in the amount of impervious area.

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

   A plan to control construction-related impacts, including erosion, sedimentation and other pollutant sources during construction has been developed. A detailed Erosion and Sedimentation Control Plan is included in the Permit Drawings. The proponent will prepare and submit a Stormwater Pollution Prevention Plan (SWPPP) prior to commencement of construction activities that will result in the disturbance of one acre of land or more.

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

   A Long-Term Operation & Maintenance (O&M) Plan has been developed for the proposed stormwater management system and is included within this document. See Section 2.0 of this report.

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

    See appendix for Illicit Discharge Statement

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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

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

The Stormwater Report must include:

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

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

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

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

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

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

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

3/25/24

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 (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[1]

☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

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): Underground Infiltration Sytstem (Stormtech SC-310, Stormtech SC-740)

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 (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

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 (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 (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.

SECTION 2.0 -
OPERATION & MAINTENANCE PLAN

Introduction

In accordance with the standards set forth by the Stormwater Management Policy issued by the Massachusetts Department of Environmental Protection (MassDEP), Allen & Major Associates, Inc. has prepared the following Operations & Maintenance (O&M) Plan for the proposed development at 252-260 Main Street, Reading, MA.

The plan is broken down into three major sections. The first section describes construction-related erosion and sedimentation controls (Demolition & Construction Maintenance Plan). The second section describes the long-term pollution prevention measures (Long Term Pollution Prevention Plan). The third section is a post-construction operation and maintenance plan designed to address the long-term maintenance needs of the stormwater management system (Long-Term Maintenance Plan – Facilities Description).

Notification Procedures for Change of Responsibility for O&M

The Stormwater Management System (SMS) for this project is owned by BLVD Reading LLC (owner). The owner shall be legally responsible for the long-term operation and maintenance of this SMS as outlined in this Operation and Maintenance Plan.

The owner shall submit an annual summary report and the completed Operation & Maintenance Schedule & Checklist to the Conservation Commission (via email or print copy), highlighting inspection and maintenance activities including performances of BMPs. Should ownership of the SMS change, the owner will continue to be responsible until the succeeding owner shall notify the Commission that the succeeding owner has assumed such responsibility. Upon subsequent transfers, the responsibility shall continue to be that of transferring owner until the transferee owner notifies the Commission of its assumption of responsibility.

In the event the SMS will serve multiple lots/owners, such as the subdivision of the existing parcel or creation of lease areas, the owner(s) shall establish an association on other legally enforceable arrangements under which the association or a single party shall have legal responsibility for the operation and maintenance of the entire SMS. The legal instrument creating such responsibility shall be recorded with the Registry of Deeds and promptly following its recording, a copy thereof shall be furnished to the Commission.

Contact Information

Stormwater Management System Owner:	BLVD Reading LLC 1 Slyvan Street Peabody, MA Phone: (781) 389-5989

Emergency Contact Information:

BLVD Reading LLC (Owner/Operator)	Phone: (781) 389-5989
Allen & Major Associates, Inc. (Site Civil Engineer)	Phone: (781) 935-6889
Reading Department of Public Works	Phone: (781) 942-9092
Reading Conservation Commission	Phone: (781) 942-9016
Reading Fire Department (non-emergency line)	Phone: (781) 944-3131
MassDEP Emergency Response	Phone: (888) 304-1133
Clean Harbors Inc (24-Hour Line)	Phone: (800) 645-8265

Demolition & Construction Maintenance Plan

1. Call Digsafe: 1-888-344-7233
2. Contact the town at least three (3) days prior to start of demolition and/or construction activities.
3. Install Erosion Control measures as shown on the Plans prepared by A&M. The town shall review the installation of straw bales and silt fencing prior to the start of any site demolition work. Install Construction fencing if determined to be necessary at the commencement of construction.
4. Install construction entrances, straw bales, and silt fence at the locations shown on the Erosion Control Plan prepared by A&M.
5. Site access shall be achieved only from the designated construction entrances.
6. Cut and clear trees in construction areas only (within the limit of work; see plans).
7. Stockpiles of materials subject to erosion shall be stabilized with erosion control matting or temporary seeding whenever practicable, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased.
8. Install silt sacks and straw bales around each drain inlet prior to any demolition and or construction activities.

9. All erosion control measures shall be inspected weekly and after every rainfall event. Records of these inspections shall be kept on-site for review.
10. All erosion control measures shall be maintained, repaired, or replaced as required or at the direction of the owner's engineer or the town.
11. Sediment accumulation up-gradient of the straw bales, silt fence, and stone check dams greater than 6" in depth shall be removed and disposed of in accordance with all applicable regulations.
12. If it appears that sediment is exiting the site, silt sacks shall be installed in all catch basins adjacent to the site. Sediment accumulation on all adjacent catch basin inlets shall be removed and the silt sack replaced if torn or damaged.
13. Install stone check dams on-site during construction as needed. Refer to the erosion control details. Temporary sediment basins combined with stone check damns shall be installed on-site during construction to control and collect runoff from upland areas of this site during demolition and construction activities.
14. The contractor shall comply with the Sedimentation and Erosion Control Notes as shown on the Site Development Plans and Specifications.
15. The stabilized construction entrances shall be inspected weekly and records of inspections kept. The entrances shall be maintained by adding additional clean, angular, durable stone to remove the soil from the construction vehicle's tires when exiting the site. If soil is still leaving the site via the construction vehicle tires, adjacent roadways shall be kept clean by street sweeping.
16. Dust pollution shall be controlled using on-site water trucks and/or an approved soil stabilization product.
17. During demolition and construction activities, Status Reports on compliance with this O&M Document shall be submitted weekly. The report shall document any deficiencies and corrective actions taken by the applicant.

Long-Term Pollution Prevention Plan

Standard #4 from the MassDEP Stormwater Management Handbook requires that a Long-Term Pollution Prevention Plan (LTPPP) be prepared and incorporated as part of the Operation and Maintenance Plan of the Stormwater Management System. The purpose of the LTPPP is to identify potential sources of pollution that may affect the quality of stormwater discharges, and to describe the implementation of practices to reduce the pollutants in stormwater discharges. The following items describe the source control and proper procedures of the LTPPP.

- Housekeeping
  The existing development has been designed to maintain a high level of water quality treatment for all stormwater discharge to the wetland areas. An Operation and Maintenance (O&M) plan has been prepared and is included in this section of the report. The owner (or its designee) is responsible for adherence to the O&M plan in a strict and complete manner.

- Storing of Materials & Water Products
  The trash and waste program for the site includes exterior dumpsters. There is a trash contractor used to pick up the waste material in the dumpsters. The stormwater drainage system has water quality inlets designed to capture trash and debris.

- Vehicle Washing
  Outdoor vehicle washing has the potential to result in high loads of nutrients, metals, and hydrocarbons during dry weather conditions, as the detergent-rich water used to wash the grime off the vehicle enters the stormwater drainage system. The existing development does not include any designated vehicle washing areas, nor is it expected that any vehicle washing will take place on-site.

- Spill Prevention & Response
  Sources of potential spill hazards include vehicle fluids, liquid fuels, pesticides, paints, solvents, and liquid cleaning products. The majority of the spill hazards would likely occur within the buildings and would not enter the stormwater drainage system. However, there are spill hazards from vehicle fluids or liquid fuels located outside of the buildings. These exterior spill hazards have the potential to enter the stormwater drainage system and are to be addressed as follows:

  1. Spill hazards of pesticides, paints, and solvents shall be remediated using the Manufacturers' recommended spill cleanup protocol.
  2. Vehicle fluids and liquid fuel spill shall be remediated according to the local and state regulations governing fuel spills.
  3. The owner shall have the following equipment and materials on hand to address a spill clean-up: brooms, dust pans, mops, rags, gloves, absorptive material, sand, sawdust, plastic and metal trash containers.
  4. All spills shall be cleaned up immediately after discovery.
  5. Spills of toxic or hazardous material shall be reported, regardless of size, to the Massachusetts Department of Environmental Protection at (888) 304-1333.

6. Should a spill occur, the pollution prevention plan will be adjusted to include measures to prevent another spill of a similar nature. A description of the spill, along with the causes and cleanup measures will be included in the updated pollution prevention plan.

- Maintenance of Lawns, Gardens, and Other Landscaped Areas
  It should be recognized that this is a general guideline towards achieving high quality and well-groomed landscaped areas. The grounds staff/landscape contractor must recognize the shortcomings of a general maintenance plan such as this, and modify and/or augment it based on weekly, monthly, and yearly observations. In order to assure the highest quality conditions, the staff must also recognize and appreciate the need to be aware of the constantly changing conditions of the landscaping and be able to respond to them on a proactive basis. No trees shall be planted over the drain lines or recharge area, and that only shallow rooted plants and shrubs will be allowed.

  - Fertilizer
    Maintenance practices should be aimed at reducing environmental, mechanical and pest stresses to promote healthy and vigorous growth. When necessary, pest outbreaks should be treated with the most sensitive control measure available. Synthetic chemical controls should be used only as a last resort to organic and biological control methods. Fertilizer, synthetic chemical controls and pest management applications (when necessary) shall be performed only by licensed applicators in accordance with the manufacturer's label instructions when environmental conditions are conducive to controlled product application.

    Only slow-release organic fertilizers should be used in the planting and mulch areas to limit the amount of nutrients that could enter downstream resource areas. Fertilization of the planting and mulch areas will be performed within manufacturers labeling instructions and shall not exceed an NPK ration of 1:1:1 (i.e. Triple 10 fertilizer mix), considered a low nitrogen mixture. Fertilizers approved for the use under this O&M Plan are as follows:

    Type: LESCO® 28-0-12 (Lawn Fertilizer)
    MERIT® 0.2 Plus Turf Fertilizer
    MOMENTUM™ Force Weed & Feed

  - Suggested Aeration Program
    In-season aeration of lawn areas is good cultural practice, and is recommended whenever feasible. It should be accomplished with a solid thin tine aeration method to reduce disruption to the use of the area. The

depth of solid tine aeration is similar to core type, but should be performed when the soil is somewhat drier for a greater overall effect.

Depending on the intensity of use, it can be expected that all landscaped lawn areas will need aeration to reduce compaction at least once per year. The first operation should occur in late May following the spring season. Methods of reducing compaction will vary based on the nature of the compaction. Compaction on newly established landscaped areas is generally limited to the top 2-3" and can be alleviated using hollow core or thin tine aeration methods.

The spring aeration should consist of two passes at opposite directions with 1/4" hollow core tines penetrating 3-5" into the soil profile. Aeration should occur when the soil is moist but not saturated. The soil cores should be shattered in place and dragged or swept back into the turf to control thatch. If desired the cores may also be removed and the area top-dressed with sand or sandy loam. If the area drains on average too slowly, the topdressing should contain a higher percentage of sand. If it is draining on average too quickly, the top dressing should contain a higher percentage of soil and organic matter.

- Landscape Maintenance Program Practices:
  - Lawn
    1. Mow a minimum of once a week in spring, to a height of 2" to 2 1/2" high. Mowing should be frequent enough so that no more than 1/3 of grass blade is removed at each mowing. The top growth supports the roots; the shorter the grass is cute, the less the roots will grow. Short cutting also dries out the soil and encourages weeds to germinate.
    2. Mow approximately once every two weeks from July 1st to August 15th depending on lawn growth.
    3. Mow on a ten-day cycle in fall, when growth is stimulated by cooler nights and increased moisture.
    4. Do not remove grass clippings after mowing.
    5. Keep mower blades sharp to prevent ragged cuts on grass leaves, which cause a brownish appearance and increase the chance for disease to enter a leaf.
  - Shrubs
    1. Mulch not more than 3" depth with shredded pine or fir bark.

2. Hand prune annually, immediately after blooming, to remove 1/3 of the above-ground biomass (older stems). Stem removals are to occur within 6" of the ground to open up shrub and maintain two-year wood (the blooming wood).
3. Hand-prune evergreen shrubs only as needed to remove dead and damaged wood and to maintain the naturalistic form of the shrub. Never mechanically shear evergreen shrubs.

- Trees
  1. Provide aftercare of new tree plantings for the first three years.
  2. Do not fertilize trees, it artificially stimulates them (unless tree health warrants).
  3. Water once a week for the first year; twice a month for the second; once a month for the third year.
  4. Prune trees on a four-year cycle.
- Invasive Species
  1. Inform the Conservation Commission Agent prior to the removal of invasive species proposed either through hand work or through chemical removal.

- Storage and Use of Herbicides and Pesticides
  Integrated Pest Management is the combination of all methods (of pest control) which may prevent, reduce, suppress, eliminate, or repel an insect population. The main requirements necessary to support any pest population are food, shelter and water, and any upset of the balance of these will assist in controlling a pest population. Scientific pest management is the knowledgeable use of all pest control methods (sanitation, mechanical, chemical) to benefit mankind's health, welfare, comfort, property and food. A Pest Management Professional (PMP) should be retained who is licensed with the Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, Department of Agricultural Resources.

  The site manager will be provided with approved bulletin before entering into or renewing an agreement to apply pesticides for the control of indoor household or structural pests, refer to 333 CMR 13.08.

  Before beginning each application, the applicator must post a Department approved notice on all of the entrances to the treated room or area. The applicator must leave such notices posted after the application. The notice will be posted at conspicuous point(s) of access to the area treated. The location and number of signs will be determined by the configuration of the area to be treated based on the applicator's best judgment. It is intended to give sufficient notice so that no one comes into an area being treated unaware that the applicator is working and pesticides are being applied. However, if the contracting entity does not want the signs posted, he/she may sign a Department approved waiver indicating this.

The applicator or employer will provide to any person upon their request the following information on previously conducted applications:

1. Name and phone number of pest control company;
2. Date and time of the application;
3. Name and license number of the applicator;
4. Target pests; and
5. Name and EPA Registration Number of pesticide products applied.

- Pet Waste Management
  The owner's landscape crew (or designee) shall remove any obvious pet waste that has been left behind by pet owners within the development. The pet waste shall be disposed of in accordance with local and state regulations.

- Operations and Management of Septic Systems
  There are no proposed septic systems within the limits of the project.

- Management of Deicing Chemicals and Snow
  Snow will be stockpiled on site until the accumulated snow becomes a hazard to the daily operations of the site. It will be the responsibility of the snow removal contractor to properly dispose of transported snow according to MassDEP, Bureau of Resource Protection – Snow Disposal Guideline #BRPG01-01, governing the proper disposal of snow. It will be the responsibility of the snow removal contractor to follow these guidelines and all applicable laws and regulations

  The owner's maintenance staff (or its designee) will be responsible for the clearing of the sidewalk and building entrances. The owner may be required to use a de-icing agent such as potassium chloride to maintain a safe walking surface. If used, the de-icing agent for the walkways and building entrances will be kept within the storage rooms located within the building. If used, de-icing agents will not be stored outside. The owner's maintenance staff will limit the application of sand.

Long-Term Maintenance Plan – Facilities Description

A maintenance log will be kept (i.e. report) summarizing inspections, maintenance, and any corrective actions taken. The log will include the date on which each inspection or maintenance task was performed, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. If a maintenance task requires the clean-out of any sediments or debris, the location where the sediment and debris was disposed after removal will be indicated. The log will be made accessible to department staff and a copy provided to the department upon request.

The following is a description of the Stormwater Management System for the project site.

Stormwater Collection System – On-Site:

The stormwater collection system is a series of inlets located at low points within the limits of the paved area. All of the proposed on-site catch basins incorporate a deep sump and hooded outlet. The catch basins are connected by a closed gravity pipe network that pass through proprietary separators prior to entering the underground detention chamber or porous pavement.

Other Maintenance Activity:

- Mosquito Control - Both above ground and underground stormwater BMPs have the potential to serve as mosquito breeding areas. Good design, proper operation and maintenance, and treatment with larvicides can minimize this potential. See the supplemental information for Mosquito Control in Stormwater Management Practices, and the Operation and Maintenance Plan Schedule for inspection schedule.
- Street Sweeping - Clear accumulations of winter sand in parking lots and along roadways at least once a year, preferably in the spring. Accumulations on pavement may be removed by pavement sweeping. Accumulations of sand along road shoulders may be removed by grading excess sand to the pavement edge and removing it manually or by a front-end loader.

Inspection and Maintenance Frequency and Corrective Measures

In accordance with MA DEP Stormwater Handbook: Volume 2, Chapter 2; the previously described BMPs will be inspected and the identified deficiencies will be corrected. Clean-out must include the removal and legal disposal of any accumulated sediments, trash, and debris. In any and all cases, operations, inspections, and maintenance activities shall utilize best practical measures to avoid and minimize impacts to wetland resource areas outside the footprint of the SMS.

Supplemental Information

- Operation & Maintenance Plan Schedule
- Massachusetts Stormwater Handbook, Chapter 5, Miscellaneous Stormwater Topics, Mosquito Control in Stormwater Management Practices.
- Massachusetts Department of Environmental Protection Bureau of Water Resources Snow Disposal Guidance.
- Stormtech Isolator ROW O&M Manual

OPERATION AND MAINTENANCE PLAN SCHEDULE **Date: 10/5/2023**

ALLEN & MAJOR ASSOCIATES, INC.

Project: Strada Mixed Use Building
Project Address: 258 Main Street Reading, MA
Responsible for O&M Plan: BLVD Reading, LLC
Address: 1 Sylvan Street, Peabody MA 01960
Phone: (781) 389-5989

BMP CATEGORY	BMP OR MAINTENANCE ACTIVITY	SCHEDULE/ FREQUENCY	NOTES	ESTIMATED ANNUAL MAINTENANCE COST	INSPECTION PERFORMED	
					DATE:	BY:
STRUCTURAL PRETREATMENT BMPs	DEEP SUMP CATCH BASIN	Four times per year (quarterly).	Inspect and clean catch basin units whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.	$1,000		
	PROPRIETARY SEPARATORS	In accordance with manufacturers requirements, but no less than twice a year following installation and once a year thereafter.	Remove sediment and other trapped pollutants at frequency or level specified by manufacturer.	$2,000		

All information within table is derived from Massachussetts Stormwater Handbook: Volume 2, Chapter 2

BMP CATEGORY	BMP OR MAINTENANCE ACTIVITY	SCHEDULE/ FREQUENCY	NOTES	ESTIMATED ANNUAL MAINTENANCE COST	INSPECTION PERFORMED	
					DATE:	BY:
INFILTRATION BMPs	DRY WELL	Inspect after every major storm in the first few months following construction. Thereafter, inspect annually.	Inspect dry wells. Measure the water depth in the observation well at 24- and 48-hour intervals after a storm. Calculate clearance rates by dividing the drop in water level (inches) by the time elapsed (hr.).	$500		
	SUBSURFACE STRUCTURES	Inspect structure inlets at least twice a year. Remove debris that may clog the system as needed.	Because subsurface structures are installed underground, they are extremely difficult to maintain. Remove any debris that might clog the system.	$500		
	OUTLET STRUCTURES	Periodic cleaning of Outlet Control Structures as needed.	Clear trash and debris as necessary.	$500		

All information within table is derived from Massachussetts Stormwater Handbook: Volume 2, Chapter 2

BMP CATEGORY	BMP OR MAINTENANCE ACTIVITY	SCHEDULE/ FREQUENCY	NOTES	ESTIMATED ANNUAL MAINTENANCE COST	INSPECTION PERFORMED	
					DATE:	BY:
OTHER MAINTENANCE ACTIVITY	**MISQUITO CONTROL**	Inspect BMPs as needed to ensure the system's drainage time is less than the maximum 72 hour period.	Massachusetts stormwater handbook requires all stormwater practices that are designed to drain do so within 72 hours to reduce the number of mosquitos that mature to adults since the aquatic stage of a mosquito is 7-10 days.	$100		
	SNOW STORAGE	Clear and remove snow to approved storage locations as necessary to ensure systems are working properly and are protected from meltwater pollutants.	Carefully select snow disposal sites before winter. Avoid dumping removed snow over catch basins, or in detention ponds, sediment forebays, rivers, wetlands, and flood plains. It is also prohibited to dump snow in the bioretention basins or gravel swales.	$500		
	STREET SWEEPING	Clear accumulations of winter sand in parking lots and along roadways at least once a year, preferably spring.	Sweep, power broom or vacuum paved areas. Submit information that confirms that all street sweepings have been completed in accordance with state and local requirements	$2,000		

All information within table is derived from Massachussetts Stormwater Handbook: Volume 2, Chapter 2

Chapter 5
Miscellaneous Stormwater Topics

Mosquito Control in Stormwater Management Practices

Both aboveground and underground stormwater BMPs have the potential to serve as mosquito breeding areas. Good design, proper operation and maintenance and treatment with larvicides can minimize this potential.

EPA recommends that stormwater treatment practices dewater within 3 days (72 hours) to reduce the number of mosquitoes that mature to adults, since the aquatic stage of many mosquito species is 7 to 10 days. Massachusetts has had a 72-hour dewatering rule in its Stormwater Management Standards since 1996. The 2008 technical specifications for BMPs set forth in Volume 2, Chapter 2 of the Massachusetts Stormwater Handbook also concur with this practice by requiring that all stormwater practices designed to drain do so within 72 hours.

Some stormwater practices are designed to include permanent wet pools. These practices – if maintained properly – can limit mosquito breeding by providing habitat for mosquito predators. Additional measures that can be taken to reduce mosquito populations include increasing water circulation, attracting mosquito predators by adding suitable habitat, and applying larvicides.

The Massachusetts State Reclamation and Mosquito Control Board (SRMCB), through the Massachusetts Mosquito Control Districts, can undertake further mosquito control actions specifically for the purpose of mosquito control pursuant to Massachusetts General Law Chapter 252. The Mosquito Control Board, http://www.mass.gov/agr/mosquito/, describes mosquito control methods and is in the process of developing guidance documents that describe Best Management Practices for mosquito control projects.

The SRMCB and Mosquito Control Districts are not responsible for operating and maintaining stormwater BMPs to reduce mosquito populations. The owners of property that construct the stormwater BMPs or municipalities that "accept" them through local subdivision approval are responsible for their maintenance.[1] The SRMCB is composed of officials from MassDEP, Department of Agricultural Resources, and Department of Conservation and Recreation. The nine (9) Mosquito Control Districts overseen by the SRMCB are located throughout Massachusetts, covering 176 municipalities.

Construction Period Best Management Practices for Mosquito Control

To minimize mosquito breeding during construction, it is essential that the following actions be taken to minimize the creation of standing pools by taking the following actions:

- ***Minimize Land Disturbance:*** Minimizing land disturbance reduces the likelihood of mosquito breeding by reducing silt in runoff that will cause construction period controls to clog and retain standing pools of water for more than 72 hours.
- ***Catch Basin inlets:*** Inspect and refresh filter fabric, hay bales, filter socks or stone dams on a regular basis to ensure that any stormwater ponded at the inlet drains within 8 hours after precipitation stops. Shorter periods may be necessary to avoid hydroplaning in roads

[1] MassDEP and MassHighway understand that the numerous stormwater BMPs along state highways pose a unique challenge. To address this challenge, the 2004 MassHighway Stormwater Handbook will provide additional information on appropriate operation and maintenance practices for mosquito control when the Handbook is revised to reflect the 2008 changes to the Stormwater Management Standards..

caused by water ponded at the catch basin inlet. Treat catch basin sumps with larvicides such as *Bacillus sphaericus* (*Bs*) using a licensed pesticide applicator.

- ***Check Dams:*** If temporary check dams are used during the construction period to lag peak rate of runoff or pond runoff for exfiltration, inspect and repair the check dams on a regular basis to ensure that any stormwater ponded behind the check dam drains within 72 hours.
- ***Design construction period sediment traps*** to dewater within 72 hours after precipitation. Because these traps are subject to high silt loads and tend to clog, treat them with the larvicide *Bs* after it rains from June through October, until the first frost occurs.
- ***Construction period open conveyances:*** When temporary manmade ditches are used for channelizing construction period runoff, inspect them on a regular basis to remove any accumulated sediment to restore flow capacity to the temporary ditch.
- ***Revegetating Disturbed Surfaces:*** Revegetating disturbed surfaces reduces sediment in runoff that will cause construction period controls to clog and retain standing pools of water for greater than 72 hours.
- ***Sediment fences/hay bale barriers:*** When inspections find standing pools of water beyond the 24-hour period after a storm, take action to restore barrier to its normal function.

<u>Post-Construction Stormwater Treatment Practices</u>

- Mosquito control begins with the environmentally sensitive site design. Environmentally sensitive site design that minimizes impervious surfaces reduces the amount of stormwater runoff. Disconnecting runoff using the LID Site Design credits outlined in the Massachusetts Stormwater Handbook reduces the amount of stormwater that must be conveyed to a treatment practice. Utilizing green roofs minimizes runoff from smaller storms. Storage media must be designed to dewater within 72 hours after precipitation.
- Mosquito control continues with the selection of structural stormwater BMPs that are unlikely to become breeding grounds for mosquitoes, such as:
  - ***Bioretention Areas/Rain Gardens/Sand Filter:*** These practices tend not to result in mosquito breeding. If any level spreaders, weirs or sediment forebays are used as part of the design, inspect them and correct them as necessary to prevent standing pools of water for more than 72 hours.
  - ***Infiltration Trenches:*** This practice tends not to result in mosquito breeding. If any level spreaders, weirs, or sediment forebays are used as part of the design, inspect them and correct them as necessary to prevent standing pools of water for more than 72 hours.
- Another mosquito control strategy is to select BMPs that can become habitats for mosquito predators, such as:
  - ***Constructed Stormwater Wetlands:*** Habitat features can be incorporated in constructed stormwater wetlands to attract dragonflies, amphibians, turtles, birds, bats, and other natural predators of mosquitoes.
  - ***Wet Basins:*** Wet basins can be designed to incorporate fish habitat features, such as deep pools. Introduce fish in consultation with Massachusetts Division of Fisheries and Wildlife. Vegetation within wet basins designed as fish habitat must be properly managed to ensure that vegetation does not overtake the habitat. Proper design to ensure that no low circulation or "dead" zones are created may reduce the potential for mosquito breeding. Introducing bubblers may increase water circulation in the wet basin.

Effective mosquito controls require proponents to design structural BMPs to prevent ponding and facilitate maintenance and, if necessary, the application of larvicides. Examples of such design practices include the following:

- ***Basins:*** Provide perimeter access around wet basins, extended dry detention basins and dry detention basins for both larviciding and routine maintenance. Control vegetation to ensure that access pathways stay open.
- ***BMPs without a permanent pool of water:*** All structural BMPs that do not rely on a permanent pool of water must drain and completely dewater within 72 hours after precipitation. This includes dry detention basins, extended dry detention basins, infiltration basins, and dry water quality swales. Use underdrains at extended dry detention basins to drain the small pools that form due to accumulation of silts. Wallace indicates that extended dry extended detention basins may breed more mosquitoes than wet basins. It is, therefore, imperative to design outlets from extended dry detention basins to completely dewater within the 72-hour period.
- ***Energy Dissipators and Flow Spreaders:*** Currier and Moeller, 2000 indicate that shallow recesses in energy dissipators and flow spreaders trap water where mosquitoes breed. Set the riprap in grout to reduce the shallow recesses and minimize mosquito breeding.
- ***Outlet control structures:*** Debris trapped in small orifices or on trash racks of outlet control structures such as multiple stage outlet risers may clog the orifices or the trash rack, causing a standing pool of water. Optimize the orifice size or trash rack mesh size to provide required peak rate attenuation/water quality detention/retention time while minimizing clogging.
- ***Rain Barrels and Cisterns:*** Seal lids to reduce the likelihood of mosquitoes laying eggs in standing water. Install mosquito netting over inlets. The cistern system should be designed to ensure that all collected water is drained into it within 72 hours.
- ***Subsurface Structures, Deep Sump Catch Basins, Oil Grit Separators, and Leaching Catch Basins:*** Seal all manhole covers to reduce likelihood of mosquitoes laying eggs in standing water. Install mosquito netting over the outlet (CALTRANS 2004).

The Operation and Maintenance Plan should provide for mosquito prevention and control.

- ***Check dams:*** Inspect permanent check dams on the schedule set forth in the O&M Plan. Inspect check dams 72 hours after storms for standing water ponding behind the dam. Take corrective action if standing water is found.
- ***Cisterns:*** Apply *Bs* larvicide in the cistern if any evidence of mosquitoes is found. The Operation and Maintenance Plan shall specify how often larvicides should be applied to waters in the cistern.
- ***Water quality swales:*** Remove and properly dispose of any accumulated sediment as scheduled in the Operation and Maintenance Plan.
- ***Larvicide Treatment:*** The Operation and Maintenance Plan must include measures to minimize mosquito breeding, including larviciding.
- The party identified in the Operation and Maintenance Plan as responsible for maintenance shall see that larvicides are applied as necessary to the following stormwater treatment practices: catch basins, oil/grit separators, wet basins, wet water quality swales, dry extended detention basins, infiltration basins, and constructed stormwater wetlands. The Operation and Maintenance Plan must ensure that all larvicides are applied by a licensed pesticide applicator and in compliance with all pesticide label requirements.
- The Operation and Maintenance Plan should identify the appropriate larvicide and the time and method of application. For example, *Bacillus sphaericus (Bs*), the preferred

larvicide for stormwater BMPs, should be hand-broadcast.[2] Alternatively, Altosid, a Methopren product, may be used. Because some practices are designed to dewater between storms, such as dry extended detention and infiltration basins, the Operation and Maintenance Plan should provide that larviciding must be conducted during or immediately after wet weather, when the detention or infiltration basin has a standing pool of water, unless a product is used that can withstand extended dry periods.

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[2] *Bacillus thuringienis israelensis* or *Bti* is usually applied by helicopter to wetlands and floodplains

Roads and Stormwater BMPs

In general, the stormwater BMPs used for land development projects can also be used for new roadways and roadway improvement projects. However, for improvement of existing roads, there are often constraints that limit the choice of BMP. These constraints derive from the linear configuration of the road, the limited area within the existing right-of-way, the structural and safety requirements attendant to good roadway design, and the long-term maintainability of the roadway drainage systems. The MassHighway Handbook provides strategies for dealing with the constraints associated with providing stormwater BMPs for roadway redevelopment projects.

Roadway design can minimize impacts caused by stormwater. Reducing roadway width reduces the total and peak volume of runoff. Designing a road with country drainage (no road shoulders or curbs) disconnects roadway runoff. Disconnection of roadway runoff is eligible for the Low Impact Site Design Credit provided the drainage is disconnected in accordance with specifications outlined in Volume 3.

Like other parties, municipalities that work within wetlands jurisdictional areas and adjacent buffer zones must design and implement structural stormwater best management practices in accordance with the Stormwater Management Standards and the Stormwater Management Handbook. In addition, in municipalities and areas where state agencies operate stormwater systems, the DPWs (or other town or state agencies) must meet the “good housekeeping“ requirement of the municipality’s or agency's MS4 permit.

MassHighway has taken stormwater management one step further by working with MassDEP to develop the MassHighway Storm Water Handbook for Highways and Bridges. The purpose of the MassHighway Handbook is to provide guidance for persons involved in the design, permitting, review and implementation of state highway projects, especially those involving existing roadways where physical constraints often limit the stormwater management options available. These constraints, like those common to redevelopment sites, may make it difficult to comply precisely with the requirements of the Stormwater Management Standards and the Massachusetts Stormwater Handbook.[3] In response to these constraints, MassDEP and MHD developed specific design, permitting, review and implementation practices that meet the unique challenges of providing environmental protection for existing state roads. The information in the MassHighway Handbook may also aid in the planning and design of projects to build new highways and to add lanes to existing highways, since they may face similar difficulties in meeting the requirements of the Stormwater Management Standards.

Although it is very useful, the MassHighway Handbook does not allow MassHighway projects to proceed without individual review and approval by the issuing authority when subject to the Wetlands Protection Act Regulations, 310 CMR 10.00, or the 401 Water Quality Certification Regulations, 314 CMR 9.00. For example, MassHighway must provide a Conservation Commission with a project-specific Operation and Maintenance Plan in accordance with Standard 9 that documents how the project’s post-construction BMPs will be operated and maintained.[4]

[3] The 2004 MassHighway Handbook outlines standardized methods for dealing with these constraints as they apply to highway redevelopment projects. MassDEP and MassHighway intend to work together to provide guidance for add a lane projects when the 2004 Handbook is revised to reflect the 2008 changes to the Stormwater Management Standards.

[4] The general permit for municipal separate storm sewer systems (the MS4 Permit) requires MassHighway to develop and implement procedures for the proper operation and maintenance of stormwater BMPs. To

Some municipalities have asked if the MassHighway Handbook governs municipal road projects. The answer is no.[5] The MassHighway Handbook was developed in response to the unique problems and challenges arising out of the management of the state highway system. Like other project proponents, cities and towns planning road or other projects in areas subject to jurisdiction under the Wetlands Protection Act must design and implement LID, non-structural and structural best management practices in accordance with the Stormwater Management Standards and the Massachusetts Stormwater Handbook.

avoid duplication of effort, MassHighway may be able rely on the same procedures to fulfill the operation and maintenance requirements of Standard 9 and the MS 4 Permit.

[5] Although the MassHighway Handbook does not govern municipal road projects, cities and towns may find some of the information presented in the Handbook useful.

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Massachusetts Department of Environmental Protection
Bureau of Water Resources
Snow Disposal Guidance

Effective Date: December 23, 2019

Applicability: Applies to all federal, state, regional and local agencies, as well as to private businesses.

Supersedes: Bureau of Resource Protection (BRP) Snow Disposal Guideline No. BRPG97-1 issued December 12, 1997 and BRPG01-01 issued March 8, 2001; Bureau of Water Resources (BWR) snow disposal guidance issued December 21, 2015 and December 12, 2018.

Approved by: Kathleen Baskin, Assistant Commissioner, Bureau of Water Resources

PURPOSE: To provide guidelines to all government agencies and private businesses regarding snow disposal site selection, site preparation and maintenance, and emergency snow disposal options that are protective of wetlands, drinking water, and water bodies, and are acceptable to the Massachusetts Department of Environmental Protection (MassDEP), Bureau of Water Resources.

APPLICABILITY: These Guidelines are issued by MassDEP's Bureau of Water Resources on behalf of all Bureau Programs (including Drinking Water Supply, Wetlands and Waterways, Wastewater Management, and Watershed Planning and Permitting). They apply to all federal agencies, state agencies, state authorities, municipal agencies and private businesses disposing of snow in the Commonwealth of Massachusetts.

INTRODUCTION

Finding a place to dispose of collected snow poses a challenge to municipalities and businesses as they clear roads, parking lots, bridges, and sidewalks. While MassDEP is aware of the threats to public safety caused by snow, collected snow that is contaminated with road salt, sand, litter, and automotive pollutants such as oil also threatens public health and the environment.

As snow melts, road salt, sand, litter, and other pollutants are transported into surface water or through the soil where they may eventually reach the groundwater. Road salt and other pollutants can contaminate water supplies and are toxic to aquatic life at certain levels. Sand washed into waterbodies can create sand bars or fill in wetlands and ponds, impacting aquatic life, causing flooding, and affecting our use of these resources.

There are several steps that communities can take to minimize the impacts of snow disposal on public health and the environment. These steps will help communities avoid the costs of a contaminated water supply, degraded waterbodies, and flooding. Everything that occurs on the land has the potential to impact the Commonwealth's water resources. Given the authority of local government over the use of the land, municipal officials and staff have a critically important role to play in protecting our water resources.

The purpose of these guidelines is to help federal agencies, state agencies, state authorities, municipalities and businesses select, prepare, and maintain appropriate snow disposal sites before the snow begins to accumulate through the winter. Following these guidelines and obtaining the necessary approvals may also help municipalities in cases when seeking reimbursement for snow disposal costs from the Federal Emergency Management Agency is possible.

RECOMMENDED GUIDELINES

These snow disposal guidelines address: (1) site selection; (2) site preparation and maintenance; and (3) emergency snow disposal.

1. SITE SELECTION

The key to selecting effective snow disposal sites is to locate them adjacent to or on pervious surfaces in upland areas or upland locations on impervious surfaces away from water resources and drinking water wells. At these locations, the snow meltwater can filter into the soil, leaving behind sand and debris which can be removed in the spring. The following conditions should be followed:

- Within water supply Zone A and Zone II, avoid storage or disposal of snow and ice containing deicing chemicals that has been collected from streets located outside these zones. Municipalities may have a water supply protection land use control that prohibits the disposal of snow and ice containing deicing chemicals from outside the Zone A and Zone II, subject to the Massachusetts Drinking Water Regulations at 310 CMR 22.20C and 310 CMR 22.21(2).
- Avoid storage or disposal of snow or ice in Interim Wellhead Protection Areas (IWPA) of public water supply wells, and within 75 feet of a private well, where road salt may contaminate water supplies.
- Avoid dumping snow into any waterbody, including rivers, the ocean, reservoirs, ponds, or wetlands. In addition to water quality impacts and flooding, snow disposed of in open water can cause navigational hazards when it freezes into ice blocks.
- Avoid dumping snow on MassDEP-designated high and medium-yield aquifers where it may contaminate groundwater.
- Avoid dumping snow in sanitary landfills and gravel pits. Snow meltwater will create more contaminated leachate in landfills posing a greater risk to groundwater, and in gravel pits, there is little opportunity for pollutants to be filtered out of the meltwater because groundwater is close to the land surface.

- Avoid disposing of snow on top of storm drain catch basins or in stormwater drainage systems including detention basins, swales or ditches. Snow combined with sand and debris may block a stormwater drainage system, causing localized flooding. A high volume of sand, sediment, and litter released from melting snow also may be quickly transported through the system into surface water.

Recommended Site Selection Procedures

It is important that the municipal Department of Public Works or Highway Department, Conservation Commission, and Board of Health work together to select appropriate snow disposal sites. The following steps should be taken:

- Estimate how much snow disposal capacity may be needed for the season so that an adequate number of disposal sites can be selected and prepared.
- Identify sites that could potentially be used for snow disposal, such as municipal open space (e.g., parking lots or parks).
- Select sites located in upland locations that are not likely to impact sensitive environmental resources first.
- If more storage space is still needed, prioritize the sites with the least environmental impact (using the site selection criteria, and local or MassGIS maps as a guide).

Snow Disposal Mapping Assistance

MassDEP has an online mapping tool to assist in identifying possible locations to potentially dispose of snow. MassDEP encourages municipalities to use this tool to identify possible snow disposal options. The tool identifies wetland resource areas, public drinking water supplies and other sensitive locations where snow should not be disposed. The tool may be accessed through the Internet at the following web address:
https://maps.env.state.ma.us/dep/arcgis/js/templates/PSF/.

2. SITE PREPARATION AND MAINTENANCE

In addition to carefully selecting disposal sites before the winter begins, it is important to prepare and maintain these sites to maximize their effectiveness. The following maintenance measures should be undertaken for all snow disposal sites:

- A silt fence or equivalent barrier should be placed securely on the downgradient side of the snow disposal site.
- Wherever possible maintain a 50-foot vegetated buffer between the disposal site and adjacent waterbodies to filter pollutants from the meltwater.
- Clear debris from the site prior to using the site for snow disposal.
- Clear debris from the site and properly dispose of it at the end of the snow season, and no later than May 15.

3. SNOW DISPOSAL APPROVALS

Proper snow disposal may be undertaken through one of the following approval procedures:

- Routine snow disposal – Minimal, if any, administrative review is required in these cases when upland and pervious snow disposal locations or upland locations on impervious surfaces that have functioning and maintained stormwater management systems have been identified, mapped, and used for snow disposal following ordinary snowfalls. Use of upland and pervious snow disposal sites avoids wetland resource areas and allows snow meltwater to recharge groundwater and will help filter pollutants, sand, and other debris. This process will address the majority of snow removal efforts until an entity exhausts all available upland snow disposal sites. The location and mapping of snow disposal sites will help facilitate each entity's routine snow management efforts.
- Emergency Certifications – If an entity demonstrates that there is no remaining capacity at upland snow disposal locations, local conservation commissions may issue an Emergency Certification under the Massachusetts Wetlands Protection regulations to authorize snow disposal in buffer zones to wetlands, certain open water areas, and certain wetland resource areas (i.e. within flood plains). Emergency Certifications can only be issued at the request of a public agency or by order of a public agency for the protection of the health or safety of citizens, and are limited to those activities necessary to abate the emergency. See 310 CMR 10.06(1)-(4). Use the following guidelines in these emergency situations:
    - Dispose of snow in open water with adequate flow and mixing to prevent ice dams from forming.
    - Do not dispose of snow in salt marshes, vegetated wetlands, certified vernal pools, shellfish beds, mudflats, drinking water reservoirs and their tributaries, Zone IIs or IWPAs of public water supply wells, Outstanding Resource Waters, or Areas of Critical Environmental Concern.
    - Do not dispose of snow where trucks may cause shoreline damage or erosion.
    - Consult with the municipal Conservation Commission to ensure that snow disposal in open water complies with local ordinances and bylaws.

- Severe Weather Emergency Declarations – In the event of a large-scale severe weather event, MassDEP may issue a broader Emergency Declaration under the Wetlands Protection Act which allows federal agencies, state agencies, state authorities, municipalities, and businesses greater flexibility in snow disposal practices. Emergency Declarations typically authorize greater snow disposal options while protecting especially sensitive resources such as public drinking water supplies, vernal pools, land containing shellfish, FEMA designated floodways, coastal dunes, and salt marsh. In the event of severe winter storm emergencies, the snow disposal site maps created by municipalities will enable MassDEP and the Massachusetts Emergency Management Agency (MEMA) in helping communities identify appropriate snow disposal locations.

  If upland disposal sites have been exhausted, the Emergency Declaration issued by MassDEP allows for snow disposal near water bodies. In these situations, a buffer of at least 50 feet, preferably vegetated, should still be maintained between the site and the waterbody. Furthermore, it is essential that the other guidelines for preparing and maintaining snow disposal sites be followed to minimize the threat to adjacent waterbodies.

Under extraordinary conditions, when all land-based snow disposal options are exhausted, the Emergency Declaration issued by MassDEP may allow disposal of snow in certain waterbodies under certain conditions. ***A federal agency, state agency, state authority, municipality or business seeking to dispose of snow in a waterbody should take the following steps***:

- Call the emergency contact phone number [(888) 304-1133)] and notify the MEMA of the municipality's intent.
- MEMA will ask for some information about where the requested disposal will take place.
- MEMA will confirm that the disposal is consistent with MassDEP's Severe Weather Emergency Declaration and these guidelines and is therefore approved.

During declared statewide snow emergency events, MassDEP's website will also highlight the emergency contact phone number [(888) 304-1133)] for authorizations and inquiries. For further non-emergency information about this Guidance you may contact your MassDEP Regional Office Service Center:

Northeast Regional Office, Wilmington, 978-694-3246
Southeast Regional Office, Lakeville, 508-946-2714
Central Regional Office, Worcester, 508-792-7650
Western Regional Office, Springfield, 413-755-2114

JellyFish® Filter Maintenance Guide

Jellyfish®

Jellyfish®

JELLYFISH® FILTER MANHOLE CONFIGURATIONS
INSPECTION & MAINTENANCE GUIDE

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1.0 Inspection and Maintenance Overview

The primary purpose of the Jellyfish® Filter is to capture and remove pollutants from stormwater runoff. As with any filtration system, these pollutants must be removed to maintain the filter's maximum treatment performance. Regular inspection and maintenance are required to insure proper functioning of the system.

Maintenance frequencies and requirements are site specific and vary depending on pollutant loading. Additional maintenance activities may be required in the event of non-storm event runoff, such as base-flow or seasonal flow, an upstream chemical spill or due to excessive sediment loading from site erosion or extreme runoff events. It is a good practice to inspect the system after major storm events.

Inspection activities are typically conducted from surface observations and include:

- Observe if standing water is present
- Observe if there is any physical damage to the deck or cartridge lids
- Observe the amount of debris in the Maintenance Access Wall (MAW)

Maintenance activities typically include:

- Removal of oil, floatable trash and debris
- Removal of collected sediments
- Rinsing and re-installing the filter cartridges
- Replace filter cartridge tentacles, as needed

Note: Separator Skirt not shown

2.0 Inspection Timing

Inspection of the Jellyfish Filter is key in determining the maintenance requirements for, and to develop a history of the site's pollutant loading characteristics. In general, inspections should be performed at the times indicated below; *or per the approved project stormwater quality documents (if applicable), whichever is more frequent*.

1. Post-construction inspection is required prior to putting the Jellyfish Filter into service. All construction debris or construction-related sediment within the device must be removed, and any damage to system components repaired, before installing the filter cartridges.
2. A minimum of two inspections during the first year of operation to assess the sediment and floatable pollutant accumulation, and to ensure proper functioning of the system.
3. Inspection frequency in subsequent years is based on the inspection and maintenance plan developed in the first year of operation. Minimum frequency should be once per year.
4. Inspection is recommended after each major storm event.
5. Inspection is required immediately after an upstream oil, fuel or other chemical spill.

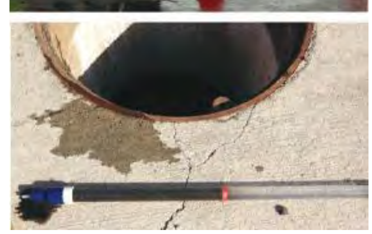
3.0 Inspection Procedure

The following procedure is recommended when performing inspections:

1. Provide traffic control measures as necessary.
2. Inspect the MAW for floatable pollutants such as trash, debris, and oil sheen.
3. Measure oil and sediment depth in several locations, by lowering a sediment probe through the MAW opening until contact is made with the floor of the structure. Record sediment depth, and presences of any oil layers.
4. Inspect cartridge lids. Missing or damaged cartridge lids to be replaced.
5. Inspect the MAW, cartridge deck, and backwash pool weir, for cracks or broken components. If damaged, repair is required.

3.1 Dry weather inspections

- Inspect the cartridge deck for standing water, and/or sediment on the deck.
- No standing water under normal operating conditions.
- Standing water inside the backwash pool, but not outside the backwash pool indicates that the filter cartridges need to be rinsed.



Inspection Utilitzing Sediment Probe

- Standing water outside the backwash pool may indicate a backwater condition caused by high water elevation in the receiving water body, or possibly a blockage in downstream infrastructure.
- Any appreciable sediment (≥1/16”) accumulated on the deck surface should be removed.

3.2 Wet weather inspections

- Observe the rate and movement of water in the unit. Note the depth of water above deck elevation within the MAW.
- Less than 6 inches, flow should be exiting the cartridge lids of each of the draindown cartridges (i.e. cartridges located outside the backwash pool).
- Greater than 6 inches, flow should be exiting the cartridge lids of each of the draindown cartridges and each of the hi-flo cartridges (i.e. cartridges located inside the backwash pool), and water should be overflowing the backwash pool weir.
- 18 inches or greater and relatively little flow is exiting the cartridge lids and outlet pipe, this condition indicates that the filter cartridges are occluded with sediment and need to be rinsed

4.0 Maintenance Requirements

Required maintenance for the Jellyfish Filter is based upon results of the most recent inspection, historical maintenance records, or the site specific water quality management plan; whichever is more frequent. In general, maintenance requires some combination of the following:

1. Sediment removal for depths reaching 12 inches or greater, or within 3 years of the most recent sediment cleaning, whichever occurs sooner.
2. Floatable trash, debris, and oil removal.
3. Deck cleaned and free from sediment.
4. Filter cartridges rinsed and re-installed as required by the most recent inspection results, or within 12 months of the most recent filter rinsing, whichever occurs sooner.
5. Replace tentacles if rinsing does not restore adequate hydraulic capacity, remove accumulated sediment, or if damaged or missing. It is recommended that tentacles should remain in service no longer than 5 years before replacement.
6. Damaged or missing cartridge deck components must be repaired or replaced as indicated by results of the most recent inspection.
7. The unit must be cleaned out and filter cartridges inspected immediately after an upstream oil, fuel, or chemical spill. Filter cartridge tentacles should be replaced if damaged or compromised by the spill.

5.0 Maintenance Procedure

The following procedures are recommended when maintaining the Jellyfish Filter:

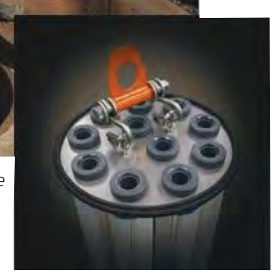
1. Provide traffic control measures as necessary.
2. Open all covers and hatches. Use ventilation equipment as required, according to confined space entry procedures.
3. Caution: Dropping objects onto the cartridge deck may cause damage.
4. Perform Inspection Procedure prior to maintenance activity.
5. To access the cartridge deck for filter cartridge service, descend the ladder and step directly onto the deck. Caution: Do not step onto the maintenance access wall (MAW) or backwash pool weir, as damage may result. Note that the cartridge deck may be slippery.
6. Maximum weight of maintenance crew and equipment on the cartridge deck not to exceed 450 lbs.

5.1 Filter Cartridge Removal

1. Remove a cartridge lid.
2. Remove cartridges from the deck using the lifting loops in the cartridge head plate. Rope or a lifting device (available from Contech) should be used. Caution: Should a snag occur, do not force the cartridge upward as damage to the tentacles may result. Wet cartridges typically weigh between 100 and 125 lbs.
3. Replace and secure the cartridge lid on the exposed empty receptacle as a safety precaution. Contech does not recommend exposing more than one empty cartridge receptacle at a time.

5.2 Filter Cartridge Rinsing

1. Remove all 11 tentacles from the cartridge head plate. Take care not to damage or break the plastic threaded nut or connector.
2. Position tentacles in a container (or over the MAW), with the threaded connector (open end) facing down, so rinse water is flushed through the membrane and captured in the container.



Cartridge Removal & Lifting Device

3. Using the Jellyfish rinse tool (available from Contech) or a low-pressure garden hose sprayer, direct water spray onto the tentacle membrane, sweeping from top to bottom along the length of the tentacle. Rinse until all sediment is removed from the membrane. Caution: Do not use a high pressure sprayer or focused stream of water on the membrane. Excessive water pressure may damage the membrane.

4. Collected rinse water is typically removed by vacuum hose.
5. Reattach tentacles to cartridge head plate. Reuse O-rings and nuts, ensuring proper placement on each tentacle.

5.3 Cleaning Procedure

1. Perform vacuum cleaning of the Jellyfish Filter only after filter cartridges have been removed from the system. Access the lower chamber for vacuum cleaning only through the maintenance access wall (MAW) opening, being careful not to damage the flexible plastic separator skirt that is attached to the underside of the deck. The separator skirt surrounds the filter cartridge zone, and could be torn if contacted by the wand. Do not lower the vacuum wand through a cartridge receptacle, as damage to the receptacle will result.
2. Vacuum floatable trash, debris, and oil, from the MAW opening. Alternatively, floatable solids may be removed by a net or skimmer.

Tentacle Rinse Using Jellyfish Rinse Tool

3. Pressure wash cartridge deck and receptacles to remove all sediment and debris. Sediment should be rinsed into the sump area. Take care not to flush rinse water into the outlet pipe.
4. Remove water from the sump area. Vacuum or pump equipment should only be introduced through the MAW.
5. Remove the sediment from the bottom of the unit through the MAW opening.

Vacuuming Sump Through MAW

6. For larger diameter Jellyfish Filter manholes (≥8-ft) and vaults without an MAW opening, complete sediment removal may be facilitated by removing a cartridge lid from an empty receptacle and inserting a jetting wand (not a vacuum wand) through the receptacle. Use the sprayer to rinse loosened sediment toward the vacuum hose in the MAW opening, being careful not to damage the receptacle.
7. After the unit is clean, re-fill the lower chamber with water if required by the local jurisdiction, and re-install filter cartridges.
8. Dispose of sediment, floatable trash and debris, oil, spent tentacles, and water according to local regulatory requirements.

5.4 Filter Cartridge Replacement

1. Cartridges should be installed after the deck has been cleaned. It is important that the receptacle surfaces be free from grit and debris.
2. If rinsing is ineffective in removing sediment from the tentacles, or if tentacles are damaged, provisions must be made to replace the spent or damaged tentacles with new tentacles. Contact Contech to order replacement tentacles.
3. Lower filter cartridge to the cartridge deck. Remove cartridge lid from deck and carefully lower the filter cartridge into the receptacle until head plate gasket is seated squarely in receptacle. Caution: Should a snag occur when lowering the cartridge into the receptacle, do not force the cartridge downward; damage may occur.
4. Replace the cartridge lid and check fit before completing rotation to a firm hand-tight attachment.

5.5 Chemical Spills

Caution: If a chemical spill has been captured, do not attempt maintenance. Immediately contact the local hazard response agency and contact Contech.

6.0 Related Maintenance Activities

Jellyfish units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

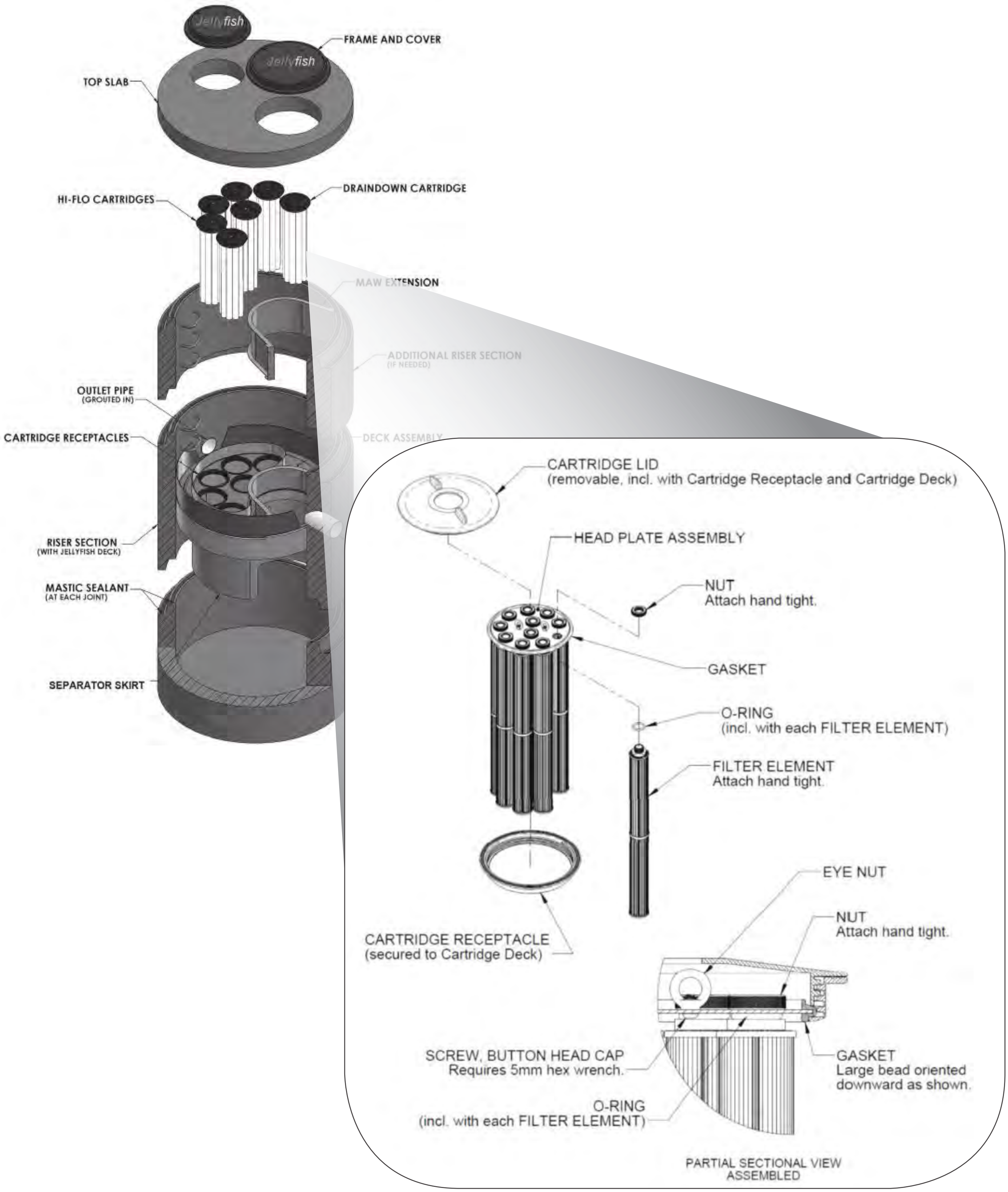
In order for maintenance of the Jellyfish filter to be successful, it is imperative that all other components be properly maintained. The maintenance and repair of upstream facilities should be carried out prior to Jellyfish maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

7.0 Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads. Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

Jellyfish Filter Components & Filter Cartridge



Jellyfish Filter Inspection and Maintenance Log						
Owner:				Jellyfish Model No:		
Location:				GPS Coordinates:		
Lande Use:	Commercial:		Industrial:		Service Station:	
	Roadway/Highway:		Airport:		Residential:	

Date/Time:						
Inspector:						
Maintenance Contractor:						
Visible Oil Present: (Y/N)						
Oil Quantity Removed:						
Floatable Debris Present: (Y/N)						
Floatable Debris Removed: (Y/N)						
Water Depth in Backwash Pool						
Draindown Cartridges externally rinsed and recommissioned: (Y/N)						
New tentacles put on Cartridges: (Y/N)						
Hi-Flo Cartridges externally rinsed and recommissioned: (Y/N)						
New tentacles put on Hi-Flo Cartridges: (Y/N)						
Sediment Depth Measured: (Y/N)						
Sediment Depth (inches or mm):						
Sediment Removed: (Y/N)						
Cartridge Lids intact: (Y/N)						
Observed Damage:						
Comments:						

Jellyfish®

CONTECH®
ENGINEERED SOLUTIONS

800.338.1122
www.ContechES.com

Support

- Drawings and specifications are available at ContechES.com/jellyfish.
- Site-specific design support is available from Contech Engineered Solutions.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, wastewater treatment and earth stabilization products. For information on other Contech segment offerings, visit ContechES.com or call 800.338.1122

The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; related foreign patents or other patents pending.

CONTECH
ENGINEERED SOLUTIONS

Stormceptor® STC Owner's Manual

Stormceptor® STC

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TITLE .... SECTION

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For patent information, go to www.ContechES.com/ip.

Your selection of a Stormceptor® means that you have chosen the most recognized and efficient stormwater oil/sediment separator available for protecting the environment. Stormceptor is a pollution control device often referred to as a "Hydrodynamic Separator (HDS)" or an "Oil Grit Separator (OGS)", engineered to remove and retain pollutants from stormwater runoff to protect our lakes, rivers and streams from the harmful effects of non-point source pollution.

1 – Stormceptor Overview

Stormceptor is a patented stormwater quality structure most often utilized as a treatment component of the underground storm drain network for stormwater pollution prevention. Stormceptor is designed to remove sediment, total suspended solids (TSS), other pollutants attached to sediment, hydrocarbons and free oil from stormwater runoff. Collectively the Stormceptor provides spill protection and prevents non-point source pollution from entering downstream waterways.

Key benefits of Stormceptor include:

- Removes sediment, suspended solids, debris, nutrients, heavy metals, and hydrocarbons (oil and grease) from runoff and snowmelt.
- Will not scour or re-suspend trapped pollutants.
- Provides sediment and oil storage.
- Provides spill control for accidents, commercial and industrial developments.
- Easy to inspect and maintain (vacuum truck).
- "STORMCEPTOR" is clearly marked on the access cover (excluding inlet designs).
- Relatively small footprint.
- 3rd Party tested and independently verified.
- Dedicated team of experts available to provide support.

Model Types:

- STC (Standard)
- EOS (Extended Oil Storage)
- OSR (Oil and Sand Removal)
- MAX (Custom designed unit, specific to site)

Configuration Types:

- Inlet unit (accommodates inlet flow entry, and multi-pipe entry)
- In-Line (accommodates multi-pipe entry)
- Submerged Unit (accommodates the site's tailwater conditions)
- Series Unit (combines treatment in two systems)

PLEASE MAINTAIN YOUR STORMCEPTOR

To ensure long-term environmental protection through continued performance as originally designed for your site, Stormceptor must be maintained, as any stormwater treatment practice does. The need for maintenance is determined through inspection of the Stormceptor. Procedures for inspection are provided within this document. Maintenance of the Stormceptor is performed from the surface via vacuum truck.

If you require information about Stormceptor, or assistance in finding resources to facilitate inspections or maintenance of your Stormceptor please call Contech at 1-800-338-1122.

2 – Stormceptor Operation and Components

Stormceptor is a flexibly designed underground stormwater quality treatment device that is unparalleled in its effectiveness for pollutant capture and retention using patented flow separation technology. Stormceptor creates a non-turbulent treatment environment below the insert platform within the system. The insert diverts water into the lower chamber, allowing free oils and debris to rise, and sediment to settle under relatively low velocity conditions. These pollutants are trapped and stored below the insert and protected from large runoff events for later removal during the maintenance procedure.

With thousands of units operating worldwide, Stormceptor delivers reliable protection every day, in every storm. The patented Stormceptor design prohibits the scour and release of captured pollutants, ensuring superior water quality treatment and protection during even the most extreme storm events. Stormceptor's proven performance is backed by the longest record of lab and field verification in the industry.

Stormceptor Schematic and Component Functions

Below are schematics of two common Stormceptor configurations with key components identified and their functions briefly described.

- **Manhole access cover** – provides access to the subsurface components
- **Precast reinforced concrete structure** – provides the vessel's watertight structural support
- **Fiberglass insert** – separates vessel into upper and lower chambers
- **Weir** – directs incoming stormwater and oil spills into the lower chamber
- **Orifice plate** – prevents scour of accumulated pollutants
- **Inlet drop tee** – conveys stormwater into the lower chamber
- **Fiberglass skirt** – provides double-wall containment of hydrocarbons
- **Outlet riser pipe** – conveys treated water to the upper chamber; primary vacuum line access port for sediment removal
- **Oil inspection port** – primary access for measuring oil depth and oil removal
- **Safety grate** – safety measure to cover riser pipe in the event of manned entry into vessel

Figure 1.

Inline Stormceptor

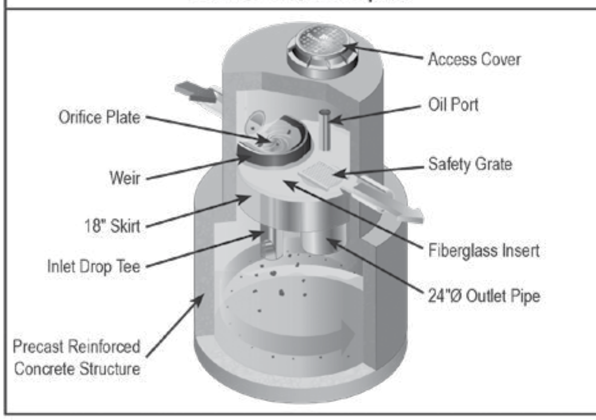
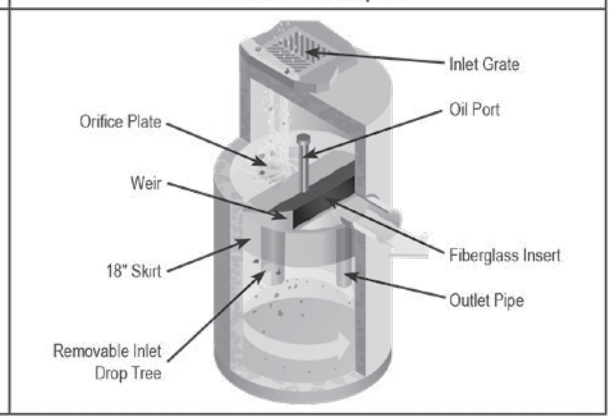


Figure 2.

Inlet Stormceptor



3 – Stormceptor Identification

Stormceptor is available in both precast concrete and fiberglass vessels, with precast concrete often being the dominant material of construction.

In the Stormceptor, a patented, engineered fiberglass insert separates the structure into an upper chamber and lower chamber. The lower chamber will remain full of water, as this is where the pollutants are sequestered for later removal. Multiple Stormceptor model (STC, OSR, EOS and MAX) configurations exist, each to be inspected and maintained in a similar fashion.

Each unit is easily identifiable as a Stormceptor by the trade name "Stormceptor" embossed on each access cover at the surface. To determine the location of "inlet" Stormceptor units with horizontal catch basin inlet, look down into the grate as the Stormceptor insert will be visible. The name "Stormceptor" is not embossed on inlet models due to the variability of inlet grates used/approved across North America.

Once the location of the Stormceptor is determined, the model number may be identified by comparing the measured depth from the fiberglass insert level at the outlet pipe's invert (water level) to the bottom of the tank using Table 1.

In addition, starting in 1996 a metal serial number tag containing the model number has been affixed to the inside of the unit, on the fiberglass insert. If the unit does not have a serial number, or if there is any uncertainty regarding the size of the unit using depth measurements, please contact your local Contech Representative for assistance.

Sizes/Models

Typical general dimensions and capacities of the standard precast STC, EOS and OSR Stormceptor models are provided in Tables 1 and 2. Typical rim to invert measurements are provided later in this document. The total depth for cleaning will be the sum of the depth from outlet pipe invert (generally the water level) to rim (grade) and the depth from outlet pipe invert to the precast bottom of the unit. Note that depths and capacities may vary slightly between regions.

Table 1. Stormceptor Dimensions - Insert to Base of Structure

STC Model	Insert to Base (in.)
450	60
900	55
1200	71
1800	105
2400	94
3600	134
4800	128
6000	150
7200	134
11000*	128
13000*	150
16000*	134

Notes:
1. Depth Below Pipe Inlet Invert to the Inside Top Base Slab can vary slightly by manufacturing facility, and can be modified to accommodate specific site designs, pollutant loads or site conditions. Contact your local representative for assistance.
**Consist of two chamber structures in series.*

Table 2. Storage Capacities

STC Model	Hydrocarbon Storage Capacity (gal)	Sediment Capacity (ft^3)
450	86	46
900	251	89
1200	251	127
1800	251	207
2400	840	205
3600	840	373
4800	909	543
6000	909	687
7200	1059	839
11000*	2797	1089
13000*	2797	1374
16000*	3055	1677

Notes:
1. Hydrocarbon and Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.
**Consist of two chamber structures in series*

4 – Stormceptor Inspection and Maintenance

Regular inspection and maintenance is a proven, cost-effective way to maximize water resource protection for all stormwater pollution control practices, and is required to insure proper functioning of the Stormceptor. Both inspection and maintenance of the Stormceptor is easily performed from the surface. Stormceptor's patented technology has no moving parts, simplifying the inspection and maintenance process.

Please refer to the following information and guidelines before conducting inspection and maintenance activities.

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess the sediment accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

When is maintenance cleaning needed?

- For optimum performance, the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, which is approximately 15% of the unit's total storage capacity (see Table 3). The frequency should be adjusted based on historical inspection results due to variable site pollutant loading.
- Sediment removal is easier when removed on a regular basis at or prior to the recommended maintenance sediment depths, as sediment build-up can compact making removal more difficult.
- The unit should be cleaned out immediately after an oil, fuel or chemical spill.

What conditions can compromise Stormceptor performance?

- If construction sediment and debris is not removed prior to activating the Stormceptor unit, maintenance frequency may be reduced.
- If the system is not maintained regularly and fills with sediment and debris beyond the capacity as indicated in Table 2, pollutant removal efficiency may be reduced.
- If an oil spill(s) exceeds the oil capacity of the system, subsequent spills may not be captured.
- If debris clogs the inlet of the system, removal efficiency of sediment and hydrocarbons may be reduced.
- If a downstream blockage occurs, a backwater condition may occur for the Stormceptor and removal efficiency of sediment and hydrocarbons may be reduced.

What training is required?

The Stormceptor is to be inspected and maintained by professional vacuum cleaning service providers with experience in the maintenance of underground tanks, sewers and catch basins.

For typical inspection and maintenance activities, no specific supplemental training is required

Recommended Stormceptor Inspection Procedure:

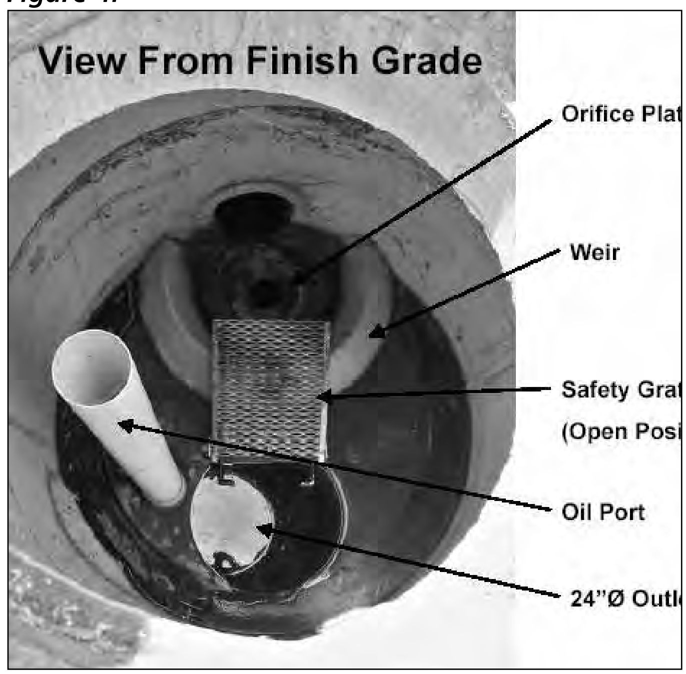
- Stormceptor is to be inspected from grade through a standard surface manhole access cover.
- Sediment and oil depth inspections are performed with a sediment probe and oil dipstick.
- Oil depth is measured through the oil inspection port, either a 4-inch or 6-inch diameter port.
- Sediment depth can be measured through the oil inspection port or the 24-inch diameter outlet riser pipe.
- Inspections also involve a visual inspection of the internal components of the system.

What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, hoist and safety harness for specially trained personnel if confined space entry is required

Figure 3.

Figure 4.



Recommended Stormceptor Maintenance Procedure

Maintenance of Stormceptor is performed using a vacuum truck. No entry into the unit is required for maintenance. DO NOT ENTER THE STORMCEPTOR CHAMBER unless you have the proper personal safety equipment, have been trained and are qualified to enter a confined space, as identified by local Occupational Safety and Health Regulations (e.g. 29 CFR 1910.146). Without the proper equipment, training and permit, entry into confined spaces can result in serious bodily harm and potentially death. Consult local and/or state regulations to determine the requirements for confined space entry. Be aware, and take precaution that the Stormceptor fiberglass insert may be slippery. In addition, be aware that some units do not have a safety grate to cover the outlet riser pipe that leads to the submerged, lower chamber.

- Ideally maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is to be maintained through a standard surface manhole access cover.
- Insert the oil dipstick into the oil inspection port. If oil is present, pump off the oil layer into separate containment using a small pump and tubing.
- Maintenance cleaning of accumulated sediment is performed with a vacuum truck.
  - » For 6-ft diameter models and larger, the vacuum hose is inserted into the lower chamber via the 24-inch outlet riser pipe (See Fig. 5).
  - » For 4-ft diameter model, the removable drop tee is lifted out, and the vacuum hose is inserted into the lower chamber via the 12-inch drop tee hole (See Fig. 6).

Figure 5.

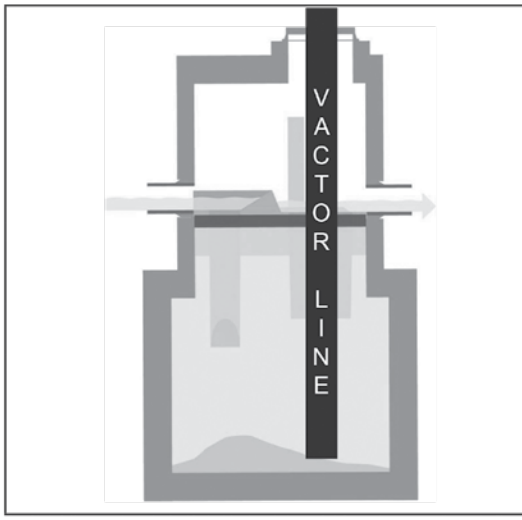
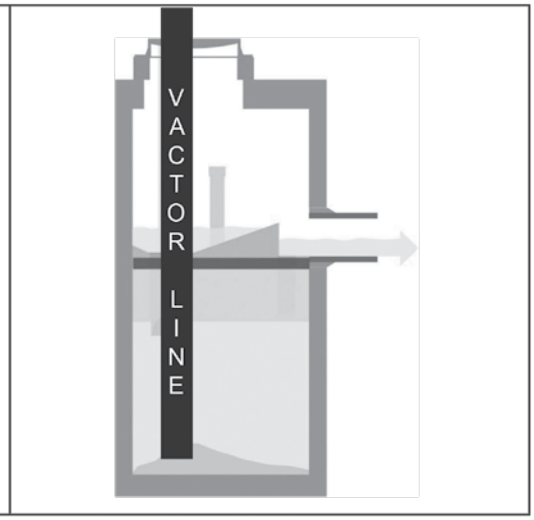


Figure 6.



- Using the vacuum hose, decant the water from the lower chamber into a separate containment tank or to the sanitary sewer, if permitted by the local regulating authority.
- Remove the sediment sludge from the bottom of the unit using the vacuum hose. For large Stormceptor units, a flexible hose is often connected to the primary vacuum line for ease of movement in the lower chamber.
- Units that have not been maintained regularly, have surpassed the maximum recommended sediment capacity, or contain damaged components may require manned entry by trained personnel using safe and proper confined space entry procedures.

What is required for proper disposal?

The requirements for the disposal of material removed from Stormceptor units are similar to that of any other stormwater treatment Best Management Practices (BMP). Local guidelines should be consulted prior to disposal of the separator contents. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste. This could be site and pollutant dependent. In some cases, approval from the disposal facility operator/agency may be required.

What about oil spills?

Stormceptor is often implemented in areas where there is high potential for oil, fuel or other hydrocarbon or chemical spills. Stormceptor units should be cleaned immediately after a spill occurs by a licensed liquid waste hauler. You should also notify the appropriate regulatory agencies as required in the event of a spill.

What if I see an oil rainbow or sheen at the Stormceptor outlet?

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a hydrocarbon rainbow or sheen can be seen at very small oil concentrations (< 10 ppm). Stormceptor is effective at removing 95% of free oil, and the appearance of a sheen at the outlet with high influent oil concentrations does not mean unit is not working to this level of removal. In addition, if the influent oil is emulsified, the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified or dissolved oil conditions.

What factors affect the costs involved with inspection/maintenance?

The Vacuum Service Industry for stormwater drainage and sewer systems is a well-established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean Stormceptor units will vary. Inspection and maintenance costs are most often based on unit size, the number of units on a site, sediment/oil/hazardous material loads, transportation distances, tipping fees, disposal requirements and other local regulations.

What factors predict maintenance frequency?

Maintenance frequency will vary with the amount of pollution on your site (number of hydrocarbon spills, amount of sediment, site activity and use, etc.). It is recommended that the frequency of maintenance be increased or reduced based on local conditions. If the sediment load is high from an unstable site or sediment loads transported from upstream catchments, maintenance may be required semi-annually. Conversely once a site has stabilized, maintenance may be required less frequently (for example: two to seven year, site and situation dependent). Maintenance should be performed immediately after an oil spill or once the sediment depth in Stormceptor reaches the value specified in Table 3 based on the unit size.

Table 3. Recommended Sediment Depths Indicating Maintenance

STC Model	Maintenance Sediment Depth (in)
450	8
900	8
1200	10
1800	15
2400	12
3600	17
4800	15
6000	18
7200	15
11000*	17
13000*	20
16000*	17

Notes:
1. The values above are for typical standard units.
** Per structure.*

Replacement parts

Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. Therefore, inspection and maintenance activities are generally focused on pollutant removal. However, if replacements parts are necessary, they may be purchased by contacting your local Contech Representative or call 800-338-1122.

The benefits of regular inspection and maintenance are many – from ensuring maximum operation efficiency, to keeping maintenance costs low, to the continued protection of natural waterways – and provide the key to Stormceptor's long and effective service life.

Stormceptor Inspection and Maintenance Log

Stormceptor Model No: ______________________________

Allowable Sediment Depth: ______________________________

Serial Number: ______________________________

Installation Date: ______________________________

Location Description of Unit: ______________________________

Other Comments: ______________________________

5 – Contact Information

Questions regarding the Stormceptor can be addressed by contacting your local Contech representative or by calling 800-338-1122.

SUPPORT

- Drawings and specifications are available at www.ContechES.com.
- Site-specific design support is available from our engineers.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, and earth stabilization products. For information, visit www.ContechES.com or call 800.338.1122

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StormFilter Inspection and Maintenance Procedures

Maintenance Guidelines

The primary purpose of the Stormwater Management StormFilter® is to filter and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the StormFilter to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is a good practice to inspect the system after major storm events.

Maintenance Procedures

Although there are many effective maintenance options, we believe the following procedure to be efficient, using common equipment and existing maintenance protocols. The following two-step procedure is recommended::

1. **Inspection**
   - Inspection of the vault interior to determine the need for maintenance.
2. **Maintenance**
   - Cartridge replacement
   - Sediment removal

Inspection and Maintenance Timing

At least one scheduled inspection should take place per year with maintenance following as warranted.

First, an inspection should be done before the winter season. During the inspection the need for maintenance should be determined and, if disposal during maintenance will be required, samples of the accumulated sediments and media should be obtained.

Second, if warranted, a maintenance (replacement of the filter cartridges and removal of accumulated sediments) should be performed during periods of dry weather.

In addition to these two activities, it is important to check the condition of the StormFilter unit after major storms for potential damage caused by high flows and for high sediment accumulation that may be caused by localized erosion in the drainage area. It may be necessary to adjust the inspection/ maintenance schedule depending on the actual operating conditions encountered by the system. In general, inspection activities can be conducted at any time, and maintenance should occur, if warranted, during dryer months in late summer to early fall.

Maintenance Frequency

The primary factor for determining frequency of maintenance for the StormFilter is sediment loading.

A properly functioning system will remove solids from water by trapping particulates in the porous structure of the filter media inside the cartridges. The flow through the system will naturally decrease as more and more particulates are trapped. Eventually the flow through the cartridges will be low enough to require replacement. It may be possible to extend the usable span of the cartridges by removing sediment from upstream trapping devices on a routine as-needed basis, in order to prevent material from being re-suspended and discharged to the StormFilter treatment system.

The average maintenance lifecycle is approximately 1-5 years. Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction may need to be inspected and maintained more often than those with fully stabilized surface conditions.

Regulatory requirements or a chemical spill can shift maintenance timing as well. The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after major storms. Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual StormFilter system or site. It is recommended that the site owner develop a database to properly manage StormFilter inspection and maintenance programs..

Inspection Procedures

The primary goal of an inspection is to assess the condition of the cartridges relative to the level of visual sediment loading as it relates to decreased treatment capacity. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, then maintenance is warranted and the cartridges need to be replaced.

Warning: In the case of a spill, the worker should abort inspection activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct an inspection:

Important: Inspection should be performed by a person who is familiar with the operation and configuration of the StormFilter treatment unit.

1. If applicable, set up safety equipment to protect and notify surrounding vehicle and pedestrian traffic.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the access portals to the vault and allow the system vent.
4. Without entering the vault, visually inspect the inside of the unit, and note accumulations of liquids and solids.
5. Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the flow of water per drainage pipe. Record all observations. Digital pictures are valuable for historical documentation.
6. Close and fasten the access portals.
7. Remove safety equipment.
8. If appropriate, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.
9. Discuss conditions that suggest maintenance and make decision as to whether or not maintenance is needed.

Maintenance Decision Tree

The need for maintenance is typically based on results of the inspection. The following Maintenance Decision Tree should be used as a general guide. (Other factors, such as Regulatory Requirements, may need to be considered)

1. Sediment loading on the vault floor.
   a. If >4" of accumulated sediment, maintenance is required.
2. Sediment loading on top of the cartridge.
   a. If >1/4" of accumulation, maintenance is required.
3. Submerged cartridges.
   a. If >4" of static water above cartridge bottom for more than 24 hours after end of rain event, maintenance is required. (Catch basins have standing water in the cartridge bay.)
4. Plugged media.
   a. If pore space between media granules is absent, maintenance is required.
5. Bypass condition.
   a. If inspection is conducted during an average rain fall event and StormFilter remains in bypass condition (water over the internal outlet baffle wall or submerged cartridges), maintenance is required.
6. Hazardous material release.
   a. If hazardous material release (automotive fluids or other) is reported, maintenance is required.
7. Pronounced scum line.
   a. If pronounced scum line (say ≥ 1/4" thick) is present above top cap, maintenance is required.

Maintenance

Depending on the configuration of the particular system, maintenance personnel will be required to enter the vault to perform the maintenance.

Important: If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flows is occurring.

Replacement cartridges can be delivered to the site or customers facility. Information concerning how to obtain the replacement cartridges is available from Contech Engineered Solutions.

Warning: In the case of a spill, the maintenance personnel should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct cartridge replacement and sediment removal maintenance:

1. If applicable, set up safety equipment to protect maintenance personnel and pedestrians from site hazards.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the doors (access portals) to the vault and allow the system to vent.
4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.
5. Make notes about the external and internal condition of the vault. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.
6. Using appropriate equipment offload the replacement cartridges (up to 150 lbs. each) and set aside.
7. Remove used cartridges from the vault using one of the following methods:

Method 1:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

   Using appropriate hoisting equipment, attach a cable from the boom, crane, or tripod to the loose cartridge. Contact Contech Engineered Solutions for suggested attachment devices.

B. Remove the used cartridges (up to 250 lbs. each) from the vault.

Important: Care must be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner.

C. Set the used cartridge aside or load onto the hauling truck.

D. Continue steps a through c until all cartridges have been removed.

Method 2:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

B. Unscrew the cartridge cap.

C. Remove the cartridge hood and float.

D. At location under structure access, tip the cartridge on its side.

E. Empty the cartridge onto the vault floor. Reassemble the empty cartridge.

F. Set the empty, used cartridge aside or load onto the hauling truck.

G. Continue steps a through e until all cartridges have been removed.

8. Remove accumulated sediment from the floor of the vault and from the forebay. This can most effectively be accomplished by use of a vacuum truck.
9. Once the sediments are removed, assess the condition of the vault and the condition of the connectors.
10. Using the vacuum truck boom, crane, or tripod, lower and install the new cartridges. Once again, take care not to damage connections.
11. Close and fasten the door.
12. Remove safety equipment.
13. Finally, dispose of the accumulated materials in accordance with applicable regulations. Make arrangements to return the used **empty** cartridges to Contech Engineered Solutions.

Related Maintenance Activities - Performed on an as-needed basis

StormFilter units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

In order for maintenance of the StormFilter to be successful, it is imperative that all other components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

Inspection Report

Date: ___________________________ Personnel: ____

Location: _________________________ System Size: ______________________________ Months in Service: _________________________

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other: ___________

Sediment Thickness in Forebay: ____ Date: _____________________________

Sediment Depth on Vault Floor: ____

Sediment Depth on Cartridge Top(s): ____

Structural Damage: ____

Estimated Flow from Drainage Pipes (if available): ____

Cartridges Submerged: Yes ☐ No ☐ Depth of Standing Water: ____

StormFilter Maintenance Activities (check off if done and give description)

☐ Trash and Debris Removal: ____

☐ Minor Structural Repairs: ____

☐ Drainage Area Report ____

Excessive Oil Loading: Yes ☐ No ☐ Source: ____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: ____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: ____

Items Needing Further Work: ____

Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals.

Other Comments:

____

____

____

____

____

____

____

____

Review the condition reports from the previous inspection visits.

StormFilter Maintenance Report

Date: ______________________ Personnel: ______________________

Location: ______________________ System Size: ______________________

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other: __________

List Safety Procedures and Equipment Used: ______________________

System Observations

Months in Service: ______________________

Oil in Forebay (if present): Yes ☐ No ☐

Sediment Depth in Forebay (if present): ______________________

Sediment Depth on Vault Floor: ______________________

Sediment Depth on Cartridge Top(s): ______________________

Structural Damage: ______________________

Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source: ______________________

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: ______________________

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: ______________________

StormFilter Cartridge Replacement Maintenance Activities

Remove Trash and Debris: Yes ☐ No ☐ Details: ______________________

Replace Cartridges: Yes ☐ No ☐ Details: ______________________

Sediment Removed: Yes ☐ No ☐ Details: ______________________

Quantity of Sediment Removed (estimate?):

Minor Structural Repairs: Yes ☐ No ☐ Details: ______________________

Residuals (debris, sediment) Disposal Methods: ______________________

Notes:

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Support

- Drawings and specifications are available at www.conteches.com.
- Site-specific design support is available from our engineers.

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Isolator™ Row O&M Manual

StormTech® Chamber System for Stormwater Management

1.0 The Isolator™ Row

1.1 INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a patent pending technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance.

Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.

1.2 THE ISOLATOR™ ROW

The Isolator Row is a row of StormTech chambers, either SC-740 or SC-310 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated side-walls allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

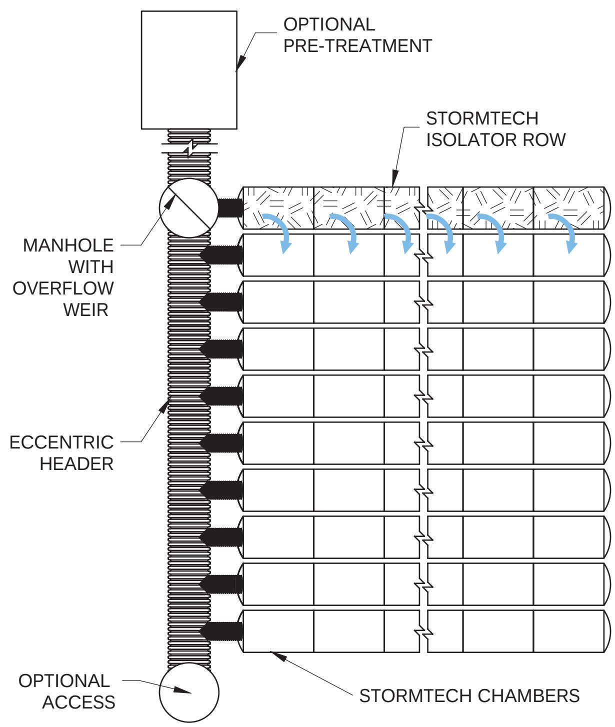
Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber.

The Isolator Row is typically designed to capture the "first flush" and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating storm water prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured. Pre-treatment best management practices can be as simple as deep sump catch basins, oil-water separators or can be innovative storm water treatment devices. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.

StormTech Isolator Row with Overflow Spillway
(not to scale)



2.1 INSPECTION

The frequency of Inspection and Maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

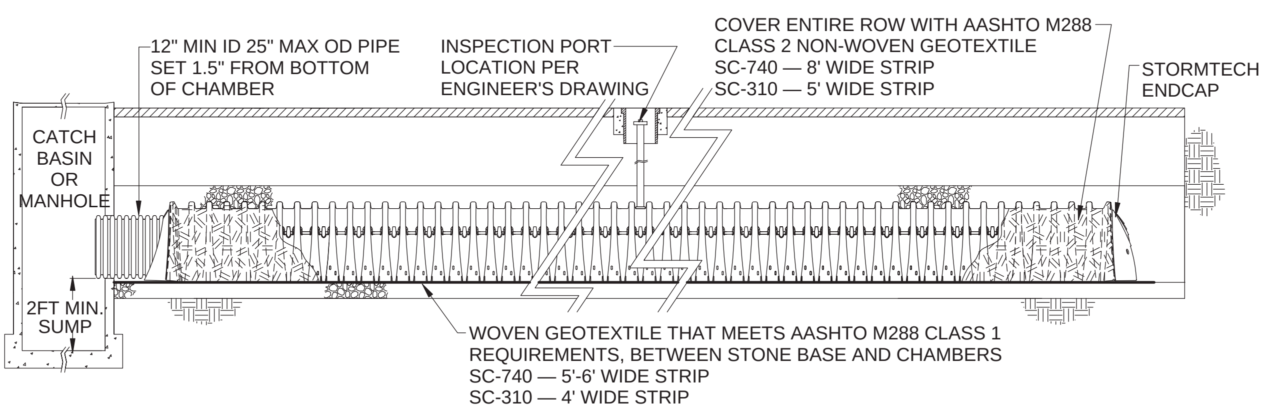
2.2 MAINTENANCE

The Isolator Row was designed to reduce the cost of periodic maintenance. By “isolating” sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Examples of culvert cleaning nozzles appropriate for Isolator Row maintenance. (These are not StormTech products.)

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45” are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row (not to scale)



3.0 Isolator Row Step By Step Maintenance Procedures

Step 1) Inspect Isolator Row for sediment

A) Inspection ports (if present)

i. Remove lid from floor box frame

ii. Remove cap from inspection riser

iii. Using a flashlight and stadia rod, measure depth of sediment and record results on maintenance log.

iv. If sediment is at, or above, 3 inch depth proceed to Step 2. If not proceed to step 3.

B) All Isolator Rows

i. Remove cover from manhole at upstream end of Isolator Row

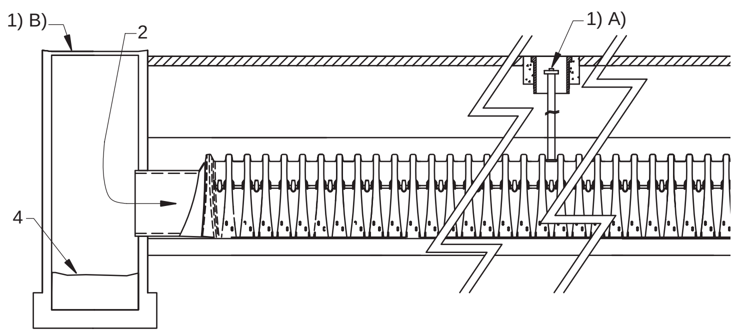
ii. Using a flashlight, inspect down Isolator Row through outlet pipe

1. Mirrors on poles or cameras may be used to avoid a confined space entry

2. Follow OSHA regulations for confined space entry if entering manhole

iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches) proceed to Step 2. If not proceed to Step 3.

StormTech Isolator Row (not to scale)



Step 2) Clean out Isolator Row using the JetVac process

A) A fixed culvert cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable

B) Apply multiple passes of JetVac until backflush water is clean

C) Vacuum manhole sump as required

Step 3) Replace all caps, lids and covers, record observations and actions

Step 4) Inspect & clean catch basins and manholes upstream of the StormTech system

Sample Maintenance Log

Date	Stadia Rod Readings		Sediment Depth (1) - (2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/01	6.3 ft.	none		New installation. Fixed point is CI frame at grade	djm
9/24/01		6.2	0.1 ft.	Some grit felt	sm
6/20/03		5.8	0.5 ft.	Mucky feel, debris visible in manhole and in Isolator row, maintenance due	rv
7/7/03	6.3 ft.		0	System jetted and vacuumed	djm

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StormTech® SC-310 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

Nominal Chamber Specifications
(not to scale)

Size (L x W x H)
85.4" x 34" x 16"
2170 mm x 864 mm x 406 mm

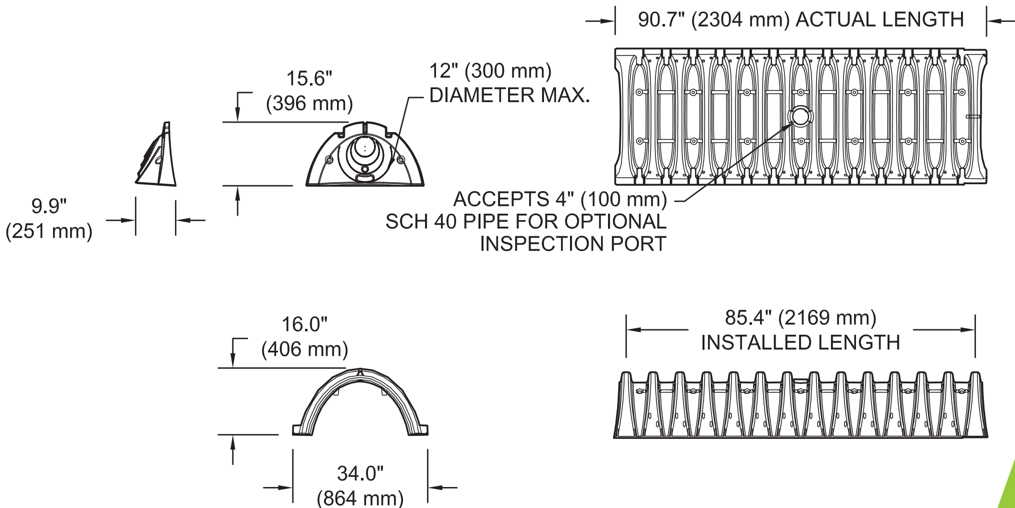
Chamber Storage
14.7 ft³ (0.42 m³)

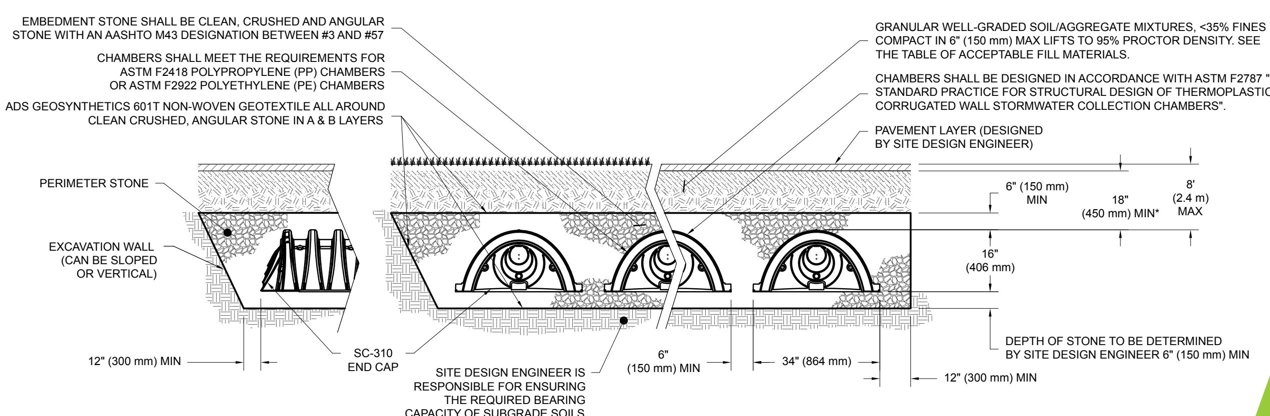
Min. Installed Storage*
31.0 ft³ (0.88 m³)

Weight
37.0 lbs (16.8 kg)

Shipping
55 chambers/pallet
108 end caps/pallet
18 pallets/truck

*Assumes 6" (150 mm) stone above and below chambers and 40% stone porosity.





*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

ADS StormTech™

StormTech SC-310 Specifications

Cumulative Storage Volumes Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 6" (150 mm) Stone Base Under Chambers.

Depth of Water in System Inches (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
28 (711)	14.70 (0.416)	31.00 (0.878)
27 (686)	14.70 (0.416)	30.21 (0.855)
26 (660)	Stone Cover 14.70 (0.416)	29.42 (0.833)
25 (635)	14.70 (0.416)	28.63 (0.811)
24 (610)	14.70 (0.416)	27.84 (0.788)
23 (584)	14.70 (0.416)	27.05 (0.766)
22 (559)	14.70 (0.416)	26.26 (0.748)
21 (533)	14.64 (0.415)	25.43 (0.720)
20 (508)	14.49 (0.410)	24.54 (0.695)
19 (483)	14.22 (0.403)	23.58 (0.668)
18 (457)	13.68 (0.387)	22.47 (0.636)
17 (432)	12.99 (0.368)	21.25 (0.602)
16 (406)	12.17 (0.345)	19.97 (0.566)
15 (381)	11.25 (0.319)	18.62 (0.528)
14 (356)	10.23 (0.290)	17.22 (0.488)
13 (330)	9.15 (0.260)	15.78 (0.447)
12 (305)	7.99 (0.227)	14.29 (0.425)
11 (279)	6.78 (0.192)	12.77 (0.362)
10 (254)	5.51 (0.156)	11.22 (0.318)
9 (229)	4.19 (0.119)	9.64 (0.278)
8 (203)	2.83 (0.081)	8.03 (0.227)
7 (178)	1.43 (0.041)	6.40 (0.181)
6 (152)	0	4.74 (0.134)
5 (127)	0	3.95 (0.112)
4 (102)	Stone Foundation 0	3.16 (0.090)
3 (76)	0	2.37 (0.067)
2 (51)	0	1.58 (0.046)
1 (25)	0	0.79 (0.022)

Note: Add 0.79 ft³ (0.022 m³) of storage for each additional inch (25 mm) of stone foundation.

Storage Volume Per Chamber ft³ (m³)

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Foundation Depth in. (mm)		
		6 (150)	12 (300)	18 (450)
SC-310 Chamber	14.7 (0.4)	31.0 (0.9)	35.7 (1.0)	40.4 (1.1)

Note: Assumes 6" (150 mm) stone above chambers, 6" (150 mm) row spacing and 40% stone porosity.

Amount of Stone Per Chamber

English Tons (yds³)	Stone Foundation Depth		
	6"	12"	18"
SC-310	2.1 (1.5)	2.7 (1.9)	3.4 (2.4)
Metric Kilograms (m³)	**150 mm**	**300 mm**	**450 mm**
SC-310	1830 (1.1)	2490 (1.5)	2990 (1.8)

Note: Assumes 6" (150 mm) of stone above and between chambers.

Volume Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth		
	6 (150)	12 (300)	18 (450)
SC-310	2.9 (2.2)	3.4 (2.6)	3.8 (2.9)

Note: Assumes 6" (150 mm) of row separation and 18" (450 mm) of cover. The volume of excavation will vary as the depth of the cover increases.

ADS StormTech products, manufactured in accordance with ASTM F2418 or ASTMF2922, comply with all requirements in the Build America, Buy America (BABA) Act.

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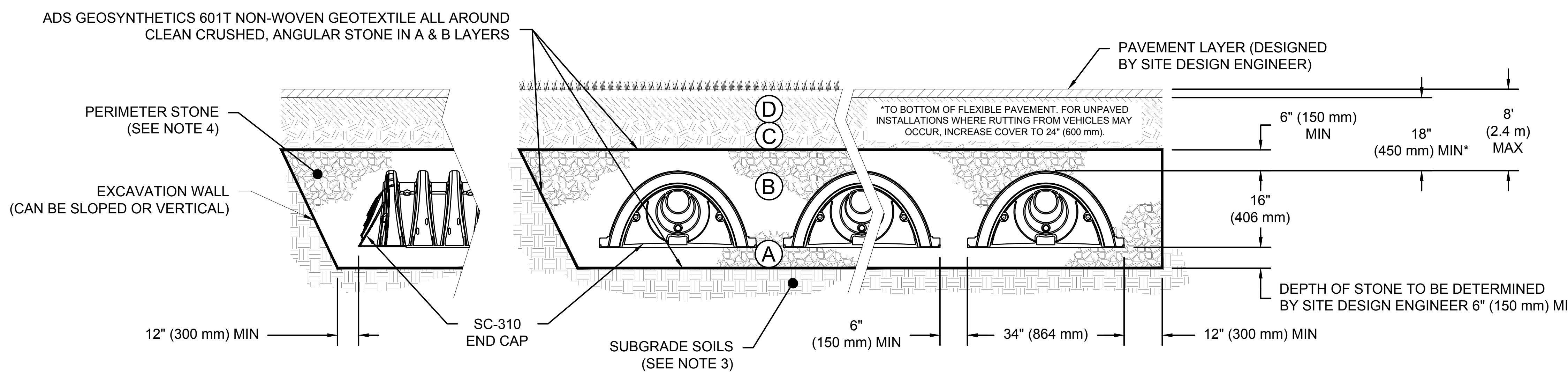
ACCEPTABLE FILL MATERIALS: STORMTECH SC-310 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER.	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2922 (POLETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-310 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2922 SHALL BE GREATER THAN OR EQUAL TO 400 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

SC-310
STANDARD CROSS SECTION
DATE: 9/12/22
DRAWN: KLJ
PROJECT #:
CHECKED: KLJ

DATE	DRWN	CHKD	DESCRIPTION

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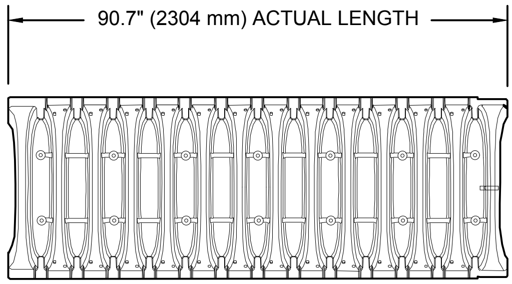
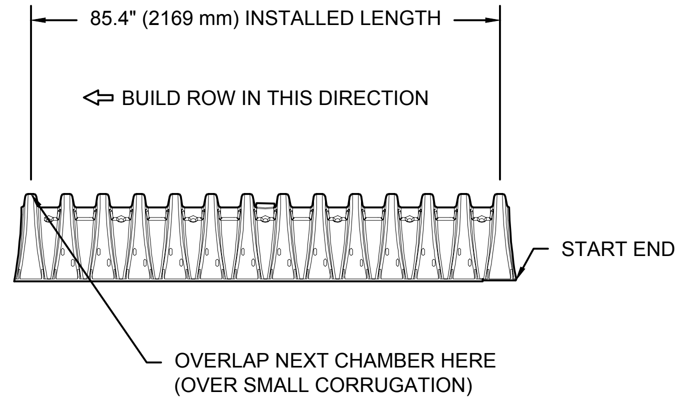
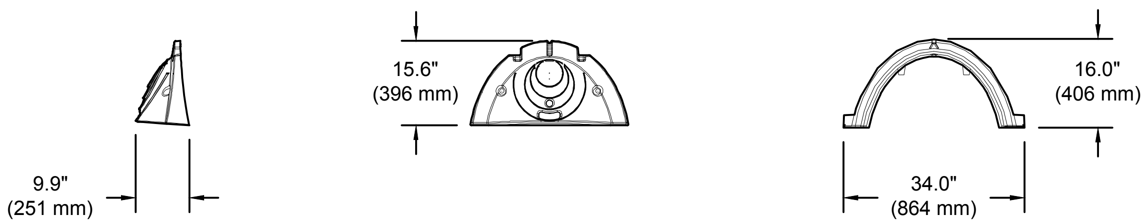
SC-310 TECHNICAL SPECIFICATION

NTS



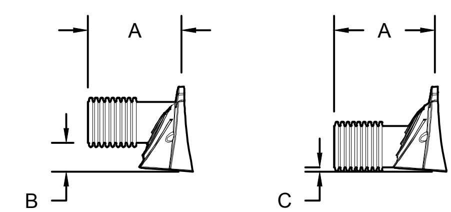




NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	34.0" X 16.0" X 85.4"	(864 mm X 406 mm X 2169 mm)
CHAMBER STORAGE	14.7 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	31.0 CUBIC FEET	(0.88 m³)
WEIGHT	35.0 lbs.	(16.8 kg)

*ASSUMES 6" (152 mm) ABOVE, BELOW, AND BETWEEN CHAMBERS



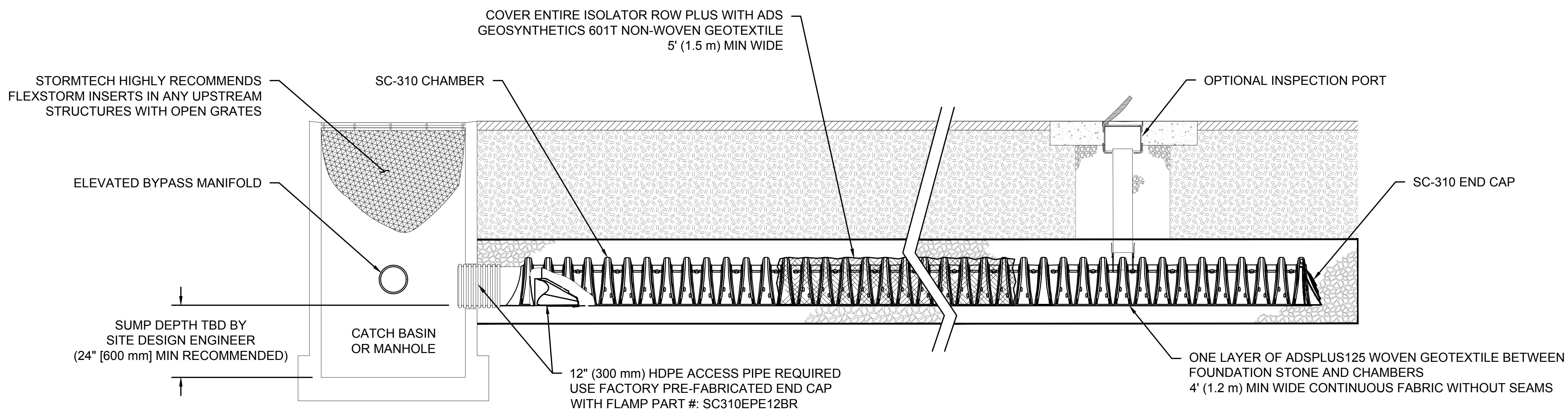
PRE-FAB STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PRE-FAB STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
PRE CORED END CAPS END WITH "PC"

PART #	STUB	A	B	C
SC310EPE06T / SC310EPE06TPC	6" (150 mm)	9.6" (244 mm)	5.8" (147 mm)	---
SC310EPE06B / SC310EPE06BPC			---	0.5" (13 mm)
SC310EPE08T / SC310EPE08TPC	8" (200 mm)	11.9" (302 mm)	3.5" (89 mm)	---
SC310EPE08B / SC310EPE08BPC			---	0.6" (15 mm)
SC310EPE10T / SC310EPE10TPC	10" (250 mm)	12.7" (323 mm)	1.4" (36 mm)	---
SC310EPE10B / SC310EPE10BPC			---	0.7" (18 mm)
SC310EPE12B	12" (300 mm)	13.5" (343 mm)	---	0.9" (23 mm)

ALL STUBS, EXCEPT FOR THE SC310EPE12B ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC310EPE12B THE 12" (300 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 0.25" (6 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL



SC-310 ISOLATOR ROW PLUS DETAIL

NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

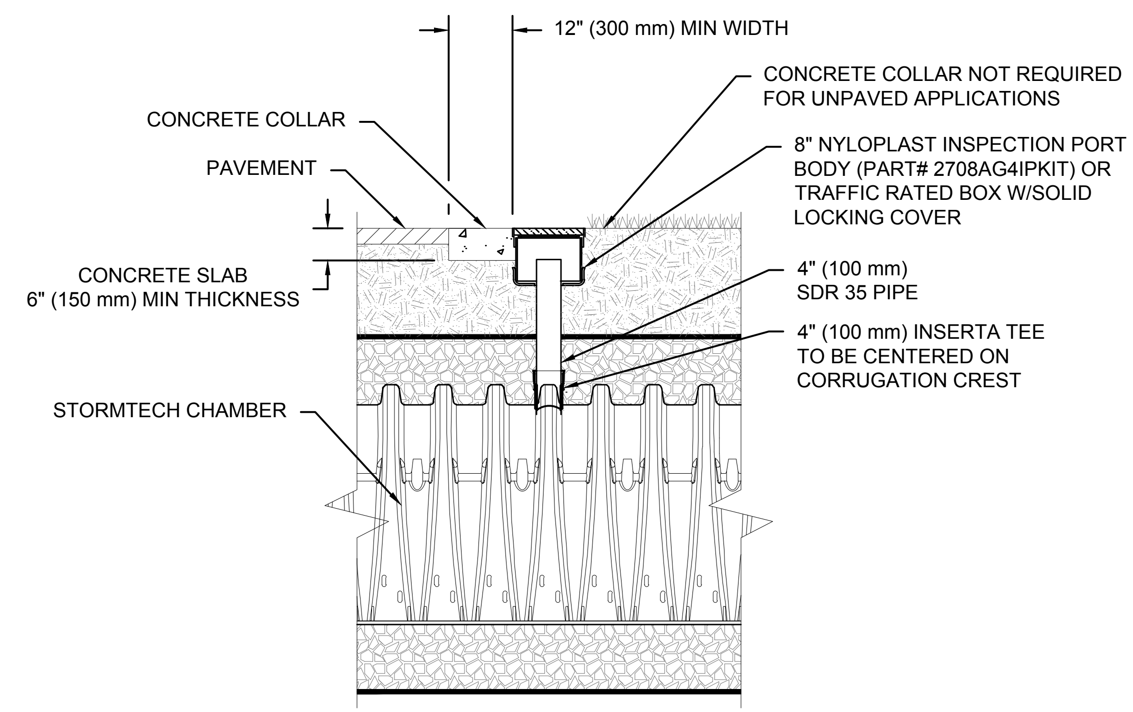
STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION CREST.

4" PVC INSPECTION PORT DETAIL
(SC SERIES CHAMBER)

NTS

SC-310
ISOLATOR ROW PLUS DETAILS

DATE: 9/12/22 | DRAWN: KLJ
PROJECT #: | CHECKED: KLJ

DATE	DRWN	CHKD	DESCRIPTION

StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026

Isolator® Row Plus
O&M Manual

The Isolator® Row Plus

Introduction

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row Plus is a technique to inexpensively enhance Total Suspended Solids (TSS) and Total Phosphorus (TP) removal with easy access for inspection and maintenance.

Looking down the Isolator Row PLUS from the manhole opening, ADS PLUS Fabric is shown between the chamber and stone base.

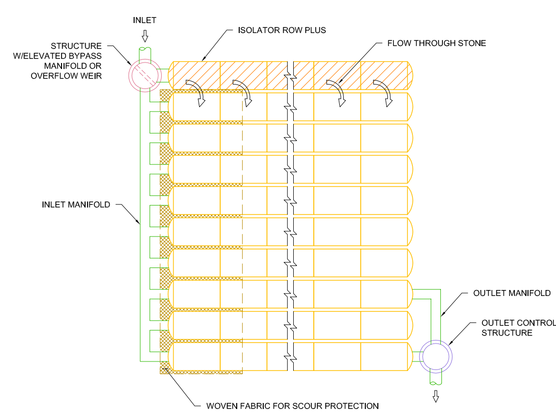
The Isolator Row Plus

The Isolator Row Plus is a row of StormTech chambers, either SC-160, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-7200 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for sediment settling and filtration as stormwater rises in the Isolator Row Plus and passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC- 310-3 and SC-740 models) allow stormwater to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row Plus protecting the adjacent stone and chambers storage areas from sediment accumulation.

ADS geotextile fabric is placed between the stone and the Isolator Row Plus chambers. The woven geotextile provides a media for stormwater filtration, a durable surface for maintenance, prevents scour of the underlying stone and remains intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the chamber’s sidewall. The non-woven fabric is not required over the SC-160, DC-780, MC-3500 or MC-7200 models as these chambers do not have perforated side walls.

The Isolator Row Plus is designed to capture the “first flush” runoff and offers the versatility to be sized on a volume basis or a flow-rate basis. An upstream manhole provides access to the Isolator Row Plus and includes a high/low concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator Row Plus bypass through a manifold to the other chambers. This is achieved with an elevated bypass manifold or a high-flow weir. This creates a differential between the Isolator Row Plus row of chambers and the manifold to the rest of the system, thus allowing for settlement time in the Isolator Row Plus. After Stormwater flows through the Isolator Row Plus and into the rest of the chamber system it is either exfiltrated into the soils below or passed at a controlled rate through an outlet manifold and outlet control structure.

StormTech Isolator Row PLUS with Overflow Spillway (not to scale)



The Isolator Row FLAMP™ (patent pending) is a flared end ramp apparatus attached to the inlet pipe on the inside of the chamber end cap. The FLAMP provides a smooth transition from pipe invert to fabric bottom. It is configured to improve chamber function performance by enhancing outflow of solid debris that would otherwise collect at the chamber's end. It also serves to improve the fluid and solid flow into the access pipe during maintenance and cleaning and to guide cleaning and inspection equipment back into the inlet pipe when complete.

The Isolator Row Plus may be part of a treatment train system. The treatment train design and pretreatment device selection by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, StormTech recommend using the Isolator Row Plus to minimize maintenance requirements and maintenance costs.

Note: *See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row Plus.*

Isolator Row Plus Inspection/Maintenance

Inspection

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row Plus should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

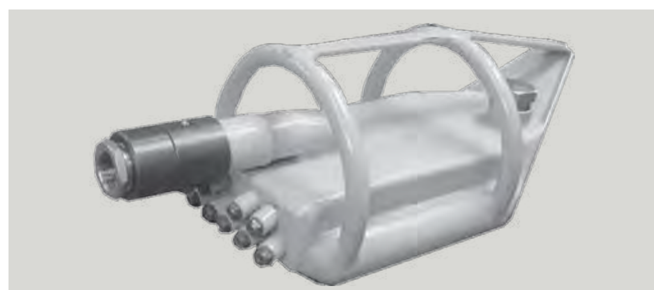
The Isolator Row Plus incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

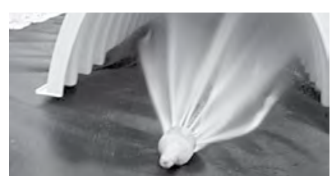
If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row Plus, clean-out should be performed.

Maintenance

The Isolator Row Plus was designed to reduce the cost of periodic maintenance. By “isolating” sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

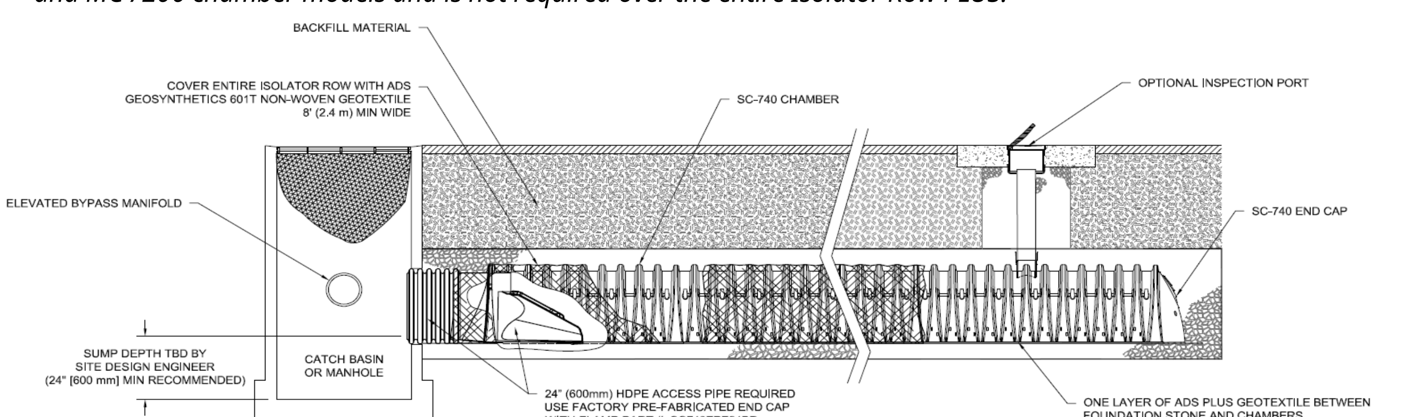
Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row Plus while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45” are best. StormTech recommends a maximum nozzle pressure of 2000 psi be utilized during cleaning. JetVac reels can vary in length. For ease of maintenance, ADS recommends Isolator Row Plus lengths up to 200' (61 m). **The JetVac process shall only be performed on StormTech Isolator Row Plus that have ADS Plus Fabric (as specified by StormTech) over their angular base stone.**





StormTech Isolator Row PLUS (*not to scale*)

Note: *Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-7200 chamber models and is not required over the entire Isolator Row PLUS.*



Isolator Row Plus Step By Step Maintenance Procedures

Step 1

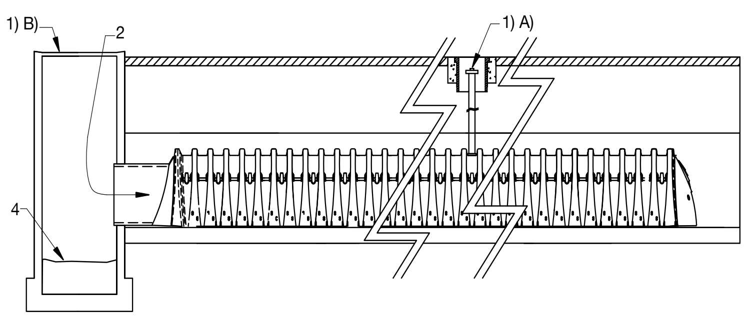
Inspect Isolator Row Plus for sediment.
- A) Inspection ports (if present)
  - i. Remove lid from floor box frame
  - ii. Remove cap from inspection riser
  - iii. Using a flashlight and stadia rod,measure depth of sediment and record results on maintenance log.
  - iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.
- B) All Isolator Row Plus
  - i. Remove cover from manhole at upstream end of Isolator Row Plus
  - ii. Using a flashlight, inspect down Isolator Row Plus through outlet pipe
    1. Mirrors on poles or cameras may be used to avoid a confined space entry
    2. Follow OSHA regulations for confined space entry if entering manhole
  - iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2.
    If not, proceed to Step 3.

Step 2

Clean out Isolator Row Plus using the JetVac process.
- A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
- B) Apply multiple passes of JetVac until backflush water is clean
- C) Vacuum manhole sump as required

Step 3
Replace all caps, lids and covers, record observations and actions.

Step 4
Inspect & clean catch basins and manholes upstream of the StormTech system.



Sample Maintenance Log

Date	Stadia Rod Readings		Sediment Depth (1)–(2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row PLUS, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

adspipe.com
800-821-6710

ADS StormTech® Installation Guide

SC-310/SC-740/DC-780

StormTech
Installation Video

Required Materials and Equipment List

- Acceptable fill materials per Table 1
- ADS Plus and non-woven geotextile fabrics
- StormTech solid end caps and pre-cored end caps
- StormTech chambers
- StormTech manifolds and fittings

Important Notes:

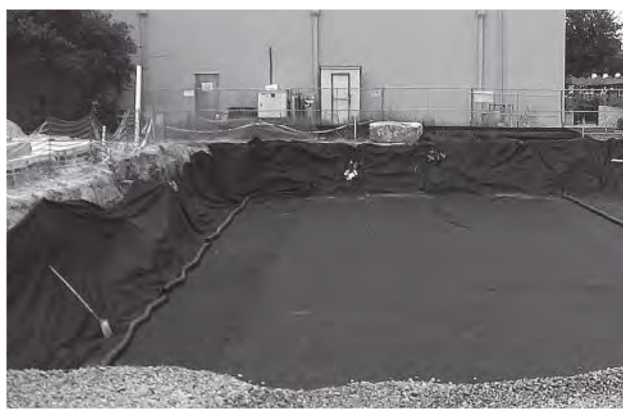
A. This installation guide provides the minimum requirements for proper installation of chambers. Non-adherence to this guide may result in damage to chambers during installation. Replacement of damaged chambers during or after backfilling is costly and very time consuming. It is recommended that all installers are familiar with this guide, and that the contractor inspects the chambers for distortion, damage and joint integrity as work progresses.

B. Use of a dozer to push embedment stone between the rows of chambers may cause damage to chambers and is not an acceptable backfill method. Any chambers damaged by using the “dump and push” method are not covered under the StormTech standard warranty.

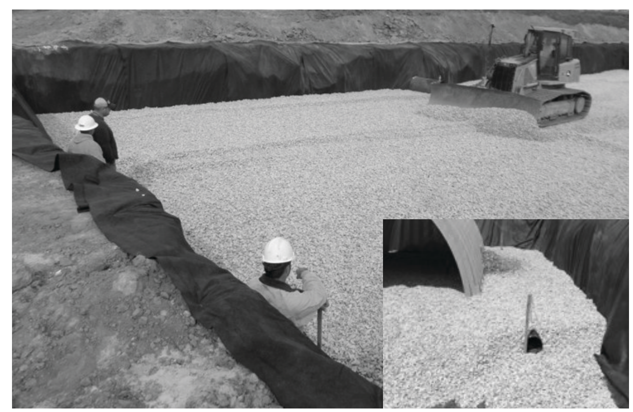
C. Care should be taken in the handling of chambers and end caps. Avoid dropping, prying or excessive force on chambers during removal from pallet and initial placement.

Requirements for System Installation

Excavate bed and prepare subgrade per engineer’s plans.



Place non-woven geotextile over prepared soils and up excavation walls. Install underdrains if required.



Place clean, crushed, angular stone foundation 6” (150 mm) min. Compact to achieve a flat surface.

Manifold, Scour Fabric and Chamber Assembly

Install manifolds and lay out ADS Plus fabric at inlet rows (min. 12.5 ft (3.8 m)) at each inlet end cap. Place a continuous piece along entire length of Isolator® Plus Row(s).

Align the first chamber and end cap of each row with inlet pipes. Contractor may choose to postpone stone placement around end chambers and leave ends of rows open for easy inspection of chambers during the backfill process.

Continue installing chambers by overlapping chamber end corrugations. Chamber joints are labeled "Lower Joint – Overlap Here" and "Build this direction – Upper Joint" Be sure that the chamber placement does not exceed the reach of the construction equipment used to place the stone. Maintain minimum 6" (150 mm) spacing between rows.

Attaching the End Caps

Lift the end of the chamber a few inches off the ground. With the curved face of the end cap facing outward, place the end cap into the chamber's end corrugation.

Prefabricated End Caps

24" (600 mm) inlets are the maximum size that can fit into a SC-740/DC-780 end cap and must be prefabricated with a 24" (600 mm) pipe stub. SC-310 chambers with a 12" (300 mm) inlet pipe must use a prefabricated end cap with a 12" (300 mm) pipe stub. When used on an Isolator Row Plus, these end caps will contain a welded FLAMP (flared end ramp) that will lay on top of the ADS Plus fabric (shown above)

Isolator Row Plus

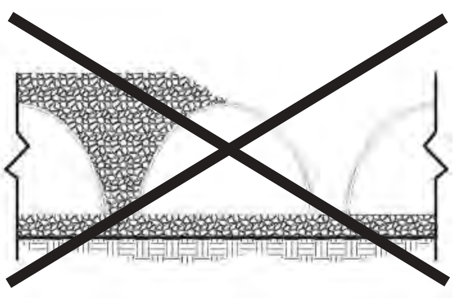
Place a continuous layer of ADS Plus fabric between the foundation stone and the Isolator Row Plus chambers, making sure the fabric lays flat and extends the entire width of the chamber feet. Drape a strip of ADS non-woven geotextile over the row of chambers (not required over DC-780). This is the same type of non-woven geotextile used as a separation layer around the angular stone of the StormTech system.

Initial Anchoring of Chambers – Embedment Stone

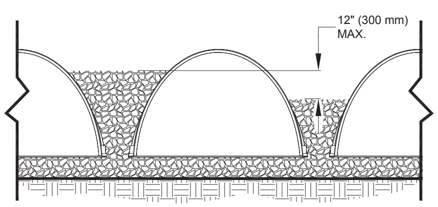
Initial embedment shall be spotted along the centerline of the chamber evenly anchoring the lower portion of the chamber. This is best accomplished with a stone conveyor or excavator reaching along the row.

No equipment shall be operated on the bed at this stage of the installation. Excavators must be located off the bed. Dump trucks shall not dump stone directly on to the bed. Dozers or loaders are not allowed on the bed at this time.

Backfill of Chambers – Embedment Stone

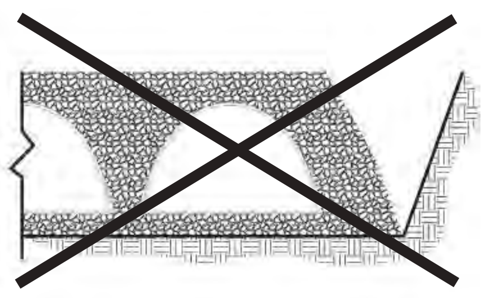


Uneven Backfill

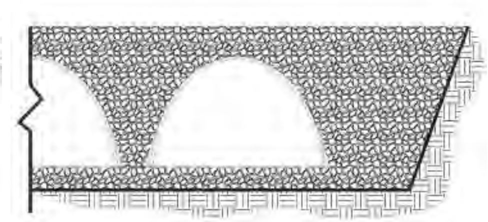


Even Backfill

Backfill chambers evenly. Stone column height should never differ by more than 12" (300 mm) between adjacent chamber rows or between chamber rows and perimeter.



Perimeter Not Backfilled



Perimeter Fully Backfilled

Perimeter stone must be brought up evenly with chamber rows. Perimeter must be fully backfilled, with stone extended horizontally to the excavation wall.

Backfill - Embedment Stone & Cover Stone

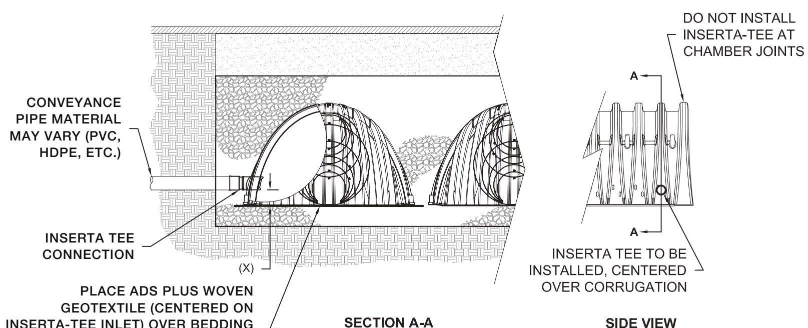
Continue evenly backfilling between rows and around perimeter until embedment stone reaches tops of chambers. Perimeter stone must extend horizontally to the excavation wall for both straight or sloped sidewalls. **Only after chambers have been backfilled to top of chamber and with a minimum 6" (150 mm) of cover stone on top of chambers can small dozers be used over the chambers for backfilling remaining cover stone.**

Small dozers and skid loaders may be used to finish grading stone backfill in accordance with ground pressure limits in Table 2. They must push material parallel to rows only. Never push perpendicular to rows. StormTech recommends that the contractor inspect chambers before placing final backfill. Any chambers damaged by construction shall be removed and replaced.

Final Backfill of Chambers – Fill Material

Install non-woven geotextile over stone. Geotextile must overlap 24" (600 mm) min. where edges meet. Compact each lift of backfill as specified in the site design engineer's drawings. Roller travel parallel with rows.

Inserta Tee Detail



CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 36, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON.		

NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

StormTech Isolator Row Plus Detail

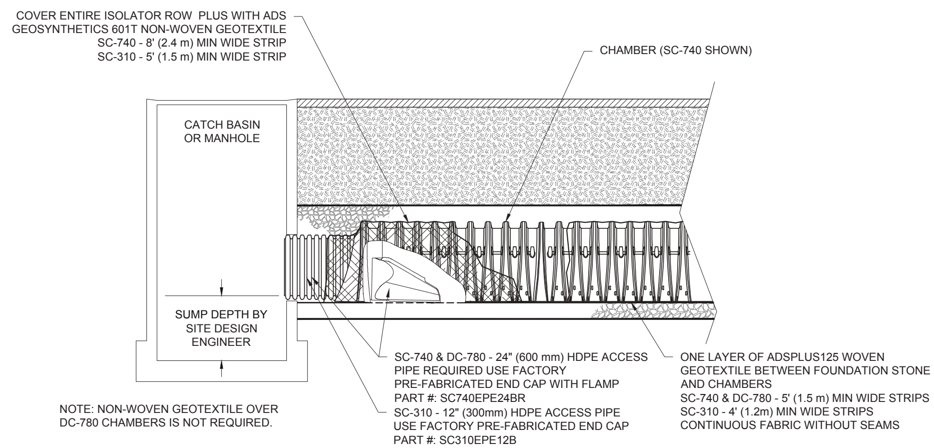


Table 1- Acceptable Fill Materials

Material Location	Description	AASHTO M43 Designation[1]	Compaction/Density Requirement
(D) **Final Fill:** Fill Material for layer 'D' starts from the top of the 'C' layer to the bottom of flexible pavement or unpaved finished grade above. Note that the pavement subbase may be part of the 'D' layer.	Any soil/rock materials, native soils or per engineer's plans. Check plans for pavement subgrade requirements.	N/A	Prepare per site design engineer's plans. Paved installations may have stringent material and preparation requirements.
(C) **Initial Fill:** Fill Material for layer 'C' starts from the top of the embedment stone ('B' layer) to 18" (450 mm) above the top of the chamber. Note that pavement subbase may be part of the 'C' layer.	Granular well-graded soil/aggregate mixtures, <35% fines or processed aggregate. Most pavement subbase materials can be used in lieu of this layer.	AASHTO M45 A-1, A-2-4, A-3 or AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	Begin compaction after min. 12" (300 mm) of material over the chambers is reached. Compact additional layers in 6" (150 mm) max. lifts to a min. 95% Proctor density for well-graded material and 95% relative density for processed aggregate materials. Roller gross vehicle weight not to exceed 12,000 lbs (53 kN). Dynamic force not to exceed 20,000 lbs (89 kN)
(B) **Embedment Stone:** Embedment Stone surrounding chambers from the foundation stone to the 'C' layer above.	Clean, crushed, angular stone	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	No compaction required.
(A) **Foundation Stone:** Foundation Stone below the chambers from the subgrade up to the foot (bottom) of the chamber.	Clean, crushed, angular stone,	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	Place and compact in 6" (150 mm) lifts using two full coverages with a vibratory compactor.[2,3]

Please Note:
1. The listed AASHTO designations are for gradations only. The stone must also be clean, crushed, angular. For example, a specification for #4 stone would state: "clean, crushed, angular no. 4 (AASHTO M43) stone".
2. StormTech compaction requirements are met for 'A' location materials when placed and compacted in 6" (150 mm) (max) lifts using two full coverages with a vibratory compactor.
3. Where infiltration surfaces may be comprised by compaction, for standard installations and standard design load conditions, a flat surface may be achieved by raking or dragging without compaction equipment. For special load designs, contact StormTech for compaction requirements.

Figure 1- Inspection Port Detail

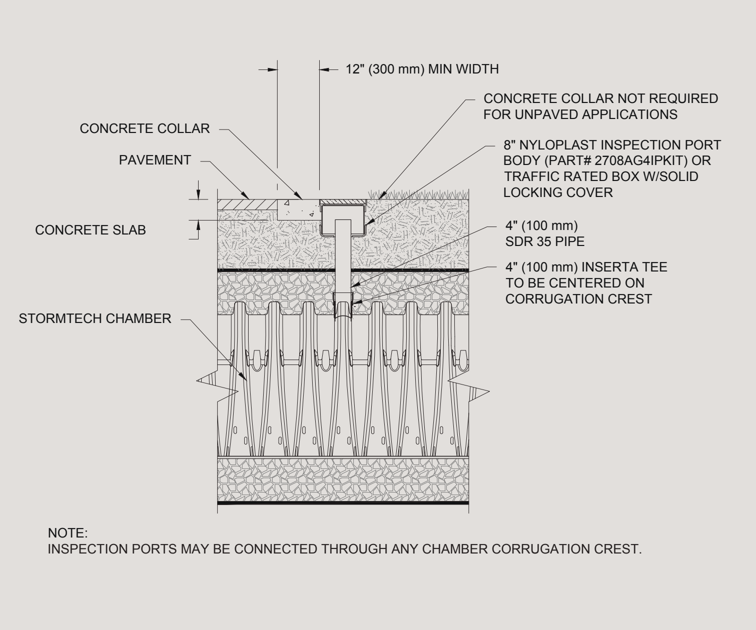
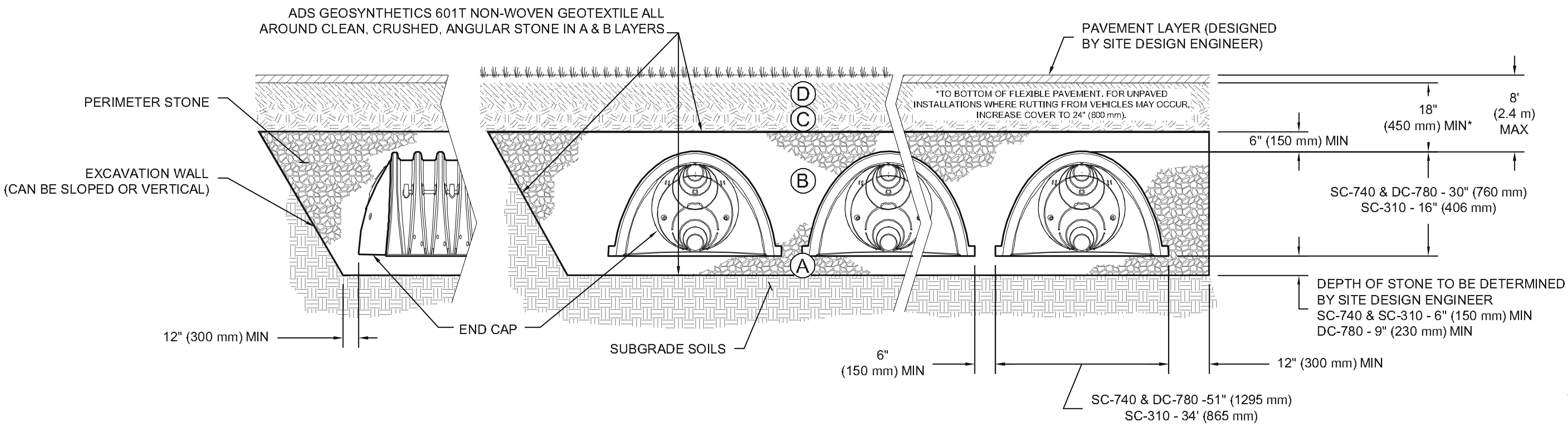


Figure 2 - Fill Material Locations



Notes:

1. 36" (900 mm) of stabilized cover materials over the chambers is recommended during the construction phase if general construction activities, such as full dump truck travel and dumping, are to occur over the bed.
2. During paving operations, dump truck axle loads on 18" (450 mm) of cover may be necessary. Precautions should be taken to avoid rutting of the road base layer, to ensure that compaction requirements have been met, and that a minimum of 18" (450 mm) of cover exists over the chambers. Contact StormTech for additional guidance on allowable axle loads during paving.
3. Ground pressure for track dozers is the vehicle operating weight divided by total ground contact area for both tracks. Excavators will exert higher ground pressures based on loaded bucket weight and boom extension.
4. Mini-excavators (< 8,000lbs/3,628 kg) can be used with at least 12" (300 mm) of stone over the chambers and are limited by the maximum ground pressures in Table 2 based on a full bucket at maximum boom extension.
5. Storage of materials such as construction materials, equipment, spoils, etc. should not be located over the StormTech system. The use of equipment over the StormTech system not covered in Table 2 (ex. soil mixing equipment, cranes, etc) is limited. Please contact StormTech for more information.
6. Allowable track loads based on vehicle travel only. Excavators shall not operate on chamber beds until the total backfill reaches 3 feet (900 mm) over the entire bed.

Table 2 - Maximum Allowable Construction Vehicle Loads[6]

Material Location	Fill Depth over Chambers in. (mm)	Maximum Allowable Wheel Loads		Maximum Allowable Track Loads[6]		Maximum Allowable Roller Loads
		Max Axle Load for Trucks lbs (kN)	Max Wheel Load for Loaders lbs (kN)	Track Width in. (mm)	Max Ground Pressure psf (kPa)	Max Drum Weight or Dynamic Force lbs (kN)
Ⓓ Final Fill Material	36" (900) Compacted	32,000 (142)	16,000 (71)	12" (305) 18" (457) 24" (610) 30" (762) 36" (914)	3880 (186) 2640 (126) 2040 (97) 1690 (81) 1470 (70)	38,000 (169)
Ⓒ Initial Fill Material	24" (600) Compacted	32,000 (142)	16,000 (71)	12" (305) 18" (457) 24" (610) 30" (762) 36" (914)	2690 (128) 1880 (90) 1490 (71) 1280 (61) 1150 (55)	20,000 (89)
	24" (600) Loose/ Dumped	32,000 (142)	16,000 (71)	12" (305) 18" (457) 24" (610) 30" (762) 36" (914)	2390 (114) 1700 (81) 1370 (65) 1190 (57) 1080 (51)	20,000 (89) Roller gross vehicle weight not toexceed 12,000 lbs. (53 kN)
	18" (450)	32,000 (142)	16,000 (71)	12" (305) 18" (457) 24" (610) 30" (762) 36" (914)	2110 (101) 1510 (72) 1250 (59) 1100 (52) 1020 (48)	20,000 (89) Roller gross vehicle weight not to exceed 12,000 lbs. (53 kN)
Ⓑ Embedment Stone	12" (300)	16,000 (71)	NOT ALLOWED	12" (305) 18" (457) 24" (610) 30" (762) 36" (914)	1540 (74) 1190 (57) 1010 (48) 910 (43) 840 (40)	20,000 (89) Roller gross vehicle weight not to exceed 12,000 lbs. (53 kN)
	6" (150)	8,000 (35)	NOT ALLOWED	12" (305) 18" (457) 24" (610) 30" (762) 36" (914)	1070 (51) 900 (43) 800 (38) 760 (36) 720 (34)	NOT ALLOWED

Table 3 - Placement Methods and Descriptions

Material Location	Placement Methods/ Restrictions	Wheel Load Restrictions	Track Load Restrictions	Roller Load Restrictions
		See Table 2 for Maximum Construction Loads		
Ⓓ Final Fill Material	A variety of placement methods may be used. All construction loads must not exceed the maximum limits in Table 2.	36" (900 mm) minimum cover required for dump trucks to dump over chambers.	Dozers to push parallel to rows until 36" (900mm) compacted cover is reached.[4]	Roller travel parallel to rows only until 36" (900 mm) compacted cover is reached.
Ⓒ Initial Fill Material	Excavator positioned off bed recommended. Small excavator allowed over chambers. Small dozer allowed.	Asphalt can be dumped into paver when compacted pavement subbase reaches 18" (450 mm) above top of chambers.	Small LGP track dozers & skid loaders allowed to grade cover stone with at least 6" (150 mm) stone under tracks at all times. Equipment must push parallel to rows at all times.	Use dynamic force of roller only after compacted fill depth reaches 12" (300 mm) over chambers. Roller travel parallel to chamber rows only.
Ⓑ Embedment Stone	No equipment allowed on bare chambers. Use excavator or stone conveyor positioned off bed or on foundation stone to evenly fill around all chambers to at least the top of chambers.	No wheel loads allowed. Material must be placed outside the limits of the chamber bed.	No tracked equipment is allowed on chambers until a min. 6" (150 mm) cover stone is in place.	No rollers allowed.
Ⓐ Foundation Stone	No StormTech restrictions. Contractor responsible for any conditions or requirements by others relative to subgrade bearing capacity, dewatering or protection of subgrade.			

ADS StormTech™

StormTech® Standard Limited Warranty

STANDARD LIMITED WARRANTY OF STORMTECH LLC ("STORMTECH"): PRODUCTS

(A) This Limited Warranty applies solely to the StormTech chambers and end plates manufactured by StormTech and sold to the original purchaser (the "Purchaser"). The chambers and end plates are collectively referred to as the "Products."

(B) The structural integrity of the Products, when installed strictly in accordance with StormTech's written installation instructions at the time of installation, are warranted to the Purchaser against defective materials and workmanship for one (1) year from the date of purchase. Should a defect appear in the Limited Warranty period, the Purchaser shall provide StormTech with written notice of the alleged defect at StormTech's corporate headquarters within ten (10) days of the discovery of the defect. The notice shall describe the alleged defect in reasonable detail. StormTech agrees to supply replacements for those Products determined by StormTech to be defective and covered by this Limited Warranty. The supply of replacement products is the sole remedy of the Purchaser for breaches of this Limited Warranty. StormTech's liability specifically excludes the cost of removal and/or installation of the Products.

(C) THIS LIMITED WARRANTY IS EXCLUSIVE. THERE ARE NO OTHER WARRANTIES WITH RESPECT TO THE PRODUCTS, INCLUDING NO IMPLIED WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.

(D) This Limited Warranty only applies to the Products when the Products are installed in a single layer. UNDER NO CIRCUMSTANCES, SHALL THE PRODUCTS BE INSTALLED IN A MULTI-LAYER CONFIGURATION.

(E) No representative of StormTech has the authority to change this Limited Warranty in any manner or to extend this Limited Warranty. This Limited Warranty does not apply to any person other than to the Purchaser.

(F) Under no circumstances shall StormTech be liable to the Purchaser or to any third party for product liability claims; claims arising from the design, shipment, or installation of the Products, or the cost of other goods or services related to the purchase and installation of the Products. For this Limited Warranty to apply, the Products must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and StormTech's written installation instructions.

(G) THE LIMITED WARRANTY DOES NOT EXTEND TO INCIDENTAL, CONSEQUENTIAL, SPECIAL OR INDIRECT DAMAGES. STORMTECH SHALL NOT BE LIABLE FOR PENALTIES OR LIQUIDATED DAMAGES, INCLUDING LOSS OF PRODUCTION AND PROFITS; LABOR AND MATERIALS; OVERHEAD COSTS; OR OTHER LOSS OR EXPENSE INCURRED BY THE PURCHASER OR ANY THIRD PARTY. SPECIFICALLY EXCLUDED FROM LIMITED WARRANTY COVERAGE ARE DAMAGE TO THE PRODUCTS ARISING FROM ORDINARY WEAR AND TEAR; ALTERATION, ACCIDENT, MISUSE, ABUSE OR NEGLECT; THE PRODUCTS BEING SUBJECTED TO VEHICLE TRAFFIC OR OTHER CONDITIONS WHICH ARE NOT PERMITTED BY STORMTECH'S WRITTEN SPECIFICATIONS OR INSTALLATION INSTRUCTIONS; FAILURE TO MAINTAIN THE MINIMUM GROUND COVERS SET FORTH IN THE INSTALLATION INSTRUCTIONS; THE PLACEMENT OF IMPROPER MATERIALS INTO THE PRODUCTS; FAILURE OF THE PRODUCTS DUE TO IMPROPER SITING OR IMPROPER SIZING; OR ANY OTHER EVENT NOT CAUSED BY STORMTECH. A PRODUCT ALSO IS EXCLUDED FROM LIMITED WARRANTY COVERAGE IF SUCH PRODUCT IS USED IN A PROJECT OR SYSTEM IN WHICH ANY GEOTEXTILE PRODUCTS OTHER THAN THOSE PROVIDED BY ADVANCED DRAINAGE SYSTEMS ARE USED. THIS LIMITED WARRANTY REPRESENTS STORMTECH'S SOLE LIABILITY TO THE PURCHASER FOR CLAIMS RELATED TO THE PRODUCTS, WHETHER THE CLAIM IS BASED UPON CONTRACT, TORT, OR OTHER LEGAL THEORY.

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800-821-6710

Drainage Filtration Separation

ADS 0601T/O NONWOVEN GEOTEXTILE SPECIFICATION

Scope

This specification describes ADS 0601T/O nonwoven geotextile.

Filter Fabric Requirements

ADS 0601T/O is an orange nonwoven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. ADS 0601T/O is inert to biological degradation and resists naturally encountered chemicals, alkali and acids. ADS 0601T/O conforms to the physical property values listed below:

Filter Fabric Properties

Property	Test Method	Unit	Typical Value[1] MD	Typical Value[1] CD
Grab Tensile Strength	ASTM D4632	lbs (N)	175 (779)	175 (779)
Grab Tensile Elongation	ASTM D4632	%	75	75
Trapezoid Tear Strength	ASTM D4533	lbs (N)	85 (378)	85 (378)
CBR Puncture Strength	ASTM D6241	lbs (N)	480 (2136)	480 (2136)
Permittivity	ASTM D4491	sec^{-1}	1.5	1.5
Flow Rate	ASTM D4491	$gal/min/ft^2$ ($l/min/m^2$)	105 (4278)	105 (4278)
UV Resistance (at 500 hours)[1]	ASTM D4355	% strength retained	80	80

Physical Properties

Property	Test Method	Unit	Typical Value[2]
Weight	ASTM D5161	oz/yd^2 (g/m^2)	6.5 (220)
Thickness	ASTM D5199	mils (mm)	65 (1.7)
Roll Dimensions (W x L)	-	ft (m)	15 x 300 (4.5 x 91)
Roll Area	-	yd^2 (m^2)	500 (418)
Estimated Roll Weight	-	lb (kg)	220 (100)

1 Modified, Minimum Test Value
2 ASTM D4439 Standard Terminology for Geosynthetics: typical value, n-*for geosynthetics*, the mean value calculated from documented manufacturing quality control test results for a defined population obtained from one test method associated with on specific property.

Separation

ADS 315W WOVEN GEOTEXTILE SPECIFICATION

Scope

This specification describes ADS 315W woven geotextile.

Filter Fabric Requirements

ADS 315W is manufactured using high-tenacity polypropylene yarns that are woven to form a dimensionally stable network, which allows the yarns to maintain their relative position. ADS 315W resists ultraviolet deterioration, rotting and biological degradation and is inert to commonly encountered soil chemicals. ADS 315W conforms to the physical property values listed below:

Filter Fabric Properties

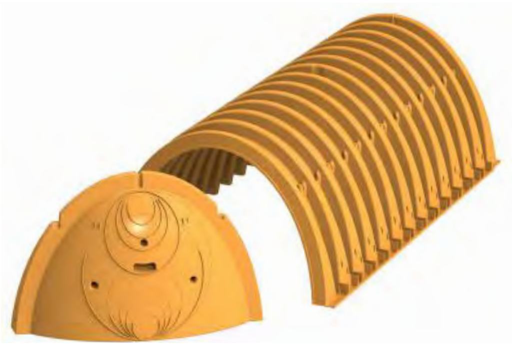
Property	Test Method	Unit	M.A.R.V. (Minimum Average Roll Value)[2]
Tensile Strength (Grab)	ASTM D4632	lbs (N)	315 (1400)
Elongation	ASTM D4632	%	15
CBR Puncture	ASTM D6241	lbs (N)	900 (4005)
Puncture	ASTM D4833	lbs (N)	150 (667)
Mullen Burst	ASTM D3786	psi (kPa)	600 (4134)
Trapezoidal Tear	ASTM D4533	lbs (N)	120 (533)
UV Resistance (at 500 hours)	ASTM D4355	%	70
Apparent Opening Size (AOS)*	ASTM D4751	U.S. Sieve (mm)	40 (.425)
Permittivity	ASTM D4491	sec^{-1}	.05
Water Flow Rate	ASTM D4491	gpm/ft^2 ($l/min/m^2$)	4 (163)

* Maximum average roll value.

Packaging

Roll Dimensions (W x L) - ft. (m)	12.5 x 360/ 15 x 300 / 17.5 x 258 (3.81 x 109.8/ 4.57 x 91.5 / 5.33 x 78.6)

StormTech® SC-740 Chamber



Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

Nominal Chamber Specifications
(not to scale)

Size (L x W x H)
85.4” x 51” x 30”
2,170 mm x 1,295 mm x 762 mm

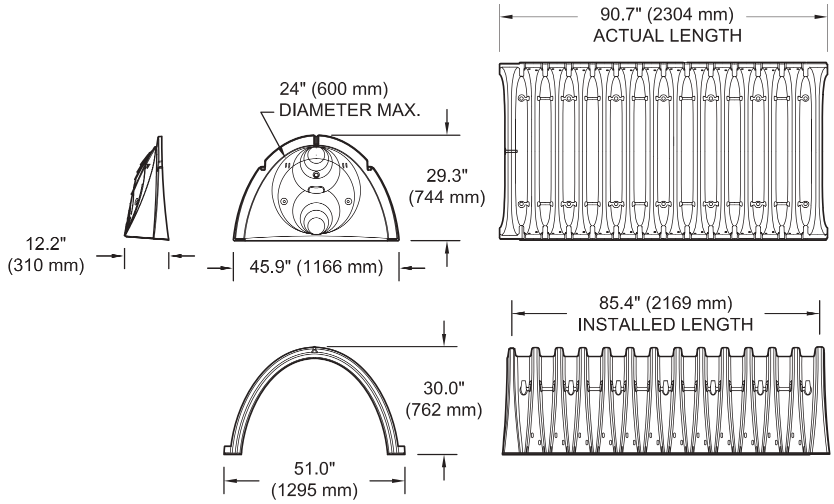
Chamber Storage
45.9 ft³ (1.30 m³)

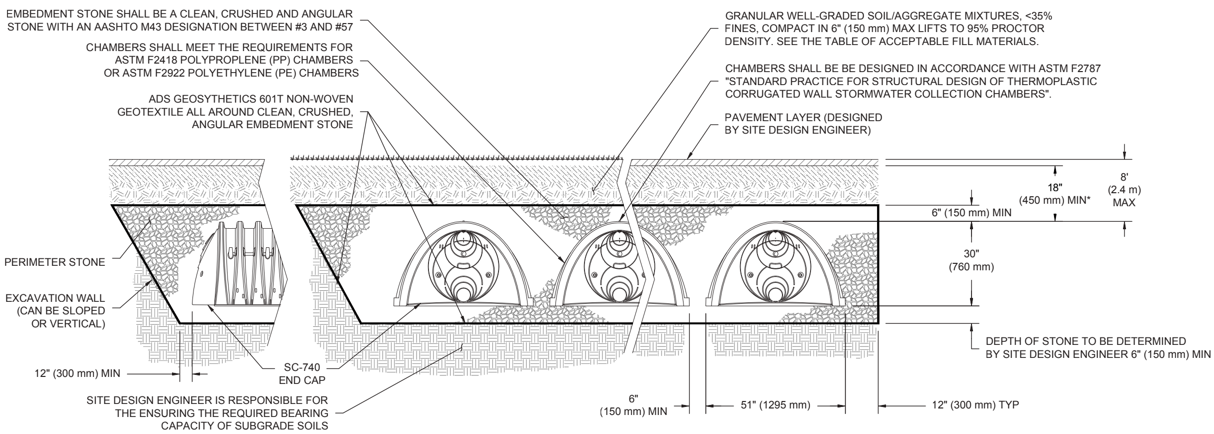
Min. Installed Storage*
74.9 ft³ (2.12 m³)

Weight
74.0 lbs (33.6 kg)

Shipping
30 chambers/pallet
60 end caps/pallet
12 pallets/truck

*Assumes 6” (150 mm) stone above, below and between chambers and 40% stone porosity.





*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

ADS StormTech™

StormTech SC-740 Specifications

Cumulative Storage Volumes Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 6" (150 mm) Stone Base Under Chambers.

Depth of Water in System Inches (mm)		Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
42 (1067)		45.90 (1.300)	74.90 (2.121)
41 (1041)		45.90 (1.300)	73.77 (2.089)
40 (1016)		45.90 (1.300)	72.64 (2.057)
39 (991)	Stone Cover	45.90 (1.300)	71.52 (2.025)
38 (965)		45.90 (1.300)	70.39 (1.993)
37 (940)		45.90 (1.300)	69.26 (1.961)
36 (914)		45.90 (1.300)	68.14 (1.929)
35 (889)		45.85 (1.298)	66.98 (1.897)
34 (864)		45.69 (1.294)	65.75 (1.862)
33 (838)		45.41 (1.286)	64.46 (1.825)
32 (813)		44.81 (1.269)	62.97 (1.783)
31 (787)		44.01 (1.246)	61.36 (1.737)
30 (762)		43.06 (1.219)	59.66 (1.689)
29 (737)		41.98 (1.189)	57.89 (1.639)
28 (711)		40.80 (1.155)	56.05 (1.587)
27 (686)		39.54 (1.120)	54.17 (1.534)
26 (660)		38.18 (1.081)	52.23 (1.479)
25 (635)		36.74 (1.040)	50.23 (1.422)
24 (610)		35.22 (0.977)	48.19 (1.365)
23 (584)		33.64 (0.953)	46.11 (1.306)
22 (559)		31.99 (0.906)	44.00 (1.246)
21 (533)		30.29 (0.858)	1.85 (1.185)
20 (508)		28.54 (0.808)	39.67 (1.123)
19 (483)		26.74 (0.757)	37.47 (1.061)
18 (457)		24.89 (0.705)	35.23 (0.997)
17 (432)		23.00 (0.651)	32.96 (0.939)
16 (406)		21.06 (0.596)	30.68 (0.869)
15 (381)		19.09 (0.541)	28.36 (0.803)
14 (356)		17.08 (0.484)	26.03 (0.737)
13 (330)		15.04 (0.426)	23.68 (0.670)
12 (305)		12.97 (0.367)	21.31 (0.608)
11 (279)		10.87 (0.309)	18.92 (0.535)
10 (254)		8.74 (0.247)	16.51 (0.468)
9 (229)		6.58 (0.186)	14.09 (0.399)
8 (203)		4.41 (0.125)	11.66 (0.330)
7 (178)		2.21 (0.063)	9.21 (0.264)
6 (152)		0 (0)	6.76 (0.191)
5 (127)		0 (0)	5.63 (0.160)
4 (102)	Stone Foundation	0 (0)	4.51 (0.128)
3 (76)		0 (0)	3.38 (0.096)
2 (51)		0 (0)	2.25 (0.064)
1 (25)		0 (0)	1.13 (0.032)

Note: Add 1.13 ft³ (0.032 m³) of storage for each additional inch (25 mm) of stone foundation.

Storage Volume Per Chamber ft³ (m³)

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Foundation Depth in. (mm)		
		6 (150)	12 (300)	18 (450)
SC-740 Chamber	45.9 (1.3)	74.9 (2.1)	81.7 (2.3)	88.4 (2.5)

Note: Assumes 6" (150 mm) stone above chambers, 6" (150 mm) row spacing and 40% stone porosity.

Amount of Stone Per Chamber

English Tons (yds³)	Stone Foundation Depth		
	6"	12"	16"
SC-740	3.8 (2.8)	4.6 (3.3)	5.5 (3.9)
Metric Kilograms (m³)	**150 mm**	**300 mm**	**450 mm**
SC-740	3,450 (2.1)	4,170 (2.5)	4,490 (3.0)

Note: Assumes 6" (150 mm) of stone above and between chambers.

Volume Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth		
	6 (150)	12 (300)	18 (450)
SC-740	5.5 (4.2)	6.2 (4.7)	6.8 (5.2)

Note: Assumes 6" (150 mm) of row separation and 18" (450 mm) of cover. The volume of excavation will vary as depth of cover increases.

ADS StormTech products, manufactured in accordance with ASTM F2418 or ASTMF2922, comply with all requirements in the Build America, Buy America (BABA) Act.

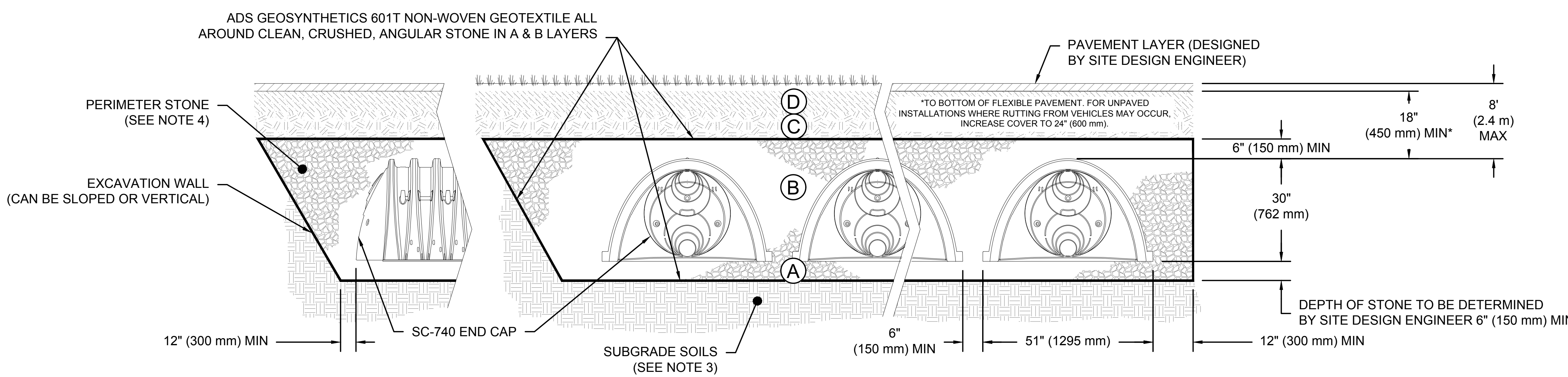
Working on a project?
Visit us at adspipe.com/stormtech and utilize the Design Tool

adspipe.com
800-821-6710

ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER.	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-740 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 550 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

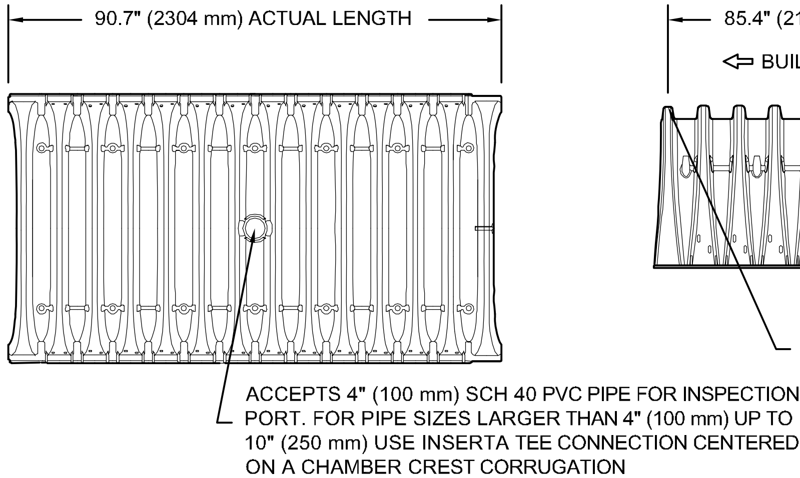
SC-740
STANDARD CROSS SECTION
DATE: 9/12/22
DRAWN: KLJ
CHECKED: KLJ
PROJECT #:

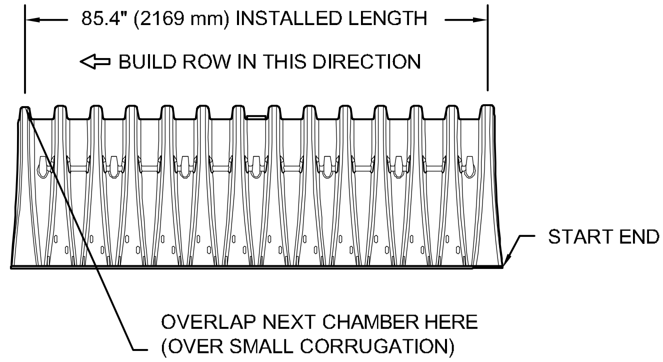
DATE	DRWN	CHKD	DESCRIPTION

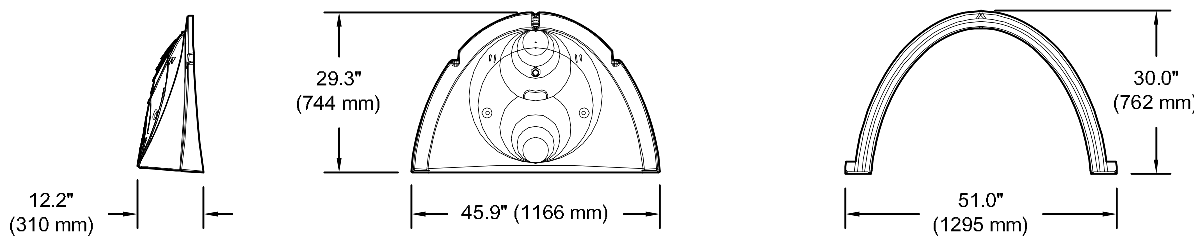
StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM
ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026

SC-740 TECHNICAL SPECIFICATION

NTS



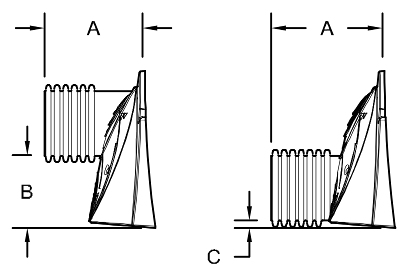




NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	51.0" X 30.0" X 85.4"	(1295 mm X 762 mm X 2169 mm)
CHAMBER STORAGE	45.9 CUBIC FEET	(1.30 m³)
MINIMUM INSTALLED STORAGE*	74.9 CUBIC FEET	(2.12 m³)
WEIGHT	75.0 lbs.	(33.6 kg)

*ASSUMES 6" (152 mm) STONE ABOVE, BELOW, AND BETWEEN CHAMBERS



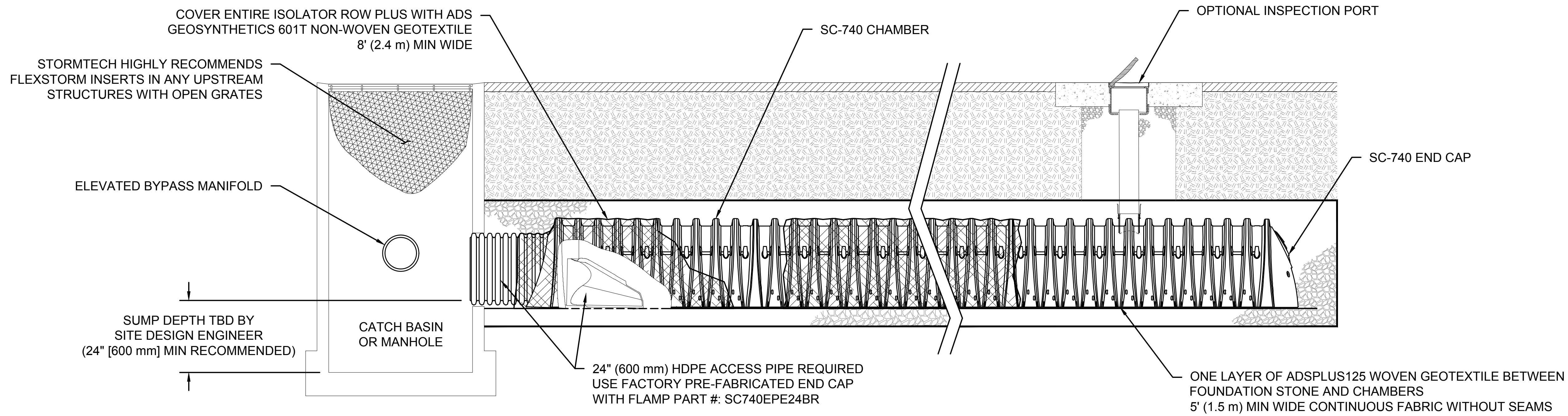
STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"

PART #	STUB	A	B	C
SC740EPE06T / SC740EPE06TPC	6" (150 mm)	10.9" (277 mm)	18.5" (470 mm)	---
SC740EPE06B / SC740EPE06BPC			---	0.5" (13 mm)
SC740EPE08T /SC740EPE08TPC	8" (200 mm)	12.2" (310 mm)	16.5" (419 mm)	---
SC740EPE08B / SC740EPE08BPC			---	0.6" (15 mm)
SC740EPE10T / SC740EPE10TPC	10" (250 mm)	13.4" (340 mm)	14.5" (368 mm)	---
SC740EPE10B / SC740EPE10BPC			---	0.7" (18 mm)
SC740EPE12T / SC740EPE12TPC	12" (300 mm)	14.7" (373 mm)	12.5" (318 mm)	---
SC740EPE12B / SC740EPE12BPC			---	1.2" (30 mm)
SC740EPE15T / SC740EPE15TPC	15" (375 mm)	18.4" (467 mm)	9.0" (229 mm)	---
SC740EPE15B / SC740EPE15BPC			---	1.3" (33 mm)
SC740EPE18T / SC740EPE18TPC	18" (450 mm)	19.7" (500 mm)	5.0" (127 mm)	---
SC740EPE18B / SC740EPE18BPC			---	1.6" (41 mm)
SC740EPE24B*	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)

ALL STUBS, EXCEPT FOR THE SC740EPE24B ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC740EPE24B THE 24" (600 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 1.75" (44 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL



SC-740 ISOLATOR ROW PLUS DETAIL

NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

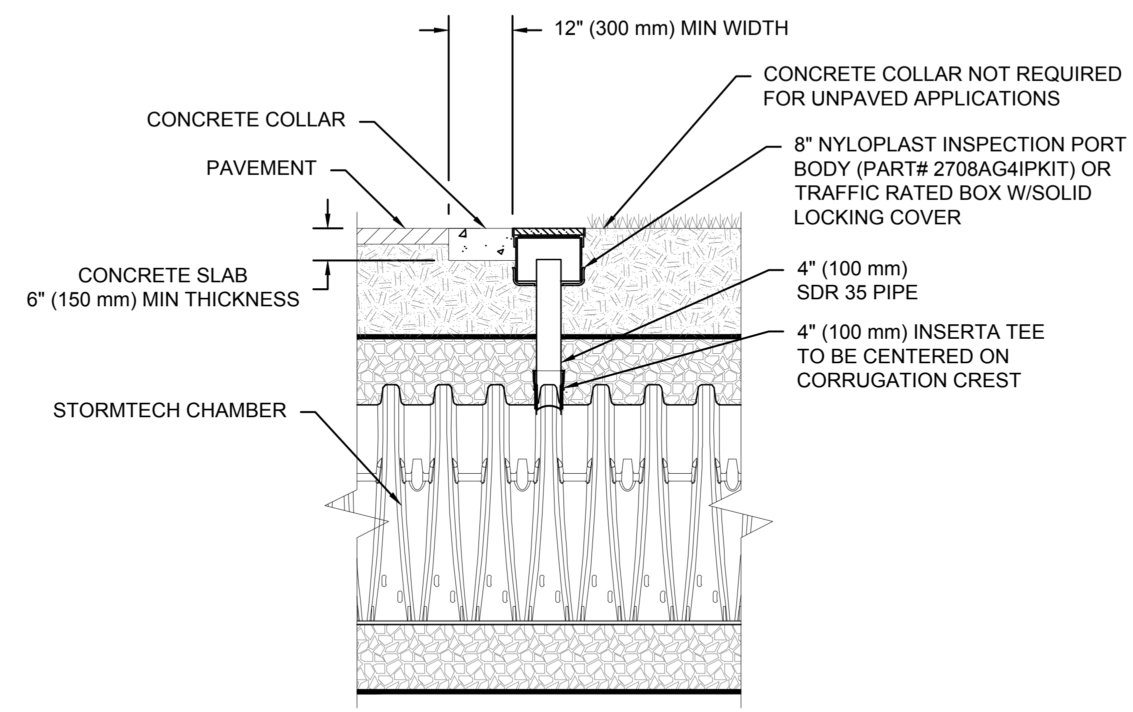
STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION CREST.

4" PVC INSPECTION PORT DETAIL (SC SERIES CHAMBER)

NTS

SC-740
ISOLATOR ROW PLUS DETAILS

DATE: 9/12/22	DRAWN: KLJ
PROJECT #:	CHECKED: KLJ

DATE	DRWN	CHKD	DESCRIPTION

StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026

SHEET 1 OF 1

Isolator® Row Plus
O&M Manual

The Isolator® Row Plus

Introduction

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row Plus is a technique to inexpensively enhance Total Suspended Solids (TSS) and Total Phosphorus (TP) removal with easy access for inspection and maintenance.

The Isolator Row Plus

The Isolator Row Plus is a row of StormTech chambers, either SC-160, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-7200 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for sediment settling and filtration as stormwater rises in the Isolator Row Plus and passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC- 310-3 and SC-740 models) allow stormwater to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row Plus protecting the adjacent stone and chambers storage areas from sediment accumulation.

ADS geotextile fabric is placed between the stone and the Isolator Row Plus chambers. The woven geotextile provides a media for stormwater filtration, a durable surface for maintenance, prevents scour of the underlying stone and remains intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the chamber's sidewall. The non-woven fabric is not required over the SC-160, DC-780, MC-3500 or MC-7200 models as these chambers do not have perforated side walls.

The Isolator Row Plus is designed to capture the "first flush" runoff and offers the versatility to be sized on a volume basis or a flow-rate basis. An upstream manhole provides access to the Isolator Row Plus and includes a high/low concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator Row Plus bypass through a manifold to the other chambers. This is achieved with an elevated bypass manifold or a high-flow weir. This creates a differential between the Isolator Row Plus row of chambers and the manifold to the rest of the system, thus allowing for settlement time in the Isolator Row Plus. After Stormwater flows through the Isolator Row Plus and into the rest of the chamber system it is either exfiltrated into the soils below or passed at a controlled rate through an outlet manifold and outlet control structure.

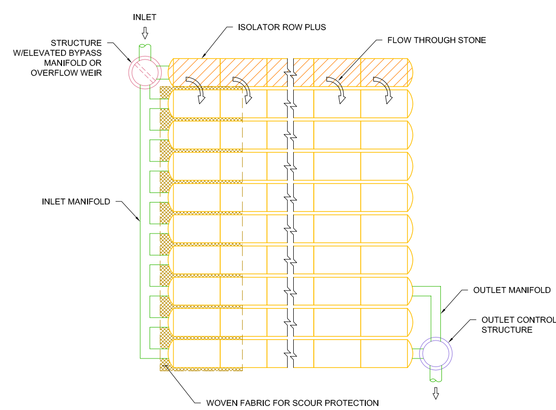
The Isolator Row FLAMP™ (patent pending) is a flared end ramp apparatus attached to the inlet pipe on the inside of the chamber end cap. The FLAMP provides a smooth transition from pipe invert to fabric bottom. It is configured to improve chamber function performance by enhancing outflow of solid debris that would otherwise collect at the chamber's end. It also serves to improve the fluid and solid flow into the access pipe during maintenance and cleaning and to guide cleaning and inspection equipment back into the inlet pipe when complete.

The Isolator Row Plus may be part of a treatment train system. The treatment train design and pretreatment device selection by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, StormTech recommend using the Isolator Row Plus to minimize maintenance requirements and maintenance costs.

Note: *See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row Plus.*

Looking down the Isolator Row PLUS from the manhole opening, ADS PLUS Fabric is shown between the chamber and stone base.

StormTech Isolator Row PLUS with Overflow Spillway (not to scale)



Isolator Row Plus Inspection/Maintenance

Inspection

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row Plus should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

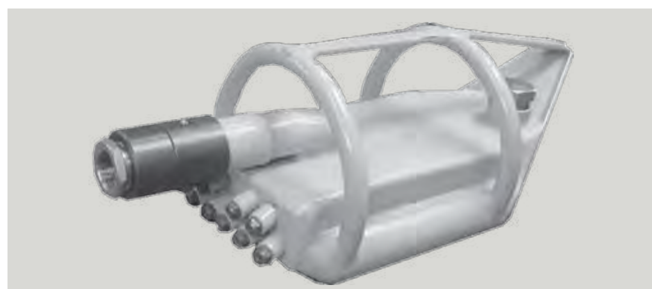
The Isolator Row Plus incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

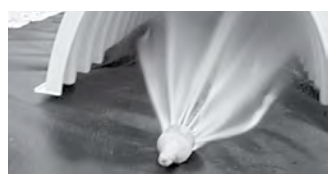
If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row Plus, clean-out should be performed.

Maintenance

The Isolator Row Plus was designed to reduce the cost of periodic maintenance. By "isolating" sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

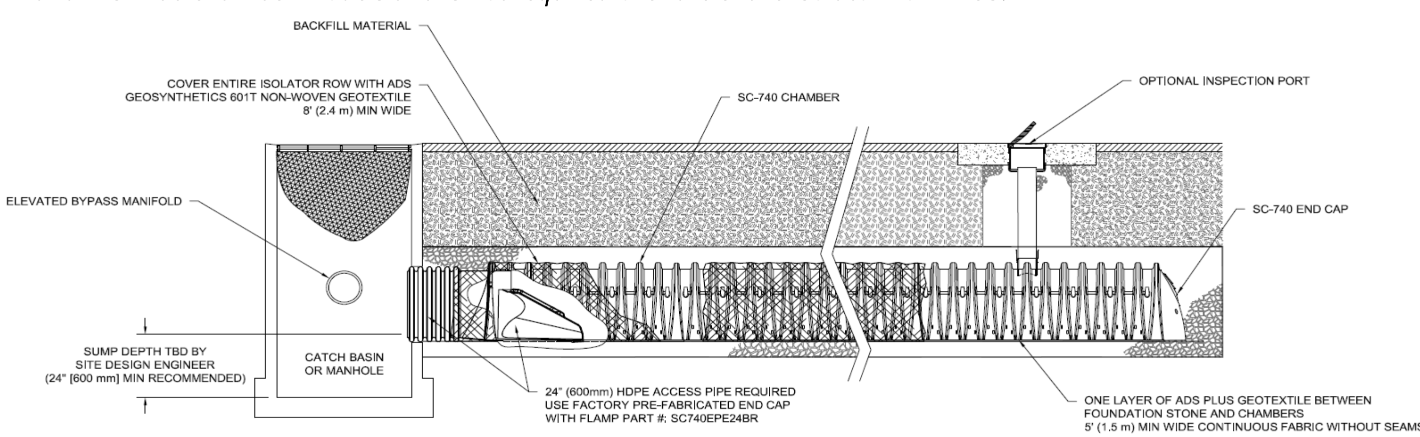
Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row Plus while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" are best. StormTech recommends a maximum nozzle pressure of 2000 psi be utilized during cleaning. JetVac reels can vary in length. For ease of maintenance, ADS recommends Isolator Row Plus lengths up to 200' (61 m). **The JetVac process shall only be performed on StormTech Isolator Row Plus that have ADS Plus Fabric (as specified by StormTech) over their angular base stone.**





StormTech Isolator Row PLUS (*not to scale*)

Note: *Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-7200 chamber models and is not required over the entire Isolator Row PLUS.*



Isolator Row Plus Step By Step Maintenance Procedures

Step 1

Inspect Isolator Row Plus for sediment.

A) Inspection ports (if present)
   i. Remove lid from floor box frame
   ii. Remove cap from inspection riser
   iii. Using a flashlight and stadia rod,measure depth of sediment and record results on maintenance log.
   iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.

B) All Isolator Row Plus
   i. Remove cover from manhole at upstream end of Isolator Row Plus
   ii. Using a flashlight, inspect down Isolator Row Plus through outlet pipe
      1. Mirrors on poles or cameras may be used to avoid a confined space entry
      2. Follow OSHA regulations for confined space entry if entering manhole
   iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2.
   If not, proceed to Step 3.

Step 2

Clean out Isolator Row Plus using the JetVac process.

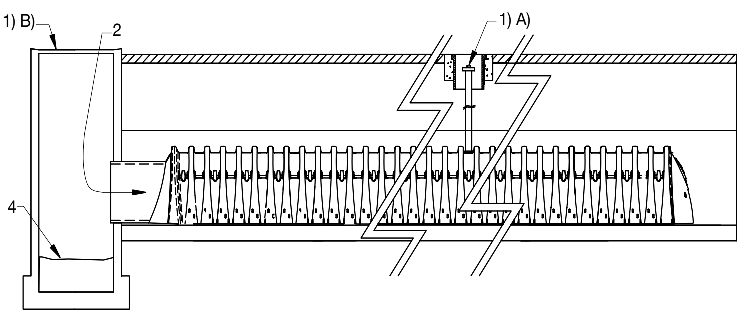
A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
B) Apply multiple passes of JetVac until backflush water is clean
C) Vacuum manhole sump as required

Step 3

Replace all caps, lids and covers, record observations and actions.

Step 4

Inspect & clean catch basins and manholes upstream of the StormTech system.



Sample Maintenance Log

Date	Stadia Rod Readings		Sediment Depth (1)–(2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row PLUS, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

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800-821-6710

ADS StormTech® Installation Guide
SC-310/SC-740/DC-780

StormTech
Installation Video

Required Materials and Equipment List

- Acceptable fill materials per Table 1
- ADS Plus and non-woven geotextile fabrics
- StormTech solid end caps and pre-cored end caps
- StormTech chambers
- StormTech manifolds and fittings

Important Notes:

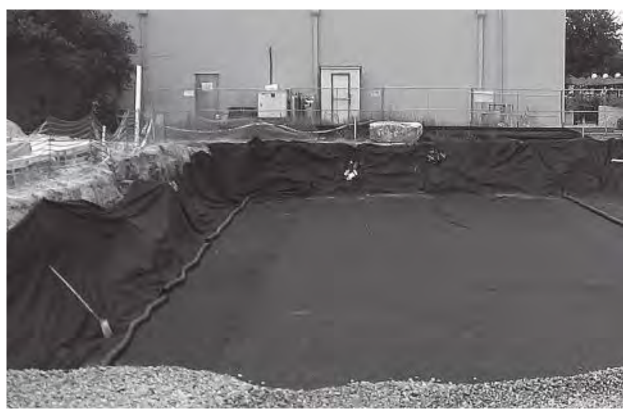
A. This installation guide provides the minimum requirements for proper installation of chambers. Non-adherence to this guide may result in damage to chambers during installation. Replacement of damaged chambers during or after backfilling is costly and very time consuming. It is recommended that all installers are familiar with this guide, and that the contractor inspects the chambers for distortion, damage and joint integrity as work progresses.

B. Use of a dozer to push embedment stone between the rows of chambers may cause damage to chambers and is not an acceptable backfill method. Any chambers damaged by using the “dump and push” method are not covered under the StormTech standard warranty.

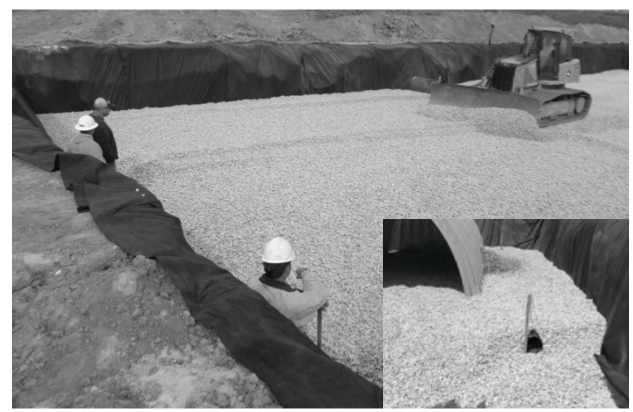
C. Care should be taken in the handling of chambers and end caps. Avoid dropping, prying or excessive force on chambers during removal from pallet and initial placement.

Requirements for System Installation

Excavate bed and prepare subgrade per engineer’s plans.



Place non-woven geotextile over prepared soils and up excavation walls. Install underdrains if required.



Place clean, crushed, angular stone foundation 6” (150 mm) min. Compact to achieve a flat surface.

Manifold, Scour Fabric and Chamber Assembly

Install manifolds and lay out ADS Plus fabric at inlet rows (min. 12.5 ft (3.8 m)) at each inlet end cap. Place a continuous piece along entire length of Isolator® Plus Row(s).

Align the first chamber and end cap of each row with inlet pipes. Contractor may choose to postpone stone placement around end chambers and leave ends of rows open for easy inspection of chambers during the backfill process.

Continue installing chambers by overlapping chamber end corrugations. Chamber joints are labeled "Lower Joint – Overlap Here" and "Build this direction – Upper Joint" Be sure that the chamber placement does not exceed the reach of the construction equipment used to place the stone. Maintain minimum 6" (150 mm) spacing between rows.

Attaching the End Caps

Lift the end of the chamber a few inches off the ground. With the curved face of the end cap facing outward, place the end cap into the chamber's end corrugation.

Prefabricated End Caps

24" (600 mm) inlets are the maximum size that can fit into a SC-740/DC-780 end cap and must be prefabricated with a 24" (600 mm) pipe stub. SC-310 chambers with a 12" (300 mm) inlet pipe must use a prefabricated end cap with a 12" (300 mm) pipe stub. When used on an Isolator Row Plus, these end caps will contain a welded FLAMP (flared end ramp) that will lay on top of the ADS Plus fabric (shown above)

Isolator Row Plus

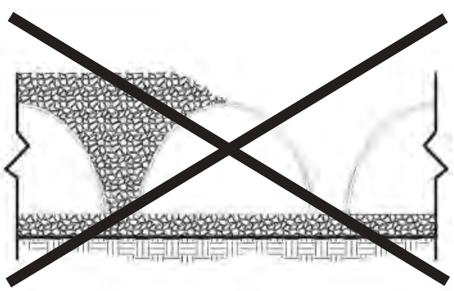
Place a continuous layer of ADS Plus fabric between the foundation stone and the Isolator Row Plus chambers, making sure the fabric lays flat and extends the entire width of the chamber feet. Drape a strip of ADS non-woven geotextile over the row of chambers (not required over DC-780). This is the same type of non-woven geotextile used as a separation layer around the angular stone of the StormTech system.

Initial Anchoring of Chambers – Embedment Stone

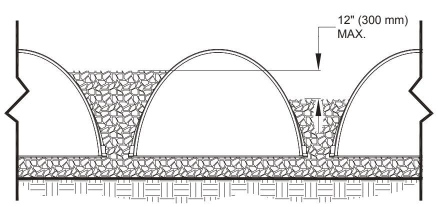
Initial embedment shall be spotted along the centerline of the chamber evenly anchoring the lower portion of the chamber. This is best accomplished with a stone conveyor or excavator reaching along the row.

No equipment shall be operated on the bed at this stage of the installation. Excavators must be located off the bed. Dump trucks shall not dump stone directly on to the bed. Dozers or loaders are not allowed on the bed at this time.

Backfill of Chambers – Embedment Stone

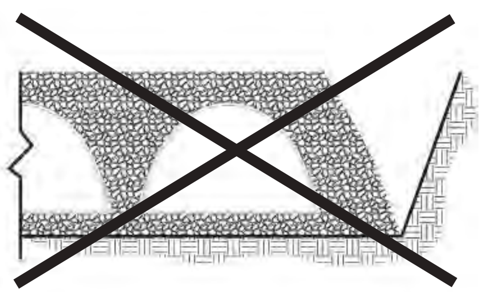


Uneven Backfill

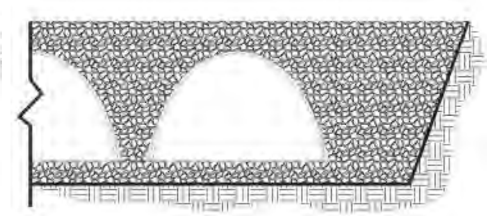


Even Backfill

Backfill chambers evenly. Stone column height should never differ by more than 12” (300 mm) between adjacent chamber rows or between chamber rows and perimeter.



Perimeter Not Backfilled



Perimeter Fully Backfilled

Perimeter stone must be brought up evenly with chamber rows. Perimeter must be fully backfilled, with stone extended horizontally to the excavation wall.

ADS StormTech™

Backfill - Embedment Stone & Cover Stone

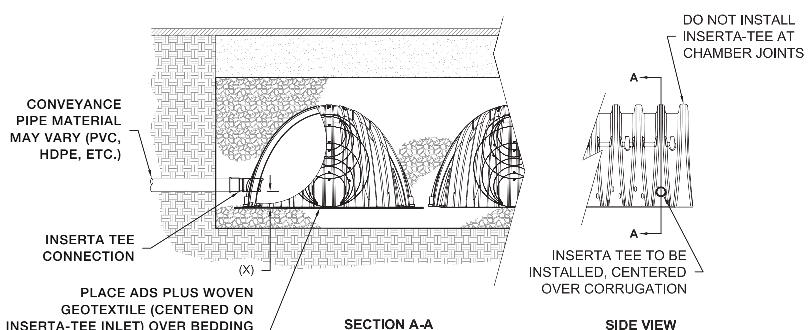
Continue evenly backfilling between rows and around perimeter until embedment stone reaches tops of chambers. Perimeter stone must extend horizontally to the excavation wall for both straight or sloped sidewalls. **Only after chambers have been backfilled to top of chamber and with a minimum 6" (150 mm) of cover stone on top of chambers can small dozers be used over the chambers for backfilling remaining cover stone.**

Small dozers and skid loaders may be used to finish grading stone backfill in accordance with ground pressure limits in Table 2. They must push material parallel to rows only. Never push perpendicular to rows. StormTech recommends that the contractor inspect chambers before placing final backfill. Any chambers damaged by construction shall be removed and replaced.

Final Backfill of Chambers – Fill Material

Install non-woven geotextile over stone. Geotextile must overlap 24" (600 mm) min. where edges meet. Compact each lift of backfill as specified in the site design engineer's drawings. Roller travel parallel with rows.

Inserta Tee Detail



NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 36, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON.		

StormTech Isolator Row Plus Detail

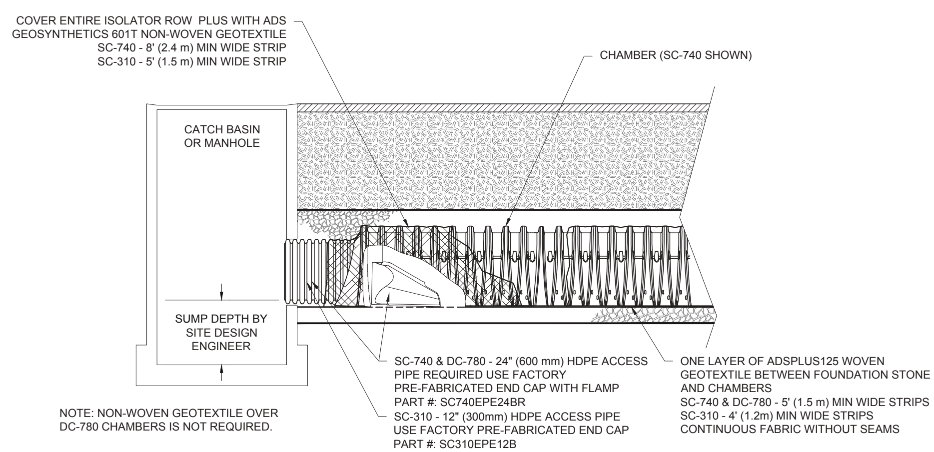


Table 1- Acceptable Fill Materials

Material Location	Description	AASHTO M43 Designation[1]	Compaction/Density Requirement
Ⓓ **Final Fill:** Fill Material for layer 'D' starts from the top of the 'C' layer to the bottom of flexible pavement or unpaved finished grade above. Note that the pavement subbase may be part of the 'D' layer.	Any soil/rock materials, native soils or per engineer's plans. Check plans for pavement subgrade requirements.	N/A	Prepare per site design engineer's plans. Paved installations may have stringent material and preparation requirements.
Ⓒ **Initial Fill:** Fill Material for layer 'C' starts from the top of the embedment stone ('B' layer) to 18" (450 mm) above the top of the chamber. Note that pavement subbase may be part of the 'C' layer.	Granular well-graded soil/aggregate mixtures, <35% fines or processed aggregate. Most pavement subbase materials can be used in lieu of this layer.	AASHTO M45 A-1, A-2-4, A-3 or AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	Begin compaction after min. 12" (300 mm) of material over the chambers is reached. Compact additional layers in 6" (150 mm) max. lifts to a min. 95% Proctor density for well-graded material and 95% relative density for processed aggregate materials. Roller gross vehicle weight not to exceed 12,000 lbs (53 kN). Dynamic force not to exceed 20,000 lbs (89 kN)
Ⓑ **Embedment Stone:** Embedment Stone surrounding chambers from the foundation stone to the 'C' layer above.	Clean, crushed, angular stone	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	No compaction required.
Ⓐ **Foundation Stone:** Foundation Stone below the chambers from the subgrade up to the foot (bottom) of the chamber.	Clean, crushed, angular stone,	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	Place and compact in 6" (150 mm) lifts using two full coverages with a vibratory compactor.[2,3]

Please Note:
1. The listed AASHTO designations are for gradations only. The stone must also be clean, crushed, angular. For example, a specification for #4 stone would state: "clean, crushed, angular no. 4 (AASHTO M43) stone".
2. StormTech compaction requirements are met for 'A' location materials when placed and compacted in 6" (150 mm) (max) lifts using two full coverages with a vibratory compactor.
3. Where infiltration surfaces may be comprised by compaction, for standard installations and standard design load conditions, a flat surface may be achieved by raking or dragging without compaction equipment. For special load designs, contact StormTech for compaction requirements.

Figure 1- Inspection Port Detail

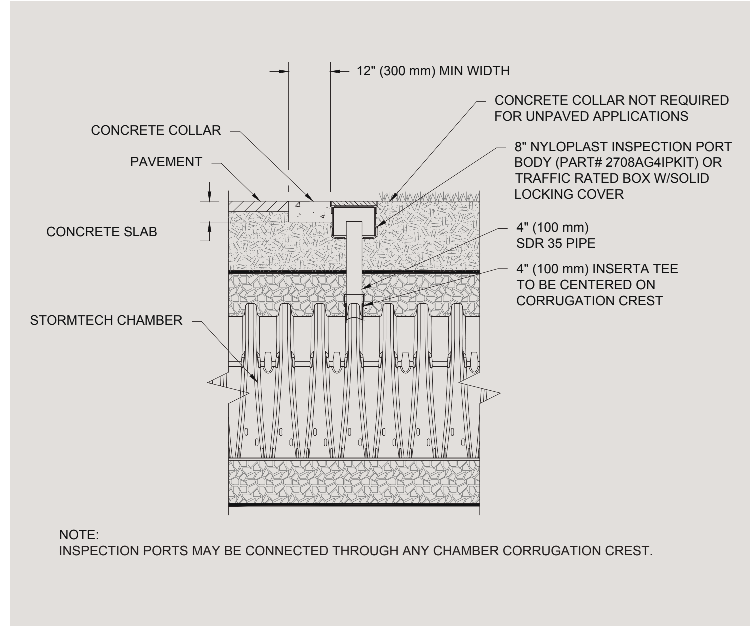
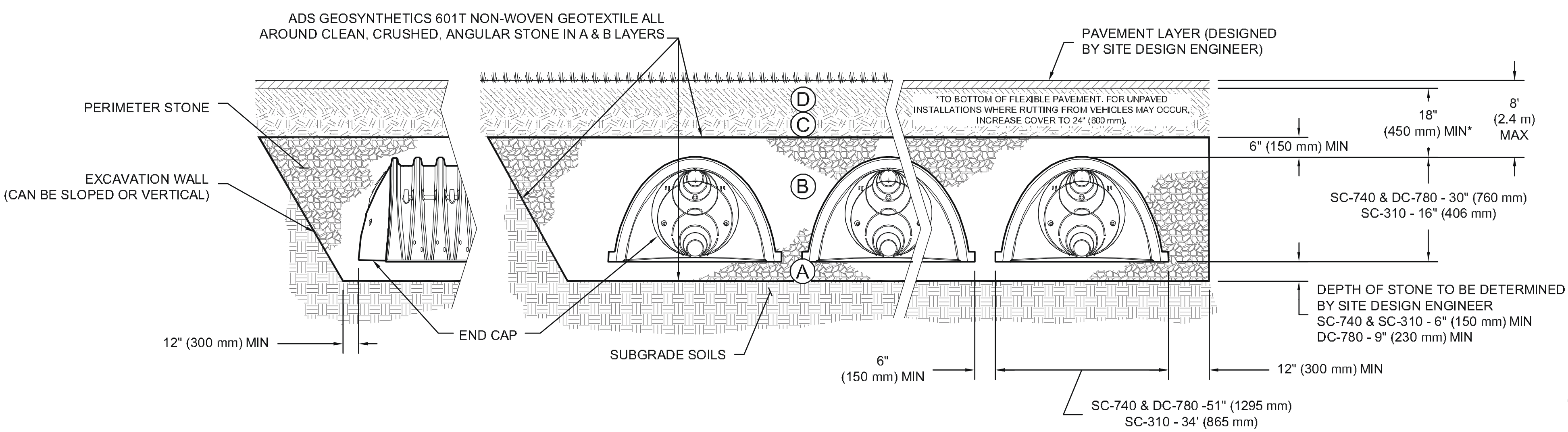


Figure 2 - Fill Material Locations



Notes:

1. 36” (900 mm) of stabilized cover materials over the chambers is recommended during the construction phase if general construction activities, such as full dump truck travel and dumping, are to occur over the bed.
2. During paving operations, dump truck axle loads on 18” (450 mm) of cover may be necessary. Precautions should be taken to avoid rutting of the road base layer, to ensure that compaction requirements have been met, and that a minimum of 18” (450 mm) of cover exists over the chambers. Contact StormTech for additional guidance on allowable axle loads during paving.
3. Ground pressure for track dozers is the vehicle operating weight divided by total ground contact area for both tracks. Excavators will exert higher ground pressures based on loaded bucket weight and boom extension.
4. Mini-excavators (< 8,000lbs/3,628 kg) can be used with at least 12” (300 mm) of stone over the chambers and are limited by the maximum ground pressures in Table 2 based on a full bucket at maximum boom extension.
5. Storage of materials such as construction materials, equipment, spoils, etc. should not be located over the StormTech system. The use of equipment over the StormTech system not covered in Table 2 (ex. soil mixing equipment, cranes, etc) is limited. Please contact StormTech for more information.
6. Allowable track loads based on vehicle travel only. Excavators shall not operate on chamber beds until the total backfill reaches 3 feet (900 mm) over the entire bed.

Table 2 - Maximum Allowable Construction Vehicle Loads[6]

Material Location	Fill Depth over Chambers in. (mm)	Maximum Allowable Wheel Loads		Maximum Allowable Track Loads[6]		Maximum Allowable Roller Loads
		Max Axle Load for Trucks lbs (kN)	Max Wheel Load for Loaders lbs (kN)	Track Width in. (mm)	Max Ground Pressure psf (kPa)	Max Drum Weight or Dynamic Force lbs (kN)
Ⓓ Final Fill Material	36” (900) Compacted	32,000 (142)	16,000 (71)	12” (305) 18” (457) 24” (610) 30” (762) 36” (914)	3880 (186) 2640 (126) 2040 (97) 1690 (81) 1470 (70)	38,000 (169)
Ⓒ Initial Fill Material	24” (600) Compacted	32,000 (142)	16,000 (71)	12” (305) 18” (457) 24” (610) 30” (762) 36” (914)	2690 (128) 1880 (90) 1490 (71) 1280 (61) 1150 (55)	20,000 (89)
	24” (600) Loose/ Dumped	32,000 (142)	16,000 (71)	12” (305) 18” (457) 24” (610) 30” (762) 36” (914)	2390 (114) 1700 (81) 1370 (65) 1190 (57) 1080 (51)	20,000 (89) Roller gross vehicle weight not toexceed 12,000 lbs. (53 kN)
	18” (450)	32,000 (142)	16,000 (71)	12” (305) 18” (457) 24” (610) 30” (762) 36” (914)	2110 (101) 1510 (72) 1250 (59) 1100 (52) 1020 (48)	20,000 (89) Roller gross vehicle weight not to exceed 12,000 lbs. (53 kN)
Ⓑ Embedment Stone	12” (300)	16,000 (71)	NOT ALLOWED	12” (305) 18” (457) 24” (610) 30” (762) 36” (914)	1540 (74) 1190 (57) 1010 (48) 910 (43) 840 (40)	20,000 (89) Roller gross vehicle weight not to exceed 12,000 lbs. (53 kN)
	6” (150)	8,000 (35)	NOT ALLOWED	12” (305) 18” (457) 24” (610) 30” (762) 36” (914)	1070 (51) 900 (43) 800 (38) 760 (36) 720 (34)	NOT ALLOWED

Table 3 - Placement Methods and Descriptions

Material Location	Placement Methods/ Restrictions	Wheel Load Restrictions	Track Load Restrictions	Roller Load Restrictions
		See Table 2 for Maximum Construction Loads		
Ⓓ Final Fill Material	A variety of placement methods may be used. All construction loads must not exceed the maximum limits in Table 2.	36” (900 mm) minimum cover required for dump trucks to dump over chambers.	Dozers to push parallel to rows until 36” (900mm) compacted cover is reached.[4]	Roller travel parallel to rows only until 36” (900 mm) compacted cover is reached.
Ⓒ Initial Fill Material	Excavator positioned off bed recommended. Small excavator allowed over chambers. Small dozer allowed.	Asphalt can be dumped into paver when compacted pavement subbase reaches 18” (450 mm) above top of chambers.	Small LGP track dozers & skid loaders allowed to grade cover stone with at least 6” (150 mm) stone under tracks at all times. Equipment must push parallel to rows at all times.	Use dynamic force of roller only after compacted fill depth reaches 12” (300 mm) over chambers. Roller travel parallel to chamber rows only.
Ⓑ Embedment Stone	No equipment allowed on bare chambers. Use excavator or stone conveyor positioned off bed or on foundation stone to evenly fill around all chambers to at least the top of chambers.	No wheel loads allowed. Material must be placed outside the limits of the chamber bed.	No tracked equipment is allowed on chambers until a min. 6” (150 mm) cover stone is in place.	No rollers allowed.
Ⓐ Foundation Stone	No StormTech restrictions. Contractor responsible for any conditions or requirements by others relative to subgrade bearing capacity, dewatering or protection of subgrade.			

ADS StormTech

StormTech® Standard Limited Warranty

STANDARD LIMITED WARRANTY OF STORMTECH LLC ("STORMTECH"): PRODUCTS

(A) This Limited Warranty applies solely to the StormTech chambers and end plates manufactured by StormTech and sold to the original purchaser (the "Purchaser"). The chambers and end plates are collectively referred to as the "Products."

(B) The structural integrity of the Products, when installed strictly in accordance with StormTech's written installation instructions at the time of installation, are warranted to the Purchaser against defective materials and workmanship for one (1) year from the date of purchase. Should a defect appear in the Limited Warranty period, the Purchaser shall provide StormTech with written notice of the alleged defect at StormTech's corporate headquarters within ten (10) days of the discovery of the defect. The notice shall describe the alleged defect in reasonable detail. StormTech agrees to supply replacements for those Products determined by StormTech to be defective and covered by this Limited Warranty. The supply of replacement products is the sole remedy of the Purchaser for breaches of this Limited Warranty. StormTech's liability specifically excludes the cost of removal and/or installation of the Products.

(C) THIS LIMITED WARRANTY IS EXCLUSIVE. THERE ARE NO OTHER WARRANTIES WITH RESPECT TO THE PRODUCTS, INCLUDING NO IMPLIED WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.

(D) This Limited Warranty only applies to the Products when the Products are installed in a single layer. UNDER NO CIRCUMSTANCES, SHALL THE PRODUCTS BE INSTALLED IN A MULTI-LAYER CONFIGURATION.

(E) No representative of StormTech has the authority to change this Limited Warranty in any manner or to extend this Limited Warranty. This Limited Warranty does not apply to any person other than to the Purchaser.

(F) Under no circumstances shall StormTech be liable to the Purchaser or to any third party for product liability claims; claims arising from the design, shipment, or installation of the Products, or the cost of other goods or services related to the purchase and installation of the Products. For this Limited Warranty to apply, the Products must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and StormTech's written installation instructions.

(G) THE LIMITED WARRANTY DOES NOT EXTEND TO INCIDENTAL, CONSEQUENTIAL, SPECIAL OR INDIRECT DAMAGES. STORMTECH SHALL NOT BE LIABLE FOR PENALTIES OR LIQUIDATED DAMAGES, INCLUDING LOSS OF PRODUCTION AND PROFITS; LABOR AND MATERIALS; OVERHEAD COSTS; OR OTHER LOSS OR EXPENSE INCURRED BY THE PURCHASER OR ANY THIRD PARTY. SPECIFICALLY EXCLUDED FROM LIMITED WARRANTY COVERAGE ARE DAMAGE TO THE PRODUCTS ARISING FROM ORDINARY WEAR AND TEAR; ALTERATION, ACCIDENT, MISUSE, ABUSE OR NEGLECT; THE PRODUCTS BEING SUBJECTED TO VEHICLE TRAFFIC OR OTHER CONDITIONS WHICH ARE NOT PERMITTED BY STORMTECH'S WRITTEN SPECIFICATIONS OR INSTALLATION INSTRUCTIONS; FAILURE TO MAINTAIN THE MINIMUM GROUND COVERS SET FORTH IN THE INSTALLATION INSTRUCTIONS; THE PLACEMENT OF IMPROPER MATERIALS INTO THE PRODUCTS; FAILURE OF THE PRODUCTS DUE TO IMPROPER SITING OR IMPROPER SIZING; OR ANY OTHER EVENT NOT CAUSED BY STORMTECH. A PRODUCT ALSO IS EXCLUDED FROM LIMITED WARRANTY COVERAGE IF SUCH PRODUCT IS USED IN A PROJECT OR SYSTEM IN WHICH ANY GEOTEXTILE PRODUCTS OTHER THAN THOSE PROVIDED BY ADVANCED DRAINAGE SYSTEMS ARE USED. THIS LIMITED WARRANTY REPRESENTS STORMTECH'S SOLE LIABILITY TO THE PURCHASER FOR CLAIMS RELATED TO THE PRODUCTS, WHETHER THE CLAIM IS BASED UPON CONTRACT, TORT, OR OTHER LEGAL THEORY.

Drainage Filtration Separation

ADS 0601T/O NONWOVEN GEOTEXTILE SPECIFICATION

Scope

This specification describes ADS 0601T/O nonwoven geotextile.

Filter Fabric Requirements

ADS 0601T/O is an orange nonwoven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. ADS 0601T/O is inert to biological degradation and resists naturally encountered chemicals, alkali and acids. ADS 0601T/O conforms to the physical property values listed below:

Filter Fabric Properties

Property	Test Method	Unit	Typical Value[1] MD	Typical Value[1] CD
Grab Tensile Strength	ASTM D4632	lbs (N)	175 (779)	175 (779)
Grab Tensile Elongation	ASTM D4632	%	75	75
Trapezoid Tear Strength	ASTM D4533	lbs (N)	85 (378)	85 (378)
CBR Puncture Strength	ASTM D6241	lbs (N)	480 (2136)	480 (2136)
Permittivity	ASTM D4491	sec^{-1}	1.5	1.5
Flow Rate	ASTM D4491	gal/min/ft^2 (l/min/m^2)	105 (4278)	105 (4278)
UV Resistance (at 500 hours)[1]	ASTM D4355	% strength retained	80	80

Physical Properties

Property	Test Method	Unit	Typical Value[2]
Weight	ASTM D5161	oz/yd^2 (g/m^2)	6.5 (220)
Thickness	ASTM D5199	mils (mm)	65 (1.7)
Roll Dimensions (W x L)	-	ft (m)	15 x 300 (4.5 x 91)
Roll Area	-	yd^2 (m^2)	500 (418)
Estimated Roll Weight	-	lb (kg)	220 (100)

1 Modified, Minimum Test Value
2 ASTM D4439 Standard Terminology for Geosynthetics: typical value, n-*for geosynthetics*, the mean value calculated from documented manufacturing quality control test results for a defined population obtained from one test method associated with on specific property.

Separation

ADS 315W WOVEN GEOTEXTILE SPECIFICATION

Scope

This specification describes ADS 315W woven geotextile.

Filter Fabric Requirements

ADS 315W is manufactured using high-tenacity polypropylene yarns that are woven to form a dimensionally stable network, which allows the yarns to maintain their relative position. ADS 315W resists ultraviolet deterioration, rotting and biological degradation and is inert to commonly encountered soil chemicals. ADS 315W conforms to the physical property values listed below:

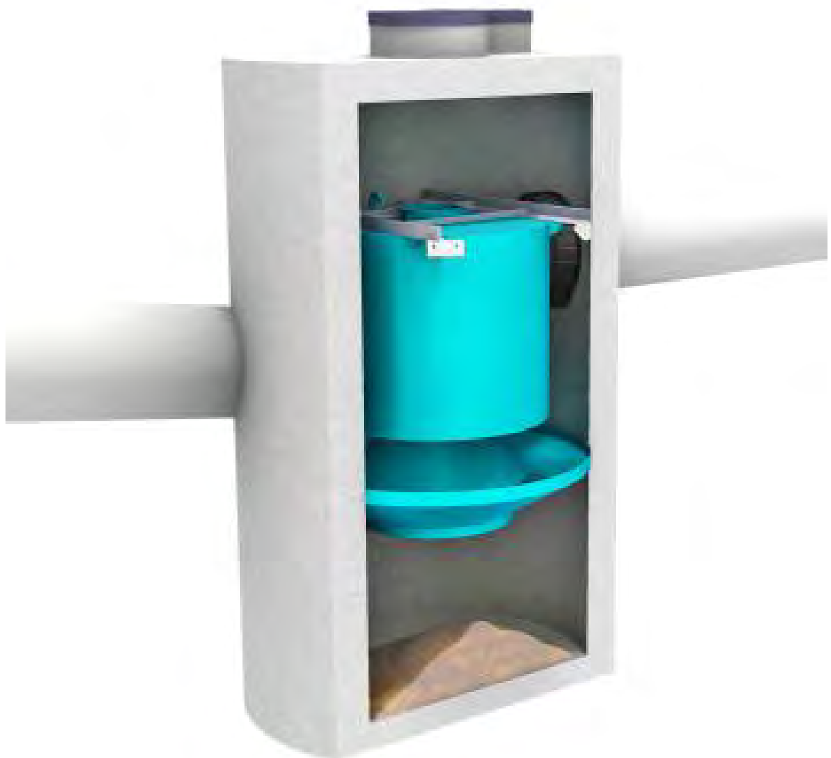
Filter Fabric Properties

Property	Test Method	Unit	M.A.R.V. (Minimum Average Roll Value)[2]
Tensile Strength (Grab)	ASTM D4632	lbs (N)	315 (1400)
Elongation	ASTM D4632	%	15
CBR Puncture	ASTM D6241	lbs (N)	900 (4005)
Puncture	ASTM D4833	lbs (N)	150 (667)
Mullen Burst	ASTM D3786	psi (kPa)	600 (4134)
Trapezoidal Tear	ASTM D4533	lbs (N)	120 (533)
UV Resistance (at 500 hours)	ASTM D4355	%	70
Apparent Opening Size (AOS)*	ASTM D4751	U.S. Sieve (mm)	40 (.425)
Permittivity	ASTM D4491	sec^{-1}	.05
Water Flow Rate	ASTM D4491	gpm/ft^2 ($l/min/m^2$)	4 (163)

* Maximum average roll value.

Packaging

Roll Dimensions (W x L) - ft. (m)	12.5 x 360/ 15 x 300 / 17.5 x 258 (3.81 x 109.8/ 4.57 x 91.5 / 5.33 x 78.6)



Operation and Maintenance Manual

Downstream Defender®

Vortex Separator for Stormwater Treatment

Turning Water Around ...®

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Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Downstream Defender® by Hydro International

The Downstream Defender® is an advanced Hydrodynamic Vortex Separator designed to provide high removal efficiencies of settleable solids and their associate pollutants, oil, and floatables over a wide range of flow rates

The Downstream Defender® has unique, flow-modifying internal components developed from extensive full-scale testing, CFD modeling and over thirty years of hydrodynamic separation experience in wastewater, combined sewer and stormwater applications. These internal components distinguish the Downstream Defender® from simple swirl-type devices and conventional oil/grit separators by minimizing turbulence and headlosses, enhancing separation, and preventing washout of previously stored pollutants.

