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CAPE COD
COMMISSION

Address: 35 Scudder Avenue, Hyannis, Massachusetts

This Development Agreement (this "Agreement") is entered into as of this 2nd day of February 2023 (the "Effective Date"), by and among the Cape Cod Commission (the "Commission"), and Quarterra Multifamily Communities, LLC ("Quarterra") and each of their respective successors and assigns. The Commission and Quarterra shall collectively be referred to herein as the "Parties".

PARTIES

WHEREAS, Quarterra is a Limited Liability Company in the business of real estate development; and

WHEREAS, the Commission is the regional planning agency for Barnstable County established by Chapter 716 of the Acts of 1989, as amended (the "Act"); and

BACKGROUND

WHEREAS, pursuant to the Act, the Commission has the authority to review certain developments of regional impact ("DRI") which, due to their size, location, or character are likely to affect more than one community; and

WHEREAS, the Commission has adopted the Code of Cape Cod Commission Regulations of General Application, including inter alia, Chapter A: Enabling Regulations Governing Review of Developments of Regional Impact, ("Chapter A") for the purpose of reviewing proposed DRIs; and Chapter D: Enabling Regulations Governing the Provisions for Development Agreements, ("Chapter D"); and

WHEREAS, for a project otherwise requiring review as a DRI, Chapter D provides for the approval of Development Agreements, which is a contract entered into in lieu of Development of Regional Impact review and in particular Section 5 thereof, which outlines the process by which a Development Agreement may be entered into by and between the Commission and a Qualified Applicant; and

COUNTY OF BARNSTABLE MASSACHUSETTS

PROCEDURAL HISTORY

WHEREAS, on December 18, 2020, Lennar Multifamily Communities, LLC ("LMC"), now known as Quarterra, filed a Notice of Intent to file a Development Agreement Application (the "NOI") with the Commission; and

WHEREAS, on February 25, 2021, the Commission determined that the proposed Project as described in the NOI application was eligible and suitable to be the subject of a Development Agreement; (See Commission NOI decision) and

WHEREAS, on May 28, 2021 LMC, now known as Quarterra, filed a Development Agreement Application with the Commission;

WHEREAS, on January 5, 2022, the Commission deemed the application complete;

WHEREAS, on January 18, 2022, the Commission Chair appointed a subcommittee ("Subcommittee") to represent the Commission in negotiating a Development Agreement;

WHEREAS, the appointed Commission subcommittee held duly noticed public hearings and meetings on the Project and to negotiate this Development Agreement on March 22, 2022, April 12, 2022, May 17, 2022, May 31, 2022, June 8, 2022, July 12, 2022, July 28, 2022, December 20, 2022, and January 5, 2023 in accordance with Chapter D; and

PROPOSED PROJECT

WHEREAS, Quarterra proposes to redevelop a portion of the 54-acre +/- property at 35 Scudder Avenue in Barnstable, Massachusetts (the "Property"), which Property was previously used as the Twin Brooks golf course;

WHEREAS, Quarterra proposes to divide the Property into two lots: a 14-acre +/- lot and a 40-acre +/- lot, as shown on Exhibit 1 (Proposed Parcel Plan); and

WHEREAS, Quarterra proposes to redevelop the 40-acre +/- lot ("Site"), with a residential development consisting of 312 new rental units located in thirteen (13) multifamily buildings, a recreation building, and other associated improvements and amenities ("Project"); and

WHEREAS, Quarterra proposes to record a Conservation Restriction to protect approximately 20.11 acres of the Site ("CR Area"), as shown on Exhibit 2(i) (Conceptual Conservation Restriction Plan); and

WHEREAS, Quarterra proposes to restore approximately 9.84 acres of the CR Area, which is currently disturbed golf course area ("Restoration Area"), as outlined in Exhibit 5 (Emblem-Hyannis Restoration Plan) (the "Restoration Plan"); and

WHEREAS, no less than 13% of the units within the Project will be Affordable Units as such term is defined in the Commission's Housing Technical Bulletin; and

WHEREAS, in connection with the Project, Quarterra will provide transportation improvements, as shown in Exhibit 3; and

WHEREAS, in connection with the Project, Quarterra will connect the Project to the Town's sewer and make a payment to offset the cost of upgrading the Town's wastewater infrastructure; and

WHEREAS, in connection with the Project, Quarterra will make efforts to improve the West End Rotary by providing for cross connections to reduce curb-cuts as shown on Exhibit 4;

WHEREAS, the Project will be developed as shown on the following plans and documents (the "Approved Project Plans"):

Exhibit 1 Proposed Parcel Plan (DRAFT), Sheet C1.0, 35 Scudder Avenue Hyannis, MA 02601, prepared for Lennar Multifamily Communities, LLC by Baxter Nye Engineering & Surveying (dated 12-10-2020)

Exhibit 2 The Proposed Emblem at Hyannis Residences, 17 Sheets, 35 Scudder Avenue, Hyannis, Massachusetts, prepared for Quarterra by Pesce Engineering (revised 09-23-2022)

- (a) Cover Sheet, Sheet 1 of 17,
- (b) Existing Conditions Plan, Sheet 2 of 17
- (c) Site Overview Plan, Sheet 3 of 17
- (d) Layout and Parking Plan (3 Sheets), Sheets 4-6 of 17
- (e) Grading & Drainage Plan (3 Sheets), Sheets 7-9 of 17
- (f) Utilities Plan (3 Sheets), Sheets 10-12 of 17
- (g) Erosion Control Plan, Sheet 13 of 17
- (h) Emergency Access Plan, Sheet 14 of 17
- (i) Conservation Restriction Plan, Sheet 15 of 17
- (j) Detail Sheet (2 Sheets), Sheets 16-17 of 17

Exhibit 3 Scudder Avenue/West End Rotary/Main Street Safety and Mobility Improvements, 3 Sheets, Transportation Impact Assessment-Proposed Residential Development- Hyannis, Massachusetts, prepared by Vanasse & Associates inc, (dated 09-12-2022)

Exhibit 4 Potential Cross Connections to Reduce Curb-Cuts, 1 Sheet, Transportation Impact Assessment-Proposed Residential Development-Hyannis, Massachusetts, prepared by Vanasse & Associates inc (dated 09-14-2022)

Exhibit 5 Emblem-Hyannis Restoration Plan, prepared for Quarterra by ILEX Environmental, Inc. (revised 12-08-2022)

Exhibit 6 Emblem Hyannis (Landscape Plans), 10 Sheets, 35 Scudder Avenue, Hyannis, MA, prepared by Michael D' Angelo Architecture LLC (revised 10/21/2022)

- (a) L0 Layout Key Plan, Sheet 1 of 10
- (b) L1 Planting and Lighting Plan, Sheet 2 of 10
- (c) L2 Planting and Lighting Plan, Sheet 3 of 10

(d) L3 Planting and Lighting Plan, Sheet 4 of 10
(e) L4 Planting and Lighting Plan, Sheet 5 of 10
(f) L5 Typical Building Planting Enlargement, Sheet 6 of 10
(g) L6, Photometric Plan, Sheet 7 of 10
(h) L7, Photometric Plan, Sheet 8 of 10
(i) L8, Photometric Plan, Sheet 9 of 10
(j) L9, Landscape Details, Sheet 10 of 10

Exhibit 7 Enhanced and Redesigned Building Elevations, 2 Sheets, Emblem Hyannis, MA prepared for Quarterra by BSB Design (dated 12-01-2022)

Exhibit 8 Enhanced and Redesigned Building Elevations, 1 Sheet, Emblem Hyannis, MA prepared for Quarterra by BSB Design (dated 11-17-2022)

Exhibit 9 Unanticipated Discovery Plan (DRAFT), 10 pages, for Development of a Parcel of Land at 35 Scudder Avenue in Hyannis, Massachusetts, prepared for Lennar Multifamily Communities (dated 07-2022)

Exhibit 10 Drainage Analysis Report, 14 Pages & Appendices A-H, Emblem Hyannis, Proposed Multifamily Residences located at 35 Scudder Avenue, Hyannis, Massachusetts, prepared for Quarterra by Pesce Engineering & Associates, Inc. (dated 10-11-2022)

DESCRIPTION OF PUBLIC BENEFITS AND IMPROVEMENTS

WHEREAS, Quarterra has agreed to provide the following public benefits and improvements:

(1) The provision of 312 units of year-round, market rate, affordable, and workforce rental housing, which will contribute to housing choice and attainability for year-round residents of Cape Cod;
(2) Contributions to public infrastructure, including:
   a. Adding sidewalk and crosswalk infrastructure proximate to the Site;
   b. Upgrading existing pedestrian and crossing infrastructure proximate to the Site and to the West End Rotary to meet the requirements of the Americans with Disabilities Act (ADA);
   c. Constructing a shared use path along Scudder Ave between Greenwood Avenue and the West End Rotary and along Main Street between the West End Rotary and Potter Avenue;
(3) Conservation of approximately 20.11 acres of the Site by recorded Conservation Restriction; and
(4) Restoration of 9.82 acres of previously disturbed golf course areas under a restoration plan that includes monitoring and maintenance for a

minimum of three years post-construction to ensure restoration goals are met.

STATEMENT OF COMPLIANCE WITH THE ACT AND THE REGIONAL POLICY PLAN

WHEREAS, the Act charges the Commission with the protection, preservation and enhancement of the unique natural, coastal, scientific, historical, cultural, architectural archaeological, recreational and other values of Cape Cod; and

WHEREAS, the Act provides that the further purposes of the Commission are the conservation and preservation of natural undeveloped areas, wildlife, flora and habitats for endangered species; the preservation of coastal resources including aquaculture; the protection of groundwater, surface water and ocean water quality, as well as the other natural resources of Cape Cod; balanced economic growth; the provision of adequate capital facilities, including transportation, water supply, and solid, sanitary and hazardous waste disposal facilities; the coordination of the provision of adequate capital facilities with the achievement of other goals; the development of an adequate supply of fair affordable housing; and the preservation of historical, cultural, archaeological, architectural, and recreational values; and

WHEREAS, the Act requires the preparation of a Regional Policy Plan that presents a coherent set of regional planning policies and objectives to guide development throughout Barnstable County, to protect the region's resources, and to reflect and reinforce the goals and purposes of the Act; and

WHEREAS, the most recent update to the Regional Policy Plan was approved as Barnstable County Ordinance 19-01, effective February 22, 2019 (the "RPP"); and

WHEREAS, the goals and objectives of the RPP derive from the values and purposes set out in section 1 of the Act. The goals and objectives guide and plan for the future of the region in a manner consistent with the vision and growth policy, around the region's natural, built, and community systems; and

WHEREAS, in support of the RPP, the Commission developed Technical Guidance. The primary application of the Technical Guidance is to assist the Commission in its determination of whether a project is consistent with applicable RPP goals and objectives, and additionally, to detail how an applicant could design and pursue its project to meet the applicable RPP goals and objectives; and

WHEREAS, the RPP identifies the need to promote housing diversity and an increase in year-round housing supply to provide an adequate supply of housing that is attainable for people with different income levels and diverse needs; and

WHEREAS, the Commission, in its Housing Technical Bulletin, defines the terms:

"AMI" as Area Median Income as determined by the U.S. Department of Housing and Urban Development (HUD);

"Affordable Housing" as housing for households earning at or below 80% of AMI;

WHEREAS, pursuant to the RPP, the Project context, as defined by Placetype, provides a lens through which the Project should be considered, relative to existing development in the area; and

WHEREAS, the Property includes both land that is mapped as Community Activity Center Placetype and land that is mapped as Natural Area Placetype as defined by the RPP; and

WHEREAS, Community Activity Centers are areas with a concentration of business activity, community activity, and a compact built environment that are more walkable and densely developed than other Placetypes and typically have ample access to transit, bike connections, and sidewalks; the RPP vision for Community Activity Centers is to accommodate mixed-use and multifamily residential development in a walkable, vibrant area, and, among other things, to provide diverse services, housing, and job opportunities with adequate infrastructure and pedestrian amenities to support development; and

WHEREAS, Natural Areas are generally the region's least developed and most sensitive areas and the RPP vision for Natural Areas is to minimize adverse development impacts to sensitive resource areas, to preserve lands that define Cape Cod's natural landscape and contribute to its scenic character, and to improve the Cape's resilience to severe storms and the effects of climate change; Natural Areas are lands with the highest significance for resource protection or conservation and are appropriate for permanent protection through acquisition and conservation restriction or for transfer of development rights to less vulnerable areas; and

WHEREAS, the residential development will be constructed within the area mapped as Community Activity Center Placetype and the undeveloped areas that make up the eastern, southern, and western boundaries of the property that are mapped as the Natural Areas Placetype will be preserved as open space and/or restored; and

WHEREAS, at public meetings and hearings on July 28, 2022 and December 20, 2022, the Commission through its subcommittee made findings with respect to the Project's consistency with the RPP. The Project's RPP consistency is summarized in Exhibit 11 (Regional Policy Plan Consistency) of this Agreement;

WHEREAS, as shown in Exhibit 11 (Regional Policy Plan Consistency), the Project is consistent with all applicable goals and objectives of the RPP, with the exception of Objective WET1, because it proposes development in the area of an isolated vegetated wetland and Objective WR4, because redevelopment of the golf course with housing will not reduce impervious area.

WHEREAS, Chapter D, Development Agreement Regulations provide that the Commission may approve a development agreement which is inconsistent with the RPP if the inconsistency is necessary to enable a substantial segment of the population to secure adequate opportunities for, *inter alia*, housing and the interests protected by the Act and RPP can be advanced or protected by an alternate approach, which shall include appropriate mitigation;

WHEREAS, the Commission through its subcommittee at a meeting on July 28, 2022 found that the Project's inconsistency with RPP Objective WET1 is necessary to enable a substantial segment of the population to secure adequate housing and that the Project advances and protects the interests protected by the Act and the RPP through the alternative approach of providing wetlands mitigation in the form of a recorded conservation restriction on approximately 20.11 acres of the site and restoration of approximately 9.84 acres of previously disturbed golf course areas; and

WHEREAS, the Commission through its subcommittee at a meeting on December 20, 2022 found that the Project's inconsistency with RPP Objective WR4 is necessary to enable a substantial segment of the population to secure adequate housing and that the Project advances and protects the interests protected by the Act and the RPP through the alternative approach of providing mitigation in the form of clustering development on the site; directly infiltrating roof runoff; reducing impervious area in Wellhead Protection Overlay district; incorporating bioretention areas in parking and roadway areas; designing the stormwater system design according to Massachusetts Stormwater Handbook standards; reducing fertilized turf and treats stormwater runoff to reduce sitewide nitrogen loading over current conditions; and adding additional bioretention capacity within the clubhouse traffic circle; and

WHEREAS, the Commission at meetings and hearings on July 28, 2022 and December 20, 2022 found that, as mitigated through the terms and conditions of this Agreement, the Project is consistent with the RPP and the Act; and

STATEMENT OF COMPLIANCE WITH THE LOCAL COMPREHENSIVE PLAN AND LOCAL ZONING

WHEREAS, The Town of Barnstable Director of Planning and Development submitted a letter to the Commission on March 22, 2022, which letter is attached hereto as Exhibit 12; and

WHEREAS, the Project is located within a Regulatory Agreement District under the Town of Barnstable Zoning Ordinance and will be subject to a regulatory agreement process with the Town of Barnstable pursuant to Section 168 of the Barnstable Zoning Ordinance; and

WHEREAS, pursuant to Section 168-6 of the Barnstable Zoning Ordinance, the Town of Barnstable may grant waivers from any inconsistencies with applicable zoning requirements; and

WHEREAS, the Local Comprehensive Plan (LCP) for the Town of Barnstable seeks to provide additional housing options in downtown Hyannis that could provide multimodal connectivity to the downtown economic center and potentially protect environmentally sensitive areas and preserve undisturbed natural areas; and

WHEREAS, the Regulatory Agreement review process and related Site Plan Review of the Project, the Town of Barnstable will continue to evaluate the Project's consistency with the LCP; and

WHEREAS, at a meeting on July 28, 2022, the Commission through its Subcommittee found that, subject to completion of the Town Regulatory Agreement process, the Project will be consistent with the Town's Local Comprehensive Plan, local development ordinances, and applicable state law; and

AGREEMENT

NOW, THEREFORE, in consideration of the public benefits and improvements Quarterra has agreed to provide as described above, and the mutual covenants contained herein, the Parties agree as follows:

Project Development and Review

1. Quarterra will develop the Project in accordance with the Approved Project Plans, and shall provide all mitigation, infrastructure and monetary contributions described in this Agreement.
2. This Agreement is effective as of the Effective Date and the term or duration of this Agreement shall be twelve (12) years from the Effective Date. During the term of this Agreement, provided that the Project is constructed consistent with the terms and conditions of this Agreement, and in compliance therewith, it shall not be subject to further review as a DRI pursuant to Sections 12 and 13 of the Act.

3. The Commission will limit regulatory review of the development of the Project to consistency with the RPP as provided for within this Agreement and with the Approved Project Plans incorporated herein.
4. The Project authorized by this Agreement shall be subject to a freeze of the application of DRI Review thresholds under Sections 12 and 13 of the Act and Chapter A.

Quarterra, as further consideration for this Development Agreement, agrees to be bound by the following conditions on the Project:

GENERAL CONDITIONS

C1. Prior to the start of construction and/or the issuance of a building permit for any building(s) constructed on the Property, Quarterra, will obtain a Preliminary Certificate of Compliance from the Commission confirming that all applicable terms, conditions, and provisions of this Agreement to allow for commencement of construction of that building or identified group of buildings (each, a "Phase") have been satisfied or completed. For the purposes of this Agreement, the start of construction shall include any site work (clearing, grading, etc.) at the Project Site. Once construction of an identified Phase has commenced, Quarterra shall pursue completion of such Phase with reasonable diligence and continuity.

C2. Prior to and as a condition to the issuance of a Preliminary Certificate of Compliance, Quarterra shall provide to the Commission a draft form of lease that will be offered to prospective tenants. The form lease shall provide for a standard term of not less than twelve (12) months.

C3. Prior to and as a condition to the issuance of a Preliminary Certificate of Compliance, Quarterra shall provide to the Commission an executed Regulatory Agreement with the Town of Barnstable (the "Regulatory Agreement")

C4. Prior to the issuance of a Certificate of Occupancy from the Town for any Phase of the Project, Quarterra will obtain a partial Certificate of Compliance with respect to such Phase (a "Partial Certificate of Compliance") from the Commission for such Phase confirming that the building(s) and relevant site work have been constructed in full compliance with all applicable terms and conditions contained herein.

C5. A Final Certificate of Compliance may be issued by the Commission following or in lieu of partial Certificate(s) for the full completion of the Project, so long as each such Phase of the Project is in full compliance will all terms and conditions contained herein.

C6. All proposed buildings, structures, infrastructure, landscaping, and sitework for the Development will be in substantial conformity with the Approved Project Plans referenced herein; provided however, that where terms or conditions of this Agreement are more restrictive than what is shown on the Approved Project Plans, the terms and conditions of this Agreement shall govern.

NATURAL RESOURCES CONDITIONS

C7. If a material change is made to the Restoration Plan as a result of a requirement imposed by a state or municipal entity and such modification is deemed by Commission staff to be more restrictive than those set forth in the Approved Project Plans, then such change shall not require modification pursuant to Section 8 of Chapter D. Any modified plans approved pursuant to this provision shall be incorporated into the Approved Project Plans.

C8. The Restoration Plan shall be implemented by a third party, experienced in landscaping and ecological restoration, selected by Quarterra and approved by Commission staff. Quarterra shall enter into an agreement with such third party to monitor and maintain work performed under the Restoration Plan for a period of three years after construction. Quarterra shall provide the third party's contact to Commission staff and the third party shall provide periodic updates to Commission staff at intervals of no less than every six months. If at any time during the monitoring period, the third party recommends more plantings for the purposes of successful restoration, Quarterra shall add the recommended plantings.

C8A. Prior to and as a condition to issuance of a Final Certificate of Compliance, Quarterra shall provide an executed monitoring agreement, as required under C8, with a third party, approved by Commission staff.

WATER RESOURCES CONDITIONS

C9. All wastewater from the Property will be pumped to and treated at the Town of Barnstable's municipal wastewater treatment facility.

C10. Prior to and as a condition to the issuance of a Partial Certificate of Compliance for the first phase of the Project, Quarterra shall provide a monetary offset in the amount of $175,000 payable to the Barnstable County Treasurer to be distributed to the Town of Barnstable for the purpose of upgrading an existing municipal sewer pump station.

C11. Stormwater infrastructure will be designed in accordance with an approved storm water management plan and constructed to adequately infiltrate runoff based on a 100-year storm event.

C12. Stormwater management systems will include Low Impact Design-focused practices, with distributed bioretention and other Best Management Practices designed to allow for infiltration while routing overflow to the infiltration basins.

C12A. Prior to final design, the Applicant shall evaluate the feasibility of adding an additional bioretention area in the vicinity of the roundabout located adjacent to the clubhouse. Final plans for the bioretention areas shall be approved by Commission staff prior to issuance of a Preliminary Certificate of Compliance. Bioretention plantings may be determined based on availability at time of construction. Any species to be planted in bioretention areas that are not included in the Landscape Plan's "Bioretention Palette" shall be checked against the list of suggested species for bioretention plantings in Volume 2 Chapter 2 of the Massachusetts Stormwater Handbook, and approved by Commission staff as an appropriate native or non-invasive species for the site.

C13. Prior to and as a condition to the issuance of a Preliminary Certificate of Compliance, Quarterra will submit for review and approval by Commission staff final stormwater management plans and an updated stormwater management report in substantially conformity with Exhibit 10 (Drainage Analysis Report) with updated stormwater treatment and capacity calculations, including updated nitrogen loading calculations.

C13A. Prior to and as a condition to the issuance of a Preliminary Certificate of Compliance, Quarterra shall provide a re-calculated estimate of seasonal high groundwater using actual depth to groundwater measurements from previous or upcoming site investigations and the appropriate adjustment factor and used to verify sufficient separation between stormwater infiltration BMPs and the seasonal high groundwater level.

C14. Prior to and as a condition to the issuance of a preliminary Certificate of Compliance, Quarterra shall submit for review and approval by Commission staff an Operations and Maintenance Plan, which will confirm that the Project (including any Phase thereof) has been designed to meet all stormwater quality under the Town of Barnstable stormwater requirements and the Stormwater Management Guidelines of the Massachusetts Department of Environmental Protection.

C15. Prior to and as a condition to the issuance of a Preliminary Certificate of Compliance, Quarterra shall submit for review and approval by Commission staff a Stormwater Pollution Prevention Plan that details phasing of the stormwater management system during construction.

OPEN SPACE CONDITIONS

C16. Prior to and as a condition to the issuance of a Preliminary Certificate of Compliance by the Commission, Quarterra shall submit for Commission staff review and approval, which approval shall not be unreasonably withheld, a draft perpetual conservation restriction (the "Conservation Restriction") consistent with Massachusetts General Laws Chapter 184, §§31-33, and accompanying plans. Said draft conservation restriction shall be accompanied by correspondence identifying a grantee willing and able to hold the restriction on the 20.11-acre +/- Conservation Area (the "Conservation Area") (identified on Exhibit 2(i)).

C16A. Prior to and as a condition to issuance of a Partial or Final Certificate of Compliance by the Commission, the Quarterra shall provide to the Commission a copy of the instrument or instruments restricting the Conservation Area as registered with the Barnstable County Registry of Deeds, and as previously reviewed and approved by Commission staff.

C16B. The Conservation Restriction contemplated by this Condition C16 is subject to the review and approval of appropriate state and local authorities. The Applicant shall use all reasonable efforts to obtain all necessary approvals for the recording of the Conservation Restriction in accordance with the terms of this Condition C16. The Commission shall accommodate any changes reasonably requested by the appropriate authorities. In the event the Conservation Restriction is not approved by all applicable authorities, the Commission finds changes to Conservation Restriction requested by such authorities to be unreasonable, or some other circumstances out of the Applicant's control prevent or interfere with execution, recording or registration of such Conservation Restriction, the Commission may issue such Certificate of Compliance requested by the Applicant, provided the Applicant takes such other actions which, in the reasonable discretion of the Commission staff, appropriately serves the purposes of preserving high quality open space, protecting wildlife and plant habitat or other natural resources, providing recreational opportunities, and reducing the effects of sprawl. Such actions may include but are not limited to recording an instrument, as approved by the Commission, to effectuate a private open space restriction, renewable by its own terms and under Chapter 184 of the General Laws in favor of a body or instrumentality of the Town, private trust, or such other entity as the Commission, in its reasonable discretion, deems appropriate for such purposes. The Conservation Restriction, as applicable, shall be made senior to any mortgage encumbrance.

C16C. Quarterra agrees not to pursue a tax deduction or any tax credits for which it might otherwise be eligible in connection with the recordation of the Conservation Restriction.

C17. In connection with obtaining approval of the proposed Conservation Restriction, Quarterra shall provide a recreational trail on the Project Site. A plan showing such recreational trail shall be reviewed and approved by Commission staff prior to issuance of a Preliminary Certificate of Compliance.

WASTE MANAGEMENT CONDITIONS

C18. Prior to and as a condition to issuance of a Preliminary Certificate of Compliance, Quarterra or its designee will submit to the Commission a plan detailing how residential recycling will be provided to residents for review and approval by Commission staff. The approved plan will be incorporated into the Approved Project Plans.

COMMUNITY DESIGN CONDITIONS

C19. Facades and proportions of all buildings shall be in substantial conformity with the buildings shown on Exhibit 7 and Exhibit 8 (Enhanced and Redesigned Building Elevations); provided however, that the following conditions must be met: no building may exceed 42′ 6″ in measurement from grade to roof ridge; hip roofs shall be used on all buildings and shall not exceed 10′ 8″ in measurement from eave to ridge; if building length exceeds the length shown in Exhibit 7 and Exhibit 8, façades must have an equal or greater proportion of façade variation to length.

C20. Prior to and as a condition to issuance of a Preliminary Certificate of Compliance, Quarterra shall submit construction plans including site plans, elevation plans for all facades of all buildings with an appropriate scale, and landscaping plans associated with screening and revegetation areas, to Commission staff for review and approval. Submitted plans will be reviewed for consistency with the Approved Project Plans and the terms and conditions herein, with particular attention to the height and roof form and overall dimensions of the buildings.

C21. Prior to and as a condition to issuance of a Final Certificate of Compliance, Quarterra shall submit as-built plans including site plans, elevation plans for all facades of all buildings with an appropriate scale, and landscaping plans to Commission staff for review and approval. Submitted plans will be reviewed for consistency with the Approved Project Plans and the terms and conditions hereof.

