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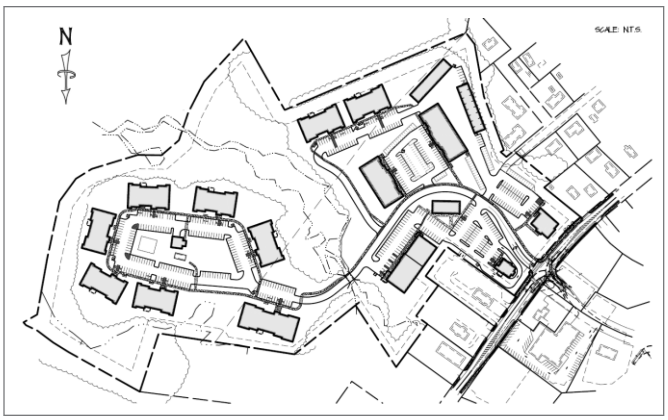
Final Environmental Impact Report (FEIR)

Sierra Vista Commons Project
Easthampton, Massachusetts
EEA# 16729

June 17, 2024
GZA File No. 15.01667035.00



SUBMITTED TO:
Massachusetts Executive Office of Energy and Environmental Affairs
Massachusetts Environmental Policy Act (MEPA) Office
100 Cambridge Street, Suite 900
Boston, MA 02114

PREPARED ON BEHALF OF:
Tasty Top Development, LLC.
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SUBMITTED ELECTRONICALLY

June 17, 2024
GZA File No. 15.01667035.00

Secretary Rebecca L. Tepper
Massachusetts Executive Office of Energy and Environmental Affairs (EEA)
Massachusetts Environmental Policy Act (MEPA) Office
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: Final Environmental Impact Report
Sierra Vista Commons Project (EEA#16729)
Easthampton, MA

Dear Secretary Tepper:

On behalf of Tasty Top Development, LLC. (Tasty Top, Proponent), GZA GeoEnvironmental, Inc. (GZA) is pleased to submit the enclosed Final Environmental Impact Report (FEIR) for the Sierra Vista Commons Project located in Easthampton, MA (the “Project”) (EEA#16729).

The Project proposes to develop the properties identified as 93, 94, 95, 97 Northampton Street (Route 10) and 1 Groveland Ave into a mixed-used residential and commercial center. Previously, these properties have supported a driving range known as Easthampton Golf, a retail ice cream stand known as Tasty Top, a single-family house, ancillary barns and sheds, and agricultural fields.

This FEIR has been developed based on the scope required by the Secretary’s Certificate on the Draft Environmental Impact Report issued on April 1, 2024.

Should you have any questions regarding this FEIR, please feel free to contact Adrienne Dunk at 413-726-2144 or adrienne.dunk@gza.com.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Adrienne Dunk

Adrienne Dunk, WPIT
Project Manager

Jennifer RM Burke

Jennifer R.M. Burke, P.E., CPSWQ
Consultant/Reviewer

Stephen Lecco

Stephen L. Lecco, AICP, CEP, PWS
Principal-in-Charge

Enclosure: Final Environmental Impact Report with attachments

EXECUTIVE SUMMARY

PROJECT BACKGROUND AND PROJECT DESCRIPTION

Tasty Top Development, LLC., the Proponent and Owner, proposes to develop the properties identified as 93, 95, 97 Northampton Street (Route 10), Easthampton, Massachusetts (the "Site"). As described in the Draft Environmental Impact Report (DEIR), the Proponent purchased the properties on the northwest side of Northampton Street identified as 1 Groveland Street and 94 Northampton Street to accommodate the preferred intersection design. These two additional properties, along with the original three parcels are collectively referenced as the "Project Area." Sierra Vista Commons (the "Project") would be a mixed-use residential and commercial center. The Site, as purchased by the Proponent on April 11, 2022, consists of approximately 33-acres of partially developed land with 332-feet of frontage along Northampton Street. The surrounding land uses abutting the Project Area include mixed commercial uses to the north and west, vacant land to the east, and residential neighborhoods to the south.

The Site has previously supported a variety of uses that have altered approximately 17.1 acres of the total Site area. Approximately 10-acres of the southern portion of the Site was operated as a driving range known as Easthampton Golf since at least the 1990s, based on aerial image review. Easthampton Golf included a paved parking area, a small building supporting a sales office, an artificial turf and natural grass tee box area, and a mowed lawn driving range. Within the immediate frontage on Northampton Street, the Site supported a retail ice cream stand and paved parking lot, as well as a single-family home and barn. These structures were removed from the Site prior to engagement in the MEPA process.

Approximately 6.5 acres within the northern portion of the Site was historically used as an agricultural field, though it has not been actively farmed in at least two years. Access to this field is currently from a pre-existing, unauthorized wooden bridge crossing the intermittent stream which bisects the property. No authorized, legal access is currently available to continue using that field for agriculture.

The two additional parcels included in the Project Area appear to have been previously disturbed. The parcel at 1 Groveland St is approximately 0.6-acres and from aerial imagery appears to contain a lawn, a vegetative screen that is oriented northwest-southeast, and sporadic other trees. The parcel at 94 Northampton Street is approximately 0.3-acres and contains a paved parking area with surrounding lawn.

To date, the Project has been authorized through multiple local- and federal level permits and authorizations including: City of Easthampton (City) Planning Board via a Plan Approval, Site Plan Review, and Special Permit; City Conservation Commission through a local Order of Conditions; and the United States Environmental Protection Agency through issuance of permit authorization under the Construction General Permit based on submittal of an associated electronic Notice of Intent. The Proponent acknowledges that should the Project differ from what was authorized by the Conservation Commission, an amended or new Order of Conditions may be required.

The Project proposes to redevelop the Site into a mixed-use residential and commercial center. The Project design matches proposed uses with those allowed in the Site zoning districts as well as those encouraged by Planning Board and City planning documents. The front portion of the Site, to a distance of 800 feet from Northampton Street, is zoned as Highway Business (HB) and the rear of the Site is zoned as Residential-Suburban A (R-15). A portion of the Site is also within the Smart Growth District. The Project includes the following development:

- Roots Learning Center (Daycare facility), approximately 9,000 square feet (SF);
- Roots Gymnastic Center, approximately 7,000 SF;
- 1 Sit-down restaurant, 220-seat capacity, approximately 5,500 SF;

- 1 Bank, approximately 3,200 SF;
- 1 Stand alone small retail, approximately 4,000 SF;
- 2 Mixed-use warehouse/storage, contractor units, approximately 7,400 SF/building;
- 1 Mixed-use retail/office buildings with 14 apartments above, approximately 16,000 SF; and
- 10 Mid-rise (3 floor) apartments buildings, 188 units total, nine 13,600 SF buildings and one 18,000 SF building.

The Project proposes to develop mixed uses within the HB zone which has direct street front access from Northampton Street. Locating the commercial and some residential development within this area was recommended by the Highway Business District Review Subcommittee in its report to the Planning Board, dated July 9, 2013. This development strategy sites business and commercial uses in the City's commercial corridor and avoids developing a single, large commercial retailer or strip mall, which was identified as a goal in the City's Master Plan and further supported by the Highway Business District Review Subcommittee. Approximately 15 acres of the Site are within this HB Zone and Smart Growth District Overlay. Fifty-eight apartments are proposed within this zone.

Most of the housing units, including the eight residential apartment buildings each containing 18 units, are proposed in the R-15 zone, away from Northampton Street. The R-15 Zone is approximately 18 acres. A total of 54 apartments Site-wide would be designated as affordable housing to meet the City of Easthampton Zoning requirements. The Master Plan identified the need for increased affordable housing given increasing housing costs and low vacancy rates in Easthampton. The City of Easthampton Housing Production Plan 2021-2026 emphasize the benefits to the City in reaching 10% affordable housing and achieving safe harbor from Chapter 40B.

The Project includes the construction of an internal roadway to provide access and circulation, parking spaces for each facility and building, and typical site utilities. This roadway will include sidewalks, crosswalks, and speed humps as necessary at critical points. To access the northern portion of the property, the current, unauthorized stream crossing will be removed, and a MA stream-crossing compliant bridge will be installed.

The Project will be serviced by sewer and water connections to existing municipal infrastructure. The water connection will be in Northampton Street while the sewer connection is to an interceptor line located along the northeastern (rear) property boundary. These municipal services have adequate capacity to service the proposed development. Trash collection will be provided via private service at dumpsters located throughout the development.

Most of the Site is currently open field or driving range lawn and is therefore already devoid of trees. Tree removal is proposed along the existing edges of the fields; however, a minimum 35-foot vegetative buffer will be provided along the abutting residential properties to the south. An existing 160-180-foot vegetative buffer will be maintained throughout the construction of the Project to divide the rear residential dwellings from the mixed-use development in the front of the Site. Additional landscape and restoration plantings are proposed to offset necessary tree removal.

CHANGES SINCE THE DEIR

The Project has not been materially revised since filing the DEIR. No changes to the preferred alternative, construction approach, or sequencing have been incorporated since the filing of the DEIR. A parking plan identifying the carpool parking spaces and electric vehicle charging stations has been added to the Project Drawings. Mitigation has been revised to include an approximately 10.8-acre Conservation Restriction, which includes approximately 7.0 acres of farmland soils, to be placed on portions of the Site outside of the limits of the development, and the community garden has been doubled in size to approximately 20,000 square feet.

MASSACHUSETTS ENVIRONMENTAL POLICY ACT APPLICABILITY AND PROCESS TO DATE, FEIR SCOPE

The Project, as currently designed, exceeds the following review thresholds, two of which are mandatory Environmental Impact Report (EIR) thresholds, as noted below:

1. Land
    a. 301 CMR 11.03(1)(a)(2) *Creation of 10 or more acres of impervious area (EIR threshold);*
    b. 301 CMR 11.03(1)(b)(2) *Creation of 5 or more acres of impervious area;*
    c. 301 CMR 11.03(1)(b)(4) *Conversion of land in active agricultural use to nonagricultural use, provided the land includes soils classified as prime, state important, or unique by the USDA;*
2. Transportation
    a. 301 CMR 11.03(6)(a)(6) *Generation of 3,000 or more New average daily trips (adt) on roadways providing access to a single location (EIR threshold);*
    b. 301 CMR 11.03(6)(b)(13) *Generation of 2,000 or more New adt on roadways providing access to a single location;*
    c. 301 CMR 11.03(6)(b)(14) *Generation of 1,000 or more New adt on roadways providing access to a single location and construction of 150 or more New parking spaces at a single location;* and
    d. 301 CMR 11.03(6)(b)(15) *Construction of 300 or more New parking spaces at a single location.*

Proponent filed an Expanded Environmental Notification Form (EENF) with the MEPA Office on June 30, 2023. The Secretary's Certificate for the EENF (EEA#16729) was issued on August 16, 2023. The Draft Environmental Impact Report (DEIR) was prepared and submitted on February 15, 2024 with the Secretary's Certificate issued on April 1, 2024. This Secertary's Certificate found the DEIR adequately and properly complied with MEPA and its implementing regulations and as such, the Proponent is submitting this Final Environmental Impact Report (FEIR) in response to the required scope that includes the following elements:

- Formatting in accordance with Section 11.07 of the MEPA regulations for outline and content;
- Description of any changes to the Project since the filing of the DEIR *(note: no changes have occurred)*;
- Revised site plans identifying project components and proposed infrastructure (**Attachment 3**);
- Updated list of required Permits, Financial Assistance, and other state, local, and federal approvals (**Section 10.0**);
- Environmental Justice (EJ) / Public Health:
    - Circulate of the FEIR or a summary thereof to an updated EJ Reference List obtained from the MEPA Office that is the same as used to provide notice of the DEIR (**Attachment 4**);
    - Summarize any outreach conducted since filing the DEIR and any changes made to the Project as a result of this outreach (**Section 3.1**);
    - Clarify the geographic radius covered by the traffic area study and further explain the >1 tpy increase in VOCs notwithstanding mitigation measures and explore additional mitigation measures for air quality impacts associated with new traffic (**Section 3.2**);
- Land Alteration:
    - Describe the Project's consistency with the Massachusetts Department of Agricultural Resources (MDAR) Agricultural Lane Mitigation Policy (**Section 4.0**);
- Traffic, Transit, Bicycle, & Pedestrian Access:

  - Provide a revised TIA that evaluates a signalized driveway option (**Section 5.1**);
  - Consult with MassDOT regarding the timing of Project implementation and funding for the design and construction of the roundabout (**Section 5.2**);
  - Clarify which intersections show a Level of Service (LOS) F conditions notwithstanding roadway improvements and proposed measures and what measures will be taken if the proposed TDM measures are not successful (**Section 5.3**);
- Wastewater:
  - Evaluate if the Project proposes a private treatment works as defined at 314 CMR 12.00 and discuss any necessary additional permitting or regulatory requirements (**Section 6.0**);
- Climate Change:
  - Re-evaluate the efficacy of the stormwater management system during a 50-year storm event as of 2070 (**Attachment 8 & 9**);
  - If the stormwater management system cannot accommodate such a storm, discuss whether the Project has engaged in flexible adaptive strategies, and whether current designs allow for upgrades to adapt to future climate conditions (**Section 7.0**);
- Greenhouse Gas Emissions (GHG):
  - Discuss Stretch Code requirements as they pertain to energy recovery ventilation in the warehouse buildings and if such ventilation is not required, commit to it as a mitigation measure or explain why it is not feasible (**Section 8.1**);
  - Revise the Passivehouse gap analysis to compare the proposed against the Passivehouse with the $0.6M incentive and to compare the estimated peak electric demand in summer and winter with the proposed HERS 45 case against the Passivehouse (**Section 8.2 & Attachment 11**);
  - Clarify what is proposed for the residential units above the retail/office buildings and incorporate that information into the gap analysis (**Section 8.2**);
- Summarize the proposed mitigation measures in a tabular format, including construction-period measures, a comprehensive list of commitments to avoid, minimize, and mitigate environmental and related public health impacts, and separately identify EJ-specific mitigation measures, if applicable (**Section 12.3, Table 12.1**);
- Provide separate Draft Section 61 Findings for each Agency Action to be taken on the Project (**Section 12.3**);
- Provide a self-certification to the MEPA Office that proposed GHG emission reduction measures, or their equivalent, were implemented as a component of the Draft Section 61 Findings (**Section 12.3**);
- Copy of the Secretary's Certificate on the DEIR and each comment letter received with direct responses to comments within MEPA jurisdiction and the Scope requirements set forth in the Secretary's Certificate (**Attachment 1 and Section 11**); and
- Circulation to those parties who commented on the DEIR and State and municipal agencies from whom the Project will seek permits or approvals (**Attachment 12**).

This FEIR has been developed specifically to address the Scope.

PERMITS, FINANCIAL ASSISTANCE, AND LAND TRANSFERS

The Project will require a Massachusetts Department of Transportation (MassDOT) Access Permit (i.e., curb cut) to provide Stie access. Additionally, State funding is being pursued from the Executive Office of Housing and Livable Communities and the Massachusetts Housing Program, Massachusetts Housing Finance Agency in the form of tax credit allocations and deferred payment loans. To date, no State funding has been awarded for the Project.

PROJECT ALTERNATIVES

The EENF and DEIR included an analysis of five alternatives as follows:

- Alternative No. 1 – Reduced Build Mixed-Use Development (Preferred Alternative);
- Alternative No. 2 – Original Design Mixed-Use Development;
- Alternative No. 3 – No Build Alternative;
- Alternative No. 4 – Detached Dwelling Residential Development within R-15 District; and
- Alternative No. 5 – Commercial Development Only within HB District.

The alternatives were evaluated in the EENF with additional discussion in the DEIR. As the Secretary's Scope for both the DEIR and FEIR did not require the evaluation of additional alternatives, this FEIR serves to clarify the remaining questions and comments pertaining to the preferred alternative only.

Alternative No. 1 – Reduced Build Mixed-Use Development (Preferred Alternative)

This alternative has been approved by the City Planning Board and includes the development of 202 apartments (54 of which will be affordable housing units), a bank, standalone retail, restaurant, two contractor storage unit buildings, a mixed-use commercial building with apartments above, a gymnastics center, and a daycare. The Project includes supportive features including a stormwater management system, internal roadway, and parking areas. A community garden, playground, and pool are provided for use by residents. The Site will be accessed by a roundabout on Route 10.

The Project will develop approximately 21.5 acres of the overall 33-acre Site and will leave approximately 11.5 acres unaltered. Compared to the original design (Alternative No. 2), the preferred alternative will:

- Reduce traffic generation by 24%;
- Reduce tree clearing by approximately 1.3 acres;
- Reduce impervious cover by approximately 25,000 square feet; and
- Increase undisturbed areas onsite.

This alternative proposes approximately 80% of the development footprint within previously cleared land to limit tree removal. This alternative was selected in coordination with the City following significant public input during Planning Board meetings. As this plan meets the Proponent's goals to develop a mixed-use development with both market rate and mixed-use affordable housing units and incorporates public input, it is the preferred alternative.

SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS

The Project has been designed to avoid and minimize environmental impacts to the extent practicable while achieving the Project purpose. Given the scope of the Project, the environmental impacts include:

- Development of approximately 21.5 acres total, inclusive of:
    - Development of 17.1 acres of previously altered land (i.e., existing impervious cover and successional old field habitat);
    - Development of 4.4 acres of previously unaltered mixed hardwood forest;
- Creation of approximately 11.8 acres of impervious cover;
- Increased water use and wastewater generation;
- Increased greenhouse gas emissions from stationary (i.e., buildings) and mobile (i.e., traffic) sources;
- Increased vehicle trips; and
- Construction phase impacts.

MITIGATION MEASURES

The Project has been designed to avoid and minimize environmental impacts by complying with applicable regulations and incorporating best practices including:

- Avoiding alteration to approximately 11.5 acres of the site, 9.3 acres of which are forested;
- Permanently protecting approximately 10.8-acres of the site outside of the development footprint through a Conservation Restriction;
- Avoiding alteration of wetland resources protected by the Wetland Protection Act and posting signage to minimize future use and access of these areas;
- Avoiding adverse impacts on state-listed rare, threatened, or endangered species;
- Designing the stormwater management system to comply with the 10 MassDEP Stormwater Management Standards, complying with the standards in the Easthampton Stormwater Ordinance, providing pretreatment and infiltration as required by the Drinking Water Regulations, and incorporating Low Impact Development Standards, including the following measures:
    - Avoiding disturbance to wetland resource areas;
    - Incorporating site design practices that group buildings, decrease overall development footprint, utilize the existing site topography and terrain by maintaining natural drainage ways and minimizing the creation of steep slopes, and avoiding created slopes greater than 3V:1H;
    - Minimizing impervious area by reducing the roadway width, designating 85 parking spaces as green space that will only be converted to parking if necessary, and removing an initially-proposed building, parking area, and driveway;
    - Minimizing disturbance to existing trees and vegetation by locating most of the development within previously-cleared areas, retaining 70% of the existing wooded areas onsite, protecting shade trees along Northampton Street, and removing an initially-proposed building, parking area, and driveway that would have required tree removal;
    - Providing rooftop stormwater treatment of most buildings via rain gardens;
    - Providing paved surface stormwater pretreatment through the use of deep sump hooded catch basins and hydrodynamic separators before discharging to infiltration/detention basins;
    - Providing groundwater recharge through two open air infiltration basins and 13 rain gardens;
    - Equipping detention/infiltration basins with outlet control structures, level spreaders, and armored emergency spillways;
    - Preparing and implementing the Stormwater Operation and Maintenance Plan;
- Designing the Site to maintain sight lines to Mount Tom from the Site entrance;
- Incorporating the minimum lighting necessary and specifying dark-sky compliant outdoor lighting to avoid light pollution or unnecessary lighting of adjacent areas;

- Specifying water conserving fixtures including low-flow faucets in wash sinks and low-flow toilets and urinals;
- Incorporating Greenhouse Gas Reduction measures including:
    - Complying with the 2023 Stretch Code (Code) for Commercial Buildings with additional energy mitigation measures including:
        - Meeting or exceeding Code requirements for building envelope performance;
        - Accounting for thermal bridging;
        - Specifying and field testing the efficacy of low air infiltration measures;
        - Specifying triple-pane energy efficient windows with less than 30% of window to wall ratio;
        - Specifying highly efficient air-source heat pumps for heating and cooling with EER values more than 10% higher than Code;
        - Specifying electric water heaters with an energy factor of 0.95;
        - Specifying energy efficient LED lighting for indoor and outdoor use;
        - Use of Energy STAR equipment and appliances;
        - Providing up to 5,000 square feet of solar Photovoltaic (PV) systems on the Daycare Center, Gymnastics Centers, and stand-alone retail as well as meeting 80% solar readiness on these roofs;
        - Providing 2 electric vehicle (EV) charging parking spaces at commercial buildings except for the contractor storage units with 25% EV readiness across commercial lots;
    - Achieving a HERS Index score of 42 not inclusive of planned solar PV installation by including the following measures:
        - Specifying continuous exterior wall, floor, and ceiling insulation;
        - Specifying triple-pane energy efficient windows with less than 30% of window to wall ratio;
        - Specifying highly efficient air-source heat pumps for heating and cooling with rooftop Energy Recovery Ventilation of 70% effectiveness;
        - Utilizing electric heat pumps for water heating;
        - Specifying energy efficient LED lighting for indoor and outdoor use;
        - Use of Energy STAR equipment and appliances;
        - Providing approximately 7,500 square feet of solar PV on residential rooftops with at least 40% solar readiness;
        - Providing 4 EV charging parking spaces per residential building with 20% EV readiness across the residential lots;
- Managing traffic increases by:
    - Incorporating the Massachusetts Department of Transportation (MassDOT) approved intersection design to maintain or improve existing level of service across the study area;
    - Pursuing signal retiming at Northampton Street/Florence Road/Highland Avenue, Northampton Street/West Street, and Northampton Street/Oneil Street intersections to improve traffic operations;
    - Implementing the Trip Reduction Plan (a.k.a. Transportation Demand Management plan) including:
        - Vanpool/carpool incentives with designated parking spaces for carpooling;
        - Encouraging pedestrian and bicycle commuting by providing a shared use path connecting the development to Northampton Street, providing bike racks outside of each building; providing secure bike storage rooms within residential buildings, and installing a Valley Bike Sare station within the Project Area;
        - Providing onsite services to minimize travel offsite by residents and commercial tenants including the recreational services for residents including a pool, playground, and community garden, providing a daycare, restaurant, bank, and retail building to meet commercial and residential needs within the Site, and designating a transportation coordinator to provide onsite support and education on the Trip Reduction Plan to residents;

        - Authorizing the transportation coordinator to work with tenants and subcontractors such as waste disposal to schedule truck delivery and traffic for off-peak hours to the extent practicable;
    - Implementing a post-development transportation management program to evaluate the success of the Trip Reduction Plan measures and validate trip projections and parking demands for the Project.
- Managing construction phase impacts by:
    - Demarcating and protecting trees, forested areas, and wetlands to avoid accidental trespass or alteration of these areas by construction equipment;
    - Phasing work to minimize the total area of disturbance at any given time;
    - Installing and maintain erosion control and sedimentation barriers as proposed throughout the Site;
    - Locating settling basins outside of the mapped Zone II Wellhead Protection Area;
    - Preparing, implementing, and updating as necessary a Stormwater Pollution Prevention Plan and implementing National Pollutant Discharge Elimination system (NPDES) (note: authorization issued in May 2024 and currently valid) Best management Practices including:
        - Construction site planning and management measures;
        - Erosion control measures including temporary and permanent cover, grading efforts, and use of riprap or other materials;
        - Sedimentation controls including stabilized construction entrances with regular maintenance and cleaning, use of sediment basins and rock dams, sediment traps, silt fences, and storm drain inlet protection; and
        - Good housekeeping/materials management efforts including waste collection and requiring spill prevention and control measures;
    - Scheduling material and equipment deliveries outside of peak traffic hours;
    - Coordinating with MassDOT and the City of Easthampton regarding the duration and timing of roadway construction given other planned roadway improvements in the area;
    - Managing construction materials onsite to the extent practicable to decrease overall construction traffic;
    - Implementing the proposed Project Waste Management Plan including waste assessment and planning, source reduction, reuse and recycling, material handling and segregation, hazardous waste management, construction debris management, and waste disposal measures;
    - Implementing surface wetting or other cover as needed to control fugitive dust;
    - Minimizing greenhouse gas and air pollutant emissions by enforcing the anti-idling requirements, requiring the use of ultra-low sulfur diesel fuel, and preferring the use of Tier 4 federal emissions standards or retrofitted equipment, if available;
    - Managing noise generation by limiting work to normal working hours, requiring appropriate equipment mufflers, scheduling work to keep average noise levels low, timing noisiest operations to the noisiest time of day, maintaining relatively uniform noise levels as practicable, and locating noisiest equipment away from property boundaries adjacent to residential properties to the extent practicable.

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLES

FIGURES

ATTACHMENTS

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 BACKGROUND

Tasty Top Development, LLC., the Proponent and Owner, proposes to develop the properties identified as 93, 95, 97 Northampton Street (Route 10), Easthampton, Massachusetts (the "Site") (**Figure 1.1**). As described in the Draft Environmental Impact Report (DEIR), the Proponent purchased the properties on the northwest side of Northampton Street identified as 1 Groveland Street and 94 Northampton Street to accommodate the preferred intersection design. These two additional properties, along with the original three parcels are collectively referenced as the "Project Area." Sierra Vista Commons (the "Project") would be a mixed-use residential and commercial center. The Site, as purchased by the Proponent on April 11, 2022, consists of approximately 33-acres of partially developed land with 332-feet of frontage along Northampton Street. The surrounding land uses abutting the Project Area include mixed commercial uses to the north and west, vacant land to the east, and residential neighborhoods to the south (**Figure 1.2**).

The Site has previously supported a variety of uses that have altered approximately 17.1 acres of the total Site area. Approximately 10-acres of the southern portion of the Site was operated as a driving range known as Easthampton Golf since at least the 1990s, based on aerial image review. Easthampton Golf included a paved parking area, a small building supporting a sales office, an artificial turf and natural grass tee box area, and a mowed lawn driving range. Within the immediate frontage on Northampton Street, the Site supported a retail ice cream stand and paved parking lot as well as a single-family home and barn. These structures have been removed from the Site though they are visible on the 2021 aerial image on **Figure 1.2**.

Approximately 6.5 acres within the northern portion of the Site was historically used as an agricultural field, though it has not been actively farmed in at least two years. Access to this field is currently from a pre-existing, unauthorized wooden bridge crossing the intermittent stream which bisects the property. No authorized, legal access is currently available to continue using that field for agriculture.

The two additional parcels included in the Project Area appear to have been previously disturbed. The parcel at 1 Groveland St is approximately 0.6-acres and from aerial imagery appears to contain a lawn, a vegetative screen that is oriented northwest-southeast, and sporadic other trees. The parcel at 94 Northampton Street is approximately 0.3-acres and contains a paved parking area with surrounding lawn.

In November 2022, the Proponent filed applications for the Project with the City of Easthampton (City) Planning Board and Conservation Commission. The City Planning Board issued a Plan Approval, Site Plan Review, and Special Permit Decision authorizing the Project as proposed herein on November 14, 2023. The Conservation Commission closed the Public Hearing on January 8, 2024 and issued the Order of Conditions on January 23, 2024. The Environmental Protection Agency (EPA) Construction General Permit (CGP) Notice of Intent has been accepted and the Proponent's authorization under the CGP began on May 6, 2024.

1.2 PURPOSE AND NEED

As described in the City of Easthampton Housing Production Plan, 2021-2026, approved by the Easthampton City Council and Planning Board in February 2021, the City of Easthampton seeks to encourage the development of its Subsidized Housing Inventory (SHI), which comprised 7% of the 2010 Census housing count. The City seeks to encourage the expansion of its SHI consistent with the housing plan regulations at 760 CMR 56.03(4). The Housing Production Plan identifies the need for the City to issue permits and approvals for at least 38 new low- or moderate-income housing units per calendar year to achieve Department of Housing and Community Development (DHCD) certification.

The Housing Production Plan is needed as Easthampton has maintained a relatively stable population over the last 30 years; however, the number of households has continued to increase over that same time. The City has experienced an 18% household growth rate compared to the 15% rate for the state. This rate places significant upward pressure on the cost of and demand for housing in Easthampton. The Housing Production Plan sets several goals including:

- Creating a variety of affordable and mixed-income housing;
- Redeveloping underutilized properties and creating infill developments in existing residential areas; and
- Promoting the development of mixed-income and mixed-use neighborhoods.

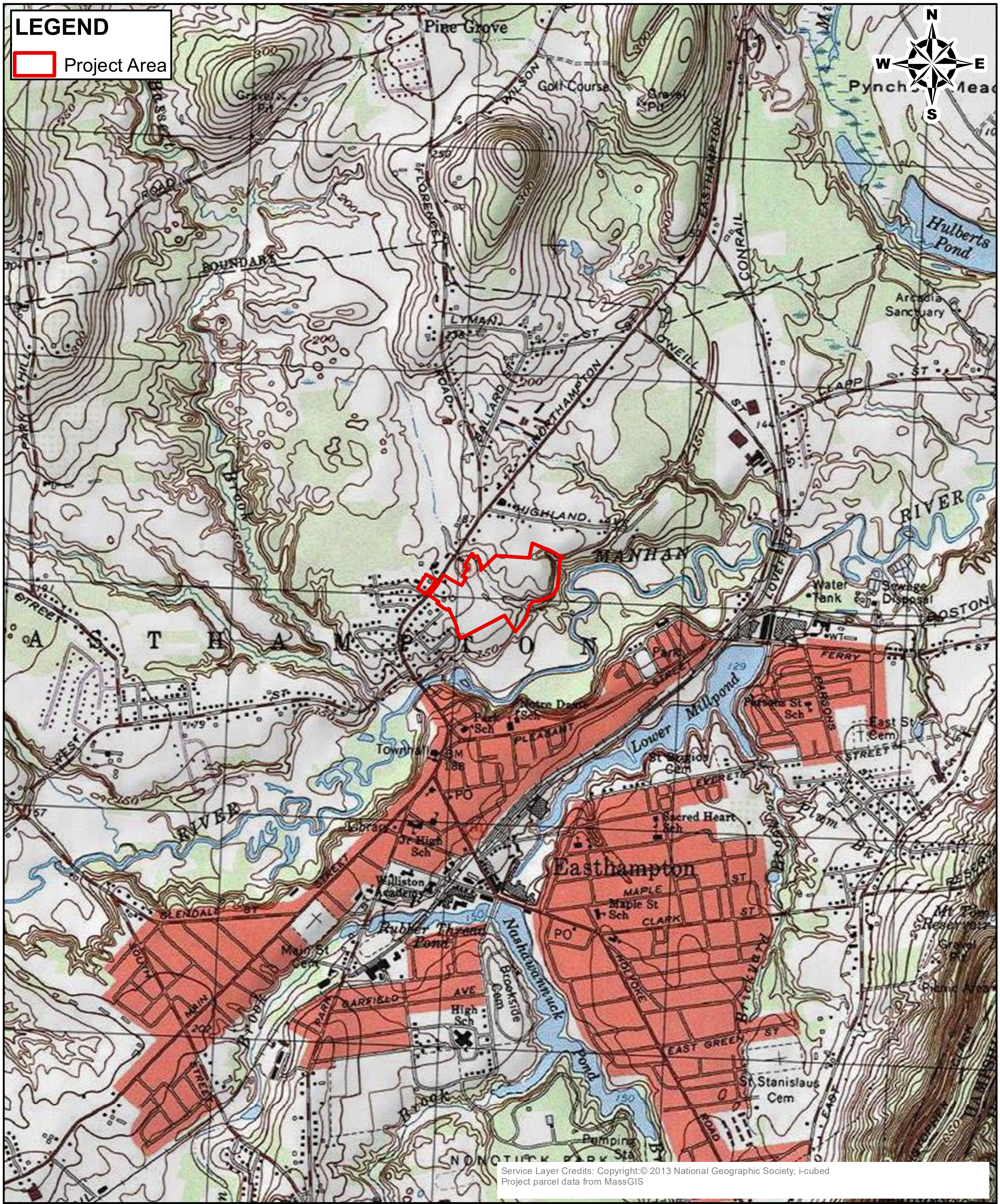
In 2022, the City of Easthampton expanded its Smart Growth Overlay District to encourage more dense development than would normally be permissible under the standard zoning requirements provided a set percentage of dwelling units are deed-restricted as affordable housing.

The Project seeks to increase both the total number of housing units and the total number of affordable housing units available in Easthampton. As found by the City Planning Board, the Project meets the local Zoning Ordinance requirements or has qualified for applicable waivers. The Project was also found to be consistent with the 2021 Comprehensive Housing Plan, in substantial conformance with the intent of the 2022-approved Smart Growth Overlay District and supports specific goals and strategies within the 2008 Master Plan. The Project, as proposed, will designate 54 units as affordable. Of those 54 units, 22 will be located within the Residential – Suburban A (R-15) Zone and 32 units will be located in the Highway Business (HB) Zone with a Smart Growth Zoning District. The mixed-use portion of the Project is also located within the HB Zone. This number of affordable units (54) satisfies the City's annual need for affordable housing development (38 units). The other housing units will be market rate apartments and will contribute to providing an increased number and diversity of household options in the City in line with Housing Production Plan goals.

1.3 MASSACHUSETTS ENVIRONMENTAL POLICY ACT PROCESS

The Project will require a Massachusetts Department of Transportation (MassDOT) Access Permit (i.e., curb cut) to provide Site access. Additionally, the following State funding is being pursued but has not yet been committed to support the development of this Project:

- Executive Office of Housing and Livable Communities (EOHLC):
  - Federal Low Income Housing Tax Credit allocation;
  - State of MA Low Income Housing Tax Credit allocation;
  - Massachusetts Affordable Housing (deferred payment loan);
  - Massachusetts Housing Stabilization Fund (deferred payment loan); and
  - Facilities Consolidation Funds (deferred payment loan).
- Massachusetts Housing Program, Massachusetts Housing Finance Agency:
  - Workforce Housing Program (deferred payment loan).



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SCALE IN FEET

SIERRA VISTA COMMONS
EASTHAMPTON MA

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
TASTY TOP DEVELOPMENT, LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

LOCUS MAP

PROJ MGR: ARD	REVIEWED BY: DMN	CHECKED BY: SLL	FIGURE
DESIGNED BY: CCO	DRAWN BY: CCO	SCALE: 1 in = 2,000 ft	1.1
DATE: 02/09/2024	PROJECT NO: 15.0167035.00	REVISION NO:	

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SCALE IN FEET

SIERRA VISTA COMMONS
EASTHAMPTON MA

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WESTFIELD, MA 01085

AERIAL MAP

PROJ MGR:	ARD	REVIEWED BY:	DMN	CHECKED BY:	SLL
DESIGNED BY:	CCO	DRAWN BY:	CCO	SCALE:	1 in = 300 ft
DATE: 02/09/2024		PROJECT NO: 15.0167035.00		REVISION NO:	

FIGURE
1.2

The Project, as currently designed, exceeds the following review thresholds, two of which are mandatory Environmental Impact Report (EIR) thresholds, as noted below:

3. Land
    a. 301 CMR 11.03(1)(a)(2) *Creation of 10 or more acres of impervious area (EIR threshold);*
    b. 301 CMR 11.03(1)(b)(2) *Creation of 5 or more acres of impervious area;*
    c. 301 CMR 11.03(1)(b)(4) *Conversion of land in active agricultural use to nonagricultural use, provided the land includes soils classified as prime, state important, or unique by the USDA;*
4. Transportation
    a. 301 CMR 11.03(6)(a)(6) *Generation of 3,000 or more New average daily trips (adt) on roadways providing access to a single location (EIR threshold);*
    b. 301 CMR 11.03(6)(b)(13) *Generation of 2,000 or more New adt on roadways providing access to a single location;*
    c. 301 CMR 11.03(6)(b)(14) *Generation of 1,000 or more New adt on roadways providing access to a single location and construction of 150 or more New parking spaces at a single location;* and
    d. 301 CMR 11.03(6)(b)(15) *Construction of 300 or more New parking spaces at a single location.*

Additionally, the Site is within a mapped Environmental Justice community and therefore required the mandatory filing of an EIR. The designated geographic area (DGA) for the Project is a one-mile radius from the Project limits.

The Proponent participated in the third-party Request for Advisory Opinion (RAO) submitted to the Massachusetts Environmental Policy Act (MEPA) Office regarding the Project in February 2023. Following the issuance of that RAO, the Proponent filed an Expanded Environmental Notification Form (EENF) with the MEPA Office on June 30, 2023. The Secretary's Certificate for the EENF (EEA#16729) was issued on August 16, 2023. The Draft Environmental Impact Report (DEIR) was prepared and submitted on February 15, 2024 with the Secretary's Certificate issued on April 1, 2024. This Secertary's Certificate found the DEIR adequately and properly complied with MEPA and its implementing regulations and as such, the Proponent is submitting this Final Environmental Impact Report (FEIR) in response to the required scope that includes the following elements:

- Formatting in accordance with Section 11.07 of the MEPA regulations for outline and content;
- Description of any changes to the Project since the filing of the DEIR *(note: no changes have occurred)*;
- Revised site plans identifying project components and proposed infrastructure (**Attachment 3**);
- Updated list of required Permits, Financial Assistance, and other state, local, and federal approvals (**Section 10.0**);
- Environmental Justice (EJ) / Public Health:
    - Circulation of the FEIR or a summary thereof to an updated EJ Reference List obtained from the MEPA Office that is the same as used to provide notice of the DEIR (**Attachment 4**);
    - Summarize any outreach conducted since filing the DEIR and any changes made to the Project as a result of this outreach (**Section 3.1**);
    - Clarify the geographic radius covered by the traffic area study and further explain the >1 tpy increase in VOCs notwithstanding mitigation measures and explore additional mitigation measures for air quality impacts associated with new traffic (**Section 3.2**);
- Land Alteration:
    - Describe the Project's consistency with the Massachusetts Department of Agricultural Resources (MDAR) Agricultural Lane Mitigation Policy (**Section 4.0**);
- Traffic, Transit, Bicycle, & Pedestrian Access:

- Provide a revised TIA that evaluates a signalized driveway option (**Section 5.1**);
- Consult with MassDOT regarding the timing of Project implementation and funding for the design and construction of the roundabout (**Section 5.2**);
- Clarify which intersections show a Level of Service (LOS) F conditions notwithstanding roadway improvements and proposed measures and what measures will be taken if the proposed TDM measures are not successful (**Section 5.3**);

- Wastewater:
  - Evaluate if the Project proposes a private treatment works as defined at 314 CMR 12.00 and discuss any necessary additional permitting or regulatory requirements (**Section 6.0**);
- Climate Change:
  - Re-evaluate the efficacy of the stormwater management system during a 50-year storm event as of 2070 (**Attachment 8 & 9**);
  - If the stormwater management system cannot accommodate such a storm, discuss whether the Project has engaged in flexible adaptive strategies, and whether current designs allow for upgrades to adapt to future climate conditions (**Section 7.0**);
- Greenhouse Gas Emissions (GHG):
  - Discuss Stretch Code requirements as they pertain to energy recovery ventilation in the warehouse buildings and if such ventilation is not required, commit to it as a mitigation measure or explain why it is not feasible (**Section 8.1**);
  - Revise the Passivehouse gap analysis to compare the proposed against the Passivehouse with the $0.6M incentive and to compare the estimated peak electric demand in summer and winter with the proposed HERS 45 case against the Passivehouse (**Section 8.2 & Attachment 11**);
  - Clarify what is proposed for the residential units above the retail/office buildings and incorporate that information into the gap analysis (**Section 8.2**);
- Summarize the proposed mitigation measures in a tabular format, including construction-period measures, a comprehensive list of commitments to avoid, minimize, and mitigate environmental and related public health impacts, and separately identify EJ-specific mitigation measures, if applicable (**Section 12.3, Table 12.1**);
- Provide separate Draft Section 61 Findings for each Agency Action to be taken on the Project (**Section 12.3**);
- Provide a self-certification to the MEPA Office that proposed GHG emission reduction measures, or their equivalent, were implemented as a component of the Draft Section 61 Findings (**Section 12.3**);
- Copy of the Secretary's Certificate on the DEIR and each comment letter received with direct responses to comments within MEPA jurisdiction and the Scope requirements set forth in the Secretary's Certificate (**Attachment 1 and Section 11**); and
- Circulation to those parties who commented on the DEIR and State and municipal agencies from whom the Project will seek permits or approvals (**Attachment 12**).

This FEIR has been developed specifically to address the Scope.

2.0 PROJECT DESCRIPTION

2.1 PROJECT SUMMARY / ELEMENTS

The Project proposes to redevelop the Site into a mixed-use residential and commercial center. Site Plans are provided in **Attachment 3**. The Project design matches proposed uses with those allowed in the Site zoning districts as well as those encouraged by Planning Board and City planning documents. The front portion of the Site, to a distance of 800 feet from Northampton Street, is zoned as Highway Business (HB) and the rear of the Site is zoned as Residential-Suburban A (R-15). A portion of the Site is also within the Smart Growth District. The Project includes the following development:

- Roots Learning Center (Daycare facility), approximately 9,000 square feet (SF);
- Roots Gymnastic Center, approximately 7,000 SF;
- 1 Sit-down restaurant, 220-seat capacity, approximately 5,500 SF;
- 1 Bank, approximately 3,200 SF;
- 1 Stand alone small retail, approximately 4,000 SF;
- 2 Mixed-use warehouse/storage, contractor units, approximately 7,400 SF/building;
- 1 Mixed-use retail/office buildings with 14 apartments above, approximately 16,000 SF; and
- 10 Mid-rise (3 floor) apartments buildings, 188 units total, nine 13,600 SF buildings and one 18,000 SF building.

The Project proposes to develop mixed uses within the HB zone which has direct street front access from Northampton Street. Locating the commercial and some residential development within this area was recommended by the Highway Business District Review Subcommittee in its report to the Planning Board dated July 9, 2013. This development strategy sites business and commercial uses in the City's commercial corridor and avoids developing a single, large commercial retailer or strip mall, which was identified as a goal in the City's Master Plan and further supported by the Highway Business District Review Subcommittee. Approximately 15 acres of the Site are within this HB Zone and Smart Growth District Overlay. Fifty-eight apartments are proposed within this zone.

Most of the housing units, including the eight residential apartment buildings each containing 18 units, are proposed in the R-15 zone, away from Northampton Street. The R-15 Zone is approximately 18 acres. A total of 54 apartments Site-wide would be designated as affordable housing to meet the City of Easthampton Zoning requirements. The Master Plan identified the need for increased affordable housing given increasing housing costs and low vacancy rates in Easthampton. The City of Easthampton Housing Production Plan 2021-2026 emphasize the benefits to the City in reaching 10% affordable housing and achieving safe harbor from Chapter 40B.

To support the proposed businesses and residences, the Project includes the construction of an internal roadway to provide access and circulation, parking spaces for each facility and building, and typical site utilities. This roadway will include sidewalks, crosswalks, and speed humps as necessary at critical points. To access the northern portion of the property, the current, unauthorized stream crossing will be replaced with a new stream-crossing compliant bridge.

The Project will be serviced by sewer and water connections to existing municipal infrastructure. The water connection will be in Northampton Street while the sewer connection is to an interceptor line located along the northeastern (rear) property boundary. These municipal services have adequate capacity to service the proposed development. Trash collection will be provided via private service at dumpsters located throughout the development.

Most of the Site is currently open field or driving range lawn and is therefore already devoid of trees. Some tree removal is proposed along the existing edges of the fields; however, a minimum 35-foot vegetative buffer will be provided along the abutting residential properties to the south. An existing 160-180-foot vegetative buffer will be maintained throughout the construction of the Project to divide the rear residential dwellings from the mixed-use development portion of the Site. Additional landscape and restoration plantings are proposed to offset necessary tree removal.

2.2 DESIGN REVISIONS SINCE FILING THE DEIR

The Project has not been materially revised since the filing of the DEIR. No changes to the preferred alternative, construction approach or sequencing have been incorporated sine the filing of the DEIR. A parking plan has been added to the Project Drawings provided as **Attachment 3** that depict the electric vehicle (EV) and commuter parking spaces. An approximately 10.8-acre conservation restriction will be placed on portions of the Site outside of the limits of the development. This restriction will permanently protect open space onsite from future development expansion outside the currently-proposed footprint.

3.0 ENVIRONMENTAL JUSTICE / PUBLIC HEALTH

In accordance with Part II of the Final MEPA Interim Protocol for Analysis of Project Impacts on Environmental Justice (EJ) Populations, effective January 1, 2022 (the "Analysis Protocol"), GZA prepared the following assessment of the existing unfair or inequitable environmental burden of the EJ populations located within the "Designated Geographic Area" (DGA) which is a one-mile radius of the Project Site. The DGA, as shown on **Figure 3.1** is primarily contained within Easthampton, though a portion of non-EJ population area is contained in Northampton based on the most recent maps released by EEA in November 2022. Four EJ populations are located within the DGA identified as Census Tract 8223 Block Groups 2 and 4 and Census Tract 8224.02 Block Groups 1 and 5. All four populations are identified as meeting the Income Environmental Justice criteria.

Based on the analysis provided in the EENF and DEIR and summarized in the Secretary's Certificate on the DEIR (**Attachment 1**), there appears to be an unfair or inequitable environmental burden on the EJ populations within the DGA compared to adjacent non-EJ populations. This conclusion is based on the Department of Public Health data indicating increased elevated blood lead prevalence within the EJ population which is 145% of the state rate. The three other vulnerable health criteria are not elevated within the EJ population and there does not appear to be a significantly higher risk of climate change-induced hazards compared to the surrounding area.

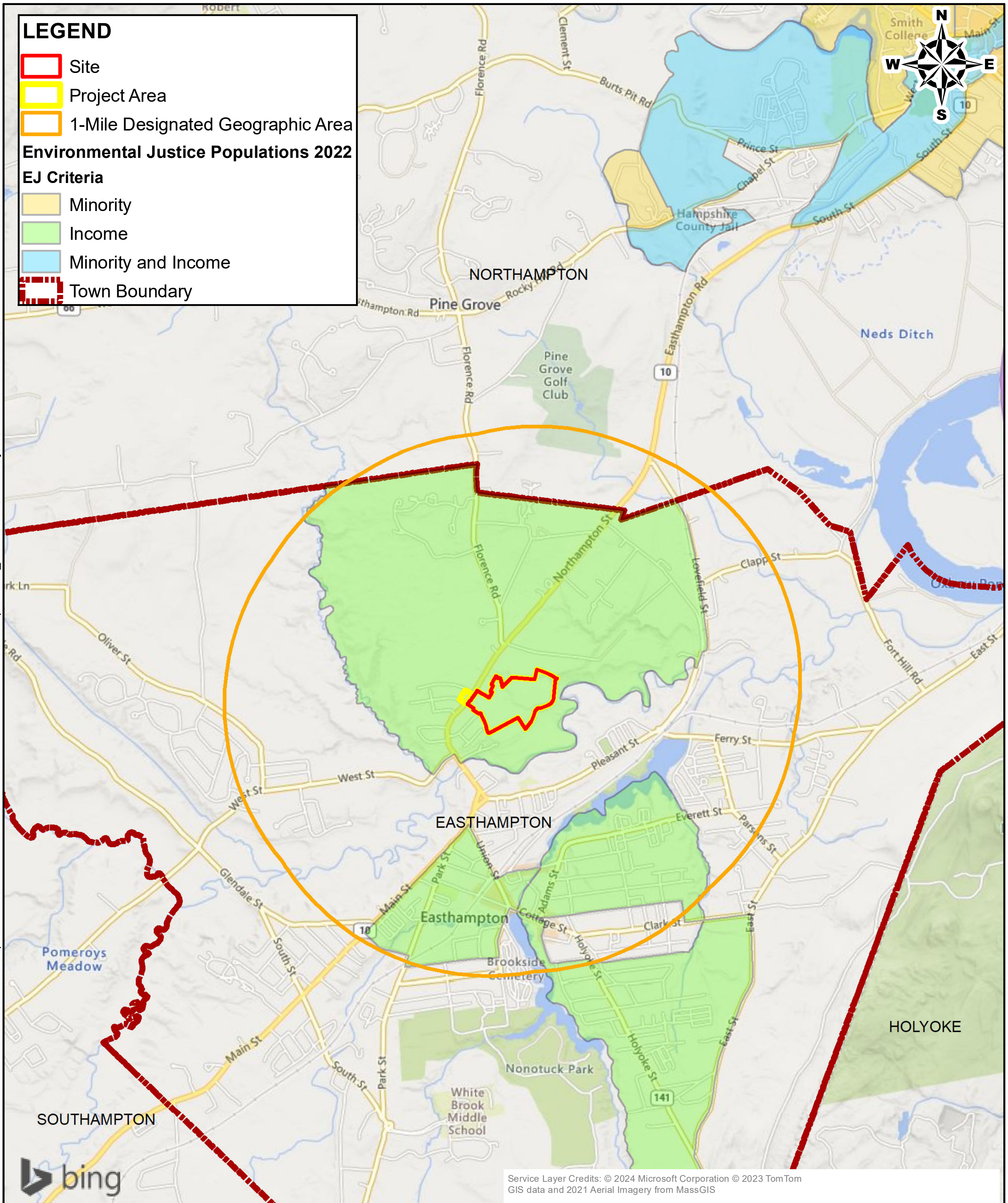
As described in the DEIR, the Project will not have disproportionate adverse effects on the surrounding EJ populations. During construction, there may be increased diesel truck traffic to the Site along major roadways which traverse EJ populations, but fewer than 20 trips per day are anticipated during construction. The exact number of truck trips will vary based on the phase of construction.

The Project has been designed in accordance with local Zoning and Planning to address a need in the City of Easthampton. The inequitable environmental burden is primarily associated with elevated blood lead level prevalence in children, which is most often associated with older homes with lead paint. The Project will provide at least 200 new, modern, and lead-free dwelling units, 54 of which will be affordable housing. This increase will assist the City in reaching 10% affordable or low-income housing units as required by the State.

Other environmental benefits identified at 301 CMR 11.02 associated with the development include:

- Access to clean natural resources – The Site will be used by residents and visitors who will be able to appreciate and benefit from the pollinator and forest habitats and intact inland wetlands onsite;
- Access to clean renewable energy sources – The Site will have solar on the daycare, gymnastics center, residential, and mixed-use buildings to provide onsite renewable energy; and
- Access to constructed playgrounds and other outdoor recreational facilities – The Site will include a playground, pool, and community garden for residents in addition to being designed as a pedestrian and bike friendly development.

The Project will provide the local community with additional choices for clean and safe housing in a City where housing demand has outpaced the State average and the available housing stock.



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SCALE IN FEET

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ENVIRONMENTAL JUSTICE POPULATIONS

PROJ MGR: ARD	REVIEWED BY: DMN	CHECKED BY: SLL	FIGURE
DESIGNED BY: CCO	DRAWN BY: CCO	SCALE: 1 in = 3,000 ft	3.1
DATE: 02/09/2024	PROJECT NO: 15.0167035.00	REVISION NO:	

3.1 COMMUNITY ENGAGMENT AND PUBLIC INVOLVEMENT

In accordance with the MEPA Public Involvement Protocol for Environmental Justice Populations, effective January 1, 2022 (the "Involvement Protocol"), the Proponent undertook measures to enhance public involvement throughout the MEPA and local permitting processes. The DEIR was circulated to a current EJ Reference List obtained from the MEPA Office as well as to those who commented on the EENF, and self-identified interested parties. As evidenced by the lack of appeal of local authorizations, decreased attendance at outreach events between those held prior to filing the EENF and the DEIR, and the decreased number of comments received on the DEIR, public interest and participation has waned over time.

Since filing the DEIR, the Proponent has updated the Project website with the DEIR filing, Secretary's Certificate, and FEIR filing. The comment portal has continued to be monitored for activity and no comments were received since the filing of the DEIR. This FEIR is available on the Project website for public download and consumption. The access information has been directly emailed to the distribution list (**Attachment 11**) and to an updated EJ Reference List that was obtained from the MEPA Office on June 7, 2024 (**Attachment 4**).

3.2 AIR QUALITY ANALYSIS

The traffic study area, included six intersections, five of which are within the mapped EJ population:

- Northampton Street (Route 10)/Florence Road/Highland Avenue (signalized; within EJ);
- Northampton Street (Route 10/West Street (signalized; within EJ);
- Northampton Street (Route 10)/Oneil Street (signalized; within EJ);
- Main Street (Route 10)/Union Street (signalized, within EJ);
- Northampton Street (Route 10)/Main Street (Route 10)/Pleasant Street/Lyman Avenue (unsignalized; non-EJ); and
- Northampton Street (Route 10)/Mountainview Street (unsignalized; within EJ).

The mesoscale air quality analysis then modeled emissions using the MOVES3 model version 3.1.0 for the 2023 Existing, 2030 No-Build, 2030 Build, and 2030 Build with Mitigation scenarios at each of the following roadway segments within the traffic study area:

- Northbound Main St approaching Union St
- Southbound Main St departing Union St
- Union St. departing Main St
- Union St. approaching Main St
- Northbound Main St from Union St to Pleasant St
- Southbound Main St from Pleasant St to Union St
- Pleasant St departing Main St
- Pleasant St approaching Main St
- Northampton from Pleasant St. to Lyman Ave.
- Northbound Northampton from Lyman Ave. to West St
- Northbound Northampton from West St to Florence Rd
- Northbound Northampton from Highland Ave. to Oneil St
- Northbound Northampton from Oneil St

- Oneil St approaching Northampton St
- Oneil St departing Northampton St
- Southbound Northampton approaching Oneil St
- Southbound Northampton from Oneil St to Highland Ave
- Southbound Northampton from Florence Rd to West St
- Southbound Northampton from West St to Lyman Ave.
- West St approaching Northampton St
- West St departing Northampton St
- Florence Rd approaching Northampton St
- Florence Rd departing Northampton St
- Highland Ave approaching Northampton St
- Highland Ave departing Northampton St

The study area also includes the following planned roadway segments:

- Northbound Northampton from West St to Site Rd
- Northbound Northampton from Site Rd to Florence Rd
- Southbound Northampton from Florence Rd to Site Rd
- Southbound Northampton from Site Rd to West St
- Roadways to Rec Center, Day Care Center, Housing, Warehousing, Strip Retail, Restaurant and Bank

Figure 3.2 identifies the study area roadway segments and intersections with the EJ populations mapped for reference.

Across the study area, Volatile Organic Compounds (VOCs) are projected to decrease from existing conditions under all three future scenarios as emissions from vehicles are projected to decrease through improved fuel economy and electrification of vehicles. With both the build and build mitigated conditions, the increase in VOCs is a result of increased vehicle trips throughout the traffic study area. Though traffic reduction measures have been incorporated, Easthampton is largely rural and most of the populace relies on personal vehicles for many or most of their trips.

Table 3.1 VOC Transportation Emission Results by Pollutant

	2023 Existing (kg/day)	2030 No-Build (kg/day)	2030 Build (kg/day)	2030 Build with Mitigation (kg/day)	Mitigation Change from 2023 Existing Condition	Mitigation Change from 2030 Build Condition
VOC	28.70 kg/day	20.72 kg/day	25.61 kg/day	24.97 kg/day	-13.0%	-2.5%
	11.5 tpy	8.34 tpy	10.30 tpy	10.04 tpy	-12.7%	-2.5%

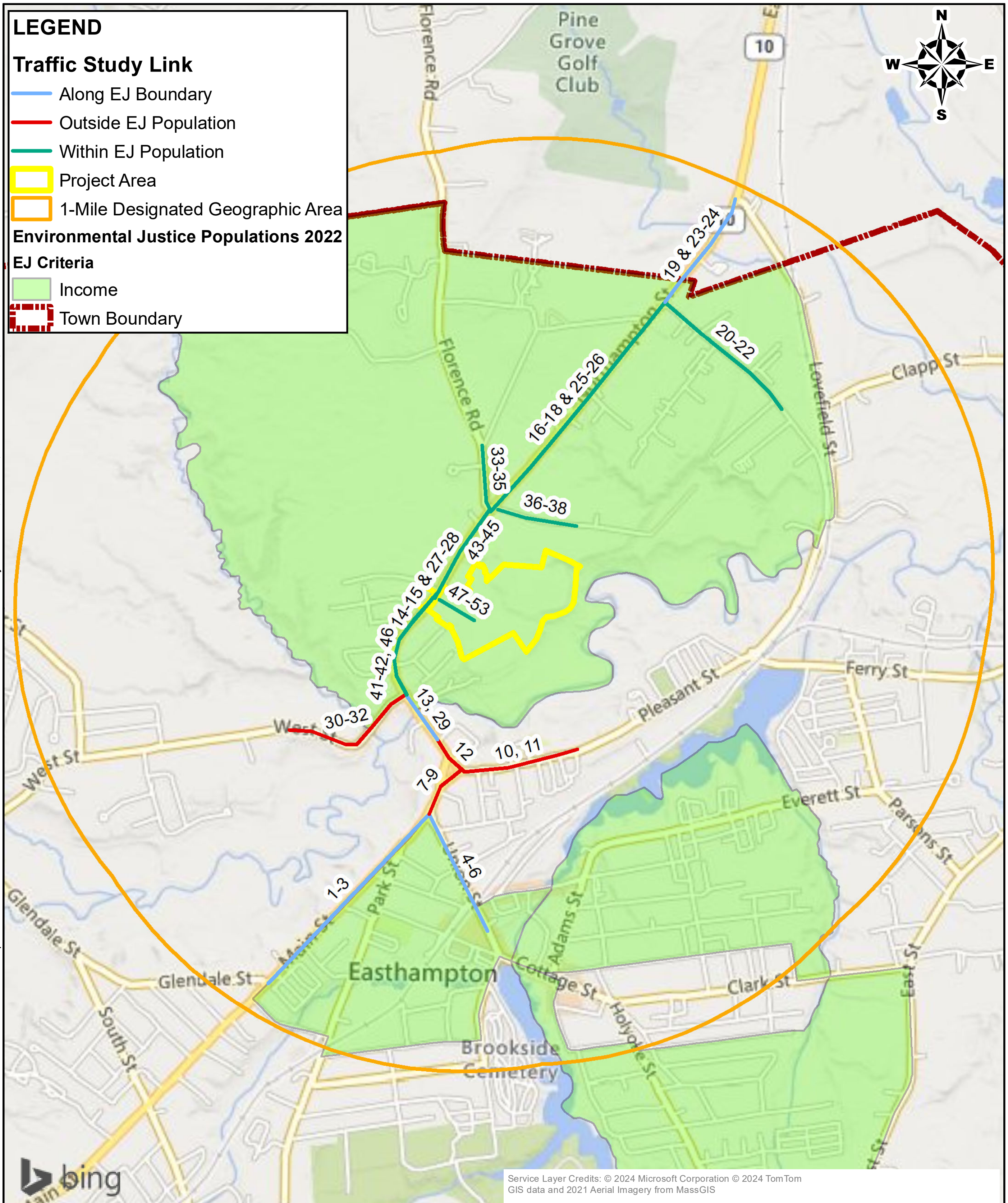
As shown in **Table 3.2**, transportation (i.e., mobile source) emissions of VOCs are anticipated to increase by 1.7 tons across the whole traffic study area, inclusive of both EJ-mapped and non-EJ-mapped populations between the 2030 No-Build and the 2030 Build with Mitigation scenarios; however, both of these future scenarios represent a decrease in VOC emissions by greater than 1 ton per year from current conditions. The 2030 Build with mitigation will decrease VOC emissions by 13% compared to existing conditions which represents an improvement in air quality. For perspective, the MassDEP typically would only require approval for a stationary source of VOC emissions with greater than 1 ton per year within a confined, specific, localized area. The traffic study area extends for approximately 2 miles along Route 10 and also considers impacts from crossroads and intersections. The Secretary's Certificate notes that the mesoscale analysis is not intended to isolate emissions increases at a single location but describe them across the whole traffic study area. The DEIR and this narrative identify that there are no increases above 1 ton per year at a single location because of the MassDEP standard for stationary emissions in the air quality regulations. Given that these traffic (i.e., mobile emissions) will be distributed across a broader area, the proposed increase appears insignificant relative to MassDEP air quality thresholds. There are no regulations pertaining to air emissions from mobile emissions such as traffic.

The existing inequitable environmental burden on the EJ population is specifically related to lead, a heavy metal which will not be altered by VOC concentrations. As shown on **Figure 3.2**, many of the roadway segments in the traffic study are along the boundary of EJ populations. Given this, the increase in VOCs is not anticipated to result in an additional or new disproportional adverse effect on EJ populations.

The Traffic Demand Measures (TDM) provided are anticipated to incentivize multi-modal forms of transportation over single occupancy vehicles. The TDM includes incentives for vanpooling/carpooling, encourages pedestrian and bicycle commutes through the installation of secure bike storage in residential building, bike racks at buildings, a Valley Bike Share station, the installing bike-friendly shared use concrete paths to connect the development to Northampton Street. Onsite recreational services are also provided, and the development is designed to be walking-friendly to support residents remaining onsite for services, the transportation coordinator has committed to educating tenants about the TDM, and working with business tenants to schedule deliveries, services, and, as possible, staff shift changes outside of peak traffic hours.

Additional measures at the site to reduce vehicle-related emissions globally that also support VOC reductions include electric vehicle charging stations in priority parking locations and electric vehicle ready parking spaces. The MassDOT projects along Northampton Street—Northampton Street Complete Streets Project and Pedestrian Improvement Plan—will improve multi-modal access from the Project to the surrounding areas by improving bicycle and pedestrian accommodations along Route 10 which is a major thoroughfare in Easthampton. The Pedestrian Improvement Plan includes coordination with the Pioneer Valley Transit Authority (PVTA) to reroute the bus down Northampton Street and establish bus stops along Northampton Street within walking distance to the Site.

In consideration of the TDM, additional emission reduction measures, and planned offsite transportation improvements, the Proponent has exhausted measures available to further reduce VOC emissions. As the overall vehicle fleets transitions to cleaner hybrid and electric vehicles, the 2030 build mitigated VOC emissions may continue to decrease.



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SCALE IN FEET

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APPROXIMATE TRAFFIC
STUDY AREA

PROJ MGR: ARD	REVIEWED BY: DMN	CHECKED BY: SLL	FIGURE
DESIGNED BY: CCO	DRAWN BY: CCO	SCALE: 1 in = 1,767 ft	3.2
DATE: 06/10/2024	PROJECT NO: 15.0167035.00	REVISION NO:	

Table 3.2 Transportation VOC Emission Results

Link ID	Link Description	EJ Area	2023 Existing VOCs (kg/hr)	2030 No-Build VOCs (kg/hr)	2030 Build VOCs (kg/hr)	2030 Build w/ TDMs VOCs (kg/hr)	2023 Existing VOCs (kg/day)	2030 No-Build VOCs (kg/day)	2030 Build VOCs (kg/day)	2030 Build w/ TDMs VOCs (kg/day)
1	FF – Northbound Main St approaching Union St	Edge	0.084	0.059	0.060	0.059	1.20	0.84	0.86	0.84
2	Q – Northbound Main St approaching Union St	Edge	0.072	0.052	0.054	0.053	1.03	0.75	0.77	0.75
3	FF – Southbound Main St departing Union St	Edge	0.055	0.038	0.040	0.039	0.78	0.54	0.57	0.55
4	FF – Union St. departing Main St	Edge	0.046	0.032	0.033	0.032	0.66	0.45	0.47	0.46
5	FF – Union St. approaching Main St	Edge	0.042	0.029	0.030	0.030	0.60	0.42	0.43	0.42
6	Q – Union St. approaching Main St	Edge	0.036	0.026	0.027	0.026	0.51	0.37	0.39	0.38
7	FF – Northbound Main St from Union St to Pleasant St	No	0.102	0.072	0.075	0.073	1.45	1.03	1.07	1.04
8	FF – Southbound Main St from Pleasant St to Union St	No	0.073	0.052	0.055	0.053	1.05	0.74	0.78	0.76
9	Q – Southbound Main St approaching Union St	No	0.066	0.048	0.051	0.050	0.95	0.69	0.73	0.71
10	FF – Pleasant St departing Main St	No	0.043	0.030	0.030	0.030	0.62	0.43	0.43	0.42
11	FF – Pleasant St approaching Main St	No	0.026	0.019	0.020	0.020	0.37	0.27	0.29	0.28
12	FF – Northampton from Pleasant St. to Lyman Ave.	No	0.097	0.071	0.075	0.073	1.38	1.01	1.07	1.05
13	FF – Northbound Northampton from Lyman Ave. to West St	Edge	0.077	0.056	0.060	0.059	1.10	0.80	0.86	0.84
14	Q – Northbound Northampton at West St	Yes	0.068	0.051	0.055	0.054	0.98	0.73	0.79	0.77
15	FF – Northbound Northampton from West St to Florence Rd	Yes	0.117	0.082	0.000	0.000	1.67	1.17	0.00	0.00
16	Q – Northbound Northampton at Florence Rd	Yes	0.082	0.063	0.065	0.064	1.17	0.90	0.93	0.91
17	FF – Northbound Northampton from Highland Ave. to Oneil St	Yes	0.089	0.062	0.068	0.066	1.27	0.88	0.97	0.95
18	Q – Northbound Northampton at Oneil St	Yes	0.063	0.048	0.053	0.051	0.90	0.68	0.75	0.73

Link ID	Link Description	EJ Area	2023 Existing VOCs (kg/hr)	2030 No-Build VOCs (kg/hr)	2030 Build VOCs (kg/hr)	2030 Build w/ TDMs VOCs (kg/hr)	2023 Existing VOCs (kg/day)	2030 No-Build VOCs (kg/day)	2030 Build VOCs (kg/day)	2030 Build w/ TDMs VOCs (kg/day)
19	FF – Northbound Northampton from Oneil St	Edge	0.078	0.058	0.063	0.061	1.12	0.82	0.90	0.88
20	FF – Oneil St approaching Northampton St	Yes	0.053	0.037	0.037	0.036	0.75	0.52	0.52	0.51
21	Q – Oneil St approaching Northampton St	Yes	0.048	0.034	0.034	0.033	0.68	0.49	0.49	0.48
22	FF – Oneil St departing Northampton St	Yes	0.034	0.024	0.024	0.023	0.48	0.34	0.34	0.33
23	FF – Southbound Northampton approaching Oneil St	Yes	0.042	0.031	0.036	0.035	0.61	0.44	0.52	0.51
24	Q – Southbound Northampton approaching Oneil St	Edge	0.039	0.029	0.034	0.033	0.56	0.42	0.49	0.48
25	FF – Southbound Northampton from Oneil St to Highland Ave	Yes	0.067	0.046	0.052	0.051	0.96	0.65	0.74	0.72
26	Q – Southbound Northampton at Highland Ave	Yes	0.047	0.035	0.040	0.039	0.68	0.50	0.57	0.56
27	FF – Southbound Northampton from Florence Rd to West St	Yes	0.074	0.051	0.000	0.000	1.05	0.73	0.00	0.00
28	Q – Southbound Northampton at West St	Yes	0.052	0.039	0.043	0.042	0.74	0.56	0.61	0.59
29	FF – Southbound Northampton from West St to Lyman Ave.	No	0.067	0.048	0.052	0.051	0.95	0.68	0.75	0.73
30	FF – West St approaching Northampton St	No	0.031	0.024	0.025	0.024	0.45	0.34	0.36	0.35
31	Q – West St approaching Northampton St	No	0.027	0.021	0.022	0.022	0.38	0.31	0.32	0.31
32	FF – West St departing Northampton St	No	0.010	0.008	0.009	0.009	0.14	0.12	0.13	0.13
33	FF – Florence Rd approaching Northampton St	Yes	0.037	0.026	0.029	0.029	0.53	0.38	0.42	0.41
34	Q – Florence Rd approaching Northampton St	Yes	0.032	0.024	0.027	0.026	0.46	0.34	0.38	0.37
35	FF – Florence Rd departing Northampton St	Yes	0.029	0.021	0.024	0.024	0.41	0.30	0.35	0.34
36	FF – Highland Ave approaching Northampton St	Yes	0.002	0.001	0.001	0.001	0.03	0.02	0.02	0.02
37	Q – Highland Ave approaching Northampton St	Yes	0.002	0.001	0.001	0.001	0.02	0.02	0.02	0.02

Link ID	Link Description	EJ Area	2023 Existing VOCs (kg/hr)	2030 No-Build VOCs (kg/hr)	2030 Build VOCs (kg/hr)	2030 Build w/ TDMs VOCs (kg/hr)	2023 Existing VOCs (kg/day)	2030 No-Build VOCs (kg/day)	2030 Build VOCs (kg/day)	2030 Build w/ TDMs VOCs (kg/day)
38	FF – Highland Ave departing Northampton St	Yes	0.001	0.001	0.001	0.001	0.02	0.01	0.01	0.01
39	Idle Link	NA	0.000	0.000	0.000	0.000	0.00	0.00	0.00	0.00
40	Off-network link (starts)	NA				0.000	0.00	0.00	0.00	0.00
41	FF – Northbound Northampton from West St to Site Rd	Yes	-	-	0.071	0.069	0.00	0.00	1.01	0.99
42	Q – Northbound Northampton at Site Rd	Yes	-	-	0.062	0.060	0.00	0.00	0.89	0.86
43	FF – Northbound Northampton from Site Rd to Florence Rd	Yes	-	-	0.074	0.072	0.00	0.00	1.06	1.04
44	FF – Southbound Northampton from Florence Rd to Site Rd	Yes	-	-	0.054	0.052	0.00	0.00	0.77	0.75
45	Q – Southbound Northampton at Site Rd	Yes	-	-	0.047	0.046	0.00	0.00	0.67	0.66
46	FF – Southbound Northampton from Site Rd to West St	Yes	-	-	0.049	0.047	0.00	0.00	0.70	0.68
47	Rec Center	Yes	-	-	0.001	0.001	0.00	0.00	0.01	0.01
48	Day Care Center	Yes	-	-	0.003	0.003	0.00	0.00	0.04	0.04
49	Housing	Yes	-	-	0.009	0.009	0.00	0.00	0.14	0.13
50	Warehousing	Yes	-	-	0.000	0.000	0.00	0.00	0.00	0.00
51	Strip Retail	Yes	-	-	0.007	0.007	0.00	0.00	0.10	0.09
52	Restaurant	Yes	-	-	0.006	0.006	0.00	0.00	0.08	0.08
53	Bank	Yes	-	-	0.002	0.002	0.00	0.00	0.03	0.03
						Kg VOC Per Day:	**28.70**	**20.72**	**25.61**	**24.97**
						Tons VOC Per Year:	**11.55**	**8.34**	**10.30**	**10.04**

4.0 LAND ALTERATION

The 1981 Executive Order #193 (EO #193) Preservation of State-Owned Agricultural Land and the subsequent 2001 Agricultural Lane Mitigation Policy (2001 Policy) define "Agricultural Land" as land comprised of soils which are classified as Prime, Unique, or of State and Local Importance by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) including land currently in active agricultural use within the 15-year time period prior to conversion.

EO #193 applies to State-owned lands which is defined as "all land under the custody or control of a state agency, [and] all lands purchased in whole or in part with state funds or federal funds administered by the state." The Site is not under the custody, control, or ownership of the Commonwealth of Massachusetts. As clarified in the 2001 Policy, the statement that "State funds and federal grants administered by the state shall not be used to encourage the conversion of agricultural land to other uses when feasible alternatives are available" in EO #193 is applicable to private properties using state monies. To date, no State money has been allocated to the Project. State funding has been sought and denied twice.

The *Policy Options for Strengthening Farmland Mitigation in Massachusetts and other New England States: Identifying policy barriers and opportunities around land access and farm transfer* document produced through The New England Land Access Policy Project (2016) identifies that the MEPA process provides a procedural process to involve the Massachusetts Department of Food and Agriculture (MDAR) in project review; however, there "is still no statutory requirement mandating mitigation of agricultural land conversion in Massachusetts."

In the EENF, the Proponent accurately depicted the conversion of farmland soils and circulated the EENF to MDAR who did not comment on the Project at that time. Following issuance of the Secretary's Certificate on the DEIR (**Attachment 1**), the Proponent's representative spoke with Barbara Hopson of MDAR via telephone on May 1, 2024 regarding potential farmland soil mitigation. During this phone call, Ms. Hopson stated that MDAR does not usually require mitigation for smaller projects, typically with less than 5 acres of agricultural land conversion, and encourages a variety of mitigation strategies including:

- Reuse of farmland soils for agricultural activities;
- Provisions for open space access; and
- Conservation of farmland soils within portions of the Site.

Follow-up emails were sent to Ms. Hopson on May 3, 2024 with links to the Project documents and Secretary Certificates for additional review and coordination. Upon additional review, on June 13, 2024, MDAR indicated that they would seek mitigation for the conversion of approximately 6.5 acres of farmland and recommended the Project incorporate a larger community garden space, maintenance of agricultural use within discrete areas onsite, specify the use of pollinator species, and potentially provide financial mitigation in the event that 6.5 acres of conversion could not be mitigated onsite.

Although the Project may or may not receive State funding, the Proponent has incorporated the following farmland measures which coincide with the MDAR-identified mitigation strategies and/or recommendations received from MDAR:

- Reuse of farmland soils for agricultural use:
    - Farmland soils will be reused onsite for the landscaping and community garden which has been doubled in size to approximately 20,000 square feet;

  - Excess farmland soils will be sold locally for agricultural use;
- Provisions for open space access:
  - The community gardens will be located in a larger central green which is located over the more recently used agricultural areas. Minimal ground disturbance and grading is proposed within this area;
  - The Proponent clarified to MDAR that pollinator species are included in the New England Conservation/Wildlife Mix proposed for use in stormwater basins, rain gardens, and adjacent to wetlands;
- Conservation of farmland soils within portions of the Site:
  - The Proponent has committed to obtaining a Conservation Restriction across portions of the Site that will not be developed which includes approximately 10.8 acres, approximately 7.0 acres of which is within mapped Prime and Farmland of statewide importance soils.

Providing for onsite agricultural use of the land is not proposed as there are extremely limited areas available for farming that would not encroach on regulated wetlands, cause changes to the approved stormwater management system, or increase the removal of trees. MDAR did not provide feedback on the proposed increase in farmland soil conservation to include the conservation restriction and larger community garden. As consultation with MDAR is ongoing, additional documentation will be provided to the MEPA Office as available. The Proponent has committed to obtaining an agreement regarding farmland soil mitigation with MDAR.

Alteration of soils classified as agricultural soils outside of the work area will be avoided through the use of proper erosion and sediment control barriers. These barriers will be maintained until exposed soils are stabilized either through installation of permanent cover or temporary cover with vegetation or other means. The engineer managing the construction has obtained a Construction General Permit (CGP) and Stormwater Pollution Prevention Plan (SWPPP) authorization as required by the Environmental Protection Agency (EPA). As shown on the plans, temporary settling basins are proposed, and the stormwater management system will be constructed ahead of significant construction to provide for onsite management during and following construction.

5.0 TRAFFIC, TRANSIT, BICYCLE, & PEDESTRIAN ACCESS

The traffic impact assessment has been prepared in accordance with the Massachusetts Department of Transportation's (MassDOT's) Traffic Impact Assessment Guidelines. ***Howard Stein Hudson (HSH)*** prepared this study for Tasty Top Development LLC, which presents the traffic and parking impacts associated with the Project. No comments were received on the transportation analysis presented in the DEIR regarding the traffic study area or conditions modeled, which included three scenarios:

- 2030 No Build – This models traffic in the study area if the Project were not built;
- 2030 Build – This models traffic impact in the study area if the Project were built and no mitigation efforts were implemented; and
- 2030 Build-Mitigated – This models the traffic impact in the study area as proposed by the Project which includes mitigation measures.

5.1 TRAFFIC IMPACT ANALYSIS – SIGNALIZED INTERSECTION

In their comments, the Massachusetts Department of Transportation (MassDOT) notes that the proposed traffic mitigation using a traffic circle, as preferred by the City and abutters, will maintain an acceptable level of service; however, they requested an analysis of a signalized site driveway. At the time of the EENF submission in June 2023, the signalized intersection was the preferred alternative, and an analysis was provided therein (**Attachment 5**). That analysis has been combined with the currently preferred traffic circle analysis in **Table 5.1** to summarizes the Build (2030), Build-Mitigated (2030) Roundabout, and Build-Mitigated (2030) Signalized conditions during the AM and PM peak hours. The supportive analyses have previously been provided with the EENF and/or DEIR.

The preferred roundabout will be a single leg roundabout aligned with a relocated Mountainview Street. Retiming efforts at Northampton Street/Florence Road/Highland Avenue, Northampton Street/West Street, and Northampton Street/Oneil Street would improve traffic operations at those signals. The non-preferred signalized intersection was evaluated in the Project Phasing, Signal Warrant Analysis, and Proposed Transportation Conditions for Approval prepared by HSH for use by the City and provided in the EENF.

The preferred alternative was selected in consultation with the City, the City's peer review traffic consultant, and an abutter-retained traffic consultant. The preferred roundabout was selected primarily due to concerns about queuing of vehicles on Northampton Street and the ability of motorists to make left-turns safely out of neighboring properties.

5.2 MASSDOT CONSULTATION

The Proponent has been consulting with MassDOT Department of Public-Private Partnerships throughout the design process. Based on the most recent conversations, MassDOT has indicated that they wish to control the design and timeline of the roundabout implementation as part of their Northampton Street Complete Streets Project (MassDOT Project No. 608423). They have sought funding from the Proponent to support the project design and construction. Final negotiations are pending to determine the Proponent's contribution; however, the framework is agreed to by both parties. Construction of this MassDOT project is expected to begin in 2028.

The Project phasing will be constructed to match roadway capacity. No changes to the design or other mitigation commitments have occurred since the DEIR.

Table 5.1. Build (2030) and Build-Mitigated (2030) Roundabout and Signalized Conditions Capacity Analysis, a.m. and p.m. Peak Hours

Intersection/Movement	Build (2030) Condition					Build Mitigated (2030) Condition – Roundabout (preferred)					Build Mitigated (2030) Condition – Signalized Intersection (not preferred)				
	LOS	Delay (s)	V/C Ratio	50% Queue (ft.)	95th % Queue (ft.)	LOS	Delay (s)	V/C Ratio	50% Queue (ft.)	95th % Queue (ft.)	LOS	Delay (s)	V/C Ratio	50% Queue (ft.)	95th % Queue (ft.)
a.m. peak hour															
Northampton St/Site Driveway	-	-	-	-	-	C	16.0	0.85	-	-	B	19.4	0.88	-	-
EB Mountainview St left/thru/right	This approach does not exist under this Condition.					A	7.8	0.03	1	1	This intersection was not modeled.				
WB Site Driveway left	F	540.0	1.72	-	199	These lane groups do not exist under this Condition.					C	33.1	0.40	36	77
WB Site Driveway right	D	27.6	0.45	-	55						C	30.8	0.08	0	46
WB Site Driveway left/thru/right	This approach does not exist under the Build (2030) Condition.					C	16.1	0.37	42	75	This approach does not exist under this Condition.				
NB Northampton St left/thru/right	A	0.0	0.63	-	0	C	20.4	0.85	141	255	C	26.2	0.92	402	#774
SB Northampton St left	A	4.8	0.19	-	17	B	10.4	0.63	57	103	B	17.7	0.49	11	58
SB Northampton St thru/right											A	4.0	0.43	76	145
p.m. peak hour															
Northampton St/Site Driveway	-	-	-	-	-	D	26.9	0.96	-	-	B	13.9	0.77	-	-
EB Mountainview St left/thru/right	This approach does not exist under this Condition.					C	19.6	0.15	5	8	This intersection was not modeled.				
WB Site Driveway left	F	Err	8.36	-	Err	These lane groups do not exist under this Condition.					D	39.2	0.50	56	107
WB Site Driveway right	C	22.9	0.45	-	57						D	35.8	0.10	0	55
WB Site Driveway left/thru/right	This approach does not exist under this Condition.					D	26.0	0.65	49	89	This approach does not exist under this Condition.				
NB Northampton St left/thru/right	A	0.0	0.53	-	0	C	22.2	0.86	142	258	B	14.5	0.75	304	535
SB Northampton St left	A	7.8	0.25	-	24	D	31.1	0.96	247	448	B	11.5	0.53	19	43
SB Northampton St thru/right											A	7.7	0.71	220	441

Grey shading indicates LOS E or F under the Build Condition or a change from LOS D or better in a previous condition to LOS E or F.
 # = 95th percentile volume exceeds capacity; queue may be longer. Queue shown is maximum after 2 cycles.

5.3 LOS CLARIFICATION

The capacity analysis summary provided in the DEIR identified several intersections where the Level of Service (LOS) will deteriorate between existing (2023) conditions and the no-build (2030) conditions. It also identified four intersections or turning movements where the LOS deteriorated to an LOS F between the no-build (2030) and the build (2030) conditions. The Synchro (**Attachment 6**) analysis indicates that the two signalized intersections will be returned to an acceptable LOS following mitigation, and the Sidra (**Attachment 7**) analysis of the roundabout indicates that Mountainview Street will also be returned to an acceptable LOS. Because the westbound Pleasant Street right turn is not involved in the roundabout and is not signalized, it was not modeled as part of the build (2030) mitigated condition (**Table 5.2**).

The full Trip Reduction Plan/Transportation Demand Management plan (TDM) was provided in the DEIR and is included in the Section 61 findings below, as is the Transportation Monitoring Program. To validate the TDM, the TMP includes requirements to collect post-development data including automatic traffic recorder counts and turning movement counts at multiple intersections, including Northampton St/Main St/Pleasant St/Lyman Ave, Northampton St/West St, Northampton St/Oneil St, and Northampton/Mountainview St/Site driveway. The collected data will be used to perform new Synchro analysis to be compared to the TIA. This data and analysis will be performed within 6 months following the completion of each phase of construction and continue for five years following full buildout of the project at 6-month or 1-year intervals. Results will be submitted to MassDOT, the City of Easthampton, and the Pioneer Valley Planning Commission. Should the TDM measures not prove successful or should the LOS at westbound Pleasant Street deteriorate to an LOS F, the Proponent will coordinate with MassDOT and the City to identify additional actions or measures to be incorporated before proceeding to the next phase of construction.

Table 5.2. Summary of New LOS F Intersections from Build (2030) Conditions

Intersection/Movement	Existing (2023) LOS	No-Build (2023) LOS	Build (2030) LOS	Build (2030) Mitigated LOS
AM Peak Hour				
WB Pleasant St right turn	D	E	F	Not Modeled
PM Peak Hour				
Northampton St/West St (signalized)	D	E	F	D
SB Northampton St left/thru/right at Oneil St. (signalized)	C	E	F	B
EB Mountainview St left/right at Northampton St	D	D	F	C

6.0 WASTEWATER

The Project includes the construction and operation of a privately owned sewer system within the development that will discharge via gravity to the City of Easthampton sewer system with wastewater treatment at the Easthampton Wastewater Treatment Plant. This designation does not require authorization or permitting by the MassDEP; however, the proposed system is subject to 314 CMR 12.00 as a privately owned treatment works. The Proponent is aware and will prepare and submit to the MassDEP and City Department of Public Works for review an Operation and Maintenance manual prepared in accordance with the standards at 314 CMR 12.04(1) as applicable which may include the following sections:

- Introduction;
- Permits and Standards;
- Description, Operation and Control of Wastewater Treatment Facilities;
- Description, Operation and Control of Sludge Handling Facilities;
- Description, Operation, Control and Testing of the Chemical Addition and Monitoring System;
- Personnel;
- Sampling and Laboratory Analysis;
- Records and Reporting;
- Maintenance;
- Emergency Operating and Response Program;
- Safety;
- Utilities and Energy Requirements;
- Infiltration and Inflow Removal; and
- Emergency Notification Procedures for overflows or bypasses in accordance with 314 CMR 12.03(8).

The Project has been designed to qualify as a sewer extension at 314 CMR 7.05(1) which is an activity not requiring a State Permit. The Project will obtain approval from the City DPW for the sewer connection, in compliance with the approved local permit.

7.0 CLIMATE CHANGE

The MEPA Interim Protocol on Climate Change Adaptation and Resiliency, effective October 1, 2021 ("Interim Protocol"), was developed to comply with Executive Order 569 that directed EEA to coordinate efforts state-wide to strengthen the resilience of communities, prepare for climate change impacts, and plan for extreme weather events to mitigate future damages. The Interim Policy is meant to complement the 2010 MEPA Greenhouse Gas Emissions Policy and Protocol.

Per the Interim Policy, projects filing with MEPA are required to prepare a project-specific analysis relative to climate change using the Resilient Massachusetts Action Team (RMAT) Climate Resilience Design Standards Tool and to attach the output report from this tool with the EENF filing. This filing is re-provided herein as **Attachment 8**. The RMAT report recommended that the Proponent model the stormwater management system during the 24-hour 10-year storm (10% annual chance) design storm in 2070 using a Tier 2 analysis. The Secretary's Certificate on the EENF requested that the Proponent model two additional storm events– the 24-hour 25-year storm (4% annual chance) and the 24-hour 50-year storm (2% annual chance)—in 2070 with a Tier 2 analysis. The modeling provided with the DEIR indicated that although the estimated 2070 50-year precipitation depth of 8.52 was greater than the current NOAA Atlas 14 precipitation depth of 8.07 inches, the stormwater management system improved runoff conditions over existing conditions.

The Secretary's Certificate on the DEIR requested that the efficacy of the stormwater management system be re-evaluated during the 2070 50-year storm event using the Resilient MA Climate change Projects Dashboard (Dashboard) as a resource. This Dashboard has precipitation values that are larger than the values obtained by following the RMAT Tier 2 future design storm rainfall depths.

GZA re-evaluated the stormwater management system using the Dashboard precipitation depth for a projected 2070 24-hour 50-year storm, which has a value of 10.2 inches as of the data access date in May 2024. GZA performed a Tier 2 analysis to compare the proposed development hydrology and hydraulics (H&H) with future conditions based on the Stormwater Management Report dated August 29, 2023 prepared by Furrow Engineering. The H&H was performed by updating the HydroCAD models v10.10 that were previously developed. The models simulate the site hydrology including rainfall and runoff and potential stormwater impacts under two conditions:

1. Existing Conditions (i.e., pre-development); and
2. Proposed Conditions (i.e., post-development).

The technical memo outlines the methodology and results and is included as **Attachment 9**. As demonstrated in **Table 7.1** and **7.2**, the proposed Stormwater Management System improves (i.e., decreases) peak runoff flows and volumes under each of the four modeled storm events.

When the stormwater management system was sized, the design engineers used the NOAA Atlas 14 current-day 24-hour 100-year storm with 1-foot of freeboard in the basins. The modeling conducted by GZA indicates that during the 10.2" precipitation event, the stormwater management basins will reach or near capacity but are not overtopped. The current design allows for increased stormwater management capacity if needed under future conditions as the stormwater basins can be excavated to an increased depth while still meeting groundwater separation distances, and berms can be added around basins to increase their storage capacity while maintaining peak water surface elevations below the first-floor elevations of adjacent buildings.

Table 7.1 Summary of Pre- and Post-Development Peak Flow Rates for the Design Storm

Peak Stormwater Runoff Flow Rate (cfs)						
Scenario		Analysis Point No.1		Analysis Point No.2		
		Pre-Development	Post-Development	Pre-Development	Post-Development	
24-hr 10-yr	Present	59.1	43.9	2.2	1.5
	2070 (RMAT Rec.)	77.7	59.8	3.6	2.4
	2070 (RMAT Tool)	99.5	74.5	5.3	3.5
24-hr 25-yr	Present	82.6	63.7	3.9	2.8
	2070 (RMAT Rec.)	106.8	84.3	5.9	4.2
24-hr 50-yr	Present	99.5	74.5	5.3	3.5
	2070 (RMAT Rec.)	127.0	96.0	7.7	5.7
	2070 (Dashboard Rec.)	159.6	112.5	10.6	8.7

Table 7.2 Summary of Pre- and Post-Development Peak Runoff Volumes for the Design Storm

Peak Stormwater Runoff Volume (Ac-ft)					
Scenario		Analysis Point No.1		Analysis Point No.2	
		Pre-Development	Post-Development	Pre-Development	Post-Development
24-hr 10-yr	Present	6.1	6.0	0.3	0.2
	2070 (RMAT Rec.)	8.0	7.9	0.4	0.3
	2070 (RMAT Tool)	10.3	10.1	0.5	0.4
24-hr 25-yr	Present	8.54	8.45	0.41	0.35
	2070 (RMAT Rec.)	11.1	11.0	0.60	0.56
24-hr 50-yr	Present	10.3	10.1	0.5	0.4
	2070 (RMAT Rec.)	13.3	13.1	0.76	0.74
	2070 (Dashboard Rec.)	16.8	16.5	1.1	1.1

8.0 GREENHOUSE GAS EMISSIONS

The greenhouse gas (GHG) emissions analysis provided in the DIER were developed consistent with the "Revised MEPA Greenhouse Gas Emissions Policy and Protocol" ("MEPA GHG Policy") dated May 5, 2010. The policy specifies that projects must quantify potential GHG emissions from direct and indirect CO2 emissions associated with the project's energy use (stationary sources), as well as transportation-related emissions (mobile sources).

8.1 COMMERCIAL BUILDINGS

For the commercial buildings, the Project proposes to comply with the 2023 Stretch Code (Code) and Prescriptive Compliance pathway as well as additional energy mitigation measures planned by the Proponent. Mitigation measures primarily focused on reducing thermal energy demand and efficient electrification.

In the DEIR, energy recovery ventilation was proposed in all buildings except for the warehouses. The Stretch Code references IECC C403.7.4 for energy recovery ventilation systems. C403.7.1 includes an exception for systems serving spaces that are heated to less than 60 degrees Fahrenheit and that are not cooled. Although not required pursuant to the Stretch Code, in response to comments received on the DEIR, energy recovery ventilation is now proposed in the two warehouse buildings. Energy Recovery Ventilation (ERV) units will be used in the two warehouses with approximately 70% heat recovery.

8.2 RESIDENTIAL BUILDINGS / PASSIVEHOUSE

The DEIR included a detailed analysis of the residential base case using the Energy Rating Index (ERI) option at R401.2.3 of the 2023 Stretch Code and proposed a mitigation case. The proposed measures are applicable to residential units located in both the 18-unit apartment buildings, and the 14-unit mixed use buildings.

As requested in the Secretary's Certificate on the DEIR, a revised Passivehouse analysis has been prepared that includes a revised gap analysis comparing what is proposed (worst case HERS 45 meeting mandatory code provisions plus the previously-committed-to envelope features and electrification) to Passivehouse with a life cycle evaluation and a professionally-estimated cost evaluation of first costs, netted against the Passivehouse $0.6M incentive. The gap analysis also estimated the peak electric demand in summer and winter with the proposed HERS Index 45 case and the Passivehouse case. The results of the Passivehouse analysis are provided in **Attachment 10**.

The first-cost gap analysis indicates that the additional construction costs for Passivehouse are $106,068 more for each residential building and $92,781 more for the mixed-use buildings than the proposed case, as well as a $315,000 assumed cost for Passivehouse verification for the development as a whole. Inclusive of the $0.6M incentive, the cost difference between the proposed case and Passive house is an increase of $868,461. With the inclusion of the 14 units above the retail/office space, it is noted that the incentive may be larger than $0.6M; however, it would not be sufficient to bridge the $0.8M gap. The life cycle cost analysis indicated that there were no additional changes in the Net Present Value as the owner pays for only water heating and ventilation.

The peak electric demand in summer and winter associated with the proposed case and Passivehouse case were also evaluated. The proposed case would not meet Phius CORE 2021 standards for heating demand and heating load in either the 18-unit apartment buildings or the mixed-use buildings.

Based on these data, the Proponent will pursue the proposed case as described in the DEIR and documented in the Section 61 findings for all residential units.

9.0 CUMULATIVE IMPACTS

The Project-specific impacts have been described and documented in this document. Since the start of the MEPA Process, neighboring property has been developed as a Starbucks and is currently operating. The Starbucks property was previously part of the Project Site and was once under common ownership. As previously identified, the property subdivision did not involve the Proponent.

Regardless, the Project impacts related to impervious cover and traffic have been analyzed and the Starbucks development has been included in this analysis. The Starbucks development will increase impervious cover in the vicinity of the Project by 22,000 SF with an additional 7,000 SF of pervious pavers (0.6 acres total). Individually and cumulatively, these sites will have an increase in impervious cover; however, they are not anticipated to result in increased stormwater runoff. The Project will result in decreased stormwater runoff under future climate scenarios and complies with both the State and the more stringent Easthampton stormwater standards. The Proponent has not directly reviewed stormwater information for the Starbucks but understands that to have received the Planning Board approval for development, it also had to comply with the applicable City Ordinances.

The Starbucks will also result in approximately 1,800 additional vehicle trips per day. This vehicle data was used in developing the existing conditions (2023) traffic model used to analyze future traffic conditions and Project impacts and will not act cumulatively upon the projected traffic conditions used herein.

10.0 REQUIRED PERMITS, REVIEWS, AND APPROVALS

The following permits or approvals are anticipated to be necessary for this Project:

- City of Easthampton Conservation Commission – Order of Conditions (Issued January 23, 2024)
- City of Easthampton Planning Board – Site Plan Approval and Special Permit Approval (Issued November 14, 2023)
- City of Easthampton Historical Commission – Approval under Demolition Delay Ordinance (Issued February 8, 2023)
- Massachusetts Environmental Policy Act Office – Secretary's Certificate on Expanded Environmental Notification Form (Issued August 16, 2023), on Draft Environmental Impact Report (Issued April 1, 2024) and on Final Environmental Impact Report
- Massachusetts Historical Commission – Project Notification Form; (Findings Letter Issued December 21, 2022)
- Massachusetts Department of Transportation – Access Permit (Application to be submitted following conclusion of MEPA Review Process)
- Massachusetts Department of Agriculture – Agricultural Land Mitigation Policy (Consultation in progress)
- US Environmental Protection Agency – Stormwater Pollution Prevention Plan and National Pollutant Discharge Elimination System Notice of Intent for coverage under the Construction General Permit (Issued May 6, 2024)

10.1 CONSISTENCY WITH APPLICABLE PERMITTING AND REVIEW REQUIREMENTS

The Project has been designed to comply with applicable permitting and review requirements as described throughout this document.

10.1.1 City of Easthampton Conservation Commission - Wetland Protection Act

The City of Easthampton Conservation Commission issued the Order of Conditions for the Project authorizing the work subject to the Wetland Protection Act. By approving the work, they have found that the Project meets applicable performance standards and requirements for stormwater management and wetland protection.

10.1.2 City of Easthampton Planning Board

The City of Easthampton Planning Board issued an approval or the Project authorizing the work subject to their local zoning and planning ordinances. Their review included a third-party review of the traffic study. By approving the work, they have found that the Project meets applicable performance standards and requirements.

10.1.3 City of Easthampton Historical Commission – Approval under Demolition Delay Ordinance

The City of Easthampton Historical Commission allowed for the removal of structures onsite following review at two hearings and the requisite delay period. By approving the work, they have found that the Project meets applicable performance standards and requirements.

10.1.4 Massachusetts Environmental Policy Act Office – Secretary's Certificate

This FEIR has been prepared in accordance with the Scope items provided in the Secretary's Certificate, dated April 1, 2024. The Proponent has also committed to issuing a self-certification that the proposed GHG measures, or their equivalent were implemented, following construction.

10.1.5 Massachusetts Historical Commission – Findings Letter

The MHC findings letter, issued December 12, 2022, found the Project "unlikely to affect significant historical or archaeological resources" and did not require additional consultation. MHC received a full copy of the EENF and did not issue comments. As such, this consultation was completed in compliance with applicable standards and requirements.

10.1.6 Massachusetts Department of Agriculture – Agricultural Land Mitigation Policy

The Proponent has been coordinating with MDAR to provide mitigation for the conversion of approximately 6.5 acres of farmland soils. The Proponent has committed to reaching a mitigation agreement with MDAR and will provide documentation to the MEPA Office as available.

10.1.7 Massachusetts Department of Transportation – Access Permit

The MassDOT Access Permit has not yet been applied for, as the application will not be submitted until after the conclusion of the MEPA Process. The MassDOT comments on the EENF, including a recommendation to expand the study area, have been incorporated into this DEIR. Should additional comments be received, the Proponent will seek to comply.

10.1.8 U.S. Environmental Protection Agency – Construction General Permit

The Project has been designed to comply with the highly prescriptive standards and requirements of the Construction General Permit. The Notice of Intent was accepted and authorizations to discharge under the Construction General Permit on May 6, 2024 and will expire on February 16, 2027.

11.0 RESPONSE TO COMMENTS

11.1 COMMENT LETTERS RECEIVED ON THE DEIR

Written comment letters were received by MEPA from the agencies, departments, organizations, and/or individuals listed below during the DEIR comment period. An annotated copy of submitted comments is included in **Attachment 1**.

- Stockbridge-Munsee Community (SM)
- Pioneer Valley Planning Commission (PVPC)
- Cernak Family (CF)
- Massachusetts Department of Environmental Policy (DEP)
- Massachusetts Department of Transportation (DOT)
- Massachusetts Department of Energy Resources (DOER)

11.2 RESPONSE TO COMMENTS ON THE DEIR

Comment letters on the DEIR were reviewed and have been identified and enumerated/coded in **Attachment 1** using the assigned initials above.

Comment Summary	*"The Stockbridge-Munsee Community recommends that an archaeological survey be conducted at this property prior to development."*
Comment(s)	SM-1
Response	Comment is noted. The Project was reviewed by the Massachusetts Historical Commission and no such survey was required. An approximately 10.8-acre Conservation Restriction is proposed across the Site and includes areas along the intermittent stream and the portions of the Site nearest to the Manhan River.
Comment Summary	*"PVPC encourages the development of a general Unanticipated Discoveries Plan which outlines specific measures to be implemented during site development, providing more guidance for the construction team."*
Comment(s)	PVPC-1
Response	An Unanticipated Discoveries Plan has been developed to provide guidance for the construction team. This plan is included herein as **Attachment 11**.
Comment Summary	*The Easthampton Historical Commission should be included on the distribution list for future correspondence related to this project.*
Comment(s)	PVPC-2
Response	The Easthampton Historical Commission has been added to the distribution list for future MEPA-related correspondence (**Attachment 12**).
Comment Summary	*PVPC requests additional information on the former Hampshire and Hampden Canal which has remnants onsite and potential impacts to canal remnants. PVPC states that a mitigation plan for the canal remnant would be helpful.*
Comment(s)	PVPC-3

Response	The former Hampshire and Hampden Canal has remnants onsite that are primarily located along the Manhan River. The only direct impact to the limits of the canal remnants is one stabilized swale from a stormwater basin. This work is located within an area of the canal demarcated as previously disturbed on maps prepared by the PVPC. The stormwater swale will be enclosed by erosion control material to minimize and avoid impacts to the surrounding area. No other impacts are proposed to or adjacent to the canal remnants. As such, no mitigation plan will be developed; however, the prepared Unanticipated Discoveries Plan will be followed. Additionally, the Proponent is coordinating with the Easthampton Historical Commission regarding signage.
Comment Summary	*Provide clarity on the trips generated during the roadway peak hour versus the peak hour of the generator/land use.*
Comment(s)	PVPC-4
Response	The roadway peak hours used are 7:00–9:00 AM and 4:00–6:00 PM. The land use/generator peak hours vary based on the multiple uses of the development, were obtained from the ITE Trip Generation Handbook, and include: • LUC 150 (warehouses) – 11:30 AM–12:30 PM and 3:00–4:00 PM; • LUC 495 (recreational community center) – 7:30–8:30 AM and 5:00–6:00 PM; • LUC 565 (day care) – 7:15–8:15 AM and 4:45–5:45 PM; • LUC 220 (low-rise multifamily housing) – 7:15–8:15 AM and 4:45–5:45 PM; • LUC 820 (shopping center) – 11:45 AM–12:45 PM and 12:15–1:15 PM; • LUC 932 (high-turnover restaurant) – 11:45 AM–12:45 PM and 12:00–1:00 PM; and • LUC 912 (drive-n bank) – 11:45 AM–12:45 PM and 12:15–1:15 PM.
Comment Summary	*"PVPC concurs with the transportation monitoring plan (TMP) for the project as outlined in the DEIR. We would like to request that PVPC be added to the distribution list for the TMP."*
Comment(s)	PVPC-5
Response	The Proponent will add PVPC to the distribution list for the TMP.
Comment Summary	*"Additional information is requested in FEIR and Section 61 Findings to identify the responsible party for the proposed changes to traffic signal timings in the study area. It is also requested that the Section 61 Findings be updated to reflect the commitment made on the construction of a roundabout on Route 10 at the project site driveway."*
Comment(s)	PVPC-6
Response	The responsible party for the proposed changes to the traffic signal timings in the study area is MassDOT with funding from the Proponent. The Section 61 Findings reflect the commitment to construct the roundabout.
Comment Summary	*"We request that the Proponent engage with MassDOT during preparation of the Final EIR (FEIR) and ultimately the Section 61 Finding process to definitively identify the roundabout alternative as the selected mitigation alterative for Sierra Vista Commons."*
Comment(s)	CF-1
Response	The Proponent has continued to engage with MassDOT to identify the roundabout as the selected mitigation alterative for the Project.

Comment Summary	*"MassDEP recommends that the FEIR Executive Summary clearly articulate that the WPA permitting process has been initiated and completed, as well as acknowledging that any changes in the project that result in new, different, or additional impacts to resource areas and/or their buffer zone may, at the discretion of the issuing authority, require filing a new Notice of Intent or amended Notice of Intent.*
Comment(s)	DEP-1
Response	The Order of Conditions is referenced in the Executive Summary. The Proponent acknowledges that changes in the proposed work outside what has been authorized in the Order of Conditions would require consultation and potentially re-permitting the work with the City of Easthampton Conservation Commission.
Comment Summary	*"The project may include ownership and operation of a private treatment works, consisting of a common sewer system…MassDEP's primary concern revolves around the potential lack of awareness among owners/operators of private treatment works regarding their regulatory responsibilities…One of the key requirements of these regulations is to establish that all treatment works, public and private, maintain and implement a written preventative maintenance program to ensure the efficient operation of the facility and equipment."*
Comment(s)	DEP-2
Response	The Project involves ownership of a private treatment works consisting of a common sewer system. The Proponent will prepare and provide to MassDEP the necessary Operation and Maintenance manual.
Comment Summary	*"The Proponent shall properly manage and dispose of all solid waste generated by or discovered during this proposed project pursuant to 310 CMR 16.00 and 310 CMR 19.000, including regulations at 310 CMR 19.017 (waste ban)."*
Comment(s)	DEP-3
Response	Comment noted. The Proponent will properly manage and dispose of solid waste.
Comment Summary	*"There are no identified permits required from MassDEP for this proposed project. Should there be impacts that require mitigation and any MassDEP permits identified in future filings, Section 61 Findings must be included."*
Comment(s)	DEP-4
Response	Comment noted. Should a MassDEP permit be required, the Proponent will provide Section 61 Findings.
Comment Summary	*The Proponent should coordinate with MassDOT's District 2 office prior to submitting the FEIR regarding the installation of the crosswalk and sidewalk from Groveland Street to the site drive in light of the pedestrian safety improvement plan.*
Comment(s)	DOT-1
Response	The Proponent is aware that MassDOT installed a new crosswalk with a rapid flashing beacon across Route 10 north of Groveland as part of MassDOT Project No. 612638. As the Proponent understands that MassDOT wishes to maintain control over the Route 10 enhancements, this element is part of the overall project negotiations between the MassDOT and Proponent for funding the design and construction of the roundabout.

Comment Summary	*"The FEIR should include the analysis of signalized site driveway option to reflect the alterative analysis conducted to determine the site access selection. The draft Section 61 Finding should be updated to reflect the commitment made regarding the construction of the roundabout.*
Comment(s)	DOT-2
Response	The analysis of the signalized driveway was previously completed and provided in the EENF. A summary of this alternative has been provided in **Section 5** above.
Comment Summary	*"MassDOT would also like to work with Proponent regarding the timing of implementation as well as the funding for the design and construction of the roundabout which should be discussed prior to the submittal of the FEIR."*
Comment(s)	DOT-3
Response	The Proponent and MassDOT have coordinated since filing the DEIR regarding the timing of project implementation and funding for the design and construction of the roundabout. The Proponent and MassDOT have an agreed-upon framework for this work with final details remaining to be addressed.
Comment Summary	*"The residential buildings, however, did not complete recommended evaluations of Passive house and the work that was performed contains a significant error. Further, no Passivehouse evaluation was performed for the 14 units above the retail/office. The proposed dwelling units, built to Passivehouse, would be eligible for more than $0.6M in MassSave incentives." Revise the gap analysis to compare what is being proposed (HERs 45, all electric) to Passivehouse to accurately estimate the difference in cost of the two plans.*
Comment(s)	DOER-1, DOER-3, DOER-6
Response	The revised Passivehouse gap analysis is provided as **Attachment 10** and compares the proposed condition to the Passivehouse analysis to accurately estimate the difference in cost between the two plans. The analysis includes the 14 units above the retail/office space.
Comment Summary	*Energy recovery ventilation is recommended for the warehouse buildings. DOER recommends reviewing the code requirements and, if recovery ventilation is not required, committing to it as a mitigation measure.*
Comment(s)	DOER-2
Response	Energy recovery ventilation is now proposed in the warehouse buildings.
Comment Summary	*Provide "a professionally-estimated cost evaluation of first costs for the proposed case and first cost for the Passivehouse case, with the later netted against a $0.6M incentive. The analysis should also include a life cycle evaluation."*
Comment(s)	DOER-4
Response	A professionally-estimated cost evaluation is provided in **Attachment 10** that includes the incentive and a life cycle evaluation.
Comment Summary	*DOER recommends estimating the peak electric demand in the summer and winter for both the HERs 45 case and Passivehouse as Passivehouse may reduce electric service loads.*
Comment(s)	DOER-5
Response	The Passivehouse evaluation in **Attachment 10** includes estimates of the peak electric demand in summer and winter for both HERS 45 and Passivehouse cases.

12.0 PROPOSED DRAFT SECTION 61 FINDINGS AND MITIGATION

12.1 INTRODUCTION

Massachusetts General Law (M.G.L.) c. 30 § 61 requires that "[a]ll authorities of the Commonwealth…review, evaluate, and determine the impact on the natural environmental of all works, projects or activities conducted by them and…use all practicable means and measures to minimize [their] damage to the environment, … Any determination made by an agency of the Commonwealth shall include a finding describing the environmental impact, if any, of the project and a finding that all feasible measures have been taken to avoid or minimize said impact." Each State Agency that issues a permit for the Project shall issue a Section 61 Finding in connection with permit issuance, identifying mitigation that is relied up on satisfy the Section 61 requirement. A proposed Section 61 Finding is provided in **Section 12.3** and a table of mitigation measures is included as part of the Section 61 Findings. Mitigation will be the responsibility of the Proponent.

12.2 ANTICIPATED STATE PERMITS AND APPROVALS

The Massachusetts Department of Transportation (MassDOT) is the only State Agency from which the Project requires a Permit or Approval. A Highway Access Permit will be required to develop the Site access from Route 10.

12.3 PROPOSED SECTION 61 FINDING

Project Name Sierra Vista Commons Project

Project Location	Easthampton, MA
Proponent	Tasty Top Development, LLC
EEA Number	16729
Date Noticed in Monitor	June 26, 2024

The potential environmental impacts of the Project have been characterized and quantified in the FEIR dated June 17, 2024, which is incorporated by reference into this Section 61 Finding. Throughout the planning and environmental review process, the Proponent has been working to develop measures to mitigate significant impacts of the Project. With the mitigation proposed and carried out in cooperation with state agencies, MassDOT finds that there are no significant unmitigated impacts.

The Proponent recognizes that the identification of effective mitigation, and implementation of that mitigation throughout the life of the Project, is central to its responsibilities under MEPA. The Proponent has accordingly prepared the annexed Table of Impacts and Mitigation Measures that specifies, for each potential state permit category, the mitigation that the Proponent will provide.

Now, therefore, MassDOT having reviewed the MEPA filings for the Project, including the mitigation measures itemized on the annexed Table of Impacts and Mitigation Measures, finds pursuant to M.G.L. C. 30, S. 61, that with the implementation of the aforesaid measures, all practicable and feasible means and measures will have been taken to avoid or minimize potential damage from the Project to the environment.

(Agency)

By (Name)

(Date)

To be attached, **Table 12.1**, describing the measures to be implemented to mitigate the effects of the Project related to the required state permits and the schedule for implementation. The mitigation measures will be implemented subject to receipt of the necessary permits and approvals. The Proponent is responsible for all proposed mitigation.

Table 12.1 Summary of Mitigation Measures

Mitigation	Schedule	Cost
Transportation; State Agency Action: MassDOT Highway Access Permit		

The Proponent is committed to the following baseline Transportation Demand Management (TDM) strategies:
• Vanpool/carpool incentives: Designated parking spaces for carpooling will be conveniently located in the parking area between Buildings 13 and 14, which is centrally located to the commercial buildings. Designated parking spaces will be clearly identified with signage.
• Encouraging Pedestrian and Bicycle Commuting:
    o The development will include an eight-foot-wide shared use concrete path that will connect the development to Northampton Street. The path will run adjacent to the main roadway through the development, and loop around the eastern residential portion of the development. The path will be wide enough to accommodate pedestrians and bicyclists.
    o The development will include a concrete pad with a bike rack outside of every building within the development. The proposed bike rack locations are shown on plan series C-2 of the project plan set.
    o Each residential apartment building will have secure bike storage rooms inside the buildings open to the residents.
    o A Valley Bike Share station will be installed on the property along the sidewalk following Northampton Street.
• On-site Services:
    o Recreational services will be provided on-site for the residents of the apartment buildings including a pool, community garden, and playground.
    o On-site commercial businesses will provide services to the residents/employees within the development, including a daycare facility, restaurants, a bank, and a retail building. These services will help to reduce vehicle trips.
    o Tasty Top LLC. will act as the transportation coordinate and provide onsite support and education on the Trip Reduction Plan to tenants.
• Off-hour Deliveries:
	During operation	Part of operating costs

Mitigation	Schedule	Cost
○ The transportation coordinator will work with tenants and subcontractors such as waste disposal to schedule truck deliveries and traffic for off-hours to the extent practicable.		
The Proponent is committed to a transportation monitoring program, as outlined: • The Proponent will conduct a post-development transportation monitoring program (TMP) to evaluate the success of the Trip Reduction Plan measures and validate trip projections and parking demand for the project. The TMP will be conducted by a licensed traffic engineer. The TMP shall: ○ Conduct Automatic Traffic Recorder (ATR) counts including vehicle classification for a continuous seven-day period at the Site driveway. ○ Perform Turning Movement Counts (TMCs) including vehicles, pedestrians, and bicycles, during the weekday morning (7:00 – 9:00 a.m.) and weekday evening (4:00 – 6:00 p.m.) peak periods at the following locations (Study Area): ▪ Northampton Street (Route 10)/Site driveway/Mountainview Street; ▪ Northampton Street (Route 10)/Florence Road/Highland Avenue; ▪ Northampton Street (Route 10)/West Street; ▪ Northampton Street (Route 10)/Oneil Street; ▪ Main Street (Route 10)/Union Street; and ▪ Northampton Street (Route 10)/Main Street (Route 10)/Pleasant Street/Lyman Avenue. ○ Perform parking inventory and occupancy of both vehicle and bicycle parking on-site. The occupancy study shall include weekday morning (8:00 – 10:00 a.m.), weekday midday (11:00 a.m. – 1:00 p.m.), weekday evening (4:00 – 6:00 p.m.), and weekday late night (after 9:00 p.m.) to capture the range of parking occupancy at different times of day. ○ Perform analysis of TMCs collected in each monitoring period at the Study Area intersections using Synchro and comparing those results to the results of the Traffic Impact Study.	During operation	Part of operating costs

Mitigation	Schedule	Cost
○ Compare the site driveway ATR data to the signal warrants and coordinate with MassDOT should the warrants be met. ○ Review analysis of Study Area intersections to determine whether the proposed signal timing changes proposed as mitigation are necessary yet subject to approval of MassDOT. • The Proponent will perform the TMP annually beginning six (6) months after the completion and issuance of Certificate of Occupancy for Phase 1. The TMP will be performed annually or six (6) months after the completion and occupancy of each successive phase of development, whichever time period is less, and will continue for five (5) years following completion of the full buildout of the project. • For each monitoring period, the Proponent will submit to MassDOT, the City of Easthampton, and the Pioneer Valley Planning Commission a TMP Report, including descriptions of the TDM implementation program, trip activity, parking inventory and occupancy, and the adequacy of the transportation mitigation. The report will be submitted to MassDOT's Public/Private Development Unit (PPDU) and District 2 Office via the Transportation Impact Assessment Monitoring Report online tool.		
The Proponent will provide funding for MassDOT to design and construct the preferred intersection design of a roundabout.	During construction	Part of construction costs
The Applicant has proposed signal timing changes at other local intersections, including Northampton Street/West Street and Northampton Street/Florence Road/Highland Avenue. These timing changes will be made once the monitoring indicates that they are needed.	During operations	Part of operating costs
The Proponent will construct a driveway connection to the adjacent Starbucks property in Phase 1 of the Project if a reasonable agreement can be made with the property owner.	During construction	Part of construction costs
Land, Wetland, & Scenic Impacts; Agency Action: None		
Approximately 11 acres of the Site will remain unaltered during and following construction with a Conservation Restriction protecting approximately 10.8 acres. Approximately 7 acres of the proposed Conservation Restriction is mapped as Prime Farmland or Farmland soils of Statewide Importance.	During construction	Part of construction costs

Mitigation	Schedule	Cost
Demarcate wetland boundaries near the development with Conservation Commission approved signage and bollards.	During operation	Part of operating costs
Construct the proposed stream crossing as designed to meet optimum stream crossing standards.	During construction	Part of construction costs
Remove the existing stream crossing and implement the approved restoration plan in response to the Site Enforcement Order.	During construction	Part of construction costs
Install the proposed downcast, full cut off lighting to avoid light pollution.	During construction	Part of construction costs
Maintain and enhance the existing vegetative buffers along residential property boundaries.	During construction & operation	Part of construction & operation costs
Plant and maintain the proposed >200 trees and >200 shrubs as identified on the approved landscape plans.	During construction & operation	Part of construction & operation costs
Construct the community garden to be at least 20,000 square feet.	During construction & operation	Part of construction & operation costs
Stormwater Management; Agency Action: None		
Construct the stormwater management system as designed and approved by the Conservation Commission, including: • Deep sump hooded catch basins to provide pretreatment; • Peak flow rate attenuation via two infiltration and four detention basins with outlet control structures, level spreaders, and emergency overflow features; • Routing of roof runoff of 13 buildings through rain gardens; and • Routing of paved surface runoff through hydrodynamic separators; To achieve at least 90% TSS removal and required phosphorus removal.	During construction	Part of construction costs

Mitigation	Schedule	Cost
Implementation of the Long Term Operation and Maintenance Plan as prescribed in the Stormwater Report.	During operation	Part of operating costs
Implementation of Low Impact Development and environmentally sensitive site design measures including: • No disturbance of Wetland Resource Areas; • Site Design Practices; • Minimizing disturbance to existing trees and shrubs; and • Use of bioretention cells (i.e., rain gardens).	During construction	Part of construction costs
Sustainability; Agency Action: None		
Meet or exceed requirements of the 2023 Stretch Code for commercial and residential buildings including: • Energy efficient windows and building envelopes; • Higher-efficiency electrical HVAC Heating and Cooling systems; • Energy efficient interior and exterior lighting; • Energy STAR equipment and appliances; and • Water conserving fixtures and practices.	During construction	Part of construction costs
Install up to 20,000 SF of solar across the daycare center, gymnastics studio building, and standalone retail buildings. 80% solar readiness of these roofs is anticipated.	During construction	Part of construction costs
Install approximately 7,500 SF of rooftop solar on the residential buildings. At least 40% solar readiness of these roofs is anticipated.	During construction	Part of construction costs
Installation of four installed EV parking spaces for residential buildings with 20% EV readiness.	During construction	Part of construction costs

Mitigation	Schedule	Cost
Installation of two installed EV parking spaces for commercial buildings, except the storage units, with 25% EV readiness.	During construction	Part of construction costs
The Proponent will provide the MEPA Office a self-certification that the proposed GHG emission reduction measures, or their equivalent, were implemented.	During construction	Part of construction costs
Construction; Agency Action: None		
Avoid direct alteration of wetland resources.	During construction	Part of construction costs
Reuse soils onsite to the extent practicable to minimize material hauling.	During construction	Part of construction costs
Sell excess farmland soils that cannot be reused onsite locally.	During construction	Part of construction costs
Phase tree removal as necessary to support planned construction.	During construction	Part of construction costs
Incorporate settling basins, erosion controls, and construction-phase pollution prevention measures to avoid discharge of turbid waters, erosion and sedimentation of resources areas, and infiltration of non-pretreated stormwater.	During construction	Part of construction costs
Implement the approved SWPPP and keep required documentation onsite and updated as necessary.	During construction	Part of construction costs
Implement the proposed Waste Management Plan including waste assessment and planning, source reduction, reuse and recycling, material handling and segregation, hazardous waste management, construction debris management, and waste disposal measures.	During construction	Part of construction costs
Manage construction efforts and timing to limit construction to normal working hours, requiring appropriate mufflers, and utilizing fulling enclosures on continuously running equipment, and scheduling operations to keep average noise levels low.	During construction	Part of construction costs

Mitigation	Schedule	Cost
Require the use of ultra low sulfur diesel and enforce the idling limit.	During construction	Part of construction costs
Manage fugitive dust by implementing appropriate erosion and sedimentation controls, stabilizing exposed soils, phasing work, and providing stabilized construction entrances, surface wetting, and street sweeping as necessary.	During construction	Part of construction costs
Housing & Community Support; Agency Action: None		
Deed-restrict 54 affordable housing units.	During construction	Part of construction costs
Increase safe and lead-free housing options in a low-housing-availability community.	During construction	Part of construction costs
Provide community and program species including the childcare center and gymnastics center.	During construction	Part of construction costs

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ATTACHMENT 1 – SECRETARY’S CERTIFICATE ON THE DRAFT ENVIRONMENTAL IMPACT REPORT

The Commonwealth of Massachusetts

Executive Office of Energy and Environmental Affairs

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April 1, 2024

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
DRAFT ENVIRONMENTAL IMPACT REPORT

PROJECT NAME	: Sierra Vista Commons
PROJECT MUNICIPALITY	: Easthampton
PROJECT WATERSHED	: Connecticut
EEA NUMBER	: 16729
PROJECT PROPONENT	: Tasty Top Development, LLC
DATE NOTICED IN MONITOR	: February 23, 2024

Pursuant to the Massachusetts Environmental Protection Act (MEPA; M.G.L. c. 30, ss. 61-62L) and Section 11.08(8) of the MEPA regulations (301 CMR 11.00), I have reviewed the Draft Environmental Impact Report (DEIR) and hereby determine that it **adequately and properly** complies with MEPA and its implementing regulations. The Proponent may prepare and submit for review a Final Environmental Impact Report (FEIR) in accordance with the Scope below. Although the DEIR was responsive to the prior Scope in clarifying the project's impacts and providing revised analyses with respect to traffic, air quality, and building energy usage, comments from Agencies on the DEIR continue to raise concerns regarding errors and omissions from said analyses that are critical to fully evaluate the project and ensure sufficient mitigation is proposed. I am allowing this project to proceed to the filing of an FEIR, which I expect will contain complete and accurate analyses. If the analyses provided in the FEIR are inadequate in describing the project's impacts and addressing other concerns raised in comments, I reserve the ability to require a Supplemental FEIR.

Project Description

As described in the DEIR, the proposed project consists of the construction of a mixed-use residential and commercial center, consisting of a 9,000 square foot (sf) Roots Learning Center (Daycare facility); a 7,000-sf Roots Gymnastic Center; a 5,000-sf sit-down restaurant with a 220-seat capacity; a

3,200-sf bank; a 4,000-sf standalone retail building; two 7,400-sf mixed-use warehouse buildings; a 16,000-sf mixed-use retail/office building with 14 apartments above; and ten mid-rise (3-floor) apartments buildings (nine 13,600-sf buildings and one 18,000-sf building). The project will also construct 478 surface parking spaces; a stormwater management system; and landscaping. The bank and sit-down restaurant are proposed to have priority visibility on the site and will be set back from Northampton Street (Route 10), a roadway controlled by the Massachusetts Department of Transportation (MassDOT), on the western portion of the site. The standalone retail building as well as the Roots Learning Center and Roots Gymnastic Center (collectively the Roots Building) will be positioned directly to the east/northeast of the bank. Seven of the ten residential buildings will be located within the northern portion of the site, across an intermittent stream that bisects the property, with surface parking and other site amenities (including a swimming pool, community garden, and playground) located within a central plaza. The remainder of the project will be located within the southern portion of the site, immediately east of the commercial/retail buildings. Access to the site will be provided by an internal roadway that will utilize a new roundabout intersection with Northampton Street, and will include sidewalks, crosswalks, and speed humps as necessary at critical points. Access to the northern portion of the property will be provided by a new bridge that will span the intermittent stream. The project will also be serviced by existing municipal sewer and water with connections to the Easthampton Main Sewer Interceptor, which runs along the northeastern property boundary, and an existing water main located in Northampton Street. In addition, a minimum 35-foot (ft) vegetative buffer will be provided along the abutting residential properties to the south.

According to the DEIR, the primary goals of the project are to redevelop an underutilized property with infill development and create a variety of affordable and mixed-income housing to advance the City's Housing Production Plan goals.

Project Site

The project site occupies approximately 33 acres of land, consisting of a mix of partially developed land, agricultural fields, wetlands, and forest, with 332 ft of frontage along Northampton Street (Route 10). The majority of the residential units are proposed within the City of Easthampton (the City)'s Residential – Suburban A (R-15) zoning district with the remainder of the project proposed within the Highway Business (HB) zoning district. The site previously supported a variety of uses that have altered approximately 17.1 acres, including approximately 10 acres of the southern portion of the site which operated as a driving range known as Easthampton Golf since at least the 1990s. Easthampton Golf included a paved parking area, a small building supporting a sales office, an artificial turf and natural grass tee box area, and a mowed lawn range. Within the immediate frontage on Northampton Street (Route 10), the site supported a retail ice cream stand and paved parking lot as well as a single-family home and barn. Approximately 6.5 acres within the northern portion of the site was historically used as an agricultural field, though it has not been actively farmed in at least two years. Access to the field is currently provided by a pre-existing, unauthorized wooden bridge that crosses an intermittent stream which bisects the property. The site is bounded by mixed commercial uses to the north and west, vacant land to the east, and residential neighborhoods to the south.

State and local wetland resource areas located within the project area include Bank, Bordering Vegetated Wetlands (BVW), and Riverfront Area (RA). According to the Massachusetts Natural Heritage and Endangered Species Program (NHESP) Atlas (15th Edition), a portion of the project site is located within Estimated and Priority Habitat of Rare Species. A portion of the project site is also located in a Massachusetts Department of Environmental Protection (MassDEP) Approved Zone II Wellhead Protection Area. Additionally, the site formerly contained a structure listed in the Massachusetts Historical Commission's (MHC) Inventory of Historic and Archaeological Assets of the Commonwealth.

The project site is located within an Environmental Justice (EJ) Population characterized by Income within the City of Easthampton. The site is located within one mile of three additional EJ Populations characterized by Income within the City of Easthampton. The site is also located within five miles of 15 additional EJ Populations.[1] As described below, the EENF identified the "Designated Geographic Area" (DGA) for the project as one mile around EJ Populations, included a review of potential impacts and benefits to the EJ Populations within this DGA, and described public involvement efforts undertaken to date.

Changes Since the EENF

Since the filing of the Expanded Environmental Notification Form (EENF), the Proponent has been working to update the project's design in order to address comments and concerns raised by state and local agencies, and the public. The DEIR describes following updates:

- As described below, the traffic study area was expanded to include four additional intersections, as requested by MassDOT, as part of the traffic analysis. No other intersections in proximity to the site are anticipated to result in an increase in peak hour traffic volume of five percent or more, or more than 100 vehicles per hour as a result of project generated trips.
- Utilizing MassDOT's Intersection Control Evaluation (ICE) procedures and in consultation with the City and MassDOT, the Proponent has selected a roundabout as the preferred intersection design alternative, in lieu of a traffic signal, to provide access to the site from Northampton Street.
- In order to accommodate the selected intersection design alternative, the Proponent has purchased the 1 Groveland Street and 94 Northampton Street properties on the northwest side of Northampton Street between Groveland Street and Mountainview Drive. Acquisition of these properties will facilitate construction of the roundabout by providing sufficient area controlled by the Proponent to be incorporated into the Northampton Street right-of-way. Additional changes to site circulation have also resulted in a reduction in total parking spaces from 510 to 478 and a modified entry to and parking at the proposed bank.
- Following a peer review, required as part of the local review and approval process with the Easthampton Conservation Commission, changes were made to the stormwater management system, including redirecting flow from one basin to another and the addition of riprap emergency spillways to several stormwater basins.
- In response to comments provided by the Massachusetts Department of Energy Resources (DOER), the project has eliminated the use of propane water heating.

[1] The EEA EJ Mapper is available at: https://www.mass.gov/info-details/environmental-justice-populations-in-massachusetts

Environmental Impacts and Mitigation

Potential environmental impacts associated with the project include the direct alteration of 21.5 acres of land (including 4.4 acres of new land alteration and tree clearing) and the creation of 11.8 acres of impervious surface (including the construction of 202 housing units with 54 units being affordable units).[2] The project will also construct 478 parking spaces; is expected to generate 4,382 New average daily trips (adt); and is anticipated to result in 68,820 gallons per day (gpd) of water use and wastewater generation.[3]

Measures to avoid, minimize, and mitigate environmental impacts include the use of erosion and sedimentation controls during construction; the construction of a stormwater management system; the installation of landscaping features and vegetative screening throughout the site; the implementation of a comprehensive Transportation Demand Management (TDM) program; and the beneficial reuse of prime farmland soil either as part of the on-site landscaping efforts or to be sold for reuse locally. Additional mitigation measures should be identified in the FEIR.

Jurisdiction and Permitting

This project is subject to MEPA review and a mandatory EIR because it requires Agency Action and meets/exceeds the MEPA thresholds 301 CMR 11.03(1)(a)(2) for the creation of 10 or more acres of impervious area and 301 CMR 11.03(6)(a)(6) for the generation of 3,000 or more New adt on roadways providing access to a single location. It also exceeds the ENF thresholds at 301 CMR 11.03(1)(b)(2) for the creation of 5 or more acres of impervious area; 301 CMR 11.03(1)(b)(4) for the conversion of land in active agricultural use to nonagricultural use, provided the land includes soils classified as prime, state important, or unique by the USDA; 301 CMR 11.03(6)(b)(13) for the generation of 2,000 or more New adt on roadways providing access to a single location; 301 CMR 11.03(6)(b)(14) for the generation of 1,000 or more New adt on roadways providing access to a single location and construction of 150 or more New parking spaces at a single location; and 301 CMR 11.03(6)(b)(15) for the construction of 300 or more New parking spaces at a single location. The project is also required to prepare an EIR pursuant to 301 CMR 11.06(7)(b) because it is located within a DGA of one or more EJ Populations.

The project will require a Vehicular Access Permit from MassDOT. The project will also require a National Pollutant Discharge Elimination System (NPDES) Construction General Permit from the U.S. Environmental Protection Agency (EPA). The project was issued an Order of Conditions (OOC) by the Easthampton Conservation Commission (MassDEP File No. 151-0322) on January 23, 2024, which was not appealed. The project also received Site Plan Approval and Special Permit Approval from the Easthampton Planning Board on November 14, 2023 and Demolition Delay approval from the Easthampton Historical Commission.[4]

[2] This represents an increase of 19 affordable units from the EENF.

[3] This represents a decrease of 22 parking spaces from the EENF.

[4] The Easthampton Demolition Delay Ordinance requires that any proposed demolition of buildings over 50 years old be reviewed and approved by the Easthampton Historical Commission.

Because the Proponent will seek Financial Assistance from one or more Agencies, MEPA jurisdiction is broad in scope and extends to all aspects of the project that are likely, directly or indirectly, to cause Damage to the Environment as defined in MEPA regulations.[5]

Review of the DEIR

The DEIR included a project description, existing and proposed conditions plans, revised estimates of project-related impacts, an updated alternatives analysis, a Traffic Impact Assessment (TIA), a revised GHG analysis, and an identification of measures to avoid, minimize and mitigate environmental impacts. The DEIR provided a response to comments on the EENF and draft Section 61 Findings.

Environmental Justice (EJ) / Public Health

As noted above, the project site is located within an EJ Population characterized by Income within the City of Easthampton. The site is located within one mile of three additional EJ Populations characterized by Income within the City of Easthampton. The site is also located within five miles of 15 additional EJ Populations. No languages were identified as being spoken by 5% or more of Limited English Proficiency ("LEP") residents within one mile of the project site.

The DEIR describes the public involvement plan that the Project has undertaken to engage with EJ Populations. In accordance with the Scope, the Proponent obtained an updated "EJ Reference List" from the MEPA office, which included a list of Community Based Organizations (CBOs) and tribes/indigenous organizations. The Proponent held an evening, in-person public drop-in office hour session for the project on January 31, 2024, at the Emily Williston Memorial Library in Easthampton, which was attended by four members of the public.[6] According to the DEIR, in advance of the meeting, the Proponent published a notice of the office hour session on the library calendar, project website, and by posting a project fact sheet at neighborhood and community gathering locations within the DGA, including information on the date, time, and location of the meeting.[7] The Proponent also sent out notice of the meeting to a digital mailing to a list of stakeholders, including individuals and organizations that commented on the EENF and to the EJ Reference List. In addition, opportunity for public review and comment was provided during the Easthampton Planning Board and Easthampton Conservation Commission hearing process. The DEIR indicates that the Proponent remains committed to supporting and updating the project website as the project progresses.

In accordance with the Scope, the DEIR also provides estimates of the number of construction period truck trips that are anticipated for the project. According to the DEIR, the project will likely result in a maximum of approximately 15 to 20 truck trips per day during peak construction phases; however, this many truck trips will not occur every day during construction. The site, which is located within the middle of an EJ Population, is only accessible via Northampton Street; therefore, there are no access routes to/from the site that would not travel through an EJ Population. It is anticipated that any

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[5] According to the DEIR, the Proponent intends to seek various forms of Financial Assistance, including tax credits and deferred payment loans, from the Executive Office of Housing and Livable Communities and the Massachusetts Housing Finance Agency.

[6] Confirmed via email on March 22, 2024 from Adrienne Dunk (GZA) to Nicholas Moreno (MEPA).

[7] See https://www.gza.com/sierra-vista-commons.

construction related trips would utilize major roadways as they travel between the regional transportation system and the project site, including Northampton Street (Route 10), Holyoke Street (Route 141), Pleasant Street, East Street, and Park Street which would provide access U.S. Interstate I-91. Following construction, diesel truck traffic to the site is anticipated to be minimal and would likely be associated with waste management vehicles (i.e., trash and recycling trucks) and deliveries to the restaurant. Fewer than ten diesel truck trips per week are anticipated following construction.

According to the DEIR, the EENF previously presented a baseline assessment of any existing unfair or inequitable Environmental Burden and related public health consequences impacting EJ Populations in accordance with 301 CMR 11.07(6)(n)1. and the MEPA Interim Protocol for Analysis of EJ Impacts. Based on the data surveyed, there appears to be an indication of an existing "unfair or inequitable" burden impacting the identified EJ Populations. In particular, two census tracts (Census Tract 8223 and Census Tract 8224.02) within the project's DGA the meet the "vulnerable health EJ criteria" for childhood blood lead. The DEIR states that while the EJ Populations within the DGA may exhibit some existing unfair or inequitable environmental burden, the Project is not expected to materially exacerbate such existing conditions. The main sources of potential construction period impacts are emissions from construction equipment, motor vehicles and fugitive dust emissions from disturbed soil surface areas. According to the DEIR, any minor construction adverse effects would be mitigated to the greatest extent practicable through use of construction period BMPs. In addition, as described below, three intersections located within EJ Populations (including Northampton Street/Florence Road/Highland Avenue, Northampton Street/Oneil Street, and Main Street (Route 10)/Union Street) will maintain or improve the level of service experienced by vehicles following project implementation.[8]

Traffic and Transportation

Study Area

As noted above, the DEIR includes a revised TIA of an expanded traffic study area around the project site; the TIA evaluates the project's impacts on intersection operations, safety, and bicycle, pedestrian, and transit modes. The intersections within the study area that have been analyzed and evaluated include:

- Northampton Street (Route 10)/Florence Road/Highland Avenue (signalized)
- Northampton Street (Route 10)/West Street (signalized)[9]
- Northampton Street (Route 10)/Oneil Street (signalized)
- Main Street (Route 10)/Union Street (signalized)
- Northampton Street (Route 10)/Main Street (Route 10)/Pleasant Street/Lyman Avenue (unsignalized)
- Northampton Street (Route 10)/Mountainview Street (unsignalized)

[8] The intersection of Northampton Street/West Street, which is located immediately adjacent to an EJ Population, will also experience an improvement during the evening peak hours.

[9] The intersections of Northampton Street/Florence Road/Highland Avenue and Northampton Street/West Street were previously reviewed in the EENF.

Trip Generation and Distribution

The DEIR states the project is expected to generate 4,382 New unadjusted adt. Base traffic conditions within the study area were developed by conducting turning movement counts (TMCs) and automatic traffic recorder (ATR) counts for both weekday and Saturday volume conditions in September 2021 at the Northampton Street (Route 10)/Florence Road/Highland Avenue intersection and in November 2022 at the Northampton Street (Route 10)/West Street intersection. ATR counts were conducted along Northampton Street (Route 10) just north of the project site in September 2021 and reconducted over a 48-hour period in January 2023. TMCs were conducted at Northampton Street/Pleasant Street and Northampton Street/Main Street in September 2022; at Northampton Street/Oneil Street in October 2023; and at Northampton Street/Mountainview Street in July 2023. In addition, MassDOT seasonal adjustment factors were reviewed; however, all months when data collection occurred, except for January, have lower-than-average vehicle volumes. Therefore, no seasonal adjustments were made to ensure a more conservative analysis.

Future traffic conditions were projected to the year 2030, using a one percent per year growth rate in base traffic conditions and a number of Institute of Transportation Engineers (ITE) Trip Generation Manual (11th Edition) Land Use Codes (LUC) representing the different components of the project, including:

- LUC 565 – Day Care Center
- LUC 220 – Multifamily Housing (Low-Rise)
- LUC 150 – Warehousing
- LUC 822 – Strip Retail Plaza
- LUC 932 – High-Turnover (Sit-Down) Restaurant
- LUC 912 – Drive-in Bank

The DEIR notes that there is no LUC for a Gymnastics Center in the ITE manual; therefore, data collected at the Roots Gymnastics Center located in Westfield, Massachusetts was used to project trip generation rates for the proposed 7,000-sf building. The DEIR also notes that there is one notable development near the project site that would generate traffic on study area roadways. Specifically, the DEIR identifies a project located at 113 Northampton Street consisting of a 2,227-sf coffee shop (Starbucks) with 33 parking spaces, generating 1,800 adt with approximately 198 of those trips occurring during the morning peak hours and 98 occurring during the afternoon peak hours. In addition, the project proposes a connection between the coffee shop parking lot and the bank parking lot. In addition, the DEIR identified a smaller project in the area that is not expected to have a significant impact on traffic. The proposed project at 150 Northampton Street consists of the renovation of an existing hospitality business to include a second floor and upgrades to the parking lot. Due to the scale of the renovation project, any project generated trips are presumed to be included in the background growth rate.

Given the nature of the proposed land use, the project is expected to generate 373 New unadjusted adt during the weekday morning peak hour and 525 New unadjusted adt during the weekday evening peak hour. Trip distribution for the project results in 39% of site traffic traveling to/from the site along Northampton Street to the north of Florence Road/Highland Avenue; 22% of site traffic traveling to/from the site along Florence Road north of Northampton Street; 7% of site traffic traveling to/from the site along West Street west of Northampton Street; 12% of site traffic traveling to/from the site along Pleasant Street east of Northampton Street; 12% of site traffic traveling to/from the site along Main Street; and 8% of site traffic traveling to/from the site along Union Street east of Main Street.

Traffic Operations

Level-of-service (LOS) analyses were conducted within the study area under existing and projected volume conditions to determine the effect that the additional site-generated traffic will have on traffic operations. LOS is represented using letter grades “A” through “F,” with LOS A representing very low delays and free flow conditions and LOS F representing unacceptable conditions for most drivers and conditions in which vehicle demand generally exceeds roadway capacity. According to the DEIR, under current conditions the intersection of Northampton Street/Florence Road/Highland Avenue operates at LOS D during the morning peak hours and at LOS E during the evening peak hours; the intersections of Northampton Street/West Street and Northampton Street/Oneil Street operate at LOS B during the morning peak hours and LOS D during the evening peak hours; and the intersection of Main Street/Union Street operates at LOS B during the morning and evening peak hours.

Under 2030 No-Build conditions, the intersection of Northampton Street/Florence Road/Highland Avenue will decrease from LOS D to LOS E during the morning peak hours and from LOS E to LOS F during the evening peak hours; the intersection of Northampton Street/West Street will decrease from LOS B to LOS C during the morning peak hours and decrease from LOS D to LOS F during the evening peak hours; the intersection of Northampton Street/Oneil Street will decrease from LOS B to LOS C during the morning peak hours and decrease from LOS D to LOS E during the evening peak hours; and the intersection of Main Street/Union Street will decrease from LOS B to LOS C during the morning peak hours and remain at LOS B during the evening peak hours. The DEIR does not provide overall LOS for the intersections of Northampton Street/Main Street/Pleasant Street/Lyman Avenue and Northampton Street/Mountainview Street; however, LOS is anticipated to remain unchanged (when compared to 2023 Existing conditions) during both the morning and evening peak hours for the majority of turning movements except for the westbound Pleasant St right turn, which will decrease from LOS D to LOS E during the morning peak hours and decrease from LOS E to LOS F during the evening peak hours.

Under 2030 Build conditions (when compared to 2030 No-Build conditions), the intersection of Northampton Street/Florence Road/Highland Avenue will improve from LOS E to LOS D during the morning peak hours and from LOS F to LOS E during the evening peak hours; the intersection of Northampton Street/West Street will remain at LOS C during the morning peak hours and improve from LOS F to LOS D during the evening peak hours; the intersection of Northampton Street/Oneil Street remain at LOS C during the morning peak hours and improve from LOS E to LOS D during the evening peak hours; and the intersection of Main Street/Union Street will remain at LOS C during the morning peak hours and at LOS B during the evening peak hours. In addition, LOS is anticipated to remain unchanged for the Northampton Street/Main Street/Pleasant Street/Lyman Avenue and Northampton Street/Mountainview Street intersections during both the morning and evening peak hours for the majority of turning movements except for the westbound Pleasant Street right turn, which will decrease from LOS E to LOS F during the morning peak hours, and the eastbound Mountainview Street left and right turn, which will decrease from LOS D to LOS E during the morning peak hours and decrease from LOS D to LOS F during the evening peak hours. As noted below, the project proposes a number of

TDM measures which have been incorporated into the traffic capacity analysis presented herein. However, a number of turning movements are still anticipated to experience a decline in LOS.

Roadway Improvements

According to the DEIR, there are number of planned improvements to roadway, bicycle, and pedestrian facilities in proximity to the project site. These improvements were incorporated into the TIA when evaluating LOS at the intersections studied. In particular, the DEIR identified the following roadway improvement projects:

- **Main Street Improvement Project (TIP) (Project No. 612258)** - The City is developing a long-term redesign plan for Main Street (Route 10) to improve safety; transit, walking, and bicycling infrastructure; plant street trees; implement green infrastructure; and employ designs to make downtown Easthampton safer and more attractive for users. MassDOT will be implementing Complete Streets throughout Downtown Easthampton. The project scope is the Manhan River Bridge, rotary (including a portion of Pleasant Street) to the intersection of Main Street and Park Street. Construction is currently anticipated to begin in 2026.
- **Northampton Street Complete Streets Project (MassDOT Project No. 608423)** – MassDOT is developing a plan to improve Northampton Street (Route 10) for all users. The roadway will be resurfaced and widened for improved bicycle accommodations, new and reconstructed sidewalks are proposed, and new wheelchair ramps and crosswalks will be installed. Other work includes improving drainage, signage, pavement markings, and other incidentals. Construction is currently anticipated to begin in 2028.
- **Pedestrian Improvement Plan** – MassDOT is implementing a pedestrian improvement plan along Northampton Street at the sight of a previous pedestrian fatality. Two new crosswalks with associated sidewalk improvements, Rectangular Rapid-Flashing Beacons (RRFBs), and new bus stops coordinated with the Pioneer Valley Transit Authority (PVTA) and the City will be installed just north of Groveland Street at 180 Northampton Street. Construction began in early November 2023.

Site Access and Parking

As noted above, the Proponent has selected a roundabout as the preferred intersection design alternative, in lieu of a traffic signal, to provide access to the site from Northampton Street. To facilitate this new connection, the Proponent has acquired the 1 Groveland Street and 94 Northampton Street properties on the northwest side of Northampton Street between Groveland Street and Mountainview Drive. Acquisition of these properties will facilitate construction of the roundabout by providing sufficient area controlled by the Proponent to be incorporated into the Northampton Street right-of-way. Gated emergency access will also be provided from Colonial Avenue (immediately southwest of the project site) to ensure a secondary means of access is available for emergency responders. The DEIR also states that recalibrating signal timings at various intersections along Route 10 would further enhance traffic efficiency. In addition, the project will create 393 parking spaces across the redeveloped site (with 85 parking spaces reserved for future construction for a total of 478 parking spaces), with parking to be provided during each phase of the in accordance with the City's parking ratio requirements. As described below, the Proponent will conduct parking inventory and occupancy surveys of both vehicle and bicycle parking on-site in order to determine in additional parking should be constructed.

Comments provided by MassDOT state that although study areas intersections will remain at an acceptable LOS with the selected intersection design and signal timing changes, the FEIR should include the analysis of a signalized site driveway option to reflect the alternative analysis conducted to support the selection of the preferred intersection alternative. Comments also note that MassDOT would also like to work with Proponent regarding the timing of implementation as well as the funding for the design and construction of the roundabout which should be discussed prior to the submittal of the FEIR. In addition, the proposed mitigation measures and draft Section 61 Findings should be updated to reflect the commitment made regarding the construction of the roundabout.

Multimodal Infrastructure

According to the DEIR, the study area provides adequate pedestrian accommodations, including sidewalks along both sides of each roadway segment and crosswalks with wheelchair ramps at all signalized intersections. However, bicycle lanes are not provided on any roadway segments within the study area. In response to the Scope, pedestrian crosswalk counts and bicycle TMCs were collected during peak hours at study area intersections. Pedestrian activity throughout the study area was found to be very low along with minimal bicycle activity during the morning and afternoon peak hours.[10] In addition, the project area is served by local public transportation options consisting of two bus routes, Route 10 (Nashawannuck Express) and Route R41, provided by the PVTA. The closest Route 10 stop is located at the CVS on Northampton Street, which is located approximately a quarter mile from the project site.[11] The closest Route R41 stop is located at the Old Town House, which is located approximately a half-mile from the project site. The DEIR states that the MassDOT pedestrian improvement plan along Northampton Street will construct a new bus stop to serve the existing PVTA route; therefore, bus stop within the project site may not be warranted. However, the Proponent remains open to further incorporate a bus stop within the project site should the PVTA request one.

Transportation Demand Management (TDM) and Monitoring

As detailed in the DEIR, the Proponent has committed to implementing a program of TDM strategies with a goal of reducing the number of single-occupancy vehicles on the road by 35% due to the implementation of strategies that promote ridesharing and encourage the use of alternative transportation modes. Specific TDM measures include:

- Providing designated parking spaces for carpooling will be conveniently located in the parking area between Buildings 13 and 14, which is centrally located to all commercial buildings. All designated parking spaces will be clearly identified with signage.
- Construction of an eight-ft wide shared use path connecting the project site to Northampton Street. The path will run adjacent to the main roadway through the development, and loop around the eastern residential portion of the development.

[10] Pedestrian and bicycle counts were taken at the same time as the TMC on September 30, 2021; November 29, 2022; and January 4, January 17, and January 18, 2023.

[11] According to the DEIR, Route 10 operates as a Flex/Van service that provides scheduled service to fixed stops but also allows for the bus to travel closer to the passenger starting or ending point.

- Construction of a concrete pad with a bike rack outside of every building. In addition, each residential apartment building will have secure bike storage rooms inside the buildings open to the residents.
- Installation of a Valley Bike Share station along the sidewalk adjacent to Northampton Street.
- Providing on-site recreational services for residents including a pool, community garden, and playground;
- Designating a Transportation Coordinator (proposed to be the Proponent) to provide onsite support and education that encourage the use of alternative modes of travel.
- On-site commercial businesses will provide services to the residents/employees within the development, including a daycare facility, restaurants, a bank, and a retail building.
- Traffic signal retiming at the intersections of Northampton Street/Florence Street/Highland Avenue and Northampton Street/West Street; and
- Installation of four electric vehicle (EV) charging stations with designated parking spaces in front of each residential building (for a total of 40 EV charging stations) and designating 20% of all residential spaces EV-ready spaces.

The Proponent has also committed, as required, to implement a five-year annual Traffic Monitoring Program (TMP) starting six months after occupancy. Specific components of the TMP would include:

- Simultaneous ATR counts including vehicle classification at the site driveway for a continuous seven-day period;
- Weekday morning and evening peak hour TMCs and operations analysis at "mitigated" intersections, including those involving site driveways;
- Perform parking inventory and occupancy counts of both vehicle and bicycle parking on-site;
- Travel survey of employees and patrons at the site (to be administered by the Transportation Coordinator); and
- Transit Ridership counts.

Comments provided by MassDOT state that the proposed TDM measures have the potential to reduce single-occupancy vehicle trips to the project site and acknowledge that the success of this program will be evaluated through the TMP.

Transportation Mitigation

As noted above, although the project has proposed a suite of TDM measures intended to reduce vehicle trips to the project site, in conjunction with anticipated roadway improvements, several intersections are still anticipated to experience a decline in LOS. In particular, the westbound Pleasant Street right turn (during the morning peak hours) and the eastbound Mountainview Street left and right turn (during the evening peak hours) are anticipated to experience an LOS F under the 2030 Build conditions. The FEIR should clarify that these intersections are still showing "F" conditions notwithstanding roadway improvements, and proposed TDM measures and signal changes. If so, the project should be subject to strict monitoring to fully evaluate the assumptions made in the TIA and to determine the effectiveness of the TDM program at all intersections throughout the study area. The FEIR should identify what actions may be taken if expectations regarding future LOS are not met.

Air Quality

In accordance with the Scope, the DEIR included an updated analysis of mesoscale emissions of volatile organic compounds (VOCs), oxides of nitrogen (NO_x), coarse particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$) under four scenarios: 2023 Existing, 2030 No-Build, 2030 Build without TDM (Base Case), and 2030 Build with TDM (Mitigation Case). The DEIR notes that the mesoscale analysis utilized the U.S. EPA MOVES3 Mobile Source Emission Factor Model and complied with the MassDEP Guidelines for Performing Mesoscale Analysis of Indirect Sources. According to the DEIR, emissions within the traffic study area (consisting of 25 existing roadway segments in proximity to the project site and five roadway segments planned as part of the project) under 2023 Existing conditions were modeled to consist of 28.7 kilograms per day (kg/day) of VOCs, 9.17 kg/day of NO_x, 0.20 kg/day of PM_{10}, and 0.18 kg/day of $PM_{2.5}$. Under 2030 No-Build conditions, emissions were modeled to consist of 20.72 kg/day of VOCs, 3.30 kg/day of NO_x, 0.124 kg/day of PM_{10}, and 0.111 kg/day of $PM_{2.5}$. Under 2030 Base Case conditions, emissions were modeled to consist of 25.61 kg/day of VOCs (4.89 kg/day increase from the 2030 No-Build condition), 3.64 kg/day of NO_x (0.34 kg/day increase from the 2030 No-Build condition), 0.137 kg/day of PM_{10} (0.013 kg/day increase from the 2030 No-Build condition), and 0.123 kg/day of $PM_{2.5}$ (0.012 kg/day increase from the 2030 No-Build condition). Comparatively, under 2030 Mitigation Case conditions, which consist of the TDM measures detailed above that the Proponent has committed to implementing, emissions were modeled to consist of 24.97 kg/day of VOCs (4.25 kg/day increase from the 2030 No-Build condition), 3.55 kg/day of NO_x (0.25 kg/day increase from the 2030 No-Build condition), 0.133 kg/day of PM_{10} (0.009 kg/day increase from the 2030 No-Build condition), and 0.120 kg/day of $PM_{2.5}$ (0.009 kg/day increase from the 2030 No-Build condition).[12] These numbers show an increase from No-Build to Build with TDM conditions of approximately 20.51% for VOCs, 7.58% for NO_x, 7.26% for PM_{10}, and 8.11% for $PM_{2.5}$ (increase of 1.71, 0.101, 0.004, and 0.004 tons per year, respectively). However, the analysis indicates that there will not be an increase over one ton per year from No-Build to Build with TDM conditions at any single intersection within the study area for the pollutants evaluated. Therefore, the DEIR states, that additional air quality mitigation, beyond the TDM measures the Proponent has committed to, is not necessary. I note, however, that the mesoscale analysis is not intended to isolate emissions increases at a single location, but rather to estimate overall impacts of the project by calculating volumetric increases in emissions over the traffic study area (which could be viewed as the maximum impact area of the project). Given the project's location within an EJ Population, the FEIR should clarify the geographic radius covered by the traffic study area, further explain what accounts for the >1 tpy increase in VOCs notwithstanding mitigation measures, and explore additional mitigation measures that could be employed to further reduce VOCs and other air emissions associated with new traffic. For instance, the FEIR should indicate whether additional TDM measures could be taken to incentivize multi-modal forms of transportation over single occupancy vehicle trips.

Land Alteration, Impervious Surfaces, and Agricultural Soils

In accordance with the Scope, the DEIR characterizes and quantifies the new land alteration including the type of vegetation that will be cleared. According to the DEIR, the site current consists of

[12] When converted to tons per year (tpy), the 2030 Build with TDM (Mitigation Case) consists of 10.05 tpy of VOCs (1.71 tpy increase from the 2030 No-Build condition), 1.43 tpy of NO_x (0.101 tpy increase from the 2030 No-Build condition), 0.054 tpy of PM_{10} (0.004 tpy increase from the 2030 No-Build condition), and 0.048 tpy of $PM_{2.5}$ (0.004 tpy increase from the 2030 No-Build condition).

approximately 0.44 acres impervious cover consisting of the paved area and building located along its Northampton Street frontage and approximately 19.3 acres of previously altered land consisting of turf lawn used for the prior driving range business and agricultural fields. Neither the turf lawn area nor the agricultural fields have been used for their prior purposes since 2022 and are currently a successional old field habitat. Approximately 13.7 acres of the site also consist of mixed hardwood forest. As noted above, two additional properties on the northwest side of Northampton Street were purchased in 2023 and consist of approximately 0.21 acres of impervious cover and 0.69 acres of previously altered but pervious cover comprised of a lawn with low-density trees throughout.

According to the DEIR, the project will develop a total of 21.5 acres of the project site and approximately 0.2-acres of the additional two properties on Northampton Street. Within the previously disturbed portions of the site (including the impervious areas and successional old field habitat), 17.1 acres will be developed into 3.17 acres of building; 7.29 acres of paved surfaces including sidewalks, driveways, and parking; and 6.64 acres of vegetated areas including turf grass, landscape plantings, and stormwater basins. Approximately 4.4 acres of the undeveloped mixed hardwood forested area will be developed into 0.94 acres of building; 0.65 acres of paved surfaces including sidewalks, driveways, and parking; and 2.81 acres of vegetated areas including turf grass, landscape plantings, and stormwater basins. The project will also convert most of 94 Northampton Street to the proposed roundabout and revised Mountainview Street intersection, whereas most of 1 Groveland Street will remain as lawn. Between the two properties, the project will convert approximately 0.12 acres of existing pavement to intersection and approximately 0.06 acres of lawn to intersection.

The DEIR also provides a comprehensive evaluation of all measures taken to reduce the amount of land alteration and conversion of impervious areas to pervious materials, including reductions in building program, roadway widths and parking areas; use of pervious pavement for roadways and/or sidewalks; land banking of parking until warranted by demand; and supplemental landscaping or tree planting to mitigate impacts associated with clearing. Specific design measures detailed in the DEIR include:

- avoiding impacts to wetland resources including the 200-feet Riverfront Area to the Manhan River;
- preserving approximately 11.5 acres (35% of the site) as natural open space, including 9.3 acres of forested land;
- minimizing alteration of steep slopes by limiting the work to only the installation of stormwater outfalls in these areas;
- incorporating Low Impact Development (LID) measures;
- reducing internal drive widths to reduce overall pavement areas;
- reserving 85 parking spaces which will be maintained as vegetated space until or unless necessary to satisfy future parking demands;
- incorporating rain gardens at each of the residential buildings to capture roof runoff and improve water quality and promote groundwater recharge;
- implementing a landscape plan which includes 203 trees, 243 shrubs, and the use of New England Conservation and Wildlife Seed; and
- reuse or sale of existing topsoil onsite.

As detailed below, the project will be implemented in phases. Tree removal has been designed to be phased such that only trees within the current work area will be removed. This is most evident in the rear portion of the site where Phase 1 will include only the tree clearing necessary to implement the stormwater features. During Phase 2, additional clearing will be necessary to accommodate the temporary fire access road; however, the final clearing limits will not be reached until Phase 3 when the remaining four rear apartment buildings will be constructed. The developed portions of the site will also be regraded to create a gradual, consistent, and stable slope to support the roadway, sidewalks, buildings, and stormwater system. Overall, site grading will alter the site elevation up to two ft and will generally slope from the northwest to the southeast. Grading will also be phased and will be limited to only those areas where work is ongoing. In order to accommodate construction of the buildings, approximately 12,000 cubic yards (cy) of soil will be excavated and removed from the site. Topsoil will be sold locally, and subsoils will be disposed of in accordance with local, state, and federal regulations. The FEIR should evaluate the project's consistency with the Massachusetts Department of Agricultural Resource (MDAR) Agricultural Land Mitigation Policy to ensure adequate mitigation is proposed for the loss of prime farmland, which is a valuable resource for the Commonwealth.

Wetlands and Stormwater

As noted above, wetland resource areas are located on and adjacent to the project site. According to the DEIR, the project only proposes alteration of the 100-ft buffer zone to Bank and BVW. Therefore, there are no applicable resource-specific performance standards for evaluation of impacts. However, the Wetlands Regulations allow for the review of proposed alteration of the buffer zone and how it may alter the capacity of the adjacent resources to protect the interests of the WPA. The DEIR states that the project will construct a new stream crossing to gain access to the northeastern portion of the project site and will subsequently remove the existing, illicit wooden stream crossing. Prior to constructing the bridge, erosion and sedimentation controls will be installed along both sides of the intermittent stream. The upland area will be excavated as necessary to install the concrete footings and foundation walls, which will include wingwalls extending landward from the edge of the Bank. Once the foundation walls are in place, the bridge decking will be installed to fully span the intermittent stream. Water and sanitary sewer lines will be run under the roadway within the bridge structure, thus avoiding direct impacts to wetland resource areas. Once the new stream crossing has been completed, the existing non-compliant stream crossing will be removed. As stated above, the Easthampton Conservation Commission reviewed the project for its consistency with the Wetlands Protection Act (WPA), the Wetland Regulations (310 CMR 10.00) and associated performance standards including the Massachusetts Stormwater Management Standards (SMS), Stream Crossing Design Standards, and local ordinances. An OOC (MassDEP File No. 151-0322) for the project was issued on January 23, 2024 and was not appealed.

In accordance with the Scope, the DEIR provided an updated Stormwater Report that includes details about the design and function of the proposed stormwater system. The stormwater system will be comprised of deep-sump, hooded catch basins, oil and grit separators/hydrodynamic separator units to remove total suspended solids (TSS), detention basins with sediment forebays, and aboveground infiltration basins. Stormwater will be captured and treated by detention and/or infiltration basins located throughout the property. The basin locations have been designed to maintain existing hydraulic patterns and flow discharge points. Runoff from the roadways and parking lots will be captured via catch basins and pipe networks, treated via water quality structures and will then be discharged to the nearest basin. Building roof runoff will be collected via downspouts and piped to the stormwater basins. Outflow from the basins will be regulated by individual outlet control structures in each basin with flow piped toward the on-site intermittent stream and discharged via a series of level spreaders. As noted previously, the Stormwater Report was subject to a peer review which has resulted in two primary changes to the design. In particular, a portion of the stormwater has been redirected from one basin to another, thereby reducing the size of the first basin. Riprap has also been incorporated into the emergency spillways in four of the basins should the basins overflow. In addition, a stormwater Operation and Maintenance Plan has been developed and will be implemented following construction to ensure the stormwater management system is properly maintained.

According to the DEIR, low impact development (LID) and environmentally sensitive site design (ESSD) measures were considered and are proposed as part of the project to manage stormwater. These measures primarily include minimizing impervious surfaces and maintaining the site's existing hydrology. Additional LID techniques include avoiding direct impacts to on-site and off-site wetland resource areas; creating a site design that maintains natural drainage patterns and minimizes the creation or disturbance of steep slopes; minimizing disturbance to existing vegetation (9.3 acres of forested land will not be altered as part of the project); and the construction of two open air infiltration basins and 13 rain gardens to promote groundwater recharge. The stormwater management system does not include subsurface infiltration structures and therefore the Underground Injection Control (UIC) registration is not applicable. Based on soil boring and test pit data collected, the proposed infiltration and detention basin bottom elevations are above groundwater elevations, and the infiltration basin bottoms are at least three ft above groundwater.[13] The DEIR states that the project does not meet the definition of a land use with a higher potential pollutant load (LUHPPL) as the parking lots have been designed to be separate and no parking lot and associated stormwater treatment train will exceed 1,000 vehicle trips per day (the identified threshold for parking lots with high-intensity-uses). However, the proposed stormwater management system has been designed to remove greater than 90% of the average annual post-construction load of total suspended solids (TSS) and 60% of total phosphorus. A hydrodynamic separator will remove 85% of the initial TSS prior to discharge into a detention or infiltration basins with a sediment forebay which will remove an additional 50 or 80% of TSS respectively resulting in at least 90% TSS removal overall. In addition, the stormwater management system includes source control, pollution prevention measures, and structural stormwater BMPs to manage water quality and provide groundwater infiltration and recharge and will therefore not have any impact on the MassDEP Approved Zone II.

Water and Wastewater

According to the DEIR, the project will be connected to the public water supply via the water main located within Northampton Street and once fully constructed, will use approximately 68,820 gpd. Public water is supplied from the Barnes Aquifer system and the City m has a permitted withdrawal limit of 3.8 million gpd and currently uses an average of approximately 42% of the permitted capacity. The DEIR states that the City has proposed to improve the water supply system along Northampton Street independent of the project due to the water main being undersized and aged. Following review by a Fire Protection Engineer, commissioned by the Proponent, the existing water supply is sufficient for the fire protection sprinkler system for the first two phases of the project. In addition, it was

[13] The DEIR states that the Easthampton Stormwater Ordinance requires a minimum of three ft separation between infiltration basins and groundwater, as compared to the two ft required by the SMS.

recommended that an 8" underground water main loop be run through the project site to connect to the municipal water supply in two locations, which has been incorporated into the project design. Phases 3 and 4 will not be constructed until the City has upgraded the Northampton Street water supply line.

The DEIR states that the project will be connected to the public sanity sewer system via the East Hampton Main Sewer Interceptor, which runs along the northeastern property boundary. Wastewater is treated at the Easthampton Wastewater Treatment Plant which has a 3.8 million gpd capacity and a current average daily flow of 2.5 million gpd (approximately 66% of the permitted capacity). Once fully constructed, the project will generate approximately 68,820 gpd of wastewater. Comments provided by MassDEP state review of the project indicates that the project may include the ownership and operation of a private (not owned by a municipality) treatment works, consisting of a common sewer system. I refer the Proponent to comments provided by MassDEP, incorporated by reference herein, which details specific regulatory requirements for the owners/operators of private treatment works.

Climate Change

Adaptation and Resiliency

In accordance with the Scope, the Proponent performed an analysis to evaluate the proposed development hydrology and hydraulics (H&H) under future climate conditions associated with the 24-hour 25-year storm (4% annual chance) and the 24-hour 50-year storm (2% annual chance) in 2070. According to the DEIR, the Proponent independently calculated the projected 2070 planning horizon 24-hour 10-year storm depth (design storm previously evaluated in the EENF) to be 5.96 inches, using methodologies recommended by the MA Resilience Design Tool.[14] Nonetheless, the MA Resilience Design Tool output report actually attached to the EENF projected the 24-hour precipitation depth associated with a 2070 10-year storm event to be 7.1 inches. Subsequently, precipitation depths associated with the 25- and 50-year storm events in 2070 were calculated to be 7.48 and 8.52 inches, respectively. According to the results of the analysis, it appears that the stormwater system, which is designed to convey and provide recharge for the current 100-year storm event (8.07"), would be resilient to the future (2070) 25-year storm event, but not the 2070 50-year storm, and is anticipated to decrease runoff flow rates and volumes compared to existing conditions under the 25-year climate scenario evaluated.[15]

The Proponent also performed a "Tier 2" analysis to evaluate the proposed development under future (2070) extreme heat conditions. Information available through the Resilient MA Climate Change Projections Dashboard was utilized as baseline values. The DEIR summarizes the results of the analysis in the following table:

[14] The DEIR states that the MA Resilience Design Tool and Resilient MA Climate Change Projections Dashboard were not used to generate projected precipitation depths as part of the analysis. The MA Resilience Design Tool output report now generates values more associated with what was formerly known as the "Tier 3" analysis.

[15] Based on the information provided in the DEIR, it does not appear that the stormwater system is resilient during a 50-year storm event as of 2070 as is stated.

Design Criteria	Baseline	50th Percentile, 2070s	Change
Annual average temperature (F)	46.98	54.63	+7.65
Annual summer temperature (F)	67.93	76.84	+8.91
Annual winter temperature (F)	25.01	32.66	+7.65
Heat Index (F)		185.4[2]	
Days Above 90 F	6.41	57.54	+51.13
Days Above 95 F	0.46	25	+24.54
Days Below 32 F	158.63	116.78	-41.85
Number of Heat Waves per Year		6.79	
Average Heat Wave Duration (days)		6.92	
Cooling Degree Days	459.27	1436.05	+976.78
Heating Degree Days	7038.04	5227.28	-1810.76

According to the DEIR, as the project involves tree removal and increases in paved areas, it is anticipated that impacts resulting from extreme heat (due to changes in future climate conditions and from the heat island effect) may generally increase over the lifetime of the development.[16] The Proponent has incorporated several measures into the design to limit the impacts of climate change and potential heat island effects on the surrounding area. Measures taken to avoid or minimize heat impacts include:

- Limiting overall tree removal on-site, specifically around wetlands and waterways to minimize heating and/or desiccating these resources;
- Configuring stormwater basins between buildings or along tree lines to provide at least partial shading of the basins to limit water warming prior to release or infiltration;
- Designing the parking areas to be several separate parking areas to support additional shading of paved surfaces;
- Using high albedo roof materials including white roofs on all buildings except for the Roots Building and the contractor storage units which will have light grey metal roofs;
- Locating stormwater basins and other site development features outside the RA;
- Designating at least 85 parking spaces to be built only if demand requires it. Prior to site demand for these spaces, the areas will be maintained with vegetative cover to limit heat absorption;
- Planting and maintaining a landscape plan with at least 203 shade trees and 243 shrubs around buildings, and along roadways and parking areas; and
- Creating a recreational area for residents that includes a swimming pool.

Greenhouse Gas (GHG) Emissions

This project is subject to review under the May 5, 2010, Revised MEPA Greenhouse Gas Emissions Policy and Protocol (MEPA GHG Policy), which requires Proponents to quantify carbon dioxide (CO_2) emissions and identify measures to avoid, minimize or mitigate such emissions. In accordance with the Scope, the DEIR included a revised GHG emissions analysis for both the project's stationary sources and transportation-related emissions (mobile sources).

Stationary Sources

[16] Heat islands are developed areas that have increased temperatures compared to undeveloped areas because buildings and pavement can absorb more heat during the day than natural landscapes. These structures then radiate that heat out at night, maintaining higher than average temperatures.

As noted above, the project proposes a total of 60,000 sf of commercial space (consisting of a restaurant, bank, retail, a gymnastics studio, day care center, and warehouse/storage units) and 350,000 sf of residential space (consisting of 202 residential units). The mixed-use retail building includes one floor for retail activity and two floors for residential units. The retail activity was evaluated in the commercial building analysis while the residential units were evaluated in the analysis of residential space.

Commercial Buildings

The EENF provides estimates of stationary source emissions for the Base Case and Mitigation Case, based on the selected mitigation measures, for each of the commercial building components of the project. The stationary Base Case represents the International Energy Conservation Code (IECC) 2021 Edition with Massachusetts Stretch Energy Code Amendments (the Stretch Code), effective July 1, 2023. GHG emissions from stationary sources are measured in tons of CO_2 equivalents per year (tpy). Emission estimates were calculated using the eQUEST energy design software and the latest CO_2 emission rate for grid electricity. According to the DEIR, as each planned commercial building is not larger than 20,000-sf, the project proposes the use of the Prescriptive Compliance pathway detailed in the Stretch Code. Therefore, the Mitigation Case includes compliance with the 2023 Stretch Code and the Prescriptive Compliance pathway, as well as additional energy mitigation measures planned by the Proponent, as described below, with a primary focus on reducing thermal energy demand and efficient electrification. The Base Case and Mitigation Case were combined to provide a cumulative estimate of emissions for the project as a whole. The DEIR asserts that the Base Case would result in 279.8 tons of CO_2 per year (CO_2/year) and the Mitigation Case would result in 241.6 tons of CO_2/year, a reduction of 13.6% from the Base Case. To achieve these emission reductions, the project, as proposed, will utilize:

- energy efficient windows (including triple panes and a U-value[17] of 0.25)
- energy efficient building envelopes (including Low-Thermal Energy Demand Intensity (TEDI), roof insulation with a U-value of 0.024, and wall insulation with a U-vale of 0.071 or lower);
- thermally broken window and wall components will be used to eliminate thermal bridges;
- low air infiltration to ensure low heating and cooling TEDI;
- higher-efficiency heating, ventilation, and air conditioning (HVAC) systems (utilizing air-source heat pumps (ASHP) for all space heating and cooling;
- Energy Recovery Ventilation (ERV) units for all buildings (70% heat recovery), except for the warehouse buildings;
- electric hot water heaters;
- Energy STAR equipment and appliances (for cooking and refrigeration);
- energy efficient interior and exterior lighting; and
- low-flow fixtures and plumbing.

The project also proposes to install roof-top Photovoltaic (PV) arrays on the Roots Building and stand-alone retail buildings, which would accommodate 20,000 sf of PV arrays across the four buildings. In addition, the Proponent has committed to making 25% of commercial parking spaces (except for the

[17] Thermal transmittance, also known as U-value, is the rate of transfer of heat through a material or structure. Lower U-values equate to higher levels of insulation.

warehouse buildings) EV-ready spaces, for a total of 48 EV-ready spaces.

Comments provided by DOER note that the warehouse buildings are proposed without energy recovery ventilation. Comments state that the Strech Code generally mandates energy recovery ventilation for most applications and is recommended in this instance. Comments further recommend reviewing the Stretch Code requirements and committing to energy recovery ventilation for the warehouse buildings even in the unusual event it is not required by code, as a mitigation measure.

Residential Buildings

According to the DEIR, the project includes nine three-story apartment buildings with 18 units, one three-story apartment building with 26 units, and one three-story mixed-use building where the first floor includes retail and the upper two floors include 14 apartments. The residential units will two options, a two-bedroom apartment (1,184 sf) or a three-bedroom apartment (1,816 sf). Generally, the three-bedroom apartments will be situated on the corners of each floor with the smaller two-bedroom apartments located in the middle of the floor. The DEIR provides estimates of stationary source emissions for the Base Case and Mitigation Case for the residential buildings based on a third-floor three-bedroom apartment with exterior walls on the north and west sides, in order to yield a conservative result. The project proposes to achieve a HERS Index score of 42; however, it is anticipated that units with shared side walls (middle location) and corner units without exterior walls on the north and west sides of each building will achieve lower HERS scores. Although it is unnecessary to take other mitigating actions if compliance with the 2023 Stretch Code and achievement of a HERS Index score of 45 has been demonstrated, the Proponent has committed to additional mitigation actions that predominantly focus on reducing thermal energy demand and efficient electrification. Specifically, the project proposes:

- energy efficient windows and building envelopes;
- higher-efficiency heating, ventilation, and air conditioning (HVAC) systems (utilizing air-source heat pumps (ASHP) for all space heating and cooling;
- Energy Recovery Ventilation (ERV) units for all buildings (70% effectiveness);
- electric ASHP water heaters;
- Energy STAR appliances (refrigerator, washer, dryer, dishwasher and range);
- energy efficient interior and exterior lighting; and
- low-flow fixtures and plumbing;

The project also proposes to have 7,500 sf of residential roof space be solar-ready (greater than 40% required by the Stretch Code); 20% of all residential parking spaces to be EV-ready (for a total of 58 EV-ready spaces); and install 4 EV charging stations per residential building (for a total of 40 EV charging stations). In addition, a Passivehouse feasibility study/gap analysis was performed in January 2024, the results of which are currently being reviewed by the Proponent.

Comments provided by DOER state that no information was provided in the DEIR for the 14-units above the retail/office building and it is recommended that these units be Passivehouse with air source heat pump space heating and electric resistance water heating. Comments also state that in the feasibility study/gap analysis provided, rather than compare Passivehouse to what is being proposed

(HERS 45, all electric), the gap analysis compared Passivehouse to the IECC 2021 prescriptive code.[18] Because the IECC 2021 prescriptive code is a much lower standard than HERS 45, the gap in this analysis is artificially enlarged, thereby making Passivehouse appear more expensive. In addition, the gap analysis did not include a professionally-estimated cost evaluation of first costs for the proposed case and first costs for the Passivehouse case. The Passivehouse feasibility study/gap analysis should be revised in accordance with the Scope.

Mobile Sources

The DEIR provides estimates of GHG emissions for the 2023 Existing, 2030 No-Build, 2030 Build without TDM (Base Case), and 2030 Build with TDM (Mitigation Case). GHG emissions from mobile sources are measured in tons of CO_2 equivalents per year (tpy). Emission estimates were calculated based on the roadway segments in the traffic study area; the length of each road segment; the vehicle approach (free-flow or queue); average speed; and traffic volumes for each segment utilizing the EPA MOVES3 model project scale option. Under 2023 Existing conditions, emissions were modeled to consist of 5,256 tpy. The 2030 No-Build would result in 5,056 tpy due to an anticipated one percent per year annual growth rate in traffic volumes. The Base Case would result in an increase of 515 tpy (5,571 tpy) over the No-Build scenario due to increased vehicle traffic resulting from project-generated vehicle trips. The Mitigation Case would increase emissions over the No-Build by 376 tpy (5,432 tpy), but represents a 139 tpy (or 2.5%) reduction as compared to the Base (Build) Case. As described above, the DEIR proposes a number of TDM measures to reduce the use of single-occupancy vehicles, promote ridesharing, and encourage the use of alternative transportation modes.

Construction Period

According to the DEIR, project construction will be constructed in four phases in order to manage overall land disturbance, construction disruptions to traffic and noise, and to allow for appropriate erosion and sediment control. In response to the Scope, the DEIR identified all components of the project to be completed in each phase, and detailed initial work to be performed site-wide in advance of future phases:

- **Phase 1** – This phase will include initial site preparation consisting of the construction of the temporary construction entrances extending into the site from Northampton Street and Colonial Avenue; implementation of erosion and sedimentation controls (silt fence with straw wattle) along the southern side of the central wetland and along both sides of the stream crossing; and construction of temporary settling basins to management stormwater during construction. The existing, stream crossing will be used to provide initial access to the rear portion of the site. Footers for the new stream crossing will be installed from either side of the stream to avoid direct wetland impacts and the new bridge span and utility lines will be installed above the footers. Site wide tree and vegetation clearing will also commence to facilitate the construction of the proposed stormwater basins. Subsurface drainage features will also be installed and protected by silt sack inlet protection and temporary swales will be graded to divert runoff around basins as necessary during construction. Underground utilities will be installed across the southern portion of the site, across the stream crossing, and into the northern portion of the site.

[18] Comments state that the IECC 2021 prescriptive is not code minimum in Massachusetts. Minimum code for these buildings would be HERS 45, which is what is being proposed.

The internal roadway and sidewalks from Northampton Street across the stream crossing will also be installed. In addition, this phase will include the construction of the Roots Building with 76 parking spaces.

- **Phase 2** – This phase will include construction of three apartment buildings with 90 parking spaces in the northern portion of the site. Additional erosion and sedimentation controls will be installed around the work area and two temporary settling basins will be constructed. Tree removal east of the temporary fire access road will commence in advance of site grading to support the construction of these buildings, parking, and the temporary fire access road. Water and sanitary sewer utilities will be extended under the roadway to service the three proposed buildings and additional stormwater management infrastructure will be installed.
- **Phase 3** – This phase will include construction of the remaining four apartment buildings with 107 parking spaces in the northern portion of the site. East of the apartment buildings, additional tree removal will be necessary to achieve the final clearing limits and facilitate final grading. The temporary fire access road will be removed, and a permanent roadway will be installed, along with permanent sidewalks to connect the buildings constructed in both Phase 2 and Phase 3. The playground, community garden, pool, and pool house will be constructed within the access road island to provide community services to the apartment buildings. This phase also includes the construction of the bank with 36 parking spaces as well as the standalone retail building with eight parking spaces. A sidewalk and crosswalk will be installed to provide safe pedestrian access to the retail space from both Northampton Street and the Roots Building. In addition, vehicle access between the bank the existing Starbucks, located adjacent to the project site, will be installed.
- **Phase 4** – This phase will include construction of the sit-down restaurant pad with 41parking spaces; the two warehouse buildings with 11 parking spaces; the mixed-use commercial building with 28 parking spaces; and the remaining three apartment buildings with 81 parking spaces. This phase will also construct sidewalks and crosswalks to connect each building and provide safe pedestrian and bicycle access around the development.

The DEIR states that all construction activities will be managed in accordance with applicable MassDEP regulations regarding Air Pollution Control (310 CMR 7.01, 7.09-7.10), and Solid Waste Facilities (310 CMR 16.00 and 310 CMR 19.00, including the waste ban provision at 310 CMR 19.017), and other applicable regulations. As noted above, solid waste generated during Project construction will be reused and recycled as appropriate. Any asphalt, brick, or concrete (ABC) rubble associated with the Project must be handled in accordance with the MassDEP Solid Waste regulations and the reuse of any materials requires the submittal of a MassDEP BWP SW41 – Beneficial Use Determination. Any remaining waste construction materials will be disposed of in accordance with state and local regulations. The Project will comply with the Solid Waste Regulations, including 310 CMR 19.017: Waste Ban, which prohibit the disposal, transfer for disposal, or contracting for disposal of certain hazardous, recyclable, or compostable items. In addition, tree removal related to land clearing, and handling/processing of clean wood, will be handled according to state regulations, including 310 CMR 16.00 and 310 CMR 19.00. In addition, the Proponent has committed to filing a Commencement of Construction Notice with MEPA pursuant to 301 CMR 11.08(10).

SCOPE

General

The FEIR should follow Section 11.07 of the MEPA regulations for outline and content, and include the information and analyses identified in this Scope. It should clearly demonstrate that the Proponent has sought to avoid, minimize, and mitigate Damage to the Environment to the maximum extent feasible.

Project Description and Permitting

The FEIR should describe any changes to the Project since the filing of the DEIR. The FEIR should identify, describe, and assess the environmental impacts of any changes to the Project that have occurred between the preparation of the DEIR and FEIR. The FEIR should also include an updated list of required Permits, Financial Assistance, and other state, local and federal approvals and provide an update on the status of each of these pending actions.

The FEIR should include site plans for existing and post-development conditions. Plans should clearly identify all project components (e.g., structures, roadways, etc.); impervious areas; surface elevations; wetland resource areas; rare species habitat; and stormwater and utility infrastructure (including EV infrastructure). These plans should also identify roadway infrastructure; bicycle and pedestrian infrastructure; the type and location of potential vehicle and bicycle parking (including EV parking); and adjacent land uses.

The information and analyses identified in this Scope should be addressed within the main body of the FEIR and not in appendices. In general, appendices should be used only to provide raw data, such as drainage calculations and TSS removal rates, that are otherwise adequately summarized with text, tables, and figures within the main body of the FEIR. Information provided in appendices should be indexed with page numbers and separated by tabs, or, if provided in electronic format, include links to individual sections. Any references in the FEIR to materials provided in an appendix should include specific page numbers to facilitate review.

Environmental Justice (EJ) / Public Health

The FEIR, or a summary thereof, should be distributed to the EJ Reference List that was used to provide notice of the DEIR. The Proponent should obtain a revised EJ Reference List from the MEPA Office to ensure that contact information is updated. The same efforts to notice the project should be made prior to the submission of the FEIR. The FEIR should provide an update on any outreach conducted since the filing of the DEIR, and identify any changes made to the Project design in response to this outreach.

The FEIR should clarify the geographic radius covered by the traffic study area, further explain what accounts for the >1 tpy increase in VOCs notwithstanding mitigation measures, and explore additional mitigation measures that could be employed to further reduce VOCs and other air emissions associated with new traffic. For instance, the FEIR should indicate whether additional TDM measures could be taken to incentivize multi-modal forms of transportation over single occupancy vehicle trips.

Land Alteration

The FEIR should include a narrative describing the project's consistency with the MDAR Agricultural Land Mitigation Policy. The FEIR should identify all measures that will be considered to mitigate impacts to prime farmland soils, including contributions to agricultural land conservation programs. In addition, the Proponent should explore granting a Conservation Restriction in order to permanently protect the portion of the project site that will be preserved as open space.

Traffic and Transportation

The FEIR should include a revised TIA that also evaluates a signalized site driveway option to reflect the alternative analysis conducted to support the selection of the roundabout intersection alternative. Prior to the filing of the FEIR, the Proponent should consult with MassDOT regarding the timing of implementation as well as the funding for the design and construction of the roundabout. The FEIR should provide an update on any such coordination, discuss timing and funding of the proposed improvements, and identify any changes made to the project design or mitigation commitments in response to this consultation. In addition, the proposed mitigation measures and draft Section 61 Findings should be updated to reflect the commitment made regarding the construction of the roundabout.

The FEIR should clarify which intersections are still showing LOS F conditions notwithstanding roadway improvements, and proposed TDM measures and signal changes. The FEIR should further clarify the TMP and what measures will be taken should the if the proposed TDM measures do not prove successful.

Wastewater

As noted above, the project may include ownership and operation of a private treatment works, consisting of a common sewer system. Prior to filing the FEIR, the Proponent should consult with MassDEP to determine whether the project proposes a private treatment works, as defined at 314 CMR 12.00. The FEIR should provide an update on any such coordination, include a determination as to whether the project will construct a treatment works, and identify any changes made to the project design or mitigation commitments in response to this consultation. To the extent that the project will construct a treatment works, the FEIR should include a narrative identifying any additional permitting or regulatory requirements, including the establishment of a preventive maintenance program to ensure the efficient operation of the facility and equipment. The FEIR should demonstrate the project's consistency with the applicable regulations at 314 CMR 12.00 and update the proposed mitigation measures accordingly.

Climate Change

Adaptation and Resiliency

The FEIR should re-evaluate the efficacy of the stormwater management system during a 50-year storm event as of 2070. Information available through the Resilient MA Climate Change Projections Dashboard could be used as a resource.[19] To the extent the project is unable to accommodate this future year storm scenario, the FEIR should discuss whether the project has engaged in flexible adaptative strategies, and whether current designs allow for future upgrades to be made to adapt to climate change.

Greenhouse Gas Emissions (GHG)

The FEIR should include a discussion of Strech Code requirements as it relates to requiring energy recovery ventilation in warehouse buildings. In the event that energy recovery ventilation is not required by the Strech Code, the Proponent should commit to incorporating it as a mitigation measure or provide an explanation as to why it is not feasible. The FEIR should include a revised Passivehouse gap analysis that compares what is being proposed to Passivehouse. The gap analysis should include a life cycle evaluation and a professionally-estimated cost evaluation of first costs for the proposed case and first costs for the Passivehouse case, with the later netted against a $0.6M incentive. The gap analysis should also estimate the peak electric demand (summer and winter) associated with the proposed HERS 45 case and the peak electric demand (summer and winter) associated with Passivehouse. The FEIR should also clarify what is proposed for the residential units above the retail/office buildings and incorporate that information into the gap analysis.

Mitigation and Draft Section 61 Findings

The FEIR should include a separate chapter summarizing all proposed mitigation measures including construction-period measures. This chapter should also include a comprehensive list of all commitments made by the Proponent to avoid, minimize, and mitigate the environmental and related public health impacts of the Project, and should include a separate section outlining mitigation commitments relative to EJ populations. The filing should contain clear commitments to implement these mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and contain a schedule for implementation. The list of commitments should be provided in a tabular format organized by subject matter (traffic, water/wastewater, GHG, environmental justice, etc.) and identify the Agency Action or Permit associated with each category of impact. Draft Section 61 Findings should be separately included for each Agency Action to be taken on the Project. The filing should clearly indicate which mitigation measures will be constructed or implemented based upon Project phasing to ensure that adequate measures are in place to mitigate impacts associated with each development phase.

To ensure that all GHG emissions reduction measures adopted by the Proponent as the Preferred Alternative are actually constructed or performed by the Proponent, the Proponent must provide a self-certification to the MEPA Office indicating that all of the required mitigation measures, or their

[19] Available at https://resilientma-mapcenter-mass-eoeea.hub.arcgis.com/.

equivalent, have been completed. The commitment to provide this self-certification in the manner outlined above shall be incorporated into the draft Section 61 Findings included in the FEIR.

Responses to Comments

The FEIR should contain a copy of this Certificate and a copy of each comment letter received. To ensure that the issues raised by commenters are addressed, the FEIR should include direct responses to comments to the extent that they are within MEPA jurisdiction. This directive is not intended, and shall not be construed, to enlarge the scope of the FEIR beyond what has been expressly identified in this certificate.

Circulation

In accordance with 301 CMR 11.16(3), the Proponent should circulate the FEIR to those parties who commented on the DEIR, each Agency from which the Project will seek Permits, Land Transfers or Financial Assistance, and to any other Agency or Person identified in the Scope. Per 301 CMR 11.16(5), the Proponent may circulate copies of the FEIR to commenters in CD-ROM format, by directing commenters to a Project website address, or electronically. However, the Proponent should make available a reasonable number of hard copies to accommodate those without convenient access to a computer to be distributed upon request on a first come, first served basis. The Proponent should send correspondence accompanying the digital copy or identifying the web address of the online version of the FEIR indicating that hard copies are available upon request, noting relevant comment deadlines, and appropriate addresses for submission of comments. A copy of the FEIR should be made available for review in the Easthampton Public Library.

April 1, 2024
Date

Rebecca L. Tepper

Comments received:

3/6/2024	Stockbridge-Munsee Community
3/20/2024	Pioneer Valley Planning Commission (PVPC)
3/22/2024	Cernak Family
3/22/2024	Massachusetts Department of Environmental Protection (MassDEP)
3/25/2024	Massachusetts Department of Transportation (MassDOT)
3/28/2024	Massachusetts Department of Energy Resources (DOER)

RLT/NJM/njm

RE: EEA #16729 - Submittal of Draft Environmental Impact Report - Sierra Vista Commons - Easthampton, MA

Adrienne Dunk <Adrienne.Dunk@gza.com>

Mon 3/11/2024 11:39 AM

To:thpo <thpo@mohican-nsn.gov>
Cc:MEPA-EJ (EEA) <MEPA-EJ@mass.gov>;Moreno, Nicholas (EEA) <Nicholas.Moreno@mass.gov>

Thank you for your comments, Jeff. I've CC'ed Nick Moreno on this email as he is the MEPA Analyst and will be compiling public comments on the EIR.

Thanks,

Adrienne

Adrienne Dunk, WPIT
Project Manager
GZA | 1350 Main Street, Suite 1400 | Springfield, MA 01103
o: 413-726-2144 | c: 201-247-8950 | adrienne.dunk@gza.com | www.gza.com | LinkedIn

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From: thpo <thpo@mohican-nsn.gov>
Sent: Wednesday, March 6, 2024 4:14 PM
To: Adrienne Dunk <Adrienne.Dunk@gza.com>
Cc: MEPA-EJ (EEA <MEPA-EJ@mass.gov>
Subject: [EXTERNAL] RE: EEA #16729 - Submittal of Draft Environmental Impact Report - Sierra Vista Commons - Easthampton, MA

Dear Adrienne,

Thank you for the plans for the drafty EIS for the proposed Sierra Vista Commons project in Easthampton, Hampshire County, MA.

I am concerned that this APE is situated in close proximity to the Manhan River and the Connecticut River which would have made it an attractive location for Native American settlement. This part of Massachusetts was an important locus of Mohican settlement and this particular location would have been an advantageous place for settlement. It is also very close to a known site: 19-HS-42: a palisaded fort.

The Stockbridge-Munsee Community recommends that an archaeological survey be conducted at this property prior to development. SM-1

Thank You,
Jeff

Jeffrey C Bendremer Ph.D., RPA
Tribal Historic Preservation Officer
Stockbridge-Munsee Community
Tribal Historic Preservation Extension Office
86 Spring St.

Catalyst for Regional Progress
pvpc
Kimberly H. Robinson, MUP
Executive Director

March 20, 2024

Ms. Rebecca Tepper, Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Attention: MEPA Unit

Reference: Review Comments on the Draft Environmental Impact Report (DEIR) for the Sierra Vista Commons Project, EEA # 16729.

Dear Secretary Tepper:

The Pioneer Valley Planning Commission (PVPC) has the following review comments on the DEIR for the above-cited project. As proposed, the project in Easthampton, MA consists of the development of a mixed-use residential and commercial center.

Historic Preservation Comments

The MHC Reconnaissance Survey Town Report for Easthampton notes the presence of 34 undated Native sites (as of 1982) and speculates that Easthampton likely had a moderate Native population with potential for surviving evidence in proximity to the Manhan River. There is a great deal of proposed ground disturbing work, over several project phases, on the 33-acre site, which currently has approximately 16 undeveloped acres. The project proposes development of 21.5 acres, including 4.4 acres of previously unaltered mixed hardwood forest. PVPC encourages the development of a general Unanticipated Discoveries Plan which outlines specific measures to be implemented during site development, providing more guidance for the construction team. PVPC-1

The Easthampton Historical Commission is not included as part of the distribution list for the DEIR. The local historic commission should be included on the distribution list for all future correspondence related to this project. PVPC-2

Additional information is requested on the former Hampshire and Hampden Canal which has remnants on site. It is requested that the FEIR include information on any potential impacts to canal remnants. A mitigation plan for protection of the canal remnant would be beneficial. PVPC-3

Transportation Comments

Additional information on the trip generation impacts of the proposed project was requested as part of PVPC's comment letter on the EENF for the project. While Attachment 5.3 in the DEIR does expand on the project trip generation information, it does not provide clarity on the trips generated during the

roadway peak hour versus the peak hour of the generator/land use. It is requested this information be PVPC-4
included as part of the FEIR.

PVPC concurs with the proposed transportation monitoring program (TPM) for the project as outlined PVPC-5
in the DEIR. We would like to request that PVPC be added to the distribution list for the TPM.

The DEIR describes how traffic operations at three of the study area signalized intersections can be improved through signal retiming. It is unclear from the DEIR who will be responsible for the proposed signal timing changes. Additional information is requested in the FEIR and Section 61 PVPC-6
Finding to identify the responsible party for the proposed changes to traffic signal timings in the study area. It is also requested that the Section 61 Finding be updated to reflect the commitment made on the construction of a roundabout on Route 10 at the project site driveway.

Thank you for the opportunity to offer our comments on this proposed project.

Sincerely,

Kimberly H. Robinson, MUP
Executive Director

cc: Jesse W. Belcher-Timme, PVPC Commissioner – Easthampton
Jeffrey Bagg, Easthampton City Planner
Bao Long, MassDOT District 2
Lionel Lucien, MassDOT Public Private Development
Adrienne Dunk, GZA Geoenvironmental, Inc.

<u>The Cernak Family</u>
(Strathrile Properties, LLC,
102 Northampton Street LLC, and
The Kenneth S. Cernak Revocable Trust)

March 22, 2024

MA Executive Office of Energy & Environmental Affairs
MEPA Office
100 Cambridge St., Suite 900
Boston, MA 02114

Attn: Nicholas Moreno, MEPA Analyst

Subject: Sierra Vista Commons Project
Easthampton, Massachusetts
EEA# 16729

Dear Nicholas:

The Cernak Family (which includes the parties mentioned in the letterhead above) is a directly impacted group of landowners owning several commercial properties directly opposite the proposed Sierra Vista Commons project with access along both Northampton Street and Mountainview Street. The Cernak Family, having operated commercial properties contributing to the local community at these locations for 90 years, has engaged professional transportation engineers MDM Transportation Consultants, Inc. (MDM) and BETA Group to assist in technical review of proposed traffic impacts and planned roadway mitigation throughout the local review and approval process including the filed Draft Environmental Impact Report (DEIR). The objective of this ongoing review and commentary is to ensure that a viable, equitable and timely set of improvements are implemented by the Proponent that will ensure the continued viability of our longstanding commercial operations and future development of our property.

During the local review and approval process, mutual agreement was reached among the Easthampton Planning Board, the Proponent, the Cernak Family, and its reviewing agents that a roundabout design option is a preferred design solution that will accommodate the mutual safety and operating needs for public travel on Northampton Street, the Sierra Vista Commons project and the abutting properties owned by the Cernak Family. In fact, this is reflected in the November 14, 2023 Decision of the Easthampton Planning Board that is included in the DEIR filing which presents a more detailed accounting of testimony that led to that conclusion. Please see the attached drawing of the preferred design solution.

We remain concerned that any alternative to a roundabout, namely a traffic signal alternative, is not an appropriate solution; in fact, a signal would have a direct negative impact on the operations of our commercial properties, adjacent commercial properties, and the general public due to extensive vehicle queuing and driveway impacts that would result as elaborated in the local record and filings. We therefore request that the Proponent engage with MassDOT during preparation of the Final EIR (FEIR) and ultimately the Section 61 Finding process to definitively identify the roundabout alternative as the selected mitigation alternative for Sierra Vista Commons. We recognize that the roundabout alternative would require land acquisition from the Cernak Family and have indicated through ongoing discussions with the Proponent's engineering team that we would support the necessary acquisition to the extent this option is selected by MassDOT. CF-1

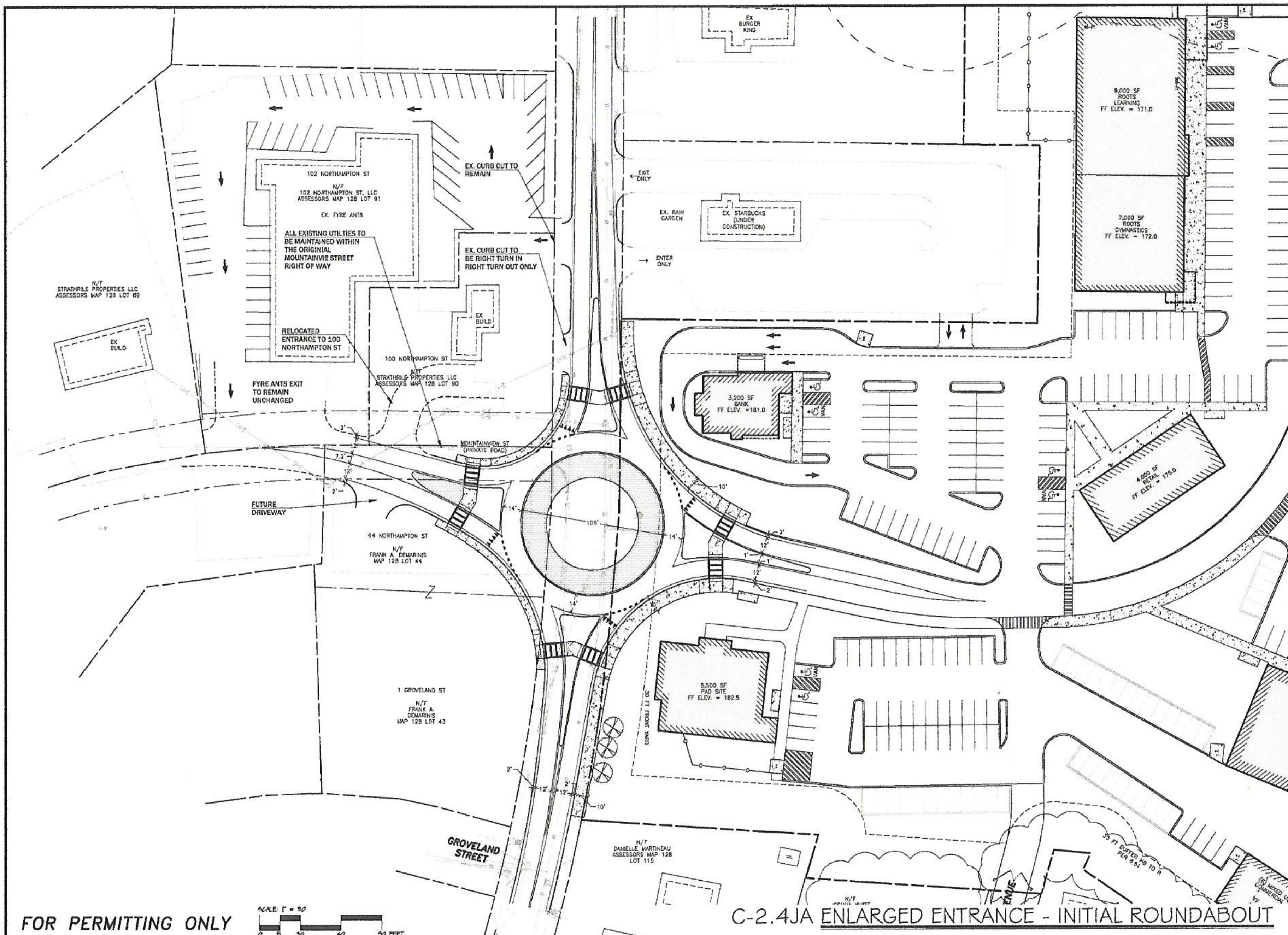
On behalf of the Cernak Family, I look forward to continued coordination with the Proponent on advancing the roundabout option and to confirmation by MassDOT that this design option will be memorialized in the Section 61 Finding for the project.