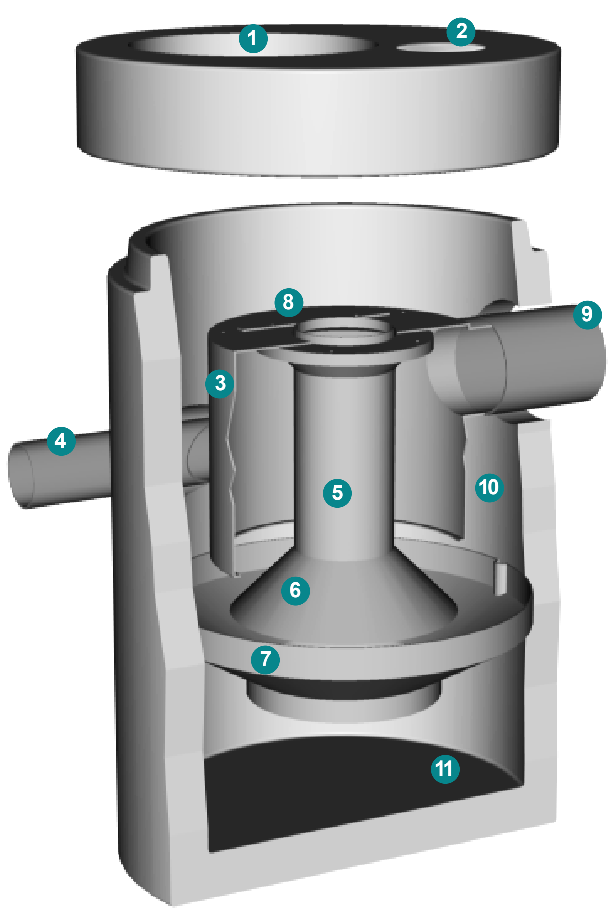
The high removal efficiencies and inherent low headlosses o the Downstream Defender® allow for a small footprint making it a compact and economical solution for the treatment of non-point source pollution.

Benefits of the Downstream Defende ®

- Removes sediment, floatables, oil and greas
- No pollutant washouts
- Small footprint
- No loss of treatment capacity between clean-outs
- Low headloss
- Efficient over a wide ranges of fl
- Easy to install
- Low maintenance

Applications

- New developments and retrofit
- Utility yards
- Streets and roadways
- Parking lots
- Pre-treatment for filters, infiltration and stora
- Industrial and commercial facilities
- Wetlands protection



Downstream Defender® Components

1. Central Access Port
2. Floatables Access Port (6-ft., 8-ft. and 10-ft. models only)
3. Dip Plate
4. Tangential Inlet
5. Center Shaft
6. Center Cone
7. Benching Skirt
8. Floatables Lid
9. Outlet Pipe
10. Floatables Storage
11. Isolated Sediment Storage Zone

Operation

Introduction

The Downstream Defender® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The Downstream Defender® has been designed to allow for easy and safe access for inspection/monitoring and clean-out procedures. Entry into the unit or removal of the internal components is not necessary for maintenance, thus safety concerns related to confined-space entry are avoided.

Pollutant Capture and Retention

The internal components of the Downstream Defender® have been designed to protect the oil, floatables and sediment storage volumes so that separator performance is not reduced as pollutants accumulate between clean-outs. Additionally, the Downstream Defender® is designed and installed into the storm drain system so that the vessel remains wet between storm events. Oil and floatables are stored on the water surface in the outer annulus separate from the sediment storage volume in the sump of the unit providing the option for separate oil disposal, and accessories such as adsorbant pads. Since the oil/floatables and sediment storage volumes are isolated from the active separation region, the potential for re-suspension and washout of stored pollutants between clean-outs is minimized.

Wet Sump

The sump of the Downstream Defender® retains a standing water level between storm events. The water in the sump prevents stored sediment from solidifying in the base of the unit. The clean-out procedure becomes more difficul and labor intensive if the system allows fine sediment to dry-out and consolidate. Dried sediment must be manually removed by maintenance crews. This is a labor intensive operation in a hazardous environment.

Blockage Protection

The Downstream Defender® has large clear openings and no internal restrictions or weirs, minimizing the risk of blockage and hydraulic losses. In addition to increasing the system headloss, orifices and internal weirs can increase the risk of blockage within the unit.

Maintenance

Overview

The Downstream Defender® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the Downstream Defender®. The Downstream Defender® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the Downstream Defender® will no longer be able to store removed sediment and oil. Maximum pollutant storage capacities are provided in Table 1.

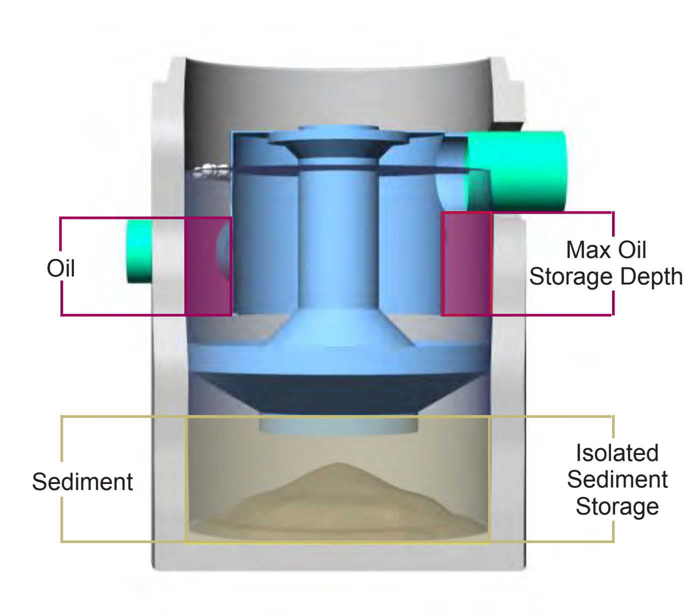


Fig.1 Pollutant storage volumes of the Downswtream Defender®.

The Downstream Defender® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole. On the 6-ft, 8-ft and 10-ft units, the floatables access port is above the outlet pipe between the concrete manhole wall and the dip plate. The sediment removal access ports for all Downstream Defender® models are located directly over the hollow center shaft.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the Downstream Defender®, nor do they require the internal components of the Downstream Defender® to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Determining Your Maintenance Schedule

The frequency of cleanout is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil/flotables removal, for a 6-ft Downstream Defender® typically takes less than 30 minutes and removes a combined water/oil volume of about 500 gallons.

Inspection Procedures

Inspection is a simple process that does not involve entry into the Downstream Defender®. Maintenance crews should be familiar with the Downstream Defender® and its components prior to inspection.

Scheduling

- It is important to inspect your Downstream Defender® every six months during the first year of operation to determine your site-specific rate of pollutant accumulatio
- Typically, inspection may be conducted during any season of the year
- Sediment removal is not required unless sediment depths exceed 75% of maximum clean-out depths stated in Table 1

Recommended Equipment

- Safety Equipment and Personal Protective Equipment (traffic cones, work gloves, etc
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net
- Sediment probe (such as a Sludge Judge®)
- Trash bag for removed floatable
- Downstream Defender® Maintenance Log

Table 1. Downstream Defender® Pollutant Storage Capacities and Max. Cleanout Depths.

Unit Diameter	Total Oil Storage	Oil Clean-out Depth	Total Sediment Storage	Sediment Clean-out Depth	Max. Liquid Volume Removed
(feet)	(gallons)	(inches)	(gallons)	(inches)	(gallons)
4	70	<16	141	<18	384
6	216	<23	424	<24	1,239
8	540	<33	939	<30	2,884
10	1,050	<42	1,757	<36	5,546
12	1,770	<49	2,970	<42	9,460

NOTES

1. Refer to Dowmstream Defender® Clean-out Detail (Fig. 1) for measurement of depths.

2. Oil accumulation is typically less than sediment, however, removal of oil and sediment during the same service is recommended.

3. Remove floatables first, then remove sediment storage volum

4. Sediment removal is not required unless sediment depths exceed 75% of maximum clean-out depths stated in Table 1.

Fig.4

Fig.5

Fig.6

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the Downstream Defender® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being don

2. Remove the lids to the manhole (Fig. 4). NOTE: The 4-ft Downstream Defender® will only have one lid.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. See Fig.7 and 8 for typical inspection views.

4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the outer annulu of the chamber.

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel (Fig.5).

6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debri removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.

7. Securely replace the grate or lid.

8. Take down safety equipment.

9. Notify Hydro International of any irregularities noted during inspection.

Floatables and Sediment Cleanout

Floatables cleanout is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.6).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose and skimmer pole to be lowered to the base of the sump.

Scheduling

- Floatables and sump cleanout are typically conducted once a year during any season.

- If sediment depths are greater than 75% of maximum clean-out depths stated in Table 1, sediment removal is required.

- Floatables and sump cleanout should occur as soon as possible following a spill in the contributing drainage area.

Fig.7 View over center shaft into sediment storage zone.

Fig.8 View of outer annulus of floatables and oil collection zone.

Recommended Equipment

- Safety Equipment (traffic cones, et
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net (if only floatables are being removed
- Sediment probe (such as a Sludge Judge®)
- Vactor truck (6-inch flexible hose recommended
- Downstream Defender® Maintenance Log

1. Set up any necessary safety equipment around the access port or grate of the Downstream Defender® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being don
2. Remove the lids to the manhole (NOTE: The 4-ft Downstream Defender® will only have one lid).
3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.
4. Using the Floatables Port for access, remove oil and floatable stored on the surface of the water with the vactor hose or the skimmer net (Fig.9).
5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (Pg.9).
6. Once all floatables have been removed, drop the vactor hose to the base of the sump via the Central Access Port. Vactor out the sediment and gross debris off the sump floor (Fig.6
7. Retract the vactor hose from the vessel.
8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.
9. Securely replace the grate or lid.

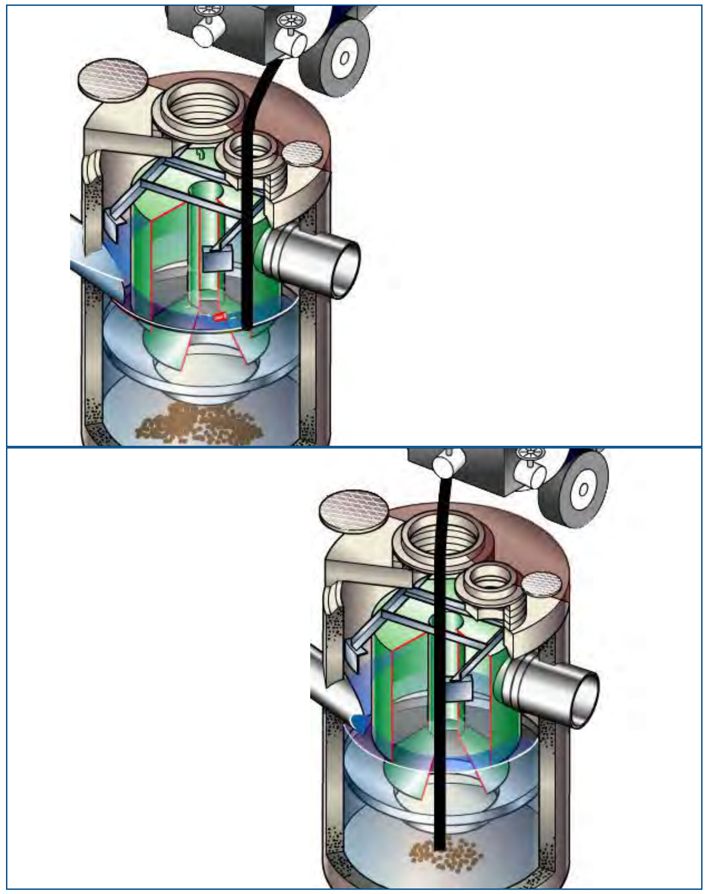


Fig.9 Floatables and sediment are removed with a vactor hose

Maintenance at a Glance

Activity	Frequency
Inspection	- Regularly during first year of installatio - Every 6 months after the first year of installatio
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area
NOTE: For most cleanouts it is not necessary to remove the entire volume of liquid in the vessel. Only removing the first few inches of oils/floatables and the sediment storage volume is require	

Downstream Defender® Installation Log

HYDRO INTERNATIONAL REFERENCE NUMBER:	
SITE NAME:	
SITE LOCATION:	
OWNER:	CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

MODEL (CIRCLE ONE): **4-FT** **6-FT** **8-FT** **10-FT** **CUSTOM**

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Downstream Defender® Inspection and Maintenance Log

Date	Initials	Depth of Floatables and Oils	Sediment * Depth Measured	Volume of Sediment Removed	Site Activity and Comments

*Note: Sediment removal is not required unless sediment depths exceed 75% of maximum clean-out depths stated in Table 1.

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Hydro International

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CALL **1 (888) 382-7808** TO SCHEDULE AN INSPECTION

Stormwater Solutions

94 Hutchins Drive
Portland, ME 04102

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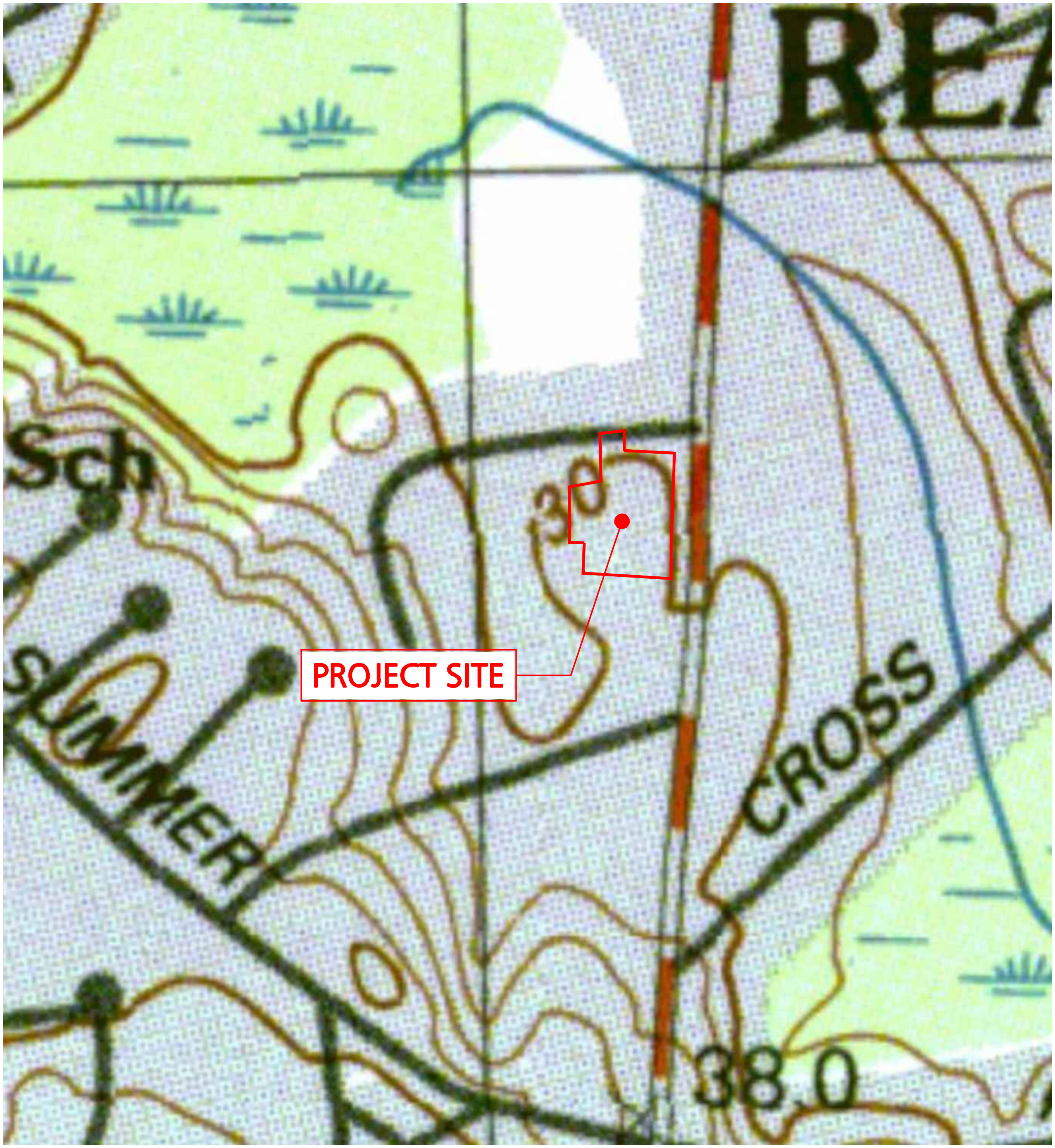
Fax: (207) 756-6212
stormwaterinquiry@hydro-int.com

www.hydro-int.com

Turning Water Around...®

SECTION 3.0 -
EXHIBITS



PREPARED BY:

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FAX: (781) 935-2896
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

PROJECT: STRADA
258 MAIN STREET
READING, MA

USGS SITE LOCUS MAP

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	1"=300'	DWG. NAME:	EXHIBITS
DESIGNED BY:	MTB	CHECKED BY:	CMQ

SHEET No.
EX-1

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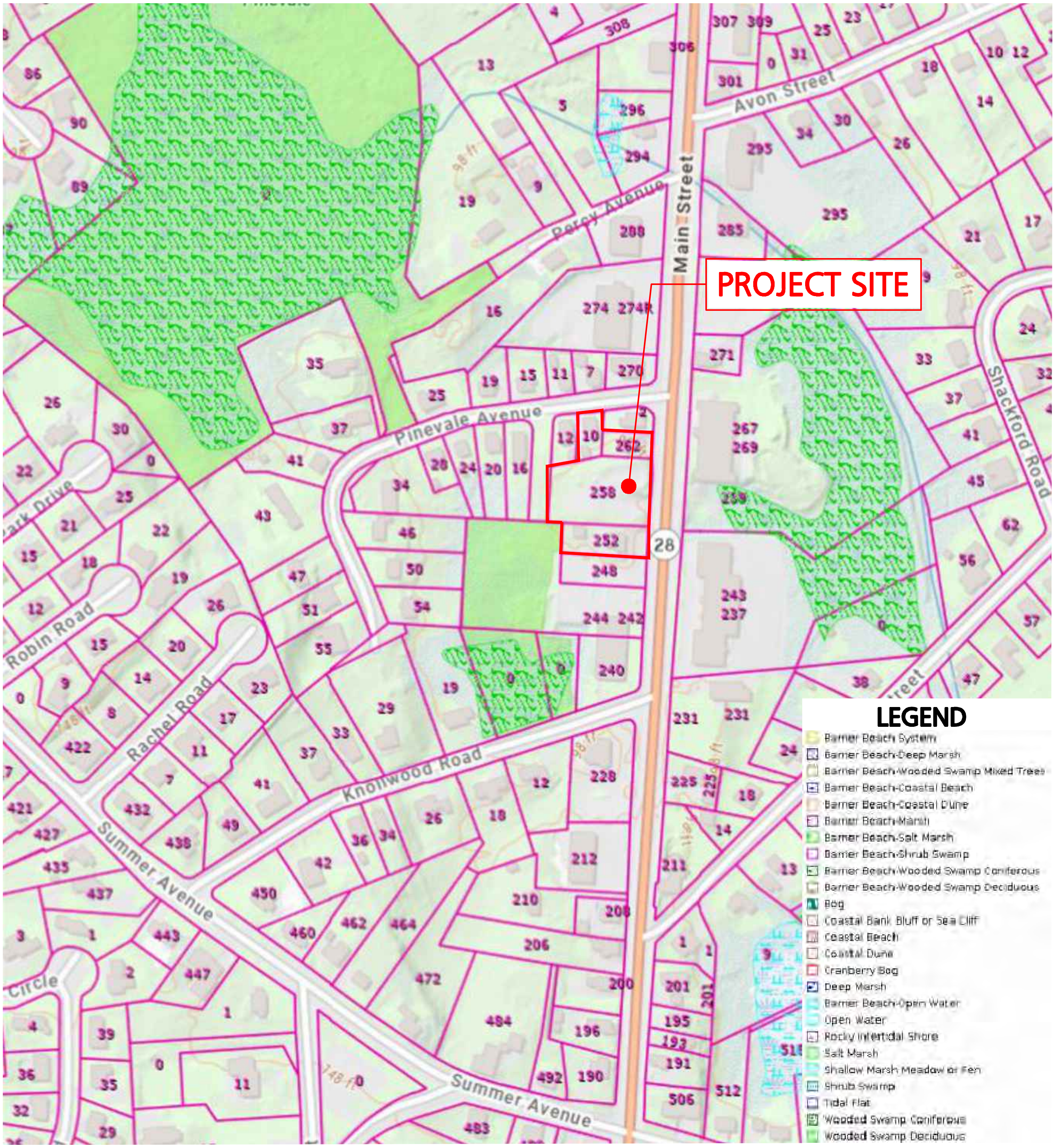
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

PROJECT:
STRADA
258 MAIN STREET
READING, MA

AERIAL PHOTO

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	1"=300'	DWG. NAME:	EXHIBITS
DESIGNED BY:	MTB	CHECKED BY:	CMQ

SHEET No.
EX-2



THERE ARE NO DEP WETLANDS DIRECTLY ON SITE
THE SITE DOES FALLS WITHIN 100 FOOT WETLAND BUFFER

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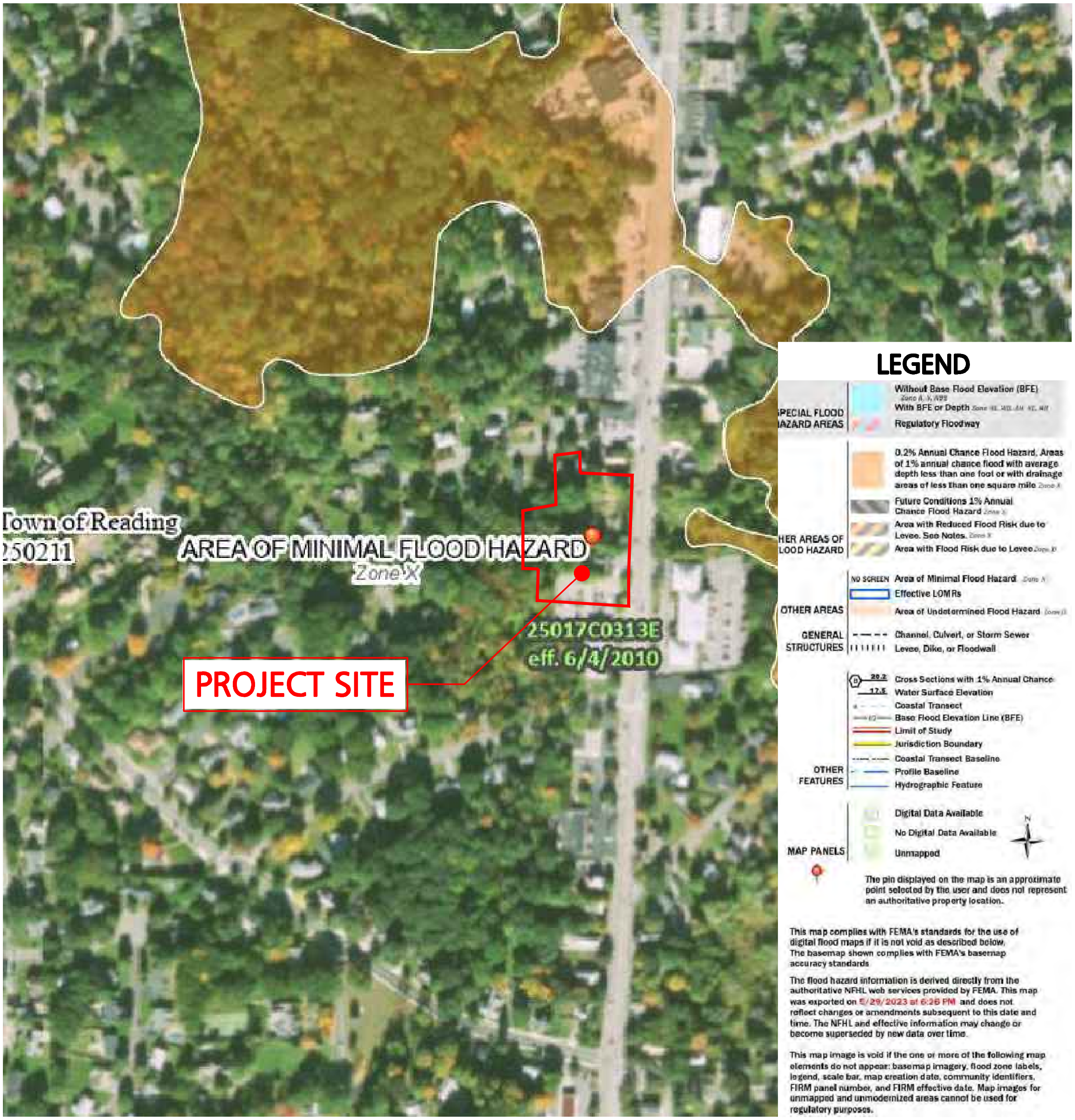
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

PROJECT: STRADA
258 MAIN STREET
READING, MA

WETLANDS MAP

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	1"=300'	DWG. NAME:	EXHIBITS
DESIGNED BY:	MTB	CHECKED BY:	CMQ

SHEET No.
EX-3



FEMA FLOOD INSURANCE RATE MAP
MIDDLESEX COUNTY, MASSACHUSETTS
COMMUNITY PANEL 312 OF 656
MAP NUMBER 25017C0313E
EFFECTIVE DATE: JUNE 4, 2010

SITE IS NOT LOCATED IN A FLOOD HAZARD ZONE

PREPARED BY:

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PROJECT:
STRADA
258 MAIN STREET
READING, MA

FEMA FIRM MAP

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	1"=300'	DWG. NAME:	EXHIBITS
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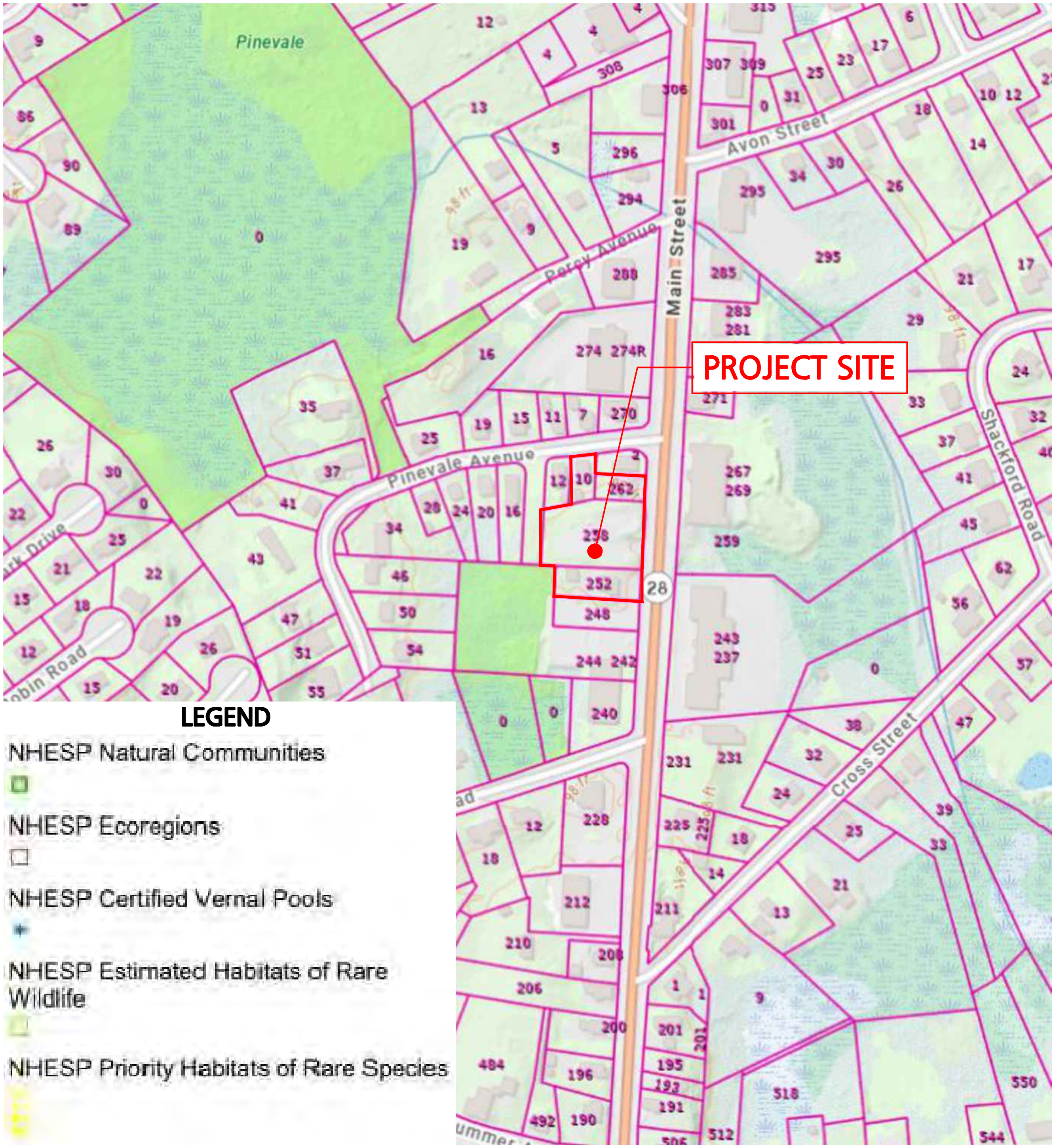
SHEET No.
EX-4



NO PRIORITY & ESTIMATED HABITATS LOCATED ON SITE

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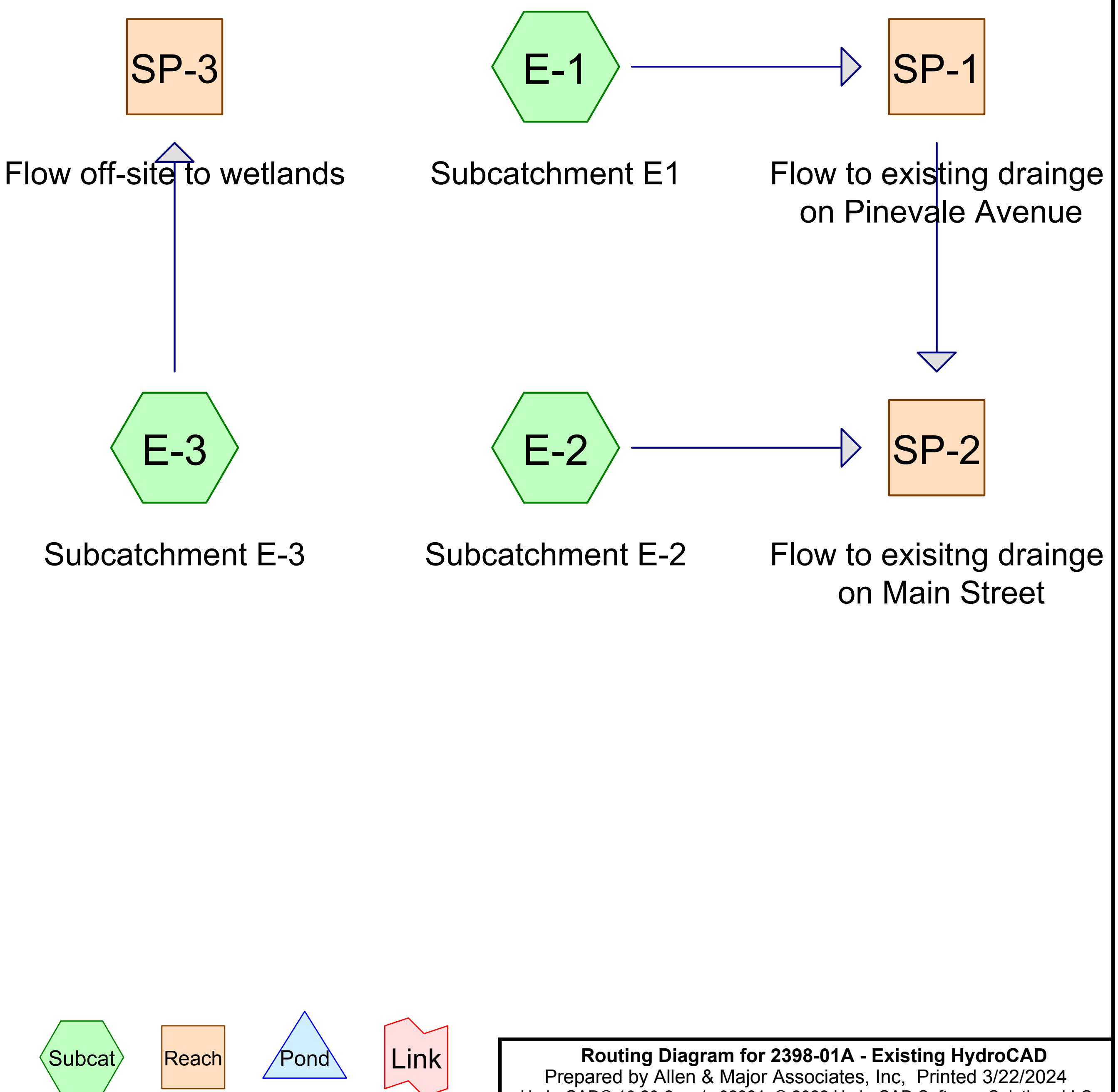
PROJECT:
STRADA
258 MAIN STREET
READING, MA

PRIORITY & ESTIMATED HABITATS

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	1"=300'	DWG. NAME:	EXHIBITS
DESIGNED BY:	MTB	CHECKED BY:	CMQ

SHEET No.
EX-5

SECTION 4.0 -
EXISTING DRAINAGE ANALYSIS



Routing Diagram for 2398-01A - Existing HydroCAD
Prepared by Allen & Major Associates, Inc, Printed 3/22/2024
HydroCAD® 10.20-2g s/n 02881 © 2022 HydroCAD Software Solutions LLC

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 4245 MA Reading Middlesex County South
Rainfall events imported from "NRCS-Rain.txt" for 4245 MA Reading Middlesex County South

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NRCC 24-hr	D	Default	24.00	1	3.31	2
2	10-Year	NRCC 24-hr	D	Default	24.00	1	5.21	2
3	25-Year	NRCC 24-hr	D	Default	24.00	1	6.40	2
4	100-Year	NRCC 24-hr	D	Default	24.00	1	8.23	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
8,464	39	>75% Grass cover, Good, HSG A (E-1, E-2, E-3)
19,705	98	Paved parking, HSG A (E-1, E-2, E-3)
1,851	98	Roofs, HSG A (E-2, E-3)
1,595	98	Unconnected roofs, HSG A (E-1)
14,480	32	Woods/grass comb., Good, HSG A (E-1, E-2, E-3)
46,095	**66**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
46,095	HSG A	E-1, E-2, E-3
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
46,095		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
8,464	0	0	0	0	8,464	>75% Grass cover, Good	
19,705	0	0	0	0	19,705	Paved parking	
1,851	0	0	0	0	1,851	Roofs	
1,595	0	0	0	0	1,595	Unconnected roofs	
14,480	0	0	0	0	14,480	Woods/grass comb., Good	
46,095	**0**	**0**	**0**	**0**	**46,095**	**TOTAL AREA**	

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

Subcatchment E-1: Subcatchment E1 Runoff Area=17,847 sf 53.69% Impervious Runoff Depth=0.89"
Flow Length=177' Tc=7.1 min CN=70 Runoff=0.36 cfs 1,328 cf

Subcatchment E-2: Subcatchment E-2 Runoff Area=18,574 sf 55.11% Impervious Runoff Depth=0.84"
Flow Length=333' Tc=6.0 min CN=69 Runoff=0.36 cfs 1,304 cf

Subcatchment E-3: Subcatchment E-3 Runoff Area=9,674 sf 34.45% Impervious Runoff Depth=0.31"
Flow Length=127' Tc=6.8 min CN=56 Runoff=0.03 cfs 254 cf

Reach SP-1: Flow to existing drainge on Pinevale Avenue Inflow=0.36 cfs 1,328 cf
Outflow=0.36 cfs 1,328 cf

Reach SP-2: Flow to exisitng drainge on Main Street Inflow=0.72 cfs 2,632 cf
Outflow=0.72 cfs 2,632 cf

Reach SP-3: Flow off-site to wetlands Inflow=0.03 cfs 254 cf
Outflow=0.03 cfs 254 cf

Total Runoff Area = 46,095 sf Runoff Volume = 2,885 cf Average Runoff Depth = 0.75"
49.78% Pervious = 22,944 sf 50.22% Impervious = 23,151 sf

Summary for Subcatchment E-1: Subcatchment E1

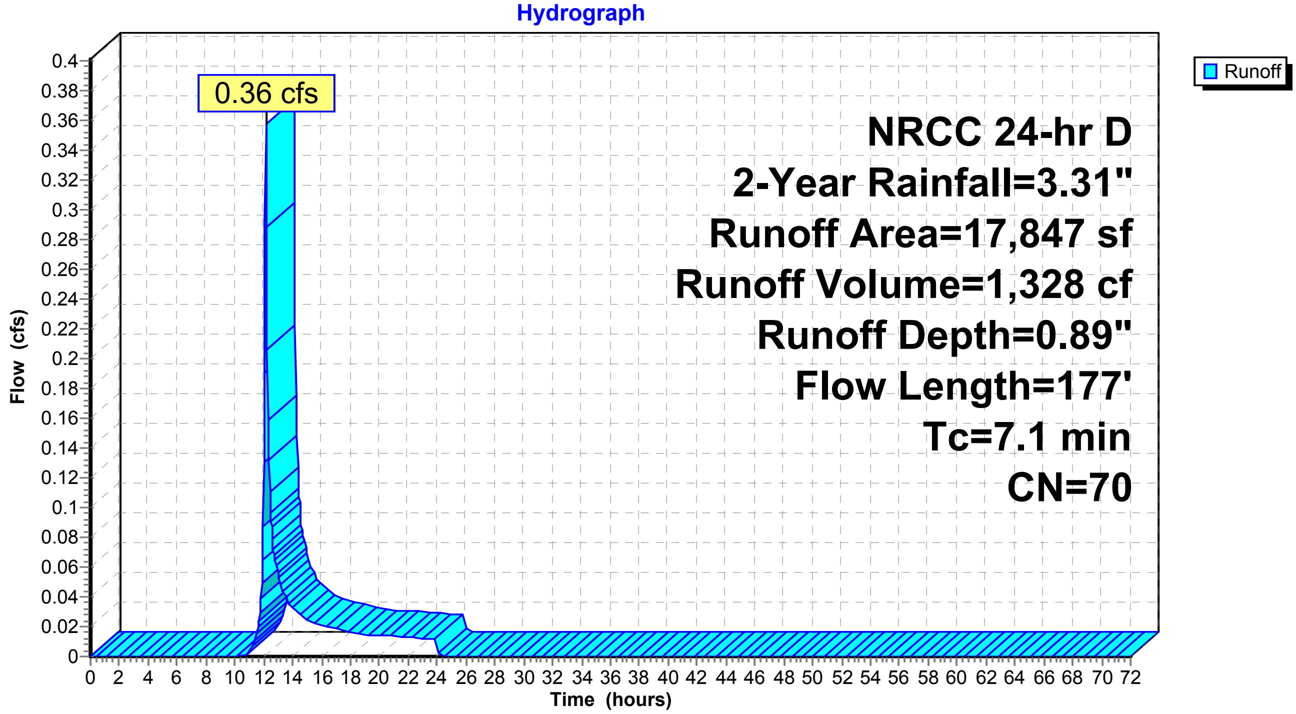
Runoff = 0.36 cfs @ 12.15 hrs, Volume= 1,328 cf, Depth= 0.89"
Routed to Reach SP-1 : Flow to existing drainge on Pinevale Avenue

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.31"

Area (sf)	CN	Description
1,595	98	Unconnected roofs, HSG A
7,987	98	Paved parking, HSG A
1,752	32	Woods/grass comb., Good, HSG A
6,513	39	>75% Grass cover, Good, HSG A
17,847	70	Weighted Average
8,265		46.31% Pervious Area
9,582		53.69% Impervious Area
1,595		16.65% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	38	0.0500	0.20		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.20"
0.2	23	0.0800	1.79		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.20"
3.6	53	0.0700	0.25		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.20"
0.2	63	0.0800	5.74		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
7.1	177	Total			

Subcatchment E-1: Subcatchment E1



Summary for Subcatchment E-2: Subcatchment E-2

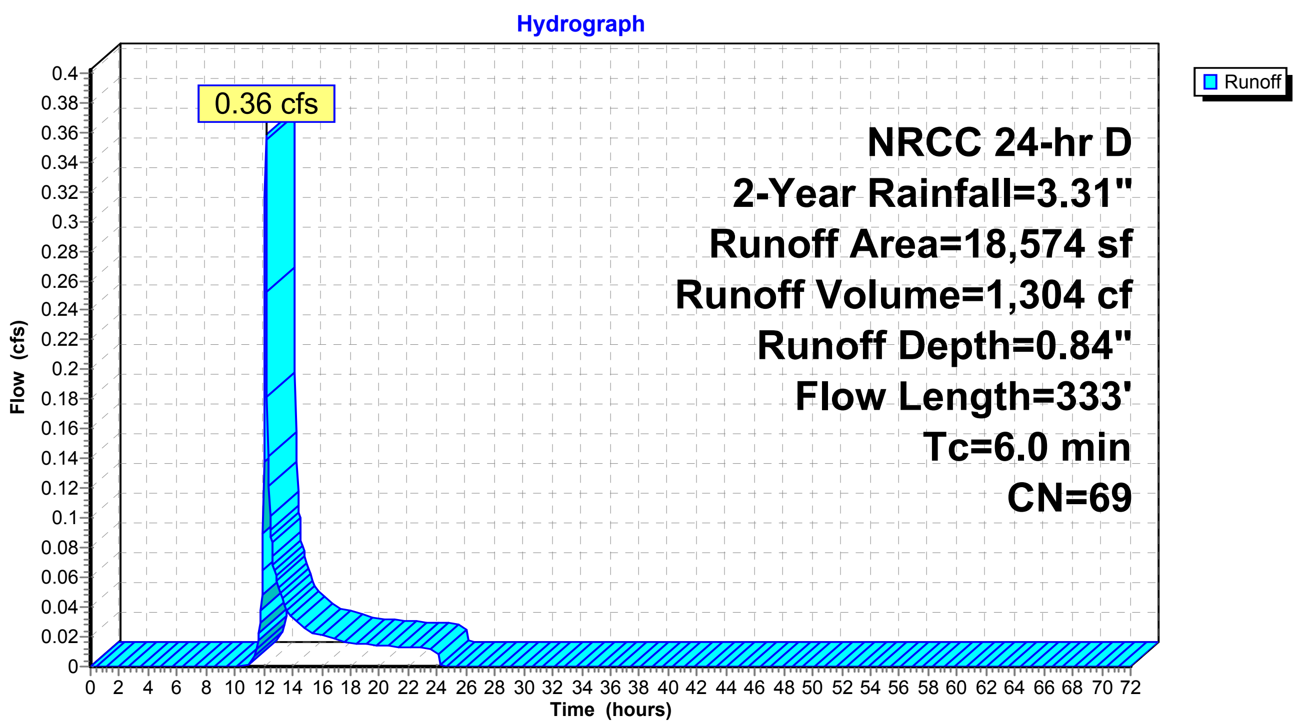
Runoff = 0.36 cfs @ 12.14 hrs, Volume= 1,304 cf, Depth= 0.84"
Routed to Reach SP-2 : Flow to exisitng drainge on Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.31"

Area (sf)	CN	Description
965	98	Roofs, HSG A
9,271	98	Paved parking, HSG A
7,853	32	Woods/grass comb., Good, HSG A
485	39	>75% Grass cover, Good, HSG A
18,574	69	Weighted Average
8,338		44.89% Pervious Area
10,236		55.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	12	0.0800	1.57		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.20"
0.3	36	0.0800	1.95		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.20"
2.3	285	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
2.7	333	Total, Increased to minimum Tc = 6.0 min			

Subcatchment E-2: Subcatchment E-2



Summary for Subcatchment E-3: Subcatchment E-3

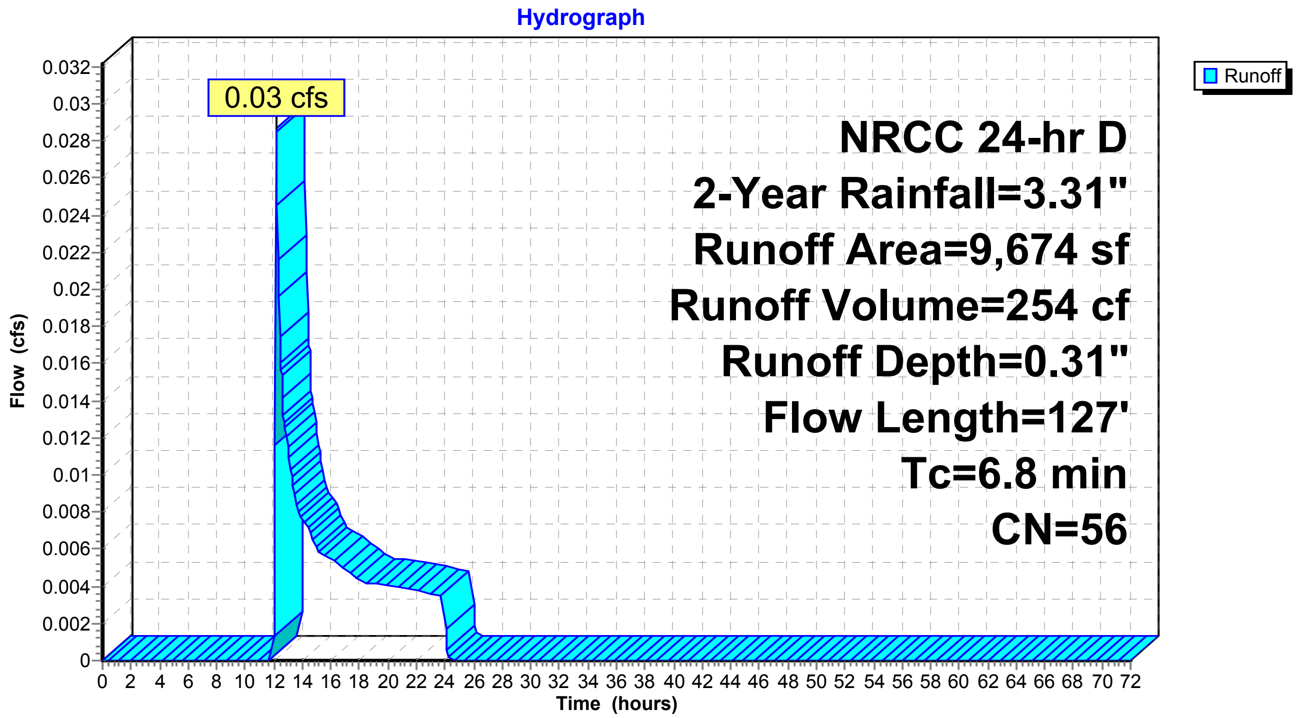
Runoff = 0.03 cfs @ 12.19 hrs, Volume= 254 cf, Depth= 0.31"
Routed to Reach SP-3 : Flow off-site to wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.31"

Area (sf)	CN	Description
886	98	Roofs, HSG A
2,447	98	Paved parking, HSG A
4,875	32	Woods/grass comb., Good, HSG A
1,466	39	>75% Grass cover, Good, HSG A
9,674	56	Weighted Average
6,341		65.55% Pervious Area
3,333		34.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	25	0.0400	0.12		**Sheet Flow, A-B**
					Grass: Dense n= 0.240 P2= 3.20"
0.2	20	0.0500	1.44		**Sheet Flow, B-C**
					Smooth surfaces n= 0.011 P2= 3.20"
2.3	23	0.0400	0.17		**Sheet Flow, C-D**
					Grass: Short n= 0.150 P2= 3.20"
0.2	15	0.0600	1.46		**Sheet Flow, D-E**
					Smooth surfaces n= 0.011 P2= 3.20"
0.5	44	0.0400	1.40		**Shallow Concentrated Flow, E-F**
					Short Grass Pasture Kv= 7.0 fps
6.8	127	Total			

Subcatchment E-3: Subcatchment E-3



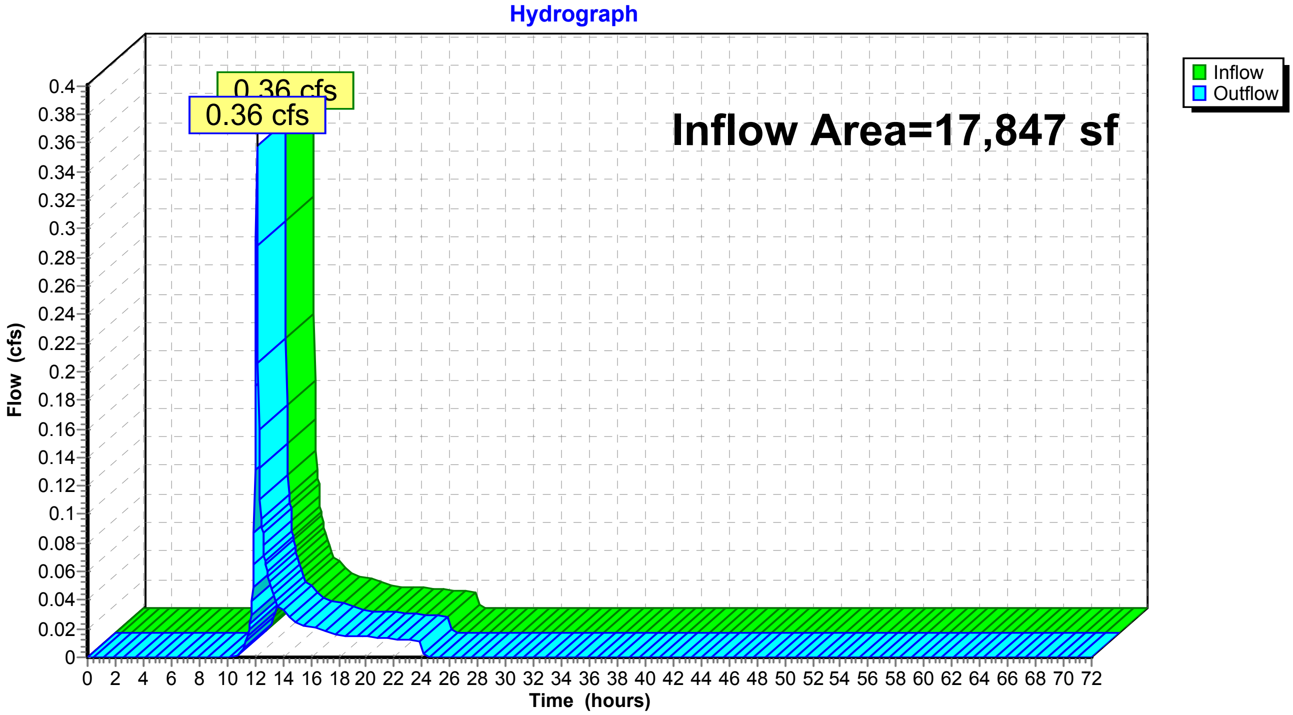
Summary for Reach SP-1: Flow to existing drainge on Pinevale Avenue

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

Inflow Area = 17,847 sf, 53.69% Impervious, Inflow Depth = 0.89" for 2-Year event
Inflow = 0.36 cfs @ 12.15 hrs, Volume= 1,328 cf
Outflow = 0.36 cfs @ 12.15 hrs, Volume= 1,328 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach SP-2 : Flow to exisitng drainge on Main Street

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach SP-1: Flow to existing drainge on Pinevale Avenue



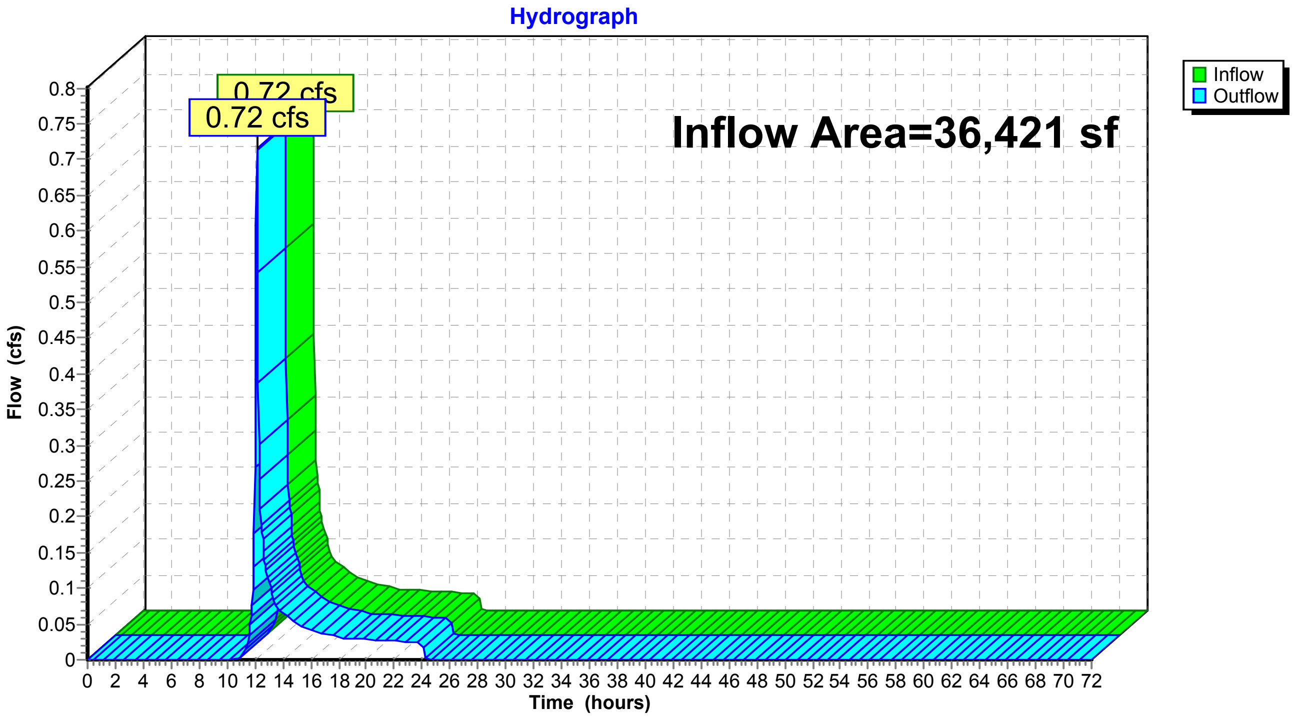
Summary for Reach SP-2: Flow to exisitng drainge on Main Street

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

Inflow Area = 36,421 sf, 54.41% Impervious, Inflow Depth = 0.87" for 2-Year event
Inflow = 0.72 cfs @ 12.14 hrs, Volume= 2,632 cf
Outflow = 0.72 cfs @ 12.14 hrs, Volume= 2,632 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach SP-2: Flow to exisitng drainge on Main Street



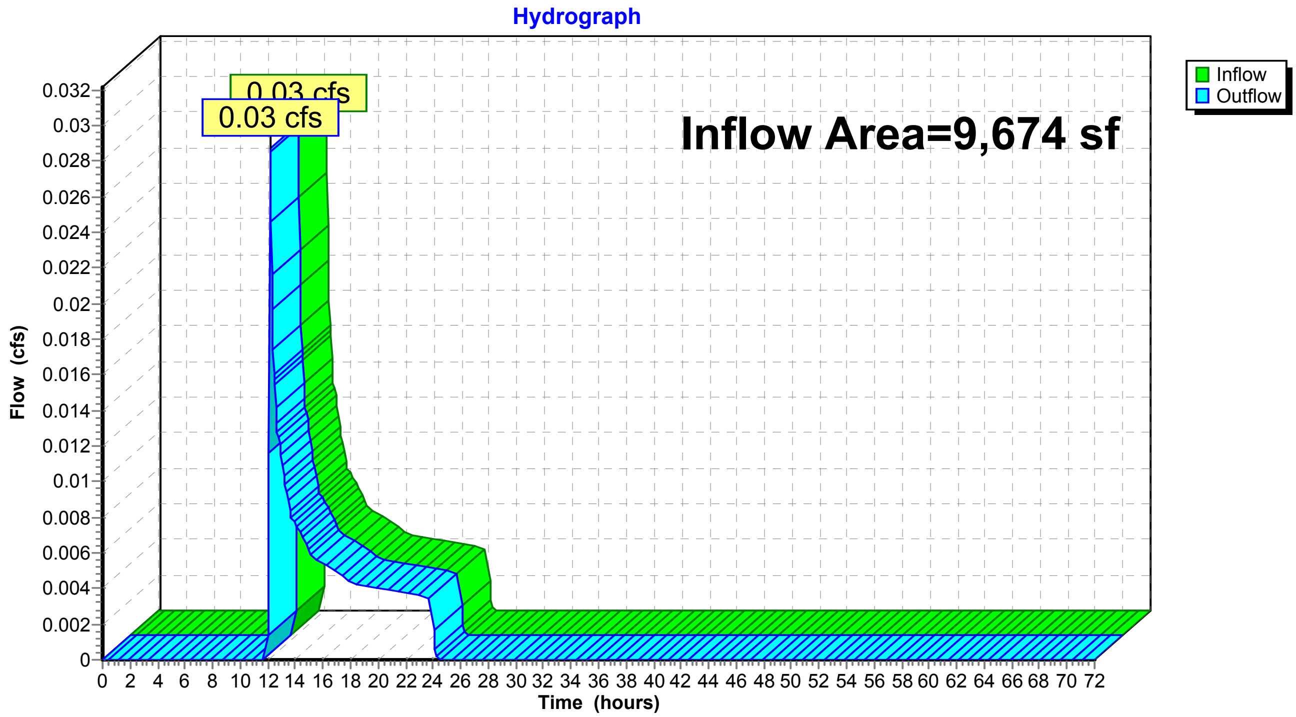
Summary for Reach SP-3: Flow off-site to wetlands

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

Inflow Area = 9,674 sf, 34.45% Impervious, Inflow Depth = 0.31" for 2-Year event
Inflow = 0.03 cfs @ 12.19 hrs, Volume= 254 cf
Outflow = 0.03 cfs @ 12.19 hrs, Volume= 254 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach SP-3: Flow off-site to wetlands



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

Subcatchment E-1: Subcatchment E1 Runoff Area=17,847 sf 53.69% Impervious Runoff Depth=2.19"
Flow Length=177' Tc=7.1 min CN=70 Runoff=0.94 cfs 3,262 cf

Subcatchment E-2: Subcatchment E-2 Runoff Area=18,574 sf 55.11% Impervious Runoff Depth=2.11"
Flow Length=333' Tc=6.0 min CN=69 Runoff=0.96 cfs 3,268 cf

Subcatchment E-3: Subcatchment E-3 Runoff Area=9,674 sf 34.45% Impervious Runoff Depth=1.15"
Flow Length=127' Tc=6.8 min CN=56 Runoff=0.24 cfs 928 cf

Reach SP-1: Flow to existing drainge on Pinevale Avenue Inflow=0.94 cfs 3,262 cf
Outflow=0.94 cfs 3,262 cf

Reach SP-2: Flow to exisitng drainge on Main Street Inflow=1.90 cfs 6,530 cf
Outflow=1.90 cfs 6,530 cf

Reach SP-3: Flow off-site to wetlands Inflow=0.24 cfs 928 cf
Outflow=0.24 cfs 928 cf

Total Runoff Area = 46,095 sf Runoff Volume = 7,458 cf Average Runoff Depth = 1.94"
49.78% Pervious = 22,944 sf 50.22% Impervious = 23,151 sf

Summary for Subcatchment E-1: Subcatchment E1

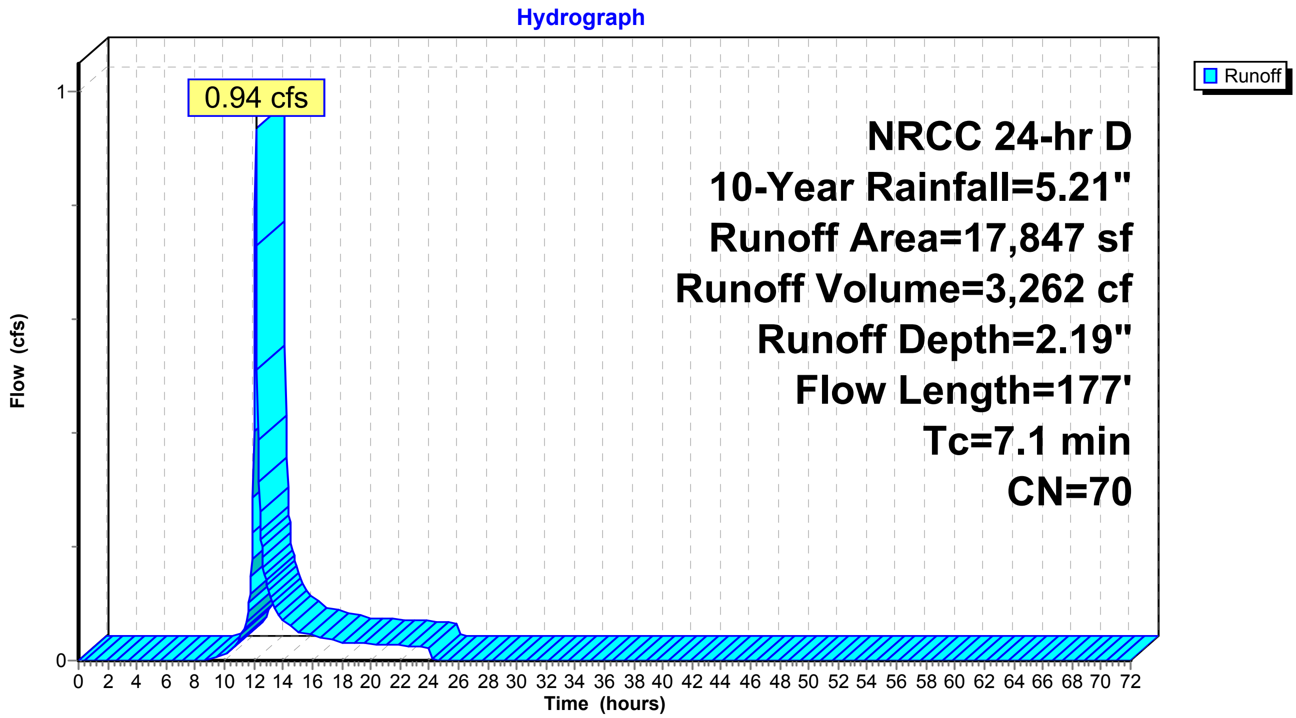
Runoff = 0.94 cfs @ 12.15 hrs, Volume= 3,262 cf, Depth= 2.19"
Routed to Reach SP-1 : Flow to existing drainge on Pinevale Avenue

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=5.21"

Area (sf)	CN	Description
1,595	98	Unconnected roofs, HSG A
7,987	98	Paved parking, HSG A
1,752	32	Woods/grass comb., Good, HSG A
6,513	39	>75% Grass cover, Good, HSG A
17,847	70	Weighted Average
8,265		46.31% Pervious Area
9,582		53.69% Impervious Area
1,595		16.65% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	38	0.0500	0.20		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.20"
0.2	23	0.0800	1.79		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.20"
3.6	53	0.0700	0.25		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.20"
0.2	63	0.0800	5.74		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
7.1	177	Total			

Subcatchment E-1: Subcatchment E1



Summary for Subcatchment E-2: Subcatchment E-2

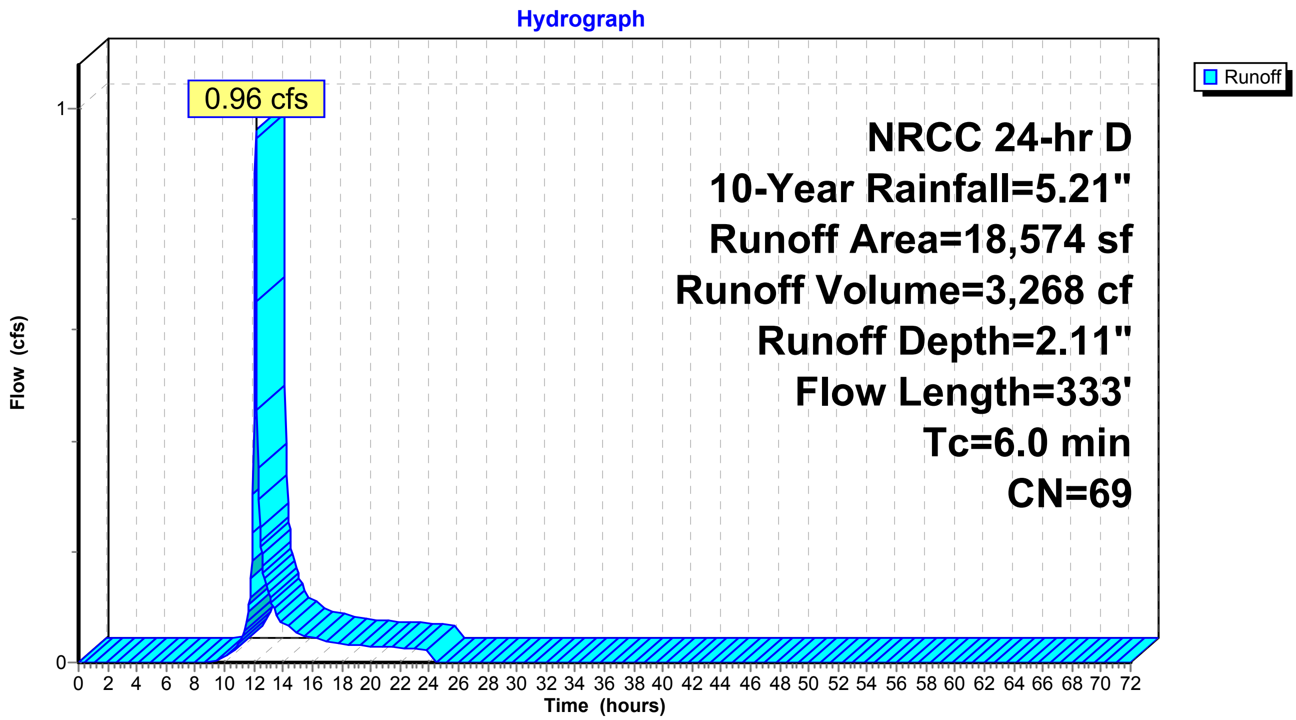
Runoff = 0.96 cfs @ 12.13 hrs, Volume= 3,268 cf, Depth= 2.11"
Routed to Reach SP-2 : Flow to exisitng drainge on Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=5.21"

Area (sf)	CN	Description
965	98	Roofs, HSG A
9,271	98	Paved parking, HSG A
7,853	32	Woods/grass comb., Good, HSG A
485	39	>75% Grass cover, Good, HSG A
18,574	69	Weighted Average
8,338		44.89% Pervious Area
10,236		55.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	12	0.0800	1.57		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.20"
0.3	36	0.0800	1.95		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.20"
2.3	285	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
2.7	333	Total, Increased to minimum Tc = 6.0 min			

Subcatchment E-2: Subcatchment E-2



Summary for Subcatchment E-3: Subcatchment E-3

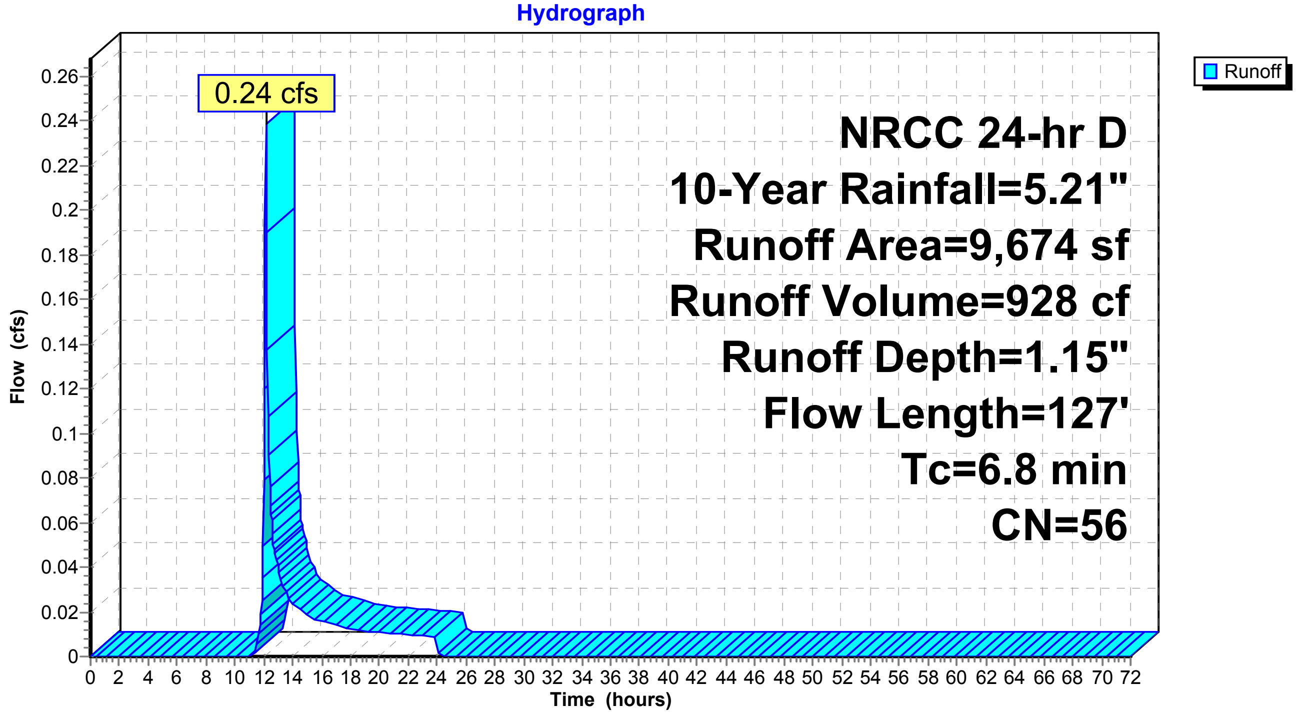
Runoff = 0.24 cfs @ 12.15 hrs, Volume= 928 cf, Depth= 1.15"
Routed to Reach SP-3 : Flow off-site to wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=5.21"

Area (sf)	CN	Description
886	98	Roofs, HSG A
2,447	98	Paved parking, HSG A
4,875	32	Woods/grass comb., Good, HSG A
1,466	39	>75% Grass cover, Good, HSG A
9,674	56	Weighted Average
6,341		65.55% Pervious Area
3,333		34.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	25	0.0400	0.12		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
0.2	20	0.0500	1.44		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.20"
2.3	23	0.0400	0.17		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.20"
0.2	15	0.0600	1.46		**Sheet Flow, D-E** Smooth surfaces n= 0.011 P2= 3.20"
0.5	44	0.0400	1.40		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
6.8	127	Total			

Subcatchment E-3: Subcatchment E-3



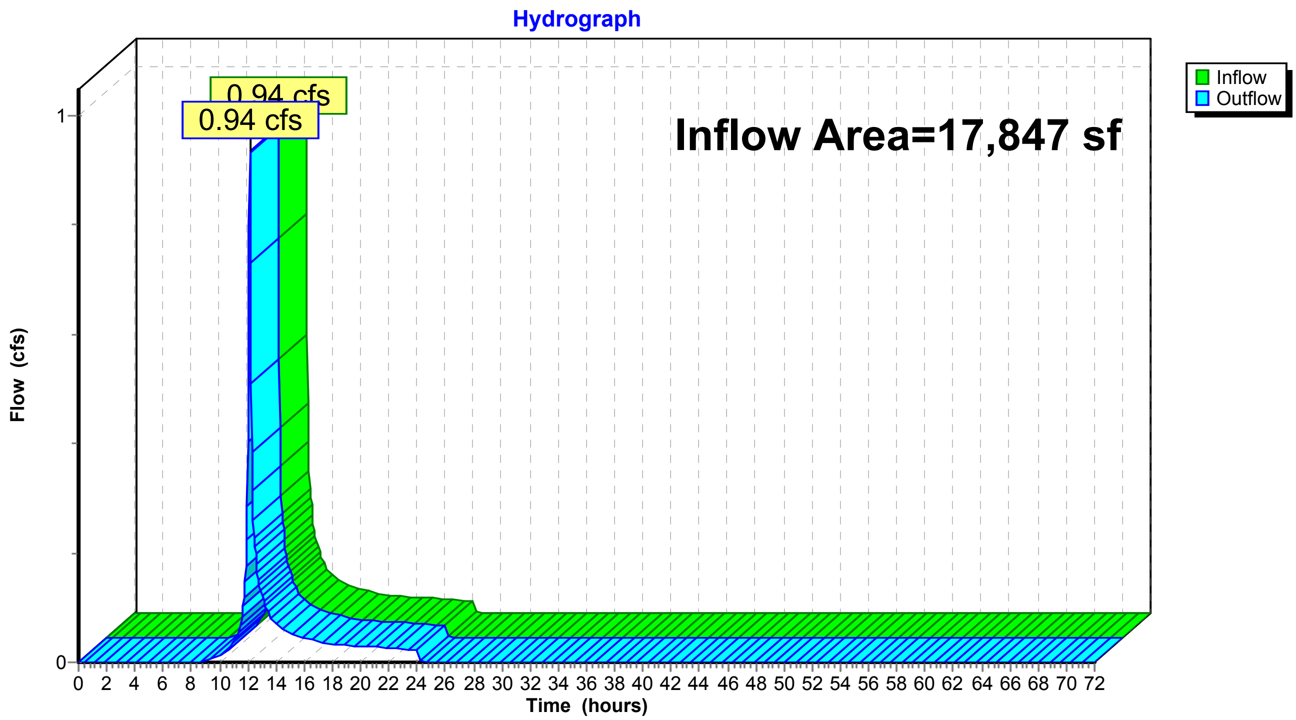
Summary for Reach SP-1: Flow to existing drainge on Pinevale Avenue

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

Inflow Area = 17,847 sf, 53.69% Impervious, Inflow Depth = 2.19" for 10-Year event
Inflow = 0.94 cfs @ 12.15 hrs, Volume= 3,262 cf
Outflow = 0.94 cfs @ 12.15 hrs, Volume= 3,262 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach SP-2 : Flow to exisitng drainge on Main Street

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach SP-1: Flow to existing drainge on Pinevale Avenue



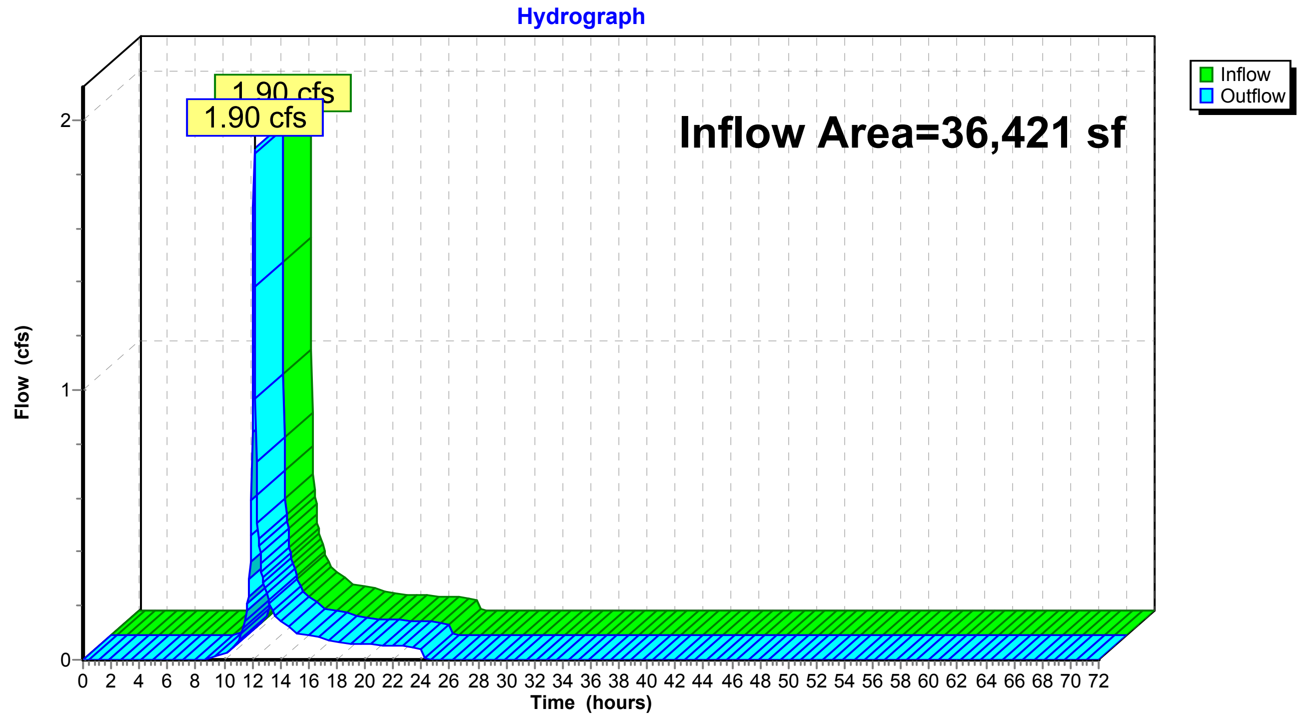
Summary for Reach SP-2: Flow to exisitng drainge on Main Street

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

Inflow Area =	36,421 sf, 54.41% Impervious,	Inflow Depth = 2.15"	for 10-Year event
Inflow =	1.90 cfs @ 12.14 hrs, Volume=	6,530 cf	
Outflow =	1.90 cfs @ 12.14 hrs, Volume=	6,530 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach SP-2: Flow to exisitng drainge on Main Street



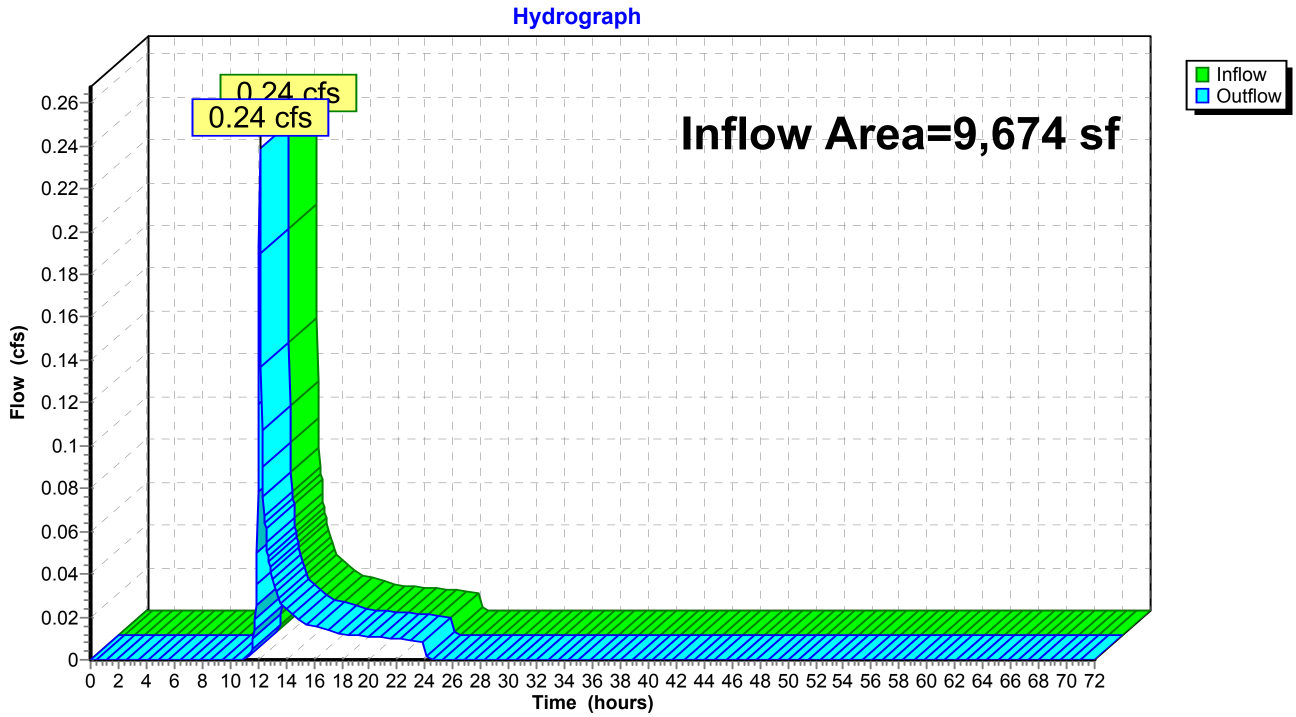
Summary for Reach SP-3: Flow off-site to wetlands

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

Inflow Area =	9,674 sf,	34.45% Impervious,	Inflow Depth = 1.15"	for 10-Year event
Inflow =	0.24 cfs @	12.15 hrs, Volume=	928 cf	
Outflow =	0.24 cfs @	12.15 hrs, Volume=	928 cf,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach SP-3: Flow off-site to wetlands



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

Subcatchment E-1: Subcatchment E1 Runoff Area=17,847 sf 53.69% Impervious Runoff Depth=3.13"
Flow Length=177' Tc=7.1 min CN=70 Runoff=1.34 cfs 4,649 cf

Subcatchment E-2: Subcatchment E-2 Runoff Area=18,574 sf 55.11% Impervious Runoff Depth=3.03"
Flow Length=333' Tc=6.0 min CN=69 Runoff=1.39 cfs 4,687 cf

Subcatchment E-3: Subcatchment E-3 Runoff Area=9,674 sf 34.45% Impervious Runoff Depth=1.84"
Flow Length=127' Tc=6.8 min CN=56 Runoff=0.41 cfs 1,482 cf

Reach SP-1: Flow to existing drainge on Pinevale Avenue Inflow=1.34 cfs 4,649 cf
Outflow=1.34 cfs 4,649 cf

Reach SP-2: Flow to exisitng drainge on Main Street Inflow=2.73 cfs 9,336 cf
Outflow=2.73 cfs 9,336 cf

Reach SP-3: Flow off-site to wetlands Inflow=0.41 cfs 1,482 cf
Outflow=0.41 cfs 1,482 cf

Total Runoff Area = 46,095 sf Runoff Volume = 10,818 cf Average Runoff Depth = 2.82"
49.78% Pervious = 22,944 sf 50.22% Impervious = 23,151 sf

Summary for Subcatchment E-1: Subcatchment E1

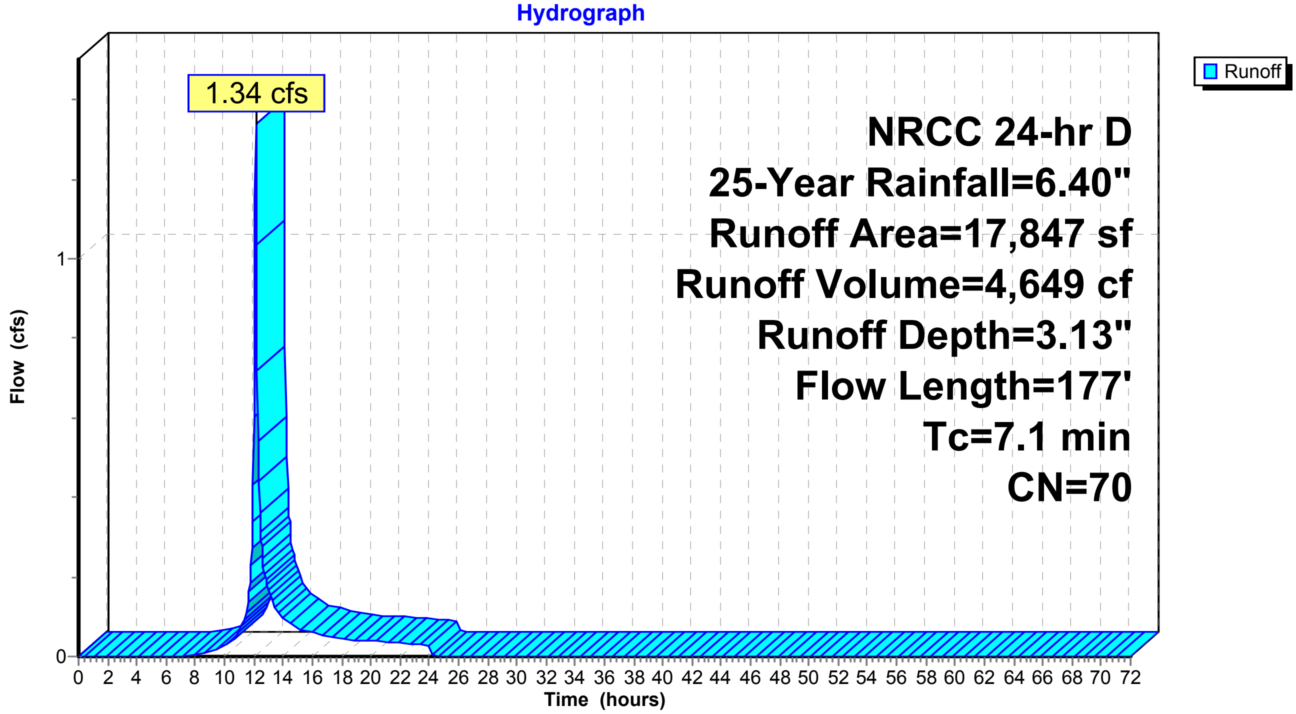
Runoff = 1.34 cfs @ 12.14 hrs, Volume= 4,649 cf, Depth= 3.13"
Routed to Reach SP-1 : Flow to existing drainge on Pinevale Avenue

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=6.40"

Area (sf)	CN	Description
1,595	98	Unconnected roofs, HSG A
7,987	98	Paved parking, HSG A
1,752	32	Woods/grass comb., Good, HSG A
6,513	39	>75% Grass cover, Good, HSG A
17,847	70	Weighted Average
8,265		46.31% Pervious Area
9,582		53.69% Impervious Area
1,595		16.65% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	38	0.0500	0.20		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.20"
0.2	23	0.0800	1.79		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.20"
3.6	53	0.0700	0.25		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.20"
0.2	63	0.0800	5.74		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
7.1	177	Total			

Subcatchment E-1: Subcatchment E1



Summary for Subcatchment E-2: Subcatchment E-2

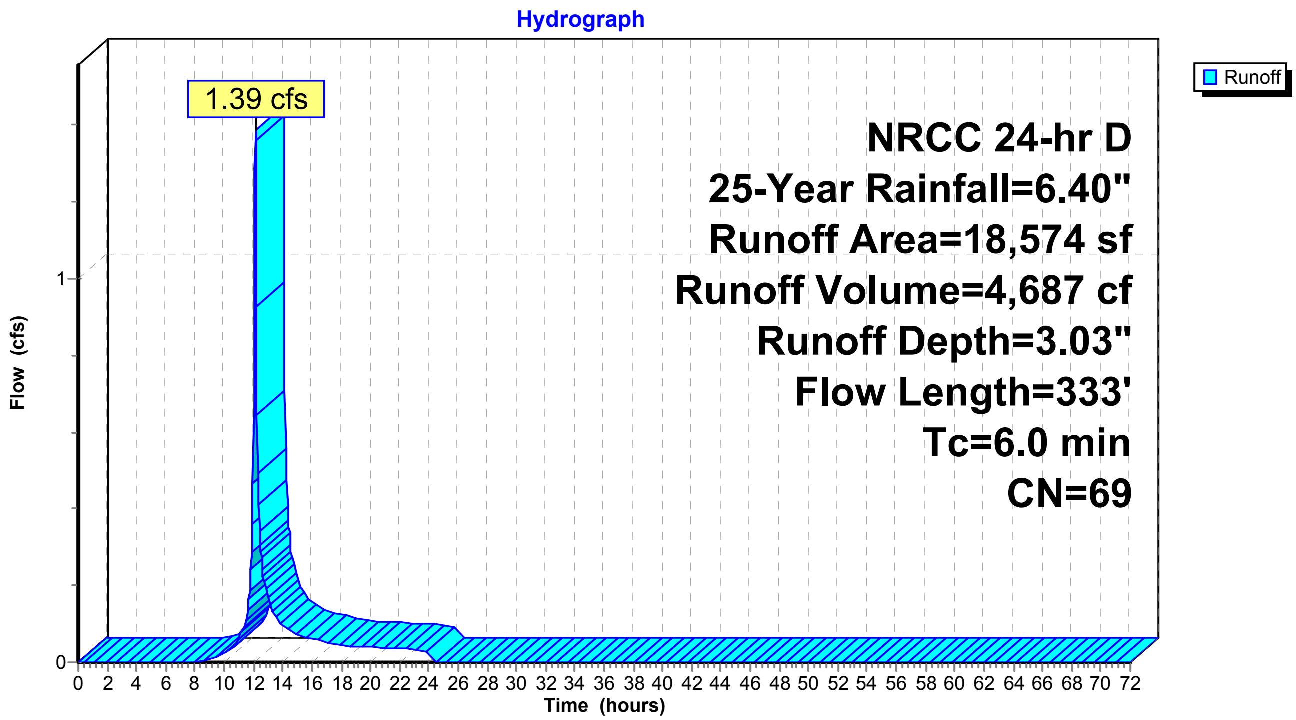
Runoff = 1.39 cfs @ 12.13 hrs, Volume= 4,687 cf, Depth= 3.03"
Routed to Reach SP-2 : Flow to exisitng drainge on Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=6.40"

Area (sf)	CN	Description
965	98	Roofs, HSG A
9,271	98	Paved parking, HSG A
7,853	32	Woods/grass comb., Good, HSG A
485	39	>75% Grass cover, Good, HSG A
18,574	69	Weighted Average
8,338		44.89% Pervious Area
10,236		55.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	12	0.0800	1.57		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.20"
0.3	36	0.0800	1.95		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.20"
2.3	285	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
2.7	333	Total, Increased to minimum Tc = 6.0 min			

Subcatchment E-2: Subcatchment E-2



Summary for Subcatchment E-3: Subcatchment E-3

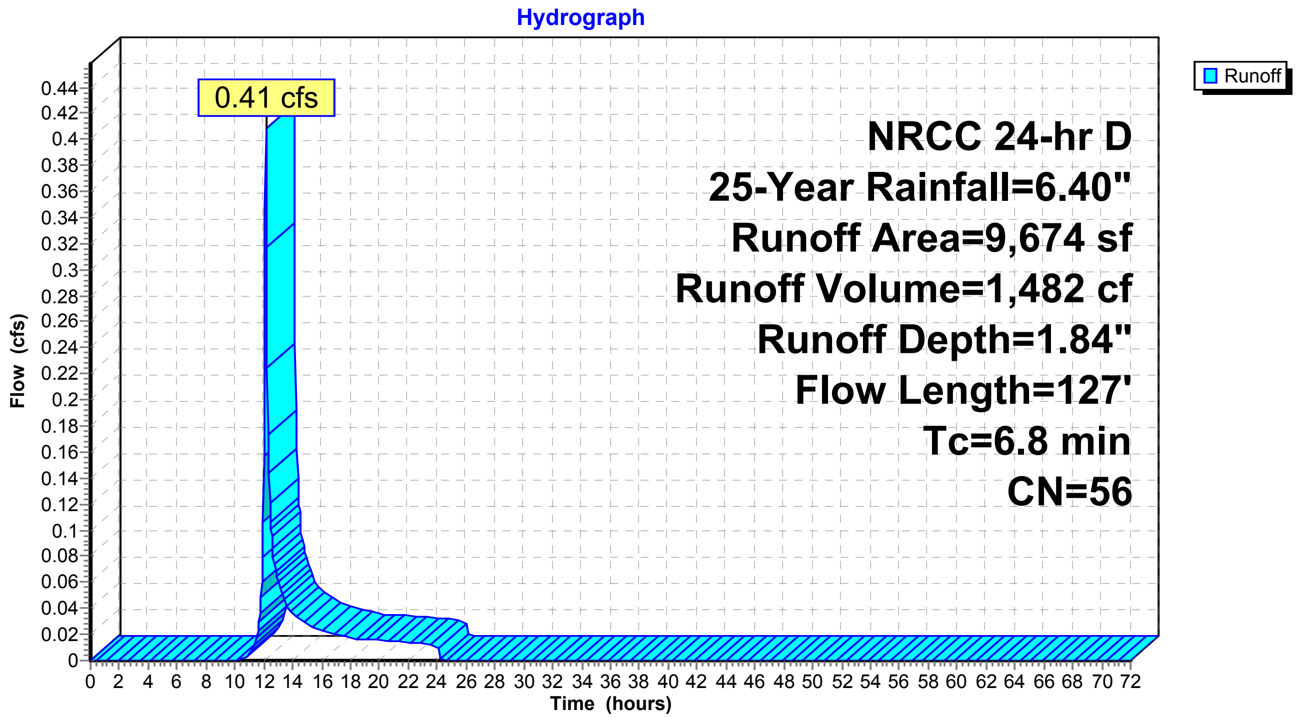
Runoff = 0.41 cfs @ 12.15 hrs, Volume= 1,482 cf, Depth= 1.84"
Routed to Reach SP-3 : Flow off-site to wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=6.40"

Area (sf)	CN	Description
886	98	Roofs, HSG A
2,447	98	Paved parking, HSG A
4,875	32	Woods/grass comb., Good, HSG A
1,466	39	>75% Grass cover, Good, HSG A
9,674	56	Weighted Average
6,341		65.55% Pervious Area
3,333		34.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	25	0.0400	0.12		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
0.2	20	0.0500	1.44		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.20"
2.3	23	0.0400	0.17		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.20"
0.2	15	0.0600	1.46		**Sheet Flow, D-E** Smooth surfaces n= 0.011 P2= 3.20"
0.5	44	0.0400	1.40		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
6.8	127	Total			

Subcatchment E-3: Subcatchment E-3



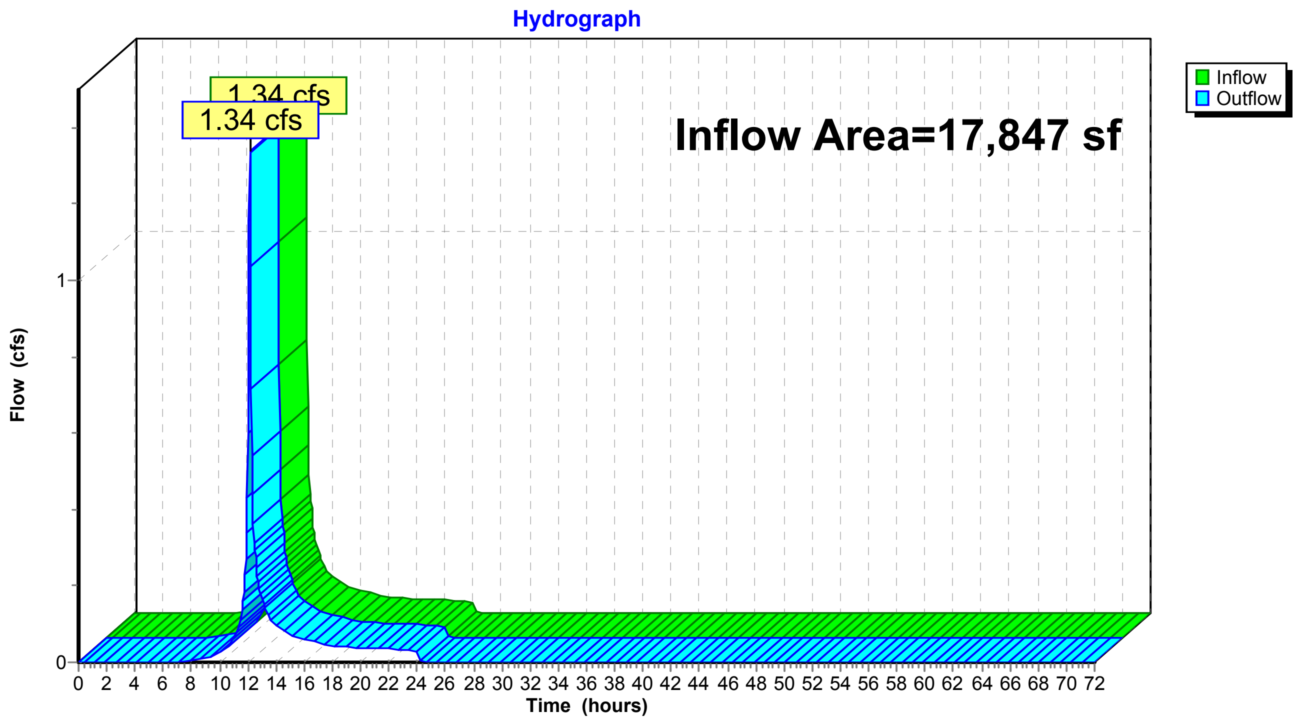
Summary for Reach SP-1: Flow to existing drainge on Pinevale Avenue

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

Inflow Area = 17,847 sf, 53.69% Impervious, Inflow Depth = 3.13" for 25-Year event
Inflow = 1.34 cfs @ 12.14 hrs, Volume= 4,649 cf
Outflow = 1.34 cfs @ 12.14 hrs, Volume= 4,649 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach SP-2 : Flow to exisitng drainge on Main Street

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach SP-1: Flow to existing drainge on Pinevale Avenue



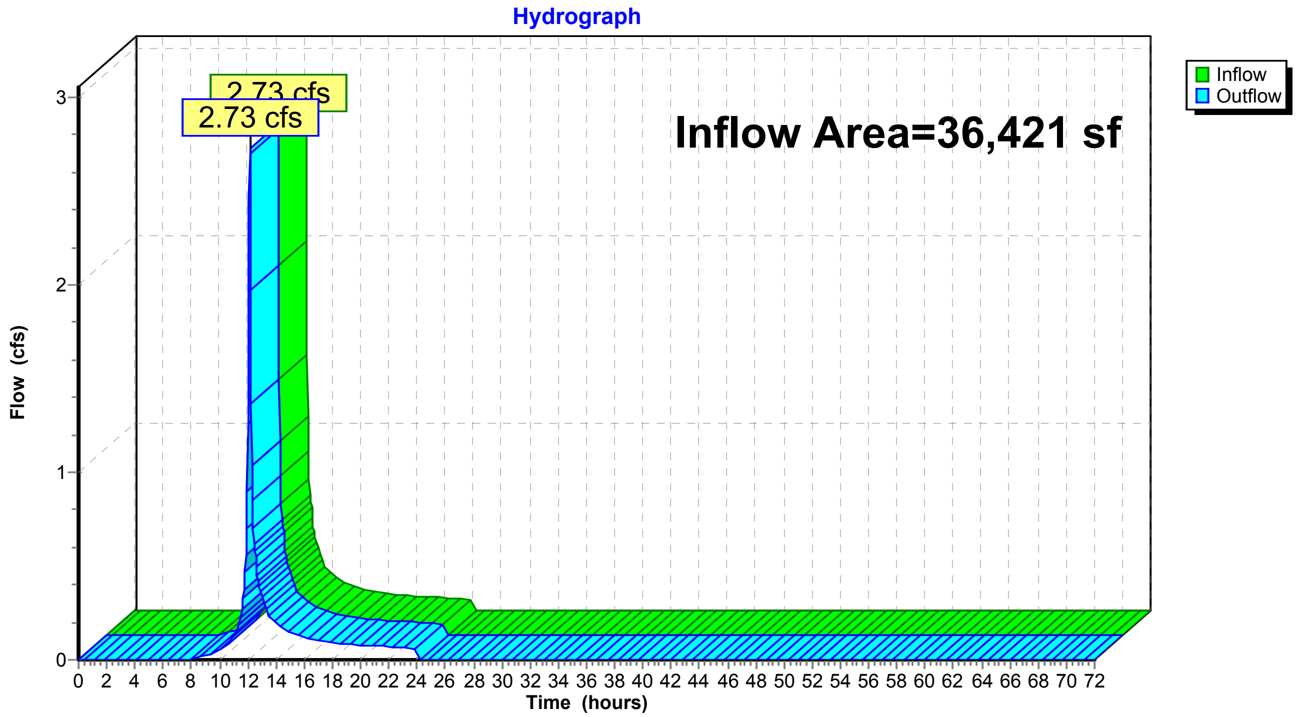
Summary for Reach SP-2: Flow to exisitng drainge on Main Street

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

Inflow Area =	36,421 sf, 54.41% Impervious,	Inflow Depth = 3.08"	for 25-Year event
Inflow =	2.73 cfs @ 12.14 hrs, Volume=	9,336 cf	
Outflow =	2.73 cfs @ 12.14 hrs, Volume=	9,336 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach SP-2: Flow to exisitng drainge on Main Street



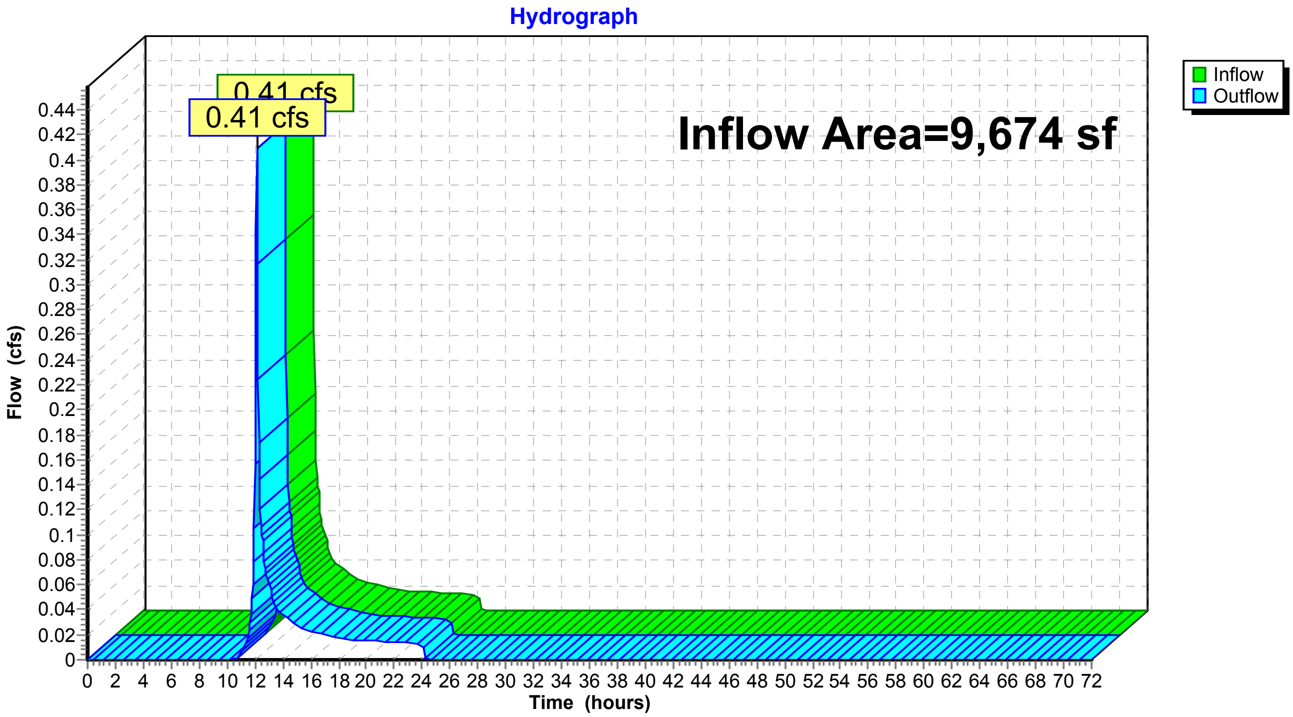
Summary for Reach SP-3: Flow off-site to wetlands

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

Inflow Area = 9,674 sf, 34.45% Impervious, Inflow Depth = 1.84" for 25-Year event
Inflow = 0.41 cfs @ 12.15 hrs, Volume= 1,482 cf
Outflow = 0.41 cfs @ 12.15 hrs, Volume= 1,482 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach SP-3: Flow off-site to wetlands



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

Subcatchment E-1: Subcatchment E1 Runoff Area=17,847 sf 53.69% Impervious Runoff Depth=4.66"
Flow Length=177' Tc=7.1 min CN=70 Runoff=1.99 cfs 6,934 cf

Subcatchment E-2: Subcatchment E-2 Runoff Area=18,574 sf 55.11% Impervious Runoff Depth=4.55"
Flow Length=333' Tc=6.0 min CN=69 Runoff=2.08 cfs 7,036 cf

Subcatchment E-3: Subcatchment E-3 Runoff Area=9,674 sf 34.45% Impervious Runoff Depth=3.05"
Flow Length=127' Tc=6.8 min CN=56 Runoff=0.71 cfs 2,462 cf

Reach SP-1: Flow to existing drainge on Pinevale Avenue Inflow=1.99 cfs 6,934 cf
Outflow=1.99 cfs 6,934 cf

Reach SP-2: Flow to exisitng drainge on Main Street Inflow=4.07 cfs 13,971 cf
Outflow=4.07 cfs 13,971 cf

Reach SP-3: Flow off-site to wetlands Inflow=0.71 cfs 2,462 cf
Outflow=0.71 cfs 2,462 cf

Total Runoff Area = 46,095 sf Runoff Volume = 16,433 cf Average Runoff Depth = 4.28"
49.78% Pervious = 22,944 sf 50.22% Impervious = 23,151 sf

Summary for Subcatchment E-1: Subcatchment E1

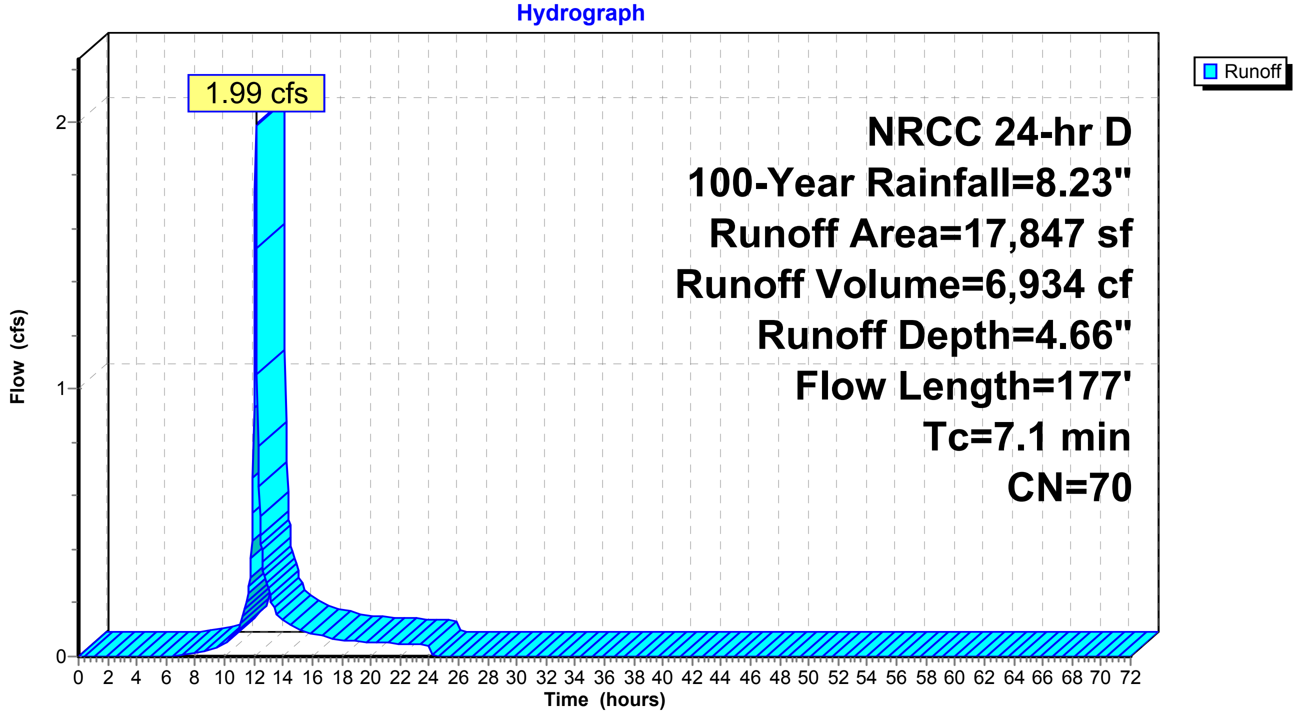
Runoff = 1.99 cfs @ 12.14 hrs, Volume= 6,934 cf, Depth= 4.66"
Routed to Reach SP-1 : Flow to existing drainge on Pinevale Avenue

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.23"

Area (sf)	CN	Description
1,595	98	Unconnected roofs, HSG A
7,987	98	Paved parking, HSG A
1,752	32	Woods/grass comb., Good, HSG A
6,513	39	>75% Grass cover, Good, HSG A
17,847	70	Weighted Average
8,265		46.31% Pervious Area
9,582		53.69% Impervious Area
1,595		16.65% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	38	0.0500	0.20		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.20"
0.2	23	0.0800	1.79		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.20"
3.6	53	0.0700	0.25		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.20"
0.2	63	0.0800	5.74		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
7.1	177	Total			

Subcatchment E-1: Subcatchment E1



Summary for Subcatchment E-2: Subcatchment E-2

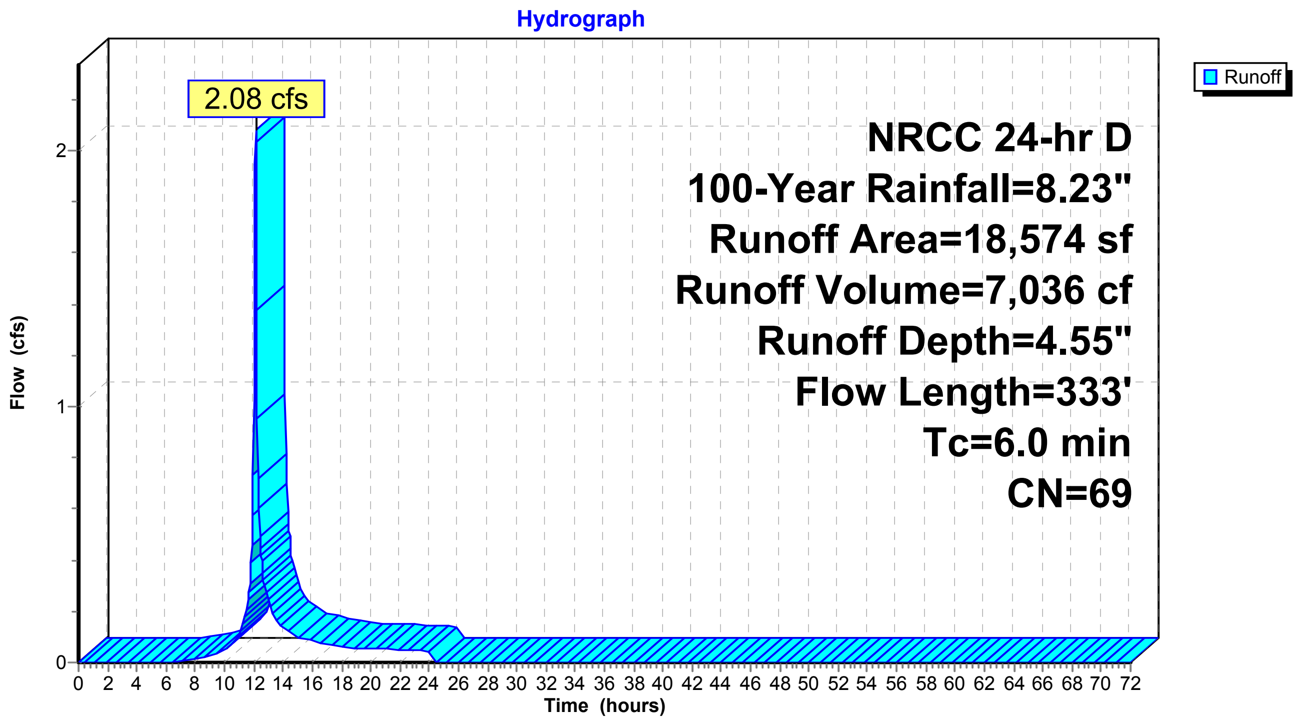
Runoff = 2.08 cfs @ 12.13 hrs, Volume= 7,036 cf, Depth= 4.55"
Routed to Reach SP-2 : Flow to exisitng drainge on Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.23"

Area (sf)	CN	Description
965	98	Roofs, HSG A
9,271	98	Paved parking, HSG A
7,853	32	Woods/grass comb., Good, HSG A
485	39	>75% Grass cover, Good, HSG A
18,574	69	Weighted Average
8,338		44.89% Pervious Area
10,236		55.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	12	0.0800	1.57		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.20"
0.3	36	0.0800	1.95		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.20"
2.3	285	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
2.7	333	Total, Increased to minimum Tc = 6.0 min			

Subcatchment E-2: Subcatchment E-2



Summary for Subcatchment E-3: Subcatchment E-3

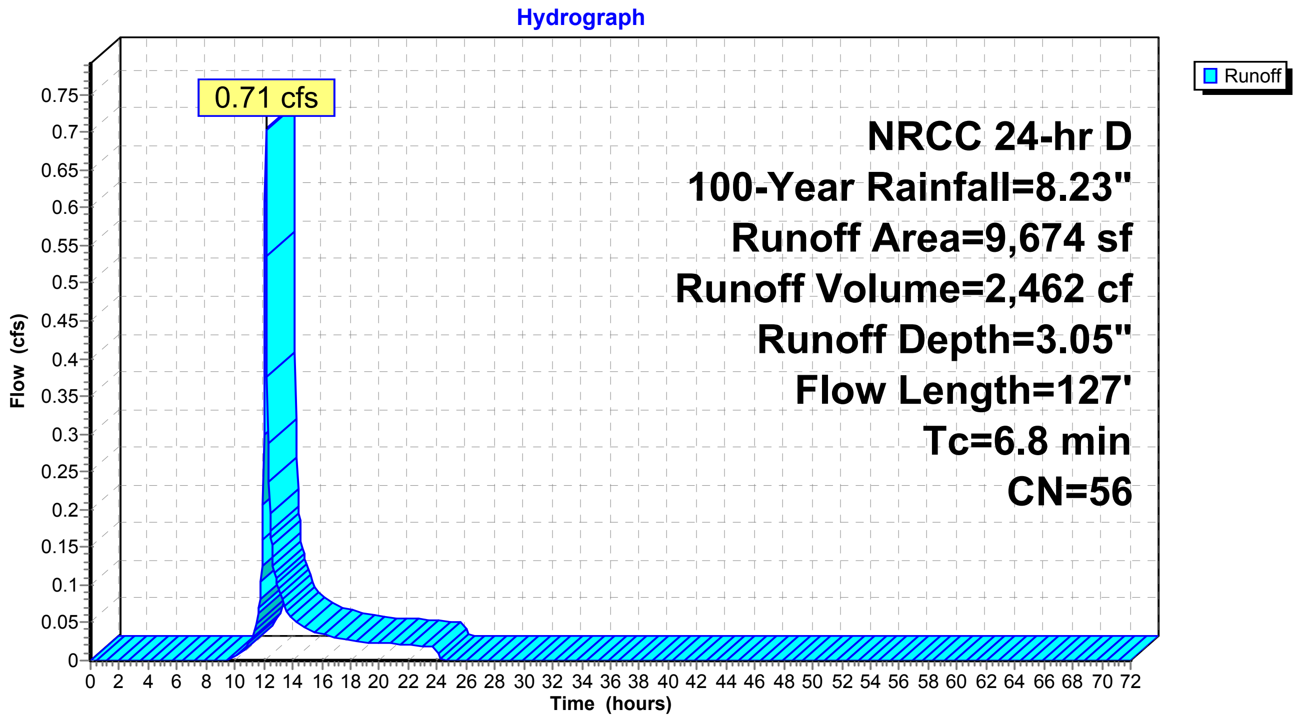
Runoff = 0.71 cfs @ 12.14 hrs, Volume= 2,462 cf, Depth= 3.05"
Routed to Reach SP-3 : Flow off-site to wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.23"

Area (sf)	CN	Description
886	98	Roofs, HSG A
2,447	98	Paved parking, HSG A
4,875	32	Woods/grass comb., Good, HSG A
1,466	39	>75% Grass cover, Good, HSG A
9,674	56	Weighted Average
6,341		65.55% Pervious Area
3,333		34.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	25	0.0400	0.12		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.20"
0.2	20	0.0500	1.44		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.20"
2.3	23	0.0400	0.17		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.20"
0.2	15	0.0600	1.46		**Sheet Flow, D-E** Smooth surfaces n= 0.011 P2= 3.20"
0.5	44	0.0400	1.40		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
6.8	127	Total			

Subcatchment E-3: Subcatchment E-3



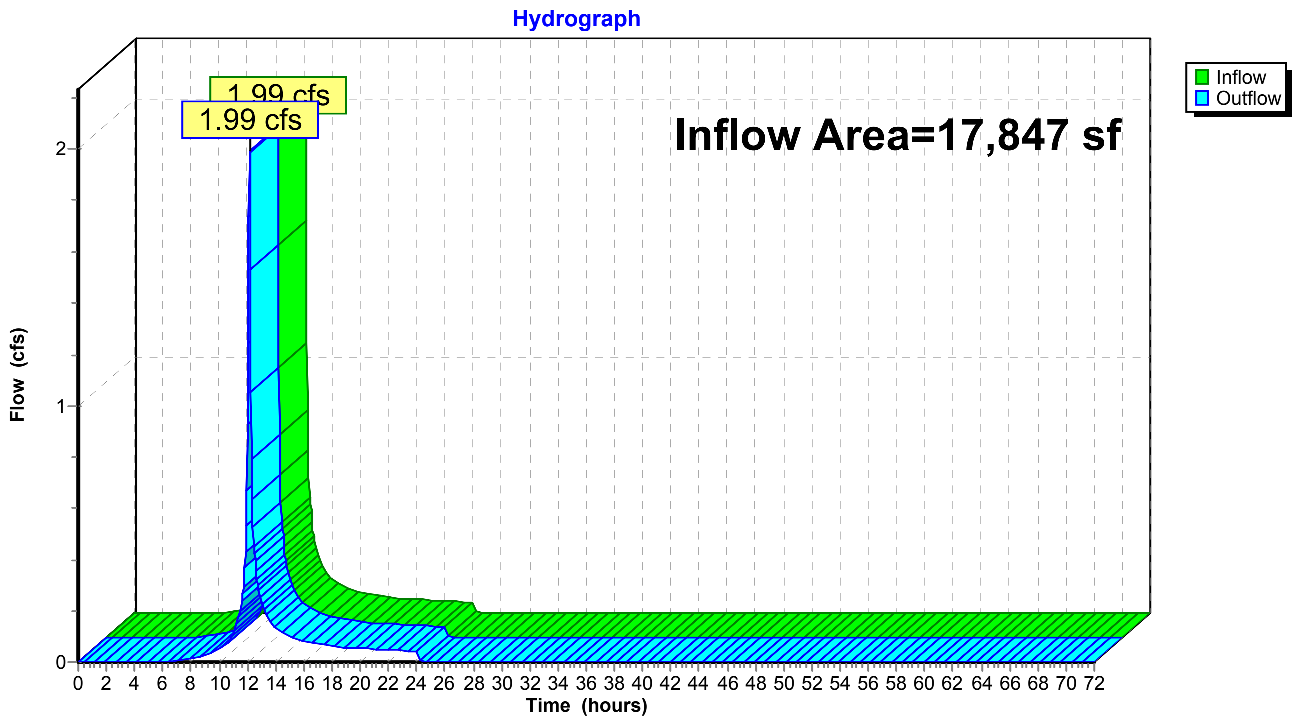
Summary for Reach SP-1: Flow to existing drainge on Pinevale Avenue

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

Inflow Area = 17,847 sf, 53.69% Impervious, Inflow Depth = 4.66" for 100-Year event
Inflow = 1.99 cfs @ 12.14 hrs, Volume= 6,934 cf
Outflow = 1.99 cfs @ 12.14 hrs, Volume= 6,934 cf, Atten= 0%, Lag= 0.0 min
Routed to Reach SP-2 : Flow to exisitng drainge on Main Street

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach SP-1: Flow to existing drainge on Pinevale Avenue



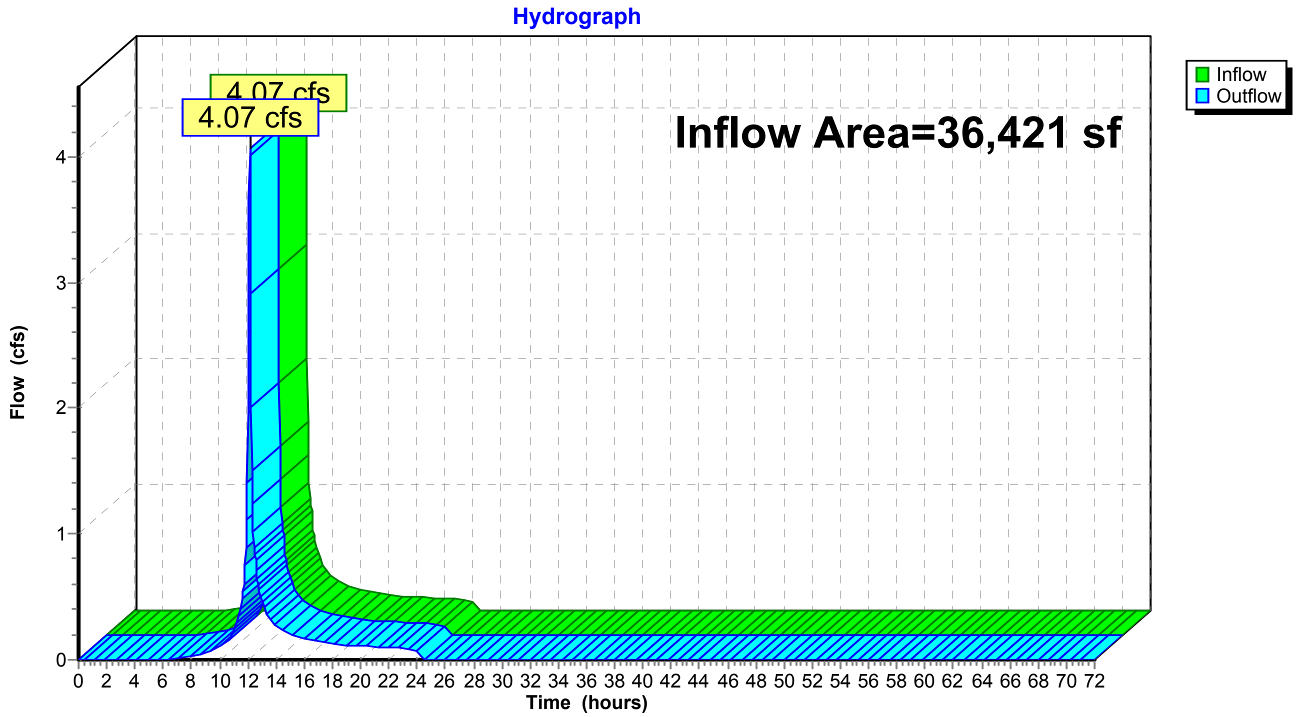
Summary for Reach SP-2: Flow to exisitng drainge on Main Street

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

Inflow Area =	36,421 sf, 54.41% Impervious,	Inflow Depth = 4.60"	for 100-Year event
Inflow =	4.07 cfs @ 12.14 hrs, Volume=	13,971 cf	
Outflow =	4.07 cfs @ 12.14 hrs, Volume=	13,971 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach SP-2: Flow to exisitng drainge on Main Street



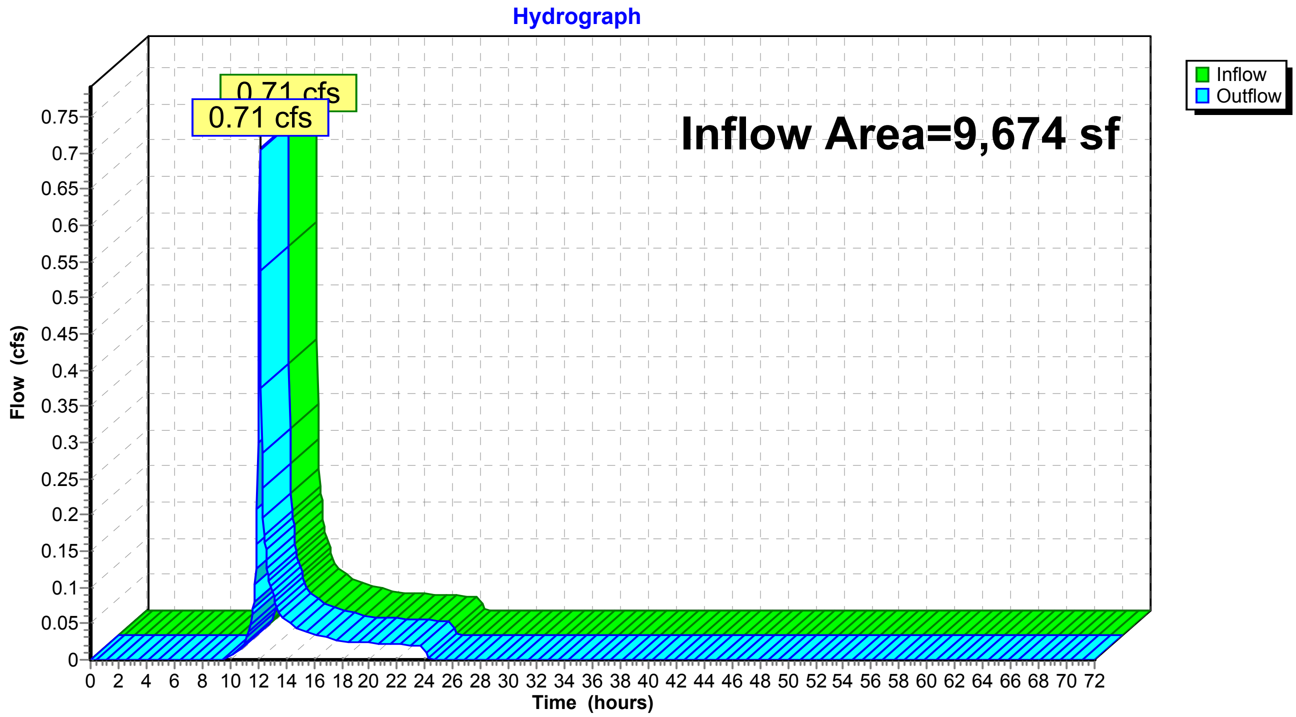
Summary for Reach SP-3: Flow off-site to wetlands

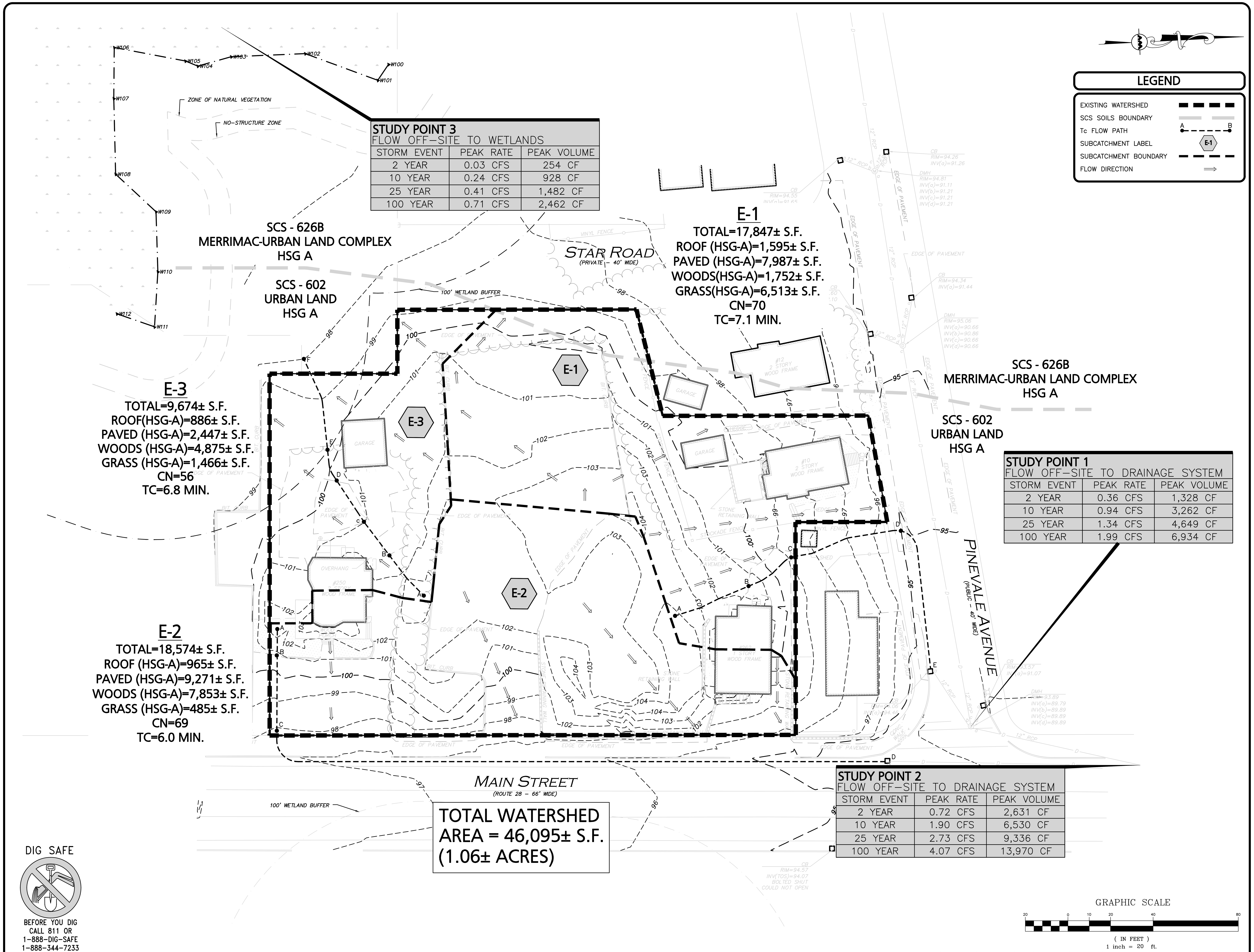
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	9,674 sf,	34.45% Impervious,	Inflow Depth = 3.05"	for 100-Year event
Inflow =	0.71 cfs @	12.14 hrs, Volume=	2,462 cf	
Outflow =	0.71 cfs @	12.14 hrs, Volume=	2,462 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach SP-3: Flow off-site to wetlands





STUDY POINT 3
FLOW OFF-SITE TO WETLANDS

STORM EVENT	PEAK RATE	PEAK VOLUME
2 YEAR	0.03 CFS	254 CF
10 YEAR	0.24 CFS	928 CF
25 YEAR	0.41 CFS	1,482 CF
100 YEAR	0.71 CFS	2,462 CF

STUDY POINT 1
FLOW OFF-SITE TO DRAINAGE SYSTEM

STORM EVENT	PEAK RATE	PEAK VOLUME
2 YEAR	0.36 CFS	1,328 CF
10 YEAR	0.94 CFS	3,262 CF
25 YEAR	1.34 CFS	4,649 CF
100 YEAR	1.99 CFS	6,934 CF

STUDY POINT 2
FLOW OFF-SITE TO DRAINAGE SYSTEM

STORM EVENT	PEAK RATE	PEAK VOLUME
2 YEAR	0.72 CFS	2,631 CF
10 YEAR	1.90 CFS	6,530 CF
25 YEAR	2.73 CFS	9,336 CF
100 YEAR	4.07 CFS	13,970 CF

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PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
B	3/25/2024	REVISED PER TOWN COMMENTS
A	2/29/2024	REVISED PER TOWN COMMENTS

APPLICANT\OWNER:
BLVD READING, LLC
c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:
STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	1" = 20'	DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
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environmental consulting ◆ landscape architecture
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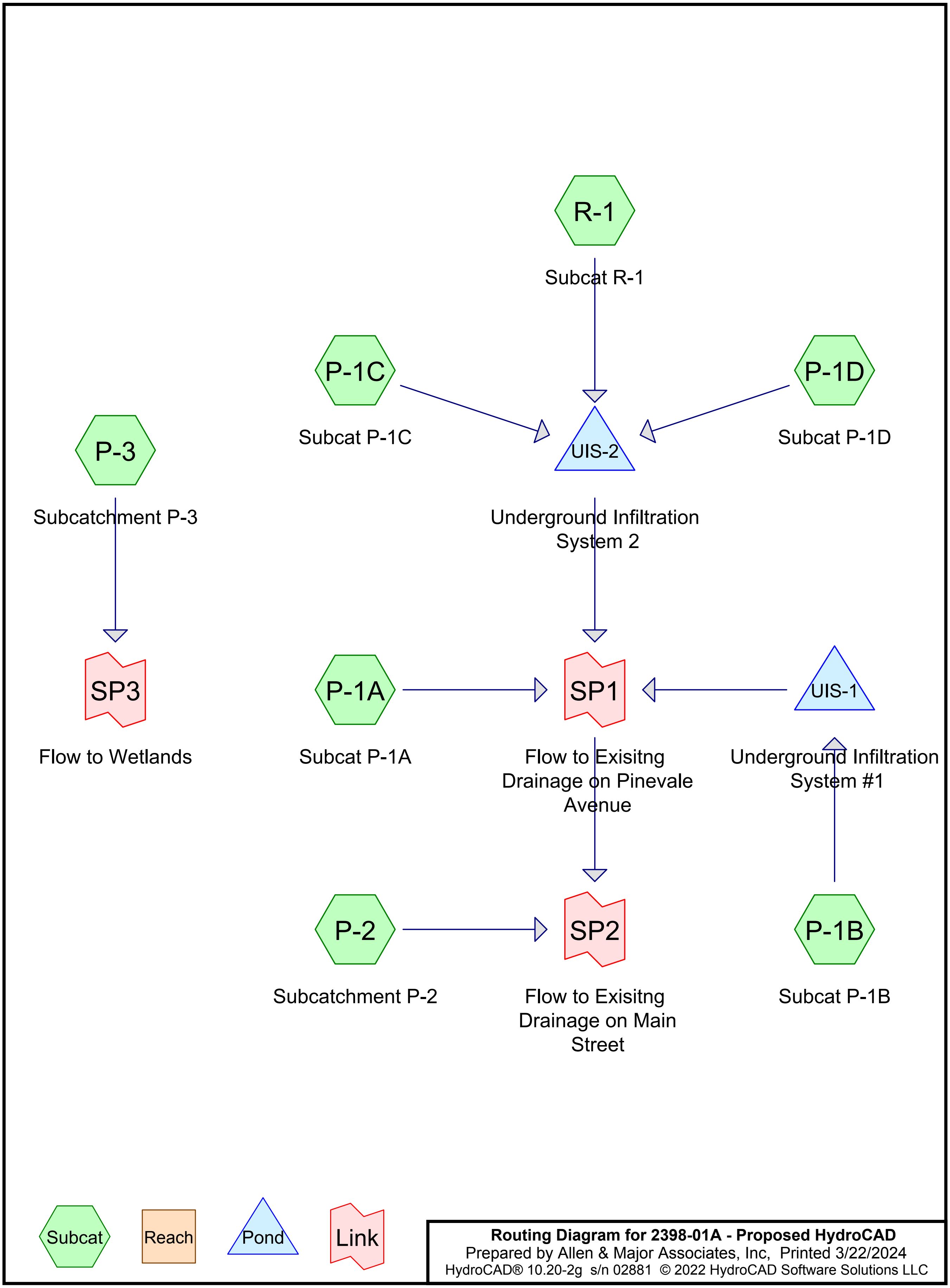
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE: EXISTING WATERSHED PLAN
SHEET No. EWS-1

SECTION 5.0 -
PROPOSED DRAINAGE ANALYSIS



Routing Diagram for 2398-01A - Proposed HydroCAD
Prepared by Allen & Major Associates, Inc, Printed 3/22/2024
HydroCAD® 10.20-2g s/n 02881 © 2022 HydroCAD Software Solutions LLC

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 4245 MA Reading Middlesex County South
Rainfall events imported from "NRCS-Rain.txt" for 4245 MA Reading Middlesex County South

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NRCC 24-hr	D	Default	24.00	1	3.31	2
2	10-Year	NRCC 24-hr	D	Default	24.00	1	5.21	2
3	25-Year	NRCC 24-hr	D	Default	24.00	1	6.40	2
4	100-Year	NRCC 24-hr	D	Default	24.00	1	8.23	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
10,890	39	>75% Grass cover, Good, HSG A (P-1A, P-1B, P-1C, P-1D, P-2, P-3)
25,266	98	Paved parking, HSG A (P-1A, P-1B, P-1C, P-1D, P-2)
9,938	98	Roofs, HSG A (P-1A, P-1C, R-1)
46,095	**84**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
46,095	HSG A	P-1A, P-1B, P-1C, P-1D, P-2, P-3, R-1
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
46,095		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
10,890	0	0	0	0	10,890	>75% Grass cover, Good	
25,266	0	0	0	0	25,266	Paved parking	
9,938	0	0	0	0	9,938	Roofs	
46,095	**0**	**0**	**0**	**0**	**46,095**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	UIS-1	94.75	93.75	100.0	0.0100	0.013	0.0	12.0	0.0
2	UIS-2	93.00	92.00	100.0	0.0100	0.013	0.0	12.0	0.0

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

Subcatchment P-1A: Subcat P-1A Runoff Area=4,271 sf 31.49% Impervious Runoff Depth=0.38"
Tc=6.0 min CN=58 Runoff=0.02 cfs 136 cf

Subcatchment P-1B: Subcat P-1B Runoff Area=6,985 sf 87.39% Impervious Runoff Depth=2.36"
Tc=0.0 min CN=91 Runoff=0.45 cfs 1,375 cf

Subcatchment P-1C: Subcat P-1C Runoff Area=16,937 sf 69.86% Impervious Runoff Depth=1.49"
Tc=0.0 min CN=80 Runoff=0.72 cfs 2,099 cf

Subcatchment P-1D: Subcat P-1D Runoff Area=7,225 sf 88.12% Impervious Runoff Depth=2.36"
Tc=0.0 min CN=91 Runoff=0.47 cfs 1,422 cf

Subcatchment P-2: Subcatchment P-2 Runoff Area=1,141 sf 58.27% Impervious Runoff Depth=1.05"
Tc=6.0 min CN=73 Runoff=0.03 cfs 100 cf

Subcatchment P-3: Subcatchment P-3 Runoff Area=644 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0 cf

Subcatchment R-1: Subcat R-1 Runoff Area=8,892 sf 100.00% Impervious Runoff Depth=3.08"
Tc=0.0 min CN=98 Runoff=0.67 cfs 2,280 cf

Pond UIS-1: Underground Infiltration System #1 Peak Elev=93.98' Storage=315 cf Inflow=0.45 cfs 1,375 cf
Discarded=0.06 cfs 1,375 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 1,375 cf

Pond UIS-2: Underground Infiltration System Peak Elev=94.42' Storage=1,646 cf Inflow=1.86 cfs 5,801 cf
Discarded=0.17 cfs 5,801 cf Primary=0.00 cfs 0 cf Outflow=0.17 cfs 5,801 cf

Link SP1: Flow to Exisitng Drainage on Pinevale Avenue Inflow=0.02 cfs 136 cf
Primary=0.02 cfs 136 cf

Link SP2: Flow to Exisitng Drainage on Main Street Inflow=0.05 cfs 236 cf
Primary=0.05 cfs 236 cf

Link SP3: Flow to Wetlands Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 46,095 sf Runoff Volume = 7,411 cf Average Runoff Depth = 1.93"
23.63% Pervious = 10,890 sf 76.37% Impervious = 35,204 sf

Summary for Subcatchment P-1A: Subcat P-1A

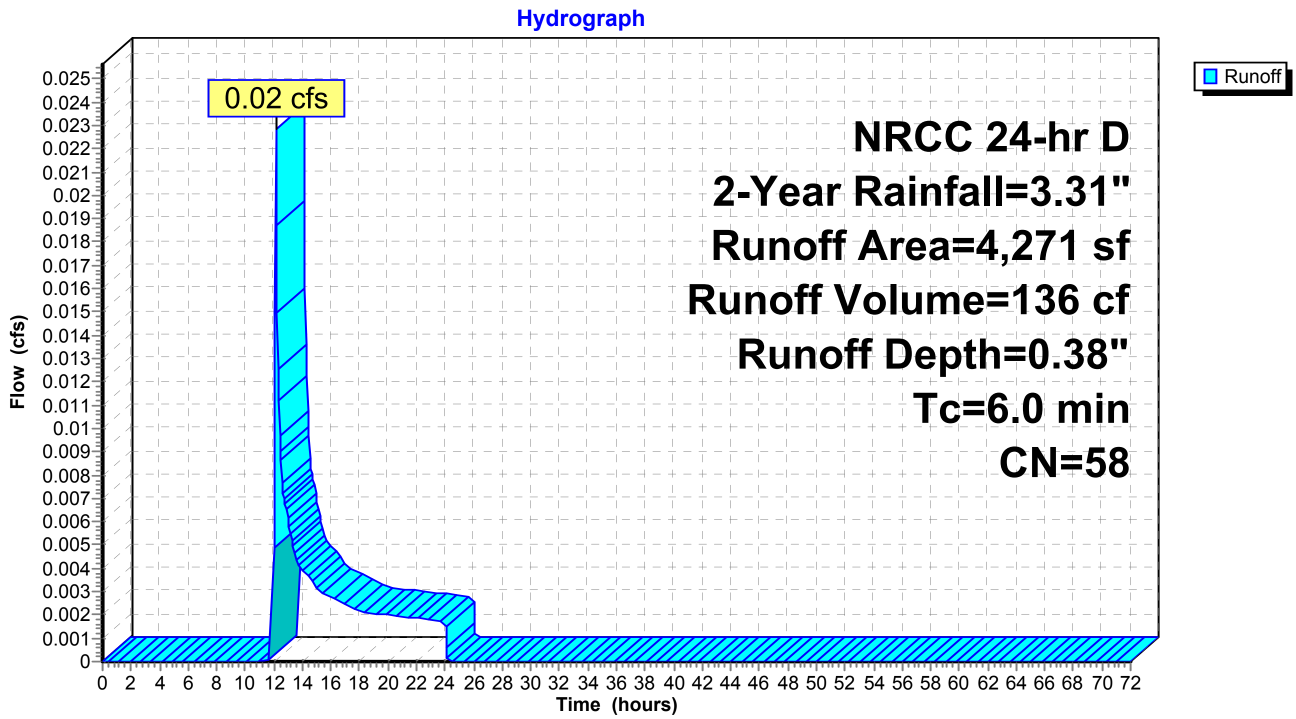
Runoff = 0.02 cfs @ 12.16 hrs, Volume= 136 cf, Depth= 0.38"
Routed to Link SP1 : Flow to Exisitng Drainage on Pinevale Avenue

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.31"

Area (sf)	CN	Description
2,926	39	>75% Grass cover, Good, HSG A
490	98	Paved parking, HSG A
855	98	Roofs, HSG A
4,271	58	Weighted Average
2,926		68.51% Pervious Area
1,345		31.49% Impervious Area

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

Subcatchment P-1A: Subcat P-1A



Summary for Subcatchment P-1B: Subcat P-1B

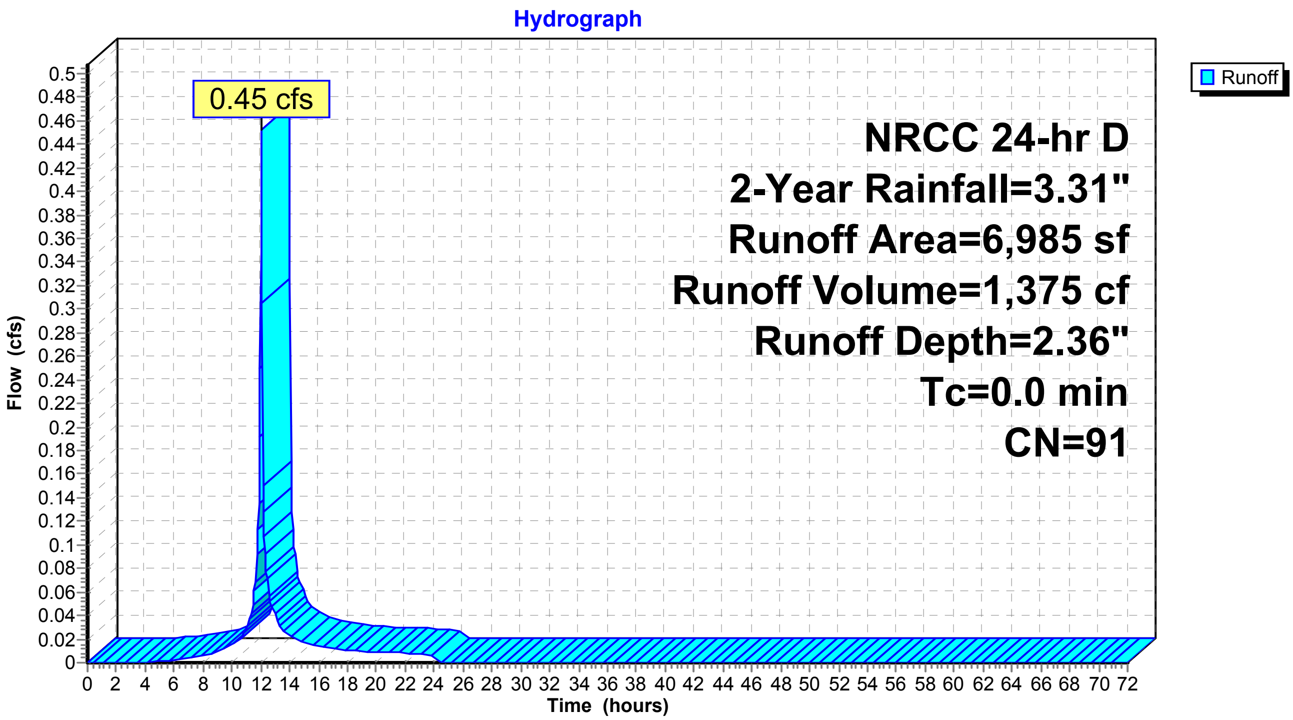
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.45 cfs @ 12.05 hrs, Volume= 1,375 cf, Depth= 2.36"
Routed to Pond UIS-1 : Underground Infiltration System #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.31"

Area (sf)	CN	Description
881	39	>75% Grass cover, Good, HSG A
6,105	98	Paved parking, HSG A
6,985	91	Weighted Average
881		12.61% Pervious Area
6,105		87.39% Impervious Area

Subcatchment P-1B: Subcat P-1B



Summary for Subcatchment P-1C: Subcat P-1C

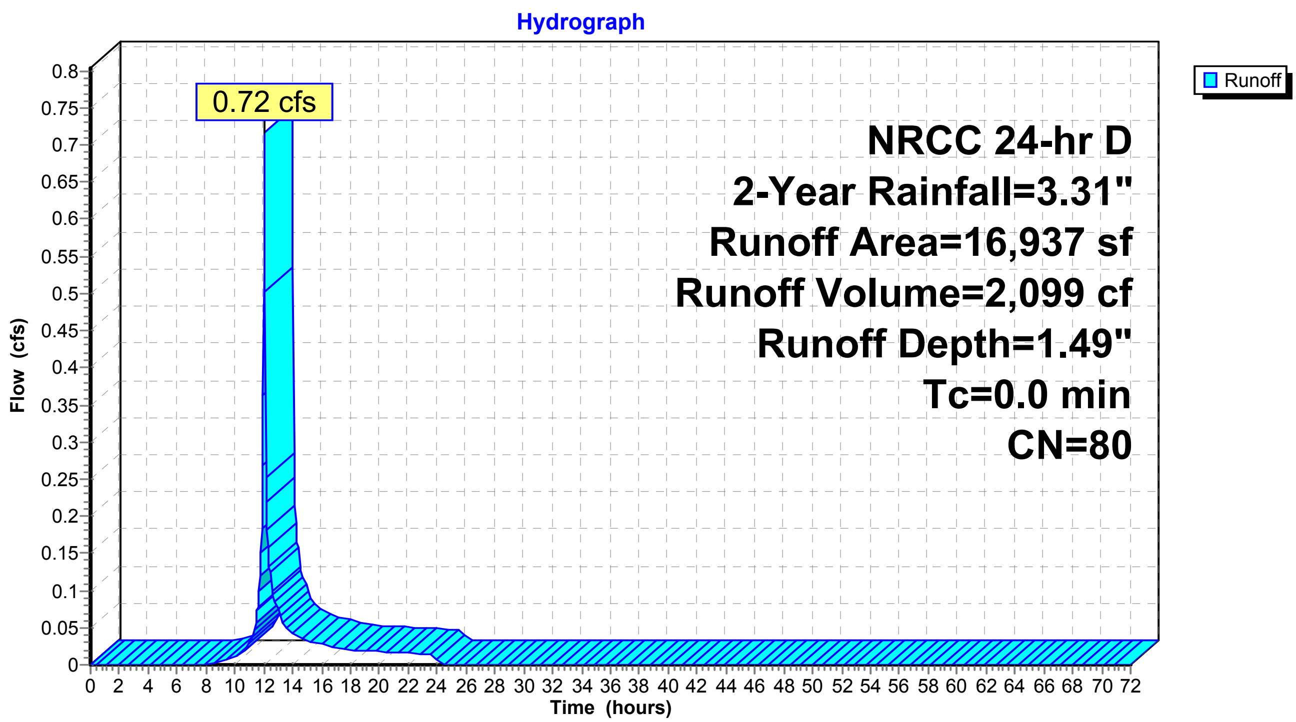
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.72 cfs @ 12.05 hrs, Volume= 2,099 cf, Depth= 1.49"
Routed to Pond UIS-2 : Underground Infiltration System 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.31"

Area (sf)	CN	Description
5,105	39	>75% Grass cover, Good, HSG A
192	98	Roofs, HSG A
11,640	98	Paved parking, HSG A
16,937	80	Weighted Average
5,105		30.14% Pervious Area
11,832		69.86% Impervious Area

Subcatchment P-1C: Subcat P-1C



Summary for Subcatchment P-1D: Subcat P-1D

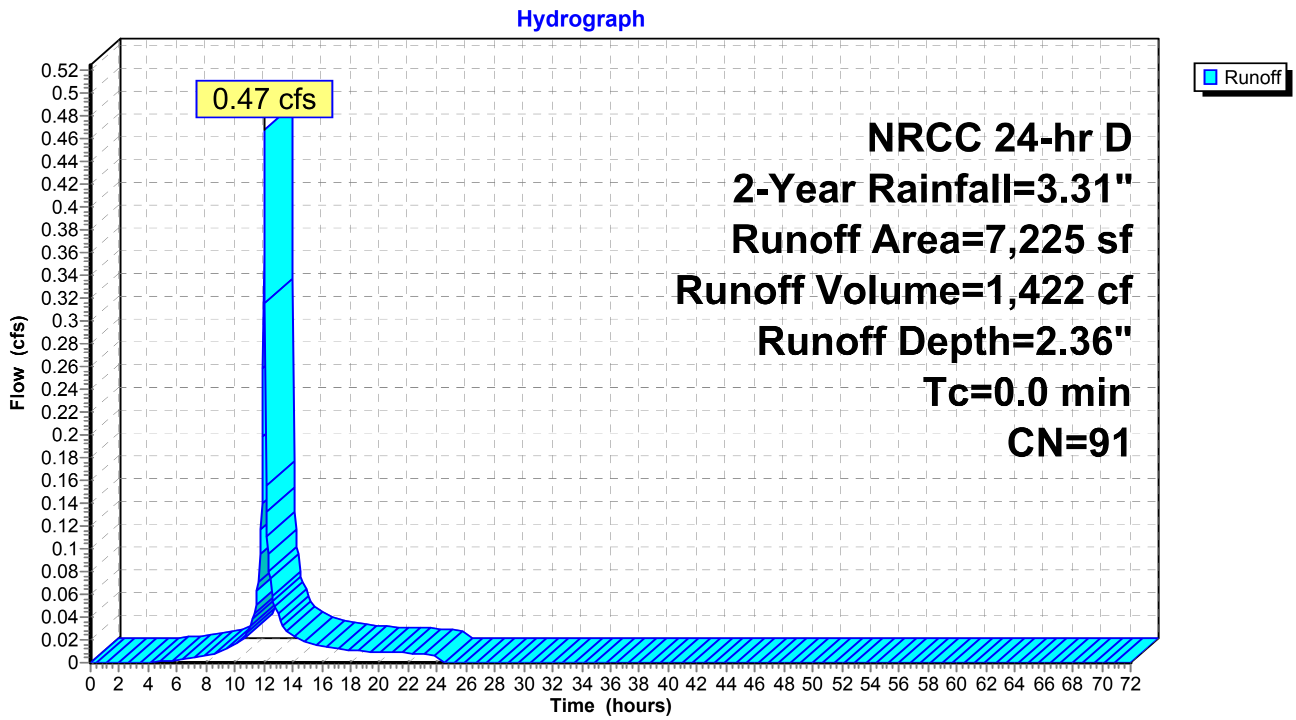
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.47 cfs @ 12.05 hrs, Volume= 1,422 cf, Depth= 2.36"
Routed to Pond UIS-2 : Underground Infiltration System 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.31"

Area (sf)	CN	Description
858	39	>75% Grass cover, Good, HSG A
6,366	98	Paved parking, HSG A
7,225	91	Weighted Average
858		11.88% Pervious Area
6,366		88.12% Impervious Area

Subcatchment P-1D: Subcat P-1D



Summary for Subcatchment P-2: Subcatchment P-2

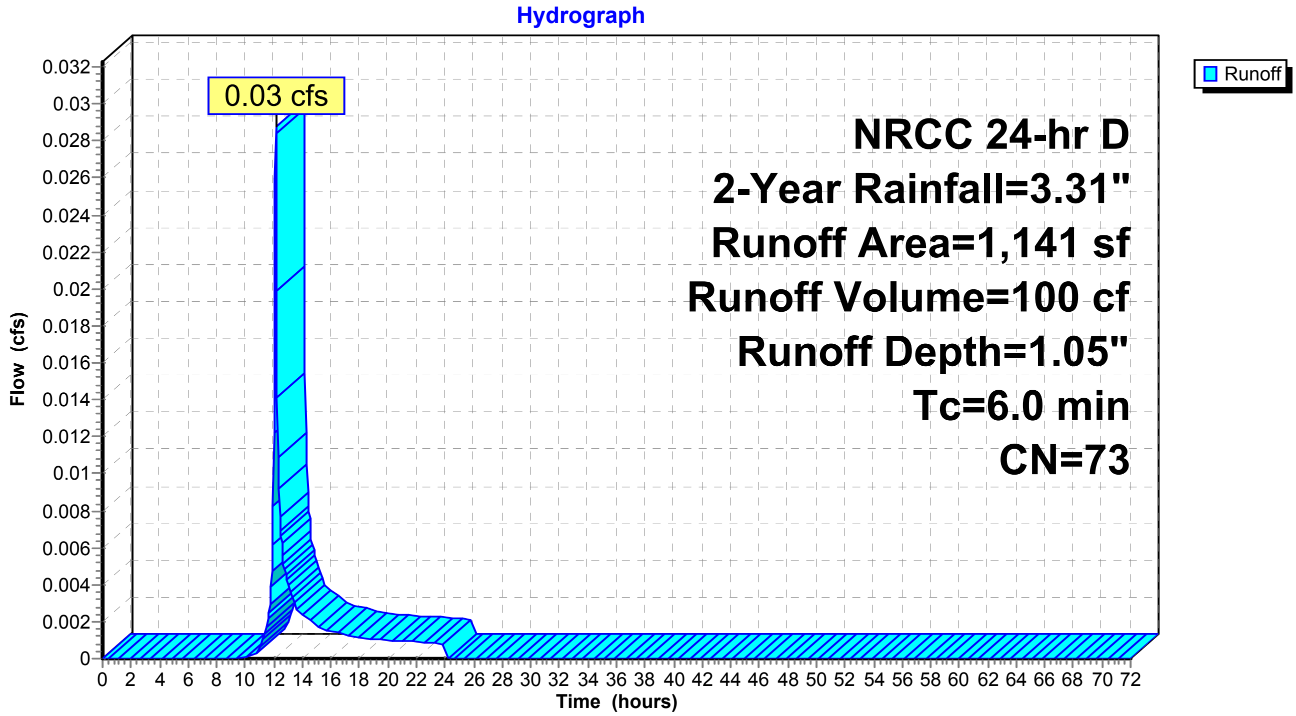
Runoff = 0.03 cfs @ 12.14 hrs, Volume= 100 cf, Depth= 1.05"
Routed to Link SP2 : Flow to Exisitng Drainage on Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.31"

Area (sf)	CN	Description
476	39	>75% Grass cover, Good, HSG A
665	98	Paved parking, HSG A
1,141	73	Weighted Average
476		41.73% Pervious Area
665		58.27% Impervious Area

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

Subcatchment P-2: Subcatchment P-2



Summary for Subcatchment P-3: Subcatchment P-3

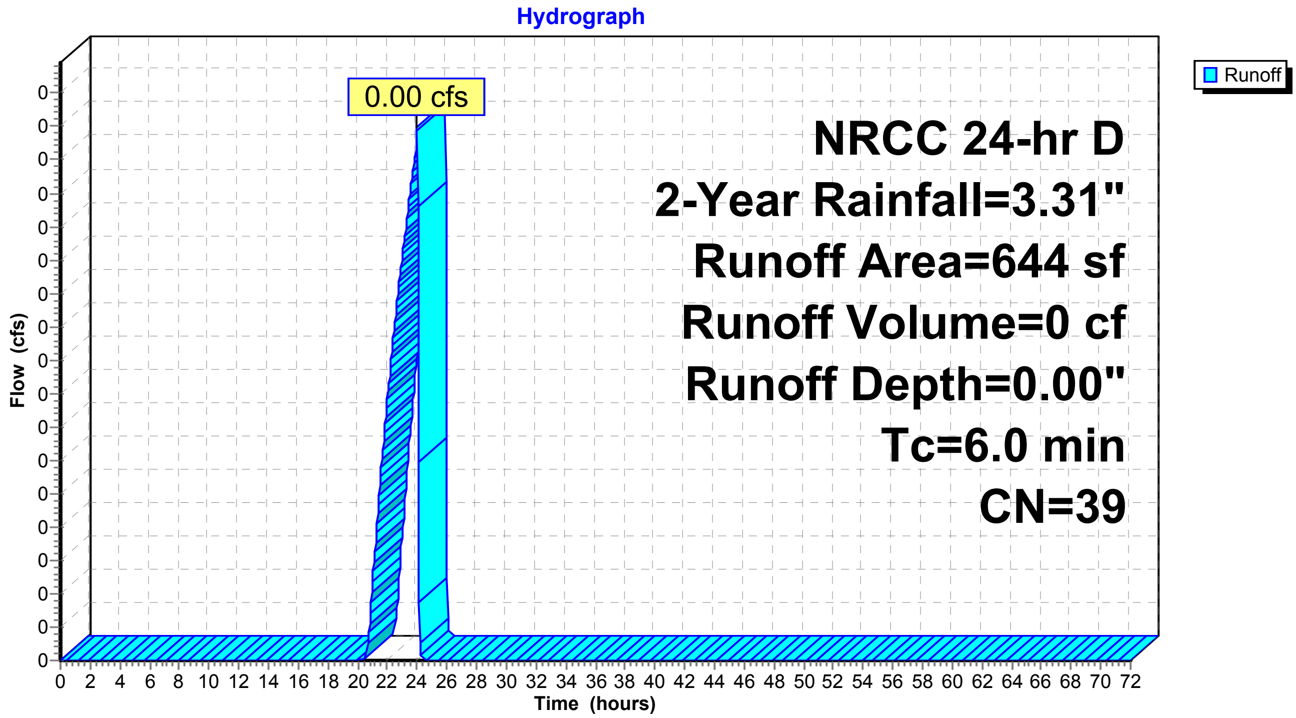
Runoff = 0.00 cfs @ 23.98 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link SP3 : Flow to Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.31"

Area (sf)	CN	Description
644	39	>75% Grass cover, Good, HSG A
644		100.00% Pervious Area

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

Subcatchment P-3: Subcatchment P-3



Summary for Subcatchment R-1: Subcat R-1

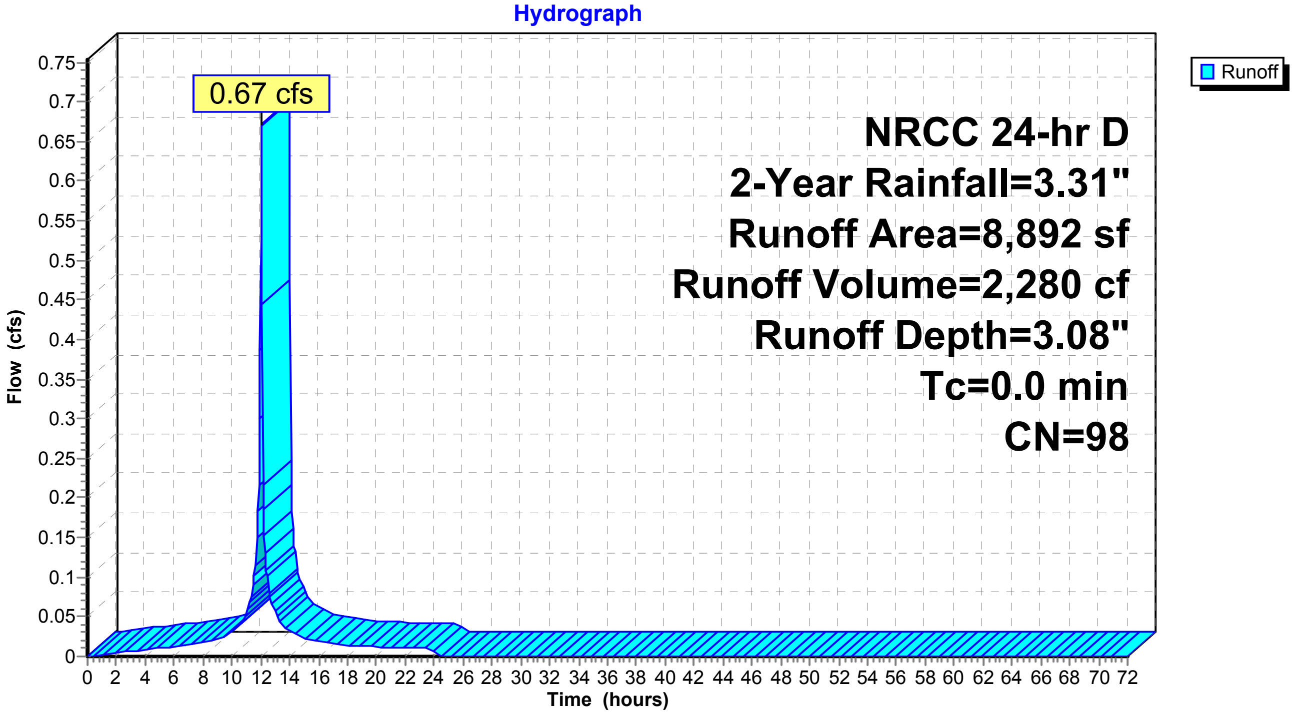
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.67 cfs @ 12.04 hrs, Volume= 2,280 cf, Depth= 3.08"
Routed to Pond UIS-2 : Underground Infiltration System 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.31"

Area (sf)	CN	Description
8,892	98	Roofs, HSG A
8,892		100.00% Impervious Area

Subcatchment R-1: Subcat R-1



Summary for Pond UIS-1: Underground Infiltration System #1

Inflow Area = 6,985 sf, 87.39% Impervious, Inflow Depth = 2.36" for 2-Year event
Inflow = 0.45 cfs @ 12.05 hrs, Volume= 1,375 cf
Outflow = 0.06 cfs @ 11.65 hrs, Volume= 1,375 cf, Atten= 87%, Lag= 0.0 min
Discarded = 0.06 cfs @ 11.65 hrs, Volume= 1,375 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP1 : Flow to Exisitng Drainage on Pinevale Avenue

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 93.98' @ 12.52 hrs Surf.Area= 1,093 sf Storage= 315 cf

Plug-Flow detention time= 29.8 min calculated for 1,374 cf (100% of inflow)
Center-of-Mass det. time= 29.8 min (841.2 - 811.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	93.33'	686 cf	**18.17'W x 60.16'L x 2.33'H Field A** 2,550 cf Overall - 590 cf Embedded = 1,960 cf x 35.0% Voids
#2A	93.83'	590 cf	**ADS_StormTech SC-310 +Cap** x 40 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 40 Chambers in 5 Rows
		1,276 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	94.75'	**12.0" Round Culvert** L= 100.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 94.75' / 93.75' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	95.55'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	93.33'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.06 cfs @ 11.65 hrs HW=93.36' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.33' (Free Discharge)
└─**1=Culvert** (Controls 0.00 cfs)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond UIS-1: Underground Infiltration System #1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

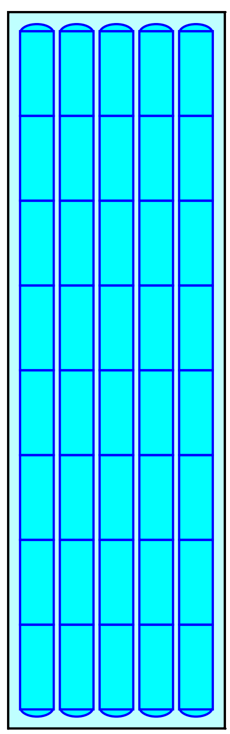
8 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 58.16' Row Length +12.0" End Stone x 2 = 60.16' Base Length
5 Rows x 34.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 18.17' Base Width
6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

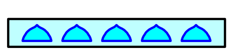
40 Chambers x 14.7 cf = 589.7 cf Chamber Storage

2,550.1 cf Field - 589.7 cf Chambers = 1,960.4 cf Stone x 35.0% Voids = 686.2 cf Stone Storage

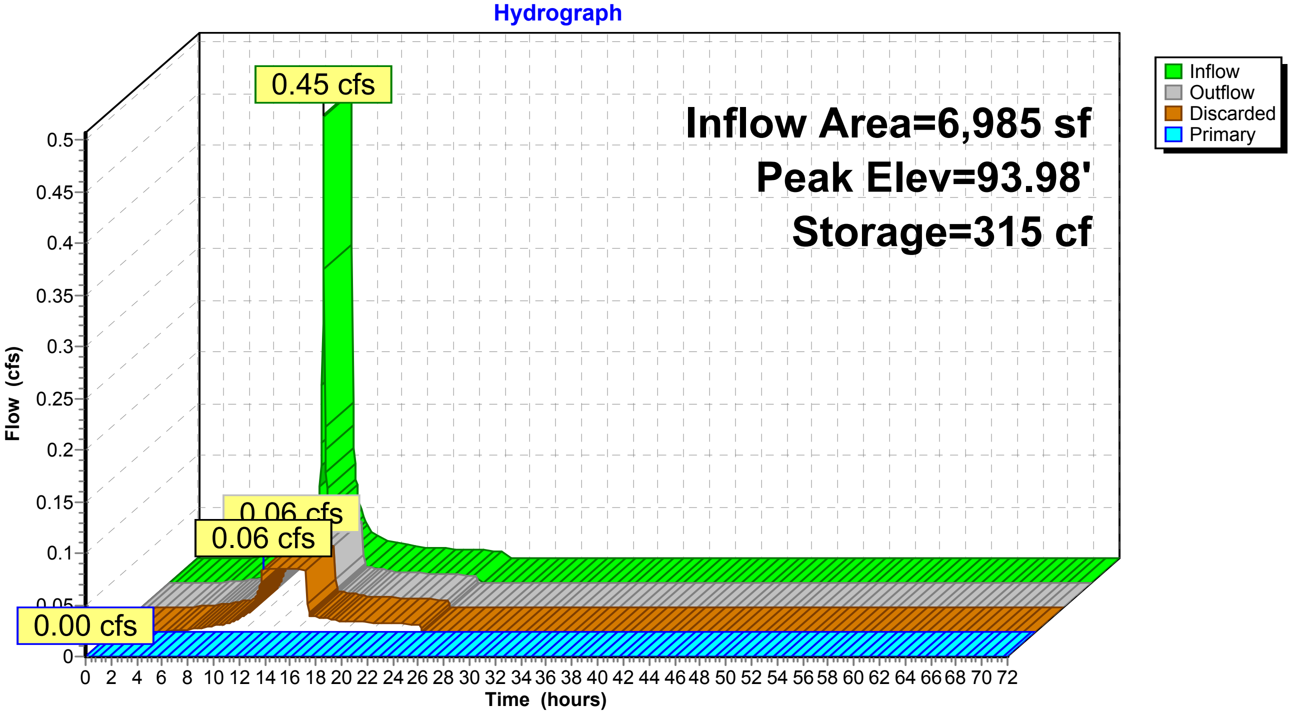
Chamber Storage + Stone Storage = 1,275.8 cf = 0.029 af
Overall Storage Efficiency = 50.0%
Overall System Size = 60.16' x 18.17' x 2.33'

40 Chambers
94.4 cy Field
72.6 cy Stone





Pond UIS-1: Underground Infiltration System #1



Summary for Pond UIS-2: Underground Infiltration System 2

Inflow Area = 33,054 sf, 81.96% Impervious, Inflow Depth = 2.11" for 2-Year event
Inflow = 1.86 cfs @ 12.05 hrs, Volume= 5,801 cf
Outflow = 0.17 cfs @ 11.50 hrs, Volume= 5,801 cf, Atten= 91%, Lag= 0.0 min
Discarded = 0.17 cfs @ 11.50 hrs, Volume= 5,801 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP1 : Flow to Exisitng Drainage on Pinevale Avenue

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 94.42' @ 12.99 hrs Surf.Area= 3,039 sf Storage= 1,646 cf

Plug-Flow detention time= 66.6 min calculated for 5,797 cf (100% of inflow)
Center-of-Mass det. time= 66.5 min (873.9 - 807.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	93.50'	2,785 cf	**77.50'W x 39.22'L x 3.50'H Field A** 10,638 cf Overall - 3,675 cf Embedded = 6,962 cf x 40.0% Voids
#2A	94.00'	3,675 cf	**ADS_StormTech SC-740 +Cap** x 80 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 80 Chambers in 16 Rows
		6,460 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	93.00'	**12.0" Round Culvert** L= 100.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 93.00' / 92.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	96.77'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	93.50'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.17 cfs @ 11.50 hrs HW=93.54' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.50' (Free Discharge)
└─**1=Culvert** (Passes 0.00 cfs of 0.75 cfs potential flow)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond UIS-2: Underground Infiltration System 2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
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

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

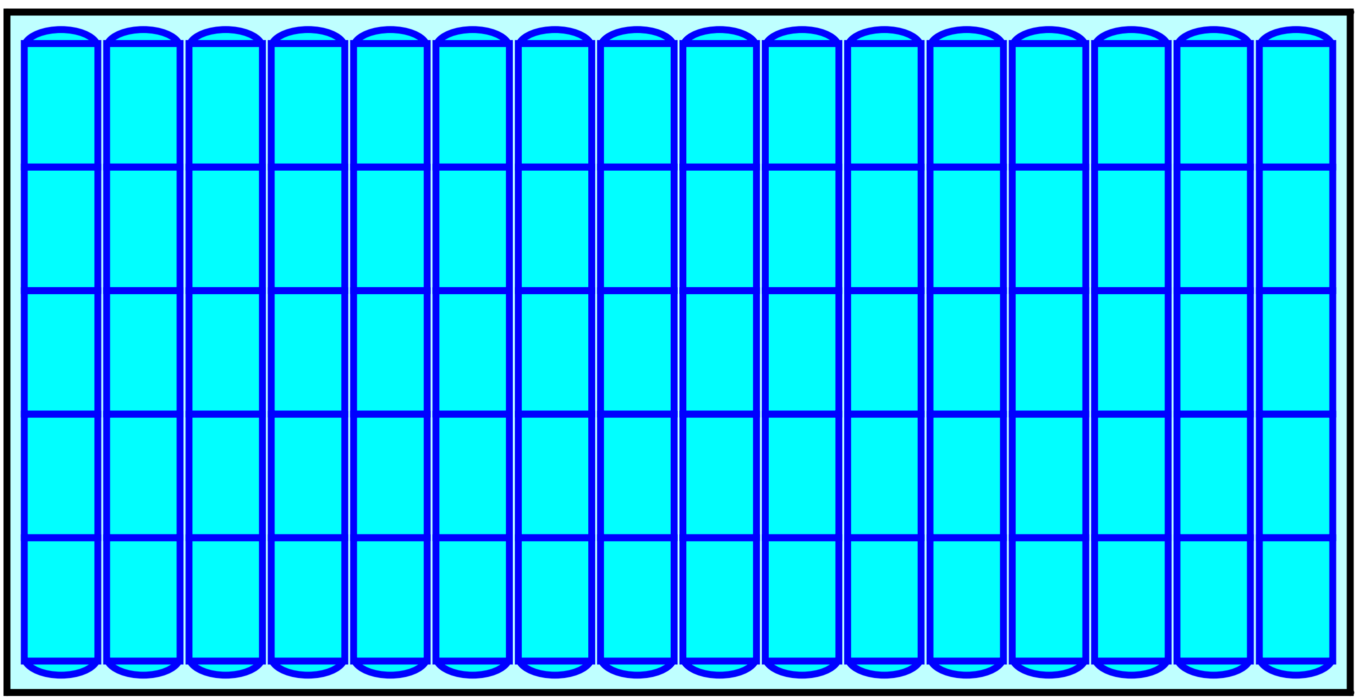
5 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 37.22' Row Length +12.0" End Stone x 2 = 39.22' Base Length
16 Rows x 51.0" Wide + 6.0" Spacing x 15 + 12.0" Side Stone x 2 = 77.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

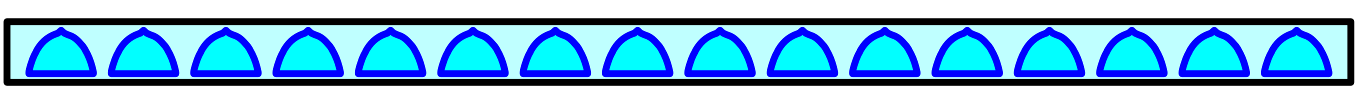
80 Chambers x 45.9 cf = 3,675.2 cf Chamber Storage

10,637.5 cf Field - 3,675.2 cf Chambers = 6,962.3 cf Stone x 40.0% Voids = 2,784.9 cf Stone Storage

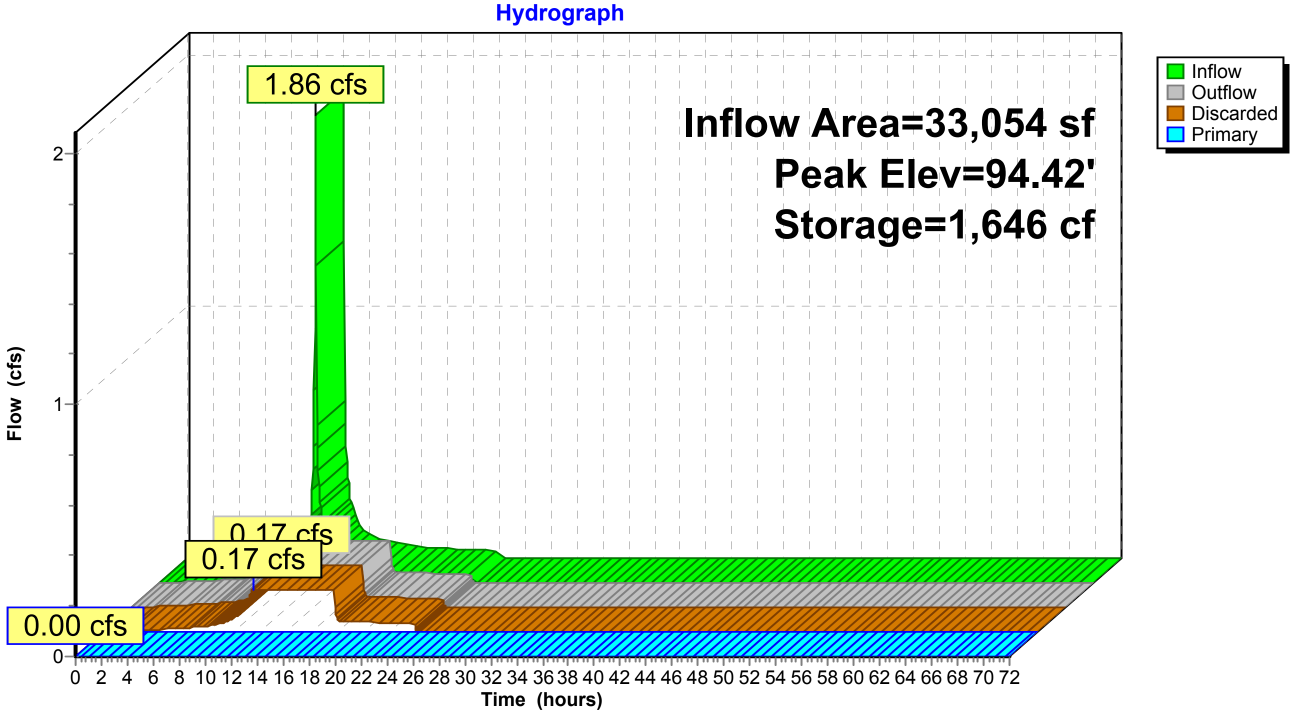
Chamber Storage + Stone Storage = 6,460.1 cf = 0.148 af
Overall Storage Efficiency = 60.7%
Overall System Size = 39.22' x 77.50' x 3.50'

80 Chambers
394.0 cy Field
257.9 cy Stone





Pond UIS-2: Underground Infiltration System 2

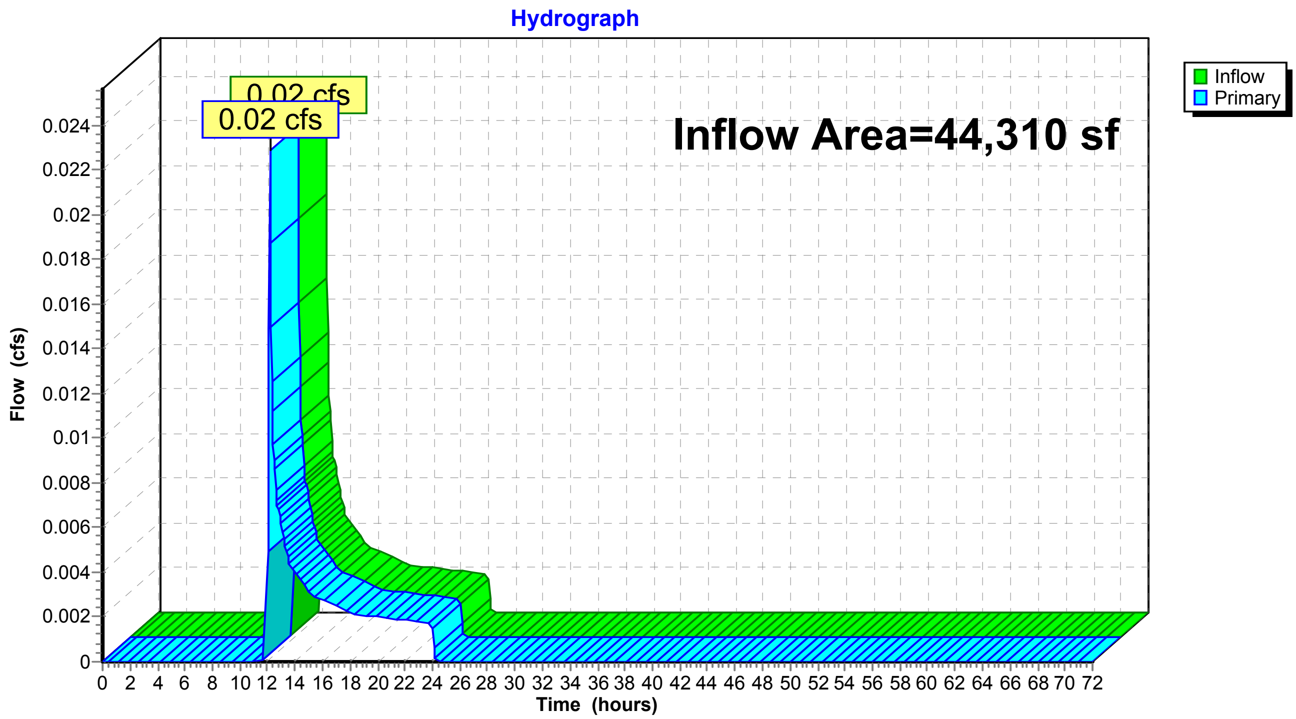


Summary for Link SP1: Flow to Exisitng Drainage on Pinevale Avenue

Inflow Area = 44,310 sf, 77.95% Impervious, Inflow Depth = 0.04" for 2-Year event
Inflow = 0.02 cfs @ 12.16 hrs, Volume= 136 cf
Primary = 0.02 cfs @ 12.16 hrs, Volume= 136 cf, Atten= 0%, Lag= 0.0 min
Routed to Link SP2 : Flow to Exisitng Drainage on Main Street

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

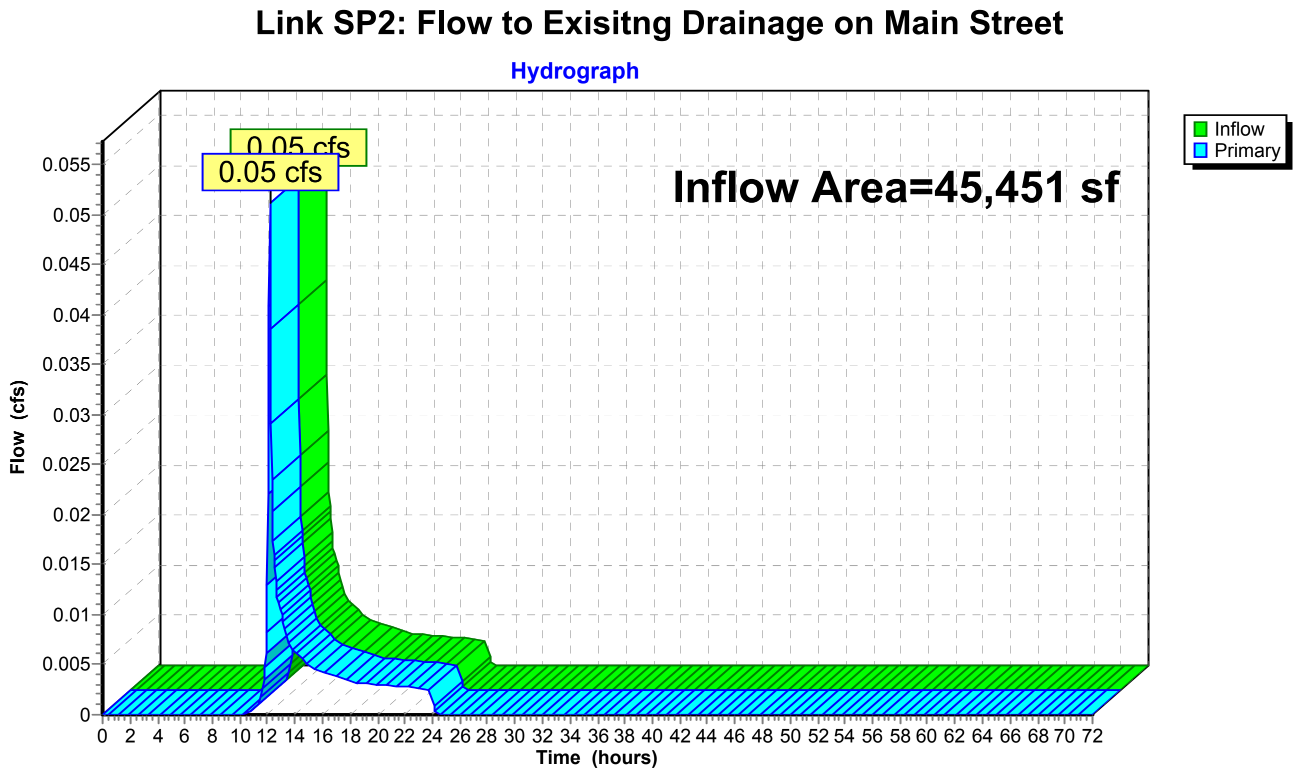
Link SP1: Flow to Exisitng Drainage on Pinevale Avenue



Summary for Link SP2: Flow to Exisitng Drainage on Main Street

Inflow Area = 45,451 sf, 77.46% Impervious, Inflow Depth = 0.06" for 2-Year event
Inflow = 0.05 cfs @ 12.15 hrs, Volume= 236 cf
Primary = 0.05 cfs @ 12.15 hrs, Volume= 236 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

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

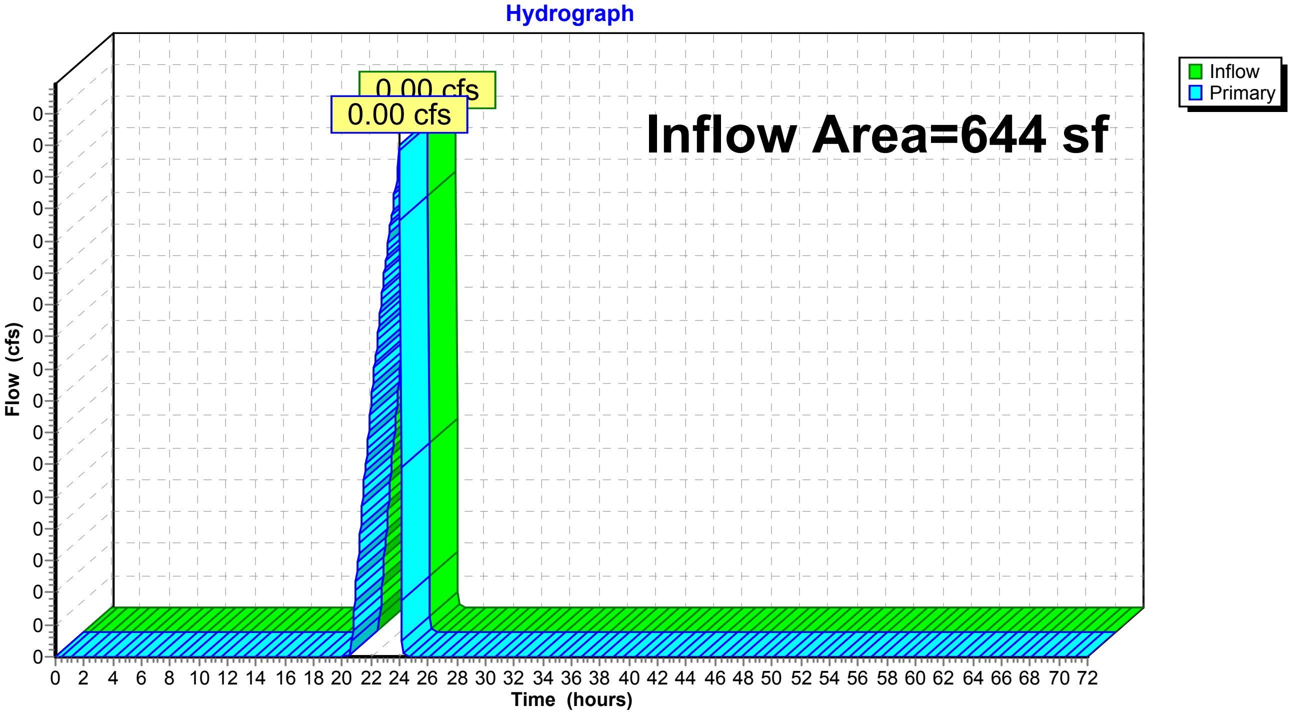


Summary for Link SP3: Flow to Wetlands

Inflow Area = 644 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 23.98 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 23.98 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

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

Link SP3: Flow to Wetlands



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

Subcatchment P-1A: Subcat P-1A Runoff Area=4,271 sf 31.49% Impervious Runoff Depth=1.29"
Tc=6.0 min CN=58 Runoff=0.13 cfs 458 cf

Subcatchment P-1B: Subcat P-1B Runoff Area=6,985 sf 87.39% Impervious Runoff Depth=4.19"
Tc=0.0 min CN=91 Runoff=0.78 cfs 2,437 cf

Subcatchment P-1C: Subcat P-1C Runoff Area=16,937 sf 69.86% Impervious Runoff Depth=3.08"
Tc=0.0 min CN=80 Runoff=1.47 cfs 4,343 cf

Subcatchment P-1D: Subcat P-1D Runoff Area=7,225 sf 88.12% Impervious Runoff Depth=4.19"
Tc=0.0 min CN=91 Runoff=0.80 cfs 2,520 cf

Subcatchment P-2: Subcatchment P-2 Runoff Area=1,141 sf 58.27% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=73 Runoff=0.07 cfs 233 cf

Subcatchment P-3: Subcatchment P-3 Runoff Area=644 sf 0.00% Impervious Runoff Depth=0.24"
Tc=6.0 min CN=39 Runoff=0.00 cfs 13 cf

Subcatchment R-1: Subcat R-1 Runoff Area=8,892 sf 100.00% Impervious Runoff Depth=4.97"
Tc=0.0 min CN=98 Runoff=1.07 cfs 3,685 cf

Pond UIS-1: Underground Infiltration System #1 Peak Elev=94.56' Storage=756 cf Inflow=0.78 cfs 2,437 cf
Discarded=0.06 cfs 2,437 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 2,437 cf

Pond UIS-2: Underground Infiltration System Peak Elev=95.48' Storage=4,074 cf Inflow=3.34 cfs 10,548 cf
Discarded=0.17 cfs 10,549 cf Primary=0.00 cfs 0 cf Outflow=0.17 cfs 10,549 cf

Link SP1: Flow to Exisitng Drainage on Pinevale Avenue Inflow=0.13 cfs 458 cf
Primary=0.13 cfs 458 cf

Link SP2: Flow to Exisitng Drainage on Main Street Inflow=0.19 cfs 690 cf
Primary=0.19 cfs 690 cf

Link SP3: Flow to Wetlands Inflow=0.00 cfs 13 cf
Primary=0.00 cfs 13 cf

Total Runoff Area = 46,095 sf Runoff Volume = 13,688 cf Average Runoff Depth = 3.56"
23.63% Pervious = 10,890 sf 76.37% Impervious = 35,204 sf

Summary for Subcatchment P-1A: Subcat P-1A

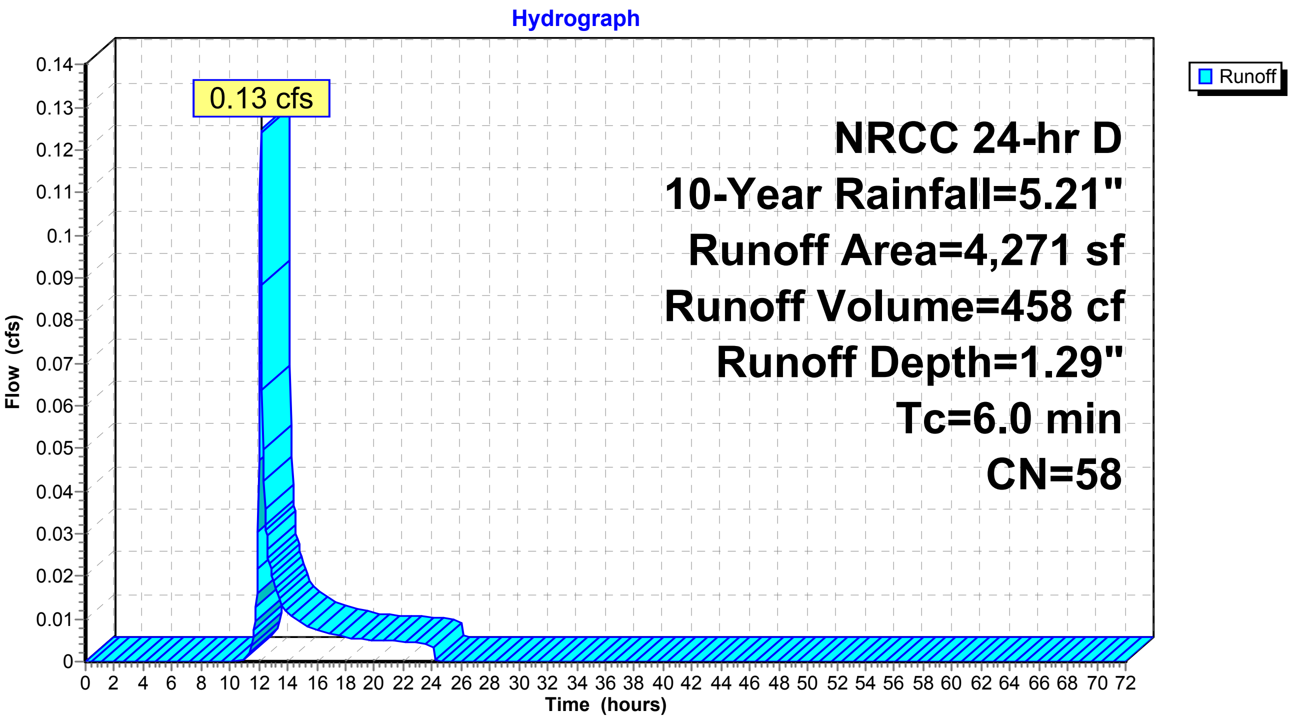
Runoff = 0.13 cfs @ 12.14 hrs, Volume= 458 cf, Depth= 1.29"
Routed to Link SP1 : Flow to Exisitng Drainage on Pinevale Avenue

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=5.21"

Area (sf)	CN	Description
2,926	39	>75% Grass cover, Good, HSG A
490	98	Paved parking, HSG A
855	98	Roofs, HSG A
4,271	58	Weighted Average
2,926		68.51% Pervious Area
1,345		31.49% Impervious Area

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

Subcatchment P-1A: Subcat P-1A



Summary for Subcatchment P-1B: Subcat P-1B

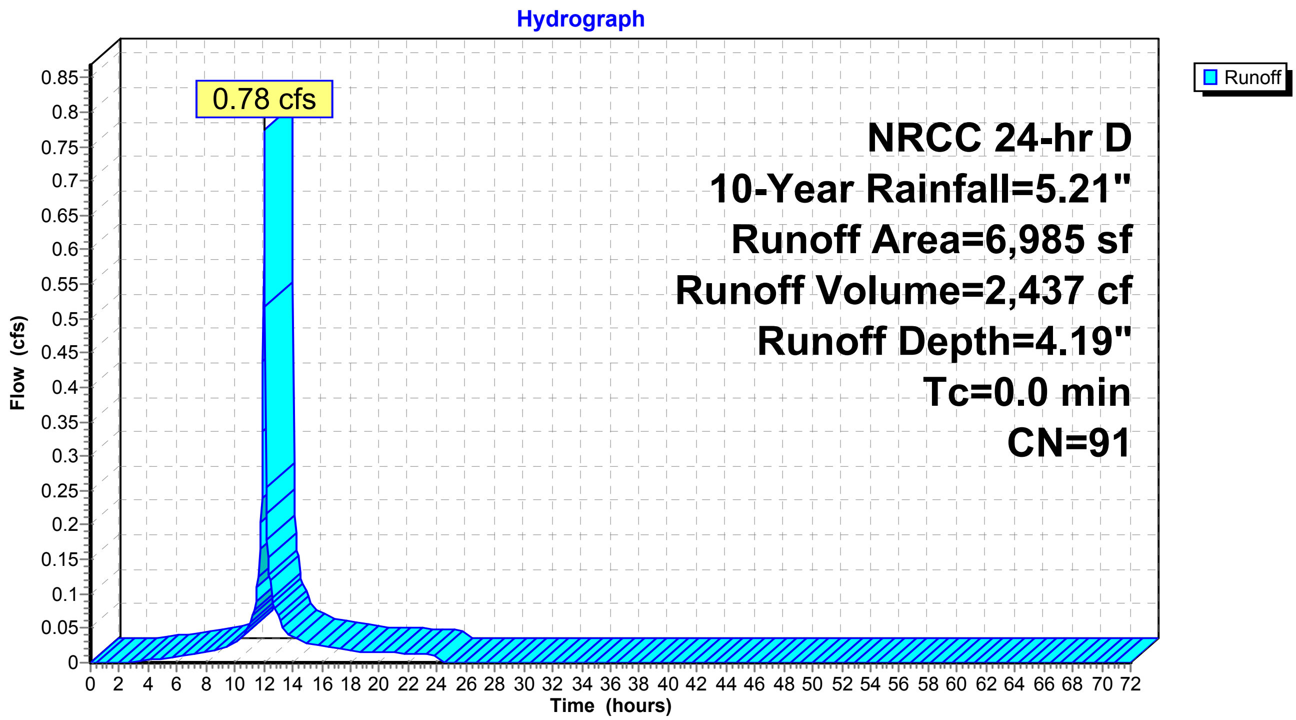
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.78 cfs @ 12.04 hrs, Volume= 2,437 cf, Depth= 4.19"
Routed to Pond UIS-1 : Underground Infiltration System #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=5.21"

Area (sf)	CN	Description
881	39	>75% Grass cover, Good, HSG A
6,105	98	Paved parking, HSG A
6,985	91	Weighted Average
881		12.61% Pervious Area
6,105		87.39% Impervious Area

Subcatchment P-1B: Subcat P-1B



Summary for Subcatchment P-1C: Subcat P-1C

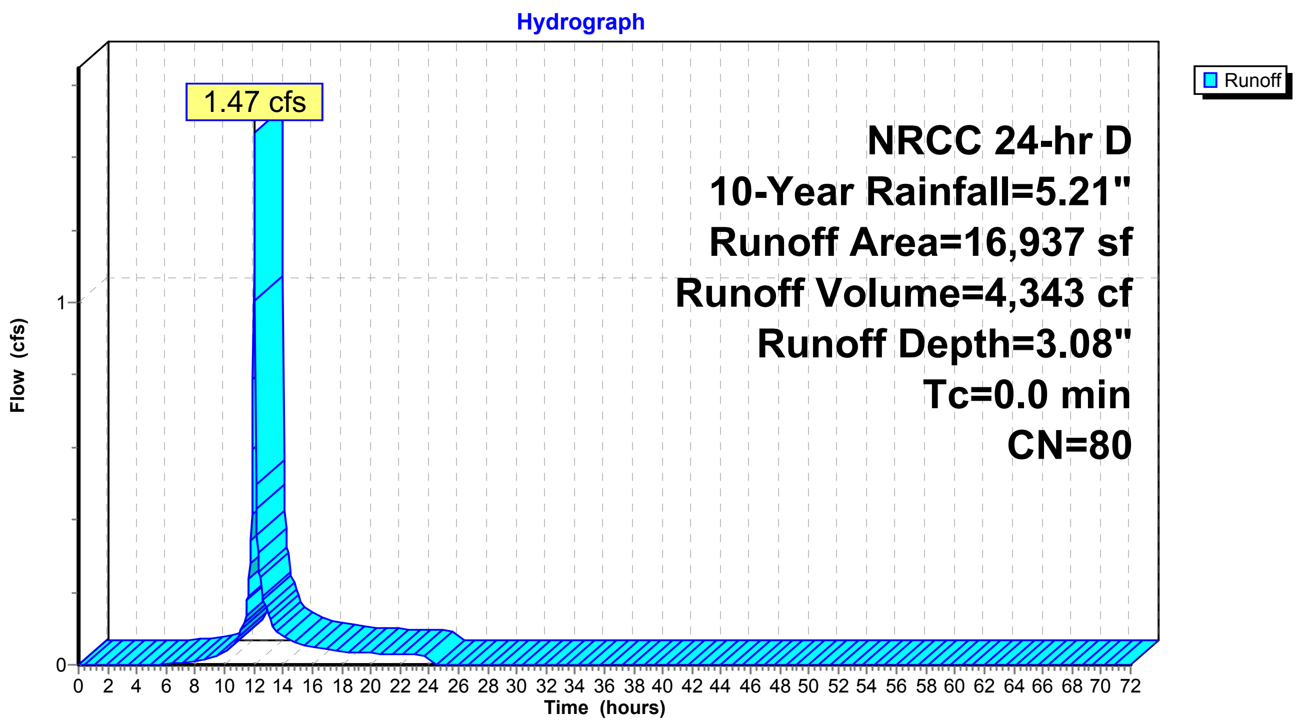
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.47 cfs @ 12.05 hrs, Volume= 4,343 cf, Depth= 3.08"
Routed to Pond UIS-2 : Underground Infiltration System 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=5.21"

Area (sf)	CN	Description
5,105	39	>75% Grass cover, Good, HSG A
192	98	Roofs, HSG A
11,640	98	Paved parking, HSG A
16,937	80	Weighted Average
5,105		30.14% Pervious Area
11,832		69.86% Impervious Area

Subcatchment P-1C: Subcat P-1C



Summary for Subcatchment P-1D: Subcat P-1D

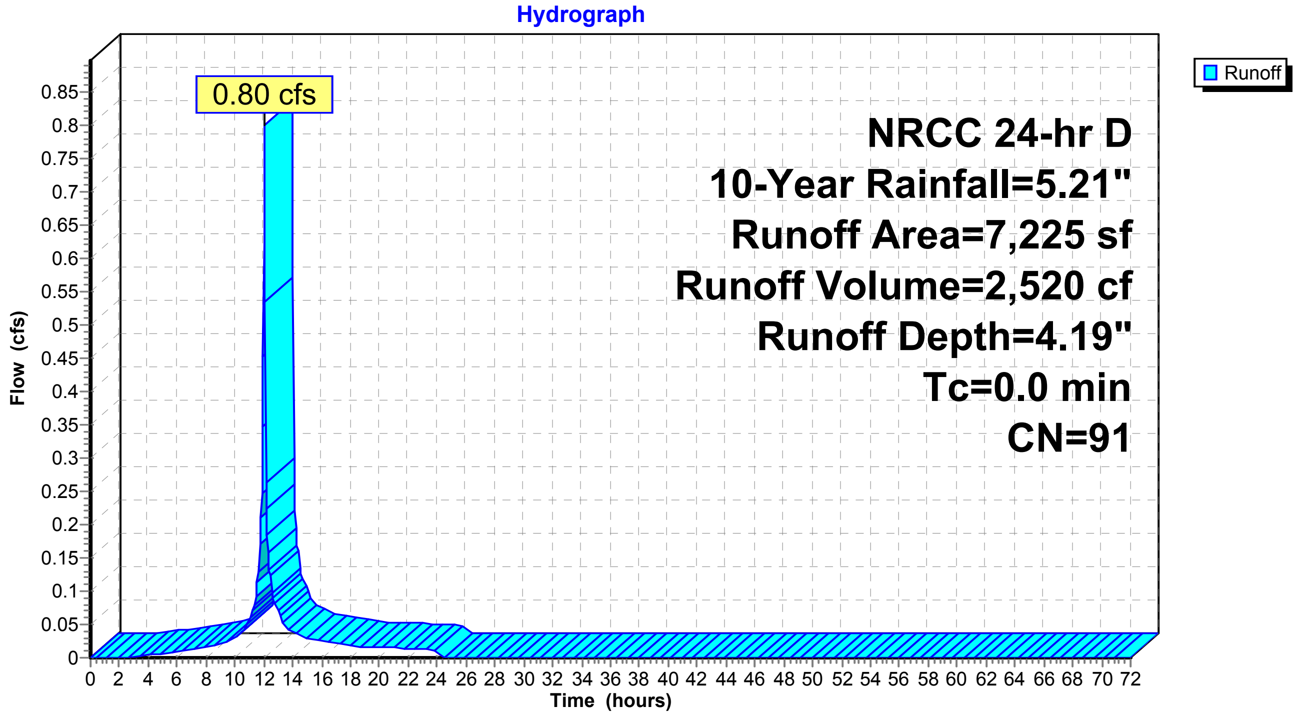
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.80 cfs @ 12.04 hrs, Volume= 2,520 cf, Depth= 4.19"
Routed to Pond UIS-2 : Underground Infiltration System 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=5.21"

Area (sf)	CN	Description
858	39	>75% Grass cover, Good, HSG A
6,366	98	Paved parking, HSG A
7,225	91	Weighted Average
858		11.88% Pervious Area
6,366		88.12% Impervious Area

Subcatchment P-1D: Subcat P-1D



Summary for Subcatchment P-2: Subcatchment P-2

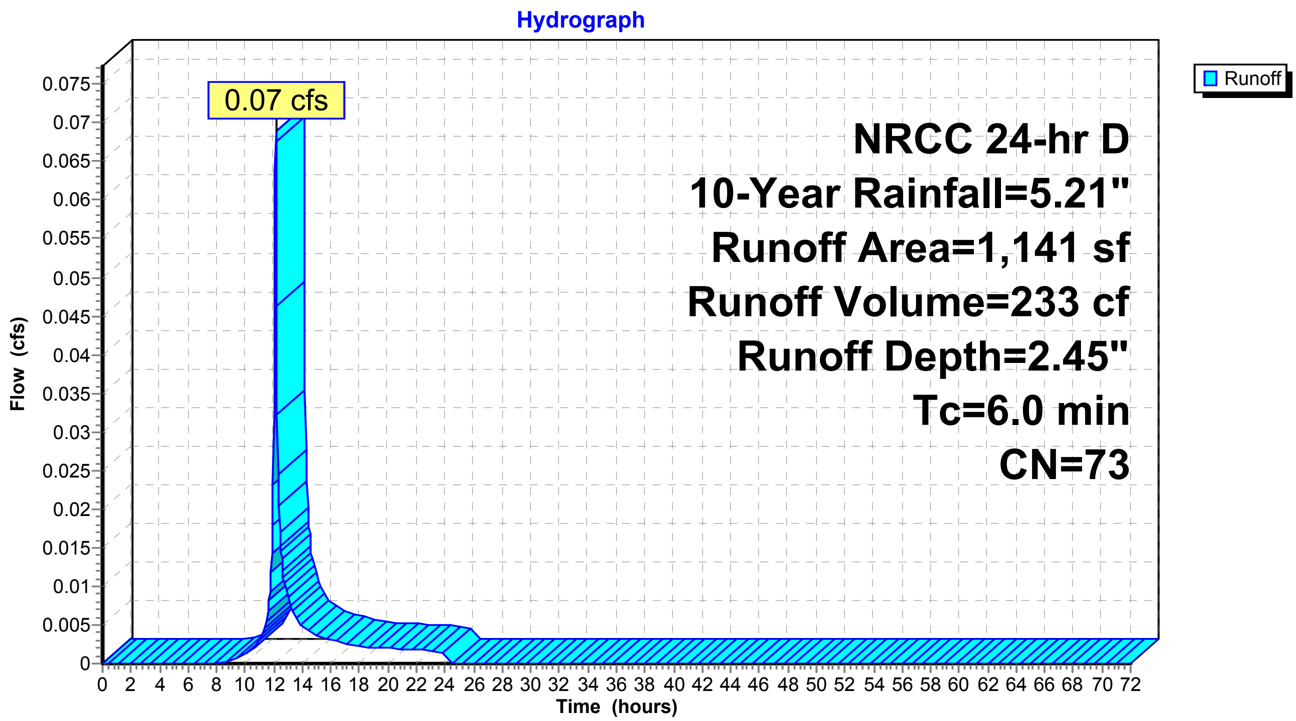
Runoff = 0.07 cfs @ 12.13 hrs, Volume= 233 cf, Depth= 2.45"
Routed to Link SP2 : Flow to Exisitng Drainage on Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=5.21"

Area (sf)	CN	Description
476	39	>75% Grass cover, Good, HSG A
665	98	Paved parking, HSG A
1,141	73	Weighted Average
476		41.73% Pervious Area
665		58.27% Impervious Area