C22. If Quarterra proposes a building design that substantially deviates from the Approved Project Plans approved herein, a request for modification shall be submitted pursuant to Section 8 of Chapter D. However, if a change is made to the design as a result of a requirement imposed by the Town and such modification is deemed by Commission staff to be more restrictive than those set forth in the Approved Project Plans approved by the Commission, then such design change shall not require modification pursuant to Section 8 of Chapter D. Any modified plans approved pursuant to this provision shall be incorporated into the Approved Project Plans.

C23. Prior to and as a condition to issuance of a preliminary Certificate of Compliance for any building, Quarterra will submit a draft landscape maintenance agreement for approval by Commission staff for that building or buildings, as applicable, will provide a fully executed landscape maintenance contract for landscaping associated with each building(s) at the time of planting and prior to the issuance of a partial Certificate of Compliance for that building or buildings. The length of the contract will be for three (3) full growing seasons for the landscaping of each building(s). Amendments of an existing maintenance contract to incorporate subsequent building(s) may be allowed. The contract will include irrigation, pruning, guying, mulching, pest management, fertilizing, erosion repair, lawn maintenance, and replacement of dead vegetation, including grass, trees, and shrubs.

C24. All Project lighting will have a full cut-off of light at no less than 90-degrees from vertical and no site lighting will extend beyond the boundaries of the Property.

TRANSPORTATION CONDITIONS

C25. A Transportation Demand Management (TDM) program shall be implemented for the Project and shall include the following measures:

- Transportation Demand Management Coordinators (TDMC) (who may also have other duties and responsibilities) will be designated to serve as the single point of contact for residents and employees, as applicable, and to lead the TDM program and associated marketing and outreach activities;
- Information regarding public transportation services, maps, schedules and fare information will be posted in a central location and/or otherwise made available to residents and employees;
- A "welcome packet" will be provided to residents and employees detailing available commuter options and will include the contact information for the TDMC and information to enroll in the employee rideshare program;
- Work-at-home workspaces (i.e., meeting/collaboration areas or similar) will be provided within the development to support telecommuting by residents;
- Pedestrian accommodations will be incorporated into the Project and consist of sidewalks and Americans with Disabilities Act (ADA)-compliant wheelchair ramps at all pedestrian crossings internal to the Property that will link building entrances to the sidewalk infrastructure;
- Exterior and interior weather-protected bicycle parking/storage

C26. Prior to and as a condition to the issuance of a preliminary Certificate of Compliance, Quarterra shall make all reasonable efforts to obtain all necessary rights, permits and approvals to implement the transportation improvements under C27, and as may be further shown on Exhibit 3 and Exhibit 4 (the "Transportation Improvements").

C26A. In the event the permits and approvals for the Transportation Improvements are not approved by all applicable authorities, the Commission finds changes to proposed traffic mitigation program that are requested by such authorities to be unreasonable, or some other circumstances out of the Applicant's control prevent or interfere with implementing the Transportation Improvements, the Commission may issue such Preliminary Certificate of Compliance requested by the Applicant, provided the Applicant takes such other actions which, in the reasonable discretion of the Commission staff, appropriately serves the purposes of mitigating and improving transportation infrastructures in the vicinity of the Site. Such actions may include but are not limited to implementing alternative improvements that result in traffic impacts that are less than are currently anticipated to result from the Redevelopment, accounting for the implementation of the Traffic Improvements.

C26B. If a Preliminary Certificate of Compliance is issued under C26A, prior to and as a condition to issuance of a Final Certificate of Compliance, Quarterra shall complete any other actions or alternative improvements that were required under C26A.

C27. Prior to and as a condition to the issuance of a Final Certificate of Compliance, and subject to obtaining all necessary rights, permits and approvals set forth in C26 above, Quarterra shall implement the following Transportation Improvements, as further shown on Exhibit 3 and Exhibit 4:

- Replace the existing sidewalk on Scudder Avenue from Greenwood Avenue to the West End Rotary with a 10-foot-wide shared use path on the southern side of the roadway.
- Relocate the existing pedestrian crossing across Scudder Avenue that is situated proximate to 100 Scudder Avenue (Capeway Towing) to the northeast leg of the Scudder Avenue/Greenwood Avenue intersection and install a pedestrian actuated Rectangular Rapid Flashing Beacon (RRFB) with accompanying pedestrian crossing warning signs.
- Improve the existing crosswalk across Scudder Avenue between The Resort & Conference Center at Hyannis and the Melody Tent to include ADA

compliant wheelchair ramps and a pedestrian actuated RRFB with accompanying pedestrian crossing warning signs.

- Reconstruct the driveway that serves the Hyannis Package Store, at 775 Main St, to reduce conflicts with pedestrians, bicyclists and motor vehicles and provide for interconnections as shown on Exhibit 4.
- Install crosswalks with accompanying ADA compliant wheelchair ramps and pedestrian actuated RRFBs with pedestrian crossing warning signs on the Scudder Avenue, Main Street and West Main Street approaches of the West End Rotary.
- Replace the existing sidewalk on the southern side of the roadway with a 10-foot-wide shared use path to extend from the West End Rotary to Potter Avenue.
- Reconstruct the existing median island at the intersection of Main Street and Potter Avenue/Stevens Streets to include a pedestrian crosswalk with ADA compliant wheelchair ramps and a pedestrian actuated RRFB with accompanying pedestrian crossing warning signs.
- Install a 5-foot-wide sidewalk along the north side of North Street from the West End Rotary to existing crosswalk approximately 700 feet east of the West End Rotary
- Improve the existing crosswalk across North Street approximately 700 feet east of the West End Rotary to include ADA compliant wheelchair ramps and a pedestrian actuated RRFB with accompanying pedestrian crossing warning signs.
- Relocate the driveway to the West End Restaurant, at 20 Scudder Avenue, from the rotary to West Main Street to reduce conflicts within the rotary and with pedestrians and bicyclists.
- Restripe the circulating area within the rotary to reduce the width of the circulating area and expand the shoulders in order to improve the definition of the traveled way to a single lane. and to accommodate bicycle circulation within the rotary.
- Upgrade, replace and supplement regulatory and guide signs on the approaches to and within the rotary.
- Fund the completion of a Road Safety Audit (RSA) for North Street and Stevens Street and design and construct the short-term safety improvements identified in the RSA.

C28. Prior to and as a condition to the issuance of a final Certificate of Compliance, Quarterra shall provide a fair share mitigation payment, in the amount of $15,672, payable to Barnstable County Treasurer, to address congestion impacts at the intersection of North Street and Stevens Street.

C29. Prior to and as a condition to the issuance of a final Certificate of Compliance, Quarterra shall provide a fair share mitigation payment, in the amount of $8,000, payable to Barnstable County Treasurer, to address congestion impacts at the intersection of West Main Street and Pitcher's Way.

C30. Fair share congestion mitigation payments made pursuant to C28 and C29 shall be held for and made available to the Town of Barnstable to support projects or strategies within the village of Hyannis that encourage alternative to automobile transportation or to congestion mitigation strategies including but not limited to planning, engineering, permitting, and construction. A 4% annual inflation rate shall be applied to the congestion mitigation payment for the period of time from the date of the final Commission decisions until the funds are paid.

ENERGY CONDITIONS

C31. Buildings will have all necessary conduits to allow for roof-mounted solar panel installation. If installation of the roof-mounted solar panels is not feasible prior to Quarterra requesting a Final Certificate of Compliance, Quarterra will provide an executed Power Purchase Agreement or Net Metering Credit Purchase Agreement for Renewable Energy Certificates (RECs) to provide at least 25% of on-site energy usage. Prior to and as a condition to issuance of a final Certificate of Compliance, the agreement shall be evaluated by Commission staff for consistency with this condition.

C32. The Project will contain 26 Electric Vehicle Supply Equipment Parking (EVSE) spaces, with two charging spaces dedicated to each residential building, located in the surface parking area and available for residents' use. EVSE Spaces shall include wiring, electrical service, and EVSE sufficient to provide Level 2 EVSE or equivalent EV charging at a minimum power of 7kW, as defined by Standard SAE J1772 for EVSE servicing light duty Electric Vehicles. The Project will contain infrastructure, including panel capacity and conduit/raceway to accommodate future build-out, for an additional 26 Capable Spaces.

C33. The Project will include conservation strategies such as individual metering of utilities, Energy Star appliances, and all LED lighting. Utilities serving the residential buildings will be located underground.

C34. The Project will utilize electric heat pumps for all heating and air conditioning in the residential units.

HOUSING CONDITIONS

C35. The Project shall at all times remain a 100% rental development of 312 units. No less than 10% of units shall be leased to Eligible Tenants earning up to 65% of AMI (hereinafter, "Low-Income Units") and no less than 3% of the units shall be leased to Eligible Tenants earning up to 80% AMI (hereinafter, "Affordable Units") where an "Eligible Tenant" is a family or individual who will live in the Unit as their primary residence.

C36. The monthly rents charged to Eligible Tenants of the Affordable Units shall not exceed an amount equal to 30% of the monthly adjusted income of an Eligible Tenant whose gross income equals 80% of the AMI, with adjustment for the number of bedrooms in the Unit, as provided by HUD.

C37. The monthly rents charged to Eligible Tenants of the Low-Income Units shall not exceed an amount equal to 30% of the monthly adjusted income of an Eligible Tenant whose gross income equals 65% of the AMI, with adjustment for the number of bedrooms in the Unit, as provided by HUD.

C38. Prior to and as a condition to issuance of the first Preliminary Certificate of Compliance for the Redevelopment, the Applicant shall submit to the Commission a copy of the housing regulatory agreement (as then drafted or executed with the Town of Barnstable and Department of Housing and Community Development, the "Housing Regulatory Agreement"). Commission Staff shall review the Regulatory Agreement to confirm it materially conforms to this Agreement, the RPP requirements and standards set forth in Housing Technical Bulletin with respect to

(i) ensuring the Low-Income Units and Affordable Units are identical to all other similarly sized units in the Redevelopment in terms of design, construction, access, and amenities, (ii) the Redevelopment's proposed rents for any and all Affordable Units and Low-Income Units, (iii) monitoring, and (iv) tenant marketing and selection. The Applicant shall record with the Barnstable Registry of Deeds or register with the Barnstable Registry District of the Land Court, as applicable, a copy of an affordable housing use restriction in accordance with the terms and conditions set forth in the Regulatory Agreement and provide the Commission of a copy the Regulatory Agreement as so recorded or registered.

C38A. Affordable Units and Low-Income Units shall be constructed such that a proportional share of Affordable Units and Low-Income Units to total residential units will be included in each phase of development, i.e., if the first phase of the

Project is 25% of the total residential units, then approximately 25% of the total Affordable Units and Low-Income Units must be completed in that first phase, etc. In addition, the unit mix of the Affordable Units and Low-Income Units shall be proportionate to all other units within the Project, i.e., if the Project is comprised of 40% one-bedroom, 50% two-bedroom and 10% three-bedroom, then the bedroom count for the Affordable Units and Low-Income Units shall be similarly allocated.

C39. No short-term leases are permitted. In connection with the foregoing, all units shall be leased for a term of no less than twelve (12) months; provided however, that 5% of units may be leased for a term of no less than nine (9) months. The foregoing restriction against short-term leases shall be incorporated into Quarterra's tenant leases to ensure that no short-term subletting or short-term rentals are allowed at the Project. Quarterra shall offer leases longer than twelve (12) months on terms and conditions acceptable to Quarterra.

CULTURAL HERITAGE CONDITIONS

C40. Prior to and as a condition to issuance of a preliminary Certificate of Compliance, Quarterra shall submit for the review and approval of Commission staff a final protocol for addressing unexpected archaeological discoveries during the construction period. The approved protocol will be incorporated into this Agreement and shall replace Exhibit 9 (Unanticipated Discovery Plan DRAFT).

MISCELLANEOUS PROVISIONS

M1. Any party to this Agreement, may file an action for equitable relief in Barnstable Superior Court to enforce the terms and conditions of this Agreement. The terms of this Agreement shall be specifically enforceable in a court of equity, after the giving of notice and an opportunity to cure, as described below. In the event the Commission believes the Applicant has violated or is about to violate any of its obligations hereunder, the Commission shall give the Applicant written notice of such actual or prospective violation and a 60-day period to commence corrective action provided the Applicant will move forward to correct any such violation and continue until such cure is completed. If the Applicant believes no violation has occurred or is about to occur, it may request a hearing before the Commission or a subcommittee thereof. The 60-day period to commence such action should be suspended until the Commission or subcommittee makes its determination and will resume should the Commission or subcommittee determine a cure is needed. The subcommittee or Commission shall hold its hearing within 45 days of such request.

If no amicable resolution is reached within 30 days after the hearing, either Party may seek a judicial resolution.

M2. This Agreement will be governed by and interpreted under the laws of the Commonwealth of Massachusetts.

M3. This Agreement shall become effective following the endorsement of this Agreement by the parties hereto, and the issuance and recording of the certificates as provided for in Section 5 of Chapter D.

M4. Quarterra will comply with all applicable state and local permitting requirements.

M5. The burdens of this Agreement will be binding upon, and the benefits will inure to, all successors in interest to its Parties, each as such benefits and burdens apply exclusively or collectively to such Parties, as applicable, as set forth herein. Subject to the foregoing, the Applicant may assign its rights and obligations under this Agreement to another entity (each a "New Entity") without the consent of the Commission, provided that any such assignment shall be in writing, shall clearly identify the scope of the rights or obligations assigned, and the rights and obligations, if any, retained by the assignor. Without limiting the foregoing, the Applicant may subdivide (including through the creation of one or more condominiums or long term ground leases or such other lawful means in accordance with applicable laws, ordinances, rules and regulations; provided that any condominium created pursuant to this M5 shall not alter the Applicant's obligation to create and maintain 312 rental housing units) the Site so long as such subdivision is consistent with the terms and conditions of this Agreement, and the Applicant may transfer all or any subdivided portion of the Site to a New Entity, subject to the Applicant's and any New Entity's acknowledgement that this Agreement shall run with title to each subdivided portion of the Site and shall be binding upon the Applicant or New Entity insofar as it is the owner of the Site, and each of its successors or assigns as to the obligations which arise under this Agreement during their respective periods of ownership of the Site and/or their respective subdivided portion(s) thereof, provided that each predecessor-in-title shall be forever released from this Agreement upon procuring a written acknowledgement from its immediate successor, addressed to the Commission, acknowledging and agreeing that such successor-in-title is bound by the terms of this Agreement and that this Agreement shall be enforceable against such successor by the Commission with respect to such successor's subdivided portion(s) of the Site the obligations created hereunder shall not be treated as assumed by any New Entity until such notice is delivered to the Commission.

M6. This Agreement may be modified pursuant to Section 8 of Chapter D of the Enabling Regulations Governing the Provisions for Development Agreements.

M7. Consistent with Section 4(a)(20) and Section 14 of the Act, the Commission has the authority to negotiate and enter this Agreement, which establishes the permitted uses, densities, and traffic within the development, the duration of the Agreement, and other terms or conditions mutually agreed upon between Quarterra and the Commission. This Development Agreement vests land use development rights in the Property for the duration of the Agreement, and such rights shall not be subject to subsequent changes in development by-laws or Commission regulations and designations.

M8. If Quarterra breaches any terms and/or conditions of this Agreement, the Commission, or its designee, and the breaching party will, as soon as reasonably practicable, meet to discuss the reasons for the breach in an attempt to avoid termination. If, in the Commission's, or its designee's, reasonable judgment, the dispute cannot be resolved, the Commission, or its designee, will send written notice to the breaching party. The parties agree for notice purposes, written notice shall be sent certified mail, return receipt requested and be addressed as follows:

For the Commission:
Executive Director
Cape Cod Commission
P.O. Box 226
3225 Main Street
Barnstable, MA 02630

For Quarterra:

Quarterra Multifamily Communities, LLC
ATTN: Dan Lee, Division President, New England
99 Summer Street, Suite 701
Boston, MA 02110

With a copy to:

Gouston & Storrs PC
ATTN: Brian Dugdale
400 Atlantic Avenue
Boston, MA 02110

Upon receipt of the written notice, the breaching party will have sixty (60) days to cure such breach, or to provide evidence that such party is acting in good faith to attempt to cure the breach. If the breaching party fails to so cure, and notify the Commission, the Commission, or its designee, may vote to send written notice to all parties that this Agreement is terminated and that all further development work by the breaching party(ies) will cease until it has been reviewed as a DRI in accordance with the Act, Chapter A and the RPP in effect at that time.

M9. The obligations of the Applicant or any New Entity do not constitute personal obligations of their members, trustees, partners, directors, officers or shareholders, or any direct or indirect constituent entity or any of their affiliates or agents. The Commission shall not seek recourse against any of the foregoing or any of their personal assets for satisfaction of any liability with respect to this Agreement or otherwise. The liability of the Applicant or a New Entity is in all cases limited to their interest in the Site or subdivided portion thereof at the time such liability is incurred and shall not extend to any other portion of the Site for which another Party has assumed responsibility pursuant to Section M5 hereof. In the event that all or any portion of the Site is subjected to a condominium regime or a long-term ground lease, the condominium association or the ground lessee, as applicable, shall be deemed to be the owner/New Entity of the affected portion of the Site. In no event shall the Applicant or New Entity be liable for any incidental, indirect, punitive, special or consequential damages. No entity comprising the Applicant or any New Entity shall be liable for any obligation or covenant hereunder not arising during the time of its ownership or interest in the Site or the applicable subdivided portion thereof. Notwithstanding anything to the contrary in this Agreement, the issuance of a Final Certificate of Compliance for any particular Phase (or sub-phase or component thereof) shall be conclusive evidence of the compliance of such Phase (or sub-phase or component) with this Agreement the time such certificate was issued, and shall terminate the obligations and liabilities of the owner of such Phase (or sub-phase or component) under this Agreement, except for any ongoing maintenance, repair, operational and related obligations, which shall survive the issuance of a Final Certificate of Compliance.

M10. Commission staff shall cooperate as reasonably necessary in connection with the Town's Regulatory Agreement review process, including, without limitation, acknowledging that, pursuant to Section 2 of the Development Agreement Regulations the Redevelopment is not subject to further DRI review, or participating in such Regulatory Agreement as may be necessary to comply with the procedural requirements set forth in Section 168-8 of the Town's Code of Ordinances.

M11. This Agreement may be executed in counterparts, each of which will be deemed an original, but all of which taken together shall constitute one and the same instrument. The Parties agree that a signature sent by facsimile or electronic mall to another Party or counsel for another Party shall have the same force and effect as an original signature.

M12. This Agreement, together with the Exhibits attached hereto (which are incorporated herein by reference and made a part hereof), constitutes the entire agreement among the Parties pertaining to the subject matter hereof and supersede all prior agreements, understandings, negotiations, and discussions, whether oral or written, of the Parties with respect thereto. No amendment, supplement, modification or waiver of this Agreement shall be binding unless executed in writing by the Party to be bound thereby.

M13. If any of the provisions contained in this Agreement shall, for any reason, be held to be invalid, illegal, or unenforceable in any respect, then, to the maximum extent permitted by law, such invalidity, illegality or unenforceability shall not affect any other provision of this Agreement

M14. Nothing in this Agreement shall be construed as an undertaking by the Applicant to construct or complete the Redevelopment, or any portion thereof, and the obligations hereunder being limited to compliance with the provisions hereof to the extent the Redevelopment, or any portion thereof, is commenced, constructed or completed. The Applicant's rights and obligations with respect to the development of any Phase shall in no way require or depend upon the development of any subsequent Phase, including the timing with respect thereto.

M15. Prior to issuance of a Preliminary Certificate, a copy of this Agreement shall be recorded with the Barnstable Registry of Deeds, the costs of recording to be paid by the Applicant.

M16. Quarterra represents and warrants to the Commission that Quarterra is a duly formed, validly existing and in good standing under the laws of Delaware and registered to do business in the Commonwealth of Massachusetts. Quarterra possesses all requisite power and authority, has taken all actions required by its organizational documents and applicable law, and has obtained all necessary consents, to execute and deliver this Agreement and to perform the obligations under this Agreement. No bankruptcy, insolvency, reorganization or similar action or proceeding, whether voluntary or involuntary, is pending, or, to Quarterra's knowledge, threatened, against Quarterra.

SIGNATURE PAGE

(1 of 2)

Executed this 2nd day of February, 2023.

Cape Cod Commission:

Harold W. Mitchell
Cape Cod Commission, Chair

COMMONWEALTH OF MASSACHUSETTS

Barnstable, ss February 2, 2023

Before me, the undersigned notary public, personally appeared Harold W. Mitchell in his capacity as Chair of the Cape Cod Commission, whose name is signed on the preceding document, and such person acknowledged to me that he signed such document voluntarily for its stated purpose on behalf of the Cape Cod Commission. The identity of such person was proved to me through satisfactory evidence of identification, which was [ ] photographic identification with signature issued by a federal or state governmental agency, [ ] oath or affirmation of a credible witness, or [x] personal knowledge of the undersigned.

Notary Public:

My Commission expires 8-28-26

LISA P. DILLON
NOTARY PUBLIC
Commonwealth of Massachusetts
My Commission Expires
August 28, 2026

SIGNATURE PAGE

(2 of 2)

______________________________ 1/25/23

Daniel Lee | Date

Division President, New England

Quarterra Multifamily Communities, LLC

COMMONWEALTH OF MASSACHUSETTS

Suffolk | January 25, 2023

Before me, the undersigned notary public, personally appeared Daniel Lee in his/her capacity as President of New England Quarterra Multifamily Communities LLC, whose name is signed on the preceding document, and such person acknowledged to me that s/he signed such document voluntarily for its stated purpose on behalf of ________________________. The identity of such person was proved to me through satisfactory evidence of identification, which was [x] photographic identification with signature issued by a federal or state governmental agency, [ ] oath or affirmation of a credible witness, or [ ] personal knowledge of the undersigned.

WALTER B. PAWLOWSKI
Notary Public
Commonwealth of Massachusetts
My Commission Expires
March 25, 2027

Notary Public: ____________________

My Commission expires: ______________

EXHIBIT LIST

Exhibit 1 Proposed Parcel Plan (DRAFT), Sheet C1.0, 35 Scudder Avenue Hyannis, MA 02601, prepared for Lennar Multifamily Communities, LLC by Baxter Nye Engineering & Surveying (dated 12-10-2020)

Exhibit 2 The Proposed Emblem at Hyannis Residences, 17 Sheets, 35 Scudder Avenue, Hyannis, Massachusetts, prepared for Quarterra by Pesce Engineering (revised 09-23-2022)

- (a) Cover Sheet, Sheet 1 of 17,
- (b) Existing Conditions Plan, Sheet 2 of 17
- (c) Site Overview Plan, Sheet 3 of 17
- (d) Layout and Parking Plan (3 Sheets), Sheets 4-6 of 17
- (e) Grading & Drainage Plan (3 Sheets), Sheets 7-9 of 17
- (f) Utilities Plan (3 Sheets), Sheets 10-12 of 17
- (g) Erosion Control Plan, Sheet 13 of 17
- (h) Emergency Access Plan, Sheet 14 of 17
- (i) Conservation Restriction Plan, Sheet 15 of 17
- (j) Detail Sheet (2 Sheets), Sheets 16-17 of 17

Exhibit 3 Scudder Avenue/West End Rotary/Main Street Safety and Mobility Improvements, 3 Sheets, Transportation Impact Assessment-Proposed Residential Development- Hyannis, Massachusetts, prepared by Vanasse & Associates inc, (dated 09-12-2022)

Exhibit 4 Potential Cross Connections to Reduce Curb-Cuts, 1 Sheet, Transportation Impact Assessment-Proposed Residential Development-Hyannis, Massachusetts, prepared by Vanasse & Associates inc (dated 09-14-2022)

Exhibit 5 Emblem-Hyannis Restoration Plan, prepared for Quarterra by ILEX Environmental, Inc. (revised 12-08-2022)

Exhibit 6 Emblem Hyannis (Landscape Plans), 10 Sheets, 35 Scudder Avenue, Hyannis, MA, prepared by Michael D' Angelo Architecture LLC (revised 10/21/2022)

- (a) L0 Layout Key Plan, Sheet 1 of 10
- (b) L1 Planting and Lighting Plan, Sheet 2 of 10
- (c) L2 Planting and Lighting Plan, Sheet 3 of 10
- (d) L3 Planting and Lighting Plan, Sheet 4 of 10
- (e) L4 Planting and Lighting Plan, Sheet 5 of 10
- (f) L5 Typical Building Planting Enlargement, Sheet 6 of 10
- (g) L6, Photometric Plan, Sheet 7 of 10
- (h) L7, Photometric Plan, Sheet 8 of 10
- (i) L8, Photometric Plan, Sheet 9 of 10
- (j) L9, Landscape Details, Sheet 10 of 10

Exhibit 7 Enhanced and Redesigned Building Elevations, 2 Sheets, Emblem Hyannis, MA prepared for Quarterra by BSB Design (dated 12-01-2022)

Exhibit 8 Enhanced and Redesigned Building Elevations, 1 Sheet, Emblem Hyannis, MA prepared for Quarterra by BSB Design (dated 11-17-2022)

Exhibit 9	Unanticipated Discovery Plan (DRAFT), 10 pages, for Development of a Parcel of Land at 35 Scudder Avenue in Hyannis, Massachusetts, prepared for Lennar Multifamily Communities (dated 07-2022)
Exhibit 10	Drainage Analysis Report, 14 Pages & Appendices A-H, Emblem Hyannis, Proposed Multifamily Residences located at 35 Scudder Avenue, Hyannis, Massachusetts, prepared for Quarterra by Pesce Engineering & Associates, Inc. (dated 10-11-2022)
Exhibit 11	Regional Policy Plan Consistency Findings (dated 12-23-2022)
Exhibit 12	Letter RE: 35 Scudder Avenue (CCC File No. 20065), Town of Barnstable, Planning and Development Department, from E. Jenkins to J. Velozo (dated 03-22-2022)

LOCUS INFORMATION :

1.) THE INTENT OF THIS PLAN IS TO DEPICT THE PROPOSED PARCELS ONLY. THE PROPOSED PARCEL BOUNDARIES ARE APPROXIMATE AND WILL BE FINALIZED AT A LATER DATE.