Sincerely,

Jennifer L. Cernak

(Cernak Family Representative)

Attachments: Preferred Roundabout Option Exhibit



C-2.4JA ENLARGED ENTRANCE - INITIAL ROUNDABOUT

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
53-57 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1	10-17-23	LDS	ADDED TRUCK APRON ON MOUNTAINVIEW ST
2	10-30-23	LDS	MISC. REVISIONS
3	- - -	- -	- - -
4	- - -	- -	- - -
5	- - -	- -	- - -

PROJECT: 2021-01-22
DRAWN BY: LDS
DATE: 9/29/2023
SCALE: 1"=30'
SHEET: C-2.4JA

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Western Regional Office • 436 Dwight Street, Springfield MA 01103 • 413-784-1100

Maura T. Healey
Governor

Kimberley Driscoll
Lieutenant Governor

Rebecca L. Tepper
Secretary

Bonnie Heiple
Commissioner

March 22, 2024

Rebecca Tepper, Secretary
Executive Office of Energy & Environmental Affairs
Massachusetts Environmental Policy Act Office
Nicholas Moreno, EEA No. 16729
100 Cambridge Street, 9th Floor
Boston, MA 02114-2524

Re: Sierra Vista Commons
Easthampton - DEIR

Dear Secretary Tepper,

The Massachusetts Department of Environmental Protection (MassDEP), Western Regional Office (WERO) appreciates the opportunity to comment on the Draft Environmental Impact Report (DEIR) submitted for the proposed Sierra Vista Commons project to be constructed at 93, 94, 95, 97 Northampton Street and 1 Groveland Street (Route 10) in Easthampton (EEA #16729). The site previously held a driving range, ice cream stand, single-family home, a barn and agricultural fields. An intermittent stream bisects the site. MassDEP attended a site meeting on July 20, 2023.

The applicable MassDEP regulatory and permitting considerations regarding wetlands, wastewater drinking water, underground injection control, air pollution, solid waste, hazardous waste and waste site cleanup are discussed.

I. Project Description

The Proponent, Tasty Top Development, LLC, is proposing to construct a mixed-use commercial and residential center to include 202 housing units contained within 10 mid-rise buildings, a restaurant, a bank, a daycare facility, a gymnastic center, a mixed-use retail/office building with apartments above, a separate retail building and 2 warehouse/storage units. Internal roadways are proposed to be constructed for building access with 478 new parking spaces. New electrical utilities, including lighted parking lots, with two EV charging stations will be located in front of each residential building. Proposed recreational opportunities include a community pool, a playground, and a community garden.

Agricultural fields located in the rear of the property have been historically accessed via an unauthorized wooden bridge crossing over an intermittent stream. The Proponent proposes removal of the existing noncompliant stream crossing and construction of a new, compliant stream crossing; the Proponent states that work will have no direct impacts to wetland resource areas. Internal potable water and wastewater utilities will be connected to the existing Easthampton infrastructure. An on-site stormwater management system, not connected to the City stormwater system, is proposed.

Environmental Justice populations are identified within one and five-mile radii of the project site in the municipalities of Easthampton, Holyoke, South Hadley, and Northampton. The categories are Income, Minority, Minority and Income, and Minority, Income and English Isolation. The Proponent posits the project will have neither short-term nor long-term environmental or public health impacts affecting Environmental Justice Populations.

Environmental Impacts associated with this project and changes since the EENF review include:

- Total site acreage - increase of .9 acres – Total - 33.9 acres
- New acres of land altered - 4.4 acres (no change)
- Acres of impervious area - existing - 0.3 acres, change – 12.1 acres, Total 12.4 acres (no change)
- Structures - Gross square footage (SF) - new - 422,000 SF, Footprint: 180,128 SF (no change)
- Number of housing units - new - 202 units (no change)
- Vehicle trips per day - 4,382 (no change)
- Parking spaces - reduction of 32 - Total – 478
- Water use (gallons per day) - new- 68,820 GPD (no change)
- Wastewater generation– new - 68,820 GPD (no change)

II. Required Mass DEP Permits and/or Applicable Regulations

Wetlands
310 CMR 10.000
Wastewater
314 CMR 7.00
Drinking Water
310 CMR 22.00
Underground Injection Control
310 CMR 27.00
Air Pollution
310 CMR 7.00
Solid Waste
310 CMR 16.00

Hazardous Waste
310 CMR 30.00
Bureau of Waste Site Cleanup
310 CMR 40.000

III. Permit Discussion

Bureau of Water Resources

Wetlands Protection Act
MassDEP wishes to emphasize that any changes in the project that result in new, different, or additional impacts to resource area and/or their buffer zone may, at the discretion of the issuing authority, require filing a new Notice of Intent or an amended Notice of Intent. DEP-1

In order to avoid any misunderstanding on the part of reviewers, MassDEP recommends that the FEIR Executive Summary clearly articulate that the WPA permitting process has been initiated and completed, as well as acknowledging that any changes in the project that result in new, different, or additional impacts to resource area and/or their buffer zone may, at the discretion of the issuing authority, require filing a new Notice of Intent or an amended Notice of Intent.

Limited Project
MassDEP has no additional comments. See prior comment letter dated August 9, 2023.

Resource Area Impacts
MassDEP has no additional comments. See prior comment letter dated August 9, 2023.

Dewatering
MassDEP has no additional comments. See prior comment letter dated August 9, 2023.

Stormwater
MassDEP has no additional comments. See prior comment letter dated August 9, 2023.

Wastewater
MassDEP review of the subject project indicates that the project may include the ownership and operation of a private (not owned by a municipality) treatment works, consisting of a common sewer system. MassDEP hereby provides notice to the proponent of its regulations at 314 CMR 12.00 and their applicability to the proposed "treatment works". The proponent should refer to the definition of treatment works in these regulations. The most recent version of the referenced regulations was promulgated in 2014 and apply to both municipal and private treatment works for the operation and maintenance of these systems. DEP-2

MassDEP's primary concern revolves around the potential lack of awareness among owners/operators of private treatment works regarding their regulatory responsibilities. These obligations encompass routine preventive maintenance and adherence to the regulations outlined in 314 CMR 12.00 and other requirements described therein. These regulations encompass the operational and maintenance requirements for both public and private treatment works, aiming to guarantee their effective functioning. One of the key requirements of these regulations is to establish that all treatment works, public and private, maintain and implement a written preventive maintenance program to ensure the efficient operation of the facility and equipment. The requirements to develop and implement the preventive maintenance plan can be found at 314 CMR 12.04(1)

Drinking Water
MassDEP has no additional comments. See prior comment letter dated August 9, 2023.

Underground Injection Control
MassDEP has no additional comments. See prior comment letter dated August 9, 2023.

Bureau of Air and Waste

Air Quality
MassDEP has no additional comments. See prior comment letter dated August 9, 2023.

Construction Activities
MassDEP has no additional comments. See prior comment letter dated August 9, 2023.

Boilers/Generators/Emergency Generators
MassDEP has no additional comments. See prior comment letter dated August 9, 2023.

Construction Equipment
MassDEP has no additional comments. See prior comment letter dated August 9, 2023.

Asbestos
MassDEP has no additional comments. See prior comment letter dated August 9, 2023.

Solid Waste
The Proponent shall properly manage and dispose of all solid waste generated by or discovered during this proposed project pursuant to 310 CMR 16.00 and 310 CMR 19.000, including the regulations at 310 CMR 19.017 (waste ban). DEP-3

Soils Management
MassDEP has no additional comments. See prior comment letter dated August 9, 2023.

Hazardous Waste
MassDEP has no additional comments. See prior comment letter dated August 9, 2023.

Bureau of Waste Site Cleanup

MassDEP has no additional comments. See prior comment letter dated August 9, 2023.

IV. Other Comments/Guidance

Greenhouse Gas Policy (GHG)

MassDEP works collaboratively with the Department of Energy Resources (MassDOER) to review the proposed GHG analysis and mitigations. MassDOER comments will be addressed under separate heading.

<u>Section 61 Findings</u>

There are no identified permits required from MassDEP for this proposed project. Should there be impacts identified that require mitigation and any MassDEP permits identified in future filings, Section 61 Findings must be included. DEP-4

MassDEP staff is available for discussions as the project progresses. If you have any questions regarding this comment letter, please do not hesitate to contact Sean Gonsalves at (781) 400-4272

Sincerely,

Sean Gonsalves, R.S. for
Michael Gorski
Regional Director

cc: MEPA File

March 25, 2024

Rebecca Tepper, Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114-2150

RE: Easthampton: Sierra Vista Commons Project - DEIR
EEA #16729

ATTN: MEPA Unit
Nicholas Moreno

Dear Secretary Tepper:

On behalf of the Massachusetts Department of Transportation, I am submitting comments regarding the Draft Environmental Impact Report for the proposed Sierra Vista Commons Project in Easthampton as prepared by the Office of Transportation Planning. If you have any questions regarding these comments, please contact J. Lionel Lucien, P.E., Manager of the Public/Private Development Unit, at (857) 368-8862.

Sincerely,

David J. Mohler
Executive Director
Office of Transportation Planning

DJM/jll

cc: Jonathan Gulliver, Administrator, Highway Division
Carrie Lavallee, P.E., Chief Engineer, Highway Division
Patricia Leavenworth, P.E., District 2 Highway Director
James Danila, P.E., State Traffic Engineer
Pioneer Valley Planning Commission (PVPC)
Town of Easthampton Planning Board

Maura Healey, Governor
Kimberley Driscoll, Lieutenant Governor
Monica Tibbits-Nutt, Secretary & CEO

MEMORANDUM

TO: David Mohler, Executive Director
Office of Transportation Planning

FROM: J. Lionel Lucien, P.E, Manager
Public/Private Development Unit

DATE: March 25, 2024

RE: Easthampton: Sierra Vista Commons Project – DEIR
EEA #16729

The Public/Private Development Unit (PPDU) has reviewed the Draft Environmental Impact Report (DEIR) for the Sierra Vista Commons Project at 93, 95, and 97 Northampton Street (Route 10) in Easthampton as submitted by GZA GeoEnvironmental, Inc. (GZA) on behalf of Tasty Top Development, LLC. (the "Proponent"). The Project site was formerly occupied by six buildings that were demolished prior to October 2022. Vehicular access to and from the site will be provided by an internal roadway that will utilize a new intersection with Route 10, and will include sidewalks, and crosswalks. The site is bounded by mixed commercial uses to the north and west, vacant land to the east, and residential neighborhoods to the south. The site currently consists of partially developed land with 332 feet of frontage along Route 10.

The Project entails the construction of a 500,000 square foot (sf) mixed-use development with a total of 478 parking spaces. The mixed-use development includes:

- Roots Learning Center (daycare facility), approximately 9,000 square feet (SF);
- Roots Gymnastic Center, approximately 7,000 SF;
- 1 sit-down restaurant, 220-seat capacity, approximately 5,500 SF;
- 1 bank, approximately 3,200 SF;
- 1 stand-alone small retail, approximately 4,000 SF;
- 2 mixed-use warehouse/storage, contractor units, approximately 7,400 SF/building;
- 1 mixed-use retail/office buildings with 14 apartments above, approximately 16,000 SF; and
- 10 mid-rise (3 floor) apartments buildings, 188 units total, nine 13,600-SF buildings and one 18,000-SF building.

The Project previously submitted an Expanded Environmental Notification Form (EENF) on July 10, 2023, for which the Secretary of Energy and Environmental Affairs issued a Certificate on August 16, 2023, requiring the Proponent to prepare a DEIR.

The DEIR includes a TIA prepared by Howard Stein Hudson in accordance with the EEA/MassDOT *Transportation Impact Assessment (TIA) Guidelines*. The TIA includes an analysis of the study area that addresses the Project's impacts on intersection operations, safety, and bicycle, pedestrian, and transit modes. The TIA generally conforms to the scope as originally described in the Project EENF and is generally responsive to MassDOT commentary.

<u>Trip Generation</u>

In accordance with the Institute of Transportation Engineers' (ITE) Trip Generation Manual (11th Edition), the EENF outlines that the Project will utilize Land Use Code (LUC) 565 (Day Care Center), LUC 20 (Multifamily Housing Low-Rise), LUC 150 (Warehousing), LUC 822 (Strip Retail Plaza under 40ksf), LUC 932 (High-Turnover Sit-Down Restaurant), and LUC 912 (Drive-in Bank) to represent a conservative estimate of trips generated by the multiple uses included in the Project. The proposed project is anticipated to generate a total of 4,382 new trips, including 373 trips during the weekday morning peak hour and 525 trips during the weekday evening peak hour.

<u>Study Area</u>

MassDOT requested the Proponent to expand their study area which now includes:

- Route 10 at Florence Road and Highland Avenue;
- Route 10 at the Project driveway;
- Route 10 at O'Neil Street;
- Route 10 at West Street;
- Route 10 at Main Street/Lyman Ave/Pleasant Street/Campus Lane;
- Route 10 at Union Street;
- Pleasant Street at Ferry Street and Lovefield Street;
- Ferry Street at East Street; and
- Route 66 (Westhampton Road) at Florence Road.

The analysis included in this DEIR was expanded to include these intersections. No other intersections were identified where the project-generated trips were anticipated to increase peak hour traffic volume by 5% or more or more than 100 vehicles per hour.

<u>Safety</u>

The TIA indicates that the Proponent acquired crash data from 2017 to 2020 from MassDOT's IMPACT portal. In MassDOT District 2, where the Project site is situated, the average crash rate at signalized intersections is 0.89 per million entering vehicles (MEV). Intersections with higher-than-average crash rates are typically subject to further examination by the jurisdictional agency. Both intersections under study have crash rates below the District

2 average, and no pedestrians were involved in these incidents. However, MassDOT notes that outside the study's data window, there was a fatal pedestrian crash in August 2022 on Route 10 near the project site.

MassDOT acknowledges a pedestrian safety improvement plan for the area where the fatality occurred, which includes installing a crosswalk and sidewalk from Groveland Street to the site drive. There should be coordination with MassDOT's District 2 office prior to submission of the FEIR regarding these concerns. DOT-1

Traffic Operations

Under the Build (2030) conditions, the intersection of Route 10/Florence Road/Highland Avenue maintains the same level of service (LOS) during both peak hours, with all approaches operating at acceptable LOS. However, the intersection of Route 10/West Street experiences a decline from LOS C to LOS E during the a.m. peak hour and from LOS E to LOS F during the p.m. peak hour. Additionally, the West Street eastbound left-turn/right-turn approach deteriorates from LOS D to LOS E during the p.m. peak hour. Similarly, at the intersection of Route 10/Oneil Street, there is no change in LOS during the a.m. peak hour but a shift from LOS E to LOS F during the p.m. peak hour, with the Route 10 southbound approach worsening to LOS F during the same period.

Continuing, at the intersection of Route 10/Union Street, an acceptable LOS is maintained during both peak hours, although the Route 10 northbound through movement declines from LOS D to LOS E during the a.m. peak hour. Further down, the intersection of Route 10/Lyman Avenue witnesses a decline from LOS C to LOS E during the p.m. peak hour. Similarly, the intersection of Route 10/Main Street/Pleasant Street westbound approach deteriorates from LOS E to LOS F during the p.m. peak hour. Additionally, at the intersections of Route 10/Mountainview Street and Route 10/Project Site Driveway, various approaches experience worsening LOS, notably reaching LOS F during peak hours.

Site Access

After extensive review involving the City, its peer reviewer, and engineers hired by affected property owners, a roundabout was selected as the best option for managing traffic flow, particularly to address concerns about vehicle queues on Route 10 and the safety of left-turns from adjacent properties. Consequently, no further examination of a signalized intersection was deemed necessary. The proposed roundabout will be a single leg one, situated in alignment with the relocation of Mountainview Street. Additionally, recalibrating signal timings at various intersections along Route 10 would further enhance traffic efficiency.

Although MassDOT notes that with this mitigation the study areas intersections will remain at an acceptable LOS, the FEIR should include the analysis of signalized site driveway option to reflect the alternative analysis conducted to determine the site access selection. The draft Section 61 Finding should be updated to reflect the commitment made regarding the DOT-2 construction of the roundabout. MassDOT would also like to work with Proponent regarding the timing of implementation as well as the funding for the design and construction of the roundabout which should be discussed prior to the submittal of the FEIR. DOT-3

Transportation Demand Management

The Proponent proposes to provide a Transportation Demand Management (TDM) program with the goal of reducing vehicle trips to the Project site. This program, briefly summarized, will include:

- Designated parking spaces for carpooling will be conveniently located in the parking area between Buildings 13 and 14, which is centrally located to all commercial buildings. All designated parking spaces will be clearly identified with signage;
- The development will include an eight-foot-wide shared use concrete path that will connect the development to Route 10. The path will run adjacent to the main roadway through the development, and loop around the eastern residential portion of the development. The path will be wide enough to accommodate pedestrians and bicyclists;
- The development will include a concrete pad with a bike rack outside of every building within the development. The proposed bike rack locations are shown on plan series C-2 of the project plan set;
- Each residential apartment building will have secure bike storage rooms inside the buildings open to the residents;
- A Valley Bike Share station will be installed on the property along the sidewalk following Route 10. The proposed location is shown on the plan sheet C-2.1 of the project plan set;
- Recreational services will be provided on-site for the residents of the apartment buildings including a pool, community garden, and playground;
- On-site commercial businesses will provide services to the residents/employees within the development, including a daycare facility, restaurants, a bank, and a retail building. These services will help to reduce vehicle trips;
- Tasty Top LLC., will act as the transportation coordinator and provide onsite support and education on the Trip Reduction Plan to tenants; and
- The transportation coordinator will work with tenants and subcontractors such as waste disposal to schedule truck deliveries and traffic for off-hours to the extent practicable.

MassDOT finds the proposed TDM measures have the potential to reduce single-occupancy-vehicle trips to the Project site and acknowledges that the success of this program will be evaluated in part under the Transportation Monitoring Program (TMP) outlined below.

Transportation Monitoring Program

The Proponent will be required to conduct an annual Traffic Monitoring Program (TMP) for a period of five years, beginning six months after occupancy of the full-build project. The TMP will include:

- Simultaneous automatic traffic recorder (ATR) counts at the site driveway for a continuous 24-hour period on a typical weekday;
- Travel survey of employees and patrons at the site (to be administered by the Transportation Coordinator);
- Weekday AM and PM peak hour turning movement counts (TMCs) and operations analysis at “mitigated” intersections, including those involving site driveways; and
- Transit Ridership counts.

The goals of the monitoring program will be to evaluate the assumptions made in the DEIR and the adequacy of the mitigation measures, as well as to determine the effectiveness of the TDM program.

Section 61 Finding

Based on minimal Project impact, responsiveness to MassDOT commentary on the Project EENF, and the provided comments above, MassDOT recommends the preparation of a FEIR. The Proponent should coordinate with appropriate MassDOT sections during the preparation of the FEIR. If you have any questions regarding these comments, please contact *William.M.Simon@dot.state.ma.us.*

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF
ENERGY AND ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENERGY RESOURCES
100 CAMBRIDGE ST., SUITE 1020
BOSTON, MA 02114
Telephone: 617-626-7300
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Maura Healey
Governor

Kim Driscoll
Lt. Governor

Rebecca Tepper
Secretary

Elizabeth Mahony
Commissioner

28 March 2024

Rebecca Tepper, Secretary
Executive Office of Energy & Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02114
Attn: MEPA Unit

RE: Sierra Vista Commons, Easthampton, MA, EEA #16729

cc: Jo Ann Bodemer, Director of Energy Efficiency, Department of Energy Resource
Elizabeth Mahony, Commissioner, Department of Energy Resources

Dear Secretary Tepper:

We've reviewed the Draft Environmental Impact Report (DEIR) for the proposed project. The project includes 140,400-sf of new multifamily buildings (ten, 3-story, 13,600-sf apartment buildings and one, 3-story, 18,000-sf building, total of 188 dwelling units) and the following commercial buildings:

Warehouse (2 buildings)	14,800-sf, total
Small retail	4,000-sf
Restaurant	5,500-sf
Gymnastics Studio	7,000-sf
Daycare Center	9,000-sf
Bank	3,200-sf

There is also a 16,000-sf building with retail/office and 14 residential units.

Executive Summary

The commercial buildings are proposing quality mitigation measures, including improved envelope and efficient electrification of space heating and hot water. The residential buildings, however, did not complete recommended evaluations of Passvehouse and the work that was DOER-1 performed contains a significant error. Further, no Passivehouse evaluation was performed for the 14 units above the retail/office. The proposed dwelling units, built to Passivehouse, would be eligible for more than **$0.6M** in MassSave incentives. Detailed comments are herein.

COMMERCIAL BUILDINGS

All the buildings are less than 20,000-sf and thus qualify for the prescriptive pathway of the Stretch Code. This project has committed to be in compliance with Section C401.3, C402 through C406, and Section C408 of IECC 2021 Edition and the 2023 Stretch Code.

The proposed buildings include improved envelope which yields the following TEDI improvements:

Table 5.21 Heating and Cooling Thermal Load Demand Intensity (TEDI)

Building	Base Case Cooling (kBtu/sf/yr)	Mitigation Case Cooling (kBtu/sf/yr)	Cooling Improvement (kBtu/sf/yr)	Base Case Heating (kBtu/sf/yr)	Mitigation Case Heating (kBtu/sf/yr)	Heating Improvement (kBtu/sf/yr)
Warehouse/Storage	13.18	11.31	14.2%	-9.97	-10.884	-9.1%
Small Retail	19.91	18.04	9.4%	-53.98	-49.63	8.1%
Restaurant	44.69	38.53	13.8%	-53.94	-52.11	3.4%
Mixed Retail	12.38	10.63	14.1%	-19.23	-18.53	3.7%
Gymnastics Studio and Daycare Center	9.32	8.08	13.4%	-36.39	-35.34	2.9%
Bank	11.02	9.1	17.5%	-37.46	-35.47	5.3%

kBtu/sf/yr = thousand British thermal units per square foot per year

Thermally broken window and wall components will be used to eliminate thermal bridges. Wood construction buildings will have continuous insulation on exterior walls, while pre-engineered metal buildings will have foam on face of framing members to provide thermal break.

The roof insulation for the restaurant, small retail, mixed retail, and bank will be U-0.026 (R-38 equivalent). The roofs for the gymnastics center, daycare facility, and warehouse will provide U-0.024 (R-42 equivalent) at the exterior, with an additional interior insulation of U-0.077 (R-13 equivalent).

The project is proposing triple-pane low-E windows with a U-Factor of 0.24 and Solar Heat Gain Coefficient of 0.615.

All buildings will be space heated with electric air source heat pumps. Water heating in all buildings will be electric resistance. No propane, gas, or other fossil fuels will be used.

The HVAC units will have EER values more than 10% higher than IEC 2021 values. Energy Recovery Ventilation (ERV) units will be used for each building with approximately 70% heat recovery. Except for the Gymnastics Center and Warehouse, electric air-source Variable Refrigerant Flow (VRF) systems will be capable of energy recovery during concurrent heating and cooling.

We note that the warehouse is proposed with no energy recovery ventilation. Energy recovery ventilation is recommended. Note that the code generally mandates energy recovery ventilation for most applications. We recommend reviewing code requirements and committing to energy recovery ventilation even in the unusual event it is not required by code, as a mitigation measure. DOER-2

Low air infiltration will be confirmed with whole-building testing in the field to ensure low heating and cooling TEDI.

All buildings except the gymnastic center and warehouse will have air infiltration of 0.25 cfm/sf at 75 Pa or less. The gymnastics center and warehouse will have standard-code air infiltration of 0.3 cfm/sf at 75 Pa.

RESIDENTIAL BUILDINGS

No information was provided for the 14-units proposed above the retail/office building. It's recommended that these units be Passivehouse with air source heat pump space heating and electric resistance water heating.

The three-story residential buildings are proposed to be all electric with HERS 45. HERS 45 is code minimum for an all-electric building.

The insulation levels for the residential buildings are: ceiling R-60 (wood frame); continuous exterior wall insulation of R-30 (Wood Frame); continuous floor insulation of R-30 (wood frame); and roof insulation of R-42.

The project is committing to an energy recovery system with a 70% effectiveness, or per C403.6.2 if using a direct control system. Air source heat pumps will provide all space heating.

In our previous review, we recommended an evaluation of Passivehouse. The evaluation provided was incomplete and erroneous, however.

<u>Error</u>

Our recommendation was to include a 'gap analysis' that compared: (a) what is being proposed; to (b) Passivehouse. In the gap analysis provided, however, rather than compare Passivehouse to what is being proposed (HERs 45, all electric), the gap analysis compared Passivehouse to IECC 2021 prescriptive code[1]. Because IECC 2021 prescriptive code is much lower standard than HERs 45, the gap in this analysis is artificially larger, which will make Passivehouse appear more expensive[2]. DOER-3

[1] Note, IECC 2021 prescriptive is not code minimum in Massachusetts. Minimum code for these buildings would be HERS 45, which is what is being proposed.

[2] For example, the gap analysis shows R-42 roof, taken from IECC 2021. In fact, an R-60 roof is proposed.

Incomplete

The gap analysis also did not include a professionally-estimated cost evaluation of first costs for the proposed case and first cost for the Passivehouse case, with the later netted against a $0.6M incentive. The analysis should also include a life cycle evaluation. DOER-4

Further, we recommend estimating the peak electric demand (summer and winter) associated with the proposed HERs 45 case and the peak electric demand (summer and winter) associated with Passivehouse. Electric service loads may be able to be reduced with Passivehouse, which will provide further value. DOER-5

The Passivehouse evaluation also did not appear to consider the 14 units above the office and retail. DOER-6

Solar and EV

The project is proposing commendable, above-code, solar and EV commitments, as noted below.

Approximately 7,500-sf of residential rooftop will be dedicated to solar PV. This will provide more than 40% of flat rooftop for solar PV readiness. In addition, solar PV is planned for the Daycare Center, Gymnastics studio, and stand-alone retail buildings (with arrays of 5,000 SF or less per building). Additional roofs will be flat with 80% solar PV readiness which exceeds minimum solar readiness requirement.

Per the code, 20% of the residential parking spaces will be EV ready. As an above-code mitigation measure, 4 EV stations per residential building will be provided. For the commercial buildings, 25% of new garage spaces for the restaurant, bank, small retail, mixed-use retail, gymnastics studio & daycare center will be EV-ready, totaling 48 spaces.

Recommendations

1. Address the Passivehouse gap analysis and cost estimates as described herein.

2. Clarify what is proposed for the residential units above the retail/office buildings. Incorporate into the gap analysis.

3. We note that the warehouse is proposed with no energy recovery ventilation. Energy recovery ventilation is recommended. Note that the code generally mandates energy recovery ventilation for most applications. We recommend reviewing code requirements and committing to energy recovery ventilation even in the unusual event it not required by code, as a mitigation measure.

Paul F. Ormond, P.E.
Energy Efficiency Engineer
Massachusetts Department of Energy Resources

ATTACHMENT 2 – SECRETARY'S CERTIFICATE ON THE EXPANDED ENVIRONMENTAL NOTIFICATION FORM

The Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, 10th Floor
Boston, MA 02114

Maura T. Healey
GOVERNOR

Kimberley Driscoll
LIEUTENANT GOVERNOR

Rebecca L. Tepper
SECRETARY

Tel: (617) 626-1000
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August 16, 2023

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
EXPANDED ENVIRONMENTAL NOTIFICATION FORM AND

PROJECT NAME	: Sierra Vista Commons
PROJECT MUNICIPALITY	: Easthampton
PROJECT WATERSHED	: Connecticut
EEA NUMBER	: 16729
PROJECT PROPONENT	: Tasty Top Development, LLC
DATE NOTICED IN MONITOR	: July 10, 2023

Pursuant to the Massachusetts Environmental Policy Act (MEPA; M.G.L. c. 30, ss. 61-62L) and Section 11.06 of the MEPA Regulations (301 CMR 11.00), I have reviewed the Expanded Environmental Notification Form (EENF), and hereby determine that this project **requires** the submission of an Environmental Impact Report (EIR). In accordance with Section 11.06(8) of the MEPA regulations, the Proponent requested that I allow a Single EIR to be submitted in lieu of the usual two-stage Draft and Final EIR process. As discussed below, comments submitted by Agencies indicate that additional analyses are needed to fully assess the project's potential impacts and evaluate the mitigation proposed, including a supplemental traffic impact study and associated air quality analysis, updated stormwater and land alteration assessment, and additional climate change analysis including greenhouse gas emissions (GHG). Accordingly, I am denying the Single EIR request; the Proponent should submit a DEIR in accordance with the Scope included in this Certificate.

Project Description

As described in the EENF, the proposed project consists of the construction of a mixed-use residential and commercial center, consisting of 350,000 square feet (sf) of residential space (comprised of 202 residential units) and 60,000 sf of commercial space; 510 surface parking spaces; a stormwater management system; and landscaping located off of Northampton Street (Route 10), a roadway controlled by the Massachusetts Department of Transportation (MassDOT). Specific components of the development would include a Roots Learning Center (Daycare facility); a Roots Gymnastic Center; a sit-down restaurant with a 220-seat capacity; a bank; a standalone small retail building; two mixed-use warehouse buildings; a mixed-use retail/office building with 14 apartments above; and ten mid-rise (3-floor) apartments buildings. Seven of the ten residential buildings will be located within the northern portion of the site, across an intermittent stream that bisects the property, with surface parking and other site amenities (including a swimming pool, community garden, and playground) located within a central plaza. The remainder of the project will be located within the southern portion of the site. Access to the site will be provided by an internal roadway that will utilize a new intersection with Northampton Street (Route 10), and will include sidewalks, crosswalks, and speed humps as necessary at critical points. Access to the northern portion of the property will be provided by a new bridge that will span the intermittent stream. The project will also be serviced by existing municipal sewer and water with connections to the Easthampton Main Sewer Interceptor, which runs along the northeastern property boundary, and an existing water main located in Northampton Street (Route 10).

Project Site

The project site occupies approximately 33 acres land, consisting of a mix of partially developed land, agricultural fields, wetlands, and forest, with 332 ft of frontage along Northampton Street (Route 10). The majority of the residential units are proposed within the City of Easthampton (the City)'s Residential – Suburban A (R-15) zoning district with the remainder of the project proposed within the Highway Business (HB) zoning district. The site previously supported a variety of uses that have altered approximately 17.1 acres, including approximately 10 acres of the southern portion of the site which operated as a driving range known as Easthampton Golf since at least the 1990s. Easthampton Golf included a paved parking area, a small building supporting a sales office, an artificial turf and natural grass tee box area, and a mowed lawn range. Within the immediate frontage on Northampton Street (Route 10), the site supported a retail ice cream stand and paved parking lot as well as a single-family home and barn. Approximately 6.5 acres within the northern portion of the site was historically used as an agricultural field, though it has not been actively farmed in at least two years. Access to the field is currently provided by a pre-existing, unauthorized wooden bridge that crosses an intermittent stream which bisects the property. The site is bounded by mixed commercial uses to the north and west, vacant land to the east, and residential neighborhoods to the south.

State and local wetland resource areas located within the project area include Bank, Bordering Vegetated Wetlands (BVW), and Riverfront Area (RA). According to the Massachusetts Natural Heritage and Endangered Species Program (NHESP) Atlas (15th Edition), a portion of the project site is located within Estimated and Priority Habitat of Rare Species. A portion of the project site is also located in a Massachusetts Department of Environmental Protection (MassDEP) Approved Zone II Wellhead Protection Area. Additionally, the site formerly contained a structure listed in the Massachusetts Historical Commission's (MHC) Inventory of Historic and Archaeological Assets of the Commonwealth.

The project site is located within an Environmental Justice (EJ) Population characterized by Income within the City of Easthampton. The site is located within one mile of three additional EJ

Populations characterized by Income within the City of Easthampton. The site is also located within five miles of 15 additional EJ Populations.[1] As described below, the EENF identified the "Designated Geographic Area" (DGA) for the project as one mile around EJ Populations, included a review of potential impacts and benefits to the EJ Populations within this DGA, and described public involvement efforts undertaken to date.

Environmental Impacts and Mitigation

Potential environmental impacts associated with the project include the direct alteration of 21.5 acres of land (including 4.4 acres of new land alteration and tree clearing), the creation of 11.8 acres of impervious surface, and the construction of 202 housing units (including 35 affordable units). The project will also construct 500 parking spaces (for a total of 510 spaces); is expected to generate 4,382 New average daily trips (adt); and is anticipated to result in 68,820 gallons per day (gpd) of water use and wastewater generation.

Measures to avoid, minimize, and mitigate environmental impacts include the use of erosion and sedimentation controls during construction; the construction of a stormwater management system; the installation of landscaping features and vegetative screening throughout the site; and the beneficial reuse of prime farmland soil either as part of the on-site landscaping efforts or to be sold for reuse locally. Additional mitigation measures should be identified in the DEIR.

Jurisdiction and Permitting

This project is subject to MEPA review and a mandatory EIR because it requires Agency Action and meets/exceeds the MEPA thresholds 301 CMR 11.03(1)(a)(2) for the creation of 10 or more acres of impervious area and 301 CMR 11.03(6)(a)(6) for the generation of 3,000 or more New adt on roadways providing access to a single location. It also exceeds the ENF thresholds at 301 CMR 11.03(1)(b)(2) for the creation of 5 or more acres of impervious area; 301 CMR 11.03(1)(b)(4) for the conversion of land in active agricultural use to nonagricultural use, provided the land includes soils classified as prime, state important, or unique by the USDA; 301 CMR 11.03(6)(b)(13) for the generation of 2,000 or more New adt on roadways providing access to a single location; 301 CMR 11.03(6)(b)(14) for the generation of 1,000 or more New adt on roadways providing access to a single location and construction of 150 or more New parking spaces at a single location; and 301 CMR 11.03(6)(b)(15) for the construction of 300 or more New parking spaces at a single location. The project is also required to prepare an EIR pursuant to 301 CMR 11.06(7)(b) because it is located within a DGA of one or more EJ Populations.

The project will require a Vehicular Access Permit from MassDOT. The project will also require a National Pollutant Discharge Elimination System (NPDES) Construction General Permit from the U.S. Environmental Protection Agency (EPA). The Proponent indicates that it intends to seek various forms of Financial Assistance, including tax credits and deferred payment loans, from state agencies.

[1] The EEA EJ Mapper is available at: https://www.mass.gov/info-details/environmental-justice-populations-in-massachusetts

The project has received Demolition Delay approval from the Easthampton Historical Commission.[2] The project will require an Order of Conditions (OOC) from the Easthampton Conservation Commission (or in the case of an appeal, a Superseding Order of Conditions from MassDEP). The project will also require Site Plan Approval and Special Permit Approval from the Easthampton Planning Board and.

Because the Proponent will seek Financial Assistance from one or more Agencies, MEPA jurisdiction is broad in scope and extends to all aspects of the project that are likely, directly or indirectly, to cause Damage to the Environment as defined in MEPA regulations.

Segmentation

The MEPA regulations include provisions (301 CMR 11.01(2)(c)) to ensure that a Project is not phased or segmented to evade, defer or curtail MEPA review. In determining whether a Project is subject to MEPA jurisdiction or meets or exceeds any review thresholds, and during MEPA review, the Proponent, any Participating Agency, and the Secretary shall consider the entirety of the Project, including any likely future Expansion, and not separate phases or segments thereof. The Proponent, any Participating Agency, and the Secretary must consider all circumstances as to "whether various work or activities constitute one Project, including but not limited to: whether the work or activities, taken together, comprise a common plan or independent undertakings, regardless of whether there is more than one Proponent; any time interval between the work or activities; and whether the environmental impacts caused by the work or activities are separable or cumulative."

On February 28, 2023, a third party filed a Request for Advisory Opinion with the MEPA Office, raising, among other issues, potential segmentation concerns. Specifically, a former portion of the property, known as 109 Northampton Street, was subdivided and a drive-through restaurant development (Starbucks) was approved by the Easthampton Planning Board. After obtaining all other necessary permits and approvals, the project then proceeded to construction. As discussed in the Advisory Opinion (AO), issued on April 13, 2023, the three properties currently owned by the Proponent and under development here (93, 95, and 97 Northampton Street), in addition to the adjacent 109 Northampton Street parcel on which the Starbucks drive-through is located, were under common ownership by a third party until 2022. However, the Starbucks drive-through parcel was subdivided from a larger parcel (via an Approval Not Required (ANR) Plan), designed, and permitted prior to the Proponent's purchase of the three properties at issue (93, 95, and 97 Northampton Road). Thus, while all parcels were once under common ownership, the timeline of events shows that the two developments (Starbucks parcel and this project) represent independent undertakings by unrelated proponents; it does not appear that any development plan was in place at 93, 95, and 97 Northampton Road at the time the Starbucks parcel underwent design and permitting. Under these circumstances, I find that project segmentation has not occurred. However, for purposes of full transparency and in accordance with the AO, the impacts associated with the Starbucks development were disclosed in the EENF and incorporated into the Traffic Impact Study (TIS) in assessing existing traffic conditions.

[2] The Easthampton Demolition Delay Ordinance requires that any proposed demolition of buildings over 50 years old be reviewed and approved by the Easthampton Historical Commission.

Request for a Single EIR

The MEPA regulations at 301 CMR 11.06(8) indicate that a Single EIR may be allowed provided I find that the EENF:

a. describes and analyzes all aspects of the project and all feasible alternatives, regardless of any jurisdictional or other limitation that may apply to the Scope;
b. provides a detailed baseline in relation to which potential environmental impacts and mitigation measures can be assessed; and,
c. demonstrates that the planning and design of the project use all feasible means to avoid potential environmental impacts.

To support a Single EIR request for any Project for which an EIR is required in accordance with 301 CMR 11.06(7)(b), I must also find that the EENF:

d. describes and analyzes all aspects of the Project that may affect Environmental Justice Populations located in whole or in part within the Designated Geographic Area around the Project; describes measures taken to provide meaningful opportunities for public involvement by Environmental Justice Populations prior to filing the expanded ENF, including any changes made to the Project to address concerns raised by or on behalf of Environmental Justice Populations; and provides a detailed baseline in relation to any existing unfair or inequitable Environmental Burden and related public health consequences impacting Environmental Justice Populations in accordance with 301 CMR 11.07(6)(n)1.

Consistent with this request, the EENF was subject to an extended comment period under 301 CMR 11.05(9).

Review of the EENF

The EENF included a project description, alternatives analysis, existing and proposed conditions plans, estimates of project-related impacts, a Traffic Impact Study (TIS), and an identification of measures to avoid, minimize and mitigate environmental impacts. It included a description of measures taken to enhance public involvement by EJ Populations and baseline assessment of any existing unfair or inequitable Environmental Burden and related public health consequences impacting EJ Populations in accordance with 301 CMR 11.07(6)(n)1.). Consistent with the MEPA Interim Protocol on Climate Change Adaptation and Resiliency, the EENF/Proposed EIR contained an output report from the Climate Resilience Design Standards Tool prepared by the Resilient Massachusetts Action Team (RMAT) (the "MA Resilience Design Tool"),[3] together with information on climate resilience strategies to be undertaken by the project.

The Proponent provided supplemental information on August 1, 2023, which included clarifications to information in the EENF with regards to the proposed solar array, mesoscale air quality analysis, and wetlands. In addition, the Proponent provided a copy of the Stormwater Report on August 7, 2023. For purposes of clarity, all supplemental information provided by the Proponent are included in references to the "EENF," unless otherwise indicated.

[3] Available at: https://resilientma.mass.gov/rmat_home/designstandards/

I received numerous comment letters raising concerns about the proposed project and its impacts relative to land alteration, impervious surface, stormwater, and traffic. In particular, comments from MassDOT request an expanded traffic study to evaluate project related impacts at additional intersections, an assessment of existing multi-modal infrastructure within the study area, and additional mitigation commitments. I am denying the request to file a Single EIR, in light of these outstanding analyses.

Alternatives Analysis

The EENF analyzed a series of alternatives to achieve the project's goal to create a variety of affordable and mixed-income housing, redevelop underutilized properties, and create infill developments. The EENF states that a No-Build Alternative was considered; however, because the site would remain in its current, vacant state, it would not create new retail/commercial business opportunities or provide additional housing units to advance the City's Housing Production Plan goals, and was therefore dismissed. As described below, the EENF evaluated four alternatives (Alternative 1, Alternative 2, Alternative 3, and the Preferred Alternative) to meet the project's goal, while managing impacts to environmental resources. Additionally, all alternatives considered would include connections to the existing water main and sanitary sewer, installation of a stormwater management system, and private underground utilities.

Alternative 1 was the original design for the project, which was submitted to the Easthampton Planning Board in 2022, and would involve the construction of a mixed-use residential and commercial center, consisting of 10 residential buildings, four mixed-use buildings, and five commercial/retail buildings. Similar to the Preferred Alternative, the commercial use would be located within the HB zoning district, closest to Northampton Street (Route 10) with the residential buildings located in the northeastern portion of the site within the R-15 zoning district; the mixed-use buildings would be located partially in both zoning districts. This alternative was approximately 10-20% larger than the Preferred Alternative and included an additional mid-rise residential building in the easternmost rear corner of the property. This alternative would result in greater impacts than the Preferred Alternative, specifically, the direct alteration of 23.1 acres of land (including 5.7 acres of tree removal), the creation of approximately 12.4 acres of impervious surface, and the construction of 206 residential units (including 35 affordable units). This alternative would also generate 5,760 adt, as well as 76,690 gpd in water demand and wastewater generation. Alternative 1 was dismissed due to concerns raised during the initial Easthampton Planning Board review process; as noted, environmental impacts were also greater than the Preferred Alternative.

Alternative 2 would maintain the original mixed-use design within the HB zoning district as Alternative 1; however, it would subdivide the rear portion of the site within the R-15 district and would install a subdivision road. Based on current zoning regulations, approximately 50 detached year-round dwellings with a minimum individual lot size of 15,000 sf would be constructed within the R-15 district. This alternative would result in greater impacts than the Preferred Alternative, specifically, the direct alteration of 23.1 acres of land (including 5.7 acres of tree removal), the creation of approximately 12.4 acres of impervious surface, and the construction of 50 residential units (including 3 affordable units). This alternative would also generate significantly fewer adt compared to the Preferred Alternative, as well as 20,000 gpd in water demand and wastewater generation. While environmental impacts are reduced, this alternative would provide less than 25% of the total housing units proposed under the Preferred Alternative. In addition, larger, more sprawling developments are not encouraged by the City as they provide fewer residential units per unit area, resulting in fewer land conservation opportunities. For these reasons, Alternative 2 was dismissed.

Alternative 3 would maintain the same mixed-use design within the R-15 district as Alternative 1; however, it would not propose any residential dwellings within the HB district near the front of the property. This alternative would not include mixed-use development and would propose to develop the site in support of a single large retailers (i.e., “big box store”) or a series of smaller retailers (i.e., “strip mall”). This alternative would result in greater impacts than the Preferred Alternative, specifically, the direct alteration of 23.1 acres of land (including 5.7 acres of tree removal), the creation of approximately 12.4 acres of impervious surface, and the construction of 174 residential units (including 26 affordable units). This alternative would also generate fewer adt compared to the Preferred Alternative, as well as 62,000 gpd in water demand and wastewater generation. Restricting the HB zoning district to commercial development only would reduce the number of residential units, which is counter to the City’s stated goal of creating additional housing. Additionally, the 2013 Highway Business District Review Subcommittee recommended to the City Council that the commercial corridor avoid the development of a single, large commercial retailer or strip mall. Therefore, Alternative 3 was dismissed as not fully meeting project goals.

The Preferred Alternative (as described herein) would involve the construction of a mixed-use residential and commercial center, consisting of ten residential buildings, three mixed-use buildings, and five commercial/retail buildings. The Preferred Alternative would result in the direct alteration of 21.5 acres of land (including 4.4 acres of tree removal); the creation of approximately 11.8 acres of impervious surface; the construction of 202 residential units (including 35 affordable units); and the addition of 500 surface parking spaces. The Preferred Alternative would also generate 4,382 adt, as well as 68,820 gpd in water demand and wastewater generation. This represents a 24% reduction in traffic generation, 1.3-acre reduction in tree clearing, and a reduction of approximately 25,000 sf of impervious surface as compared to the originally proposed Alternative 1.

Environmental Justice (EJ) / Public Health

As noted above, the project site is located within an EJ Population characterized by Income within the City of Easthampton. The site is located within one mile of three additional EJ Populations characterized by Income within the City of Easthampton. The site is also located within five miles of 15 additional EJ Populations. No languages were identified as being spoken by 5% or more of Limited English Proficiency (“LEP”) residents within one mile of the project site.

The EENF described public involvement activities conducted prior to filing, including advance notification of the project to a list of community-based organizations (CBOs) and tribes/indigenous organizations (the “EJ Reference List”) provided by the MEPA Office. The Proponent circulated an EJ Screening Form to these entities with an overview of the project and information on ways to request a community meeting. According to the EENF, public involvement activities also included two drop-in office hour sessions at the Emily Williston Memorial Library in Easthampton on Wednesday, May 3 and Saturday, May 6, prior to filing the EENF, and the posting of a project fact sheet at neighborhood and community gathering locations within the DGA. Additionally, the Proponent has created a project website that provides general information about the project such as a project description, information on where the project is in the MEPA review process, and a contact form so that members of the public can contact the Proponent directly with questions, comments, or to request a meeting.[4] A copy of the EENF and supporting documentation were distributed to the EJ Reference List prior to filing with MEPA.

The EENF contains a baseline assessment of any existing unfair or inequitable Environmental Burden and related public health consequences impacting EJ Populations in accordance with 301 CMR 11.07(6)(n)1. and the MEPA Interim Protocol for Analysis of EJ Impacts. According to the EENF, the data surveyed show some indication of an existing "unfair or inequitable" burden impacting the identified EJ Populations. The DPH EJ Tool does not identify any municipalities but does identify two census tracts within the one mile DGA as exhibiting "vulnerable health EJ criteria"; this term is defined in the DPH EJ Tool to include any one of four environmentally related health indicators that are measured to be 110% above statewide rates based on a five-year rolling average.[5] Specifically, within the project's DGA, the two census tracts (Census Tract 8223 and Census Tract 8224.02) meet the "vulnerable health EJ criteria" for the following parameter:

- Childhood blood lead

In addition, the EENF indicates that the following sources of potential pollution exist within EJ block groups that are located within the one-mile DGA, based on the mapping layers available in the DPH EJ Tool:

- Major air and waste facilities: 4
- M.G.L. c. 21E sites: 2
- "Tier II" toxics use reporting facilities: 3
- MassDEP sites with AULs: 2
- Underground storage tanks: 6
- EPA facilities: 3
- Road infrastructure: 2 (State Route 141 and State Route 10)
- Other transportation infrastructure: 2 (railway)
- Region transit agencies: 1 (Pioneer Valley Transit Authority with 26 stops within the DGA)
- Energy generation and supply: 2

The EENF states that while the EJ Populations within the DGA may exhibit some existing unfair or inequitable environmental burden, the project will not have disproportionate adverse effects on said EJ Populations. Rather, the EENF states, the project will provide the local community with additional choices for clean and safe housing in a City where housing demand has outpaced the State average and the available housing stock. As discussed below, that traffic impacts along Northampton Street (Route 10) will affect both EJ and non-EJ populations similarly; however, traffic is anticipated to be improved compared to the 2030 Build scenario, following intersection improvements for the proposed site drive and incorporation of additional mitigation measures. In addition, the main sources of potential

[4] See https://www.gza.com/sierra-vista-commons.

[5] See https://matracking.ehs.state.ma.us/Environmental-Data/ej-vulnerable-health/environmental-justice.html. Four vulnerable health EJ criteria are tracked in the DPH EJ Viewer, of which two (heart attack hospitalization and childhood asthma) are tracked on a municipal level and on a census tract level, and two (childhood blood lead, and low birth weight) are tracked only on a census tract level.

construction period impacts are emissions from construction equipment, motor vehicles and fugitive dust emissions from disturbed soil surface areas. According to the EENF, any minor construction adverse effects would be mitigated to the greatest extent practicable through use of construction period best management practices (BMPs). The DEIR should update its analysis of the project's impacts to determine whether the project may result in disproportionate adverse effects, or increase the risks of climate change based on based on the additional analyses requested below.

Traffic and Transportation

Study Area

The EENF includes a TIS of the study area around the project site that evaluates the project's impacts on intersection operations, safety, and bicycle, pedestrian, and transit modes. The intersections within the study area that have been analyzed and evaluated include:

- Northampton Street (Route 10)/Florence Road/Highland Avenue (signalized)
- Northampton Street (Route 10/West Street (signalized)

Comments provided by MassDOT requests that the traffic study area be expanded to include at least three additional intersections that appear to meet the *EEA/MassDOT Transportation Impact Assessment (TIA) Guidelines*.

Trip Generation and Distribution

The EENF states the project is expected to generate 4,382 New unadjusted adt. Base traffic conditions within the study area were developed by conducting turning movement counts (TMCs) and automatic traffic recorder (ATR) counts for both weekday and Saturday volume conditions in September 2021 at the Northampton Street (Route 10)/Florence Road/Highland Avenue intersection and in November 2022 at the Northampton Street (Route 10)/West Street intersection. In addition, ATR counts were conducted along Northampton Street (Route 10) just north of the project site in September 2021 and reconducted over a 48-hour period in January 2023.

Future traffic conditions were projected to the year 2030, using a one percent per year growth rate in base traffic conditions and a number of Institute of Transportation Engineers (ITE) Trip Generation Manual (11th Edition) Land Use Codes (LUC) representing the different components of the project, including:

- LUC 565 – Day Care Center
- LUC 220 – Multifamily Housing (Low-Rise)
- LUC 150 – Warehousing
- LUC 822 – Strip Retail Plaza
- LUC 932 – High-Turnover (Sit-Down) Restaurant
- LUC 912 – Drive-in Bank

The TIS also notes that there is one notable approved development near the project site that would generate a significant volume of traffic on study area roadways. Specifically, the TIS identifies a project located at 113 Northampton Street (Route 10) consisting of a 2,227-sf coffee shop (Starbucks) with 33 parking spaces, generating 1,800 adt with approximately 198 of those trips occurring during the morning peak hours and 98 occurring during the afternoon peak hours. Given the nature of the proposed land use, the project is expected to generate 373 New unadjusted adt during the weekday morning peak hour and 525 New unadjusted adt during the weekday evening peak hour. Trip distribution for the project results in 39% of site traffic traveling to/from the site along Northampton Street (Route 10) to the north of Florence Road/Highland Avenue, 22% of site traffic traveling to/from the site along Florence Road north of Northampton Street (Route 10), 7% of site traffic traveling to/from the site along West Street west of Northampton Street (Route 10), and 32% of site traffic traveling to/from the site along Route 10 south of West Street.

Traffic Operations

Level-of-service (LOS) analyses were conducted within the study area under existing and projected volume conditions to determine the effect that the additional site-generated traffic will have on traffic operations. LOS is represented using letter grades “A” through “F,” with LOS A representing very low delays and free flow conditions and LOS F representing unacceptable conditions for most drivers and conditions in which vehicle demand generally exceeds roadway capacity. According to the TIS, the intersection of Northampton Street (Route 10)/Florence Road/Highland Avenue currently operates at LOS D during the morning peak hour and at LOS E during the evening peak hour, whereas the intersection of Northampton Street (Route 10)/ West Street currently operates at LOS B during the morning peak hour and LOS D during the evening peak hour. Under 2030 No-Build conditions, the intersection of Northampton Street (Route 10)/Florence Road/Highland Avenue will decrease from LOS D to LOS E during the morning peak hour and from LOS E to LOS F during the evening peak hour. Similarly, the intersection of Northampton Street (Route 10)/ West Street will decrease from LOS B to LOS C during the morning peak hour and decrease from LOS D to LOS F during the evening peak hour. Under 2030 Build conditions (without any proposed mitigation), the intersection of Northampton Street (Route 10)/Florence Road/Highland Avenue will experience the same decrease in LOS under the 2030 No-Build conditions; however, the intersection of Northampton Street (Route 10)/ West Street will decrease from LOS C to LOS E during the morning peak hour and LOS D to LOS F during the evening peak hour, when compared to 2030 No-Build conditions. Under 2030 Mitigated Build (which incorporates the Transportation Demand Management (TDM) measures detailed below) conditions, the intersection of Northampton Street (Route 10)/Florence Road/Highland Avenue will improve from LOS E to LOS D during the morning peak hour and from LOS F to LOS E during the evening peak hour, compared to 2030 Build conditions. Similarly, the intersection of Northampton Street (Route 10)/ West Street will improve from LOS E to LOS C during the morning peak hour and from LOS F to LOS D during the evening peak hour.

As noted, MassDOT has requested supplemental analysis of traffic patterns at additional intersections. MassDOT is planning a Complete Streets Project (MassDOT Project No. 608423) along Route 10 that will address existing deficiencies, improve multi-modal mobility, and help mitigate the impacts of the project proposed herein. Therefore, the Proponent should coordinate mitigation efforts with the MassDOT District 2 office prior to the preparation of the DEIR. In addition, comments provided by the Pioneer Valley Planning Commission (PVPC) note the City and Pioneer Valley Metropolitan Planning Organization (PVMPO) are working collaboratively to implement the Easthampton Downtown Complete Streets project (612258) as part of the region’s Transportation

Improvement Program (TIP). The DEIR should expand the traffic analysis presented in the EENF in light of other roadway improvements underway, and should update mitigation commitments accordingly.

Site Access

As noted above, site access will be provided via an internal roadway that intersects with Northampton Street (Route 10). To facilitate this new connection, the project proposes to install a traffic signal or roundabout on Northampton Street (Route 10) at the project site drive. Signal retiming at the Northampton Street (Route 10)/Florence Road/Highland Avenue and Northampton Street (Route 10)/West Street intersections would also be needed to improve traffic operations at the signal, reducing delays. Gated emergency access will also be provided from Colonial Avenue (immediately southwest of the project site) to ensure a secondary means of access is available for emergency responders. The EENF notes that the Proponent will continue to work with the City and MassDOT to select a preferred site access alternative and determine if additional mitigation measures are necessary to improve site access and safety. The DEIR should identify the preferred intersection alternative (roundabout or signalized intersection) based on said consultation, discuss potential impacts, and identify appropriate mitigation based on the selected alternative.

Transportation Demand Management (TDM)

As detailed in the EENF, the Proponent has committed to implementing a program of TDM strategies that is anticipated to reduce traffic volumes 2.5% between 2030 Build and 2030 Mitigated Build conditions. The Proponent has committed to a number of specific TDM measures, including:

- Installation of a traffic signal or roundabout at the intersection of the project site's access drive and Northampton Street (Route 10) with pedestrian crosswalks;
- Traffic signal retiming at the intersections of Northampton Street (Route 10)/Florence Street/Highland Avenue and Northampton Street (Route 10)/West Street;
- Installation of 20 electric vehicle (EV) charging stations with designated parking spaces in front of each residential building;
- Incorporating wide sidewalks crosswalks, and speed humps at critical road crossings to facilitate safe biking and pedestrian access;
- Providing bicycle racks for the residential and commercial buildings;
- Reduction of employee trips during peak periods through alternative work schedules, telecommuting and/or flex time will be considered with tenants;
- Strict enforcement of the Massachusetts vehicle anti-idling law; and
- Consideration of incorporating Park-n-Ride Lots.

Comments provided by the PVPC state that the EENF erroneously notes that the site is not currently served by transit; to the contrary, the Pioneer Valley Transit Authority (PVTA) Nashawannuck Express Flex/Van Service serves Route 10 in the vicinity of the project site. The EENF notes the Proponent may consider providing a park-and-ride lot on site if the current PVTA Route 41 bus route is modified to pass by the site.

Comments provided by MassDOT request additional evaluation of existing bicycle and pedestrian traffic and infrastructure within the traffic study area. Improvements to multi-modal site access should be incorporated into the proposed TDM measures as additional mitigation for project related impacts. MassDOT identifies a number of other TDM measures in comments that should be evaluated and incorporated into the project. MassDOT also notes the Proponent will be required to implement a Traffic Monitoring Program (TMP) for a period of five years, beginning six months after occupancy of the full-build project. These items should be addressed in accordance with the Scope.

Air Quality

The EENF included an analysis of mesoscale emissions of volatile organic compounds (VOCs) and oxides of nitrogen (NO_X) under three scenarios: 2030 No-Build, 2030 Build without TDM (Base Case), and 2030 Build with TDM (Mitigation Case). The EENF notes that the mesoscale analysis utilized the U.S. EPA MOVES3 Mobile Source Emission Factor Model and complied with the MassDEP Guidelines for Performing Mesoscale Analysis of Indirect Sources. According to the EENF, emissions within the study area under 2030 No-Build conditions were modeled to consist of 8.52 kilograms per day (kg/day) of VOC and 1.44 kg/day of NO_X. Under 2030 Base Case conditions, emissions were modeled to consist of 12.33 kg/day of VOC (3.81 kg/day increase from the 2030 No-Build condition) and 1.51 kg/day of NO_X (0.7 kg/day increase from the 2030 No-Build condition). Comparatively, under 2030 Mitigation Case conditions, which the Proponent has committed to implementing, emissions were modeled to consist of 12.02 kg/day of VOC (3.50 kg/day increase from the 2030 No-Build condition) and 1.47 kg/day of NO_X (0.3 kg/day increase from the 2030 No-Build condition).[6] These numbers show a modest increase from No-Build to Build conditions; however, the EENF did not include a review of pollutant emissions under Existing conditions as a point of comparison nor did it evaluate other criteria air pollutants such as coarse and fine particulate matter (PM_{10} and $PM_{2.5}$). I also note that an increase in any air pollutant of over 1 ton per year (tpy) requires "limited plan" approval under MassDEP's air permitting regulations for stationary sources (310 CMR 7.02). Given that the level of VOCs over the traffic study area appears comparable, the Proponent should consider mitigation to address this condition, particularly as it may affect nearby EJ Populations. This information should be provided in accordance with the Scope.

Land Alteration and Impervious Surfaces

As discussed above, the project will result in the direct alteration of 21.5 acres of land, consisting of a mix of partially developed land, agricultural fields, wetlands, and forest. Approximately 4.4 acres of tree removal is proposed, and 9.3 acres of trees will be retained. According to the EENF, the project will convert current turf lawn, inactive agricultural fields, and forest edge habitat into a mixed-use development, resulting in the creation of 11.8 acres of impervious surface. Specific components of the development would include a Roots Learning Center (Daycare facility) consisting of approximately 9,000 sf; a Roots Gymnastic Center consisting of approximately 7,000 sf; a sit-down restaurant, with a 220-seat capacity, consisting of approximately 5,500 sf; a bank consisting of approximately 3,200 sf; a standalone small retail building consisting of approximately 4,000 sf; two mixed-use warehouse buildings consisting of approximately 6,800 sf each; a mixed-use retail/office building with 14 apartments above consisting of approximately 16,000 sf; and ten mid-rise (3 floor) apartments buildings,

[6] When converted to tons per year (tpy), the Mitigation Case consists of 4.84 tpy of VOC (1.04 tpy increase from the 2030 No-Build condition) and 0.59 tpy of NO_x (0.01 tpy increase from the 2030 No-Build condition).

providing 188 units total, consisting of nine 13,600 sf buildings and one 18,000 sf building. Approximately 11.5 acres or 35% of the total property will remain undisturbed. As discussed above, the EENF characterizes the site as partially developed but does not provide a complete characterization of the site. Additional information should be provided in the DEIR to fully evaluate the project's impacts.

Wetlands and Stormwater

As noted above, wetland resource areas are located on and adjacent to the project site. According to the EENF, the project will construct a new stream crossing to gain access to the northeastern portion of the project site and will subsequently remove the existing, illicit wooden stream crossing. The proposed crossing will be compliant with the Massachusetts Stream Crossing Design Standards and will have a width of 1.25 times the existing bank full width, thereby preserving the integrity of the Bank. Therefore, it is anticipated that the project will not result in any permanent impacts to wetland resource areas.

As stated above, the Easthampton Conservation Commission (or MassDEP in the case of an appeal) will review the project for its consistency with the Wetlands Protection Act (WPA), the Wetland Regulations (310 CMR 10.00) and associated performance standards including the Massachusetts Stormwater Management Standards (SMS), Stream Crossing Design Standards, and local bylaws. According to the EENF, a Notice of Intent (DEP File No. 151-0322) was filed with the Easthampton Conservation Commission on November 21, 2022. Comments provided by the Easthampton Conservation Commission state that in June 2022, an Enforcement Order was issued for unpermitted activities related to fill within the 100ft Buffer Zone, historic fill within BVW (likely due to past unpermitted agricultural activities), and the installation of an unpermitted stream crossing which does not meet the Stream Crossing Standards. A separate restoration plan for the removal of the unpermitted crossing and restoration of those related impacted wetland resource areas has been approved and is currently being implemented by the Proponent. Comments also note that the unpermitted crossing will be allowed to remain for a period of two years so that it may be utilized for the construction of the new crossing proposed as part of the project described herein.

Comments provided by MassDEP note that the Proponent asserts eligibility for review under the Limited Project provisions contained at 310 CMR 10.53(3)(e). As for all Limited Projects, allowance under these provisions is at the discretion of the local Conservation Commission and to the extent practicable, work must comply with the General Performance Standards for all potentially affected wetland resource areas. Comments also note that the bridge supports and footings, associated with the new proposed stream crossing, are to be installed in proximity to BVW. The project must demonstrate how the bridge will be installed in a manner that avoids alteration to the adjacent BVW and fully complies with the Massachusetts Stream Crossing Standards. In addition, comments note additional information is needed to clarify how the water line and sanitary sewer line crossing will be installed in a manner that avoids alteration to regulated resource areas. Comments indicate that the WPA and associated regulations do not have a designation of "temporary impacts" to resource areas. Should the installation of the utility lines meet the definition of "Alter" in 310 CMR 10.04, then the Proponent is required to identify the nature and extent of the alteration and demonstrate how the proposed project will meet the performance standards.

In order to mitigate increases in peak discharge rates as a result of the new impervious surfaces, a comprehensive stormwater management system has been designed that includes deep-sump, hooded catch basins, oil and grit separators/hydrodynamic separator units to remove total suspended solids (TSS), detention basins with sediment forebays, and aboveground infiltration basins. Stormwater will be captured and treated by detention and/or infiltration basins located throughout the property. The basin locations have been designed to maintain existing hydraulic patterns and flow discharge points. Runoff from the roadways and parking lots will be captured via catch basins and pipe networks, treated via water quality structures and will then be discharged to the nearest basin. Building roof runoff will be collected via downspouts and piped to the stormwater basins. Outflow from the basins will be regulated by individual outlet control structures in each basin with flow piped toward the on-site intermittent stream and discharged via a series of level spreaders. Based on the information contained in the EENF, it is unclear whether there is adequate separation between the proposed infiltration/detention basins and groundwater across the site. In addition, the Stormwater Report, included with the EENF, states that the project site does not qualify as a Land Use with Higher Potential Pollutant Loads (LUHPPL); however, the SMS defines a LUHPPL to included parking lots with high-intensity-uses (1000 vehicle trips per day or more) and the proposed project is anticipated to generate 4,382 vehicle trips per day.

According to the Stormwater Report, the Proponent evaluated precipitation depth and peak intensities, utilizing NOAA Atlas 14 precipitation data (2yr – 3.13"; 10yr – 5.04"; 25yr – 6.23"; and 100yr – 8.07") for a 24-hour storm event. The stormwater management system has been designed to convey and provide groundwater recharge for stormwater runoff up to the current 100-year storm event (8.07"). The stormwater management system will also provide at least 90% TSS removal and there will be a reduction in peak rates of runoff for all storms analyzed, including up to the current 100-yr, 24-hour storm event. Additionally, as noted above, the eastern portion of the site is located within a MassDEP Approved Zone II of a public water supply. The EENF states that the project has been designed in compliance with the SMS and therefore will not alter the volume or rate of water discharged from the site and no negative impacts to groundwater supply or quality are anticipated.

Comments provided by the Easthampton Conservation Commission state that the Stormwater Report is currently undergoing a peer review in order to assess compliance with the Easthampton Stormwater Management Ordinance, specifically with respect to the design of the stormwater management system, future slope stability due to tree removal, and stormwater basin location/design. However, comments also note it has not yet been determined whether the peer review will result in any changes to the proposed stormwater management system design.

Comments provided by MassDEP state that the project is required to demonstrate compliance with the SMS, per 310 CMR 10.05(6)(k), and the Water Quality Regulations at 314 CMR 9.00. Comments state the Proponent should consider environmentally sensitive site design and planning. Considerations should include low impact development techniques, stormwater best management practices (BMP) utilizing source control (nonstructural control measures), structural BMPs and maintenance. MassDEP also notes that stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near 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 MassDEP to be suitable for managing discharges to such areas. In addition, comments state that the use of conveyances of stormwater through underground infiltration structures may qualify as under the jurisdiction of the MassDEP Underground

Injection Control (UIC) program, and if so, must be registered with MassDEP. The Proponent should coordinate with MassDEP regarding the final proposed stormwater management system design and determine if the proposed project requires the submission of a BRP WS-06 UIC Registration application.

Climate Change

Adaptation and Resiliency

Effective October 1, 2021, all MEPA projects are required to submit an output report from the MA Resilience Design Tool to assess the climate risks of the project. Based on the output report attached to the EENF, the project has a "High" exposure rating based on the project's location for the extreme precipitation (urban flooding) and extreme heat climate parameters. The project location also scores "Low" in ecosystem benefits. Based on the 40-year useful life and the self-assessed criticality identified for the mixed-use development (including the ten residential buildings, Roots Gymnastics & Child Care Facility, and restaurants and mixed-use commercial/retail space, as three separate assets), the MA Resilience Design Tool recommends a planning horizon of 2070 and a return period associated with a 10-year (10% chance) storm event. It also recommends planning for the 50th percentile for applicable extreme heat parameters. These recommendations appear to be based on a "Low" criticality assessment of the assets and a relatively shorter useful life, which is not appropriate given the scale of the development. This analysis should be supplemented in accordance with the Scope.

The MA Resilience Design Tool output indicates that the maximum annual daily rainfall exceeds 10" within the overall project's useful life; the project site is anticipated to have a 30+ day increase in days over 90 degrees Fahrenheit within project's useful life; and the project proposes to remove trees and create new impervious surface. These factors are indicated in the Tool as contributing to "High" exposures for the extreme precipitation (urban flooding) and extreme heat climate parameters. According to the MA Resilience Design Tool output, the projected 24-hour precipitation depth associated with a 2070 10-year storm event is 7.1 inches. Therefore, it appears that the stormwater system, which is designed to convey and provide recharge for the current 100-year storm event (8.07") would be resilient to the future (2070) 10-year storm event as recommended by the Tool. To help mitigate against potential heat island impacts, the Proponent has incorporated several measures into the project's design including limiting overall tree removal; configuring stormwater basins between buildings or along tree lines to provide at least partial shading of the basins to limit water warming prior to release or infiltration; locating stormwater basins and other site development features outside the RA; designating at least 75 parking spaces to be built only if demand requires; planting and maintaining a landscape plan with at least 190 shade trees around buildings, and along roadways and parking areas; and providing a recreational area for residents that includes a swimming pool.

Greenhouse Gas Emissions (GHG)

This project is subject to review under the May 5, 2010, Revised MEPA Greenhouse Gas Emissions Policy and Protocol (MEPA GHG Policy), which requires Proponents to quantify carbon dioxide (CO_2) emissions and identify measures to avoid, minimize or mitigate such emissions. The analysis should quantify the direct and indirect CO_2 emissions of the project's energy use (stationary sources) and transportation-related emissions (mobile sources). Direct emissions include on-site stationary sources, which typically emit GHGs by burning fossil fuel for heat, hot water, steam and other processes. Indirect emissions result from the consumption of energy, such as electricity, that is generated off-site by burning of fossil fuels, and from emissions from vehicles used by employees, vendors, customers and others.

Stationary Sources

As noted above, the project proposes a total of 60,000 sf of commercial space (consisting of a restaurant, bank, retail, a gymnastics studio, day care center, and warehouse/storage units) and 350,000 sf of residential space (consisting of 202 residential units). The mixed-use retail building includes one floor for retail activity and two floors for residential units. The retail activity was evaluated in the commercial building analysis while the residential units were evaluated in the analysis of residential space.

Commercial Buildings

The EENF provides estimates of stationary source emissions for the Base Case and Mitigation Case, based on the selected mitigation measures, for each of the commercial building components of the project. The stationary Base Case represents the International Energy Conservation Code (IECC) 2021 Edition with Massachusetts Stretch Energy Code Amendments (the Code), effective July 1, 2023, and ASHRAE 90.1-2019. The Mitigation Case includes all energy saving measures, as described below, that the project has committed to, based on achieving a total of 15 credits listed in the IECC 2021 Edition. The Base Cases and Mitigation Cases were combined to provide a cumulative estimate of emissions for the commercial component of the project. The EENF asserts that the combined Base Case would result in 244.7 short tons of CO_2 per year (CO_2/year) and the Mitigation Case would result in 202 short tons of CO_2/year, a reduction of 17.5% from the Base Case. To achieve these emission reductions, the project, as proposed, will utilize energy efficient windows and building envelope; high-efficiency heating, ventilation, and air conditioning (HVAC) systems; efficient propane-fired hot water heaters; energy efficient interior and exterior lighting; Energy STAR equipment and appliances; and low-flow fixtures and plumbing. Additionally, the project proposes to install a cumulative 90,000 sf of rooftop Photovoltaic (PV) arrays across the project, which would generate approximately 1.26 Megawatts (MW) of electricity.

Comments provided by DOER support the energy efficiency commitments made by the Proponent, but also identify errors in the analysis and opportunities for additional improvements. In particular, comments state that the commercial buildings analysis utilized an incorrect baseline in evaluating the Base Case and is limiting mitigation to efficiency improvements that are required by the Code as part of the baseline. The EENF also makes extensive references to proposed R values (R value cavity and R value continuous); however, the R value table has been removed from the Code and only the U value table remains. Comments note that additional information is needed to fully evaluate the project based on the proposed vertical envelope; thermal bridge derating; air infiltration; and ventilation energy recovery. I refer the Proponent to DOER’s comment letter for additional guidance on future analysis.

Residential Buildings

According to the EENF, the residential units will two options, a two-bedroom apartment or a three-bedroom apartment. Generally, the three-bedroom apartments will be situated on the corners of each floor with the smaller two-bedroom apartments located in the middle of the floor. The EENF provides estimates of stationary source emissions for the Base Case and Mitigation Case for the residential buildings based on a third-floor three-bedroom apartment with exterior walls on the north and west sides, in order to yield a conservative result. The project proposes to achieve a HERS Index score of 42, by implementing a number of energy efficiency measures, such as triple pane windows, highly energy-efficient appliances, and rooftop PV arrays. In addition, the Proponent plans to perform a Passive House evaluation performed by the utility to determine if those standards could potentially be achieved in a cost-effective manner. It is expected that residential units with shared side walls (middle location) and corner units without exterior walls will achieve lower HERS scores.

Comments from DOER note additional information is needed to fully evaluate the residential component of the project with respect to quality envelope, heat recovery, and management of solar gains. Comments also indicate that the project could also benefit from Passivehouse design, which should be thoroughly evaluated.[7] The project is proposing extensive use of propane water heating in all buildings, which can result in high costs and high emissions. Comments state that a switch to electric air source heat pumps for water heating would reduce operating costs by $50,000 per year and would reduce lifetime emissions generated by the project by 56% in 2050.

Mobile Sources

The EENF provides estimates of GHG emissions for the 2030 No-Build, 2030 Build without TDM (Base Case), and 2030 Build with TDM (Mitigation Case). GHG emissions from mobile sources are measured in tons of CO_2 equivalents per year (tpy). Emission estimates were calculated based on the roadway segments in the traffic study area; the length of each road segment; the vehicle approach (free-flow or queue); average speed; and traffic volumes for each segment utilizing the EPA MOVES3 model project scale option. The 2030 No-Build would result in 2,199 (tpy) due to an anticipated one percent per year annual growth rate in traffic volumes. The Base Case (Build condition) would result in an increase of 467 tpy (2,666 tpy) over the No-Build scenario due to increased vehicle traffic resulting from project-generated vehicle trips. The Mitigation Case would increase emissions over the No-Build by 401 tpy (2,600 tpy), but represents a 66 tpy (or 1.03%) reduction as compared to the Base (Build) Case. The EENF proposes two electric vehicle (EV) charging stations at each residential building for a total of ten EV charging stations. Comments from DOER recommend the project for increasing the number of EV charging stations at each residential building from two to five and providing at least two EV charging stations at each commercial building. DOER also notes that an EV readiness of 25% for all buildings is recommended but additional information is needed to evaluate how much EV readiness is proposed for each building. I strongly encourage the Proponent to increase its commitment to EV charging to align with statewide GHG reduction goals; EV readiness and charging stations should be addressed in the DEIR.

[7] MassSave currently pays $3,000 per unit for Passivehouse (over $600,000 for the proposed 202 units) and offers incentives for Passivehouse evaluations and preliminary design.

Water Supply and Wastewater Generation

As noted above, the project is anticipated to generate 68,820 gpd of water demand and wastewater generation. The project will be serviced by existing municipal sewer and water with connections to the Easthampton Main Sewer Interceptor, which runs along the northeastern property boundary, and an existing water main located in Northampton Street (Route 10). During review of the EENF, commenters provided documents that had been submitted to the Easthampton Planning board in their review of the project. In particular, a letter from the Easthampton Fire Chief notes that water main upgrades are required to fully service the project and that no work beyond Phase 2 should proceed until water supply upgrades have been performed.

Comments provided by MassDEP recommend that the Proponent coordinate with the local sewer authority regarding permitting the sewer connection relative to this project and consult with the Easthampton Department of Public Works Sewer Division to ensure compliance with the City's Infiltration and Inflow (I/I) removal requirements, including mitigation of the volume of stormwater runoff into combined sewers when a new connection or extension is permitted. Comments also recommend detailed consultation with the Easthampton Department of Public Works Water Division to ensure there is adequate capacity and infrastructure as well as compliance with local requirements. In addition, MassDEP advises compliance with all cross-connection requirements, including coordination with the City and the use of backflow prevention devices on municipal water sources throughout the facility and during construction.

Rare Species

As described previously, a portion of the project site is mapped as Estimated Habitat (EH 1319) and Priority Habitat (PH 2084). State-listed species and their habitats are protected under the Massachusetts Endangered Species Act (MESA) (M.G.L. c. 131A) and its implementing regulations (321 CMR 10.00). While no work is currently proposed within mapped Estimated Habitat, one apartment building and a stormwater basin, which will be seeded with a Conservation Seed Mix, will be partially located within mapped Priority Habitat for Rare Species. All projects or activities proposed within Priority Habitat, which are not otherwise exempt pursuant to 321 CMR 10.14, require review through a direct filing with NHESP for compliance with the MESA Regulations (321 CMR 10.18). NHESP has reviewed the proposed project pursuant to MESA and issued a determination (NHESP File No. 22-41496) on December 15, 2022, stating that the project, as described herein, will not result in a prohibited Take of state-listed rare species.[8]

Historic and Archaeological Resources

As noted above, the property previously contained a house (EAH.694), dating to approximately 1840, that was listed by MHC in the *Inventory of Historic and Archaeological Assets of the Commonwealth*.[9] According to the EENF, the Proponent submitted Project Notification Form (PNF) to

[8] On July 17, 2023, NHESP confirmed via email from Jesse Leddick (NHESP) to Nicholas Moreno (MEPA) that there are no additional comments or concerns relative to state-listed species and their habitats beyond those detailed in the issued determination.

[9] Although the house was listed in the *Inventory of Historic and Archaeological Assets of the Commonwealth*, MHC notes the house is neither on the State Register of Historic Places nor eligible for listing on the National Register of Historic Places.

the MHC in November 2022 disclosing the intention to demolish the structure and construct a multi-building mixed use development on the project site. After review, a determination (MHC# RC.72301) was issued on December 21, 2022 by MHC, stating that the project is unlikely to affect significant historic or archaeological resources. The Proponent subsequently presented the project to the Easthampton Historical Commission on January 11, 2023 and February 8, 2023, which issued approval the demolition of the house pursuant to the Easthampton Demolition Delay Ordinance. The house and two-part gabled barn have since been demolished in compliance with applicable regulations.

Construction Period

According to the EENF, the project is expected to commence in December 2023 (following conclusion of MEPA review and other permit reviews) and be completed by December 2025. Prior to the commencement of work, erosion and sedimentation controls will be established throughout the work area and will be maintained until the site is stabilized. The project has been designed to be constructed in four phases in order to manage overall land disturbance, construction disruptions to traffic and noise, and to allow for appropriate erosion and sediment control. Phase 1 will include establishing access from Northampton Street through the site and across the intermittent stream; the removal of the unauthorized crossing; and the construction of the Roots Learning Center, the Roots Gymnastic Center, and associated parking areas and stormwater features. Phase 2 will include construction of the three apartment buildings in the northeast portion of the site and appurtenant features including parking and stormwater. Phase 3 will include construction of the bank, the standalone retail space near the Roots Gymnastics Center, and four additional apartment buildings in the northeast portion of the site as well as their appurtenant features including parking areas, stormwater management features, a pool, playground, and a community garden. Phase 4 will include construction of the restaurant, the mixed-use commercial buildings with apartments above, the two warehouse buildings, and the three remaining apartment buildings which will be constructed alongside their access roadway, parking areas, and stormwater management features.

Comments provide by MassDEP state that dewatering activities may be necessary at various stages of the project. Should dewatering be necessary for project implementation, dewatering should be conducted such that no sediment enters the on- or off-site wetland resource areas. In addition, the Proponent must maintain appropriate stream flow during the work and ensure adequate capacity for bypassing the work area or implement provisions to accommodate heavy rain or flood events. To the extent dewatering activities are proposed, details of how this will be accomplished should be included in the DEIR.

SCOPE

General

The DEIR should follow Section 11.07 of the MEPA regulations for outline and content and provide the information and analyses required in this Scope. It should clearly demonstrate that the

Proponent will avoid, minimize, and mitigate Damage to the Environment to the maximum extent practicable through project alternatives and design.

Project Description and Permitting

The DEIR should describe any changes to the project since the filing of the EENF. The Single EIR should identify, describe, and assess the environmental impacts of any changes to the project that have occurred between the preparation of the EENF and DEIR. The DEIR should also include an updated list of required Permits, Financial Assistance, and other state, local and federal approvals and provide an update on the status of each of these pending actions. The DEIR should include a description and analysis of applicable statutory and regulatory standards and requirements, and a discussion of the project's consistency with those standards.

The DEIR should include revised site plans for existing and post-development conditions. Plans should clearly identify all project components (e.g., structures, roadways, etc.); impervious areas; surface elevations; wetland resource areas; rare species habitat; and stormwater and utility infrastructure (including EV infrastructure). These plans should also identify roadway infrastructure; bicycle and pedestrian infrastructure; the type and location of potential vehicle and bicycle parking (including EV parking); and adjacent land uses.

The information and analyses identified in this Scope should be addressed within the main body of the DEIR and not in appendices. In general, appendices should be used only to provide raw data, such as traffic counts, drainage calculations, TSS removal rates, and air quality/GHG emissions data, that is otherwise adequately summarized with text, tables and figures within the main body of the DEIR. Information provided in appendices should be indexed with page numbers and separated by tabs, or, if provided in electronic format, include links to individual sections. Any references in the DEIR to materials provided in an appendix should include specific page numbers to facilitate review.

Environmental Justice (EJ) / Public Health

The DEIR should include a separate section on "Environmental Justice," and contain a description of measures the Proponent has taken, and intends to undertake, to promote public involvement by EJ Populations during the remainder of the MEPA review process and subsequent permitting, including a discussion of any of the best practices listed in the MEPA EJ Public Involvement Protocol that the project intends to employ or has employed by the time of the DEIR filing. The DEIR, or a summary thereof, should be distributed to the EJ Reference List, and an updated list should be obtained from the MEPA Office prior to filing the DEIR so as to ensure that organizational contacts are up to date. The Proponent should continue outreach and engagement prior to filing the DEIR, and should conduct one or more community meetings prior to filing the DEIR.

As further discussed below, the DEIR should update its analysis of the project's impacts to determine whether the project may result in disproportionate adverse effects, or increase the risks of climate change, on the identified EJ Populations, in accordance with 301 CMR 11.07(6)(n)2. and the MEPA Interim Protocol for Analysis of EJ Impacts, based on the revisions to the traffic study, mesoscale air quality analysis, and GHG emissions analysis. As noted below, the DEIR should provide updated analysis of air pollutants other than VOCs and NOx, and consider mitigation for increases of any pollutant over 1 tpy from the No Build to Build condition. The DEIR should estimate the number of diesel truck trips that are anticipated to travel to/from the site daily based on the anticipated building uses. The DEIR should also estimate the number of construction period truck trips that are anticipated for the project, and indicate routes of travel through the identified EJ Populations within one mile of the site.

Traffic and Transportation

The DEIR should include a revised TIS that evaluates an expanded traffic study area to include the intersections of Route 10/O'Neil Street, Route 10/Pleasant Street, and Route 10/Union Street at a minimum. Other intersections where project generated trips are anticipated to increase peak hour traffic volumes by five percent or more, or by more than 100 vehicles per hour should also be evaluated in the revised TIS. The DEIR should also provide a detailed summary of all relevant data, including capture assumptions congruent with the ITE Trip Generation Manual (11^{th} Edition), used to estimate net trip generation. The DEIR should identify the preferred intersection alternative (roundabout or signalized intersection) and discuss how the roadway improvements will impact traffic operations (including at Mountainview Street across from the project site) and support the implementation of the MassDOT Complete Streets project. The DEIR should also include a discussion of how the Proponent will evaluate the need to construct additional parking.

The DEIR should include an evaluation of bicycle and pedestrian traffic within the study area and should identify existing bicycle and pedestrian infrastructure serving the project site, document gaps in existing infrastructure and desire lines for future use, and recommend multi-modal site access as a component of project mitigation. The DEIR should also summarize transit operations within the study area and document the feasibility of transit commutation to the project site. The Proponent should consult with consult with the PVTA to identify the potential to provide for future transit service to the site. The DEIR should provide an update on any such coordination and identify any changes made to the project design or mitigation commitments in response to this consultation.

The DEIR should provide a detailed TDM program with the goal of reducing vehicle trips by employees of the project. I refer the Proponent to comments provided by MassDOT, which are incorporated herein by reference, which include a list of minimum potential measures that should be incorporated. The DEIR should also quantify the traffic and emissions reductions associated with the proposed TDM measures to the extent feasible. The DEIR should include a firm commitment to implementing a Transportation Monitoring Program (TMP) and should describe specific measures that will be included in the TMP.

MassDOT comments have indicated that other roadway improvements are underway in the immediate vicinity of the project site, including a Complete Streets Project (MassDOT Project No. 608423) along Route 10. The DEIR should evaluate the project's mitigation measures in light of these improvements to assess the adequacy of mitigation with and without the addition of other roadway improvements. To the extent TDM remains the only mitigation provided by the proponent, the DEIR should contain a discussion of how these measures will be made legally enforceable through tenant agreements or other means, and how the effectiveness of the measures will be monitored over time. The DEIR should clearly state assumptions of the percentage decrease in traffic and associated air emissions associated with the Proponent's mitigation commitments, including TDM. The Proponent should coordinate mitigation efforts with the MassDOT District 2 office prior to the preparation of the DEIR.

Air Quality

The DEIR should supplement the mesoscale air quality analysis to include an evaluation of VOCs and NO_x under Existing conditions in comparison to future condition. The DEIR should also provide an evaluation of PM_{10} and $PM_{2.5}$ and provide percentage increases/reductions for Existing, 2030 No-Build, 2030 Base Case, and 2030 Mitigation Case conditions. The DEIR should also specifically discuss the project's impacts at specific intersections adjacent to the identified EJ Populations where traffic generated by the project is likely to extend. To the extent data are available, the DEIR should estimate the increase in air pollutants at those locations. If any air pollutant is anticipated to increase over 1tpy from No Build to Build conditions at any single intersection or over the traffic study area, the DEIR should consider mitigation to address the increase. The DEIR should also discuss additional mitigation that the project will adopt to minimize air quality impacts from traffic.

Land Alteration and Impervious Surfaces

The DEIR should differentiate between areas of the existing site that are currently paved/impervious and areas that have been previously altered but not paved/impervious. The DEIR should compare how proposed impervious cover (buildings and pavement) compares to the updated characterization of the existing property. The DEIR should also characterize and quantify the new land alteration including the type of vegetation that will be cleared (i.e., mature trees, scrub shrub, etc.). It should provide a comprehensive evaluation of all measures to reduce the amount of land alteration and conversion of impervious areas to pervious materials, including reductions in building program, roadway widths and parking areas; use of pervious pavement for roadways and/or sidewalks; land banking of parking until warranted by demand; and supplemental landscaping or tree planting to mitigate impacts associated with clearing. It should cumulatively and separately quantify the total amount of alteration and fill associated with each of the buildings, roadways, parking, wastewater, water and stormwater infrastructure, lawns and landscaping, and other project components.

The DEIR should include site plans that clearly locate and delineate areas proposed for development and areas to be left undisturbed. Since the project is anticipated to be phased, the DEIR should clearly identify the activities proposed for each phase and the area to be developed. The DEIR should describe how proposed land alteration, such as clearing, regrading, or paving, will be limited to the minimum area necessary at any time. The DEIR should provide a plan that clearly identifies areas of cut and fill and provide estimates of cut and fill volumes to achieve proposed site grades.

Wetlands and Stormwater

The DEIR should demonstrate that all components of the project are designed to meet the appropriate performance standards for the relevant wetland resource areas and how the project will protect the interests of the WPA. The DEIR should demonstrate how the bridge will be installed in a manner that avoids alteration to the adjacent BVW and fully complies with the Massachusetts Stream Crossing Standards. The DEIR should include a narrative with accompanying plans that describes how the water line and sanitary sewer line, located at the new proposed stream crossing, will be installed in a manner that avoids alteration to regulated resource areas.

The DEIR should provide an updated Stormwater Report that includes details about the design and function of the proposed stormwater system, including a discussion of any low impact development techniques, stormwater BMPs utilizing source control (nonstructural control measures), structural BMPs, and maintenance requirements. The DEIR should confirm whether there is adequate separation between the bottom of each infiltration/detention basin and the maximum groundwater elevation to ensure groundwater quality. It should also include a discussion as to whether the proposed project meets the definition of a LUHPPL and how the project will comply with the SMS. The DEIR should clearly identify any changes made to the stormwater management system design resulting from the peer review process currently underway.

The DEIR should include a plan and narrative depicting the catchment area intended to be attenuated by each of the infiltration basins/detention basins, indicating which stormwater connections are associated directly with each of the basins. The DEIR should describe all proposed pre-treatment BMPs within the stormwater treatment train and provide a draft stormwater Operation and Maintenance Plan and total suspended solids removal rates. The DEIR should identify and discuss the specific source control and pollution prevention measures and the specific structural stormwater BMPs proposed to manage discharges to the MassDEP Approved Zone II. Additionally, the Proponent should coordinate with MassDEP regarding the final proposed stormwater management system design and determine if the proposed project requires the submission of a BRP WS-06 UIC Registration application. The DEIR should provide an update on any such coordination and identify any changes made to the project design or additional permits/approvals needed to be obtained in response to this consultation.

Climate Change

Adaptation and Resiliency

As discussed above, the DEIR should evaluate whether the project is maximizing opportunities for environmentally sensitive site design and low impact development techniques to promote site resiliency based on project future climate conditions. The DEIR should also describe the specific design measures that will be implemented to avoid or minimize heat impacts on the surrounding environment, including but not limited to the number of new trees to be planted on-site and the potential use of high albedo products that will better reflect sunlight and reduce heat impacts. The DEIR should evaluate the efficacy of the stormwater management system over additional storm scenarios, including the 25-year and 50-year condition as of 2070. Information available through the Resilient MA Climate Change Projections Dashboard could be used as a resource.[10]

Greenhouse Gas Emissions (GHG)

The DEIR should include a revised GHG emissions analysis consistent with the recommendations identified in the DOER comment letter, which is incorporated herein by reference. Specifically, the Base Case should be revised to include additional efficiency measures contained in Section C406 of the Code and the Mitigation Case should be revised to include mitigation measures

[10] Available at https://resilientma-mapcenter-mass-eoeea.hub.arcgis.com/.

which focus on reducing thermal energy demand (TEDI) and efficient electrification. The DEIR should include estimates of both the heating and cooling TEDI (for the baseline and proposed scenarios). It should include revised descriptions of baseline and proposed envelope performance, in terms of U value, per the Code, and reported U values should reflect the values after thermal bridge derating.

The DEIR should evaluate higher roof performance for the gymnastic center, daycare, and warehouse storage. The DEIR should provide, for each building, the derated U-value of opaque wall assemblies and the proposed window to wall ratio. If glazed wall systems are proposed, the DEIR should provide the derated U-value of the opaque and vision portions of the glazed wall, along with the percent area (of the total vertical) of proposed opaque glazed wall and vision glazed wall. The DEIR should include information on air infiltration and evaluate whether better than code air infiltration as a possible mitigate measure. It should also provide information on the proposed ventilation energy recovery and confirm ventilation energy recovery with a 70% effectiveness is being provided for all buildings, in accordance with the Code. The DEIR should also describe the type of electric air source heat pump space system to be used and evaluate the use of electric air-source VRF type heat pump systems capable of energy recovery during concurrent heating and cooling; or, a network of connected air source heat pumps capable of energy recovery during concurrent heating and cooling.

The DEIR should provide additional information on the envelope quality, heat recovery, and management of solar gains proposed by the project for the residential buildings. The DEIR should include a complete Passivehouse evaluation by a certified Passivehouse consultant through this MassSave program. The DEIR should evaluate the feasibility and cost-effectiveness of water heating with air source heat pumps for all buildings (residential and commercial). The DEIR should quantify the total square footage of PV arrays proposed for each building. It should also clarify the minimum solar readiness for the commercial buildings and the multifamily buildings, as required by the Code, and describe whether above-code rooftop solar readiness is proposed as a mitigation measure.

The DEIR should include an evaluate increasing the number of EV charging stations at each residential building from two to five and providing at least two EV charging stations at each commercial building. It should also quantify the EV readiness of each building and evaluate providing an EV readiness of 25% for all buildings. Commitments to increase the number of EV charging stations or the percentage of EV readiness for each building should be included as additional mitigation for the project in the DEIR.

Water Supply

The DEIR should evaluate the adequacy of the water supply capacity available for the project, for each phase and the project as a whole. The DEIR should identify any upgrades needed to the existing water supply infrastructure to support the project.

Construction Period

The DEIR should clearly identify all components of the project to be completed in each phase, and fully detail any initial work to be performed site-wide in advance of future phases. The DEIR should clearly state a commitment to complete MEPA review and any required permitting prior to commencing construction; once commenced, a Commencement of Construction Notice should be filed with MEPA pursuant to 301 CMR 11.08(10). The DEIR should describe how construction activities will be managed in accordance with applicable MassDEP regulations regarding Air Pollution Control (310 CMR 7.01, 7.09-7.10), and Solid Waste Facilities (310 CMR 16.00 and 310 CMR 19.00, including the waste ban provision at 310 CMR 19.017). The DEIR should describe all construction-period impacts and mitigation relative to state-listed species, wetlands, stormwater, noise, air quality, water quality, and traffic. It should describe all BMPs that will be employed to avoid erosion or sedimentation in areas of disturbance that are associated with future phases of work. It should describe truck routes and other mitigation measures that may be implemented to minimize impacts to residential areas by trucks travelling to the site during the construction period. Construction equipment should use engines meeting Tier 4 federal emissions standards, or if unavailable, confirm that the project will require its construction contractors to use Ultra Low Sulfur Diesel fuel, and discuss the use of after-engine emissions controls, such as oxidation catalysts or diesel particulate filters.

The DEIR should provide detailed information regarding the project's generation, handling, recycling, and disposal of construction and demolition debris (C&D) and identify measures to reduce solid waste generated by the project. I strongly encourage the Proponent to commit to C&D recycling activities as a sustainable measure for the project. The Proponent is reminded that any contaminated material encountered during construction must be managed in accordance with the MCP and with prior notification to MassDEP. The DEIR should describe stormwater management measures that will be implemented during construction. It should describe potential construction period dewatering activities and associated permitting (i.e., NPDES) and identify mitigation measures. To the extent dewatering activities are proposed, the DEIR should include a discussion of dewatering activities; measures to be implemented to ensure that no sediment enters the on- or off-site wetland resource areas; and how the project will maintain appropriate stream flow during the work and ensure adequate capacity for bypassing the work area or identify the specific provisions that will be implemented to accommodate heavy rain or flood events. All construction-period mitigation measures should be listed in the draft Section 61 Findings. The DEIR should describe how the project will comply with all applicable construction-period regulatory requirements.

Mitigation and Draft Section 61 Findings

The DEIR should include a separate chapter summarizing all proposed mitigation measures including construction-period measures. This chapter should also include a comprehensive list of all commitments made by the Proponent to avoid, minimize and mitigate the environmental and related public health impacts of the project, and should include a separate section outlining mitigation commitments relative to EJ Populations. The filing should contain clear commitments to implement these mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and contain a schedule for implementation. The list of commitments should be provided in a tabular format organized by subject matter (traffic, water/wastewater, GHG, environmental justice, etc.) and identify the Agency Action or Permit associated with each category of impact. Draft Section 61 Findings should be separately included for each Agency Action to be taken on the project. The filing should clearly indicate which mitigation measures will be constructed or implemented based upon project phasing to ensure that adequate measures are in place to mitigate impacts associated with each development phase.

To ensure that all GHG emissions reduction measures adopted by the Proponent as the Preferred

Alternative are actually constructed or performed by the Proponent, the Proponent must provide a self-certification to the MEPA Office indicating that all of the required mitigation measures, or their equivalent, have been completed. The commitment to provide this self-certification in the manner outlined above shall be incorporated into the draft Section 61 Findings included in the DEIR.

Responses to Comments

The DEIR should contain a copy of this Certificate and a copy of each comment letter received. In order to ensure that the issues raised by commenters are addressed, the DEIR should include a comprehensive response to comments that specifically address each issue raised in the comment letter; references to a chapter or sections of the DEIR alone are not adequate and should only be used, with reference to specific page numbers, to support a direct response. This directive is not intended, and shall not be construed, to enlarge the scope of the DEIR beyond what has been expressly identified in this certificate.

Circulation

In accordance with 301 CMR 11.16(3), the Proponent should circulate the DEIR to each Person or Agency who commented on the EENF, each Agency from which the Project will seek Permits, Land Transfers or Financial Assistance, and to any other Agency or Person identified in the Scope. Pursuant to 301 CMR 11.16(5), the Proponent may circulate copies of the DEIR to commenters in in a digital format (e.g., CD-ROM, USB drive), by directing commenters to a project website address, or electronically. However, the Proponent should make available a reasonable number of hard copies to accommodate those without convenient access to a computer to be distributed upon request on a first come, first served basis. The Proponent should send correspondence accompanying the digital copy or identifying the web address of the online version of the DEIR indicating that hard copies are available upon request, noting relevant comment deadlines, and appropriate addresses for submission of comments. A copy of the DEIR should be made available for review in the Easthampton Public Library.

August 16, 2023	
Date	Rebecca L. Tepper

Comments received:

Comments submitted on the MEPA Public Comments Portal

7/18/2023 Robert Peirent (supplemental comments submitted on 7/30/2023)
7/19/2023 Rebecca Stachowicz
7/28/2023 Mary Lou Splain
8/4/2023 Elisabeth Goodman (on behalf of 102 Northampton Street LLC)
8/7/2023 Sara Merand

8/8/2023 Easthampton Conservation Commission
8/8/2023 Janet Muzzy

<u>Comments submitted by email</u>

7/16/2023 Henry Walz and Susan Grant
7/19/2023 Dianne McLane
7/19/2023 Deborah August (supplemental comments submitted on 7/20/2023 & 8/6/2023)
7/19/2023 Susanna Walz
7/20/2023 Amanda Kallenbach
7/20/2023 Pascommuck Conservation Trust
7/23/2023 Nancy Natale
7/28/2023 Massachusetts Department of Energy Resources (DOER)
7/31/2023 Thomas Brown
8/2/2023 Pioneer Valley Planning Commission (PVPC)
8/3/2023 Janna Tetreault
8/6/2023 Lucille Kostek and Larry Kostek
8/7/2023 Barry Roth
8/8/2023 Katherine Ahern
8/9/2023 Marty Klein
8/9/2023 Massachusetts Department of Transportation (MassDOT)
8/9/2023 Massachusetts Department of Environmental Protection (MassDEP)

RLT/NJM/njm

ATTACHMENT 3 – PROJECT DRAWINGS WITH PARKING PLAN

SIERRA VISTA COMMONS

PERMITTING SET

93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

DATE: 11-29-22
REVISED: 12-6-23

OWNER & PROFESSIONALS

APPLICANT:

TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

RECORD OWNER:

TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

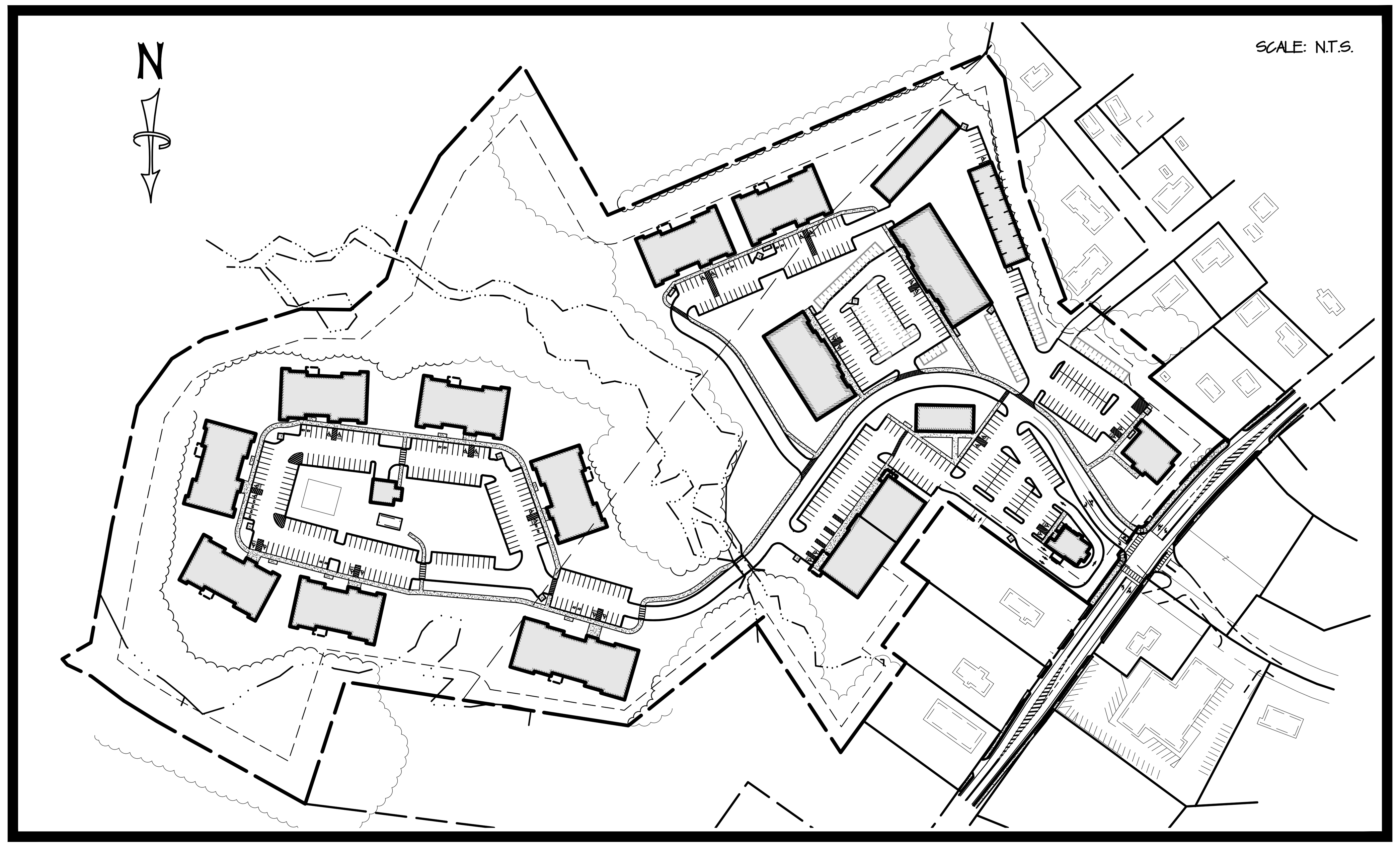
CIVIL ENGINEER:

FURROW ENGINEERING
199 SERVISTAR INDUSTRIAL WAY – SUITE 2
WESTFIELD, MASSACHUSETTS 01085

DESIGN/BUILDER:

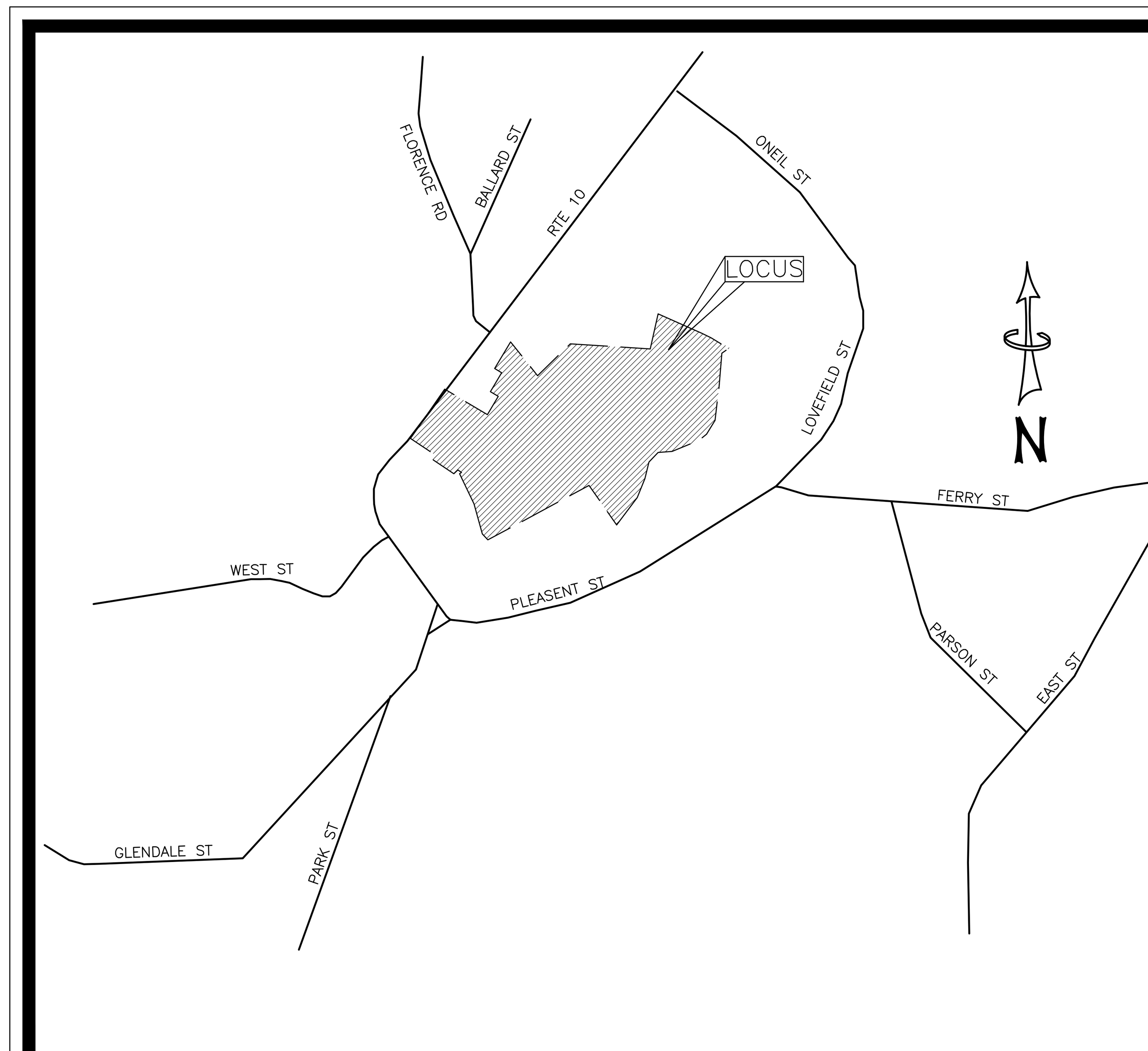
SAGE ENGINEERING & CONTRACTING, INC.
199 SERVISTAR INDUSTRIAL WAY – SUITE 2
WESTFIELD, MASSACHUSETTS 01085

PROJECT SITE PLAN



LOCUS PLAN

NOT TO SCALE



DRAWING LIST

T-1 TITLE SHEET

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

BORING PERFORMED BY GEOINSIGHT ON : 11/2/2005 & 11/3/2005

BORING No. 1

DEPTH (FT)	SOIL TEXTURE
0–2	TOPSOIL
2–3	SAND
3–10	CLAYEY SILT
10–12	FINE SAND
12–18.9	SILT AND CLAY
GROUND WATER: 7'	
REFUSAL AT 18'–11"	
BORING TERMINATED AT 18'–11"	

BORING No. 2

DEPTH (FT)	SOIL TEXTURE
0–2	TOPSOIL
2–16.5	SAND TILL
GROUND WATER: 8'	
SPOON REFUSAL AT 16'–1"	
AUGUR REFUSAL/BORING TERMINATED AT 16'–8"	

BORING No. 3

DEPTH (FT)	SOIL TEXTURE
0–2	TOPSOIL
2–4	FINE SAND
4–7	SILTY SAND
7–13	SILT AND CLAY
13–15.5	SAND TILL
15.5–16.25	WEATHERED BEDROCK
GROUND WATER: 6'	
SPOON REFUSAL AT 16'–3"	
BORING TERMINATED AT 16'–3"	

BORING No. 6

DEPTH (FT)	SOIL TEXTURE
0–2	TOPSOIL
2–2.5	SAND
2.5–5	SILT
5–5.5	ORGANIC SAND
5.5–6.5	SILT
6.5–9	SAND TILL
9–11	LIKELY BOULDERS
11–13.75	BEDROCK
GROUND WATER: N/A	
SPOON REFUSAL AT 8'–9"	
CORING STARTED AT 8'–9"	
BORING TERMINATED AT 13'–9"	

BORING No. 4

DEPTH (FT)	SOIL TEXTURE
0–2.5	TOPSOIL
2.5–3.5	SAND
3.5–10	CLAYEY, SANDY, SILT
10–18.25	SAND TILL
GROUND WATER: 6'	
AUGUR REFUSAL AT 18'–3"	
BORING TERMINATED AT 18'–3"	

BORING No. 5

DEPTH (FT)	SOIL TEXTURE
0–2	TOPSOIL
2–5	SAND
5–6	SILT
6–6.5	TILL
GROUND WATER: 3'	
SPOON REFUSAL AT 6'–7"	
AUGER REFUSAL AT 6'–9"	

PERFORMED BY: FURROW ENGINEERING ON : 12/30/2022

DEEP HOLE No. F–1

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–12"	A	SL
12–18"	B	SL
18"–50"	C1	VFSL POCKETS OF SAND 30%
HIGH GROUND WATER: 36"		

DEEP HOLE No. F–2

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–10"	A	SL
10–28"	B	LS
28"–84"	C1	VFSL POCKETS OF SAND 30%
HIGH GROUND WATER: 38"		

DEEP HOLE No. F–3

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–10"	A	SL
10–24"	B	LS
24"–52"	C1	FLS POCKETS OF MED. SAND 30%
HIGH GROUND WATER: 46"		

DEEP HOLE No. F–4

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–11"	A	SL
11–29"	B	LS
29"–80"	C1	VFSL POCKETS OF SAND 30%
HIGH GROUND WATER: 34"		

DEEP HOLE No. F–5 EL.= 161.8'

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–12"	A	SL
12–22"	B	MED. SAND
22"–52"	C1	FSL POCKETS OF SAND 30%
52"–84"	C2	FSL
HIGH GROUND WATER: 36" (EL.= 158.8')		

DEEP HOLE No. F–6

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–11"	A	SL
11–23"	B	MED. SAND
23"–50"	C1	FSL POCKETS OF SAND 30%
50"–78"	C2	FSL
HIGH GROUND WATER: 38"		

DEEP HOLE No. F–7

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–10"	A	SL
10–31"	B	SL
31"–83"	C1	SL POCKETS OF COBBLES 15% TO 20%. FIRM
83"–134"	C2	FSL 5% COBBLES
HIGH GROUND WATER: 70"		

DEEP HOLE No. F–8

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–11"	A	SL
11–23"	B	LS
23"–29"	C1	MED. SAND
29"–73"	C2	VFSL FIRM TO EXCAV
HIGH GROUND WATER: 44"		

DEEP HOLE No. F–9

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–7"	A	SL
7–24"	B	SL
24"–96"	C1	VFSL/SILT V.FIRM TO EXCAVATE
HIGH GROUND WATER: 50"		

DEEP HOLE No. F–10 EL.= 170.8'

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–8"	A	SL
8–23"	B	LS
23"–61"	C1	VFLS
HIGH GROUND WATER: 38" (EL.= 167.6')		

DEEP HOLE No. F–11

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–7"	A	SL
7–24"	B	SL
24"–96"	C1	VFSL/SILT V.FIRM TO EXCAVATE
HIGH GROUND WATER: 50"		

DEEP HOLE No. F–12

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–7"	A	SL
7–24"	B	SL
24"–96"	C1	VFSL/SILT V.FIRM TO EXCAVATE
HIGH GROUND WATER: 50"		

DEEP HOLE No. F–13

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–11"	A	SL
11–23"	B	LS
23"–29"	C1	MED. SAND
29"–73"	C2	VFSL FIRM TO EXCAV
HIGH GROUND WATER: 44"		

PERFORMED BY: FURROW ENGINEERING ON : 4/5/2023

DEEP HOLE No. 501 EL.= 161.6'

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–12"	A	SL
12–32"	B	LS
32"–60"	C1	COARSE SAND POCKETS OF LS
HIGH GROUND WATER: 40" (EL.= 158.3')		

DEEP HOLE No. 502 EL.= 160.2'

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–12"	A	SL
12–28"	B	LS
28"–71"	C1	COARSE SAND POCKETS OF LS
HIGH GROUND WATER: 36" (EL.= 157.2')		

DEEP HOLE No. 503 EL.= 145.4'

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–8"	A	SL
8–19"	B	SL
19"–74"	C1	LS POCKETS OF VFS 40% POCKETS OF COARSE SAND 30%
HIGH GROUND WATER: 45" (EL.= 141.7')		

DEEP HOLE No. 504 EL.= 144.3'

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–8"	A	SL
8–26"	B	SL
26"–60"	C1	LS POCKETS OF VFS 40% POCKETS OF COARSE SAND 30%
HIGH GROUND WATER: 43" (EL.= 140.7')		

DEEP HOLE No. 505 EL.= 144.1'

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–8"	A	SL
8–30"	B	SL
30"–65"	C1	LS POCKETS OF VFS AND COARSE SAND
HIGH GROUND WATER: 40" (EL.= 140.8')		

DEEP HOLE No. 506 EL.= 170.2'

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–9"	A	SL
9–28"	B	LS
28"–70"	C1	VFLS
HIGH GROUND WATER: 40" (EL.= 166.9')		

DEEP HOLE No. 507 EL.= 170.4'

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–9"	A	SL
9–30"	B	LS
30"–75"	C1	VFLS
HIGH GROUND WATER: 39" (EL.= 167.2')		

PERF. BY: BAYSTATE ENVIRONMENTAL CONSULTANTS INC. ON: 10/30/2008

DEEP HOLE No. 1

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–12"	A	SL
12–26"	B	SL
26–44"	C1	VFSL
44–62"	C2	S(C)
62–120"	C3	VFSL
HIGH GROUND WATER: >44"		

DEEP HOLE No. 2

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–10"	A	SL
10–18"	B	SL
18–32"	C1	S(C)
32–72"	C2	VFSL
HIGH GROUND WATER: >32"		

DEEP HOLE No. 3

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–12"	A	SL
12–18"	B	LS
18–32"	C1	S(C)
32–60"	C2	VFSL
HIGH GROUND WATER: >32"		

DEEP HOLE No. 4

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–12"	A	SL
12–24"	Bw	SL
24–34"	C1	LS
34–96"	C2	VFSL
HIGH GROUND WATER: >34"		

DEEP HOLE No. 5

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–9"	A	SL
9–24"	Bw	LS
24–60"	C1	VFSL
60–84"	C2	SL
84–120"	Cd3	LS
HIGH GROUND WATER: >60"		

DEEP HOLE No. 6

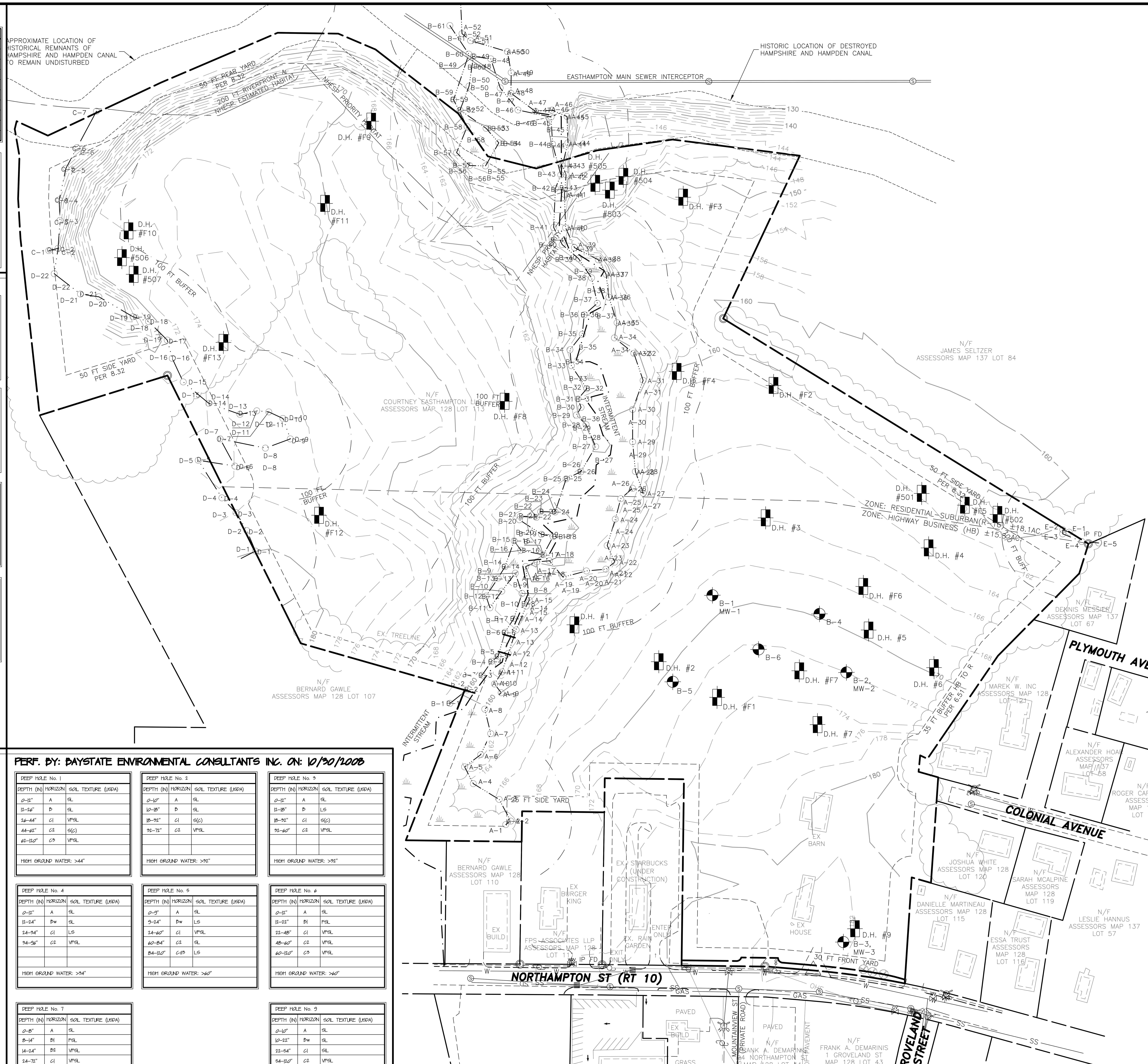
DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–12"	A	SL
12–22"	B1	FSL
22–48"	C1	VFSL
48–60"	C2	VFSL
60–120"	C3	VFSL
HIGH GROUND WATER: >60"		

DEEP HOLE No. 7

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–8"	A	SL
8–14"	B1	FSL
14–24"	B2	VFSL
24–72"	C1	VFSL
72–108"	C2	FSL
HIGH GROUND WATER: >72"		

DEEP HOLE No. 9

DEPTH (IN)	HORIZON	SOIL TEXTURE (USDA)
0–10"	A	SL
10–22"	Bw	SL
22–54"	C1	SIL
54–120"	C2	VFSL
HIGH GROUND WATER: >54"		



FOR PERMITTING ONLY

TP-1 TEST PIT & SOIL BORING PLAN

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93–97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

COMMONWEALTH OF MASSACHUSETTS BRYAN J. BALICKI CIVIL No. 48862 REGISTERED PROFESSIONAL ENGINEER

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1	12–28–22	BJB	REVISED PER PLANNING COMMENTS
2	1–31–23	LDS	REVISED PER CONSERVATION COMMENTS
3	3–13–23	LDS	REVISED PER CITY ENGINEER COMMENTS
4	4–10–23	LDS	ADDED TEST PIT INFORMATION
5	10–11–23	LDS	REVISED PROJECT SITE ENTRANCE

PROJECT #: 1042–01–22

DRAWN BY: LDS

DATE: 1/31/2022

SCALE: 1"=80'

SHEET: TP-1

PLAN REFERENCES

1. FOR REFERENCE TO ENCLOSED PERIMETER SEE HAMPSHIRE COUNTY REGISTRY OF DEEDS PLAN BOOK 195 PAGE 27 AND PLAN OF RECORD TITLED "APPROVAL NOT REQUIRED PLAN OF LAND" PREPARED FOR ALRIG USA BY CONTROL POINT ASSOCIATES, INC. AND RECORDED IN THE HAMPSHIRE COUNTY REGISTRY OF DEEDS PLAN BOOK 251 PAGE 105.
2. UNDERGROUND UTILITY LOCATIONS ARE BASED ON SURFACE FEATURES AS LOCATED BY A SURVEY PERFORMED BY THIS OFFICE AND AVAILABLE RECORD GIS DATA PROVIDED BY THE CITY. LOCATIONS ARE APPROXIMATE AND ACTUAL LOCATIONS SHOULD BE VERIFIED WITH THE APPROPRIATE UTILITY COMPANY AND/OR MUNICIPAL DEPARTMENT PRIOR TO CONSTRUCTION.
3. UNDERGROUND UTILITY GIS DATA WAS PROVIDED BY THE CITY OF EASTHAMPTON
4. ABUTTING PROPERTY LINE INFORMATION AND BUILDING LOCATIONS ARE APPROXIMATE ONLY AND THIS INFORMATION WAS OBTAINED BY EASTHAMPTON GIS.
5. THE TOPOGRAPHIC INFORMATION SHOWN IS FROM A GPS SURVEY IN THE FIELD PERFORMED BY THIS OFFICE DURING THE MONTH OF FEBRUARY 2022. TOPOGRAPHIC INFORMATION IS SUPPLEMENTED WITH INFORMATION FROM PLAN OF RECORD TITLED " PROPOSED RETAIL DEVELOPMENT" PREPARED BY WAGNER ENGINEERING ASSOCIATES, INC. DATED AUGUST 8, 2008
6. RESOURCE AREA DELINEATION WAS COMPLETED BY GZA GEOENVIRONMENTAL, INC. BETWEEN JUNE, 2022 AND NOVEMBER, 2022 AND LOCATED IN THE FIELD BY SURVEY BY SAGE ENGINEERING & CONTRACTING, INC DURING THE MONTHS OF JUNE, 2022 AND NOVEMBER, 2022.

GENERAL SITE/UTILITY NOTES

1. PRIOR TO STARTING EXCAVATION WORK ON THE SITE, THE CONTRACTOR SHALL CONTACT DIG SAFE (FOUR DAYS PRIOR TO WORK), TO HAVE ALL UTILITIES PROPERLY MARKED IN THE FIELD. CONTRACTOR SHALL ALSO CONTACT EASTHAMPTON DPW FOUR DAYS PRIOR TO ANY WORK WITHIN A CITY ROADWAY, TO HAVE ALL UTILITIES PROPERLY MARKED IN THE FIELD.
2. CONTRACTOR TO VERIFY EXISTING CONDITIONS PRIOR TO CONSTRUCTION. IF FIELD CONDITIONS ARE OBSERVED THAT SIGNIFICANTLY VARY FROM THOSE SHOWN ON THESE PLANS, IMMEDIATELY NOTIFY THE ENGINEER TO RESOLVE THE CONFLICTING INFORMATION.
3. PRIOR TO SUBMITTAL OF PROPOSAL, THE GENERAL CONTRACTOR AND HIS SUBCONTRACTORS SHALL BE RESPONSIBLE FOR BECOMING FAMILIAR WITH ALL CONDITIONS. NO EXTRAS DUE TO UNFAMILIARITY WITH THE EXISTING SITE OR WORKING CONDITIONS SHALL BE PERMITTED.
4. ALL EXCAVATIONS SHALL COMPLY WITH THE CURRENT OSHA STANDARDS.
5. LOAM AND SEED ALL DISTURBED AREAS UNLESS OTHERWISE SPECIFIED.
6. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE APPROXIMATE AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES THAT RESULT FROM THE CONTRACTORS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
7. IF THE LOCATION, ELEVATION, OR SIZE OF AN EXISTING UTILITY IS FOUND TO CONFLICT WITH PROPOSED WORK THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER TO RESOLVE THE CONFLICT.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING DAMAGE TO WORK PERFORMED DURING CONSTRUCTION, SUCH AS, BUT NOT LIMITED TO, DRAINAGE, UTILITIES, PAVEMENT, SIDEWALKS, STRIPING AND CURBING.
9. CONTRACTOR SHALL BE RESPONSIBLE FOR MAKING ARRANGEMENTS TO ALTER ALL PRIVATE UTILITIES, INCLUDING GAS AND ELECTRIC.
10. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL SURFACE DRAINAGE ON-SITE DURING CONSTRUCTION.
11. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT NO EXPENSE TO THE OWNER. THE EASTHAMPTON CONSERVATION COMMISSION SHALL BE NOTIFIED IMMEDIATELY THROUGH ITS AGENT.
12. ACCESS TO THE SITE FOR EMERGENCY VEHICLES MUST BE PRESERVED AT ALL TIMES.
13. ALL STRUCTURES AND SITE FEATURES, INCLUDING PROPOSED DRAINAGE, SEWER SYSTEMS, AND ROADWAY, SHALL BE CLEANED AND ALL DEBRIS REMOVED PRIOR TO THE ACCEPTANCE BY THE OWNER.
14. ALL EXISTING DRAINAGE STRUCTURES BEING CONNECTED TO ARE TO BE CLEANED OUT AND REPAIRED AS NEEDED. EXISTING DRAINAGE PIPES BEING UTILIZED BY THE PROPOSED DRAINAGE ARE TO BE CLEANED OUT TO REMOVE ALL SILT AND DEBRIS.
15. CONTRACTOR SHALL ENSURE THE STORM DRAINAGE SYSTEM IS WATERTIGHT. ALL DRAINAGE PIPE ENTERING CONCRETE STRUCTURES SHALL BE SEALED TO ENSURE A WATERTIGHT CONNECTION.
16. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DEWATERING OF TRENCHES AND EXCAVATIONS DURING CONSTRUCTION.
17. ALL DEMOLISHED MATERIALS, PAVEMENT, CURBING, DEMOLISHED TREES, SURPLUS MATERIAL, AND RUBBLE SHALL BE HANDLES/DISPOSED OF OFF SITE BY THE CONTRACTOR AT HIS EXPENSE IN ACCORDANCE WITH ALL OF THE CITY/TOWN ORDINANCES AND ALL APPLICABLE STATE AND FEDERAL ENVIRONMENTAL REGULATIONS.
18. ALL WORK PERFORMED IN THE CITY/TOWN RIGHT-OF-WAY AND EASEMENTS SHALL BE IN ACCORDANCE WITH THE CITY/TOWN STANDARDS AND SPECIFICATIONS.
19. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL REQUIRED WORK PERMITS FOR WORK WITHIN A PUBLIC WAY.
20. ALL WORK INCLUDED IN THE CONDITIONS OF APPROVAL FOR STATE AND LOCAL PERMITS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE CONFORMED TO DURING CONSTRUCTION.
21. ALL BACKFILL TO BE PLACED IN 12" LIFTS UNLESS OTHERWISE NOTED, AND SHALL BE COMPACTED TO 95% OF MAXIMUM DRY DENSITY DETERMINED BY STANDARD PROCTOR TEST (ASTM 698) FOR ALL APPLICABLE TYPES OF BACKFILL MATERIAL.
22. CONTRACTOR SHALL HAVE FIELD COMPACTION TEST PERFORMED IN ACCORDANCE WITH ASTM D5195-02 AND PROVIDE RESULTS TO ENGINEER PRIOR TO PLACEMENT OF INFRASTRUCTURE OR BITUMINOUS BINDER.
23. WHERE APPLICABLE, ALL MATERIALS AND METHODS ARE TO COMPLY WITH THE CITY/TOWN DPW STANDARDS OR MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
24. CONTRACTOR SHALL GRADE DRAINAGE AWAY FROM BUILDINGS IN ALL AREAS.
25. CONTRACTOR SHALL OBTAIN A ROAD OPENING PERMIT FROM THE CITY OF EASTHAMPTON PRIOR TO ANY WORK WITHIN COLONIAL AVENUE.

FOR PERMITTING ONLY

LAYOUT NOTES

1. THE BUILDING DIMENSIONS SHALL BE OBTAINED FROM THE ARCHITECTURAL PLANS. ANY DISCREPANCIES IN BUILDING DIMENSIONS/LAYOUT BETWEEN THE SITE PLANS AND ARCHITECTURAL PLANS SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COORDINATION AND COST OF ALL FIELD LAYOUT BASED ON INFORMATION SUPPLIED BY THE SURVEYOR OF RECORD. ANY DISCREPANCIES BETWEEN THE PLANS AND FIELD LAYOUT SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TAKING TIES TO ALL UTILITY CONNECTIONS, BENDS, VALVES, AND INVERTS AND PROVIDE ALL INFORMATION ON AS-BUILT PLANS TO BE REVIEWED AND APPROVED BY THE ENGINEER AND OWNER.
4. CONTRACTOR SHALL PROTECT ALL BENCHMARKS AND PROPERTY MONUMENTATION AND SHALL REPAIR OR REPLACE AT HIS OWN EXPENSE IF DISTURBED DURING CONSTRUCTION.
5. CONTRACTOR SHALL PREPARE FOUNDATION PLAN(S) STAMPED BY A PROFESSIONAL LAND SURVEYOR IN MASSACHUSETTS FOR EACH FOUNDATION SHOWING THE AS-BUILT LOCATION WITH DISTANCE TO NEAREST PROPERTY LINE TO BUILDING INSPECTOR FOR APPROVAL PRIOR TO ANY BUILDING CONSTRUCTION.

EROSION CONTROL NOTES

1. ALL EROSION CONTROL MEASURES SHOWN ON THE PLANS, SPECIFIED, AND REQUIRED BY THE ENGINEER AND/OR THE EASTHAMPTON CONSERVATION COMMISSION AGENT SHALL BE INSTALLED PRIOR TO CONSTRUCTION OR IMMEDIATELY UPON REQUEST. EROSION CONTROL MEASURES SHALL BE MAINTAINED UNTIL WORK IS COMPLETE AND/OR PERMANENT VEGETATION IS ESTABLISHED.
2. EXCESS TOPSOIL STRIPPED FROM AREAS TO BE DISTURBED SHALL BE STOCKPILED WITHIN THE PROJECT LIMIT OF WORK IN AN AREA APPROVED BY THE OWNER, ENGINEER, AND CONSERVATION COMMISSION OR ITS AGENT.
3. ANY TOPSOIL STOCKPILES THAT WILL BE LEFT UNDISTURBED FOR MORE THAN 14 DAYS SHALL BE TEMPORARILY SEEDED WITH WINTER RYE AT A RATE OF 30 LBS PER ACRE.
4. AREAS THAT HAVE BEEN PREVIOUSLY DISTURBED AND WORK HAS BEEN COMPLETED SHALL BE STABILIZED AND RESTORED WITH PERMANENT VEGETATIVE COVER.
5. ALL GRADING IS TO HAVE A MAXIMUM SLOPE OF 3:1 UNLESS OTHERWISE NOTED.
6. ALL SLOPES GREATER THAN 3:1, AFTER BEING LOAMED AND SEEDED, SHALL BE SECURED WITH EROSION CONTROL BLANKETS (NORTH AMERICAN GREEN S150 OR EQUAL) INSTALLED IN ACCORDANCE WITH THE MANUFACTURER.
7. CONSTRUCTION ENTRANCE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THESE DRAWINGS.
8. SILT FENCE SHALL BE INSTALLED IN ACCORDANCE WITH THESE DRAWINGS. SILT FENCE SHALL BE INSPECTED AND REPAIRED ROUTINELY AND FOLLOWING STORM EVENTS.

ACCESSIBILITY NOTES

1. THE CONTRACTOR SHALL BE FAMILIAR WITH AND ADHERE TO THE REQUIREMENTS OF 521 CMR.
2. ALL ACCESSIBLE ROUTES, PARKING, LOADING ZONES, ENTRANCES, AND TRANSITIONS SHALL BE CONSTRUCTED IN ACCORDANCE WITH 521 CMR.
3. IF ANY CHANGES ARE MADE TO THE PROPOSED BUILDING THAT WOULD AFFECT ACCESSIBILITY, THE CONTRACTOR AND/OR ARCHITECT SHALL NOTIFY THE ENGINEER.

UNIT DENSITY SUMMARY:

R-15 ZONE:

PROJECT DESIGNED UNDER SECTION 8.3 MULTI-FAMILY HOUSING WITH 15% MINIMUM AFFORDABLE

MINIMUM LOT AREA PER TABLE 6-1 : 5,000 S.F. PER UNIT

R-15 AREA = 18.1 ACRES (788,436 SF) / 5,000 SF/UNIT = 158 UNITS ALLOWED.

TOTAL PROPOSED UNITS = 144 IN R-15 ZONED AREA.

HIGHWAY BUSINESS (HB) ZONE:

PROJECT DESIGNED UNDER SECTION 7.43 SMART GROWTH ZONING OVERLAY DISTRICT.

ALLOWS FOR 20 DWELLING UNITS/ ACRE

HB AREA = 15 ACRES * 20 UNIT/ACRE = 316 UNITS ALLOWED.

TOTAL PROPOSED UNITS = 58 IN HB ZONED AREA.

UNIT SUMMARY:

TOTAL RESIDENTIAL DWELLING UNITS PROJECT WIDE: 202 UNITS

AFFORDABLE HOUSING UNITS:
R-15 ZONE: 15% AFFORDABLE HOUSING = 144 UNITS*15% = 22 UNITS
HB ZONE: 25% AFFORDABLE HOUSING = 58 UNITS*25% = 15 UNITS

TOTAL AFFORDABLE HOUSING UNITS PROJECT WIDE = 37 UNITS

PARKING SUMMARY:

MULTI-FAMILY HOUSING

REQUIREMENTS UNDER TABLE 10-3 MULTI FAMILY W/ 15% AFFORDABLE: 1.5 SPACES PER UNIT

-144 UNITS * 1.5 SPACES/UNITS = 216 SPACES

- 8 VISITOR SPACES FOR COMMON AREAS

TOTAL SPACES REQUIRED IN R-15 MULTI FAMILY : 224 SPACES
TOTAL SPACES PROVIDED : 224 INCL. ACCESSIBLE

HIGHWAY BUSINESS ZONE SMART GROWTH OVERLAY DISTRICT

1) MULTI FAMILY DWELLING UNITS: 1 PER EACH DWELLING UNIT (TABLE 7-6)

- 58 DWELLING UNITS * 1 SPACE PER UNIT = 58 SPACES REQUIRED

2) GYMNASTICS CENTER (RECREATIONAL FACILITY) 1 PER 1,000 SF

-7,000 SF * 1 SPACE/1,000 SF = 7 SPACES

3) DAY CARE FACILITY: 1 SPACE PER 2 EMPLOYEES PLUS
1 SPACE PER 8 STUDENTS

-20 EMPLOYEES * 1 SPACE/2 EMPLOYEES = 10 SPACES
-100 STUDENTS * 1 SPACE/8 STUDENTS = 13 SPACES
SUB-TOTAL: 23 SPACES

4) COMMERCIAL SPACE IN RESIDENTIAL UNITS (RETAIL AND PROFESSIONAL OFFICES)

-20,000 SF * 1 SPACE/ 1,000 SF = 20 SPACES

5) FREE STANDING RETAIL SPACE

-4,000 SF * 1 SPACE/ 1,000 SF = 4 SPACES

6) FREE STANDING COMMERCIAL SPACE

-15,000 SF * 1 SPACE/ 1,000 SF = 15 SPACES

7) RESTAURANT

-1 FOR EACH (4) SEATS PLUS
1 FOR EVERY (2) EMPLOYEES

-10 EMPLOYEES * 1 SPACE/2 EMPLOYEES = 5 SPACES
-150 SEATS * 1 SPACE/4 SEATS = 38 SPACES
SUB-TOTAL: 43 SPACES

8) BANK

-1 FOR EACH (200) SF GROSS FLOOR AREA PLUS
6 STACKING SPACES FOR EACH DRIVE-IN WINDOW

-3,200 SF * 1 SPACE/ 200 SF = 16 SPACES

TOTAL SPACES REQUIRED IN HB ZONE: 186
TOTAL SPACES PROVIDED IN HB ZONE: *254 INCL. ACCESSIBLE

PROVISIONS MADE FOR 85 ADDITIONAL ON DEMAND SPACES TO BE BUILT ONLY IF DEMAND NECESSITATES

NOTE: PARKING WAS REDUCED BY 50 PARKING SPACES AS A RESULT OF THE CHANGES TO THE SITE PLANS MADE ON 6-1-23

SYMBOL & LINE LEGEND

EX. UTILITY POLE	PR. UTILITY POLE
EX. HYDRANT	PR. HYDRANT
EX. GAS VALVE	PR. WATER/GAS VALVE
EX. WATER VALVE	PR. CATCH BASIN
EX. MONITORING WELL	PR. MANHOLE
EX. CATCH BASIN	PR. FLARED END SECTION
EX. DRAINAGE MANHOLE	PR. WELL
EX. SANITARY MANHOLE	EX. LIGHTPOST
EX. ELECTRIC MANHOLE	EX. WATER SHUT-OFF
EX. WELL	EX. ONE POLE SIGN
EX. MANHOLE (UNMARKED)	EX. WETLANDS
PERCOLATION TEST	UTILITY POLE WITH LIGHT
DEEP HOLE OBSERVATION	X 500.00 EX. SPOT GRADE
BORING	X 500.00 PR. SPOT GRADE
IRON PIPE FOUND	WF-1 WETLAND FLAG
CONCRETE BOUND FOUND	

	LIMIT OF BVW W/ FLAGS
	TOP OF BANK
	25' RIVERFRONT
	BUFFER ZONE
	RAILROAD TRACKS
150	EX. CONTOUR 5' INTERVALS
149	EX. CONTOUR 1' INTERVALS
150	PR. CONTOUR
	EX. FENCE
	PR. FENCE
	GUARDRAIL
	TREE LINE
GAS	EX. GAS LINE
W	EX. WATER LINE
OHE	EX. OVERHEAD ELECTRIC WIRES
UE	EX. UNDERGROUND ELECTIC
UGT	EX. UNDERGROUND TEL-CATV-DATA
SD	EX. STORM WATER DRAIN
SS	EX. SANITARY SEWER
FM	EX. SANITARY SEWER FORCE MAIN
LW	LIMIT OF WORK
GAS	PR. GAS LINE
W	PR. WATER LINE
OHE	PR. OVERHEAD ELECTRIC WIRES
UE	PR. UNDERGROUND ELECTIC
SD	PR. STORM WATER DRAIN
SD SD	PR. PERFORATED STORM WATER DRAIN
SS	PR. SANITARY SEWER

C-0 NOTES

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
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Phone: (413) 562-4884

COMMONWEALTH OF MASSACHUSETTS
BRYAN J. BALICKI
CIVIL
No. 48962
REGISTERED PROFESSIONAL ENGINEER

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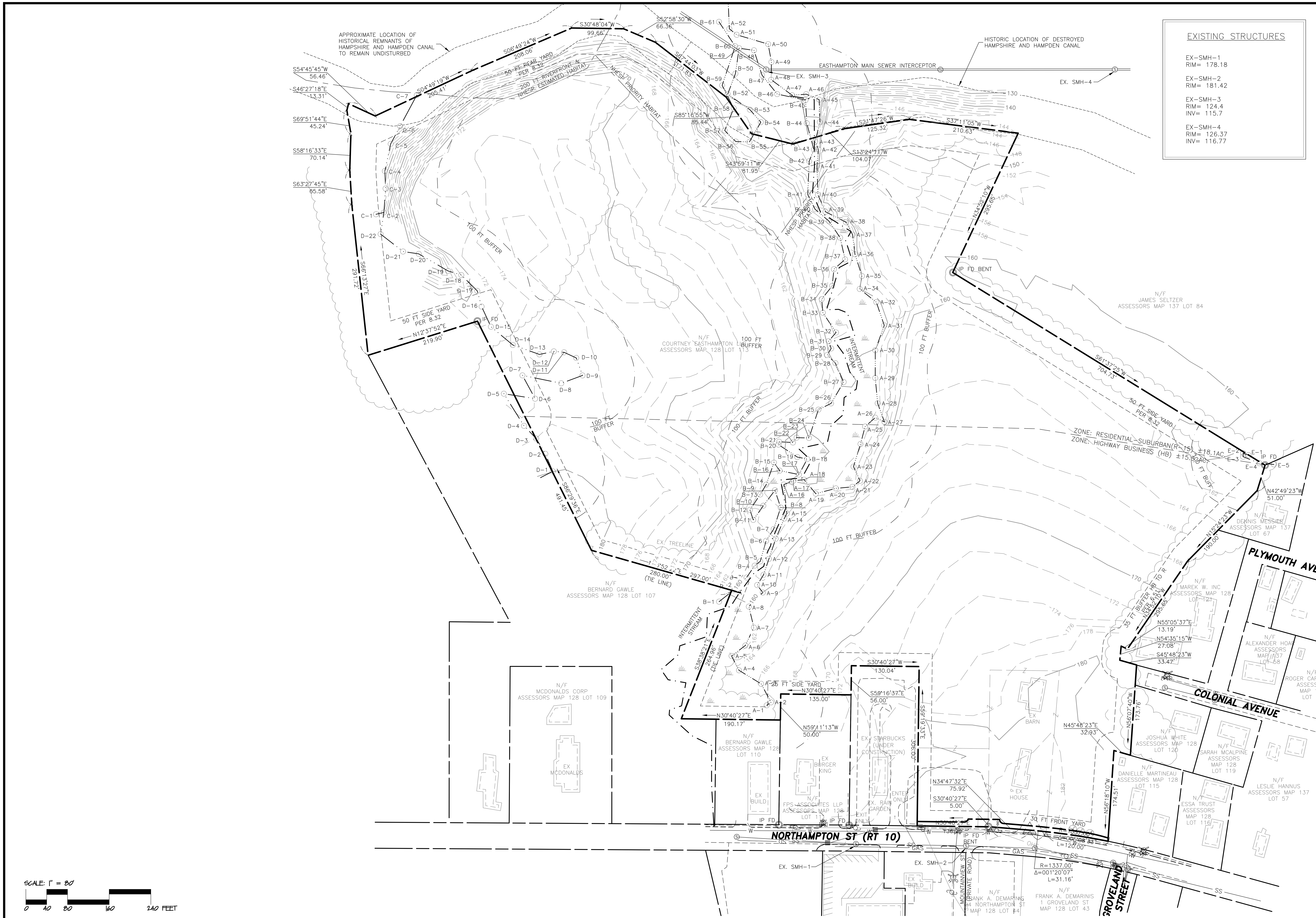
NO.	DATE:	BY:	REVISION DESCRIPTION
1	6-19-23	LDS	REVISED PARKING SUMMARY
2	10-11-23	LDS	REVISED PARKING SUMMARY
3	10-30-23	LDS	MISC. REVISIONS
4	11-14-23	LDS	REVISED EROSION CONTROL NOTES
5	12-6-23	LDS	REVISED PER CON. COM. COMMENTS

PROJECT #: 1042-01-22
DRAWN BY: LDS
DATE: 11-1-2022
SCALE: N.T.S.
SHEET: C-0



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C-1 EXISTING CONDITIONS PLAN

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
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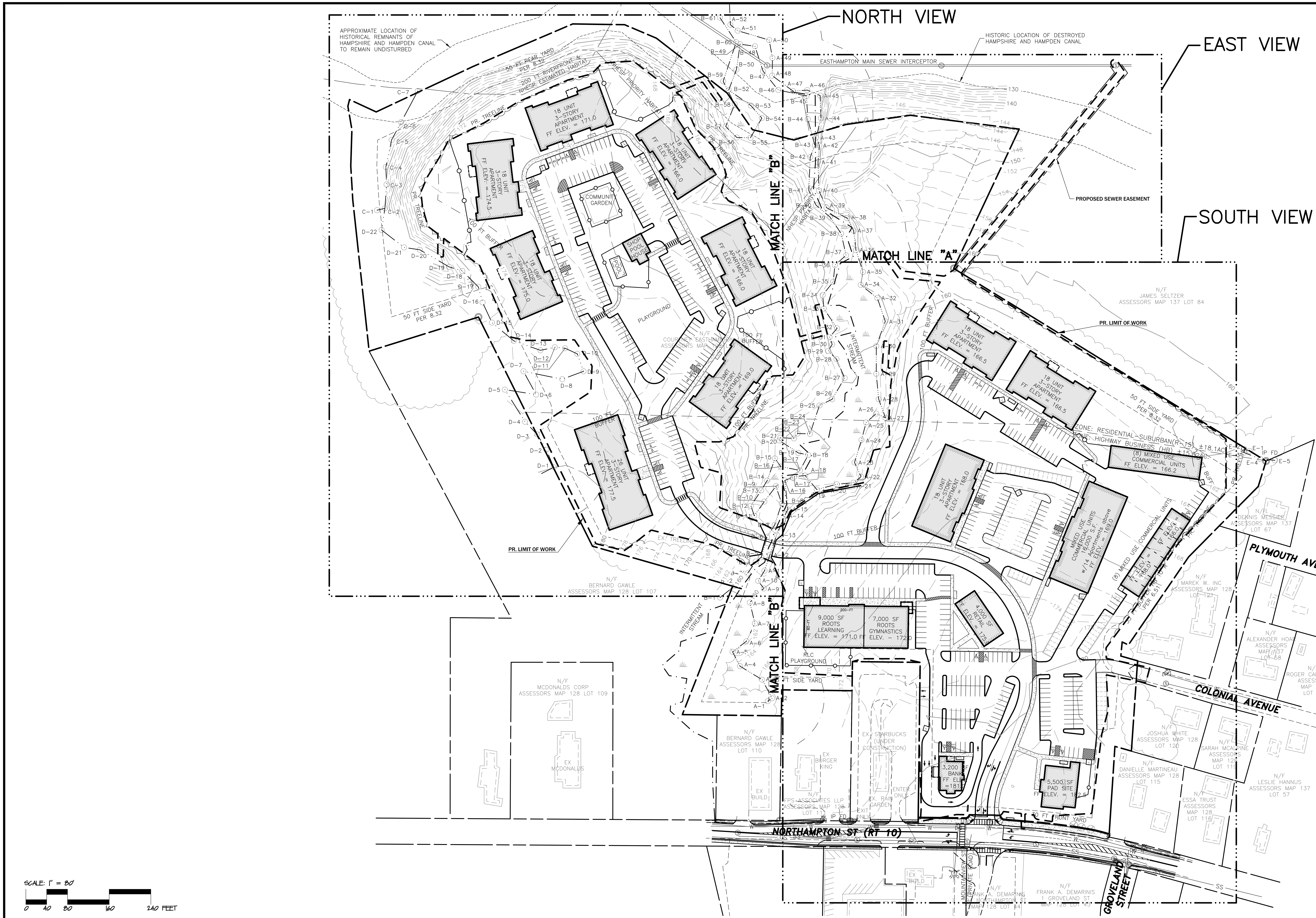
Phone: (413) 562-4884

COMMONWEALTH OF MASSACHUSETTS BRYAN J. BALICKI CIVIL REGISTERED PROFESSIONAL ENGINEER

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO	DATE:	BY:	REVISION DESCRIPTION
2	12-28-22	BJB	REVISED PER PLANNING COMMENTS
3	1-31-23	LDS	REVISED PER CONSERVATION COMMENTS
4	3-13-23	LDS	REVISED PER CITY ENGINEER COMMENTS
5	4-12-23	LDS	REVISED PER CITY ENGINEER COMMENTS
6	10-11-23	LDS	REVISED PROJECT SITE ENTRANCE

PROJECT #: 1042-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: 1"=80'
SHEET: C-1



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C-2.0 OVERALL SITE LAYOUT PLAN

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
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Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 502-4884

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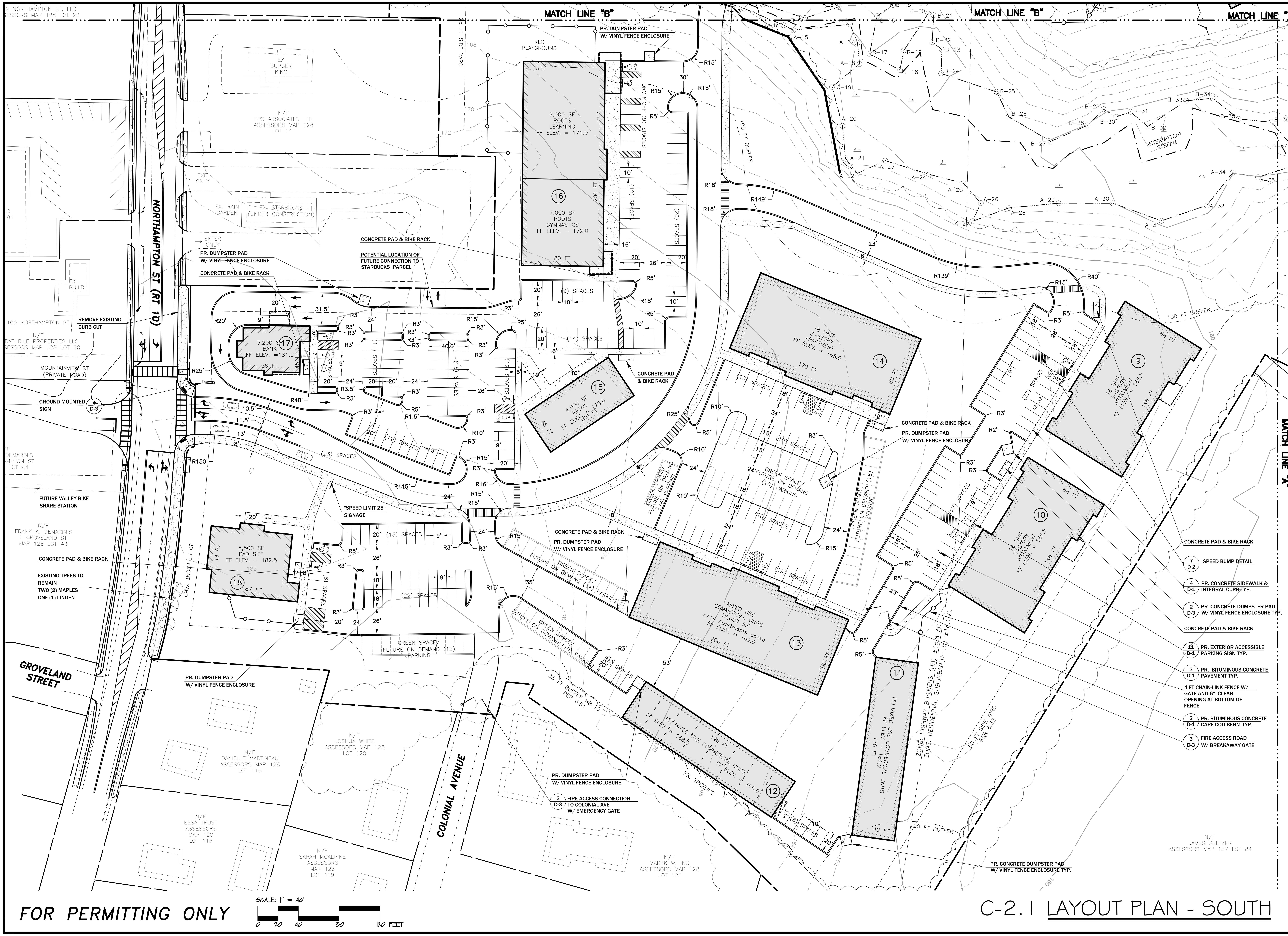
NO.	DATE:	BY:	REVISION DESCRIPTION
1	6-19-23	LDS	REMOVE BUILD. B & MISC. REVISIONS
2	7-27-23	LDS	REVISED PER B&T PEER REVIEW
3	10-11-23	LDS	REVISED PROJECT SITE ENTRANCE
4	10-30-23	LDS	MISC. REVISIONS
5	11-17-23	LDS	REVISED INFILTRATION BASINS

PROJECT #: 042-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: 1"=80'
SHEET: C-2.0



C-2.1 LAYOUT PLAN - SOUTH

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
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199 Servistar Industrial Way - Suite 2
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Phone: (413) 562-4884

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NO.	DATE:	BY:	REVISION DESCRIPTION
1	7-27-23	LDS	REVISED PER B&T PEER REVIEW
2	10-11-23	LDS	REVISED PROJECT SITE ENTRANCE
3	10-30-23	LDS	MISC. REVISIONS
4	11-14-23	LDS	ADDED 6" OPENING UNDER FENCING
5	11-17-23	LDS	REVISED INFILTRATION BASINS

PROJECT #: 042-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: 1"=40'
SHEET: C-2.1

FOR PERMITTING ONLY

C-2.2 LAYOUT PLAN - NORTH

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
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Phone: (413) 562-4884

COMMONWEALTH OF MASSACHUSETTS
BRYAN J. BALICKI
CIVIL
REGISTERED PROFESSIONAL ENGINEER

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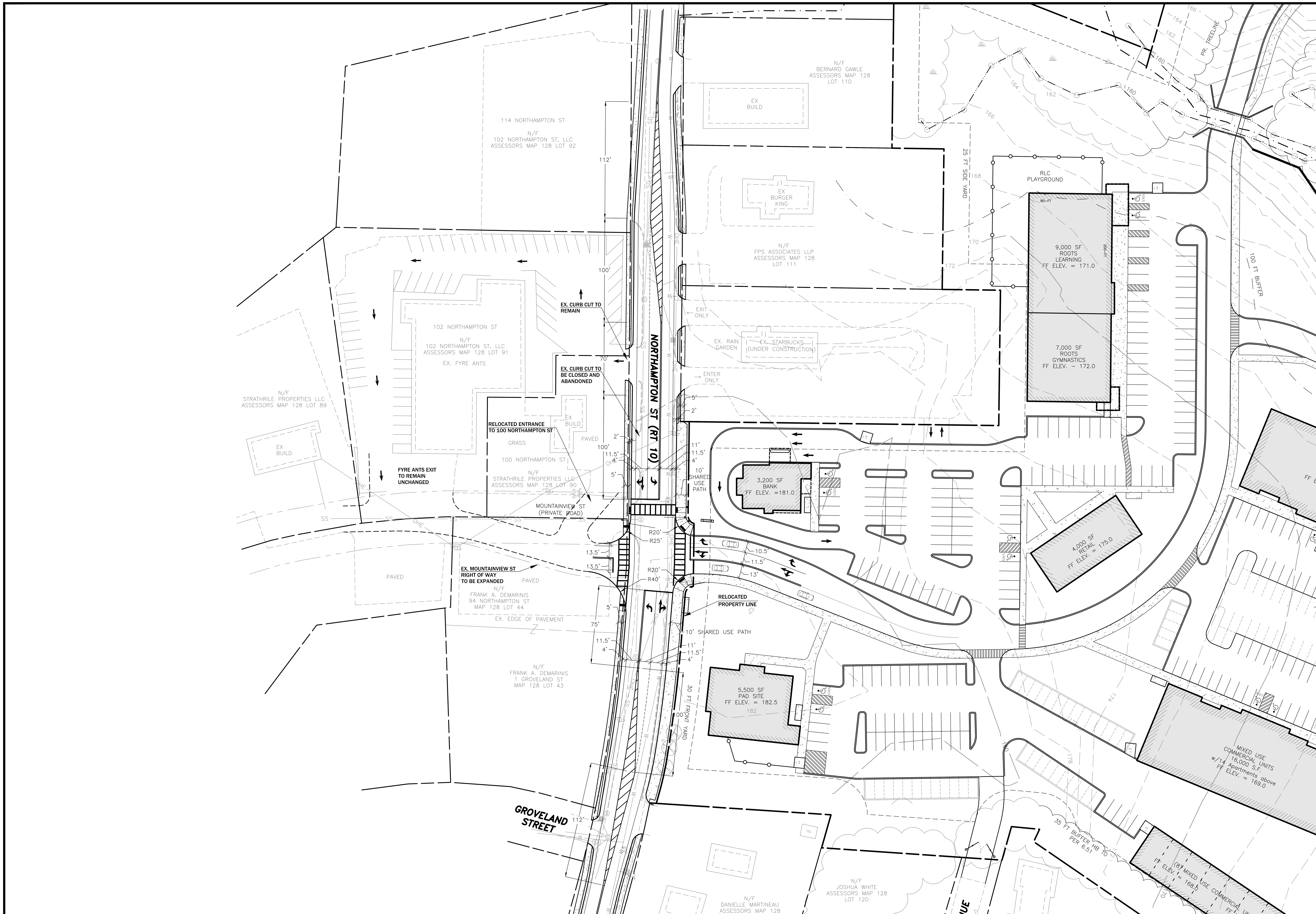
NO.	DATE:	BY:	REVISION DESCRIPTION
1	4-28-23	LDS	REVISED PER CONSERVATION COMMENTS
2	6-19-23	LDS	REMOVE BUILD. 8 & MISC. REVISIONS
3	7-27-23	LDS	REVISED PER B&T PEER REVIEW
4	11-14-23	LDS	ADDED 6" OPENING UNDER FENCING
5	11-17-23	LDS	REVISED INFILTRATION BASINS

PROJECT #: 042-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: 1"=40'
SHEET: C-2.2



FOR PERMITTING ONLY

SCALE: 1" = 40'
0 20 40 80 120 FEET

C-2.4 ENLARGED SITE ENTRANCE LAYOUT PLAN

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

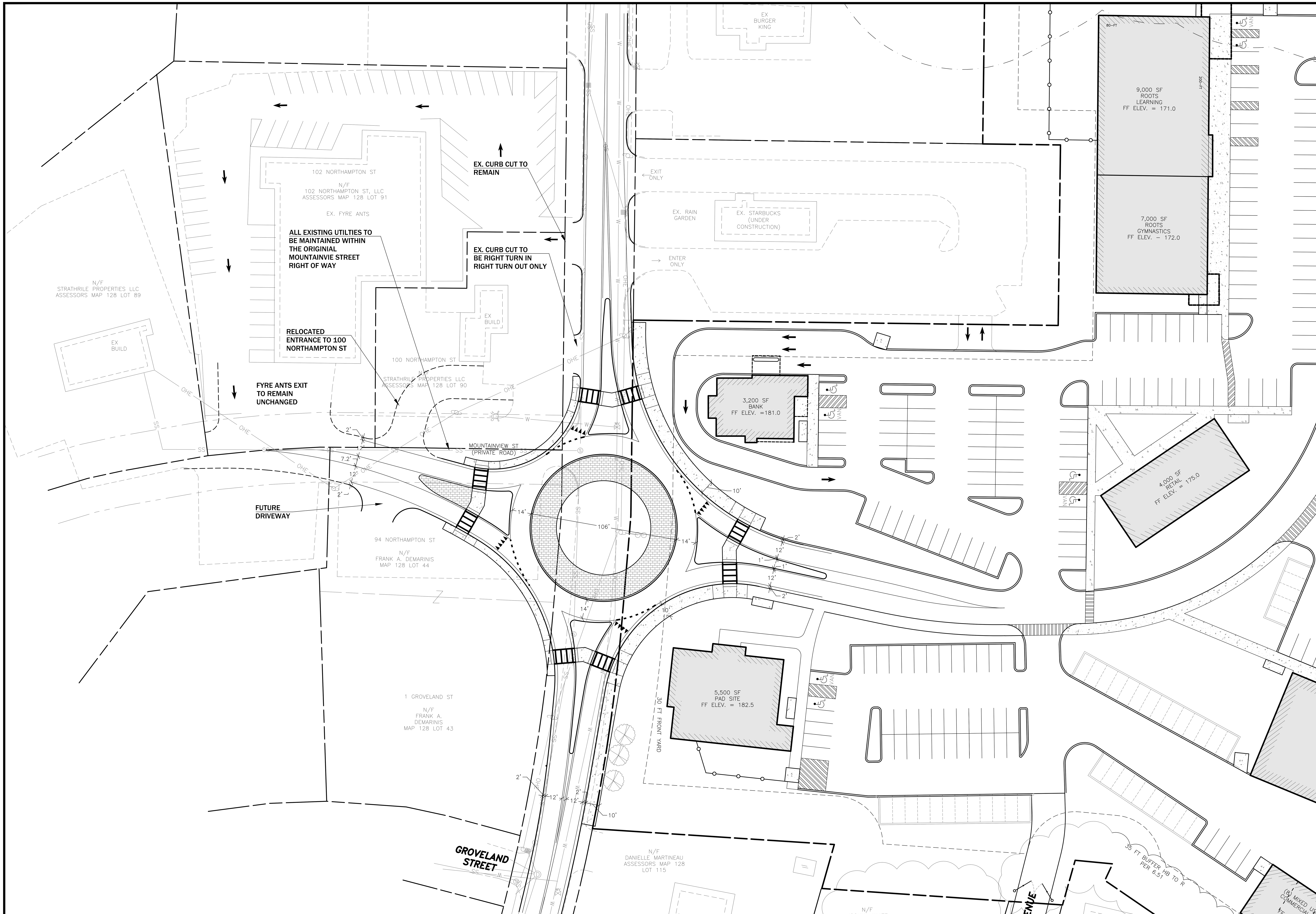
Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

COMMONWEALTH OF MASSACHUSETTS
BRYAN J. BALICKI
CIVIL
REGISTERED PROFESSIONAL ENGINEER

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1	7-27-23	LDS	REVISED PER P&T PEER REVIEW
2	9-6-23	LDS	REVISED ENTRANCE LOCATION
3	9-29-23	LDS	REVISED INTERSECTION
4	10-11-23	LDS	REVISED PROJECT SITE ENTRANCE
5	10-30-23	LDS	MISC. REVISIONS

PROJECT #: 042-01-22
DRAWN BY: LDS
DATE: 5/11/2023
SCALE: 1"=40'
SHEET: C-2.4



FOR PERMITTING ONLY

C-2.4JA ENLARGED ENTRANCE - INITIAL ROUNDABOUT

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

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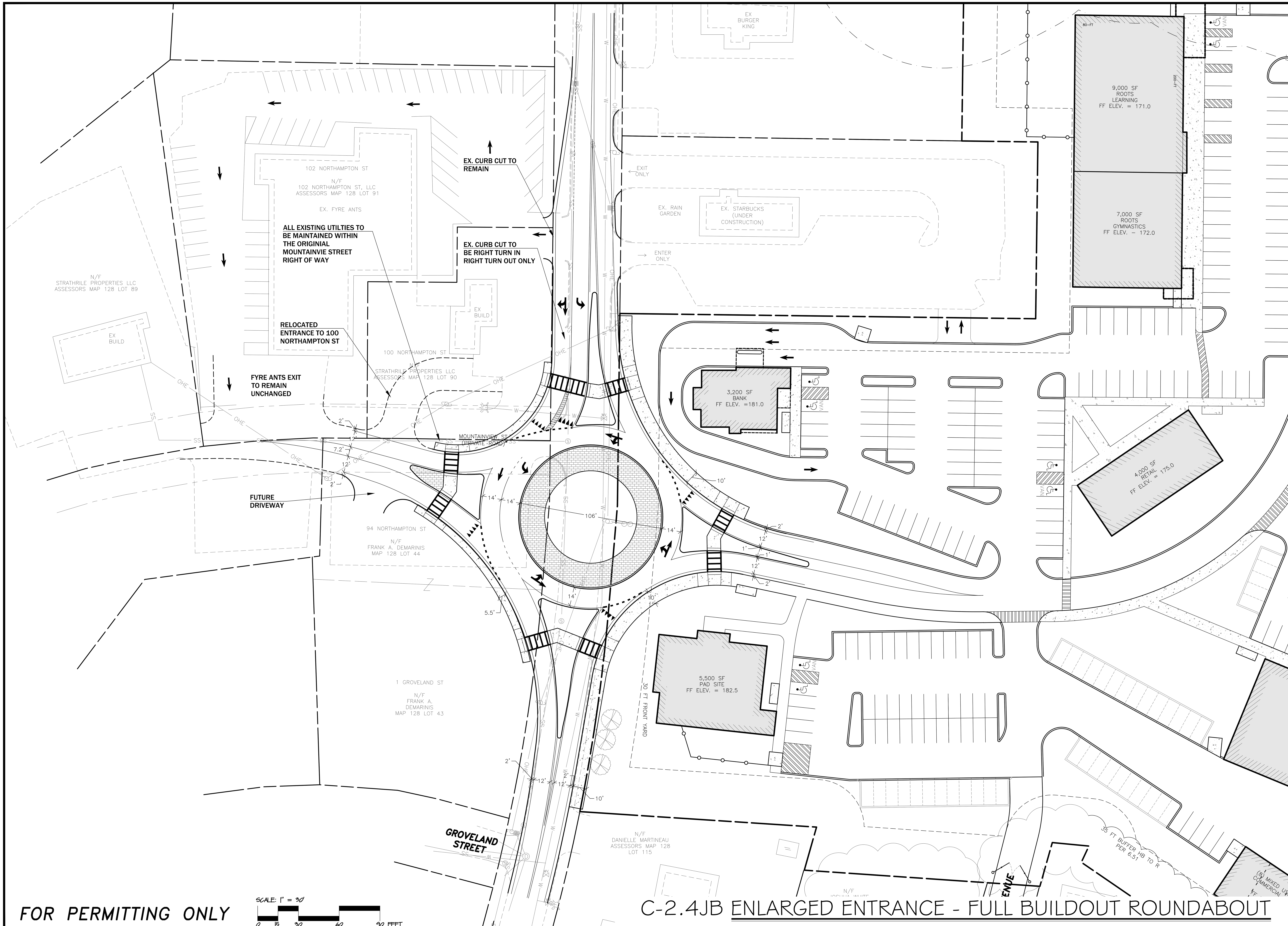
NO.	DATE:	BY:	REVISION DESCRIPTION
1	10-17-23	LDS	ADDED TRUCK APRON ON MOUNTAINVIEW ST
2	10-30-23	LDS	MISC. REVISIONS
3	-	-	-
4	-	-	-
5	-	-	-

PROJECT #: 041-01-22
DRAWN BY: LDS
DATE: 9/29/2023
SCALE: 1"=30'
SHEET: C-2.4JA



FOR PERMITTING ONLY

C-2.4JB ENLARGED ENTRANCE - FULL BUILDOUT ROUNDABOUT

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

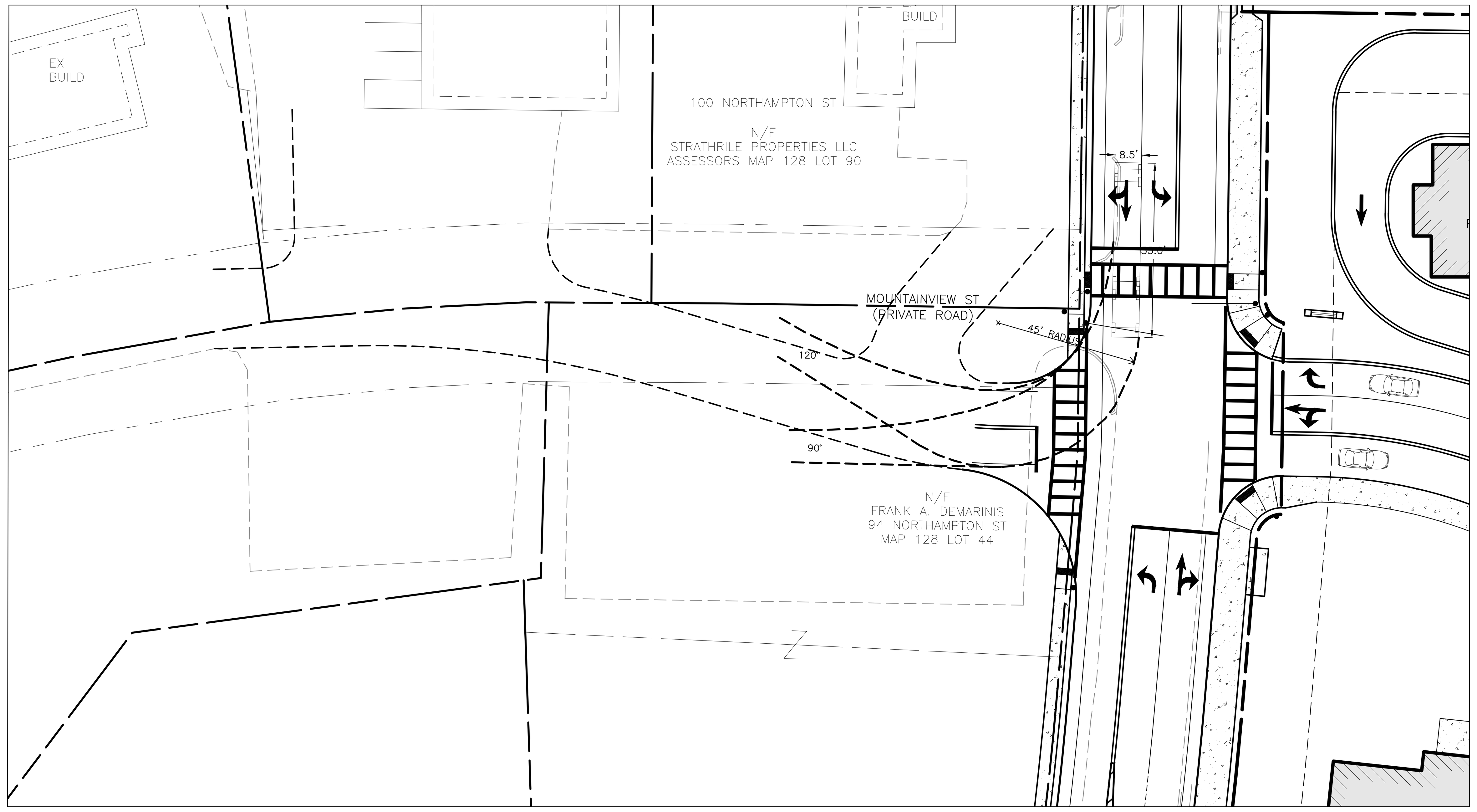
Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

BRYAN J. BALICKI CIVIL REGISTERED PROFESSIONAL ENGINEER

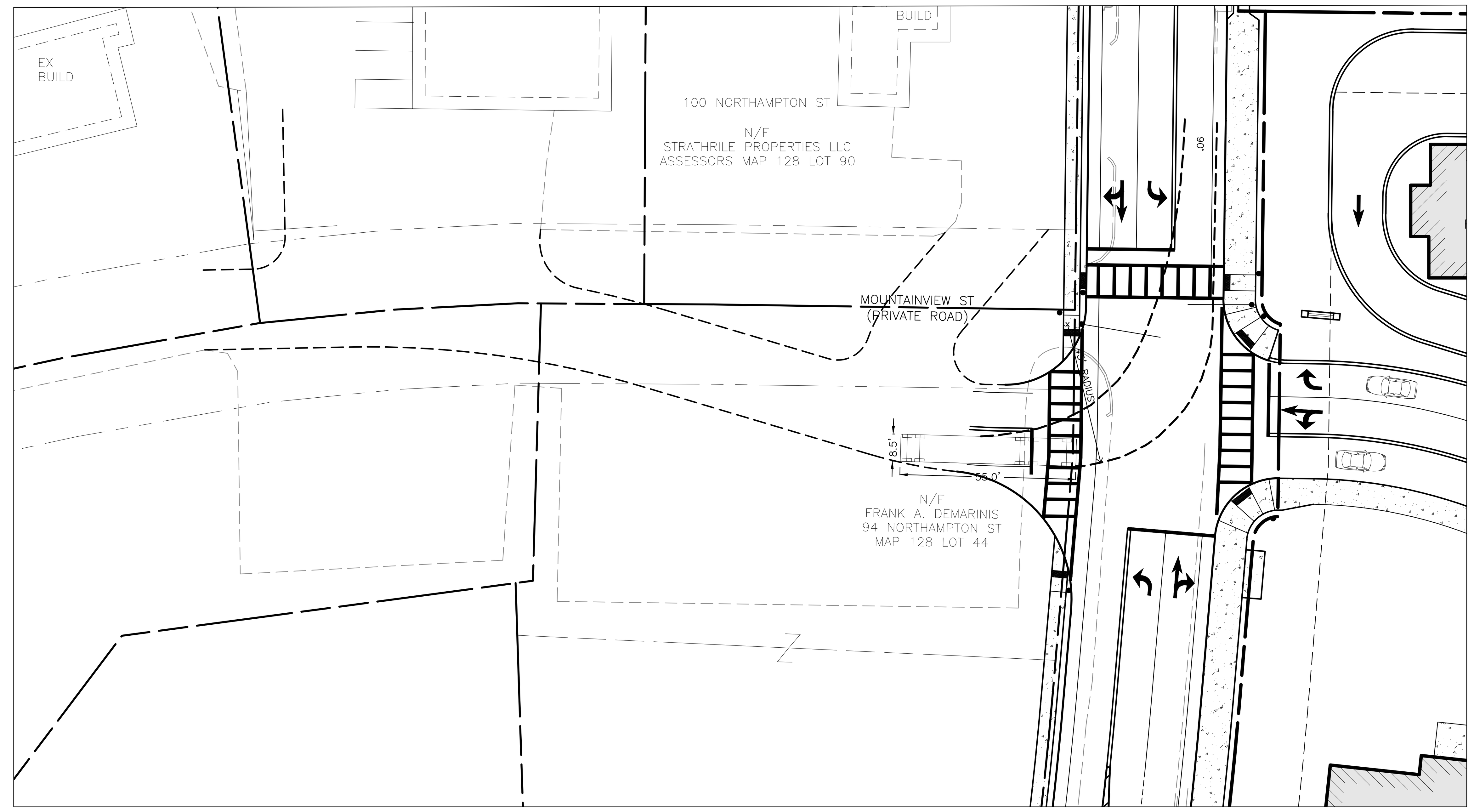
ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1	10-30-23	LDS	MISC. REVISIONS
2	-	-	-
3	-	-	-
4	-	-	-
5	-	-	-

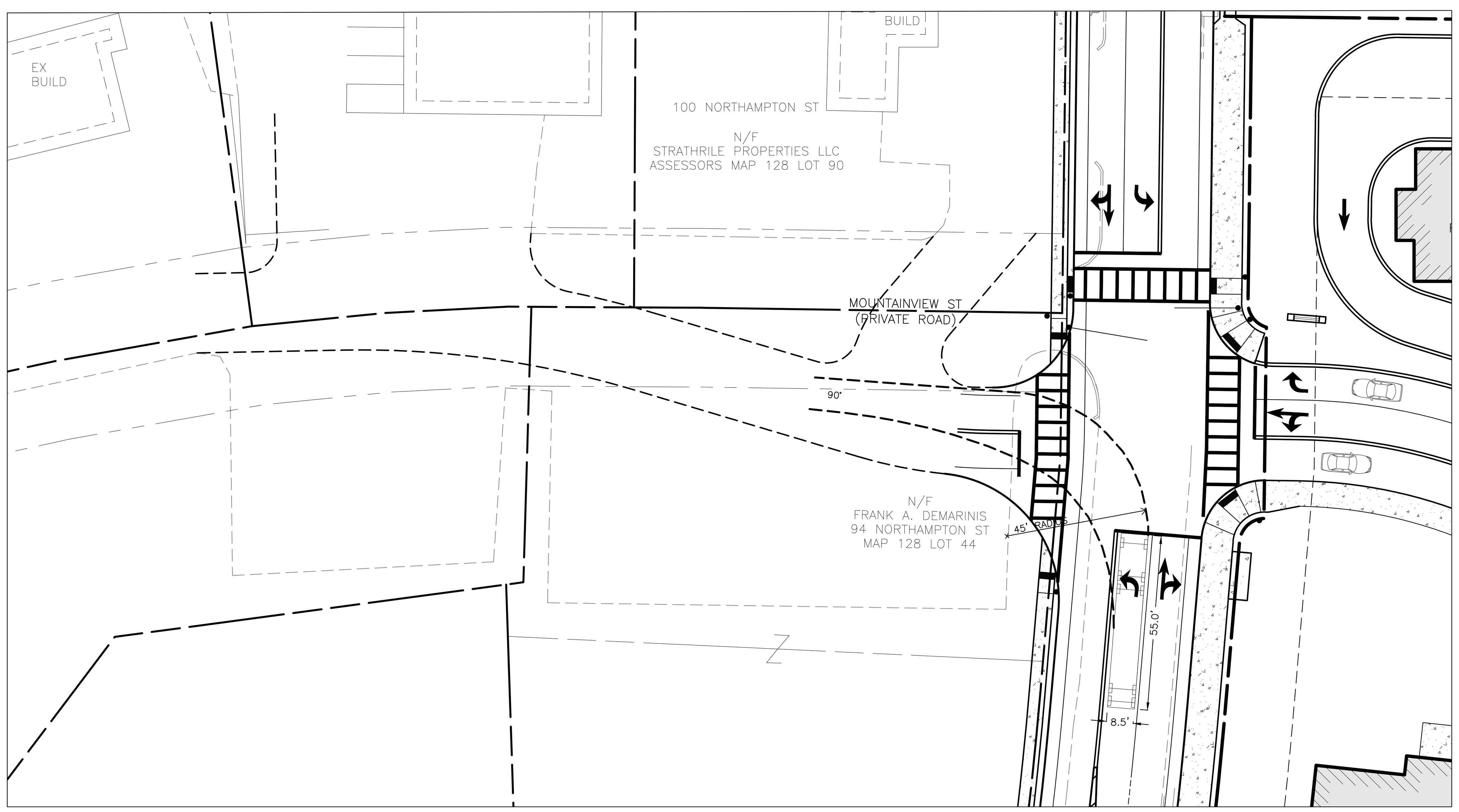
PROJECT #: 042-01-22
DRAWN BY: LDS
DATE: 9/29/2023
SCALE: 1"=30'
SHEET: C-2.4JB



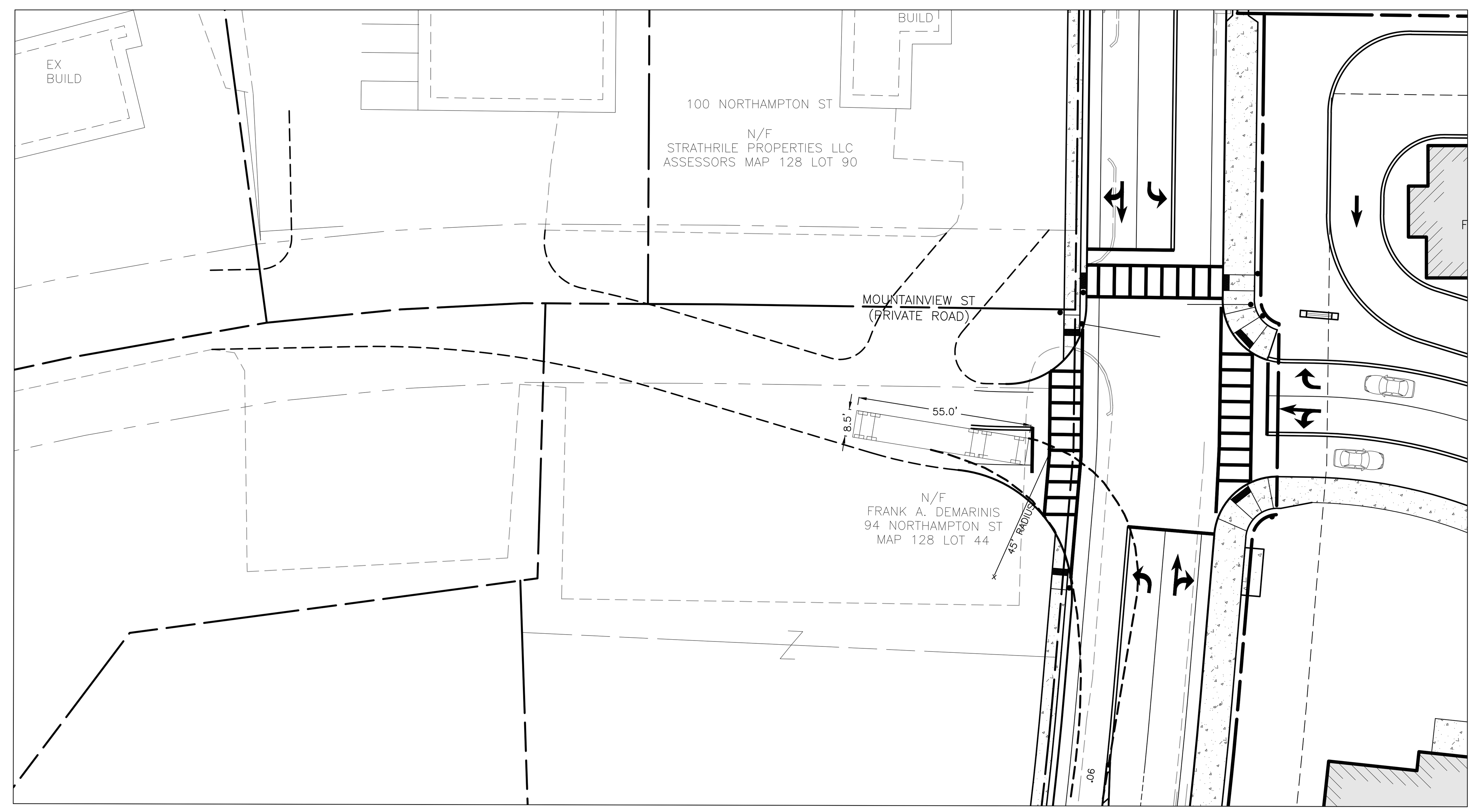
(1) SOUTHBOUND TURN FROM ROUTE 10
1" = 30'



(3) NORTHBOUND TURN FROM MOUNTAINVIEW ST
1" = 30'



(2) NORTHBOUND TURN FROM ROUTE 10
1" = 30'



(4) SOUTHBOUND TURN FROM MOUNTAINVIEW ST
1" = 30'

NOTES:

1) DESIGN VEHICLE IS AAHSTO WB-55 DESIGN SEMITRAILER COMBINATION

FOR PERMITTING ONLY

SCALE: 1" = 30'
0 15 30 60 90 FEET

C-2.5 TRUCK TURNING PLAN

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1	10-11-23	LDS	SUBMITTED TO PLANNING BOARD
2	-	-	-
3	-	-	-
4	-	-	-
5	-	-	-

PROJECT #: 042-01-22
DRAWN BY: LDS
DATE: 9/28/2023
SCALE: 1"=30'
SHEET: C-2.5

SITE PLANTING LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	TREES			
A	ACER RUBRUM	RED MAPLE	56	2" CAL. MIN.
B	GLEDITSIA TRIACANTHOS INERMIS 'HALKA'	HALKA HONEYLOCUST	24	2" CAL. MIN
C	CRATAEGUS PHAENOPYRUM	WASHINGTON HAWTHORN	27	2" CAL. MIN
D	THUJA OCCIDENTALIS	ARBOR VITAE	81	3'–4'
SG	CELTIS OCCIDENTALIS	COMMON HACKBERRY	15	2" CAL. MIN
	SHRUBS			
E	HYPERICUM DENSIFLORUM	BUSHY ST. JOHN'S WORT	99	#3
F	ILEX VERTICILLATA 'RED SPRITE'	'RED SPRITE' WINTERBERRY	133	#3
G	HAMAMELIS VIRGINIANA	WITCH HAZEL	39	#3
	GRASSES			
H	ANDROPOGON GERARDII	BIG BLUESTEM	424	3" LINER
	SEED			
PSM	PREMIUM SEED MIX (LAWN AREA)*		RATE 6LBS/1,000 SF	
	NEW ENGLAND CONSERVATION & WILDLIFE SEED MIX (NEWE00205)**		RATE: 25LBS/ACRE	

NOTES:
1. SEE SHEETS C–3.1, C–3.2, & C–3.3 FOR SITE PLANTINGS IDENTIFICATION
2. SEE SHEET C–3.4 ENLARGED BUILDING & UTILITIES PLAN FOR APARTMENT BUILDING PLANTINGS

*PREMIUM SEED MIX INCLUDES –
50% RYEGRASS
20% CHEWINGS FESCUE
15% CREEPING RED FESCUE
15% KENTUCKY BLUEGRASS

**

NEW ENGLAND WETLAND PLANTS, INC
820 WEST STREET, AMHERST, MA 01002
PHONE: 413-548-8000 FAX 413-549-4000
EMAIL: INFO@NEWP.COM WEB ADDRESS: WWW.NEWP.COM

New England Conservation/Wildlife Mix

Botanical Name	Common Name	Indicator
Elymus virginicus	Virginia Wild Rye	FACW-
Schizachyrium scoparium	Little Bluestem	FACU
Andropogon gerardii	Big Bluestem	FAC
Festuca rubra	Red Fescue	FACU
Sorghastrum nutans	Indian Grass	UPL
Panicum virgatum	Switch Grass	FAC
Chamaecrista fasciculata	Partridge Pea	FACU
Desmodium canadense	Showy Tick Trefoil	FAC
Asclepias tuberosa	Butterfly Milkweed	NI
Bidens frondosa	Beggar Ticks	FACW
Eupatorium purpureum (Eutrochium maculatum)	Purple Joe Pye Weed	FAC
Rudbeckia hirta	Black Eyed Susan	FACU-
Aster pilosus (Symphyotrichum pilosum)	Heath (or Hairy) Aster	UPL
Solidago juncea	Early Goldenrod	

PRICE PER LB. $39.50 MIN. QUANITY 2 LBS. **TOTAL:** $79.00 APPLY: 25 LBS/ACRE :1750 sq ft/lb

The New England Conservation/Wildlife Mix provides a permanent cover of grasses, wildflowers, and legumes For both good erosion control and wildlife habitat value. The mix is designed to be a no maintenance seeding, and is appropriate for cut and fill slopes, detention basin side slopes, and disturbed areas adjacent to commercial and residential projects.

New England Wetland Plants, Inc. may modify seed mixes at any time depending upon seed availability. The design criteria and ecological function of the mix will remain unchanged. Price is $/bulk pound, FOB warehouse, Plus SH and applicable taxes.

TOPSOIL NOTES:

1. ALL DISTURBED AREAS TO BE SEEDED OR PLANTED SHALL RECEIVE TOPSOIL (6" MINIMUM DEPTH).

2. TOPSOIL SHALL CONSIST OF FERTILE, FRIABLE, NATURAL LOAM FREE OF SUBSOIL, CLAY LUMPS, BRUSH, STONES OR OTHER DELETERIOUS MATERIALS LARGER THAN 2" IN GREATEST DIMENSION AND MEETING THE FOLLOWING GRADATION, pH AND ORGANIC CONTENT REQUIREMENTS:

SIEVE	PERCENT PASSING
2"	100
1"	85 – 100
¼"	65–100
NO. 200	20–60

PH RANGE: 5.5 – 7.6
ORGANIC CONTENT: 2% – 20%

3. PROPOSED TOPSOIL SHALL BE TESTED BY INDEPENDENT TESTING FACILITY WITH TEST RESULTS SUBMITTED TO THE ENGINEER FOR APPROVAL. CONTRACTOR SHALL PAY FOR ALL TESTING. ACCEPTANCE OF TOPSOIL SHALL BE BASED UPON TEST RESULTS. ONE TEST SHALL BE PERFORMED PER 100 C.Y. OF TOPSOIL.

4. NATURAL TOPSOIL MAY BE AMENDED WITH APPROVED MATERIALS, BY APPROVED METHODS, TO MEET THE ABOVE SPECIFICATIONS.

SCALE: 1" = 80'
0 40 80 160 240 FEET

FOR PERMITTING ONLY

C-3.0 OVERALL LANDSCAPE PLAN

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93–97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

COMMONWEALTH OF MASSACHUSETTS BRYAN J. BALICKI CIVIL No. 48002 REGISTERED PROFESSIONAL ENGINEER

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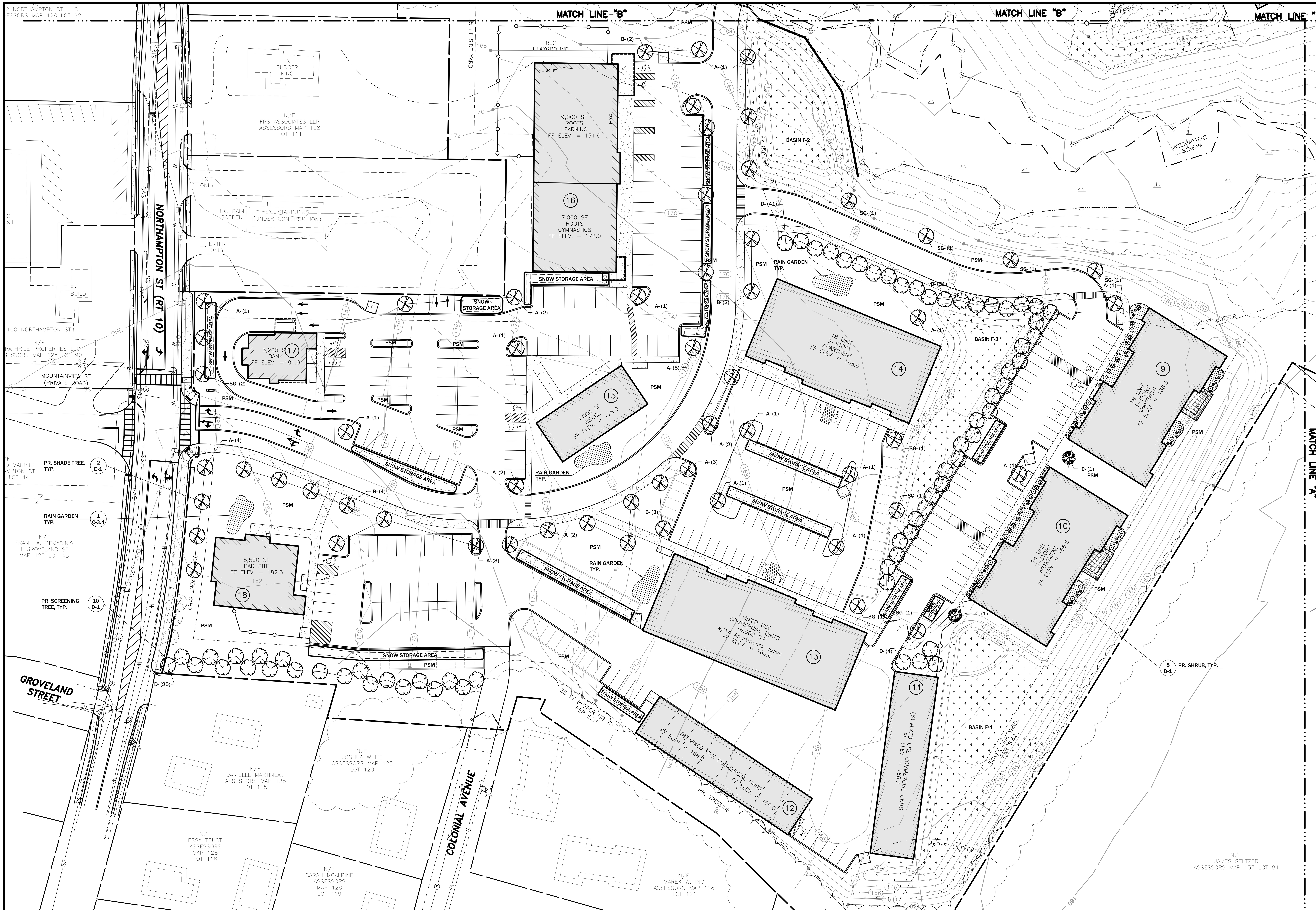
NO.	DATE:	BY:	REVISION DESCRIPTION
1	8-29-23	LDS	REVISED PER CON COM COMMENTS
2	10-11-23	LDS	REVISED PROJECT SITE ENTRANCE
3	10-30-23	LDS	MISC. REVISIONS
4	11-17-23	LDS	REVISED INFILTRATION BASINS
5	12-6-23	LDS	REVISED PER CON. COM. COMMENTS

PROJECT #: 1042-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: 1"=80'
SHEET: C-3.0



FOR PERMITTING ONLY

SCALE: 1" = 40'
0 20 40 80 120 FEET

C-3.1 LANDSCAPE PLAN - SOUTH

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1	8-29-23	LDS	REVISED PER CON COM COMMENTS
2	10-11-23	LDS	REVISED PROJECT SITE ENTRANCE
3	10-30-23	LDS	MISC. REVISIONS
4	11-17-23	LDS	REVISED INFILTRATION BASINS
5	12-6-23	LDS	REVISED PER CON. COM. COMMENTS

PROJECT #: 10A2-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: 1"=40'
SHEET: C-3.1

FOR PERMITTING ONLY

SCALE: 1" = 40'

0 20 40 80 120 FEET

C-3.2 LANDSCAPE PLAN - NORTH

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

COMMONWEALTH OF MASSACHUSETTS BRYAN J. BALICKI CIVIL No. 48862 REGISTERED PROFESSIONAL ENGINEER

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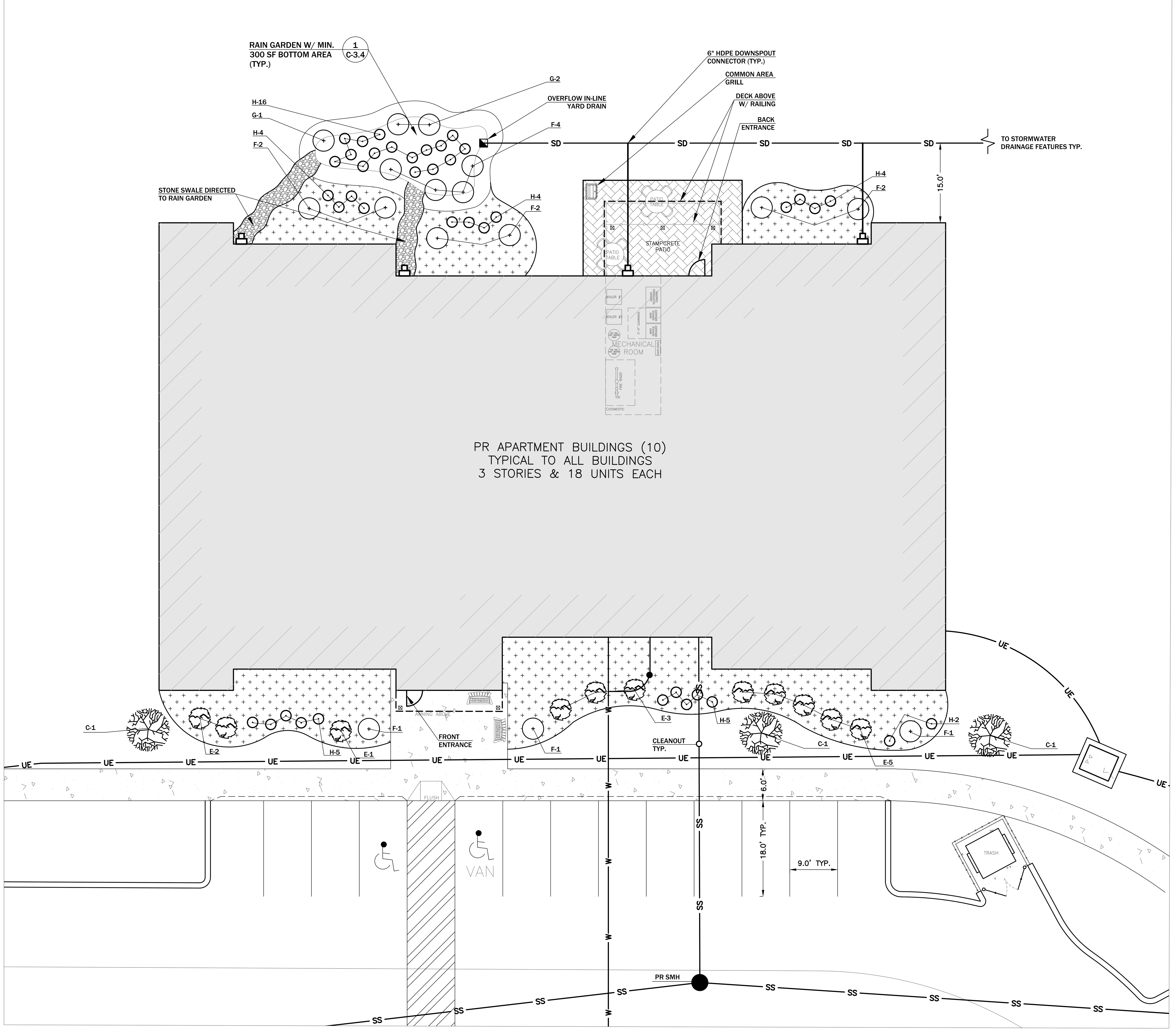
NO.	DATE:	BY:	REVISION DESCRIPTION
1	6-19-23	LDS	REMOVE BUILD. 8 & MISC. REVISIONS
2	7-27-23	LDS	REVISED PER B&T PEER REVIEW
3	8-29-23	LDS	REVISED PER CON COM COMMENTS
4	10-11-23	LDS	ADDED SCREENING/WETLAND PLANTS
5	11-17-23	LDS	REVISED INFILTRATION BASINS

PROJECT #: 1042-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: 1"=40'
SHEET: C-3.2

NOTE:
1. A RAIN GARDEN WILL BE CONSTRUCTED AT BUILDINGS 1, 2, 3, 4, 5, 6, 7, 9, 10, 13, 14, 15, AND 18.
2. RAIN GARDEN LOCATION WILL VARY FOR EACH BUILDING DEPENDING ON SITE CONSTRAINTS & OBSTRUCTIONS.