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

Subcatchment P-2: Subcatchment P-2



Summary for Subcatchment P-3: Subcatchment P-3

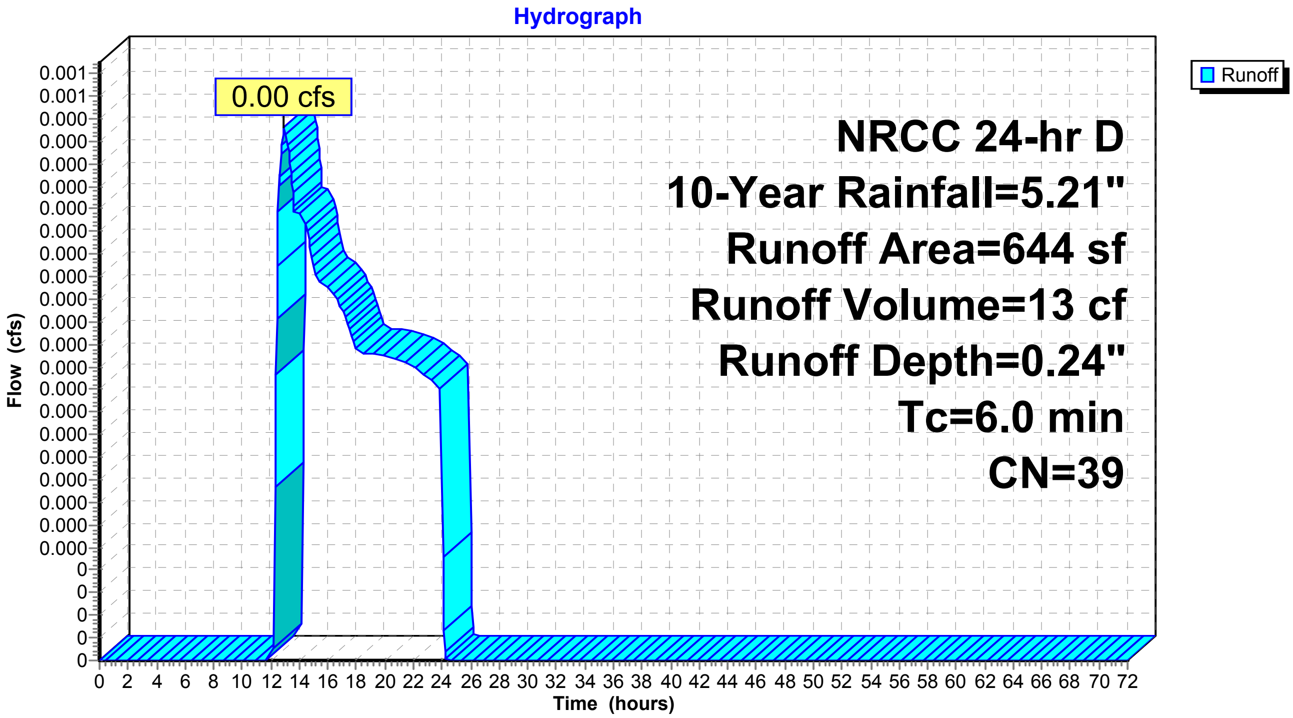
Runoff = 0.00 cfs @ 12.95 hrs, Volume= 13 cf, Depth= 0.24"
Routed to Link SP3 : Flow to Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=5.21"

Area (sf)	CN	Description
644	39	>75% Grass cover, Good, HSG A
644		100.00% Pervious Area

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

Subcatchment P-3: Subcatchment P-3



Summary for Subcatchment R-1: Subcat R-1

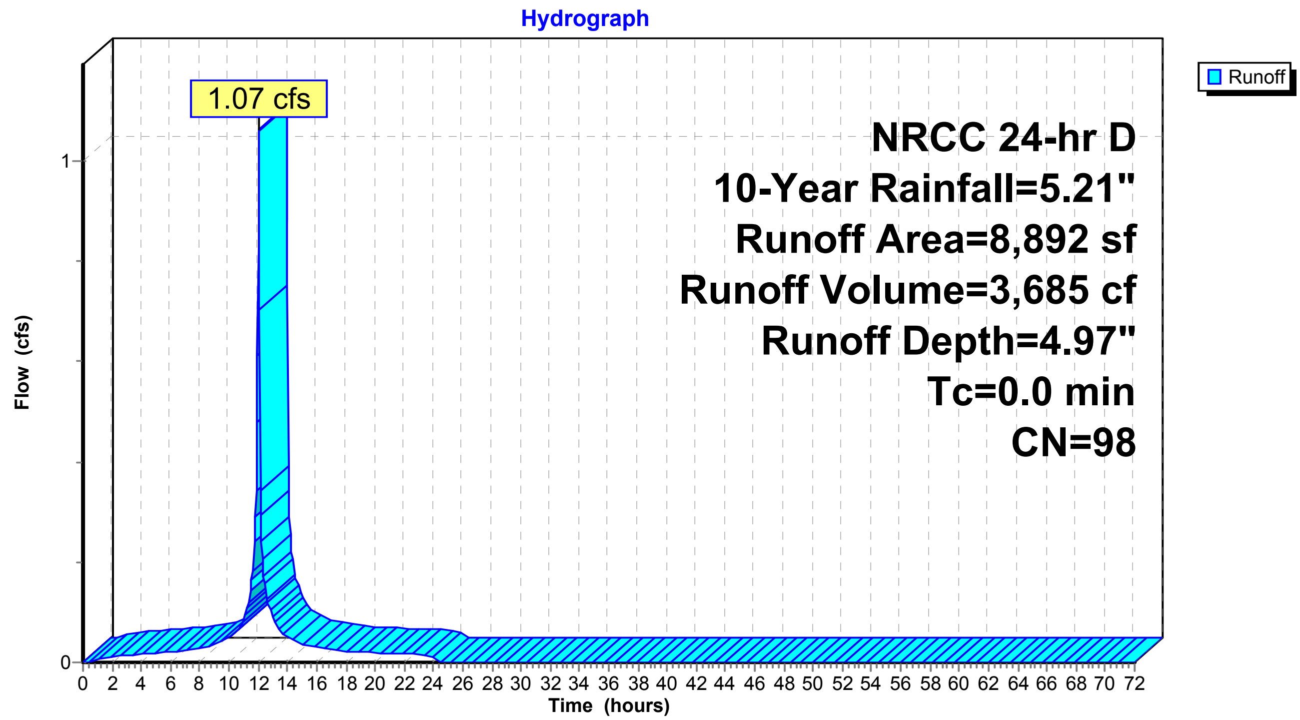
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.07 cfs @ 12.04 hrs, Volume= 3,685 cf, Depth= 4.97"
Routed to Pond UIS-2 : Underground Infiltration System 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=5.21"

Area (sf)	CN	Description
8,892	98	Roofs, HSG A
8,892		100.00% Impervious Area

Subcatchment R-1: Subcat R-1



Summary for Pond UIS-1: Underground Infiltration System #1

Inflow Area = 6,985 sf, 87.39% Impervious, Inflow Depth = 4.19" for 10-Year event
Inflow = 0.78 cfs @ 12.04 hrs, Volume= 2,437 cf
Outflow = 0.06 cfs @ 11.15 hrs, Volume= 2,437 cf, Atten= 92%, Lag= 0.0 min
Discarded = 0.06 cfs @ 11.15 hrs, Volume= 2,437 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP1 : Flow to Exisitng Drainage on Pinevale Avenue

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 94.56' @ 13.10 hrs Surf.Area= 1,093 sf Storage= 756 cf

Plug-Flow detention time= 86.1 min calculated for 2,435 cf (100% of inflow)
Center-of-Mass det. time= 86.1 min (877.1 - 791.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	93.33'	686 cf	**18.17'W x 60.16'L x 2.33'H Field A** 2,550 cf Overall - 590 cf Embedded = 1,960 cf x 35.0% Voids
#2A	93.83'	590 cf	**ADS_StormTech SC-310 +Cap** x 40 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 40 Chambers in 5 Rows
		1,276 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	94.75'	**12.0" Round Culvert** L= 100.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 94.75' / 93.75' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	95.55'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	93.33'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.06 cfs @ 11.15 hrs HW=93.36' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.33' (Free Discharge)
└─**1=Culvert** (Controls 0.00 cfs)
  └─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond UIS-1: Underground Infiltration System #1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

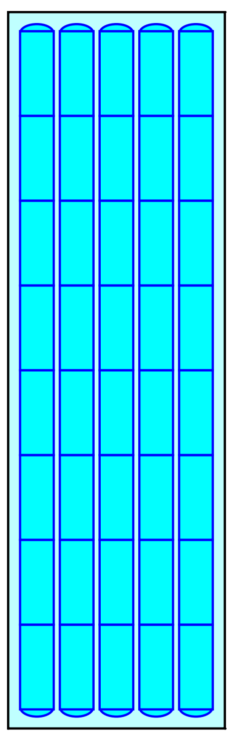
8 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 58.16' Row Length +12.0" End Stone x 2 = 60.16' Base Length
5 Rows x 34.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 18.17' Base Width
6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

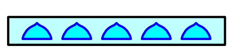
40 Chambers x 14.7 cf = 589.7 cf Chamber Storage

2,550.1 cf Field - 589.7 cf Chambers = 1,960.4 cf Stone x 35.0% Voids = 686.2 cf Stone Storage

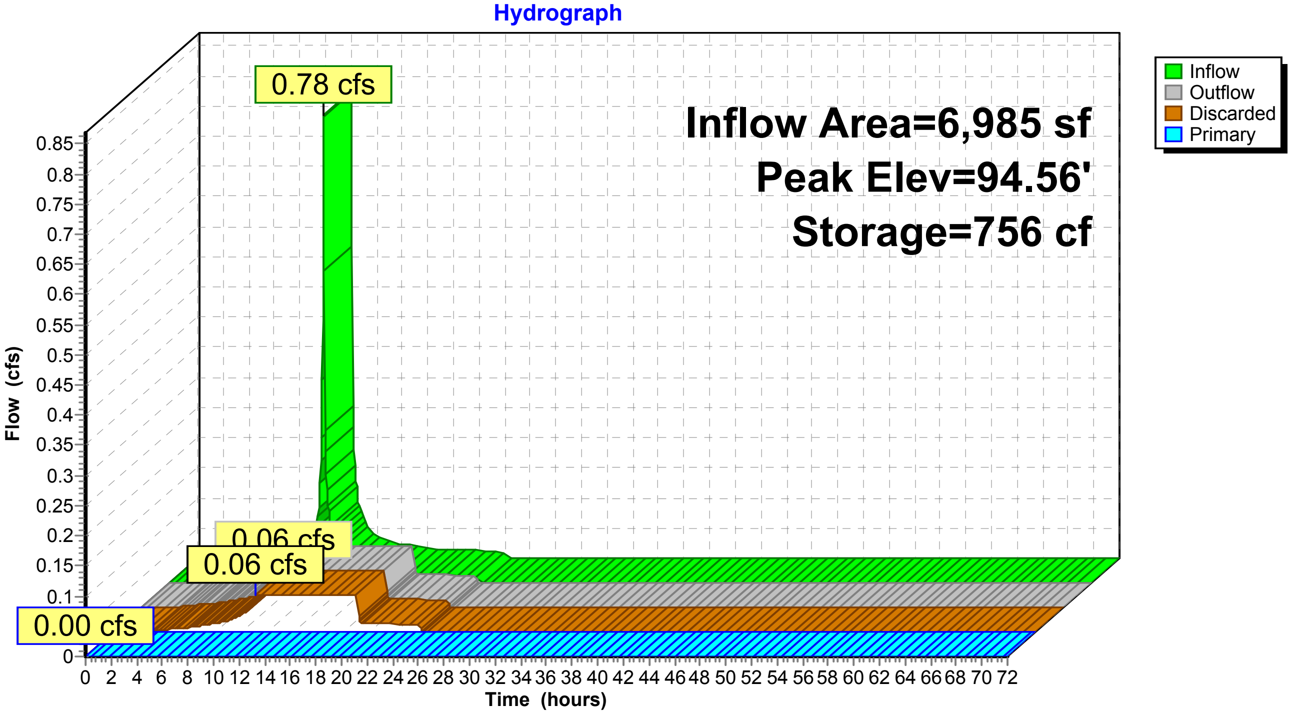
Chamber Storage + Stone Storage = 1,275.8 cf = 0.029 af
Overall Storage Efficiency = 50.0%
Overall System Size = 60.16' x 18.17' x 2.33'

40 Chambers
94.4 cy Field
72.6 cy Stone





Pond UIS-1: Underground Infiltration System #1



Summary for Pond UIS-2: Underground Infiltration System 2

Inflow Area = 33,054 sf, 81.96% Impervious, Inflow Depth = 3.83" for 10-Year event
Inflow = 3.34 cfs @ 12.05 hrs, Volume= 10,548 cf
Outflow = 0.17 cfs @ 10.75 hrs, Volume= 10,549 cf, Atten= 95%, Lag= 0.0 min
Discarded = 0.17 cfs @ 10.75 hrs, Volume= 10,549 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP1 : Flow to Exisitng Drainage on Pinevale Avenue

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 95.48' @ 14.04 hrs Surf.Area= 3,039 sf Storage= 4,074 cf

Plug-Flow detention time= 206.8 min calculated for 10,542 cf (100% of inflow)
Center-of-Mass det. time= 206.8 min (999.9 - 793.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	93.50'	2,785 cf	**77.50'W x 39.22'L x 3.50'H Field A** 10,638 cf Overall - 3,675 cf Embedded = 6,962 cf x 40.0% Voids
#2A	94.00'	3,675 cf	**ADS_StormTech SC-740 +Cap** x 80 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 80 Chambers in 16 Rows
		6,460 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	93.00'	**12.0" Round Culvert** L= 100.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 93.00' / 92.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	96.77'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	93.50'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.17 cfs @ 10.75 hrs HW=93.54' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.50' (Free Discharge)
└─**1=Culvert** (Passes 0.00 cfs of 0.75 cfs potential flow)
  └─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond UIS-2: Underground Infiltration System 2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
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

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

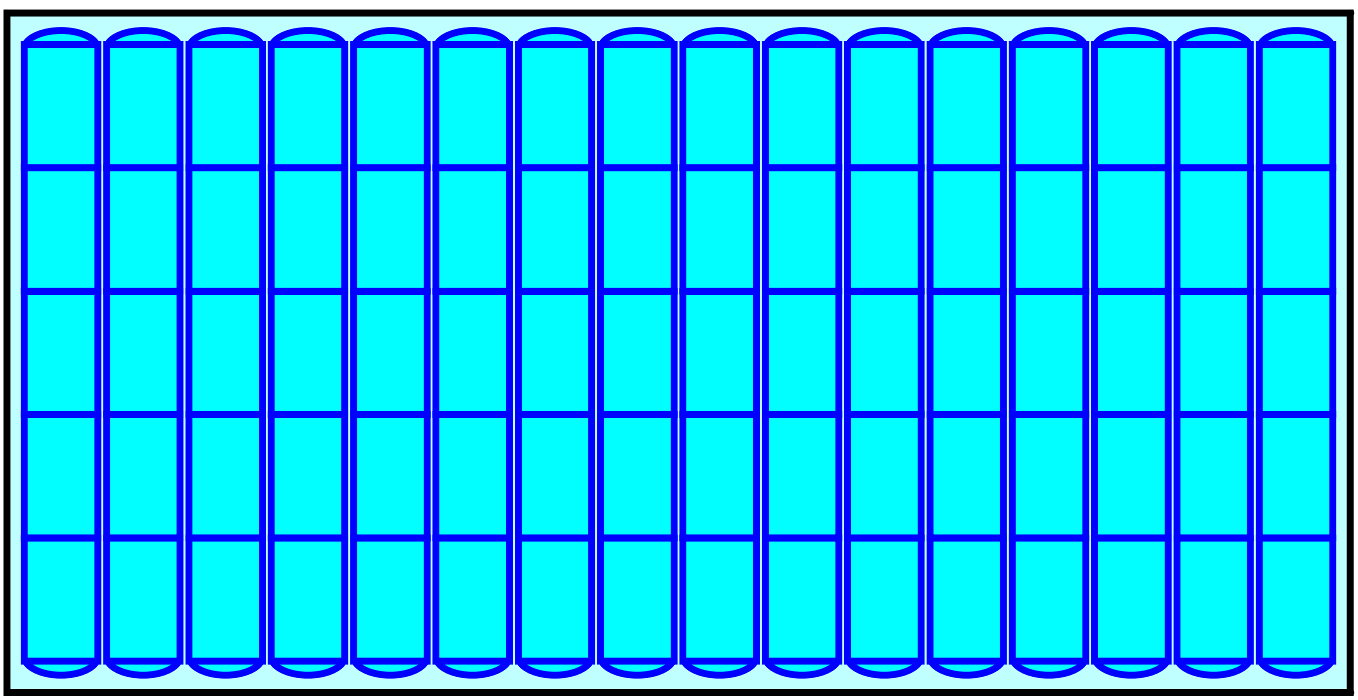
5 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 37.22' Row Length +12.0" End Stone x 2 = 39.22' Base Length
16 Rows x 51.0" Wide + 6.0" Spacing x 15 + 12.0" Side Stone x 2 = 77.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

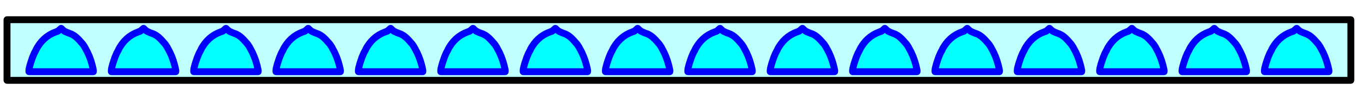
80 Chambers x 45.9 cf = 3,675.2 cf Chamber Storage

10,637.5 cf Field - 3,675.2 cf Chambers = 6,962.3 cf Stone x 40.0% Voids = 2,784.9 cf Stone Storage

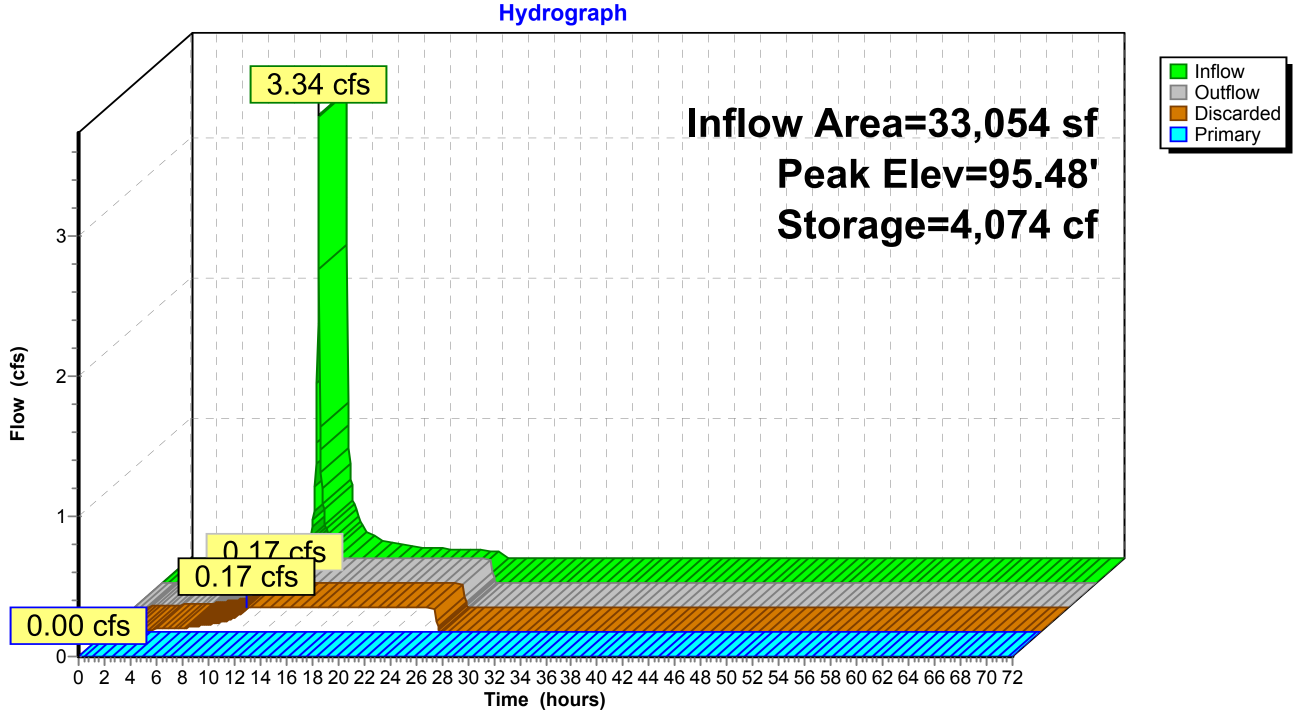
Chamber Storage + Stone Storage = 6,460.1 cf = 0.148 af
Overall Storage Efficiency = 60.7%
Overall System Size = 39.22' x 77.50' x 3.50'

80 Chambers
394.0 cy Field
257.9 cy Stone





Pond UIS-2: Underground Infiltration System 2

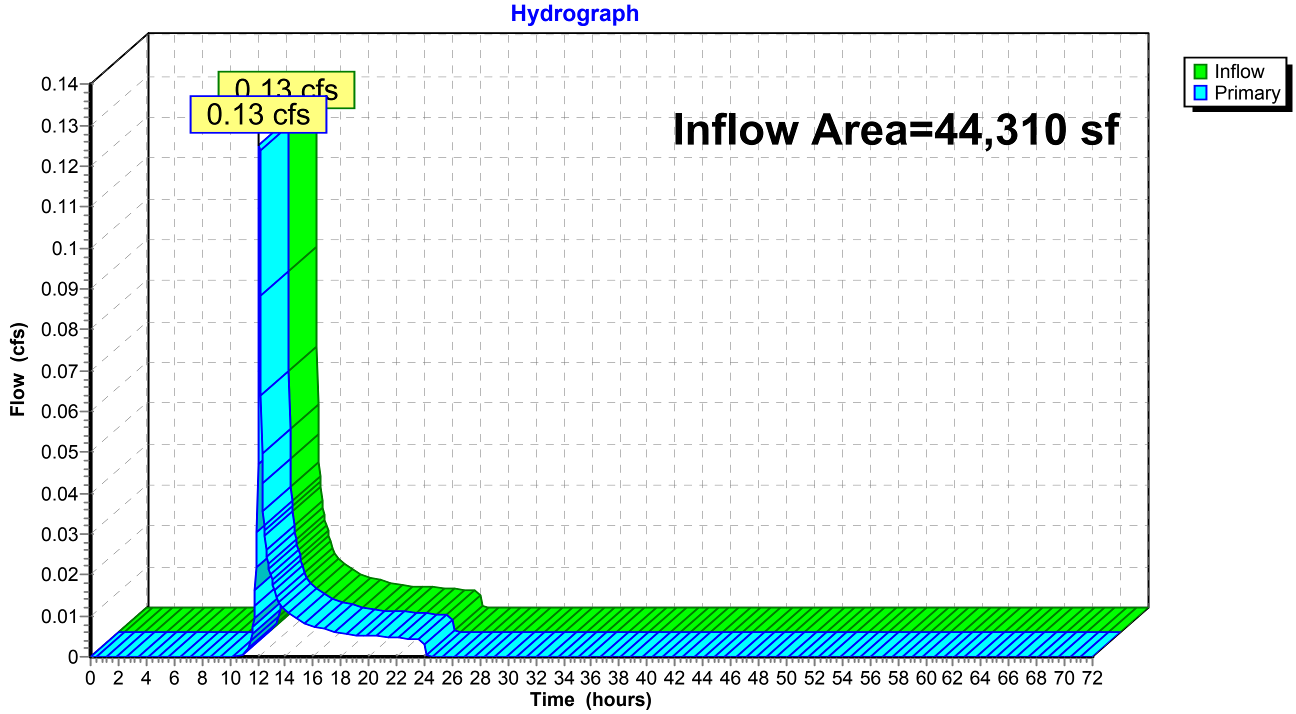


Summary for Link SP1: Flow to Exisitng Drainage on Pinevale Avenue

Inflow Area = 44,310 sf, 77.95% Impervious, Inflow Depth = 0.12" for 10-Year event
Inflow = 0.13 cfs @ 12.14 hrs, Volume= 458 cf
Primary = 0.13 cfs @ 12.14 hrs, Volume= 458 cf, Atten= 0%, Lag= 0.0 min
Routed to Link SP2 : Flow to Exisitng Drainage on Main Street

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

Link SP1: Flow to Exisitng Drainage on Pinevale Avenue

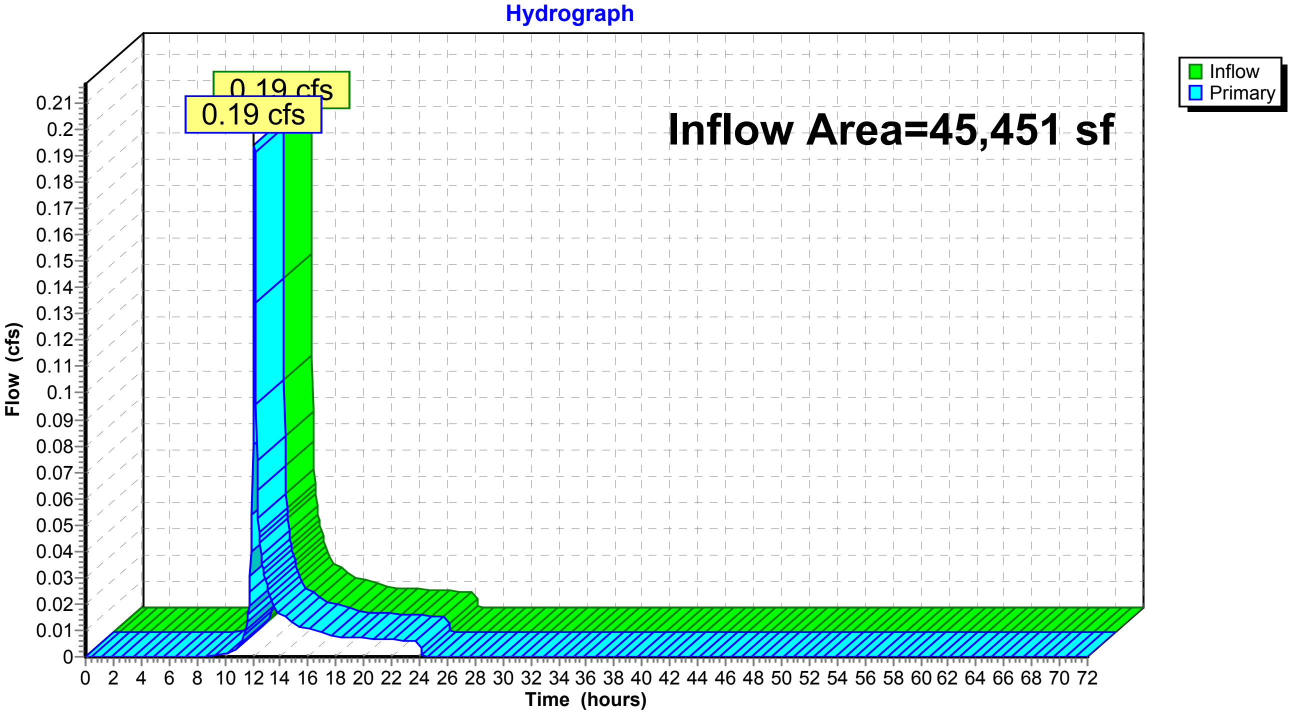


Summary for Link SP2: Flow to Exisitng Drainage on Main Street

Inflow Area = 45,451 sf, 77.46% Impervious, Inflow Depth = 0.18" for 10-Year event
Inflow = 0.19 cfs @ 12.14 hrs, Volume= 690 cf
Primary = 0.19 cfs @ 12.14 hrs, Volume= 690 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

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

Link SP2: Flow to Exisitng Drainage on Main Street

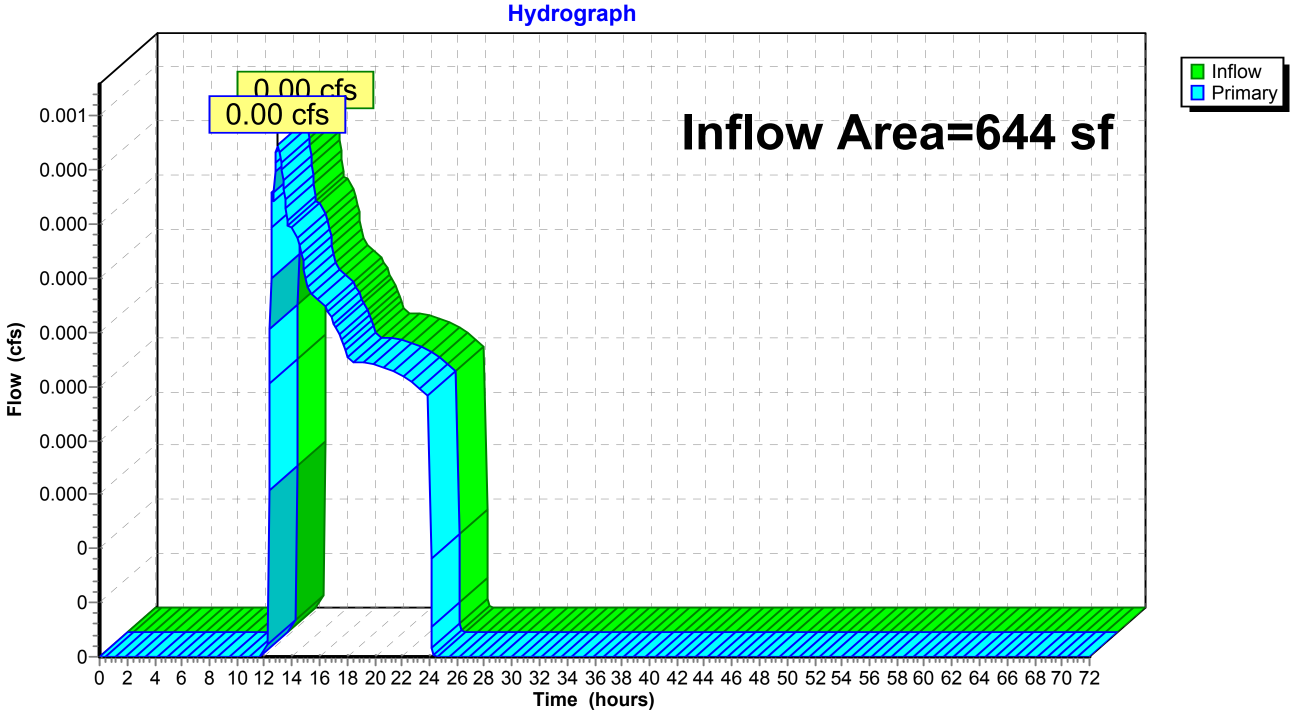


Summary for Link SP3: Flow to Wetlands

Inflow Area = 644 sf, 0.00% Impervious, Inflow Depth = 0.24" for 10-Year event
Inflow = 0.00 cfs @ 12.95 hrs, Volume= 13 cf
Primary = 0.00 cfs @ 12.95 hrs, Volume= 13 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

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

Link SP3: Flow to Wetlands



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

Subcatchment P-1A: Subcat P-1A Runoff Area=4,271 sf 31.49% Impervious Runoff Depth=2.01"
Tc=6.0 min CN=58 Runoff=0.21 cfs 716 cf

Subcatchment P-1B: Subcat P-1B Runoff Area=6,985 sf 87.39% Impervious Runoff Depth=5.35"
Tc=0.0 min CN=91 Runoff=0.98 cfs 3,114 cf

Subcatchment P-1C: Subcat P-1C Runoff Area=16,937 sf 69.86% Impervious Runoff Depth=4.14"
Tc=0.0 min CN=80 Runoff=1.96 cfs 5,849 cf

Subcatchment P-1D: Subcat P-1D Runoff Area=7,225 sf 88.12% Impervious Runoff Depth=5.35"
Tc=0.0 min CN=91 Runoff=1.01 cfs 3,221 cf

Subcatchment P-2: Subcatchment P-2 Runoff Area=1,141 sf 58.27% Impervious Runoff Depth=3.42"
Tc=6.0 min CN=73 Runoff=0.10 cfs 325 cf

Subcatchment P-3: Subcatchment P-3 Runoff Area=644 sf 0.00% Impervious Runoff Depth=0.57"
Tc=6.0 min CN=39 Runoff=0.00 cfs 30 cf

Subcatchment R-1: Subcat R-1 Runoff Area=8,892 sf 100.00% Impervious Runoff Depth=6.16"
Tc=0.0 min CN=98 Runoff=1.31 cfs 4,565 cf

Pond UIS-1: Underground Infiltration System Peak Elev=95.16' Storage=1,085 cf Inflow=0.98 cfs 3,114 cf
Discarded=0.06 cfs 3,114 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 3,114 cf

Pond UIS-2: Underground Infiltration System Peak Elev=96.55' Storage=5,913 cf Inflow=4.28 cfs 13,635 cf
Discarded=0.17 cfs 13,637 cf Primary=0.00 cfs 0 cf Outflow=0.17 cfs 13,637 cf

Link SP1: Flow to Exisitng Drainage on Pinevale Avenue Inflow=0.21 cfs 716 cf
Primary=0.21 cfs 716 cf

Link SP2: Flow to Exisitng Drainage on Main Street Inflow=0.30 cfs 1,041 cf
Primary=0.30 cfs 1,041 cf

Link SP3: Flow to Wetlands Inflow=0.00 cfs 30 cf
Primary=0.00 cfs 30 cf

Total Runoff Area = 46,095 sf Runoff Volume = 17,820 cf Average Runoff Depth = 4.64"
23.63% Pervious = 10,890 sf 76.37% Impervious = 35,204 sf

Summary for Subcatchment P-1A: Subcat P-1A

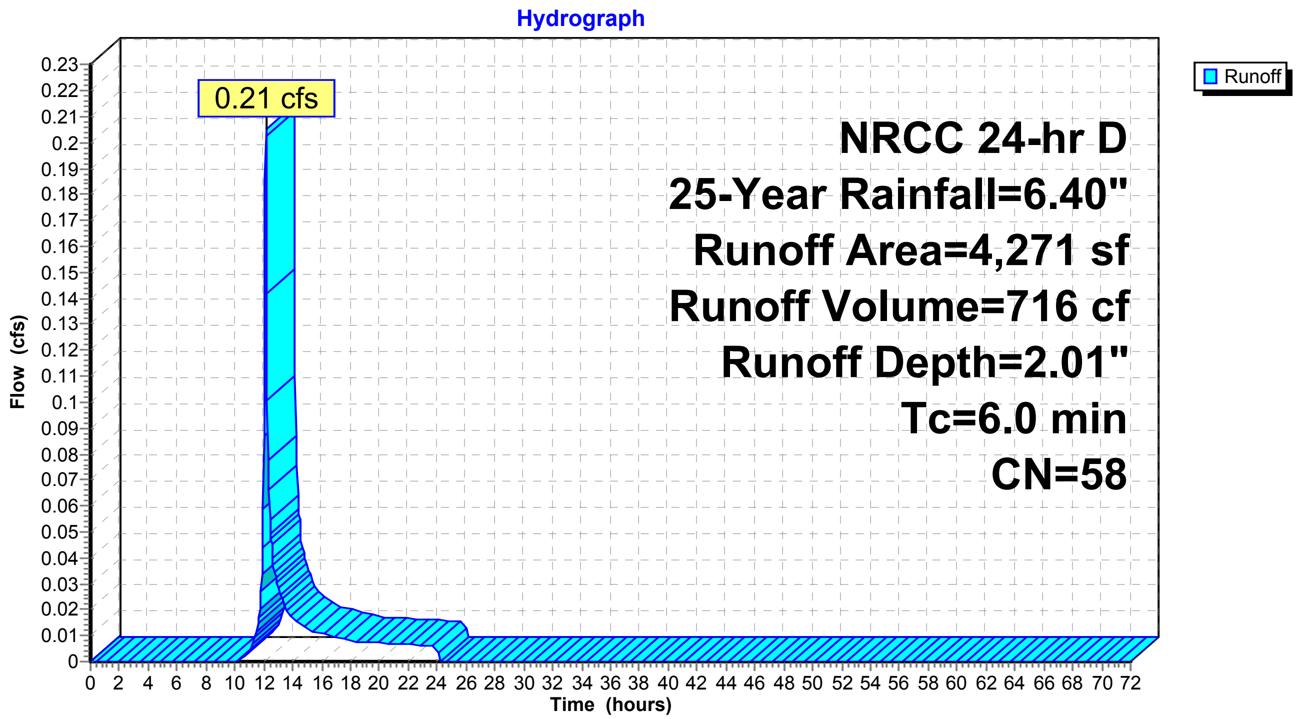
Runoff = 0.21 cfs @ 12.14 hrs, Volume= 716 cf, Depth= 2.01"
Routed to Link SP1 : Flow to Exisitng Drainage on Pinevale Avenue

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=6.40"

Area (sf)	CN	Description
2,926	39	>75% Grass cover, Good, HSG A
490	98	Paved parking, HSG A
855	98	Roofs, HSG A
4,271	58	Weighted Average
2,926		68.51% Pervious Area
1,345		31.49% Impervious Area

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

Subcatchment P-1A: Subcat P-1A



Summary for Subcatchment P-1B: Subcat P-1B

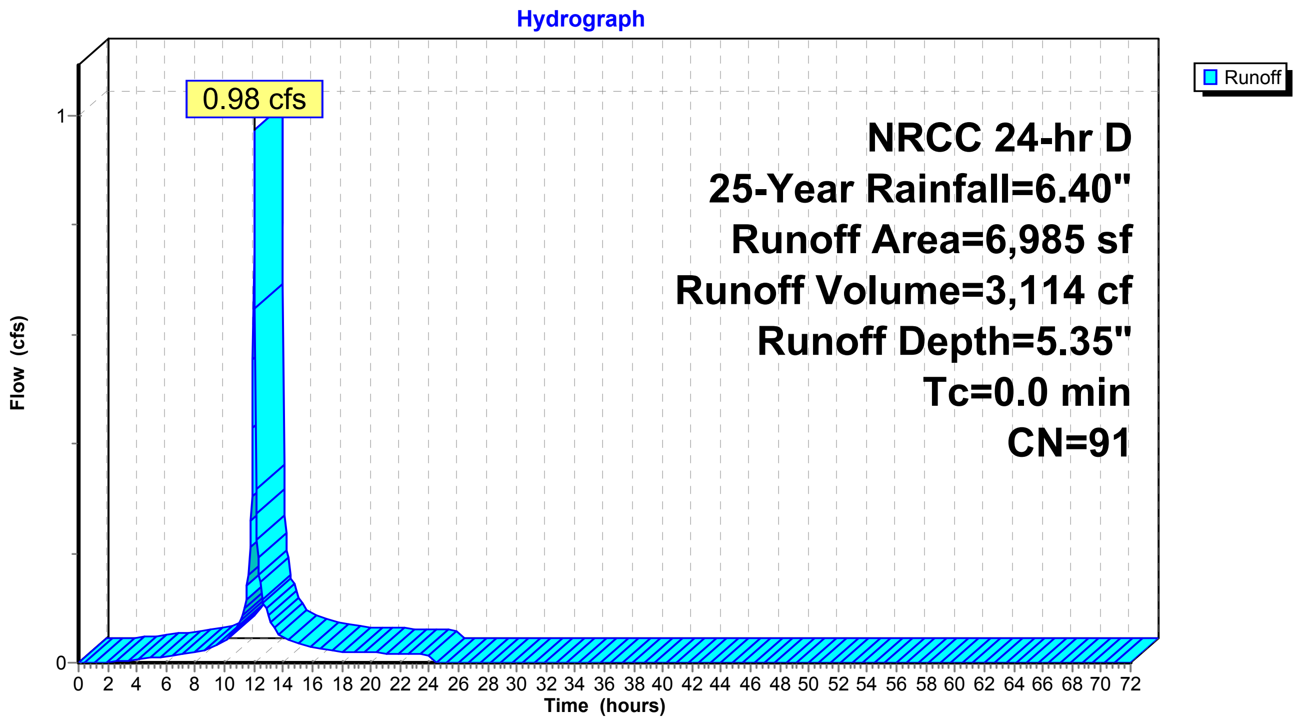
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.98 cfs @ 12.04 hrs, Volume= 3,114 cf, Depth= 5.35"
Routed to Pond UIS-1 : Underground Infiltration System #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=6.40"

Area (sf)	CN	Description
881	39	>75% Grass cover, Good, HSG A
6,105	98	Paved parking, HSG A
6,985	91	Weighted Average
881		12.61% Pervious Area
6,105		87.39% Impervious Area

Subcatchment P-1B: Subcat P-1B



Summary for Subcatchment P-1C: Subcat P-1C

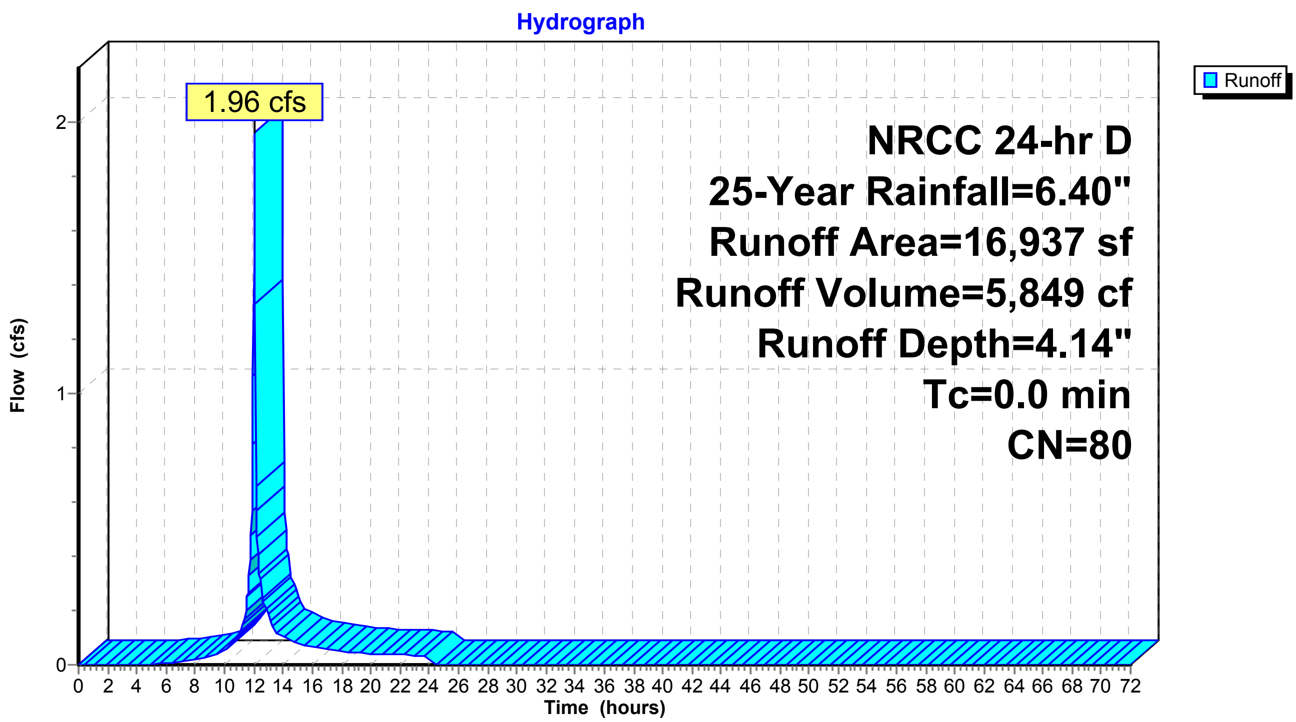
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.96 cfs @ 12.05 hrs, Volume= 5,849 cf, Depth= 4.14"
Routed to Pond UIS-2 : Underground Infiltration System 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=6.40"

Area (sf)	CN	Description
5,105	39	>75% Grass cover, Good, HSG A
192	98	Roofs, HSG A
11,640	98	Paved parking, HSG A
16,937	80	Weighted Average
5,105		30.14% Pervious Area
11,832		69.86% Impervious Area

Subcatchment P-1C: Subcat P-1C



Summary for Subcatchment P-1D: Subcat P-1D

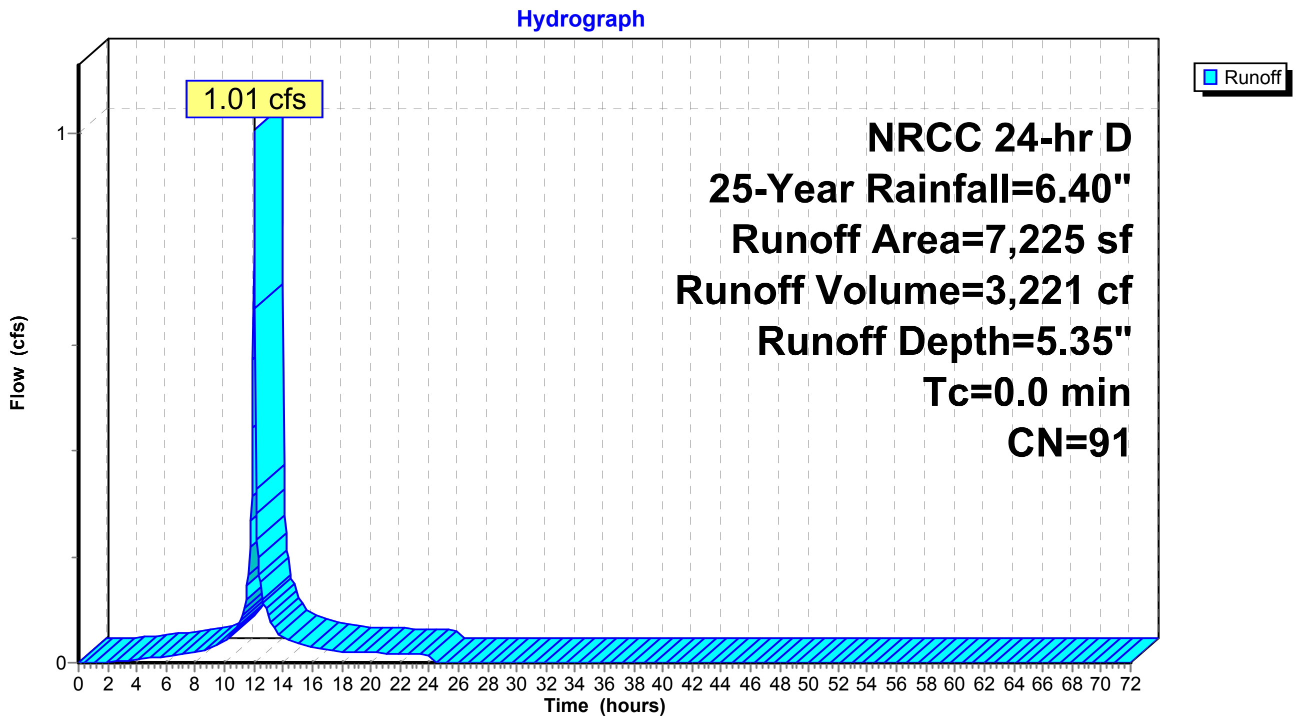
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.01 cfs @ 12.04 hrs, Volume= 3,221 cf, Depth= 5.35"
Routed to Pond UIS-2 : Underground Infiltration System 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=6.40"

Area (sf)	CN	Description
858	39	>75% Grass cover, Good, HSG A
6,366	98	Paved parking, HSG A
7,225	91	Weighted Average
858		11.88% Pervious Area
6,366		88.12% Impervious Area

Subcatchment P-1D: Subcat P-1D



Summary for Subcatchment P-2: Subcatchment P-2

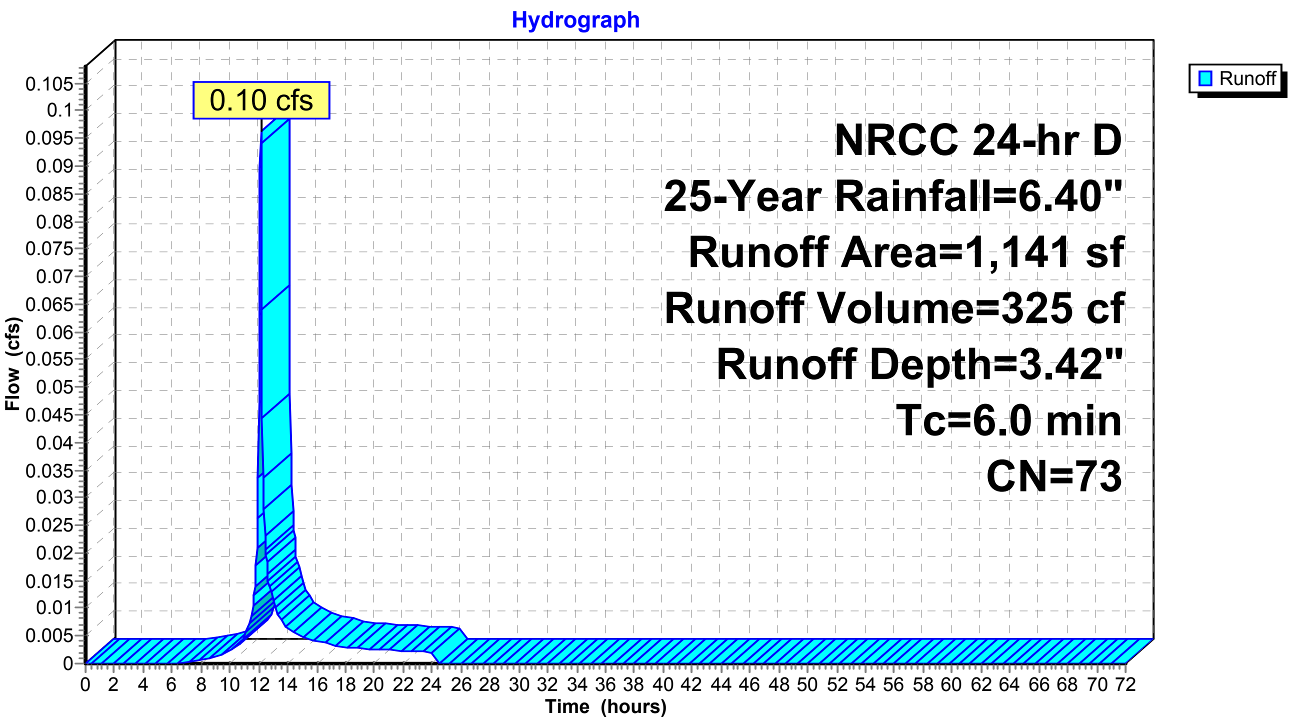
Runoff = 0.10 cfs @ 12.13 hrs, Volume= 325 cf, Depth= 3.42"
Routed to Link SP2 : Flow to Exisitng Drainage on Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=6.40"

Area (sf)	CN	Description
476	39	>75% Grass cover, Good, HSG A
665	98	Paved parking, HSG A
1,141	73	Weighted Average
476		41.73% Pervious Area
665		58.27% Impervious Area

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

Subcatchment P-2: Subcatchment P-2



Summary for Subcatchment P-3: Subcatchment P-3

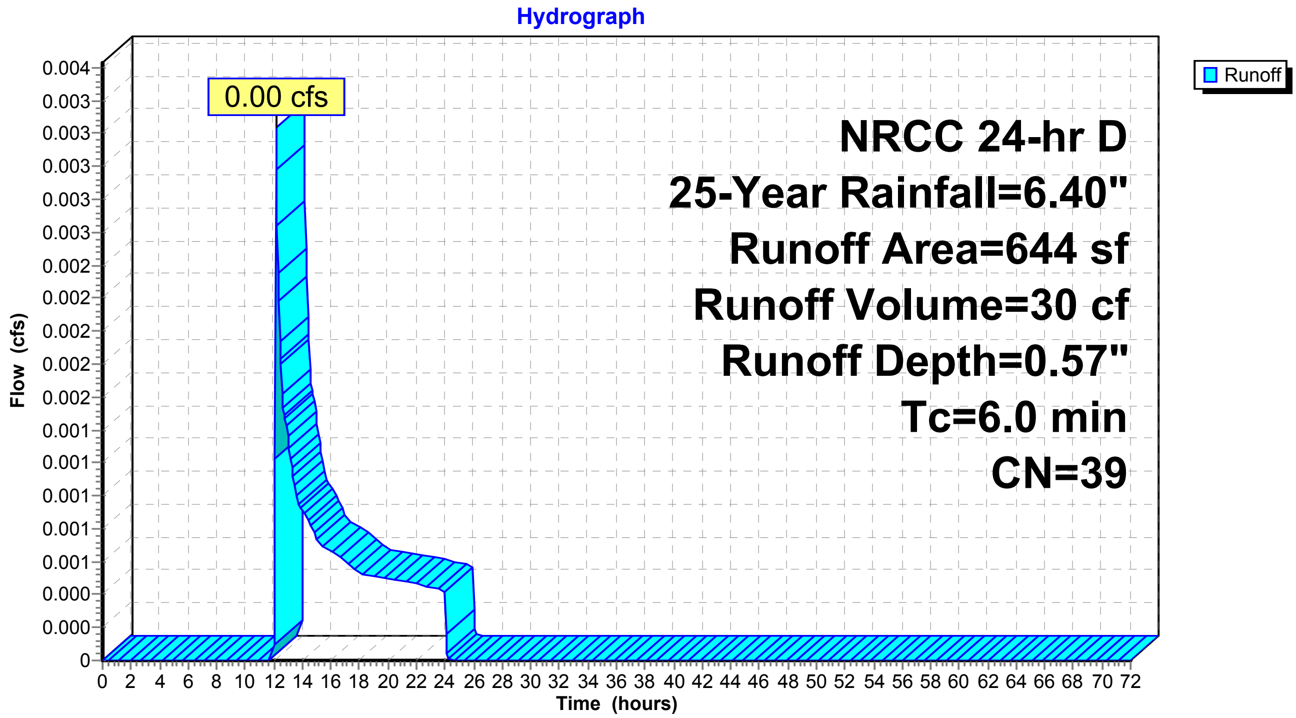
Runoff = 0.00 cfs @ 12.17 hrs, Volume= 30 cf, Depth= 0.57"
Routed to Link SP3 : Flow to Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=6.40"

Area (sf)	CN	Description
644	39	>75% Grass cover, Good, HSG A
644		100.00% Pervious Area

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

Subcatchment P-3: Subcatchment P-3



Summary for Subcatchment R-1: Subcat R-1

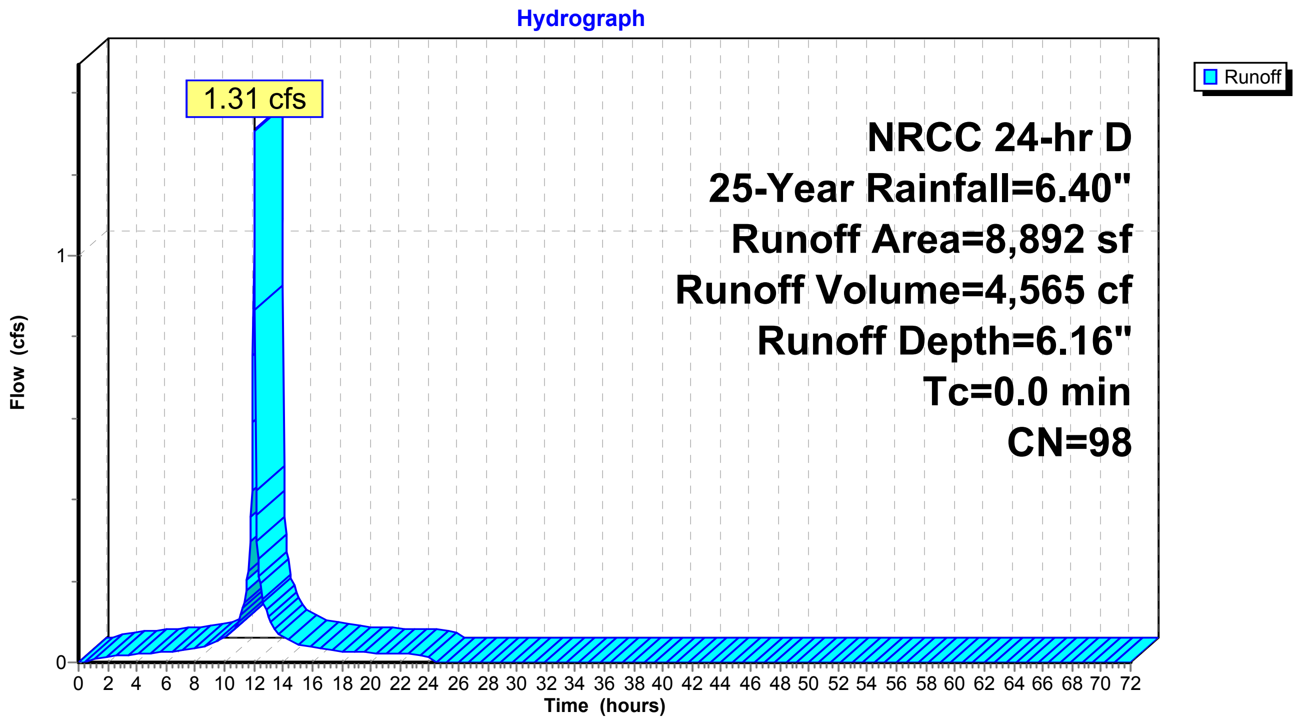
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.31 cfs @ 12.04 hrs, Volume= 4,565 cf, Depth= 6.16"
Routed to Pond UIS-2 : Underground Infiltration System 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=6.40"

Area (sf)	CN	Description
8,892	98	Roofs, HSG A
8,892		100.00% Impervious Area

Subcatchment R-1: Subcat R-1



Summary for Pond UIS-1: Underground Infiltration System #1

Inflow Area = 6,985 sf, 87.39% Impervious, Inflow Depth = 5.35" for 25-Year event
Inflow = 0.98 cfs @ 12.04 hrs, Volume= 3,114 cf
Outflow = 0.06 cfs @ 10.85 hrs, Volume= 3,114 cf, Atten= 94%, Lag= 0.0 min
Discarded = 0.06 cfs @ 10.85 hrs, Volume= 3,114 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP1 : Flow to Exisitng Drainage on Pinevale Avenue

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 95.16' @ 13.41 hrs Surf.Area= 1,093 sf Storage= 1,085 cf

Plug-Flow detention time= 134.7 min calculated for 3,112 cf (100% of inflow)
Center-of-Mass det. time= 134.7 min (917.6 - 782.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	93.33'	686 cf	**18.17'W x 60.16'L x 2.33'H Field A** 2,550 cf Overall - 590 cf Embedded = 1,960 cf x 35.0% Voids
#2A	93.83'	590 cf	**ADS_StormTech SC-310 +Cap** x 40 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 40 Chambers in 5 Rows
		1,276 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	94.75'	**12.0" Round Culvert** L= 100.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 94.75' / 93.75' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	95.55'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	93.33'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.06 cfs @ 10.85 hrs HW=93.35' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.33' (Free Discharge)
└─**1=Culvert** (Controls 0.00 cfs)
  └─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond UIS-1: Underground Infiltration System #1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

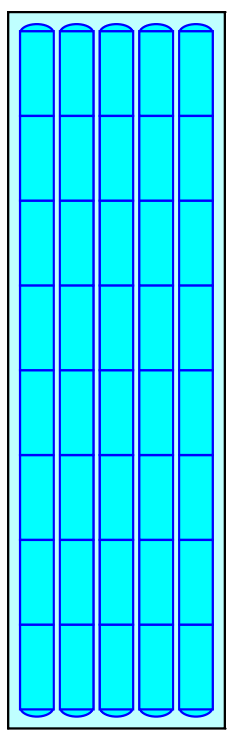
8 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 58.16' Row Length +12.0" End Stone x 2 = 60.16' Base Length
5 Rows x 34.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 18.17' Base Width
6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

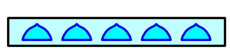
40 Chambers x 14.7 cf = 589.7 cf Chamber Storage

2,550.1 cf Field - 589.7 cf Chambers = 1,960.4 cf Stone x 35.0% Voids = 686.2 cf Stone Storage

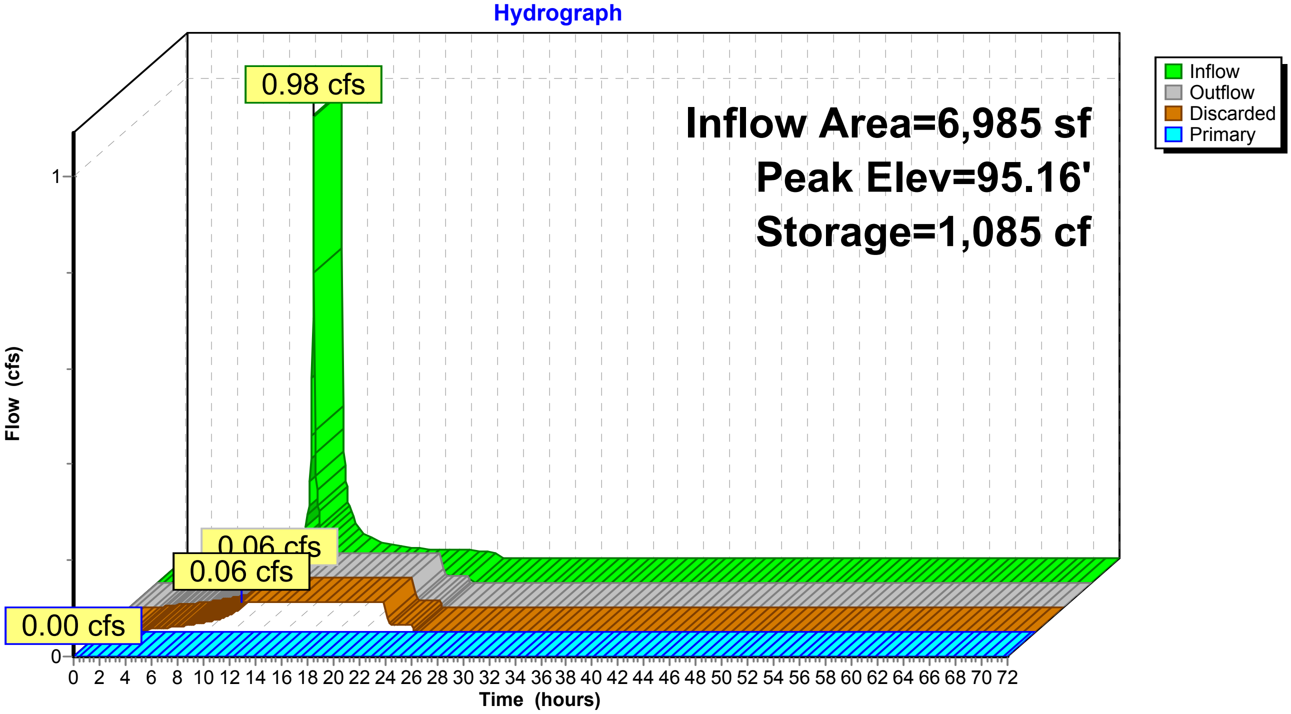
Chamber Storage + Stone Storage = 1,275.8 cf = 0.029 af
Overall Storage Efficiency = 50.0%
Overall System Size = 60.16' x 18.17' x 2.33'

40 Chambers
94.4 cy Field
72.6 cy Stone





Pond UIS-1: Underground Infiltration System #1



Summary for Pond UIS-2: Underground Infiltration System 2

Inflow Area = 33,054 sf, 81.96% Impervious, Inflow Depth = 4.95" for 25-Year event
Inflow = 4.28 cfs @ 12.05 hrs, Volume= 13,635 cf
Outflow = 0.17 cfs @ 10.25 hrs, Volume= 13,637 cf, Atten= 96%, Lag= 0.0 min
Discarded = 0.17 cfs @ 10.25 hrs, Volume= 13,637 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP1 : Flow to Exisitng Drainage on Pinevale Avenue

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 96.55' @ 14.75 hrs Surf.Area= 3,039 sf Storage= 5,913 cf

Plug-Flow detention time= 313.0 min calculated for 13,627 cf (100% of inflow)
Center-of-Mass det. time= 313.1 min (1,099.7 - 786.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	93.50'	2,785 cf	**77.50'W x 39.22'L x 3.50'H Field A** 10,638 cf Overall - 3,675 cf Embedded = 6,962 cf x 40.0% Voids
#2A	94.00'	3,675 cf	**ADS_StormTech SC-740 +Cap** x 80 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 80 Chambers in 16 Rows
		6,460 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	93.00'	**12.0" Round Culvert** L= 100.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 93.00' / 92.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	96.77'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	93.50'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.17 cfs @ 10.25 hrs HW=93.54' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.50' (Free Discharge)
└─**1=Culvert** (Passes 0.00 cfs of 0.75 cfs potential flow)
  └─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond UIS-2: Underground Infiltration System 2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
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

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

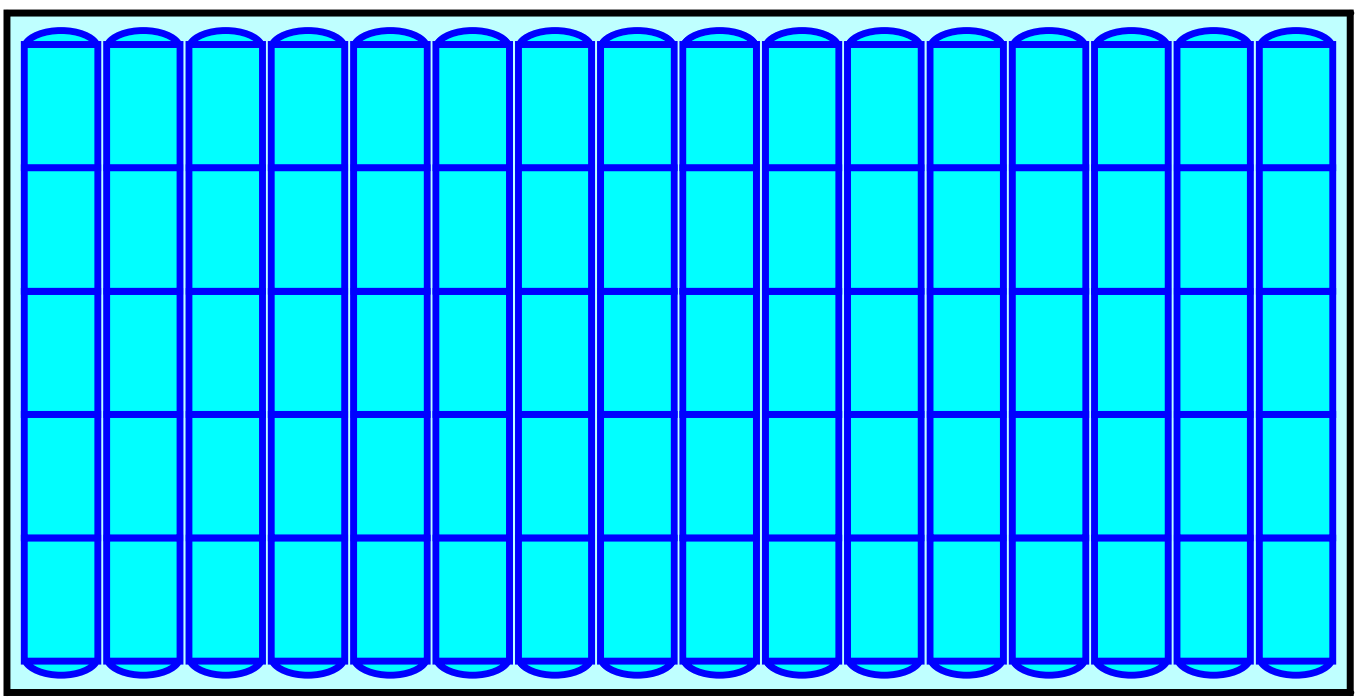
5 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 37.22' Row Length +12.0" End Stone x 2 = 39.22' Base Length
16 Rows x 51.0" Wide + 6.0" Spacing x 15 + 12.0" Side Stone x 2 = 77.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

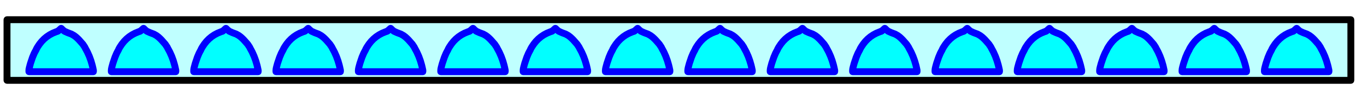
80 Chambers x 45.9 cf = 3,675.2 cf Chamber Storage

10,637.5 cf Field - 3,675.2 cf Chambers = 6,962.3 cf Stone x 40.0% Voids = 2,784.9 cf Stone Storage

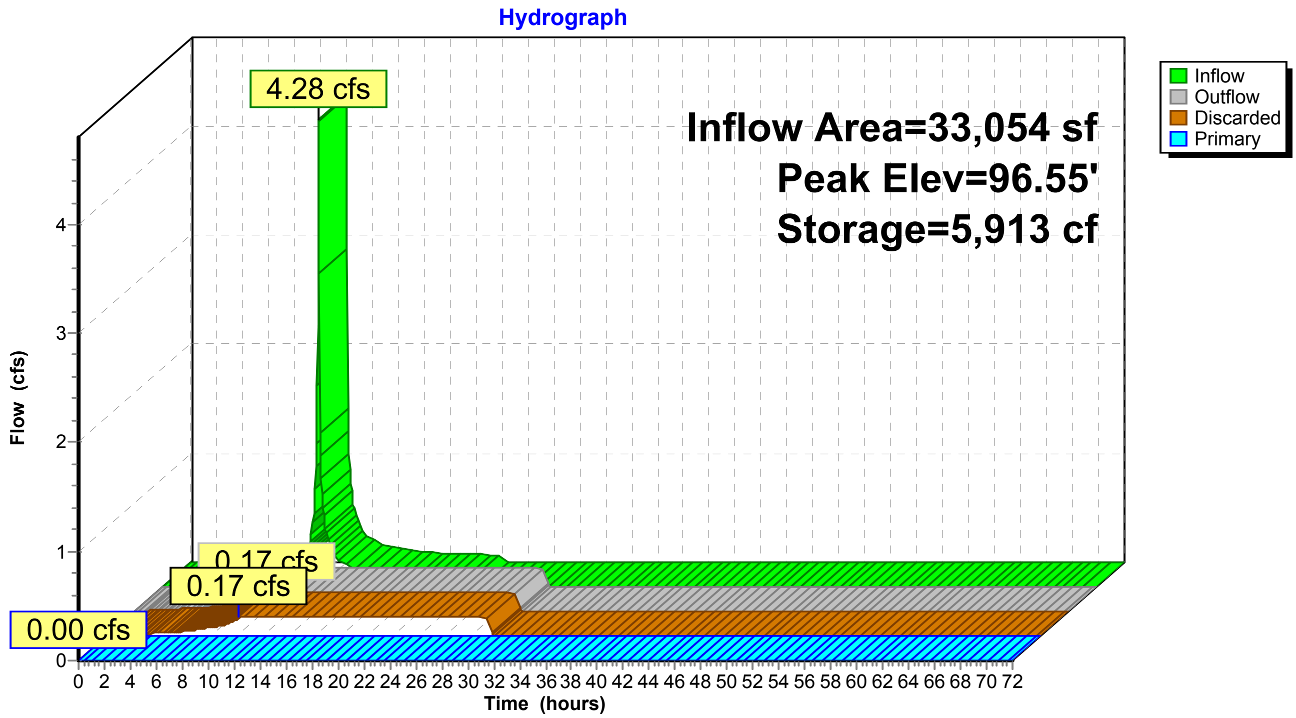
Chamber Storage + Stone Storage = 6,460.1 cf = 0.148 af
Overall Storage Efficiency = 60.7%
Overall System Size = 39.22' x 77.50' x 3.50'

80 Chambers
394.0 cy Field
257.9 cy Stone





Pond UIS-2: Underground Infiltration System 2

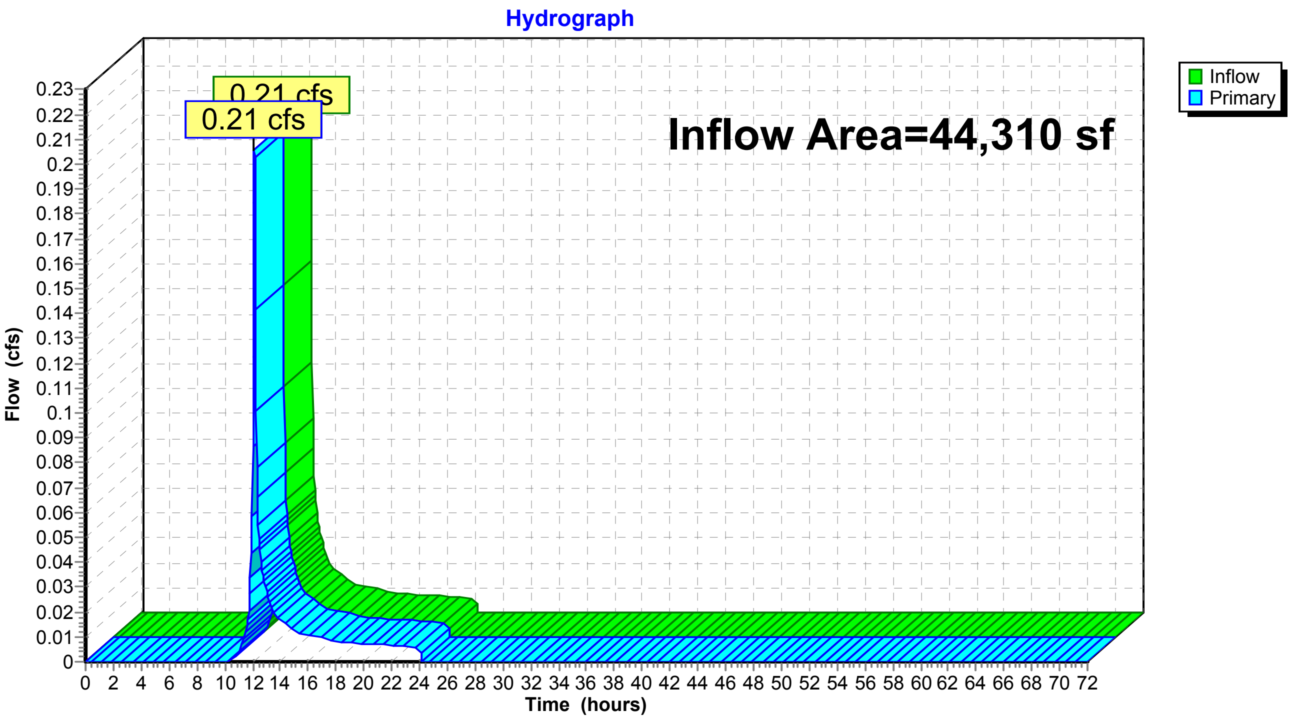


Summary for Link SP1: Flow to Exisitng Drainage on Pinevale Avenue

Inflow Area = 44,310 sf, 77.95% Impervious, Inflow Depth = 0.19" for 25-Year event
Inflow = 0.21 cfs @ 12.14 hrs, Volume= 716 cf
Primary = 0.21 cfs @ 12.14 hrs, Volume= 716 cf, Atten= 0%, Lag= 0.0 min
Routed to Link SP2 : Flow to Exisitng Drainage on Main Street

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

Link SP1: Flow to Exisitng Drainage on Pinevale Avenue

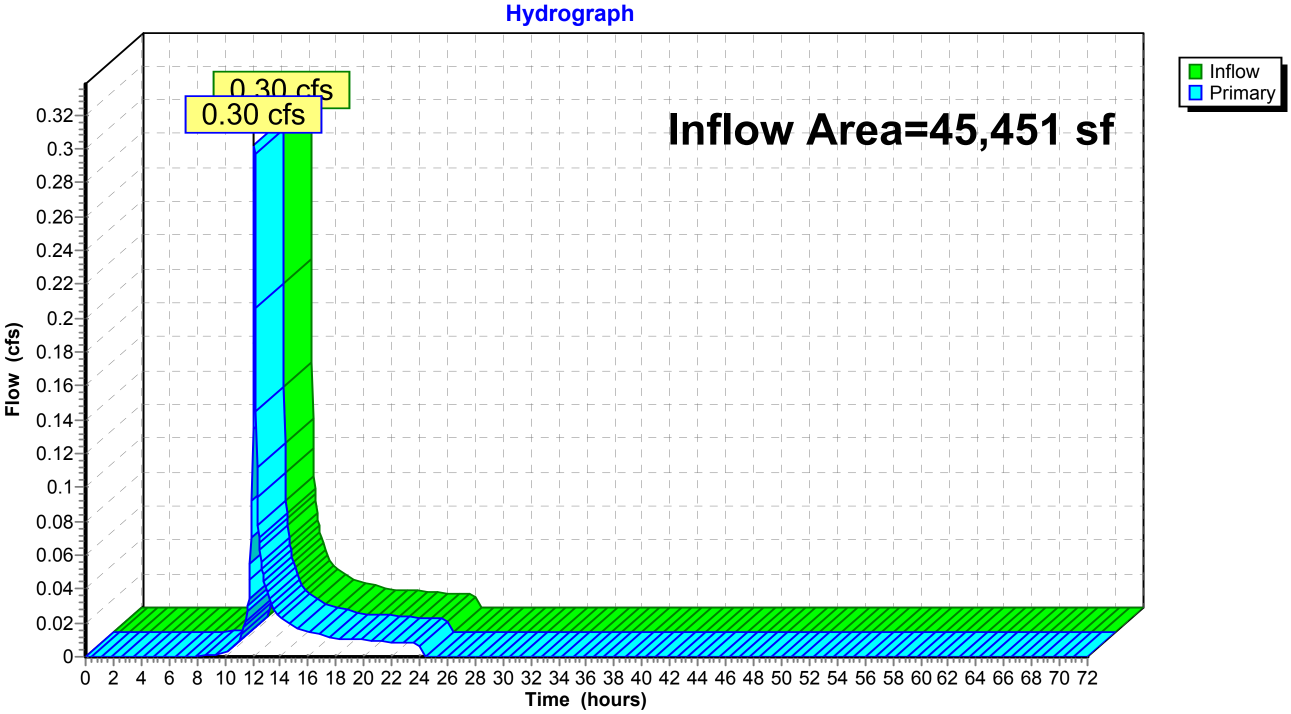


Summary for Link SP2: Flow to Exisitng Drainage on Main Street

Inflow Area = 45,451 sf, 77.46% Impervious, Inflow Depth = 0.27" for 25-Year event
Inflow = 0.30 cfs @ 12.13 hrs, Volume= 1,041 cf
Primary = 0.30 cfs @ 12.13 hrs, Volume= 1,041 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

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

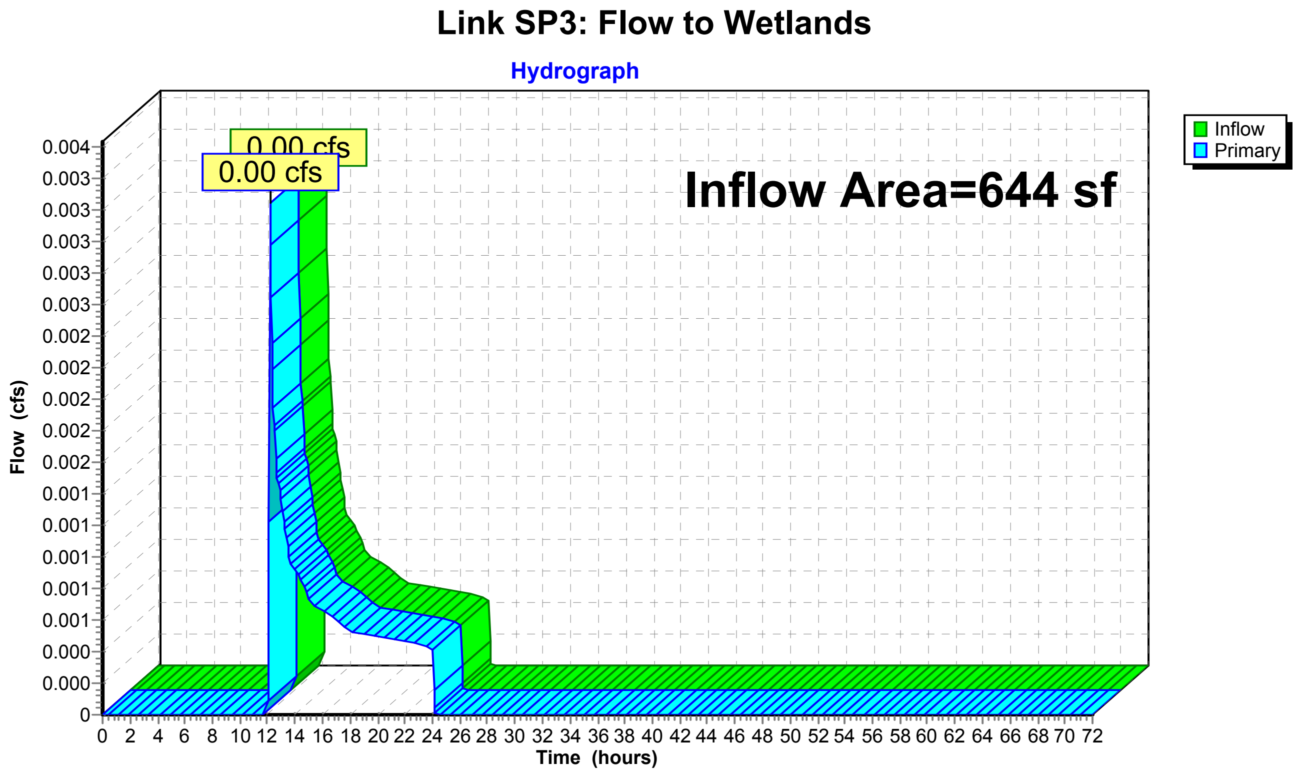
Link SP2: Flow to Exisitng Drainage on Main Street



Summary for Link SP3: Flow to Wetlands

Inflow Area = 644 sf, 0.00% Impervious, Inflow Depth = 0.57" for 25-Year event
Inflow = 0.00 cfs @ 12.17 hrs, Volume= 30 cf
Primary = 0.00 cfs @ 12.17 hrs, Volume= 30 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

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



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

Subcatchment P-1A: Subcat P-1A Runoff Area=4,271 sf 31.49% Impervious Runoff Depth=3.28"
Tc=6.0 min CN=58 Runoff=0.34 cfs 1,167 cf

Subcatchment P-1B: Subcat P-1B Runoff Area=6,985 sf 87.39% Impervious Runoff Depth=7.15"
Tc=0.0 min CN=91 Runoff=1.28 cfs 4,163 cf

Subcatchment P-1C: Subcat P-1C Runoff Area=16,937 sf 69.86% Impervious Runoff Depth=5.84"
Tc=0.0 min CN=80 Runoff=2.72 cfs 8,244 cf

Subcatchment P-1D: Subcat P-1D Runoff Area=7,225 sf 88.12% Impervious Runoff Depth=7.15"
Tc=0.0 min CN=91 Runoff=1.32 cfs 4,306 cf

Subcatchment P-2: Subcatchment P-2 Runoff Area=1,141 sf 58.27% Impervious Runoff Depth=5.01"
Tc=6.0 min CN=73 Runoff=0.14 cfs 477 cf

Subcatchment P-3: Subcatchment P-3 Runoff Area=644 sf 0.00% Impervious Runoff Depth=1.25"
Tc=6.0 min CN=39 Runoff=0.01 cfs 67 cf

Subcatchment R-1: Subcat R-1 Runoff Area=8,892 sf 100.00% Impervious Runoff Depth=7.99"
Tc=0.0 min CN=98 Runoff=1.69 cfs 5,920 cf

Pond UIS-1: Underground Infiltration System Peak Elev=95.63' Storage=1,262 cf Inflow=1.28 cfs 4,163 cf
Discarded=0.06 cfs 3,755 cf Primary=0.24 cfs 410 cf Outflow=0.31 cfs 4,166 cf

Pond UIS-2: Underground Infiltration System Peak Elev=96.97' Storage=6,426 cf Inflow=5.73 cfs 18,470 cf
Discarded=0.17 cfs 15,543 cf Primary=1.02 cfs 2,933 cf Outflow=1.19 cfs 18,477 cf

Link SP1: Flow to Exisitng Drainage on Pinevale Avenue Inflow=1.43 cfs 4,511 cf
Primary=1.43 cfs 4,511 cf

Link SP2: Flow to Exisitng Drainage on Main Street Inflow=1.48 cfs 4,987 cf
Primary=1.48 cfs 4,987 cf

Link SP3: Flow to Wetlands Inflow=0.01 cfs 67 cf
Primary=0.01 cfs 67 cf

Total Runoff Area = 46,095 sf Runoff Volume = 24,345 cf Average Runoff Depth = 6.34"
23.63% Pervious = 10,890 sf 76.37% Impervious = 35,204 sf

Summary for Subcatchment P-1A: Subcat P-1A

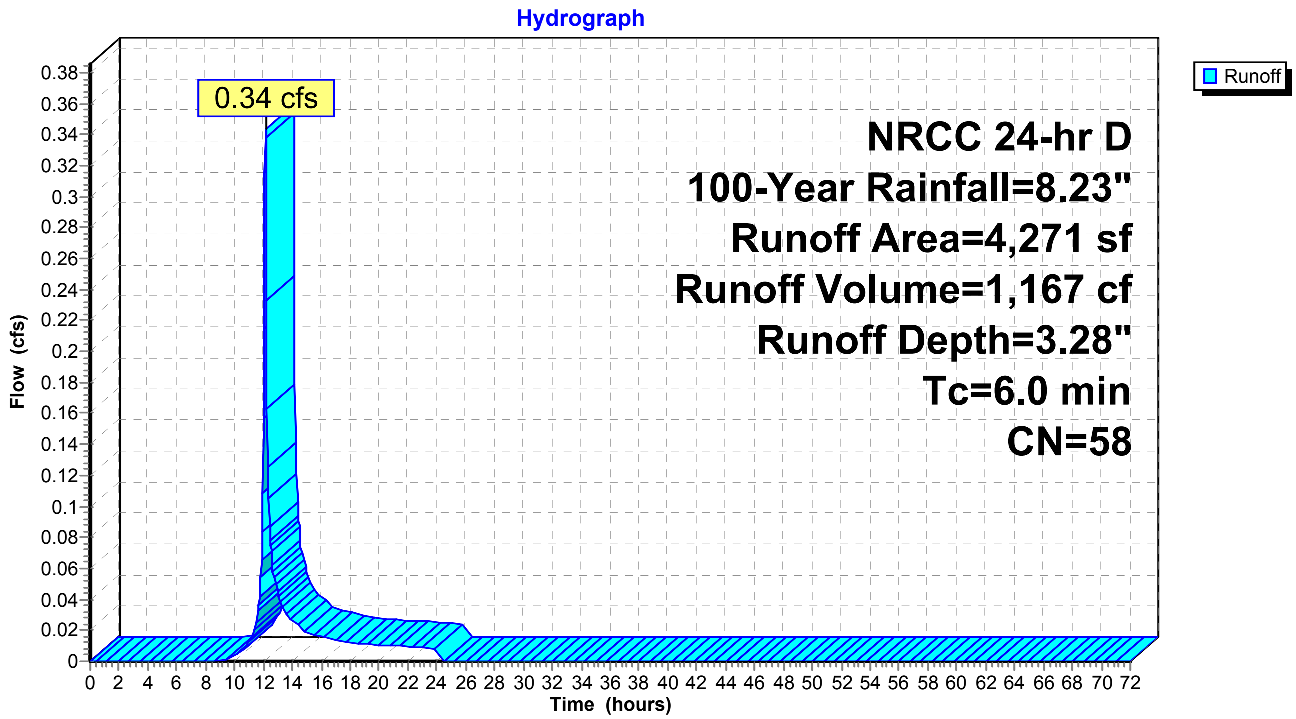
Runoff = 0.34 cfs @ 12.13 hrs, Volume= 1,167 cf, Depth= 3.28"
Routed to Link SP1 : Flow to Exisitng Drainage on Pinevale Avenue

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.23"

Area (sf)	CN	Description
2,926	39	>75% Grass cover, Good, HSG A
490	98	Paved parking, HSG A
855	98	Roofs, HSG A
4,271	58	Weighted Average
2,926		68.51% Pervious Area
1,345		31.49% Impervious Area

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

Subcatchment P-1A: Subcat P-1A



Summary for Subcatchment P-1B: Subcat P-1B

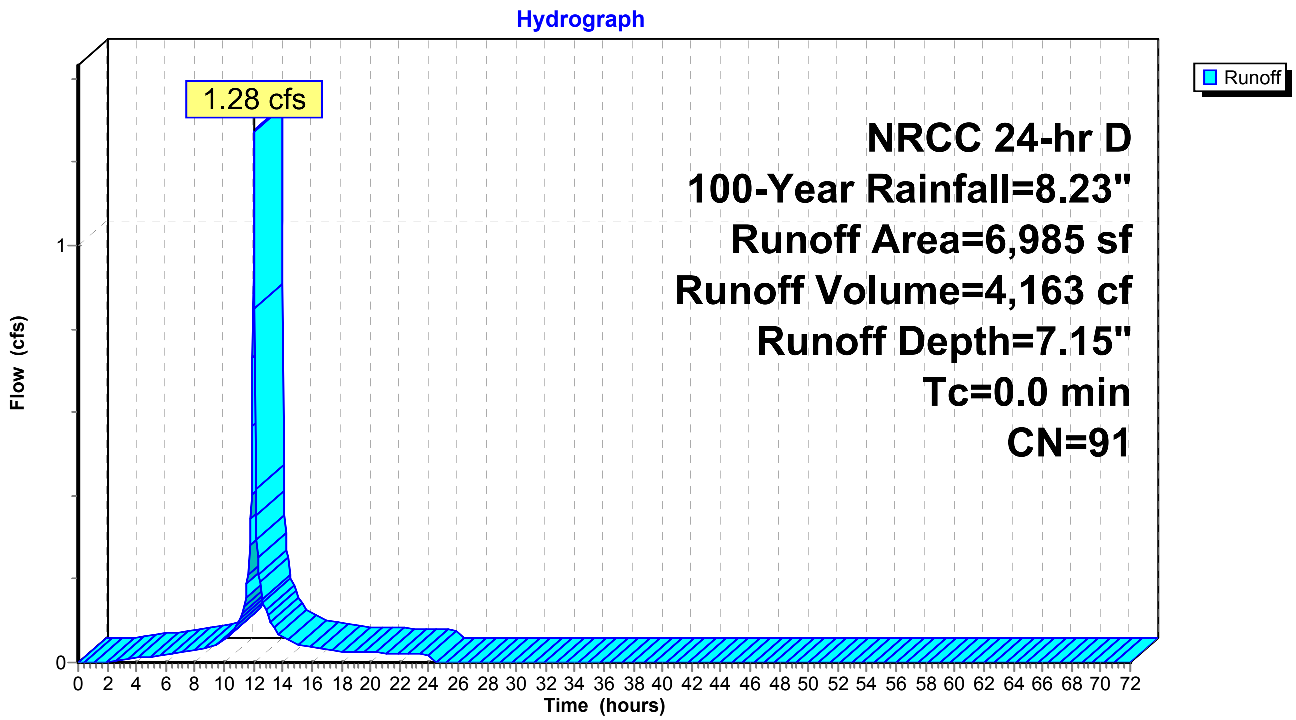
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.28 cfs @ 12.04 hrs, Volume= 4,163 cf, Depth= 7.15"
Routed to Pond UIS-1 : Underground Infiltration System #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.23"

Area (sf)	CN	Description
881	39	>75% Grass cover, Good, HSG A
6,105	98	Paved parking, HSG A
6,985	91	Weighted Average
881		12.61% Pervious Area
6,105		87.39% Impervious Area

Subcatchment P-1B: Subcat P-1B



Summary for Subcatchment P-1C: Subcat P-1C

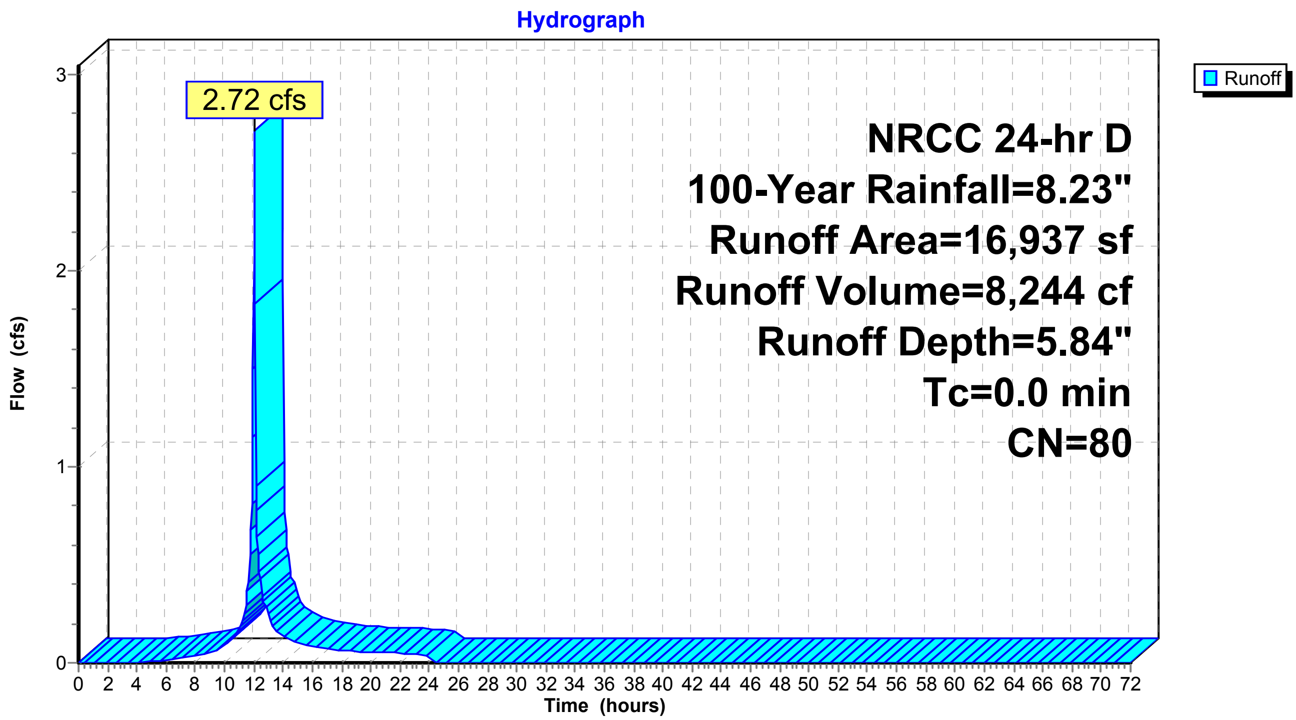
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 2.72 cfs @ 12.05 hrs, Volume= 8,244 cf, Depth= 5.84"
Routed to Pond UIS-2 : Underground Infiltration System 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.23"

Area (sf)	CN	Description
5,105	39	>75% Grass cover, Good, HSG A
192	98	Roofs, HSG A
11,640	98	Paved parking, HSG A
16,937	80	Weighted Average
5,105		30.14% Pervious Area
11,832		69.86% Impervious Area

Subcatchment P-1C: Subcat P-1C



Summary for Subcatchment P-1D: Subcat P-1D

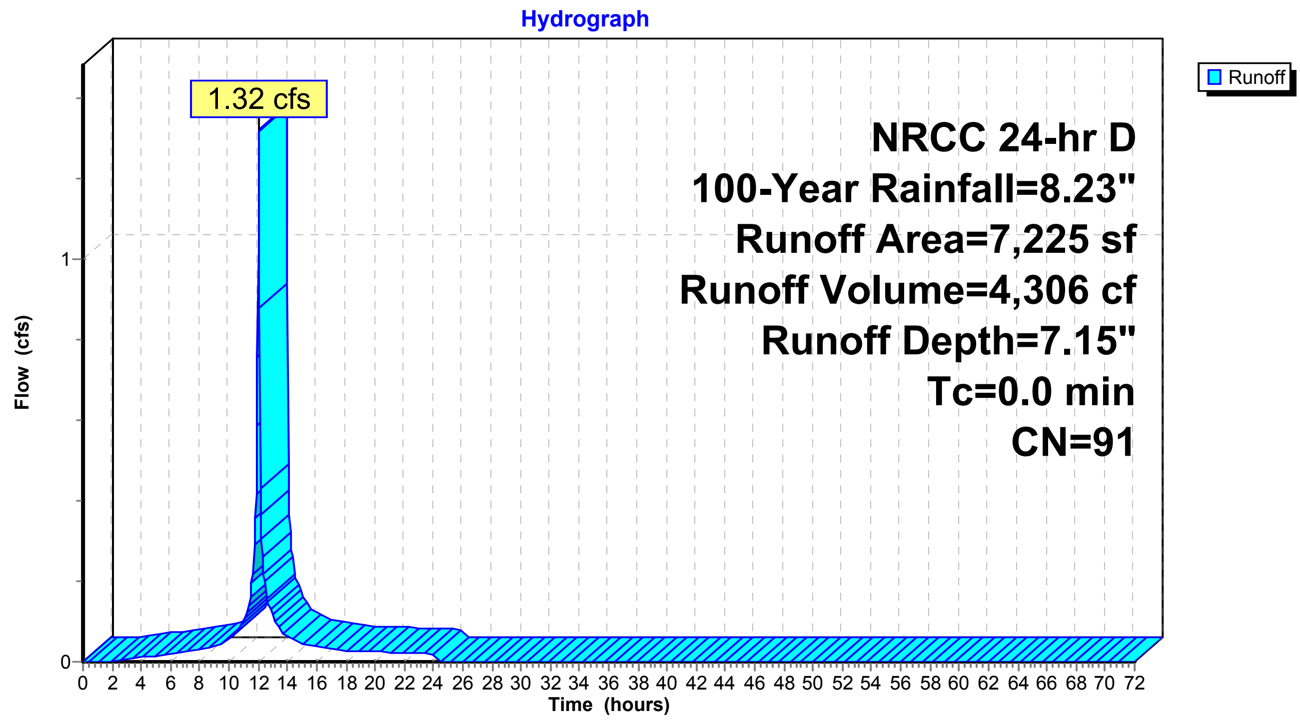
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.32 cfs @ 12.04 hrs, Volume= 4,306 cf, Depth= 7.15"
Routed to Pond UIS-2 : Underground Infiltration System 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.23"

Area (sf)	CN	Description
858	39	>75% Grass cover, Good, HSG A
6,366	98	Paved parking, HSG A
7,225	91	Weighted Average
858		11.88% Pervious Area
6,366		88.12% Impervious Area

Subcatchment P-1D: Subcat P-1D



Summary for Subcatchment P-2: Subcatchment P-2

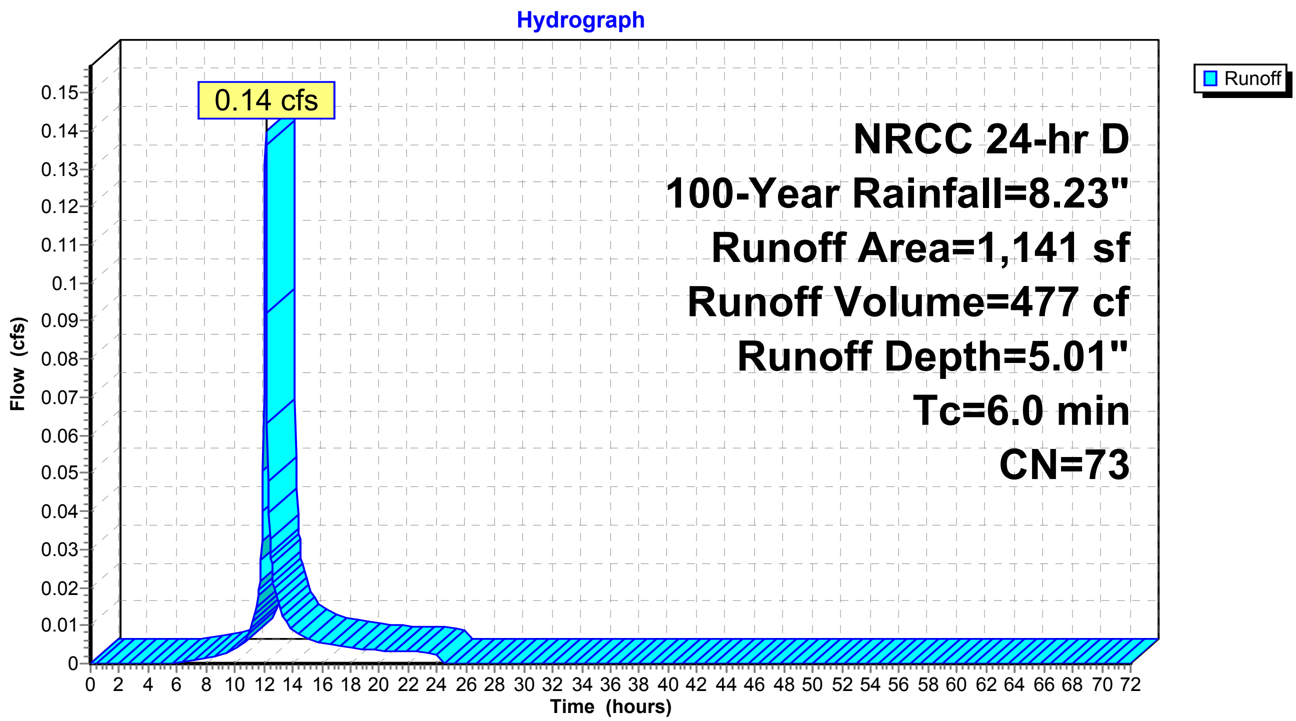
Runoff = 0.14 cfs @ 12.13 hrs, Volume= 477 cf, Depth= 5.01"
Routed to Link SP2 : Flow to Exisitng Drainage on Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.23"

Area (sf)	CN	Description
476	39	>75% Grass cover, Good, HSG A
665	98	Paved parking, HSG A
1,141	73	Weighted Average
476		41.73% Pervious Area
665		58.27% Impervious Area

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

Subcatchment P-2: Subcatchment P-2



Summary for Subcatchment P-3: Subcatchment P-3

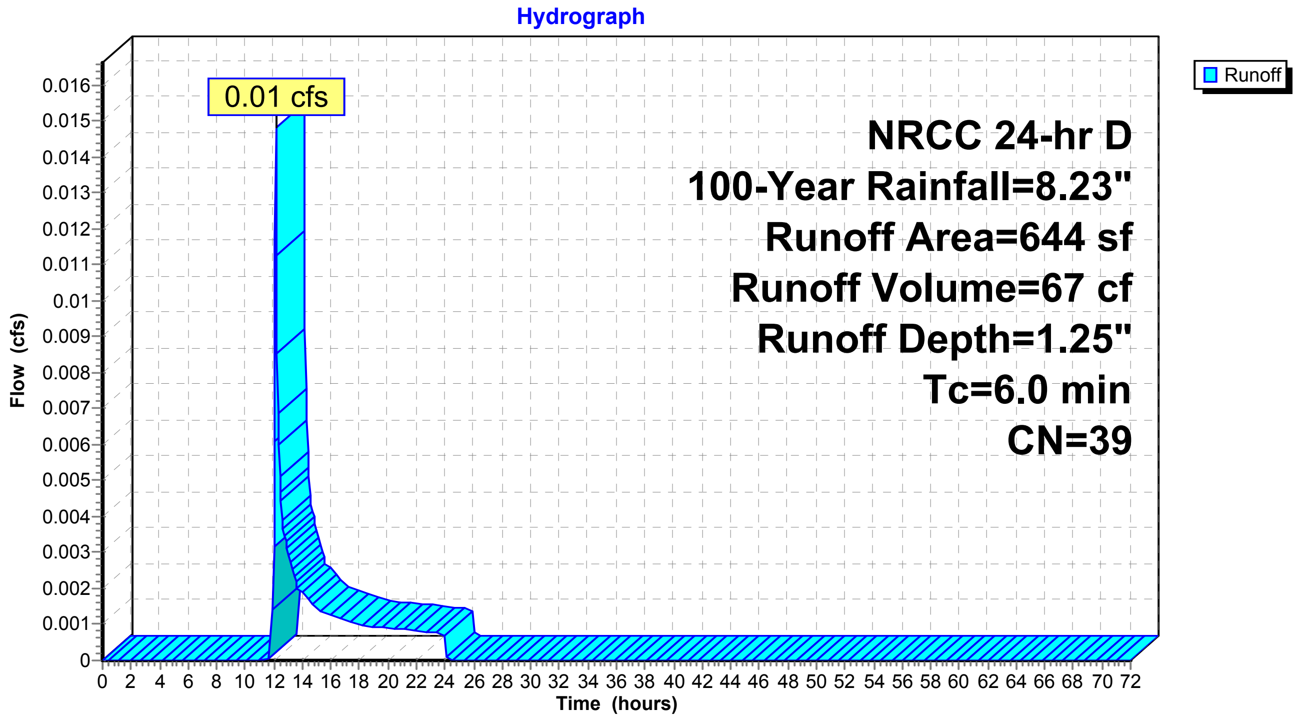
Runoff = 0.01 cfs @ 12.15 hrs, Volume= 67 cf, Depth= 1.25"
Routed to Link SP3 : Flow to Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.23"

Area (sf)	CN	Description
644	39	>75% Grass cover, Good, HSG A
644		100.00% Pervious Area

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

Subcatchment P-3: Subcatchment P-3



Summary for Subcatchment R-1: Subcat R-1

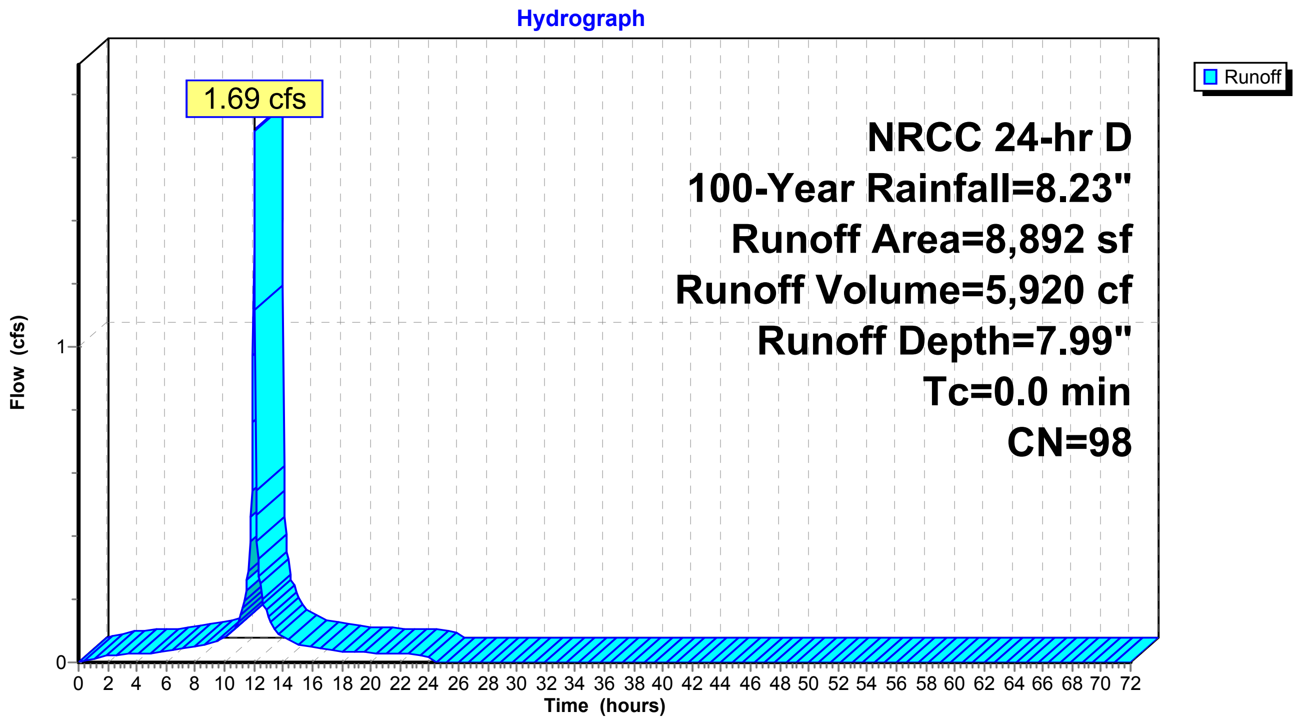
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.69 cfs @ 12.04 hrs, Volume= 5,920 cf, Depth= 7.99"
Routed to Pond UIS-2 : Underground Infiltration System 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.23"

Area (sf)	CN	Description
8,892	98	Roofs, HSG A
8,892		100.00% Impervious Area

Subcatchment R-1: Subcat R-1



Summary for Pond UIS-1: Underground Infiltration System #1

Inflow Area = 6,985 sf, 87.39% Impervious, Inflow Depth = 7.15" for 100-Year event
Inflow = 1.28 cfs @ 12.04 hrs, Volume= 4,163 cf
Outflow = 0.31 cfs @ 12.26 hrs, Volume= 4,166 cf, Atten= 76%, Lag= 13.1 min
Discarded = 0.06 cfs @ 10.40 hrs, Volume= 3,755 cf
Primary = 0.24 cfs @ 12.26 hrs, Volume= 410 cf
Routed to Link SP1 : Flow to Exisitng Drainage on Pinevale Avenue

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 95.63' @ 12.26 hrs Surf.Area= 1,093 sf Storage= 1,262 cf

Plug-Flow detention time= 148.7 min calculated for 4,163 cf (100% of inflow)
Center-of-Mass det. time= 149.1 min (922.8 - 773.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	93.33'	686 cf	**18.17'W x 60.16'L x 2.33'H Field A** 2,550 cf Overall - 590 cf Embedded = 1,960 cf x 35.0% Voids
#2A	93.83'	590 cf	**ADS_StormTech SC-310 +Cap** x 40 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 40 Chambers in 5 Rows
		1,276 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	94.75'	**12.0" Round Culvert** L= 100.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 94.75' / 93.75' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	95.55'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	93.33'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.06 cfs @ 10.40 hrs HW=93.35' (Free Discharge)
3=Exfiltration (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.23 cfs @ 12.26 hrs HW=95.62' (Free Discharge)
1=Culvert (Passes 0.23 cfs of 1.83 cfs potential flow)
2=Broad-Crested Rectangular Weir (Weir Controls 0.23 cfs @ 0.77 fps)

Pond UIS-1: Underground Infiltration System #1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

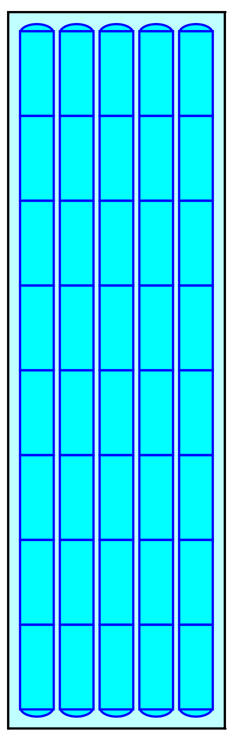
8 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 58.16' Row Length +12.0" End Stone x 2 = 60.16' Base Length
5 Rows x 34.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 18.17' Base Width
6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

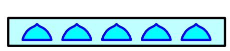
40 Chambers x 14.7 cf = 589.7 cf Chamber Storage

2,550.1 cf Field - 589.7 cf Chambers = 1,960.4 cf Stone x 35.0% Voids = 686.2 cf Stone Storage

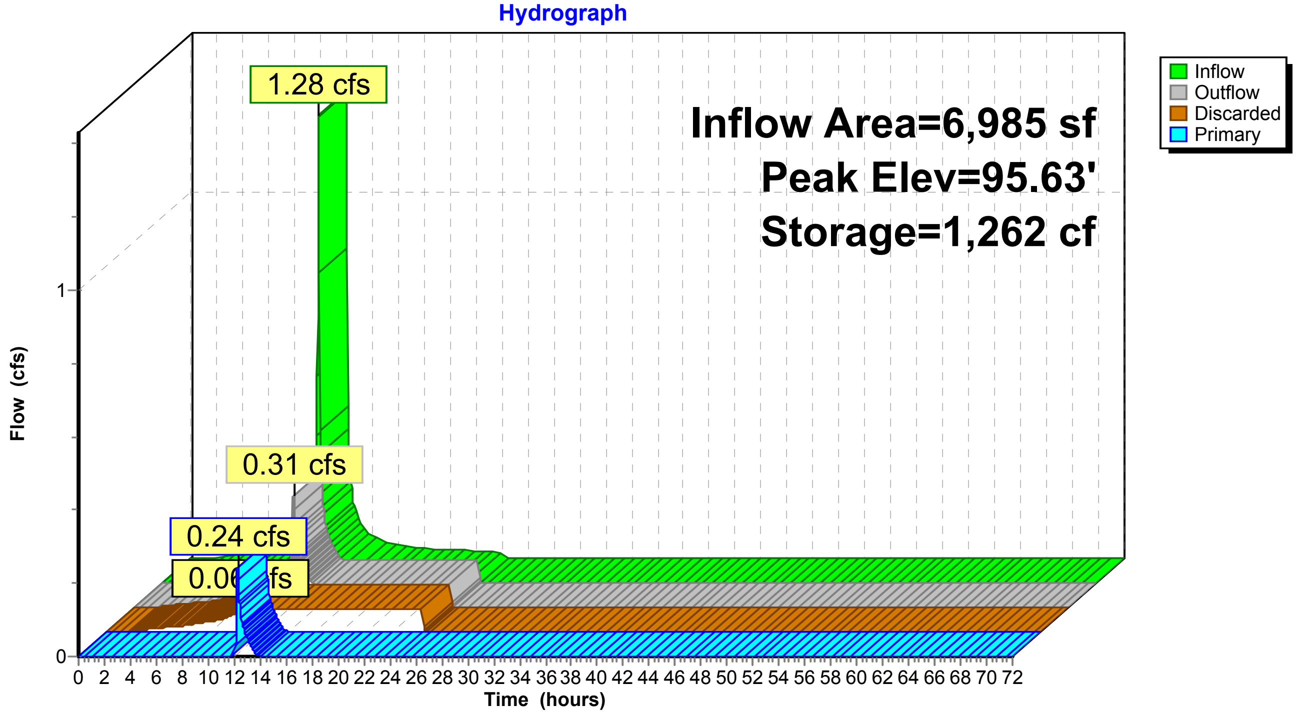
Chamber Storage + Stone Storage = 1,275.8 cf = 0.029 af
Overall Storage Efficiency = 50.0%
Overall System Size = 60.16' x 18.17' x 2.33'

40 Chambers
94.4 cy Field
72.6 cy Stone





Pond UIS-1: Underground Infiltration System #1



Summary for Pond UIS-2: Underground Infiltration System 2

Inflow Area = 33,054 sf, 81.96% Impervious, Inflow Depth = 6.71" for 100-Year event
Inflow = 5.73 cfs @ 12.04 hrs, Volume= 18,470 cf
Outflow = 1.19 cfs @ 12.29 hrs, Volume= 18,477 cf, Atten= 79%, Lag= 14.9 min
Discarded = 0.17 cfs @ 9.40 hrs, Volume= 15,543 cf
Primary = 1.02 cfs @ 12.29 hrs, Volume= 2,933 cf
Routed to Link SP1 : Flow to Exisitng Drainage on Pinevale Avenue

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 96.97' @ 12.29 hrs Surf.Area= 3,039 sf Storage= 6,426 cf

Plug-Flow detention time= 288.5 min calculated for 18,464 cf (100% of inflow)
Center-of-Mass det. time= 288.8 min (1,067.8 - 779.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	93.50'	2,785 cf	**77.50'W x 39.22'L x 3.50'H Field A** 10,638 cf Overall - 3,675 cf Embedded = 6,962 cf x 40.0% Voids
#2A	94.00'	3,675 cf	**ADS_StormTech SC-740 +Cap** x 80 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 80 Chambers in 16 Rows
		6,460 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	93.00'	**12.0" Round Culvert** L= 100.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 93.00' / 92.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	96.77'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	93.50'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.17 cfs @ 9.40 hrs HW=93.54' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=1.01 cfs @ 12.29 hrs HW=96.97' (Free Discharge)
└─**1=Culvert** (Passes 1.01 cfs of 5.56 cfs potential flow)
  └─**2=Broad-Crested Rectangular Weir** (Weir Controls 1.01 cfs @ 1.26 fps)

Pond UIS-2: Underground Infiltration System 2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
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

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

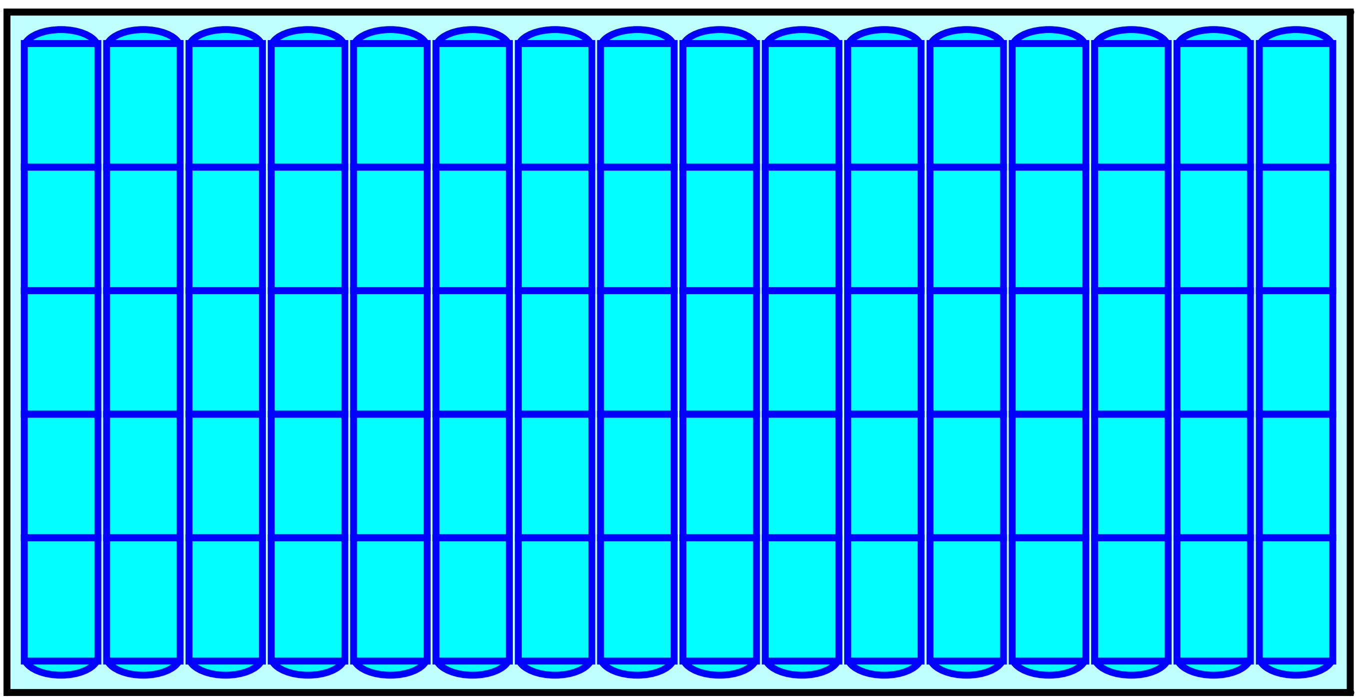
5 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 37.22' Row Length +12.0" End Stone x 2 = 39.22' Base Length
16 Rows x 51.0" Wide + 6.0" Spacing x 15 + 12.0" Side Stone x 2 = 77.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

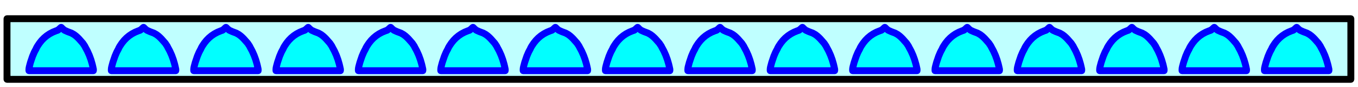
80 Chambers x 45.9 cf = 3,675.2 cf Chamber Storage

10,637.5 cf Field - 3,675.2 cf Chambers = 6,962.3 cf Stone x 40.0% Voids = 2,784.9 cf Stone Storage

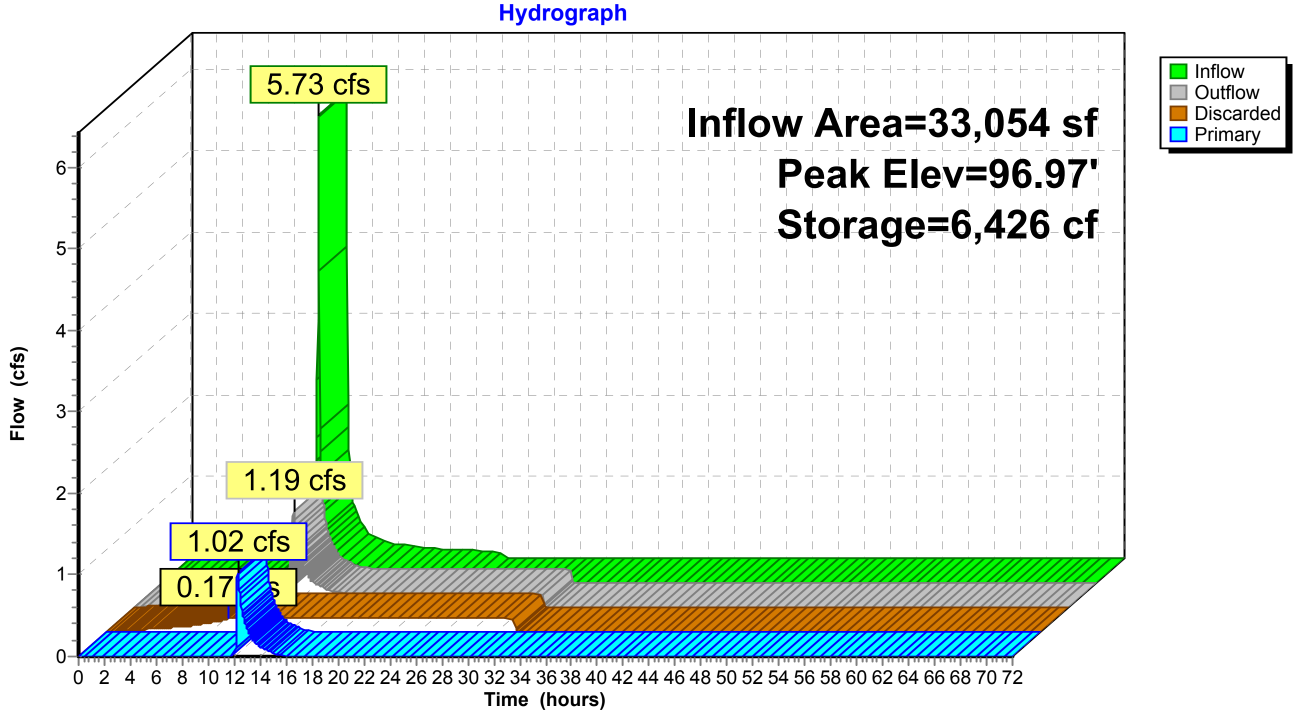
Chamber Storage + Stone Storage = 6,460.1 cf = 0.148 af
Overall Storage Efficiency = 60.7%
Overall System Size = 39.22' x 77.50' x 3.50'

80 Chambers
394.0 cy Field
257.9 cy Stone





Pond UIS-2: Underground Infiltration System 2

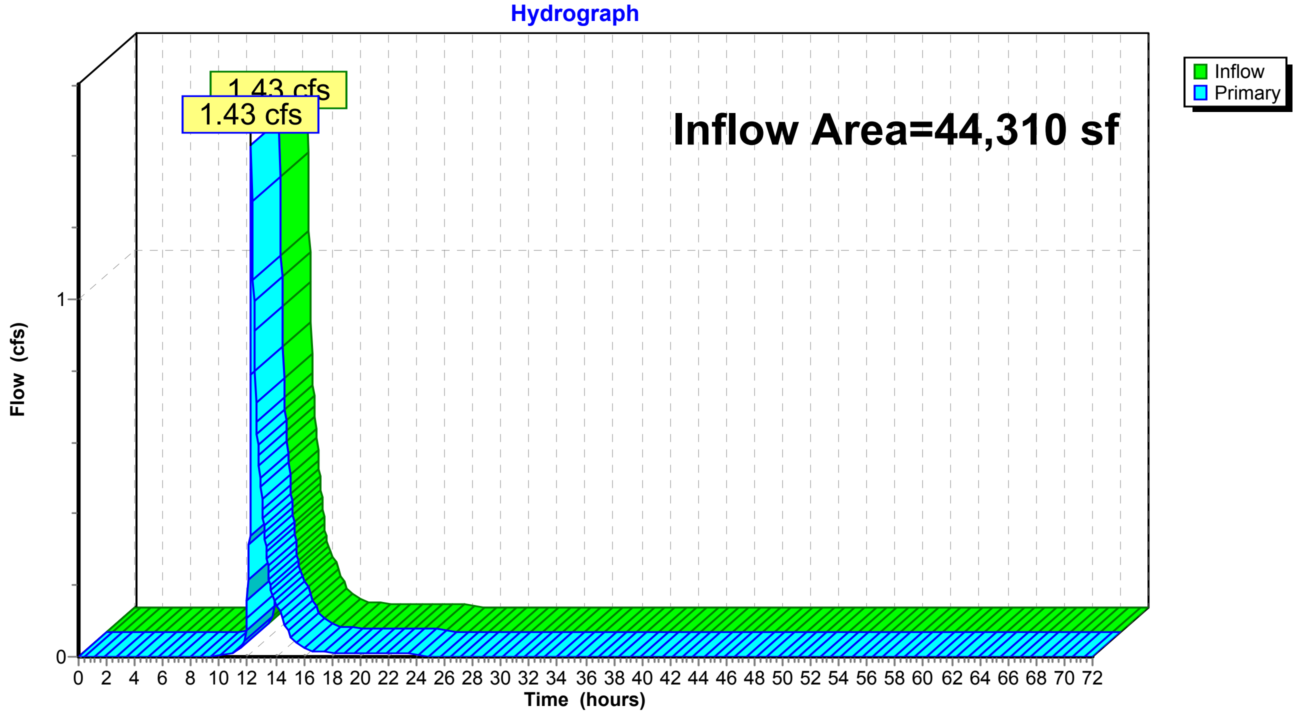


Summary for Link SP1: Flow to Exisitng Drainage on Pinevale Avenue

Inflow Area = 44,310 sf, 77.95% Impervious, Inflow Depth = 1.22" for 100-Year event
Inflow = 1.43 cfs @ 12.27 hrs, Volume= 4,511 cf
Primary = 1.43 cfs @ 12.27 hrs, Volume= 4,511 cf, Atten= 0%, Lag= 0.0 min
Routed to Link SP2 : Flow to Exisitng Drainage on Main Street

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

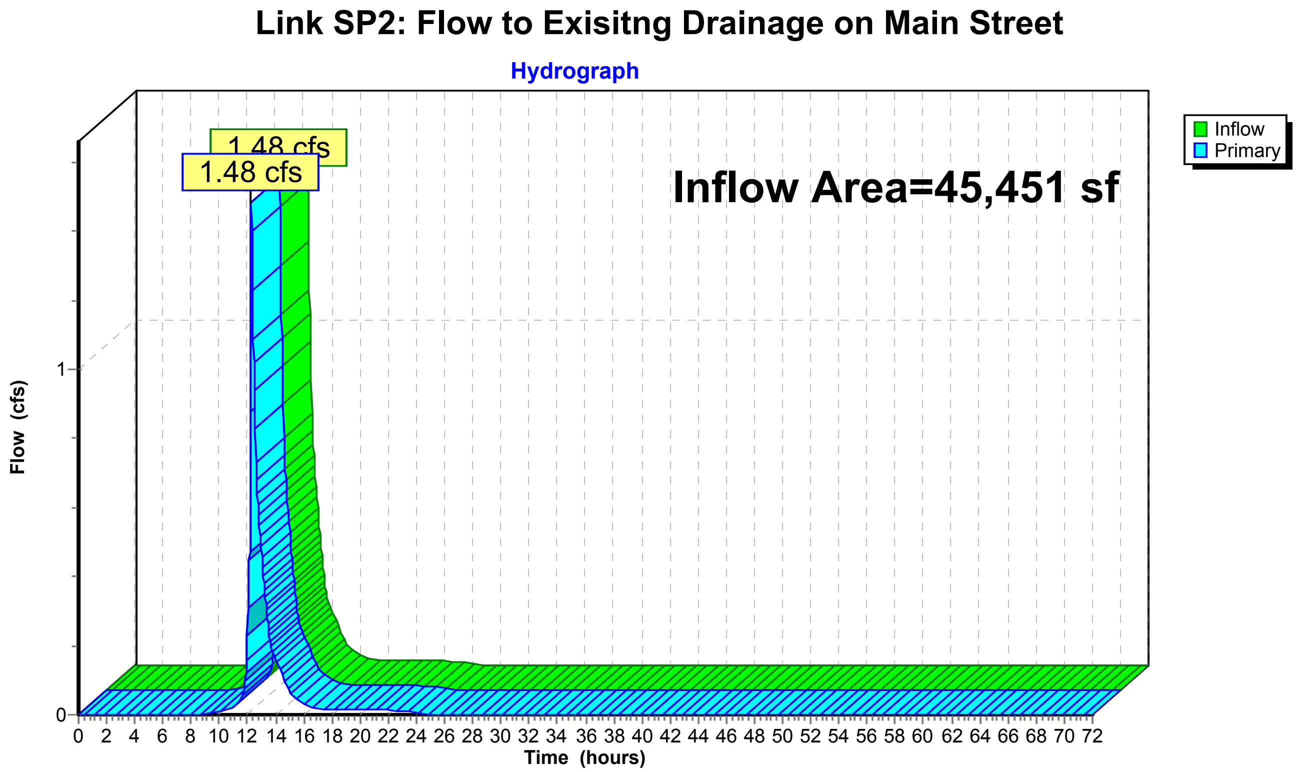
Link SP1: Flow to Exisitng Drainage on Pinevale Avenue



Summary for Link SP2: Flow to Exisitng Drainage on Main Street

Inflow Area = 45,451 sf, 77.46% Impervious, Inflow Depth = 1.32" for 100-Year event
Inflow = 1.48 cfs @ 12.27 hrs, Volume= 4,987 cf
Primary = 1.48 cfs @ 12.27 hrs, Volume= 4,987 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

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

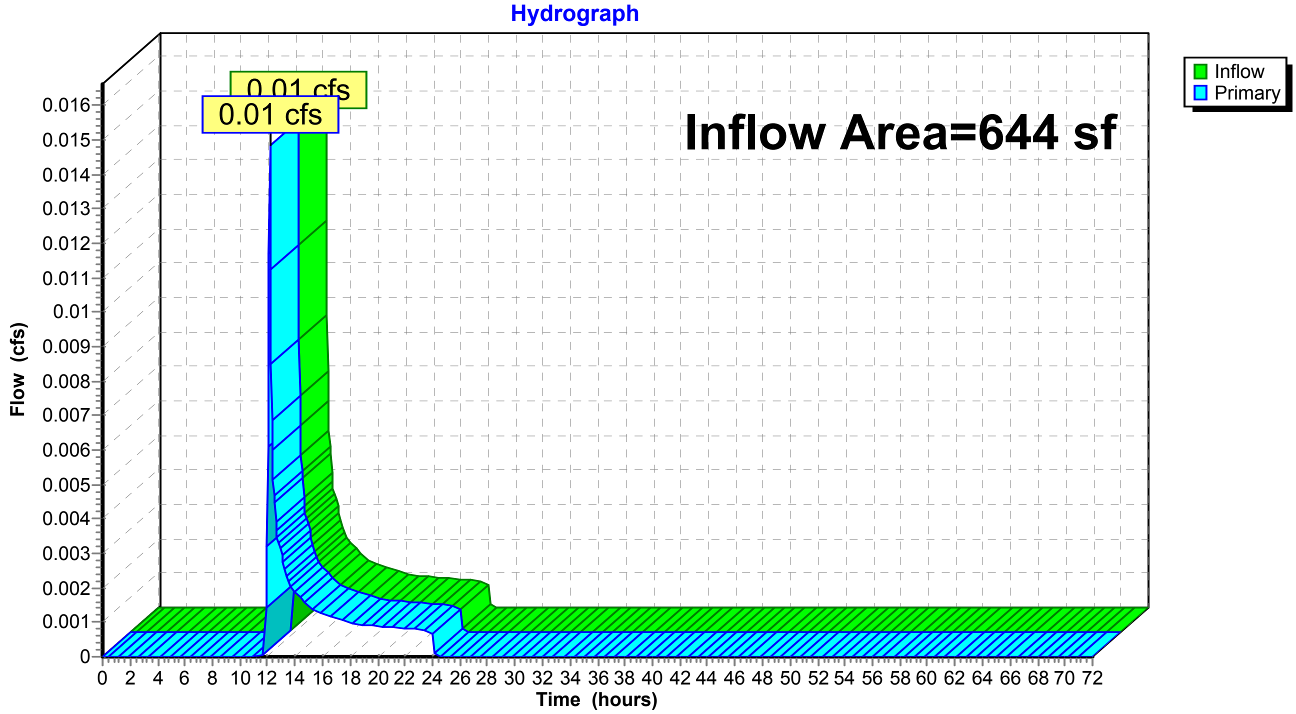


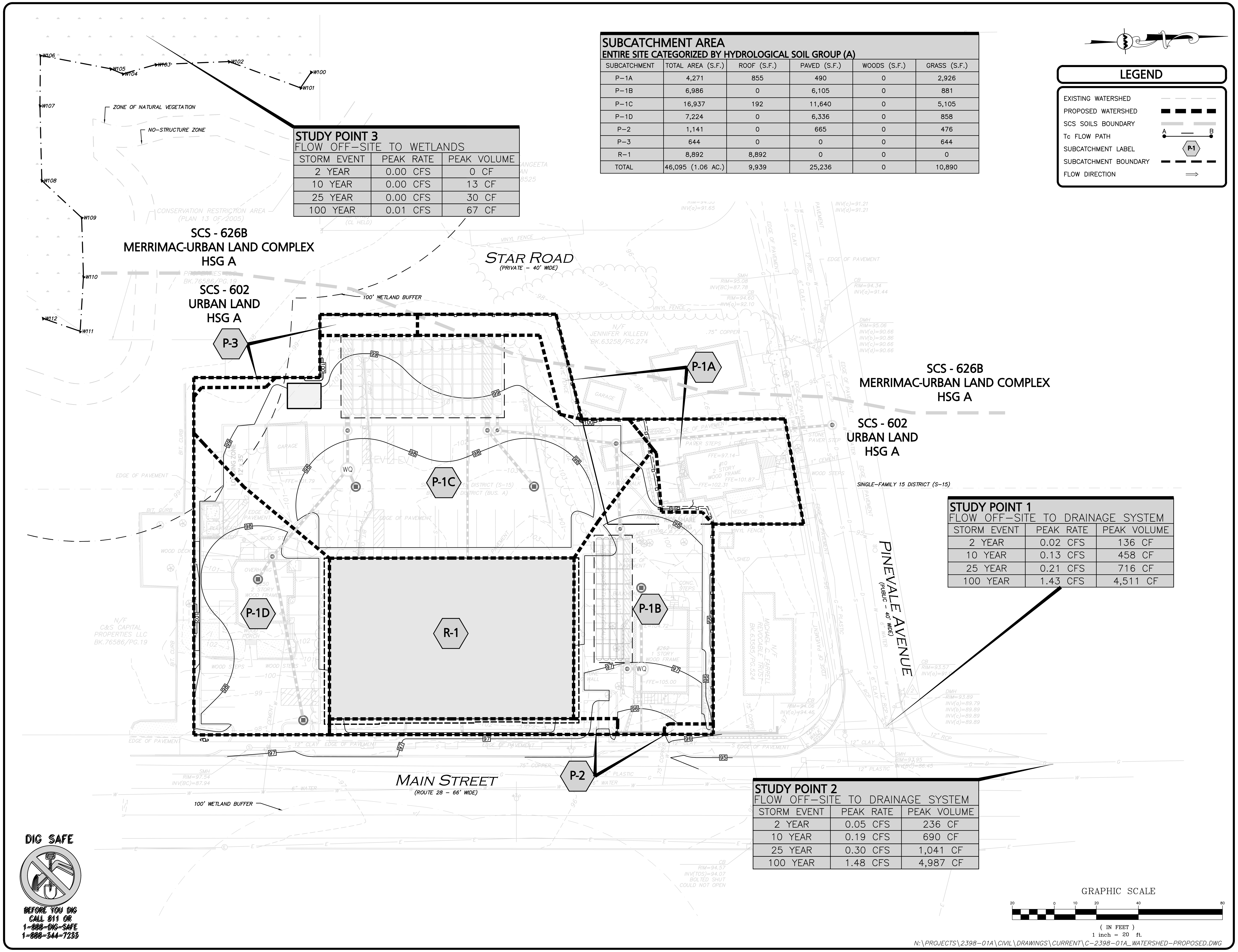
Summary for Link SP3: Flow to Wetlands

Inflow Area = 644 sf, 0.00% Impervious, Inflow Depth = 1.25" for 100-Year event
Inflow = 0.01 cfs @ 12.15 hrs, Volume= 67 cf
Primary = 0.01 cfs @ 12.15 hrs, Volume= 67 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1L

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

Link SP3: Flow to Wetlands





SUBCATCHMENT AREA

ENTIRE SITE CATEGORIZED BY HYDROLOGICAL SOIL GROUP (A)

SUBCATCHMENT	TOTAL AREA (S.F.)	ROOF (S.F.)	PAVED (S.F.)	WOODS (S.F.)	GRASS (S.F.)
P-1A	4,271	855	490	0	2,926
P-1B	6,986	0	6,105	0	881
P-1C	16,937	192	11,640	0	5,105
P-1D	7,224	0	6,336	0	858
P-2	1,141	0	665	0	476
P-3	644	0	0	0	644
R-1	8,892	8,892	0	0	0
TOTAL	46,095 (1.06 AC.)	9,939	25,236	0	10,890

LEGEND

- EXISTING WATERSHED
- PROPOSED WATERSHED
- SCS SOILS BOUNDARY
- Tc FLOW PATH (A — B)
- SUBCATCHMENT LABEL (P-1)
- SUBCATCHMENT BOUNDARY
- FLOW DIRECTION

STUDY POINT 3

FLOW OFF-SITE TO WETLANDS

STORM EVENT	PEAK RATE	PEAK VOLUME
2 YEAR	0.00 CFS	0 CF
10 YEAR	0.00 CFS	13 CF
25 YEAR	0.00 CFS	30 CF
100 YEAR	0.01 CFS	67 CF

STUDY POINT 1

FLOW OFF-SITE TO DRAINAGE SYSTEM

STORM EVENT	PEAK RATE	PEAK VOLUME
2 YEAR	0.02 CFS	136 CF
10 YEAR	0.13 CFS	458 CF
25 YEAR	0.21 CFS	716 CF
100 YEAR	1.43 CFS	4,511 CF

STUDY POINT 2

FLOW OFF-SITE TO DRAINAGE SYSTEM

STORM EVENT	PEAK RATE	PEAK VOLUME
2 YEAR	0.05 CFS	236 CF
10 YEAR	0.19 CFS	690 CF
25 YEAR	0.30 CFS	1,041 CF
100 YEAR	1.48 CFS	4,987 CF

N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\C-2398-01A_WATERSHED-PROPOSED.DWG

COMMONWEALTH OF MASSACHUSETTS
CARLTON M. QUINN
CIVIL
No.49923
REGISTERED PROFESSIONAL ENGINEER

PROFESSIONAL ENGINEER FOR ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
B	3/25/2024	REVISED PER TOWN COMMENTS
A	2/29/2024	REVISED PER TOWN COMMENTS

APPLICANT\OWNER:
BLVD READING, LLC
c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:

STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	1" = 20'	DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ◆ land surveying
environmental consulting ◆ landscape architecture
www.allenmajor.com
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WOBURN MA 01801
TEL: (781) 935-6889
FAX: (781) 935-2896
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE:	SHEET No.
PROPOSED WATERSHED PLAN	PWS-1

SECTION 6.0 -
APPENDIX

NOAA Atlas 14, Volume 10, Version 3
Location name: Reading, Massachusetts, USA*
Latitude: 42.5055°, Longitude: -71.1034°
Elevation: 182 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	**0.309** (0.238-0.390)	**0.373** (0.287-0.471)	**0.478** (0.367-0.606)	**0.566** (0.432-0.722)	**0.686** (0.508-0.917)	**0.775** (0.565-1.06)	**0.871** (0.619-1.24)	**0.983** (0.660-1.43)	**1.15** (0.744-1.73)	**1.29** (0.816-1.98)
10-min	**0.438** (0.337-0.552)	**0.529** (0.407-0.668)	**0.678** (0.519-0.859)	**0.801** (0.611-1.02)	**0.971** (0.720-1.30)	**1.10** (0.800-1.50)	**1.23** (0.876-1.76)	**1.39** (0.934-2.02)	**1.63** (1.05-2.45)	**1.83** (1.16-2.81)
15-min	**0.515** (0.396-0.649)	**0.622** (0.478-0.785)	**0.797** (0.611-1.01)	**0.943** (0.720-1.20)	**1.14** (0.847-1.53)	**1.29** (0.940-1.77)	**1.45** (1.03-2.07)	**1.64** (1.10-2.38)	**1.92** (1.24-2.89)	**2.15** (1.36-3.30)
30-min	**0.708** (0.545-0.893)	**0.855** (0.658-1.08)	**1.10** (0.841-1.39)	**1.30** (0.989-1.65)	**1.57** (1.17-2.11)	**1.78** (1.30-2.44)	**2.00** (1.42-2.86)	**2.26** (1.52-3.28)	**2.65** (1.71-3.99)	**2.97** (1.88-4.57)
60-min	**0.901** (0.693-1.14)	**1.09** (0.838-1.38)	**1.40** (1.07-1.77)	**1.65** (1.26-2.11)	**2.00** (1.49-2.68)	**2.27** (1.65-3.11)	**2.55** (1.81-3.64)	**2.88** (1.93-4.18)	**3.38** (2.18-5.09)	**3.80** (2.40-5.84)
2-hr	**1.17** (0.904-1.46)	**1.42** (1.10-1.78)	**1.83** (1.42-2.31)	**2.18** (1.67-2.76)	**2.65** (1.98-3.54)	**3.00** (2.20-4.10)	**3.38** (2.43-4.83)	**3.85** (2.59-5.56)	**4.58** (2.97-6.85)	**5.22** (3.31-7.95)
3-hr	**1.36** (1.06-1.69)	**1.65** (1.29-2.07)	**2.14** (1.66-2.69)	**2.55** (1.96-3.21)	**3.11** (2.33-4.13)	**3.52** (2.60-4.80)	**3.97** (2.87-5.66)	**4.53** (3.06-6.51)	**5.41** (3.52-8.06)	**6.18** (3.93-9.38)
6-hr	**1.75** (1.37-2.17)	**2.14** (1.67-2.66)	**2.77** (2.16-3.46)	**3.30** (2.56-4.14)	**4.03** (3.04-5.32)	**4.56** (3.38-6.17)	**5.14** (3.74-7.28)	**5.88** (3.98-8.38)	**7.02** (4.58-10.4)	**8.02** (5.12-12.1)
12-hr	**2.23** (1.76-2.74)	**2.72** (2.15-3.36)	**3.54** (2.78-4.37)	**4.21** (3.28-5.24)	**5.13** (3.90-6.72)	**5.81** (4.34-7.80)	**6.56** (4.78-9.19)	**7.48** (5.08-10.6)	**8.90** (5.82-13.0)	**10.1** (6.48-15.1)
24-hr	**2.67** (2.12-3.27)	**3.31** (2.62-4.05)	**4.35** (3.44-5.34)	**5.21** (4.10-6.44)	**6.40** (4.89-8.33)	**7.27** (5.46-9.70)	**8.23** (6.04-11.5)	**9.42** (6.43-13.2)	**11.3** (7.42-16.4)	**12.9** (8.30-19.1)
2-day	**3.03** (2.42-3.68)	**3.83** (3.06-4.66)	**5.13** (4.08-6.26)	**6.21** (4.92-7.62)	**7.70** (5.93-9.99)	**8.78** (6.65-11.7)	**10.0** (7.42-14.0)	**11.6** (7.92-16.1)	**14.1** (9.27-20.3)	**16.3** (10.5-24.0)
3-day	**3.31** (2.66-4.01)	**4.17** (3.35-5.06)	**5.58** (4.46-6.78)	**6.74** (5.36-8.24)	**8.34** (6.45-10.8)	**9.51** (7.23-12.6)	**10.8** (8.05-15.0)	**12.5** (8.59-17.4)	**15.3** (10.1-21.9)	**17.7** (11.4-25.9)
4-day	**3.59** (2.89-4.33)	**4.47** (3.60-5.40)	**5.92** (4.75-7.18)	**7.12** (5.67-8.68)	**8.77** (6.80-11.3)	**9.98** (7.60-13.2)	**11.3** (8.45-15.7)	**13.1** (9.00-18.1)	**15.9** (10.5-22.8)	**18.5** (11.9-26.9)
7-day	**4.36** (3.53-5.23)	**5.28** (4.27-6.34)	**6.78** (5.47-8.17)	**8.03** (6.43-9.73)	**9.75** (7.59-12.4)	**11.0** (8.41-14.4)	**12.4** (9.26-17.0)	**14.2** (9.80-19.5)	**17.1** (11.3-24.3)	**19.7** (12.7-28.4)
10-day	**5.06** (4.11-6.05)	**6.00** (4.88-7.19)	**7.55** (6.11-9.07)	**8.84** (7.11-10.7)	**10.6** (8.27-13.5)	**11.9** (9.10-15.5)	**13.3** (9.94-18.1)	**15.1** (10.5-20.7)	**18.0** (12.0-25.4)	**20.5** (13.3-29.5)
20-day	**7.04** (5.76-8.36)	**8.08** (6.61-9.60)	**9.78** (7.97-11.7)	**11.2** (9.07-13.4)	**13.1** (10.3-16.4)	**14.6** (11.2-18.6)	**16.1** (11.9-21.4)	**17.9** (12.5-24.2)	**20.5** (13.7-28.7)	**22.7** (14.7-32.3)
30-day	**8.69** (7.14-10.3)	**9.80** (8.05-11.6)	**11.6** (9.51-13.8)	**13.1** (10.7-15.7)	**15.2** (11.9-18.9)	**16.8** (12.8-21.2)	**18.4** (13.6-24.1)	**20.2** (14.1-27.1)	**22.6** (15.1-31.3)	**24.4** (15.9-34.7)
45-day	**10.8** (8.90-12.7)	**12.0** (9.88-14.1)	**13.9** (11.4-16.5)	**15.5** (12.7-18.5)	**17.8** (14.0-21.8)	**19.5** (14.9-24.4)	**21.2** (15.6-27.3)	**22.9** (16.1-30.6)	**25.1** (16.9-34.6)	**26.7** (17.4-37.7)
60-day	**12.6** (10.4-14.8)	**13.8** (11.4-16.2)	**15.9** (13.1-18.7)	**17.5** (14.4-20.8)	**19.9** (15.6-24.3)	**21.7** (16.6-27.0)	**23.5** (17.2-30.0)	**25.1** (17.7-33.4)	**27.2** (18.3-37.4)	**28.6** (18.7-40.2)

[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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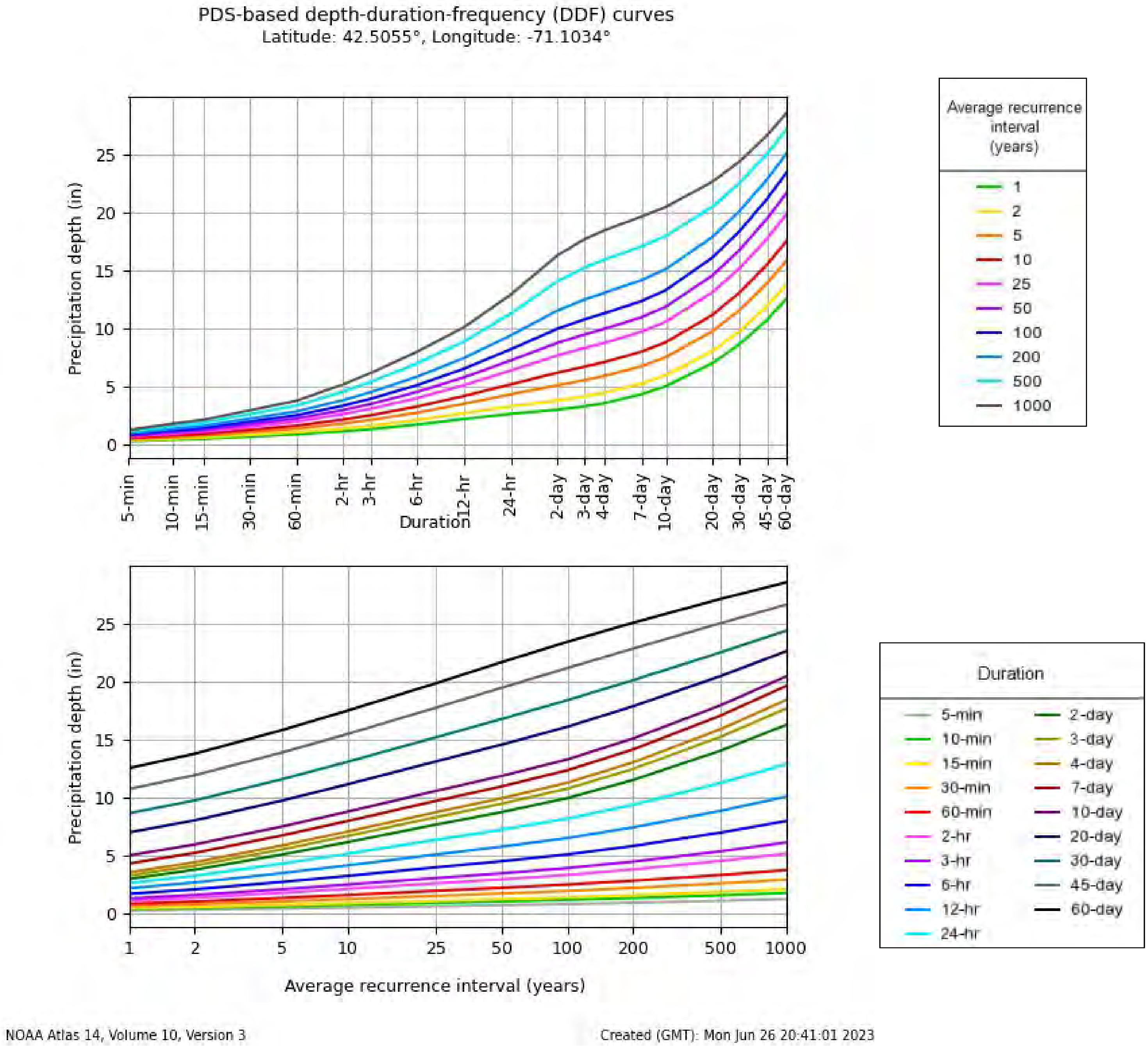
PF graphical



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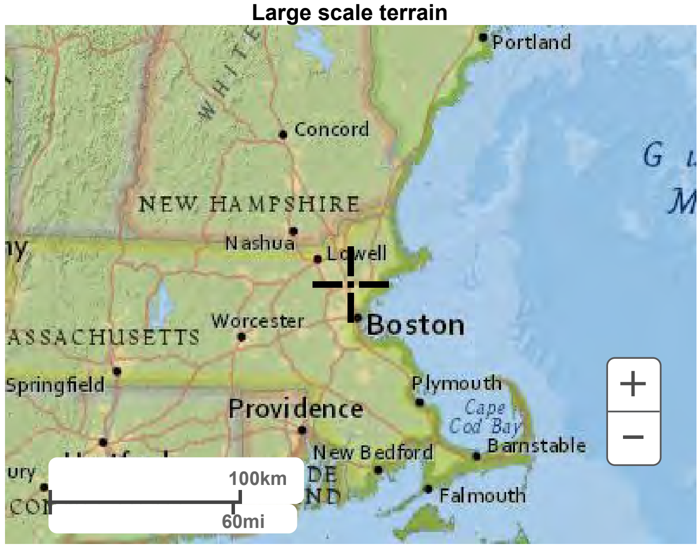
Maps & aerials

Small scale terrain

Large scale terrain



Large scale map

Large scale aerial

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National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Manning's Roughness Coefficients ("n")

Conduit	Manning's Coefficients
Closed Conduits	
Asbestos-Cement Pipe	0.011 to 0.015
Brick	0.013 to 0.017
Cast Iron Pipe	
Cement-lined and seal-coated	0.011 to 0.015
Concrete (Monolithic)	
Smooth forms	0.012 to 0.014
Rough forms	0.015 to 0.017
Concrete Pipe	0.011 to 0.015
Corrugated-Metal Pipe (1/2 - STUL 34470 2 1/2-inch corrgtn.)	
Plain	0.022 to 0.026
Paved invert	0.018 to 0.022
Spun asphalt-lined	0.011 to 0.015
Plastic Pipe (Smooth)	0.011 to 0.015
Vitrified Clay	
Pipes	0.011 to 0.015
Liner channels	0.013 to 0.017
Open Channels	
Lined Channels	
Asphalt	0.013 to 0.017
Brick	0.012 to 0.018
Concrete	0.011 to 0.020
Rubble or riprap	0.020 to 0.035
Vegetal	0.030 to 0.040
Excavated or Dredged	
Earth, straight and uniform	0.020 to 0.030
Earth, winding, fairly uniform	0.025 to 0.040
Rock	0.030 to 0.045
Unmaintained	0.050 to 0.140
Natural Channels (minor streams, top width at flood state < 100 feet)	
Fairly regular section	0.030 to 0.070
Irregular section with pools	0.040 to 0.100

Source: Design and Construction of Sanitary and Storm Sewers, American Society of Civil Engineers and the Water Pollution Control Federation, 1969.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Middlesex County, Massachusetts

July 17, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

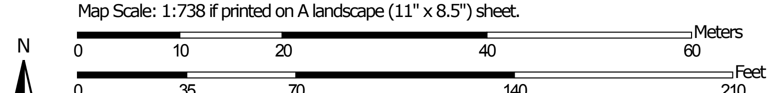
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

Map Scale: 1:738 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- 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 1:25,000.

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: Middlesex County, Massachusetts
Survey Area Data: Version 22, Sep 9, 2022

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
602	Urban land	1.6	57.1%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	1.2	42.9%
Totals for Area of Interest		**2.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Middlesex County, Massachusetts

602—Urban land

Map Unit Setting

National map unit symbol: 9950
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Udorthents, loamy

Percent of map unit: 5 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 5 percent
Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

Udorthents, wet substratum

Percent of map unit: 5 percent
Hydric soil rating: No

626B—Merrimac-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyr9
Elevation: 0 to 820 feet
Mean annual precipitation: 36 to 71 inches

Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Merrimac and similar soils: 45 percent
Urban land: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Crest, side slope, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Description of Urban Land

Typical profile

M - 0 to 10 inches: cemented material

Properties and qualities

Slope: 0 to 8 percent

Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Windsor

Percent of map unit: 5 percent
Landform: Outwash terraces, dunes, outwash plains, deltas
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, crest, side slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

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Allen & Major Associates, Inc.		Computation Sheet	
Title	***Pipe Sizing Table***	By	SMF
Project	*STRADA Mixed Use Building*	Chk'd	CMQ
Location	258 MAIN STREET, READING	Apprv'd	CMQ
Date	December 10, 2023		
Revised	March 25, 2024		

Minimum Slope:	0.005
Minimum Pipe Size:	12"
Rainfall Intensity (in/hr):	6.40 (25 year storm)
Manning's n:	0.013 HDPE (SMOOTH BORE)
Minimum Pipe Cover:	1.5'

Line						Req'd. Capac.	Pipe Size	Slope	Flow at Inv. Slope		Drop	Invert Elevation		Rim Elev.		Pipe
From Upper	To Lower	Length (feet)	Area (acres)	wgt. *C*	*C* A	*Qd* (cfs)	*D* (in)	*s* (%)	Q_{full} (cfs)	V_{full} (fps)	(feet)	Upper (ft)	Lower (ft)	Upper (ft)	Cover (ft)	Material
CB-1A	DMH-1	79	0.066	0.85	0.056	0.36	12	0.50%	2.54	3.22	0.40	94.14	93.74	97.05	1.79	HDPE
CB-1B	DMH-1	13	0.100	0.81	0.080	0.52	12	1.00%	3.57	4.54	0.13	93.87	93.74	97.50	2.51	HDPE
DMH-1	WQU-1	55				0.88	12	1.00%	3.58	4.55	0.55	93.64	93.09	97.75	2.99	HDPE
CB-2	WQU-1	9	0.217	0.74	0.160	1.02	12	1.00%	3.58	4.54	0.09	93.18	93.09	97.40	3.09	HDPE
WQU-1	DMH-2	19				1.02	12	0.50%	2.51	3.19	0.09	94.09	94.00	98.05	2.83	HDPE
RD-1	UIS-2	68	0.204	0.90	0.184	1.18	10	0.50%	1.55	2.84	0.34	94.44	94.10	98.50	3.10	HDPE
WQU-3	DMH-3	35	0.172	0.72	0.123	0.79	12	1.00%	3.56	4.53	0.35	94.35	94.00	97.40	1.93	HDPE
CB-3	WQU-2	37	0.082	0.82	0.067	0.43	12	1.00%	3.58	4.54	0.37	92.74	92.36	96.50	2.64	HDPE
TD-1	WQU-2	30	0.078	0.85	0.066	0.42	12	5.00%	7.98	10.14	1.48	93.84	92.36	95.50	0.53	HDPE
WQU-2	DMH-7	7				0.85	12	0.50%	2.54	3.22	0.03	93.36	93.33	97.00	2.51	HDPE
OCS-1	DMH-5	59	**HYDROCAD: 25 YEAR STORM**			0.00	12	1.00%	3.58	4.54	0.59	93.69	93.10	98.18	3.37	HDPE
DMH-6	DMH-5	41	**HYDROCAD: 25 YEAR STORM**			0.00	12	1.00%	3.57	4.54	0.41	93.51	93.10	97.85	3.22	HDPE
DMH-5	DMH-8	101	**HYDROCAD: 25 YEAR STORM**			0.00	12	0.99%	3.55	4.51	1.00	93.00	92.00	98.70	4.58	HDPE

				Computation Sheet
Title	***MA DEP Standard Calculations***		By	MTB
Project	*Strada, Mixed Use Building*		Chk'd	CMQ
Location	258 Main Street, Reading MA		Apprv'd	CMQ
Date	October 10, 2024			
Revised	March 25, 2024			

Stormwater Recharge/Water Quality Volume Table

Rv = F * Impervious Area

Rv *= Required Recharge Volume, expressed in* ft^3*, cubic yards or acre-feet*

F *= Target Depth Factor associated with each Hydraulic Soil Group*

Impervious Area *= pavement & rooftop area on site*

A_{WQ} *= Required Water Quality Treatment Volume, expressed in* ft^3

D_{WQ} *= Water Quality Depth*

A_{IMP} *= Impervious Area (excluding non-metal roofs)*

Watershed	Area (Sq. Ft.)	Landscaped	Impervious Area (Square Feet)		Recharge Required			Water Quality Volume Required	
			HSG A (F=.6)	HSG B (F=.35)	F Avg. (Inches)	Impervious Area (Feet)	Rv (ft^3)	D_{WQ} (Inch)	A_{WQ}
P-1A	4,271	2,926	1,345	0	0.6	1,345	67	1.0	112
P-1B	6,986	881	6,105	0	0.6	6,105	305	1.0	509
P-1C	16,937	5,105	11,832	0	0.6	11,832	592	1.0	986
P-1D	7,224	858	6,366	0	0.6	6,366	318	1.0	531
P-2	1,141	476	665	0	0.6	665	33	1.0	55
P-3	644	644	0	0	0.0	0	0	1.0	0
R-1	8,892	0	8,892	0	0.6	8,892	445	1.0	741
Total	**46,095**	**10,890**	**35,205**	**0**	0.6	**35,205**	**1,760**	1.0	**2,934**

Rv = F * Impervious Area

Rv *= Required Recharge Volume, expressed in* ft^3*, cubic yards or acre-feet*

F *= Target Depth Factor associated with each Hydraulic Soil Group*

Impervious Area *= pavement & rooftop area on site*

	Required (cf)	Provided (cf)	
ARv =	305	1,262	Underground Infiltration System #1 (P-1B)
ARv =	305	1,262	Total

	Required (cf)	Provided (cf)	
ARv =	1,355	6,423	Underground Infiltration System #2 (P-1C,P-1D,R-1)
ARv =	1,355	6,423	Total

Water Quality Volume

A_{WQ} *= Required Water Quality Treatment Volume, expressed in* ft^3

D_{WQ} *= Water Quality Depth*

A_{IMP} *= Impervious Area (excluding non-metal roofs)*

				Computation Sheet
Title	***MA DEP Standard Calculations***		By	MTB
Project	*Strada, Mixed Use Building*		Chk'd	CMQ
Location	258 Main Street, Reading MA		Apprv'd	CMQ
Date	March 25, 2024			

	Required (cf)	Provided (cf)	
A_{WQ} =	***909***	***1,262***	***Underground Infiltration System #1 (P-1B)***
A_{WQ} =	***909***	***1,262***	***Total***

	Required (cf)	Provided (cf)	
A_{WQ} =	***509***	***6,423***	***Underground Infiltration System #2 (P-1C,P-1D,R-1)***
A_{WQ} =	***509***	***6,423***	***Total***

Draindown Within 72 Hours

$\textbf{Time}_{\textbf{drawdown}}$=(Rv) (1/Design Infiltration Rate in inches per hour) (Conversion for inches to feet) (1/bottom area in feet)

Infiltration System #1 - HSG A	
Infiltration Rate (in/Hr)=	2.41
Bottom Area (ft^2) =	1,093
Infiltration Volume (ft^3) =	1,262
$\textbf{Time}_{\textbf{drawdown}}$ **(Hours)**=	5.75

Infiltration System #2 - HSG A	
Infiltration Rate (in/Hr)=	2.41
Bottom Area (ft^2) =	3,039
Infiltration Volume (ft^3) =	6,423
$\textbf{Time}_{\textbf{drawdown}}$ **(Hours)**=	10.52

TSS Removal Worksheet

Location:	258 Main Street, Reading MA
Date:	10/05/23
Project:	Strada - Mixed Use Builidng
Prepared By:	MTB
Date:	10/05/23

Underground Infiltration System #1,2,3

TSS Removal Calculation Worksheet	B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
	Deep Sump Catch Basins	**0.25**	**1.00**	**0.25**	**0.75**
	Water Quality Unit	**0.50**	**0.75**	**0.38**	**0.38**
	StormTech Chambers	**0.80**	**0.38**	**0.30**	**0.08**

Total TSS Removal = **93%**

*Equals remaining load from previous BMP (E) which enters the BMP

ALLEN & MAJOR ASSOCIATES,

Project No.	2398-01A	**Sheet:** 1 of 2	
Project Description:	Mixed Use Building		
Calculated By:	SMF	**Date**: 2/28/2024	
Revision By:	SMF	**Date:** 3/25/2024	
Checked By:	CMQ	**Date:** 3/25/2024	

ESTIMATION FOR PHOSPHORUS REMOVAL

Proposed Condition Phosphorus Loading

Site Use	Phosphorus Load by Land Use (lbs/ac/yr)	Area (Acres)	Proposed Phosphorus Load (lbs/yr)
High Density Residential	2.32	0.80	1.86
Open Space Soil Type A	0.03	0.25	0.01
Forest	0.13	0.03	0.00
	Total	**1.08**	**1.88**

Proposed Condition Phosphorus Loading Reduction

BMP	BMP (Appendix F Category)	Total Phosphorus Load to BMP (lbs/yr)***	BMP Removal %**	Phosphorus Removed by BMPs (lbs/year)
Infiltration Chambers #1	Infiltration Trench	0.33	100%	0.33
Infiltration Chambers #2	Infiltration Trench	1.44	100%	1.44
Note: See following pages for phosphorus removal calculations			**Total**	**1.76**

Proposed Load before reduction		**-**	**Loading Reduction**	**=Actual Constructed Phosphorus Load**
Actual Constructed Phosphorus Load	1.88	-	1.76	
Actual Constructed Phosphorus Load	**0.11**	**lb/yr**		

Percent Phosphorus Removed =	Loading Reduction / Proposed Load before reduction x 100			
Percent Phosphorus Removed =	**94%**	**>**	**60%**	**TARGET IS MET**

Project No.	2398-01A	**Sheet:** 2 of 2	
Project Description:	Mixed Use Building		
Calculated By:	SMF	**Date**: 2/28/2024	
Revision By:	SMF	**Date:** 3/25/2024	
Checked By:	CMQ	**Date:** 3/25/2024	

ALLEN & MAJOR ASSOCIATES, INC.

Phosphorus Calculations Per BMP

Infiltration Chambers #1	Phosphorus Load by Land Use (lbs/ac/yr)	Area (Acres)	Proposed Phosphorus Load (lbs/yr) (per BMP)			
High Density Residential	2.32	0.14	0.33	Area to Chambers*	6,986	S.F.
Open Space Soil Type A	0.03	0.02	0.00	Volume Treated	1,232	C.F.
Open Space Soil Type C	0.21	0.00	0.00	Depth of runoff treated	2.1	IN.
Open Space Soil Type D	0.37	0.00	0.00	**BMP Removal %****	**100%**	
Forest	0.13	0.00	0.00			
	total	**0.16**	**0.33**			

Infiltration Chambers #2	Phosphorus Load by Land Use (lbs/ac/yr)	Area (Acres)	Proposed Phosphorus Load (lbs/yr) (per BMP)			
High Density Residential	2.32	0.62	1.43	Area to Chambers*	33,054	S.F.
Open Space Soil Type A	0.03	0.14	0.00	Volume Treated	6,181	C.F.
Open Space Soil Type C	0.21	0.00	0.00	Depth of runoff treated	2.2	IN.
Open Space Soil Type D	0.37	0.00	0.00	**BMP Removal %****	**100%**	
Forest	0.13	0.00	0.00			
	total	**0.76**	**1.44**			

Commonwealth of Massachusetts
City/Town of Reading

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

One Sylvan LLC
Owner Name

258 Main Street
Street Address

011.0-0000-0193.0
Map/Lot #

Reading
City

MA
State

01867
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey Web Soil Survey (Source) 602 (Soil Map Unit) Urban Land (Soil Series)

   Ledges (Landform) N/A (Soil Limitations)

   Excavated and Filled land. (Soil Parent material)

3. Surficial Geological Report 2018 / Stone, Stone, DiGiacomo-Cohen (Year Published/Source) Coarse Deposits. (Map Unit)

   consist of gravel deposits, sand and gravel deposits, and sand deposits.
   Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer: N/A (Wetland Type)

7. Current Water Resource Conditions (USGS): 12/8/2023 (Month/Day/ Year) Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed: Not in Zone A, Zone II, or IWPA.
   (Zone II, IWPA, Zone A, EEA Data Portal, etc.)
   N/A

Commonwealth of Massachusetts
City/Town of Reading

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: STP - 1 (Hole #) | 11/28/2023 (Date) | 11:10 (Time) | Sunny (Weather) | 42.514180 (Latitude) | -71.104250 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Trees/weeds (Vegetation) | Damaged asphalt (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 3-8 (Slope (%))

Description of Location: Appx. 11' south of the center of the bend in the southern bit curb in vacant parking lot.

2. Soil Parent Material: Excavated and filled land | Ledge (Landform) | SU (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body ± feet | Drainage Way ± feet | Wetlands ± feet
Property Line ± feet | Drinking Water Well ± feet | Other ± feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: - Depth to Weeping in Hole - Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-12	A	FSL	10YR 3/2	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	-
12-34	Bw	FSL	10YR 5/4	-	Cnc :- Dpl: -	-	15-35	15-35	Massive	Friable	Boulders encountered
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
Large boulders encountered at 34".

Commonwealth of Massachusetts
City/Town of Reading

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: STP - 2 (Hole #) | 11/28/2023 (Date) | 11:32 (Time) | Sunny (Weather) | 42.514180 (Latitude) | -71.104250 (Longitude)

1. Land Use: Vacant Lot (e.g., woodland, agricultural field, vacant lot, etc.) | Trees/weeds (Vegetation) | Damaged asphalt (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 3-8 (Slope (%))

   Description of Location: Appx. 14' southwest of the edge of the southwest bit curb.

2. Soil Parent Material: Excavated and filled land | Ledges (Landform) | SU (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body ± feet | Drainage Way ± feet | Wetlands ± feet
   Property Line ± feet | Drinking Water Well ± feet | Other ± feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: - Depth to Weeping in Hole - Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-12	A	FSL	10YR 3/2	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	-
12-27	Bw	FSL	10YR 5/4	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	-
27-104	C	Fine-Medium Sand	10YR 5/2	-	Cnc :- Dpl: -	-	15-35	15-35	S. Grain	Loose	Bouldery
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of Reading

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one): Obs. Hole #STP - 1 Obs. Hole #STP - 2

	Obs. Hole #STP - 1	Obs. Hole #STP - 2
☐ Depth to soil redoximorphic features	- inches	- inches
☐ Depth to observed standing water in observation hole	- inches	- inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

______________________ Index Well Number ______________________ Reading Date

$S_h = S_c - [S_r \times (OW_c - OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

   ☐ Yes ☒ No

   b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: _____ inches Lower boundary: _____ inches

   c. If no, at what depth was impervious material observed? Upper boundary: 12 inches Lower boundary: 34 inches

Commonwealth of Massachusetts
City/Town of Reading

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

William Simmons | 12/8/2023
Signature of Soil Evaluator | Date

William Simmons / SE 14606 | May 1, 2025
Typed or Printed Name of Soil Evaluator / License # | Expiration Date of License

Name of Approving Authority Witness | Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Reading

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

One Sylvan LLC
Owner Name

258 Main Street
Street Address

011.0-0000-0193.0
Map/Lot #

Reading
City

MA
State

01867
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey Web Soil Survey (Source) 602 (Soil Map Unit) Urban Land (Soil Series)

   Ledges (Landform) N/A (Soil Limitations)

   Excavated and Filled land.
   Soil Parent material

3. Surficial Geological Report 2018 / Stone, Stone, DiGiacomo-Cohen (Year Published/Source) Coarse Deposits (Map Unit)

   Consist of gravel deposits, sand and gravel deposits, and sand deposits.
   Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer: N/A (Wetland Type)

7. Current Water Resource Conditions (USGS): 12/8/2023 (Month/Day/ Year) Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed: Not in Zone A, Zone II, or IWPA.
   (Zone II, IWPA, Zone A, EEA Data Portal, etc.)

   N/A

Commonwealth of Massachusetts
City/Town of Reading

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: STP - 3 (Hole #) | 11/28/2023 (Date) | 12:11 (Time) | Sunny (Weather) | 42.514180 (Latitude) | -71.104250 (Longitude)

1. Land Use: Vacant Lot (e.g., woodland, agricultural field, vacant lot, etc.) | Trees/weeds (Vegetation) | Damaged Asphalt (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 3-8 (Slope (%))

Description of Location: Appx. 11' NW of the NW bit curb in the vacant parking lot.

2. Soil Parent Material: Excavated and filled land | Ledge (Landform) | SU (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body ± feet | Drainage Way ± feet | Wetlands ± feet
Property Line ± feet | Drinking Water Well ± feet | Other ± feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: - Depth to Weeping in Hole - Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-30	A	FSL	10YR 3/2	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	Comm. root through layer
30-62	Bw	FSL	10YR 5/4	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	Comm. root to 62"
62-108	C	fine-medium sand	10YR 5/2	-	Cnc :- Dpl: -	-	15-35	15-35	S. Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of Reading

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: STP - 4 (Hole #) | 11/28/2023 (Date) | 12:50 (Time) | Sunny (Weather) | 42.514180 (Latitude) | -71.104250 (Longitude)

1. Land Use: Vacant Lot (e.g., woodland, agricultural field, vacant lot, etc.) | N/A (Vegetation) | Stonewall nearby (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 3-8 (Slope (%))

   Description of Location: 10' NE of the center of the chamfer side of the edge of the bottom concrete step to 262 Main St.

2. Soil Parent Material: Excavated and filled land | Ledges (Landform) | SH (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body ± feet | Drainage Way ± feet | Wetlands ± feet

   Property Line 7 feet | Drinking Water Well ± feet | Other ± feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: - Depth to Weeping in Hole - Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-4	Bw	FSL	10YR 5/4	-	Cnc :- Dpl: -	-	15-35	-	Massive	Friable	Fill Layer
4-8	Ab	FSL	10YR 3/2	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	
8-34	Bw2	FSL	10YR 5/4	-	Cnc :- Dpl: -	-	15-35	15-35	Massive	Friable	Fill Layer
34-109	C	fine-medium sand	10YR 5/2	-	Cnc :- Dpl: -	-	15-35	15-35	S. Grain	Loose	Fill Layer
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of Reading

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one): Obs. Hole #STP - 3 Obs. Hole #STP - 4

	Obs. Hole #STP - 3	Obs. Hole #STP - 4
☐ Depth to soil redoximorphic features	- inches	- inches
☐ Depth to observed standing water in observation hole	- inches	- inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____________________ Index Well Number   _____________________ Reading Date

$S_h = S_c - [S_r \times (OW_c - OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☐ Yes ☒ No

b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: _____ inches Lower boundary: _____ inches

c. If no, at what depth was impervious material observed? Upper boundary: 8 inches Lower boundary: 109 inches

Commonwealth of Massachusetts
City/Town of Reading

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

William Simmons | 12/8/2023
Signature of Soil Evaluator | Date

William Simmons / SE 14606 | May 1, 2025
Typed or Printed Name of Soil Evaluator / License # | Expiration Date of License

Name of Approving Authority Witness | Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Reading

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

One Sylvan LLC
Owner Name

258 Main Street
Street Address

011.0-0000-0193.0
Map/Lot #

Reading
City

MA
State

01867
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey
Web Soil Survey
Source

602
Soil Map Unit

Urban Land
Soil Series

Ledges
Landform

N/A
Soil Limitations

Excavated and Filled land.
Soil Parent material

3. Surficial Geological Report
2018 / Stone, Stone, DiGiacomo-Cohen
Year Published/Source

Coarse Deposits
Map Unit

Consist of gravel deposits, sand and gravel deposits, and sand deposits.
Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No
If yes, MassGIS Wetland Data Layer: N/A
Wetland Type

7. Current Water Resource Conditions (USGS): 12/8/2023
Month/Day/ Year
Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:
(Zone II, IWPA, Zone A, EEA Data Portal, etc.)
Not in Zone A, Zone II, or IWPA.
N/A

Commonwealth of Massachusetts
City/Town of Reading

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: STP - 5 (Hole #) | 11/28/2023 (Date) | 1:40 (Time) | P. Sunny/Cloudy (Weather) | 42.514180 (Latitude) | -71.104250 (Longitude)

1. Land Use: Single Family Dwelling (e.g., woodland, agricultural field, vacant lot, etc.) | Grass (Vegetation) | Stonewall (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 3-8 (Slope (%))

Description of Location: Appx. 14' SE of the E corner of the stonewall in the backyard of 10 Pinevale Ave.

2. Soil Parent Material: Excavated and filled land | Ledge (Landform) | SH (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body ± feet | Drainage Way ± feet | Wetlands ± feet
Property Line 2 feet | Drinking Water Well ± feet | Other ± feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: - Depth to Weeping in Hole - Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-6	A	FSL	10YR 3/2	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	Comm. roots to 6"
6-14	Bw	FSL	10YR 5/6	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	
14-113	C	fine-medium sand	10YR 5/2	-	Cnc :- Dpl: -	-	15-35	15-35	S. Grain	Loose	Lightly Bouldery (>10%)
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
2' away from property line shared with 262 Main St, a vacant lot.

Commonwealth of Massachusetts
City/Town of Reading

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one): Obs. Hole #STP-5 Obs. Hole #_____

	Obs. Hole #STP-5	Obs. Hole #_____
☐ Depth to soil redoximorphic features	- inches	_____ inches
☐ Depth to observed standing water in observation hole	- inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_______________ Index Well Number _______________ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☒ Yes ☐ No

b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 14 inches Lower boundary: 113 inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of Reading

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

William Simmons
Signature of Soil Evaluator

12/8/2023
Date

William Simmons / SE 14606
Typed or Printed Name of Soil Evaluator / License #

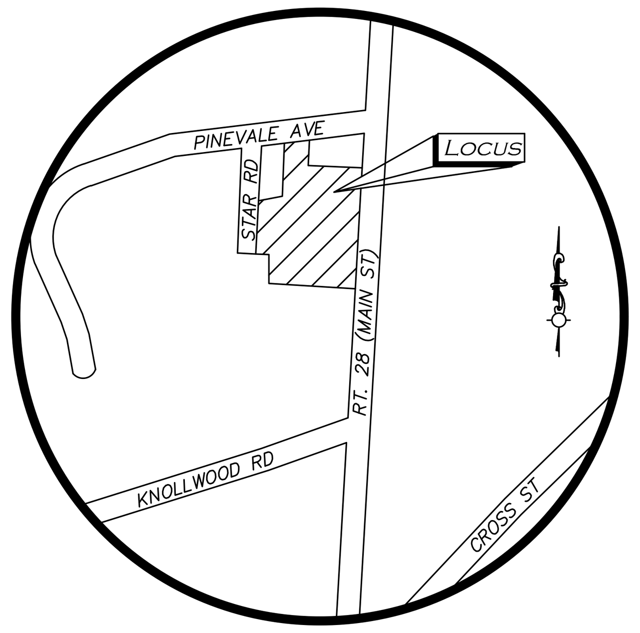
May 1, 2025
Expiration Date of License

Name of Approving Authority Witness

Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:



Locus Map
(NOT TO SCALE)

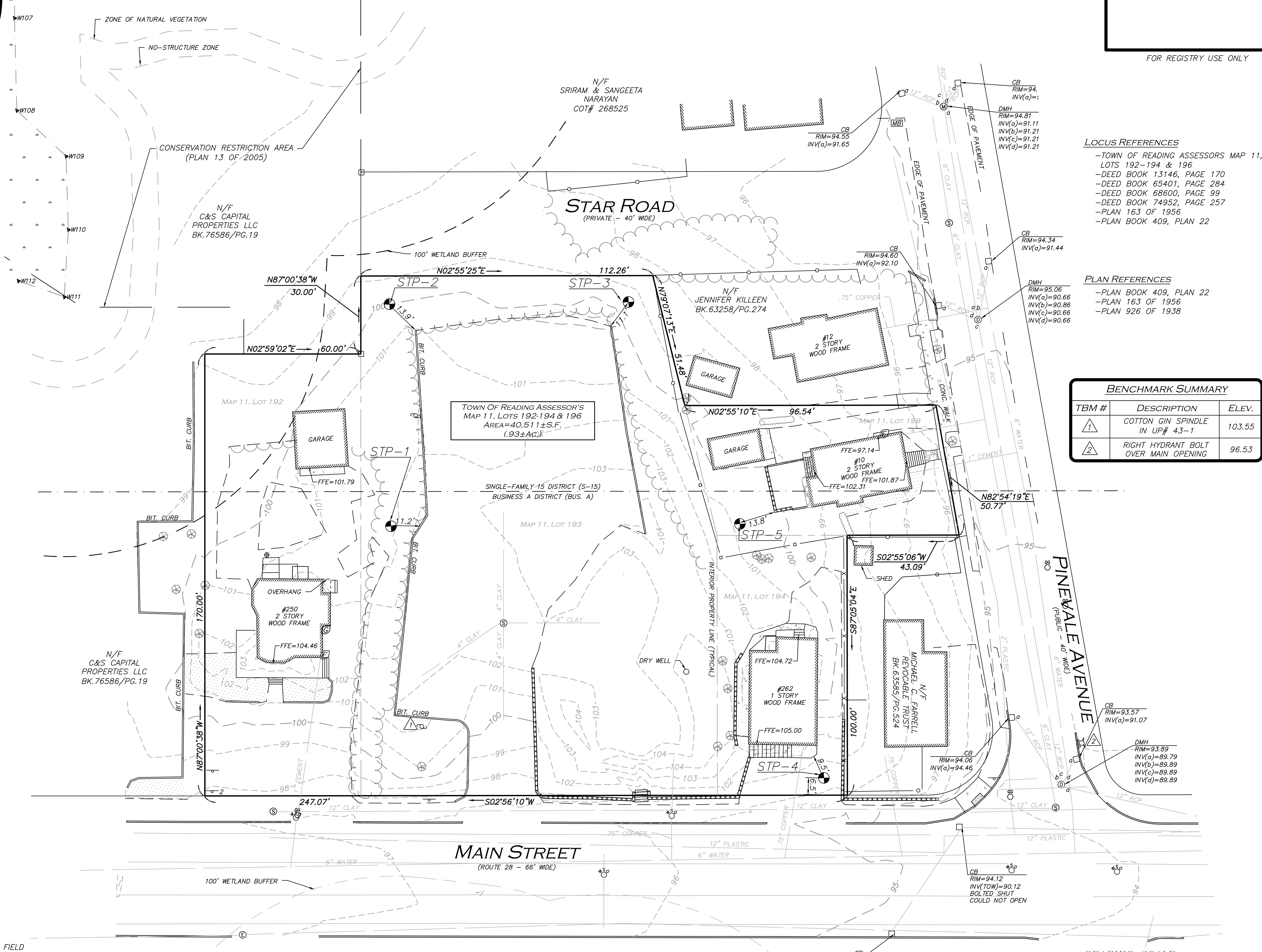
Notes

1. NORTH ARROW IS BASED ON MASSACHUSETTS GRID COORDINATE SYSTEM (MAINLAND ZONE) (NAD 83).
2. BOOK/PAGE AND PLAN REFERENCES ARE TAKEN FROM MIDDLESEX (SOUTH) REGISTRY OF DEEDS IN CAMBRIDGE, MA.
3. VERTICAL DATUM IS NAVD 88.
4. CONTOUR INTERVAL IS ONE FOOT (1').
5. ALL CURBING SHOWN HEREON IS GRANITE, UNLESS OTHERWISE NOTED.
6. WETLAND FLAGS DELINEATED BY GODDARD CONSULTING, LLC ON MARCH 7, 2023.

FOR REGISTRY USE ONLY

Legend

STONE BOUND (SB)	
DRAIN MANHOLE (DMH)	
SEWER MANHOLE (SMH)	
ELECTRIC MANHOLE (EMH)	
MISC. MANHOLE (MH)	
CATCH BASIN (CB)	
UTILITY POLE	
FIRE HYDRANT	
WATER GATE	
GAS GATE	
TREE	
SIGN	
MAILBOX	MB
WETLAND FLAG	A31
GAS METER	
ELECTRIC METER	
CONCRETE	
LANDSCAPED AREA (LSA)	
STONE PAVERS	
TACTILE DOME STRIP	
BUILDING	
BUILDING OVERHANG	
WETLAND	
BUFFER ZONE	
1' CONTOUR	53
5' CONTOUR	55
PROPERTY LINE	
ABUTTERS LINE	
INTERIOR PROPERTY LINE	
ZONE LINE	
STONE RETAINING WALL	
TREE LINE	
EDGE OF PAVEMENT	
CURB	
CHAIN LINK FENCE	x
STOCKADE FENCE	
VINYL FENCE	o
WATER LINE	W
SEWER LINE	S
DRAIN LINE	D
GAS LINE	G
ELECTRIC LINE	E
TELEPHONE LINE	T
FINISHED FLOOR ELEVATION	FFE
CONCRETE	CONC.
STONE BOUND W/DRILL HOLE	SB/DH
CENTER LINE	CL
FOUND	FND
NOW OR FORMERLY	N/F
BOOK	BK.
PAGE	PG.



Locus References

- TOWN OF READING ASSESSORS MAP 11, LOTS 192-194 & 196
- DEED BOOK 13146, PAGE 170
- DEED BOOK 65401, PAGE 284
- DEED BOOK 68600, PAGE 99
- DEED BOOK 74952, PAGE 257
- PLAN 163 OF 1956
- PLAN BOOK 409, PLAN 22

Plan References

- PLAN BOOK 409, PLAN 22
- PLAN 163 OF 1956
- PLAN 926 OF 1938

Benchmark Summary

TBM #	Description	Elev.
1	COTTON GIN SPINDLE IN UP# 43-1	103.55
2	RIGHT HYDRANT BOLT OVER MAIN OPENING	96.53

Utility Statement

THE UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. ALLEN & MAJOR ASSOCIATES, INC. (A&M) MAKES NO GUARANTEE THAT THE UTILITIES SHOWN HEREON COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. A&M FURTHER DOES NOT WARRANT THAT THE UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. A&M HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

N:\PROJECTS\2398-01A\SURVEY\DRAWINGS\CURRENT\S-2398-01A-EC.DWG

WE HEREBY CERTIFY THAT:

THIS PLAN IS THE RESULT OF AN ACTUAL ON THE GROUND SURVEY PERFORMED ON OR BETWEEN APRIL 3, 2023 AND APRIL 13, 2023.

THIS PLAN WAS PREPARED IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS DATED JANUARY 1, 1976 AND REVISED JANUARY 12, 1988.

ACCORDING TO DEEDS AND PLANS OF RECORD, THE PROPERTY LINES SHOWN ON THIS PLAN ARE THE LINES DIVIDING EXISTING OWNERSHIP, AND THE LINES OF THE STREETS OR WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS AND WAYS ALREADY ESTABLISHED, AND THAT NO NEW LINES FOR THE DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

THE ABOVE CERTIFICATION IS INTENDED TO MEET REGISTRY OF DEEDS REQUIREMENTS FOR THE RECORDING OF PLANS AND IS NOT A CERTIFICATION TO THE TITLE OR OWNERSHIP OF THE PROPERTY SHOWN. OWNERS OF ADJOINING PROPERTIES ARE SHOWN ACCORDING TO CURRENT TOWN OF READING ASSESSOR'S INFORMATION.

THE ABOVE IS CERTIFIED TO THE BEST OF MY PROFESSIONAL KNOWLEDGE, INFORMATION AND BELIEF.

ALLEN & MAJOR ASSOCIATES, INC.

Sept. 6, 2023

C:\Users\cobrien\Desktop\Norman Lipsitz .jpg

PROFESSIONAL LAND SURVEYOR FOR ALLEN & MAJOR ASSOCIATES, INC.

9/6/23

COMMONWEALTH OF MASSACHUSETTS
NORMAN I. LIPSITZ
No.28446
PROFESSIONAL LAND SURVEYOR

C:\Users\cobrien\Desktop\Norman Lipsitz .jpg

REV	DATE	DESCRIPTION

APPLICANT\OWNER:

ONE SYLVAN LLC
PO BOX 4449
PEABODY, MA 01961

PROJECT:

252-260 MAIN STREET
READING, MA

PROJECT NO. 2398-01A	DATE: 09/06/23
SCALE: 1" = 20'	DWG. NO. S-2398-01A-EC
DRAFTED BY: COB/SMM	CHECKED BY: COB/NIL

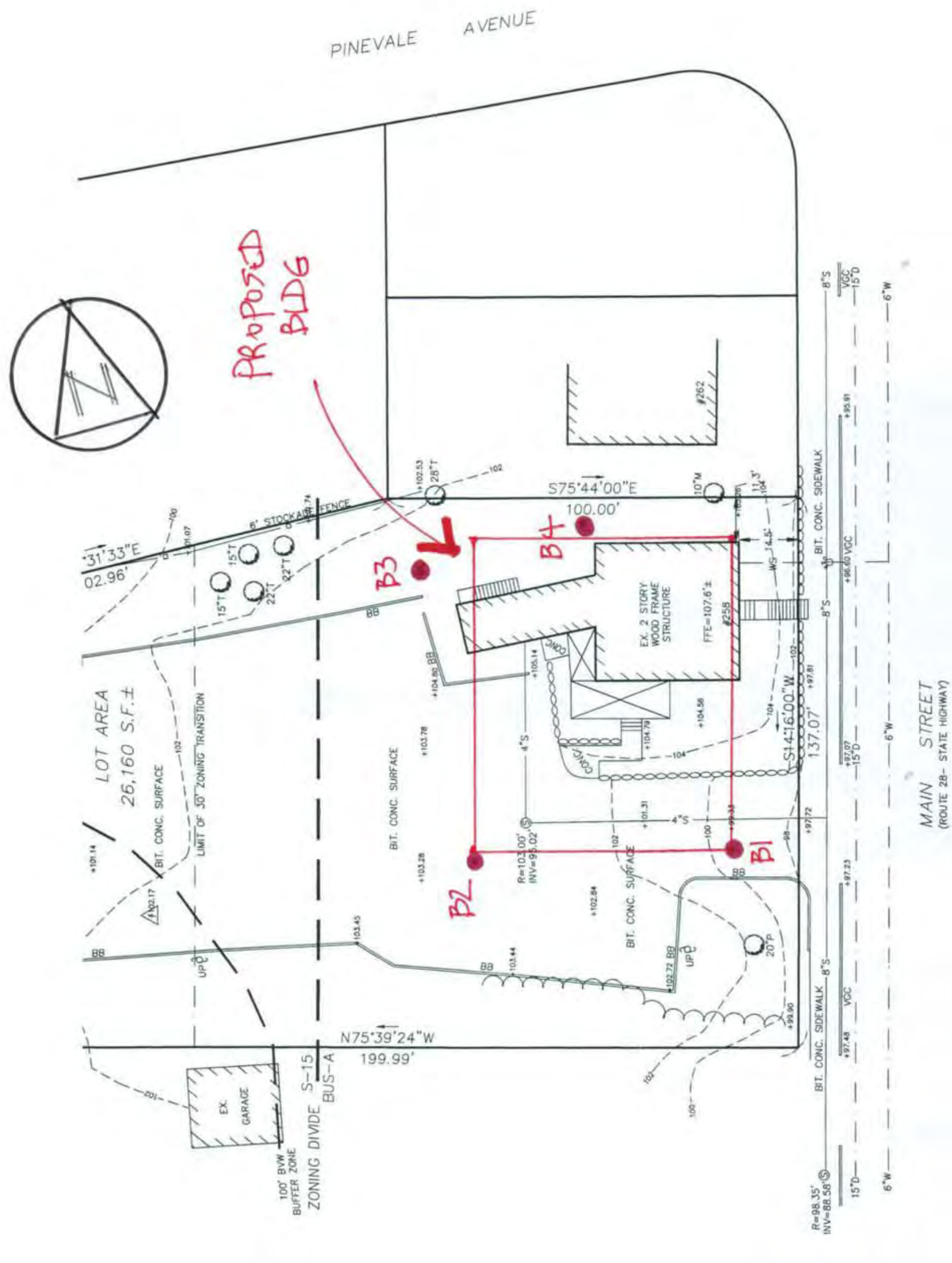
PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ◆ land surveying
environmental consulting ◆ landscape architecture
www.allenmajor.com
100 COMMERCE WAY
WOBURN MA 01801-8501
TEL: (781) 935-6889
FAX: (781) 935-2896

WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

THIS DRAWING HAS BEEN PREPARED IN DIGITAL FORMAT. CLIENT/CLIENT'S REPRESENTATIVE OR CONSULTANTS MAY BE PROVIDED COPIES OF DRAWINGS AND SPECIFICATIONS FOR HIS/HER INFORMATION AND/OR SPECIFIC USE ON THIS PROJECT. DUE TO THE POTENTIAL THAT THE PROVIDED INFORMATION MAY BE MODIFIED UNINTENTIONALLY OR OTHERWISE, ALLEN & MAJOR ASSOCIATES, INC. MAY REMOVE ALL INDICATION OF THE DOCUMENT'S AUTHORSHIP ON THE DIGITAL MEDIA. PRINTED REPRESENTATIONS OR PORTABLE DOCUMENT FORMAT OF THE DRAWINGS AND SPECIFICATIONS ISSUED SHALL BE THE ONLY RECORD COPIES OF ALLEN & MAJOR ASSOCIATES, INC.'S WORK PRODUCT.

DRAWING TITLE:	SHEET No.
PROPERTY LINE/ EXISTING CONDITIONS	V-101


PINEVALE AVENUE
PROPOSED BLDG
B1
B2
B3
B4
LOT AREA 26,160 S.F.±
BIT. CONC. SURFACE
LIMIT OF 30' ZONING TRANSITION
6' STOCKADE FENCE
S75°44'00"E
100.00'
N75°39'24"W
199.99'
S14°16'00"W
137.07'
EX. 2 STORY WOOD FRAME STRUCTURE
FFE=107.6'±
#258
#262
EX. GARAGE
100' BVW BUFFER ZONE
ZONING DIVIDE
S-15
BUS-A
R=103.00'
INV=95.02'
R=98.35'
INV=88.58'
BIT. CONC. SIDEWALK
MAIN STREET
(ROUTE 28- STATE HIGHWAY)

TEST BORING LOG

SHEET 1

Soil Exploration Corp. Geotechnical Drilling Groundwater Monitor Well 148 Pioneer Drive Leominster, MA 01453 978 840-0391	**Site: 258 Main Street** **Reading, MA**	BORING B-1 PROJECT NO. 13-0733 DATE: July 29, 2013

Ground Elevation:	100 ft+/-
Date Started:	July 26, 2013
Date Finished:	July 26, 2013
Driller:	TF
Soil Engineer/Geologist:	KM

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION
7/25/13	12 ft	n/a	Upon Completion

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
							Pavement
						4"	
1		1	10"	1'0"-3'0"	4-7-6-6		Brown, fine to coarse Sand, some silt, little gravel (FILL)
		2	12"	3'0"-5'0"	11-14-20-26	3'	
5		3	8"	5'0"-7'0"	16-21-28-29		Brown, fine to coarse Sand & Gravel, little silt (GLACIAL)
10		4	10"	10'0"-12'0"	19-16-23-20		Brown, fine to coarse Sand & Gravel, trace silt, cobbles,
15		5	8"	15'0"-17'0"	26-40-39-58		Same, wet
						18'	Auger Refusal at 18 ft
20							
25							
30							
35							

Notes: Hollow Stem Auger Size - 4-1/4"

				CASING	SAMPLE	CORE TYPE
Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose,	Trace	0 to 10%				
10 -30 M Dense, 30 -50 Dense, 50+ V	Little	10 to 20%	ID SIZE (IN)		SS	
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M	Some	20 to 35%	HAMMER WGT (LB)		140 lb.	
8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.	And	35% to 50%	HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 2

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Site: 258 Main Street
Reading, MA

BORING B-2

PROJECT NO. 13-0733

DATE: July 29, 2013

Ground Elevation: 103 ft+/-
Date Started: July 26, 2013
Date Finished: July 26, 2013
Driller: TF
Soil Engineer/Geologist: KM

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION
7/26/13	14 ft	n/a	Upon Completion

Depth Ft.	Casing bl/ft	Sample No.	Sample Pen/Rec	Sample Depth	Sample Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
							Pavement
1		1	8"	1'0"-3'0"	7-10-12-9		Brown, fine to medium Sand, some gravel, little silt, dry (FILL)
						3'	
		2	4"	3'0"-5'0"	12-16-17-21		Brown, fine to medium Sand & Gravel, trace silt, cobbles, dry
5		3	12"	5'0"-7'0"	28-29-31-34		Same, dry w/ cobbles (GLACIAL)
10		4	12"	10'0"-12'0"	23-20-29-35		Brown, fine to medium Sand, some gravel, little silt, cobbles, boulders
15		5	10"	15'0"-16'6"	42-68-87		Brown, fine to medium Sand & Gravel, little silt, cobbles, wet
						16'6"	
							Refusal at 16'6"
20							
25							
30							
35							

Notes: Hollow Stem Auger Size - 4-1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 3

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Site: 258 Main Street
Reading, MA

BORING B-3/B-3A

PROJECT NO. 13-0733

DATE: July 29, 2013

Ground Elevation:	103 ft+/-
Date Started:	July 26, 2013
Date Finished:	July 26, 2013
Driller:	TF
Soil Engineer/Geologist:	KM

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION
7/26/13	14 ft	n/a	Upon Completion

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Sample Depth	Blows/6”	Strata	Visual Identification of Soil and / or Rock Sample
							Topsoil
1		1	6”	0”-2’0”	3-3-4-5		
						2’	
		2	4”	2’0”-4’0”	9-31-12-13		Rust Brown, fine to medium Sand, some silt, trace loam (SUBSOIL/FILL)
						5’	
5		3	8”	5’0”-7’0”	26-32-29-31		Brown, fine to medium Sand & Gravel, trace silt, cobbles, boulders, dry
10		4	10”	10’0”-12’0”	24-31-28-29		Brown, fine to coarse Sand & Gravel, little silt, cobbles
							(GLACIAL)
15		5	10”	15’0”-17’0”	34-51-72-68		Same, wet
						18’	B-3 refusal at 5 ft B-3A refusal at 18 ft
20							
25							
30							
35							

Notes: Hollow Stem Auger Size - 4-1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 4

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Site: 258 Main Street
Reading, MA

BORING B-4

PROJECT NO. 13-0733

DATE: July 29, 2013

Ground Elevation: 103 ft+/-
Date Started: July 26, 2013
Date Finished: July 26, 2013
Driller: TF
Soil Engineer/Geologist: KM

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION
7/26/13	14 ft	n/a	Upon Completion

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Depth	Blows/6”	Strata	Visual Identification of Soil and / or Rock Sample
1		1	4”	0”-2’0”	2-3-3-5		Black, Organic Silt, roots (TOPSOIL)
						2’	
		2	6”	2’0”-4’0”	5-8-9-12		Brown, fine to medium Sand & Gravel, little silt, dry (FILL)
						5’	
5		3	6”	5’0”-6’6”	18-29-85		Brown, fine to medium Sand & Gravel, little silt, cobbles, boulders, dry
10		4	6”	10’0”-12’0”	12-18-15-24		Same (GLACIAL)
15		5	10”	15’0”-15’10”	63-100/4”		Same, wet
						17’	Refusal at 17 ft
20							
25							
30							
35							

Notes: Hollow Stem Auger Size - 4-1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

Illicit Discharge Compliance Statement

Responsibility:

The Owner is responsible for ultimate compliance with all provisions of the Massachusetts Stormwater Management Policy, the USEPA NPDES Construction General Permit and responsible for identifying and eliminating illicit discharges (as defined by the USEPA).

OWNER NAME: BLVD Reading, LLC

ADDRESS: 1 Sylvan Road

Peabody, MA 01960

TEL. NUMBER: (781) 389-5989

Engineer's Compliance Statement:

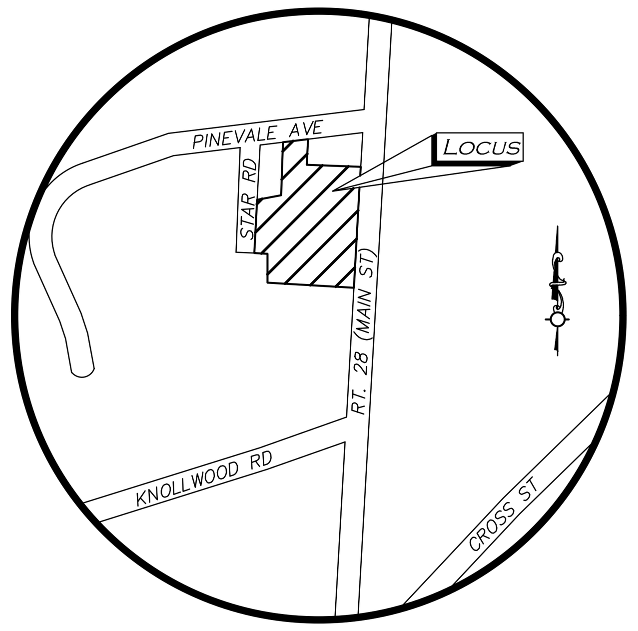
To the best of my knowledge, the attached plans, computations and specifications meet the requirements of Standard 10 of the Massachusetts Stormwater Handbook regarding illicit discharges to the stormwater management system and that no detectable illicit discharges exist on the site. All documents and attachments were prepared under my direction and qualified personnel properly gathered and evaluated the information submitted, to the best of my knowledge.

Included with this statement are site plans, drawn to scale, that identify the location of systems for conveying stormwater on the site and show that these systems do not allow the entry of any illicit discharges into the stormwater management system. The plans also show any systems for conveying wastewater and/or groundwater on the site and show that there are no connections between the stormwater and wastewater systems.

For a redevelopment project (if applicable), all actions taken to identify and remove illicit discharges, including without limitation, visual screening, dye or smoke testing, and the removal of any sources of illicit discharges to the stormwater management system are documented and included with this statement.

Notwithstanding the foregoing, an illicit discharge does not include discharges from the following activities or facilities: firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing, and water used to clean residential buildings without detergents.

CIVIL SITE PLANS FOR:
STRADA
MIXED USE BUILDING
252-262 MAIN STREET &
10 PINEVALE AVENUE READING, MA



LOCUS MAP
(NOT TO SCALE)

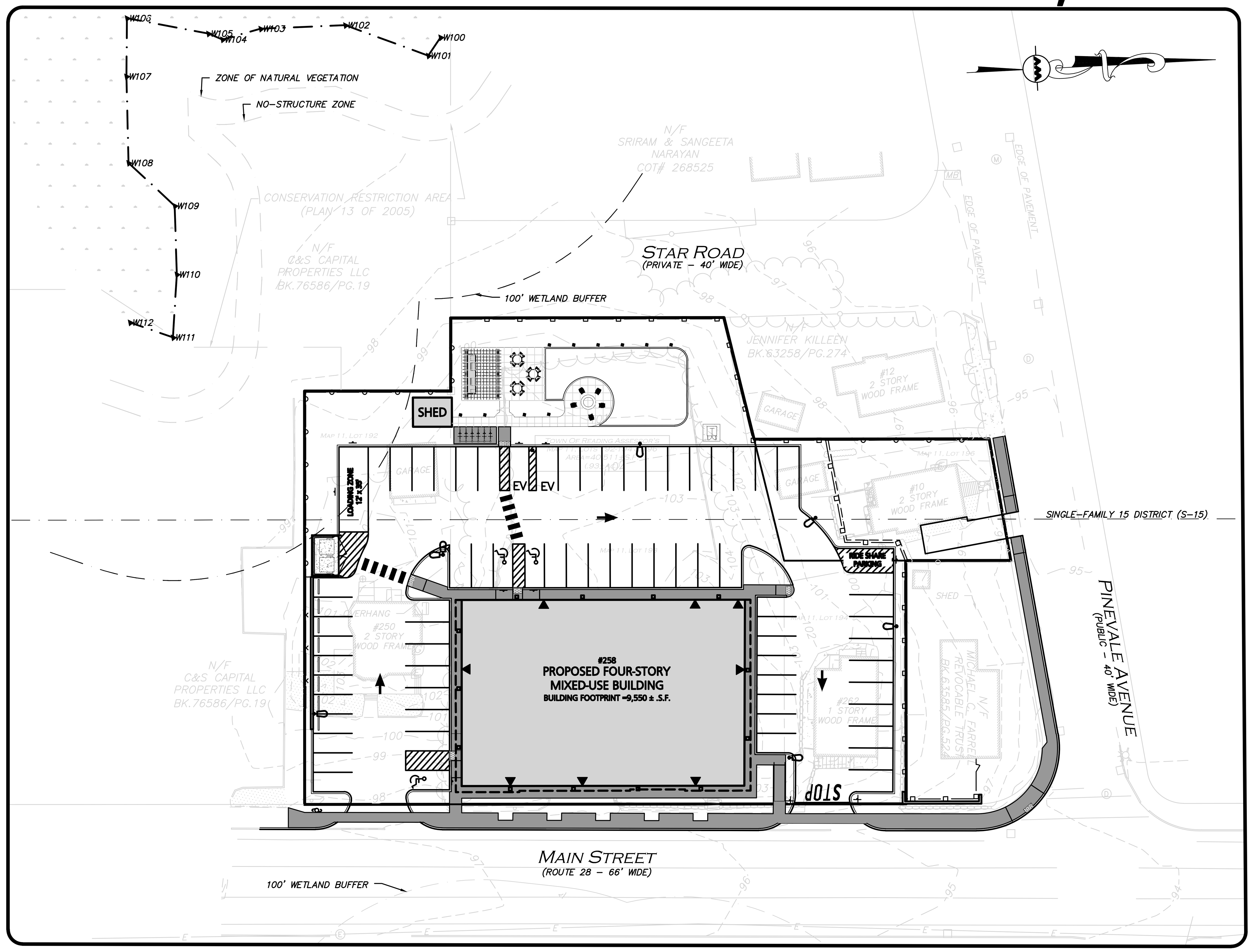
ASSESSOR'S INFORMATION			
MAP	LOT	BLOCK	AREA (ACRES)
11	192	000	0.23
11	193	000	0.60
11	194	000	0.11
11	196	000	0.11

OWNER / APPLICANT:
BLVD READING, LLC
c/o SAVERIO FULCINITI
1 SYLVAN STRET
PEABODY, MA 01960

CIVIL ENGINEER/LANDSCAPE ARCHITECT
& LAND SURVEYOR:
ALLEN & MAJOR ASSOCIATES
100 COMMERCE WAY, SUITE 5
WOBURN, MA 01801
781.935.6889

ARCHITECT:
RP ARCHITECTUAL STUDIO
78 HIGHLAND CIRCLE
WAYLAND, MA O1778
617.794.7759

WETLAND SCIENTIST:
GODDARD CONSULTING, LLC
291 MAIN STREET, SUITE 8
NORTHBOROUGH, MA 01532
508.393.3784



LIST OF DRAWINGS			
DRAWING TITLE	SHEET NO.	ISSUED	LAST REVISED
PROPERTY LINE/EXISTING CONDITIONS	V-101	09-06-2023	
ABBREVIATIONS & NOTES	C-001 - 002	10-05-2023	03-25-2024
EROSION CONTROL PLAN	C-100	10-05-2023	03-25-2024
SITE PREPARATION PLAN	C-101	10-05-2023	03-25-2024
LAYOUT & MATERIALS PLAN	C-102	10-05-2023	03-25-2024
GRADING & DRAINAGE PLAN	C-103	10-05-2023	03-25-2024
UTILITIES PLAN	C-104	10-05-2023	03-25-2024
LIGHTING PLAN	C-105	10-05-2023	03-25-2024
SNOW STORAGE PLAN	C-106	10-05-2023	03-25-2024
VEHICLE MOVEMENT PLAN	C-107A - C-107B	10-05-2023	03-25-2024
FIRE TRUCK TURNING PLAN	C-108	10-05-2023	03-25-2024
ABUTTING PROPERTY DIMENSION PLAN	C-109	10-05-2023	03-25-2024
SITE CROSS SECTION PLAN	C-201	10-05-2023	03-25-2024
DETAILS	C-501 - C-509	10-05-2023	03-25-2024
LANDSCAPE PLAN	L-101	10-05-2023	03-25-2024
SITE AMENITIES PLAN	L-102	10-05-2023	03-25-2024
LANDSCAPE NOTES & DETAILS	L-501 - L-502	10-05-2023	03-25-2024
SITE AMENITIES DETAILS	L-503	10-05-2023	03-25-2024

N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\C-2398-01A_COVER.DWG

PREPARED BY:
ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ♦ land surveying
environmental consulting ♦ landscape architecture
www.allenmajor.com
100 COMMERCE WAY, SUITE 5
WOBURN MA 01801
TEL: (781) 935-6889
FAX: (781) 935-2896

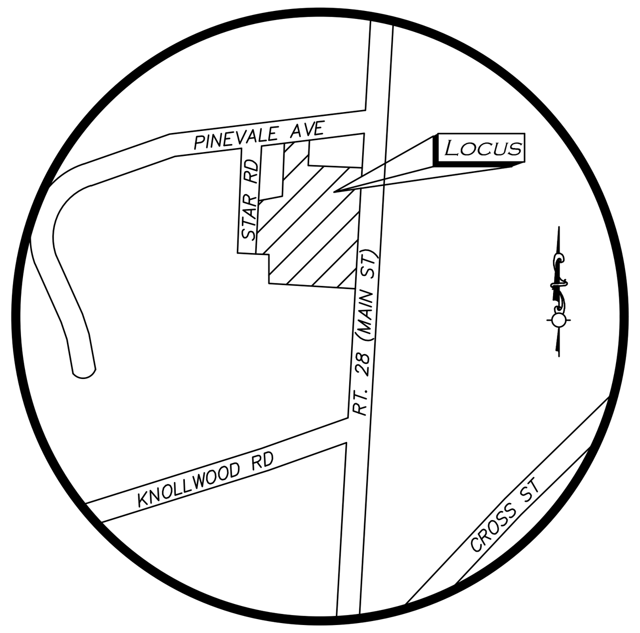
WOBURN, MA ♦ LAKEVILLE, MA ♦ MANCHESTER, NH

GRAPHIC SCALE
30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.