2.) CURRENT OWNER – TFG HYANNIS HOSPITALITY LLC
35 SCUDDER AVENUE, HYANNIS MA. 02601

DEED BOOK 22498 PAGE 88

ASSESSORS MAP 289 PARCEL 110

3.) ZONING DISTRICT: RB
MINIMUM LOT SIZE: 43,560 SF
MINIMUM FRONTAGE: 20 FT
MINIMUM FRONT YARD: 20 FT
MINIMUM SIDE YARD: 10 FT
MINIMUM REAR YARD: 10 FT

ZONING OVERLAY DISTRICTS:
WPOD – WELLHEAD PROTECTION OVERLAY DISTRICT
APOD – AQUIFER PROTECTION OVERLAY DISTRICT

4.) BY GRAPHICAL PLOTTING ONLY PARCEL LIES WITHIN FLOOD ZONE X (UN-SHADED), ZONE X (SHADED), ZONE AE (EL.11), ZONE AE (EL.12), ZONE AE (EL.13) AND ZONE VE (EL.13) AS DEFINED BY COMMUNITY PANEL No. 250001 0568 J, EFFECTIVE DATE: JULY 16, 2014. FLOOD ZONE LINES SHOWN HEREON ARE DEPICTED FROM MA. GIS AND ARE APPROXIMATE ONLY.

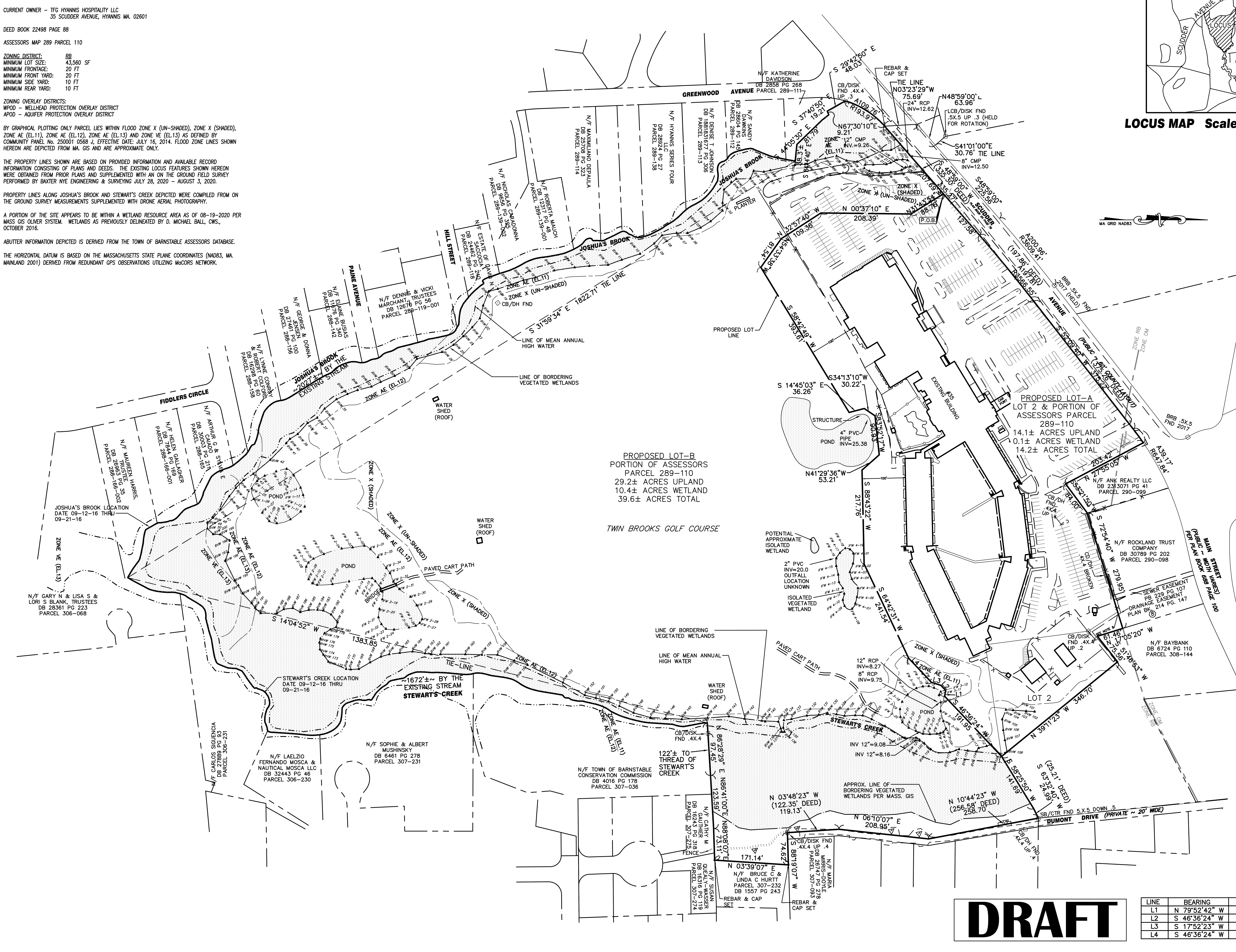
5.) THE PROPERTY LINES SHOWN ARE BASED ON PROVIDED INFORMATION AND AVAILABLE RECORD INFORMATION CONSISTING OF PLANS AND DEEDS. THE EXISTING LOCUS FEATURES SHOWN HEREON WERE OBTAINED FROM PRIOR PLANS AND SUPPLEMENTED WITH AN ON THE GROUND FIELD SURVEY PERFORMED BY BAXTER NYE ENGINEERING & SURVEYING JULY 28, 2020 – AUGUST 3, 2020.

6.) PROPERTY LINES ALONG JOSHUA'S BROOK AND STEWART'S CREEK DEPICTED WERE COMPILED FROM ON THE GROUND SURVEY MEASUREMENTS SUPPLEMENTED WITH DRONE AERIAL PHOTOGRAPHY.

7.) A PORTION OF THE SITE APPEARS TO BE WITHIN A WETLAND RESOURCE AREA AS OF 08-19-2020 PER MASS GIS OLIVER SYSTEM. WETLANDS AS PREVIOUSLY DELINEATED BY D. MICHAEL BALL, CWS., OCTOBER 2016.

8.) ABUTTER INFORMATION DEPICTED IS DERIVED FROM THE TOWN OF BARNSTABLE ASSESSORS DATABASE.

9.) THE HORIZONTAL DATUM IS BASED ON THE MASSACHUSETTS STATE PLANE COORDINATES (NAD83, MA. MAINLAND 2001) DERIVED FROM REDUNDANT GPS OBSERVATIONS UTILIZING MaCORS NETWORK.



LOCUS MAP Scale: 1"=2000'

DRAFT

LINE	BEARING	DISTANCE
L1	N 79°52'42" W	13.77'
L2	S 46°36'24" W	15.83'
L3	S 17°52'23" W	22.99'
L4	S 46°36'24" W	76.92'

BAXTER NYE ENGINEERING & SURVEYING

BAXTER NYE ENGINEERING & SURVEYING

Registered Professional Engineers and Land Surveyors

78 North Street – 3rd Floor
Hyannis, Massachusetts 02601

Phone – (508) 771-7502
Fax – (508) 771-7622
www.baxter-nye.com

STAMP | STAMP

CONSULTANT

CONSULTANT

PREPARED FOR:
Lennar Multifamily Communities, LLC.

PROJECT TITLE
35 Scudder Avenue
Hyannis, MA 02601

DATE | DESCRIPTION

SHEET TITLE
Proposed Parcel Plan

SHEET NO
C1.0

DATE: DECEMBER 10, 2020

100 0 100 200
SCALE IN FEET
SCALE: 1"=100'

DRAWN BY: SDM CHECKED BY: MWE
JOB NO: 2020–033 FILE: 2020–033 ALTA.dwg

THE PROPOSED EMBLEM AT HYANNIS RESIDENCES

35 SCUDDER AVENUE
HYANNIS, MASSACHUSETTS

DATE: FEBRUARY 11, 2021
REV 6: SEPTEMBER 23, 2022

LIST OF DRAWINGS

SHEET NO.	TITLE
1 OF 17	COVER SHEET
2 OF 17	EXISTING CONDITIONS PLAN
3 OF 17	SITE OVERVIEW PLAN
4 OF 17	LAYOUT & PARKING PLAN (1)
5 OF 17	LAYOUT & PARKING PLAN (2)
6 OF 17	LAYOUT & PARKING PLAN (3)
7 OF 17	GRADING & DRAINAGE PLAN (1)
8 OF 17	GRADING & DRAINAGE PLAN (2)
9 OF 17	GRADING & DRAINAGE PLAN (3)
10 OF 17	UTILITIES PLAN (1)
11 OF 17	UTILITIES PLAN (2)
12 OF 17	UTILITIES PLAN (3)
13 OF 17	EROSION CONTROL PLAN
14 OF 17	EMERGENCY ACCESS PLAN
15 OF 17	CONSERVATION RESTRICTION PLAN
16 OF 17	DETAIL SHEET
17 OF 17	DETAIL SHEET

CIVIL ENGINEERING BY:
PESCE ENGINEERING & ASSOSCIATES, INC.
43 PORTER LANE
WEST DENNIS, MA 02670

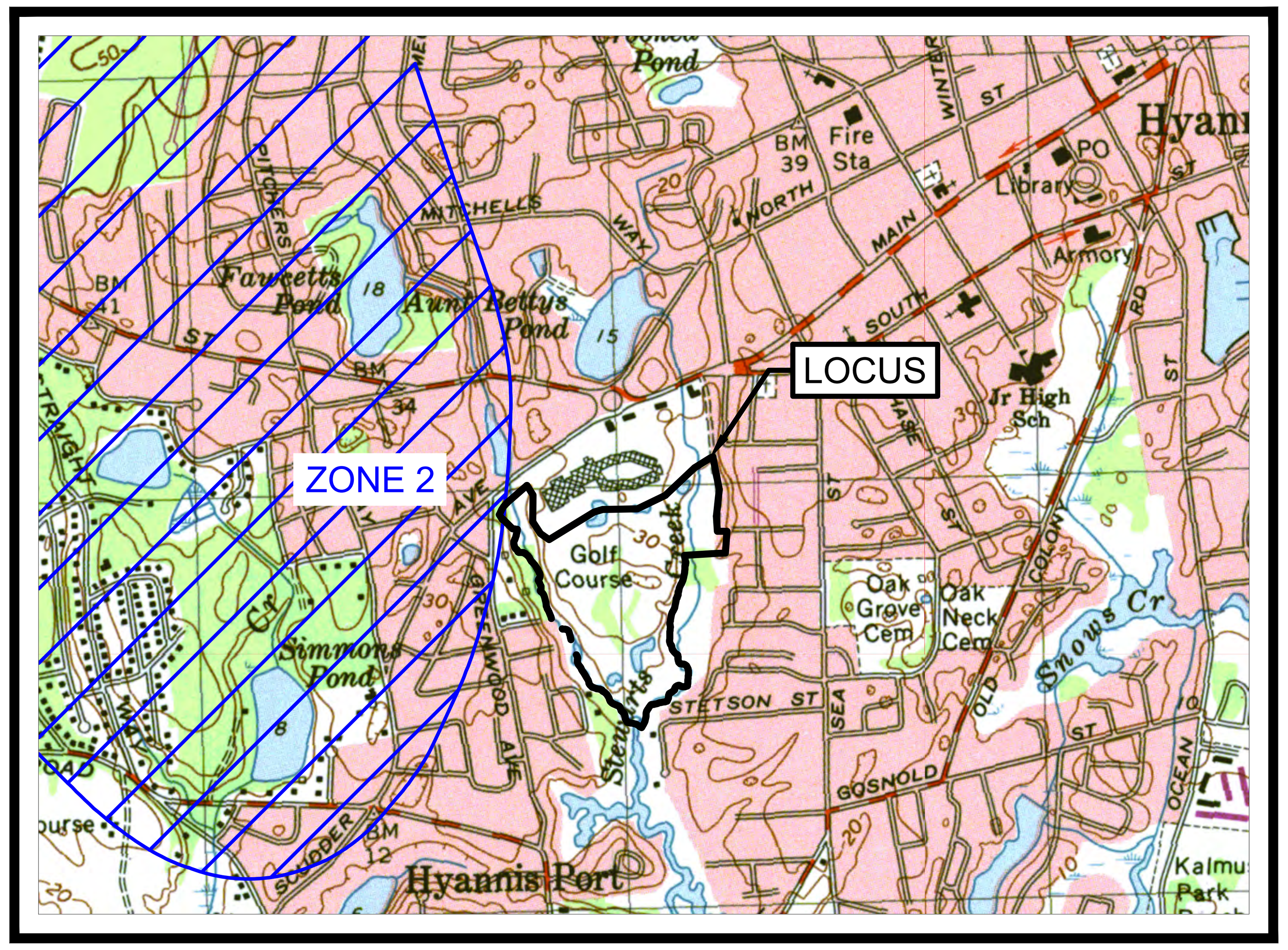
LAND SURVEYING BY:
BAXTER NYE ENGINEERING & SURVEYING
78 NORTH STREET - 3RD FLOOR
HYANNIS, MA 02601

ARCHITECTURE BY:
BSB DESIGN, INC.
220 N. SMITH STREET, SUITE 210
PALATINE, IL 60067

LANDSCAPING BY:
MICHAEL D'ANGELO LANDSCAPE ARCHITECTURE LLC
732 EAST BROADWAY, SUITE 3
BOSTON, MA 02127

TRANSPORTATION ENGINEERING BY:
VANASSE & ASSOCIATES, INC.
35 NEW ENGLAND BUSINESS CENTER DRIVE, SUITE 140
ANDOVER, MA 01810

PREPARED FOR:
Quarterra
QUARTERRA
99 SUMMER STREET, SUITE 701
BOSTON, MA 02110



U.S.G.S. MAP
SCALE 1" = 1000'

AERIAL MAP
SCALE 1" = 400'

LEGEND

EXISTING	DESCRIPTION	PROPOSED
	CONCRETE BOUND	
----11----	CONTOUR	11
x11.0	SPOT GRADE	11x0
	CATCH BASIN	
	YARD DRAIN	
D	DRAIN MANHOLE	D
—D—D—	DRAIN PIPE	—D—D—
— W —	WATER LINE	— W —
WV	WATER GATE	WV
	HYDRANT	
— O/H/W —	OVERHEAD ELEC. UTILITIES	— O/H/W —
— — — —	UNDERGROUND ELEC. UTILITIES	— E/T/C —
E	ELEC TRANSFORMER	E
T	ELEC. JUNCTION BOX	T
	UTILITY POLE	
— 6" S —	6" SEWER PIPE	— 6" S —
— 8" S —	8" SEWER PIPE	— 8" S —
— 4" FM —	4" SEWER FORCE MAIN	— 4" FM —
S	SEWER MANHOLE	S

COMMONWEALTH OF MASSACHUSETTS
EDWARD L. PESCE
CIVIL
NO. 32001
REGISTERED PROFESSIONAL ENGINEER

Edward L. Pesce 23 SEP 2022
EDWARD L. PESCE, P.E. DATE

THE PROPOSED EMBLEM AT HYANNIS RESIDENCES
AT
35 SCUDDER AVENUE
IN
HYANNIS, MASSACHUSETTS
(BARNSTABLE COUNTY)

COVER SHEET

REVISIONS:

No.	DATE	DESC.
6	9-23-22	Site Layout Modified
5	11-1-21	CCC Comments; CR Area Mod
4	10-22-21	CCC Comments; CR Area Added
3	5-21-21	Utility Easement Sheet Added
2	4-23-21	Raingarden; Detail Sheets Added
1	4-1-21	CCC Submittal

PREPARED FOR:
QUARTERRA
99 SUMMER STREET, SUITE 701
BOSTON, MA 02110
Quarterra

ENGINEERING BY:
PESCE ENGINEERING & ASSOCIATES, INC.
Edward L. Pesce, P.E., LEED® AP
43 Porter Lane
West Dennis, MA 02670
epesce@comcast.net Cell: 508-333-7630

LAND SURVEYING BY:
BAXTER NYE ENGINEERING
& SURVEYING
78 NORTH STREET, 3RD FLOOR
HYANNIS, MA 02601

DATE:	FEBRUARY 11, 2021
FIELD:	CB/RB
CALC./DESIGN:	ELP
DRAWN:	BJW
CHECK:	ELP
JOB NO:	5061

SHEET 1 OF 17

LOCUS INFORMATION:

1. THE INTENT OF THIS PLAN IS TO DETAIL EXISTING SITE CONDITIONS AT LOCUS.

2. **CURRENT OWNER:**
   TFG HYANNIS HOSPITALITY
   35 SCUDDER AVENUE, HYANNIS, MA 02601

   DEED BOOK 22498, PAGE 88

   ASSESSORS MAP 289, PARCEL 110

3. **ZONING DISTRICT: RB**
   MINIMUM LOT SIZE: 43, 560 S.F.
   MINIMUM FRONTAGE: 20 FT
   MINIMUM FRONT YARD: 20 FT
   MINIMUM SIDE YARD: 10 FT
   MINIMUM REAR YARD: 10 FT

4. **ZONING OVERLAY DISTRICTS:**
   WPOD - WELLHEAD PROTECTION OVERLAY DISTRICT
   APOD - AQUIFER PROTECTION OVERLAY DISTRICT

5. BY GRAPHICAL PLOTTING ONLY PARCEL LIES WITHIN FLOOD ZONE X (UN-SHADED), ZONE X (SHADED), ZONE AE (EL. 11), ZONE AE (EL. 12), ZONE AE (EL. 13), AND ZONE VE (EL. 13) AS DEFINED BY COMMUNITY PANEL NO. 250001 0568 J, EFFECTIVE DATE: JULY 16, 2014. FLOOD ZONE LINES SHOWN HERON ARE DEPICTED FROM MA. GIS AND ARE APPROXIMATE ONLY.

6. A TITLE SEARCH HAS BEEN PROVIDED BY CHICAGO TITLE INSURANCE COMPANY, COMMITMENT No. 110041-20-00998-MA, REVISION 1, EFFECTIVE DATE JULY 7, 2020
   CERTIFIED BY: DEREK J. KREBS, ESQ. HOLT NEY ZATCOFF & WASSERMAN, LLP

7. THE PROPERTY LINES SHOWN ARE BASED ON PROVIDED INFORMATION AND AVAILABLE RECORD INFORMATION CONSISTING OF PLANS AND DEEDS. THE EXISTING LOCUS FEATURES SHOWN HERON WERE OBTAINED FROM PRIOR PLANS AND SUPPLEMENTED WITH AN ON-THE-GROUND FIELD SURVEY PERFORMED BY BAXTER & NYE ENGINEERING & SURVEYING JULY 28, 2020 - AUGUST 3, 2020.

8. NO EVIDENCE OF RECENT EARTH MOVING WORK, BUILDING CONSTRUCTION, OR BUILDING ADDITIONS OBSERVED IN THE PROCESS OF CONDUCTING THE FIELDWORK.

9. THERE WAS NO OBSERVED EVIDENCE OF THE SITE USED AS A SOLID WASTE DUMP, SUMP, OR SANITARY LANDFILL.

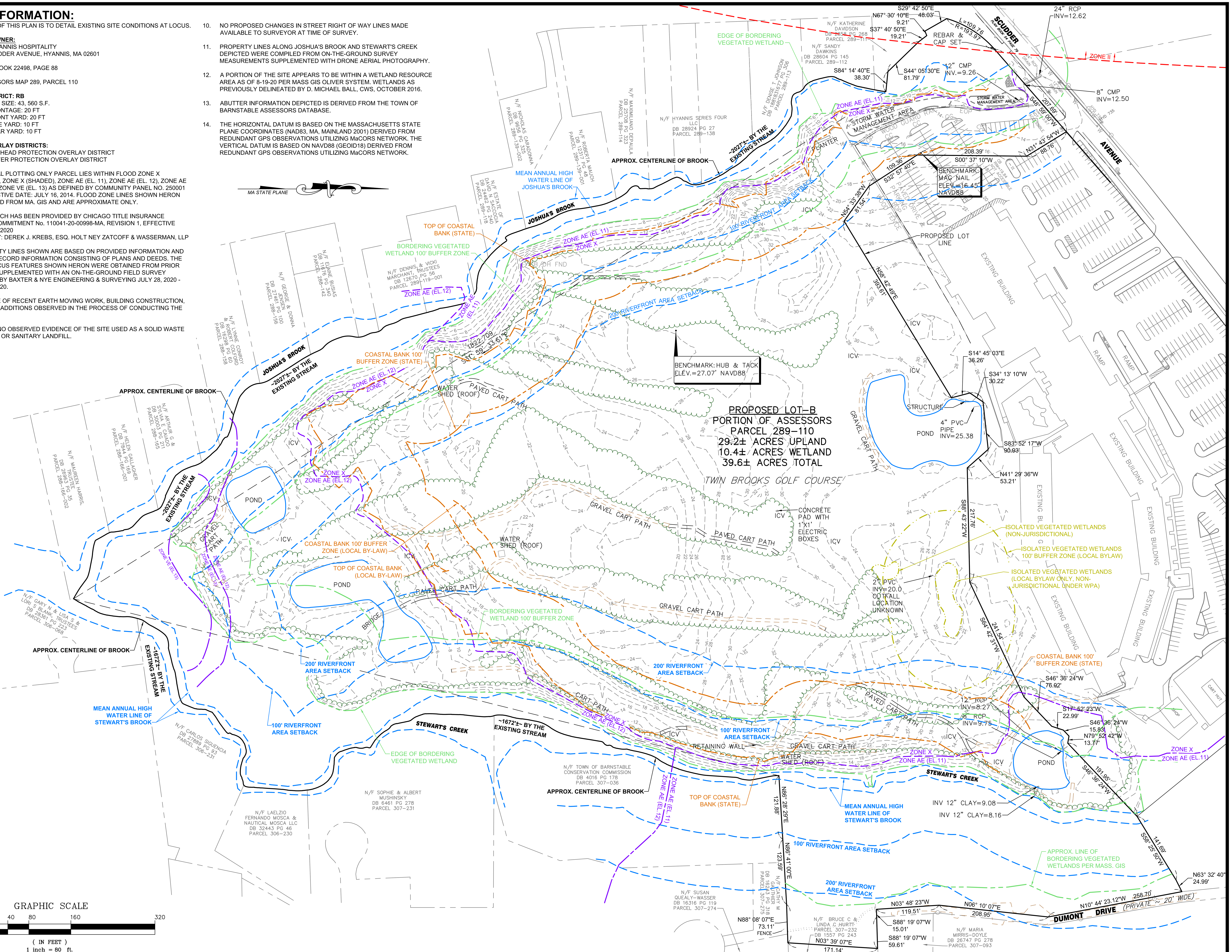
10. NO PROPOSED CHANGES IN STREET RIGHT OF WAY LINES MADE AVAILABLE TO SURVEYOR AT TIME OF SURVEY.

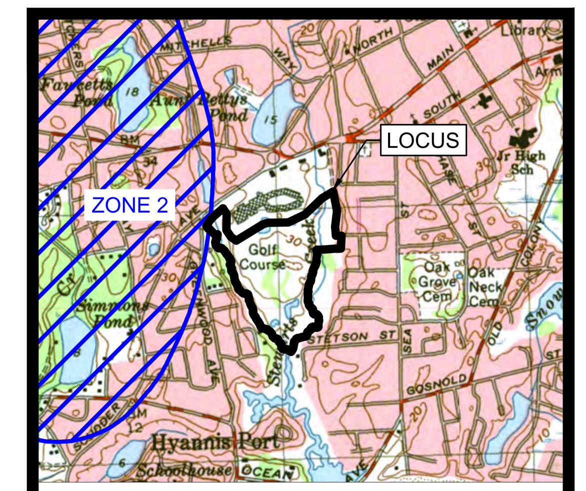
11. PROPERTY LINES ALONG JOSHUA'S BROOK AND STEWART'S CREEK DEPICTED WERE COMPILED FROM ON-THE-GROUND SURVEY MEASUREMENTS SUPPLEMENTED WITH DRONE AERIAL PHOTOGRAPHY.

12. A PORTION OF THE SITE APPEARS TO BE WITHIN A WETLAND RESOURCE AREA AS OF 8-19-20 PER MASS GIS OLIVER SYSTEM. WETLANDS AS PREVIOUSLY DELINEATED BY D. MICHAEL BALL, CWS, OCTOBER 2016.

13. ABUTTER INFORMATION DEPICTED IS DERIVED FROM THE TOWN OF BARNSTABLE ASSESSORS DATABASE.

14. THE HORIZONTAL DATUM IS BASED ON THE MASSACHUSETTS STATE PLANE COORDINATES (NAD83, MA, MAINLAND 2001) DERIVED FROM REDUNDANT GPS OBSERVATIONS UTILIZING MaCORS NETWORK. THE VERTICAL DATUM IS BASED ON NAVD88 (GEOID18) DERIVED FROM REDUNDANT GPS OBSERVATIONS UTILIZING MaCORS NETWORK.