RESIDENTIAL BUILDING PLANTING LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	TREES			
A	ACER RUBRUM	RED MAPLE	–	2" CAL. MIN.
B	GLEDITSIA TRIACANTHOS INERMIS 'HALKA'	HALKA HONEYLOCUST	–	2" CAL. MIN.
C	CRATAEGUS PHAENOPYRUM	WASHINGTON HAWTHORN	3	2" CAL. MIN.
D	THUJA OCCIDENTALIS	ARBOR VITAE	–	3'–4'
SG	CELTIS OCCIDENTALIS	COMMON HACKBERRY	–	2" CAL MIN..
	SHRUBS			
E	HYPERICUM DENSIFLORUM	BUSHY ST. JOHN'S WORT	11	#3
F	ILEX VERTICILLATA 'RED SPRITE'	'RED SPRITE' WINTERBERRY	13	#3
G	HAMAMELIS VIRGINIANA	WITCH HAZEL	3	#3
	GRASSES			
H	ANDROPOGON GERARDII	BIG BLUESTEM	40	3" LINER

STORM WATER DRAINAGE PIPE LEGEND

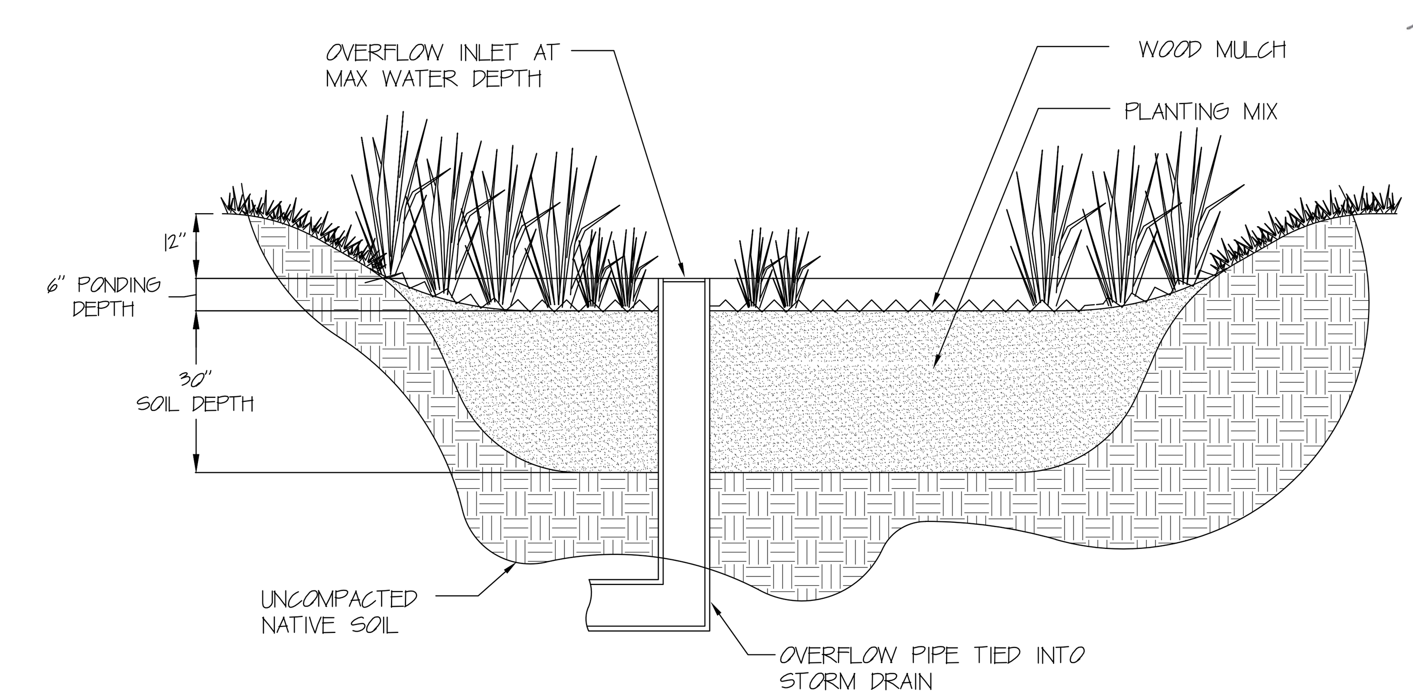
- – – SD – – SD – = PERFORATED 6" HDPE UNDERDRAIN
- —— SD —— = SOLID HDPE PIPE (SIZE AS NOTED)
- ———— = 6" HDPE DOWNSPOUT CONNECTOR

RAIN GARDEN OPERATION & MAINTENANCE NOTES

1. INSEPCT SOIL AND REPAIR ERODED AREAS MONTHLY.
2. RE-MULCH VOID AREAS AS NEEDED.
3. REMOVE LITTER AND DEBRIS MONTHLY.
4. TREAT DISEASED VEGETATION AS NEEDED.
5. REMOVE AND REPLACE DEAD VEGETATION TWICE PER YEAR (SPRING & FALL)
6. REMOVE INVASIVE SPECIES AS NEEDED TO PREVENT SPREADING INTO RAIN GARDEN
7. REPLACE MULCH EVERY 2 YEARS, IN THE EARLY SPRING.
8. NEVER STORE SNOW IN OR AROUND RAIN GARDEN TO AVOID SALT CONTAMINATION.
9. ALL DEAD, DISEASED, AND INVASIVE PLANTS AND PLANT MATERIAL SHALL BE REMOVED OFF SITE AND DISPOSED OF PROPERLY.

RAIN GARDEN MAINTENANCE SCHEDULE

ACTIVITY	TIME OF YEAR	FREQUENCY
INSPECT & REMOVE TRASH	YEAR ROUND	MONTHLY
MULCH	SPRING	ANNUALY
REMOVE DEAD VEGETATION	FALL OR SPRING	ANNUALY
REPLACE DEAD VEGETATION	SPRING	ANNUALY
PRUNE	SPRING OR FALL	ANNUALY
REPLACE ENTIRE MEDIA & ALL VEGETATION	LATE SPRING/EARLY SUMMER	AS NEEDED



NOTES:
1. ALL PLANT MATERIAL TO BE SPECIFIED BY MASS DEP STORMWATER GUIDES.
2. SITE MUST BE FULLY STABILIZED PRIOR TO RAIN GARDEN CONSTRUCTION.
3. NATIVE SOIL BELOW AND SURROUNDING THE RAIN GARDEN AREA MUST NOT BE COMPACTED.
4. CONSTRUCTION SEDIMENT SHALL NOT BE PERMITTED TO ENTER THE RAIN GARDEN.
5. PLANTING MIX TO CONTAIN 75% COARSE SAND AND 25% FILTREXX GROWINGMEDIA OR APPROVED EQUAL.

1 C-3.4 RAIN GARDEN DETAIL
SCALE: N.T.S.

FOR PERMITTING ONLY

SCALE: 1" = 10'
0 5 10 20 30 FEET

C-3.4 ENLARGED UNIT LANDSCAPE PLAN

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

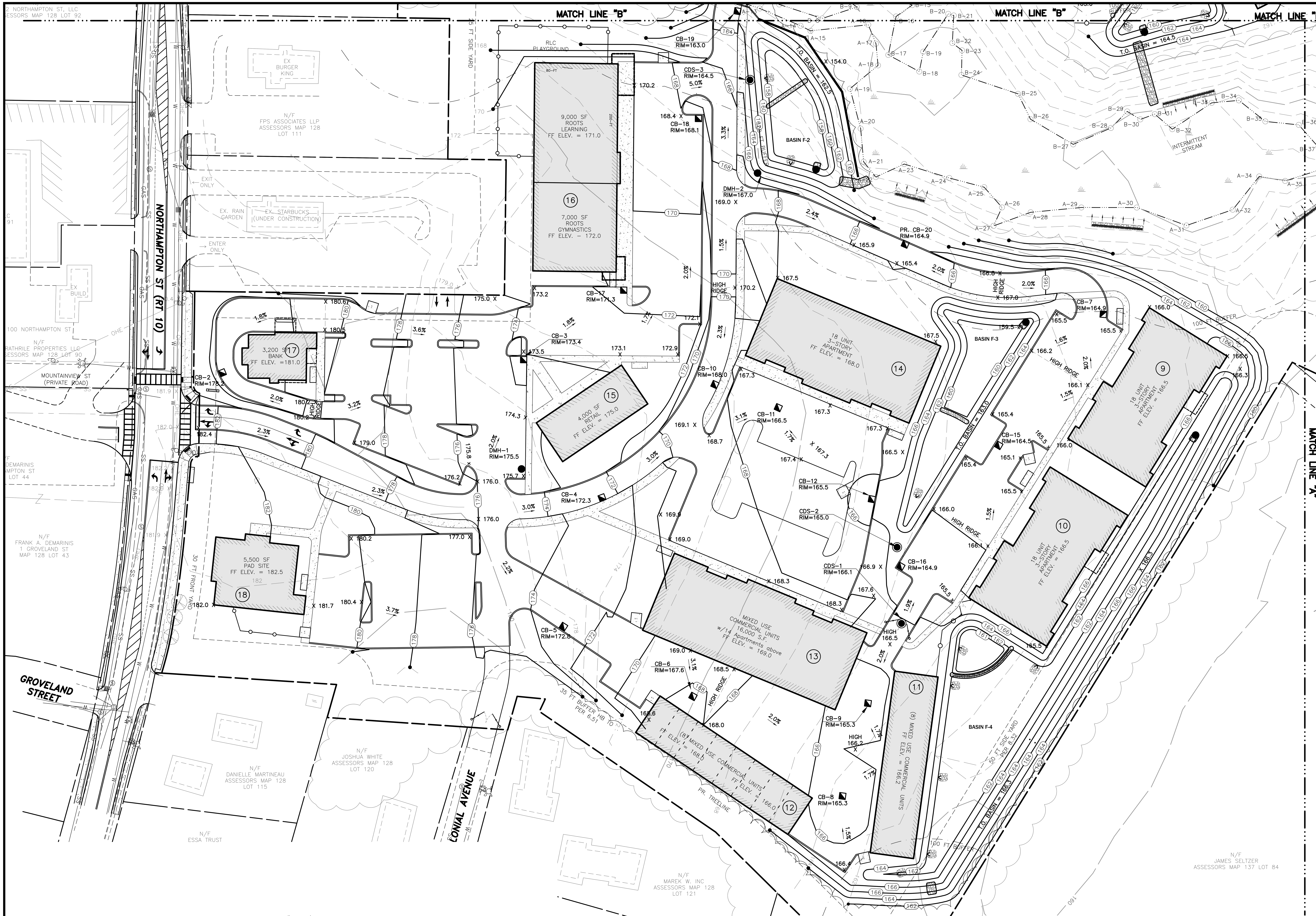
Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562 4884

COMMONWEALTH OF MASSACHUSETTS
BRYAN J. BALICKI
CIVIL
No. 48962
REGISTERED PROFESSIONAL ENGINEER

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1	7-27-23	LDS	REVISED PER B&T PEER REVIEW
2	8-29-23	LDS	REVISED PER CON COM COMMENTS
3	11-14-23	LDS	ADDED NOTE 9
4	11-17-23	LDS	CHANGES PER CONSERVATION COMMISSION
5	12-6-23	LDS	REVISED PER CON. COM. COMMENTS

PROJECT #: 1042-01-22
DRAWN BY: HJM
DATE: 11/7/2022
SCALE: 1"=10'
SHEET: C-3.4



FOR PERMITTING ONLY

SCALE: 1" = 40'

0 20 40 80 120 FEET

C-4.1 GRADING PLAN - SOUTH

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

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NO.	DATE:	BY:	REVISION DESCRIPTION
1	10-11-23	LDS	REVISED PROJECT SITE ENTRANCE
2	10-18-23	LDS	REVISED PER B&T PEER REVIEW
3	10-30-23	LDS	MISC. REVISIONS
4	11-14-23	LDS	BASIN F-4 MINOR REGRADING
5	11-17-23	LDS	REVISED INFILTRATION BASINS

PROJECT #: OAZ-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: 1"=40'
SHEET: C-4.1

C-4.2 GRADING PLAN - NORTH

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

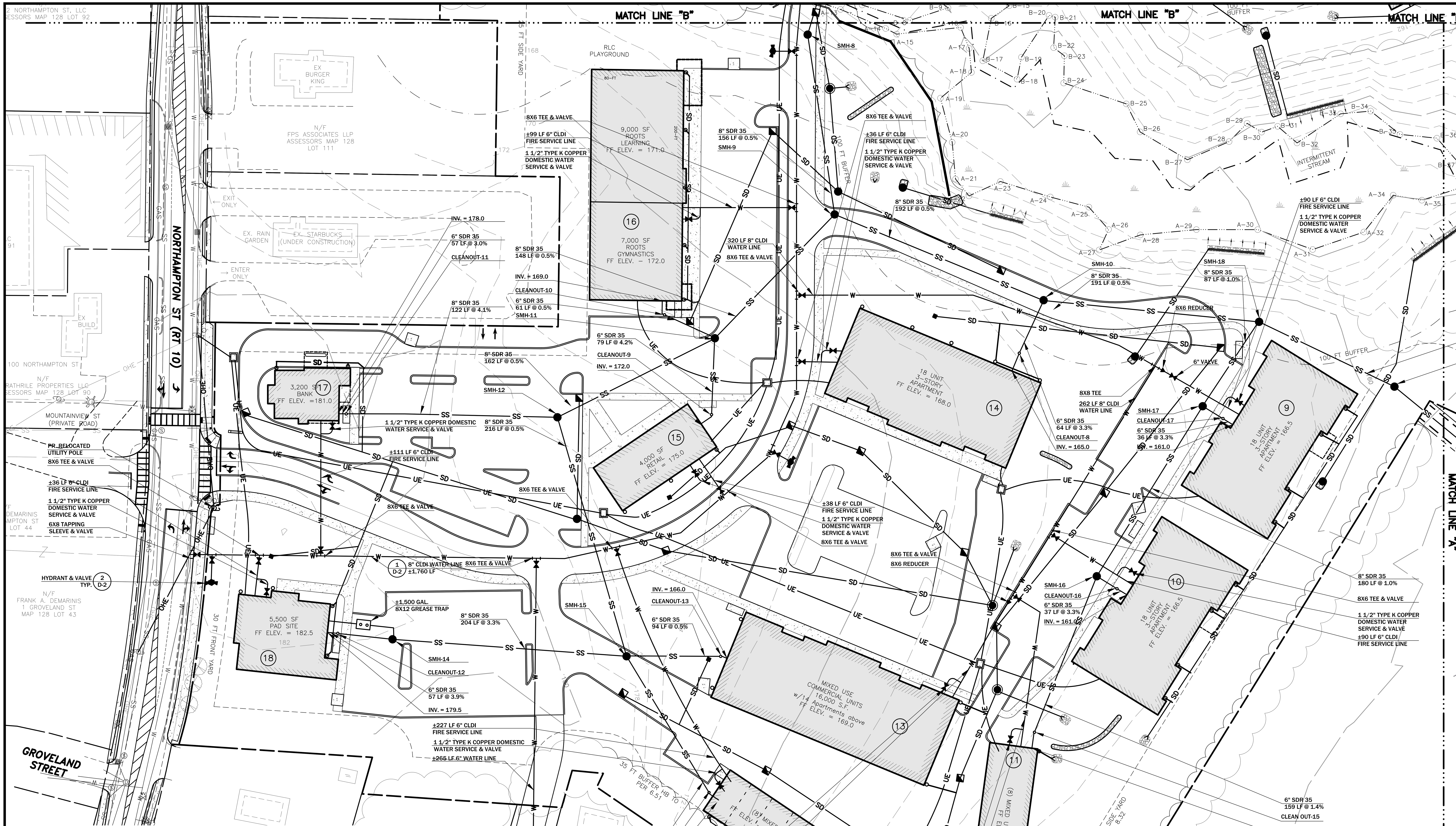
Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

COMMONWEALTH OF MASSACHUSETTS BRYAN J. BALICKI CIVIL REGISTERED PROFESSIONAL ENGINEER

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1	7-27-23	LDS	REVISED PER B&T PEER REVIEW
2	8-29-23	LDS	REVISED PER B&T PEER REVIEW
3	10-30-23	LDS	MISC. REVISIONS
4	11-14-23	LDS	BASIN R-1 MINOR REGRADING
5	11-17-23	LDS	REVISED INFILTRATION BASINS

PROJECT #: 1042-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: 1"=40'
SHEET: C-4.2



PROPOSED STRUCTURES

SMH–8
RIM= 164.0
INV IN (SMH–7)= 159.9
INV OUT= 159.8

SMH–9
RIM= 168.6
INV IN (SMH–11)= 161.3
INV IN (SMH–8)= 159.0
INV OUT= 158.9

SMH–10
RIM= 165.9
INV IN (BUILD–14)= 162.9
INV IN (SMH–9)= 157.9
INV OUT= 157.8

SMH–11
RIM= 171.7
INV IN (BUILD–15)= 168.7
INV IN (BUILD–16)= 168.7
INV IN (SMH–12)= 162.2
INV OUT= 162.1

SMH–12
RIM= 174.8
INV IN (BUILD 17)= 171.2
INV IN (SMH–15)= 163.1
INV OUT= 163.0

SMH–14
RIM= 180.3
INV IN (BUILD–18)= 176.5
INV OUT= 176.4

SMH–15
RIM= 173.5
INV IN (SMH–14)= 173.4
INV IN (BUILD–13)= 164.3
INV OUT= 164.2

SMH–16
RIM= 165.75
INV IN (BUILD–11)= 159.8
INV IN (BUILD–10)= 159.8
INV OUT= 159.7

SMH–17
RIM= 165.75
INV IN (BUILD–9)= 159.8
INV IN (SMH–16)= 157.9
INV OUT= 157.8

SMH–18
RIM= 164.5
INV IN (SMH–17)= 156.9
INV IN (SMH–10)= 156.9
INV OUT= 156.8

FOR PERMITTING ONLY

SCALE: 1" = 40'

0 20 40 80 120 FEET

C-5.1 UTILITIES PLAN - SOUTH

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
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Phone: (413) 562-4884

COMMONWEALTH OF MASSACHUSETTS BRYAN J. BALICKI CIVIL No. 48862 REGISTERED PROFESSIONAL ENGINEER

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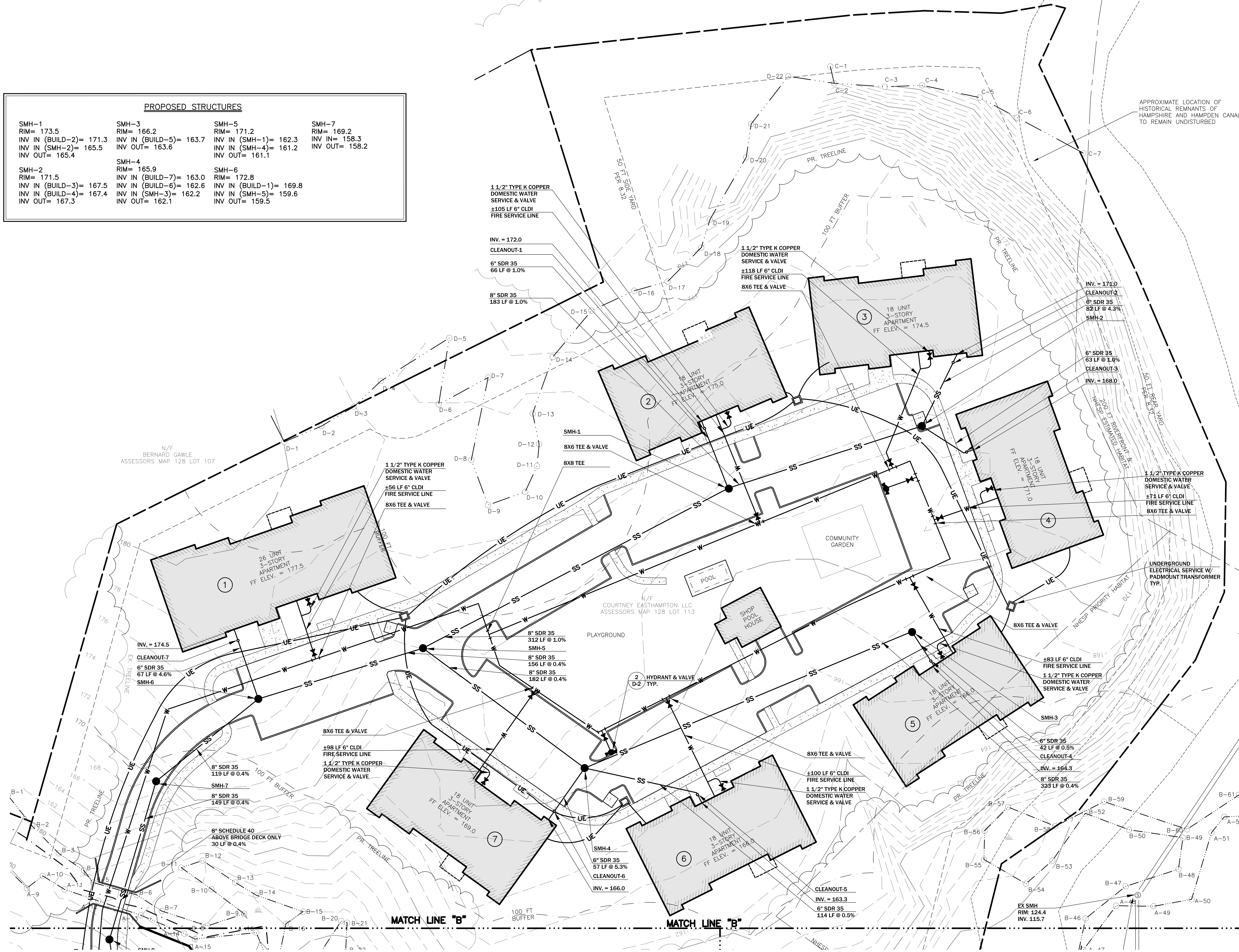
NO.	DATE:	BY:	REVISION DESCRIPTION
1	6-19-23	LDS	REMOVE BUILD. 8 & MISC. REVISIONS
2	7-27-23	LDS	REVISED PER B&T PEER REVIEW
3	10-11-23	LDS	REVISED PROJECT SITE ENTRANCE
4	10-30-23	LDS	MISC. REVISIONS
5	11-17-23	LDS	REVISED INFILTRATION BASINS

PROJECT #: 1042-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: 1"=40'
SHEET: C-5.1

PROPOSED STRUCTURES

SMH-1	SMH-3	SMH-5	SMH-7
RIM= 173.5	RIM= 166.2	RIM= 171.2	RIM= 169.2
INV IN (BUILD-2)= 171.3	INV IN (BUILD-5)= 163.7	INV IN (SMH-1)= 162.3	INV IN= 158.3
INV IN (SMH-2)= 165.5	INV OUT= 163.6	INV IN (SMH-4)= 161.2	INV OUT= 158.2
INV OUT= 165.4		INV OUT= 161.1	

SMH-2	SMH-4	SMH-6
RIM= 171.5	RIM= 165.9	RIM= 172.8
INV IN (BUILD-3)= 167.5	INV IN (BUILD-7)= 163.0	INV IN (BUILD-1)= 169.8
INV IN (BUILD-4)= 167.4	INV IN (BUILD-6)= 162.6	INV IN (SMH-5)= 159.6
INV OUT= 167.3	INV IN (SMH-3)= 162.2	INV OUT= 159.5



FOR PERMITTING ONLY

SCALE: 1" = 40'

0 20 40 80 120 FEET

C-5.2 UTILITIES PLAN - NORTH

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

COMMONWEALTH OF MASSACHUSETTS BRYAN J. BALICKI CIVIL No. 48663 REGISTERED PROFESSIONAL ENGINEER

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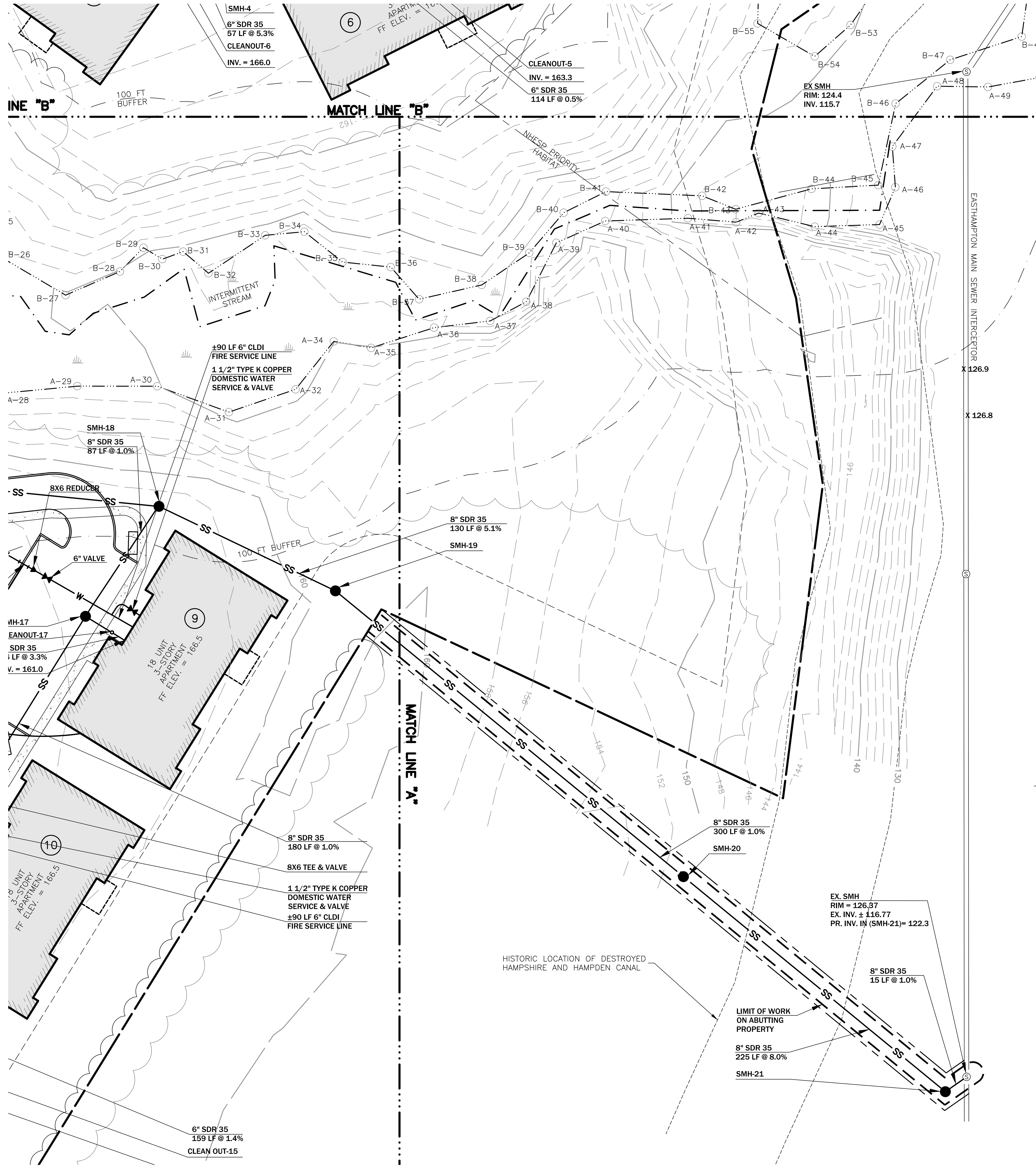
NO.	DATE:	BY:	REVISION DESCRIPTION
1	4-10-23	LDS	REVISED PER CITY ENGINEER COMMENTS
2	4-28-23	LDS	REVISED PER CONSERVATION COMMENTS
3	6-19-23	LDS	REMOVE BUILD. 8 & MISC. REVISIONS
4	7-27-23	LDS	REVISED PER B&T PEER REVIEW
5	11-17-23	LDS	REVISED INFILTRATION BASINS

PROJECT #: 1042-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: 1"=40'
SHEET: C-5.2



PROPOSED STRUCTURES

SMH–18
RIM= 163.5
INV IN(SMH–17)= 156.9
INV IN(SMH–10)= 156.9
INV OUT= 156.8

SMH–19
RIM= 159.4
INV IN(SMH–18)= 150.2
INV OUT= 150.1

SMH–20
RIM= 151.0
INV IN(SMH–19)= 147.1
INV OUT= 140.6

SMH–21
RIM= 127.0
INV IN(SMH–20)= 122.6
INV OUT= 122.5

FOR PERMITTING ONLY

SCALE: 1" = 40'
0 20 40 80 120 FEET

C-5.3 UTILITIES PLAN - EAST

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

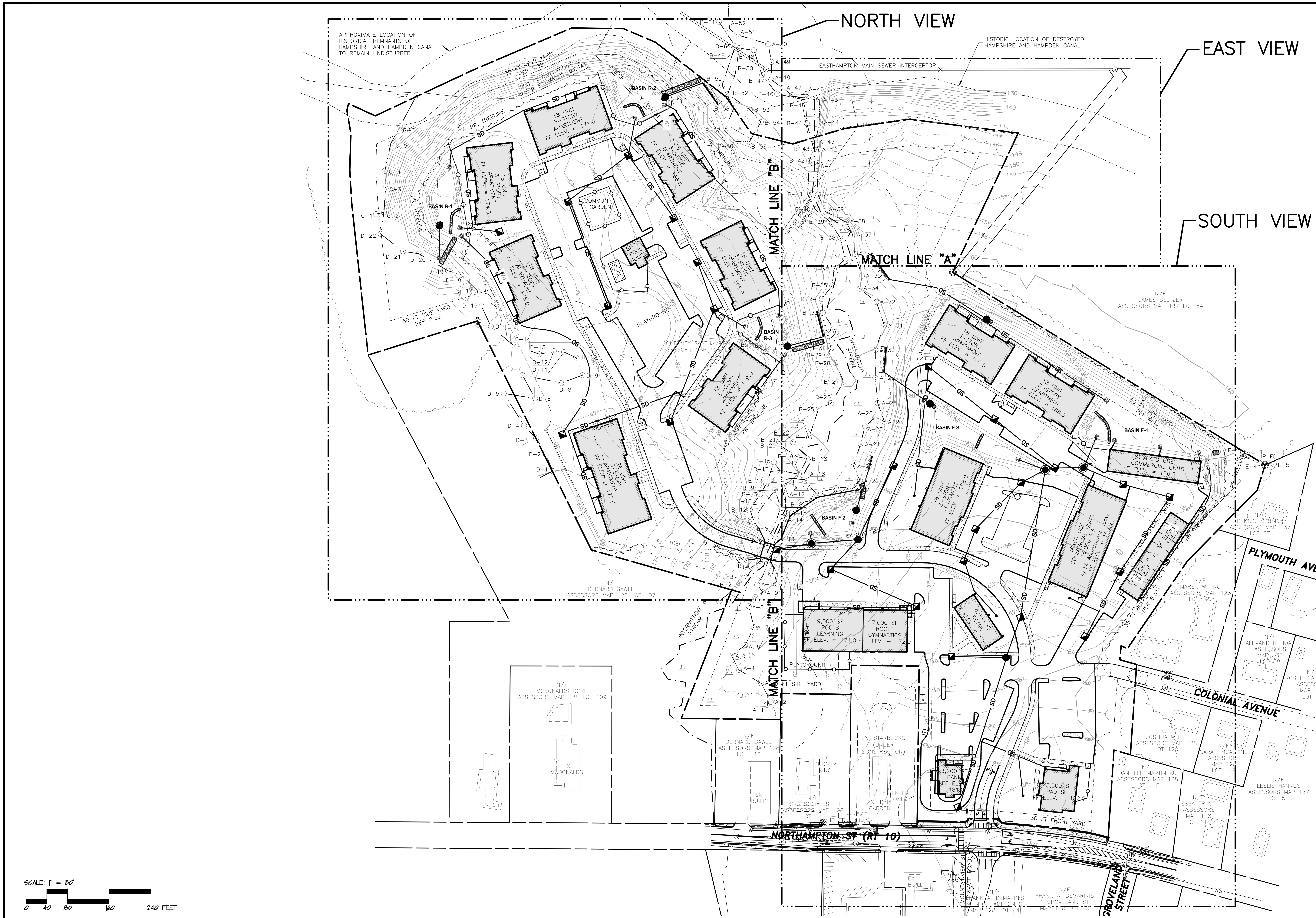
APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1	4-10-23	LDS	REVISED PER CITY ENGINEER COMMENTS
2	4-28-23	LDS	REVISED PER CONSERVATION COMMENTS
3	6-19-23	LDS	REMOVE BUILD. 8 & MISC. REVISIONS
4	7-27-23	LDS	REVISED PER B&T PEER REVIEW
5	11-17-23	LDS	REVISED INFILTRATION BASINS

PROJECT #: 042-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: 1"=40'
SHEET: C-5.3



FOR PERMITTING ONLY

C-6.0 OVERALL DRAINAGE PLAN

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

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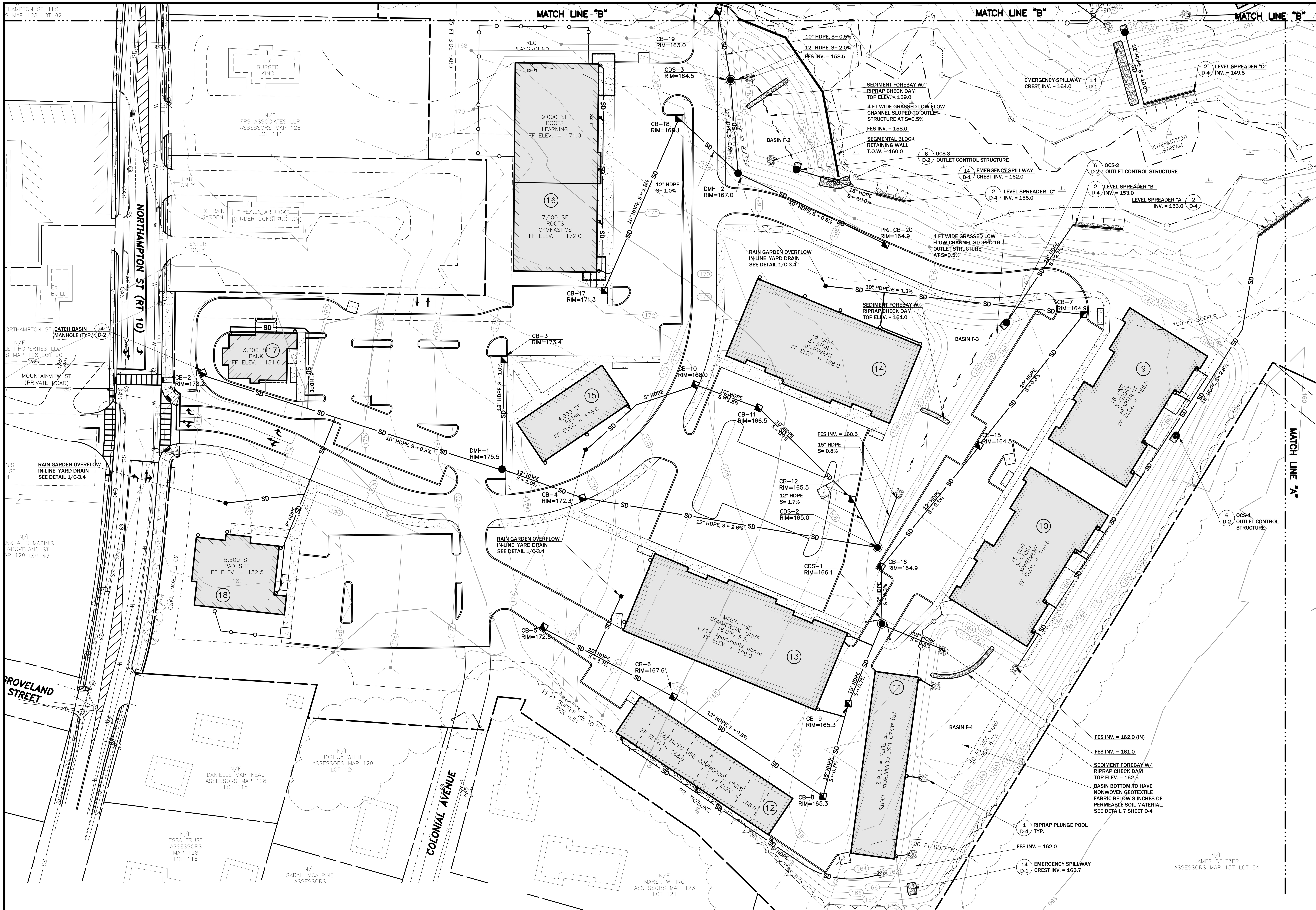
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

BRYAN J. BALICKI CIVIL No. REGISTERED PROFESSIONAL ENGINEER

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1	7-27-23	LDS	REVISED PER B&T PEER REVIEW
2	8-29-23	LDS	REVISED PER B&T PEER REVIEW
3	10-11-23	LDS	REVISED PROJECT SITE ENTRANCE
4	10-30-23	LDS	MISC. REVISIONS
5	11-17-23	LDS	REVISED INFILTRATION BASINS

PROJECT #: 0A2-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: 1"=80'
SHEET: C-6.0



SCALE: 1" = 40'
0 20 40 80 120 FEET

NOTES:

1) SEE PLAN SHEET C-6.3 FOR PROPOSED STRUCTURES SCHEDULE

C-6.1 DRAINAGE PLAN - SOUTH

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
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Westfield, MA 01085
Phone: (413) 562-4884

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1	8-29-23	LDS	REVISED PER B&T PEER REVIEW
2	10-11-23	LDS	REVISED PROJECT SITE ENTRANCE
3	10-30-23	LDS	MISC. REVISIONS
4	11-17-23	LDS	REVISED INFILTRATION BASINS
5	12-6-23	LDS	RAIN GARDEN YARD DRAINS ADDED

PROJECT #: 1042-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: 1"=40'
SHEET: C-6.1

PROPOSED STRUCTURES

CB-2
RIM= 178.2
INV OUT CB-3= 174.6

CB-3
RIM= 173.4
INV OUT DMH-1= 170.4

CB-4
RIM= 172.3
INV IN DMH-1= 168.5
INV OUT CDS-2= 168.4

CB-5
RIM= 172.8
INV OUT CB-6= 168.8

CB-6
RIM= 167.6
INV IN CB-5= 163.6
INV OUT CB-8= 163.5

CB-7
RIM= 164.9
INV IN BUILD 14= 162.5
INV OUT CB-15= 162.4

CB-8
RIM= 165.3
INV IN CB-6= 162.5
INV OUT CB-9= 162.4

CB-9
RIM= 165.3
INV IN CB-8= 161.8
INV OUT CDS-1= 161.7

CB-10
RIM= 168.0
INV OUT CB-11= 164.0

CB-11
RIM= 166.5
INV IN CB-10= 163.0
INV OUT CB-12= 162.9

CB-12
RIM= 165.5
INV IN CB-11= 162.0
INV OUT CDS-2= 161.9

CB-15
RIM= 164.5
INV IN CB-7= 161.9
INV OUT CB-16= 161.8

CB-16
RIM= 164.9
INV IN CB-15= 161.4
INV OUT CDS-2= 161.3

CB-17
RIM= 171.3
INV OUT CB-18= 167.3

CB-18
RIM= 168.1
INV IN CB-17= 164.2
INV OUT DMH-2= 164.1

CB-19
RIM= 163.0
INV OUT CDS-3= 160.0

CB-20
RIM= 164.9
INV OUT DMH-2= 161.0

CB-21
RIM= 170.5
INV OUT CDS-4= 166.5

CB-22
RIM= 164.0
INV OUT CDS-4= 161.0

CB-23
RIM= 164.9
INV OUT CDS-5= 162.4

CB-24
RIM= 172.4
INV OUT CDS-6= 168.9

CB-25
RIM= 171.6
INV IN CB-24= 167.8
INV OUT CDS-5= 167.7

CB-26
RIM= 154.1
INV OUT CDS-7= 151.1

CDS-1
MODEL: CDS2020
RIM= 166.1
INV IN CB-9= 161.2
INV IN CB-16= 161.15
INV OUT FES= 161.15

CDS-2
MODEL: CDS2015
RIM= 165.0
INV IN CB-12= 161.0
INV IN CB-4= 161.0
INV OUT FES= 160.9

CDS-3
MODEL: CDS2015
RIM= 164.5
INV IN CB-19= 159.6
INV IN DMH-2= 159.6
INV OUT FES= 159.5

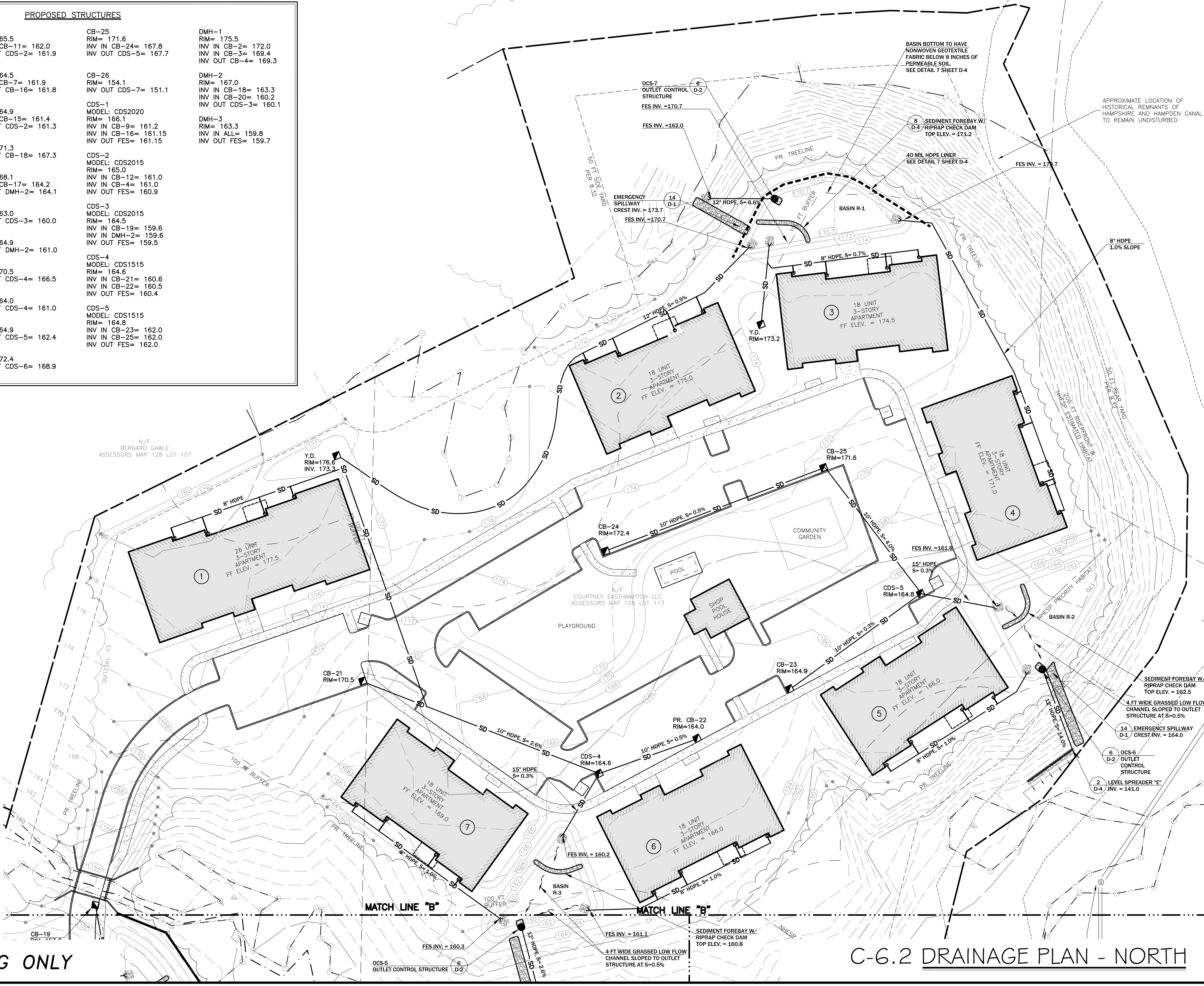
CDS-4
MODEL: CDS1515
RIM= 164.6
INV IN CB-21= 160.6
INV IN CB-22= 160.5
INV OUT FES= 160.4

CDS-5
MODEL: CDS1515
RIM= 164.8
INV IN CB-23= 162.0
INV IN CB-25= 162.0
INV OUT FES= 162.0

DMH-1
RIM= 175.5
INV IN CB-2= 172.0
INV IN CB-3= 169.4
INV OUT CB-4= 169.3

DMH-2
RIM= 167.0
INV IN CB-18= 163.3
INV IN CB-20= 160.2
INV OUT CDS-3= 160.1

DMH-3
RIM= 163.3
INV IN ALL= 159.8
INV OUT FES= 159.7



FOR PERMITTING ONLY

C-6.2 DRAINAGE PLAN - NORTH

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
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COMMONWEALTH OF MASSACHUSETTS BRYAN J. BALICKI CIVIL No. 48862 REGISTERED PROFESSIONAL ENGINEER

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NO.	DATE:	BY:	REVISION DESCRIPTION
1	6-19-23	LDS	REMOVE BUILD. 8 & MISC. REVISIONS
2	7-27-23	LDS	REVISED PER B&T PEER REVIEW
3	8-29-23	LDS	REVISED PER B&T PEER REVIEW
4	10-30-23	LDS	MISC. REVISIONS
5	11-17-23	LDS	REVISED INFILTRATION BASINS

PROJECT #: 1042-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: 1"=40'
SHEET: C-6.2

EROSION AND SEDIMENTATION CONTROL DURING CONSTRUCTION ACTIVITIES

A. GENERAL

1. TEMPORARY STABILIZATION: ANY DISTURBED AREA WHERE CONSTRUCTION ACTIVITY IS SUSPENDED FOR MORE THAN FOURTEEN DAYS SHALL BE SEEDED WITH WINTER RYE AT A RATE OF 30 LBS PER ACRE TO STABILIZE ERODIBLE MATERIALS.
2. PERMANENT STABILIZATION: WHEN AN AREA HAS BEEN GRADED TO THE FINAL INCREMENT, IT SHALL BE SEEDED WITH THE SEED MIX AND AT THE APPLICATION RATE SPECIFIED IN THE SITE PLANTING LIST WITHIN FOURTEEN DAYS.
3. EROSION CONTROL BLANKETS SHALL BE USED FOR STABILIZATION IN AREAS WHERE SLOPES GREATER THAN 15% ARE BEING DISTURBED.
4. TEMPORARY STRAW BALE EROSION CONTROL BARRIERS SHALL BE INSTALLED AS NEEDED.
5. AFTER AREA IS STABILIZED, ALL TEMPORARY EROSION AND SEDIMENT CONTROLS SHALL BE REMOVED AFTER INSPECTION AND APPROVAL BY THE CONSERVATION COMMISSION OR ITS AGENT.
6. EROSION AND SEDIMENT CONTROLS SHALL BE INSTALLED IN ACCORDANCE WITH THE PROJECT PHASING PLANS, AS WELL AS THE EROSION & SEDIMENT CONTROL PLAN SHEETS C-7.1 TO C-7.3. THESE CONTROLS INCLUDE SILT FENCE W/ STRAW WATTLE OR STRAW BALES, EROSION CONTROL BLANKETS, STRAW BALE BARRIERS, AND STABILIZED CONSTRUCTION ENTRANCES.
7. EROSION & SEDIMENT CONTROLS SHALL BE MAINTAINED IN ACCORDANCE WITH THE PROJECT CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENT CONTROL PLAN FOUND IN THE STORMWATER MANAGEMENT REPORT.

B. CONSTRUCTION WASTE & MATERIALS:

1. ALL WASTE MATERIAL SHALL BE REGULARLY COLLECTED AND TRANSPORTED OFF SITE IN DUMPSTERS BY A LICENSED WASTE DISPOSAL CONTRACTOR AND DISPOSED OF AT A WASTE FACILITY THAT MEETS ALL FEDERAL, STATE, AND LOCAL REGULATIONS.
2. ALL WASTE MATERIALS SHALL BE COLLECTED AND STORED INA A MANNER THAT WILL PREVENT MATERIALS FROM ENTERING WATERCOURSES, WETLANDS, OR OTHER OFF-SITE AREAS. THIS INCLUDES FIELD LOCATING WASTE COLLECTION AREAS ON-SITE IN UPLAND AREAS THAT DO NOT RECEIVE A SUBSTANTIAL AMOUNT OF STORMWATER FLOW.
3. NO HAZARDOUS WASTE WILL BE STORED ON-SITE.
4. THE CONTRACTOR WILL MAINTAIN SPILL CONTROL KITS ON SITE AT ALL TIMES IN CASE OF VEHICLE FLUID SPILLS.

C. TREE AND VEGETATED AREA PROTECTION

1. EXISTING TREES AND VEGETATED AREAS TO REMAIN SHALL BE PROTECTED WITH TEMPORARY CONSTRUCTION AND EROSION CONTROL FENCE. EROSION CONTROL FENCE SHALL BE LAID OUT BY FIELD SURVEY AND INSTALLED AT THE LIMIT OF WORK PRIOR TO TREE CLEARING.
2. NO VEHICLES OR EQUIPMENT SHALL BE OPERATED WITHIN THE TREE PROTECTION AREA. THERE SHALL BE NO STORAGE OF VEHICLES OR MATERIALS, OR DISPOSAL OF WASTE MATERIALS, WITHIN THE TREE AND VEGETATED AREA PROTECTION AREA.
3. ANY EXISTING TREES THAT ARE INTENDED TO REMAIN THAT ARE DAMAGED BY CONSTRUCTION ACTIVITIES SHALL BE REPAIRED OR REPLACED BY A CERTIFIED ARBORIST AT A RATE OF 2 TREES PLANTED FOR EVERY 1 TREE THAT IS BEING REPLACED. IF A TREE IS DAMAGED BY THE CONTRACTOR IT SHALL BE REPAIRED OR REPLACED AT THE CONTRACTOR'S EXPENSE.

D. TEMPORARY SETTLING BASINS

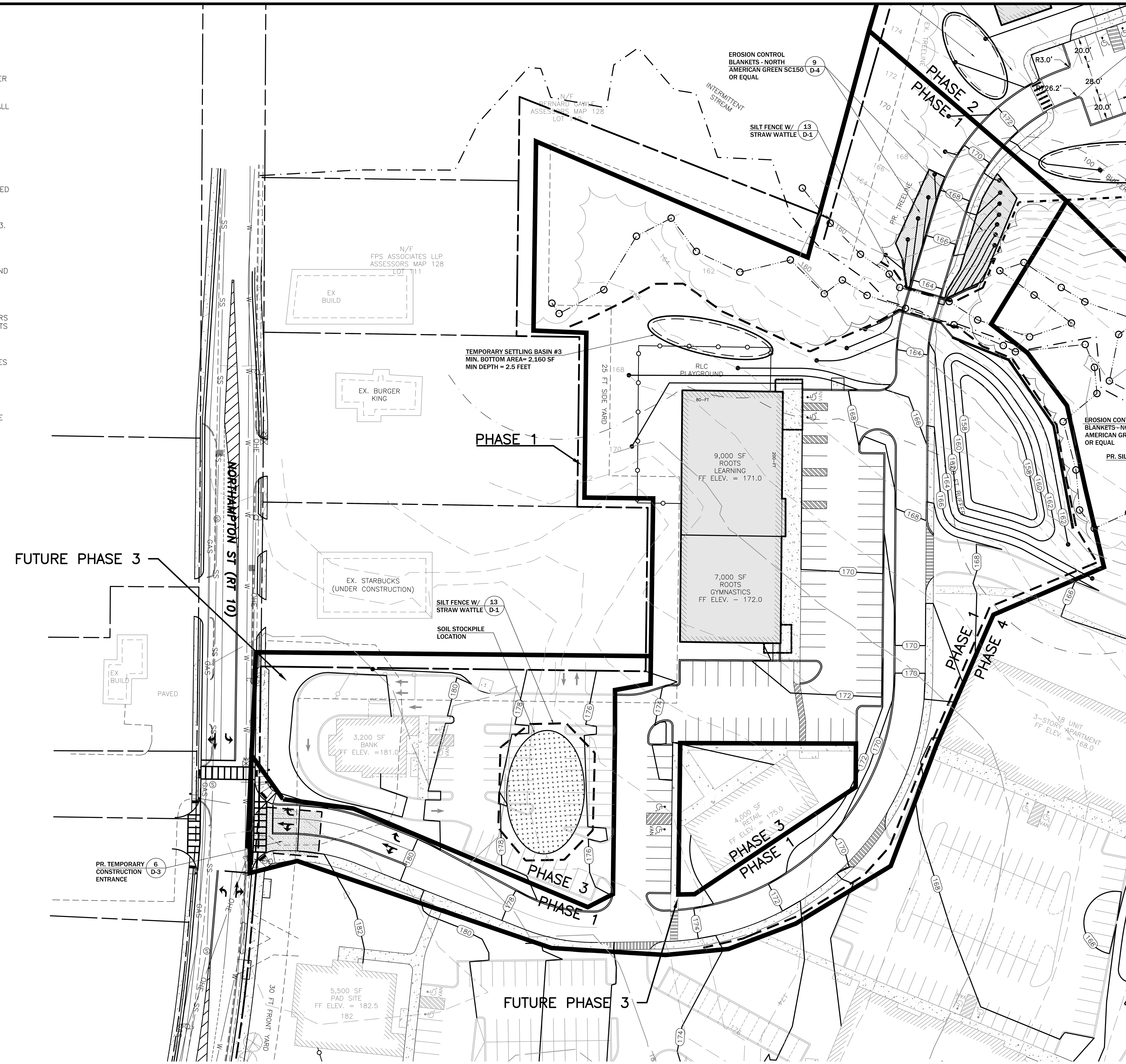
1. SETTLING BASIN SIDE SLOPES SHALL BE 3:1 OR FLATTER.
2. INSTALL BASINS PRIOR TO DISTURBING LARGE PORTIONS OF THE UPLAND CONSTRUCTION SITE.
3. REMOVE ALL VEGETATION AND ROOT MAT PRIOR TO CONSTRUCTION OF THE BASIN EMBANKMENT.
4. COMPACT EMBANKMENT FILL SOILS BY TRAVERSING WITH EQUIPMENT IN ONE-FOOT LIFTS DURING CONSTRUCTION
5. STABILIZE BASIN SIDE SLOPES AND BERMS WITH SEED IMMEDIATELY AFTER CONSTRUCTION.

EROSION CONTROL BARRIER LEGEND:

— — — = SILT FENCE W/ STRAW WATTLE

- - - - = STRAW WATTLE

-- -- -- = SILT FENCE W/ STRAW BALE



PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
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Phone: (413) 562-4884

BRYAN J. BALICKI CIVIL No. 50818 — COMMONWEALTH OF MASSACHUSETTS — REGISTERED PROFESSIONAL ENGINEER

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NO.	DATE:	BY:	REVISION DESCRIPTION
1	7-27-23	LDS	REVISED PER B&T PEER REVIEW
2	8-29-23	LDS	REVISED PER B&T PEER REVIEW
3	10-11-23	LDS	REVISED PROJECT SITE ENTRANCE
4	10-18-23	LDS	REVISED PER B&T PEER REVIEW
5	12-6-23	LDS	REVISED PER CON. COM. COMMENTS

PROJECT #: 1042-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: 1"=40'
SHEET: C-7.1

FOR PERMITTING ONLY

C-7.1 EROSION & SEDIMENT CONTROL PLAN - PHASE 1

FOR PERMITTING ONLY

C-7.2 EROSION & SEDIMENT CONTROL PLAN - PHASE 2 & 3

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
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Westfield, MA 01085
Phone: (413) 562-4884

COMMONWEALTH OF MASSACHUSETTS
BRYAN J. BALICKI
CIVIL
No. 48869
REGISTERED PROFESSIONAL ENGINEER

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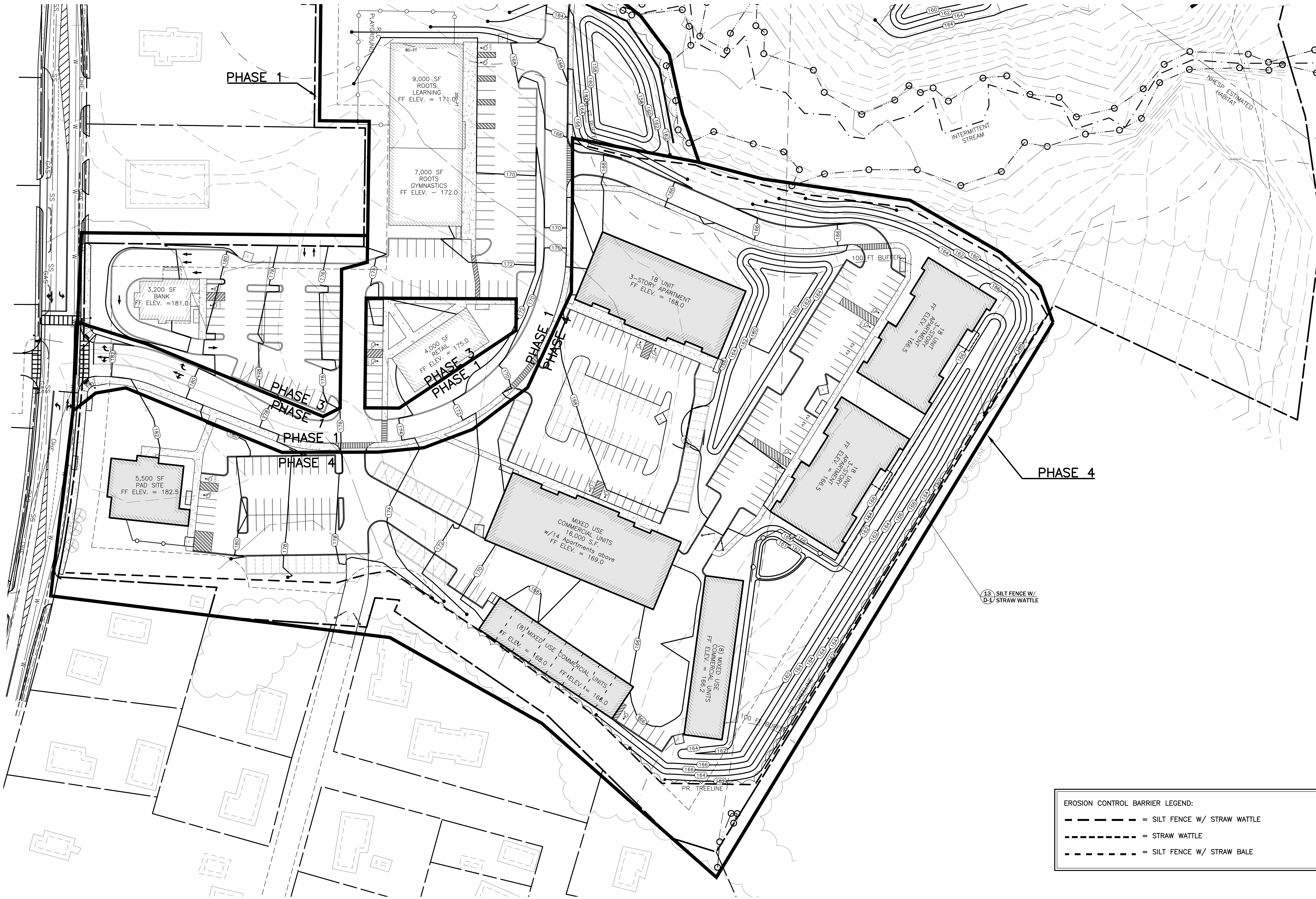
NO.	DATE:	BY:	REVISION DESCRIPTION
1	3-13-23	LDS	REVISED PER CITY ENGINEER COMMENTS
2	6-19-23	LDS	REMOVE BUILD. 8 & MISC. REVISIONS
3	7-27-23	LDS	REVISED PER B&T PEER REVIEW
4	8-29-23	LDS	REVISED PER B&T PEER REVIEW
5	12-6-23	LDS	REVISED PER CON. COM. COMMENTS

PROJECT #: 042-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: 1"=40'
SHEET: C-7.2



FOR PERMITTING ONLY

C-7.3 EROSION & SEDIMENT CONTROL PLAN - PHASE 4

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

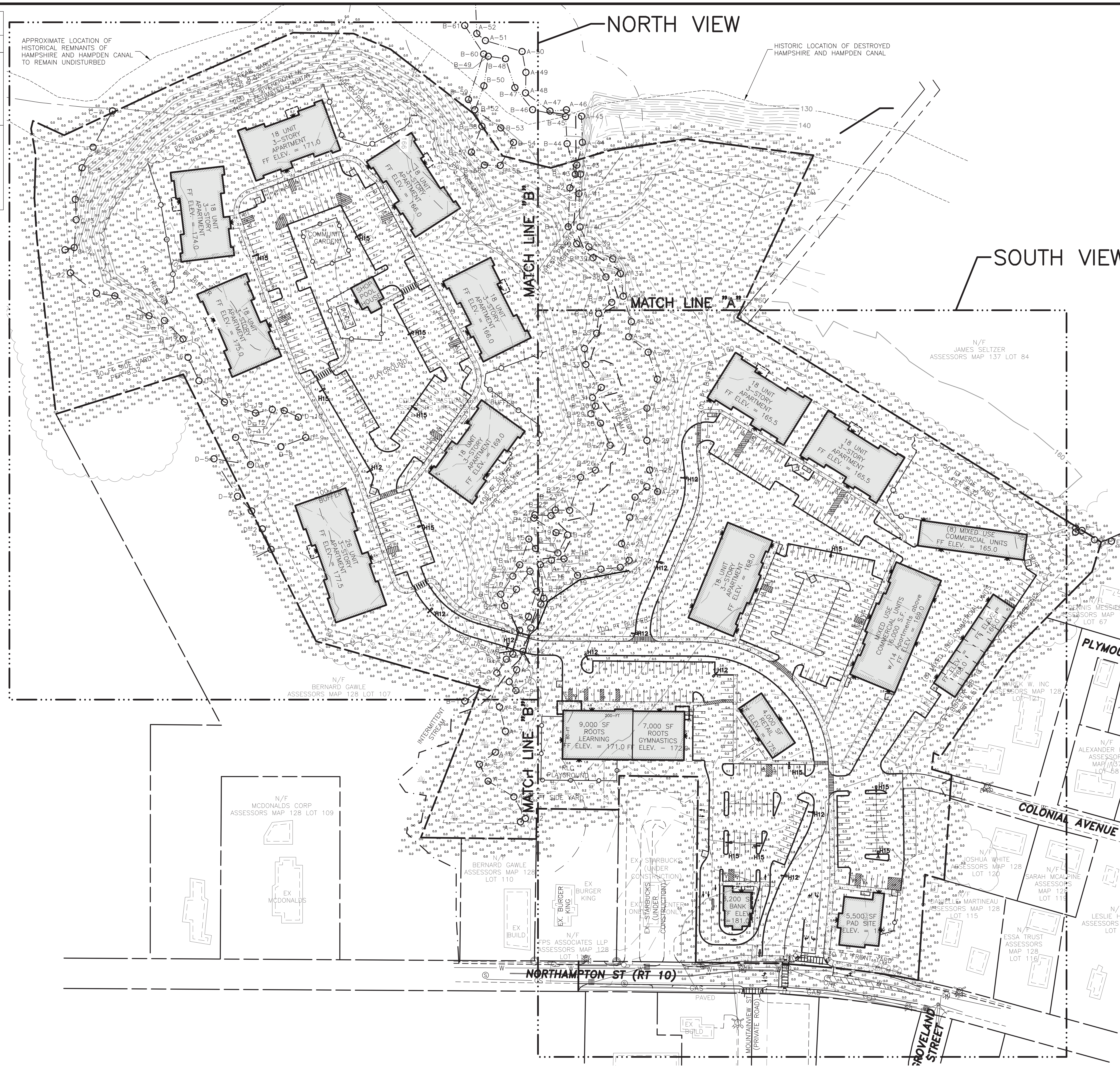
ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1	6-19-23	LDS	REMOVE BUILD. & MISC. REVISIONS
2	7-27-23	LDS	REVISED PER B&T PEER REVIEW
3	10-11-23	LDS	REVISED PROJECT SITE ENTRANCE
4	10-30-23	LDS	MISC. REVISIONS
5	12-6-23	LDS	REVISED PER CON. COM. COMMENTS

PROJECT #: 042-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: 1"=50'
SHEET: C-7.3

TOTAL SITE LUMINAIRE SCHEDULE

SYMBOL	LAMP	DESCRIPTION	MODEL	WATTS	QUANTITY
	POLE LIGHT	POLE MOUNTED LED AREA LIGHT MOUNT HEIGHT: AS NOTED	EALS03 EVOLVE LED AREA GE LIGHTING SOLUTIONS, 3000K, ELS-03-XX-D5-SW -7-30	100	22
	WALL PACK	WALL MOUNTED LED AREA LIGHT MOUNT HEIGHT 15'-0"	LED FULL CUTOFF WALL PACK COOPER LIGHTING SOLUTIONS LUMARK, 3000K, AXCS4A-W-GRF	44	55



FOR PERMITTING ONLY

C-9.0 OVERALL SITE LIGHTING PLAN

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1	6-21-23	EDN	LIGHTING REVISED
2	7-27-23	LDS	REVISED PER B&T PEER REVIEW
3	10-6-23	EDN	GENERAL REVISIONS
4	-	-	-
5	-	-	-

PROJECT #: 0A2-01-22
DRAWN BY: EDN
DATE: 1/31/2022
SCALE: 1"=80'
SHEET: C-9.0

TOTAL SITE LUMINAIRE SCHEDULE

SYMBOL	LAMP	DESCRIPTION	MODEL	WATTS	QUANTITY
	POLE LIGHT	POLE MOUNTED LED AREA LIGHT MOUNT HEIGHT: AS NOTED	EALS03 EVOLVE LED AREA GE LIGHTING SOLUTIONS, 3000K, ELS-03-XX-D5-SW-7-30	100	22
	WALL PACK	WALL MOUNTED LED AREA LIGHT MOUNT HEIGHT 15'-0"	LED FULL CUTOFF WALL PACK COOPER LIGHTING SOLUTIONS LUMARK (FORMERLY EATON), 3000K, AXCS4A-W-GRF	44	55

FOR PERMITTING ONLY

C-9.1 SITE LIGHTING PLAN - SOUTH

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

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199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

COMMONWEALTH OF MASSACHUSETTS BRYAN J. BALICKI CIVIL No. 52699 REGISTERED PROFESSIONAL ENGINEER

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1	6-21-23	EDN	LIGHTING REVISED
2	7-27-23	LPS	REVISED PER B&T PEER REVIEW
3	10-6-23	EDN	GENERAL REVISIONS
4	-	-	-
5	-	-	-

PROJECT #: 1042-01-22
DRAWN BY: EDN
DATE: 1/31/2022
SCALE: 1"=40'
SHEET: C-9.1

TOTAL SITE LUMINAIRE SCHEDULE

SYMBOL	LAMP	DESCRIPTION	MODEL	WATTS	QUANTITY
	POLE LIGHT	POLE MOUNTED LED AREA LIGHT MOUNT HEIGHT: AS NOTED	EALS03 EVOLVE LED AREA GE LIGHTING SOLUTIONS, 3000K, ELS-03-XX-D5-SW-7-30	100	22
	WALL PACK	WALL MOUNTED LED AREA LIGHT MOUNT HEIGHT 15'-0"	LED FULL CUTOFF WALL PACK COOPER LIGHTING SOLUTIONS LUMARK (FORMERLY EATON), 3000K, AXCS4A-W-GRF	44	55

FOR PERMITTING ONLY

C-9.2 SITE LIGHTING PLAN - NORTH

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

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Phone: (413) 562-4884

COMMONWEALTH OF MASSACHUSETTS BRYAN J. BALICKI CIVIL No. 48863 REGISTERED PROFESSIONAL ENGINEER

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1	6-21-23	EDN	LIGHTING REVISED
2	7-27-23	LPS	REVISED PER B&T PEER REVIEW
3	10-6-23	EDN	GENERAL REVISIONS
4	- - -	-	- - -
5	- - -	-	- - -

PROJECT #: 1042-01-22
DRAWN BY: EDN
DATE: 1/31/2022
SCALE: 1"=40'
SHEET: C-9.2

PHASING PLAN

PHASE 1:
- ROOTS LEARNING CENTER: 9,000 SF
- ROOTS GYMNASTICS CENTER: 7,000 SF

SUBTOTAL AREA =16,000 SF
SUBTOTAL PARKING SPACES =76

PHASE 2:
- THREE APARTMENT BUILDINGS: 34,650 SF EACH

SUBTOTAL AREA =103,950 SF
SUBTOTAL PARKING SPACES =90

PHASE 3:
- FOUR APARTMENT BUILDINGS: 34,650 SF EACH
  107 TOTAL PARKING SPACES
- ONE 3,200 SF BANK
  36 TOTAL PARKING SPACES
- ONE 4,000 SF RETAIL BUILDING
  8 TOTAL PARKING SPACES

SUBTOTAL AREA =145,800 SF
SUBTOTAL PARKING SPACES =151

PHASE 4:
- THREE APARTMENT BUILDINGS: 34,650 SF EACH
  81 TOTAL PARKING SPACES
- TWO WAREHOUSE BUILDINGS: 7,400 SF EACH
  11 PARKING SPACES
- ONE MIXED USE COMMERCIAL 16,000 SF
  14 APARTMENTS ABOVE: 16,000 SF
  28 PARKING SPACES
- ONE 5,500 SF RESTAURANT PAD
  41 PARKING SPACES

SUBTOTAL AREA =156,250 SF
SUBTOTAL PARKING SPACES =161

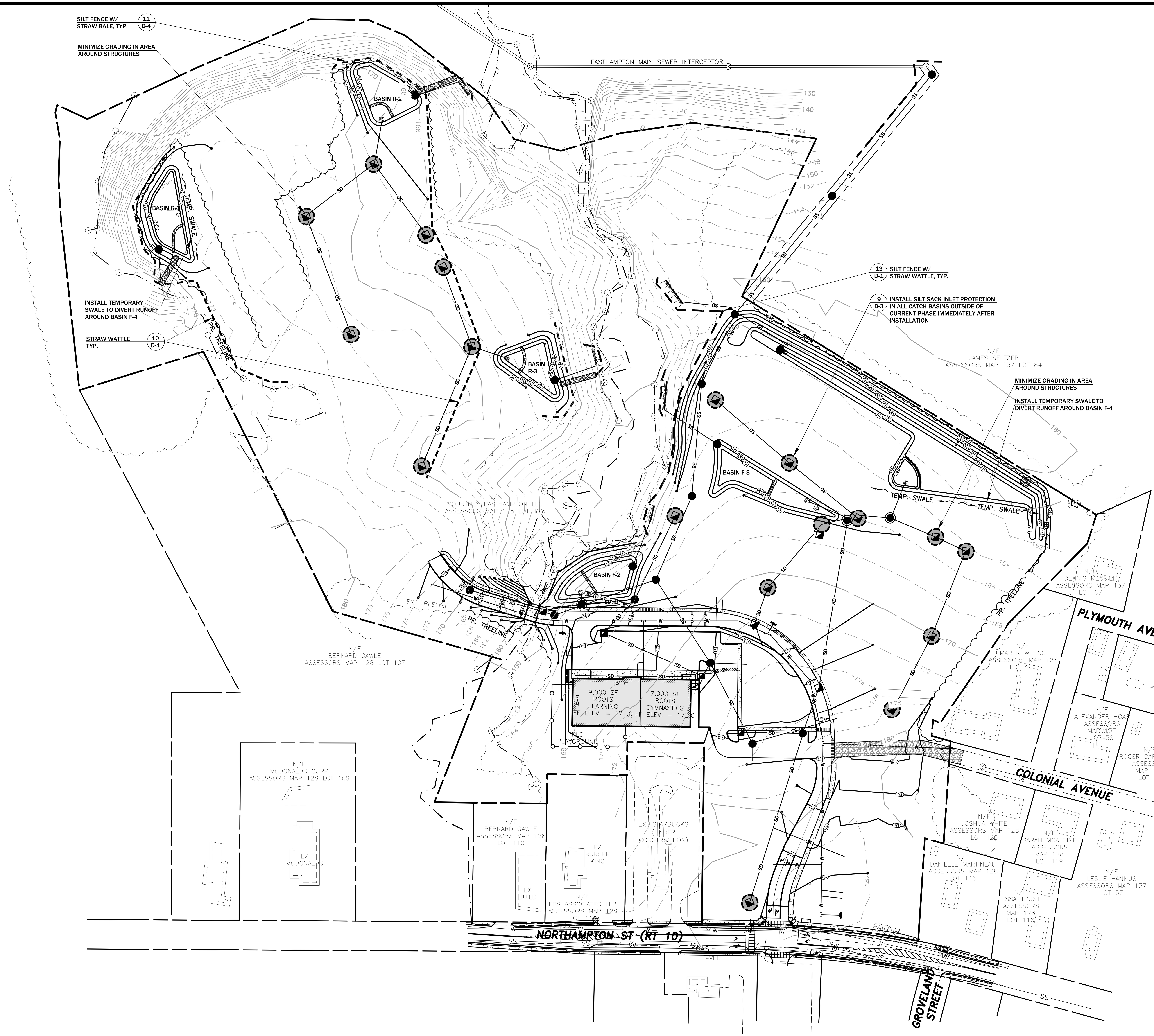
OVERALL TOTAL AREA= 422,000 SF
OVERALL TOTAL PARKING SPACES = 478 PARKING SPACES

EROSION & SEDIMENTATION CONTROL NOTES

1. TEMPORARY STABILIZATION: ANY DISTURBED AREA WHERE CONSTRUCTION ACTIVITY IS SUSPENDED FOR MORE THAN FOURTEEN DAYS SHALL BE SEEDED WITH WINTER RYE AT A RATE OF 30 LBS PER ACRE TO STABILIZE ERODIBLE MATERIALS.
2. PERMANENT STABILIZATION: WHEN AN AREA HAS BEEN GRADED TO THE FINAL INCREMENT, IT SHALL BE SEEDED WITH THE SEED MIX AND AT THE APPLICATION RATE SPECIFIED IN THE SITE PLANTING LIST WITHIN FOURTEEN DAYS.
3. EROSION CONTROL BLANKETS SHALL BE USED FOR STABILIZATION IN AREAS WHERE SLOPES ARE GREATER THAN 15% ARE BEING DISTURBED.
4. TEMPORARY STRAW BALE EROSION CONTROL BARRIERS SHALL BE INSTALLED AS NEEDED.
5. AFTER AREA IS STABILIZED, ALL TEMPORARY EROSION AND SEDIMENT CONTROLS SHALL BE REMOVED AFTER INSPECTION AND APPROVAL BY THE CONSERVATION COMMISSION OR ITS AGENT.
6. EROSION AND SEDIMENT CONTROLS SHALL BE INSTALLED IN ACCORDANCE WITH THE PROJECT PHASING PLANS, AS WELL AS THE EROSION & SEDIMENT CONTROL PLAN SHEETS C-7.1 TO C-7.3. THESE CONTROLS INCLUDE SILT FENCE W/ STRAW WATTLE OR STRAW BALES, EROSION CONTROL BLANKETS, STRAW BALE BARRIERS, AND STABILIZED CONSTRUCTION ENTRANCES.
7. EROSION & SEDIMENT CONTROLS SHALL BE MAINTAINED IN ACCORDANCE WITH THE PROJECT CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENT CONTROL PLAN FOUND IN THE STORMWATER MANAGEMENT REPORT.

EROSION CONTROL BARRIER LEGEND:

— — — — = SILT FENCE W/ STRAW WATTLE
- - - - - - = STRAW WATTLE
— - — - — = SILT FENCE W/ STRAW BALE



FOR PERMITTING ONLY

P-1 PROJECT PHASING PLAN - PHASE 1

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

BRYAN J. BALICKI CIVIL No. REGISTERED PROFESSIONAL ENGINEER

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NO.	DATE:	BY:	REVISION DESCRIPTION
1	7-27-23	LDS	REVISED PER B&T PEER REVIEW
2	10-11-23	LDS	REVISED PROJECT SITE ENTRANCE
3	10-30-23	LDS	MISC. REVISIONS
4	11-17-23	LDS	REVISED INFILTRATION BASINS
5	12-6-23	LDS	REVISED PER CON. COM. COMMENTS

PROJECT #: 1042-01-22
DRAWN BY: LDS
DATE: 8/15/2022
SCALE: 1"=80'
SHEET: P-1

PHASING PLAN

PHASE 1:
-ROOTS LEARNING CENTER: 9,000 SF
-ROOTS GYMNASTICS CENTER: 7,000 SF

SUBTOTAL AREA =16,000 SF
SUBTOTAL PARKING SPACES =76

PHASE 2:
-THREE APARTMENT BUILDINGS: 34,650 SF EACH

SUBTOTAL AREA =103,950 SF
SUBTOTAL PARKING SPACES =90

PHASE 3:
-FOUR APARTMENT BUILDINGS: 34,650 SF EACH
107 TOTAL PARKING SPACES

-ONE 3,200 SF BANK
36 TOTAL PARKING SPACES

-ONE 4,000 SF RETAIL BUILDING
8 TOTAL PARKING SPACES

SUBTOTAL AREA =145,800 SF
SUBTOTAL PARKING SPACES =151

PHASE 4:
-THREE APARTMENT BUILDINGS: 34,650 SF EACH
81 TOTAL PARKING SPACES

-TWO WAREHOUSE BUILDINGS: 7,400 SF EACH
11 PARKING SPACES

-ONE MIXED USE COMMERCIAL 16,000 SF
14 APARTMENTS ABOVE: 16,000 SF
28 PARKING SPACES

-ONE 5,500 SF RESTAURANT PAD
41 PARKING SPACES

SUBTOTAL AREA =156,250 SF
SUBTOTAL PARKING SPACES =161

OVERALL TOTAL AREA= 422,000 SF
OVERALL TOTAL PARKING SPACES = 478 PARKING SPACES

EROSION & SEDIMENTATION CONTROL NOTES

1. TEMPORARY STABILIZATION: ANY DISTURBED AREA WHERE CONSTRUCTION ACTIVITY IS SUSPENDED FOR MORE THAN FOURTEEN DAYS SHALL BE SEEDED WITH WINTER RYE AT A RATE OF 30 LBS PER ACRE TO STABILIZE ERODIBLE MATERIALS.
2. PERMANENT STABILIZATION: WHEN AN AREA HAS BEEN GRADED TO THE FINAL INCREMENT, IT SHALL BE SEEDED WITH THE SEED MIX AND AT THE APPLICATION RATE SPECIFIED IN THE SITE PLANTING LIST WITHIN FOURTEEN DAYS.
3. EROSION CONTROL BLANKETS SHALL BE USED FOR STABILIZATION IN AREAS WHERE SLOPES GREATER THAN 15% ARE BEING DISTURBED.
4. TEMPORARY STRAW BALE EROSION CONTROL BARRIERS SHALL BE INSTALLED AS NEEDED.
5. AFTER AREA IS STABILIZED, ALL TEMPORARY EROSION AND SEDIMENT CONTROLS SHALL BE REMOVED AFTER INSPECTION AND APPROVAL BY THE CONSERVATION COMMISSION OR ITS AGENT.
6. EROSION AND SEDIMENT CONTROLS SHALL BE INSTALLED IN ACCORDANCE WITH THE PROJECT PHASING PLANS, AS WELL AS THE EROSION & SEDIMENT CONTROL PLAN SHEETS C-7.1 TO C-7.3. THESE CONTROLS INCLUDE SILT FENCE W/ STRAW WATTLE OR STRAW BALES, EROSION CONTROL BLANKETS, STRAW BALE BARRIERS, AND STABILIZED CONSTRUCTION ENTRANCES.
7. EROSION & SEDIMENT CONTROLS SHALL BE MAINTAINED IN ACCORDANCE WITH THE PROJECT CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENT CONTROL PLAN FOUND IN THE STORMWATER MANAGEMENT REPORT.

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

COMMONWEALTH OF MASSACHUSETTS — BRYAN J. BALICKI — CIVIL — No. — REGISTERED PROFESSIONAL ENGINEER

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NO.	DATE:	BY:	REVISION DESCRIPTION
1	7-27-23	LDS	REVISED PER B&T PEER REVIEW
2	10-11-23	LDS	REVISED PROJECT SITE ENTRANCE
3	10-30-23	LDS	MISC. REVISIONS
4	11-17-23	LDS	REVISED INFILTRATION BASINS
5	12-6-23	LDS	REVISED PER CON. COM. COMMENTS

PROJECT #: 1042-01-22
DRAWN BY: LDS
DATE: 2/9/2023
SCALE: 1"=80'
SHEET: P-2

FOR PERMITTING ONLY

P-2 PROJECT PHASING PLAN - PHASE 2

PHASING PLAN

PHASE 1:
–ROOTS LEARNING CENTER: 9,000 SF
–ROOTS GYMNASTICS CENTER: 7,000 SF

SUBTOTAL AREA =16,000 SF
SUBTOTAL PARKING SPACES =76

PHASE 2:
–THREE APARTMENT BUILDINGS: 34,650 SF EACH

SUBTOTAL AREA =103,950 SF
SUBTOTAL PARKING SPACES =90

PHASE 3:
–FOUR APARTMENT BUILDINGS: 34,650 SF EACH
107 TOTAL PARKING SPACES

–ONE 3,200 SF BANK
36 TOTAL PARKING SPACES

–ONE 4,000 SF RETAIL BUILDING
8 TOTAL PARKING SPACES

SUBTOTAL AREA =145,800 SF
SUBTOTAL PARKING SPACES =151

PHASE 4:
–THREE APARTMENT BUILDINGS: 34,650 SF EACH
81 TOTAL PARKING SPACES

–TWO WAREHOUSE BUILDINGS: 7,400 SF EACH
11 PARKING SPACES

–ONE MIXED USE COMMERCIAL 16,000 SF
14 APARTMENTS ABOVE: 16,000 SF
28 PARKING SPACES

–ONE 5,500 SF RESTAURANT PAD
41 PARKING SPACES

SUBTOTAL AREA =156,250 SF
SUBTOTAL PARKING SPACES =161

OVERALL TOTAL AREA= 422,000 SF
OVERALL TOTAL PARKING SPACES = 478 PARKING SPACES

EROSION & SEDIMENTATION CONTROL NOTES

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FOR PERMITTING ONLY

P-3 PROJECT PHASING PLAN - PHASE 3

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

COMMONWEALTH OF MASSACHUSETTS BRYAN J. BALICKI CIVIL No. 46862 REGISTERED PROFESSIONAL ENGINEER

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NO.	DATE:	BY:	REVISION DESCRIPTION
1	7-27-23	LDS	REVISED PER B&T PEER REVIEW
2	10-11-23	LDS	REVISED PROJECT SITE ENTRANCE
3	10-30-23	LDS	MISC. REVISIONS
4	11-17-23	LDS	REVISED INFILTRATION BASINS
5	12-6-23	LDS	REVISED PER CON. COM. COMMENTS

PROJECT #: 1042-01-22
DRAWN BY: LDS
DATE: 2/9/2023
SCALE: 1"=80'
SHEET: P-3

PHASING PLAN

PHASE 1:
–ROOTS LEARNING CENTER: 9,000 SF
–ROOTS GYMNASTICS CENTER: 7,000 SF

SUBTOTAL AREA =16,000 SF
SUBTOTAL PARKING SPACES =76

PHASE 2:
–THREE APARTMENT BUILDINGS: 34,650 SF EACH

SUBTOTAL AREA =103,950 SF
SUBTOTAL PARKING SPACES =90

PHASE 3:
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FOR PERMITTING ONLY

P-4 PROJECT PHASING PLAN - PHASE 4

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

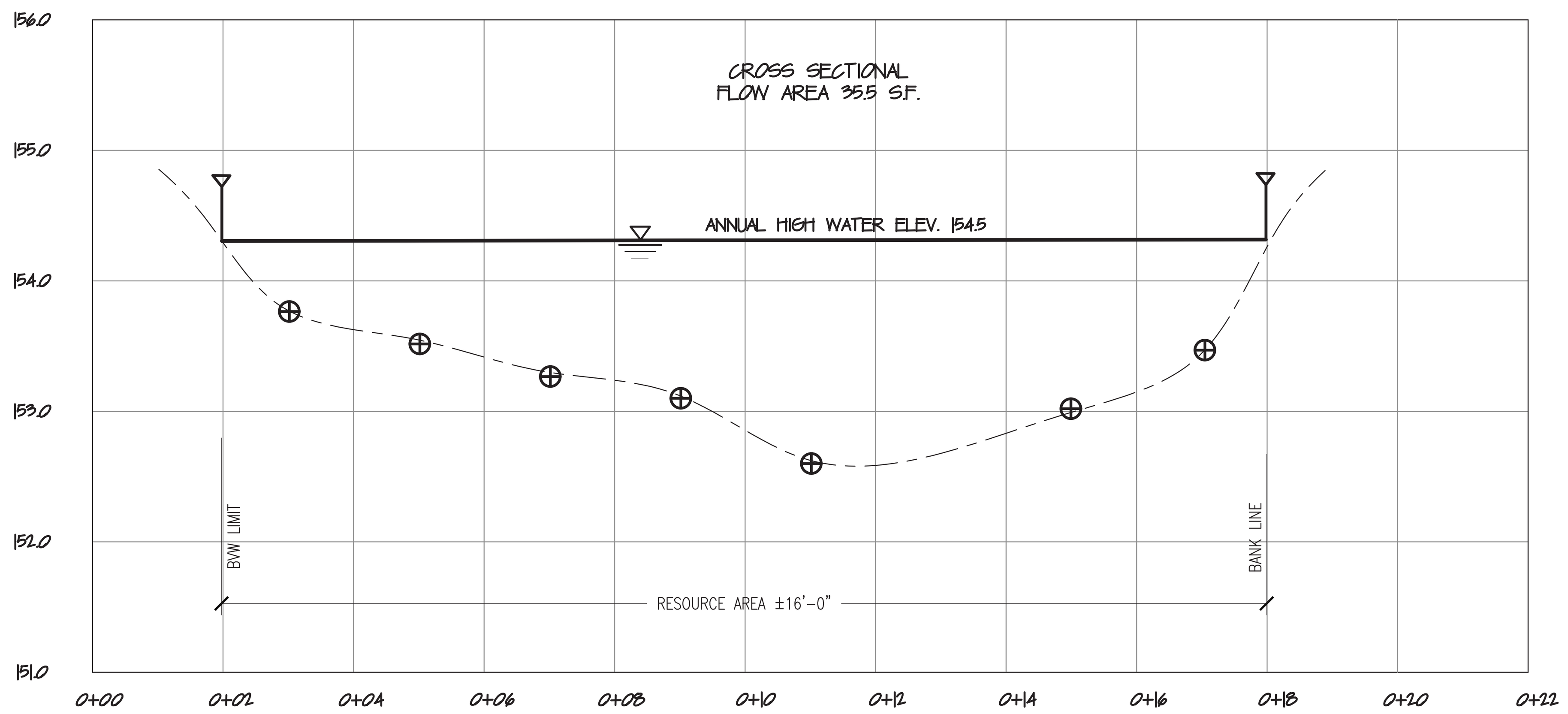
Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

COMMONWEALTH OF MASSACHUSETTS BRYAN J. BALICKI CIVIL REGISTERED PROFESSIONAL ENGINEER

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

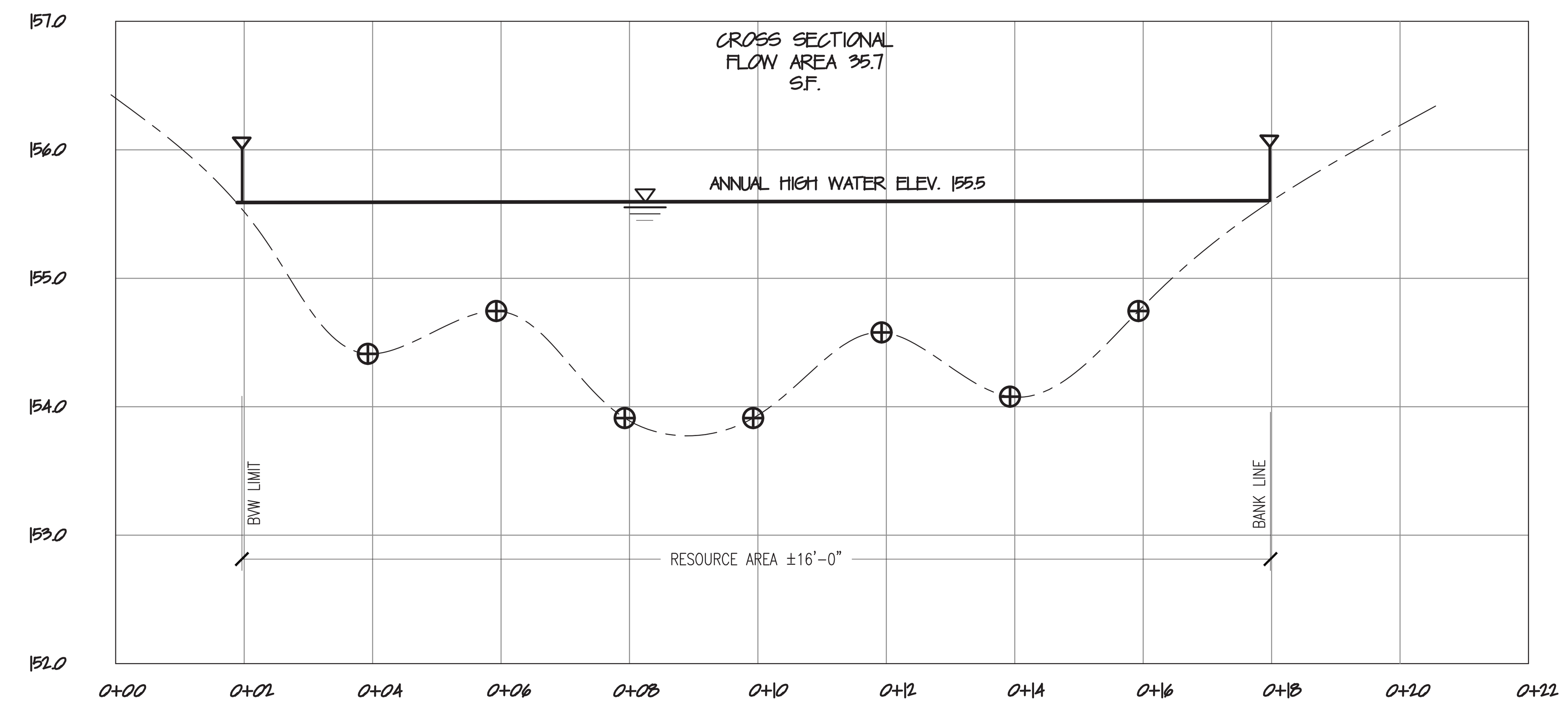
NO	DATE:	BY:	REVISION DESCRIPTION
1	7-27-23	LDS	REVISED PER B&T PEER REVIEW
2	10-11-23	LDS	REVISED PROJECT SITE ENTRANCE
3	10-30-23	LDS	MISC. REVISIONS
4	11-17-23	LDS	REVISED INFILTRATION BASINS
5	12-6-23	LDS	REVISED PER CON. COM. COMMENTS

PROJECT #: 1042-01-22
DRAWN BY: LDS
DATE: 2/9/2023
SCALE: 1"=80'
SHEET: P-4



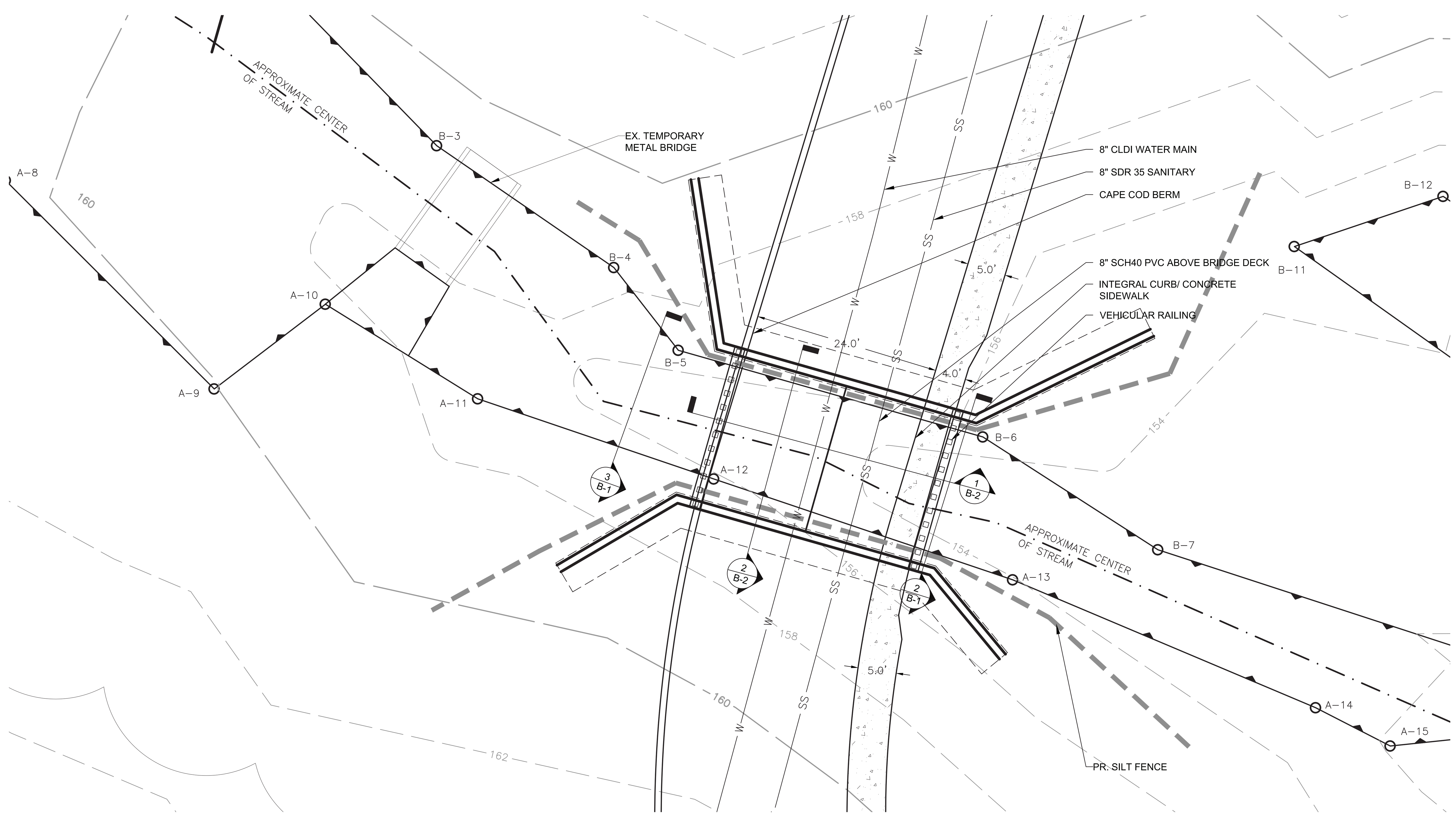
2 / B-1 EXISTING INTERMITTENT STREAM CROSS SECTION #1

SCALE: 1"=2' HORIZONTAL
1"= 1' VERTICAL



3 / B-1 EXISTING INTERMITTENT STREAM CROSS SECTION #2

SCALE: 1"=2' HORIZONTAL
1"= 1' VERTICAL



PLAN VIEW

SCALE: 1"= 10'

NOTES:
FIELD MEASURED ON 11-15-22 BY FRANK DEMARINIS, PE AND ELIAS-DIMITRIS NIKOLAIDIS, PE.

FOR PERMITTING ONLY

B-1 BRIDGE PLAN

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON ST
EASTHAMPTON, MA 01027

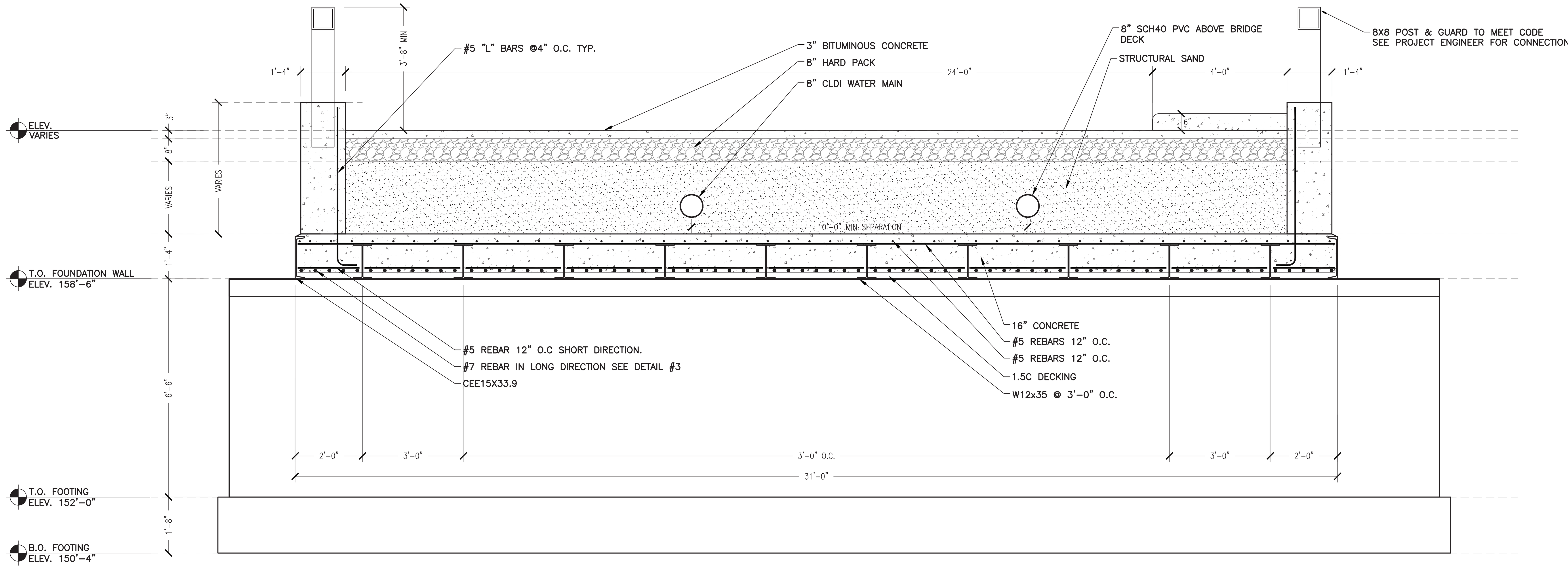
APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1	11-29-22	BJB	SUBMITTED TO PLANNING
2	1-31-23	LDS	REVISED PER CONSERVATION COMMENTS
3	3-13-23	LDS	REVISED PER CITY ENGINEER COMMENTS
4	-	-	-
5	-	-	-

PROJECT #: 042-01-22
DRAWN BY: EDN
DATE: 11/11/2022
SCALE: VARIES
SHEET: B-1



1 B-2 BRIDGE SECTION #1
SCALE: 1/2"=1'-0"

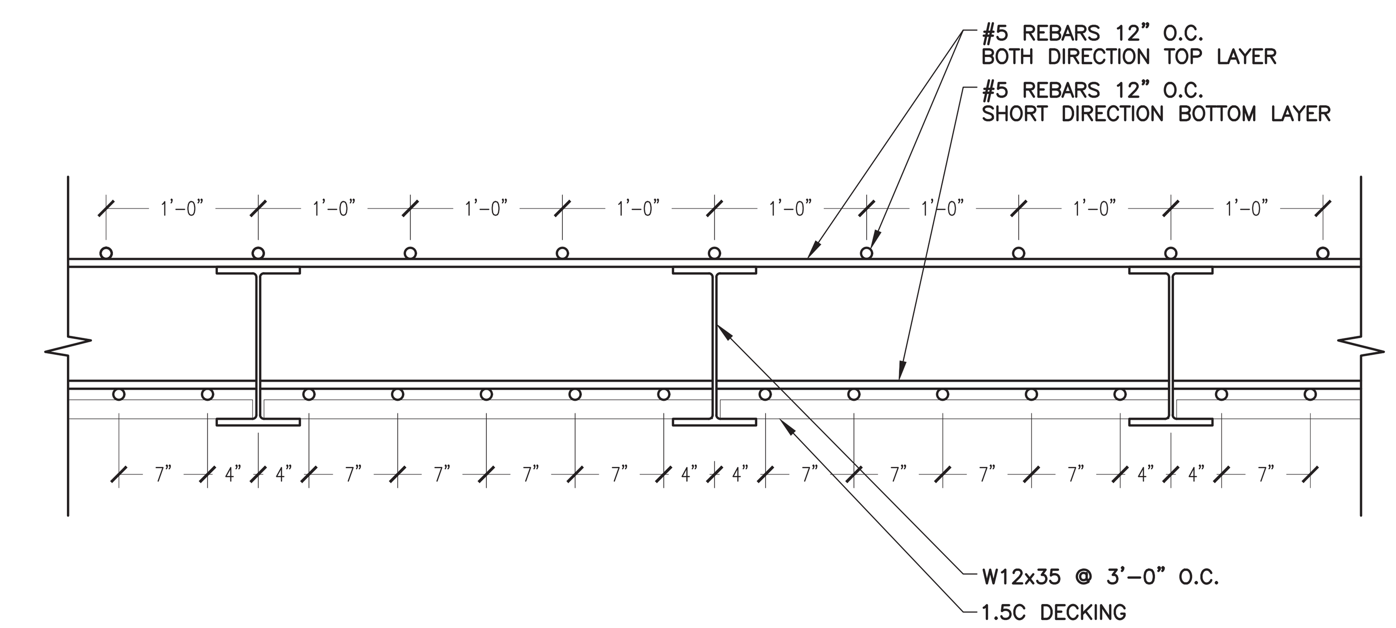
MASSACHUSETTS STREAM CROSSING "OPTIMUM" STANDARDS

1. **SPANS USING A BRIDGE:**
   THE PROPOSED CROSSING IS A BRIDGE TYPE STRUCTURE WHICH WILL COMPLETELY SPAN THE CHANNEL AND ASSOCIATED BVW. NO DISTURBANCE TO EITHER WILL BE REQUIRED. THIS WILL LEAVE A NATURAL CHANNELS STRUCTURE IN PLACE.
2. **CULVERT:**
   NOT APPLICABLE
3. **SPANS THE STREAMBED AND BANKS:**
   THE AVERAGE BANKFULL WIDTH IS 15'-4". THE MAXIMUM BANKFUL WIDTH OF 16'-0" WAS USED TO DETERMINE THE CLEAR SPAN OF THE BRIDGE CROSSING.

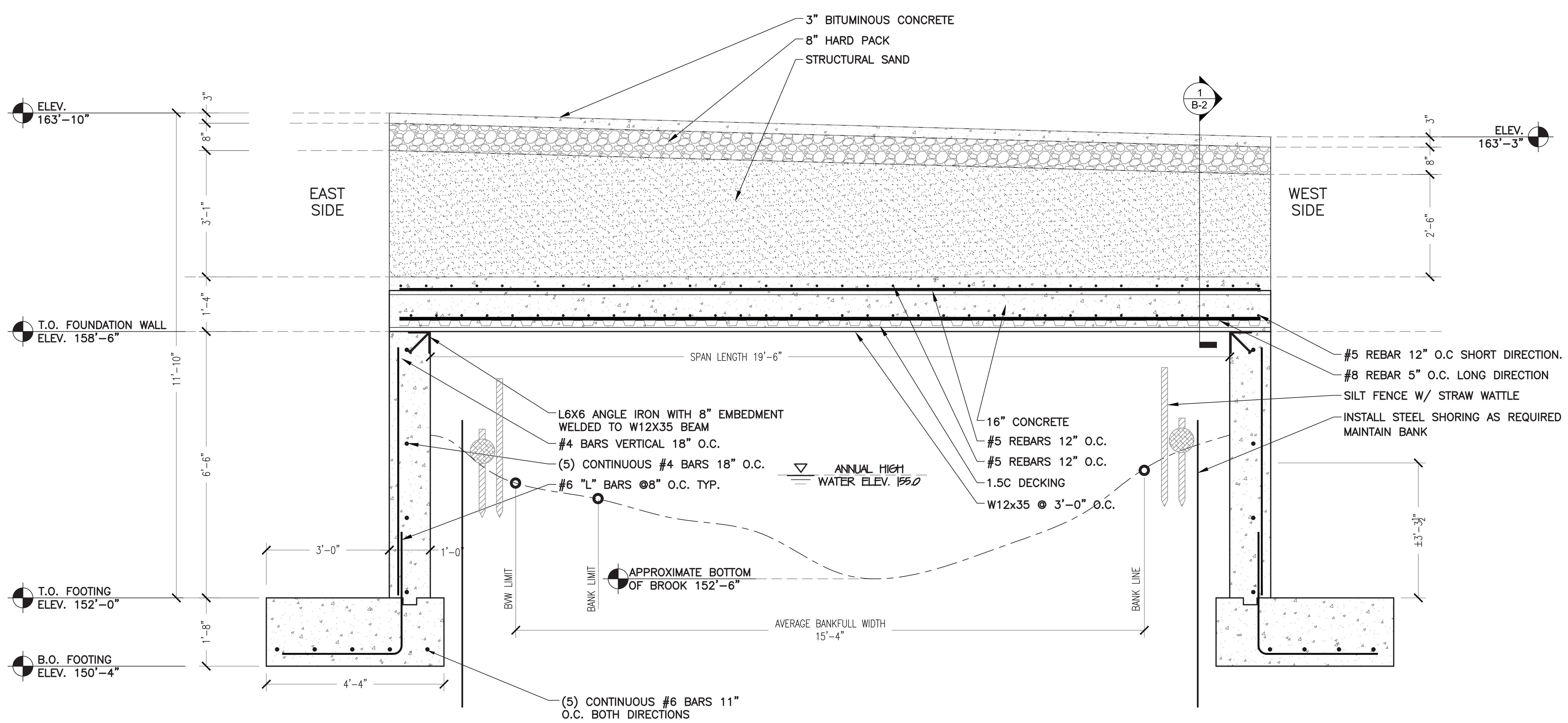
   THE REQUIRED BRIDGE CLEAR SPAN WIDTH IS 19.2' (16' X 1.2).
   THE PROPOSED BRIDGE CLEAR SPAN WIDTH IS 19.5'.

   THE PROPOSED CROSSING WAS DESIGNED TO HAVE A WIDTH OF 1.22 TIMES THE EXISTING BANKFULL WIDTH (GREATER THAN THE REQUIRED MINIMUM 1.2 TIMES THE BANKFULL WIDTH)
4. **NATURAL BOTTOM SUBSTRATE WITHIN THE STRUCTURE:**
   THE PROPOSED CROSSING WILL NOT ALTER THE EXISTING CHANNEL, IT WILL BE PRESERVED IN ITS NATURAL STATE.
5. **DESIGNED WITH APPROPRIATE BED FORMS AND STREAMBED CHARACTERISTICS SO THAT WATER DEPTHS AND VELOCITIES ARE COMPARABLE TO THOSE FOUND IN THE NATURAL CHANNEL AT A VARIETY OF FLOWS.**
   THE PROPOSED CROSSING WILL NOT ALTER THE EXISTING CHANNEL, IT WILL BE PRESERVED IN ITS NATURAL STATE. THIS WILL ALLOW THE CURRENT FLOW PATTERNS TO REMAIN UNCHANGED.
6. **MAINTAINS A MINIMUM HEIGHT OF 6 FT AND OPENNESS OF 1.64 FEET:**
   THE PROPOSED CROSSING HAS A HEIGHT OF 6 FEET AND AN OPENNESS RATIO OF 3.05 FEET
   CROSS SECTIONAL AREA OF CROSSING: 94.6 SQUARE FEET
   LENGTH OF CROSSING: 31 FEET
   OPENNESS RATIO = 3.05
7. **BANKS SHOULD BE PRESENT ON EACH SIDE OF THE STREAM MATCHING THE HORIZONTAL PROFILE OF THE EXISTING STREAM AND BANKS:**
   THE EXISTING CHANNELS BANKS WILL BE PRESERVED.

THE PROPOSED CROSSING DESIGN MEETS THE "OPTIMUM" LEVEL FOR ALL SIX APPLICABLE STANDARDS.



3 B-2 STEEL DETAIL
SCALE: 1"=1'-0"



2 B-2 BRIDGE SECTION #2
SCALE: 1/2"=1'-0"

NOTES:

1. CONCRETE TO BE 4,000 PSI MINIMUM, AIR ENTRAINED, NORMAL WEIGHT AND 3/4" MAX AGGREGATE SIZE.
2. 60,000 PSI MINIMUM REBAR YIELD STRENGTH
3. BRIDGE DESIGNED TO SUPPORT A MAXIMUM LOAD OF AN HL-93 TANDEM TIRE VEHICLE

FOR PERMITTING ONLY

B-2 BRIDGE PLAN

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON ST
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

COMMONWEALTH OF MASSACHUSETTS BRYAN J. BALICKI CIVIL No. 48862 REGISTERED PROFESSIONAL ENGINEER

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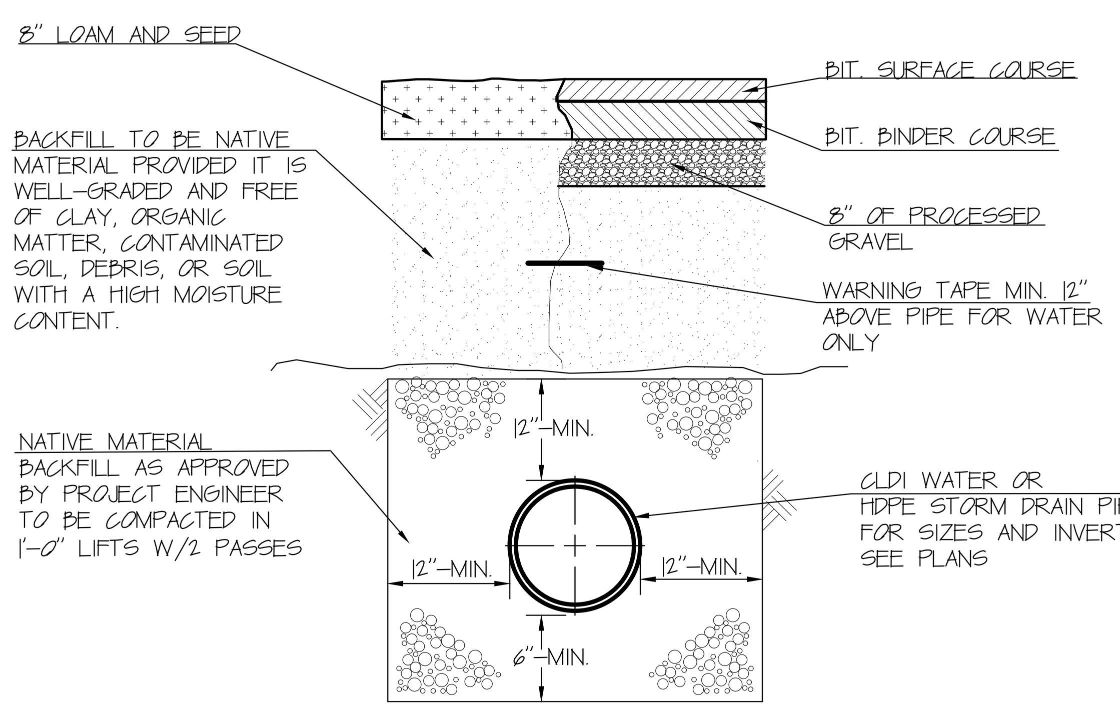
NO.	DATE:	BY:	REVISION DESCRIPTION
1	1-5-23	EDN	MISC. REVISIONS
2	1-31-23	LDS	REVISED PER CONSERVATION COMMENTS
3	3-13-23	LDS	REVISED PER CITY ENGINEER COMMENTS
4	7-27-23	LDS	REVISED PER B&T PEER REVIEW
5	8-29-23	LDS	REVISED PER B&T PEER REVIEW

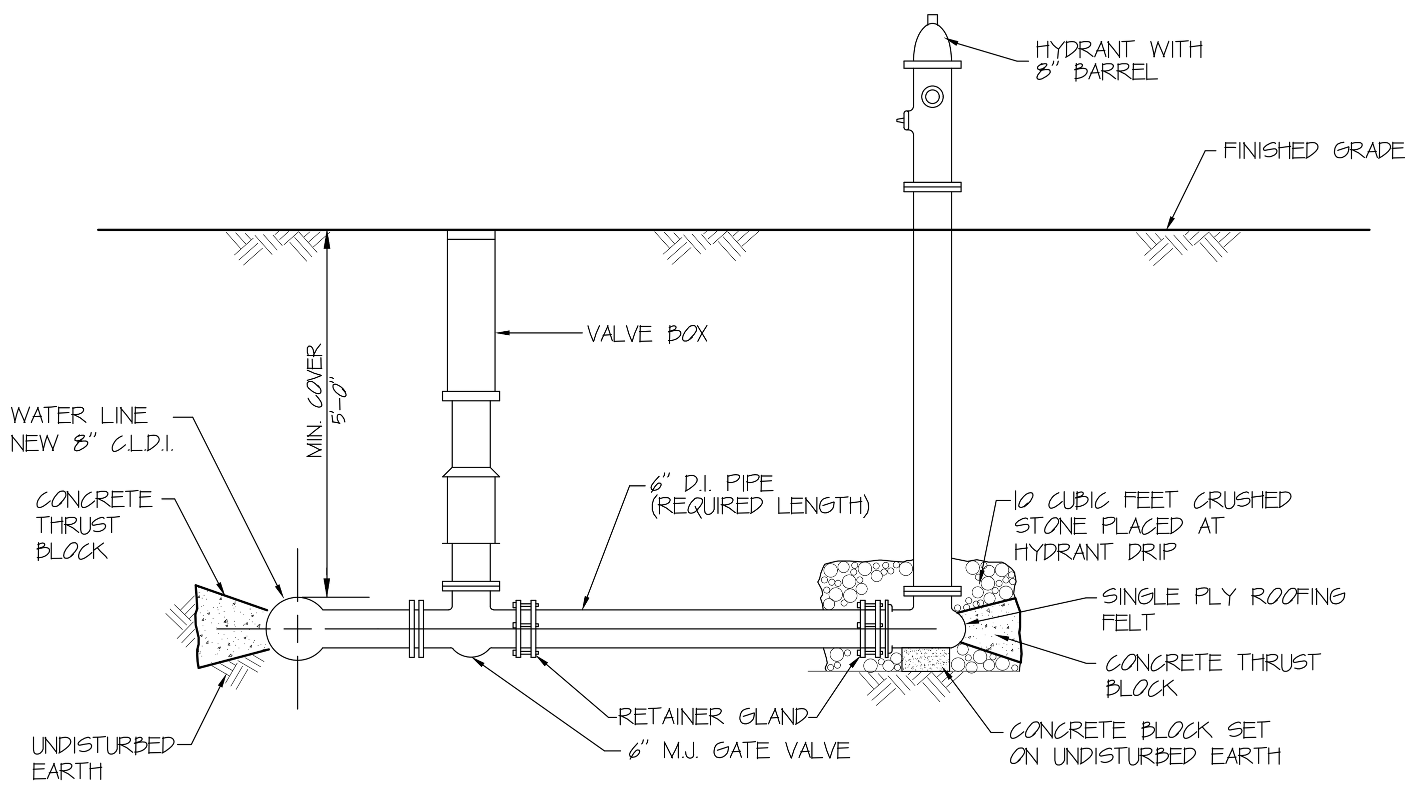
PROJECT #: 1042-01-22
DRAWN BY: EDN
DATE: 11/11/2022
SCALE: N.T.S.
SHEET: B-2


5" THICK 3000 P.S.I. CONC. (MIN.)
6X6-W1.4XW1.4 REINFORCED MESH AT MID DEPTH
NATURAL SUBGRADE TO BE COMPACTED
8" MIN. BANK RUN GRAVEL OR HARD PACK
NOTES: 1. CONTROL JOINTS 5' MAX O.C. EACH WAY
2. EXPANSION JOINTS 20' MAX SPACING
1 D-1 EXTERIOR CONCRETE TYP. CROSS-SECTION
N.T.S.
BIT. CONC. CAPE COD BERM
1' - 0"
SURFACE COURSE
BINDER COURSE
3 1/2"
4 1/2"
8" OF BANKRUN GRAVEL OR HARD PACK
2 D-1 BITUMINOUS CONCRETE BERM DETAIL
N.T.S.
1 1/2" BIT. SURFACE COURSE TYPE 1
1 1/2" BIT. BINDER COURSE TYPE 1
8" BANK RUN GRAVEL OR HARD PACK
- COMPACTED SUBGRADE -
NOTE: 1. SURFACE AND BINDER COURSE SHALL CONFORM TO M.H.D. STANDARD SPECIFICATIONS: SECTION 460 CLASS 1 BITUMINOUS CONCRETE PAVEMENT TYPE 1-1
2. GRAVEL TO BE COMPACTED IN 4" LIFTS AND APPROVED BY SITE ENGINEER
3 D-1 BITUMINOUS CONCRETE PAVEMENT DETAIL
N.T.S.
3/8" PREMOULDED EXPANSION JOINT FILLER AND SEALANT AT 20' MAX OC AND AT BLDG. WALL
SAW CUT SCORE LINE
5'-0", TYP. (4'-0" @ BRIDGE)
1/2" BATTER
1/2" R
1/4" PER FOOT PITCH
2-#4 BARS 3" O.C.
4" OR 6"
5"
18"
8"
6" x 6" x W1.4 x W1.4 REINFORCING MESH AT MID DEPTH
BIT. CONC. FINISH COURSE
BIT. CONC. BASE COURSE
8" MIN. BANK RUN GRAVEL OR HARD PACK
4 D-1 CONCRETE SIDEWALK WITH INTEGRAL CURB DETAIL
N.T.S.
PRE-CAST CATCHBASIN SEE DETAIL
CURB LINE
AS SHOWN ON PLANS
24'-0"
12'-0"
12'-0"
4-FEET WIDE BIT. SIDEWALK
3/8" PER FOOT CROWN
M.H.
3-1/2"
HYDRANT
ASPHALT BERM
GRAVEL
GRAVEL 1' WIDER ON BOTH SIDES FOR BERM
6'-6"
TEL & ELEC. CONDUITS
CURB LINE
PRE-CAST SANITARY M.H.
COVER 4'-6"
WATER
4' SUMP
5 D-1 TYPICAL ROAD CROSS-SECTION
N.T.S.
BOTTOM OF RAMP FLUSH WITH PAVEMENT
CURB/BERM TRANSITION
LANDSCAPED AREA
CONCRETE SIDEWALK
1:12 (8.33%) MAX RAMP
VARIES 24" MIN.
6' MIN.
VARIES 24" MIN.
CURB/BERM
PAVEMENT
NOTES:
1. ALL WORK SHALL CONFORM TO APPLICABLE LOCAL ORDINANCES AS WELL AS LATEST ADA STANDARDS ALONG ACCESSIBLE ROUTES.
2. MAXIMUM SLOPE OF ACCESSIBLE SIDEWALK AND ADJOURNING PAVEMENT ALONG AN ACCESSIBLE ROUTE SHALL BE 5%
3. MAXIMUM SLOPE OF ADJOURNING PAVEMENT AT HANDICAP ACCESS AISLES SHALL BE 2%
4. MAXIMUM CROSS SLOPE OF SIDEWALK AND CURB RAMP SHALL BE 2% (1% MIN.)
6 D-1 ACCESSIBLE CURB CUT RAMP - TYPE B
N.T.S.
CURB/BERM
CURB/BERM TRANSITION
CONCRETE SIDEWALK
6' MIN.
LANDSCAPED AREA
1:12 (8.33%) MAX RAMP
VARIES 24" MIN.
INTEGRAL CONCRETE CURB
CURB TRANSITION
BOTTOM OF RAMP FLUSH WITH PAVEMENT
PAVEMENT
NOTES:
1. ALL WORK SHALL CONFORM TO APPLICABLE LOCAL ORDINANCES AS WELL AS LATEST ADA STANDARDS ALONG ACCESSIBLE ROUTES.
2. MAXIMUM SLOPE OF ACCESSIBLE SIDEWALK AND ADJOURNING PAVEMENT ALONG AN ACCESSIBLE ROUTE SHALL BE 5%
3. MAXIMUM SLOPE OF ADJOURNING PAVEMENT AT HANDICAP ACCESS AISLES SHALL BE 2%
4. MAXIMUM CROSS SLOPE OF SIDEWALK AND CURB RAMP SHALL BE 2% (1% MIN.)
7A D-1 ACCESSIBLE CURB CUT RAMP - TYPE C
N.T.S.
6' MIN.
LANDSCAPED AREA
CONCRETE SIDEWALK
1:12 (8.33%) MAX RAMP
1:12 (8.33%) MAX RAMP
VARIES 24" MIN.
INTEGRAL CONCRETE CURB
CURB TRANSITION
BOTTOM OF RAMP FLUSH WITH PAVEMENT
36" MIN.
VARIES 24" MIN.
PAVEMENT
NOTES:
1. ALL WORK SHALL CONFORM TO APPLICABLE LOCAL ORDINANCES AS WELL AS LATEST ADA STANDARDS ALONG ACCESSIBLE ROUTES.
2. MAXIMUM SLOPE OF ACCESSIBLE SIDEWALK AND ADJOURNING PAVEMENT ALONG AN ACCESSIBLE ROUTE SHALL BE 5%
3. MAXIMUM SLOPE OF ADJOURNING PAVEMENT AT HANDICAP ACCESS AISLES SHALL BE 2%
4. MAXIMUM CROSS SLOPE OF SIDEWALK AND CURB RAMP SHALL BE 2% (1% MIN.)
7B D-1 ACCESSIBLE CURB CUT RAMP - TYPE D
N.T.S.
PRUNE BUT RETAIN NATURAL FORM OF TREE
RUBBER HOSE FRICTION GUARD
#10 WIRE-NEW GALVANIZED
STAKES BETWEEN 1/3 & 2/3 HEIGHT OF TREE
FINAL GROUNDLINE SAME AS AT NURSERY
TREE WRAPPED TO 6" ABOVE HOSE
4"-6" EARTH SAUCER
4" SHREDDED BARK MULCH
REMOVE BURLAP FROM TOP 1/3 OF PLANT BALL
3 AGRIFORM PLANTING TABLETS PER PLANT
AMMENDED BACKFILL, 1 PART PEAT MOSS, 3 PARTS TOPSOIL
ANY BALL OVER 2 FEET IN DIAMETER SHALL BE PLATFORMED
12"
SUBGRADE
9 D-1 DECIDUOUS TREE DETAIL
N.T.S.
WIDE NYLON WEBBING
FINAL GROUNDLINE SAME AS AT NURSERY
1/3 TREE HEIGHT
4"-6" EARTH SAUCER
4" SHREDDED BARK MULCH
REMOVE BURLAP FROM TOP 1/3 OF PLANT BALL
3 AGRIFORM PLANTING TABLETS PER PLANT
AMMENDED BACKFILL, 1 PART PEAT MOSS, 3 PARTS TOPSOIL
ANY BALL OVER 2 FEET IN DIAMETER SHALL BE PLATFORMED
SUBGRADE
10 D-1 EVERGREEN TREE DETAIL
N.T.S.
8'-0" MIN.
BASIN EMBANKMENT
3
1
6" DEPTH
18" MIN.
WELL GRADED RIP RAP AVERAGE 6" DIAM.
SECTION A-A
A
18" MIN.
MAXIMUM EXISTING SLOPE
2:1
RIPRAP OUTLET DISSIPATER
FILTER FABRIC
EXTEND RIPRAP TO TOE OF SLOPE ON WETLAND SIDE OF BERM. SEE PLAN FOR LOCATION
A
14 D-1 EMERGENCY SPILLWAY DETAIL
N.T.S.
PARKING ONLY
60" MIN
NOTES:
1) ACCESSIBLE PARKING SIGN SHALL COMPLY WITH ANSI 703.7
2) VAN ACCESSIBLE SPACES SHALL INCLUDE THE WORDS: "VAN-ACCESSIBLE"
11 D-1 EXTERIOR ACCESSIBLE PARKING SIGNAGE
N.T.S.
GEOTEXTILE FABRIC
3 FOOT WOOD SUPPORT POSTS 8 FT. ON CENTER
FLOW DIRECTION
DRIVE STAKE UNTIL 2-3" REMAINS EXPOSED
USE SILT FENCE INSTALLATION ATTACHMENT TO ENTRENCH SILT FENCE
STRAW WATTLE INSTALLED ON UPGRADIENT SIDE
EXISTING GROUND
6"
SET WATTLE IN A 2-3" DEEP TRENCH
1' MIN.
18" OR 24" WOOD STAKES 4 FT ON CENTER
±4"
NOTES:
1) UPGRADIENT OF AREAS WITH 20% SLOPES OR GREATER, INSTALL STRAW BALES IN PLACE OF STRAW WATTLES.
13 D-1 SILT FENCE W/ STRAW WATTLE DETAIL
N.T.S.
EVERGREEN
DECIDUOUS
CUT & REMOVE TOP 1/3 OF BURLAP
MULCH - 4" DEPTH
4" SAUCER
FINISH GRADE
"WEED CHECK" FABRIC
PLANTING SOIL
6" MIN.
6" MIN.
FERTILIZER ROOT PACKET 2 PER SHRUB, 6"-8" DEEP PLACED AS ROOT BALL IS BACKFILLED
EXISTING SUBGRADE
NOTE: PRUNE 1/3 TOP GROWTH ON DECIDUOUS TREES & SHRUBS. REMOVE ALL DEAD CANE.
8 D-1 SHRUB PLANTING DETAIL
N.T.S.
LID TO BE MARKED SEWER
FINISHED GRADE
24" MIN
C.O. ADAPTER & 4" PLUG
VALVE BOX-TOP SECTION
4" SDR-35 P.V.C. LENGTH OF PIPE AS REQUIRED
45° BEND - 4" SDR-35 P.V.C.
FLOW
4"x4"x4" SDR-35 P.V.C. WYE
12 D-1 IN-LINE CLEANOUT DETAIL
N.T.S.
FOR PERMITTING ONLY
D-1 SITE DETAILS - SHEET 1
PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027
APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085
Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884
COMMONWEALTH OF MASSACHUSETTS
BRYAN J. BALICKI
CIVIL
REGISTERED PROFESSIONAL ENGINEER
ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID
NO. | DATE: | BY: | REVISION DESCRIPTION
1 | 11-29-22 | BJB | SUBMITTED TO PLANNING
2 | 1-31-23 | LDS | REVISED PER CONSERVATION COMMENTS
3 | 3-13-23 | LDS | REVISED PER CITY ENGINEER COMMENTS
4 | 4-10-23 | LDS | REVISED PER CITY ENGINEER COMMENTS
5 | 8-29-23 | LDS | REVISED PER B&T PEER REVIEW
PROJECT #: 042-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: AS NOTED
SHEET: D-1

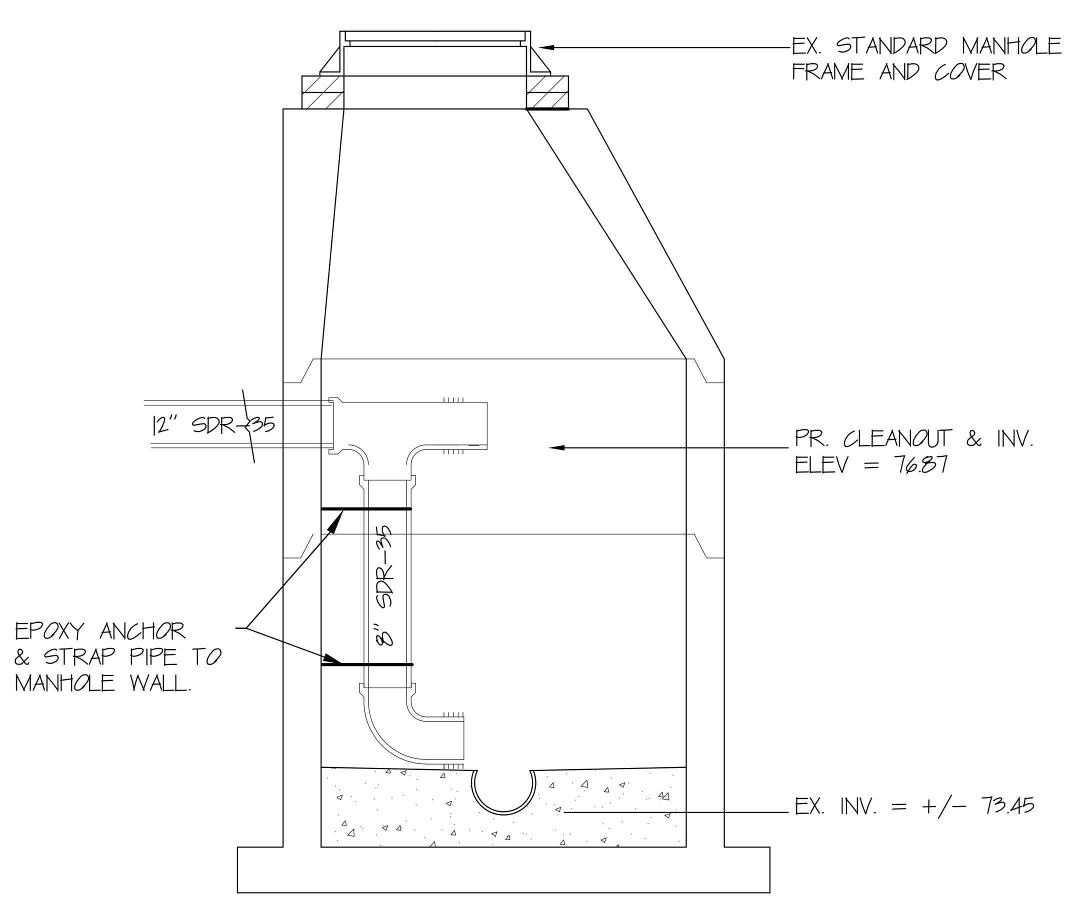


NOTES:
1. 5'-0" MINIMUM COVER FOR WATER MAIN ONLY.
2. FOR PAVED AREAS COMPACT ALL BACKFILL TO 95% MODIFIED PROCTOR.
3. FOR UNPAVED AREAS COMPACT ALL BACKFILL TO 90% MODIFIED PROCTOR.

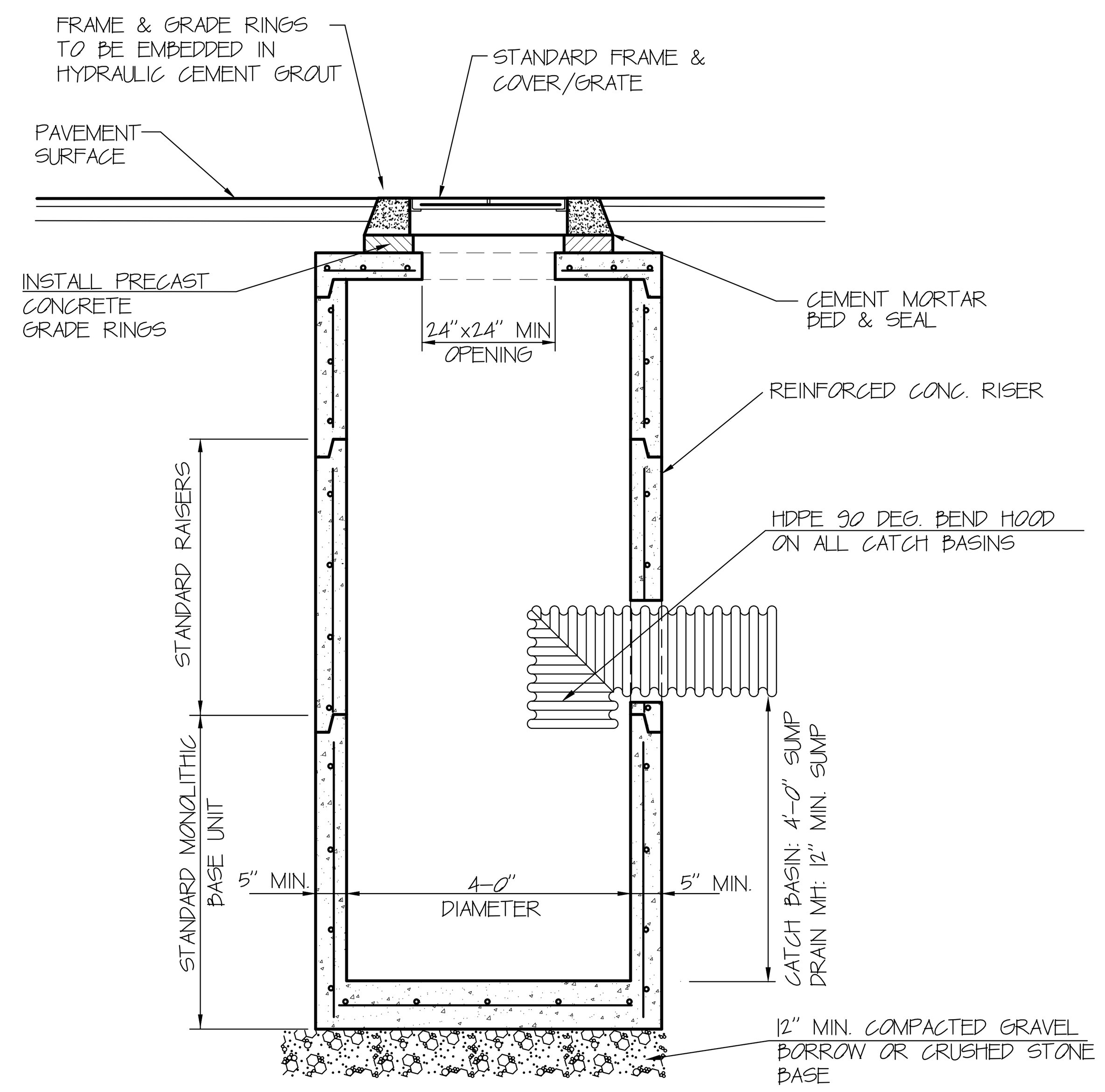
1 D-2 TYPICAL PIPE TRENCH DETAIL
N.T.S.



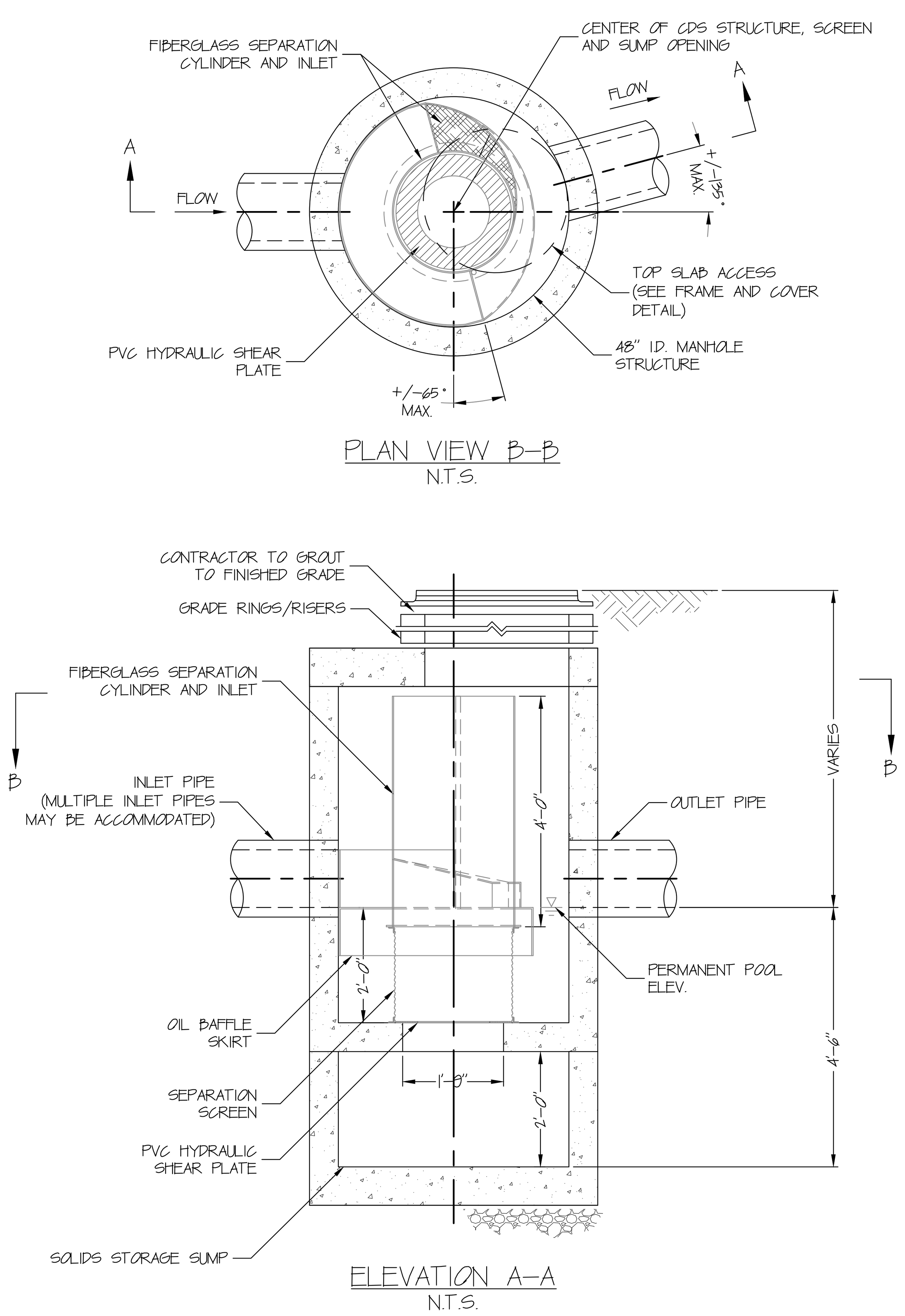
2 D-2 HYDRANT AND VALVE DETAIL
N.T.S.



3 D-2 SANITARY DROP INLET DETAIL
N.T.S.



4 D-2 PRE-CAST STORM DRAIN MANHOLE & CATCH BASIN DETAIL
N.T.S.



5 D-2 CDS2015-4-C - CDS INLINE STANDARD DETAIL
N.T.S.

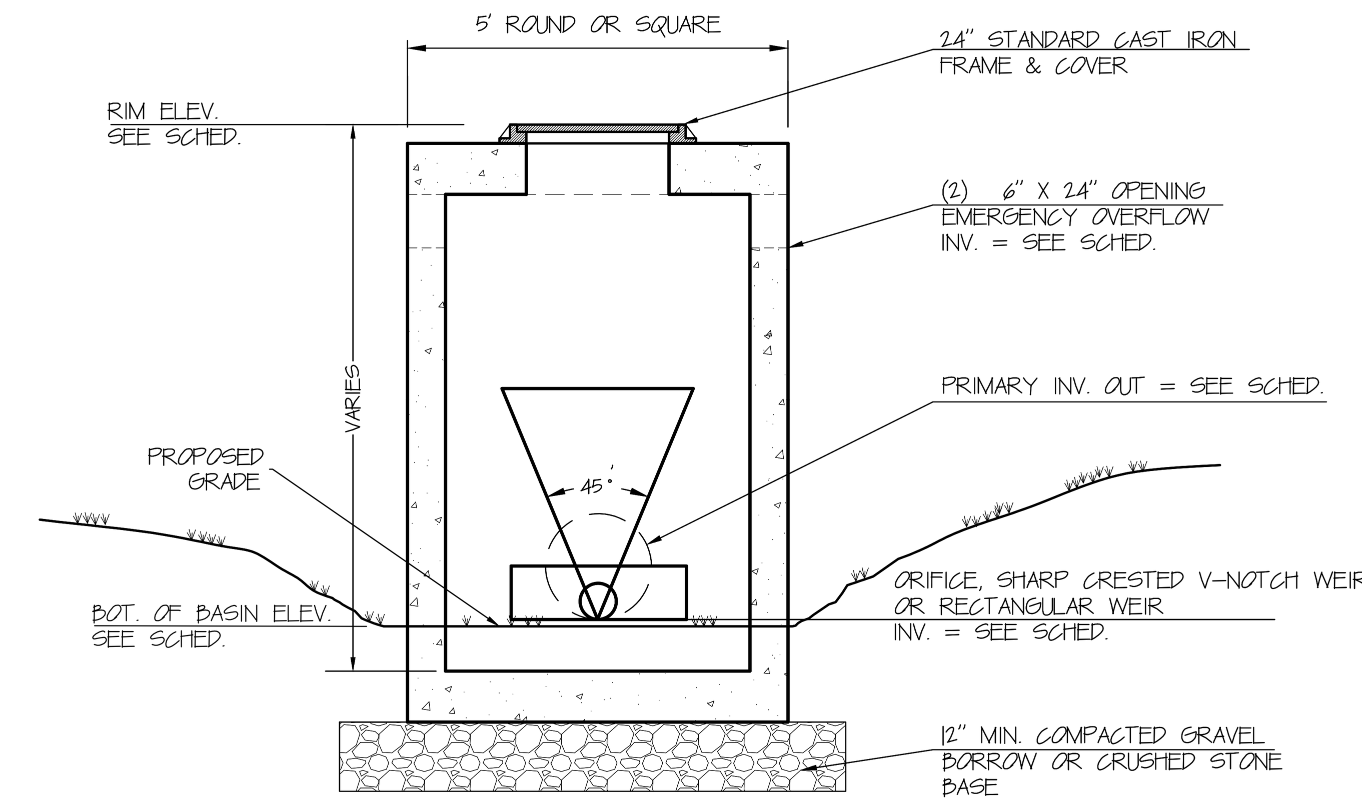
DESIGN NOTES
1. THE STANDARD CDS2015-4-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE. SOME CONFIGURATIONS MAY BE COMBINED TO SUITE SITE REQUIREMENTS.

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

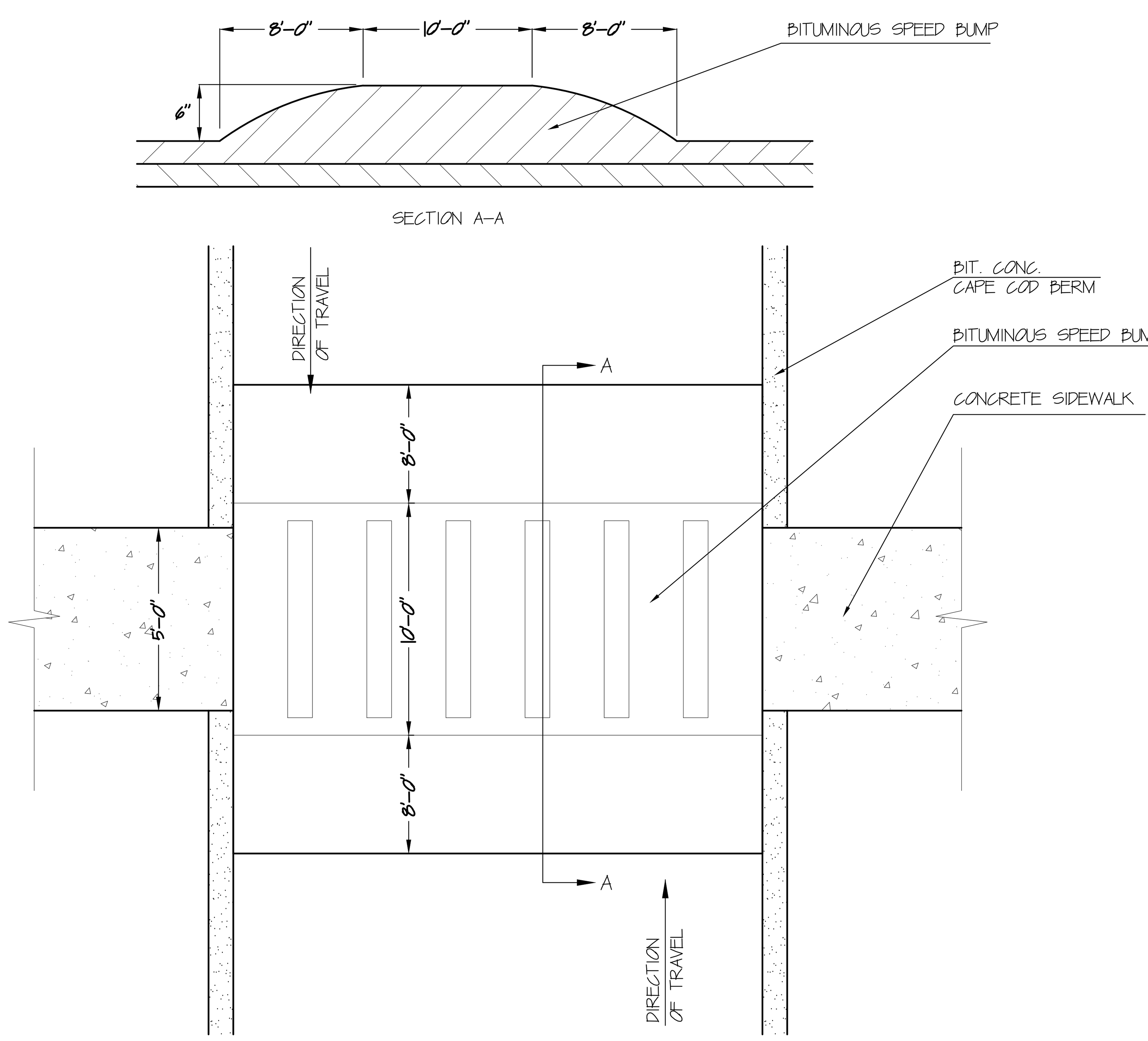
BASIN OUTLET CONTROL STRUCTURE SCHEDULE

Detention Basin	Bottom Elevation	Berm Elevation	Max. allowable Water Elv.	100 Year Water Elev. In Basin	Outlet Control Structure ID	Primary Invert Out	Primary Diameter Inches	Rectangular Weir Width	Rectangular Weir Elevation	Vee Weir at 45 Degree angel Elevation	Vee Weir at 45 Degree angel crest length	6"X24" Emergency Overflow
Basin R-1 (infiltration)	170.7	174.2	173.2	172.5	OCS-7	165.8	12	none	none	170.4	0	173.2
Basin R-2	161.5	164.5	163.5	163.0	OCS-6	152.0	12	2.5 feet	161.5	none	none	163.0
Basin R-3	159.8	164.5	163.5	163.1	OCS-5	156.0	12	none	none	159.8	0.5 feet	163.1
Basin F-2	158.0	162.5	161.5	161.4	OCS-3	158.0	15	none	none	159.0	0	161.4
Basin F-3	159.5	163.0	162.0	161.6	OCS-2	156.0	18	none	none	159.0	1.0 feet	161.6
Basin F-4 (infiltration)	162.0	166.3	165.3	164.6	OCS-1	159.0	18	5.0 feet	163.4	none	none	165.3



NOTE:
TRASH RACK WITH WELDED WIRE MESH WITH 1/2-INCH OPENINGS MOUNTED ON NO. 4 BARS SHALL BE PROVIDED OUTSIDE ORIFICE. CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR APPROVAL BY PROJECT ENGINEER.

6 D-2 OUTLET CONTROL STRUCTURE DETAIL
N.T.S.



7 D-2 SPEED BUMP DETAIL
N.T.S.

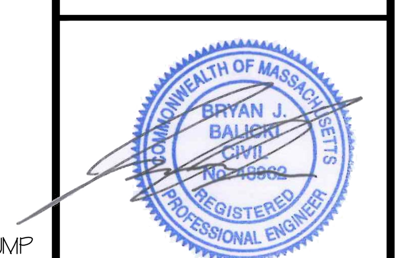
FOR PERMITTING ONLY

D-2 SITE DETAILS - SHEET 2

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884



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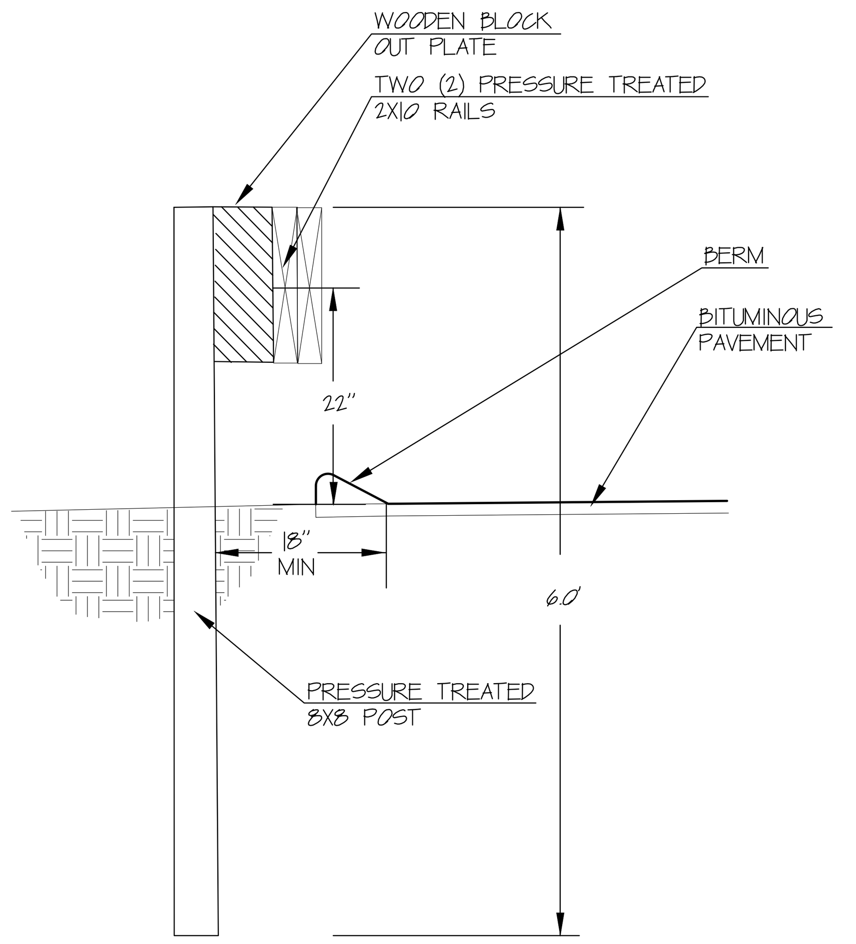
NO.	DATE:	BY:	REVISION DESCRIPTION
1	4-10-23	LDS	REVISED PER CITY ENGINEER COMMENTS
2	6-19-23	LDS	REVISED OCS SCHEDULE TABLE
3	7-27-23	LDS	REVISED PER B&T PEER REVIEW
4	10-18-23	LDS	REVISED PER B&T PEER REVIEW
5	10-30-23	LDS	MISC. REVISIONS

PROJECT #: 1042-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: AS NOTED
SHEET: D-2

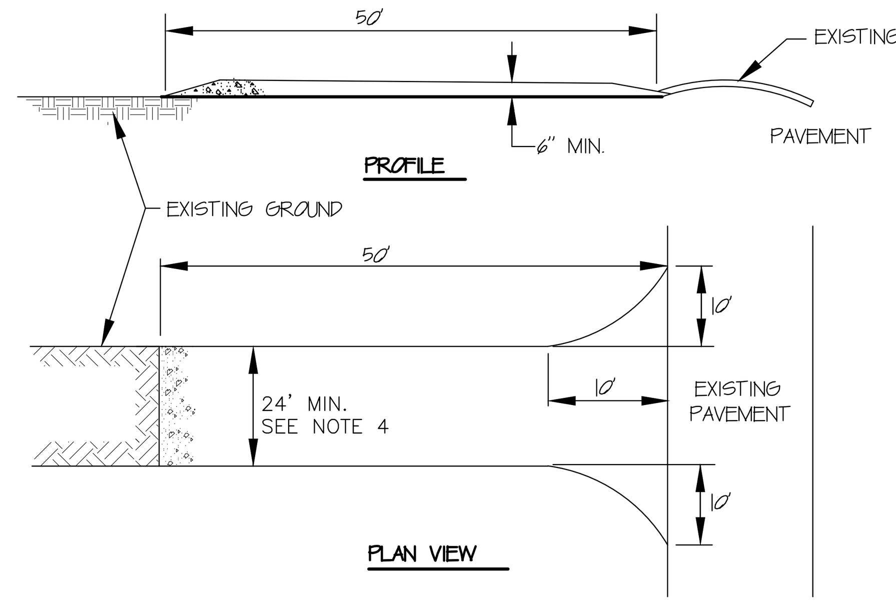


NOTES:

1. GUARDRAIL POSTS TO BE INSTALLED A MINIMUM OF 6 FEET ON CENTER.
2. ALL FASTENERS TO BE ⅝" DIAM. STAINLESS STEEL OR GALVANIZED CARRIAGE BOLTS.
3. EACH POST AND BEAM CONNECTION TO HAVE A MINIMUM OF FOUR FASTENERS.

1/D-3 WOODEN BEAM GUARDRAIL DETAIL

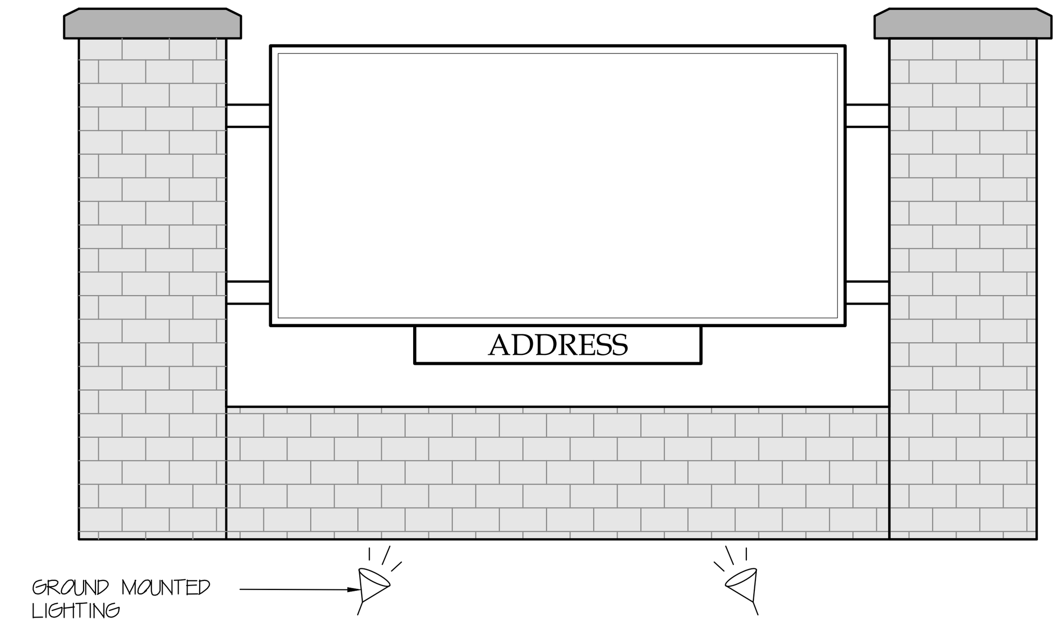
N.T.S.



1. STONE SIZE–USE 2" STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH–AS REQUIRED, BUT NOT LESS THAN 50'
3. THICKNESS–NOT LESS THAN 6".
4. WIDTH– 24' MINIMUM FOR SINGLE ENTRANCE TO SITE, 12' MINIMUM FOR MULTIPLE ENTRANCE TO SITE
5. FILTER CLOTH–WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. MAINTENANCE–THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS–OF–WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED,DROPPED,WASHED, OR TRACKED ONTO PUBLIC RIGHTS–OF–WAY MUST BE REMOVED IMMEDIATELY.
7. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

6/D-3 CONSTRUCTION ENTRANCE PLAN

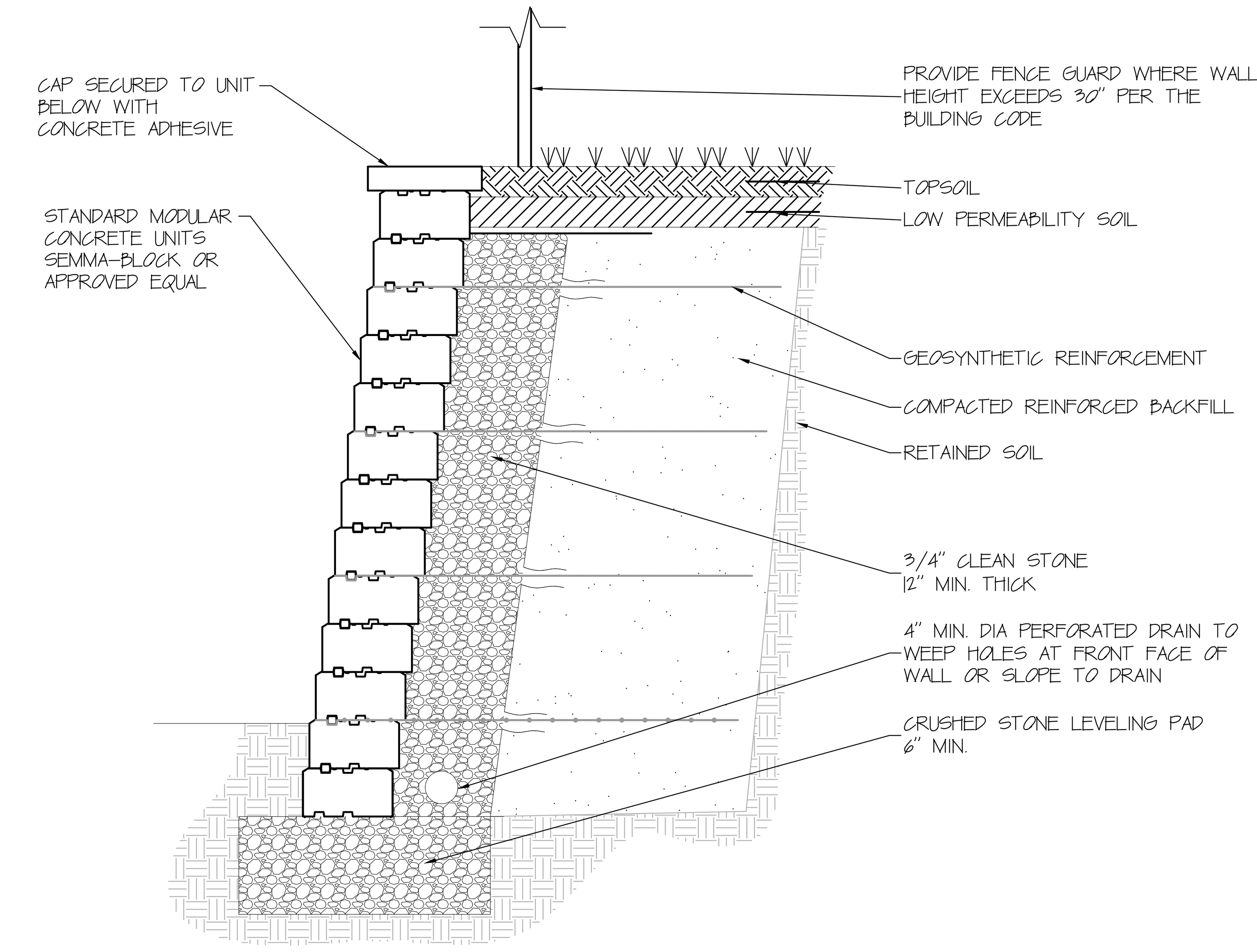
N.T.S.



NOTES:
1. SIGN MUST CONFORM TO CITY OF EASTHAMPTON SIGN BYLAWS
2. GRAPHIC DESIGN OF SIGN TO BE COMPLETED BY GC AND SUBMITTED TO OWNER FOR APPROVAL

4/D-3 PROPERTY SIGNAGE DETAIL

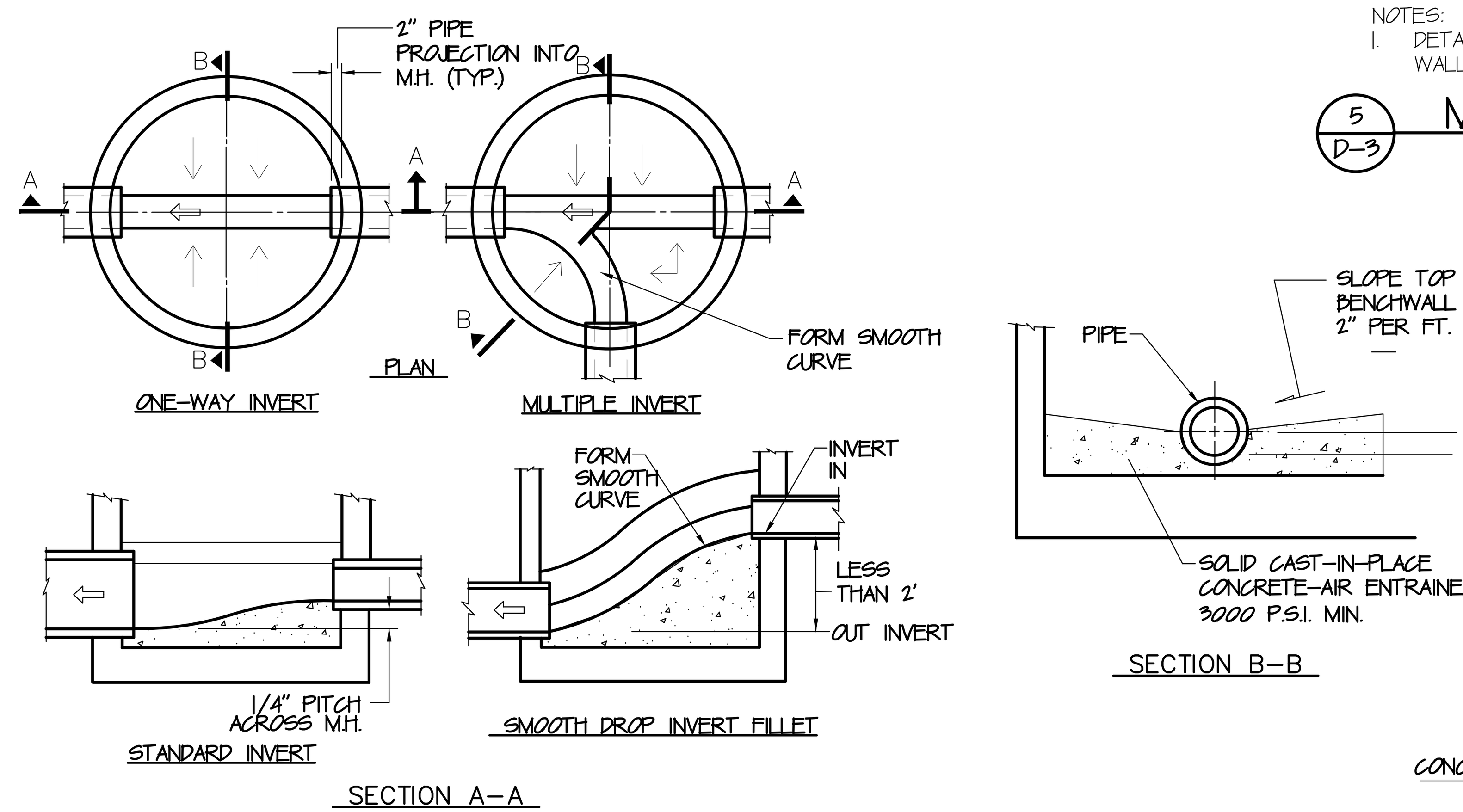
N.T.S.



NOTES:
1. DETAIL PROVIDED FOR GENERAL INFORMATION ONLY. FINAL SHOP DRAWINGS OF MODULAR WALL SYSTEM TO BE SUBMITTED TO SITE ENGINEER FOR APPROVAL.

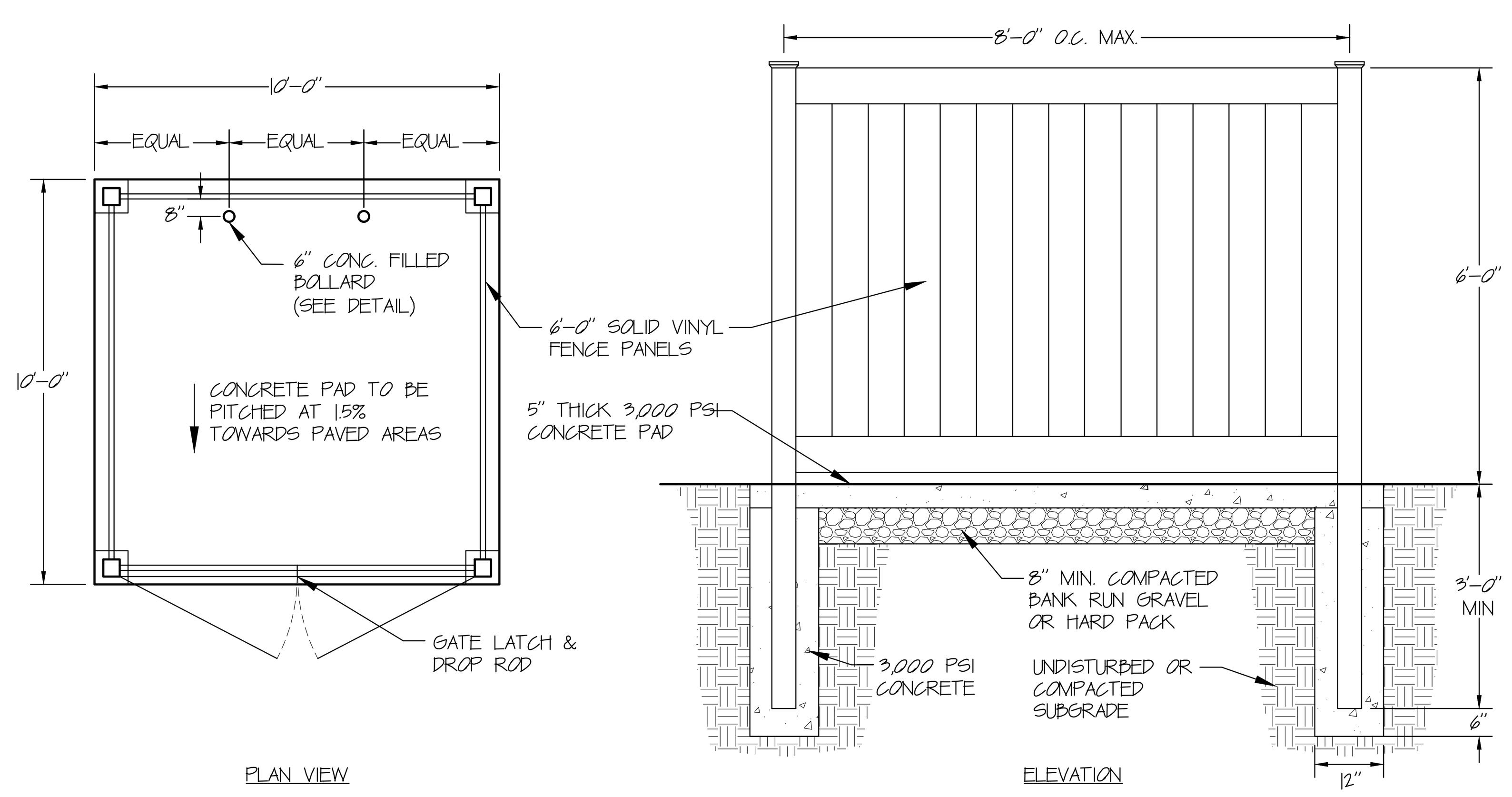
5/D-3 MODULAR RETAINING WALL SECTION DETAIL

N.T.S.



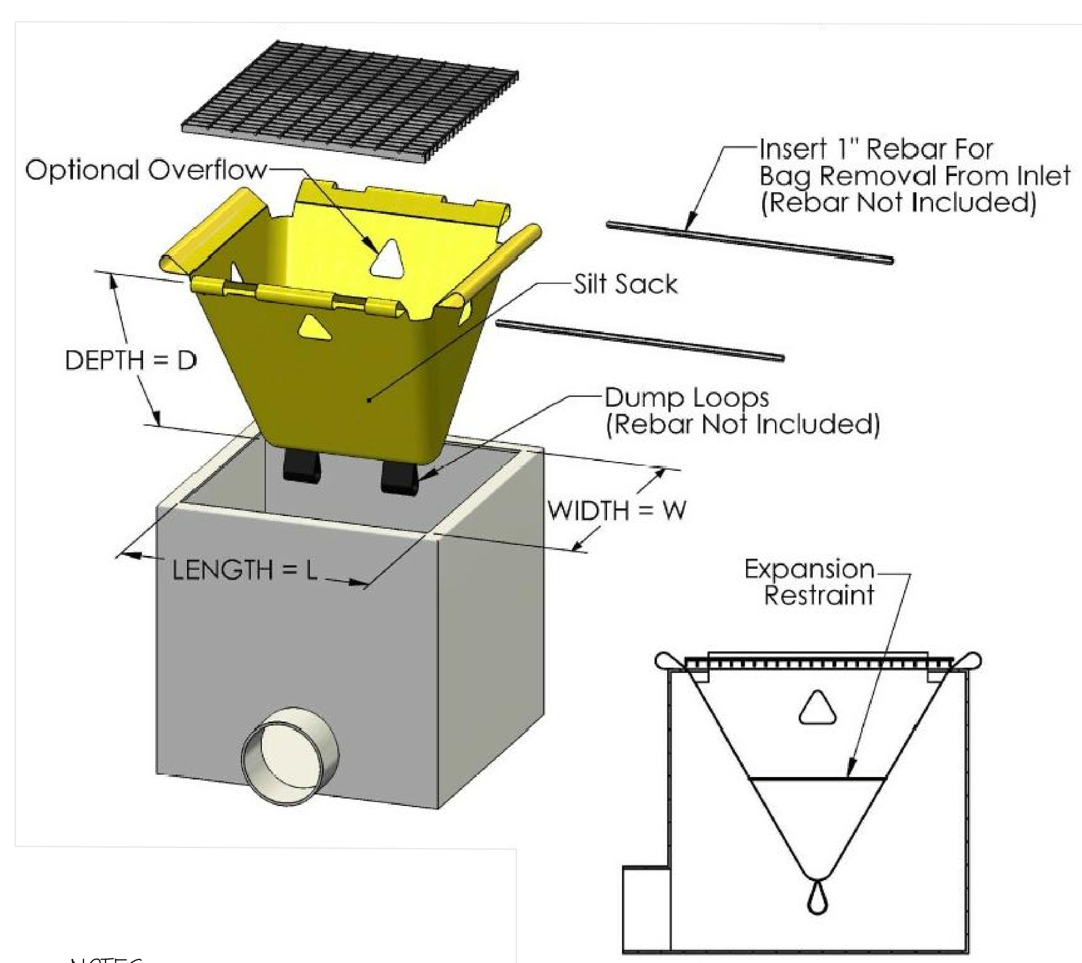
7/D-3 SANITARY MANHOLE INVERT, CHANNEL, AND BENCHWALL DETAIL

N.T.S.



2/D-3 DUMPSTER ENCLOSURE DETAIL

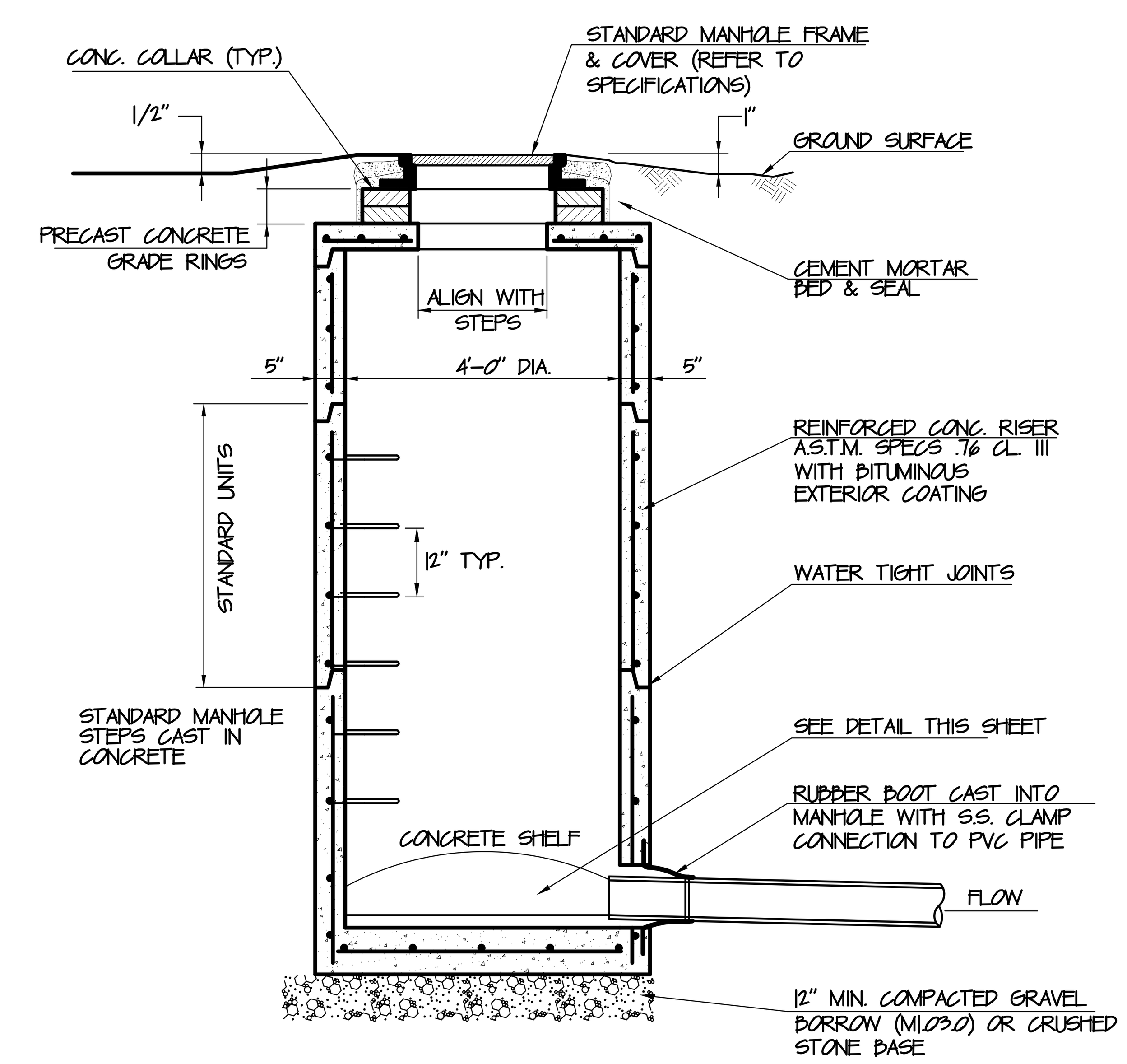
N.T.S.



NOTES:
1. SIZE TO BE VERIFIED IN FIELD PRIOR TO INSTALLATION.
2. SILTSACK TO BE CLEANED AND MAINTAINED PERIODICALLY AND AFTER ALL STORM EVENTS UNTIL CONTRIBUTING WATERSHED HAS BEEN STABILIZED WITH VEGETATION AND/OR COMPACTED PROCESSED STONE.

9/D-3 SILTSACK INLET PROTECTION

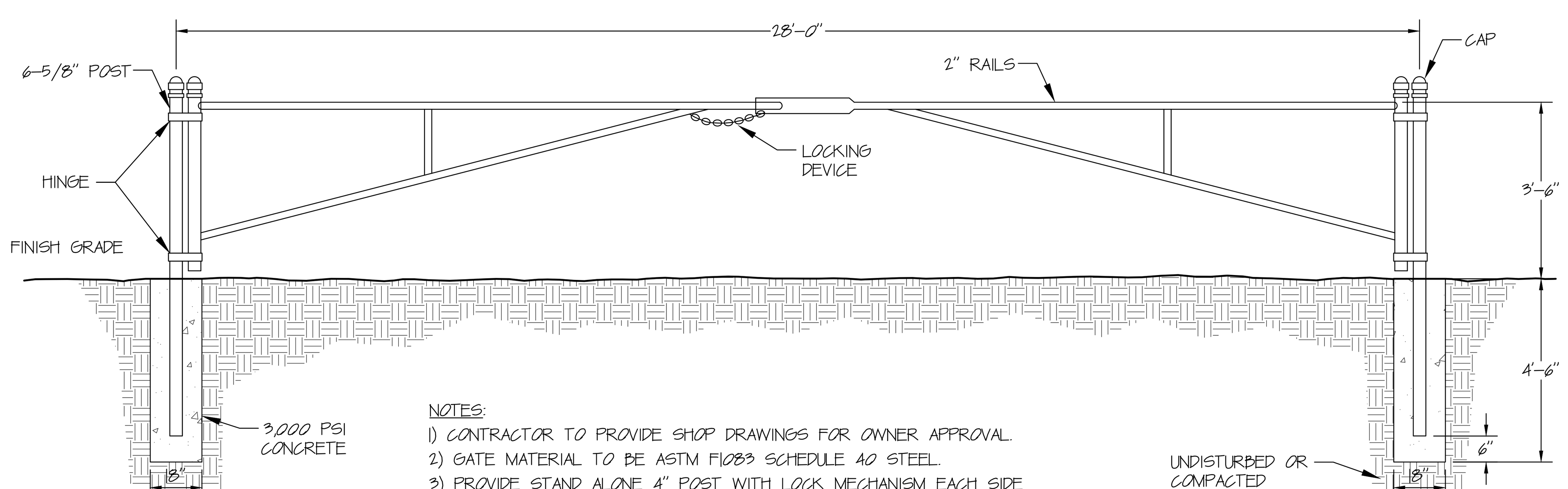
N.T.S.



NOTES:
PRECAST SANITARY SEWER MANHOLES SHALL CONFORM TO THE CITY OF EASTHAMPTON DPW STANDARDS.

8/D-3 SANITARY SEWER PRECAST MANHOLE DETAIL

N.T.S.



NOTES:
1) CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR OWNER APPROVAL.
2) GATE MATERIAL TO BE ASTM F1083 SCHEDULE 40 STEEL.
3) PROVIDE STAND ALONE 4" POST WITH LOCK MECHANISM EACH SIDE OF GATE SO THAT WHEN GATE IS OPENED, GATE ARMS CAN BE LOCKED AND SECURED IN THE OPEN POSITION.

3/D-3 DOUBLE SWING BARRIER ARM GATE DETAIL

N.T.S.

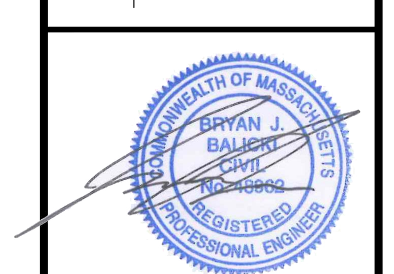
FOR PERMITTING ONLY

D-3 SITE DETAILS - SHEET 3

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884



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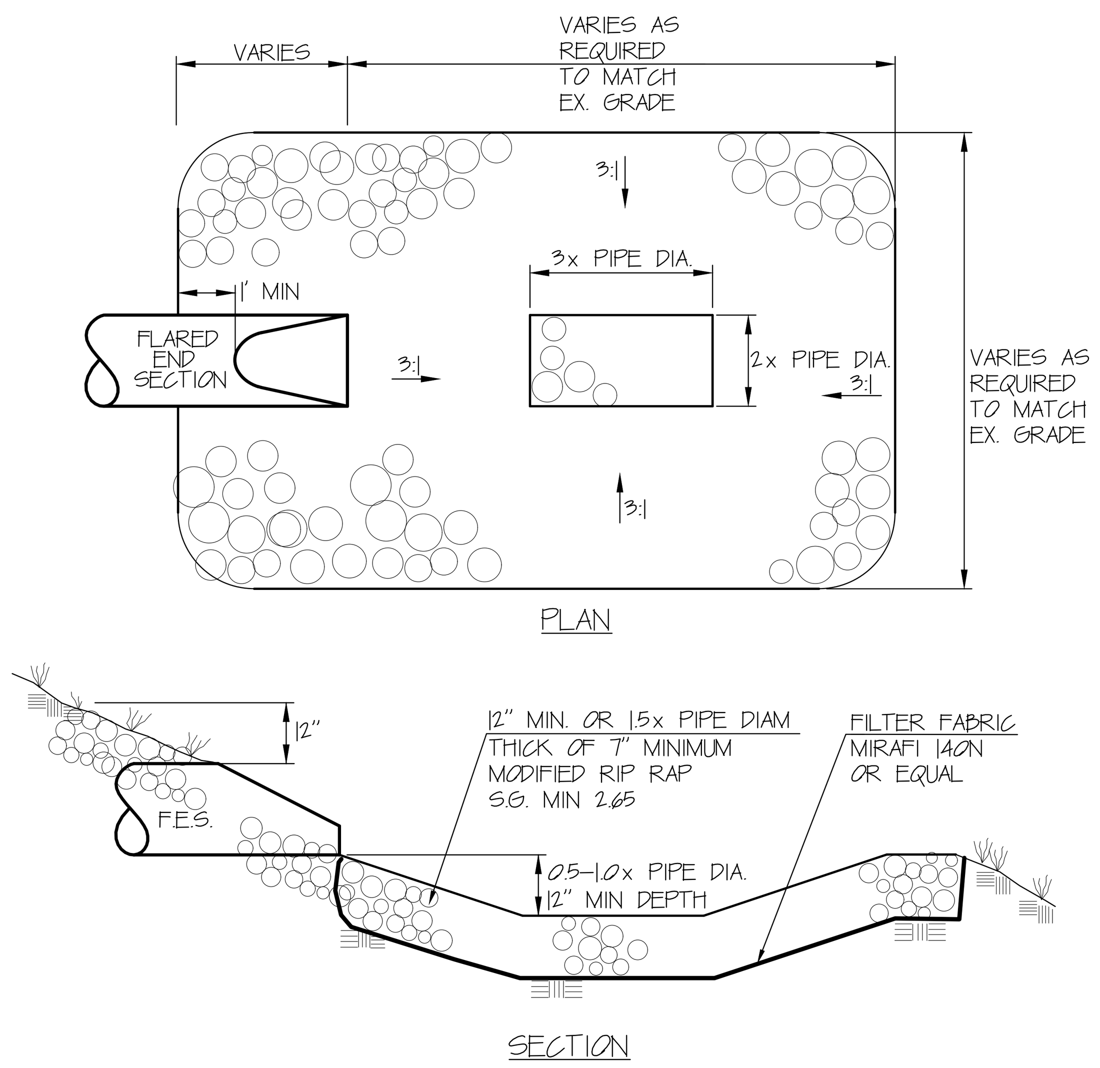
NO.	DATE:	BY:	REVISION DESCRIPTION
1	11-29-22	BJB	SUBMITTED TO PLANNING
2	1-31-23	LDS	REVISED PER CONSERVATION COMMENTS
3	3-13-23	LDS	REVISED PER CITY ENGINEER COMMENTS
4	4-10-23	LDS	REVISED PER CITY ENGINEER COMMENTS
5	-	-	-

PROJECT #: 1041-01-22
DRAWN BY: LDS
DATE: 1/31/2022
SCALE: AS NOTED
SHEET: D-3

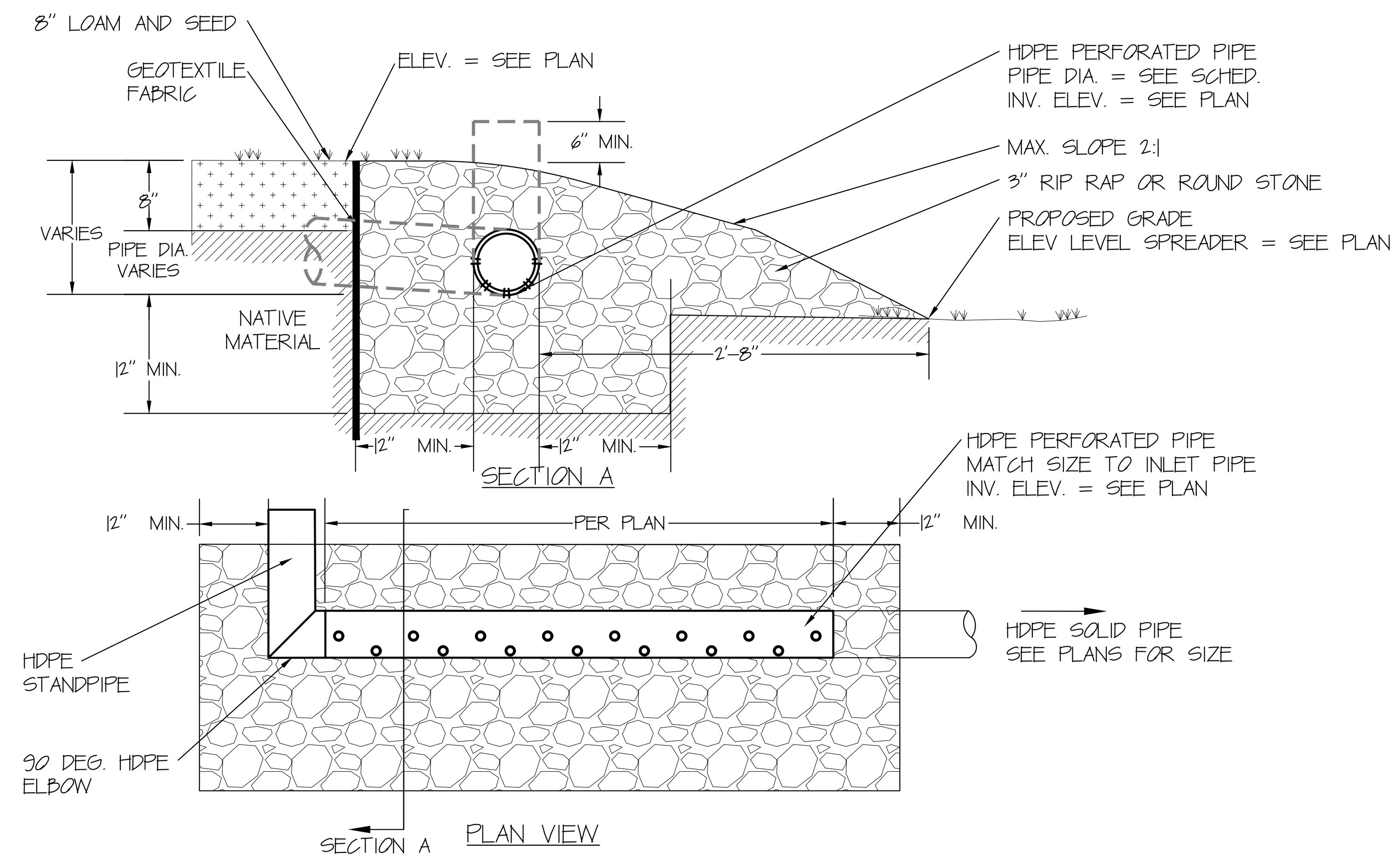


1 D-4 FLARED END SECTION PLUNGE POOL DETAIL

N.T.S.