COMMONWEALTH OF MASSACHUSETTS
CARLTON M. QUINN
CIVIL
No.49923
REGISTERED PROFESSIONAL ENGINEER
3.25.24

PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

ISSUED FOR APPROVAL: OCTOBER 5, 2023
REVISED PER TOWN COMMENTS: FEBRUARY 29, 2024
REVISED PER TOWN COMMENTS: MARCH 25, 2024



LOCUS MAP
(NOT TO SCALE)

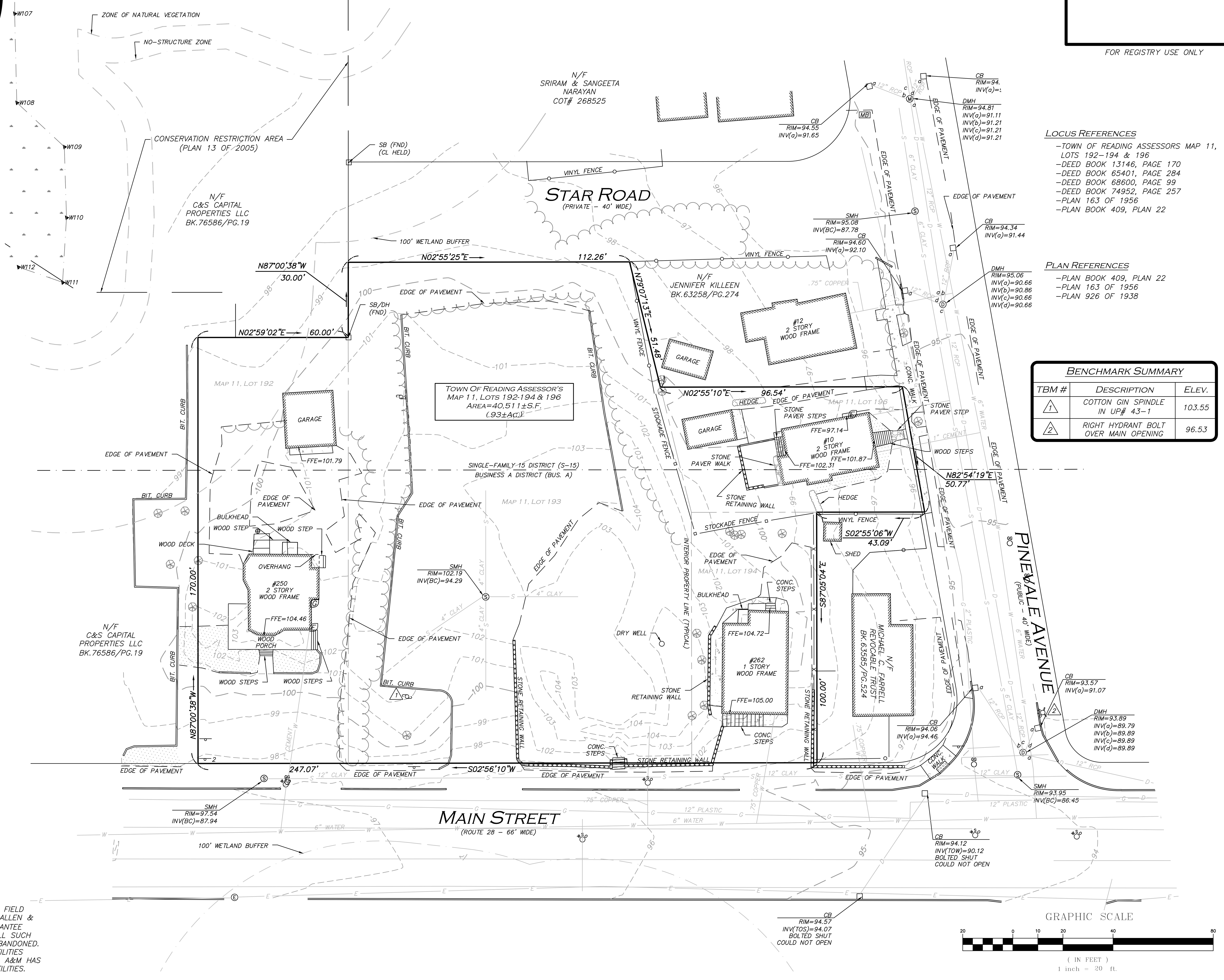
LEGEND

STONE BOUND (SB)	
DRAIN MANHOLE (DMH)	
SEWER MANHOLE (SMH)	
ELECTRIC MANHOLE (EMH)	
MISC. MANHOLE (MH)	
CATCH BASIN (CB)	
UTILITY POLE	
FIRE HYDRANT	
WATER GATE	
GAS GATE	
TREE	
SIGN	
MAILBOX	MB
WETLAND FLAG	A31
GAS METER	
ELECTRIC METER	
CONCRETE	
LANDSCAPED AREA (LSA)	
STONE PAVERS	
TACTILE DOME STRIP	
BUILDING	
BUILDING OVERHANG	
WETLAND	
BUFFER ZONE	
1' CONTOUR	53
5' CONTOUR	55
PROPERTY LINE	
ABUTTERS LINE	
INTERIOR PROPERTY LINE	
ZONE LINE	
STONE RETAINING WALL	
TREE LINE	
EDGE OF PAVEMENT	
CURB	
CHAIN LINK FENCE	
STOCKADE FENCE	
VINYL FENCE	
WATER LINE	W
SEWER LINE	S
DRAIN LINE	D
GAS LINE	G
ELECTRIC LINE	E
TELEPHONE LINE	T
FINISHED FLOOR ELEVATION	FFE
CONCRETE	CONC.
STONE BOUND W/DRILL HOLE	SB/DH
CENTER LINE	CL
FOUND	FND
NOW OR FORMERLY	N/F
BOOK	BK.
PAGE	PG.

NOTES

1. NORTH ARROW IS BASED ON MASSACHUSETTS GRID COORDINATE SYSTEM (MAINLAND ZONE) (NAD 83).
2. BOOK/PAGE AND PLAN REFERENCES ARE TAKEN FROM MIDDLESEX (SOUTH) REGISTRY OF DEEDS IN CAMBRIDGE, MA.
3. VERTICAL DATUM IS NAVD 88.
4. CONTOUR INTERVAL IS ONE FOOT (1').
5. ALL CURBING SHOWN HEREON IS GRANITE, UNLESS OTHERWISE NOTED.
6. WETLAND FLAGS DELINEATED BY GODDARD CONSULTING, LLC ON MARCH 7, 2023.

FOR REGISTRY USE ONLY



LOCUS REFERENCES

- TOWN OF READING ASSESSORS MAP 11, LOTS 192-194 & 196
- DEED BOOK 13146, PAGE 170
- DEED BOOK 65401, PAGE 284
- DEED BOOK 68600, PAGE 99
- DEED BOOK 74952, PAGE 257
- PLAN 163 OF 1956
- PLAN BOOK 409, PLAN 22

PLAN REFERENCES

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- PLAN 926 OF 1938

BENCHMARK SUMMARY

TBM #	DESCRIPTION	ELEV.
1	COTTON GIN SPINDLE IN UP# 43-1	103.55
2	RIGHT HYDRANT BOLT OVER MAIN OPENING	96.53

UTILITY STATEMENT

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N:\PROJECTS\2398-01A\SURVEY\DRAWINGS\CURRENT\S-2398-01A-EC.DWG

WE HEREBY CERTIFY THAT:

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ACCORDING TO DEEDS AND PLANS OF RECORD, THE PROPERTY LINES SHOWN ON THIS PLAN ARE THE LINES DIVIDING EXISTING OWNERSHIP, AND THE LINES OF THE STREETS OR WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS AND WAYS ALREADY ESTABLISHED, AND THAT NO NEW LINES FOR THE DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

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THE ABOVE IS CERTIFIED TO THE BEST OF MY PROFESSIONAL KNOWLEDGE, INFORMATION AND BELIEF.

ALLEN & MAJOR ASSOCIATES, INC.

Sept. 6, 2023

PROFESSIONAL LAND SURVEYOR FOR ALLEN & MAJOR ASSOCIATES, INC.

COMMONWEALTH OF MASSACHUSETTS
NORMAN I. LIPSITZ
No.28446
PROFESSIONAL LAND SURVEYOR

9/6/23

REV	DATE	DESCRIPTION

APPLICANT\OWNER:

ONE SYLVAN LLC
PO BOX 4449
PEABODY, MA 01961

PROJECT:

252-260 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	09/06/23
SCALE:	1" = 20'	DWG. NAME:	S-2398-01A-EC
DRAFTED BY:	COB/SMM	CHECKED BY:	COB/NIL

PREPARED BY:

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civil engineering ◆ land surveying
environmental consulting ◆ landscape architecture
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100 COMMERCE WAY
WOBURN MA 01801-8501
TEL: (781) 935-6889
FAX: (781) 935-2896

WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE: PROPERTY LINE/ EXISTING CONDITIONS

SHEET No. V-101

NOTES

GENERAL NOTES:

1. TOPOGRAPHIC INFORMATION AND EXISTING SITE FEATURES WERE OBTAINED FROM AN ACTUAL FIELD SURVEY PERFORMED BY ALLEN & MAJOR ASSOCIATES, INC, 100 COMMERCE WAY, WOBURN, MASSACHUSETTS.
2. ZONING DISTRICT IS SINGLE–FAMILY 15 DISTRICT (S–15) AND BUSINESS A DISTRICT (BUS.A).
3. OVERALL LOT SIZE: 1.05± ACRES
4. DURING CONSTRUCTION, ALL VEHICLES MUST BE PARKED ON SITE.
5. DURING CONSTRUCTION, ALL STAGING AND DELIVERIES WILL OCCUR ON SITE.
6. THIS PROJECT WILL BE SERVED BY PUBLIC WATER AND SEWER AND PRIVATE, NATURAL GAS, TELEPHONE, CABLE AND ELECTRIC. ALL UTILITY LINES WILL BE INSTALLED UNDERGROUND UNLESS OTHERWISE NOTED.
7. THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AND STRUCTURES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF VARIOUS UTILITY COMPANIES AND WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THIS INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE LOCATION OF ALL UNDERGROUND UTILITIES AND STRUCTURES SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. THE CONTRACTOR MUST CONTACT THE APPROPRIATE UTILITY COMPANY, ANY GOVERNING PERMITTING AUTHORITY, AND "DIGSAFE" AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION WORK TO REQUEST EXACT FIELD LOCATION OF UTILITIES AND THE ENGINEER SHALL BE NOTIFIED IN WRITING OF ANY UTILITIES INTERFERING WITH THE PROPOSED CONSTRUCTION AND APPROPRIATE REMEDIAL ACTION TAKEN BEFORE PROCEEDING WITH THE WORK. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS AT NO ADDITIONAL COST.
8. ALL PROPOSED MAIN BUILDING ENTRANCES AND WALKS SHALL BE HANDICAP ACCESSIBLE PER FEDERAL ADA & MA AAB REGULATIONS.
9. ALL SITE WORK DONE FOR THIS PROJECT SHALL BE IN STRICT ACCORDANCE WITH THE SITE PLANS AND SITE WORK SPECIFICATIONS FOR CONSTRUCTION.
10. ANY DAMAGE TO PRIVATE OR PUBLIC PROPERTIES DUE TO THE CONTRACTOR'S ACTIVITIES SHALL BE REPAIRED AND RESTORED BY THE CONTRACTOR AT THEIR OWN EXPENSE.
11. ALL PROPERTY MARKERS AND STREET LINE MONUMENTS SHALL BE PROPERLY PROTECTED DURING CONSTRUCTION. ANY DAMAGE TO THESE ITEMS SHALL BE REPAIRED AND RESTORED BY A SURVEYOR REGISTERED IN THE STATE OF MASSACHUSETTS AT THE CONTRACTOR'S EXPENSE.
12. ALL APPLICABLE PERMITS AND AN APPROVED SET OF PLANS SHALL BE AVAILABLE AT THE CONSTRUCTION SITE.
13. THE CONTRACTOR IS RESPONSIBLE FOR SCHEDULING A PRE–CONSTRUCTION MEETING THE WITH THE APPROPRIATE CITY DEPARTMENTS, THE APPROPRIATE UTILITY COMPANIES, THE OWNER AND OWNER'S REPRESENTATIVE. THE MEETING SHALL TAKE PLACE PRIOR TO THE START OF CONSTRUCTION AND THE CONTRACTOR MUST PROVIDE 48 HOURS NOTICE TO ALL ATTENDEES PRIOR TO THE START OF THE MEETING.
14. APPROPRIATE WARNING SIGNS, MARKERS, BARRICADES AND/OR FLAG MEN SHALL BE PROVIDED TO REGULATE TRAFFIC. CONSTRUCTION TRAFFIC CONTROLS SHALL BE IMPLEMENTED AND OPERATED ACCORDING TO THE MASS DEPARTMENT OF TRANSPORTATION, THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) AND THE LOCAL AUTHORITY.
15. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ADDITIONAL BENCHMARK INFORMATION IF REQUIRED. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING BENCHMARKS. IF IT IS NECESSARY TO RELOCATE A BENCHMARK, IT SHALL BE RELOCATED BY A MASSACHUSETTS PROFESSIONAL LAND SURVEYOR AND DONE SO AT THE CONTRACTOR'S EXPENSE.
16. ALL BUILDING DIMENSIONS ARE MEASURED TO THE OUTSIDE FACE OF THE BUILDING.
17. ALL RADII ARE 3 FEET UNLESS OTHERWISE NOTED.
18. ALL PARKING LOT AND AISLE DIMENSIONS ARE TAKEN FROM THE FACE OF CURB AND INDICATE EDGE OF PAVEMENT.
19. CONSTRUCTION DURING WET WEATHER OR WINTER CONDITIONS IS TO BE ANTICIPATED AND PROVISIONS TO ADEQUATELY ADDRESS THESE CONDITIONS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AT NO ADDITIONAL COST.
20. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING AND PAYING FOR ANY PERMITS AND/OR CONNECTION FEES REQUIRED TO CARRY OUT THE WORK INCLUDING BUT NOT LIMITED TO DEMOLITION.
21. DISPOSAL OF ALL DEMOLISHED MATERIALS INCLUDING EXISTING MISC. CONSTRUCTION DEBRIS IS THE RESPONSIBILITY OF THE CONTRACTOR AND MUST BE DISPOSED OF OFF–SITE IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL MUNICIPAL REQUIREMENTS AT NO ADDITIONAL COST.
22. ALL DISTURBED AREAS NOT NOTED TO RECEIVE OTHER TREATMENT ARE TO RECEIVE SIX INCHES (6") MINIMUM OF TOPSOIL & SEED, AND BE MAINTAINED UNTIL ESTABLISHED & ACCEPTED.
23. EXISTING STRUCTURES WITHIN CONSTRUCTION LIMITS ARE TO BE PROTECTED, ABANDONED, REMOVED OR RELOCATED AS NECESSARY.
24. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL RELOCATIONS, INCLUDING BUT NOT LIMITED TO, ALL UTILITIES, STORM DRAINAGE, SIGNS, & POLES, ETC. AS REQUIRED. ALL WORK SHALL BE IN ACCORDANCE WITH THE LOCAL MUNICIPALITY'S GOVERNING AUTHORITY'S SPECIFICATIONS AND SHALL BE APPROVED BY SAME.
25. THE CONTRACTOR SHALL COORDINATE WITH ALL UTILITY COMPANIES TO DETERMINE EXACT POINT OF SERVICE CONNECTION AND DISCONNECTION AT EXISTING UTILITY.
26. ALL ELEVATIONS SHOWN ARE IN REFERENCE TO THE BENCHMARKS SHOWN ON THE EXISTING CONDITIONS SITE PLAN AND MUST BE VERIFIED BY THE GENERAL CONTRACTOR AT GROUNDBREAKING.
27. CONTRACTOR IS RESPONSIBLE FOR DIGGING TEST HOLES AND VERIFYING ANY EXISTING UTILITY OR STRUCTURE PRIOR TO CONSTRUCTION. CONTRACTOR SHALL VERIFY THAT BASED ON EXACT LOCATION OF EXISTING UTILITIES, THERE ARE NO CONFLICTS BETWEEN THE EXISTING AND THE PROPOSED UTILITIES/DRAINAGE STRUCTURES.
28. THE CONTRACTOR SHALL ADHERE TO ALL PERMIT CONDITIONS PROVIDED BY ALL GOVERNING AGENCIES AT NO ADDITIONAL COSTS. THIS INCLUDES BUT IS NOT LIMITED TO BUILDING PERMITS, DEMOLITION PERMITS, PLUMBING, GAS, AND ELECTRICAL PERMITS. PERMITS FROM THE PLANNING BOARD OR CITY COUNCIL.
29. DURING EXCAVATION, ANY EXISTING EARTH CUT MATERIALS THAT DO NOT MEET THE "ORDINARY FILL" SPECIFICATIONS OR "LOAM" SPECIFICATIONS AND CANNOT BE REUSED SHALL BE REMOVED OFFSITE BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNERS. MATERIAL WHICH DOES NOT MEET THE SPECIFICATION INCLUDES ALL BOULDERS, ROCKS, CONSTRUCTION DEBRIS, AND MISC. MATERIAL. PRIOR TO REUSE, CONTRACTOR TO PROVIDE TESTING REPORT OF SIEVE ANALYSIS TO ENGINEER FOR APPROVAL. CONTRACTOR CAN AMEND MATERIALS AND CONTINUE TO RETEST AS NECESSARY AT NO ADDITIONAL COST TO OWNER. AFTER AMENDING, IF MATERIAL STILL DOES NOT MEET THE SPECIFICATIONS, IT IS TO BE REMOVED FROM SITE AT NO ADDITIONAL COST TO THE OWNER AND IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS.
30. ANY PROPOSED SIGNAGE SHALL BE APPROVED BY SEPARATE APPLICATION TO THE APPROPRIATE MUNICIPAL AUTHORITY INCLUDING BUT NOT LIMITED TO THE ZONING BOARD OF APPEALS AND CITY COUNCIL. ALL PROPOSED SIGNAGE MUST MEET THE REQUIREMENTS OF THE LOCAL ZONING CODE.

GRADING & DRAINAGE NOTES:

1. EXISTING PAVEMENT SHALL BE SAW–CUT AND PAVEMENT JOINT SHALL BE INSTALLED WHERE NECESSARY TO ENSURE A SMOOTH CONTINUOUS GRADE.
2. PITCH EVENLY BETWEEN SPOT GRADES. ALL PAVED AREAS MUST PITCH TO DRAIN AT A MINIMUM OF 1/8" PER FOOT UNLESS OTHERWISE SPECIFIED. ANY DISCREPANCIES NOT ALLOWING THIS MINIMUM PITCH SHALL BE REPORTED TO THE ENGINEER PRIOR TO CONTINUING WORK.
3. ALL GRADING OPERATIONS SHALL BE COORDINATED WITH THE APPROPRIATE UTILITY COMPANIES.
4. IN LANDSCAPED AREAS THE TOP ELEVATION OF MANHOLES SHALL MATCH THE FINISH GRADE OF THE TOPSOIL. IN PAVED AREAS THE TOP ELEVATIONS OF MANHOLES SHALL MATCH FINISH GRADE.
5. ALL AREAS DISTURBED DURING CONSTRUCTION SHALL BE STABILIZED AS SOON AS POSSIBLE UPON COMPLETION OF CONSTRUCTION WORK IN THE AREA.
6. TEMPORARY TUBULAR BARRIER PROTECTION AND/OR SILT SACKS SHALL BE INSTALLED AND MAINTAINED AT EXISTING DRAINAGE STRUCTURES DURING CONSTRUCTION, TO PREVENT SEDIMENT LADEN RUNOFF FROM ENTERING THE DRAINAGE SYSTEM.
7. CONTRACTOR IS RESPONSIBLE FOR DEMOLITION OF EXISTING STRUCTURES INCLUDING REMOVAL OF ANY EXISTING UTILITIES SERVING THE STRUCTURE PER DEMOLITION PLAN.
8. ALL CATCH BASINS, MANHOLES, INFILTRATION SYSTEMS, AND WATER QUALITY STRUCTURES ARE TO BE CLEANED TO REMOVE ALL CONSTRUCTION SILT AND DEBRIS PRIOR TO FINAL APPROVAL.
9. IF ANY EXISTING UTILITY STRUCTURES TO REMAIN ARE DAMAGED DURING CONSTRUCTION, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO REPAIR AND/OR REPLACE THE EXISTING STRUCTURE AS NECESSARY TO RETURN IT TO EXISTING CONDITIONS OR BETTER AT NO ADDITIONAL COST.
10. ALL STORM PIPES ENTERING STRUCTURES SHALL BE GROUTED TO ENSURE CONNECTION AT STRUCTURE IS WATERTIGHT.
11. ALL STORM DRAIN MANHOLES SHALL HAVE TRAFFIC BEARING RING & COVERS & SHALL BE LABELED "DRAIN".
12. THE CONTRACTOR SHALL ADHERE TO ALL TERMS & CONDITIONS AS OUTLINED IN THE GENERAL N.P.D.E.S. PERMIT FOR STORM WATER DISCHARGE ASSOCIATED WITH CONSTRUCTION ACTIVITIES.
13. CONTRACTOR SHALL ENSURE POSITIVE DRAINAGE AWAY FROM BUILDINGS FOR ALL NATURAL AND PAVED AREAS.
14. CONTRACTOR SHALL APPLY STABILIZATION FABRIC TO ALL SLOPES STEEPER THAN 3H:1V.
15. ALL DRAINAGE SYSTEM COMPONENTS SHALL CONFORM TO LOCAL REQUIREMENTS.

UTILITY NOTES:

1. THE LATEST STANDARDS OF THE LOCAL MUNICIPALITY SHALL BE FOLLOWED WHEN INSTALLING ANY STORM DRAIN WORK. STORM DRAIN WORK WILL BE INSPECTED BY THE LOCAL GOVERNING AUTHORITY PERSONNEL AND ALL COSTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
2. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION.
3. ABANDONED EXISTING UTILITIES AND UTILITIES TO BE ABANDONED SHALL EITHER BE ABANDONED IN PLACE AS NOTED OR SHALL BE REMOVED AND DISPOSED OF AS SPECIFIED. ALL UTILITIES SCHEDULED FOR ABANDONMENT OR REMOVAL AND DISPOSAL MUST BE COORDINATED BY THE CONTRACTOR WITH THE RESPECTIVE UTILITY OWNER. WHEN ABANDONED UTILITIES ARE TO BE LEFT IN PLACE, PLUG OR CAP THE ENDS OF THE CONDUITS AND PIPES. REMOVE ABANDONED UTILITY MANHOLES, JUNCTION BOXES AND SIMILAR STRUCTURES TO A MINIMUM DEPTH OF 4 FEET BELOW FINISHED GRADE AND PUNCTURE OR BREAK THE BOTTOM SLABS OF MANHOLES AND SIMILAR STRUCTURE TO ALLOW DRAINAGE. BACKFILL AND COMPACT EXCAVATIONS RESULTING FROM REMOVAL OF UTILITY FACILITATES, AS REQUIRED TO RESTORE THE ORIGINAL GRADE.
4. THE CONTRACTOR SHALL MAKE ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENTS OF NATURAL GAS, ELECTRIC, TELEPHONE AND ANY OTHER UTILITY BY THE UTILITY OWNER.
5. THE CONTRACTOR SHALL USE THE FOLLOWING PIPE MATERIALS:
   - DRAIN – HDPE (HIGH DENSITY CORRUGATED POLYETHYLENE PIPE WITH SMOOTH INNER WALL), ASTM D2321 (UNLESS OTHERWISE SPECIFIED ON PLAN)
8. BEFORE UTILITY WORK BEGINS, THE CONTRACTOR WILL COORDINATE WITH THE LOCAL MUNICIPALITY FOR THE APPROPRIATE PERMIT AND INSPECTION FEES.
9. A MINIMUM OF 10 FEET CLEAR HORIZONTALLY SHALL BE MAINTAINED BETWEEN WATER MAINS AND SANITARY SEWER MAINS AND/OR STORM DRAINS. WHENEVER CONDITIONS PREVENT A LATERAL SEPARATION OF 10 FEET TO A WATER MAIN, THE WATER MAIN SHALL BE LAID IN A SEPARATE TRENCH AND THE DIFFERENCE IN ELEVATION BETWEEN THE WATER MAIN AND THE SEWER MAIN SHALL BE AT LEAST 18 INCHES.
10. ALL FILL MATERIAL IS TO BE IN PLACE, AND COMPACTED BEFORE INSTALLATION OF PROPOSED UTILITIES.
11. CONTRACTOR SHALL NOTIFY THE UTILITY AUTHORITY'S INSPECTORS 72 HOURS BEFORE CONNECTING TO ANY EXISTING LINE.
12. MINIMUM TRENCH WIDTH SHALL BE 2 FEET.
13. CONTRACTOR SHALL MAINTAIN A MINIMUM OF 5'–0" COVER AND A MAXIMUM OF 8'–0" COVER ON ALL WATERLINES.
14. IN THE EVENT OF A VERTICAL CONFLICT BETWEEN WATERLINES, SANITARY LINES, STORM LINES AND GAS LINES (EXISTING AND PROPOSED), THE SANITARY LINE SHALL BE DUCTILE IRON PIPE WITH MECHANICAL JOINTS AT LEAST 10 FEET ON BOTH SIDES OF CROSSING, THE WATERLINE SHALL HAVE MECHANICAL JOINTS WITH APPROPRIATE THRUST BLOCKING AS REQUIRED TO PROVIDE A MINIMUM OF 18" CLEARANCE BETWEEN THE PIPES. WHERE THE WATERLINE IS LESS THAN THE 18" VERTICAL CLEARANCE AND MEETING 10' HORIZONTAL CLEARANCE CANNOT BE MET, THE WATER MUST BE ENCASED IN CONCRETE.
15. ALL CONCRETE FOR ENCASEMENTS SHALL HAVE A MINIMUM 28 DAY COMPRESSION STRENGTH OF 3000 P.S.I.
16. CONTRACTOR IS RESPONSIBLE FOR COMPLYING WITH THE SPECIFICATIONS OF THE LOCAL AUTHORITIES WITH REGARDS TO MATERIALS AND INSTALLATION OF THE WATER, SEWER, GAS AND ELECTRICAL AND TELECOMMUNICATIONS LINES.
17. ALL NECESSARY INSPECTIONS AND/OR CERTIFICATIONS REQUIRED BY CODES AND/OR UTILITY SERVICE COMPANIES SHALL BE PERFORMED PRIOR TO ANNOUNCED BUILDING POSSESSION AND THE FINAL CONNECTION OF SERVICE.
18. DRAWINGS DO NOT NECESSARILY SHOW ALL EXISTING UTILITIES.

ABBREVIATIONS

ABAN	ABANDON
ADJ	ADJUST
B	BORING
BC	BOTTOM OF CURB
BIT	BITUMINOUS
BCB	BITUMINOUS CONCRETE BERM
BLDG	BUILDING
BM	BENCH MARK
BOS	BOTTOM OF SLOPE
BOW	BOTTOM OF WALL
BRK	BRICK
BV&B	BUTTERFLY VALVE & BOX
BVW	BORDERING VEGETATED WETLAND
CATV	CABLE TELEVISION
CB	CATCH BASIN
CF	CUBIC FEET
CFS	CUBIC FEET PER SECOND
CI	CAST IRON (PIPE)
CL	CENTERLINE
CLDI	CEMENT LINED DUCTILE IRON (PIPE)
CM	CONSTRUCTION MANAGER
CMP	CORRUGATED METAL PIPE
CO	CLEAN OUT
CONC	CONCRETE
CONST	CONSTRUCTION
CONT	CONTRACTOR
CRD	COORDINATE
CPP	CORRUGATED POLYETHYLENE PIPE
CUL	CULVERT
CY	CUBIC YARD
DB	DISTRIBUTION BOX
DBL	DOUBLE
DEM	DEMOLISH
DET	DETENTION
DI	DUCTILE IRON (PIPE)
DIA	DIAMETER
DIM	DIMENSION
DMH	DRAIN MANHOLE
DW	DOMESTIC WATER (OR DRY WELL)
DWG	DRAWING
DYCL	DOUBLE YELLOW CENTERLINE
EHH	ELECTRIC HANDHOLE
EL	ELEVATION
ELEC	ELECTRIC
EMH	ELECTRIC MANHOLE
EOP	EDGE OF PAVEMENT
EOR	EDGE OF ROAD
EOW	EDGE OF WETLANDS
ETC	ELECTRIC, TELEPHONE, CABLE
EXIST	EXISTING
EXT	EXTERIOR
FA	FIRE ALARM
FCC	FLUSH CONCRETE CURB
FES	FLARED END SECTION
FFE	FINISH FLOOR ELEVATION
FLNP	FIRE LANE NO PARKING
FPS	FEET PER SECOND
FS	FIRE SERVICE
FT	FOOT/FEET
GC	GENERAL CONTRACTOR
GEN	GENERAL
GG	GAS GATE
GR	GUIDE RAIL
GRAN	GRANITE
GV	GATE VALVE
GV&B	GATE VALVE & BOX
GW	GROUND WATER
HCR	HANDICAP RAMP
HOR	HORIZONTAL
HT	HEIGHT
HW	HEADWALL
HWY	HIGHWAY
HYD	HYDRANT
ID	INSIDE DIAMETER
IN	INCHES
INCL	INCLUDE
INST	INSTALLED
INV, I.E.	INVERT, INVERT ELEVATION

L	LENGTH
LB	LEACHING BASIN
LP	LIGHT POLE
MAT	MATERIAL
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MTD	MOUNTED
MW	MONITORING WELL
N	NORTH
NIC	NOT IN CONTRACT
NO	NUMBER
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OHW	OVERHEAD WIRE
OVHD	OVERHEAD
OW	OBSERVATION WELL
PC	POINT OF CURVATURE
PCC	PRECAST CONCRETE CURB
PI	POINT OF INTERSECTION
PKG	PARKING
PL	PROPERTY LINE
PLMB	PLUMBING
POC	POINT ON CURVATURE
POT	POINT ON TANGENT
PRC	POINT OF REVERSE CURVATURE
PROP, P	PROPOSED
PT	POINT (OR POINT OF TANGENT)
PVC	POLYVINYL CHLORIDE (PIPE)
R&R	REMOVE & RESET/REPLACE
R&S	REMOVE & STACK
RCP	REINFORCED CONCRETE PIPE
RD	ROAD (OR ROOF DRAIN)
RED	REDUCER
RELOC	RELOCATE
REM	REMOVE
RET	RETAIN, RETAINING OR RETENTION
ROW	RIGHT OF WAY
RR	RAILROAD
RWL	RAIN WATER LEADER
RWY	ROADWAY
SD	SUBDRAIN
SF	SQUARE FEET
SGC	SLOPED GRANITE CURB
SMH	SEWER MANHOLE
SP	STANDPIPE
SPEC	SPECIFICATION
STA	STATION
STC	STORMCEPTOR
STD	STANDARD
STRTL	STRUCTURAL
SWEL	SOLID WHITE EDGE LINE
SW	SIDEWALK
SWLL	SOLID WHITE LANE LINE
SYCL	SOLID YELLOW CENTERLINE
TB	TEST BORING
TC	TOP OF CURB
TD	TRENCH DRAIN
TEL, T	TELEPHONE
TMH	TELEPHONE MANHOLE
TOS	TOP OF SLOPE
TOW	TOP OF WALL
TP	TEST PIT
TS&V	TAPPING SLEEVE & VALVE
TYP	TYPICAL
UD	UNDERDRAIN
UL	UNDERWRITERS LABORATORY
UP	UTILITY POLE
VCP	VITRIFIED CLAY PIPE
VERT	VERTICAL
VGC	VERTICAL GRANITE CURB
WD	WOOD
WG	WATER GATE
WM	WATER MAIN
WMH	WATER MANHOLE
WSO	WATER SHUTOFF

N:\PROJECTS\2398–01A\CIVIL\DRAWINGS\CURRENT\C–2398–01A_ABBREVIATIONS & NOTES.DWG

COMMONWEALTH OF MASSACHUSETTS
CARLTON M. QUINN
CIVIL
No.49923
REGISTERED PROFESSIONAL ENGINEER
3.25.24

PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
B	3/25/2024	REVISED PER TOWN COMMENTS
A	2/29/2024	REVISED PER TOWN COMMENTS

APPLICANT\OWNER:
BLVD READING, LLC
c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:

STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	NONE	DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:

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WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE:	SHEET No.
ABBREVIATIONS & NOTES	C-001

EROSION CONTROL NOTES

EROSION & SEDIMENTATION CONTROL NOTES:

1. EROSION CONTROL SHALL BE INSTALLED PRIOR TO CONSTRUCTION AND SHALL BE ADEQUATE TO MAINTAIN SEDIMENT ON SITE. ANY MODIFICATIONS TO SILT CONTROLS SHOWN ON THE APPROVED PLANS AS A RESULT OF ACTUAL FIELD CONDITIONS OR CONSTRUCTION PRACTICES SHALL BE INSTALLED IN ACCORDANCE WITH B.M.P. (BEST MANAGEMENT PRACTICES) PER THE E.P.A. 2017 "CONSTRUCTION GENERAL PERMIT" MANUAL, AND MASSACHUSETTS 2003 EROSION & SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS. ANY SUCH MODIFICATIONS FROM THE ABOVE MANUALS SHALL BE INSTALLED AS APPROVED BY THE ENGINEER OR THE LOCAL MUNICIPALITY.

2. AREAS OF EXPOSED SOIL UNDERGOING CONSTRUCTION THAT WILL NOT BE COVERED AND OR FINISHED GRADED SHALL BE STABILIZED AS SOON AS PRACTICABLE BUT IN NO CASE MORE THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY (UNLESS MUNICIPALITY HAS STRICTER REQUIREMENTS WHICH SHALL BE FOLLOWED) IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED. TEMPORARY EROSION CONTROL MEASURES SHALL INCLUDE EROSION CONTROL MESH, NETTING OR MULCH AS DIRECTED BY THE OWNER'S REPRESENTATIVE AND SHOWN ON THE DESIGN PLANS. IF MULCH IS USED, STRAW MULCH SHALL BE APPLIED AT THE RATE OF 4 BALES PER 1,000 SQUARE FEET. APPLICATION AREA SHALL BE SUFFICIENTLY COVERED WITH MULCH TO AVOID ANY VISIBLE SOIL EXPOSURE. MULCH SHALL BE KEPT MOIST TO AVOID LOSS DUE TO WIND. MULCH AND NETTING SHALL BE APPLIED IN THE BASE OF ALL GRASSED WATERWAYS, IN VEGETATIVE SLOPES WHICH EXCEED 15% AND DISTURBED AREAS WITHIN 100 FEET OF WETLANDS OR STREAMS.

3. IF DISTURBED AREAS DO NOT RECEIVE FINAL SEEDING BY OCTOBER 1ST OF THE CONSTRUCTION YEAR, THEN ALL DISTURBED AREAS SHALL BE SEEDED WITH A WINTER COVER CROP AT THE RATE OF 3 LBS PER 1,000 SQUARE FEET. WINTER SEEDING SHALL BE COVERED WITH EROSION CONTROL MESH (MULCH AND NETTING). HEAVY GRADE MATS SHALL BE USED IN THE BASE OF ALL GRASSED WATERWAYS ON VEGETATED SLOPES IN EXCESS OF 15%, AND ANY DISTURBED AREAS WITHIN 100 FEET OF WETLANDS OR STREAMS. MULCH AND NETTING SHALL ALSO BE PROVIDED FOR ADDITIONAL WINTER PROTECTION.

4. ALL TOPSOIL SHALL BE COLLECTED, STOCKPILED, SEEDED WITH RYE AT 3LBS PER 1,000 SQUARE FOOT AND MULCHED, AND REUSED AS REQUIRED. TUBULAR BARRIERS SHALL BE PLACED DOWN GRADIENT FROM STOCKPILED LOAM. LOAM SHALL BE STOCKPILED AT LOCATIONS DESIGNATED BY THE OWNER AND ENGINEER.

5. ALL TUBULAR BARRIERS, SILT SACKS, AND EROSION CONTROL BERMS SHALL BE INSTALLED ACCORDING TO THE SITE PREPARATION PLAN. THESE SHALL BE MAINTAINED DURING DEVELOPMENT TO REMOVE SEDIMENT FROM RUNOFF WATER. ALL THE FILTER BARRIERS AND EROSION CONTROL BERMS SHALL BE INSPECTED AFTER ANY RAINFALL OR RUNOFF EVENT, MAINTAINED AND CLEANED UNTIL ALL AREAS HAVE AT LEAST 85–90% VIGOROUS PERENNIAL COVER OF GRASSES.

6. ADJACENT ROADS SHALL BE PERIODICALLY SWEPT OR WASHED TO AVOID TRACKING MUD, DUST OR DEBRIS FROM THE CONSTRUCTION AREA AS OFTEN AS NECESSARY (WHICH COULD BE ON A DAILY BASIS) TO REMOVE ANY SOIL OR SEDIMENTS AT NO ADDITIONAL COST TO THE OWNER. A WATERING TRUCK WILL BE USED TO PERIODICALLY SPRINKLE CONSTRUCTION AREAS IN ORDER TO KEEP THE LEVEL OF DUST TO A MINIMUM DURING THE DRY MONTHS AT NO ADDITIONAL COST TO THE OWNER.

7. THE CONTRACTOR SHALL USE EXTREME CAUTION TO AVOID ALLOWING SEDIMENTS TO ENTER THE STORM DRAIN SYSTEM DURING CONSTRUCTION. BOTH EXISTING AND PROPOSED CATCH BASIN INLETS SHALL BE PROTECTED DURING CONSTRUCTION BY THE USE SILT SACKS AND/OR TUBULAR BARRIERS AROUND EACH INLET AS NOTED ON THE PLANS. INLET PROTECTION MAY BE REMOVED ONLY AFTER FINISHED AREAS ARE PAVED AND THE VEGETATED SLOPES ARE ESTABLISHED WITH AT LEAST 85–90% OF VIGOROUS PERENNIAL GROWTH.

8. AS APPLICABLE, EROSION CONTROL MESH SHALL BE APPLIED IN ACCORDANCE WITH THE PLANS OVER ALL FINISHED SEEDED AREAS AS SPECIFIED ON THE DESIGN PLANS.

9. AT A MINIMUM, ALL TUBULAR BARRIERS AND FILTER FABRIC SHALL REMAIN IN PLACE UNTIL SEEDINGS OR PLANTINGS HAVE BECOME 85–90% ESTABLISHED. THE LOCAL CONSERVATION COMMISSION MUST APPROVE THE REMOVAL OR RELOCATION OF ANY OF THE TUBULAR BARRIERS AND FILTER FABRIC. ONCE THE TUBULAR BARRIERS ARE REMOVED THE AREAS ARE TO BE LOAMED AND SEEDED TO ACHIEVE FULL STABILIZATION.

10. AT THE OWNER'S DISCRETION ADDITIONAL EROSION CONTROL MEASURES MAY BE REQUIRED TO MAINTAIN STABILITY OF EARTHWORKS AND FINISHED GRADED AREAS. THE CONTRACTOR, AT HIS EXPENSE, WILL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ANY ADDITIONAL MEASURES AS SPECIFIED BY THE OWNER. THIS INCLUDES BUT IS NOT LIMITED TO REQUESTS BY MA DEP, THE ENGINEER AND THE LOCAL MUNICIPALITY, AS AUTHORIZED BY THE OWNER. FAILURE TO COMPLY WITH THE OWNER'S DIRECTIONS WILL RESULT IN DISCONTINUATION OF CONSTRUCTION ACTIVITIES.

11. INSPECTIONS AND MONITORING MAINTENANCE MEASURES SHALL BE APPLIED AS NEEDED DURING THE ENTIRE CONSTRUCTION CYCLE. WEEKLY INSPECTIONS SHALL BE HELD THROUGH THE DURATION OF CONSTRUCTION ACTIVITY. WEEKLY INSPECTION REPORTS SHALL BE MAINTAINED BY THE CONTRACTOR AND LOCATED IN THE CONTRACTORS FIELD OFFICE ONSITE. IN ADDITION TO THE NORMAL WEEKLY INSPECTIONS, THE CONTRACTOR SHALL PERFORM AN INSPECTION OF ALL EROSION CONTROL MEASURES AFTER EACH RAINFALL OR RUNOFF EVENT, AND PERFORM THE NECESSARY REPAIRS. THE INSPECTIONS SHALL INCLUDE BUT NOT BE LIMITED TO THE SITE'S DOWN STREAM DISCHARGE POINTS.

12. IF ANY EVIDENCE OF SEDIMENTATION IS OBSERVED AT THE STORMWATER MANAGEMENT AREA INLETS, THE CONTRACTOR SHALL, AT HIS OWN EXPENSE, PROVIDE A PLAN TO THE ENGINEER TO REMOVE ANY ACCUMULATED SEDIMENT IN THESE AREAS. THE CONTRACTOR SHALL ALSO IMMEDIATELY PROVIDE ADDITIONAL ON SITE EROSION AND SEDIMENTATION CONTROL MEASURES TO PREVENT FURTHER DEGRADATION OF THE AREA.

13. FOLLOWING THE TEMPORARY OR FINAL SEEDINGS, THE CONTRACTOR SHALL INSPECT THE WORK AREA SEMI–MONTHLY TO ENSURE THE AREAS HAVE A MINIMUM OF 85–90% VEGETATED VIGOROUS GROWTH. RE–SEEDING SHALL BE CARRIED OUT BY THE CONTRACTOR WITH FOLLOW UP INSPECTIONS IN THE EVENT OF ANY FAILURES UNTIL VEGETATION IS ADEQUATELY ESTABLISHED.

14. CONTRACTOR & ALL SITE SUBCONTRACTORS SHALL BE FAMILIAR WITH & FOLLOW ALL APPROVED PERMITS AND CONDITIONS. CONTRACTOR SHALL MAINTAIN A COPY OF ALL APPROVED PERMITS ONSITE. ALL CONDITIONS & RECOMMENDATIONS WITHIN THE APPROVED PERMITS SHALL BE COMPLETED.

15. ALL EROSION MEASURES SHALL BE INSTALLED PRIOR TO CONSTRUCTION AND SHALL BE ADEQUATE TO MAINTAIN SEDIMENT ON SITE. ANY MODIFICATIONS SHALL BE INSTALLED AS DIRECTED BY THE ENGINEER OR THE LOCAL MUNICIPALITY.

16. EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE MAINTAINED DURING CONSTRUCTION, AND SHALL REMAIN IN PLACE UNTIL ALL SITE WORK IS COMPLETE AND GROUND COVER IS ESTABLISHED.

17. TOP OF STOCKPILES SHALL BE COVERED IN SUCH MANNER THAT STORMWATER DOES NOT INFILTRATE THE MATERIALS AND THEREBY RENDER THE SAME UNSUITABLE FOR FILL USE.

18. ALL DISTURBED OR EXPOSED AREAS SUBJECT TO EROSION SHALL BE STABILIZED WITH MULCH OR SEEDED FOR TEMPORARY VEGETATIVE COVER. NO AREA, SUBJECT TO EROSION SHALL BE LEFT DISTURBED AND UNSTABILIZED FOR PERIODS LONGER THAN IS ABSOLUTELY NECESSARY TO CARRY OUT THAT PORTION OF THE CONSTRUCTION WORK OR SIX MONTHS AFTER SOIL HAS BEEN DISTURBED WHICHEVER IS LESS.

19. CULVERT/PIPE INLETS AND OUTFALLS SHALL BE PROTECTED BY TUBULAR BARRIER FILTERS AND STONE CHECK DAMS UNTIL DISTURBED AREAS ARE PERMANENTLY STABILIZED.

20. TUBULAR BARRIER DIKES SHALL BE CONSTRUCTED AT ALL EXISTING & PROPOSED CATCH BASINS. NO SEDIMENTATION SHALL ENTER THE ON–SITE OR OFF–SITE DRAINAGE SYSTEMS AT ANY TIME.

21. ALL EROSION CONTROL MEASURES SHALL BE ROUTINELY INSPECTED, CLEANED AND REPAIRED OR REPLACED AS NECESSARY THROUGHOUT ALL PHASES OF CONSTRUCTION. IN ADDITION, INSPECTIONS SHALL TAKE PLACE WEEKLY AND BEFORE AND AFTER EACH RAINFALL EVENT.

22. ALL PROPOSED SLOPES STEEPER THAN 3:1 SHALL BE STABILIZED WITH JUTE MESH AND PROTECTED FROM EROSION UNTIL WORK IS COMPLETE AND GROUND COVER IS ESTABLISHED.

23. THE CONTRACTOR SHALL KEEP ON SITE AT ALL TIMES ADDITIONAL TUBULAR BARRIERS FOR INSTALLATION AT THE DIRECTION OF THE ENGINEER OR THE TOWN ENGINEER TO MITIGATE ANY EMERGENCY CONDITION.

24. AS CONSTRUCTION DISTURBANCE IS GREATER THAN 1 ACRE, A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) CONSTRUCTION GENERAL PERMIT NOI, AND STORM WATER POLLUTION PREVENTION PLAN (SWPPP) WILL NEED TO BE SUBMITTED TO THE EPA. THE NPDES PERMIT FOR STORM WATER DISCHARGE, & CONSTRUCTION GENERAL PERMIT NOI WILL BE REQUIRED TO BE SUBMITTED AT LEAST 14 DAYS PRIOR TO COMMENCING CONSTRUCTION BY THE CONTRACTOR.

25. OWNER AND CONTRACTOR ARE RESPONSIBLE FOR COMPLIANCE WITH THE CONSTRUCTION GENERAL PERMIT NOI. WEEKLY SWPPP INSPECTION REPORTS TO BE PERFORMED BY CONTRACTOR. COPIES OF ALL SWPPP INSPECTION REPORTS SHALL BE PROVIDED TO THE LOCAL MUNICIPALITY, EPA, DEP, OR ANY OTHER AUTHORITY REQUESTING WITHIN 3 DAYS OF EACH INSPECTION.

26. APPLICABLE WORK AND MATERIALS SHALL COMPLY WITH ALL LOCAL, MA DEP, EPA CONSTRUCTION GENERAL PERMIT STANDARDS. ALL CONSTRUCTION SHALL CONFORM TO THE APPLICABLE SITE PLAN REGULATIONS FROM THE LOCAL AND USDA SOIL CONSERVATION SERVICE VEGETATIVE PRACTICES IN SITE DEVELOPMENT.

27. A WATERING TRUCK SHALL BE USED TO PERIODICALLY SPRINKLE CONSTRUCTION AREAS IN ORDER TO KEEP THE LEVEL OF DUST TO A MINIMUM DURING THE DRY MONTHS AND AS REQUIRED.

28. IF DEWATERING IS NECESSARY IT SHALL ONLY BE COMPLETED AS FOLLOWS: THE DISCHARGE SHALL BE STOPPED IMMEDIATELY IF THE RECEIVING AREA SHOWS ANY SIGN OF INSTABILITY OR EROSION. ALL CHANNELS, SWALES, AND DITCHES DUG FOR DISCHARGING WATER FROM THE EXCAVATED AREA SHALL BE STABLE PRIOR TO DIRECTING DISCHARGE TO THEM. IF A CONSTRUCTION EQUIPMENT BUCKET IS USED, IT SHALL EMPTY THE MATERIAL TO A STABLE AREA. NO DEWATERING SHALL OCCUR DURING PERIODS OF INTENSE, HEAVY RAIN. FLOW TO THE SEDIMENT REMOVAL STRUCTURE SHALL NOT EXCEED THE STRUCTURE'S CAPACITY TO SETTLE AND FILTER FLOW OR ITS VOLUME CAPACITY. WHENEVER POSSIBLE, THE DISCHARGE FROM THE SEDIMENT REMOVAL STRUCTURE SHALL DRAIN TO A WELL–VEGETATED BUFFER BY SHEET FLOW WHILE MAXIMIZING THE DISTANCE TO THE NEAREST WATER RESOURCE AND MINIMIZING THE SLOPE OF THE BUFFER AREA. THERE SHALL BE NO DIRECT DISCHARGE TO EXISTING WETLANDS OR STREAMS. ALL DISCHARGE SHALL BE IN COMPLIANCE WITH STATE, LOCAL, AND FEDERAL REQUIREMENTS.

29. INITIATE STABILIZATION OF EXPOSED AREAS IMMEDIATELY IF CONSTRUCTION WORK TEMPORARILY OR PERMANENTLY CEASES.

30. ALL DISCHARGES FROM POLLUTION SOURCES ARE PROHIBITED ONSITE SUCH AS FUELS, WASTEWATER FROM WASH OUT OF CONCRETE, WASTEWATER FROM CLEAN OUT OF PAINTS, FORM RELEASE OILS, SOLVENTS, ADHESIVES, CURING COMPOUNDS, POLLUTANTS USED FOR MAINTENANCE OF VEHICLES AND EQUIPMENT, SOAPS & SOLVENTS, TOXIC OR HAZARDOUS SUBSTANCES, CHEMICALS AND OILS. IF A POLLUTANT IS DISCHARGED IT NEEDS TO BE IMMEDIATELY CLEANED UP BY REMOVING THE CHEMICAL AND AFFECTED SOIL OR AREA OF SPILL FROM THE SITE IN ACCORDANCE WITH BOTH THE MANUFACTURER RECOMMENDATIONS, FEDERAL, STATE, AND LOCAL REQUIREMENTS. DO NOT HOSE DOWN AND SPREAD SPILLED ITEM. ALL CHEMICALS USED ON THE SITE SHALL BE IN LEAK–PROOF CONTAINERS STORED AWAY FROM WETLANDS, SURFACE WATERS, STORMWATER INLETS, AND DRAINAGE MEASURES. SPILL KITS SHALL BE AVAILABLE ONSITE FOR EMERGENCY USE. THERE SHALL BE A SECONDARY CONTAINMENT MEASURE OF ALL CHEMICALS IN ADDITION TO SPILL–PROOF CONTAINERS.

31. PRIOR TO COMMENCEMENT OF CONSTRUCTION, APPLICABLE CONTRACTOR PERSONNEL MUST HAVE AN UNDERSTANDING OF THE EPA CONSTRUCTION GENERAL PERMIT REQUIREMENTS AND THEIR SPECIFIC RESPONSIBILITIES UNDER THE PERMIT. AT A MINIMUM, PERSONNEL MUST BE TRAINED AND UNDERSTAND THE FOLLOWING: LOCATION OF ALL STORMWATER CONTROLS AND HOW TO MAINTAIN THEM, PROCEDURES FOR COMPLYING WITH THE POLLUTION PREVENTION REQUIREMENTS. PROCEDURES FOR CONDUCTING INSPECTIONS, RECORDING FINDINGS, AND TAKING CORRECTIVE ACTION.

32. ALL SEDIMENT TRACKED ONTO ROADWAYS MUST BE REMOVED AT END OF EACH WORK DAY.

33. ALL USE OF CATIONIC TREATMENT CHEMICALS (EXAMPLES INCLUDE POLYMERS, CHITOSAN, CATIONIC PAM, FLOCCULANTS OR OTHER CHEMICAL UTILIZED FOR STABILIZATION) ARE PROHIBITED. IF ALL OTHER AVAILABLE STABILIZATION MEASURES ARE NOT POSSIBLE AND USE OF CATIONIC CHEMICALS IS ABSOLUTELY NECESSARY THE CONTRACTOR WILL NEED TO CONTACT THE EPA NEW ENGLAND OFFICE IN WRITING FOR APPROVAL AND SPECIFIC REQUIREMENTS (MAXIMUM DOSAGE RATE, RESIDUAL TESTING, SPECIFIC LIMITATIONS, ETC) PRIOR TO USE.

34. IF USING NON–VEGETATIVE STABILIZATION MEASURES, IT MUST BE COMPLETED NO LATER THAN 14 DAYS AFTER INITIATING STABILIZATION. ALL AREAS OF EXPOSED SOILS MUST BE COVERED.

35. INSPECTIONS OF EROSION CONTROL MEASURES SHALL BE AT LEAST ONCE EVERY 7 DAYS BY THE CONTRACTOR. AT A MINIMUM INSPECTIONS SHALL INCLUDE ALL DISTURBED AREAS, ALL STORMWATER CONTROLS AND POLLUTION PREVENTION MEASURES, ALL LOCATIONS WHERE STABILIZATION MEASURES HAVE BEEN IMPLEMENTED, EQUIPMENT AND MATERIAL STORAGE AREAS, ALL AREAS WHERE STORMWATER FLOWS AND ALL POINTS OF DISCHARGE. WHEN CORRECTIVE ACTIONS ARE REQUIRED, THE CONTRACTOR MUST IMMEDIATELY TAKE ALL STEPS TO PREVENT POLLUTANT DISCHARGES UNTIL A PERMANENT SOLUTION IS IMPLEMENTED. AS NECESSARY NEW OR MODIFIED CONTROLS MUST BE INSTALLED AND OPERATIONAL, THE REPAIR MUST BE COMPLETED WITHIN 7 DAYS FROM THE TIME OF DISCOVERY. WITHIN 24 HOURS OF A TRIGGERING CONDITION OCCURRING THAT REQUIRES A CORRECTIVE ACTION, A CORRECTIVE ACTION REPORT MUST BE COMPLETED.

MAINTENANCE:

1. ALL MEASURES STATED ON THE STORMWATER POLLUTION PREVENTION PLANS, SHALL BE MAINTAINED IN FULLY FUNCTIONAL CONDITION BY CONTRACTOR UNTIL NO LONGER REQUIRED FOR A COMPLETED PHASE OF WORK OR FINAL STABILIZATION OF THE SITE. ALL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE CHECKED BY A QUALIFIED PERSON IN ACCORDANCE WITH THE CONTRACT DOCUMENTS OR THE APPLICABLE PERMIT, WHICHEVER IS MORE STRINGENT, AND REPAIRED IN ACCORDANCE WITH THE FOLLOWING:
   - INLET PROTECTION DEVICES AND BARRIERS SHALL BE REPAIRED OR REPLACED IF THEY SHOW SIGNS OF UNDERMINING, OR DETERIORATION.
   - ALL SEEDED AREAS SHALL BE CHECKED REGULARLY TO SEE THAT A HEALTHY STAND OF GRASS IS MAINTAINED. AREAS SHOULD BE FERTILIZED, WATERED, AND RESEEDED AS NEEDED.
   - ALL SEDIMENT CONTROLS SHALL BE REPAIRED TO THEIR ORIGINAL CONDITIONS IF DAMAGED. SEDIMENT SHALL BE REMOVED FROM THE TUBULAR SEDIMENT CONTROLS WHEN IT REACHES HALF THE HEIGHT OF THE CONTROL MEASURE OR AS REQUESTED BY THE OWNER OR ENGINEER.
   - THE CONSTRUCTION ENTRANCES SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOW OF MUD ONTO PUBLIC RIGHTS–OF–WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING OF THE CONSTRUCTION ENTRANCES AS CONDITIONS DEMAND.
   - THE TEMPORARY PARKING AND STORAGE AREA SHALL BE KEPT IN GOOD CONDITION (SUITABLE FOR PARKING AND STORAGE). THIS MAY REQUIRE PERIODIC TOP DRESSING OF THE TEMPORARY PARKING AS CONDITIONS DEMAND.
   - OUTLET STRUCTURES IN THE SEDIMENTATION BASINS SHALL BE MAINTAINED IN OPERATIONAL CONDITIONS AT ALL TIMES. SEDIMENT SHALL BE REMOVED FROM SEDIMENT BASINS OR TRAPS WHEN THE DESIGN CAPACITY HAS BEEN REDUCED BY 50%.

CONSTRUCTION GENERAL PERMIT NOTES AND NARRATIVE:

1. NARRATIVE: THE STORMWATER POLLUTION PREVENTION PLANS CONSIST OF THE SITE PREPARATION PLAN TOGETHER WITH AN EXISTING CONDITIONS PLANS, GRADING PLANS, ABBREVIATIONS AND NOTES SHEETS, AND DETAIL SHEETS.

2. THE EROSION CONTROL PLAN WILL BE IMPLEMENTED TO:

3. TREAT EROSION AS SOON AS POSSIBLE AFTER DISTURBANCE.

4. PREVENT SEDIMENT FROM LEAVING THE CONSTRUCTION AREA AND ENTERING THE RECEIVING WATERS.

5. CONSTRUCTION ACTIVITIES SHALL BE SCHEDULED TO MINIMIZE EROSION.

6. ONLY DISTURB, CLEAR, OR GRADE AREAS NECESSARY FOR CONSTRUCTION.

N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\C-2398-01A_ABBREVIATIONS & NOTES.DWG

COMMONWEALTH OF MASSACHUSETTS
3.25.24
CARLTON M. QUINN
CIVIL
No.49923
REGISTERED PROFESSIONAL ENGINEER

PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
B	3/25/2024	REVISED PER TOWN COMMENTS
A	2/29/2024	REVISED PER TOWN COMMENTS

APPLICANT\OWNER:
BLVD READING, LLC
c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:

STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	NONE	DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ◆ land surveying
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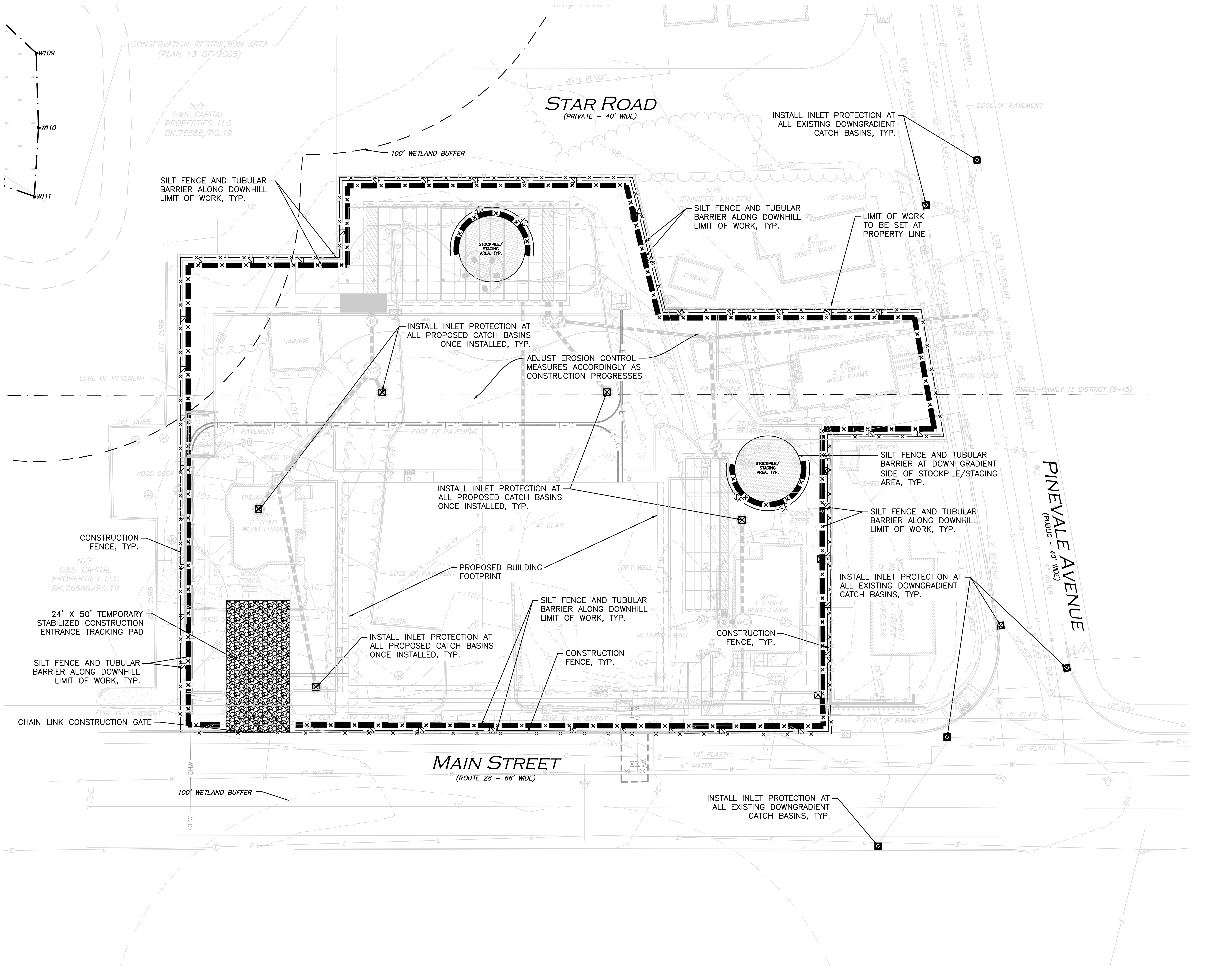
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

THIS DRAWING HAS BEEN PREPARED IN ELECTRONIC FORMAT. CLIENT/CLIENT'S REPRESENTATIVE OR CONSULTANT MAY BE PROVIDED COPIES OF DRAWINGS AND SPECIFICATIONS ON MAGNETIC MEDIA FOR HIS/HER INFORMATION AND USE FOR SPECIFIC APPLICATION TO THIS PROJECT. DUE TO THE POTENTIAL THAT THE MAGNETIC INFORMATION MAY BE MODIFIED UNINTENTIONALLY OR OTHERWISE, ALLEN & MAJOR ASSOCIATES, INC. MAY REMOVE ALL INDICATION OF THE DOCUMENT'S AUTHORSHIP ON THE MAGNETIC MEDIA. PRINTED REPRESENTATIONS OF THE DRAWINGS AND SPECIFICATIONS ISSUED SHALL BE THE ONLY RECORD COPIES OF ALLEN & MAJOR ASSOCIATES, INC.'S WORK PRODUCT.

DRAWING TITLE:	SHEET No.
ABBREVIATIONS & NOTES	C-002



LEGEND

- SILT FENCE
- TUBULAR BARRIER
- EROSION CONTROL FABRIC
- CATCH BASIN FILTER
- STONE CHECK DAM
- STABILIZED ENTRANCE
- CONSTRUCTION FENCE
- STOCKPILE/STAGING AREA

NOTES:

1. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR IT'S REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
2. ALL ELEVATIONS REFER TO NAVD 88.
3. THE INFORMATION SHOWN ON THIS PLAN IS THE SOLE PROPERTY OF ALLEN & MAJOR ASSOCIATES, INC. IT'S INTENDED USE IS TO PROVIDE INFORMATION. ANY ALTERATION, MISUSE, OR RECALCULATION OF INFORMATION OR DATA WITHOUT THE EXPRESSED, WRITTEN CONSENT OF ALLEN & MAJOR ASSOCIATES, INC. IS STRICTLY PROHIBITED.
4. THE CONTRACTOR SHALL CONTACT "DIGSAFE" AND THE TOWN OF READING DEPARTMENT OF PUBLIC WORKS AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION WORK TO REQUEST THE LOCATION OF THE EXISTING UTILITIES.

   DIGSAFE: 1–800–344–7233
   READING DEPT. OF PUBLIC WORKS: 1–781–942–9092
5. SEE THE ABBREVIATIONS AND NOTES PLAN, C–001 AND C–002 FOR GENERAL NOTES, AND EROSION CONTROL NOTES.
6. EXISTING CONDITIONS BASE PLAN TAKEN FROM PLANS ENTITLED "PROPERTY LINE/EXISTING CONDITIONS 252–260 MAIN STREET READING" PREPARED BY ALLEN & MAJOR ASSOCIATES, SHEET V–101, ORIGINAL SCALE 1"=20', DATED SEPTEMEBR 6, 2023.

DIG SAFE

BEFORE YOU DIG
CALL 811 OR
1–888–DIG–SAFE
1–888–344–7233

GRAPHIC SCALE

(IN FEET)
1 inch = 20 ft.

N:\PROJECTS\2398–01A\CIVIL\DRAWINGS\CURRENT\C–2398–01A_EROSION CONTROL.DWG

COMMONWEALTH OF MASSACHUSETTS
CARLTON M. QUINN
CIVIL
No.49923
REGISTERED PROFESSIONAL ENGINEER
3.25.24

PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
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APPLICANT\OWNER:
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c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:

S

STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	1" = 20'	DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:

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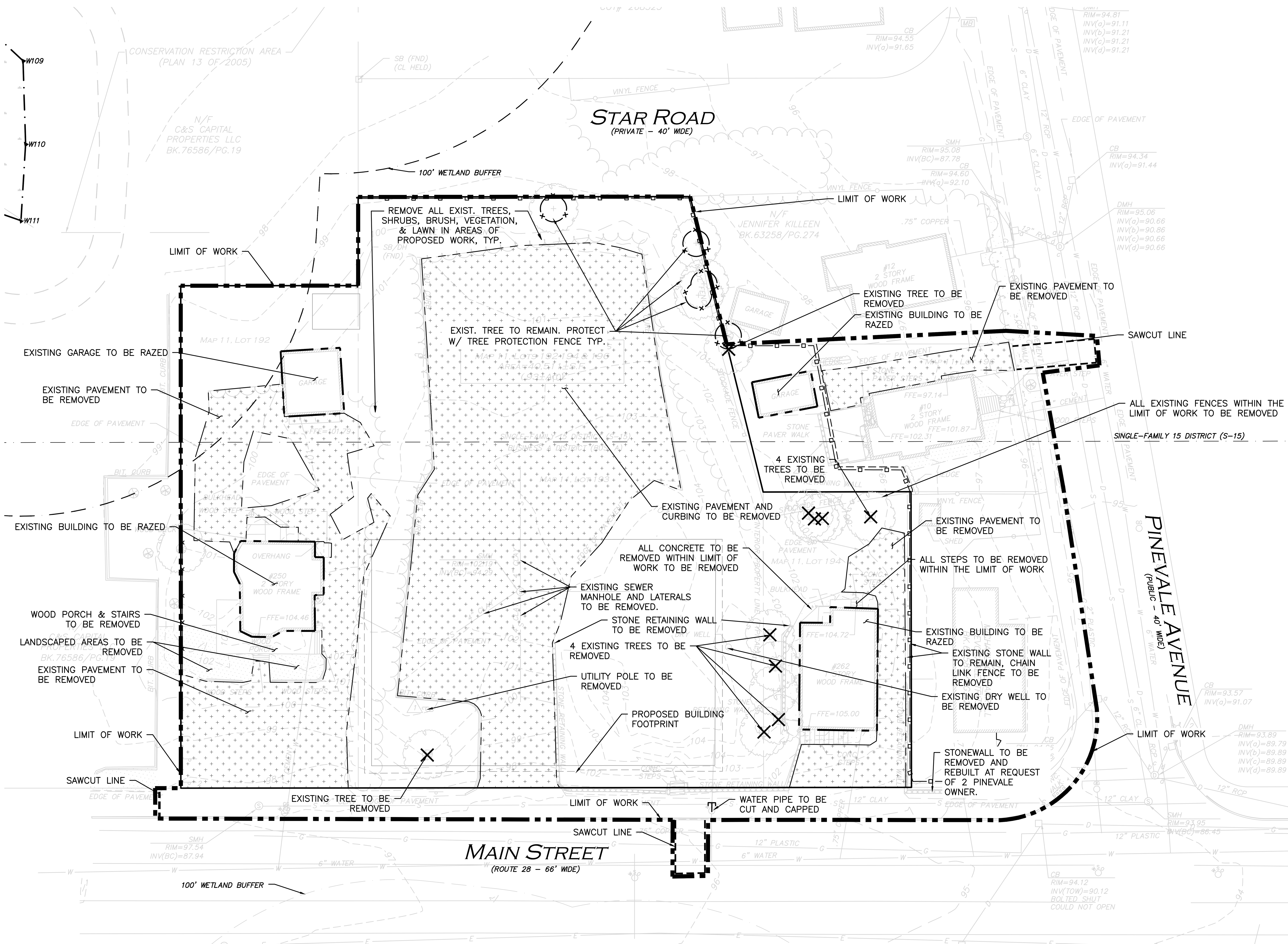
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE:	SHEET No.
EROSION CONTROL PLAN	C-100



LEGEND

LIMIT OF WORK	
TREE TO BE REMOVED	
BUILDING TO BE REMOVED	
PAVEMENT TO BE REMOVED	
UTILITY CUT AND CAP	
TEMPORARY FENCE	
SAWCUT LINE	

NOTES:

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   DIGSAFE: 1-800-344-7233
   READING DEPT. OF PUBLIC WORKS: 1-781-942-9092
3. ALTHOUGH CERTAIN ITEMS HAVE BEEN NOTED ON THIS DRAWING FOR DEMOLITION, NO ATTEMPT HAS BEEN MADE TO DELINEATE EACH AND EVERY ITEM THAT REQUIRES DEMOLITION FOR THE COMPLETION OF THE PROJECT. THE CONTRACTOR WILL BE RESPONSIBLE FOR ALL NECESSARY DEMOLITION WORK TO COMPLETE THE PROJECT AT NO ADDITIONAL COST TO THE OWNER. ALLEN & MAJOR ASSOCIATES, INC. IS NOT RESPONSIBLE FOR SITE DEMOLITION ITEMS NOT SHOWN ON THE SURVEY, OR SPECIFICALLY NOTED. THE DEMOLITION NOTES AND ARROWS ON THIS PLAN ARE TYPICAL AND DO NOT REFLECT QUANTITY.

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GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.

N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\C-2398-01A_SITE PREPERATION.DWG

COMMONWEALTH OF MASSACHUSETTS
3.25.24
CARLTON M. QUINN
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No.49923
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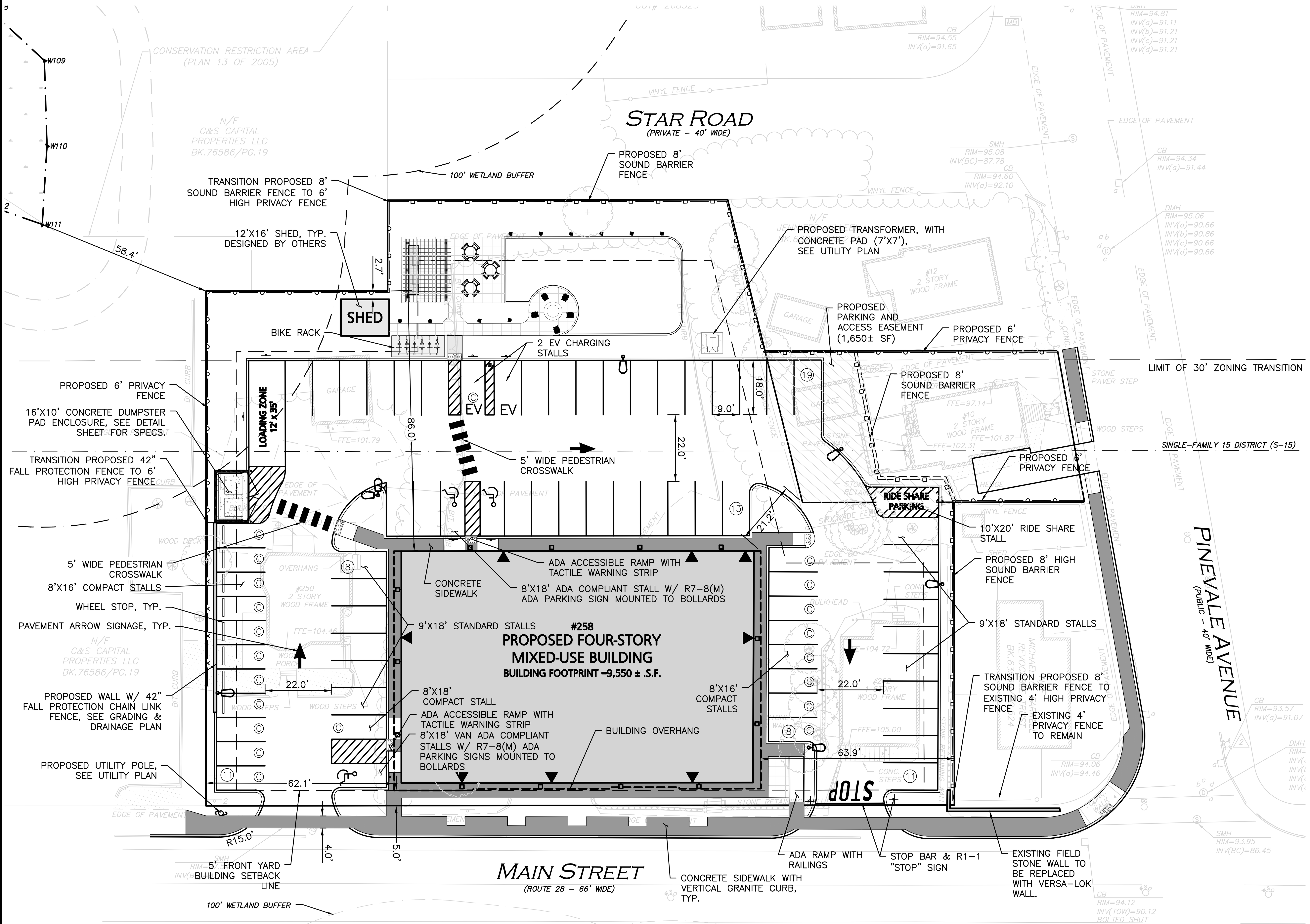
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE:	SHEET No.
SITE PREPARATION PLAN	C-101



LEGEND

- PROP. PROPERTY LINE
- SIGN
- BOLLARD
- BUILDING
- BUILDING ARCHITECTURE
- BUILDING INTERIOR WALLS
- CURB
- RETAINING WALL
- PARKING STRIPING
- ROADWAY STRIPING
- TRAFFIC ARROWS
- SIDEWALK
- ADA ACCESSIBLE RAMP
- ADA DET. WARNING SURFACE
- SETBACK LINE
- PARKING COUNT
- COMPACT PARKING STALL
- PRIVACY FENCE
- CHAIN LINK FENCE
- SILENT FENCE
- TRANSFORMER
- LIGHTING

DIMENSIONAL REQUIREMENTS: BUSINESS-A DISTRICT (BUS. A) MIXED-USE DEVELOPMENT

ITEM	REQUIRED/ALLOWED	PROPOSED
LOT AREA (MIN.)	N/A	41,354± S.F. 0.95± ACRES
LOT FRONTAGE (MIN.)	N/A	247'.0
FRONT YARD BUILDING SETBACK	5' (MIN.)	5'.0
SIDE YARD BUILDING SETBACK	10' (MIN.)	21.2'
REAR YARD BUILDING SETBACK	20' (MIN.)	21.2'
BUILDING LOT COVERAGE (MAX.)	60%	24%
BUILDING HEIGHT (MAX.)	45'	45.0'
OPEN SPACE	N/A	28%

OFF-STREET PARKING SUMMARY

USE: RETAIL STORES/OFFICES/CONSUMER ESTABLISHMENTS
ONE SPACE PER 300 SQUARE FEET (S.F.) OF GROSS FLOOR AREA

RESIDENTIAL
1.25 SPACES PER DWELLING UNIT

PARKING SUMMARY:
USE: 7,500 S.F. RETAIL (NET)
7,500/300 = 25 REQUIRED SPACES.

USE: 30 UNITS
30*1.25 = 38 REQUIRED SPACES

ADA REQUIRED: THERE ARE BETWEEN 51-75 PROPOSED PARKING SPACES, REQUIRING 4 TOTAL PARKING STALLS TO BE ACCESSIBLE AND ONE VAN ACCESSIBLE.

ADA PROVIDED: 3 TOTAL ACCESSIBLE WITH 1 VAN ACCESSIBLE

STANDARD (9'x18')	COMPACT (8'x16') (1)	TANDEM (9'x18')	ACCESSIBLE (8'x18')	TOTAL PROVIDED	TOTAL REQUIRED
46	21 (30%)	0	3	70	63

(1) PER READING ZONING BYLAW DATED APRIL 2022 SECTION 5.6.7.4(C), UP TO 30% OF THE TOTAL REQUIRED PARKING SPACES FOR A MIXED-USE PROJECT MAY BE STRIPED AND MARKED AS COMPACT SPACES (8'X16').

GENERAL NOTES:

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GENERAL NOTES:

1. THE EXISTING CONDITIONS USED IN THIS DRAWING IS FROM AN EXISTING CONDITIONS PLAN PREPARED BY ALLEN & MAJOR ASSOCIATES, INC., ENTITLED "PROPERTY USE/EXISTING CONDITIONS" FOR 252-260 MAIN STREET DATED APRIL 27, 2023 AND PREPARED FOR ONE SYLVAN LLC.
2. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR IT'S REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
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4. SEE AMENITIES PLAN L-102 AND AMENITY DETAILS L-503 FOR MORE INFORMATION.

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1-888-344-7233

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(IN FEET)
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N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\C-2398-01A_LAYOUT & MATERIALS.DWG

COMMONWEALTH OF MASSACHUSETTS
CARLTON M. QUINN
CIVIL
No.49923
REGISTERED PROFESSIONAL ENGINEER
3.25.24

PROFESSIONAL ENGINEER FOR ALLEN & MAJOR ASSOCIATES, INC.

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PROJECT:

S

STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	1" = 20'	DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ◆ land surveying
environmental consulting ◆ landscape architecture
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WOBURN MA 01801
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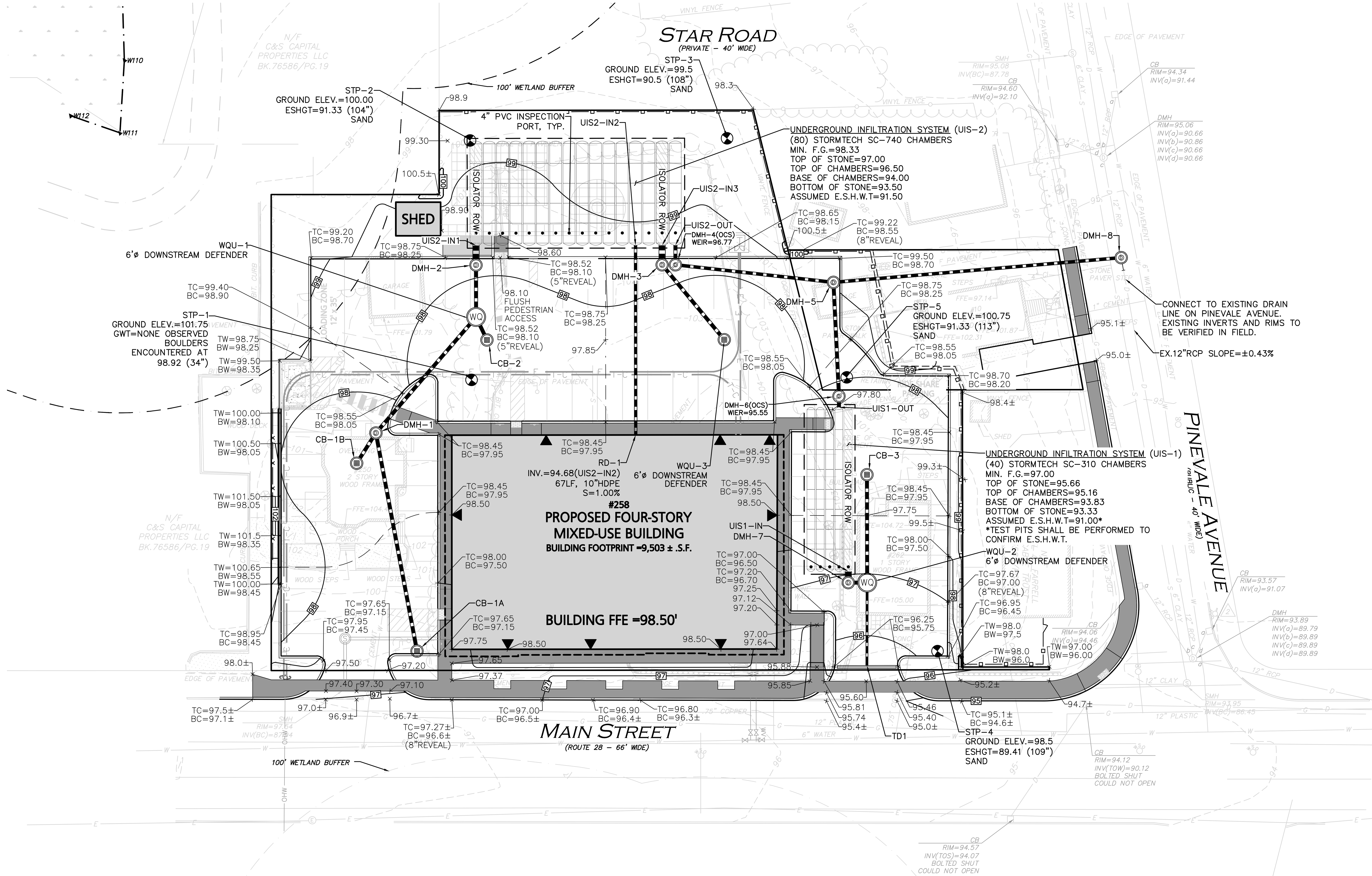
FAX: (781) 935-2896

WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE:	SHEET No.
LAYOUT & MATERIALS PLAN	C-102



LEGEND

DRAIN MANHOLE (DMH)	
CATCH BASIN (CB)	
OUTLET CONTROL STRUCTURE	
WATER QUALITY UNIT	WQ
ISOLATOR ROW	
DRAIN LINE	
10' CONTOUR	150
2' CONTOUR	148
SPOT GRADE	TC=98.00 BC=97.50
INFILTRATION SYSTEM	
INFILTRATION CHAMBERS	

NOTES:

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2. THE CONTRACTOR SHALL CONTACT "DIGSAFE" AND THE TOWN OF READING DEPARTMENT OF PUBLIC WORKS AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION WORK TO REQUEST THE LOCATION OF THE EXISTING UTILITIES.

   DIGSAFE: 1–800–344–7233
   READING DEPT. OF PUBLIC WORKS: 1–781–942–9092
3. PIPE DIMENSIONS ARE MEASURED FROM CENTER TO CENTER OF EACH STRUCTURE.
4. ALL ELEVATIONS REFER TO NAVD 88.

DRAIN STRUCTURE TABLE

STRUCTURE	STRUCTURE DETAILS
CB–1A	RIM = 97.05 INV OUT = 94.14 (DMH–1)
CB–1B	RIM = 97.50 INV OUT = 93.87 (DMH–1)
CB–2	RIM = 97.40 INV OUT = 93.18 (WQU–1)
CB–3	RIM = 97.60 INV OUT = 92.74 (WQU–2)

DRAIN STRUCTURE TABLE

STRUCTURE	STRUCTURE DETAILS
DMH–1	RIM = 97.75 INV IN = 93.74 (CB–1B) INV IN = 93.74 (CB–1A) INV OUT = 93.64 (WQU–1)
DMH–2	RIM = 98.15 INV IN = 94.00 (WQU–1) INV OUT = 94.00 (UIS2–IN1)
DMH–3	RIM = 98.20 INV IN = 94.00 (WQU–3) INV OUT = 94.00 (UIS2–IN3)
DMH–4(OCS)	RIM = 98.18 INV IN = 94.00 (UIS2–OUT) INV OUT = 93.69 (DMH–5)

DRAIN STRUCTURE TABLE

STRUCTURE	STRUCTURE DETAILS
DMH–5	RIM = 98.70 INV IN = 93.10 (DMH–6(OCS)) INV IN = 93.10 (DMH–4(OCS)) INV OUT = 93.00 (DMH–8)
DMH–6(OCS)	RIM = 97.85 INV IN = 93.50 (UIS1–OUT) INV OUT = 93.50 (DMH–5)
DMH–7	RIM = 96.90 INV IN = 93.33 (WQU–2) INV OUT = 93.33 (UIS1–IN)
DMH–8	RIM = 95.10 INV IN = 92.00 (DMH–5) INV OUT = 90.50 (EX.12"RCP)

DRAIN STRUCTURE TABLE

STRUCTURE	STRUCTURE DETAILS
TD1	RIM = 95.75 INV OUT = 93.84 (WQU–2)
WQU–1	RIM = 97.60 INV IN = 93.09 (DMH–1) INV IN = 93.09 (CB–2) INV OUT = 94.09 (DMH–2)
WQU–2	RIM = 96.95 INV IN = 92.36 (CB–3) INV IN = 92.36 (TD1) INV OUT = 93.36 (DMH–7)
WQU–3	RIM = 97.40 INV OUT = 94.35 (DMH–3)

DRAIN PIPE TABLE

PIPE SEGMENT	SIZE	LENGTH	SLOPE	MATERIAL
CB–1A – DMH–1	12"	79'	0.50%	HDPE
CB–1B – DMH–1	12"	13'	1.00%	HDPE
CB–2 – WQU–1	12"	9'	1.00%	HDPE
CB–3 – WQU–2	12"	37'	1.00%	HDPE
DMH–1 – WQU–1	12"	55'	1.00%	HDPE
DMH–2 – UIS2–IN1	24"	7'	0.00%	HDPE
DMH–3 – UIS2–IN3	24"	7'	0.00%	HDPE
DMH–4(OCS) – DMH–5	12"	57'	1.04%	HDPE
DMH–5 – DMH–8	12"	103'	0.97%	HDPE
DMH–6(OCS) – DMH–5	12"	41'	1.00%	HDPE

DRAIN PIPE TABLE

PIPE SEGMENT	SIZE	LENGTH	SLOPE	MATERIAL
DMH–7 – UIS1–IN	24"	4'	0.00%	HDPE
RD–1 – UIS2–IN2	10"	68'	1.00%	HDPE
TD1 – WQU–2	8"	30'	5.00%	HDPE
UIS1–OUT – DMH–6(OCS)	12"	4'	0.00%	HDPE
UIS2–OUT – DMH–4(OCS)	12"	7'	0.00%	HDPE
WQU–1 – DMH–2	12"	19'	0.50%	HDPE
WQU–2 – DMH–7	12"	7'	0.50%	HDPE
WQU–3 – DMH–3	12"	35'	1.00%	HDPE

DIG SAFE

BEFORE YOU DIG
CALL 811 OR
1–888–DIG–SAFE
1–888–344–7233

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

N:\PROJECTS\2398–01A\CIVIL\DRAWINGS\CURRENT\C–2398–01A_GRADING & DRAINAGE.DWG

COMMONWEALTH OF MASSACHUSETTS
CARLTON M. QUINN
CIVIL
No.49923
REGISTERED PROFESSIONAL ENGINEER
3.25.24

PROFESSIONAL ENGINEER FOR ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
B	3/25/2024	REVISED PER TOWN COMMENTS
A	2/29/2024	REVISED PER TOWN COMMENTS

APPLICANT\OWNER:
BLVD READING, LLC
c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

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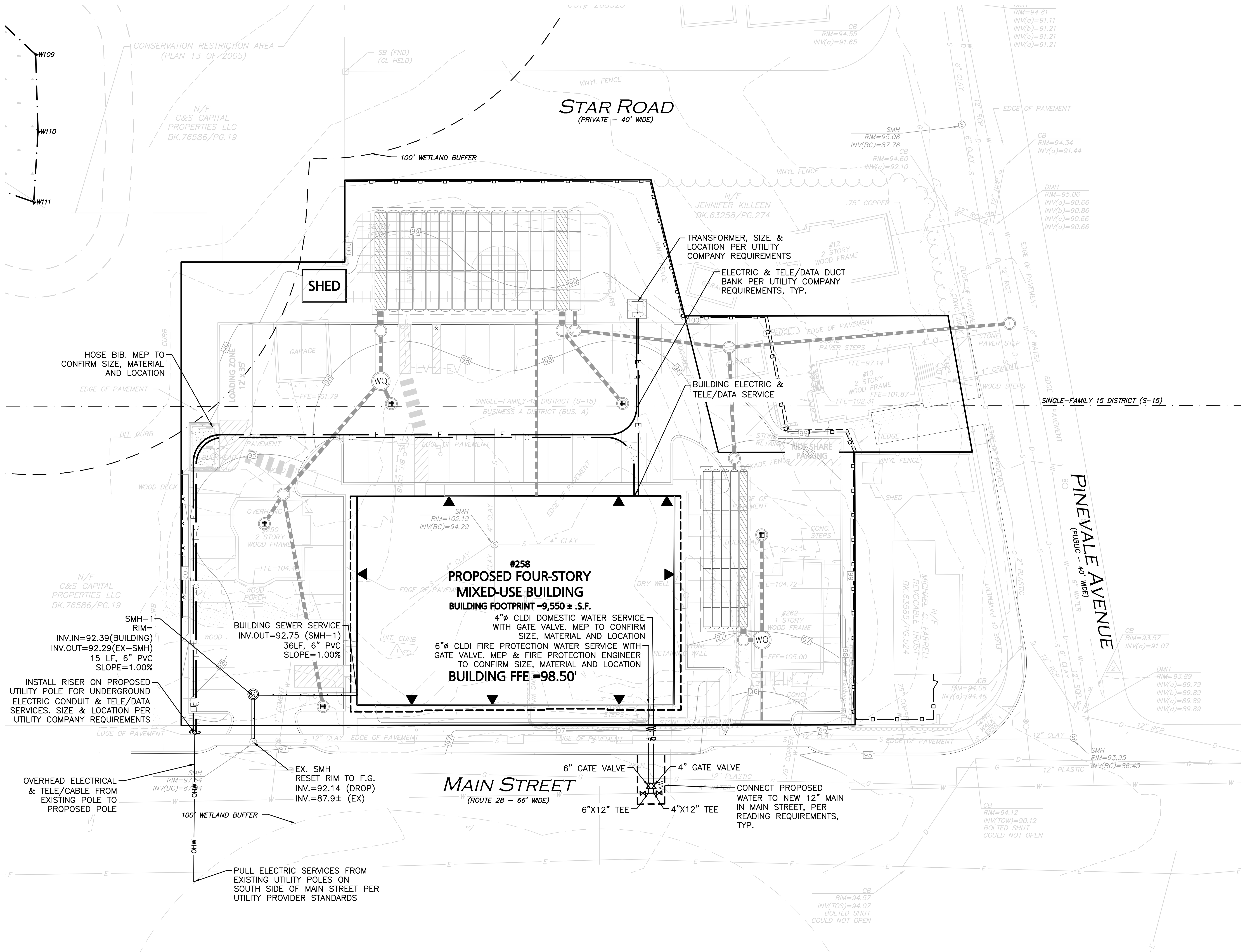
DRAWING TITLE:	SHEET No.
GRADING & DRAINAGE PLAN	C-103



LEGEND

SEWER MANHOLE	
SEWER LINE	
WATER LINE	W
WATER (FIRE SERVICE)	W-F
WATER (DOMESTIC SERVICE)	W-D
WATER VALVE	WV
OVER HEAD WIRE	OHW
UTILLITY POLE	
ELECTRICAL CONDUIT	E
TELE/CABLE CONDUIT	T-C
SAWCUT LINE	

NOTES:

1. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR IT'S REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
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   READING DEPT. OF PUBLIC WORKS: 1-781-942-9092
5. ALL WATER CONSTRUCTION METHODS AND MATERIALS SHALL BE IN ACCORDANCE WITH TOWN OF READING STANDARDS, TYP.

DIG SAFE

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1-888-344-7233

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
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N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\C-2398-01A_UTILITIES.DWG

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CARLTON M. QUINN
CIVIL
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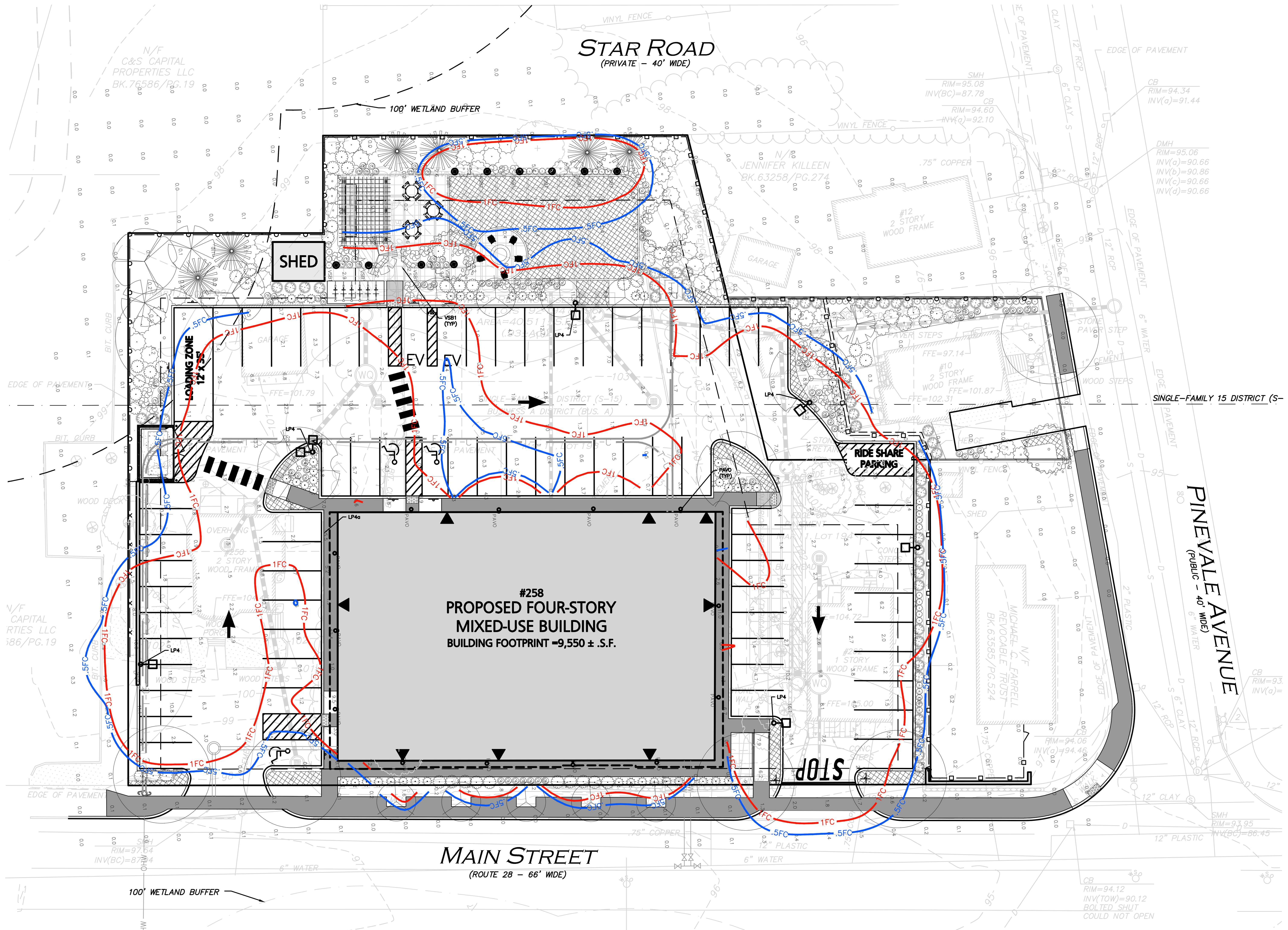
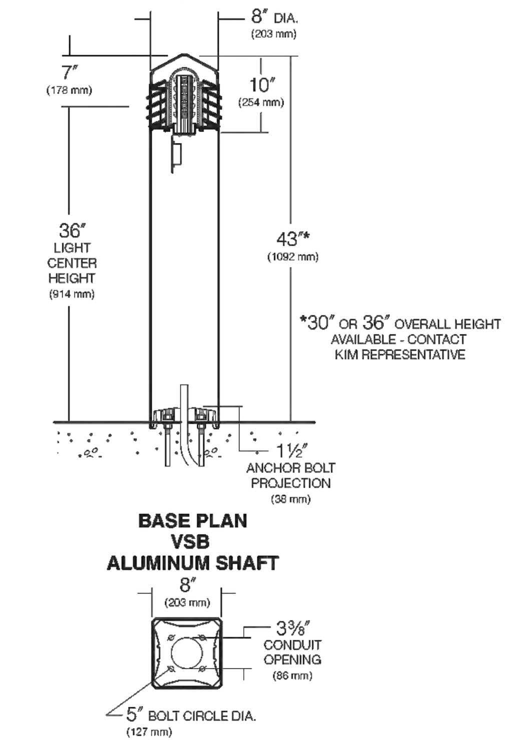
DRAWING TITLE:	SHEET No.
UTILITIES PLAN	C-104



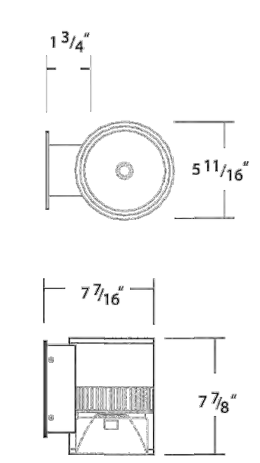
Specifications

VSB Models
10 - 20 Diodes

VSB1 - Single Function Luminaire (Aluminum Shaft)
Maximum weight: 35 lb



WALKWAY BOLLARD LIGHT FIXTURE
KIM LIGHTING, VSB1 LED



WALL MOUNT
ALCON LIGHTING - PAVO

LEGEND

DOUBLE POLE LIGHT	
SINGLE POLE LIGHT	
WALL MOUNT LIGHT	
BOLLARD LIGHT	
1 FOOTCANDLE CONTOUR	1FC
.5 FOOTCANDLE CONTOUR	.5FC
LIGHTING LEVELS GIVEN IN FOOT–CANDLES	0.0 0.1 0.2 0.4 0.6

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3. FOOT CANDLE VALUES SHOWN ON THE PLAN ARE PRODUCED UTILIZING DESIGN MASTER PHOTOMETRICS SOFTWARE AND ASSOCIATED IES FILES BY THE MANUFACTURER FOR THE PROPOSED LIGHT FIXTURE.
4. ALL PHOTOMETRIC DATA REFERS TO UNITS IN FOOT CANDLES (FC). THE LIMIT OF 1.0 FC ILLUMINATION IS SHOWN IN A RED SOLID LINE AND THE LIMIT OF THE 0.5 FOOT CANDLE (FC) ILLUMINATION IS SHOWN IN BLUE.
5. QUANTITY SHOWN IN LUMINIARE SCHEDULE TABLE DENOTES NUMBER OF FIXTURE HEADS. REFER TO PLAN FOR POLES WITH DOUBLE FIXTURES.
6. ALL ILLUMINATION ON PARKING LOTS MUST BE SHIELDED SO AS NOT TO SHINE UPON ABUTTING PROPERTIES.
7. SEE ARCHITECTURAL DRAWINGS FOR ADDITIONAL LIGHTING INFORMATION.
8. ALL PROPOSED LIGHTING FIXTURES SHALL BE DARK SKY COMPLIANT.
9. LIGHT POLES ADJACENT TO PARKING SHALL HAVE THE 3'–0" REVEAL FOOTING. LIGHT POLES ADJACENT TO SIDEWALKS SHALL HAVE FOOTING IN A FLUSH CONDITION.

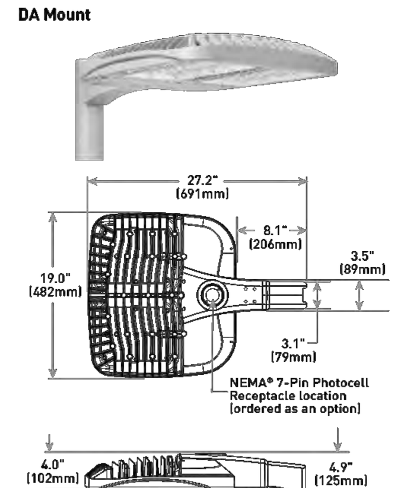
GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

GENERAL PHOTOMETRIC SCHEDULE	
AVERAGE FOOT–CANDLES	1.96
MAXIMUM FOOT–CANDLES	25.6
MINIMUM FOOT–CANDLES	0.0

DA Mount



LIGHT FIXTURE - OSQ LED AREA - LARGE
CREE LIGHTING - OSQ SERIES

LUMINAIRE SCHEDULE

CALLOUT	QUANTITY	SYMBOL	DESCRIPTION	MOUNTING	MOUNTING HEIGHT	COLOR	TOTAL LUMENS	LAMP DEPRECIATION
LP4	7		Cree OSQ Series Area Luminaire, Type IV Medium w/ Backlight Shield, T Input Power Designator, 4000K	POLE	12'–6"	Grey	20427	0.9
PAVO	13		ALCON LIGHTING, INC. 6" ROUND 1–DIRECTION WALL MOUNT (IP65) 1500LM	WALL	16'–0"	White	1650	0.9
VSB1	11		KIM LIGHTING, VSB1–15L4K SQUARE BOLLARD LED	SURFACE	3'–0"	Grey	804	0.9

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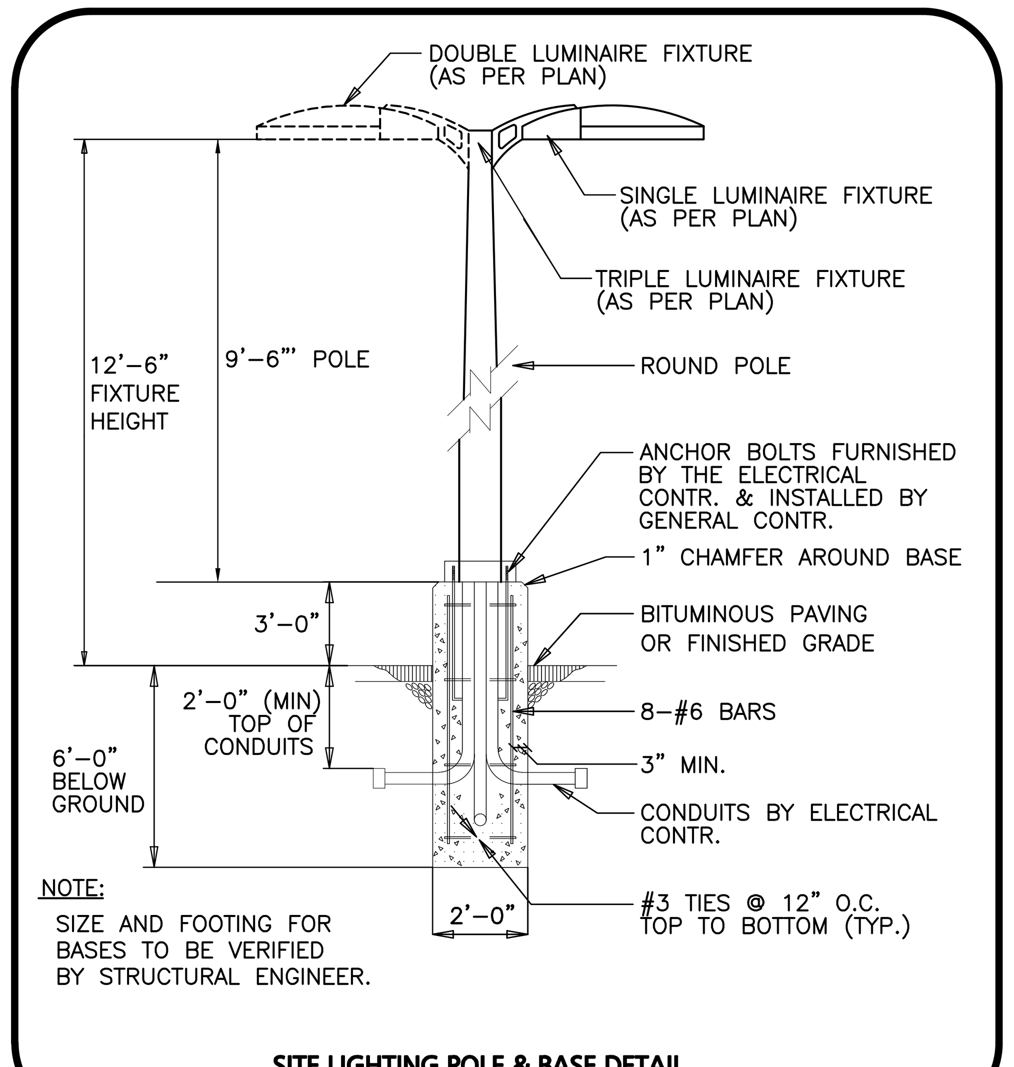
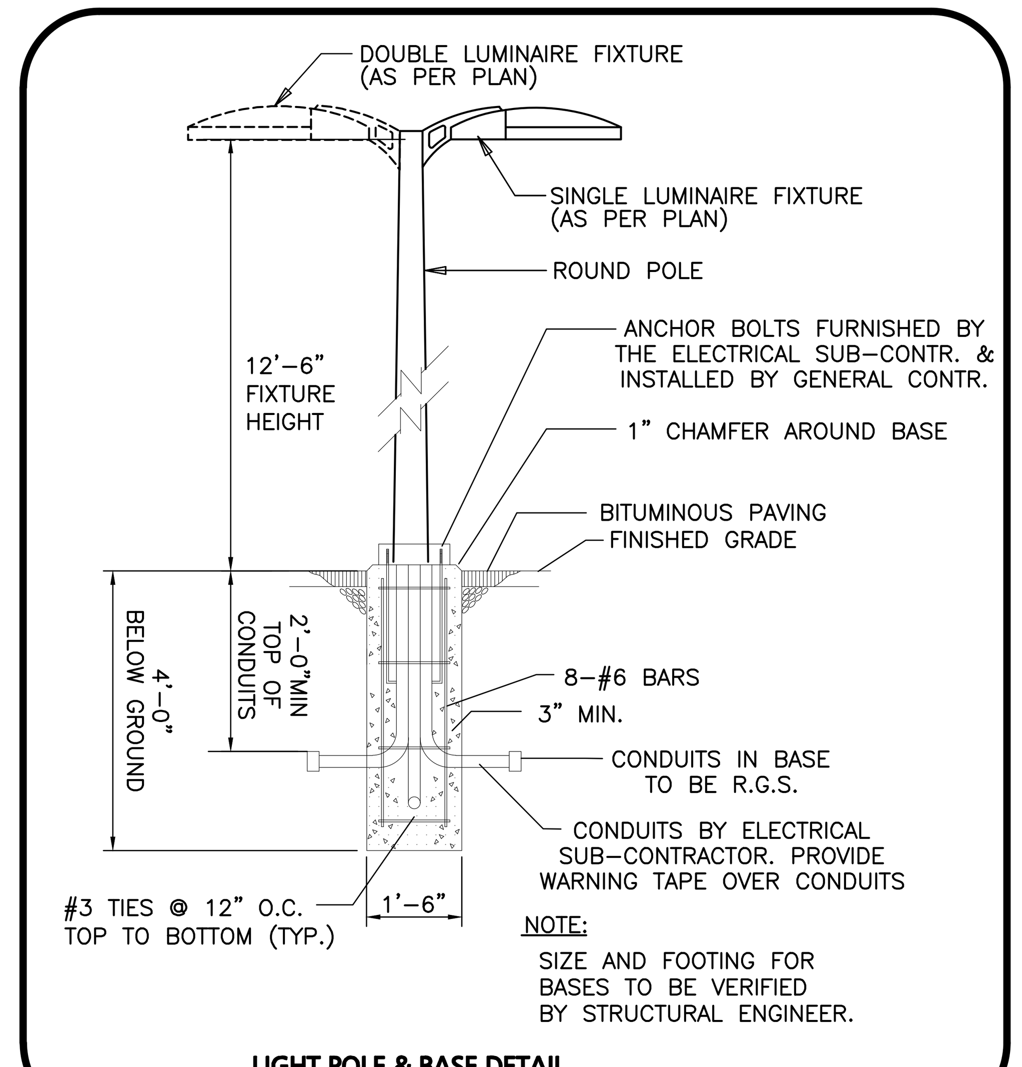


NOTE:
SIZE AND FOOTING FOR BASES TO BE VERIFIED BY STRUCTURAL ENGINEER.

SITE LIGHTING POLE & BASE DETAIL
NOT TO SCALE



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LIGHT POLE & BASE DETAIL
NOT TO SCALE

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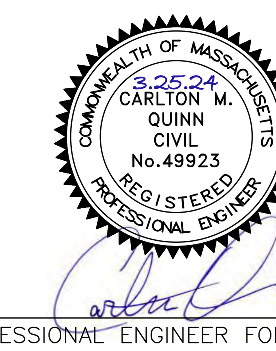

PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

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c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

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STRADA
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258 MAIN STREET
READING, MA

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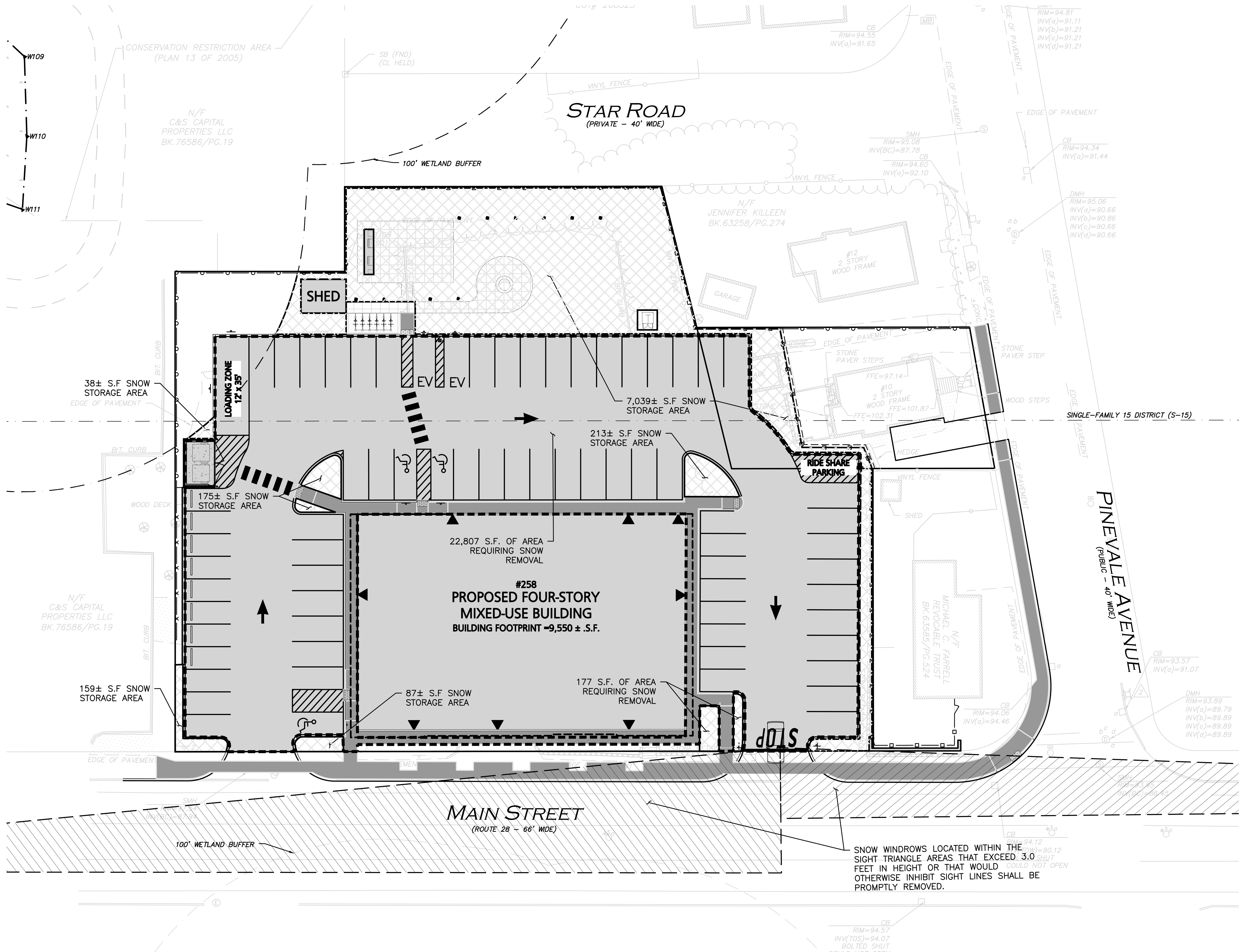
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE: LIGHTING PLAN

SHEET No. C-105



LEGEND

SNOW STORAGE AREA

NOTES:

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2. THE PLAN DEPICTS APPROXIMATELY 7,889 S.F. OF AREA AVAILABLE FOR PRIMARY SNOW STORAGE WITHIN THE PROJECT AREA FOR AN AREA OF 22,808 SF REQUIRING SNOW REMOVAL. THE AREA IS ESTIMATED TO ACCOMMODATE AN APPROXIMATE 6.9' OF SNOWFALL, ASSUMING A 5:1 COMPACTION AND AN AVERAGE SNOW PILE HEIGHT OF 4.0'. ADDITIONAL SNOW SECONDARY SNOW STORAGE AREAS ARE AVAILABLE ON-SITE IS NECESSARY.
3. IT IS UNLIKELY THIS PROJECT WOULD NEED SNOW TO BE REMOVED OFF-SITE, BUT IF NECESSARY: SNOW WILL BE STOCKPILED ON SITE UNTIL THERE IS NOT ENOUGH SPACE. AS NECESSARY, THE SNOW WILL BE REMOVED AND DISPOSED OF OFF-SITE. IT WILL BE THE RESPONSIBILITY OF THE SNOW REMOVAL CONTRACTOR TO PROPERLY DISPOSE OF TRANSPORTED SNOW ACCORDING TO MASSACHUSETTS DEP, BUREAU OF RESOURCE PROTECTION – MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION BUREAU OF WATER RESOURCES SNOW DISPOSAL GUIDANCE EFFECTIVE DATE: DECEMBER 23, 2019, GOVERNING THE PROPER DISPOSAL OF SNOW. IT WILL BE THE RESPONSIBILITY OF THE SNOW REMOVAL CONTRACTOR TO FOLLOW THESE GUIDELINES AND ALL APPLICABLE LAWS AND REGULATIONS.
4. UNDER NO CIRCUMSTANCES SHALL SNOW BE STORED IN ANY WETLAND RESOURCE AREA OR PROPOSED STORMWATER MANAGEMENT SYSTEM.
5. SNOW STORAGE WILL BE IMPLEMENTED TO AVOID HYDRANTS, FENCES LANDSCAPING AND OTHER PERMANENT FEATURES.

DIG SAFE

BEFORE YOU DIG
CALL 811 OR
1-888-DIG-SAFE
1-888-344-7233

GRAPHIC SCALE

(IN FEET)
1 inch = 20 ft.

N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\C-2398-01A_SNOW STORAGE.DWG

COMMONWEALTH OF MASSACHUSETTS
CARLTON M. QUINN
CIVIL
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3.25.24

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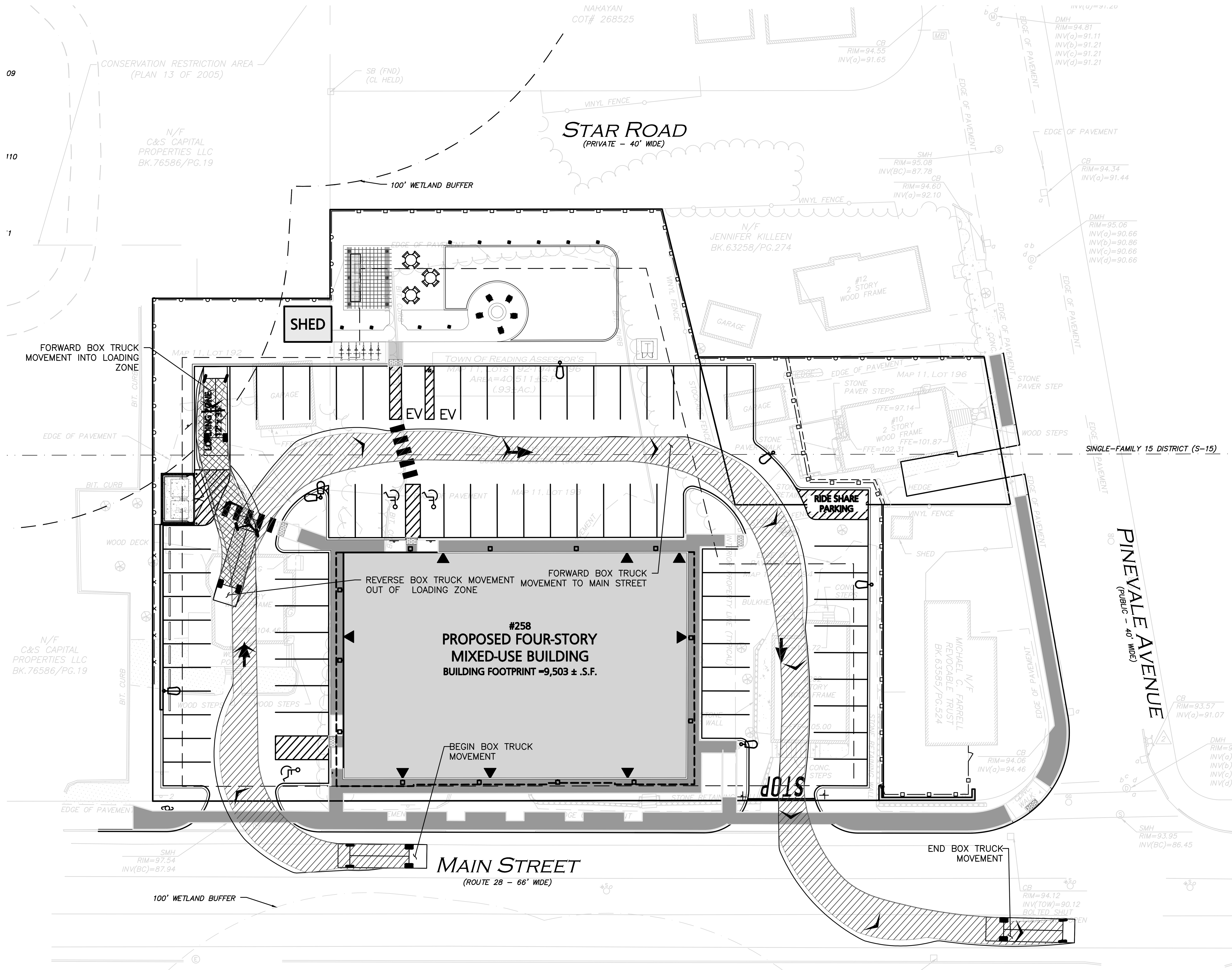
DRAWING TITLE:	SHEET No.
SNOW STORAGE PLAN	C-106



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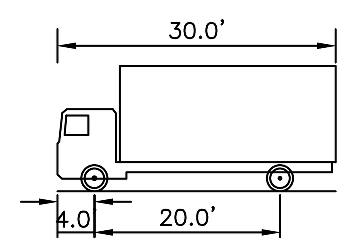

SU-30 – Single Unit Truck	
Overall Length	30.0ft
Overall Width	8.0ft
Overall Body Height	13.5ft
Min Body Ground Clearance	1.4ft
Track Width	8.0ft
Lock-to-lock time	5.0s
Max Steering Angle (Virtual)	31.8°

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GRAPHIC SCALE

(IN FEET)
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N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\C-2398-01A_VEHICLE MOVEMENT.DWG

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100 COMMERCE WAY, SUITE 5
WOBURN MA 01801
TEL: (781) 935-6889
FAX: (781) 935-2896
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE:	SHEET No.
VEHICLE MOVEMENT PLAN	C-107A

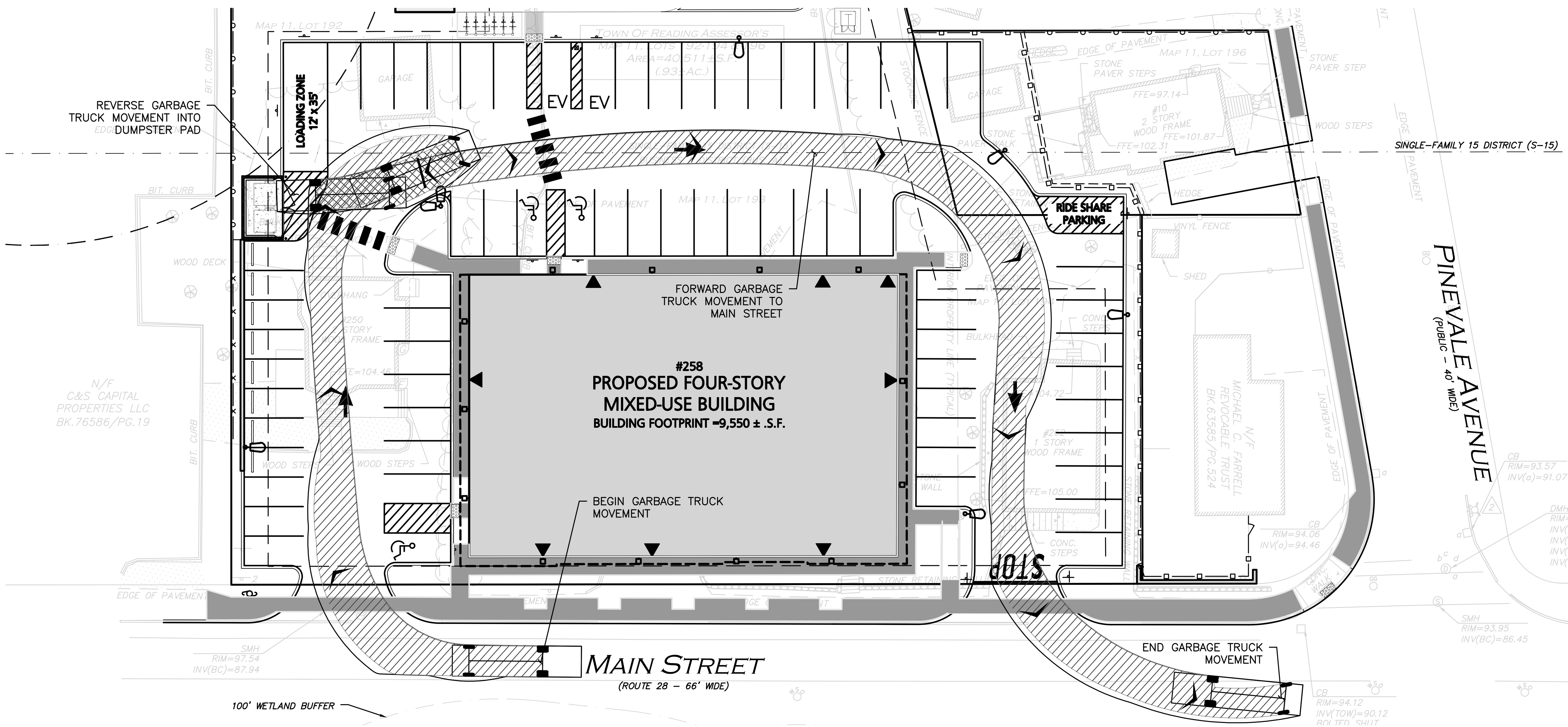

EXHIBIT 1: REAR LOAD GARBAGE TRUCK CIRCULATION

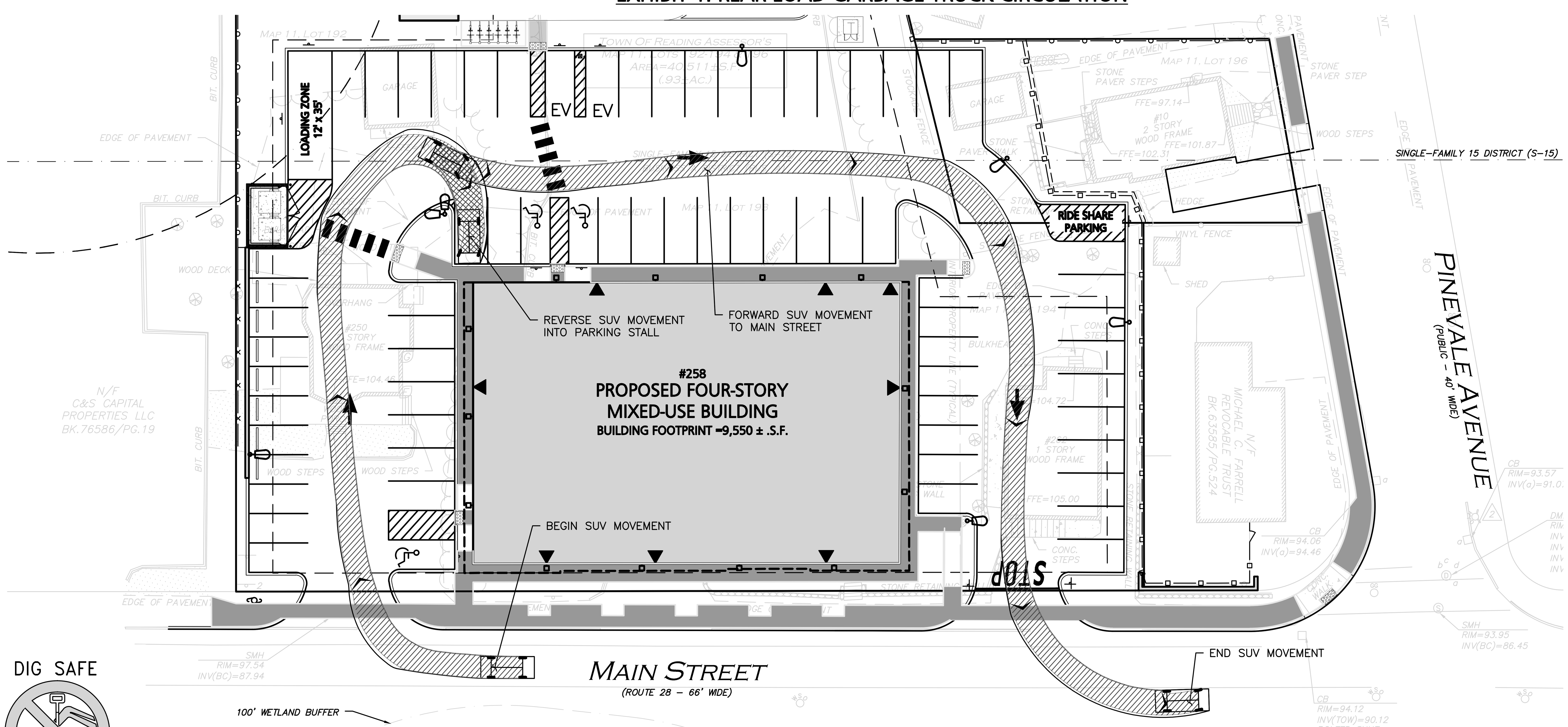

EXHIBIT 2: 4WD SUV CIRCULATION

DIG SAFE

BEFORE YOU DIG
CALL 811 OR
1-888-DIG-SAFE
1-888-344-7233

GENERAL NOTES:

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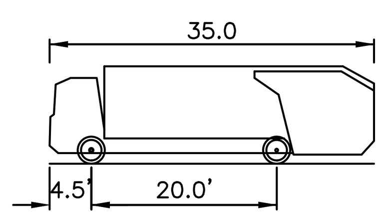
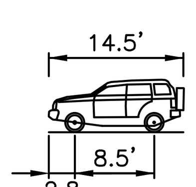


Rear-Load Garbage Truck	
Overall Length	35.0ft
Overall Width	8.3ft
Overall Body Height	10.5ft
Min Body Ground Clearance	1.0ft
Track Width	8.3ft
Lock-to-lock time	6.0s
Curb to Curb Turning Radius	29.3ft



4WD SUV	
Overall Length	14.5ft
Overall Width	5.9ft
Overall Body Height	5.6ft
Min Body Ground Clearance	0.6ft
Track Width	5.9ft
Lock-to-lock time	4.0s
Curb to Curb Turning Radius	18.3ft

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\C-2398-01A_VEHICLE MOVEMENT.DWG

COMMONWEALTH OF MASSACHUSETTS
3.25.24
CARLTON M. QUINN
CIVIL
No.49923
REGISTERED PROFESSIONAL ENGINEER

PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
B	3/25/2024	REVISED PER TOWN COMMENTS
A	2/29/2024	REVISED PER TOWN COMMENTS

APPLICANT\OWNER:
BLVD READING, LLC
c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:

STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	1" = 20'	DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:

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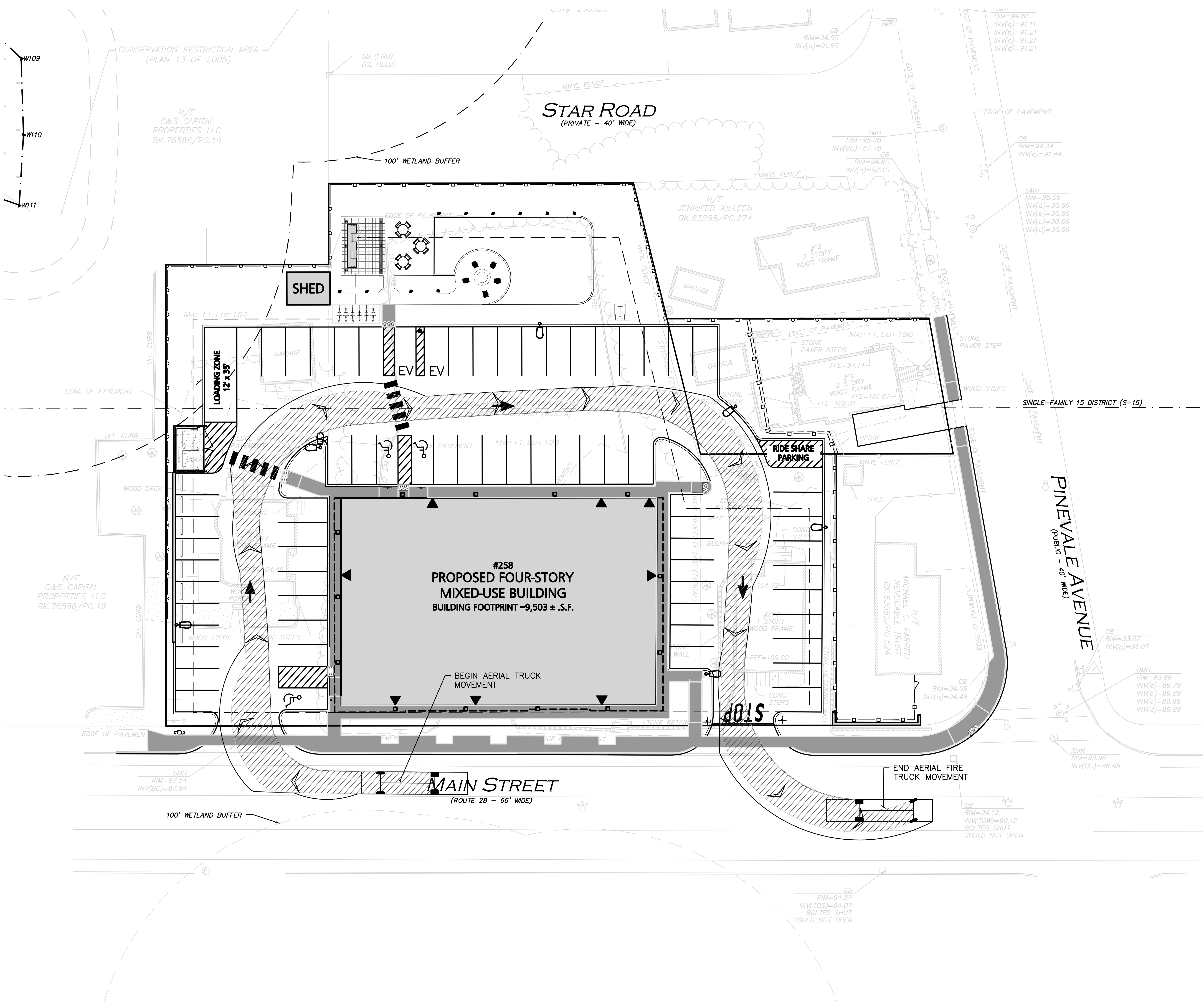
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE:	SHEET No.
VEHICLE MOVEMENT PLAN	C-107B



NOTES:

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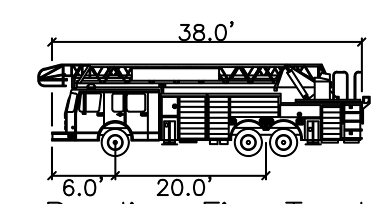
2. FIRE TRUCK DIMENSIONS USED IN VEHICLE SWEPT PATH ANALYSIS WERE PROVIDED BY THE TOWN OF READING FIRE DEPARTMENT.



Reading Fire Truck

Overall Length	38.0ft
Overall Width	8.0ft
Track Width	8.0ft
Lock-to-lock time	6.0s
Max Wheel Angle	34.0°

DIG SAFE

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CALL 811 OR
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1-888-344-7233

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\C-2398-01A_ FIRE TRUCK TURNING.DWG

COMMONWEALTH OF MASSACHUSETTS
3.25.24
CARLTON M. QUINN
CIVIL
No.49923
REGISTERED PROFESSIONAL ENGINEER

PROFESSIONAL ENGINEER FOR
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c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:

S

STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	1" = 20'	DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

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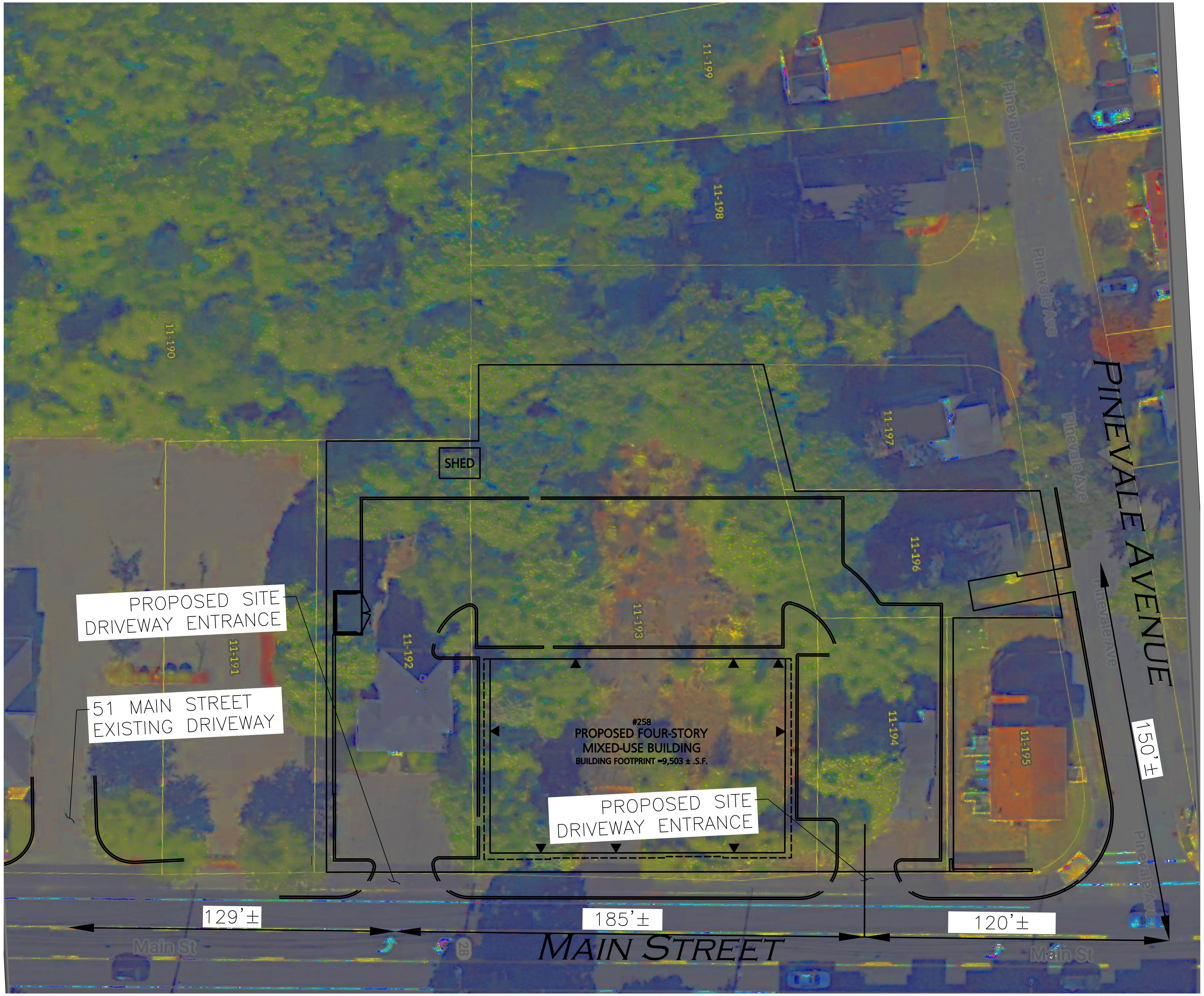
DRAWING TITLE:	SHEET No.
FIRE TRUCK TURNING PLAN	C-108



GENERAL NOTES

1. BASE MAP PROVIDED BY READING GIS.
2. THE INFORMATION SHOWN ON THIS PLAN IS THE SOLE PROPERTY OF ALLEN & MAJOR ASSOCIATES, INC. ITS INTENDED USE IS TO PROVIDE INFORMATION. ANY ALTERATION, MISUSE, OR RECALCULATION OF INFORMATION OR DATA WITHOUT THE EXPRESSED, WRITTEN CONSENT OF ALLEN & MAJOR ASSOCIATES, INC. IS STRICTLY PROHIBITED.

DIG SAFE

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1-888-DIG-SAFE
1-888-344-7233

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\C-2398-01A_ABUTTING PROPERTY DIMENSION PLAN.DWG

COMMONWEALTH OF MASSACHUSETTS
3.25.24
CARLTON M. QUINN
CIVIL
No.49923
REGISTERED PROFESSIONAL ENGINEER

PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

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c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:

S

STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	1" = 20'	DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:

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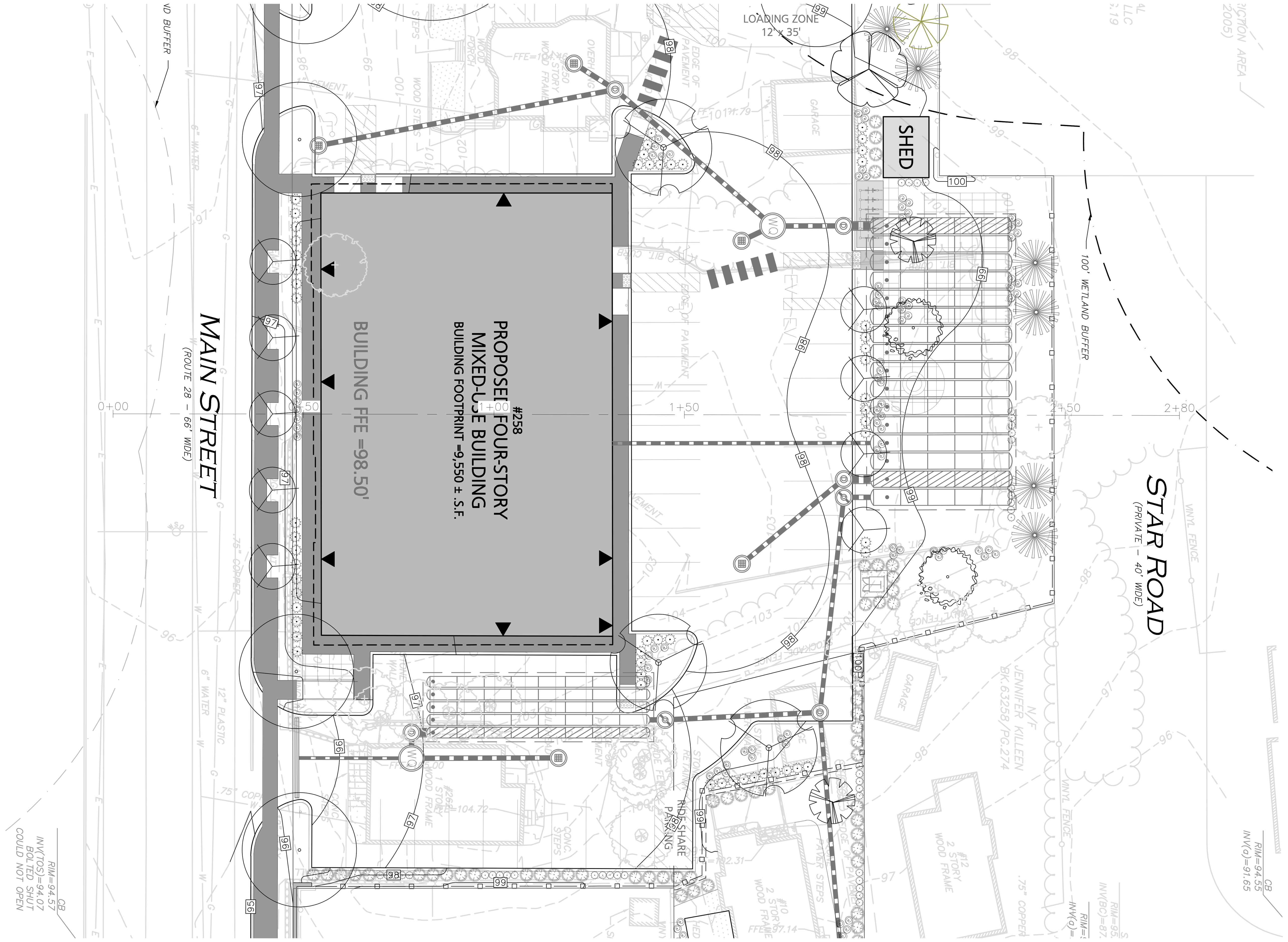
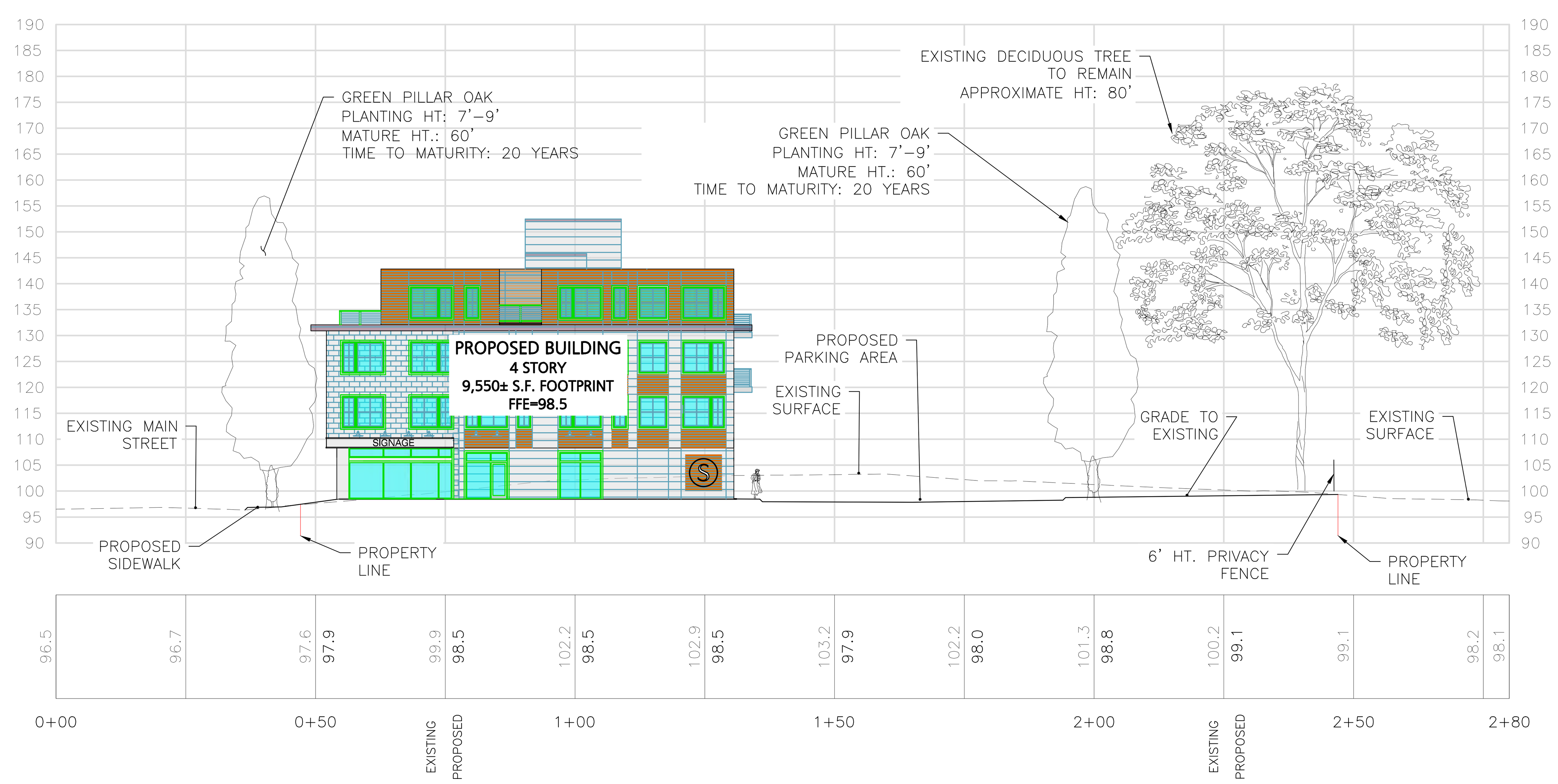
DRAWING TITLE:

ABUTTING PROPERTY DIMENSION PLAN

SHEET No.

C-109





BUILDING PROFILE
1"=20' HORIZ.
1"=20' VERT.

GRAPHIC SCALE
(IN FEET)
1 inch = 20 ft.

NOTES:

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2. THE CONTRACTOR SHALL CONTACT "DIGSAFE" AND THE TOWN OF READING DEPARTMENT OF PUBLIC WORKS AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION WORK TO REQUEST THE LOCATION OF THE EXISTING UTILITIES.

   DIGSAFE: 1-800-344-7233
   READING DEPT. OF PUBLIC WORKS:
   1-781-942-9092

3. ALL ELEVATIONS REFER TO NAVD 88.

N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\C-2398-01A_SITE SECTION.DWG

COMMONWEALTH OF MASSACHUSETTS
3.25.24
CARLTON M. QUINN
CIVIL
No.49923
REGISTERED PROFESSIONAL ENGINEER

PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

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PEABODY, MA 01960

PROJECT:

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MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	1" = 20'	DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

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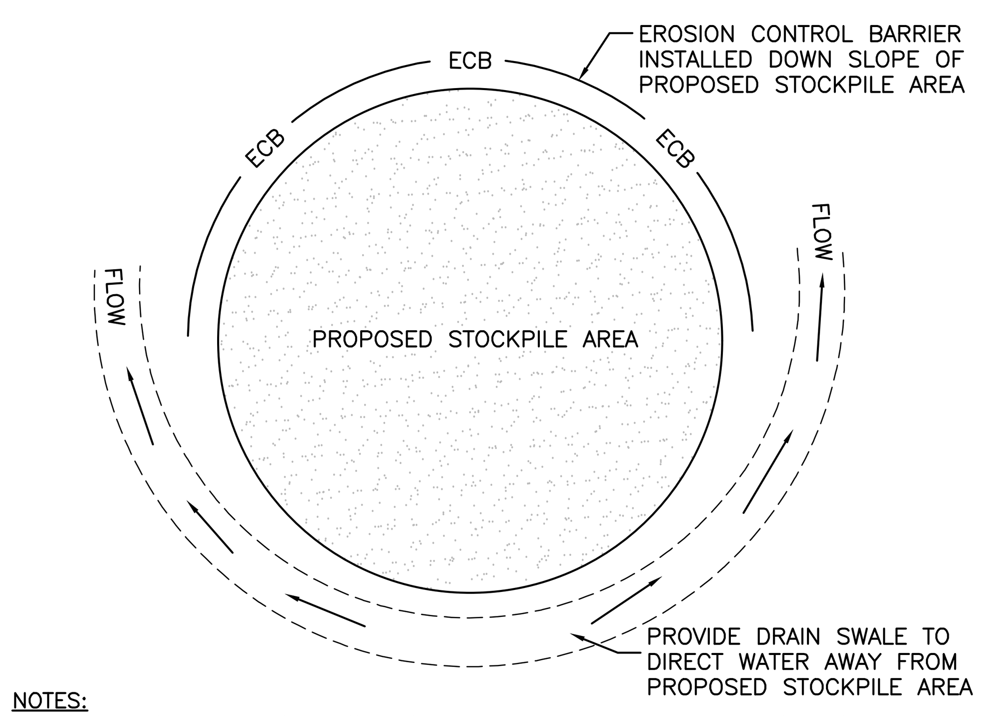
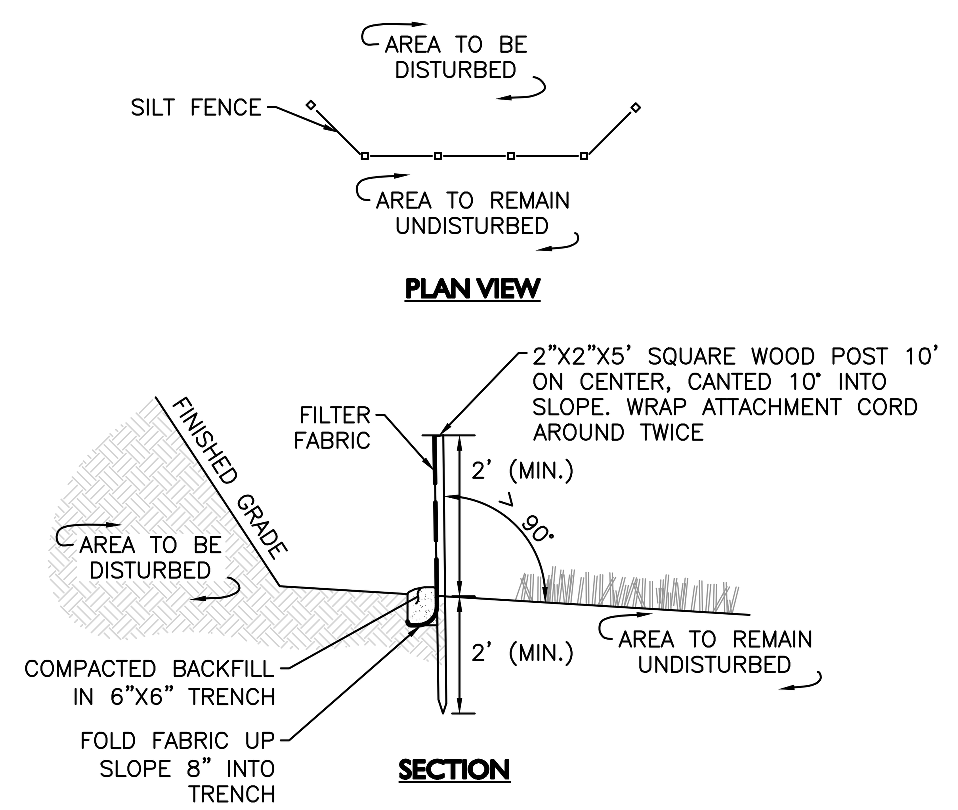
DRAWING TITLE: SITE CROSS SECTION PLAN

SHEET No. C-201



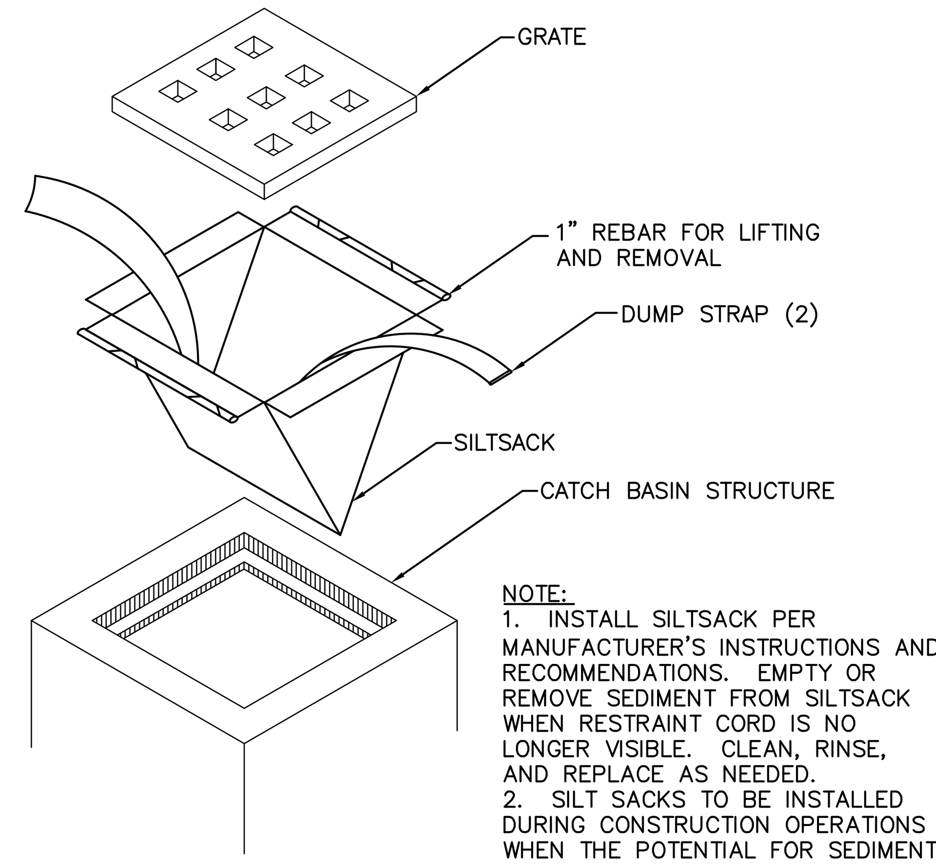
NOTES:
1. SOIL AND FILL STOCKPILES EXPECTED TO REMAIN IN PLACE FOR LESS THAN 90 DAYS SHALL BE COVERED WITH STRAW AND MULCH (AT 100LBS/1,000 SF), OR WITH AN ANCHORED TARP WITHIN 7 DAYS OR PRIOR TO ANY RAINFALL.
2. SOIL AND FILL STOCKPILES EXPECTED TO REMAIN IN PLACE FOR 90 DAYS OR MORE SHALL BE SEEDED WITH WINTER RYE (FOR FALL SEEDING AT 1LB/1,000 SF) OR OATS (FOR SUMMER SEEDING AT 2LB/1,000 SF) AND THEN COVERED WITH HAY MULCH (AT 100LB/1,000 SF) OR AN ANCHORED TARP WITHIN 7 DAYS OR PRIOR TO ANY RAINFALL.

STOCKPILE PROTECTION 1
NOT TO SCALE



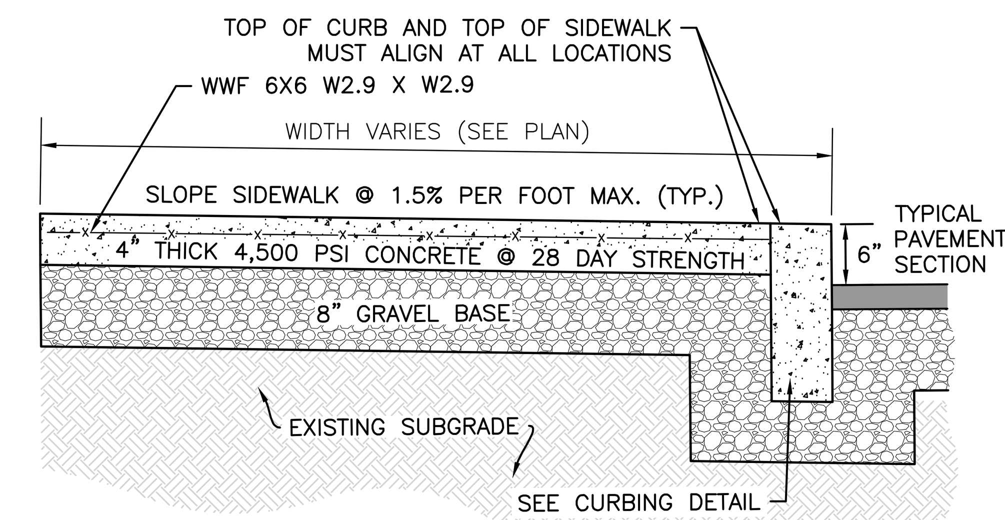
NOTE:
DEPTH TO BE 2' UNLESS POST IS TO BE SET IN PEAT THEN 3' OR DEPTH POSSIBLE BY PUSHING BY HAND SHALL BE REQUIRED.

SILT FENCE 2
NOT TO SCALE



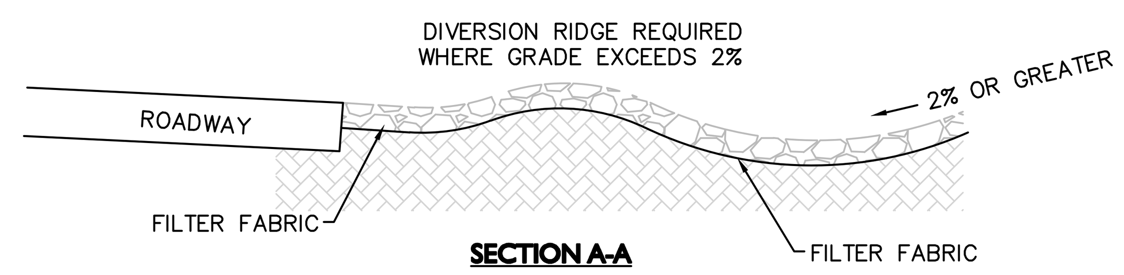
NOTE:
1. INSTALL SILTSACK PER MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS. EMPTY OR REMOVE SEDIMENT FROM SILTSACK WHEN RESTRAINT CORD IS NO LONGER VISIBLE. CLEAN, RINSE, AND REPLACE AS NEEDED.
2. SILT SACKS TO BE INSTALLED DURING CONSTRUCTION OPERATIONS WHEN THE POTENTIAL FOR SEDIMENT TO ENTER EXISTING & PROPOSED BASINS EXISTS.

SILTSACK INLET DETAIL 3
NOT TO SCALE

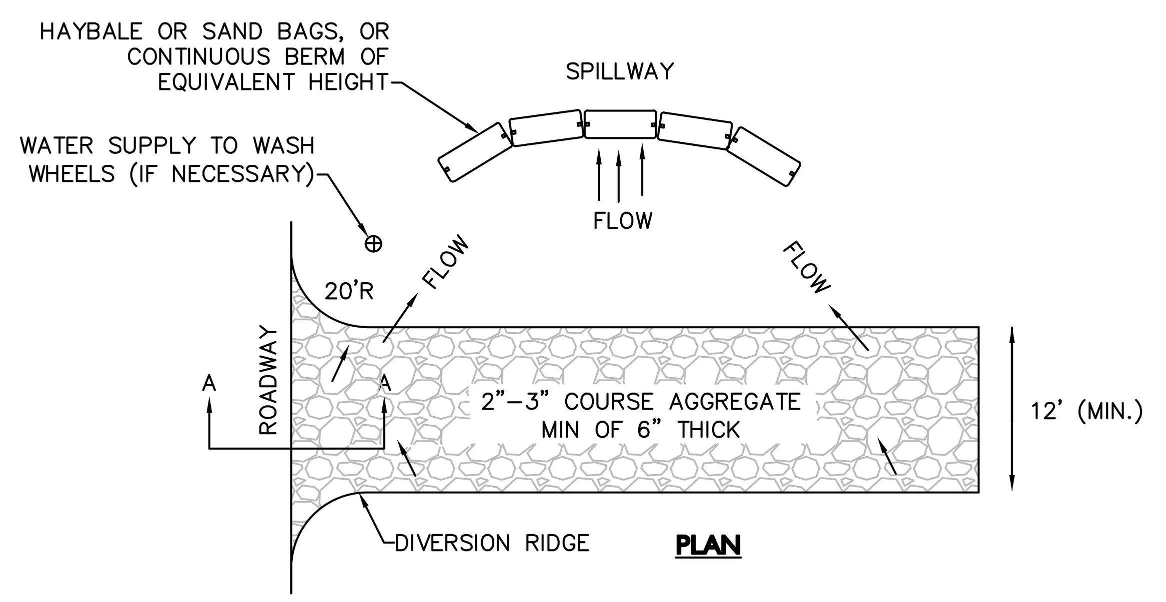


NOTES:
1. SIDEWALK TO HAVE TOOLED JOINTS IN A 5' x 5' (TYP.) GRID WITH EXPANSION JOINTS 15' ON CENTER AND PREMOLDED FILLER
2. TOOLED JOINT 6" FROM FACE OF CURB
3. SEE PLAN FOR ELEVATIONS AT CURB
4. SIDEWALK CROSS SLOPE TO BE 1.5% MAX & SIDEWALK LONGITUDINAL SLOPE TO BE 4.5% MAX, TYP.

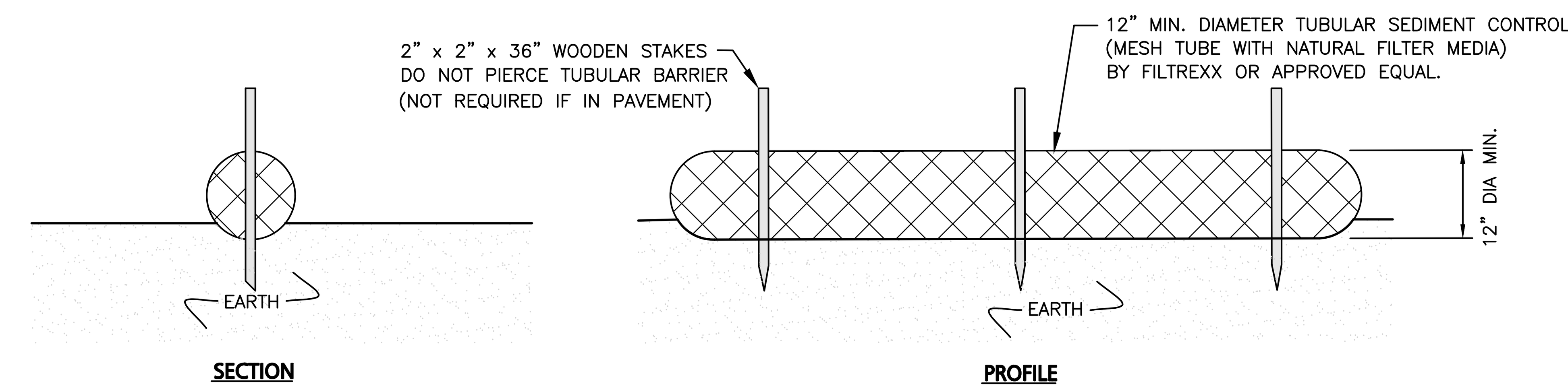
CONCRETE SIDEWALK WITH CURB 4
NOT TO SCALE



NOTES:
1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAYS. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTERING THE PUBLIC RIGHT-OF-WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.
4. USE SANDBAGS, HAYBALES, OR OTHER APPROVED METHODS TO CHANNELIZE RUNOFF TO BASIN AS REQUIRED.

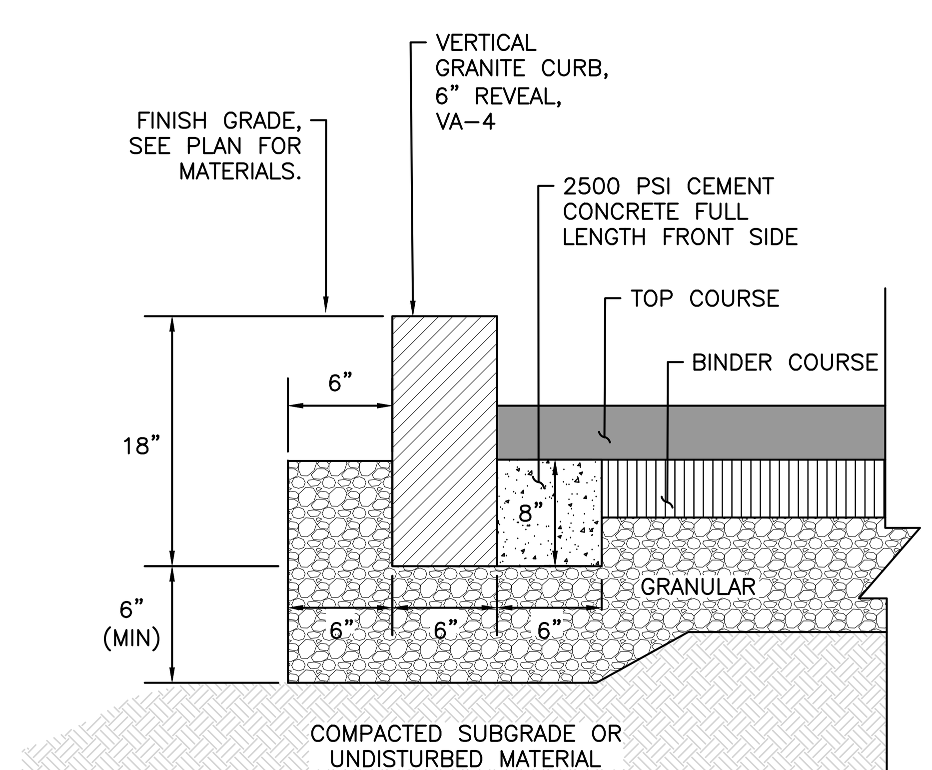


TEMPORARY CONSTRUCTION ENTRANCE/EXIT 5
NOT TO SCALE

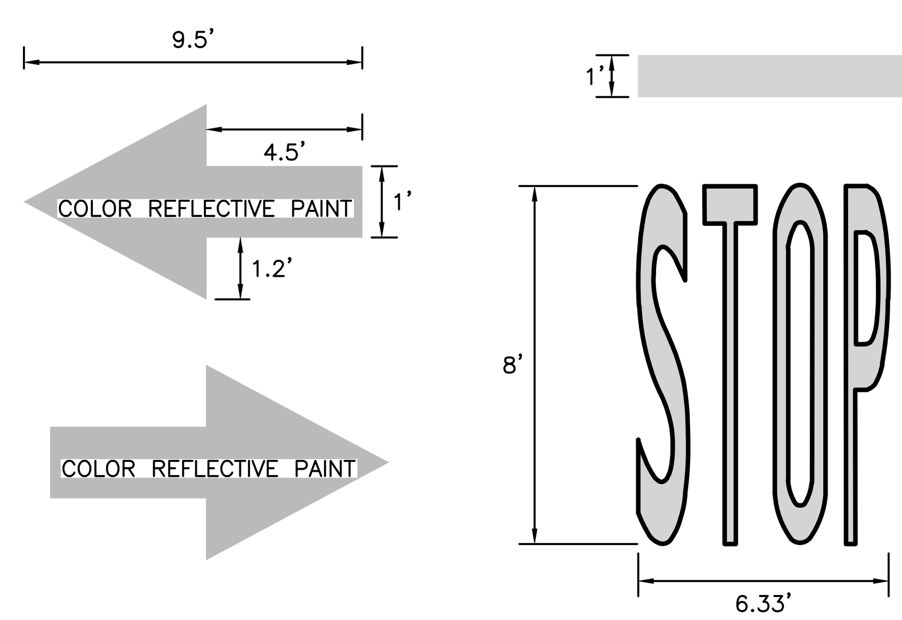


NOTES:
1. ALL MATERIALS TO MEET MANUFACTURERS SPECIFICATIONS.
2. INSTALL WOODEN STAKES IN A CRISS-CROSS PATTERN EVERY 8' ON CENTER.
2. OVERLAP TUBULAR BARRIER SEGMENTS A MINIMUM OF 12".
3. THE CONTRACTOR SHALL MAINTAIN THE TUBULAR BARRIERS IN A FUNCTIONAL CONDITION AT ALL TIMES. THE CONTROLS SHALL BE ROUTINELY INSPECTED BY THE CONTRACTOR.
4. WHERE THE TUBULAR BARRIERS REQUIRE REPAIR OR SEDIMENT REMOVAL, IT WILL BE COMPLETED BY THE CONTRACTOR AT NO ADDITIONAL COST.
5. AT A MINIMUM, THE CONTRACTOR SHALL REMOVE SEDIMENTS COLLECTED AT THE BASE WHEN THEY REACH 1/3 THE EXPOSED HEIGHT OF THE BARRIER.

TUBULAR SEDIMENT BARRIER 6
NOT TO SCALE

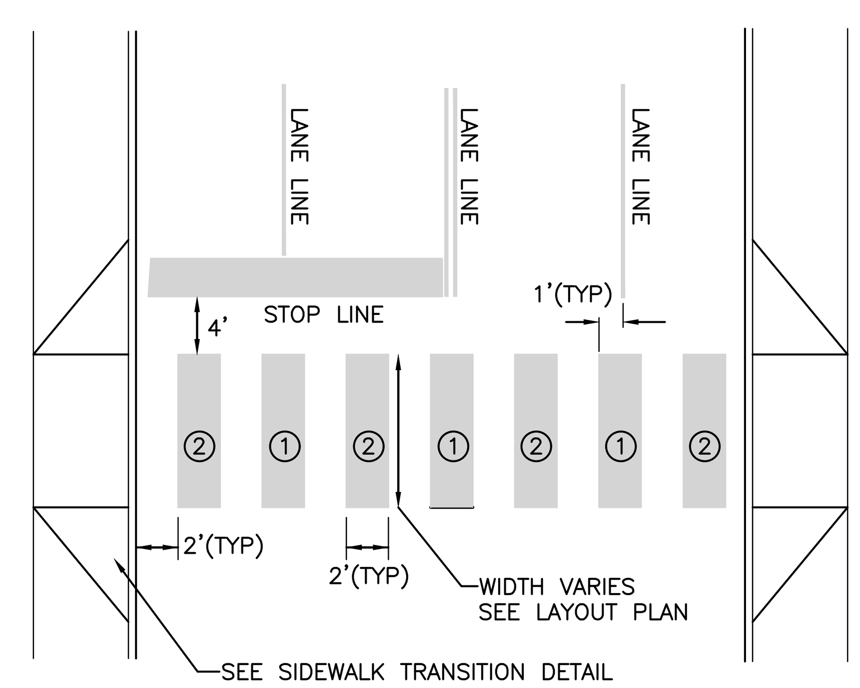


VERTICAL GRANITE CURB 7
NOT TO SCALE



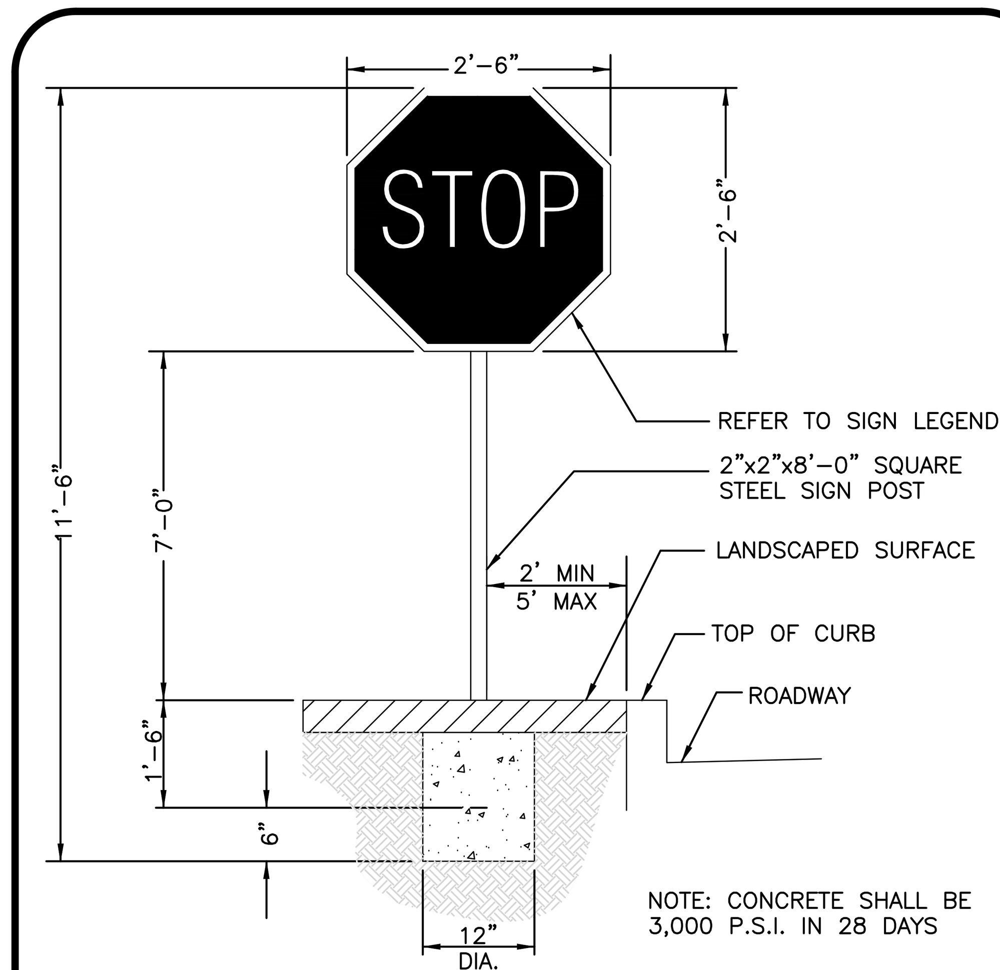
NOTES:
1. ALL WORDS AND SYMBOLS SHALL CONFORM TO THE LATEST VERSION OF THE M.U.T.C.D.
2. ARROW SIZES MAY BE REDUCED APPROXIMATELY ONE-THIRD FOR LOW-SPEED URBAN CONDITIONS

PAINTED STOP LINE & STRAIGHT ARROWS 8
NOT TO SCALE



NOTE:
1 LANE LINE STRIP: THIS IS LOCATED IN THE LINE WITH EACH LANE LINE AND HALF THE STRIP ON EACH SIDE.
2 MID LINE STRIP: THIS IS LOCATED MIDWAY BETWEEN EACH LANE LINE STRIP.

CROSSWALK STRIPING 9
NOT TO SCALE



NOTE: CONCRETE SHALL BE 3,000 P.S.I. IN 28 DAYS

STOP SIGN 10
NOT TO SCALE

N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\C-2398-01A_DETAILS.DWG

COMMONWEALTH OF MASSACHUSETTS 3.25.24 CARLTON M. QUINN CIVIL No.49923 REGISTERED PROFESSIONAL ENGINEER

PROFESSIONAL ENGINEER FOR ALLEN & MAJOR ASSOCIATES, INC.

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c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:

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STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	AS SHOWN	DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:

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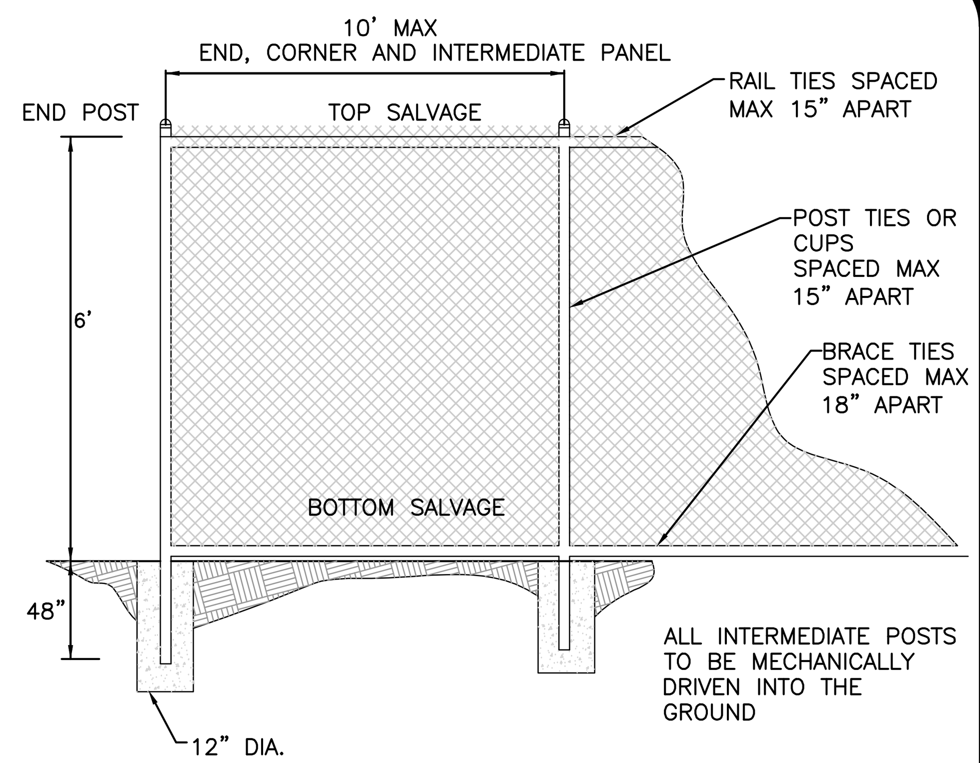
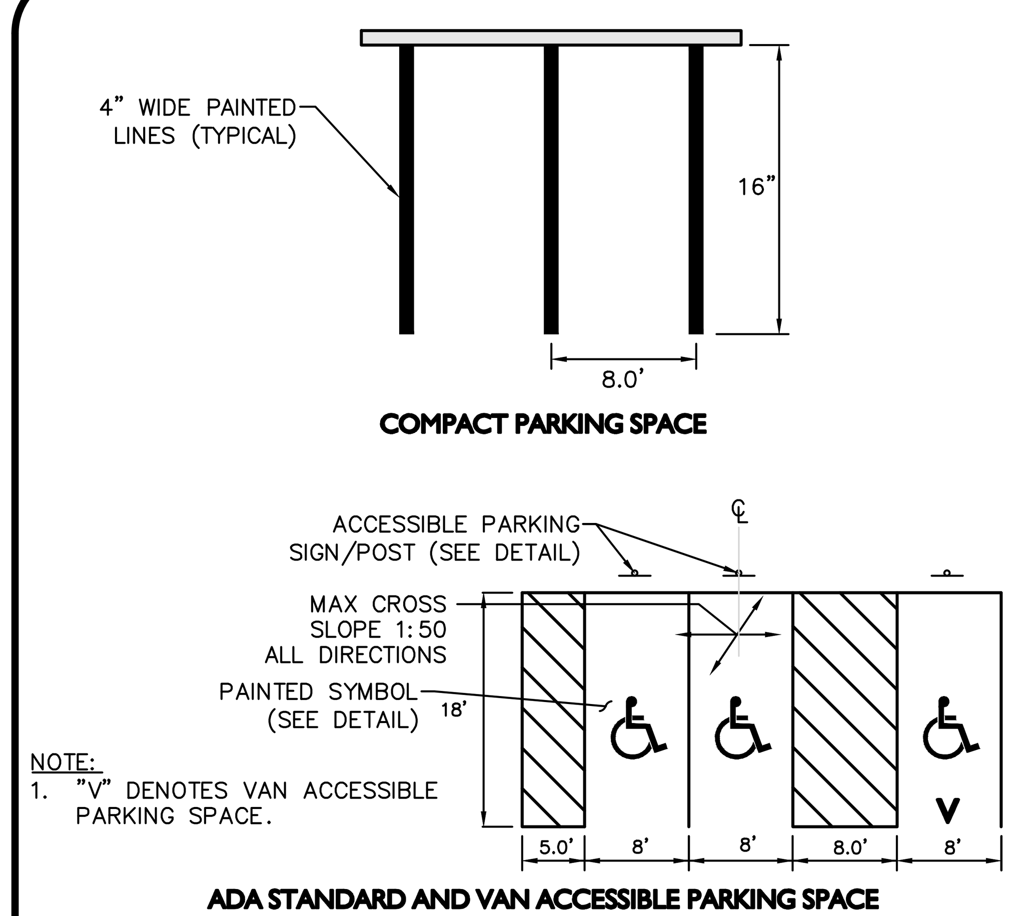
DRAWING TITLE:	SHEET No.
DETAILS	C-501

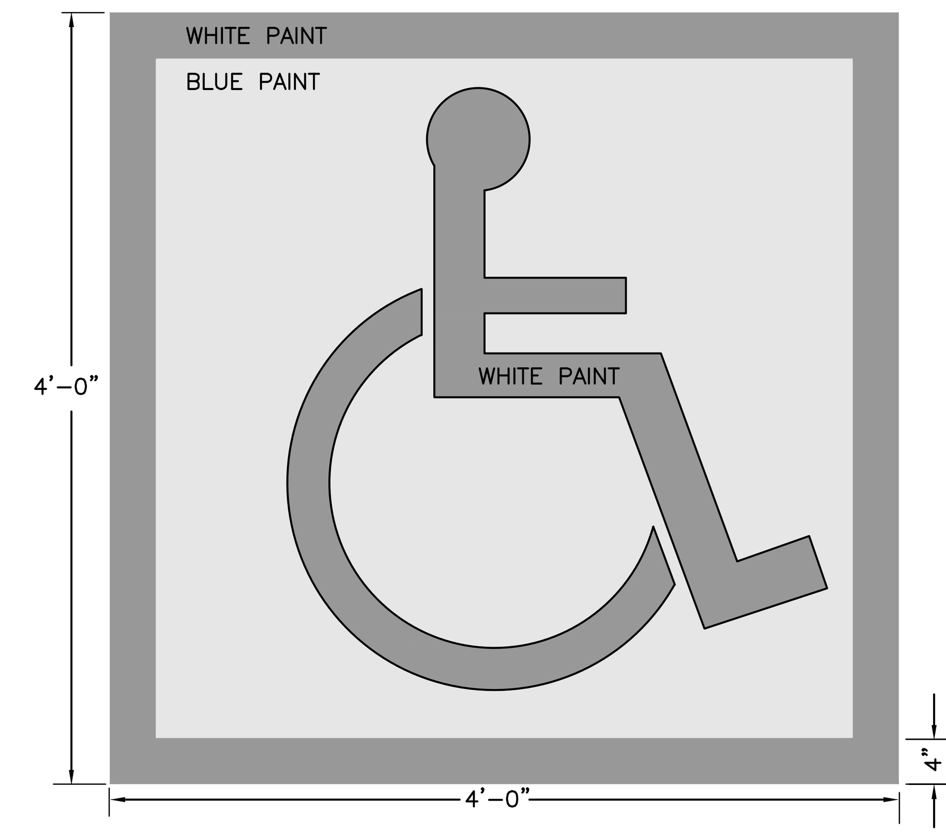


CHAIN LINK FENCE
NOT TO SCALE
1



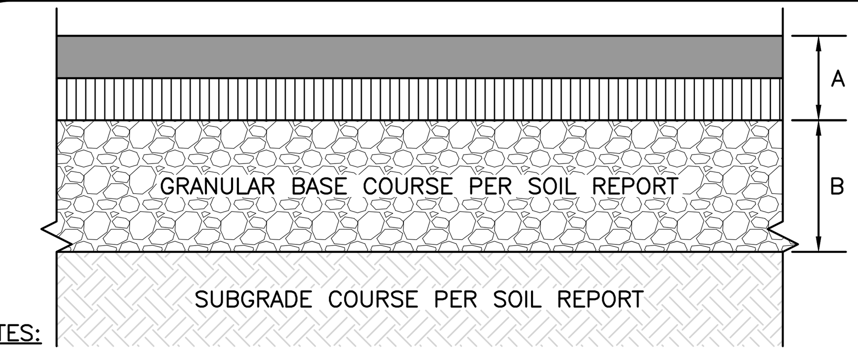
NOTE:
1. "V" DENOTES VAN ACCESSIBLE PARKING SPACE.

ADA AND COMPACT PARKING STRIPING
NOT TO SCALE
2



1. SYMBOL SHALL BE CENTERED WITHIN THE PARKING STALL.
2. SYMBOL IS REQUIRED TO CONTRAST WITH BACKGROUND. USE WHITE PAINT ON BLACK ASPHALT, BLUE ON WHITE WHERE APPLICABLE.

ACCESSIBLE PARKING STALL PAVEMENT MARKING
NOT TO SCALE
3

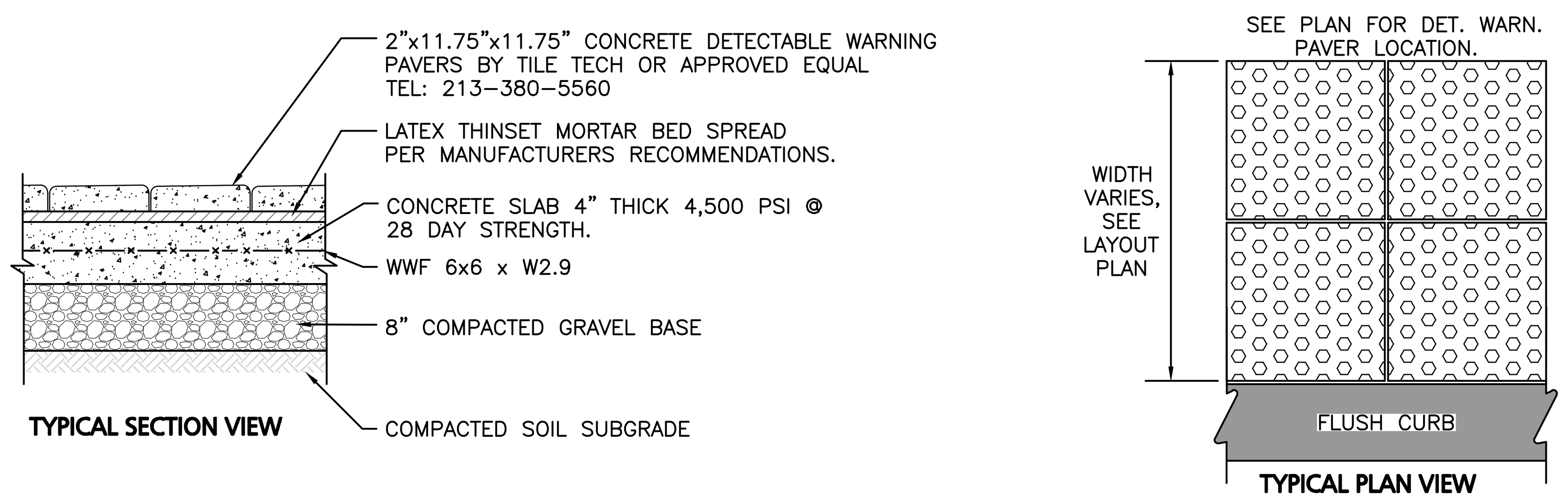


NOTES:
1. COMPACT SOIL SUBGRADE UNIFORMLY TO AT LEAST 95 PERCENT OF ASTM D1557 LABORATORY DENSITY.
2. PROOF-ROLL PREPARED SUBGRADE TO IDENTIFY SIFT POCKETS AND AREAS OF EXCESS YIELDING. EXCAVATE SOFT SPOTS, UNSATISFACTORY SOILS, AND AREAS OF EXCESSIVE PUMPING OR RUTTING, AS DETERMINED BY GEOTECHNICAL ENGINEER AND REPLACE WITH COMPACTED BACKFILL OR FILL AS DIRECTED.
3. CONTRACTOR SHALL COORDINATE SURFACE, BINDER, BASE, AND SUBBASE COURSES WITH GEOTECHNICAL OR SOILS REPORT. REFER TO REPORT FOR RECOMMENDATIONS FOR LOCAL SOILS OR DRAINAGE CONDITIONS AND/OR METHODS.
4. BASE COURSE SHALL EXTEND 6 INCHES BEYOND PAVEMENT EDGE WHERE PAVEMENT DOES NOT ABUT CURB, WALL, STEPS, OR FIXED OBJECT.
5. PAVEMENT EDGES SHALL BE TAMPED WHERE PAVEMENT DOES NOT ABUT CURB, WALL, STEPS, OR FIXED OBJECT

STANDARD DUTY PAVING
A= 1.5" ASPHALT CONCRETE – SURFACE COURSE (M.3.11.0, TABLE A, TOP COURSE)
1.5" ASPHALT CONCRETE – BINDER COURSE (M.3.11.0, TABLE A, BINDER COURSE)

B= 4" BASE COURSE (MHD 2.01.7)
C= 12" SUBBASE COURSE (MHD 1.03.0, TYPE B)

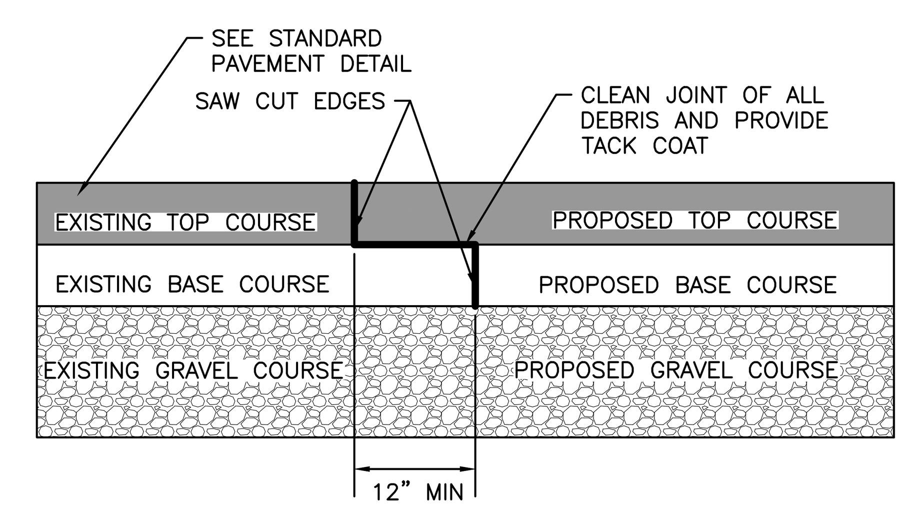
STANDARD DUTY BITUMINOUS PAVEMENT
NOT TO SCALE
3



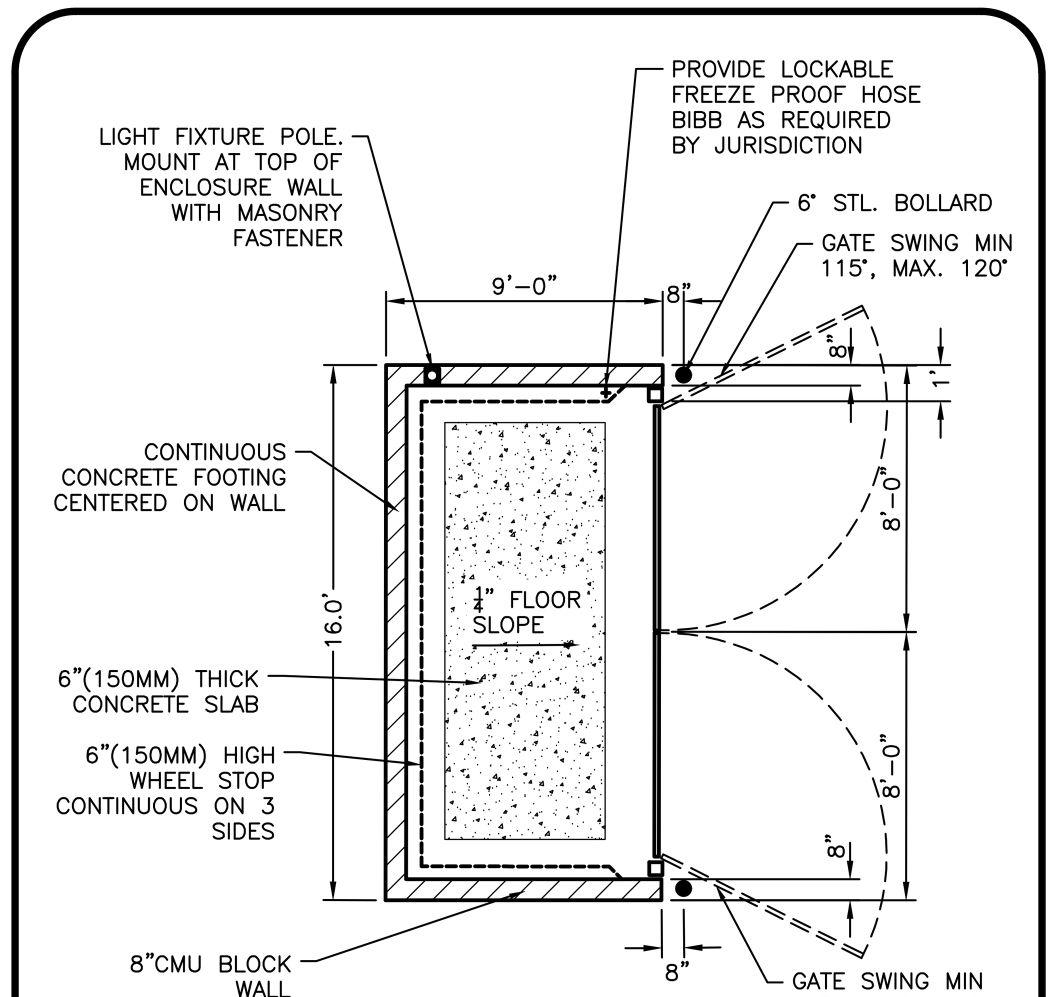
NOTES:
1. CONCRETE SLAB SHALL BE SLOPED 1.5% CROSS PITCH MAX TO PROVIDE COMPLETE SURFACE DRAINAGE. SEE GRADING PLAN & HANDICAP CURB CUT / CURB TRANSISTION DETAIL.
2. SLAB TO HAVE STEEL TROWEL AND FINE BROOM FINISH. DO NOT USE CURING COMPOUNDS. CONTRACTOR TO ADD EXPANSION JOINTS AND PREMOLDED FILLER AT EDGE OF TILES AND ADJACENT MATERIAL.
3. SET TILES FLUSH WITH ADJACENT MATERIALS.
4. SUBMIT SHOP DRAWINGS OF TILES AND SAMPLE FOR APPROVAL OF COLOR TO OWNER / ARCH.
5. INSTALL DETECTABLE WARNING PAVERS PER MANUFACTURER'S RECOMMENDATIONS OR DESIGN ENGINEER.
6. ALL DET. WARN. PAVERS SHALL COMPLY WITH ADA REGULATIONS.

DETECTABLE WARNING PAVERS
NOT TO SCALE
5

NOTE:
TACK COAT – PROVIDE EMULSIFIED ASPHALT WHICH CONFORMS TO THE REQUIREMENTS OF THE STATE SPECIFICATIONS, DILUTED WITH ONE PART WATER TO ONE ONE PART ASPHALT FOLLOWING AASHTO M140/ASTM D997, OR AASHTO M208/ASTM D2397, SS-1H, CSS-1, OR CSS-1H.

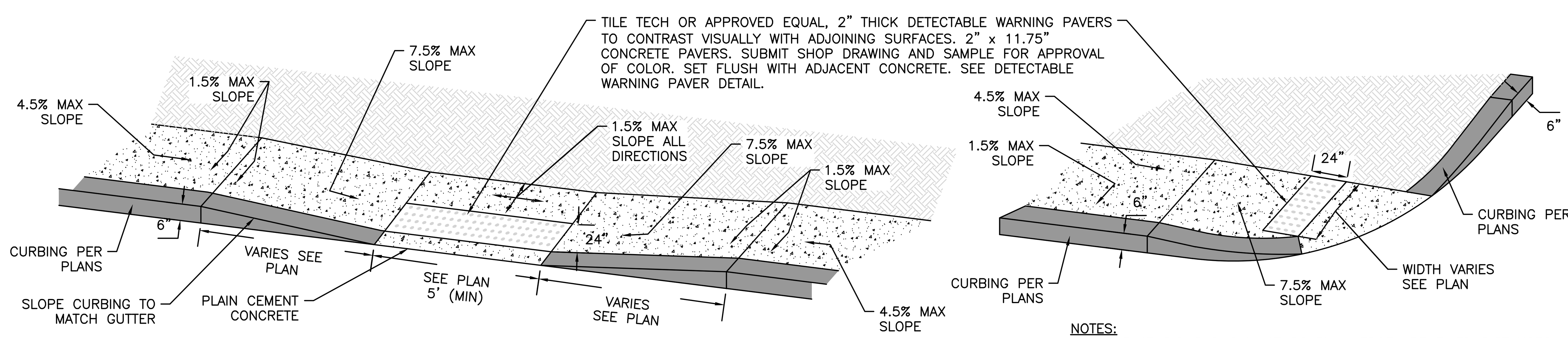


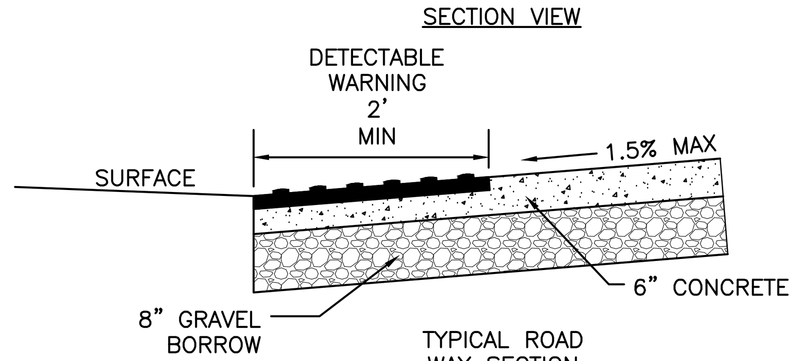
PAVEMENT KEY CUT
NOT TO SCALE
6



NOTES:
1. NO OPEN CHAIN LINK ENCLOSURES WILL BE ALLOWED FOR THE TRASH AND RECYCLING AREA
2. ENCLOSURE SHALL BE LOCKABLE WITH A PADLOCK FOR SECURITY
3. THE TRASH AND RECYCLING AREA WILL BE LOCATED NO GREATER THAN 500 FEET FROM THE ENTRANCE TO THE PREMISES (THE PATH TO WHICH LOCATION SHALL BE WELL LIT
4. ENCLOSURE SHALL BE OF SUFFICIENT SIZE TO INCLUDE THEREIN, ALL TRASH, RECYCLING, AND COMPOST
5. ENCLOSURE SHALL BE WELL LIT AND LOCATED IN AN AREA THAT WILL NOT INTERRUPT THE FLOW TO DRIVE-THRU LANE (IF APPLICABLE) OR ACCESS TO THE PARKING AREAS OR INGRESS OR EGRESS TO AND FROM THE PREMISES
6. ENCLOSURE SHALL NOT BE AN AREA UNDER OVERHEAD WIRES OR OTHER BARRIERS
7. ENCLOSURE MUST BE POSITIONED SO THAT TENANT'S TRASH REMOVAL VENDOR CAN ACCESS THE CONTAINERS BY EITHER A FRONT LOAD OR REAR LOAD TRASH REMOVAL VEHICLE WITH A VEHICLE TURNING RADIUS OF 40-45 FEET TO MAKE A 90 DEGREE TURN.
8. ALL DESIGNS MUST BE IN ACCORDANCE WITH ALL APPLICABLE LAWS, INCLUDING TRASH AND RECYCLING LAWS AND/OR WITH ESTABLISHED HAULING INFRASTRUCTURE AND SECONDARY MARKETS TO SUPPORT RECOVERY AND MATERIAL REUSE IN FORM OF POST-CONSUMER CONTENT FOR PRODUCTS.

Trash Enclosure Details
NOT TO SCALE
8





NOTES:
1. THE DIMENSIONS SHOWN AT ROADWAY EDGE ARE FIXED DISTANCES.
2. RAMP CROSS SECTION TO BE THE SAME AS ADJACENT SIDEWALK; I.E. DEPTH OF SURFACE AND FOUNDATION.
3. PORTLAND CEMENT CONCRETE RAMPS ARE TO BE TEXTURED BY BROOMING IN A DIRECTION PARALLEL TO THE LENGTH OF THE RAMP.
4. IN NO CASE ARE THE RAMPS TO BE PLACED BEHIND THE STOP LINE.
5. THE DIMENSIONS ARE SUBJECT TO CHANGE IN THE FIELD IF EXISTING APPURTENANCES OR CONDITIONS WILL MAKE THE RAMP LOCATIONS IMPRACTICAL OR UNSAFE. CONSULT CIVIL ENGINEER PRIOR TO MAKING ANY MODIFICATIONS.

ADA ACCESSIBLE CURB CUT AND TRANSITION
NOT TO SCALE
7

N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\C-2398-01A_DETAILS.DWG

COMMONWEALTH OF MASSACHUSETTS
CARLTON M. QUINN
CIVIL
No.49923
REGISTERED PROFESSIONAL ENGINEER
3.25.24

PROFESSIONAL ENGINEER FOR ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
B	3/25/2024	REVISED PER TOWN COMMENTS
A	2/29/2024	REVISED PER TOWN COMMENTS

APPLICANT\OWNER:
BLVD READING, LLC
c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:

STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	AS SHOWN	DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:

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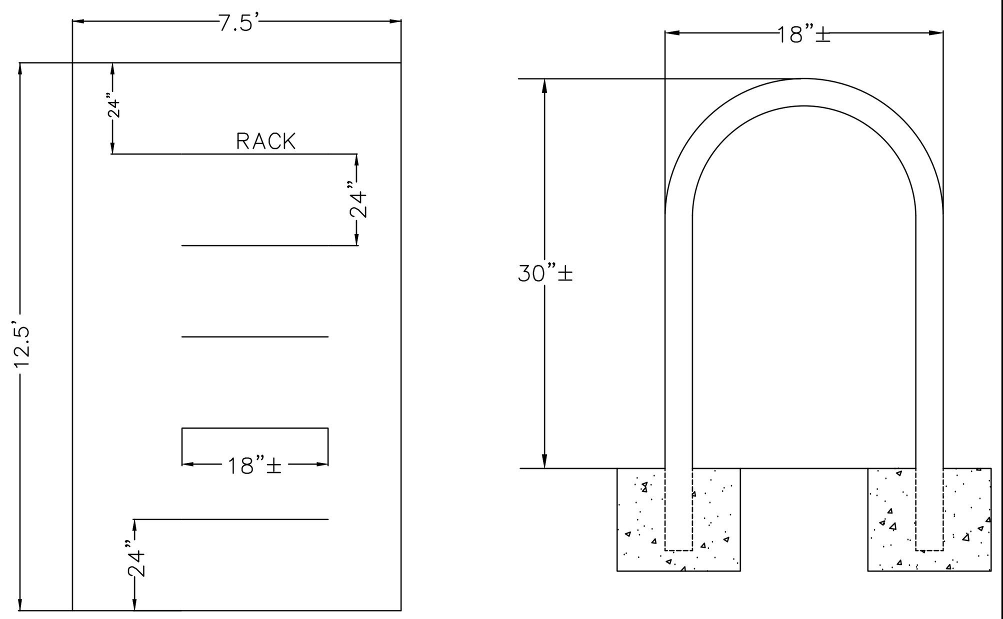
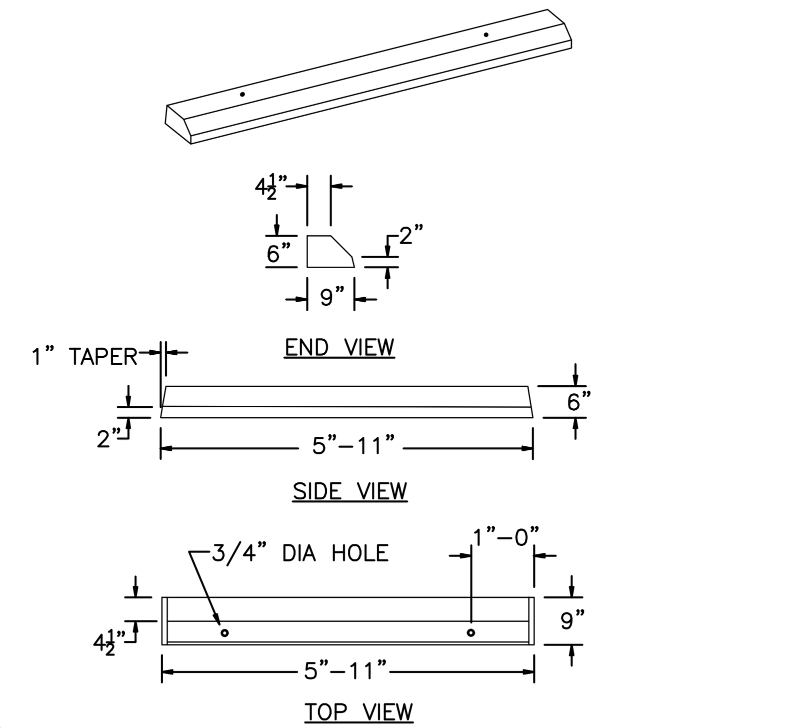
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE: DETAILS
SHEET No. C-502

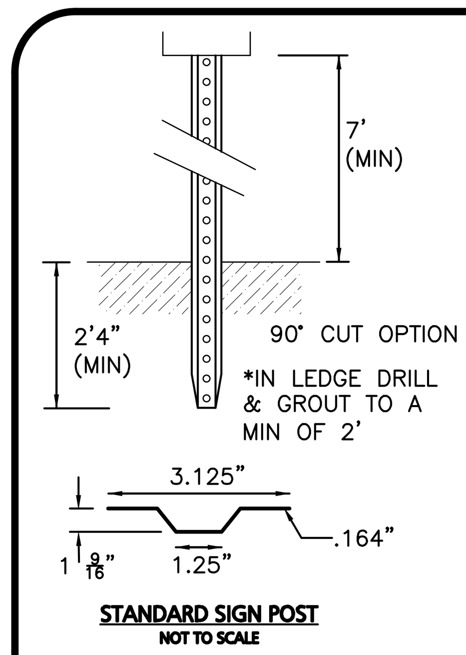


TYPICAL BICYCLE RACK
NOT TO SCALE
1

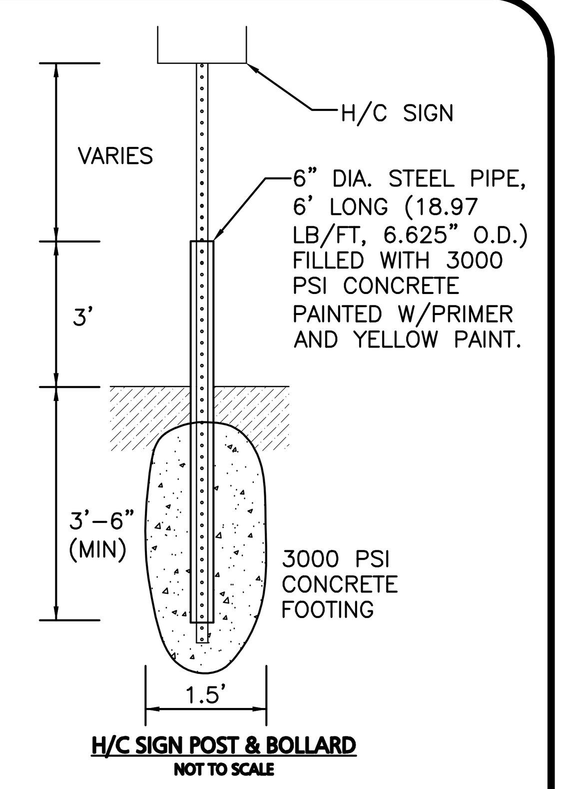


NOTES
1. CONCRETE: 4,500 PSI MINIMUM AFTER 28 DAYS.
2. PINS AVAILABLE.
3. APPROXIMATE WEIGHT: 265 LBS.