LOCUS MAP
SCALE 1" = 2000'

COMMONWEALTH OF MASSACHUSETTS
EDWARD L. PESCE
CIVIL
NO. 32001
REGISTERED PROFESSIONAL ENGINEER

Edward L. Pesce 23 SEP 2022

EDWARD L. PESCE, P.E. DATE

THE PROPOSED EMBLEM AT HYANNIS RESIDENCES

AT

35 SCUDDER AVENUE

IN

HYANNIS, MASSACHUSETTS

(BARNSTABLE COUNTY)

EXISTING CONDITIONS

REVISIONS:

No.	DATE	DESC.
6	9-23-22	Site Layout Modified
5	11-1-21	CCC Comments; CR Area Mod
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1	4-1-21	CCC Submittal

PREPARED FOR:
QUARTERRA
99 SUMMER STREET, SUITE 701
BOSTON, MA 02110

Quarterra

ENGINEERING BY:
PESCE ENGINEERING & ASSOCIATES, INC.
Edward L. Pesce, P.E., LEED® AP
43 Porter Lane
West Dennis, MA 02670
epesce@comcast.net Cell: 508-333-7630

LAND SURVEYING BY:
BAXTER NYE ENGINEERING & SURVEYING
78 NORTH STREET, 3RD FLOOR
HYANNIS, MA 02601

DATE: FEBRUARY 11, 2021

FIELD: CB/RB

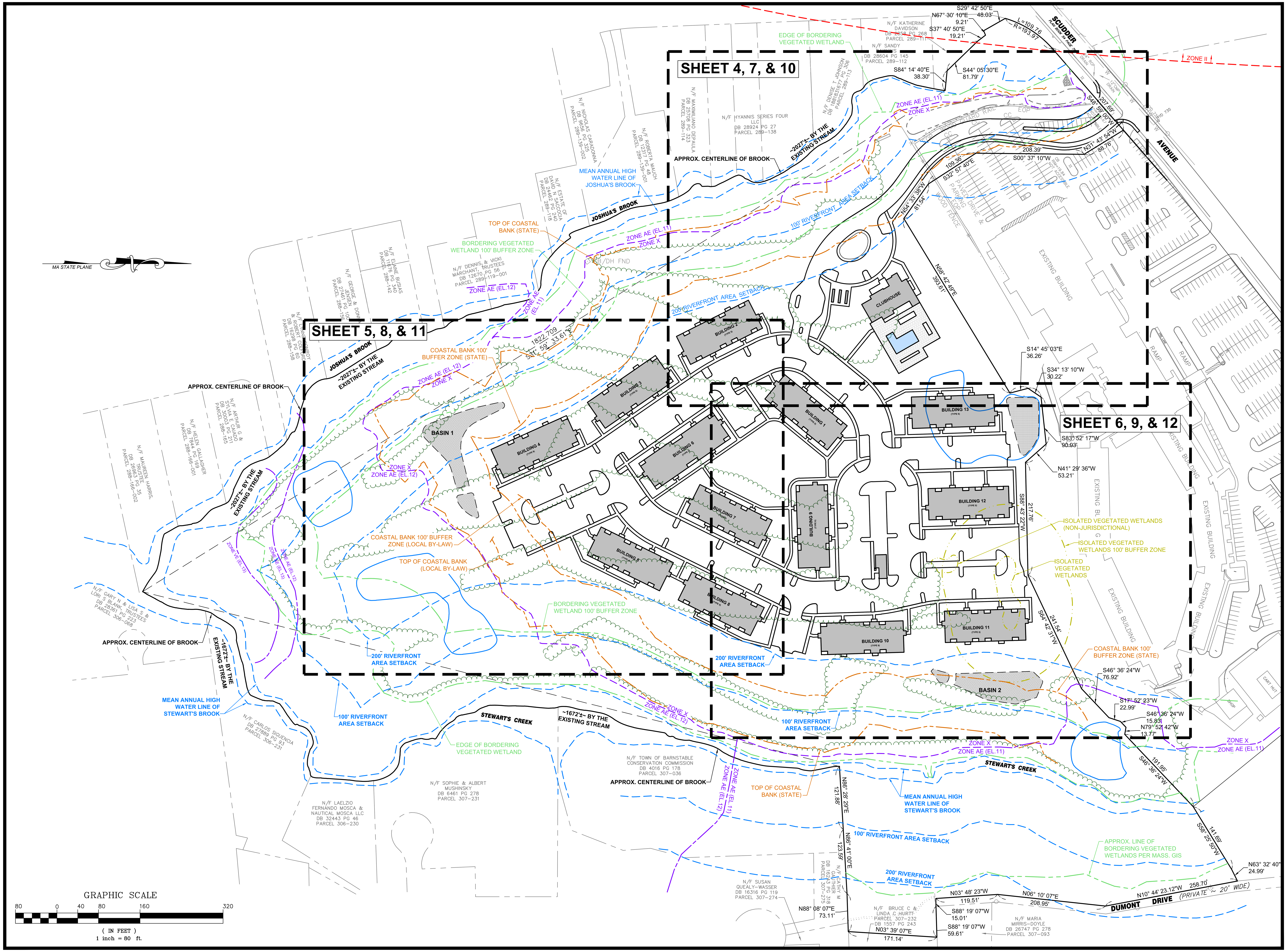
CALC./DESIGN: ELP

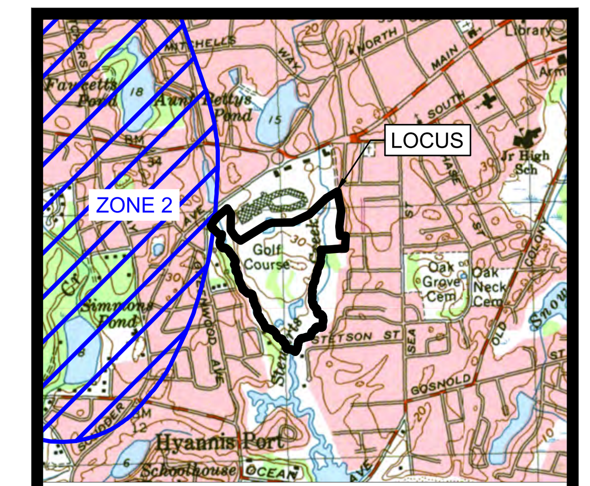
DRAWN: BJW

CHECK: ELP

JOB NO: 5061

SHEET 2 OF 17





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SITE OVERVIEW

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SHEET 3 OF 17

ZONING SCHEDULE - RESIDENCE B (RB)

WELLHEAD PROTECTION & AQUIFER PROTECTION OVERLAY DISTRICT

ITEM	REQUIRED	PROPOSED
MIN. LOT AREA	43,560 S.F.	39.6 AC
MIN. FRONTAGE	20'	207.69'
MIN. LOT WIDTH	100'	>100'
MIN. FRONT YARD	20'	503.7'
MIN. SIDE YARD	10'	27.6'
MIN. REAR YARD	10'	211.5
MAX. BUILDING HEIGHT	30'	46'-8 1/2" *
MIN. OPEN SPACE	30%	54.7%
MAX. LOT COVERAGE	50%	23%
(ALL RECHARGE DISPOSED ON SITE)		

* REQUIRES WAIVER (REGULATORY AGREEMENT)

PARKING SCHEDULE

REQUIRED:

ATTACHED DWELLING UNITS (D.U):	312 UNITS	
1.5 SPACES PER D.U:	468 SPACES	
1 VISITOR SPACE PER 10 D.U.:	47 SPACES	515 REQUIRED

PROVIDED:

TOTAL PARKING SPACES: **493 PROVIDED***

* REQUIRES WAIVER (REGULATORY AGREEMENT)

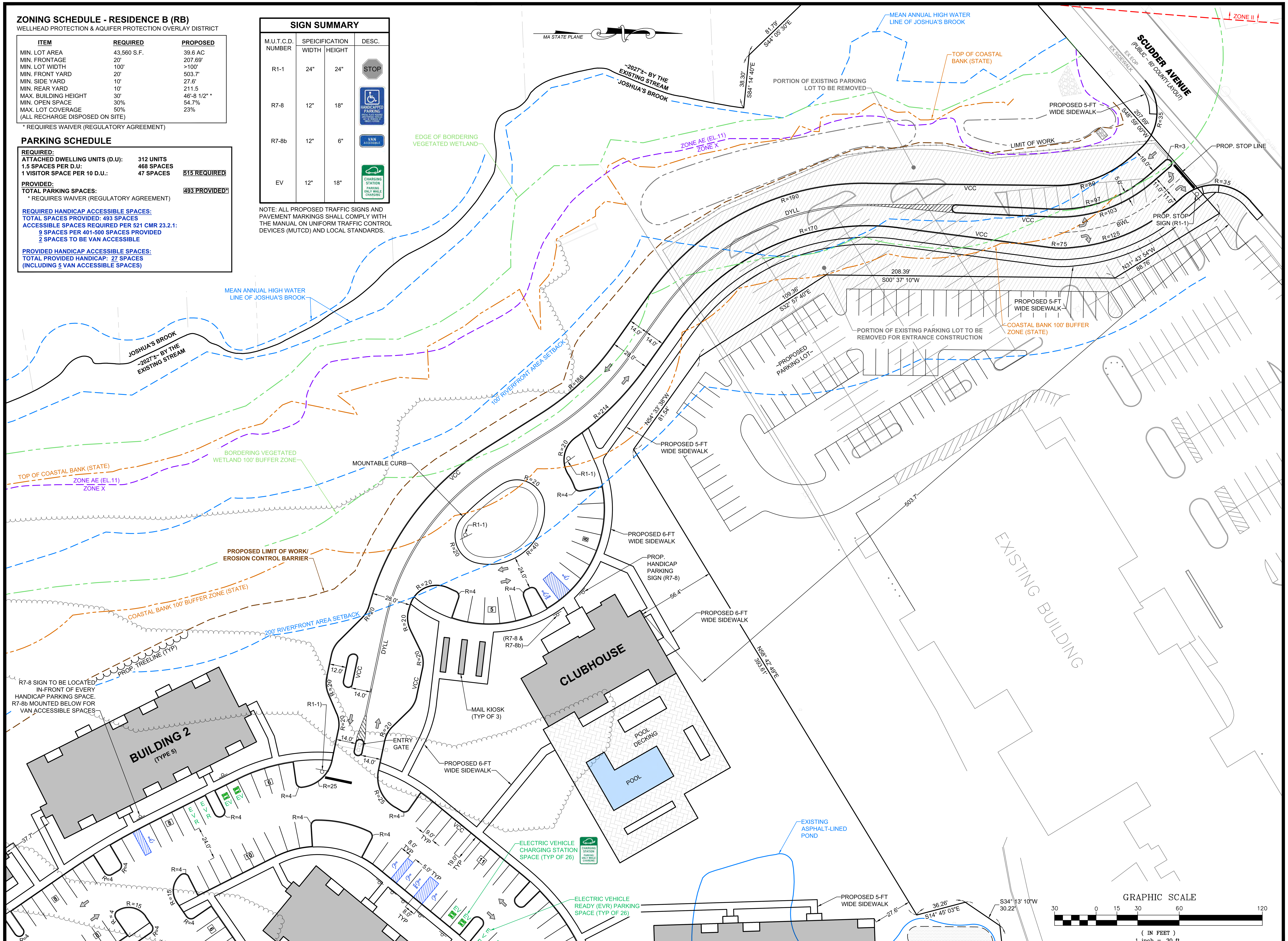
REQUIRED HANDICAP ACCESSIBLE SPACES:
TOTAL SPACES PROVIDED: 493 SPACES
ACCESSIBLE SPACES REQUIRED PER 521 CMR 23.2.1:
9 SPACES PER 401-500 SPACES PROVIDED
2 SPACES TO BE VAN ACCESSIBLE

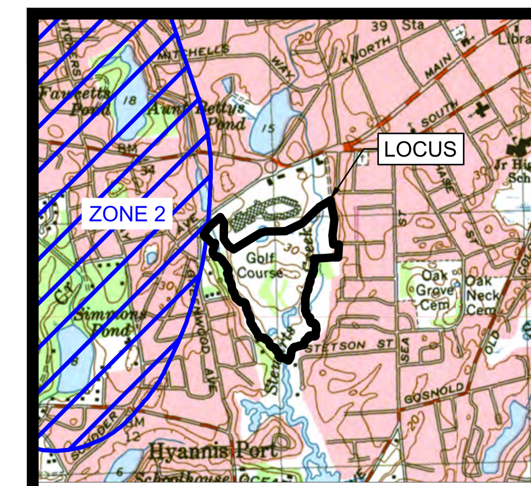
PROVIDED HANDICAP ACCESSIBLE SPACES:
TOTAL PROVIDED HANDICAP: 27 SPACES
(INCLUDING 5 VAN ACCESSIBLE SPACES)

SIGN SUMMARY

M.U.T.C.D. NUMBER	SPECIFICATION WIDTH	SPECIFICATION HEIGHT	DESC.
R1-1	24"	24"	STOP
R7-8	12"	18"	HANDICAPPED PARKING
R7-8b	12"	6"	VAN ACCESSIBLE
EV	12"	18"	CHARGING STATION PARKING ONLY WHILE CHARGING

NOTE: ALL PROPOSED TRAFFIC SIGNS AND PAVEMENT MARKINGS SHALL COMPLY WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) AND LOCAL STANDARDS.





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CIVIL
NO. 32001
REGISTERED PROFESSIONAL ENGINEER

Edward L. Pesce 23 SEP 2022

EDWARD L. PESCE, P.E. DATE

THE PROPOSED EMBLEM AT HYANNIS RESIDENCES

AT

35 SCUDDER AVENUE

IN

HYANNIS, MASSACHUSETTS

(BARNSTABLE COUNTY)

LAYOUT & PARKING (1)

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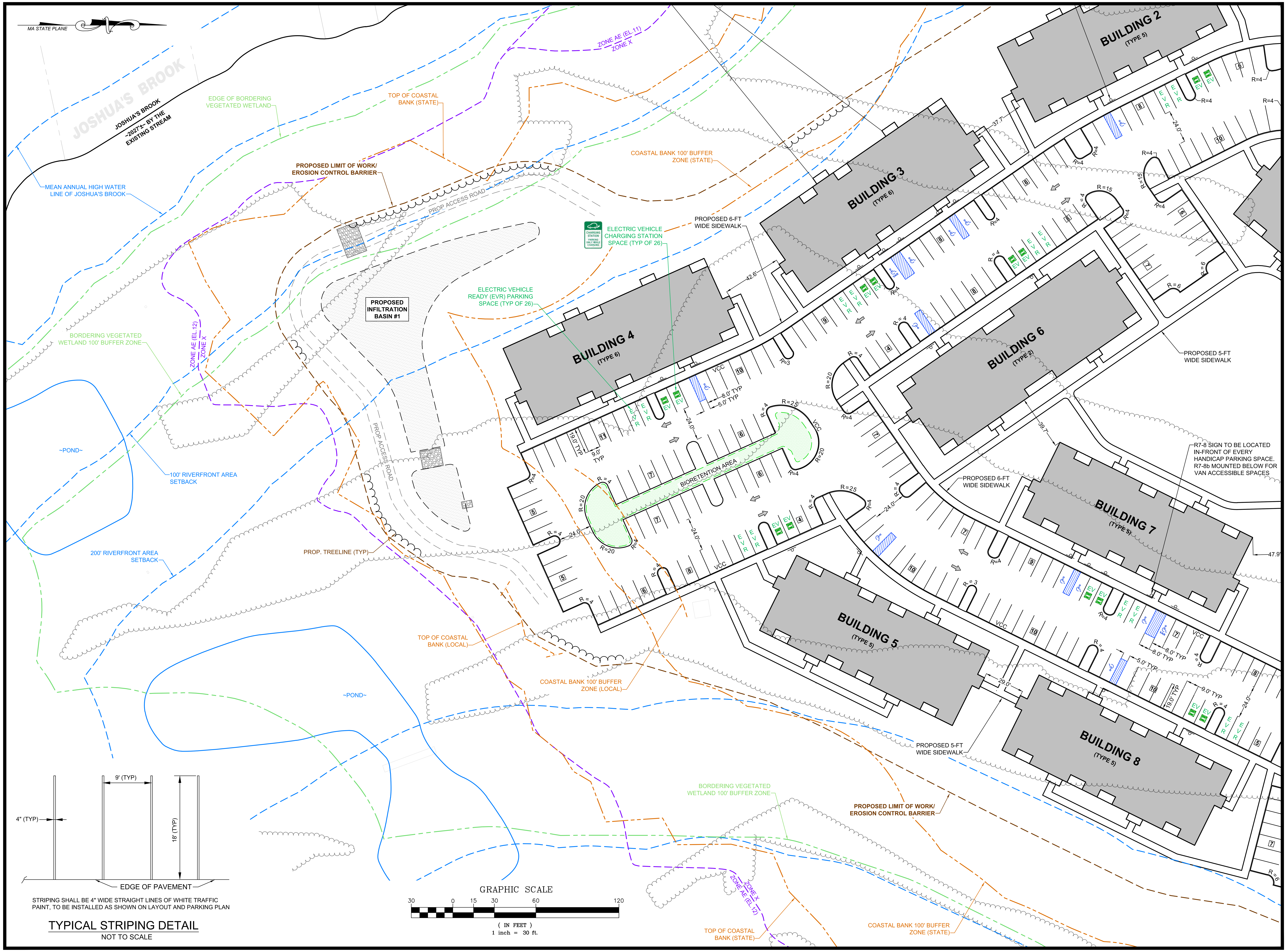
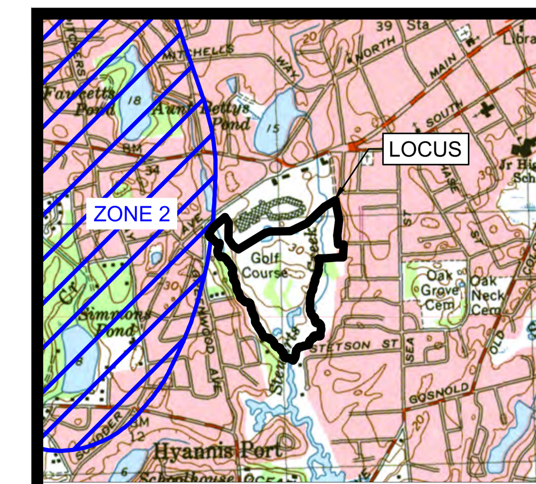
JOB NO:	5061

SHEET 4 OF 17





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LAYOUT & PARKING (2)

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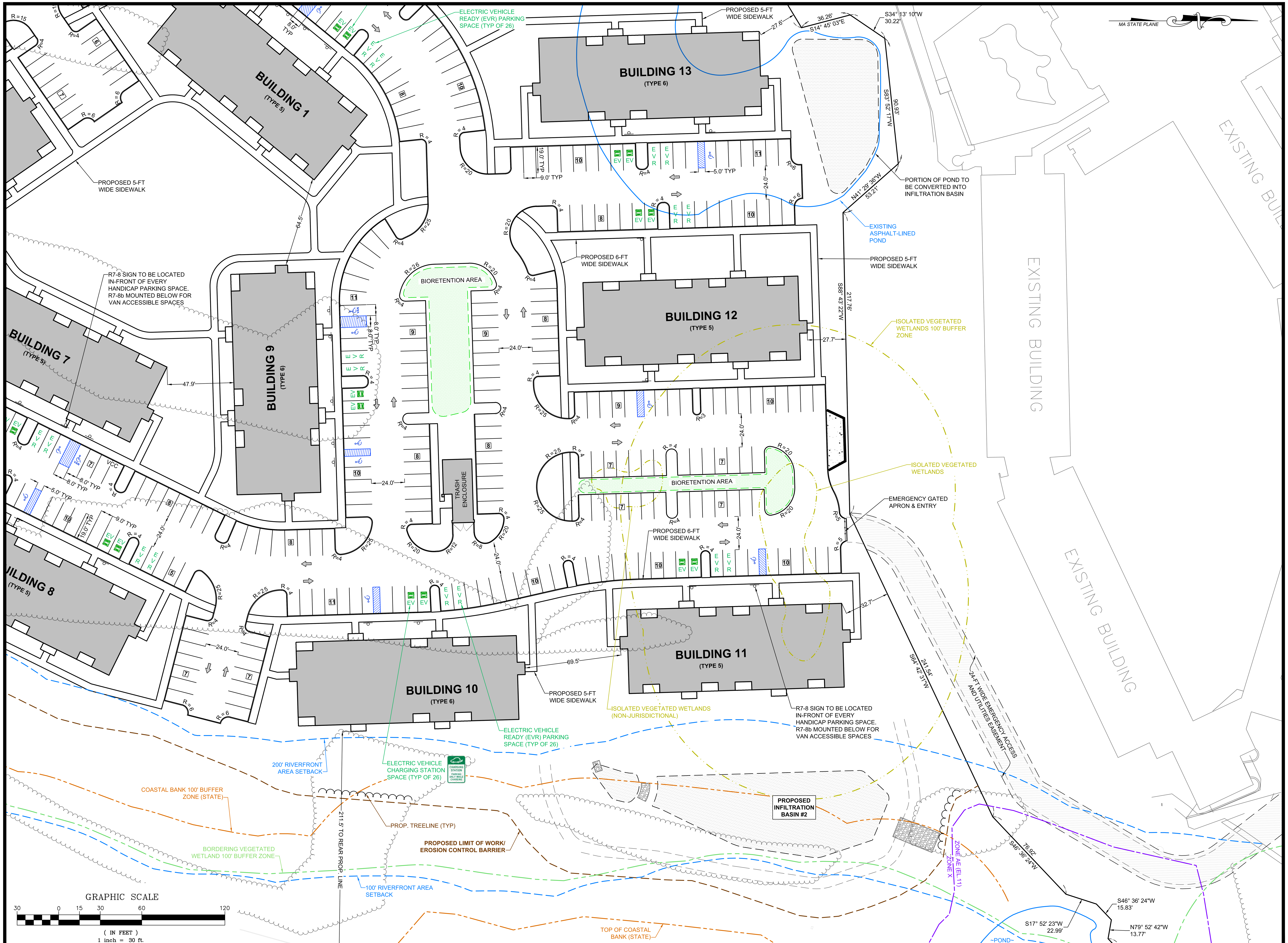
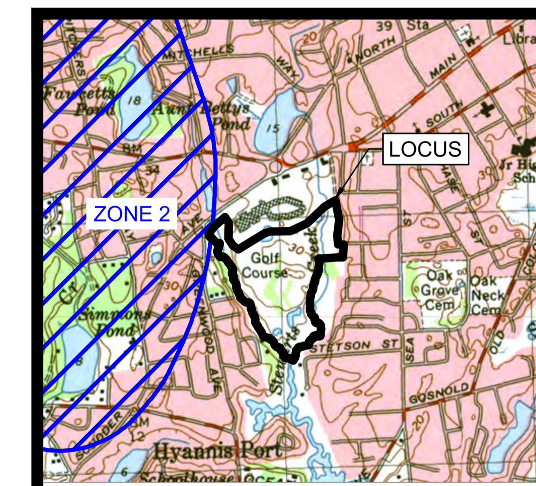
SHEET 5 OF 17





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LAYOUT & PARKING (3)

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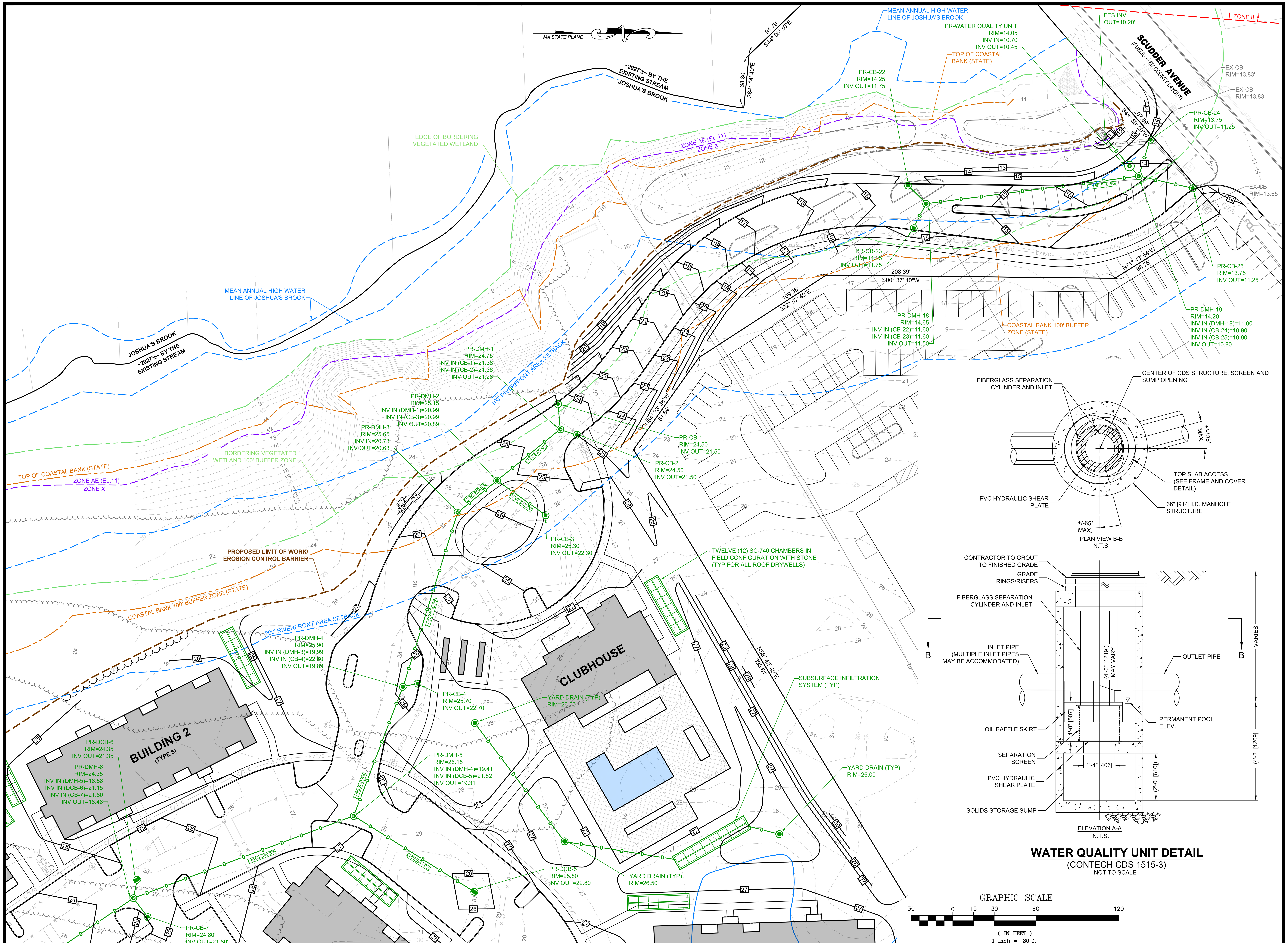
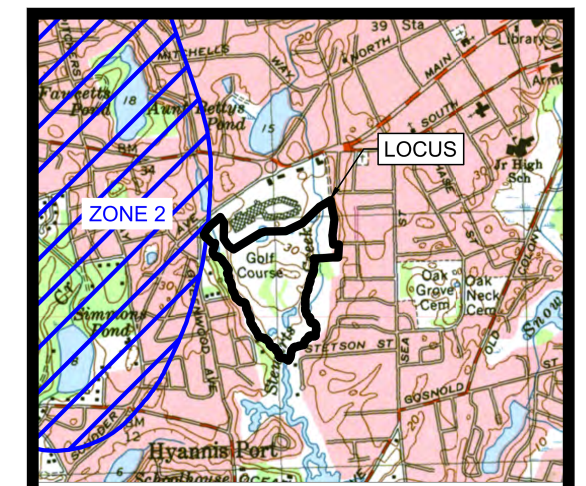
SHEET 6 OF 17





LOCUS MAP
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Edward L. Pesce 23 SEP 2022

EDWARD L. PESCE, P.E. DATE

THE PROPOSED EMBLEM AT HYANNIS RESIDENCES

AT

35 SCUDDER AVENUE

IN

HYANNIS, MASSACHUSETTS

(BARNSTABLE COUNTY)

GRADING & DRAINAGE (1)