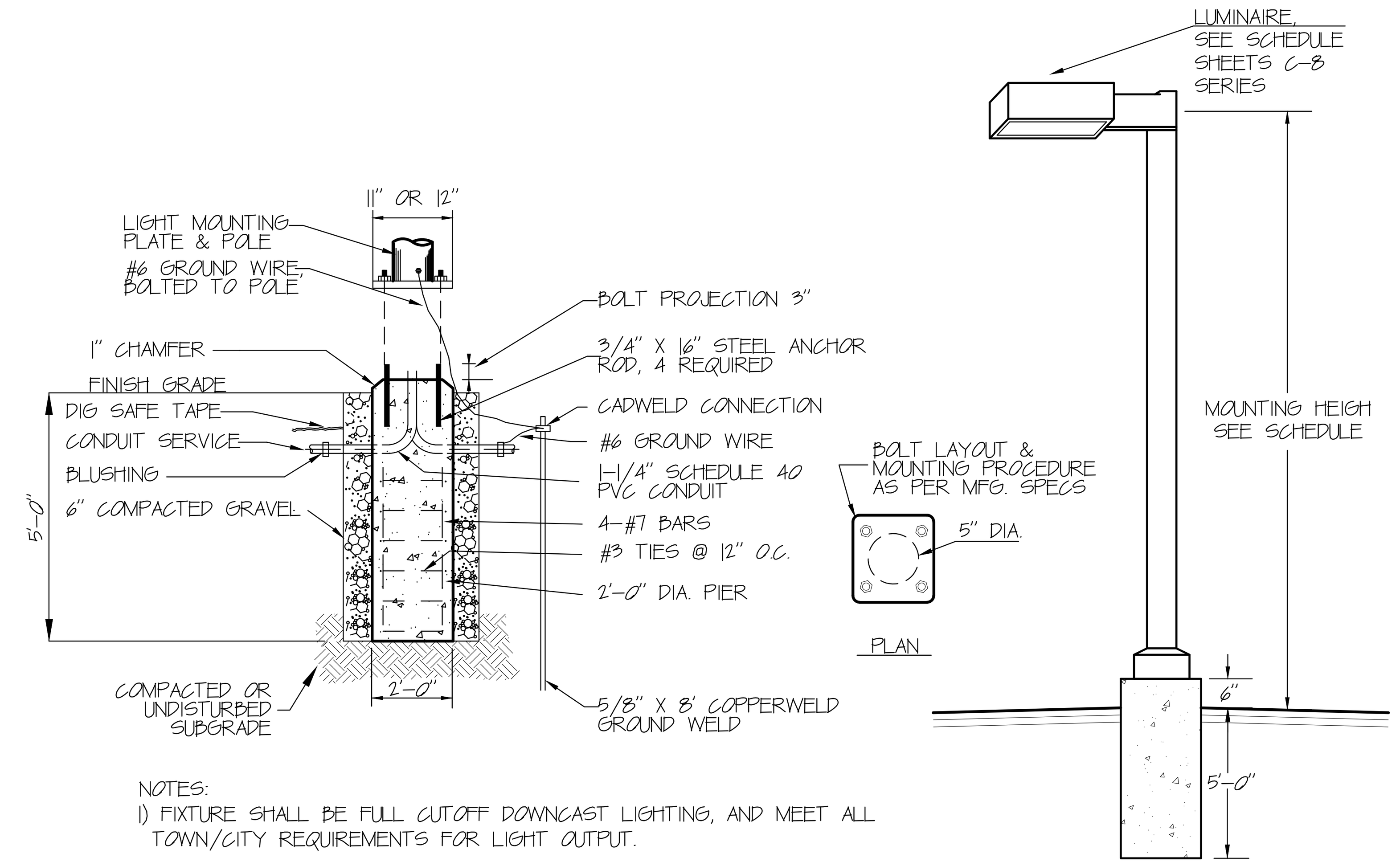
LEVEL SPREADER SCHEDULE

Level Spreader Location	Level Spreader ID	Pipe Diameter (inches)	Perforation Diameter (inches)	# Perforations per LF of pipe	Invert Elevation	Design Length of Perforated Spreader Pipe
Basin R-2	E	12	1.0	12	141.0'	50
Basin R-3	D	12	1.0	12	149.5'	50
Basin F-2	C	15	1.0	12	155.0'	40
Basin F-3	B	18	1.0	15	153.0'	50
Basin F-4	A	18	1.0	15	153.0'	60



2 D-4 LEVEL SPREADER DETAIL

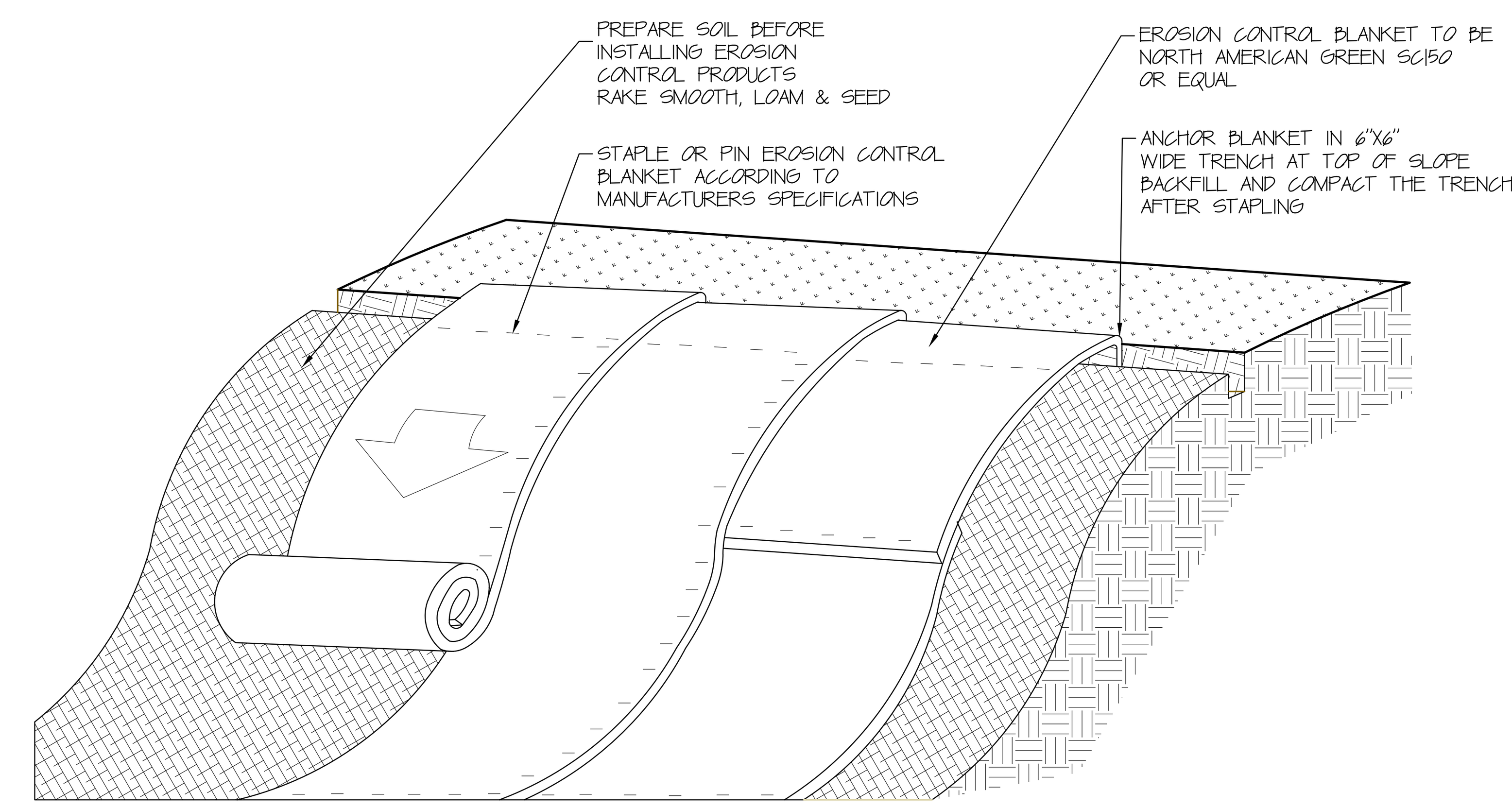
N.T.S.



NOTES:
1) FIXTURE SHALL BE FULL CUTOFF DOWNCAST LIGHTING, AND MEET ALL TOWN/CITY REQUIREMENTS FOR LIGHT OUTPUT.

5 D-4 POLE MOUNTED LIGHT & BASE DETAIL

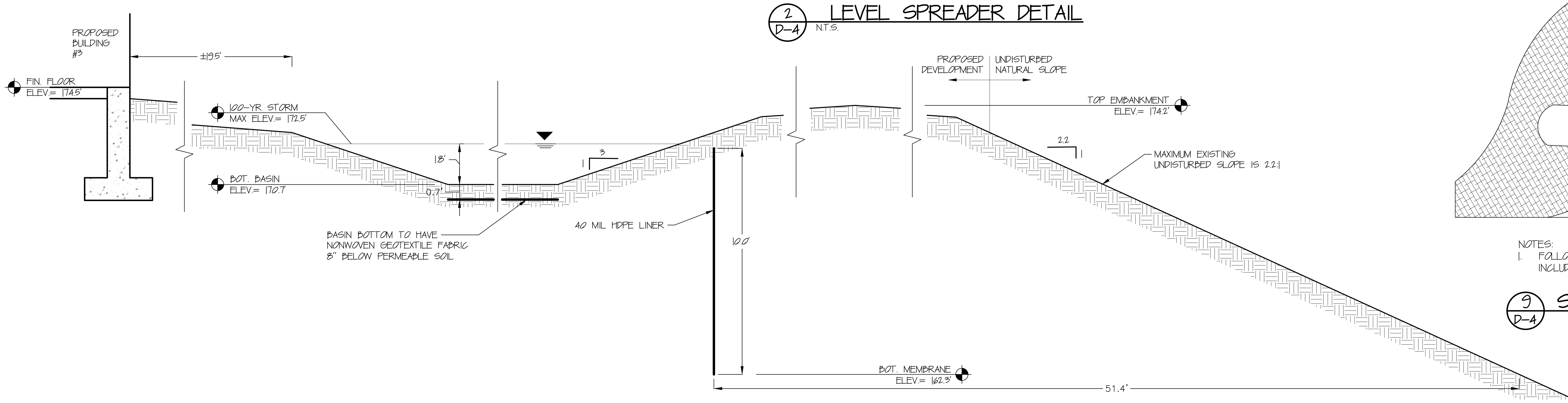
N.T.S.



NOTES:
1. FOLLOW ALL MANUFACTURERS SPECIFICATIONS FOR INSTALLATION OF EROSION CONTROL BLANKETS INCLUDING ANCHORAGE, STAPLING PATTERN, AND OVERLAPPING.

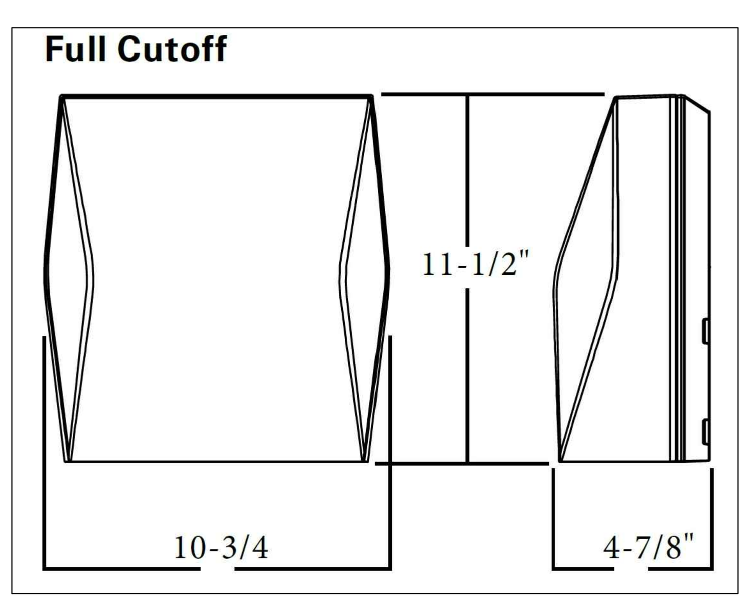
9 D-4 SLOPE INSTALLATION OF EROSION CONTROL BLANKET

N.T.S.



7 D-4 INFILTRATION BASIN R-1 SECTION

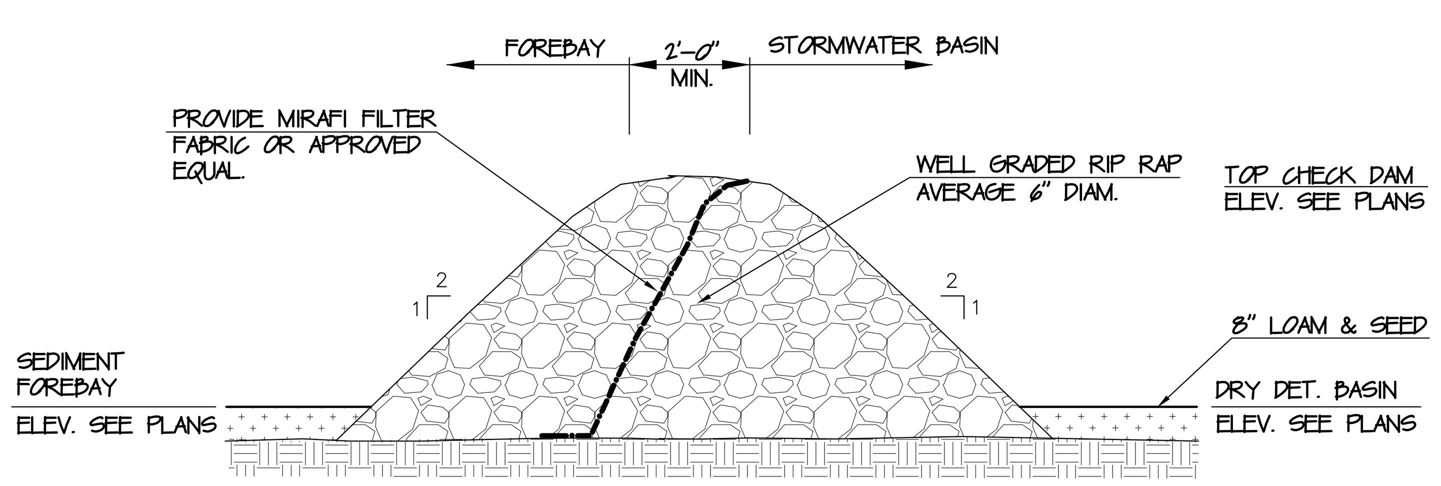
SCALE: 1" = 5'



NOTES:
1) MAKE: COOPER LIGHTING
2) SERIES: LUMARK AXCENT
3) MODEL: AXCLAA-W-GRF
4) COLOR: 3000K
5) 44 WATT

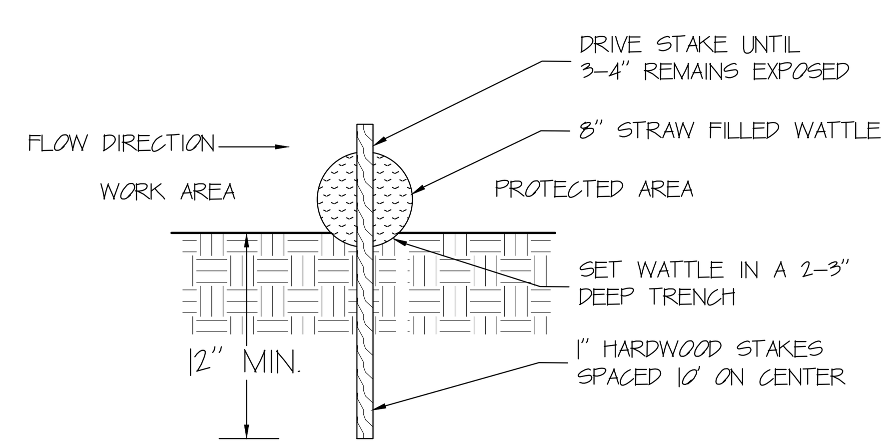
6 D-4 WALL MOUNTED LED LIGHT

N.T.S.



8 D-4 FOREBAY CHECK DAM SECTION DETAIL

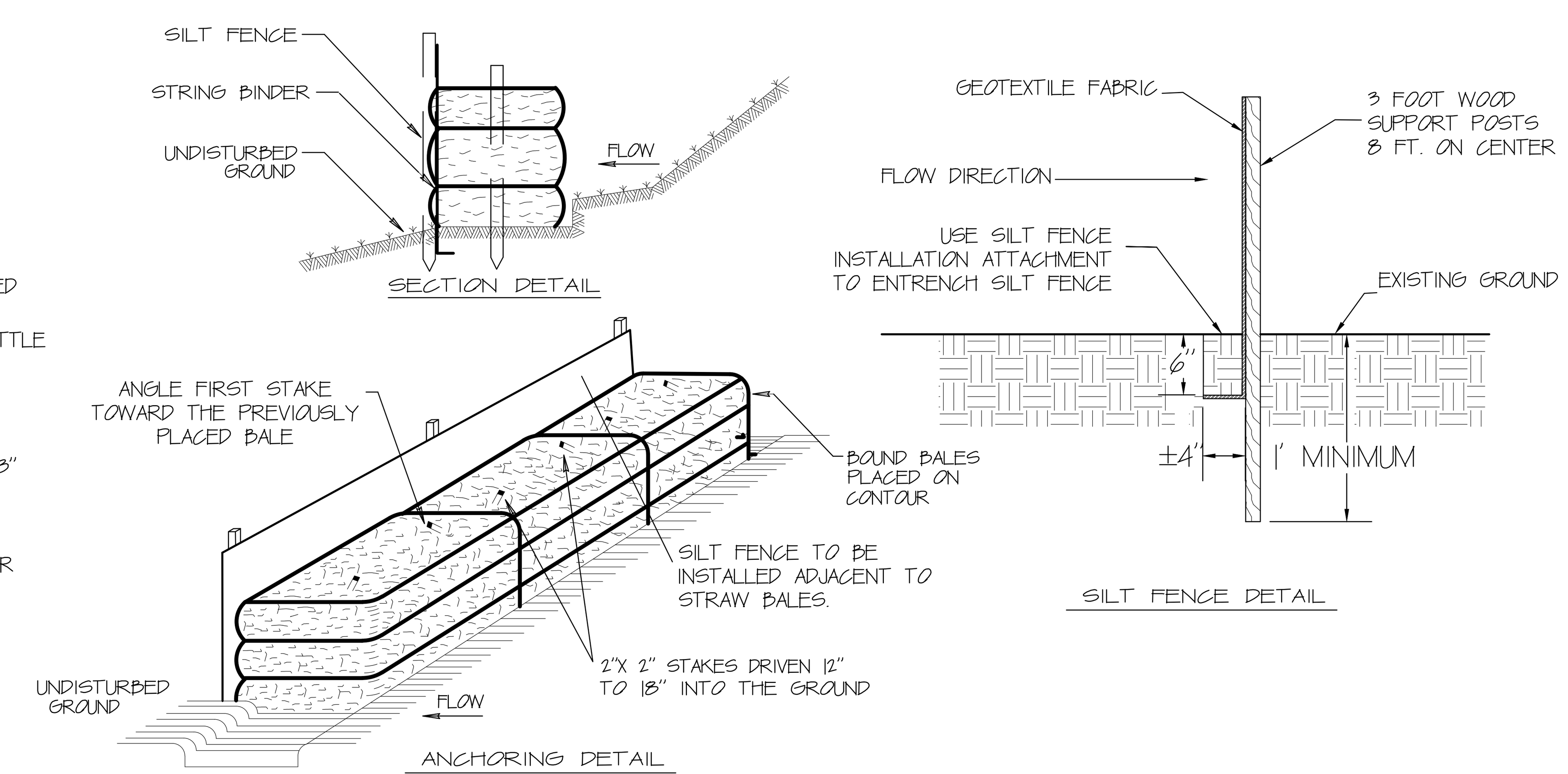
SCALE: N.T.S.



NOTES:
1. OVERLAP STRAW WATTLES A MINIMUM OF 12"
2. IF INSTALLED ON HARD SURFACES (PAVEMENT) WEIGHTS CAN BE SUBSTITUTED FOR STAKES

10 D-4 STRAW WATTLE DETAIL

N.T.S.



11 D-4 SILT FENCE W/ STRAW BALE DETAIL

N.T.S.

FOR PERMITTING ONLY

D-4 SITE DETAILS - SHEET 4

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 502-4884

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1	6-19-23	LDS	REMOVE BASIN F-1 SECTION
2	7-27-23	LDS	REVISED PER B&T PEER REVIEW
3	8-29-23	LDS	REVISED PER B&T PEER REVIEW
4	10-30-23	LDS	MISC. REVISIONS
5	12-6-23	LDS	ADDED DETAIL 10 & 11 PER CON COM

PROJECT #: 1242-01-22

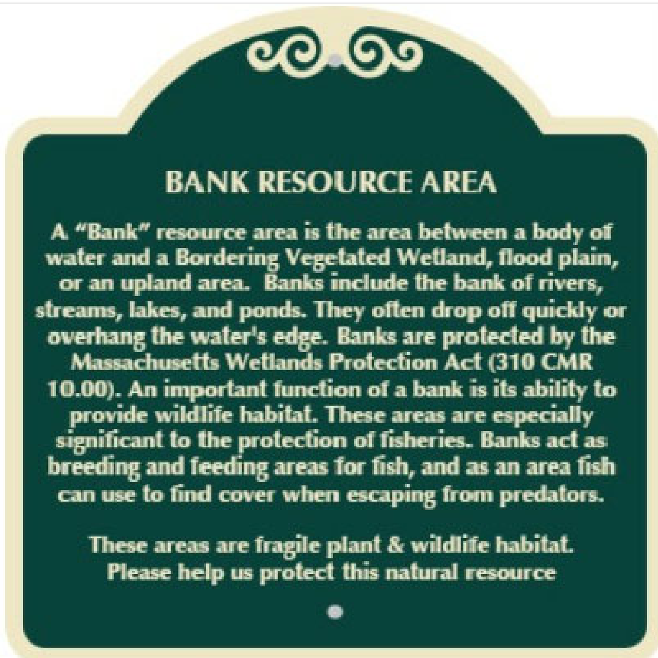
DRAWN BY: LDS

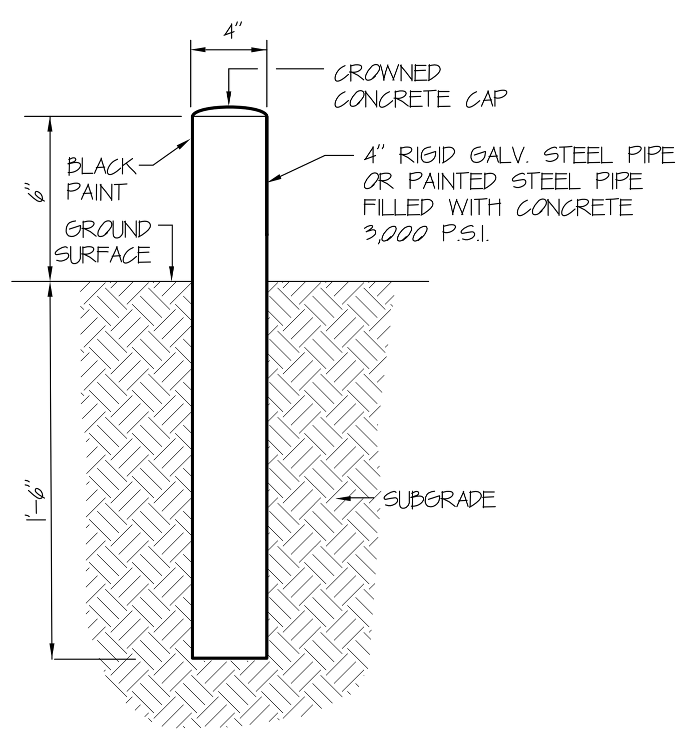
DATE: 1/31/2022

SCALE: AS NOTED

SHEET: D-4

SIGN SCHEDULE

SIGN ID	QTY	DESCRIPTION
SIGN #1	2	
SIGN #2	1	
SIGN #3	9	



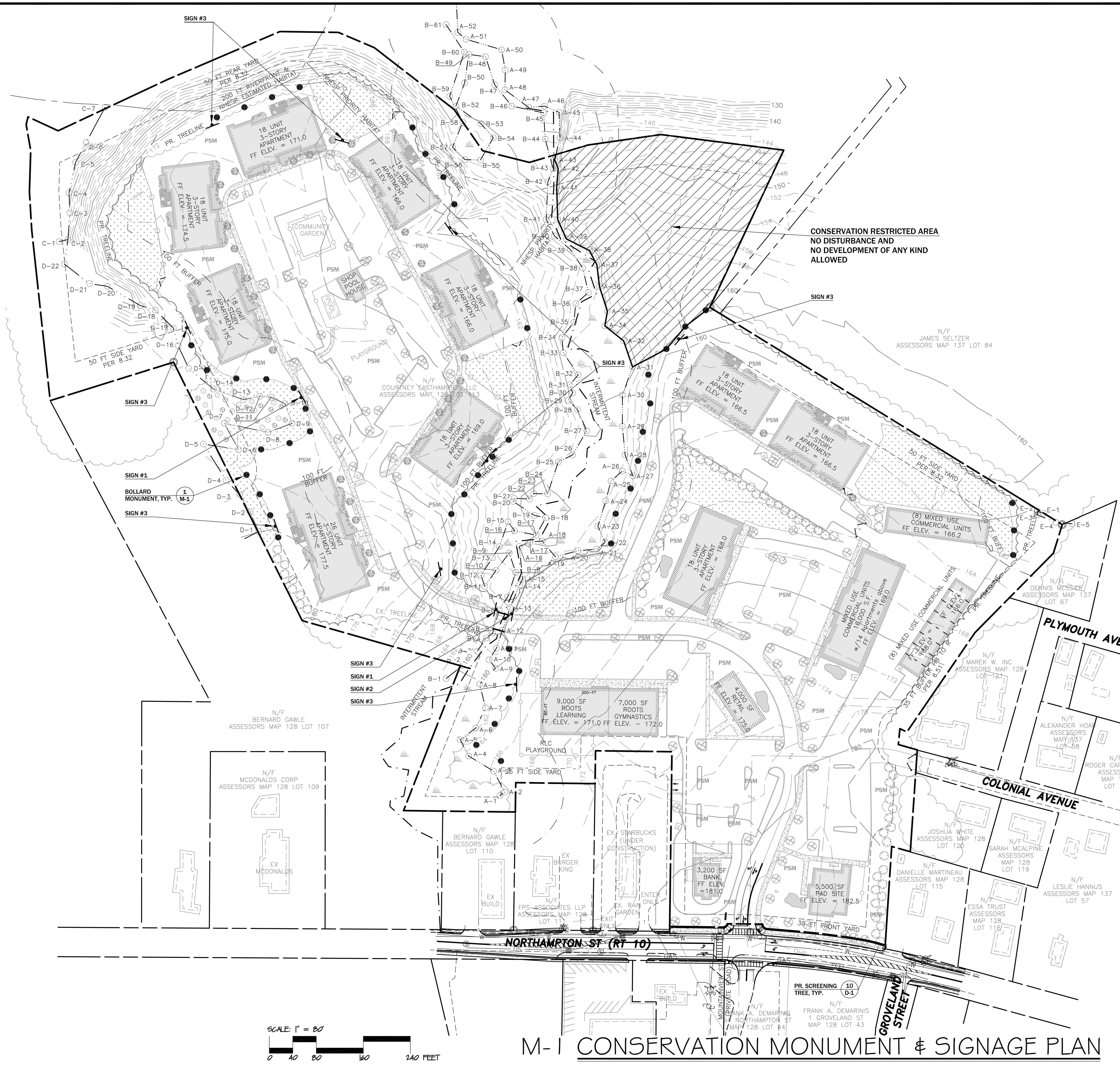
1 / M-1 PIPE BOLLARD DETAIL

N.T.S.

FERTILIZER NOTE

NO FERTILIZER, PESTICIDES, OR HERBICIDES SHALL BE USED WITHIN THE 100 FOOT WETLAND BUFFER ZONE AND NHESP DESIGNATED HABITATS, EXCEPT PESTICIDES USED FOR MOSQUITO AND TICK CONTROL.

FOR PERMITTING ONLY



M-1 CONSERVATION MONUMENT & SIGNAGE PLAN

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

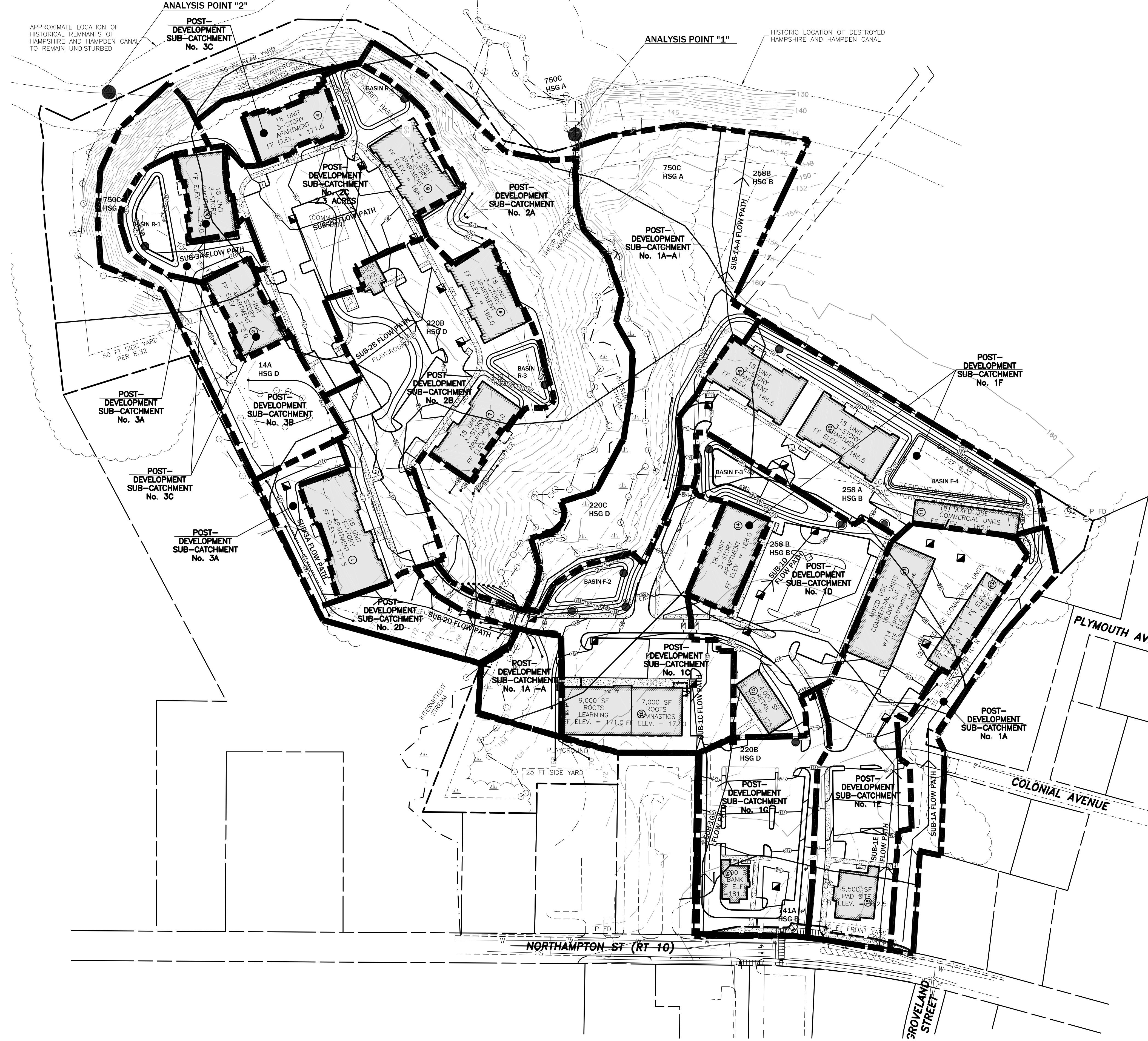
APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1			
2			
3			
4			
5			

PROJECT #: 042-01-22
DRAWN BY: LDS
DATE: 12/14/2023
SCALE: 1"=80
SHEET: M-1



F-2 POST-DEVELOPMENT SUB-CATCHMENT PLAN

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
89-91 NORTHAMPTON ST
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

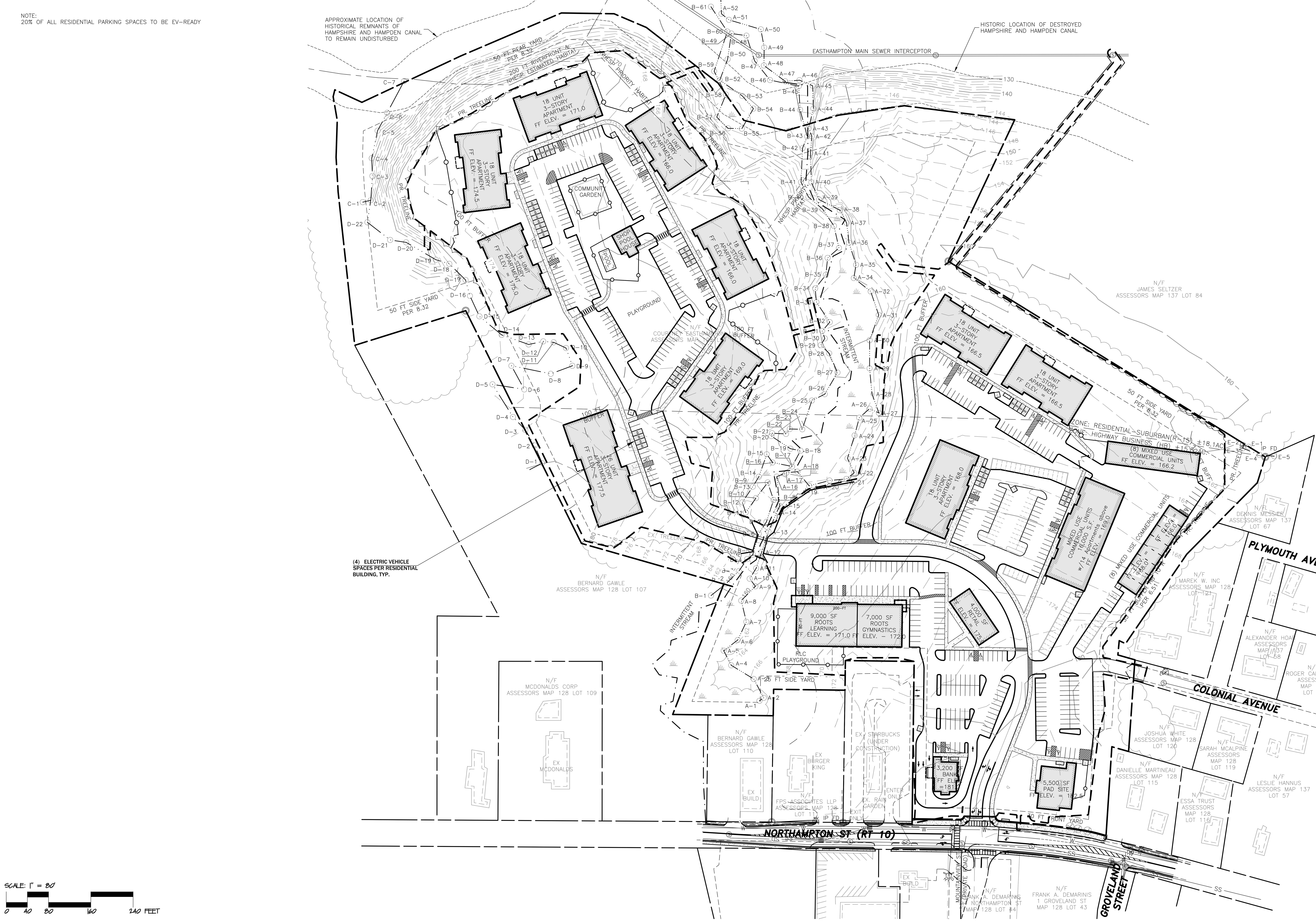
Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 562-4884

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1	1-31-23	LDS	REVISED PER CONSERVATION COMMENTS
2	3-13-23	LDS	REVISED PER CITY ENGINEER COMMENTS
3	7-27-23	LDS	REVISED PER B&T PEER REVIEW
4	-	-	-
5	-	-	-

PROJECT #: 042-01-22
DRAWN BY: LDS
DATE: 11/11/2022
SCALE: 1"=80'
SHEET: F-2

NOTE:
20% OF ALL RESIDENTIAL PARKING SPACES TO BE EV-READY



FOR PERMITTING ONLY

EV-1 EV PARKING PLAN

PROJECT DESCRIPTION:
SIERRA VISTA COMMONS
93-97 NORTHAMPTON STREET
EASTHAMPTON, MA 01027

APPLICANT:
TASTY TOP DEVELOPMENT LLC
199 SERVISTAR INDUSTRIAL WAY
WESTFIELD, MA 01085

Furrow Engineering
199 Servistar Industrial Way - Suite 2
Westfield, MA 01085
Phone: (413) 502-4884

ORIGINAL SEAL IS IN BLUE INK COPIES ARE NOT VALID

NO.	DATE:	BY:	REVISION DESCRIPTION
1			
2			
3			
4			
5			

PROJECT #: 1042-01-22
DRAWN BY: LDS
DATE: 5/10/2024
SCALE: 1"=80'
SHEET: EV-1

ATTACHMENT 4 – ENVIRONMENTAL JUSTICE REFERENCE LIST

Project-Specific EJ Distribution List

Populate this Project-Specific Distribution List with the appropriate contacts from all 4 tabs in the EJ Reference List workbook

Project Name: Sierra Vista Commons Project

Project Address: 93, 94, 95, 97 Northampton Street, 1 Groveland Ave, Easthampton

MA Municipalities in Project's DGA: Easthampton & Northampton

Date Generated: 6/10/2024 as update to MEPA-generated EENF & DEIR lists

Filing Type: ☐ ENF/EENF ☑ DEIR/FEIR ☐ SEIR ☐ Other

First Name	Last Name	Title	Phone	Email	Affiliation	Contact Source
Claire	B.W. Muller	Movement Building Director	(508) 308-9261	claire@uumassaction.org	Unitarian Universalist Mass Action Network	Statewide CBO
Julia	Blatt	Executive Director	(617) 714-4272	juliablatt@massriversalliance.org	Mass Rivers Alliance	Statewide CBO
Jodi	Valenta	Massachusetts State Director	(617) 367-6200	Jodi.Valenta@tpl.org	The Trust for Public Land	Statewide CBO
Kerry	Bowie	Board President	Not Provided	kerry@msaadapartners.com	Browning the GreenSpace	Statewide CBO
Sylvia	Broude	Executive Director	(617) 292-4821	sylvia@communityactionworks.org	Community Action Works	Statewide CBO
Heather	Clish	Director of Conservation & Recreation Policy	(617) 523-0655	hclish@outdoors.org	Appalachian Mountain Club	Statewide CBO
Johannes	Epke	Staff Attorney	(617) 850-1761	jepke@clf.org	Conservation Law Foundation	Statewide CBO
Brittney	Jenkins	Vice President		Bjenkins@clf.org	Conservation Law Foundation	Statewide CBO
Amy	Boyd Rabin	Vice President of Policy	(617) 221-8258	aboydrabin@environmentalleague.org	Environmental League of Massachusetts	Statewide CBO
Zahra	Saifee	Policy & Advocacy Coordinator	(435) 632-9482	zsaifee@environmentalleague.org	Environmental League of Massachusetts	Statewide CBO
Ben	Hellerstein	MA State Director	(617) 747-4368	ben@environmentmassachusetts.org	Environment Massachusetts	Statewide CBO
Robb	Johnson	Executive Director	(978) 443-2233	robb@massland.org	Mass Land Trust Coalition	Statewide CBO
Cindy	Luppi	New England Director	(617) 338-8131 x208	cluppi@cleanwater.org	Clean Water Action	Statewide CBO
Lena Miles	Entin Gresham	Interim Co-Directors	Not Provided	Lena@N2NMa.org Miles@N2NMa.org	Neighbor to Neighbor Mass.	Statewide CBO
Rob	Moir	Executive Director	Not Provided	rob@oceanriver.org	Ocean River Institute	Statewide CBO
Deb	Pasternak	Director, MA Chapter	(617) 423-5775	deb.pasternak@sierraclub.org	Sierra Club MA	Statewide CBO
Heidi	Ricci	Director of Policy	Not Provided	hricci@massaudubon.org	Mass Audubon	Statewide CBO
Alma	Gordon	President	Not Provided	tribalcouncil@chappaquiddickwampanoag.org	Chappaquiddick Tribe of the Wampanoag Nation	Indigenous Org
Cheryll	Toney Holley	Chair	(774) 317-9138	crwritings@aol.com	Nipmuc Nation (Hassanamisco Nipmucs)	Indigenous Org
John	Peters, Jr.	Executive Director	(617) 573-1292	john.peters@mass.gov	Massachusetts Commission on Indian Affairs (MCIA)	Indigenous Org
Melissa	Ferretti	Chair	(508) 304-5023	melissa@herringpondtribe.org	Herring Pond Wampanoag Tribe	Indigenous Org
Patricia	D. Rocker	Council Chair	Not Provided	rockerpatriciad@verizon.net	Chappaquiddick Tribe of the Wampanoag Nation, Whale Clan	Indigenous Org
Raquel	Halsey	Executive Director	(617) 232-0343	rhalsey@naicob.org	North American Indian Center of Boston	Indigenous Org
Cora	Pierce	Not Provided	Not Provided	Coradot@yahoo.com	Pocassett Wampanoag Tribe	Indigenous Org
Elizabeth	Solomon	Not Provided	Not Provided	Solomon.Elizabeth@gmail.com	Massachusetts Tribe at Ponkapoag	Indigenous Org
Stockbridge-Munsee Tribe		Historic Preservat	(413) 884-6048	THPO@Mohican-nsn.gov	Stockbridge-Munsee Tribe	Federal Tribe
Bettina	Washington	Tribal Historic Preservation Officer	(508) 560-9014	thpo@wampanoagtribe-nsn.gov	Wampanoag Tribe of Gay Head (Aquinnah)	Federal Tribe
Brian	Weeden	Chair	(774) 413-0520	Brian.Weeden@mwtribe-nsn.gov	Mashpee Wampanoag Tribe	Federal Tribe
David	Weeden	THPO/Director	(774) 327.0068	David.Weeden@mwtribe-nsn.gov	Mashpee Wampanoag Tribe	Federal Tribe
Nakia	Hendricks Jr.	Office Manager	Not Provided	106Review@mwtribe-nsn.gov	Mashpee Wampanoag Tribe	Federal Tribe
Mark	Wamsley	Conservation Director	Not Provided	mark@kestreltrust.org	Kestrel Land Trust	Local CBO
Sarita	Hudson	Director Programs & Development	(413) 794-7739	shudson@publichealthwm.org	Public Health Institute of Western Mass	Local CBO
Mireille	Bejjani	Energy Justice Director	Not Provided	mbejjani8@gmail.com	Community Action Works	Local CBO
Ryan	Odonnell	Water Quality Monitoring Coordinator	Not Provided	rodonnell@ctriver.org	Connecticut River Conservancy	Local CBO
				etoncommctr@gmail.com	Easthampton Community Center	Supplemental Research
				ctarail@easthamptonma.gov	Easthampton Council on Aging and Enrichment Center	Supplemental Research
				office@etonhousing.com	Easthampton Housing Authority	Supplemental Research
				afhp@easthamptonma.gov	Affordable & Fair Housing Partnership	Supplemental Research
				ecchurchfood@gmail.com	Easthampton Congregational Church - Food Cupboard	Supplemental Research

ATTACHMENT 5 – TRAFFIC WARRANT ANALYSIS

STUDY AND ANALYSIS INFORMATION

Municipality:	Easthampton	**Analysis Date:**	6/14/2023
County:		**Conducted By:**	ECP
MassDOT Engineering District:	2	**Agency/Company Name:**	HSH

Analysis Information

Data Collection Date:	9/30/2021
Day of the Week:	Thursday

Is the intersection in a built-up area of an isolated community of <10,000 population? No

Major Street Information

Major Street Name and Route Number:	Northampton Street (Route 10)
Major Street Approach #1 Direction:	N-Bound
Major Street Approach #2 Direction:	S-Bound

Number of Lanes for Moving Traffic on Each Major Street Approach:	1	**LANE(S)**
Speed Limit or 85th Percentile Speed on the Major Street:	40	**MPH**

Minor Street Information

Minor Street Name and Route Number:	Proposed Site Driveway
Minor Street Approach #1 Direction:	W-Bound
Minor Street Approach #2 Direction:	N/A

Number of Lanes for Moving Traffic on Each Minor Street Approach:	2	**LANE(S)**

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Applicable?	Warrant Met?
Warrant 1, Eight-Hour Vehicular Volume	Yes	No
Warrant 2, Four-Hour Vehicular Volume	Yes	No
Warrant 3, Peak Hour	Yes	No
Warrant 4, Pedestrian Volume	No	N/A
Warrant 5, School Crossing	No	N/A
Warrant 6, Coordinated Signal System	No	N/A
Warrant 7, Crash Experience	No	N/A
Warrant 8, Roadway Network	No	N/A
Warrant 9, Intersection Near a Grade Crossing	No	N/A
Warrant PA-1, ADT Volume Warrant	No	N/A
Warrant PA-2, Midblock and Trail Crossings	No	N/A

MUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	2 or More Lanes

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	No

Combination of Conditions A and B Necessary?*: No

**Only applicable for Warrant 1 if after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems. See Section 4C.02 of the 2009 MUTCD for application.*

Condition A - Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	500	400	350	280	150	120	105	84
2 or More	1	600	480	420	336	150	120	105	84
2 or More	2 or More	600	480	420	336	200	160	140	112
1	2 or More	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	750	600	525	420	75	60	53	42
2 or More	1	900	720	630	504	75	60	53	42
2 or More	2 or More	900	720	630	504	100	80	70	56
1	2 or More	750	600	525	420	100	80	70	56

Condition A Evaluation

Number of Unique Hours Met: 0 **Condition A Satisfied?** No

Condition B Evaluation

Number of Unique Hours Met: 0 **Condition B Satisfied?** No

Combination of Condition A and Condition B Evaluation

Number of Unique Hours Met for Condition A: N/A

Number of Unique Hours Met for Condition B: N/A

Combination of Condition A and Condition B Satisfied? N/A

MUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	2 or More Lanes

Total Number of Unique Hours Met On Figure 4C-1
0

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	No

Hour Interval Beginning At	Hourly Vehicular Volume: Major Street Combined Vehicles Per Hour (VPH)	Hourly Vehicular Volume: Highest Minor Street Approach Vehicles Per Hour (VPH)	Hour Met?
12:00 AM	62	0	
12:15 AM	53	0	
12:30 AM	46	0	
12:45 AM	44	0	
1:00 AM	35	0	
1:15 AM	41	0	
1:30 AM	38	0	
1:45 AM	35	0	
2:00 AM	41	0	
2:15 AM	35	0	
2:30 AM	33	0	
2:45 AM	33	0	
3:00 AM	33	0	
3:15 AM	36	0	
3:30 AM	49	0	
3:45 AM	58	0	
4:00 AM	74	0	
4:15 AM	96	0	
4:30 AM	123	0	
4:45 AM	176	0	
5:00 AM	233	0	
5:15 AM	291	0	
5:30 AM	374	0	
5:45 AM	523	0	
6:00 AM	644	2	
6:15 AM	762	2	
6:30 AM	911	2	
6:45 AM	987	2	
7:00 AM	1197	47	
7:15 AM	1315	47	
7:30 AM	1373	47	
7:45 AM	1399	47	
8:00 AM	1368	47	
8:15 AM	1369	47	
8:30 AM	1305	47	
8:45 AM	1245	47	
9:00 AM	1166	9	
9:15 AM	1116	9	
9:30 AM	1110	9	
9:45 AM	1157	9	
10:00 AM	1165	8	
10:15 AM	1170	8	
10:30 AM	1185	8	
10:45 AM	1200	8	
11:00 AM	1245	5	
11:15 AM	1280	5	
11:30 AM	1364	5	
11:45 AM	1374	5	
12:00 PM	1378	1	
12:15 PM	1371	1	
12:30 PM	1344	1	
12:45 PM	1377	1	
1:00 PM	1356	7	
1:15 PM	1372	7	
1:30 PM	1400	7	
1:45 PM	1401	7	
2:00 PM	1450	2	
2:15 PM	1485	2	
2:30 PM	1522	2	
2:45 PM	1535	2	
3:00 PM	1536	2	
3:15 PM	1557	2	
3:30 PM	1557	2	
3:45 PM	1595	2	
4:00 PM	1645	67	
4:15 PM	1684	67	
4:30 PM	1641	67	
4:45 PM	1578	67	
5:00 PM	1531	68	
5:15 PM	1405	68	
5:30 PM	1329	68	
5:45 PM	1233	68	
6:00 PM	1067	17	
6:15 PM	998	17	
6:30 PM	936	17	
6:45 PM	866	17	
7:00 PM	789	5	
7:15 PM	712	5	
7:30 PM	637	5	
7:45 PM	562	5	
8:00 PM	513	3	
8:15 PM	464	3	
8:30 PM	405	3	
8:45 PM	401	3	
9:00 PM	373	0	
9:15 PM	345	0	
9:30 PM	327	0	
9:45 PM	269	0	
10:00 PM	245	0	
10:15 PM	209	0	
10:30 PM	189	0	
10:45 PM	165	0	
11:00 PM	135	0	

MUTCD WARRANT 3, PEAK HOUR

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	2 or More Lanes

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	No
Is this signal warrant being applied for an unusual case, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time?	N/A

Indicate whether all three of the following conditions for the same 1 hour (any four consecutive 15-minute periods) of an average day are present*	
Does the total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equal or exceed 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach?	N/A
Does the volume on the same minor-street approach (one direction only) equal or exceed 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes?	N/A
Does the total entering volume serviced during the hour equal or exceed 650 vehicles per hour for intersection with three approaches or 800 vehicles per hour for intersections with four or more approaches?	N/A

If applicable, attach all supporting calculations and documentation.

Total Number of Unique Hours Met On Figure 4C-3
0

	Hourly Vehicular Volume		
Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Hour Met?
12:00 AM	62	0	
12:15 AM	53	0	
12:30 AM	46	0	
12:45 AM	44	0	
1:00 AM	35	0	
1:15 AM	41	0	
1:30 AM	38	0	
1:45 AM	35	0	
2:00 AM	41	0	
2:15 AM	35	0	
2:30 AM	33	0	
2:45 AM	33	0	
3:00 AM	33	0	
3:15 AM	36	0	
3:30 AM	49	0	
3:45 AM	58	0	
4:00 AM	74	0	
4:15 AM	96	0	
4:30 AM	123	0	
4:45 AM	176	0	
5:00 AM	233	0	
5:15 AM	291	0	
5:30 AM	374	0	
5:45 AM	523	0	
6:00 AM	644	2	
6:15 AM	762	2	
6:30 AM	911	2	
6:45 AM	987	2	
7:00 AM	1197	47	
7:15 AM	1315	47	
7:30 AM	1373	47	
7:45 AM	1399	47	
8:00 AM	1368	47	
8:15 AM	1369	47	
8:30 AM	1305	47	
8:45 AM	1245	47	
9:00 AM	1166	9	
9:15 AM	1116	9	
9:30 AM	1110	9	
9:45 AM	1157	9	
10:00 AM	1165	8	
10:15 AM	1170	8	
10:30 AM	1185	8	
10:45 AM	1200	8	
11:00 AM	1245	5	
11:15 AM	1280	5	
11:30 AM	1364	5	
11:45 AM	1374	5	
12:00 PM	1378	1	
12:15 PM	1371	1	
12:30 PM	1344	1	
12:45 PM	1377	1	
1:00 PM	1356	7	
1:15 PM	1372	7	
1:30 PM	1400	7	
1:45 PM	1401	7	
2:00 PM	1450	2	
2:15 PM	1485	2	
2:30 PM	1522	2	
2:45 PM	1535	2	
3:00 PM	1536	2	
3:15 PM	1557	2	
3:30 PM	1557	2	
3:45 PM	1595	2	
4:00 PM	1645	67	
4:15 PM	1684	67	
4:30 PM	1641	67	
4:45 PM	1578	67	
5:00 PM	1531	68	
5:15 PM	1405	68	
5:30 PM	1329	68	
5:45 PM	1233	68	
6:00 PM	1067	17	
6:15 PM	998	17	
6:30 PM	936	17	
6:45 PM	866	17	
7:00 PM	789	5	
7:15 PM	712	5	
7:30 PM	637	5	
7:45 PM	562	5	
8:00 PM	513	3	
8:15 PM	464	3	
8:30 PM	405	3	
8:45 PM	401	3	
9:00 PM	373	0	
9:15 PM	345	0	
9:30 PM	327	0	
9:45 PM	269	0	
10:00 PM	245	0	
10:15 PM	209	0	
10:30 PM	189	0	
10:45 PM	165	0	
11:00 PM	135	0	

STUDY AND ANALYSIS INFORMATION

Municipality:	Easthampton	**Analysis Date:**	6/14/2022
County:		**Conducted By:**	ECP
MassDOT Engineering District:	2	**Agency/Company Name:**	HSH

Analysis Information

Data Collection Date:	9/30/2021
Day of the Week:	Thursday

Is the intersection in a built-up area of an isolated community of <10,000 population? No

Major Street Information

Major Street Name and Route Number:	Northampton Street (Route 10)
Major Street Approach #1 Direction:	N-Bound
Major Street Approach #2 Direction:	S-Bound

Number of Lanes for Moving Traffic on Each Major Street Approach:	1	**LANE(S)**
Speed Limit or 85th Percentile Speed on the Major Street:	40	**MPH**

Minor Street Information

Minor Street Name and Route Number:	Proposed Site Driveway
Minor Street Approach #1 Direction:	W-Bound
Minor Street Approach #2 Direction:	N/A

Number of Lanes for Moving Traffic on Each Minor Street Approach:	2	**LANE(S)**

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Applicable?	Warrant Met?
Warrant 1, Eight-Hour Vehicular Volume	Yes	No
Warrant 2, Four-Hour Vehicular Volume	Yes	No
Warrant 3, Peak Hour	Yes	No
Warrant 4, Pedestrian Volume	No	N/A
Warrant 5, School Crossing	No	N/A
Warrant 6, Coordinated Signal System	No	N/A
Warrant 7, Crash Experience	No	N/A
Warrant 8, Roadway Network	No	N/A
Warrant 9, Intersection Near a Grade Crossing	No	N/A
Warrant PA-1, ADT Volume Warrant	No	N/A
Warrant PA-2, Midblock and Trail Crossings	No	N/A

MUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	2 or More Lanes

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	No

Combination of Conditions A and B Necessary?*: No

**Only applicable for Warrant 1 if after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems. See Section 4C.02 of the 2009 MUTCD for application.*

Condition A - Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	500	400	350	280	150	120	105	84
2 or More	1	600	480	420	336	150	120	105	84
2 or More	2 or More	600	480	420	336	200	160	140	112
1	2 or More	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	750	600	525	420	75	60	53	42
2 or More	1	900	720	630	504	75	60	53	42
2 or More	2 or More	900	720	630	504	100	80	70	56
1	2 or More	750	600	525	420	100	80	70	56

Condition A Evaluation

Number of Unique Hours Met: 0 **Condition A Satisfied?** No

Condition B Evaluation

Number of Unique Hours Met: 0 **Condition B Satisfied?** No

Combination of Condition A and Condition B Evaluation

Number of Unique Hours Met for Condition A: N/A

Number of Unique Hours Met for Condition B: N/A

Combination of Condition A and Condition B Satisfied? N/A

MUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	2 or More Lanes

Total Number of Unique Hours Met On Figure 4C-1
0

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	No

Hourly Vehicular Volume			
Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Hour Met?
12:00 AM	64	1	
12:15 AM	55	1	
12:30 AM	48	1	
12:45 AM	46	1	
1:00 AM	36	1	
1:15 AM	42	1	
1:30 AM	39	1	
1:45 AM	36	1	
2:00 AM	42	1	
2:15 AM	36	1	
2:30 AM	34	1	
2:45 AM	34	1	
3:00 AM	34	1	
3:15 AM	37	1	
3:30 AM	50	1	
3:45 AM	59	1	
4:00 AM	75	3	
4:15 AM	97	3	
4:30 AM	124	3	
4:45 AM	177	3	
5:00 AM	234	6	
5:15 AM	292	6	
5:30 AM	375	6	
5:45 AM	524	6	
6:00 AM	647	18	
6:15 AM	765	18	
6:30 AM	914	18	
6:45 AM	990	18	
7:00 AM	1203	66	
7:15 AM	1321	66	
7:30 AM	1379	66	
7:45 AM	1405	66	
8:00 AM	1374	6	
8:15 AM	1375	6	
8:30 AM	1311	6	
8:45 AM	1251	6	
9:00 AM	1172	19	
9:15 AM	1122	19	
9:30 AM	1116	19	
9:45 AM	1163	19	
10:00 AM	1170	19	
10:15 AM	1175	19	
10:30 AM	1190	19	
10:45 AM	1205	19	
11:00 AM	1253	15	
11:15 AM	1288	15	
11:30 AM	1372	15	
11:45 AM	1382	15	
12:00 PM	1388	9	
12:15 PM	1381	9	
12:30 PM	1354	9	
12:45 PM	1387	9	
1:00 PM	1364	17	
1:15 PM	1380	17	
1:30 PM	1408	17	
1:45 PM	1409	17	
2:00 PM	1462	13	
2:15 PM	1497	13	
2:30 PM	1534	13	
2:45 PM	1547	13	
3:00 PM	1551	14	
3:15 PM	1572	14	
3:30 PM	1572	14	
3:45 PM	1610	14	
4:00 PM	1665	79	
4:15 PM	1704	79	
4:30 PM	1661	79	
4:45 PM	1598	79	
5:00 PM	1551	80	
5:15 PM	1425	80	
5:30 PM	1349	80	
5:45 PM	1253	80	
6:00 PM	1088	31	
6:15 PM	1019	31	
6:30 PM	957	31	
6:45 PM	887	31	
7:00 PM	806	15	
7:15 PM	729	15	
7:30 PM	654	15	
7:45 PM	579	15	
8:00 PM	530	11	
8:15 PM	481	11	
8:30 PM	422	11	
8:45 PM	418	11	
9:00 PM	385	6	
9:15 PM	357	6	
9:30 PM	339	6	
9:45 PM	281	6	
10:00 PM	255	5	
10:15 PM	219	5	
10:30 PM	199	5	
10:45 PM	175	5	
11:00 PM	141	3	

MUTCD WARRANT 3, PEAK HOUR

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	2 or More Lanes

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	No

Is this signal warrant being applied for an unusual case, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time?	N/A

Indicate whether all three of the following conditions for the same 1 hour (any four consecutive 15-minute periods) of an average day are present*	
Does the total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equal or exceed 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach?	N/A
Does the volume on the same minor-street approach (one direction only) equal or exceed 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes?	N/A
Does the total entering volume serviced during the hour equal or exceed 650 vehicles per hour for intersection with three approaches or 800 vehicles per hour for intersections with four or more approaches?	N/A
If applicable, attach all supporting calculations and documentation.	

Total Number of Unique Hours Met On Figure 4C-3
0

	Hourly Vehicular Volume		
Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Hour Met?
12:00 AM	64	1	
12:15 AM	55	1	
12:30 AM	48	1	
12:45 AM	46	1	
1:00 AM	36	1	
1:15 AM	42	1	
1:30 AM	39	1	
1:45 AM	36	1	
2:00 AM	42	1	
2:15 AM	36	1	
2:30 AM	34	1	
2:45 AM	34	1	
3:00 AM	34	1	
3:15 AM	37	1	
3:30 AM	50	1	
3:45 AM	59	1	
4:00 AM	75	3	
4:15 AM	97	3	
4:30 AM	124	3	
4:45 AM	177	3	
5:00 AM	234	6	
5:15 AM	292	6	
5:30 AM	375	6	
5:45 AM	524	6	
6:00 AM	647	18	
6:15 AM	765	18	
6:30 AM	914	18	
6:45 AM	990	18	
7:00 AM	1203	66	
7:15 AM	1321	66	
7:30 AM	1379	66	
7:45 AM	1405	66	
8:00 AM	1374	6	
8:15 AM	1375	6	
8:30 AM	1311	6	
8:45 AM	1251	6	
9:00 AM	1172	19	
9:15 AM	1122	19	
9:30 AM	1116	19	
9:45 AM	1163	19	
10:00 AM	1170	19	
10:15 AM	1175	19	
10:30 AM	1190	19	
10:45 AM	1205	19	
11:00 AM	1253	15	
11:15 AM	1288	15	
11:30 AM	1372	15	
11:45 AM	1382	15	
12:00 PM	1388	9	
12:15 PM	1381	9	
12:30 PM	1354	9	
12:45 PM	1387	9	
1:00 PM	1364	17	
1:15 PM	1380	17	
1:30 PM	1408	17	
1:45 PM	1409	17	
2:00 PM	1462	13	
2:15 PM	1497	13	
2:30 PM	1534	13	
2:45 PM	1547	13	
3:00 PM	1551	14	
3:15 PM	1572	14	
3:30 PM	1572	14	
3:45 PM	1610	14	
4:00 PM	1665	79	
4:15 PM	1704	79	
4:30 PM	1661	79	
4:45 PM	1598	79	
5:00 PM	1551	80	
5:15 PM	1425	80	
5:30 PM	1349	80	
5:45 PM	1253	80	
6:00 PM	1088	31	
6:15 PM	1019	31	
6:30 PM	957	31	
6:45 PM	887	31	
7:00 PM	806	15	
7:15 PM	729	15	
7:30 PM	654	15	
7:45 PM	579	15	
8:00 PM	530	11	
8:15 PM	481	11	
8:30 PM	422	11	
8:45 PM	418	11	
9:00 PM	385	6	
9:15 PM	357	6	
9:30 PM	339	6	
9:45 PM	281	6	
10:00 PM	255	5	
10:15 PM	219	5	
10:30 PM	199	5	
10:45 PM	175	5	
11:00 PM	141	3	

STUDY AND ANALYSIS INFORMATION

Municipality:	Easthampton	**Analysis Date:**	6/14/2023
County:		**Conducted By:**	ECP
MassDOT Engineering District:	2	**Agency/Company Name:**	HSH

Analysis Information

Data Collection Date:	9/30/2021
Day of the Week:	Thursday

Is the intersection in a built-up area of an isolated community of <10,000 population? No

Major Street Information

Major Street Name and Route Number:	Northampton Street (Route 10)
Major Street Approach #1 Direction:	N-Bound
Major Street Approach #2 Direction:	S-Bound

Number of Lanes for Moving Traffic on Each Major Street Approach: 1 **LANE(S)**
Speed Limit or 85th Percentile Speed on the Major Street: 40 **MPH**

Minor Street Information

Minor Street Name and Route Number:	Proposed Site Driveway
Minor Street Approach #1 Direction:	W-Bound
Minor Street Approach #2 Direction:	N/A

Number of Lanes for Moving Traffic on Each Minor Street Approach: 2 **LANE(S)**

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Applicable?	Warrant Met?
Warrant 1, Eight-Hour Vehicular Volume	Yes	No
Warrant 2, Four-Hour Vehicular Volume	Yes	No
Warrant 3, Peak Hour	Yes	No
Warrant 4, Pedestrian Volume	No	N/A
Warrant 5, School Crossing	No	N/A
Warrant 6, Coordinated Signal System	No	N/A
Warrant 7, Crash Experience	No	N/A
Warrant 8, Roadway Network	No	N/A
Warrant 9, Intersection Near a Grade Crossing	No	N/A
Warrant PA-1, ADT Volume Warrant	No	N/A
Warrant PA-2, Midblock and Trail Crossings	No	N/A

MUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	2 or More Lanes

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	No

Combination of Conditions A and B Necessary?*: No

**Only applicable for Warrant 1 if after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems. See Section 4C.02 of the 2009 MUTCD for application.*

Condition A - Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	500	400	350	280	150	120	105	84
2 or More	1	600	480	420	336	150	120	105	84
2 or More	2 or More	600	480	420	336	200	160	140	112
1	2 or More	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	750	600	525	420	75	60	53	42
2 or More	1	900	720	630	504	75	60	53	42
2 or More	2 or More	900	720	630	504	100	80	70	56
1	2 or More	750	600	525	420	100	80	70	56

Condition A Evaluation

Number of Unique Hours Met: 0 **Condition A Satisfied?** No

Condition B Evaluation

Number of Unique Hours Met: 4 **Condition B Satisfied?** No

Combination of Condition A and Condition B Evaluation

Number of Unique Hours Met for Condition A: N/A

Number of Unique Hours Met for Condition B: N/A

Combination of Condition A and Condition B Satisfied? N/A

MUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	2 or More Lanes

Total Number of Unique Hours Met On Figure 4C-1
2

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	No

Hourly Vehicular Volume			
Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Hour Met?
12:00 AM	66	2	
12:15 AM	57	2	
12:30 AM	50	2	
12:45 AM	48	2	
1:00 AM	37	2	
1:15 AM	43	2	
1:30 AM	40	2	
1:45 AM	37	2	
2:00 AM	43	2	
2:15 AM	37	2	
2:30 AM	35	2	
2:45 AM	35	2	
3:00 AM	35	2	
3:15 AM	38	2	
3:30 AM	51	2	
3:45 AM	60	2	
4:00 AM	76	7	
4:15 AM	98	7	
4:30 AM	125	7	
4:45 AM	178	7	
5:00 AM	235	13	
5:15 AM	293	13	
5:30 AM	376	13	
5:45 AM	525	13	
6:00 AM	653	36	
6:15 AM	771	36	
6:30 AM	920	36	
6:45 AM	996	36	
7:00 AM	1234	105	
7:15 AM	1352	105	
7:30 AM	1410	105	
7:45 AM	1436	105	
8:00 AM	1405	105	
8:15 AM	1406	105	
8:30 AM	1342	105	
8:45 AM	1282	105	
9:00 AM	1191	42	
9:15 AM	1141	42	
9:30 AM	1135	42	
9:45 AM	1182	42	
10:00 AM	1188	44	
10:15 AM	1193	44	
10:30 AM	1208	44	
10:45 AM	1223	44	
11:00 AM	1279	42	
11:15 AM	1314	42	
11:30 AM	1398	42	
11:45 AM	1408	42	
12:00 PM	1417	37	
12:15 PM	1410	37	
12:30 PM	1383	37	
12:45 PM	1416	37	
1:00 PM	1390	46	
1:15 PM	1406	46	
1:30 PM	1434	46	
1:45 PM	1435	46	
2:00 PM	1492	43	
2:15 PM	1527	43	
2:30 PM	1564	43	
2:45 PM	1577	43	
3:00 PM	1582	46	
3:15 PM	1603	46	
3:30 PM	1603	46	
3:45 PM	1641	46	
4:00 PM	1735	140	Met
4:15 PM	1774	140	Met
4:30 PM	1731	140	Met
4:45 PM	1668	140	Met
5:00 PM	1621	141	Met
5:15 PM	1495	141	Met
5:30 PM	1419	141	Met
5:45 PM	1323	141	Met
6:00 PM	1121	59	
6:15 PM	1052	59	
6:30 PM	990	59	
6:45 PM	920	59	
7:00 PM	833	34	
7:15 PM	756	34	
7:30 PM	681	34	
7:45 PM	606	34	
8:00 PM	553	27	
8:15 PM	504	27	
8:30 PM	445	27	
8:45 PM	441	27	
9:00 PM	402	17	
9:15 PM	374	17	
9:30 PM	356	17	
9:45 PM	298	17	
10:00 PM	268	12	
10:15 PM	232	12	
10:30 PM	212	12	
10:45 PM	188	12	
11:00 PM	147	8	

MUTCD WARRANT 3, PEAK HOUR

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	2 or More Lanes

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	No
Is this signal warrant being applied for an unusual case, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time?	No

Indicate whether all three of the following conditions for the same 1 hour (any four consecutive 15-minute periods) of an average day are present*	
Does the total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equal or exceed 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach?	N/A
Does the volume on the same minor-street approach (one direction only) equal or exceed 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes?	N/A
Does the total entering volume serviced during the hour equal or exceed 650 vehicles per hour for intersection with three approaches or 800 vehicles per hour for intersections with four or more approaches?	N/A
**If applicable, attach all supporting calculations and documentation.*	

Total Number of Unique Hours Met On Figure 4C-3
0

	Hourly Vehicular Volume		
Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Hour Met?
12:00 AM	66	2	
12:15 AM	57	2	
12:30 AM	50	2	
12:45 AM	48	2	
1:00 AM	37	2	
1:15 AM	43	2	
1:30 AM	40	2	
1:45 AM	37	2	
2:00 AM	43	2	
2:15 AM	37	2	
2:30 AM	35	2	
2:45 AM	35	2	
3:00 AM	35	2	
3:15 AM	38	2	
3:30 AM	51	2	
3:45 AM	60	2	
4:00 AM	76	7	
4:15 AM	98	7	
4:30 AM	125	7	
4:45 AM	178	7	
5:00 AM	235	13	
5:15 AM	293	13	
5:30 AM	376	13	
5:45 AM	525	13	
6:00 AM	653	36	
6:15 AM	771	36	
6:30 AM	920	36	
6:45 AM	996	36	
7:00 AM	1234	105	
7:15 AM	1352	105	
7:30 AM	1410	105	
7:45 AM	1436	105	
8:00 AM	1405	105	
8:15 AM	1406	105	
8:30 AM	1342	105	
8:45 AM	1282	105	
9:00 AM	1191	42	
9:15 AM	1141	42	
9:30 AM	1135	42	
9:45 AM	1182	42	
10:00 AM	1188	44	
10:15 AM	1193	44	
10:30 AM	1208	44	
10:45 AM	1223	44	
11:00 AM	1279	42	
11:15 AM	1314	42	
11:30 AM	1398	42	
11:45 AM	1408	42	
12:00 PM	1417	37	
12:15 PM	1410	37	
12:30 PM	1383	37	
12:45 PM	1416	37	
1:00 PM	1390	46	
1:15 PM	1406	46	
1:30 PM	1434	46	
1:45 PM	1435	46	
2:00 PM	1492	43	
2:15 PM	1527	43	
2:30 PM	1564	43	
2:45 PM	1577	43	
3:00 PM	1582	46	
3:15 PM	1603	46	
3:30 PM	1603	46	
3:45 PM	1641	46	
4:00 PM	1735	140	
4:15 PM	1774	140	
4:30 PM	1731	140	
4:45 PM	1668	140	
5:00 PM	1621	141	
5:15 PM	1495	141	
5:30 PM	1419	141	
5:45 PM	1323	141	
6:00 PM	1121	59	
6:15 PM	1052	59	
6:30 PM	990	59	
6:45 PM	920	59	
7:00 PM	833	34	
7:15 PM	756	34	
7:30 PM	681	34	
7:45 PM	606	34	
8:00 PM	553	27	
8:15 PM	504	27	
8:30 PM	445	27	
8:45 PM	441	27	
9:00 PM	402	17	
9:15 PM	374	17	
9:30 PM	356	17	
9:45 PM	298	17	
10:00 PM	268	12	
10:15 PM	232	12	
10:30 PM	212	12	
10:45 PM	188	12	
11:00 PM	147	8	

STUDY AND ANALYSIS INFORMATION

Municipality:	Easthampton	**Analysis Date:**	6/14/2023
County:		**Conducted By:**	ECP
MassDOT Engineering District:	2	**Agency/Company Name:**	HSH

Analysis Information

Data Collection Date:	9/30/2021
Day of the Week:	Thursday

Is the intersection in a built-up area of an isolated community of <10,000 population? No

Major Street Information

Major Street Name and Route Number:	Northampton Street (Route 10)
Major Street Approach #1 Direction:	N-Bound
Major Street Approach #2 Direction:	S-Bound

Number of Lanes for Moving Traffic on Each Major Street Approach:	1	**LANE(S)**
Speed Limit or 85th Percentile Speed on the Major Street:	40	**MPH**

Minor Street Information

Minor Street Name and Route Number:	Proposed Site Driveway
Minor Street Approach #1 Direction:	W-Bound
Minor Street Approach #2 Direction:	N/A

Number of Lanes for Moving Traffic on Each Minor Street Approach:	2	**LANE(S)**

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Applicable?	Warrant Met?
Warrant 1, Eight-Hour Vehicular Volume	Yes	Yes
Warrant 2, Four-Hour Vehicular Volume	Yes	Yes
Warrant 3, Peak Hour	Yes	Yes
Warrant 4, Pedestrian Volume	No	N/A
Warrant 5, School Crossing	No	N/A
Warrant 6, Coordinated Signal System	No	N/A
Warrant 7, Crash Experience	No	N/A
Warrant 8, Roadway Network	No	N/A
Warrant 9, Intersection Near a Grade Crossing	No	N/A
Warrant PA-1, ADT Volume Warrant	No	N/A
Warrant PA-2, Midblock and Trail Crossings	No	N/A

MUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	2 or More Lanes

######

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	No

Combination of Conditions A and B Necessary?*: No

**Only applicable for Warrant 1 if after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems. See Section 4C.02 of the 2009 MUTCD for application.*

Condition A - Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor street approach (one direction only)			
Major Street	**Minor Street**	**100%**	**80%**	**70%**	**56%**	**100%**	**80%**	**70%**	**56%**
1	1	500	400	350	280	150	120	105	84
2 or More	1	600	480	420	336	150	120	105	84
2 or More	2 or More	600	480	420	336	200	160	140	112
1	2 or More	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor street approach (one direction only)			
Major Street	**Minor Street**	**100%**	**80%**	**70%**	**56%**	**100%**	**80%**	**70%**	**56%**
1	1	750	600	525	420	75	60	53	42
2 or More	1	900	720	630	504	75	60	53	42
2 or More	2 or More	900	720	630	504	100	80	70	56
1	2 or More	750	600	525	420	100	80	70	56

Condition A Evaluation

Number of Unique Hours Met: 2 **Condition A Satisfied?** No

Condition B Evaluation

Number of Unique Hours Met: 11 **Condition B Satisfied?** Yes

Combination of Condition A and Condition B Evaluation

Number of Unique Hours Met for Condition A: N/A

Number of Unique Hours Met for Condition B: N/A

Combination of Condition A and Condition B Satisfied? N/A

MUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	2 or More Lanes

Total Number of Unique Hours Met On Figure 4C-1
7

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	No

	Hourly Vehicular Volume		
Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Hour Met?
12:00 AM	68	5	
12:15 AM	59	5	
12:30 AM	52	5	
12:45 AM	50	5	
1:00 AM	38	4	
1:15 AM	44	4	
1:30 AM	41	4	
1:45 AM	38	4	
2:00 AM	44	4	
2:15 AM	38	4	
2:30 AM	36	4	
2:45 AM	36	4	
3:00 AM	37	3	
3:15 AM	40	3	
3:30 AM	53	3	
3:45 AM	62	3	
4:00 AM	78	11	
4:15 AM	100	11	
4:30 AM	127	11	
4:45 AM	180	11	
5:00 AM	239	20	
5:15 AM	297	20	
5:30 AM	380	20	
5:45 AM	529	20	
6:00 AM	667	59	
6:15 AM	785	59	
6:30 AM	934	59	
6:45 AM	1010	59	
7:00 AM	1317	190	Met
7:15 AM	1435	190	Met
7:30 AM	1493	190	Met
7:45 AM	1519	190	Met
8:00 AM	1488	190	Met
8:15 AM	1489	190	Met
8:30 AM	1425	190	Met
8:45 AM	1365	190	Met
9:00 AM	1232	81	
9:15 AM	1182	81	
9:30 AM	1176	81	
9:45 AM	1223	81	
10:00 AM	1242	94	
10:15 AM	1247	94	
10:30 AM	1262	94	
10:45 AM	1277	94	
11:00 AM	1366	109	
11:15 AM	1401	109	
11:30 AM	1485	109	
11:45 AM	1495	109	
12:00 PM	1509	128	Met
12:15 PM	1502	128	Met
12:30 PM	1475	128	Met
12:45 PM	1508	128	Met
1:00 PM	1457	134	Met
1:15 PM	1473	134	Met
1:30 PM	1501	134	Met
1:45 PM	1502	134	Met
2:00 PM	1551	109	
2:15 PM	1586	109	
2:30 PM	1623	109	
2:45 PM	1636	109	
3:00 PM	1644	108	
3:15 PM	1665	108	
3:30 PM	1665	108	
3:45 PM	1703	108	
4:00 PM	1860	245	Met
4:15 PM	1899	245	Met
4:30 PM	1856	245	Met
4:45 PM	1793	245	Met
5:00 PM	1746	246	Met
5:15 PM	1620	246	Met
5:30 PM	1544	246	Met
5:45 PM	1448	246	Met
6:00 PM	1211	141	Met
6:15 PM	1142	141	Met
6:30 PM	1080	141	Met
6:45 PM	1010	141	
7:00 PM	903	106	
7:15 PM	826	106	
7:30 PM	751	106	
7:45 PM	676	106	
8:00 PM	604	89	
8:15 PM	555	89	
8:30 PM	496	89	
8:45 PM	492	89	
9:00 PM	435	60	
9:15 PM	407	60	
9:30 PM	389	60	
9:45 PM	331	60	
10:00 PM	289	35	
10:15 PM	253	35	
10:30 PM	233	35	
10:45 PM	209	35	
11:00 PM	157	20	

MUTCD WARRANT 3, PEAK HOUR

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	2 or More Lanes

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	No
Is this signal warrant being applied for an unusual case, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time?	Yes

Indicate whether all three of the following conditions for the same 1 hour (any four consecutive 15-minute periods) of an average day are present*	
Does the total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equal or exceed 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach?	N/A
Does the volume on the same minor-street approach (one direction only) equal or exceed 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes?	N/A
Does the total entering volume serviced during the hour equal or exceed 650 vehicles per hour for intersection with three approaches or 800 vehicles per hour for intersections with four or more approaches?	N/A
*If applicable, attach all supporting calculations and documentation.	

Total Number of Unique Hours Met On Figure 4C-3
4

Hour Interval Beginning At	Hourly Vehicular Volume: Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Hour Met?
12:00 AM	68	5	
12:15 AM	59	5	
12:30 AM	52	5	
12:45 AM	50	5	
1:00 AM	38	4	
1:15 AM	44	4	
1:30 AM	41	4	
1:45 AM	38	4	
2:00 AM	44	4	
2:15 AM	38	4	
2:30 AM	36	4	
2:45 AM	36	4	
3:00 AM	37	3	
3:15 AM	40	3	
3:30 AM	53	3	
3:45 AM	62	3	
4:00 AM	78	11	
4:15 AM	100	11	
4:30 AM	127	11	
4:45 AM	180	11	
5:00 AM	239	20	
5:15 AM	297	20	
5:30 AM	380	20	
5:45 AM	529	20	
6:00 AM	667	59	
6:15 AM	785	59	
6:30 AM	934	59	
6:45 AM	1010	59	
7:00 AM	1317	190	Met
7:15 AM	1435	190	Met
7:30 AM	1493	190	Met
7:45 AM	1519	190	Met
8:00 AM	1488	190	Met
8:15 AM	1489	190	Met
8:30 AM	1425	190	Met
8:45 AM	1365	190	Met
9:00 AM	1232	81	
9:15 AM	1182	81	
9:30 AM	1176	81	
9:45 AM	1223	81	
10:00 AM	1242	94	
10:15 AM	1247	94	
10:30 AM	1262	94	
10:45 AM	1277	94	
11:00 AM	1366	109	
11:15 AM	1401	109	
11:30 AM	1485	109	
11:45 AM	1495	109	
12:00 PM	1509	128	
12:15 PM	1502	128	
12:30 PM	1475	128	
12:45 PM	1508	128	
1:00 PM	1457	134	
1:15 PM	1473	134	
1:30 PM	1501	134	
1:45 PM	1502	134	
2:00 PM	1551	109	
2:15 PM	1586	109	
2:30 PM	1623	109	
2:45 PM	1636	109	
3:00 PM	1644	108	
3:15 PM	1665	108	
3:30 PM	1665	108	
3:45 PM	1703	108	
4:00 PM	1860	245	Met
4:15 PM	1899	245	Met
4:30 PM	1856	245	Met
4:45 PM	1793	245	Met
5:00 PM	1746	246	Met
5:15 PM	1620	246	Met
5:30 PM	1544	246	Met
5:45 PM	1448	246	Met
6:00 PM	1211	141	
6:15 PM	1142	141	
6:30 PM	1080	141	
6:45 PM	1010	141	
7:00 PM	903	106	
7:15 PM	826	106	
7:30 PM	751	106	
7:45 PM	676	106	
8:00 PM	604	89	
8:15 PM	555	89	
8:30 PM	496	89	
8:45 PM	492	89	
9:00 PM	435	60	
9:15 PM	407	60	
9:30 PM	389	60	
9:45 PM	331	60	
10:00 PM	289	35	
10:15 PM	253	35	
10:30 PM	233	35	
10:45 PM	209	35	
11:00 PM	157	20	

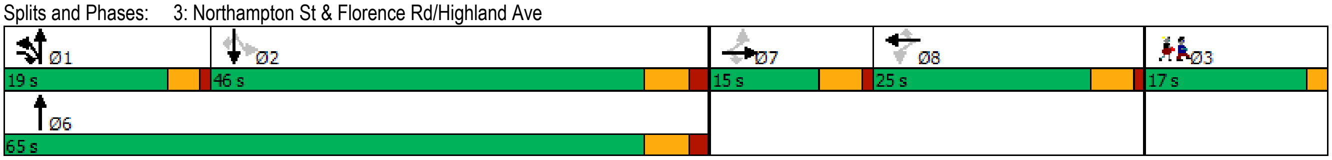
ATTACHMENT 6 – SYNCHRO INTERSECTION LEVEL OF SERVICE REPORT

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3	Ø6
Lane Configurations														
Traffic Volume (vph)	82	1	228	9	2	4	217	521	4	5	263	23		
Future Volume (vph)	82	1	228	9	2	4	217	521	4	5	263	23		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	0		80	0		5	150		0	0		75		
Storage Lanes	0		1	0		1	1		0	0		1		
Taper Length (ft)	25			25			25			25				
Satd. Flow (prot)	0	1648	1599	0	1826	1615	1752	1879	0	0	1862	1429		
Flt Permitted		0.398			0.787		0.950				0.989			
Satd. Flow (perm)	0	688	1599	0	1495	1615	1752	1879	0	0	1843	1429		
Right Turn on Red			Yes			Yes			Yes			Yes		
Satd. Flow (RTOR)			268			125						116		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		1171			1559			1081			1048			
Travel Time (s)		26.6			35.4			24.6			23.8			
Peak Hour Factor	0.85	0.85	0.85	0.54	0.54	0.54	0.92	0.92	0.92	0.88	0.88	0.88		
Heavy Vehicles (%)	10%	0%	1%	0%	0%	0%	3%	1%	0%	0%	2%	13%		
Shared Lane Traffic (%)														
Lane Group Flow (vph)	0	97	268	0	21	7	236	570	0	0	305	26		
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm		
Protected Phases		7	1		8		1	6 1			2		3	6
Permitted Phases	7		7	8		8				2		2		
Total Split (s)	15.0	15.0	19.0	25.0	25.0	25.0	19.0			46.0	46.0	46.0	17.0	65.0
Total Lost Time (s)		5.0	4.0		5.0	5.0	4.0				6.0	6.0		
Act Effct Green (s)		10.0	26.1		7.6	7.6	15.1	59.2			40.1	40.1		
Actuated g/C Ratio		0.10	0.25		0.07	0.07	0.14	0.56			0.38	0.38		
v/c Ratio		1.49	0.45		0.19	0.03	0.94	0.54			0.43	0.04		
Control Delay		320.0	4.7		52.1	0.2	89.8	17.7			27.5	0.1		
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	0.0		
Total Delay		320.0	4.7		52.1	0.2	89.8	17.7			27.5	0.1		
LOS		F	A		D	A	F	B			C	A		
Approach Delay		88.5			39.1			38.8			25.3			
Approach LOS		F			D			D			C			
Queue Length 50th (ft)		~96	0		14	0	167	250			160	0		
Queue Length 95th (ft)		#194	29		24	0	#334	371			241	0		
Internal Link Dist (ft)		1091			1479			1001			968			
Turn Bay Length (ft)			80			5	150					75		
Base Capacity (vph)		65	599		286	410	251	1061			706	618		
Starvation Cap Reductn		0	0		0	0	0	0			0	0		
Spillback Cap Reductn		0	0		0	0	0	0			0	0		
Storage Cap Reductn		0	0		0	0	0	0			0	0		
Reduced v/c Ratio		1.49	0.45		0.07	0.02	0.94	0.54			0.43	0.04		

Intersection Summary

Area Type: Other
Cycle Length: 122
Actuated Cycle Length: 104.8
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.49
Intersection Signal Delay: 47.7 — Intersection LOS: D
Intersection Capacity Utilization 67.2% — ICU Level of Service C
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Northampton St & Florence Rd/Highland Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	82	1	228	9	2	4	217	521	4	5	263	23
Future Volume (vph)	82	1	228	9	2	4	217	521	4	5	263	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)		1647	1599		1826	1615	1752	1879			1862	1429
Flt Permitted		0.40	1.00		0.79	1.00	0.95	1.00			0.99	1.00
Satd. Flow (perm)		688	1599		1495	1615	1752	1879			1843	1429
Peak-hour factor, PHF	0.85	0.85	0.85	0.54	0.54	0.54	0.92	0.92	0.92	0.88	0.88	0.88
Adj. Flow (vph)	96	1	268	17	4	7	236	566	4	6	299	26
RTOR Reduction (vph)	0	0	205	0	0	7	0	0	0	0	0	16
Lane Group Flow (vph)	0	97	63	0	21	0	236	570	0	0	305	10
Heavy Vehicles (%)	10%	0%	1%	0%	0%	0%	3%	1%	0%	0%	2%	13%
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm
Protected Phases		7	1		8		1	6 1			2	
Permitted Phases	7		7	8		8				2		2
Actuated Green, G (s)		10.0	25.1		4.6	4.6	15.1	59.3			40.2	40.2
Effective Green, g (s)		10.0	25.1		4.6	4.6	15.1	59.3			40.2	40.2
Actuated g/C Ratio		0.09	0.23		0.04	0.04	0.14	0.55			0.38	0.38
Clearance Time (s)		5.0	4.0		5.0	5.0	4.0				6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0				5.0	5.0
Lane Grp Cap (vph)		64	375		64	69	247	1041			692	536
v/s Ratio Prot			0.02				c0.13	c0.30				
v/s Ratio Perm		c0.14	0.02		c0.01	0.00					0.17	0.01
v/c Ratio		1.52	0.17		0.33	0.00	0.96	0.55			0.44	0.02
Uniform Delay, d1		48.5	32.6		49.7	49.0	45.6	15.3			25.0	21.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2		296.7	0.2		3.0	0.0	44.6	0.6			2.0	0.1
Delay (s)		345.2	32.8		52.7	49.0	90.2	15.9			27.0	21.1
Level of Service		F	C		D	D	F	B			C	C
Approach Delay (s)		115.8			51.8			37.6			26.6	
Approach LOS		F			D			D			C	

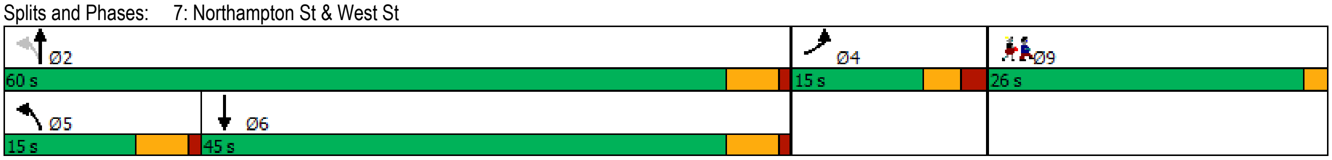
Intersection Summary			
HCM 2000 Control Delay	54.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	107.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	178	81	31	614	492	51	
Future Volume (vph)	178	81	31	614	492	51	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0	0	100			0	
Storage Lanes	1	0	1			0	
Taper Length (ft)	25		25				
Satd. Flow (prot)	1705	0	1703	1827	1848	0	
Flt Permitted	0.967		0.221				
Satd. Flow (perm)	1705	0	396	1827	1848	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	18				6		
Link Speed (mph)	30			30	30		
Link Distance (ft)	900			913	1559		
Travel Time (s)	20.5			20.8	35.4		
Peak Hour Factor	0.86	0.86	0.91	0.91	0.94	0.94	
Heavy Vehicles (%)	2%	6%	6%	4%	1%	6%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	301	0	34	675	577	0	
Turn Type	Prot		pm+pt	NA	NA		
Protected Phases	4		5	2	6		9
Permitted Phases			2				
Total Split (s)	15.0		15.0	60.0	45.0		26.0
Total Lost Time (s)	5.0		5.0	5.0	5.0		
Act Effct Green (s)	11.3		29.6	29.6	25.9		
Actuated g/C Ratio	0.21		0.54	0.54	0.47		
v/c Ratio	0.82		0.09	0.69	0.66		
Control Delay	47.5		7.6	14.3	18.4		
Queue Delay	0.0		0.0	0.0	0.0		
Total Delay	47.5		7.6	14.3	18.4		
LOS	D		A	B	B		
Approach Delay	47.5			14.0	18.4		
Approach LOS	D			B	B		
Queue Length 50th (ft)	62		3	104	80		
Queue Length 95th (ft)	#402		24	422	434		
Internal Link Dist (ft)	820			833	1479		
Turn Bay Length (ft)			100				
Base Capacity (vph)	365		481	1645	1494		
Starvation Cap Reductn	0		0	0	0		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.82		0.07	0.41	0.39		

Intersection Summary

Area Type: Other
Cycle Length: 101
Actuated Cycle Length: 55.1
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 21.9 Intersection LOS: C
Intersection Capacity Utilization 55.5% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Northampton St & West St



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	178	81	31	614	492	51
Future Volume (vph)	178	81	31	614	492	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.96		1.00	1.00	0.99	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1704		1703	1827	1849	
Flt Permitted	0.97		0.22	1.00	1.00	
Satd. Flow (perm)	1704		396	1827	1849	
Peak-hour factor, PHF	0.86	0.86	0.91	0.91	0.94	0.94
Adj. Flow (vph)	207	94	34	675	523	54
RTOR Reduction (vph)	15	0	0	0	3	0
Lane Group Flow (vph)	286	0	34	675	574	0
Heavy Vehicles (%)	2%	6%	6%	4%	1%	6%
Turn Type	Prot		pm+pt	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases			2			
Actuated Green, G (s)	11.3		33.1	33.1	25.9	
Effective Green, g (s)	11.3		33.1	33.1	25.9	
Actuated g/C Ratio	0.19		0.56	0.56	0.44	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	326		270	1024	811	
v/s Ratio Prot	c0.17		0.00	c0.37	0.31	
v/s Ratio Perm			0.07			
v/c Ratio	0.88		0.13	0.66	0.71	
Uniform Delay, d1	23.2		8.0	9.0	13.5	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	22.4		0.2	1.5	2.8	
Delay (s)	45.6		8.2	10.6	16.3	
Level of Service	D		A	B	B	
Approach Delay (s)	45.6			10.5	16.3	
Approach LOS	D			B	B	

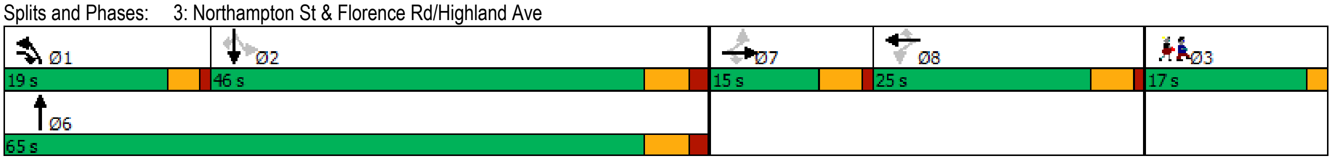
Intersection Summary			
HCM 2000 Control Delay	19.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	59.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	55.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3
Lane Configurations													
Traffic Volume (vph)	72	7	295	26	7	4	236	376	13	12	566	37	
Future Volume (vph)	72	7	295	26	7	4	236	376	13	12	566	37	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		80	0		5	150		0	0		75	
Storage Lanes	0		1	0		1	1		0	0		1	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	1695	1583	0	1828	1615	1770	1872	0	0	1862	1615	
Flt Permitted		0.378			0.711		0.950				0.988		
Satd. Flow (perm)	0	670	1583	0	1351	1615	1770	1872	0	0	1841	1615	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			328			125		2				116	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1171			1559			1081			1048		
Travel Time (s)		26.6			35.4			24.6			23.8		
Peak Hour Factor	0.90	0.90	0.90	0.84	0.84	0.84	0.87	0.87	0.87	0.89	0.89	0.89	
Heavy Vehicles (%)	8%	0%	2%	0%	0%	0%	2%	1%	0%	0%	2%	0%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	88	328	0	39	5	271	447	0	0	649	42	
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm	
Protected Phases		7	1		8		1	6			2		3
Permitted Phases	7		7	8		8				2		2	
Total Split (s)	15.0	15.0	19.0	25.0	25.0	25.0	19.0	65.0		46.0	46.0	46.0	17.0
Total Lost Time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0	
Act Effct Green (s)		10.1	26.1		8.7	8.7	15.1	59.3			40.2	40.2	
Actuated g/C Ratio		0.10	0.25		0.08	0.08	0.14	0.56			0.38	0.38	
v/c Ratio		1.40	0.51		0.35	0.02	1.08	0.43			0.93	0.06	
Control Delay		288.5	5.1		56.6	0.2	124.0	16.2			54.4	0.2	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	0.0	
Total Delay		288.5	5.1		56.6	0.2	124.0	16.2			54.4	0.2	
LOS		F	A		E	A	F	B			D	A	
Approach Delay		65.0			50.2			56.9			51.1		
Approach LOS		E			D			E			D		
Queue Length 50th (ft)		~85	0		27	0	~223	184			448	0	
Queue Length 95th (ft)		#196	39		57	0	#384	269			#709	0	
Internal Link Dist (ft)		1091			1479			1001			968		
Turn Bay Length (ft)			80			5	150					75	
Base Capacity (vph)		63	637		256	407	251	1048			698	684	
Starvation Cap Reductn		0	0		0	0	0	0			0	0	
Spillback Cap Reductn		0	0		0	0	0	0			0	0	
Storage Cap Reductn		0	0		0	0	0	0			0	0	
Reduced v/c Ratio		1.40	0.51		0.15	0.01	1.08	0.43			0.93	0.06	

Intersection Summary

Area Type: Other
Cycle Length: 122
Actuated Cycle Length: 106
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.40
Intersection Signal Delay: 56.4 Intersection LOS: E
Intersection Capacity Utilization 76.2% ICU Level of Service D
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Northampton St & Florence Rd/Highland Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	72	7	295	26	7	4	236	376	13	12	566	37
Future Volume (vph)	72	7	295	26	7	4	236	376	13	12	566	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	0.99			1.00	0.85
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)		1694	1583		1827	1615	1770	1872			1862	1615
Flt Permitted		0.38	1.00		0.71	1.00	0.95	1.00			0.99	1.00
Satd. Flow (perm)		670	1583		1352	1615	1770	1872			1841	1615
Peak-hour factor, PHF	0.90	0.90	0.90	0.84	0.84	0.84	0.87	0.87	0.87	0.89	0.89	0.89
Adj. Flow (vph)	80	8	328	31	8	5	271	432	15	13	636	42
RTOR Reduction (vph)	0	0	252	0	0	5	0	1	0	0	0	26
Lane Group Flow (vph)	0	88	76	0	39	0	271	446	0	0	649	16
Heavy Vehicles (%)	8%	0%	2%	0%	0%	0%	2%	1%	0%	0%	2%	0%
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm
Protected Phases		7	1		8		1	6			2	
Permitted Phases	7		7	8		8				2		2
Actuated Green, G (s)		10.1	25.2		5.7	5.7	15.1	59.3			40.2	40.2
Effective Green, g (s)		10.1	25.2		5.7	5.7	15.1	59.3			40.2	40.2
Actuated g/C Ratio		0.09	0.23		0.05	0.05	0.14	0.55			0.37	0.37
Clearance Time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	5.0			5.0	5.0
Lane Grp Cap (vph)		62	368		71	85	247	1025			683	600
v/s Ratio Prot			0.03				c0.15	0.24				
v/s Ratio Perm		c0.13	0.02		c0.03	0.00					c0.35	0.01
v/c Ratio		1.42	0.21		0.55	0.00	1.10	0.44			0.95	0.03
Uniform Delay, d1		49.1	33.5		50.0	48.6	46.6	14.5			33.0	21.6
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2		260.0	0.3		8.4	0.0	85.7	1.3			24.2	0.1
Delay (s)		309.1	33.7		58.4	48.6	132.3	15.9			57.2	21.7
Level of Service		F	C		E	D	F	B			E	C
Approach Delay (s)		92.0			57.3			59.8			55.1	
Approach LOS		F			E			E			E	

Intersection Summary			
HCM 2000 Control Delay	65.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	108.2	Sum of lost time (s)	22.0
Intersection Capacity Utilization	76.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	85	64	82	580	734	210	
Future Volume (vph)	85	64	82	580	734	210	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0	0	100			0	
Storage Lanes	1	0	1			0	
Taper Length (ft)	25		25				
Satd. Flow (prot)	1708	0	1770	1900	1801	0	
Flt Permitted	0.972		0.082				
Satd. Flow (perm)	1708	0	153	1900	1801	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	30				17		
Link Speed (mph)	30			30	30		
Link Distance (ft)	900			913	1559		
Travel Time (s)	20.5			20.8	35.4		
Peak Hour Factor	0.89	0.89	0.93	0.93	0.91	0.91	
Heavy Vehicles (%)	1%	3%	2%	0%	3%	0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	168	0	88	624	1038	0	
Turn Type	Prot		pm+pt	NA	NA		
Protected Phases	4		5	2	6		9
Permitted Phases			2				
Total Split (s)	15.0		15.0	60.0	45.0		26.0
Total Lost Time (s)	5.0		5.0	5.0	5.0		
Act Effct Green (s)	9.9		54.7	54.7	43.8		
Actuated g/C Ratio	0.13		0.70	0.70	0.56		
v/c Ratio	0.70		0.32	0.47	1.03		
Control Delay	45.8		9.5	8.8	58.0		
Queue Delay	0.0		0.0	0.0	0.0		
Total Delay	45.8		9.5	8.8	58.0		
LOS	D		A	A	E		
Approach Delay	45.8			8.9	58.0		
Approach LOS	D			A	E		
Queue Length 50th (ft)	60		9	90	~520		
Queue Length 95th (ft)	#202		52	362	#1147		
Internal Link Dist (ft)	820			833	1479		
Turn Bay Length (ft)			100				
Base Capacity (vph)	246		314	1347	1009		
Starvation Cap Reductn	0		0	0	0		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.68		0.28	0.46	1.03		

Intersection Summary

Area Type: Other

Cycle Length: 101

Actuated Cycle Length: 78.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.03

Intersection Signal Delay: 38.7 Intersection LOS: D

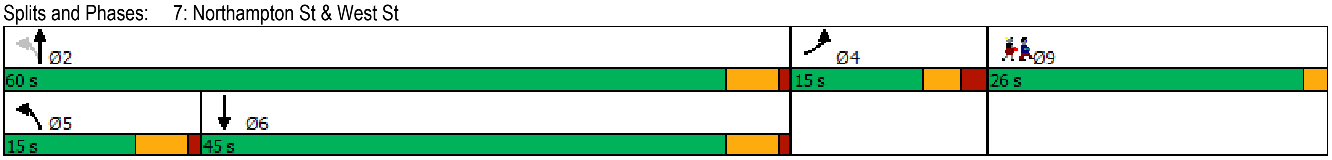
Intersection Capacity Utilization 77.1% ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Northampton St & West St



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	85	64	82	580	734	210
Future Volume (vph)	85	64	82	580	734	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.94		1.00	1.00	0.97	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1709		1770	1900	1801	
Flt Permitted	0.97		0.08	1.00	1.00	
Satd. Flow (perm)	1709		153	1900	1801	
Peak-hour factor, PHF	0.89	0.89	0.93	0.93	0.91	0.91
Adj. Flow (vph)	96	72	88	624	807	231
RTOR Reduction (vph)	26	0	0	0	8	0
Lane Group Flow (vph)	142	0	88	624	1030	0
Heavy Vehicles (%)	1%	3%	2%	0%	3%	0%
Turn Type	Prot		pm+pt	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases			2			
Actuated Green, G (s)	9.9		55.7	55.7	43.8	
Effective Green, g (s)	9.9		55.7	55.7	43.8	
Actuated g/C Ratio	0.12		0.69	0.69	0.54	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	208		242	1303	971	
v/s Ratio Prot	c0.08		0.03	c0.33	c0.57	
v/s Ratio Perm			0.22			
v/c Ratio	0.68		0.36	0.48	1.06	
Uniform Delay, d1	34.1		17.2	6.0	18.7	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	8.8		0.9	0.3	46.5	
Delay (s)	43.0		18.1	6.2	65.2	
Level of Service	D		B	A	E	
Approach Delay (s)	43.0			7.7	65.2	
Approach LOS	D			A	E	

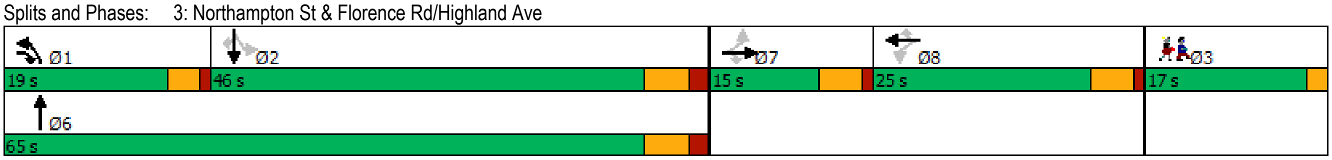
Intersection Summary			
HCM 2000 Control Delay	41.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	81.2	Sum of lost time (s)	17.0
Intersection Capacity Utilization	77.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3
Lane Configurations													
Traffic Volume (vph)	88	1	258	10	2	4	252	597	4	5	302	25	
Future Volume (vph)	88	1	258	10	2	4	252	597	4	5	302	25	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		80	0		5	150		0	0		75	
Storage Lanes	0		1	0		1	1		0	0		1	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	1648	1599	0	1824	1615	1752	1879	0	0	1862	1429	
Flt Permitted		0.398			0.777		0.950				0.989		
Satd. Flow (perm)	0	688	1599	0	1476	1615	1752	1879	0	0	1843	1429	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			304			125						116	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1171			1559			1081			1048		
Travel Time (s)		26.6			35.4			24.6			23.8		
Peak Hour Factor	0.85	0.85	0.85	0.54	0.54	0.54	0.92	0.92	0.92	0.88	0.88	0.88	
Heavy Vehicles (%)	10%	0%	1%	0%	0%	0%	3%	1%	0%	0%	2%	13%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	105	304	0	23	7	274	653	0	0	349	28	
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm	
Protected Phases		7	1		8		1	6			2		3
Permitted Phases	7		7	8		8				2		2	
Total Split (s)	15.0	15.0	19.0	25.0	25.0	25.0	19.0	65.0		46.0	46.0	46.0	17.0
Total Lost Time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0	
Act Effct Green (s)		10.0	26.1		7.7	7.7	15.1	59.3			40.2	40.2	
Actuated g/C Ratio		0.10	0.25		0.07	0.07	0.14	0.56			0.38	0.38	
v/c Ratio		1.62	0.49		0.21	0.03	1.09	0.62			0.50	0.05	
Control Delay		367.6	4.9		52.5	0.2	127.8	19.6			28.9	0.1	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	0.0	
Total Delay		367.6	4.9		52.5	0.2	127.8	19.6			28.9	0.1	
LOS		F	A		D	A	F	B			C	A	
Approach Delay		98.0			40.3			51.6			26.7		
Approach LOS		F			D			D			C		
Queue Length 50th (ft)		~107	0		16	0	~224	306			189	0	
Queue Length 95th (ft)		#210	30		25	0	#401	454			280	0	
Internal Link Dist (ft)		1091			1479			1001			968		
Turn Bay Length (ft)			80			5	150					75	
Base Capacity (vph)		65	626		282	410	251	1060			705	618	
Starvation Cap Reductn		0	0		0	0	0	0			0	0	
Spillback Cap Reductn		0	0		0	0	0	0			0	0	
Storage Cap Reductn		0	0		0	0	0	0			0	0	
Reduced v/c Ratio		1.62	0.49		0.08	0.02	1.09	0.62			0.50	0.05	

Intersection Summary

Area Type: Other
Cycle Length: 122
Actuated Cycle Length: 105
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.62
Intersection Signal Delay: 56.9 Intersection LOS: E
Intersection Capacity Utilization 73.6% ICU Level of Service D
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Northampton St & Florence Rd/Highland Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	88	1	258	10	2	4	252	597	4	5	302	25
Future Volume (vph)	88	1	258	10	2	4	252	597	4	5	302	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)		1647	1599		1825	1615	1752	1880			1862	1429
Flt Permitted		0.40	1.00		0.78	1.00	0.95	1.00			0.99	1.00
Satd. Flow (perm)		688	1599		1476	1615	1752	1880			1842	1429
Peak-hour factor, PHF	0.85	0.85	0.85	0.54	0.54	0.54	0.92	0.92	0.92	0.88	0.88	0.88
Adj. Flow (vph)	104	1	304	19	4	7	274	649	4	6	343	28
RTOR Reduction (vph)	0	0	233	0	0	7	0	0	0	0	0	17
Lane Group Flow (vph)	0	105	71	0	23	0	274	653	0	0	349	11
Heavy Vehicles (%)	10%	0%	1%	0%	0%	0%	3%	1%	0%	0%	2%	13%
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm
Protected Phases		7	1		8		1	6			2	
Permitted Phases	7		7	8		8				2		2
Actuated Green, G (s)		10.0	25.1		4.7	4.7	15.1	59.3			40.2	40.2
Effective Green, g (s)		10.0	25.1		4.7	4.7	15.1	59.3			40.2	40.2
Actuated g/C Ratio		0.09	0.23		0.04	0.04	0.14	0.55			0.38	0.38
Clearance Time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	5.0			5.0	5.0
Lane Grp Cap (vph)		64	374		64	70	247	1040			691	536
v/s Ratio Prot			0.03				c0.16	c0.35				
v/s Ratio Perm		c0.15	0.02		c0.02	0.00					0.19	0.01
v/c Ratio		1.64	0.19		0.36	0.00	1.11	0.63			0.51	0.02
Uniform Delay, d1		48.5	32.9		49.7	49.0	46.0	16.4			25.8	21.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2		348.0	0.2		3.4	0.0	89.7	2.9			2.6	0.1
Delay (s)		396.5	33.1		53.2	49.0	135.7	19.2			28.4	21.1
Level of Service		F	C		D	D	F	B			C	C
Approach Delay (s)		126.4			52.2			53.7			27.9	
Approach LOS		F			D			D			C	

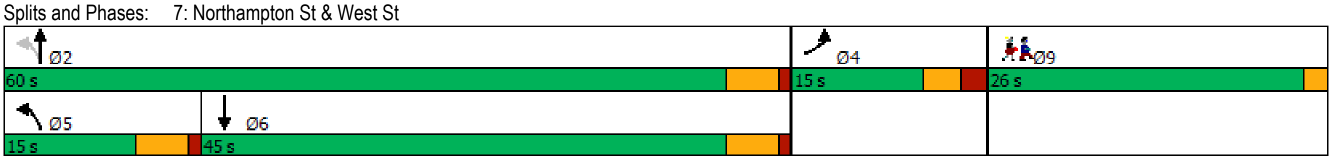
Intersection Summary			
HCM 2000 Control Delay	65.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	107.1	Sum of lost time (s)	22.0
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	224	87	33	692	547	75	
Future Volume (vph)	224	87	33	692	547	75	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0	0	100			0	
Storage Lanes	1	0	1			0	
Taper Length (ft)	25		25				
Satd. Flow (prot)	1710	0	1703	1827	1840	0	
Flt Permitted	0.965		0.184				
Satd. Flow (perm)	1710	0	330	1827	1840	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	15				8		
Link Speed (mph)	30			30	30		
Link Distance (ft)	900			913	1559		
Travel Time (s)	20.5			20.8	35.4		
Peak Hour Factor	0.86	0.86	0.91	0.91	0.94	0.94	
Heavy Vehicles (%)	2%	6%	6%	4%	1%	6%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	361	0	36	760	662	0	
Turn Type	Prot		pm+pt	NA	NA		
Protected Phases	4		5	2	6		9
Permitted Phases			2				
Total Split (s)	15.0		15.0	60.0	45.0		26.0
Total Lost Time (s)	5.0		5.0	5.0	5.0		
Act Effct Green (s)	11.3		33.3	33.3	29.7		
Actuated g/C Ratio	0.19		0.57	0.57	0.50		
v/c Ratio	1.06		0.10	0.74	0.71		
Control Delay	97.2		7.3	15.3	19.4		
Queue Delay	0.0		0.0	0.0	0.0		
Total Delay	97.2		7.3	15.3	19.4		
LOS	F		A	B	B		
Approach Delay	97.2			14.9	19.4		
Approach LOS	F			B	B		
Queue Length 50th (ft)	~107		4	127	99		
Queue Length 95th (ft)	#505		25	513	#575		
Internal Link Dist (ft)	820			833	1479		
Turn Bay Length (ft)			100				
Base Capacity (vph)	340		450	1604	1406		
Starvation Cap Reductn	0		0	0	0		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	1.06		0.08	0.47	0.47		

Intersection Summary

Area Type: Other
Cycle Length: 101
Actuated Cycle Length: 58.9
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.06
Intersection Signal Delay: 32.9 Intersection LOS: C
Intersection Capacity Utilization 62.5% ICU Level of Service B
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Northampton St & West St



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	224	87	33	692	547	75
Future Volume (vph)	224	87	33	692	547	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.96		1.00	1.00	0.98	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1711		1703	1827	1839	
Flt Permitted	0.97		0.18	1.00	1.00	
Satd. Flow (perm)	1711		330	1827	1839	
Peak-hour factor, PHF	0.86	0.86	0.91	0.91	0.94	0.94
Adj. Flow (vph)	260	101	36	760	582	80
RTOR Reduction (vph)	12	0	0	0	4	0
Lane Group Flow (vph)	349	0	36	760	658	0
Heavy Vehicles (%)	2%	6%	6%	4%	1%	6%
Turn Type	Prot		pm+pt	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases			2			
Actuated Green, G (s)	11.3		36.8	36.8	29.7	
Effective Green, g (s)	11.3		36.8	36.8	29.7	
Actuated g/C Ratio	0.18		0.59	0.59	0.47	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	307		239	1070	869	
v/s Ratio Prot	c0.20		0.01	c0.42	0.36	
v/s Ratio Perm			0.08			
v/c Ratio	1.14		0.15	0.71	0.76	
Uniform Delay, d1	25.8		8.6	9.2	13.6	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	93.3		0.3	2.2	3.8	
Delay (s)	119.0		8.9	11.5	17.4	
Level of Service	F		A	B	B	
Approach Delay (s)	119.0			11.3	17.4	
Approach LOS	F			B	B	

Intersection Summary			
HCM 2000 Control Delay	34.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	62.8	Sum of lost time (s)	17.0
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3
Lane Configurations													
Traffic Volume (vph)	77	8	316	28	8	4	253	403	14	13	607	40	
Future Volume (vph)	77	8	316	28	8	4	253	403	14	13	607	40	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		80	0		5	150		0	0		75	
Storage Lanes	0		1	0		1	1		0	0		1	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	1696	1583	0	1830	1615	1770	1872	0	0	1862	1615	
Flt Permitted		0.381			0.714		0.950				0.985		
Satd. Flow (perm)	0	675	1583	0	1357	1615	1770	1872	0	0	1836	1615	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			351			125		2				116	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1171			1559			1081			1048		
Travel Time (s)		26.6			35.4			24.6			23.8		
Peak Hour Factor	0.90	0.90	0.90	0.84	0.84	0.84	0.87	0.87	0.87	0.89	0.89	0.89	
Heavy Vehicles (%)	8%	0%	2%	0%	0%	0%	2%	1%	0%	0%	2%	0%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	95	351	0	43	5	291	479	0	0	697	45	
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm	
Protected Phases		7	1		8		1	6			2		3
Permitted Phases	7		7	8		8				2		2	
Total Split (s)	15.0	15.0	19.0	25.0	25.0	25.0	19.0	65.0		46.0	46.0	46.0	17.0
Total Lost Time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0	
Act Effct Green (s)		10.0	26.1		9.0	9.0	15.1	59.2			40.1	40.1	
Actuated g/C Ratio		0.09	0.24		0.08	0.08	0.14	0.54			0.37	0.37	
v/c Ratio		1.53	0.54		0.38	0.02	1.19	0.47			1.03	0.07	
Control Delay		342.7	5.3		58.2	0.2	160.5	17.9			77.6	0.2	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	0.0	
Total Delay		342.7	5.3		58.2	0.2	160.5	17.9			77.6	0.2	
LOS		F	A		E	A	F	B			E	A	
Approach Delay		77.2			52.2			71.8			73.0		
Approach LOS		E			D			E			E		
Queue Length 50th (ft)		~96	0		30	0	~254	203			~542	0	
Queue Length 95th (ft)		#211	40		62	0	#420	296			#792	0	
Internal Link Dist (ft)		1091			1479			1001			968		
Turn Bay Length (ft)			80			5	150					75	
Base Capacity (vph)		62	646		250	400	245	1020			677	669	
Starvation Cap Reductn		0	0		0	0	0	0			0	0	
Spillback Cap Reductn		0	0		0	0	0	0			0	0	
Storage Cap Reductn		0	0		0	0	0	0			0	0	
Reduced v/c Ratio		1.53	0.54		0.17	0.01	1.19	0.47			1.03	0.07	

Intersection Summary

Area Type: Other

Cycle Length: 122

Actuated Cycle Length: 108.7

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 1.53

Intersection Signal Delay: 73.0 Intersection LOS: E

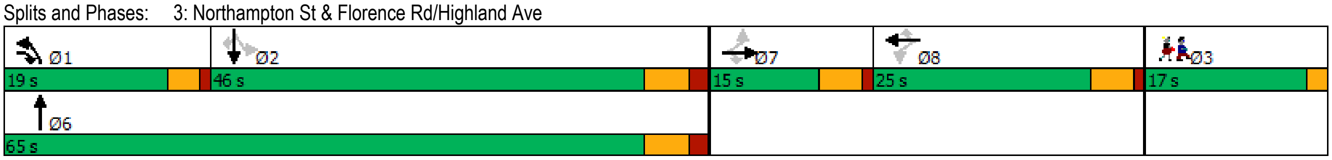
Intersection Capacity Utilization 80.2% ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Northampton St & Florence Rd/Highland Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	8	316	28	8	4	253	403	14	13	607	40
Future Volume (vph)	77	8	316	28	8	4	253	403	14	13	607	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	0.99			1.00	0.85
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)		1695	1583		1830	1615	1770	1872			1862	1615
Flt Permitted		0.38	1.00		0.71	1.00	0.95	1.00			0.99	1.00
Satd. Flow (perm)		675	1583		1357	1615	1770	1872			1836	1615
Peak-hour factor, PHF	0.90	0.90	0.90	0.84	0.84	0.84	0.87	0.87	0.87	0.89	0.89	0.89
Adj. Flow (vph)	86	9	351	33	10	5	291	463	16	15	682	45
RTOR Reduction (vph)	0	0	271	0	0	5	0	1	0	0	0	29
Lane Group Flow (vph)	0	95	80	0	43	0	291	478	0	0	697	16
Heavy Vehicles (%)	8%	0%	2%	0%	0%	0%	2%	1%	0%	0%	2%	0%
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm
Protected Phases		7	1		8		1	6			2	
Permitted Phases	7		7	8		8				2		2
Actuated Green, G (s)		10.0	25.1		7.5	7.5	15.1	59.2			40.1	40.1
Effective Green, g (s)		10.0	25.1		7.5	7.5	15.1	59.2			40.1	40.1
Actuated g/C Ratio		0.09	0.23		0.07	0.07	0.14	0.54			0.37	0.37
Clearance Time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	5.0			5.0	5.0
Lane Grp Cap (vph)		61	361		92	110	243	1009			670	589
v/s Ratio Prot			0.03				c0.16	0.26				
v/s Ratio Perm		c0.14	0.02		c0.03	0.00					c0.38	0.01
v/c Ratio		1.56	0.22		0.47	0.00	1.20	0.47			1.04	0.03
Uniform Delay, d1		49.9	34.4		49.2	47.7	47.4	15.7			34.8	22.4
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2		316.2	0.3		3.7	0.0	121.7	1.6			45.7	0.1
Delay (s)		366.1	34.7		52.9	47.7	169.0	17.3			80.5	22.4
Level of Service		F	C		D	D	F	B			F	C
Approach Delay (s)		105.3			52.4			74.6			77.0	
Approach LOS		F			D			E			E	

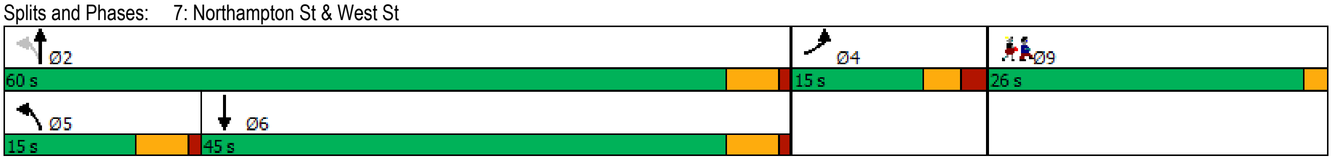
Intersection Summary			
HCM 2000 Control Delay	81.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	109.8	Sum of lost time (s)	22.0
Intersection Capacity Utilization	80.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	91	69	88	622	787	225	
Future Volume (vph)	91	69	88	622	787	225	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0	0	100			0	
Storage Lanes	1	0	1			0	
Taper Length (ft)	25		25				
Satd. Flow (prot)	1706	0	1770	1900	1801	0	
Flt Permitted	0.972		0.082				
Satd. Flow (perm)	1706	0	153	1900	1801	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	30				17		
Link Speed (mph)	30			30	30		
Link Distance (ft)	900			913	1559		
Travel Time (s)	20.5			20.8	35.4		
Peak Hour Factor	0.89	0.89	0.93	0.93	0.91	0.91	
Heavy Vehicles (%)	1%	3%	2%	0%	3%	0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	180	0	95	669	1112	0	
Turn Type	Prot		pm+pt	NA	NA		
Protected Phases	4		5	2	6		9
Permitted Phases			2				
Total Split (s)	15.0		15.0	60.0	45.0		26.0
Total Lost Time (s)	5.0		5.0	5.0	5.0		
Act Effct Green (s)	10.2		54.8	54.8	43.8		
Actuated g/C Ratio	0.13		0.69	0.69	0.55		
v/c Ratio	0.73		0.34	0.51	1.11		
Control Delay	48.6		10.5	9.3	84.8		
Queue Delay	0.0		0.0	0.0	0.0		
Total Delay	48.6		10.5	9.3	84.8		
LOS	D		B	A	F		
Approach Delay	48.6			9.5	84.8		
Approach LOS	D			A	F		
Queue Length 50th (ft)	66		10	101	~596		
Queue Length 95th (ft)	#223		58	401	#1251		
Internal Link Dist (ft)	820			833	1479		
Turn Bay Length (ft)			100				
Base Capacity (vph)	245		313	1341	1004		
Starvation Cap Reductn	0		0	0	0		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.73		0.30	0.50	1.11		

Intersection Summary

Area Type: Other
Cycle Length: 101
Actuated Cycle Length: 79.1
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.11
Intersection Signal Delay: 53.6 Intersection LOS: D
Intersection Capacity Utilization 81.7% ICU Level of Service D
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Northampton St & West St



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	91	69	88	622	787	225
Future Volume (vph)	91	69	88	622	787	225
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.94		1.00	1.00	0.97	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1708		1770	1900	1801	
Flt Permitted	0.97		0.08	1.00	1.00	
Satd. Flow (perm)	1708		153	1900	1801	
Peak-hour factor, PHF	0.89	0.89	0.93	0.93	0.91	0.91
Adj. Flow (vph)	102	78	95	669	865	247
RTOR Reduction (vph)	26	0	0	0	8	0
Lane Group Flow (vph)	154	0	95	669	1104	0
Heavy Vehicles (%)	1%	3%	2%	0%	3%	0%
Turn Type	Prot		pm+pt	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases			2			
Actuated Green, G (s)	10.1		55.8	55.8	43.8	
Effective Green, g (s)	10.1		55.8	55.8	43.8	
Actuated g/C Ratio	0.12		0.68	0.68	0.54	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	211		243	1300	967	
v/s Ratio Prot	c0.09		0.03	c0.35	c0.61	
v/s Ratio Perm			0.23			
v/c Ratio	0.73		0.39	0.51	1.14	
Uniform Delay, d1	34.4		17.3	6.3	18.9	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	11.9		1.0	0.3	76.3	
Delay (s)	46.2		18.3	6.6	95.2	
Level of Service	D		B	A	F	
Approach Delay (s)	46.2			8.1	95.2	
Approach LOS	D			A	F	

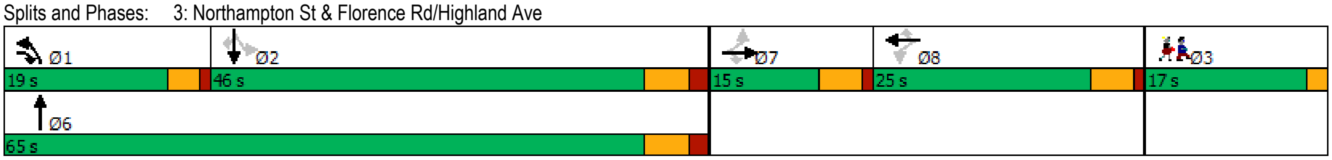
Intersection Summary			
HCM 2000 Control Delay	58.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	81.5	Sum of lost time (s)	17.0
Intersection Capacity Utilization	81.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3
Lane Configurations													
Traffic Volume (vph)	88	1	298	10	2	4	295	671	4	5	373	25	
Future Volume (vph)	88	1	298	10	2	4	295	671	4	5	373	25	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		80	0		5	150		0	0		75	
Storage Lanes	0		1	0		1	1		0	0		1	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	1648	1599	0	1824	1615	1752	1879	0	0	1861	1429	
Flt Permitted		0.398			0.777		0.950				0.990		
Satd. Flow (perm)	0	688	1599	0	1476	1615	1752	1879	0	0	1845	1429	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			351			125						116	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1171			1559			1081			1048		
Travel Time (s)		26.6			35.4			24.6			23.8		
Peak Hour Factor	0.85	0.85	0.85	0.54	0.54	0.54	0.92	0.92	0.92	0.88	0.88	0.88	
Heavy Vehicles (%)	10%	0%	1%	0%	0%	0%	3%	1%	0%	0%	2%	13%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	105	351	0	23	7	321	733	0	0	430	28	
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm	
Protected Phases		7	1		8		1	6			2		3
Permitted Phases	7		7	8		8				2		2	
Total Split (s)	15.0	15.0	19.0	25.0	25.0	25.0	19.0	65.0		46.0	46.0	46.0	17.0
Total Lost Time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0	
Act Effct Green (s)		10.0	26.1		7.7	7.7	15.1	59.3			40.2	40.2	
Actuated g/C Ratio		0.10	0.25		0.07	0.07	0.14	0.56			0.38	0.38	
v/c Ratio		1.62	0.53		0.21	0.03	1.28	0.69			0.61	0.05	
Control Delay		367.6	5.1		52.5	0.2	191.5	21.9			31.8	0.1	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	0.0	
Total Delay		367.6	5.1		52.5	0.2	191.5	21.9			31.8	0.1	
LOS		F	A		D	A	F	C			C	A	
Approach Delay		88.5			40.3			73.6			29.8		
Approach LOS		F			D			E			C		
Queue Length 50th (ft)		~107	0		16	0	~293	368			246	0	
Queue Length 95th (ft)		#210	31		25	0	#480	544			356	0	
Internal Link Dist (ft)		1091			1479			1001			968		
Turn Bay Length (ft)			80			5	150					75	
Base Capacity (vph)		65	661		282	410	251	1060			705	618	
Starvation Cap Reductn		0	0		0	0	0	0			0	0	
Spillback Cap Reductn		0	0		0	0	0	0			0	0	
Storage Cap Reductn		0	0		0	0	0	0			0	0	
Reduced v/c Ratio		1.62	0.53		0.08	0.02	1.28	0.69			0.61	0.05	

Intersection Summary

Area Type: Other
Cycle Length: 122
Actuated Cycle Length: 105
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.62
Intersection Signal Delay: 66.5 Intersection LOS: E
Intersection Capacity Utilization 81.2% ICU Level of Service D
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Northampton St & Florence Rd/Highland Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	88	1	298	10	2	4	295	671	4	5	373	25
Future Volume (vph)	88	1	298	10	2	4	295	671	4	5	373	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)		1647	1599		1825	1615	1752	1880			1862	1429
Flt Permitted		0.40	1.00		0.78	1.00	0.95	1.00			0.99	1.00
Satd. Flow (perm)		688	1599		1476	1615	1752	1880			1844	1429
Peak-hour factor, PHF	0.85	0.85	0.85	0.54	0.54	0.54	0.92	0.92	0.92	0.88	0.88	0.88
Adj. Flow (vph)	104	1	351	19	4	7	321	729	4	6	424	28
RTOR Reduction (vph)	0	0	269	0	0	7	0	0	0	0	0	17
Lane Group Flow (vph)	0	105	82	0	23	0	321	733	0	0	430	11
Heavy Vehicles (%)	10%	0%	1%	0%	0%	0%	3%	1%	0%	0%	2%	13%
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm
Protected Phases		7	1		8		1	6			2	
Permitted Phases	7		7	8		8				2		2
Actuated Green, G (s)		10.0	25.1		4.7	4.7	15.1	59.3			40.2	40.2
Effective Green, g (s)		10.0	25.1		4.7	4.7	15.1	59.3			40.2	40.2
Actuated g/C Ratio		0.09	0.23		0.04	0.04	0.14	0.55			0.38	0.38
Clearance Time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	5.0			5.0	5.0
Lane Grp Cap (vph)		64	374		64	70	247	1040			692	536
v/s Ratio Prot			0.03				c0.18	c0.39				
v/s Ratio Perm		c0.15	0.02		c0.02	0.00					0.23	0.01
v/c Ratio		1.64	0.22		0.36	0.00	1.30	0.70			0.62	0.02
Uniform Delay, d1		48.5	33.1		49.7	49.0	46.0	17.5			27.3	21.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2		348.0	0.3		3.4	0.0	161.2	4.0			4.2	0.1
Delay (s)		396.5	33.4		53.2	49.0	207.2	21.5			31.4	21.1
Level of Service		F	C		D	D	F	C			C	C
Approach Delay (s)		117.0			52.2			78.1			30.8	
Approach LOS		F			D			E			C	

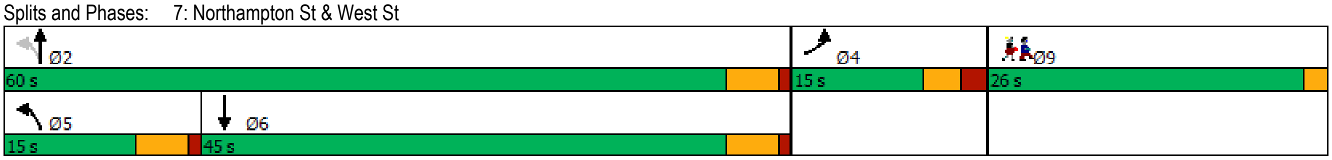
Intersection Summary			
HCM 2000 Control Delay	75.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	107.1	Sum of lost time (s)	22.0
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	237	87	33	750	608	88	
Future Volume (vph)	237	87	33	750	608	88	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0	0	100			0	
Storage Lanes	1	0	1			0	
Taper Length (ft)	25		25				
Satd. Flow (prot)	1715	0	1703	1827	1838	0	
Flt Permitted	0.965		0.186				
Satd. Flow (perm)	1715	0	333	1827	1838	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	14				9		
Link Speed (mph)	30			30	30		
Link Distance (ft)	900			913	1559		
Travel Time (s)	20.5			20.8	35.4		
Peak Hour Factor	0.86	0.86	0.91	0.91	0.94	0.94	
Heavy Vehicles (%)	2%	6%	6%	4%	1%	6%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	377	0	36	824	741	0	
Turn Type	Prot		pm+pt	NA	NA		
Protected Phases	4		5	2	6		9
Permitted Phases			2				
Total Split (s)	15.0		15.0	60.0	45.0		26.0
Total Lost Time (s)	5.0		5.0	5.0	5.0		
Act Effct Green (s)	10.5		43.5	43.5	39.6		
Actuated g/C Ratio	0.15		0.64	0.64	0.58		
v/c Ratio	1.36		0.10	0.70	0.69		
Control Delay	210.8		7.1	14.1	18.3		
Queue Delay	0.0		0.0	0.0	0.0		
Total Delay	210.8		7.1	14.1	18.3		
LOS	F		A	B	B		
Approach Delay	210.8			13.8	18.3		
Approach LOS	F			B	B		
Queue Length 50th (ft)	~173		4	146	119		
Queue Length 95th (ft)	#529		25	594	#690		
Internal Link Dist (ft)	820			833	1479		
Turn Bay Length (ft)			100				
Base Capacity (vph)	277		425	1546	1151		
Starvation Cap Reductn	0		0	0	0		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	1.36		0.08	0.53	0.64		

Intersection Summary

Area Type: Other
Cycle Length: 101
Actuated Cycle Length: 68
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.36
Intersection Signal Delay: 53.0 Intersection LOS: D
Intersection Capacity Utilization 66.2% ICU Level of Service C
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Northampton St & West St



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	237	87	33	750	608	88
Future Volume (vph)	237	87	33	750	608	88
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.96		1.00	1.00	0.98	
Flt Protected	0.96		0.95	1.00	1.00	
Satd. Flow (prot)	1714		1703	1827	1837	
Flt Permitted	0.96		0.19	1.00	1.00	
Satd. Flow (perm)	1714		333	1827	1837	
Peak-hour factor, PHF	0.86	0.86	0.91	0.91	0.94	0.94
Adj. Flow (vph)	276	101	36	824	647	94
RTOR Reduction (vph)	12	0	0	0	4	0
Lane Group Flow (vph)	365	0	36	824	737	0
Heavy Vehicles (%)	2%	6%	6%	4%	1%	6%
Turn Type	Prot		pm+pt	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases			2			
Actuated Green, G (s)	10.5		46.9	46.9	39.6	
Effective Green, g (s)	10.5		46.9	46.9	39.6	
Actuated g/C Ratio	0.14		0.65	0.65	0.55	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	248		258	1181	1003	
v/s Ratio Prot	c0.21		0.00	c0.45	0.40	
v/s Ratio Perm			0.09			
v/c Ratio	1.47		0.14	0.70	0.73	
Uniform Delay, d1	31.0		8.5	8.2	12.5	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	233.0		0.2	1.8	2.8	
Delay (s)	264.0		8.7	10.1	15.3	
Level of Service	F		A	B	B	
Approach Delay (s)	264.0			10.0	15.3	
Approach LOS	F			B	B	

Intersection Summary			
HCM 2000 Control Delay	60.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	72.5	Sum of lost time (s)	17.0
Intersection Capacity Utilization	66.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	74	117	913	71	111	570
Future Volume (Veh/h)	74	117	913	71	111	570
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	80	127	992	77	121	620
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						1261
pX, platoon unblocked	0.83					
vC, conflicting volume	1892	1030			1069	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1972	1030			1069	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	55			81	
cM capacity (veh/h)	46	283			652	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	80	127	1069	741
Volume Left	80	0	0	121
Volume Right	0	127	77	0
cSH	46	283	1700	652
Volume to Capacity	1.72	0.45	0.63	0.19
Queue Length 95th (ft)	199	55	0	17
Control Delay (s)	540.0	27.6	0.0	4.8
Lane LOS	F	D		A
Approach Delay (s)	225.6		0.0	4.8
Approach LOS	F			

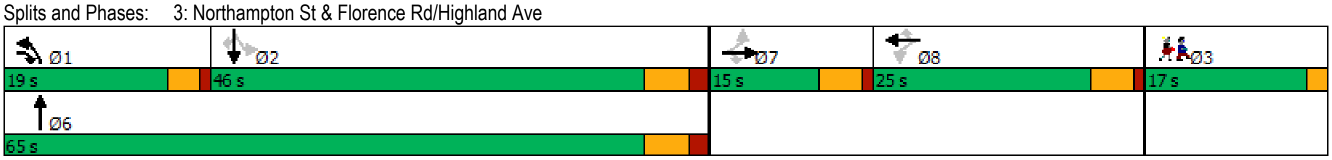
Intersection Summary			
Average Delay	24.9		
Intersection Capacity Utilization	102.6%	ICU Level of Service	G
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3
Lane Configurations													
Traffic Volume (vph)	77	8	377	28	8	4	307	499	14	13	716	40	
Future Volume (vph)	77	8	377	28	8	4	307	499	14	13	716	40	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		80	0		5	150		0	0		75	
Storage Lanes	0		1	0		1	1		0	0		1	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	1693	1583	0	1830	1615	1770	1874	0	0	1862	1615	
Flt Permitted		0.382			0.709		0.950				0.986		
Satd. Flow (perm)	0	677	1583	0	1347	1615	1770	1874	0	0	1837	1615	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			433			125		2				116	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1171			1559			1081			1048		
Travel Time (s)		26.6			35.4			24.6			23.8		
Peak Hour Factor	0.85	0.85	0.85	0.54	0.54	0.54	0.92	0.92	0.92	0.88	0.88	0.88	
Heavy Vehicles (%)	8%	0%	2%	0%	0%	0%	2%	1%	0%	0%	2%	0%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	100	444	0	67	7	334	557	0	0	829	45	
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm	
Protected Phases		7	1		8		1	6			2		3
Permitted Phases	7		7	8		8				2		2	
Total Split (s)	15.0	15.0	19.0	25.0	25.0	25.0	19.0	65.0		46.0	46.0	46.0	17.0
Total Lost Time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0	
Act Effct Green (s)		10.0	26.1		10.9	10.9	15.1	59.3			40.2	40.2	
Actuated g/C Ratio		0.09	0.24		0.10	0.10	0.14	0.54			0.36	0.36	
v/c Ratio		1.64	0.63		0.50	0.03	1.39	0.55			1.24	0.07	
Control Delay		383.6	6.5		61.6	0.2	235.5	20.8			154.6	0.2	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	0.0	
Total Delay		383.6	6.5		61.6	0.2	235.5	20.8			154.6	0.2	
LOS		F	A		E	A	F	C			F	A	
Approach Delay		75.8			55.8			101.3			146.6		
Approach LOS		E			E			F			F		
Queue Length 50th (ft)		~106	3		47	0	~327	262			~761	0	
Queue Length 95th (ft)		#211	35		54	0	#533	404			#1025	0	
Internal Link Dist (ft)		1091			1479			1001			968		
Turn Bay Length (ft)			80			5	150					75	
Base Capacity (vph)		61	704		244	395	241	1004			667	660	
Starvation Cap Reductn		0	0		0	0	0	0			0	0	
Spillback Cap Reductn		0	0		0	0	0	0			0	0	
Storage Cap Reductn		0	0		0	0	0	0			0	0	
Reduced v/c Ratio		1.64	0.63		0.27	0.02	1.39	0.55			1.24	0.07	

Intersection Summary

Area Type: Other
Cycle Length: 122
Actuated Cycle Length: 110.7
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.64
Intersection Signal Delay: 110.7 Intersection LOS: F
Intersection Capacity Utilization 91.0% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Northampton St & Florence Rd/Highland Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	8	377	28	8	4	307	499	14	13	716	40
Future Volume (vph)	77	8	377	28	8	4	307	499	14	13	716	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)		1694	1583		1829	1615	1770	1874			1862	1615
Flt Permitted		0.38	1.00		0.71	1.00	0.95	1.00			0.99	1.00
Satd. Flow (perm)		677	1583		1346	1615	1770	1874			1837	1615
Peak-hour factor, PHF	0.85	0.85	0.85	0.54	0.54	0.54	0.92	0.92	0.92	0.88	0.88	0.88
Adj. Flow (vph)	91	9	444	52	15	7	334	542	15	15	814	45
RTOR Reduction (vph)	0	0	336	0	0	6	0	1	0	0	0	29
Lane Group Flow (vph)	0	100	108	0	67	1	334	556	0	0	829	16
Heavy Vehicles (%)	8%	0%	2%	0%	0%	0%	2%	1%	0%	0%	2%	0%
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm
Protected Phases		7	1		8		1	6			2	
Permitted Phases	7		7	8		8				2		2
Actuated Green, G (s)		10.0	25.1		9.3	9.3	15.1	59.3			40.2	40.2
Effective Green, g (s)		10.0	25.1		9.3	9.3	15.1	59.3			40.2	40.2
Actuated g/C Ratio		0.09	0.22		0.08	0.08	0.14	0.53			0.36	0.36
Clearance Time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	5.0			5.0	5.0
Lane Grp Cap (vph)		60	355		112	134	239	994			661	581
v/s Ratio Prot			0.04				c0.19	0.30				
v/s Ratio Perm		c0.15	0.03		c0.05	0.00					c0.45	0.01
v/c Ratio		1.67	0.31		0.60	0.00	1.40	0.56			1.25	0.03
Uniform Delay, d1		50.9	36.0		49.4	47.0	48.3	17.5			35.8	23.1
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2		362.1	0.5		8.3	0.0	202.3	2.3			126.5	0.1
Delay (s)		413.0	36.5		57.7	47.0	250.6	19.8			162.3	23.2
Level of Service		F	D		E	D	F	B			F	C
Approach Delay (s)		105.7			56.7			106.3			155.1	
Approach LOS		F			E			F			F	

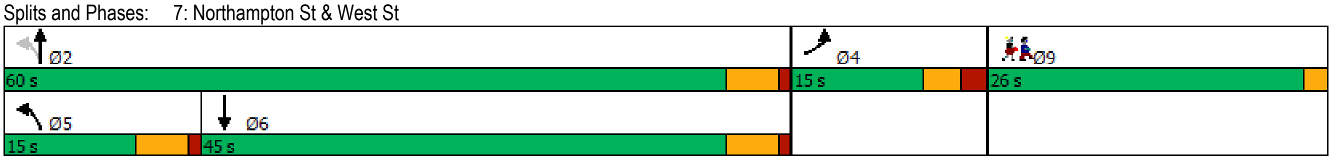
Intersection Summary			
HCM 2000 Control Delay	122.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	111.7	Sum of lost time (s)	22.0
Intersection Capacity Utilization	91.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	111	69	88	711	866	242	
Future Volume (vph)	111	69	88	711	866	242	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0	0	100			0	
Storage Lanes	1	0	1			0	
Taper Length (ft)	25		25				
Satd. Flow (prot)	1717	0	1770	1900	1803	0	
Flt Permitted	0.970		0.083				
Satd. Flow (perm)	1717	0	155	1900	1803	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	25				16		
Link Speed (mph)	30			30	30		
Link Distance (ft)	900			913	1559		
Travel Time (s)	20.5			20.8	35.4		
Peak Hour Factor	0.89	0.89	0.93	0.93	0.91	0.91	
Heavy Vehicles (%)	1%	3%	2%	0%	3%	0%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	203	0	95	765	1218	0	
Turn Type	Prot		pm+pt	NA	NA		
Protected Phases	4		5	2	6		9
Permitted Phases			2				
Total Split (s)	15.0		15.0	60.0	45.0		26.0
Total Lost Time (s)	5.0		5.0	5.0	5.0		
Act Effct Green (s)	10.2		54.4	54.4	43.5		
Actuated g/C Ratio	0.13		0.69	0.69	0.55		
v/c Ratio	0.84		0.35	0.58	1.21		
Control Delay	60.1		10.4	10.6	127.4		
Queue Delay	0.0		0.0	0.0	0.0		
Total Delay	60.1		10.4	10.6	127.4		
LOS	E		B	B	F		
Approach Delay	60.1			10.6	127.4		
Approach LOS	E			B	F		
Queue Length 50th (ft)	79		10	125	~698		
Queue Length 95th (ft)	#266		58	498	#1400		
Internal Link Dist (ft)	820			833	1479		
Turn Bay Length (ft)			100				
Base Capacity (vph)	243		316	1350	1004		
Starvation Cap Reductn	0		0	0	0		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.84		0.30	0.57	1.21		

Intersection Summary

Area Type: Other
Cycle Length: 101
Actuated Cycle Length: 78.6
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.21
Intersection Signal Delay: 77.3 — Intersection LOS: E
Intersection Capacity Utilization 88.0% — ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Northampton St & West St



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	111	69	88	711	866	242
Future Volume (vph)	111	69	88	711	866	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.95		1.00	1.00	0.97	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1717		1770	1900	1802	
Flt Permitted	0.97		0.08	1.00	1.00	
Satd. Flow (perm)	1717		154	1900	1802	
Peak-hour factor, PHF	0.89	0.89	0.93	0.93	0.91	0.91
Adj. Flow (vph)	125	78	95	765	952	266
RTOR Reduction (vph)	22	0	0	0	7	0
Lane Group Flow (vph)	181	0	95	765	1211	0
Heavy Vehicles (%)	1%	3%	2%	0%	3%	0%
Turn Type	Prot		pm+pt	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases			2			
Actuated Green, G (s)	10.2		55.3	55.3	43.4	
Effective Green, g (s)	10.2		55.3	55.3	43.4	
Actuated g/C Ratio	0.13		0.68	0.68	0.54	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	215		242	1295	964	
v/s Ratio Prot	c0.11		0.03	c0.40	c0.67	
v/s Ratio Perm			0.23			
v/c Ratio	0.84		0.39	0.59	1.26	
Uniform Delay, d1	34.7		17.1	6.9	18.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	24.7		1.1	0.7	123.6	
Delay (s)	59.4		18.2	7.6	142.5	
Level of Service	E		B	A	F	
Approach Delay (s)	59.4			8.8	142.5	
Approach LOS	E			A	F	

Intersection Summary			
HCM 2000 Control Delay	84.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	81.1	Sum of lost time (s)	17.0
Intersection Capacity Utilization	88.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	96	150	726	109	170	951
Future Volume (Veh/h)	96	150	726	109	170	951
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	104	163	789	118	185	1034
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						1261
pX, platoon unblocked	0.65					
vC, conflicting volume	2252	848			907	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2653	848			907	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	55			75	
cM capacity (veh/h)	12	361			750	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	104	163	907	1219
Volume Left	104	0	0	185
Volume Right	0	163	118	0
cSH	12	361	1700	750
Volume to Capacity	8.36	0.45	0.53	0.25
Queue Length 95th (ft)	Err	57	0	24
Control Delay (s)	Err	22.9	0.0	7.8
Lane LOS	F	C		A
Approach Delay (s)	3908.7		0.0	7.8
Approach LOS	F			

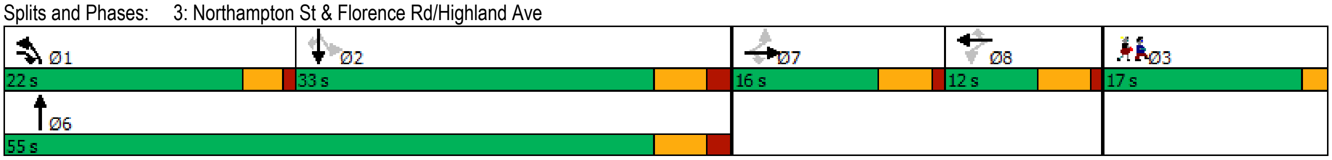
Intersection Summary			
Average Delay	440.1		
Intersection Capacity Utilization	119.6%	ICU Level of Service	H
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3
Lane Configurations													
Traffic Volume (vph)	88	1	298	10	2	4	295	671	4	5	373	25	
Future Volume (vph)	88	1	298	10	2	4	295	671	4	5	373	25	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		80	0		5	150		0	0		75	
Storage Lanes	0		1	0		1	1		0	0		1	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	1678	1583	0	1824	1615	1770	1861	0	0	1843	1404	
Flt Permitted		0.355					0.950				0.989		
Satd. Flow (perm)	0	625	1583	0	1900	1615	1770	1861	0	0	1825	1404	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			335			153						142	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1171			1559			1083			1048		
Travel Time (s)		26.6			35.4			24.6			23.8		
Peak Hour Factor	0.89	0.89	0.89	0.73	0.73	0.73	0.88	0.88	0.88	0.80	0.80	0.80	
Heavy Vehicles (%)	8%	0%	2%	0%	0%	0%	2%	2%	5%	0%	3%	15%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	100	335	0	17	5	335	768	0	0	472	31	
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm	
Protected Phases		7	1		8		1	6			2		3
Permitted Phases	7		7	8		8				2		2	
Total Split (s)	16.0	16.0	22.0	12.0	12.0	12.0	22.0	55.0		33.0	33.0	33.0	17.0
Total Lost Time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0	
Act Effct Green (s)		11.2	33.2		7.1	7.1	18.3	49.9			27.5	27.5	
Actuated g/C Ratio		0.14	0.42		0.09	0.09	0.23	0.63			0.35	0.35	
v/c Ratio		1.14	0.39		0.10	0.02	0.82	0.66			0.75	0.05	
Control Delay		177.1	2.9		39.8	0.0	49.3	15.8			34.2	0.2	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	0.0	
Total Delay		177.1	2.9		39.8	0.0	49.3	15.8			34.2	0.2	
LOS		F	A		D	A	D	B			C	A	
Approach Delay		43.0			30.7			26.0			32.1		
Approach LOS		D			C			C			C		
Queue Length 50th (ft)		~46	0		7	0	135	145			168	0	
Queue Length 95th (ft)		#190	29		26	0	#393	#572			#404	0	
Internal Link Dist (ft)		1091			1479			1003			968		
Turn Bay Length (ft)			80			5	150					75	
Base Capacity (vph)		88	858		171	284	409	1172			633	579	
Starvation Cap Reductn		0	0		0	0	0	0			0	0	
Spillback Cap Reductn		0	0		0	0	0	0			0	0	
Storage Cap Reductn		0	0		0	0	0	0			0	0	
Reduced v/c Ratio		1.14	0.39		0.10	0.02	0.82	0.66			0.75	0.05	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 79.2
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.14
Intersection Signal Delay: 31.1 Intersection LOS: C
Intersection Capacity Utilization 81.2% ICU Level of Service D
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Northampton St & Florence Rd/Highland Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	88	1	298	10	2	4	295	671	4	5	373	25
Future Volume (vph)	88	1	298	10	2	4	295	671	4	5	373	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)		1678	1583		1825	1615	1770	1861			1844	1404
Flt Permitted		0.36	1.00		1.00	1.00	0.95	1.00			0.99	1.00
Satd. Flow (perm)		626	1583		1900	1615	1770	1861			1825	1404
Peak-hour factor, PHF	0.89	0.89	0.89	0.73	0.73	0.73	0.88	0.88	0.88	0.80	0.80	0.80
Adj. Flow (vph)	99	1	335	14	3	5	335	762	5	6	466	31
RTOR Reduction (vph)	0	0	217	0	0	5	0	0	0	0	0	21
Lane Group Flow (vph)	0	100	118	0	17	0	335	768	0	0	472	10
Heavy Vehicles (%)	8%	0%	2%	0%	0%	0%	2%	2%	5%	0%	3%	15%
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm
Protected Phases		7	1		8		1	6			2	
Permitted Phases	7		7	8		8				2		2
Actuated Green, G (s)		11.2	29.5		2.4	2.4	18.3	49.9			27.6	27.6
Effective Green, g (s)		11.2	29.5		2.4	2.4	18.3	49.9			27.6	27.6
Actuated g/C Ratio		0.13	0.35		0.03	0.03	0.22	0.59			0.33	0.33
Clearance Time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	5.0			5.0	5.0
Lane Grp Cap (vph)		83	556		54	46	386	1106			600	461
v/s Ratio Prot			0.05				c0.19	0.41				
v/s Ratio Perm		c0.16	0.03		c0.01	0.00					c0.26	0.01
v/c Ratio		1.20	0.21		0.31	0.00	0.87	0.69			0.79	0.02
Uniform Delay, d1		36.4	19.1		39.9	39.6	31.6	11.7			25.5	19.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2		163.9	0.2		3.3	0.0	18.2	3.6			10.0	0.1
Delay (s)		200.3	19.2		43.3	39.6	49.8	15.3			35.5	19.1
Level of Service		F	B		D	D	D	B			D	B
Approach Delay (s)		60.9			42.4			25.8			34.5	
Approach LOS		E			D			C			C	

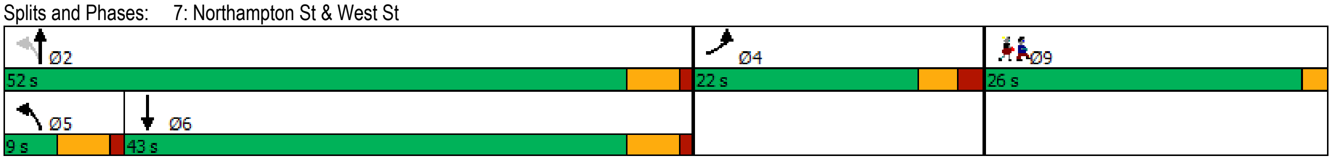
Intersection Summary			
HCM 2000 Control Delay	35.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	83.9	Sum of lost time (s)	22.0
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	237	87	33	750	608	88	
Future Volume (vph)	237	87	33	750	608	88	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0	0	100			0	
Storage Lanes	1	0	1			0	
Taper Length (ft)	25		25				
Satd. Flow (prot)	1745	0	1671	1863	1811	0	
Flt Permitted	0.965		0.124				
Satd. Flow (perm)	1745	0	218	1863	1811	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	16				8		
Link Speed (mph)	30			30	30		
Link Distance (ft)	900			913	1549		
Travel Time (s)	20.5			20.8	35.2		
Peak Hour Factor	0.93	0.93	0.92	0.92	0.91	0.91	
Heavy Vehicles (%)	1%	2%	8%	2%	3%	4%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	349	0	36	815	765	0	
Turn Type	Prot		pm+pt	NA	NA		
Protected Phases	4		5	2	6		9
Permitted Phases			2				
Total Split (s)	22.0		9.0	52.0	43.0		26.0
Total Lost Time (s)	5.0		5.0	5.0	5.0		
Act Effct Green (s)	17.4		44.5	44.5	39.4		
Actuated g/C Ratio	0.23		0.59	0.59	0.52		
v/c Ratio	0.85		0.17	0.75	0.81		
Control Delay	49.7		11.0	19.3	26.8		
Queue Delay	0.0		0.0	0.0	0.0		
Total Delay	49.7		11.0	19.3	26.8		
LOS	D		B	B	C		
Approach Delay	49.7			18.9	26.8		
Approach LOS	D			B	C		
Queue Length 50th (ft)	147		5	211	273		
Queue Length 95th (ft)	#424		29	#721	#775		
Internal Link Dist (ft)	820			833	1469		
Turn Bay Length (ft)			100				
Base Capacity (vph)	411		206	1178	944		
Starvation Cap Reductn	0		0	0	0		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.85		0.17	0.69	0.81		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 75.9
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 27.5 Intersection LOS: C
Intersection Capacity Utilization 66.2% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Northampton St & West St



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	237	87	33	750	608	88
Future Volume (vph)	237	87	33	750	608	88
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.96		1.00	1.00	0.98	
Flt Protected	0.96		0.95	1.00	1.00	
Satd. Flow (prot)	1744		1671	1863	1811	
Flt Permitted	0.96		0.12	1.00	1.00	
Satd. Flow (perm)	1744		219	1863	1811	
Peak-hour factor, PHF	0.93	0.93	0.92	0.92	0.91	0.91
Adj. Flow (vph)	255	94	36	815	668	97
RTOR Reduction (vph)	13	0	0	0	4	0
Lane Group Flow (vph)	336	0	36	815	761	0
Heavy Vehicles (%)	1%	2%	8%	2%	3%	4%
Turn Type	Prot		pm+pt	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases			2			
Actuated Green, G (s)	17.4		46.7	46.7	39.4	
Effective Green, g (s)	17.4		46.7	46.7	39.4	
Actuated g/C Ratio	0.22		0.59	0.59	0.49	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	381		170	1092	896	
v/s Ratio Prot	c0.19		0.01	c0.44	c0.42	
v/s Ratio Perm			0.12			
v/c Ratio	0.88		0.21	0.75	0.85	
Uniform Delay, d1	30.1		12.8	12.1	17.5	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	20.7		0.6	2.8	7.6	
Delay (s)	50.8		13.4	14.9	25.1	
Level of Service	D		B	B	C	
Approach Delay (s)	50.8			14.9	25.1	
Approach LOS	D			B	C	

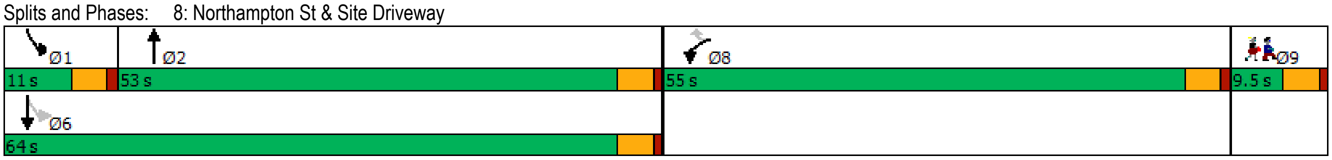
Intersection Summary			
HCM 2000 Control Delay	25.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	79.6	Sum of lost time (s)	17.0
Intersection Capacity Utilization	66.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Lane Configurations							
Traffic Volume (vph)	74	117	913	71	111	570	
Future Volume (vph)	74	117	913	71	111	570	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0	0		0	100		
Storage Lanes	1	1		0	1		
Taper Length (ft)	25				25		
Satd. Flow (prot)	1770	1583	1844	0	1770	1863	
Flt Permitted	0.950				0.075		
Satd. Flow (perm)	1770	1583	1844	0	140	1863	
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		127	3				
Link Speed (mph)	30		30			30	
Link Distance (ft)	486		1549			145	
Travel Time (s)	11.0		35.2			3.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	80	127	1069	0	121	620	
Turn Type	Prot	Perm	NA		pm+pt	NA	
Protected Phases	8		2		1	6	9
Permitted Phases		8			6		
Total Split (s)	55.0	55.0	53.0		11.0	64.0	9.5
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5	
Act Effct Green (s)	8.8	8.8	48.5		59.5	59.5	
Actuated g/C Ratio	0.11	0.11	0.63		0.77	0.77	
v/c Ratio	0.40	0.43	0.92		0.50	0.43	
Control Delay	37.8	11.4	28.6		14.9	4.4	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	37.8	11.4	28.6		14.9	4.4	
LOS	D	B	C		B	A	
Approach Delay	21.6		28.6			6.1	
Approach LOS	C		C			A	
Queue Length 50th (ft)	36	0	402		11	76	
Queue Length 95th (ft)	77	46	#774		58	145	
Internal Link Dist (ft)	406		1469			65	
Turn Bay Length (ft)					100		
Base Capacity (vph)	1156	1078	1158		244	1433	
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.07	0.12	0.92		0.50	0.43	

Intersection Summary

Area Type: Other
Cycle Length: 128.5
Actuated Cycle Length: 77.3
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 19.6 Intersection LOS: B
Intersection Capacity Utilization 73.9% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Northampton St & Site Driveway



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	74	117	913	71	111	570
Future Volume (vph)	74	117	913	71	111	570
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5		4.5	4.5
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1583	1845		1770	1863
Flt Permitted	0.95	1.00	1.00		0.08	1.00
Satd. Flow (perm)	1770	1583	1845		141	1863
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	80	127	992	77	121	620
RTOR Reduction (vph)	0	113	1	0	0	0
Lane Group Flow (vph)	80	14	1068	0	121	620
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Actuated Green, G (s)	8.8	8.8	48.5		59.5	59.5
Effective Green, g (s)	8.8	8.8	48.5		59.5	59.5
Actuated g/C Ratio	0.11	0.11	0.63		0.77	0.77
Clearance Time (s)	4.5	4.5	4.5		4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	201	180	1157		245	1434
v/s Ratio Prot	c0.05		c0.58		0.04	c0.33
v/s Ratio Perm		0.01			0.34	
v/c Ratio	0.40	0.08	0.92		0.49	0.43
Uniform Delay, d1	31.8	30.6	12.7		16.1	3.1
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.3	0.2	13.4		1.6	1.0
Delay (s)	33.1	30.8	26.2		17.7	4.0
Level of Service	C	C	C		B	A
Approach Delay (s)	31.7		26.2			6.3
Approach LOS	C		C			A

Intersection Summary			
HCM 2000 Control Delay	19.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	77.3	Sum of lost time (s)	18.0
Intersection Capacity Utilization	73.9%	ICU Level of Service	D
Analysis Period (min)	15		

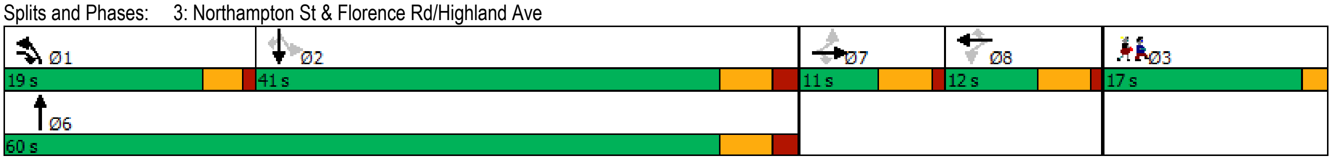
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3
Lane Configurations													
Traffic Volume (vph)	77	8	377	28	8	4	307	499	14	13	716	40	
Future Volume (vph)	77	8	377	28	8	4	307	499	14	13	716	40	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		80	0		5	150		0	0		75	
Storage Lanes	0		1	0		1	1		0	0		1	
Taper Length (ft)	25			25			25			25			
Satd. Flow (prot)	0	1696	1583	0	1828	1615	1770	1874	0	0	1862	1615	
Flt Permitted		0.624			0.712		0.950				0.986		
Satd. Flow (perm)	0	1106	1583	0	1353	1615	1770	1874	0	0	1837	1615	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			385			153		2				142	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1171			1559			1083			1048		
Travel Time (s)		26.6			35.4			24.6			23.8		
Peak Hour Factor	0.93	0.93	0.93	0.65	0.65	0.65	0.88	0.88	0.88	0.95	0.95	0.95	
Heavy Vehicles (%)	8%	0%	2%	0%	0%	0%	2%	1%	0%	0%	2%	0%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	92	405	0	55	6	349	583	0	0	768	42	
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm	
Protected Phases		7	1		8		1	6			2		3
Permitted Phases	7		7	8		8				2		2	
Total Split (s)	11.0	11.0	19.0	12.0	12.0	12.0	19.0	60.0		41.0	41.0	41.0	17.0
Total Lost Time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0	
Act Effct Green (s)		6.1	23.2		7.1	7.1	15.2	54.6			35.4	35.4	
Actuated g/C Ratio		0.07	0.28		0.08	0.08	0.18	0.65			0.42	0.42	
v/c Ratio		1.16	0.57		0.48	0.02	1.09	0.48			0.99	0.06	
Control Delay		191.9	5.8		55.4	0.2	114.1	10.9			58.1	0.1	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	0.0	
Total Delay		191.9	5.8		55.4	0.2	114.1	10.9			58.1	0.1	
LOS		F	A		E	A	F	B			E	A	
Approach Delay		40.2			49.9			49.5			55.1		
Approach LOS		D			D			D			E		
Queue Length 50th (ft)		~57	6		28	0	~208	135			385	0	
Queue Length 95th (ft)		#180	48		53	0	#449	326			#822	0	
Internal Link Dist (ft)		1091			1479			1003			968		
Turn Bay Length (ft)			80			5	150					75	
Base Capacity (vph)		79	715		114	276	319	1219			774	763	
Starvation Cap Reductn		0	0		0	0	0	0			0	0	
Spillback Cap Reductn		0	0		0	0	0	0			0	0	
Storage Cap Reductn		0	0		0	0	0	0			0	0	
Reduced v/c Ratio		1.16	0.57		0.48	0.02	1.09	0.48			0.99	0.06	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 84
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.16
Intersection Signal Delay: 49.5 Intersection LOS: D
Intersection Capacity Utilization 91.0% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Northampton St & Florence Rd/Highland Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	8	377	28	8	4	307	499	14	13	716	40
Future Volume (vph)	77	8	377	28	8	4	307	499	14	13	716	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)		1696	1583		1829	1615	1770	1874			1862	1615
Flt Permitted		0.62	1.00		0.71	1.00	0.95	1.00			0.99	1.00
Satd. Flow (perm)		1105	1583		1353	1615	1770	1874			1838	1615
Peak-hour factor, PHF	0.93	0.93	0.93	0.65	0.65	0.65	0.88	0.88	0.88	0.95	0.95	0.95
Adj. Flow (vph)	83	9	405	43	12	6	349	567	16	14	754	42
RTOR Reduction (vph)	0	0	290	0	0	6	0	1	0	0	0	25
Lane Group Flow (vph)	0	92	115	0	55	0	349	582	0	0	768	17
Heavy Vehicles (%)	8%	0%	2%	0%	0%	0%	2%	1%	0%	0%	2%	0%
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm
Protected Phases		7	1		8		1	6			2	
Permitted Phases	7		7	8		8				2		2
Actuated Green, G (s)		6.1	21.3		5.4	5.4	15.2	54.6			35.4	35.4
Effective Green, g (s)		6.1	21.3		5.4	5.4	15.2	54.6			35.4	35.4
Actuated g/C Ratio		0.07	0.25		0.06	0.06	0.18	0.63			0.41	0.41
Clearance Time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	5.0			5.0	5.0
Lane Grp Cap (vph)		77	389		84	100	310	1181			751	660
v/s Ratio Prot			0.05				c0.20	0.31				
v/s Ratio Perm		c0.08	0.02		c0.04	0.00					c0.42	0.01
v/c Ratio		1.19	0.29		0.65	0.00	1.13	0.49			1.02	0.03
Uniform Delay, d1		40.2	26.5		39.7	38.1	35.7	8.6			25.6	15.3
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2		164.2	0.4		16.9	0.0	89.5	1.5			38.7	0.1
Delay (s)		204.5	27.0		56.6	38.1	125.2	10.1			64.3	15.4
Level of Service		F	C		E	D	F	B			E	B
Approach Delay (s)		59.8			54.7			53.2			61.8	
Approach LOS		E			D			D			E	

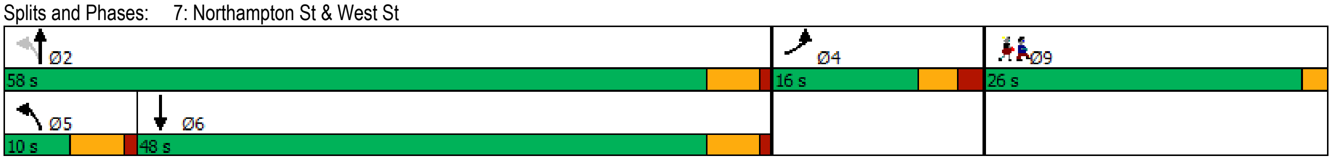
Intersection Summary			
HCM 2000 Control Delay	57.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	86.6	Sum of lost time (s)	22.0
Intersection Capacity Utilization	91.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	Ø9
Lane Configurations							
Traffic Volume (vph)	111	69	88	711	866	242	
Future Volume (vph)	111	69	88	711	866	242	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0	0	100			0	
Storage Lanes	1	0	1			0	
Taper Length (ft)	25		25				
Satd. Flow (prot)	1643	0	1787	1881	1827	0	
Flt Permitted	0.970		0.079				
Satd. Flow (perm)	1643	0	149	1881	1827	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)	25				18		
Link Speed (mph)	30			30	30		
Link Distance (ft)	900			913	1549		
Travel Time (s)	20.5			20.8	35.2		
Peak Hour Factor	0.83	0.83	0.90	0.90	0.96	0.96	
Heavy Vehicles (%)	9%	2%	1%	1%	1%	1%	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	217	0	98	790	1154	0	
Turn Type	Prot		pm+pt	NA	NA		
Protected Phases	4		5	2	6		9
Permitted Phases			2				
Total Split (s)	16.0		10.0	58.0	48.0		26.0
Total Lost Time (s)	5.0		5.0	5.0	5.0		
Act Effct Green (s)	11.1		53.7	53.7	45.7		
Actuated g/C Ratio	0.14		0.68	0.68	0.58		
v/c Ratio	0.85		0.47	0.61	1.08		
Control Delay	61.3		15.5	11.1	70.7		
Queue Delay	0.0		0.0	0.0	0.0		
Total Delay	61.3		15.5	11.1	70.7		
LOS	E		B	B	E		
Approach Delay	61.3			11.6	70.7		
Approach LOS	E			B	E		
Queue Length 50th (ft)	86		11	142	~601		
Queue Length 95th (ft)	#238		#69	499	#1183		
Internal Link Dist (ft)	820			833	1469		
Turn Bay Length (ft)			100				
Base Capacity (vph)	254		207	1289	1073		
Starvation Cap Reductn	0		0	0	0		
Spillback Cap Reductn	0		0	0	0		
Storage Cap Reductn	0		0	0	0		
Reduced v/c Ratio	0.85		0.47	0.61	1.08		

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 78.4
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.08
Intersection Signal Delay: 46.6 — Intersection LOS: D
Intersection Capacity Utilization 88.0% — ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7: Northampton St & West St



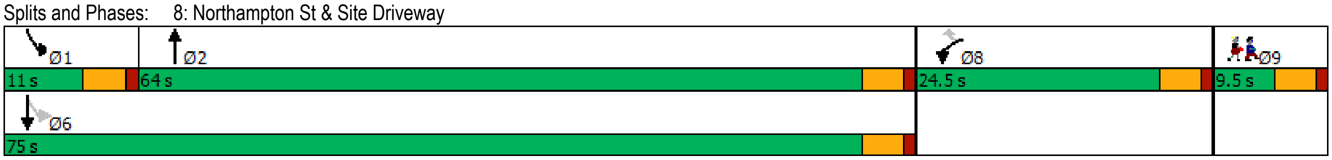
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	111	69	88	711	866	242
Future Volume (vph)	111	69	88	711	866	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frt	0.95		1.00	1.00	0.97	
Flt Protected	0.97		0.95	1.00	1.00	
Satd. Flow (prot)	1644		1787	1881	1826	
Flt Permitted	0.97		0.08	1.00	1.00	
Satd. Flow (perm)	1644		148	1881	1826	
Peak-hour factor, PHF	0.83	0.83	0.90	0.90	0.96	0.96
Adj. Flow (vph)	134	83	98	790	902	252
RTOR Reduction (vph)	22	0	0	0	8	0
Lane Group Flow (vph)	195	0	98	790	1146	0
Heavy Vehicles (%)	9%	2%	1%	1%	1%	1%
Turn Type	Prot		pm+pt	NA	NA	
Protected Phases	4		5	2	6	
Permitted Phases			2			
Actuated Green, G (s)	11.1		54.7	54.7	45.7	
Effective Green, g (s)	11.1		54.7	54.7	45.7	
Actuated g/C Ratio	0.14		0.68	0.68	0.56	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	225		181	1271	1031	
v/s Ratio Prot	c0.12		0.03	c0.42	c0.63	
v/s Ratio Perm			0.34			
v/c Ratio	0.87		0.54	0.62	1.11	
Uniform Delay, d1	34.2		18.7	7.3	17.6	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	27.9		3.3	1.0	63.9	
Delay (s)	62.1		22.0	8.3	81.5	
Level of Service	E		C	A	F	
Approach Delay (s)	62.1			9.8	81.5	
Approach LOS	E			A	F	

Intersection Summary			
HCM 2000 Control Delay	51.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	80.9	Sum of lost time (s)	17.0
Intersection Capacity Utilization	88.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø9
Lane Configurations							
Traffic Volume (vph)	96	150	726	109	170	951	
Future Volume (vph)	96	150	726	109	170	951	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0	0		0	100		
Storage Lanes	1	1		0	1		
Taper Length (ft)	25				25		
Satd. Flow (prot)	1770	1583	1829	0	1770	1863	
Flt Permitted	0.950				0.169		
Satd. Flow (perm)	1770	1583	1829	0	315	1863	
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		163	11				
Link Speed (mph)	30		30			30	
Link Distance (ft)	486		1549			145	
Travel Time (s)	11.0		35.2			3.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	104	163	907	0	185	1034	
Turn Type	Prot	Perm	NA		pm+pt	NA	
Protected Phases	8		2		1	6	9
Permitted Phases		8			6		
Total Split (s)	24.5	24.5	64.0		11.0	75.0	9.5
Total Lost Time (s)	4.5	4.5	4.5		4.5	4.5	
Act Effct Green (s)	10.6	10.6	59.6		70.6	70.6	
Actuated g/C Ratio	0.12	0.12	0.66		0.78	0.78	
v/c Ratio	0.50	0.50	0.75		0.53	0.71	
Control Delay	45.7	11.6	15.7		8.3	8.7	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	45.7	11.6	15.7		8.3	8.7	
LOS	D	B	B		A	A	
Approach Delay	24.9		15.7			8.7	
Approach LOS	C		B			A	
Queue Length 50th (ft)	56	0	304		19	220	
Queue Length 95th (ft)	107	55	535		43	441	
Internal Link Dist (ft)	406		1469			65	
Turn Bay Length (ft)					100		
Base Capacity (vph)	393	478	1211		351	1458	
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.26	0.34	0.75		0.53	0.71	

Intersection Summary	
Area Type: Other	
Cycle Length: 109	
Actuated Cycle Length: 90.2	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.75	
Intersection Signal Delay: 13.1	Intersection LOS: B
Intersection Capacity Utilization 70.8%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 8: Northampton St & Site Driveway



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	96	150	726	109	170	951
Future Volume (vph)	96	150	726	109	170	951
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5		4.5	4.5
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.98		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1583	1830		1770	1863
Flt Permitted	0.95	1.00	1.00		0.17	1.00
Satd. Flow (perm)	1770	1583	1830		315	1863
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	104	163	789	118	185	1034
RTOR Reduction (vph)	0	144	4	0	0	0
Lane Group Flow (vph)	104	19	903	0	185	1034
Turn Type	Prot	Perm	NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Actuated Green, G (s)	10.6	10.6	59.6		70.6	70.6
Effective Green, g (s)	10.6	10.6	59.6		70.6	70.6
Actuated g/C Ratio	0.12	0.12	0.66		0.78	0.78
Clearance Time (s)	4.5	4.5	4.5		4.5	4.5
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	208	186	1209		351	1458
v/s Ratio Prot	c0.06		c0.49		0.04	c0.56
v/s Ratio Perm		0.01			0.37	
v/c Ratio	0.50	0.10	0.75		0.53	0.71
Uniform Delay, d1	37.3	35.6	10.3		10.1	4.8
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.9	0.2	4.2		1.4	2.9
Delay (s)	39.2	35.8	14.5		11.5	7.7
Level of Service	D	D	B		B	A
Approach Delay (s)	37.1		14.5			8.3
Approach LOS	D		B			A

Intersection Summary			
HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.2	Sum of lost time (s)	18.0
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		

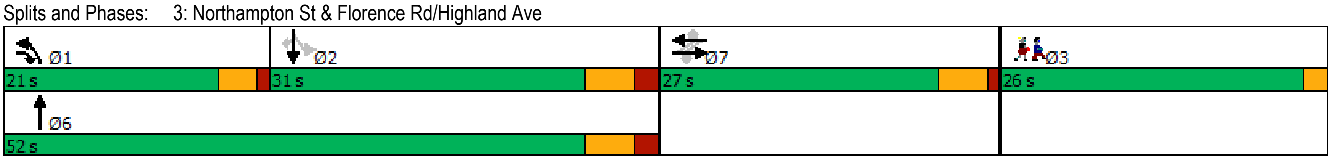
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3
Lane Configurations													
Traffic Volume (vph)	88	1	298	10	2	4	295	671	4	5	373	25	
Future Volume (vph)	88	1	298	10	2	4	295	671	4	5	373	25	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		80	0		5	150		0	0		75	
Storage Lanes	0		1	0		1	1		0	0		1	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt			0.850			0.850		0.999				0.850	
Flt Protected		0.953			0.960		0.950				0.999		
Satd. Flow (prot)	0	1648	1599	0	1824	1615	1752	1879	0	0	1861	1429	
Flt Permitted		0.711			0.724		0.950				0.989		
Satd. Flow (perm)	0	1229	1599	0	1376	1615	1752	1879	0	0	1843	1429	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			351			94						83	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1171			1559			1081			1048		
Travel Time (s)		26.6			35.4			24.6			23.8		
Lane Group Flow (vph)	0	105	351	0	23	7	321	733	0	0	430	28	
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm	
Protected Phases		7	1		7		1	6			2		3
Permitted Phases	7		7	7		7				2		2	
Total Split (s)	27.0	27.0	21.0	27.0	27.0	27.0	21.0	52.0		31.0	31.0	31.0	26.0
Total Lost Time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0	
Act Effct Green (s)		11.4	30.4		11.4	11.4	17.6	49.2			25.9	25.9	
Actuated g/C Ratio		0.16	0.44		0.16	0.16	0.25	0.70			0.37	0.37	
v/c Ratio		0.53	0.39		0.10	0.02	0.73	0.55			0.63	0.05	
Control Delay		39.0	2.6		28.2	0.0	39.2	11.7			27.1	0.2	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	0.0	
Total Delay		39.0	2.6		28.2	0.0	39.2	11.7			27.1	0.2	
LOS		D	A		C	A	D	B			C	A	
Approach Delay		11.0			21.7			20.1			25.5		
Approach LOS		B			C			C			C		
Queue Length 50th (ft)		41	0		8	0	123	134			144	0	
Queue Length 95th (ft)		99	24		19	0	#363	499			#391	0	
Internal Link Dist (ft)		1091			1479			1001			968		
Turn Bay Length (ft)			80			5	150					75	
Base Capacity (vph)		400	895		448	589	441	1324			683	581	
Starvation Cap Reductn		0	0		0	0	0	0			0	0	
Spillback Cap Reductn		0	0		0	0	0	0			0	0	
Storage Cap Reductn		0	0		0	0	0	0			0	0	
Reduced v/c Ratio		0.26	0.39		0.05	0.01	0.73	0.55			0.63	0.05	

Intersection Summary

Area Type: Other
Cycle Length: 105
Actuated Cycle Length: 69.8
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 19.3 Intersection LOS: B
Intersection Capacity Utilization 81.2% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Northampton St & Florence Rd/Highland Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	88	1	298	10	2	4	295	671	4	5	373	25
Future Volume (vph)	88	1	298	10	2	4	295	671	4	5	373	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)		1647	1599		1825	1615	1752	1880			1862	1429
Flt Permitted		0.71	1.00		0.72	1.00	0.95	1.00			0.99	1.00
Satd. Flow (perm)		1230	1599		1376	1615	1752	1880			1842	1429
Peak-hour factor, PHF	0.85	0.85	0.85	0.54	0.54	0.54	0.92	0.92	0.92	0.88	0.88	0.88
Adj. Flow (vph)	104	1	351	19	4	7	321	729	4	6	424	28
RTOR Reduction (vph)	0	0	219	0	0	6	0	0	0	0	0	18
Lane Group Flow (vph)	0	105	132	0	23	1	321	733	0	0	430	10
Heavy Vehicles (%)	10%	0%	1%	0%	0%	0%	3%	1%	0%	0%	2%	13%
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm
Protected Phases		7	1		7		1	6			2	
Permitted Phases	7		7	7		7				2		2
Actuated Green, G (s)		9.6	27.2		9.6	9.6	17.6	47.6			26.0	26.0
Effective Green, g (s)		9.6	27.2		9.6	9.6	17.6	47.6			26.0	26.0
Actuated g/C Ratio		0.13	0.38		0.13	0.13	0.24	0.66			0.36	0.36
Clearance Time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	5.0			5.0	5.0
Lane Grp Cap (vph)		162	599		182	213	425	1234			660	512
v/s Ratio Prot			0.05				c0.18	c0.39				
v/s Ratio Perm		c0.09	0.03		0.02	0.00					0.23	0.01
v/c Ratio		0.65	0.22		0.13	0.00	0.76	0.59			0.65	0.02
Uniform Delay, d1		29.8	15.4		27.7	27.3	25.5	7.0			19.5	15.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2		8.6	0.2		0.3	0.0	7.5	2.1			4.9	0.1
Delay (s)		38.5	15.6		28.1	27.3	32.9	9.1			24.4	15.1
Level of Service		D	B		C	C	C	A			C	B
Approach Delay (s)		20.9			27.9			16.4			23.8	
Approach LOS		C			C			B			C	

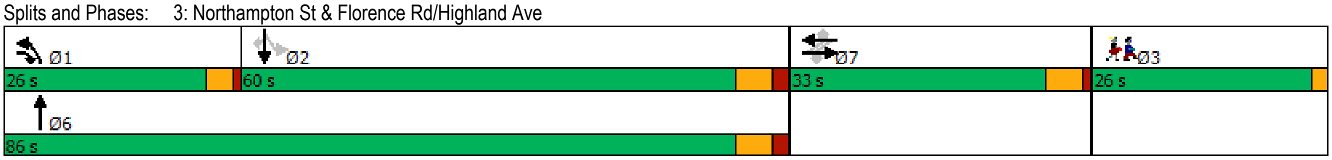
Intersection Summary			
HCM 2000 Control Delay	19.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	72.5	Sum of lost time (s)	17.0
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø3
Lane Configurations													
Traffic Volume (vph)	77	8	377	28	8	4	307	499	14	13	716	40	
Future Volume (vph)	77	8	377	28	8	4	307	499	14	13	716	40	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		80	0		5	150		0	0		75	
Storage Lanes	0		1	0		1	1		0	0		1	
Taper Length (ft)	25			25			25			25			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt			0.850			0.850		0.996				0.850	
Flt Protected		0.956			0.963		0.950				0.999		
Satd. Flow (prot)	0	1693	1583	0	1830	1615	1770	1874	0	0	1862	1615	
Flt Permitted		0.697			0.676		0.950				0.987		
Satd. Flow (perm)	0	1234	1583	0	1284	1615	1770	1874	0	0	1839	1615	
Right Turn on Red			Yes			Yes			Yes			Yes	
Satd. Flow (RTOR)			376			68		2				60	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1171			1559			1081			1048		
Travel Time (s)		26.6			35.4			24.6			23.8		
Lane Group Flow (vph)	0	100	444	0	67	7	334	557	0	0	829	45	
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm	
Protected Phases		7	1		7		1	6			2		3
Permitted Phases	7		7	7		7				2		2	
Total Split (s)	33.0	33.0	26.0	33.0	33.0	33.0	26.0	86.0		60.0	60.0	60.0	26.0
Total Lost Time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0	
Act Effct Green (s)		14.1	40.7		14.1	14.1	22.2	80.8			54.5	54.5	
Actuated g/C Ratio		0.13	0.37		0.13	0.13	0.20	0.74			0.50	0.50	
v/c Ratio		0.63	0.54		0.40	0.03	0.93	0.40			0.90	0.05	
Control Delay		63.2	6.5		51.7	0.2	76.1	7.8			40.5	3.5	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0			0.0	0.0	
Total Delay		63.2	6.5		51.7	0.2	76.1	7.8			40.5	3.5	
LOS		E	A		D	A	E	A			D	A	
Approach Delay		16.9			46.9			33.4			38.6		
Approach LOS		B			D			C			D		
Queue Length 50th (ft)		64	29		42	0	219	103			469	0	
Queue Length 95th (ft)		128	71		56	0	#516	332			#998	15	
Internal Link Dist (ft)		1091			1479			1001			968		
Turn Bay Length (ft)			80			5	150					75	
Base Capacity (vph)		320	827		333	470	361	1391			921	839	
Starvation Cap Reductn		0	0		0	0	0	0			0	0	
Spillback Cap Reductn		0	0		0	0	0	0			0	0	
Storage Cap Reductn		0	0		0	0	0	0			0	0	
Reduced v/c Ratio		0.31	0.54		0.20	0.01	0.93	0.40			0.90	0.05	

Intersection Summary

Area Type: Other
Cycle Length: 145
Actuated Cycle Length: 108.8
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 31.9 Intersection LOS: C
Intersection Capacity Utilization 91.0% ICU Level of Service F
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Northampton St & Florence Rd/Highland Ave



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	77	8	377	28	8	4	307	499	14	13	716	40
Future Volume (vph)	77	8	377	28	8	4	307	499	14	13	716	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00			1.00	0.85
Flt Protected		0.96	1.00		0.96	1.00	0.95	1.00			1.00	1.00
Satd. Flow (prot)		1694	1583		1829	1615	1770	1874			1862	1615
Flt Permitted		0.70	1.00		0.68	1.00	0.95	1.00			0.99	1.00
Satd. Flow (perm)		1235	1583		1283	1615	1770	1874			1839	1615
Peak-hour factor, PHF	0.85	0.85	0.85	0.54	0.54	0.54	0.92	0.92	0.92	0.88	0.88	0.88
Adj. Flow (vph)	91	9	444	52	15	7	334	542	15	15	814	45
RTOR Reduction (vph)	0	0	252	0	0	6	0	1	0	0	0	23
Lane Group Flow (vph)	0	100	192	0	67	1	334	556	0	0	829	22
Heavy Vehicles (%)	8%	0%	2%	0%	0%	0%	2%	1%	0%	0%	2%	0%
Turn Type	Perm	NA	pm+ov	Perm	NA	Perm	Prot	NA		Perm	NA	Perm
Protected Phases		7	1		7		1	6			2	
Permitted Phases	7		7	7		7				2		2
Actuated Green, G (s)		14.1	36.3		14.1	14.1	22.2	80.7			54.5	54.5
Effective Green, g (s)		14.1	36.3		14.1	14.1	22.2	80.7			54.5	54.5
Actuated g/C Ratio		0.13	0.33		0.13	0.13	0.20	0.73			0.49	0.49
Clearance Time (s)		5.0	4.0		5.0	5.0	4.0	6.0			6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	5.0			5.0	5.0
Lane Grp Cap (vph)		157	520		164	206	356	1371			908	797
v/s Ratio Prot			0.07				c0.19	0.30				
v/s Ratio Perm		c0.08	0.05		0.05	0.00					c0.45	0.01
v/c Ratio		0.64	0.37		0.41	0.00	0.94	0.41			0.91	0.03
Uniform Delay, d1		45.7	28.3		44.3	42.0	43.4	5.6			25.7	14.3
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00
Incremental Delay, d2		8.2	0.4		1.7	0.0	31.8	0.9			15.0	0.1
Delay (s)		53.9	28.7		45.9	42.0	75.2	6.5			40.7	14.4
Level of Service		D	C		D	D	E	A			D	B
Approach Delay (s)		33.3			45.5			32.3			39.4	
Approach LOS		C			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	35.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	110.3	Sum of lost time (s)	17.0
Intersection Capacity Utilization	91.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

MOVEMENT SUMMARY

Site: 1A [3 Leg Roundabout Alt_AM (Site Folder: Northampton St at Site Driveway Alts)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: Northampton St (Rte 10)															
8	T1	All MCs	992	2.6	992	2.6	0.922	26.2	LOS D	39.9	1018.3	1.00	1.09	1.54	20.5
18	R2	All MCs	77	2.6	77	2.6	0.922	26.2	LOS D	39.9	1018.3	1.00	1.09	1.54	16.0
Approach			1070	2.6	1070	2.6	0.922	26.2	LOS D	39.9	1018.3	1.00	1.09	1.54	20.2
East: Site Driveway															
1	L2	All MCs	80	2.0	80	2.0	0.719	41.5	LOS E	4.6	116.5	0.93	1.16	1.48	15.5
16	R2	All MCs	127	2.0	127	2.0	0.719	41.5	LOS E	4.6	116.5	0.93	1.16	1.48	13.4
Approach			208	2.0	208	2.0	0.719	41.5	LOS E	4.6	116.5	0.93	1.16	1.48	14.2
North: Northampton St (Rte 10)															
7	L2	All MCs	121	1.0	121	1.0	0.605	9.8	LOS A	6.9	173.7	0.55	0.22	0.55	18.2
4	T1	All MCs	620	1.0	620	1.0	0.605	9.8	LOS A	6.9	173.7	0.55	0.22	0.55	26.1
Approach			740	1.0	740	1.0	0.605	9.8	LOS A	6.9	173.7	0.55	0.22	0.55	25.1
All Vehicles			2017	2.0	2017	2.0	0.922	21.8	LOS C	39.9	1018.3	0.83	0.78	1.17	21.2

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6 Extended.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Extended Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 1B [3 Leg Roundabout Alt_PM (Site Folder: Northampton St at Site Driveway Alts)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: Northampton St (Rte 10)															
8	T1	All MCs	781	0.5	781	0.5	0.831	20.0	LOS C	24.2	607.7	1.00	1.05	1.56	22.0
18	R2	All MCs	117	0.5	117	0.5	0.831	20.0	LOS C	24.2	607.7	1.00	1.05	1.56	17.4
Approach			898	0.5	898	0.5	0.831	20.0	LOS C	24.2	607.7	1.00	1.05	1.56	21.5
East: Site Driveway															
1	L2	All MCs	104	2.0	104	2.0	0.612	23.1	LOS C	4.3	108.3	0.91	1.04	1.33	20.0
16	R2	All MCs	163	2.0	163	2.0	0.612	23.1	LOS C	4.3	108.3	0.91	1.04	1.33	17.7
Approach			267	2.0	267	2.0	0.612	23.1	LOS C	4.3	108.3	0.91	1.04	1.33	18.7
North: Northampton St (Rte 10)															
7	L2	All MCs	185	1.4	185	1.4	1.031	43.8	LOS F	77.4	1956.7	1.00	1.71	1.94	11.3
4	T1	All MCs	1034	1.4	1034	1.4	1.031	43.8	LOS F	77.4	1956.7	1.00	1.71	1.94	18.0
Approach			1218	1.4	1218	1.4	1.031	43.8	LOS E	77.4	1956.7	1.00	1.71	1.94	17.1
All Vehicles			2384	1.1	2384	1.1	1.031	32.5	LOS D	77.4	1956.7	0.99	1.39	1.73	18.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6 Extended.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Extended Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Project: J:\22\22223 - 95 Northampton St Easthampton\Project\Analysis\SIDRA\Proposed Roundabout Alts Analysis_05302023.sip9

MOVEMENT SUMMARY

Site: 1C [4 Leg Roundabout Alt_AM (Site Folder: Northampton St at Site Driveway Alts)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: Northampton St (Rte 10)															
3	L2	All MCs	1	2.6	1	2.6	0.925	26.7	LOS D	41.2	1051.1	1.00	1.15	1.59	13.6
8	T1	All MCs	992	2.6	992	2.6	0.925	26.7	LOS D	41.2	1051.1	1.00	1.15	1.59	20.4
18	R2	All MCs	77	2.6	77	2.6	0.925	26.7	LOS D	41.2	1051.1	1.00	1.15	1.59	16.0
Approach			1071	2.6	1071	2.6	0.925	26.7	LOS D	41.2	1051.1	1.00	1.15	1.59	20.2
East: Site Driveway															
1	L2	All MCs	80	2.0	80	2.0	0.725	42.3	LOS E	4.7	118.2	0.93	1.17	1.49	15.5
6	T1	All MCs	1	2.0	1	2.0	0.725	42.3	LOS E	4.7	118.2	0.93	1.17	1.49	4.5
16	R2	All MCs	127	2.0	127	2.0	0.725	42.3	LOS E	4.7	118.2	0.93	1.17	1.49	13.3
Approach			209	2.0	209	2.0	0.725	42.3	LOS E	4.7	118.2	0.93	1.17	1.49	14.2
North: Northampton St (Rte 10)															
7	L2	All MCs	121	1.0	121	1.0	0.608	9.9	LOS A	6.9	174.0	0.55	0.23	0.55	18.1
4	T1	All MCs	620	1.0	620	1.0	0.608	9.9	LOS A	6.9	174.0	0.55	0.23	0.55	26.2
14	R2	All MCs	1	1.0	1	1.0	0.608	9.9	LOS A	6.9	174.0	0.55	0.23	0.55	18.3
Approach			741	1.0	741	1.0	0.608	9.9	LOS A	6.9	174.0	0.55	0.23	0.55	25.1
West: Mountainview Drive															
5	L2	All MCs	1	2.0	1	2.0	0.007	7.5	LOS A	0.0	0.7	0.67	0.52	0.67	24.9
2	T1	All MCs	1	2.0	1	2.0	0.007	7.5	LOS A	0.0	0.7	0.67	0.52	0.67	11.5
12	R2	All MCs	1	2.0	1	2.0	0.007	7.5	LOS A	0.0	0.7	0.67	0.52	0.67	27.7
Approach			3	2.0	3	2.0	0.007	7.5	LOS A	0.0	0.7	0.67	0.52	0.67	22.7
All Vehicles			2024	2.0	2024	2.0	0.925	22.1	LOS C	41.2	1051.1	0.83	0.81	1.20	21.1

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6 Extended.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Extended Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 1D [4 Leg Roundabout Alt_PM (Site Folder: Northampton St at Site Driveway Alts)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: Northampton St (Rte 10)															
3	L2	All MCs	1	0.5	1	0.5	0.842	21.1	LOS C	25.6	641.8	1.00	1.16	1.67	14.4
8	T1	All MCs	781	0.5	781	0.5	0.842	21.1	LOS C	25.6	641.8	1.00	1.16	1.67	21.8
18	R2	All MCs	117	0.5	117	0.5	0.842	21.1	LOS C	25.6	641.8	1.00	1.16	1.67	17.2
Approach			899	0.5	899	0.5	0.842	21.1	LOS C	25.6	641.8	1.00	1.16	1.67	21.3
East: Site Driveway															
1	L2	All MCs	104	2.0	104	2.0	0.625	24.1	LOS C	4.4	111.3	0.91	1.06	1.36	19.8
6	T1	All MCs	1	2.0	1	2.0	0.625	24.1	LOS C	4.4	111.3	0.91	1.06	1.36	6.0
16	R2	All MCs	163	2.0	163	2.0	0.625	24.1	LOS C	4.4	111.3	0.91	1.06	1.36	17.6
Approach			268	2.0	268	2.0	0.625	24.1	LOS C	4.4	111.3	0.91	1.06	1.36	18.5
North: Northampton St (Rte 10)															
7	L2	All MCs	185	1.4	185	1.4	1.034	44.9	LOS F	78.5	1983.9	1.00	1.78	2.01	11.2
4	T1	All MCs	1034	1.4	1034	1.4	1.034	44.9	LOS F	78.5	1983.9	1.00	1.78	2.01	17.9
14	R2	All MCs	1	1.4	1	1.4	1.034	44.9	LOS F	78.5	1983.9	1.00	1.78	2.01	11.3
Approach			1220	1.4	1220	1.4	1.034	44.9	LOS E	78.5	1983.9	1.00	1.78	2.01	17.0
West: Existing Lot Dwy															
5	L2	All MCs	12	2.0	12	2.0	0.079	20.7	LOS C	0.3	7.6	0.86	0.86	0.86	18.4
2	T1	All MCs	1	2.0	1	2.0	0.079	20.7	LOS C	0.3	7.6	0.86	0.86	0.86	8.0
12	R2	All MCs	2	2.0	2	2.0	0.079	20.7	LOS C	0.3	7.6	0.86	0.86	0.86	21.1
Approach			15	2.0	15	2.0	0.079	20.7	LOS C	0.3	7.6	0.86	0.86	0.86	18.2
All Vehicles			2402	1.1	2402	1.1	1.034	33.5	LOS D	78.5	1983.9	0.99	1.46	1.80	18.6

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6 Extended.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Extended Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

QUEUE ANALYSIS

Site: 1A [3 Leg Roundabout Alt_AM (Site Folder: Northampton St at Site Driveway Alts)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

New Site
Site Category: (None)
Roundabout

Lane Queues (Distance)

Lane Number	Contin. Lane	Deg. Satn v/c	Prog. Factor (Queue)	Overflow Queue (ft)	Back of Queue (ft) Av.	Back of Queue (ft) 95%	Queue at Start of Gap (ft) Av.	Queue at Start of Gap (ft) 95%	Cycle-Average Queue (ft) Av.	Cycle-Average Queue (ft) 95%	Queue Storage Ratio Av.	Queue Storage Ratio 95%	Prob. Block. %	Prob. SL Ov. %	Ov. Lane No.
South: Northampton St (Rte 10)															
Lane 1		0.922	1.000	114.1	409.7	1018.3	157.4	391.2	198.9	360.8	0.26	0.64	0.0	NA	NA
Approach		0.922			409.7	1018.3	157.4	391.2	198.9	360.8	0.26	0.64			
East: Site Driveway															
Lane 1		0.719	1.000	13.6	46.9	116.5	44.3	110.2	60.8	110.4	0.23	0.58	0.0	NA	NA
Approach		0.719			46.9	116.5	44.3	110.2	60.8	110.4	0.23	0.58			
North: Northampton St (Rte 10)															
Lane 1		0.605	1.000	0.0	69.9	173.7	31.9	79.3	50.6	91.9	0.06	0.14	0.0	NA	NA
Approach		0.605			69.9	173.7	31.9	79.3	50.6	91.9	0.06	0.14			
Intersection		0.922			409.7	1018.3	157.4	391.2	198.9	360.8	0.26	0.64			

Roundabout Capacity Model: US HCM 6 Extended.
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Extended Roundabout Capacity Model.
Short Lanes are not included in determining Queue Storage Ratios.