BUMPER CURBING SINGLE FACE
NOT TO SCALE
2

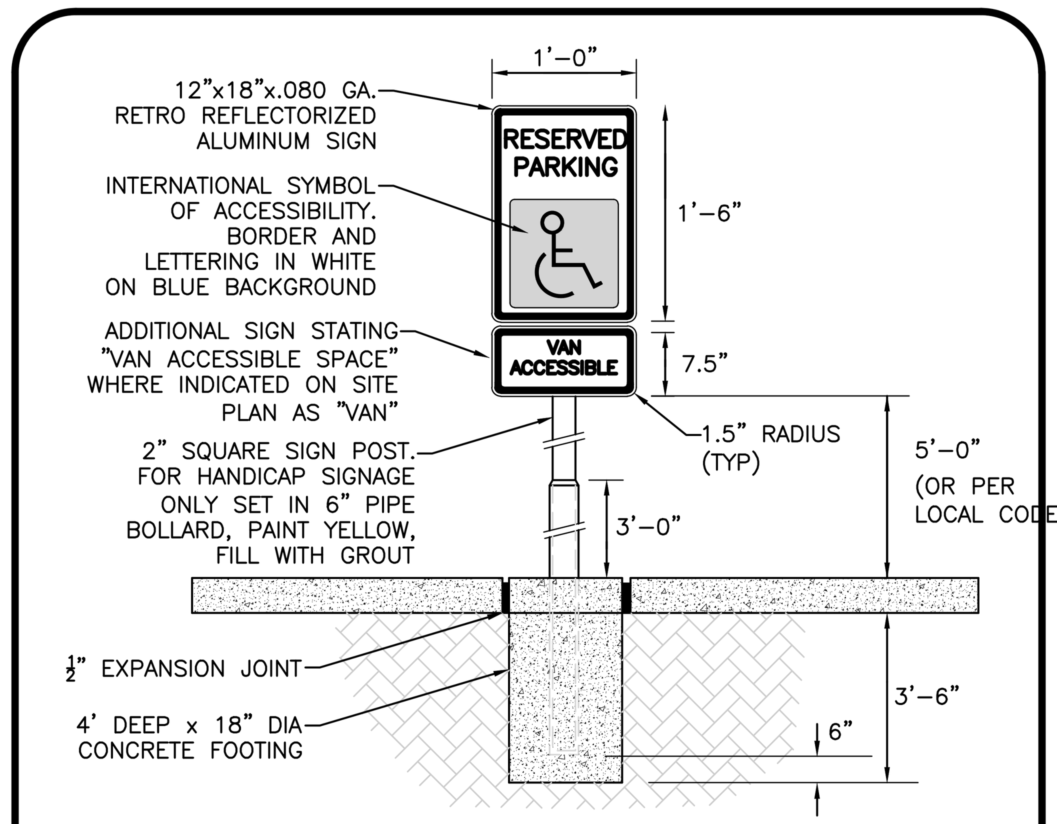


LENGTH: AS REQUIRED
WEIGHT PER LF: 2.50 LBS (MIN)
HOLES: 3/8" DIAMETER, 1" C-C FULL LENGTH
STEEL: SHALL CONFORM TO ASTM A-499 OR ASTM A-576
FINISH: SHALL BE PAINTED WITH 2 COATS OF AN APPROVED MEDIUM GREEN, BAKED ON OR AIR DRIED, PAINT OF WEATHER RESISTANT QUALITY.



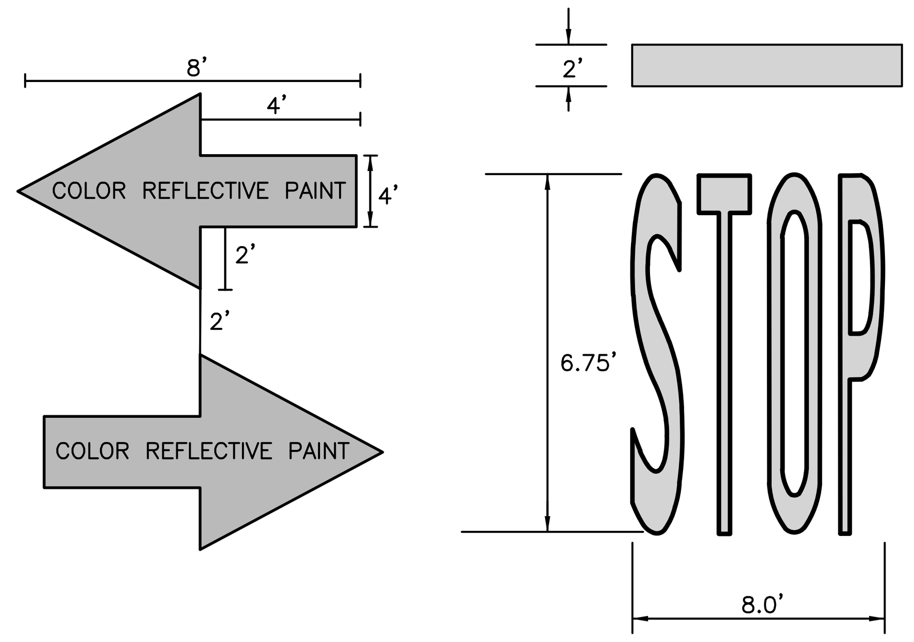
NOTE:
1. STEEL PIPE BOLLARD & CONCRETE FOOTING TO BE USED ON POST MOUNTED SIGNS IN PAVED AREAS.

SIGN POST DETAILS
NOT TO SCALE
3

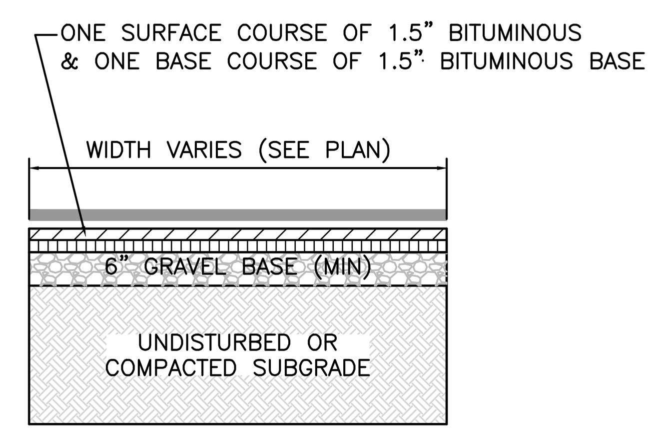


NOTES:
1. SPECIFIC CODE SHALL BE REFERENCED FOR LOCAL AND STATE REQUIREMENTS.
2. PROVIDE (1) SIGN PER HANDICAP SPACE. SEE SITE PLAN FOR EXACT LOCATION.
3. EXPANSION JOINT MATERIAL NOT REQUIRED WITH FLEXIBLE PAVEMENT.

ADA ACCESSIBLE PARKING / TRAFFIC CONTROL SIGNAGE
NOT TO SCALE
4

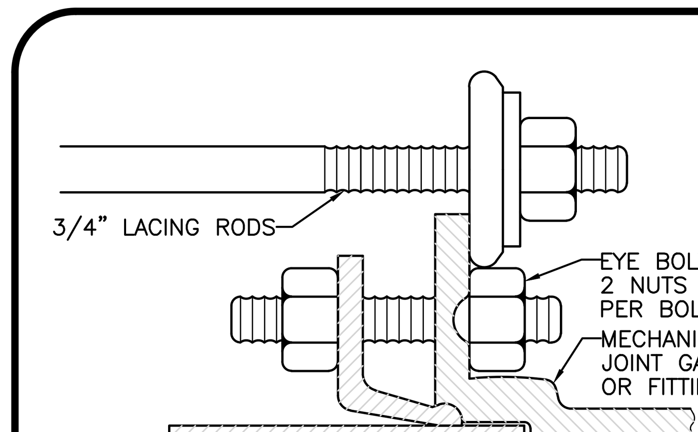


WHITE THERMOPLASTIC LETTERING/ ARROWS
NOT TO SCALE
5



NOTES
1. SEE PLAN FOR ELEVATIONS.

BITUMINOUS WALKWAY
NOT TO SCALE
6

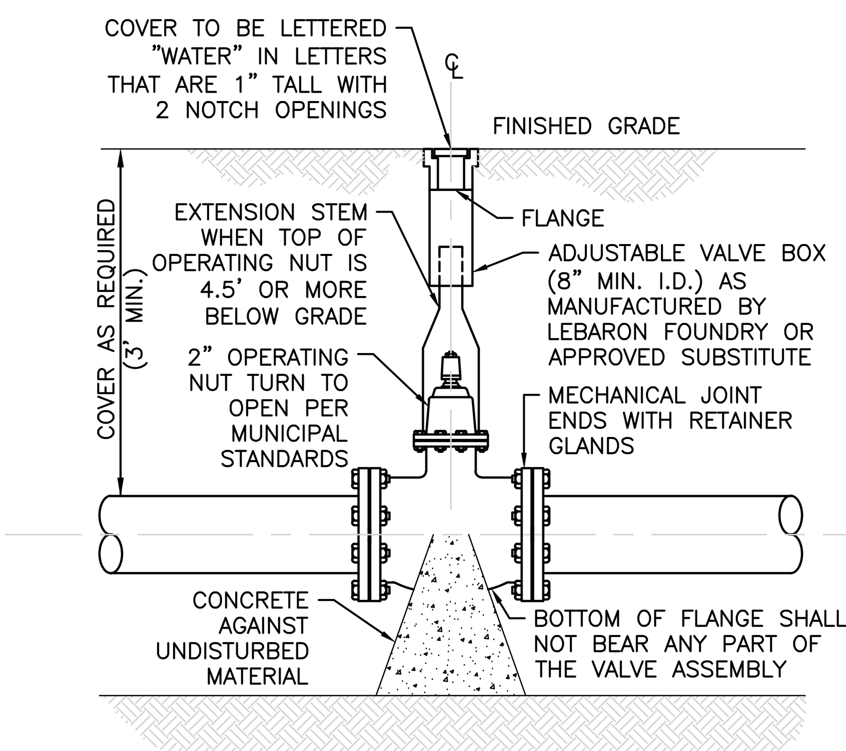


PIPE SIZE	No. LACING RODS
4", 6" & 8"	2 – 3/4" *
10" & 12"	4 – 3/4" *
16"	4 – 3/4" *
20"	6 – 3/4" *

1. NUMBER OF LACING RODS IS BASED ON MAXIMUM PRESSURE OF 125 P.S.I. IN MAIN.
2. EYE-BOLTS AND LACING RODS ARE TO BE FABRICATED FROM A-36 STEEL.
3. STEEL LACING RODS SHALL HAVE A YIELD STRESS OF NOT LESS THAN 36,000 P.S.I.
4. EYE-BOLTS SHALL HAVE A MINIMUM TENSILE STRENGTH OF 7,000 LBS. EACH.

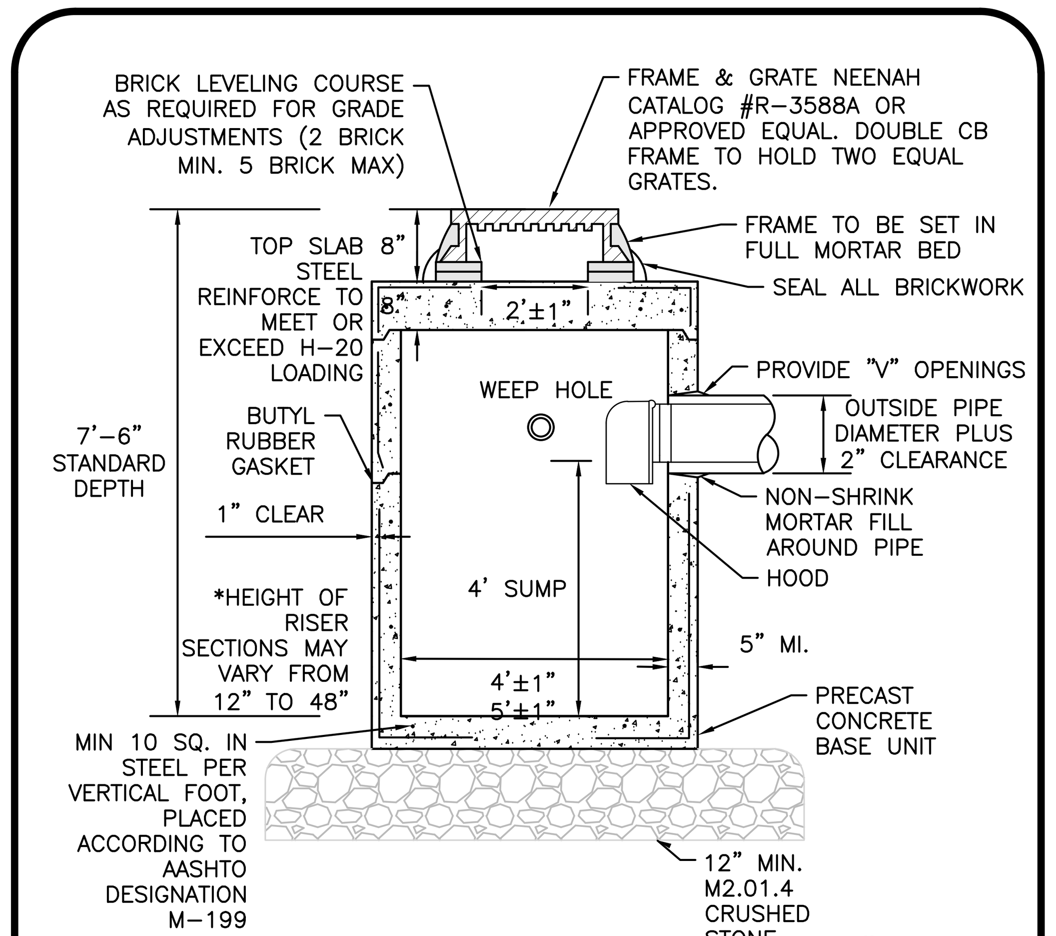
* STANDARD LENGTHS ARE 6' & 10'. COUPLINGS MAY BE USED FOR LONGER LENGTHS.

MECHANICAL JOINT LACING DETAIL
NOT TO SCALE
7

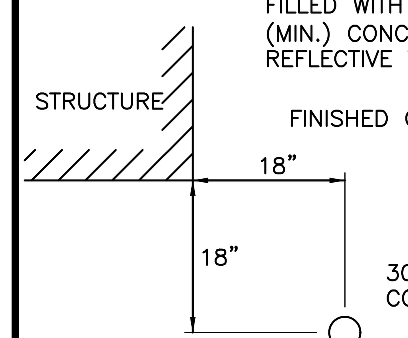


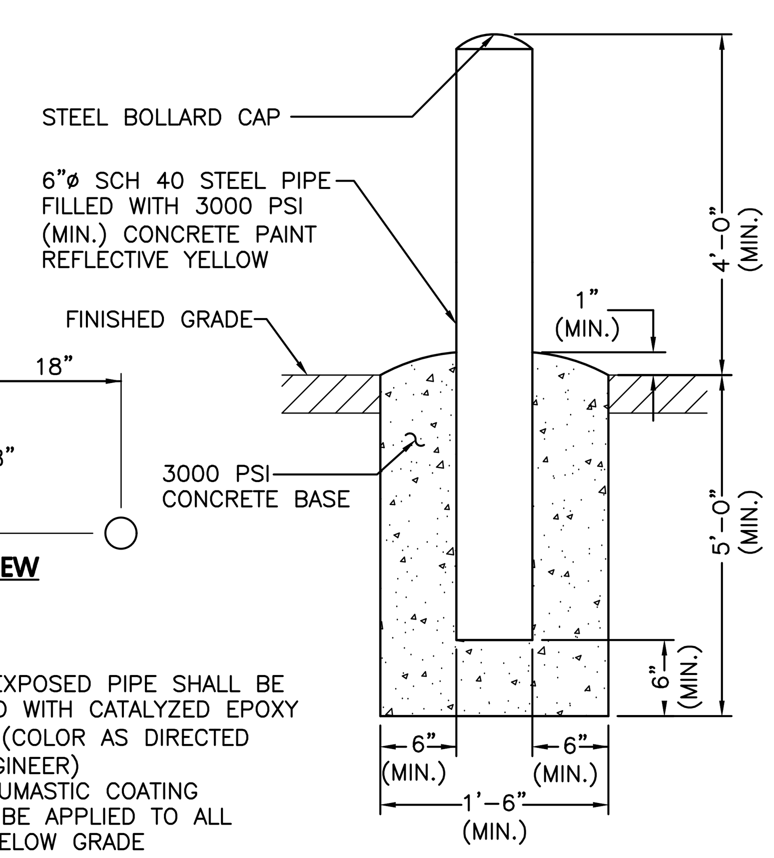
NOTE:
1. CONTRACTOR MAY USE ANCHOR TEES AT HIS OPTION.
2. HYDRANTS AND VALVES TO OPERATE PER MUNICIPAL STANDARDS

GATE VALVE
NOT TO SCALE
8



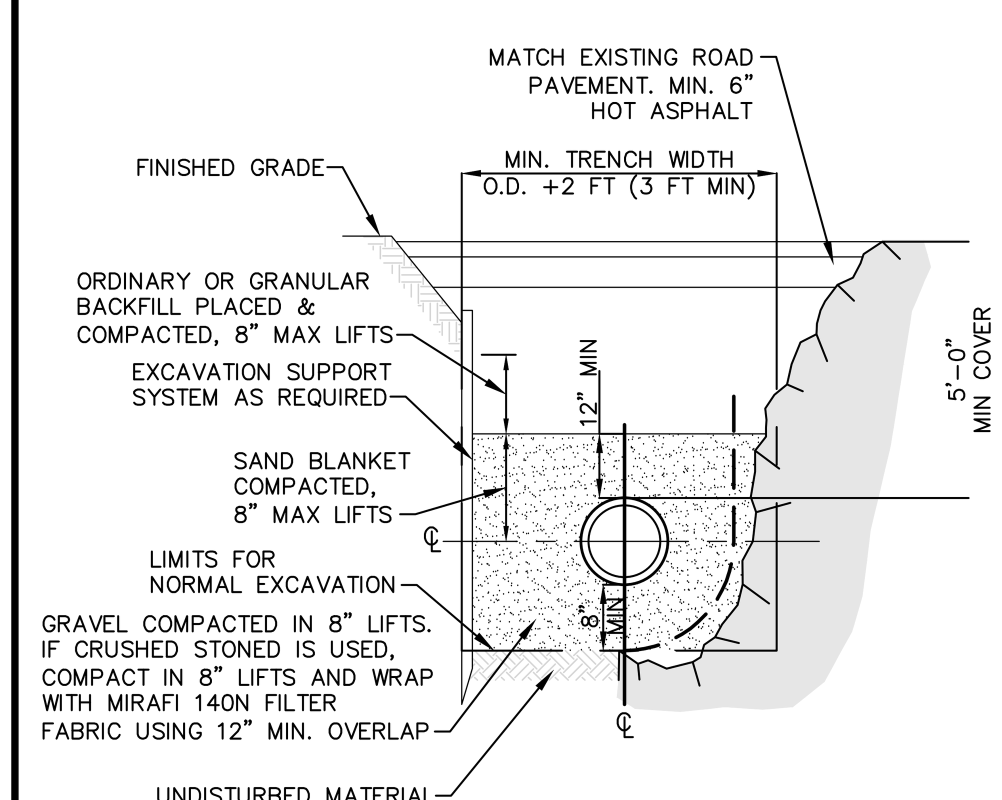
CATCH BASIN
NOT TO SCALE
9



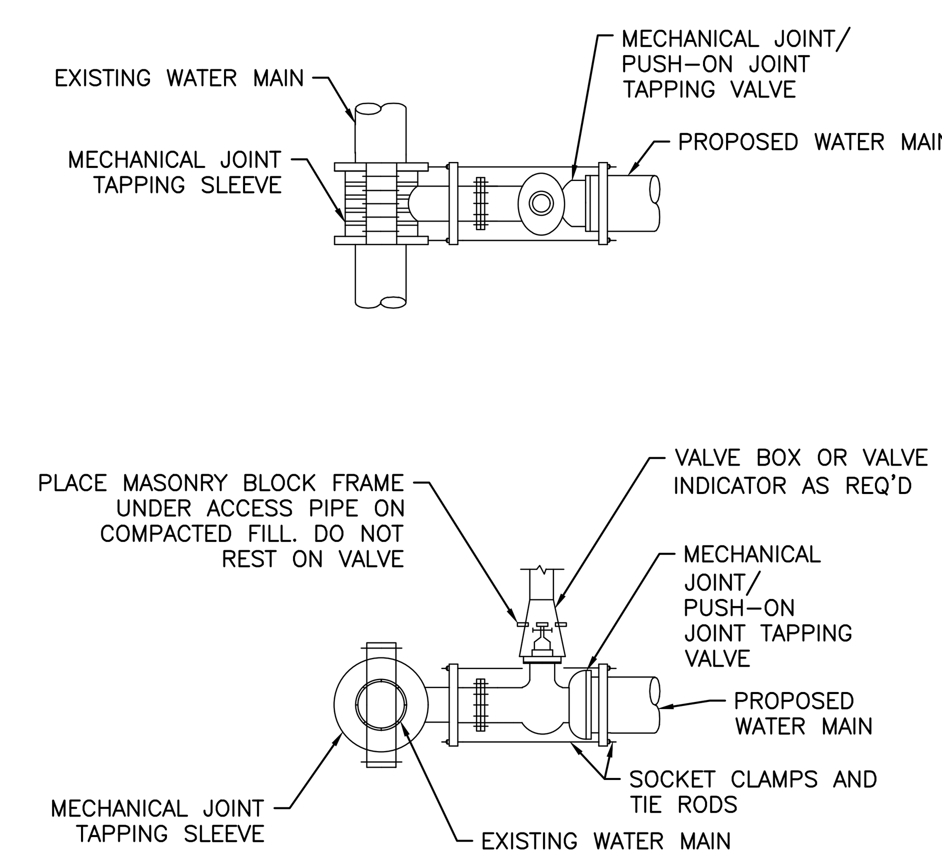


NOTE:
-ALL EXPOSED PIPE SHALL BE PAINTED WITH CATALYZED EPOXY PAINT. (COLOR AS DIRECTED BY ENGINEER)
-A BITUMASTIC COATING SHALL BE APPLIED TO ALL PIPE BELOW GRADE

FIXED BOLLARD
NOT TO SCALE
10



WATER TRENCH SECTION
NOT TO SCALE
11



TAPPING VALVE AND SLEEVE
NOT TO SCALE
12

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PROFESSIONAL ENGINEER FOR ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
B	3/25/2024	REVISED PER TOWN COMMENTS
A	2/29/2024	REVISED PER TOWN COMMENTS

APPLICANT\OWNER:
BLVD READING, LLC
c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:

STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	AS SHOWN	DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ♦ land surveying
environmental consulting ♦ landscape architecture
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WOBURN, MA ♦ LAKEVILLE, MA ♦ MANCHESTER, NH

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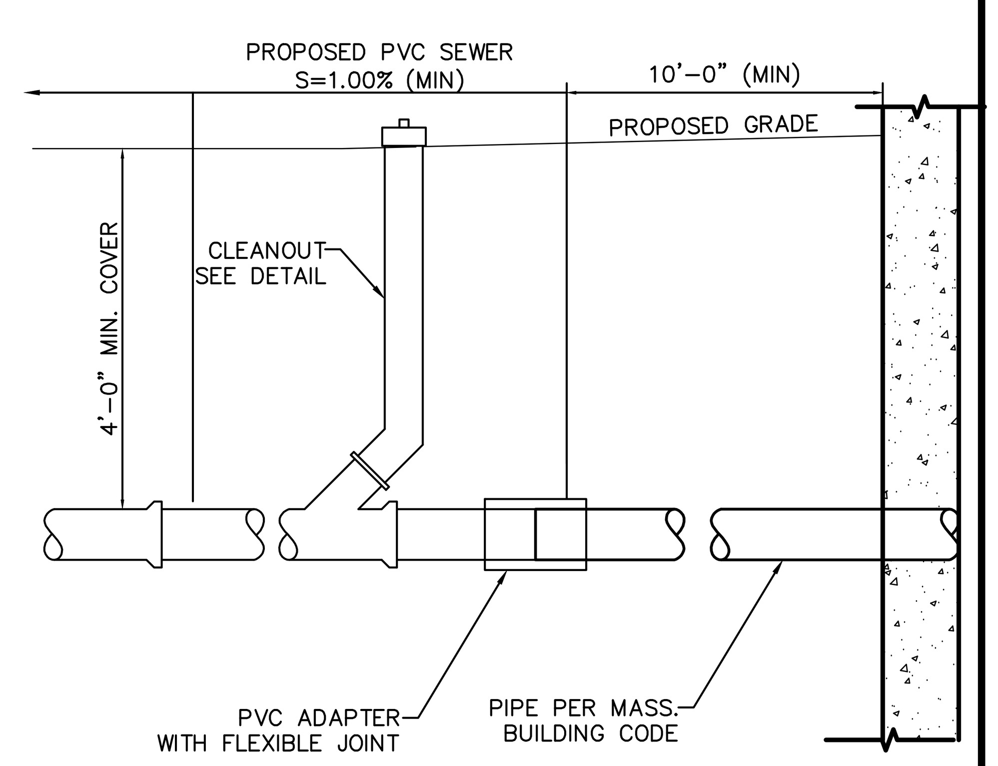
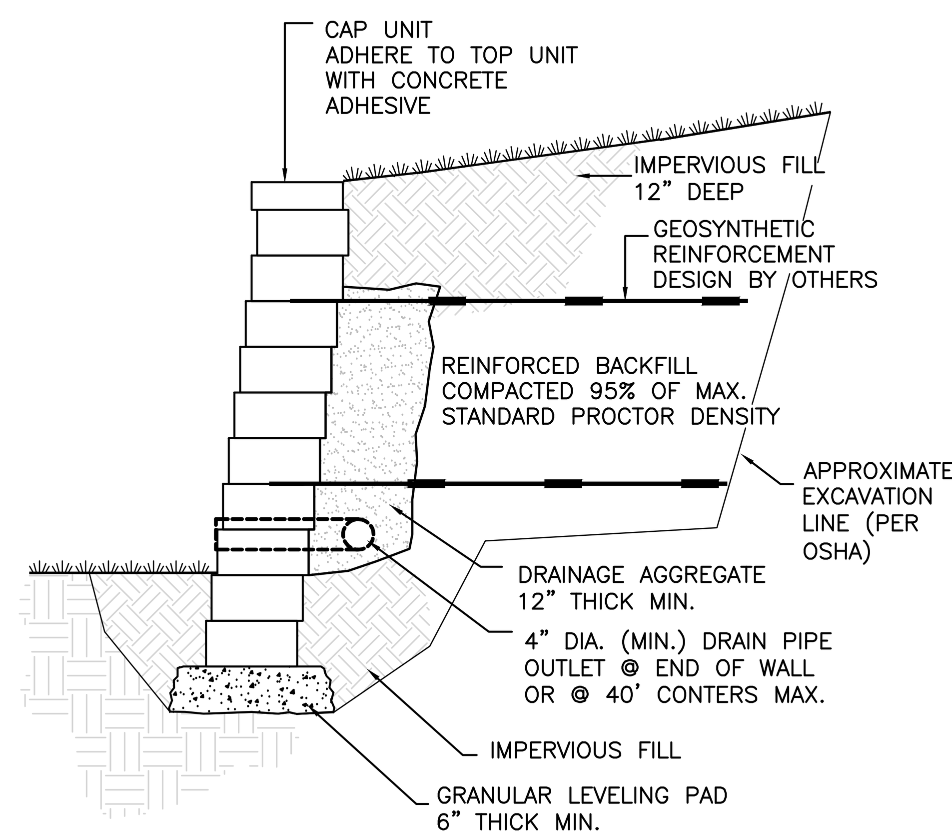
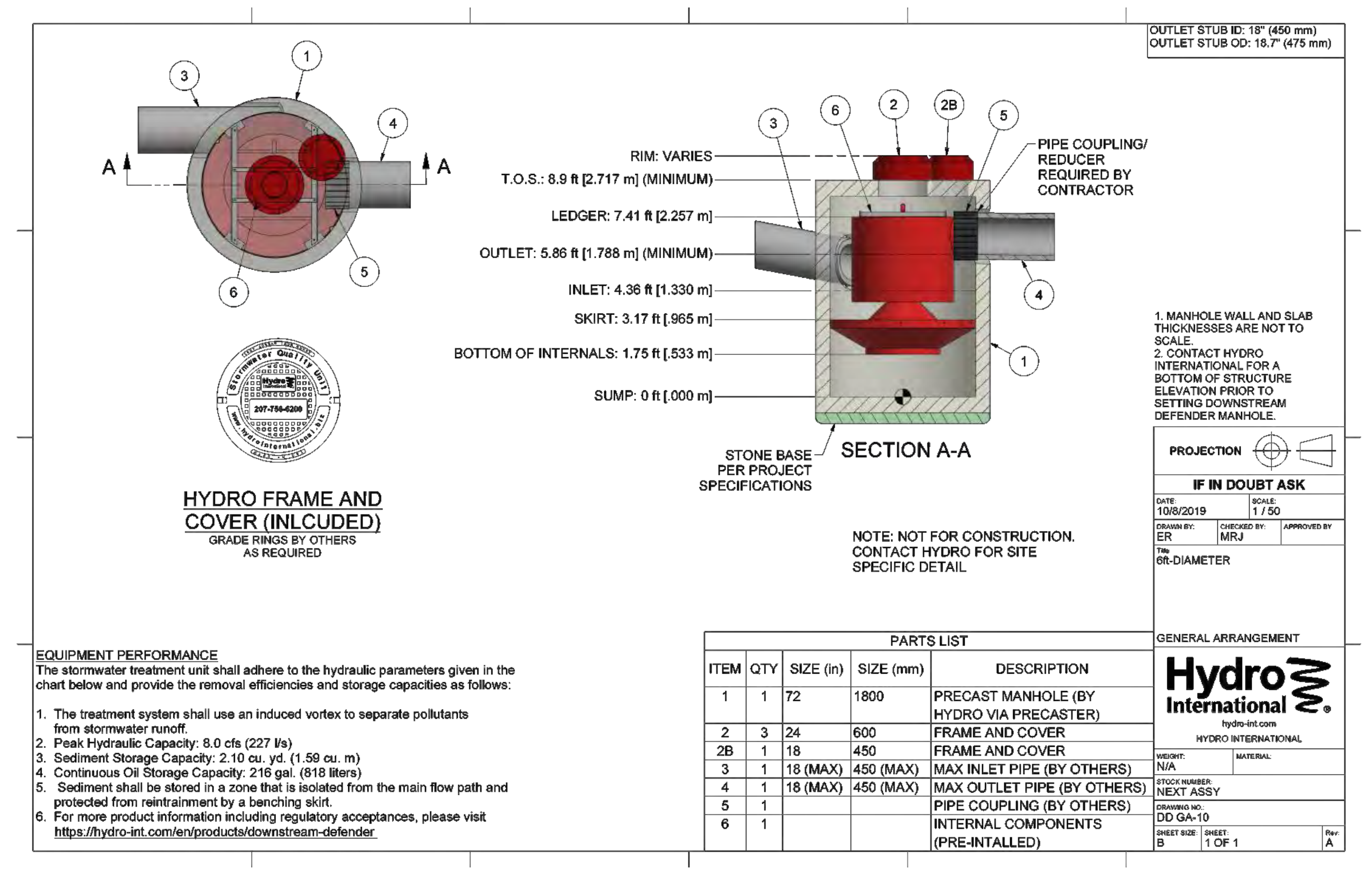
DRAWING TITLE: DETAILS
SHEET No. C-503



BUILDING SEWER SERVICE 1
NOT TO SCALE



TYPICAL SEGMENTAL BLOCK RETAINING WALL 2
NOT TO SCALE



EQUIPMENT PERFORMANCE
The stormwater treatment unit shall adhere to the hydraulic parameters given in the chart below and provide the removal efficiencies and storage capacities as follows:

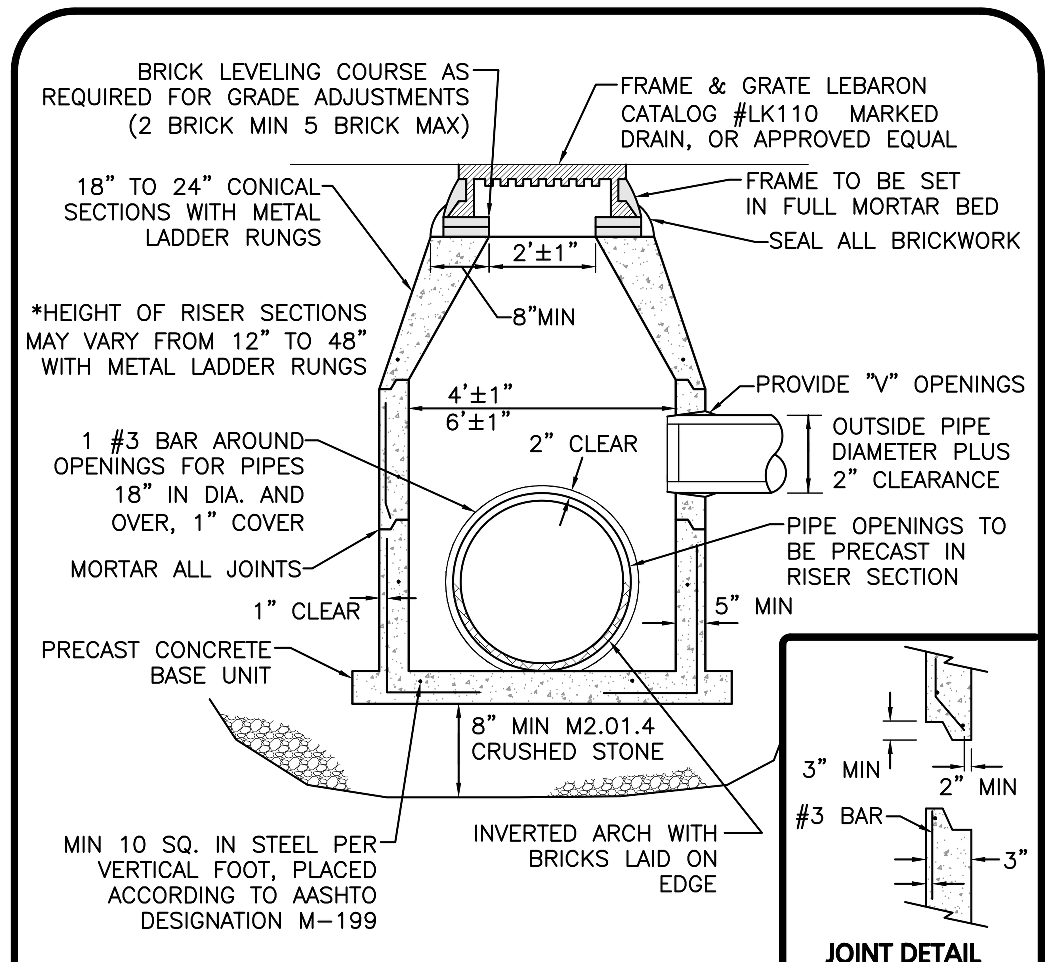
1. The treatment system shall use an induced vortex to separate pollutants from stormwater runoff.
2. Peak Hydraulic Capacity: 8.0 cfs (227 l/s)
3. Sediment Storage Capacity: 2.10 cu. yd. (1.59 cu. m)
4. Continuous Oil Storage Capacity: 216 gal. (818 liters)
5. Sediment shall be stored in a zone that is isolated from the main flow path and protected from reintrainment by a benching skirt.
6. For more product information including regulatory acceptances, please visit https://hydro-int.com/en/products/downstream-defender

PARTS LIST

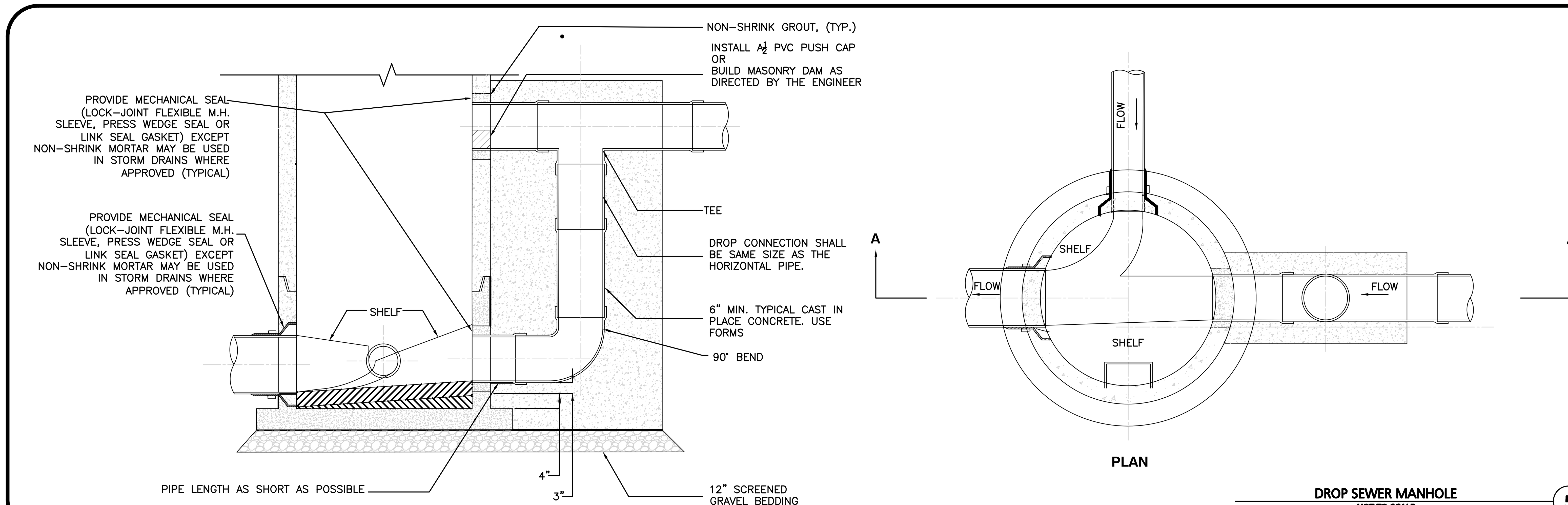
ITEM	QTY	SIZE (in)	SIZE (mm)	DESCRIPTION
1	1	72	1800	PRECAST MANHOLE (BY HYDRO VIA PRECASTER)
2	3	24	600	FRAME AND COVER
2B	1	18	450	FRAME AND COVER
3	1	18 (MAX)	450 (MAX)	MAX INLET PIPE (BY OTHERS)
4	1	18 (MAX)	450 (MAX)	MAX OUTLET PIPE (BY OTHERS)
5	1			PIPE COUPLING (BY OTHERS)
6	1			INTERNAL COMPONENTS (PRE-INTALLED)

6 FT. DOWNSTREAM DEFENDER 3

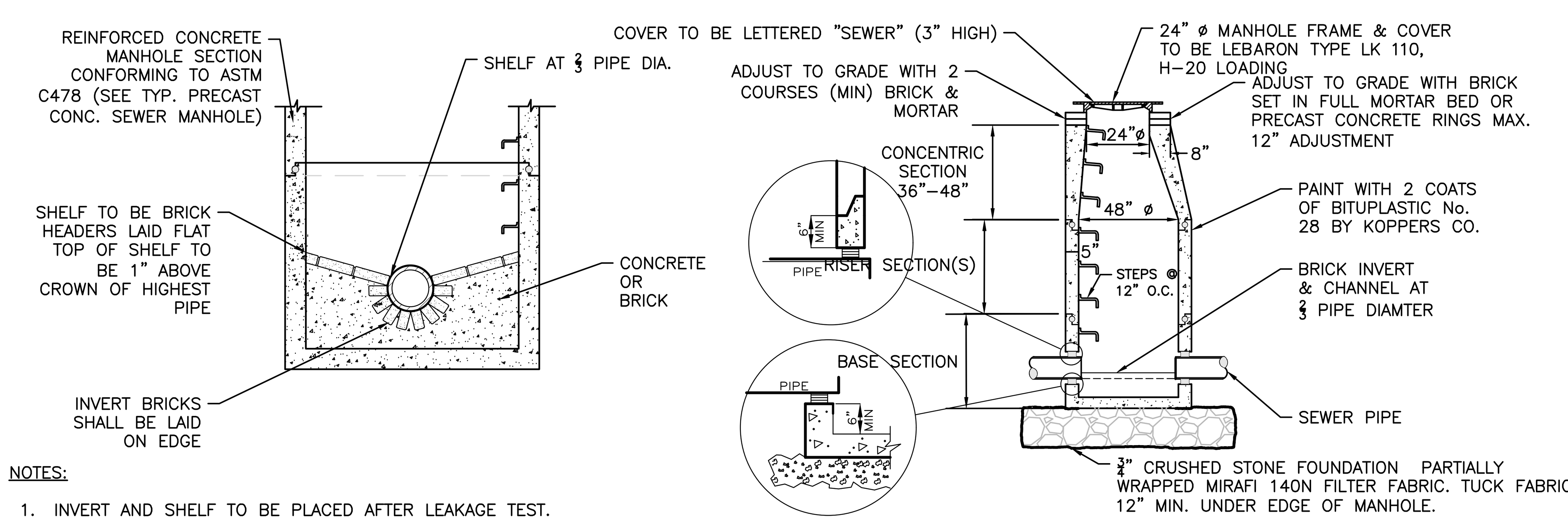
NOT FOR CONSTRUCTION



PRECAST DRAIN MANHOLE 4
NOT TO SCALE



DROP SEWER MANHOLE 5
NOT TO SCALE

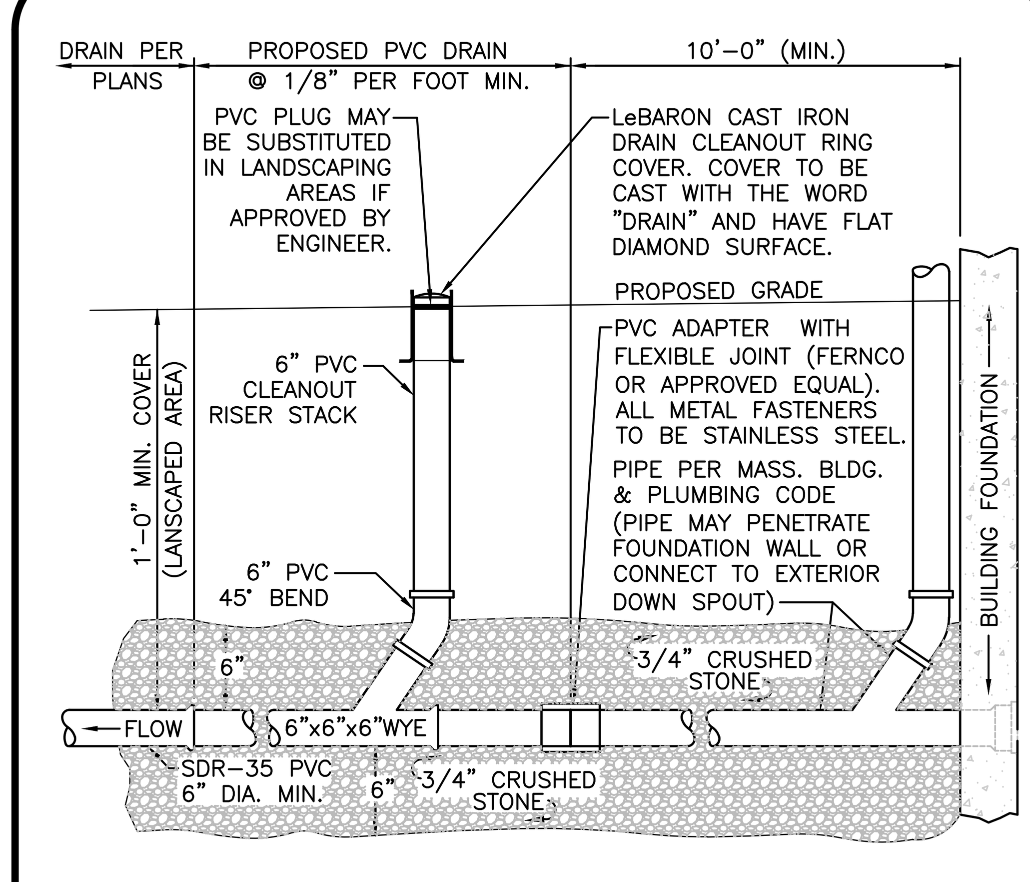


NOTES:

1. INVERT AND SHELF TO BE PLACED AFTER LEAKAGE TEST.
2. MANHOLES SHALL HAVE A BRICK PAVED SHELF AND INVERT, CONSTRUCTED TO CONFORM TO THE SIZE OF PIPE AND FLOW. AT CHANGES IN DIRECTION, THE INVERTS SHALL BE LAID OUT IN CURVES OF THE LONGEST RADIUS POSSIBLE TANGENT TO THE CENTER LINE OF THE HIGHEST PIPE CROWN AND SLOPE TO DRAIN TOWARD THE FLOWING THROUGH CHANNEL. UNDERLAYMENT OF INVERT AND SHELF SHALL CONSIST OF CEMENT CONCRETE OR BRICK IN MORTAR.

NOTE:
THE MANHOLE, INCLUDING ALL COMPONENT PARTS, SHALL HAVE ADEQUATE SPACE, STRENGTH AND LEAK PROOF QUALITIES CONSIDERED NECESSARY FOR THE INTENDED SERVICE SPACE REQUIREMENT AND CONFIGURATIONS SHALL BE AS SHOWN ON THE DRAWING. MANHOLES MAY BE AN ASSEMBLY OR PRECAST SECTIONS, WITH OR WITHOUT STEEL REINFORCEMENT, WITH ADEQUATE JOINTING OR CONCRETE CAST MONOLITHICALLY IN PLACE WITH OR WITHOUT REINFORCEMENT. IN ANY APPROVED MANHOLE, THE COMPLETE STRUCTURE SHALL BE OF SUCH MATERIAL AND QUALITY AS TO WITHSTAND LOADS OF 8 TONS (H-20 LOADING) WITHOUT FAILURE AND PREVENT LEAKAGE IN EXCESS OF ONE GALLON PER DAY PER VERTICAL FOOT OF MANHOLE.

PRECAST CONCRETE SEWER MANHOLE 6
NOT TO SCALE



ROOF DRAIN 5
NOT TO SCALE

N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\C-2398-01A_DETAILS.DWG

COMMONWEALTH OF MASSACHUSETTS
3.25.24
CARLTON M. QUINN
CIVIL
No.49923
REGISTERED PROFESSIONAL ENGINEER

PROFESSIONAL ENGINEER FOR ALLEN & MAJOR ASSOCIATES, INC.

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c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:

STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	AS SHOWN	DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:

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DRAWING TITLE:	SHEET No.
DETAILS	C-504

SC-310 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-310.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE OR POLYETHYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2922 (POLETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 400 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2922 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

SC-310 STORMTECH CHAMBER SPECIFICATION (1)
NOT TO SCALE

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF THE SC-310 SYSTEM

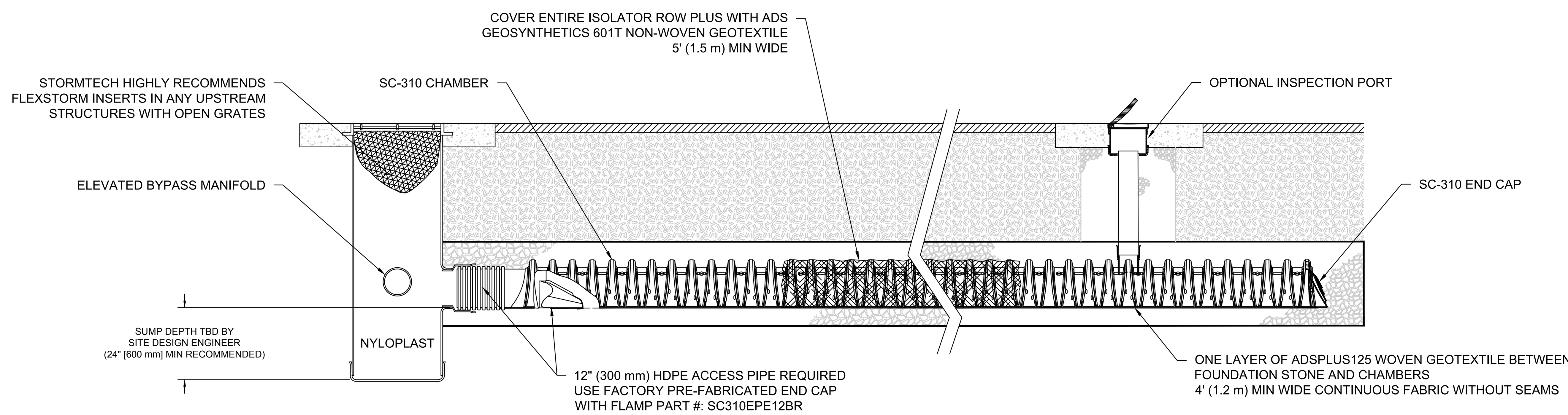
1. STORMTECH SC-310 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-310 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm).
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

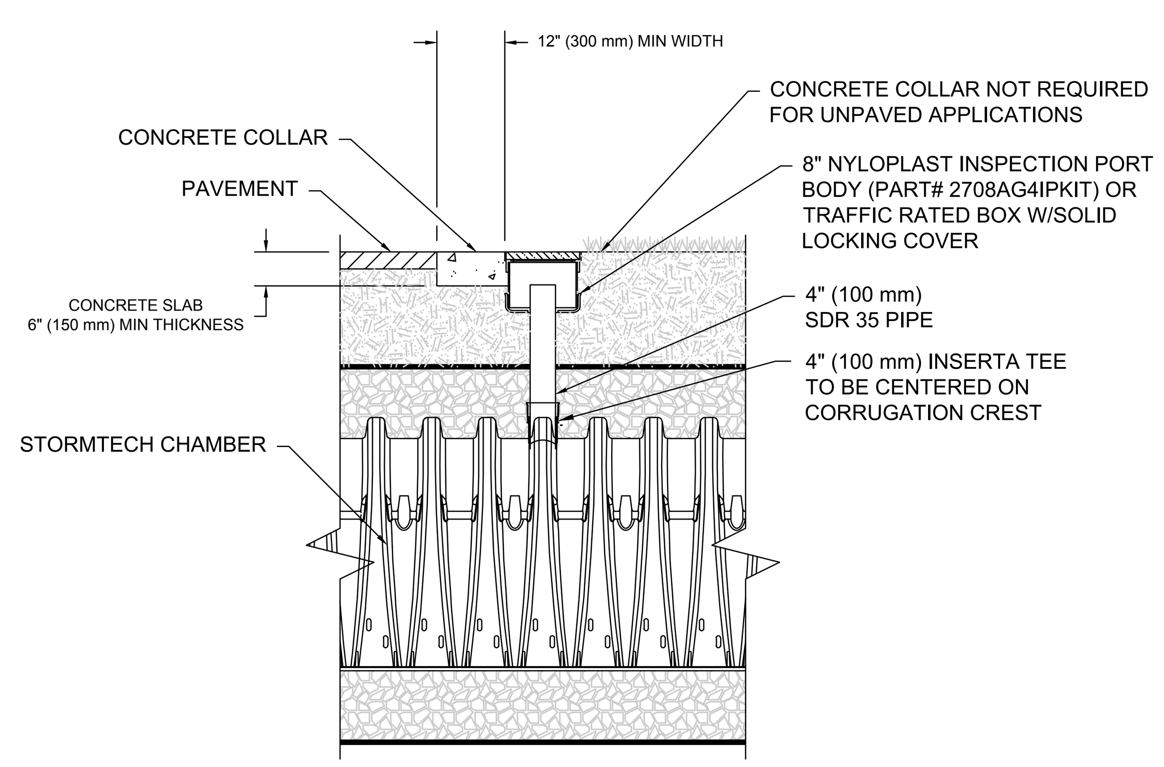
1. STORMTECH SC-310 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
2. THE USE OF CONSTRUCTION EQUIPMENT OVER SC-310 & SC-740 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.



SC-310 ISOLATOR ROW PLUS DETAIL (2)
NOT TO SCALE



NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION CREST.

4" PVC INSPECTION PORT DETAIL (SC SERIES CHAMBER) (3)
NOT TO SCALE

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

ADS™
Advanced Drainage Systems, Inc.

ADS SiteAssist™
FOR STORMTECH INSTALLATION INSTRUCTIONS VISIT OUR APP

N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\C-2398-01A_DETAILS.DWG

COMMONWEALTH OF MASSACHUSETTS
CARLTON M. QUINN
CIVIL
No.49923
REGISTERED PROFESSIONAL ENGINEER
3.25.24

PROFESSIONAL ENGINEER FOR ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
B	3/25/2024	REVISED PER TOWN COMMENTS
A	2/29/2024	REVISED PER TOWN COMMENTS

APPLICANT\OWNER:
BLVD READING, LLC
c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:

STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:		DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ◆ land surveying
environmental consulting ◆ landscape architecture
www.allenmajor.com
100 COMMERCE WAY, SUITE 5
WOBURN MA 01801
TEL: (781) 935-6889
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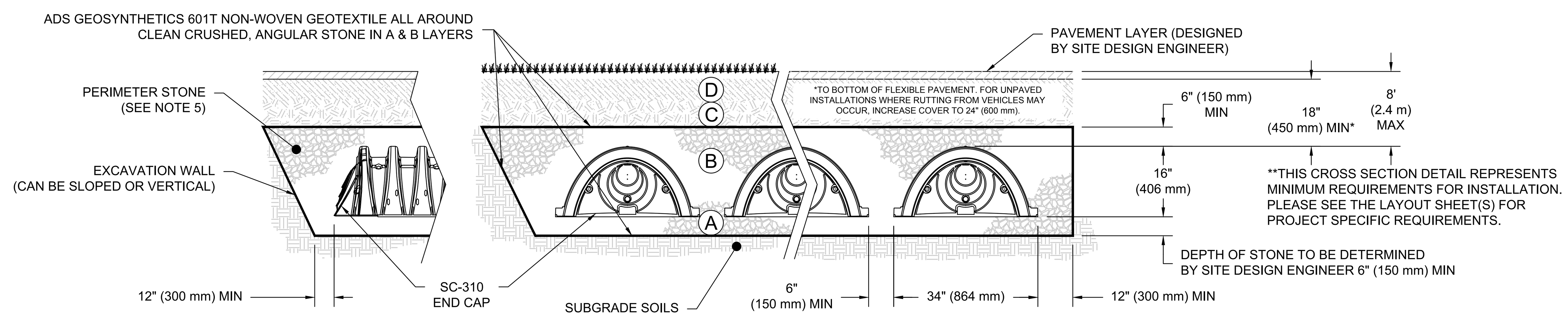
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE: DETAILS

SHEET No. C-505

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER.	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



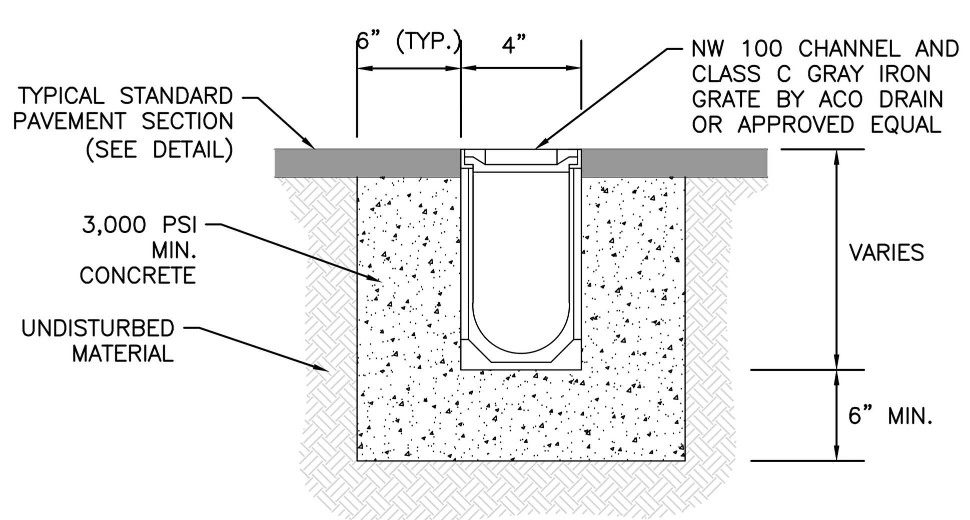
NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2922 (POLETHYLENE) OR ASTM F2418 (POLYPROPYLENE), "STANDARD SPECIFICATION FOR CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-310 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2922 SHALL BE GREATER THAN OR EQUAL TO 400 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

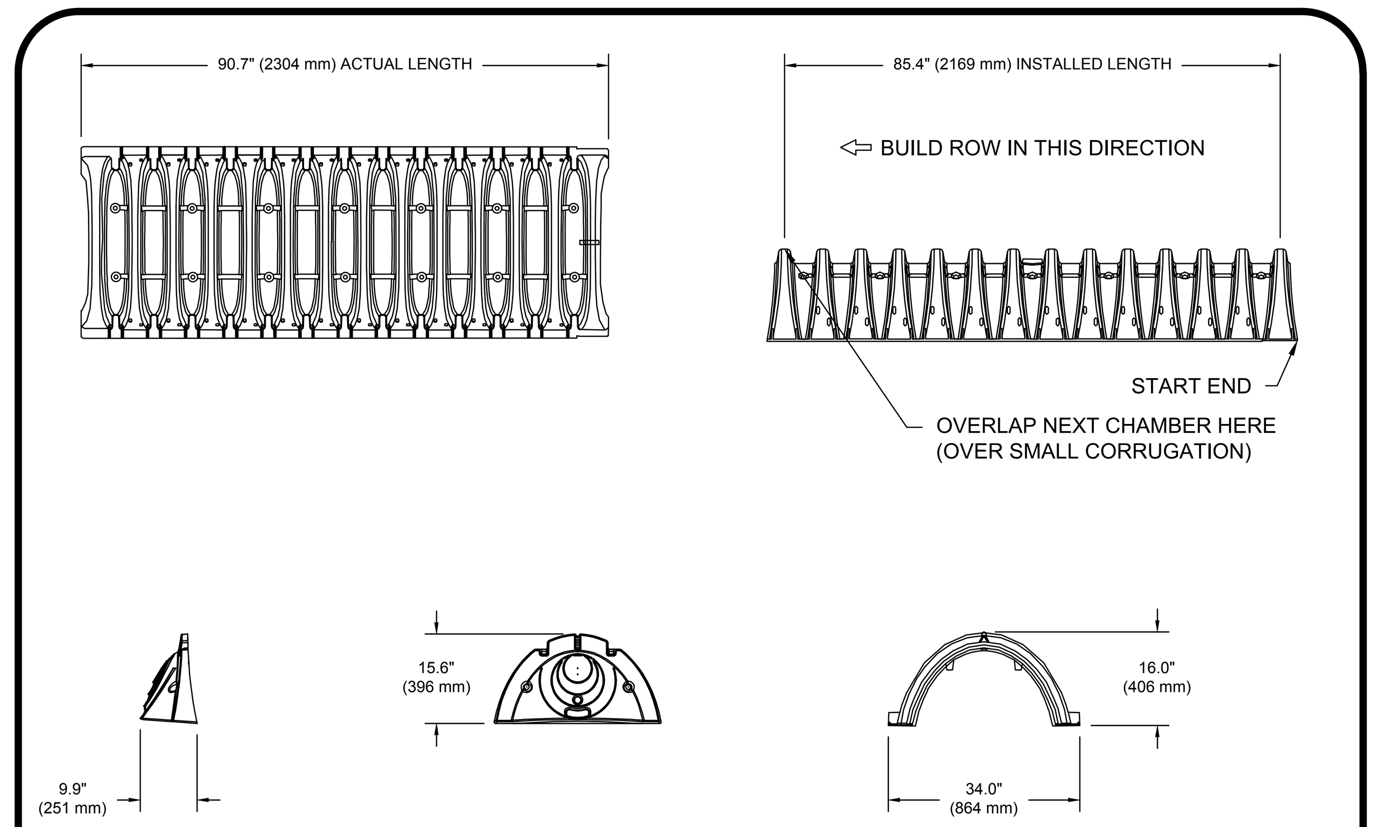
SC-310 CROSS SECTION DETAIL 1
NOT TO SCALE

NOTES:

1. PROVIDE PRE-SLOPED TRENCH SECTION DEPTH AS REQUIRED TO FACILITATE FLOW TO OUTLET.
2. TRENCH DRAIN SLOPED 16" PER FOOT (MIN.) TOWARDS OUTLET.
3. TRENCH DRAIN SHALL BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURE'S SPECIFICATIONS AND RECOMMENDATIONS.
4. CONTRACTOR TO SUBMIT SHOP DRAWING TO CIVIL ENGINEER FOR APPROVAL.



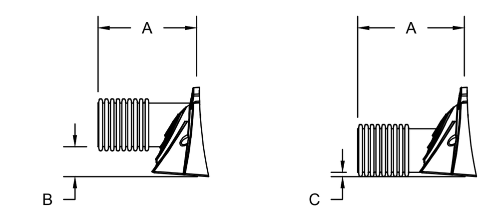
TRENCH DRAIN 3
NOT TO SCALE



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	34.0" X 16.0" X 85.4"	(864 mm X 406 mm X 2169 mm)
CHAMBER STORAGE	14.7 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	31.0 CUBIC FEET	(0.88 m³)
WEIGHT	35.0 lbs.	(16.8 kg)

*ASSUMES 6" (152 mm) ABOVE, BELOW, AND BETWEEN CHAMBERS



PRE-FAB STUB AT BOTTOM OF END CAP WITH FLAMP END WITH "BR"
PRE-FAB STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PRE-FAB STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
PRE CORED END CAPS END WITH "PC"

PART #	STUB	A	B	C
SC310EPE06T / SC310EPE06TPC	6" (150 mm)	9.6" (244 mm)	5.8" (147 mm)	---
SC310EPE06B / SC310EPE06BPC			---	0.5" (13 mm)
SC310EPE08T / SC310EPE08TPC	8" (200 mm)	11.9" (302 mm)	3.5" (89 mm)	---
SC310EPE08B / SC310EPE08BPC			---	0.6" (15 mm)
SC310EPE10T / SC310EPE10TPC	10" (250 mm)	12.7" (323 mm)	1.4" (36 mm)	---
SC310EPE10B / SC310EPE10BPC			---	0.7" (18 mm)
SC310EPE12B	12" (300 mm)	13.5" (343 mm)	---	0.9" (23 mm)
SC310EPE12BR	12" (300 mm)	13.5" (343 mm)	---	0.9" (23 mm)

ALL STUBS, EXCEPT FOR THE SC310EPE12B ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC310EPE12B THE 12" (300 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 0.25" (6 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL

SC-310 TECHNICAL SPECIFICATIONS 2
NOT TO SCALE

N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\C-2398-01A_DETAILS.DWG

COMMONWEALTH OF MASSACHUSETTS
3.25.24
CARLTON M. QUINN
CIVIL
No.49923
REGISTERED PROFESSIONAL ENGINEER

PROFESSIONAL ENGINEER FOR ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
B	3/25/2024	REVISED PER TOWN COMMENTS
A	2/29/2024	REVISED PER TOWN COMMENTS

APPLICANT\OWNER:
BLVD READING, LLC
c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:
STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	AS SHOWN	DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:
ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ◆ land surveying
environmental consulting ◆ landscape architecture
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WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE: DETAILS
SHEET No. C-506

SC-740 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH SC-740.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 550 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

SC-740 STORMTECH CHAMBER SPECIFICATION (1)
NOT TO SCALE

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF THE SC-740 SYSTEM

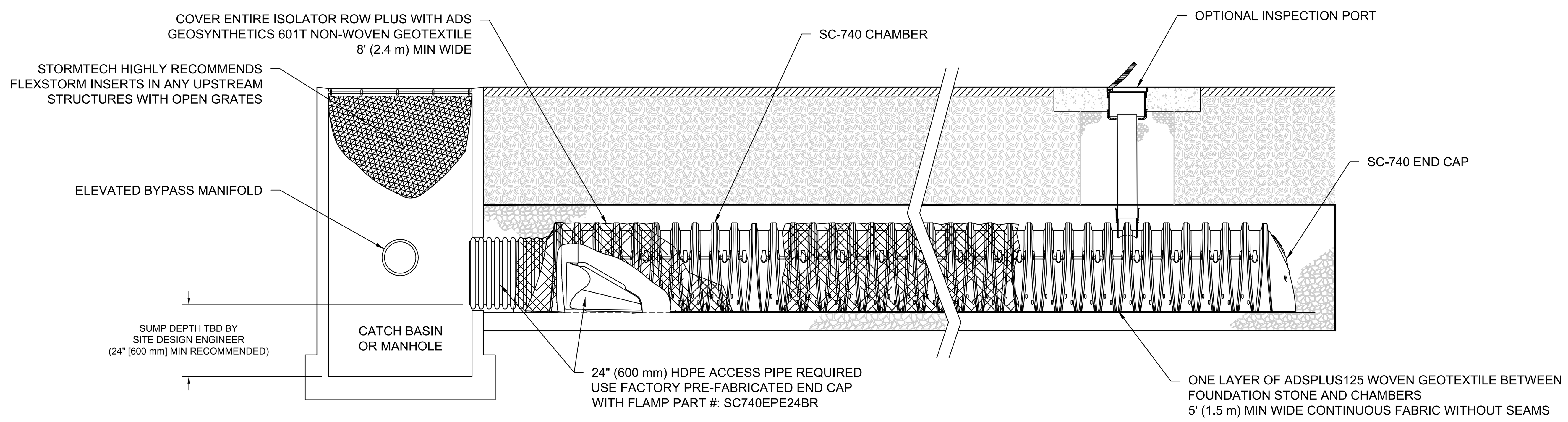
1. STORMTECH SC-740 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm).
8. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
9. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

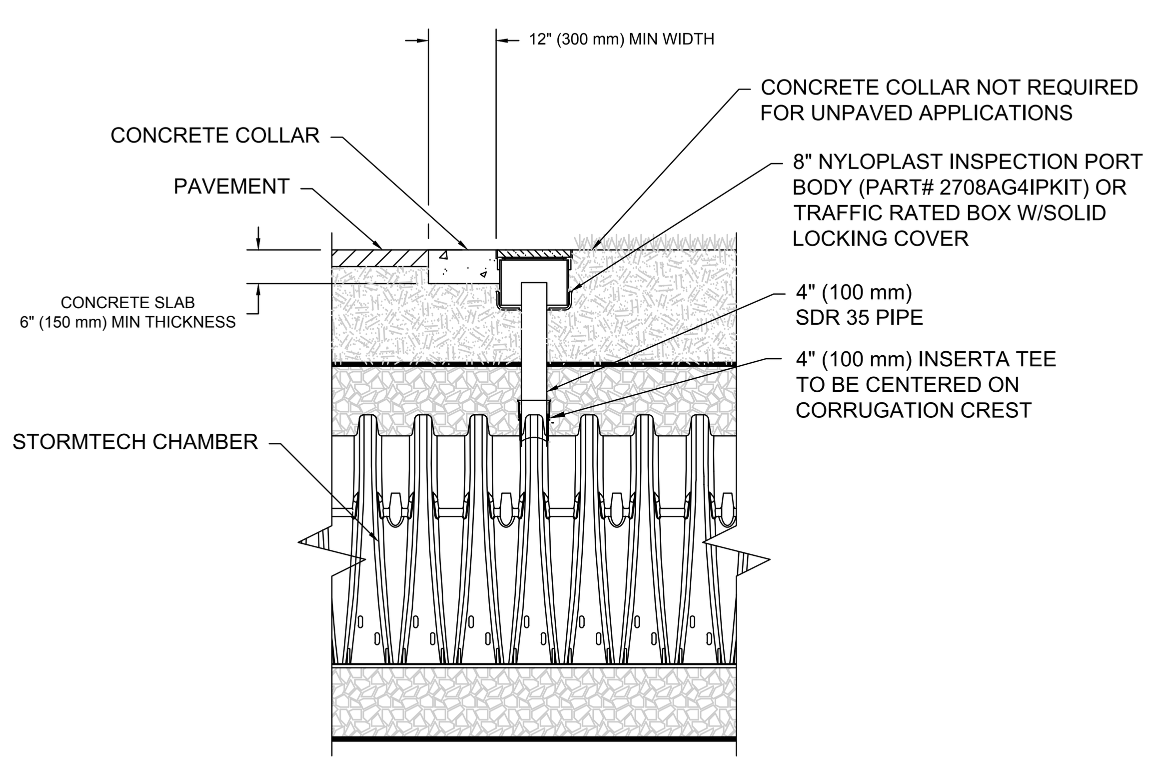
1. STORMTECH SC-740 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
2. THE USE OF CONSTRUCTION EQUIPMENT OVER SC-740 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADERS, DUMP TRUCKS, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH SC-310/SC-740/DC-780 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO THE CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.



SC-740ISOLATOR ROW PLUS DETAIL (2)
NOT TO SCALE



NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION CREST.

4" PVC INSPECTION PORT DETAIL (SC SERIES CHAMBER) (3)
NOT TO SCALE

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

SiteAssist™
FOR STORMTECH INSTALLATION INSTRUCTIONS VISIT OUR APP

N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\C-2398-01A_DETAILS.DWG

COMMONWEALTH OF MASSACHUSETTS
3.25.24
CARLTON M. QUINN
CIVIL
No.49923
REGISTERED PROFESSIONAL ENGINEER

PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
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A	2/29/2024	REVISED PER TOWN COMMENTS

APPLICANT\OWNER:
BLVD READING, LLC
c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:
STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:		DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:
ALLEN & MAJOR ASSOCIATES, INC.
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WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

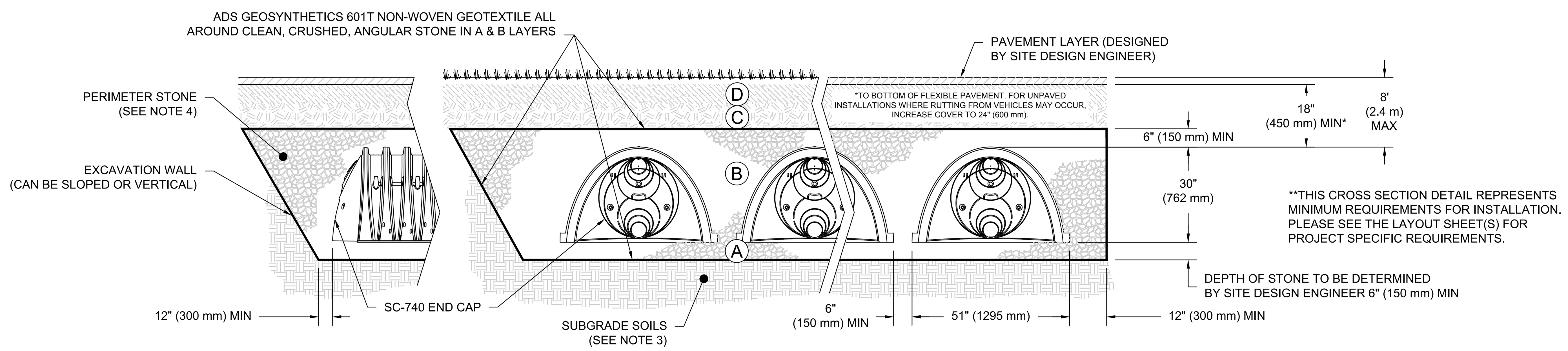
DRAWING TITLE: DETAILS

SHEET No. C-507

ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER.	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

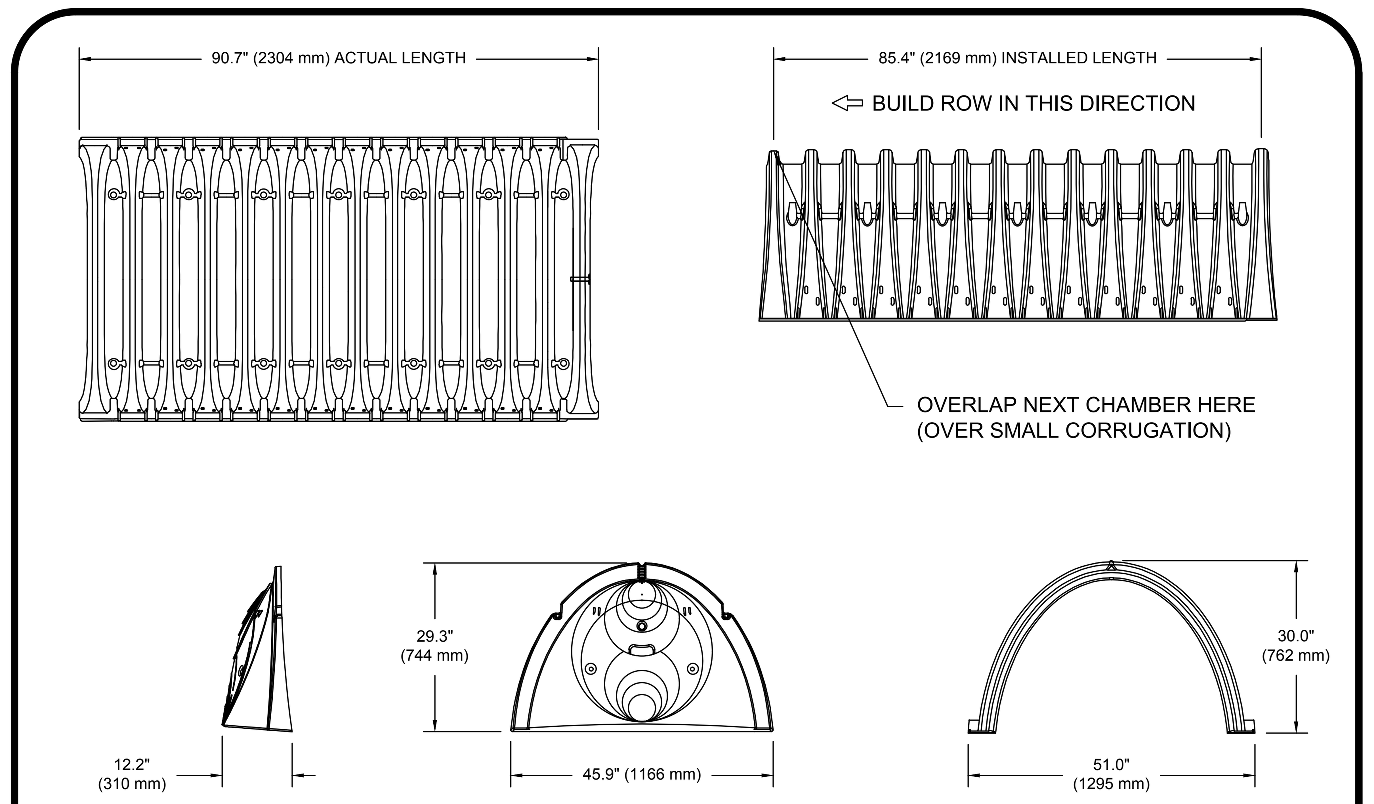
PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-740 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 550 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

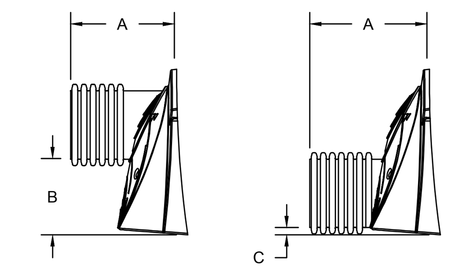
SC-740 CROSS SECTION DETAIL (1)
NOT TO SCALE



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	51.0" X 30.0" X 85.4"	(1295 mm X 762 mm X 2169 mm)
CHAMBER STORAGE	45.9 CUBIC FEET	(1.30 m^3)
MINIMUM INSTALLED STORAGE*	74.9 CUBIC FEET	(2.12 m^3)
WEIGHT	75.0 lbs.	(33.6 kg)

*ASSUMES 6" (152 mm) STONE ABOVE, BELOW, AND BETWEEN CHAMBERS



PRE-FAB STUB AT BOTTOM OF END CAP WITH FLAMP END WITH "BR"
PRE-FAB STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PRE-FAB STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
PRE-CORED END CAPS END WITH "PC"

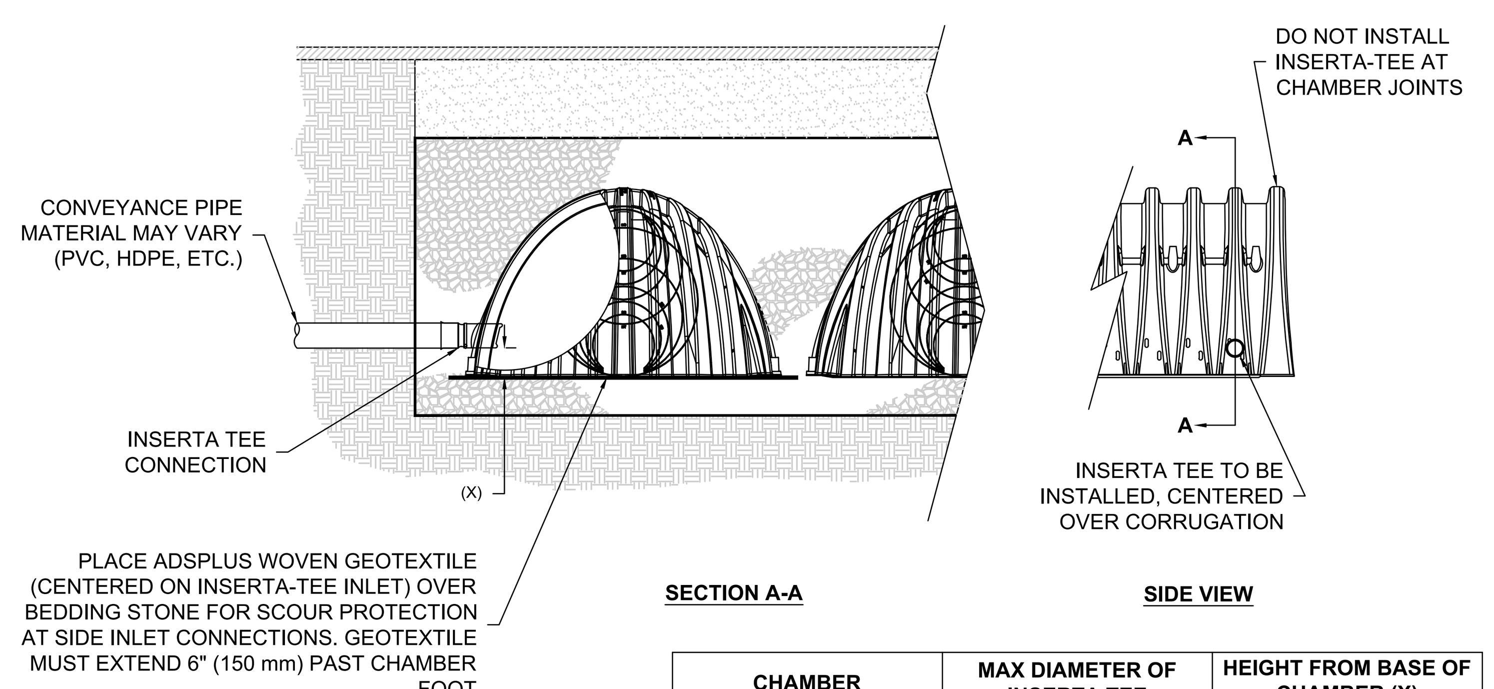
PART #	STUB	A	B	C
SC740EPE06T / SC740EPE06TPC	6" (150 mm)	10.9" (277 mm)	18.5" (470 mm)	---
SC740EPE06B / SC740EPE06BPC			---	0.5" (13 mm)
SC740EPE08T /SC740EPE08TPC	8" (200 mm)	12.2" (310 mm)	16.5" (419 mm)	---
SC740EPE08B / SC740EPE08BPC			---	0.6" (15 mm)
SC740EPE10T / SC740EPE10TPC	10" (250 mm)	13.4" (340 mm)	14.5" (368 mm)	---
SC740EPE10B / SC740EPE10BPC			---	0.7" (18 mm)
SC740EPE12T / SC740EPE12TPC	12" (300 mm)	14.7" (373 mm)	12.5" (318 mm)	---
SC740EPE12B / SC740EPE12BPC			---	1.2" (30 mm)
SC740EPE15T / SC740EPE15TPC	15" (375 mm)	18.4" (467 mm)	9.0" (229 mm)	---
SC740EPE15B / SC740EPE15BPC			---	1.3" (33 mm)
SC740EPE18T / SC740EPE18TPC	18" (450 mm)	19.7" (500 mm)	5.0" (127 mm)	---
SC740EPE18B / SC740EPE18BPC			---	1.6" (41 mm)
SC740EPE24B*	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)
SC740EPE24BR*	24" (600 mm)	18.5" (470 mm)	---	0.1" (3 mm)

ALL STUBS, EXCEPT FOR THE SC740EPE24B/SC740EPE24BR ARE PLACED AT BOTTOM OF END CAP SUCH THAT THE OUTSIDE DIAMETER OF THE STUB IS FLUSH WITH THE BOTTOM OF THE END CAP. FOR ADDITIONAL INFORMATION CONTACT STORMTECH AT 1-888-892-2694.

* FOR THE SC740EPE24B/SC740EPE24BR THE 24" (600 mm) STUB LIES BELOW THE BOTTOM OF THE END CAP APPROXIMATELY 1.75" (44 mm). BACKFILL MATERIAL SHOULD BE REMOVED FROM BELOW THE N-12 STUB SO THAT THE FITTING SITS LEVEL.

NOTE: ALL DIMENSIONS ARE NOMINAL

SC-740 TECHNICAL SPECIFICATIONS (2)
NOT TO SCALE



SECTION A-A **SIDE VIEW**

CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)
MC-7200	12" (300 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

NOTES:
- PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.
- CONTACT ADS ENGINEERING SERVICES IF INSERTA TEE INLET MUST BE RAISED AS NOT ALL INVERTS ARE POSSIBLE.

SC-740 INSERTA-TEE SIDE INLET DETAIL (3)
NOT TO SCALE

COMMONWEALTH OF MASSACHUSETTS
3.25.24
CARLTON M. QUINN
CIVIL
No.49923
REGISTERED PROFESSIONAL ENGINEER

PROFESSIONAL ENGINEER FOR ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
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APPLICANT\OWNER:
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c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:

STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	AS SHOWN	DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
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environmental consulting ◆ landscape architecture
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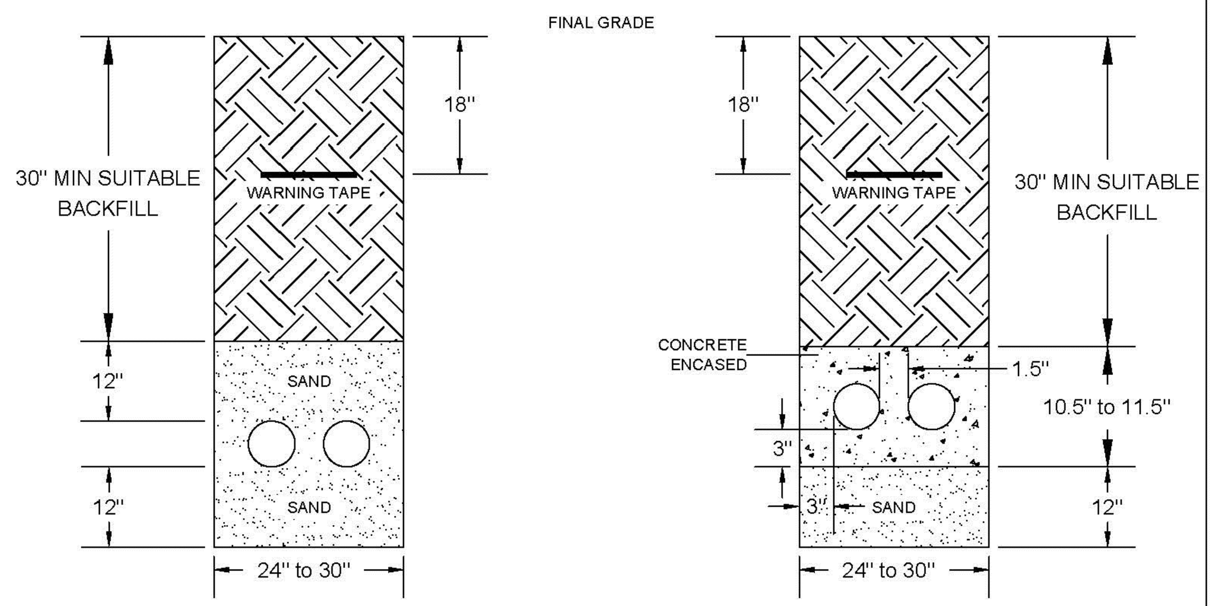
DRAWING TITLE: DETAILS

SHEET No. C-508



TYPICAL CROSS SECTION
TRENCH DETAIL FOR CONDUIT

TYPICAL CROSS SECTION
TRENCH DETAIL FOR CONDUIT
CONCRETE ENCASEMENT

1. SPECIFICATIONS: ALL WORK SHALL BE IN ACCORDANCE WITH THESE STANDARDS. THE NATIONAL ELECTRICAL SAFETY CODE, STATE AND LOCAL CODE REQUIREMENTS. ADDITIONAL SEPCIFICATIONS, WHEN REQUIRED, TO BE FURNISHED BY THE RMLD ENGINEERING DIVISION UPON REQUEST.
2. OWNERSHIP: CONTRACTOR SHALL FURNISH TRENCH, BACKFILL, AND CONDUIT.
3. APPROVAL: CUSTOMER SHALL OBTAIN APPROVAL OF PLANS BY THE RMLD ENGINEERING DIVISION. NO TRENCH SHALL BE BACKFILLED OR POURED WITH CONCRETE UNTIL INSPECTED BY RMLD ENGINEERING DIVISION.
4. CONDUIT: TYPICAL INSTALLATION SHOWN. TYPICAL SIZE OF CONDUITS SHALL BE 4" FOR PRIMARY AND 3" FOR SECONDARY; UNLESS OTHERWISE NOTED BY RMLD ENGINEERING.
5. SAND/FILL: PROVIDE AS SHOWN; ALL FILL BEING THOROUGHLY COMPACTED.

NOTES:
ANY VARIATION IN TRENCH SPECIFICATIONS MUST HAVE PRIOR APPROVAL OF RMLD ENGINEERING DIVISION.

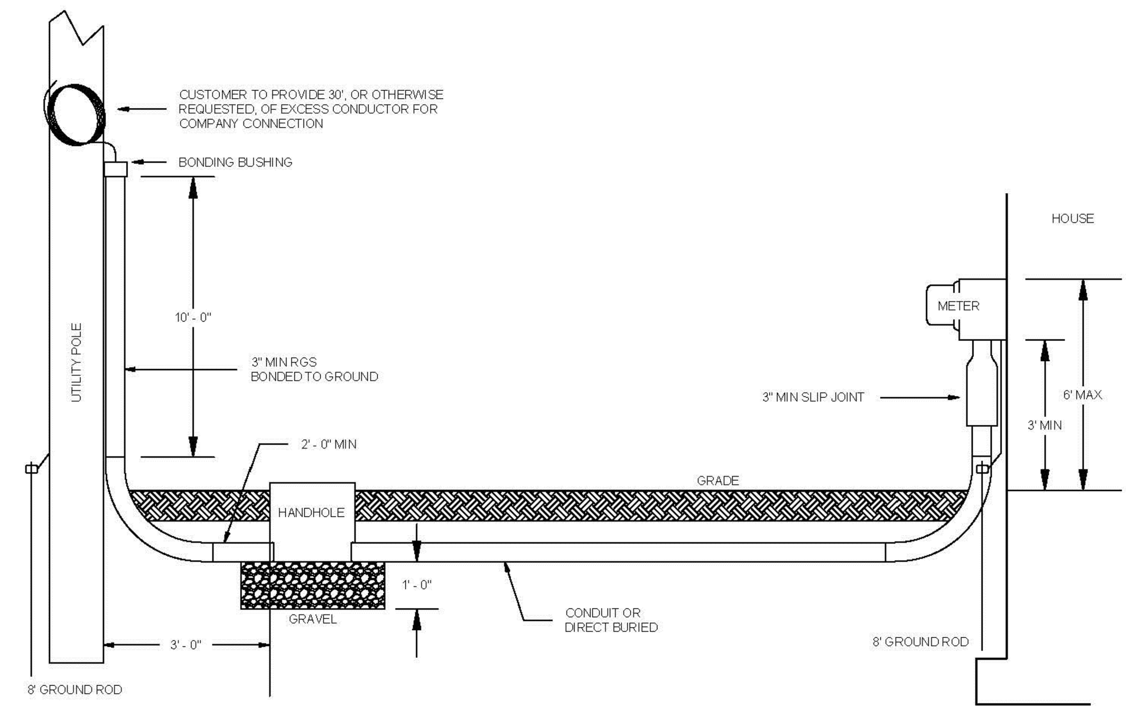
ALL REQUIRED EASEMENTS SHALL BE SECURED BY THE CONTRACTOR/OWNER

"DIG SAFE" NOTIFICATION IS THE RESPONSIBILITY OF THE CONTRACTOR

RMLD Reading Municipal Light Department
RELIABLE POWER FOR GENERATIONS
230 Ash St. Reading, MA 01867

FIGURE 22
TYPICAL TRENCH SPECIFICATIONS

SCALE: N.T.S DATE: 9/24/2020



NOTES:

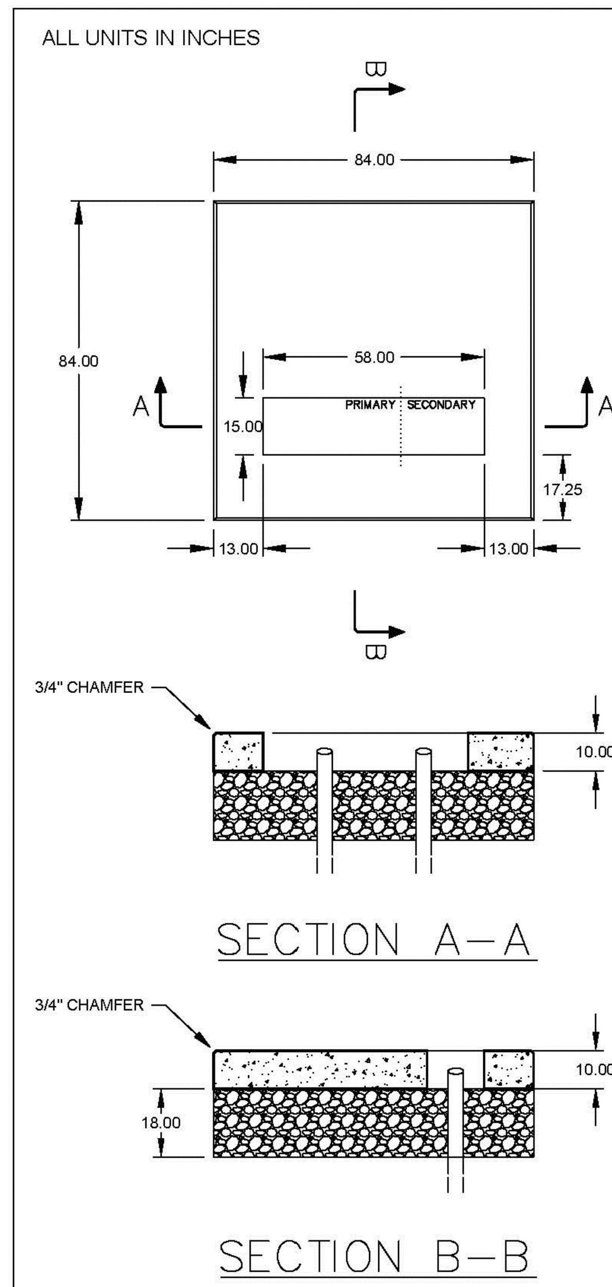
1. ALL EQUIPMENT, EXCEPT WATT-HOUR METER, SHALL BE FURNISHED AND INSTALL BY THE CUSTOMER, UNLESS SPECIFICALLY NOTED
2. CUSTOMER TO INSTALL RISER AT RMLD UTILITY POLE.
MINIMUM RISER INSTALLATION REQUIREMENTS: 10' RIGID STEEL (RGS) CONDUIT, RGS SWEEP AND 2' MIN RGS CONDUIT GETAWAY FROM UTILITY POLE
3. CUSTOMER TO INSTALL HANDHOLE; PROVIDED BY RMLD OF THE FOLLOWING SIZES: 12"x24" OR 17"x30". SIZE OF HANDHOLE TO BE DETERMINED BY RMLD ENGINEERING
4. CUSTOMER WILL FURNISH AND INSTALL WIRE FOR ENTIRE LENGTH,FROM METER SOCKET TO POLE. CUSTOMER TO INCLUDE ENOUGH WIRE TO REACH RMLD SECONDARY CONDUCTORS. (LENGTH SHORTAGE WILL BE CUSTOMER'S RESPONSIBILITY TO RESOLVE)
5. RMLD TO MAKE ALL SERVICE CONNECTIONS AND DISCONNECTIONS AT UTILITY POLE
6. UTILITY POLE SHALL HAVE NO MORE THAN 4 RISERS ASSOCIATED

RMLD Reading Municipal Light Department
RELIABLE POWER FOR GENERATIONS
230 Ash St. Reading, MA 01867

FIGURE 9
CUSTOMER SECONDARY RISER AND SERVICE LATERAL (600V AND BELOW)

SCALE: N.T.S DATE: 9/24/2020

ALL UNITS IN INCHES



1. SPECIFICATIONS: ALL WORK SHALL BE IN ACCORDANCE WITH THESE STANDARDS. THE NATIONAL ELECTRICAL SAFETY CODE, STATE AND LOCAL CODE REQUIREMENTS. ADDITIONAL SPECIFICATIONS, WHEN REQUIRED, TO BE FURNISHED BY THE RMLD ENGINEERING DIVISION UPON REQUEST.
2. OWNERSHIP: CONTRACTOR SHALL FURNISH AND OWN CONCRETE PAD, GROUND GRID, CONDUITS AND GROUND WIRES
3. APPROVAL: CUSTOMER SHALL OBTAIN APPROVAL OF PLANS BY THE WIRE INSPECTOR AND RMLD . PLANS SHALL SHOW CONCRETE PAD, ALSO CONDUITS, LOCATION, TYPE, SIZE AND NUMBER
4. LOCATION / PROTECTION: PAD LOCATION TO BE APPROVED BY RMLD. THERE SHALL BE NO OBSTRUCTIONS WITHIN 4' OF THE REAR, OF THE SIDES, AND 12' OF THE FRONT. IN AREAS OF VEHICULAR ACTIVITY APPROVED BARRIERS SHALL BE INSTALLED, BY THE CUSTOMER, AROUND THE PAD FOR MECHANICAL PROTECTION OF THE TRANSFORMER.
5. CONDUIT: INSTALL AS SHOWN. CONDUIT TO BE 4" IN DIAMETER FOR PRIMARY AND 3" FOR SECONDARY, USE 36" RADIUS BENDS. TERMINATIONS OF CONDUITS FOR PRIMARY AND SECONDARY SHALL BE INSTALLED IN THEIR RESPECTIVE ZONES; PRIMARY ON LEFT, SECONDARY ON RIGHT (WHEN FACING THE FRONT DOORS OF TRANSFORMER).
6. GROUND GRID: CONTRACTOR TO INSTALL, 1/0 STR (7 STRANDS) BARE COPPER WIRE LOOP 12" BELOW PAD GRADE. LEAVE 36" WIRE ABOVE PAD AT TWO OPPPOSITE POINTS IN THE CONDUIT OPENINGS, FOR GROUNDING OF THE TRANSFORMER. DRIVE FOUR (4) 3/4" BY 8' COPPERWELD GROUND RODS IN EACH CORNER OF PAD AND BOND TO GROUND WIRE
7. BACKFILL: ALL FILL BEING THOROUGHLY COMPACTED
8. CONCRETE PAD: CONCRETE MINIMUM STRENGTH 5,000 PSI AFTER 28 DAYS, ALL REINFORCEMENT PER ASTM A-615, ALL MATERIAL CONFORM TO ACI-318
9. CONDUCTORS: PRIMARY AND SECONDARY CONDUCTORS AND TERMINATIONS TO BE INSTALL BY CUSTOMER. PRIMARY CONNECTION AT RISER POLE TO BE DONE BY RMLD. CABLE TEST REPORT REQUIRED BEFORE CABLE CAN BE ENERGIZED.

RMLD Reading Municipal Light Department
RELIABLE POWER FOR GENERATIONS
230 Ash St. Reading, MA 01867

FIGURE 27
CONCRETE PAD (84x84)
UP TO 500KVA

SCALE: N.T.S DATE: 9/24/2020

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COMMONWEALTH OF MASSACHUSETTS
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STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	AS SHOWN	DWG. NAME:	C-2398-01A
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
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environmental consulting ◆ landscape architecture
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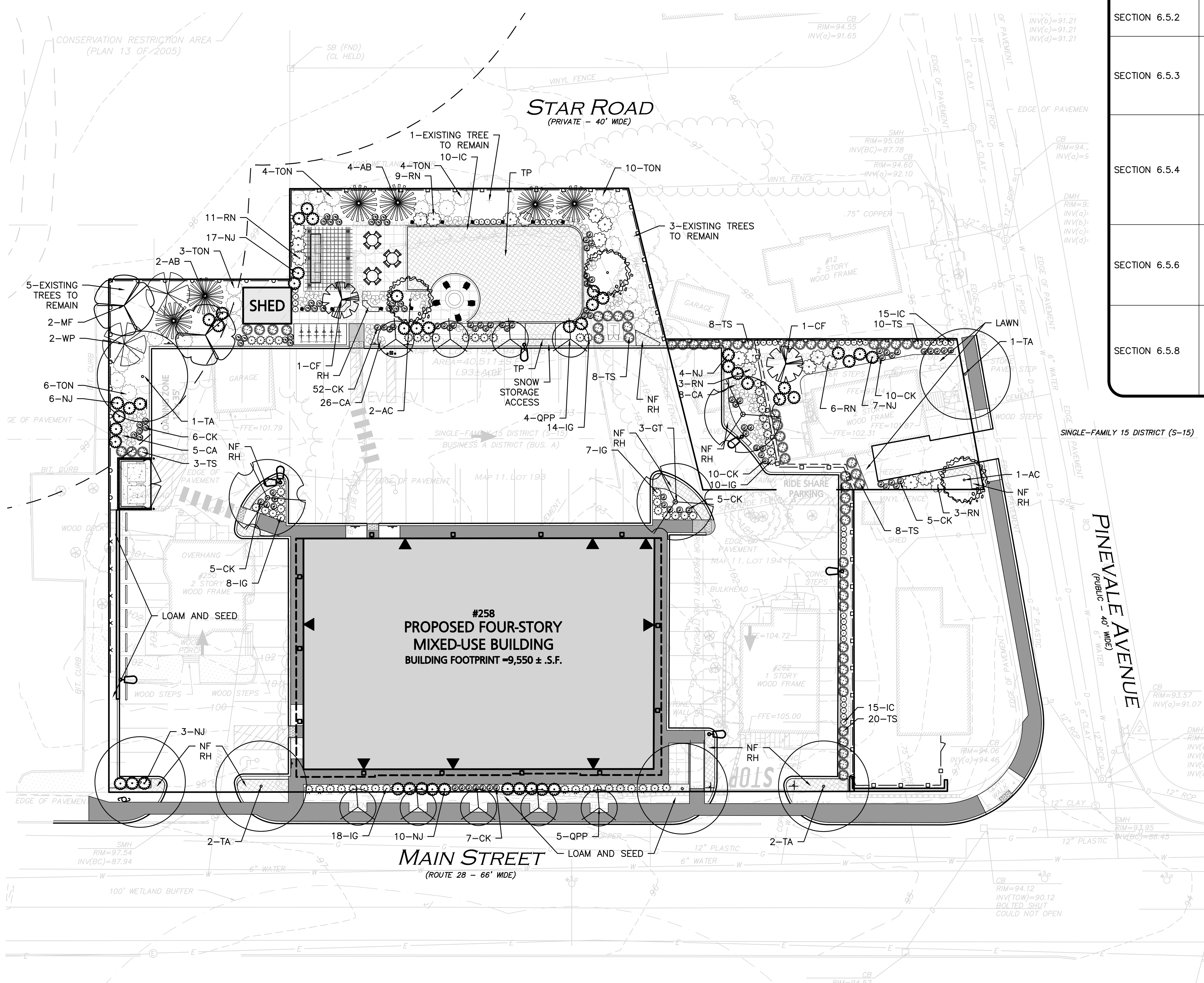
FAX: (781) 935-2896

WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE: DETAILS

SHEET No. C-509



TOWN OF READING ZONING SUMMARY - LANDSCAPE

BUSINESS A AND SINGLE FAMILY 15 DISTRICTS

REGULATION	ITEM	REQUIRED / ALLOWED	PROPOSED
SECTION 6.5.2	IF THERE IS NOT AN ADEQUATE AMOUNT OF SIDE YARD AREA TO LANDSCAPE, A FENCE MAY BE ALLOWED AS AN ALTERNATIVE	SIDE YARD SCREENING	PRIVACY FENCE PROVIDED
SECTION 6.5.3	EXPOSED STORAGE AREAS, MACHINERY, GARBAGE DUMPSTERS, SERVICE AREAS, TRUCK LOADING AREAS, UTILITY BUILDINGS, AND STRUCTURES SHALL BE SCREENED FROM THE VIEW OF ABUTTING PROPERTIES AND STREETS USING PLANTINGS, FENCES, AND OTHER APPROPRIATE METHODS.	UTILITY SCREENING	SCREENING PROVIDED
SECTION 6.5.4	A LANDSCAPING MAINTENANCE PLAN SHALL BE PREPARED AND SUBMITTED AS PART OF THE LANDSCAPE DESIGN PLAN. ALL LANDSCAPED AREAS SHALL BE PROPERLY MAINTAINED. ANY TREE OR SHRUB THAT DIES SHALL BE REPLACED WITHIN ONE (1) GROWING SEASON. REPLACEMENT TREES AND SHRUBS SHALL BE OF SIMILAR TYPE AND SIZE TO WHAT WAS APPROVED AS PART OF THE ORIGINAL APPROVAL.	LANDSCAPE MAINTENANCE PLAN	SEE DETAIL SHEET
SECTION 6.5.6	NO MORE THAN 50 PERCENT (50%) OF THE TREES, APPROVED TO BE PLANTED, SHALL BE OF ANY ONE SPECIES AND NO LESS THAN 25 PERCENT (25%) OF THE TOTAL TREES PLANTED SHALL BE OF ANY ONE SPECIES. TREES SHALL BE CHOSEN FROM A LIST PROVIDED BY THE TREE WARDEN	TREE SPECIES	SEE PLAN
SECTION 6.5.8	THE MINIMUM ACCEPTABLE SIZE OF TREE TO BE PLANTED ALONG A PUBLIC WAY SHALL BE THREE (3) INCH TRUNK CALIPER AT FOUR (4) FEET ABOVE THE GRADE. AT THE TIME OF DELIVERY, THE TREE WARDEN MUST APPROVE THE PROPOSED TREES. EVERGREEN TREES SHALL BE AT LEAST EIGHT (8) FEET TALL AT THE TIME OF PLANTING.	TREE SIZE	3" CALIPER DECIDUOUS TREES AND 8' HT EVERGREEN TREES

LEGEND

- DECIDUOUS TREE
- EVERGREEN TREE
- FLOWERING TREE
- SHRUBS
- MULCH BED
- PERENNIALS/GROUNDCOVER
- WILDFLOWER SEED MIX
- EROSION CONTROL SEED MIX

GENERAL NOTES:

1. THE EXISTING CONDITIONS USED IN THIS DRAWING IS FROM AN EXISTING CONDITIONS PLAN PREPARED BY ALLEN & MAJOR ASSOCIATES, INC., ENTITLED "PROPERTY USE/EXISTING CONDITIONS" FOR 252–260 MAIN STREET DATED APRIL 27, 2023 AND PREPARED FOR ONE SYLVAN LLC.
2. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR IT'S REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
3. THE INFORMATION SHOWN ON THIS PLAN IS THE SOLE PROPERTY OF ALLEN & MAJOR ASSOCIATES, INC. ITS INTENDED USE IS TO PROVIDE INFORMATION. ANY ALTERATION, MISUSE, OR RECALCULATION OF INFORMATION OR DATA WITHOUT THE EXPRESSED, WRITTEN CONSENT OF ALLEN & MAJOR ASSOCIATES, INC. IS STRICTLY PROHIBITED.
4. A TOTAL OF 53 TREES LARGER THAN 6" DBH EXIST ON SITE.
5. THIS DESIGN PROVIDES 9 EXISTING TREES TO REMAIN.

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

DIG SAFE

BEFORE YOU DIG
CALL 811 OR
1-888-DIG-SAFE
1-888-344-7233

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COMMONWEALTH OF MASSACHUSETTS
Jacqueline B. Thibault
NO. 1526
REGISTERED LANDSCAPE ARCHITECT

03.25.2024

PROFESSIONAL LANDSCAPE ARCHITECT FOR ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
B	3/25/2024	REVISED PER TOWN COMMENTS
A	2/29/2024	REVISED PER TOWN COMMENTS

APPLICANT\OWNER:
BLVD READING, LLC
c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:

STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

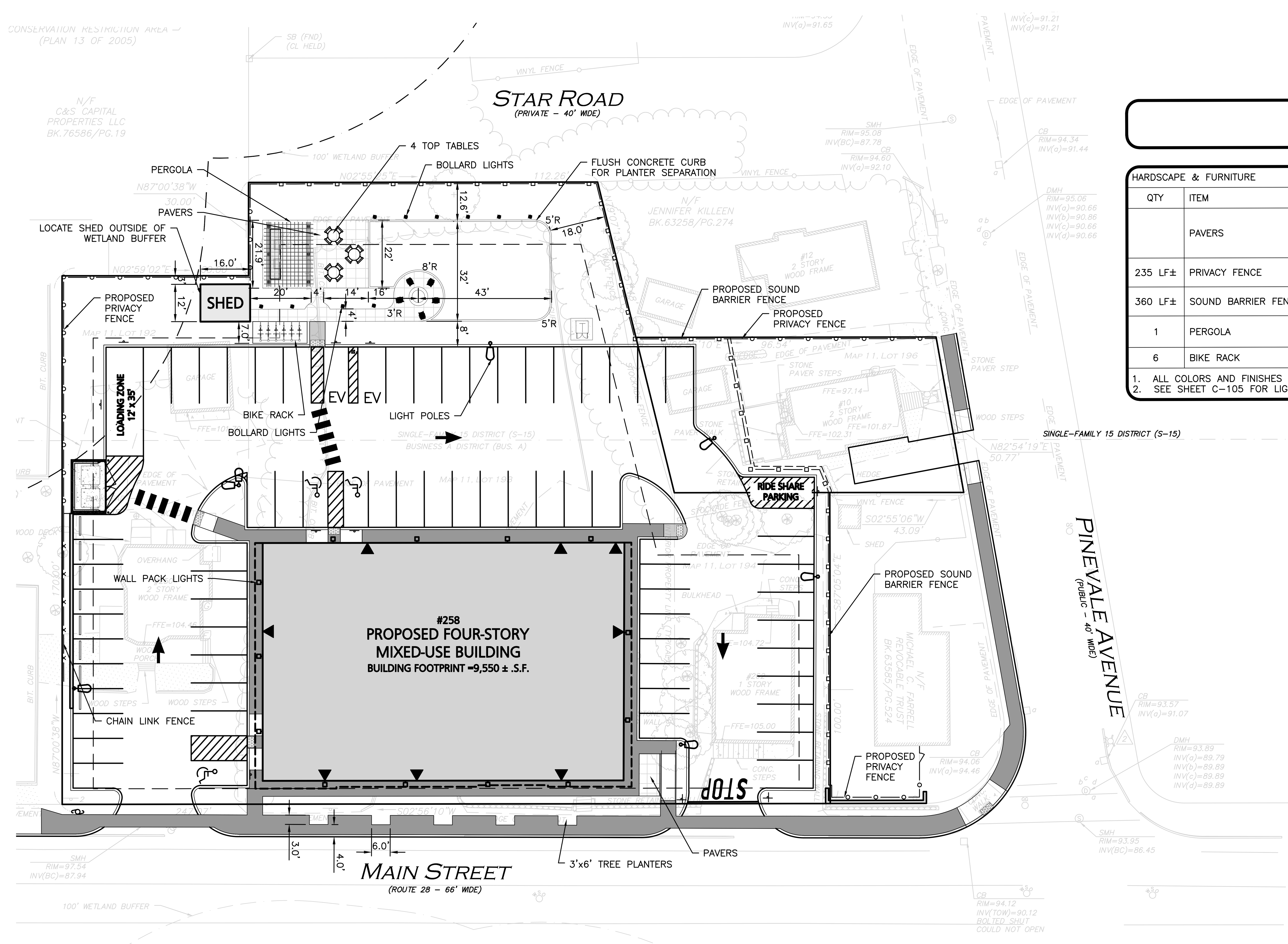
PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	1" = 20'	DWG. NAME:	L-2398-01A
DESIGNED BY:	JBT	CHECKED BY:	CMQ

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ◆ land surveying
environmental consulting ◆ landscape architecture
www.allenmajor.com
100 COMMERCE WAY, SUITE 5
WOBURN MA 01801
TEL: (781) 935-6889
FAX: (781) 935-2896

WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE:	SHEET No.
LANDSCAPE PLAN	L-101



MATERIALS SCHEDULE

HARDSCAPE & FURNITURE

QTY	ITEM	MODEL NUMBER	COLOR	SIZE	COMPANY
	PAVERS	ARCANA	FIELD: CORVARA ACCENT: VIVANTO	24"x24" 2" DEEP	UNILOCK.COM
235 LF±	PRIVACY FENCE	BUFFTECH CHESTERFIELD VINYL FENCE	WHITE	6' HEIGHT	AVOFENCEANDSUPPLY.COM
360 LF±	SOUND BARRIER FENCE	SILENT PROTECTOR	WHITE	8' HEIGHT	ACOUSTIGUARD.COM
1	PERGOLA	L.A. MODERN OR SILVERADO MODERN	MOSAIC REDWOOD	25'-6" x 12'-9"	FOREVERREDWOOD.COM
6	BIKE RACK	OAHU NO SCRATCH	TBD	36" RADIUS	SPORTWORKS.COM

1. ALL COLORS AND FINISHES TO BE FINAL APPROVED/SELECTED BY OWNER/ARCHITECT
2. SEE SHEET C-105 FOR LIGHT POLES, WALL PACKS, AND BOLLARDS.

GENERAL NOTES:

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1-888-344-7233

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft

N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\L-2398-01A_AMENITIES.DWG

03.25.2024
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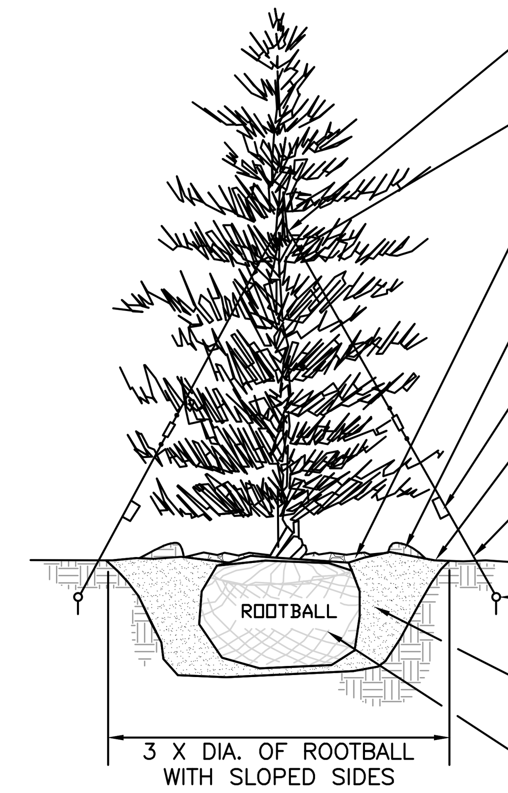
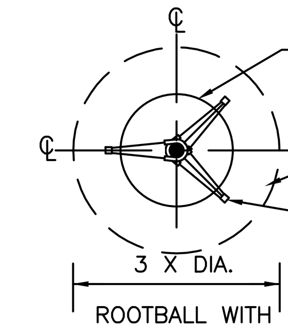
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE:	SHEET No.
SITE AMENITIES PLAN	L-102

NOT USED
NOT TO SCALE
1



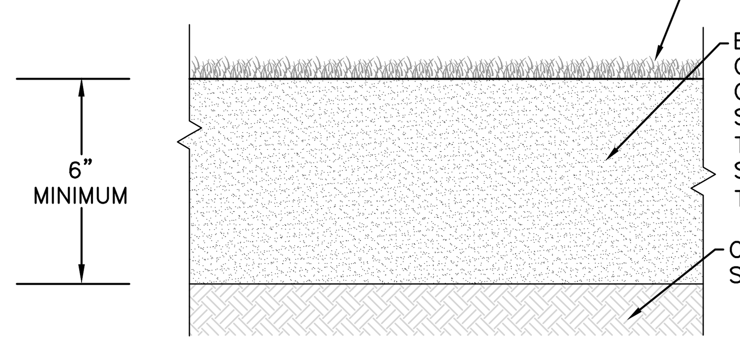
REMOVE ABORKNOT AFTER ONE GROWING SEASON
ABORKNOT BY DEEP ROOTS OR APPROVED EQUAL
3" FLUSH MULCH. DO NOT MOUND MULCH. SEE PLAN FOR TYPE.
4" EARTH SAUCER
WARNING FLAG 18" ABOVE FINISH GRADE
FINISH GRADE
SET ANGLE OF GUY WIRES TO ENTER GROUND AT OUTER LIMIT OF BRANCHES.
STEEL EYE STAKES BY DEEP ROOTS OR APPROVED EQUAL
BACKFILL PLANTING SOIL MIX: SEE NOTES 4 AND 5.
CUT & ENTIRELY REMOVE WIRE BASKET AND ALL SYNTHETIC MATERIALS FROM ROOTBALL. IF BURLAPPED, CUT OFF & REMOVE MIN. 2/3 OF BURLAP.



PLAN VIEW

NOTES
1. TREES SHALL BEAR SAME RELATIONSHIP TO FINISH GRADE AS IT BORE TO NURSERY OR FIELD GRADE. ROOT FLARE SHALL BE 2" ABOVE FINISH GRADE. REMOVE SOIL FROM TRUNK FLARE OF TREE TO DETERMINE ACTUAL TOP OF ROOTBALL AREA.
2. ATTACH GUY WIRES AT 2/3 HEIGHT OF TREE.
3. BACKFILL WITH PLANTING MIX. PLANT MIX TO BE: 50% NATIVE TOPSOIL, 20% BLENDED AND GROUND COMPOST (LEAVES & ORGANIC MATERIAL, NO ASH OR TOXIC MATERIALS) 20% PEAT MOSS, 10% SAND.
4. ADD MYCORRHIZA SOIL ADDITIVES AND SLOW RELEASE FERTILIZER WHEN PLANT HOLES ARE 50% FILLED AND WATER THOROUGHLY AT COMPLETION.

EVERGREEN TREE
NOT TO SCALE
2



SEED OR SOD. SEE LANDSCAPE PLAN FOR TYPE
BOTH ONSITE AND OFFSITE COMPACTED SCREENED TOPSOIL (NO STONES LARGER THAN 3/8")
COMPACTED SUBGRADE SOILS

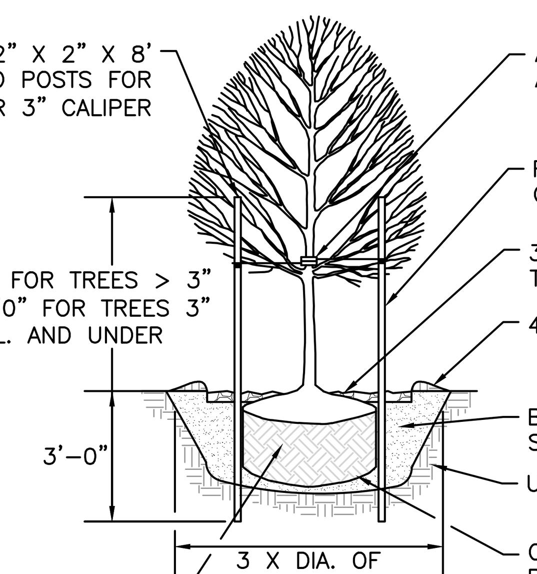
TEXTURE CLASS	% OF TOTAL WEIGHT
SAND	45% – 65%
SILT	15% – 35%
CLAY	5% – 20%

SIEVE	% PASSING
3/8"	100
NO. 4	85–100
NO. 40	60–85
NO. 100	38–60
NO. 200	28–40

NOTES:
1. TOP OF LOAM (TOPSOIL) IS FINISH GRADE.
2. ALL TOPSOIL (BOTH ONSITE AND OFFSITE SOURCES) SHALL BE COMPOSED OF A NATURAL, FERTILE, FRIABLE SOIL TYPICAL OF CULTIVATED TOPSOILS OF THE LOCALITY. SOIL SHALL BE SUITABLE FOR THE GERMINATION OF SEEDS AND SUPPORT OF VEGETATIVE GROWTH, WITH ADDITIVES, IF REQUIRED, TO ACHIEVE PARTICLE DISTRIBUTION AND ORGANIC CONTENT BELOW. TOPSOIL SHALL BE TAKEN FROM A WELL-DRAINED, ARIABLE SITE, FREE OF SUBSOIL, LARGE STONES, EARTH CLODS, STICKS, TRASH, STUMPS, CLAY LUMPS, ROOTS, OTHER OBJECTIONABLE, EXTRANEOUS MATTER OR DEBRIS NOR CONTAIN TOXIC SUBSTANCES.
3. THE CONTRACTOR SHALL PROVIDE THE OWNER / LANDSCAPE ARCHITECT WITH TOPSOIL TEST RESULTS (RECOMMEND UMASS AMHERST SOIL TESTING LAB) FOR APPROVAL PRIOR TO OBTAINING AND PLACING THE SOIL. IF THE PLANTING SOIL (BOTH ONSITE AND OFFSITE SOURCES) DOES NOT FALL WITHIN THE REQUIRED SIEVE ANALYSIS, TEXTURAL CLASS, ORGANIC CONTENT, OR PH RANGE, IT SHALL BE ADJUSTED TO MEET THE SPECIFICATIONS THROUGH THE ADDITION OF SAND, COMPOST, LIMESTONE, OR ALUMINUM SULFATE TO BRING IT WITHIN THE SPECIFIED LIMITS.
4. TOPSOIL SHALL HAVE A PH VALUE BETWEEN 5.5 AND 6.5. TOPSOIL SHALL CONTAIN BETWEEN 4% AND 8% ORGANIC MATTER OF TOTAL DRY WEIGHT AND SHALL CONFORM TO THE FOLLOWING GRADATION AND TEXTURE CLASS ABOVE.

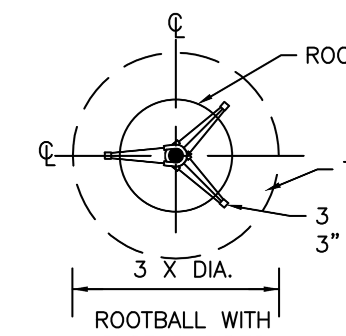
TOPSOIL FOR TREES, SHRUBS, & PERENNIALS
NOT TO SCALE
4

(2) MIN. 2" X 2" X 8' WOOD POSTS FOR TREES UNDER 3" CALIPER
10'-0" FOR TREES > 3" CAL. 8'0" FOR TREES 3" CAL. AND UNDER



ROOTBALL
ARBOR TIES BY DEEP ROOTS OR APPROVED EQUAL.
REMOVE STAKES AFTER ONE GROWING SEASON.
3" BARK MULCH. SEE PLAN FOR TYPE. DO NOT MOUND MULCH.
4" EARTH SAUCER AROUND TREE.
BACKFILL PLANTING MIX. SEE NOTES 2 & 3.
UNDISTURBED SUBGRADE.
CUT & ENTIRELY REMOVE WIRE BASKET AND ALL SYNTHETIC MATERIALS FROM ROOT BALL. IF BURLAPPED, CUT OFF & REMOVE MIN. 2/3 OF BURLAP.

SECTION VIEW

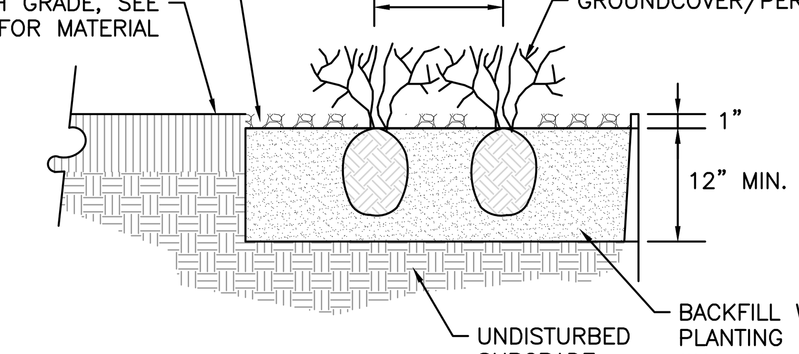


PLAN VIEW

NOTES:
1. ALL TREES SHALL HAVE THE SAME RELATIONSHIP TO FINISH GRADE AFTER PLANTING AS THEY HAD AT THE ORIGINAL NURSERY SETTING. ROOT FLARE SHALL BE 2" ABOVE FINISH GRADE. REMOVE SOIL FROM TRUNK FLARE OF TREE TO DETERMINE ACTUAL ROOTBALL AREA.
2. BACKFILL WITH PLANTING MIX. PLANT MIX TO BE: 50% NATIVE TOPSOIL, 20% BLENDED AND GROUND COMPOST (LEAVES & ORGANIC MATERIAL, NO ASH OR TOXIC MATERIALS) 20% PEAT MOSS, 10% SAND.
3. ADD MYCORRHIZA SOIL ADDITIVES AND SLOW RELEASE FERTILIZER WHEN PLANT HOLES ARE 50% FILLED AND WATER THOROUGHLY AT COMPLETION.

DECIDUOUS TREE
NOT TO SCALE
3

2" BARK MULCH, SEE PLANT FOR TYPE.
FINISH GRADE, SEE PLAN FOR MATERIAL
SPACING AND PATTERN VARIES SEE PLAN
GROUNDCOVER/PERENNIAL

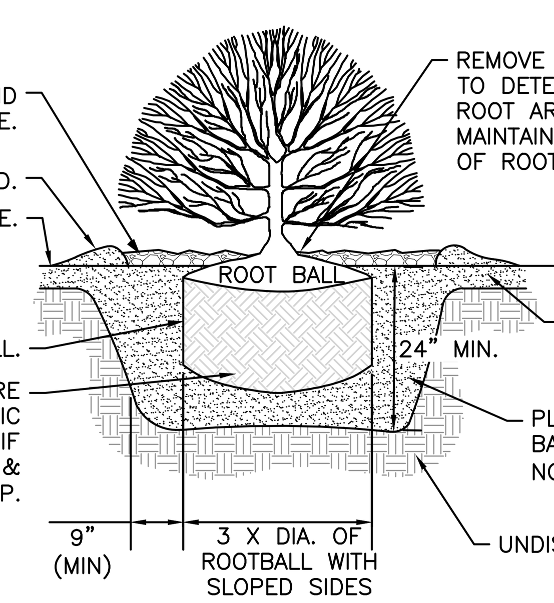


UNDISTURBED SUBGRADE.
BACKFILL WITH PLANTING MIX. SEE NOTES 1,2 AND 3.

NOTES:
1. ALL GROUNDCOVER/PERENNIALS SHALL HAVE THE SAME RELATIONSHIP TO FINISH GRADE AFTER PLANTING AS THEY HAD AT THE ORIGINAL NURSERY SETTING. ROOT FLARE SHALL BE 2" ABOVE FINISH GRADE. REMOVE SOIL FROM STEM OF GROUND COVER/ PERENNIAL TO DETERMINE ACTUAL ROOTBALL AREA.
2. BACKFILL WITH PLANTING MIX. PLANT MIX TO BE: 50% NATIVE TOPSOIL, 20% BLENDED AND GROUND COMPOST (LEAVES & ORGANIC MATERIAL, NO ASH OR TOXIC MATERIALS) 20% PEAT MOSS, 10% SAND.
3. ADD MYCORRHIZA SOIL ADDITIVES AND SLOW RELEASE FERTILIZER WHEN PLANT HOLES ARE 50% FILLED AND WATER THOROUGHLY AT COMPLETION.

GROUNDCOVER/PERENNIAL PLANTING
NOT TO SCALE
5

3" MULCH. DO NOT MOUND MULCH. SEE PLAN FOR TYPE.
4" EARTH SAUCER AROUND.
FINISH GRADE.
ROOT BALL.
CUT & ENTIRELY REMOVE WIRE BASKET AND ALL SYNTHETIC MATERIALS FROM ROOTBALL. IF BURLAPPED, CUT OFF & REMOVE MIN. 2/3 OF BURLAP.



REMOVE SOIL FROM STEMS TO DETERMINE WHERE ROOT AREA BEGINS. MAINTAIN ORIGINAL GRADE OF ROOT FLARE.
6" MIN. TOPSOIL AT LAWN AREAS.
PLANTING MIX BACKFILL SEE NOTES #2 &3
UNDISTURBED SOIL

NOTES:
1. ALL SHRUBS ROOT FLARE SHALL HAVE THE SAME RELATIONSHIP TO FINISH GRADE AFTER PLANTING AS THEY HAD AT THE ORIGINAL NURSERY SETTING.
2. BACKFILL WITH PLANTING MIX. PLANT MIX TO BE: 50% NATIVE TOPSOIL, 20% COMPOST (LEAVES & ORGANIC MATERIAL, NO ASH) 20% PEAT MOSS, 10% SAND.
3. ADD MYCORRHIZA SOIL ADDITIVES AND SLOW RELEASE FERTILIZER WHEN PLANT HOLES ARE 50% FILLED. WATER THOROUGHLY AT COMPLETION.
4. SHRUB BEDS TO HAVE 24" MIN. OF CONTINUOUS PLANTING SOIL.

SHRUB
NOT TO SCALE
6

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03.25.2024

PROFESSIONAL LANDSCAPE ARCHITECT FOR ALLEN & MAJOR ASSOCIATES, INC.

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1 SYLVAN STREET
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STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

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PREPARED BY:
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DRAWING TITLE: LANDSCAPE NOTES & DETAILS
SHEET No. L-501

LANDSCAPE MANAGEMENT NOTES:

LANDSCAPE MANAGEMENT PLAN

IT SHOULD BE RECOGNIZED THAT THIS IS A GENERAL GUIDELINE TOWARDS ACHIEVING HIGH QUALITY AND WELL GROOMED LANDSCAPED AREAS. THE GROUNDS STAFF / LANDSCAPE CONTRACTOR MUST RECOGNIZE THE SHORTCOMINGS OF A GENERAL MAINTENANCE PROGRAM SUCH AS THIS, AND MODIFY AND/OR AUGMENT IT BASED ON WEEKLY, MONTHLY, AND YEARLY OBSERVATIONS. IN ORDER TO ASSURE THE HIGHEST QUALITY CONDITIONS, THE STAFF MUST ALSO RECOGNIZE AND APPRECIATE THE NEED TO BE AWARE OF THE CONSTANTLY CHANGING CONDITIONS OF THE LANDSCAPING AND BE ABLE TO RESPOND TO THEM ON A PROACTIVE BASIS.

FERTILIZER

- MAINTENANCE PRACTICES SHOULD BE AIMED AT REDUCING ENVIRONMENTAL, MECHANICAL AND PEST STRESSES TO PROMOTE HEALTHY AND VIGOROUS GROWTH. WHEN NECESSARY, PEST OUTBREAKS SHOULD BE TREATED WITH THE MOST SENSITIVE CONTROL MEASURE AVAILABLE. SYNTHETIC CHEMICAL CONTROLS SHOULD BE USED ONLY AS A LAST RESORT TO ORGANIC AND BIOLOGICAL CONTROL METHODS. FERTILIZER, SYNTHETIC CHEMICAL CONTROLS AND PEST MANAGEMENT APPLICATIONS (WHEN NECESSARY) SHOULD BE PERFORMED ONLY BY LICENSED APPLICATORS IN ACCORDANCE WITH THE MANUFACTURER'S LABEL INSTRUCTIONS WHEN ENVIRONMENTAL CONDITIONS ARE CONDUCIVE TO CONTROLLED PRODUCT APPLICATION.

- ONLY SLOW-RELEASE ORGANIC FERTILIZERS SHOULD BE USED IN THE LANDSCAPED AREAS TO LIMIT THE AMOUNT OF NUTRIENTS THAT COULD ENTER DOWNSTREAM RESOURCE AREAS. FERTILIZATION OF DEVELOPED AREAS ON SITE WILL BE PERFORMED WITHIN MANUFACTURERS LABELING INSTRUCTIONS AND SHALL NOT EXCEED AN NPK RATIO OF 1:1:1 (I.E. TRIPLE 10 FERTILIZER MIX), CONSIDERED A LOW NITROGEN MIXTURE. ADDITIONALLY, THE FERTILIZER WILL INCLUDE A SLOW RELEASE ELEMENT.

LANDSCAPE MAINTENANCE PROGRAM PRACTICES:

SHRUBS

- MULCH NOT MORE THAN 3" DEPTH WITH SHREDDED PINE OR FIR BARK.
- HAND PRUNE ANNUALLY, IMMEDIATELY AFTER BLOOMING, TO REMOVE 1/3 OF THE ABOVE-GROUND BIOMASS (OLDER STEMS). STEM REMOVALS TO OCCUR WITHIN 6" OF THE GROUND TO OPEN UP SHRUB AND MAINTAIN TWO-YEAR WOOD (THE BLOOMING WOOD).
- FERTILIZE WITH 1/2 LB. SLOW-RELEASE FERTILIZER (SEE ABOVE SECTION ON FERTILIZER) EVERY SECOND YEAR.
- HAND PRUNE EVERGREEN SHRUBS ONLY AS NEEDED TO REMOVE DEAD AND DAMAGED WOOD AND TO MAINTAIN THE NATURALISTIC FORM OF THE SHRUB. NEVER MECHANICALLY SHEAR EVERGREEN SHRUBS.

TREES

- PROVIDE AFTERCARE FOR NEW TREE PLANTINGS FOR THE FIRST THREE YEARS.
- DO NOT FERTILIZE TREES, IT ARTIFICIALLY STIMULATES THEM (UNLESS TREE HEALTH WARRANTS).
- WATER ONCE A WEEK FOR THE FIRST YEAR; TWICE A MONTH THE SECOND, ONCE A MONTH THE THIRD YEAR.
- PRUNE TREES ON A FOUR-YEAR CYCLE.

ORNAMENTAL GRASSES/PERENNIALS

- APPLY LOW- NITROGEN 10-10-10 FERTILIZER AS GROWTH RESUMES IN THE SPRING.
- WATER THOROUGHLY.
- GRASSES/PERENNIALS DO NOT NEED TO BE CUT DOWN BEFORE WINTER. IN FACT, THEY ARE ATTRACTIVE WHEN LEFT STANDING AND THE FOLIAGE HELPS TO INSULATE THE CROWN OF THE PLANT.
- CUT BACK THE FOLIAGE TO ABOUT 4-6 INCHES IN THE SPRING BEFORE GROWTH RESUMES. WHEN FOLIAGE IS REMOVED, SPRING GROWTH WILL BEGIN EARLIER. OLD FOLIAGE LEFT ON THE PLANT CAN DELAY THE CROWN'S WARMING AND SUBSEQUENT GROWTH BY AS MUCH AS 3 WEEKS.

WATERING

- WATERING TREES, SHRUBS AND PERENNIALS SHOULD BE DONE WEEKLY UPON ESTABLISHMENT FOR 6 MONTHS.

LANDSCAPE NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE TOWN OF READING.
2. PLANTING PLAN IS DIAGRAMMATIC IN NATURE. FINAL PLACEMENT OF PLANTS TO BE APPROVED BY THE LANDSCAPE ARCHITECT IN THE FIELD.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING ALL UTILITY COMPANIES, ANY PERMITTING AGENCIES, AND "DIG-SAFE" (1-888-344-7233) AT LEAST 72 HOURS IN ADVANCE OF ANY WORK THAT WILL REQUIRE EXCAVATION. CONTRACTOR SHALL NOTIFY THE OWNERS REPRESENTATIVE OF NAY CONFLICTS IN WRITING.
4. NO PLANT MATERIAL SHALL BE INSTALLED UNTIL ALL GRADING AND CONSTRUCTION HAS BEEN COMPLETED IN THE IMMEDIATE AREA.
5. ANY TREES NOTED AS "SEAL OR SELECTED SPECIMEN" SHALL BE TAGGED AND SEALED BY THE LANDSCAPE ARCHITECT.
6. ALL TREES SHALL BE BALLED AND BURLAPPED (B&B) UNLESS OTHERWISE NOTED OR APPROVED BY THE OWNER'S REPRESENTATIVE AND LANDSCAPE ARCHITECT.
7. CONTRACTOR SHALL VERIFY QUANTITIES SHOWN ON PLANT LIST. QUANTITIES SHOWN ON PLANS SHALL GOVERN OVER PLANT LIST.
8. ANY PROPOSED PLANT SUBSTITUTIONS MUST BE APPROVED IN WRITING BY OWNER'S REPRESENTATIVE AND LANDSCAPE ARCHITECT.
9. ALL PLANT MATERIALS INSTALLED SHALL MEET THE GUIDELINES ESTABLISHED BY THE AMERICAN STANDARD FOR NURSERY STOCK PUBLISHED BY AMERICANHORT (LATEST EDITION).
10. ALL PLANT MATERIALS SHALL BE GUARANTEED FOR ONE YEAR FOLLOWING DATE OF ACCEPTANCE. ANY PLANT MATERIALS WHICH DIE WITHIN THE ONE YEAR PLANT GUARANTEE PERIOD WILL BE REPLACED BY THE LANDSCAPE CONTRACTOR. OWNERS TO COORDINATE DIRECTLY WITH THE LANDSCAPE CONTRACTOR FOR REPLACEMENT PLANTINGS.
11. ANY FALL TRANSPLANTING HAZARD PLANTS SHALL BE DUG IN THE SPRING AND STORED FOR FALL PLANTING.
12. TREES SHALL HAVE A MINIMUM CALIPER AS INDICATED ON THE PLANTING SCHEDULE TAKEN ONE FOOT ABOVE THE ROOT CROWN.
13. ALL PLANT BEDS AND TREE SAUCERS TO RECEIVE 3" OF PINE BARK MULCH. GROUNDCOVER AREAS SHALL RECEIVE 1" OF PINE BARK MULCH.
14. ALL DECIDUOUS TREES ADJACENT TO WALKWAYS AND ROADWAYS SHALL HAVE A BRANCHING PATTERN TO ALLOW FOR A MINIMUM OF 7' OF CLEARANCE BETWEEN THE GROUND AND THE LOWEST BRANCH.
15. ALL TREE STAKES SHALL BE STAINED DARK BROWN.
16. CONTRACTOR RESPONSIBLE FOR WATERING UNTIL A UNIFORM STAND OF VEGETATION IS ESTABLISHED AND ACCEPTED.
17. ALL PARKING ISLANDS PLANTED WITH SHRUBS SHALL HAVE 24" OF TOP SOIL. FINISH GRADE SHALL BE SLOPED TO SIX INCHES (6") ABOVE THE TOP OF CURB.
18. SOIL SAMPLES, TESTS, AND SHOP DRAWINGS SHALL BE PROVIDED TO THE LANDSCAPE ARCHITECT OR THE OWNER FOR APPROVAL PRIOR TO CONSTRUCTION.
19. MULCH SHALL NOT BE NEWLY APPLIED WITHIN 18" OF ANY COMBUSTIBLE PORTION OF ANY BUILDING PER THE LATEST BOARD OF FIRE PREVENTION REGULATIONS (527 CMR 17.05).
20. ALL LANDSCAPED AREAS WITH SHRUBS, TREES, AND PERENNIALS TO HAVE 2 FEET MINIMUM DEPTH OF TOPSOIL. TWO FEET OF TOPSOIL AROUND TREES AND SHRUBS DOES NOT INCLUDE AMENDED PLANTING SOIL WITHIN TREE / SHRUB PIT FOR FULL DEPTH OF ROOTBALLS. SEE PLANTING DETAILS FOR PLANTING DEPTH AT SHRUBS AND TREES. TOPSOIL TO BE TESTED BY CONTRACTOR, AND APPROVED BY A&M PRIOR TO PURCHASE AND OR PLACEMENT. GENERAL, DEMOLITION, AND LANDSCAPE CONTRACTORS TO COORDINATE PROPER DEPTH OF EXISTING MATERIAL REMOVAL ACROSS SITE SO THAT 2 FEET MINIMUM DEPTHS OF PROPOSED TOPSOIL NOTED ABOVE ARE MET. SEE TOPSOIL DETAIL.
21. PRIOR TO LAYING TOPSOIL, ALL SUBSOIL (BELOW PROPOSED TOPSOIL) TO BE TILLED TO A DEPTH OF AT LEAST 18" TO REMOVE CONSTRUCTION COMPACTION AND ALLOW FOR PROPER DRAINAGE OF TOPSOILS.
22. IF THERE IS NO PROPOSED IRRIGATION SYSTEM AFTER PLANTINGS AREAS HAVE BEEN INSTALLED, LANDSCAPE CONTRACTOR RESPONSIBLE TO TEMPORARILY WATER ALL INSTALLED PLANTINGS, AREAS MIN. 4 TIMES A WEEK DURING INITIAL ESTABLISHMENT PERIOD OF 6 MONTHS AFTER ALL LANDSCAPING IS INSTALLED.
23. ALL PROPOSED LANDSCAPE AREAS INCLUDING TREES, SHRUB BEDS, AND PERENNIALS SHALL BE PROVIDED WITH WATER EFFICIENT UNDERGROUND IRRIGATION. DESIGN AND INSTALLATION OF IRRIGATION SYSTEM TO BE PERFORMED BY AN APPROVED IRRIGATION DESIGN BUILD CONTRACTOR OR BY AN APPROVED EQUAL TO BE DETERMINED BY THE OWNERS REPRESENTATIVE AND LANDSCAPE ARCHITECT. IRRIGATION SYSTEM IS TO BE DESIGNED FOR EFFICIENT WATER USAGE INCLUDING: USE OF DRIP IRRIGATION FOR SHRUBS AND PERENNIALS, IRRIGATION SYSTEM WITH HEAD-TO-HEAD COVERAGE, A CENTRAL SHUT-OFF VALVE, SEPARATE ZONES FOR EACH TYPE OF BEDDING AREA BASED ON WATERING NEEDS, AND A RAIN SENSOR TO SHUT OFF IRRIGATION DURING RAIN EVENTS.

PLANTING SCHEDULE -TREES, SHRUBS, GROUNDCOVERS & PERENNIALS

	KEY	QTY	BOTANICAL NAME	COMMON NAME	SIZE	SPACING	COMMENTS
DECIDUOUS SHADE AND FLOWERING TREES							
*	GT	3	GLEDITSIA TRICANTHOS	THORNLESS HONEYLOCUST	3" CAL.	AS SHOWN	B&B
*	QPP	9	QUERCUS PALUSTRIS 'GREEN PILLAR'	GREEN PILLAR OAK	3" CAL.	AS SHOWN	B&B
*	TA	6	TILIA AMERICANA 'REDMOND'	REDMOND AMERICAN LINDEN	3" CAL.	AS SHOWN	B&B
ORNAMENTAL TREES							
*	AC	3	AMELANCHIER CANADENSIS	SHADBLOW SERVICEBERRY	6-7' HT.	AS SHOWN	B&B
*	CF	2	CORNUS FLORIDA	FLOWERING DOGWOOD	3" CAL.	AS SHOWN	B&B
*	MF	2	MALUS FLORIBUNDA	CRABAPPLE	3" CAL.	AS SHOWN	B&B
*	WP	2	PRUNUS AMERICANA	WILD PLUM	3" CAL.	AS SHOWN	B&B
EVERGREEN TREES							
*	AB	6	ABIES BALSAMEA	BALSAM FIR	#10	15' O.C.	POT
*	TON	27	THUJA OCCIDENTALIS 'NIGRA'	AMERICAN ARBORVITAE	7-8' HT.	5' O.C.	B&B
TOTAL TREES		60					
SHRUBS							
*	NJ	47	CEANOTHUS AMERICANUS	NEW JERSEY TEA	2.5'-3' HT.	AS SHOWN	B&B
*	CA	39	CLETHRA ALNIFOLIA	SUMMERSWEET	#5	48" O.C.	POT
	IC	40	ILEX CRENATA 'SKY PENCIL'	SKY PENCIL HOLLY	#15	24" O.C.	POT
*	IG	57	ILEX GLABRA 'SHAMROCK'	SHAMROCK INKBERRY	#7	36" O.C.	POT
*	RN	32	RHODODENDRON 'NOVA ZEMBLA'	NOVA ZEMBLA RHODODENDRON	#5	6' O.C.	POT
*	TS	57	THUJA OCCICENTALIS 'SMARAGD'	SMARAGD ARBORVITAE	6-7' HT.	AS SHOWN	B&B
PERENNIALS/GRASSES							
	CK	100	CALAMAGROSTIS 'KARL FOERSTER'	KARL FOERSTER FEATHER REED GRASS	#2	24" O.C	STAGGERED
	NF	TBD	NEPETA X FAASSENII 'WALKER'S LOW'	WALKER'S LOW CATMINT	#2	36" O.C.	STAGGERED
*	RH	TBD	RUDBECKIA FULGIDA	BLACK EYED SUSAN	#1	30" O.C.	STAGGERED
	TP	TBD	THYMUS PRAECOX 'ALBIFLORUS'	STEPABLES CREEPING THYME	QUART	8" O.C.	STAGGERED
ANNUALS							
		TBD	"PROVEN WINNERS" BREATHTAKING MIX		FLATS	AS NEEDED	STAGGERED
*	DENOTES NATIVE SPECIES OR NATIVE CULTIVAR						

MASSACHUSETTS
Jacqueline B. Trainer
REGISTERED LANDSCAPE ARCHITECT
NO. 1526

03.25.2024

PROFESSIONAL LANDSCAPE ARCHITECT FOR ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
B	3/25/2024	REVISED PER TOWN COMMENTS
A	2/29/2024	REVISED PER TOWN COMMENTS

APPLICANT\OWNER:
BLVD READING, LLC
c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:

STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	AS SHOWN	DWG. NAME:	L-2398-01A
DESIGNED BY:	JBT	CHECKED BY:	CMQ

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ◆ land surveying
environmental consulting ◆ landscape architecture
www.allenmajor.com
100 COMMERCE WAY, SUITE 5
WOBURN MA 01801
TEL: (781) 935-6889
FAX: (781) 935-2896
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE: LANDSCAPE NOTES & DETAILS

SHEET No. L-502

NOTES:
1. THIS DETAIL IS PROTOTYPICAL IN NATURE AND IS NOT TO BE USED TO BUILD FROM FOR CONSTRUCTION. CONTRACTOR SHALL SUBMIT SHOP DRAWING FOR APPROVAL PRIOR TO ORDER & PURCHASE.
2. PERGOLA DESIGNED & BUILT BY FOREVER REDWOOD OR EQUAL. ALL PERGOLA WOOD TO BE MOSAIC REDWOOD, 12 YEAR WARRANTY.
3. FLUSH CUTTING RAFTER AND SUPPORTS END CUT DETAIL.
4. 4 POST ANCHOR KIT FOR WOOD WITH LAG BOLTS.
5. 4 FT. DEPTH MIN. CONC. FOOTINGS FOP ALL POSTS. WOOD TO BE STAINED OR LEFT NATURAL. TRANSPARENT SEALANT INCLUDED. FOR PRICING PURPOSES ONLY STAINED WITH 2 COATS. PROVIDE SHOP DRAWINGS FOR APPROVAL PRIOR TO ORDERING.
6. PERGOLA STRUCTURE INCLUDING FASTENERS, WOOD SIZING, AND 4 FT. DEPTH CONCRETE FOOTINGS FOR ALL POSTS TO BE REVIEWED AND APPROVED BY STRUCTURAL ENGINEER LICENSED IN THE STATE OF MA & AT CONTRACTOR'S COST PRIOR TO PURCHASE & INSTALLATION. PERGOLA CONTRACTOR TO COORD. PERGOLA INSTALLATION WITH ADJACENT LIGHTING, SURFACE MATERIALS, AND FOOTING CONTRACTORS.

   FOREVER REDWOOD
   33732 ANNAPOLIS RD.
   ANNAPOLIS, CA 95412
   CUSTOMER SERVICE / ORDER INFO
   ALEJANDRO OR SOPHIA
   (866) 332-2403
   HELP@FOREVERREDWOOD.COM

   PERGOLA TO BE:
   "THE L.A. MODERN PERGOLA" OR "THE SILVERADO MODERN PERGOLA"
   25'-6" X 12'-9", POST HEIGHT: 10 FT. NO WALL PRIVACY PANELS

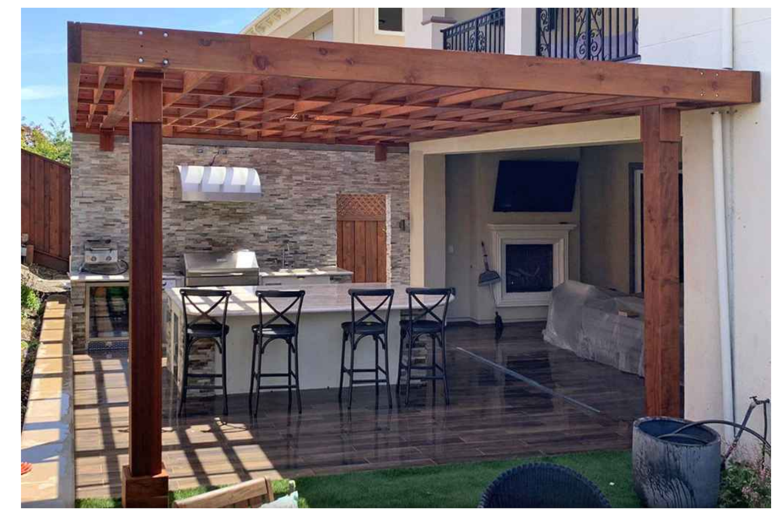
   8" x 8" POSTS ON 4 FT. DEPTH BELOW GRADE CONCRETE FOOTINGS (4,500 PSI) AT 28 DAY STRENGTH.

   PERGOLA ROOF STYLE: OPEN ROOF WITH SLATS AT 12" AND RAFTERS AT 18"

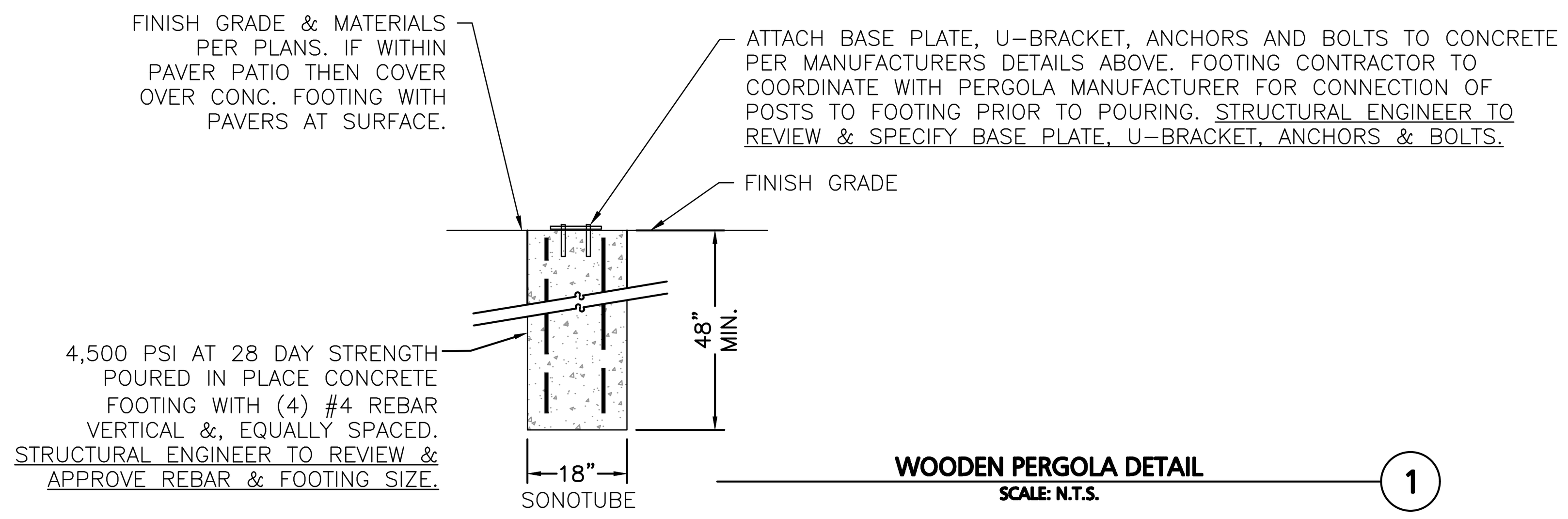
   POST DECORATIVE TRIM: VERTICAL POST
   DECORATIVE TRIM (ALL POSTS)

   MINIMUM POST ANCHORING: POST ANCHOR KIT ON 4 FT. DEPTH BELOW GRADE CONC. FOOTINGS (4,500 PSI) FOR HURRICANE-WIND. A MASSACHUSETTS LICENSED STRUCTURAL ENGINEER (AT CONTRACTOR COST) TO PROVIDE REVIEW & APPROVAL FOR STATE CODES, & WIND & SNOW LOAD. CONTRACTOR TO MAKE CHANGES AS APPROPRIATE FOR THIS SITE & AS NOTED BY THE STRUCTURAL ENGINEER.

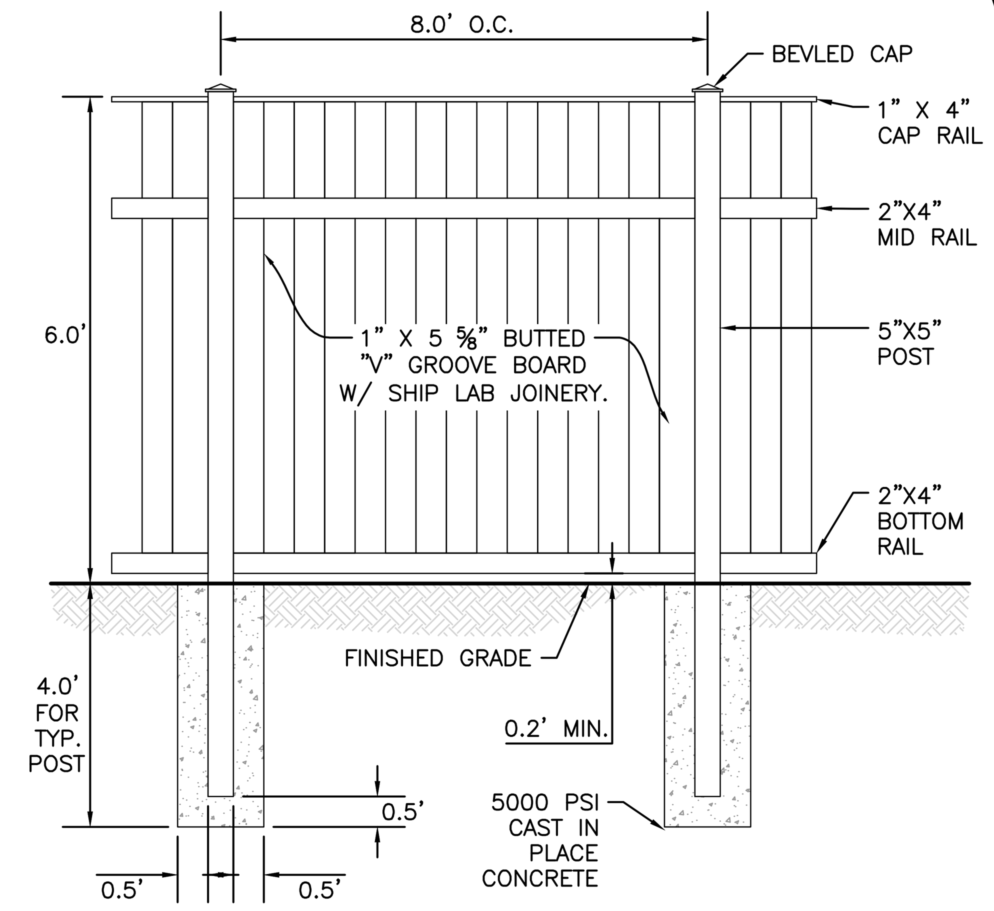
L A MODERN PERGOLA



SILVERADO MODERN PERGOLA



WOODEN PERGOLA DETAIL
SCALE: N.T.S.
1



NOTES:
1. 6' HEIGHT PRIVACY FENCE. SEE SHEET L-102 FOR MODEL NUMBER.
2. PREPARE SHOP DRAWINGS FOR APPROVAL PRIOR TO CONSTRUCTION.
3. COLOR TO BE WHITE AND TO BE APPROVED BY OWNER.
4. SEE PLAN FOR LOCATIONS.

PRIVACY FENCE
NOT TO SCALE
2

Oahu No Scratch® Bicycle Rack

Capacity: 2 Warranty: 1 Year

- » No Scratch® bumper protects bike frames
- » Superior functionality and aesthetics
- » High security
- » Extremely difficult to cut
- » Works with a variety of lock types

Product Specifications

Materials:
- » Stainless Steel or Mild Steal
  - » Outer Tube: 2" x 1" x 0.120" rectangular tubing
  - » Inner Bar: 0.25" x 2" flat bar
- » Santoprene® Rubber Bumper

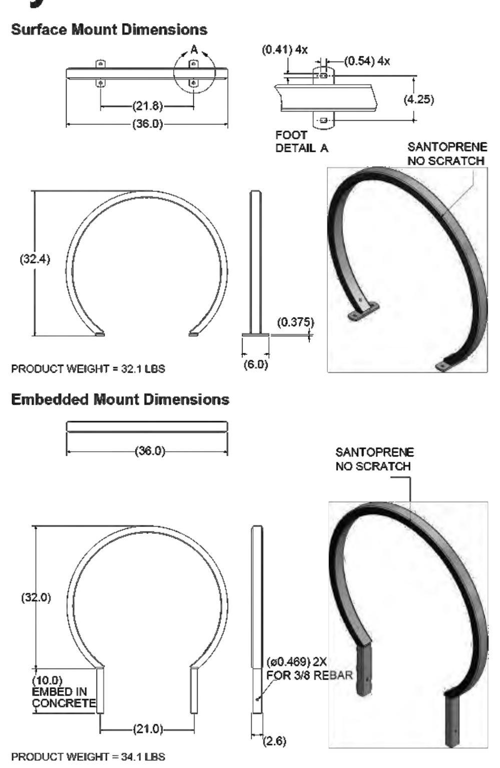
Finishing Options:
- ☐ Stainless Steel Bead Blast Satin (recommended)
- ☐ Stainless Steel Powder Coat
- ☐ Stainless Steel Thermoplastic (Plascoat)
- ☐ Mild Steel Hot Dipped Galvanized (Surface Mount Only)
- ☐ Mild Steel Powder Coat
- ☐ Mild Steel Thermoplastic (Plascoat)

Mounting Options:
- ☐ Surface Mount: 0.375" x 2" x 6" flat bar foot
- ☐ Embedded In-Ground Mount into concrete footing

Hardware Options:
- ☐ Concrete Wedge Anchors (standard)
  - ☐ + Tamper Resistant Nuts (recommended)

For other hardware options contact our sales and support staff.

Surface Mount Dimensions

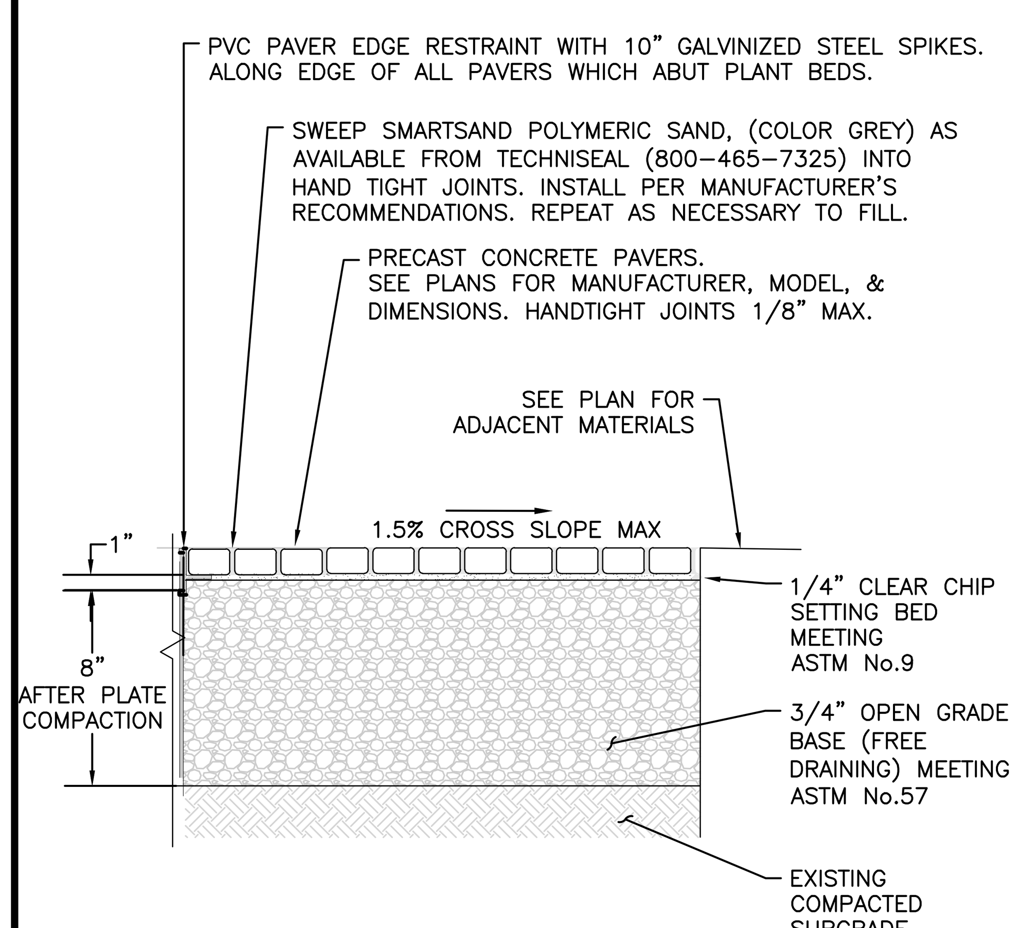


* All dimensions are in inches

Revised: 11/09/2020

www.sportworks.com

BIKE RACK
NOT TO SCALE
3



FIELD PAVERS

ARCANA

Manufactured with EasyClean, an integral sealer that is a property of the paver allowing for easier clean-ups when a spill happens before a stain can develop.

TO BE USED FOR FIREPIT PATIO AREA. PERMEABLE PAVER SPACERS WILL BE REQUIRED IN THIS APPLICATION TO MAKE ARCANA PERMEABLE.

24"X24"
606mm x 606mm x 50mm
23 7/8" x 23 7/8" x 2"

ARCANA | CORVARA COLOR

ACCENT PAVERS

ARCANA

Manufactured with EasyClean, an integral sealer that is a property of the paver allowing for easier clean-ups when a spill happens before a stain can develop.

TO BE USED FOR FIREPIT PATIO AREA. PERMEABLE PAVER SPACERS WILL BE REQUIRED IN THIS APPLICATION TOMAKE ARCANA PERMEABLE.

24"X24"
606mm x 606mm x 50mm
23 7/8" x 23 7/8" x 2"

ARCANA| VIVANTO

NOTES:
1. SUBMIT SAMPLES & SHOP DRAWING OF PAVERS AND COLOR CHART FOR APPROVAL PRIOR TO ORDERING.
2. SUBMIT SHOP DRAWING FOR APPROVAL OF SETTING BED AND FREE DRAINING BASE SIEVE ANALYSIS PRIOR TO ORDERING.
3. FIELD PAVERS TO BE 24" x 24" x 2" DEEP ARCANA IN CORVARA COLOR.
4. ACCENT BAND PAVERS TO BE 24" x 24" x 2" DEEP ARCANA IN VIVANTO COLOR.

PRECAST CONCRETE PAVERS
NOT TO SCALE
4

AcoustiGuard

AG160-WC

Sound Barrier / Absorption Wall

Acoustically Absorbent, High Transmission Loss Barrier Wall System

NOTES:
1. 6' HEIGHT SILENT PROTECTOR FENCE.
2. PREPARE SHOP DRAWINGS FOR APPROVAL PRIOR TO CONSTRUCTION.
3. COLOR TO BE WHITE AND TO BE APPROVED BY OWNER.
4. SEE PLAN FOR LOCATIONS.

SILENT PROTECTOR (ABSORPTIVE)

SOUND BARRIER FENCE
NOT TO SCALE
6

N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\L-2398-01A_AMENITIES.DWG

COMMONWEALTH OF MASSACHUSETTS REGISTERED LANDSCAPE ARCHITECT NO. 1526

03.25.2024

PROFESSIONAL LANDSCAPE ARCHITECT FOR ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
B	3/25/2024	REVISED PER TOWN COMMENTS
A	2/29/2024	REVISED PER TOWN COMMENTS

APPLICANT\OWNER:
BLVD READING, LLC
c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:

STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	AS SHOWN	DWG. NAME:	L-2398-01A
DESIGNED BY:	JBT	CHECKED BY:	CMQ

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ♦ land surveying
environmental consulting ♦ landscape architecture
www.allenmajor.com
100 COMMERCE WAY, SUITE 5
WOBURN MA 01801
TEL: (781) 935-6889
FAX: (781) 935-2896
WOBURN, MA ♦ LAKEVILLE, MA ♦ MANCHESTER, NH

DRAWING TITLE:	SHEET No.
SITE AMENITIES DETAILS	L-503

Town of Reading
16 Lowell Street, Reading, MA 01867

Community Planning & Development Commission
Andrew MacNichol *Community Development Director*
Direct: 781-942-6670
amacnichol@ci.reading.ma.us
readingma.gov/community-planning-and-development-commission

April 8, 2024

Special Permit and Site Plan Review

DECISION

Project: Strada on South Main
Address: 258-262 Main Street
Applicant & Owner: BLVD Reading, LLC

To the Town Clerk:
This is to certify that, at a public hearing of the Community Planning and Development Commission opened on December 11, 2023 and closed on XXX by a motion duly made and seconded, it was voted:

"We, the Reading Community Planning and Development Commission, upon request from BLVD Reading LLC, under the provision of Sections 4.3 and 4.6 of the Zoning Bylaws of the Town of Reading and under the Town of Reading General Bylaw Section 7.9 and CPDC Stormwater Management and Erosion Control Regulations, to consider the Site Plan and Stormwater Permit for 252, 258, 262 Main Street & 10 Pinevale Avenue (Assessors Map 11, Lots 192, 193, 194, 196) as shown on the Site Development Plans prepared by Allen and Major Associates, Inc., dated October 5, 2023 and most recently revised XXX and architectural plans prepared by RP Architectural Studio, dated October 23, 2023 and most recently revised XXX – do hereby vote X-X-X, to ____ the said plans. And under the provisions of Section 4.4 and 5.6.7 of the Zoning Bylaws of the Town of Reading we do hereby vote X-X-X to ____ the Special Permit for Mixed-Use on site, subject to the Findings and Conditions below."

Materials Submitted:
The following materials were submitted into the public record:

1. Site Plan Review Application, Narrative, and Filing Fee, received 11/6/23.
2. Stormwater Permit Application, received 11/28/23.
3. Cover Letter, dated 11/1/23.
4. Certified List of Abutters, dated 7/31/23.
5. Email from Senior Planner to Applicant stating submission was Substantially Complete, dated 11/15/23, including a list of minor revisions for the next plan submission.
6. Legal Notice published in the Daily Times Chronicle on 11/21/23 and 11/28/23.

7. Civil Engineering and Site Plans, 252-262 Main St & 10 Pinevale Ave, Reading MA, prepared by Allen & Major Associates, Inc., including the following:
    1. Sheet: Title Sheet, originally dated 10/5/23 and last updated 3/25/24.
    2. Sheet V-101: Property Line/Existing Conditions, dated 9/6/23.
    3. Sheet C-001: Abbreviations & Notes, originally dated 10/5/23 and last updated 3/25/24.
    4. Sheet C-002: Abbreviations & Notes, originally dated 10/5/23 and last updated 3/25/24.
    5. Sheet C-100: Erosion Control Plan, originally dated 10/5/23 and last updated 3/25/24.
    6. Sheet C-101: Site Preparation Plan, originally dated 10/5/23 and last updated 3/25/24.
    7. Sheet C-102: Layout & Materials Plan, originally dated 10/5/23 and last updated 3/25/24.
    8. Sheet C-103: Grading & Drainage Plan, originally dated 10/5/23 and last updated 3/25/24.
    9. Sheet C-104: Utilities Plan, originally dated 10/5/23 and last updated 3/25/24.
    10. Sheet C-105: Lighting Plan, originally dated 10/5/23 and last updated 3/25/24.
    11. Sheet C-106: Snow Storage Plan, originally dated 10/5/23 and last updated 3/25/24.
    12. Sheet C-107A: Vehicle Movement Plan, originally dated 10/5/23 and last updated 3/25/24.
    13. Sheet C-107B: Vehicle Movement Plan, originally dated 10/5/23 and last updated 3/25/24.
    14. Sheet C-108: Fire Truck Turning Plan, originally dated 10/5/23 and last updated 3/25/24.
    15. Sheet C-109: Abutting Property Dimension Plan, originally dated 10/5/23 and last updated 3/25/24.
    16. Sheet C-201: Site Cross Section Plan, originally dated 10/5/23, and last updated 3/25/24.
    17. Sheets C-501-509: Details, originally dated 10/5/23 and last updated 3/25/24.
    18. Sheet L-101: Landscape Plan, originally dated 10/5/23 and last updated 3/25/24.
    19. Sheet L-102: Site Amenities Plan, originally dated 10/5/23 and last updated 3/25/24.
    20. Sheet L-501: Landscape Notes & Details, originally dated 10/5/23 and last updated 3/25/24.
    21. Sheet L-502: Landscape Notes & Details, originally dated 10/5/23 and last updated 3/25/24.
    22. Sheets L-503: Site Amenities Details, originally dated 10/5/23 and last updated 3/25/24.
8. Architectural Plans for Strada, 258 Main Street Redevelopment, Reading, MA, prepared by RP Architectural Studio, including the following:
    1. Sheet: Title Sheet, originally dated 10/23/23 and last updated 3/25/24.
    2. Sheet A0.1: Plan Diagrams, originally dated 10/23/23 and last updated 3/25/24.
    3. Sheet A1.0: Proposed First Floor Plan, originally dated 10/23/23 and last updated 3/25/24.
    4. Sheet A1.1: Proposed Second Floor Plan, originally dated 10/23/23 and last updated 3/25/24
    5. Sheet A1.2: Proposed Third Floor Plan, originally dated 10/23/23 and last updated 3/25/24.
    6. Sheet A1.3: Proposed Fourth Floor Plan, originally dated 10/23/23 and last updated 3/25/24.
    7. Sheet A1.4: Proposed Roof Plan, originally dated 10/23/23 and last updated 3/25/24.
    8. Sheet A2.1: Proposed Elevations, South and East Sides, originally dated 10/23/23 and last updated 3/25/24.
    9. Sheet A2.1: Proposed Elevations, North and West Sides, originally dated 10/23/23 and last updated 3/25/24.
    10. Sheet A3.1: Materials, originally dated 10/23/23 and last updated 3/25/24.
    11. Sheet A3.2: Lighting, originally dated 10/23/23 and last updated 3/25/24.
    12. Sheet R1.1: Renderings, Southeast & Southwest corners, dated 10/23/23.
    13. Sheet R1.2: Renderings, Northeast & Northwest corners, dated 10/23/23.
    14. Sheet R1.3: Renderings, rooftop, dated 10/23/23.
    15. Sheet R1.3: Renderings, Shadow Study, dated 10/23/23.

9. Existing Tree Plan, prepared by Allen & Major Associates, Inc., dated 3/25/24.
10. Drainage Report, Strada Mixed Used Building 252-262 Main Street & 10 Pinevale Ave reading, MA, prepared by Allen & Major Associates, Inc., prepared for BLVD Reading, LLC, dated 10/5/23 and most recently updated 3/25/24.
11. Transportation Impact Assessment, Proposed Mixed-Use Development 252, 258, 262 Main St & 10 Pinevale Ave Reading MA, prepared by Vanasse & Associates Inc., prepared for BLVD Reading, LLC, dated October 2023
12. Response memo from Applicant to Planning Staff, dated 11/28/23.
13. Submittal of Changes Memo from Saverio Fulciniti to CPDC, dated 1/3/24.
14. Soil Removal Memo from Carlton Quinn to CDD, dated 1/3/24.
15. Plans Associated with Alternate Plan Concept for Review at 1/8/24 Meeting by Allen & Major Associates
    a. Landscape Concept Plan CP-101, dated 1/3/24.
    b. Alternative Layout & Materials Plan C-110, dated 1/3/24.
    c. Alternate Fire Truck Turning Plan C-108, dated 1/3/24.
    d. Existing Tree Plan L-001, dated 1/3/24.
16. Summary of Changes Memo from Jesse Schomer to CPDC, dated 2/6/24.
17. Summary of Changes Memo from Jesse Schomer to CPDC, dated 3/4/24.
18. Summary of Changes Memo from Jesse Schomer to CPDC, dated 3/29/24.
19. Response Letter to Town Engineer Comments, submitted by Allen & Major Associates, Inc., dated 3/26/24.
20. Memo from Landscape Architect Jacqui Trainer to Applicant, dated 2/27/24.
21. Public Comment:
    a. Email from Resident Killeen at 12 Pinevale Ave, received 11/7/23.
    b. Email from Resident McCarty at 43 Pinevale Ave, received 11/7/23.
    c. Email from Resident Lloyd at 46 Pinevale Ave, received 11/13/23.
    d. Letter from Resident Guidi at 54 Pinevale Ave, received 12/4/23.
    e. Email from Resident McKenzie at 7 Pinevale Ave, received 12/4/23.
    f. Email from Residents Farrells at 2 Pinevale Ave, received 12/4/23.
    g. Email from Residents Fullers at 24 Pinevale Ave, received 12/6/23.
    h. Email from Residents Hickeys at 25 Pinevale Ave, received 12/6/23.
    i. Email from Residents Narayan at 16 Pinevale Ave, received 12/6/23.
    j. Email from Residents Willis at 11 Pinevale Ave, received 12/6/23.
    k. Email, video, and photos from Resident Killeen at 12 Pinevale Ave, received 12/6/23.
    l. Email from Residents Richards at 50 Pinevale Ave, received 12/7/23.
    m. Neighborhood Response Memo to SPP Entitlement Criteria for 258 Main St, submitted by Killeen at 12/11/23 meeting.
    n. Email and photos from Resident Killeen at 12 Pinevale Ave, received 1/5/24.
    o. Email from Resident Eves at 134 Pine Ridge Rd, received 1/7/24.
    p. Summary Slides from Resident Narayan at 16 Pinevale, received 1/8/24.
    q. Summary Slides from Resident Richards at 50 Pinevale Ave, received 1/8/24.
    r. Email from Resident Rombola at 9 Pennsylvania Ave, received 1/8/24.
    s. Email from Residents Farrells at 2 Pinevale Ave, received 2/9/24.
    t. Letter from Resident Killeen at 2 Pinevale Ave, dated 2/10/24.

u. Email from Resident Reardon at 25 Pinevale Ave, received 2/11/24.
v. Email from Residents Fullers at 24 Pinevale Ave, received 2/12/24.
w. Email from Resident McKenzie at 7 Pinevale Ave, received 2/12/24.
x. Comments submitted by Resident Guidi at 54 Pinevale Ave, received 2/13/24.
y. Comments submitted by Resident Guidi at 54 Pinevale Ave, received 3/13/24.

22. Memo from Town Engineer, dated 12/7/23.
23. Memo from Town Engineer, dated 3/19/24.
24. Draft Decision, dated 4/8/24.

Findings:

1. **Overview:** The subject site is comprised of four contiguous lots ('site') under common ownership and/or purchase and sales agreement that total 1.059 acres of land. The development tract is primarily zoned Business-A along its eastern edge which fronts onto Main Street. A portion of the development tract is zoned S-15 along the western half of the lots that front Main Street (252, 258, and 262 Main) and the lot at 10 Pinevale Avenue.

2. **Proposal:** The proposal is to construct a 4-story Mixed-Use building, including thirty (30) apartments, three (3) of which will be Deed Restricted Affordable Units. The building will include 7,500SF of commercial space on the first floor. The proposed parking on site includes seventy (70) surface parking spaces, to be used by both the residential and commercial tenants. Four (4) existing curb cuts are being condensed into two (2) curb cuts on Main Street. Access to the residential units will be through a lobby at the rear of the building while the commercial tenant entrances will be provided along sides and the façade facing Main Street. Other site improvements include lowering the overall elevation of the site to better match Main Street, improving landscaping, and adding 3,100SF of outdoor amenity space for residents at the rear of the lot. The existing dwelling at 10 Pinevale Ave will be maintained, with permanent easements provided for the use of the back of the lot at 10 Pinevale Ave as a portion of the parking lot for the proposed mixed-use building.

3. **Existing Use:** The four (4) existing parcels have varying conditions. The existing uses, sizes, and characteristics of the lots are summarized in the table below.

	252 Main St	258 Main St	262 Main St	10 Pinevale Ave	Total
Existing Use:	Mixed-use (2 units)	N/A Razed	N/A vacant structure	Single Family	
Prior Use:	N/A	Office	Mixed-use (2 units)	N/A	
Assessor's ID	11-192	11-193	11-194	11-196	
Lot Size (Acres)	0.234	0.601 (26,160 SF)	0.115 (5,000 SF)	0.109	1.059 Acres
Zoning (primary)	Business A	Business A	Business A	S-15	
Structures on lot	2	0	1	2	5
Year Built (if appl.)	1930	N/A	1926	1925	Avg Age 96 years
Curb Cuts on Main	1	1	1	0	3
Commercial GSF	+/- 700 SF	0 SF	+/- 200 SF	0 SF	+/- 900 SF
Residential Units	1	0	1	1	3
Affordable Units	0	0	0	0	0

The site is abutted by residential uses directly to the north. The 10 Pinevale lot is between two existing residential buildings: 2 Pinevale which is a rental two-family and 12 Pinevale which is an owner-occupied single-family home. Directly to the west of the site behind 258 Main St is a private paper street "Star Road". To the west of 252 Main is an undeveloped piece of land containing wetlands that is the rear part of the parcel 248 Main Street, under different ownership. To the south, the site is abutted by commercial uses with a parking lot and 3-story office building. To the east across Main Street from the site is a recently built 4-story multi-family residential building.

4. **Zoning:** The site overall is split-zoned between the Business-A (Bus-A) Zoning District along the Main Street frontage and the Single-Family S-15 Zoning District at the rear of the lots that front Main St and across 10 Pinevale Avenue. According to section 3.4.1 of the Zoning Bylaw:

   Where a district boundary line divides any lot existing at the time of the line's adoption, any provision of the Zoning Bylaw applicable to a district in which the lot has frontage on a street may be extended so as to be applicable to the portion of the lot that is not more than thirty (30) feet from the district boundary line; provided, however, that this provision shall not apply to any lot used for multi-family housing or to the Aquifer Protection Overlay District boundary lines established by Section 10.3 of the Zoning Bylaw.

   The proposed mixed-use building is entirely within the Bus-A zoned area. When Bus-A is extended the additional 30ft from Main Street, as allowed under Section 3.4.1, the parking lot is fully contained within said extension. The portion of the development that is not within Bus-A or the 30ft extension of Bus-A and is within the S-15 zoning is the proposed rear resident amenity space (including the drainage infrastructure underneath), landscape and screening.

   Per Section 5.6.7, Mixed-Use projects along south Main Street may be authorized by CPDC via Special Permit and shall be designed to comply with the South Main Street Design Best Practices. Per Section 5.3, multi-family housing is permitted by-right within the Bus-A Zoning District. Restaurants and retails stores are also allowed by-right within Bus-A.

5. **Site Plan Review Applicability:** According to Section 4.6.2 of the Zoning Bylaw,

   "*Site Plan Review is required if the proposed construction or site alteration involves any of the following:*

   a. An increase in Gross Floor Area of 500 square feet or more, via the creation of new floor area, that results in the requirement for or addition of 2 or more parking spaces (regardless of parking-related exemptions or waivers); or
   b. A Change of Use within a structure containing an existing public, institutional or commercial use; an existing multi-family dwelling, or a structure containing more than one use; to a use permitted by Special Permit from the CPDC."

The project triggers Site Plan Review by both a Change of Use to a use permitted by Special Permit from the CPDC and an Increase in Gross Floor Area that requires the addition of 2 or more parking spaces.

6. **Special Permit Applicability:** The Applicant requests a Special Permit per Sections 4.4 and 5.6.7 of the Zoning Bylaw in order to construct a Mixed-Use building in Business-A. Mixed-Use requires a Special Permit in Business-A and must meet the requirements laid out in Sections 5.6.7 and 6.3, or request waivers. The application must meet the Special Permit criteria laid out in Section 4.4.5 of the Zoning Bylaw.

7. **Site Access and Circulation:** Mixed-Use projects should limit the number and length of curb cuts on Main Street. The proposed redevelopment would consolidate the four (4) existing curb cuts on Main Street into two (2) curb cuts on Main Street. All drive-aisles and entrances/exits proposed are for one-way traffic only. The southernmost curb cut off of Main Street is proposed as a 22ft curb cut and as entrance only; the one-way drive-aisle through the parking lot is 22ft wide. The northernmost curb cut onto Main St is proposed as a 22ft curb cut for exit only, with no turning movement restrictions and including a stop sign with painted STOP bar.

8. **Parking:** Parking for residential uses must be provided at a rate of 1.25 spaces per unit. With 30 units proposed, 37.5 spaces are required for residential uses. Parking is required at 1 space per 300SF for commercial space. With 7,500 SF of commercial space proposed, 25 spaces are required for commercial uses. The development proposes 70 total parking spaces, exceeding the required 63 spaces.

    - Three (3) ADA spaces are required with one (1) van accessible. Three (3) ADA spaces are proposed with one (1) van accessible.
    - Up to 30% of the total parking spaces are allowed to be proposed as compact spaces (8’ wide and 16’ long). Twenty-one (21) total parking spaces are proposed to be compact, or 30% of the total parking spaces.
    - An electric car charging station with two (2) charging ports has also been proposed in the surface area lot for two (2) of the parking spaces.
    - One (1) ride share parking stall is being proposed.

    Thus, sixty-four (64) parking spaces are being offered as general unrestricted parking.

    With the residential lobby being at the back of the building it is presumed that residents would primarily park in the rear, leaving spaces towards the sides of the parking lot for commercial employees and customers.

9. **Bicycle parking:** Bicycle parking is required to be provided and an outdoor bike rack has been proposed in the rear amenity area, across the parking lot from the residential entrance.

10. **Loading Spaces:** One loading space is required for each Mixed-Use project. A 12ft by 35ft loading zone is proposed in the parking lot, directly off the primary drive aisle and adjacent to the dumpster pad. The loading zone would be large enough for two (2) cars or one (1) box truck to park, and its location directly off the drive-aisle allows enough room for the turning movements of a box truck.

11. **Traffic Impacts:** In this stretch of Main Street there is one lane in each direction with a center two-way left turn lane. Pinevale Avenue is a dead-end road the connects into Main Street with a stop sign. Across the street from Pinevale Avenue is a driveway for the 269 Main Street multi-family building.

    The Applicant submitted a Transportation Impact Assessment prepared by Vanasse & Associates, Inc. who reviewed existing traffic conditions in the area in May 2023 and proposed future traffic impacts from the Mixed-Use project. Traffic generation was calculated using the ITE trip-generation statistics. The project was analyzed as *Strip Retail Plaza* for 6,150SF of the commercial space, *High-Turnover (Sit-Down) Restaurant* for 2,000SF commercial space, and *Multifamily Housing (Low-Rise)* for the previously proposed forty (40) multi-family units. Overall, that iteration of the project was expected to generate 592 net new vehicle trips on an average weekday—296 vehicles entering and exiting. Of those trips, two hundred (200) were proposed to be for the general commercial uses, one-hundred-twenty-two (122) trips for any restaurant use, and two-hundred-seventy (270) trips for residential uses. For peak travel they projected thirty-five (35) new vehicle trips during the weekday morning peak and fifty-four (54) new trips during weekday evening peak hour.

    The report concluded that project-related traffic increases will result in minor delays at area intersections with minimal change in vehicle queuing expected. The project will not result in significant increases in overall traffic volumes.

    Changes to the project since then including the reduction in residential units by 25% and a decrease in commercial square footage will result in even lower traffic impacts than those modeled in the original Transportation Impact Assessment. Changes to the driveway design including the closure of the originally proposed driveway onto Pinevale Ave should result in no queuing impacts to Pinevale Ave as both the entrance and exit for the building are now located on Main St.

12. **Interior Space:** The proposed building will be 35,636sf of Gross Floor Area across the four floors. The proposed building will maintain 7,500 GSF of commercial space and 22,499 GSF of residential space; the remaining 5,637 GSF space being shared utility, entry, circulation, hallway and other.

    a. <u>Commercial Component</u>: Section 5.6.7.2(a) requires that 25% of the gross floor area within a Mixed-Use project be dedicated to commercial space. The first floor of the proposed project includes 7,500 GSF of commercial space, which is 25% of the 29,999 GSF of the proposed building after netting out shared/common spaces. The commercial spaces are accessed via entrances on the sides and the front of the building facing Main Street. The first floor also includes the residential entrance in the rear of the building with mail and package storage and the elevator lobby, associated mechanicals, and stairs.

b. Residential Component: Section 5.6.7.3(a) requires that for Mixed-Use projects that front Main St, residential units will be located at the rear or upper floor only. The project contains thirty (30) residential units that are split across the three (3) upper floors. The second and third floors include 8,034 GSF of residential space with eleven (11) total units each, both floors split into one (1) studio, seven (7) 1-bedrooms, and three (3) 2-bedroom units. The fourth floor has 6,360 GSF of residential space across eight (8) total units, with one (1) studio apartment, three (3) 1-bedrooms, and four (4) 2-bedrooms.

   There are two (2) units on the second floor at the rear of the building (facing away from Main St) with small private balconies (~40SF), three (3) on the third-floor rear, and eight (8) units on the fourth floor facing all directions with balconies/roof decks that range in size from ~40SF up to ~340SF. Thirteen units in total have private balcony space.

   Units are anticipated to be offered as rentals. Unit sizes range from 461-539 GSF studios, 549-768 GSF 1-bedrooms, and 941-1020 GSF 2-bedrooms.

   i. **Affordable Units:** 5.6.7.3(b) requires that in projects of ten (10) or more residential units a minimum of 10% of units shall be made affordable to households earning at or below 80% of Area Median Income (AMI). Three (3) of the thirty (30) apartments proposed will be deed-restricted Affordable units available at 80% AMI.

13. **Dimensional Requirements:**

   a. **Setbacks:** Mixed-Use in Bus-A districts requires a 5ft front yard setback, a 10ft side yard setback, and a 20ft rear yard setback. The proposed building meets all setback requirements with a 5ft front yard setback, a 21.2ft side yard setback (but 63.9ft from the shared property line with 2 Pinevale Ave), and a rear yard setback of 21.2ft.

   b. **Lot Coverage:** The maximum lot coverage allowed is 60% and the proposed project maintains 20.6% lot coverage.

   c. **Step-backs:** South Main Street Design Guidelines recommend a 10ft step-back when above a 3rd floor level. The project proposes a 10ft step-back at the 4th floor level along the front/eastern façade facing Main Street.

   d. **Building Height:** The building is proposed to be 45ft tall, though it is 54ft-8in at its highest point. It complies with the 45ft maximum height allowed in the Bus-A Zoning District due to the fact that the tower elements on the roof will not be habitable, thus according to Table 6.3, Footnote 2 of the Reading Zoning Bylaw the structures are exempt from the maximum height requirements as height requirements do not apply to structures not intended for occupancy. The habitable portion of the building is proposed to be 45ft at its highest point. Stairwell and elevator overruns, as well as roof mounted infrastructure, shall be centrally located on the roof.

14. **Lighting:** Seven (7) light poles are proposed in the surface parking area, six (6) singles and one (1) double at a height of 12'6". Building lighting will consist of gooseneck fixtures above the first-floor signage and entrances, wall-mounted cylindrical down-lights on the 2nd floor both in the front and in the rear. A series of 3ft tall bollard lights is proposed for the rear resident amenity area. All building lighting will be dark-sky compliant and use energy efficient LEDs. All lighting proposed will be not less than 560nm such that the blue/ultraviolet wavelengths that affect insects, amphibians, and wildlife are removed—as requested by the Conservation Commission members.
15. **Design / Building Materials:** The four-story building has a flat roof and uses three (3) styles of materials to showcase changes in the massing of the façade and features a series of overhangs and canopies to articulate the form. The façade is composite panels, a dark concrete composite in color "Shadow", a light masonry-style panel in "Desert Beige" and a wood-style composite panel in "Cedar".
16. **South Main Street Design Best Practices:** The Applicant was advised to adhere to the Best Practices whenever possible and has incorporated many of the goals into the design of the site including: minimizing parking in front of the building, putting landscaping/greenery along the street edge to provide screening and curb appeal, improving the pedestrian environment, locating the building as close to Main Street as permitted, having a step-back at the fourth floor, and enhancing residential uses. Overall, the proposal substantially meets the Design Guidelines.
17. **Pedestrian Access:** Concrete sidewalks with vertical granite curbing is to be provided and replaced along the frontage on Main Street to the corner of Pinevale Ave down. Existing sidewalk along Pinevale Ave shall not be disturbed or replace to maintain the mature street trees. Concrete pathways will fully surround the building footprint for residential and commercial access. The pedestrian walkways across the parking lot to the rear amenity area and to the dumpster enclosures are proposed to be striped.
18. **Resource Area:** The southwestern portion of the site contains 100ft wetland buffer area. The buffer area covers a sliver of the parking lot, landscaped areas, and the proposed loading zone. The wetland line was delineated on March 9, 2023. The applicant filed a Notice of Intent with the Conservation Commission.
19. **Stormwater Permit Applicability:** Any activity that results in disturbance of one (1) or more acres of land and any land-disturbing activity that is part of a Common Plan or Development or Sale that will ultimately result in the disturbance of one (1) or more acres of land, shall be

subject to the requirements of the Stormwater Management and Erosion Control Bylaw and Regulations. The project proposes to disturb and develop over one acre of land area and as such is required to meet the Stormwater Permit requirements.

20. **Drainage/Stormwater:** Under current conditions the site flows in three directions. A western portion flows offsite into the drainage system on Pinevale Avenue. An eastern portion flows offsite towards the catch basin on Main St. A southern portion flows offsite towards the existing wetlands to the southwest. The proposed development will maintain 76.37% of area as impervious (35,205sf).

    The proposed stormwater management system for the site consists of a series of drywells, catch basins, water quality units, roof drains, underground piping, area drains, that collect flows into two (2) underground infiltration chambers. The two systems maintain an emergency overflow pipe which outlets into the municipal right of way. The infiltration systems were designed to contain flow for the 25-year storm event to mitigate existing flow to the existing municipal structures and promote infiltration. The stormwater management infrastructure and design also show a reduction of flow during the 100-year event. A Stormwater Operation and Maintenance Plan was submitted within the Stormwater Report detailing cleaning and inspection requirements.

21. **Landscaping & Screening:** Landscaping is proposed around the building and surface parking area. The plan replaces 45 existing trees with 51 new and 9 preserved trees, totaling 60 trees on site plus shrubs and grasses. A mix of 20+ types of native deciduous, evergreen, and ornamental/flowering trees are proposed, as well as the series of shrubs, grasses, annuals, and perennials.

    An 8ft sound mitigating fence is proposed along the northern and western property lines to substantially screen parking and amenity areas. A separate 6ft stockade fence is proposed along a portion of the south/southwest property lines where the site abuts commercial use; as well as between 10 Pinevale and 12 Pinevale Ave. A retaining wall with a 42in fall-protection fence is proposed along the remainder of the southern property line. Planting beds and landscape screening are proposed along all lot lines in front of the fence, to provide both visual screening and sound mitigation for the abutters. Landscaping is also heavily focused in the rear resident amenity space.

22. **Amenity Space:** There is a 4,050SF area in the rear of the site along the western lot line that is dedicated as outdoor amenity space for residents. A pergola with picnic tables and a grassy area are the primary features. Use of the amenity space will be administrated by the property managers, with limited hours of access and rules included in every lease. A shed is proposed nearby for storage of the amenity seating, etc. over winter.

23. **Utilities:** Electrical and communication services will be extended from Main Street below ground. The pad mount transformer will be located at the rear of the site in the amenity

area off the parking lot and screened by landscaping so as to limit visibility but not access. The building will be run solely on electricity.

Water and sewer services will be connected off Main St. All connections shall meet Town standards.

24. **Public Safety:** Sheet C-108 demonstrates the fire truck turning movements through the parking lot.
25. **Signage:** No building signage has been proposed or is approved herein with this application.
26. **Trash/Dumpster:** The applicant proposes a concrete dumpster pad with full enclosure. The trash area is located in the southwestern corner of the parking lot, directly off of the 22ft drive aisle, allowing for easy navigation of the parking lot by a dumpster truck. Trash management for both the commercial and residential spaces will be handled by the building management. An Operations and Maintenance Plan shall be submitted detailing the trash removal practices of the facility.
27. **Snow Storage and Removal:** Snow storage locations have been depicted on plan sheet C-106, utilizing the amenity area and elevated islands within the site. Any excess snow that impedes sight lines or vehicular/pedestrian movements will be hauled off-site.

Conditions:
General:

1. **Public Health, Safety and Welfare:** If, at any time, the site becomes a nuisance to public health, safety or welfare (i.e., traffic spillover onto Route 28, excessive noise, unreasonable site illumination beyond the hours of operation, etc.) – as shall be evidenced by substantiated complaints to the Police Department or Public Services Office – the Applicant/Owner shall agree to work with Staff to rectify the problem. Should the situation warrant it, an additional Site Plan Review by the CPDC may be required.
2. **Utilities**: All utilities, structures, frames and covers shall meet the Town of Reading standards. The electric utility plan is subject to approval by the Reading Municipal Light Department (RMLD).
3. **Site Plan Decision:** The Site Plan Decision herein does not include approval for any future uses or site renovations that may – on their own merits and design – trigger the requirements of site plan review and/or require a separate special permit. All future proposed uses requiring a site plan review or a special permit shall obtain such approval(s) prior to occupancy of any tenant space.
4. **Signage**: No site signage has been approved herein. The Applicant shall submit a Sign Permit Application to the Planning Division for review and approval prior to the installation of any signage.
5. **Sidewalk Improvement:** The Applicant will need an access permit from MassDOT to modify the curb cuts. As part of this permit, the Applicant shall seek permission to repair any damage to the sidewalk along their property frontage and adjacent ramps to follow the Engineering Division and MassDOT standards.

6. **Handicap Parking:** The handicap parking spaces shall be properly posted in the locations depicted on the approved Plans.
7. **Landscaping**: The landscaping shall be installed as indicated on the final approved plans. In the event that weather conditions prevent completion of the proposed landscaping prior to the desired date of occupancy, the Applicant shall submit a bond to cover the cost of installation of the remaining landscaping features.
8. **Architecture:** The building façade on each elevation (north, south, east, west) shall be substantially as indicated on the approved architectural plans and elevations.
9. **Commercial Spaces:** It is strongly recommended that the Applicant prep the commercial spaces with utility connections, grease traps, etc. in anticipation of future tenants.
10. **Order of Conditions:** At all times throughout construction of the project and occupancy of the site, the Applicant and/or future owners shall comply with all provisions of any Order of Conditions issued for the project by the Reading Conservation Commission. As part of the Purchase and Sale Agreement, the Applicant shall provide a copy of the Order of Conditions to the buyer for each lot.

11. **Affordable Units**: A total of 3 residential units (or 10% of total units), shall be deed restricted in perpetuity by households whose maximum income does not exceed eighty percent (80%) of the Boston Area Median Income (AMI), adjusted for household size, as published by the U.S. Department of Housing and Urban Development (HUD).
    a. **Design & Construction**: Affordable units must be dispersed throughout a Development Project and be comparable in initial construction quality and exterior design to the Unrestricted Units. The Affordable Units must have access to all on-site amenities. Affordable Units shall be finished housing units. All Affordable Units must be constructed and available for occupancy not later than concurrently with construction and occupancy of Unrestricted Units.
    b. **Unit Mix**: The total number of bedrooms in the Affordable Units shall be at least proportionate to the total number of bedrooms in all units of the project.
    c. **Affordable Housing Restriction**: Each Affordable Unit shall be subject to an Affordable Housing Restriction which is recorded with the Middlesex South Registry of Deeds, and shall include, at a minimum, items a through m of Reading Zoning Bylaw Section 10.5.10.5.
    d. **Documentation:** One hard copy and an electronic version of any documentation submitted to EOHLC in compliance with their requirements shall be submitted to the Community Development Director. This shall include but not be limited to: the Affirmative Fair Housing Marketing Plan, the Tenant Selection Procedure, the Regulatory and Use Agreement, and any other documents pertinent to the affordability of each affordable rental unit.
    e. **Affirmative Fair Housing:** Pursuant to 760 CMR 59.00 (MGL Ch. 40R), the project shall comply with federal, state, and local fair housing laws, and the affordable units shall be subject to an Affirmative Fair Housing Marketing Plan (the “AFHMP”) that complies with EOHLC Guidelines for G.L. c.40B Comprehensive Permit Projects applicable to the Project promulgated by DHCD (the “40B Guidelines”). The Applicant

shall comply at all times with all provisions of its Affirmative Fair Housing Marketing Plan, including, without limitation the initial lottery and other tenant selection procedures.

f. **Local Preference:** To the extent permitted by applicable law, the AFHMP shall include a local selection preference for up to 70% of the Affordable Units for the following categories: (a) current residents of Reading, (b) employees of Reading (i.e., municipal, Public Schools, RMLD, etc.), (c) employees of local businesses, and (d) households with children attending schools in Reading. An annual report of sales activity to such local preference categories shall be submitted to the Community Development Director.

g. **Monitoring Agent**: The Applicant shall ensure that there is effective annual monitoring and enforcement of the Affordable Housing Restriction during the term of Affordability, administered through a Monitoring Agent and pursuant to the criteria of Reading Zoning Bylaw Section 10.5.10.6.

h. **Costs of Housing Marketing and Selection Plan**: The housing marketing and selection plan shall make provision for payment by the owner of reasonable costs to the Monitoring Agent and the owner shall pay reasonable costs to the Monitoring Agent to develop, advertise, and maintain the list of Eligible Households and to monitor and enforce compliance with affordability requirements,

Stormwater Permit Conditions:

1. The Applicant shall notify the Community Development Director and Town Engineer before significant site milestones, such as installation of erosion and sediment control measures or completion of site clearing.
2. The Applicant shall conduct and document periodic inspections of all control measures (before, during and/or after construction) and submit reports to the Community Development Director and Town Engineer.
3. The Applicant shall post, before the start of land disturbance activity, a cash bond or other surety to secure the performance of the Permittee's obligations under the Stormwater Permit.
4. The Applicant shall record notice of the Operation & Maintenance Plan with the Registry of Deeds (or the Land Court for registered land).
5. The Applicant shall establish a dedicated source of funding for long-term operation and maintenance of stormwater control measures, if not conducted by the Town.
6. The Applicant shall submit, to the Community Development Director and Town Engineer, an annual certification documenting the work that has been done over the last 12 months to properly operate and maintain the stormwater control measures.
7. The Applicant shall notify the CPDC in writing of any change or alteration of a land-disturbing activity authorized in a Stormwater Permit before the change or alteration occurs. If the proposed change or alteration is minor, the Community Development Director, after coordinating with the Town Engineer, may authorize such change or alteration in writing with a copy to the CPDC. Otherwise, the Community Development Director shall forward the notification of change or alteration to the CPDC. If the CPDC determines that the change or

alteration is significant, it may require the Permittee to apply for an amendment to the Stormwater Permit.

8. The Approval of the Stormwater Permit shall lapse two (2) years after the date of its issuance if construction pursuant thereto has not begun; provided however, that the CPDC may grant an extension of the two (2) year period, for a maximum of one (1) year, upon a finding of good cause, including the need to obtain other local, state, and federal permits duly applied for, at the written request of the applicant, if submitted to the CPDC at least thirty (30) days prior to the expiration of the two (2) year period.
9. The CPDC may, upon application by the Permittee, amend a Stormwater Permit. Any such amendment shall conform to the requirements of the Stormwater Management and Erosion Control Bylaw and Regulations.
10. Within 60 days of the completion of construction of the project, the Permittee shall submit to the Community Development Director and Town Engineer a record plan detailing the actual stormwater management system as installed. The as-built plan must depict all on-site controls, both structural and non-structural, designed to manage the stormwater associated with the completed site. Such plan shall be provided both in hard copy and as an electronic file. Upon review of the as-built plan, the Community Development Director and Town Engineer may approve it or may direct the Permittee to take any actions necessary to correct the plan or to comply with any outstanding requirements of the Stormwater Permit.

Prior to the Commencement of Site Work and Start of Construction:

1. **Engineering Concerns**: The Applicant shall work with Engineering staff to address any remaining concerns.
2. **Conservation Concerns**: The Applicant shall work with the Conservation Administrator to satisfy any remaining concerns.
3. **Plan Revisions:** The Applicant shall revise the Site Plan pursuant to any conditions imposed herein and submit 2 full-size (24x36) copies of the revised plans to the Community Development Director for review and approval prior to the issuance of a Building Permit. Revisions include but are not limited to:
    a. Architectural Elevation Sheets shall be corrected to note the appropriate floor levels;
    b.
4. **Other Permits:** The Owner/Applicant is responsible for obtaining all other requirements and permits including but not limited to, utility connections, sewer, water, curb cut, street opening and Jackie's Law excavation permits from the Engineering Department (prior to excavation), and Board of Health approvals.
5. **Pre-construction Meeting:** The Owner/Applicant and contractors shall coordinate with the Community Development Director to schedule a pre-construction meeting with Town staff prior to applying for building permits, in order to review these conditions and any and all final construction sequencing, details and plans for this project.
6. **Stormwater:** A Stormwater Operation and Maintenance Plan shall be submitted for review and approval by the Engineering Department prior to the start of construction. The Plan shall

be developed for construction and post construction procedures and shall be provided in a report separate from the construction plans.

7. **Rooftop Mechanicals**: The Applicant shall ensure the shielding of rooftop mechanical units so they are not visible from the street, and to mitigate the visual and audible impact of the units.
8. **Electric Utility**: The electric utility plan, including the locations of light poles, transformers, etc. shall be approved by the Reading Municipal Light Department (RMLD).
9. **ADA/MAAB:** Certification shall be furnished to the Community Development Director that the proposal is in conformance with the provisions of the Americans with Disabilities Act (ADA) and the Massachusetts Architectural Access Board (AAB).
10. **Construction Schedule:** A construction schedule shall be submitted to the Community Development Director, Town Engineer, Conservation Commission and Building Inspector prior to the start of construction.
11. **Construction Drawings:** Full construction documents must be submitted and approved by the Fire Department. A building permit shall not be issued until the Fire Department has approved the plans.
12. **I/I Fee:** The project will be subject to an Inflow/Infiltration Fee if it is determined that the new sewer flow is greater than historical usage.

During Construction:

1. **Construction Hours:** Construction shall be limited to the hours stated in Section 8.9.8 "Construction Hours" of the Reading General Bylaws and said hours shall be posted in a conspicuous place at the entrance prior to any work on the site.
2. **Construction Activities:** Construction activities shall be conducted in a workmanlike manner at all times. Blowing dust or debris shall be controlled by the Applicant through stabilization, wetting down, and proper storage and disposal methods, subject to the approval of the Health Agent or designee. The Applicant shall ensure that the abutting local streets are kept clear of dirt and debris, which may accumulate as a result of construction activities for the Project. Documentation shall be provided demonstrating ongoing pest management control, subject to the approval of and administration by the Health Division.
3. **Site Inspections:** Town staff or their designee shall have reasonable access to inspect the site to determine compliance with this Decision.
4. **Coordination with Town Officials:** The Applicant and/or its contractor shall provide – during construction – complete, full coordination with local officials on making alterations to existing utilities, future utilities on site shall be installed underground, subject to local utility approval.
5. **Water Services:** All water services and connections shall be in accordance with the Town of Reading's Water Division standards.
6. **Plan Changes:** Any changes to the site layout or utility design during site work or construction shall be submitted to the Engineering Division and Community Development Director for review and approval prior to the construction of the change in design.

7. **Bond:** The Applicant/Owner shall furnish a bond for the final As-Built plans prior to the issuance of the final certificate of occupancy. The bond amount shall be determined by the Town Engineer. The bond shall be returned once the requirements of this condition are met.

Prior to the Issuance of a Certificate of Occupancy:

1. **Compliance Review:** The Applicant shall schedule a meeting with the Building Inspector and Community Development Director before a request for a Certificate of Occupancy to review compliance with this Decision and any other applicable permits.
2. **Pavement Markings:** Pavement markings/arrows within the site shall be painted as they are shown on the plan.
3. **Operation and Maintenance Plan**: An O&M Plan shall be prepared for the catch basins; infiltration basins and stormwater management infrastructure.
4. **Conveyance of Easements:**
    a. The Applicant shall execute a Conveyance of Easements and Utilities transferring to the Town valid, unencumbered title to appurtenances thereto constructed and installed. All easements, as reviewed by the Town Engineer and Town Counsel, shall be properly written and recorded.
    b. The easement between 10 Pinevale Ave and the Development Tract shall be submitted to the Community Development Director.
5. **Property Management Agreement**: A Property Management Agreement shall be submitted to the Community Development Director detailing the management of trash and recycling procedures; snow management; loading and unloading by moving trucks, vans, delivery vehicles, etc.; emergency vehicle access and maintenance of landscaping.
6. **Rooftop Mechanicals**: Any proposed or future rooftop mechanicals, or exterior building equipment, shall be screened with sound control devices or construction that mitigates the equipment noise. The equipment shall be set back from building facades so that it is not visible from street views or the abutting residential neighborhood, or screened from view behind parapets enclosed within architectural elements that integrate it into the building design.
7. **Architecture:** The building façade on each elevation (north, south, east, west) shall be substantially as indicated on the approved architectural plans and elevations.
8. **Landscaping**: The landscaping shall be installed as indicated on the final approved landscape plans. In the event that weather conditions prevent completion of the proposed landscaping prior to the desired date of occupancy, the Applicant shall submit a bond to cover the cost of installation of the remaining landscaping features.
9. **Pinevale Conservation Area Improvement Funding**: The Applicant shall submit a payment of funds in $7,500 to the Community Development Director for the use of improvements at the Pinevale Conservation Area. Improvements may include, but are not limited to: entrance enhancements, invasive species removal/management, and trail maintenance, improvement or extension.

10. **As-Built Plans:** Two full size paper copies and electronic AutoCAD final As-Built plans showing the building footprint, drainage systems and utility connections shall be submitted to the Community Development Director and Town Engineer to ensure compliance with this decision and other applicable Town standards. The bond held for this requirement will be returned to the Applicant once this condition has been fulfilled.

Conditions for Ongoing Maintenance after Construction:

1. **Lighting**: All exterior building and site lighting shall comply with the dark sky initiatives (light shall shine down only) with the light source being fully shielded (with cutoff shields) so that any spillage onto abutting properties shall be limited to 0.1-foot candles.
2. **Landscaping:** The site landscaping as depicted on the approved plan shall be maintained in a healthy condition in perpetuity. In the event that landscaping is damaged during snow removal operations, the property owner shall replace such landscaping during the next growing season.
3. **Off-Street Loading and Delivery:** No delivery trucks shall queue on Main Street or within the on-site circulation aisles in a manner that impedes traffic flow through the parking lot. Commercial deliveries shall be prohibited between the hours of 10:00PM and 5:00AM. Delivery by tractor trailer shall be prohibited.
4. **Snow Removal**: Snow shall be stored in a manner so that it shall not impact the landscaping, pedestrian pathways, vehicular sight lines, travel lanes or parking areas. Snow shall be removed from the site by the Applicant and/or its designee if the accumulated snow exceeds the capacity of the snow storage area or impedes vehicular sight lines, travel lanes or the parking lot.
5. **Trash Removal:** All trash collection and disposal is the responsibility of the future owner. The owner shall ensure daily that exterior areas of the site remain clear of debris, trash and any equipment used in connection with any commercial activities on site. Trash pick-up shall be contained on-site and shall not impede access into the site.
6. **Storm Water Operations & Maintenance**: Conditions within the long-term Operations and Maintenance Plan shall be adhered to by the Property Owner. Annual O&M reports shall be delivered to the Town Engineer by January 15th of each year.

Modifications/Revisions - Plan Changes after Approval by the Approving Authority:
If, at any time before or during development, it becomes necessary or desirable for an Applicant to make modifications to a Site Plan, the Applicant shall appear at a regular meeting of the CPDC and submit, if required by the CPDC, plans showing the modification. Modification requests shall be processed in accordance with the rules governing Site Plan Review unless, upon review and determination by the Community Development Director, the proposed changes qualify as a Minor Modification pursuant to Section 4.6.9.2.

1. Minor Modification: Changes that do not substantially alter the concept of the approved Plan in terms of the specific location, the proposed land use, the design of building form and approved building details and materials, site grading or egress points. These include but are not limited to small changes in site layout, topography, architectural plans, landscaping plan, traffic circulation, parking, lighting, signage, open space or other criteria set forth in Section 4.6.9.1. Requests for approval under a minor modification for future renovations/alterations to the approved site plan or for future tenant changes shall be reviewed by the Community Development Director to determine if the proposed work qualifies for review through the Minor Site Plan Review process of Section 4.6.3 of the Reading Zoning Bylaw. If the work is eligible for review under Minor Site Plan review, the Community Development Director may review and grant approval of the proposed work by administrative approval of the Minor Modification. At the determination of the Community Development Director, the Applicant may be required to present the proposed project at a public meeting of the CPDC.

2. Major Modification: Substantial additions, deletions or deviations from the approved plan, including but not limited to changes in site layout, topography, architectural plan, landscaping plans, traffic circulation, parking, lighting plan, signage, open space or other criteria set forth in Section 4.6.9.1 of the Reading Zoning Bylaw. (Note: Approval of the major modification shall be grounds for reconsideration of the Site Plan application. Denial of proposed major modifications shall not invalidate the Site Plan in conformance with the previously approved Plan).