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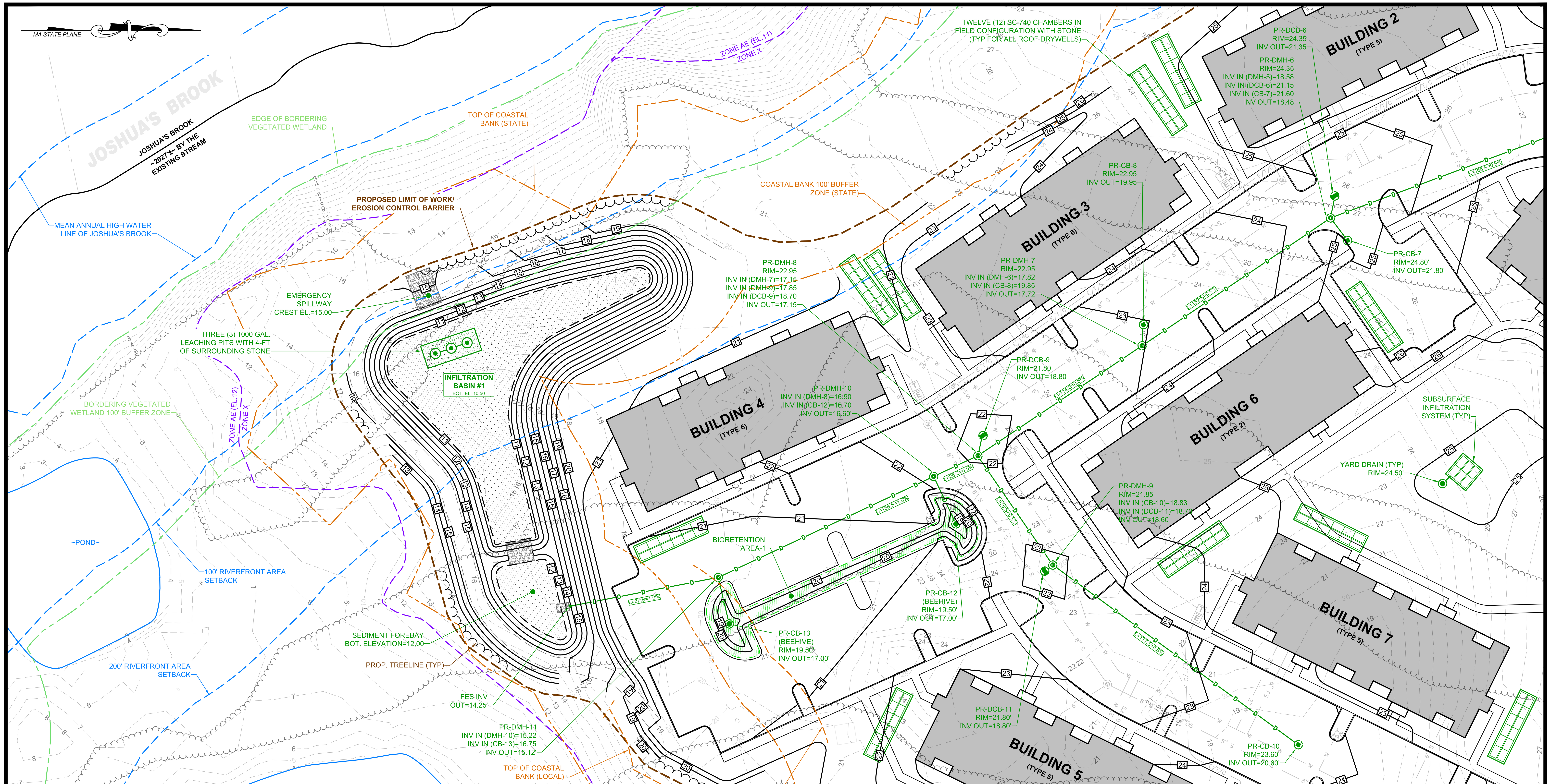
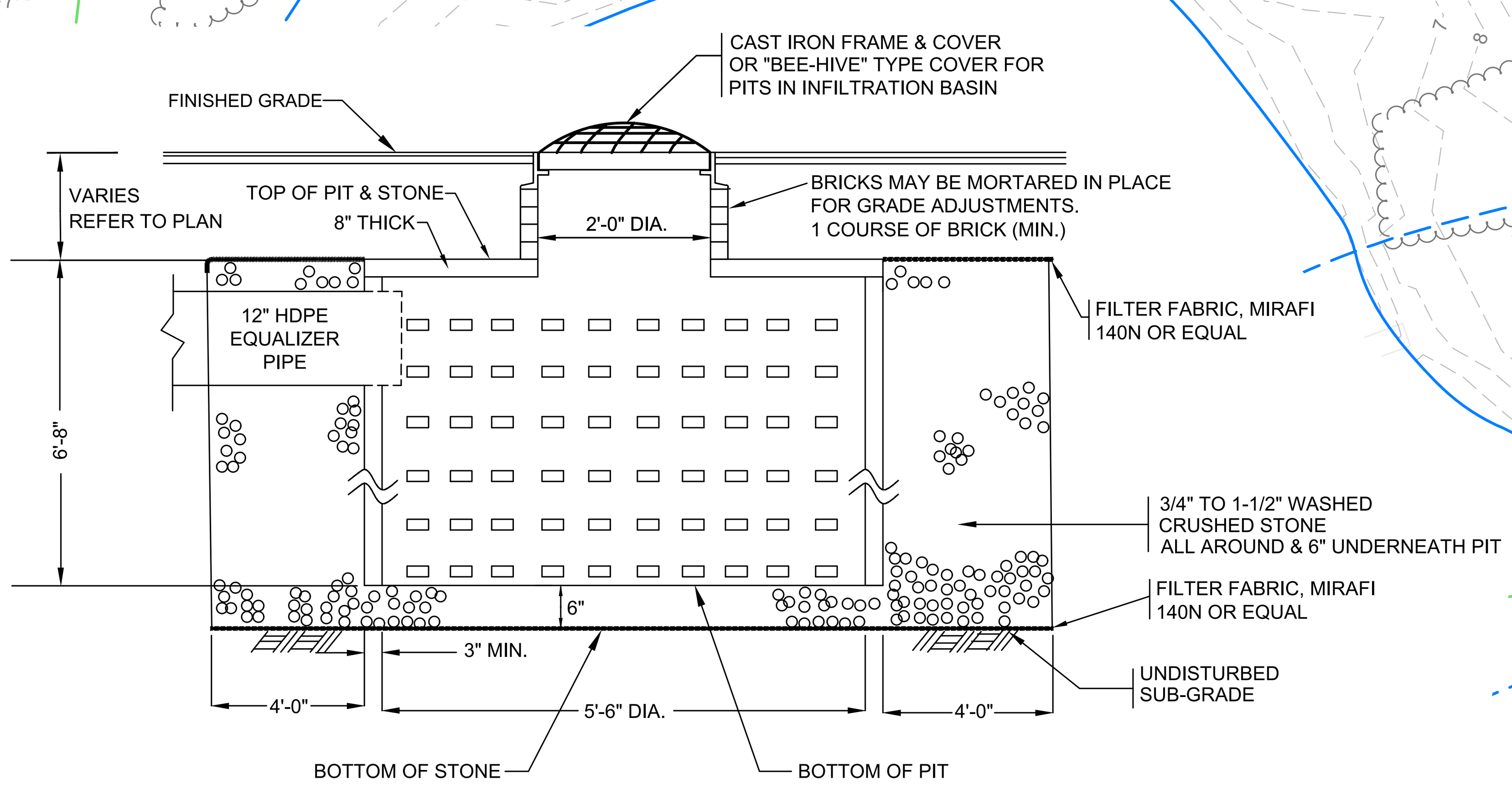
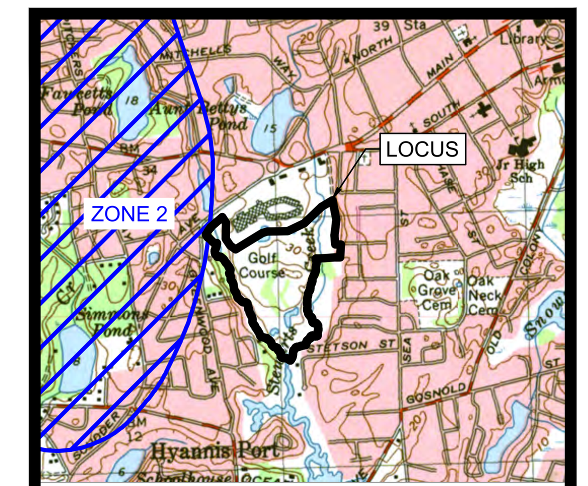
SHEET 7 OF 17





PRECAST CONCRETE 1,000 GALLON LEACHING PIT (H-20)
LOCATED IN INFILTRATION BASIN #1 & #2 ONLY
NOT TO SCALE



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GRADING & DRAINAGE (2)

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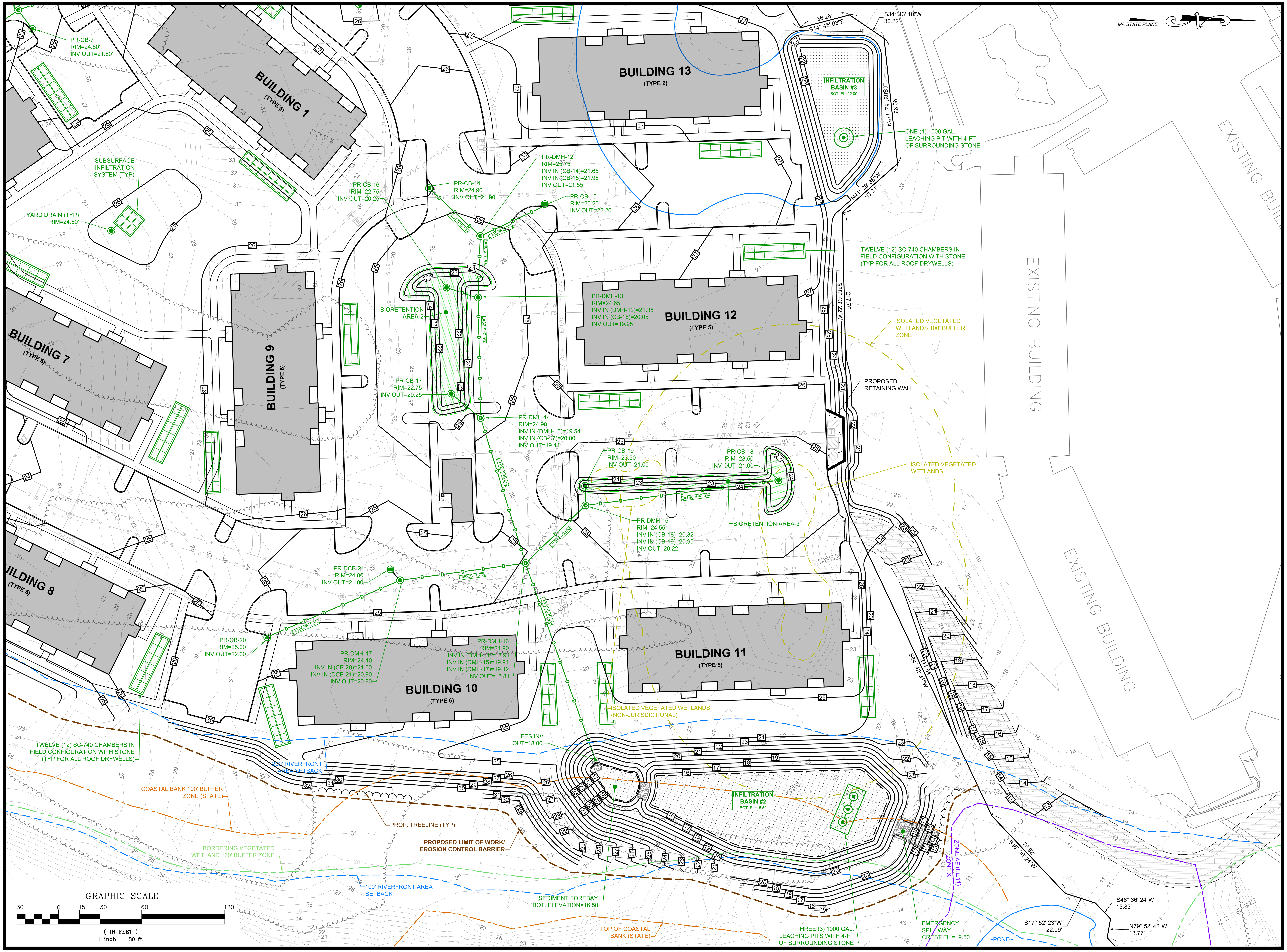
SHEET 8 OF 17



LOCUS

ZONE 2

Hyannis Port

LOCUS MAP

SCALE 1" = 2000'

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GRADING & DRAINAGE (3)

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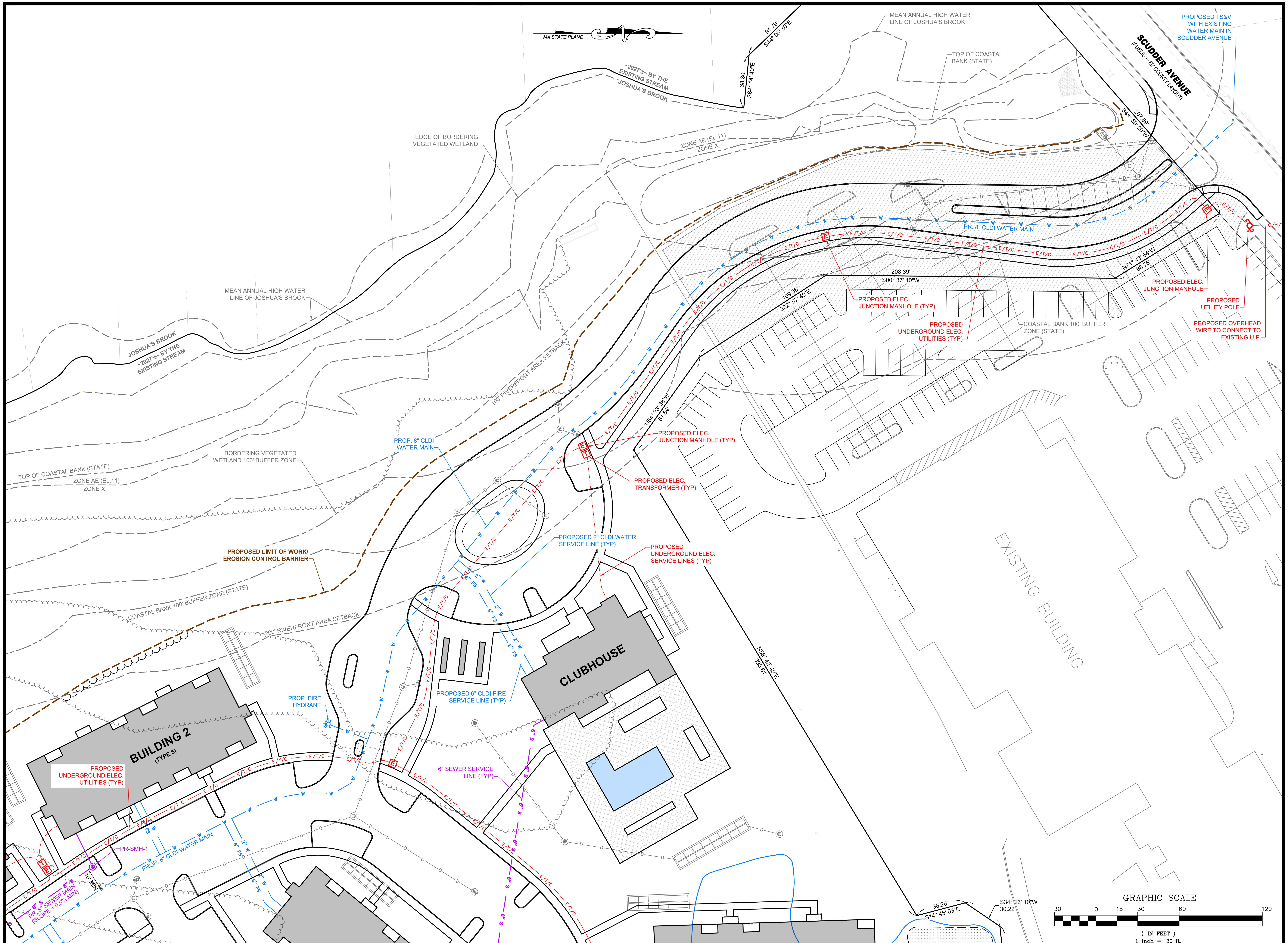
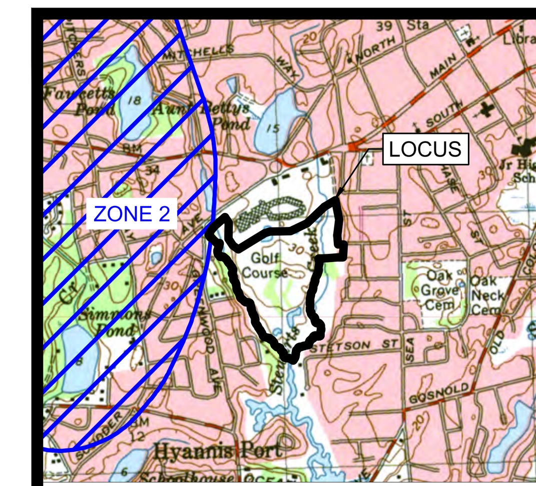
SHEET 9 OF 17





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THE PROPOSED EMBLEM AT HYANNIS RESIDENCES

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UTILITIES PLAN (1)

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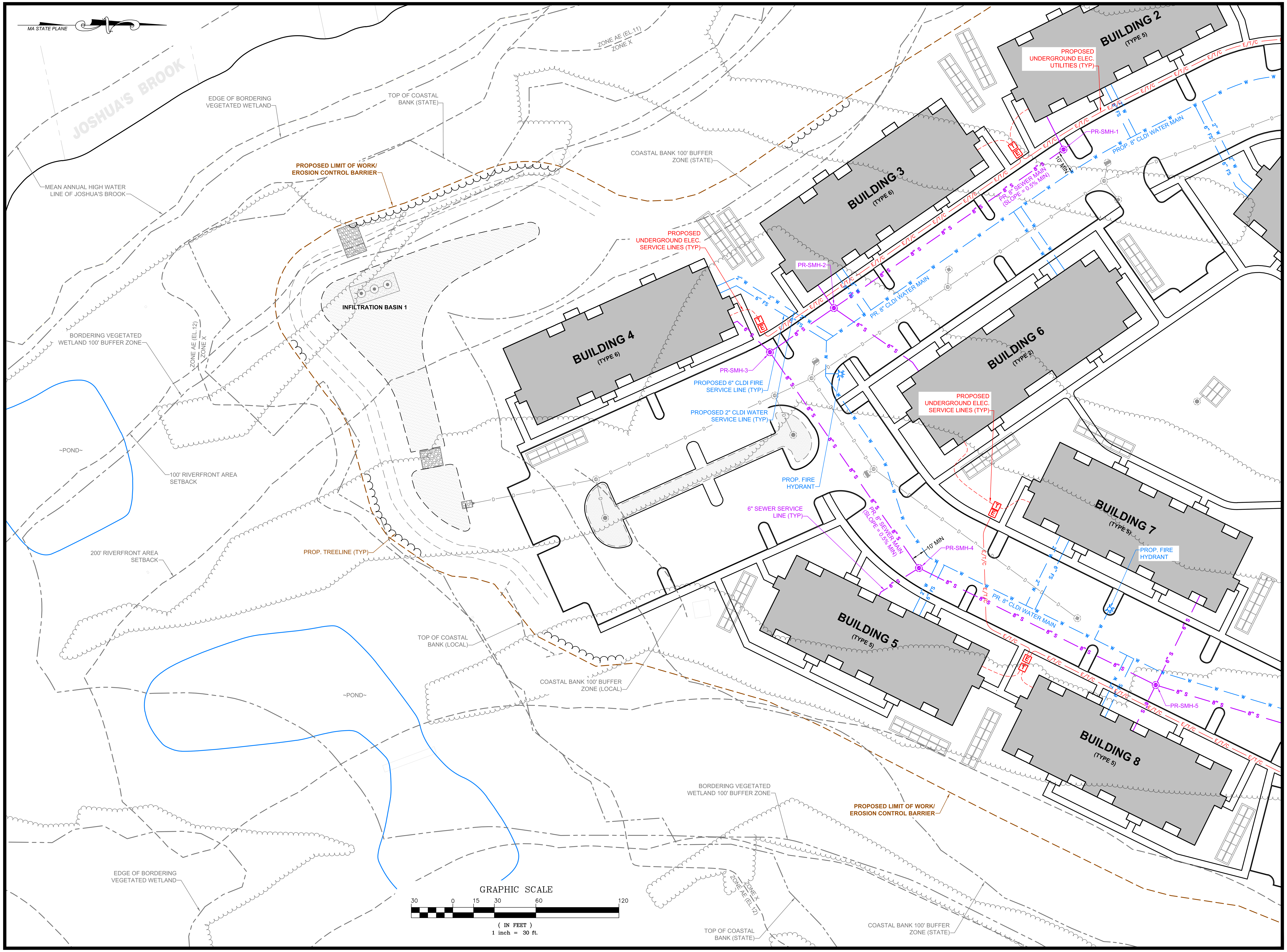
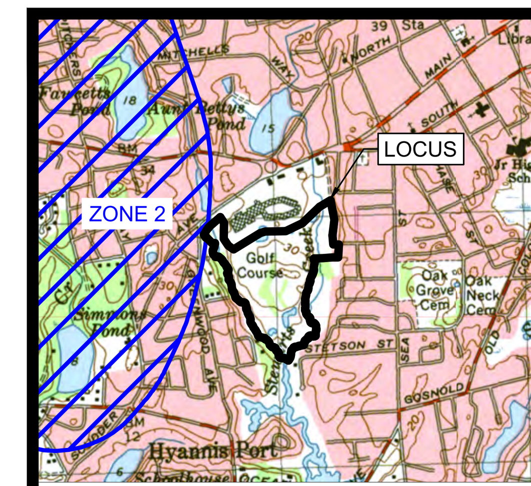
SHEET 10 OF 17





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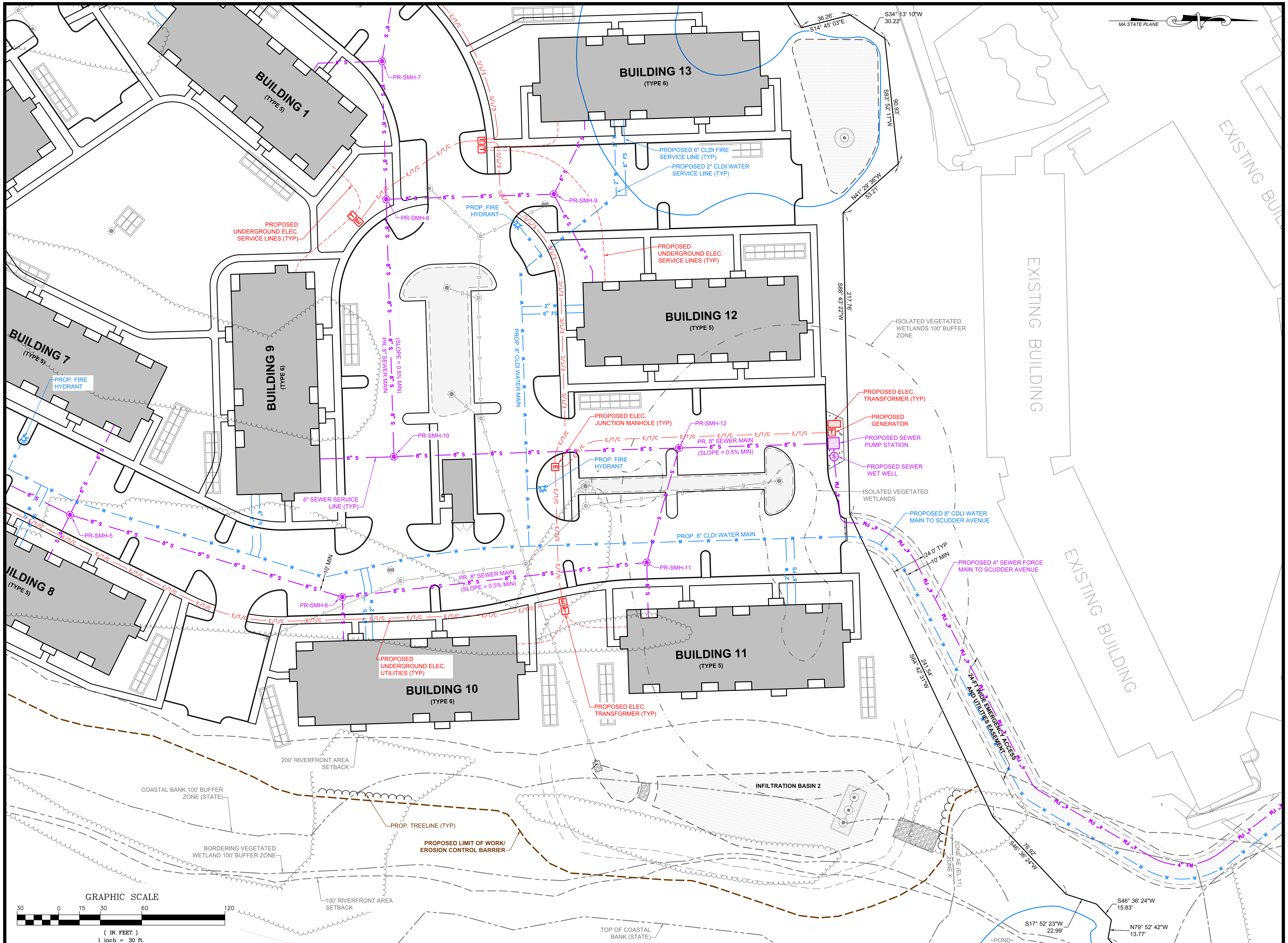
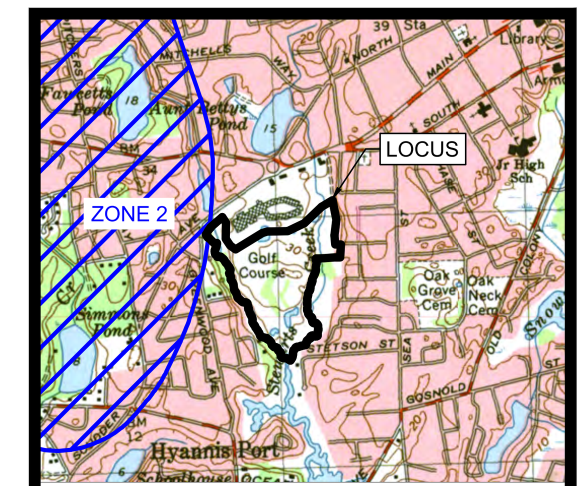
LAND SURVEYING BY:
BAXTER NYE ENGINEERING & SURVEYING
78 NORTH STREET, 3RD FLOOR
HYANNIS, MA 02601