Lane Queues (Vehicles)

Lane Number	Contin. Lane	Deg. Satn v/c	Prog. Factor (Queue)	Overflow Queue (veh)	Back of Queue (veh) Av.	Back of Queue (veh) 95%	Queue at Start of Gap (veh) Av.	Queue at Start of Gap (veh) 95%	Cycle-Average Queue (veh) Av.	Cycle-Average Queue (veh) 95%	Queue Storage Ratio Av.	Queue Storage Ratio 95%	Prob. Block. %	Prob. SL Ov. %	Ov. Lane No.
South: Northampton St (Rte 10)															
Lane 1		0.922	1.000	4.5	16.1	39.9	6.2	15.3	7.8	14.1	0.26	0.64	0.0	NA	NA
Approach		0.922			16.1	39.9	6.2	15.3	7.8	14.1	0.26	0.64			
East: Site Driveway															
Lane 1		0.719	1.000	0.5	1.8	4.6	1.7	4.3	2.4	4.3	0.23	0.58	0.0	NA	NA
Approach		0.719			1.8	4.6	1.7	4.3	2.4	4.3	0.23	0.58			
North: Northampton St (Rte 10)															
Lane 1		0.605	1.000	0.0	2.8	6.9	1.3	3.1	2.0	3.6	0.06	0.14	0.0	NA	NA
Approach		0.605			2.8	6.9	1.3	3.1	2.0	3.6	0.06	0.14			
Intersection		0.922			16.1	39.9	6.2	15.3	7.8	14.1	0.26	0.64			

Roundabout Capacity Model: US HCM 6 Extended.
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Extended Roundabout Capacity Model.
Short Lanes are not included in determining Queue Storage Ratios.

Continuous Lane Performance

Lane Number	Deg. Satn v/c	Unint. Speed mph	Unint. Travel Delay sec	Hdwy sec	Spacing ft	Aver. Vehicle Length ft	Occup. Time sec	Space Time sec	Space Occup. Ratio %	Time Occup. Ratio %	Density veh/mi	Density pc/mi	LOS (Density Method)
There are no Continuous Lanes at this Site.													

QUEUE ANALYSIS

Site: 1B [3 Leg Roundabout Alt_PM (Site Folder: Northampton St at Site Driveway Alts)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

New Site
Site Category: (None)
Roundabout

Lane Queues (Distance)

Lane Number	Contin. Lane	Deg. Satn v/c	Prog. Factor (Queue)	Overflow Queue (ft)	Back of Queue (ft) Av.	Back of Queue (ft) 95%	Queue at Start of Gap (ft) Av.	Queue at Start of Gap (ft) 95%	Cycle-Average Queue (ft) Av.	Cycle-Average Queue (ft) 95%	Queue Storage Ratio Av.	Queue Storage Ratio 95%	Prob. Block. %	Prob. SL Ov. %	Ov. Lane No.
South: Northampton St (Rte 10)															
Lane 1		0.831	1.000	68.7	244.5	607.7	110.7	275.1	125.2	227.1	0.15	0.38	0.0	NA	NA
Approach		0.831			244.5	607.7	110.7	275.1	125.2	227.1	0.15	0.38			
East: Site Driveway															
Lane 1		0.612	1.000	10.5	43.6	108.3	37.9	94.2	43.6	79.0	0.22	0.54	0.0	NA	NA
Approach		0.612			43.6	108.3	37.9	94.2	43.6	79.0	0.22	0.54			
North: Northampton St (Rte 10)															
Lane 1		1.031	1.000	288.5	787.3	1956.7	341.7	849.2	374.4	679.2	0.66	1.63	22.1	NA	NA
Approach		1.031			787.3	1956.7	341.7	849.2	374.4	679.2	0.66	1.63			
Intersection		1.031			787.3	1956.7	341.7	849.2	374.4	679.2	0.66	1.63			

Roundabout Capacity Model: US HCM 6 Extended.
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Extended Roundabout Capacity Model.
Short Lanes are not included in determining Queue Storage Ratios.

Lane Queues (Vehicles)

Lane Number	Contin. Lane	Deg. Satn v/c	Prog. Factor (Queue)	Overflow Queue (veh)	Back of Queue (veh) Av.	Back of Queue (veh) 95%	Queue at Start of Gap (veh) Av.	Queue at Start of Gap (veh) 95%	Cycle-Average Queue (veh) Av.	Cycle-Average Queue (veh) 95%	Queue Storage Ratio Av.	Queue Storage Ratio 95%	Prob. Block. %	Prob. SL Ov. %	Ov. Lane No.
South: Northampton St (Rte 10)															
Lane 1		0.831	1.000	2.7	9.7	24.2	4.4	11.0	5.0	9.0	0.15	0.38	0.0	NA	NA
Approach		0.831			9.7	24.2	4.4	11.0	5.0	9.0	0.15	0.38			
East: Site Driveway															
Lane 1		0.612	1.000	0.4	1.7	4.3	1.5	3.7	1.7	3.1	0.22	0.54	0.0	NA	NA
Approach		0.612			1.7	4.3	1.5	3.7	1.7	3.1	0.22	0.54			
North: Northampton St (Rte 10)															
Lane 1		1.031	1.000	11.4	31.1	77.4	13.5	33.6	14.8	26.9	0.66	1.63	22.1	NA	NA
Approach		1.031			31.1	77.4	13.5	33.6	14.8	26.9	0.66	1.63			
Intersection		1.031			31.1	77.4	13.5	33.6	14.8	26.9	0.66	1.63			

Roundabout Capacity Model: US HCM 6 Extended.
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Extended Roundabout Capacity Model.
Short Lanes are not included in determining Queue Storage Ratios.

Continuous Lane Performance

Lane Number	Deg. Satn v/c	Unint. Speed mph	Unint. Travel Delay sec	Hdwy sec	Spacing ft	Aver. Vehicle Length ft	Occup. Time sec	Space Time sec	Space Occup. Ratio %	Time Occup. Ratio %	Density veh/mi	pc/mi	LOS (Density Method)
There are no Continuous Lanes at this Site.													

QUEUE ANALYSIS

Site: 1C [4 Leg Roundabout Alt_AM (Site Folder: Northampton St at Site Driveway Alts)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

New Site
Site Category: (None)
Roundabout

Lane Queues (Distance)

Lane Number	Contin. Lane	Deg. Satn v/c	Prog. Factor (Queue)	Overflow Queue (ft)	Back of Queue (ft) Av.	Back of Queue (ft) 95%	Queue at Start of Gap (ft) Av.	Queue at Start of Gap (ft) 95%	Cycle-Average Queue (ft) Av.	Cycle-Average Queue (ft) 95%	Queue Storage Ratio Av.	Queue Storage Ratio 95%	Prob. Block. %	Prob. SL Ov. %	Ov. Lane No.
South: Northampton St (Rte 10)															
Lane 1		0.925	1.000	122.0	422.9	1051.1	165.4	411.2	202.8	367.9	0.26	0.66	0.0	NA	NA
Approach		0.925			422.9	1051.1	165.4	411.2	202.8	367.9	0.26	0.66			
East: Site Driveway															
Lane 1		0.725	1.000	14.0	47.5	118.2	45.0	111.8	62.2	112.9	0.24	0.59	0.0	NA	NA
Approach		0.725			47.5	118.2	45.0	111.8	62.2	112.9	0.24	0.59			
North: Northampton St (Rte 10)															
Lane 1		0.608	1.000	0.0	70.0	174.0	31.9	79.3	51.1	92.7	0.06	0.15	0.0	NA	NA
Approach		0.608			70.0	174.0	31.9	79.3	51.1	92.7	0.06	0.15			
West: Mountainview Drive															
Lane 1		0.007	1.000	0.0	0.3	0.7	0.3	0.7	0.2	0.3	0.00	0.00	0.0	NA	NA
Approach		0.007			0.3	0.7	0.3	0.7	0.2	0.3	0.00	0.00			
Intersection		0.925			422.9	1051.1	165.4	411.2	202.8	367.9	0.26	0.66			

Roundabout Capacity Model: US HCM 6 Extended.
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Extended Roundabout Capacity Model.
Short Lanes are not included in determining Queue Storage Ratios.

Lane Queues (Vehicles)

Lane Number	Contin. Lane	Deg. Satn v/c	Prog. Factor (Queue)	Overflow Queue (veh)	Back of Queue (veh) Av.	Back of Queue (veh) 95%	Queue at Start of Gap (veh) Av.	Queue at Start of Gap (veh) 95%	Cycle-Average Queue (veh) Av.	Cycle-Average Queue (veh) 95%	Queue Storage Ratio Av.	Queue Storage Ratio 95%	Prob. Block. %	Prob. SL Ov. %	Ov. Lane No.
South: Northampton St (Rte 10)															
Lane 1		0.925	1.000	4.8	16.6	41.2	6.5	16.1	7.9	14.4	0.26	0.66	0.0	NA	NA
Approach		0.925			16.6	41.2	6.5	16.1	7.9	14.4	0.26	0.66			
East: Site Driveway															
Lane 1		0.725	1.000	0.5	1.9	4.7	1.8	4.4	2.4	4.4	0.24	0.59	0.0	NA	NA
Approach		0.725			1.9	4.7	1.8	4.4	2.4	4.4	0.24	0.59			
North: Northampton St (Rte 10)															
Lane 1		0.608	1.000	0.0	2.8	6.9	1.3	3.1	2.0	3.7	0.06	0.15	0.0	NA	NA
Approach		0.608			2.8	6.9	1.3	3.1	2.0	3.7	0.06	0.15			
West: Mountainview Drive															
Lane 1		0.007	1.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.0	NA	NA

Approach	0.007	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00
Intersection	0.925	16.6	41.2	6.5	16.1	7.9	14.4	0.26	0.66

Roundabout Capacity Model: US HCM 6 Extended.
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Extended Roundabout Capacity Model.
Short Lanes are not included in determining Queue Storage Ratios.

Continuous Lane Performance

Lane Number	Deg. Satn v/c	Unint. Speed mph	Unint. Travel Delay sec	Hdwy sec	Spacing ft	Aver. Vehicle Length ft	Occup. Time sec	Space Time sec	Space Occup. Ratio %	Time Occup. Ratio %	Density veh/mi	Density pc/mi	LOS (Density Method)
There are no Continuous Lanes at this Site.													

QUEUE ANALYSIS

Site: 1D [4 Leg Roundabout Alt_PM (Site Folder: Northampton St at Site Driveway Alts)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

New Site
Site Category: (None)
Roundabout

Lane Queues (Distance)

Lane Number	Contin. Lane	Deg. Satn	Prog. Factor (Queue)	Overflow Queue (ft)	Back of Queue (ft)		Queue at Start of Gap (ft)		Cycle-Average Queue (ft)		Queue Storage Ratio		Prob. Block.	Prob. SL Ov.	Ov. Lane No.
		v/c			Av.	95%	Av.	95%	Av.	95%	Av.	95%	%	%	
South: Northampton St (Rte 10)															
Lane 1		0.842	1.000	78.4	258.3	641.8	120.2	298.8	132.1	239.6	0.16	0.40	0.0	NA	NA
Approach		0.842			258.3	641.8	120.2	298.8	132.1	239.6	0.16	0.40			
East: Site Driveway															
Lane 1		0.625	1.000	11.2	44.8	111.3	39.0	97.0	45.7	82.9	0.22	0.56	0.0	NA	NA
Approach		0.625			44.8	111.3	39.0	97.0	45.7	82.9	0.22	0.56			
North: Northampton St (Rte 10)															
Lane 1		1.034	1.000	303.3	798.2	1983.9	356.6	886.2	384.2	696.9	0.67	1.65	22.7	NA	NA
Approach		1.034			798.2	1983.9	356.6	886.2	384.2	696.9	0.67	1.65			
West: Existing Lot Dwy															
Lane 1		0.079	1.000	0.0	3.1	7.6	3.0	7.6	2.2	4.0	0.02	0.04	0.0	NA	NA
Approach		0.079			3.1	7.6	3.0	7.6	2.2	4.0	0.02	0.04			
Intersection		1.034			798.2	1983.9	356.6	886.2	384.2	696.9	0.67	1.65			

Roundabout Capacity Model: US HCM 6 Extended.
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Extended Roundabout Capacity Model.
Short Lanes are not included in determining Queue Storage Ratios.

Lane Queues (Vehicles)

Lane Number	Contin. Lane	Deg. Satn	Prog. Factor (Queue)	Overflow Queue (veh)	Back of Queue (veh)		Queue at Start of Gap (veh)		Cycle-Average Queue (veh)		Queue Storage Ratio		Prob. Block.	Prob. SL Ov.	Ov. Lane No.
		v/c			Av.	95%	Av.	95%	Av.	95%	Av.	95%	%	%	
South: Northampton St (Rte 10)															
Lane 1		0.842	1.000	3.1	10.3	25.6	4.8	11.9	5.3	9.5	0.16	0.40	0.0	NA	NA
Approach		0.842			10.3	25.6	4.8	11.9	5.3	9.5	0.16	0.40			
East: Site Driveway															
Lane 1		0.625	1.000	0.4	1.8	4.4	1.5	3.8	1.8	3.3	0.22	0.56	0.0	NA	NA
Approach		0.625			1.8	4.4	1.5	3.8	1.8	3.3	0.22	0.56			
North: Northampton St (Rte 10)															
Lane 1		1.034	1.000	12.0	31.6	78.5	14.1	35.1	15.2	27.6	0.67	1.65	22.7	NA	NA
Approach		1.034			31.6	78.5	14.1	35.1	15.2	27.6	0.67	1.65			
West: Existing Lot Dwy															
Lane 1		0.079	1.000	0.0	0.1	0.3	0.1	0.3	0.1	0.2	0.02	0.04	0.0	NA	NA

Approach	0.079	0.1	0.3	0.1	0.3	0.1	0.2	0.02	0.04
Intersection	1.034	31.6	78.5	14.1	35.1	15.2	27.6	0.67	1.65

Roundabout Capacity Model: US HCM 6 Extended.
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Extended Roundabout Capacity Model.
Short Lanes are not included in determining Queue Storage Ratios.

Continuous Lane Performance

Lane Number	Deg. Satn v/c	Unint. Speed mph	Unint. Travel Delay sec	Hdwy sec	Spacing ft	Aver. Vehicle Length ft	Occup. Time sec	Space Time sec	Space Occup. Ratio %	Time Occup. Ratio %	Density veh/mi	pc/mi	LOS (Density Method)
There are no Continuous Lanes at this Site.													

ATTACHMENT 7 – DETAILED SIDRA ANALYSIS

MOVEMENT SUMMARY

Site: 1C [4 Leg - Peer Review Comment AM (Site Folder: Northampton St at Site Driveway Alts)]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: Northampton St (Rte 10)															
3	L2	All MCs	1	0.0	1	0.0	0.854	20.2	LOS C	25.9	658.8	1.00	0.90	1.40	14.9
8	T1	All MCs	899	2.2	899	2.2	0.854	20.4	LOS C	25.9	658.8	1.00	0.90	1.40	22.5
18	R2	All MCs	77	0.0	77	0.0	0.854	20.2	LOS C	25.9	658.8	1.00	0.90	1.40	18.0
Approach			977	2.0	977	2.0	0.854	20.4	LOS C	25.9	658.8	1.00	0.90	1.40	22.2
East: Site Driveway															
1	L2	All MCs	80	2.0	80	2.0	0.210	12.8	LOS B	0.9	23.7	0.79	0.76	0.79	23.5
6	T1	All MCs	1	0.0	1	0.0	0.210	11.9	LOS B	0.9	23.7	0.79	0.76	0.79	7.9
16	R2	All MCs	127	2.0	127	2.0	0.370	18.3	LOS C	1.9	47.2	0.84	0.88	0.97	20.8
Approach			209	2.0	209	2.0	0.370	16.1	LOS C	1.9	47.2	0.82	0.83	0.90	21.9
North: Northampton St (Rte 10)															
7	L2	All MCs	131	0.0	131	0.0	0.634	10.3	LOS B	7.4	186.5	0.57	0.23	0.57	17.7
4	T1	All MCs	640	2.0	640	2.0	0.634	10.5	LOS B	7.4	186.5	0.57	0.23	0.57	26.7
14	R2	All MCs	1	0.0	1	0.0	0.634	10.3	LOS B	7.4	186.5	0.57	0.23	0.57	17.9
Approach			772	1.7	772	1.7	0.634	10.4	LOS B	7.4	186.5	0.57	0.23	0.57	25.4
West: Mountainview Drive															
5	L2	All MCs	4	0.0	4	0.0	0.025	7.8	LOS A	0.1	2.6	0.69	0.61	0.69	25.7
2	T1	All MCs	4	0.0	4	0.0	0.025	7.8	LOS A	0.1	2.6	0.69	0.61	0.69	8.2
12	R2	All MCs	4	0.0	4	0.0	0.025	7.8	LOS A	0.1	2.6	0.69	0.61	0.69	28.2
Approach			12	0.0	12	0.0	0.025	7.8	LOS A	0.1	2.6	0.69	0.61	0.69	20.7
All Vehicles			1970	1.9	1970	1.9	0.854	16.0	LOS C	25.9	658.8	0.81	0.63	1.01	23.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6 Extended.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Extended Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

QUEUE ANALYSIS

Site: 1C [4 Leg - Peer Review Comment AM (Site Folder: Northampton St at Site Driveway Alts)]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

New Site
Site Category: (None)
Roundabout

Lane Queues (Distance)

Lane Number	Contin. Lane	Deg. Satn v/c	Prog. Factor (Queue)	Overflow Queue (ft)	Back of Queue (ft) Av.	Back of Queue (ft) 95%	Queue at Start of Gap (ft) Av.	Queue at Start of Gap (ft) 95%	Cycle-Average Queue (ft) Av.	Cycle-Average Queue (ft) 95%	Queue Storage Ratio Av.	Queue Storage Ratio 95%	Prob. Block. %	Prob. SL Ov. %	Ov. Lane No.
South: Northampton St (Rte 10)															
Lane 1		0.854	1.000	64.9	266.1	661.3	104.9	260.7	140.8	255.3	0.17	0.41	0.0	NA	NA
Approach		0.854			266.1	661.3	104.9	260.7	140.8	255.3	0.17	0.41			
East: Site Driveway															
Lane 1		0.608	1.000	8.7	38.3	95.3	35.3	87.8	41.5	75.2	0.19	0.48	0.0	NA	NA
Approach		0.608			38.3	95.3	35.3	87.8	41.5	75.2	0.19	0.48			
North: Northampton St (Rte 10)															
Lane 1		0.636	1.000	0.0	77.3	192.0	33.2	82.5	57.0	103.3	0.06	0.16	0.0	NA	NA
Approach		0.636			77.3	192.0	33.2	82.5	57.0	103.3	0.06	0.16			
West: Mountainview Drive															
Lane 1		0.025	1.000	0.0	1.0	2.6	1.0	2.6	0.7	1.2	0.01	0.01	0.0	NA	NA
Approach		0.025			1.0	2.6	1.0	2.6	0.7	1.2	0.01	0.01			
Intersection		0.854			266.1	661.3	104.9	260.7	140.8	255.3	0.19	0.48			

Roundabout Capacity Model: US HCM 6 Extended.
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Extended Roundabout Capacity Model.
Short Lanes are not included in determining Queue Storage Ratios.

Lane Queues (Vehicles)

Lane Number	Contin. Lane	Deg. Satn v/c	Prog. Factor (Queue)	Overflow Queue (veh)	Back of Queue (veh) Av.	Back of Queue (veh) 95%	Queue at Start of Gap (veh) Av.	Queue at Start of Gap (veh) 95%	Cycle-Average Queue (veh) Av.	Cycle-Average Queue (veh) 95%	Queue Storage Ratio Av.	Queue Storage Ratio 95%	Prob. Block. %	Prob. SL Ov. %	Ov. Lane No.
South: Northampton St (Rte 10)															
Lane 1		0.854	1.000	2.6	10.5	26.0	4.1	10.3	5.5	10.1	0.17	0.41	0.0	NA	NA
Approach		0.854			10.5	26.0	4.1	10.3	5.5	10.1	0.17	0.41			
East: Site Driveway															
Lane 1		0.608	1.000	0.3	1.5	3.8	1.4	3.5	1.6	3.0	0.19	0.48	0.0	NA	NA
Approach		0.608			1.5	3.8	1.4	3.5	1.6	3.0	0.19	0.48			
North: Northampton St (Rte 10)															
Lane 1		0.636	1.000	0.0	3.1	7.6	1.3	3.3	2.2	4.1	0.06	0.16	0.0	NA	NA
Approach		0.636			3.1	7.6	1.3	3.3	2.2	4.1	0.06	0.16			
West: Mountainview Drive															
Lane 1		0.025	1.000	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.01	0.01	0.0	NA	NA

Approach	0.025	0.0	0.1	0.0	0.1	0.0	0.0	0.01	0.01
Intersection	0.854	10.5	26.0	4.1	10.3	5.5	10.1	0.19	0.48

Roundabout Capacity Model: US HCM 6 Extended.
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Extended Roundabout Capacity Model.
Short Lanes are not included in determining Queue Storage Ratios.

Continuous Lane Performance

Lane Number	Deg. Satn v/c	Unint. Speed mph	Unint. Travel Delay sec	Hdwy sec	Spacing ft	Aver. Vehicle Length ft	Occup. Time sec	Space Time sec	Space Occup. Ratio %	Time Occup. Ratio %	Density veh/mi	Density pc/mi	LOS (Density Method)
There are no Continuous Lanes at this Site.													

MOVEMENT SUMMARY

Site: 1D [4 Leg - Peer Review Comment PM (Site Folder: Northampton St at Site Driveway Alts)]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance																
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] ft	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed mph
South: Northampton St (Rte 10)															
3	L2	All MCs	8	0.0	8	0.0	0.858	22.1	LOS C	28.0	703.1	1.00	1.22	1.72	14.7
8	T1	All MCs	789	0.7	789	0.7	0.858	22.2	LOS C	28.0	703.1	1.00	1.22	1.72	22.1
18	R2	All MCs	124	0.0	124	0.0	0.858	22.1	LOS C	28.0	703.1	1.00	1.22	1.72	17.5
Approach			920	0.6	920	0.6	0.858	22.2	LOS C	28.0	703.1	1.00	1.22	1.72	21.5
East: Site Driveway															
1	L2	All MCs	104	2.0	104	2.0	0.646	26.0	LOS D	4.6	115.9	0.92	1.08	1.40	19.7
6	T1	All MCs	1	0.0	1	0.0	0.646	25.2	LOS D	4.6	115.9	0.92	1.08	1.40	6.4
16	R2	All MCs	163	2.0	163	2.0	0.646	26.0	LOS D	4.6	115.9	0.92	1.08	1.40	17.7
Approach			268	2.0	268	2.0	0.646	26.0	LOS D	4.6	115.9	0.92	1.08	1.40	18.5
North: Northampton St (Rte 10)															
7	L2	All MCs	175	0.0	175	0.0	0.963	31.1	LOS D	53.0	1330.1	1.00	1.41	1.64	13.2
4	T1	All MCs	953	0.5	953	0.5	0.963	31.1	LOS D	53.0	1330.1	1.00	1.41	1.64	21.0
14	R2	All MCs	10	0.0	10	0.0	0.963	31.1	LOS D	53.0	1330.1	1.00	1.41	1.64	13.3
Approach			1138	0.4	1138	0.4	0.963	31.1	LOS D	53.0	1330.1	1.00	1.41	1.64	19.9
West: Existing Lot Dwy															
5	L2	All MCs	13	0.0	13	0.0	0.152	19.6	LOS C	0.6	15.8	0.86	0.86	0.86	19.7
2	T1	All MCs	2	0.0	2	0.0	0.152	19.6	LOS C	0.6	15.8	0.86	0.86	0.86	6.4
12	R2	All MCs	19	0.0	19	0.0	0.152	19.6	LOS C	0.6	15.8	0.86	0.86	0.86	22.3
Approach			34	0.0	34	0.0	0.152	19.6	LOS C	0.6	15.8	0.86	0.86	0.86	20.5
All Vehicles			2361	0.7	2361	0.7	0.963	26.9	LOS D	53.0	1330.1	0.99	1.29	1.63	20.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6 Extended.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Extended Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

QUEUE ANALYSIS

Site: 1D [4 Leg - Peer Review Comment PM (Site Folder: Northampton St at Site Driveway Alts)]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

New Site
Site Category: (None)
Roundabout

Lane Queues (Distance)

Lane Number	Contin. Lane	Deg. Satn v/c	Prog. Factor (Queue)	Overflow Queue (ft)	Back of Queue (ft) Av.	Back of Queue (ft) 95%	Queue at Start of Gap (ft) Av.	Queue at Start of Gap (ft) 95%	Cycle-Average Queue (ft) Av.	Cycle-Average Queue (ft) 95%	Queue Storage Ratio Av.	Queue Storage Ratio 95%	Prob. Block. %	Prob. SL Ov. %	Ov. Lane No.
South: Northampton St (Rte 10)															
Lane 1		0.858	1.000	88.4	282.9	703.1	131.0	325.6	142.4	258.4	0.18	0.44	0.0	NA	NA
Approach		0.858			282.9	703.1	131.0	325.6	142.4	258.4	0.18	0.44			
East: Site Driveway															
Lane 1		0.646	1.000	12.2	46.6	115.9	40.8	101.4	49.2	89.2	0.23	0.58	0.0	NA	NA
Approach		0.646			46.6	115.9	40.8	101.4	49.2	89.2	0.23	0.58			
North: Northampton St (Rte 10)															
Lane 1		0.963	1.000	156.4	535.2	1330.1	205.4	510.4	246.7	447.5	0.45	1.11	8.1	NA	NA
Approach		0.963			535.2	1330.1	205.4	510.4	246.7	447.5	0.45	1.11			
West: Existing Lot Dwy															
Lane 1		0.152	1.000	0.0	6.3	15.8	6.2	15.4	4.6	8.4	0.03	0.08	0.0	NA	NA
Approach		0.152			6.3	15.8	6.2	15.4	4.6	8.4	0.03	0.08			
Intersection		0.963			535.2	1330.1	205.4	510.4	246.7	447.5	0.45	1.11			

Roundabout Capacity Model: US HCM 6 Extended.
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Extended Roundabout Capacity Model.
Short Lanes are not included in determining Queue Storage Ratios.

Lane Queues (Vehicles)

Lane Number	Contin. Lane	Deg. Satn v/c	Prog. Factor (Queue)	Overflow Queue (veh)	Back of Queue (veh) Av.	Back of Queue (veh) 95%	Queue at Start of Gap (veh) Av.	Queue at Start of Gap (veh) 95%	Cycle-Average Queue (veh) Av.	Cycle-Average Queue (veh) 95%	Queue Storage Ratio Av.	Queue Storage Ratio 95%	Prob. Block. %	Prob. SL Ov. %	Ov. Lane No.
South: Northampton St (Rte 10)															
Lane 1		0.858	1.000	3.5	11.3	28.0	5.2	13.0	5.7	10.3	0.18	0.44	0.0	NA	NA
Approach		0.858			11.3	28.0	5.2	13.0	5.7	10.3	0.18	0.44			
East: Site Driveway															
Lane 1		0.646	1.000	0.5	1.8	4.6	1.6	4.0	1.9	3.5	0.23	0.58	0.0	NA	NA
Approach		0.646			1.8	4.6	1.6	4.0	1.9	3.5	0.23	0.58			
North: Northampton St (Rte 10)															
Lane 1		0.963	1.000	6.2	21.3	53.0	8.2	20.3	9.8	17.8	0.45	1.11	8.1	NA	NA
Approach		0.963			21.3	53.0	8.2	20.3	9.8	17.8	0.45	1.11			
West: Existing Lot Dwy															
Lane 1		0.152	1.000	0.0	0.3	0.6	0.2	0.6	0.2	0.3	0.03	0.08	0.0	NA	NA

Approach	0.152	0.3	0.6	0.2	0.6	0.2	0.3	0.03	0.08
Intersection	0.963	21.3	53.0	8.2	20.3	9.8	17.8	0.45	1.11

Roundabout Capacity Model: US HCM 6 Extended.
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Extended Roundabout Capacity Model.
Short Lanes are not included in determining Queue Storage Ratios.

Continuous Lane Performance

Lane Number	Deg. Satn	Unint. Speed	Unint. Travel Delay	Hdwy	Spacing	Aver. Vehicle Length	Occup. Time	Space Time	Space Occup. Ratio	Time Occup. Ratio	Density		LOS (Density Method)
	v/c	mph	sec	sec	ft	ft	sec	sec	%	%	veh/mi	pc/mi	
There are no Continuous Lanes at this Site.													

Organisation: HOWARD STEIN HUDSON | Licence: NETWORK / 1PC | Processed: Thursday, October 5, 2023 12:26:55 PM
Project: J:\22\22223 - 95 Northampton St Easthampton\Project\Analysis\SIDRA\Proposed Roundabout Alts Analysis_09272023.sip9

ATTACHMENT 8 – RMAT REPORT

Climate Resilience Design Standards Tool Project Report

Sierra Vista Commons

Date Created: 3/14/2023 8:53:10 AM
Created By: adrienne.dunk@gza.com
Date Report Generated: 3/28/2023 10:27:48 AM
Tool Version: Version 1.2
Project Contact Information: Frank DeMarinis (Frank@sage-llc.com)

Project Summary

Link to Project

Estimated Capital Cost: $80000000.00
End of Useful Life Year: 2063
Project within mapped Environmental Justice neighborhood: No

Ecosystem Service Benefits	Scores
Project Score	Low

Exposure	Scores
Sea Level Rise/Storm Surge	Not Exposed
Extreme Precipitation - Urban Flooding	High Exposure
Extreme Precipitation - Riverine Flooding	Not Exposed
Extreme Heat	High Exposure

Asset Preliminary Climate Risk Rating Summary

Number of Assets: 3

Asset Risk	Sea Level Rise/Storm Surge	Extreme Precipitation - Urban Flooding	Extreme Precipitation - Riverine Flooding	Extreme Heat
Sierra Vista Commons - Apartments (10 Buildings)	Low Risk	High Risk	Low Risk	High Risk
Roots Gymnastics & Child Care Facility	Low Risk	High Risk	Low Risk	High Risk
Restaurants (2) and mixed-use commercial and retail space	Low Risk	High Risk	Low Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
Sierra Vista Commons - Apartments (10 Buildings)					
Roots Gymnastics & Child Care Facility					
Restaurants (2) and mixed-use commercial and retail space					
Extreme Precipitation					
Sierra Vista Commons - Apartments (10 Buildings)	2070			10-yr (10%)	Tier 2

Roots Gymnastics & Child Care Facility	2070		10-yr (10%)	Tier 2
Restaurants (2) and mixed-use commercial and retail space	2070		10-yr (10%)	Tier 2
Extreme Heat				
Sierra Vista Commons - Apartments (10 Buildings)	2070	50th		Tier 2
Roots Gymnastics & Child Care Facility	2070	50th		Tier 2
Restaurants (2) and mixed-use commercial and retail space	2070	50th		Tier 2

Scoring Rationale - Project Exposure Score

The purpose of the Exposure Score output is to provide a preliminary assessment of whether the overall project site and subsequent assets are exposed to impacts of natural hazard events and/or future impacts of climate change. For each climate parameter, the Tool will calculate one of the following exposure ratings: Not Exposed, Low Exposure, Moderate Exposure, or High Exposure. The rationale behind the exposure rating is provided below.

Sea Level Rise/Storm Surge

This project received a "Not Exposed" because of the following:

- Not located within the predicted mean high water shoreline by 2030
- No historic coastal flooding at project site
- Not located within the Massachusetts Coast Flood Risk Model (MC-FRM)

Extreme Precipitation - Urban Flooding

This project received a "High Exposure" because of the following:

- Increased impervious area
- Maximum annual daily rainfall exceeds 10 inches within the overall project's useful life
- No historic flooding at project site
- Existing impervious area of the project site is less than 10%

Extreme Precipitation - Riverine Flooding

This project received a "Not Exposed" because of the following:

- No historic riverine flooding at project site
- The project is not within a mapped FEMA floodplain [outside of the Massachusetts Coast Flood Risk Model (MC-FRM)]
- Project is more than 500ft from a waterbody
- Project is not likely susceptible to riverine erosion

Extreme Heat

This project received a "High Exposure" because of the following:

- 30+ days increase in days over 90 deg. F within project's useful life
- Increased impervious area
- Existing trees are being removed as part of the proposed project
- Existing impervious area of the project site is less than 10%
- Located within 100 ft of existing water body

Scoring Rationale - Asset Preliminary Climate Risk Rating

A Preliminary Climate Risk Rating is determined for each infrastructure and building asset by considering the overall project Exposure Score and responses to Step 4 questions provided by the user in the Tool. Natural Resource assets do not receive a risk rating. The following factors are what influenced the risk ratings for each asset.

Asset - Sierra Vista Commons - Apartments (10 Buildings)
Primary asset criticality factors influencing risk ratings for this asset:

- Asset may inaccessible/inoperable for more than a day but less than a week after natural hazard event
- Less than 1,000 people would be directly affected by the loss/inoperability of the asset
- The building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Some alternative programs and/or services are available to support the community
- Cost to replace is less than $10 million
- There are no hazardous materials in the asset

Asset - Roots Gymnastics & Child Care Facility
Primary asset criticality factors influencing risk ratings for this asset:

- Asset can be inaccessible/inoperable more than a week after natural hazard event without consequences
- Loss/inoperability of the asset would have impacts limited to local area and/or municipality
- The building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Some alternative programs and/or services are available to support the community
- Cost to replace is less than $10 million
- There are no hazardous materials in the asset

Asset - Restaurants (2) and mixed-use commercial and retail space
Primary asset criticality factors influencing risk ratings for this asset:

- Asset can be inaccessible/inoperable more than a week after natural hazard event without consequences
- Less than 1,000 people would be directly affected by the loss/inoperability of the asset
- The building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
- Some alternative programs and/or services are available to support the community
- Cost to replace is less than $10 million
- There are no hazardous materials in the asset

Project Climate Resilience Design Standards Output

Climate Resilience Design Standards and Guidance are recommended for each asset and climate parameter. The Design Standards for each climate parameter include the following: recommended planning horizon (target and/or intermediate), recommended return period (Sea Level Rise/Storm Surge and Precipitation) or percentile (Heat), and a list of applicable design criteria that are likely to be affected by climate change. Some design criteria have numerical values associated with the recommended return period and planning horizon, while others have tiered methodologies with step-by-step instructions on how to estimate design values given the other recommended design standards.

Asset: Sierra Vista Commons - Apartments (10 Buildings) — Building/Facility

Sea Level Rise/Storm Surge — Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation — High Risk

Target Planning Horizon: 2070
Return Period: 10-yr (10%)

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 2

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Sierra Vista Commons - Apartments (10 Buildings)	2070	10-Year (10%)	7.1	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: NOT APPLICABLE

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 50th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 2

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Asset: Roots Gymnastics & Child Care Facility Building/Facility

Sea Level Rise/Storm Surge Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation High Risk

Target Planning Horizon: 2070
Return Period: 10-yr (10%)

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

While Total Precipitation Depth & Peak Intensity for 24-hour Design Storms are useful to inform planning and design, it is recommended to also consider additional longer- and shorter-duration precipitation events and intensities in accordance with best practices. Longer-duration, lower-intensity storms allow time for infiltration and reduce the load on infrastructure over the duration of the storm. Shorter-duration, higher-intensity storms often have higher runoff volumes because the water does not have enough time to infiltrate infrastructure systems (e.g., catch basins) and may overflow or back up during such storms, resulting in flooding. In the Northeast, short-duration high intensity rain events are becoming more frequent, and there is often little early warning for these events, making it difficult to plan operationally. While the Tool does not provide recommended design standards for these scenarios, users should still consider both short- and long-duration precipitation events and how they may impact the asset.

The projected values, standards, and guidance provided within this Tool may be used to inform plans and designs, but they do not provide guarantees for future conditions or resilience. The projected values are not to be considered final or appropriate for construction documents without supporting engineering analyses. The guidance provided within this Tool is intended to be general and users are encouraged to do their own due diligence

Applicable Design Criteria

Tiered Methodology: Tier 2

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Roots Gymnastics & Child Care Facility	2070	10-Year (10%)	7.1	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: NOT APPLICABLE

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 50th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 2

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Asset: Restaurants (2) and mixed-use commercial and retail space Building/Facility

Sea Level Rise/Storm Surge Low Risk

Applicable Design Criteria

Projected Tidal Datums: NOT APPLICABLE

Projected Water Surface Elevation: NOT APPLICABLE

Projected Wave Action Water Elevation: NOT APPLICABLE

Projected Wave Heights: NOT APPLICABLE

Projected Duration of Flooding: NOT APPLICABLE

Projected Design Flood Velocity: NOT APPLICABLE

Projected Scour & Erosion: NOT APPLICABLE

Extreme Precipitation High Risk

Target Planning Horizon: 2070
Return Period: 10-yr (10%)

LIMITATIONS: The recommended Standards for Total Precipitation Depth & Peak Intensity are determined by the user drawn polygon and relationships as defined in the Supporting Documents. The projected Total Precipitation Depth values provided through the Tool are based on the climate projections developed by Cornell University as part of EEA's Massachusetts Climate and Hydrologic

Risk Project, GIS-based data as of 10/15/21. For additional information on the methodology of these precipitation outputs, see Supporting Documents.

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Applicable Design Criteria

Tiered Methodology: Tier 2

Projected Total Precipitation Depth & Peak Intensity for 24-hr Design Storms: APPLICABLE

Asset Name	Recommended Planning Horizon	Recommended Return Period (Design Storm)	Projected 24-hr Total Precipitation Depth (inches)	Step-by-Step Methodology for Peak Intensity
Restaurants (2) and mixed-use commercial and retail space	2070	10-Year (10%)	7.1	Downloadable Methodology PDF

Projected Riverine Peak Discharge & Peak Flood Elevation: NOT APPLICABLE

Extreme Heat High Risk

Target Planning Horizon: 2070
Percentile: 50th Percentile

Applicable Design Criteria

Tiered Methodology: Tier 2

Projected Annual/Summer/Winter Average Temperatures: APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Projected Heat Index: APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Projected Growing Degree Days: NOT APPLICABLE

Projected Days Per Year With Max Temp > 95°F, >90°F, <32°F: APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Projected Number of Heat Waves Per Year & Average Heat Wave Duration: APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Projected Cooling Degree Days & Heating Degree Days (base = 65°F): APPLICABLE
Methodology to Estimate Projected Values : Tier 2

Project Inputs

Core Project Information

Name:	Sierra Vista Commons
Given the expected useful life of the project, through what year do you estimate the project to last (i.e. before a major reconstruction/renovation)?	2063
Location of Project:	Easthampton
Estimated Capital Cost:	$80,000,000
Who is the Submitting Entity?	Private Other Tasty Top Development, LLC Frank DeMarinis (Frank@sage-llc.com)
Is this project being submitted as part of a state grant application?	No
Which grant program?	
What stage are you in your project lifecycle?	Permitting
Is climate resiliency a core objective of this project?	No
Is this project being submitted as part of the state capital planning process?	No
Is this project being submitted as part of a regulatory review process or permitting?	Yes
Brief Project Description:	The Project will develop three parcels totaling approximately 33 acres into a mixed use residential and commercial center. The Project would include a daycare, gymnastics center, 180 apartment units, two restaurants, and mixed use retail/offices and mixed use warehouse/storage areas. This RMAT is being submitted as part of the MEPA review. The Project is currently under consideration by the local Conservation Commission and Planning Board.
Project Submission Comments:	

Project Ecosystem Service Benefits

No Ecosystem Service Benefits are provided by this project

Factors to Improve Output

✓ Incorporate nature-based solutions that may provide flood protection
✓ Incorporate nature-based solutions that may reduce storm damage
✓ Protect public water supply by reducing the risk of contamination, pollution, and/or runoff of surface and groundwater sources used for human consumption
✓ Incorporate strategies that reduce carbon emissions
✓ Incorporate green infrastructure or nature-based solutions that recharge groundwater
✓ Incorporate green infrastructure to filter stormwater
✓ Incorporate nature-based solutions that improve water quality
✓ Incorporate nature-based solutions that sequester carbon carbon
✓ Increase biodiversity, protect critical habitat for species, manage invasive populations, and/or provide connectivity to other habitats
✓ Preserve, enhance, and/or restore coastal shellfish habitats
✓ Incorporate vegetation that provides pollinator habitat
✓ Identify opportunities to remediate existing sources of pollution
✓ Provide opportunities for passive and/or active recreation through open space
✓ Increase plants, trees, and/or other vegetation to provide oxygen production
✓ Mitigate atmospheric greenhouse gas concentrations and other toxic air pollutants through nature-based solutions
✓ Identify opportunities to prevent pollutants from impacting ecosystems
✓ Incorporate education and/or protect cultural resources as part of your project

Is the primary purpose of this project ecological restoration?

No

Project Benefits

Provides flood protection through nature-based solutions	No
Reduces storm damage	No
Recharges groundwater	No
Protects public water supply	No
Filters stormwater using green infrastructure	No
Improves water quality	No
Promotes decarbonization	No
Enables carbon sequestration	No
Provides oxygen production	No
Improves air quality	No
Prevents pollution	No
Remediates existing sources of pollution	No
Protects fisheries, wildlife, and plant habitat	No

Protects land containing shellfish	No
Provides pollinator habitat	No
Provides recreation	No
Provides cultural resources/education	No

Project Climate Exposure

Is the primary purpose of this project ecological restoration?	No
Does the project site have a history of coastal flooding?	No
Does the project site have a history of flooding during extreme precipitation events (unrelated to water/sewer damages)?	No
Does the project site have a history of riverine flooding?	No
Does the project result in a net increase in impervious area of the site?	Yes
Are existing trees being removed as part of the proposed project?	Yes

Project Assets

Asset: Sierra Vista Commons - Apartments (10 Buildings)
Asset Type: Typically Occupied
Asset Sub-Type: Residential building - Private Housing
Construction Type: New Construction
Construction Year: 2023
Useful Life: 40

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Building may be inaccessible/inoperable for more than a day, but less than a week after natural hazards events without consequences

Identify the geographic area directly affected by permanent loss or significant inoperability of the building/facility.
Impacts limited to site only

Identify the population directly served that would be affected by the permanent loss of use or inoperability of the building/facility.
Less than 1,000 people

Identify if the building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
The building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.

If the building/facility became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?
Inoperability of the building/facility would not be expected to result in injuries

If there are hazardous materials in your building/facility, what are the extent of impacts related to spills/releases of these materials?
There are no hazardous materials in the building/facility

If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?
Minor – Inoperability will not likely affect other facilities, assets, or buildings

If this building/facility was damaged beyond repair, how much would it approximately cost to replace?
Less than $10 million

Is this a recreational facility which can be vacated during a natural hazard event?
No

If the building/facility became inoperable for longer than acceptable in Question 1, what are the public and/or social services impacts?
Some alternative programs and/or services are available to support the community

If the building/facility became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?
No impact on surrounding natural resources is expected

If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e. the building is not able to serve or operate its intended users or function)?
Loss of building is not expected to reduce the ability to maintain government services.

If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts to loss of confidence in government (i.e. the building is not able to serve or operate its intended users or function)?
No Impact

Asset: Roots Gymnastics & Child Care Facility
Asset Type: Typically Occupied
Asset Sub-Type: Childcare facility
Construction Type: New Construction
Construction Year: 2023
Useful Life: 40

Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Building may be inaccessible/inoperable more than a week after natural hazard event without consequences

Identify the geographic area directly affected by permanent loss or significant inoperability of the building/facility.
Impacts would be limited to local area and/or municipality

Identify the population directly served that would be affected by the permanent loss of use or inoperability of the building/facility.
Less than 1,000 people

Identify if the building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
The building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.

If the building/facility became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?
Inoperability of the building/facility would not be expected to result in injuries
If there are hazardous materials in your building/facility, what are the extent of impacts related to spills/releases of these materials?
There are no hazardous materials in the building/facility
If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?
Minor – Inoperability will not likely affect other facilities, assets, or buildings
If this building/facility was damaged beyond repair, how much would it approximately cost to replace?
Less than $10 million
Is this a recreational facility which can be vacated during a natural hazard event?
Yes
If the building/facility became inoperable for longer than acceptable in Question 1, what are the public and/or social services impacts?
Some alternative programs and/or services are available to support the community
If the building/facility became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?
No impact on surrounding natural resources is expected
If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e. the building is not able to serve or operate its intended users or function)?
Loss of building is not expected to reduce the ability to maintain government services.
If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts to loss of confidence in government (i.e. the building is not able to serve or operate its intended users or function)?
No Impact
Asset: Restaurants (2) and mixed-use commercial and retail space
Asset Type: Typically Occupied
Asset Sub-Type: Non-residential building (office, commercial, retail)
Construction Type: New Construction
Construction Year: 2023
Useful Life: 40
Identify the length of time the asset can be inaccessible/inoperable without significant consequences.
Building may be inaccessible/inoperable more than a week after natural hazard event without consequences
Identify the geographic area directly affected by permanent loss or significant inoperability of the building/facility.
Impacts limited to site only
Identify the population directly served that would be affected by the permanent loss of use or inoperability of the building/facility.
Less than 1,000 people
Identify if the building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
The building/facility provides services to populations that reside within Environmental Justice neighborhoods or climate vulnerable populations.
If the building/facility became inoperable for longer than acceptable in Question 1, how, if at all, would it be expected to impact people's health and safety?
Inoperability of the building/facility would not be expected to result in injuries
If there are hazardous materials in your building/facility, what are the extent of impacts related to spills/releases of these materials?
There are no hazardous materials in the building/facility
If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts on other facilities, assets, and/or infrastructure?
Minor – Inoperability will not likely affect other facilities, assets, or buildings
If this building/facility was damaged beyond repair, how much would it approximately cost to replace?
Less than $10 million
Is this a recreational facility which can be vacated during a natural hazard event?
No
If the building/facility became inoperable for longer than acceptable in Question 1, what are the public and/or social services impacts?
Some alternative programs and/or services are available to support the community
If the building/facility became inoperable for longer than acceptable in Question 1, what are the environmental impacts related to natural resources?
No impact on surrounding natural resources is expected
If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts to government services (i.e. the building is not able to serve or operate its intended users or function)?
Loss of building is not expected to reduce the ability to maintain government services.
If the building/facility became inoperable for longer than acceptable in Question 1, what are the impacts to loss of confidence in government (i.e. the building is not able to serve or operate its intended users or function)?
No Impact

Report Comments

N/A

ATTACHMENT 9 – TECHNICAL MEMORANDUM – RMAT TIER 2 PRECIPITATION ANALYSIS SUMMARY

TECHNICAL MEMORANDUM

RMAT TIER 2 PRECIPITATION ANALYSIS SUMMARY
SIERRA VISTA COMMONS
EASTHAMPTON, MA

MAY 2023
REVISED FEBRUARY 2024

In accordance with the *Massachusetts Environmental Policy Act (MEPA) Interim Protocol on Climate Change Adaptation and Resiliency*, effective October 1, 2021, GZA GeoEnvironmental, Inc. (GZA) is providing this technical memorandum to present the results of the hydrologic and hydraulic (H&H) analysis based on the output from the Resilient Massachusetts Action Team (RMAT) Climate Resilience Design Standards Tool and expanded upon in accordance with the Scope identified in the Secretary's Certificate on the Expanded Environmental Notification Form (EENF) and Draft Environmental Impact Report (DEIR).

The focus of this revised expanded evaluation was to assess the efficacy of the stormwater management system during the 2070 50-year storm as projected by the Resilient MA Climate Change Projections Dashboard.

This memorandum and its conclusions are subject to the limitations in **Appendix A**.

BACKGROUND AND OBJECTIVE

The following descriptions of the project are derived from the *Site Evaluation Statement and Stormwater Management Report* dated August 29, 2023[1].

The site consists of approximately 33 acres of partially developed land and is located at 93-97 Northampton Street, in Easthampton, Hampshire County, Massachusetts. The subject parcel is located east of Northampton Street (Route 10) between Florence Road and Groveland Street. The parcel maintains approximately 332 feet of frontage on Northampton Street. It is abutted to the north and west by mixed commercial uses, to the east by vacant land, and to the south by residential neighborhoods.

The majority of the existing site has been previously developed in a variety of uses. Approximately 10 acres of land on the Northampton Street side of the property was historically used as a driving range formerly known as Easthampton Golf. This consisted of a small paved parking area, a small shed that acted as a sales office, an artificial turf and natural grass tee box area, and mowed grass driving range. Along the immediate frontage of Northampton Street was a retail ice cream stand and paved parking area, and a single-family home and barn. The ice cream stand has been demolished and removed.

Approximately 6.5 acres located to the east of the intermittent stream on the parcel has been historically used as an agricultural field. Access to the farmland was via a wooden bridge crossing the intermittent stream. The remaining land is vacant woodland.

For the proposed project work, Tasty Top Development, LLC is proposing to redevelop the site into a mixed use residential and commercial center. The project is broken down into the following structures and uses:

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[1] Sierra Vista Commons, Site Evaluation Statement and Stormwater Management Report, Furrow Engineering, November 14, 2022 (Revised: August 29, 2023).

- 9,000 SF Roots Learning Center (Daycare)
- 7,000 SF Roots Gymnastic Center
- 10 Mid-Rise apartment buildings (188 units)
- 5,500 SF Sit-down restaurant (220 seat capacity)
- 3,200 SF drive-through bank
- 16,000 SF mixed-use commercial/residential building with 14 apartments above
- 4,000 SF retail building
- 14,800 SF Mixed-use warehouse storage in two buildings

Included in the redevelopment will be construction of internal roadway system for circulation, parking spaces for each building and typical site utilities. The project will be serviced by municipal sewer and water connection to Northampton Street.

Stormwater from the proposed development will be captured and treated by a number of detention and infiltration basins spaced throughout the property. The basins' location have been designed to maintain existing hydraulic patterns and flow discharge points. Runoff from roadways and parking lots will be captured via catch basins and pipe networks and discharged to the nearest stormwater basin. Runoff from pavement surfaces will be treated through water quality structures before being sent to the basins. Runoff from the building roofs will be collected via downspouts and piped via rain gardens to the stormwater basins. There are a total of two infiltration basins which will help promote groundwater recharge.

The objective of GZA's H&H analysis is to assess the proposed development work in the context of climate change factors, such as extreme precipitation. The analysis includes the peak flow rates for the present day, as well as taking into consideration Late-century (2070-2090) potential climate change scenarios.

METHODOLOGY

<u>CLIMATE RESILENCY</u>

The MEPA Office requires the use of the RMAT Climate Resilience Design Standards Tool (i.e., the RMAT Tool) to give users a preliminary climate change exposure and risk rating, recommended climate resilience design standards, and guidelines with best practices to support implementation.

As described in the *Climate Resilience Design Standards and Guidelines Tool User Guide* (Resilient Massachusetts Action Team, April 2021), the RMAT Tool provides output for "Recommended Climate Resilience Design Standards" which include tiered methodology based on the recommended level of effort that informs users on how to calculate design criteria values for asset and project design. Tier 1 methodology requires the lowest level of effort and Tier 3 methodology requires the greatest level of effort. The RMAT Tool also recommends either a mid-century (2030/2050) or late century (2070/2090) target planning horizon.

Considering proposed project conditions, the RMAT Tool identified the applicable Tier and corresponding level of analysis for climate parameters including Extreme Precipitation, Urban Flooding and Extreme Heat. For Extreme Precipitation, the RMAT Tool identified a target planning horizon of **2070** and **Tier 2** methodology to assess 24-hour 10-year precipitation storm depth and peak intensity and resulting urban flooding.

The RMAT Climate Resilience Design Standards Total Precipitation Depth and Peak Intensity Design Criteria Tiered Methodology guidance document describes the recommended Tier 2 methodology, as follows:

- Identify present-day NOAA Atlas 14 median 24-hour design storm precipitation (rainfall) depths;
- Apply percent increase to NOAA median values based on given planning horizon for each given 24-hour design storm depth;
- Use applied rainfall distribution (SCS Type III rainfall distribution) to estimate design storm hyetograph and peak intensity for given design storm depths for use in the hydrologic model.

Tier 2 future design storms are created by applying the percent increases shown in **Table 1** to the present-day rainfall depths.

Table 1: Future Design Storms Percent Increase

Design Storm	Mid Century (2030/2050)	Late Century (2070/2090)
More Frequent Design Storms[1]	8%	20%
100-yr Design Storm	11%	27%
Extreme Design Storm[2]	15%	36%

[1] More frequent storms include 2-, 5-, 10-, 25-, and 50-yr design storms
[2] Extreme storms include 200- and 500-yr design storms

Comments on the EENF requested the stormwater management system also be modeled with the 2070 50-year storm. The precipitation depth for this storm was calculated using the RMAT recommended methodology and the stormwater system effectively management the event. However, the Scope for the FEIR requested that the storm be re-evaluated using information available from the Resilient MA Climate Change Projection Dashboard which lists a 24-hr 50-yr precipitation depth for the Connecticut River Basin as 10.2".

HYDROLOGIC AND HYDRAULIC (H&H) MODELING

Two HydroCAD models v10.20 were previously developed by Furrow Engineering (from Stormwater Management Report Revised: August 29, 2023) to simulate the site hydrology (rainfall-runoff) and the potential stormwater impacts of the project. The first model was used to simulate peak flow rates and volumes under existing conditions (i.e., pre-development), while the second one was used to evaluate proposed, post-development conditions.

The National Resource Conservation Service (NRCS) Curve Number method, outlined in the USDA-NRCS Technical Release 55, was used in the HydroCAD model to simulate changes based on a combination of land uses. Each flow path was delineated along the longest hydrologic path within each corresponding sub-catchment to estimate times of concentration as outlined in the USDA-NRCS National Engineering Handbook Section 630 Chapter 15. Detailed description of modeling inputs and methodology is included in the Site Evaluation Statement and Stormwater Management Report by Furrow Engineering.

For this revised addendum, GZA updated the models to include the future 2070 24-hr 50-year storm as supplied by the Resilient MA Climate Change Projection Dashboard, a storm depth of **10.2 inches**. Current and projected precipitation depths for the 10-, 25-, and 50-year storms are included in **Table 2**.

GZA used the Soil Conservation Service (SCS) Type III rainfall distribution as recommended in the Tier 2 RMAT Climate Resilience Design Standards and Guidelines.

Table 2: Comparison of Current and Projected Precipitation Depth from the RMAT Guidance

Storm	Current NOAA ATLAS 14 Depth (in)	RMAT Recommended Future Estimate (in)	RMAT Tool Future Estimate (in)	RMAT Climate Change Projection Dashboard (in)*
24-hr 10-yr	4.97	5.96	7.10	-
24-hr 25-yr	6.23	7.48	N/A	-
24-hr 50-yr	7.10	8.52	N/A	10.2
*Data Accessed May 2024				

RESULTS

The following tables summarize the updated HydroCAD analysis results for pre- and post-development conditions during the projected precipitation events. **Table 3** and **4** show the change in peak flow rates and volumes due to development at the site, respectively.

Table 3: Summary of Pre- and Post- Development Peak Flow Rates for the 24-hr 10-year Storm

Peak Stormwater Runoff Flow Rate (cfs)					
Scenario		Analysis Point No.1		Analysis Point No.2	
		Pre-Development	Post-Development	Pre-Development	Post-Development
24-hr 10-yr	Present	59.1	43.9	2.2	1.5
	2070 (RMAT Rec.)	77.7	59.8	3.6	2.4
	2070 (RMAT Tool)	99.5	74.5	5.3	3.5
24-hr 25-yr	Present	82.6	63.7	3.9	2.8
	2070 (RMAT Rec.)	106.8	84.3	5.9	4.2
24-hr 50-yr	Present	99.5	74.5	5.3	3.5
	2070 (RMAT Rec.)	127.0	96.0	7.7	5.7
	2070 (Dashboard Rec.)	159.6	112.5	10.6	8.7

Table 4: Summary of Pre- and Post- Development Peak Runoff Volumes for the 24-hr 10-year Storm

Peak Stormwater Runoff Volume (Ac-ft)					
Scenario		Analysis Point No.1		Analysis Point No.2	
		Pre-Development	Post-Development	Pre-Development	Post-Development
24-hr 10-yr	**Present**	6.1	6.0	0.3	0.2
	2070 (RMAT Rec.)	8.0	7.9	0.4	0.3
	2070 (RMAT Tool)	10.3	10.1	0.5	0.4
24-hr 25-yr	**Present**	8.54	8.45	0.41	0.35
	2070 (RMAT Rec.)	11.1	11.0	0.60	0.56
24-hr 50-yr	**Present**	10.3	10.1	0.5	0.4
	2070 (RMAT Rec.)	13.3	13.1	0.76	0.74
	2070 (Dashboard Rec.)	16.8	16.5	1.1	1.1

Using the updated HydroCAD model, GZA estimated the peak stormwater flow rates and volumes for pre- and post-development conditions during the various projected 2070 24-hr storms. In general, increased precipitation depths for future scenarios resulted in increased runoff flow rates and volumes, as would be expected. However, post-development conditions at the site are expected to be equivalent or improved by reducing runoff flow rate and volume for the relevant storm events analyzed.

During the future 24-hr 10-yr storm recommended by the RMAT guidance, model results indicate that peak flow rate at **Analysis Point No.1** is expected to decrease from approximately 77.7 to 59.8 cfs (-23%) due to development. Similarly, peak flow rate at **Analysis Point No.2** decreased from 3.6 to 2.4 cfs (-32%). Runoff volumes at **Analysis Point No.1** and **No.2** decreased by 2% (8.0 to 7.9 Ac-ft) and 33% (0.4 to 0.3 Ac-ft) due to development, respectively, with the addition of infiltration basins as part of the stormwater system design.

During the future 24-hr 10-yr storm estimated by the RMAT Tool, post-development is expected to decrease flow rates from 99.5 to 74.5 cfs (-25%) at **Analysis Point No.1** and from 5.3 to 3.5 cfs (-33%) at **Analysis Point No.2**. The model also indicated that runoff volumes decreased by 2% (10.3 to 10.1 Ac-ft) at **Analysis Point No.1** and by 23% at **Analysis Point No.2.**

During the future 24-hr 50-yr storm estimated by the Climate Change Projections Dashboard, post-development is expected to decrease flow rates from 159.6 to 112.5 cfs (-29%) at **Analysis Point No.1** and from 10.6 to 8.7 cfs (-18%) at **Analysis Point No.2**. The model also indicated that runoff volumes decreased by 2% (16.8 to 16.5 Ac-ft) at **Analysis Point No.1.**

Detailed inputs and outputs of the updated HydroCAD models by GZA are included in this memorandum and can be viewed in **Appendix B**.

CONCLUSIONS

To fulfill MEPA requirements identified in the Secretary's Certificate on the EENF and DEIR, the RMAT Tool was used to assess the projects climate change exposure and risk rating. The RMAT Tool identified a target planning horizon of 2070 and Tier 2 methodology to assess 24-hr precipitation storm depth and peak intensity, and urban flooding.

To fulfill RMAT design criteria, GZA updated the HydroCAD model previously developed by Furrow Engineering to include the projected precipitation depths obtained using both the RMAT recommended and the RMAT tool precipitation as well as to accommodate the additional storm depth requested in the Secretary's Certificates.

The results indicated that post-development runoff quantity is expected to be improved by reducing runoff peak flow rates and volumes and increasing infiltration under each of the four modeled 2070 future precipitation events. The models using the precipitation depth of 10.2 inches did not result in the stormwater basins overtopping or releasing uncontrolled waters into adjacent areas.

Attachments: Appendix A – Hydrologic & Hydraulic Evaluation Limitations
Appendix B – HydroCAD Models

APPENDIX A
Hydrologic & Hydraulic Evaluation Limitations

USE OF REPORT

1. GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of the Client for the stated purpose(s) and location(s) identified in the Report. Use of this Report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

STANDARD OF CARE

2. Our findings and conclusions are based on the work conducted as part of the Scope of Services set forth in the Report and/or proposal, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. Conditions other than described in this report may be found at the subject location(s).

3. The interpretations and conclusions presented in the Report were based solely upon the services described therein, and not on scientific tasks or procedures beyond the scope of the described services. The work described in this report was carried out in accordance with the agreed upon Terms and Conditions of Engagement.

4. GZA's hydrologic and hydraulic evaluation was performed in accordance with generally accepted practices of qualified professionals performing the same type of services at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made. The findings are dependent on numerous assumptions and uncertainties inherent in the assessment process. The findings of the evaluation are not an absolute characterization of actual risks, but rather serve to highlight potential sources of risk at the site(s).

5. Unless specifically stated otherwise, the evaluations performed by GZA and associated results and conclusions are based upon evaluation of historic data, trends, references, and guidance with respect to the current climate and sea level conditions. Future climate change may result in alterations to inputs which influence flooding at the site (*e.g.*, rainfall totals, storm intensities, mean sea level, *etc*.). Such changes may have implications on the estimated flood elevations, flood frequencies and/or other parameters contained in this report.

RELIANCE ON INFORMATION FROM OTHERS

6. In conducting our work, GZA has relied upon certain information made available by public agencies, Client and/or others. GZA did not attempt to independently verify the accuracy or completeness of that information. Any inconsistencies in this information which we have noted are discussed in the Report.

COMPLIANCE WITH CODES AND REGULATIONS

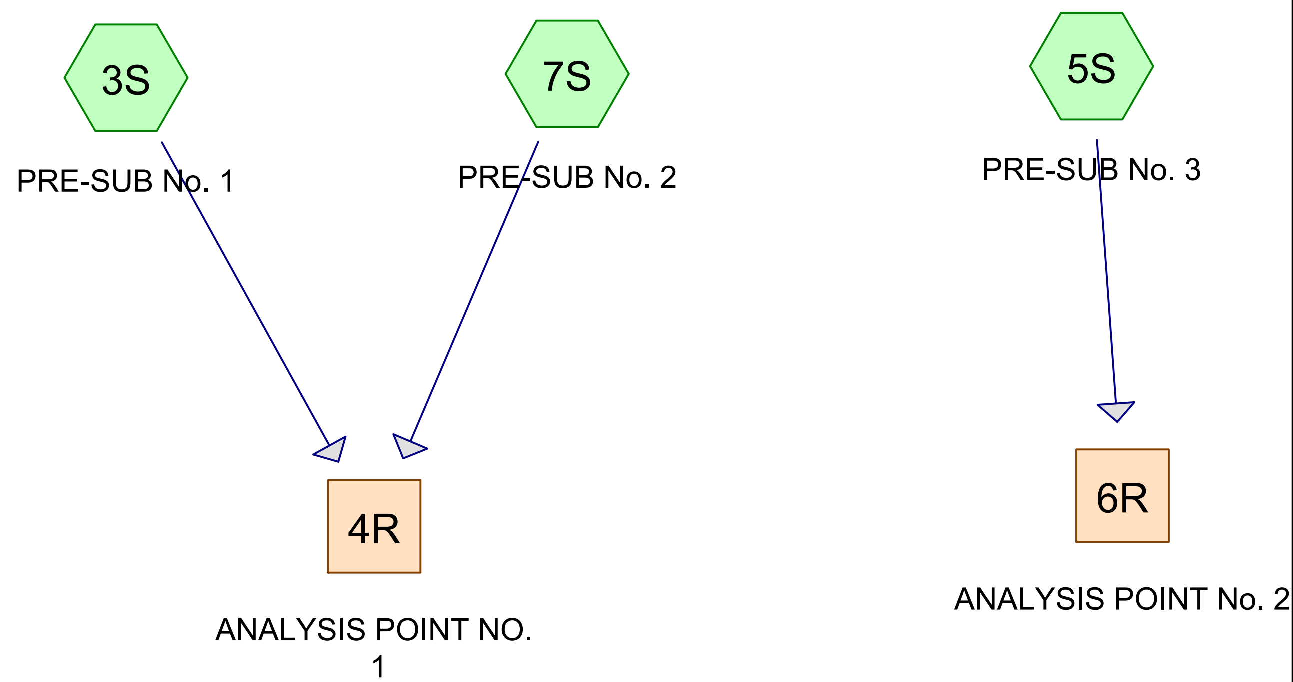
7. We used reasonable care in identifying and interpreting applicable codes and regulations necessary to execute our scope of work. These codes and regulations are subject to various, and possibly contradictory, interpretations. Interpretations with codes and regulations by other parties are beyond our control.

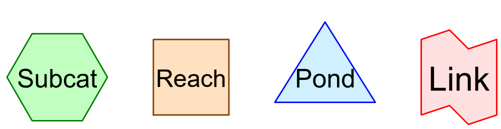
ADDITIONAL INFORMATION

8. In the event that the Client or others authorized to use this report obtain information on conditions at the site(s) not contained in this report, such information shall be brought to GZA's attention forthwith. GZA will evaluate such information and, on the basis of this evaluation, may modify the opinions stated in this report.

ADDITIONAL SERVICES

9. GZA recommends that we be retained to provide services during any future investigations, design, implementation activities, construction, and/or property development/ redevelopment at the Site. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.





Routing Diagram for 1042-PreDevelopment-1-30-2023
Prepared by GZA GeoEnvironmental, Inc, Printed 2/13/2024
HydroCAD® 10.20-4a s/n 01286 © 2023 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	10-YR	Type III 24-hr		Default	24.00	1	4.97	2
2	25-YR	Type III 24-hr		Default	24.00	1	6.22	2
3	Future 10-YR	Type III 24-hr		Default	24.00	1	5.96	2
4	Future 25-YR	Type III 24-hr		Default	24.00	1	7.48	2
5	Future 50-YR	Type III 24-hr		Default	24.00	1	8.52	2
6	RMAT 10-YR	Type III 24-hr		Default	24.00	1	7.10	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.073	49	50-75% Grass cover, Fair, HSG A (3S)
5.784	69	50-75% Grass cover, Fair, HSG B (3S)
5.912	84	50-75% Grass cover, Fair, HSG D (3S)
0.123	98	Ex. Buildings (3S)
0.408	98	Ex. Pavement (3S)
6.203	89	Row crops, straight row, Good, HSG D (5S, 7S)
1.876	30	Woods, Good, HSG A (3S, 5S)
0.747	55	Woods, Good, HSG B (3S)
8.418	77	Woods, Good, HSG D (3S, 5S, 7S)
29.544	**76**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
1.948	HSG A	3S, 5S
6.531	HSG B	3S
0.000	HSG C	
20.533	HSG D	3S, 5S, 7S
0.531	Other	3S
29.544		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.073	5.784	0.000	5.912	0.000	11.769	50-75% Grass cover, Fair	3S
0.000	0.000	0.000	0.000	0.123	0.123	Ex. Buildings	3S
0.000	0.000	0.000	0.000	0.408	0.408	Ex. Pavement	3S
0.000	0.000	0.000	6.203	0.000	6.203	Row crops, straight row, Good	5S, 7S
1.876	0.747	0.000	8.418	0.000	11.040	Woods, Good	3S, 5S, 7S
1.948	**6.531**	**0.000**	**20.533**	**0.531**	**29.544**	**TOTAL AREA**	

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

Subcatchment 3S: PRE-SUB No. 1 Runoff Area=695,653 sf 3.33% Impervious Runoff Depth=2.42"
Flow Length=1,394' Tc=19.9 min CN=75 Runoff=30.38 cfs 3.227 af

Subcatchment 5S: PRE-SUB No. 3 Runoff Area=114,127 sf 0.00% Impervious Runoff Depth=1.15"
Flow Length=327' Tc=16.2 min CN=58 Runoff=2.21 cfs 0.252 af

Subcatchment 7S: PRE-SUB No. 2 Runoff Area=477,139 sf 0.00% Impervious Runoff Depth=3.15"
Flow Length=530' Tc=15.9 min CN=83 Runoff=29.72 cfs 2.873 af

Reach 4R: ANALYSIS POINT NO. 1 Inflow=59.05 cfs 6.100 af
Outflow=59.05 cfs 6.100 af

Reach 6R: ANALYSIS POINT No. 2 Inflow=2.21 cfs 0.252 af
Outflow=2.21 cfs 0.252 af

Total Runoff Area = 29.544 ac Runoff Volume = 6.351 af Average Runoff Depth = 2.58"
98.20% Pervious = 29.012 ac 1.80% Impervious = 0.531 ac

Summary for Subcatchment 3S: PRE-SUB No. 1

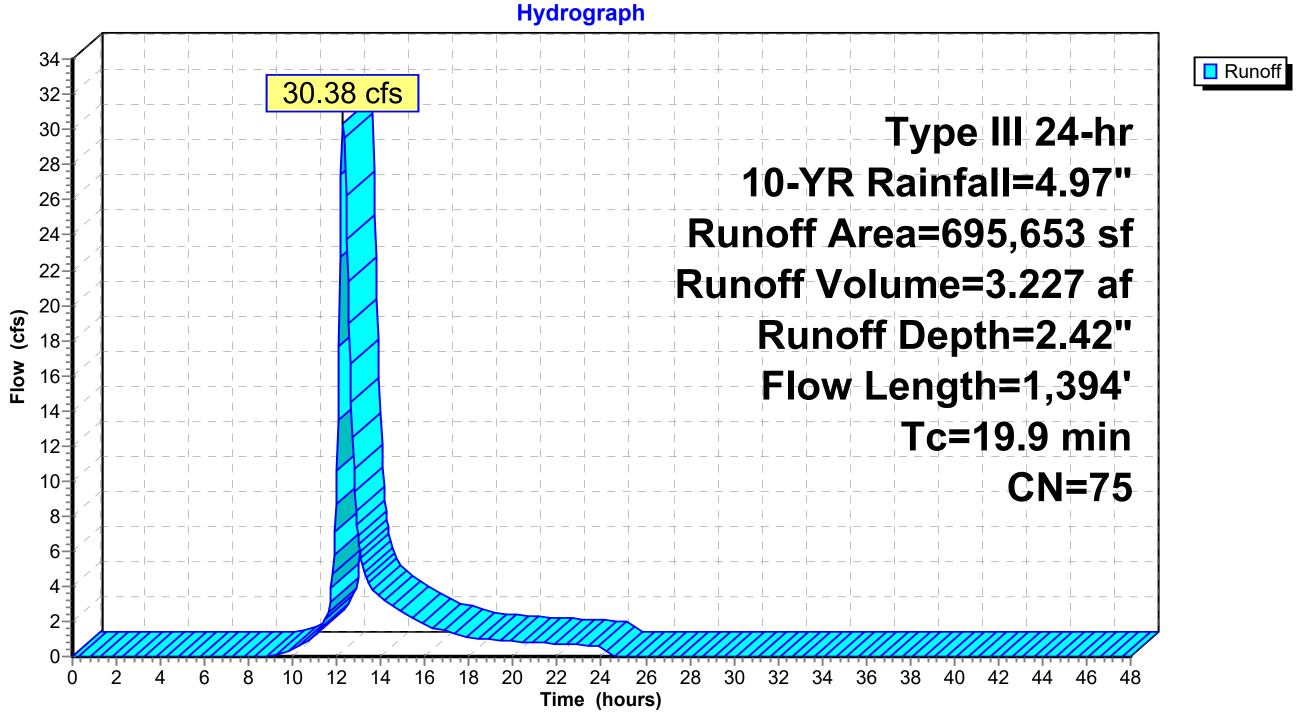
Runoff = 30.38 cfs @ 12.28 hrs, Volume= 3.227 af, Depth= 2.42"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.97"

	Area (sf)	CN	Description
*	17,789	98	Ex. Pavement
*	5,351	98	Ex. Buildings
	25,382	30	Woods, Good, HSG A
	32,537	55	Woods, Good, HSG B
	101,920	77	Woods, Good, HSG D
	3,166	49	50-75% Grass cover, Fair, HSG A
	251,971	69	50-75% Grass cover, Fair, HSG B
	257,537	84	50-75% Grass cover, Fair, HSG D
	695,653	75	Weighted Average
	672,513		96.67% Pervious Area
	23,140		3.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.7	245	0.0245	2.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	411	0.0340	2.77		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.9	523	0.0050	4.48	44.82	**Channel Flow,** Area= 10.0 sf Perim= 11.0' r= 0.91' n= 0.022 Earth, clean & straight
0.2	115	0.0950	11.59	115.88	**Channel Flow,** Area= 10.0 sf Perim= 12.0' r= 0.83' n= 0.035 Earth, dense weeds
19.9	1,394	Total			

Subcatchment 3S: PRE-SUB No. 1



Summary for Subcatchment 5S: PRE-SUB No. 3

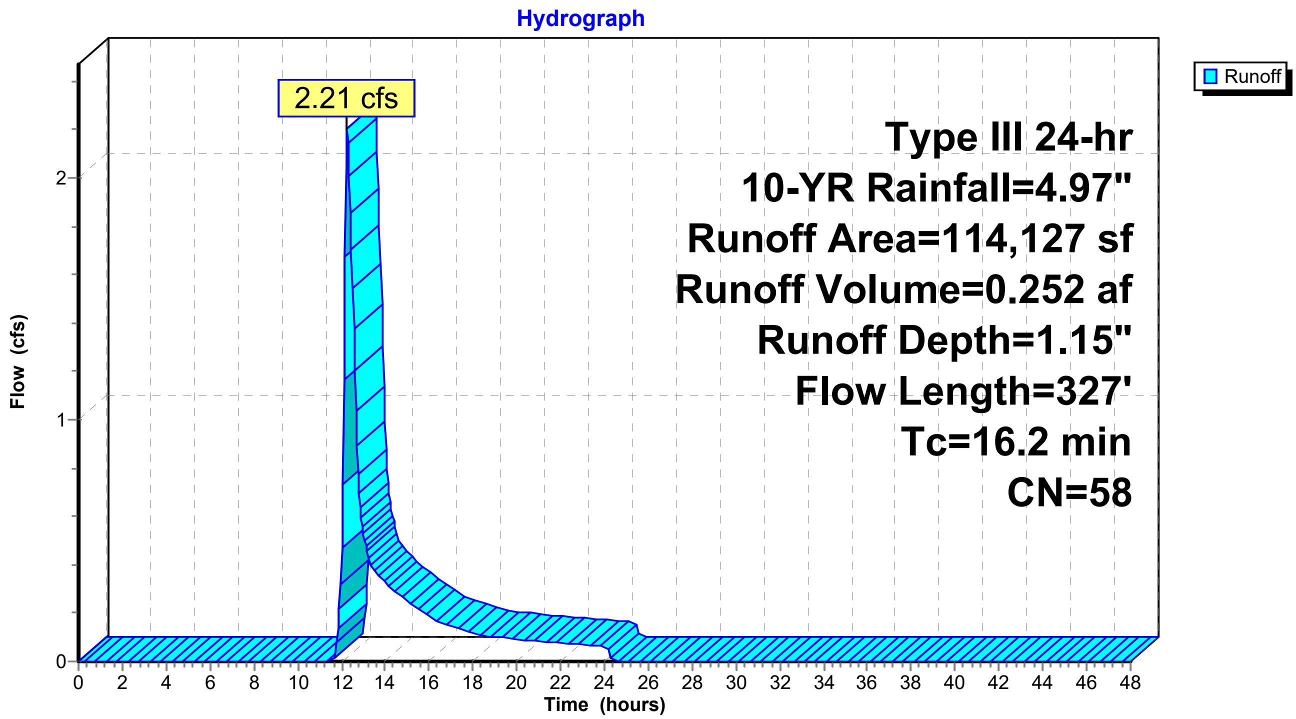
Runoff = 2.21 cfs @ 12.26 hrs, Volume= 0.252 af, Depth= 1.15"
Routed to Reach 6R : ANALYSIS POINT No. 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.97"

Area (sf)	CN	Description
37,230	89	Row crops, straight row, Good, HSG D
20,575	77	Woods, Good, HSG D
56,322	30	Woods, Good, HSG A
114,127	58	Weighted Average
114,127		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	100	0.0330	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.90"
3.5	157	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	70	0.3300	2.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.2	327	Total			

Subcatchment 5S: PRE-SUB No. 3



Summary for Subcatchment 7S: PRE-SUB No. 2

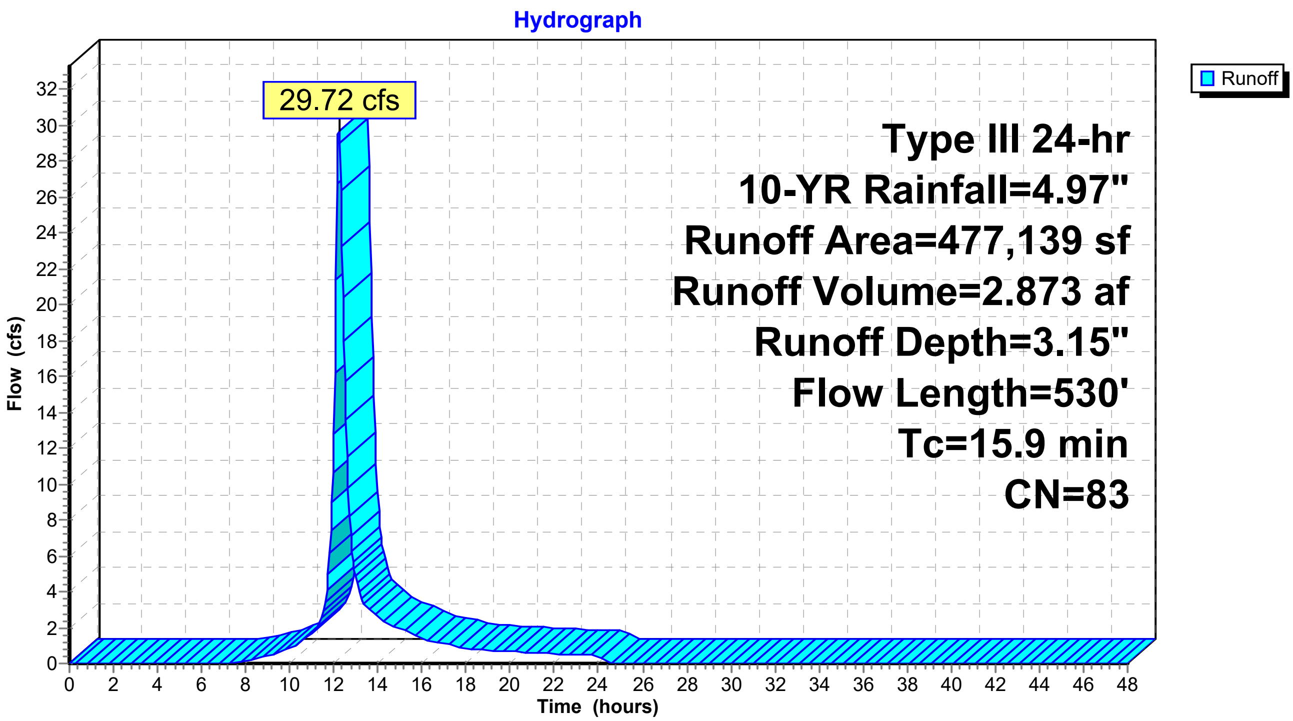
Runoff = 29.72 cfs @ 12.22 hrs, Volume= 2.873 af, Depth= 3.15"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.97"

Area (sf)	CN	Description
244,176	77	Woods, Good, HSG D
232,963	89	Row crops, straight row, Good, HSG D
477,139	83	Weighted Average
477,139		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.0190	0.14		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 2.90"
3.2	330	0.0370	1.73		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
1.1	100	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.9	530	Total			

Subcatchment 7S: PRE-SUB No. 2



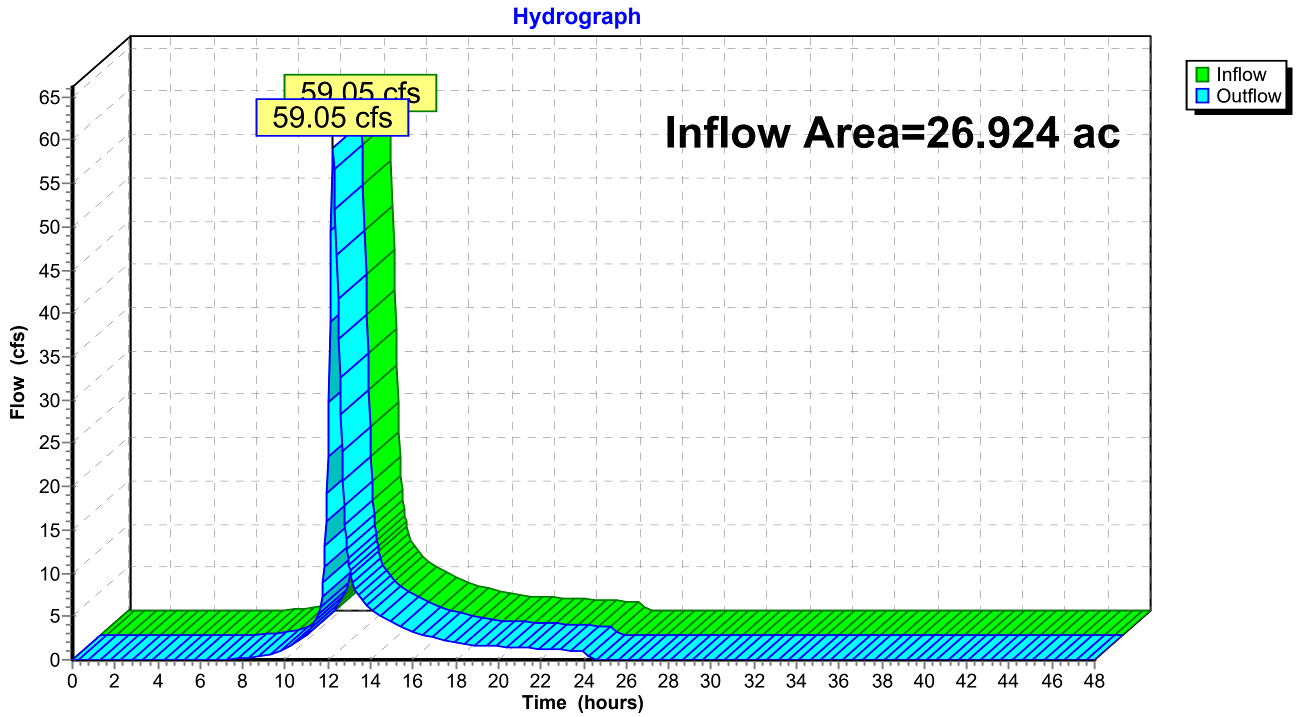
Summary for Reach 4R: ANALYSIS POINT NO. 1

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

Inflow Area = 26.924 ac, 1.97% Impervious, Inflow Depth = 2.72" for 10-YR event
Inflow = 59.05 cfs @ 12.25 hrs, Volume= 6.100 af
Outflow = 59.05 cfs @ 12.25 hrs, Volume= 6.100 af, Atten= 0%, Lag= 0.0 min

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

Reach 4R: ANALYSIS POINT NO. 1



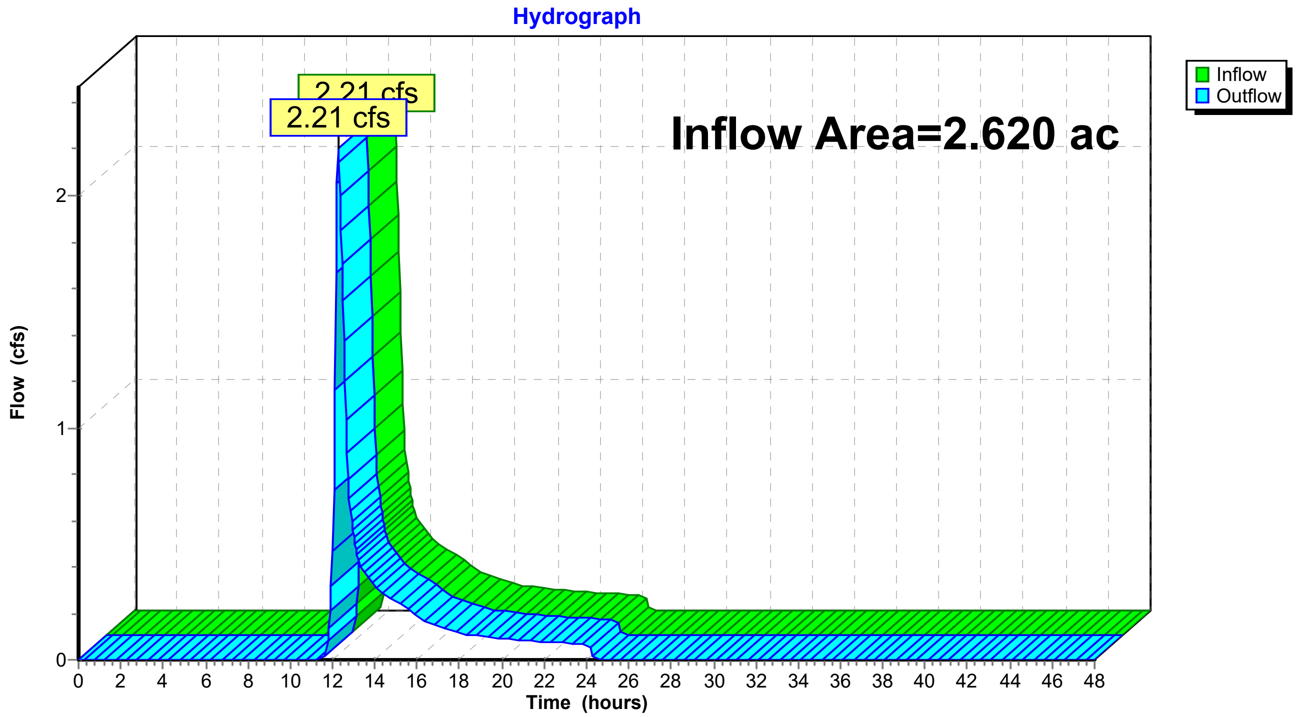
Summary for Reach 6R: ANALYSIS POINT No. 2

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

Inflow Area =	2.620 ac,	0.00% Impervious, Inflow Depth = 1.15"	for 10-YR event
Inflow =	2.21 cfs @	12.26 hrs, Volume=	0.252 af
Outflow =	2.21 cfs @	12.26 hrs, Volume=	0.252 af, Atten= 0%, Lag= 0.0 min

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

Reach 6R: ANALYSIS POINT No. 2



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

Subcatchment 3S: PRE-SUB No. 1 Runoff Area=695,653 sf 3.33% Impervious Runoff Depth=3.47"
Flow Length=1,394' Tc=19.9 min CN=75 Runoff=43.71 cfs 4.618 af

Subcatchment 5S: PRE-SUB No. 3 Runoff Area=114,127 sf 0.00% Impervious Runoff Depth=1.90"
Flow Length=327' Tc=16.2 min CN=58 Runoff=3.94 cfs 0.414 af

Subcatchment 7S: PRE-SUB No. 2 Runoff Area=477,139 sf 0.00% Impervious Runoff Depth=4.30"
Flow Length=530' Tc=15.9 min CN=83 Runoff=40.28 cfs 3.921 af

Reach 4R: ANALYSIS POINT NO. 1 Inflow=82.60 cfs 8.540 af
Outflow=82.60 cfs 8.540 af

Reach 6R: ANALYSIS POINT No. 2 Inflow=3.94 cfs 0.414 af
Outflow=3.94 cfs 0.414 af

Total Runoff Area = 29.544 ac Runoff Volume = 8.954 af Average Runoff Depth = 3.64"
98.20% Pervious = 29.012 ac 1.80% Impervious = 0.531 ac

Summary for Subcatchment 3S: PRE-SUB No. 1

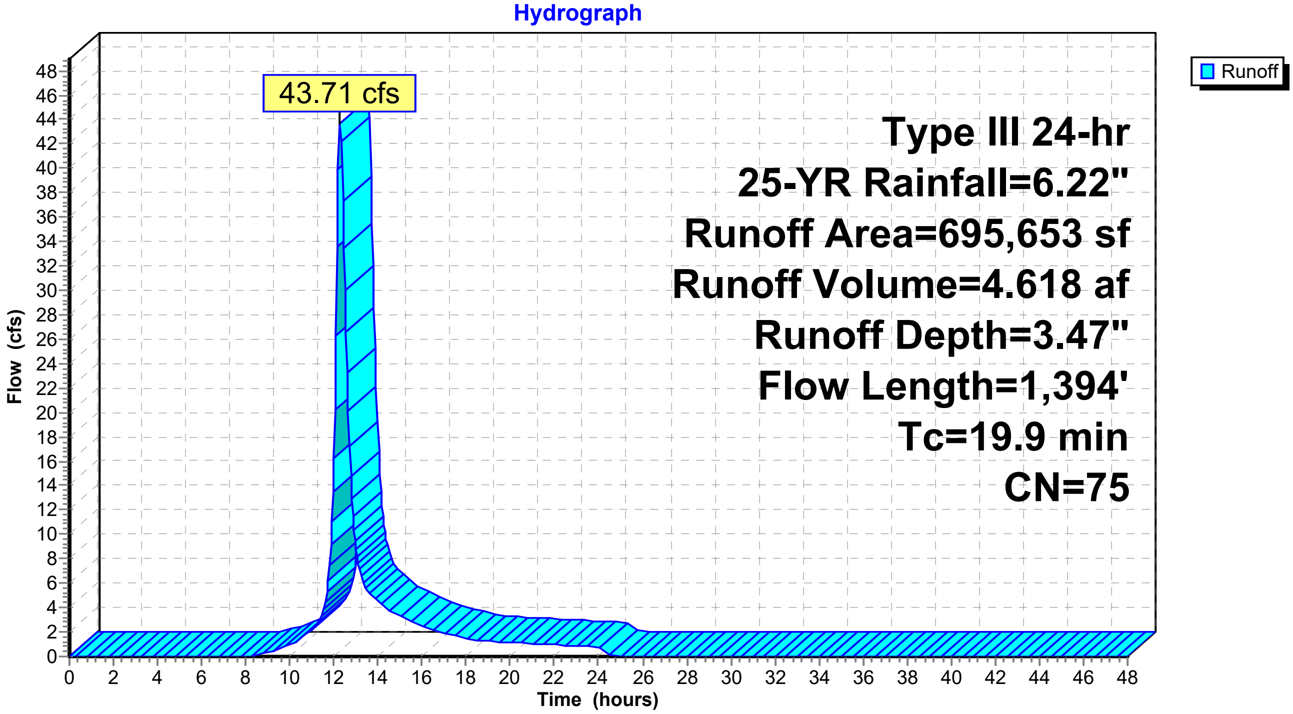
Runoff = 43.71 cfs @ 12.28 hrs, Volume= 4.618 af, Depth= 3.47"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.22"

	Area (sf)	CN	Description
*	17,789	98	Ex. Pavement
*	5,351	98	Ex. Buildings
	25,382	30	Woods, Good, HSG A
	32,537	55	Woods, Good, HSG B
	101,920	77	Woods, Good, HSG D
	3,166	49	50-75% Grass cover, Fair, HSG A
	251,971	69	50-75% Grass cover, Fair, HSG B
	257,537	84	50-75% Grass cover, Fair, HSG D
	695,653	75	Weighted Average
	672,513		96.67% Pervious Area
	23,140		3.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.7	245	0.0245	2.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	411	0.0340	2.77		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.9	523	0.0050	4.48	44.82	**Channel Flow,** Area= 10.0 sf Perim= 11.0' r= 0.91' n= 0.022 Earth, clean & straight
0.2	115	0.0950	11.59	115.88	**Channel Flow,** Area= 10.0 sf Perim= 12.0' r= 0.83' n= 0.035 Earth, dense weeds
19.9	1,394	Total			

Subcatchment 3S: PRE-SUB No. 1



Summary for Subcatchment 5S: PRE-SUB No. 3

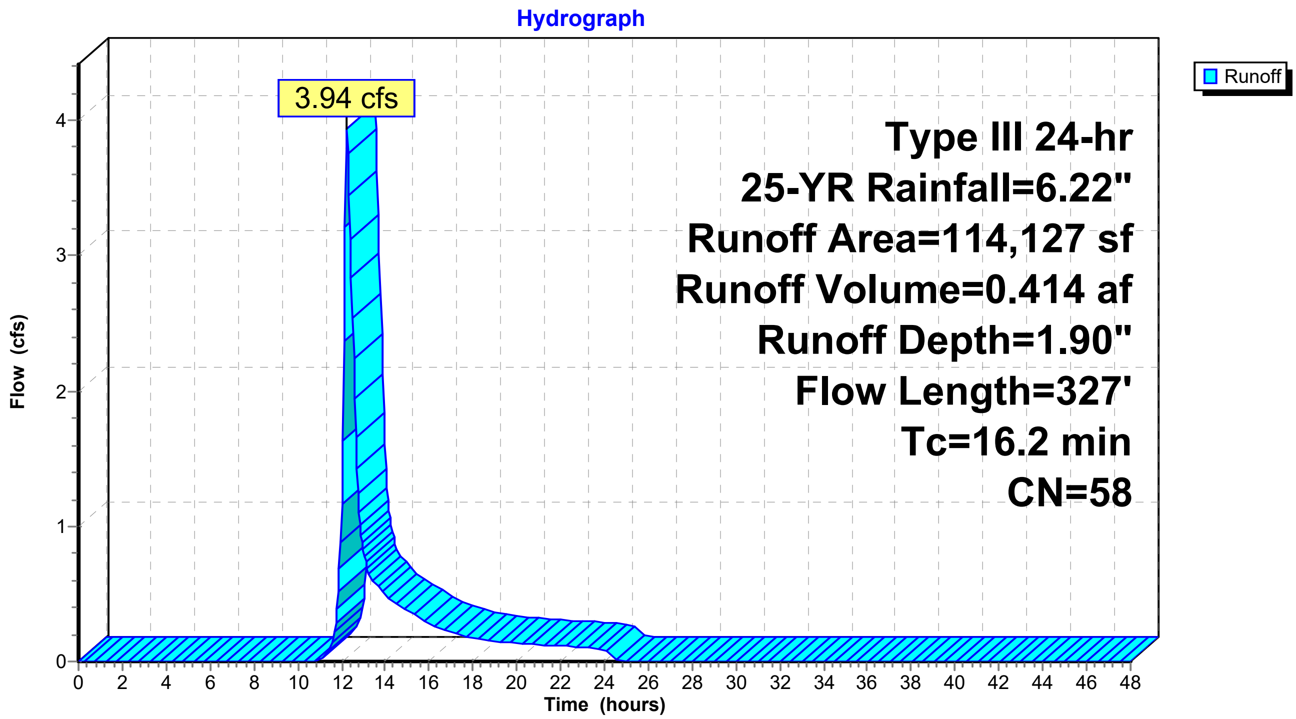
Runoff = 3.94 cfs @ 12.25 hrs, Volume= 0.414 af, Depth= 1.90"
Routed to Reach 6R : ANALYSIS POINT No. 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.22"

Area (sf)	CN	Description
37,230	89	Row crops, straight row, Good, HSG D
20,575	77	Woods, Good, HSG D
56,322	30	Woods, Good, HSG A
114,127	58	Weighted Average
114,127		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	100	0.0330	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.90"
3.5	157	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	70	0.3300	2.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.2	327	Total			

Subcatchment 5S: PRE-SUB No. 3



Summary for Subcatchment 7S: PRE-SUB No. 2

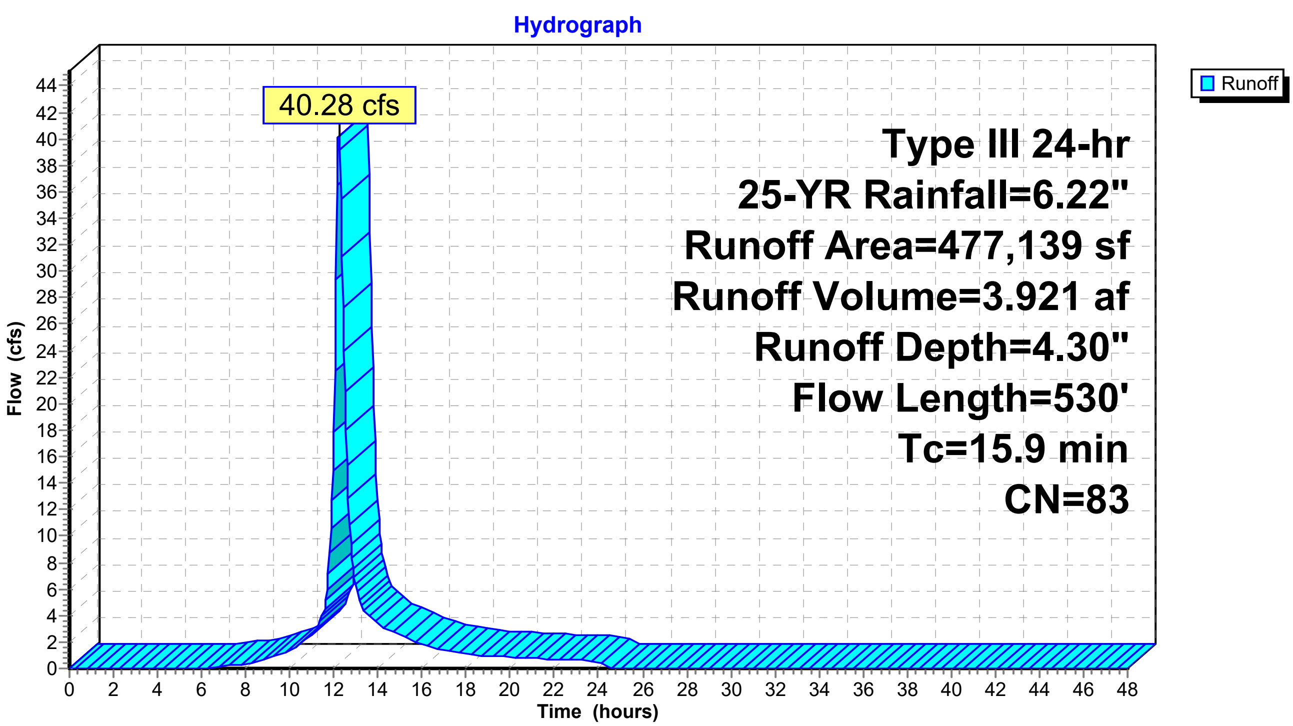
Runoff = 40.28 cfs @ 12.22 hrs, Volume= 3.921 af, Depth= 4.30"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.22"

Area (sf)	CN	Description
244,176	77	Woods, Good, HSG D
232,963	89	Row crops, straight row, Good, HSG D
477,139	83	Weighted Average
477,139		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.0190	0.14		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 2.90"
3.2	330	0.0370	1.73		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
1.1	100	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.9	530	Total			

Subcatchment 7S: PRE-SUB No. 2

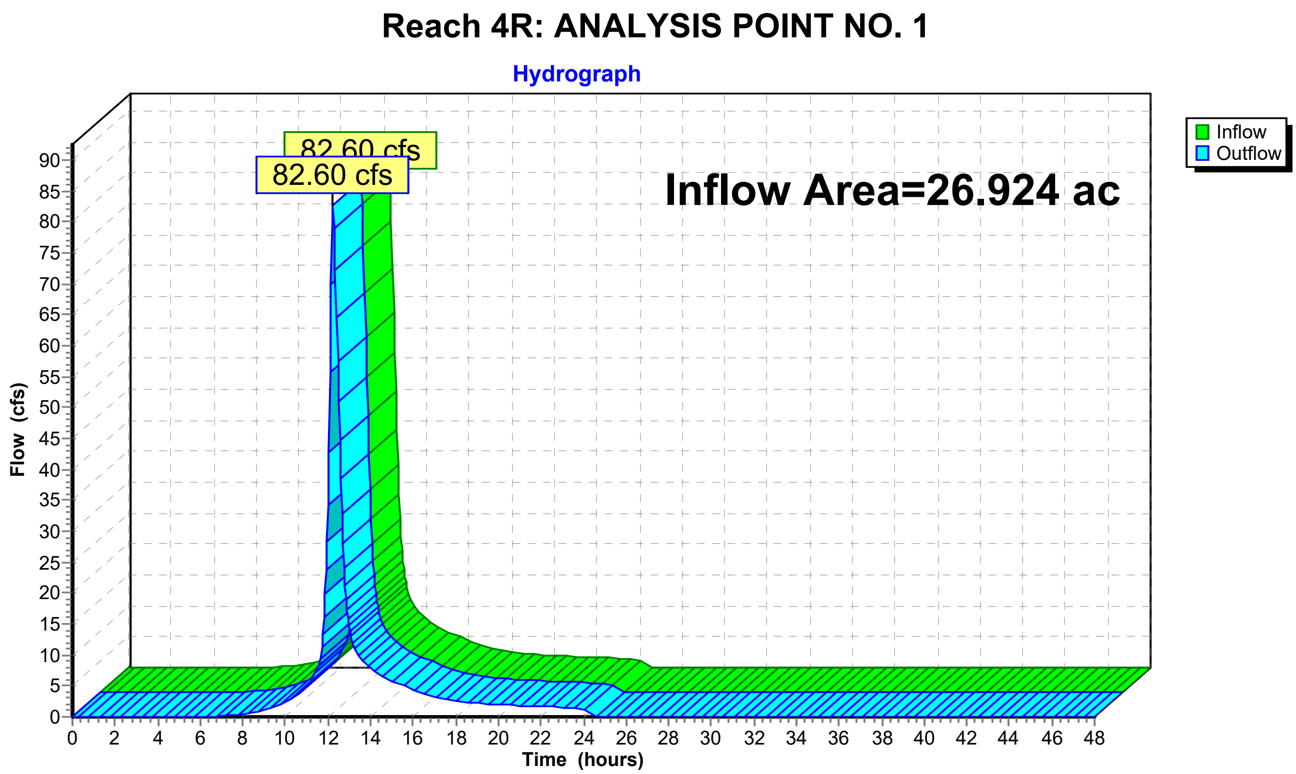


Summary for Reach 4R: ANALYSIS POINT NO. 1

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

Inflow Area = 26.924 ac, 1.97% Impervious, Inflow Depth = 3.81" for 25-YR event
Inflow = 82.60 cfs @ 12.25 hrs, Volume= 8.540 af
Outflow = 82.60 cfs @ 12.25 hrs, Volume= 8.540 af, Atten= 0%, Lag= 0.0 min

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

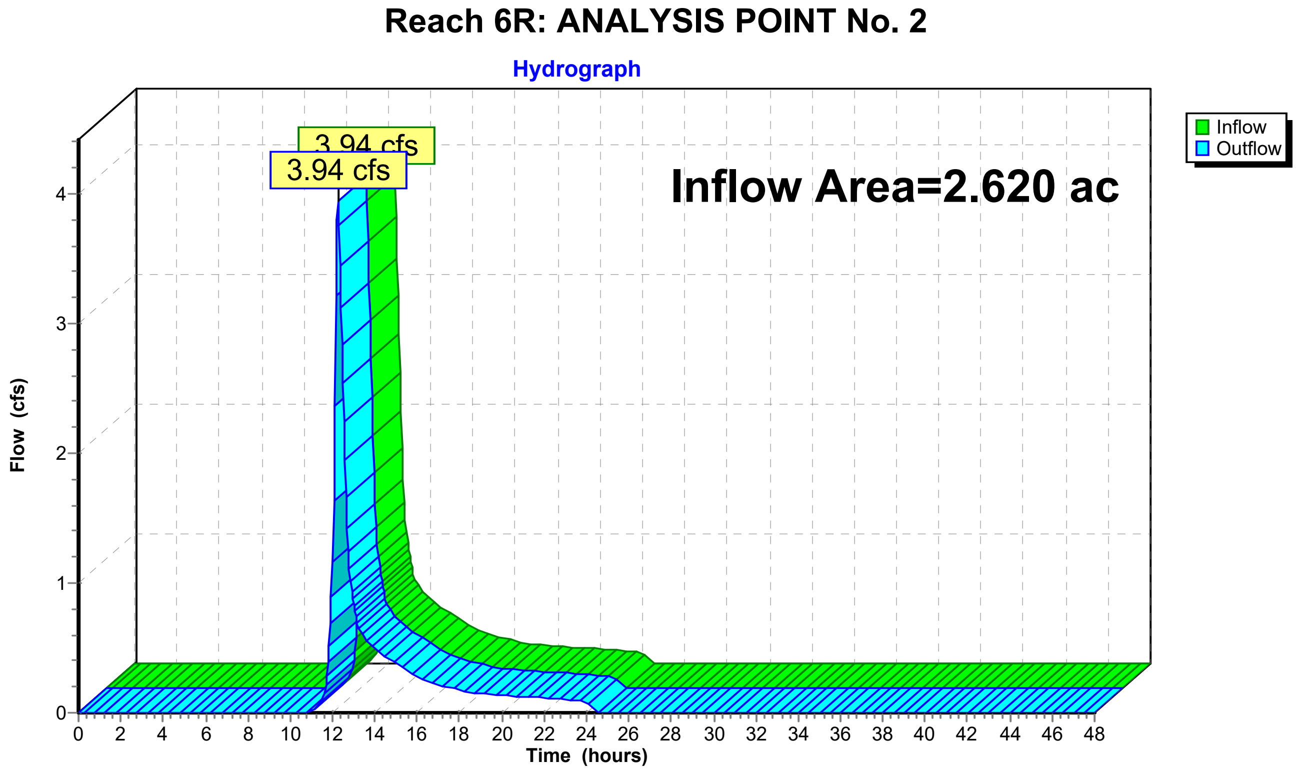


Summary for Reach 6R: ANALYSIS POINT No. 2

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

Inflow Area =	2.620 ac,	0.00% Impervious, Inflow Depth = 1.90"	for 25-YR event
Inflow =	3.94 cfs @	12.25 hrs, Volume=	0.414 af
Outflow =	3.94 cfs @	12.25 hrs, Volume=	0.414 af, Atten= 0%, Lag= 0.0 min

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



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

Subcatchment 3S: PRE-SUB No. 1 Runoff Area=695,653 sf 3.33% Impervious Runoff Depth=3.25"
Flow Length=1,394' Tc=19.9 min CN=75 Runoff=40.89 cfs 4.323 af

Subcatchment 5S: PRE-SUB No. 3 Runoff Area=114,127 sf 0.00% Impervious Runoff Depth=1.73"
Flow Length=327' Tc=16.2 min CN=58 Runoff=3.56 cfs 0.378 af

Subcatchment 7S: PRE-SUB No. 2 Runoff Area=477,139 sf 0.00% Impervious Runoff Depth=4.05"
Flow Length=530' Tc=15.9 min CN=83 Runoff=38.07 cfs 3.701 af

Reach 4R: ANALYSIS POINT NO. 1 Inflow=77.65 cfs 8.023 af
Outflow=77.65 cfs 8.023 af

Reach 6R: ANALYSIS POINT No. 2 Inflow=3.56 cfs 0.378 af
Outflow=3.56 cfs 0.378 af

Total Runoff Area = 29.544 ac Runoff Volume = 8.401 af Average Runoff Depth = 3.41"
98.20% Pervious = 29.012 ac 1.80% Impervious = 0.531 ac

Summary for Subcatchment 3S: PRE-SUB No. 1

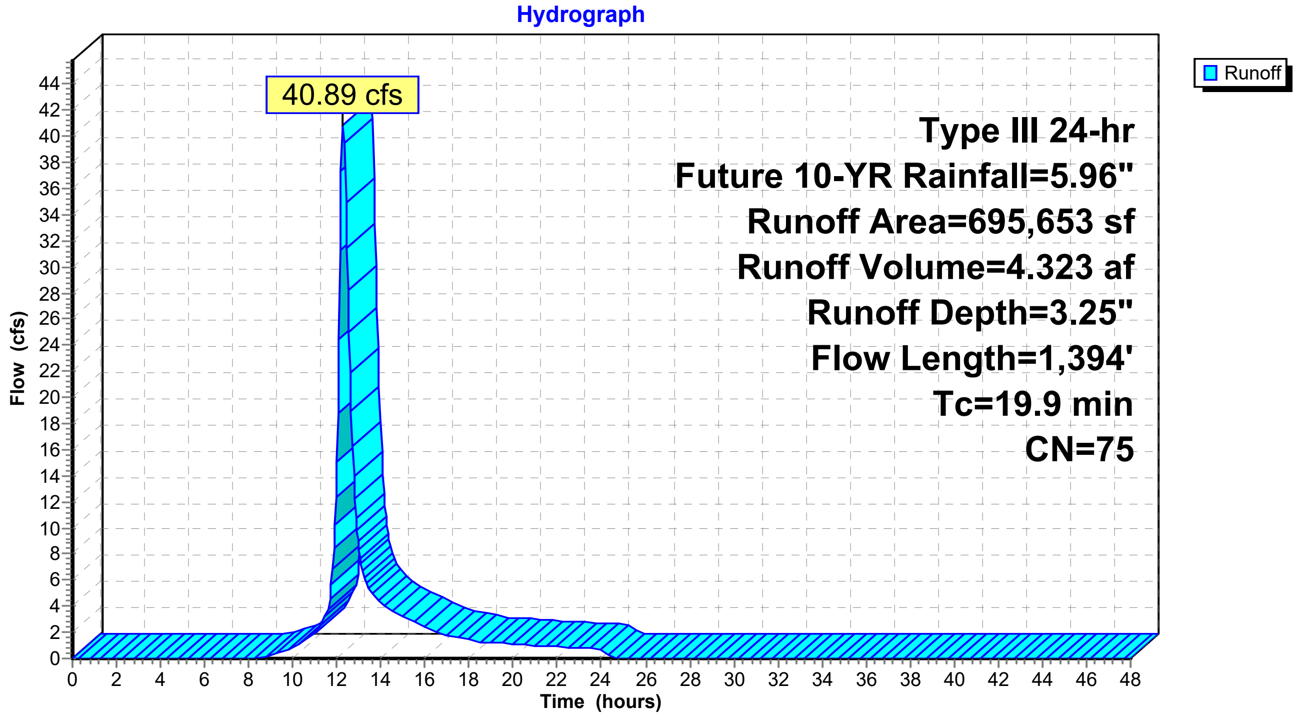
Runoff = 40.89 cfs @ 12.28 hrs, Volume= 4.323 af, Depth= 3.25"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 10-YR Rainfall=5.96"

	Area (sf)	CN	Description
*	17,789	98	Ex. Pavement
*	5,351	98	Ex. Buildings
	25,382	30	Woods, Good, HSG A
	32,537	55	Woods, Good, HSG B
	101,920	77	Woods, Good, HSG D
	3,166	49	50-75% Grass cover, Fair, HSG A
	251,971	69	50-75% Grass cover, Fair, HSG B
	257,537	84	50-75% Grass cover, Fair, HSG D
	695,653	75	Weighted Average
	672,513		96.67% Pervious Area
	23,140		3.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.7	245	0.0245	2.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	411	0.0340	2.77		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.9	523	0.0050	4.48	44.82	**Channel Flow,** Area= 10.0 sf Perim= 11.0' r= 0.91' n= 0.022 Earth, clean & straight
0.2	115	0.0950	11.59	115.88	**Channel Flow,** Area= 10.0 sf Perim= 12.0' r= 0.83' n= 0.035 Earth, dense weeds
19.9	1,394	Total			

Subcatchment 3S: PRE-SUB No. 1



Summary for Subcatchment 5S: PRE-SUB No. 3

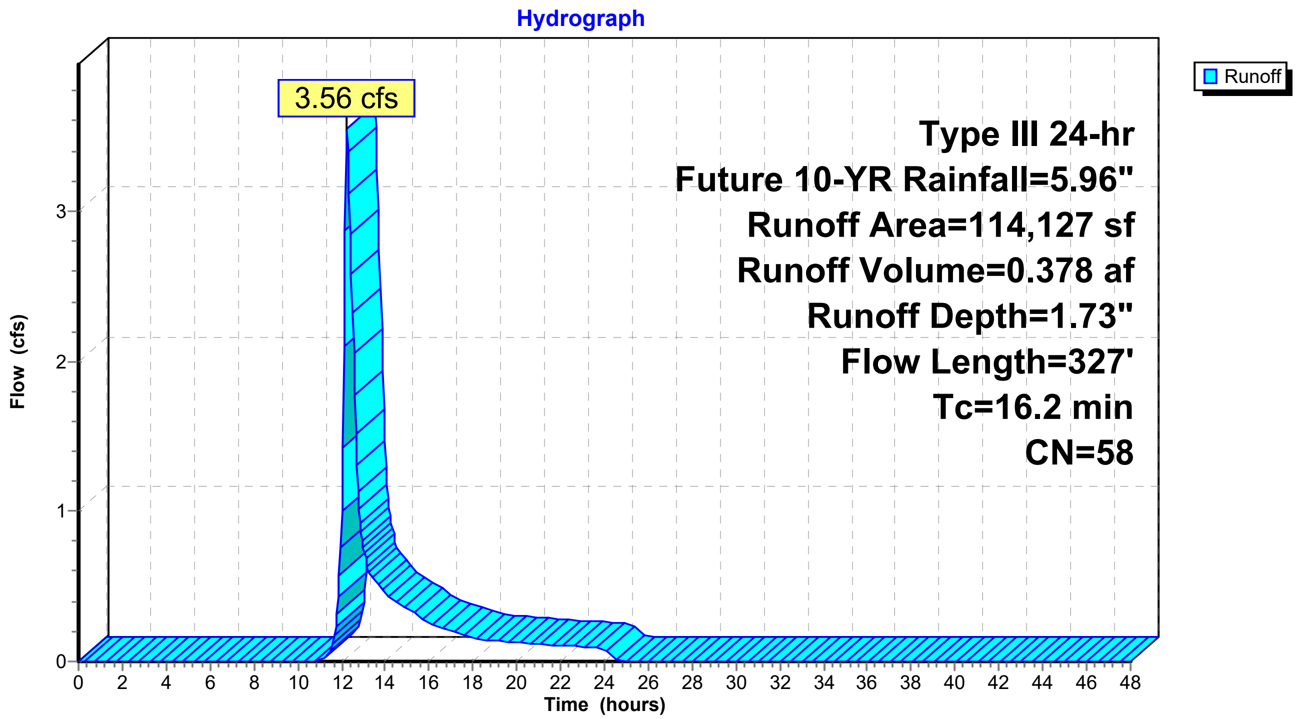
Runoff = 3.56 cfs @ 12.25 hrs, Volume= 0.378 af, Depth= 1.73"
Routed to Reach 6R : ANALYSIS POINT No. 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 10-YR Rainfall=5.96"

Area (sf)	CN	Description
37,230	89	Row crops, straight row, Good, HSG D
20,575	77	Woods, Good, HSG D
56,322	30	Woods, Good, HSG A
114,127	58	Weighted Average
114,127		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	100	0.0330	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.90"
3.5	157	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	70	0.3300	2.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.2	327	Total			

Subcatchment 5S: PRE-SUB No. 3



Summary for Subcatchment 7S: PRE-SUB No. 2

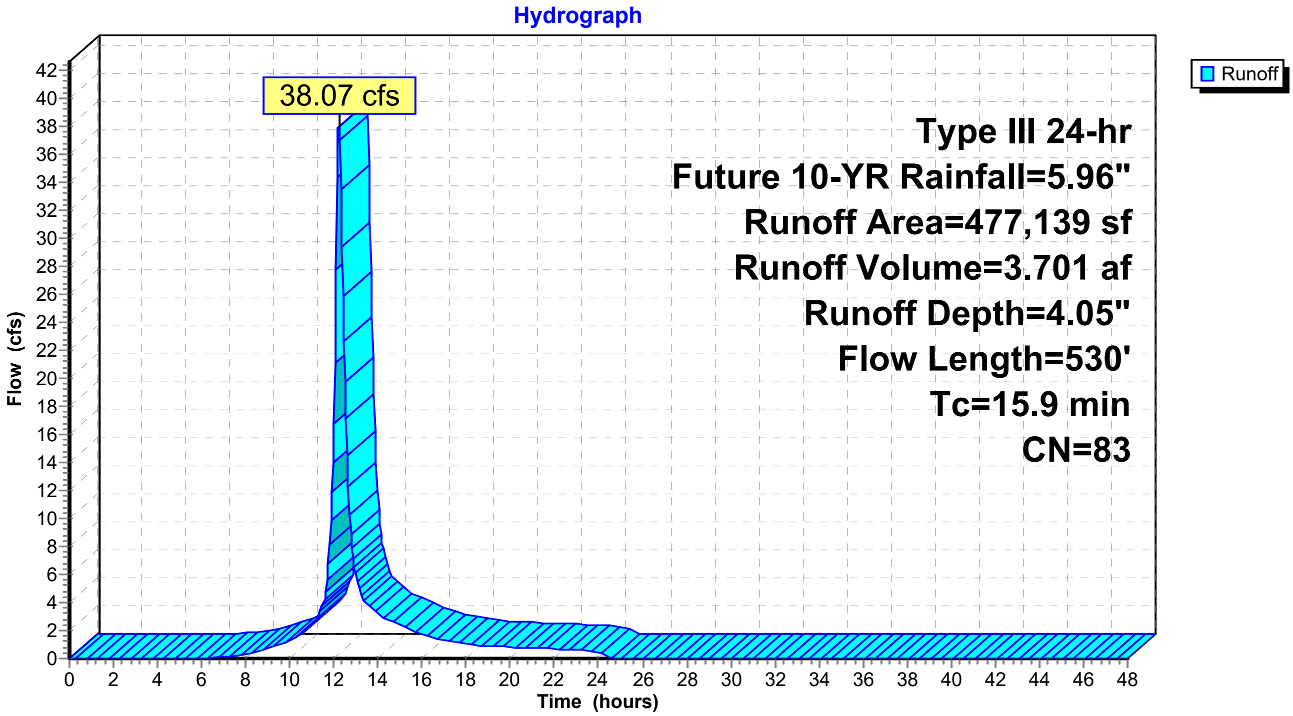
Runoff = 38.07 cfs @ 12.22 hrs, Volume= 3.701 af, Depth= 4.05"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 10-YR Rainfall=5.96"

Area (sf)	CN	Description
244,176	77	Woods, Good, HSG D
232,963	89	Row crops, straight row, Good, HSG D
477,139	83	Weighted Average
477,139		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.0190	0.14		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 2.90"
3.2	330	0.0370	1.73		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
1.1	100	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.9	530	Total			

Subcatchment 7S: PRE-SUB No. 2



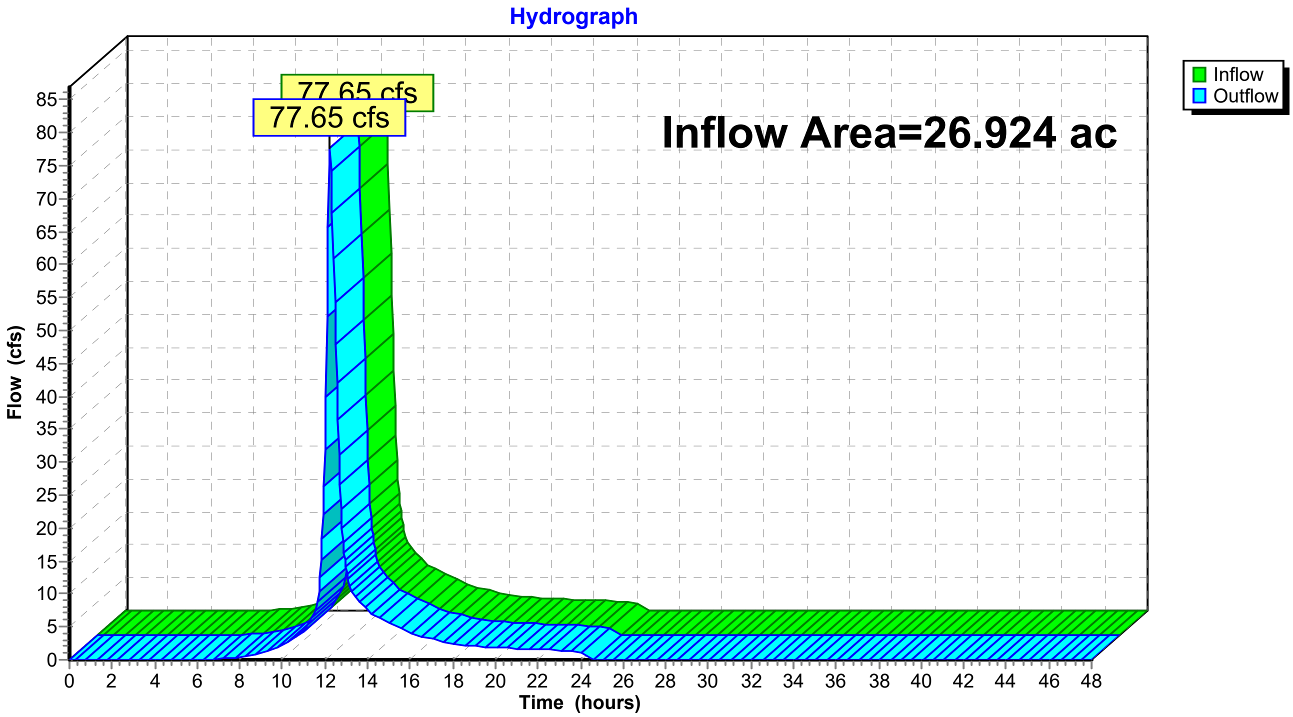
Summary for Reach 4R: ANALYSIS POINT NO. 1

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

Inflow Area =	26.924 ac,	1.97% Impervious, Inflow Depth =	3.58"	for Future 10-YR event
Inflow =	77.65 cfs @	12.25 hrs, Volume=	8.023 af	
Outflow =	77.65 cfs @	12.25 hrs, Volume=	8.023 af,	Atten= 0%, Lag= 0.0 min

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

Reach 4R: ANALYSIS POINT NO. 1



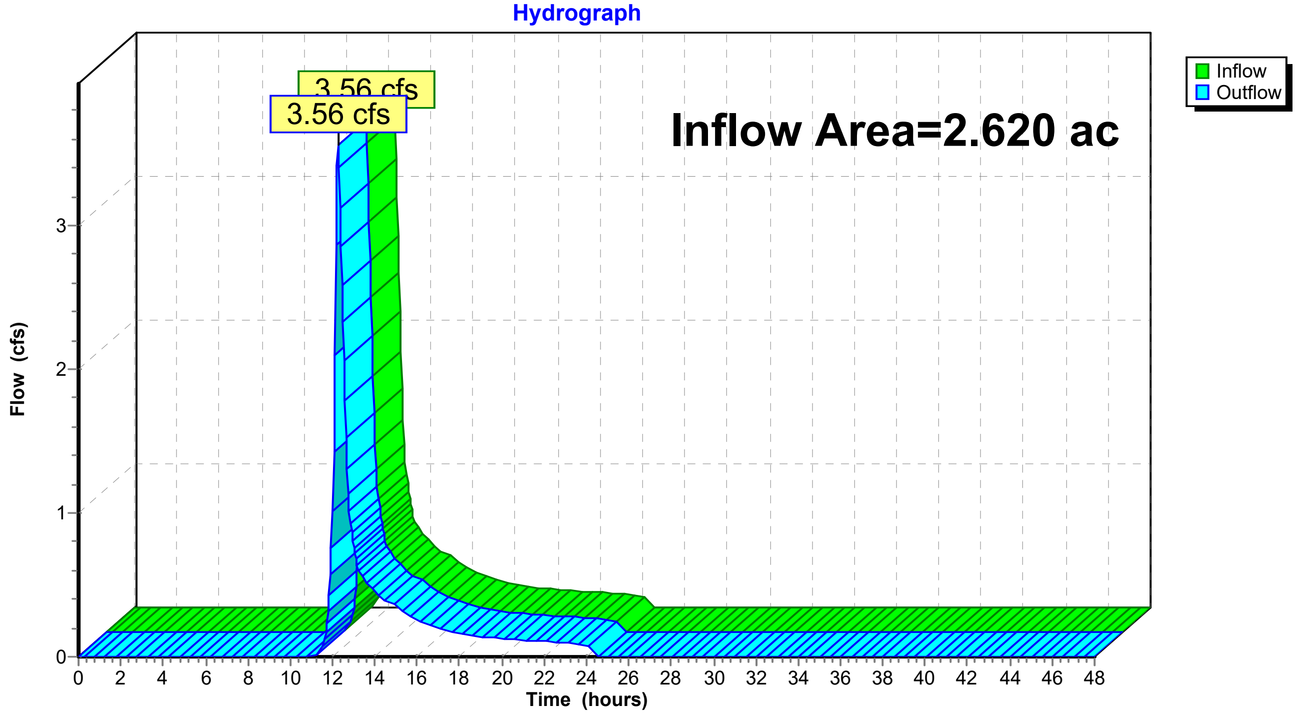
Summary for Reach 6R: ANALYSIS POINT No. 2

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

Inflow Area = 2.620 ac, 0.00% Impervious, Inflow Depth = 1.73" for Future 10-YR event
Inflow = 3.56 cfs @ 12.25 hrs, Volume= 0.378 af
Outflow = 3.56 cfs @ 12.25 hrs, Volume= 0.378 af, Atten= 0%, Lag= 0.0 min

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

Reach 6R: ANALYSIS POINT No. 2



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

Subcatchment 3S: PRE-SUB No. 1 Runoff Area=695,653 sf 3.33% Impervious Runoff Depth=4.58"
Flow Length=1,394' Tc=19.9 min CN=75 Runoff=57.72 cfs 6.089 af

Subcatchment 5S: PRE-SUB No. 3 Runoff Area=114,127 sf 0.00% Impervious Runoff Depth=2.74"
Flow Length=327' Tc=16.2 min CN=58 Runoff=5.91 cfs 0.598 af

Subcatchment 7S: PRE-SUB No. 2 Runoff Area=477,139 sf 0.00% Impervious Runoff Depth=5.48"
Flow Length=530' Tc=15.9 min CN=83 Runoff=50.96 cfs 5.004 af

Reach 4R: ANALYSIS POINT NO. 1 Inflow=106.81 cfs 11.093 af
Outflow=106.81 cfs 11.093 af

Reach 6R: ANALYSIS POINT No. 2 Inflow=5.91 cfs 0.598 af
Outflow=5.91 cfs 0.598 af

Total Runoff Area = 29.544 ac Runoff Volume = 11.691 af Average Runoff Depth = 4.75"
98.20% Pervious = 29.012 ac 1.80% Impervious = 0.531 ac

Summary for Subcatchment 3S: PRE-SUB No. 1

[47] Hint: Peak is 129% of capacity of segment #4

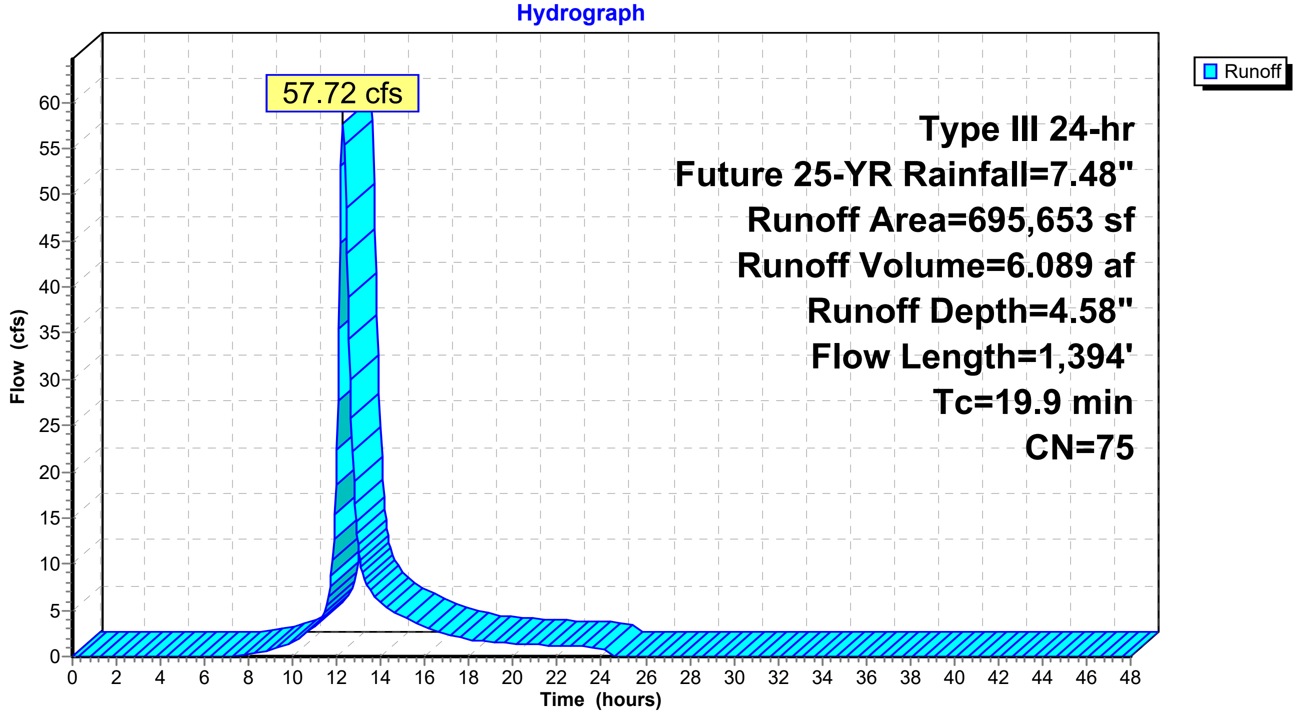
Runoff = 57.72 cfs @ 12.27 hrs, Volume= 6.089 af, Depth= 4.58"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 25-YR Rainfall=7.48"

	Area (sf)	CN	Description
*	17,789	98	Ex. Pavement
*	5,351	98	Ex. Buildings
	25,382	30	Woods, Good, HSG A
	32,537	55	Woods, Good, HSG B
	101,920	77	Woods, Good, HSG D
	3,166	49	50-75% Grass cover, Fair, HSG A
	251,971	69	50-75% Grass cover, Fair, HSG B
	257,537	84	50-75% Grass cover, Fair, HSG D
	695,653	75	Weighted Average
	672,513		96.67% Pervious Area
	23,140		3.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.7	245	0.0245	2.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	411	0.0340	2.77		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.9	523	0.0050	4.48	44.82	**Channel Flow,** Area= 10.0 sf Perim= 11.0' r= 0.91' n= 0.022 Earth, clean & straight
0.2	115	0.0950	11.59	115.88	**Channel Flow,** Area= 10.0 sf Perim= 12.0' r= 0.83' n= 0.035 Earth, dense weeds
19.9	1,394	Total			

Subcatchment 3S: PRE-SUB No. 1



Summary for Subcatchment 5S: PRE-SUB No. 3

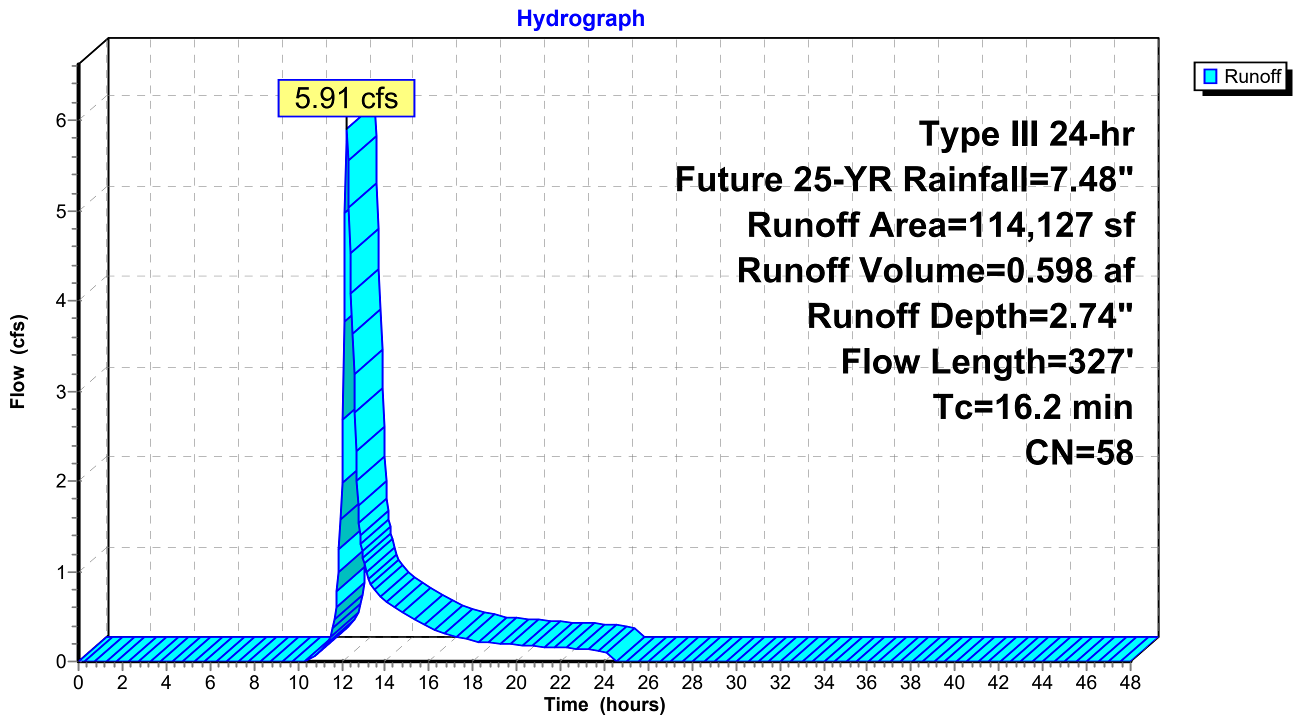
Runoff = 5.91 cfs @ 12.24 hrs, Volume= 0.598 af, Depth= 2.74"
Routed to Reach 6R : ANALYSIS POINT No. 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 25-YR Rainfall=7.48"

Area (sf)	CN	Description
37,230	89	Row crops, straight row, Good, HSG D
20,575	77	Woods, Good, HSG D
56,322	30	Woods, Good, HSG A
114,127	58	Weighted Average
114,127		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	100	0.0330	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.90"
3.5	157	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	70	0.3300	2.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.2	327	Total			

Subcatchment 5S: PRE-SUB No. 3



Summary for Subcatchment 7S: PRE-SUB No. 2

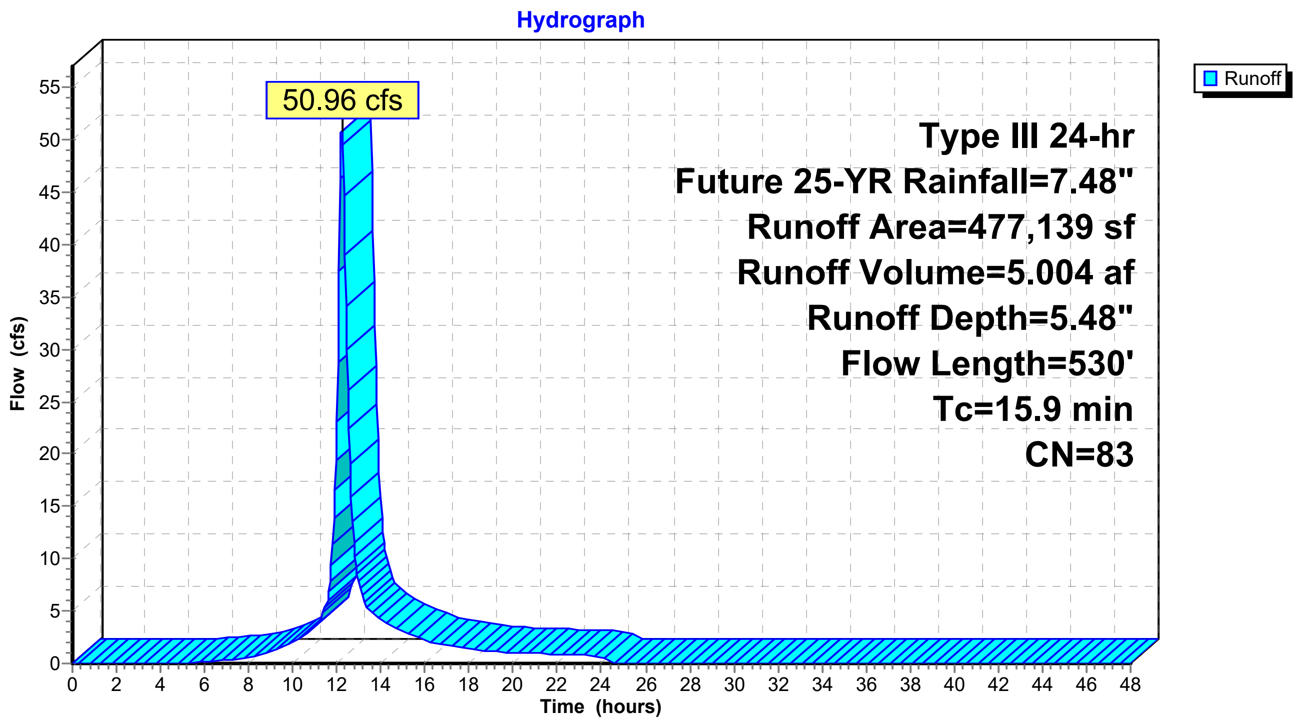
Runoff = 50.96 cfs @ 12.21 hrs, Volume= 5.004 af, Depth= 5.48"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 25-YR Rainfall=7.48"

Area (sf)	CN	Description
244,176	77	Woods, Good, HSG D
232,963	89	Row crops, straight row, Good, HSG D
477,139	83	Weighted Average
477,139		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.0190	0.14		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 2.90"
3.2	330	0.0370	1.73		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
1.1	100	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.9	530	Total			

Subcatchment 7S: PRE-SUB No. 2



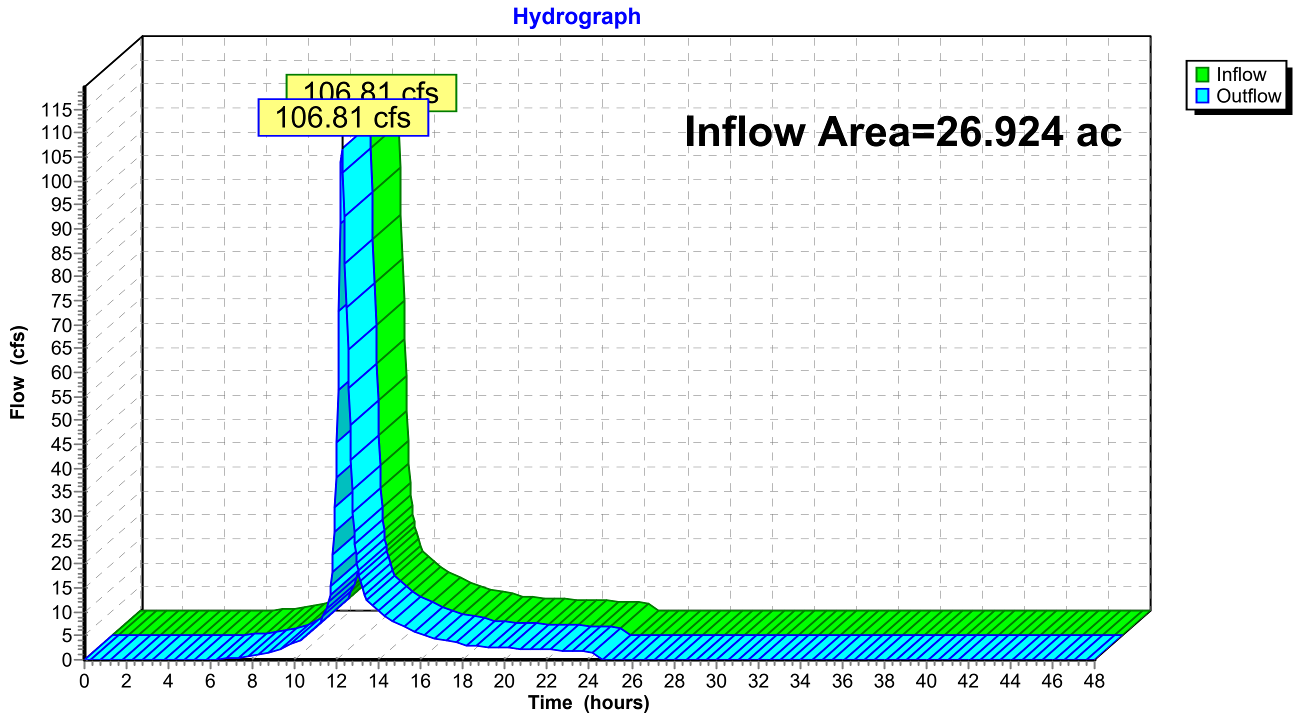
Summary for Reach 4R: ANALYSIS POINT NO. 1

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

Inflow Area = 26.924 ac, 1.97% Impervious, Inflow Depth = 4.94" for Future 25-YR event
Inflow = 106.81 cfs @ 12.24 hrs, Volume= 11.093 af
Outflow = 106.81 cfs @ 12.24 hrs, Volume= 11.093 af, Atten= 0%, Lag= 0.0 min

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

Reach 4R: ANALYSIS POINT NO. 1

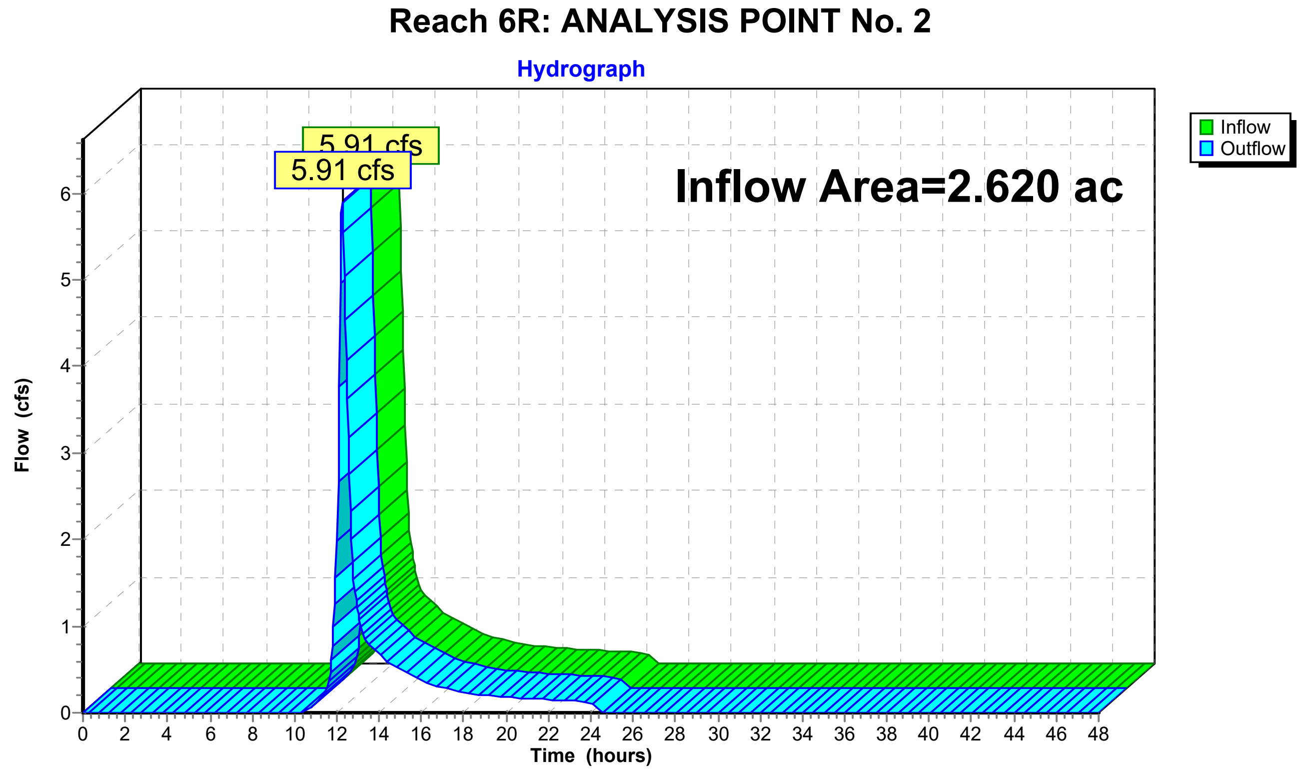


Summary for Reach 6R: ANALYSIS POINT No. 2

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

Inflow Area =	2.620 ac,	0.00% Impervious, Inflow Depth = 2.74"	for Future 25-YR event
Inflow =	5.91 cfs @	12.24 hrs, Volume=	0.598 af
Outflow =	5.91 cfs @	12.24 hrs, Volume=	0.598 af, Atten= 0%, Lag= 0.0 min

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



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

Subcatchment 3S: PRE-SUB No. 1 Runoff Area=695,653 sf 3.33% Impervious Runoff Depth=5.51"
Flow Length=1,394' Tc=19.9 min CN=75 Runoff=69.36 cfs 7.337 af

Subcatchment 5S: PRE-SUB No. 3 Runoff Area=114,127 sf 0.00% Impervious Runoff Depth=3.49"
Flow Length=327' Tc=16.2 min CN=58 Runoff=7.66 cfs 0.763 af

Subcatchment 7S: PRE-SUB No. 2 Runoff Area=477,139 sf 0.00% Impervious Runoff Depth=6.48"
Flow Length=530' Tc=15.9 min CN=83 Runoff=59.76 cfs 5.911 af

Reach 4R: ANALYSIS POINT NO. 1 Inflow=126.96 cfs 13.248 af
Outflow=126.96 cfs 13.248 af

Reach 6R: ANALYSIS POINT No. 2 Inflow=7.66 cfs 0.763 af
Outflow=7.66 cfs 0.763 af

Total Runoff Area = 29.544 ac Runoff Volume = 14.011 af Average Runoff Depth = 5.69"
98.20% Pervious = 29.012 ac 1.80% Impervious = 0.531 ac

Summary for Subcatchment 3S: PRE-SUB No. 1

[47] Hint: Peak is 155% of capacity of segment #4

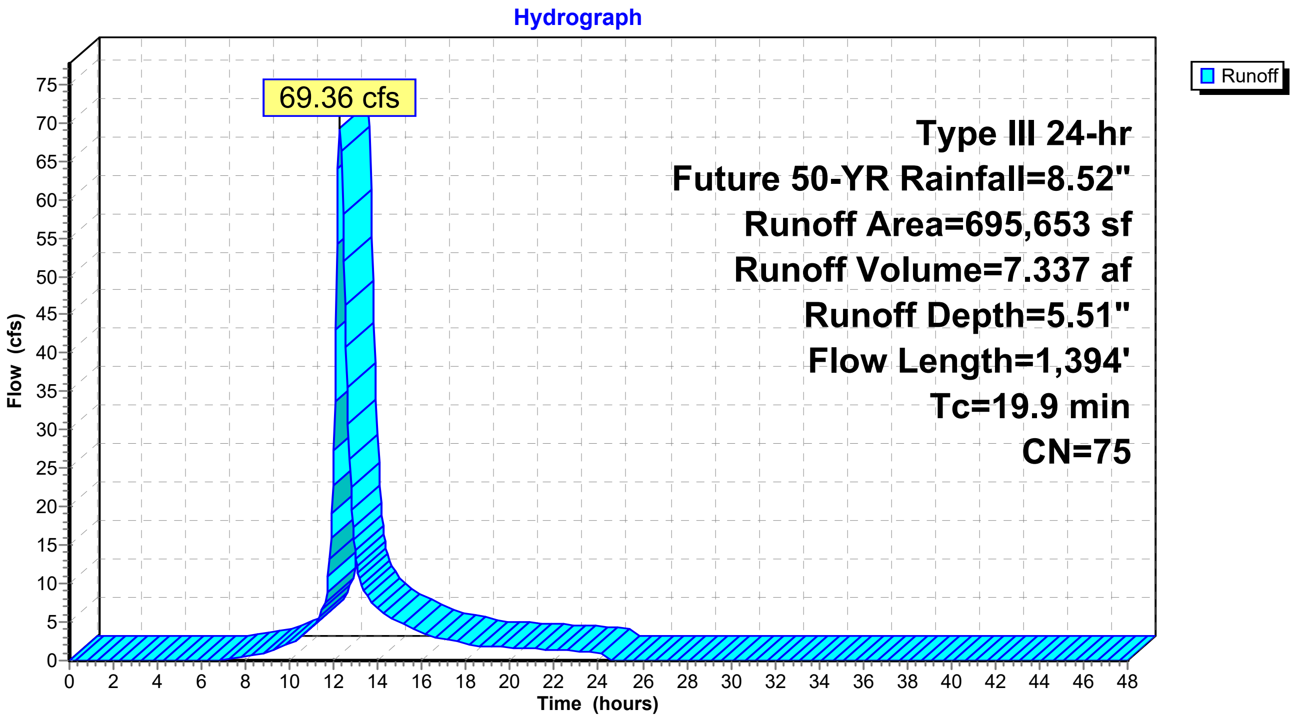
Runoff = 69.36 cfs @ 12.27 hrs, Volume= 7.337 af, Depth= 5.51"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 50-YR Rainfall=8.52"

	Area (sf)	CN	Description
*	17,789	98	Ex. Pavement
*	5,351	98	Ex. Buildings
	25,382	30	Woods, Good, HSG A
	32,537	55	Woods, Good, HSG B
	101,920	77	Woods, Good, HSG D
	3,166	49	50-75% Grass cover, Fair, HSG A
	251,971	69	50-75% Grass cover, Fair, HSG B
	257,537	84	50-75% Grass cover, Fair, HSG D
	695,653	75	Weighted Average
	672,513		96.67% Pervious Area
	23,140		3.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.7	245	0.0245	2.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	411	0.0340	2.77		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.9	523	0.0050	4.48	44.82	**Channel Flow,** Area= 10.0 sf Perim= 11.0' r= 0.91' n= 0.022 Earth, clean & straight
0.2	115	0.0950	11.59	115.88	**Channel Flow,** Area= 10.0 sf Perim= 12.0' r= 0.83' n= 0.035 Earth, dense weeds
19.9	1,394	Total			

Subcatchment 3S: PRE-SUB No. 1



Summary for Subcatchment 5S: PRE-SUB No. 3

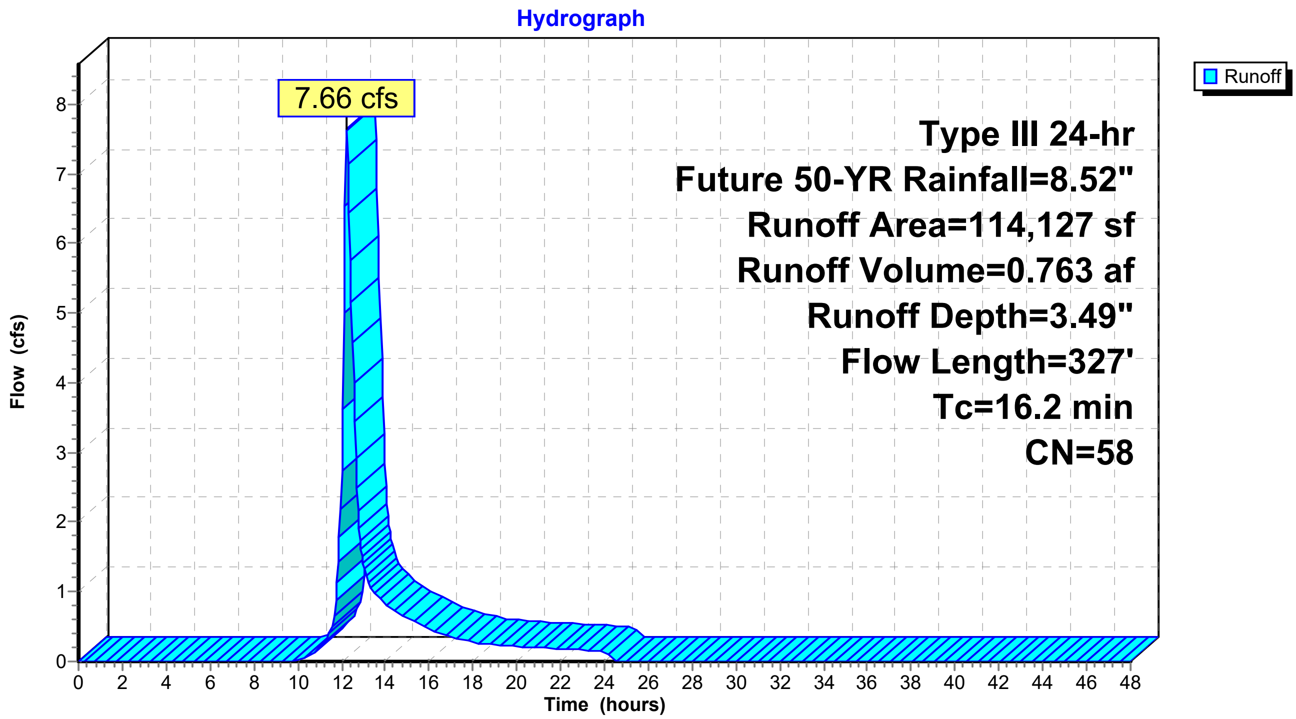
Runoff = 7.66 cfs @ 12.23 hrs, Volume= 0.763 af, Depth= 3.49"
Routed to Reach 6R : ANALYSIS POINT No. 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 50-YR Rainfall=8.52"

Area (sf)	CN	Description
37,230	89	Row crops, straight row, Good, HSG D
20,575	77	Woods, Good, HSG D
56,322	30	Woods, Good, HSG A
114,127	58	Weighted Average
114,127		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	100	0.0330	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.90"
3.5	157	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	70	0.3300	2.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.2	327	Total			

Subcatchment 5S: PRE-SUB No. 3



Summary for Subcatchment 7S: PRE-SUB No. 2

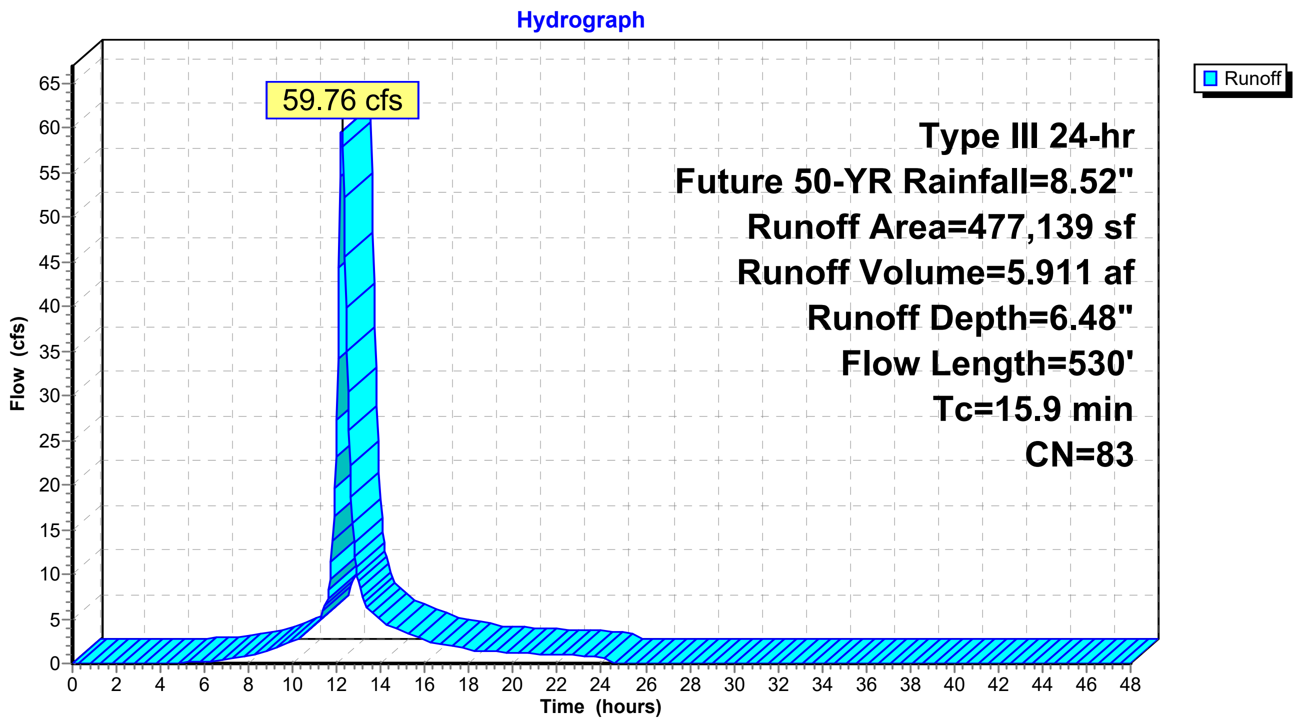
Runoff = 59.76 cfs @ 12.21 hrs, Volume= 5.911 af, Depth= 6.48"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 50-YR Rainfall=8.52"

Area (sf)	CN	Description
244,176	77	Woods, Good, HSG D
232,963	89	Row crops, straight row, Good, HSG D
477,139	83	Weighted Average
477,139		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.0190	0.14		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 2.90"
3.2	330	0.0370	1.73		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
1.1	100	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.9	530	Total			

Subcatchment 7S: PRE-SUB No. 2

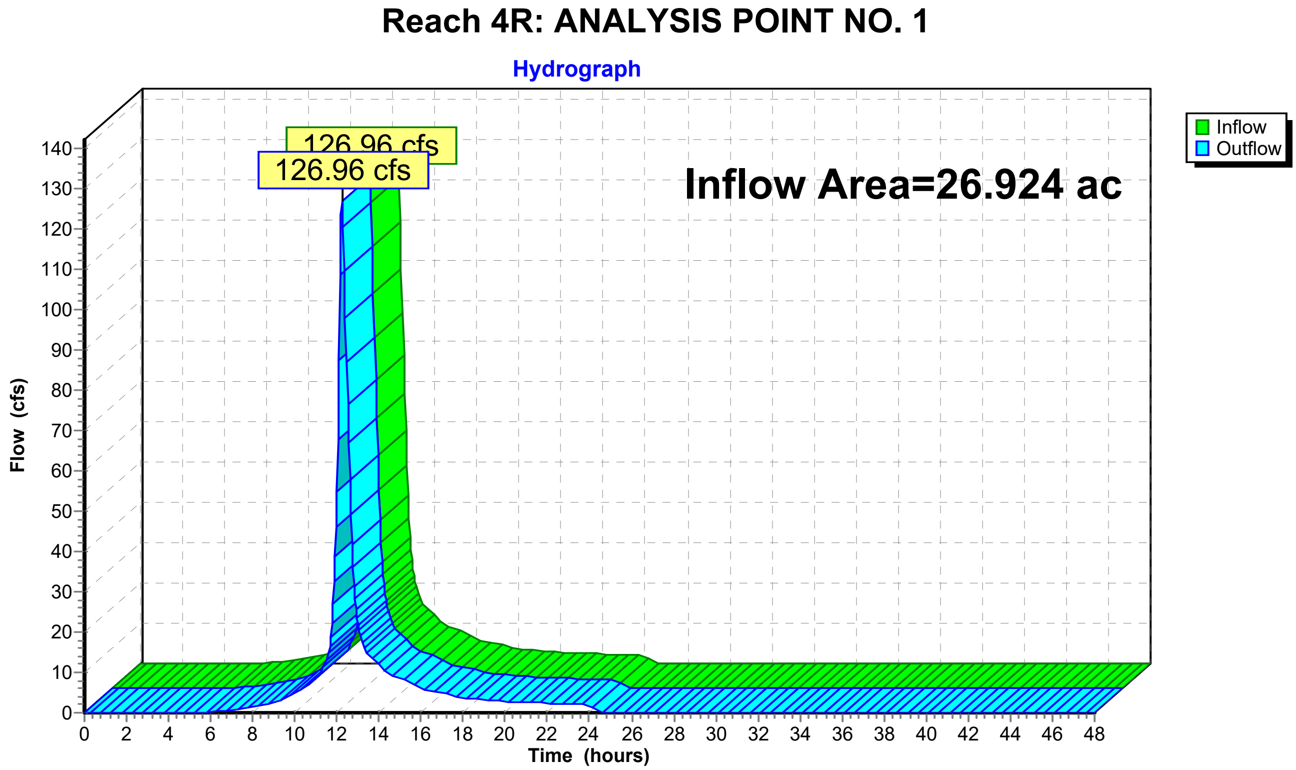


Summary for Reach 4R: ANALYSIS POINT NO. 1

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

Inflow Area = 26.924 ac, 1.97% Impervious, Inflow Depth = 5.90" for Future 50-YR event
Inflow = 126.96 cfs @ 12.24 hrs, Volume= 13.248 af
Outflow = 126.96 cfs @ 12.24 hrs, Volume= 13.248 af, Atten= 0%, Lag= 0.0 min

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



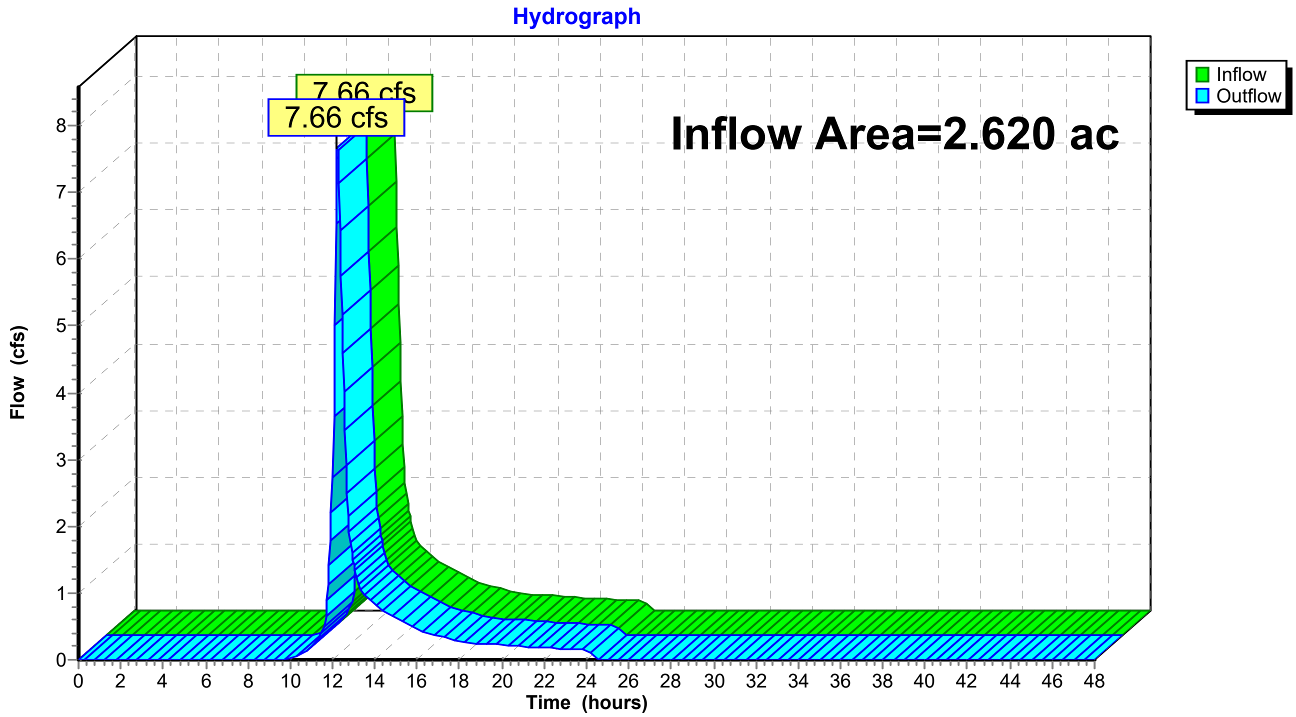
Summary for Reach 6R: ANALYSIS POINT No. 2

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

Inflow Area = 2.620 ac, 0.00% Impervious, Inflow Depth = 3.49" for Future 50-YR event
Inflow = 7.66 cfs @ 12.23 hrs, Volume= 0.763 af
Outflow = 7.66 cfs @ 12.23 hrs, Volume= 0.763 af, Atten= 0%, Lag= 0.0 min

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

Reach 6R: ANALYSIS POINT No. 2



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

Subcatchment 3S: PRE-SUB No. 1 Runoff Area=695,653 sf 3.33% Impervious Runoff Depth=4.24"
Flow Length=1,394' Tc=19.9 min CN=75 Runoff=53.50 cfs 5.640 af

Subcatchment 5S: PRE-SUB No. 3 Runoff Area=114,127 sf 0.00% Impervious Runoff Depth=2.48"
Flow Length=327' Tc=16.2 min CN=58 Runoff=5.30 cfs 0.541 af

Subcatchment 7S: PRE-SUB No. 2 Runoff Area=477,139 sf 0.00% Impervious Runoff Depth=5.12"
Flow Length=530' Tc=15.9 min CN=83 Runoff=47.73 cfs 4.676 af

Reach 4R: ANALYSIS POINT NO. 1 Inflow=99.48 cfs 10.315 af
Outflow=99.48 cfs 10.315 af

Reach 6R: ANALYSIS POINT No. 2 Inflow=5.30 cfs 0.541 af
Outflow=5.30 cfs 0.541 af

Total Runoff Area = 29.544 ac Runoff Volume = 10.856 af Average Runoff Depth = 4.41"
98.20% Pervious = 29.012 ac 1.80% Impervious = 0.531 ac

Summary for Subcatchment 3S: PRE-SUB No. 1

[47] Hint: Peak is 119% of capacity of segment #4

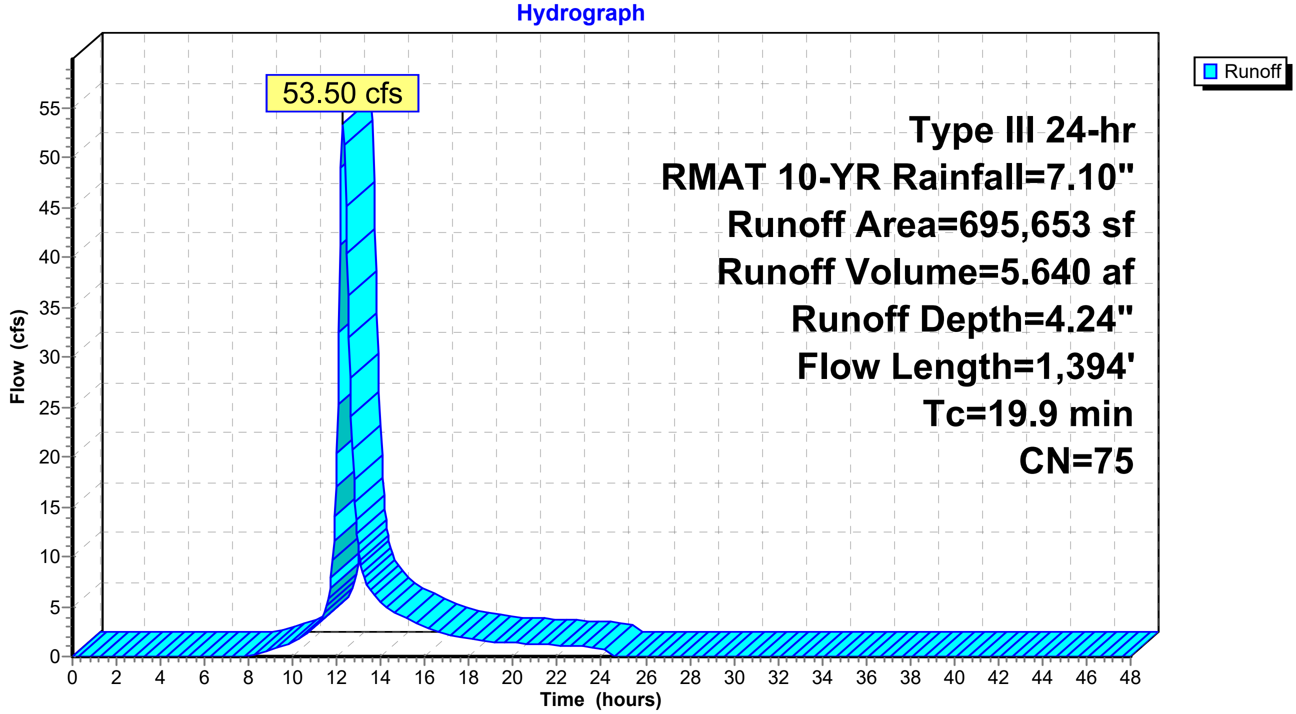
Runoff = 53.50 cfs @ 12.27 hrs, Volume= 5.640 af, Depth= 4.24"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr RMAT 10-YR Rainfall=7.10"

	Area (sf)	CN	Description
*	17,789	98	Ex. Pavement
*	5,351	98	Ex. Buildings
	25,382	30	Woods, Good, HSG A
	32,537	55	Woods, Good, HSG B
	101,920	77	Woods, Good, HSG D
	3,166	49	50-75% Grass cover, Fair, HSG A
	251,971	69	50-75% Grass cover, Fair, HSG B
	257,537	84	50-75% Grass cover, Fair, HSG D
	695,653	75	Weighted Average
	672,513		96.67% Pervious Area
	23,140		3.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.7	245	0.0245	2.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
2.5	411	0.0340	2.77		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.9	523	0.0050	4.48	44.82	**Channel Flow,** Area= 10.0 sf Perim= 11.0' r= 0.91' n= 0.022 Earth, clean & straight
0.2	115	0.0950	11.59	115.88	**Channel Flow,** Area= 10.0 sf Perim= 12.0' r= 0.83' n= 0.035 Earth, dense weeds
19.9	1,394	Total			

Subcatchment 3S: PRE-SUB No. 1



Summary for Subcatchment 5S: PRE-SUB No. 3

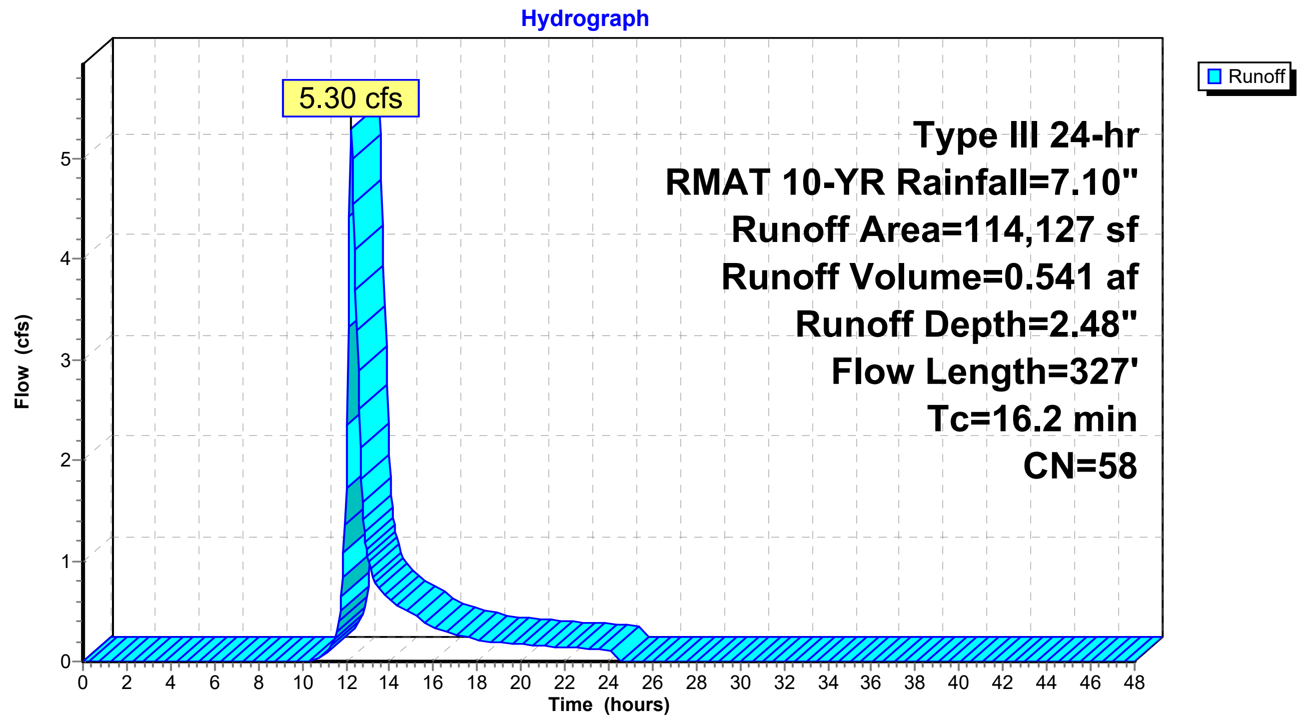
Runoff = 5.30 cfs @ 12.24 hrs, Volume= 0.541 af, Depth= 2.48"
Routed to Reach 6R : ANALYSIS POINT No. 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr RMAT 10-YR Rainfall=7.10"

Area (sf)	CN	Description
37,230	89	Row crops, straight row, Good, HSG D
20,575	77	Woods, Good, HSG D
56,322	30	Woods, Good, HSG A
114,127	58	Weighted Average
114,127		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	100	0.0330	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.90"
3.5	157	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	70	0.3300	2.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.2	327	Total			

Subcatchment 5S: PRE-SUB No. 3



Summary for Subcatchment 7S: PRE-SUB No. 2

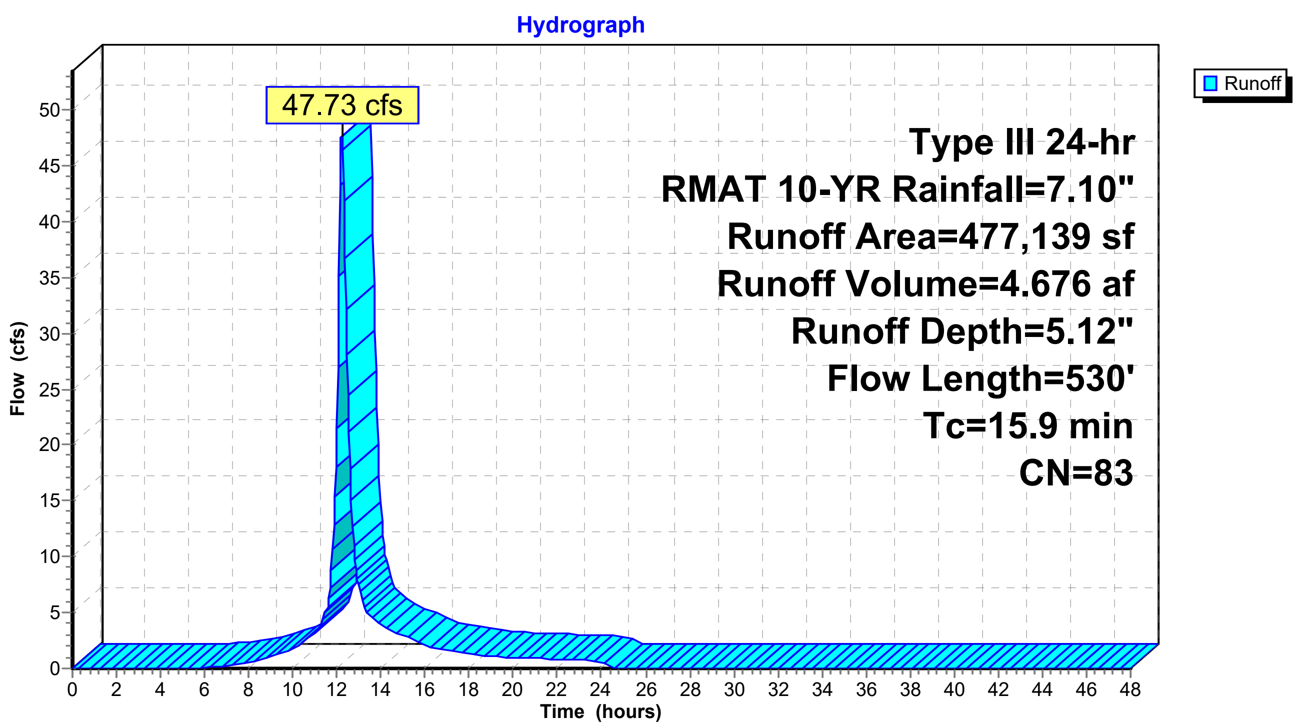
Runoff = 47.73 cfs @ 12.21 hrs, Volume= 4.676 af, Depth= 5.12"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr RMAT 10-YR Rainfall=7.10"

Area (sf)	CN	Description
244,176	77	Woods, Good, HSG D
232,963	89	Row crops, straight row, Good, HSG D
477,139	83	Weighted Average
477,139		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.0190	0.14		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 2.90"
3.2	330	0.0370	1.73		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
1.1	100	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.9	530	Total			

Subcatchment 7S: PRE-SUB No. 2



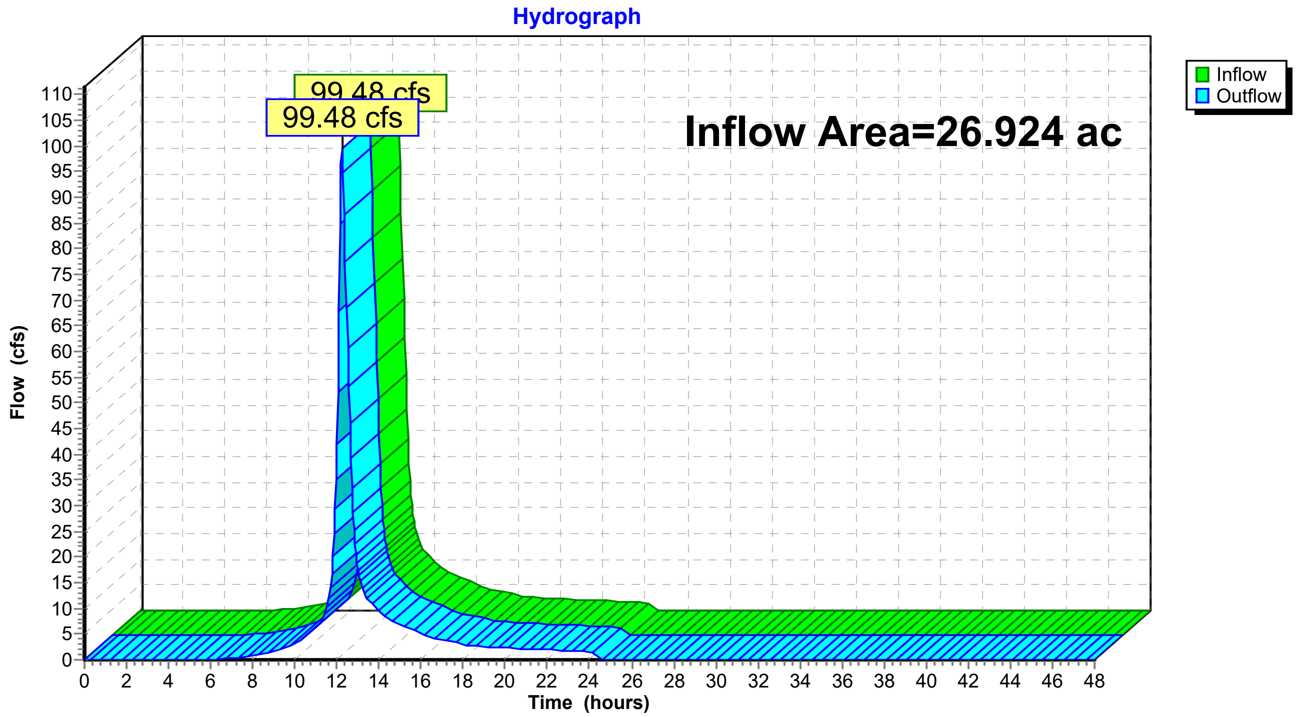
Summary for Reach 4R: ANALYSIS POINT NO. 1

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

Inflow Area = 26.924 ac, 1.97% Impervious, Inflow Depth = 4.60" for RMAT 10-YR event
Inflow = 99.48 cfs @ 12.24 hrs, Volume= 10.315 af
Outflow = 99.48 cfs @ 12.24 hrs, Volume= 10.315 af, Atten= 0%, Lag= 0.0 min

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

Reach 4R: ANALYSIS POINT NO. 1

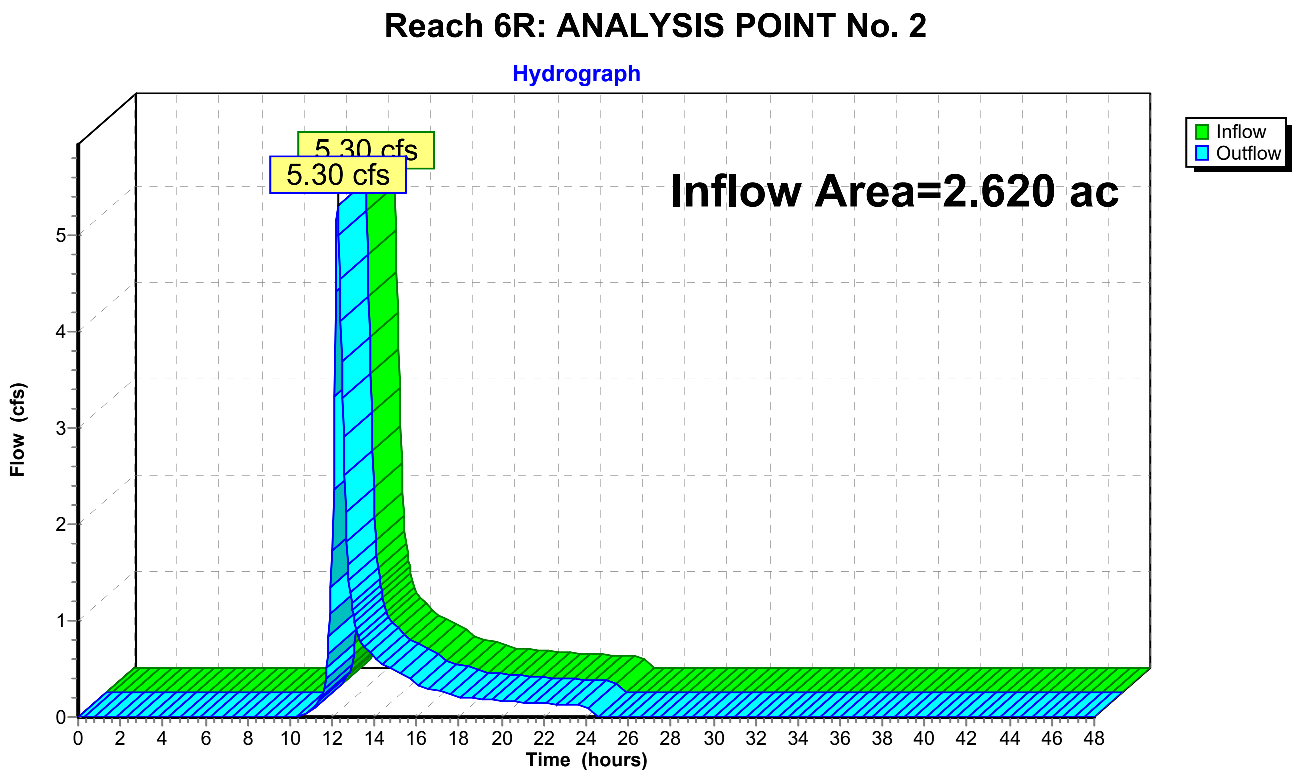


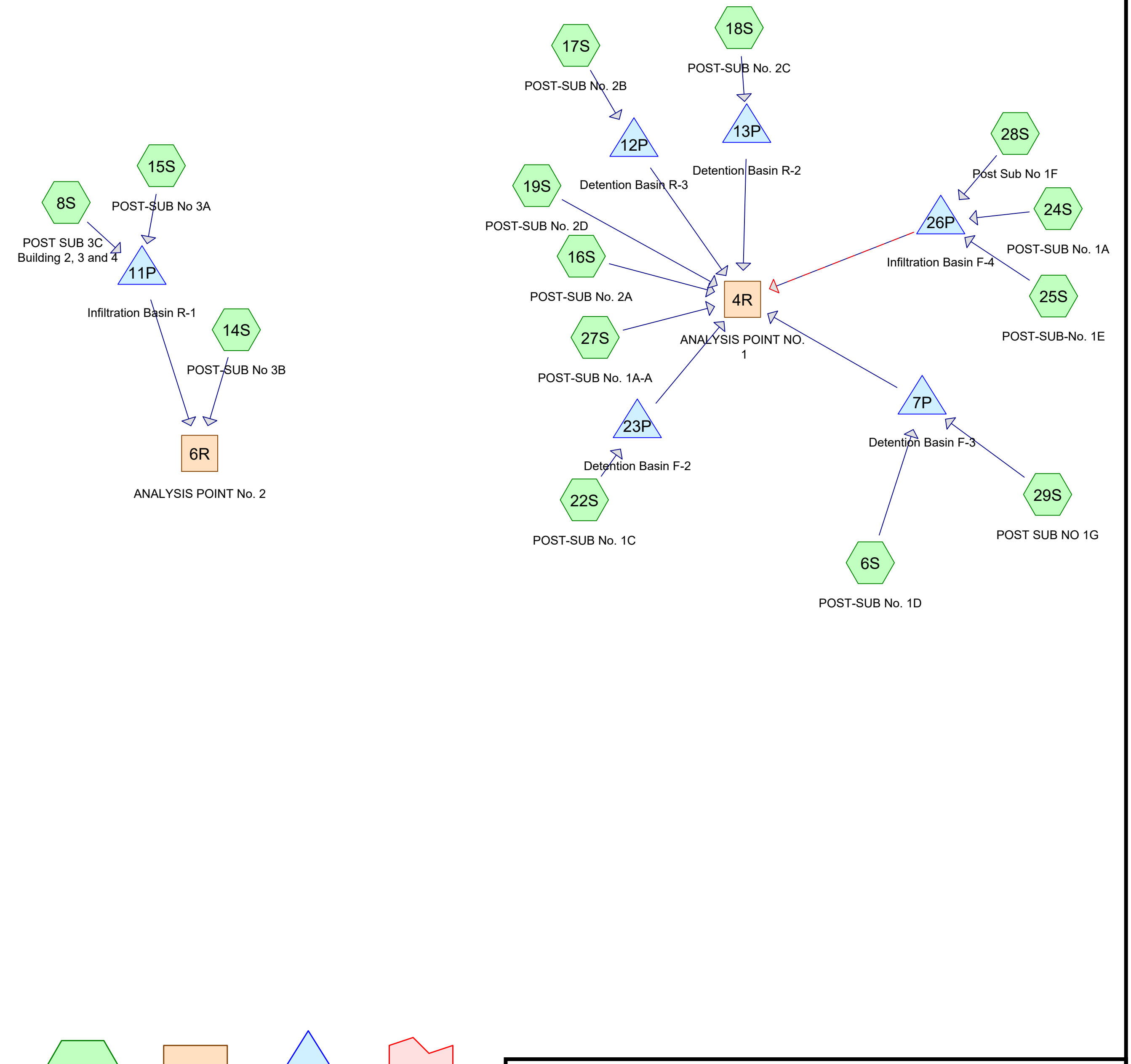
Summary for Reach 6R: ANALYSIS POINT No. 2

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

Inflow Area = 2.620 ac, 0.00% Impervious, Inflow Depth = 2.48" for RMAT 10-YR event
Inflow = 5.30 cfs @ 12.24 hrs, Volume= 0.541 af
Outflow = 5.30 cfs @ 12.24 hrs, Volume= 0.541 af, Atten= 0%, Lag= 0.0 min

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





Routing Diagram for 1042-PostDevelopment-1-30-2023
Prepared by GZA GeoEnvironmental, Inc, Printed 2/13/2024
HydroCAD® 10.20-4a s/n 01286 © 2023 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	10-YR	Type III 24-hr		Default	24.00	1	4.97	2
2	25-YR	Type III 24-hr		Default	24.00	1	6.23	2
3	Future 10-YR	Type III 24-hr		Default	24.00	1	5.96	2
4	Future 25-YR	Type III 24-hr		Default	24.00	1	7.48	2
5	Future 50-YR	Type III 24-hr		Default	24.00	1	8.52	2
6	RMAT 10-YR	Type III 24-hr		Default	24.00	1	7.10	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.290	39	>75% Grass cover, Good, HSG A (14S, 15S, 16S)
2.644	61	>75% Grass cover, Good, HSG B (6S, 22S, 25S, 27S, 28S, 29S)
5.046	80	>75% Grass cover, Good, HSG D (6S, 14S, 16S, 17S, 18S, 19S, 22S, 25S, 27S, 29S)
0.341	71	>75% grass cover, Good, HSG B (24S)
0.505	98	Basin (15S, 28S)
0.643	73	Brush, Good, HSG D (14S)
1.818	98	Building Roof (8S, 28S, 29S)
1.631	98	Building Roofs (6S, 17S, 18S, 22S)
0.664	98	Buildings (25S)
0.666	98	Detention Basin (6S, 17S, 18S, 22S)
4.605	98	Pavement and Walks (6S, 17S, 18S, 22S)
1.820	98	Pavement and walks (28S, 29S)
1.123	30	Woods, Good, HSG A (14S, 27S)
0.114	55	Woods, Good, HSG B (27S)
5.133	77	Woods, Good, HSG D (14S, 16S, 19S, 24S, 27S)
1.512	98	pavement and walks (25S)
29.555	**82**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
2.413	HSG A	14S, 15S, 16S, 27S
3.098	HSG B	6S, 22S, 24S, 25S, 27S, 28S, 29S
0.000	HSG C	
10.821	HSG D	6S, 14S, 16S, 17S, 18S, 19S, 22S, 24S, 25S, 27S, 29S
13.222	Other	6S, 8S, 15S, 17S, 18S, 22S, 25S, 28S, 29S
29.555		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
1.290	2.644	0.000	5.046	0.000	8.979	>75% Grass cover, Good	6S, 14S, 15S, 16S, 17S, 18S, 19S, 22S, 25S, 27S, 28S, 29S
0.000	0.341	0.000	0.000	0.000	0.341	>75% grass cover, Good	24S
0.000	0.000	0.000	0.000	0.505	0.505	Basin	15S, 28S
0.000	0.000	0.000	0.643	0.000	0.643	Brush, Good	14S
0.000	0.000	0.000	0.000	1.818	1.818	Building Roof	8S, 28S, 29S
0.000	0.000	0.000	0.000	1.631	1.631	Building Roofs	6S, 17S, 18S, 22S
0.000	0.000	0.000	0.000	0.664	0.664	Buildings	25S
0.000	0.000	0.000	0.000	0.666	0.666	Detention Basin	6S, 17S, 18S, 22S
0.000	0.000	0.000	0.000	4.605	4.605	Pavement and Walks	6S, 17S, 18S, 22S
0.000	0.000	0.000	0.000	1.820	1.820	Pavement and walks	28S, 29S
1.123	0.114	0.000	5.133	0.000	6.370	Woods, Good	14S, 16S, 19S, 24S, 27S
0.000	0.000	0.000	0.000	1.512	1.512	pavement and walks	25S
2.413	**3.098**	**0.000**	**10.821**	**13.222**	**29.555**	**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	6S	0.00	0.00	216.0	0.0050	0.013	0.0	15.0	0.0	
2	25S	0.00	0.00	475.0	0.0050	0.013	0.0	15.0	0.0	
3	29S	0.00	0.00	545.0	0.0050	0.013	0.0	15.0	0.0	
4	7P	156.00	153.00	110.0	0.0273	0.013	0.0	18.0	0.0	
5	11P	165.80	162.00	58.0	0.0655	0.013	0.0	12.0	0.0	
6	12P	158.00	144.00	85.0	0.1647	0.013	0.0	12.0	0.0	
7	13P	152.00	141.00	78.0	0.1410	0.013	0.0	12.0	0.0	
8	23P	158.00	155.00	80.0	0.0375	0.013	0.0	15.0	0.0	
9	26P	158.00	153.00	221.0	0.0226	0.013	0.0	18.0	0.0	

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

Subcatchment 6S: POST-SUB No. 1D Runoff Area=87,909 sf 70.36% Impervious Runoff Depth=3.74"
Flow Length=411' Tc=15.4 min CN=89 Runoff=6.45 cfs 0.630 af

Subcatchment 8S: POST SUB 3C Runoff Area=34,500 sf 100.00% Impervious Runoff Depth=4.73"
Tc=10.0 min CN=98 Runoff=3.33 cfs 0.312 af

Subcatchment 14S: POST-SUB No 3B Runoff Area=67,024 sf 0.00% Impervious Runoff Depth=1.35"
Flow Length=760' Tc=15.8 min CN=61 Runoff=1.62 cfs 0.173 af

Subcatchment 15S: POST-SUB No 3A Runoff Area=42,540 sf 19.23% Impervious Runoff Depth=0.68"
Flow Length=158' Slope=0.0100 '/' Tc=14.2 min CN=50 Runoff=0.37 cfs 0.055 af

Subcatchment 16S: POST-SUB No. 2A Runoff Area=158,671 sf 0.00% Impervious Runoff Depth=2.26"
Flow Length=180' Tc=14.2 min CN=73 Runoff=7.33 cfs 0.685 af

Subcatchment 17S: POST-SUB No. 2B Runoff Area=143,182 sf 67.42% Impervious Runoff Depth=4.06"
Flow Length=221' Tc=11.8 min CN=92 Runoff=12.26 cfs 1.112 af