Signed as to the accuracy of the vote as reflected in the minutes

____

Andrew MacNichol, Community Development Director Date

Cc: Applicant, Town Clerk

STRADA

258 Main Street Redevelopment

READING, MASSACHUSETTS

March 25th, 2024

PREPARED FOR:
Community Planning and Development Committee
TOWN HALL
16 Lowel Street
Reading, MA 01867
Tel (781) 942-6612

OWNER:
BLVD Reading, LLC
P.O. Box 4449
Peabody, MA 01961
Tel (781) 389-5989

ARCHITECT:
RP ARCHITECTURAL STUDIO
78 Highland Circle
Wayland, MA 01778
Tel (617) 794-7759

CIVIL ENGINEER:
ALLEN & MAJOR ASSOCIATES, INC.
100 Commerce Way, Suite 5
Woburn, MA 01801
Tel (781) 935-6889

Front Elevation

PROJECT:
258 Main Street - Mixed use New Construction
Reading, MA

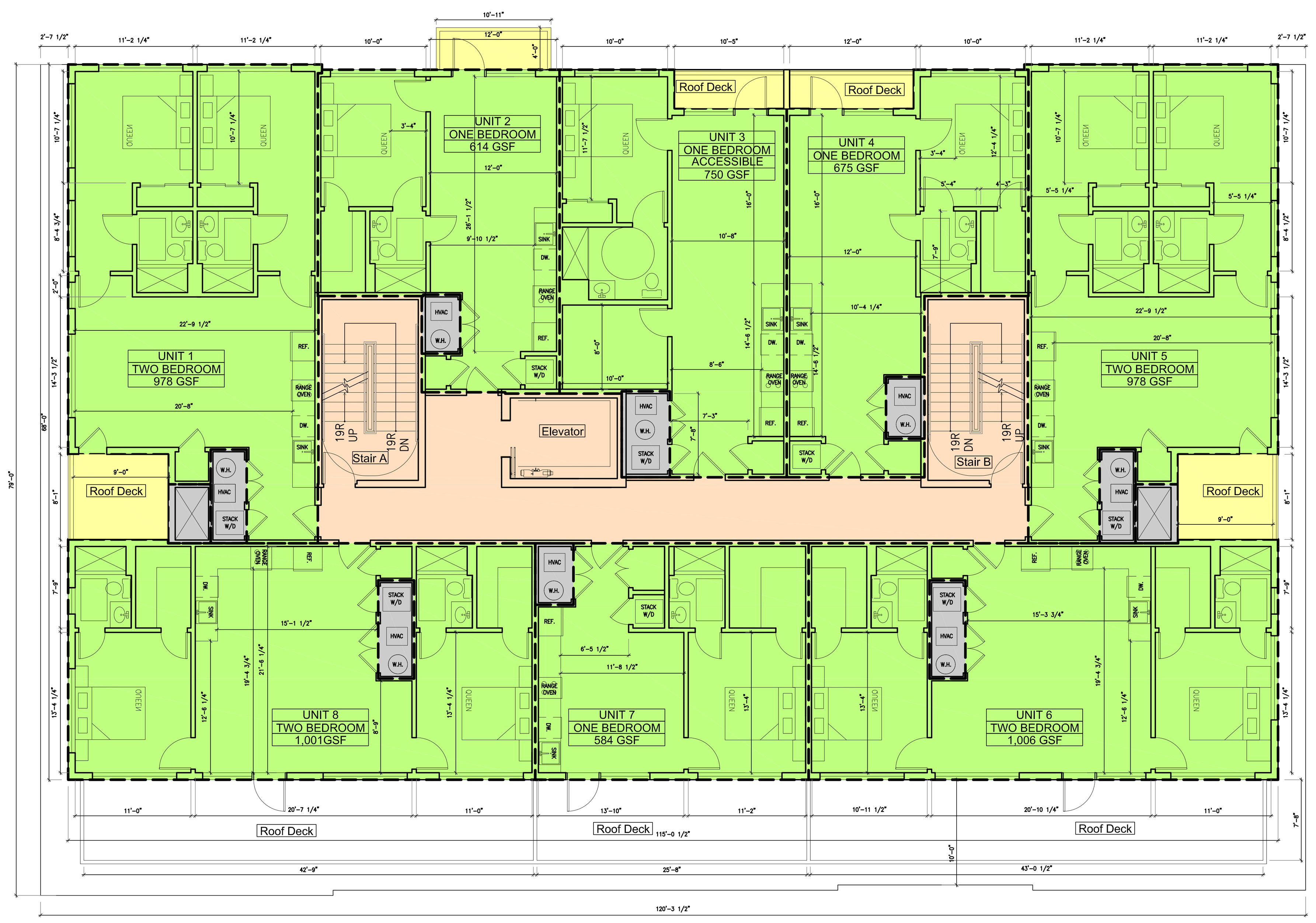
RP Architectural Studio
78 Highland Circle
Wayland, MA 01778
Tel. 617-794-7759

Project Team:

Date:	Revisions:

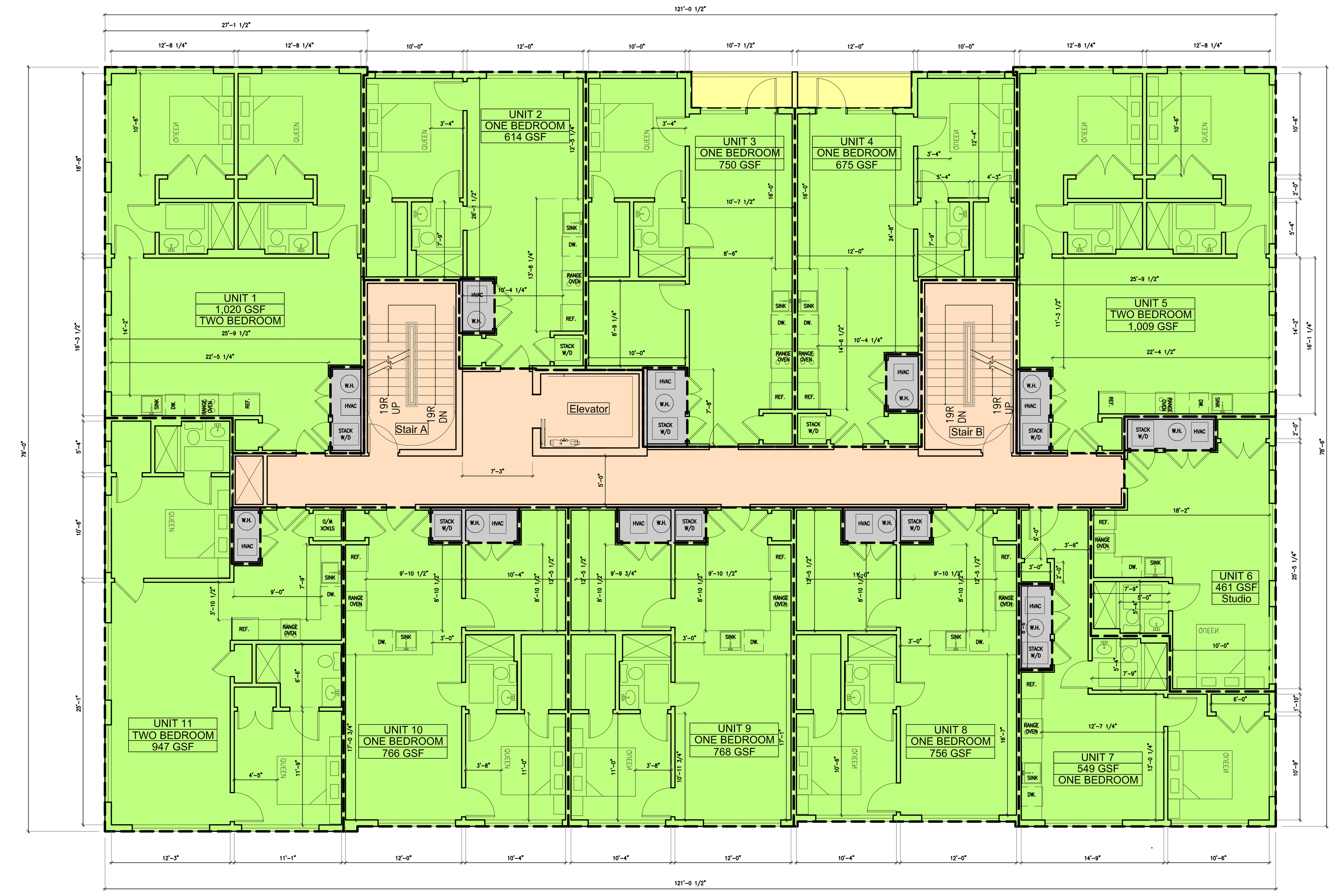
Drawing Title:

Scale:
Drawing No. :
Job No.: 434
Date: 3/25/24



TOTAL RESIDENTIAL GSF = 6,734 - 245 = 6,489
TOTAL COMMERCIAL GSF = 7,500

4 Fourth Floor Plan
Scale: 3/32" = 1'-0"



TOTAL RESIDENTIAL GSF = 8,324 - 319 = 8,005
TOTAL COMMERCIAL GSF = 7,500

2 Second Floor Plan
Scale: 3/32" = 1'-0"

GRAPHIC KEY

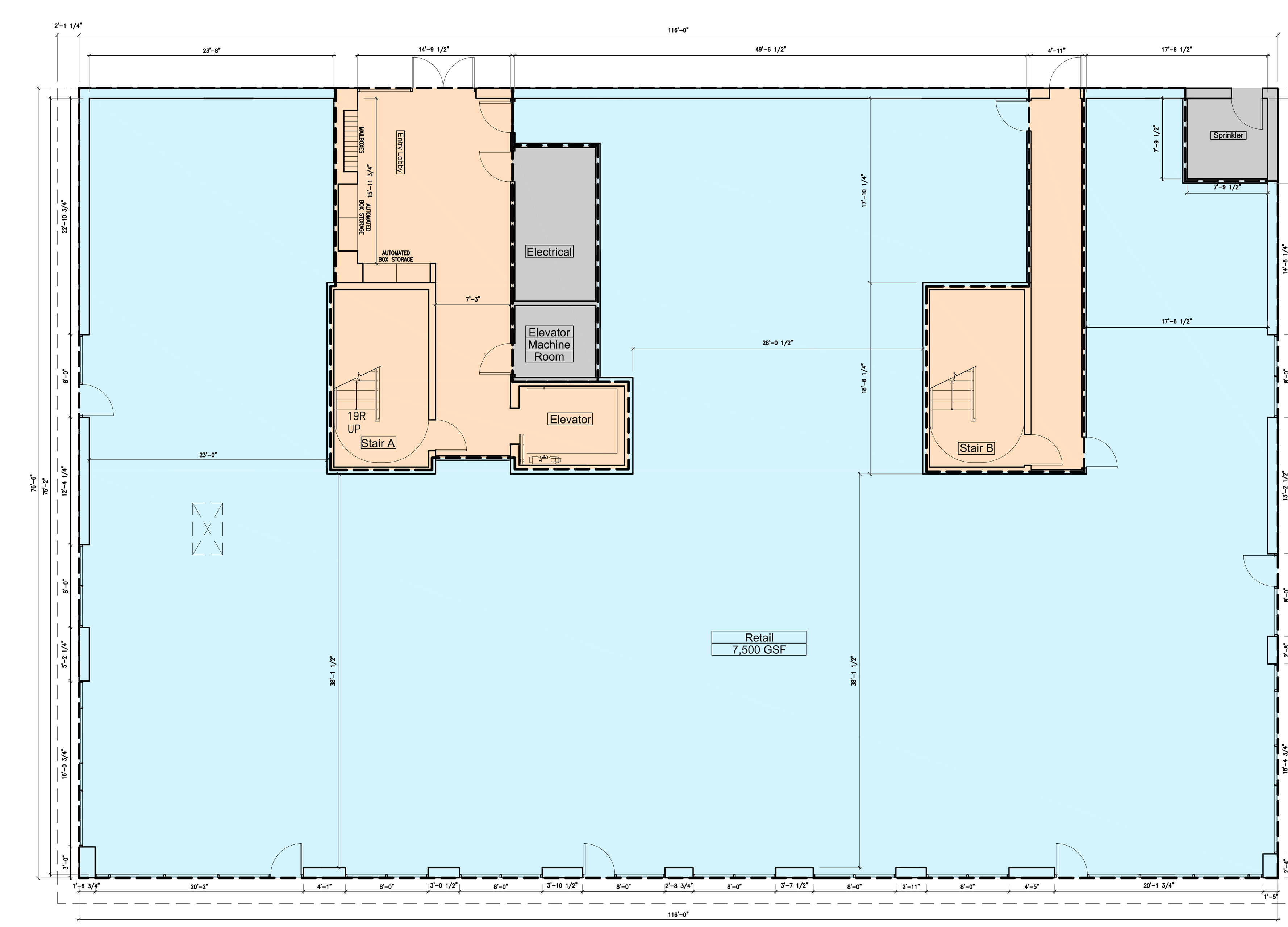
- RESIDENTIAL UNIT
- COMMERCIAL SPACE
- EGRESS/ CIRCULATION/ AMENITIES
- BALCONY/ ROOF DECK
- UTILITY

RESIDENTIAL / COMMERCIAL PERCENT RATIO CALCULATION
TOTAL FIRST FLOOR COMMERCIAL GROSS FLOOR AREA= 7,500 GSF
TOTAL SECOND FLOOR RESIDENTIAL GROSS FLOOR AREA= 8,005 GSF TOTAL THIRD FLOOR RESIDENTIAL GROSS FLOOR AREA= 8,005 GSF TOTAL FOURTH FLOOR RESIDENTIAL GROSS FLOOR AREA= 6,489 GSF
TOTAL RESIDENTIAL GROSS FLOOR AREA= 22,499 GSF
TOTAL RESIDENTIAL / COMMERCIAL PERCENT = 75% / 25%

TOTAL GROSS FLOOR AREA
TOTAL FIRST FLOOR GROSS FLOOR AREA= 8,873 GSF TOTAL SECOND FLOOR GROSS FLOOR AREA= 9,470 GSF TOTAL THIRD FLOOR GROSS FLOOR AREA= 9,470 GSF TOTAL FOURTH FLOOR GROSS FLOOR AREA= 7,629 GSF TOTAL ROOF FLOOR GROSS FLOOR AREA= 194 GSF
TOTAL GROSS FLOOR AREA = 35,636

TOTAL RESIDENTIAL GSF = 8,324 - 319 = 8,005
TOTAL COMMERCIAL GSF = 7,500

3 Third Floor Plan
Scale: 3/32" = 1'-0"



TOTAL COMMERCIAL GSF = 7,500

1 First Floor Plan
Scale: 3/32" = 1'-0"

PROJECT:
258 Main Street - Mixed use New Construction
Reading, MA

RP Architectural Studio
78 Highland Circle
Wayland, MA 01778
Tel. 617-794-7759

Project Team:

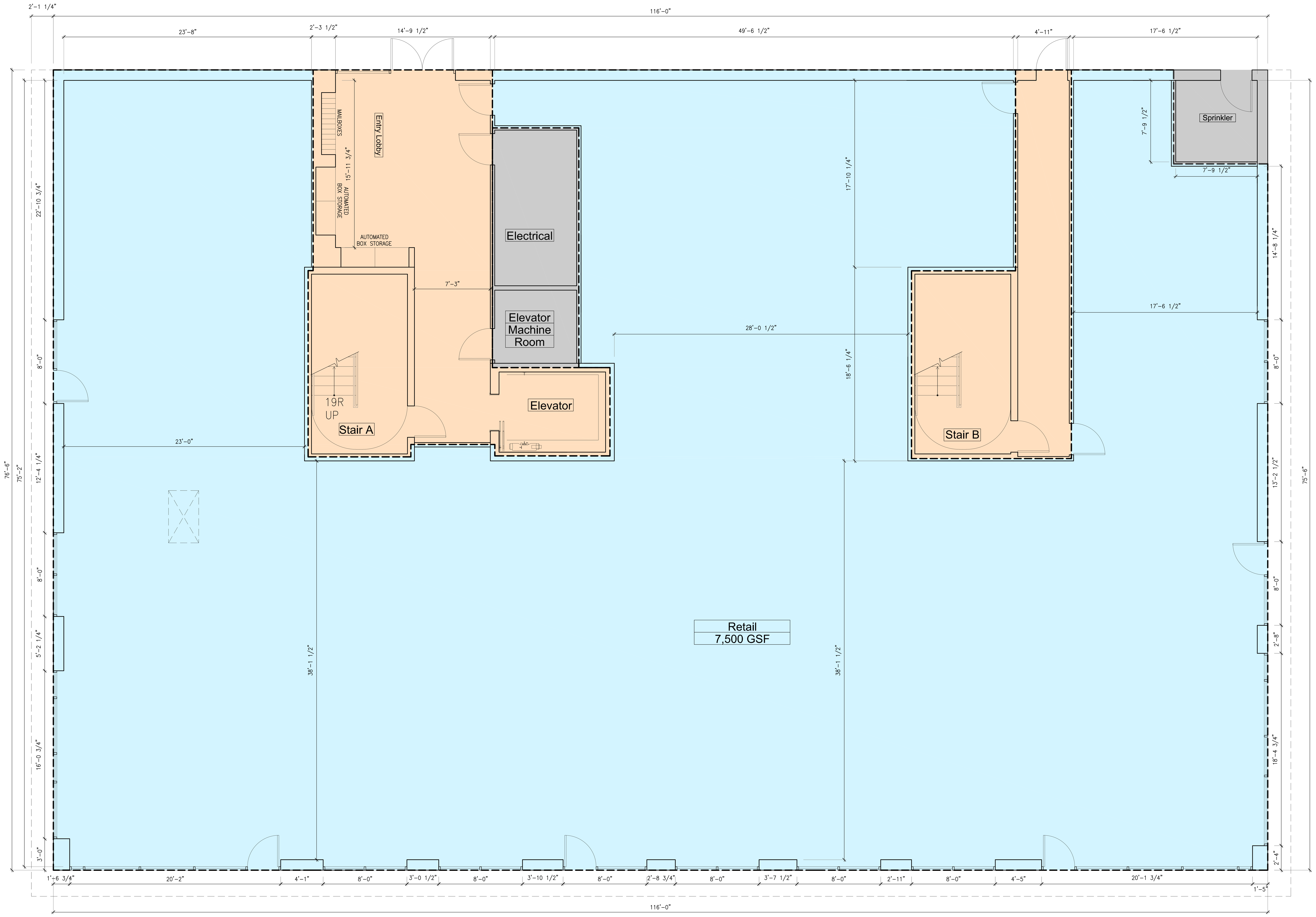
Date:	Revisions:

Drawing Title:
Plan Diagrams

Scale:	Noted	Drawing No. :
Job No.:	434	A0.1
Date:	3/25/24	

GRAPHIC KEY

- RESIDENTIAL UNIT
- COMMERCIAL SPACE
- EGRESS/ CIRCULATION/ AMENITIES
- BALCONY/ ROOF DECK
- UTILITY



TOTAL COMMERCIAL GSF = 7,500

1 First Floor Plan
Scale: 3/16" = 1'-0"

PROJECT:
258 Main Street - Mixed use New Construction
Reading, MA

RP Architectural Studio

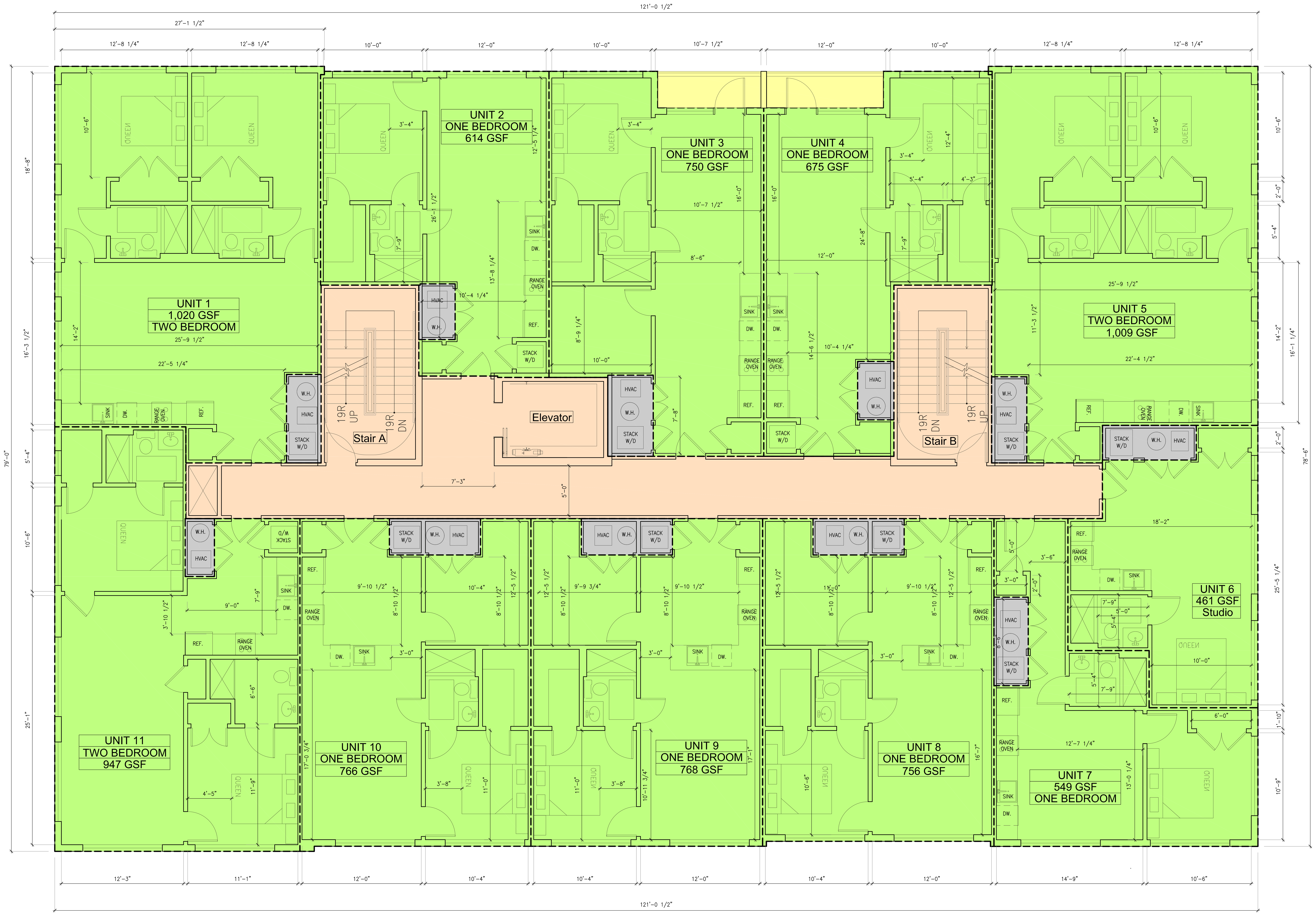
78 Highland Circle
Wayland, MA 01778
Tel. 617-794-7759

Project Team:

Date:	Revisions:

Drawing Title:
Proposed Floor Plans

Scale: Noted
Job No.: 434
Date: 3/25/24
Drawing No. : A1.0



GRAPHIC KEY

- RESIDENTIAL UNIT
- COMMERCIAL SPACE
- EGRESS/ CIRCULATION/ AMENITIES
- BALCONY/ ROOF DECK
- UTILITY

TOTAL RESIDENTIAL GSF = 8,324 - 319 = 8,005

TOTAL COMMERCIAL GSF = 7,500

1 Second Floor Plan

Scale: 3/16" = 1'-0"

PROJECT:
258 Main Street - Mixed use New Construction
Reading, MA

RP Architectural Studio
78 Highland Circle
Wayland, MA 01778
Tel. 617-794-7759

Project Team:

Date:	Revisions:

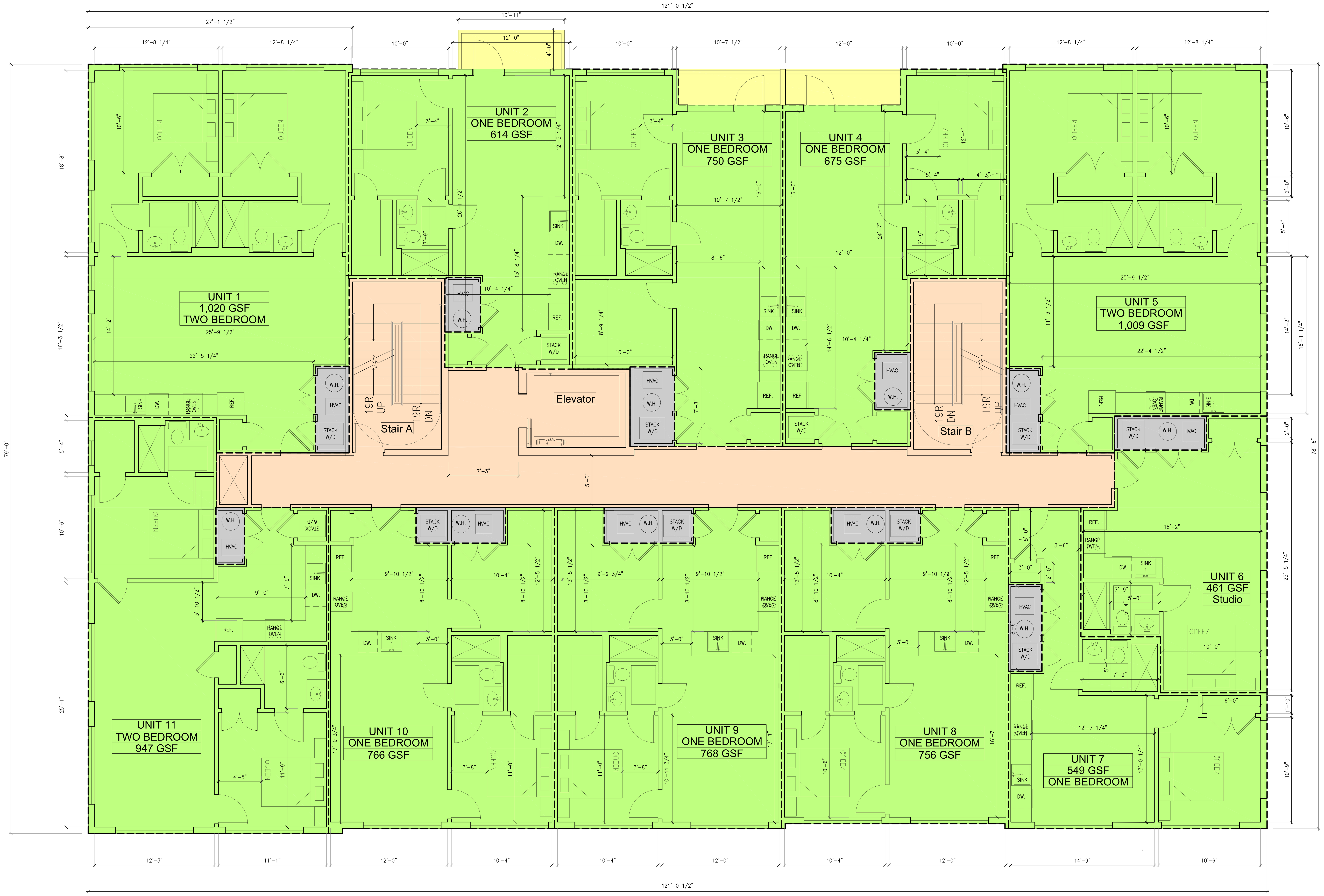
Drawing Title:
Proposed Floor Plans

Scale: Noted

Drawing No. : A1.1

Job No.: 434

Date: 3/25/24



GRAPHIC KEY
RESIDENTIAL UNIT
COMMERCIAL SPACE
EGRESS/ CIRCULATION/ AMENITIES
BALCONY/ ROOF DECK
UTILITY

TOTAL RESIDENTIAL GSF = 8,324 - 319 = 8,005

TOTAL COMMERCIAL GSF = 7,500

1 Third Floor Plan
Scale: 3/16" = 1'-0"

PROJECT:
258 Main Street - Mixed use New Construction
Reading, MA

RP Architectural Studio
78 Highland Circle
Wayland, MA 01778
Tel. 617-794-7759

Project Team:

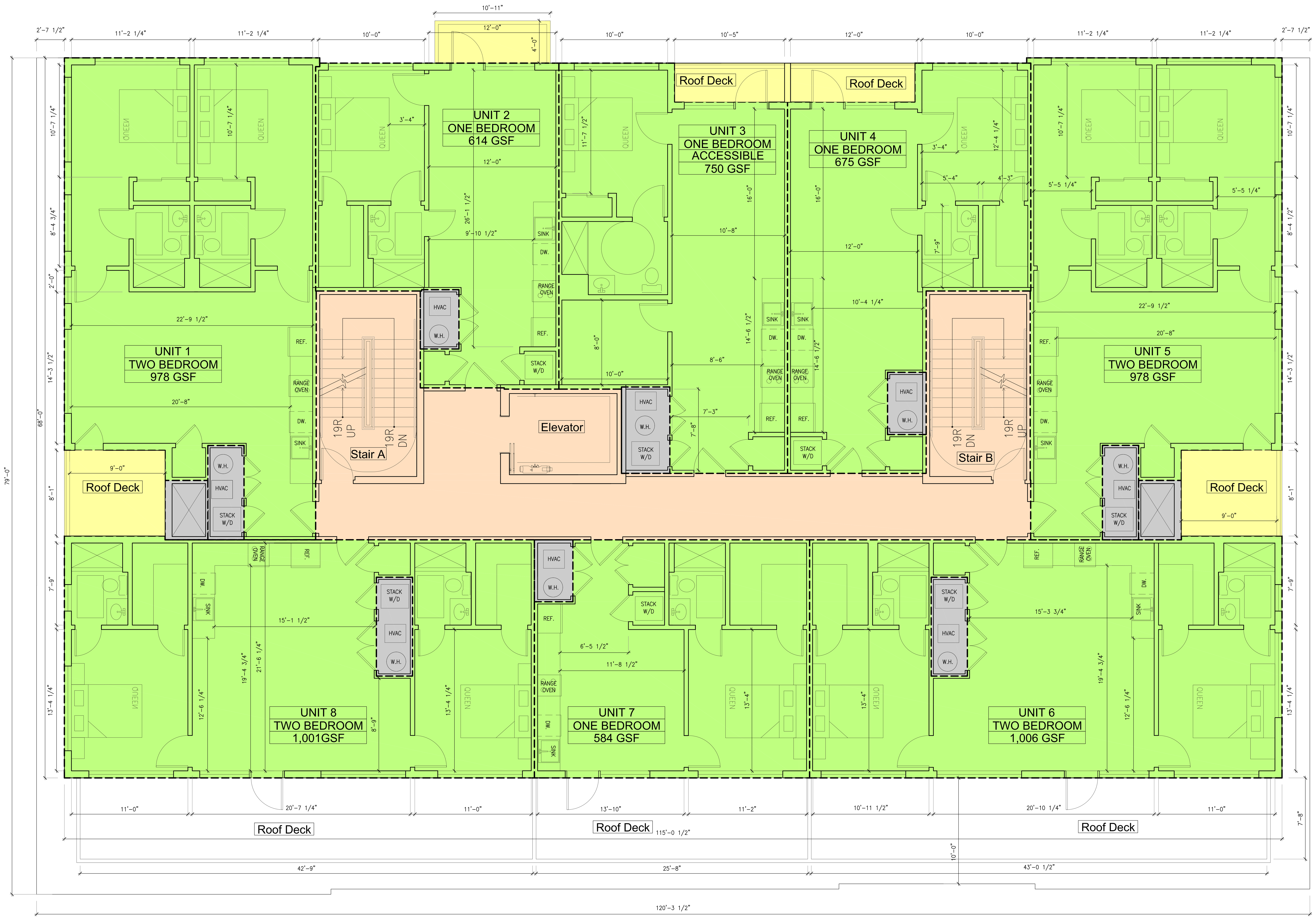
Date: | Revisions:

Drawing Title:
Proposed Floor Plans

Scale: Noted
Job No.: 434
Date: 3/25/24
Drawing No. : A1.2

GRAPHIC KEY

- RESIDENTIAL UNIT
- COMMERCIAL SPACE
- EGRESS/ CIRCULATION/ AMENITIES
- BALCONY/ ROOF DECK
- UTILITY



TOTAL RESIDENTIAL GSF = 6,734 - 245 = 6,489
TOTAL COMMERCIAL GSF = 7,500

1 Fourth Floor Plan
Scale: 3/16" = 1'-0"

PROJECT:
258 Main Street - Mixed use New Construction
Reading, MA

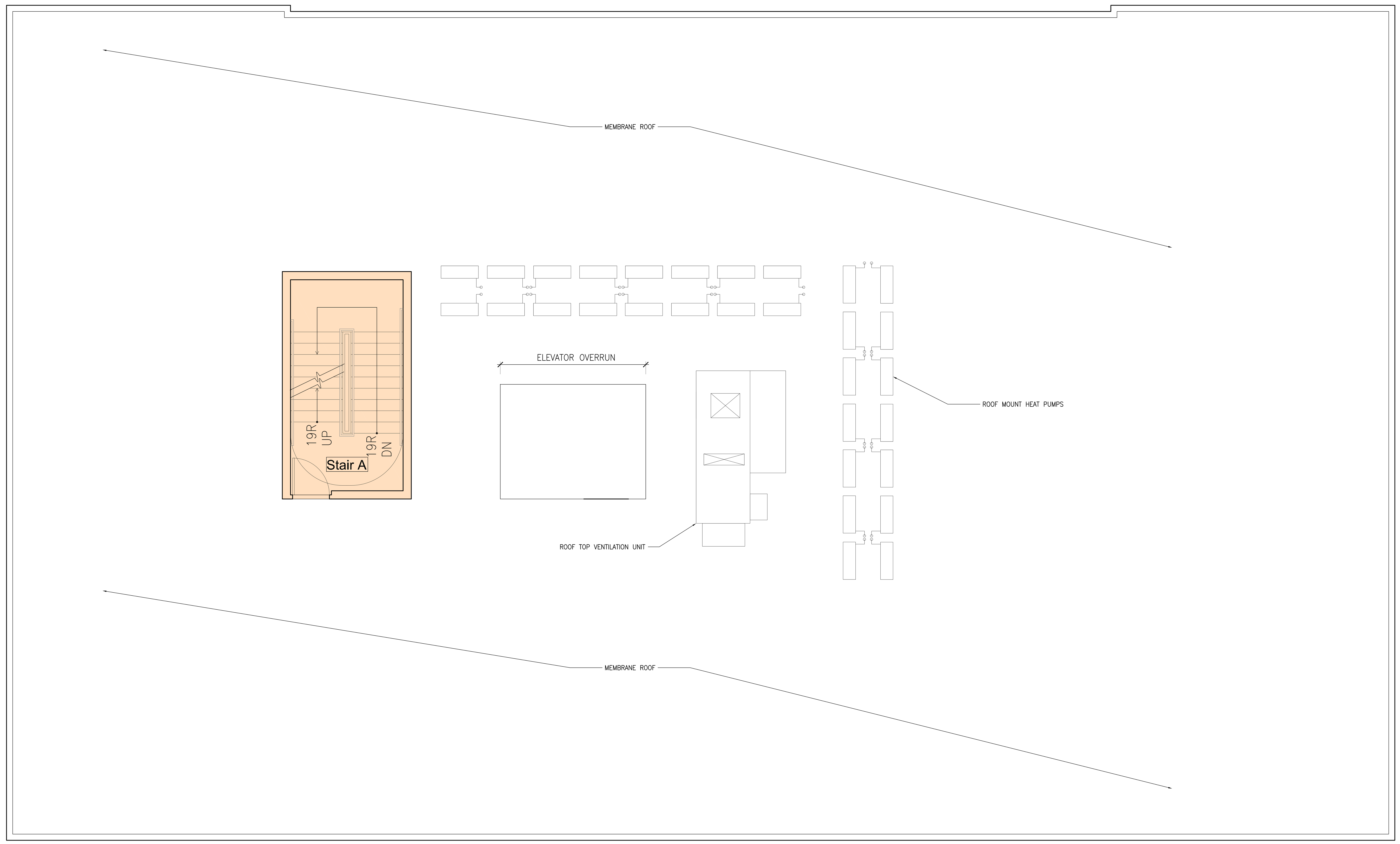
RP Architectural Studio
78 Highland Circle
Wayland, MA 01778
Tel. 617-794-7759

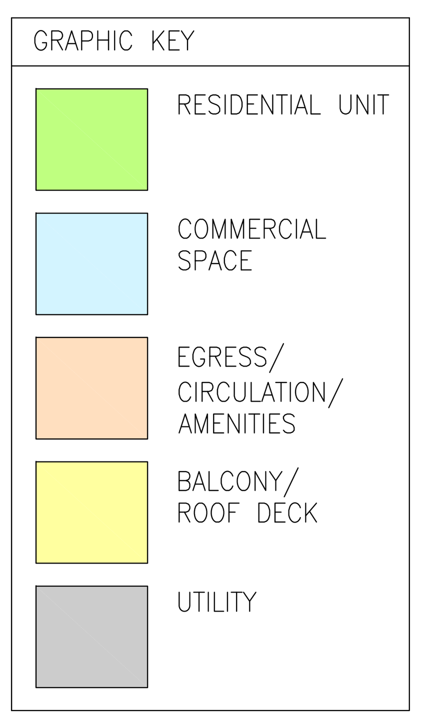
Project Team:

Date:	Revisions:

Drawing Title:
Proposed Floor Plans

Scale:	Noted	Drawing No. :
Job No.:	434	A1.3
Date:	3/25/24	





1 Roof Plan
Scale: 3/16" = 1'-0"

PROJECT:
258 Main Street - Mixed use New Construction
Reading, MA

RP Architectural Studio
78 Highland Circle
Wayland, MA 01778
Tel. 617-794-7759

Project Team:

Date:	Revisions:

Drawing Title:
Proposed Roof Plan

Scale:	Noted	Drawing No. :
Job No.:	434	A1.4
Date:	3/25/24	

2 Proposed South Elevation
Scale: 1/4" = 1'-0"

1 Proposed East Elevation
Scale: 3/16" = 1'-0"

PROJECT:
258 Main Street - Mixed use New Construction
Reading, MA

RP Architectural Studio

78 Highland Circle
Wayland, MA 01778
Tel. 617-794-7759

Project Team:

Date:	Revisions:

Drawing Title:
Proposed Elevations

Scale: Noted
Job No.: 434
Date: 3/25/24
Drawing No.: A2.1

2 Proposed North Elevation
Scale: 3/16" = 1'-0"

1 Proposed West Elevation
Scale: 1/4" = 1'-0"

PROJECT:
258 Main Street - Mixed use New Construction
Reading, MA

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78 Highland Circle
Wayland, MA 01778
Tel. 617-794-7759

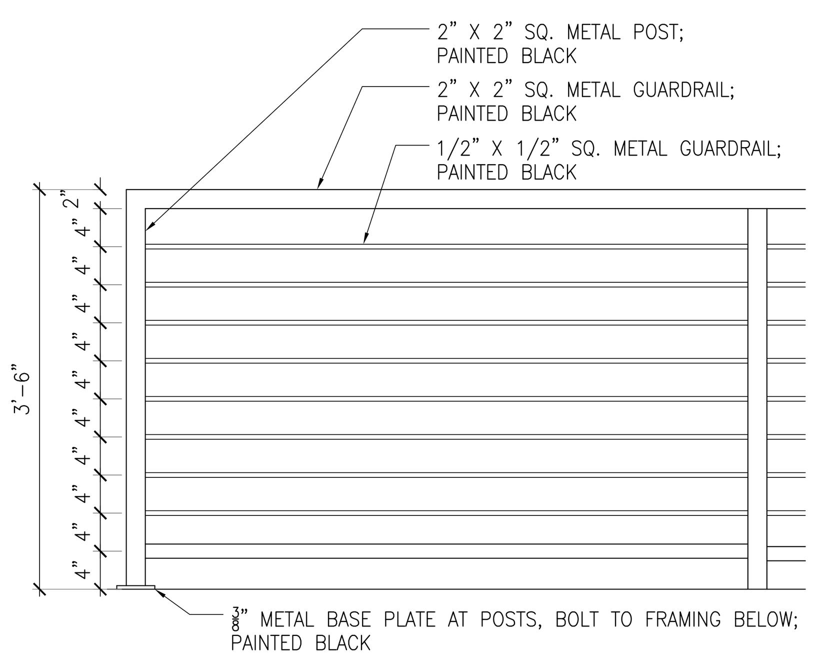
Project Team:

Date:	Revisions:

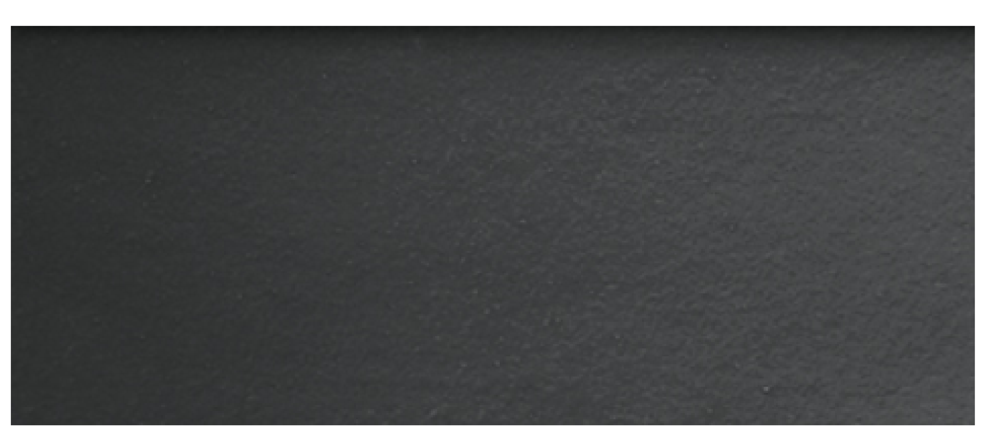
Drawing Title:
Proposed Elevations

Scale: Noted
Job No.: 434
Date: 3/25/24
Drawing No.: A2.2

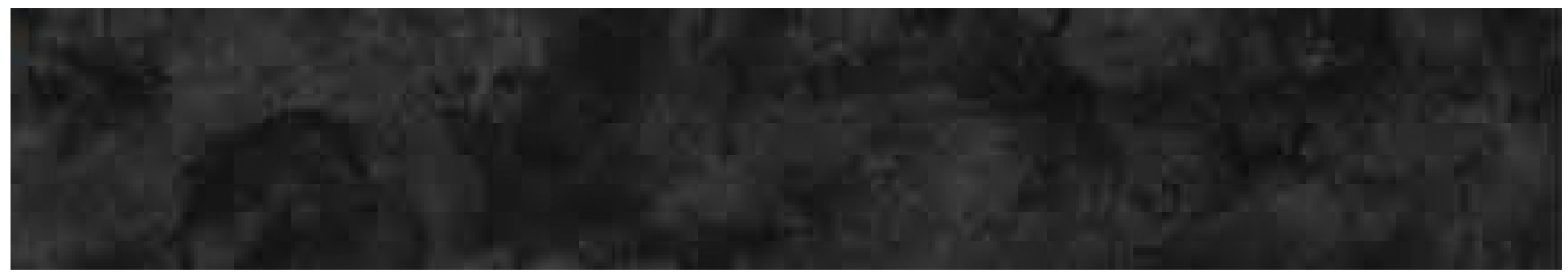
EXAMPLE OF GUARD RAILING STYLE



5 Rooftop Guard Railing Type
SCALE: 3/4" = 1'-0"



4 Door, Window, Trim, and Flashing Color: Black



3 EXTERIOR SIDING COLOR C: Nichiha Concrete Corbosa Series Composite Panel - Color "Shadow"

2 EXTERIOR SIDING COLOR B: Nichiha Masonry Series Composite Panel - Color "Desert Beige"

1 EXTERIOR SIDING COLOR A: Nichiha Vintage Wood Composite Panel - Color "Cedar"

PROJECT:
258 Main Street - Mixed use New Construction
Reading, MA

RP Architectural Studio
78 Highland Circle
Wayland, MA 01778
Tel. 617-794-7759

Project Team:

Date:	Revisions:

Drawing Title:
Materials

Scale: Noted
Job No.: 434
Date: 3/25/24
Drawing No. : A3.1

Pathfinder | 52120BK

Job Name:______ Job Type:______ Quantity:______ Comments:______

PRODUCT DESCRIPTION

With solid Die-Cast Aluminum construction and powered by a range voltage input driver, Pathfinder is a high performance down light for commercial and residential installations. Available in Black, Architectural Bronze, or Metallic Sliver there is sure to be a style to fit most any installation.

MEASUREMENTS

DIMENSION	: 5.5" W x 5.5" H x 4" Ext
BACK PLATE	: 5.5" W x 5.5" H x 2.75" HCO
HANGING WEIGHT	: 2.2 lb

LAMPING

INPUT VOLTAGE	: 120-277V
LUMENS	: 880 Rated (820 Del.)
BULB	: 1 x 15W LED PCB Integrated , 15W Total
BULB INCLUDED	: (Integrated)
DIMMABLE	: Dimmable at 120V with ELV
CRI	: 80 CRI
COLOR_TEMP	: 3000K
LIGHTING_DIRECTION	: Down

FINISHES OPTION

- Architectural Bronze
- Black
- Silver

MATERIAL

Die Cast Aluminum

RATINGS

cETLus
Wet Location
For Outdoor DARKSKY

ADDITIONAL

INSTALL UP/DOWN: Up/Down
OPERATING TEMPERATURE:
-20°C (-4°F), 40°C (104°F)

Always consult a qualified electrician before installing any lighting product.

MAXIM® LIGHTING

WESTERN DISTRIBUTION CENTER (HEADQUARTER)
253 NORTH VINELAND AVE I CITY OF INDUSTRY, CA 91746

EASTERN DISTRIBUTION CENTER
4200 SHIRLEY DR. I ATLANTA, GA 30336

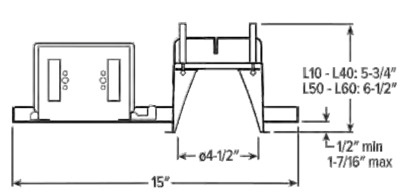
P. 626.956.4200 I F. 626.956.4225 I maximlighting.com

4 Wall Mount Lighting

DR

4DR LED 4.5″ Downlight – Round

Williams



CATALOG #:
TYPE:
PROJECT:

NEW CONSTRUCTION AND REMODEL

FEATURES

TrimLock®

- Innovative TrimLock reflector retention system ensures trim remains flush with ceiling plane
- Industry-leading efficacies as high as 113 lm/W – ENERGY STAR® certified
- Available on QuickShip

SPECIFICATIONS

- HOUSING – Die-cast aluminum trim housing with forged aluminum heat sink. Galvanized steel splice compartment with driver mounting plate/enclosure. Swing-out mounting arms adjust for ceiling thickness from 1/2″ - 1-7/16″ (see options for additional ceiling thicknesses).
- TRIMLOCK – Innovative TrimLock reflector retention system ensures the trim remains flush with the ceiling plane.
- OPEN REFLECTOR – Low-iridescent anodized aluminum. Clear semi-specular finish standard.
- LENSED TRIM – Die-cast aluminum frame with micro-prismatic, tempered glass lens.
- ELECTRICAL – High-performance Class 2 C.O.B. LED array. Modular quick-connect plug for easy field-connection of LED light assembly to driver. Reported L70>55,000 hours. Reported L90>55,000 hours. Estimated L70 = 200,000 hours.
- MOUNTING – Recessed. 20 ga. galvanized steel mounting pan for new construction or IC-rated enclosure. Remodel kit option includes receiver bracket hardware. Minimum 24″ O.C. marked spacing required for L50 and L60 lumen packages.
- LISTINGS –
  - cCSAus conforms to UL STD 1598; Certified to CAN/CSA STD C22.2 No. 250.0 for damp locations. LED light assembly conforms to UL 2108 for remote installation.
  - Suitable for wet location under covered ceiling when specified with WET/CC or TD options.
  - ENERGY STAR® certified in select configurations, see www.energystar.gov
  - IC-rated for direct contact with insulation when specified with I Mounting Type.
  - City of Chicago Environmental Air approved when specified with CP option.
  - Complies with ASTM-E283 when specified with ATH option.
  - RoHS compliant.
  - Title 24 (JA8) compliant in select configurations, see www.cacertappliances.energy.ca.gov.
- WARRANTY – 5-year limited warranty, see hew.com/warranty.

ENERGY STAR

bios ILLUMINATED
Available with BIOS® consult factory

ORDERING EXAMPLE: 4DR - TL - L20/835 - OPTIONS - DIM - UNV - OW - OF - CS - TRIM OPTIONS - N - F1
(HOUSING: 4DR - TL - L20/835 - OPTIONS - DIM - UNV; TRIM: OW - OF - CS - TRIM OPTIONS; MOUNT.: N - F1)

HOUSING

SERIES	LUMENS [1]	CRI	CCT	OPTIONS		CONTROL [2]		VOLTAGE
4DR - TL TrimLock	L10 1,000lm [3]	8 80	27 2700K	SCA__	Sloped ceiling adapter [5]	DIM	Dimming driver, 0-10V	UNV 120-277V
	L15 1,500lm	9 90 [4]	30 3000K	ATH	Airtight construction	DIM1	1% Dimming driver, 0-10V	347 347V [6]
	L20 2,000lm		35 3500K	F	Fuse			
	L30 3,000lm		40 4000K	EM/7W	7-watt emergency battery [7]			
	L40 4,000lm		50 5000K	EM/10W	10-watt emergency battery [8]			
	L50 5,000lm			EM/10W/RTS	10-watt emergency battery with regressed test switch [9]			
	L60 6,000lm			CP	Chicago plenum (CCEA) [10]			
				SDT	Stepdown transformer [11]			
				TC	Adjustable mounting arms for 1-1/2″ – 2-1/4″ thick ceilings			

TRIM [12]

TRIM TYPE
- O Open reflector
- L Flush lens
- R Regressed lens
- A Angled lens [14]
- S Non-conductive flush lens for shower applications [15]

DISTRIBUTION [13]
- W Wide: 65° Open, 50° Flush, 50° Regressed
- M Medium [16]: 45° Open, 35° Flush, 30° Regressed
- N Narrow [17]: 10° Open, 25° Flush, 25° Regressed
- WW Wall wash [18]

FLANGE TYPE
- OF 1/2″ standard flange
- SF 1/4″ mud-in flange [19]

REFLECTOR FINISH

Open trim types
- CS Clear semi-specular anodize
- SG Satin-glow anodize
- GD Gold anodize
- CG Champagne gold anodize
- PW Pewter anodize
- SPC Clear specular anodize
- RG Rose gold anodize
- WH White texture powder coat
- BL Black texture powder coat

Lens trim types
- CS Clear semi-specular powder coat
- WH White texture powder coat
- BL Black texture powder coat
- MB Black texture splay with white flange [27]

TRIM OPTIONS
- MWT Textured white trim flange [20]
- IP IP65 rated trim [21]
- AD Diffuse acrylic lens [22]
- PD Diffuse 1/8″ polycarbonate lens [23]
- TD Diffuse polycarbonate lens media at top of open reflector [24]
- WET/CC Wet location, covered ceiling listed [25]
- AM Anti-microbial [26]

MOUNTING

MOUNTING TYPE [28]
- N Open pan for new construction
- I IC-rated enclosure for new construction [30]
- R Remodel kit [31]

MOUNTING HARDWARE [29]
- F1 Integral 2-position fixed pan bracket, universal bar hanger included [32]
- BA1 Adjustable butterfly pan bracket, bar hanger not included [33]
- CA1 Adjustable caterpillar pan bracket, universal bar hanger included [34]

NOTES

1. Lumen output based on O trim type, W distribution and CS finish, 3500K/80CRI. Actual lumens may vary +/-5%, see page 2 for FIXTURE PERFORMANCE DATA
2. See page 4 for ADDITIONAL CONTROL OPTIONS.
3. Not available with EM/10W emergency batteries.
4. Extended lead times may apply. Consult factory for availability.
5. 9″ aperture, specify degrees of slope in 5° increments, 05°-30°. See page 4 for SLOPED CEILING ADAPTOR DETAILS. Not available with ATH or TC options. N Mounting Type only. Not available with WET/CC.
6. Not available with EM batteries or DMX controls.
7. N and R Mounting Types only.
8. N and R Mounting Types only.
9. Not available with WET/CC, ATH or IP options. N and R Mounting Types only. See page 5 for EM/10W/RTS DETAILS.
10. I Mounting Type required.
11. May be required for 347V, see product builder at hew.com/product-builder
12. Trim ships separately.
13. Beam angle based on CS or WH reflector finish.
14. Available with WW Distribution only.
15. W Distribution, OF Flange Type, WH Reflector Finish only. Standard with AD diffuse acrylic lens. IP and WET/CC options standard.
16. Not available with lumen stops L50 and higher when specified with flush or regressed trim types.
17. Not available with lumen stops L50 and higher when specified with flush or regressed trim types.
18. O and A Trim Types only.
19. For use with mud-in plaster construction only, supplied with mud flange installation kit. See page 5 for FLANGE TYPE DETAILS. Not available with ATH or IP options.
20. Not available with WH Reflector Finish, L or S Trim Types.
21. L and R Trim Types only.
22. Not available with O trim type. W distribution only.
23. Not available with O trim type. W distribution only.
24. O Trim Type only. WET/CC standard. L50 lumen package max.
25. L50 lumen package max with O Trim Type.
26. WH and BL Reflector Finishes only. Not available with S Trim Type.
27. R Trim Type only. Not available with MWT.
28. Mounting hardware required (N and I only), ordered separately, see MOUNTING HARDWARE ordering info. See page 5 for MOUNTING TYPE DETAILS.
29. Additional mounting hardware options available. See page 6 for MOUNTING HARDWARE DETAILS.
30. L20 lumen package max. L30 available, wide distribution only for lensed trims.
31. Also used in new construction sheetrock ceilings.
32. N and I Mounting Types only. I Mounting requires external brackets.
33. N Mounting Type only
34. N Mounting Type only

H.E. Williams, Inc. ▪ Carthage, Missouri ▪ www.hew.com ▪ 417-358-4065 ▪ Designed and Manufactured in the USA
Information contained herein is subject to change without notice. HEW.70694.LA REV.09/16/20

Downlights
Page 1 of 6

3 Recessed Downlighting

ALCON LIGHTING

SHOP NOW

Project Name: Type: Quantity:

Pavo Architectural LED 6-Inch Cylinder Wall Downlight

FIXTURE SPECIFICATIONS

INTENDED USE

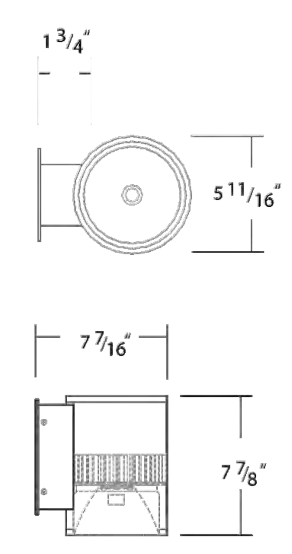
This architectural cylinder wall light is a versatile low-glare lighting fixture. This product can be used indoors and outdoors for commercial or retail purposes. The downlight can also be used to accent and create dramatic effects or provide safety and security. This fixture is exclusively designed for downlighting.

PRODUCT FAMILY

- **11218-DIR** Cylinder Direct
- **11218-ADJ** Cylinder Adjustable
- **11219-2D** Cylinder Direct Indirect
- **11220-DIR** Square Direct
- **11221-2D** Square Direct Indirect

FEATURES

Construction: Round One Piece High Grade Aluminum with corrosion-resistant finish
Light Engine: LED Chip-On-Board
Lens: Tempered Glass and Silicone O-Ring
Reflector: Glare-Free, One piece, Heavy Gauge Aluminum
Mounting: Includes Bracket for Installation Directly to a 4" octagonal electrical junction-box
Voltage: 120V *(Non-Dimming)*, 120V/277V *(Dimming)*
CRI: 84+
Dimming: Universal Dimming System Compatible with 2-Wire TRIAC, 3-Wire ELV, and 5-Wire 0-10V Dimmers
Life: L70 - 50,000 Hours
Emergency: 90 Minutes Minimum, Remote Test Switch, Plate Cover, Junction Box Included
Listing: ETL/cETL Listed Suitable for Wet Location. Assembled in the US (IP65)
Electrical: Electronic Direct Current Class 2 driver
Warranty: 5 Years Carefree for Parts and Components (Labor not included). We recommend the use of surge protectors on the power entering LED Housings. Surge damage is not covered by warranty.
Compliancy: Dark Sky Compliant when fixture is pointing downward.



SPEC GRADE · ASSEMBLED IN THE USA · DIMMABLE · LIMITED 5-YEAR WARRANTY · DARK SKY COMPLIANT · WET LOCATION SUITABLE · IP65 TESTED & APPROVED · INTERTEK ETL LISTED C US

ORDERING INFORMATION Example: (11218-DIR-L15-B60-UNI-40K-WH-EM)

Model	Lumen	Beam Spread	Dimming	Color Temperature	Finish	Options
11218-DIR Pavo-Cylinder	**L10** 1000 lm (15W) Standard	**B2** 2° Narrow Spot	**ND** Standard Non-Dimming (120V)	**27K** 2700K	**WH** White	**EM** Emergency
	L15 1500 lm (22W)	**B10** 10° Spot	**UNI** Universal (120V / 277V)	**30K** 3000K	**BK** Black	
	L22 2200 lm (22W)	**B20** 20° Wide Spot		**35K** 3500K	**SL** Silver	
	L26 2600 lm (30W)	**B45** 45° Flood		**40K** 4000K Standard	**BZ** Bronze	
		B60 60° Wide Flood Standard		**50K** 5000K		
		WW Wall Wash				
		IV Type IV (forward throw)				

▸AlconLighting.com © 2020 ▸(877) 733-5236 Rev. 03/20/20 1/2

2 Wall Mount Lighting

Elias Outdoor LED Wall Sconce
By Kichler

LUMENS
Call Us (877) 445-4486

Elias Outdoor LED Wall Sconce
By Kichler

Product Options

Size: Medium

Details

Finish: Textured Black with Gold interior

Dimensions

Medium Option Backplate: Diameter 6"
Medium Option Fixture: Height 9", Depth 11", Diameter 16", Weight 1.5Lbs

Lighting

Medium

Lamp Type	LED Built-in
Total Lumens	425
Total Watts	9.00
Volts	120
Color Temp	3000 (Soft White)
CRI	90
Equivalent Halogen, CFL or LED Bulb Can Be Used	No

Notes:

Prepared by:

Prepared for:
Project:
Room:
Placement:
Approval:

Additional Details

Product URL:
https://www.lumens.com/elias-outdoor-led-wall-sconce-by-kichler-KCH1991370.html
Rating: ETL Listed Wet

ITEM#: KCH1991370

Created September 12th, 2023

1 Gooseneck Lighting

PROJECT:
258 Main Street - Mixed use New Construction
Reading, MA

RP Architectural Studio

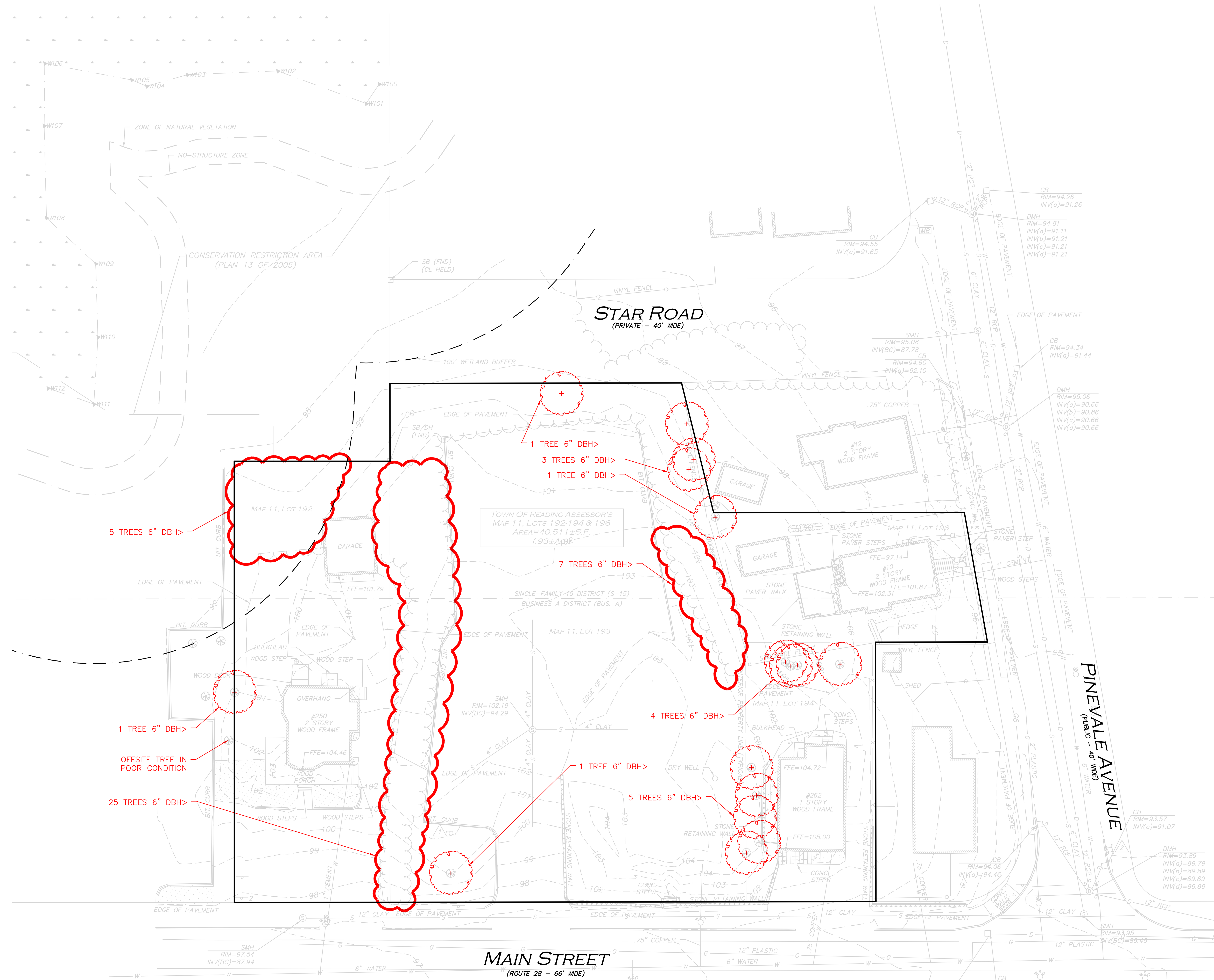
78 Highland Circle
Wayland, MA 01778
Tel. 617-794-7759

Project Team:

Date:	Revisions:

Drawing Title:
Lighting

Scale: Noted
Job No.: 434
Date: 3/25/24
Drawing No. : A3.2



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1-888-344-7233

NOTES:

1. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR IT'S REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
2. THE INFORMATION SHOWN ON THIS PLAN IS THE SOLE PROPERTY OF ALLEN & MAJOR ASSOCIATES, INC. IT'S INTENDED USE IS TO PROVIDE INFORMATION. ANY ALTERATION, MISUSE, OR RECALCULATION OF INFORMATION OR DATA WITHOUT THE EXPRESSED, WRITTEN CONSENT OF ALLEN & MAJOR ASSOCIATES, INC. IS STRICTLY PROHIBITED.
3. EXISTING TREES WERE OBSERVED AND COUNTED ON JANUARY 02, 2024.
4. A TOTAL OF 53 TREES LARGER THAN 6" DBH EXIST ON SITE.
5. THE MAJORITY OF TREES WERE ESTIMATED TO BE APPROXIMATELY 60'–70' TALL.

GRAPHIC SCALE
(IN FEET)
1 inch = 20 ft.

PROFESSIONAL LANDSCAPE ARCHITECT FOR ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION
B	3/25/2024	REVISED PER TOWN COMMENTS
A	2/29/2024	REVISED PER TOWN COMMENTS

APPLICANT\OWNER:
BLVD READING, LLC
c/o SAVERIO FULCINITI
1 SYLVAN STREET
PEABODY, MA 01960

PROJECT:

STRADA
MIXED USE BUILDING
258 MAIN STREET
READING, MA

PROJECT NO.	2398-01A	DATE:	10-05-2023
SCALE:	1" = 20'	DWG. NAME:	L-2398-01A
DESIGNED BY:	JBT	CHECKED BY:	CMQ

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ◆ land surveying
environmental consulting ◆ landscape architecture
www.allenmajor.com
100 COMMERCE WAY, SUITE 5
WOBURN MA 01801
TEL: (781) 935-6889
FAX: (781) 935-2896
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE: EXISTING TREE PLAN

SHEET No. L-001

N:\PROJECTS\2398-01A\CIVIL\DRAWINGS\CURRENT\L-2398-01A_EX TREE SURVEY.DWG

100 Commerce Way, Suite 5, Woburn, MA | T (781) 935-6889 | F (781) 935-2896
allenmajor.com

ALLEN & MAJOR ASSOCIATES, INC.

March 26, 2024

Andrew MacNichol Community Development Director Community Planning and Development Commission 16 Lowell Street Reading, MA 01867	**A&M Project #:**	2398-01A
	Re:	258 Main Street Reading, MA

Dear Mr. MacNichol,

On behalf of our client, Saverio Fulciniti/Reading CRE Ventures, LLC., Allen & Major Associates, Inc. (A&M) is providing the following responses to a memo from the Town Engineer Ryan Percival, PE, dated 03/19/2024.

The response to comments are shown below in **bold** preceded by the original comment shown in *italics*.

Key Issues/Concerns:

Comment 1: *The applicant has changed the parking lot to allow for improved flow through traffic, with one way in and one way out.*

Response 1: The applicant concurs with this statement.

Comment 2: *The applicant is required to obtain a State Highway Access Permit for the driveway curb cuts and utility work.*

Response 2: The applicant concurs with this statement.

Comment 3: *The turning movements on sheet C-107B show a very awkward and tight movement on the first parking space at the rear of the building. It appears that the turning movement also encroaches into the spaces located on the curved portion of the lot.*

Response 3: The fire truck does not encroach on any parking spaces. The plans have been revised to provide additional stripping at the corner to clearly illustrate that there is no encroachment.
Additionally, the plans were revised to remove the parking stalls located on the radius in lieu of a more conventional perpendicular parking layout. This resulted in more room for the fire truck to make turning movements.

Comment 4: *The spaces on the curved portion of the lot shall be dimensioned to ensure proper spacing. The layout is an irregular shape.*

Response 4: The plans were revised to remove the parking stalls located on the radius in lieu of a more conventional perpendicular parking layout.

Comment 5: *The drainage report shows a reduction in post-development runoff volumes and flows for the 2, 10, 25 and 100-year storms utilizing the NOAA Atlas 14 rainfall frequencies. Study Point #3 shows no flow to the wetlands are the impacts to the wetland hydrology being considered?*

Response 5: The drainage report was prepared to illustrate no runoff from the site for the 25-year storm event per Town of Reading standard stormwater practices. Wetland hydrology is being considered as the area of existing surface runoff to the wetland is proposed to be collected and infiltrated within the existing watershed of wetland.

This provides a more consistent and reliable volume of water to the wetland that will be collected and slowly infiltrated and routed back to the wetland through groundwater flows. This is consistent with standard engineering practices and guidelines of the MassDEP.

Comment 6: *The applicant shows a 93% TSS Removal and 94% Phosphorous Removal, meeting Town regulations.*

Response 6: The applicant concurs with this statement.

Comment 7: *The project will trigger a Town Storm Water Permit.*

Response 7: The applicant concurs with this statement.

Comment 8: *The applicant is responsible for filing all necessary permits, including but not limited to any NPDES permits.*

Response 8: The applicant concurs with this statement.

Comment 9: *Fire flow test shall be performed.*

Response 9: The applicant is agreeable to this as a condition of approval.

Comment 10: *Sewer flow study shall be performed.*

Response 10: The applicant is agreeable to this as a condition of approval.

Comment 11: *Trench paving in the Town ROW shall meet Town Standards, trench paving in the State Highway Layout shall meet State permit requirements.*

Response 11: The applicant is agreeable to this as a condition of approval.

Comment 12: The site may be subject to a Sewer Connection Fee. All utilities shall be approved materials and installed in accordance with the Department of Public Works Standards.

Response 12: The applicant is agreeable to this as a condition of approval.

Comment 13: Engineering Division shall be notified 72 hours in advance to mark out Town utilities.

Response 13: The applicant is agreeable to this as a condition of approval.

Comment 14: All water, sewer, curb cut, street opening, and Jackie's Law excavation permits shall be obtained at the Engineering Division prior to any excavations.

Response 14: The applicant is agreeable to this as a condition of approval.

Comment 15: All site work shall be inspected by the Engineering Division. The Applicant/Owner's contractor shall submit a construction schedule of proposed work. All inspections shall be scheduled 48 hours in advance.

Response 15: The applicant is agreeable to this as a condition of approval.

Comment 16: An approved site as-built shall be submitted to the Engineering Division within 60 days of certificate of occupancy. The as-built shall be submitted in mylar and electronic ACAD format.

Response 16: The applicant is agreeable to this as a condition of approval.

A&M believes these responses will provide sufficient information for the continued review of this application. If you require additional information, please feel free to contact me.

Very Truly Yours,

ALLEN & MAJOR ASSOCIATES, INC.

Carlton M. Quinn, P.E.
Woburn Civil Department Head

Copy: Saverio Fulciniti (by email)

Enclosure: Civil Site Plans, dated March 25, 2024

Drainage Report, Dated March 25, 2024

Jesse D. Schomer, Esq.
jschomer@regnante.com

Regnante Sterio LLP
Attorneys-at-Law
401 Edgewater Place, Suite 630
Wakefield, MA 01880
(781) 246-2525
regnante.com

March 29, 2024

Town of Reading
Community Planning and Development Commission
Attn: John Weston, Chair
Attn: Andrew MacNichol, Community Development Director
Reading Town Hall, 16 Lowell Street, Reading, MA01867

Re: Special Permit Application
Applicant: BLVD Reading, LLC
Project: Strada at 252, 258, & 262 Main Street & 10 Pinevale Avenue

Dear Board Members:

I write on behalf of my client, BLVD Reading, LLC ("Applicant"), the applicant and developer of Strada at 252, 258, 262 Main Street and 10 Pinevale Avenue ("Project").

The Applicant has finalized the Architectural & Civil Plans based on the feedback provided by municipal departments, as well as comments from the CPDC members and local residents during the March 11, 2024 CPDC hearing. Given that the prior feedback has already been incorporated into the Project plans, this submission represents the final plan set. Included with this submission for your reference please find the following:

- Narrative Summary of Changes (see following pages)
- Final Civil Package & Drainage Report, response to Engineering Memo, prepared by Allen & Major
- Final Architectural Package, prepared by RP Architectural Studio

If you should have any questions, or additional feedback, please feel free to reach out. We look forward to presenting these materials at the CPDC's upcoming meeting.

Respectfully Submitted,

BLVD Reading, LLC
By its Attorney,

Jesse D. Schomer, Esq.

Summary of Changes

Parking Design

In response to the Engineering Division's Memo dated March 19, 2024, the northwest and southwest corners of the lot have been "squared off" to improve design as depicted in Figure 1 & 2. *No loss of parking has occurred.*

Figure 1: Previous Layout & Materials Plan

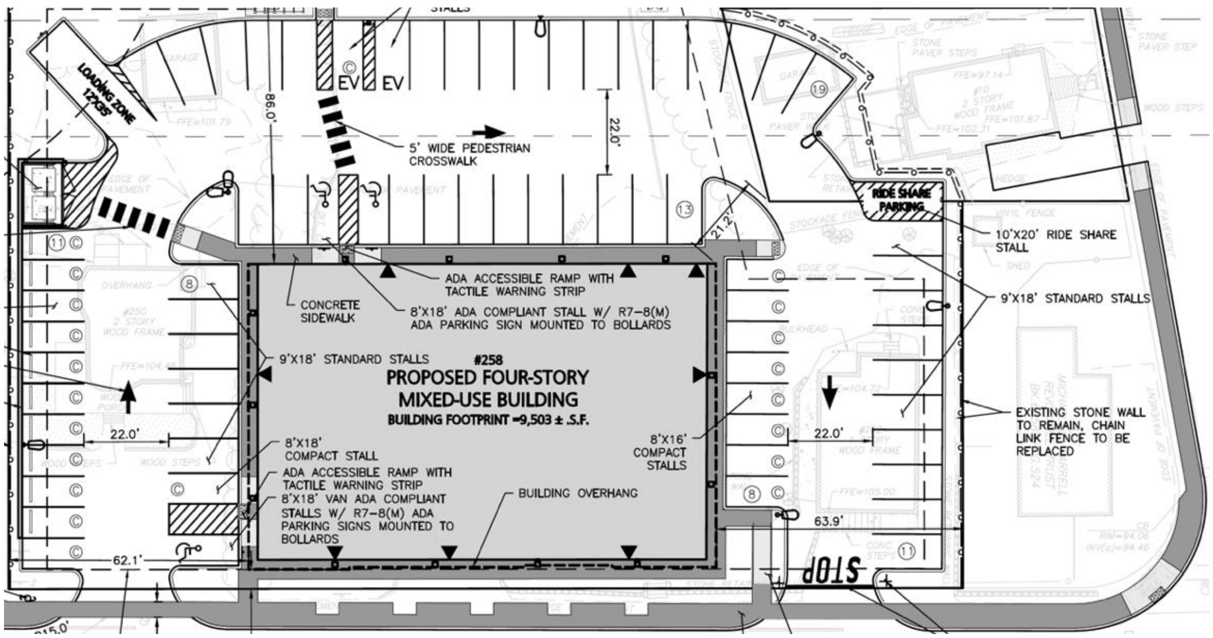
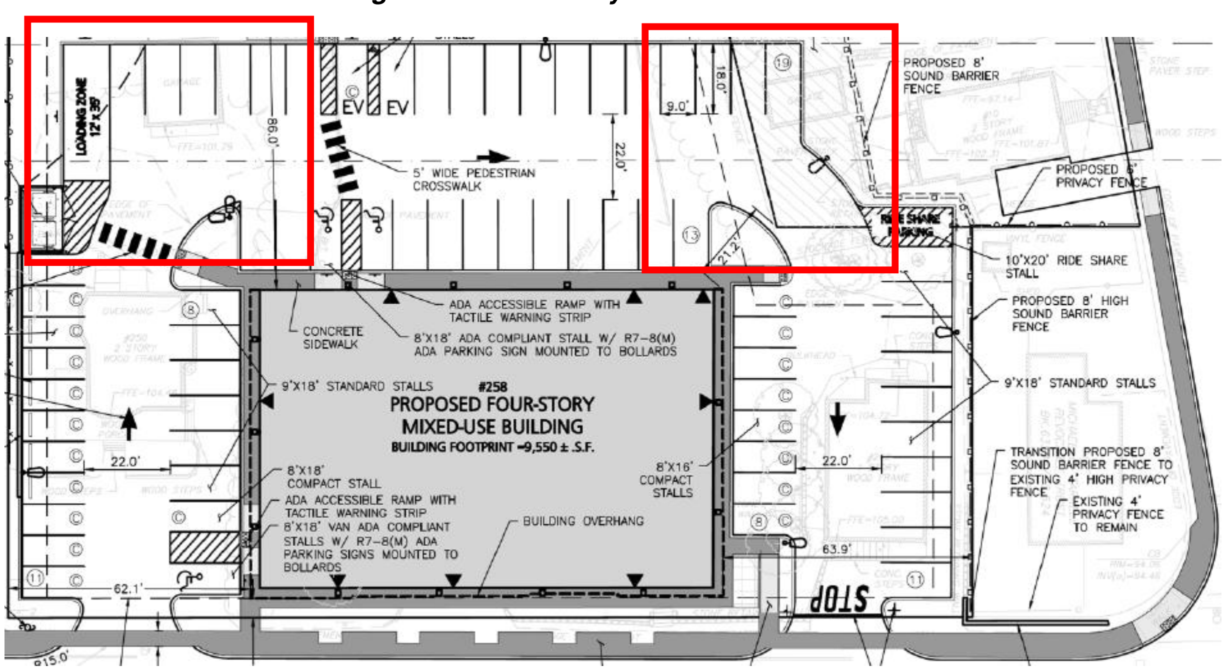


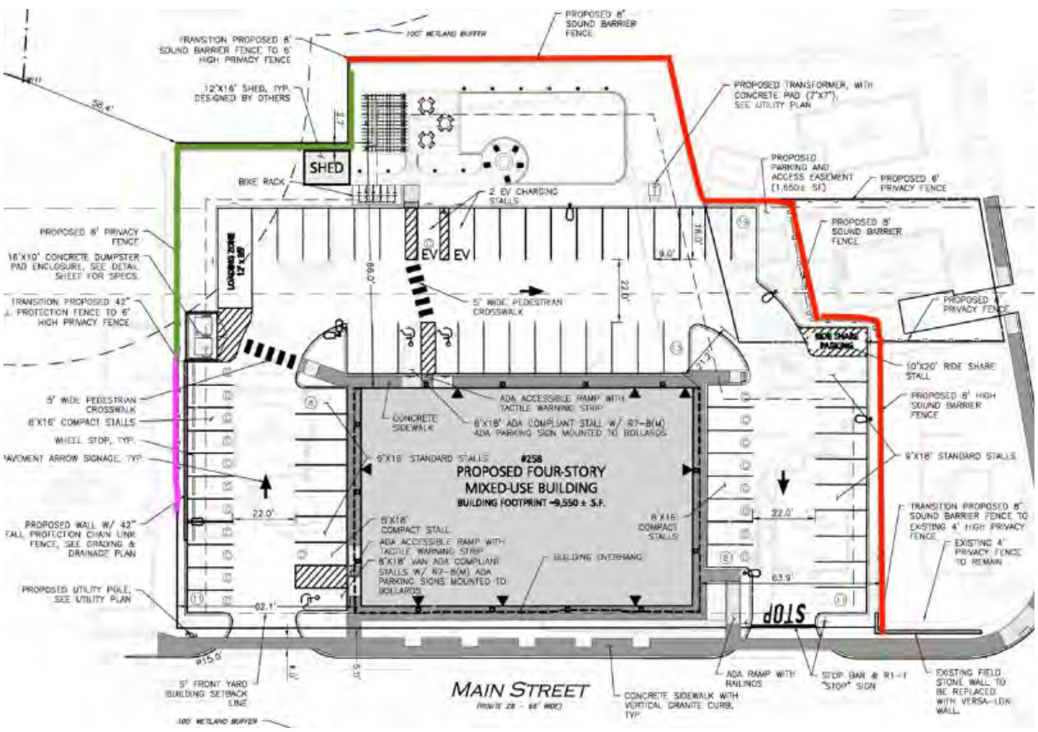
Figure 2: Revised Layout & Materials Plan



Perimeter Fencing and Amenity Area

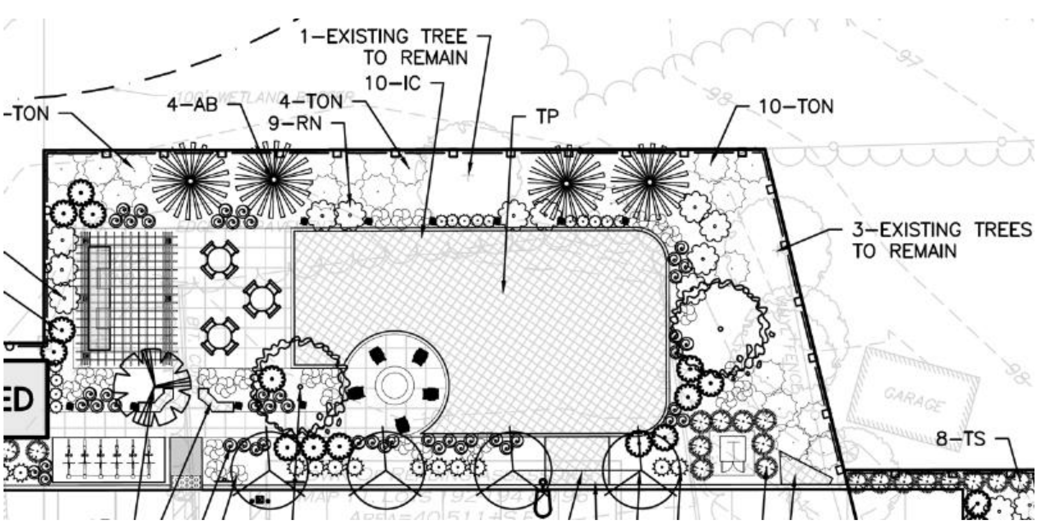
Based on feedback from abutting property owners, the Applicant has elected to use an 8' sound mitigating fence along the lot lines at 2, 10, and 12 Pinevale Avenue and Star Road (shown in red line). A 6' privacy fence (shown in green) will be used from Star Road through behind the dumpster, at which point, the Applicant will transition to a fall-protection fence (shown in pink) to avoid creating a visual silo.

Figure 3: Fence Plan



In addition, the amenity area has been updated to reflect the requested change to preserve the existing trees, and remove the berms as shown in Figure 4 below.

Figure 4: Amenity Area



Special Permit Criteria

In addition to complying with the Town's Mixed-Use regulations, the project advances the policy goals of each of the special permit criteria (see Zoning Bylaw § 4.4.5) under which the CPDC will review this project:

- **The proposed use will be suitably located in the neighborhood in which it is proposed and in relation to the entire Town.**

  This mixed use multifamily/commercial development is complementary to existing multifamily and commercial uses in the neighborhood and is appropriately designed to buffer single-family abutters from project impacts. The preservation and enhancement of 10 Pinevale Avenue provides a meaningful transition to the residential neighborhood.

- **The proposed use will be compatible with existing uses and other uses permitted by right in the same district.**

  The project directly abuts existing commercial and multifamily uses in the B-A district and is appropriately designed to buffer single-family abutters from project impacts. The project directly supports the initiatives outlined the community's housing production & economic development plans as they pertain to the PDA-2B location.

- **The proposed use will not constitute a nuisance due to air and water pollution, flood, noise, dust, vibration, lights, or visually offensive structures and accessories.**

  The project will comply with all applicable environmental regulations to protect against any nuisance due to these issues.

- **The proposed use will not be a substantial inconvenience or hazard to abutters, vehicles, or pedestrians.**

  The project layout has been designed to provide safe and convenient access to all parties and poses no hazard to abutters, vehicles, or pedestrians. The preservation of 10 Pinevale Avenue removes access from the abutting residential neighborhood.

- **Adequate and appropriate facilities will be provided for the proper operation of the proposed use.**

  All necessary site utilities, access, parking, loading, snow storage, and stormwater management are provided by the project.

- **Adjoining premises will be reasonably protected against any possible detrimental or offensive uses on the site, including unsightly or obnoxious appearance.**

  Landscaping and setbacks as described above, as well as appropriate design of the building and layout of the site, and 8', sound mitigating fencing will buffer single-family abutters from all project impacts, including visual impact, noise, traffic, and shadowing. Also, the trash enclosure has been located as far away from residential abutters as possible and will be professionally managed to ensure that residents' concerns relating to other nearby properties and projects do not occur here.

- **The proposed use will be in conformance with the sign regulations of Section 8 of the Zoning Bylaw.**

  No request for approval of signage is presently before the CPDC. However, signage will be tastefully designed, appropriate for the neighborhood, and will fully comply with Section 8 as a condition of this approval.

- **The proposed use will provide convenient and safe vehicular and pedestrian movement within the site in relation to adjacent streets, property or improvements.**

  The traffic study prepared by Vanasse & Associates demonstrates that the project provides convenient and safe access for vehicles and pedestrians, and is appropriately designed in relation to adjacent streets, uses, and the neighborhood in general. The Town of Reading Engineering Memo dated March 19, 2024 states, "The applicant has changed the parking lot to allow for improved flow through traffic, with one way in and one way out."

- **Adequate space will be provided for the off-street loading and unloading of vehicles, goods, products, materials, and equipment incidental to the normal operation of the proposed use.**

  A dedicated loading zone for deliveries and move-ins/move-outs is provided. Additionally, the surplus of parking spaces available on the site will accommodate short-term deliveries, loading, and unloading, such as rideshares (Uber, Lyft, etc.) and private-vehicle deliveries (Uber Eats, Amazon, etc.). A dedicated rideshare space has been allocated on the site to encourage alternative mobility.

- **Adequate methods of disposal and storage will be provided for sewage, refuse and other wastes resulting from the proposed uses, and adequate methods of drainage will be provided for surface water.**

  The project proposes to connect to public sewer infrastructure and will comply with all applicable regulations necessary to do so. The project has been designed to fully comply with all applicable local, state, and federal stormwater management and drainage regulations, including the Massachusetts Stormwater Management Standards and NPDES requirements.

- **The proposed uses will ensure protection from flood hazards, considering such factors as elevation of buildings, drainage, adequacy of sewage disposal, erosion and sedimentation control, equipment location, refuse disposal, storage of buoyant materials, extent of paving, effect of fill, roadways, or other encroachments on flood runoff and flow.**

  The project has been designed to fully comply with all applicable local, state, and federal stormwater management and drainage regulations, including the Massachusetts Stormwater Management Standards and NPDES requirements.

- **The proposed use will ensure protection of water quality in both public and private supplies.**

  The project will have no impact to public or private water supplies.

246 & 248 WALNUT STREET

A RESIDENTIAL SUBDIVISION
IN READING, MA

STORMWATER MANAGEMENT REPORT

VOLUME 1 OF 2

STORMWATER MANAGEMENT DESIGN

December 20, 2023

PREPARED FOR:

STELLA CONSTRUCTION
25 EVERETT STREET
WOBURN, MA 01810

PREPARED BY:
MEISNER BREM CORPORATION
142 LITTLETON ROAD, STE. 16
WESTFORD, MA 01886

MBC JOB NUMBER: 3110

2	*3-22-24*	*Phosphorus Removal & Add CB 7*	*IJA*
1	*2-8-24*	*NOAA 14 Rainfall & Cul-De-Sac Circle*	*IJA*
NO.	**DATE**	**REVISION**	**BY**

246 & 248 WALNUT STREET
STORMWATER MANAGEMENT REPORT – VOLUME 1 OF 2
A RESIDENTIAL SUBDIVISION IN READING, MA

THE FOLLOWING REPORT HAS BEEN PREPARED UNDER THE SUPERVISION OF A REGISTERED PROFESSIONAL ENGINEER LICENSED IN THE COMMONWEALTH OF MASSACHUSETTS.

246 & 248 WALNUT STREET

A RESIDENTIAL SUBDIVISION
IN READING, MA

Volume 1

STORMWATER MANAGEMENT DESIGN

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246 & 248 WALNUT STREET
STORMWATER MANAGEMENT REPORT – VOLUME 1 OF 2
A RESIDENTIAL SUBDIVISION IN READING, MA

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VOLUME 2

STORMWATER CHECKLIST

HYDROCAD WORKSHEETS - 2, 10, 25, 100-YEAR, 100-YEAR (NOAA 14) STORM EVENTS

NOAA ATLAS 14 RAINFALL DATA

SECTION 1.0 INTRODUCTION

The following Stormwater Management Report outlines the proposed drainage design, the analysis of the pre and post development stormwater conditions, the design of the structural and non-structural drainage components, the proposed stormwater mitigation strategies for change in cover and proposed impervious area, compliance with Massachusetts Department of Environmental Protection (MassDEP) Stormwater Handbook, and other related stormwater issues of the development of the project. It also is intended to satisfy the state and local regulations and requirements to protect the surrounding neighborhoods, the natural resources, the existing drainage utilities, and the waters of the Commonwealth from adverse impacts resulting from the stormwater runoff.

This report defines a program for controlling, conveying, treating and discharging the stormwater runoff from the site in accordance with the adopted MassDEP *Stormwater Handbook, the Federal and State Clean Water Acts, the Wetlands Protection Act, the Coastal Zone Act, a portion of the National Pollutant Discharge Elimination System Program and the Town of Reading Subdivision Regulations.*

The report identifies by means of narratives, calculations, plans and specifications that suitable and appropriate quantity and quality control measures have been provided to gather, control, treat, and discharge stormwater runoff. The storm frequencies analyzed are the 2 yr, 10 yr, 25 yr, and 100 yr utilizing NOAA Atlas 14 rainfall data pursuant to MassDEP and local regulations. A summary tabulation of the pre development and post development peak flow rates and volumes is provided for all storm events analyzed.

This stormwater analysis includes a quantity comparison of the pre-developed flows to the post-developed flows to assure that no increase in the rate of runoff at the property boundaries. The design includes the totality of LID practices, BMP's, and Stormwater Management Facilities (SMF's) to control the discharge flow rate from the site at a rate no greater than the existing pre-developed flow rate. This Report also discusses the design for the water quality treatment and groundwater recharge methods, and evaluates the compliance to the various codes, regulations, and policies.

246 & 248 WALNUT STREET

STORMWATER MANAGEMENT REPORT – VOLUME 1 OF 2

A RESIDENTIAL SUBDIVISION IN READING, MA

This report includes:

i) discussion of the project area: existing and proposed,

ii) various record maps and plans

iii) overview discussion of stormwater management design

iv) full analysis of the Pre vs. Post Development conditions,

v) division of the land into SubCatchment Areas,

vi) computation of the weighted average "CN" for each SubCatchment area,

vii) computation of the time of concentrations for each SubCatchment area,

viii) grades of stormwater components from the grading plan of the site,

ix) final HydroCAD report with all subcatchment areas, pipe sizes, types, slopes, and invert elevations, treatment systems, and infiltration areas.

x) summary of pre vs post development flow rates

xi) discussion of BMP

xii) computations of provided vs. required recharge

xiii) computations of provided water quality volume vs. required water quality volume

xiv) operation and maintenance manual

The full plan set entitled Definitive Subdivision Plan Set, "246 & 248 Walnut Street", Reading, MA prepared for Stella Construction, by Meisner Brem Corporation, dated December 5, 2023, revised March 22, consisting of 13 sheets (Plans), is hereby incorporated herein by reference.

SECTION 2.0 GENERAL PROJECT INFORMATION -

SECTION 2.1 GENERAL

The proposed project is two-lot subdivision on a previously developed parcel known as 246 Walnut Street. A new single family home will be constructed on each lot. A new 150 ft long private way will be constructed to service the two lots.

SECTION 2.2 EXISTING CONDITIONS

2.2.1 Site

The site is a single parcel in the Single Family 20 Zone with a total area of about 2 acres. There is currently an existing house, gravel driveway, and small paved driveway. The west side of the site nearest Walnut Street is generally open and grassed. The eastern portion of the site is forested and contains a large wetland area. The site is located just downslope of an interchange associated with Interstate Route 93.

2.2.2 Geology

The property generally slopes to the east, starting from a high point around elevation 124 near #236 Walnut Street and down to the eastern wetland around elevation 98. Slopes are generally between 6% and 30% with the steeper areas near the wetland. NRCS soil mapping indicates soils consisting of Swansea muck and fill associated with Route 93, although on-site soil testing indicates loamy sand with a deep water table.

For more information on soil types, especially NCRS soil mapping see Section 3.3.

2.2.3 Pre Development Drainage Areas and Sub Catchment Areas

The Sub Catchment Areas, or Drainage Areas, all drain to the wetland on the eastern side of the property. This wetland is thus used as the point of analysis.

Subcatchment 100 encompasses all of the upland area on the site as well as offsite flow from 236 Walnut Street. This area consists mostly of woods with some existing pavement and buildings on 236 & 246 Walnut Street. The center area of the site is open and grassed.

2.2.4 Post Development Sub Catchment Areas

There are two Post-Development Drainage Areas. Subcatchment 100 again comprises the portion of the site that will discharge directly to the eastern wetland after development. This is generally the rear of the two new house lots.

Subcatchments 120 and 150 represent the areas that will drain into individual catch basins and infiltration chamber system. This consists of most of the paved access way and most of the offsite flow coming from 236 Walnut Street.

2.2.5 Wetlands

As described above, there is a large wetland area on the eastern portion of the site. several wetlands on the site that are part of a larger interconnected system located offsite. A stream is located just offsite to the east. The 200-foot Riverfront Area associated with the stream projects onto the site.

SECTION 2.3 EXISTING SOILS

2.3.1 NRCS Soil Types

The Soil Conservation Service with the United States Department of Agriculture has mapped the project area for soil types. The SCS soils types are now available online at the USDA Natural Resources Conservation Service (NRCS) website. A print-out of the Off Site Soils and On Site Soils is included herein in Section 3.4.

The USDA classifies soils into four (4) hydrologic soil groups as follows:

TABLE 2.3: NRCS - SCS SOIL GROUPS

SCS Soils Group	General Description
A	Sands & Gravels - highly permeable
B	Glacial Till – more permeable
C	Glacial Till – less permeable
D	Impermeable, silts, clays, muck

> *Group A—Soils in this group have low runoff potential when thoroughly wet. Water is transmitted freely through the soil. Group A soils typically have less than 10 percent clay and more than 90 percent sand or gravel and have gravel or sand textures. Some soils having loamy sand, sandy loam, loam or silt loam textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments.*
>
> *Group B—Soils in this group have moderately low runoff potential when thoroughly wet. Water transmission through the soil is unimpeded. Group B soils typically have between 10 percent and 20 percent clay and 50 percent to 90 percent sand and have loamy sand or sandy loam textures. Some soils having loam, silt loam, silt, or sandy clay loam textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments.*
>
> *Group C—Soils in this group have moderately high runoff potential when thoroughly wet. Water transmission through the soil is somewhat restricted. Group C soils typically have between 20 percent and 40 percent clay and less than 50 percent sand and have loam, silt loam, sandy clay loam, clay loam, and silty clay loam textures. Some soils having clay, silty clay, or sandy clay textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments.*
>
> *Group D—Soils in this group have high runoff potential when thoroughly wet. Water movement through the soil is restricted or very restricted. Group D soils typically have greater than 40 percent clay, less than 50 percent sand, and have clayey textures. In some areas, they also have high shrink-swell potential. All soils with a depth to a water impermeable layer less than 50 centimeters [20 inches] and all soils with a water table within 60 centimeters [24 inches] of the surface are in this group, although some may have a dual classification, as described in the next section, if they can be adequately drained.*[1]

The soils on the site consist of soils within Hydrologic Soil Group D within the wetland, as shown on the NRCS map provided in Section 3.2, and Hydrologic Soil Group A within the upland areas, as shown on the soil testing provided in Volume 2.

SECTION 2.4 PROPOSED DEVELOPMENT

The proposed development is an 2 lot single-family subdivision with an associated 150 ft private way. The private way will be 20 ft wide, paved, and will terminate in a circular turnaround. The lots

[1] Part 630, Hydrology, National Engineering Handbook, Chapter 7, Hydrology by United States Department of Agriculture, Natural Resources Conservation Service, 2007 (210-V1-NEH, May, 2007)

shall be served by municipal sewer and water. Water and sewer service connections to each lot will be constructed along the proposed roadway. The lots shall also be served by underground electric/cable/phone utilities to be constructed along the newly constructed roadway.

The paved areas will drain to catch basins to be constructed along the private way, which then discharges via pipes to an infiltration chamber system known as Stormwater Management Facility 1 (SMF 1). The chamber system will treat, detain, and infiltrate runoff in order to satisfy the State Stormwater Standards.

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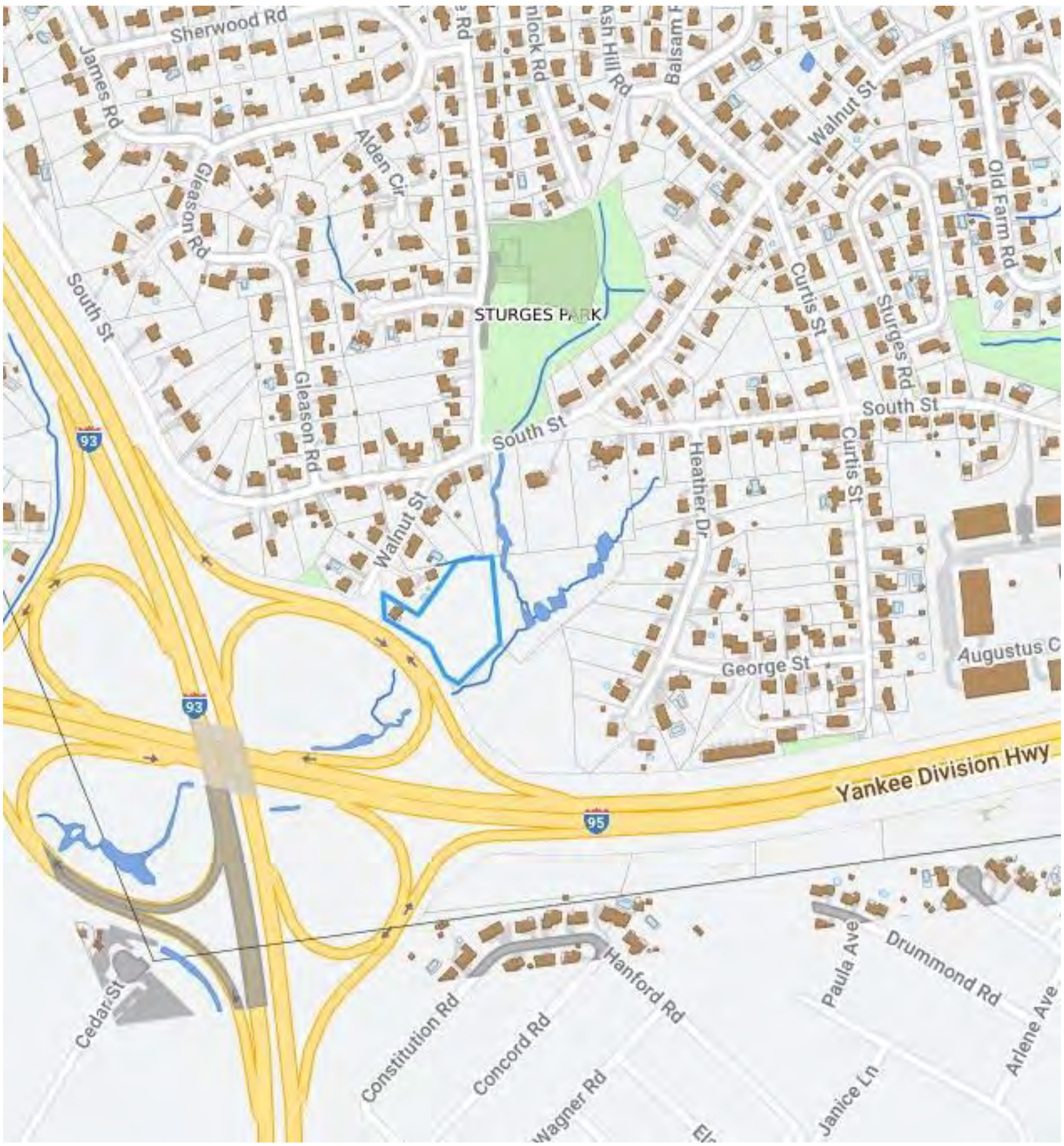
Section 3.0 Maps

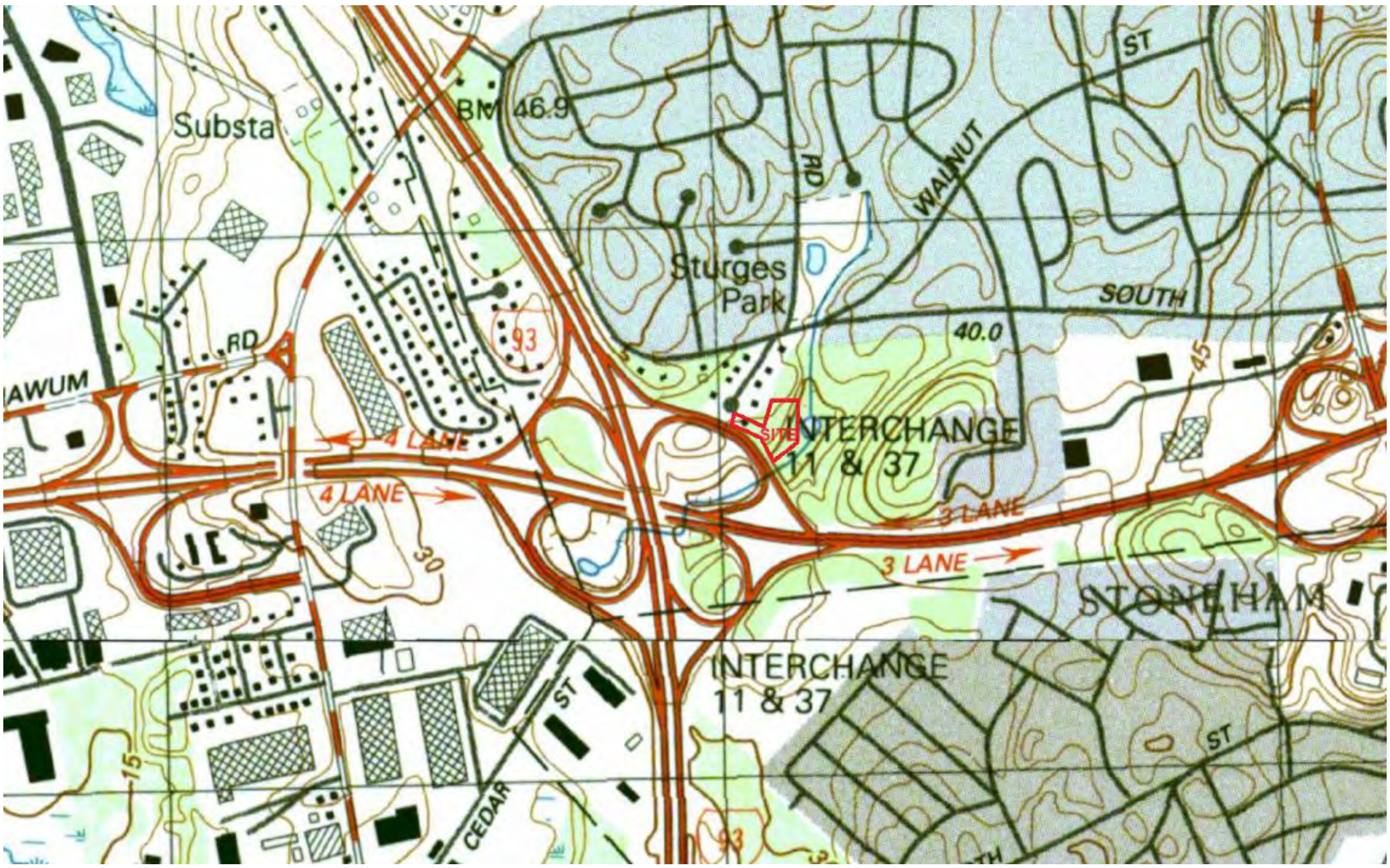
SECTION 3.1 SITE LOCUS MAP

FIGURE 3.1 NOT TO SCALE



SECTION 3.2 USGS MAP

FIGURE 3.2 NOT TO SCALE



SECTION 3.3 SOILS MAP

FIGURE 3.3 ON SITE SOILS: SCALE: AS SHOWN

Note: See Figure 3.4 on the following page for soil legend

FIGURE 3.4: SOIL LEGEND AND SITE COVERAGE (% OF AOI)

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
51A	Swansea muck, 0 to 1 percent slopes	4.6	49.0%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	1.4	15.2%
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	1.1	11.4%
629C	Canton-Charlton-Urban land complex, 3 to 15 percent slopes	1.1	12.1%
656	Udorthents-Urban land complex	1.2	12.3%
Totals for Area of Interest		**9.4**	**100.0%**

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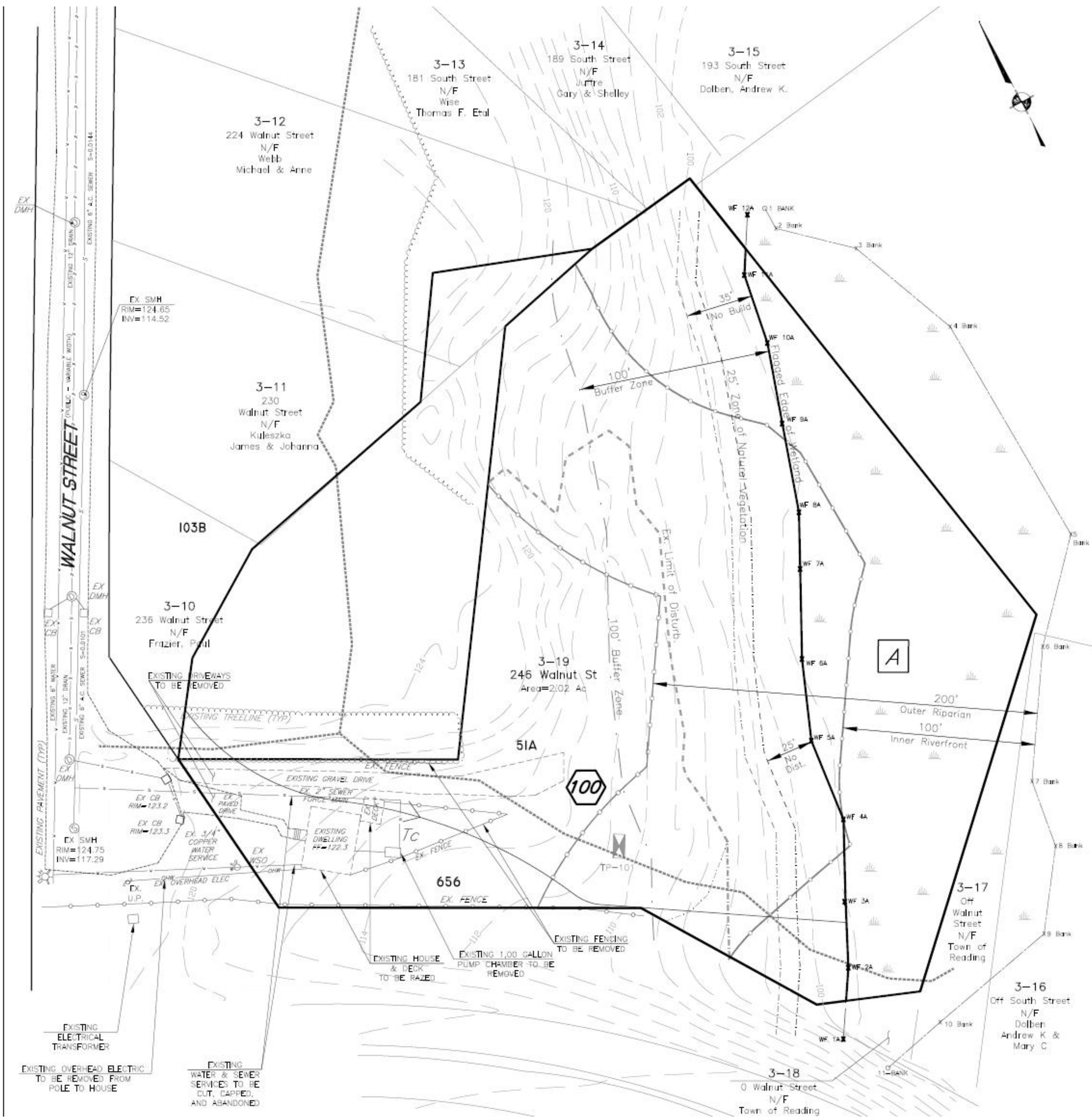
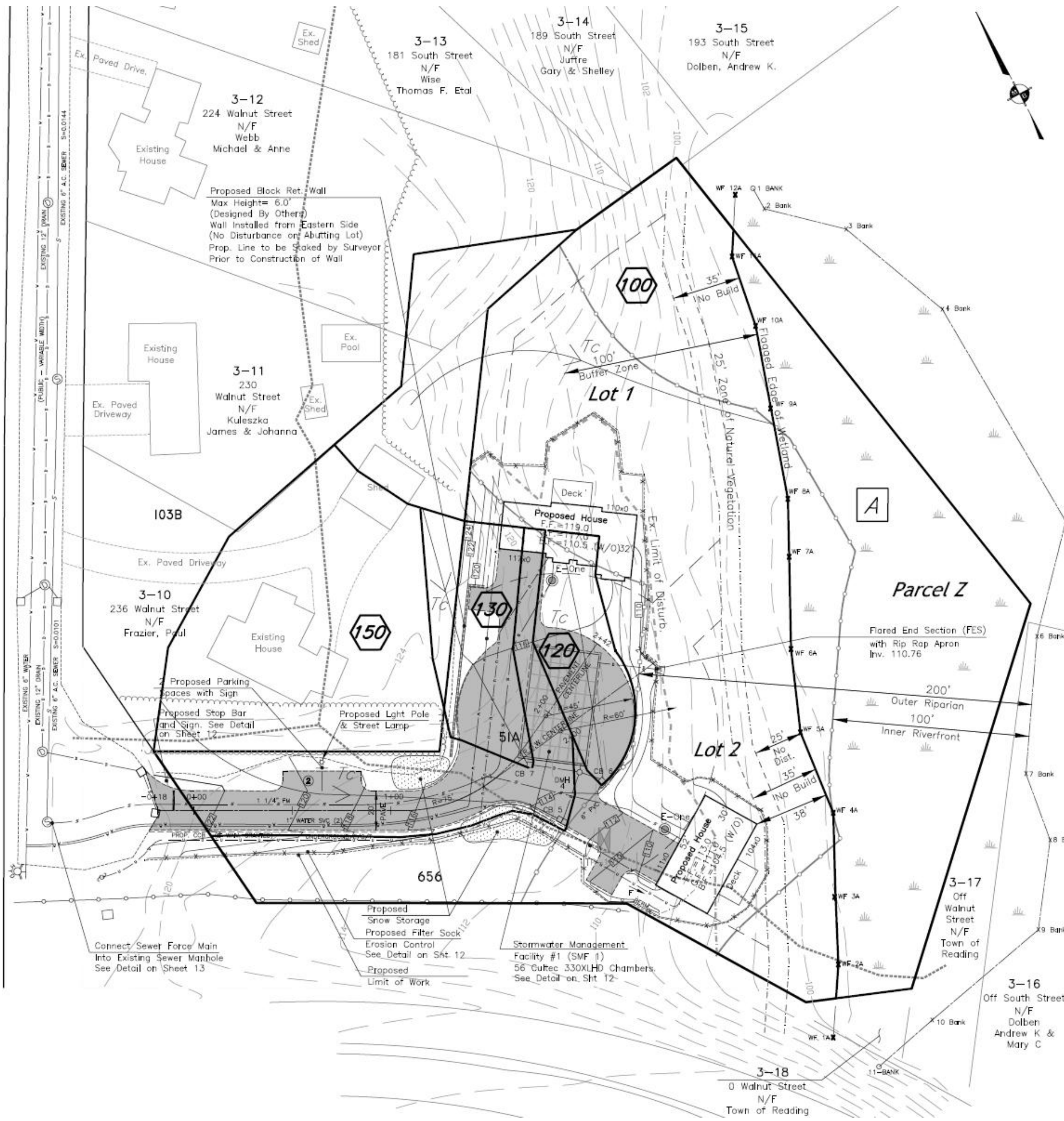
SECTION 3.4 DRAINAGE AREA MAPS – PRE DEVELOPMENT



SECTION 3.5 DRAINAGE AREA MAPS – POST DEVELOPMENT



Section 4.0 Stormwater Management Overview

SECTION 4.1 STORMWATER MANAGEMENT PLAN – DEFINITION AND GOALS

4.1.1 Definition

A *Stormwater Management Plan* is a program for controlling, conveying, treating and discharging stormwater runoff. It is a system intended to protect the surrounding neighborhoods, the existing drainage facilities, and the waters of the Commonwealth of Massachusetts from adverse impacts caused by stormwater runoff. The plan consists of engineering designs including drawings, details and specifications of construction, narratives, and supporting calculations to justify the feasibility to construct and comply with the requirements of the adopted MassDEP *Stormwater Handbook, the Federal and State Clean Water Acts, the Wetlands Protection Act, the Coastal Zone Act, a portion of the National Pollutant Discharge Elimination System Program and the Town of Reading Subdivision Regulations.*

4.1.2 Goal

The goal of a *Stormwater Management Plan* is to provide suitable quantity and quality control measures for stormwater runoff from a developed property compliant with the applicable regulatory standards including the adopted MassDEP *Stormwater Handbook*. It should be simplistic in design, cost effective to construct, and reasonable to maintain. The design should blend into the natural features and site resources and take full advantage of existing environmental mechanisms to accomplish any necessary mitigation. The primary intention of the adopted MassDEP *Stormwater Handbook* is to provide the guidance for the selection, implementation and operation and management of such systems.

SECTION 4.2 UNDERSTANDING RUNOFF AND STORMWATER MANAGEMENT

4.2.1 Hydrologic Cycle

The basis of stormwater management begins with the understanding of the natural mechanisms of the earth's ecosystems. This requires the knowledge of the hydrologic cycle that generates the runoff that in turn creates the rivers, ponds and wetlands we are so familiar with. These surface features are the primary source for the recharge of the subsurface aquifers. Development or the construction of man-made features alters these natural cycles and their performances. The key to good management of the altered circumstances is to know and understand, then imitate the natural mechanisms, controlling the stormwater runoff in much the same way that nature does. This is also a key component of Low Impact Development, mirroring nature by limiting the changed environment, recharging as close as possible to the location of each raindrop, and using natural, sustainable structures where necessary with as little impact as possible.

The hydrologic cycle describes the simplistic logical mechanisms of water within the earth's ecosystems. It is a representation of the equilibrium that is constantly balancing the status of water affected by the variations in the seasons, temperatures, weather and rainfall. It also is affected by both natural and man-made impacts to the ecosystem. The cycle is presented as three basic steps:

PRECIPITATION: consisting of rain, snow, hail, sleet, fog or mist.

COLLECTION and INFILTRATION: representative of the precipitation converting to runoff, concentrating into surface drainage features such as rivers, creeks, lakes, ponds, and wetlands. A portion of this will infiltrate into the soils, percolating downward to recharge the groundwater and contribute to the subsurface aquifers.

EVAPORATION and TRANSPIRATION: the process of vaporizing the water fluid to return it to the atmosphere, by means of thermally evaporating the surface waters, or via the vegetation uptake and natural release through the leaves.[2]

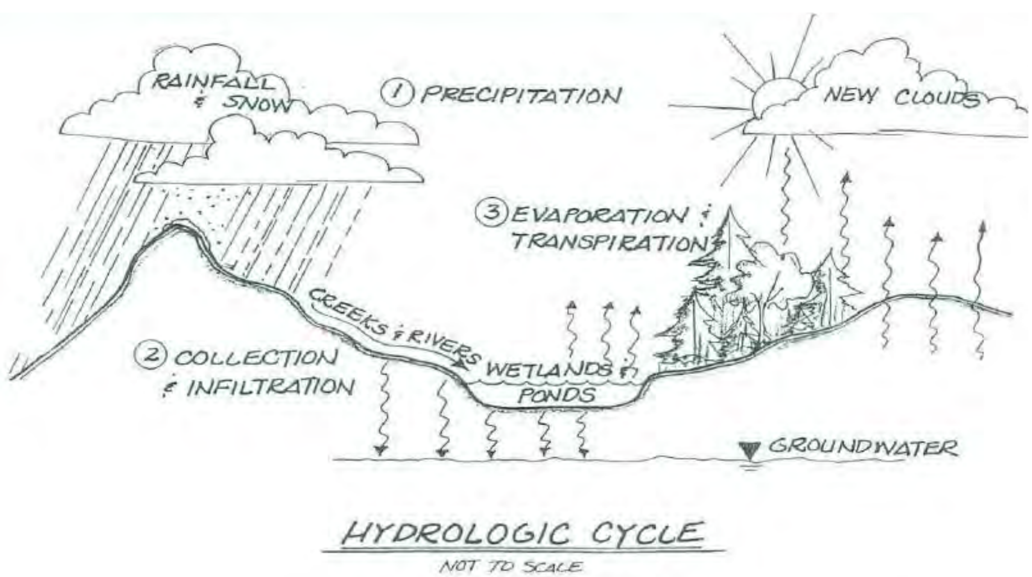


Figure 4.1

[2] Excerpted from: "*Managing Stormwater in Massachusetts*", Volume Two: Best Management Practices (BMP) Manual, dated March 1997

After understanding the role water plays in the earth's ecosystem, the next focus is on the localized features that effect the generation of the runoff. This will aid in predicting the quantities, the quality and the character of the flows.

4.2.2 Stormwater Runoff

Runoff, or surface water movement, is a result of the COLLECTION and INFILTRATION stage of the hydrologic cycle. The volume, speed and character of the runoff flow is dependent on the size of the precipitation event (i.e. the amount of water in a given time period) and the conditions of the land. As the precipitation contacts the surface, the runoff generated is dependent on the contributing area size, shape, topography, soils, antecedent moisture content from previous precipitation including snowmelt, vegetative coverage, and drainage features. These items, in conjunction with man-made features, directly affect the water's movements.

4.2.2.1 Contributing Area

The contributing area establishes the boundary limits for the waters movement. It is the relationship between the topographic features and the physics of gravitational forces. Simply put, as the precipitation falls to the surface, it runs downhill from the highest point. The boundary limits represent the highest established elevations within the "lay of the land", i.e.; the break lines between the basin areas, much like the peak of a roofline, directing the flow in a direction of the lower elevations. The contributing area size is a factor directly correlating the total runoff volume to the available collection surface. The area shape is a function of its consistency or homogeneous nature established by the topography and land features (e.g. a sharp valley with a wide flat floodplain, vs. a long rolling meadows with multiple intermittent drainage channels which will potentially generate two completely different runoff flow regimes).

4.2.2.2 Topography

The topography not only defines the contributing area, but also has a major effect on the rate of runoff, the peak discharge, velocity and the resulting soil erosion potential, and other flow characteristics. The slope differential, or total change in elevation, quantifies the physical vertical drop through the flow travel path length (drop per length, rise/run), used in calculating the runoff velocity (length traveled per time period, feet per second) and thus the travel time (Tc).

The velocity is a result of the concentration of flows that in turn define the creation of the drainage features. The flow velocities are a factor in the energy force behind surface weathering and wear related to erosional factors that develop streambeds and channels. The lack of significant velocity is evident in the ponded areas such as lakes and wetlands. When the velocities increase, the flow regime has the ability to move materials of heavier weight (suspended solids). As it slows the heavier particles separate out and drop to the bottom. The end result is erosion or sedimentation. The velocity changes not only with the slope, but is directly related to the size of the precipitation event, the smoothness of the channel surface (roughness coefficient, n), the cross-sectional geometry, and the depth of flow in the channel bed which is a function of the flow rate (Q).

4.2.2.3 Soils

Soil properties influence the process of the generation of the runoff from rainfall. The major effect of soils to runoff is on the volume of runoff generated as the remnant flow of the soils' ability to percolate, or infiltrate the precipitation contacting it. The type of soil regulates the overall capacity and ability over time to absorb runoff. For example, a clay matrix of soil may percolate a large portion of the beginning precipitation, but as the material quickly reaches a saturation point, it swells, stopping the ability of the runoff to infiltrate into the soil, thus generating a higher level of runoff. On the other hand, a clean sand or gravel matrix could potentially infiltrate all the runoff indefinitely, minimizing surface runoff. The effect of the soils on the runoff estimation calculations is represented as one component of the *"runoff curve number" (CN).* Soils are categorized in one of four generalized groupings, "A","B","C", and "D", ranging from a high infiltration – low runoff "A" type (sand), to a low infiltration – high runoff "D" type (clay or muck).

Infiltration into the different soil horizons (layers) offers water quality treatment by filtration, adsorption, absorption and biochemical breakdown of pollutants. Some soils offer better removal capacities for specific pollutants than others do. The organic topsoil has a tremendous ability to collect and breakdown organic and hydrocarbon compounds. This is due to the composition of the materials similar to compost (breaking down of the foliage, litter and debris), in an environment rich in aerobic (presence of oxygen) bacteria cultures and free-ion receptor points. As the water infiltrates downward into the anaerobic (lack of oxygen) conditions other chemical reactions that can only occur under those environmental conditions will occur along with the physical act of filtering to remove and breakdown additional pollutants. The type of soil including its chemical composition affects the removal rate based on its ionization capacity. Lastly, soil acts as a physical filter trapping particulates, suspended solids, and pathogens.

In summary, infiltration of rain water through the ground helps to cleanse the water by physical (filtration), chemical (ionic exchange), and biological (bacteria) processes.

4.2.2.4 Vegetation

Vegetation affects runoff in several ways. The foliage and its litter maintain the surfaces' ability to infiltrate by protecting it from compacting and sealing under the impacts of precipitation. Some of the rainfall is retained on the surfaces of the leaves and evaporates directly back into the atmosphere. Other trapped water is lagged or stored so long prior to contacting the surface and joining the flow regime, that it is insignificant to affecting the peak runoff. Transpiration from the plants takes a portion of the soil moisture and releases it through the leaves as a natural byproduct of their nutrient uptake. The ground cover vegetation, in combination with the ground litter create numerous micro barriers damming the water flow, slowing and detaining it, resulting in an elongated time of concentration. This flow through the vegetation acts as nature's water quality treatment method, "biofiltering", removing pollutants from the flow regime by plant uptake and biological breakdown. The effects of the vegetation or ground surface characteristics on the runoff estimation is represented as the other component of the *"runoff curve number" (CN)*, incorporated with the soil type.

4.2.2.5 Drainage Features

The drainage features affect the runoff characteristics by collecting, conveying, storing and distributing the flows according to specific site features and their attributes. These include the intermittent rills, creek beds, channels, streams, lakes, ponds, wetlands, swamps, low points, dams, and any other element, structural, man-made or not, that the runoff must pass through to complete the hydrologic cycle. All stormwater modeling assigns a mathematical input to each element in order to represent the resultant water or runoff flows.

Some elements function to reduce, detain, store or slow the runoff flows, such as ponds, wetlands and swamps. The runoff cycle's flow increases and decreases and are often stored and slowed by the ponding of the larger, flatter areas, buffering the downstream features from damaging excessive flow. Part of the micro-ecosystem characteristic of ponding is their ability to survive the water surface fluctuation caused by the periodic flooding and receding. During low flow periods the stored water is a critical source to support the local fauna and flora and contributing to recharging the subsurface aquifers. These areas also act as natural water quality treatment facilities by allowing for sedimentation, biofilter pollutant uptake within the vegetation, and filtering both through the vegetation and the soils.

Other elements increase the flows and the related velocities, such as creeks, rivers and drainage channels. These features are the conduits for which to transport the runoff and, by virtue of what they are, tend to collect and concentrate the flows, increasing the speed as they go. Since the velocity is a result of the slope, the channel section and roughness coefficient, the natural site characteristics such as the topography, soils, vegetation and ground cover which control those factors. Most drainage channels geometry and capacities are a result of the channel adapting to the natural flow conditions contributing to them. A typical stream cross-section consists of a low flow drainage channel with a capacity to convey the small storm events occurring up to the two year storm frequency (i.e. the typical day to day rainfall). Above the low flow channel is a flatter zone contained

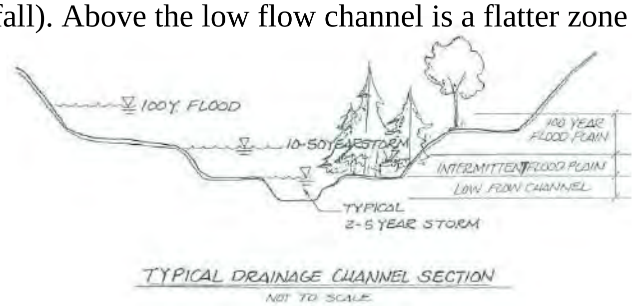


Figure 4.2

between higher banking, referred to as the intermittent flood plain, with a capacity to flow and store the runoff from the five year to up to fifty year storm events, i.e.; the larger, less occurring, but more damaging events. This zone tends to be vegetated, sometimes heavily, due to the infrequency of flooding, and the availability of water from the low flow channel saturation during the drought periods. The vegetation is beneficial in that it slows the flows with root systems that protect the stream channel from erosion. An additional elevated bench to the section is common, and is configured the same, above the intermittent flood plain, and may be commonly referred to as the 100 year floodplain. This is an area that becomes inundated with flooded runoff during extreme rainfalls. It is compounded by the fact that all components of the drainage system are operating beyond capacity, backing the water up into any available storage volume. These events tend to be of uncommon frequency, short lived, but they cause considerable damages.

Finally, total watershed areas and time of concentration are significant factors in the impacts of various storm frequencies. Typically, rivers and large streams will engage in maximum flow many days after the initial or the most intense part of the rainfall event. This is because it takes many hours for the runoff from large watersheds to join with other flows from hundreds of rills and channels, dozens of creeks, tributaries, and streams prior to joining sections of the upstream river, then time for the river to flow downstream for many miles. Therefore, on shorter, intense storms the small drainage area sites near rivers may have little impact on the river's flooding impacts that will be occurring many hours in the future and well after the peak discharges from a specific small site, downstream and near the river. Detaining these small site flows could actually be detrimental by delaying the peak discharge rate to join with the larger watershed peak flows. The topic point being discussed is simply that an individual site's drainage system should be analyzed as part of a whole and not myopically, by each small developed site.

SECTION 4.3 STORMWATER MANAGEMENT DESIGN

Stormwater Management Facilities need to be developed with consideration of a wide range of variables within the clearly defined objective to provide runoff control. Selection of the proper treatment mechanisms for the specific site use and characteristics are the key to successful management.

Generally, stormwater management systems are considered an element of the framework of an overall water resource system for a particular watershed. The designer first evaluates the impacts from a regional perspective, and then narrows the focus to the specific site. As the designer determines the components of the specific site drainage system, various related factors, both regionally and locally are considered, evaluated, incorporated, and detailed into the engineering design.

Stormwater management combines a distinct range of interrelated variables to compose a unified program of action. These are divided into five categories:

1) Design Issues: storm frequencies and intensities, soils, vegetation, groundwater, peak flows, quality treatment, life/safety

2) Regional Issues: climate, watershed/ sub-basin relationship, environmental sensitivity to receiving waters
3) Local Issues: adjacent land use, material specifications and availability, access and construction feasibility
4) Costs: project costs, stormwater management costs, cost/benefit analysis, land availability and value
5) Maintenance: owner/manager of system, responsible entity, expertise, equipment handler, inspection, protection, monitoring

Using these parameters as a guide, the designer evaluates the site conditions, develops a drainage concept, and performs hydrologic and stormwater design and hydraulic calculations to prepare the basis for the plan. The design concept is supported by the hydrologic, hydraulic and modeling / routing calculations, the plan design and details and the material specifications of the drainage system components. After a submittal and approval process with the appropriate authority, the design engineer or municipal engineer should monitor the construction for compliance with the intended design concept of the plans. Site inspections are performed to verify the assumed site conditions and allow for modifications if the conditions vary. Upon completing the construction, the system implementation, performance monitoring, and maintenance phase begins. At this point the day to day operation would be the responsibility of the operating entity. The design engineer should be available to the owner to monitor the system for operational troubleshooting and in-situ modifications as required.

Selection of suitable stormwater management systems is site-specific. All sites are different, this is inherent in stormwater management design. There is no single process or detail that can be used in every instance. All of the previously mentioned design parameters should be reviewed to help in developing the “best design” for a particular site, but note that ultimately each design is customized to the specifics of the runoff and site characteristics. As mentioned previously, the final design is often based on Low Impact Development (LID) techniques or the selection of Best Management Practices (BMP) that have been developed considering all site parameters. All BMP’s must have detailed specifications designed for each site and for each usage within a project.

Above all, throughout the system design and BMP selection process, the final choices should adhere to the following primary goals:

1) Imitate Natural Control Mechanisms
2) Preserve and Utilize the Existing Natural Resources
3) Quantity and Quality control
4) Simple, Long Lasting Design
5) Cost Effective Construction
6) Easy Maintenance

With these concepts in mind, the design engineer determines the best choice for a quality design.

SECTION 4.4 BEST MANAGEMENT PRACTICES (BMP)

Best Management Practices (BMP), for the purposes of stormwater management, are structural, non-structural and managerial techniques that are recognized to be the most effective and practical means to prevent, control and reduce non-point source pollutants from entering receiving waters. They consist of proven engineering designs, source controls, managed facility operations and maintenance, and public education and awareness programs.

Best Management Practices are utilized to prevent and reduce the adverse impacts due to runoff by:

1) Preserving the hydrologic conditions to resemble the pre-developed conditions,
2) Reducing and preventing flooding by managing the peak runoff rates,
3) Treating the discharges prior to entering the receiving water bodies; removing sediments, oils, and other pollutants; "polishing" the runoff,
4) Minimizing erosion and sedimentation,
5) Reducing the total suspended solids and other pollutants; improving the water quality,
6) Protecting the sensitive environments related to the natural resources.

BMP's vary in their intended usage and ability to be adapted to the site conditions. They also offer differing types and degrees of mitigation, sometimes requiring combinations of systems in order to comply with performance standards. It is imperative that the BMP selection process includes the review of the benefits and drawbacks to identify the limitations of the choice.

The most cost efficient, productive and yet simple BMP's are those that are constructed and operate similar to natural systems. The mechanisms of the earth's ecosystems offer examples of the best practices. Surface vegetation acts to control erosion, slow runoff, filter out and biologically uptake pollutants. Creeks and rivers convey flows through channels with a natural capacity to handle runoff. Ponds, lakes and wetland swamps store excessive flows, slowing the runoff allowing for sedimentation and biological pollutant breakdown. All these items contribute to the recharge of the subsurface aquifers. Because of their natural origins, they continually adapt to changes modifying their configurations, balancing the system as a whole.

The best manmade systems are those similar to the existing natural site features, incorporated into the terrain and operated under the same mechanisms. The end product is an aesthetic blend of synthetic facilities melded into the natural landscape, requiring less maintenance, and resulting in better performance.

SECTION 4.5 STORMWATER MANAGEMENT OVERVIEW - SUMMARY AND CONCLUSION

Precipitation, whether it occurs as rain or snow, is the primary contributing source of water that **runs off** the surface of a watershed. The kind of soil and type of vegetation have a major controlling effect on the portion of the precipitation that "runs off" or generally known as runoff. The combined effect of the soil and the vegetative cover on the amount of runoff is represented by the runoff Curve Numbers (CN).

The hydrologic cycle is an explanation of how rainfall either infiltrates, transpires, evaporates, or runs off. The runoff component is the primary feature of stormwater management. The concepts of LID and BMP are to mirror nature as much as possible and to design mitigation strategies to have the least impact as possible. Properly designed stormwater management systems serve to minimize the impact of development through designed processes and controls.

Development and drainage improvements, along with the site's topography and shape characteristics are a factor in the rate of runoff. Drainage systems are modeled, both hydrologic and hydraulic, to determine the peak runoff flow rates which are used to predict the impacts due to development and to design a stormwater management system for mitigation.

The stormwater management plan identifies the site parameters and conditions for a designer to take advantage of the mechanisms of the naturally occurring features. With careful planning, many of the natural resources can be left undisturbed benefiting and enhancing the project and yet providing mitigation for the impacts of the development. A quality plan will not only control the flow and provide treatment, but it will also protect the sensitive natural resources.

Lastly, any specific BMP's utilized should be constructed and maintained properly to be fully effective. Often, the maintenance falls onto municipal public works staff, a homeowner's association, or a single homeowner. Also too often, simple maintenance is neglected and eventually affects the systems capacity to properly treat the runoff as designed.

Yet, in the last 30 years, stormwater management has made a huge and positive impact on our environment in developed areas, which should continue with the advent of newer technologies and increased use.

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SECTION 5.0 STORMWATER MANAGEMENT SYSTEM

SECTION 5.1 MASSDEP STORMWATER MANAGEMENT STANDARDS

The proposed Storm Water Management Plan addresses the Storm Water Management Standards that have been developed by MassDEP to protect the waters of the Commonwealth from adverse impacts resulting from storm water runoff. The design is based on concepts and recommendations obtained from various sources and criteria primarily the Massachusetts Stormwater Handbook, http://www.mass.gov/eea/agencies/massdep/water/regulations/massachusetts-stormwater-handbook.html

The following is a re-printing of the Massachusetts Stormwater Standards

THE STORMWATER MANAGEMENT STANDARDS

1. No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.
2. Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.
3. Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.
4. Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:

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

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

   c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

5. For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.
6. Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A “storm water discharge” as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.
7. A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.
8. A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.
9. A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.
10. All illicit discharges to the stormwater management system are prohibited.[3]

[3] Massachusetts Stormwater Handbook, Volume 1:
http://www.mass.gov/eea/agencies/massdep/water/regulations/massachusetts-stormwater-handbook.html

SECTION 5.2 HYDROLOGIC MODEL

5.2.1 Flow Rate Models

5.2.2 <u>Standard 2</u>: No Increase in Post Development Peak Discharge Rates

The purpose of a majority of the Stormwater Management Calculations is an attempt to model the Pre Development vs. Post Development flow rates. This is a critical component of stormwater management outline as Standard 2 and is encapsulated best by again quoting from the MassDEP Stormwater Handbook:

> **Standard 2:** Stormwater management systems shall be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.
>
> To prevent storm damage and downstream and off-site flooding, Standard 2 requires that the post-development peak discharge rate be equal to or less than the pre-development rate from the 2-year and the 10-year 24-hour storms. BMPs that slow runoff rates through storage and gradual release, such as LID techniques, extended dry detention basins, and wet basins, must be provided to meet Standard 2. Where an area is within the 100-year coastal flood plain or land subject to coastal storm flowage, the control of peak discharge rates is usually unnecessary and may be waived.
>
> For projects subject to jurisdiction under the Wetlands Protection Act, the issuing authority relies on <u>TR 20 and 55</u>[4], which are guides for estimating the effects of land use changes on runoff volume and peak rates of discharge published by Natural Resource Conservation Service (NRCS*)*. Applicants must calculate runoff rates from pre-existing and post-development conditions. <u>**Measurement of peak discharge rates is calculated at a design point, typically the lowest point of discharge at the downgradient property boundary.**</u> (emphasis added) The topography of the site may require evaluation at more than one design point, if flow leaves the property in more than one direction. An applicant may demonstrate that a feature beyond the property boundary (e.g. culvert) is more appropriate as a design point.[5]
>
> Proponents must also evaluate the impact of peak discharges from the 100-year 24-hour storm. If this evaluation shows that increased off-site flooding will result from peak discharges from the 100-year 24-hour storms, BMPs must also be provided to attenuate these discharges. [6]

---

[4] NRCS TR 20&55 - http://www.wsi.nrcs.usda.gov/products/W2Q/H&H/Tools_Models/tool_mod.html. See the Hydrology Handbook for Conservation Commissioners, http://www.mass.gov/dep/water/laws/hydrol.pdf.
[5] The evaluation may show that retaining the 100-year 24-hour storm event is not needed. In some cases, retaining stormwater from the 100-year 24-hour storm event onsite may aggravate downstream impacts, because of the project's location within the watershed and the timing of the release of stormwater.
[6]Massachusetts Stormwater Handbook, Volume 1:
http://www.mass.gov/eea/agencies/massdep/water/regulations/massachusetts-stormwater-handbook.html

Flow rate estimates were predicted utilizing *Guidelines for Soil and Water Conservation in Urbanized Areas of Massachusetts*, dated October 1997, prepared by U.S. National Resources Conservation Service (NRCS) and "Urban Hydrology for Small Watersheds, Technical Release Number 55", dated 1986, prepared by NRCS. The chosen storm type for this area is the TR 55, Type III storm.

Flow estimate calculations were performed using the "HydroCAD v 10.05" (HydroCAD) stormwater computer modeling software. In addition, the facilities are designed in accordance with generally accepted engineering principles and practices, in conformance with all jurisdictional requirements.

5.2.3 Point of Analysis

5.2.3.1 Description of Subject Site – Point of Analysis Determination

It is important to note the underlined portion above (emphasis added) to highlight a critical component in Stormwater Management and Hydrologic Analysis: the Point of Analysis at the downgradient property boundary.

In order to meet Standard 2 to determine the impact from runoff quantity as a result of development it is necessary to hydrologically model the runoff in an undeveloped site condition, pre-development, and then again in a proposed developed condition, post-development. The representative models are run under the critical design storm frequency events to determine the estimated flow rates for the given scenarios. In all instances, the models are run at a determined Point of Analysis, or possibly at multiple Points of Analysis dependent on property lines, grades, and if the site is within more than one primary watershed. This is a critical concept in stormwater management.

The Points of Analysis for this subject property are as follows:

A Eastern Wetland

Sucbatchment Series 100

5.2.4 Strategies for Mitigation of Stormwater Runoff

The undeveloped rates (Pre) are compared to the developed rates (Post), resulting in a differential volume representative of the "*increase in peak runoff due to the development*". At such time a set of Best Management Practice (BMP) designs are incorporated to mitigate the increase. In this case the primary BMP structural components for the majority of the changed runoff are the infiltration chambers.

The proposed stormwater management design is incorporated into the proposed post-development HydroCAD model and run under the critical design storm scenarios to determine the operational performance of the system. Discharge volumes, velocities, depth of flows and dissipation spreads are then calculated to verify the impacts to the receiving areas.

The proposed storm water management plan for this project has been developed using Structural and Non-Structural Best Management Practices (BMP's).

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Section 6.0 Design Summary and Conclusions: PRE VS. POST ANALYSIS

6.1 SUMMARY - DISCUSSION

The following informational charts are a synopsis of the comparative scenario models to determine the stormwater runoff conditions. The data is a result of mathematical models representing the pre and post developed conditions. The pre-developed results were compared to the post-developed results to determine the approximate sizing requirements of the BMP's to be used to mitigate the impacts due to development.

The following tables represent the site condition data and the results of the HydroCAD® Stormwater Modeling System by HydroCAD Software Solution, LLC to verify that the proposed stormwater management system will comply with the guidelines for *Soil and Water Conservation in Urbanized Areas of Massachusetts*, and the Commonwealth of Massachusetts adopted and referenced *Stormwater Management Handbook*.

The following summary tabulations are developed separately for each design storm event for the Point of Analysis described in Section 5.2.3. The design storm events include the 2-year, 10-year, 25-year, and 100-year design storm frequencies. The rainfall depths for these storm events are given by NOAA Atlas 14. The tabulations show the results of the entire stormwater management system to the points of analysis.

The complete stormwater models for the 2-year, 10-year, 25-year, and 100-year design storm frequencies are presented in Volume 2 of this report.

The Point of Analysis outlined in Section 5.2.3 above is reprinted here for reference:

A Eastern Wetland

Sucbatchment Series 100

6.2 SUMMARY TABLES: PRE-DEVEOPMENT VS POST-DEVELOPMENT

Table 6.1 Point of Analysis A – Eastern Wetland – Peak Flow Rates

Storm Frequency	Rainfall (in)	Pre-Development (cfs)	Post-Development (cfs)	Difference (cfs)
2 Year Storm	3.30	**0.00**	**0.00**	**-0.00**
10 Year Storm	5.21	**0.13**	**0.05**	**-0.08**
25 Year Storm	6.39	**0.54**	**0.28**	**-0.26**
100 Year Storm	8.22	**2.01**	**2.00**	**-0.01**

Table 6.2 Point of Analysis A – Eastern Wetland – Volumes

Storm Frequency	Rainfall (in)	Pre-Development (cf)	Post-Development (cf)	Difference (cf)
2 Year Storm	3.30	**15**	**0**	**-15**
10 Year Storm	5.21	**1,919**	**1,019**	**-900**
25 Year Storm	6.39	**4,416**	**2,928**	**-1,488**
100 Year Storm	8.22	**9,811**	**9,474**	**-337**

6.3 CONCLUSION

On the issue of ensuring no increase in the post development peak flow rate of runoff, Standards 1 and 2 of the MassDEP Stormwater Handbook and associated regulations states:

> **Standard 1:** No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth**.**
>
> **Standard 2:** Stormwater management systems shall be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.
>
> To prevent storm damage and downstream and off-site flooding, Standard 2 requires that the post-development peak discharge rate is equal to or less than the pre-development rate from the 2-year and the 10-year 24-hour storms. [7]

Then also,

> Proponents must also evaluate the impact of peak discharges from the 100-year 24-hour storm. If this evaluation shows that increased off-site flooding will result from peak discharges from the 100-year 24-hour storms, BMPs must also be provided to attenuate these discharges.

The location of the design point is a critical criteria, also defined in the Stormwater Handbook as:

> Measurement of peak discharge rates is calculated at a design point, typically the lowest point of discharge <u>at the downgradient property boundary</u>. The topography of the site may require evaluation at more than one design point, if flow leaves the property in more than one direction. (emphasis added).

Standard 1 and Standard 2 are met. The project design has no untreated direct discharge to any wetland resource area. The Stormwater Management Facility detains the storm event up to and including the 100-year storm and provides treatment for almost all of the paved area.

The quantitative analysis of the peak flow rates tabulated above show no increase in the rate of runoff and volume of runoff at the Point of Analysis for the 2 year, 10 year, 25 year, and 100 year storm events. The increase in post development runoff is properly attenuated by the proposed on–site stormwater controls and designs.

---

[7] Massachusetts Stormwater Handbook, Volume 1: Standard 2, http://www.mass.gov/eea/agencies/massdep/water/regulations/massachusetts-stormwater-handbook.html

SECTION 7.0 DOCUMENTING COMPLIANCE WITH STANDARD 3: RECHARGE

7.1 Recharge – Provide Required Annual Recharge (Rv)

7.1.1 Determine Required Recharge (Rv)

Mass DEP outlines Standard 3 to address Groundwater Recharge as follows:

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

Reference is made to the regulations and Volume 3 of the Stormwater Handbook as to the basis of the required calculations.

The stormwater runoff volume to be recharged to groundwater is determined using the existing site (predevelopment) soil conditions. The total impervious area introduced through site development is multiplied by one of the following recharge factors.

TABLE 8.1 RECHARGE RATES

Hydrologic Group	Volume to Recharge (x Total Impervious Area)
A	0.60 inches of runoff
B	0.35 inches of runoff
C	0.25 inches of runoff
D	0.10 inches of runoff

The Required Recharge is based on the following formula:

$$Rv = F \times A_{IMP}$$

Where:

Rv	= *Required Recharge Volume*, expressed in Ft^3, cubic yards, or acre-feet
F	= Target Depth Factor associated with each Hydrologic Soil Group
A_{IMP}	= Impervious Area pavement and rooftop area on site

For the subject property, using the *Static Method* with the target factor of 0.60 inches based on Soil Group A, the computation follows:

Given:	HSG A =	0.60 in.	
	A_{IMP} =	22,527 ft^2	(includes off-site impervious areas)

$Rv = ((22{,}527\ ft^2) \times 0.60\ in) \div (12\ in/ft) =$ 1,127 ft^3

Required Recharge (Rv) = 1,127 ft^3

7.1.2 Determine Recharge Provided:

Recharge Volume at: <u>SMF 1 – Cultec Infiltration Chambers</u>

Given:	Volume of Chambers below outlet =	3,825 CF	(From HydroCAD)
	Total Bottom Area =	2,102 SF	(From HydroCAD)

Calculations:

$Rv_{(Provided)}$ = Volume below outlet = 3,825 CF Provided

$Rv_{(Provided)}$ = 3,825 CF > *Rv* = 1,127 CF

The provided storage (without accounting for any infiltration) of the infiltration systems is 3,825 cubic feet. In reality the recharge provided is greater than this number due to infiltration. It is also worth noting that the required recharge volume includes offsite impervious areas, which do not need to be recharged.

Standard 3, Required Recharge is provided: 3,825 CF > 1,127 CF

7.1.3 Verify Basin Drains

CHECK THAT INFILTRATION BASINS DRAIN WITHIN 72 HOURS:

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

Where:

Rv = Storage Volume
K = Saturated Hydraulic Conductivity For "Static" and "Simple Dynamic" Methods, use Rawls Rate (see Table 8). For "Dynamic Field" Method, use 50% of the in-situ saturated hydraulic conductivity.
Bottom Area = Bottom Area of Recharge Structure

TABLE 7.2: 1982 RAWLS RATES[8]

Texture Class	NRCS Hydrologic Soil Group (HSG)	Infiltration Rate Inches/Hour
Sand	A	8.27
Loamy Sand	A	2.41
Sandy Loam	B	1.02
Loam	B	0.52
Silt Loam	C	0.27
Sandy Clay Loam	C	0.17
Clay Loam	D	0.09
Silty Clay Loam	D	0.06
Sandy Clay	D	0.05
Silty Clay	D	0.04
Clay	D	0.02

Soil Test 101 in the vicinity of the proposed infiltration system (SMF 1) indicates loamy sand. The Rawls Rate for Loamy Sand is these calculations and the Hydrologic Model.

Check Time to Drain (T_D) less than 72 hours with infiltration rate 2.41 inches per hour

[8] Rawls, Brakensiek and Saxton, 1982, Estimation of Soil Water Properties, Transactions American Society of Agricultural Engineers 25(5): 1316 - 1320, 1328

Infiltration at SMF 1:

T_D = 1,127 ft³ / (2.41 in/hr) x (1 ft/12 in) x (2,102 SF)

T_D = 1,127 ft³ / 422 ft³/hour

TD = 2.7 hours < 72 hours	Full Recharge Volume will Drain in less than 72 hours	**OK**

Therefore the infiltration systems will drain within 72 hours as required.

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Section 8.0 Documenting Compliance with Standard 4: Water Quality Volume

8.1 Water Quality Volume – V_{WQ}

8.1.1 Water Quality Volume V_{WQ} – Brief Description of Requirement

Mass DEP outlines Standard 4 to address Total Suspended Solids as follows:

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

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

The formula for determining the Water Quality Volume is:

$$V_{WQ} = (DWQ/12 \text{ inches/foot}) * (A_{IMP})$$

Where:

V_{WQ} = *Required Water Quality Volume (in cubic feet)*

D_{WQ} = *Water Quality Depth: one-inch for discharges within a Zone II or Interim Wellhead Protection Area, to or near another critical area, runoff from a LUHPPL, or exfiltration to soils with infiltration rate greater than 2.4 inches/hour; ½-inch for discharges near or to other areas.*

A_{IMP} = *Impervious Area (in square feet)*

For the subject project, since there will be exfiltration to soils with an infiltration rate greater than 2.4 inches per hour, a Water Quality Depth of 1 inch is used:

Use: D_{WQ} = 1 inch

8.1.2 SMF 1 Water Quality Volume VWQ:

Given:

A_{IMP} = 22,527 ft² (includes off-site impervious areas)

V_{WQ} = (D_{WQ} / 12 inches/foot) * (A_{IMP} square feet)

V_{WQ} = (*1 inch*/12 inches/foot) * (22,527 ft^2)

V_{WQ} = 1,878 ft^3

VWQ Provided in Cultec Chambers (SMF 1) below lowest outlet = 3,825 CF (From HydroCAD))

Check Water Quality Volume

$V_{WQ}^{Provided}$ = 3,825 ft^3 > $V_{WQ}^{Required}$ = 1,878 ft^3 ------	**OK**

8.1.3 SMF 1 Separator Row Sizing Calculations

There is no stated methodology in the Massachusetts Stormwater Handbook to size a chamber system separator row. The methodology for sizing a sediment forebay will be used in this calculation: *"At minimum, size the volume of the sediment forebay to hold 0.1-inch/impervious acre to pretreat water quality volume"*

V_{Req} = (0.1 inch) x A_{IMP}

V_{Req} = (0.1 inch) x (22,527 ft^2) x (1ft/12in) = 188 ft^3

$V_{(Provided)}$ = 52.2 ft^3 per chamber x 8 chambers in Seperator Row = 417 ft^3

$V_{(Provided)}$ = 417 ft^3 > V_{Req} = 188 ft^3 ------	**OK**

8.2 Total Suspended Solids (TSS)

General Description of TSS Removal provided via SMF 1:

Paved runoff will enter standard catch basins designed with deep sumps ($\geq$ 4 feet) to settle large suspended and non suspended solids.

The piped conveyance system discharges the runoff into a Cultec Separator Row, which is wrapped in geotextile fabric to trap the suspended and non suspended solids. The runoff then continues into the Cultec Infiltration System. This system detains runoff and infiltrates it into the ground.

In summary, several LID and BMP techniques are being used to achieve the 80% TSS removal as outlined on the MassDEP stormwater worksheets shown on the following pages.

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TABLE 8.1: TOTAL SUSPENDED SOLIDS: SMF 1

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: SMF 1: Cultec Infiltration System

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Subsurface Infiltration Structure	0.80	0.75	0.60	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15

Total TSS Removal = 85%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: 246 & 248 Walnut St, Reading
Prepared By: IJA
Date: 11/29/2023

*Equals remaining load from previous BMP (E) which enters the BMP

TSS = 85% which is greater than 80% required ------------ OK

Standard 4 is met with the use of various BMP techniques as described above and as outlined in MassDEP TSS Table 8.1

SECTION 9.0 REMAINING STATE STANDARDS

The following is a brief discussion of State Standards 5, 6, 7, 8, 9 and 10.

Standards 5, 6 and 7 are not applicable to this project. There is no higher pollutant load expected, there is no discharge to a critical area, and the project is not filed as re-development.

Standards 8 is met via construction phase erosion and sediment control procedures that are depicted on the project plans.

Standards 9 and 10 are met with the Operation and Maintenance Plan and Illicit Discharge Statement. See Section 11

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SECTION 10.0 PHOSPHORUS REMOVAL

The Town of Reading requires removal of phosphorus, a common pollutant in urban watersheds. Removal calculations are provided below based on the Massachusetts Small MS4 General Permit, Appendix F, Attachment 3.

Information for the contributing drainage areas for the project are summarized below:

ID	Land Use	Area	Hydrologic Soil Group
Impervious Area (IA)	Low Density Residential	22,527 SF	A
Pervious Area (PA)	Low Density Residential	24,090 SF	A

SMF 1 Volume to the lowest outlet = 3,825 CF

Convert SMF 1 volume to inches of impervious runoff: 3,825 CF / 22,527 SF x 12 in/ft = 2.03 in

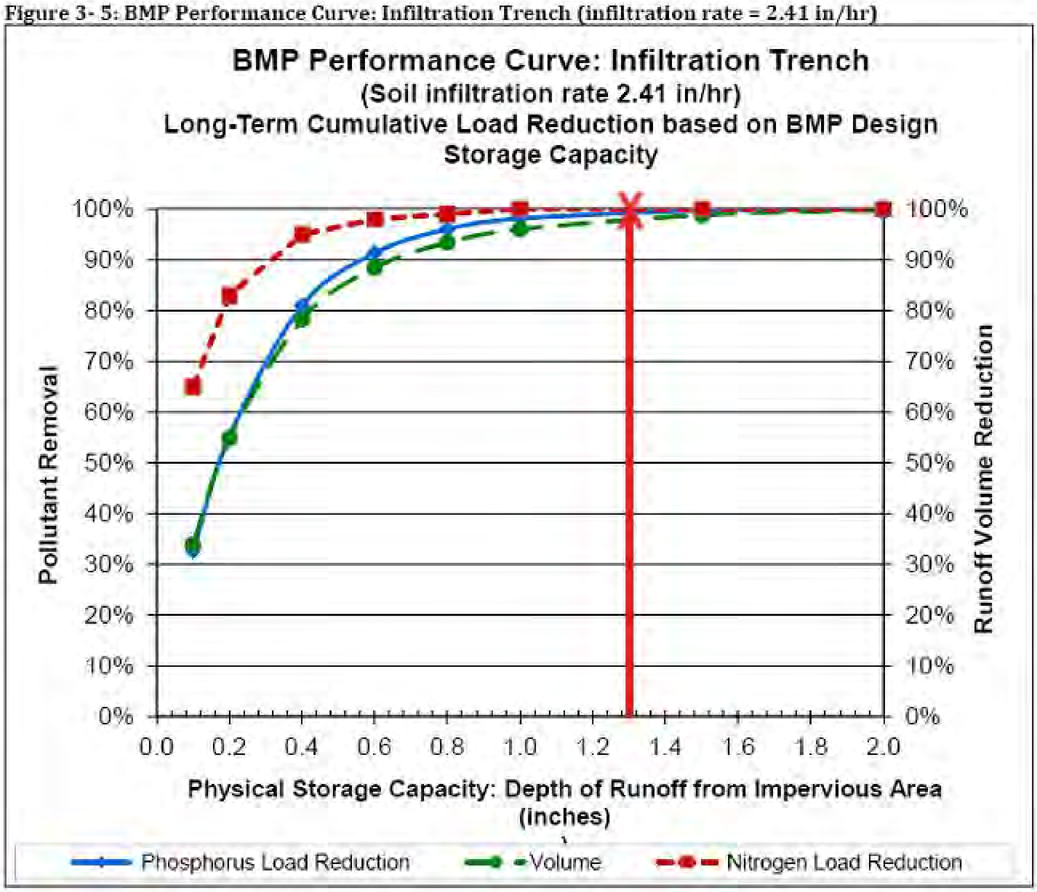
Convert SMF 1 volume to inches of pervious runoff: 3,825 CF / 24,090 SF x 12 in/ft x 0.39*= 0.74 in

SMF 1 volume, in inches, available to treat runoff from imp. areas only: 2.03 in–0.74 in = 1.29 in

SMF 1 is Subsurface Infiltration – use Infiltration Trench (Infiltration Rate=2.41 in/hr) BMP Performance Curve** for Long-Term Phosphorus Reduction (shown on the following page) to estimate Phosphorus removal for a volume of 1.29 inches:

*Note: Curve Number (CN) of 39 is used to estimate pervious runoff, based on grass HSG A ground cover
** Note: Performance Curve via Massachusetts MS4 General Permit Appendix F

Figure 3- 5: BMP Performance Curve: Infiltration Trench (infiltration rate = 2.41 in/hr)



SMF 1 Reduction in Phosphorus for a volume of 1.29 inches: > **98%**

>98% phosphorus removal is achieved

SECTION 11.0 OPERATION AND MAINTENANCE

11.1 INTRODUCTION

This section addresses the issue of operation and maintenance for the proposed Stormwater Management System after construction (Standard 9), and an illicit discharge statement (Standard 10). If this section is separated from the remainder of this Stormwater Management Report (SMR), the SMR is hereby incorporated by reference, a copy of which will be in the records of the Reading Planning Board as well as other locations. The title of the final SMR is:

"246 & 248 WALNUT STREET"
A RESIDENTIAL SUBDIVISION
IN READING, MA
STORMWATER MANAGEMENT REPORT
December 20, 2023
Prepared For:
Stella Construction
25 Everett St, Woburn, MA 01810
Prepared By:
Meisner Brem Corporation
142 Littleton Road, Ste. 16
Westford, MA 01886
MBC Job Number: 3110

The maintenance standards presented herein are based on Mass DEP "The Stormwater Handbook", as previously referenced, *the Federal and State Clean Water Acts, the Wetlands Protection Act, the Coastal Zone Act, a portion of the National Pollutant Discharge Elimination System Program and the Town of Reading Subdivision Regulations* with various reports and guidance associated therewith.

These maintenance and operations procedures are intended as general guidelines, however additional procedures shall be developed if necessary, as the systems are completed and operated over a period of time. As with all stormwater facilities, the conditions change or the management of them can be simplified as the operation personnel become more familiar with them. The most effective maintenance and operations can be customized to the specific facility as the system develops and situations merit.

11.2 DESIGN PARAMETERS OF EROSION CONTROL AND MANAGEMENT

Generally, storm water management systems are considered an element of the framework of an overall water resource system for a particular watershed. The designer first evaluates the impacts from a regional perspective, then narrows the focus to the specific site. As the designer determines the components of the specific site drainage system, various related factors, both regionally and locally are considered, evaluated, incorporated, and detailed into the engineering design.

Stormwater management combines a distinct range of interrelated variables to compose a unified program of action. These are divided into five categories:

- Design Issues: storm frequencies and intensities, soils, vegetation, groundwater, peak flows, quality treatment, life/safety
- Regional Issues: climate, watershed/ sub-basin relationship, environmental sensitivity to receiving waters
- Local Issues: adjacent land use, material specifications and availability, access and construction feasibility
- Costs: project costs, storm water management costs, cost/benefit analysis, land availability and value
- Maintenance: owner/manager of system, responsible entity, expertise, equipment handler, inspection, protection, monitoring

Using these parameters as a guide, the designer evaluates the site conditions, developing a drainage concept and performs hydrologic and design calculations to prepare the basis for the plan. The design concept is supported by the engineering hydraulic and routing calculations, the plan details and the material specifications of the drainage system components. A key component of a good design is an understanding of the requirements of maintenance, especially since many of these systems will be maintained by a Homeowner’s Association.

11.3 OPERATION AND MAINTENANCE OF STORMWATER MANAGEMENT FACILITIES

Proper maintenance is essential to ensure that the performance of the system meets the design expectation. A system that is not maintained may fail and could lead to financial loss, damage to surrounding infrastructure or environmentally sensitive areas and increasing the liability of the property owners.

11.3.1 Personnel and Education

Personnel make the difference between a Stormwater Management System that performs as designed throughout its lifetime or one that fails due to lack of attention. *Education* provides the personnel with the skills needed to effectively maintain a Stormwater Management System. *Record Keeping* allows the personnel to track the maintenance and the System's performance so as to determine when major maintenance tasks are required.

Maintenance of the structural components of the stormwater management facilities will be the responsibility of the homeowners association. Maintenance should be performed as outlined below in items 1-10. In addition to the town, each of the homeowners – through their association - should have a copy of this report with a copy of the grading design plan. Full comprehension of these documents will educate the homeowners and allow them to properly maintain the stormwater management system.

The homeowners association should be aware of the Stormwater Management Facilities' intended purpose of removing contaminants from the stormwater runoff flow from the site. The result is the collection, removal and storage of the contaminants within the facility components. These potentially consist of trash/debris, oils, sediment and soluble/insoluble materials. In most situations, these can be handled, stored and disposed of with minimal safety requirements, in that the health hazards are non-existent or minimal with the concentrations involved. However, the owner shall be aware of the risk and/or the possibility of potential dangers. An example would be in the system was inundated with an excessive concentration due to an accidental spill.

11.3.2 Record Keeping

Record Keeping – It is recommended that a record log be kept of measured sediment levels at regular (annual) maintenance and after each major storm event. Sediment accumulation should be measured at the retention basin and logged in the record. Sediment should be removed annually, or when the sediment buildup has met the threshold outlined below. These activities should be logged as well.

Forms for recording the inspections and maintenance are included at the end of this section.

11.3.3 Post-Development Operation and Maintenance schedule

Upon completion of construction, this Operation and Maintenance schedule shall be adhered to by the Owners and their agents, advisors, consultants, and contractors, or any future agent with associated responsibility. The outline below shall be adhered to as closely as possible to ensure the proper function of the drainage system.

1. The paved areas shall be swept annually, at a minimum. Sweeping shall be done after the final snow melt when sand or de-icer can be easily swept. Any collected debris shall be removed in accordance with all local, state, and federal regulations.

2. Any culverts shall be inspected at least twice per year, including one time after the final snowmelt of the season, and any obstructions shall be removed and disposed of in accordance with all local, state, and federal regulations.

3. No erosion control measures shall be removed until all contributing upslope areas are stabilized.

4. Snow plowing of the roadway shall be performed regularly and after all storms which result in an accumulation of snow 1 inch or greater.

5. The use of road salt and similar de-icers should be minimized and restricted to paved areas only. Road salt and de-icers shall not be stored on-site.

6. See section 11.3.4 for individual BMP procedures.

11.3.4 Permanent Best Management Practices

Operation and maintenance of the catch basins, inlets, infiltration systems, and associated drainage structures should occur as follows. A map of these systems is provided in Section 11.3.7 of this report:

1. Catch Basins – Deep Sump– Inspect catch basins at least four times per year and at the end of the foliage and snow- removal seasons. Sediments must also be removed once per year, preferably in early May, or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin. If handling runoff from land uses with higher potential pollutant loads or discharging runoff near or to a critical area, more frequent cleaning may be necessary.
2. Inlets – Pipe inlets and spillway structures should be inspected annually and after every major storm. Accumulated debris and sediment should be removed. If pipes are coated, the coating should be checked and repaired as necessary.
3. Outlets – Pipe outlets should be inspected annually and after every major storm. The condition of the pipes should then be noted and repairs made as necessary. If erosion is taking place, then measures should be taken to stabilize and protect the affected area of the outlet.

4. Cultec Infiltration Systems- Systems should be inspected at least twice annually, and following any rainfall event exceeding 2.5 inches in a 24 hour period, with maintenance or rehabilitation conducted as warranted by such inspection. Pretreatment measures such as the separator row should be inspected at least twice annually, and cleaned of accumulated sediment as warranted by inspection, but no less than once annually. The separator row can be cleaned via a high pressure water nozzle inserted through the inlet catch basins. The water nozzle should be used to flush sediment into the inlet catch basin for vacuuming.

   If an infiltration system does not drain within 72-hours following a rainfall event, then a qualified professional should assess the condition of the facility to determine measures required to restore infiltration function, including but not limited to removal of accumulated sediments or reconstruction of the infiltration system.

5. Outlet Protection (riprap apron) – The outlet protection should be inspected at least annually and after every major storm. If the riprap has been displaced, undermined or damaged, it should be repaired immediately. The channel immediately below the outlet should be checked to see that erosion is not occurring. The downstream channel should be kept clear of obstructions such as fallen trees, debris, and sediment that could change flow patterns and/or tailwater depths on the pipes. Repairs must be carried out immediately to avoid additional damage to the outlet protection apron.

6. Loam and Seed: Loam and seed establishes grasses on highly erodible soils or critically eroding areas. Loam and seed stabilizes the underlying soil, reduces damages from sediment, maintains or improves water quality and reduces stormwater runoff. On steeper slopes, jute matting, organic mesh, or other devices are used to retain the soil until a full lawn or slope is fully stabilized with mature grow in. Fertilizer and seed type and application rates are on the final drawings.

11.3.5 Other Site Controls

1. Good house keeping - The contractor is necessary for maintaining accurate and complete records of the construction activities on site. The contractor must also ensure that chemicals, pesticides, and fertilizers are properly stored. Regular disposal of garbage, rubbish or sanitary waste disposal, and prompt cleanup of spills is necessary to minimize the potential for pollution.

2. Waste disposal, sanitary septic disposal, and materials management - The proper management should include storage of hazardous materials such as paints, oils, etc. These materials should be stored in the contractor’s vehicle or placed on an impervious floor or surface, i.e. (Basement floor or concrete slab.)

3. Spills - All personnel involved with the construction activities have knowledge of whom to contact in the event of a spill that is a source of storm water contamination. The contractor shall ensure that appropriate measures are taken to prevent spills and respond in the event of a spill. In the event of a spill the contractor should take measures to reduce storm water contact stopping the source of the spill, contain the spill, and absorb the material as quickly as possible.
4. Sanitary portable toilets shall be utilized to avoid direct discharge.
5. Vehicle wash down – in appropriate locations over 100 feet from wetlands draining to a sediment basin

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11.3.6 Illicit Discharge Statement

The undersigned certifies that no illicit discharges will be permitted on the property, at all times, in perpetuity. The undersigned further certifies that no illicit discharges presently exist at the site.

____

Signature

If any illicit discharge is accidentally released, the following protocol is to be utilized:

If the construction site has a release of a hazardous substance or of oil in an amount which exceeds a reportable quantity as defined at 40 CFR Part 11, 40 CFR Part 117, or 40 CFR Part 302 then the permittee shall:

a) Call the National Response Center,

b) Modify the Pollution Prevention Plan as to the nature of the release and,

c) Submit a written description of the spill.

11.3.7 Operation and Maintenance Generic Forms

See the following pages for the following forms:

- Best Management Practices – Summary of Inspections
- Grading and Stabilization Activities Log

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Best Management Practices
Summary of Inspections

Project Site: ______________________

Location: ______________________

Phase or Limits: ______________________

Inspection Number	Date	Inspector	Item Inspected (see list @ right)	Condition/Remarks	Action to be Taken	Follow up Comments

List of Inspections
A. Hay Bale/Silt Fence
B. Sediment Ponds
C. Site Clearing, Grub
D. Storm Drain Pipe & Conveyance
E. BMP - Indicate type (mandatory)
F. Stone Condition
G. Velocity Dissipaters
H. Structural Components
I. Permanent Stabilization

Submittal Log

Date	Agency

Grading and Stabilization Activities Log

Date Grading Activity Initiated	Description of Grading Activity	Description of Stabilization Measure and Location	Date Grading Activity Ceased (Indicate Temporary or Permanent)	Date When Stabilization Measures Initiated

Use Additional Sheets if Necessary

EPA SWPPP Template, Version 1.0

DEFINITIVE SUBDIVISION PLAN SET

246 & 248 WALNUT STREET

READING, MASSACHUSETTS

TAX MAP 3 LOT 9

WAIVER LIST

GRANTED: These waivers were granted on July 10, 2023:

1. Section 7.1.1.a requiring a right of way width of 60 feet.

Granted at the Preliminary Stage, requesting herewith at Definitive Stage.

2. Section 7.1.5 requiring dead end streets to be no longer than 500 feet.

Granted at Preliminary Stage with a condition that utilities are sufficient to support the proposed development and noting that at the existing end of Walnut Street there is an existing 45' diameter paved cul-de-sac turnaround, requesting herewith at Definitive Stage with expected same condition.

REQUESTS:

3. Section 7.1.3 requiring a Typical Cross Section for a 60 feet street.

A waiver is requested for the typical cross section including the pavement width to be 20 feet in width with the use as a private way and as the minimum width generally required of the fire department.

4. Section 7.1.1.(b) requiring certain street grades. One of the requirements needs a waiver being slightly steeper than 2% for 64 feet due to being a private roadway and because it is at the end of the current flat area for the existing cul-de-sac.

5. Section 7.1.5(e) requiring a landscaped cul-de-sac. The applicant requests a waiver to allow for a fully paved cul-de-sac without a landscaped island.

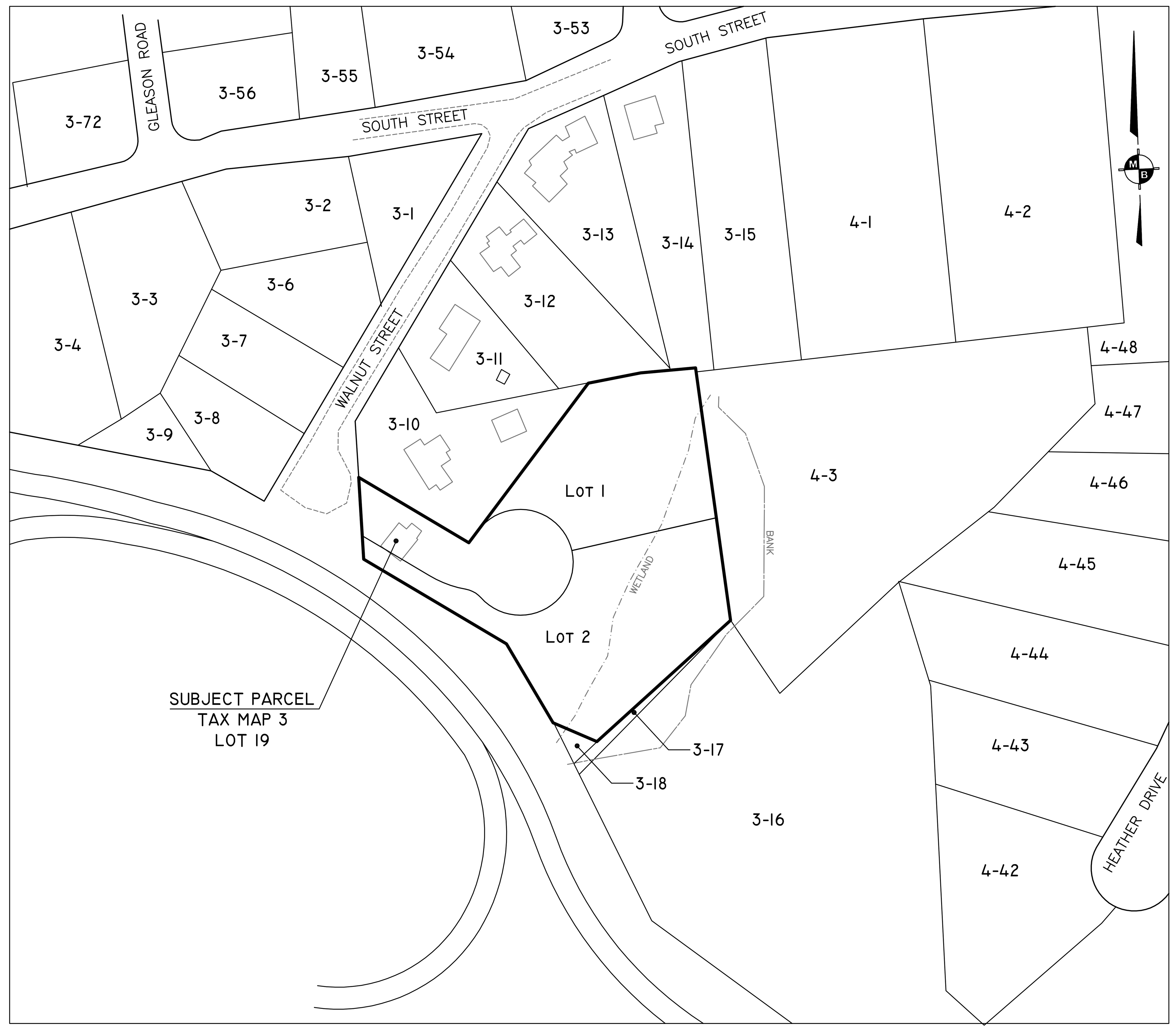
6. Section 7.1.7 requiring vertical granite curbing. The applicant requests a waiver since it will be a private drive and since there is no curbing on either side of the road on the existing Walnut Street.

7. Section 7.2 requiring sidewalks along both sides of the roadway. The applicant requests a waiver since it will be a private drive and since there are no sidewalks on either side of the road on the existing Walnut Street.

8. Section 6.1.1.d.3 requiring a full traffic study. The applicant requests relief from the requirement as the project is proposing only one new residential dwelling.

9. Section 7.6.2.2 requesting a waiver for new trees. The applicant is not sure a waiver is required but if so then the applicant is proposing to planting a total of 20 new trees, including street trees (Little Leaf Linden) as part of the replication / mitigation for work within the wetland resource areas for the Conservation Commission in addition to dozens of trees left remaining in and adjacent to the wetland. There is not really any room on this site for any more trees.

10. Section 8.5.1.1 for Pipes and Culverts to be reinforced concrete. Due to the infiltration system and the fact that the maintenance will not be by the Town of Reading as a private drive a waiver is requested to allow HDPE piping, which is typical for infiltration system piping.



LOCUS MAP - 100 Scale

PREPARED FOR:

STELLA CONSTRUCTION
25 Everett Street
Woburn, MA 01810

PREPARED BY:

MEISNER BREM CORPORATION
142 LITTLETON ROAD, STE. 16, WESTFORD, MA 01886 · (978) 692-1313
202 MAIN STREET, SALEM, NH 03079 · (603) 893-3301

SHEET INDEX

1	COVER SHEET
2	NOTE SHEET
3	LOCUS INSET PLAN (100 SCALE)
4	EXISTING CONDITIONS PLAN (30 SCALE)
5	OVERALL LAYOUT PLAN (30 SCALE)
6	DEFINITIVE SUBDIVISION PLAN (30 SCALE)
7	PLAN & PROFILE - PRIVATE WAY (40 SCALE)
8	GRADING & UTILITY PLAN (30 SCALE)
9	ALTERNATIVE "A" PLAN (30 SCALE)
10	CONSERVATION PLAN (30 SCALE)
11	PRELIMINARY PROOF PLAN (60' ROW) (30 SCALE)
12	DETAIL SHEET (GENERAL & DRAINAGE DETAILS)
13	DETAIL SHEET (WATER & SEWER DETAILS)

APPROVAL: READING PLANNING BOARD

DATE

3110

COMMONWEALTH OF MASSACHUSETTS
JEFFREY A. BREM
CIVIL
34780
REGISTERED PROFESSIONAL ENGINEER

12.15.23

REV. 4	3-22-2024	IA
PER TOWN COMMENTS		
REV. 3	3-5-2024	PM/IA
PER TOWN COMMENTS		
REV. 2	2-8-2024	PM/IA
PER TOWN COMMENTS		
REV. 1	1-30-2024	JB/PM
PER TOWN COMMENTS		

SUBDIVISION PLAN SET – COVER SHEET
246 & 248 WALNUT STREET
READING, MASSACHUSETTS

PREPARED FOR:
STELLA CONSTRUCTION
25 Everett Street
Woburn, MA 01810
857-251-5110

DECEMBER 20, 2023

30 15 0 30 60

SCALE: 1"=30'

"ALL TECHNICAL WORK BY ANY INDIVIDUAL DONE FOR THE PREPARATION OF THIS PLAN IS THE RESPONSIBILITY OF MEISNER BREM CORPORATION AND NOT THE INDIVIDUAL"

MEISNER BREM CORPORATION
142 LITTLETON ROAD, STE. 16, WESTFORD, MA 01886 · (978) 692-1313
202 MAIN STREET, SALEM, NH 03079 · (603) 893-3301

JOB NUMBER: 3110
ACAD FILE: 3110-Stella Const. Prelim

DATE OF PLAN : DECEMBER 20, 2023
REVISION 1 : JANUARY 30, 2024
REVISION 2 : FEBRUARY 8, 2024
REVISION 3 : MARCH 5, 2024
REVISION 4 : MARCH 22, 2024

3110

A. PROPERTY AND ZONING NOTES

1. PURPOSE OF PLAN
   THIS PLAN IS INTENDED TO BE A DEFINITIVE SUBDIVISION PLAN PURSUANT TO M.G.L. Ch.41, SECTION 81T AND SECTION 5.0 OF THE READING SUBDIVISION REGULATIONS – SHOWING ONE EXISITING LOT BEING SUBDIVIDED INTO TWO LOTS WITH A SMALL EXTENSION OF WALNUT STREET (TOTAL 1 NEW LOT).
2. TAX MAP 3 PARCEL 19
   LOT AREA: 2.02 ACRES
3. OWNER:
   STEVEN T BALSAVICH, ERIK KORTZ, JOSEPH MALIEWSKI (BOOK 80377 PG 291 MSRD)
4. ZONING: SINGLE FAMILY 20
   REQUIRED AREA: 20,000 S.F.
   (12,000 S.F. UPLAND)
   REQUIRED FRONTAGE: 120'
   (*80' ON A CURVE LESS THEN 200')
   *REDUCED FRONTAGE MUST BE 120'
   AT THE REAR OF THE FRONT SETBACK
   REQUIRED LOT WIDTH: 80'
   (MEASURED AT ALL POINTS FROM THE
   REQUIRED FRONTAGE:
   TO THE FRONT OF THE DWELLING
   SETBACKS: FRONT: 20'
   SIDE: 15'
   REAR: 20'
5. PROJECT TO BE SERVICED BY MUNICIPAL WATER AND SEWER
6. WAIVER WAS GRANTED TO SET RIGHT–OF–WAY WIDTH TO 50' (SECTION 7.1.5.a.)
7. WAIVER WAS GRANTED FOR MAXIMUM LENGTH OF A CUL–DE–SAC GREATER THAN 500' (SECTION 7.1.1.a. WIDTH AND GRADE OF WAYS)
8. WETLAND DELINEATION PERFORMED BY BASBANES AND ASSOCIATES IN JANUARY OF 2023 AND SURVEYED BY EISNER BREM CORPORATION
9. THE PROJECT WILL REQUIRE AN ORDER OF CONDITIONS FROM THE READING CONSERVATION COMMISSION FOR WORK WITHIN THE BUFFER AND THE RIVERFRONT AREA. AS PART OF THE NOTICE OF INTENT APPLICATION THE APPLICANT WILL BE REQUIRED TO PERFORM AN ALTERNATIVE ANALYSIS PURSUANT TO 310 CMR 10.58(4)(c) FOR WORK IN THE OUTER RIPARIAN ZONE OF THE RIVER FRONT AREA.

B. PLAN REFERENCES

1. "PLAN SHOWING LAND IN READING, MASS OWNED BY LESLIE M. JAY ET. AL.", PREPARED BY ERWATSON, SURVEYOR, 16 CEDAR ST, READING, MA, DATED JUNE 1959, AND RECORDED IN THE MSRD AS PLAN BOOK 9510 PLAN 394
2. "PLAN OF LAND IN READING, MASS", OWNED BY STROUT & WING, 485 MAIN ST, READING MASS, PREPARED BY JOHN W. PARSONS, 44 ALLEN AVE, LYNN MA, DATED SEPTEMBER 30, 1954, AND RECORDED IN THE MSRD AS PLAN BOOK 9349 PLAN END.
3. "SUBDIVISION PLAN OF LAND IN READING", PREPARED BY H. KINGMAN ABBOTT, SURVEYOR, DATED FEBRUARY 1949, AND RECORDED IN THE MSRD AS REGISTERED LAND PLAN BOOK 551, PLAN 52. LAND COURT PLAN NUMBER 14713–4.
3. "SUBDIVISION PLAN OF LAND IN READING", PREPARED BY H. KINGMAN ABBOTT, SURVEYOR, DATED FEBRUARY 1948, AND RECORDED IN THE MSRD AS REGISTERED LAND PLAN BOOK 431, PLAN 121. LAND COURT PLAN NUMBER 14713–X.

C. GENERAL CONSTRUCTION NOTES

1. ALL CONSTRUCTION SHALL CONFORM TO THE APPLICABLE REQUIREMENTS AND SPECIFICATIONS OF THE TOWN OF READING IN THE LATEST SUBDIVISION RULES AND REGULATIONS AT THE TIME OF THIS PLAN SUBMISSION AND OTHER APPLICABLE SPECIFICATIONS UNLESS SPECIFICALLY WAIVED BY THE PLANNING BOARD. OTHERWISE ALL CONSTRUCTION SHALL CONFORM TO THE LATEST AVAILABLE STANDARD SPECIFICATIONS FOR STANDARD HIGHWAYS AND BRIDGES (AND SUPPLEMENTS PUBLISHED BY THE COMMONWEALTH OF MASSACHUSETTS HIGHWAY DEPARTMENT.)
2. THE CONTRACTOR SHALL GIVE 72 HOUR NOTICE TO TOWN ENGINEERS FOR INSPECTIONS.
3. THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING AND COORDINATING ALL CONSTRUCTION ACTIVITIES WITH THE APPROPRIATE TOWN DEPARTMENTS TO VERIFY ALL CONNECTIONS TO EXISTING SERVICES AND TO ARRANGE FOR INSPECTIONS.
4. COMPLIANCE WITH ALL APPLICABLE REGULATIONS AND SPECIAL CONDITIONS OF THE TOWN AGENCIES SUCH AS THE PLANNING BOARD, CONSERVATION COMMISSION, BOARD OF HEALTH, AND OTHERS IS MANDATORY AND IS THE RESPONSIBILITY OF THE OWNER.
5. THE OWNER IS HEREBY NOTIFIED THAT THIS PLAN MAY CONTAIN CONDITIONS OF APPROVAL FROM THE PLANNING BOARD AND/OR THE CONSERVATION COMMISSION WHICH MAY NOT APPEAR ON THESE PLANS BUT ARE ON FILE WITH THE TOWN. CONTRACTOR SHALL HAVE A COPY OF THE ORDER OF CONDITIONS ON SITE AT ALL TIMES & SHALL BE FAMILIAR WITH ALL CONDITIONS.
6. THE OWNER AND/OR CONTRACTOR SHALL VERIFY ALL ZONING REQUIREMENTS FOR CONFORMANCE PRIOR TO ANY CONSTRUCTION.
7. ANY ALTERATION OF THIS DESIGN OR CHANGE DURING CONSTRUCTION MAY REQUIRE APPROVAL OF VARIOUS TOWN BOARDS OR AGENCIES AND SHALL BE REVIEWED AND APPROVED BY THE OWNER AND/OR THE DESIGN ENGINEER PRIOR TO CONSTRUCTION. ALLOW FOR A MINIMUM OF SEVEN DAYS FOR MODIFICATIONS.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION, SIZE AND ELEVATION OF ALL EXISTING UTILITIES SHOWN OR NOT SHOWN ON THESE PLANS AND SHALL VERIFY THAT ALL THE INFORMATION SHOWN HEREON IS CONSISTENT, COMPLETE, ACCURATE, AND CAN BE CONSTRUCTED PRIOR TO AND/OR DURING CONSTRUCTION. MEISNER BREM CORPORATION, AS THE DESIGN ENGINEER, SHALL BE NOTIFIED IN WRITING OF ANY DISCREPANCIES, ERRORS, OMISSIONS, OR EXISTING UTILITIES FOUND INTERFERING WITH THE PROPOSED CONSTRUCTION SO THAT REMEDIAL ACTION MAY BE TAKEN BEFORE PROCEEDING WITH THE WORK.
9. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING ACCURATE AS–BUILT INFORMATION OF ALL WORK, ESPECIALLY UNDERGROUND CONSTRUCTION OF UTILITY LINES, SERVICES, CONNECTIONS, ETC. AND APPROPRIATE TIES TO ABOVE GROUND PERMANENT STRUCTURES, FIELD SURVEY COORDINATES, OR SOME OTHER METHOD OF ESTABLISHING THE AS–BUILT CONDITION OF ALL CONSTRUCTION. MEISNER BREM CORPORATION SHALL BE GIVEN A 72 HOUR NOTICE FOR THE COLLECTION OF ALL AS–BUILT DATA. IF PERTINENT DESIGN COMPONENTS ARE BACK FILLED OR COVERED, IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO EXPOSE THEM AS REQUIRED.
10. ALL UTILITIES, ELECTRIC, TELEPHONE, OR CABLE TV, SHALL BE INSTALLED UNDERGROUND.
11. CONTRACTOR IS RESPOSNSIBLE FOR AND SHALL CONTACT THE LOCAL DIGSAGE OFFICE 72 HOURS PRIOR TO THE START OF CONSTRUCTION (DIAL 811 OR 888–DIG–SAFE).

D. CONSTRUCTION SEQUENCE

1. THE CONTRACTOR SHALL SET UP A PRE–CONSTRUCTION MEETING WITH THE RELEVANT TOWN STAFF TO DISCUSS PROJECT SEQUENCE AND SCHEDULE.
2. THE LIMIT OF TREE CLEARING SHALL BE MARKED BY THE OWNER/SURVEYOR/ ENGINEER BEFORE ANY TREE REMOVAL IS TO TAKE PLACE. ALL CLEARING OPERATIONS FOR ROADWAY, RIGHT OF WAY, GRADING, AND UTILITIES SHALL BE PERFORMED AT ONE TIME. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ANY PERMITS REQUIRED FOR THE TREE REMOVAL PROCESS PRIOR TO STARTING WORK.
3. ALL EROSION CONTROLS SUCH AS STRAWBALES AND SILT FENCE SHALL BE INSTALLED AS SHOWN ON THE PLANS PRIOR TO ANY GRADING OPERATIONS. EROSION CONTROL SHALL BE INSPECTED, MAINTAINED AND REPAIRED WHEN NECESSARY THROUGHOUT THE COURSE OF CONSTRUCTION. EROSION CONTROLS MUST BE INSTALLED PRIOR TO TREE REMOVAL.
4. TOPSOIL SHALL BE STRIPPED, STOCKPILED AND STABILIZED WITH TEMPORARY SEEDING. ROUGH GRADING OF THE JUNIPER HILL ROADND BUILDING SITES SHALL THEN BEGIN.
5. BEGIN ALL TEMPORARY AND/OR PERMANENT SEEDING WHEREVER POSSIBLE, AND ON ALL CUT AND FILL SLOPES AS THEY ARE CONSTRUCTED.
6. AS SECTIONS OF THE PROJECT ARE COMPLETED (BUILDINGS, FINISH PAVING, ETC.), COMPLETE FINAL GRADING, PERMANENT SEEDING AND LANDSCAPING. EROSION CONTROL MEASURES ARE TO BE REMOVED ONLY AFTER PERMANENT VEGETATION IS ESTABLISHED. EROSION CONTROLS MAY BE REMOVED ONLY UPON ISSUANCE OF THE CERTIFICATE OF COMPLIANCE OR BY THE WRITTEN STATEMENT BY THE CONSERVATION COMISSION.

E. STORM DRAINAGE

1. STORM DRAINAGE MATERIALS AND CONSTRUCTION SHALL COMPLY TO ALL PERTINENT FEDERAL, STATE AND TOWN RULES AND REGULATIONS.
2. ALL PIPE DISTANCES SHOWN ARE TO CENTER OF MANHOLES (CENTER OF STRUCTURE) AND CENTER OF CATCH BASINS.
3. STORM WATER PIPING SHALL CONSIST OF:
   A) ALL SOLID PIPES SHALL BE HDPE OR APPROVED EQUAL ACCEPTABLE TO THE TOWN OF WESTFORD UNLESS OTHERWISE SHOWN.
4. ALL CONCRETE STRUCTURES: CATCH BASINS, DRYWELLS, MANHOLES, SEDIMENTATION SUMPED MANHOLES AND OUTLET STRUCTURES SHALL BE:
   A) SHEA CONCRETE PRODUCTS, INC.
   WILMINGTON, MA
   508–658–2645
   OR APPROVED EQUAL.
   B) ALL STRUCTURES SHALL BE H–20 LOADING.
   C) ALL STRUCTURES SHALL BE PLACED ON A MINIMUM OF 6" THICK BED OF 1 1/2" CRUSHED STONE, MINIMUM OF 1' BEYOND THE STRUCTURE FOOTPRINT. THIS SHALL BE PLACED ON UNDISTURBED NATIVE GROUND OR ON 95% COMPACTED SUBGRADE, PER ASTM D–1557 (PROCTOR).
   D) ALL STRUCTURES REQUIRING ACCESS MANHOLES OR HATCHWAYS SHALL BE BROUGHT TO GRADE BY PRECAST CONCRETE RISERS OR CONCRETE BLOCK (OR BRICK). MORTAR JOINTS FLUSH TO FINISH GRADE WITH STRUCTURE. FINISH GRADE SHALL BE SUCH AS TO PROMOTE DRAINAGE AWAY FROM STRUCTURES.

F. GRADING NOTES

1. FINISH GRADING, EXCAVATION AND BACKFILL SHALL BE DONE IN ACCORDANCE WITH THE APPROVED DESIGN PLANS, SPECIFICATIONS AND DETAILS.
2. PRIOR TO ANY GRADING ACTIVITIES, ALL GRASSED AREAS ARE TO BE MOWED, AND VEGETATION REMOVED. STUMPS, ROOTS AND SOD ARE TO BE GRUBBED AND REMOVED FROM THE SITE GRADING AREAS.
3. FINISH GRADING AND RESTORATION OF FINAL SURFACE SHALL BE DONE SUCH AS TO PROMOTE DRAINAGE AWAY FROM ACCESS MANHOLES, CLEANOUTS AND STRUCTURES. GRADING SHALL BE FINISHED IN A CONTINUOUS GRADE SUCH THAT RUNOFF WILL NOT COLLECT, POND OR CREATE EROSIONAL GULLIES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO CORRECT ANY SUCH CONDITIONS. FINAL RESTORATION SHALL CONSIST OF THE STABILIZATION OF FINISH SURFACE WITH TOPSOIL AND SEEDING IN LANDSCAPED AREAS, INCLUDING BUT NOT LIMITED TO THE PLANTING OF SCREENING TREES AND BUSHES AND THE PLACEMENT OF COMPACTED GRAVEL WITH ASPHALT OR CONCRETE SURFACE WHERE REQUIRED PER PLAN.
4. BURIAL OF WASTE MATERIAL SHALL NOT BE ALLOWED. CONTRACTOR SHALL REMOVE ALL WASTE MATERIALS FROM THE SITE AND DISPOSE OF THEM AT A LOCATION APPROVED BY THE READING PLANNING BOARD OR BUILDING DEPARTMENT.
5. BACKFILL AND FILLS SHALL BE SELECT NATIVE, SELECT GRANULAR OR PROCESSED MATERIALS. THE TYPE OF MATERIAL SHALL CONFORM WITH THE DETAILS AND SPECIFICATIONS SUPPLIED IN THIS PLAN SET OR WITH THE MANUFACTURER'S RECOMMENDED SPECIFICATIONS.

F. GRADING NOTES (CONTINUED)

6. BACKFILL AND FILLS SHALL BE PLACED IN 6 INCH LIFTS AND COMPACTED TO WITHIN 95% DENSITY PER ASTM STANDARDS. IT SHALL BE PLACED ON UNDISTURBED NATIVE SOILS FREE OF TOPSOILS, ORGANICS AND DELETERIOUS MATERIALS, OR ON A 95% COMPACTED DENSITY SUBGRADE. IN AREAS EXCEEDING 2 FT CUTS OR ON SLOPES GREATER THAN 20%, BENCHING OUT SHALL BE REQUIRED TO KEY IN FILL MATERIALS. COMPACTION SHALL MEET THE REQUIREMENTS OF THE ASTM D–1557 (PROCTOR) TEST.
7. WATER COMPACTION OF TRENCHES AND/OR JETTING IS NOT ALLOWED WITHOUT WRITTEN CONSENT OF DESIGN ENGINEER AND THE TOWN OF WESTFORD.
8. ALL EXCAVATIONS SHALL BE DEWATERED PRIOR TO PLACEMENT OF BACKFILL OR FILLS IN ACCORDANCE WITH DETAILS PROVIDED HEREIN OR BY THE TOWN ENGINEERS INSTRUCTIONS. THE ENGINEER SHALL BE CONTACTED IF GROUNDWATER IS OBSERVED IN THE EXCAVATION AREAS.
9. ALL EXCESS MATERIALS GENERATED FROM THE SITE SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE WITH THE OWNER FOR DISPOSAL. ALL ORGANIC TOPSOILS ARE TO BE STOCKPILED FOR RESTORATION USAGE AT THE COMPLETION OF THE JOB. ALL SELECT GRANULAR MATERIALS SHALL BE STOCKPILED FOR USAGE IN STRUCTURAL FILLS SUCH AS DRIVEWAY SUBGRADES. ANY CONTAMINATED SOILS SHALL BE DISPOSED OF IN ACCORDANCE WITH LOCAL HEALTH DEPARTMENT REGULATIONS. ALL CONCRETE, ASPHALT, CONSTRUCTION DEBRIS AND WASTE MATERIALS SHALL BE REMOVED FROM THE SITE AT THE COMPLETION OF THE PROJECT UNLESS OTHER ARRANGEMENTS ARE MADE WITH THE PROPERTY OWNER.
10. ALL SLOPES RESULTING FROM THE GRADING OF THE STREETS THAT UTILIZE THE OPTION OF A RETAINING WALL OR NATURAL LEDGE FACE SHALL REQUIRE PRE–APPROVAL FROM THE TOWN OF WESTFORD AND THE DESIGN ENGINEER. ALL RETAINING WALLS SHALL BE DESIGNED BY OTHERS. UNLESS OTHERWISE DETAILED HEREIN (SEE SHT 9). ALL LEDGE SLOPES SHALL BE REVIEWED IN–FIELD BY THE DESIGN ENGINEER PRIOR TO FINAL APPROVAL AND ACCEPTANCE.
11. ALL SLOPES OF 2:1 OR GREATER SHALL BE STABILIZED WITH HAY OR JUTE MATTING AND SHALL BE APPROVED BY THE DESIGN ENGINEER.
12. SLOPES SHALL NOT BE STEEPER THAN 2:1 WITHOUT SPECIFIC GEOTECHNICAL DESIGN.
13. ALL CONSTRUCTION AND EARTH REMOVAL SHALL CONFORM TO THE PERMIT ISSUED BY THE WESTFORD PLANNING BOARD – SEE EARTH REMOVAL PLAN – EXHIBIT C

G. EROSION CONTROL NOTES

1) EROSION AND SEDIMENT CONTROL PRACTICES INCLUDE THE USE OF THE FOLLOWING: STRAW BALE BARRIERS, SILT FENCE BARRIERS, WATTLES, TEMPORARY SEDIMENT BASINS, PARTICLE SEPARATORS AND GRASS AND/OR ROCK LINED SWALES. EROSION CONTROL PRACTICES WILL BE CONSTRUCTED AND MAINTAINED ACCORDING WITH STANDARD PRACTICES OF THE U.S.D.A., SOIL CONSERVATION SERVICE.
2) CONSTRUCT A STABILIZATION CONSTRUCTION ENTRANCE (SEE NOTE C.2 HEREON).
3) STRAW BALE BARRIERS/SILT SCREEN FENCES SHALL BE INSTALLED AT THE LIMITS OF CONSTRUCTION. THEY ARE INTENDED PRIMARILY TO INTERCEPT AND FILTER SMALL VOLUMES OF "SHEET FLOWING" RUNOFF, OR AS SEDIMENT TRAPS IN SMALL SWALES. STRAWBALES HAVE A USEFUL LIFE OF 3 MONTHS WHEN WET AND THEREFORE MUST BE INSPECTED AND REPAIRED OR REPLACED PERIODICALLY. SILT SCREEN FENCES WILL FUNCTION 6 MONTHS OR LONGER IF KEPT FREE OF SEDIMENT ACCUMULATIONS.
4) THE PURPOSE OF TEMPORARY EROSION CONTROL MEASURES IS TO LIMIT THE AMOUNT OF SOIL TRANSPORTED FROM ON–SITE AREAS TO OFF SITE AREAS, AND ANY WETLANDS.
5) THE FOLLOWING VEGETATIVE MEASURES SHALL BE USED TO PROVIDE BOTH TEMPORARY AND PERMANENT SOIL EROSION CONTROL:
   A) TOPSOIL STOCKPILING: TOPSOIL SHALL BE STRIPPED AND STOCKPILED FOR LATER USE ON CRITICAL AREAS AND ALL OTHER AREAS TO BE SEEDED. THE STOCKPILE SHALL NOT BE COMPACTED AND SHALL BE STABILIZED AGAINST EROSION WITH TEMPORARY SEEDING.
   B) TEMPORARY SEEDING:
   B–1) BEDDING – REMOVE STONES AND TRASH THAT WILL INTERFERE WITH SEEDING THE AREA. WHERE FEASIBLE, TILL THE SOIL TO A DEPTH OF ABOUT 3 IN. TO PREPARE SEED BED AND MIX THE FERTILIZER INTO THE SOIL.
   B–2) FERTILIZER – FERTILIZER SHOULD BE UNIFORMLY SPREAD OVER THE AREA PRIOR TO BEING TILLED INTO THE SOIL.
   B–3) SEED MIXTURES – USE ANY OF THE FOLLOWING:

SPECIES	PER ACRE	PER 1000 S.F.	DATES	DEPTH
WINTER RYE	112 LBS.	2.5 LBS.	8/15 – 9/5	1 "
OATS	30 LBS.	2.0 LBS.	SPRING – 5/15	1 "
ANNUAL RYEGRASS	40 LBS.	1.0 LBS.	4/15 – 9/15	0.25"

   B–4) MULCHING – WHERE IT IS IMPRACTICAL TO INCORPORATE FERTILIZER AND SEED INTO MOIST SOIL, THE SEEDED AREA SHOULD BE MULCHED TO FACILITATE GERMINATION. MULCH IN THE FORM OF HAY OR STRAW SHOULD BE APPLIED AT A RATE OF 70 TO 90 LBS PER 1000 S.F.
   C) PERMANENT SEEDING:
   C–1) BEDDING – STONES LARGER THAN 4 IN. DIA., TRASH, ROOTS, AND OTHER DEBRIS THAT WILL INTERFERE WITH SEEDING AND FUTURE MAINTENANCE OF THE AREA SHOULD BE REMOVED. WHERE FEASIBLE, THE SOIL SHOULD BE TILLED TO A DEPTH OF 4 IN. TO PREPARE A SEEDBED AND MIX FERTILIZER INTO THE SOIL. THE SEEDBED SHOULD BE LEFT IN A REASONABLY FIRM AND SMOOTH CONDITION.
   C–2) FERTILIZER – LIME AND FERTILIZER SHOULD BE APPLIED EVENLY OVER THE AREA PRIOR TO OR AT THE TIME OF SEEDING AND INCORPORATED INTO THE SOIL. KINDS AND AMOUNTS OF LIME AND FERTILIZER SHOULD BE BASED ON AN EVALUATION OF SOIL TESTS. WHEN A SOIL TEST IS NOT AVAILABLE, THE FOLLOWING MINIMUM AMOUNTS SHOULD BE APPLIED.
   – AGRICULTURAL LIMESTONE @ 50 LBS PER 1000 S.F.
   – 10–10–10 FERTILIZER @ 12 LBS PER 1000 S.F.

G. EROSION CONTROL NOTES (CONTINUED)

C–3) SEED MIXTURES – (RECOMMENDED)

TYPE	RATE LBS. PER ACRE	RATE LBS. PER 1000 S.F.	USE
TALL FESQUE	20	0.45	STEEP CUTS & FILLS
CREEPING RED FESQUE	20	0.45	DETENTION BASINS
RED TOP	2	0.50	AND SWALES
TOTAL	42	1.40	
CREEPING RED FESQUE	50	1.15	ALL OTHER
KENTUCKY BLUEGRASS	50	1.15	AREAS
TOTAL	100	2.30	

C–4) MULCHING – MULCH SHOULD BE USED ON HIGHLY ERODIBLE SOILS, ON CRITICALLY ERODING AREAS, AND ON AREAS WHERE CONSERVATION OF MOISTURE WILL FACILITATE PLANT ESTABLISHMENT. PER THE FOLLOWING CHART:

TYPE	RATE PER 1000 S.F.	USE & COMMENTS
HAY OR STRAW	70 TO 90 LBS.	MUST BE DRY & FREE FROM MOLD. MAY BE USED WITH PLANTINGS.
WOOD CHIPS OR BARK MULCH	460 TO 920 LBS	USED MOSTLY WITH TREES AND SHRUBS PLANTING.
JUTE & FIBROUS MATTING	AS PER MANUFACTURER SPECIFICATIONS	USED IN SLOPE AREAS. WATER COURSES AND AREAS.
CRUSHED STONE 1/4 TO 1/2" ø	PLACE AT MIN. 2X THE THICKNESS OF LARGEST MATERIALS	EFFECTIVE IN CONTROLLING WIND & WATER EROSION

C–5) SODDING – SODDING IS DONE WHERE IT IS DESIRABLE TO RAPIDLY ESTABLISH COVER ON A DISTURBED AREA. SODDING AN AREA MAY BE SUBSTITUTED FOR PERMANENT SEEDING PROCEDURES ANYWHERE ON THE SITE. BED PREPARATION FERTILIZER AND PLACEMENT OF SOD SHALL BE PERFORMED ACCORDING TO THE S.C.S. HANDBOOK.
C–6) DURING THE PERIOD OF THE CONSTRUCTION AND/OR UNTIL LONG TERM VEGETATION IS ESTABLISHED:
C–6–A) SEEDED AREAS WILL BE FERTILIZED AND BE SEEDED AS NECESSARY TO INSURE ESTABLISHMENT.
C–6–B) ADDITIONAL STONE MAY HAVE TO BE ADDED TO THE CONSTRUCTION ENTRANCE, ROCK LINED SWALES, PERIODICALLY TO MAINTAIN THE PROPER FUNCTIONING OF THE EROSION CONTROL STRUCTURE.
C–6–C) ALL DIVERSIONS AND SWALES WILL BE CHECKED WEEKLY AND REPAIRED WHEN NECESSARY UNTIL ADEQUATE VEGETATION IS ESTABLISHED.
C–6–D) ALL STRAW BALE BARRIERS AND SILT SCREEN FENCES WILL BE CHECKED REGULARLY. NECESSARY REPAIRS WILL BE MADE TO CORRECT UNDERMINING OR DETERIORATION OF THE BARRIER.
C–6–E) ALL DRAINAGE STRUCTURES AND DETENTION BASINS SHALL BE CONSTRUCTED PRIOR TO ANY CONSTRUCTION ACTIVITIES IN EACH DRAINAGE AREA TO PREVENT SOIL EROSION TO OFF–SITE AREAS.
C–6–F) ALL DRAINAGE STRUCTURES AND DETENTION BASINS SHALL BE CLEANED AFTER ALL CONSTRUCTION IS COMPLETE AND VEGETATION IS ESTABLISHED.