DATE: FEBRUARY 11, 2021
FIELD: CB/RB
CALC./DESIGN: ELP
DRAWN: BJW
CHECK: ELP
JOB NO: 5061

SHEET 11 OF 17





LOCUS MAP
SCALE 1" = 2000'

COMMONWEALTH OF MASSACHUSETTS
EDWARD L. PESCE
CIVIL
NO. 32001
REGISTERED PROFESSIONAL ENGINEER

23 SEP 2022

EDWARD L. PESCE, P.E. DATE

THE PROPOSED EMBLEM AT HYANNIS RESIDENCES

AT

35 SCUDDER AVENUE

IN

HYANNIS, MASSACHUSETTS

(BARNSTABLE COUNTY)

UTILITIES PLAN (3)

REVISIONS:

No.	DATE	DESC.
6	9-23-22	Site Layout Modified
5	11-1-21	CCC Comments; CR Area Mod
4	10-22-21	CCC Comments; CR Area Added
3	5-21-21	Utility Easement Sheet Added
2	4-23-21	Raingarden; Detail Sheets Added
1	4-1-21	CCC Submittal

PREPARED FOR:
QUARTERRA
99 SUMMER STREET, SUITE 701
BOSTON, MA 02110

Quarterra

ENGINEERING BY:

PESCE ENGINEERING & ASSOCIATES, INC.
Edward L. Pesce, P.E., LEED AP
43 Porter Lane
West Dennis, MA 02670
epesce@comcast.net Cell: 508-333-7630

LAND SURVEYING BY:
BAXTER NYE ENGINEERING & SURVEYING
78 NORTH STREET, 3RD FLOOR
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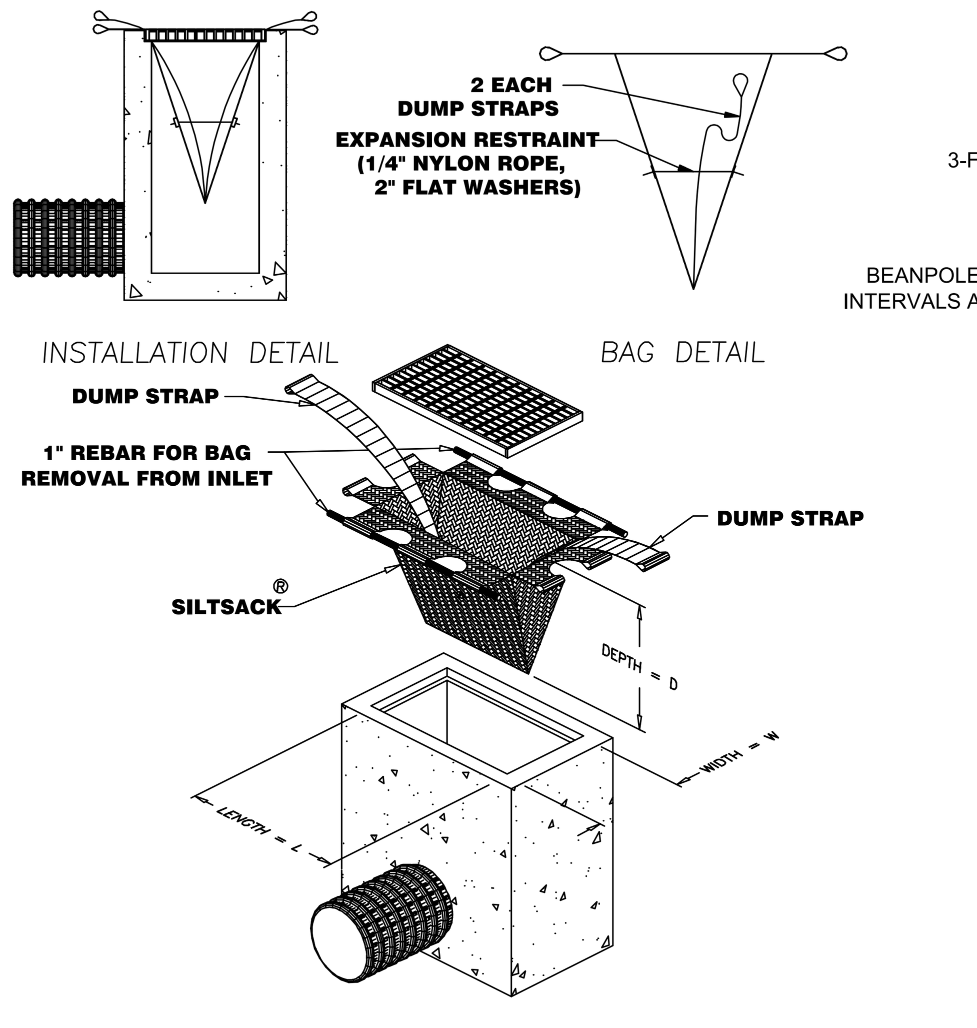
DATE:	FEBRUARY 11, 2021
FIELD:	CB/RB
CALC./DESIGN:	ELP
DRAWN:	BJW
CHECK:	ELP
JOB NO:	5061

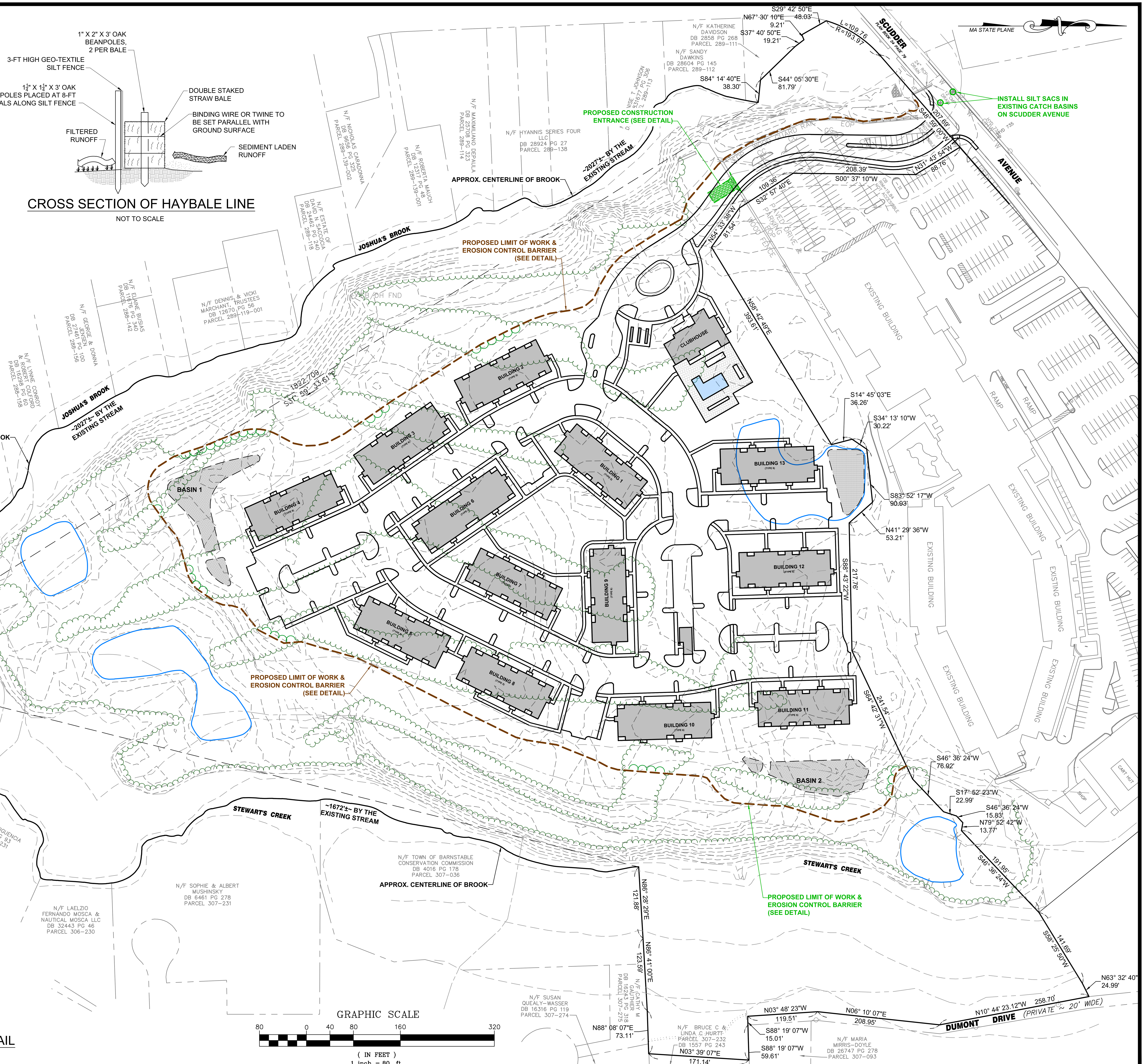
SHEET 12 OF 17



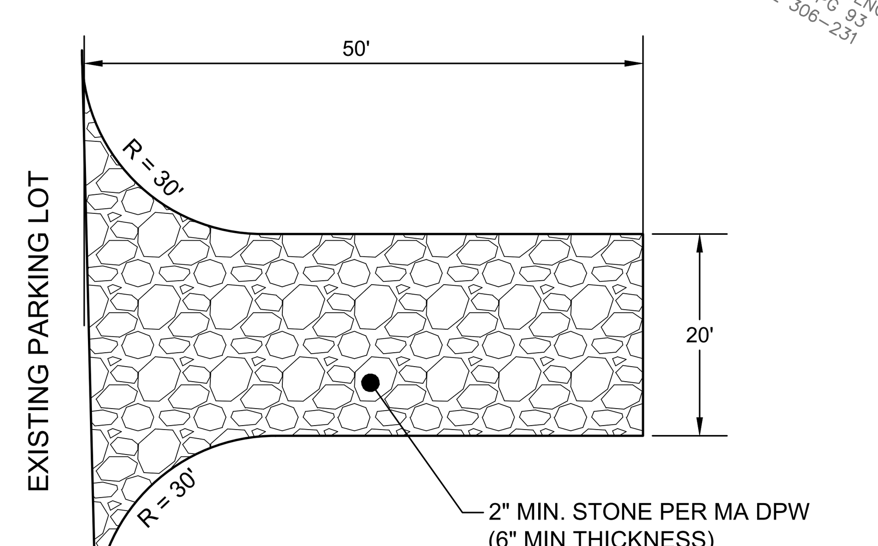
DETAIL OF SILT SACK SEDIMENT CONTROL DEVICE
(TO BE PLACED IN EX. CATCH BASINS DOWNGRADIENT OF PROJECT AND CONSTRUCTED CATCH BASINS ONCE BINDER IS PLACED)
NOT TO SCALE

1" X 2" X 3' OAK BEANPOLES, 2 PER BALE
3-FT HIGH GEO-TEXTILE SILT FENCE
1½" X 1½" X 3' OAK BEANPOLES PLACED AT 8-FT INTERVALS ALONG SILT FENCE
DOUBLE STAKED STRAW BALE
BINDING WIRE OR TWINE TO BE SET PARALLEL WITH GROUND SURFACE
FILTERED RUNOFF
SEDIMENT LADEN RUNOFF

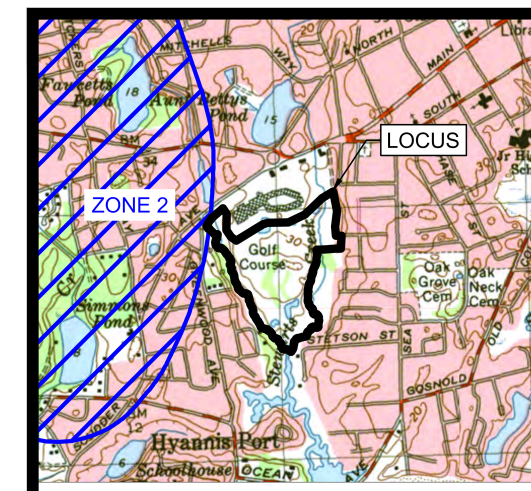
CROSS SECTION OF HAYBALE LINE
NOT TO SCALE



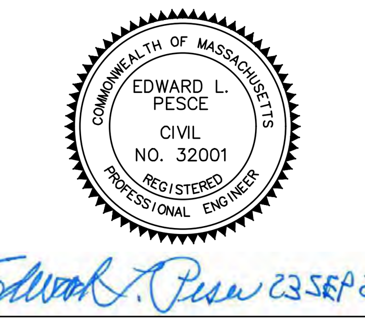
GRAPHIC SCALE
80 0 40 80 160 320
(IN FEET)
1 inch = 80 ft.



TEMPORARY CONSTRUCTION ENTRANCE DETAIL
NOT TO SCALE



LOCUS MAP
SCALE 1" = 2000'



Edward L. Pesce 23 SEP 2022
EDWARD L. PESCE, P.E. DATE

THE PROPOSED EMBLEM AT HYANNIS RESIDENCES
AT
35 SCUDDER AVENUE
IN
HYANNIS, MASSACHUSETTS
(BARNSTABLE COUNTY)

EROSION CONTROL PLAN

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PREPARED FOR:
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BOSTON, MA 02110

Quarterra

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epesce@comcast.net Cell: 508-333-7630

LAND SURVEYING BY:
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78 NORTH STREET, 3RD FLOOR
HYANNIS, MA 02601

DATE: FEBRUARY 11, 2021
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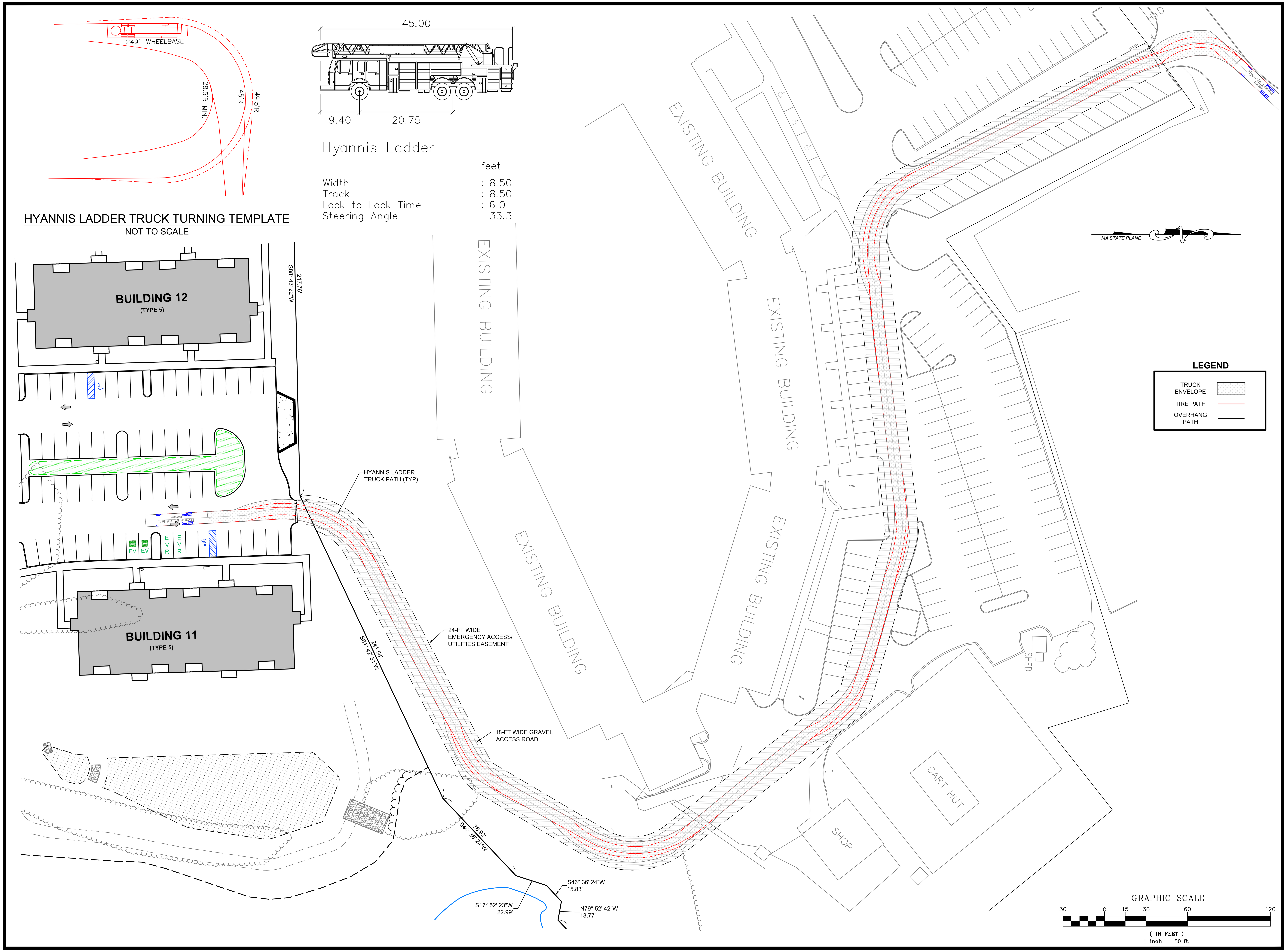
CHECK: ELP
JOB NO: 5061

SHEET 13 OF 17



LOCUS MAP
SCALE 1" = 2000'

COMMONWEALTH OF MASSACHUSETTS EDWARD L. PESCE CIVIL NO. 32001 REGISTERED PROFESSIONAL ENGINEER

23 SEP 2022

EDWARD L. PESCE, P.E. DATE

THE PROPOSED EMBLEM AT HYANNIS RESIDENCES

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(BARNSTABLE COUNTY)

EMERGENCY ACCESS PLAN

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LAND SURVEYING BY:
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DATE: FEBRUARY 11, 2021
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CALC./DESIGN: ELP
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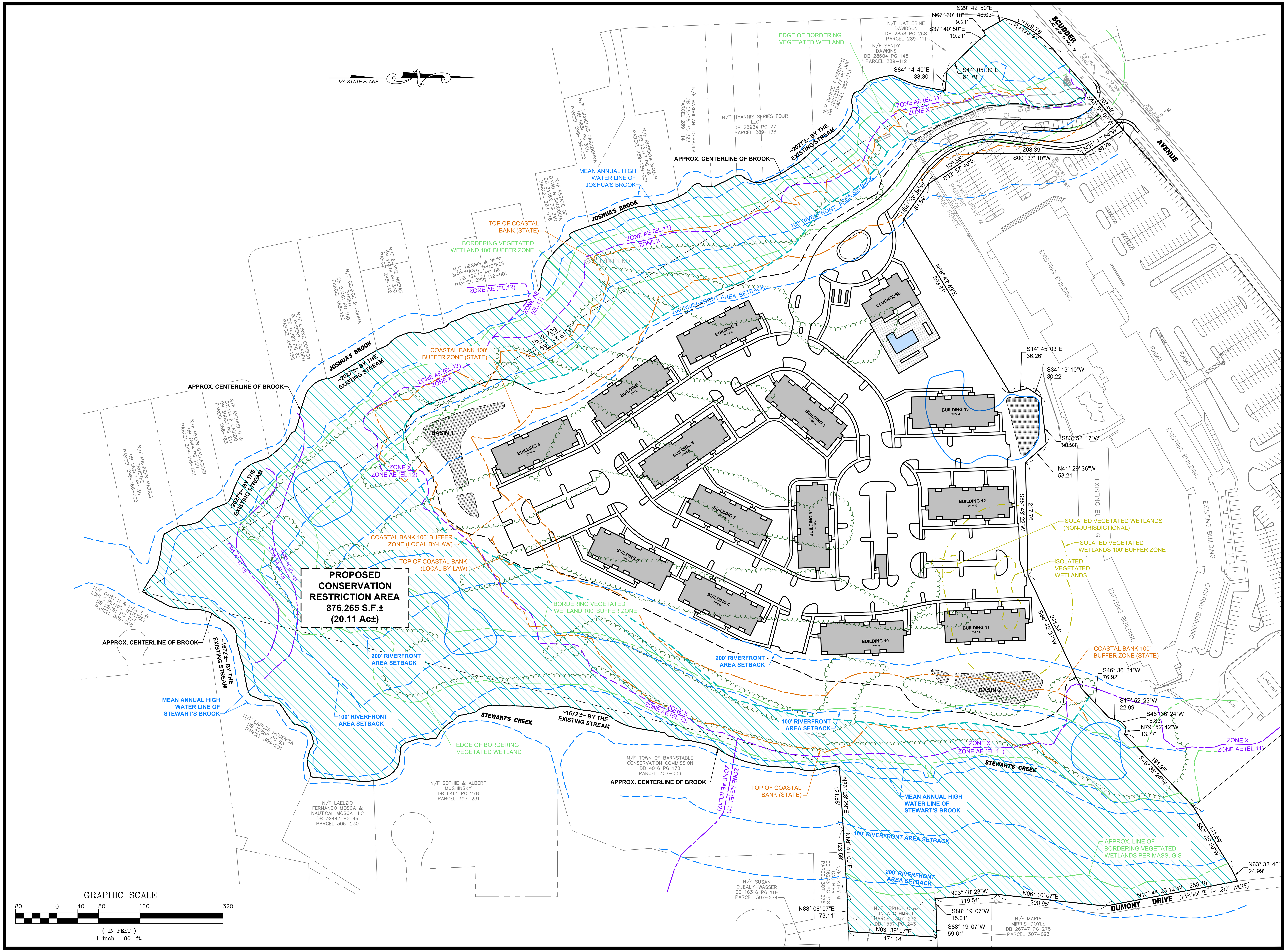
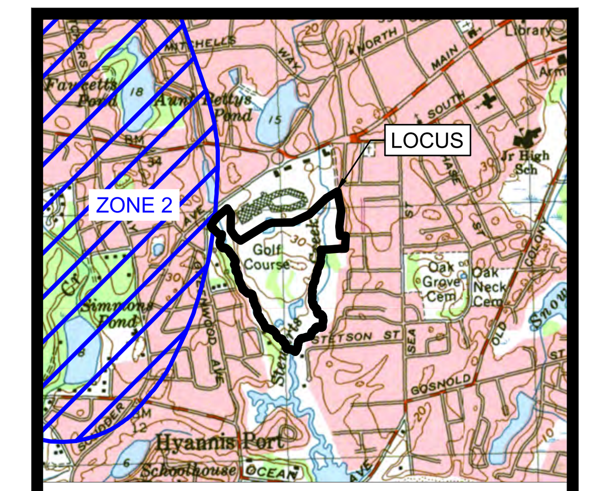
JOB NO: 5061

SHEET 14 OF 17





LOCUS MAP
SCALE 1" = 2000'

EDWARD L. PESCE CIVIL NO. 32001 REGISTERED PROFESSIONAL ENGINEER

23 SEP 2022

EDWARD L. PESCE, P.E. DATE

THE PROPOSED EMBLEM AT HYANNIS RESIDENCES

AT

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IN

HYANNIS, MASSACHUSETTS

(BARNSTABLE COUNTY)

CONCEPTUAL CONSERVATION RESTRICTION PLAN

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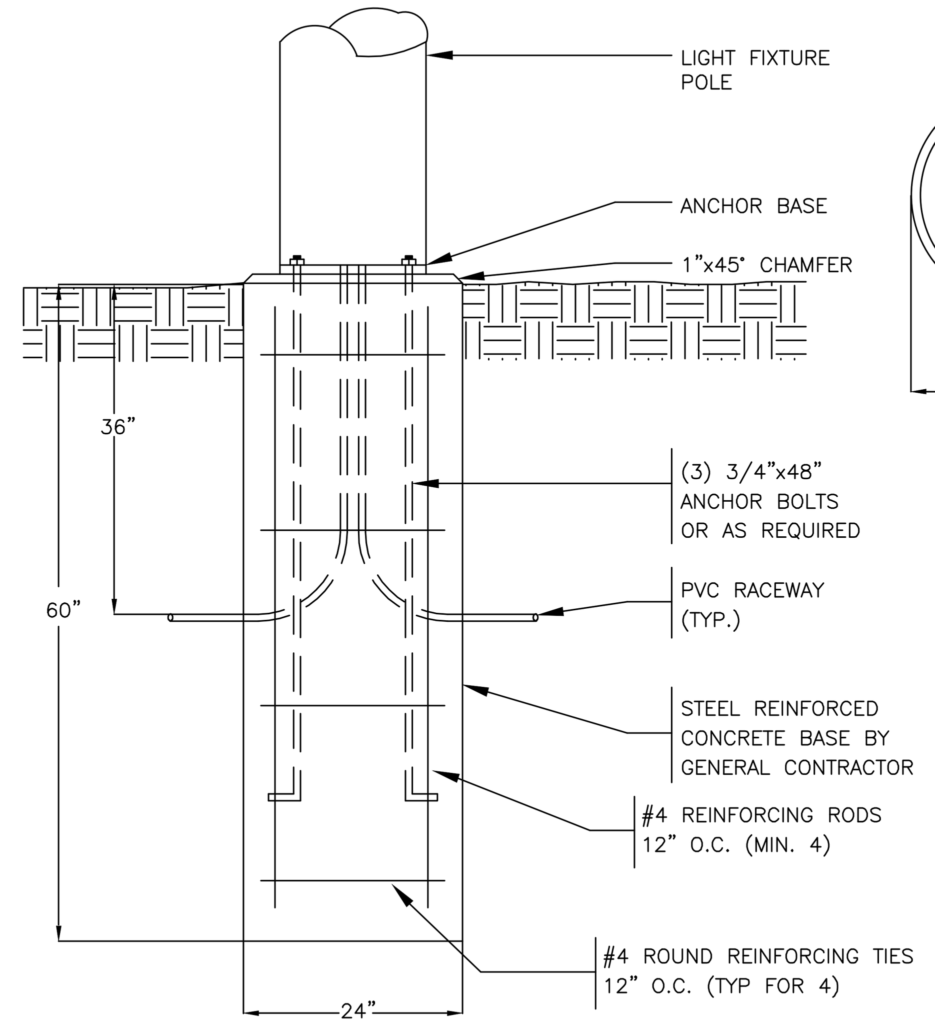
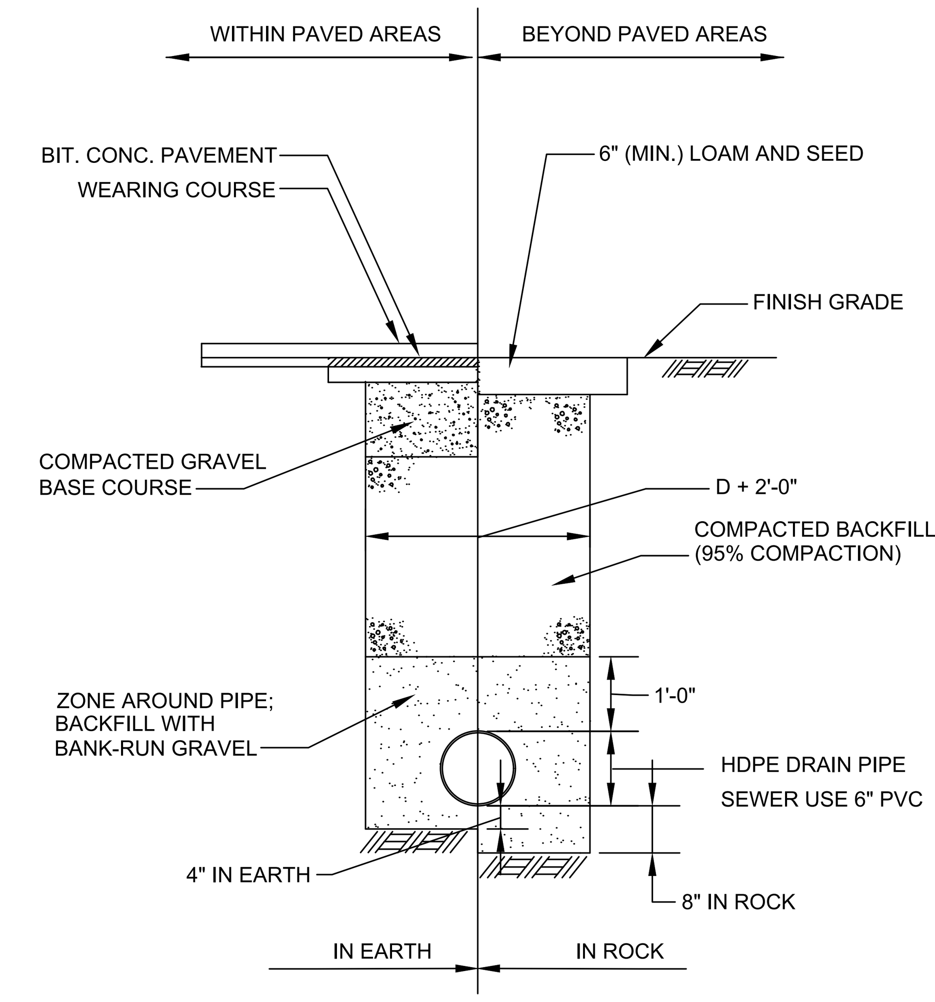
SHEET 15 OF 17