Subcatchment 18S: POST-SUB No. 2C Runoff Area=113,851 sf 60.00% Impervious Runoff Depth=3.95"
Flow Length=205' Tc=11.0 min CN=91 Runoff=9.78 cfs 0.861 af

Subcatchment 19S: POST-SUB No. 2D Runoff Area=24,504 sf 0.00% Impervious Runoff Depth=2.69"
Flow Length=333' Tc=19.2 min CN=78 Runoff=1.21 cfs 0.126 af

Subcatchment 22S: POST-SUB No. 1C Runoff Area=102,217 sf 72.38% Impervious Runoff Depth=3.85"
Tc=10.0 min CN=90 Runoff=8.83 cfs 0.752 af

Subcatchment 24S: POST-SUB No. 1A Runoff Area=38,417 sf 0.00% Impervious Runoff Depth=2.42"
Flow Length=800' Tc=22.3 min CN=75 Runoff=1.60 cfs 0.178 af

Subcatchment 25S: POST-SUB-No. 1E Runoff Area=114,681 sf 82.66% Impervious Runoff Depth=4.06"
Flow Length=869' Tc=17.9 min CN=92 Runoff=8.42 cfs 0.891 af

Subcatchment 27S: POST-SUB No. 1A-A Runoff Area=173,610 sf 0.00% Impervious Runoff Depth=1.78"
Flow Length=342' Tc=14.3 min CN=67 Runoff=6.13 cfs 0.592 af

Subcatchment 28S: Post Sub No 1F Runoff Area=122,407 sf 67.79% Impervious Runoff Depth=3.44"
Tc=10.0 min CN=86 Runoff=9.66 cfs 0.805 af

Subcatchment 29S: POST SUB NO 1G Runoff Area=63,889 sf 85.79% Impervious Runoff Depth=4.17"
Flow Length=885' Tc=18.0 min CN=93 Runoff=4.76 cfs 0.509 af

Reach 4R: ANALYSIS POINT NO. 1 Inflow=42.84 cfs 6.013 af
Outflow=42.84 cfs 6.013 af

Reach 6R: ANALYSIS POINT No. 2 Inflow=1.62 cfs 0.186 af
Outflow=1.62 cfs 0.186 af

Pond 7P: Detention Basin F-3 Peak Elev=160.45' Storage=6,812 cf Inflow=11.17 cfs 1.139 af
Outflow=8.32 cfs 1.139 af

Pond 11P: Infiltration Basin R-1 Peak Elev=170.73' Storage=5,703 cf Inflow=3.55 cfs 0.368 af
Discarded=0.34 cfs 0.355 af Primary=0.07 cfs 0.012 af Outflow=0.41 cfs 0.368 af

Pond 12P: Detention Basin R-3 Peak Elev=161.91' Storage=8,635 cf Inflow=12.26 cfs 1.112 af
Outflow=6.98 cfs 1.112 af

Pond 13P: Detention Basin R-2 Peak Elev=162.47' Storage=4,241 cf Inflow=9.78 cfs 0.861 af
Outflow=7.26 cfs 0.861 af

Pond 23P: Detention Basin F-2 Peak Elev=160.65' Storage=14,666 cf Inflow=8.83 cfs 0.752 af
Outflow=3.74 cfs 0.632 af

Pond 26P: Infiltration Basin F-4 Peak Elev=163.01' Storage=32,874 cf Inflow=18.26 cfs 1.874 af
Discarded=0.50 cfs 1.008 af Primary=7.68 cfs 0.867 af Outflow=8.17 cfs 1.874 af

Total Runoff Area = 29.555 ac Runoff Volume = 7.683 af Average Runoff Depth = 3.12"
55.26% Pervious = 16.333 ac 44.74% Impervious = 13.222 ac

Summary for Subcatchment 6S: POST-SUB No. 1D

[47] Hint: Peak is 141% of capacity of segment #4

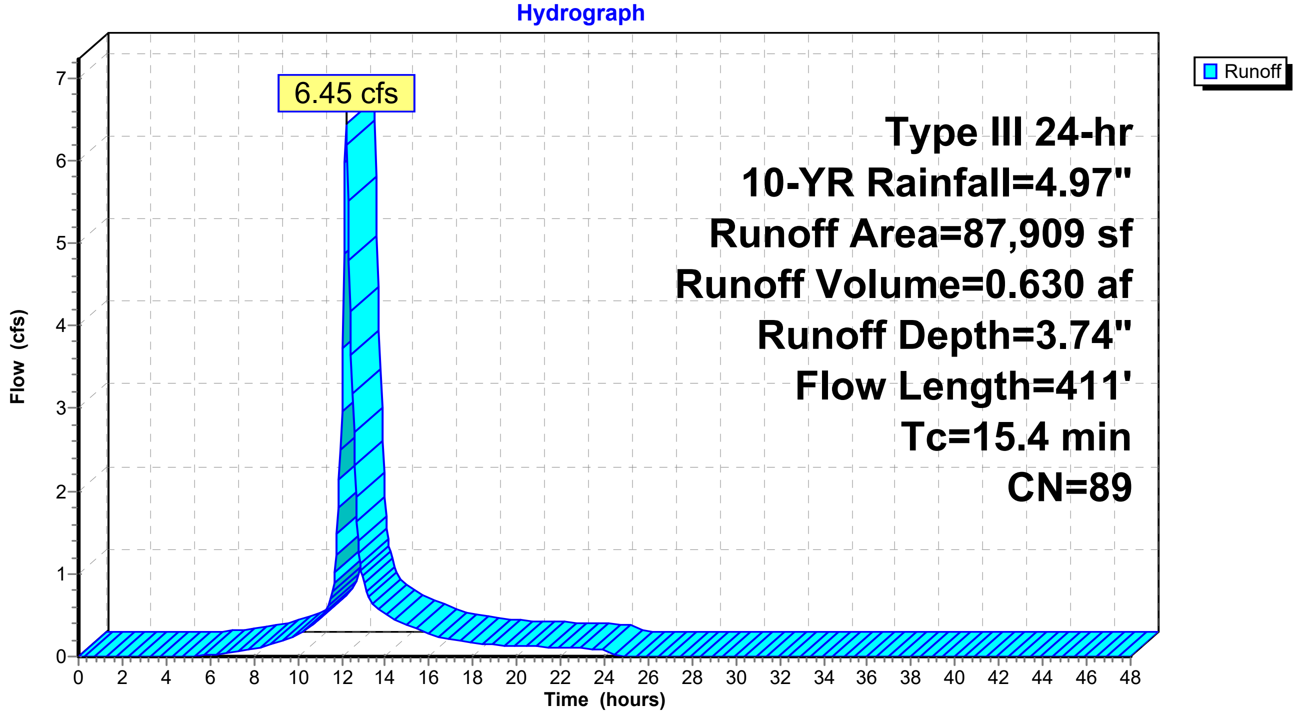
Runoff = 6.45 cfs @ 12.21 hrs, Volume= 0.630 af, Depth= 3.74"
Routed to Pond 7P : Detention Basin F-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.97"

	Area (sf)	CN	Description
*	4,000	98	Building Roofs
*	10,503	98	Detention Basin
*	47,347	98	Pavement and Walks
	7,767	80	>75% Grass cover, Good, HSG D
	18,292	61	>75% Grass cover, Good, HSG B
	87,909	89	Weighted Average
	26,059		29.64% Pervious Area
	61,850		70.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.6	55	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.2	40	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	216	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
15.4	411	Total			

Subcatchment 6S: POST-SUB No. 1D



Summary for Subcatchment 8S: POST SUB 3C Building 2, 3 and 4

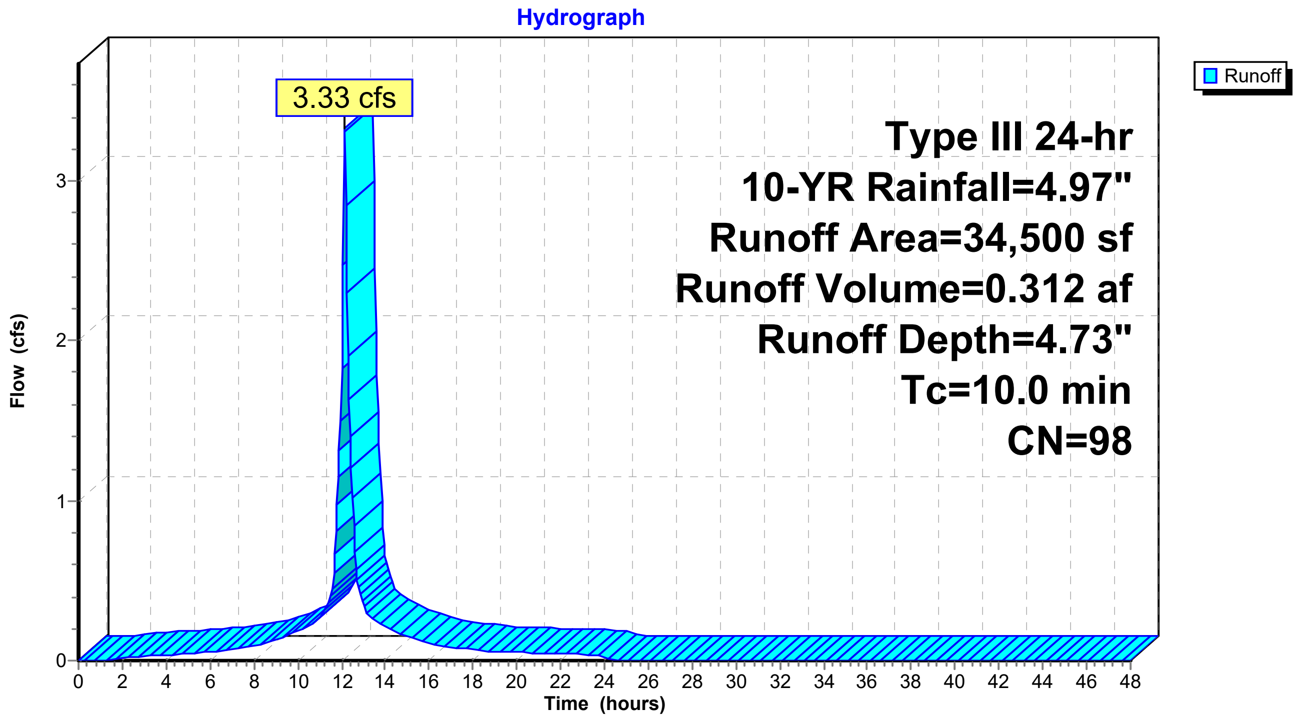
Runoff = 3.33 cfs @ 12.14 hrs, Volume= 0.312 af, Depth= 4.73"
Routed to Pond 11P : Infiltration Basin R-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.97"

	Area (sf)	CN	Description
*	34,500	98	Building Roof
	0	80	>75% Grass cover, Good, HSG D
	34,500	98	Weighted Average
	34,500		100.00% Impervious Area

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

Subcatchment 8S: POST SUB 3C Building 2, 3 and 4



Summary for Subcatchment 14S: POST-SUB No 3B

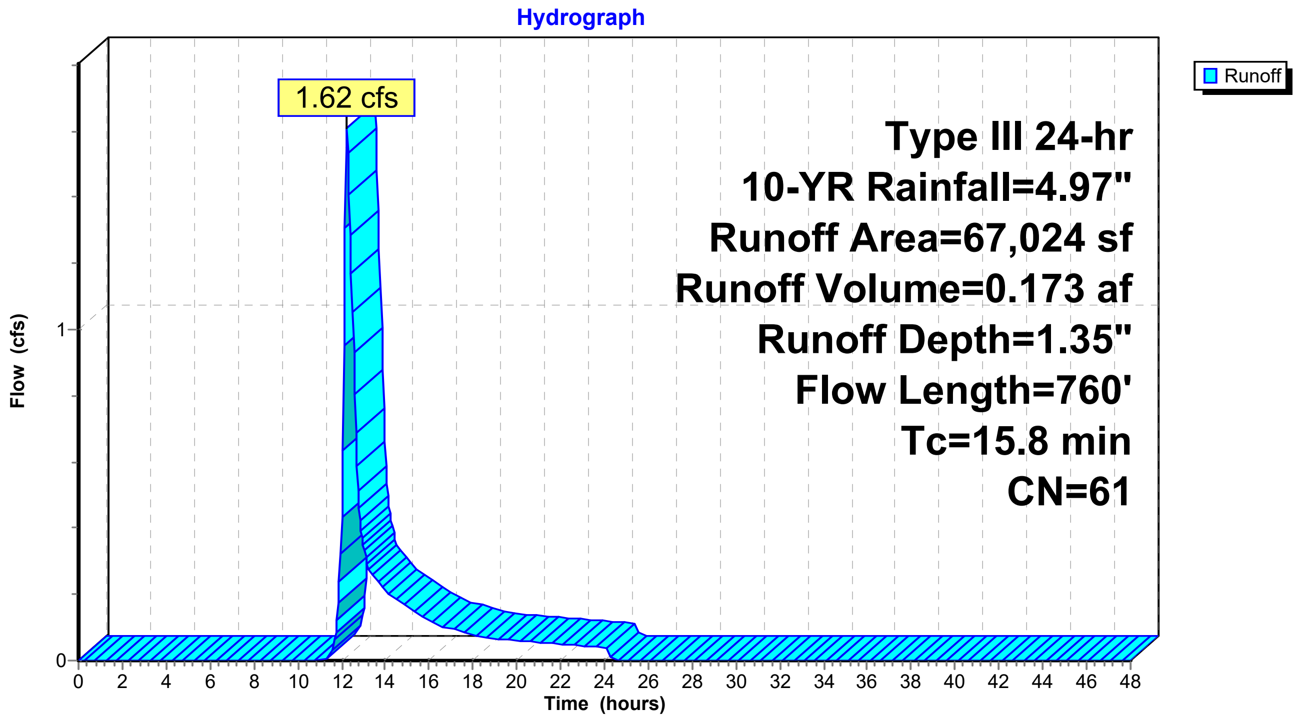
Runoff = 1.62 cfs @ 12.25 hrs, Volume= 0.173 af, Depth= 1.35"
Routed to Reach 6R : ANALYSIS POINT No. 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.97"

Area (sf)	CN	Description
28,004	73	Brush, Good, HSG D
19,012	30	Woods, Good, HSG A
4,184	77	Woods, Good, HSG D
3,089	39	>75% Grass cover, Good, HSG A
12,735	80	>75% Grass cover, Good, HSG D
67,024	61	Weighted Average
67,024		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.6	200	0.0200	2.12		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.6	460	0.0650	12.11	60.55	**Channel Flow,** Area= 5.0 sf Perim= 7.0' r= 0.71' n= 0.025 Earth, clean & winding
15.8	760	Total			

Subcatchment 14S: POST-SUB No 3B



Summary for Subcatchment 15S: POST-SUB No 3A

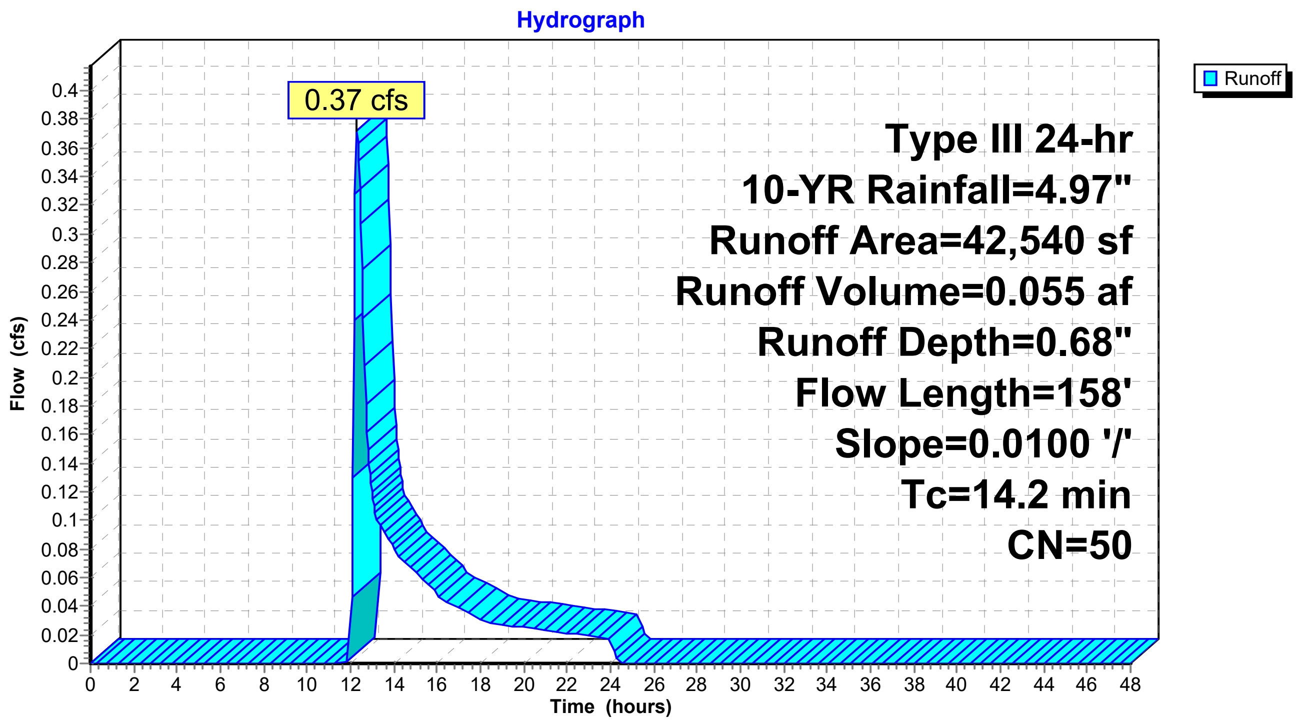
Runoff = 0.37 cfs @ 12.29 hrs, Volume= 0.055 af, Depth= 0.68"
Routed to Pond 11P : Infiltration Basin R-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.97"

	Area (sf)	CN	Description
	0	49	50-75% Grass cover, Fair, HSG A
	34,361	39	>75% Grass cover, Good, HSG A
*	8,179	98	Basin
	42,540	50	Weighted Average
	34,361		80.77% Pervious Area
	8,179		19.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.6	58	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.2	158	Total			

Subcatchment 15S: POST-SUB No 3A



Summary for Subcatchment 16S: POST-SUB No. 2A

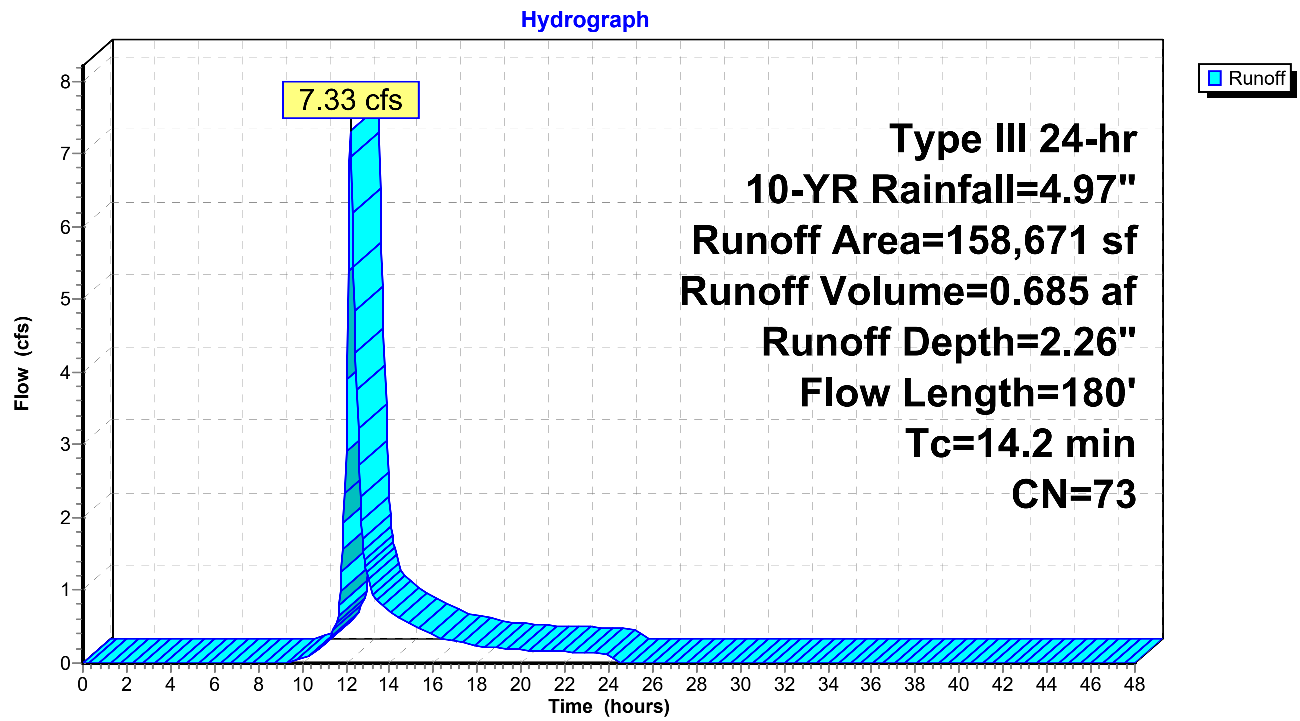
Runoff = 7.33 cfs @ 12.20 hrs, Volume= 0.685 af, Depth= 2.26"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.97"

	Area (sf)	CN	Description
	93,385	77	Woods, Good, HSG D
	46,536	80	>75% Grass cover, Good, HSG D
	0	32	Woods/grass comb., Good, HSG A
*	18,750	39	>75% Grass cover, Good, HSG A
	158,671	73	Weighted Average
	158,671		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.6	80	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.2	180	Total			

Subcatchment 16S: POST-SUB No. 2A



Summary for Subcatchment 17S: POST-SUB No. 2B

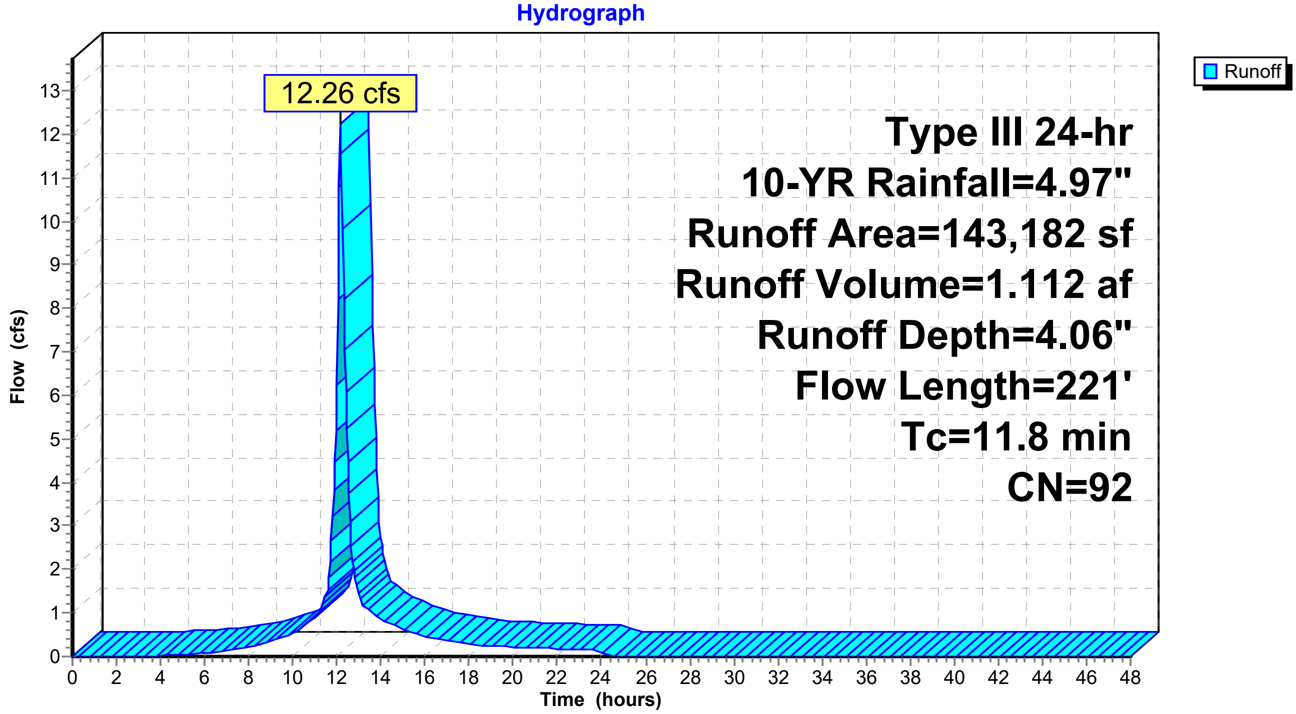
Runoff = 12.26 cfs @ 12.16 hrs, Volume= 1.112 af, Depth= 4.06"
Routed to Pond 12P : Detention Basin R-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.97"

	Area (sf)	CN	Description
*	39,478	98	Building Roofs
*	50,310	98	Pavement and Walks
*	6,744	98	Detention Basin
	46,650	80	>75% Grass cover, Good, HSG D
	143,182	92	Weighted Average
	46,650		32.58% Pervious Area
	96,532		67.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	90	0.0190	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.4	10	0.0300	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.1	30	0.0850	4.37		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.6	91	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.8	221	Total			

Subcatchment 17S: POST-SUB No. 2B



Summary for Subcatchment 18S: POST-SUB No. 2C

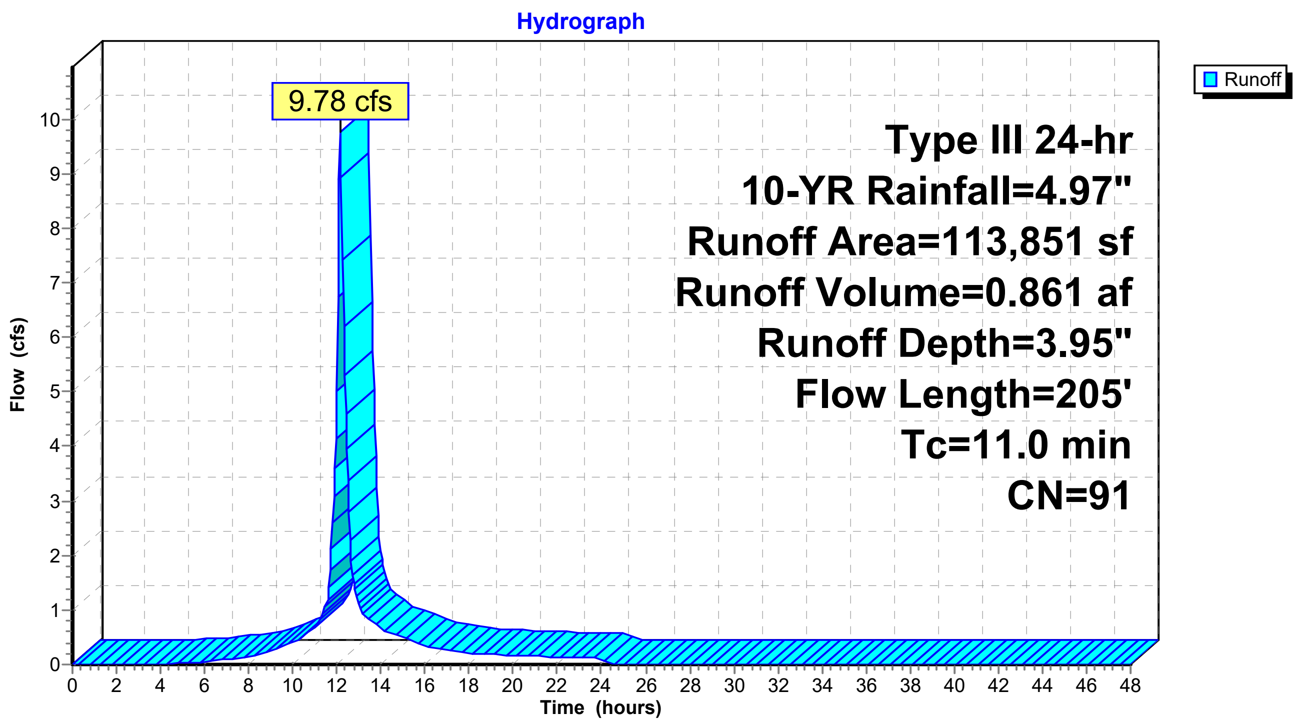
Runoff = 9.78 cfs @ 12.15 hrs, Volume= 0.861 af, Depth= 3.95"
Routed to Pond 13P : Detention Basin R-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.97"

	Area (sf)	CN	Description
*	11,500	98	Building Roofs
*	6,502	98	Detention Basin
*	50,311	98	Pavement and Walks
	45,538	80	>75% Grass cover, Good, HSG D
	0	80	>75% Grass cover, Good, HSG D
	113,851	91	Weighted Average
	45,538		40.00% Pervious Area
	68,313		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.7	105	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.0	205	Total			

Subcatchment 18S: POST-SUB No. 2C



Summary for Subcatchment 19S: POST-SUB No. 2D

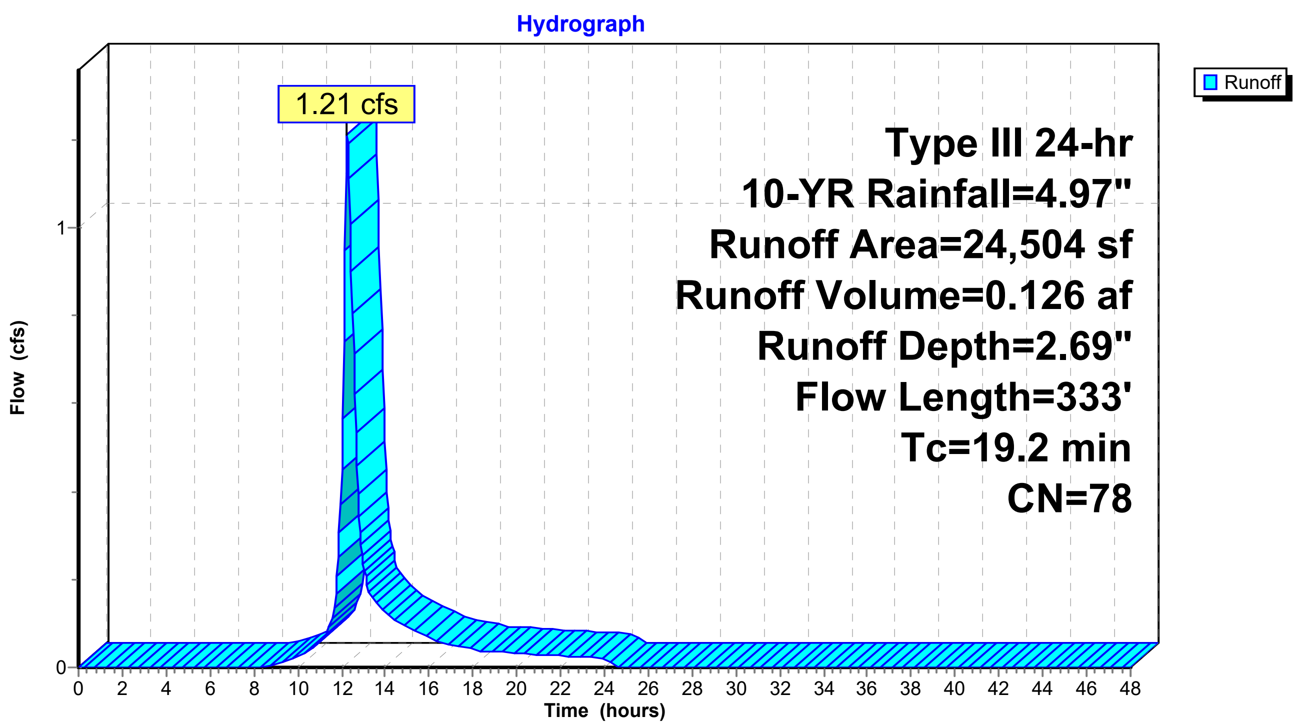
Runoff = 1.21 cfs @ 12.27 hrs, Volume= 0.126 af, Depth= 2.69"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.97"

Area (sf)	CN	Description
14,488	77	Woods, Good, HSG D
10,016	80	>75% Grass cover, Good, HSG D
24,504	78	Weighted Average
24,504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.5	100	0.0330	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.90"
0.7	233	0.1200	5.20		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
19.2	333	Total			

Subcatchment 19S: POST-SUB No. 2D



Summary for Subcatchment 22S: POST-SUB No. 1C

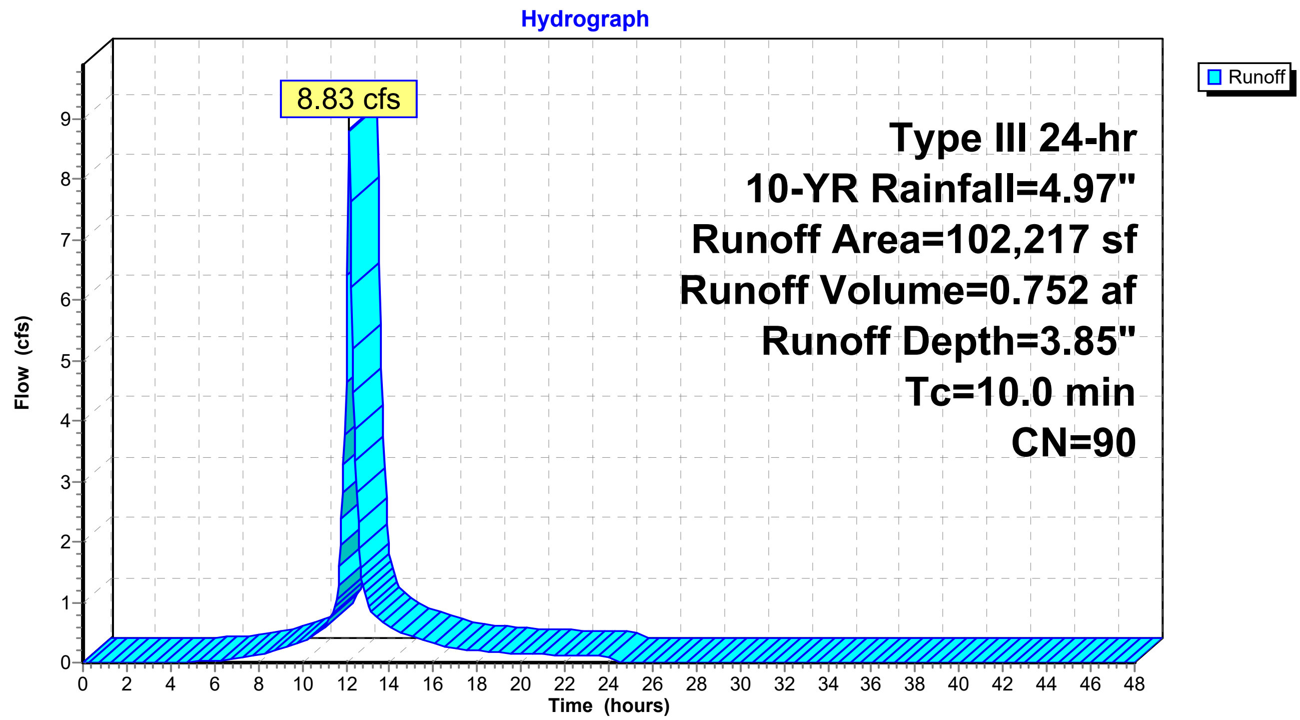
Runoff = 8.83 cfs @ 12.14 hrs, Volume= 0.752 af, Depth= 3.85"
Routed to Pond 23P : Detention Basin F-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.97"

	Area (sf)	CN	Description
*	16,090	98	Building Roofs
*	52,636	98	Pavement and Walks
*	5,255	98	Detention Basin
	14,731	61	>75% Grass cover, Good, HSG B
	13,505	80	>75% Grass cover, Good, HSG D
	102,217	90	Weighted Average
	28,236		27.62% Pervious Area
	73,981		72.38% Impervious Area

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

Subcatchment 22S: POST-SUB No. 1C



Summary for Subcatchment 24S: POST-SUB No. 1A

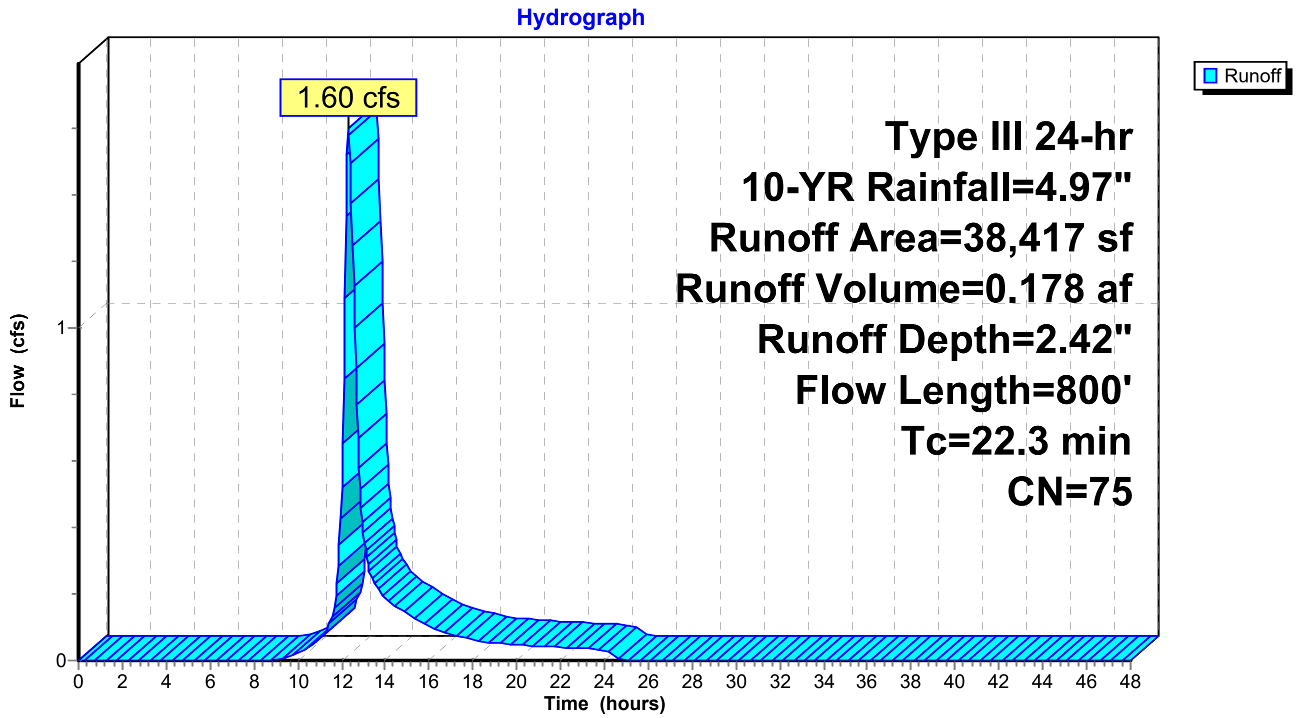
Runoff = 1.60 cfs @ 12.32 hrs, Volume= 0.178 af, Depth= 2.42"
Routed to Pond 26P : Infiltration Basin F-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.97"

	Area (sf)	CN	Description
	23,572	77	Woods, Good, HSG D
	0	73	Woods/grass comb., Poor, HSG B
*	14,845	71	>75% grass cover, Good, HSG B
	38,417	75	Weighted Average
	38,417		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0150	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.90"
5.5	700	0.0200	2.12		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
22.3	800	Total			

Subcatchment 24S: POST-SUB No. 1A



Summary for Subcatchment 25S: POST-SUB-No. 1E

[47] Hint: Peak is 184% of capacity of segment #4

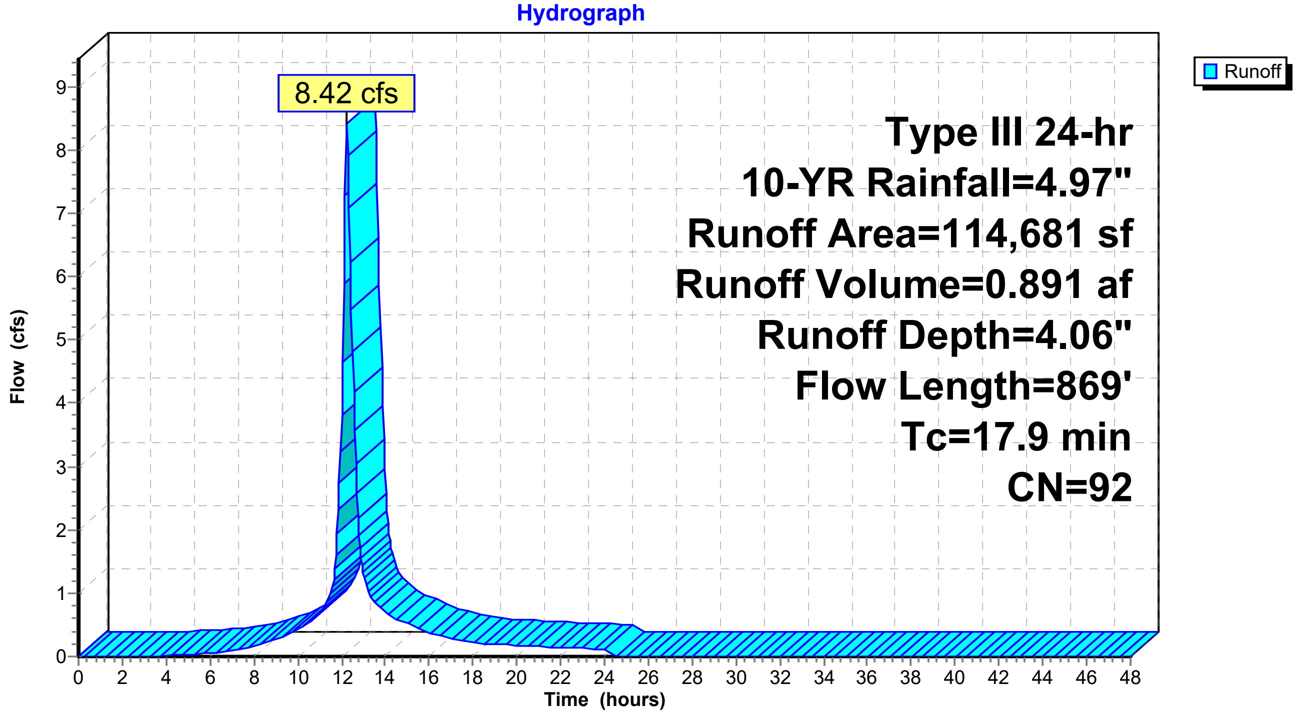
Runoff = 8.42 cfs @ 12.24 hrs, Volume= 0.891 af, Depth= 4.06"
Routed to Pond 26P : Infiltration Basin F-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.97"

	Area (sf)	CN	Description
*	28,932	98	Buildings
*	65,867	98	pavement and walks
	15,194	61	>75% Grass cover, Good, HSG B
	4,688	80	>75% Grass cover, Good, HSG D
	114,681	92	Weighted Average
	19,882		17.34% Pervious Area
	94,799		82.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0090	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	40	0.0090	1.42		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.1	254	0.0350	3.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.1	475	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
17.9	869	Total			

Subcatchment 25S: POST-SUB-No. 1E



Summary for Subcatchment 27S: POST-SUB No. 1A-A

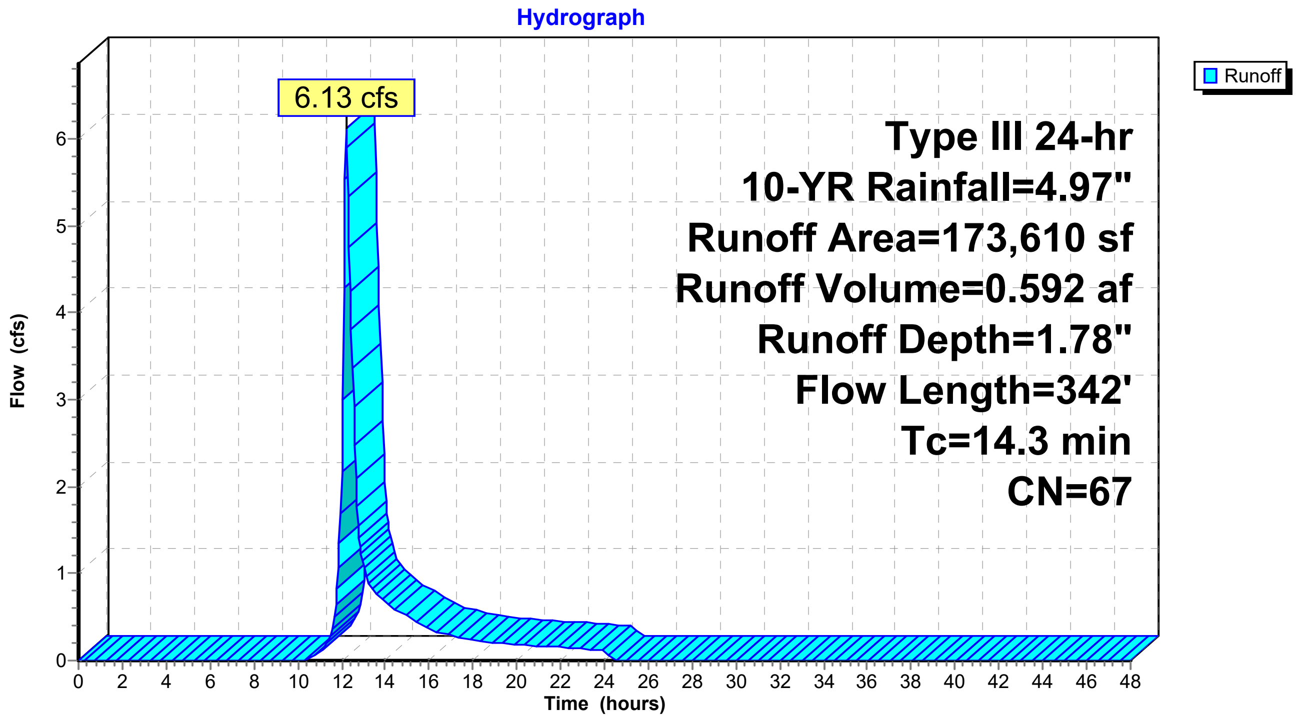
Runoff = 6.13 cfs @ 12.21 hrs, Volume= 0.592 af, Depth= 1.78"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.97"

	Area (sf)	CN	Description
	87,949	77	Woods, Good, HSG D
	4,955	55	Woods, Good, HSG B
*	29,916	30	Woods, Good, HSG A
	0	32	Woods/grass comb., Good, HSG A
	0	79	Woods/grass comb., Good, HSG D
	30,440	80	>75% Grass cover, Good, HSG D
*	20,350	61	>75% Grass cover, Good, HSG B
	173,610	67	Weighted Average
	173,610		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	20	0.0500	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	42	0.0360	1.33		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.5	200	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	12	0.3000	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
8.7	68	0.0360	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.90"
14.3	342	Total			

Subcatchment 27S: POST-SUB No. 1A-A



Summary for Subcatchment 28S: Post Sub No 1F

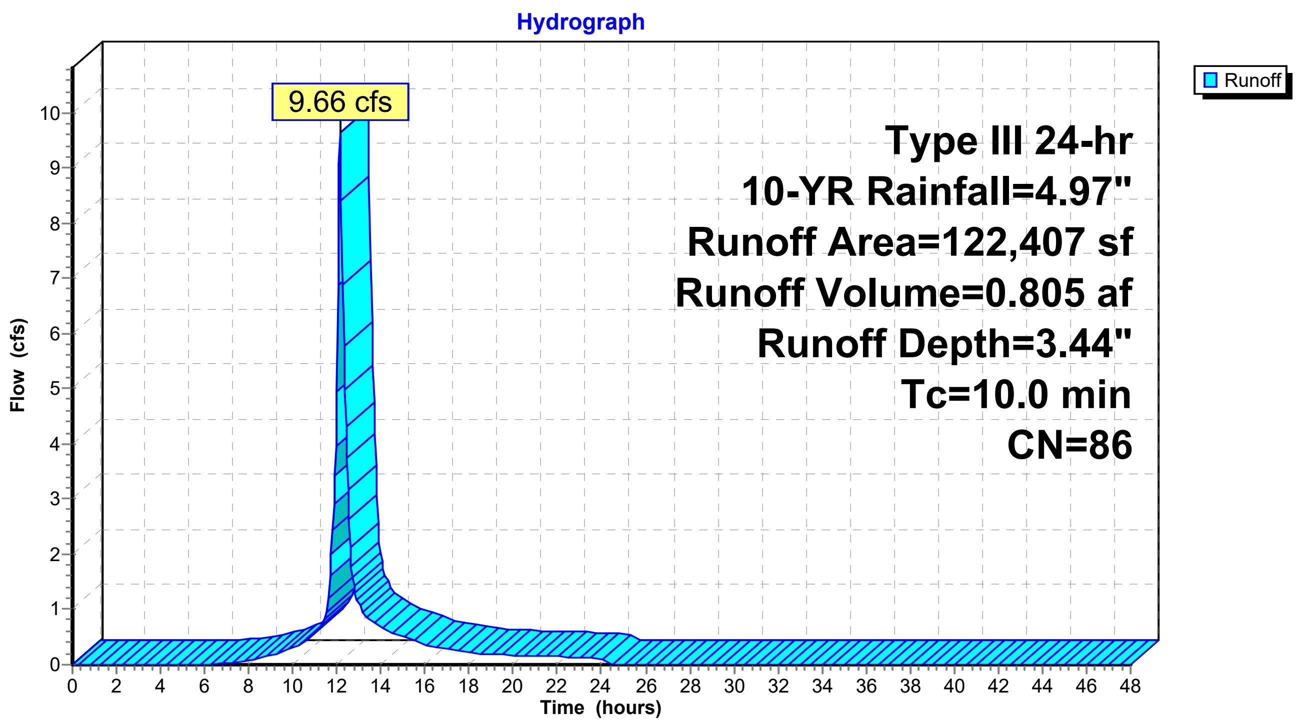
Runoff = 9.66 cfs @ 12.14 hrs, Volume= 0.805 af, Depth= 3.44"
Routed to Pond 26P : Infiltration Basin F-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.97"

	Area (sf)	CN	Description
*	23,000	98	Building Roof
*	7,000	98	Building Roof
	39,422	61	>75% Grass cover, Good, HSG B
*	27,685	98	Pavement and walks
*	13,800	98	Basin
*	11,500	98	Building Roof
	122,407	86	Weighted Average
	39,422		32.21% Pervious Area
	82,985		67.79% Impervious Area

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

Subcatchment 28S: Post Sub No 1F



Summary for Subcatchment 29S: POST SUB NO 1G

[47] Hint: Peak is 104% of capacity of segment #4

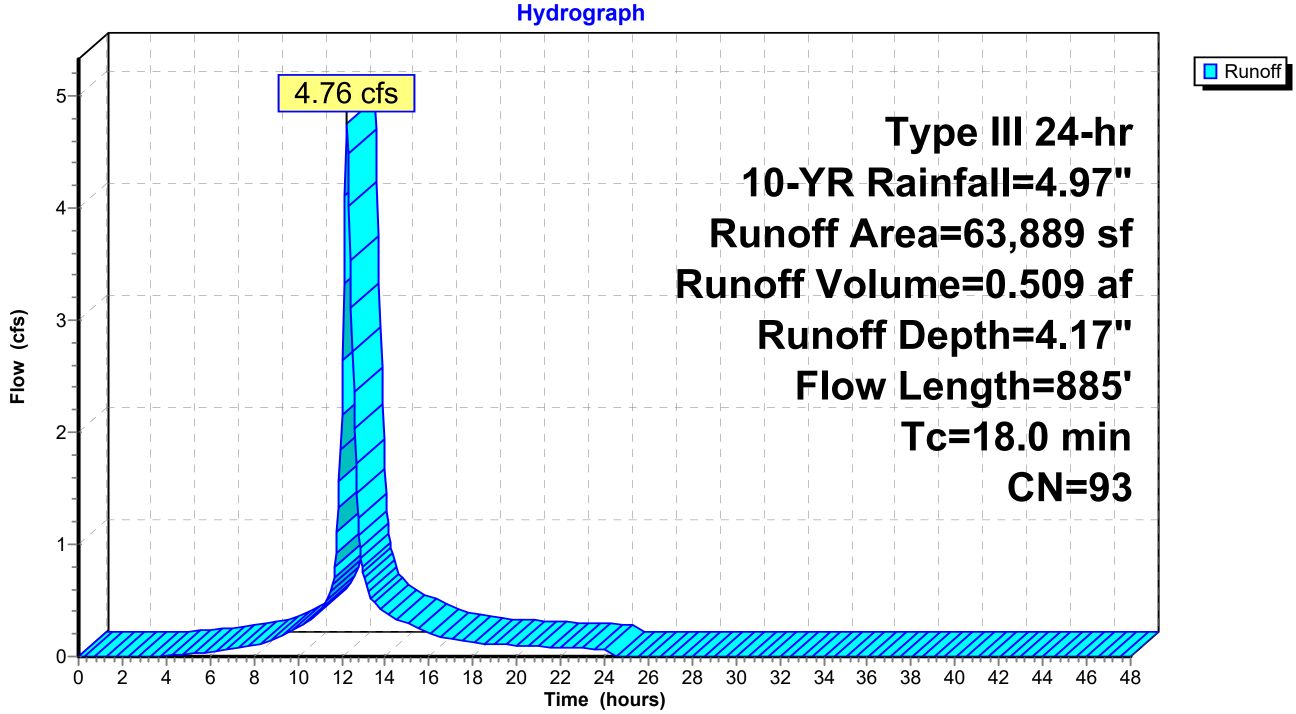
Runoff = 4.76 cfs @ 12.24 hrs, Volume= 0.509 af, Depth= 4.17"
Routed to Pond 7P : Detention Basin F-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.97"

	Area (sf)	CN	Description
*	51,612	98	Pavement and walks
	7,166	61	>75% Grass cover, Good, HSG B
	1,911	80	>75% Grass cover, Good, HSG D
*	3,200	98	Building Roof
	63,889	93	Weighted Average
	9,077		14.21% Pervious Area
	54,812		85.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0090	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	40	0.0090	1.42		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.9	200	0.0350	3.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	545	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
18.0	885	Total			

Subcatchment 29S: POST SUB NO 1G



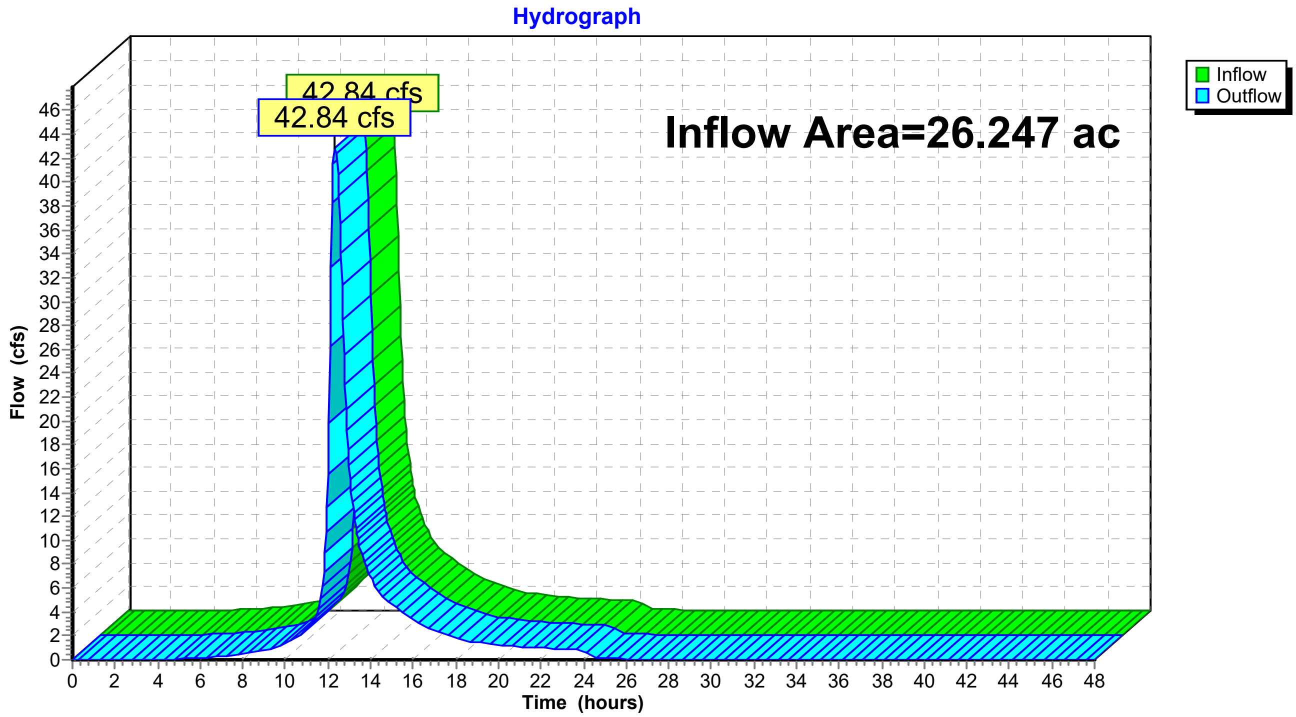
Summary for Reach 4R: ANALYSIS POINT NO. 1

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

Inflow Area = 26.247 ac, 46.64% Impervious, Inflow Depth = 2.75" for 10-YR event
Inflow = 42.84 cfs @ 12.33 hrs, Volume= 6.013 af
Outflow = 42.84 cfs @ 12.33 hrs, Volume= 6.013 af, Atten= 0%, Lag= 0.0 min

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

Reach 4R: ANALYSIS POINT NO. 1



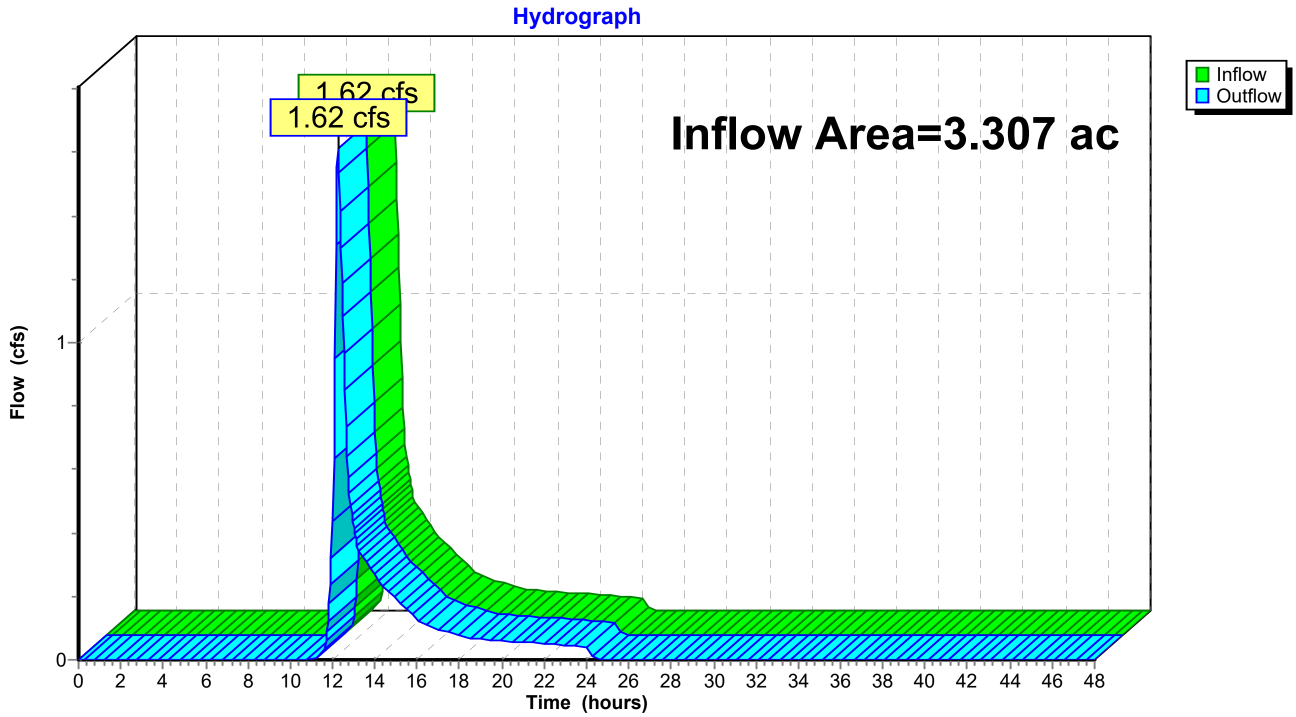
Summary for Reach 6R: ANALYSIS POINT No. 2

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

Inflow Area = 3.307 ac, 29.63% Impervious, Inflow Depth = 0.67" for 10-YR event
Inflow = 1.62 cfs @ 12.25 hrs, Volume= 0.186 af
Outflow = 1.62 cfs @ 12.25 hrs, Volume= 0.186 af, Atten= 0%, Lag= 0.0 min

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

Reach 6R: ANALYSIS POINT No. 2



Summary for Pond 7P: Detention Basin F-3

Inflow Area = 3.485 ac, 76.85% Impervious, Inflow Depth = 3.92" for 10-YR event
Inflow = 11.17 cfs @ 12.22 hrs, Volume= 1.139 af
Outflow = 8.32 cfs @ 12.37 hrs, Volume= 1.139 af, Atten= 26%, Lag= 9.4 min
Primary = 8.32 cfs @ 12.37 hrs, Volume= 1.139 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 160.45' @ 12.37 hrs Surf.Area= 7,291 sf Storage= 6,812 cf

Plug-Flow detention time= 12.2 min calculated for 1.138 af (100% of inflow)
Center-of-Mass det. time= 12.2 min (809.4 - 797.2)

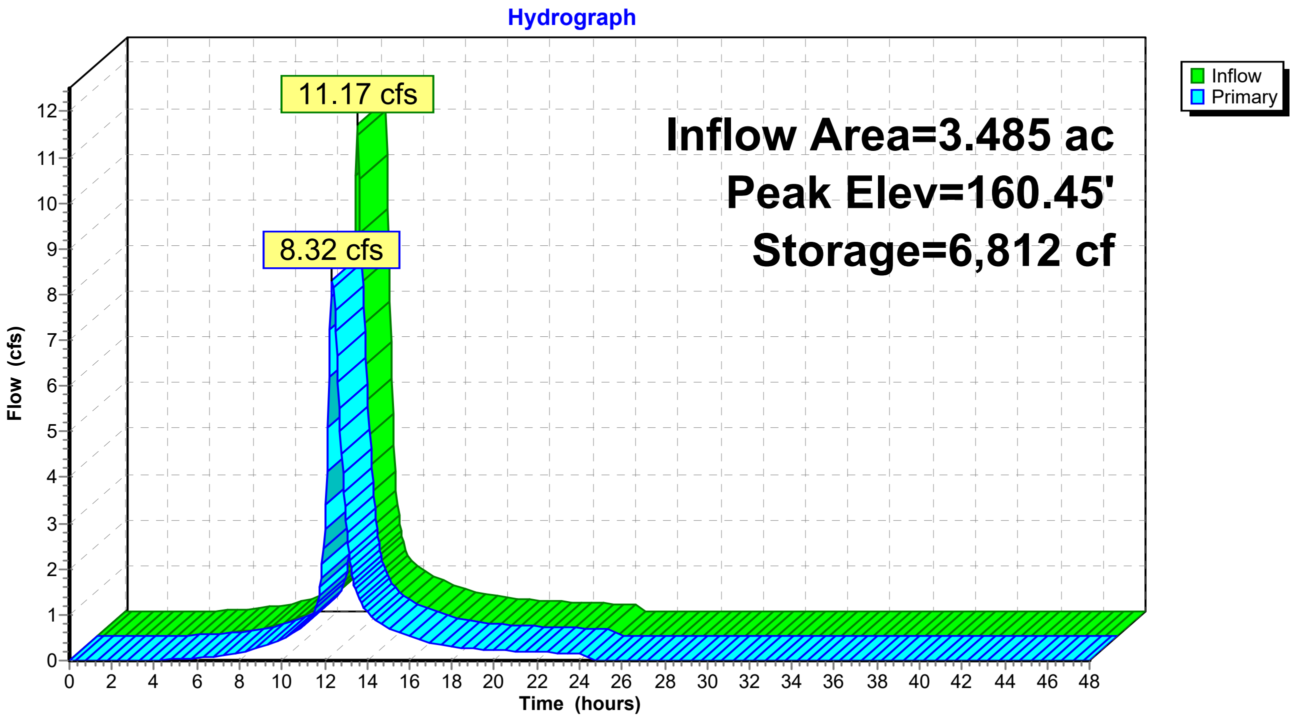
Volume	Invert	Avail.Storage	Storage Description
#1	159.00'	25,382 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.00	1	0	0
159.50	4,101	1,026	1,026
160.00	6,508	2,652	3,678
162.00	9,953	16,461	20,139
162.50	11,018	5,243	25,382

Device	Routing	Invert	Outlet Devices
#1	Device 3	156.00'	**18.0" Round Culvert** L= 110.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 156.00' / 153.00' S= 0.0273 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	159.00'	**45.0 deg x 1.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#3	Primary	155.67'	**18.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=8.28 cfs @ 12.37 hrs HW=160.45' (Free Discharge)
└─**3=Level Spreader Riser** (Passes 8.28 cfs of 18.60 cfs potential flow)
  └─**1=Culvert** (Passes 8.28 cfs of 16.37 cfs potential flow)
    └─**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 8.28 cfs @ 3.56 fps)

Pond 7P: Detention Basin F-3



Summary for Pond 11P: Infiltration Basin R-1

Inflow Area = 1.769 ac, 55.40% Impervious, Inflow Depth = 2.50" for 10-YR event
Inflow = 3.55 cfs @ 12.14 hrs, Volume= 0.368 af
Outflow = 0.41 cfs @ 13.14 hrs, Volume= 0.368 af, Atten= 89%, Lag= 59.7 min
Discarded = 0.34 cfs @ 13.14 hrs, Volume= 0.355 af
Primary = 0.07 cfs @ 13.14 hrs, Volume= 0.012 af
Routed to Reach 6R : ANALYSIS POINT No. 2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 170.73' @ 13.14 hrs Surf.Area= 6,050 sf Storage= 5,703 cf

Plug-Flow detention time= 130.0 min calculated for 0.367 af (100% of inflow)
Center-of-Mass det. time= 129.9 min (907.5 - 777.6)

Volume	Invert	Avail.Storage	Storage Description
#1	169.70'	14,244 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

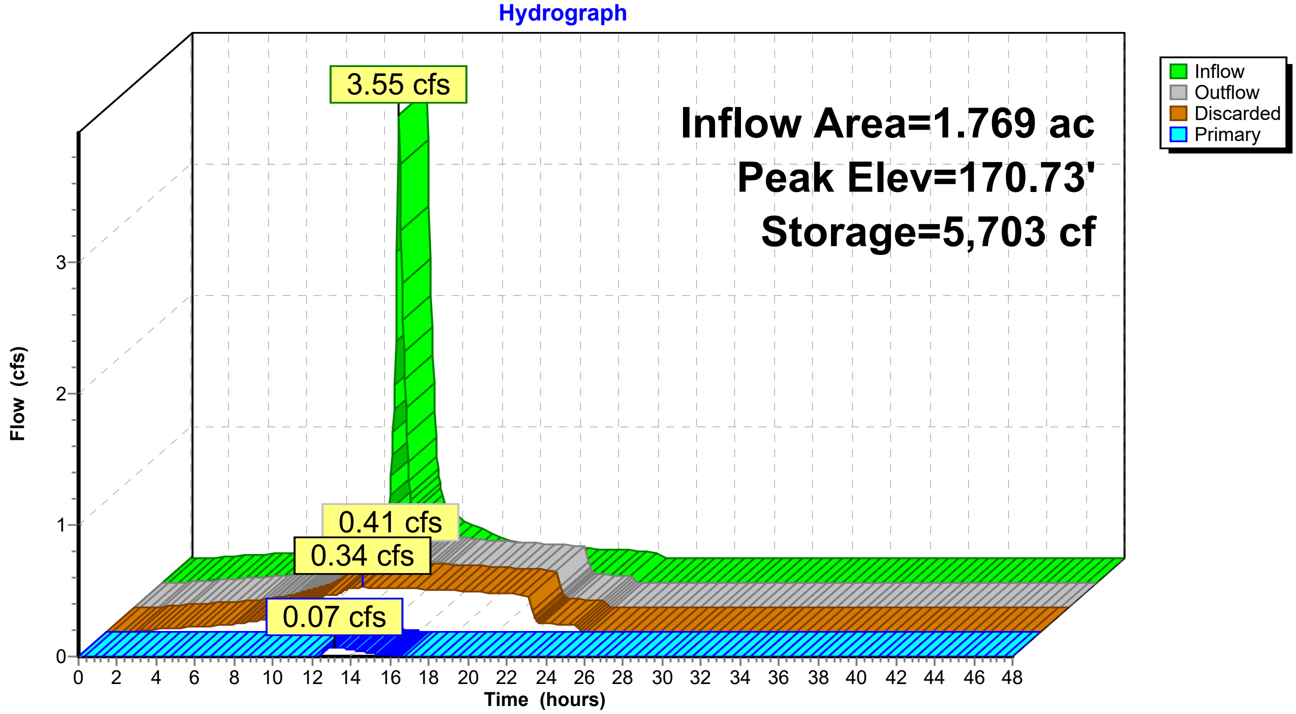
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
169.70	5,001	0	0	5,001
170.00	5,302	1,545	1,545	5,312
172.00	7,458	12,699	14,244	7,540

Device	Routing	Invert	Outlet Devices
#1	Primary	165.80'	**12.0" Round Culvert** L= 58.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 165.80' / 162.00' S= 0.0655 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	169.70'	**2.410 in/hr Exfiltration over Wetted area**
#3	Device 1	170.40'	**45.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.34 cfs @ 13.14 hrs HW=170.73' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.34 cfs)

Primary OutFlow Max=0.07 cfs @ 13.14 hrs HW=170.73' (Free Discharge)
└─**1=Culvert** (Passes 0.07 cfs of 7.96 cfs potential flow)
  └─**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.07 cfs @ 1.48 fps)

Pond 11P: Infiltration Basin R-1



Summary for Pond 12P: Detention Basin R-3

Inflow Area = 3.287 ac, 67.42% Impervious, Inflow Depth = 4.06" for 10-YR event
Inflow = 12.26 cfs @ 12.16 hrs, Volume= 1.112 af
Outflow = 6.98 cfs @ 12.36 hrs, Volume= 1.112 af, Atten= 43%, Lag= 11.8 min
Primary = 6.98 cfs @ 12.36 hrs, Volume= 1.112 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 161.91' @ 12.36 hrs Surf.Area= 5,163 sf Storage= 8,635 cf

Plug-Flow detention time= 26.6 min calculated for 1.111 af (100% of inflow)
Center-of-Mass det. time= 26.7 min (815.0 - 788.3)

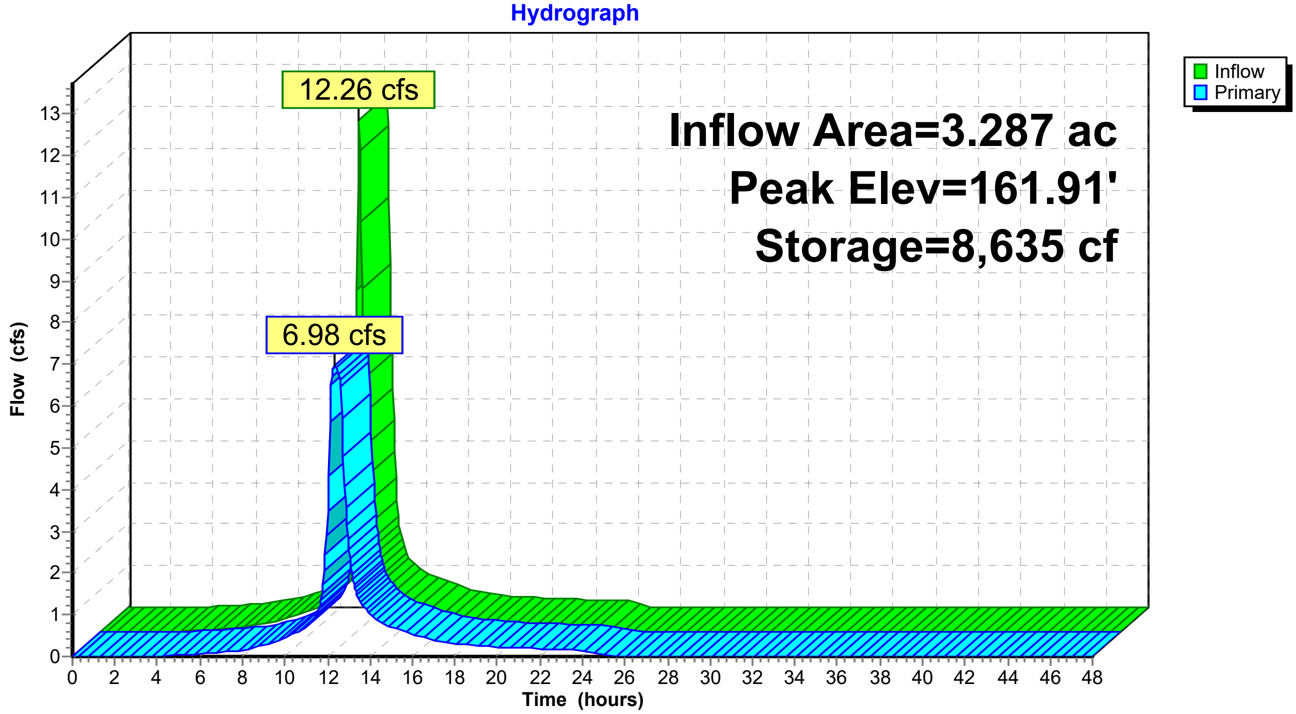
Volume	Invert	Avail.Storage	Storage Description
#1	159.80'	25,303 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.80	200	0	0
160.00	3,502	370	370
162.00	5,243	8,745	9,115
164.00	7,209	12,452	21,567
164.50	7,736	3,736	25,303

Device	Routing	Invert	Outlet Devices
#1	Device 3	158.00'	**12.0" Round Culvert** L= 85.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.00' / 144.00' S= 0.1647 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	159.80'	**45.0 deg x 0.5' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#3	Primary	150.67'	**12.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=6.98 cfs @ 12.36 hrs HW=161.91' (Free Discharge)
└─**3=Level Spreader Riser** (Passes 6.98 cfs of 12.68 cfs potential flow)
  └─**1=Culvert** (Inlet Controls 6.98 cfs @ 8.89 fps)
    └─**2=Sharp-Crested Vee/Trap Weir** (Passes 6.98 cfs of 11.71 cfs potential flow)

Pond 12P: Detention Basin R-3



Summary for Pond 13P: Detention Basin R-2

Inflow Area = 2.614 ac, 60.00% Impervious, Inflow Depth = 3.95" for 10-YR event
Inflow = 9.78 cfs @ 12.15 hrs, Volume= 0.861 af
Outflow = 7.26 cfs @ 12.26 hrs, Volume= 0.861 af, Atten= 26%, Lag= 6.7 min
Primary = 7.26 cfs @ 12.26 hrs, Volume= 0.861 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 162.47' @ 12.26 hrs Surf.Area= 6,019 sf Storage= 4,241 cf

Plug-Flow detention time= 7.8 min calculated for 0.860 af (100% of inflow)
Center-of-Mass det. time= 7.8 min (799.5 - 791.7)

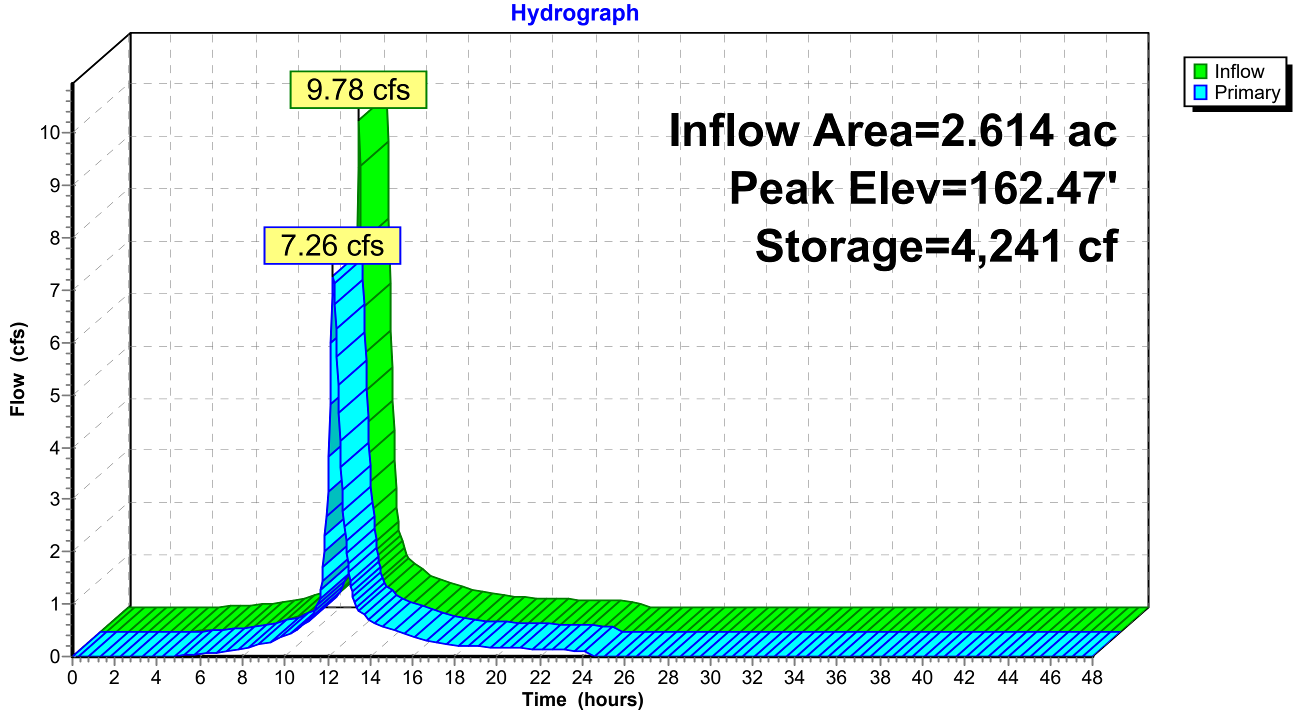
Volume	Invert	Avail.Storage	Storage Description
#1	161.50'	18,409 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
161.50	400	0	0
162.00	5,563	1,491	1,491
164.00	7,484	13,047	14,538
164.50	7,999	3,871	18,409

Device	Routing	Invert	Outlet Devices
#1	Device 3	152.00'	**12.0" Round Culvert** L= 78.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.00' / 141.00' S= 0.1410 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	161.50'	**2.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	143.17'	**12.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.21 cfs @ 12.26 hrs HW=162.47' (Free Discharge)
└─**3=Level Spreader Riser** (Passes 7.21 cfs of 16.61 cfs potential flow)
  └─**1=Culvert** (Passes 7.21 cfs of 11.94 cfs potential flow)
    └─**2=Sharp-Crested Rectangular Weir** (Weir Controls 7.21 cfs @ 3.22 fps)

Pond 13P: Detention Basin R-2



Summary for Pond 23P: Detention Basin F-2

Inflow Area = 2.347 ac, 72.38% Impervious, Inflow Depth = 3.85" for 10-YR event
Inflow = 8.83 cfs @ 12.14 hrs, Volume= 0.752 af
Outflow = 3.74 cfs @ 12.41 hrs, Volume= 0.632 af, Atten= 58%, Lag= 16.5 min
Primary = 3.74 cfs @ 12.41 hrs, Volume= 0.632 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 160.65' @ 12.41 hrs Surf.Area= 6,911 sf Storage= 14,666 cf

Plug-Flow detention time= 215.6 min calculated for 0.632 af (84% of inflow)
Center-of-Mass det. time= 149.3 min (944.0 - 794.6)

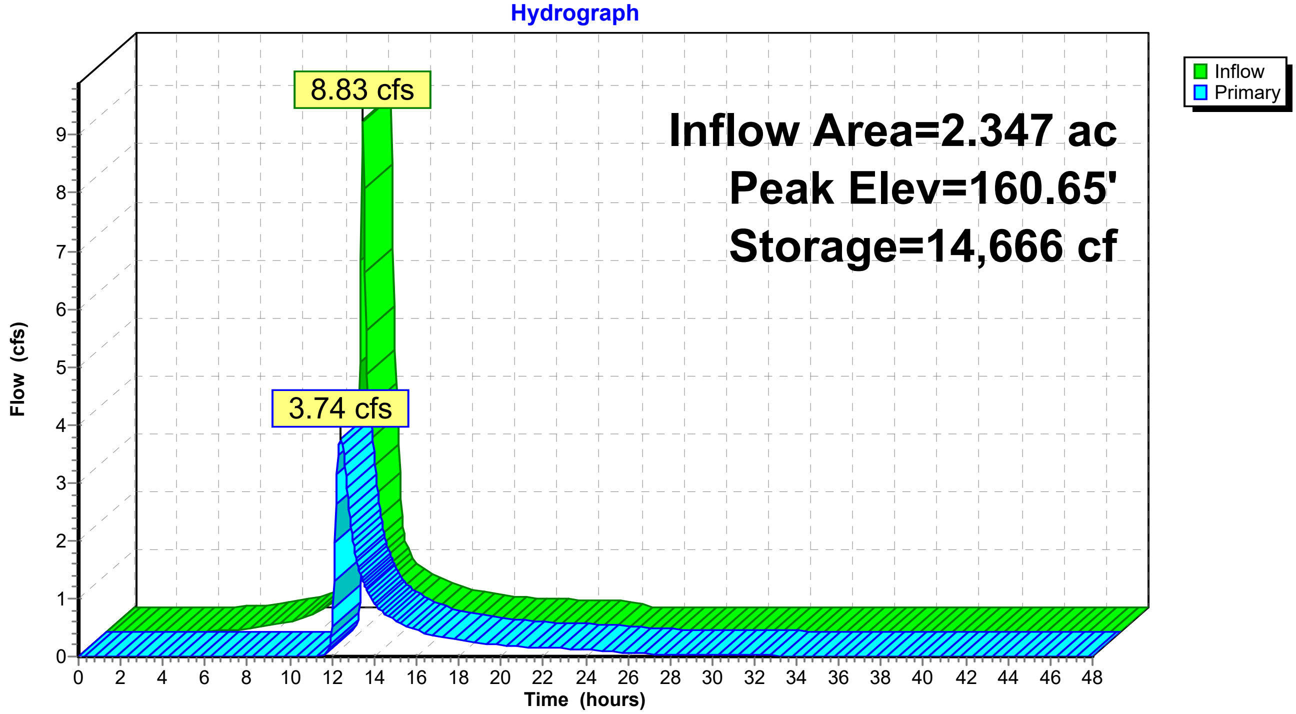
Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	29,366 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	4,222	0	0
160.00	6,163	10,385	10,385
162.00	8,447	14,610	24,995
162.50	9,035	4,371	29,366

Device	Routing	Invert	Outlet Devices
#1	Device 2	158.00'	**15.0" Round Culvert** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.00' / 155.00' S= 0.0375 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Primary	157.42'	**15.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads
#3	Device 1	159.00'	**45.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=3.73 cfs @ 12.41 hrs HW=160.65' (Free Discharge)
└─**2=Level Spreader Riser** (Passes 3.73 cfs of 10.63 cfs potential flow)
  └─**1=Culvert** (Passes 3.73 cfs of 8.42 cfs potential flow)
    └─**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 3.73 cfs @ 3.29 fps)

Pond 23P: Detention Basin F-2



Summary for Pond 26P: Infiltration Basin F-4

Inflow Area = 6.325 ac, 64.53% Impervious, Inflow Depth = 3.56" for 10-YR event
Inflow = 18.26 cfs @ 12.17 hrs, Volume= 1.874 af
Outflow = 8.17 cfs @ 12.54 hrs, Volume= 1.874 af, Atten= 55%, Lag= 22.1 min
Discarded = 0.50 cfs @ 12.54 hrs, Volume= 1.008 af
Primary = 7.68 cfs @ 12.54 hrs, Volume= 0.867 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 163.01' @ 12.54 hrs Surf.Area= 20,971 sf Storage= 32,874 cf

Plug-Flow detention time= 309.4 min calculated for 1.872 af (100% of inflow)
Center-of-Mass det. time= 310.1 min (1,115.6 - 805.5)

Volume	Invert	Avail.Storage	Storage Description
#1	161.00'	55,617 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

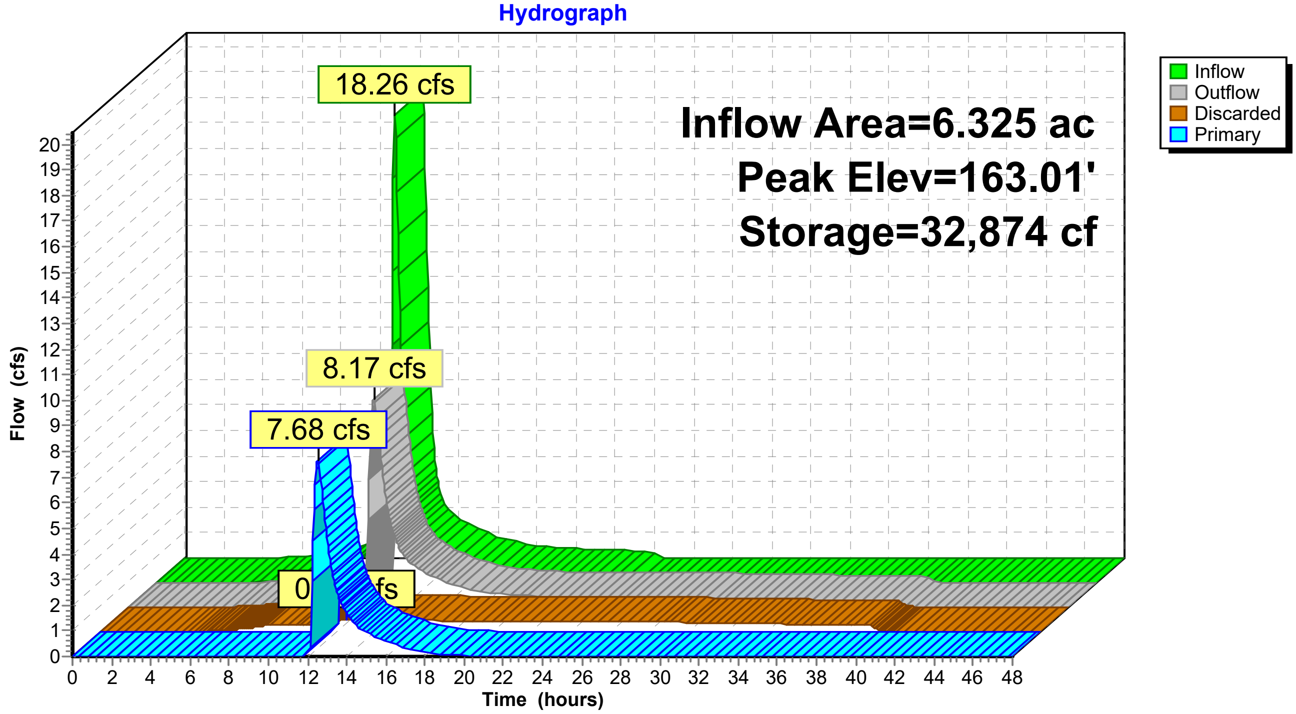
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
161.00	10,567	0	0	10,567
162.00	17,000	13,657	13,657	17,013
164.00	25,230	41,960	55,617	25,307

Device	Routing	Invert	Outlet Devices
#1	Device 4	158.00'	**18.0" Round Culvert** L= 221.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.00' / 153.00' S= 0.0226 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Discarded	161.00'	**1.020 in/hr Exfiltration over Wetted area**
#3	Device 1	162.40'	**5.0' long x 2.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	155.67'	**18.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.50 cfs @ 12.54 hrs HW=163.01' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.50 cfs)

Primary OutFlow Max=7.66 cfs @ 12.54 hrs HW=163.01' (Free Discharge)
└─**4=Level Spreader Riser** (Passes 7.66 cfs of 23.06 cfs potential flow)
  └─**1=Culvert** (Passes 7.66 cfs of 16.32 cfs potential flow)
    └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 7.66 cfs @ 2.56 fps)

Pond 26P: Infiltration Basin F-4



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

Subcatchment 6S: POST-SUB No. 1D Runoff Area=87,909 sf 70.36% Impervious Runoff Depth=4.96"
Flow Length=411' Tc=15.4 min CN=89 Runoff=8.43 cfs 0.834 af

Subcatchment 8S: POST SUB 3C Runoff Area=34,500 sf 100.00% Impervious Runoff Depth=5.99"
Tc=10.0 min CN=98 Runoff=4.19 cfs 0.395 af

Subcatchment 14S: POST-SUB No 3B Runoff Area=67,024 sf 0.00% Impervious Runoff Depth=2.16"
Flow Length=760' Tc=15.8 min CN=61 Runoff=2.73 cfs 0.277 af

Subcatchment 15S: POST-SUB No 3A Runoff Area=42,540 sf 19.23% Impervious Runoff Depth=1.26"
Flow Length=158' Slope=0.0100 '/' Tc=14.2 min CN=50 Runoff=0.88 cfs 0.102 af

Subcatchment 16S: POST-SUB No. 2A Runoff Area=158,671 sf 0.00% Impervious Runoff Depth=3.28"
Flow Length=180' Tc=14.2 min CN=73 Runoff=10.75 cfs 0.996 af

Subcatchment 17S: POST-SUB No. 2B Runoff Area=143,182 sf 67.42% Impervious Runoff Depth=5.30"
Flow Length=221' Tc=11.8 min CN=92 Runoff=15.76 cfs 1.451 af

Subcatchment 18S: POST-SUB No. 2C Runoff Area=113,851 sf 60.00% Impervious Runoff Depth=5.18"
Flow Length=205' Tc=11.0 min CN=91 Runoff=12.64 cfs 1.129 af

Subcatchment 19S: POST-SUB No. 2D Runoff Area=24,504 sf 0.00% Impervious Runoff Depth=3.78"
Flow Length=333' Tc=19.2 min CN=78 Runoff=1.71 cfs 0.177 af

Subcatchment 22S: POST-SUB No. 1C Runoff Area=102,217 sf 72.38% Impervious Runoff Depth=5.07"
Tc=10.0 min CN=90 Runoff=11.47 cfs 0.991 af

Subcatchment 24S: POST-SUB No. 1A Runoff Area=38,417 sf 0.00% Impervious Runoff Depth=3.48"
Flow Length=800' Tc=22.3 min CN=75 Runoff=2.31 cfs 0.256 af

Subcatchment 25S: POST-SUB-No. 1E Runoff Area=114,681 sf 82.66% Impervious Runoff Depth=5.30"
Flow Length=869' Tc=17.9 min CN=92 Runoff=10.83 cfs 1.162 af

Subcatchment 27S: POST-SUB No. 1A-A Runoff Area=173,610 sf 0.00% Impervious Runoff Depth=2.70"
Flow Length=342' Tc=14.3 min CN=67 Runoff=9.55 cfs 0.898 af

Subcatchment 28S: Post Sub No 1F Runoff Area=122,407 sf 67.79% Impervious Runoff Depth=4.63"
Tc=10.0 min CN=86 Runoff=12.84 cfs 1.084 af

Subcatchment 29S: POST SUB NO 1G Runoff Area=63,889 sf 85.79% Impervious Runoff Depth=5.41"
Flow Length=885' Tc=18.0 min CN=93 Runoff=6.10 cfs 0.661 af

Reach 4R: ANALYSIS POINT NO. 1 Inflow=63.73 cfs 8.449 af
Outflow=63.73 cfs 8.449 af

Reach 6R: ANALYSIS POINT No. 2 Inflow=2.77 cfs 0.352 af
Outflow=2.77 cfs 0.352 af

Pond 7P: Detention Basin F-3 Peak Elev=160.70' Storage=8,625 cf Inflow=14.47 cfs 1.495 af
Outflow=11.04 cfs 1.495 af

Pond 11P: Infiltration Basin R-1 Peak Elev=171.07' Storage=7,819 cf Inflow=4.88 cfs 0.498 af
Discarded=0.36 cfs 0.423 af Primary=0.39 cfs 0.075 af Outflow=0.75 cfs 0.498 af

Pond 12P: Detention Basin R-3 Peak Elev=162.55' Storage=12,166 cf Inflow=15.76 cfs 1.451 af
Outflow=7.61 cfs 1.451 af

Pond 13P: Detention Basin R-2 Peak Elev=162.68' Storage=5,491 cf Inflow=12.64 cfs 1.129 af
Outflow=9.48 cfs 1.129 af

Pond 23P: Detention Basin F-2 Peak Elev=161.01' Storage=17,158 cf Inflow=11.47 cfs 0.991 af
Outflow=6.04 cfs 0.871 af

Pond 26P: Infiltration Basin F-4 Peak Elev=163.30' Storage=38,979 cf Inflow=24.11 cfs 2.501 af
Discarded=0.52 cfs 1.069 af Primary=13.40 cfs 1.432 af Outflow=13.92 cfs 2.501 af

Total Runoff Area = 29.555 ac Runoff Volume = 10.414 af Average Runoff Depth = 4.23"
55.26% Pervious = 16.333 ac 44.74% Impervious = 13.222 ac

Summary for Subcatchment 6S: POST-SUB No. 1D

[47] Hint: Peak is 185% of capacity of segment #4

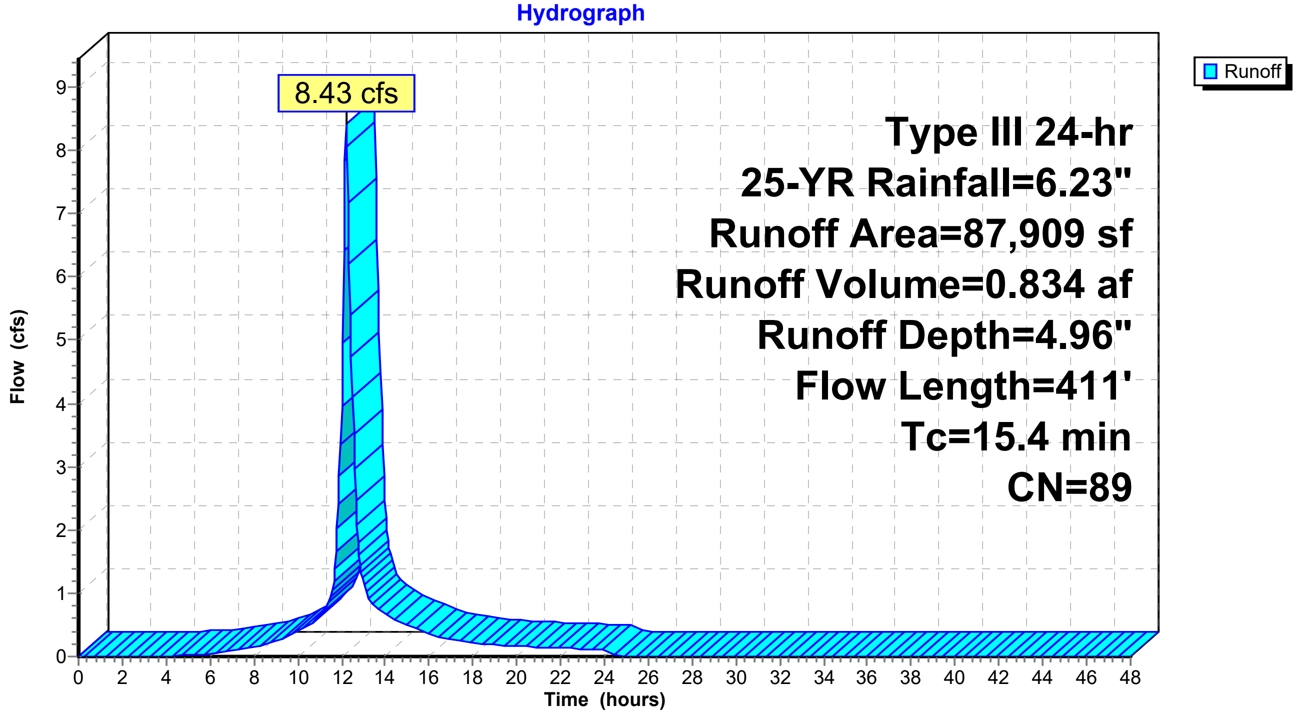
Runoff = 8.43 cfs @ 12.21 hrs, Volume= 0.834 af, Depth= 4.96"
Routed to Pond 7P : Detention Basin F-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.23"

	Area (sf)	CN	Description
*	4,000	98	Building Roofs
*	10,503	98	Detention Basin
*	47,347	98	Pavement and Walks
	7,767	80	>75% Grass cover, Good, HSG D
	18,292	61	>75% Grass cover, Good, HSG B
	87,909	89	Weighted Average
	26,059		29.64% Pervious Area
	61,850		70.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.6	55	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.2	40	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	216	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
15.4	411	Total			

Subcatchment 6S: POST-SUB No. 1D



Summary for Subcatchment 8S: POST SUB 3C Building 2, 3 and 4

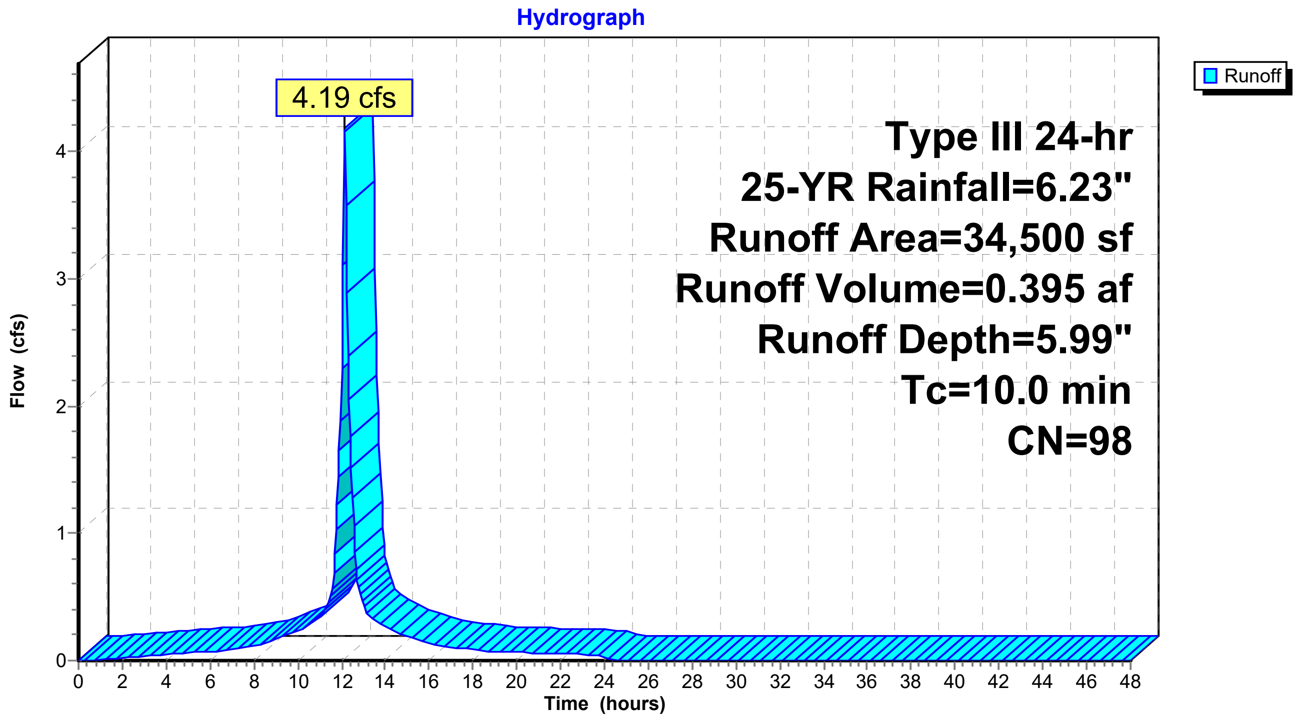
Runoff = 4.19 cfs @ 12.14 hrs, Volume= 0.395 af, Depth= 5.99"
Routed to Pond 11P : Infiltration Basin R-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.23"

	Area (sf)	CN	Description
*	34,500	98	Building Roof
	0	80	>75% Grass cover, Good, HSG D
	34,500	98	Weighted Average
	34,500		100.00% Impervious Area

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

Subcatchment 8S: POST SUB 3C Building 2, 3 and 4



Summary for Subcatchment 14S: POST-SUB No 3B

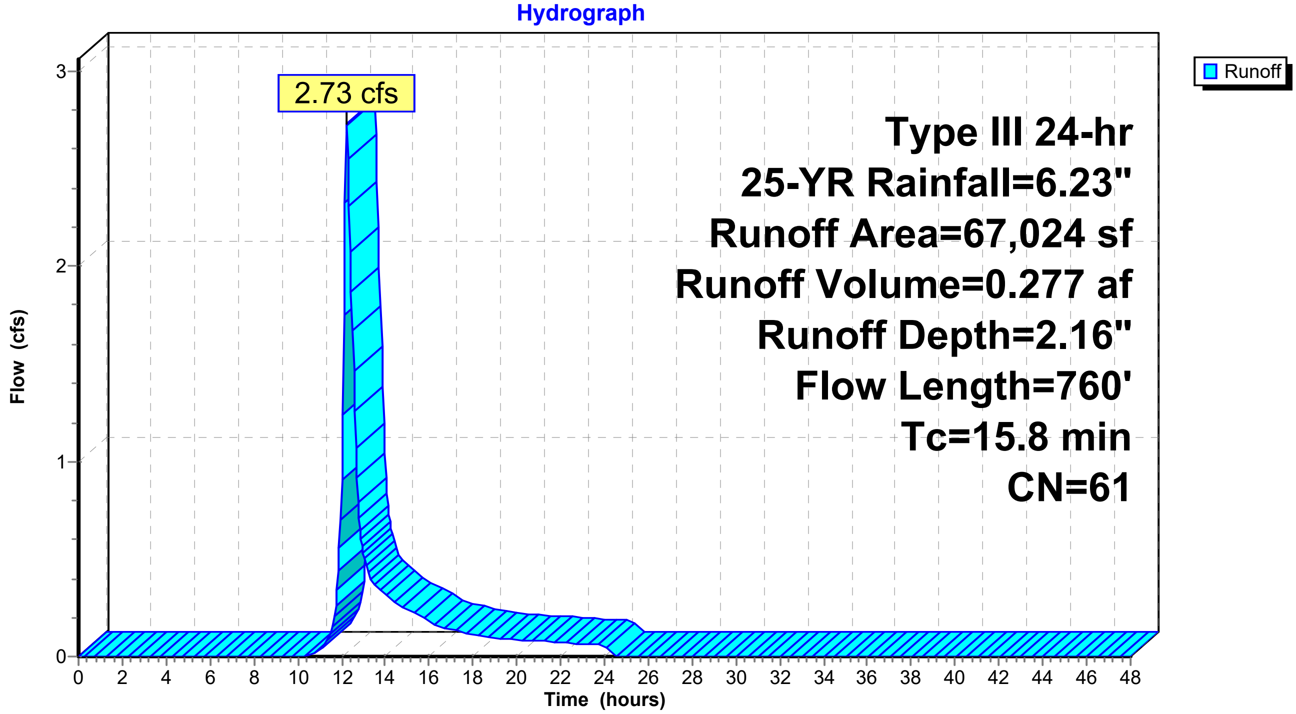
Runoff = 2.73 cfs @ 12.23 hrs, Volume= 0.277 af, Depth= 2.16"
Routed to Reach 6R : ANALYSIS POINT No. 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.23"

Area (sf)	CN	Description
28,004	73	Brush, Good, HSG D
19,012	30	Woods, Good, HSG A
4,184	77	Woods, Good, HSG D
3,089	39	>75% Grass cover, Good, HSG A
12,735	80	>75% Grass cover, Good, HSG D
67,024	61	Weighted Average
67,024		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.6	200	0.0200	2.12		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.6	460	0.0650	12.11	60.55	**Channel Flow,** Area= 5.0 sf Perim= 7.0' r= 0.71' n= 0.025 Earth, clean & winding
15.8	760	Total			

Subcatchment 14S: POST-SUB No 3B



Summary for Subcatchment 15S: POST-SUB No 3A

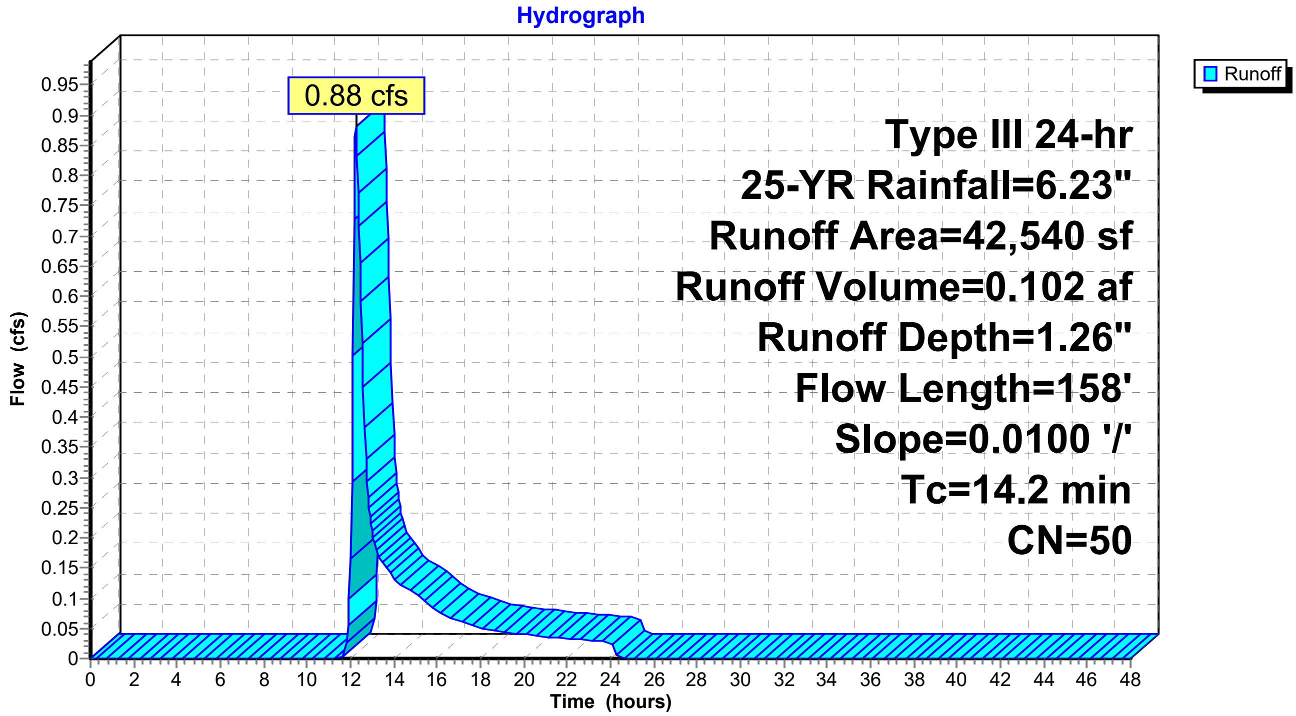
Runoff = 0.88 cfs @ 12.24 hrs, Volume= 0.102 af, Depth= 1.26"
Routed to Pond 11P : Infiltration Basin R-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.23"

	Area (sf)	CN	Description
	0	49	50-75% Grass cover, Fair, HSG A
	34,361	39	>75% Grass cover, Good, HSG A
*	8,179	98	Basin
	42,540	50	Weighted Average
	34,361		80.77% Pervious Area
	8,179		19.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.6	58	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.2	158	Total			

Subcatchment 15S: POST-SUB No 3A



Summary for Subcatchment 16S: POST-SUB No. 2A

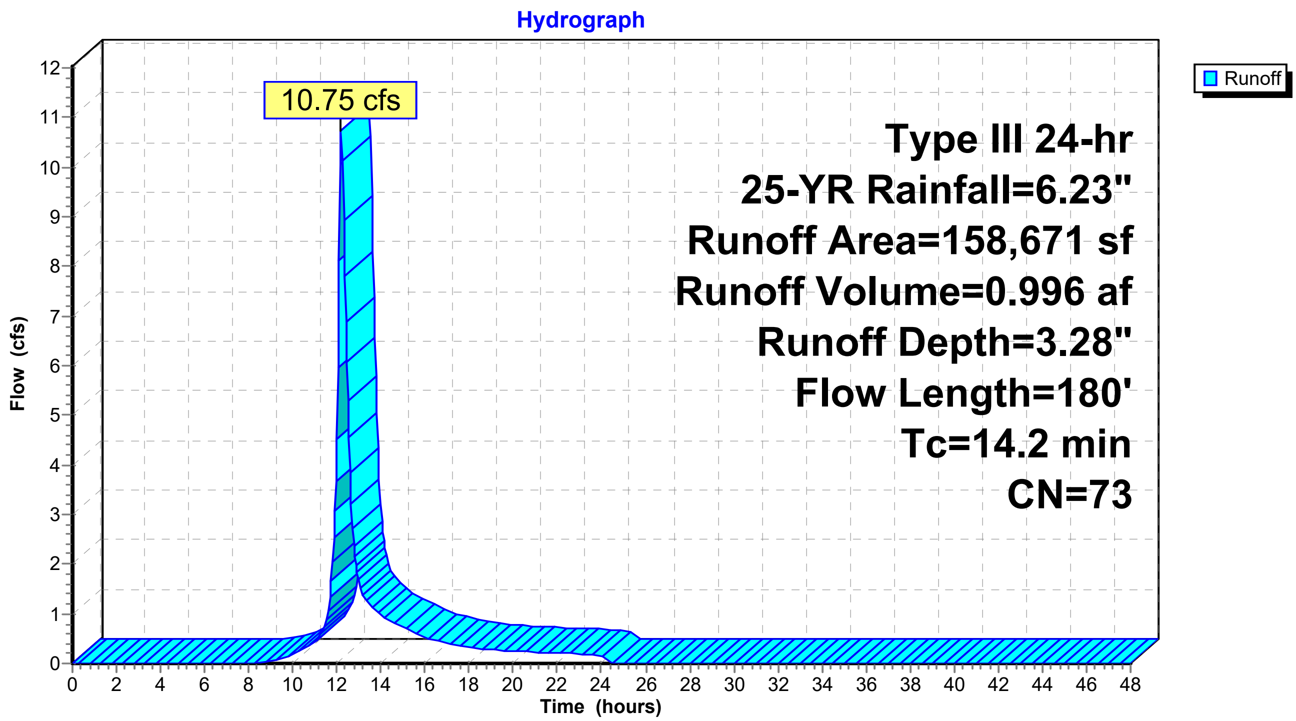
Runoff = 10.75 cfs @ 12.20 hrs, Volume= 0.996 af, Depth= 3.28"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.23"

	Area (sf)	CN	Description
	93,385	77	Woods, Good, HSG D
	46,536	80	>75% Grass cover, Good, HSG D
	0	32	Woods/grass comb., Good, HSG A
*	18,750	39	>75% Grass cover, Good, HSG A
	158,671	73	Weighted Average
	158,671		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.6	80	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.2	180	Total			

Subcatchment 16S: POST-SUB No. 2A



Summary for Subcatchment 17S: POST-SUB No. 2B

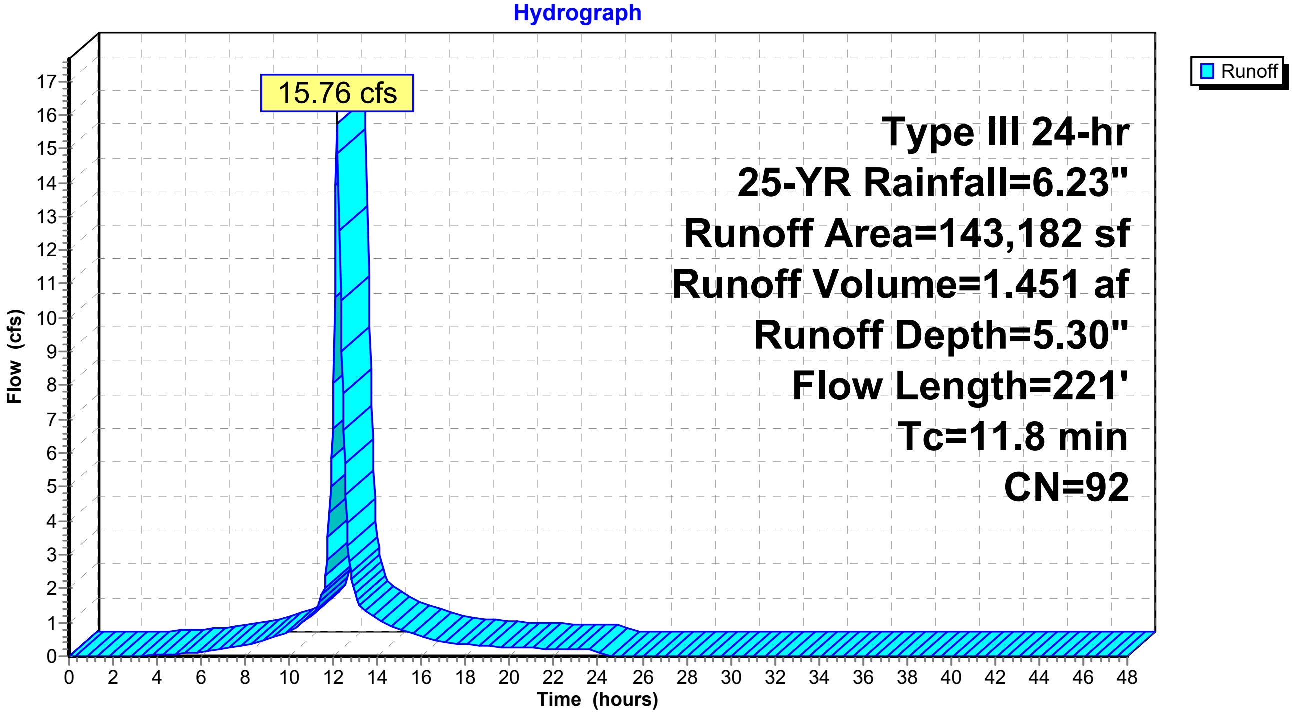
Runoff = 15.76 cfs @ 12.16 hrs, Volume= 1.451 af, Depth= 5.30"
Routed to Pond 12P : Detention Basin R-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.23"

	Area (sf)	CN	Description
*	39,478	98	Building Roofs
*	50,310	98	Pavement and Walks
*	6,744	98	Detention Basin
	46,650	80	>75% Grass cover, Good, HSG D
	143,182	92	Weighted Average
	46,650		32.58% Pervious Area
	96,532		67.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	90	0.0190	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.4	10	0.0300	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.1	30	0.0850	4.37		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.6	91	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.8	221	Total			

Subcatchment 17S: POST-SUB No. 2B



Summary for Subcatchment 18S: POST-SUB No. 2C

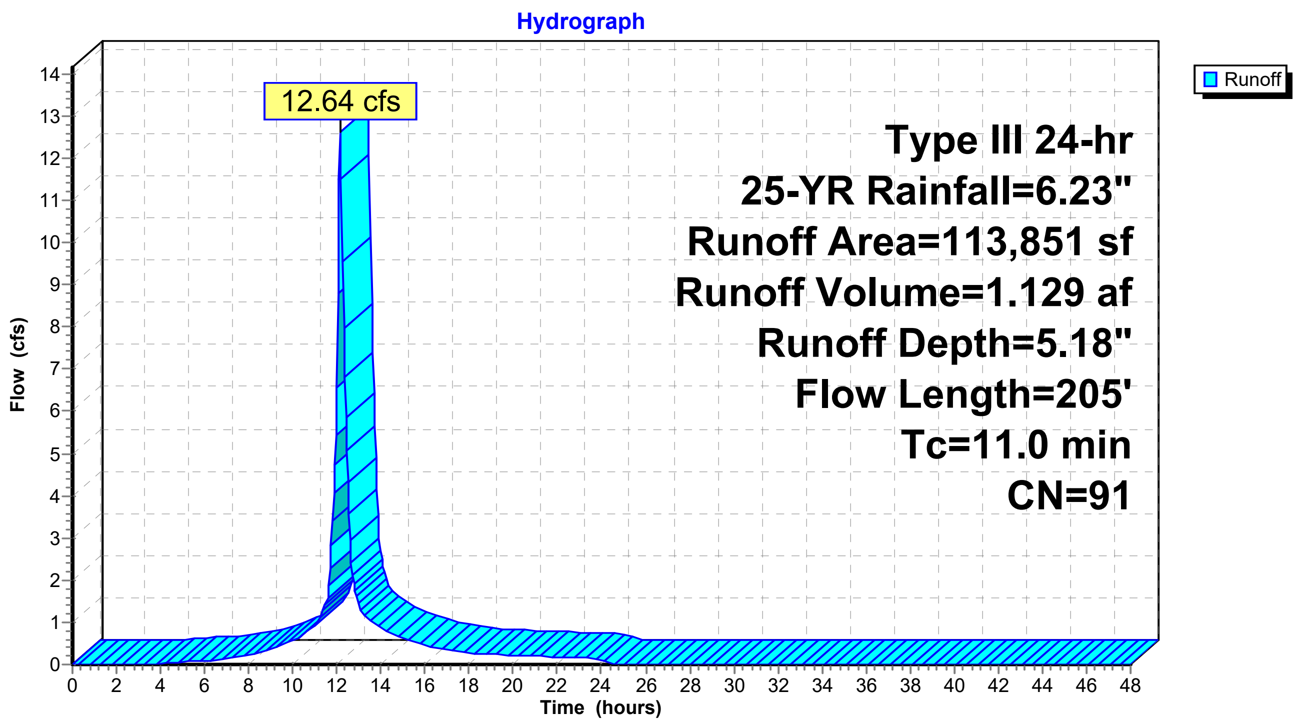
Runoff = 12.64 cfs @ 12.15 hrs, Volume= 1.129 af, Depth= 5.18"
Routed to Pond 13P : Detention Basin R-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.23"

	Area (sf)	CN	Description
*	11,500	98	Building Roofs
*	6,502	98	Detention Basin
*	50,311	98	Pavement and Walks
	45,538	80	>75% Grass cover, Good, HSG D
	0	80	>75% Grass cover, Good, HSG D
	113,851	91	Weighted Average
	45,538		40.00% Pervious Area
	68,313		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.7	105	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.0	205	Total			

Subcatchment 18S: POST-SUB No. 2C



Summary for Subcatchment 19S: POST-SUB No. 2D

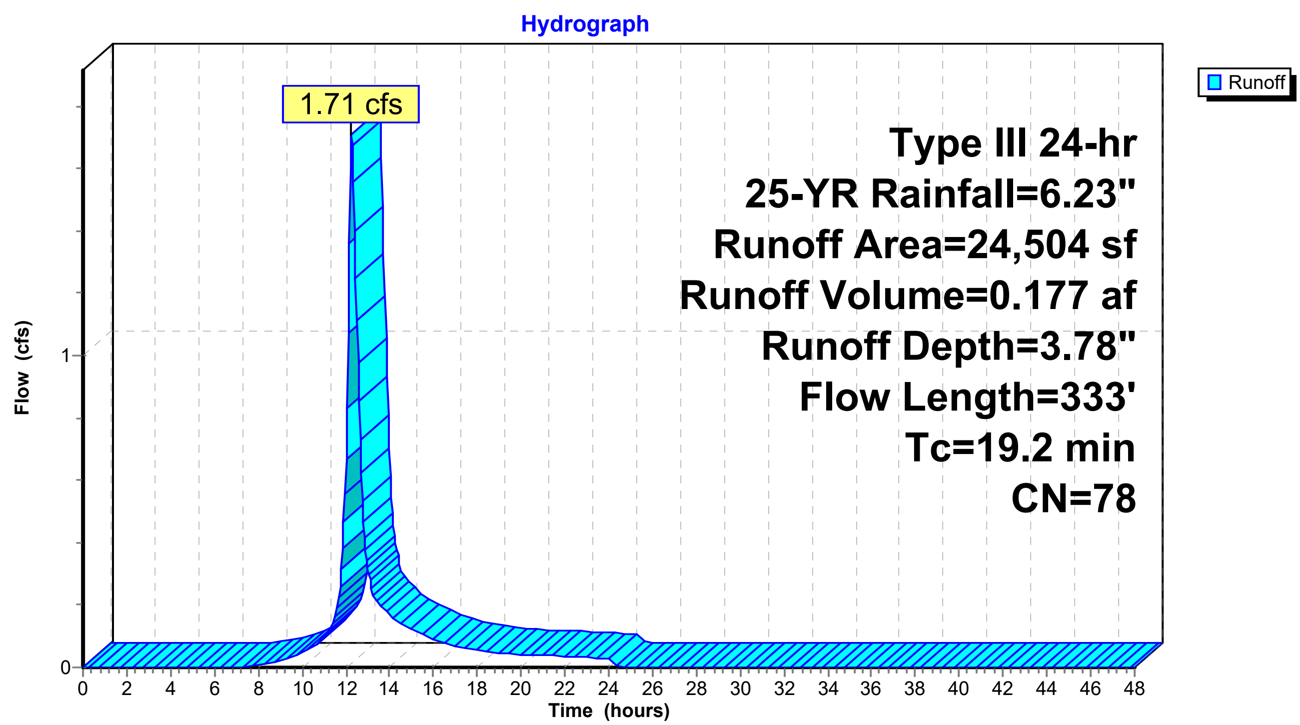
Runoff = 1.71 cfs @ 12.26 hrs, Volume= 0.177 af, Depth= 3.78"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.23"

Area (sf)	CN	Description
14,488	77	Woods, Good, HSG D
10,016	80	>75% Grass cover, Good, HSG D
24,504	78	Weighted Average
24,504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.5	100	0.0330	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.90"
0.7	233	0.1200	5.20		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
19.2	333	Total			

Subcatchment 19S: POST-SUB No. 2D



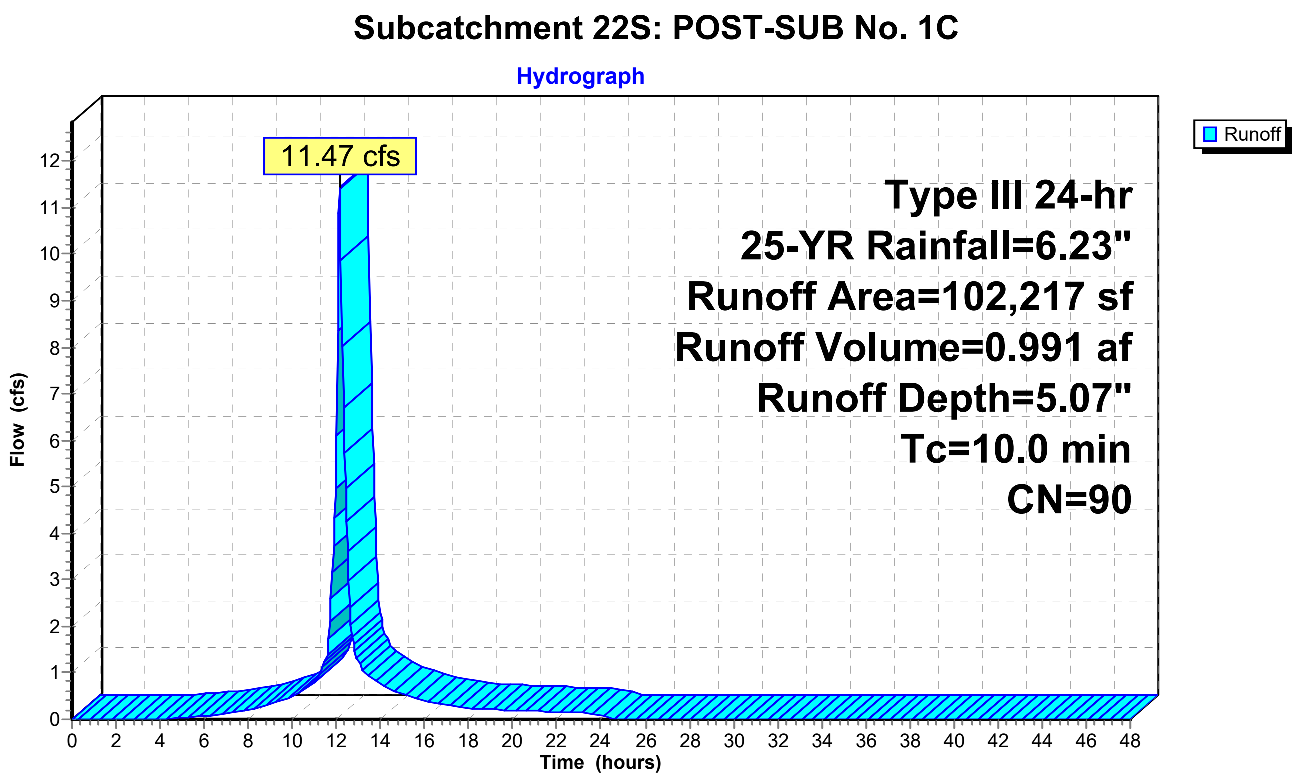
Summary for Subcatchment 22S: POST-SUB No. 1C

Runoff = 11.47 cfs @ 12.14 hrs, Volume= 0.991 af, Depth= 5.07"
Routed to Pond 23P : Detention Basin F-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.23"

	Area (sf)	CN	Description
*	16,090	98	Building Roofs
*	52,636	98	Pavement and Walks
*	5,255	98	Detention Basin
	14,731	61	>75% Grass cover, Good, HSG B
	13,505	80	>75% Grass cover, Good, HSG D
	102,217	90	Weighted Average
	28,236		27.62% Pervious Area
	73,981		72.38% Impervious Area

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



Summary for Subcatchment 24S: POST-SUB No. 1A

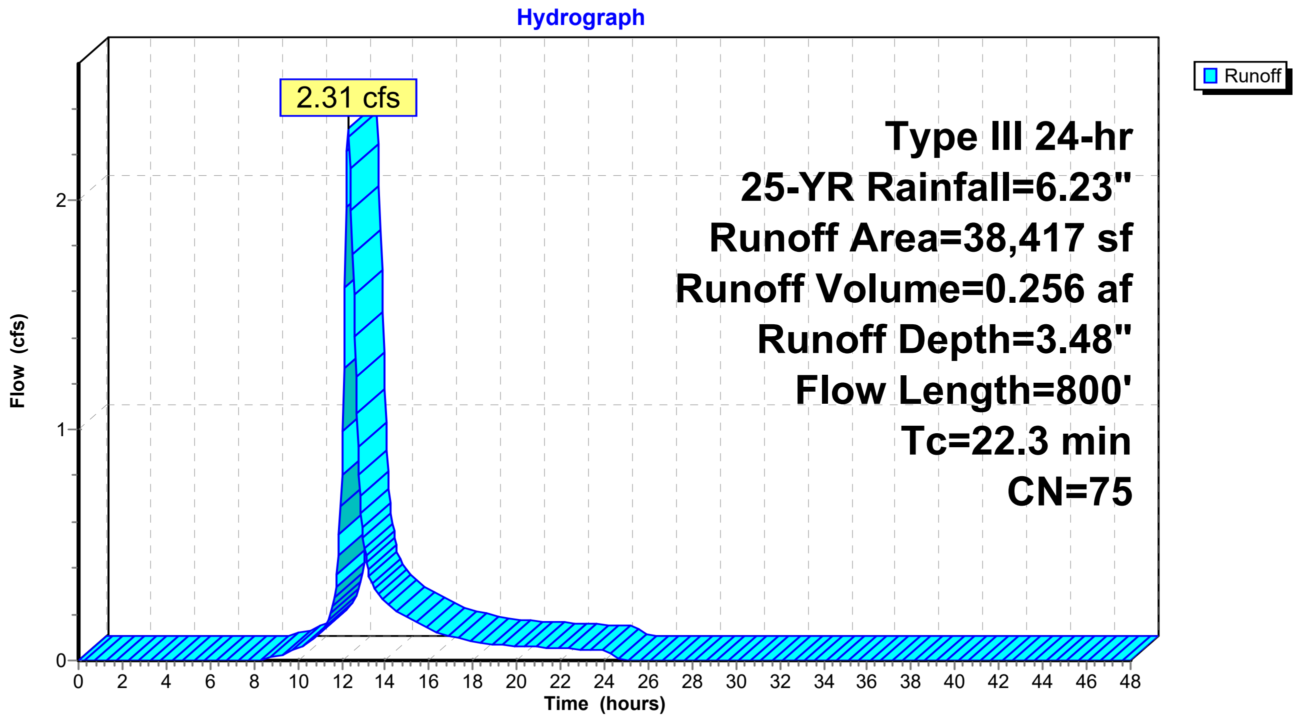
Runoff = 2.31 cfs @ 12.31 hrs, Volume= 0.256 af, Depth= 3.48"
Routed to Pond 26P : Infiltration Basin F-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.23"

	Area (sf)	CN	Description
	23,572	77	Woods, Good, HSG D
	0	73	Woods/grass comb., Poor, HSG B
*	14,845	71	>75% grass cover, Good, HSG B
	38,417	75	Weighted Average
	38,417		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0150	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.90"
5.5	700	0.0200	2.12		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
22.3	800	Total			

Subcatchment 24S: POST-SUB No. 1A



Summary for Subcatchment 25S: POST-SUB-No. 1E

[47] Hint: Peak is 237% of capacity of segment #4

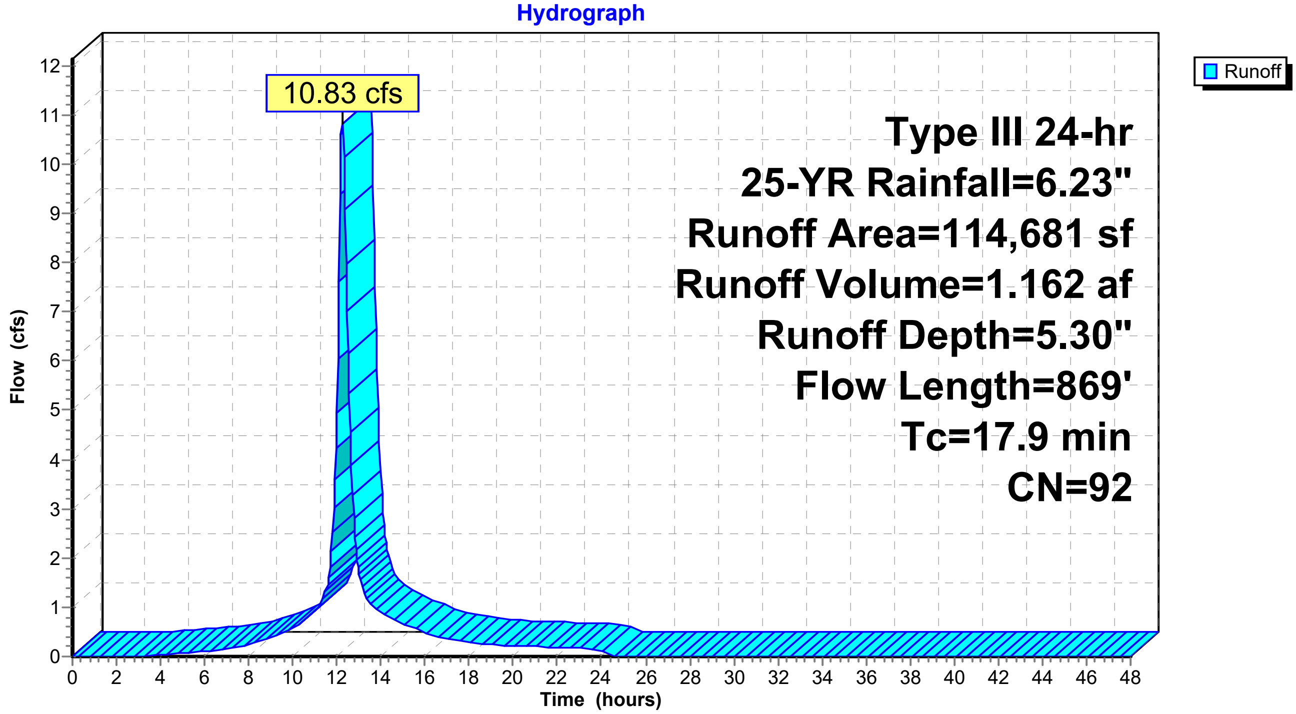
Runoff = 10.83 cfs @ 12.24 hrs, Volume= 1.162 af, Depth= 5.30"
Routed to Pond 26P : Infiltration Basin F-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.23"

	Area (sf)	CN	Description
*	28,932	98	Buildings
*	65,867	98	pavement and walks
	15,194	61	>75% Grass cover, Good, HSG B
	4,688	80	>75% Grass cover, Good, HSG D
	114,681	92	Weighted Average
	19,882		17.34% Pervious Area
	94,799		82.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0090	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	40	0.0090	1.42		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.1	254	0.0350	3.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.1	475	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
17.9	869	Total			

Subcatchment 25S: POST-SUB-No. 1E



Summary for Subcatchment 27S: POST-SUB No. 1A-A

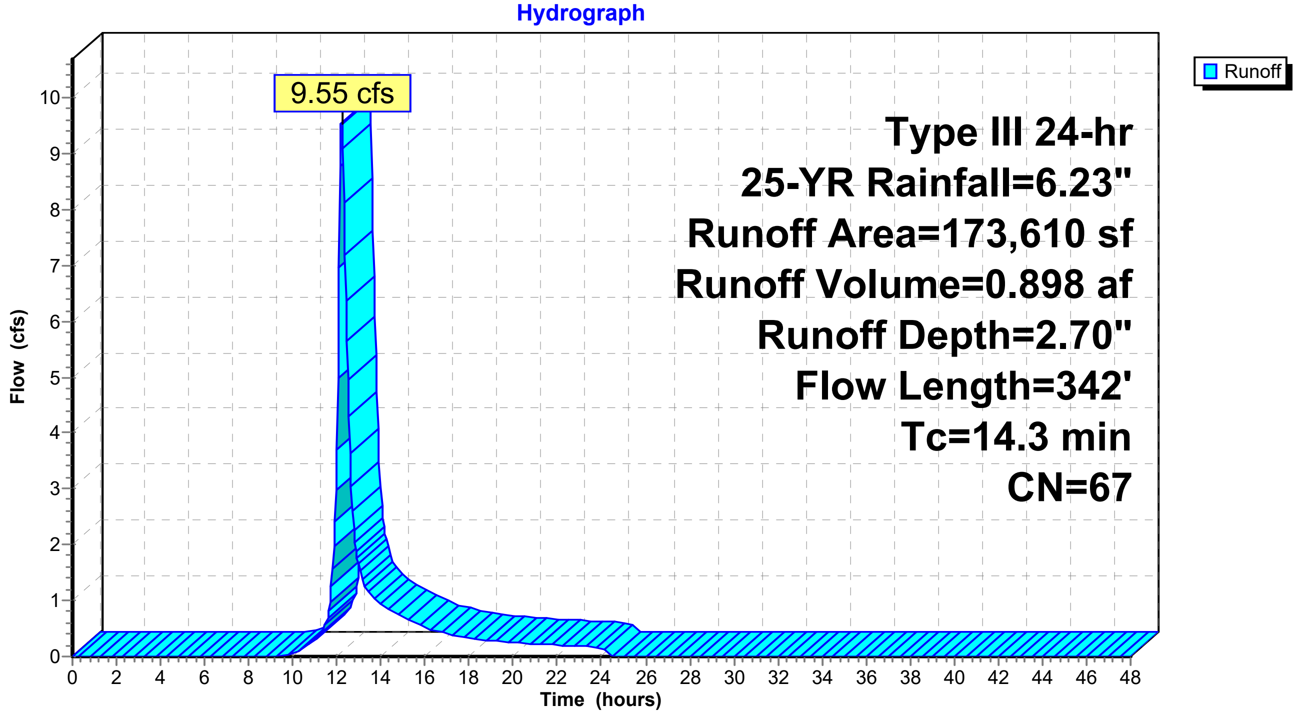
Runoff = 9.55 cfs @ 12.21 hrs, Volume= 0.898 af, Depth= 2.70"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.23"

	Area (sf)	CN	Description
	87,949	77	Woods, Good, HSG D
	4,955	55	Woods, Good, HSG B
*	29,916	30	Woods, Good, HSG A
	0	32	Woods/grass comb., Good, HSG A
	0	79	Woods/grass comb., Good, HSG D
	30,440	80	>75% Grass cover, Good, HSG D
*	20,350	61	>75% Grass cover, Good, HSG B
	173,610	67	Weighted Average
	173,610		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	20	0.0500	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	42	0.0360	1.33		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.5	200	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	12	0.3000	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
8.7	68	0.0360	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.90"
14.3	342	Total			

Subcatchment 27S: POST-SUB No. 1A-A



Summary for Subcatchment 28S: Post Sub No 1F

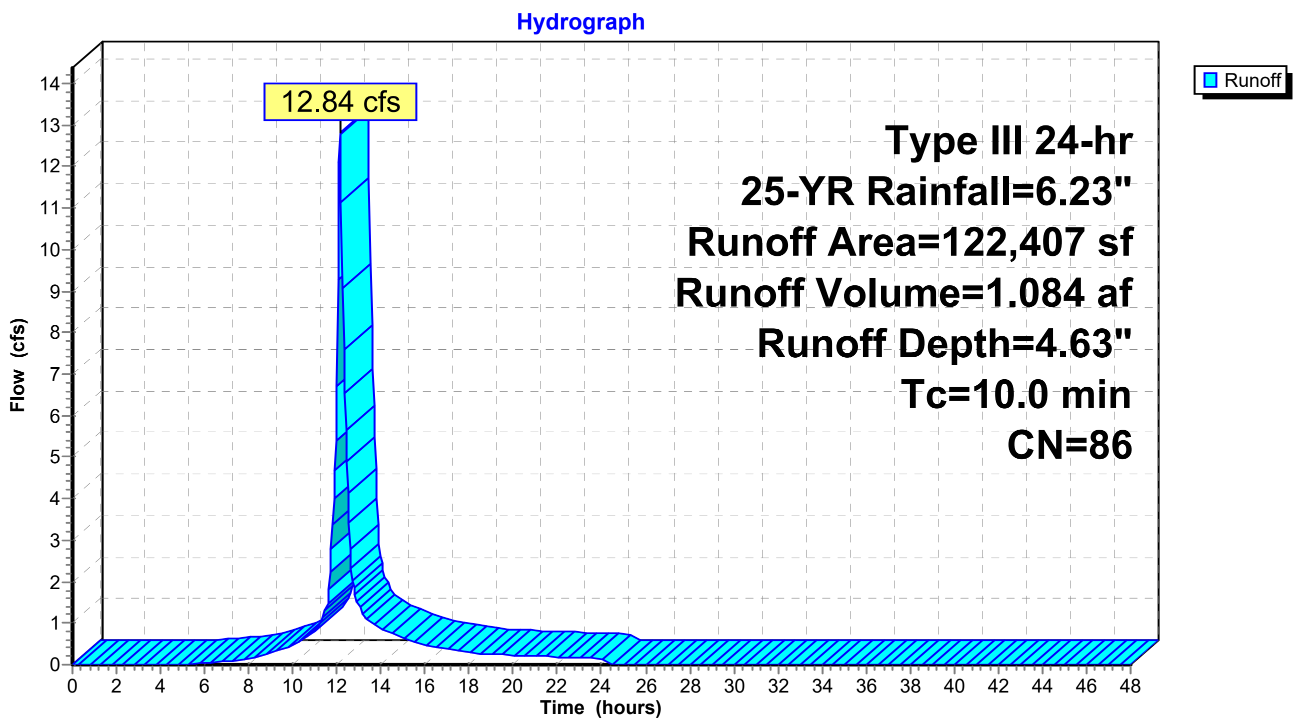
Runoff = 12.84 cfs @ 12.14 hrs, Volume= 1.084 af, Depth= 4.63"
Routed to Pond 26P : Infiltration Basin F-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.23"

	Area (sf)	CN	Description
*	23,000	98	Building Roof
*	7,000	98	Building Roof
	39,422	61	>75% Grass cover, Good, HSG B
*	27,685	98	Pavement and walks
*	13,800	98	Basin
*	11,500	98	Building Roof
	122,407	86	Weighted Average
	39,422		32.21% Pervious Area
	82,985		67.79% Impervious Area

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

Subcatchment 28S: Post Sub No 1F



Summary for Subcatchment 29S: POST SUB NO 1G

[47] Hint: Peak is 133% of capacity of segment #4

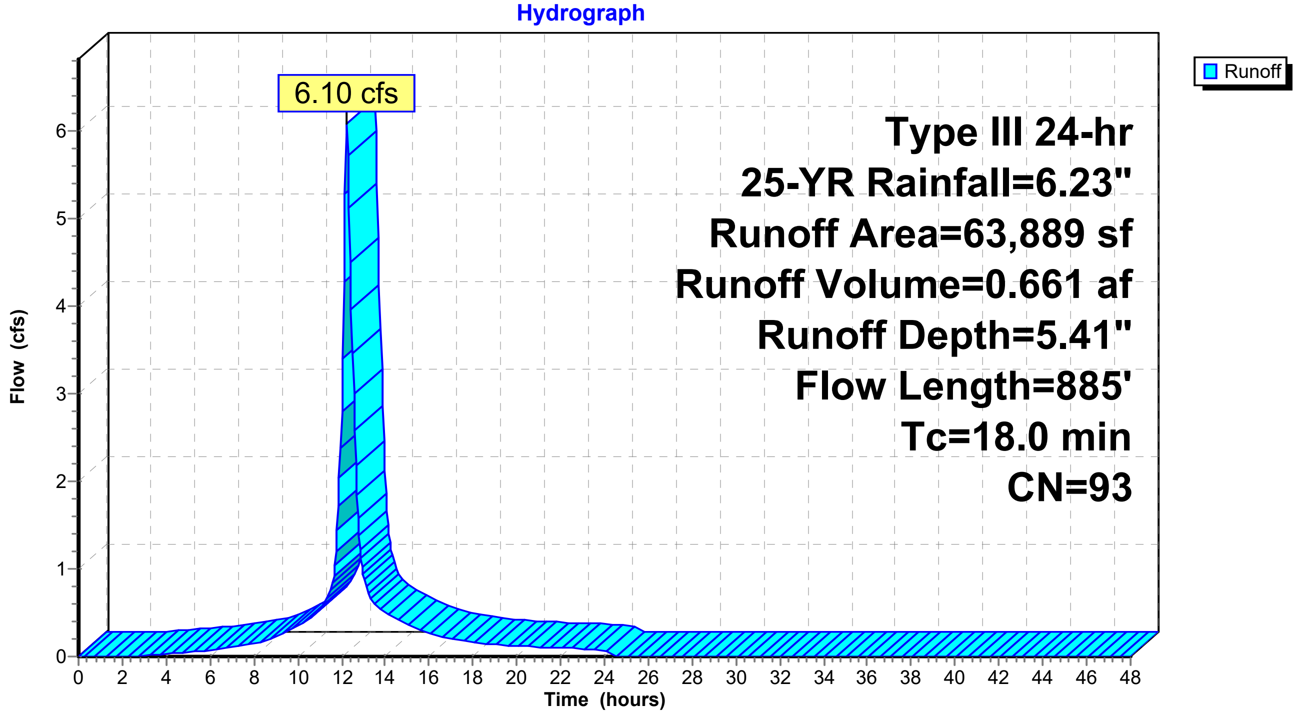
Runoff = 6.10 cfs @ 12.24 hrs, Volume= 0.661 af, Depth= 5.41"
Routed to Pond 7P : Detention Basin F-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.23"

	Area (sf)	CN	Description
*	51,612	98	Pavement and walks
	7,166	61	>75% Grass cover, Good, HSG B
	1,911	80	>75% Grass cover, Good, HSG D
*	3,200	98	Building Roof
	63,889	93	Weighted Average
	9,077		14.21% Pervious Area
	54,812		85.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0090	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	40	0.0090	1.42		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.9	200	0.0350	3.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	545	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
18.0	885	Total			

Subcatchment 29S: POST SUB NO 1G

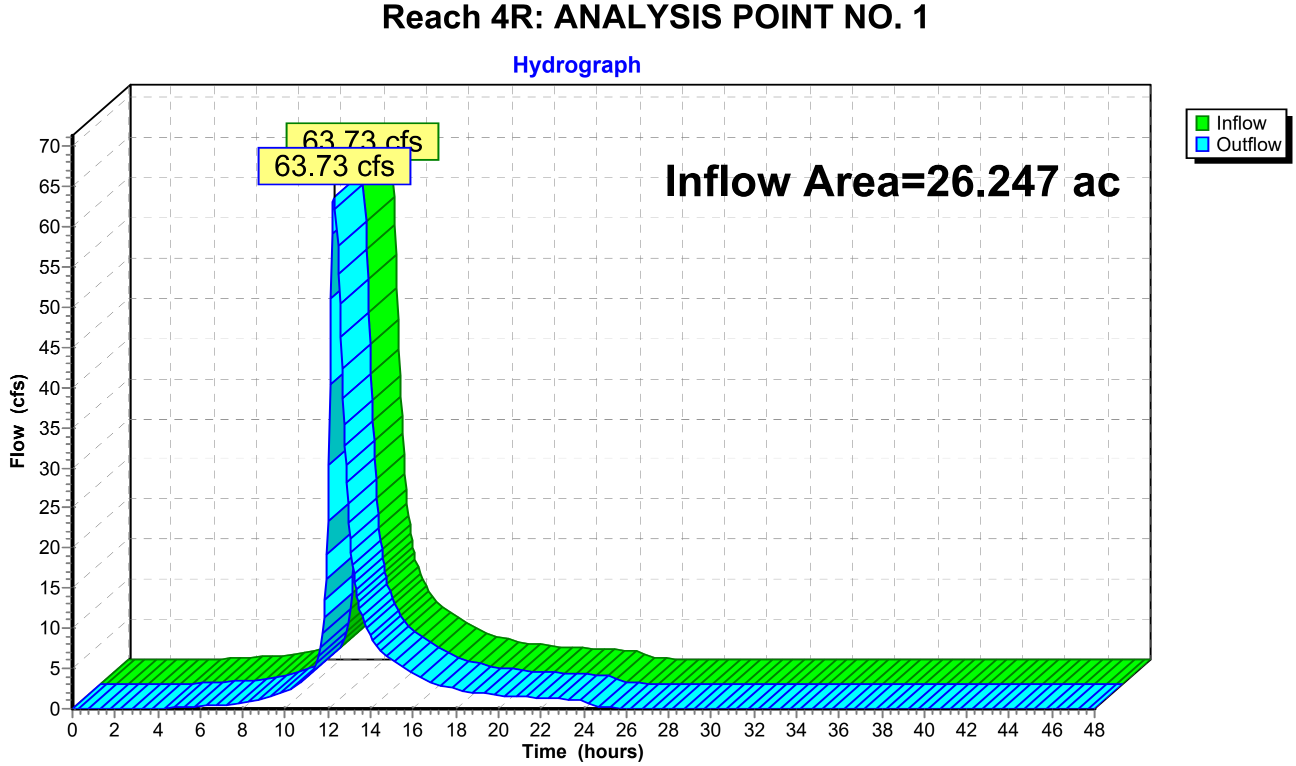


Summary for Reach 4R: ANALYSIS POINT NO. 1

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

Inflow Area = 26.247 ac, 46.64% Impervious, Inflow Depth = 3.86" for 25-YR event
Inflow = 63.73 cfs @ 12.29 hrs, Volume= 8.449 af
Outflow = 63.73 cfs @ 12.29 hrs, Volume= 8.449 af, Atten= 0%, Lag= 0.0 min

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



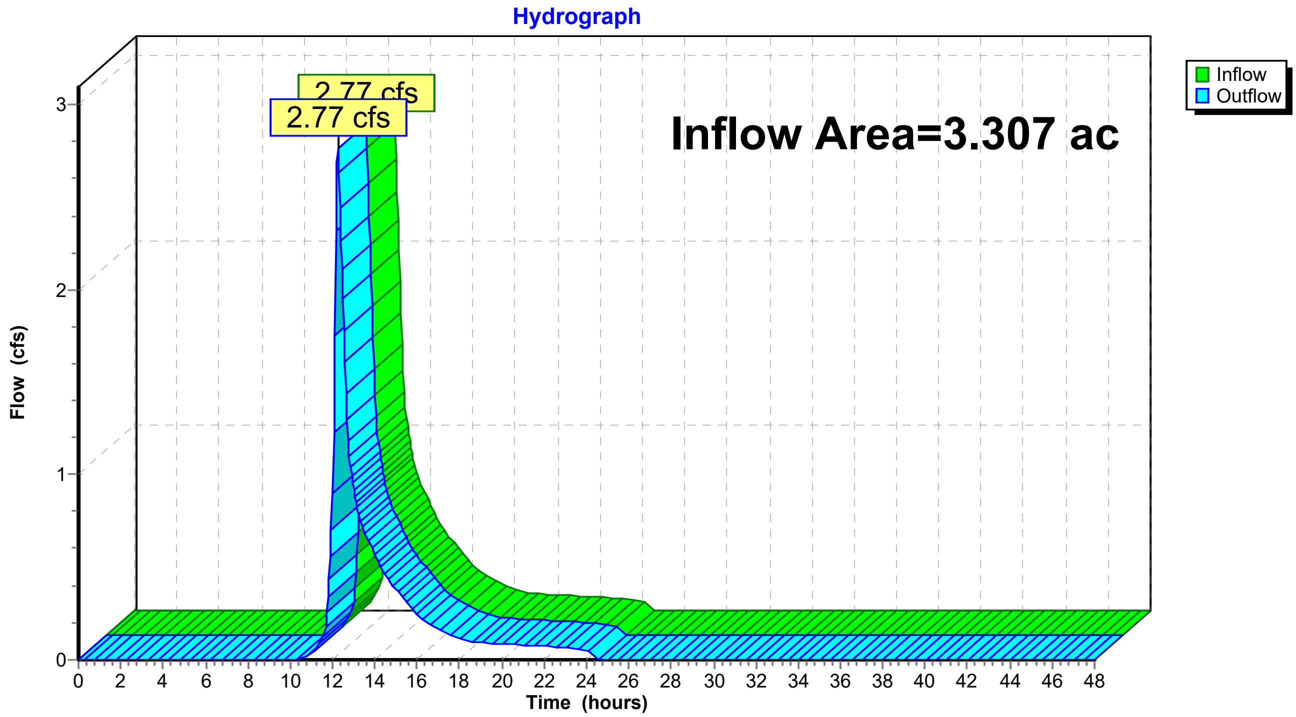
Summary for Reach 6R: ANALYSIS POINT No. 2

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

Inflow Area = 3.307 ac, 29.63% Impervious, Inflow Depth = 1.28" for 25-YR event
Inflow = 2.77 cfs @ 12.24 hrs, Volume= 0.352 af
Outflow = 2.77 cfs @ 12.24 hrs, Volume= 0.352 af, Atten= 0%, Lag= 0.0 min

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

Reach 6R: ANALYSIS POINT No. 2



Summary for Pond 7P: Detention Basin F-3

Inflow Area = 3.485 ac, 76.85% Impervious, Inflow Depth = 5.15" for 25-YR event
Inflow = 14.47 cfs @ 12.22 hrs, Volume= 1.495 af
Outflow = 11.04 cfs @ 12.36 hrs, Volume= 1.495 af, Atten= 24%, Lag= 8.8 min
Primary = 11.04 cfs @ 12.36 hrs, Volume= 1.495 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 160.70' @ 12.36 hrs Surf.Area= 7,707 sf Storage= 8,625 cf

Plug-Flow detention time= 12.4 min calculated for 1.494 af (100% of inflow)
Center-of-Mass det. time= 12.4 min (802.5 - 790.1)

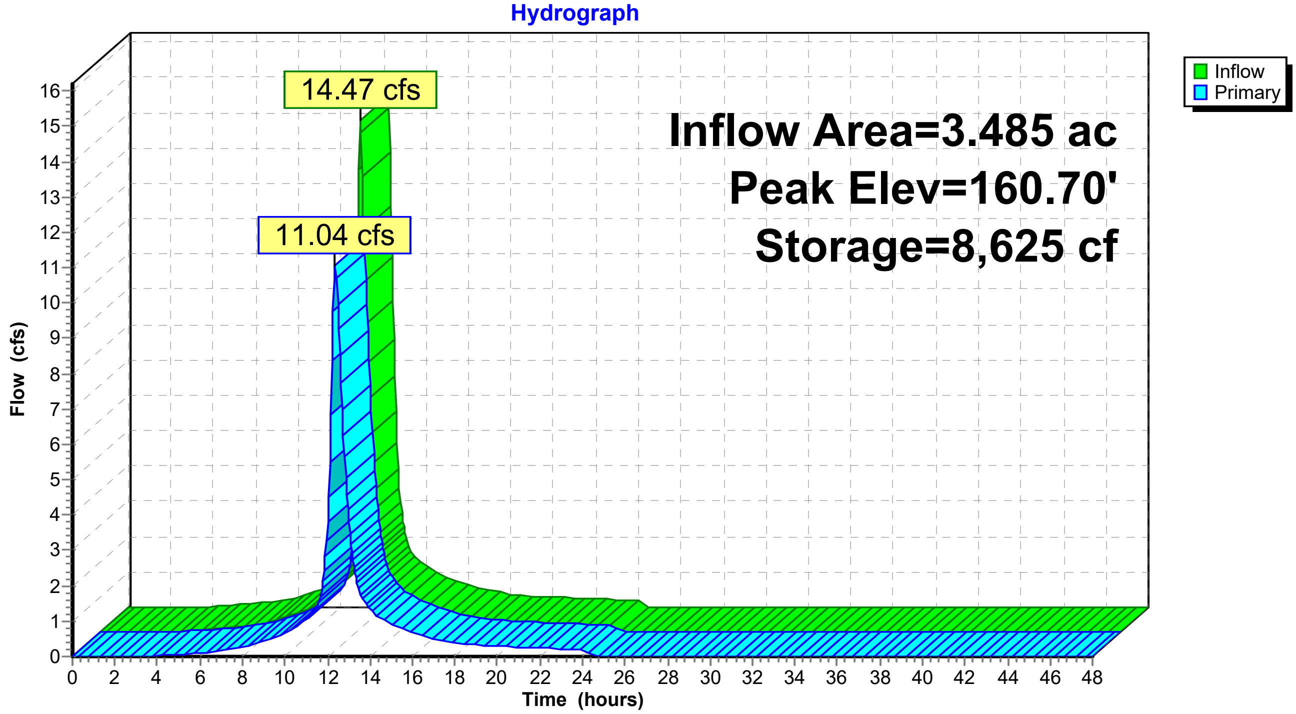
Volume	Invert	Avail.Storage	Storage Description
#1	159.00'	25,382 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.00	1	0	0
159.50	4,101	1,026	1,026
160.00	6,508	2,652	3,678
162.00	9,953	16,461	20,139
162.50	11,018	5,243	25,382

Device	Routing	Invert	Outlet Devices
#1	Device 3	156.00'	**18.0" Round Culvert** L= 110.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 156.00' / 153.00' S= 0.0273 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	159.00'	**45.0 deg x 1.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#3	Primary	155.67'	**18.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=10.99 cfs @ 12.36 hrs HW=160.69' (Free Discharge)
└─**3=Level Spreader Riser** (Passes 10.99 cfs of 19.07 cfs potential flow)
  └─**1=Culvert** (Passes 10.99 cfs of 16.89 cfs potential flow)
    └─**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 10.99 cfs @ 3.82 fps)

Pond 7P: Detention Basin F-3



Summary for Pond 11P: Infiltration Basin R-1

Inflow Area = 1.769 ac, 55.40% Impervious, Inflow Depth = 3.38" for 25-YR event
Inflow = 4.88 cfs @ 12.15 hrs, Volume= 0.498 af
Outflow = 0.75 cfs @ 12.85 hrs, Volume= 0.498 af, Atten= 85%, Lag= 42.3 min
Discarded = 0.36 cfs @ 12.85 hrs, Volume= 0.423 af
Primary = 0.39 cfs @ 12.85 hrs, Volume= 0.075 af
Routed to Reach 6R : ANALYSIS POINT No. 2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 171.07' @ 12.85 hrs Surf.Area= 6,413 sf Storage= 7,819 cf

Plug-Flow detention time= 140.3 min calculated for 0.497 af (100% of inflow)
Center-of-Mass det. time= 140.1 min (919.3 - 779.2)

Volume	Invert	Avail.Storage	Storage Description
#1	169.70'	14,244 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

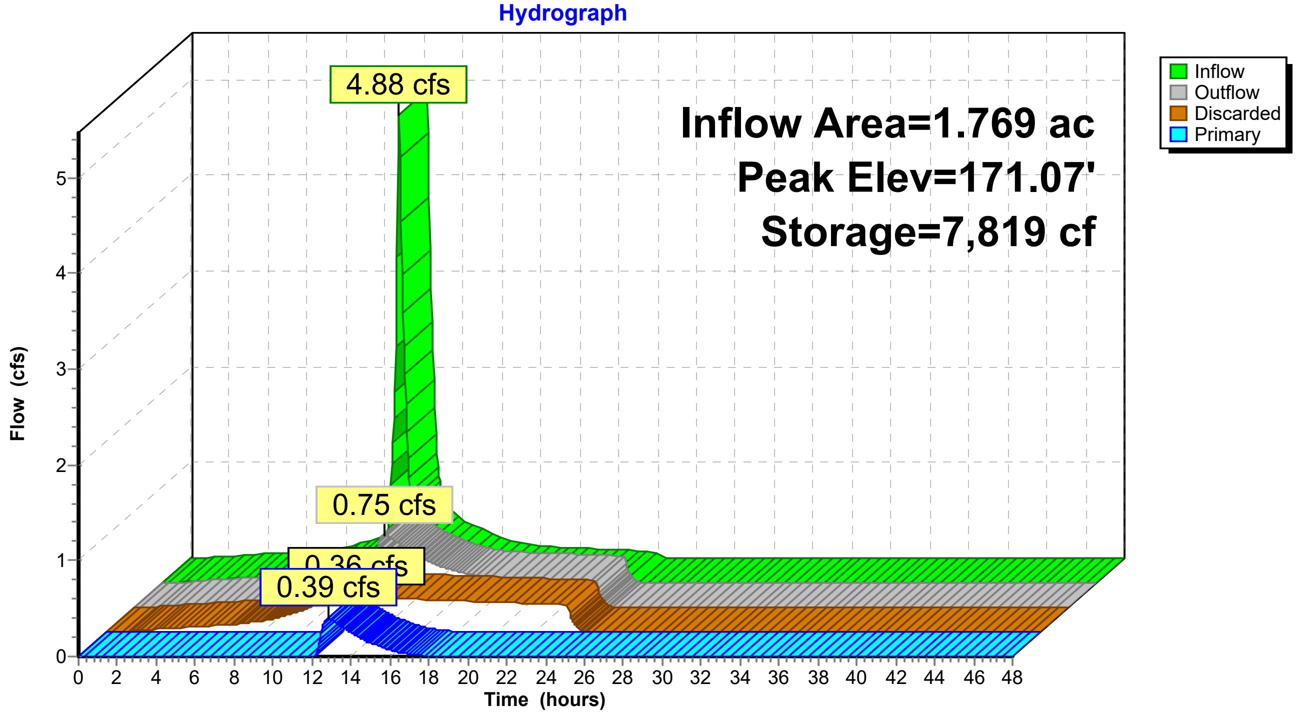
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
169.70	5,001	0	0	5,001
170.00	5,302	1,545	1,545	5,312
172.00	7,458	12,699	14,244	7,540

Device	Routing	Invert	Outlet Devices
#1	Primary	165.80'	**12.0" Round Culvert** L= 58.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 165.80' / 162.00' S= 0.0655 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	169.70'	**2.410 in/hr Exfiltration over Wetted area**
#3	Device 1	170.40'	**45.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.36 cfs @ 12.85 hrs HW=171.07' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.36 cfs)

Primary OutFlow Max=0.39 cfs @ 12.85 hrs HW=171.07' (Free Discharge)
└─**1=Culvert** (Passes 0.39 cfs of 8.26 cfs potential flow)
  └─**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.39 cfs @ 2.10 fps)

Pond 11P: Infiltration Basin R-1



Summary for Pond 12P: Detention Basin R-3

Inflow Area = 3.287 ac, 67.42% Impervious, Inflow Depth = 5.30" for 25-YR event
Inflow = 15.76 cfs @ 12.16 hrs, Volume= 1.451 af
Outflow = 7.61 cfs @ 12.41 hrs, Volume= 1.451 af, Atten= 52%, Lag= 15.0 min
Primary = 7.61 cfs @ 12.41 hrs, Volume= 1.451 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 162.55' @ 12.41 hrs Surf.Area= 5,787 sf Storage= 12,166 cf

Plug-Flow detention time= 27.4 min calculated for 1.451 af (100% of inflow)
Center-of-Mass det. time= 27.1 min (808.6 - 781.4)

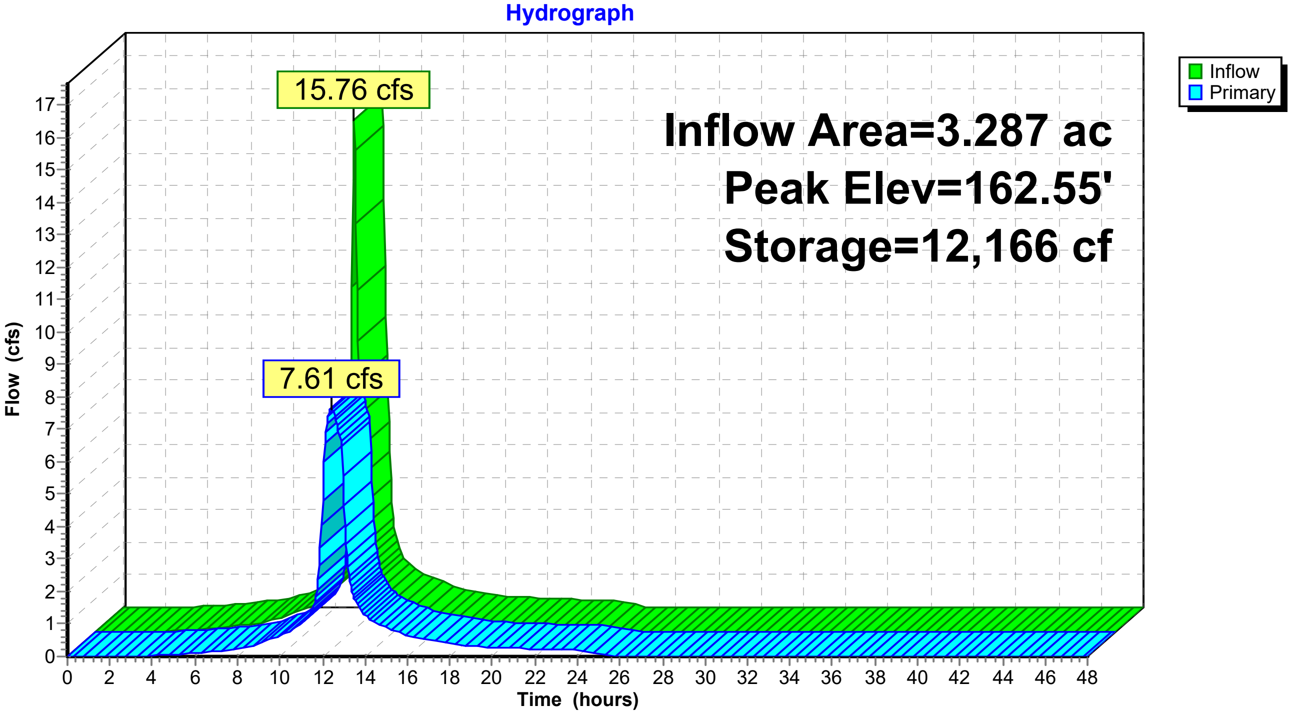
Volume	Invert	Avail.Storage	Storage Description
#1	159.80'	25,303 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.80	200	0	0
160.00	3,502	370	370
162.00	5,243	8,745	9,115
164.00	7,209	12,452	21,567
164.50	7,736	3,736	25,303

Device	Routing	Invert	Outlet Devices
#1	Device 3	158.00'	**12.0" Round Culvert** L= 85.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.00' / 144.00' S= 0.1647 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	159.80'	**45.0 deg x 0.5' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#3	Primary	150.67'	**12.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.61 cfs @ 12.41 hrs HW=162.55' (Free Discharge)
└─**3=Level Spreader Riser** (Passes 7.61 cfs of 13.03 cfs potential flow)
  └─**1=Culvert** (Inlet Controls 7.61 cfs @ 9.69 fps)
    └─**2=Sharp-Crested Vee/Trap Weir** (Passes 7.61 cfs of 20.61 cfs potential flow)

Pond 12P: Detention Basin R-3



Summary for Pond 13P: Detention Basin R-2

Inflow Area = 2.614 ac, 60.00% Impervious, Inflow Depth = 5.18" for 25-YR event
Inflow = 12.64 cfs @ 12.15 hrs, Volume= 1.129 af
Outflow = 9.48 cfs @ 12.26 hrs, Volume= 1.129 af, Atten= 25%, Lag= 6.5 min
Primary = 9.48 cfs @ 12.26 hrs, Volume= 1.129 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 162.68' @ 12.26 hrs Surf.Area= 6,215 sf Storage= 5,491 cf

Plug-Flow detention time= 8.0 min calculated for 1.128 af (100% of inflow)
Center-of-Mass det. time= 8.0 min (792.5 - 784.5)

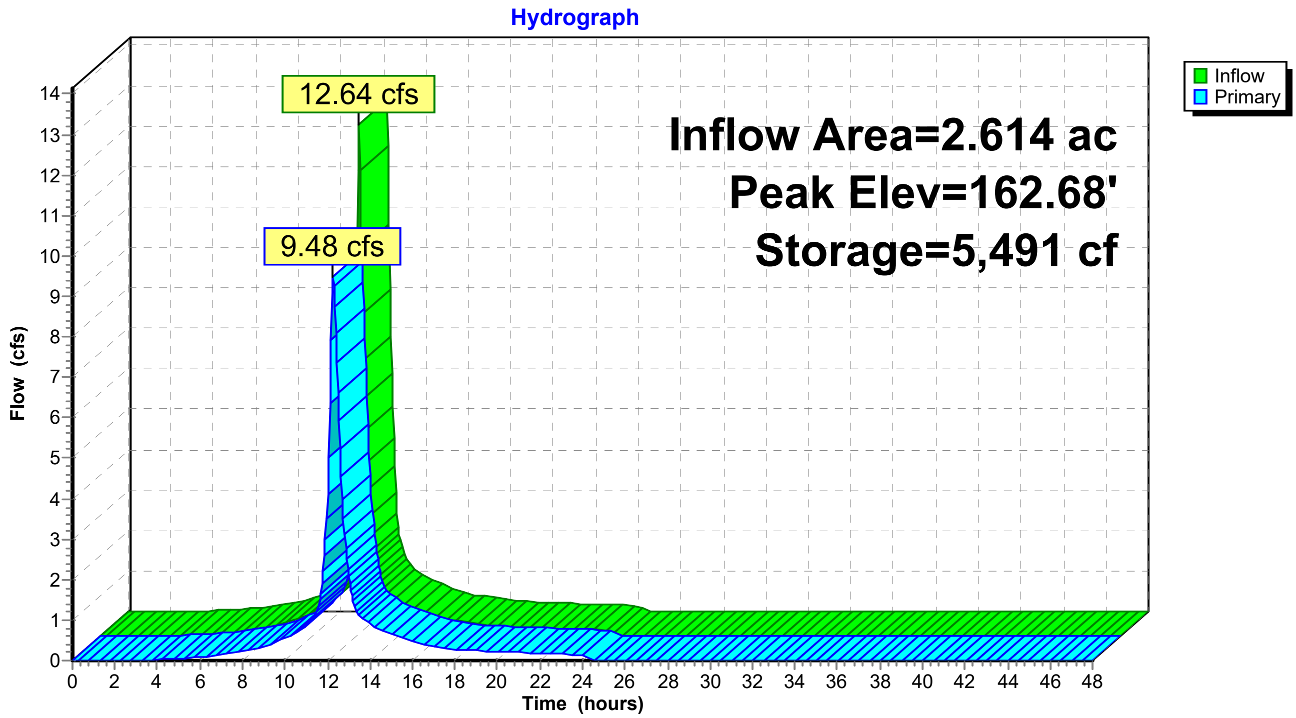
Volume	Invert	Avail.Storage	Storage Description
#1	161.50'	18,409 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
161.50	400	0	0
162.00	5,563	1,491	1,491
164.00	7,484	13,047	14,538
164.50	7,999	3,871	18,409

Device	Routing	Invert	Outlet Devices
#1	Device 3	152.00'	**12.0" Round Culvert** L= 78.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.00' / 141.00' S= 0.1410 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	161.50'	**2.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	143.17'	**12.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=9.44 cfs @ 12.26 hrs HW=162.68' (Free Discharge)
└─**3=Level Spreader Riser** (Passes 9.44 cfs of 16.70 cfs potential flow)
  └─**1=Culvert** (Passes 9.44 cfs of 12.06 cfs potential flow)
    └─**2=Sharp-Crested Rectangular Weir** (Weir Controls 9.44 cfs @ 3.55 fps)

Pond 13P: Detention Basin R-2



Summary for Pond 23P: Detention Basin F-2

Inflow Area = 2.347 ac, 72.38% Impervious, Inflow Depth = 5.07" for 25-YR event
Inflow = 11.47 cfs @ 12.14 hrs, Volume= 0.991 af
Outflow = 6.04 cfs @ 12.34 hrs, Volume= 0.871 af, Atten= 47%, Lag= 11.9 min
Primary = 6.04 cfs @ 12.34 hrs, Volume= 0.871 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 161.01' @ 12.34 hrs Surf.Area= 7,311 sf Storage= 17,158 cf

Plug-Flow detention time= 180.9 min calculated for 0.870 af (88% of inflow)
Center-of-Mass det. time= 127.0 min (914.2 - 787.2)

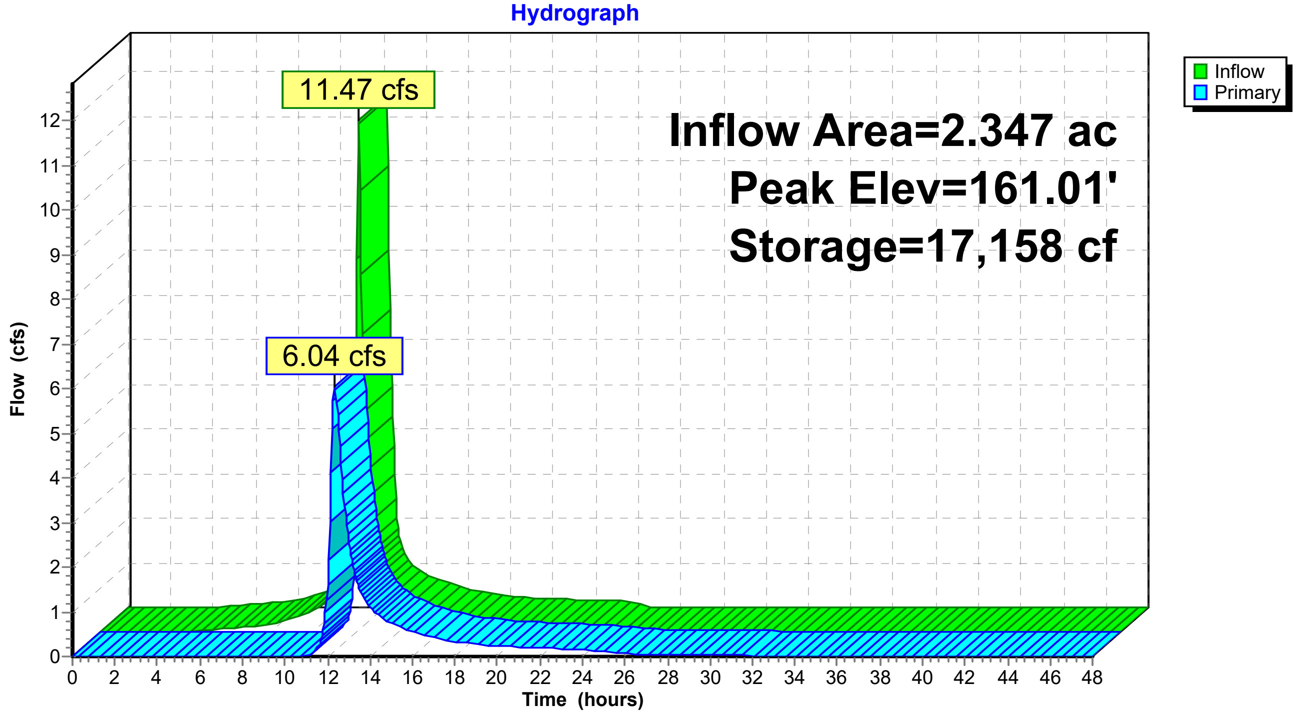
Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	29,366 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	4,222	0	0
160.00	6,163	10,385	10,385
162.00	8,447	14,610	24,995
162.50	9,035	4,371	29,366

Device	Routing	Invert	Outlet Devices
#1	Device 2	158.00'	**15.0" Round Culvert** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.00' / 155.00' S= 0.0375 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Primary	157.42'	**15.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads
#3	Device 1	159.00'	**45.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=6.02 cfs @ 12.34 hrs HW=161.00' (Free Discharge)
└─**2=Level Spreader Riser** (Passes 6.02 cfs of 11.19 cfs potential flow)
  └─**1=Culvert** (Passes 6.02 cfs of 9.11 cfs potential flow)
    └─**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 6.02 cfs @ 3.62 fps)

Pond 23P: Detention Basin F-2



Summary for Pond 26P: Infiltration Basin F-4

Inflow Area = 6.325 ac, 64.53% Impervious, Inflow Depth = 4.75" for 25-YR event
Inflow = 24.11 cfs @ 12.17 hrs, Volume= 2.501 af
Outflow = 13.92 cfs @ 12.45 hrs, Volume= 2.501 af, Atten= 42%, Lag= 16.7 min
Discarded = 0.52 cfs @ 12.45 hrs, Volume= 1.069 af
Primary = 13.40 cfs @ 12.45 hrs, Volume= 1.432 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 163.30' @ 12.45 hrs Surf.Area= 22,154 sf Storage= 38,979 cf

Plug-Flow detention time= 252.6 min calculated for 2.499 af (100% of inflow)
Center-of-Mass det. time= 253.4 min (1,051.5 - 798.1)

Volume	Invert	Avail.Storage	Storage Description
#1	161.00'	55,617 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

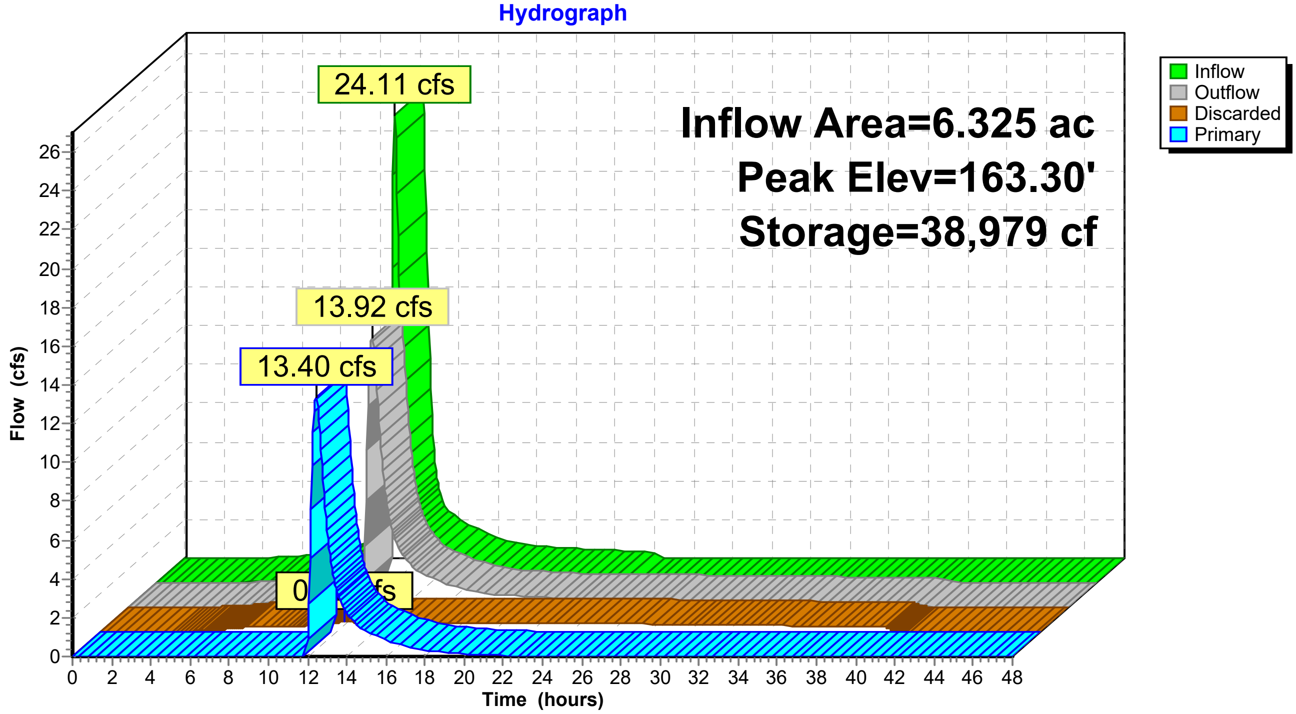
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
161.00	10,567	0	0	10,567
162.00	17,000	13,657	13,657	17,013
164.00	25,230	41,960	55,617	25,307

Device	Routing	Invert	Outlet Devices
#1	Device 4	158.00'	**18.0" Round Culvert** L= 221.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.00' / 153.00' S= 0.0226 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Discarded	161.00'	**1.020 in/hr Exfiltration over Wetted area**
#3	Device 1	162.40'	**5.0' long x 2.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	155.67'	**18.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.52 cfs @ 12.45 hrs HW=163.30' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.52 cfs)

Primary OutFlow Max=13.39 cfs @ 12.45 hrs HW=163.30' (Free Discharge)
└─**4=Level Spreader Riser** (Passes 13.39 cfs of 23.50 cfs potential flow)
  └─**1=Culvert** (Passes 13.39 cfs of 16.64 cfs potential flow)
    └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 13.39 cfs @ 3.10 fps)

Pond 26P: Infiltration Basin F-4



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

Subcatchment 6S: POST-SUB No. 1D Runoff Area=87,909 sf 70.36% Impervious Runoff Depth=4.70"
Flow Length=411' Tc=15.4 min CN=89 Runoff=8.01 cfs 0.790 af

Subcatchment 8S: POST SUB 3C Runoff Area=34,500 sf 100.00% Impervious Runoff Depth=5.72"
Tc=10.0 min CN=98 Runoff=4.00 cfs 0.378 af

Subcatchment 14S: POST-SUB No 3B Runoff Area=67,024 sf 0.00% Impervious Runoff Depth=1.98"
Flow Length=760' Tc=15.8 min CN=61 Runoff=2.48 cfs 0.254 af

Subcatchment 15S: POST-SUB No 3A Runoff Area=42,540 sf 19.23% Impervious Runoff Depth=1.12"
Flow Length=158' Slope=0.0100 '/' Tc=14.2 min CN=50 Runoff=0.76 cfs 0.091 af

Subcatchment 16S: POST-SUB No. 2A Runoff Area=158,671 sf 0.00% Impervious Runoff Depth=3.06"
Flow Length=180' Tc=14.2 min CN=73 Runoff=10.00 cfs 0.927 af

Subcatchment 17S: POST-SUB No. 2B Runoff Area=143,182 sf 67.42% Impervious Runoff Depth=5.03"
Flow Length=221' Tc=11.8 min CN=92 Runoff=15.01 cfs 1.378 af

Subcatchment 18S: POST-SUB No. 2C Runoff Area=113,851 sf 60.00% Impervious Runoff Depth=4.92"
Flow Length=205' Tc=11.0 min CN=91 Runoff=12.03 cfs 1.071 af

Subcatchment 19S: POST-SUB No. 2D Runoff Area=24,504 sf 0.00% Impervious Runoff Depth=3.54"
Flow Length=333' Tc=19.2 min CN=78 Runoff=1.60 cfs 0.166 af

Subcatchment 22S: POST-SUB No. 1C Runoff Area=102,217 sf 72.38% Impervious Runoff Depth=4.81"
Tc=10.0 min CN=90 Runoff=10.90 cfs 0.940 af

Subcatchment 24S: POST-SUB No. 1A Runoff Area=38,417 sf 0.00% Impervious Runoff Depth=3.25"
Flow Length=800' Tc=22.3 min CN=75 Runoff=2.16 cfs 0.239 af

Subcatchment 25S: POST-SUB-No. 1E Runoff Area=114,681 sf 82.66% Impervious Runoff Depth=5.03"
Flow Length=869' Tc=17.9 min CN=92 Runoff=10.32 cfs 1.104 af

Subcatchment 27S: POST-SUB No. 1A-A Runoff Area=173,610 sf 0.00% Impervious Runoff Depth=2.50"
Flow Length=342' Tc=14.3 min CN=67 Runoff=8.79 cfs 0.830 af

Subcatchment 28S: Post Sub No 1F Runoff Area=122,407 sf 67.79% Impervious Runoff Depth=4.37"
Tc=10.0 min CN=86 Runoff=12.16 cfs 1.024 af

Subcatchment 29S: POST SUB NO 1G Runoff Area=63,889 sf 85.79% Impervious Runoff Depth=5.14"
Flow Length=885' Tc=18.0 min CN=93 Runoff=5.81 cfs 0.629 af

Reach 4R: ANALYSIS POINT NO. 1 Inflow=59.25 cfs 7.919 af
Outflow=59.25 cfs 7.919 af

Reach 6R: ANALYSIS POINT No. 2 Inflow=2.50 cfs 0.312 af
Outflow=2.50 cfs 0.312 af

Pond 7P: Detention Basin F-3 Peak Elev=160.65' Storage=8,248 cf Inflow=13.77 cfs 1.418 af
Outflow=10.45 cfs 1.418 af

Pond 11P: Infiltration Basin R-1 Peak Elev=171.00' Storage=7,377 cf Inflow=4.59 cfs 0.469 af
Discarded=0.36 cfs 0.411 af Primary=0.30 cfs 0.058 af Outflow=0.66 cfs 0.469 af

Pond 12P: Detention Basin R-3 Peak Elev=162.41' Storage=11,372 cf Inflow=15.01 cfs 1.378 af
Outflow=7.48 cfs 1.378 af

Pond 13P: Detention Basin R-2 Peak Elev=162.64' Storage=5,226 cf Inflow=12.03 cfs 1.071 af
Outflow=9.00 cfs 1.071 af

Pond 23P: Detention Basin F-2 Peak Elev=160.94' Storage=16,674 cf Inflow=10.90 cfs 0.940 af
Outflow=5.55 cfs 0.819 af

Pond 26P: Infiltration Basin F-4 Peak Elev=163.24' Storage=37,729 cf Inflow=22.86 cfs 2.366 af
Discarded=0.52 cfs 1.058 af Primary=12.18 cfs 1.308 af Outflow=12.70 cfs 2.366 af

Total Runoff Area = 29.555 ac Runoff Volume = 9.820 af Average Runoff Depth = 3.99"
55.26% Pervious = 16.333 ac 44.74% Impervious = 13.222 ac

Summary for Subcatchment 6S: POST-SUB No. 1D

[47] Hint: Peak is 175% of capacity of segment #4

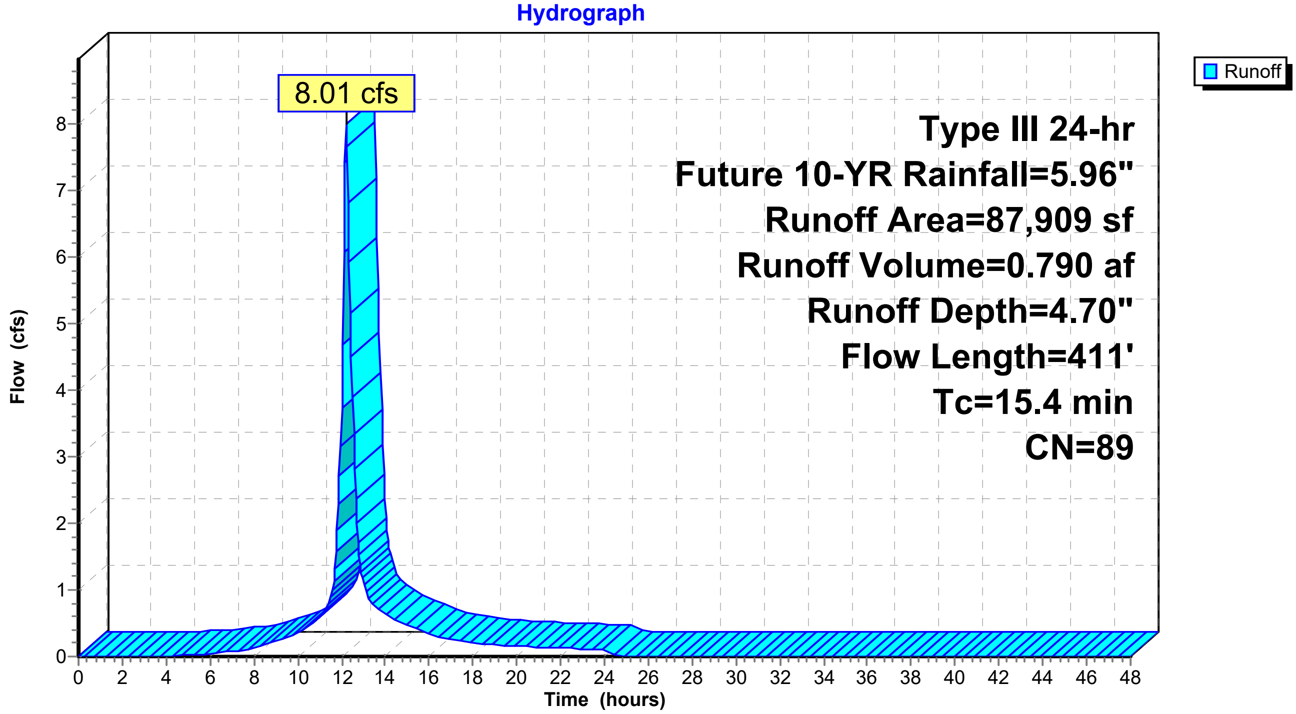
Runoff = 8.01 cfs @ 12.21 hrs, Volume= 0.790 af, Depth= 4.70"
Routed to Pond 7P : Detention Basin F-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 10-YR Rainfall=5.96"

	Area (sf)	CN	Description
*	4,000	98	Building Roofs
*	10,503	98	Detention Basin
*	47,347	98	Pavement and Walks
	7,767	80	>75% Grass cover, Good, HSG D
	18,292	61	>75% Grass cover, Good, HSG B
	87,909	89	Weighted Average
	26,059		29.64% Pervious Area
	61,850		70.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.6	55	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.2	40	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	216	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
15.4	411	Total			

Subcatchment 6S: POST-SUB No. 1D



Summary for Subcatchment 8S: POST SUB 3C Building 2, 3 and 4

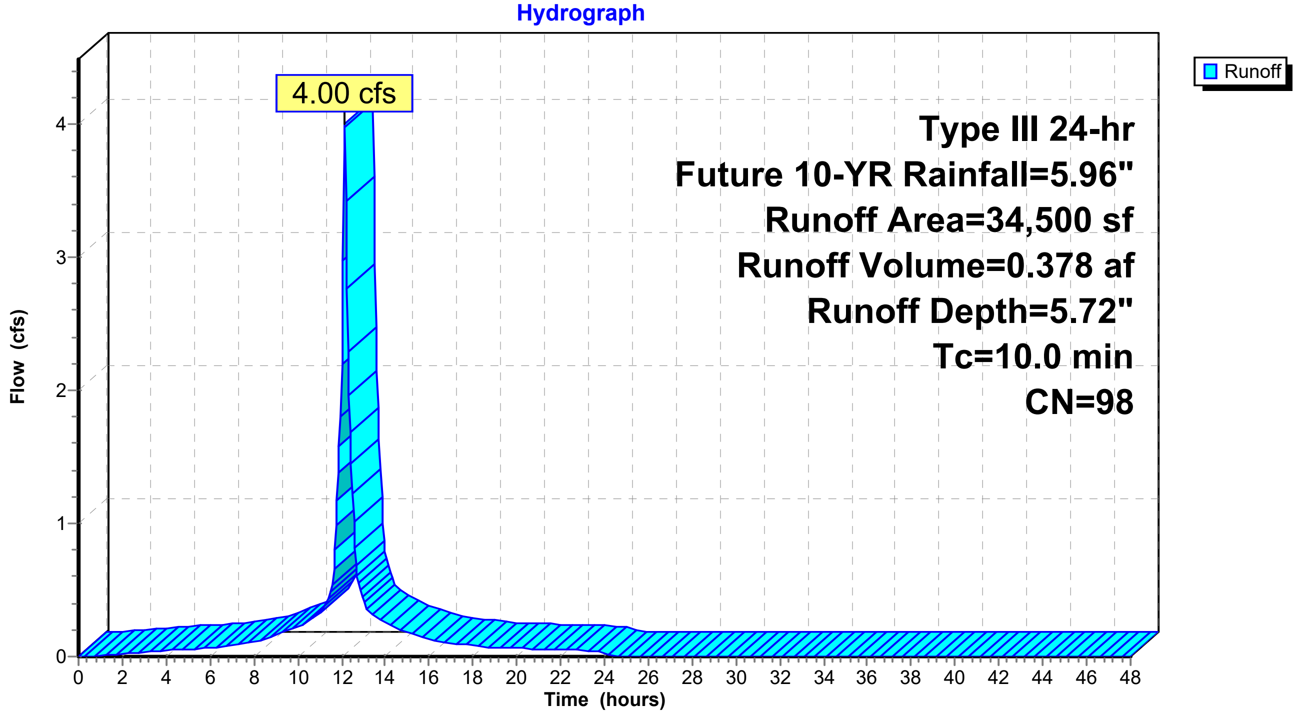
Runoff = 4.00 cfs @ 12.14 hrs, Volume= 0.378 af, Depth= 5.72"
Routed to Pond 11P : Infiltration Basin R-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 10-YR Rainfall=5.96"

	Area (sf)	CN	Description
*	34,500	98	Building Roof
	0	80	>75% Grass cover, Good, HSG D
	34,500	98	Weighted Average
	34,500		100.00% Impervious Area

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

Subcatchment 8S: POST SUB 3C Building 2, 3 and 4



Summary for Subcatchment 14S: POST-SUB No 3B

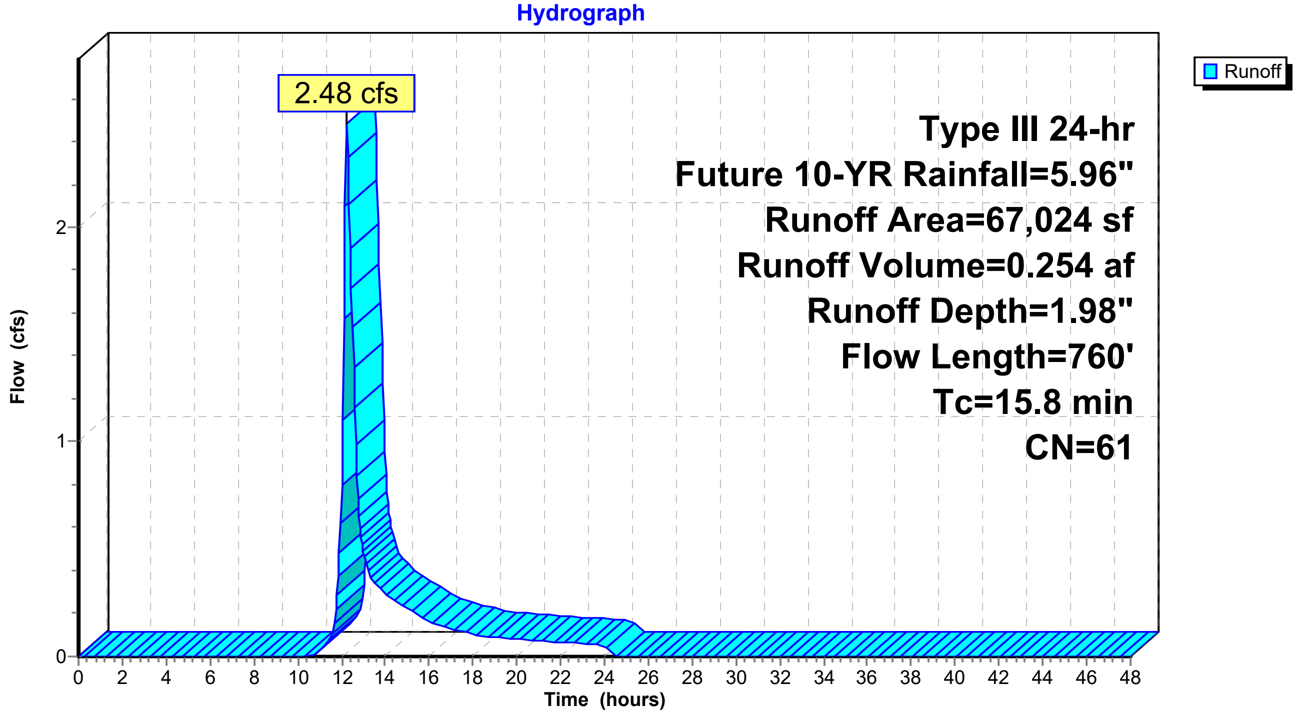
Runoff = 2.48 cfs @ 12.24 hrs, Volume= 0.254 af, Depth= 1.98"
Routed to Reach 6R : ANALYSIS POINT No. 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 10-YR Rainfall=5.96"