ABBREVIATION LIST

B.F.	BASEMENT FLOOR
BIT.	BITUMINOUS CONCRETE
CONC.	CATCH BASIN
CB	REINFORCED CONCRETE PIPE
RCP	DRAIN MANHOLE
DMH	ELEVATION
EL.	FLARED END SECTION
F.E.S.	FIRST FLOOR
F.F.	FINISH GRADE
F.G.	DISTRIBUTION BOX
D.B.	SEPTIC TANK
S.T.	SLAB
SL.	HIGH POINT
H.P.	INVERT
INV.	IRON ROD
I.R.	DRILL HOLE
D.H.	STONE BOUND
S.B.	LOW POINT
LP N/F	NOW OR FORMERLY
CCB PROP.	CAPE COD BERM PROPOSED
T.C.	TOP CONCRETE
TYP.	TYPICAL
UP	UTILITY POLE
FND.	FOUND
BK.	BOOK
PG.	PAGE
I.P.	IRON PIPE
BND	BOUND
EP EX.	EDGE OF PAVEMENT EXISTING
EXIST.	EXISTING INVERT
I.E.	ELEVATION
VGC	SLOPED GRANITE CURB
TOF	TOP OF FOUNDATION
U.U.	UNDERGROUND UTILITIES (CABLE, TELE, ELEC)
SMF	STORMWATER MANAGEMENT FACILITY
FB	FOREBAY
INV.	INVERT OF PIPE

LEGEND

EXISTING	DESCRIPTION	PROPOSED
102	2 FOOT CONTOUR	102
110	10 FOOT CONTOUR	110
	EDGE OF WETLAND	
	100' BUFFER ZONE	
	EDGE OF PAVEMENT	
	CURBING	
	STONE WALL	
IP	IRON PIN	IP T.B.S
IR	IRON ROD	IR T.B.S
DH	DRILL HOLE	DH T.B.S
SBDH FND	STONE BOUND W/ D.H.	
71.0	SPOT GRADE	71x0
	TREE LINE	
	DRAIN PIPE	
	DRAIN MANHOLE	
	CATCH BASIN	
UU	UNDERGROUND UTILITIES (CABLE, TELE, ELEC)	UU
	WELL	W
	SIGN	
	STREET LIGHT	
	BUILDING SETBACK	
UP #72	UTLILTY POLE	UP #73
	EROSION CONTROL (AS SPECIFIED)	
	TREE	
	PROPANE TANK	

FOR REGISTRY USE ONLY

APPROVAL: READING PLANNING BOARD

DATE

3110

COMMONWEALTH OF MASSACHUSETTS
JEFFREY A. BREM
CIVIL
34780
REGISTERED PROFESSIONAL ENGINEER

12.15.23

REV. 4	3–22–2024	IA
PER TOWN COMMENTS		
REV. 3	3–5–2024	PM/IA
PER TOWN COMMENTS		
REV. 2	2–8–2024	PM/IA
PER TOWN COMMENTS		
REV. 1	1–30–2024	JB/PM
PER TOWN COMMENTS		

SUBDIVISION PLAN SET – NOTE SHEET

246 & 248 WALNUT STREET READING, MASSACHUSETTS

PREPARED FOR:

STELLA CONSTRUCTION
25 Everett Street
Woburn, MA 01810
857–251–5110

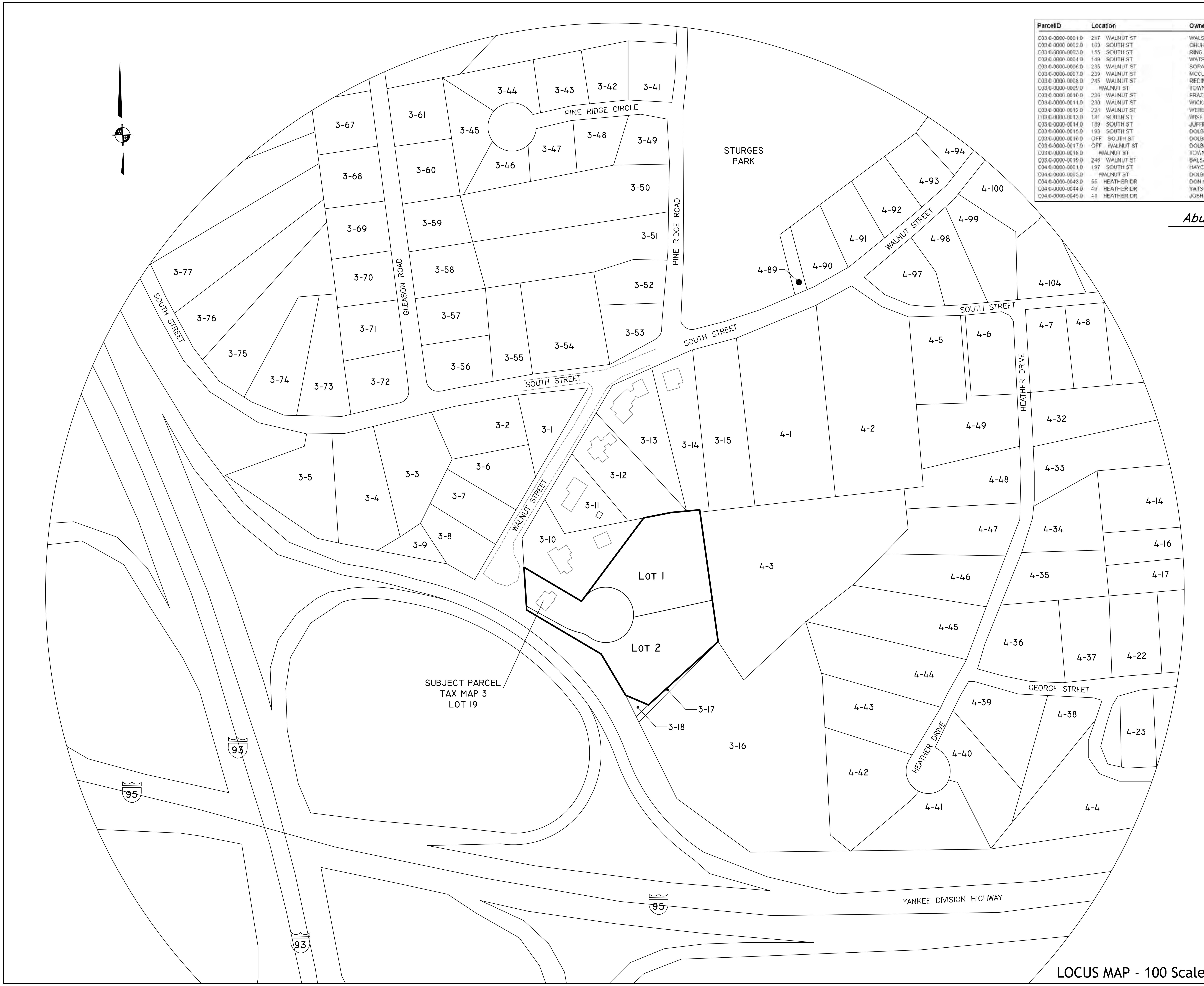
DECEMBER 20, 2023

30 15 0 30 60

SCALE: NONE

MEISNER BREM CORPORATION
142 LITTLETON ROAD, STE. 16, WESTFORD, MA 01886 · (978) 692–1313
202 MAIN STREET, SALEM, NH 03079 · (603) 893–3301

JOB NUMBER: 3110
ACAD FILE: 3110–Stella Const. Prelim



ParcelID	Location	Owner	Co-Owner	Mailing Address	City	State	Zip
003.0-0000-0001.0	217 WALNUT ST	WALSH DAVID J	KELLIE A WALSH	217 WALNUT ST	READING	MA	01867
003.0-0000-0002.0	163 SOUTH ST	CIHUHA STEPHEN C JR ETAL TRS	163 SOUTH STREET READII	50 LOTHROP RD	READING	MA	01867
003.0-0000-0003.0	155 SOUTH ST	RING JONATHAN	RING EMILY TE	155 SOUTH ST	READING	MA	01867
003.0-0000-0004.0	149 SOUTH ST	WATSON JOSEPH J	WATSON DIANE J TE	149 SOUTH ST	READING	MA	01867
003.0-0000-0006.0	235 WALNUT ST	SORACCO MICHAEL G	HEATHER C SORACCO	235 WALNUT ST	READING	MA	01867
003.0-0000-0007.0	239 WALNUT ST	MCCLELLAN MAUREEN		239 WALNUT ST	READING	MA	01867
003.0-0000-0008.0	245 WALNUT ST	REDINGER MATTHEW I	REDINGER IRA H JR JT	245 WALNUT ST	READING	MA	01867
003.0-0000-0009.0	WALNUT ST	TOWN OF READING		16 LOWELL STREET	READING	MA	01867
003.0-0000-0010.0	236 WALNUT ST	FRAZIER PAUL STEPHEN		236 WALNUT ST	READING	MA	01867
003.0-0000-0011.0	230 WALNUT ST	WICKS JEFFREY DAVID	MACKWICKS MILLICENT TE	230 WALNUT ST	READING	MA	01867
003.0-0000-0012.0	224 WALNUT ST	WEBB MICHAEL J	LEE ANNE R WEBB	224 WALNUT ST	READING	MA	01867
003.0-0000-0013.0	181 SOUTH ST	WISE THOMAS F ETAL TRUSTEES	THE WISE LIVING TRUST	181 SOUTH ST	READING	MA	01867
003.0-0000-0014.0	189 SOUTH ST	JUFFRE GARY M	SHELLEY S JUFFRE	189 SOUTH ST	READING	MA	01867
003.0-0000-0015.0	193 SOUTH ST	DOLBEN ANDREW K		213 SOUTH ST	READING	MA	01867
003.0-0000-0016.0	OFF SOUTH ST	DOLBEN ANDREW K	MARY C DOLBEN	213 SOUTH ST	READING	MA	01867
003.0-0000-0017.0	OFF WALNUT ST	DOLBEN ANDREW K	MARY C DOLBEN	213 SOUTH ST	READING	MA	01867
003.0-0000-0018.0	WALNUT ST	TOWN OF READING		16 LOWELL ST	READING	MA	01930
003.0-0000-0019.0	246 WALNUT ST	BALSAVICH STEVEN T	KORTZ ERIK ETAL JTROS	246 WALNUT ST	READING	MA	01867
004.0-0000-0001.0	197 SOUTH ST	HAYES CHRISTOPHER	ROTONDO AMANDA	197 SOUTH ST	READING	MA	01867
004.0-0000-0003.0	WALNUT ST	DOLBEN ANDREW K	MARY C DOLBEN	213 SOUTH ST	READING	MA	01867
004.0-0000-0043.0	55 HEATHER DR	DON STEWART A	SUSAN M DON	55 HEATHER DR	READING	MA	01867
004.0-0000-0044.0	49 HEATHER DR	YATSUHASHI AMY E	DOUGLAS S YATSUHASHI	49 HEATHER DR	READING	MA	01867
004.0-0000-0045.0	41 HEATHER DR	JOSHI SAUMIL NITIN	JOSHI DRASHTI SAUMIL TE	41 HEATHER DRIVE	READING	MA	01867

Abutting Property Information

APPROVAL: READING PLANNING BOARD

DATE

3110

COMMONWEALTH OF MASSACHUSETTS
JEFFREY A. BREM
CIVIL
34780
REGISTERED
PROFESSIONAL ENGINEER

12.15.23

REV. 4	3-22-2024	IA
PER TOWN COMMENTS		
REV. 3	3-5-2024	PM/IA
PER TOWN COMMENTS		
REV. 2	2-8-2024	PM/IA
PER TOWN COMMENTS		
REV. 1	1-30-2024	JB/PM
PER TOWN COMMENTS		

SUBDIVISION PLAN SET – LOCUS INSET PLAN

246 & 248 WALNUT STREET
READING, MASSACHUSETTS

PREPARED FOR:

STELLA CONSTRUCTION
25 Everett Street
Woburn, MA 01810
857-251-5110

DECEMBER 20, 2023

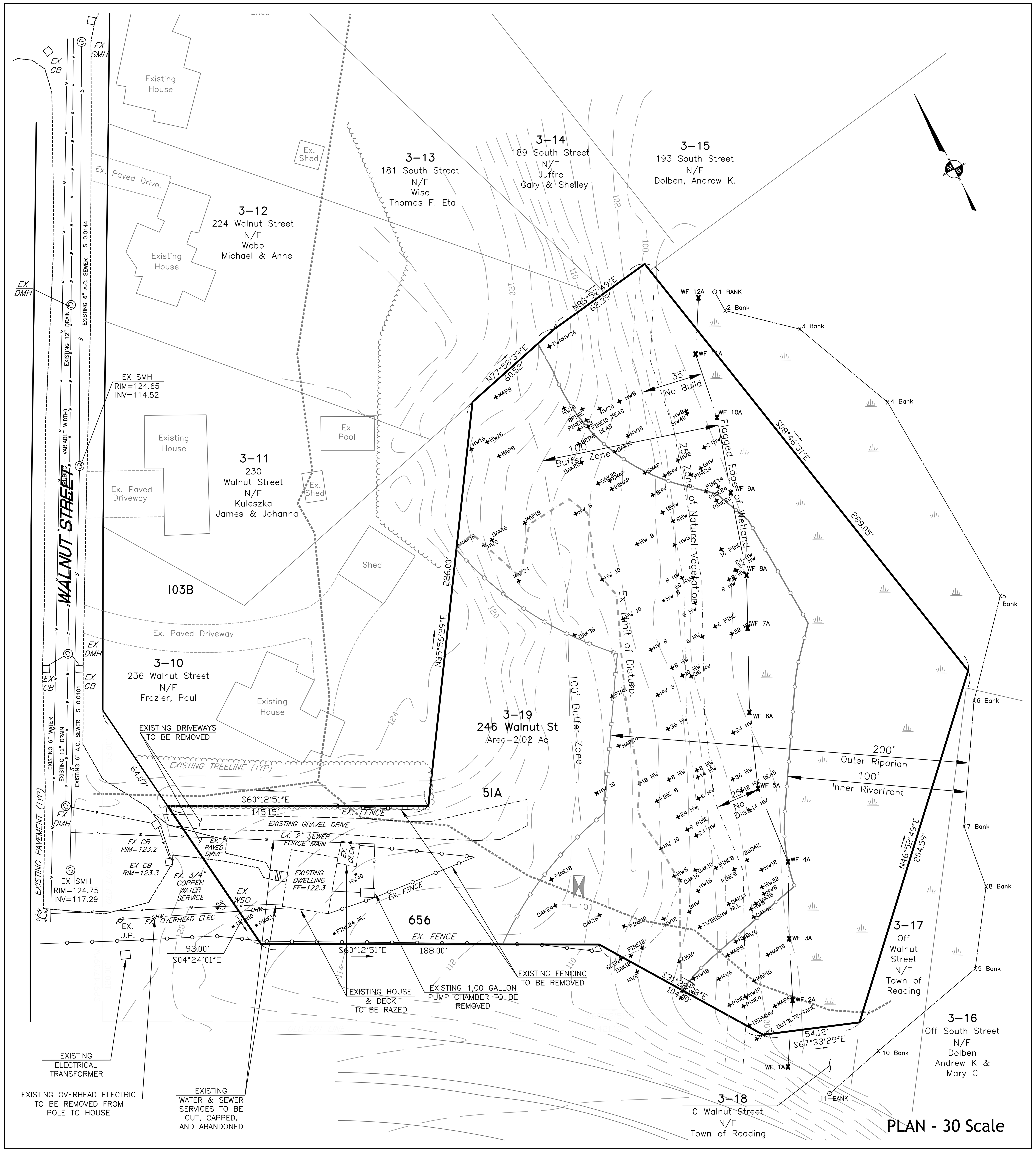
100 50 0 100 200

SCALE: 1"=100'

"ALL TECHNICAL WORK BY ANY INDIVIDUAL DONE FOR THE PREPARATION OF THIS PLAN IS THE RESPONSIBILITY OF MEISNER BREM CORPORATION AND NOT THE INDIVIDUAL"

MEISNER BREM CORPORATION
142 LITTLETON ROAD, STE. 16, WESTFORD, MA 01886 · (978) 692-1313
202 MAIN STREET, SALEM, NH 03079 · (603) 893-3301

JOB NUMBER: 3110
ACAD FILE: 3110-Stella Const. Prelim



LEGEND

4 Bank	BANK – WITH FLAG #
WF 9A	EDGE OF BORDERING VEGETATED WETLAND (BVW)
	ZONE OF NATURAL VEGETATION (25')
	35' NO BUILD ZONE
	100' BUFFER ZONE TO BVW
	100' INNER RIPARIAN ZONE (INNER RIVERFRONT)
	200' RIVERFRONT AREA (OUTER RIPARIAN)
	EXISTING LIMIT OF DISTURBANCE
	SOILS LINE

SOIL TESTING: J. BREM, SE **DATE:** 7-14-2023

TP-101 EL. 112.83

"A" LOAM 0–6" 10YR 3/3	
"B" 6–24" SUBSOIL 10YR 3/4	
"C1" 24–36" LOAMY SAND 10YR 4/2	
"C2" 36–72" LOAMY SAND 5% COBBLES 5YR 4/3	

GWO @ N/A
WEEP @ N/A
ESHGW @ None

NRCS SOILS:

51A – Swansea muck, 0 to 1% slopes
103B – Charlton-Hollis-Rock Outcrop Complex, 3% to 8% slopes
656 – Udorthents-Urban Land Complex

SOILS LINE

APPROVAL: READING PLANNING BOARD

DATE

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PER TOWN COMMENTS		
REV. 3	3-5-2024	PM/IA
PER TOWN COMMENTS		
REV. 2	2-8-2024	PM/IA
PER TOWN COMMENTS		
REV. 1	1-30-2024	JB/PM
PER TOWN COMMENTS		

SUBDIVISION PLAN SET – EXISTING CONDITIONS

246 & 248 WALNUT STREET READING, MASSACHUSETTS

PREPARED FOR:
STELLA CONSTRUCTION
25 Everett Street
Woburn, MA 01810
857-251-5110

DECEMBER 20, 2023

30 15 0 30 60
SCALE: 1"=30'

MEISNER BREM CORPORATION
142 LITTLETON ROAD, STE. 16, WESTFORD, MA 01886 · (978) 692-1313
202 MAIN STREET, SALEM, NH 03079 · (603) 893-3301

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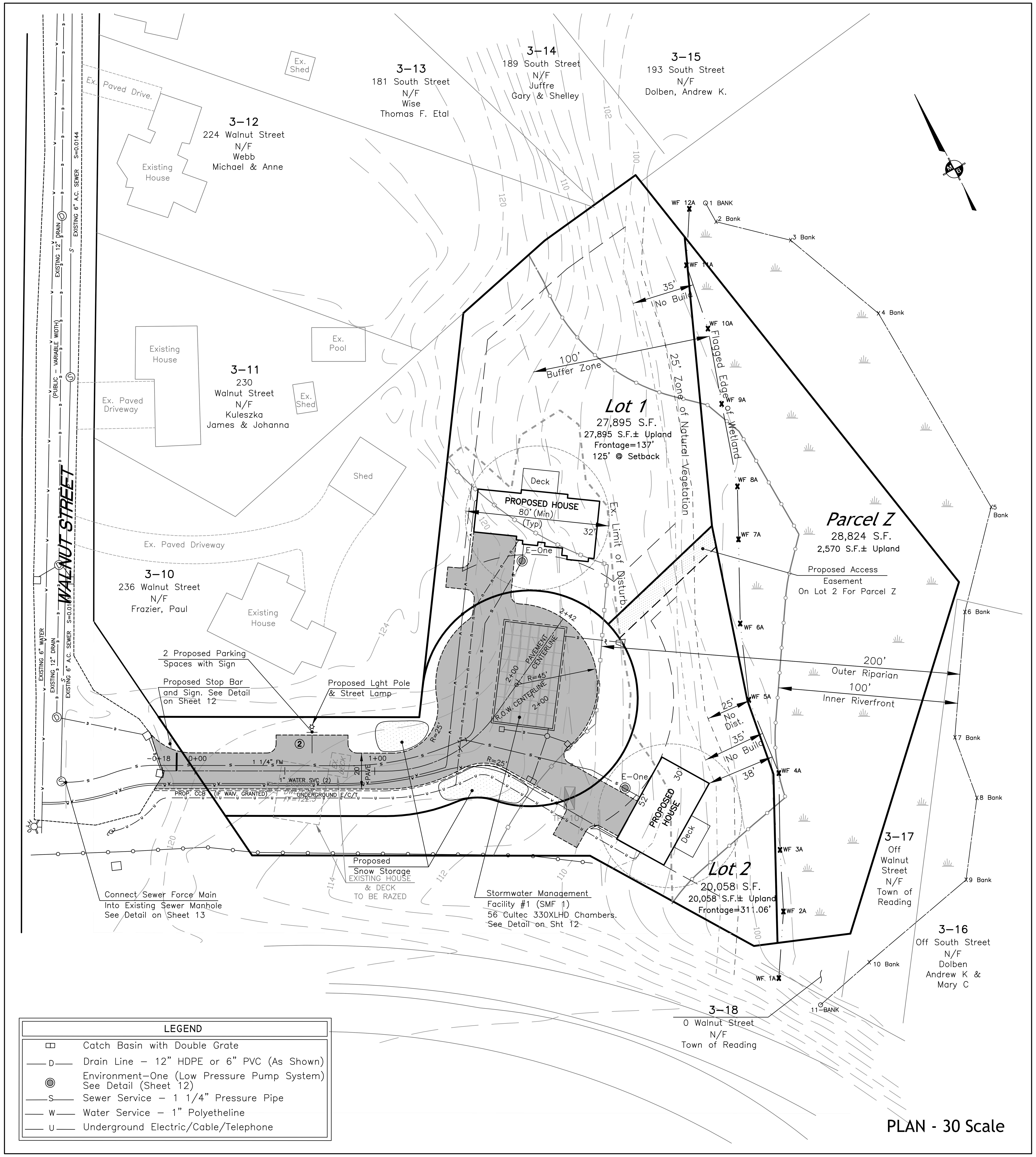

APPROVAL: READING PLANNING BOARD

DATE

3110

COMMONWEALTH OF MASSACHUSETTS
JEFFREY A. BREM
CIVIL 34780
REGISTERED PROFESSIONAL ENGINEER
12.15.23

REV. 4	3–22–2024	IA
PER TOWN COMMENTS		
REV. 3	3–5–2024	PM/IA
PER TOWN COMMENTS		
REV. 2	2–8–2024	PM/IA
PER TOWN COMMENTS		
REV. 1	1–30–2024	JB/PM
PER TOWN COMMENTS		

SUBDIVISION PLAN SET – OVERALL LAYOUT PLAN

246 & 248 WALNUT STREET READING, MASSACHUSETTS

PREPARED FOR:

STELLA CONSTRUCTION
25 Everett Street
Woburn, MA 01810
857–251–5110

DECEMBER 20, 2023

30 15 0 30 60

SCALE: 1"=30'

"ALL TECHNICAL WORK BY ANY INDIVIDUAL DONE FOR THE PREPARATION OF THIS PLAN IS THE RESPONSIBILITY OF MEISNER BREM CORPORATION AND NOT THE INDIVIDUAL"

MEISNER BREM CORPORATION
142 LITTLETON ROAD, STE. 16, WESTFORD, MA 01886 · (978) 692–1313
202 MAIN STREET, SALEM, NH 03079 · (603) 893–3301

JOB NUMBER: 3110
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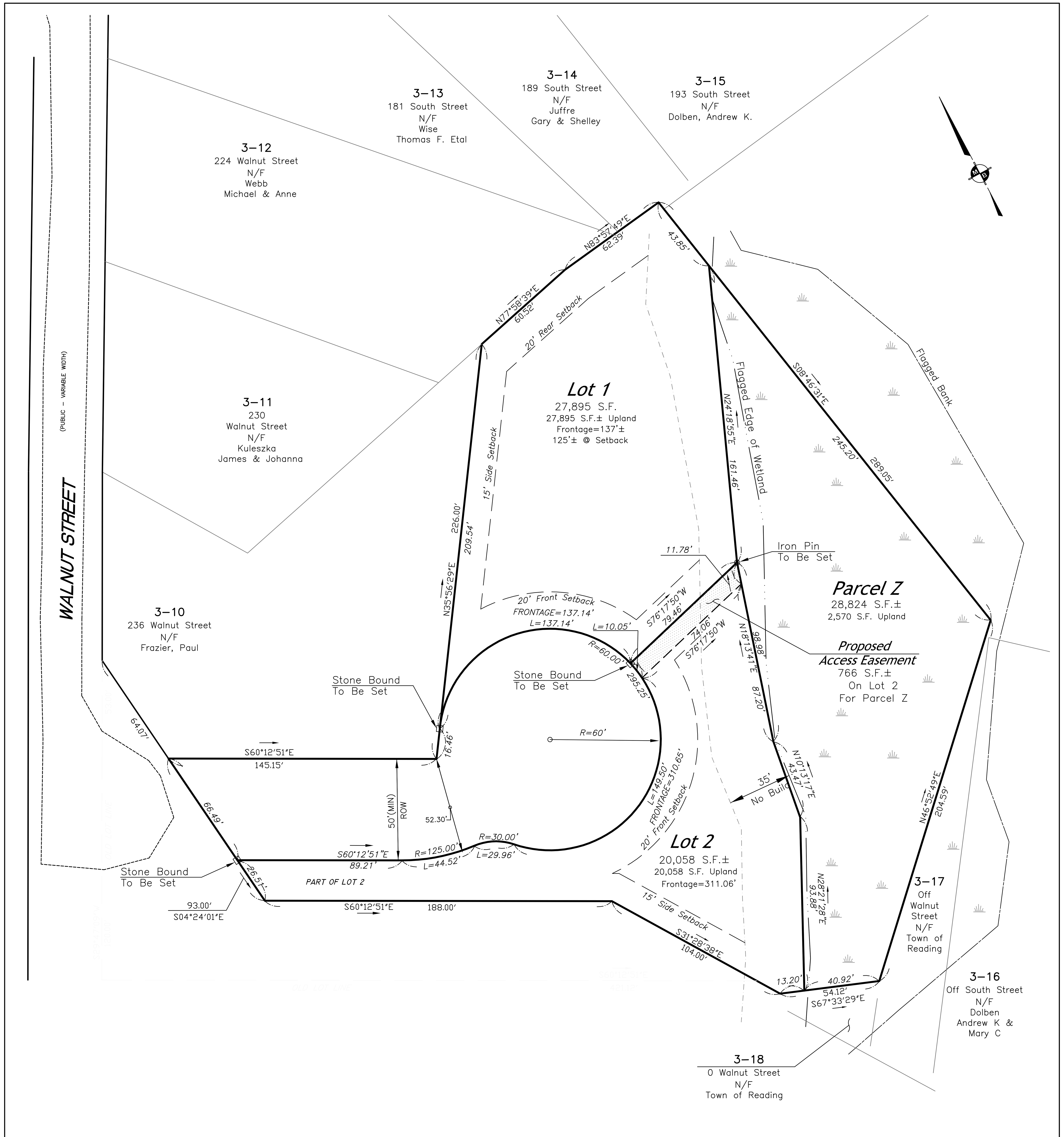


PLAN - 30 Scale

A. PROPERTY AND ZONING NOTES

1. PURPOSE OF PLAN
   THIS PLAN IS INTENDED TO BE A DEFINITIVE SUBDIVISION PLAN PURSUANT TO M.G.L. Ch.41, Section 81T AND Section 5.0 OF THE READING SUBDIVISION REGULATIONS SHOWING ONE EXISITING LOT BEING SUBDIVIDEDNTO TWO LOTS WITH A SMALL EXTENSION OF WALNUT STREET (TOTAL 1 NEW LOT).
2. TAX MAP 3 PARCEL 19
   LOT AREA: 2.02 ACRES
3. OWNER:
   BALSAVICH STEVEN T KORTZ ERIK ETAL JTROS
4. ZONING: SINGLE FAMILY 20
   REQUIRED AREA: 20,000 S.F.
   (12,000 S.F. UPLAND)
   REQUIRED FRONTAGE: 120'
   (*80' ON A CURVE LESS THEN 200')
   *REDUCED FRONTAGE MUST BE 120'
   AT THE REAR OF THE FRONT SETBACK
   REQUIRED LOT WIDTH: 80'
   (MEASURED AT ALL POINTS FROM THE
   REQUIRED FRONTAGE:
   TO THE FRONT OF THE DWELLING
   SETBACKS: FRONT: 20'
   SIDE: 15'
   REAR: 20'
5. PROJECT TO BE SERVICED BY MUNICIPAL WATER AND SEWER
6. WAIVER WILL BE REQUESTED TO SET RIGHT-OF-WAY WIDTH TO 50' (SECTION 7.1.5.a.)
7. WAIVER MAY BE REQUIRED FOR MAXIMUM LENGTH OF A CUL-DE-SAC GREATER THAN 500' (SECTION 7.1.1.a. WIDTH AND GRADE OF WAYS)
8. WETLAND DELINEATION PERFORMED BY BASBANES AND ASSOCIATES IN JANUARY OF 2023 AND SURVEYED BY EISNER BREM CORPORATION
9. THE PROJECT WILL REQUIRE AN ORDER OF CONDITIONS FROM THE READING CONSERVATION COMMISSION FOR WORK WITHIN THE RIVERFRONT AREA. AS PART OF THE NOTICE OF INTENT APPLICATION THE APPLICANT WILL BE REQUIRED TO PERFORM AN ALTERNATIVE ANALYSIS PURSUANT TO 310 CMR 10.58(4)(c) FOR WORK IN THE OUTER RIPARIAN ZONE OF THE RIVER FRONT AREA.

FOR REGISTRY USE ONLY

I, ____________, CLERK OF THE TOWN OF READING, MA., HEREBY CERTIFY THE NOTICE OF APPROVAL OF THIS PLAN BY THE WESTFORD PLANNING BOARD HAS BEEN RECEIVED AND RECORDED AT THIS OFFICE AND NO APPEAL WAS RECEIVED DURING THE TWENTY DAYS AFTER SUCH RECEIPT AND RECORDING OF SAID NOTICE.

TOWN CLERK ____________ DATE ____________

I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED IN ACCORDANCE WITH THE UNIFORM INSTRUCTIONS FOR THE PREPARATION OF PLANS SET FORTH BY THE REGISTERS OF DEEDS AND THAT ALL SURVEYING CONFORMS TO THE TECHNICAL STANDARDS FOR PROPERTY SURVEYS OF THE AMERICAN CONGRESS ON SURVEYING AND MAPPING.

DATE ____________

APPROVED ____________, SUBJECT TO COVENANT CONDITIONS SET FORTH IN A COVENANT EXECUTED BY____________ DATED ______, AND TO BE (RECORDED) (REGISTERED) HERE WITH.

APPROVAL: READING PLANNING BOARD

DATE ____________

COMMONWEALTH OF MASSACHUSETTS
KURT D. MEISNER
35405
PROFESSIONAL LAND SURVEYOR

REV. 4	3-22-2024	IA
PER TOWN COMMENTS		
REV. 3	3-5-2024	PM/IA
PER TOWN COMMENTS		
REV. 2	2-8-2024	PM/IA
PER TOWN COMMENTS		
REV. 1	1-30-2024	JB/PM
PER TOWN COMMENTS		

SUBDIVISION PLAN SET – DEFINITIVE PLAN

246 & 248 WALNUT STREET READING, MASSACHUSETTS

PREPARED FOR:

STELLA CONSTRUCTION
25 Everett Street
Woburn, MA 01810
857-251-5110

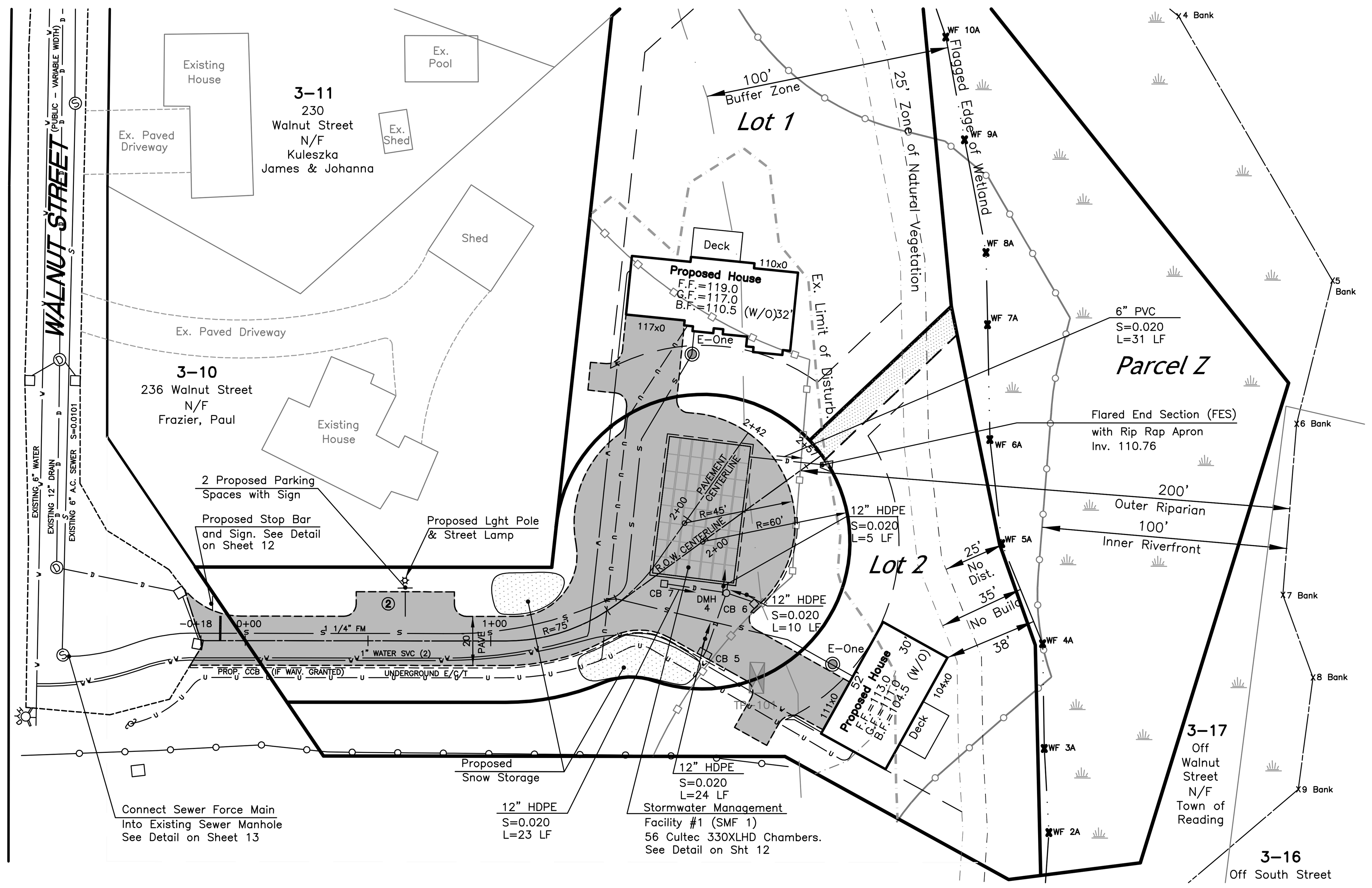
DECEMBER 20, 2023

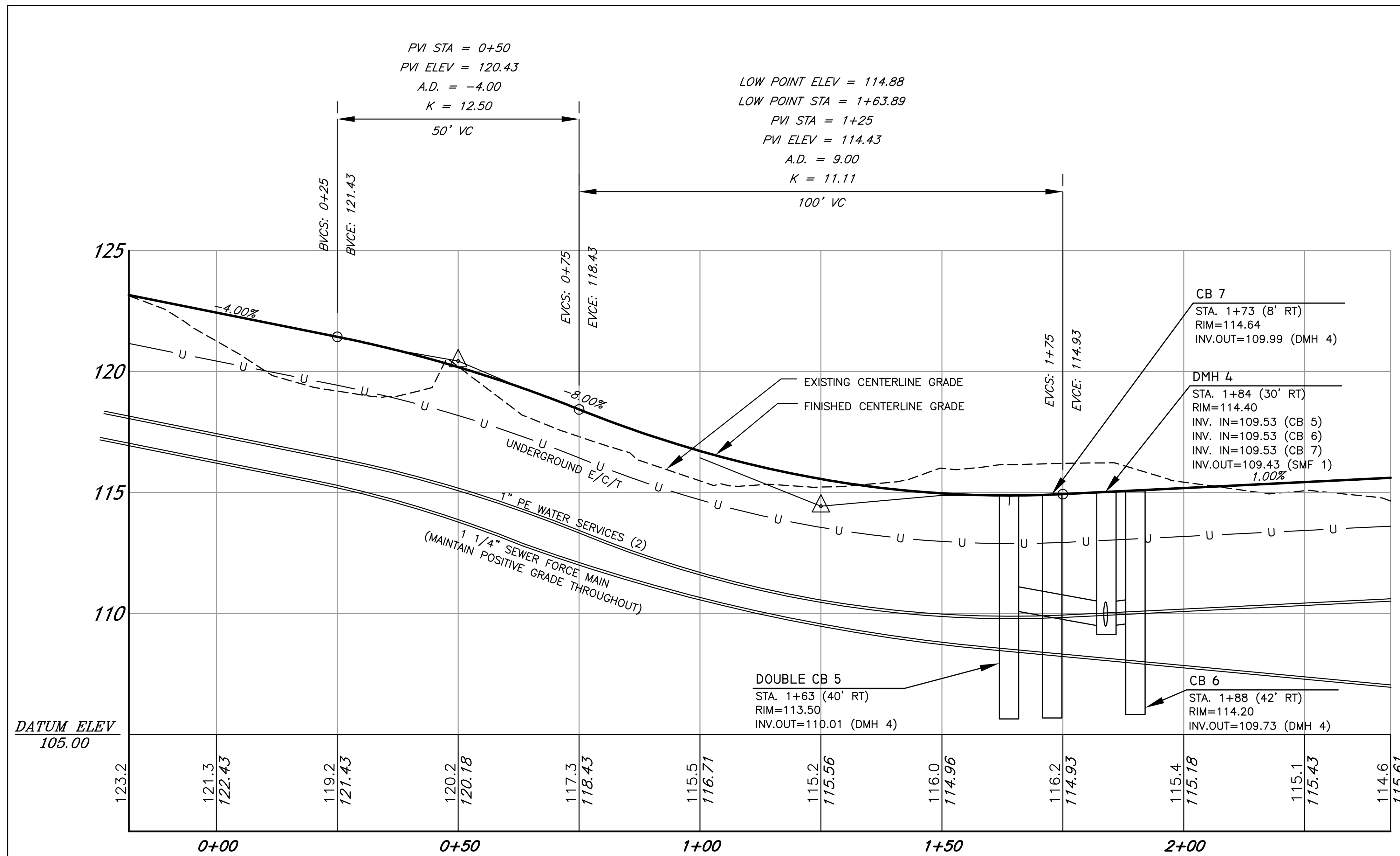
30 15 0 30 60
SCALE: 1"=30'

MEISNER BREM CORPORATION
142 LITTLETON ROAD, STE. 16, WESTFORD, MA 01886 · (978) 692-1313
202 MAIN STREET, SALEM, NH 03079 · (603) 893-3301

"ALL TECHNICAL WORK BY ANY INDIVIDUAL DONE FOR THE PREPARATION OF THIS PLAN IS THE RESPONSIBILITY OF MEISNER BREM CORPORATION AND NOT THE INDIVIDUAL"

JOB NUMBER: 3110
ACAD FILE: 3110-Stella Const. Prelim





Private Way Profile – Pavement Centerline

SCALE: H: 1"=20'
V: 1"=4'

PLAN - 40 Scale

LEGEND

◫	Catch Basin with Double Grate
—— D ——	Drain Line – 12" HDPE or 6" PVC (As Shown)
◉	Environment–One (Low Pressure Pump System) See Detail (Sheet 12)
—— S ——	Sewer Service – 1 1/4" Pressure Pipe
—— W ——	Water Service – 1" Polyetheline
—— U ——	Underground Electric/Cable/Telephone

"ALL TECHNICAL WORK BY ANY INDIVIDUAL DONE FOR THE PREPARATION OF THIS PLAN IS THE RESPONSIBILITY OF MEISNER BREM CORPORATION AND NOT THE INDIVIDUAL"

APPROVAL: READING PLANNING BOARD

DATE

3110

COMMONWEALTH OF MASSACHUSETTS
JEFFREY A. BREM
CIVIL
34780
REGISTERED PROFESSIONAL ENGINEER

12.15.23

REV. 4	3-22-2024	IA
PER TOWN COMMENTS		
REV. 3	3-5-2024	PM/IA
PER TOWN COMMENTS		
REV. 2	2-8-2024	PM/IA
PER TOWN COMMENTS		
REV. 1	1-30-2024	JB/PM
PER TOWN COMMENTS		

SUBDIVISION PLAN SET – PLAN & PROFILE

246 & 248 WALNUT STREET
READING, MASSACHUSETTS

PREPARED FOR:

STELLA CONSTRUCTION
25 Everett Street
Woburn, MA 01810
857-251-5110

DECEMBER 20, 2023

40 20 0 40 80

SCALE: 1"=40'

MEISNER BREM CORPORATION
142 LITTLETON ROAD, STE. 16, WESTFORD, MA 01886 · (978) 692-1313
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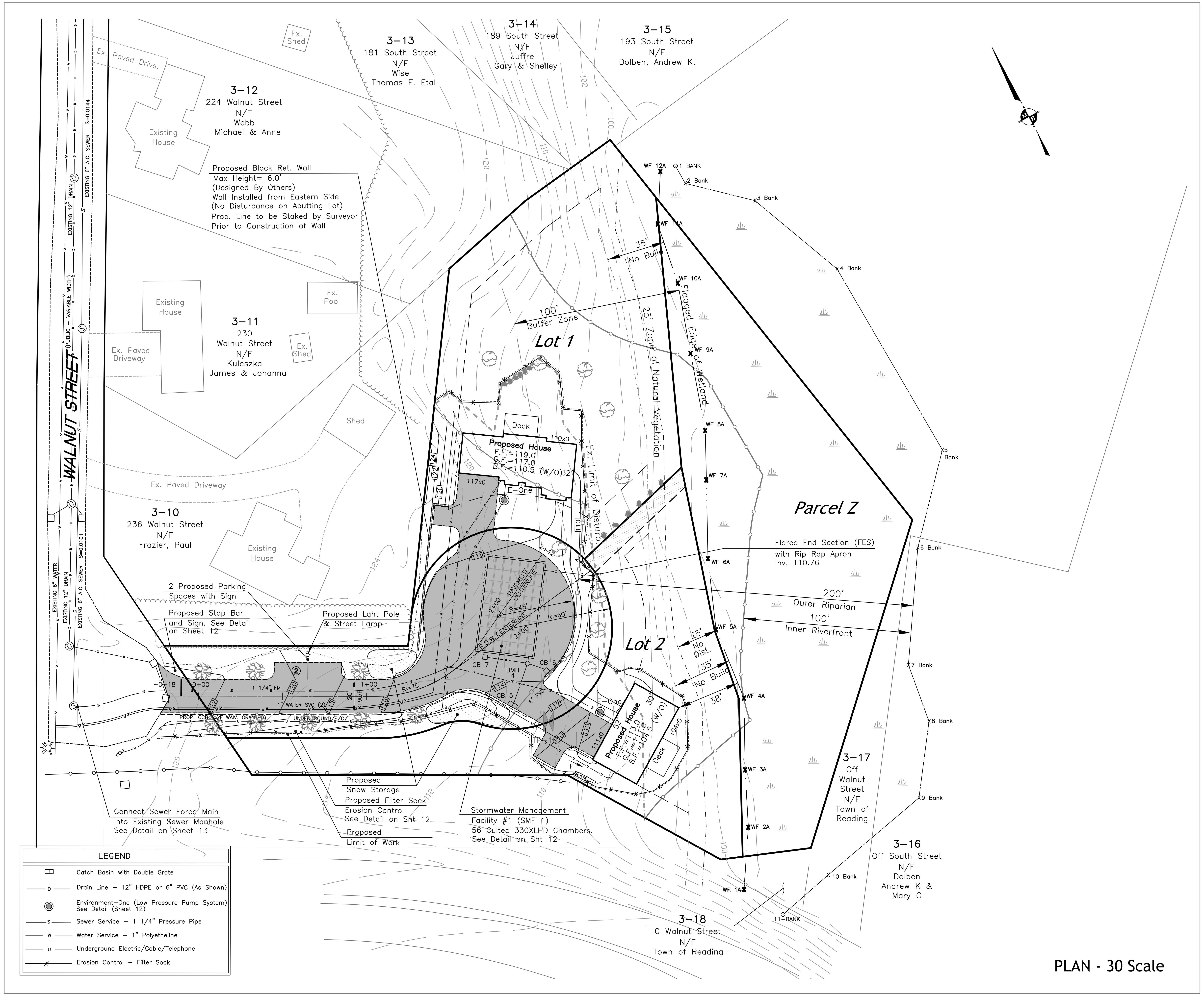

NOTES

1. ALL CATCH BASINS SHALL HAVE A "SILT SACK" INSTALLED FOR THE DURATION OF CONSTRUCTION. SEE DETAIL ON SHEET 11.

APPROVAL: READING PLANNING BOARD

DATE

3110

COMMONWEALTH OF MASSACHUSETTS
JEFFREY A. BREM
CIVIL
34780
REGISTERED
PROFESSIONAL ENGINEER

12.15.23

REV. 4	3–22–2024	IA
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PER TOWN COMMENTS		
REV. 2	2–8–2024	PM/IA
PER TOWN COMMENTS		
REV. 1	1–30–2024	JB/PM
PER TOWN COMMENTS		

SUBDIVISION PLAN SET – GRADING PLAN

246 & 248 WALNUT STREET
READING, MASSACHUSETTS

PREPARED FOR:

STELLA CONSTRUCTION
25 Everett Street
Woburn, MA 01810
857–251–5110

DECEMBER 20, 2023

30 15 0 30 60

SCALE: 1"=30'

"ALL TECHNICAL WORK BY ANY INDIVIDUAL DONE FOR THE PREPARATION OF THIS PLAN IS THE RESPONSIBILITY OF MEISNER BREM CORPORATION AND NOT THE INDIVIDUAL"

MEISNER BREM CORPORATION
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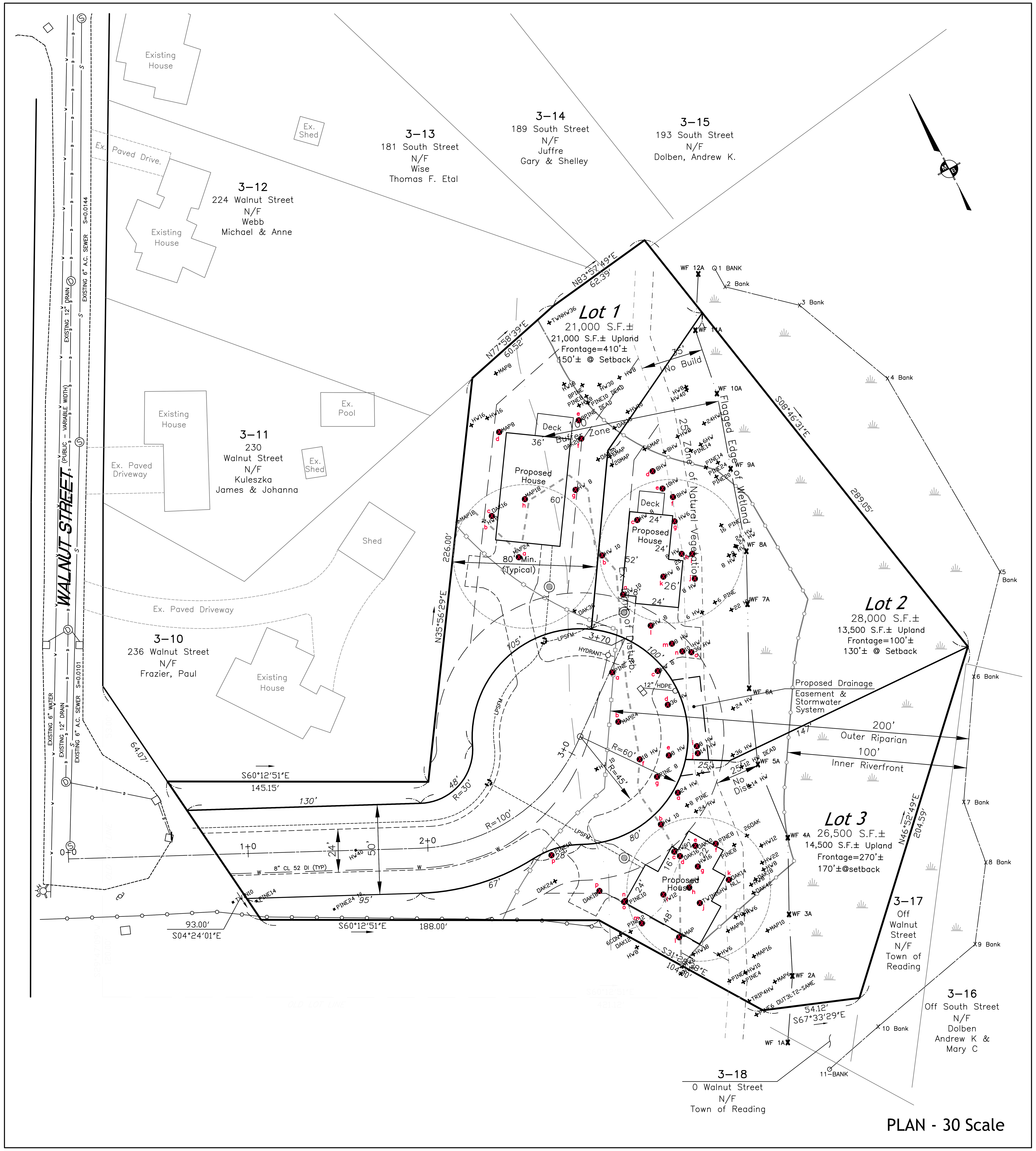

TREE REMOVAL

Lot 1 (7)		Lot 2 (14)		Lot 3 (16)		Road (7)	
a	24" Maple	a	10" HW	a	24" HW	a	10" Pine
b	8" HW	b	10" HW	b	10" HW	b	24" Maple
c	16" Oak	c	8" HW	c	6" HW	c	8" HW
d	8" Maple	d	10" HW	d	16" Oak	d	36" HW
e	8" Pine	e	8" HW	e	16" Oak	e	8" HW
f	20" Oak	f	6" HW	f	8" Pine	f	18" HW
g	8" HW	g	8" HW	g	16" HW	g	8" Pine
		h	8" HW	h	8" HW		
		i	8" HW	i	12" HW		
		j	6" Pine	j	16" HW Twin		
		k	8" HW	k	14" Oak		
		l	8" HW	l	6" Maple		
		m	10" HW	m	12" Pine		
		n	36" HW	n	10" Spruce		
				o	10" Pine		
				p	18" Oak		

APPROVAL: READING PLANNING BOARD

DATE

3110
COMMONWEALTH OF MASSACHUSETTS
JEFFREY A. BREM
CIVIL
34780
REGISTERED PROFESSIONAL ENGINEER
12.15.23

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PER TOWN COMMENTS		
REV. 3	3-5-2024	PM/IA
PER TOWN COMMENTS		
REV. 2	2-8-2024	PM/IA
PER TOWN COMMENTS		
REV. 1	1-30-2024	JB/PM
PER TOWN COMMENTS		

ALTERNATIVE "A" PLAN

246 & 248 WALNUT STREET
READING, MASSACHUSETTS

PREPARED FOR:

STELLA CONSTRUCTION
25 Everett Street
Woburn, MA 01810
857-251-5110

DECEMBER 20, 2023

30 15 0 30 60

SCALE: 1"=30'

"ALL TECHNICAL WORK BY ANY INDIVIDUAL DONE FOR THE PREPARATION OF THIS PLAN IS THE RESPONSIBILITY OF MEISNER BREM CORPORATION AND NOT THE INDIVIDUAL"

MEISNER BREM CORPORATION
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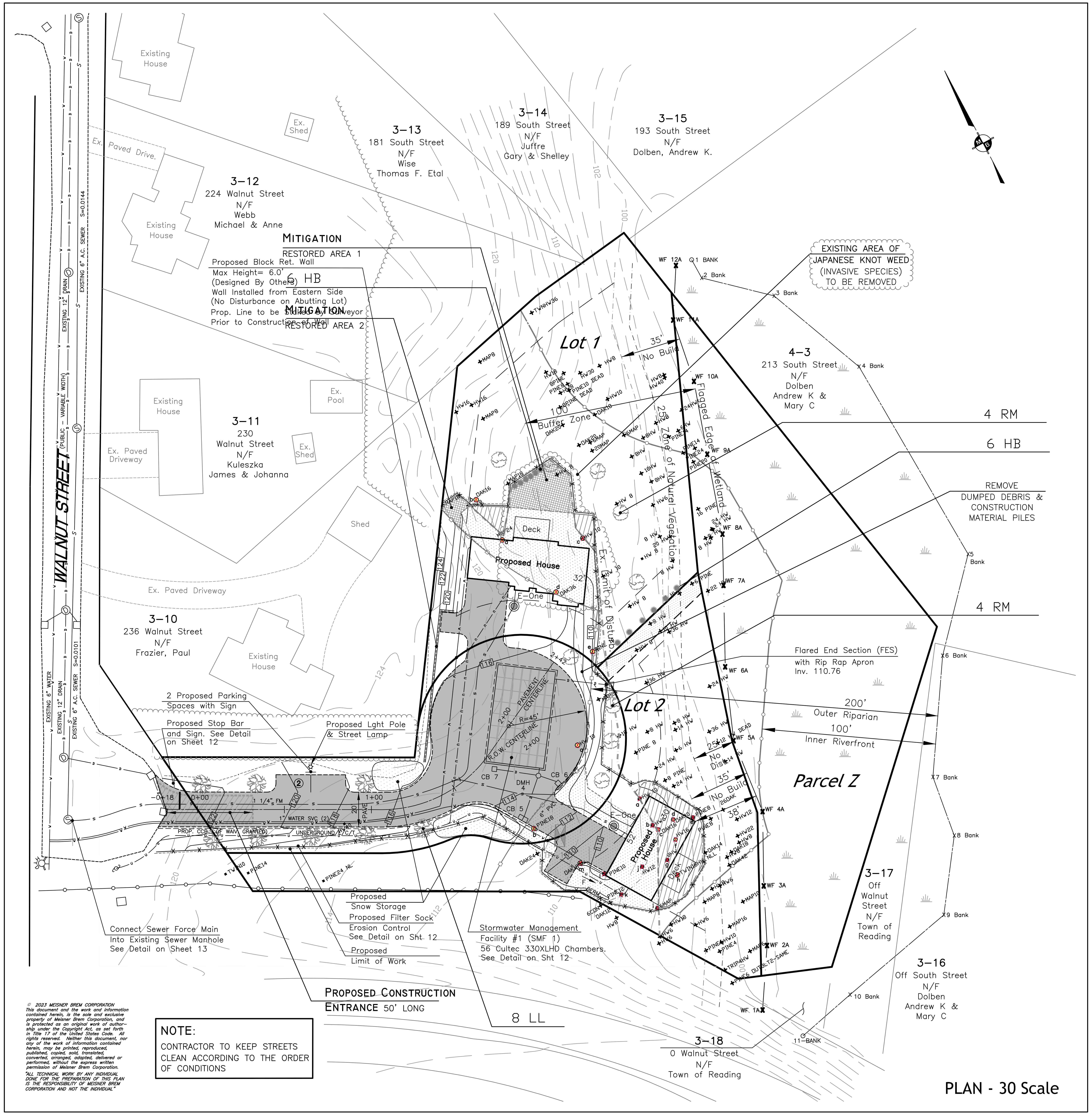


"ALL TECHNICAL WORK BY ANY INDIVIDUAL DONE FOR THE PREPARATION OF THIS PLAN IS THE RESPONSIBILITY OF MEISNER BREM CORPORATION AND NOT THE INDIVIDUAL"

NOTE:
CONTRACTOR TO KEEP STREETS CLEAN ACCORDING TO THE ORDER OF CONDITIONS

Tabulation of Alternative Analysis Impact

Description	Alternative A 3 Lots	Alternative B Preferred 2 Lots
Number of Single Family Homes	3	2
Total Riverfront Area on Entire Parcel	71,030 SF	71,030 SF
Total Lot Area	87,991 SF	87,991 SF
Total Disturbed Area/Limit of Work – Entire Parcel	50,380 SF	30,700 SF
Proposed Work within Previously Disturbed Area (2668 + 3329)	26,073SF	5,997 SF
Newly Disturbed Area (345 + 1575)		1,920 SF
Less Restored Previously Disturbed Area (Mittigation 1 & 2)		–895 SF
Total Riverfront Permanent Impact	**16,791 SF**	**7,022 SF**
Max of 10% Riverfront – Allowed per WPA	**7,103 SF**	**7,103 SF**
Meets 310 CMR 10.58 – less than **7,103 SF**	No	**Yes**
ADDITIONAL ANALYSIS COMPARISONS:		
Total Proposed Impervious Area (on Entire Property)	11,029 SF	4,918 SF
Number of Trees Removed – Road	8	2
Number of Trees Removed – Lot 1	7	6
Number of Trees Removed – Lot 2	15	11
Number of Trees Removed – Lot 3	16	N/A
Total Number of Trees to be Removed	46	20
Roadway Maintenance Status	Public – Town	Private – Lot Owners

Newly Disturbed Area within the Riverfront (Lot 1 – 345 S.F. + Lot 2 – 1,575 S.F. = 1,920 S.F.)

TREE REPLACEMENT SCHEDULE

	DECIDUOUS	NET	TOTAL
DECIDUOUS TREES TO BE REMOVED	15	15	15
DECIDUOUS TREES TO BE PLANTED	16	16	
DECIDUOUS BUSHES TO BE PLANTED	12	4	
TOTAL NET DECIDUOUS TREES			20 > 15
EVERGREEN TREES TO BE REMOVED	5	0	0
EVERGREEN TREES TO BE PLANTED	0	0	0 < 5

TREE REMOVAL

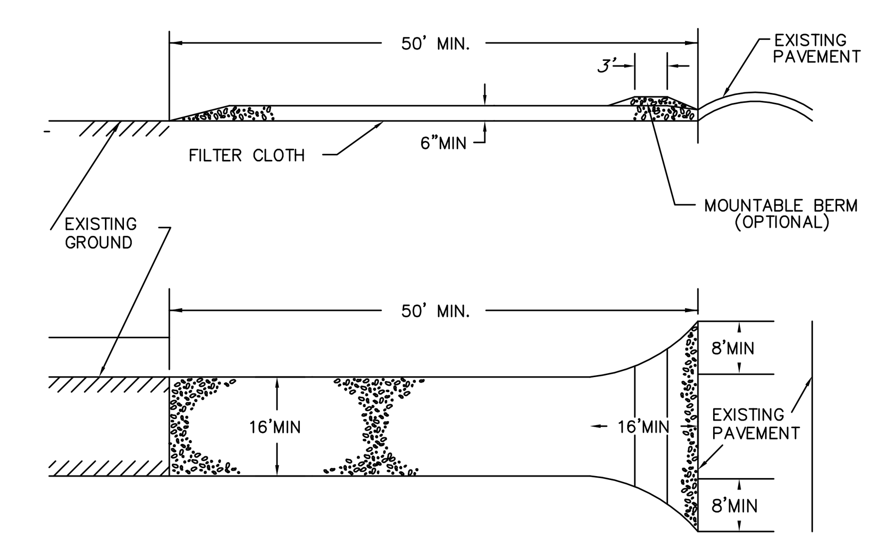
LOT 1 (5)	LOT 2 (11)	ROAD (2)
a 24" Maple	a 10" HW	a 10" HW
b 16" Oak	b 6" HW	b 18" Pine
c 10" HW	c 16" Oak	
d 36" OAK	d 10" Oak	
e 10" Pine	e 8" Pine	
	f 16" HW	
	g 8" HW	
	h 16" HW Twin	
	i 6" Maple	
	j 12" HW	
	k 12" Pine	
	l 10" Pine	
	m18" Oak	

PLANTING SCHEDULE

SYMBOL	QTY.	ABV.	BOTANICAL NAME	COMMON NAME	SIZE
	8	LL	Little Leaf Linden	Tilia cordata	8' HIGH 2" cal.
	8	RM	Red Maple (Native)	Acer rubrum (Native)	8' HIGH 2" cal.
	12	HB	High Bush Blueberry	Vaccinium corymbosum	2 Gallon

APPROVAL: READING PLANNING BOARD

DATE



STABILIZED CONSTRUCTION EXIT
NOT TO SCALE

NOTES:
1) STONE FOR STABILIZED CONSTRUCTION ENTRANCE SHALL BE 1 TO 2 INCH STONE, RECLAIMED STONE, OR RECYCLED CONCRETE EQUIVALENT.
2) THE LENGTH OF THE STABILIZED ENTRANCE SHALL NOT BE LESS THAN 50 FEET, EXCEPT FOR A SINGLE RESIDENTIAL LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY.
3) THE THICKNESS OF THE STONE FOR THE STABILIZED ENTRANCE SHALL NOT BE LESS THAN 6 INCHES.
4) THE WIDTH OF THE ENTRANCE SHALL NOT BE LESS THAN THE FULL WIDTH OF THE ENTRANCE WHERE INGRESS AND EGRESS OCCURS OR 10 FEET, WHICH EVER IS GREATER.
5) GEOTEXTILE FILTER CLOTH SHALL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING THE STONE. FILTER CLOTH IS NOT REQUIRED FOR A SINGLE FAMILY RESIDENCE LOT.
6) ALL SURFACE WATER THAT IS FLOWING TO OR DIVERTED TOWARD THE CONSTRUCTION ENTRANCE SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A BERM WITH 5:1 SLOPES THAT CAN BE CROSSED BY VEHICLES MAY BE SUBSTITUTED FOR THE PIPE.
7) THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS–OF–WAY. THIS MAY REQUIRE PERIODIC TOPDRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, WASHED, OR TRACKED ONTO PUBLIC RIGHT–OF–WAY MUST BE REMOVED PROMPTLY.
8) CONTRACTOR TO COMPLY WITH ALL REGULATIONS PER UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA) NOTICE OF INTENT FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY UNDER A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) GENERAL PERMIT.
9) CONTRACTOR TO PREPARE AND BE IN COMPLIANCE WITH A STORM WATER POLLUTION PREVENTION PLAN LOCATED ON SITE PER USEPA GENERAL PERMIT.

3110
COMMONWEALTH OF MASSACHUSETTS
JEFFREY A. BREM
CIVIL
34780
REGISTERED PROFESSIONAL ENGINEER
12.15.23

REV. 4	3–22–2024	IA
PER TOWN COMMENTS		
REV. 3	2–22–2024	JB/PM
PER TOWN COMMENTS		
REV. 2	2–8–2024	PM/IA
PER TOWN COMMENTS		
REV. 1	1–30–2024	JB/PM
PER TOWN COMMENTS		

CONSERVATION PLAN
246 & 248 WALNUT STREET
READING, MASSACHUSETTS

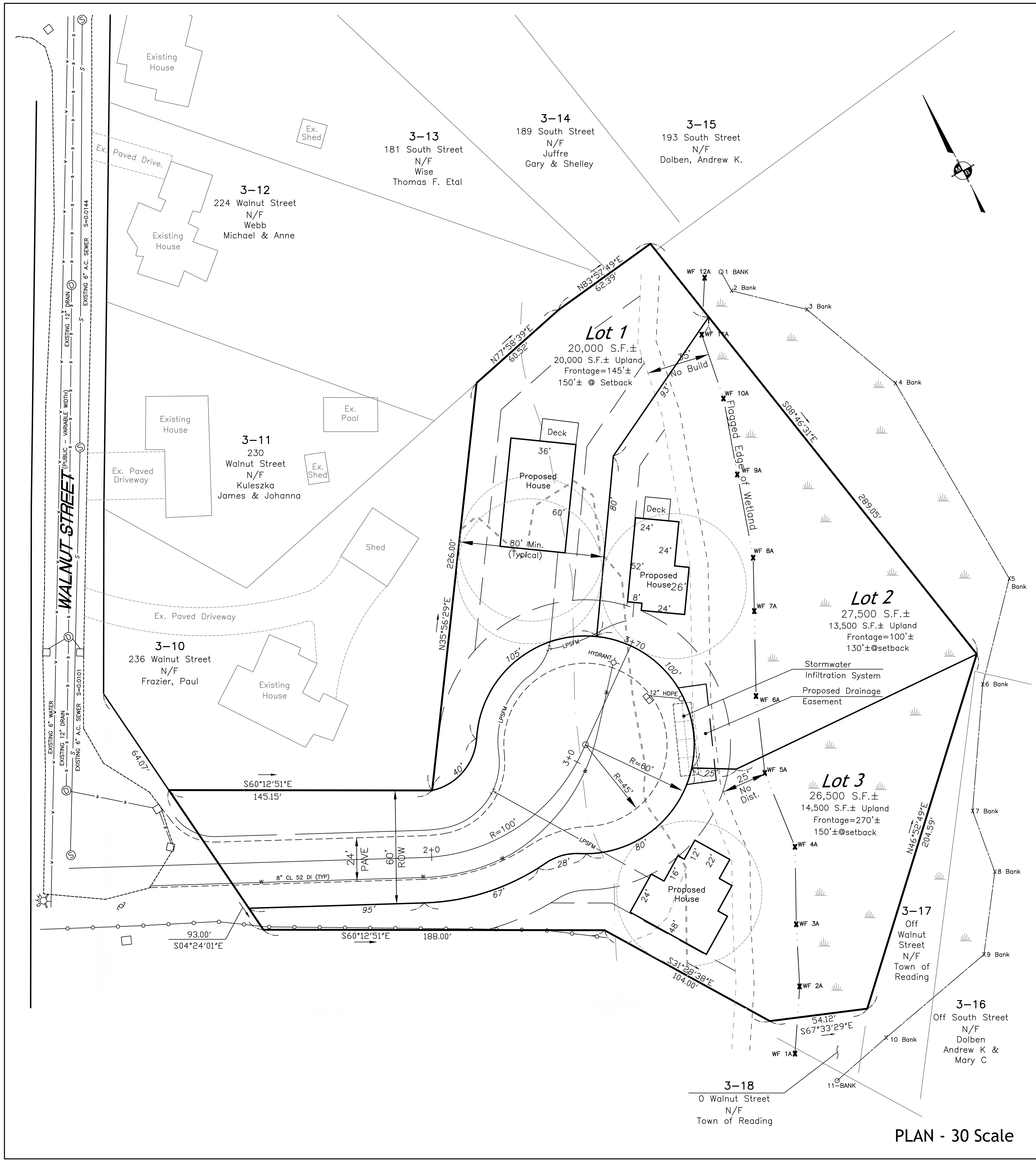
PREPARED FOR:
STELLA CONSTRUCTION
25 Everett Street
Woburn, MA 01810
857–251–5110

DECEMBER 20, 2023

30 15 0 30 60
SCALE: 1"=30'

MEISNER BREM CORPORATION
142 LITTLETON ROAD, STE. 16, WESTFORD, MA 01886 · (978) 692–1313
202 MAIN STREET, SALEM, NH 03079 · (603) 893–3301

JOB NUMBER: 3110
ACAD FILE: 3110–Stella Const. Prelim



REV. 4	3-22-2024	IA
	PER TOWN COMMENTS	
REV. 3	3-5-2024	PM/IA
	PER TOWN COMMENTS	
REV. 2	2-8-2024	PM/IA
	PER TOWN COMMENTS	
REV. 1	1-30-2024	JB/PM
	PER TOWN COMMENTS	

PRELIMINARY PROOF PLAN – 60' ROW

246 WALNUT STREET
READING, MASSACHUSETTS

PREPARED FOR:

STELLA CONSTRUCTION
25 Everett Street
Woburn, MA 01810

DECEMBER 20, 2023

30 15 0 30 60
SCALE: 1"=30'

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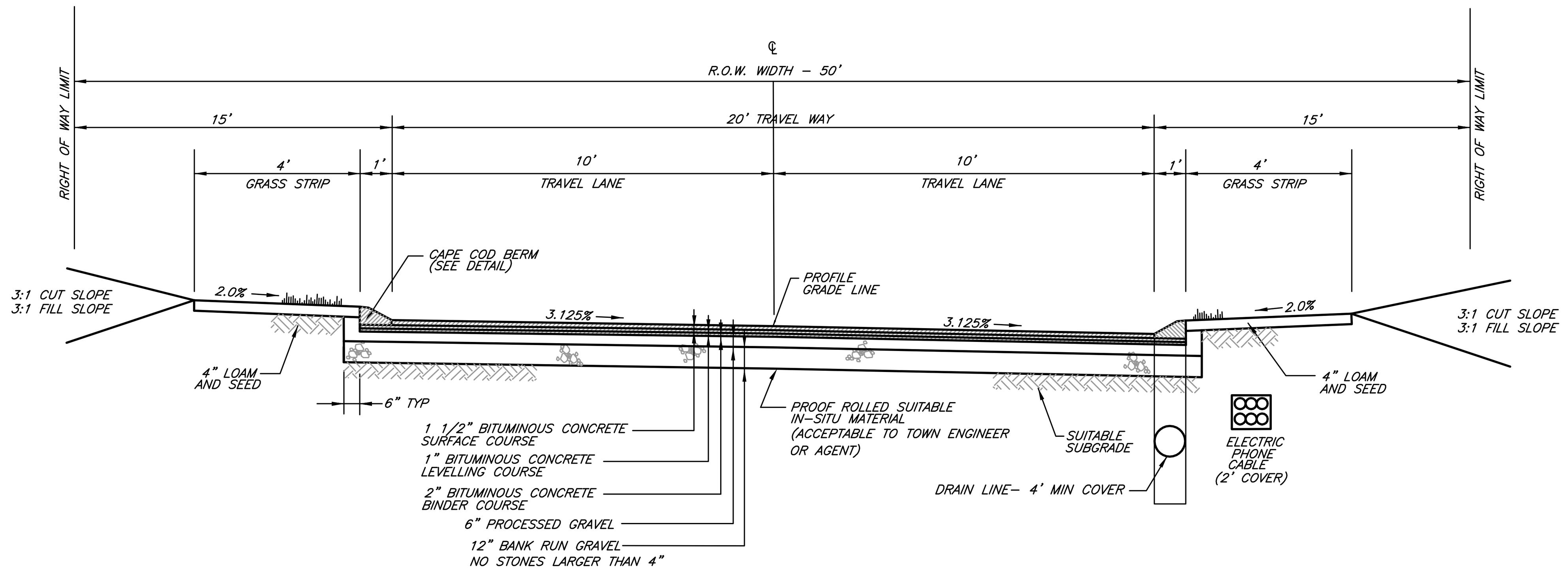


ALL UTILITIES SHALL BE INSTALLED UNDERGROUND IN ACCORDANCE WITH SECTION 7 OF THE READING RULES AND REGULATIONS GOVERNING THE SUBDIVISION OF LAND.

ALL LOTS TO HAVE A SERVICE CONNECTION AVAILABLE.

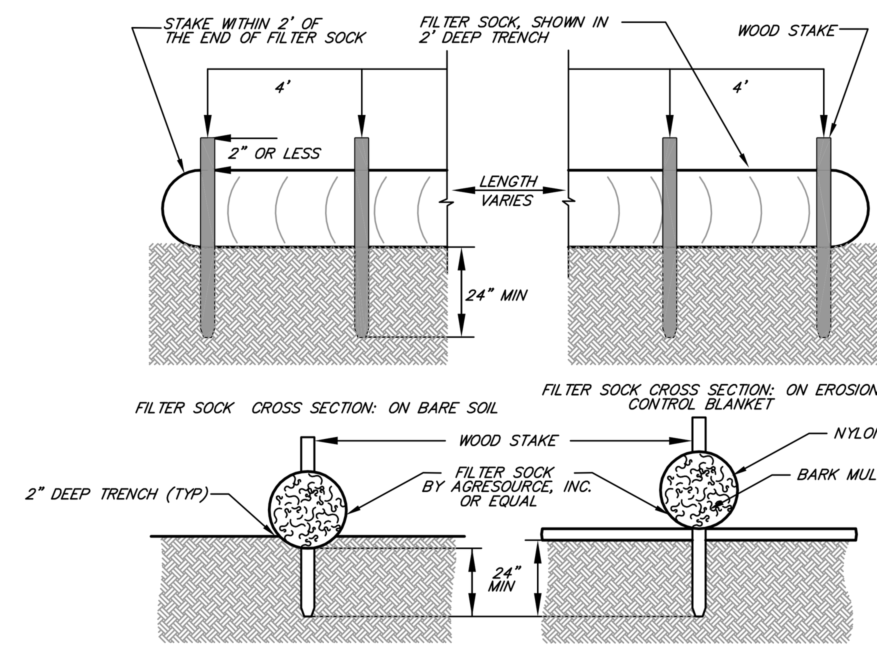
INSTALLATION OF UNDERGROUND UTILITIES SHALL BE INSPECTED PRIOR TO ANY BACKFULLING OF TRENCHES OR OTHER COVERING OF STRUCTURE.

NOTE: ALL MATERIALS SHALL MEET THE MINUMUM REQUIREMENTS OF THE LATEST MASSDOT STANDARD SPECIFICATIONS FOR HIGHWAYS AND

BRIDGES AS AMENDED.

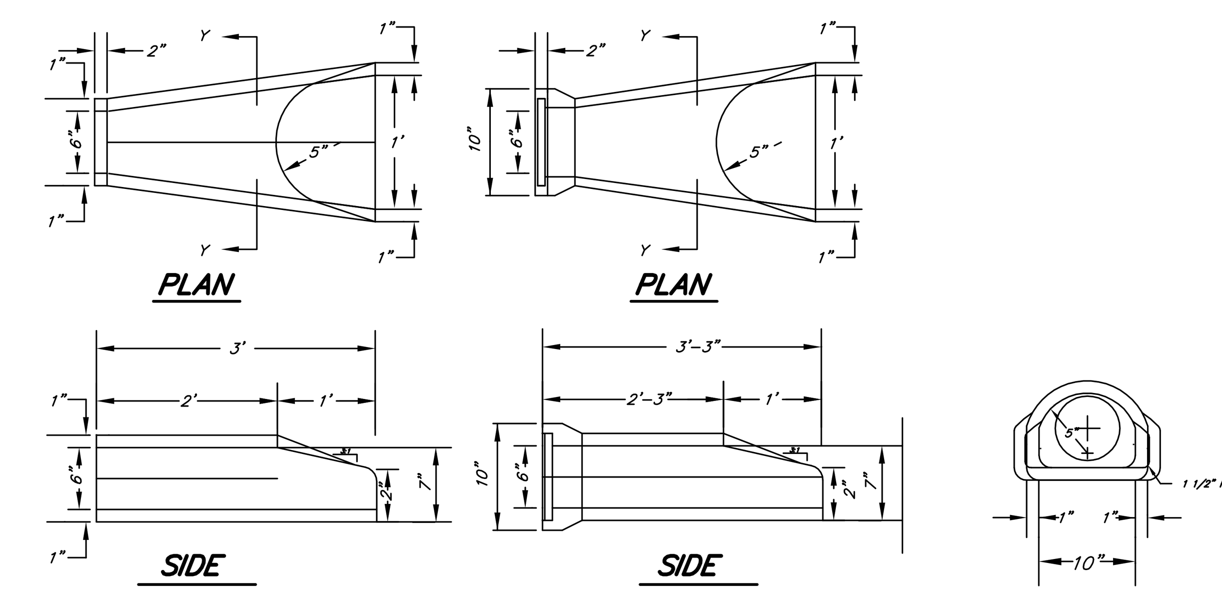
TYPICAL ROAD CROSS SECTION

NOT TO SCALE



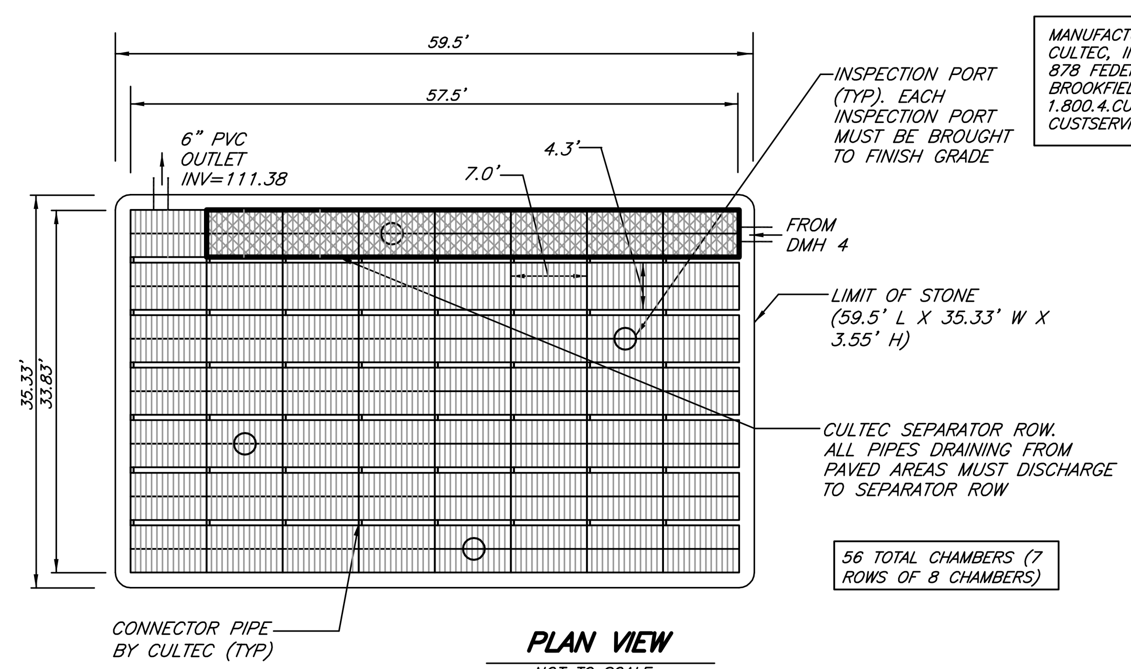
FILTER SOCK DETAIL

NOT TO SCALE



FLARED END SECTION

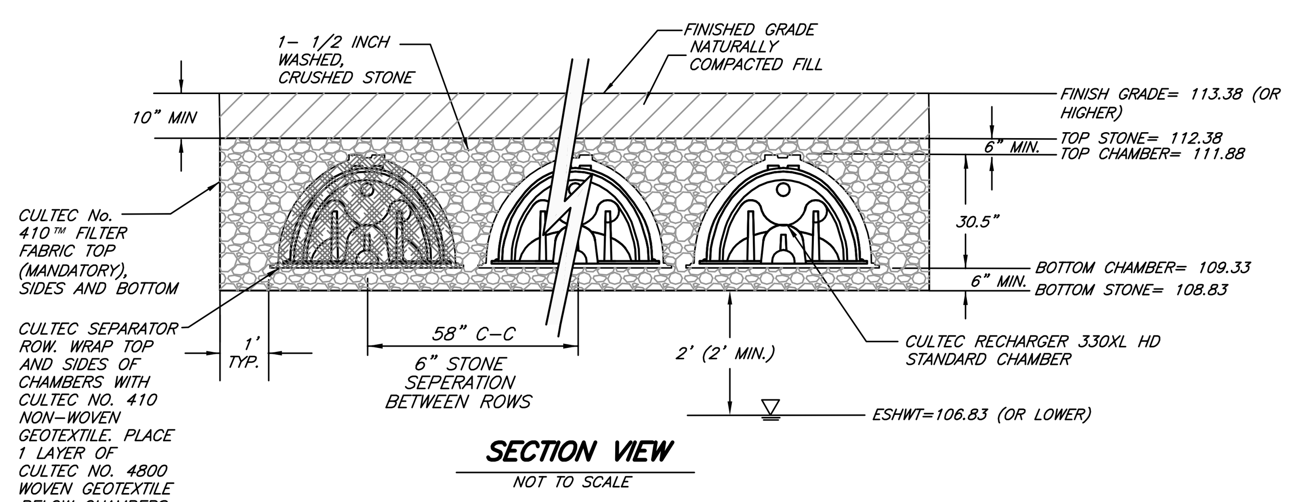
NOT TO SCALE



MANUFACTURER INFO:
CULTEC, INC
878 FEDERAL RD, PO BOX 280
BROOKFIELD, CT 06804
1.800.4.CULTEC
CUSTSERVICE@CULTEC.COM

PLAN VIEW

NOT TO SCALE

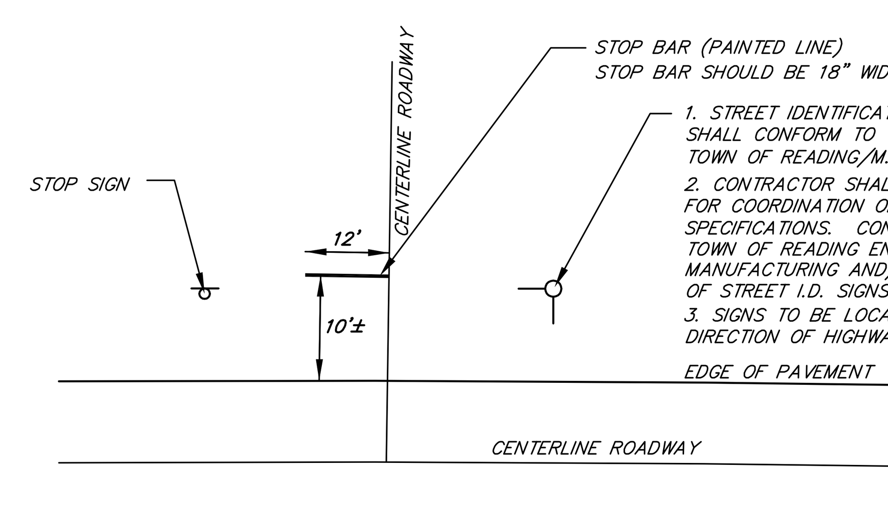


SECTION VIEW

NOT TO SCALE

SMF 1 – CULTEC INFILTRATION DETAIL

NOT TO SCALE

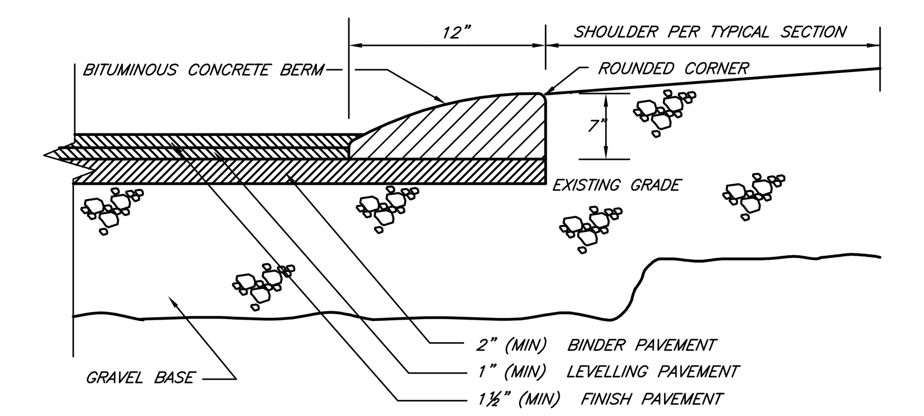


1. STREET IDENTIFICATION SIGN SHALL CONFORM TO THE TOWN OF READING/M.U.T.C.D. SPECIFICATIONS.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION OF STREET I.D SIGN SPECIFICATIONS. CONTRACTOR SHALL CONTACT TOWN OF READING ENGINEERING PRIOR TO MANUFACTURING AND/OR PLACEMENT OF STREET I.D. SIGNS.
3. SIGNS TO BE LOCATED AT DIRECTION OF HIGHWAY SUPERVISOR.

STOP BAR/STREET SIGN DETAIL

NOT TO SCALE

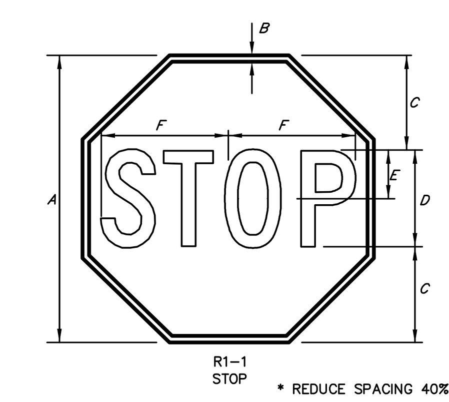
1. STOP SIGN SHALL BE PLACED NOT LESS THAN 6 FEET FROM EDGE OF TRAVELED WAY.
2. STOP SIGN SHALL BE PLACED NOT LESS THAN 7 FEET IN HEIGHT FROM FINISHED GRADE.
3. STOP SIGN SHALL UTILIZE A GREEN ENAMEL U-CHANNEL



PAVEMENT & CAPE COD BERM CURBING DETAIL

NOT TO SCALE

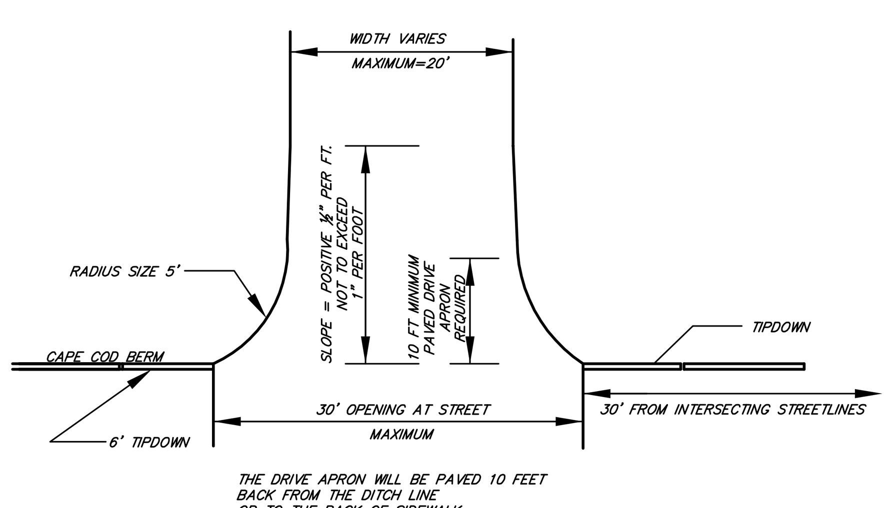
NOTE: SLOPED GRANITE CURBING MAY BE REQUIRED. CAPE COD BERM TO BE USED ONLY IF WAIVER IS GRANTED



A	B	C	D	E	F
18	.375	6	6 C	3	7.75
24	.625	8	8 C	4	10
30	.75	10	10 C	5	12.5
36	.875	12	12 C	6	15
48	1.25	16	16 C	8	20

STOP SIGN DETAIL

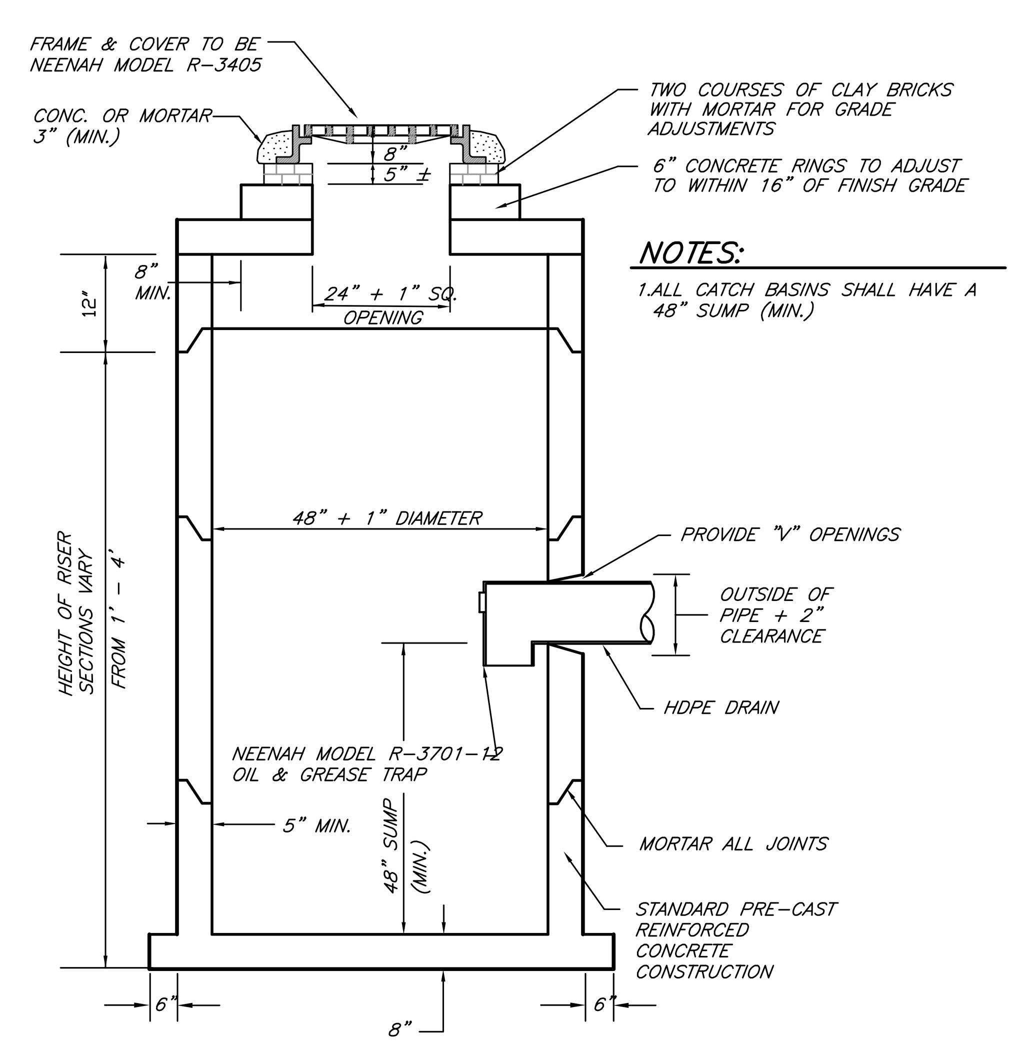
NOT TO SCALE



THE DRIVE APRON WILL BE PAVED 10 FEET BACK FROM THE DITCH LINE OR TO THE BACK OF SIDEWALK

TYPICAL DRIVEWAY DETAIL

NOT TO SCALE

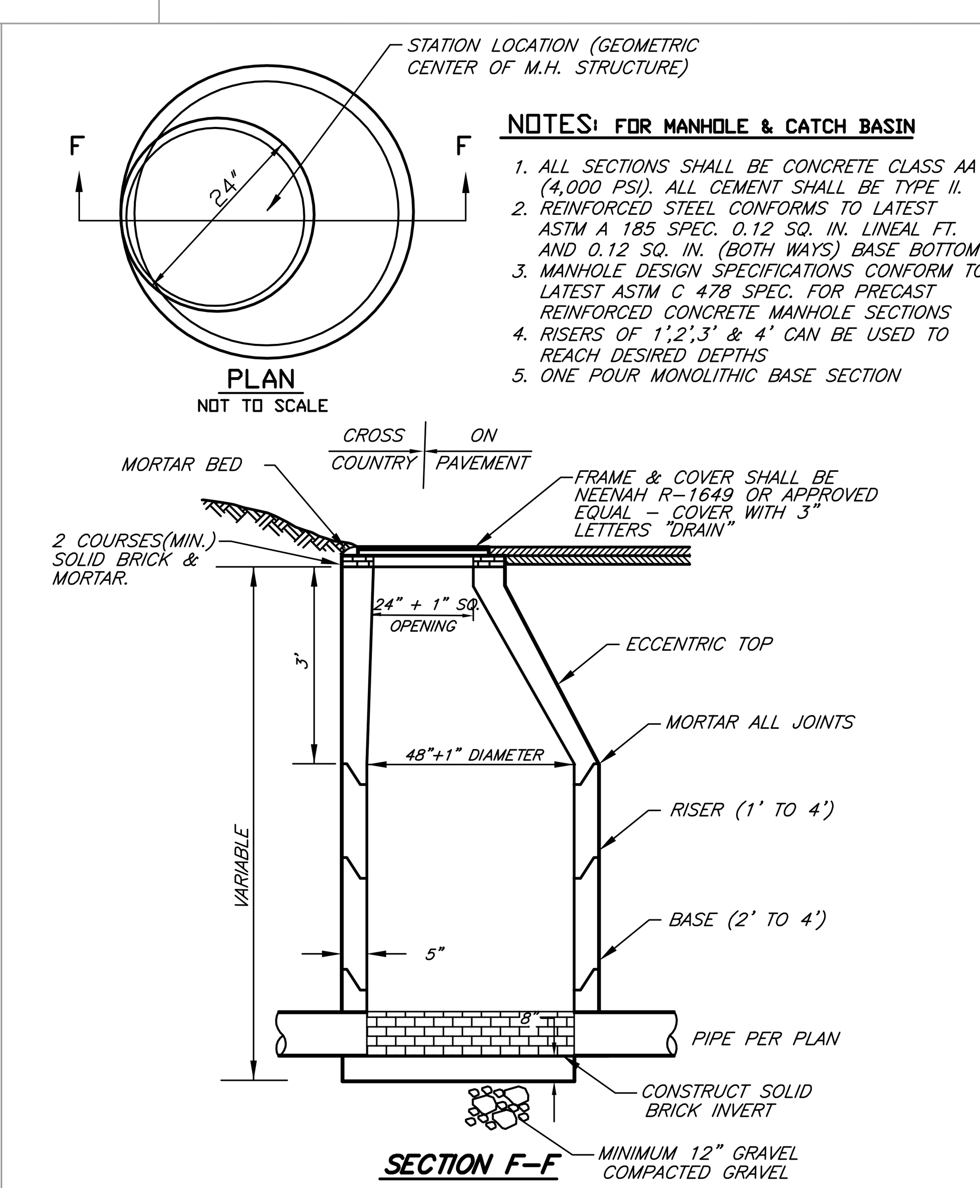


NOTES:

1. ALL CATCH BASINS SHALL HAVE A 48" SUMP (MIN.)

CATCH BASIN DETAIL

NOT TO SCALE



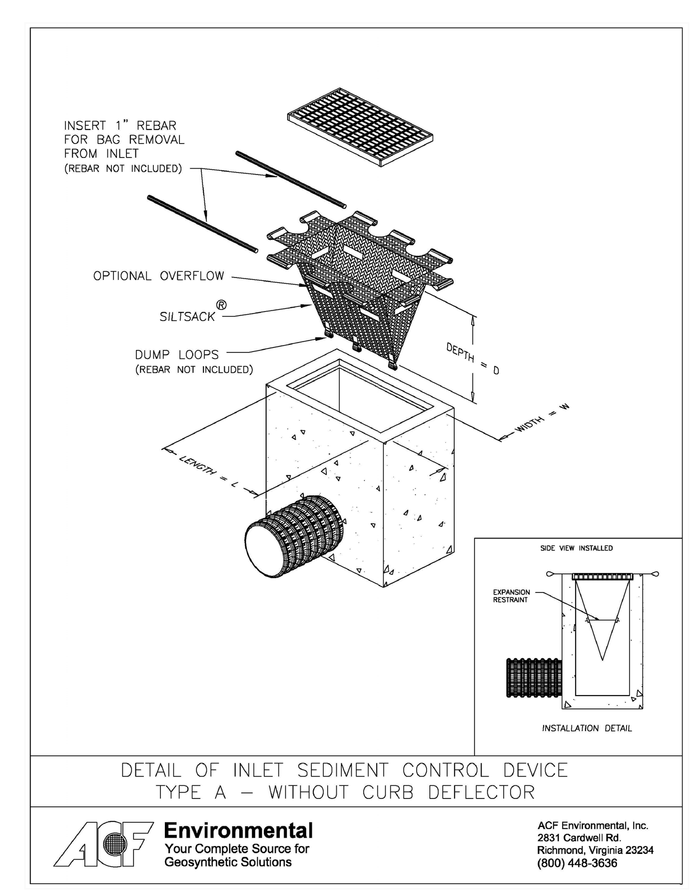
NOTES: FOR MANHOLE & CATCH BASIN

1. ALL SECTIONS SHALL BE CONCRETE CLASS AA (4,000 PSI). ALL CEMENT SHALL BE TYPE II.
2. REINFORCED STEEL CONFORMS TO LATEST ASTM A 185 SPEC. 0.12 SQ. IN. LINEAL FT. AND 0.12 SQ. IN. (BOTH WAYS) BASE BOTTOM
3. MANHOLE DESIGN SPECIFICATIONS CONFORM TO LATEST ASTM C 478 SPEC. FOR PRECAST REINFORCED CONCRETE MANHOLE SECTIONS
4. RISERS OF 1',2',3' & 4' CAN BE USED TO REACH DESIRED DEPTHS
5. ONE POUR MONOLITHIC BASE SECTION

SECTION F–F

PRECAST DRAIN MANHOLE DETAIL

NOT TO SCALE



DETAIL OF INLET SEDIMENT CONTROL DEVICE TYPE A – WITHOUT CURB DEFLECTOR

ACF Environmental
Your Complete Source for Geosynthetic Solutions

ACF Environmental, Inc.
2831 Cardwell Rd.
Richmond, Virginia 23234
(800) 448-3636

CATCH BASIN – SILT SACK

NOT TO SCALE

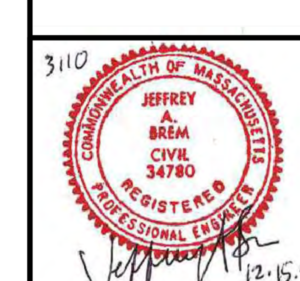
NOTE: SILT SACK TO BE INSTALLED ON ALL CATCH BASINS AND SHALL REMAIN FOR THE DURATION OF CONSTRUCTION.

"ALL TECHNICAL WORK BY ANY INDIVIDUAL DONE FOR THE PREPARATION OF THIS PLAN IS THE RESPONSIBILITY OF MEISNER BREM CORPORATION AND NOT THE INDIVIDUAL"

APPROVAL: READING PLANNING BOARD

DATE

3110



REV. 4	3-22-2024	IA
PER TOWN COMMENTS		
REV. 3	3-5-2024	PM/IA
PER TOWN COMMENTS		
REV. 2	2-8-2024	PM/IA
PER TOWN COMMENTS		
REV. 1	1-30-2024	JB/PM
PER TOWN COMMENTS		

DETAIL SHEET – GENERAL & DRAINAGE

246 & 248 WALNUT STREET
READING, MASSACHUSETTS

PREPARED FOR:

STELLA CONSTRUCTION
25 Everett Street
Woburn, MA 01810
857-251-5110

DECEMBER 20, 2023

30 15 0 30 60

SCALE: 1"=30'

MEISNER BREM CORPORATION
142 LITTLETON ROAD, STE. 16, WESTFORD, MA 01886 · (978) 692-1313
202 MAIN STREET, SALEM, NH 03079 · (603) 893-3301

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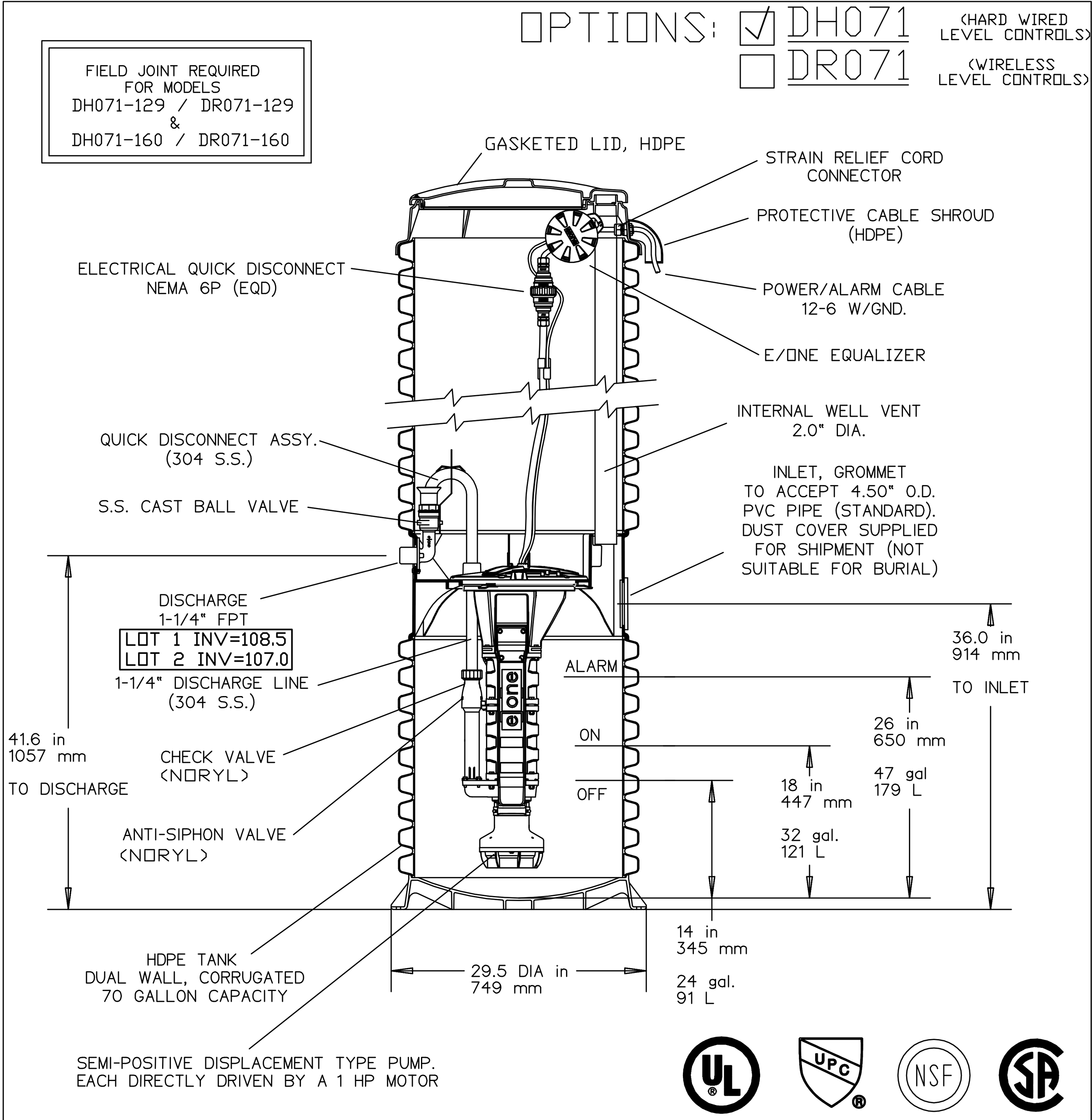


CONCRETE BALLAST MAY BE REQUIRED
SEE INSTALLATION INSTRUCTION
FOR DETAILS

NOTE: DIMENSIONS ARE FOR REF ONLY

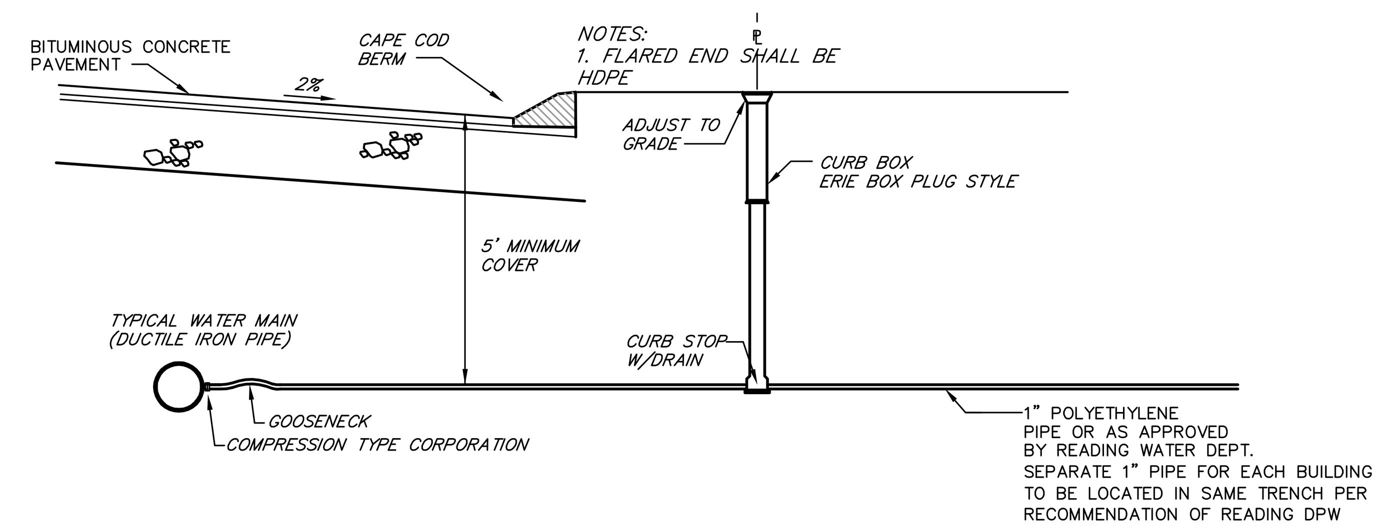
AD	CH	10/20/10	E	
DR BY	CHK'D	DATE	ISSUE	SCALE

eone SEWER SYSTEMS

MODEL DH071 / DR071
DETAIL SHEET

NA0050P02

E/ONE GRINDER PUMP DETAIL
NOT TO SCALE



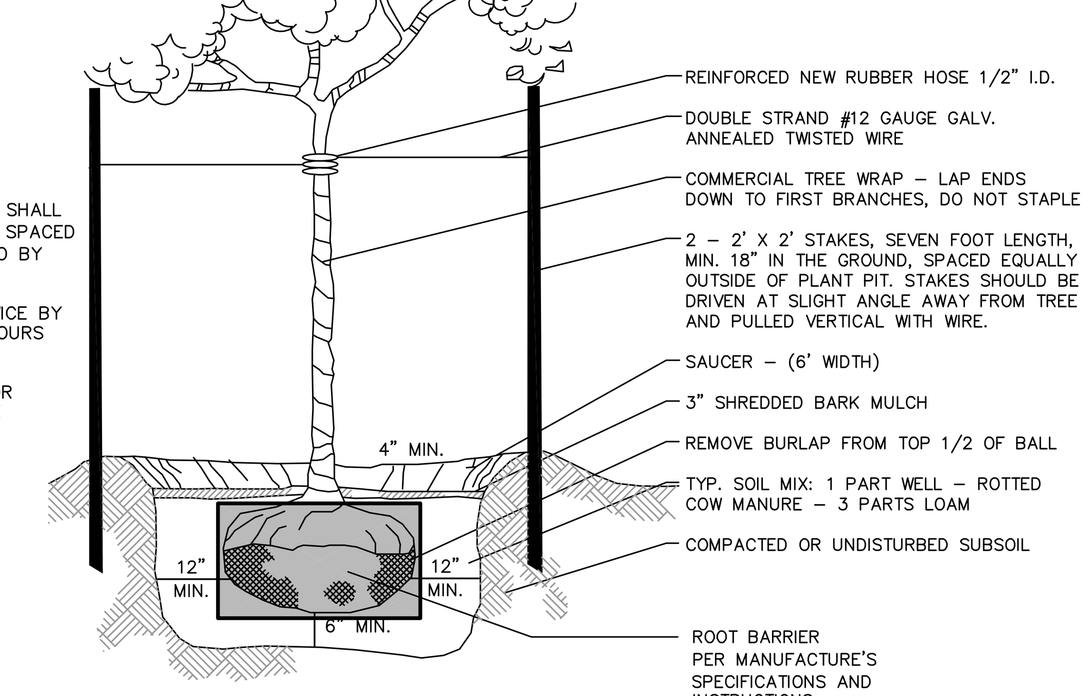
NOTES:
1. FLARED END SHALL BE HDPE

WATER SERVICE DETAIL
NOT TO SCALE

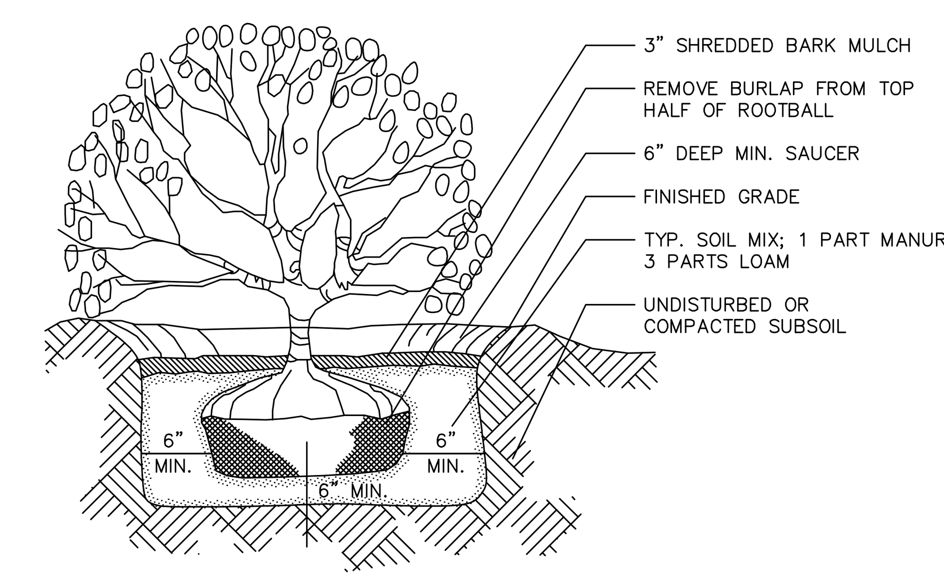
NOTES:

1. WATER SERVICE TO BE A MINIMUM OF 5' DEEP.
2. PRIOR TO BACKFILL, THE WATER SERVICE IS TO BE INSPECTED BY A REPRESENTATIVE OF THE TOWN.
3. APPLICATION FOR WATER SERVICE AND AN APPROVED "STREET OPENING PERMIT" MUST BE OBTAINED FROM THE DEPT. OF PUBLIC WORKS

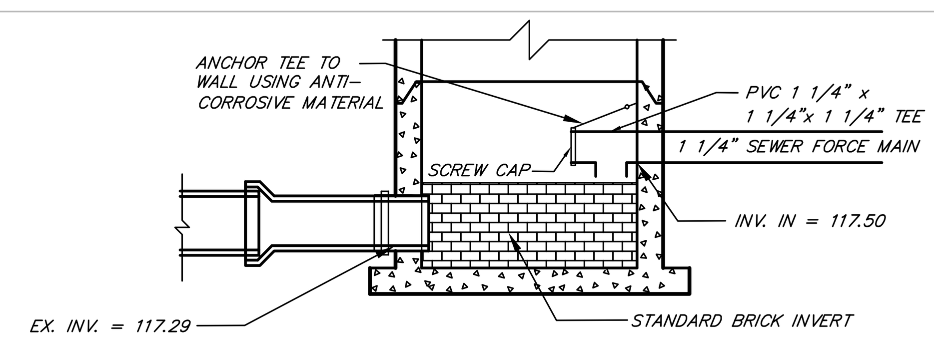
1. TREES EXCEEDING 3" CALIPER SHALL HAVE GUY WIRES (3 EQUALLY SPACED AND STAKED) INSTEAD OF TWO BY TWO STAKING.
2. TREES SHALL BE WATERED TWICE BY FLOODING DURING FIRST 24 HOURS AFTER PLANTING.
3. STAKES SHALL BE CYPRESS OR OTHER WOOD OF COMPARABLE WEATHERING RESISTANCE.



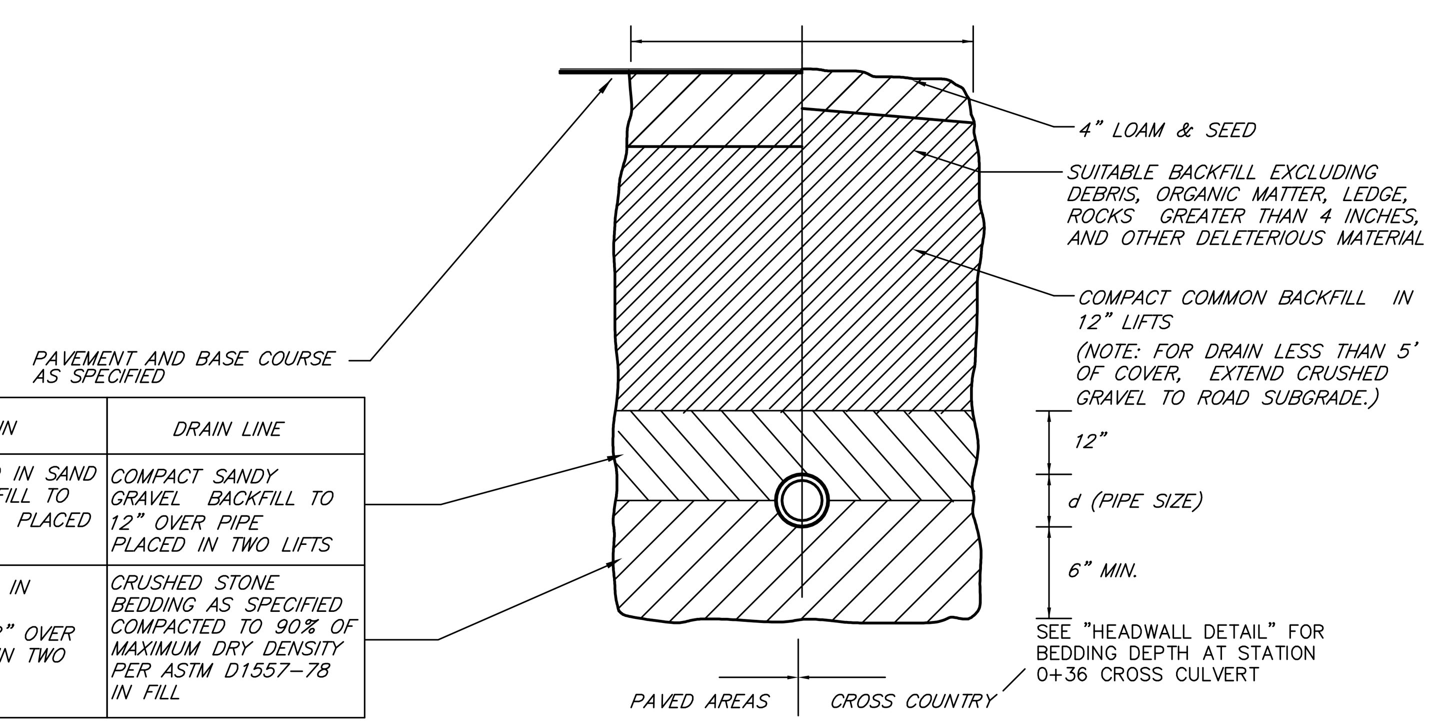
TYPICAL DECIDUOUS PLANTING
NOT TO SCALE



TYPICAL SHRUB PLANTING DETAIL
NOT TO SCALE



SEWER TIE–IN DETAIL
NOT TO SCALE

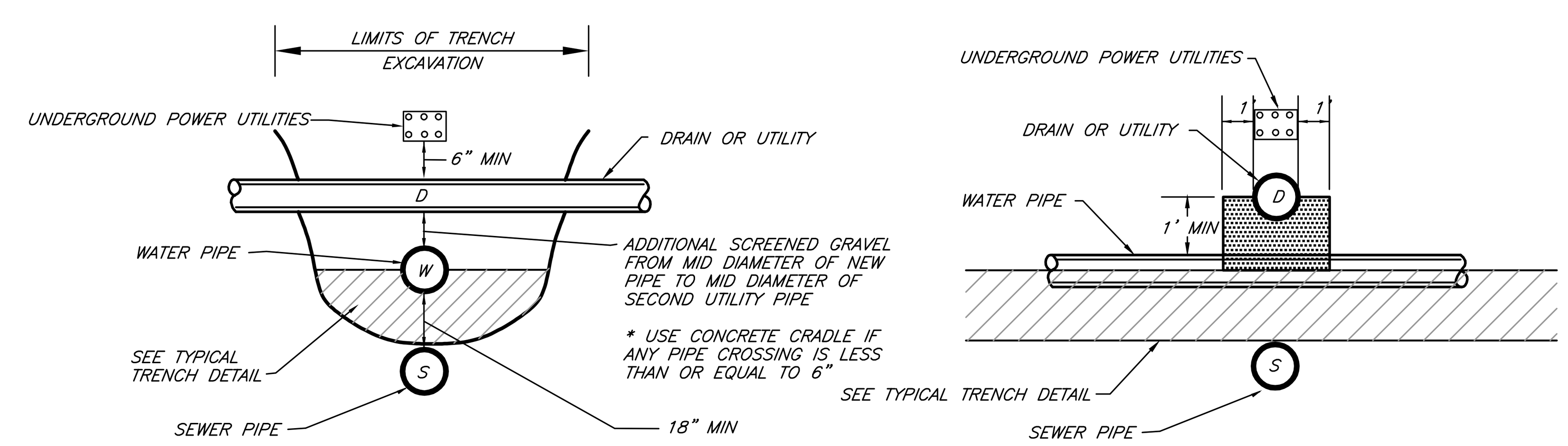


WATER MAIN	DRAIN LINE
FULLY ENCASED IN SAND BACKFILL BACKFILL TO 12" OVER PIPE PLACED IN TWO LIFTS	COMPACT SANDY GRAVEL BACKFILL TO 12" OVER PIPE PLACED IN TWO LIFTS
FULLY ENCASED IN SAND BACKFILL BACKFILL TO 12" OVER PIPE PLACED IN TWO LIFTS	CRUSHED STONE BEDDING AS SPECIFIED COMPACTED TO 90% OF MAXIMUM DRY DENSITY PER ASTM D1557–78 IN FILL

BEDDING		
PVC/ABS PIPE		RCP/DIP
%PASSING	SIZE	BANK RUN GRAVEL
100%	1"	
90–100%	3/4"	
20–55%	3/8"	
0–10%	4 SIEVE	
0–5%	8 SIEVE	

TYPICAL TRENCH SECTION
NOT TO SCALE

NOTE:
CONTRACTOR SHALL ENSURE FULL COMPACTION AROUND THE BOTTOM SIDES OF THE PIPE BY HAND TAMPING AND OTHER ACCEPTABLE METHODS.



UTILITY CROSSING DETAIL
NOT TO SCALE

APPROVAL: READING PLANNING BOARD

DATE

3110

COMMONWEALTH OF MASSACHUSETTS
JEFFREY A. BREM
CIVIL
34780
REGISTERED PROFESSIONAL ENGINEER
12.15.23

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REV. 1	1–30–2024	JB/PM
PER TOWN COMMENTS		

DETAIL SHEET – WATER & SEWER
246 & 248 WALNUT STREET
READING, MASSACHUSETTS

PREPARED FOR:
STELLA CONSTRUCTION
25 Everett Street
Woburn, MA 01810
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JOB NUMBER: 3110
ACAD FILE: 3110–Stella Const. Prelim

246 & 248 WALNUT STREET

A RESIDENTIAL SUBDIVISION
IN READING, MA

STORMWATER MANAGEMENT REPORT

VOLUME 2 OF 2

STORMWATER MANAGEMENT DESIGN

December 20, 2023

PREPARED FOR:

STELLA CONSTRUCTION
25 EVERETT STREET
WOBURN, MA 01810

PREPARED BY:
MEISNER BREM CORPORATION
142 LITTLETON ROAD, STE. 16
WESTFORD, MA 01886

MBC JOB NUMBER: 3110

2	*3-22-24*	*Phosphorus Removal & Add CB 7*	*IJA*
1	*2-8-24*	*NOAA 14 Rainfall & Cul-De-Sac Circle*	*IJA*
NO.	**DATE**	**REVISION**	**BY**

246 & 248 WALNUT STREET
STORMWATER MANAGEMENT REPORT – VOLUME 2 OF 2
A RESIDENTIAL SUBDIVISION IN READING, MA

THE FOLLOWING REPORT HAS BEEN PREPARED UNDER THE SUPERVISION OF A REGISTERED PROFESSIONAL ENGINEER LICENSED IN THE COMMONWEALTH OF MASSACHUSETTS.

246 & 248 WALNUT STREET

A RESIDENTIAL SUBDIVISION
IN READING, MA

Volume 2

STORMWATER MANAGEMENT DESIGN

MEISNER BREM CORPORATION

142 LITTLETON ROAD, STE. 16, WESTFORD, MA 01886

246 & 248 WALNUT STREET

STORMWATER MANAGEMENT REPORT – VOLUME 2 OF 2

A RESIDENTIAL SUBDIVISION IN READING, MA

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SECTION 2.2 EXISTING CONDITIONS
SECTION 2.3 EXISTING SOILS
SECTION 2.4 PROPOSED DEVELOPMENT

SECTION 3.0 MAPS

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SECTION 3.3 FLOOD INSURANCE RATE MAP (FIRM)
SECTION 3.4 SOILS MAP
SECTION 3.5 DRAINAGE AREA MAPS – PRE DEVELOPMENT
SECTION 3.6 DRAINAGE AREA MAPS – POST DEVELOPMENT

SECTION 4.0 STORMWATER MANAGEMENT OVERVIEW

SECTION 4.1 STORMWATER MANAGEMENT PLAN – DEFINITION AND GOALS
SECTION 4.2 UNDERSTANDING RUNOFF AND STORMWATER MANAGEMENT
SECTION 4.3 STORMWATER MANAGEMENT DESIGN
SECTION 4.4 BEST MANAGEMENT PRACTICES (BMP)
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SECTION 5.0 STORMWATER MANAGEMENT SYSTEM

SECTION 5.1 MASSDEP STORMWATER MANAGEMENT STANDARDS
SECTION 5.2 HYDROLOGIC MODEL

SECTION 6.0 DESIGN CONCLUSIONS AND SUMMARY

6.1 SUMMARY DISCUSSION
6.2 SUMMARY TABLES
6.3 CONCLUSION

246 & 248 WALNUT STREET

STORMWATER MANAGEMENT REPORT – VOLUME 2 OF 2

A RESIDENTIAL SUBDIVISION IN READING, MA

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SECTION 8.0 DOCUMENTING COMPLIANCE WITH STANDARD 4: WATER QUALITY VOLUME
- 8.1 WATER QUALITY VOLUME – VWQ
- 8.2 TOTAL SUSPENDED SOLIDS (TSS)

SECTION 9.0 REMAINING STATE STANDARDS

SECTION 10.0 PHOSPHORUS REMOVAL

SECTION 11.0 OPERATION AND MAINTENANCE
- 11.1 INTRODUCTION
- 11.2 DESIGN PARAMETERS OF EROSION CONTROL AND MANAGEMENT
- 11.3 OPERATION AND MANAGEMENT OF STORMWATER MANAGEMENT FACILITIES

VOLUME 2

STORMWATER CHECKLIST

HYDROCAD WORKSHEETS - 2, 10, 25, 100-YEAR, 100-YEAR (NOAA 14) STORM EVENTS

NOAA ATLAS 14 RAINFALL DATA

STORMWATER CHECKLIST

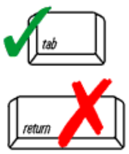
SEE FOLLOWING PAGES FOR MASS DEP STORMWATER CHECKLIST

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

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

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

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

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

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

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:

- [x] 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
- [x] Other (describe): Infiltration Practices

Standard 1: No New Untreated Discharges

- [x] 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 (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[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

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 (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 (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 (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;

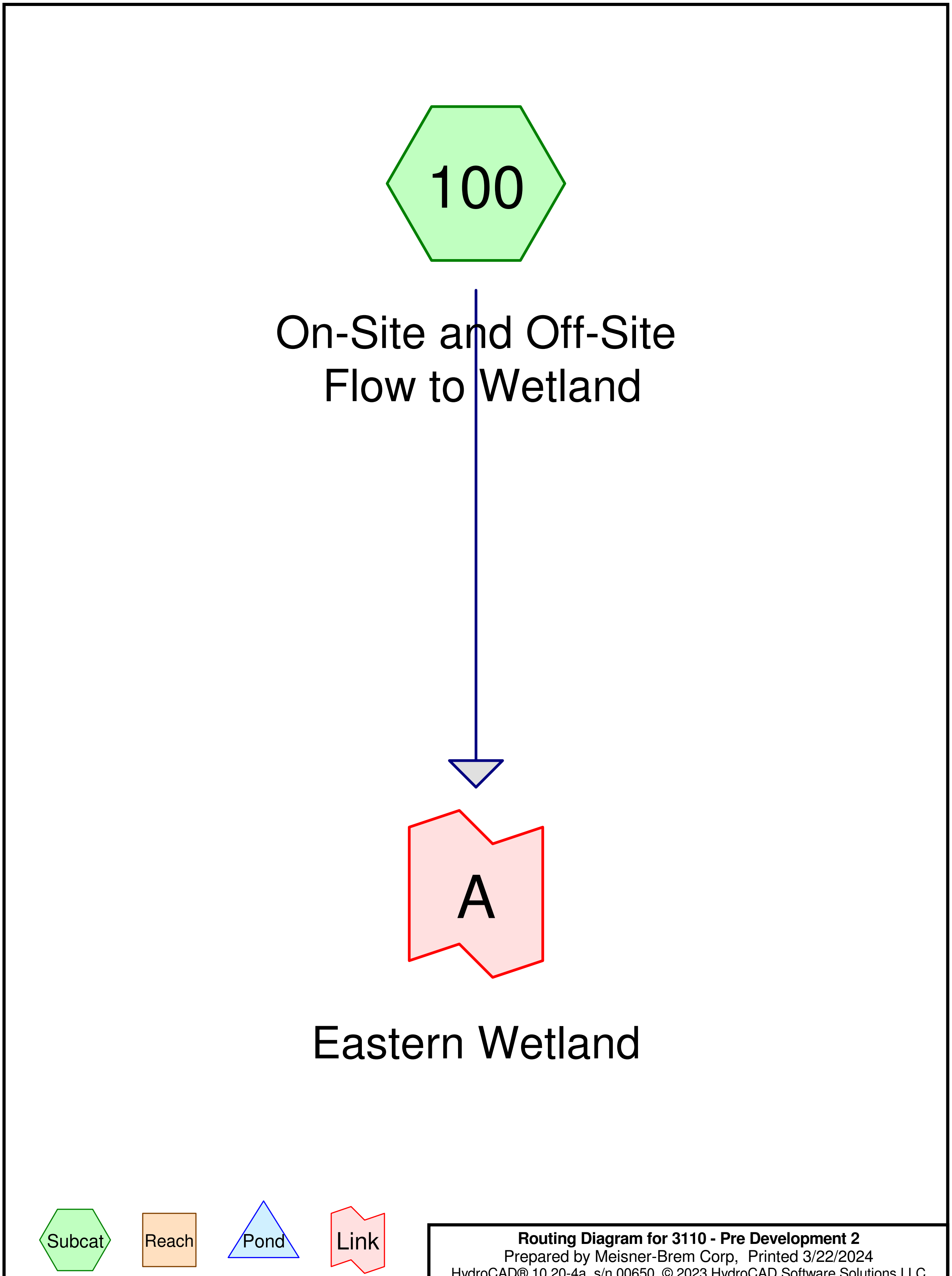
☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

HydroCAD Printouts

Pre Development

Storm Frequency: 2, 10, 25, 100 Year

NOAA 14 Storm Events



Routing Diagram for 3110 - Pre Development 2
Prepared by Meisner-Brem Corp, Printed 3/22/2024
HydroCAD® 10.20-4a s/n 00650 © 2023 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.30	2
2	10-Year	Type III 24-hr		Default	24.00	1	5.21	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.39	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.22	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
39,382	39	>75% Grass cover, Good, HSG A (100)
7,000	98	Paved parking, HSG A (100)
47,768	30	Woods, Good, HSG A (100)
94,150	**39**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
94,150	HSG A	100
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
94,150		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
39,382	0	0	0	0	39,382	>75% Grass cover, Good	
7,000	0	0	0	0	7,000	Paved parking	
47,768	0	0	0	0	47,768	Woods, Good	
94,150	**0**	**0**	**0**	**0**	**94,150**	**TOTAL AREA**	

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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: On-Site and Off-Site Runoff Area=94,150 sf 7.43% Impervious Runoff Depth=0.00"
Flow Length=360' Tc=7.7 min CN=39 Runoff=0.00 cfs 15 cf

Link A: Eastern Wetland Inflow=0.00 cfs 15 cf
Primary=0.00 cfs 15 cf

Total Runoff Area = 94,150 sf Runoff Volume = 15 cf Average Runoff Depth = 0.00"
92.57% Pervious = 87,150 sf 7.43% Impervious = 7,000 sf

Summary for Subcatchment 100: On-Site and Off-Site Flow to Wetland

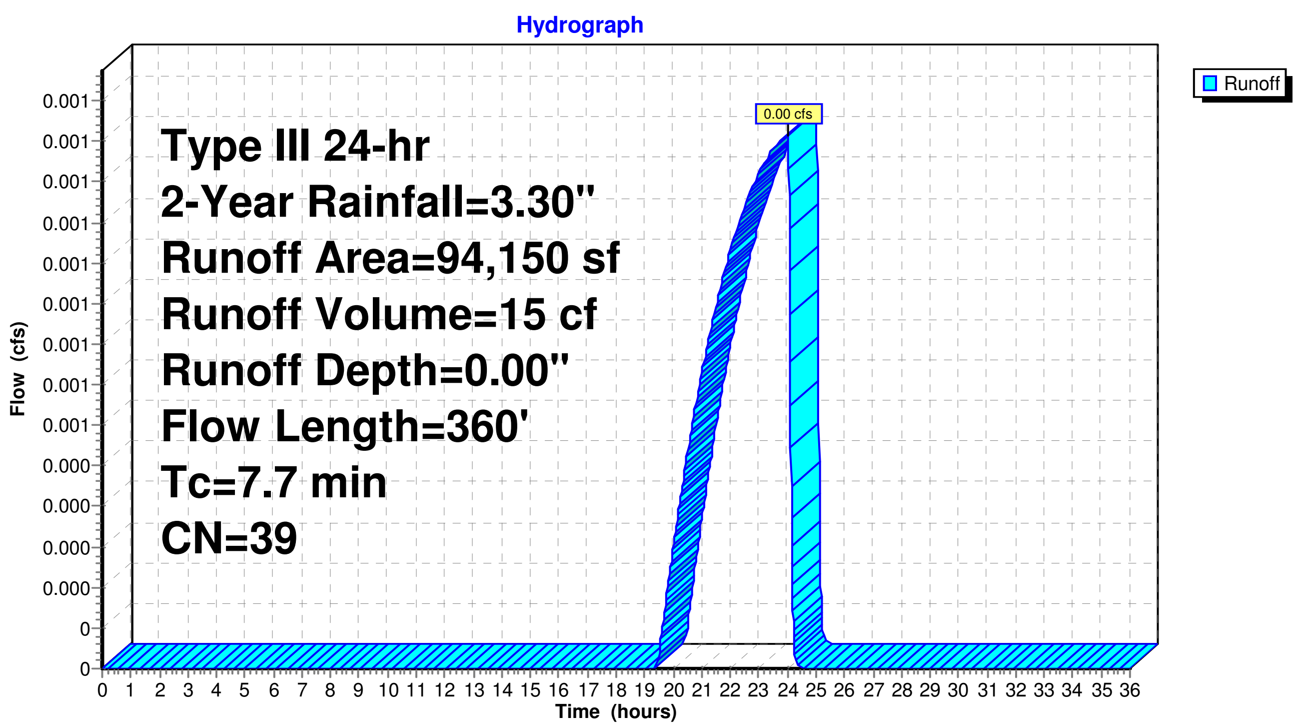
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 15 cf, Depth= 0.00"
Routed to Link A : Eastern Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.30"

Area (sf)	CN	Description
47,768	30	Woods, Good, HSG A
39,382	39	>75% Grass cover, Good, HSG A
7,000	98	Paved parking, HSG A
94,150	39	Weighted Average
87,150		92.57% Pervious Area
7,000		7.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	30	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
2.0	190	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	140	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.7	360	Total			

Subcatchment 100: On-Site and Off-Site Flow to Wetland

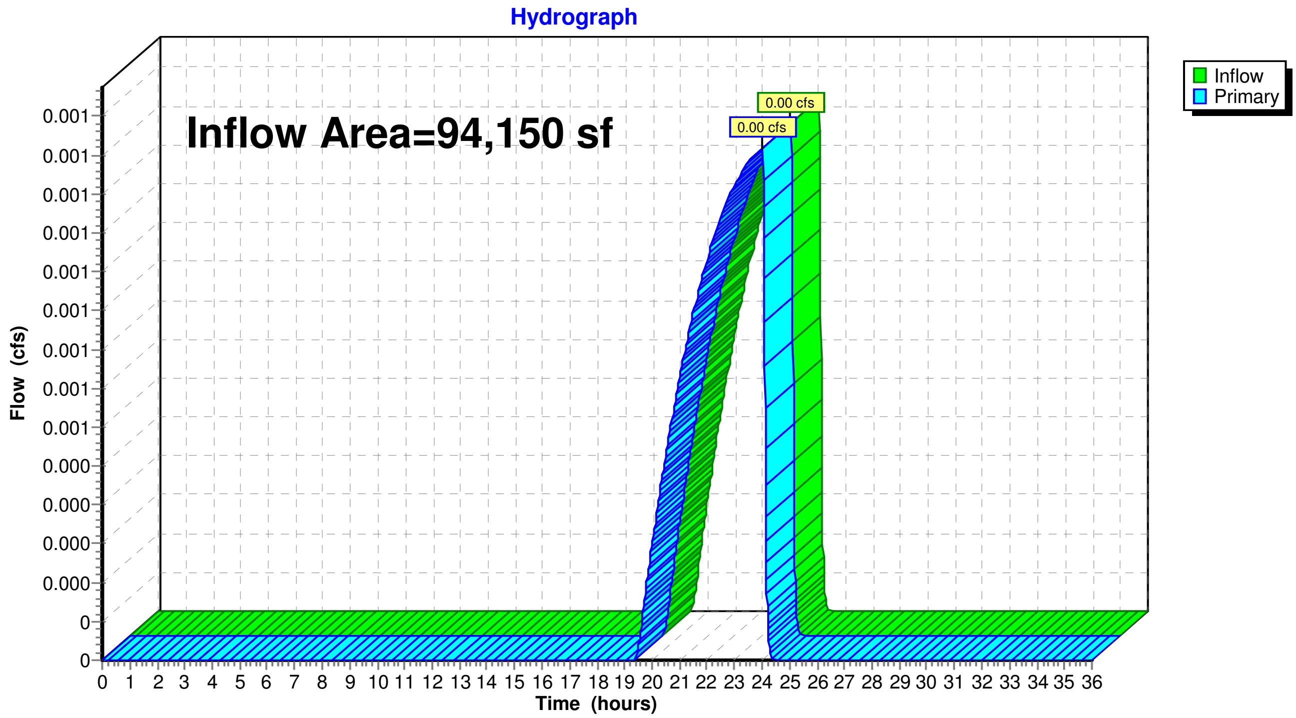


Summary for Link A: Eastern Wetland

Inflow Area =	94,150 sf, 7.43% Impervious,	Inflow Depth = 0.00"	for 2-Year event
Inflow =	0.00 cfs @ 24.00 hrs,	Volume=	15 cf
Primary =	0.00 cfs @ 24.00 hrs,	Volume=	15 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link A: Eastern Wetland



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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: On-Site and Off-Site Runoff Area=94,150 sf 7.43% Impervious Runoff Depth=0.24"
Flow Length=360' Tc=7.7 min CN=39 Runoff=0.13 cfs 1,919 cf

Link A: Eastern Wetland Inflow=0.13 cfs 1,919 cf
Primary=0.13 cfs 1,919 cf

Total Runoff Area = 94,150 sf Runoff Volume = 1,919 cf Average Runoff Depth = 0.24"
92.57% Pervious = 87,150 sf 7.43% Impervious = 7,000 sf

Summary for Subcatchment 100: On-Site and Off-Site Flow to Wetland

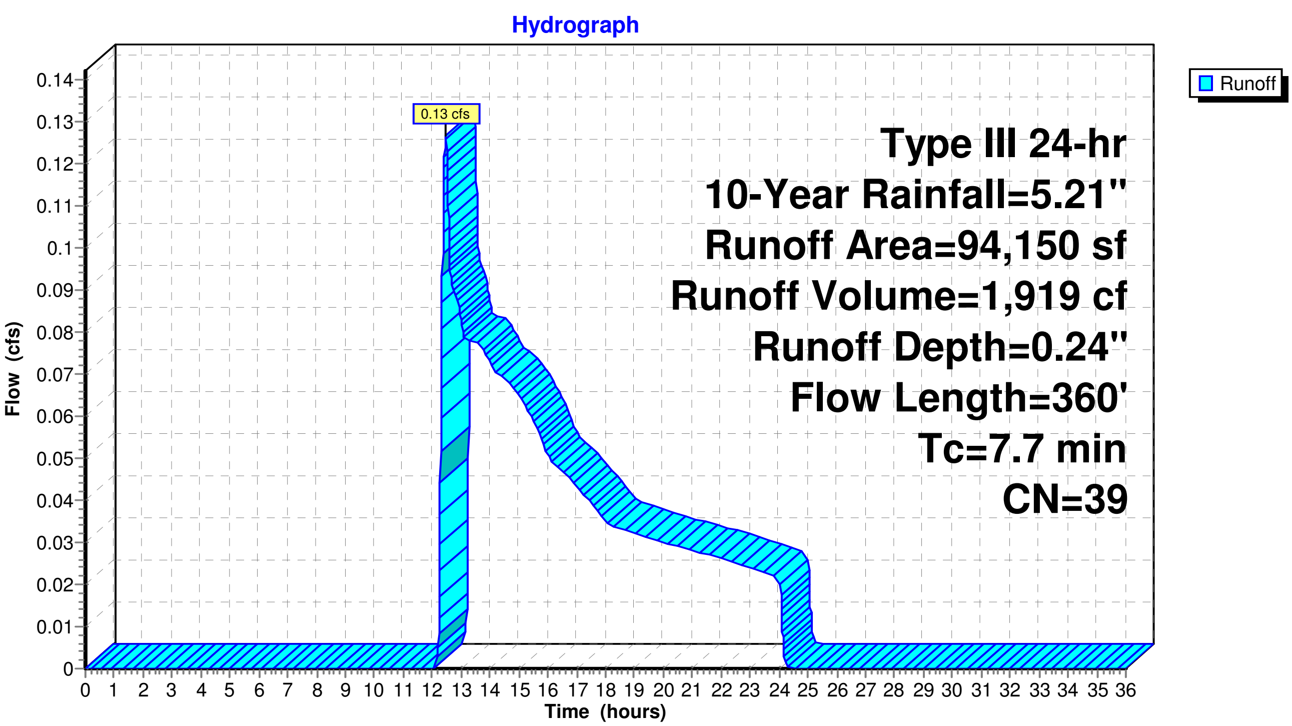
Runoff = 0.13 cfs @ 12.47 hrs, Volume= 1,919 cf, Depth= 0.24"
Routed to Link A : Eastern Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.21"

Area (sf)	CN	Description
47,768	30	Woods, Good, HSG A
39,382	39	>75% Grass cover, Good, HSG A
7,000	98	Paved parking, HSG A
94,150	39	Weighted Average
87,150		92.57% Pervious Area
7,000		7.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	30	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
2.0	190	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	140	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.7	360	Total			

Subcatchment 100: On-Site and Off-Site Flow to Wetland

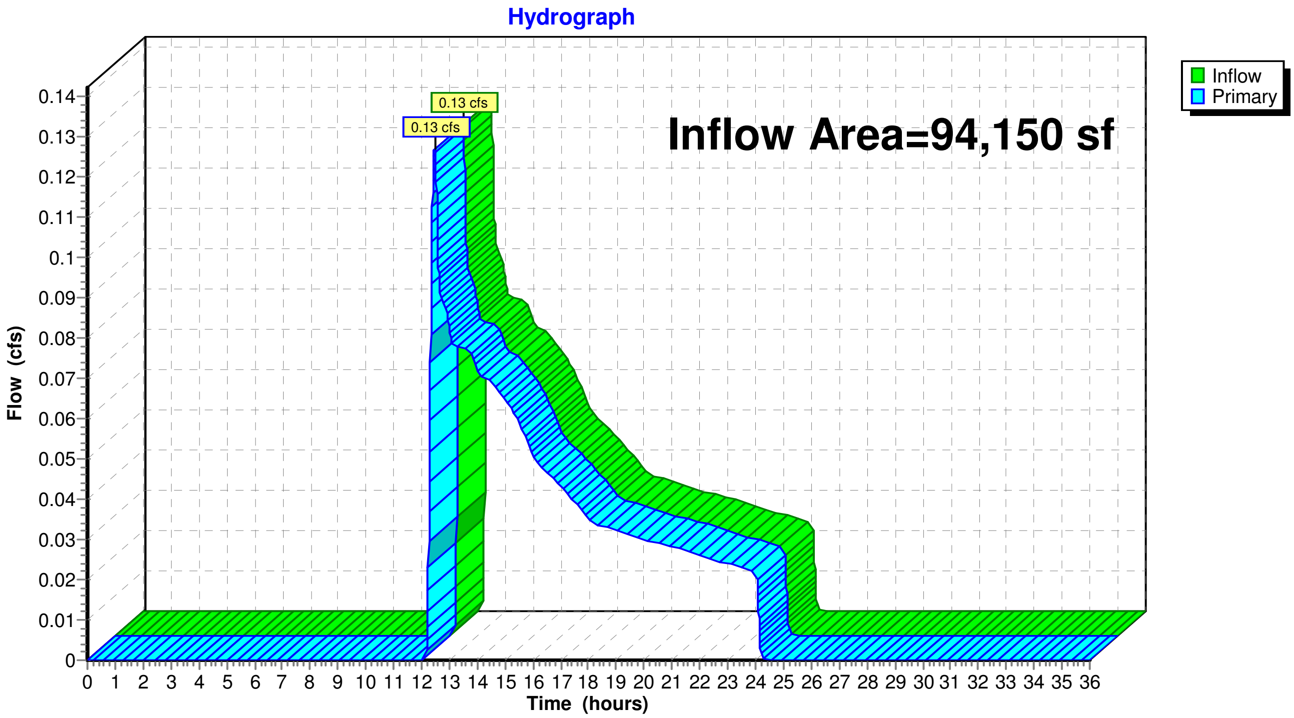


Summary for Link A: Eastern Wetland

Inflow Area = 94,150 sf, 7.43% Impervious, Inflow Depth = 0.24" for 10-Year event
Inflow = 0.13 cfs @ 12.47 hrs, Volume= 1,919 cf
Primary = 0.13 cfs @ 12.47 hrs, Volume= 1,919 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link A: Eastern Wetland



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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: On-Site and Off-Site Runoff Area=94,150 sf 7.43% Impervious Runoff Depth=0.56"
Flow Length=360' Tc=7.7 min CN=39 Runoff=0.54 cfs 4,416 cf

Link A: Eastern Wetland Inflow=0.54 cfs 4,416 cf
Primary=0.54 cfs 4,416 cf

Total Runoff Area = 94,150 sf Runoff Volume = 4,416 cf Average Runoff Depth = 0.56"
92.57% Pervious = 87,150 sf 7.43% Impervious = 7,000 sf

Summary for Subcatchment 100: On-Site and Off-Site Flow to Wetland

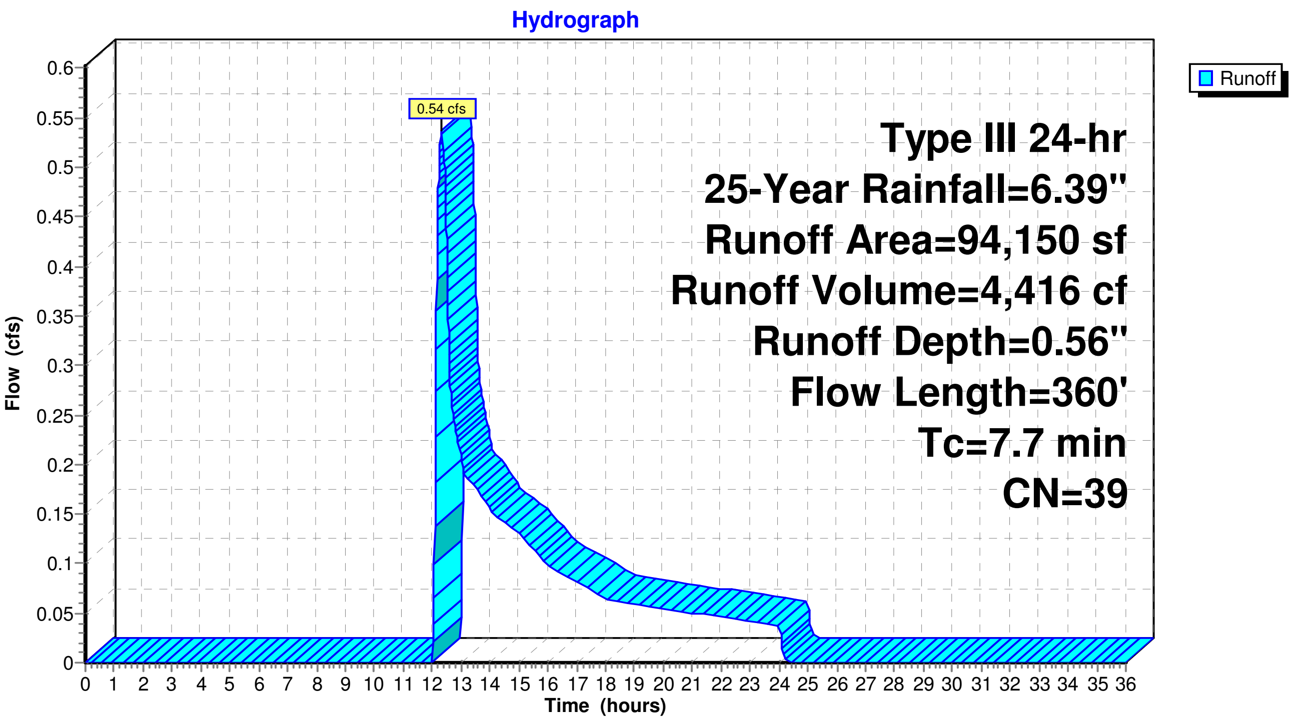
Runoff = 0.54 cfs @ 12.33 hrs, Volume= 4,416 cf, Depth= 0.56"
Routed to Link A : Eastern Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.39"

Area (sf)	CN	Description
47,768	30	Woods, Good, HSG A
39,382	39	>75% Grass cover, Good, HSG A
7,000	98	Paved parking, HSG A
94,150	39	Weighted Average
87,150		92.57% Pervious Area
7,000		7.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	30	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
2.0	190	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	140	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.7	360	Total			

Subcatchment 100: On-Site and Off-Site Flow to Wetland

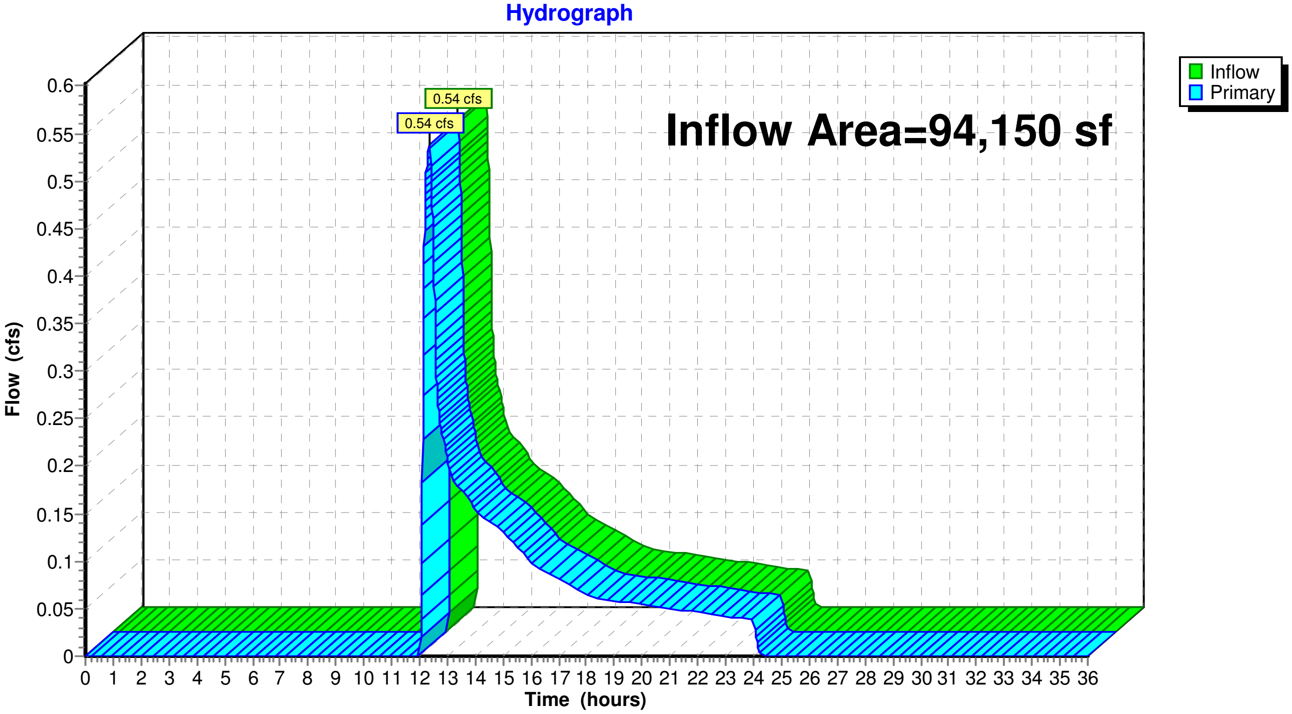


Summary for Link A: Eastern Wetland

Inflow Area =	94,150 sf,	7.43% Impervious,	Inflow Depth = 0.56"	for 25-Year event	
Inflow =	0.54 cfs @	12.33 hrs,	Volume=	4,416 cf	
Primary =	0.54 cfs @	12.33 hrs,	Volume=	4,416 cf,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link A: Eastern Wetland



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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: On-Site and Off-Site Runoff Area=94,150 sf 7.43% Impervious Runoff Depth=1.25"
Flow Length=360' Tc=7.7 min CN=39 Runoff=2.01 cfs 9,811 cf

Link A: Eastern Wetland Inflow=2.01 cfs 9,811 cf
Primary=2.01 cfs 9,811 cf

Total Runoff Area = 94,150 sf Runoff Volume = 9,811 cf Average Runoff Depth = 1.25"
92.57% Pervious = 87,150 sf 7.43% Impervious = 7,000 sf

Summary for Subcatchment 100: On-Site and Off-Site Flow to Wetland

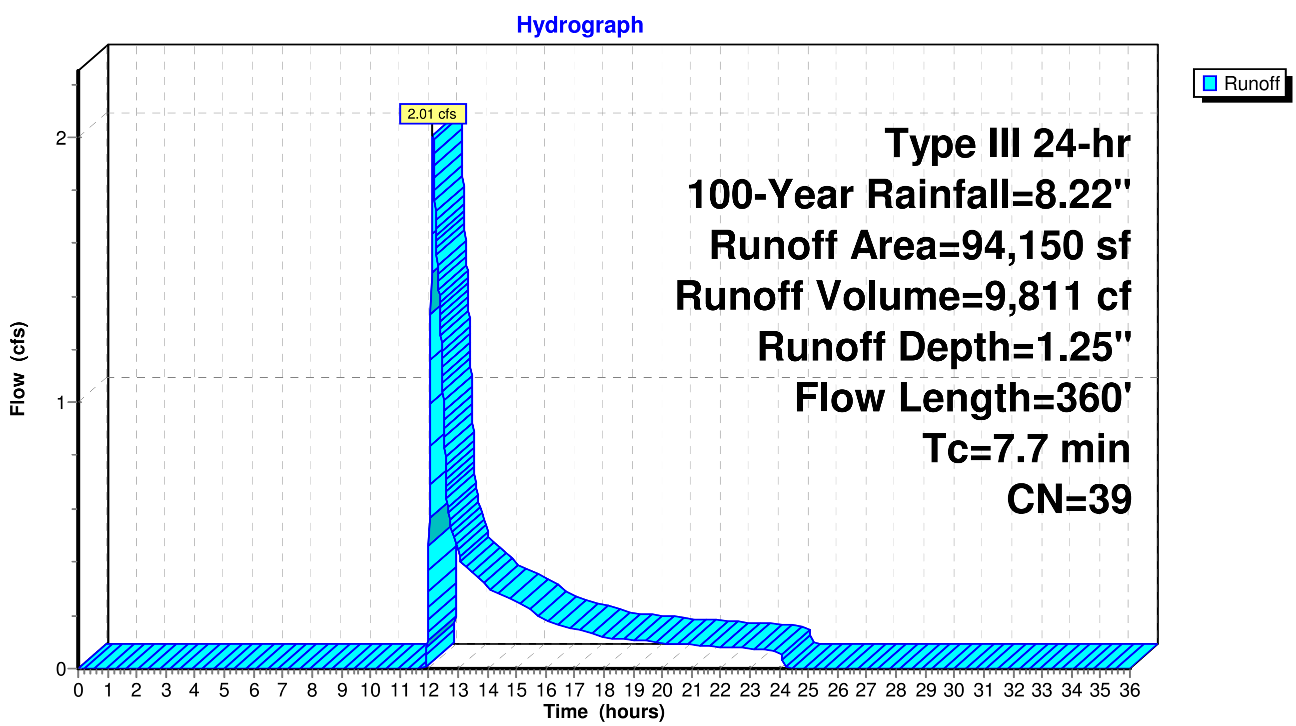
Runoff = 2.01 cfs @ 12.14 hrs, Volume= 9,811 cf, Depth= 1.25"
Routed to Link A : Eastern Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
47,768	30	Woods, Good, HSG A
39,382	39	>75% Grass cover, Good, HSG A
7,000	98	Paved parking, HSG A
94,150	39	Weighted Average
87,150		92.57% Pervious Area
7,000		7.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	30	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
2.0	190	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	140	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.7	360	Total			

Subcatchment 100: On-Site and Off-Site Flow to Wetland

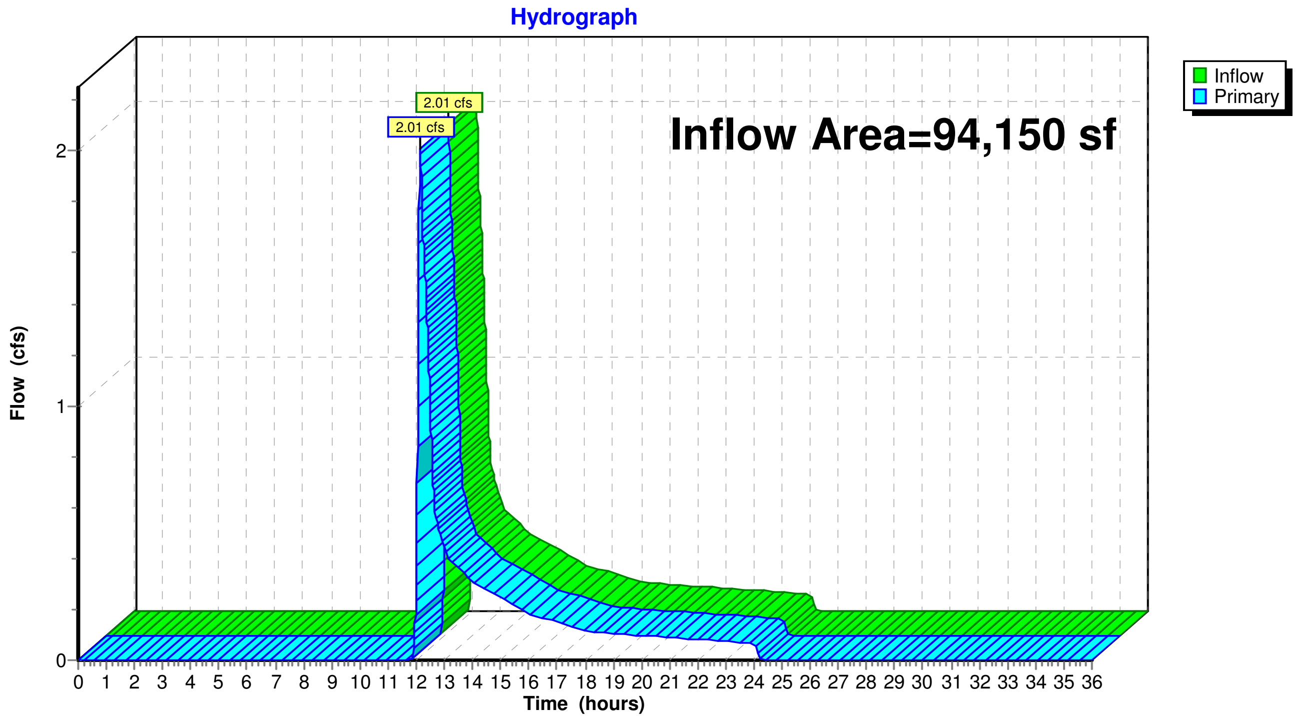


Summary for Link A: Eastern Wetland

Inflow Area =	94,150 sf,	7.43% Impervious,	Inflow Depth = 1.25"	for 100-Year event	
Inflow =	2.01 cfs @	12.14 hrs, Volume=	9,811 cf		
Primary =	2.01 cfs @	12.14 hrs, Volume=	9,811 cf,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link A: Eastern Wetland

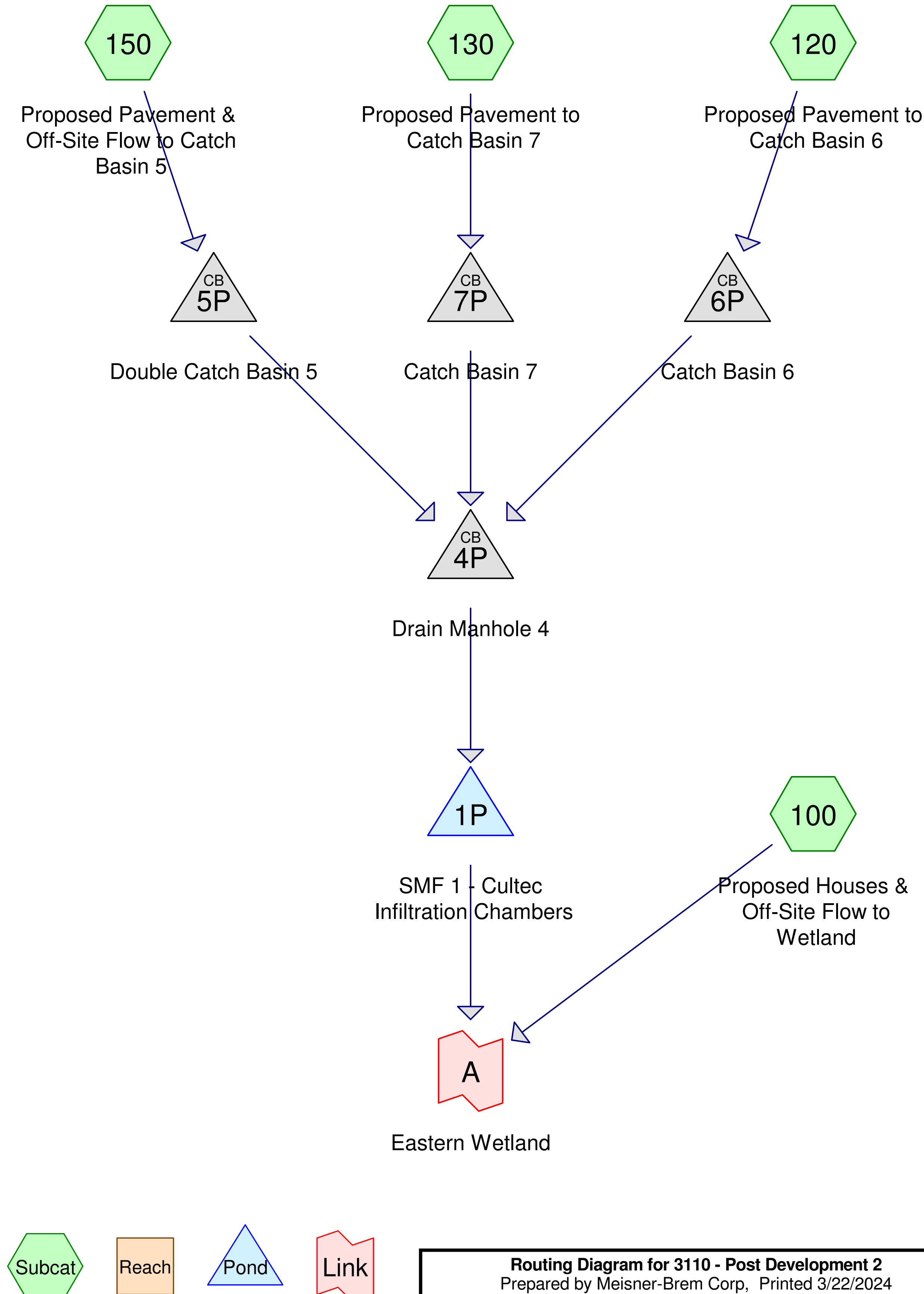


HydroCAD Printouts

Post Development

Storm Frequency: 2, 10, 25, 100 Year

NOAA 14 Storm Events



Routing Diagram for 3110 - Post Development 2
Prepared by Meisner-Brem Corp, Printed 3/22/2024
HydroCAD® 10.20-4a s/n 00650 © 2023 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.30	2
2	10-Year	Type III 24-hr		Default	24.00	1	5.21	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.39	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.22	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
24,090	39	>75% Grass cover, Good, HSG A (100, 120, 130, 150)
22,527	98	Paved parking, HSG A (100, 120, 130, 150)
47,533	30	Woods, Good, HSG A (100, 150)
94,150	**49**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
94,150	HSG A	100, 120, 130, 150
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
94,150		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
24,090	0	0	0	0	24,090	>75% Grass cover, Good	
22,527	0	0	0	0	22,527	Paved parking	
47,533	0	0	0	0	47,533	Woods, Good	
94,150	**0**	**0**	**0**	**0**	**94,150**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	1P	111.38	110.76	31.0	0.0200	0.011	0.0	6.0	0.0	
2	4P	109.43	109.33	5.0	0.0200	0.013	0.0	12.0	0.0	
3	5P	110.01	109.53	24.0	0.0200	0.013	0.0	12.0	0.0	
4	6P	109.73	109.53	10.0	0.0200	0.013	0.0	12.0	0.0	
5	7P	109.99	109.53	23.0	0.0200	0.013	0.0	12.0	0.0	

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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: Proposed Houses & Runoff Area=58,891 sf 9.20% Impervious Runoff Depth=0.00"
Flow Length=200' Slope=0.1000 '/' Tc=8.0 min CN=38 Runoff=0.00 cfs 0 cf

Subcatchment 120: Proposed Pavement to Runoff Area=3,976 sf 69.22% Impervious Runoff Depth=1.48"
Flow Length=110' Tc=3.8 min CN=80 Runoff=0.17 cfs 490 cf

Subcatchment 130: Proposed Pavement to Runoff Area=4,883 sf 45.48% Impervious Runoff Depth=0.69"
Flow Length=140' Tc=5.1 min CN=66 Runoff=0.08 cfs 282 cf

Subcatchment 150: Proposed Pavement & Runoff Area=26,400 sf 45.96% Impervious Runoff Depth=0.65"
Flow Length=220' Tc=5.5 min CN=65 Runoff=0.38 cfs 1,429 cf

Pond 1P: SMF 1 - Cultec Infiltration Chambers Peak Elev=109.38' Storage=502 cf Inflow=0.61 cfs 2,202 cf
Discarded=0.12 cfs 2,202 cf Primary=0.00 cfs 0 cf Outflow=0.12 cfs 2,202 cf

Pond 4P: Drain Manhole 4 Peak Elev=109.86' Inflow=0.61 cfs 2,202 cf
12.0" Round Culvert n=0.013 L=5.0' S=0.0200 '/' Outflow=0.61 cfs 2,202 cf

Pond 5P: Double Catch Basin 5 Peak Elev=110.31' Inflow=0.38 cfs 1,429 cf
12.0" Round Culvert n=0.013 L=24.0' S=0.0200 '/' Outflow=0.38 cfs 1,429 cf

Pond 6P: Catch Basin 6 Peak Elev=109.97' Inflow=0.17 cfs 490 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0200 '/' Outflow=0.17 cfs 490 cf

Pond 7P: Catch Basin 7 Peak Elev=110.13' Inflow=0.08 cfs 282 cf
12.0" Round Culvert n=0.013 L=23.0' S=0.0200 '/' Outflow=0.08 cfs 282 cf

Link A: Eastern Wetland Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 94,150 sf Runoff Volume = 2,202 cf Average Runoff Depth = 0.28"
76.07% Pervious = 71,623 sf 23.93% Impervious = 22,527 sf

Summary for Subcatchment 100: Proposed Houses & Off-Site Flow to Wetland

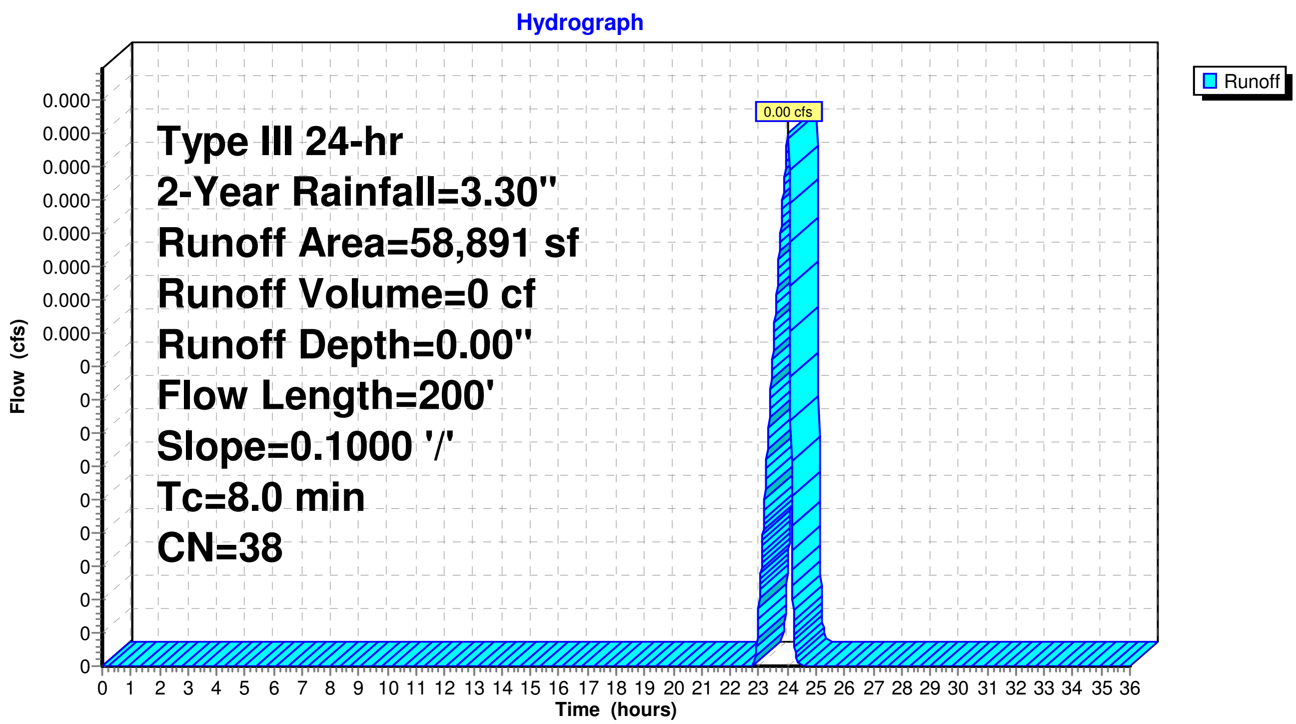
Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link A : Eastern Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.30"

Area (sf)	CN	Description
43,942	30	Woods, Good, HSG A
9,529	39	>75% Grass cover, Good, HSG A
5,420	98	Paved parking, HSG A
58,891	38	Weighted Average
53,471		90.80% Pervious Area
5,420		9.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.6	150	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.0	200	Total			

Subcatchment 100: Proposed Houses & Off-Site Flow to Wetland



Summary for Subcatchment 120: Proposed Pavement to Catch Basin 6

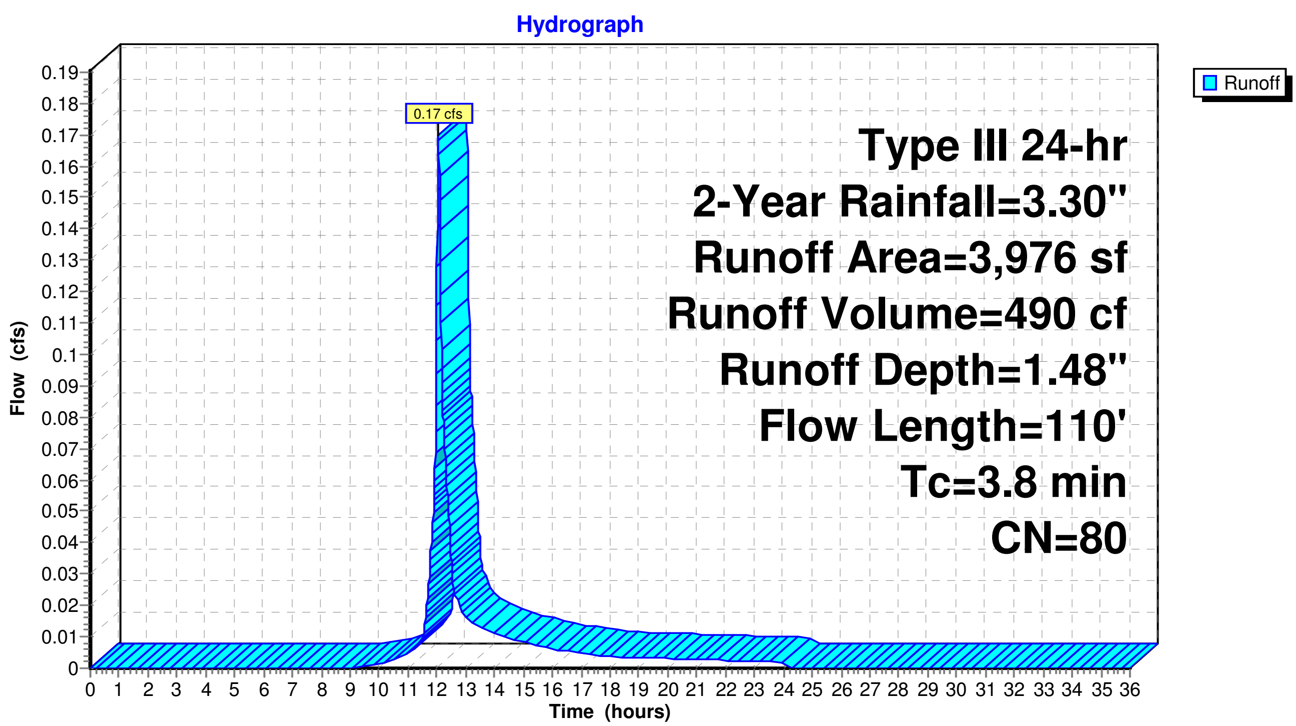
Runoff = 0.17 cfs @ 12.06 hrs, Volume= 490 cf, Depth= 1.48"
Routed to Pond 6P : Catch Basin 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.30"

Area (sf)	CN	Description
1,224	39	>75% Grass cover, Good, HSG A
2,752	98	Paved parking, HSG A
3,976	80	Weighted Average
1,224		30.78% Pervious Area
2,752		69.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	35	0.0300	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
0.3	75	0.0340	3.74		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.8	110	Total			

Subcatchment 120: Proposed Pavement to Catch Basin 6



Summary for Subcatchment 130: Proposed Pavement to Catch Basin 7

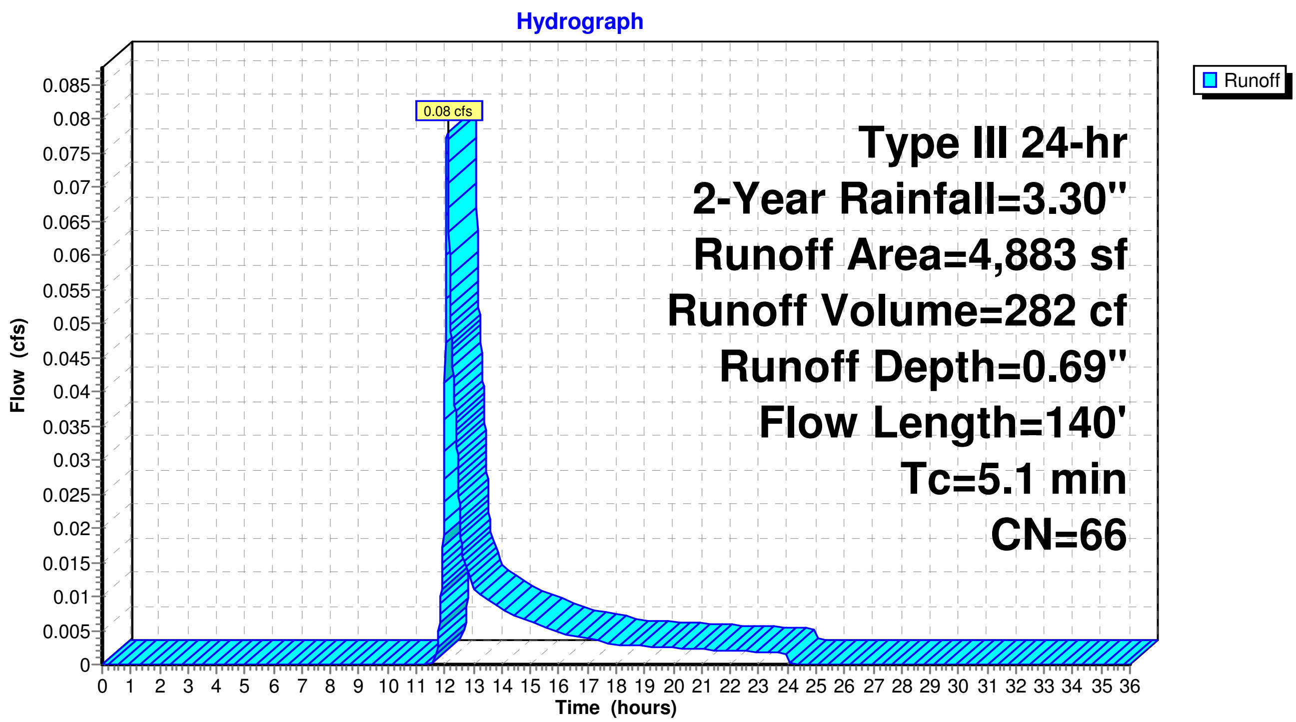
Runoff = 0.08 cfs @ 12.09 hrs, Volume= 282 cf, Depth= 0.69"
Routed to Pond 7P : Catch Basin 7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.30"

Area (sf)	CN	Description
2,662	39	>75% Grass cover, Good, HSG A
2,221	98	Paved parking, HSG A
4,883	66	Weighted Average
2,662		54.52% Pervious Area
2,221		45.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.0300	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
0.1	30	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	60	0.0340	3.74		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.1	140	Total			

Subcatchment 130: Proposed Pavement to Catch Basin 7



Summary for Subcatchment 150: Proposed Pavement & Off-Site Flow to Catch Basin 5

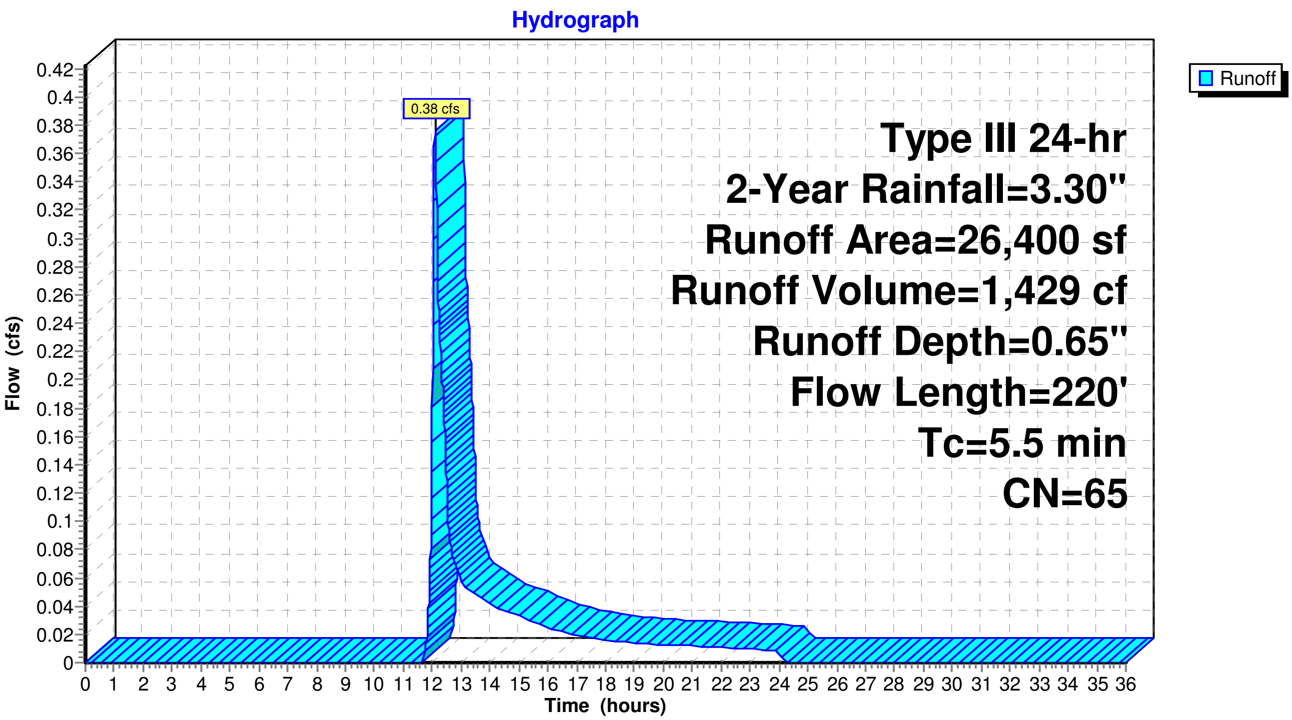
Runoff = 0.38 cfs @ 12.10 hrs, Volume= 1,429 cf, Depth= 0.65"
Routed to Pond 5P : Double Catch Basin 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.30"

Area (sf)	CN	Description
3,591	30	Woods, Good, HSG A
10,675	39	>75% Grass cover, Good, HSG A
12,134	98	Paved parking, HSG A
26,400	65	Weighted Average
14,266		54.04% Pervious Area
12,134		45.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	30	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.6	50	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	140	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.5	220	Total			

Subcatchment 150: Proposed Pavement & Off-Site Flow to Catch Basin 5



Summary for Pond 1P: SMF 1 - Cultec Infiltration Chambers

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=439)

Inflow Area = 35,259 sf, 48.52% Impervious, Inflow Depth = 0.75" for 2-Year event
Inflow = 0.61 cfs @ 12.09 hrs, Volume= 2,202 cf
Outflow = 0.12 cfs @ 12.02 hrs, Volume= 2,202 cf, Atten= 81%, Lag= 0.0 min
Discarded = 0.12 cfs @ 12.02 hrs, Volume= 2,202 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link A : Eastern Wetland

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 109.38' @ 12.65 hrs Surf.Area= 2,102 sf Storage= 502 cf
Flood Elev= 113.48' Surf.Area= 2,102 sf Storage= 4,778 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 28.4 min (908.0 - 879.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	108.83'	1,779 cf	**35.33'W x 59.50'L x 3.54'H Field A** 7,446 cf Overall - 2,999 cf Embedded = 4,447 cf x 40.0% Voids
#2A	109.33'	2,999 cf	**Cultec R-330XLHD** x 56 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 7 rows
		4,778 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	108.83'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	111.38'	**6.0" Round Culvert** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 111.38' / 110.76' S= 0.0200 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.12 cfs @ 12.02 hrs HW=108.88' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=108.83' TW=0.00' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)

Pond 1P: SMF 1 - Cultec Infiltration Chambers - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 7 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

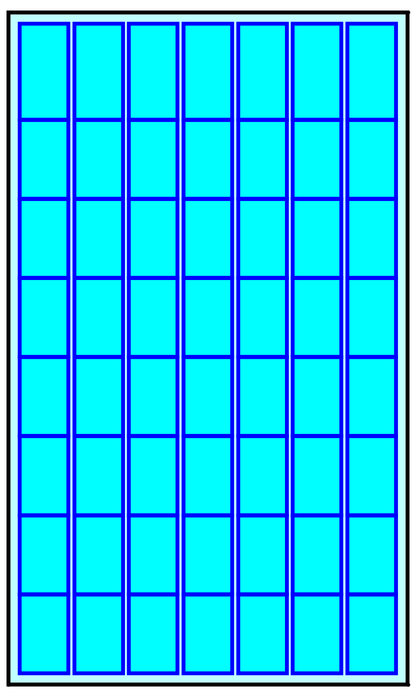
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
7 Rows x 52.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 35.33' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

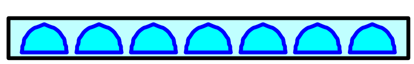
56 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 7 Rows = 2,999.0 cf Chamber Storage

7,445.8 cf Field - 2,999.0 cf Chambers = 4,446.7 cf Stone x 40.0% Voids = 1,778.7 cf Stone Storage

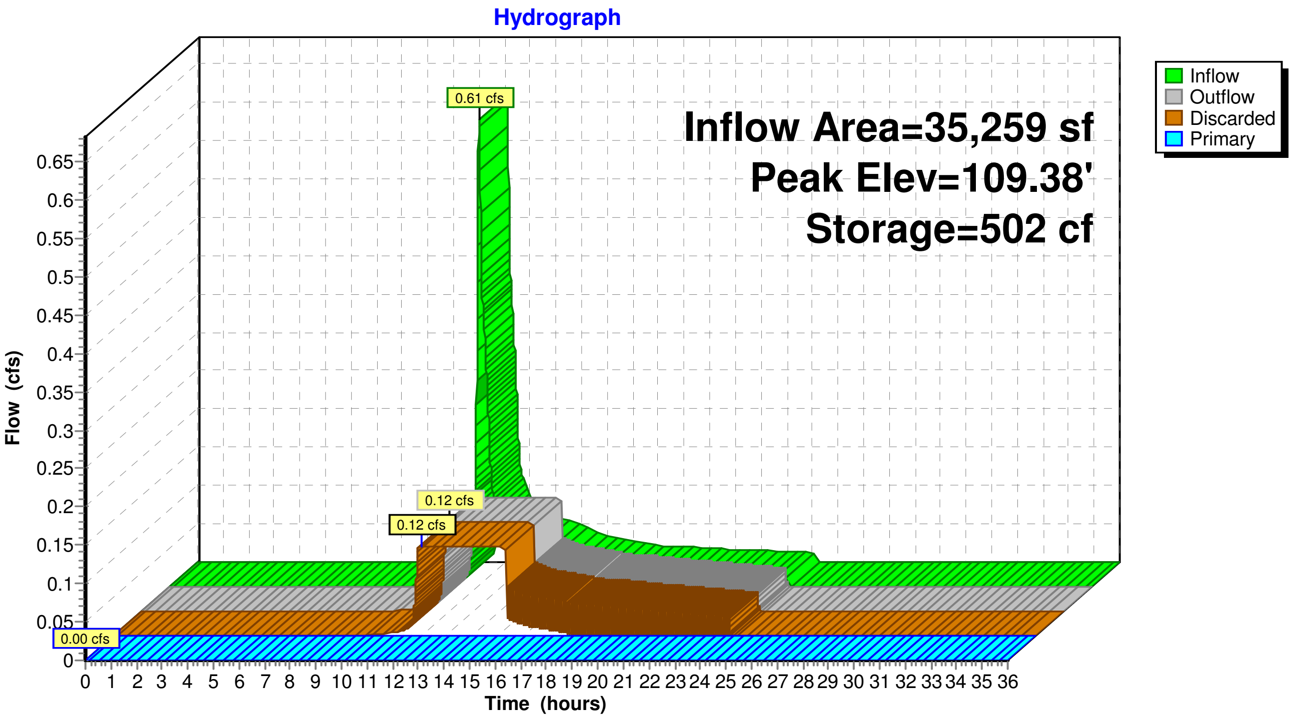
Chamber Storage + Stone Storage = 4,777.7 cf = 0.110 af
Overall Storage Efficiency = 64.2%
Overall System Size = 59.50' x 35.33' x 3.54'

56 Chambers
275.8 cy Field
164.7 cy Stone





Pond 1P: SMF 1 - Cultec Infiltration Chambers



Summary for Pond 4P: Drain Manhole 4

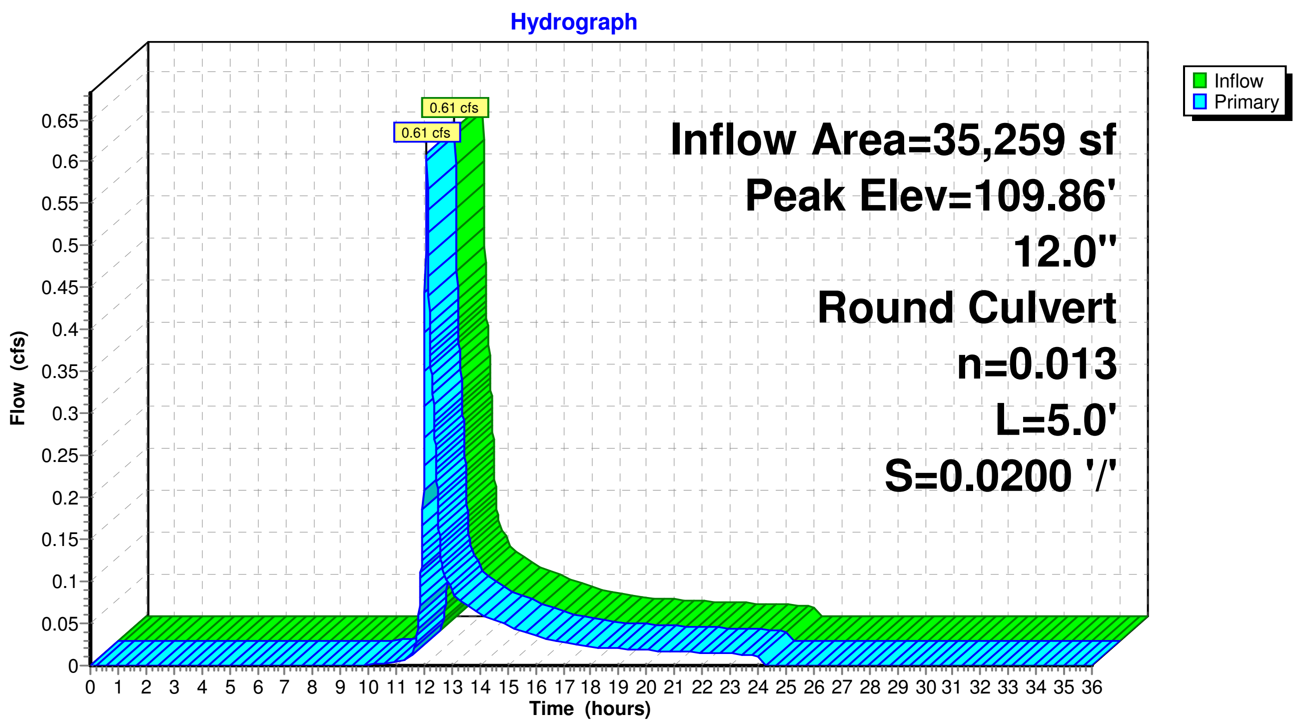
Inflow Area = 35,259 sf, 48.52% Impervious, Inflow Depth = 0.75" for 2-Year event
Inflow = 0.61 cfs @ 12.09 hrs, Volume= 2,202 cf
Outflow = 0.61 cfs @ 12.09 hrs, Volume= 2,202 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.61 cfs @ 12.09 hrs, Volume= 2,202 cf
Routed to Pond 1P : SMF 1 - Cultec Infiltration Chambers

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 109.86' @ 12.09 hrs
Flood Elev= 114.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	109.43'	**12.0" Round Culvert** L= 5.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 109.43' / 109.33' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.61 cfs @ 12.09 hrs HW=109.86' TW=109.00' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.61 cfs @ 2.77 fps)

Pond 4P: Drain Manhole 4



Summary for Pond 5P: Double Catch Basin 5

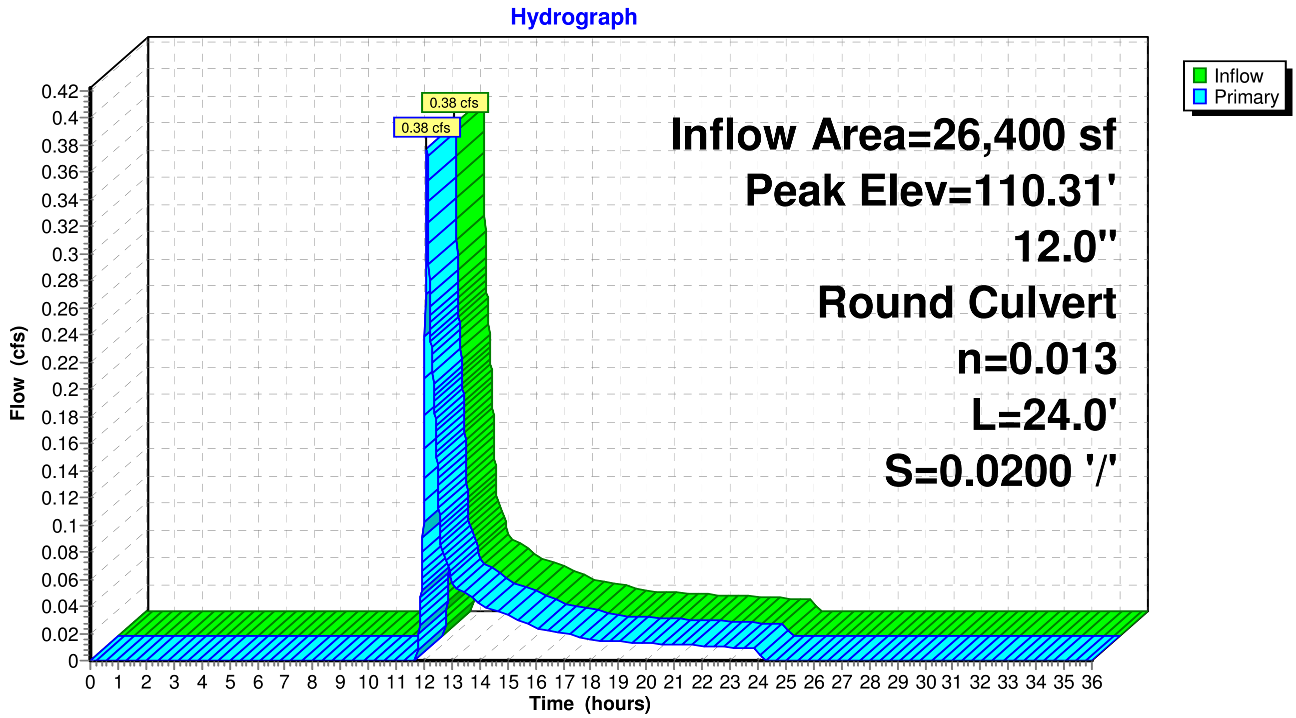
Inflow Area = 26,400 sf, 45.96% Impervious, Inflow Depth = 0.65" for 2-Year event
Inflow = 0.38 cfs @ 12.10 hrs, Volume= 1,429 cf
Outflow = 0.38 cfs @ 12.10 hrs, Volume= 1,429 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.38 cfs @ 12.10 hrs, Volume= 1,429 cf
Routed to Pond 4P : Drain Manhole 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 110.31' @ 12.10 hrs
Flood Elev= 113.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	110.01'	**12.0" Round Culvert** L= 24.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 110.01' / 109.53' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.38 cfs @ 12.10 hrs HW=110.31' TW=109.86' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.38 cfs @ 1.87 fps)

Pond 5P: Double Catch Basin 5



Summary for Pond 6P: Catch Basin 6

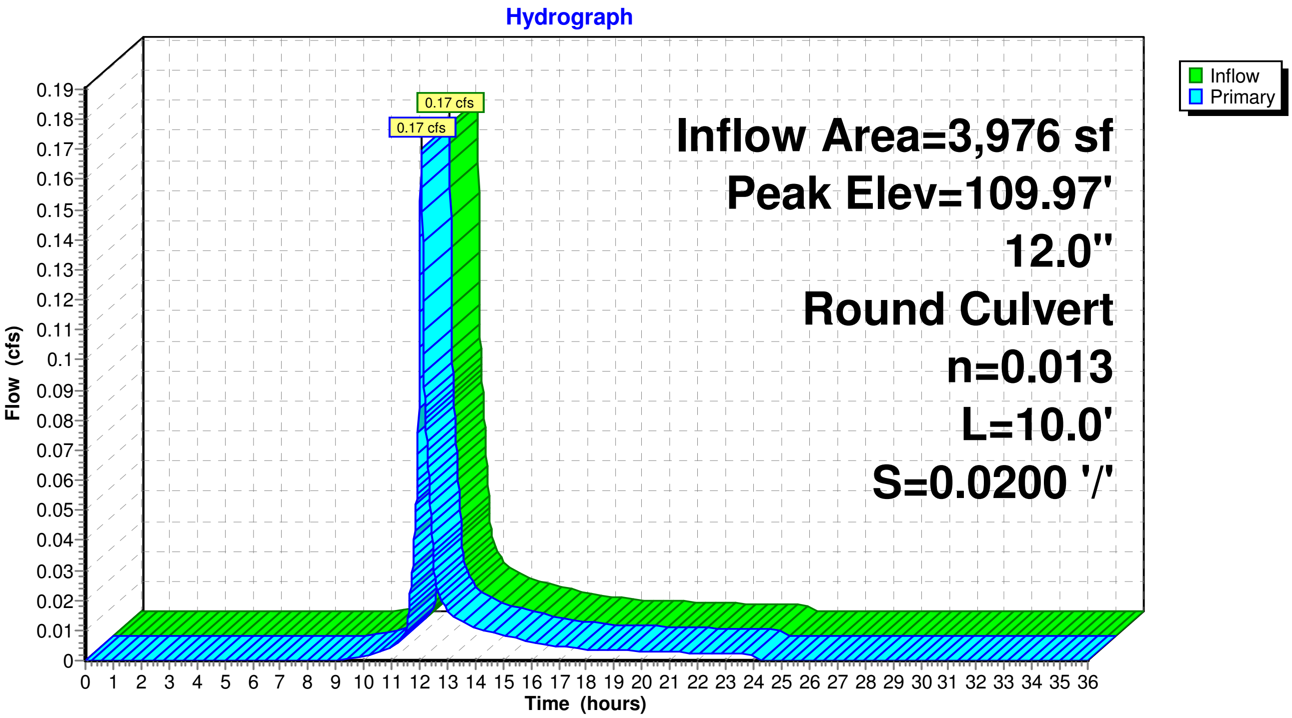
Inflow Area = 3,976 sf, 69.22% Impervious, Inflow Depth = 1.48" for 2-Year event
Inflow = 0.17 cfs @ 12.06 hrs, Volume= 490 cf
Outflow = 0.17 cfs @ 12.06 hrs, Volume= 490 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.17 cfs @ 12.06 hrs, Volume= 490 cf
Routed to Pond 4P : Drain Manhole 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 109.97' @ 12.08 hrs
Flood Elev= 114.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	109.73'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 109.73' / 109.53' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.16 cfs @ 12.06 hrs HW=109.96' TW=109.84' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.16 cfs @ 1.75 fps)

Pond 6P: Catch Basin 6



Summary for Pond 7P: Catch Basin 7

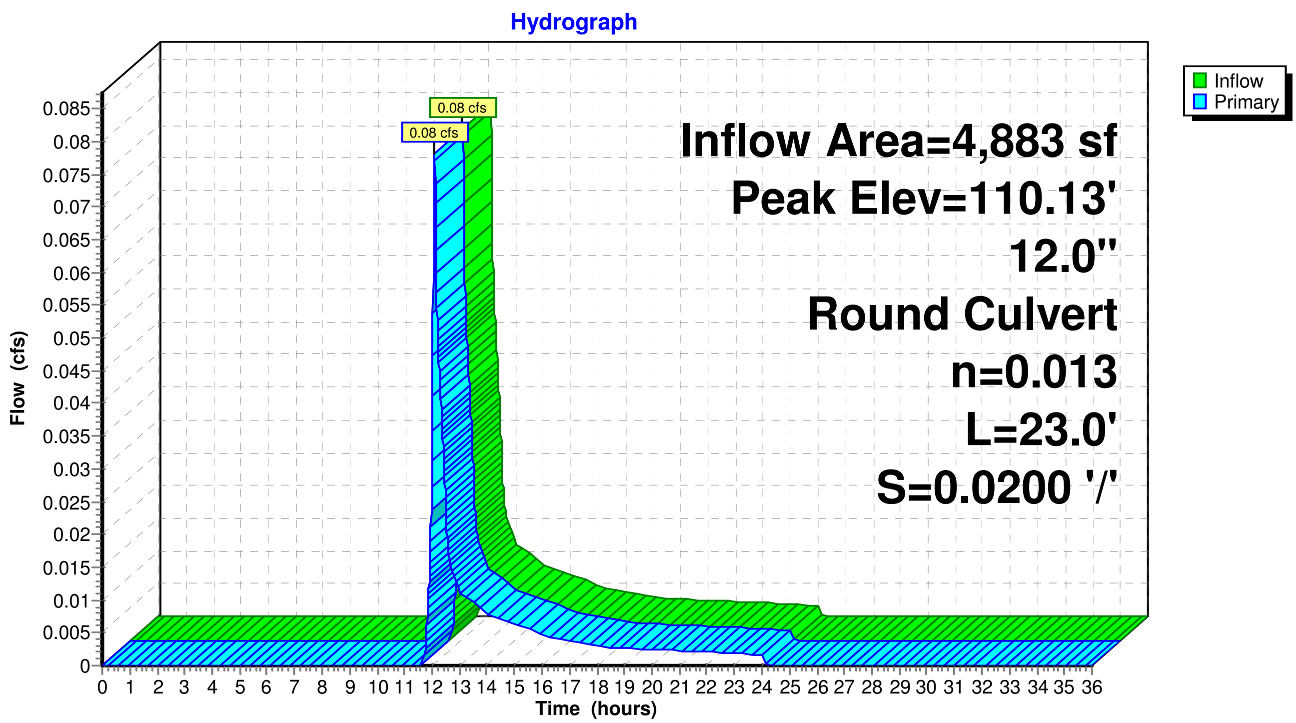
Inflow Area = 4,883 sf, 45.48% Impervious, Inflow Depth = 0.69" for 2-Year event
Inflow = 0.08 cfs @ 12.09 hrs, Volume= 282 cf
Outflow = 0.08 cfs @ 12.09 hrs, Volume= 282 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.08 cfs @ 12.09 hrs, Volume= 282 cf
Routed to Pond 4P : Drain Manhole 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 110.13' @ 12.09 hrs
Flood Elev= 114.64'

Device	Routing	Invert	Outlet Devices
#1	Primary	109.99'	**12.0" Round Culvert** L= 23.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 109.99' / 109.53' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.08 cfs @ 12.09 hrs HW=110.13' TW=109.86' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.08 cfs @ 1.75 fps)

Pond 7P: Catch Basin 7

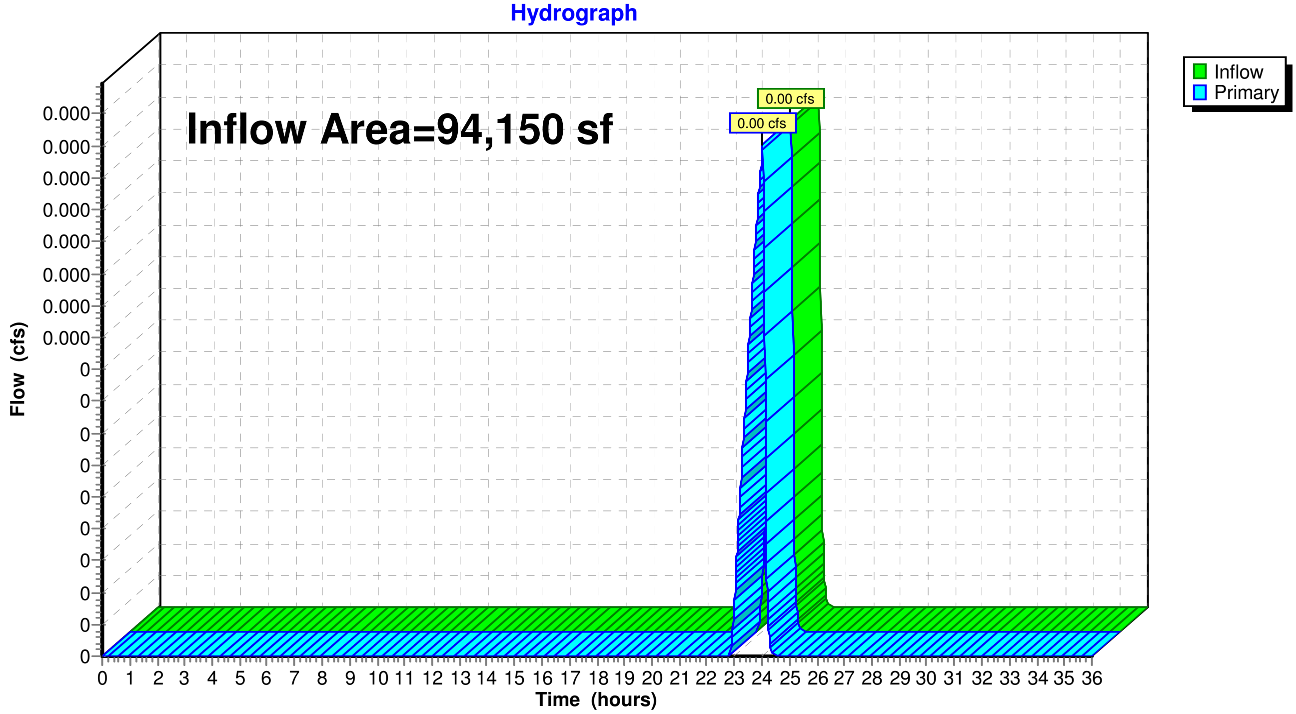


Summary for Link A: Eastern Wetland

Inflow Area = 94,150 sf, 23.93% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 24.02 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 24.02 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link A: Eastern Wetland



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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: Proposed Houses & Runoff Area=58,891 sf 9.20% Impervious Runoff Depth=0.21"
Flow Length=200' Slope=0.1000 '/' Tc=8.0 min CN=38 Runoff=0.05 cfs 1,019 cf

Subcatchment 120: Proposed Pavement to Runoff Area=3,976 sf 69.22% Impervious Runoff Depth=3.08"
Flow Length=110' Tc=3.8 min CN=80 Runoff=0.36 cfs 1,019 cf

Subcatchment 130: Proposed Pavement to Runoff Area=4,883 sf 45.48% Impervious Runoff Depth=1.87"
Flow Length=140' Tc=5.1 min CN=66 Runoff=0.25 cfs 762 cf

Subcatchment 150: Proposed Pavement & Runoff Area=26,400 sf 45.96% Impervious Runoff Depth=1.79"
Flow Length=220' Tc=5.5 min CN=65 Runoff=1.25 cfs 3,949 cf

Pond 1P: SMF 1 - Cultec Infiltration Peak Elev=110.54' Storage=2,540 cf Inflow=1.82 cfs 5,730 cf
Discarded=0.12 cfs 5,731 cf Primary=0.00 cfs 0 cf Outflow=0.12 cfs 5,731 cf

Pond 4P: Drain Manhole 4 Peak Elev=110.54' Inflow=1.82 cfs 5,730 cf
12.0" Round Culvert n=0.013 L=5.0' S=0.0200 '/' Outflow=1.82 cfs 5,730 cf

Pond 5P: Double Catch Basin 5 Peak Elev=110.66' Inflow=1.25 cfs 3,949 cf
12.0" Round Culvert n=0.013 L=24.0' S=0.0200 '/' Outflow=1.25 cfs 3,949 cf

Pond 6P: Catch Basin 6 Peak Elev=110.54' Inflow=0.36 cfs 1,019 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0200 '/' Outflow=0.36 cfs 1,019 cf

Pond 7P: Catch Basin 7 Peak Elev=110.54' Inflow=0.25 cfs 762 cf
12.0" Round Culvert n=0.013 L=23.0' S=0.0200 '/' Outflow=0.25 cfs 762 cf

Link A: Eastern Wetland Inflow=0.05 cfs 1,019 cf
Primary=0.05 cfs 1,019 cf

Total Runoff Area = 94,150 sf Runoff Volume = 6,748 cf Average Runoff Depth = 0.86"
76.07% Pervious = 71,623 sf 23.93% Impervious = 22,527 sf

Summary for Subcatchment 100: Proposed Houses & Off-Site Flow to Wetland

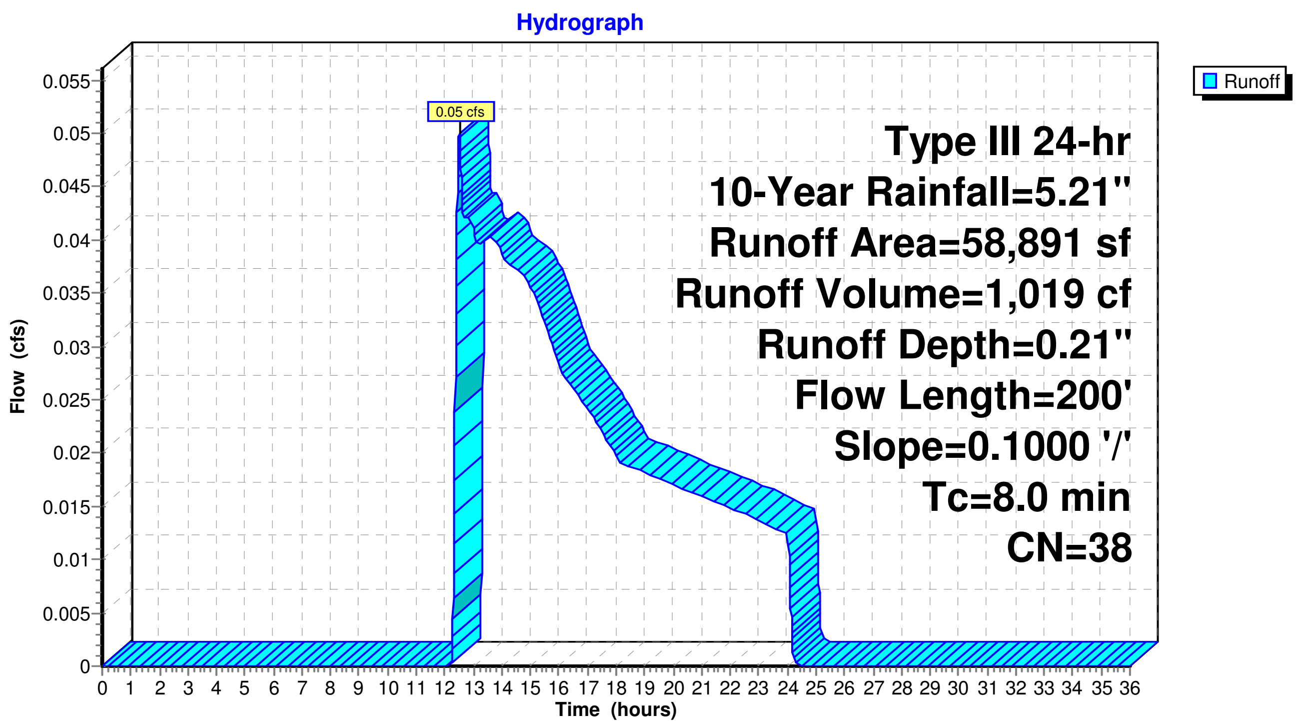
Runoff = 0.05 cfs @ 12.51 hrs, Volume= 1,019 cf, Depth= 0.21"
Routed to Link A : Eastern Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.21"

Area (sf)	CN	Description
43,942	30	Woods, Good, HSG A
9,529	39	>75% Grass cover, Good, HSG A
5,420	98	Paved parking, HSG A
58,891	38	Weighted Average
53,471		90.80% Pervious Area
5,420		9.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.6	150	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.0	200	Total			

Subcatchment 100: Proposed Houses & Off-Site Flow to Wetland



Summary for Subcatchment 120: Proposed Pavement to Catch Basin 6

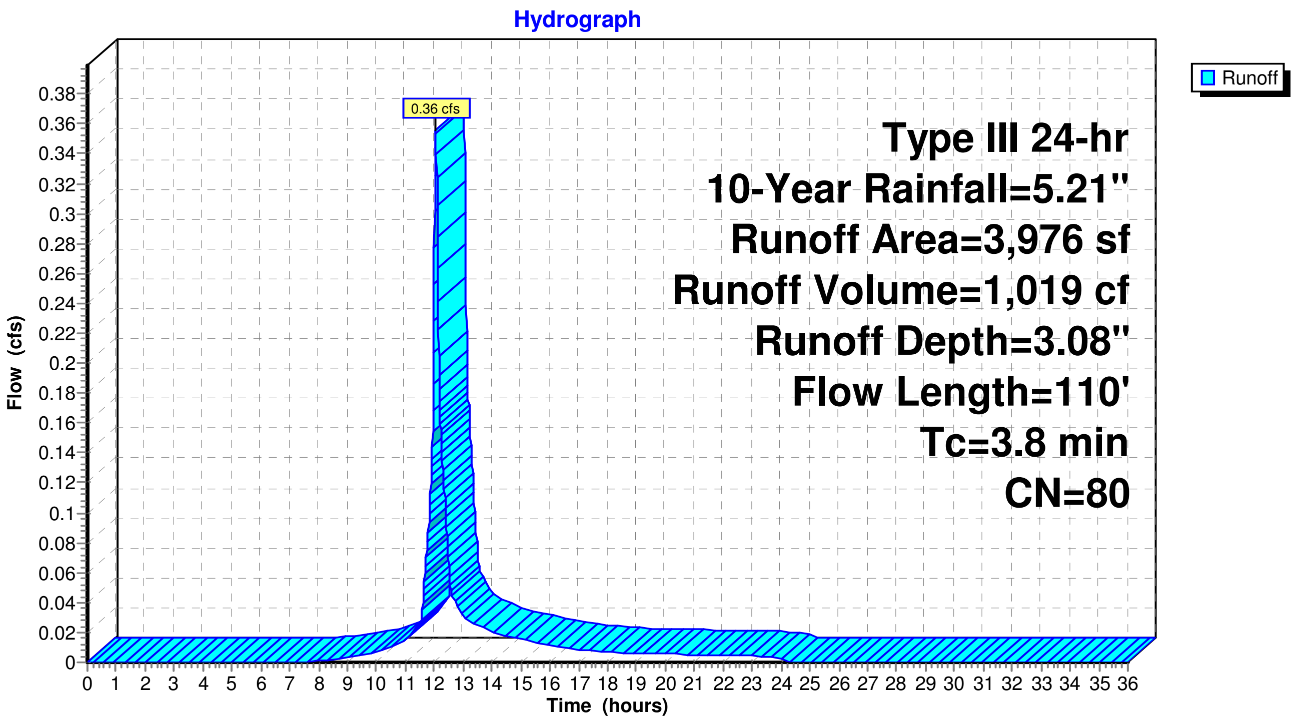
Runoff = 0.36 cfs @ 12.06 hrs, Volume= 1,019 cf, Depth= 3.08"
Routed to Pond 6P : Catch Basin 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.21"

Area (sf)	CN	Description
1,224	39	>75% Grass cover, Good, HSG A
2,752	98	Paved parking, HSG A
3,976	80	Weighted Average
1,224		30.78% Pervious Area
2,752		69.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	35	0.0300	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
0.3	75	0.0340	3.74		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.8	110	Total			

Subcatchment 120: Proposed Pavement to Catch Basin 6



Summary for Subcatchment 130: Proposed Pavement to Catch Basin 7

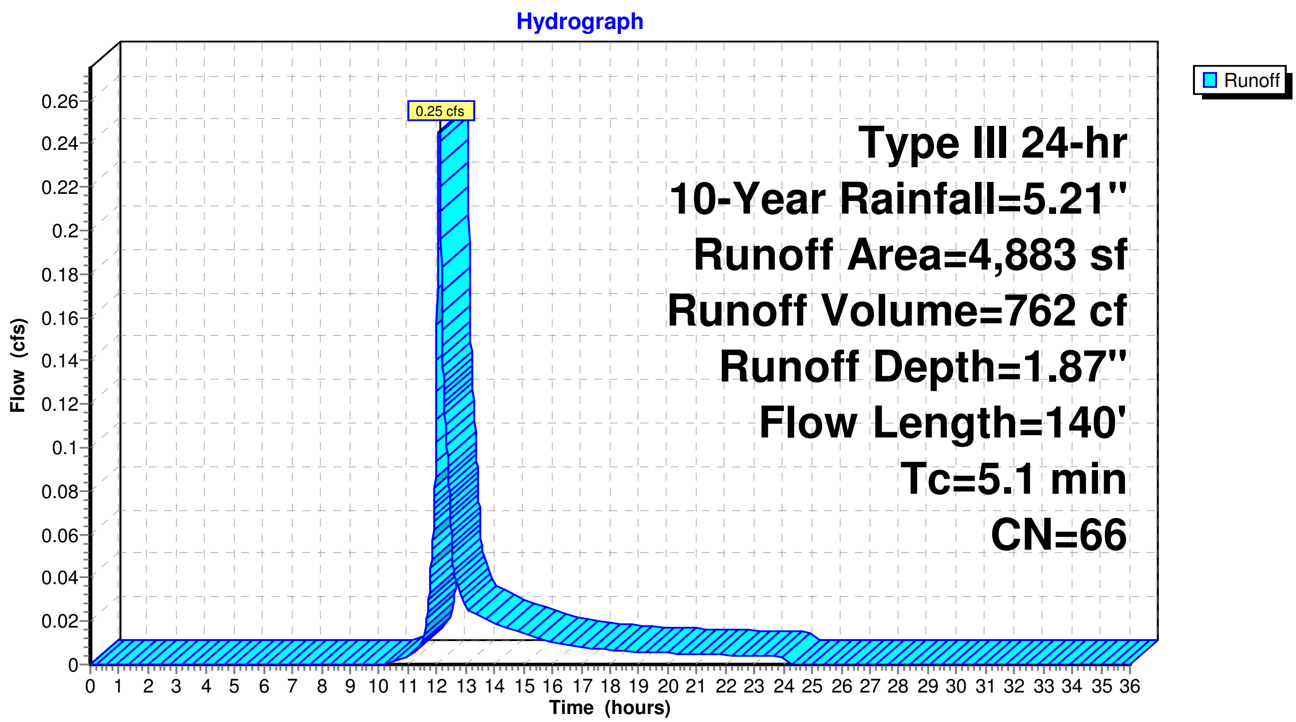
Runoff = 0.25 cfs @ 12.08 hrs, Volume= 762 cf, Depth= 1.87"
Routed to Pond 7P : Catch Basin 7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.21"