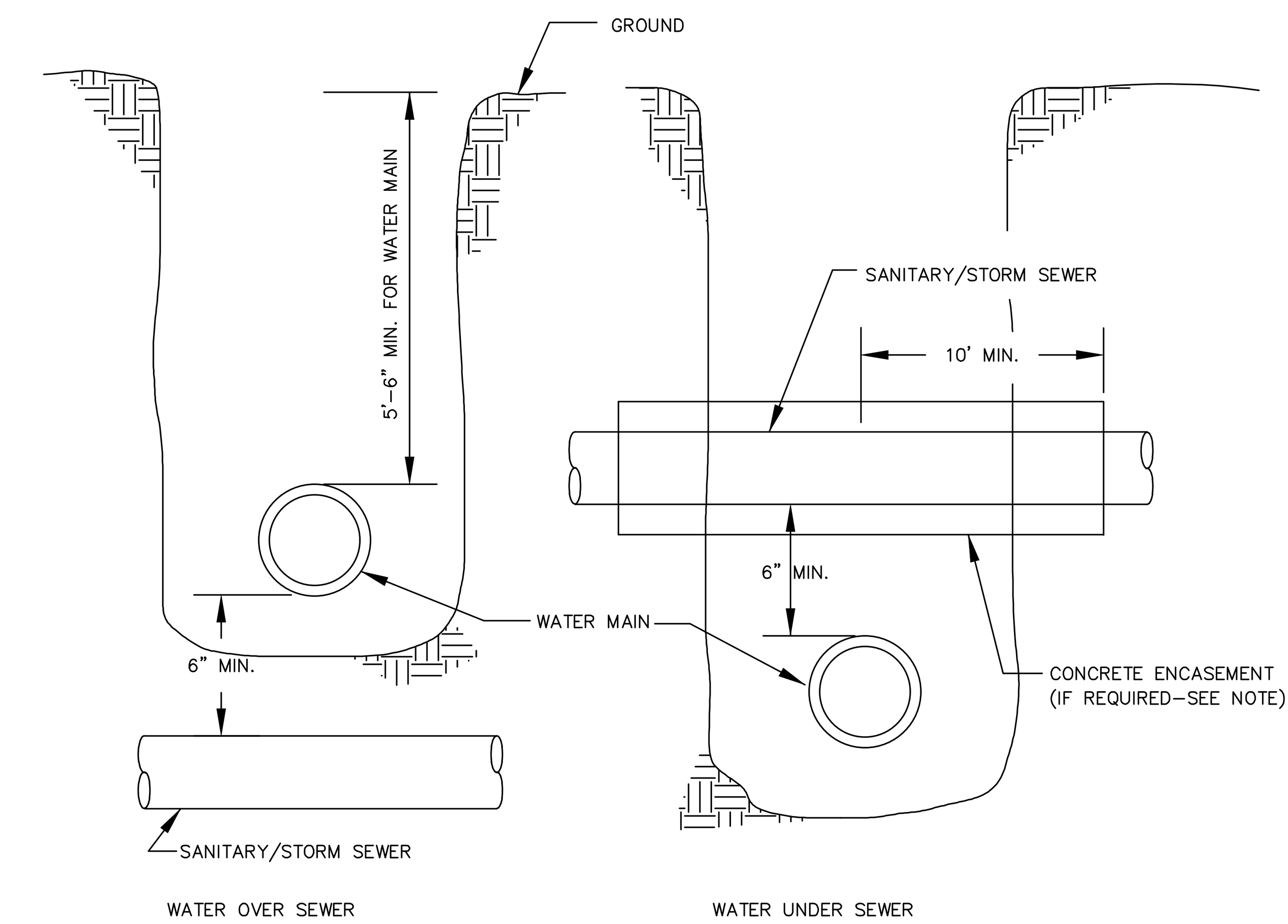
LIGHT POLE BASE DETAIL (TO PROVIDE A 15-FT MOUNTING HEIGHT)

SCALE: N.T.S.



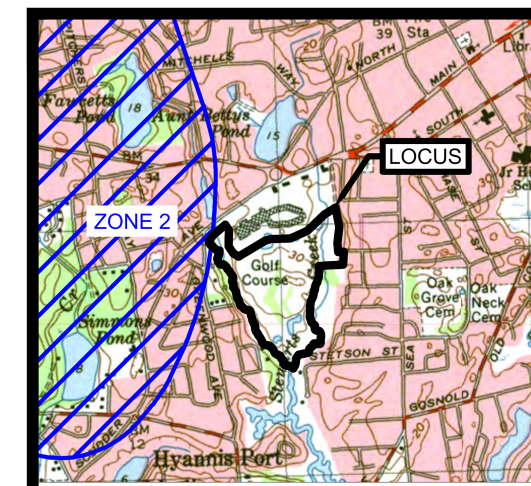
TRENCH DETAIL

NOT TO SCALE

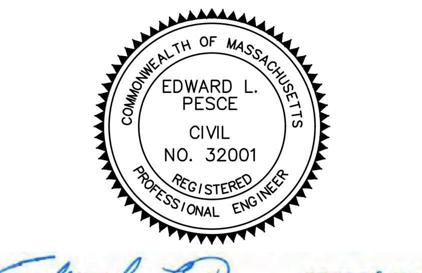


TYPICAL TRENCH SECTIONS WATER-SEWER CROSSING

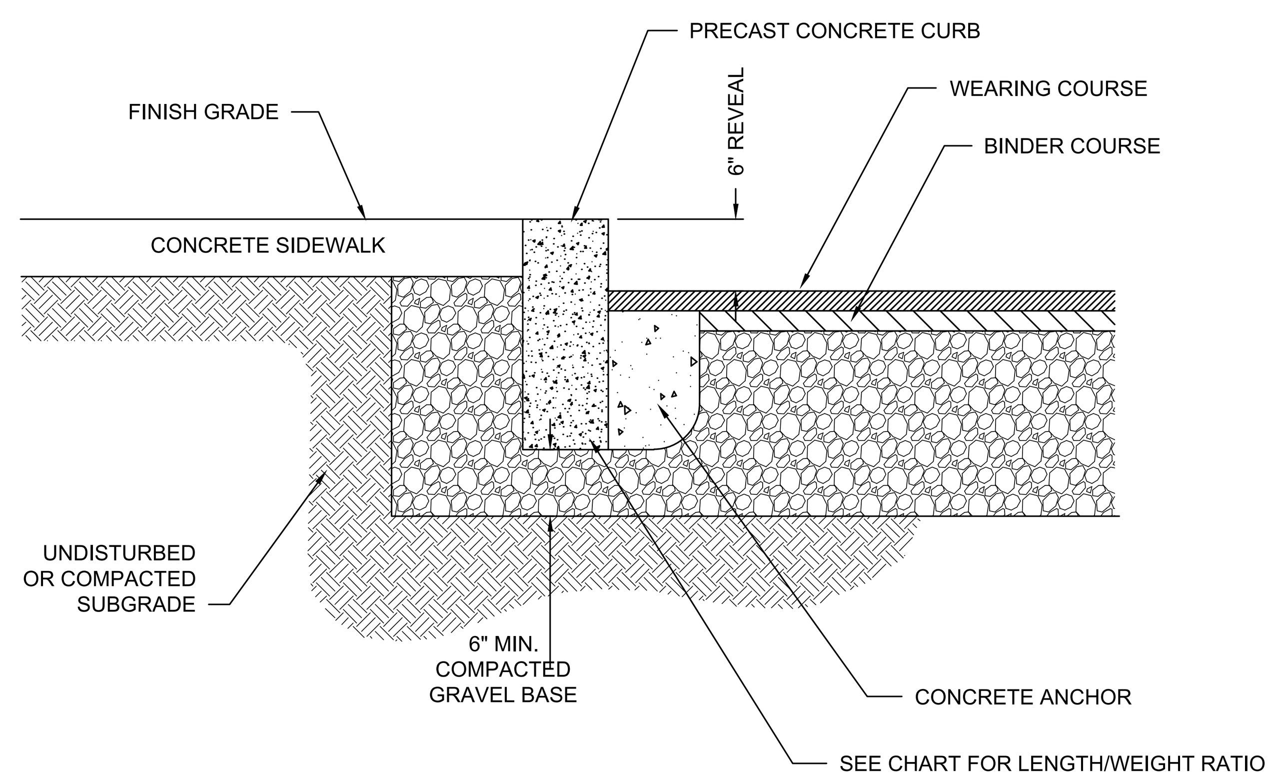
NOT TO SCALE



LOCUS MAP
SCALE 1" = 2000'



Edward L. Pesce 23 SEP 2022
EDWARD L. PESCE, P.E. DATE



DATA CHARTS

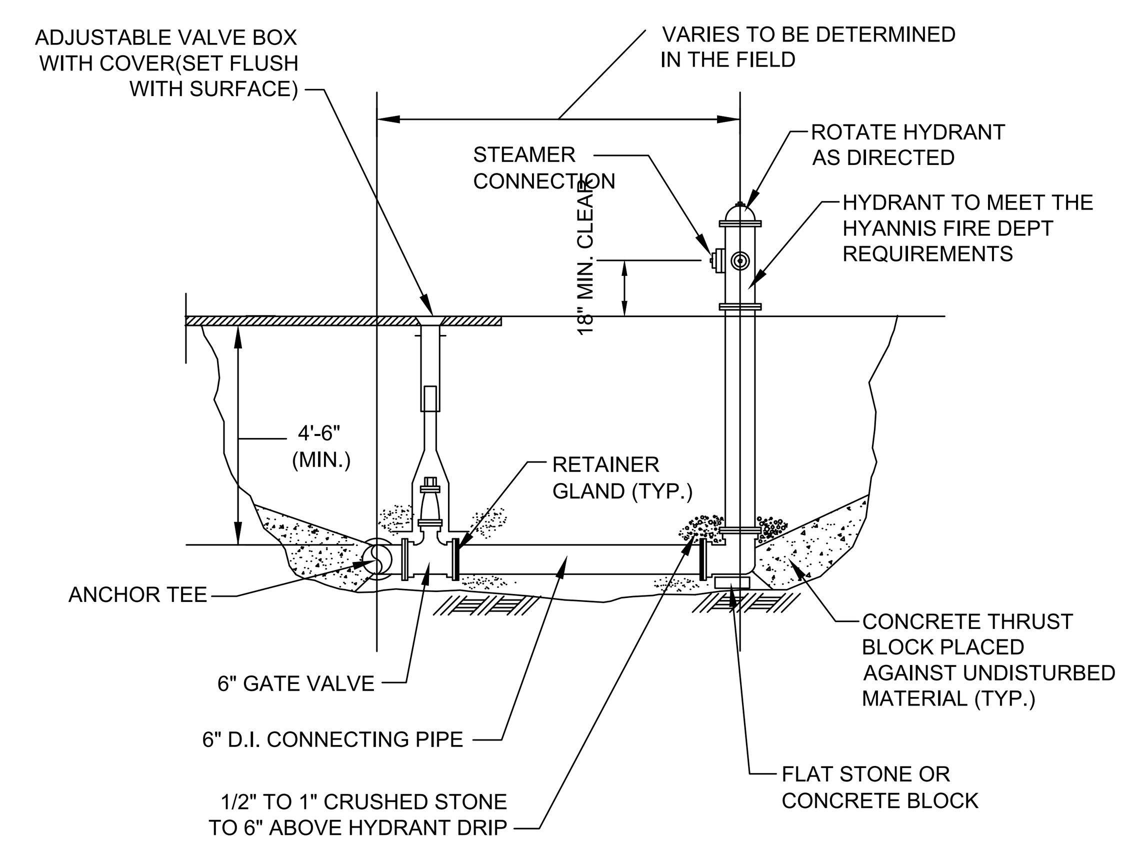
LENGTH	APPROX. WEIGHT
3'-0"	365 LBS
4'-0"	487 LBS
5'-0"	609 LBS
6'-0"	731 LBS

DESIGN DATA & GENERAL NOTES

(1) CONCRETE STRENGTH F'C 4,000 PSI @ 28 DAYS. DENSITY 150 PCF.
(2) CEMENT, PORTLAND TYPE I OR III PER ASTM C150-81.
(3) ADMIXTURES, OIR & PLASTICIZERS PER ASTM C233-82.
(4) AIR ENTRAINMENT 5%-7%

PRECAST CONCRETE CURB

NOT TO SCALE



NOTE: DEPTH OF HYDRANT BURY TO SUIT INSTALLED DEPTH OF COVER OVER WATERMAIN.

HYDRANT ASSEMBLY DETAIL

NOT TO SCALE

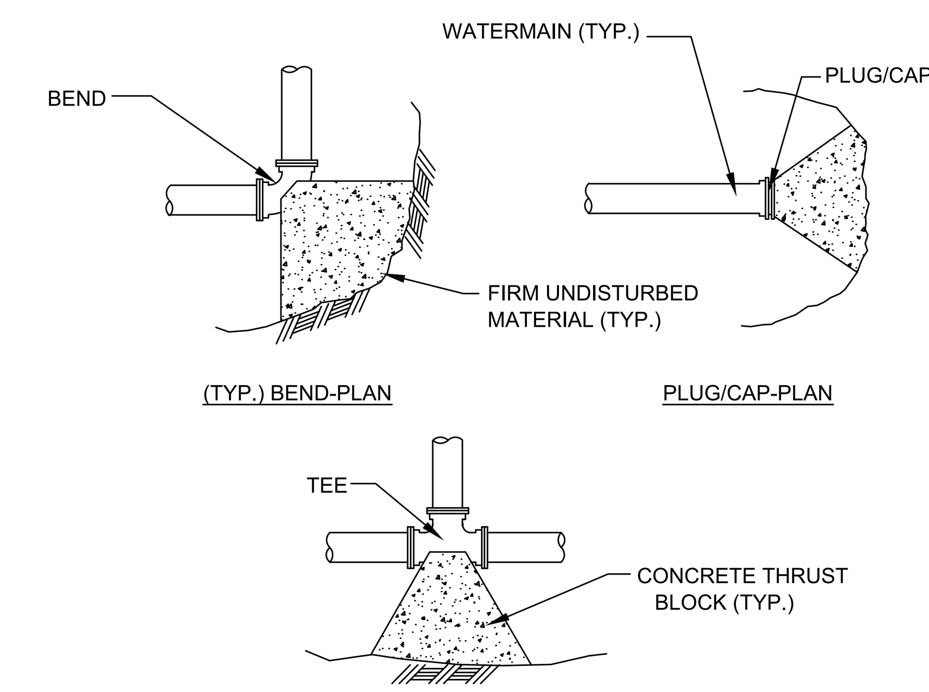


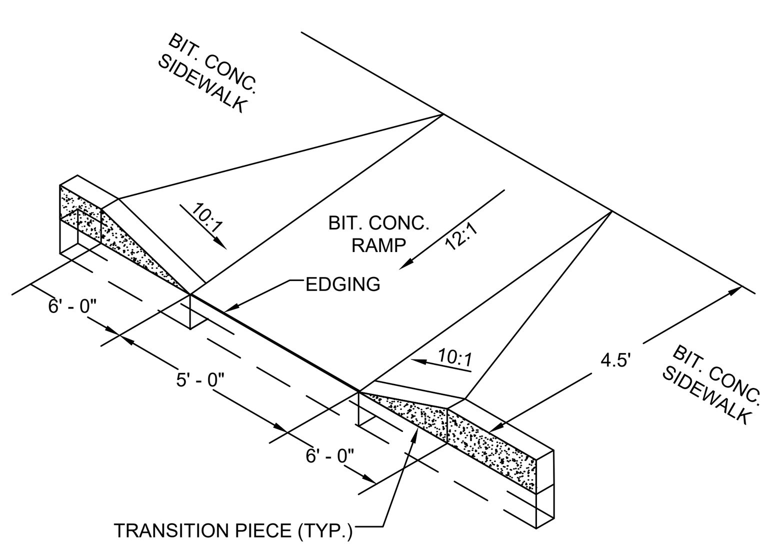
TABLE OF BEARING AREAS (S.F.)

SIZE OF MAIN (IN.)	BEND (90)	BENDS (45&UNDER)	TEES,CAPS OR PLUGS
8 & UNDER	6	3	4
10 & 12	12	6	9

NOTES:
1. CONCRETE FOR THRUST BLOCKS SHALL HAVE MINIMUM COMPRESSIVE STRENGTH OF 2000 PSI AT 28 DAYS.
2. THRUST BLOCK BEARING AREAS TOO BE IN ACCORDANCE WITH TABLE, UNLESS DETERMINED OTHERWISE BY THE ENGINEER BECAUSE OF SOIL CONDITIONS.
3. THRUST BLOCK SIDES SHALL BE FORMED WITH PLYWOOD.

THRUST BLOCK DETAIL

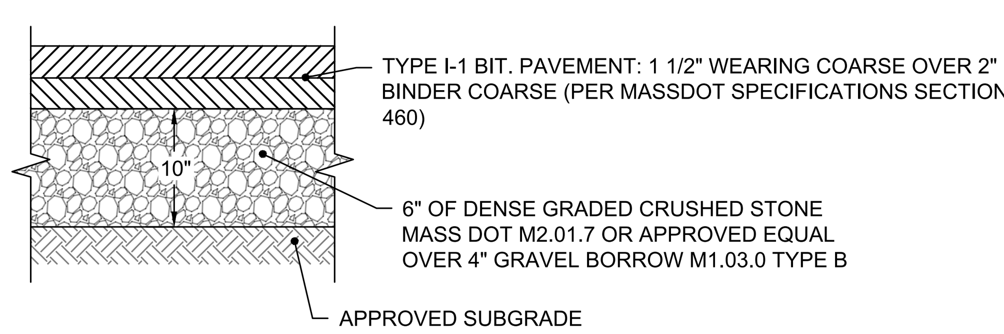
NOT TO SCALE



NOTE: ALL RAMPS SHALL BE CONSTRUCTED IN ACCORDANCE WITH ADA / MASS. AAB REGULATIONS.

HANDICAPPED RAMP

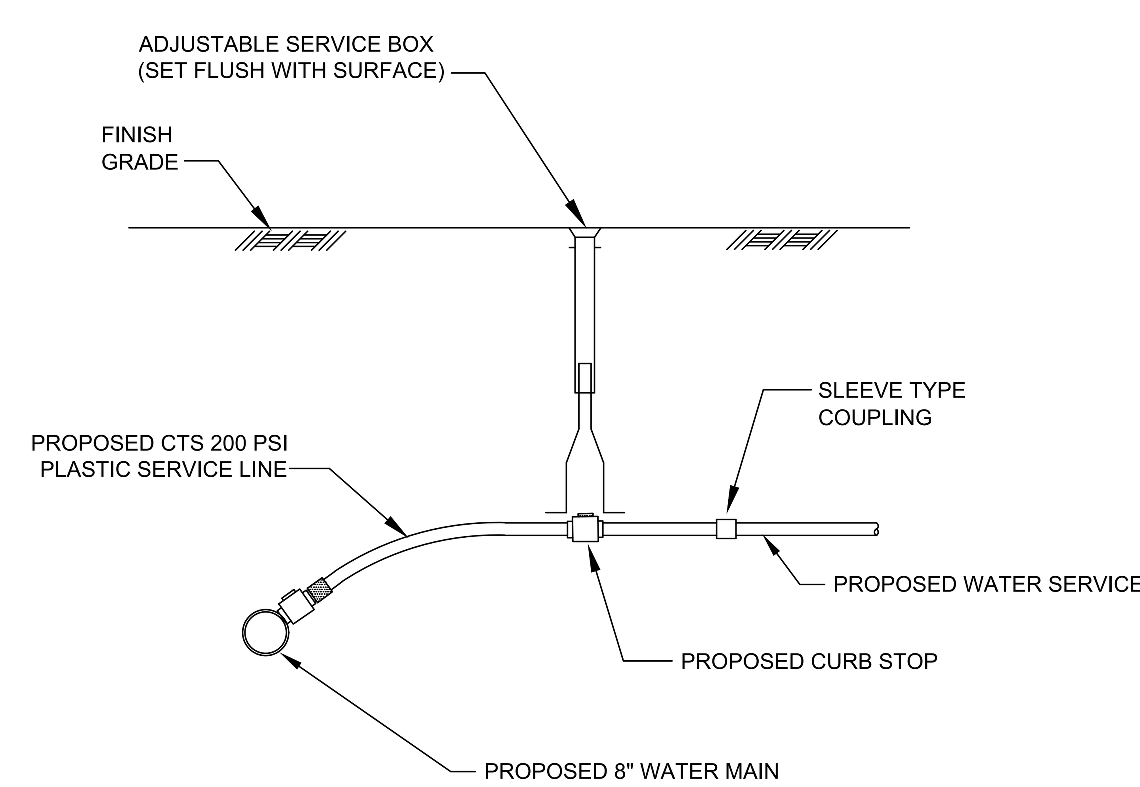
NOT TO SCALE



PAVEMENT NOTES:
1. SUBGRADE MATERIAL SHALL CONSISTS OF INERT MATERIAL THAT IS HARD, DURABLE STONE AND/OR COARSE SAND, FREE FROM LOAM AND CLAY TO A DEPTH NOT LESS THAN 4-FT BELOW FINISHED GRADE ELEVATION. ALL UNSUITABLE MATERIAL SHALL BE EXCAVATED AND REMOVED PRIOR TO SUBGRADE INSTALLATION.
2. SUBGRADE SHALL BE PLACED IN MAXIMUM 8" LIFTS (COMPACTED TO 95%)
3. REFER TO SITE PLAN FOR EXTENTS OF BIT. PAVEMENT.
4. THE INSTALLED BINDER COARSE SHALL BE SWEPT CLEAN PRIOR TO THE INSTALLATION OF THE WEARING COARSE BY A MECHANICAL SWEEPER.

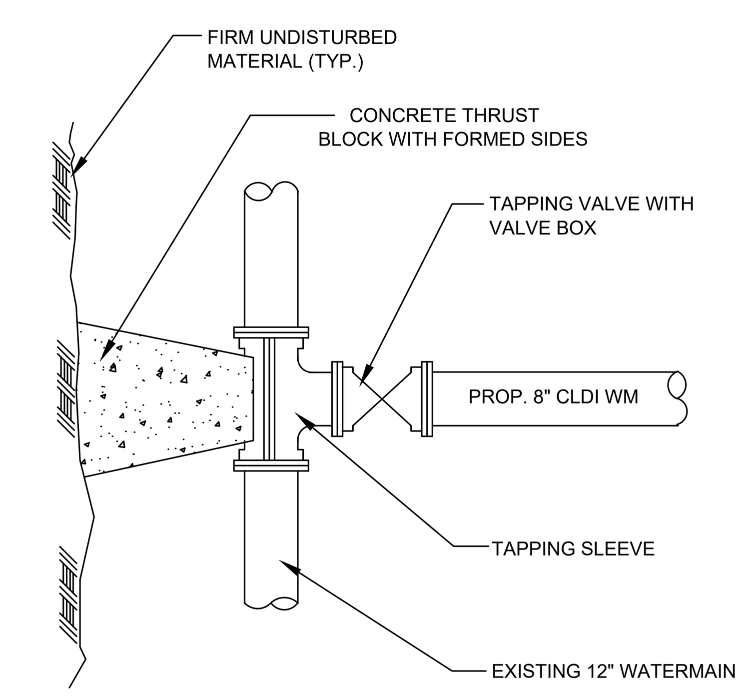
TYPICAL PAVEMENT SECTION

NOT TO SCALE



WATER SERVICE CONNECTION

NOT TO SCALE



NOTE: CONTRACTOR TO VERIFY OUTSIDE DIAMETER OF EXISTING MAIN.