Area (sf)	CN	Description
28,004	73	Brush, Good, HSG D
19,012	30	Woods, Good, HSG A
4,184	77	Woods, Good, HSG D
3,089	39	>75% Grass cover, Good, HSG A
12,735	80	>75% Grass cover, Good, HSG D
67,024	61	Weighted Average
67,024		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.6	200	0.0200	2.12		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.6	460	0.0650	12.11	60.55	**Channel Flow,** Area= 5.0 sf Perim= 7.0' r= 0.71' n= 0.025 Earth, clean & winding
15.8	760	Total			

Subcatchment 14S: POST-SUB No 3B



Summary for Subcatchment 15S: POST-SUB No 3A

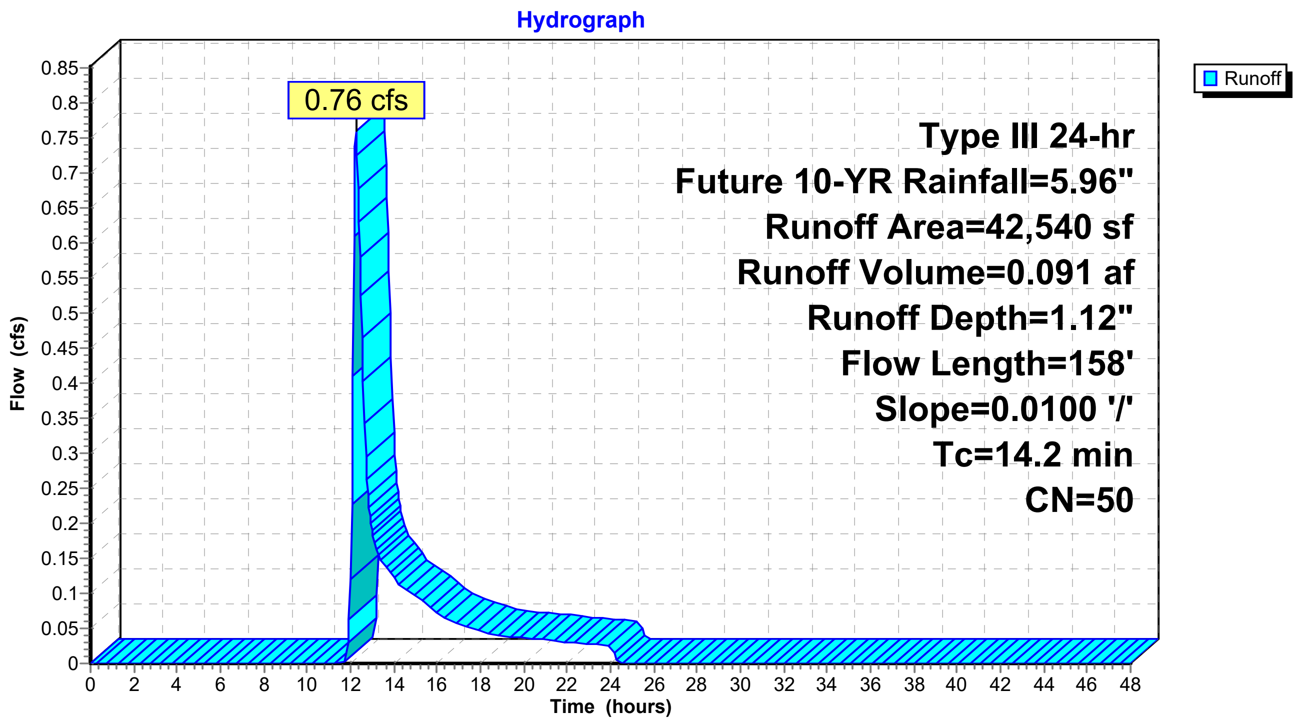
Runoff = 0.76 cfs @ 12.25 hrs, Volume= 0.091 af, Depth= 1.12"
Routed to Pond 11P : Infiltration Basin R-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 10-YR Rainfall=5.96"

	Area (sf)	CN	Description
	0	49	50-75% Grass cover, Fair, HSG A
	34,361	39	>75% Grass cover, Good, HSG A
*	8,179	98	Basin
	42,540	50	Weighted Average
	34,361		80.77% Pervious Area
	8,179		19.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.6	58	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.2	158	Total			

Subcatchment 15S: POST-SUB No 3A



Summary for Subcatchment 16S: POST-SUB No. 2A

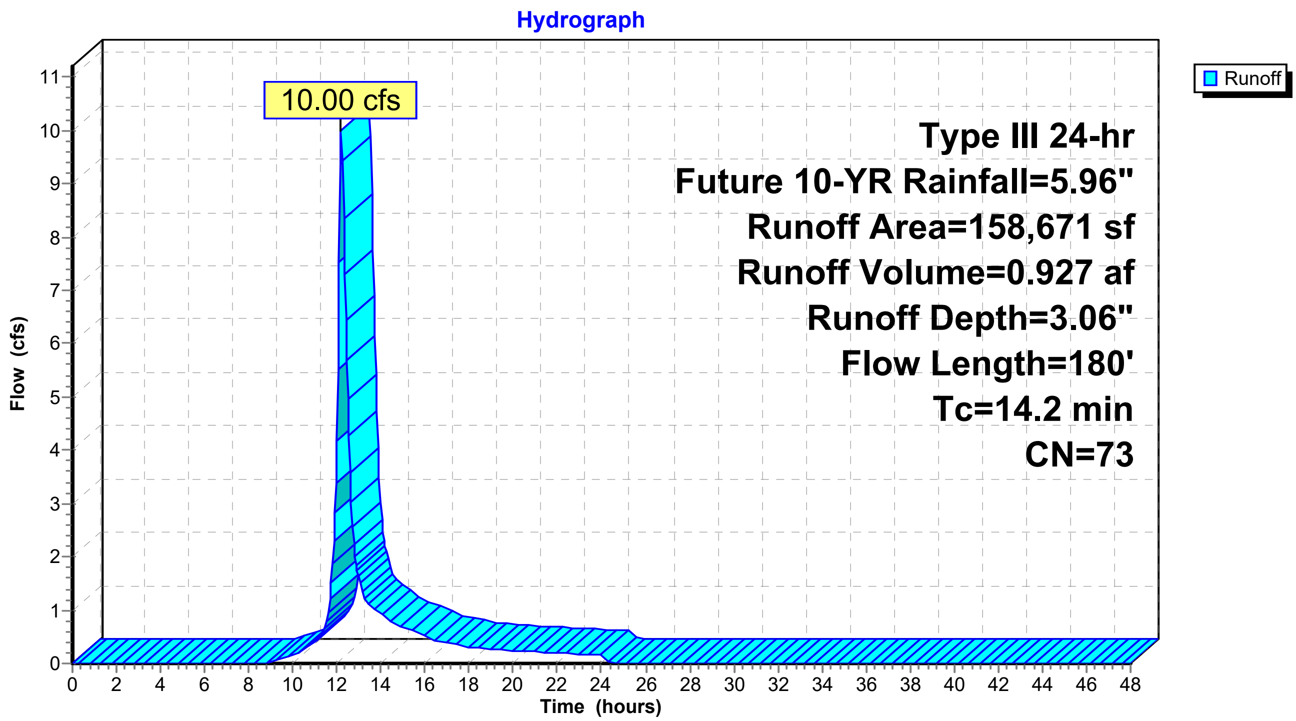
Runoff = 10.00 cfs @ 12.20 hrs, Volume= 0.927 af, Depth= 3.06"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 10-YR Rainfall=5.96"

	Area (sf)	CN	Description
	93,385	77	Woods, Good, HSG D
	46,536	80	>75% Grass cover, Good, HSG D
	0	32	Woods/grass comb., Good, HSG A
*	18,750	39	>75% Grass cover, Good, HSG A
	158,671	73	Weighted Average
	158,671		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.6	80	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.2	180	Total			

Subcatchment 16S: POST-SUB No. 2A



Summary for Subcatchment 17S: POST-SUB No. 2B

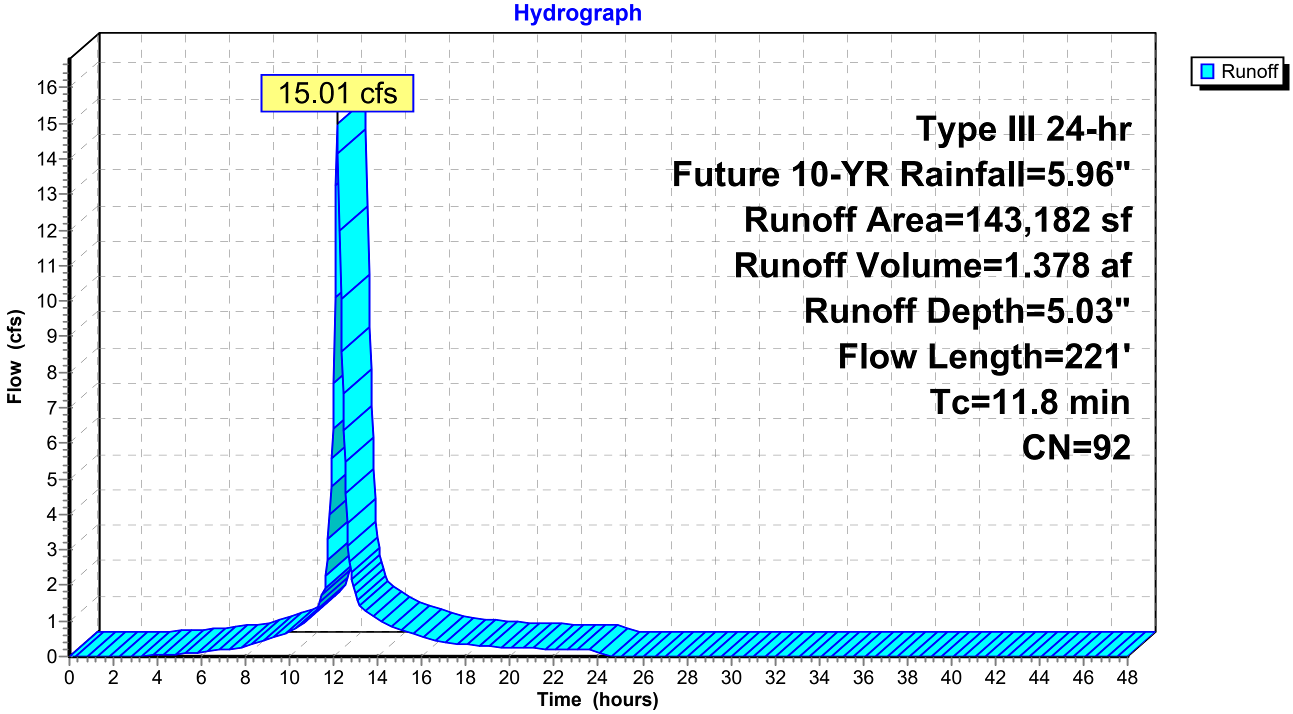
Runoff = 15.01 cfs @ 12.16 hrs, Volume= 1.378 af, Depth= 5.03"
Routed to Pond 12P : Detention Basin R-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 10-YR Rainfall=5.96"

	Area (sf)	CN	Description
*	39,478	98	Building Roofs
*	50,310	98	Pavement and Walks
*	6,744	98	Detention Basin
	46,650	80	>75% Grass cover, Good, HSG D
	143,182	92	Weighted Average
	46,650		32.58% Pervious Area
	96,532		67.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	90	0.0190	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.4	10	0.0300	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.1	30	0.0850	4.37		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.6	91	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.8	221	Total			

Subcatchment 17S: POST-SUB No. 2B



Summary for Subcatchment 18S: POST-SUB No. 2C

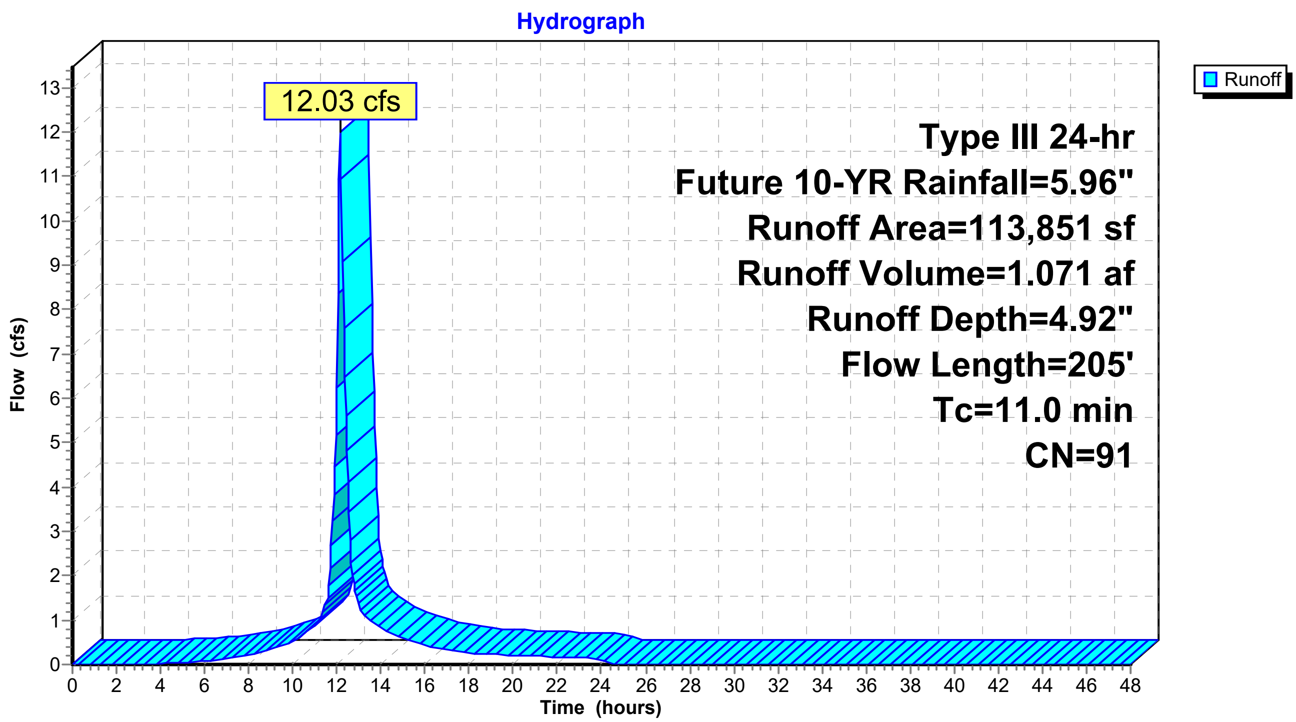
Runoff = 12.03 cfs @ 12.15 hrs, Volume= 1.071 af, Depth= 4.92"
Routed to Pond 13P : Detention Basin R-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 10-YR Rainfall=5.96"

	Area (sf)	CN	Description
*	11,500	98	Building Roofs
*	6,502	98	Detention Basin
*	50,311	98	Pavement and Walks
	45,538	80	>75% Grass cover, Good, HSG D
	0	80	>75% Grass cover, Good, HSG D
	113,851	91	Weighted Average
	45,538		40.00% Pervious Area
	68,313		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.7	105	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.0	205	Total			

Subcatchment 18S: POST-SUB No. 2C



Summary for Subcatchment 19S: POST-SUB No. 2D

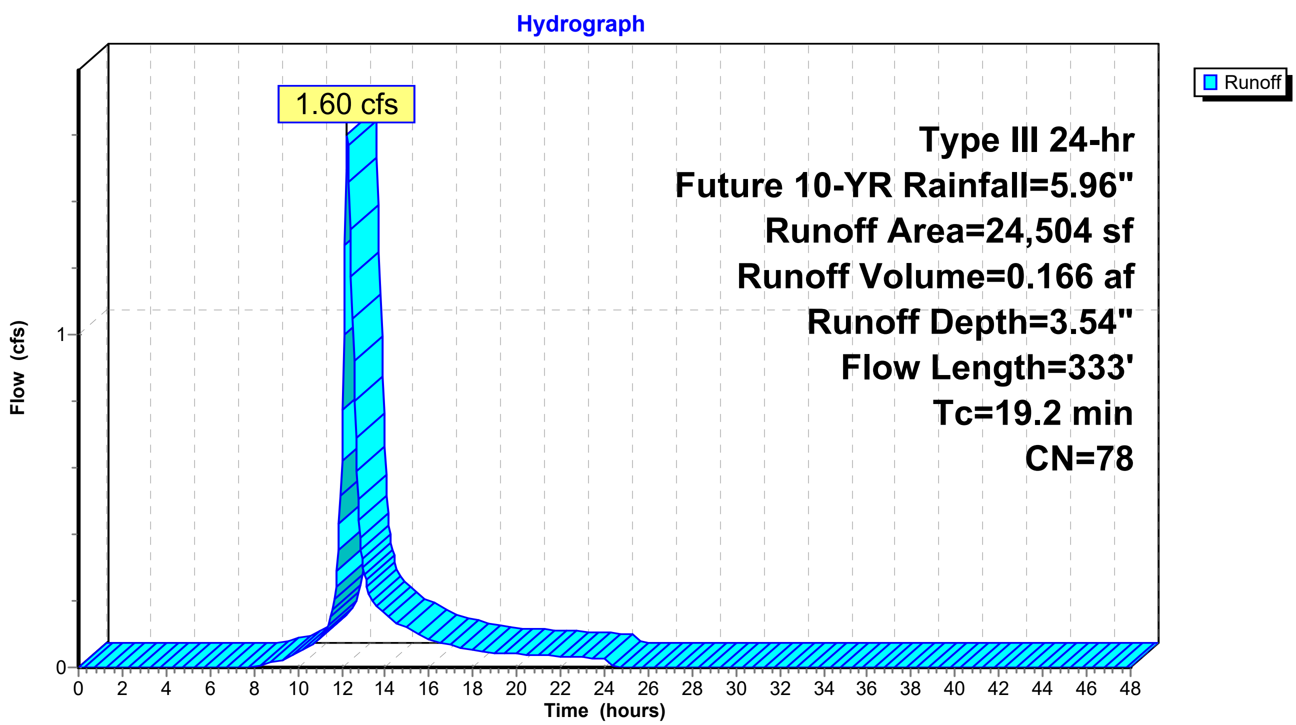
Runoff = 1.60 cfs @ 12.26 hrs, Volume= 0.166 af, Depth= 3.54"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 10-YR Rainfall=5.96"

Area (sf)	CN	Description
14,488	77	Woods, Good, HSG D
10,016	80	>75% Grass cover, Good, HSG D
24,504	78	Weighted Average
24,504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.5	100	0.0330	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.90"
0.7	233	0.1200	5.20		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
19.2	333	Total			

Subcatchment 19S: POST-SUB No. 2D



Summary for Subcatchment 22S: POST-SUB No. 1C

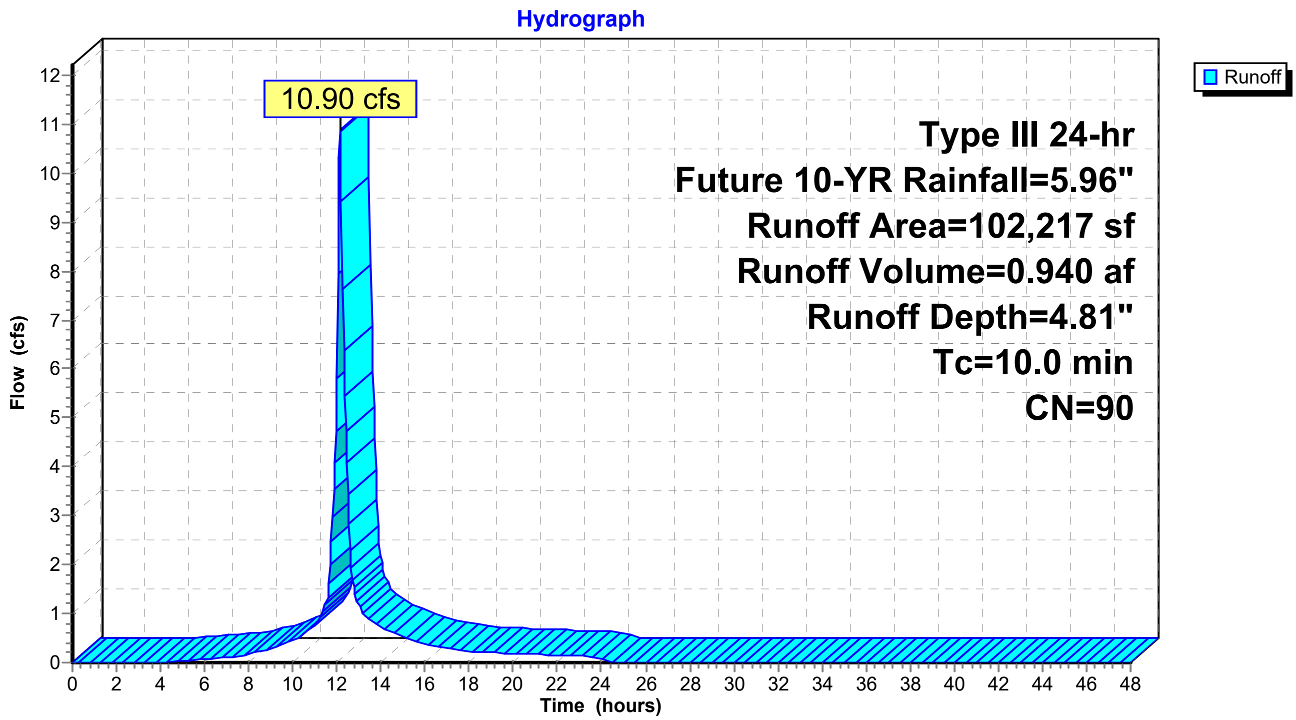
Runoff = 10.90 cfs @ 12.14 hrs, Volume= 0.940 af, Depth= 4.81"
Routed to Pond 23P : Detention Basin F-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 10-YR Rainfall=5.96"

	Area (sf)	CN	Description
*	16,090	98	Building Roofs
*	52,636	98	Pavement and Walks
*	5,255	98	Detention Basin
	14,731	61	>75% Grass cover, Good, HSG B
	13,505	80	>75% Grass cover, Good, HSG D
	102,217	90	Weighted Average
	28,236		27.62% Pervious Area
	73,981		72.38% Impervious Area

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

Subcatchment 22S: POST-SUB No. 1C



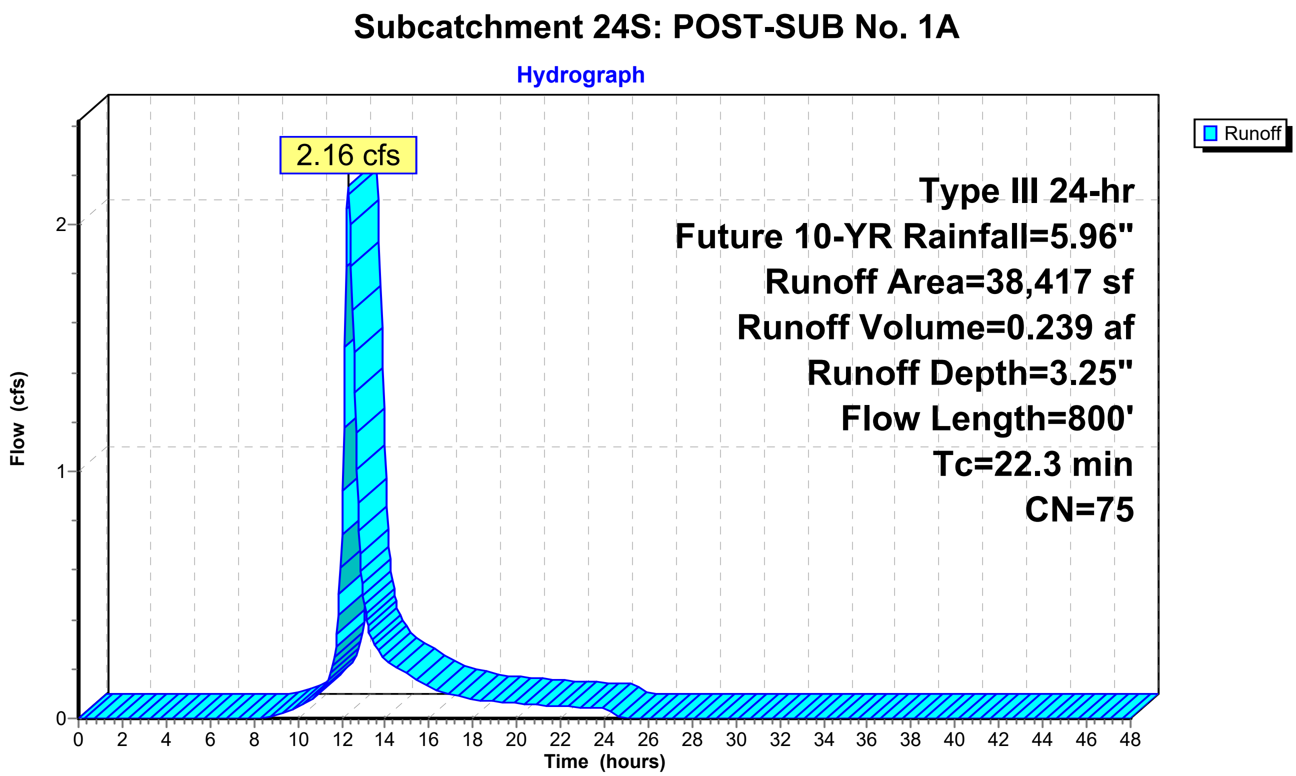
Summary for Subcatchment 24S: POST-SUB No. 1A

Runoff = 2.16 cfs @ 12.31 hrs, Volume= 0.239 af, Depth= 3.25"
Routed to Pond 26P : Infiltration Basin F-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 10-YR Rainfall=5.96"

	Area (sf)	CN	Description
	23,572	77	Woods, Good, HSG D
	0	73	Woods/grass comb., Poor, HSG B
*	14,845	71	>75% grass cover, Good, HSG B
	38,417	75	Weighted Average
	38,417		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0150	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.90"
5.5	700	0.0200	2.12		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
22.3	800	Total			



Summary for Subcatchment 25S: POST-SUB-No. 1E

[47] Hint: Peak is 226% of capacity of segment #4

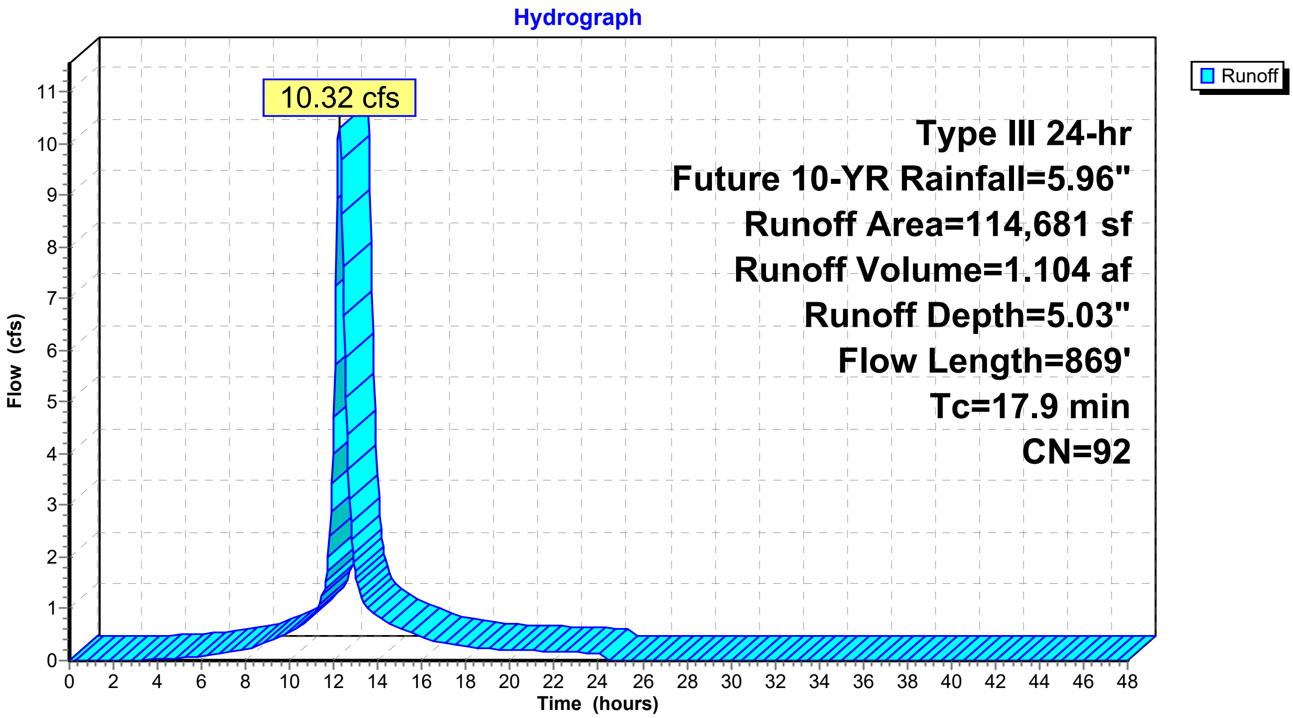
Runoff = 10.32 cfs @ 12.24 hrs, Volume= 1.104 af, Depth= 5.03"
Routed to Pond 26P : Infiltration Basin F-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 10-YR Rainfall=5.96"

	Area (sf)	CN	Description
*	28,932	98	Buildings
*	65,867	98	pavement and walks
	15,194	61	>75% Grass cover, Good, HSG B
	4,688	80	>75% Grass cover, Good, HSG D
	114,681	92	Weighted Average
	19,882		17.34% Pervious Area
	94,799		82.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0090	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	40	0.0090	1.42		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.1	254	0.0350	3.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.1	475	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
17.9	869	Total			

Subcatchment 25S: POST-SUB-No. 1E



Summary for Subcatchment 27S: POST-SUB No. 1A-A

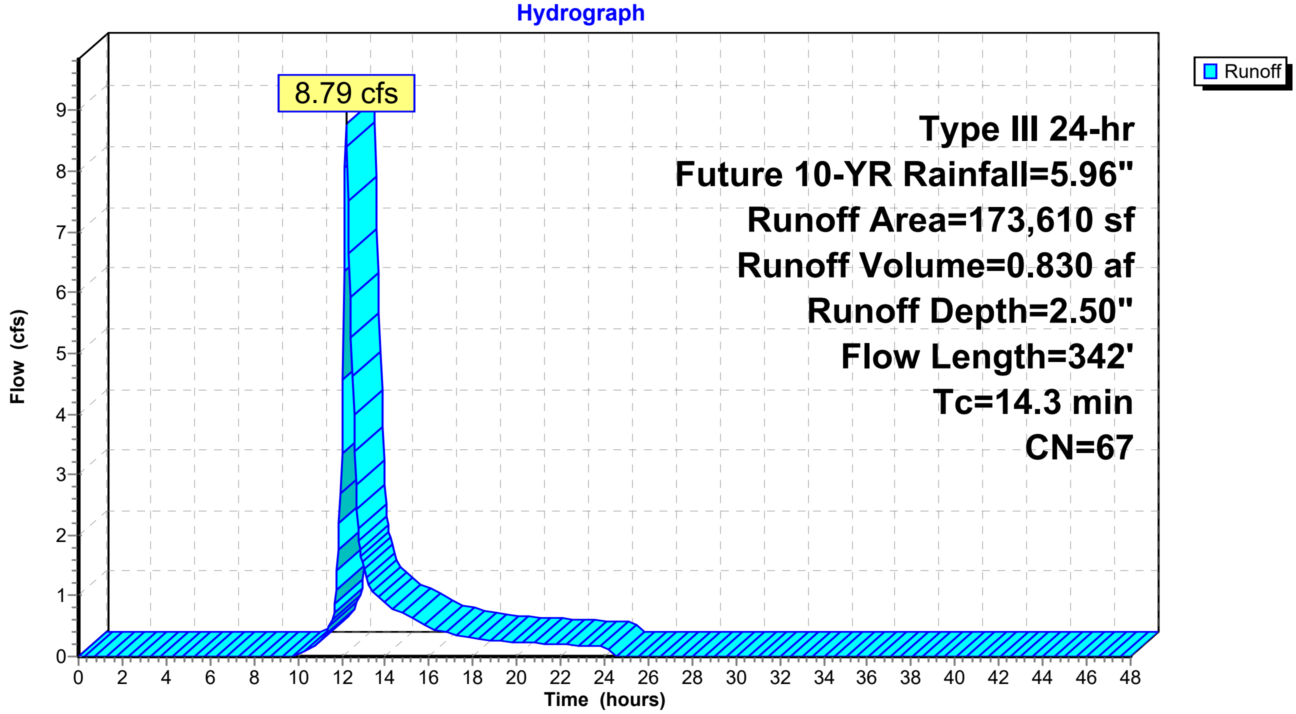
Runoff = 8.79 cfs @ 12.21 hrs, Volume= 0.830 af, Depth= 2.50"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 10-YR Rainfall=5.96"

	Area (sf)	CN	Description
	87,949	77	Woods, Good, HSG D
	4,955	55	Woods, Good, HSG B
*	29,916	30	Woods, Good, HSG A
	0	32	Woods/grass comb., Good, HSG A
	0	79	Woods/grass comb., Good, HSG D
	30,440	80	>75% Grass cover, Good, HSG D
*	20,350	61	>75% Grass cover, Good, HSG B
	173,610	67	Weighted Average
	173,610		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	20	0.0500	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	42	0.0360	1.33		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.5	200	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	12	0.3000	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
8.7	68	0.0360	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.90"
14.3	342	Total			

Subcatchment 27S: POST-SUB No. 1A-A



Summary for Subcatchment 28S: Post Sub No 1F

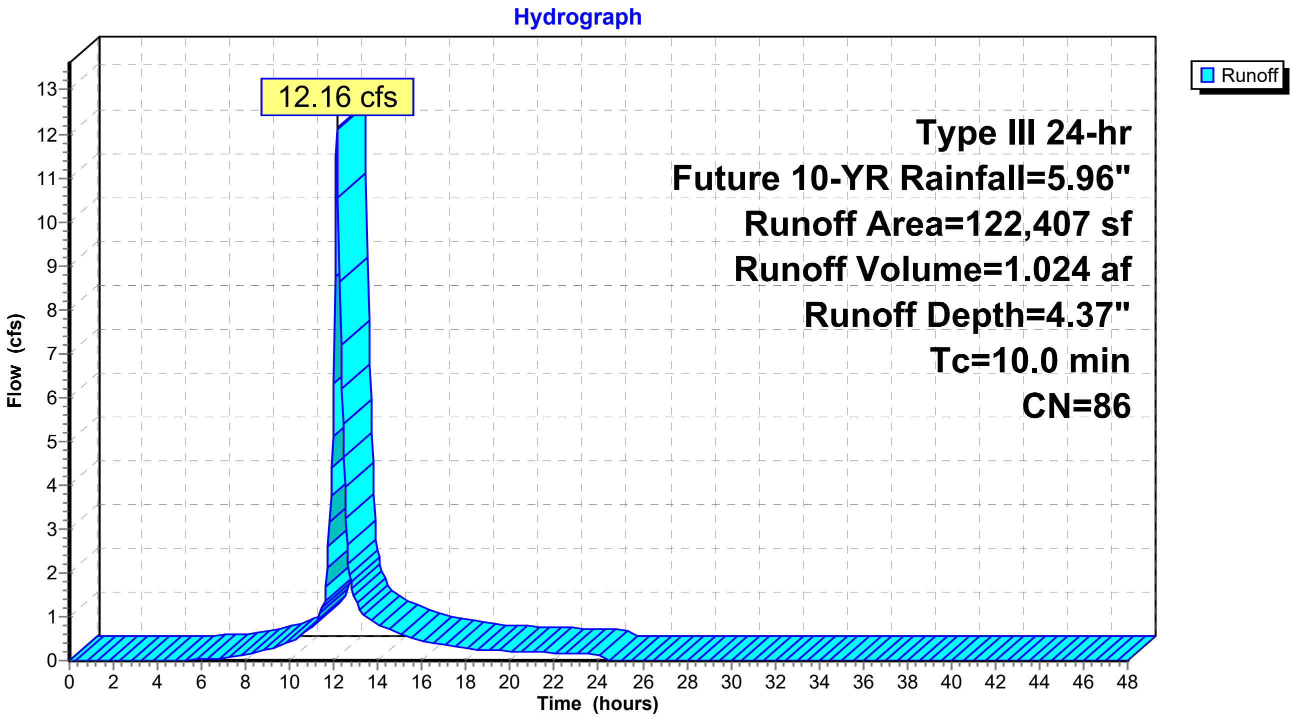
Runoff = 12.16 cfs @ 12.14 hrs, Volume= 1.024 af, Depth= 4.37"
Routed to Pond 26P : Infiltration Basin F-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 10-YR Rainfall=5.96"

	Area (sf)	CN	Description
*	23,000	98	Building Roof
*	7,000	98	Building Roof
	39,422	61	>75% Grass cover, Good, HSG B
*	27,685	98	Pavement and walks
*	13,800	98	Basin
*	11,500	98	Building Roof
	122,407	86	Weighted Average
	39,422		32.21% Pervious Area
	82,985		67.79% Impervious Area

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

Subcatchment 28S: Post Sub No 1F



Summary for Subcatchment 29S: POST SUB NO 1G

[47] Hint: Peak is 127% of capacity of segment #4

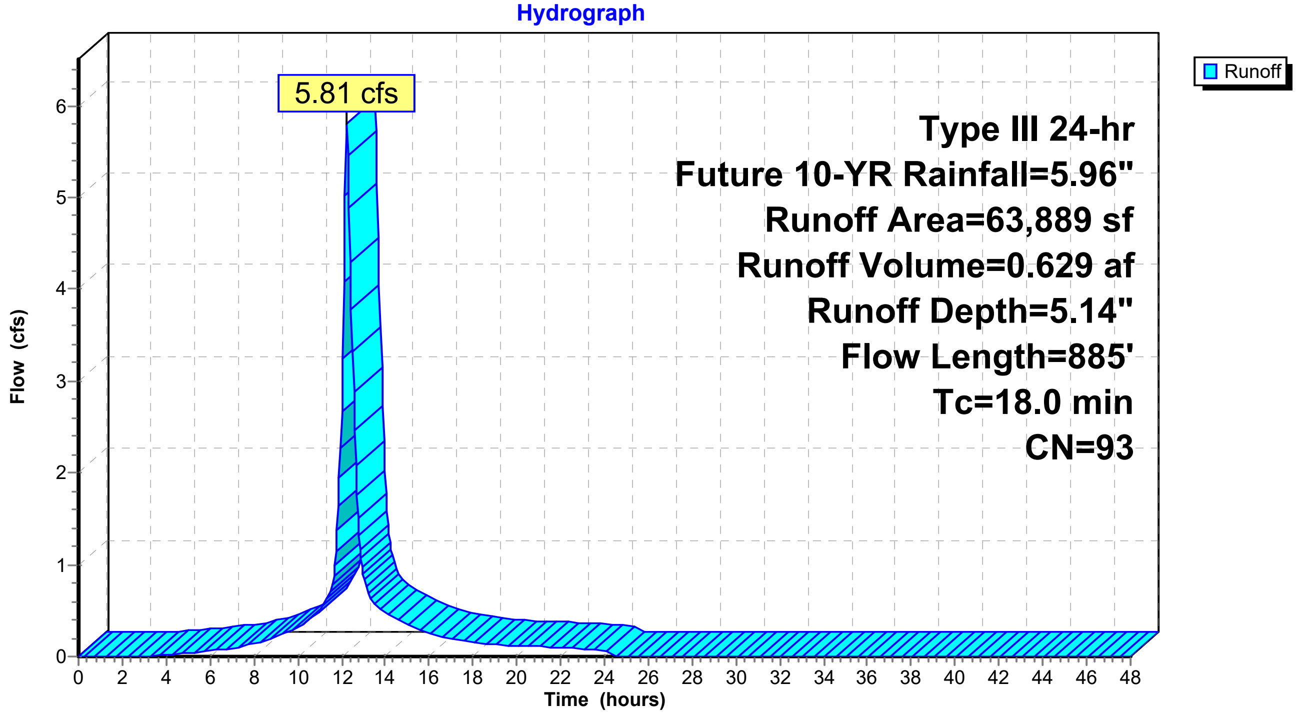
Runoff = 5.81 cfs @ 12.24 hrs, Volume= 0.629 af, Depth= 5.14"
Routed to Pond 7P : Detention Basin F-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 10-YR Rainfall=5.96"

	Area (sf)	CN	Description
*	51,612	98	Pavement and walks
	7,166	61	>75% Grass cover, Good, HSG B
	1,911	80	>75% Grass cover, Good, HSG D
*	3,200	98	Building Roof
	63,889	93	Weighted Average
	9,077		14.21% Pervious Area
	54,812		85.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0090	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	40	0.0090	1.42		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.9	200	0.0350	3.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	545	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
18.0	885	Total			

Subcatchment 29S: POST SUB NO 1G



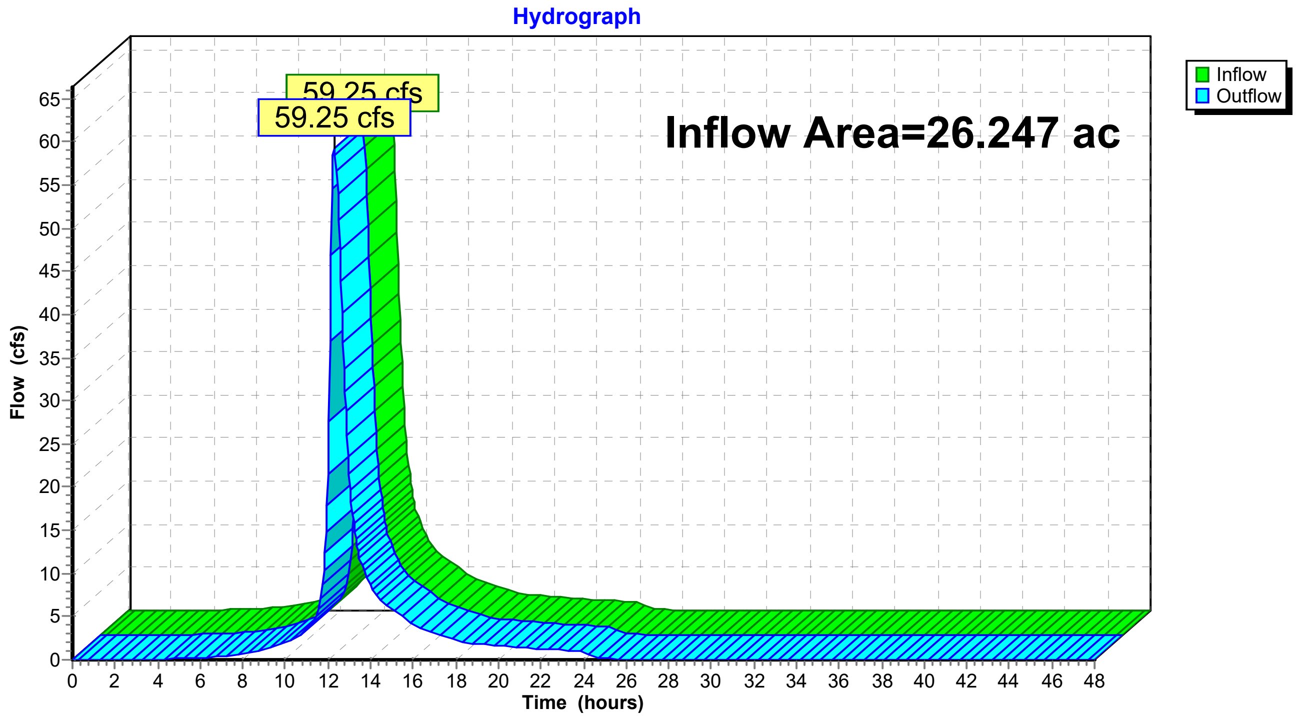
Summary for Reach 4R: ANALYSIS POINT NO. 1

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

Inflow Area = 26.247 ac, 46.64% Impervious, Inflow Depth = 3.62" for Future 10-YR event
Inflow = 59.25 cfs @ 12.30 hrs, Volume= 7.919 af
Outflow = 59.25 cfs @ 12.30 hrs, Volume= 7.919 af, Atten= 0%, Lag= 0.0 min

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

Reach 4R: ANALYSIS POINT NO. 1

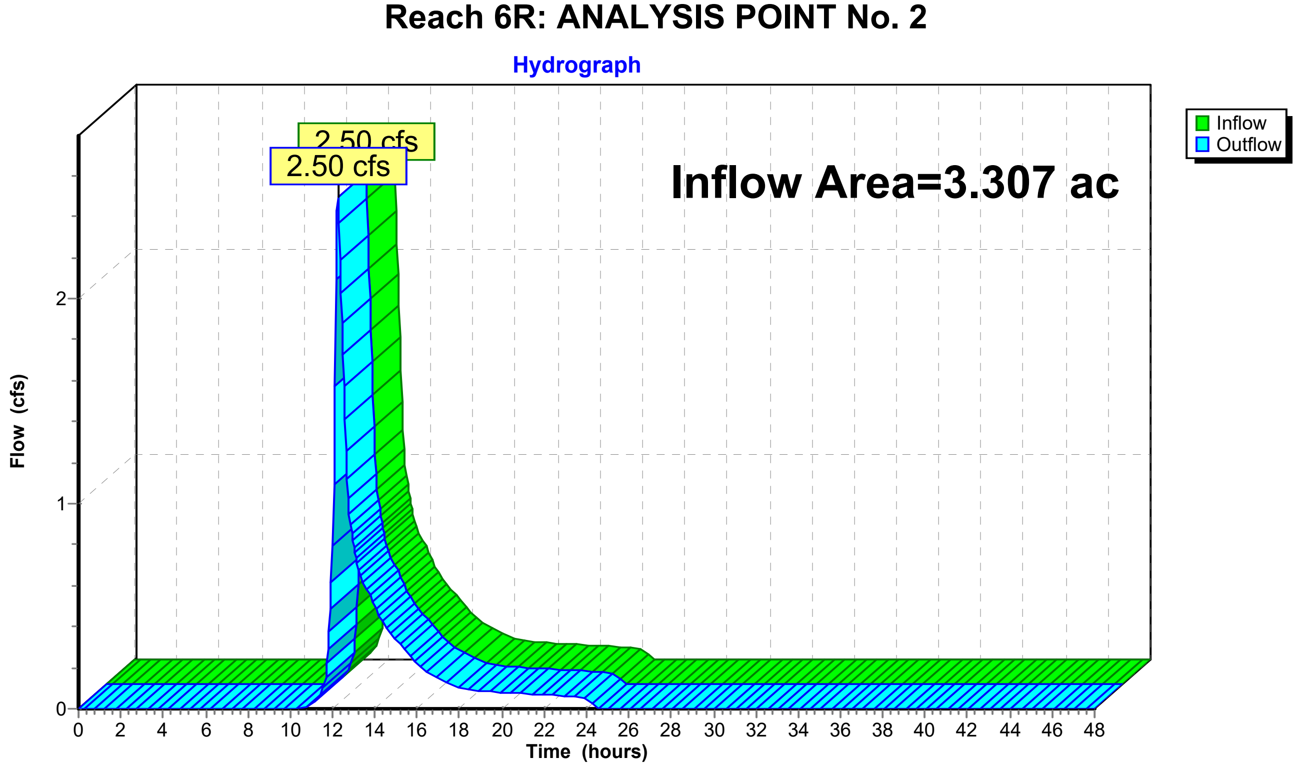


Summary for Reach 6R: ANALYSIS POINT No. 2

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

Inflow Area = 3.307 ac, 29.63% Impervious, Inflow Depth = 1.13" for Future 10-YR event
Inflow = 2.50 cfs @ 12.24 hrs, Volume= 0.312 af
Outflow = 2.50 cfs @ 12.24 hrs, Volume= 0.312 af, Atten= 0%, Lag= 0.0 min

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



Summary for Pond 7P: Detention Basin F-3

Inflow Area = 3.485 ac, 76.85% Impervious, Inflow Depth = 4.88" for Future 10-YR event
Inflow = 13.77 cfs @ 12.22 hrs, Volume= 1.418 af
Outflow = 10.45 cfs @ 12.37 hrs, Volume= 1.418 af, Atten= 24%, Lag= 8.9 min
Primary = 10.45 cfs @ 12.37 hrs, Volume= 1.418 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 160.65' @ 12.37 hrs Surf.Area= 7,622 sf Storage= 8,248 cf

Plug-Flow detention time= 12.4 min calculated for 1.417 af (100% of inflow)
Center-of-Mass det. time= 12.4 min (803.8 - 791.4)

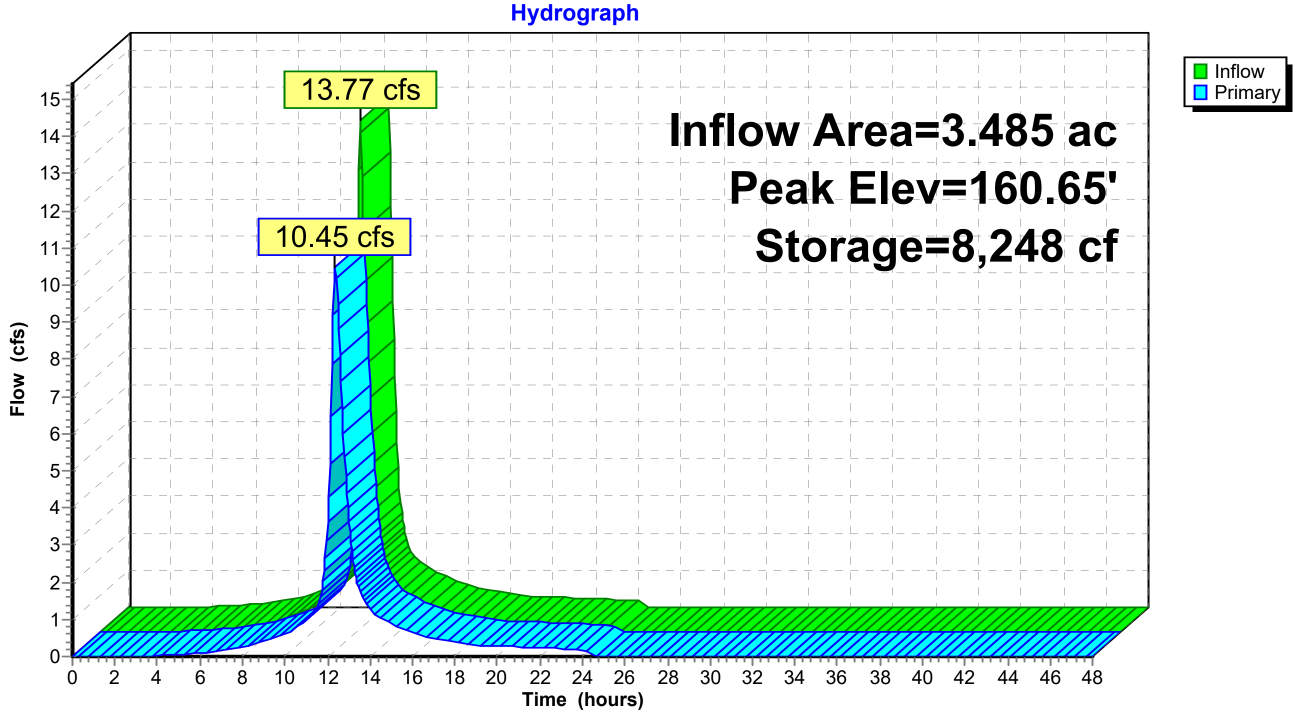
Volume	Invert	Avail.Storage	Storage Description
#1	159.00'	25,382 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.00	1	0	0
159.50	4,101	1,026	1,026
160.00	6,508	2,652	3,678
162.00	9,953	16,461	20,139
162.50	11,018	5,243	25,382

Device	Routing	Invert	Outlet Devices
#1	Device 3	156.00'	**18.0" Round Culvert** L= 110.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 156.00' / 153.00' S= 0.0273 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	159.00'	**45.0 deg x 1.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#3	Primary	155.67'	**18.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=10.41 cfs @ 12.37 hrs HW=160.64' (Free Discharge)
└─**3=Level Spreader Riser** (Passes 10.41 cfs of 18.97 cfs potential flow)
  └─**1=Culvert** (Passes 10.41 cfs of 16.79 cfs potential flow)
    └─**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 10.41 cfs @ 3.77 fps)

Pond 7P: Detention Basin F-3



Summary for Pond 11P: Infiltration Basin R-1

Inflow Area = 1.769 ac, 55.40% Impervious, Inflow Depth = 3.18" for Future 10-YR event
Inflow = 4.59 cfs @ 12.15 hrs, Volume= 0.469 af
Outflow = 0.66 cfs @ 12.92 hrs, Volume= 0.469 af, Atten= 86%, Lag= 46.5 min
Discarded = 0.36 cfs @ 12.92 hrs, Volume= 0.411 af
Primary = 0.30 cfs @ 12.92 hrs, Volume= 0.058 af
Routed to Reach 6R : ANALYSIS POINT No. 2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 171.00' @ 12.92 hrs Surf.Area= 6,338 sf Storage= 7,377 cf

Plug-Flow detention time= 140.2 min calculated for 0.469 af (100% of inflow)
Center-of-Mass det. time= 140.0 min (919.0 - 778.9)

Volume	Invert	Avail.Storage	Storage Description
#1	169.70'	14,244 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

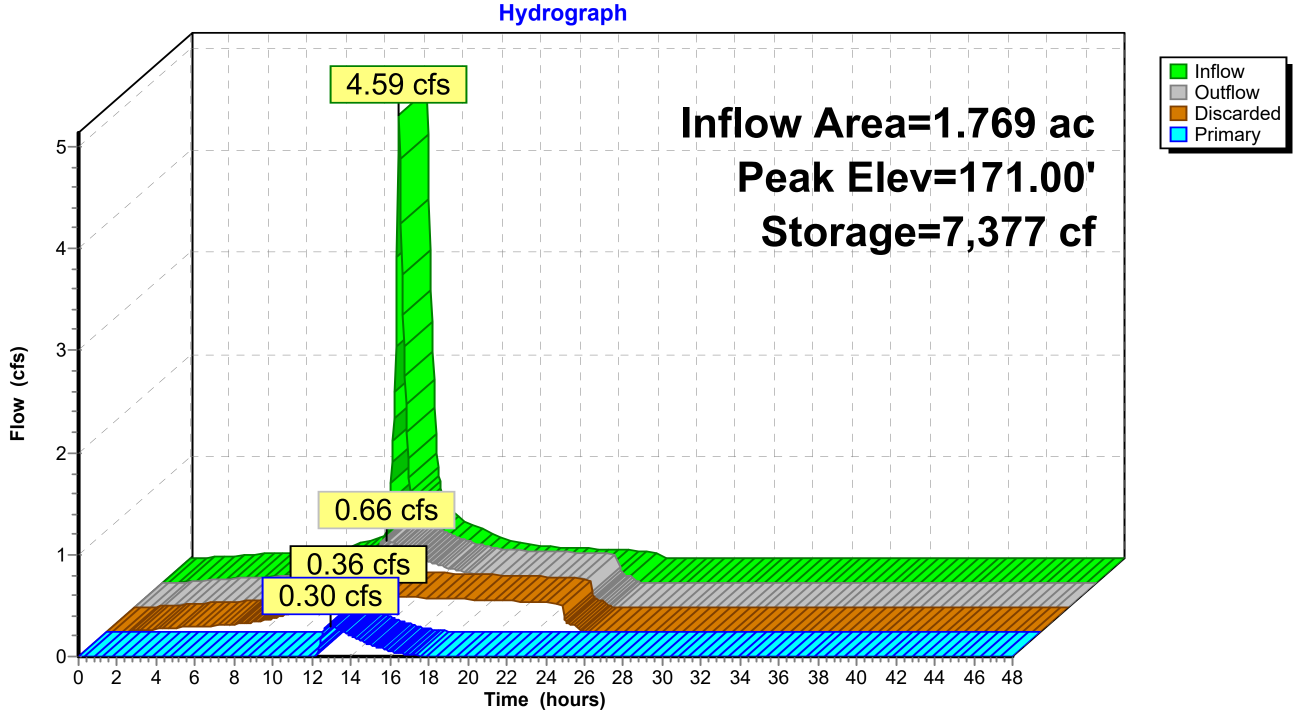
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
169.70	5,001	0	0	5,001
170.00	5,302	1,545	1,545	5,312
172.00	7,458	12,699	14,244	7,540

Device	Routing	Invert	Outlet Devices
#1	Primary	165.80'	**12.0" Round Culvert** L= 58.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 165.80' / 162.00' S= 0.0655 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	169.70'	**2.410 in/hr Exfiltration over Wetted area**
#3	Device 1	170.40'	**45.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.36 cfs @ 12.92 hrs HW=171.00' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.36 cfs)

Primary OutFlow Max=0.30 cfs @ 12.92 hrs HW=171.00' (Free Discharge)
└─**1=Culvert** (Passes 0.30 cfs of 8.20 cfs potential flow)
└─**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.30 cfs @ 1.99 fps)

Pond 11P: Infiltration Basin R-1



Summary for Pond 12P: Detention Basin R-3

Inflow Area = 3.287 ac, 67.42% Impervious, Inflow Depth = 5.03" for Future 10-YR event
Inflow = 15.01 cfs @ 12.16 hrs, Volume= 1.378 af
Outflow = 7.48 cfs @ 12.40 hrs, Volume= 1.378 af, Atten= 50%, Lag= 14.4 min
Primary = 7.48 cfs @ 12.40 hrs, Volume= 1.378 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 162.41' @ 12.40 hrs Surf.Area= 5,650 sf Storage= 11,372 cf

Plug-Flow detention time= 26.9 min calculated for 1.376 af (100% of inflow)
Center-of-Mass det. time= 27.0 min (809.7 - 782.7)

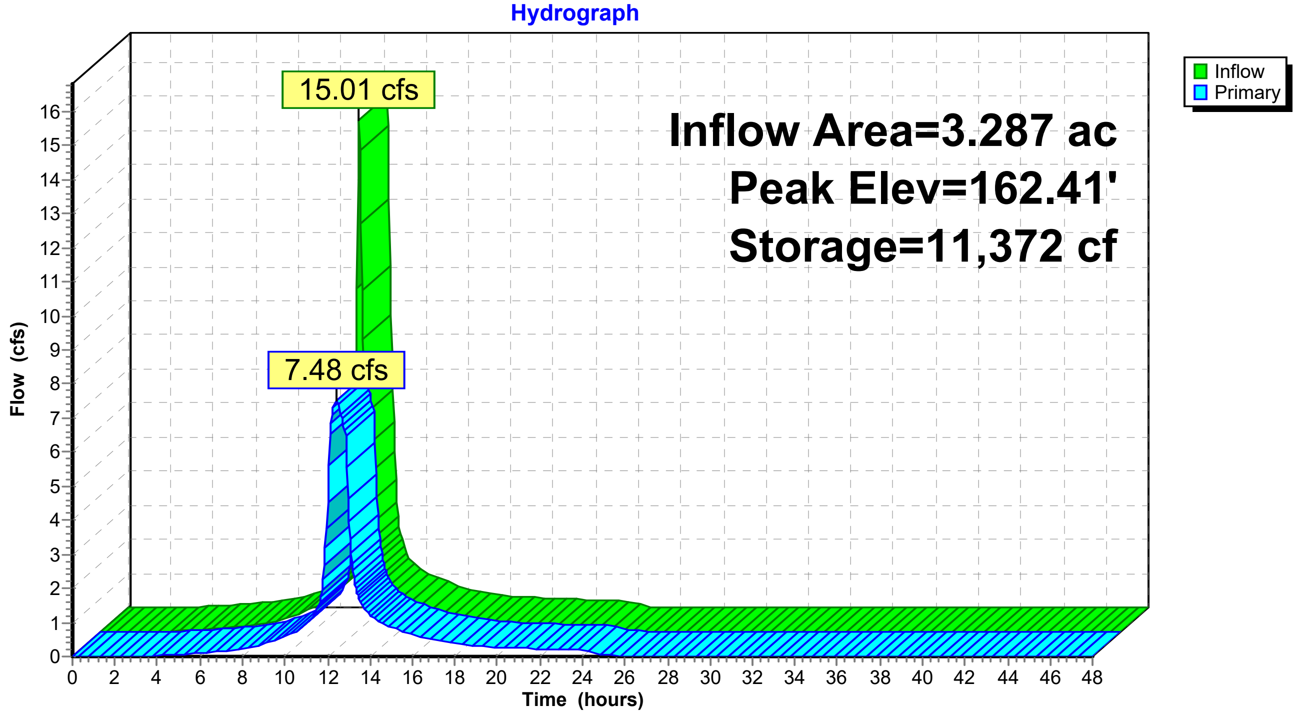
Volume	Invert	Avail.Storage	Storage Description
#1	159.80'	25,303 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.80	200	0	0
160.00	3,502	370	370
162.00	5,243	8,745	9,115
164.00	7,209	12,452	21,567
164.50	7,736	3,736	25,303

Device	Routing	Invert	Outlet Devices
#1	Device 3	158.00'	**12.0" Round Culvert** L= 85.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.00' / 144.00' S= 0.1647 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	159.80'	**45.0 deg x 0.5' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#3	Primary	150.67'	**12.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.48 cfs @ 12.40 hrs HW=162.41' (Free Discharge)
└─**3=Level Spreader Riser** (Passes 7.48 cfs of 12.96 cfs potential flow)
  └─**1=Culvert** (Inlet Controls 7.48 cfs @ 9.53 fps)
    └─**2=Sharp-Crested Vee/Trap Weir** (Passes 7.48 cfs of 18.47 cfs potential flow)

Pond 12P: Detention Basin R-3



Summary for Pond 13P: Detention Basin R-2

Inflow Area = 2.614 ac, 60.00% Impervious, Inflow Depth = 4.92" for Future 10-YR event
Inflow = 12.03 cfs @ 12.15 hrs, Volume= 1.071 af
Outflow = 9.00 cfs @ 12.26 hrs, Volume= 1.071 af, Atten= 25%, Lag= 6.5 min
Primary = 9.00 cfs @ 12.26 hrs, Volume= 1.071 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 162.64' @ 12.26 hrs Surf.Area= 6,174 sf Storage= 5,226 cf

Plug-Flow detention time= 8.0 min calculated for 1.070 af (100% of inflow)
Center-of-Mass det. time= 8.0 min (793.8 - 785.9)

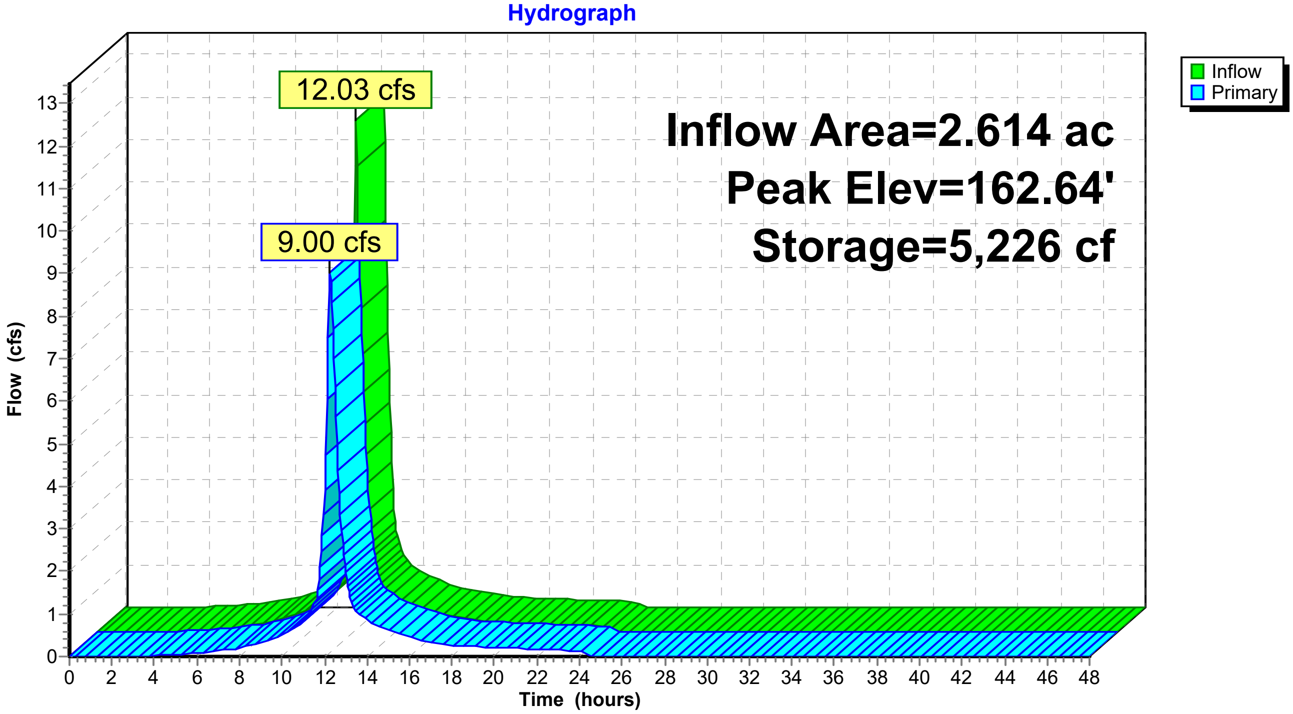
Volume	Invert	Avail.Storage	Storage Description
#1	161.50'	18,409 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
161.50	400	0	0
162.00	5,563	1,491	1,491
164.00	7,484	13,047	14,538
164.50	7,999	3,871	18,409

Device	Routing	Invert	Outlet Devices
#1	Device 3	152.00'	**12.0" Round Culvert** L= 78.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.00' / 141.00' S= 0.1410 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	161.50'	**2.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	143.17'	**12.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=8.96 cfs @ 12.26 hrs HW=162.63' (Free Discharge)
└─**3=Level Spreader Riser** (Passes 8.96 cfs of 16.68 cfs potential flow)
  └─**1=Culvert** (Passes 8.96 cfs of 12.04 cfs potential flow)
    └─**2=Sharp-Crested Rectangular Weir** (Weir Controls 8.96 cfs @ 3.48 fps)

Pond 13P: Detention Basin R-2



Summary for Pond 23P: Detention Basin F-2

Inflow Area = 2.347 ac, 72.38% Impervious, Inflow Depth = 4.81" for Future 10-YR event
Inflow = 10.90 cfs @ 12.14 hrs, Volume= 0.940 af
Outflow = 5.55 cfs @ 12.35 hrs, Volume= 0.819 af, Atten= 49%, Lag= 12.7 min
Primary = 5.55 cfs @ 12.35 hrs, Volume= 0.819 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 160.94' @ 12.35 hrs Surf.Area= 7,235 sf Storage= 16,674 cf

Plug-Flow detention time= 186.7 min calculated for 0.818 af (87% of inflow)
Center-of-Mass det. time= 130.8 min (919.5 - 788.6)

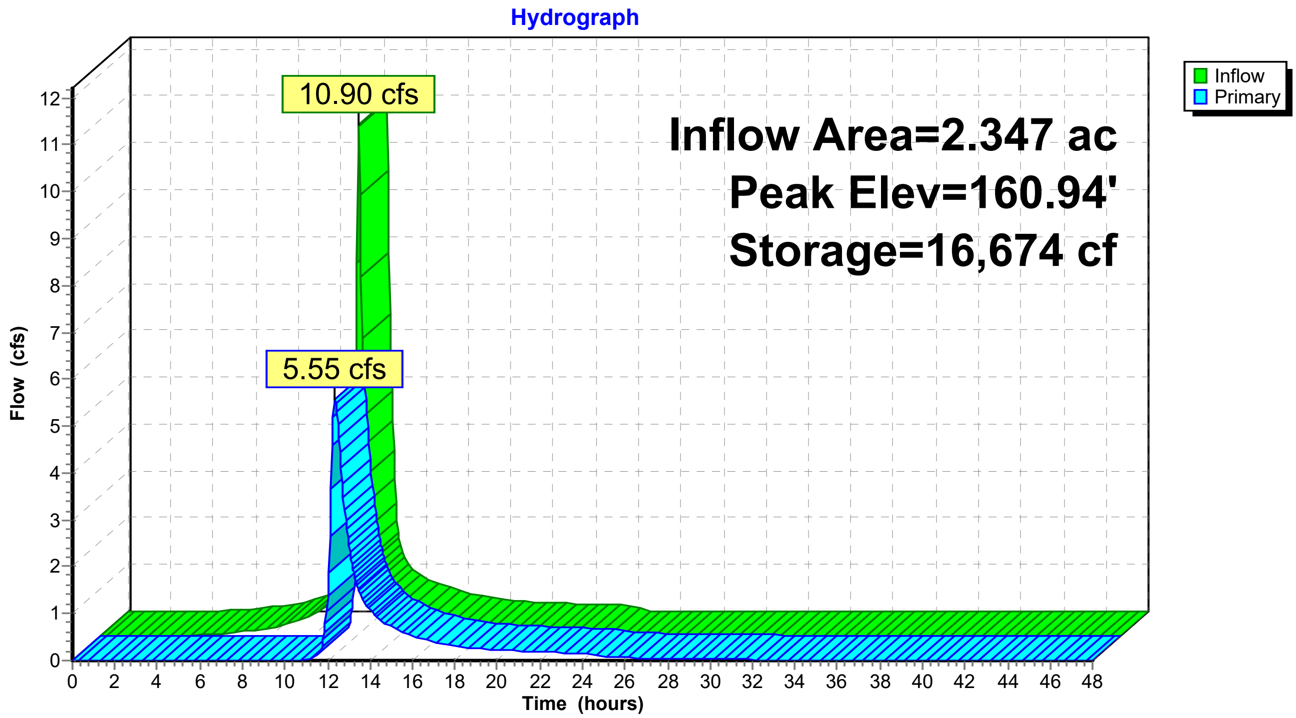
Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	29,366 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	4,222	0	0
160.00	6,163	10,385	10,385
162.00	8,447	14,610	24,995
162.50	9,035	4,371	29,366

Device	Routing	Invert	Outlet Devices
#1	Device 2	158.00'	**15.0" Round Culvert** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.00' / 155.00' S= 0.0375 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Primary	157.42'	**15.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads
#3	Device 1	159.00'	**45.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=5.55 cfs @ 12.35 hrs HW=160.94' (Free Discharge)
└─**2=Level Spreader Riser** (Passes 5.55 cfs of 11.08 cfs potential flow)
  └─**1=Culvert** (Passes 5.55 cfs of 8.99 cfs potential flow)
    └─**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 5.55 cfs @ 3.56 fps)

Pond 23P: Detention Basin F-2



Summary for Pond 26P: Infiltration Basin F-4

Inflow Area = 6.325 ac, 64.53% Impervious, Inflow Depth = 4.49" for Future 10-YR event
Inflow = 22.86 cfs @ 12.17 hrs, Volume= 2.366 af
Outflow = 12.70 cfs @ 12.47 hrs, Volume= 2.366 af, Atten= 44%, Lag= 17.5 min
Discarded = 0.52 cfs @ 12.47 hrs, Volume= 1.058 af
Primary = 12.18 cfs @ 12.47 hrs, Volume= 1.308 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 163.24' @ 12.47 hrs Surf.Area= 21,914 sf Storage= 37,729 cf

Plug-Flow detention time= 262.9 min calculated for 2.363 af (100% of inflow)
Center-of-Mass det. time= 263.7 min (1,063.2 - 799.5)

Volume	Invert	Avail.Storage	Storage Description
#1	161.00'	55,617 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

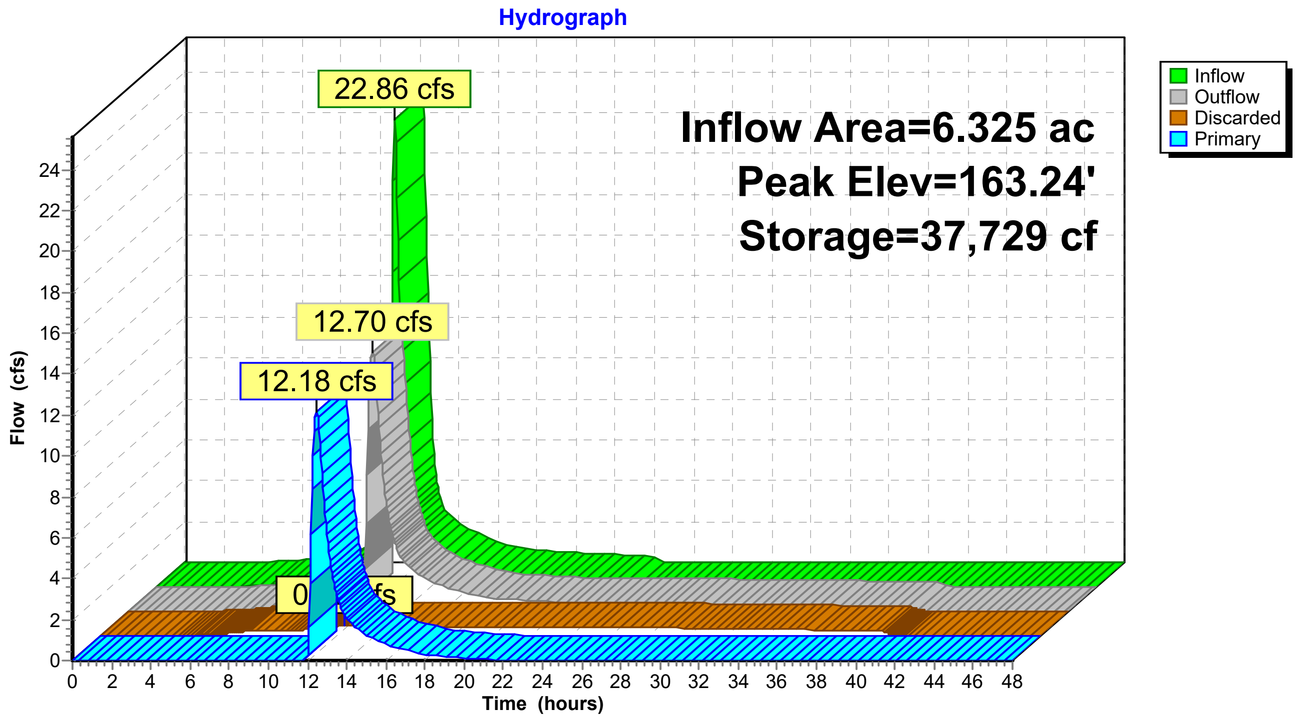
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
161.00	10,567	0	0	10,567
162.00	17,000	13,657	13,657	17,013
164.00	25,230	41,960	55,617	25,307

Device	Routing	Invert	Outlet Devices
#1	Device 4	158.00'	**18.0" Round Culvert** L= 221.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.00' / 153.00' S= 0.0226 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Discarded	161.00'	**1.020 in/hr Exfiltration over Wetted area**
#3	Device 1	162.40'	**5.0' long x 2.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	155.67'	**18.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.52 cfs @ 12.47 hrs HW=163.24' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.52 cfs)

Primary OutFlow Max=12.14 cfs @ 12.47 hrs HW=163.24' (Free Discharge)
└─**4=Level Spreader Riser** (Passes 12.14 cfs of 23.41 cfs potential flow)
  └─**1=Culvert** (Passes 12.14 cfs of 16.57 cfs potential flow)
    └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 12.14 cfs @ 2.99 fps)

Pond 26P: Infiltration Basin F-4



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

Subcatchment 6S: POST-SUB No. 1D Runoff Area=87,909 sf 70.36% Impervious Runoff Depth=6.18"
Flow Length=411' Tc=15.4 min CN=89 Runoff=10.39 cfs 1.039 af

Subcatchment 8S: POST SUB 3C Runoff Area=34,500 sf 100.00% Impervious Runoff Depth=7.24"
Tc=10.0 min CN=98 Runoff=5.03 cfs 0.478 af

Subcatchment 14S: POST-SUB No 3B Runoff Area=67,024 sf 0.00% Impervious Runoff Depth=3.05"
Flow Length=760' Tc=15.8 min CN=61 Runoff=3.96 cfs 0.392 af

Subcatchment 15S: POST-SUB No 3A Runoff Area=42,540 sf 19.23% Impervious Runoff Depth=1.94"
Flow Length=158' Slope=0.0100 '/' Tc=14.2 min CN=50 Runoff=1.52 cfs 0.158 af

Subcatchment 16S: POST-SUB No. 2A Runoff Area=158,671 sf 0.00% Impervious Runoff Depth=4.35"
Flow Length=180' Tc=14.2 min CN=73 Runoff=14.28 cfs 1.321 af

Subcatchment 17S: POST-SUB No. 2B Runoff Area=143,182 sf 67.42% Impervious Runoff Depth=6.53"
Flow Length=221' Tc=11.8 min CN=92 Runoff=19.20 cfs 1.788 af

Subcatchment 18S: POST-SUB No. 2C Runoff Area=113,851 sf 60.00% Impervious Runoff Depth=6.41"
Flow Length=205' Tc=11.0 min CN=91 Runoff=15.45 cfs 1.396 af

Subcatchment 19S: POST-SUB No. 2D Runoff Area=24,504 sf 0.00% Impervious Runoff Depth=4.91"
Flow Length=333' Tc=19.2 min CN=78 Runoff=2.21 cfs 0.230 af

Subcatchment 22S: POST-SUB No. 1C Runoff Area=102,217 sf 72.38% Impervious Runoff Depth=6.29"
Tc=10.0 min CN=90 Runoff=14.06 cfs 1.231 af

Subcatchment 24S: POST-SUB No. 1A Runoff Area=38,417 sf 0.00% Impervious Runoff Depth=4.58"
Flow Length=800' Tc=22.3 min CN=75 Runoff=3.04 cfs 0.336 af

Subcatchment 25S: POST-SUB-No. 1E Runoff Area=114,681 sf 82.66% Impervious Runoff Depth=6.53"
Flow Length=869' Tc=17.9 min CN=92 Runoff=13.21 cfs 1.432 af

Subcatchment 27S: POST-SUB No. 1A-A Runoff Area=173,610 sf 0.00% Impervious Runoff Depth=3.69"
Flow Length=342' Tc=14.3 min CN=67 Runoff=13.18 cfs 1.227 af

Subcatchment 28S: Post Sub No 1F Runoff Area=122,407 sf 67.79% Impervious Runoff Depth=5.83"
Tc=10.0 min CN=86 Runoff=15.99 cfs 1.365 af

Subcatchment 29S: POST SUB NO 1G Runoff Area=63,889 sf 85.79% Impervious Runoff Depth=6.65"
Flow Length=885' Tc=18.0 min CN=93 Runoff=7.41 cfs 0.812 af

Reach 4R: ANALYSIS POINT NO. 1 Inflow=84.27 cfs 10.946 af
Outflow=84.27 cfs 10.946 af

Reach 6R: ANALYSIS POINT No. 2 Inflow=4.20 cfs 0.556 af
Outflow=4.20 cfs 0.556 af

Pond 7P: Detention Basin F-3 Peak Elev=160.91' Storage=10,310 cf Inflow=17.72 cfs 1.851 af
Outflow=13.79 cfs 1.851 af

Pond 11P: Infiltration Basin R-1 Peak Elev=171.38' Storage=9,839 cf Inflow=6.32 cfs 0.636 af
Discarded=0.38 cfs 0.472 af Primary=1.01 cfs 0.164 af Outflow=1.39 cfs 0.636 af

Pond 12P: Detention Basin R-3 Peak Elev=163.19' Storage=16,076 cf Inflow=19.20 cfs 1.788 af
Outflow=8.19 cfs 1.788 af

Pond 13P: Detention Basin R-2 Peak Elev=162.87' Storage=6,698 cf Inflow=15.45 cfs 1.396 af
Outflow=11.68 cfs 1.396 af

Pond 23P: Detention Basin F-2 Peak Elev=161.27' Storage=19,146 cf Inflow=14.06 cfs 1.231 af
Outflow=8.25 cfs 1.110 af

Pond 26P: Infiltration Basin F-4 Peak Elev=163.57' Storage=45,111 cf Inflow=29.91 cfs 3.133 af
Discarded=0.55 cfs 1.111 af Primary=16.93 cfs 2.022 af Outflow=17.48 cfs 3.133 af

Total Runoff Area = 29.555 ac Runoff Volume = 13.206 af Average Runoff Depth = 5.36"
55.26% Pervious = 16.333 ac 44.74% Impervious = 13.222 ac

Summary for Subcatchment 6S: POST-SUB No. 1D

[47] Hint: Peak is 227% of capacity of segment #4

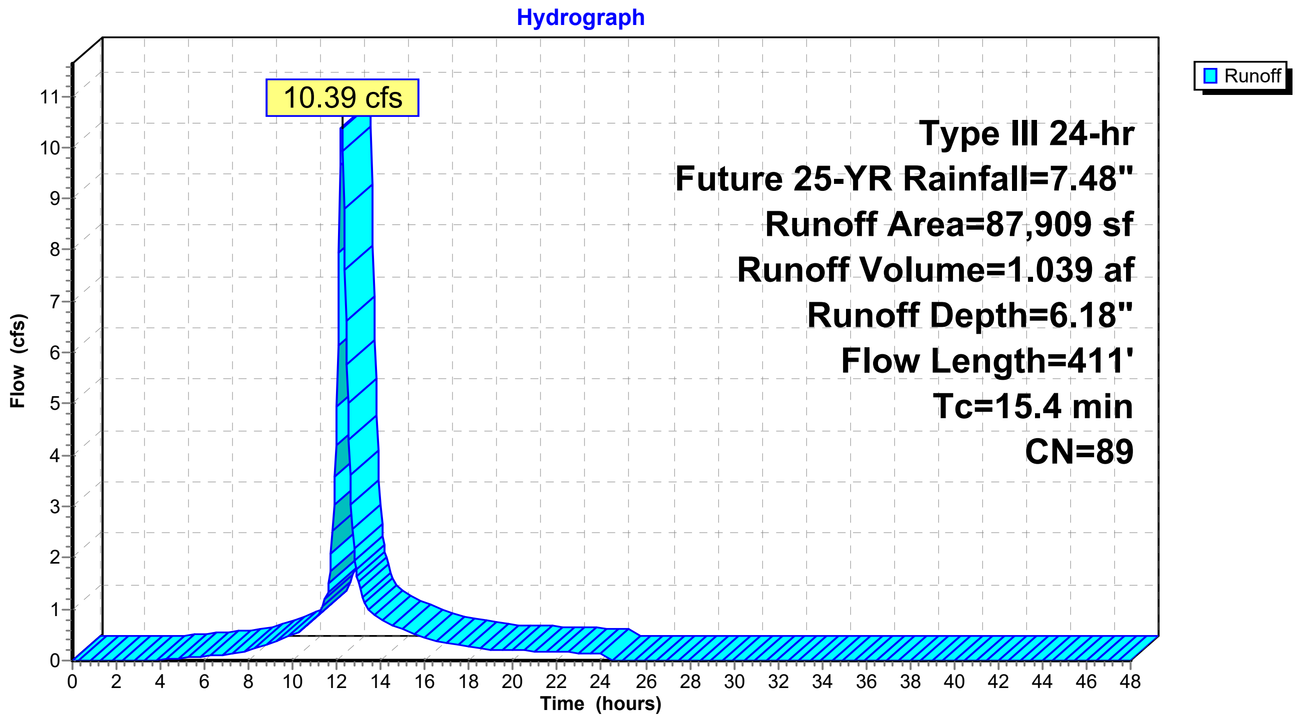
Runoff = 10.39 cfs @ 12.21 hrs, Volume= 1.039 af, Depth= 6.18"
Routed to Pond 7P : Detention Basin F-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 25-YR Rainfall=7.48"

	Area (sf)	CN	Description
*	4,000	98	Building Roofs
*	10,503	98	Detention Basin
*	47,347	98	Pavement and Walks
	7,767	80	>75% Grass cover, Good, HSG D
	18,292	61	>75% Grass cover, Good, HSG B
	87,909	89	Weighted Average
	26,059		29.64% Pervious Area
	61,850		70.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.6	55	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.2	40	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	216	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
15.4	411	Total			

Subcatchment 6S: POST-SUB No. 1D



Summary for Subcatchment 8S: POST SUB 3C Building 2, 3 and 4

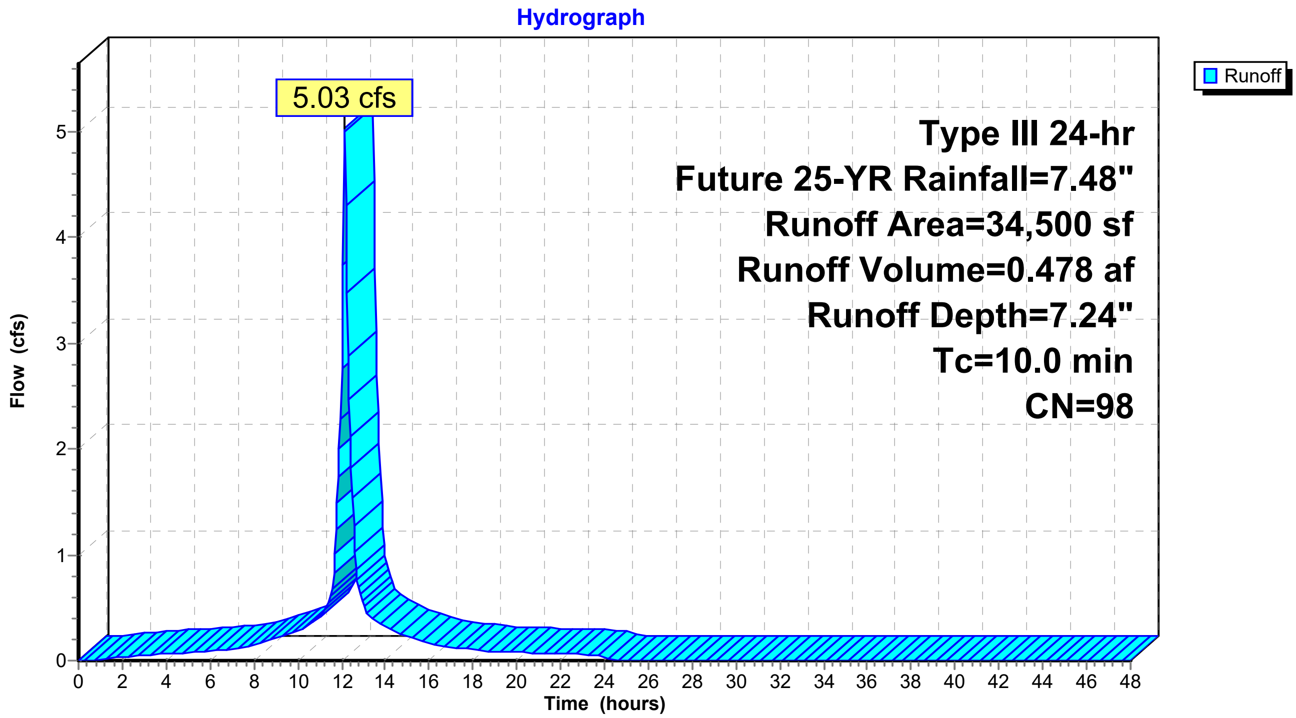
Runoff = 5.03 cfs @ 12.14 hrs, Volume= 0.478 af, Depth= 7.24"
Routed to Pond 11P : Infiltration Basin R-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 25-YR Rainfall=7.48"

	Area (sf)	CN	Description
*	34,500	98	Building Roof
	0	80	>75% Grass cover, Good, HSG D
	34,500	98	Weighted Average
	34,500		100.00% Impervious Area

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

Subcatchment 8S: POST SUB 3C Building 2, 3 and 4



Summary for Subcatchment 14S: POST-SUB No 3B

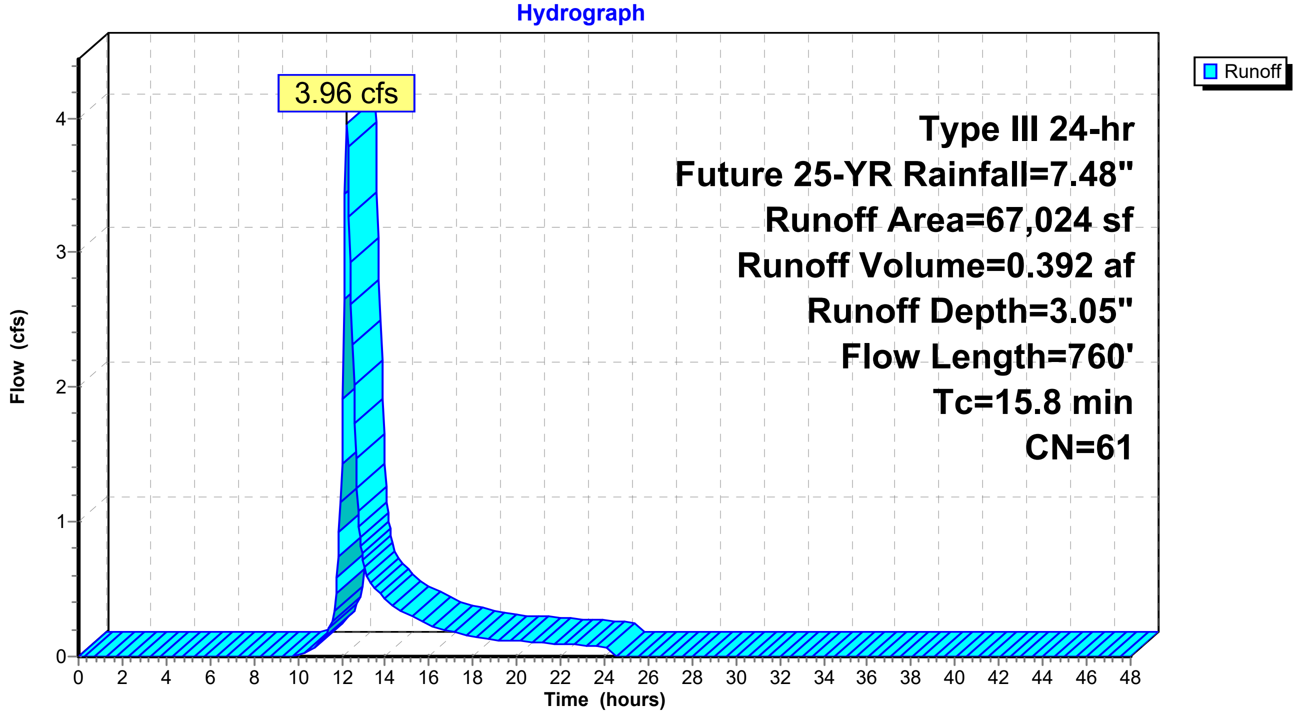
Runoff = 3.96 cfs @ 12.23 hrs, Volume= 0.392 af, Depth= 3.05"
Routed to Reach 6R : ANALYSIS POINT No. 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 25-YR Rainfall=7.48"

Area (sf)	CN	Description
28,004	73	Brush, Good, HSG D
19,012	30	Woods, Good, HSG A
4,184	77	Woods, Good, HSG D
3,089	39	>75% Grass cover, Good, HSG A
12,735	80	>75% Grass cover, Good, HSG D
67,024	61	Weighted Average
67,024		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.6	200	0.0200	2.12		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.6	460	0.0650	12.11	60.55	**Channel Flow,** Area= 5.0 sf Perim= 7.0' r= 0.71' n= 0.025 Earth, clean & winding
15.8	760	Total			

Subcatchment 14S: POST-SUB No 3B



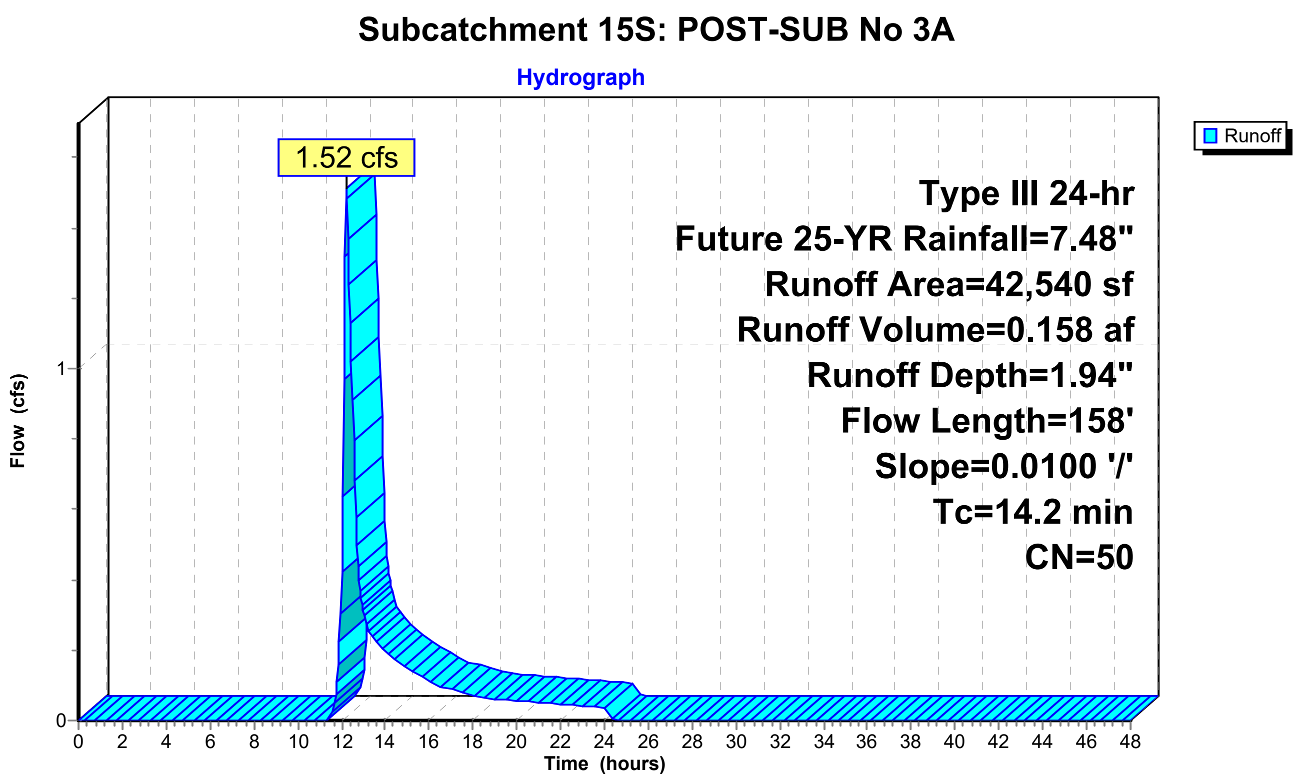
Summary for Subcatchment 15S: POST-SUB No 3A

Runoff = 1.52 cfs @ 12.22 hrs, Volume= 0.158 af, Depth= 1.94"
Routed to Pond 11P : Infiltration Basin R-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 25-YR Rainfall=7.48"

	Area (sf)	CN	Description
	0	49	50-75% Grass cover, Fair, HSG A
	34,361	39	>75% Grass cover, Good, HSG A
*	8,179	98	Basin
	42,540	50	Weighted Average
	34,361		80.77% Pervious Area
	8,179		19.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.6	58	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.2	158	Total			



Summary for Subcatchment 16S: POST-SUB No. 2A

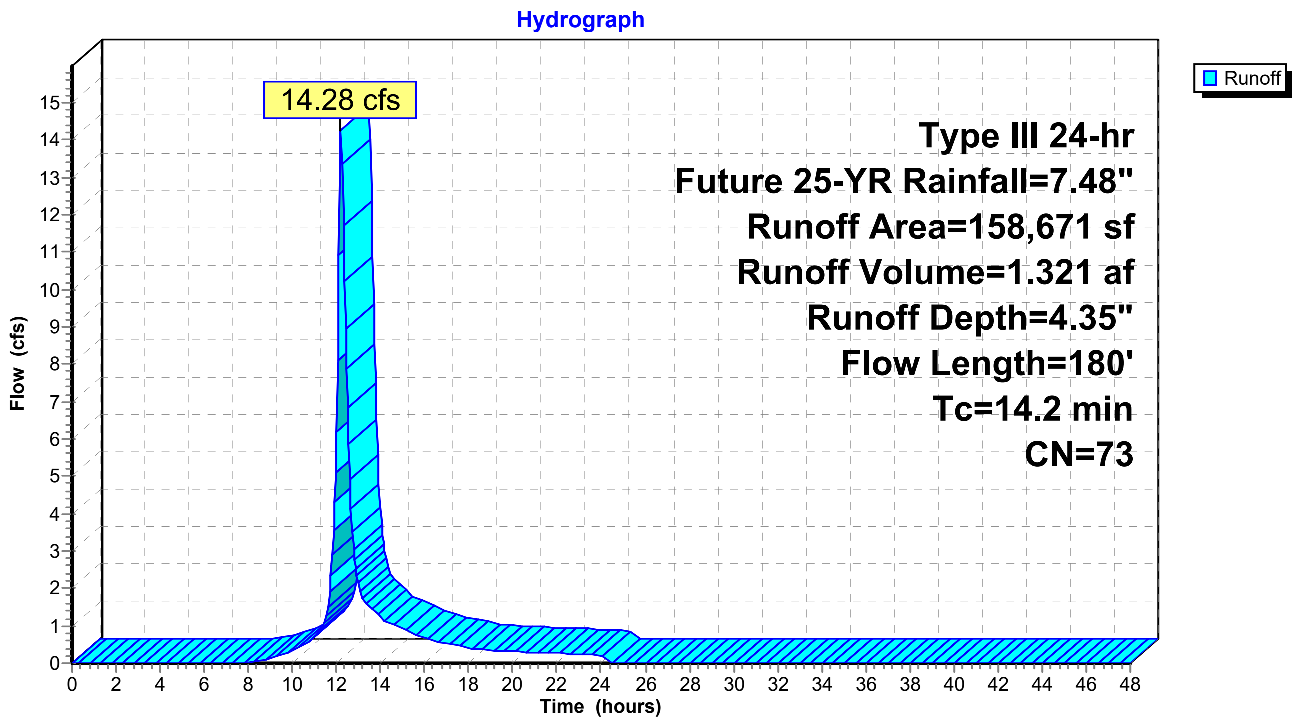
Runoff = 14.28 cfs @ 12.20 hrs, Volume= 1.321 af, Depth= 4.35"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 25-YR Rainfall=7.48"

	Area (sf)	CN	Description
	93,385	77	Woods, Good, HSG D
	46,536	80	>75% Grass cover, Good, HSG D
	0	32	Woods/grass comb., Good, HSG A
*	18,750	39	>75% Grass cover, Good, HSG A
	158,671	73	Weighted Average
	158,671		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.6	80	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.2	180	Total			

Subcatchment 16S: POST-SUB No. 2A



Summary for Subcatchment 17S: POST-SUB No. 2B

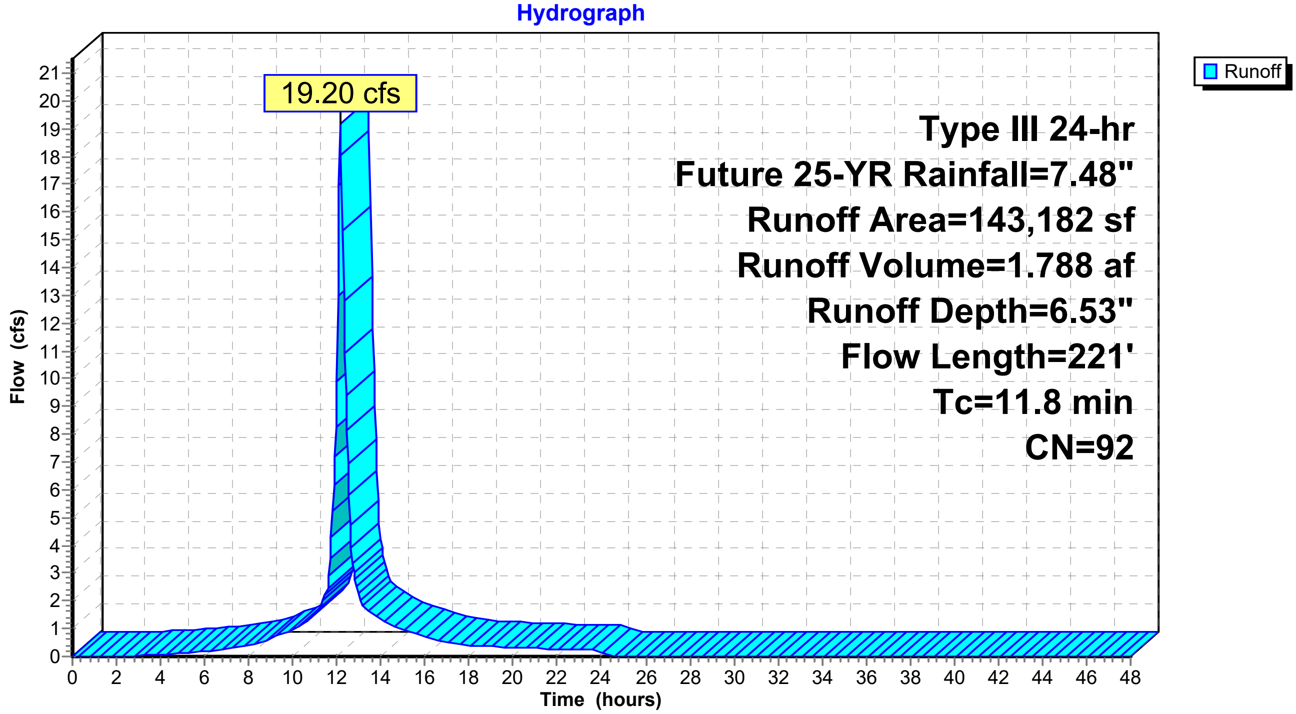
Runoff = 19.20 cfs @ 12.16 hrs, Volume= 1.788 af, Depth= 6.53"
Routed to Pond 12P : Detention Basin R-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 25-YR Rainfall=7.48"

	Area (sf)	CN	Description
*	39,478	98	Building Roofs
*	50,310	98	Pavement and Walks
*	6,744	98	Detention Basin
	46,650	80	>75% Grass cover, Good, HSG D
	143,182	92	Weighted Average
	46,650		32.58% Pervious Area
	96,532		67.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	90	0.0190	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.4	10	0.0300	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.1	30	0.0850	4.37		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.6	91	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.8	221	Total			

Subcatchment 17S: POST-SUB No. 2B



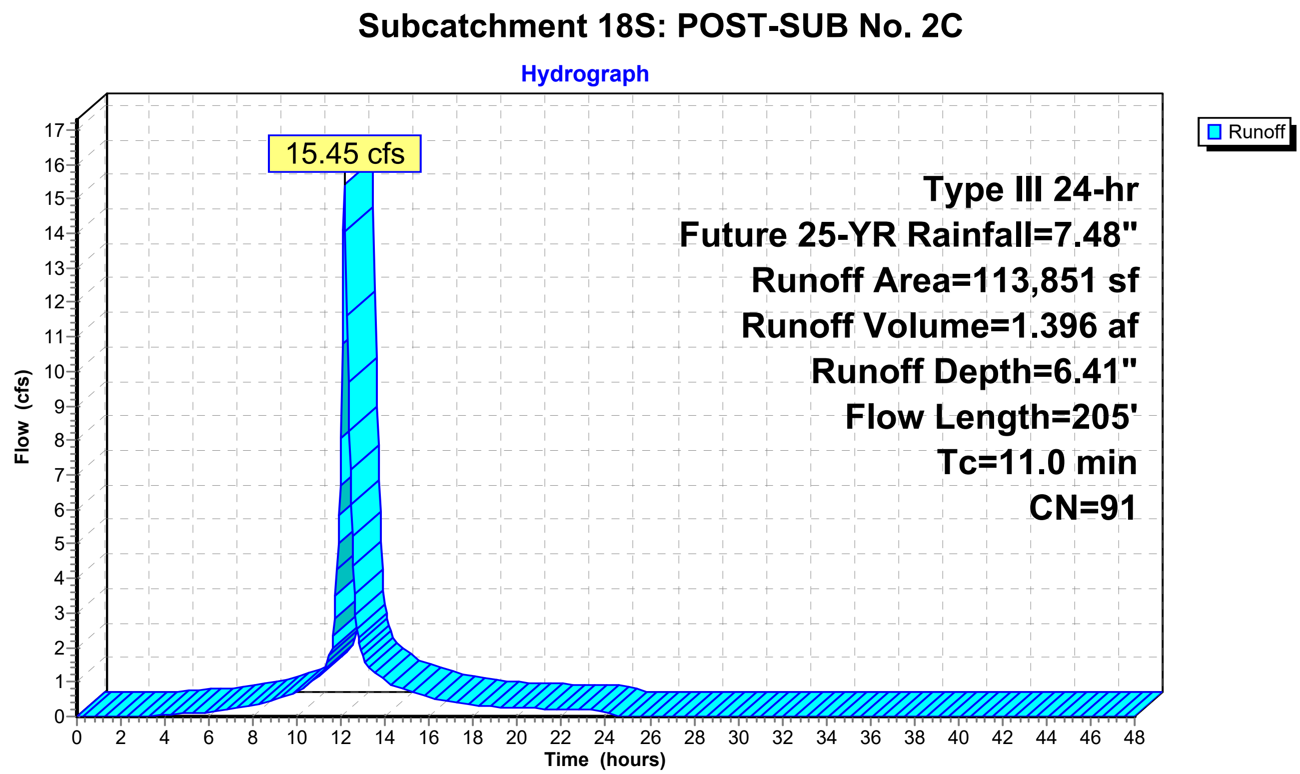
Summary for Subcatchment 18S: POST-SUB No. 2C

Runoff = 15.45 cfs @ 12.15 hrs, Volume= 1.396 af, Depth= 6.41"
Routed to Pond 13P : Detention Basin R-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 25-YR Rainfall=7.48"

	Area (sf)	CN	Description
*	11,500	98	Building Roofs
*	6,502	98	Detention Basin
*	50,311	98	Pavement and Walks
	45,538	80	>75% Grass cover, Good, HSG D
	0	80	>75% Grass cover, Good, HSG D
	113,851	91	Weighted Average
	45,538		40.00% Pervious Area
	68,313		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.7	105	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.0	205	Total			



Summary for Subcatchment 19S: POST-SUB No. 2D

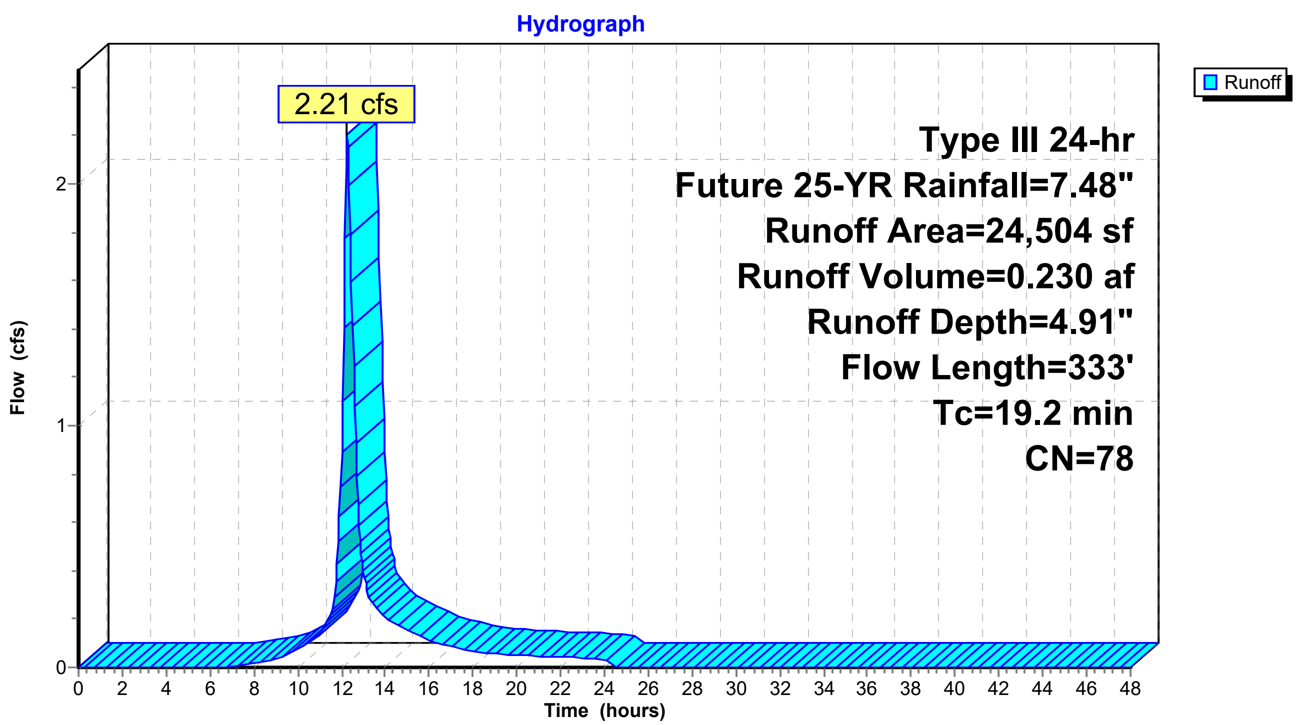
Runoff = 2.21 cfs @ 12.26 hrs, Volume= 0.230 af, Depth= 4.91"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 25-YR Rainfall=7.48"

Area (sf)	CN	Description
14,488	77	Woods, Good, HSG D
10,016	80	>75% Grass cover, Good, HSG D
24,504	78	Weighted Average
24,504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.5	100	0.0330	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.90"
0.7	233	0.1200	5.20		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
19.2	333	Total			

Subcatchment 19S: POST-SUB No. 2D



Summary for Subcatchment 22S: POST-SUB No. 1C

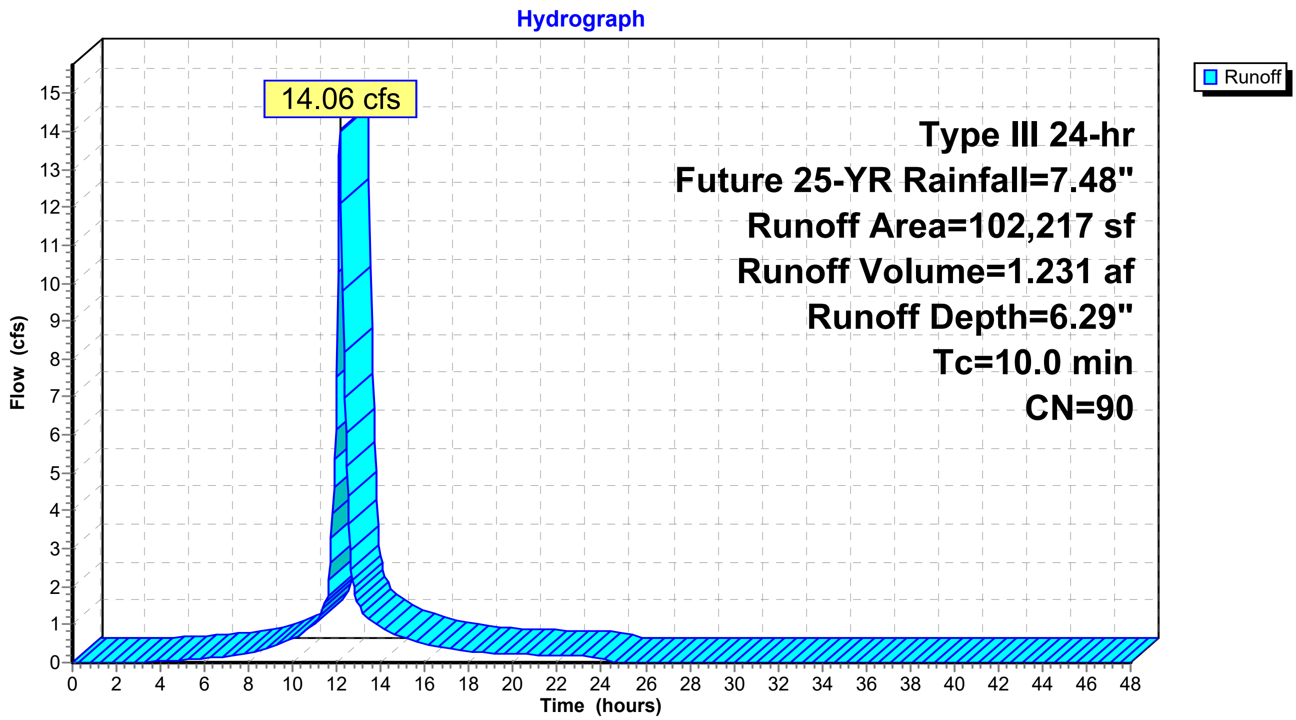
Runoff = 14.06 cfs @ 12.14 hrs, Volume= 1.231 af, Depth= 6.29"
Routed to Pond 23P : Detention Basin F-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 25-YR Rainfall=7.48"

	Area (sf)	CN	Description
*	16,090	98	Building Roofs
*	52,636	98	Pavement and Walks
*	5,255	98	Detention Basin
	14,731	61	>75% Grass cover, Good, HSG B
	13,505	80	>75% Grass cover, Good, HSG D
	102,217	90	Weighted Average
	28,236		27.62% Pervious Area
	73,981		72.38% Impervious Area

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

Subcatchment 22S: POST-SUB No. 1C



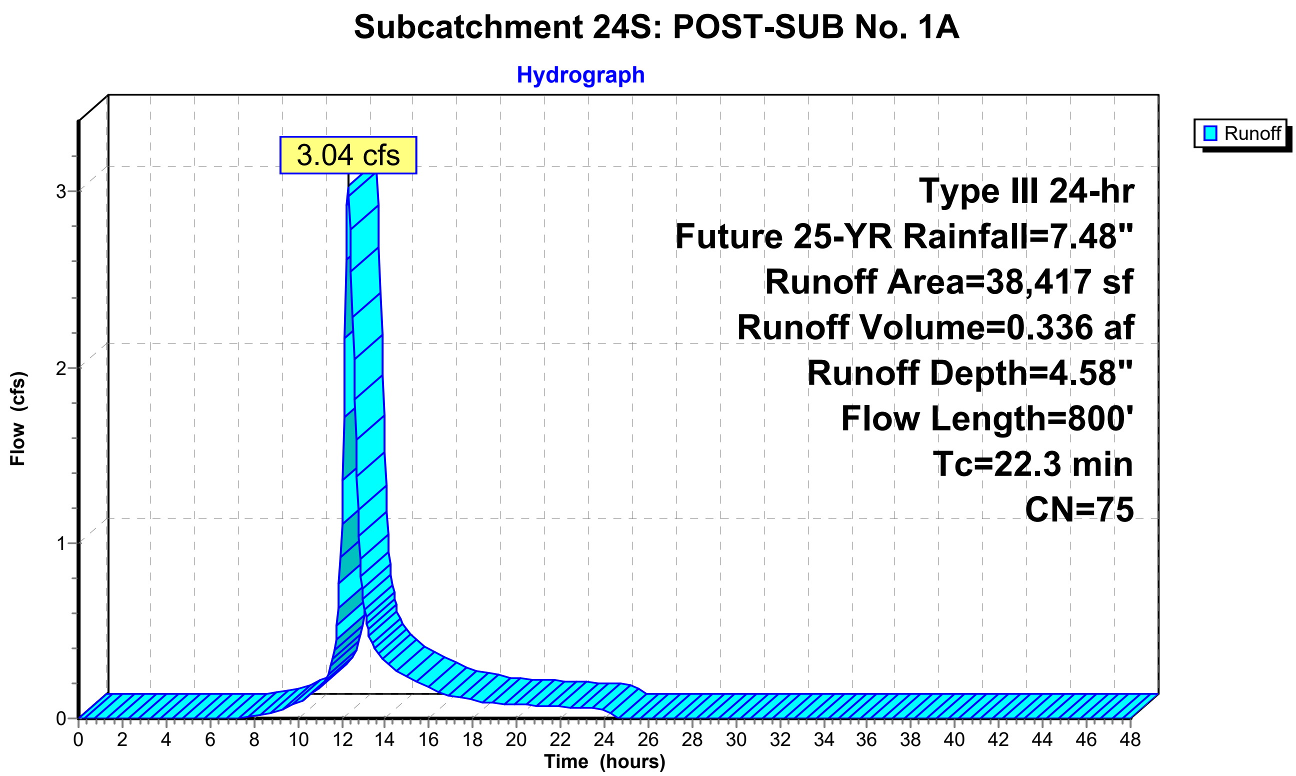
Summary for Subcatchment 24S: POST-SUB No. 1A

Runoff = 3.04 cfs @ 12.31 hrs, Volume= 0.336 af, Depth= 4.58"
Routed to Pond 26P : Infiltration Basin F-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 25-YR Rainfall=7.48"

	Area (sf)	CN	Description
	23,572	77	Woods, Good, HSG D
	0	73	Woods/grass comb., Poor, HSG B
*	14,845	71	>75% grass cover, Good, HSG B
	38,417	75	Weighted Average
	38,417		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0150	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.90"
5.5	700	0.0200	2.12		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
22.3	800	Total			



Summary for Subcatchment 25S: POST-SUB-No. 1E

[47] Hint: Peak is 289% of capacity of segment #4

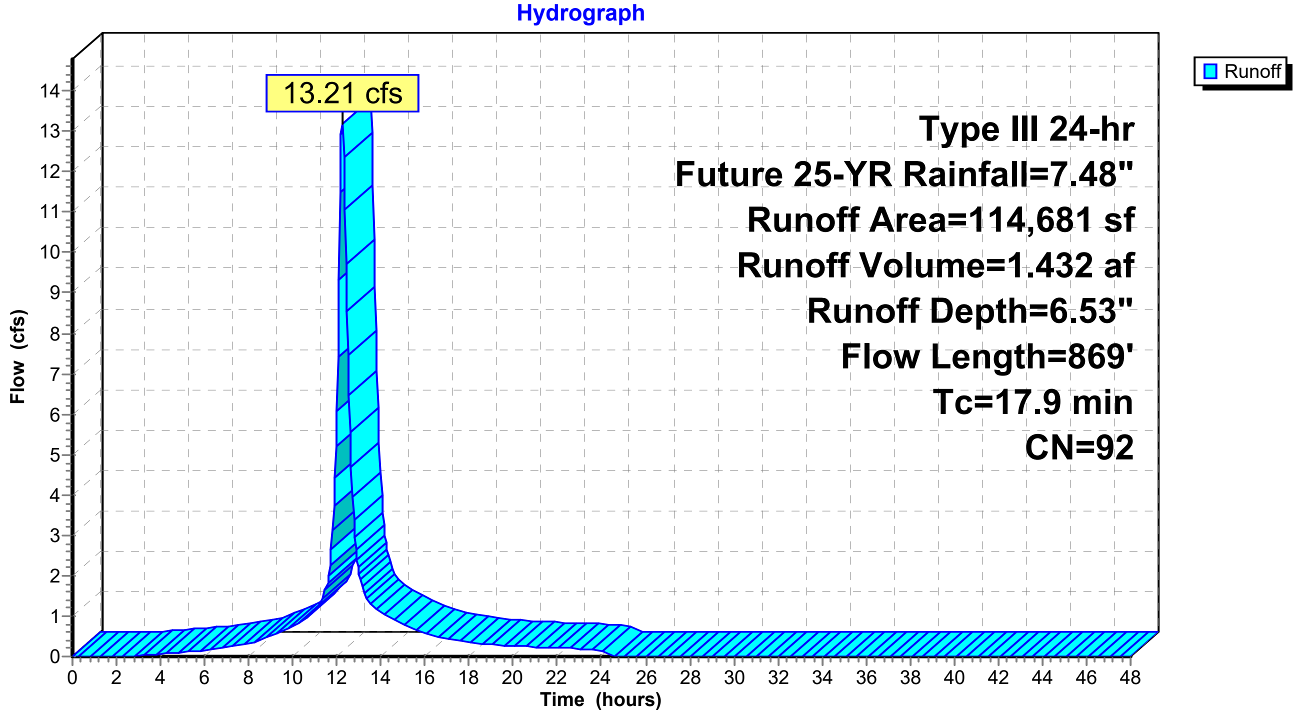
Runoff = 13.21 cfs @ 12.24 hrs, Volume= 1.432 af, Depth= 6.53"
Routed to Pond 26P : Infiltration Basin F-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 25-YR Rainfall=7.48"

	Area (sf)	CN	Description
*	28,932	98	Buildings
*	65,867	98	pavement and walks
	15,194	61	>75% Grass cover, Good, HSG B
	4,688	80	>75% Grass cover, Good, HSG D
	114,681	92	Weighted Average
	19,882		17.34% Pervious Area
	94,799		82.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0090	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	40	0.0090	1.42		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.1	254	0.0350	3.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.1	475	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
17.9	869	Total			

Subcatchment 25S: POST-SUB-No. 1E



Summary for Subcatchment 27S: POST-SUB No. 1A-A

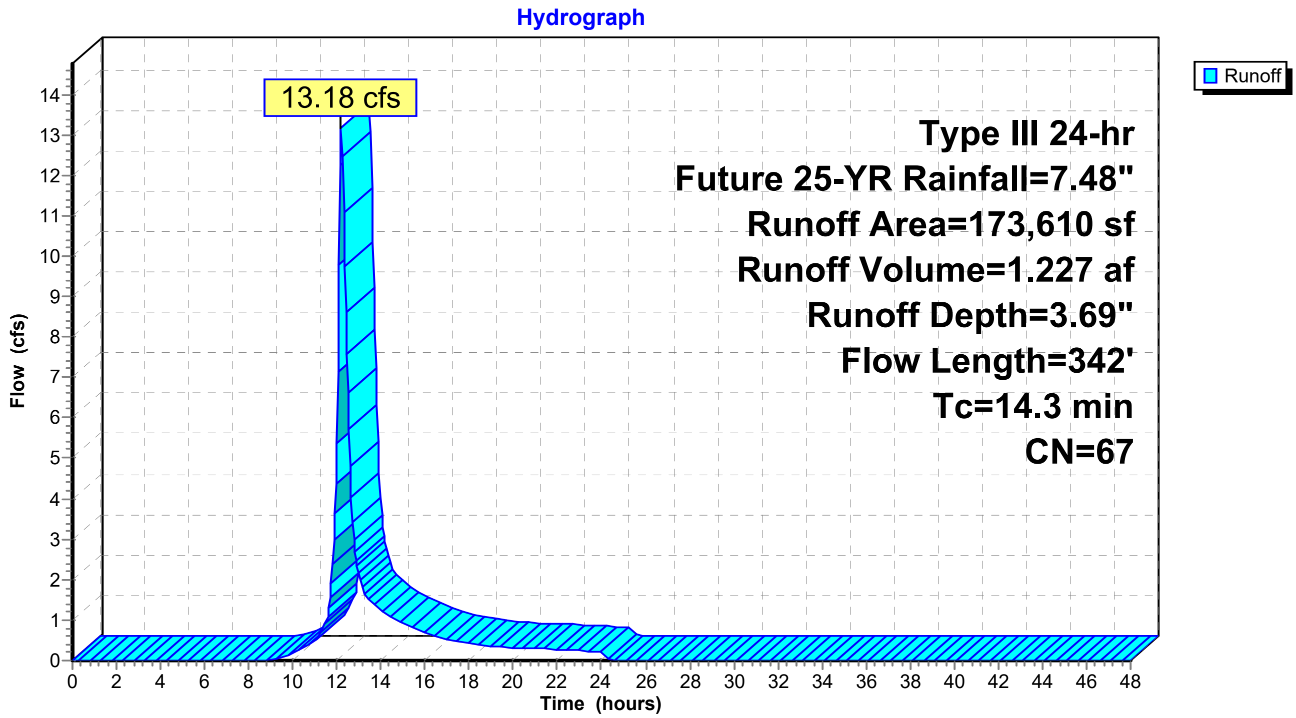
Runoff = 13.18 cfs @ 12.20 hrs, Volume= 1.227 af, Depth= 3.69"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 25-YR Rainfall=7.48"

	Area (sf)	CN	Description
	87,949	77	Woods, Good, HSG D
	4,955	55	Woods, Good, HSG B
*	29,916	30	Woods, Good, HSG A
	0	32	Woods/grass comb., Good, HSG A
	0	79	Woods/grass comb., Good, HSG D
	30,440	80	>75% Grass cover, Good, HSG D
*	20,350	61	>75% Grass cover, Good, HSG B
	173,610	67	Weighted Average
	173,610		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	20	0.0500	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	42	0.0360	1.33		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.5	200	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	12	0.3000	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
8.7	68	0.0360	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.90"
14.3	342	Total			

Subcatchment 27S: POST-SUB No. 1A-A



Summary for Subcatchment 28S: Post Sub No 1F

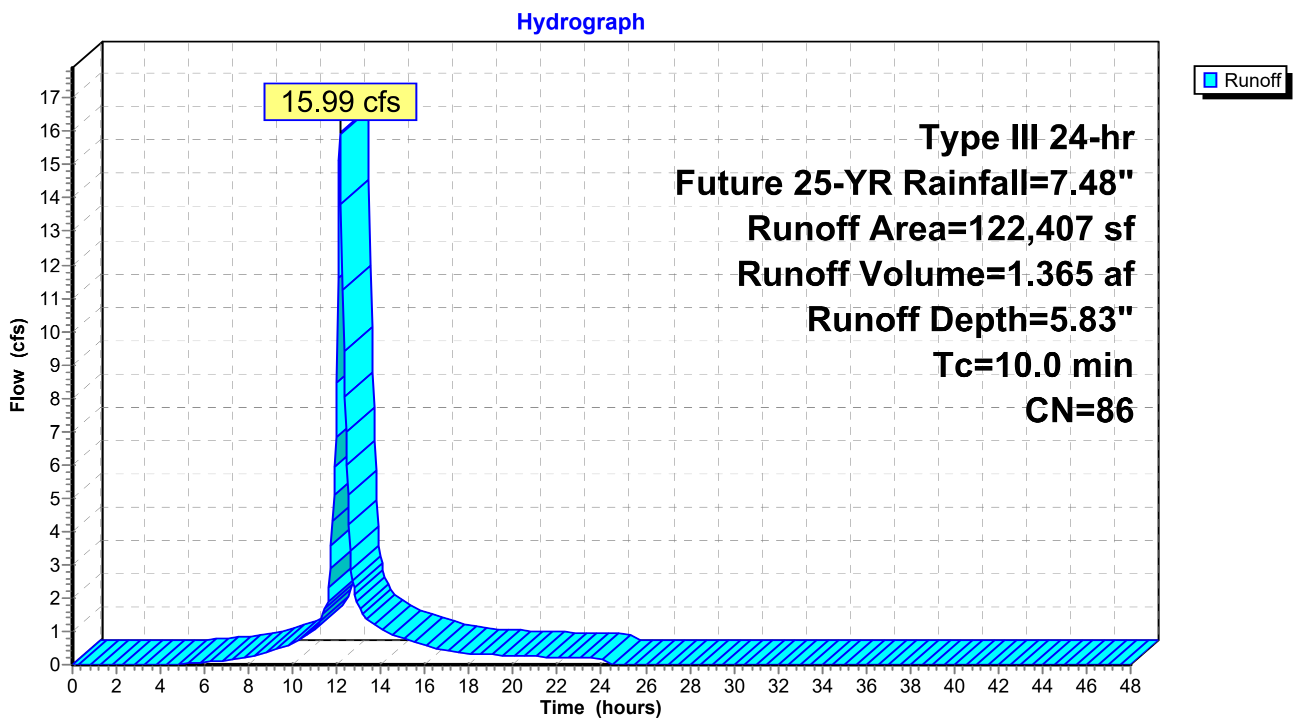
Runoff = 15.99 cfs @ 12.14 hrs, Volume= 1.365 af, Depth= 5.83"
Routed to Pond 26P : Infiltration Basin F-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 25-YR Rainfall=7.48"

	Area (sf)	CN	Description
*	23,000	98	Building Roof
*	7,000	98	Building Roof
	39,422	61	>75% Grass cover, Good, HSG B
*	27,685	98	Pavement and walks
*	13,800	98	Basin
*	11,500	98	Building Roof
	122,407	86	Weighted Average
	39,422		32.21% Pervious Area
	82,985		67.79% Impervious Area

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

Subcatchment 28S: Post Sub No 1F



Summary for Subcatchment 29S: POST SUB NO 1G

[47] Hint: Peak is 162% of capacity of segment #4

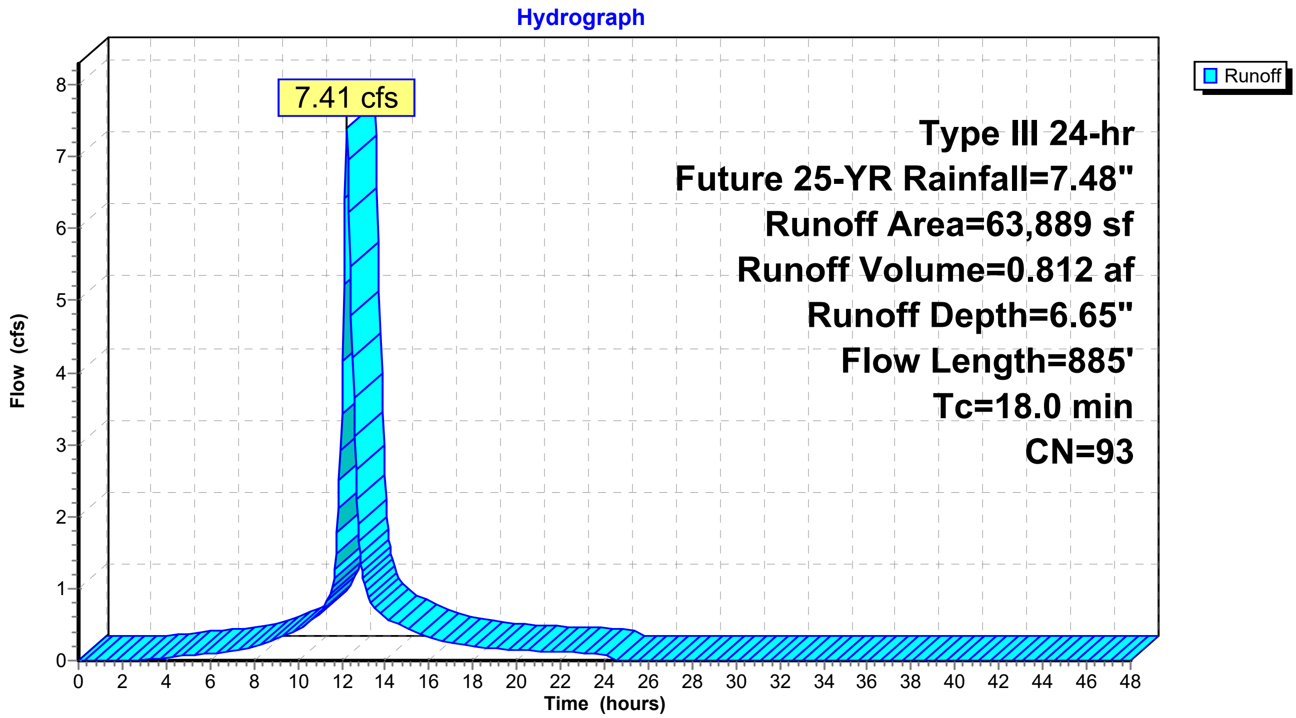
Runoff = 7.41 cfs @ 12.24 hrs, Volume= 0.812 af, Depth= 6.65"
Routed to Pond 7P : Detention Basin F-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 25-YR Rainfall=7.48"

	Area (sf)	CN	Description
*	51,612	98	Pavement and walks
	7,166	61	>75% Grass cover, Good, HSG B
	1,911	80	>75% Grass cover, Good, HSG D
*	3,200	98	Building Roof
	63,889	93	Weighted Average
	9,077		14.21% Pervious Area
	54,812		85.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0090	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	40	0.0090	1.42		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.9	200	0.0350	3.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	545	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
18.0	885	Total			

Subcatchment 29S: POST SUB NO 1G



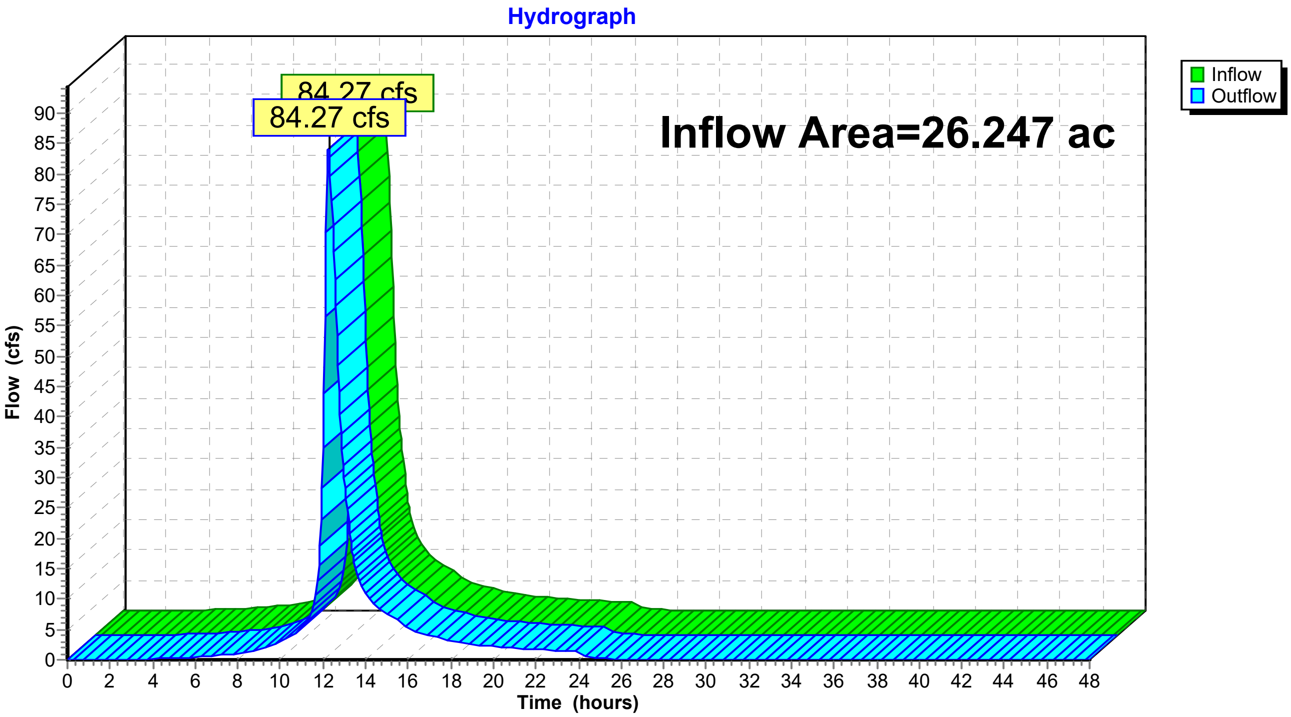
Summary for Reach 4R: ANALYSIS POINT NO. 1

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

Inflow Area = 26.247 ac, 46.64% Impervious, Inflow Depth = 5.00" for Future 25-YR event
Inflow = 84.27 cfs @ 12.26 hrs, Volume= 10.946 af
Outflow = 84.27 cfs @ 12.26 hrs, Volume= 10.946 af, Atten= 0%, Lag= 0.0 min

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

Reach 4R: ANALYSIS POINT NO. 1



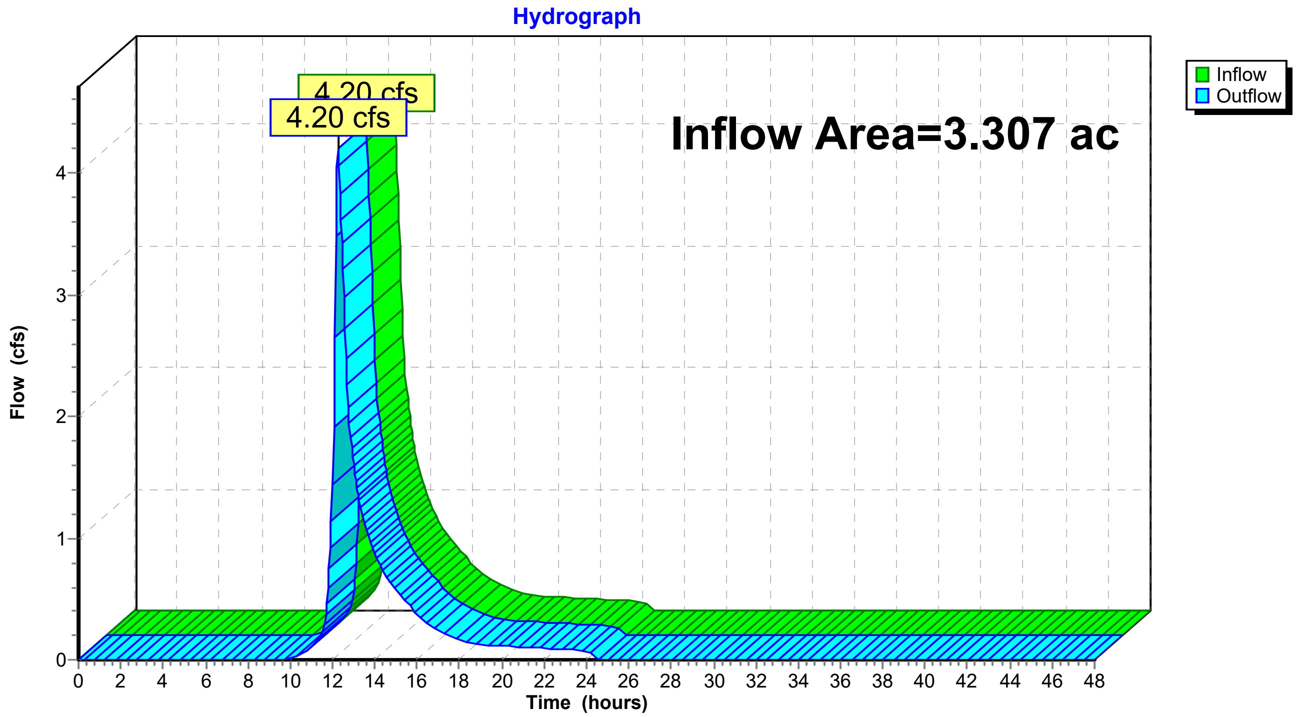
Summary for Reach 6R: ANALYSIS POINT No. 2

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

Inflow Area = 3.307 ac, 29.63% Impervious, Inflow Depth = 2.02" for Future 25-YR event
Inflow = 4.20 cfs @ 12.25 hrs, Volume= 0.556 af
Outflow = 4.20 cfs @ 12.25 hrs, Volume= 0.556 af, Atten= 0%, Lag= 0.0 min

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

Reach 6R: ANALYSIS POINT No. 2



Summary for Pond 7P: Detention Basin F-3

Inflow Area = 3.485 ac, 76.85% Impervious, Inflow Depth = 6.37" for Future 25-YR event
Inflow = 17.72 cfs @ 12.22 hrs, Volume= 1.851 af
Outflow = 13.79 cfs @ 12.36 hrs, Volume= 1.851 af, Atten= 22%, Lag= 8.4 min
Primary = 13.79 cfs @ 12.36 hrs, Volume= 1.851 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 160.91' @ 12.36 hrs Surf.Area= 8,075 sf Storage= 10,310 cf

Plug-Flow detention time= 12.5 min calculated for 1.849 af (100% of inflow)
Center-of-Mass det. time= 12.5 min (797.2 - 784.7)

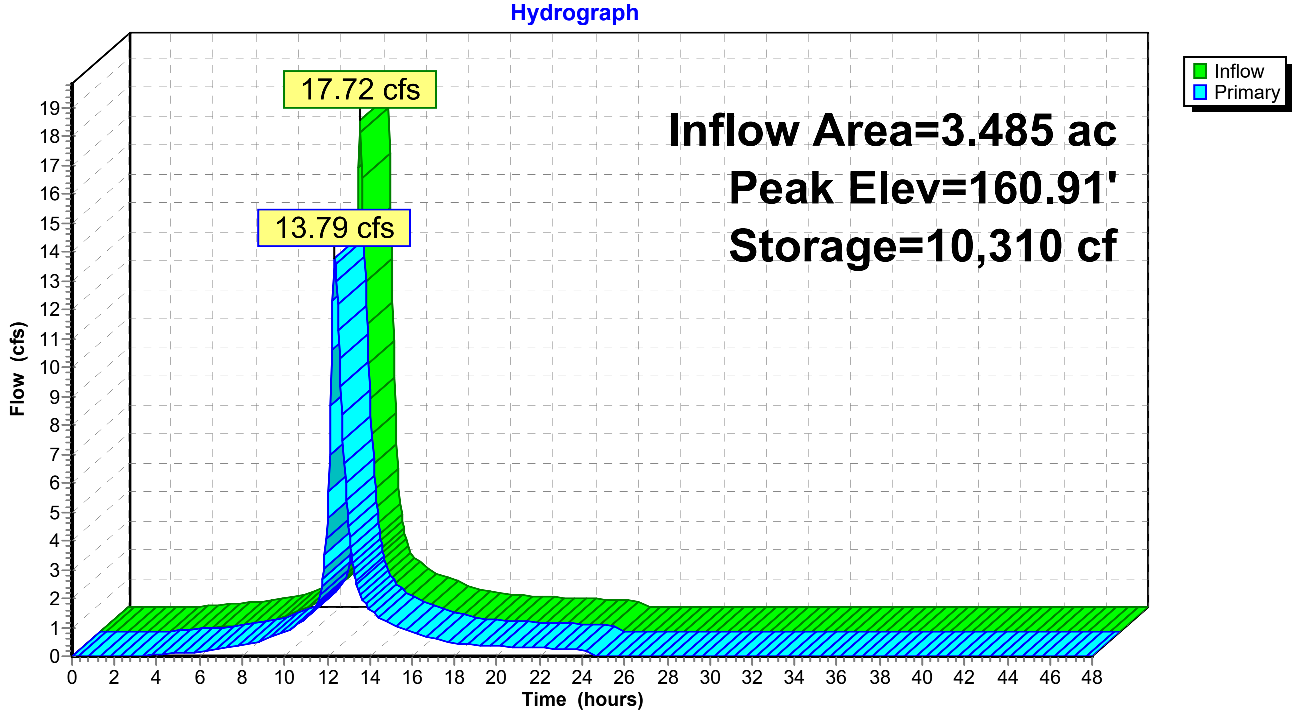
Volume	Invert	Avail.Storage	Storage Description
#1	159.00'	25,382 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.00	1	0	0
159.50	4,101	1,026	1,026
160.00	6,508	2,652	3,678
162.00	9,953	16,461	20,139
162.50	11,018	5,243	25,382

Device	Routing	Invert	Outlet Devices
#1	Device 3	156.00'	**18.0" Round Culvert** L= 110.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 156.00' / 153.00' S= 0.0273 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	159.00'	**45.0 deg x 1.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#3	Primary	155.67'	**18.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=13.76 cfs @ 12.36 hrs HW=160.91' (Free Discharge)
└─**3=Level Spreader Riser** (Passes 13.76 cfs of 19.47 cfs potential flow)
  └─**1=Culvert** (Passes 13.76 cfs of 17.32 cfs potential flow)
    └─**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 13.76 cfs @ 4.03 fps)

Pond 7P: Detention Basin F-3



Summary for Pond 11P: Infiltration Basin R-1

Inflow Area = 1.769 ac, 55.40% Impervious, Inflow Depth = 4.31" for Future 25-YR event
Inflow = 6.32 cfs @ 12.15 hrs, Volume= 0.636 af
Outflow = 1.39 cfs @ 12.67 hrs, Volume= 0.636 af, Atten= 78%, Lag= 30.9 min
Discarded = 0.38 cfs @ 12.67 hrs, Volume= 0.472 af
Primary = 1.01 cfs @ 12.67 hrs, Volume= 0.164 af
Routed to Reach 6R : ANALYSIS POINT No. 2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 171.38' @ 12.67 hrs Surf.Area= 6,750 sf Storage= 9,839 cf

Plug-Flow detention time= 135.7 min calculated for 0.635 af (100% of inflow)
Center-of-Mass det. time= 135.6 min (915.5 - 779.9)

Volume	Invert	Avail.Storage	Storage Description
#1	169.70'	14,244 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

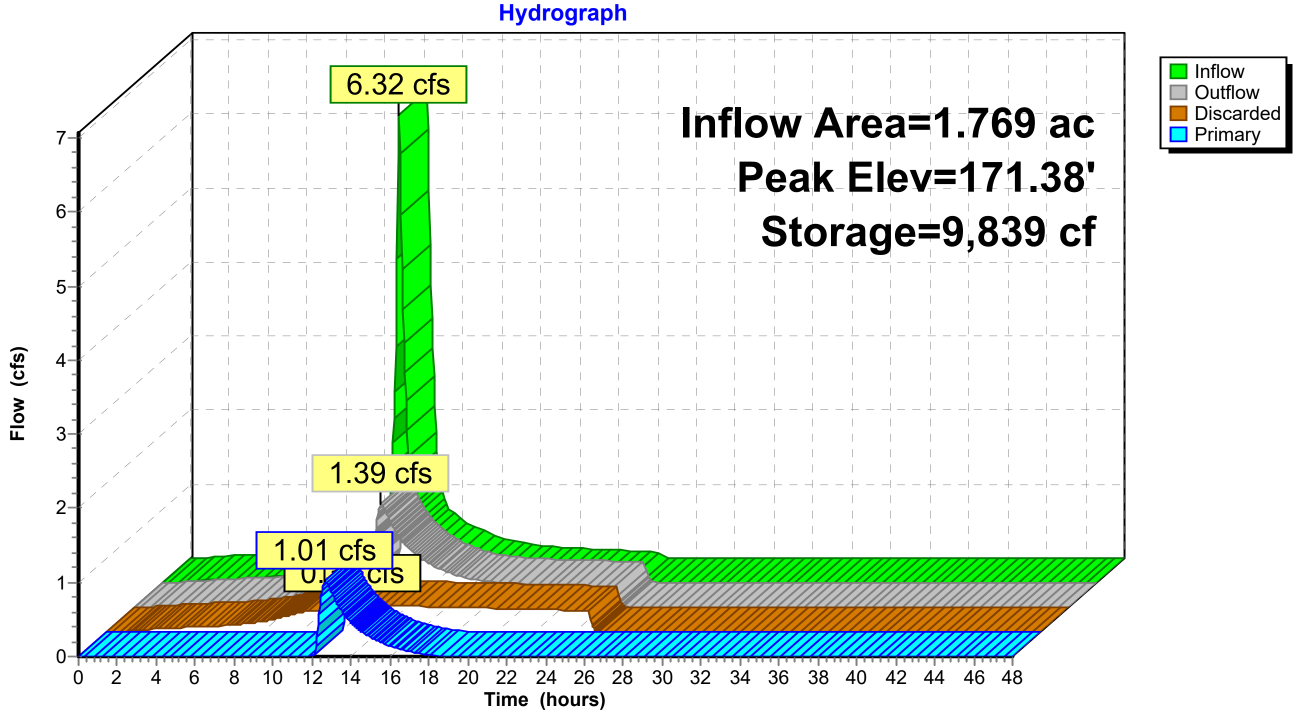
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
169.70	5,001	0	0	5,001
170.00	5,302	1,545	1,545	5,312
172.00	7,458	12,699	14,244	7,540

Device	Routing	Invert	Outlet Devices
#1	Primary	165.80'	**12.0" Round Culvert** L= 58.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 165.80' / 162.00' S= 0.0655 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	169.70'	**2.410 in/hr Exfiltration over Wetted area**
#3	Device 1	170.40'	**45.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.38 cfs @ 12.67 hrs HW=171.38' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.38 cfs)

Primary OutFlow Max=1.01 cfs @ 12.67 hrs HW=171.38' (Free Discharge)
└─**1=Culvert** (Passes 1.01 cfs of 8.52 cfs potential flow)
  └─**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 1.01 cfs @ 2.53 fps)

Pond 11P: Infiltration Basin R-1



Summary for Pond 12P: Detention Basin R-3

Inflow Area = 3.287 ac, 67.42% Impervious, Inflow Depth = 6.53" for Future 25-YR event
Inflow = 19.20 cfs @ 12.16 hrs, Volume= 1.788 af
Outflow = 8.19 cfs @ 12.45 hrs, Volume= 1.788 af, Atten= 57%, Lag= 17.4 min
Primary = 8.19 cfs @ 12.45 hrs, Volume= 1.788 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 163.19' @ 12.45 hrs Surf.Area= 6,417 sf Storage= 16,076 cf

Plug-Flow detention time= 28.3 min calculated for 1.788 af (100% of inflow)
Center-of-Mass det. time= 28.0 min (804.3 - 776.3)

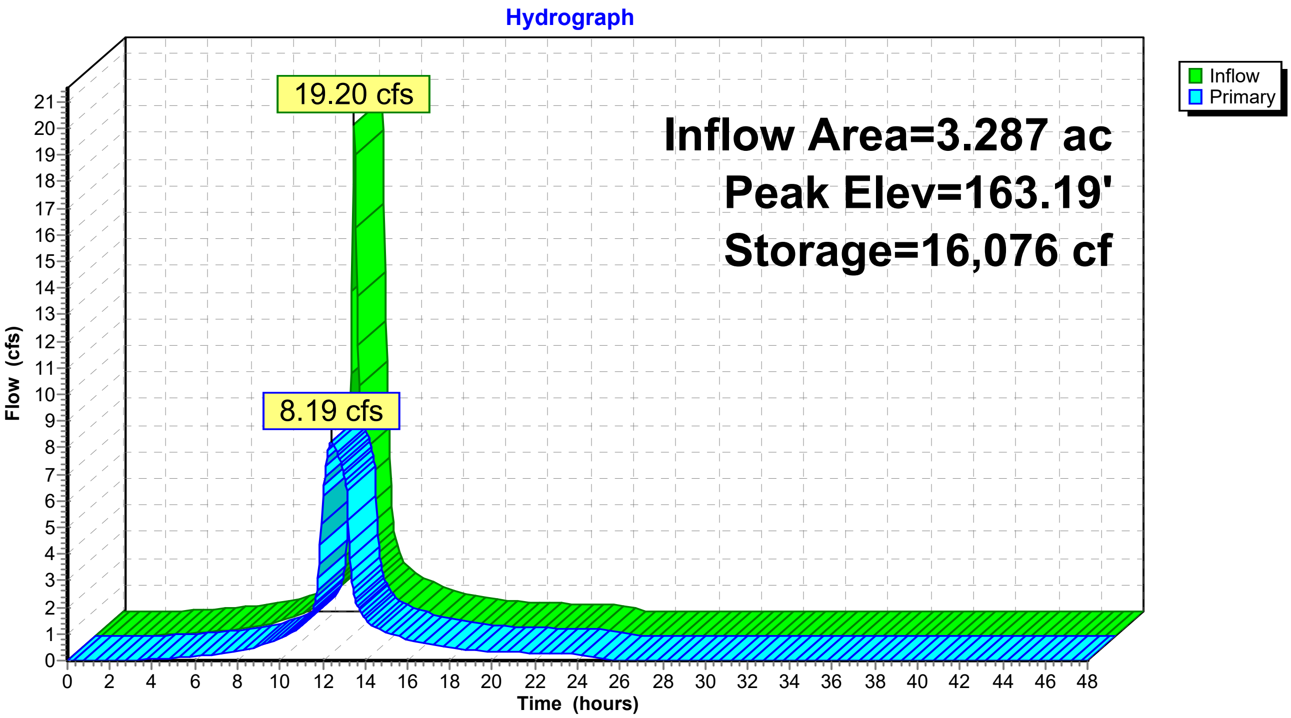
Volume	Invert	Avail.Storage	Storage Description
#1	159.80'	25,303 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.80	200	0	0
160.00	3,502	370	370
162.00	5,243	8,745	9,115
164.00	7,209	12,452	21,567
164.50	7,736	3,736	25,303

Device	Routing	Invert	Outlet Devices
#1	Device 3	158.00'	**12.0" Round Culvert** L= 85.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.00' / 144.00' S= 0.1647 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	159.80'	**45.0 deg x 0.5' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#3	Primary	150.67'	**12.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=8.19 cfs @ 12.45 hrs HW=163.19' (Free Discharge)
└─**3=Level Spreader Riser** (Passes 8.19 cfs of 13.38 cfs potential flow)
  └─**1=Culvert** (Inlet Controls 8.19 cfs @ 10.43 fps)
    └─**2=Sharp-Crested Vee/Trap Weir** (Passes 8.19 cfs of 32.49 cfs potential flow)

Pond 12P: Detention Basin R-3



Summary for Pond 13P: Detention Basin R-2

Inflow Area = 2.614 ac, 60.00% Impervious, Inflow Depth = 6.41" for Future 25-YR event
Inflow = 15.45 cfs @ 12.15 hrs, Volume= 1.396 af
Outflow = 11.68 cfs @ 12.26 hrs, Volume= 1.396 af, Atten= 24%, Lag= 6.4 min
Primary = 11.68 cfs @ 12.26 hrs, Volume= 1.396 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 162.87' @ 12.26 hrs Surf.Area= 6,399 sf Storage= 6,698 cf

Plug-Flow detention time= 8.1 min calculated for 1.395 af (100% of inflow)
Center-of-Mass det. time= 8.1 min (787.2 - 779.1)

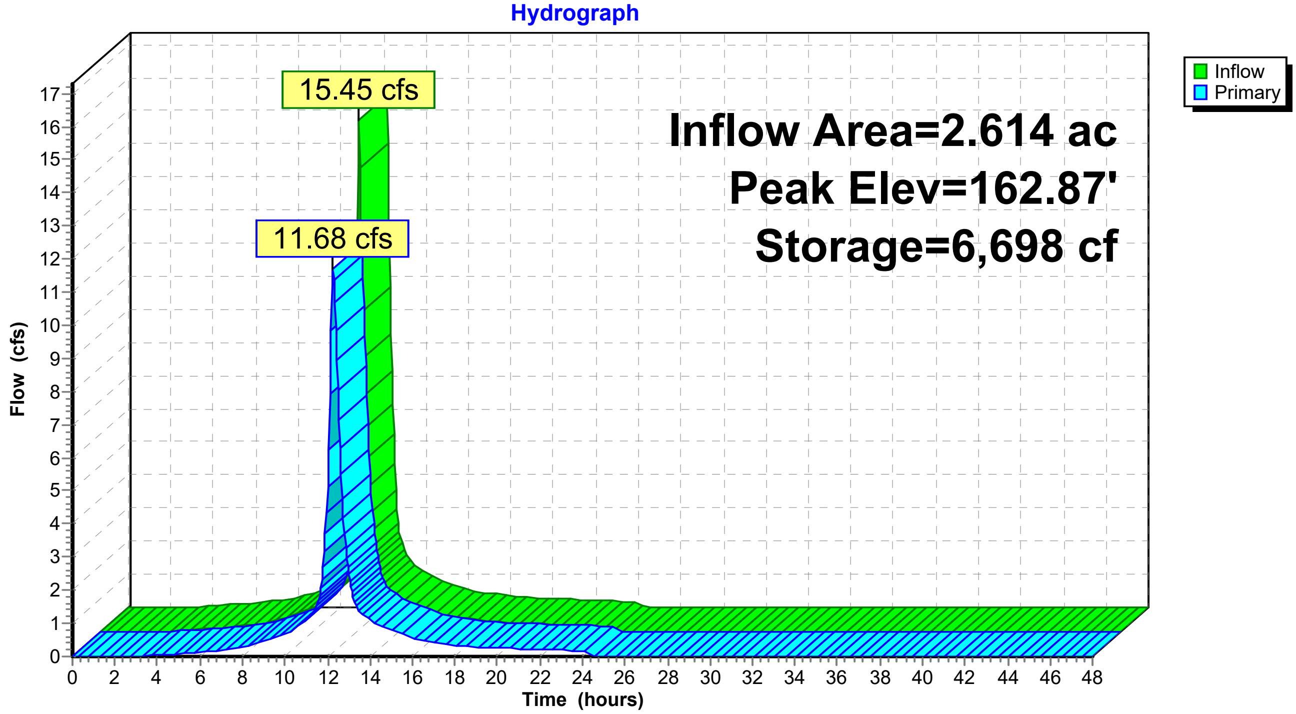
Volume	Invert	Avail.Storage	Storage Description
#1	161.50'	18,409 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
161.50	400	0	0
162.00	5,563	1,491	1,491
164.00	7,484	13,047	14,538
164.50	7,999	3,871	18,409

Device	Routing	Invert	Outlet Devices
#1	Device 3	152.00'	**12.0" Round Culvert** L= 78.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.00' / 141.00' S= 0.1410 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	161.50'	**2.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	143.17'	**12.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=11.64 cfs @ 12.26 hrs HW=162.87' (Free Discharge)
└─**3=Level Spreader Riser** (Passes 11.64 cfs of 16.78 cfs potential flow)
  └─**1=Culvert** (Passes 11.64 cfs of 12.18 cfs potential flow)
    └─**2=Sharp-Crested Rectangular Weir** (Weir Controls 11.64 cfs @ 3.82 fps)

Pond 13P: Detention Basin R-2



Summary for Pond 23P: Detention Basin F-2

Inflow Area = 2.347 ac, 72.38% Impervious, Inflow Depth = 6.29" for Future 25-YR event
Inflow = 14.06 cfs @ 12.14 hrs, Volume= 1.231 af
Outflow = 8.25 cfs @ 12.30 hrs, Volume= 1.110 af, Atten= 41%, Lag= 10.0 min
Primary = 8.25 cfs @ 12.30 hrs, Volume= 1.110 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 161.27' @ 12.30 hrs Surf.Area= 7,615 sf Storage= 19,146 cf

Plug-Flow detention time= 159.6 min calculated for 1.109 af (90% of inflow)
Center-of-Mass det. time= 113.2 min (894.8 - 781.6)

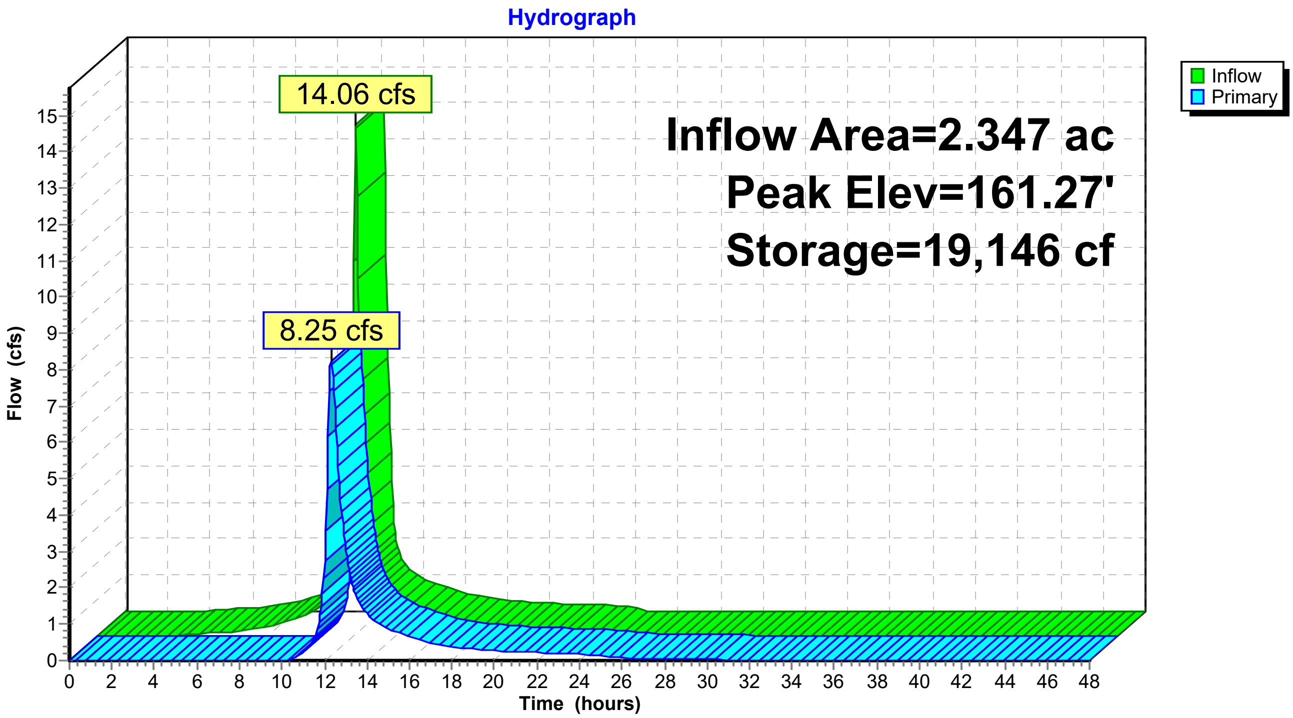
Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	29,366 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	4,222	0	0
160.00	6,163	10,385	10,385
162.00	8,447	14,610	24,995
162.50	9,035	4,371	29,366

Device	Routing	Invert	Outlet Devices
#1	Device 2	158.00'	**15.0" Round Culvert** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.00' / 155.00' S= 0.0375 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Primary	157.42'	**15.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads
#3	Device 1	159.00'	**45.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=8.24 cfs @ 12.30 hrs HW=161.27' (Free Discharge)
└─**2=Level Spreader Riser** (Passes 8.24 cfs of 11.59 cfs potential flow)
  └─**1=Culvert** (Passes 8.24 cfs of 9.61 cfs potential flow)
    └─**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 8.24 cfs @ 3.86 fps)

Pond 23P: Detention Basin F-2



Summary for Pond 26P: Infiltration Basin F-4

Inflow Area = 6.325 ac, 64.53% Impervious, Inflow Depth = 5.95" for Future 25-YR event
Inflow = 29.91 cfs @ 12.17 hrs, Volume= 3.133 af
Outflow = 17.48 cfs @ 12.44 hrs, Volume= 3.133 af, Atten= 42%, Lag= 16.2 min
Discarded = 0.55 cfs @ 12.44 hrs, Volume= 1.111 af
Primary = 16.93 cfs @ 12.44 hrs, Volume= 2.022 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 163.57' @ 12.44 hrs Surf.Area= 23,311 sf Storage= 45,111 cf

Plug-Flow detention time= 214.5 min calculated for 3.130 af (100% of inflow)
Center-of-Mass det. time= 215.4 min (1,007.8 - 792.4)

Volume	Invert	Avail.Storage	Storage Description
#1	161.00'	55,617 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

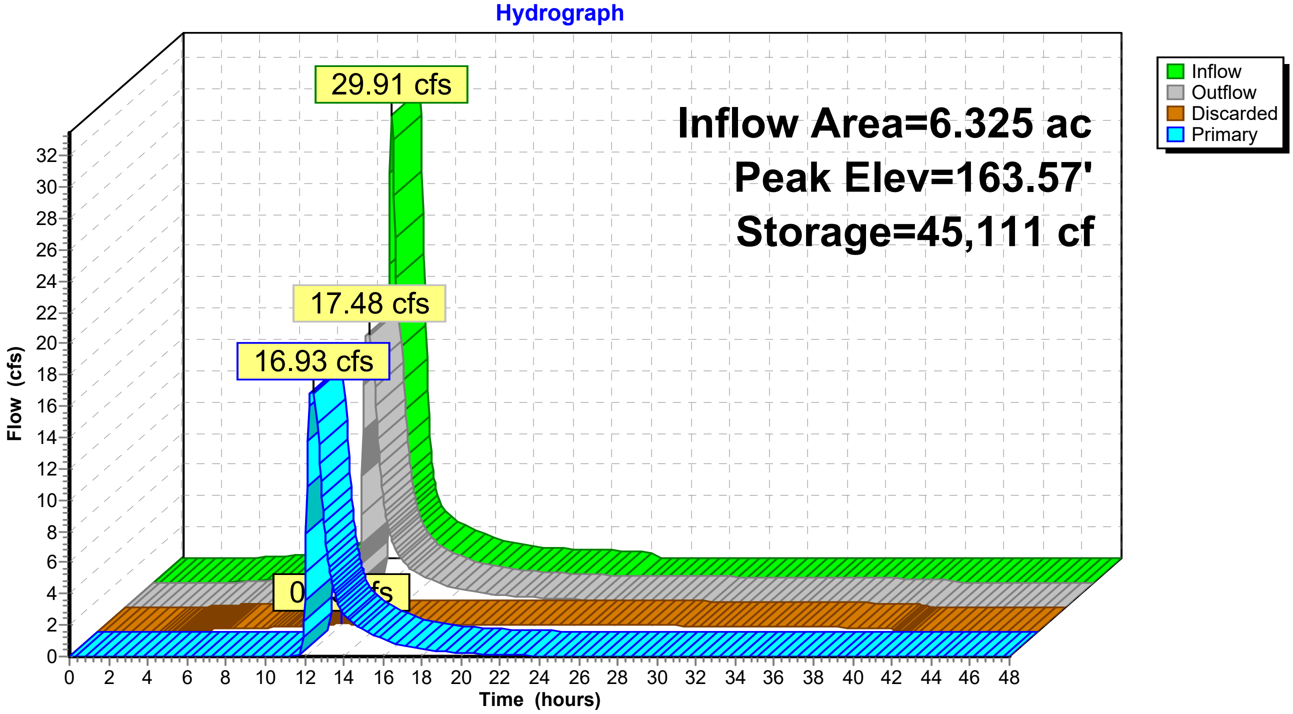
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
161.00	10,567	0	0	10,567
162.00	17,000	13,657	13,657	17,013
164.00	25,230	41,960	55,617	25,307

Device	Routing	Invert	Outlet Devices
#1	Device 4	158.00'	**18.0" Round Culvert** L= 221.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.00' / 153.00' S= 0.0226 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Discarded	161.00'	**1.020 in/hr Exfiltration over Wetted area**
#3	Device 1	162.40'	**5.0' long x 2.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	155.67'	**18.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.55 cfs @ 12.44 hrs HW=163.57' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.55 cfs)

Primary OutFlow Max=16.93 cfs @ 12.44 hrs HW=163.57' (Free Discharge)
└─**4=Level Spreader Riser** (Passes 16.93 cfs of 23.91 cfs potential flow)
  └─**1=Culvert** (Outlet Controls 16.93 cfs @ 9.58 fps)
    └─**3=Sharp-Crested Rectangular Weir** (Passes 16.93 cfs of 19.62 cfs potential flow)

Pond 26P: Infiltration Basin F-4



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

Subcatchment 6S: POST-SUB No. 1D Runoff Area=87,909 sf 70.36% Impervious Runoff Depth=7.20"
Flow Length=411' Tc=15.4 min CN=89 Runoff=12.00 cfs 1.210 af

Subcatchment 8S: POST SUB 3C Runoff Area=34,500 sf 100.00% Impervious Runoff Depth=8.28"
Tc=10.0 min CN=98 Runoff=5.74 cfs 0.546 af

Subcatchment 14S: POST-SUB No 3B Runoff Area=67,024 sf 0.00% Impervious Runoff Depth=3.85"
Flow Length=760' Tc=15.8 min CN=61 Runoff=5.07 cfs 0.493 af

Subcatchment 15S: POST-SUB No 3A Runoff Area=42,540 sf 19.23% Impervious Runoff Depth=2.57"
Flow Length=158' Slope=0.0100 '/' Tc=14.2 min CN=50 Runoff=2.10 cfs 0.209 af

Subcatchment 16S: POST-SUB No. 2A Runoff Area=158,671 sf 0.00% Impervious Runoff Depth=5.27"
Flow Length=180' Tc=14.2 min CN=73 Runoff=17.27 cfs 1.601 af

Subcatchment 17S: POST-SUB No. 2B Runoff Area=143,182 sf 67.42% Impervious Runoff Depth=7.56"
Flow Length=221' Tc=11.8 min CN=92 Runoff=22.06 cfs 2.070 af

Subcatchment 18S: POST-SUB No. 2C Runoff Area=113,851 sf 60.00% Impervious Runoff Depth=7.44"
Flow Length=205' Tc=11.0 min CN=91 Runoff=17.77 cfs 1.620 af

Subcatchment 19S: POST-SUB No. 2D Runoff Area=24,504 sf 0.00% Impervious Runoff Depth=5.87"
Flow Length=333' Tc=19.2 min CN=78 Runoff=2.63 cfs 0.275 af

Subcatchment 22S: POST-SUB No. 1C Runoff Area=102,217 sf 72.38% Impervious Runoff Depth=7.32"
Tc=10.0 min CN=90 Runoff=16.21 cfs 1.431 af

Subcatchment 24S: POST-SUB No. 1A Runoff Area=38,417 sf 0.00% Impervious Runoff Depth=5.51"
Flow Length=800' Tc=22.3 min CN=75 Runoff=3.65 cfs 0.405 af

Subcatchment 25S: POST-SUB-No. 1E Runoff Area=114,681 sf 82.66% Impervious Runoff Depth=7.56"
Flow Length=869' Tc=17.9 min CN=92 Runoff=15.17 cfs 1.658 af

Subcatchment 27S: POST-SUB No. 1A-A Runoff Area=173,610 sf 0.00% Impervious Runoff Depth=4.56"
Flow Length=342' Tc=14.3 min CN=67 Runoff=16.31 cfs 1.513 af

Subcatchment 28S: Post Sub No 1F Runoff Area=122,407 sf 67.79% Impervious Runoff Depth=6.84"
Tc=10.0 min CN=86 Runoff=18.60 cfs 1.601 af

Subcatchment 29S: POST SUB NO 1G Runoff Area=63,889 sf 85.79% Impervious Runoff Depth=7.68"
Flow Length=885' Tc=18.0 min CN=93 Runoff=8.49 cfs 0.939 af

Reach 4R: ANALYSIS POINT NO. 1 Inflow=96.03 cfs 13.062 af
Outflow=96.03 cfs 13.062 af

Reach 6R: ANALYSIS POINT No. 2 Inflow=5.69 cfs 0.743 af
Outflow=5.69 cfs 0.743 af

Pond 7P: Detention Basin F-3 Peak Elev=161.07' Storage=11,641 cf Inflow=20.42 cfs 2.149 af
Outflow=16.09 cfs 2.149 af

Pond 11P: Infiltration Basin R-1 Peak Elev=171.61' Storage=11,450 cf Inflow=7.57 cfs 0.756 af
Discarded=0.39 cfs 0.506 af Primary=1.72 cfs 0.250 af Outflow=2.12 cfs 0.756 af

Pond 12P: Detention Basin R-3 Peak Elev=163.72' Storage=19,583 cf Inflow=22.06 cfs 2.070 af
Outflow=8.64 cfs 2.070 af

Pond 13P: Detention Basin R-2 Peak Elev=163.07' Storage=7,979 cf Inflow=17.77 cfs 1.620 af
Outflow=12.29 cfs 1.620 af

Pond 23P: Detention Basin F-2 Peak Elev=161.46' Storage=20,575 cf Inflow=16.21 cfs 1.431 af
Outflow=9.90 cfs 1.310 af

Pond 26P: Infiltration Basin F-4 Peak Elev=163.87' Storage=52,265 cf Inflow=34.73 cfs 3.664 af
Discarded=0.58 cfs 1.141 af Primary=17.25 cfs 2.523 af Outflow=17.83 cfs 3.664 af

Total Runoff Area = 29.555 ac Runoff Volume = 15.573 af Average Runoff Depth = 6.32"
55.26% Pervious = 16.333 ac 44.74% Impervious = 13.222 ac

Summary for Subcatchment 6S: POST-SUB No. 1D

[47] Hint: Peak is 263% of capacity of segment #4

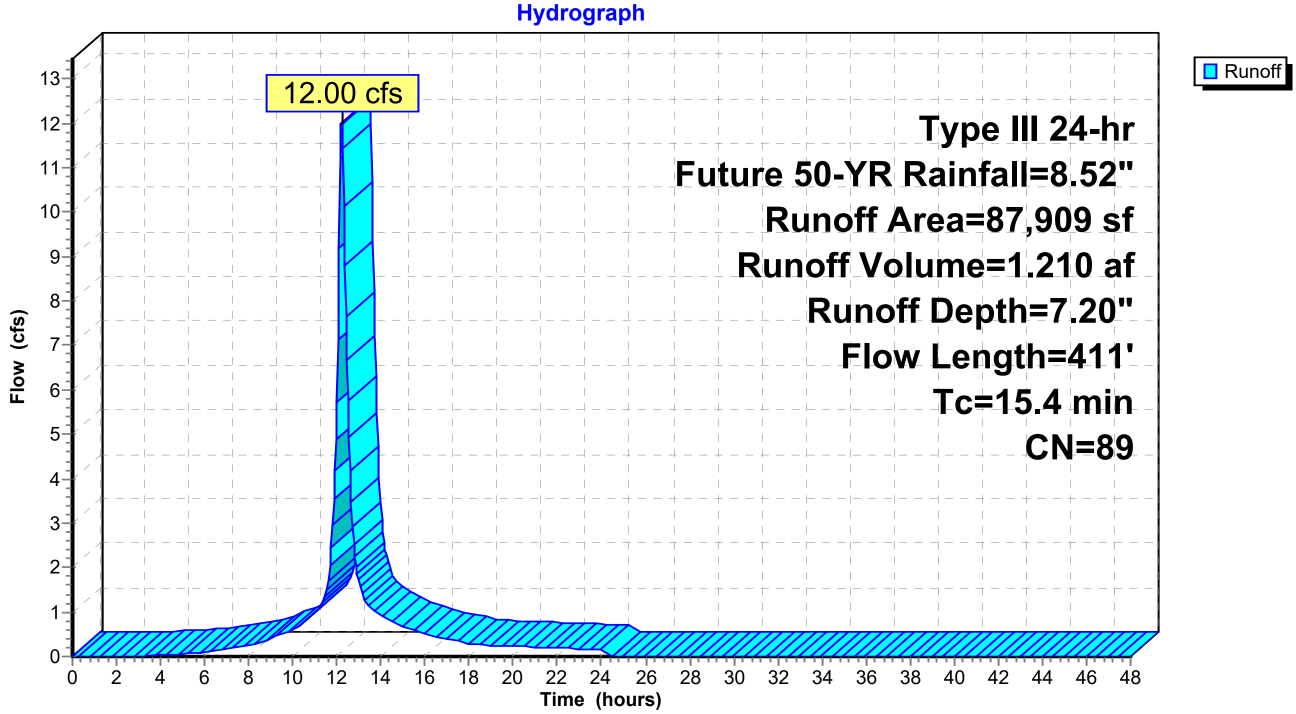
Runoff = 12.00 cfs @ 12.20 hrs, Volume= 1.210 af, Depth= 7.20"
Routed to Pond 7P : Detention Basin F-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 50-YR Rainfall=8.52"

	Area (sf)	CN	Description
*	4,000	98	Building Roofs
*	10,503	98	Detention Basin
*	47,347	98	Pavement and Walks
	7,767	80	>75% Grass cover, Good, HSG D
	18,292	61	>75% Grass cover, Good, HSG B
	87,909	89	Weighted Average
	26,059		29.64% Pervious Area
	61,850		70.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.6	55	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.2	40	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	216	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
15.4	411	Total			

Subcatchment 6S: POST-SUB No. 1D



Summary for Subcatchment 8S: POST SUB 3C Building 2, 3 and 4

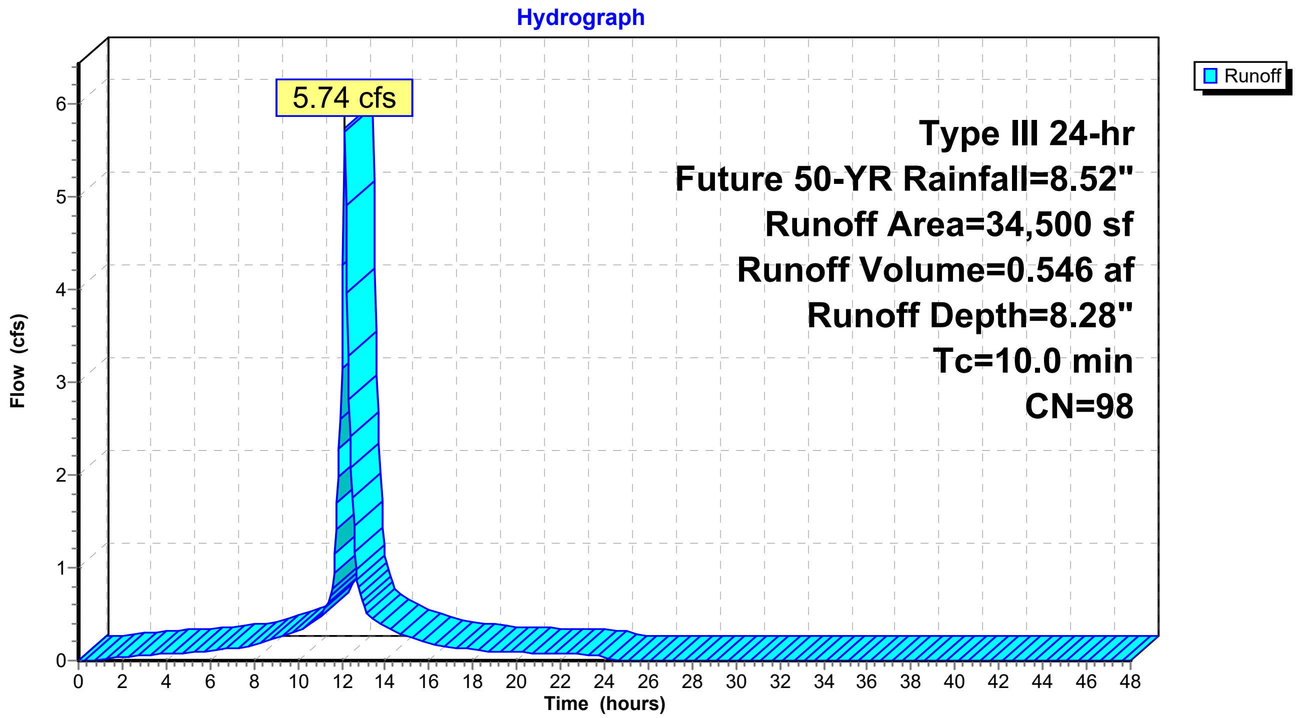
Runoff = 5.74 cfs @ 12.14 hrs, Volume= 0.546 af, Depth= 8.28"
Routed to Pond 11P : Infiltration Basin R-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 50-YR Rainfall=8.52"

	Area (sf)	CN	Description
*	34,500	98	Building Roof
	0	80	>75% Grass cover, Good, HSG D
	34,500	98	Weighted Average
	34,500		100.00% Impervious Area

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

Subcatchment 8S: POST SUB 3C Building 2, 3 and 4



Summary for Subcatchment 14S: POST-SUB No 3B

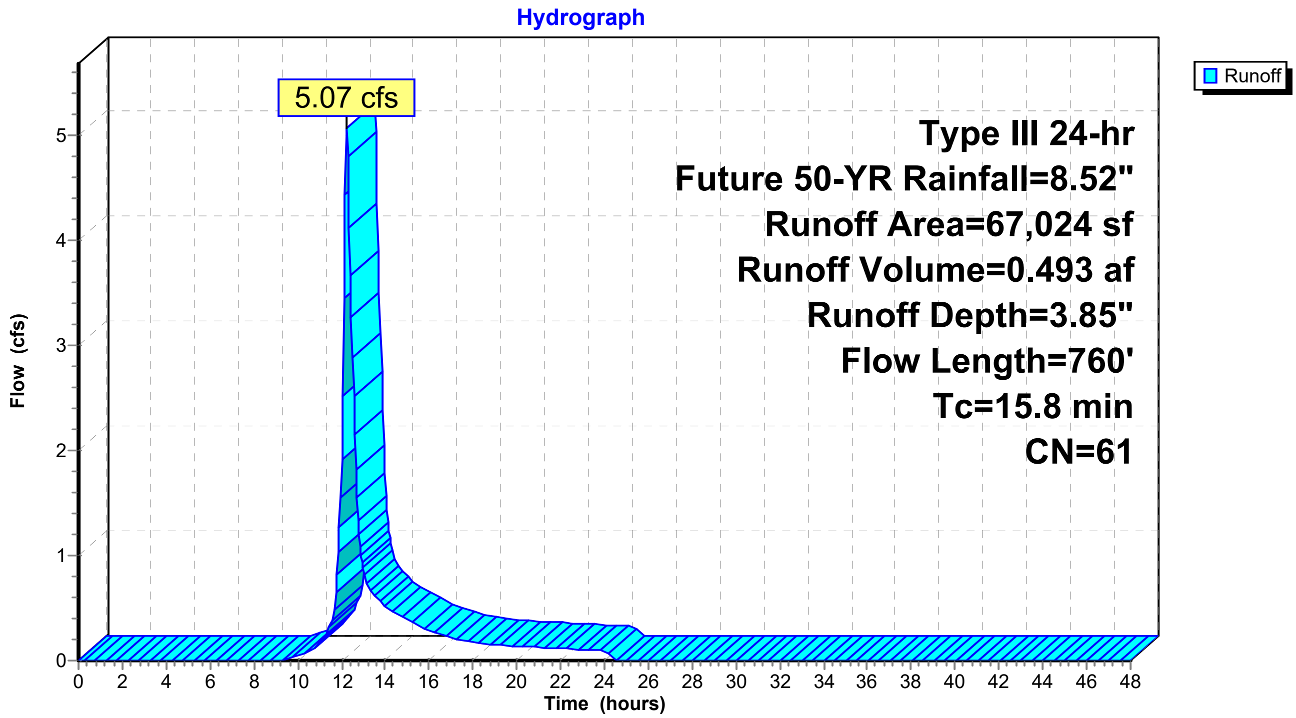
Runoff = 5.07 cfs @ 12.22 hrs, Volume= 0.493 af, Depth= 3.85"
Routed to Reach 6R : ANALYSIS POINT No. 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 50-YR Rainfall=8.52"

Area (sf)	CN	Description
28,004	73	Brush, Good, HSG D
19,012	30	Woods, Good, HSG A
4,184	77	Woods, Good, HSG D
3,089	39	>75% Grass cover, Good, HSG A
12,735	80	>75% Grass cover, Good, HSG D
67,024	61	Weighted Average
67,024		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.6	200	0.0200	2.12		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.6	460	0.0650	12.11	60.55	**Channel Flow,** Area= 5.0 sf Perim= 7.0' r= 0.71' n= 0.025 Earth, clean & winding
15.8	760	Total			

Subcatchment 14S: POST-SUB No 3B



Summary for Subcatchment 15S: POST-SUB No 3A

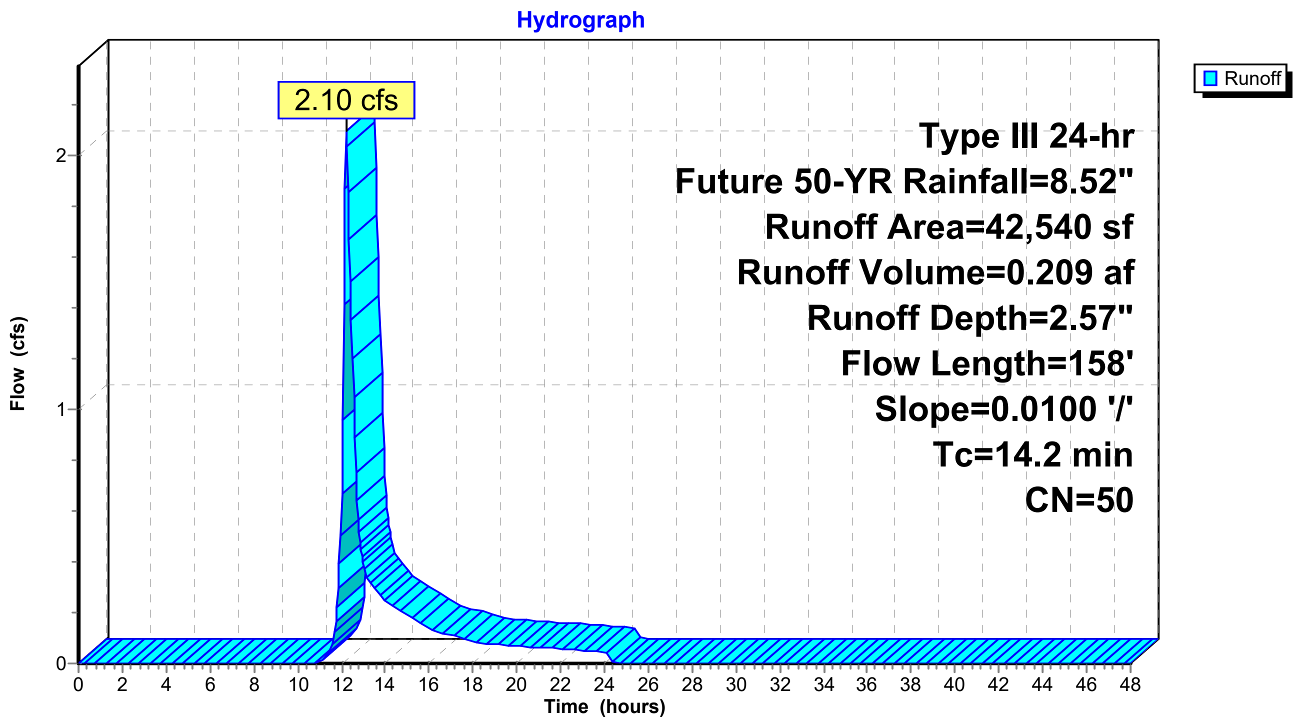
Runoff = 2.10 cfs @ 12.22 hrs, Volume= 0.209 af, Depth= 2.57"
Routed to Pond 11P : Infiltration Basin R-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 50-YR Rainfall=8.52"

	Area (sf)	CN	Description
	0	49	50-75% Grass cover, Fair, HSG A
	34,361	39	>75% Grass cover, Good, HSG A
*	8,179	98	Basin
	42,540	50	Weighted Average
	34,361		80.77% Pervious Area
	8,179		19.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.6	58	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.2	158	Total			

Subcatchment 15S: POST-SUB No 3A



Summary for Subcatchment 16S: POST-SUB No. 2A

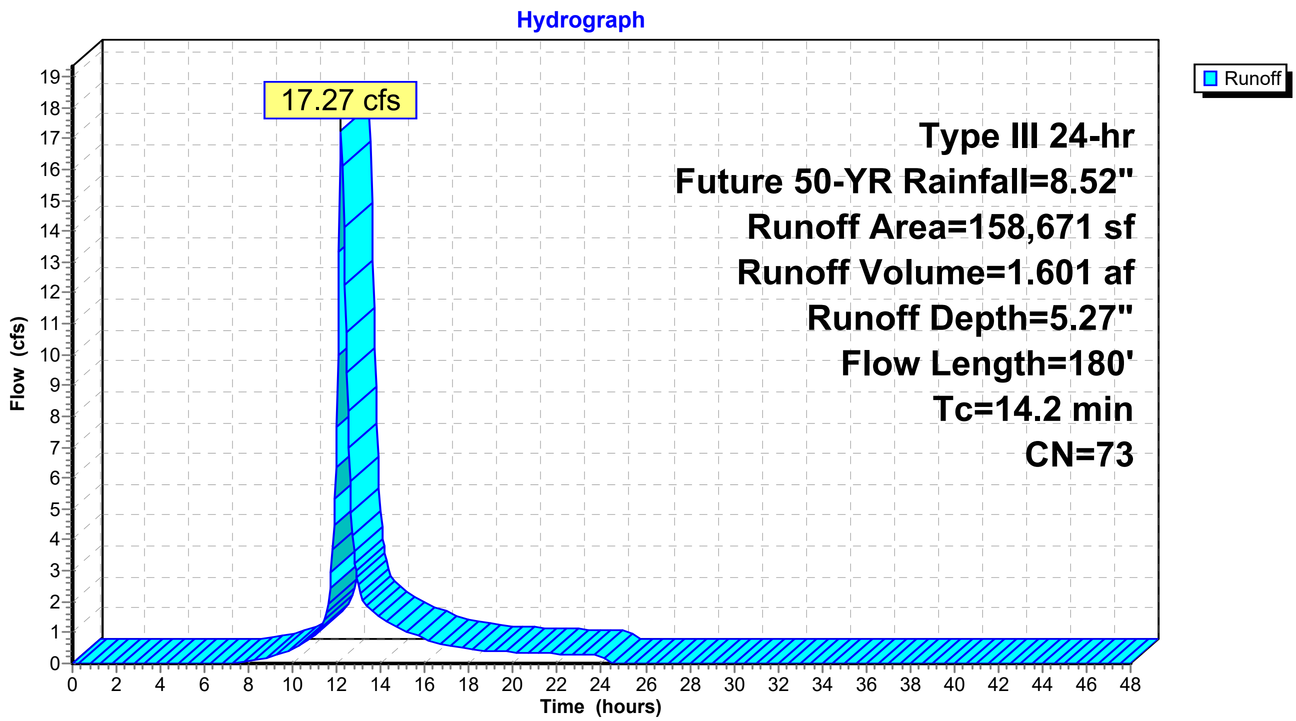
Runoff = 17.27 cfs @ 12.20 hrs, Volume= 1.601 af, Depth= 5.27"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 50-YR Rainfall=8.52"

	Area (sf)	CN	Description
	93,385	77	Woods, Good, HSG D
	46,536	80	>75% Grass cover, Good, HSG D
	0	32	Woods/grass comb., Good, HSG A
*	18,750	39	>75% Grass cover, Good, HSG A
	158,671	73	Weighted Average
	158,671		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.6	80	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.2	180	Total			

Subcatchment 16S: POST-SUB No. 2A



Summary for Subcatchment 17S: POST-SUB No. 2B

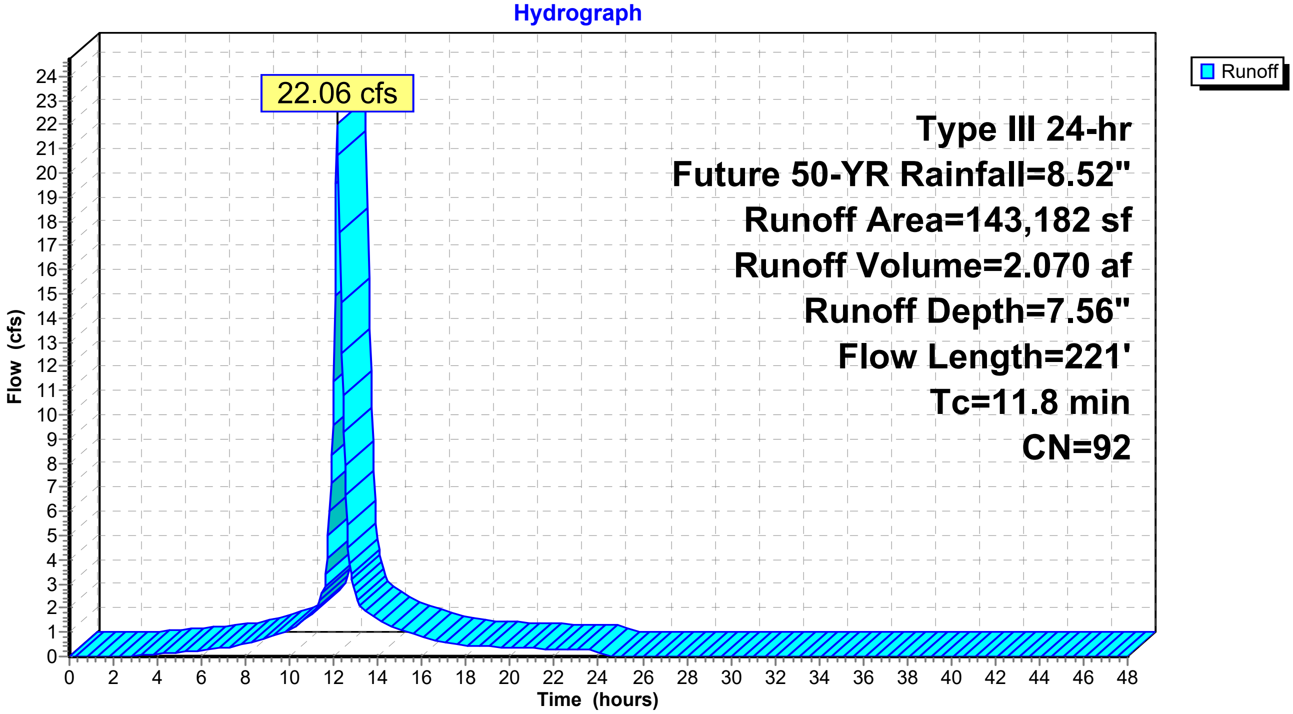
Runoff = 22.06 cfs @ 12.16 hrs, Volume= 2.070 af, Depth= 7.56"
Routed to Pond 12P : Detention Basin R-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 50-YR Rainfall=8.52"