Area (sf)	CN	Description
2,662	39	>75% Grass cover, Good, HSG A
2,221	98	Paved parking, HSG A
4,883	66	Weighted Average
2,662		54.52% Pervious Area
2,221		45.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.0300	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
0.1	30	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	60	0.0340	3.74		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.1	140	Total			

Subcatchment 130: Proposed Pavement to Catch Basin 7



Summary for Subcatchment 150: Proposed Pavement & Off-Site Flow to Catch Basin 5

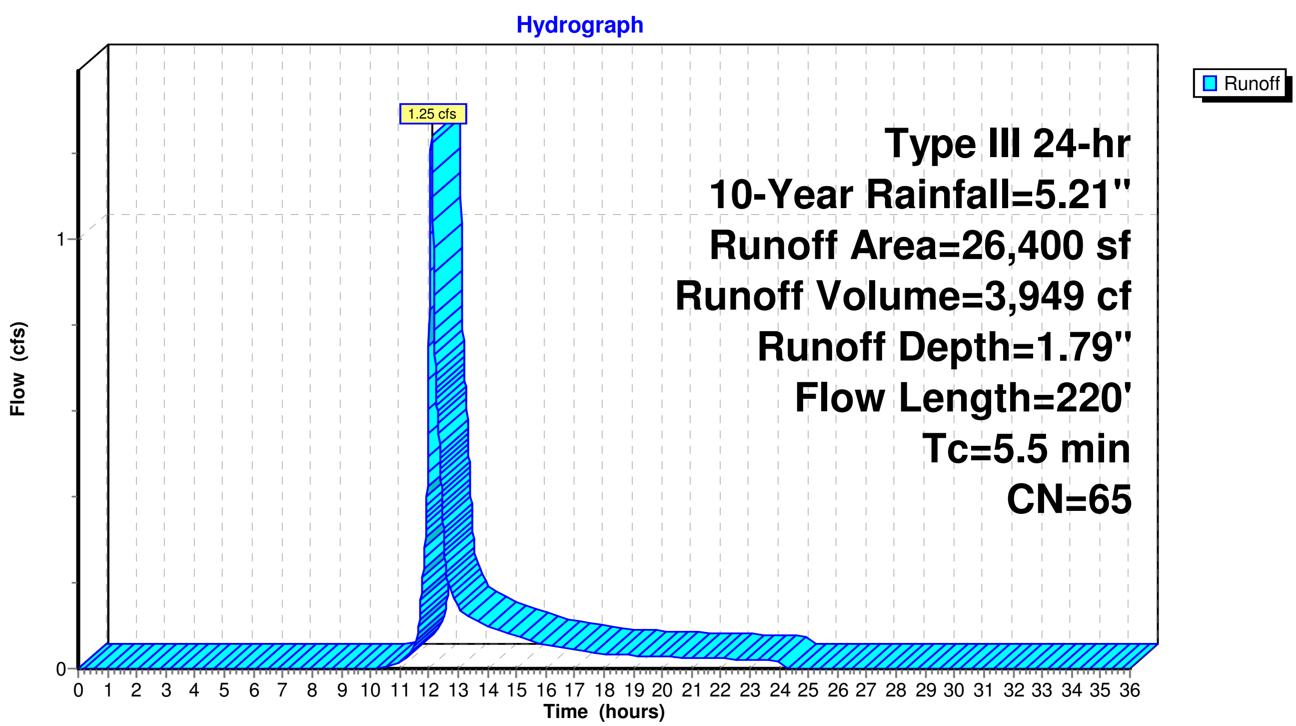
Runoff = 1.25 cfs @ 12.09 hrs, Volume= 3,949 cf, Depth= 1.79"
Routed to Pond 5P : Double Catch Basin 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.21"

Area (sf)	CN	Description
3,591	30	Woods, Good, HSG A
10,675	39	>75% Grass cover, Good, HSG A
12,134	98	Paved parking, HSG A
26,400	65	Weighted Average
14,266		54.04% Pervious Area
12,134		45.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	30	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.6	50	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	140	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.5	220	Total			

Subcatchment 150: Proposed Pavement & Off-Site Flow to Catch Basin 5



Summary for Pond 1P: SMF 1 - Cultec Infiltration Chambers

Inflow Area = 35,259 sf, 48.52% Impervious, Inflow Depth = 1.95" for 10-Year event
Inflow = 1.82 cfs @ 12.08 hrs, Volume= 5,730 cf
Outflow = 0.12 cfs @ 11.75 hrs, Volume= 5,731 cf, Atten= 94%, Lag= 0.0 min
Discarded = 0.12 cfs @ 11.75 hrs, Volume= 5,731 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link A : Eastern Wetland

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 110.54' @ 14.60 hrs Surf.Area= 2,102 sf Storage= 2,540 cf
Flood Elev= 113.48' Surf.Area= 2,102 sf Storage= 4,778 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 220.8 min (1,071.2 - 850.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	108.83'	1,779 cf	**35.33'W x 59.50'L x 3.54'H Field A** 7,446 cf Overall - 2,999 cf Embedded = 4,447 cf x 40.0% Voids
#2A	109.33'	2,999 cf	**Cultec R-330XLHD** x 56 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 7 rows
		4,778 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	108.83'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	111.38'	**6.0" Round Culvert** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 111.38' / 110.76' S= 0.0200 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.12 cfs @ 11.75 hrs HW=108.88' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=108.83' TW=0.00' (Dynamic Tailwater)
2=Culvert (Controls 0.00 cfs)

Pond 1P: SMF 1 - Cultec Infiltration Chambers - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 7 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

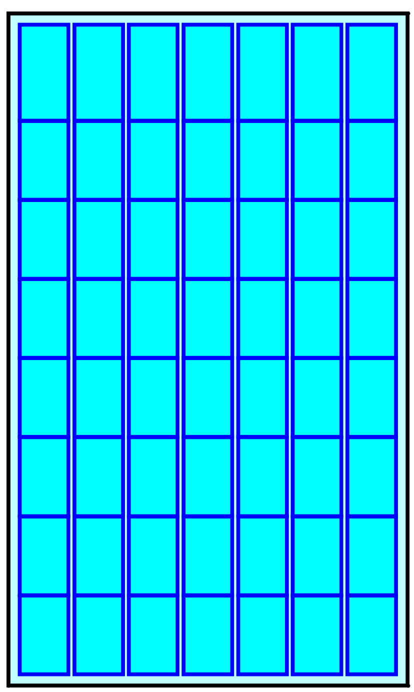
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
7 Rows x 52.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 35.33' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

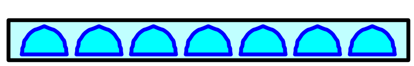
56 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 7 Rows = 2,999.0 cf Chamber Storage

7,445.8 cf Field - 2,999.0 cf Chambers = 4,446.7 cf Stone x 40.0% Voids = 1,778.7 cf Stone Storage

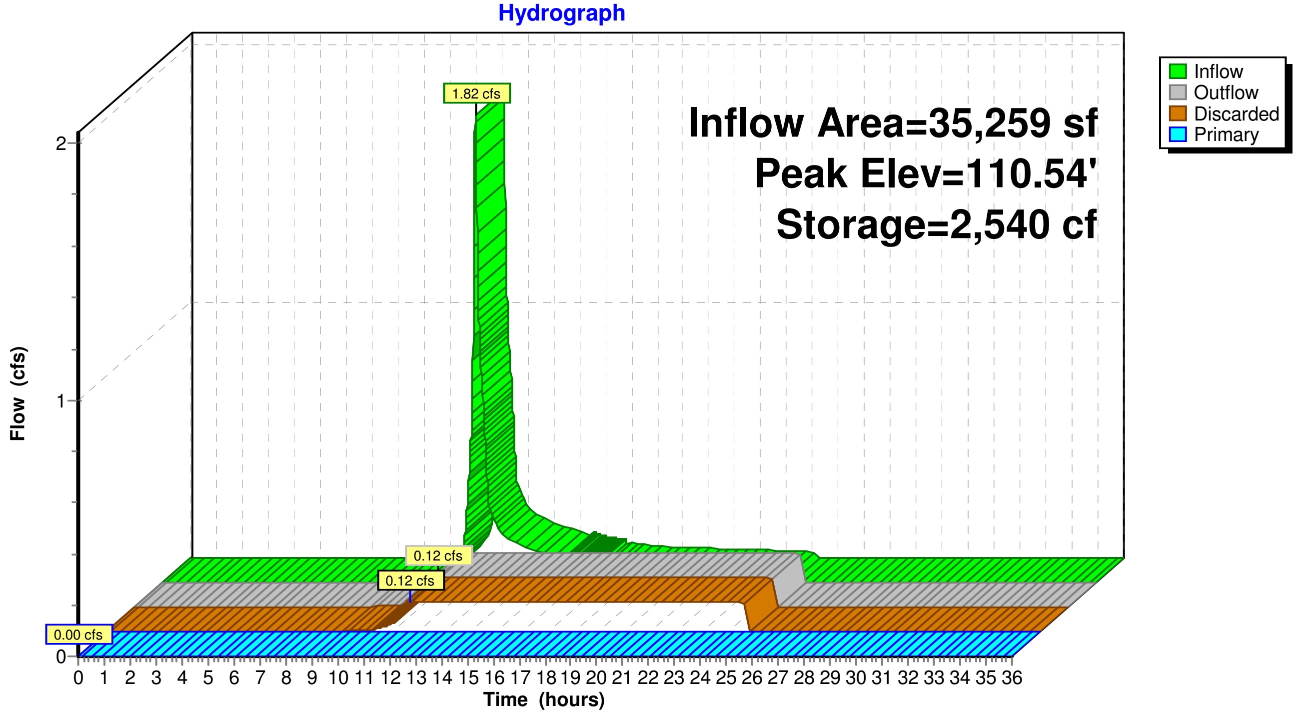
Chamber Storage + Stone Storage = 4,777.7 cf = 0.110 af
Overall Storage Efficiency = 64.2%
Overall System Size = 59.50' x 35.33' x 3.54'

56 Chambers
275.8 cy Field
164.7 cy Stone





Pond 1P: SMF 1 - Cultec Infiltration Chambers



Summary for Pond 4P: Drain Manhole 4

[80] Warning: Exceeded Pond 6P by 0.77' @ 15.80 hrs (1.77 cfs 8,356 cf)

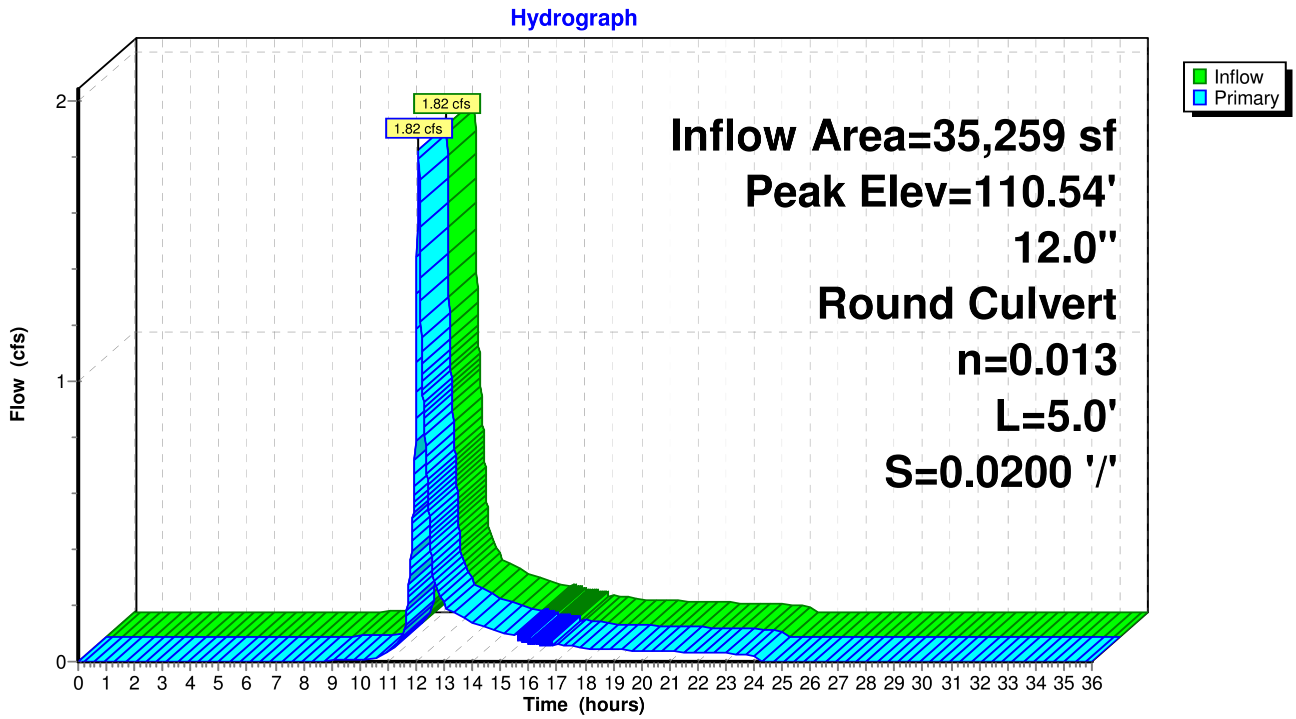
Inflow Area = 35,259 sf, 48.52% Impervious, Inflow Depth = 1.95" for 10-Year event
Inflow = 1.82 cfs @ 12.08 hrs, Volume= 5,730 cf
Outflow = 1.82 cfs @ 12.08 hrs, Volume= 5,730 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.82 cfs @ 12.08 hrs, Volume= 5,730 cf
Routed to Pond 1P : SMF 1 - Cultec Infiltration Chambers

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 110.54' @ 14.61 hrs
Flood Elev= 114.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	109.43'	**12.0" Round Culvert** L= 5.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 109.43' / 109.33' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.82 cfs @ 12.08 hrs HW=110.27' TW=109.55' (Dynamic Tailwater)
1=Culvert (Barrel Controls 1.82 cfs @ 3.50 fps)

Pond 4P: Drain Manhole 4



Summary for Pond 5P: Double Catch Basin 5

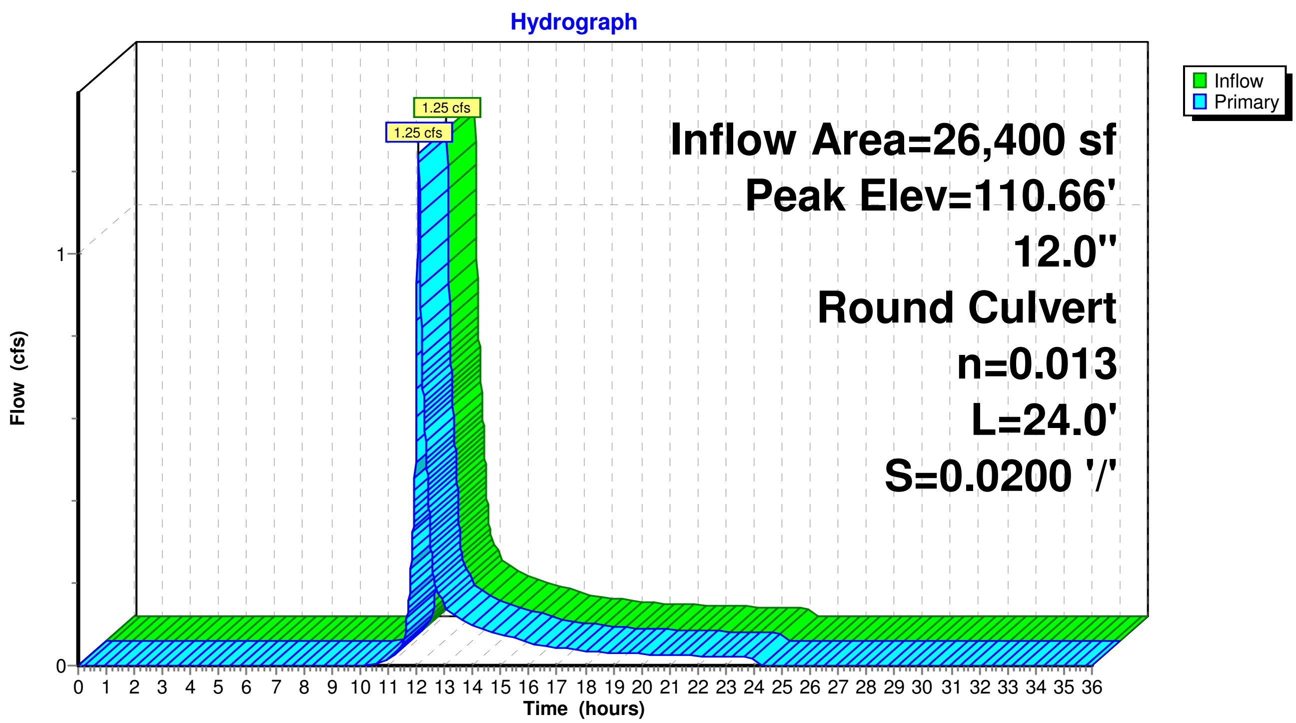
Inflow Area = 26,400 sf, 45.96% Impervious, Inflow Depth = 1.79" for 10-Year event
Inflow = 1.25 cfs @ 12.09 hrs, Volume= 3,949 cf
Outflow = 1.25 cfs @ 12.09 hrs, Volume= 3,949 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.25 cfs @ 12.09 hrs, Volume= 3,949 cf
Routed to Pond 4P : Drain Manhole 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 110.66' @ 12.09 hrs
Flood Elev= 113.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	110.01'	**12.0" Round Culvert** L= 24.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 110.01' / 109.53' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.25 cfs @ 12.09 hrs HW=110.65' TW=110.27' (Dynamic Tailwater)
↑**1=Culvert** (Outlet Controls 1.25 cfs @ 3.31 fps)

Pond 5P: Double Catch Basin 5



Summary for Pond 6P: Catch Basin 6

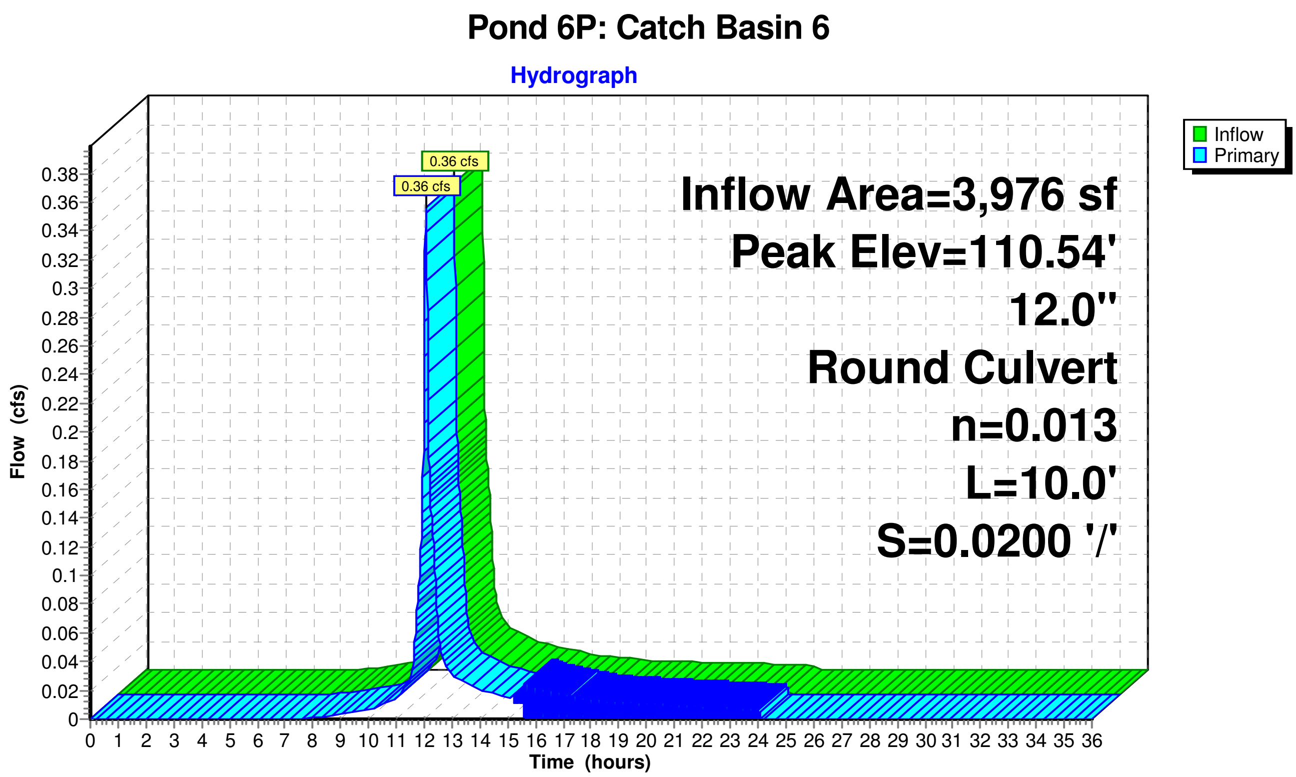
[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=441)

Inflow Area = 3,976 sf, 69.22% Impervious, Inflow Depth = 3.08" for 10-Year event
Inflow = 0.36 cfs @ 12.06 hrs, Volume= 1,019 cf
Outflow = 0.36 cfs @ 12.06 hrs, Volume= 1,019 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.36 cfs @ 12.06 hrs, Volume= 1,019 cf
Routed to Pond 4P : Drain Manhole 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 110.54' @ 14.62 hrs
Flood Elev= 114.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	109.73'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 109.73' / 109.53' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.22 cfs @ 12.06 hrs HW=110.26' TW=110.24' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.22 cfs @ 0.77 fps)



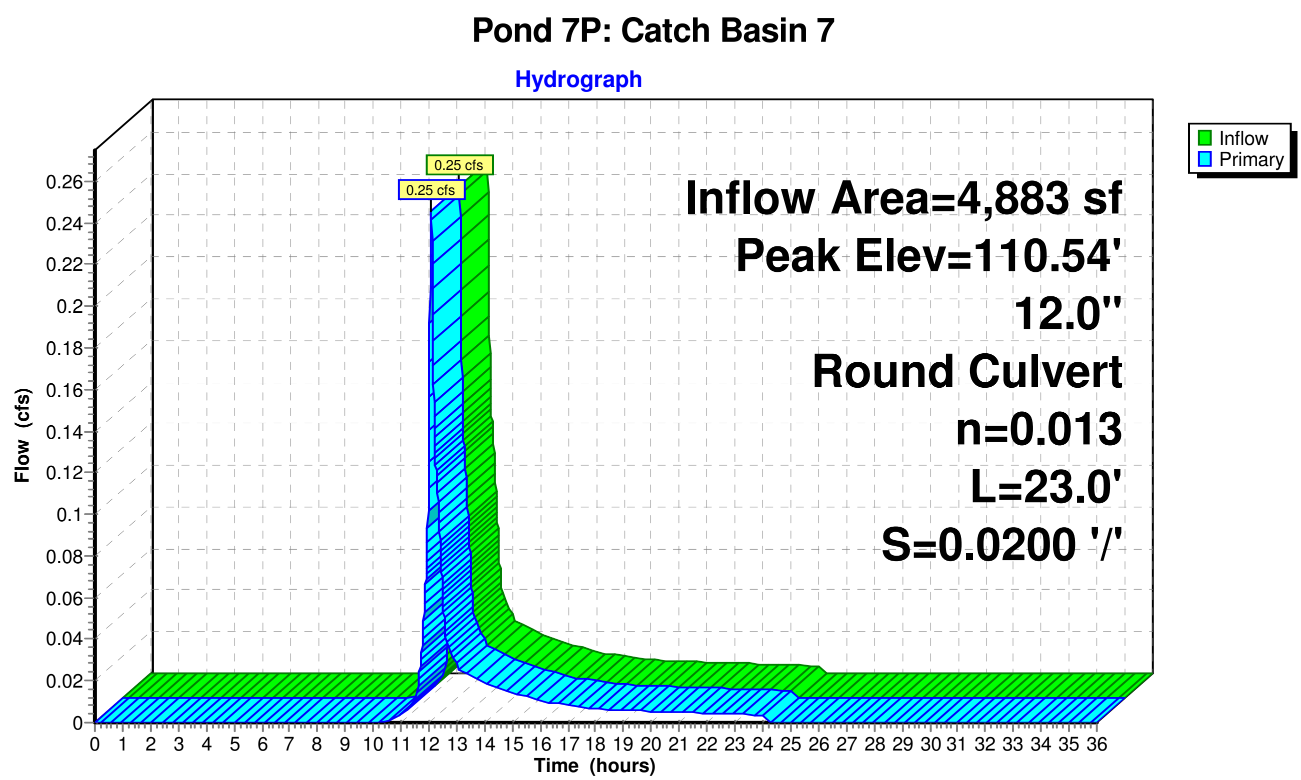
Summary for Pond 7P: Catch Basin 7

Inflow Area = 4,883 sf, 45.48% Impervious, Inflow Depth = 1.87" for 10-Year event
Inflow = 0.25 cfs @ 12.08 hrs, Volume= 762 cf
Outflow = 0.25 cfs @ 12.08 hrs, Volume= 762 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.25 cfs @ 12.08 hrs, Volume= 762 cf
Routed to Pond 4P : Drain Manhole 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 110.54' @ 14.62 hrs
Flood Elev= 114.64'

Device	Routing	Invert	Outlet Devices
#1	Primary	109.99'	**12.0" Round Culvert** L= 23.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 109.99' / 109.53' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.24 cfs @ 12.08 hrs HW=110.35' TW=110.27' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.24 cfs @ 1.38 fps)

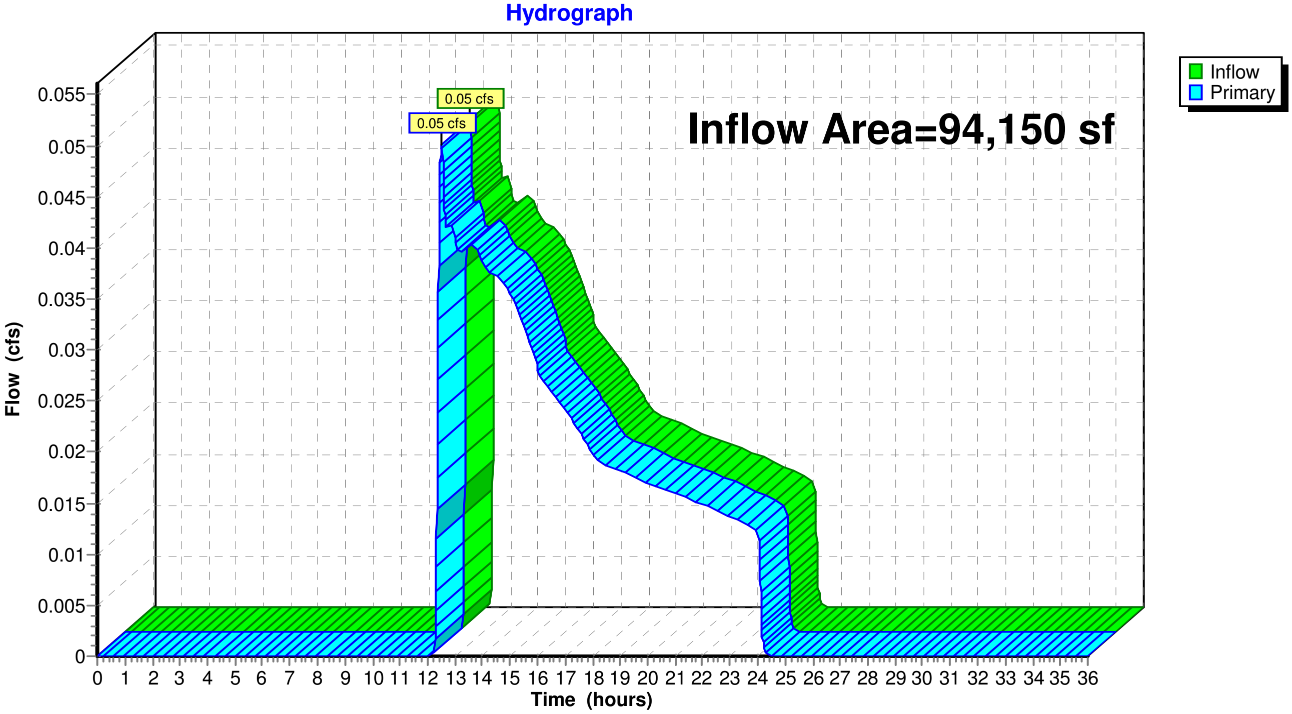


Summary for Link A: Eastern Wetland

Inflow Area =	94,150 sf,	23.93% Impervious,	Inflow Depth = 0.13"	for 10-Year event
Inflow =	0.05 cfs @	12.51 hrs, Volume=	1,019 cf	
Primary =	0.05 cfs @	12.51 hrs, Volume=	1,019 cf,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link A: Eastern Wetland



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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: Proposed Houses & Runoff Area=58,891 sf 9.20% Impervious Runoff Depth=0.50"
Flow Length=200' Slope=0.1000 '/' Tc=8.0 min CN=38 Runoff=0.28 cfs 2,468 cf

Subcatchment 120: Proposed Pavement to Runoff Area=3,976 sf 69.22% Impervious Runoff Depth=4.13"
Flow Length=110' Tc=3.8 min CN=80 Runoff=0.48 cfs 1,370 cf

Subcatchment 130: Proposed Pavement to Runoff Area=4,883 sf 45.48% Impervious Runoff Depth=2.73"
Flow Length=140' Tc=5.1 min CN=66 Runoff=0.37 cfs 1,112 cf

Subcatchment 150: Proposed Pavement & Runoff Area=26,400 sf 45.96% Impervious Runoff Depth=2.64"
Flow Length=220' Tc=5.5 min CN=65 Runoff=1.88 cfs 5,805 cf

Pond 1P: SMF 1 - Cultec Infiltration Peak Elev=111.54' Storage=4,026 cf Inflow=2.69 cfs 8,282 cf
Discarded=0.12 cfs 7,823 cf Primary=0.07 cfs 461 cf Outflow=0.19 cfs 8,284 cf

Pond 4P: Drain Manhole 4 Peak Elev=111.54' Inflow=2.69 cfs 8,282 cf
12.0" Round Culvert n=0.013 L=5.0' S=0.0200 '/' Outflow=2.69 cfs 8,282 cf

Pond 5P: Double Catch Basin 5 Peak Elev=111.54' Inflow=1.88 cfs 5,805 cf
12.0" Round Culvert n=0.013 L=24.0' S=0.0200 '/' Outflow=1.88 cfs 5,805 cf

Pond 6P: Catch Basin 6 Peak Elev=111.54' Inflow=0.48 cfs 1,370 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0200 '/' Outflow=0.48 cfs 1,367 cf

Pond 7P: Catch Basin 7 Peak Elev=111.54' Inflow=0.37 cfs 1,112 cf
12.0" Round Culvert n=0.013 L=23.0' S=0.0200 '/' Outflow=0.37 cfs 1,110 cf

Link A: Eastern Wetland Inflow=0.28 cfs 2,928 cf
Primary=0.28 cfs 2,928 cf

Total Runoff Area = 94,150 sf Runoff Volume = 10,755 cf Average Runoff Depth = 1.37"
76.07% Pervious = 71,623 sf 23.93% Impervious = 22,527 sf

Summary for Subcatchment 100: Proposed Houses & Off-Site Flow to Wetland

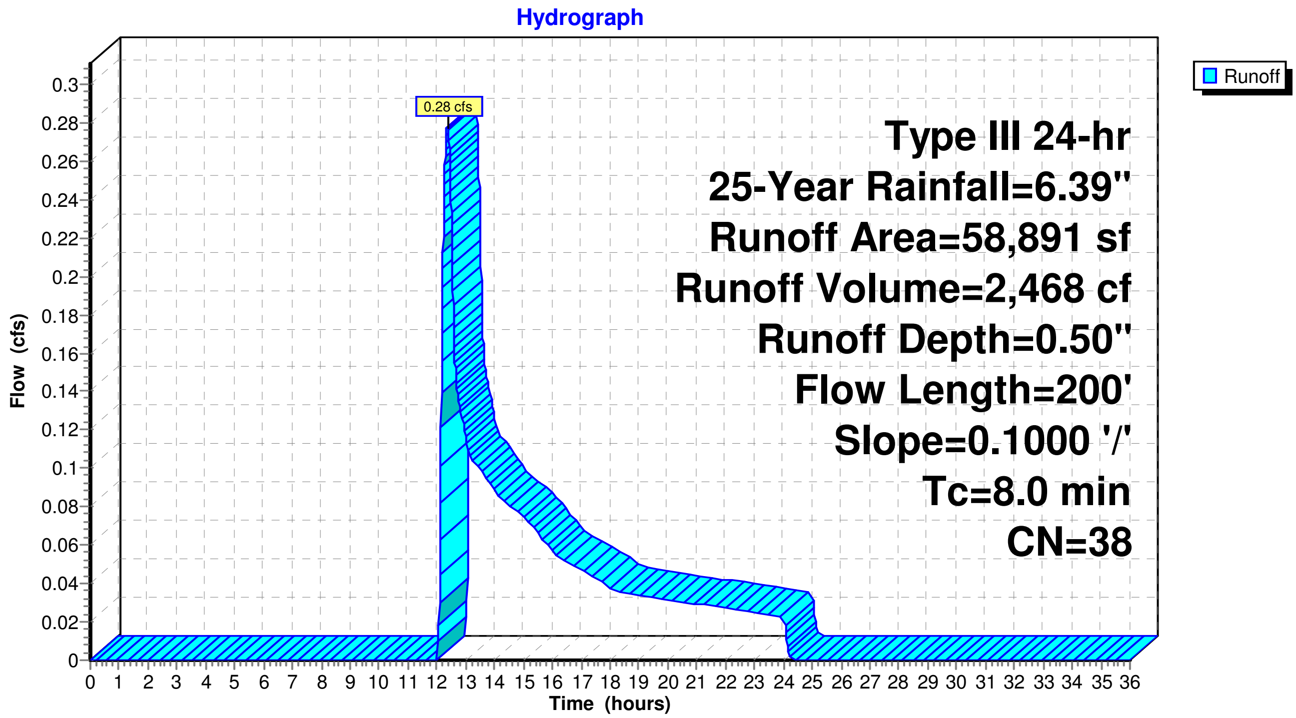
Runoff = 0.28 cfs @ 12.36 hrs, Volume= 2,468 cf, Depth= 0.50"
Routed to Link A : Eastern Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.39"

Area (sf)	CN	Description
43,942	30	Woods, Good, HSG A
9,529	39	>75% Grass cover, Good, HSG A
5,420	98	Paved parking, HSG A
58,891	38	Weighted Average
53,471		90.80% Pervious Area
5,420		9.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.6	150	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.0	200	Total			

Subcatchment 100: Proposed Houses & Off-Site Flow to Wetland



Summary for Subcatchment 120: Proposed Pavement to Catch Basin 6

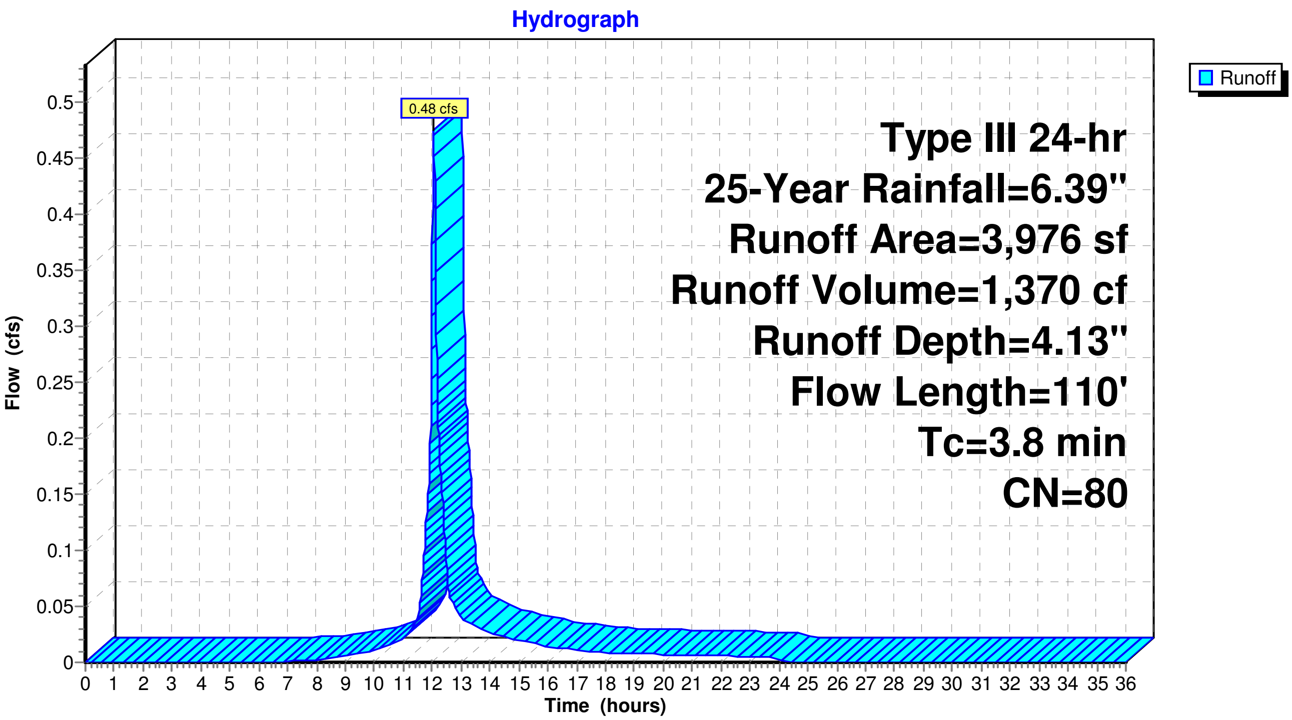
Runoff = 0.48 cfs @ 12.06 hrs, Volume= 1,370 cf, Depth= 4.13"
Routed to Pond 6P : Catch Basin 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.39"

Area (sf)	CN	Description
1,224	39	>75% Grass cover, Good, HSG A
2,752	98	Paved parking, HSG A
3,976	80	Weighted Average
1,224		30.78% Pervious Area
2,752		69.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	35	0.0300	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
0.3	75	0.0340	3.74		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.8	110	Total			

Subcatchment 120: Proposed Pavement to Catch Basin 6



Summary for Subcatchment 130: Proposed Pavement to Catch Basin 7

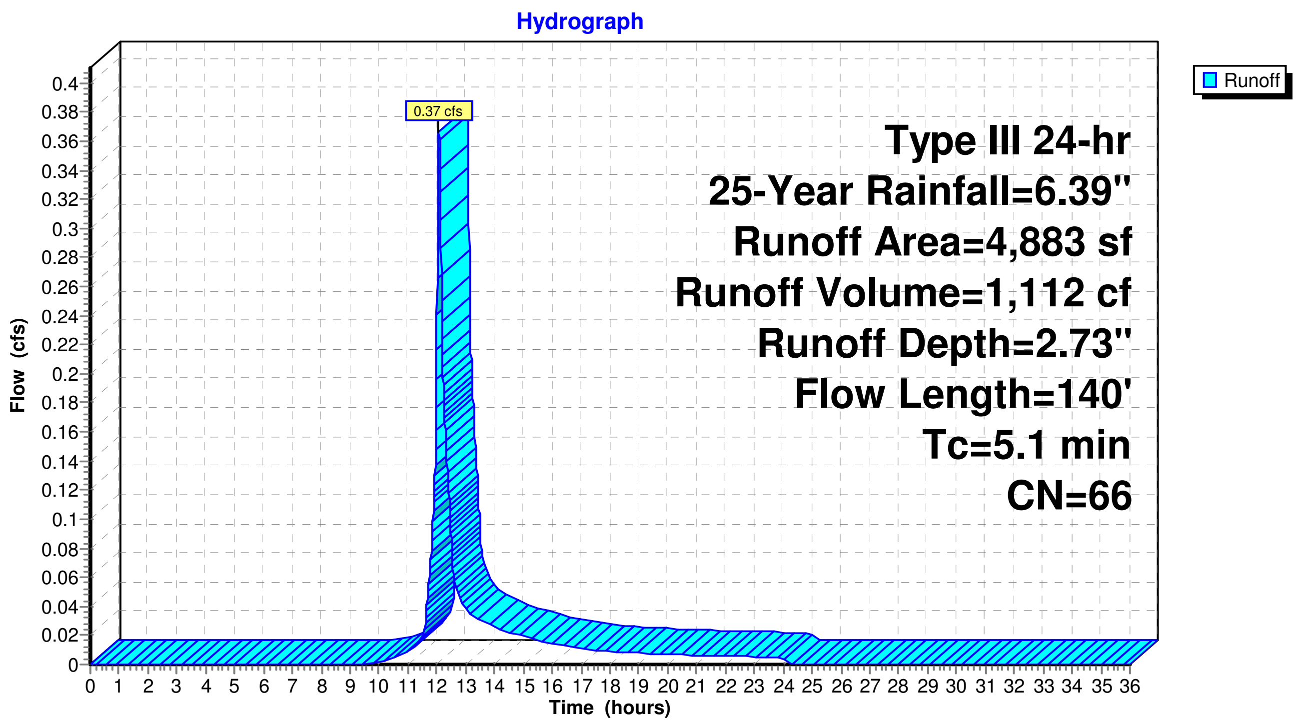
Runoff = 0.37 cfs @ 12.08 hrs, Volume= 1,112 cf, Depth= 2.73"
Routed to Pond 7P : Catch Basin 7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.39"

Area (sf)	CN	Description
2,662	39	>75% Grass cover, Good, HSG A
2,221	98	Paved parking, HSG A
4,883	66	Weighted Average
2,662		54.52% Pervious Area
2,221		45.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.0300	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
0.1	30	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	60	0.0340	3.74		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.1	140	Total			

Subcatchment 130: Proposed Pavement to Catch Basin 7



Summary for Subcatchment 150: Proposed Pavement & Off-Site Flow to Catch Basin 5

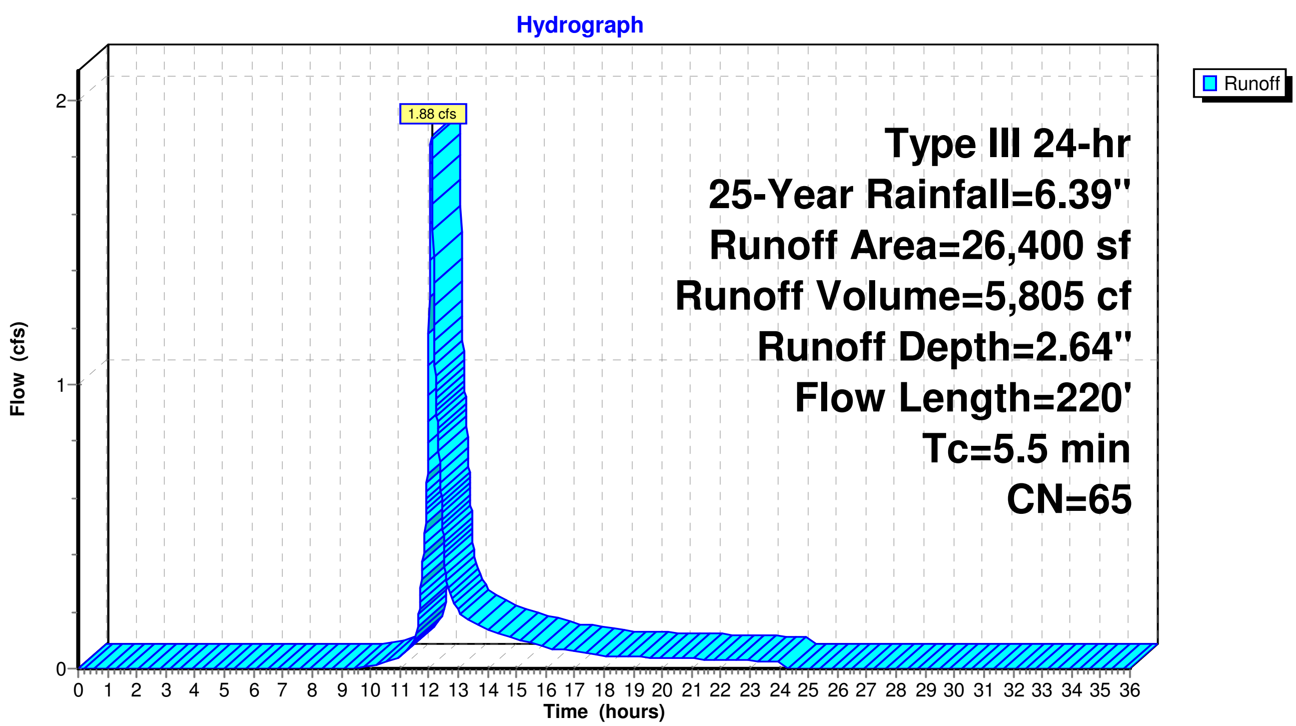
Runoff = 1.88 cfs @ 12.09 hrs, Volume= 5,805 cf, Depth= 2.64"
Routed to Pond 5P : Double Catch Basin 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.39"

Area (sf)	CN	Description
3,591	30	Woods, Good, HSG A
10,675	39	>75% Grass cover, Good, HSG A
12,134	98	Paved parking, HSG A
26,400	65	Weighted Average
14,266		54.04% Pervious Area
12,134		45.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	30	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.6	50	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	140	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.5	220	Total			

Subcatchment 150: Proposed Pavement & Off-Site Flow to Catch Basin 5



Summary for Pond 1P: SMF 1 - Cultec Infiltration Chambers

[80] Warning: Exceeded Pond 4P by 0.84' @ 24.17 hrs (1.82 cfs 3,361 cf)

Inflow Area = 35,259 sf, 48.52% Impervious, Inflow Depth = 2.82" for 25-Year event
Inflow = 2.69 cfs @ 12.08 hrs, Volume= 8,282 cf
Outflow = 0.19 cfs @ 13.96 hrs, Volume= 8,284 cf, Atten= 93%, Lag= 112.7 min
Discarded = 0.12 cfs @ 11.61 hrs, Volume= 7,823 cf
Primary = 0.07 cfs @ 13.96 hrs, Volume= 461 cf
Routed to Link A : Eastern Wetland

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 111.54' @ 13.96 hrs Surf.Area= 2,102 sf Storage= 4,026 cf
Flood Elev= 113.48' Surf.Area= 2,102 sf Storage= 4,778 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 330.8 min (1,170.5 - 839.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	108.83'	1,779 cf	**35.33'W x 59.50'L x 3.54'H Field A** 7,446 cf Overall - 2,999 cf Embedded = 4,447 cf x 40.0% Voids
#2A	109.33'	2,999 cf	**Cultec R-330XLHD** x 56 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 7 rows
		4,778 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	108.83'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	111.38'	**6.0" Round Culvert** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 111.38' / 110.76' S= 0.0200 '/' Cc= 0.900 n= 0.011 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.12 cfs @ 11.61 hrs HW=108.88' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.07 cfs @ 13.96 hrs HW=111.54' TW=0.00' (Dynamic Tailwater)
2=Culvert (Inlet Controls 0.07 cfs @ 1.35 fps)

Pond 1P: SMF 1 - Cultec Infiltration Chambers - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 7 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

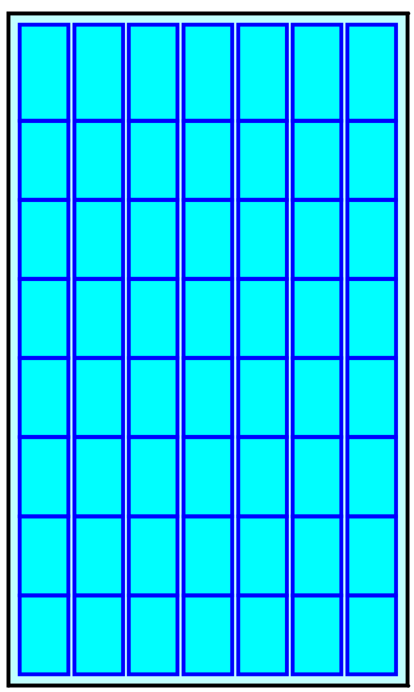
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
7 Rows x 52.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 35.33' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

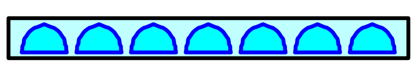
56 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 7 Rows = 2,999.0 cf Chamber Storage

7,445.8 cf Field - 2,999.0 cf Chambers = 4,446.7 cf Stone x 40.0% Voids = 1,778.7 cf Stone Storage

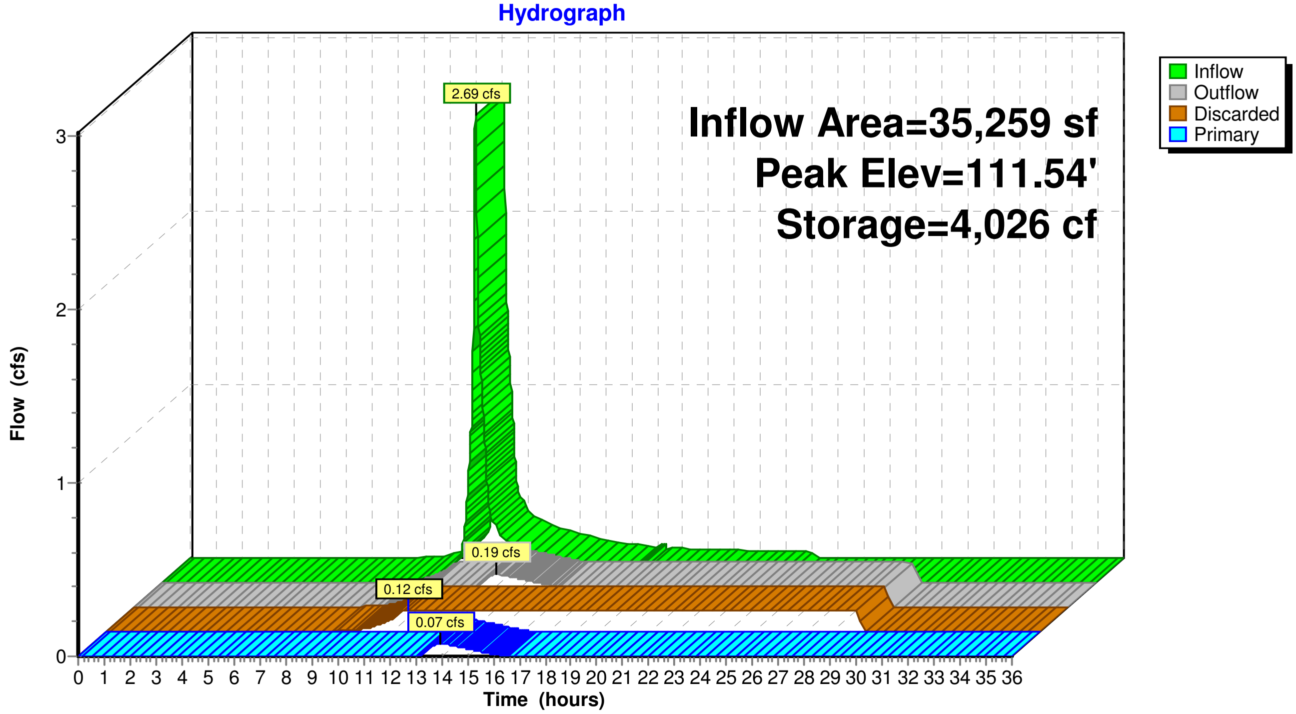
Chamber Storage + Stone Storage = 4,777.7 cf = 0.110 af
Overall Storage Efficiency = 64.2%
Overall System Size = 59.50' x 35.33' x 3.54'

56 Chambers
275.8 cy Field
164.7 cy Stone





Pond 1P: SMF 1 - Cultec Infiltration Chambers



Summary for Pond 4P: Drain Manhole 4

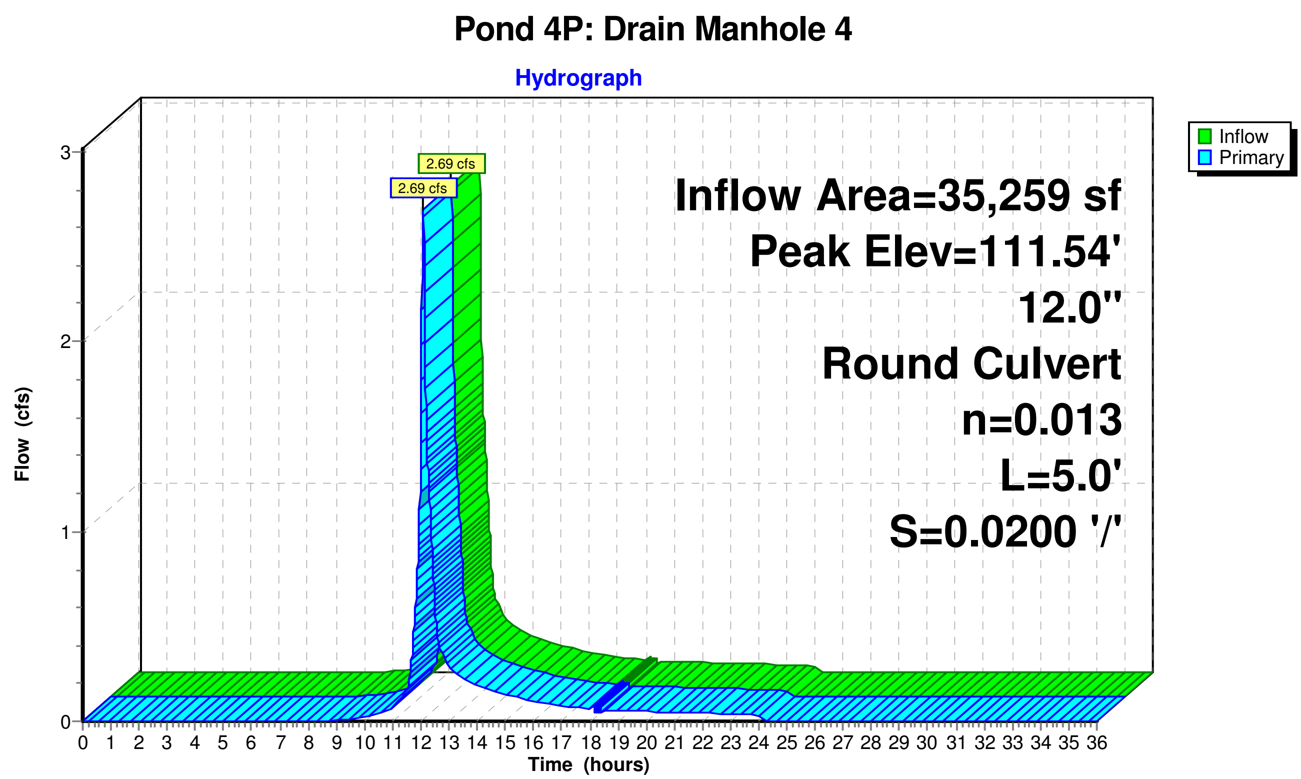
[80] Warning: Exceeded Pond 5P by 0.22' @ 24.30 hrs (0.15 cfs 482 cf)
[80] Warning: Exceeded Pond 6P by 1.74' @ 15.54 hrs (4.22 cfs 22,826 cf)
[80] Warning: Exceeded Pond 7P by 1.50' @ 15.25 hrs (3.78 cfs 22,753 cf)

Inflow Area = 35,259 sf, 48.52% Impervious, Inflow Depth = 2.82" for 25-Year event
Inflow = 2.69 cfs @ 12.08 hrs, Volume= 8,282 cf
Outflow = 2.69 cfs @ 12.08 hrs, Volume= 8,282 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.69 cfs @ 12.08 hrs, Volume= 8,282 cf
Routed to Pond 1P : SMF 1 - Cultec Infiltration Chambers

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 111.54' @ 13.96 hrs
Flood Elev= 114.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	109.43'	**12.0" Round Culvert** L= 5.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 109.43' / 109.33' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.69 cfs @ 12.08 hrs HW=110.54' TW=109.89' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 2.69 cfs @ 3.87 fps)



Summary for Pond 5P: Double Catch Basin 5

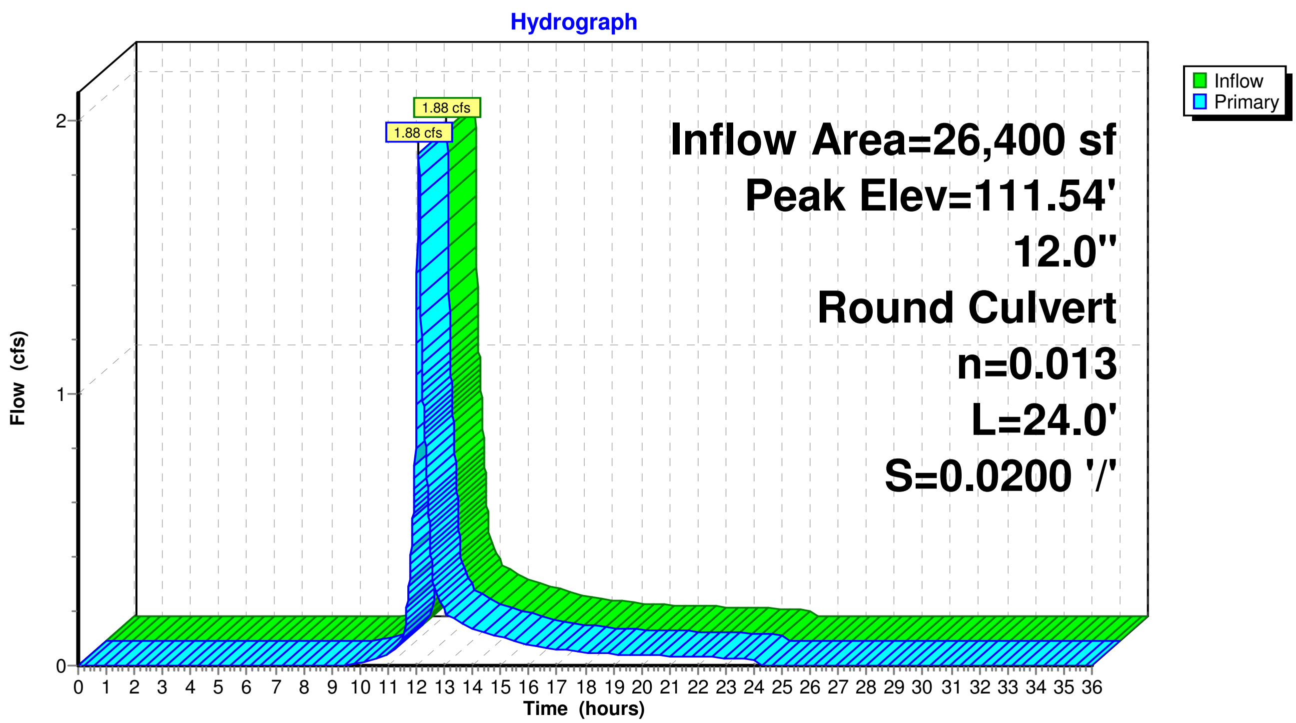
Inflow Area = 26,400 sf, 45.96% Impervious, Inflow Depth = 2.64" for 25-Year event
Inflow = 1.88 cfs @ 12.09 hrs, Volume= 5,805 cf
Outflow = 1.88 cfs @ 12.09 hrs, Volume= 5,805 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.88 cfs @ 12.09 hrs, Volume= 5,805 cf
Routed to Pond 4P : Drain Manhole 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 111.54' @ 13.97 hrs
Flood Elev= 113.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	110.01'	**12.0" Round Culvert** L= 24.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 110.01' / 109.53' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.88 cfs @ 12.09 hrs HW=110.90' TW=110.53' (Dynamic Tailwater)
1=Culvert (Outlet Controls 1.88 cfs @ 3.36 fps)

Pond 5P: Double Catch Basin 5



Summary for Pond 6P: Catch Basin 6

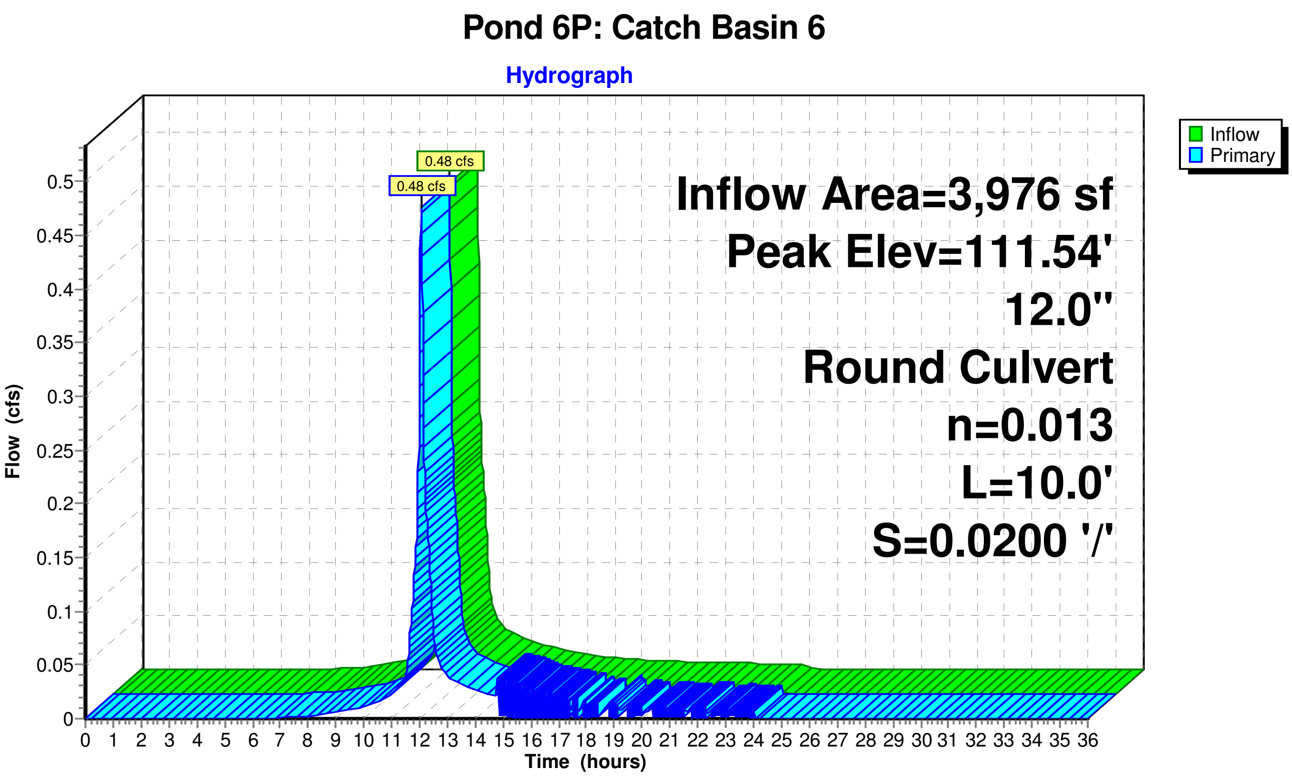
[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=428)

Inflow Area = 3,976 sf, 69.22% Impervious, Inflow Depth = 4.13" for 25-Year event
Inflow = 0.48 cfs @ 12.06 hrs, Volume= 1,370 cf
Outflow = 0.48 cfs @ 12.06 hrs, Volume= 1,367 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.48 cfs @ 12.06 hrs, Volume= 1,367 cf
Routed to Pond 4P : Drain Manhole 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 111.54' @ 13.97 hrs
Flood Elev= 114.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	109.73'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 109.73' / 109.53' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.06 hrs HW=110.49' TW=110.50' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)



Summary for Pond 7P: Catch Basin 7

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=456)

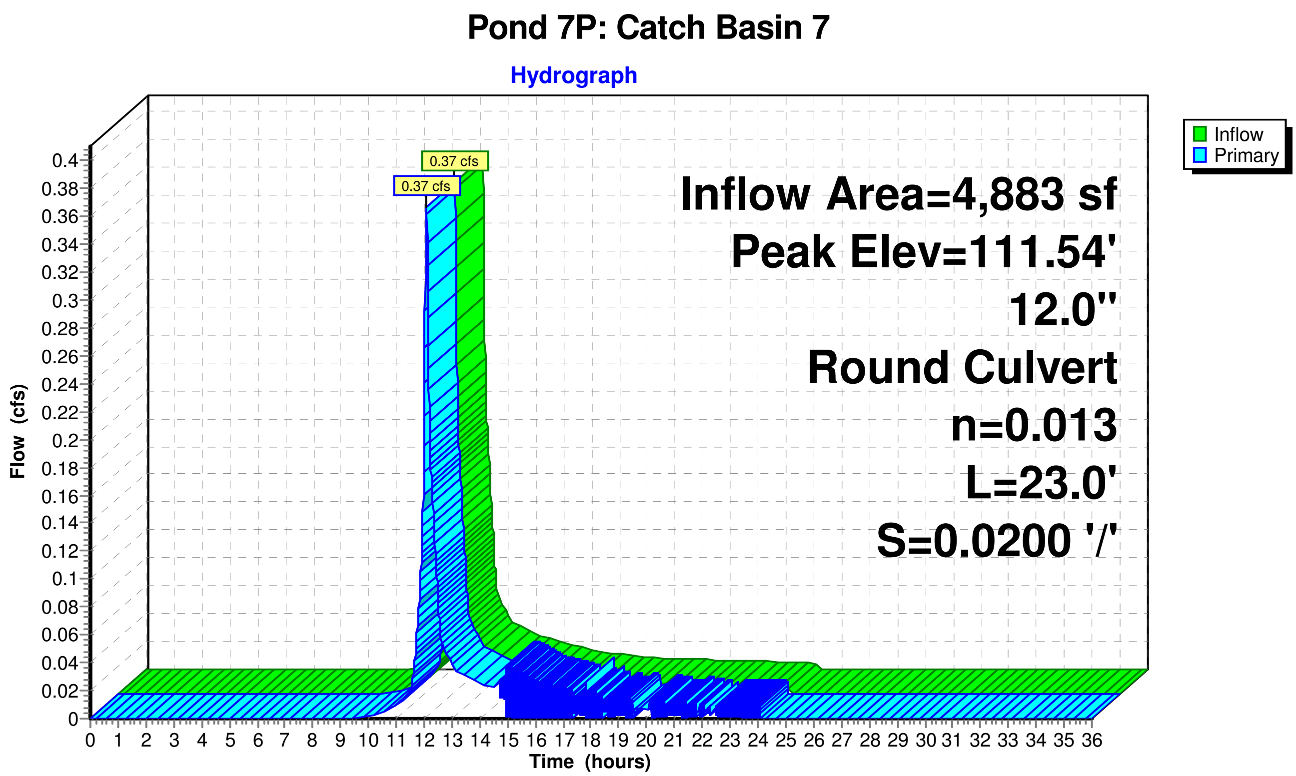
Inflow Area =	4,883 sf,	45.48% Impervious,	Inflow Depth = 2.73"	for 25-Year event
Inflow =	0.37 cfs @	12.08 hrs, Volume=	1,112 cf	
Outflow =	0.37 cfs @	12.08 hrs, Volume=	1,110 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.37 cfs @	12.08 hrs, Volume=	1,110 cf	

Routed to Pond 4P : Drain Manhole 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 111.54' @ 13.97 hrs
Flood Elev= 114.64'

Device	Routing	Invert	Outlet Devices
#1	Primary	109.99'	**12.0" Round Culvert** L= 23.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 109.99' / 109.53' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.34 cfs @ 12.08 hrs HW=110.57' TW=110.54' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.34 cfs @ 1.02 fps)

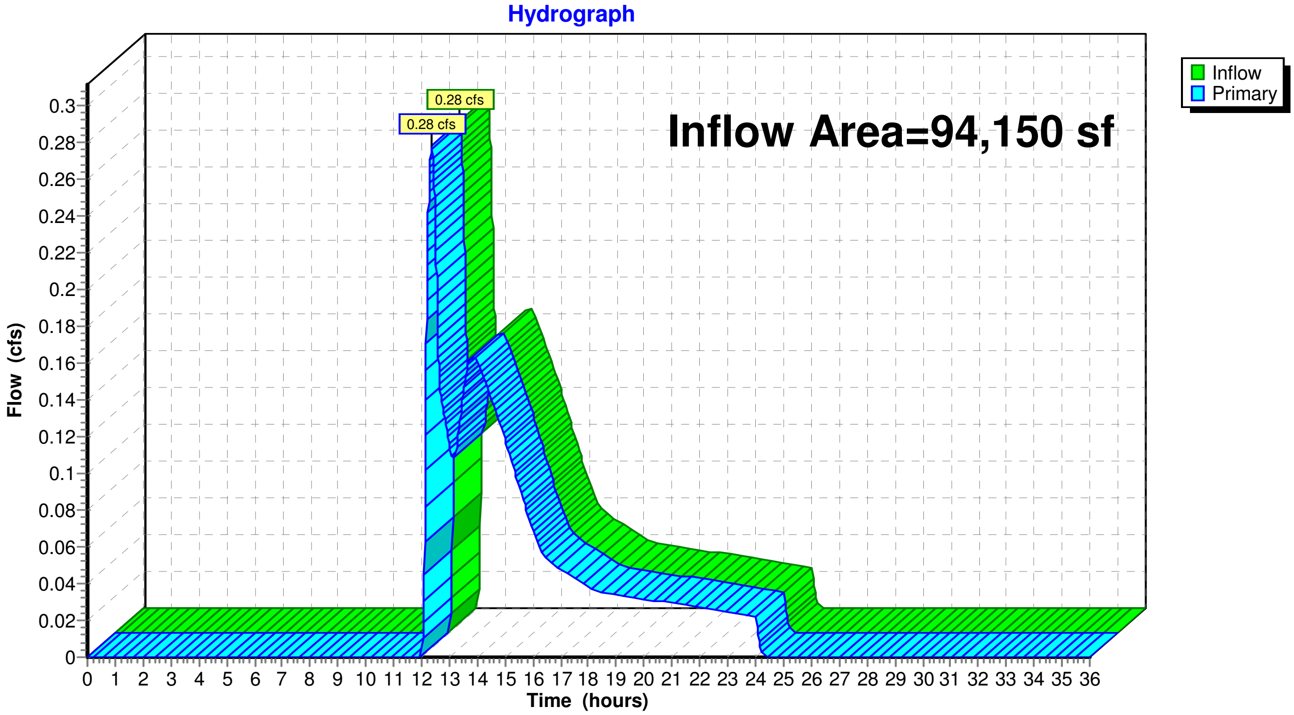


Summary for Link A: Eastern Wetland

Inflow Area =	94,150 sf, 23.93% Impervious,	Inflow Depth = 0.37"	for 25-Year event
Inflow =	0.28 cfs @ 12.36 hrs, Volume=	2,928 cf	
Primary =	0.28 cfs @ 12.36 hrs, Volume=	2,928 cf, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link A: Eastern Wetland



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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: Proposed Houses & Runoff Area=58,891 sf 9.20% Impervious Runoff Depth=1.16"
Flow Length=200' Slope=0.1000 '/' Tc=8.0 min CN=38 Runoff=1.07 cfs 5,668 cf

Subcatchment 120: Proposed Pavement to Runoff Area=3,976 sf 69.22% Impervious Runoff Depth=5.83"
Flow Length=110' Tc=3.8 min CN=80 Runoff=0.66 cfs 1,932 cf

Subcatchment 130: Proposed Pavement to Runoff Area=4,883 sf 45.48% Impervious Runoff Depth=4.19"
Flow Length=140' Tc=5.1 min CN=66 Runoff=0.57 cfs 1,704 cf

Subcatchment 150: Proposed Pavement & Runoff Area=26,400 sf 45.96% Impervious Runoff Depth=4.07"
Flow Length=220' Tc=5.5 min CN=65 Runoff=2.94 cfs 8,960 cf

Pond 1P: SMF 1 - Cultec Infiltration Peak Elev=113.46' Storage=4,778 cf Inflow=4.13 cfs 12,592 cf
Discarded=0.12 cfs 8,789 cf Primary=1.28 cfs 3,806 cf Outflow=1.40 cfs 12,594 cf

Pond 4P: Drain Manhole 4 Peak Elev=113.56' Inflow=4.13 cfs 12,592 cf
12.0" Round Culvert n=0.013 L=5.0' S=0.0200 '/' Outflow=4.13 cfs 12,592 cf

Pond 5P: Double Catch Basin 5 Peak Elev=113.61' Inflow=2.94 cfs 8,960 cf
12.0" Round Culvert n=0.013 L=24.0' S=0.0200 '/' Outflow=2.94 cfs 8,960 cf

Pond 6P: Catch Basin 6 Peak Elev=113.56' Inflow=0.66 cfs 1,932 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0200 '/' Outflow=0.66 cfs 1,929 cf

Pond 7P: Catch Basin 7 Peak Elev=113.56' Inflow=0.57 cfs 1,704 cf
12.0" Round Culvert n=0.013 L=23.0' S=0.0200 '/' Outflow=0.57 cfs 1,703 cf

Link A: Eastern Wetland Inflow=2.00 cfs 9,474 cf
Primary=2.00 cfs 9,474 cf

Total Runoff Area = 94,150 sf Runoff Volume = 18,265 cf Average Runoff Depth = 2.33"
76.07% Pervious = 71,623 sf 23.93% Impervious = 22,527 sf

Summary for Subcatchment 100: Proposed Houses & Off-Site Flow to Wetland

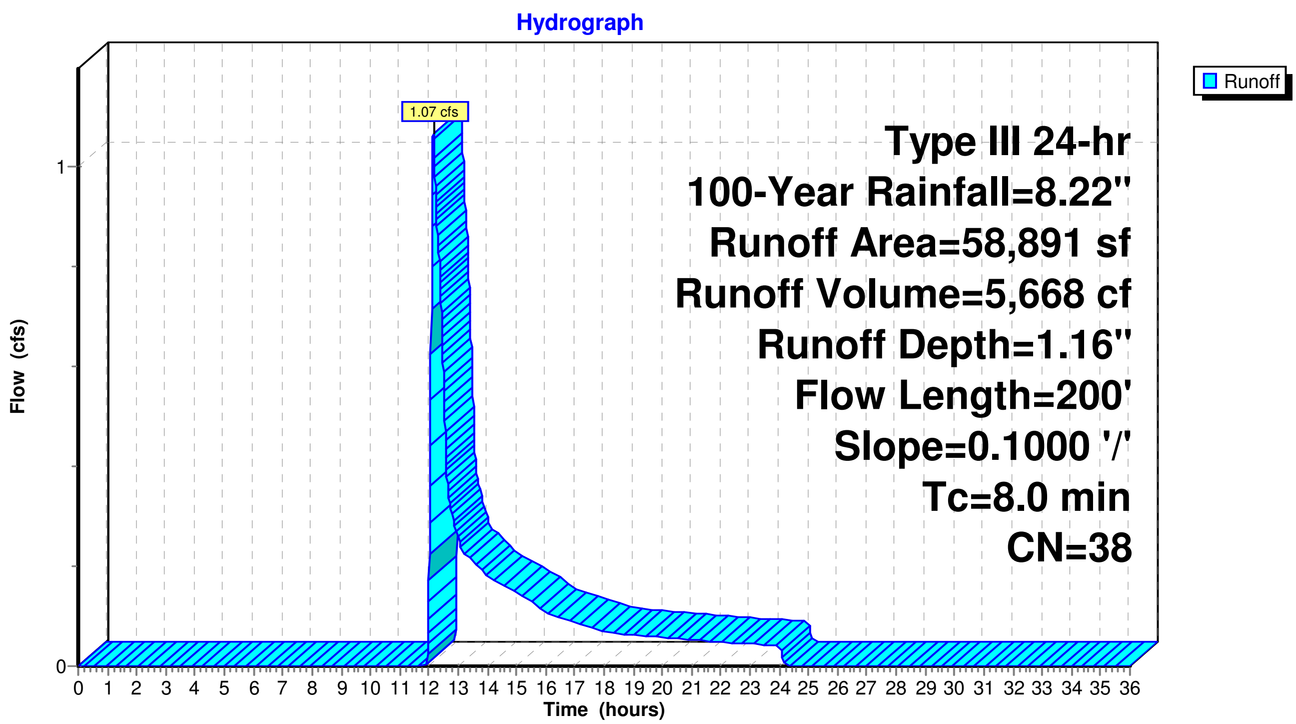
Runoff = 1.07 cfs @ 12.15 hrs, Volume= 5,668 cf, Depth= 1.16"
Routed to Link A : Eastern Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
43,942	30	Woods, Good, HSG A
9,529	39	>75% Grass cover, Good, HSG A
5,420	98	Paved parking, HSG A
58,891	38	Weighted Average
53,471		90.80% Pervious Area
5,420		9.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.6	150	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.0	200	Total			

Subcatchment 100: Proposed Houses & Off-Site Flow to Wetland



Summary for Subcatchment 120: Proposed Pavement to Catch Basin 6

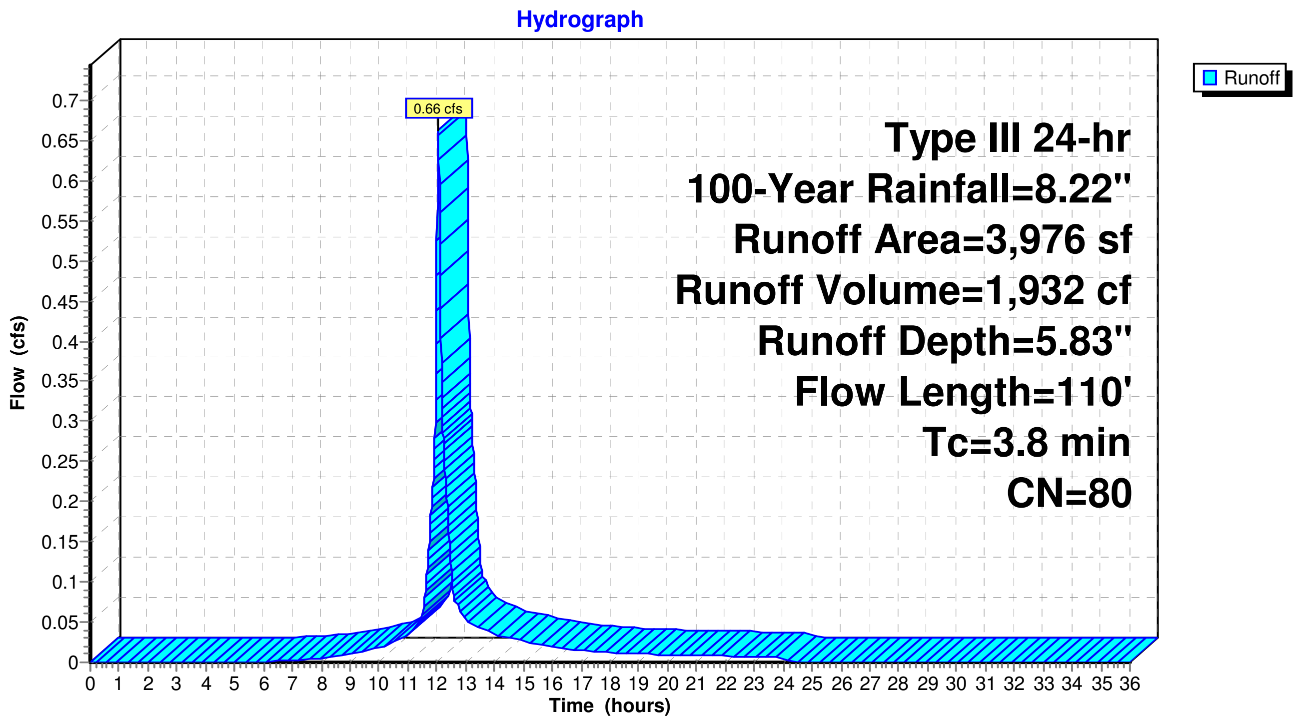
Runoff = 0.66 cfs @ 12.06 hrs, Volume= 1,932 cf, Depth= 5.83"
Routed to Pond 6P : Catch Basin 6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
1,224	39	>75% Grass cover, Good, HSG A
2,752	98	Paved parking, HSG A
3,976	80	Weighted Average
1,224		30.78% Pervious Area
2,752		69.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	35	0.0300	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
0.3	75	0.0340	3.74		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.8	110	Total			

Subcatchment 120: Proposed Pavement to Catch Basin 6



Summary for Subcatchment 130: Proposed Pavement to Catch Basin 7

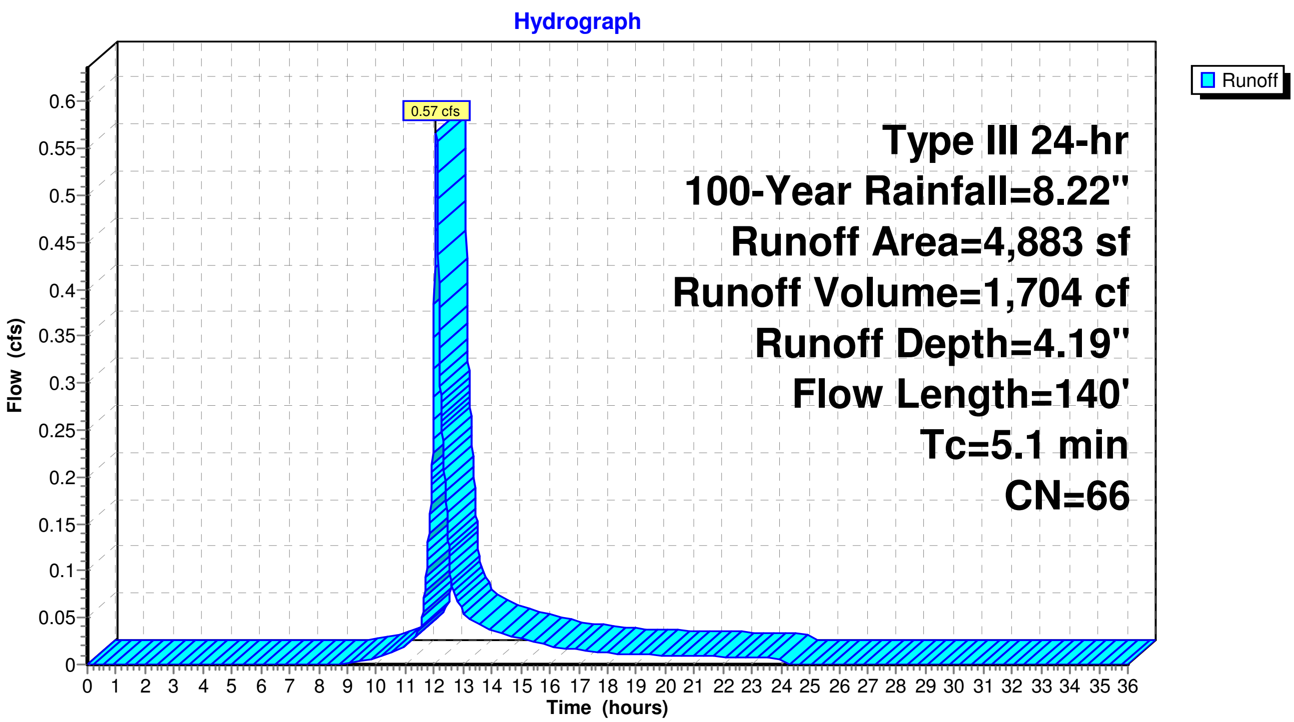
Runoff = 0.57 cfs @ 12.08 hrs, Volume= 1,704 cf, Depth= 4.19"
Routed to Pond 7P : Catch Basin 7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
2,662	39	>75% Grass cover, Good, HSG A
2,221	98	Paved parking, HSG A
4,883	66	Weighted Average
2,662		54.52% Pervious Area
2,221		45.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.0300	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
0.1	30	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	60	0.0340	3.74		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.1	140	Total			

Subcatchment 130: Proposed Pavement to Catch Basin 7



Summary for Subcatchment 150: Proposed Pavement & Off-Site Flow to Catch Basin 5

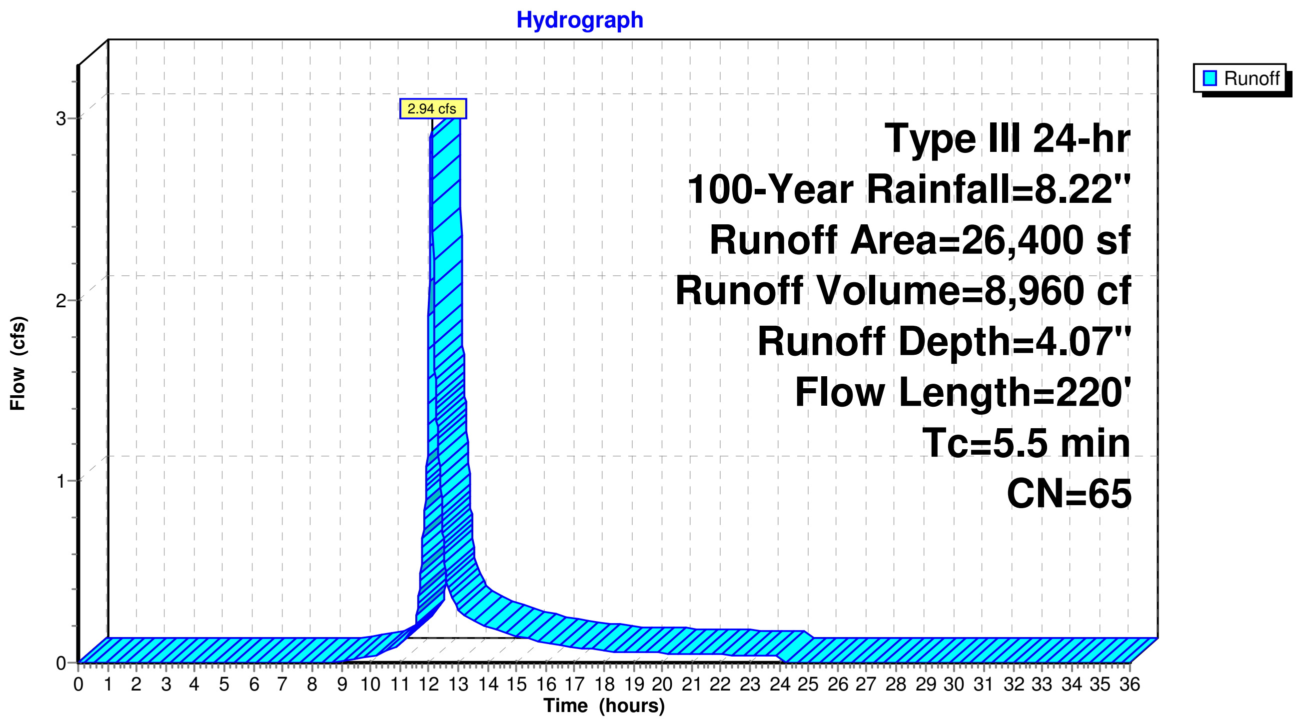
Runoff = 2.94 cfs @ 12.08 hrs, Volume= 8,960 cf, Depth= 4.07"
Routed to Pond 5P : Double Catch Basin 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.22"

Area (sf)	CN	Description
3,591	30	Woods, Good, HSG A
10,675	39	>75% Grass cover, Good, HSG A
12,134	98	Paved parking, HSG A
26,400	65	Weighted Average
14,266		54.04% Pervious Area
12,134		45.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	30	0.1000	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.6	50	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	140	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.5	220	Total			

Subcatchment 150: Proposed Pavement & Off-Site Flow to Catch Basin 5



Summary for Pond 1P: SMF 1 - Cultec Infiltration Chambers

[93] Warning: Storage range exceeded by 1.08'
[80] Warning: Exceeded Pond 4P by 1.20' @ 24.16 hrs (2.98 cfs 7,716 cf)

Inflow Area = 35,259 sf, 48.52% Impervious, Inflow Depth = 4.29" for 100-Year event
Inflow = 4.13 cfs @ 12.08 hrs, Volume= 12,592 cf
Outflow = 1.40 cfs @ 12.42 hrs, Volume= 12,594 cf, Atten= 66%, Lag= 20.6 min
Discarded = 0.12 cfs @ 11.14 hrs, Volume= 8,789 cf
Primary = 1.28 cfs @ 12.42 hrs, Volume= 3,806 cf
Routed to Link A : Eastern Wetland

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 113.46' @ 12.42 hrs Surf.Area= 2,102 sf Storage= 4,778 cf
Flood Elev= 113.48' Surf.Area= 2,102 sf Storage= 4,778 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 257.4 min (1,085.3 - 827.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	108.83'	1,779 cf	**35.33'W x 59.50'L x 3.54'H Field A**
			7,446 cf Overall - 2,999 cf Embedded = 4,447 cf x 40.0% Voids
#2A	109.33'	2,999 cf	**Cultec R-330XLHD** x 56 Inside #1
			Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
			Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
			Row Length Adjustment= +1.50' x 7.45 sf x 7 rows
		4,778 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	108.83'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	111.38'	**6.0" Round Culvert**
			L= 31.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 111.38' / 110.76' S= 0.0200 '/' Cc= 0.900
			n= 0.011 PVC, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.12 cfs @ 11.14 hrs HW=108.88' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=1.25 cfs @ 12.42 hrs HW=113.37' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 1.25 cfs @ 6.35 fps)

Pond 1P: SMF 1 - Cultec Infiltration Chambers - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 7 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

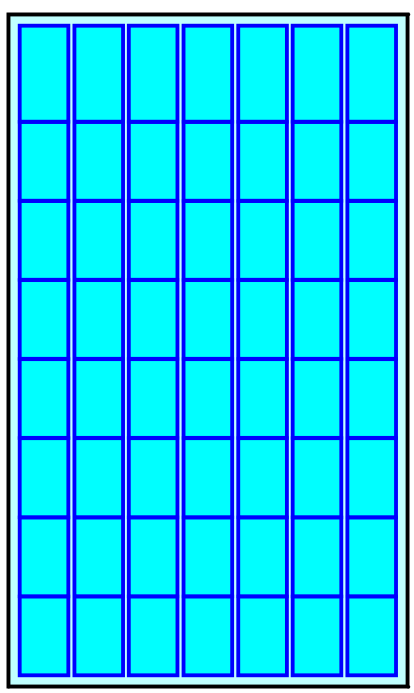
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
7 Rows x 52.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 35.33' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

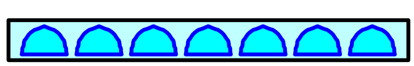
56 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 7 Rows = 2,999.0 cf Chamber Storage

7,445.8 cf Field - 2,999.0 cf Chambers = 4,446.7 cf Stone x 40.0% Voids = 1,778.7 cf Stone Storage

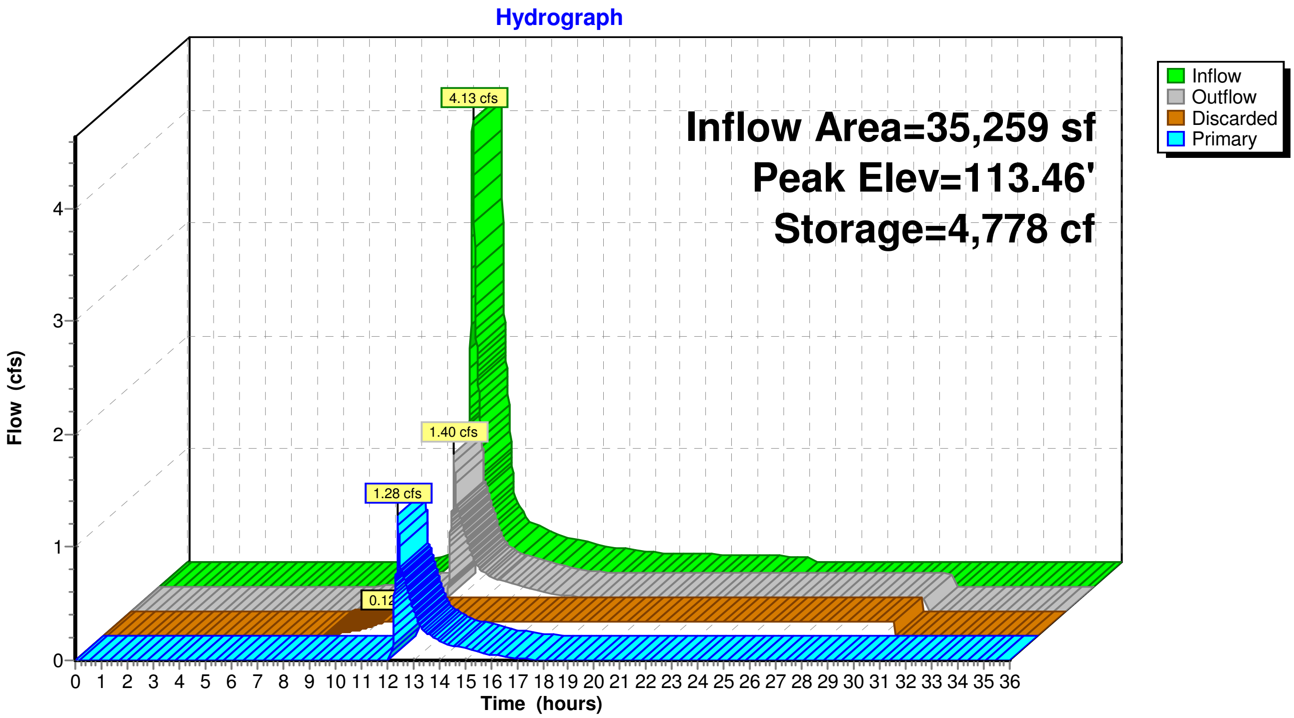
Chamber Storage + Stone Storage = 4,777.7 cf = 0.110 af
Overall Storage Efficiency = 64.2%
Overall System Size = 59.50' x 35.33' x 3.54'

56 Chambers
275.8 cy Field
164.7 cy Stone





Pond 1P: SMF 1 - Cultec Infiltration Chambers



Summary for Pond 4P: Drain Manhole 4

[80] Warning: Exceeded Pond 5P by 1.02' @ 12.43 hrs (3.82 cfs 1,335 cf)
[80] Warning: Exceeded Pond 6P by 1.67' @ 17.96 hrs (4.09 cfs 14,851 cf)
[80] Warning: Exceeded Pond 7P by 1.49' @ 16.47 hrs (3.77 cfs 24,236 cf)

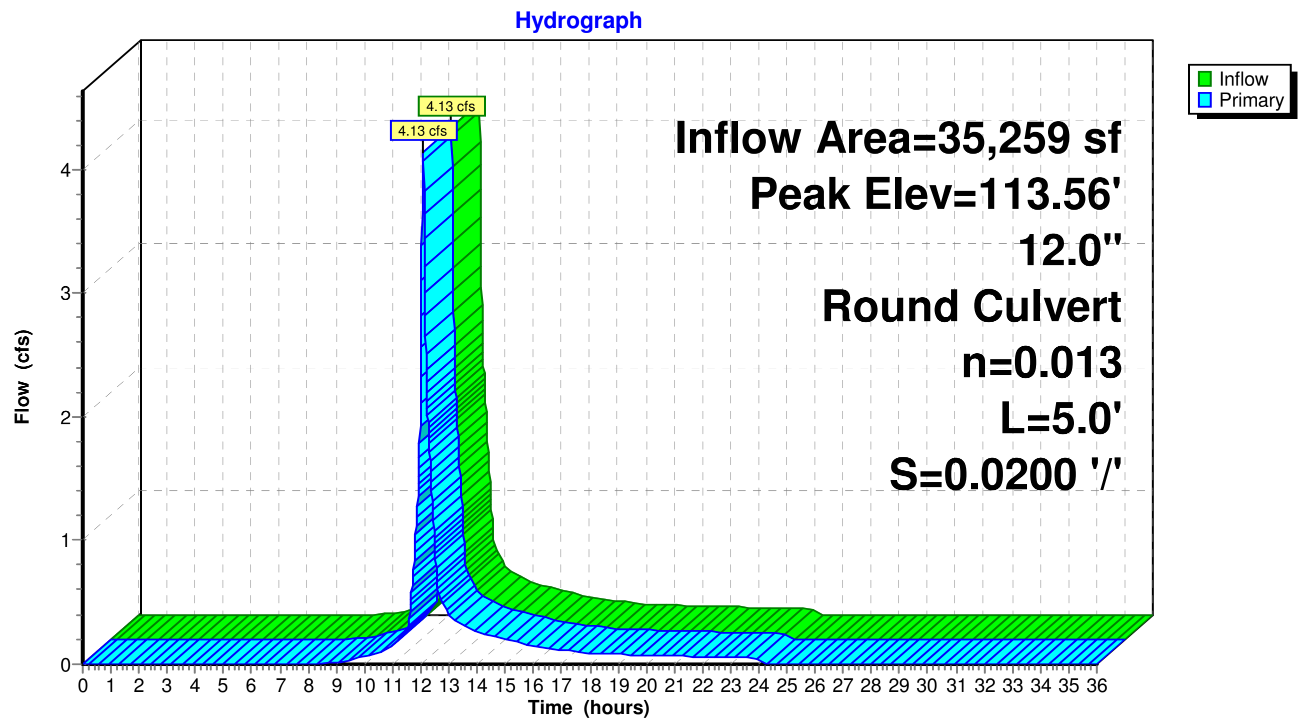
Inflow Area = 35,259 sf, 48.52% Impervious, Inflow Depth = 4.29" for 100-Year event
Inflow = 4.13 cfs @ 12.08 hrs, Volume= 12,592 cf
Outflow = 4.13 cfs @ 12.08 hrs, Volume= 12,592 cf, Atten= 0%, Lag= 0.0 min
Primary = 4.13 cfs @ 12.08 hrs, Volume= 12,592 cf
Routed to Pond 1P : SMF 1 - Cultec Infiltration Chambers

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 113.56' @ 12.43 hrs
Flood Elev= 114.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	109.43'	**12.0" Round Culvert** L= 5.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 109.43' / 109.33' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.98 cfs @ 12.08 hrs HW=111.68' TW=110.57' (Dynamic Tailwater)
1=Culvert (Inlet Controls 3.98 cfs @ 5.07 fps)

Pond 4P: Drain Manhole 4



Summary for Pond 5P: Double Catch Basin 5

[58] Hint: Peaked 0.11' above defined flood level

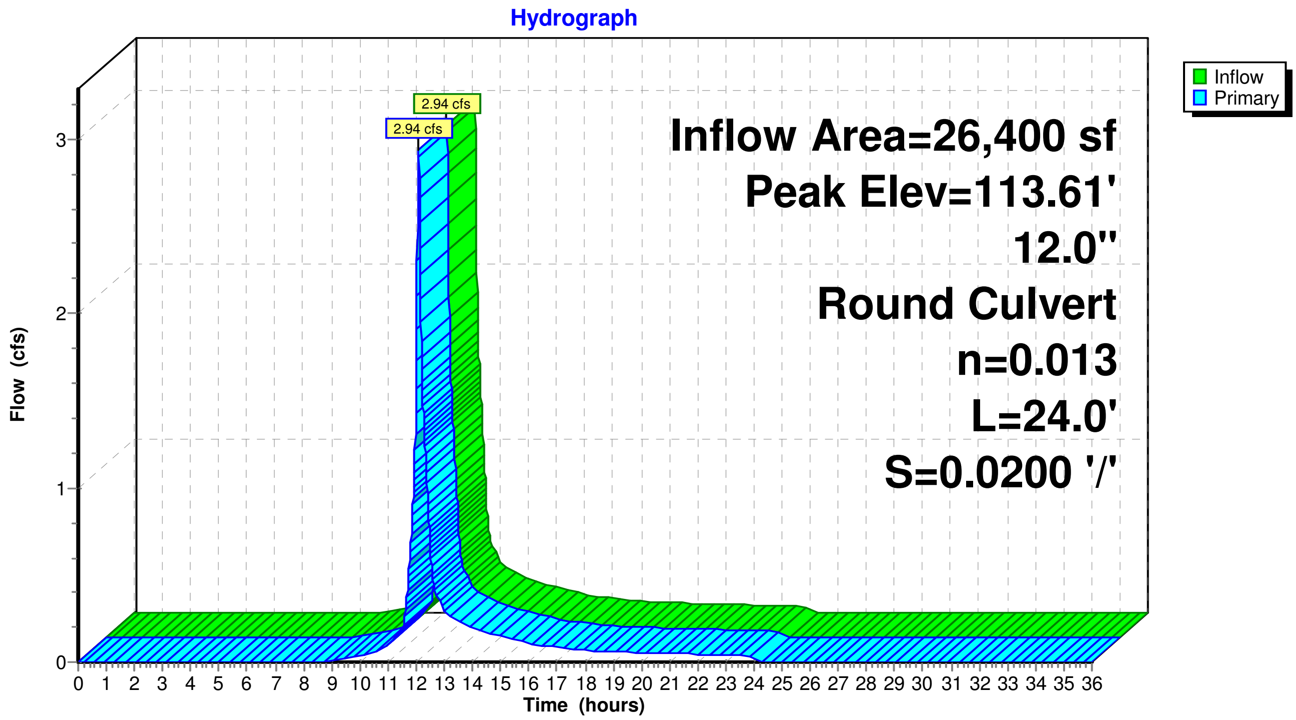
Inflow Area = 26,400 sf, 45.96% Impervious, Inflow Depth = 4.07" for 100-Year event
Inflow = 2.94 cfs @ 12.08 hrs, Volume= 8,960 cf
Outflow = 2.94 cfs @ 12.08 hrs, Volume= 8,960 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.94 cfs @ 12.08 hrs, Volume= 8,960 cf
Routed to Pond 4P : Drain Manhole 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 113.61' @ 12.44 hrs
Flood Elev= 113.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	110.01'	**12.0" Round Culvert** L= 24.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 110.01' / 109.53' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.72 cfs @ 12.08 hrs HW=112.24' TW=111.72' (Dynamic Tailwater)
1=Culvert (Inlet Controls 2.72 cfs @ 3.47 fps)

Pond 5P: Double Catch Basin 5



Summary for Pond 6P: Catch Basin 6

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=347)

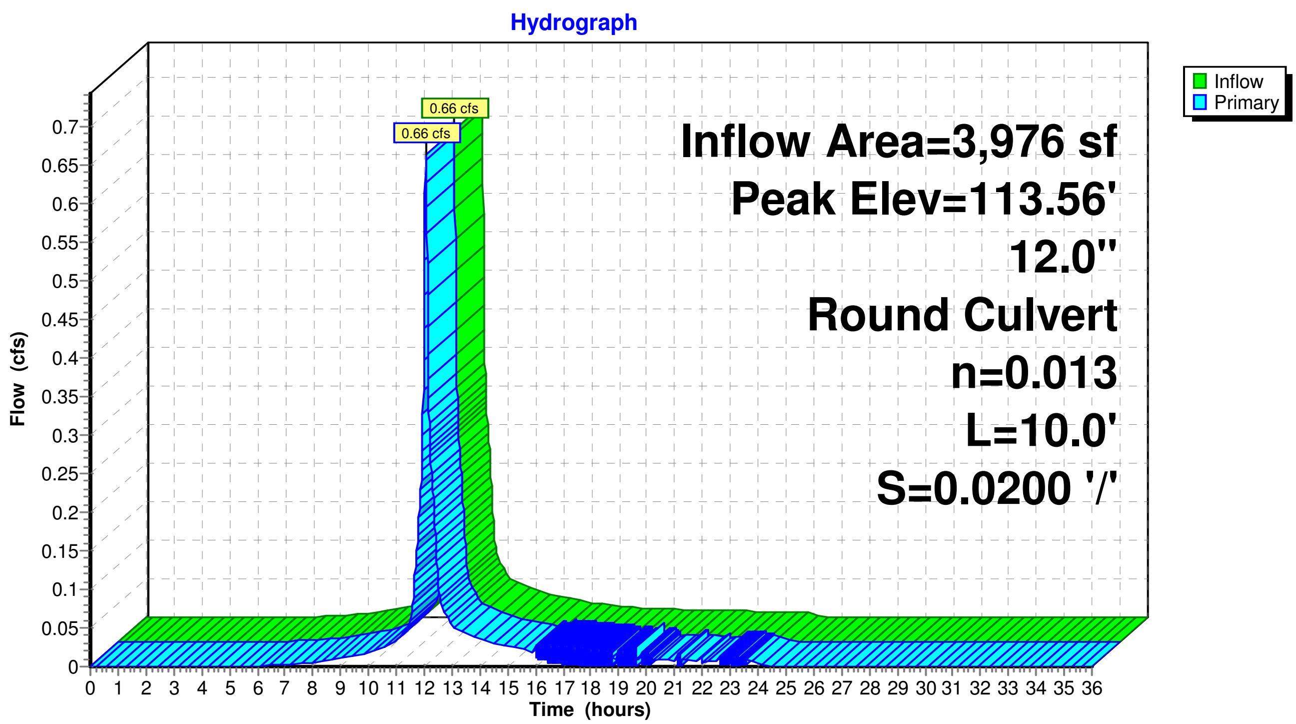
Inflow Area = 3,976 sf, 69.22% Impervious, Inflow Depth = 5.83" for 100-Year event
Inflow = 0.66 cfs @ 12.06 hrs, Volume= 1,932 cf
Outflow = 0.66 cfs @ 12.06 hrs, Volume= 1,929 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.66 cfs @ 12.06 hrs, Volume= 1,929 cf
Routed to Pond 4P : Drain Manhole 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 113.56' @ 12.44 hrs
Flood Elev= 114.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	109.73'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 109.73' / 109.53' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.06 hrs HW=111.26' TW=111.40' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Pond 6P: Catch Basin 6



Summary for Pond 7P: Catch Basin 7

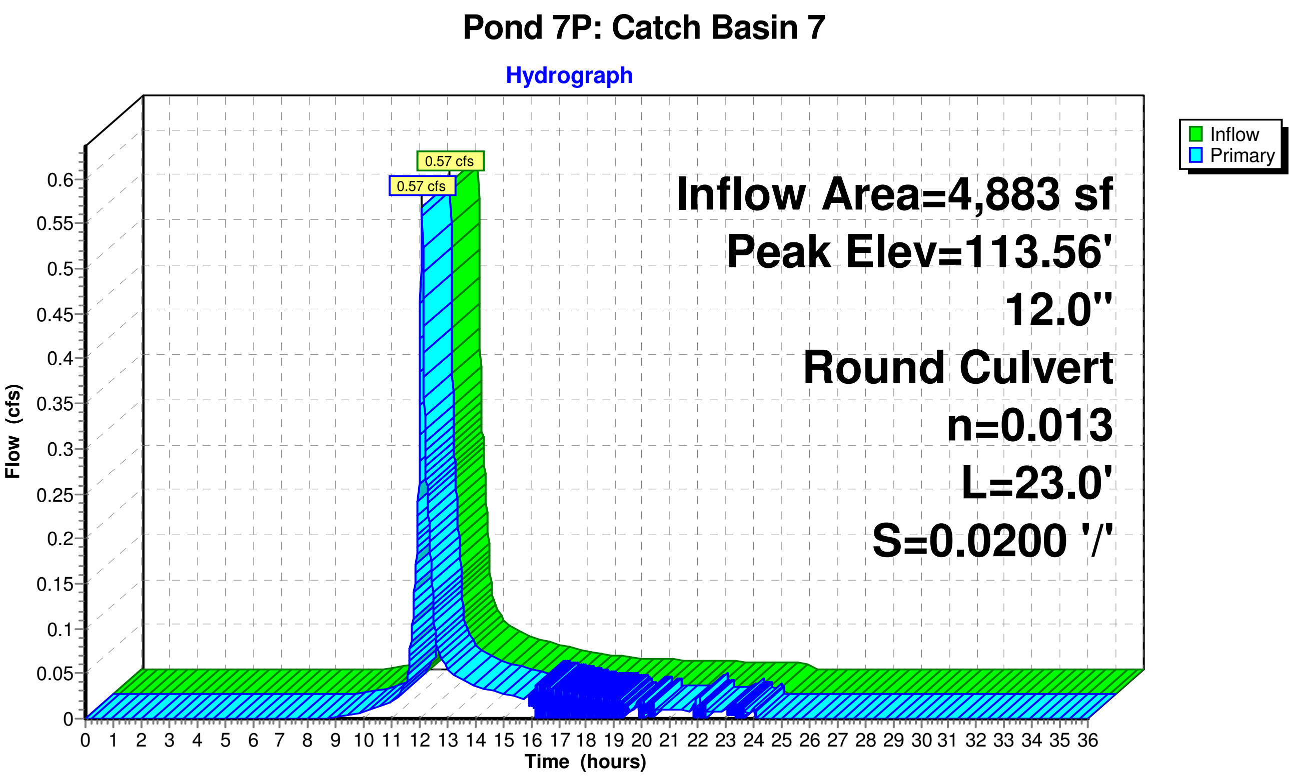
[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=307)

Inflow Area = 4,883 sf, 45.48% Impervious, Inflow Depth = 4.19" for 100-Year event
Inflow = 0.57 cfs @ 12.08 hrs, Volume= 1,704 cf
Outflow = 0.57 cfs @ 12.08 hrs, Volume= 1,703 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.57 cfs @ 12.08 hrs, Volume= 1,703 cf
Routed to Pond 4P : Drain Manhole 4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 113.56' @ 12.44 hrs
Flood Elev= 114.64'

Device	Routing	Invert	Outlet Devices
#1	Primary	109.99'	**12.0" Round Culvert** L= 23.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 109.99' / 109.53' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.08 hrs HW=111.59' TW=111.68' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

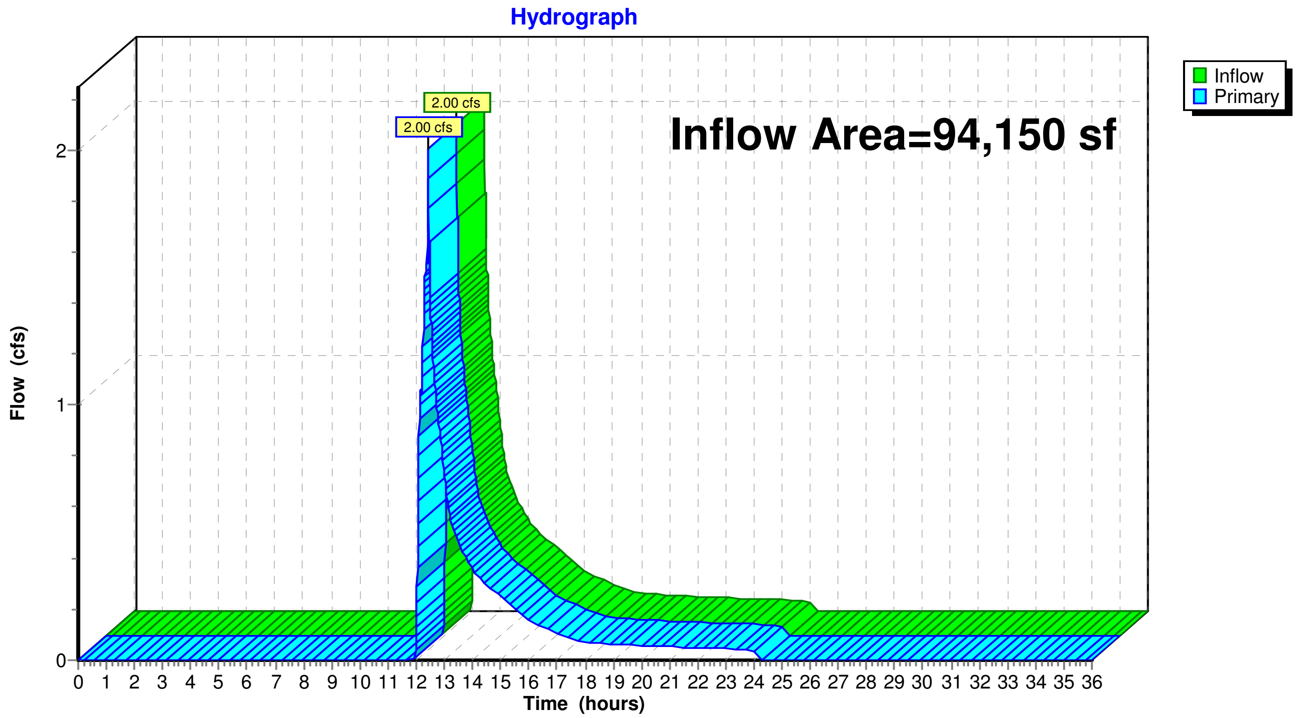


Summary for Link A: Eastern Wetland

Inflow Area =	94,150 sf,	23.93% Impervious,	Inflow Depth = 1.21"	for 100-Year event
Inflow =	2.00 cfs @	12.42 hrs, Volume=	9,474 cf	
Primary =	2.00 cfs @	12.42 hrs, Volume=	9,474 cf,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Link A: Eastern Wetland



NOAA Atlas 14 Rainfall Data

NOAA Atlas 14, Volume 10, Version 3
Location name: Reading, Massachusetts, USA*
Latitude: 42.5036°, Longitude: -71.1167°
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	0.308 (0.237-0.389)	0.373 (0.287-0.471)	0.479 (0.367-0.606)	0.567 (0.432-0.722)	0.687 (0.509-0.919)	0.776 (0.566-1.06)	0.872 (0.620-1.25)	0.985 (0.660-1.43)	1.15 (0.746-1.74)	1.29 (0.819-1.99)
10-min	0.437 (0.336-0.551)	0.528 (0.406-0.667)	0.678 (0.520-0.858)	0.802 (0.611-1.02)	0.973 (0.721-1.30)	1.10 (0.801-1.51)	1.24 (0.878-1.77)	1.40 (0.935-2.03)	1.63 (1.06-2.46)	1.83 (1.16-2.82)
15-min	0.514 (0.396-0.648)	0.622 (0.478-0.785)	0.798 (0.611-1.01)	0.943 (0.719-1.20)	1.14 (0.848-1.53)	1.29 (0.942-1.77)	1.45 (1.03-2.08)	1.64 (1.10-2.39)	1.92 (1.24-2.90)	2.16 (1.36-3.32)
30-min	0.707 (0.544-0.891)	0.855 (0.657-1.08)	1.10 (0.841-1.39)	1.30 (0.991-1.66)	1.58 (1.17-2.11)	1.78 (1.30-2.44)	2.00 (1.42-2.87)	2.26 (1.52-3.30)	2.66 (1.72-4.01)	2.99 (1.89-4.60)
60-min	0.899 (0.692-1.13)	1.09 (0.837-1.37)	1.40 (1.07-1.77)	1.66 (1.26-2.11)	2.01 (1.49-2.69)	2.27 (1.66-3.12)	2.56 (1.82-3.66)	2.89 (1.94-4.20)	3.39 (2.19-5.12)	3.82 (2.42-5.88)
2-hr	1.17 (0.903-1.46)	1.42 (1.10-1.78)	1.83 (1.41-2.31)	2.18 (1.67-2.76)	2.65 (1.98-3.54)	3.00 (2.20-4.10)	3.38 (2.43-4.84)	3.85 (2.59-5.57)	4.58 (2.97-6.86)	5.22 (3.31-7.97)
3-hr	1.36 (1.05-1.69)	1.65 (1.28-2.06)	2.14 (1.66-2.68)	2.55 (1.96-3.21)	3.10 (2.33-4.13)	3.51 (2.59-4.79)	3.96 (2.86-5.66)	4.52 (3.05-6.51)	5.41 (3.51-8.06)	6.18 (3.93-9.39)
6-hr	1.75 (1.37-2.17)	2.14 (1.67-2.65)	2.77 (2.16-3.45)	3.30 (2.56-4.13)	4.02 (3.04-5.31)	4.55 (3.38-6.16)	5.14 (3.73-7.28)	5.87 (3.97-8.37)	7.01 (4.57-10.4)	8.01 (5.11-12.1)
12-hr	2.23 (1.76-2.74)	2.72 (2.14-3.35)	3.53 (2.77-4.37)	4.20 (3.28-5.23)	5.13 (3.89-6.71)	5.81 (4.33-7.80)	6.55 (4.77-9.19)	7.47 (5.08-10.6)	8.89 (5.82-13.0)	10.1 (6.48-15.1)
24-hr	2.67 (2.12-3.26)	3.30 (2.62-4.04)	4.34 (3.43-5.34)	5.21 (4.09-6.43)	6.39 (4.88-8.32)	7.26 (5.45-9.70)	8.22 (6.03-11.5)	9.42 (6.43-13.2)	11.3 (7.42-16.4)	12.9 (8.30-19.2)
2-day	3.03 (2.42-3.67)	3.82 (3.05-4.65)	5.13 (4.08-6.25)	6.21 (4.91-7.61)	7.70 (5.92-9.98)	8.78 (6.65-11.7)	9.99 (7.41-14.0)	11.6 (7.91-16.1)	14.1 (9.27-20.3)	16.3 (10.5-24.0)
3-day	3.31 (2.66-4.00)	4.17 (3.34-5.04)	5.57 (4.45-6.77)	6.73 (5.35-8.22)	8.34 (6.44-10.8)	9.50 (7.22-12.6)	10.8 (8.04-15.0)	12.5 (8.58-17.4)	15.3 (10.1-21.9)	17.7 (11.4-25.9)
4-day	3.58 (2.88-4.32)	4.47 (3.59-5.39)	5.91 (4.74-7.16)	7.11 (5.66-8.66)	8.76 (6.79-11.3)	9.97 (7.59-13.2)	11.3 (8.44-15.7)	13.1 (8.99-18.1)	15.9 (10.5-22.8)	18.5 (11.9-26.9)
7-day	4.35 (3.52-5.22)	5.27 (4.26-6.33)	6.77 (5.46-8.16)	8.02 (6.42-9.71)	9.74 (7.58-12.4)	11.0 (8.40-14.4)	12.4 (9.25-17.0)	14.2 (9.80-19.5)	17.1 (11.3-24.3)	19.7 (12.7-28.5)
10-day	5.05 (4.10-6.04)	6.00 (4.87-7.17)	7.55 (6.10-9.05)	8.83 (7.09-10.7)	10.6 (8.26-13.4)	11.9 (9.09-15.5)	13.3 (9.93-18.1)	15.1 (10.5-20.7)	18.0 (12.0-25.4)	20.5 (13.3-29.5)
20-day	7.04 (5.76-8.35)	8.08 (6.60-9.59)	9.78 (7.96-11.7)	11.2 (9.05-13.4)	13.1 (10.3-16.4)	14.6 (11.1-18.6)	16.1 (11.9-21.4)	17.9 (12.5-24.2)	20.5 (13.7-28.7)	22.6 (14.7-32.3)
30-day	8.68 (7.14-10.3)	9.80 (8.04-11.6)	11.6 (9.50-13.8)	13.1 (10.7-15.7)	15.2 (11.9-18.8)	16.8 (12.8-21.2)	18.4 (13.6-24.0)	20.1 (14.1-27.1)	22.5 (15.1-31.3)	24.4 (15.9-34.7)
45-day	10.8 (8.89-12.7)	12.0 (9.86-14.1)	13.9 (11.4-16.4)	15.5 (12.7-18.5)	17.8 (13.9-21.8)	19.5 (14.9-24.4)	21.2 (15.6-27.3)	22.9 (16.1-30.5)	25.0 (16.8-34.6)	26.6 (17.4-37.6)
60-day	12.6 (10.4-14.8)	13.8 (11.4-16.2)	15.9 (13.1-18.7)	17.5 (14.3-20.8)	19.9 (15.6-24.3)	21.7 (16.6-27.0)	23.4 (17.2-30.0)	25.1 (17.7-33.4)	27.1 (18.3-37.4)	28.6 (18.7-40.2)

[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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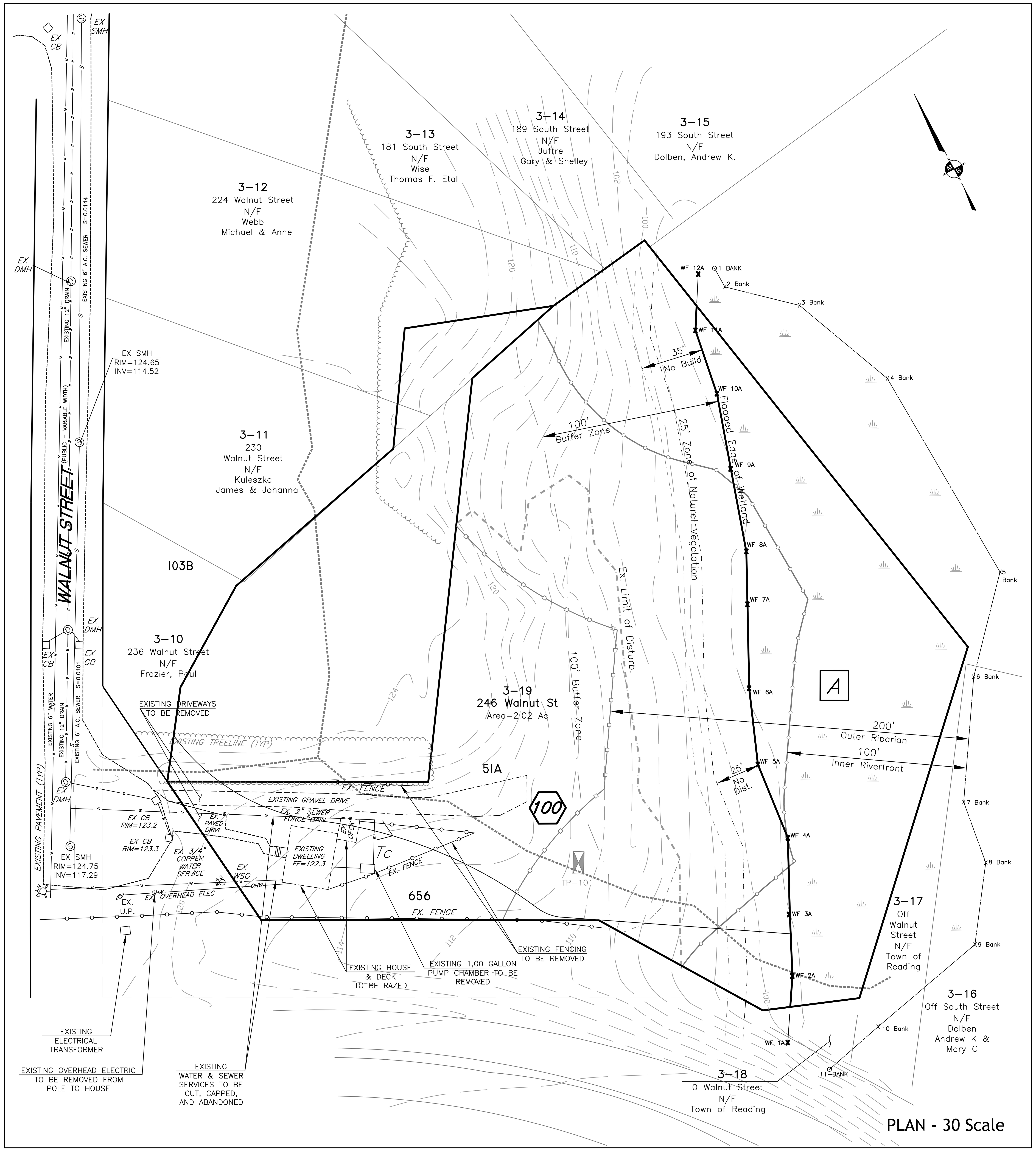
PF graphical



NRCS SOILS:

51A – Swansea muck, 0 to 1% slopes
103B – Charlton–Hollis–Rock Outcrop Complex, 3% to 8% slopes
656 – Urdothents–Urban Land Complex

-------------------- SOILS LINE

PRE-DEVELOPMENT DRAINAGE MAP

246 & 248 WALNUT STREET
READING, MASSACHUSETTS

PREPARED FOR:

STELLA CONSTRUCTION
25 Everett Street
Woburn, MA 01810
857-251-5110

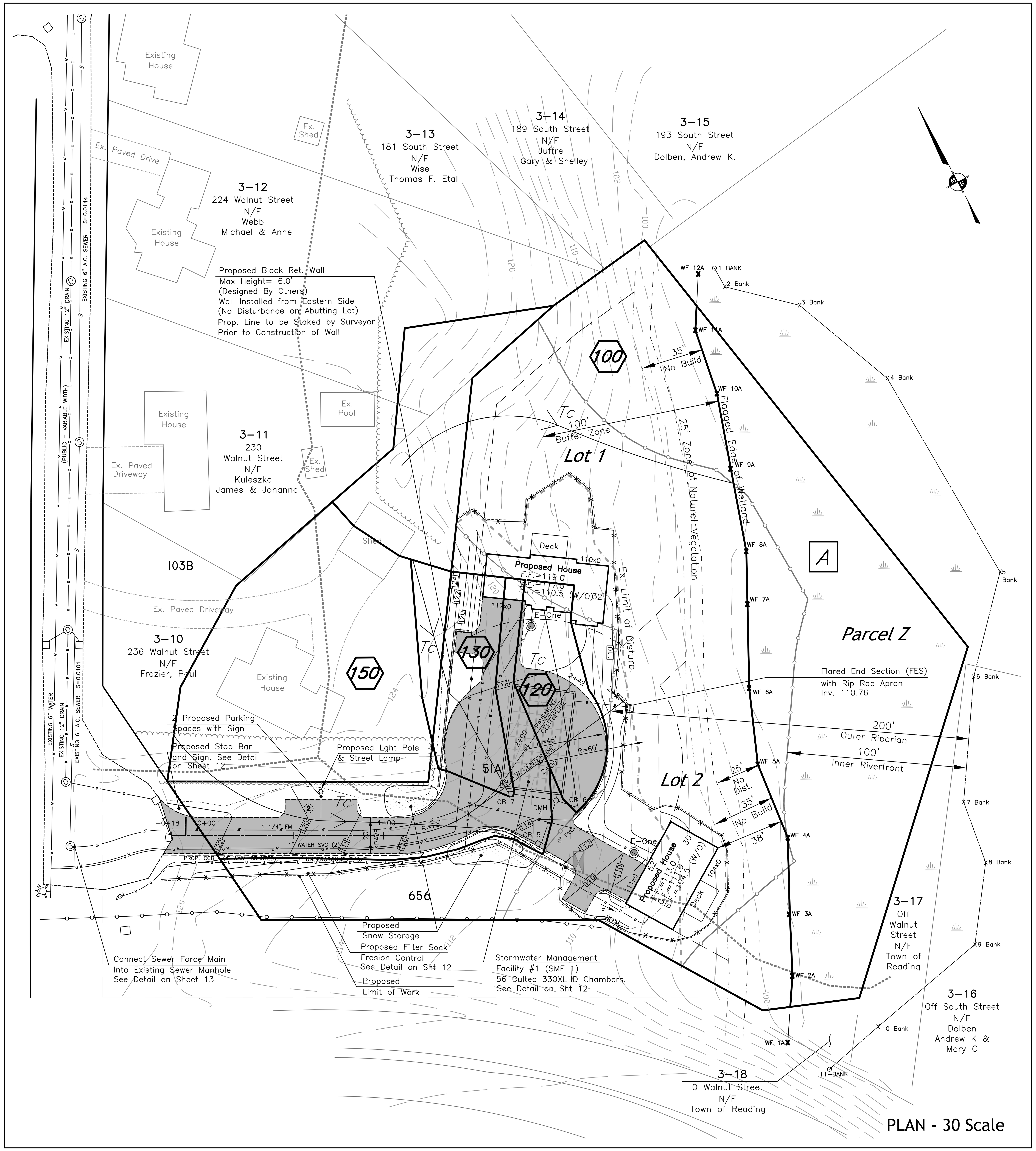
DECEMBER 20, 2023

30 15 0 30 60

SCALE: 1"=30'

MEISNER BREM CORPORATION
142 LITTLETON ROAD, STE. 16, WESTFORD, MA 01886 - (978) 692-1313
202 MAIN STREET, SALEM, NH 03079 - (603) 893-3301

JOB NUMBER: 3110
ACAD FILE: 3110-Stella Const. Prelim



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51A – Swansea muck, 0 to 1% slopes
103B – Charlton–Hollis–Rock Outcrop Complex, 3% to 8% slopes
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-------------------- SOILS LINE

POST–DEVELOPMENT DRAINAGE MAP
246 & 248 WALNUT STREET
READING, MASSACHUSETTS

PREPARED FOR:
STELLA CONSTRUCTION
25 Everett Street
Woburn, MA 01810
857–251–5110

DECEMBER 20, 2023

30 15 0 30 60
SCALE: 1"=30'

MEISNER BREM CORPORATION
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JOB NUMBER: 3110
ACAD FILE: 3110–Stella Const. Prelim.

Town of Reading
16 Lowell Street, Reading, MA 01867

Community Planning & Development Commission
Andrew MacNichol, *Community Development Director*
Direct: 781-942-6670
amacnichol@ci.reading.ma.us
readingma.gov/community-planning-and-development-commission

March 11, 2024

Definitive Subdivision Plan
DECISION

246 Walnut St
Proposed Street Name: Walnut St Extension

To the Town Clerk:
This is to certify, that at a public hearing of the Reading Community Planning and Development Commission (CPDC), which was opened on March 11, 2024, and closed on XXX, by a motion duly made and seconded, it was voted:

"We, the CPDC, as requested by Stella Construction, under the Town of Reading's Subdivision Rules & Regulations, and MGL Chapter 41 Sections 81K through 81GG, to consider the 3-Lot Definitive Subdivision Plan for property located at 246 Walnut St (Assessors Map 3, Lot 19), as shown on the plans prepared by Meisner Brem Corporation, originally dated 12/20/23, and most recently revised 3/22/24, in support of an application filed on 2/28/24, do hereby vote X-X-X to _____ the said plans, inclusive of the waivers listed herein, subject to the Findings and Conditions below."

MATERIALS:
The following documents and plans were submitted into the public record:

1. Form B: Application for a Definitive Subdivision Plan, filed with the Town Clerk 2/28/24
2. Form G: Designer's Certificate, dated 12/1/23 and received 1/8/24
3. Certified List of Abutters, dated 12/4/23
4. Legal Notice, published in Daily Times Chronicle on 1/24/24 and 1/31/24
5. Cover letter, including list of waivers requested from Reading Subdivision Regulations, dated 11/30/23
6. Email from Senior Planner to Applicant with a statement deeming the submission Complete, and including a list of minor revisions to be made for the next plan submission, dated 1/8/24
7. Definitive Subdivision Plans for 246 Walnut St, prepared by Meisner Brem Corporation, dated 12/20/23 and most recently revised 2/8/24, including the following:
    a. Sheet 1: Cover Sheet, dated 12/6/23, last updated 3/22/24
    b. Sheet 2: Note Sheet, dated 12/6/23, last updated 3/22/24
    c. Sheet 3: Locus Sheet, dated 12/6/23, last updated 3/22/24
    d. Sheet 4: Existing Conditions Plan, dated 12/6/23, last updated 3/22/24
    e. Sheet 5: Overall Layout Plan, dated 12/6/23, last updated 3/22/24
    f. Sheet 6: Definitive Subdivision Plan, dated 12/6/23, last updated 3/22/24

g. Sheet 7: Plan & Profile of Way, dated 12/6/23, last updated 3/22/24
h. Sheet 8: Grading & Utility Plan, dated 12/6/23, last updated 3/22/24
i. Sheet 9: Alternative "A" Plan, dated 12/6/23, last updated 3/5/24
j. Sheet 10: Conservation / NOI Plan, dated 12/6/23, last updated 2/22/24
k. Sheet 11: Proof Plan, dated 12/6/23, last updated 3/22/24
l. Sheets 12-13: Detail Sheets, dated 12/6/23, last updated 3/22/24

8. Application Narrative, dated 11/30/23, revised 3/4/24
9. Stormwater Management Report, Volumes 1 & 2, dated 12/20/23, last updated 3/22/24
    a. Sheet 1: Pre-development Drainage Map, dated 12/20/23
    b. Sheet 2: Post-development Drainage Map, dated 12/20/23
10. Email Summarizing Plan Changes, dated 2/29/24
11. Memo Summarizing Subsequent Plan Changes, dated 3/22/24
12. Memo from Town Engineer to Community Development Director, dated 3/7/24
13. Draft Decision, dated 4/8/24

FINDINGS:

1. **Existing Conditions:** Walnut St is an existing 50' wide Public Way with 24' of paved roadway width serving eight single-family homes. It dead-ends in a partial cul-de-sac. The development tract is comprised of 246 Walnut St, which is the last house on Walnut St. The 2.02-acre tract currently has one single-family home on the western portion of it, closest to Walnut St. The site is entirely within the S-20 Zoning District. The tract maintains 240 linear ft of frontage along Walnut St. The eastern portions of the site are flagged wetlands and the eastern abutting properties contain a river. The 100' inner riverfront line crosses approximately the eastern third of the tract and the 200' outer riverfront line covers the majority of the site, with only the westernmost portions excluded.

   The property generally slopes east, starting from the highest elevation nearest to Walnut St towards the wetlands on the eastern edge. Slopes range from 6% up to 30% near the wetlands.

2. **Proposal:** The Applicant is proposing to raze the existing single-family home and to subdivide the lot into three parcels: two buildable tracts, and one parcel containing the wetlands on the site which will be donated to the Town's Conservation Land. Walnut Street is proposed to be extended by approximately 260' in length, with a 50' right-of-way width on paper and 20' width paved. The applicant is requesting a waiver to reduce the right-of-way width from the required 60' width to 50'. The extension will terminate in a cul-de-sac with a radius of 60', 45' of which will be paved.

3. **Zoning & Upland Area:** The site is within the S-20 Zoning District; the two proposed buildable lots comply with the frontage and area requirements of the S-20 Zoning District. Single-family dwellings are to be compliant with the setbacks, lot coverage and height limitations of the S-20 Zoning District. There are no known Special Permits or Variances relative to the subject properties

   A minimum total of 20,000sf of area, 12,000sf of upland area, and 120' linear feet of frontage is required. Or per Footnote 3, the required frontage can be reduced to not less than 80 ft if the street is a curve having a radius of not more than 200 ft and that lot has a width of not less than 120 ft.

    a. Lot 1 is proposed to be 27,895sf, all of which is upland, with 137ft of frontage.

    b. Lot 2 is proposed to be 20,058sf, all of which is upland, and 311ft of frontage.

c. Parcel Z (non-buildable) is proposed to be 28,824sf, of which only 2,570sf is upland, and with no frontage.

4. **Proof Plan:** A proof plan depicting a 60' right-of-way and 60' cul-de-sac was shown on the plan 60' Right of Way Proof Plan.

5. **Proposed Right-of-Way:** The Applicant proposes a reduction to a 50' right-of-way that would extend the existing variable 40' right of way of Walnut St by 260' and terminate in a 45' paved cul-de-sac. The extension will bring the dead-end portion of Walnut Street from South Street to a total length of approximately 750-feet. The extension will provide the necessary frontage and access for the proposed 2 new single-family homes on the tract. The extension of the right-of-way will be private. Two (2) parking spaces with signage are being proposed on the north side of the right of way before reaching the cul-de-sac, for future users or visitors to the Conservation land.

6. **Wetlands:** A wetland survey was performed by Basbanes and Associates in January 2023 and an area of Bordering Vegetated Wetlands (BVW) was flagged on the eastern portion of the tract. The buildable lot areas are proposed outside of the 35' no build zone, although work is proposed within the 100' buffer zone. The flagged bank of the river in the eastern abutting properties means that the 100' inner riverfront line crosses approximately the eastern third of the tract and the 200' outer riverfront line covers the majority of the site, with only the westernmost portions excluded.

7. **Conservation Review:** The Application required an Order of Area Resource Delineation (ORAD) and Notice of Intent (NOI) with the Conservation Commission, as well as the issuance of an Order of Conditions prior to permitting. As part of the Notice of Intent the applicant was required to perform an alternative analysis pursuant to 310 CMR 10.58(4)(c) for work in the outer riparian zone of the river front area.

   As part of the Conservation Review the following additional mitigation items were agreed to:

   a. The Applicant will be donating Parcel Z to the Town as Conservation land.
   b. An access easement will be provided roughly at the lot line between Lots 1 & 2 to provide access to the Conservation land behind on "Parcel Z" behind the two front lots.
   c. 2 parking spaces are being provided for parking for individuals to access the Conservation land.
   d. An existing area of Japanese Knotweed (invasive species) on site will be removed.
   e. The Applicant will be donating the construction of a pedestrian bridge over the stream at Sturges Park, roughly 1,000ft upstream from the site.

8. **Traffic:** Due to the proposal of two buildable tracts with a net of one single-family dwelling, the Applicant is requesting a waiver for the requirement of a Traffic Study submittal under Section 6.1.1.d.3 of the Subdivision Rules and Regulations.

9. **Trees/Landscaping/Screening:** Deciduous and Evergreen trees with 6" and greater diameter have been depicted on the plan set. The Applicant proposes removing 20 trees on the site (15 deciduous and 5 evergreen), and replacing them 8 Little Leaf Lindens, 8 Red Maples, and 12 High Bush Blueberries. All trees proposed to be removed from, and all replacement species proposed have been approved by the Conservation Commission.

   A 6' high block wall is being proposed on the western side of the cul-de-sac and along Lot 1, between the lot and the direct abutter to the west.

   Small grass lawn areas are proposed adjacent to each proposed home.

10. **Lighting:** One light pole with a street lamp is proposed on the roadway extension next to the proposed two parking spaces. Typical house mounted lights will be provided at the proposed lots.
11. **Utilities:** Both Town water and sewer are proposed to be extended and connected to the proposed house lot. Electric, Telephone and Cable service shall also be provided. All utilities are proposed to be underground and extended through the proposed right-of-way. Separation and trenching for each shall meet Engineering Division
12. **Drainage:** The site is being proposed to be split into two sub-catchment areas. Sub-catchment area 100 comprises the rear portion of the site that will discharge directly to the eastern wetland—the same as under existing conditions—and comprises the rear of the two new house lots.

    Sub-catchments 120 and 150 represent the areas that will drain into individual catch basins (3 total within the right of way) and direct to the Cultec infiltration chamber system within the right of way prior to discharge. This capture area includes the paved access way and the existing offsite flow coming from 236 Walnut St. From this infiltration system is a spillover with a flared end section and rip rap apron that directs east towards the wetlands.

    Post-development flow rates and volumes are shown to be equal to or less than existing on the 2-, 10-, 25- and 100-year storm events. There is no untreated direct discharge into any resource area.
13. **Snow Storage:** Areas for snow storage have been identified directly off the road extension before reaching the cul-de-sac.
14. **Rooftop Solar:** The Applicant shall consider orienting the home so that future owners can benefit from potential rooftop solar installations and/or passive heating.
15. **Board of Health:** In accordance with M.G.L. Ch. 41 Section 81U, a copy of the Form B and plans were submitted to the Board of Health.

WAIVERS:

The Applicant has requested, and the Commission has ______the following waivers from the Town of Reading Subdivision Regulations:

1. A waiver from Section 6.1.1.d.3 requiring a Traffic Study.
    The Applicant requests relief from the requirement due to the modest scope of one additional single-family home.
2. A waiver from Section 7.1.1.a requiring a right of way width of 60-feet.
    The Applicant proposes to extend the layout of Walnut St at the 50-foot width.
3. A waiver from Section 7.1.1.b requiring street grades to be a maximum of two percent for a distance of at least sixty-four feet from beginning of intersection.
    The Applicant proposes a right-of-way with a grade of 4% within the 64-foot distance from the intersection.
4. A waiver from Section 7.1.3 requiring a typical cross section for a 60-ft street.
    The Applicant is waiving other elements of the typical 60-ft street and thus will be providing a cross-section that presents the actual roadway design.
5. A waiver from Section 7.1.5.a requiring dead-end streets to be no longer than 500 ft.

The Applicant proposes an extension of Walnut St by 260-feet, bringing the dead end of Walnut St to a total of an estimated 750-feet in length. A 45-foot paved cul-de-sac is provided for turnaround.

6. A waiver from Sections 7.1.5.e requiring a landscaped cul-de-sac island.
    a. *The Applicant proposes the full removal of a cul-de-sac island due to maintenance and plowing concerns.*
7. A waiver from Sections 7.1.7 requiring the installation of granite curbing.
    a. *The Applicant proposed a Cape Cod Asphalt Berm curb along the southern most edge of the right of way throat to support the drainage design and flow pattern.*
8. A waiver from Section 7.2 requiring sidewalks along the roadway.
    a. *The Applicant proposes a waiver from sidewalks due to no existing sidewalks located within the existing layout of Walnut Street.*
9. A waiver from section 8.5.1.1 for Pipes and Culverts to be reinforced concrete.
    a. *The Applicant proposes to meet current engineering standards and materials as required per the Engineering Division (i.e. ductile iron piping).*

CONDITIONS:

General:

1. **No Further Subdivision:** This Decision of Approval is limited to the number of lots shown on the endorsed plans.

2. **Other Permits:** The Applicant is responsible for obtaining all other required Federal, State and Local permits, including but not limited to: a NPDES Permit; utility permits for sewer, water, electric, etc.; curb cut, driveway, MassDOT and Jackie's Law excavation permits; Board of Health approvals; and an Order of Conditions from the Conservation Commission.

3. **Order of Conditions:** At all times throughout construction of the project and occupancy of the site, the Applicant and/or future owners shall comply with all provisions of any Order of Conditions issued for the project by the Reading Conservation Commission. As part of the Purchase and Sale Agreement, the Applicant shall provide a copy of the Order of Conditions to the buyer for each lot.

4. **Subordination:** All encumbrances, mortgages and restrictions shall be subordinated to this Decision of Approval and the Covenant Agreement described herein as a matter of record.

5. **Property Maintenance:** The Applicant shall maintain the property in a neat and orderly fashion while the development is pending, and during construction. The Applicant is responsible to perform all snow and ice removal operations, as well as all other maintenance operations, as required prior to any Town acceptance of the Right of Way.

Prior to Plan Endorsement:

1. **Plan Revisions**: The Applicant shall revise the Definitive Plan pursuant to any conditions imposed herein and submit 2 full-size (24x36) copies of the revised plans to the Community Development Director for review and approval prior to the issuance of a Building Permit. Revisions include but are not limited to:

    a. The Applicant shall submit a revised XXX

2. **Engineering Comments:** The Applicant shall coordinate with the Town Engineer to resolve any necessary outstanding comments listed in their memo.

3. **Snow Storage:** The Applicant shall coordinate with the Conservation Commission, Town Engineer and DPW Director to determine the most appropriate location on-site for snow storage.

4. **Electric Utility**: The electric utility plan shall be approved by the Reading Municipal Light Department (RMLD). Locations of light poles, transformers, etc. shall be added to the plans and approved by RMLD.

5. **Mylars:** The Applicant shall submit two (2) complete sets of mylar plans, and an electronic version, to the Community Development Director for endorsement by the CPDC.

6. **Owner of Record:** The Applicant shall have become the owner of record of the subject land to be subdivided and shall provide acceptable documentation of such to the Community Development Director.

7. **Trees/Landscaping/Screening:** All trees proposed to be removed from within the 100' wetland buffer shall be approved by the Conservation Commission. All plantings / tree removal shall be approved by the Conservation Commission.

Prior to the Release of Any Lot:

1. **Covenant Agreement:** The Applicant shall submit to the Town Engineer and Community Development Director, a Covenant Agreement (Form H) that is fully completed, properly executed, duly recorded, and running with the land, providing that the ways and services shall be constructed in accordance with the approved Definitive Subdivision Plan and approval conditions thereof to serve any lot before such lot may be built upon or conveyed other than by mortgage deed. No partial release of lots from this Covenant shall be allowed. This Covenant shall be referred to on the Definitive Subdivision Plan as follows:

   "A Covenant Agreement between the Community Planning and Development Commission of the Town of Reading and ______________ (Applicant) to secure completion of required ways and utilities has been executed and is recorded at the Middlesex South Registry of Deeds with this plan."

2. **Sureties:** A surety in the form of a bond or deposit of money or negotiable securities sufficient in the opinion of the CPDC to secure the construction of ways and the installation of municipal services may be provided, acceptable to the CPDC at any time prior to the completion of the subdivision. The value of the surety shall be based on the total estimated costs, including engineering, management, supervisory, inspections, inflation, and contingencies, and the costs to prepare as-built plans, to complete all remaining required improvements in the subdivision over a period of time extending to four years from the date of the establishment of the surety, together with the costs of any restoration of affected lands and properties. The Applicant shall secure said surety via any of the following methods of performance guarantee:

   1. Performance Bond – Secured by Deposit (Form I); or
   2. Performance Bond – Secured by Surety Company (Form J); or
   3. Retention of Funds by Lender – Three Party Agreement (Form K).

3. **Lot Release:** CPDC shall vote to release all or certain subdivision lots, and the Community Development Director shall provide a Notice to the Building Inspector (Form L) of such.

Prior to the Commencement of Site Work, Road Work, or Utility Work:

1. **Engineering Comments:** The Applicant shall coordinate with the Town Engineer to resolve any necessary outstanding comments listed in the memo dated 9/20/23.
2. **Pre-Construction Meeting:** The Applicant shall contact the Community Development Director to set up a pre-construction meeting with Town staff.
3. **Recorded Plans:** The Applicant shall provide one (1) copy of the recorded plan and two (2) duplicate certified copies of all other recorded documents to the Community Development Director.
4. **Erosion Controls:** Any erosion controls shown on the plans approved herein and/or approved by the Conservation Commission shall be installed to the satisfaction of the Conservation Administrator and Town Engineer.
5. **Notification:** The Engineering Division shall be notified 72 hours in advance of excavation work to mark out Town-owned utilities.
6. **Trees:** Any trees requiring removal need to be identified and approved by the Conservation Commission and/or Tree Warden, as appropriate.

Prior to the Issuance of a Building Permit for any Lot:

1. **Engineering Comments:** The Applicant shall coordinate with the Town Engineer to resolve any necessary outstanding comments listed in the memo dated 3/7/2024.
2. **Driveway Permits:** The Applicant shall receive approvals for the proposed driveways from the Engineering Division.
3. **I&I Fee:** The Applicant is subject to the required one-time Inflow & Infiltration Fee of twice the Title V flow multiplied by $4.00.
4. **Plot Plans:** Individual plot plans for each lot shall be submitted to the Town Engineer and Conservation Administrator for review and approval. These plans shall indicate locations of proposed utilities, driveway locations and widths, final lot grading, and delineations of any resource areas or resource area buffers.
5. **Building Permit Plans:** Building Permit Plans shall be submitted for review by the Building Inspector, including all information required for the issuance of a Building Permit.

During Construction:

1. **Order of Conditions:** The Applicant shall ensure that all requirements of the Order of Conditions issued by the Conservation Commission are complied with at all times.
2. **Utilities**: All utilities, structures, frames and covers shall meet Town of Reading standards.
3. **Materials**: All project materials shall be stockpiled safely.
4. **Inspections:** All site work shall be inspected by the Engineering Division. The Applicant / Owner's Contractor shall submit a construction schedule of proposed work. All inspections shall be scheduled at least 24 hours in advance.
5. **Reduction of Performance Guarantee:** The Applicant may submit at any time a Request for Reduction or Release of Surety Amount (Form M) to reflect the actual expected cost of work remaining to be completed.

6. **Time Limit for Completion:** Construction of all required improvements shall be completed fully and to the satisfaction of CPDC in accordance with the approved Definitive Subdivision Plan, conditions of approval, and any modifications thereto duly authorized, within two years of the date of endorsement of the plan or the time set forth in any surety, whichever is earlier. The Applicant may request a one-year extension of time in writing from the CPDC before the expiration of said two-year period.

Prior to the Issuance of a Certificate of Occupancy for any Lot:

1. **Conveyance of Easements and Utilities:** The Applicant shall execute a Conveyance of Easements and Utilities (Form N) transferring to the Town valid, unencumbered title to all sanitary sewers, stormwater drains, water mains and all appurtenances thereto constructed and installed in the subdivision. All easements, as reviewed by the Town Engineer and Town Counsel, shall be properly written and recorded. In no instance shall any lot be sold until all easements and utilities are properly conveyed to the Town.
2. **Public Access Easements:** The Applicant shall provide a copy of easements required for public access to the trail and Conservation land. Necessary approvals from the Select Board and others shall be received prior to issuance of occupancy.
    i. A Public Access Easement shall be required for the entirety of the right-of-way to allow public access to the parking spaces and across the cul-de-sac.
    ii. A Public Access Easement shall be required for the proposed trail/path connection between Lot 1 and Lot 2 from the right of way to the Conservation Land. All easements shall be approved by legislating bodies and recorded at the Registry of Deeds prior to the issuance of final occupancy. All homeowners shall receive copies of the Easements and HOA Documents shall reference such as required.
3. **Road Work:** The roadway base course and binder shall have been constructed properly and approved by the Town Engineer.
4. **Drainage:** The stormwater infiltration system shall be properly constructed, operational, and inspected by the Town Engineer and Conservation Administrator.
5. **Homeowners Association Documentation:** Finalized HOA documents shall be provided to the Community Development Director for review and shall include the following language:
    a. **Right-of-Way Layout**: No structures shall be allowed in the right-of-way layout. Reference to required Public Access Easements shall be referred to.
    b. **Stormwater Management Plan:** Reference shall be made in the Homeowner's Association documents to the Stormwater Operations and Management Plan for the site. Current and future owners of the lots shall be notified that they are responsible for maintaining the stormwater system, including but not limited to the catch basins, infiltration gallery, and drainage structures within the right of way layout.
    c. **Trash/Recycling:** Trash/recycling shall be placed at the curb side for regular pick up by the Town's contracted haulers.
    d. **Public Easements:** The Public Access Easement for the trail/path connection to Parcel Z shall be referred to.

7. **Parcel Z Conveyance:** The Applicant shall submit demonstrated proof that "Parcel Z" has been conveyed to the Town for preservation as Conservation land. The granite bounds marking the wetland line and the access easement should be fully installed to the satisfaction

of the Conservation Administrator, Community Development Director and Town Engineer prior to the issuance of occupancy permit.

Prior to the Issuance of a Certificate of Completion or the Release from Covenant:

1. **As-Built Plans:** Upon completion of construction, and within 60 days of the issuance of the final Certificate of Occupancy for the project, the Applicant shall prepare and submit As-Built Plans in hard copy, PDF and AutoCAD format to the Community Development Director and Town Engineer.
2. **Final Release of Performance Guarantee:** The Applicant shall submit a Form M for review by the Town Engineer and Community Development Director. The CPDC shall not release the performance guarantee unless and until written documentation from the Town Engineer and Community Development Director have been provided verifying the durability of required improvements as outlined under Section 9.5.2.1 of the Subdivision Regulations.
3. **Certificate of Completion:** The Applicant shall submit a Certificate of Completion (Form O) for review by the Town Engineer and Community Development Director. The CPDC shall not vote to approve the Certificate of Completion unless and until the requirements of Section 9.5.2.4 of the Subdivision Regulations have been satisfied.

Signed as to the accuracy of the vote as reflected in the minutes:

____

Andrew MacNichol, Community Development Director Date

Cc: Applicant, Town Clerk, CPDC, planning file

March 22, 2024

Community Planning & Development Commission
C/O Andrew MacNichol, Director
16 Lowell St
Reading, MA 01867

Re: Engineering & Staff Review
246 & 248 Walnut St Subdivision

Dear Mr. MacNichol and Commissioners,

Meisner Brem Corporation has revised the Subdivision Plan Set and Stormwater Management Report in response to comments received from the Engineering Division dated March 6. This revision is labeled "Revision 4" on the plans and is intended to address all the comments received to-date. Please see below for an explanation of the revisions and responses to each comment:

1. Phosphorus removal calculations are now included in Volume 1, Section 10 of the Stormwater Management Report. Calculations are based on the Massachusetts Small MS4 General Permit. The calculations show greater than 98% phosphorus removal.

2. A 100 ft long vertical curve is provided to allow for a smooth transition between the 1% downgrade and 8% upgrade. Note that this curve corresponds to a "K Value" of 11 which is greater than the AASHTO "K Value" for a 15 mph design speed (K=10). A simple graphical representation of a firetruck traversing the road profile is included as an attachment to this letter. The graphic assumes the body of the firetruck is 1 ft from the ground and the firetruck is 37 ft long. The graphic shows significant clearance between the body of the firetruck and the road. No bottoming out is expected.

3. The electric services for both lots are moved further from the water services to ensure separate trenches are dug for each.

4. A new catch basin, CB 7, is added north of CBs 5 and 6. A catch basin along the northern edge of the cul-de-sac would not catch much runoff unless the road is crowned. The designer does not wish to crown the road due to the limited space on the site and pre-existing flow patterns. The new CB will reduce the runoff directed to the other CBs.

5. A small berm and a flow arrow are now shown near the boundary of Lot 2 to prevent flow onto the State Highway Layout. See sheet 8.

6. A blanket easement will be created via deed to encompass the entire private way. The applicant would accept this as a condition of approval.

7. The drainage flared end section is moved slightly further to the west. Note that no trail is proposed at this time. The access easement is for municipal access to Conservation land.

8. The retaining wall is now specified as a block wall which is easily built from one side. The wall label also states that no disturbance can occur on the abutting lot, and that the property line shall be staked by a surveyor prior to construction of the wall. See sheet 8.

9. There is no cleanout proposed – this comment appears to refer to the flared end section in comment #7.

10. The applicant will comply with construction requirements listed on the second page of the memo.

Lastly, two additional revisions have been made based on CPDC Staff comments and feedback from the Commission:

11. A single red maple tree is added to correct the discrepancy between the planting quantities on the planting table and the plan view. See sheet 10.

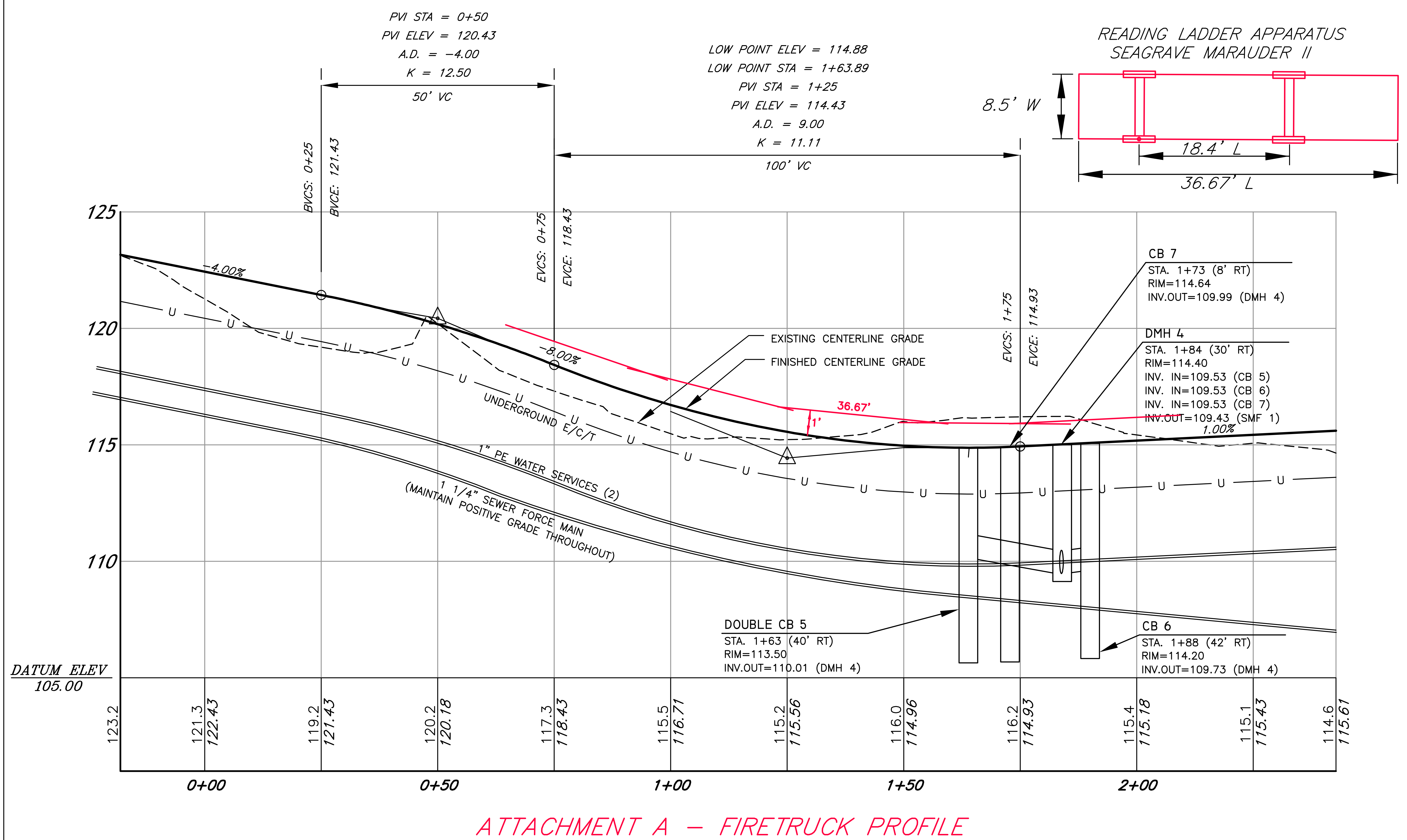
11. The cape cod berm is now labelled to state that a waiver is required from the requirement from granite curbing. See label on sheet 8 and detail on sheet 12.

Very Truly Yours,
MEISNER BREM CORPORATION

Ian J. Ainslie

Ian Ainslie, PE

Cc: Stella Construction



ATTACHMENT A – FIRETRUCK PROFILE

Private Way Profile – Pavement Centerline

SCALE: H: 1"=20'
V: 1"=4'

TOWN TO COORDINATE #18 ENTRANCE
USE OPTION-2 W/ GRASS MEDIAN
SANBORN STREET
WOBURN STREET
LINDEN STREET
HAVEN STREET
GOULD STREET
ASH STREET
EX-UP w/ Comcast Service to be UG for widening of roadway (Town to Confirm)
REVIEW PARKING OPTION
UP IMPACT, REMOVE UP OR R&r
existing roadway 23 ft
Prop -28 ft
7.5-13-7.5
8' EX- SIDEWALK AND PLANTTING IMPACT
UP Impact
No hyd
REVIEW PARKING OPTION
UP Impact
SW Clearance 36"
limit of work
LIMIT OF PHASE II WORK
MATCHLINE
DOWNTOWN PHASE II
PROGRESS MEETING
COMMENTS
07/26/2023

HIGH STREET
WOBURN STREET
LINCOLN STREET
ARLINGTON STREET
BRANDE COURT
CHUTE STREET
HAVEN STREET
GREEN STREET
ASH STREET
WASHINGTON STREET
MINOT STREET
MAIN STREET
RAILROAD TRACKS
45 High Street
RET UP
36" Clearance
FA Box
21"/36"
clearance
Wider Sidewalk
EX-UP
5'-6"
Approx Location of
conduit sleeve under
the track
limit of work
Review design in
front of new building
Possible expand
sidewalk and remove
parkings
RETAIN CURB
LINE??
Ex-Water Main / Gas
Keep Existing as
discuss w/ Town
Widening??
Remove WCR and
crosswalk
Town to Review
Trees in this area for
removal
DOWNTOWN PHASE II
PROGRESS MEETING
COMMENTS
07/26/2023

DRAFT

DOWNTOWN READING – PHASE 2

COMMUNITY PLANNING & DEVELOPMENT COMMISSION MEETING

APRIL 8, 2024

FOR REVIEW

04/02/2024

- Introductions
- Project Area
- Benefit & Goals
- Examples of how to Achieve these goals
- Next Steps in the Design
- Discussion

Agenda

Project Team

Town of Reading

Ryan Percival PE – Town Engineer

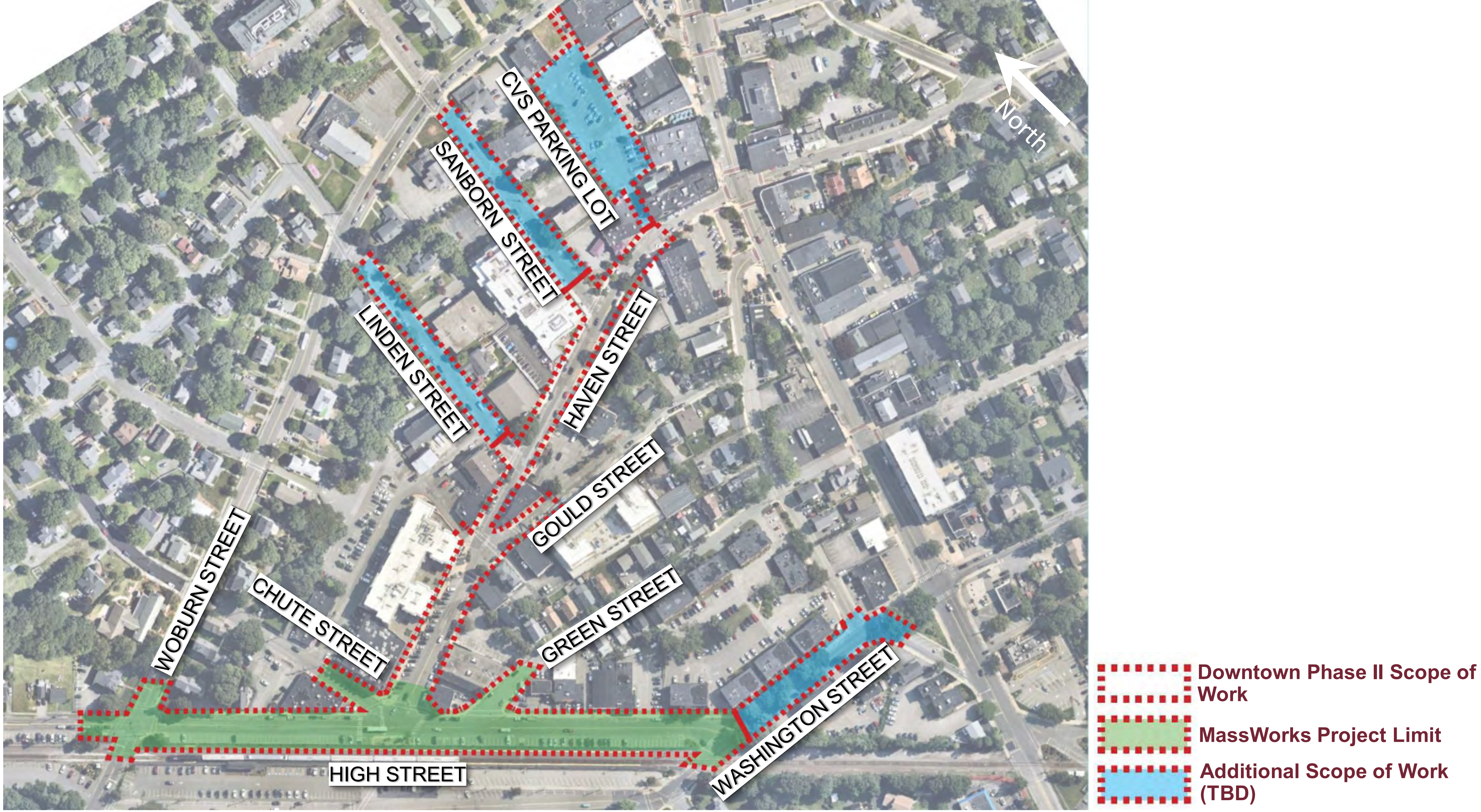
Andrew MacNichol – Community Development Director

BETA Group, Inc.

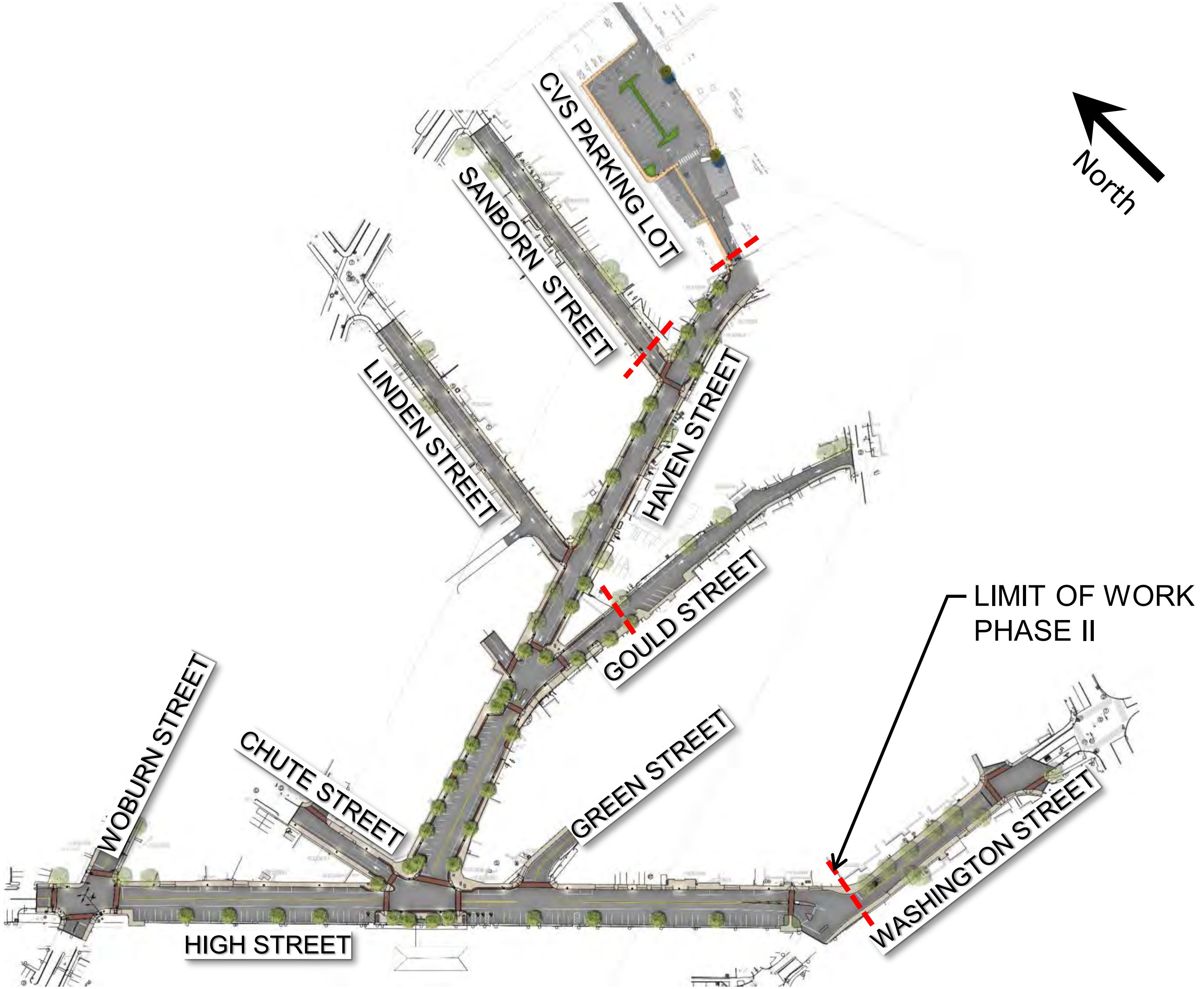
Darshan N. Jhaveri, PE – Project Manager

Scott Ridder – Landscape Architect

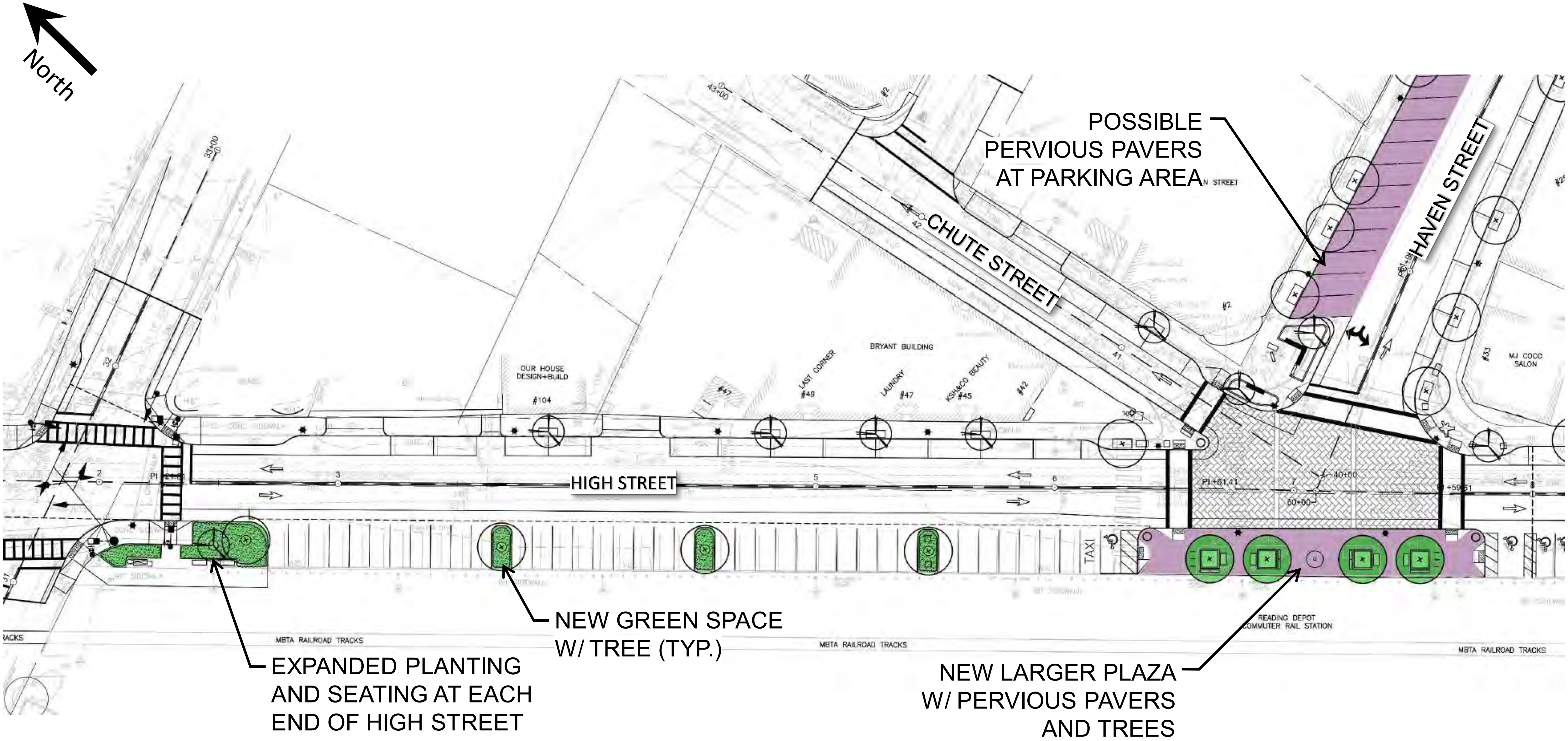
Introductions



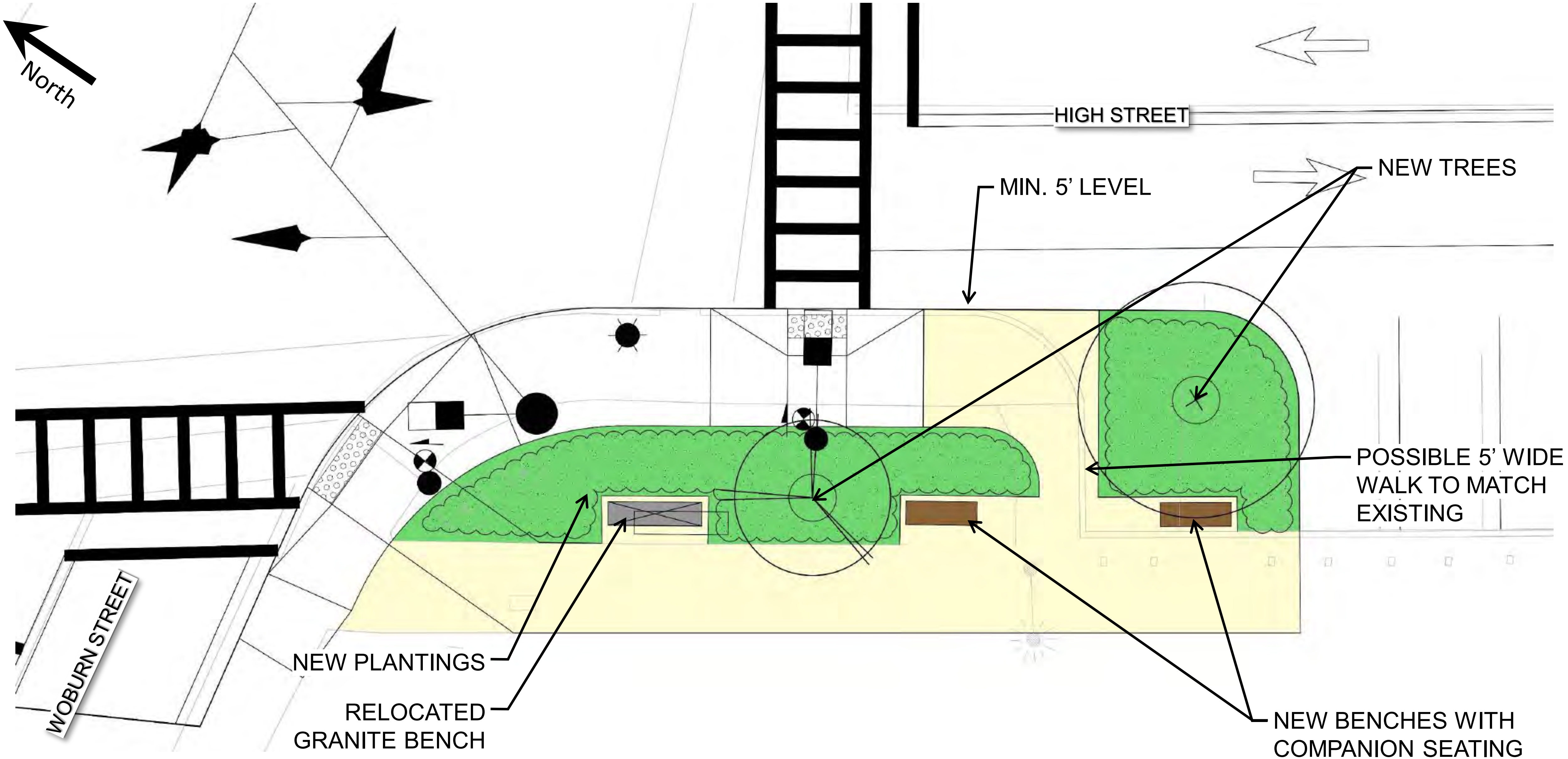
Project Location



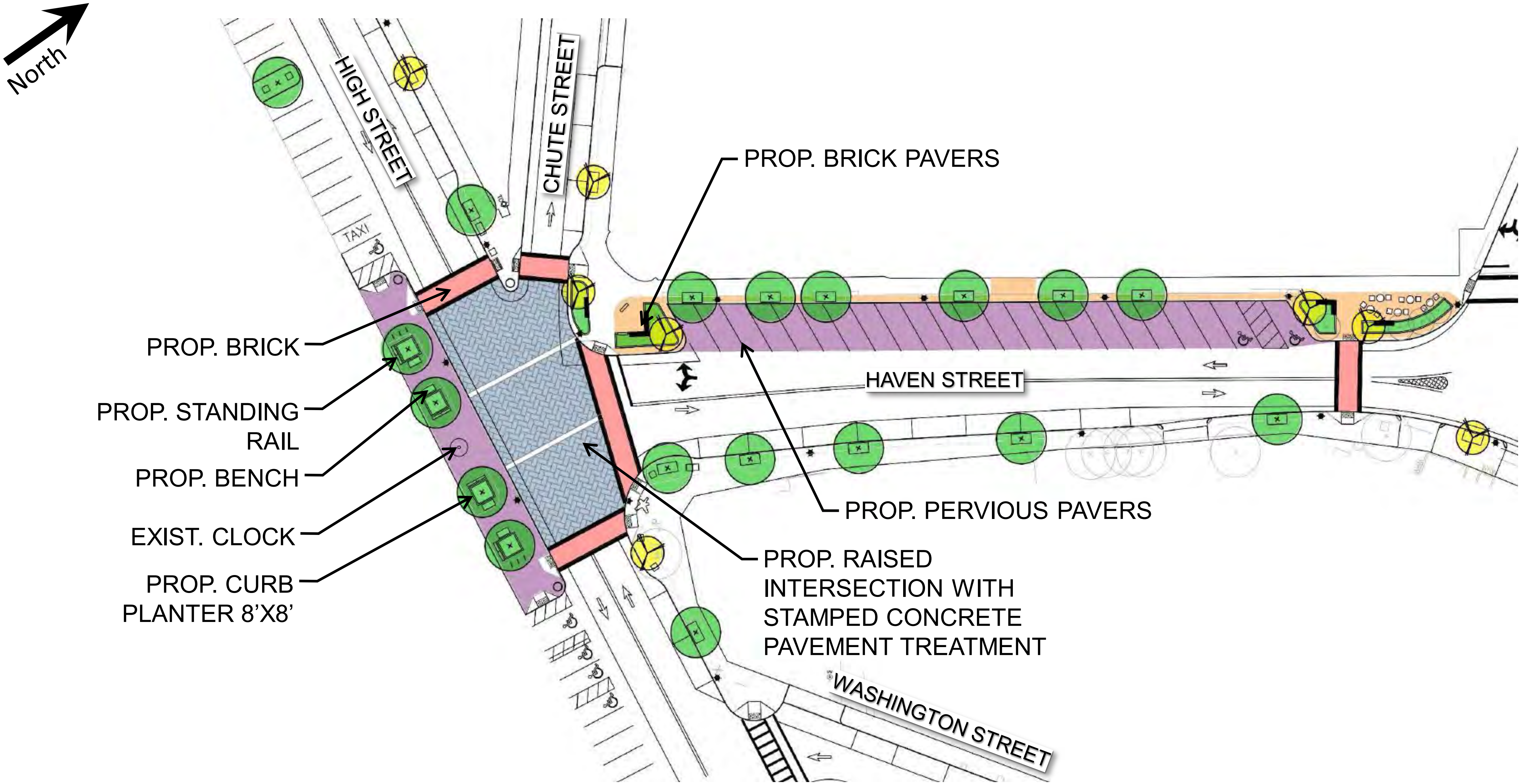
Downtown Phase II Limits



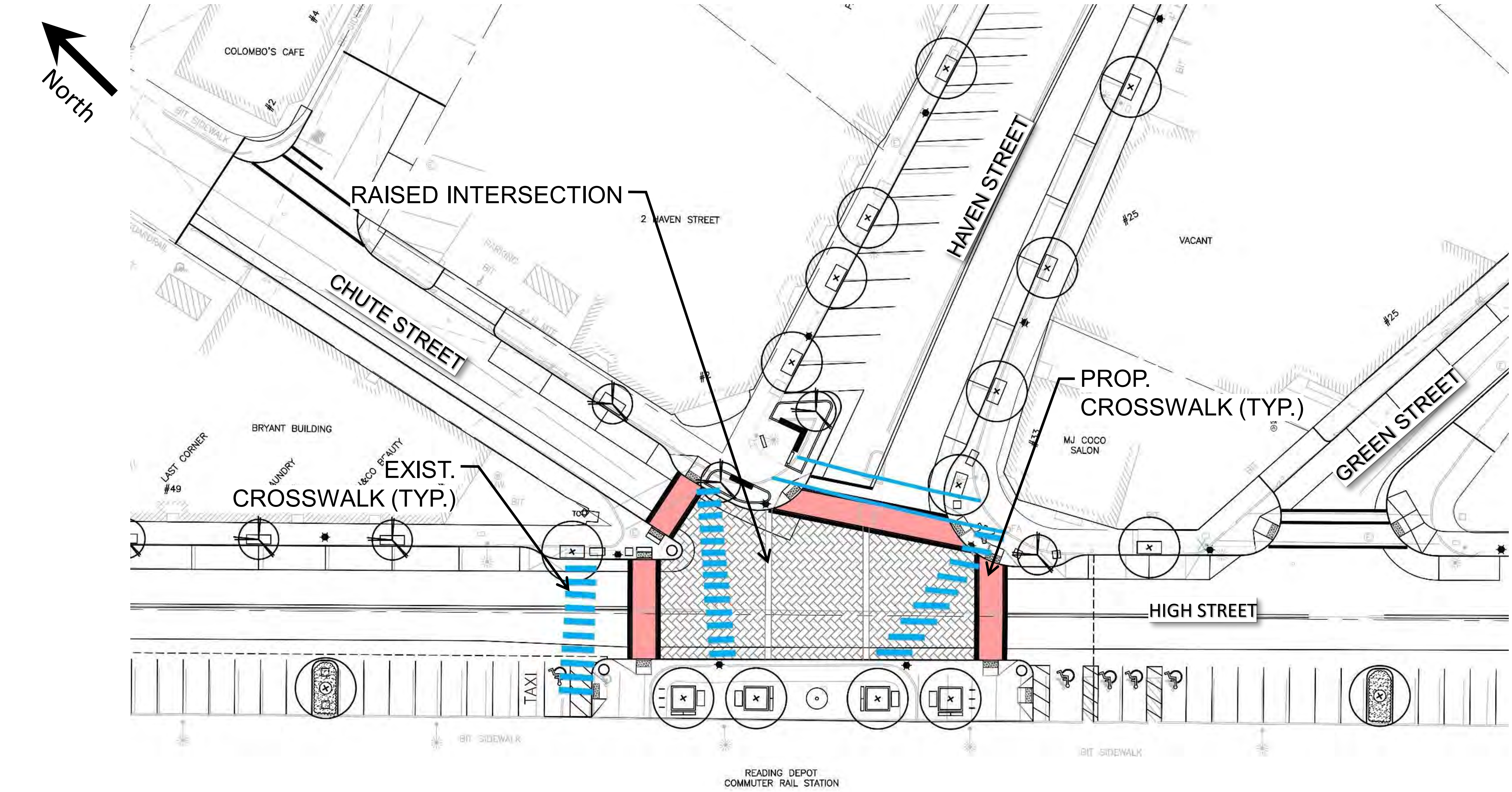
Maximize Landscape/Reduce Impervious/Capture Stormwater



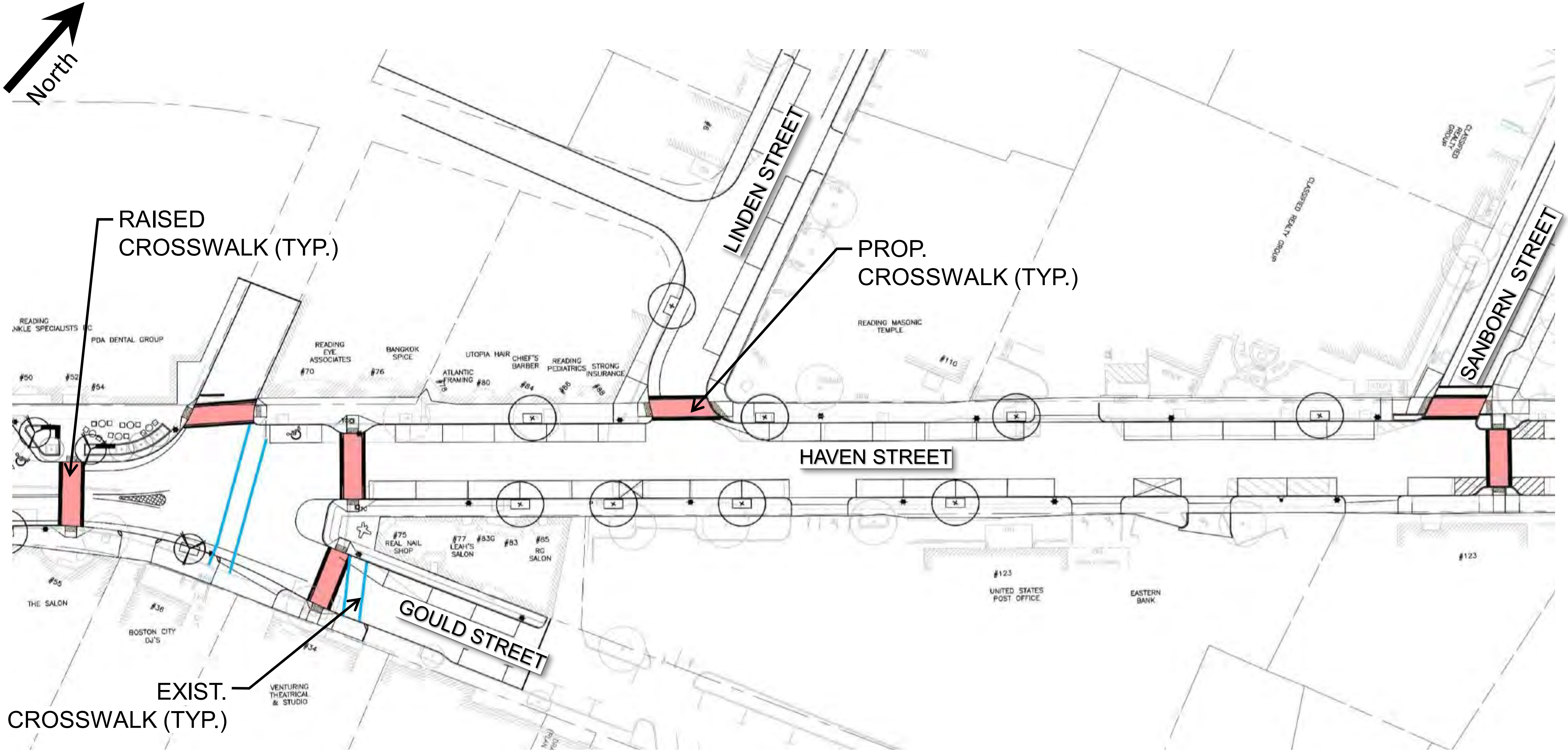
Maximize Landscape/Reduce Impervious/Capture Stormwater



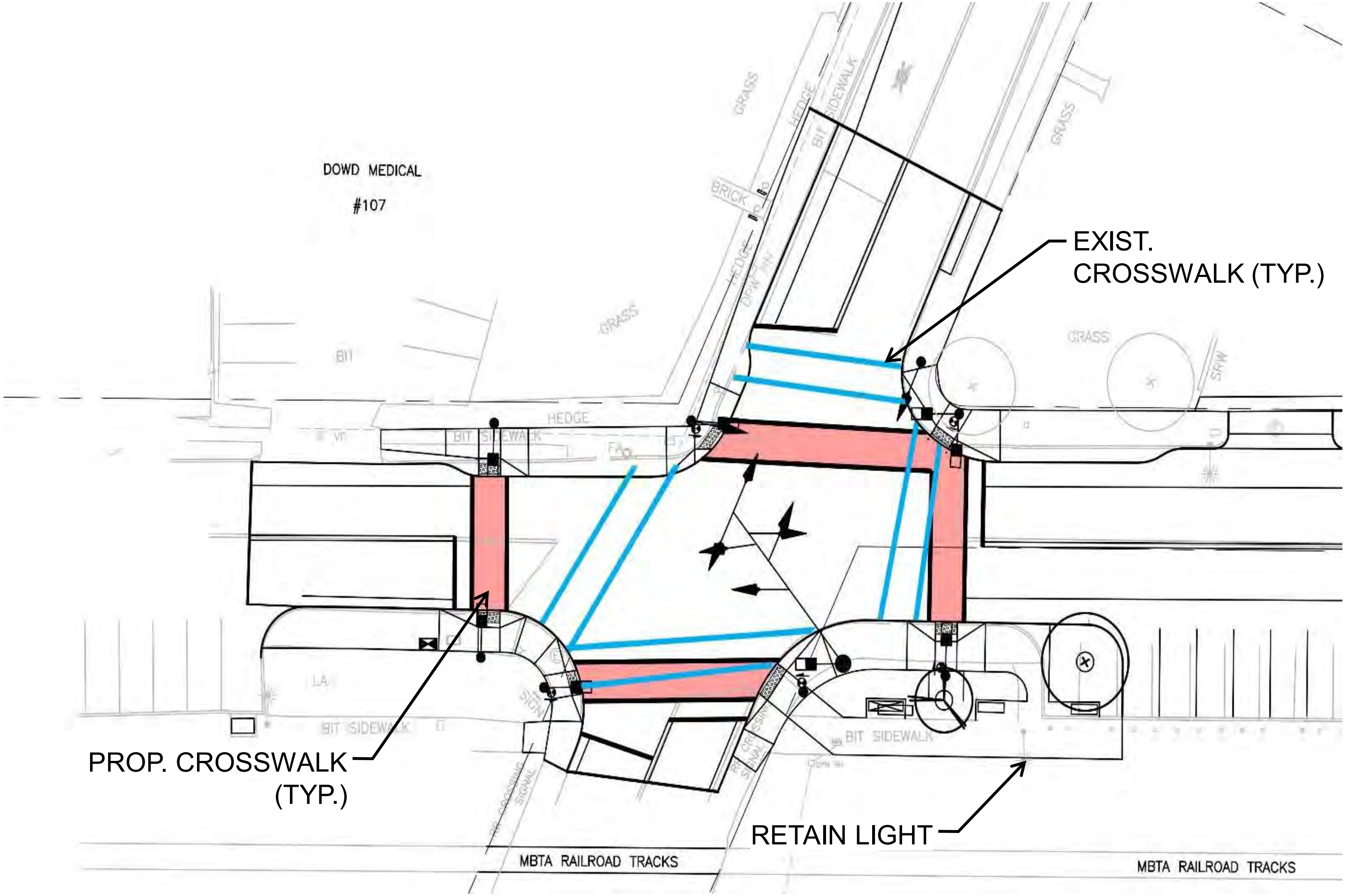
Maximize Landscape/Reduce Impervious/Capture Stormwater



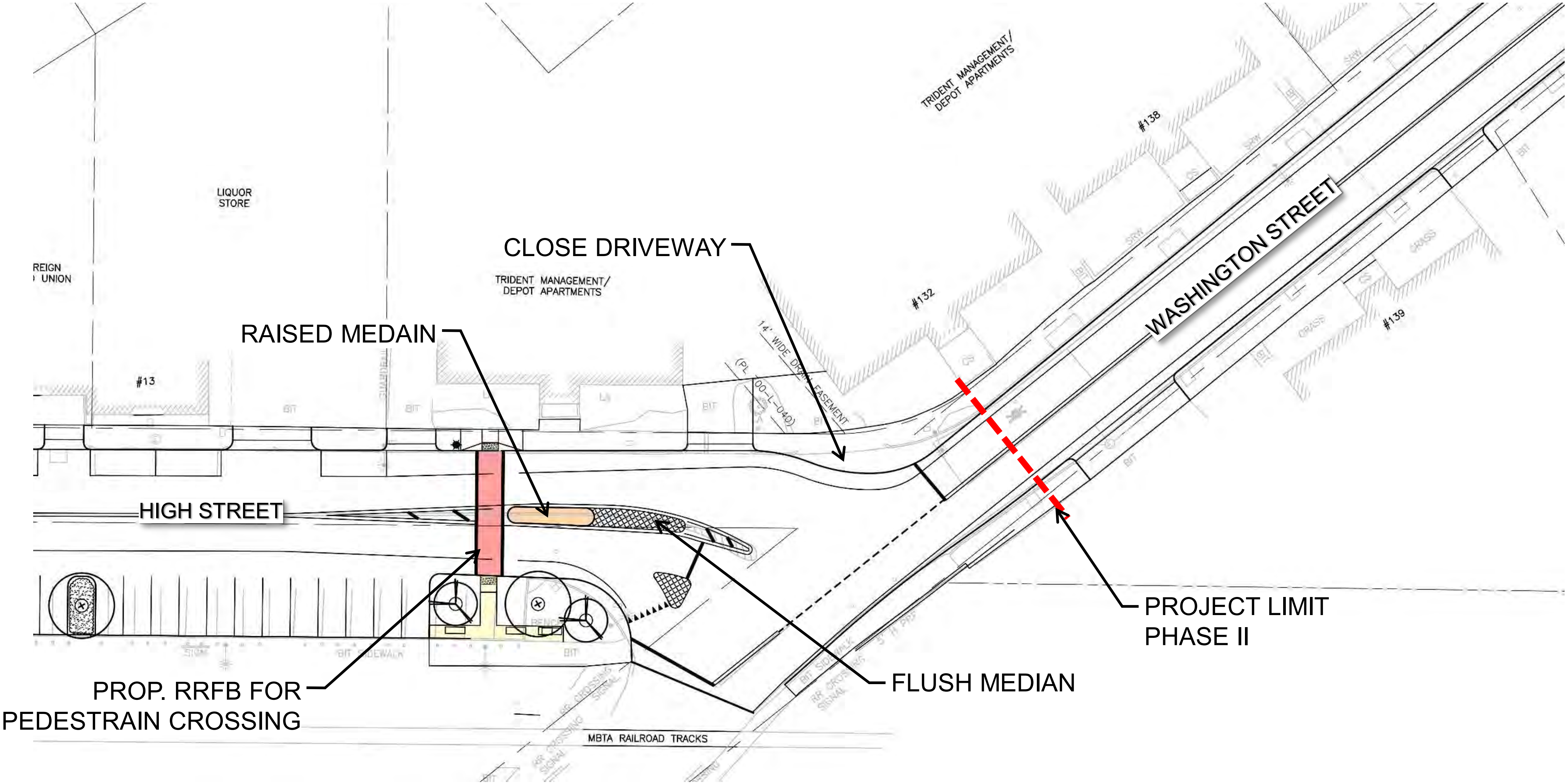
Pedestrian Walks & Crossing Improvements



Pedestrian Walks & Crossing Improvements



Vehicular & Traffic Improvements



Vehicular & Traffic Improvements

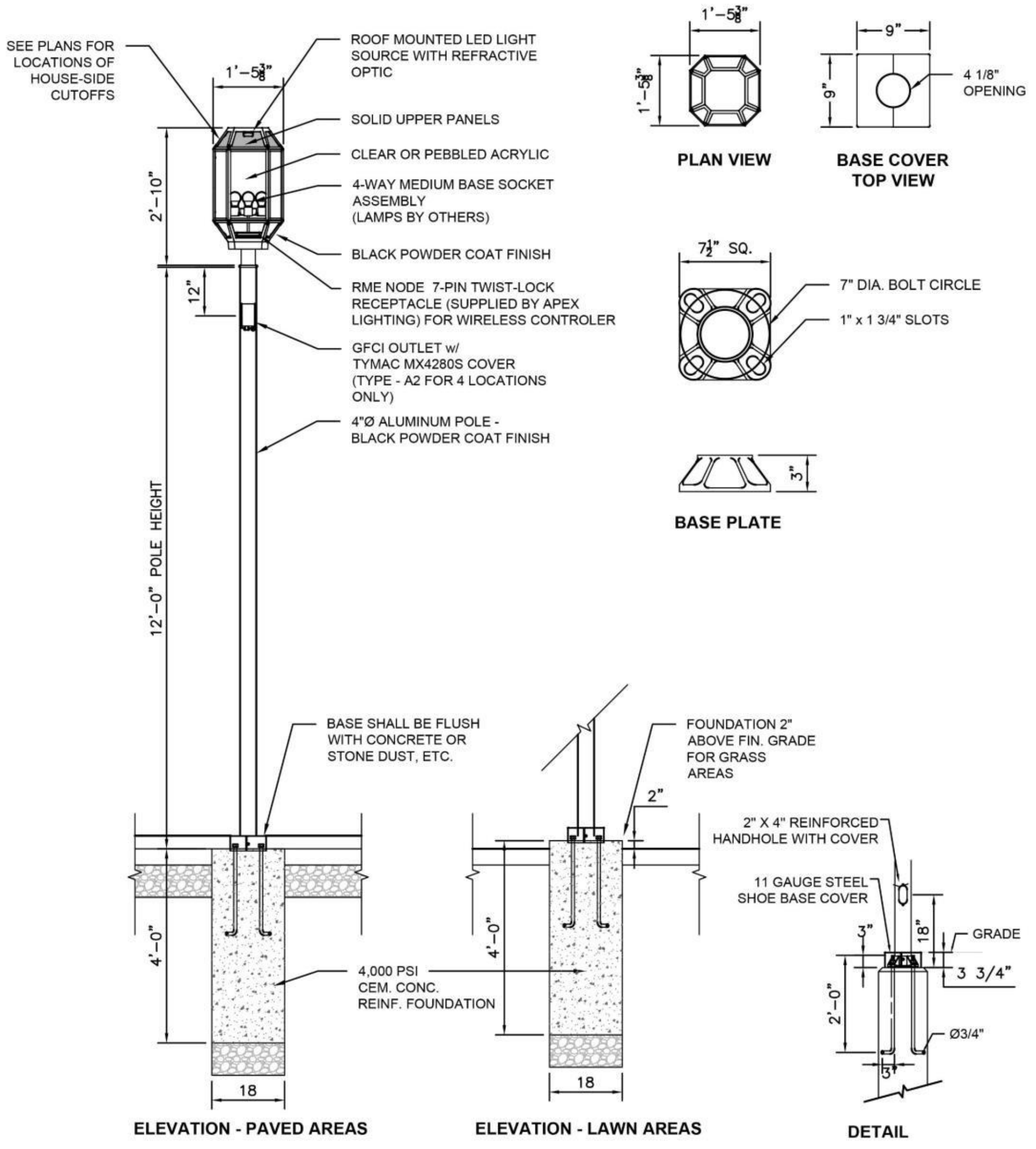
Main Street

High Street

Haven Street

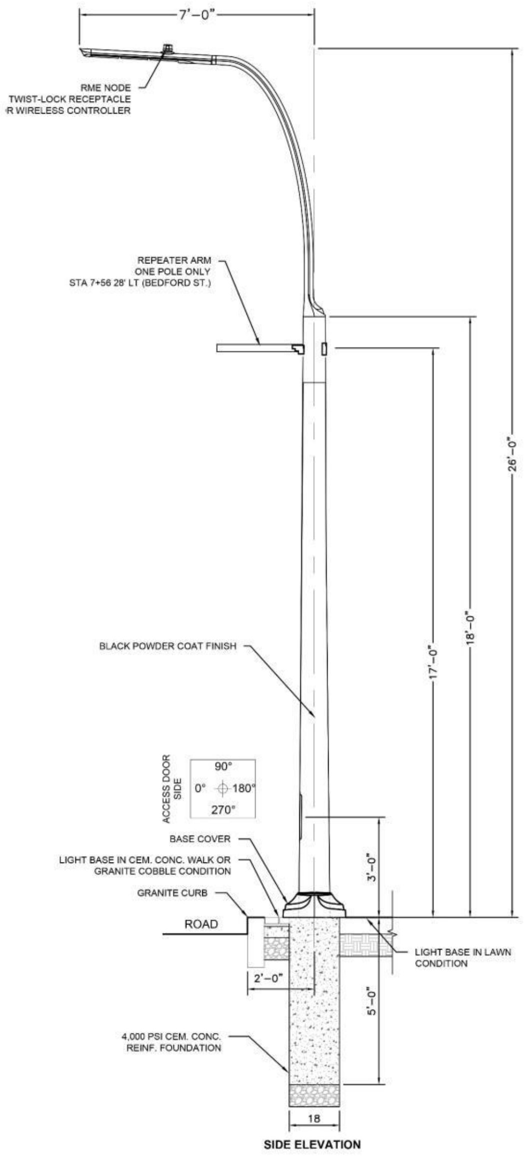
Lighting Considerations - Existing

Lighting Considerations – Concept Examples



LIGHTING FIXTURE - TYPE A1 & A2 - 12 FOOT POLE

SCALE: 1/2"=1'-0"



LIGHTING FIXTURE - TYPE B - 26 FOOT POLE

SCALE: 1/2"=1'-0"

Lighting Considerations – Lexington, MA.

Lighting Considerations – Lexington, MA.

Co-Space Activation & Placemaking

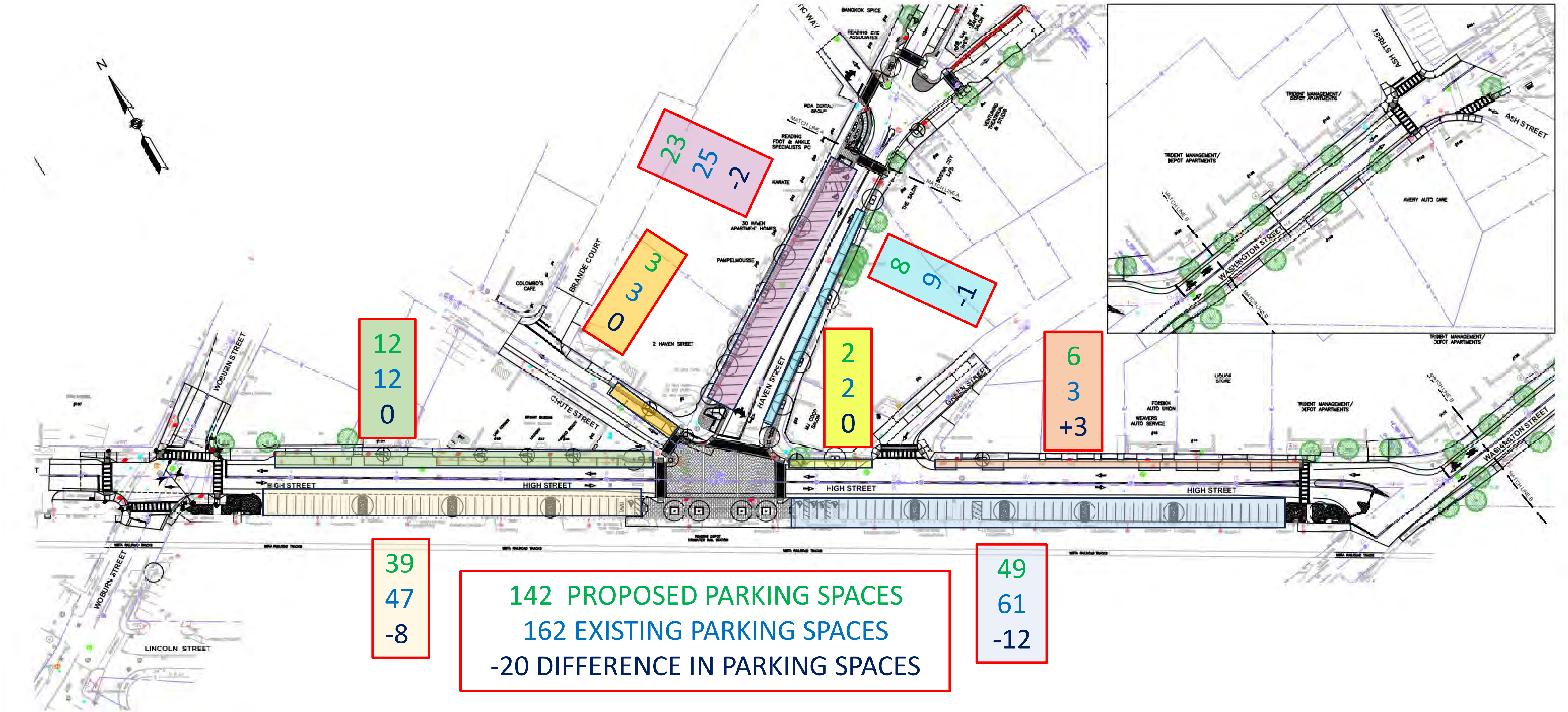
Co-Space Activation & Placemaking

Co-Space Activation & Placemaking

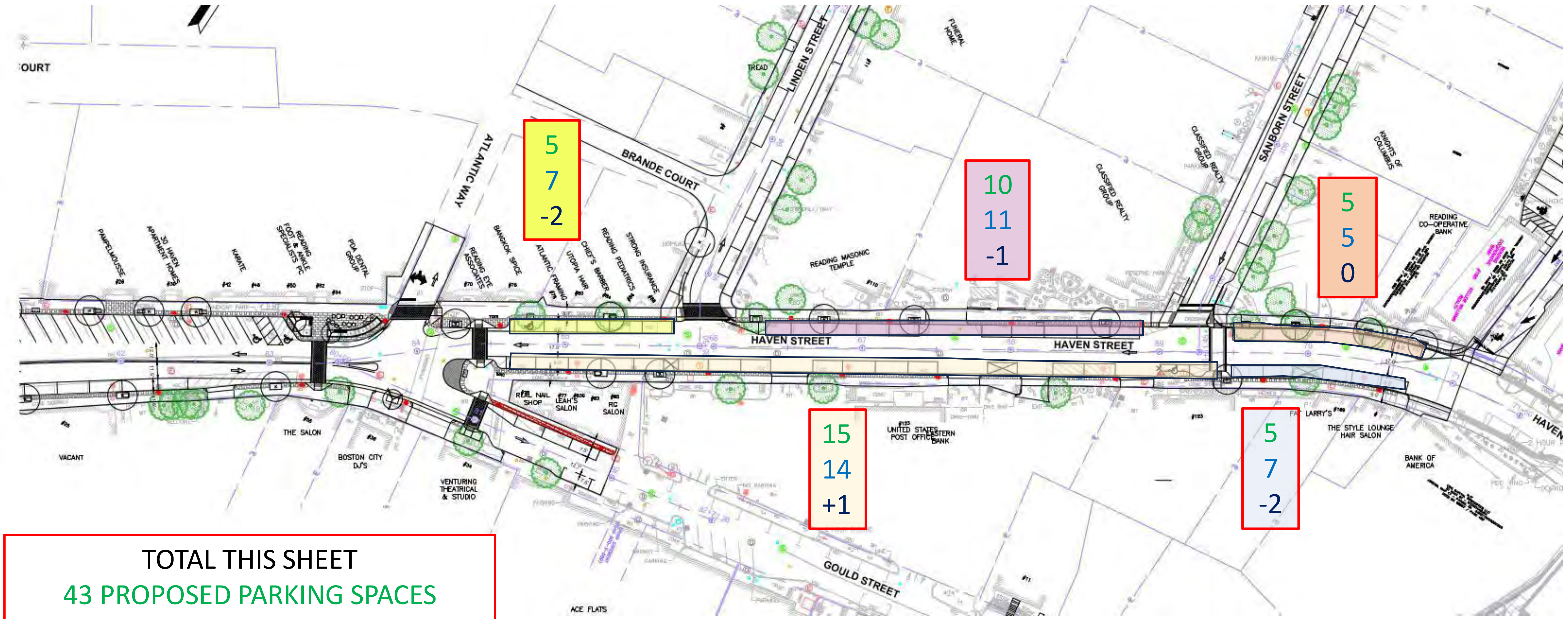
- Continue Stakeholder Engagement thru Summer of 2024
- Fine-tune Design Details
- Secure Funding
- Bid in Fall of 2024
- Construction Spring 2025

Next Steps in the Process

Discussion



Parking Inventory



TOTAL THIS SHEET

43 PROPOSED PARKING SPACES

48 EXISTING PARKING SPACES

-5 DIFFERENCE IN PARKING SPACES

Parking Inventory

Downtown Phase 2

- Haven Street
- High Street
- Washington Street
- Linden Street
- Sanborn Street
- Chute Street
- Green Street
- Gould Street
- CVS Parking Lot