	Area (sf)	CN	Description
*	39,478	98	Building Roofs
*	50,310	98	Pavement and Walks
*	6,744	98	Detention Basin
	46,650	80	>75% Grass cover, Good, HSG D
	143,182	92	Weighted Average
	46,650		32.58% Pervious Area
	96,532		67.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	90	0.0190	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.4	10	0.0300	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.1	30	0.0850	4.37		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.6	91	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.8	221	Total			

Subcatchment 17S: POST-SUB No. 2B



Summary for Subcatchment 18S: POST-SUB No. 2C

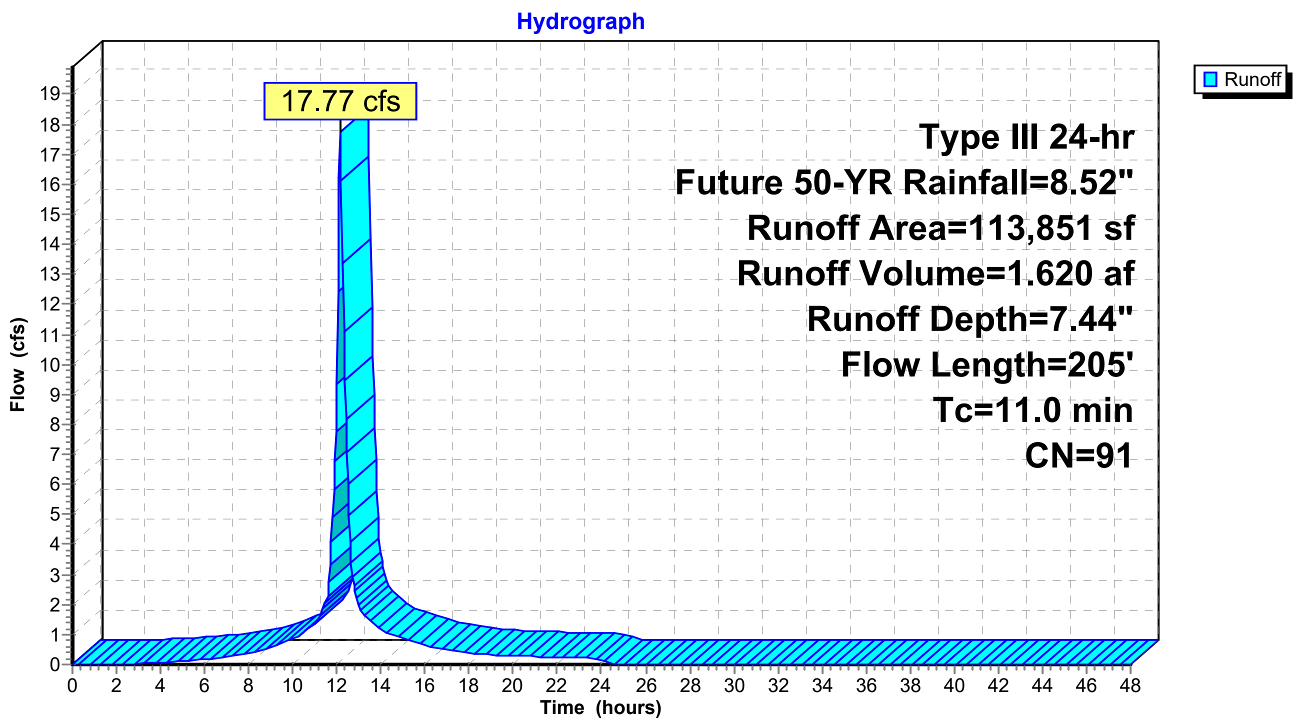
Runoff = 17.77 cfs @ 12.15 hrs, Volume= 1.620 af, Depth= 7.44"
Routed to Pond 13P : Detention Basin R-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 50-YR Rainfall=8.52"

	Area (sf)	CN	Description
*	11,500	98	Building Roofs
*	6,502	98	Detention Basin
*	50,311	98	Pavement and Walks
	45,538	80	>75% Grass cover, Good, HSG D
	0	80	>75% Grass cover, Good, HSG D
	113,851	91	Weighted Average
	45,538		40.00% Pervious Area
	68,313		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.7	105	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.0	205	Total			

Subcatchment 18S: POST-SUB No. 2C



Summary for Subcatchment 19S: POST-SUB No. 2D

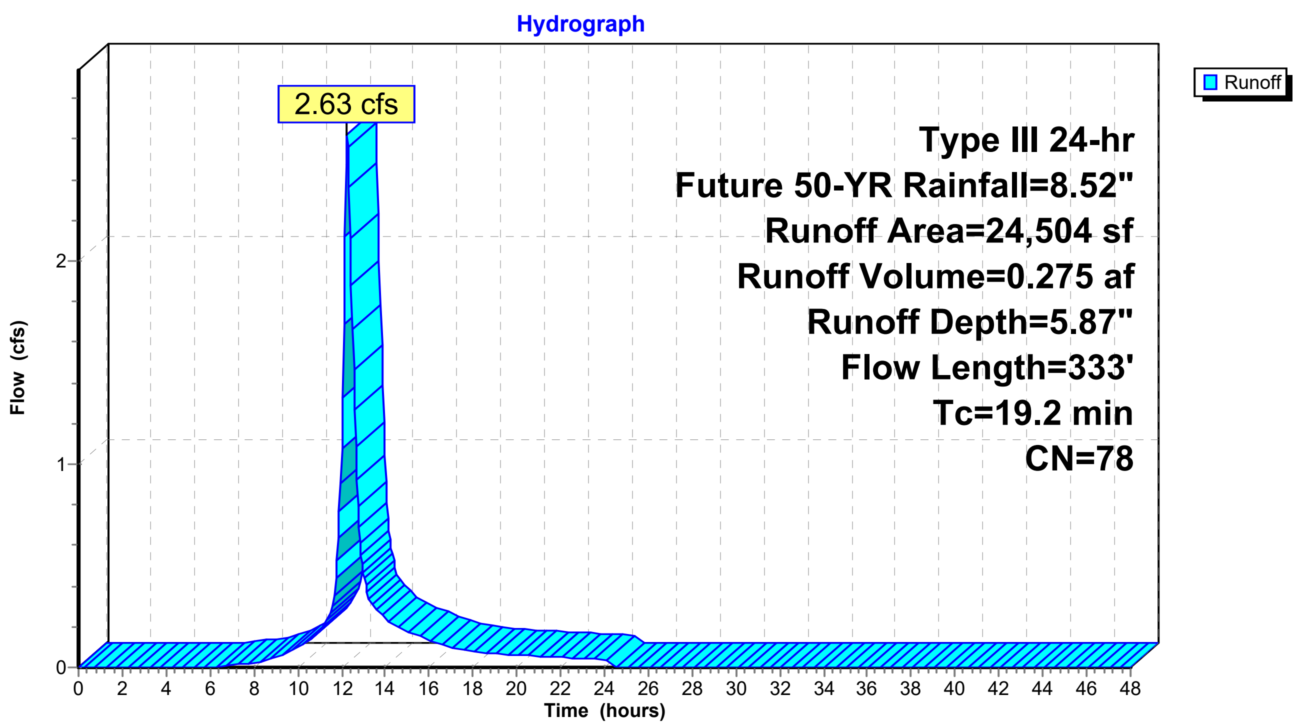
Runoff = 2.63 cfs @ 12.26 hrs, Volume= 0.275 af, Depth= 5.87"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 50-YR Rainfall=8.52"

Area (sf)	CN	Description
14,488	77	Woods, Good, HSG D
10,016	80	>75% Grass cover, Good, HSG D
24,504	78	Weighted Average
24,504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.5	100	0.0330	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.90"
0.7	233	0.1200	5.20		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
19.2	333	Total			

Subcatchment 19S: POST-SUB No. 2D



Summary for Subcatchment 22S: POST-SUB No. 1C

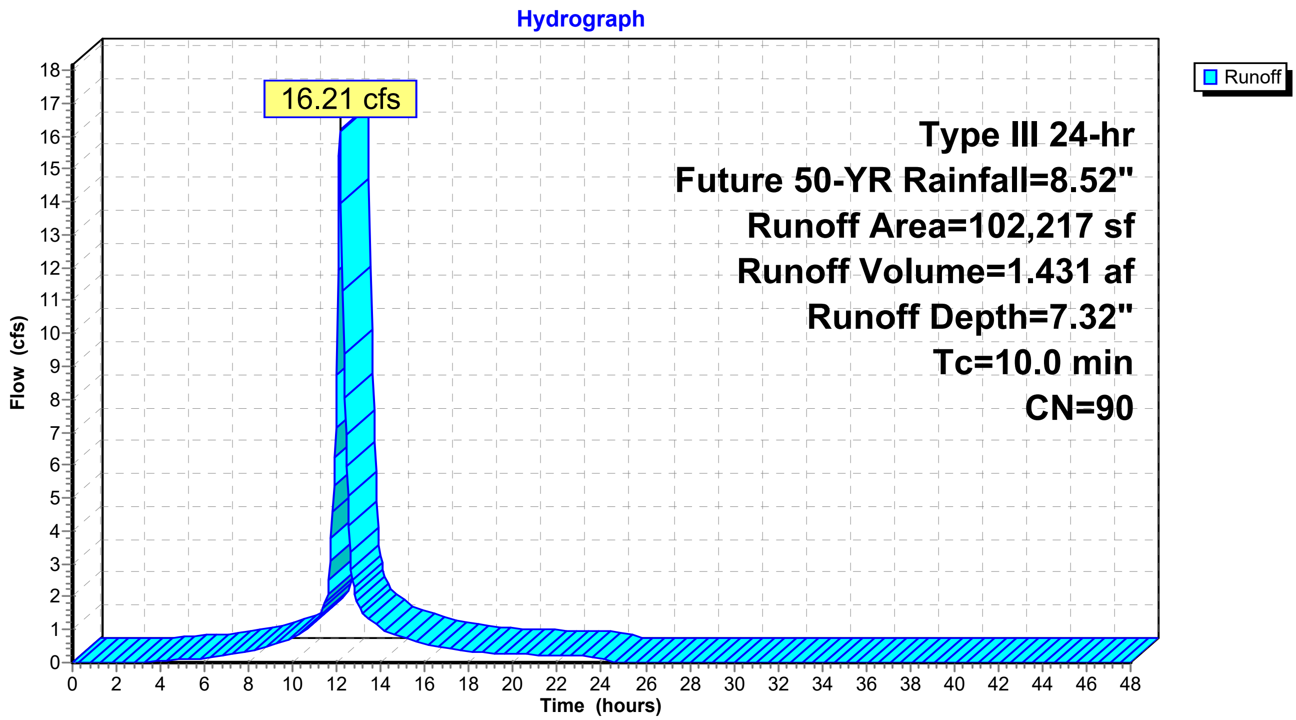
Runoff = 16.21 cfs @ 12.14 hrs, Volume= 1.431 af, Depth= 7.32"
Routed to Pond 23P : Detention Basin F-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 50-YR Rainfall=8.52"

	Area (sf)	CN	Description
*	16,090	98	Building Roofs
*	52,636	98	Pavement and Walks
*	5,255	98	Detention Basin
	14,731	61	>75% Grass cover, Good, HSG B
	13,505	80	>75% Grass cover, Good, HSG D
	102,217	90	Weighted Average
	28,236		27.62% Pervious Area
	73,981		72.38% Impervious Area

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

Subcatchment 22S: POST-SUB No. 1C



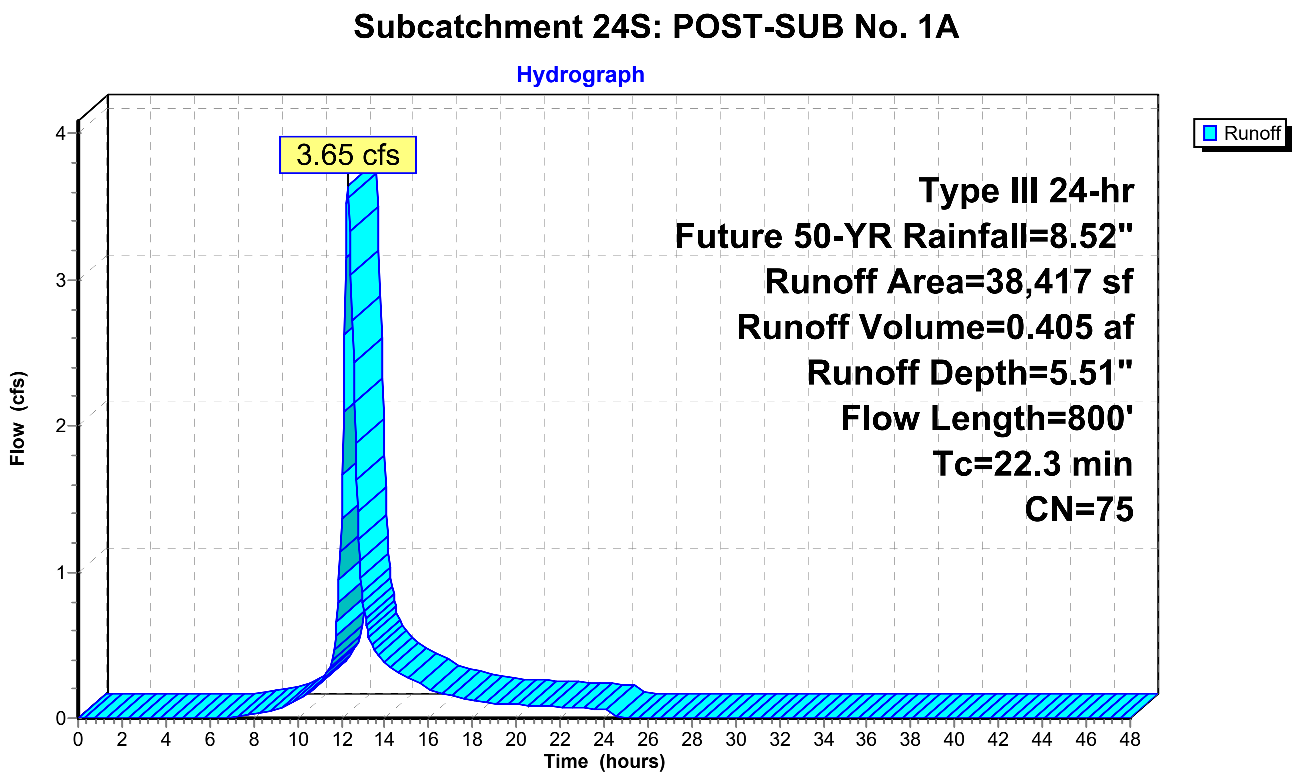
Summary for Subcatchment 24S: POST-SUB No. 1A

Runoff = 3.65 cfs @ 12.31 hrs, Volume= 0.405 af, Depth= 5.51"
Routed to Pond 26P : Infiltration Basin F-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 50-YR Rainfall=8.52"

	Area (sf)	CN	Description
	23,572	77	Woods, Good, HSG D
	0	73	Woods/grass comb., Poor, HSG B
*	14,845	71	>75% grass cover, Good, HSG B
	38,417	75	Weighted Average
	38,417		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0150	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.90"
5.5	700	0.0200	2.12		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
22.3	800	Total			



Summary for Subcatchment 25S: POST-SUB-No. 1E

[47] Hint: Peak is 332% of capacity of segment #4

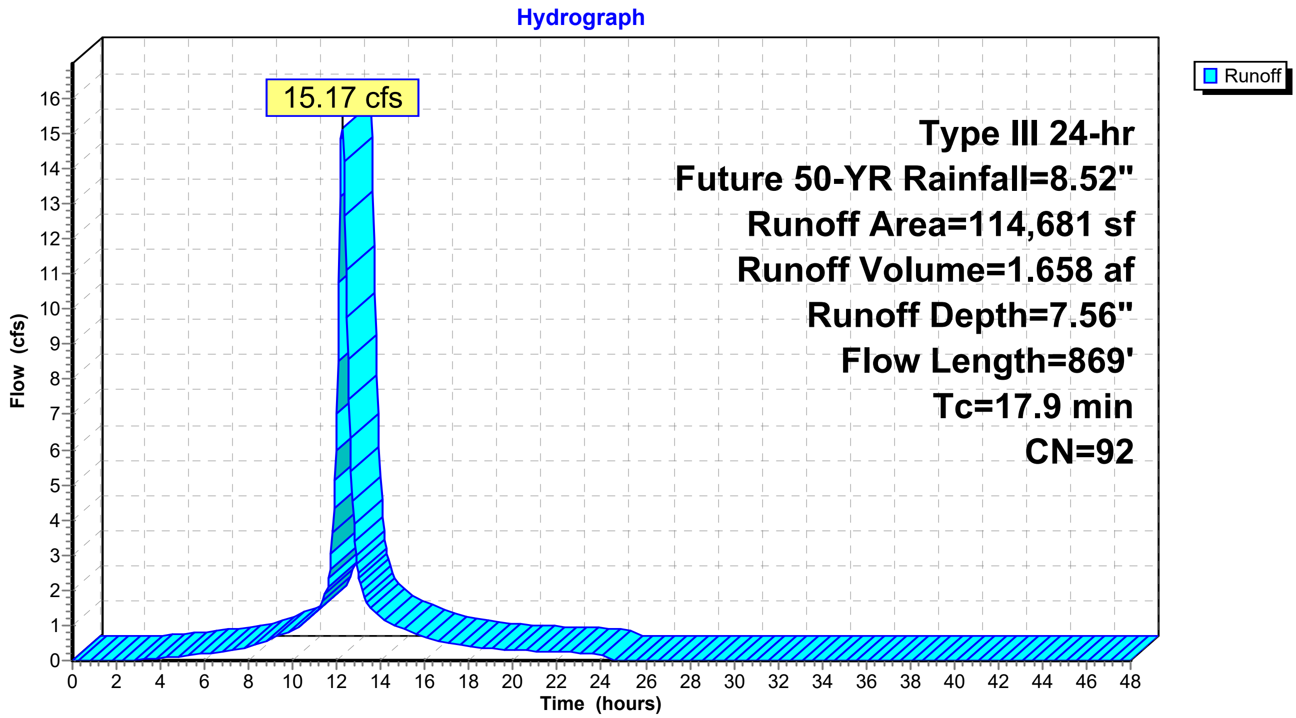
Runoff = 15.17 cfs @ 12.24 hrs, Volume= 1.658 af, Depth= 7.56"
Routed to Pond 26P : Infiltration Basin F-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 50-YR Rainfall=8.52"

	Area (sf)	CN	Description
*	28,932	98	Buildings
*	65,867	98	pavement and walks
	15,194	61	>75% Grass cover, Good, HSG B
	4,688	80	>75% Grass cover, Good, HSG D
	114,681	92	Weighted Average
	19,882		17.34% Pervious Area
	94,799		82.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0090	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	40	0.0090	1.42		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.1	254	0.0350	3.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.1	475	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
17.9	869	Total			

Subcatchment 25S: POST-SUB-No. 1E



Summary for Subcatchment 27S: POST-SUB No. 1A-A

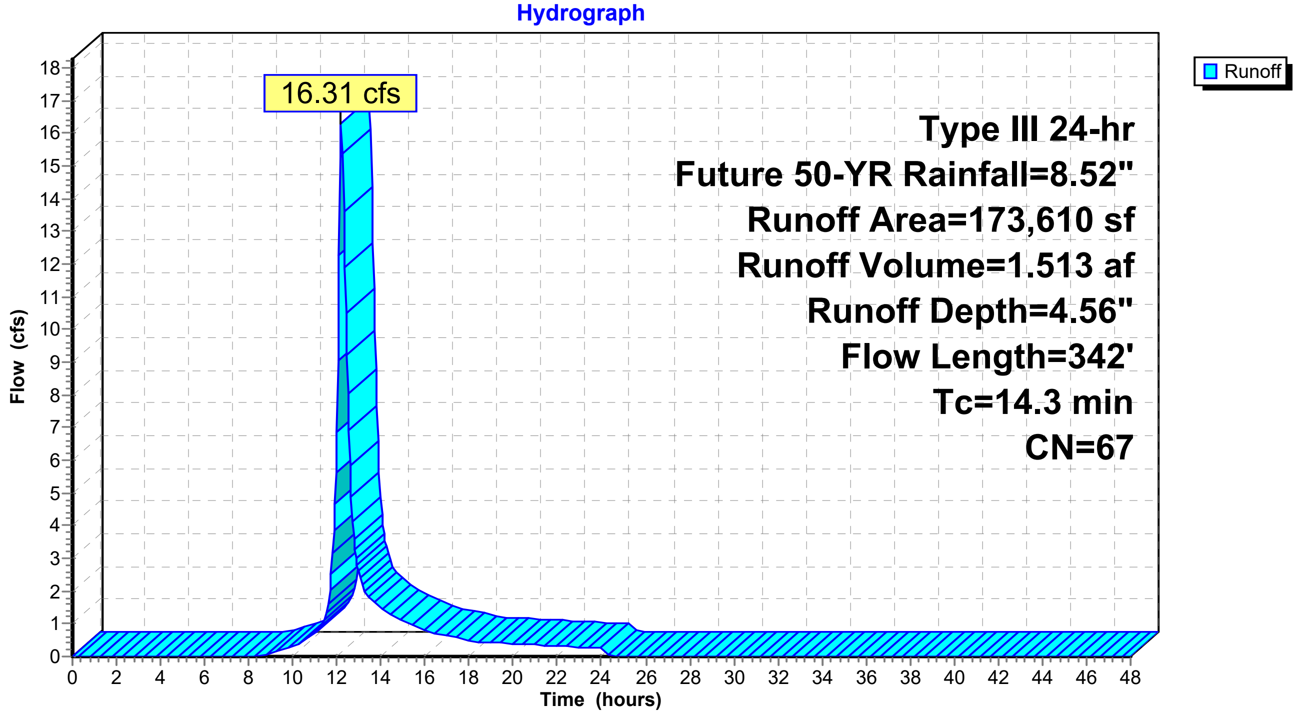
Runoff = 16.31 cfs @ 12.20 hrs, Volume= 1.513 af, Depth= 4.56"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 50-YR Rainfall=8.52"

	Area (sf)	CN	Description
	87,949	77	Woods, Good, HSG D
	4,955	55	Woods, Good, HSG B
*	29,916	30	Woods, Good, HSG A
	0	32	Woods/grass comb., Good, HSG A
	0	79	Woods/grass comb., Good, HSG D
	30,440	80	>75% Grass cover, Good, HSG D
*	20,350	61	>75% Grass cover, Good, HSG B
	173,610	67	Weighted Average
	173,610		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	20	0.0500	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	42	0.0360	1.33		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.5	200	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	12	0.3000	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
8.7	68	0.0360	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.90"
14.3	342	Total			

Subcatchment 27S: POST-SUB No. 1A-A



Summary for Subcatchment 28S: Post Sub No 1F

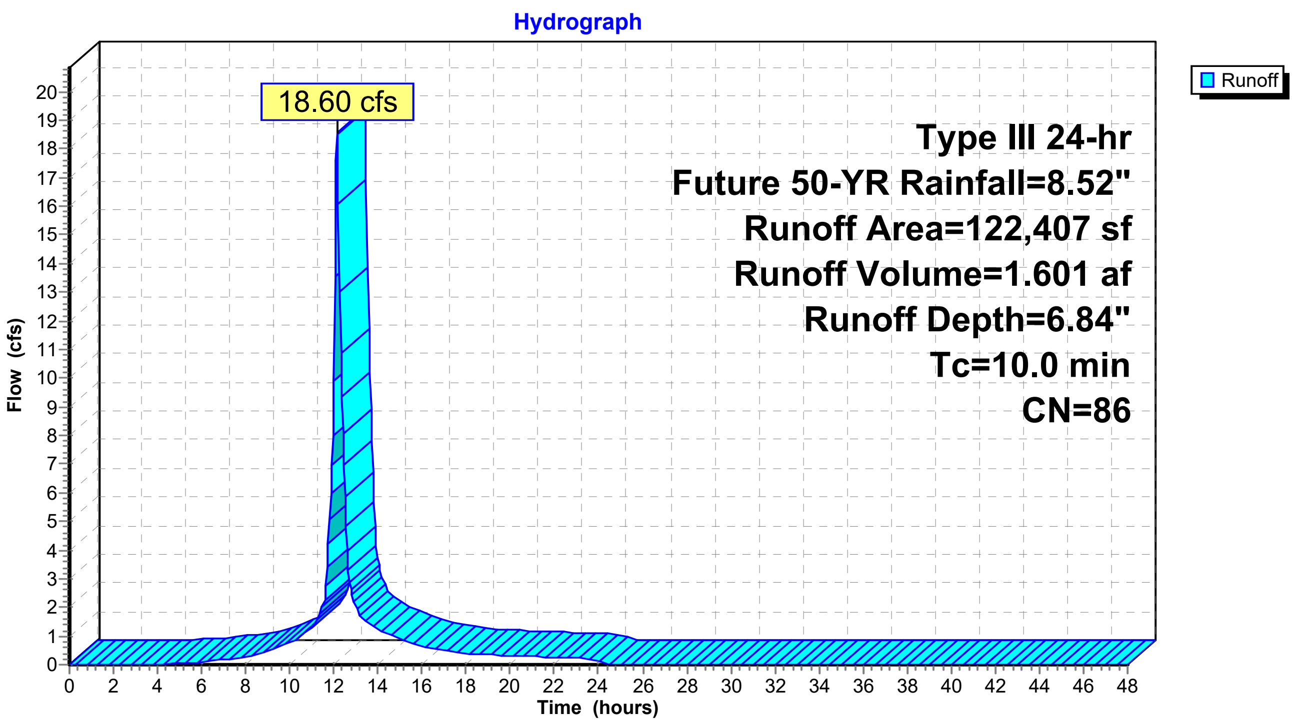
Runoff = 18.60 cfs @ 12.14 hrs, Volume= 1.601 af, Depth= 6.84"
Routed to Pond 26P : Infiltration Basin F-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 50-YR Rainfall=8.52"

	Area (sf)	CN	Description
*	23,000	98	Building Roof
*	7,000	98	Building Roof
	39,422	61	>75% Grass cover, Good, HSG B
*	27,685	98	Pavement and walks
*	13,800	98	Basin
*	11,500	98	Building Roof
	122,407	86	Weighted Average
	39,422		32.21% Pervious Area
	82,985		67.79% Impervious Area

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

Subcatchment 28S: Post Sub No 1F



Summary for Subcatchment 29S: POST SUB NO 1G

[47] Hint: Peak is 186% of capacity of segment #4

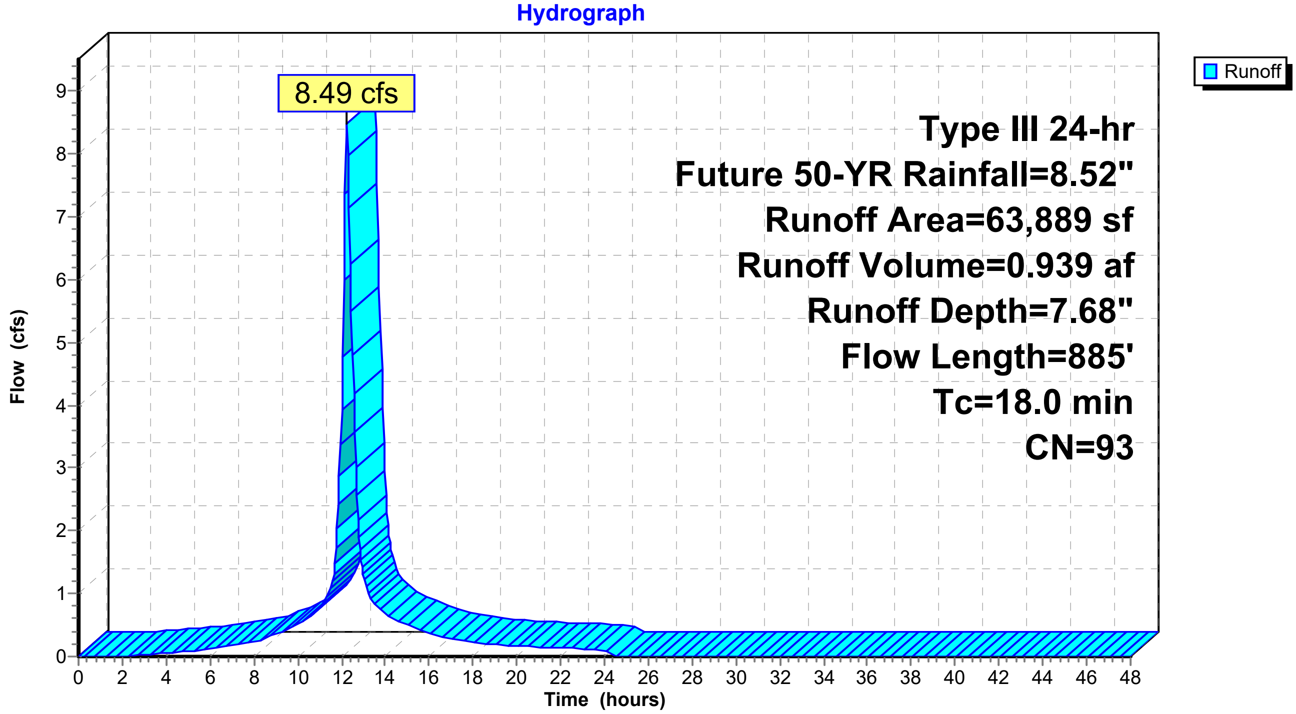
Runoff = 8.49 cfs @ 12.24 hrs, Volume= 0.939 af, Depth= 7.68"
Routed to Pond 7P : Detention Basin F-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Future 50-YR Rainfall=8.52"

	Area (sf)	CN	Description
*	51,612	98	Pavement and walks
	7,166	61	>75% Grass cover, Good, HSG B
	1,911	80	>75% Grass cover, Good, HSG D
*	3,200	98	Building Roof
	63,889	93	Weighted Average
	9,077		14.21% Pervious Area
	54,812		85.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0090	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	40	0.0090	1.42		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.9	200	0.0350	3.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	545	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
18.0	885	Total			

Subcatchment 29S: POST SUB NO 1G

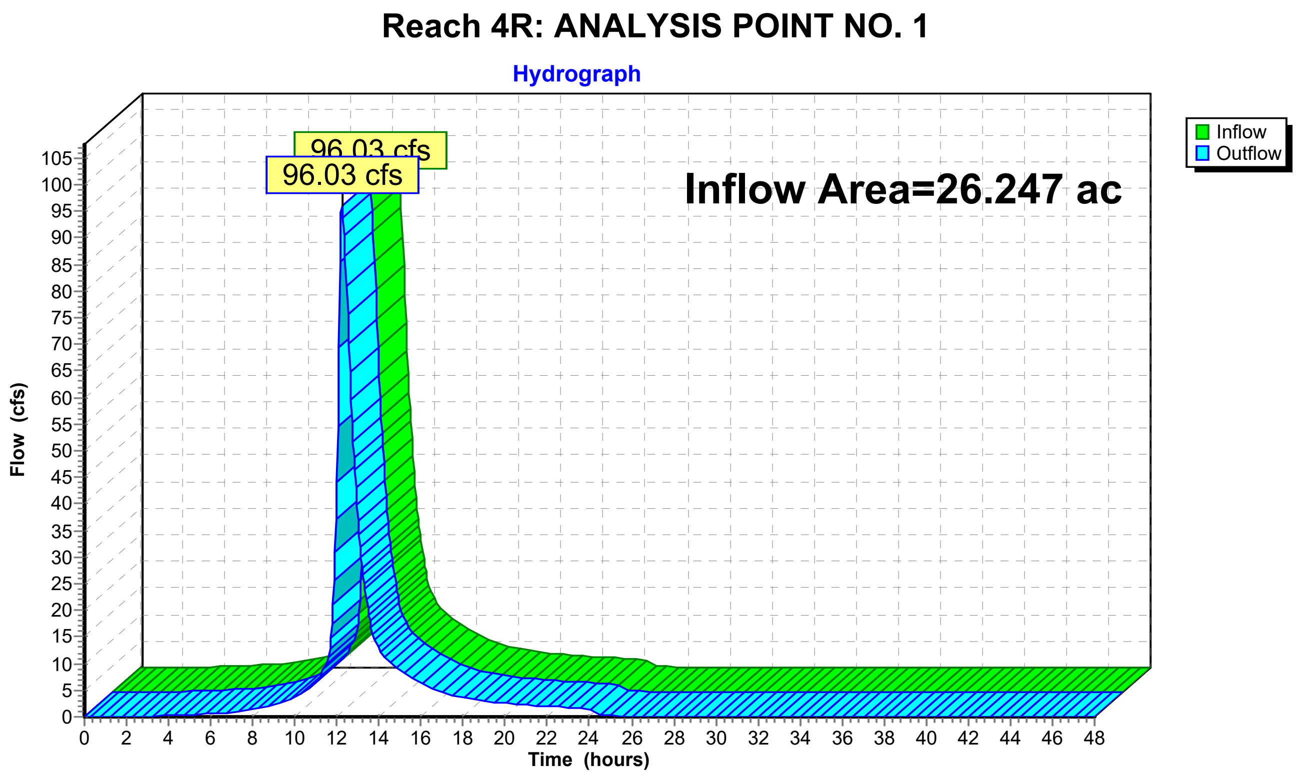


Summary for Reach 4R: ANALYSIS POINT NO. 1

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

Inflow Area = 26.247 ac, 46.64% Impervious, Inflow Depth = 5.97" for Future 50-YR event
Inflow = 96.03 cfs @ 12.24 hrs, Volume= 13.062 af
Outflow = 96.03 cfs @ 12.24 hrs, Volume= 13.062 af, Atten= 0%, Lag= 0.0 min

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

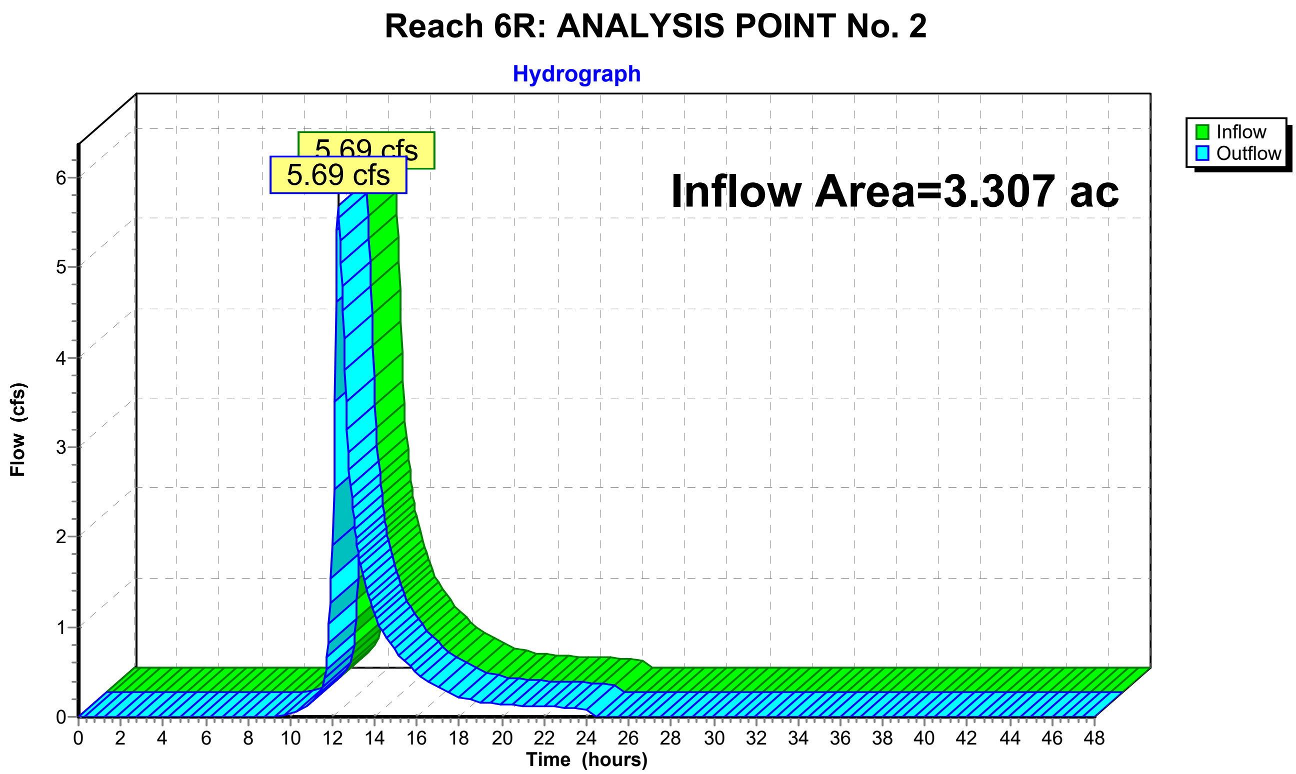


Summary for Reach 6R: ANALYSIS POINT No. 2

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

Inflow Area = 3.307 ac, 29.63% Impervious, Inflow Depth = 2.70" for Future 50-YR event
Inflow = 5.69 cfs @ 12.26 hrs, Volume= 0.743 af
Outflow = 5.69 cfs @ 12.26 hrs, Volume= 0.743 af, Atten= 0%, Lag= 0.0 min

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



Summary for Pond 7P: Detention Basin F-3

Inflow Area = 3.485 ac, 76.85% Impervious, Inflow Depth = 7.40" for Future 50-YR event
Inflow = 20.42 cfs @ 12.22 hrs, Volume= 2.149 af
Outflow = 16.09 cfs @ 12.35 hrs, Volume= 2.149 af, Atten= 21%, Lag= 8.1 min
Primary = 16.09 cfs @ 12.35 hrs, Volume= 2.149 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 161.07' @ 12.35 hrs Surf.Area= 8,354 sf Storage= 11,641 cf

Plug-Flow detention time= 12.5 min calculated for 2.147 af (100% of inflow)
Center-of-Mass det. time= 12.5 min (793.6 - 781.1)

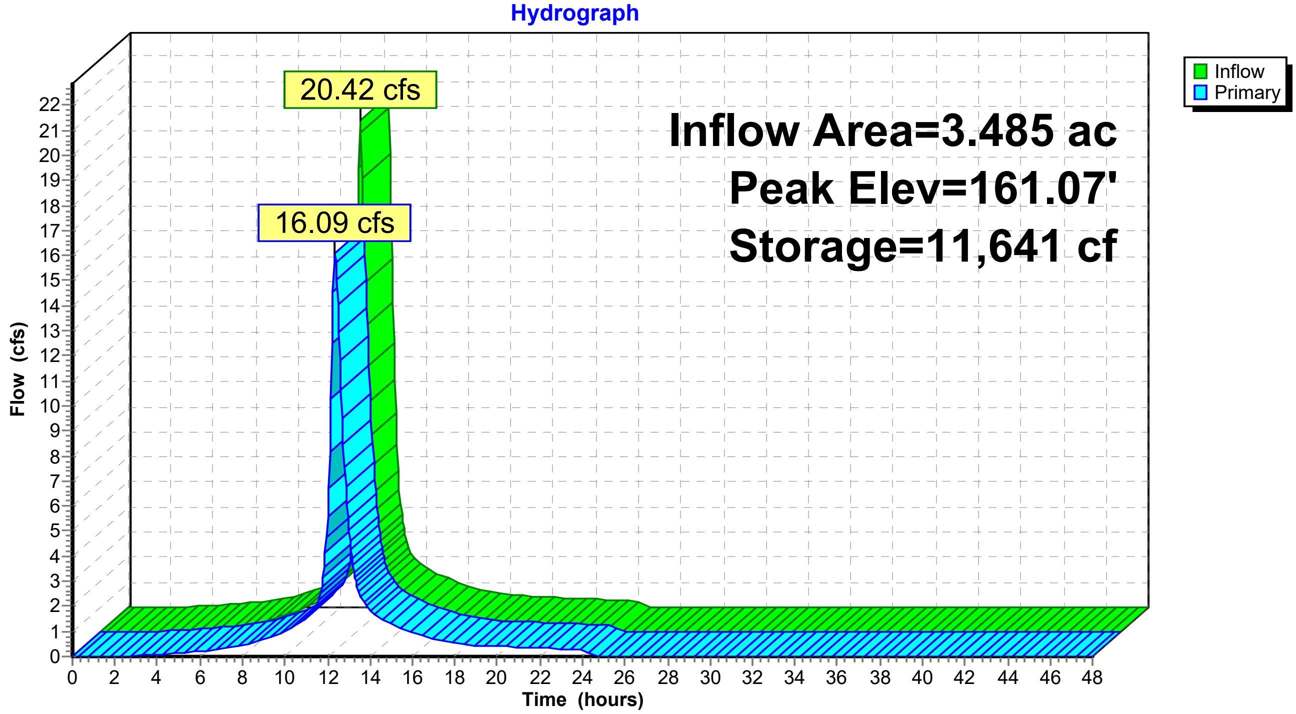
Volume	Invert	Avail.Storage	Storage Description
#1	159.00'	25,382 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.00	1	0	0
159.50	4,101	1,026	1,026
160.00	6,508	2,652	3,678
162.00	9,953	16,461	20,139
162.50	11,018	5,243	25,382

Device	Routing	Invert	Outlet Devices
#1	Device 3	156.00'	**18.0" Round Culvert** L= 110.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 156.00' / 153.00' S= 0.0273 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	159.00'	**45.0 deg x 1.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#3	Primary	155.67'	**18.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=16.09 cfs @ 12.35 hrs HW=161.07' (Free Discharge)
└─**3=Level Spreader Riser** (Passes 16.09 cfs of 19.77 cfs potential flow)
  └─**1=Culvert** (Passes 16.09 cfs of 17.59 cfs potential flow)
    └─**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 16.09 cfs @ 4.18 fps)

Pond 7P: Detention Basin F-3



Summary for Pond 11P: Infiltration Basin R-1

Inflow Area = 1.769 ac, 55.40% Impervious, Inflow Depth = 5.13" for Future 50-YR event
Inflow = 7.57 cfs @ 12.15 hrs, Volume= 0.756 af
Outflow = 2.12 cfs @ 12.60 hrs, Volume= 0.756 af, Atten= 72%, Lag= 26.7 min
Discarded = 0.39 cfs @ 12.60 hrs, Volume= 0.506 af
Primary = 1.72 cfs @ 12.60 hrs, Volume= 0.250 af
Routed to Reach 6R : ANALYSIS POINT No. 2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 171.61' @ 12.60 hrs Surf.Area= 7,013 sf Storage= 11,450 cf

Plug-Flow detention time= 129.8 min calculated for 0.755 af (100% of inflow)
Center-of-Mass det. time= 129.8 min (909.9 - 780.1)

Volume	Invert	Avail.Storage	Storage Description
#1	169.70'	14,244 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

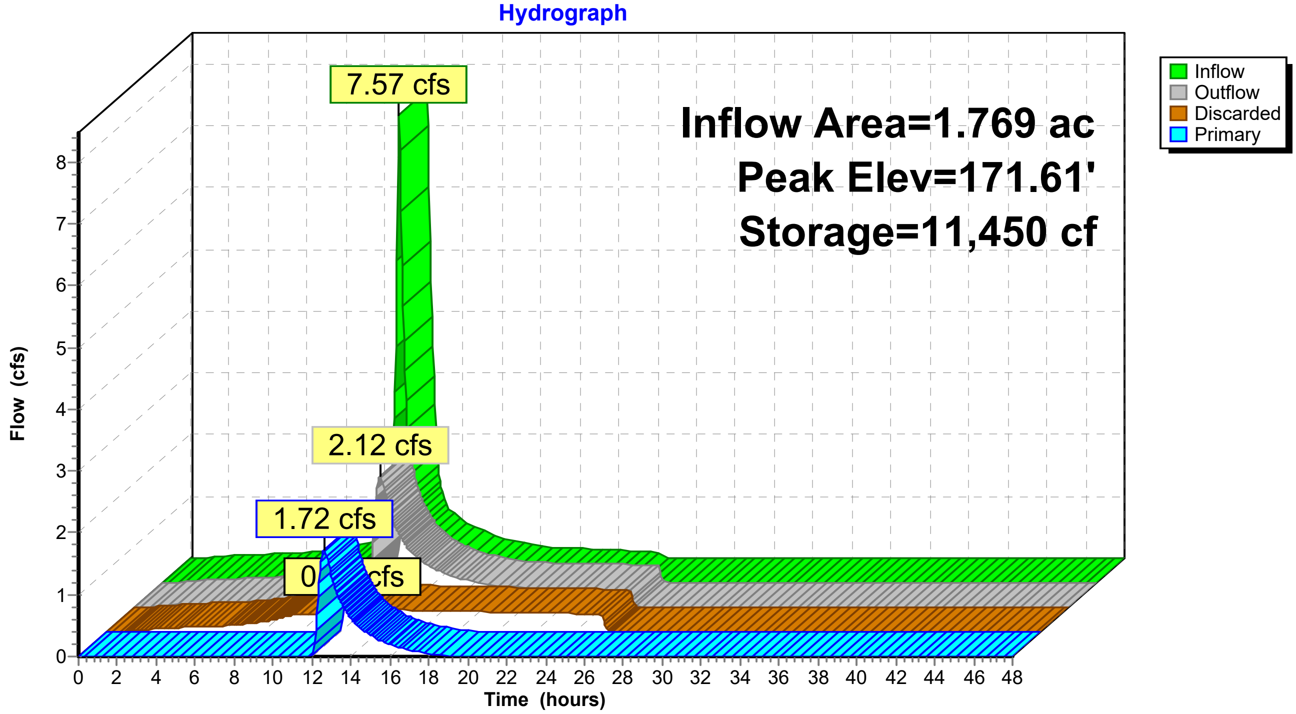
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
169.70	5,001	0	0	5,001
170.00	5,302	1,545	1,545	5,312
172.00	7,458	12,699	14,244	7,540

Device	Routing	Invert	Outlet Devices
#1	Primary	165.80'	**12.0" Round Culvert** L= 58.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 165.80' / 162.00' S= 0.0655 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	169.70'	**2.410 in/hr Exfiltration over Wetted area**
#3	Device 1	170.40'	**45.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.39 cfs @ 12.60 hrs HW=171.61' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=1.72 cfs @ 12.60 hrs HW=171.61' (Free Discharge)
└─**1=Culvert** (Passes 1.72 cfs of 8.72 cfs potential flow)
  └─**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 1.72 cfs @ 2.82 fps)

Pond 11P: Infiltration Basin R-1



Summary for Pond 12P: Detention Basin R-3

Inflow Area = 3.287 ac, 67.42% Impervious, Inflow Depth = 7.56" for Future 50-YR event
Inflow = 22.06 cfs @ 12.16 hrs, Volume= 2.070 af
Outflow = 8.64 cfs @ 12.47 hrs, Volume= 2.070 af, Atten= 61%, Lag= 19.0 min
Primary = 8.64 cfs @ 12.47 hrs, Volume= 2.070 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 163.72' @ 12.47 hrs Surf.Area= 6,933 sf Storage= 19,583 cf

Plug-Flow detention time= 28.9 min calculated for 2.068 af (100% of inflow)
Center-of-Mass det. time= 29.0 min (801.8 - 772.8)

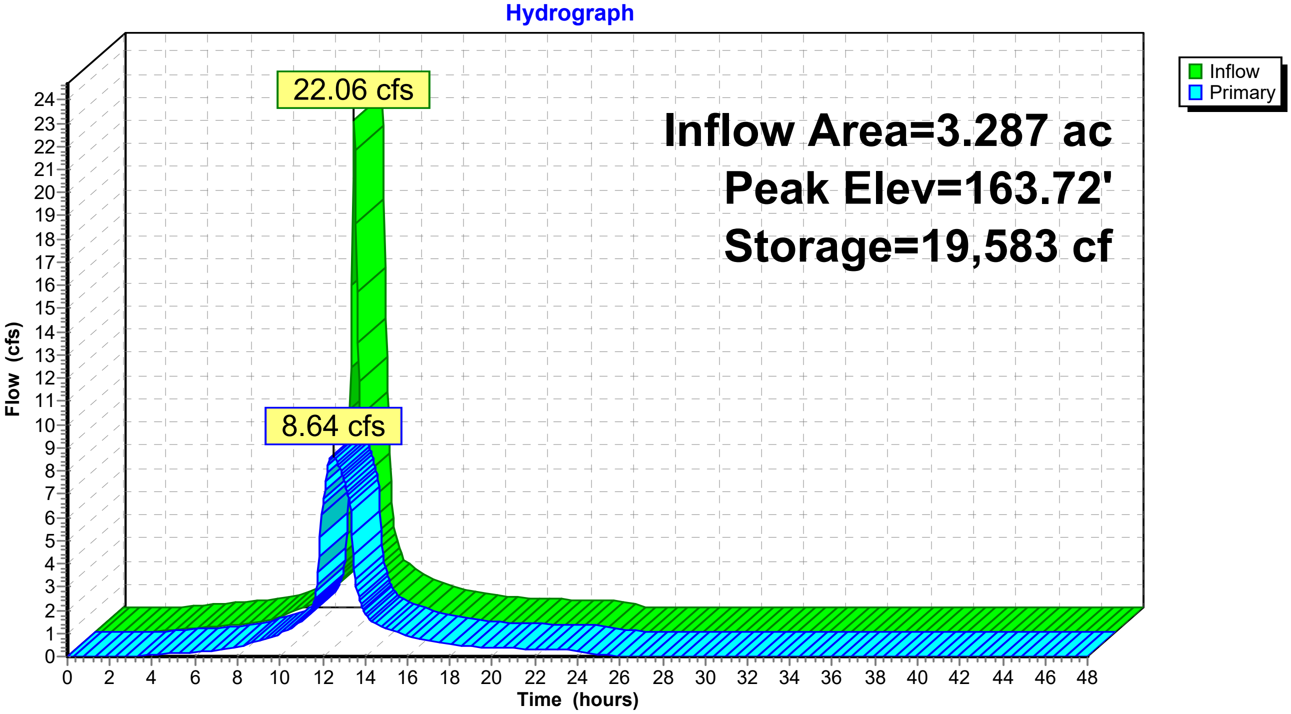
Volume	Invert	Avail.Storage	Storage Description
#1	159.80'	25,303 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.80	200	0	0
160.00	3,502	370	370
162.00	5,243	8,745	9,115
164.00	7,209	12,452	21,567
164.50	7,736	3,736	25,303

Device	Routing	Invert	Outlet Devices
#1	Device 3	158.00'	**12.0" Round Culvert** L= 85.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.00' / 144.00' S= 0.1647 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	159.80'	**45.0 deg x 0.5' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#3	Primary	150.67'	**12.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=8.64 cfs @ 12.47 hrs HW=163.71' (Free Discharge)
└─**3=Level Spreader Riser** (Passes 8.64 cfs of 13.66 cfs potential flow)
  └─**1=Culvert** (Inlet Controls 8.64 cfs @ 11.00 fps)
    └─**2=Sharp-Crested Vee/Trap Weir** (Passes 8.64 cfs of 44.54 cfs potential flow)

Pond 12P: Detention Basin R-3



Summary for Pond 13P: Detention Basin R-2

Inflow Area = 2.614 ac, 60.00% Impervious, Inflow Depth = 7.44" for Future 50-YR event
Inflow = 17.77 cfs @ 12.15 hrs, Volume= 1.620 af
Outflow = 12.29 cfs @ 12.25 hrs, Volume= 1.620 af, Atten= 31%, Lag= 6.0 min
Primary = 12.29 cfs @ 12.25 hrs, Volume= 1.620 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 163.07' @ 12.27 hrs Surf.Area= 6,589 sf Storage= 7,979 cf

Plug-Flow detention time= 8.3 min calculated for 1.618 af (100% of inflow)
Center-of-Mass det. time= 8.3 min (783.8 - 775.5)

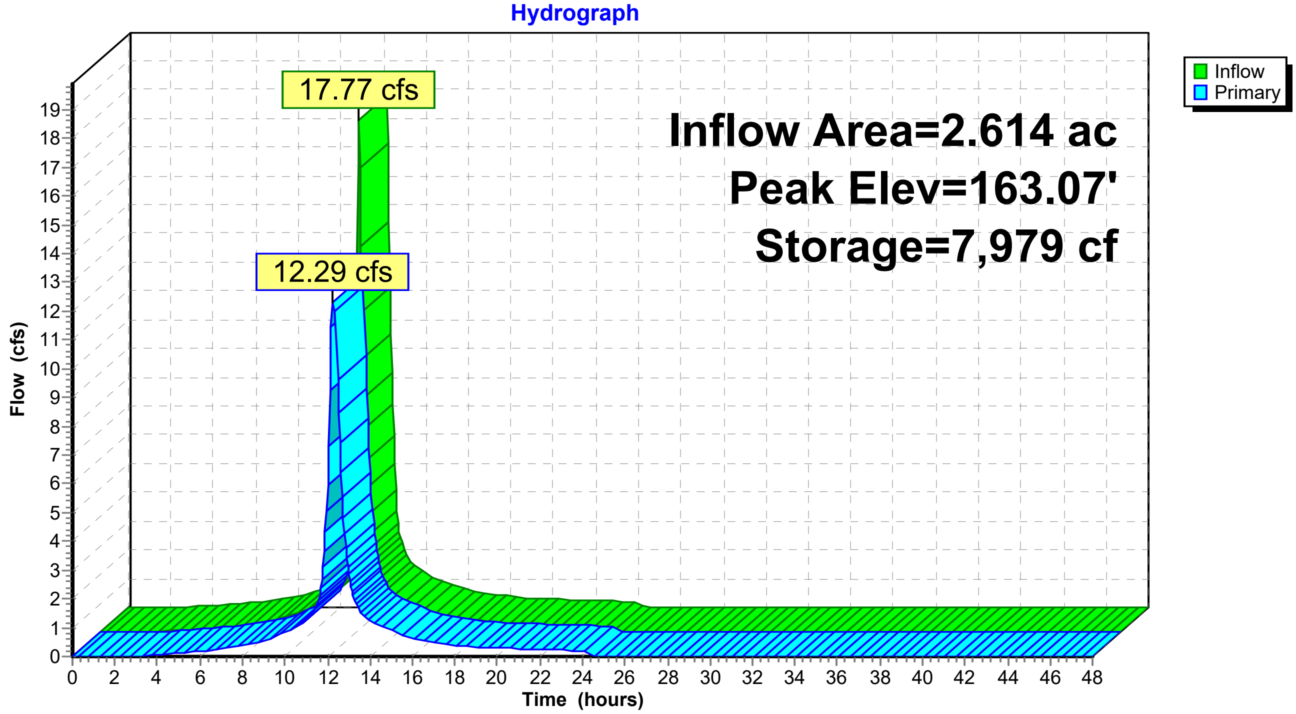
Volume	Invert	Avail.Storage	Storage Description
#1	161.50'	18,409 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
161.50	400	0	0
162.00	5,563	1,491	1,491
164.00	7,484	13,047	14,538
164.50	7,999	3,871	18,409

Device	Routing	Invert	Outlet Devices
#1	Device 3	152.00'	**12.0" Round Culvert** L= 78.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.00' / 141.00' S= 0.1410 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	161.50'	**2.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	143.17'	**12.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=12.29 cfs @ 12.25 hrs HW=163.06' (Free Discharge)
└─**3=Level Spreader Riser** (Passes 12.29 cfs of 16.87 cfs potential flow)
  └─**1=Culvert** (Inlet Controls 12.29 cfs @ 15.65 fps)
    └─**2=Sharp-Crested Rectangular Weir** (Passes 12.29 cfs of 13.94 cfs potential flow)

Pond 13P: Detention Basin R-2



Summary for Pond 23P: Detention Basin F-2

Inflow Area = 2.347 ac, 72.38% Impervious, Inflow Depth = 7.32" for Future 50-YR event
Inflow = 16.21 cfs @ 12.14 hrs, Volume= 1.431 af
Outflow = 9.90 cfs @ 12.29 hrs, Volume= 1.310 af, Atten= 39%, Lag= 9.2 min
Primary = 9.90 cfs @ 12.29 hrs, Volume= 1.310 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 161.46' @ 12.29 hrs Surf.Area= 7,827 sf Storage= 20,575 cf

Plug-Flow detention time= 146.3 min calculated for 1.309 af (91% of inflow)
Center-of-Mass det. time= 104.8 min (882.6 - 777.8)

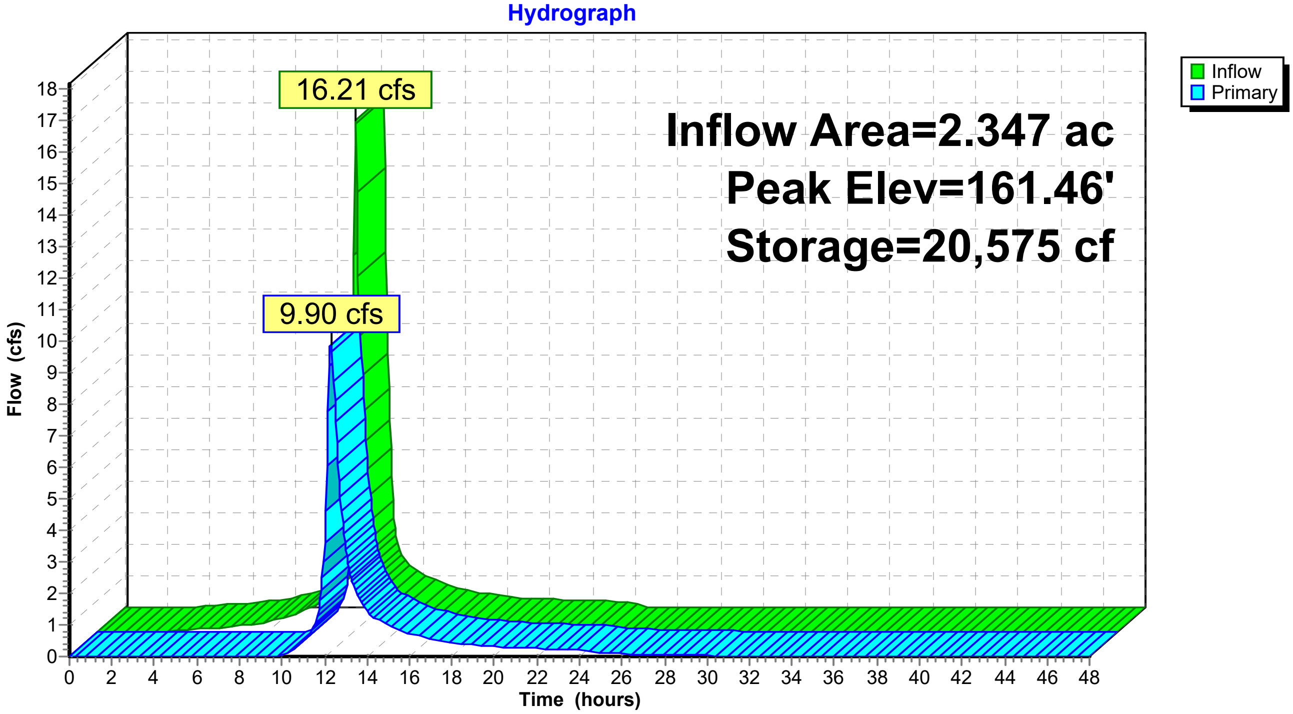
Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	29,366 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	4,222	0	0
160.00	6,163	10,385	10,385
162.00	8,447	14,610	24,995
162.50	9,035	4,371	29,366

Device	Routing	Invert	Outlet Devices
#1	Device 2	158.00'	**15.0" Round Culvert** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.00' / 155.00' S= 0.0375 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Primary	157.42'	**15.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads
#3	Device 1	159.00'	**45.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=9.94 cfs @ 12.29 hrs HW=161.45' (Free Discharge)
└─**2=Level Spreader Riser** (Passes 9.94 cfs of 11.87 cfs potential flow)
  └─**1=Culvert** (Inlet Controls 9.94 cfs @ 8.10 fps)
    └─**3=Sharp-Crested Vee/Trap Weir** (Passes 9.94 cfs of 10.00 cfs potential flow)

Pond 23P: Detention Basin F-2



Summary for Pond 26P: Infiltration Basin F-4

Inflow Area = 6.325 ac, 64.53% Impervious, Inflow Depth = 6.95" for Future 50-YR event
Inflow = 34.73 cfs @ 12.17 hrs, Volume= 3.664 af
Outflow = 17.83 cfs @ 12.49 hrs, Volume= 3.664 af, Atten= 49%, Lag= 18.9 min
Discarded = 0.58 cfs @ 12.49 hrs, Volume= 1.141 af
Primary = 17.25 cfs @ 12.49 hrs, Volume= 2.523 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 163.87' @ 12.49 hrs Surf.Area= 24,626 sf Storage= 52,265 cf

Plug-Flow detention time= 192.9 min calculated for 3.661 af (100% of inflow)
Center-of-Mass det. time= 193.8 min (982.4 - 788.6)

Volume	Invert	Avail.Storage	Storage Description
#1	161.00'	55,617 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

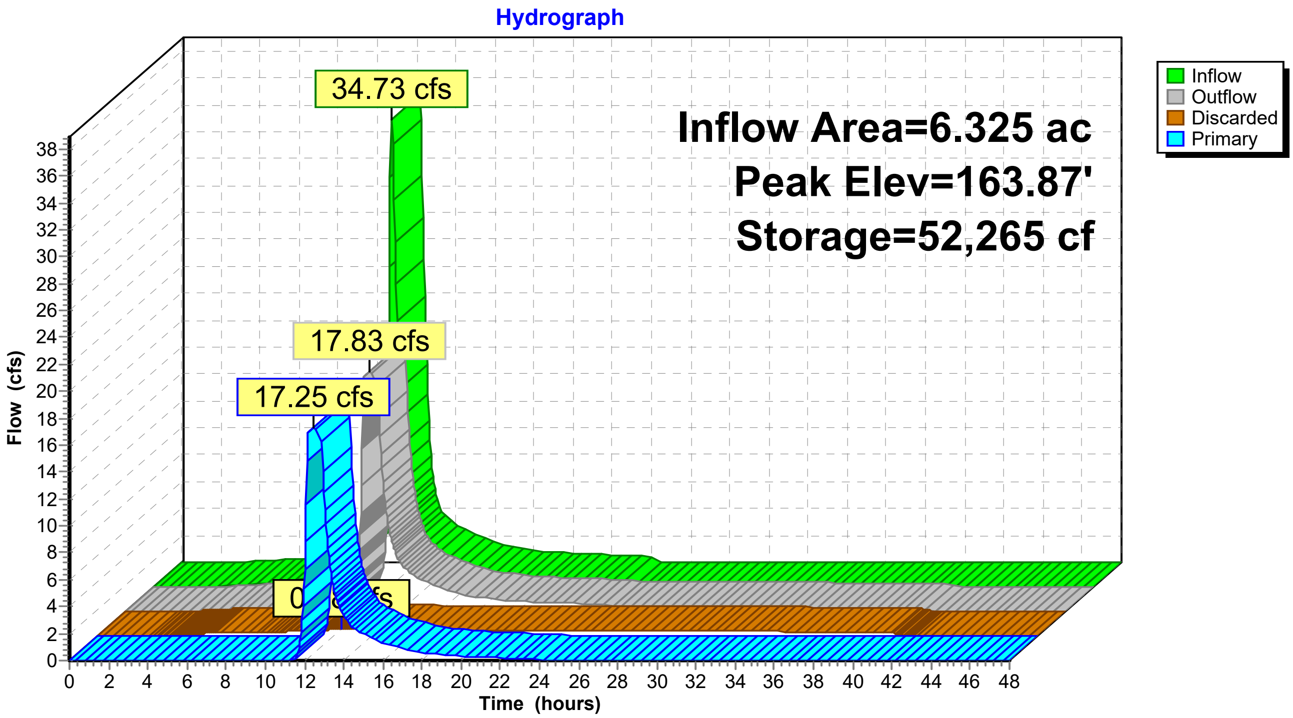
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
161.00	10,567	0	0	10,567
162.00	17,000	13,657	13,657	17,013
164.00	25,230	41,960	55,617	25,307

Device	Routing	Invert	Outlet Devices
#1	Device 4	158.00'	**18.0" Round Culvert** L= 221.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.00' / 153.00' S= 0.0226 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Discarded	161.00'	**1.020 in/hr Exfiltration over Wetted area**
#3	Device 1	162.40'	**5.0' long x 2.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	155.67'	**18.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.58 cfs @ 12.49 hrs HW=163.86' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.58 cfs)

Primary OutFlow Max=17.24 cfs @ 12.49 hrs HW=163.86' (Free Discharge)
└─**4=Level Spreader Riser** (Passes 17.24 cfs of 24.36 cfs potential flow)
  └─**1=Culvert** (Outlet Controls 17.24 cfs @ 9.76 fps)
    └─**3=Sharp-Crested Rectangular Weir** (Passes 17.24 cfs of 27.26 cfs potential flow)

Pond 26P: Infiltration Basin F-4



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

Subcatchment 6S: POST-SUB No. 1D Runoff Area=87,909 sf 70.36% Impervious Runoff Depth=5.81"
Flow Length=411' Tc=15.4 min CN=89 Runoff=9.79 cfs 0.976 af

Subcatchment 8S: POST SUB 3C Runoff Area=34,500 sf 100.00% Impervious Runoff Depth=6.86"
Tc=10.0 min CN=98 Runoff=4.78 cfs 0.453 af

Subcatchment 14S: POST-SUB No 3B Runoff Area=67,024 sf 0.00% Impervious Runoff Depth=2.77"
Flow Length=760' Tc=15.8 min CN=61 Runoff=3.58 cfs 0.356 af

Subcatchment 15S: POST-SUB No 3A Runoff Area=42,540 sf 19.23% Impervious Runoff Depth=1.72"
Flow Length=158' Slope=0.0100 '/' Tc=14.2 min CN=50 Runoff=1.32 cfs 0.140 af

Subcatchment 16S: POST-SUB No. 2A Runoff Area=158,671 sf 0.00% Impervious Runoff Depth=4.02"
Flow Length=180' Tc=14.2 min CN=73 Runoff=13.20 cfs 1.221 af

Subcatchment 17S: POST-SUB No. 2B Runoff Area=143,182 sf 67.42% Impervious Runoff Depth=6.15"
Flow Length=221' Tc=11.8 min CN=92 Runoff=18.16 cfs 1.686 af

Subcatchment 18S: POST-SUB No. 2C Runoff Area=113,851 sf 60.00% Impervious Runoff Depth=6.04"
Flow Length=205' Tc=11.0 min CN=91 Runoff=14.59 cfs 1.315 af

Subcatchment 19S: POST-SUB No. 2D Runoff Area=24,504 sf 0.00% Impervious Runoff Depth=4.57"
Flow Length=333' Tc=19.2 min CN=78 Runoff=2.05 cfs 0.214 af

Subcatchment 22S: POST-SUB No. 1C Runoff Area=102,217 sf 72.38% Impervious Runoff Depth=5.92"
Tc=10.0 min CN=90 Runoff=13.28 cfs 1.158 af

Subcatchment 24S: POST-SUB No. 1A Runoff Area=38,417 sf 0.00% Impervious Runoff Depth=4.24"
Flow Length=800' Tc=22.3 min CN=75 Runoff=2.82 cfs 0.311 af

Subcatchment 25S: POST-SUB-No. 1E Runoff Area=114,681 sf 82.66% Impervious Runoff Depth=6.15"
Flow Length=869' Tc=17.9 min CN=92 Runoff=12.49 cfs 1.350 af

Subcatchment 27S: POST-SUB No. 1A-A Runoff Area=173,610 sf 0.00% Impervious Runoff Depth=3.39"
Flow Length=342' Tc=14.3 min CN=67 Runoff=12.06 cfs 1.125 af

Subcatchment 28S: Post Sub No 1F Runoff Area=122,407 sf 67.79% Impervious Runoff Depth=5.46"
Tc=10.0 min CN=86 Runoff=15.03 cfs 1.279 af

Subcatchment 29S: POST SUB NO 1G Runoff Area=63,889 sf 85.79% Impervious Runoff Depth=6.27"
Flow Length=885' Tc=18.0 min CN=93 Runoff=7.01 cfs 0.766 af

Reach 4R: ANALYSIS POINT NO. 1 Inflow=78.29 cfs 10.181 af
Outflow=78.29 cfs 10.181 af

Reach 6R: ANALYSIS POINT No. 2 Inflow=3.73 cfs 0.491 af
Outflow=3.73 cfs 0.491 af

Pond 7P: Detention Basin F-3 Peak Elev=160.85' Storage=9,808 cf Inflow=16.74 cfs 1.743 af
Outflow=12.95 cfs 1.743 af

Pond 11P: Infiltration Basin R-1 Peak Elev=171.29' Storage=9,232 cf Inflow=5.87 cfs 0.593 af
Discarded=0.37 cfs 0.458 af Primary=0.79 cfs 0.135 af Outflow=1.16 cfs 0.593 af

Pond 12P: Detention Basin R-3 Peak Elev=163.00' Storage=14,856 cf Inflow=18.16 cfs 1.686 af
Outflow=8.02 cfs 1.686 af

Pond 13P: Detention Basin R-2 Peak Elev=162.81' Storage=6,334 cf Inflow=14.59 cfs 1.315 af
Outflow=11.01 cfs 1.315 af

Pond 23P: Detention Basin F-2 Peak Elev=161.20' Storage=18,586 cf Inflow=13.28 cfs 1.158 af
Outflow=7.59 cfs 1.037 af

Pond 26P: Infiltration Basin F-4 Peak Elev=163.47' Storage=42,858 cf Inflow=28.15 cfs 2.941 af
Discarded=0.54 cfs 1.100 af Primary=16.82 cfs 1.841 af Outflow=17.36 cfs 2.941 af

Total Runoff Area = 29.555 ac Runoff Volume = 12.350 af Average Runoff Depth = 5.01"
55.26% Pervious = 16.333 ac 44.74% Impervious = 13.222 ac

Summary for Subcatchment 6S: POST-SUB No. 1D

[47] Hint: Peak is 214% of capacity of segment #4

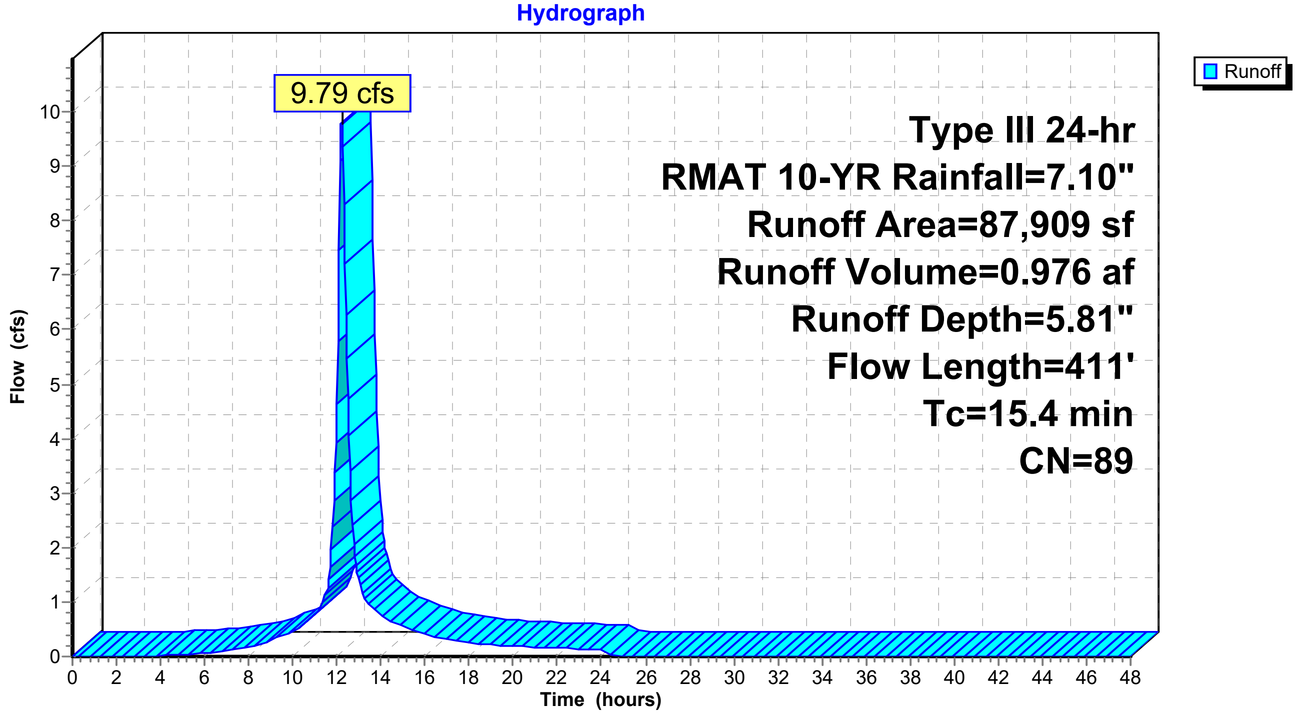
Runoff = 9.79 cfs @ 12.21 hrs, Volume= 0.976 af, Depth= 5.81"
Routed to Pond 7P : Detention Basin F-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr RMAT 10-YR Rainfall=7.10"

	Area (sf)	CN	Description
*	4,000	98	Building Roofs
*	10,503	98	Detention Basin
*	47,347	98	Pavement and Walks
	7,767	80	>75% Grass cover, Good, HSG D
	18,292	61	>75% Grass cover, Good, HSG B
	87,909	89	Weighted Average
	26,059		29.64% Pervious Area
	61,850		70.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.6	55	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.2	40	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	216	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
15.4	411	Total			

Subcatchment 6S: POST-SUB No. 1D



Summary for Subcatchment 8S: POST SUB 3C Building 2, 3 and 4

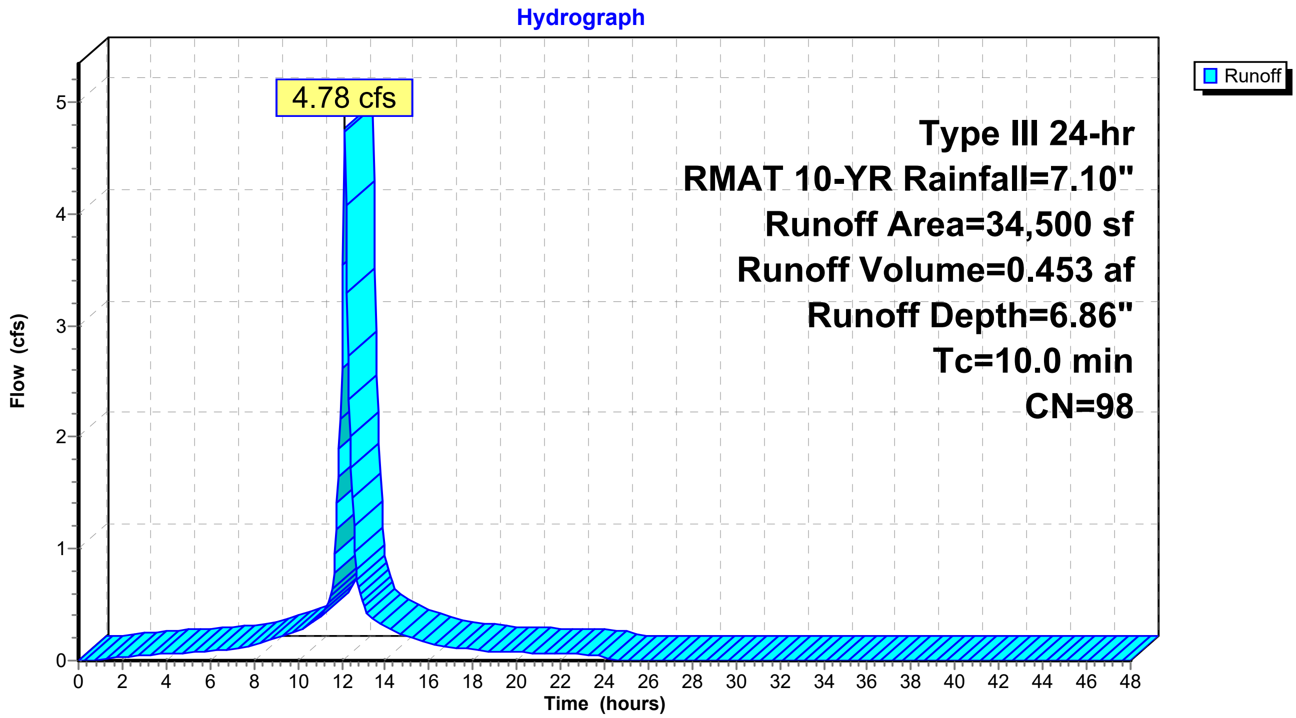
Runoff = 4.78 cfs @ 12.14 hrs, Volume= 0.453 af, Depth= 6.86"
Routed to Pond 11P : Infiltration Basin R-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr RMAT 10-YR Rainfall=7.10"

	Area (sf)	CN	Description
*	34,500	98	Building Roof
	0	80	>75% Grass cover, Good, HSG D
	34,500	98	Weighted Average
	34,500		100.00% Impervious Area

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

Subcatchment 8S: POST SUB 3C Building 2, 3 and 4



Summary for Subcatchment 14S: POST-SUB No 3B

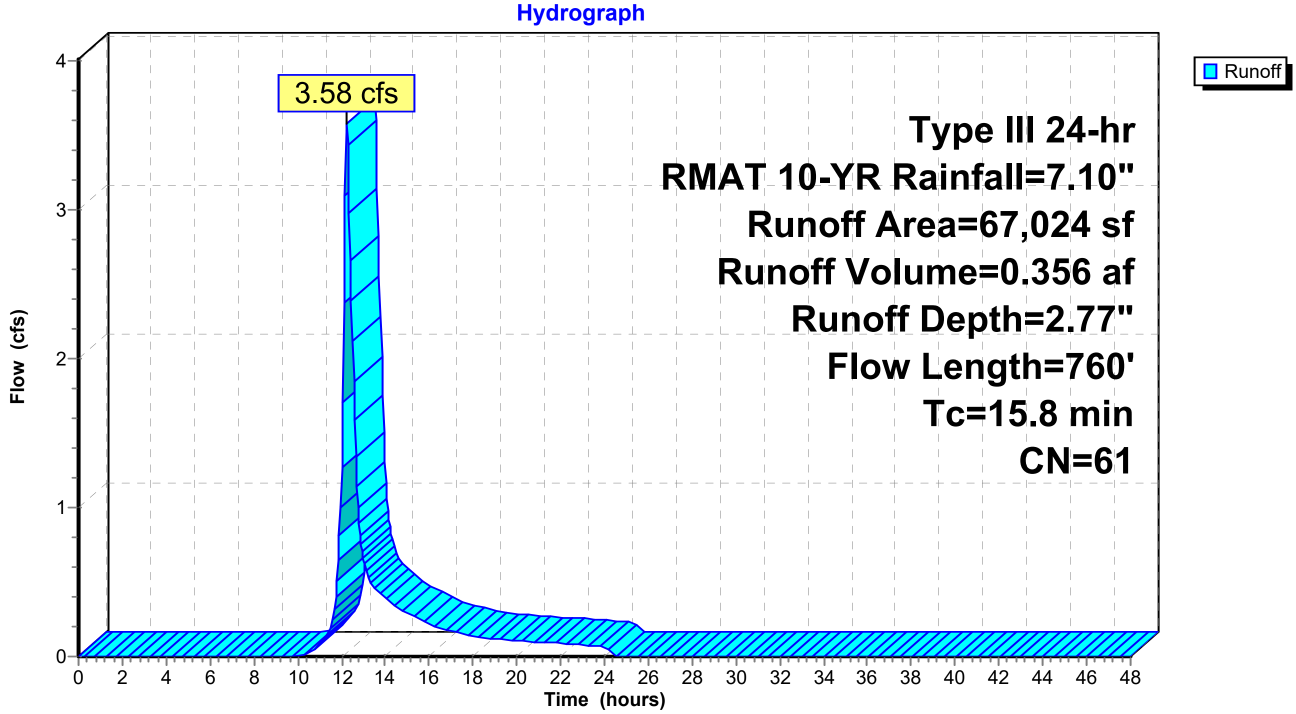
Runoff = 3.58 cfs @ 12.23 hrs, Volume= 0.356 af, Depth= 2.77"
Routed to Reach 6R : ANALYSIS POINT No. 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr RMAT 10-YR Rainfall=7.10"

Area (sf)	CN	Description
28,004	73	Brush, Good, HSG D
19,012	30	Woods, Good, HSG A
4,184	77	Woods, Good, HSG D
3,089	39	>75% Grass cover, Good, HSG A
12,735	80	>75% Grass cover, Good, HSG D
67,024	61	Weighted Average
67,024		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.6	200	0.0200	2.12		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.6	460	0.0650	12.11	60.55	**Channel Flow,** Area= 5.0 sf Perim= 7.0' r= 0.71' n= 0.025 Earth, clean & winding
15.8	760	Total			

Subcatchment 14S: POST-SUB No 3B



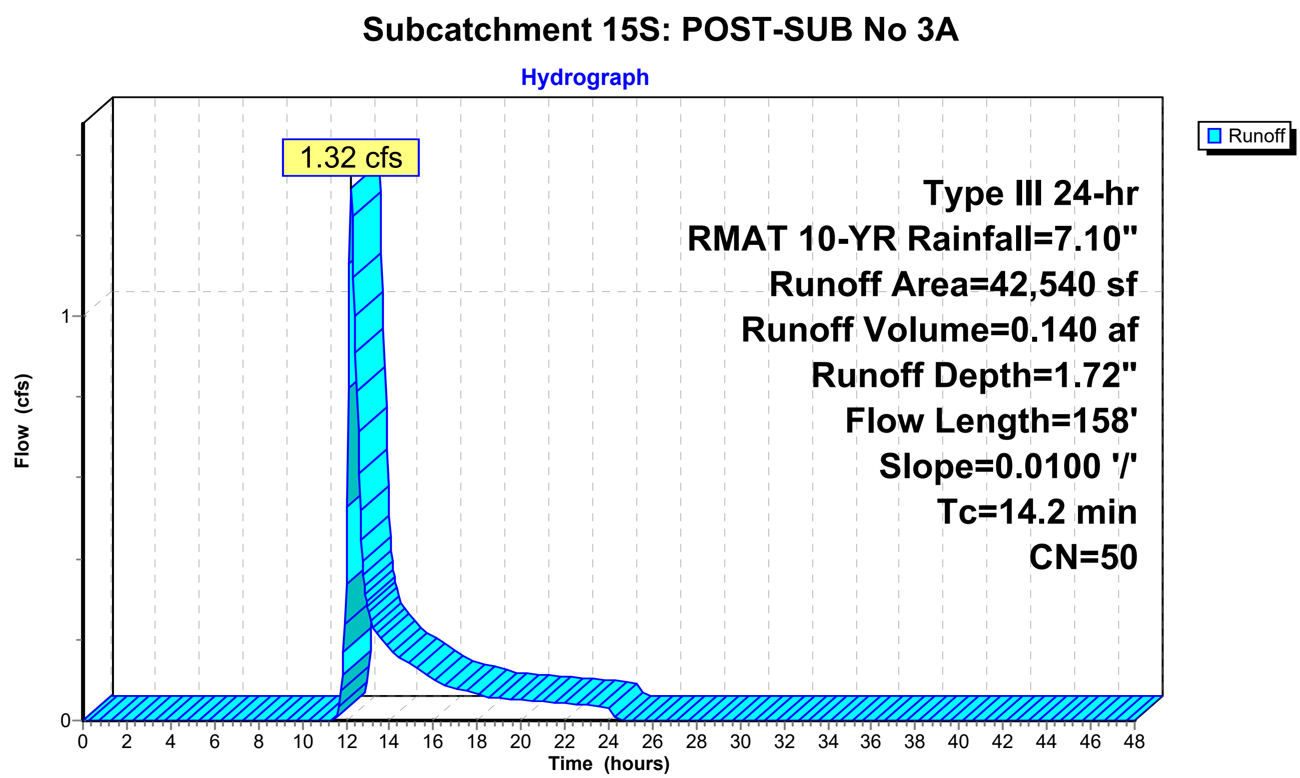
Summary for Subcatchment 15S: POST-SUB No 3A

Runoff = 1.32 cfs @ 12.22 hrs, Volume= 0.140 af, Depth= 1.72"
Routed to Pond 11P : Infiltration Basin R-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr RMAT 10-YR Rainfall=7.10"

	Area (sf)	CN	Description
	0	49	50-75% Grass cover, Fair, HSG A
	34,361	39	>75% Grass cover, Good, HSG A
*	8,179	98	Basin
	42,540	50	Weighted Average
	34,361		80.77% Pervious Area
	8,179		19.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.6	58	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.2	158	Total			



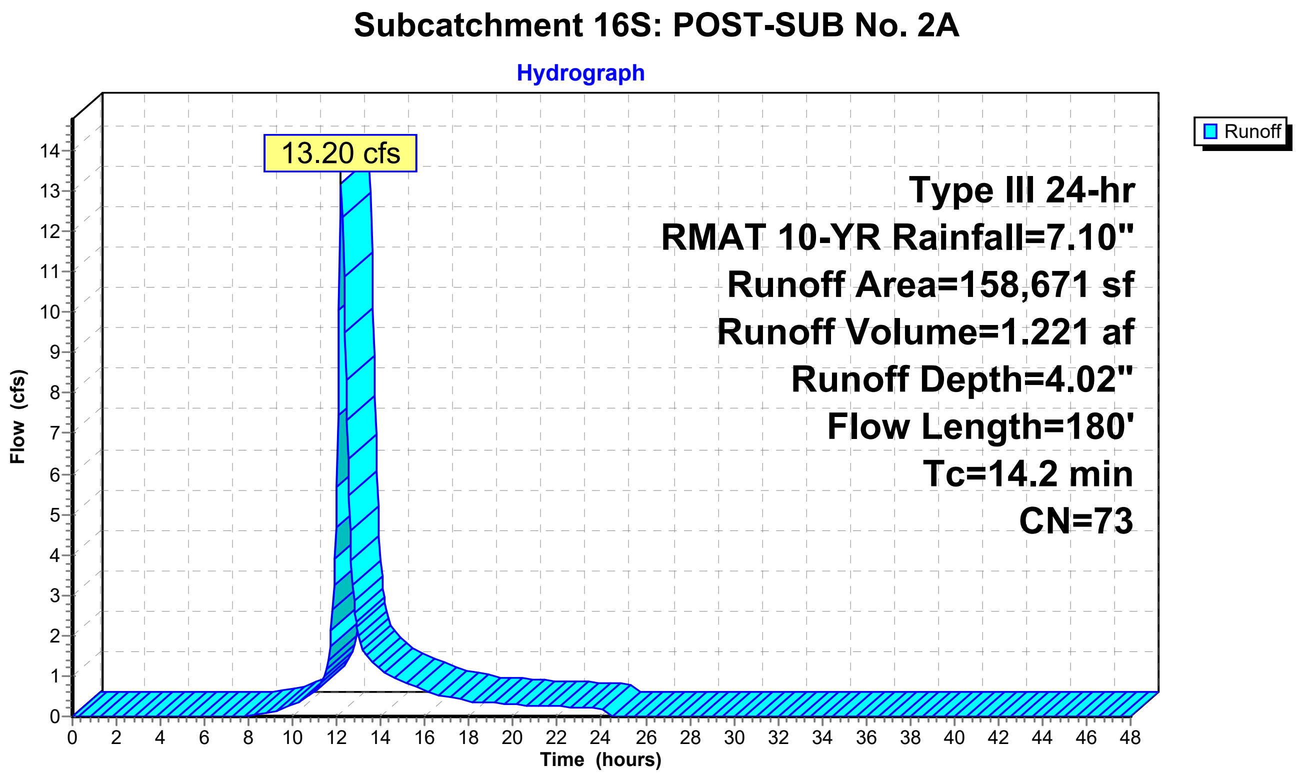
Summary for Subcatchment 16S: POST-SUB No. 2A

Runoff = 13.20 cfs @ 12.20 hrs, Volume= 1.221 af, Depth= 4.02"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr RMAT 10-YR Rainfall=7.10"

	Area (sf)	CN	Description
	93,385	77	Woods, Good, HSG D
	46,536	80	>75% Grass cover, Good, HSG D
	0	32	Woods/grass comb., Good, HSG A
*	18,750	39	>75% Grass cover, Good, HSG A
	158,671	73	Weighted Average
	158,671		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.6	80	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.2	180	Total			



Summary for Subcatchment 17S: POST-SUB No. 2B

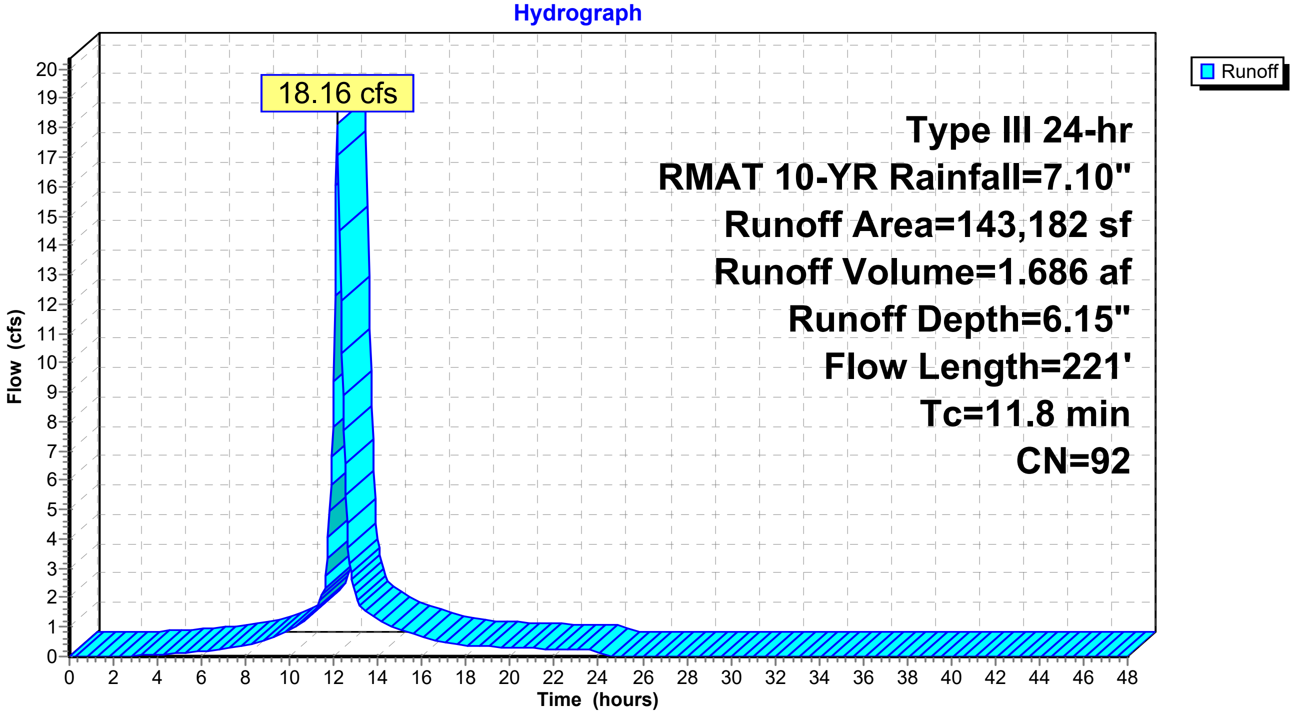
Runoff = 18.16 cfs @ 12.16 hrs, Volume= 1.686 af, Depth= 6.15"
Routed to Pond 12P : Detention Basin R-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr RMAT 10-YR Rainfall=7.10"

	Area (sf)	CN	Description
*	39,478	98	Building Roofs
*	50,310	98	Pavement and Walks
*	6,744	98	Detention Basin
	46,650	80	>75% Grass cover, Good, HSG D
	143,182	92	Weighted Average
	46,650		32.58% Pervious Area
	96,532		67.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	90	0.0190	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.4	10	0.0300	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.1	30	0.0850	4.37		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.6	91	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.8	221	Total			

Subcatchment 17S: POST-SUB No. 2B



Summary for Subcatchment 18S: POST-SUB No. 2C

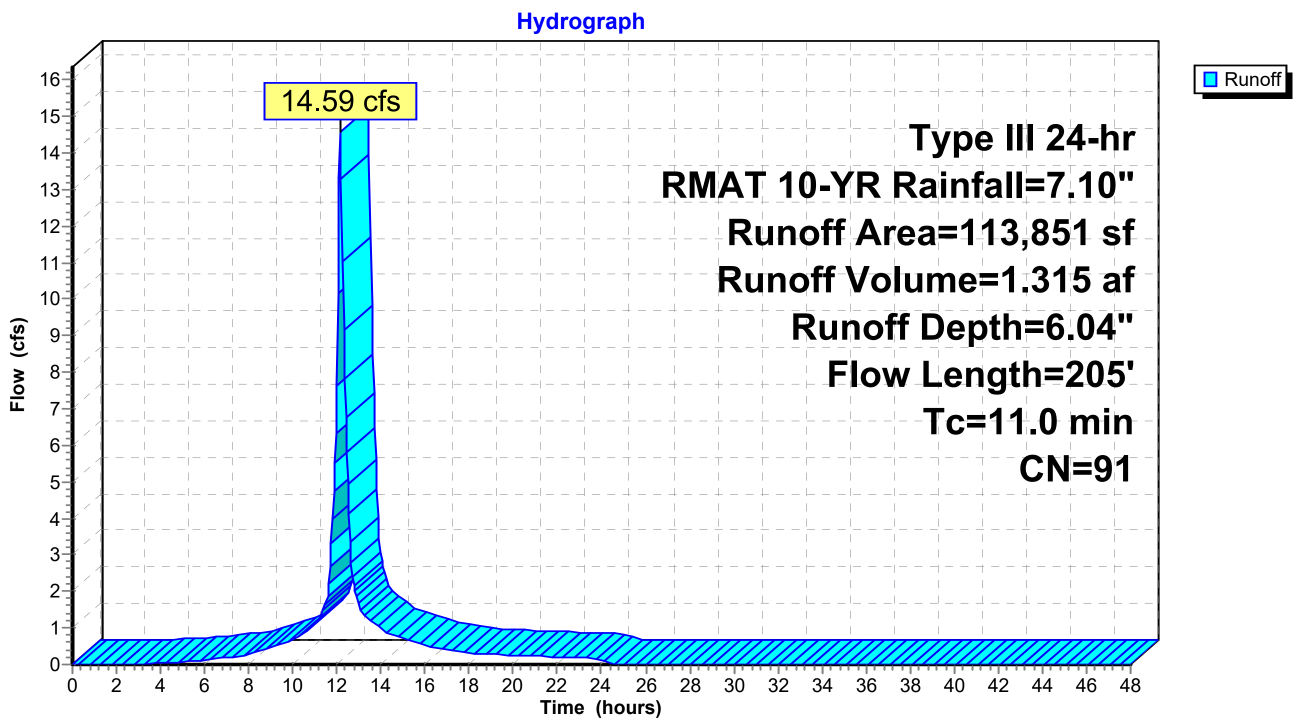
Runoff = 14.59 cfs @ 12.15 hrs, Volume= 1.315 af, Depth= 6.04"
Routed to Pond 13P : Detention Basin R-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr RMAT 10-YR Rainfall=7.10"

	Area (sf)	CN	Description
*	11,500	98	Building Roofs
*	6,502	98	Detention Basin
*	50,311	98	Pavement and Walks
	45,538	80	>75% Grass cover, Good, HSG D
	0	80	>75% Grass cover, Good, HSG D
	113,851	91	Weighted Average
	45,538		40.00% Pervious Area
	68,313		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.7	105	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.0	205	Total			

Subcatchment 18S: POST-SUB No. 2C



Summary for Subcatchment 19S: POST-SUB No. 2D

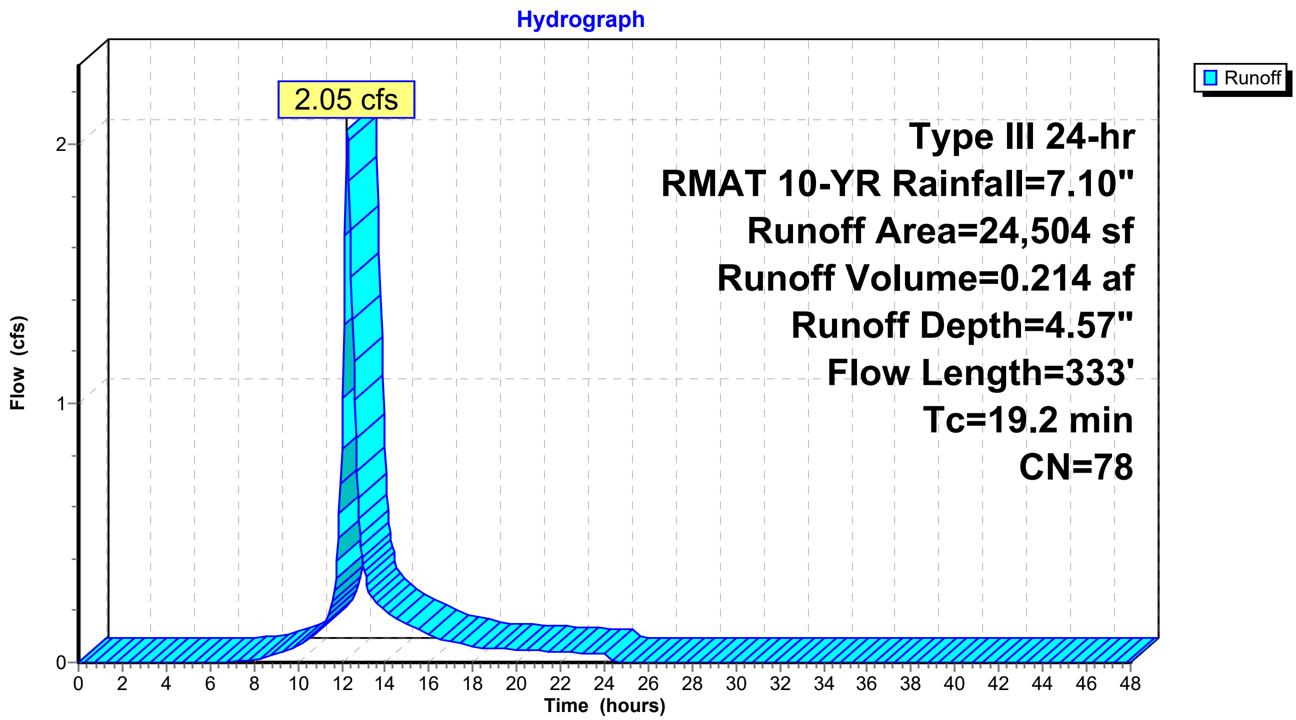
Runoff = 2.05 cfs @ 12.26 hrs, Volume= 0.214 af, Depth= 4.57"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr RMAT 10-YR Rainfall=7.10"

Area (sf)	CN	Description
14,488	77	Woods, Good, HSG D
10,016	80	>75% Grass cover, Good, HSG D
24,504	78	Weighted Average
24,504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.5	100	0.0330	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.90"
0.7	233	0.1200	5.20		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
19.2	333	Total			

Subcatchment 19S: POST-SUB No. 2D



Summary for Subcatchment 22S: POST-SUB No. 1C

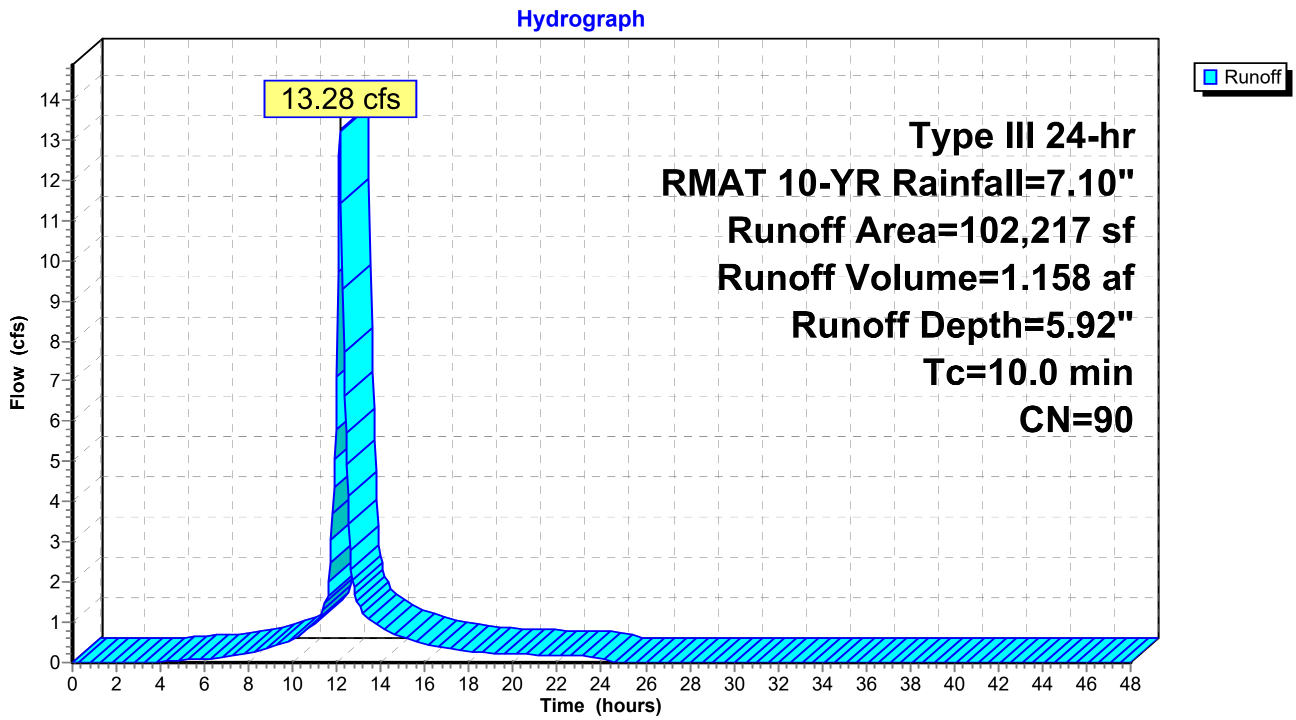
Runoff = 13.28 cfs @ 12.14 hrs, Volume= 1.158 af, Depth= 5.92"
Routed to Pond 23P : Detention Basin F-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr RMAT 10-YR Rainfall=7.10"

	Area (sf)	CN	Description
*	16,090	98	Building Roofs
*	52,636	98	Pavement and Walks
*	5,255	98	Detention Basin
	14,731	61	>75% Grass cover, Good, HSG B
	13,505	80	>75% Grass cover, Good, HSG D
	102,217	90	Weighted Average
	28,236		27.62% Pervious Area
	73,981		72.38% Impervious Area

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

Subcatchment 22S: POST-SUB No. 1C



Summary for Subcatchment 24S: POST-SUB No. 1A

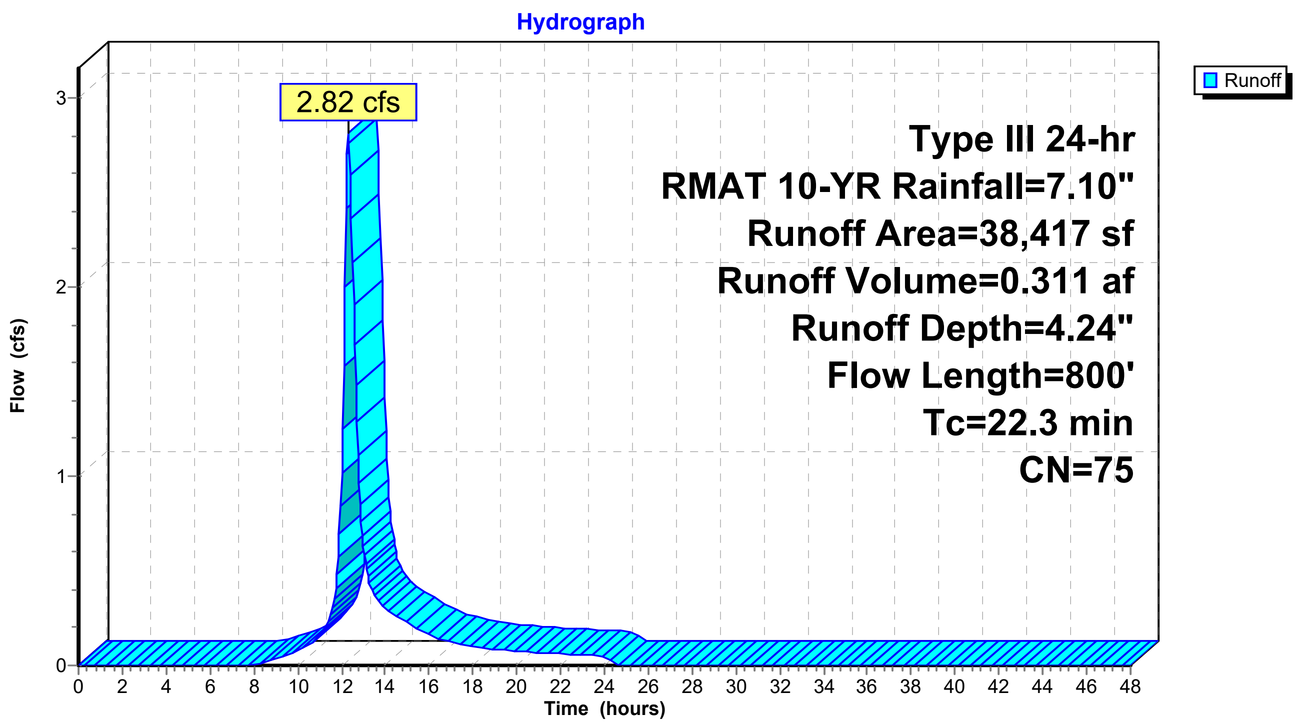
Runoff = 2.82 cfs @ 12.31 hrs, Volume= 0.311 af, Depth= 4.24"
Routed to Pond 26P : Infiltration Basin F-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr RMAT 10-YR Rainfall=7.10"

	Area (sf)	CN	Description
	23,572	77	Woods, Good, HSG D
	0	73	Woods/grass comb., Poor, HSG B
*	14,845	71	>75% grass cover, Good, HSG B
	38,417	75	Weighted Average
	38,417		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	100	0.0150	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.90"
5.5	700	0.0200	2.12		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
22.3	800	Total			

Subcatchment 24S: POST-SUB No. 1A



Summary for Subcatchment 25S: POST-SUB-No. 1E

[47] Hint: Peak is 273% of capacity of segment #4

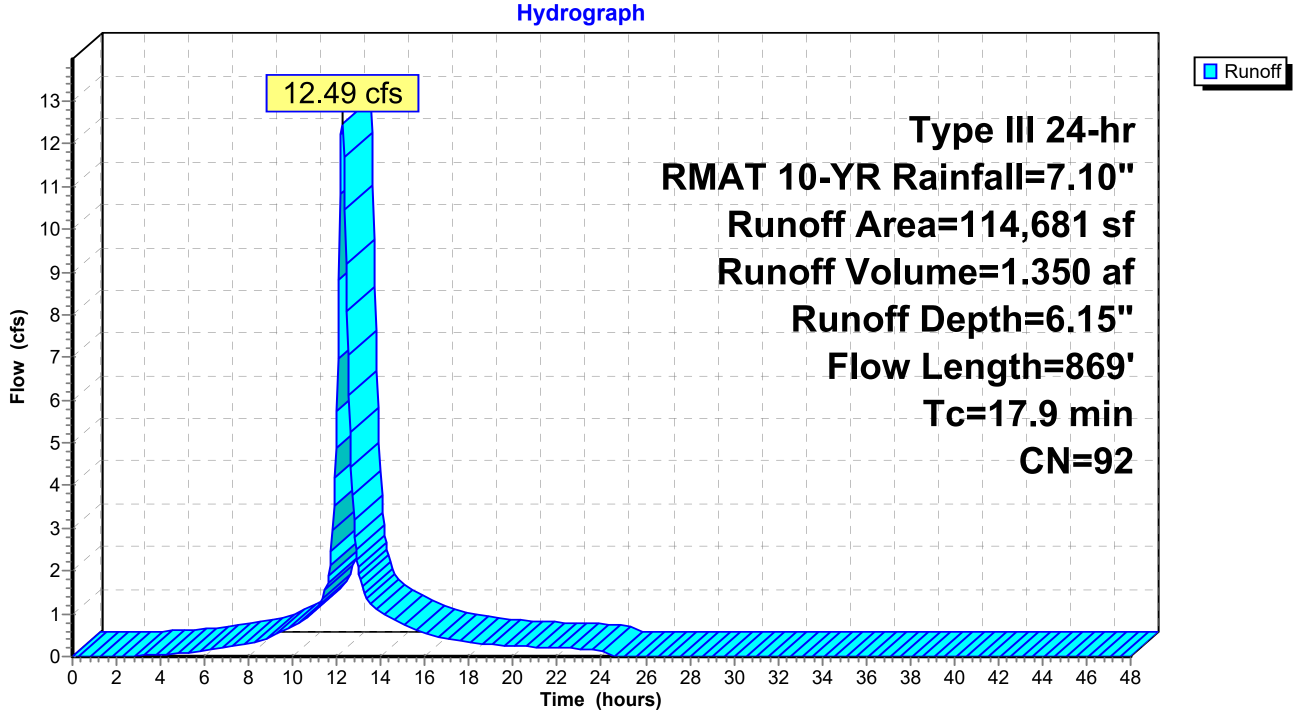
Runoff = 12.49 cfs @ 12.24 hrs, Volume= 1.350 af, Depth= 6.15"
Routed to Pond 26P : Infiltration Basin F-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr RMAT 10-YR Rainfall=7.10"

	Area (sf)	CN	Description
*	28,932	98	Buildings
*	65,867	98	pavement and walks
	15,194	61	>75% Grass cover, Good, HSG B
	4,688	80	>75% Grass cover, Good, HSG D
	114,681	92	Weighted Average
	19,882		17.34% Pervious Area
	94,799		82.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0090	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	40	0.0090	1.42		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.1	254	0.0350	3.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.1	475	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
17.9	869	Total			

Subcatchment 25S: POST-SUB-No. 1E



Summary for Subcatchment 27S: POST-SUB No. 1A-A

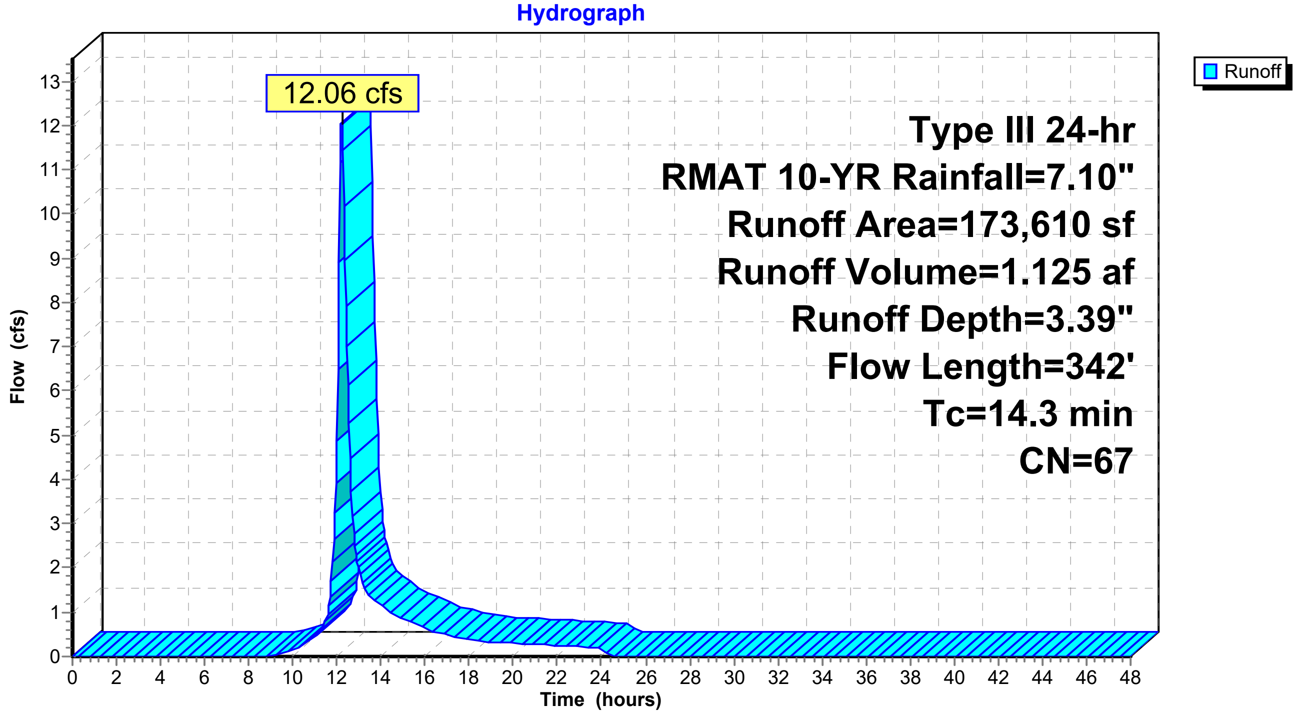
Runoff = 12.06 cfs @ 12.20 hrs, Volume= 1.125 af, Depth= 3.39"
Routed to Reach 4R : ANALYSIS POINT NO. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr RMAT 10-YR Rainfall=7.10"

	Area (sf)	CN	Description
	87,949	77	Woods, Good, HSG D
	4,955	55	Woods, Good, HSG B
*	29,916	30	Woods, Good, HSG A
	0	32	Woods/grass comb., Good, HSG A
	0	79	Woods/grass comb., Good, HSG D
	30,440	80	>75% Grass cover, Good, HSG D
*	20,350	61	>75% Grass cover, Good, HSG B
	173,610	67	Weighted Average
	173,610		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	20	0.0500	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	42	0.0360	1.33		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.5	200	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	12	0.3000	0.31		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
8.7	68	0.0360	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.90"
14.3	342	Total			

Subcatchment 27S: POST-SUB No. 1A-A



Summary for Subcatchment 28S: Post Sub No 1F

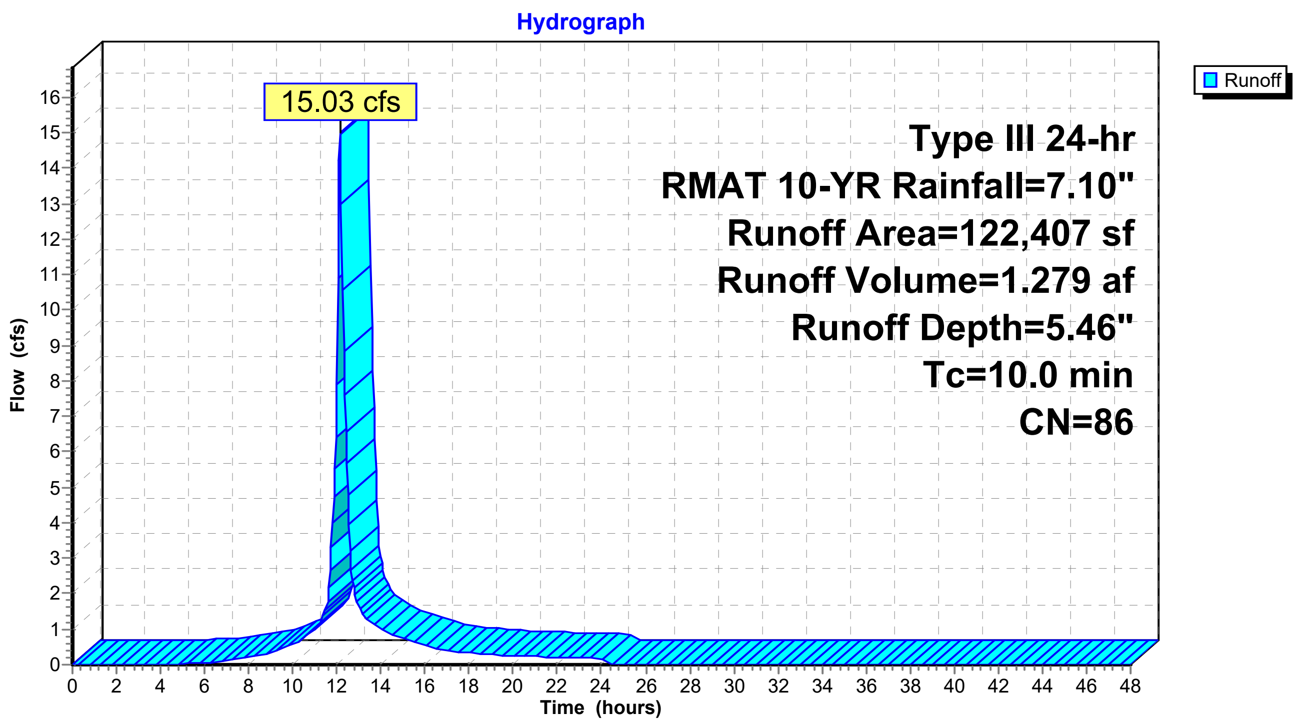
Runoff = 15.03 cfs @ 12.14 hrs, Volume= 1.279 af, Depth= 5.46"
Routed to Pond 26P : Infiltration Basin F-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr RMAT 10-YR Rainfall=7.10"

	Area (sf)	CN	Description
*	23,000	98	Building Roof
*	7,000	98	Building Roof
	39,422	61	>75% Grass cover, Good, HSG B
*	27,685	98	Pavement and walks
*	13,800	98	Basin
*	11,500	98	Building Roof
	122,407	86	Weighted Average
	39,422		32.21% Pervious Area
	82,985		67.79% Impervious Area

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

Subcatchment 28S: Post Sub No 1F



Summary for Subcatchment 29S: POST SUB NO 1G

[47] Hint: Peak is 153% of capacity of segment #4

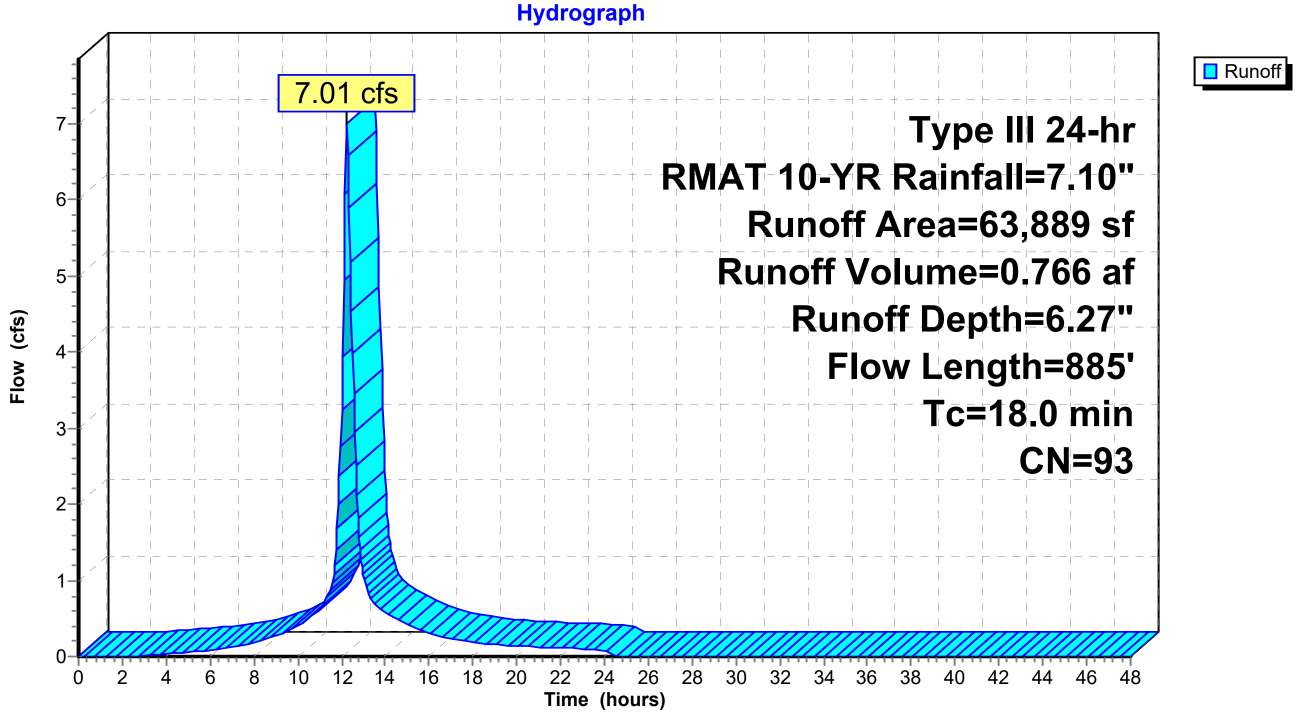
Runoff = 7.01 cfs @ 12.24 hrs, Volume= 0.766 af, Depth= 6.27"
Routed to Pond 7P : Detention Basin F-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr RMAT 10-YR Rainfall=7.10"

	Area (sf)	CN	Description
*	51,612	98	Pavement and walks
	7,166	61	>75% Grass cover, Good, HSG B
	1,911	80	>75% Grass cover, Good, HSG D
*	3,200	98	Building Roof
	63,889	93	Weighted Average
	9,077		14.21% Pervious Area
	54,812		85.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0090	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	40	0.0090	1.42		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.9	200	0.0350	3.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	545	0.0050	3.72	4.57	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
18.0	885	Total			

Subcatchment 29S: POST SUB NO 1G

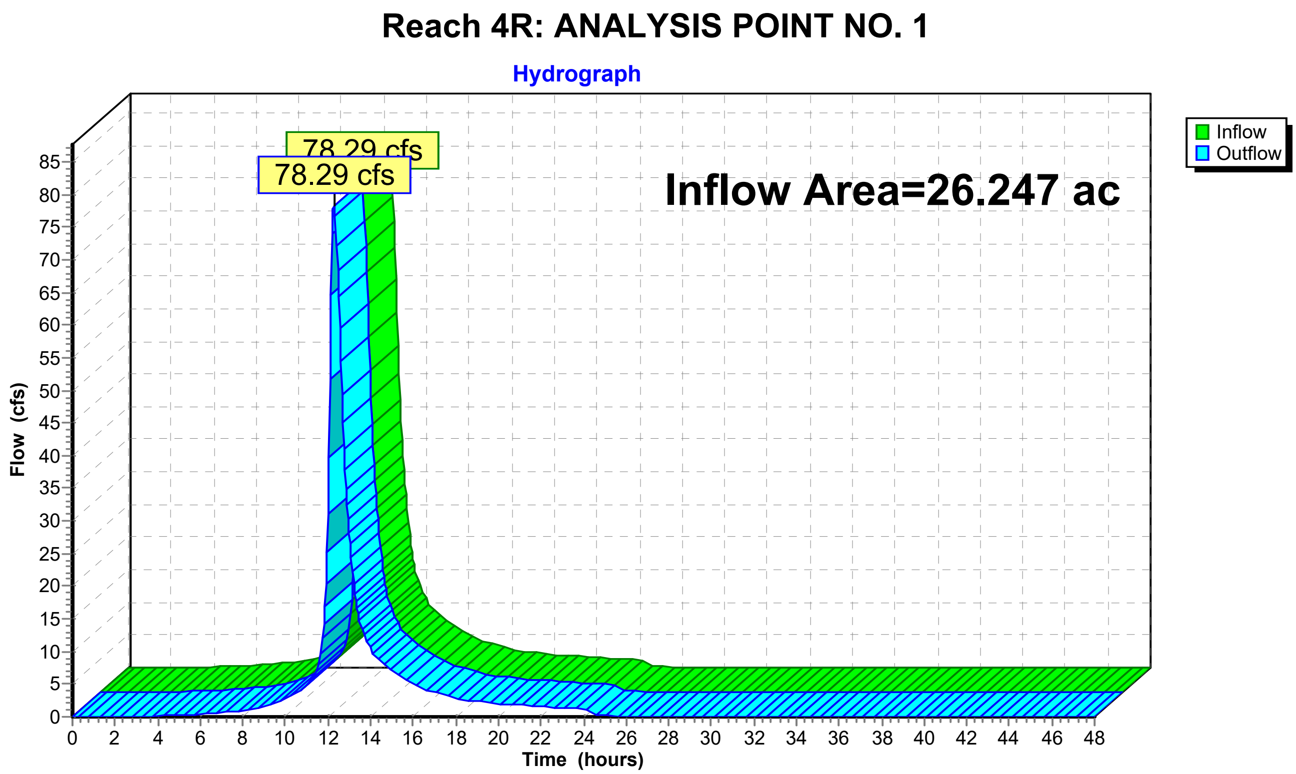


Summary for Reach 4R: ANALYSIS POINT NO. 1

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

Inflow Area = 26.247 ac, 46.64% Impervious, Inflow Depth = 4.65" for RMAT 10-YR event
Inflow = 78.29 cfs @ 12.27 hrs, Volume= 10.181 af
Outflow = 78.29 cfs @ 12.27 hrs, Volume= 10.181 af, Atten= 0%, Lag= 0.0 min

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

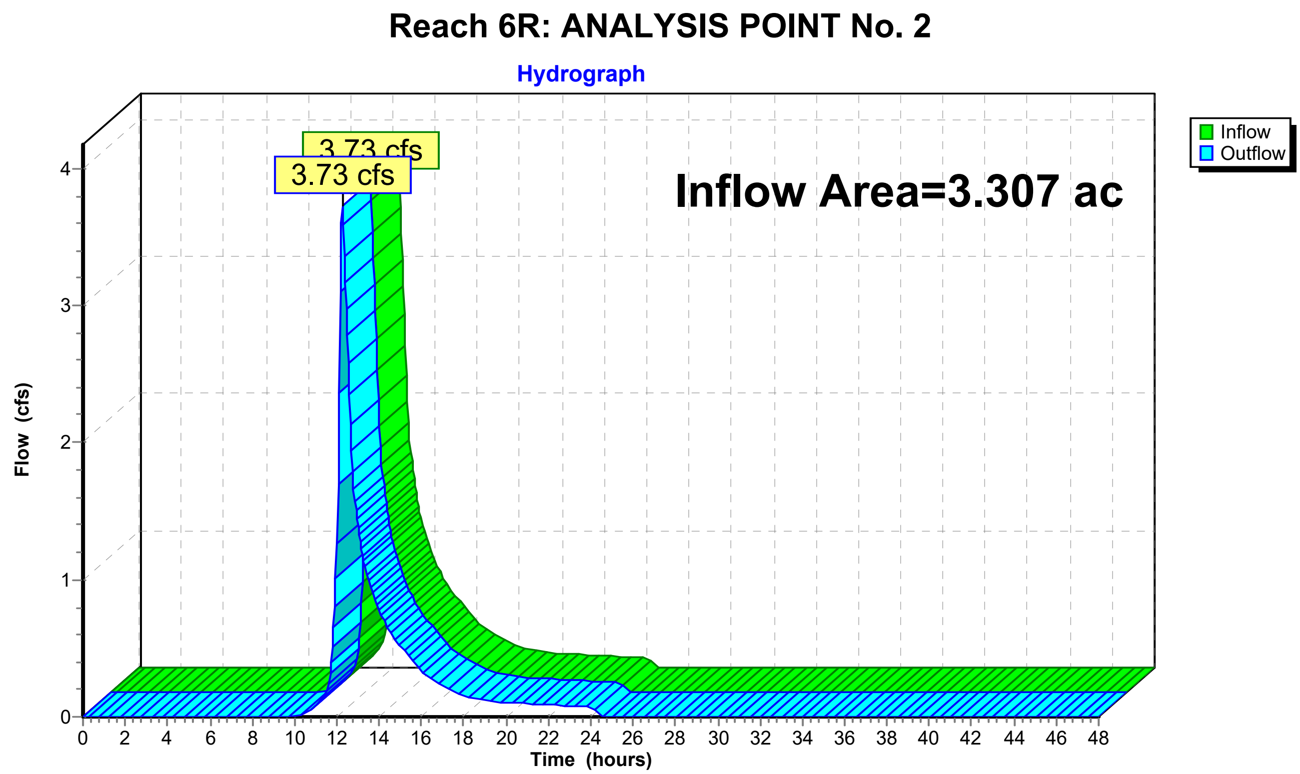


Summary for Reach 6R: ANALYSIS POINT No. 2

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

Inflow Area =	3.307 ac, 29.63% Impervious,	Inflow Depth = 1.78"	for RMAT 10-YR event	
Inflow =	3.73 cfs @	12.25 hrs, Volume=	0.491 af	
Outflow =	3.73 cfs @	12.25 hrs, Volume=	0.491 af, Atten= 0%, Lag= 0.0 min	

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



Summary for Pond 7P: Detention Basin F-3

Inflow Area = 3.485 ac, 76.85% Impervious, Inflow Depth = 6.00" for RMAT 10-YR event
Inflow = 16.74 cfs @ 12.22 hrs, Volume= 1.743 af
Outflow = 12.95 cfs @ 12.36 hrs, Volume= 1.743 af, Atten= 23%, Lag= 8.5 min
Primary = 12.95 cfs @ 12.36 hrs, Volume= 1.743 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 160.85' @ 12.36 hrs Surf.Area= 7,967 sf Storage= 9,808 cf

Plug-Flow detention time= 12.4 min calculated for 1.741 af (100% of inflow)
Center-of-Mass det. time= 12.4 min (798.7 - 786.2)

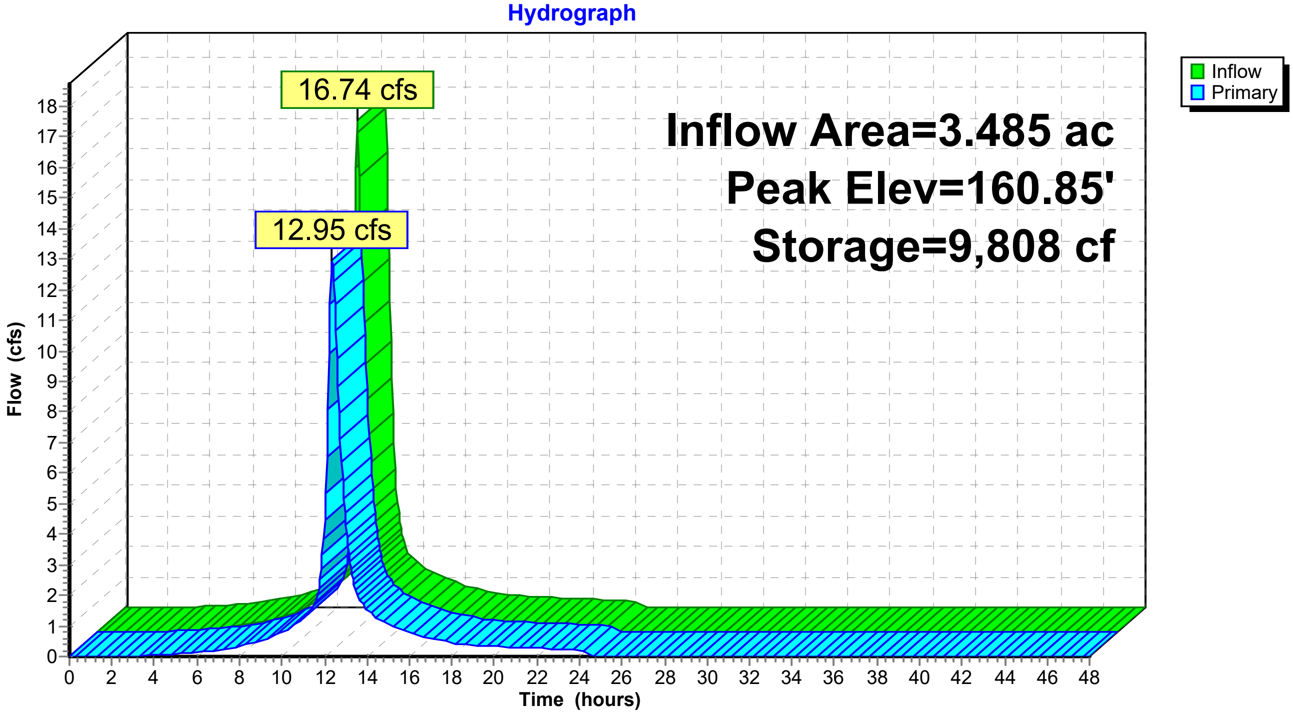
Volume	Invert	Avail.Storage	Storage Description
#1	159.00'	25,382 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.00	1	0	0
159.50	4,101	1,026	1,026
160.00	6,508	2,652	3,678
162.00	9,953	16,461	20,139
162.50	11,018	5,243	25,382

Device	Routing	Invert	Outlet Devices
#1	Device 3	156.00'	**18.0" Round Culvert** L= 110.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 156.00' / 153.00' S= 0.0273 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	159.00'	**45.0 deg x 1.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#3	Primary	155.67'	**18.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=12.91 cfs @ 12.36 hrs HW=160.84' (Free Discharge)
└─**3=Level Spreader Riser** (Passes 12.91 cfs of 19.35 cfs potential flow)
  └─**1=Culvert** (Passes 12.91 cfs of 17.21 cfs potential flow)
    └─**2=Sharp-Crested Vee/Trap Weir** (Weir Controls 12.91 cfs @ 3.97 fps)

Pond 7P: Detention Basin F-3



Summary for Pond 11P: Infiltration Basin R-1

Inflow Area = 1.769 ac, 55.40% Impervious, Inflow Depth = 4.02" for RMAT 10-YR event
Inflow = 5.87 cfs @ 12.15 hrs, Volume= 0.593 af
Outflow = 1.16 cfs @ 12.70 hrs, Volume= 0.593 af, Atten= 80%, Lag= 33.2 min
Discarded = 0.37 cfs @ 12.70 hrs, Volume= 0.458 af
Primary = 0.79 cfs @ 12.70 hrs, Volume= 0.135 af
Routed to Reach 6R : ANALYSIS POINT No. 2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 171.29' @ 12.70 hrs Surf.Area= 6,650 sf Storage= 9,232 cf

Plug-Flow detention time= 137.6 min calculated for 0.592 af (100% of inflow)
Center-of-Mass det. time= 137.5 min (917.2 - 779.7)

Volume	Invert	Avail.Storage	Storage Description
#1	169.70'	14,244 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

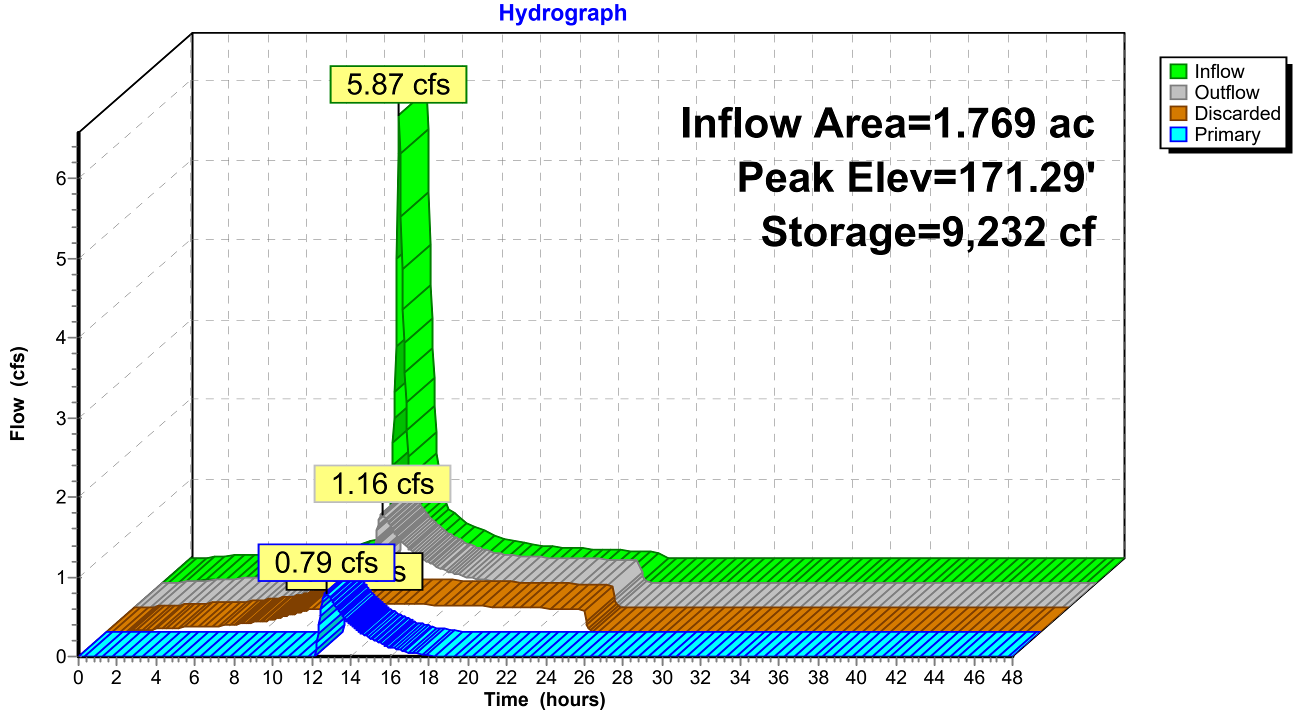
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
169.70	5,001	0	0	5,001
170.00	5,302	1,545	1,545	5,312
172.00	7,458	12,699	14,244	7,540

Device	Routing	Invert	Outlet Devices
#1	Primary	165.80'	**12.0" Round Culvert** L= 58.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 165.80' / 162.00' S= 0.0655 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	169.70'	**2.410 in/hr Exfiltration over Wetted area**
#3	Device 1	170.40'	**45.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.37 cfs @ 12.70 hrs HW=171.29' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.37 cfs)

Primary OutFlow Max=0.79 cfs @ 12.70 hrs HW=171.29' (Free Discharge)
└─**1=Culvert** (Passes 0.79 cfs of 8.45 cfs potential flow)
  └─**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.79 cfs @ 2.41 fps)

Pond 11P: Infiltration Basin R-1



Summary for Pond 12P: Detention Basin R-3

Inflow Area = 3.287 ac, 67.42% Impervious, Inflow Depth = 6.15" for RMAT 10-YR event
Inflow = 18.16 cfs @ 12.16 hrs, Volume= 1.686 af
Outflow = 8.02 cfs @ 12.44 hrs, Volume= 1.686 af, Atten= 56%, Lag= 16.7 min
Primary = 8.02 cfs @ 12.44 hrs, Volume= 1.686 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 163.00' @ 12.44 hrs Surf.Area= 6,227 sf Storage= 14,856 cf

Plug-Flow detention time= 28.0 min calculated for 1.686 af (100% of inflow)
Center-of-Mass det. time= 27.7 min (805.4 - 777.7)

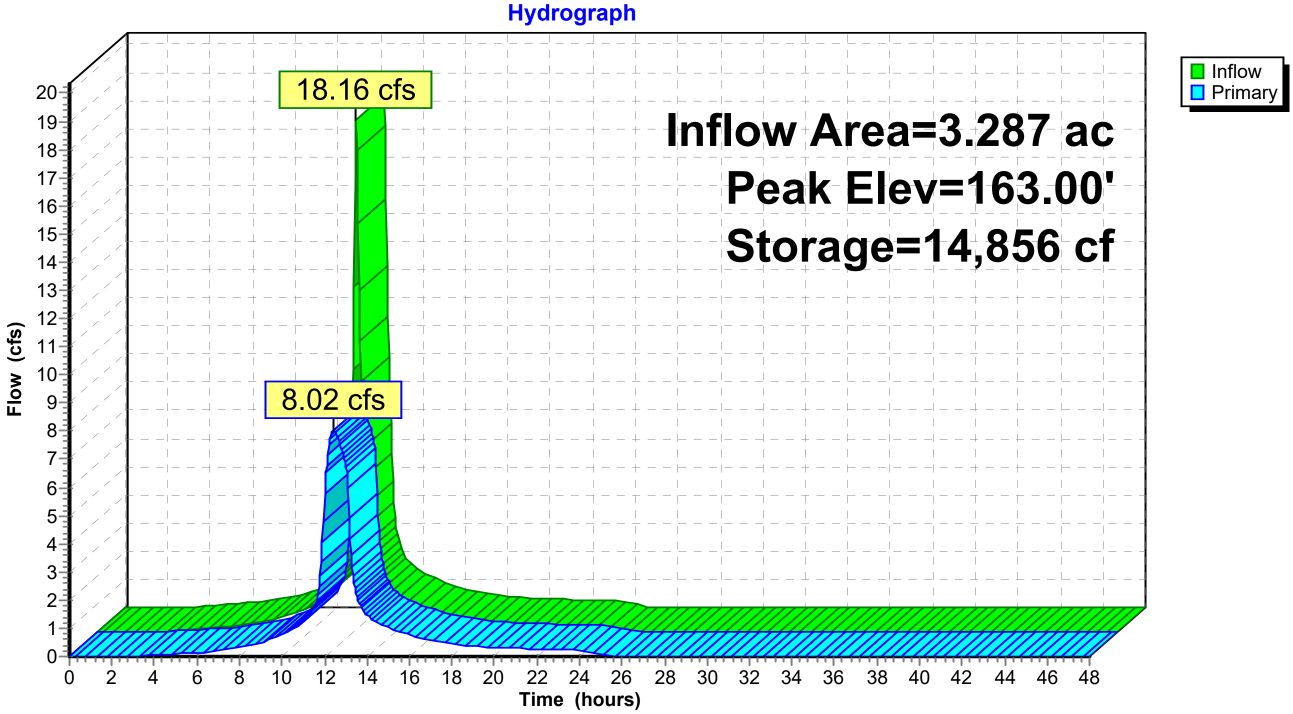
Volume	Invert	Avail.Storage	Storage Description
#1	159.80'	25,303 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
159.80	200	0	0
160.00	3,502	370	370
162.00	5,243	8,745	9,115
164.00	7,209	12,452	21,567
164.50	7,736	3,736	25,303

Device	Routing	Invert	Outlet Devices
#1	Device 3	158.00'	**12.0" Round Culvert** L= 85.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.00' / 144.00' S= 0.1647 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	159.80'	**45.0 deg x 0.5' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#3	Primary	150.67'	**12.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=8.02 cfs @ 12.44 hrs HW=163.00' (Free Discharge)
└─**3=Level Spreader Riser** (Passes 8.02 cfs of 13.28 cfs potential flow)
  └─**1=Culvert** (Inlet Controls 8.02 cfs @ 10.21 fps)
    └─**2=Sharp-Crested Vee/Trap Weir** (Passes 8.02 cfs of 28.54 cfs potential flow)

Pond 12P: Detention Basin R-3



Summary for Pond 13P: Detention Basin R-2

Inflow Area = 2.614 ac, 60.00% Impervious, Inflow Depth = 6.04" for RMAT 10-YR event
Inflow = 14.59 cfs @ 12.15 hrs, Volume= 1.315 af
Outflow = 11.01 cfs @ 12.26 hrs, Volume= 1.315 af, Atten= 25%, Lag= 6.4 min
Primary = 11.01 cfs @ 12.26 hrs, Volume= 1.315 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 162.81' @ 12.26 hrs Surf.Area= 6,344 sf Storage= 6,334 cf

Plug-Flow detention time= 8.1 min calculated for 1.314 af (100% of inflow)
Center-of-Mass det. time= 8.1 min (788.7 - 780.6)

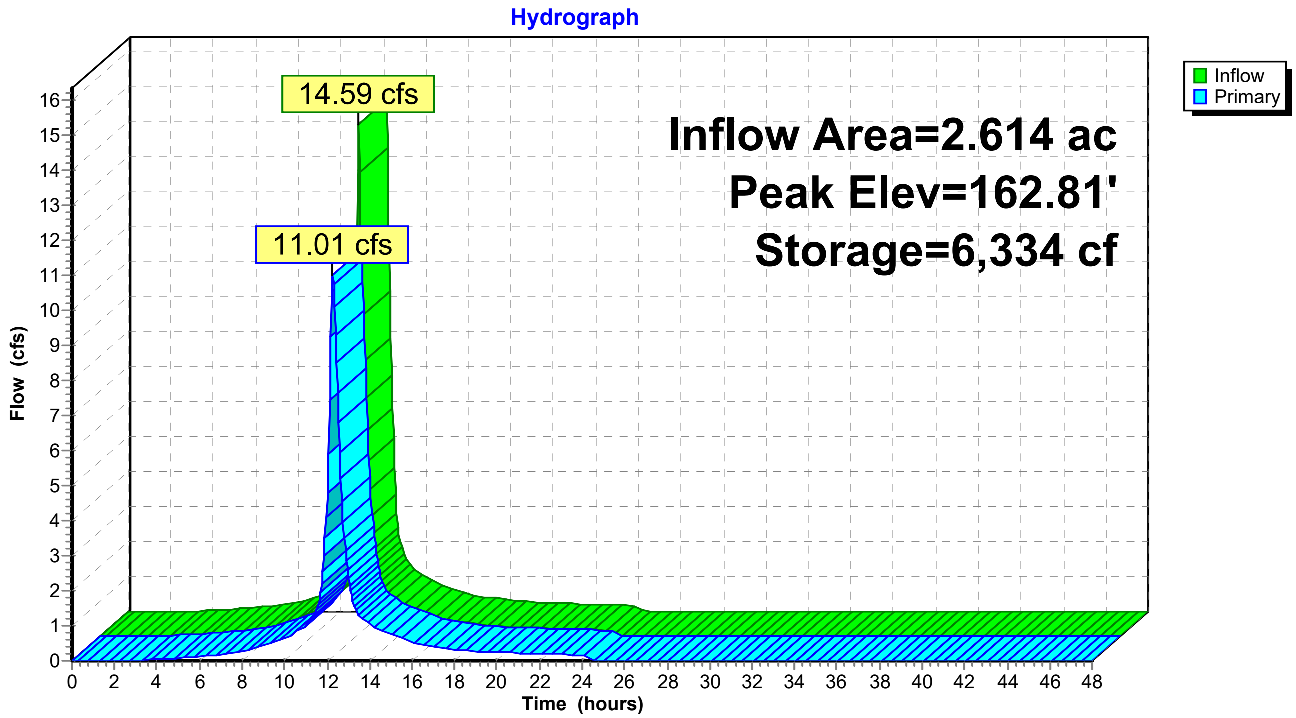
Volume	Invert	Avail.Storage	Storage Description
#1	161.50'	18,409 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
161.50	400	0	0
162.00	5,563	1,491	1,491
164.00	7,484	13,047	14,538
164.50	7,999	3,871	18,409

Device	Routing	Invert	Outlet Devices
#1	Device 3	152.00'	**12.0" Round Culvert** L= 78.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.00' / 141.00' S= 0.1410 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	161.50'	**2.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	143.17'	**12.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=10.97 cfs @ 12.26 hrs HW=162.81' (Free Discharge)
└─**3=Level Spreader Riser** (Passes 10.97 cfs of 16.76 cfs potential flow)
  └─**1=Culvert** (Passes 10.97 cfs of 12.14 cfs potential flow)
    └─**2=Sharp-Crested Rectangular Weir** (Weir Controls 10.97 cfs @ 3.74 fps)

Pond 13P: Detention Basin R-2



Summary for Pond 23P: Detention Basin F-2

Inflow Area = 2.347 ac, 72.38% Impervious, Inflow Depth = 5.92" for RMAT 10-YR event
Inflow = 13.28 cfs @ 12.14 hrs, Volume= 1.158 af
Outflow = 7.59 cfs @ 12.31 hrs, Volume= 1.037 af, Atten= 43%, Lag= 10.4 min
Primary = 7.59 cfs @ 12.31 hrs, Volume= 1.037 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 161.20' @ 12.31 hrs Surf.Area= 7,531 sf Storage= 18,586 cf

Plug-Flow detention time= 165.3 min calculated for 1.036 af (89% of inflow)
Center-of-Mass det. time= 116.8 min (900.0 - 783.2)

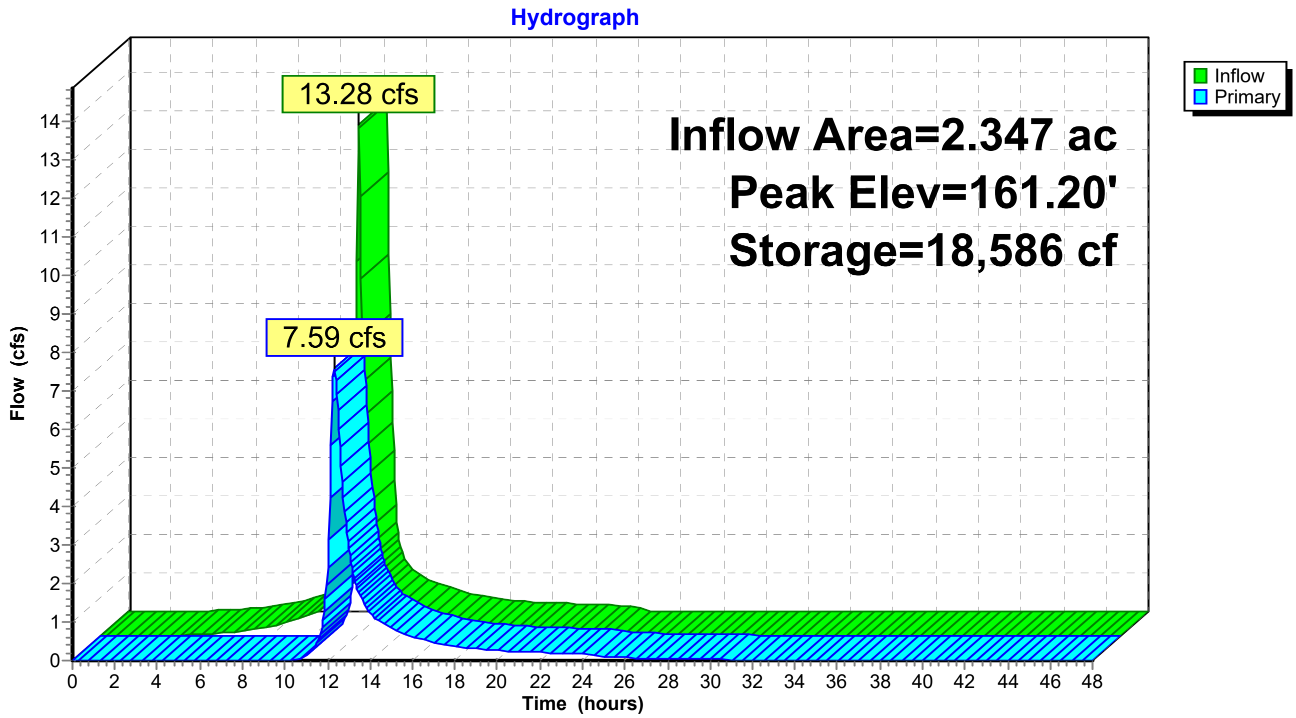
Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	29,366 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	4,222	0	0
160.00	6,163	10,385	10,385
162.00	8,447	14,610	24,995
162.50	9,035	4,371	29,366

Device	Routing	Invert	Outlet Devices
#1	Device 2	158.00'	**15.0" Round Culvert** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.00' / 155.00' S= 0.0375 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Primary	157.42'	**15.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads
#3	Device 1	159.00'	**45.0 deg Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=7.57 cfs @ 12.31 hrs HW=161.19' (Free Discharge)
└─**2=Level Spreader Riser** (Passes 7.57 cfs of 11.48 cfs potential flow)
 └─**1=Culvert** (Passes 7.57 cfs of 9.47 cfs potential flow)
  └─**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 7.57 cfs @ 3.79 fps)

Pond 23P: Detention Basin F-2



Summary for Pond 26P: Infiltration Basin F-4

Inflow Area = 6.325 ac, 64.53% Impervious, Inflow Depth = 5.58" for RMAT 10-YR event
Inflow = 28.15 cfs @ 12.17 hrs, Volume= 2.941 af
Outflow = 17.36 cfs @ 12.40 hrs, Volume= 2.941 af, Atten= 38%, Lag= 13.6 min
Discarded = 0.54 cfs @ 12.42 hrs, Volume= 1.100 af
Primary = 16.82 cfs @ 12.40 hrs, Volume= 1.841 af
Routed to Reach 4R : ANALYSIS POINT NO. 1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 163.47' @ 12.42 hrs Surf.Area= 22,889 sf Storage= 42,858 cf

Plug-Flow detention time= 224.5 min calculated for 2.937 af (100% of inflow)
Center-of-Mass det. time= 225.3 min (1,019.3 - 794.0)

Volume	Invert	Avail.Storage	Storage Description
#1	161.00'	55,617 cf	**Custom Stage Data (Conic)**Listed below (Recalc)

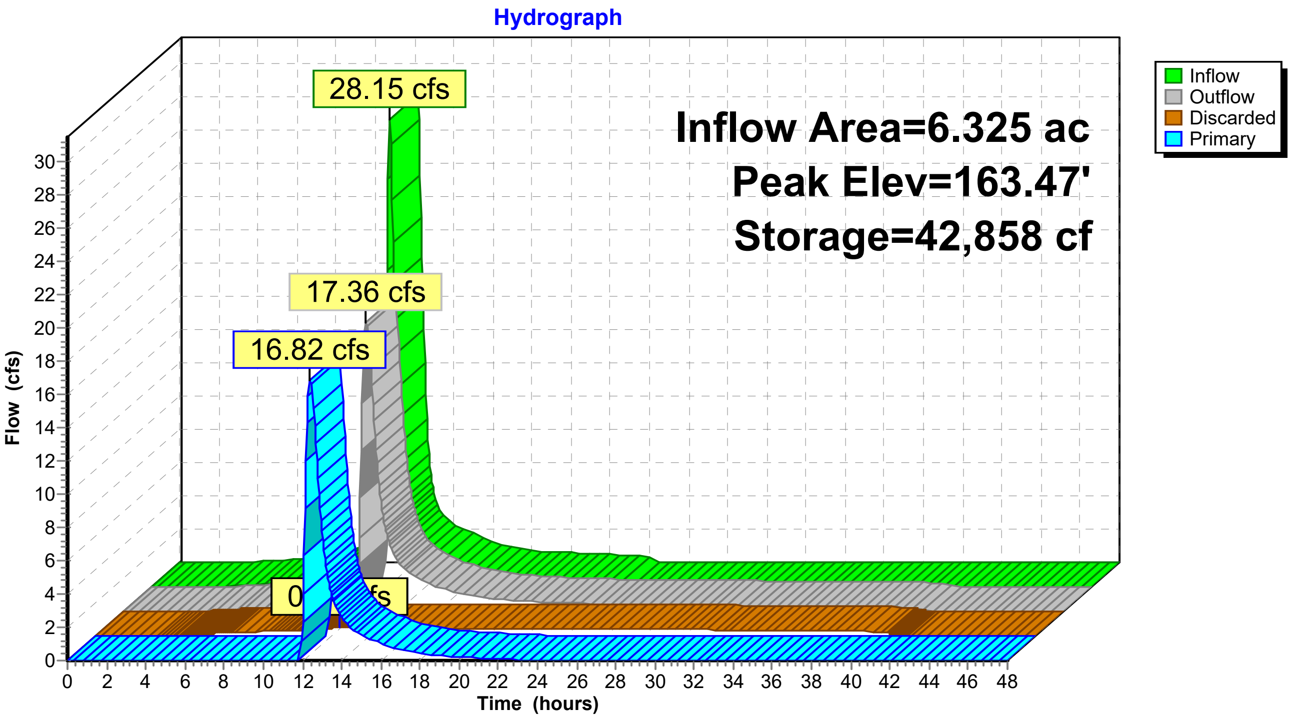
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
161.00	10,567	0	0	10,567
162.00	17,000	13,657	13,657	17,013
164.00	25,230	41,960	55,617	25,307

Device	Routing	Invert	Outlet Devices
#1	Device 4	158.00'	**18.0" Round Culvert** L= 221.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 158.00' / 153.00' S= 0.0226 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Discarded	161.00'	**1.020 in/hr Exfiltration over Wetted area**
#3	Device 1	162.40'	**5.0' long x 2.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Primary	155.67'	**18.0" Horiz. Level Spreader Riser** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.54 cfs @ 12.42 hrs HW=163.47' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.54 cfs)

Primary OutFlow Max=16.82 cfs @ 12.40 hrs HW=163.47' (Free Discharge)
↑—**4=Level Spreader Riser** (Passes 16.82 cfs of 23.76 cfs potential flow)
↑—**1=Culvert** (Outlet Controls 16.82 cfs @ 9.52 fps)
↑—**3=Sharp-Crested Rectangular Weir** (Passes 16.82 cfs of 17.27 cfs potential flow)

Pond 26P: Infiltration Basin F-4



APPENDIX B
HydroCAD Models

ATTACHMENT 10 – PASSIVEHOUSE GAP ANALYSIS

AIRTIGHT
ENERGY CONSULTING, INC.

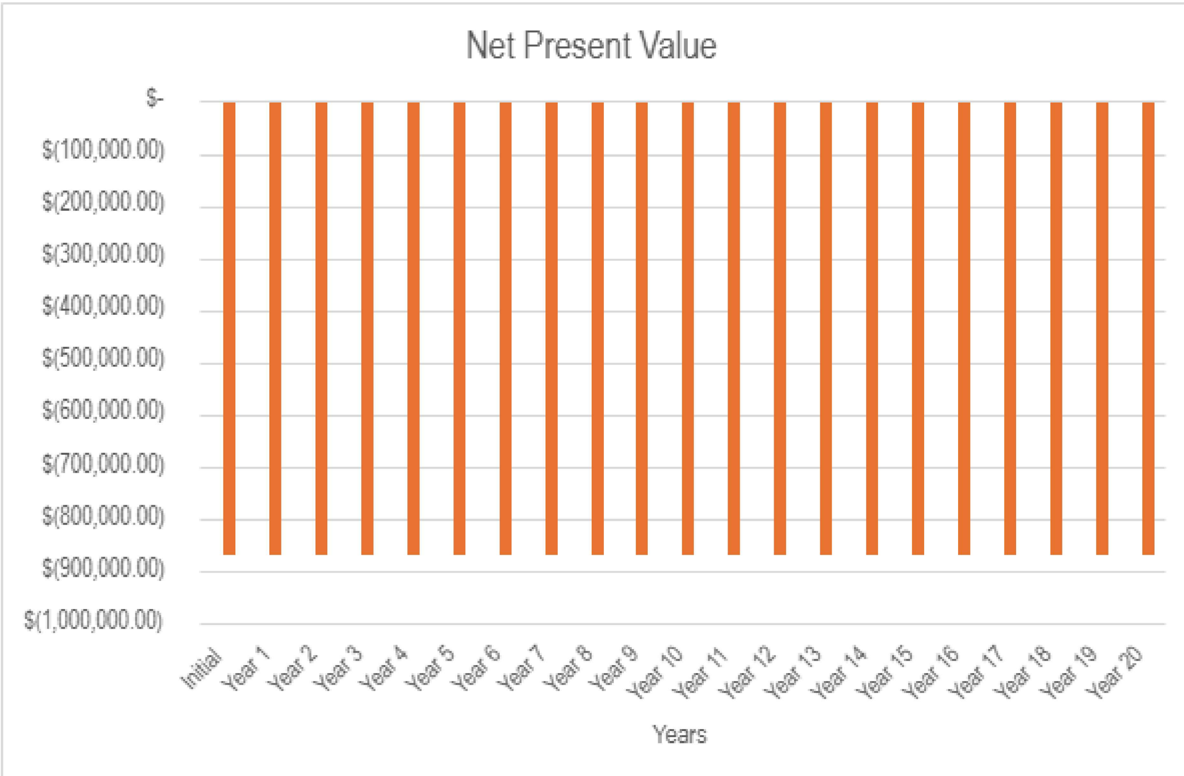
Life Cycle Cost Analysis: Scenario #3

Sierra Vista Commons, Easthampton MA

Airtight Energy Consulting Inc. has completed a Life Cycle Cost Analysis (LCCA) based on the Passive House Feasibility Studies and cost estimates.

Variable	Assumption
Life Cycle Period	20 years
Discount Rate	7.5% interest rate – 2.9% inflation rate = 4.6% discount rate
Additional Construction Costs for Passive House	$106,068 for each residential buildings $92,781 for units over commercial space See accompanying Passive House Feasibility Studies and Cost Comparison Documents
Additional Design/Verification Costs for Passive House	$315,000 assumed for development as a whole
Passive House Incentives	$600,000 assumed for development as a whole
Energy Use Reduction	**Owner pays for water heating and ventilation.** 0 kWh/year each for residential buildings 0 kWh/year for units over commercial space (All energy saving measures on tenant meters)
Demand Reduction	0.0 kW each for residential buildings 0.0 kW for units over commercial space (All energy saving measures on tenant meters)
Cost of Electricity	Delivery Service Charge: $0.04384/kWh + $23.12/month/kW Supplier Service Charge: $0.15513/kWh Per Eversource published rates for Small Commercial (Demand) G-1
Energy Escalation Rate	2.68% Nominal Rate - 2.9% Inflation Rate = -0.21% Realized Rate Per online NIST Calculator

Based on the assumptions above, the initial additional investment to build the residential dwelling units to Passive House standard is $868,461 (additional construction costs and design/verification costs minus incentives). This additional investment is shown as a negative cash flow in the chart below. Over 20 years, there is no change in Net Present Value since there are no energy savings, assuming the owner pays only for water heating and ventilation.



Simple Payback: N/A

Discounted Payback: N/A

Savings to Investment Ratio: N/A

Analyst	**Date**	**Job Number**
Mark Newey	5/31/2024	23-001

SAGE ENGINEERING & CONTRACTING, INC 05/24/24

199 Servistar Industrial Way - Suite 2
Westfield, Massachusetts 01085
Tel: 413-562-4884
Fax: 413-562-4899

SIERRA VISTA COMMONS
PASSIVE HOUSE COST COMPARISON
14 UNIT MIXED BUILDING

			Unit Costs		
	Description	Unit	Quantity	Unit Price	Cost
1	Under Slab Floor Insulation				
	Base Case R-10 Perimter	ls	1.00	$9,120.00	$9,120.00
	Passive House: R-10 perimiter with R-8 under slab	ls	1.00	$60,970.00	$60,970.00
2	Exterior Walls				
	Base Case: R-10 Exterior zip sheathing w/ R-20 cavity (exterior material Cost only)	ls	1.00	$55,781.00	$55,781.00
	Passive House: R-12 Exterior zip Sheating w/ R-20 Cavity (exterior material cost only)	ls	1.00	$64,540.00	$64,540.00
3	Windows				
	Base Case: Single/Double Hung U: 0.324, Glass U: 0.25, SHGF 0.29 Frame: 2"	ls	1.00	$45,053.00	$45,053.00
	Passive House: Casement or tilt/turn U 0.195, Glass U: 0.123, SHGC: 0.35 Frame 4"	ls	1.00	$66,170.00	$66,170.00
4	Ventilation				
	Base: 70% Sensible Recovery Centralized 840 CFM	ls	1.00	$6,555.00	$6,555.00
	Passive House: 80% Sensible Recovery Centralized 840 CFM	ls	1.00	$8,030.00	$8,030.00
5	Recirculation Loop 440 feet per loop assuming 1" pipe				
	Base Case: 1" insulation, continous circulations	ls	1.00	$1,210.00	$1,210.00
	Passive House: 1.5" insulation, on demand circulation	ls	1.00	$3,090.00	$3,090.00
6	Unit Piping				
	Base Case: 1/2 to 3/4" px, 40 foot runs	ea	14.00	$6,500.00	$91,000.00
	Passive House: 1/2" Pex, up to 20 foot runs	ea	14.00	$5,800.00	$81,200.00
7	Clothes Washers				
	Base Case: 284 kWh per year, 1.57 EF (samsung WA45T3200AW)	ea	14.00	$549.00	$7,686.00
	Passive House: 1240 kWh/ year, 2.70 EF (samsung WF45H6300AG)	ea	14.00	$1,199.00	$16,786.00
8	Closthes Dryers				
	Base Case: Electric exhaust Vented, 3.73 CEF (Samsung DVE45T3200W)	ea	14.00	$549.00	$7,686.00
	Passive House: Electric Condensing Ventless 3.93 CEF (Bosch WTG86403UC)	ea	14.00	$1,149.00	$16,086.00

Base Case Total	**$224,091.00**
Passive House Total	**$316,872.00**
Cost Increase of Passive House Per Building	**$92,781.00**
Interest Over 20 years @ 7.5 %	**$96,604.00**
Total Cost Difference	**$189,385.00**

Sage Engineering & Contracting, Inc — 05/24/24

199 Servistar Industrial Way - Suite 2
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Tel: 413-562-4884
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Sierra Vista Commons
Passive House Cost Comparison
Typical 18 Unit Building

	Description	Unit	Unit Costs Quantity	Unit Price	Cost
1	Under Slab Floor Insulation				
	Base Case R-10 Perimter	ls	1.00	$6,910.00	$6,910.00
	Passive House: R-10 perimiter with R-8 under slab	ls	1.00	$44,710.00	$44,710.00
2	Exterior Walls				
	Base Case: R-10 Exterior zip sheathing w/ R-20 cavity (exterior material Cost only)	ls	1.00	$72,842.00	$72,842.00
	Passive House: R-12 Exterior zip Sheating w/ R-20 Cavity (exterior material cost only)	ls	1.00	$84,280.00	$84,280.00
3	Windows				
	Base Case: Single/Double Hung U: 0.324, Glass U: 0.25, SHGF 0.29 Frame: 2"	ls	1.00	$83,671.00	$83,671.00
	Passive House: Casement or tilt/turn U 0.195, Glass U: 0.123, SHGC: 0.35 Frame 4"	ls	1.00	$121,564.00	$121,564.00
4	Ventilation				
	Base: 70% Sensible Recovery Centralized 1200 CFM	ls	1.00	$9,365.00	$9,365.00
	Passive House: 80% Sensible Recovery Centralized 1200 CFM	ls	1.00	$16,388.75	$16,388.75
5	Recirculation Loop 507 feet per loop assuming 1" pipe				
	Base Case: 1" insulation, continous circulations	ls	1.00	$1,395.00	$1,395.00
	Passive House: 1.5" insulation, on demand circulation	ls	1.00	$3,408.00	$3,408.00
6	Unit Piping				
	Base Case: 1/2 to 3/4" px, 40 foot runs	ea	18.00	$6,500.00	$117,000.00
	Passive House: 1/2" Pex, up to 20 foot runs	ea	18.00	$5,800.00	$104,400.00
7	Clothes Washers				
	Base Case: 284 kWh per year, 1.57 EF (samsung WA45T3200AW)	ea	18.00	$549.00	$9,882.00
	Passive House: 1240 kWh/ year, 2.70 EF (samsung WF45H6300AG)	ea	18.00	$1,199.00	$21,582.00
8	Closthes Dryers				
	Base Case: Electric exhaust Vented, 3.73 CEF (Samsung DVE45T3200W)	ea	18.00	$549.00	$9,882.00
	Passive House: Electric Condensing Ventless 3.93 CEF (Bosch WTG86403UC)	ea	18.00	$1,149.00	$20,682.00

Base Case Total	**$310,947.00**
Passive House Total	**$417,014.75**
Cost Increase of Passive House Per Building	**$106,067.75**
Interest Over 20 years @ 7.5 %	**$99,005.00**
Cost Difference over the 9 Buildings	**$954,609.75**
Interest Cost over the 9 Buildings	**$891,045.00**
Total Cost Difference	**$1,845,654.75**

PASSIVE HOUSE FEASIBILITY STUDY: 5/13/2024

Sierra Vista Commons, Easthampton MA

Based on Schematic Design plans 2/7/2022

Building Type:	14 residential units above commercial space, 18 bedrooms
Building Size:	17,597 ft^2 interior Conditioned Floor Area (iCFA) 41,818 ft^2 exterior envelope surface area
Weather Location:	Westfield, MA

Passive House Targets

Phius+ 2021 CORE certification targets are set for each project based on the building type, size, and location. The targets for this project are shown below. This analysis assumes only the residential portion of the building is certified as Passive House:

Criteria	**Target**
Annual Heating Demand	7.5 kBtu/ft^2/year
Annual Cooling Demand	5.6 kBtu/ft^2/year
Peak Heating Load	5.6 Btu/ft^2/hour
Peak Cooling Load	1.7 Btu/ft^2/hour
Source Energy Criteria	5375 kWh/person/year

Passive House Feasibility Study Results

Airtight Energy Consulting Inc. has completed a Passive House Feasibility Study based on the plans provided. The Base Case is based on an anticipated worst-case HERS energy model (HERS 45) that meets mandatory code provisions and the envelope features already committed to by the project team.

Building Envelope	**Base Case (HERS 45)**	**Passive House**
Slab floor	R-10 perimeter insulation only	R-10 perimeter insulation **R-8** underslab insulation
Exterior walls	R-10 exterior insulated sheathing 2x6 walls with R-20 insulation	**R-12** exterior insulated sheathing 2x6 walls with R-20 insulation
Windows	Single or Double Hung Installed U-value: 0.30 Glass U-value: SHGC: 0.29 Frame thickness: 2 inches	Casement or Tilt/Turn Installed U-value: **0.195** Glass U-value: **0.123** SHGC: **0.35** Frame thickness: **4** inches
Glass doors	Installed U-value: 0.324 Glass U-value: 0.25 SHGC: 0.29 Frame thickness: 2 inches	Installed U-value: 0.324 Glass U-value: 0.25 SHGC: 0.29 Frame thickness: 2 inches
Opaque door	U-value: 0.70	**U-value: 0.56**
Roof	R-60 exterior rigid insulation	R-60 exterior rigid insulation
Thermal bridges	None modeled	None modeled
Airtightness	0.40 CFM50/ft^2	**0.06 CFM50/ft^2**

Mechanical Systems	**Base Case (HERS 45)**	**Passive House**
Heating and cooling	PTAC heat pumps Heating: 3.0 COP / 8.5 HSPF Cooling: 10 EER / 11.1 SEER	PTAC heat pumps Heating: 3.0 COP / 8.5 HSPF Cooling: 10 EER / 11.1 SEER
Ventilation	Rooftop ERV 70% Sensible Recovery Efficiency 0.8 watts/CFM Balanced supply and exhaust 35 CFM exhaust from each kitchen 25 CFM exhaust from each bathroom	Rooftop ERV **80%** Sensible Recovery Efficiency 0.8 watts/CFM Balanced supply and exhaust 35 CFM exhaust from each kitchen 25 CFM exhaust from each bathroom
Ventilation air conditioning	Rooftop heat pump Heating: 3.0 COP / 8.5 HSPF Cooling: 10 EER / 11.1 SEER	Rooftop heat pump Heating: 3.0 COP / 8.5 HSPF Cooling: 10 EER / 11.1 SEER

Plumbing Systems	**Base Case (HERS 45)**	**Passive House**
Water heating	Heat pump water heater 200 gallons, 3.57 EF	Heat pump water heater 200 gallons, 3.57 EF

Recirculation loop	440 feet long 1.5 inch average pipe diameter 1” insulation Continuous circulation	440 feet long 1.5 inch average pipe diameter **1.5”** insulation **On demand** circulation
Unit piping	½" to ¾" PEX Up to 40 foot runs	**½"** PEX Up to **20 foot** runs

Electrical	**Base Case (HERS 45)**	**Passive Building**
Interior lighting	100% LED	100% LED
Exterior lighting	100% LED	100% LED
Refrigerators	450 kWh/year	450 kWh/year
Dishwashers	270 kWh/year	270 kWh/year
Clothes washers	284 kWh/year 4.2 ft^3 1.57 EF	**120 kWh/year** **4.5 ft^3** **2.70 EF**
Clothes dryers	Electric exhaust vented 3.73 CEF	Electric **condensing ventless** 3.93 CEF
EV charging stations	A minimum of 20% EV-ready parking spaces	A minimum of 20% EV-ready parking spaces

Preliminary WUFI Energy Model Results

<u>Base Case</u>

Certificate criteria: **Phius CORE 2021**

Heating demand

specific: **19** kBtu/ft²yr

target: **7.5** kBtu/ft²yr

total: 334,262.19 kBtu/yr

Cooling demand

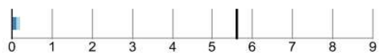
sensible: **0.1** kBtu/ft²yr

latent: **0.07** kBtu/ft²yr

specific: **0.17** kBtu/ft²yr

target: **5.6** kBtu/ft²yr

total: 3,027.07 kBtu/yr

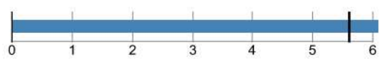


Heating load

specific: **14.63** Btu/hr ft²

target: **5.6** Btu/hr ft²

total: 257,395.3 Btu/hr

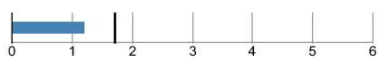


Cooling load

specific: **1.19** Btu/hr ft²

target: **1.7** Btu/hr ft²

total: 20,959.82 Btu/hr



Source energy

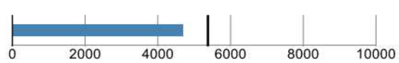
total: **149,482.16** kWh/yr

specific: **4,671** kWh/Person yr

target: **5,375** kWh/Person yr

total: **510,003.96** kBtu/yr

specific: 28.99 kBtu/ft²yr



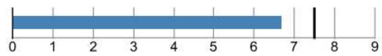
The Base Case is based on meeting a HERS 45 index in the worst-case unit. As you can see, the heating demand and heating load are far too high to meet Passive House requirements.

Passive House

Certificate criteria: **Phius CORE 2021**

Heating demand

specific:	**6.67**	kBtu/ft²yr
target:	**7.5**	kBtu/ft²yr
total:	117,385.85	kBtu/yr

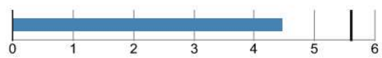


Cooling demand

sensible:	**0.14**	kBtu/ft²yr
latent:	**0.82**	kBtu/ft²yr
specific:	**0.96**	kBtu/ft²yr
target:	**5.6**	kBtu/ft²yr
total:	16,880.2	kBtu/yr

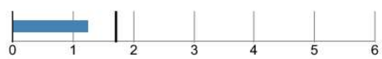
Heating load

specific:	**4.47**	Btu/hr ft²
target:	**5.6**	Btu/hr ft²
total:	78,586.85	Btu/hr



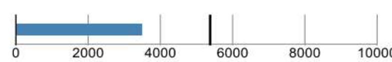
Cooling load

specific:	**1.23**	Btu/hr ft²
target:	**1.7**	Btu/hr ft²
total:	21,687.34	Btu/hr



Source energy

total:	**111,458.09**	kWh/yr
specific:	**3,483**	kWh/Person yr
target:	**5,375**	kWh/Person yr
total:	**380,273.25**	kBtu/yr
specific:	21.61	kBtu/ft²yr



The Passive Building would meet the energy modeling requirements of the Phius+ 2021 CORE standard, with a 11% buffer on the heating demand, and a larger buffer on all other thresholds. Not all features of the building have been drawn or modeled at this stage, so these are preliminary findings only.

Energy Modeler	**Date**	**Job Number**
Mark Newey	5/13/2024	23-001

PASSIVE HOUSE FEASIBILITY STUDY: 5/13/2024

Sierra Vista Commons, Easthampton MA

Based on Schematic Design plans 2/7/2022

Building Type:	Multifamily, 18 units, 47 bedrooms
Building Size:	33,604 ft^2 interior Conditioned Floor Area (iCFA) 39,870 ft^2 exterior envelope surface area
Weather Location:	Westfield, MA

Passive House Targets

Phius+ 2021 CORE certification targets are set for each project based on the building type, size, and location. The targets for this project are shown below:

Criteria	**Target**
Annual Heating Demand	5.4 kBtu/ft^2/year
Annual Cooling Demand	6.8 kBtu/ft^2/year
Peak Heating Load	4.3 Btu/ft^2/hour
Peak Cooling Load	1.7 Btu/ft^2/hour
Source Energy Criteria	4475 kWh/person/year

Passive House Feasibility Study Results

Airtight Energy Consulting Inc. has completed a Passive House Feasibility Study based on the plans provided. The Base Case is based on an anticipated worst-case HERS energy model (HERS 45) that meets mandatory code provisions and the envelope features already committed to by the project team.

Building Envelope	**Base Case**	**Passive House**
Slab floor	R-10 perimeter insulation only	R-10 perimeter insulation **R-8** underslab insulation
Exterior walls	R-10 exterior insulated sheathing 2x6 walls with R-20 insulation	**R-12** exterior insulated sheathing 2x6 walls with R-20 insulation
Windows	Single or Double Hung Installed U-value: 0.324 Glass U-value:0.25 SHGC: 0.29 Frame thickness: 2 inches	Casement or Tilt/Turn Installed U-value: **0.195** Glass U-value: **0.123** SHGC: **0.35** Frame thickness: **4** inches
Glass doors	Installed U-value: 0.324 Glass U-value: 0.25 SHGC: 0.29 Frame thickness: 2 inches	Installed U-value: 0.324 Glass U-value: 0.25 SHGC: 0.29 Frame thickness: 2 inches
Roof	R-60 exterior rigid insulation	R-60 exterior rigid insulation
Thermal bridges	None modeled	None modeled
Airtightness	0.40 CFM50/ft^2	**0.06 CFM50/ft^2**

Mechanical Systems	**Base Case**	**Passive House**
Heating and cooling	PTAC heat pumps Heating: 3.0 COP / 8.5 HSPF Cooling: 10 EER / 11.1 SEER	PTAC heat pumps Heating: 3.0 COP / 8.5 HSPF Cooling: 10 EER / 11.1 SEER
Ventilation	Rooftop ERV 70% Sensible Recovery Efficiency 0.8 watts/CFM Balanced supply and exhaust 35 CFM exhaust from each kitchen 25 CFM exhaust from each bathroom	Rooftop ERV **80%** Sensible Recovery Efficiency 0.8 watts/CFM Balanced supply and exhaust 35 CFM exhaust from each kitchen 25 CFM exhaust from each bathroom
Ventilation air conditioning	Rooftop heat pump Heating: 3.0 COP / 8.5 HSPF Cooling: 10 EER / 11.1 SEER	Rooftop heat pump Heating: 3.0 COP / 8.5 HSPF Cooling: 10 EER / 11.1 SEER

Plumbing Systems	**Base Case**	**Passive House**
Water heating	Heat pump water heater 40 gallons, 3.57 EF	Heat pump water heater 40 gallons, 3.57 EF
Recirculation loop	507 feet long	507 feet long

	1.5 inch average pipe diameter 1" insulation Continuous circulation	1.5 inch average pipe diameter **1.5"** insulation **On demand** circulation
Unit piping	½" to ¾" PEX Up to 40 foot runs	**½"** PEX Up to **20 foot** runs

Electrical	**Base Case**	**Passive Building**
Interior lighting	100% LED	100% LED
Exterior lighting	100% LED	100% LED
Refrigerators	450 kWh/year	450 kWh/year
Dishwashers	270 kWh/year	270 kWh/year
Clothes washers	284 kWh/year 4.2 ft^3 1.57 EF	**120 kWh/year** **4.5 ft^3** **2.70 EF**
Clothes dryers	Electric exhaust vented 3.73 CEF	Electric **condensing ventless** 3.93 CEF
EV charging stations	A minimum of 20% EV-ready parking spaces	A minimum of 20% EV-ready parking spaces

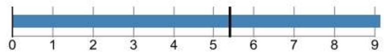
Preliminary WUFI Energy Model Results

Base Case

Certificate criteria: **Phius CORE 2021**

Heating demand

specific:	**13.94**	kBtu/ft²yr
target:	**5.4**	kBtu/ft²yr
total:	468,366.63	kBtu/yr

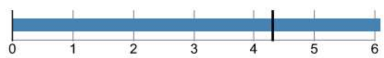


Cooling demand

sensible:	**0.03**	kBtu/ft²yr
latent:	**0.65**	kBtu/ft²yr
specific:	**0.69**	kBtu/ft²yr
target:	**6.8**	kBtu/ft²yr
total:	23,147.78	kBtu/yr

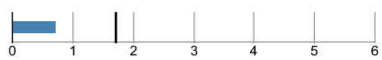
Heating load

specific:	**8.91**	Btu/hr ft²
target:	**4.3**	Btu/hr ft²
total:	299,389.76	Btu/hr



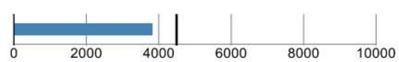
Cooling load

specific:	**0.7**	Btu/hr ft²
target:	**1.7**	Btu/hr ft²
total:	23,662.34	Btu/hr



Source energy

total:	**246,466.13**	kWh/yr
specific:	**3,792**	kWh/Person yr
target:	**4,475**	kWh/Person yr
total:	**840,894.33**	kBtu/yr
specific:	25.03	kBtu/ft²yr



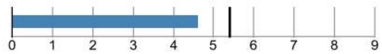
The Base Case is based on meeting a HERS 45 index in the worst-case unit. As you can see, the heating demand and heating load are far too high to meet Passive House requirements.

Passive House

Certificate criteria: **Phius CORE 2021**

Heating demand

specific:	**4.59**	kBtu/ft²yr
target:	**5.4**	kBtu/ft²yr
total:	154,293.89	kBtu/yr

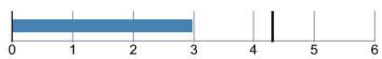


Cooling demand

sensible:	**0.18**	kBtu/ft²yr
latent:	**1.98**	kBtu/ft²yr
specific:	**2.16**	kBtu/ft²yr
target:	**6.8**	kBtu/ft²yr
total:	72,733.17	kBtu/yr

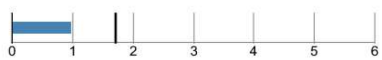
Heating load

specific:	**2.97**	Btu/hr ft²
target:	**4.3**	Btu/hr ft²
total:	99,641.4	Btu/hr



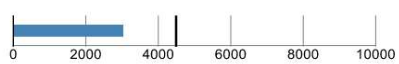
Cooling load

specific:	**0.95**	Btu/hr ft²
target:	**1.7**	Btu/hr ft²
total:	32,038.41	Btu/hr



Source energy

total:	**196,089.88**	kWh/yr
specific:	**3,017**	kWh/Person yr
target:	**4,475**	kWh/Person yr
total:	**669,020.4**	kBtu/yr
specific:	19.91	kBtu/ft²yr



The Passive Building would meet the energy modeling requirements of the Phius+ 2021 CORE standard, with a 15% buffer on the heating demand, and a larger buffer on all other thresholds. Not all features of the building have been drawn or modeled at this stage, so these are preliminary findings only.

Energy Modeler	**Date**	**Job Number**
Mark Newey	5/13/2024	23-001

ATTACHMENT 11 – UNANTICIPATED DISCOVERY PLAN

Sierra Vista Commons

Unanticipated Discovery Plan

INTRODUCTION

The Sierra Vista Commons Project (Project) located at 93, 95, 97, and 94 Northampton Street and 1 Groveland Street in the City of Easthampton (Project Area) will be redeveloped to support a mixed-use residential and commercial center. A new intersection configuration along Northampton Street will also be constructed. During earthwork, should unanticipated discoveries be made, the following procedure will be followed. This Unanticipated Discovery Plan (Plan) should be incorporated into construction bid and plan documents. The Plan should be maintained onsite during active earth work activities.

PROCEDURES

1. In the event that a suspected site is uncovered during construction activity, construction activity shall immediately be halted in the area of the find until it can be determined whether the object represents a potentially significant feature or site.

2. The project field staff will immediately notify the project proponent upon the suspension of work activities in the area of the find. Notification will include the specific location in which the potential feature or site is located.

3. The project proponent will immediately contact a cultural resource management consultant to review the information. On-site personnel will provide information on the location and any discernable characteristics of the potential cultural resource (the target), and any survey data depicting the find. This information will be forwarded for review by the project archaeologist for the cultural resource management consultant.

4. If the project archaeologist determines that the site, feature, or target is not potentially of cultural significance, the project field staff through the project proponent will be notified by the project archaeologist that work may resume. The project archaeologist will also notify the Massachusetts Historical Commission (MHC) of this determination.

5. If, based upon both previously acquired and current remote sensing survey data, or other indications (e.g., timbers, etc.), it is determined that the new target is possibly a potential cultural resource, the project archaeologist will inform the project proponent, who will inform the project field staff that work may not resume at the given location until notified in writing by the proponent. The applicable federal and state review agencies will be notified of this determination within 2 working days.

6. A visual inspection by an archaeologist will be conducted to determine if the site is potentially eligible for listing in the National Register. The results of the survey will be formally submitted to applicable federal and state agencies (if applicable) for final review and comment.

a. If it is determined that the target, feature, or site does not represent a potentially significant resource, and project proponent is in receipt of written comment from the review agency(s), work may resume in that area.

b. If a National Register determination cannot be made in accordance with Step 6, the project proponent may either undertake additional research to satisfy Step 7 or exercise Step 8 (avoidance).

7. If agency review concurs or concludes that the site may be important and is potentially National Register eligible, the project proponent will develop avoidance measures to eliminate the site from the Area of Potential Effects. Any proposed avoidance measures will be made available to the applicable review agencies for review and comment.

8. If avoidance measures cannot be developed and executed, the resource may be excavated and/or removed only under a memorandum of agreement with all interested parties subject to appropriate state permits. This memorandum will outline an adequate data recovery plan that specifies a qualified research team and an appropriate research design. The appropriate permits must also be secured from the MHC prior to conducting any further disturbance to the site.

CONTACTS

State Archaeologist/Massachusetts Historical Commission/SHPO
220 Morrissey Boulevard
Boston, MA 02125
Contact: Brona Simon, State Archaeologist/Acting Executive Director
(617) 727-8470; FAX: (617) 727-5128
mhc@sec.state.ma.us; Brona.simon@sec.state.ma.us

Stockbridge-Munsee Community Tribal Historic Preservation Extension Office
86 Spring Street
Williamstown, MA 01267
Contact: Jeffrey C Bendremer
thpo@mohican-nsn.gov

Wampanoag Tribe of Gay Head (Aquinnah)
20 Black Brook Road
Aquinnah, MA 02535
Contact: Bettina Washington
thpo@wampanoagtribe-nsn.gov

Mashpee Wampanoag Tribe
483 Great Neck Road South
Mashpee, MA 02649
Contact: David Weeden
106review@mwtribe-nsn.gov
David.weeden@mwtribe-nsn.gov

ATTACHMENT 12 – DISTRIBUTION LIST

Final Environmental Impact Report (FEIR)
for the
Sierra Vista Commons Project
Easthampton, Massachusetts

Electronic Distribution List

The email address for the contact person for each agency is provided below based on the Distribution List available from MEPA dated March 8, 2024.

Agency/Party	Physical Address	Email Address
MEPA Office	Executive Office of Energy and Environmental Affairs (EEA) Attn: MEPA Office 100 Cambridge Street, Suite 900 Boston, MA 02114	MEPA@mass.gov
Massachusetts Department of Environmental Protection (MassDEP) Boston Office	Department of Environmental Protection Commissioner's Office One Winter Street Boston, MA 02108	Helena.boccadoro@mass.gov
MassDEP Regional Office	MassDEP Western Regional Office Attn: MEPA Coordinator State House West – 4th Floor 436 Dwight Street Springfield, MA 01103	Kathleen.fournier@mass.gov
Massachusetts Department of Transportation Boston Office	MassDOT Public/Private Development Unit 10 Park Plaza, Suite 4150 Boston, MA 02116	MassDOTPPDU@dot.state.ma.us
Massachusetts Department of Transportation District Office	MassDOT District #2 Attn: MEPA Coordinator 811 North King Street Northampton, MA 01060	Bao.lang@dot.state.ma.us Garrett.postema@dot.state.ma.us
Applicable Regional Planning Agency	Pioneer Valley Regional Planning Commission (PVPC) Attn: Gary Roux 60 Congress Street, 1st Floor Springfield, MA 01104	gmroux@pvpc.org and one paper copy submitted
Municipal Offices – City of Easthampton	Easthampton City Council 50 Payson Avenue Easthampton, MA 01027	blabombard@easthamptonma.gov City Council Clerk
	Planning Board 50 Payson Avenue Easthampton, MA 01027	jbagg@easthamptonma.gov City Planner

	Conservation Commission 50 Payson Avenue Easthampton, MA 01027	ctragert@easthamptonma.gov Conservation Agent
	Health Department 50 Payson Avenue Easthampton, MA 01027	health@easthamptonma.gov
	Historical Commission c/o Mary Giza 50 Payson Avenue Easthampton, MA 01027	mgiza@easthamptonma.gov
	Emily Williston Memorial Library 9 Park Street Easthampton, MA 01027	kschapiro@ewmlibrary.org And one hard copy submitted
EEA Environmental Justice	MEPA Office Attn: EEA EJ Director 100 Cambridge Street, Suite 900 Boston, MA 02144	MEPA-EJ@mass.gov
Department of Energy Resources	Department of Energy Resources Attn: MEPA Coordinator 100 Cambridge Street, 10th Floor Boston, MA 02114	Paul.ormond@mass.gov
Executive Office of Housing and Livable Communities & Massachusetts Housing Program, Massachusetts Housing Finance Agency	EOHLC 100 Cambridge St. Boston, MA 02114	Catherine.racer@mass.gov
Department of Agricultural Resources	Department of Agricultural Resources Attn: MEPA Coordinator 138 Memorial Avenue, Suite 42 West Springfield, MA 01089	Barbara.hopson@mass.gov
Stockbridge-Bunsee Community	Tribal Historic Preservation Officer Jeffery C. Bendremer Ph.D., RPA	thpo@mohican-nsn.gov
Robert Peirent	*N/A*	*rpeirent@gmail.com*
Rebecca Stachowicz	*N/A*	*Rebecca.stachowicz@gmail.com*
Mary Lou Splain	*N/A*	*msplain@gmail.com*
Elisabeth Goodman on behalf of 102 Northampton Street LLC	*N/A*	*EGoodman@cainhibbard.com*
Sara Merand	*N/A*	*saramerand@gmail.com*
Janet Muzzy	*N/A*	*liztish@charter.net*
Henry Walz and Susan Grant	*N/A*	*grantwalz@verizon.net*

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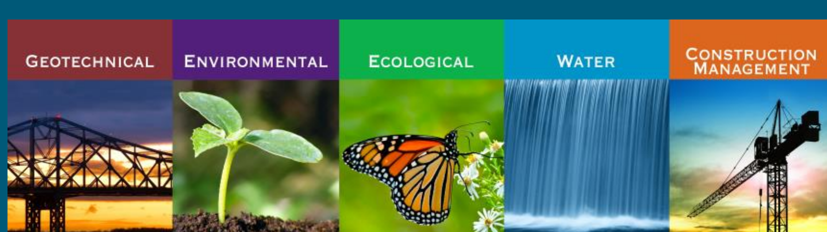
Nancy Natale	*N/A*	*nancynatale@gmail.com*
Thomas Brown	*N/A*	*Tbrown0554@yahoo.com*
Janna Tetreault, Easthampton Affordable & Fair Housing Partnership	*N/A*	*afhp@easthamptonma.gov*
Lucille and Larry Kostek	*N/A*	*ldkosteksmile@yahoo.com*
Barry Roth	*N/A*	*abenideemail@comcast.net*
Katherine Ahern	*N/A*	*kahernhello@gmail.com*
Marty Klein	*N/A*	*forager2@gmail.com*
Robert J. Michaud, MDM Transportation Consultants, Inc. on behalf of the Cernak family	N/A	rmichaud@mdmtrans.com
Rick Cernak	*N/A*	*ricksrocksracks@gmail.com*
MEPA Environmental Justice Reference List		See Attachment 4 for complete listing
Additional Organizations and Individuals Notified		See Attachment 4 for complete listing

*Email address received on submitted comments resulted in email failure notice. Additional related email addressees used to deliver DEIR submission notice.

Note: Italic indicate the Party commented on the EENF or requested to be on circulation list during public outreach, but not comment on the DEIR. For completeness, FEIR circulated to these parties.



GZA GeoEnvironmental, Inc.