TAPPING SLEEVE & VALVE DETAIL

NOT TO SCALE

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(BARNSTABLE COUNTY)

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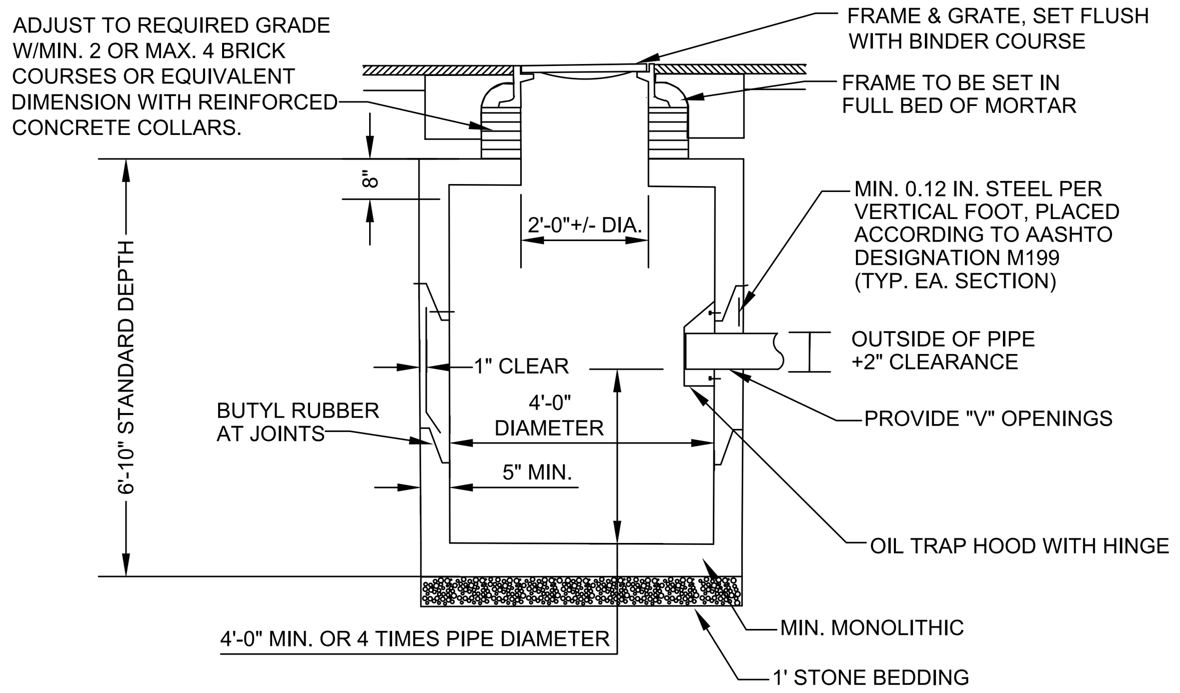
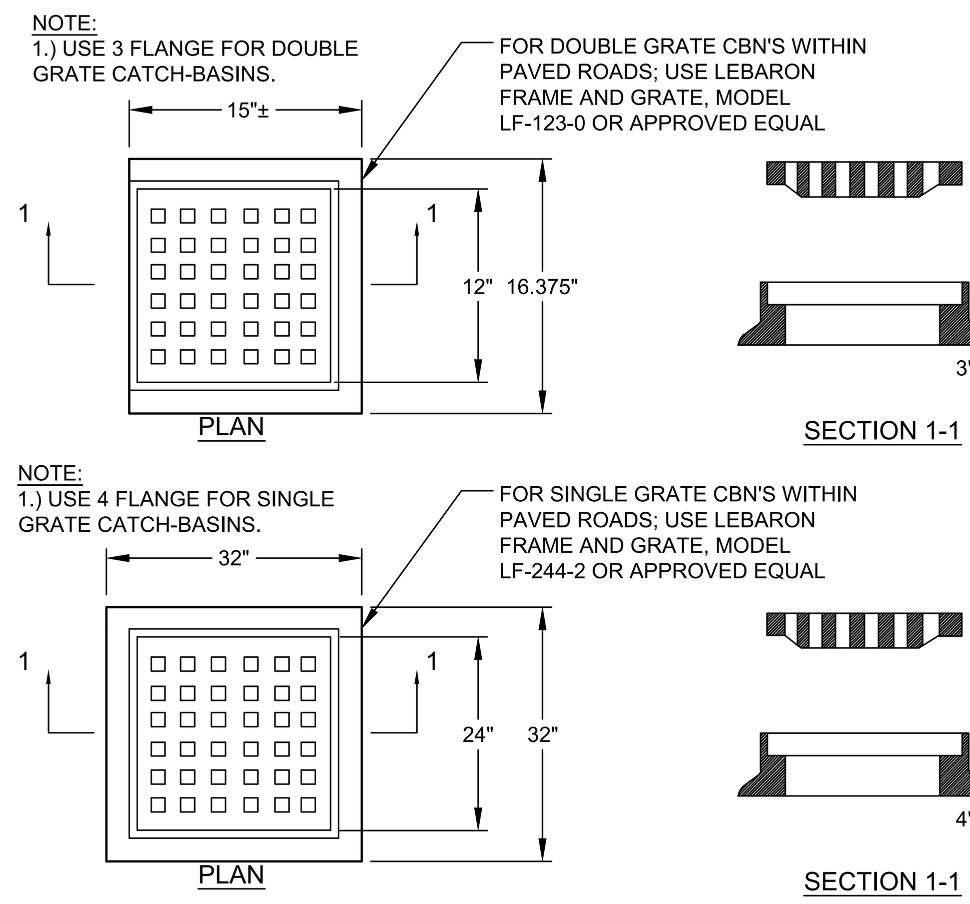
SHEET 16 OF 17



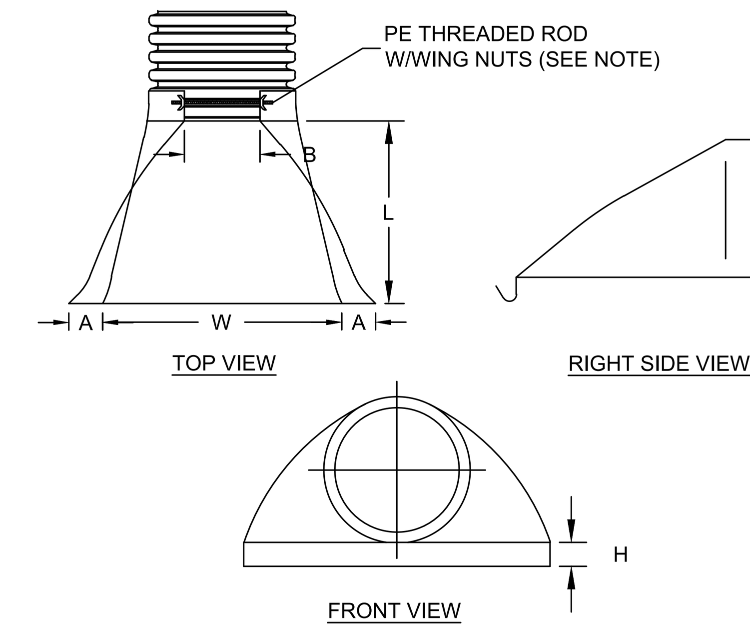
PRECAST CONCRETE CATCH BASIN (H-20)

NOT TO SCALE



CATCH BASIN FRAME & GRATE (H-20)

NOT TO SCALE

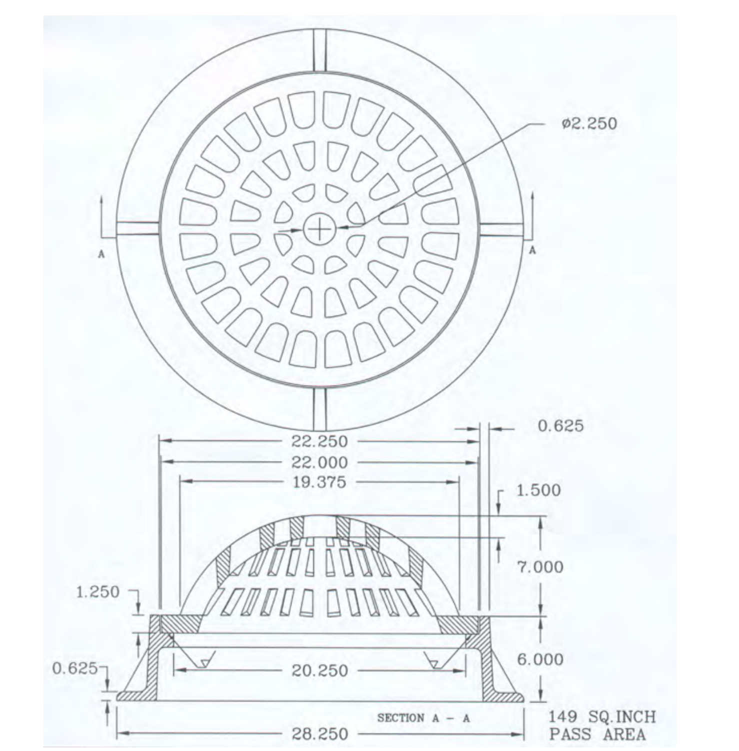


PART	PIPE SIZE	A	B (MAX)	H	L	W
1210-NP	12" 300 mm	6.5" 165 mm	10" 254 mm	6.5" 165 mm	25" 635 mm	29" 735 mm
1210-NP	15" 375 mm	6.5" 165 mm	10" 254 mm	6.5" 165 mm	25" 635 mm	29" 735 mm
1810-NP	18" 450 mm	7.5" 190 mm	15" 380 mm	6.5" 165 mm	32" 812 mm	35" 890 mm
2410-NP	24" 600 mm	7.5" 190 mm	18" 450 mm	6.5" 165 mm	36" 900 mm	45" 1140 mm
3012-NP	30" 750 mm	10.5" 266 mm	N/A	7.0" 178 mm	53" 1345 mm	68" 1725 mm
3612-NP	36" 900 mm	10.5" 266 mm	N/A	7.0" 178 mm	53" 1345 mm	68" 1725 mm

NOTE: PE THREADED ROD W/WING NUTS PROVIDED FOR END SECTIONS 12"-24". 30" & 36" END SECTIONS TO BE WELDED TO PIPE PER MANUFACTURER'S RECOMMENDATIONS.

ADS FLARED END SECTION

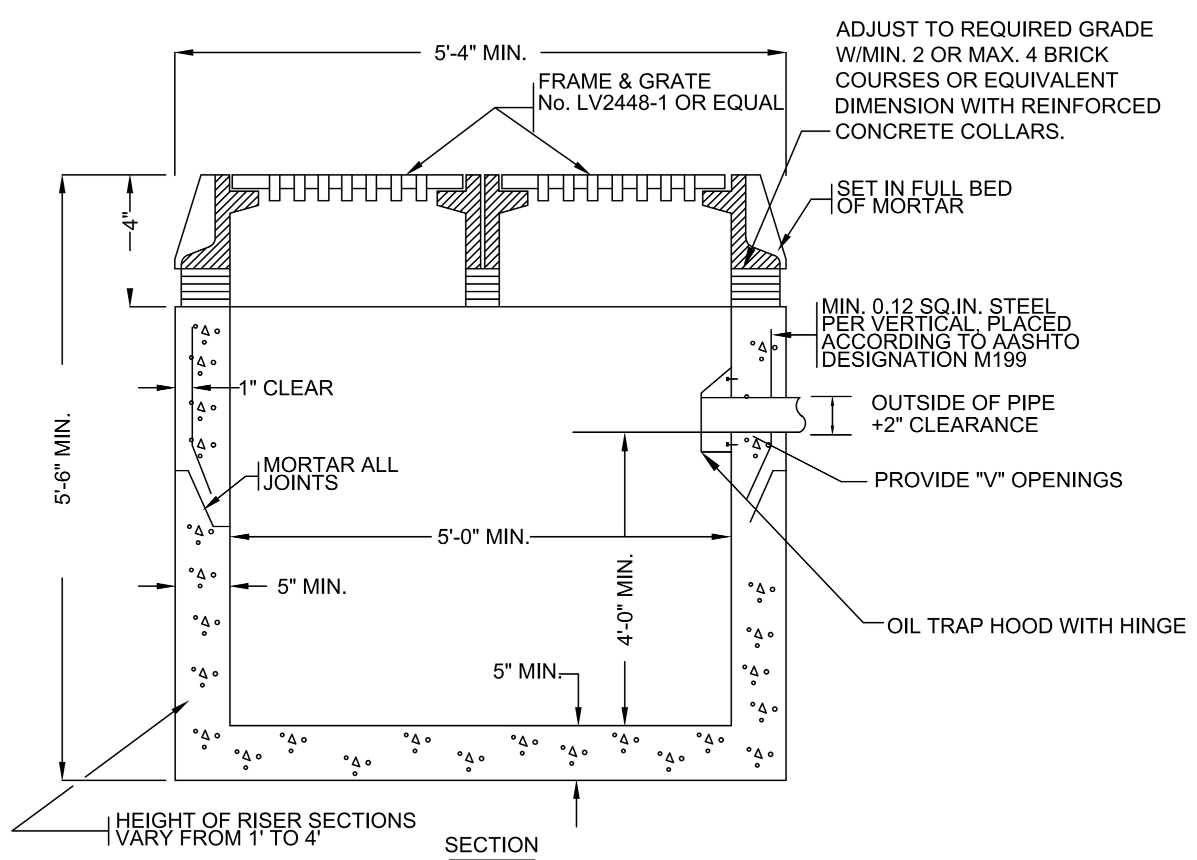
NOT TO SCALE



BEEHIVE INLET GRATE DETAIL

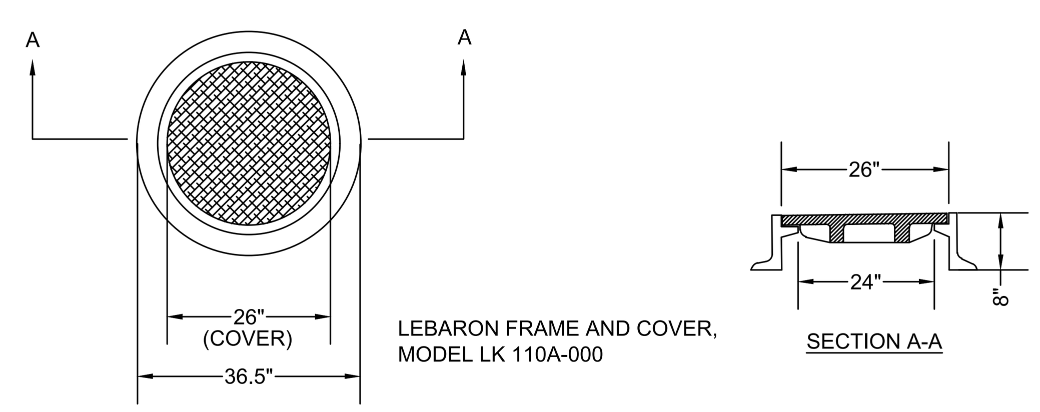
(NEENAH FOUNDRY CAST IRON FRAME & COVER)
(CATALOG NUMBER R-2561-A OR APPROVED EQUAL)

NOT TO SCALE



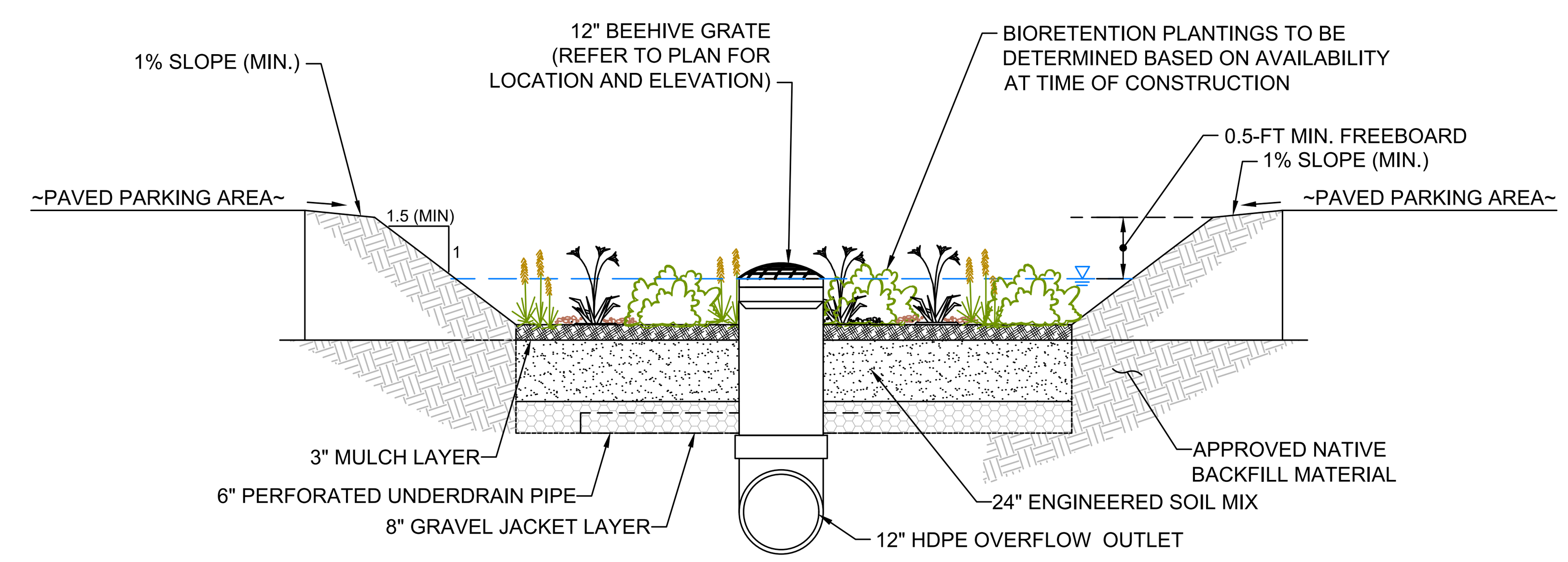
STANDARD CATCH BASIN W/ DOUBLE FRAME & GRATE

NOT TO SCALE



STANDARD MANHOLE FRAME & COVER(H-20)

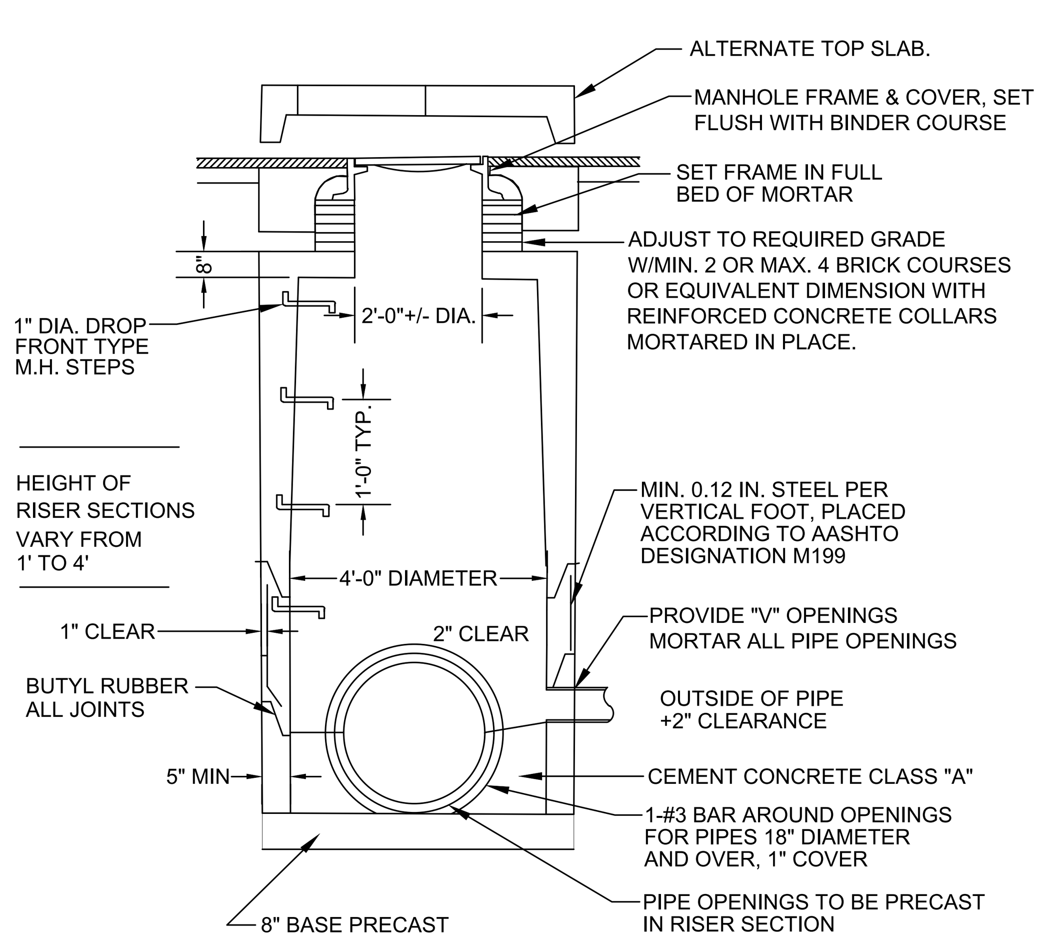
NOT TO SCALE



BIORETENTION SWALE

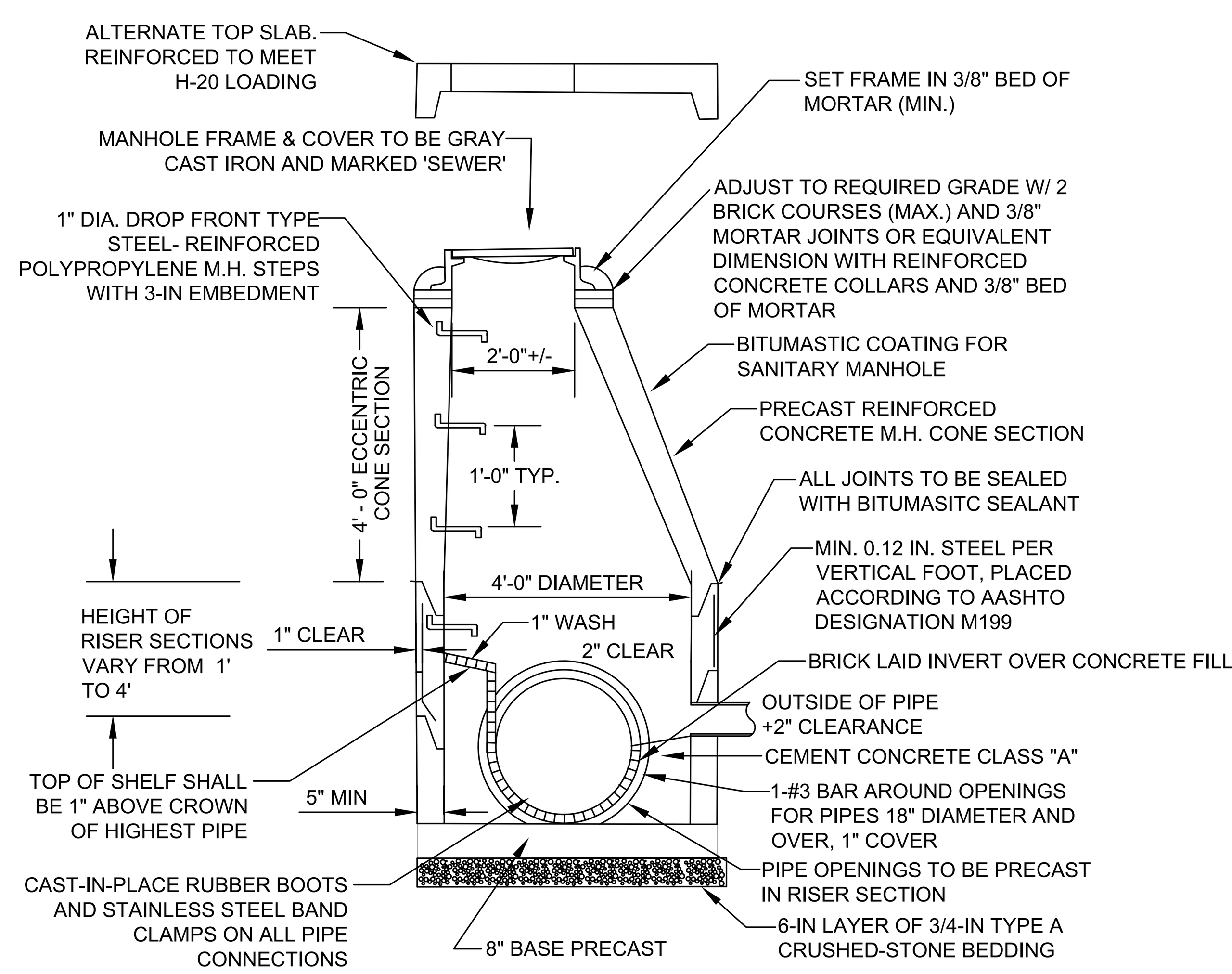
NOT TO SCALE

BIORETENTION NOTES:
1. USE THE ENGINEERED SOIL MIX BELOW. (ENGINEERED SOIL MIX FOR BIORETENTION SYSTEMS) DESIGNED TO EXFILTRATE; THE SOIL MIX FOR BIORETENTION AREAS SHOULD BE A MIXTURE OF 40 % SAND, 20-30% TOPSOIL, AND 30-40% COMPOST.
2. THE SOIL MIX MUST BE UNIFORM, FREE OF STONES, STUMPS, ROOTS OR SIMILAR OBJECTS LARGER THAN 2 INCHES. CLAY CONTENT SHOULD NOT EXCEED 5%.
3. SOIL PH SHOULD GENERALLY BE BETWEEN 5.5-6.5.
4. USE SOILS WITH 1.5% TO 3% ORGANIC CONTENT AND MAXIMUM 500-PPM SOLUBLE SALTS.
5. THE SAND COMPONENT SHOULD BE GRAVELLY SAND THAT MEETS ASTM D 422.
6. THE TOPSOIL COMPONENT SHALL BE A SANDY LOAM, LOAMY SAND OR LOAM TEXTURE.
7. THE COMPOST COMPONENT MUST BE PROCESSED FROM YARD WASTE IN ACCORDANCE WITH MASSDEP GUIDELINES. THE COMPOST SHALL NOT CONTAIN BIOSOLIDS.
8. THE PLANTING PLAN SHALL INCLUDE A MIX OF HERBACEOUS PERENNIALS, SHRUBS, AND (IF CONDITIONS PERMIT) UNDERSTORY TREES THAT CAN TOLERATE INTERMITTENT PONDING, OCCASIONAL SALINE CONDITIONS DUE TO ROAD SALT, AND EXTENDED DRY PERIODS.



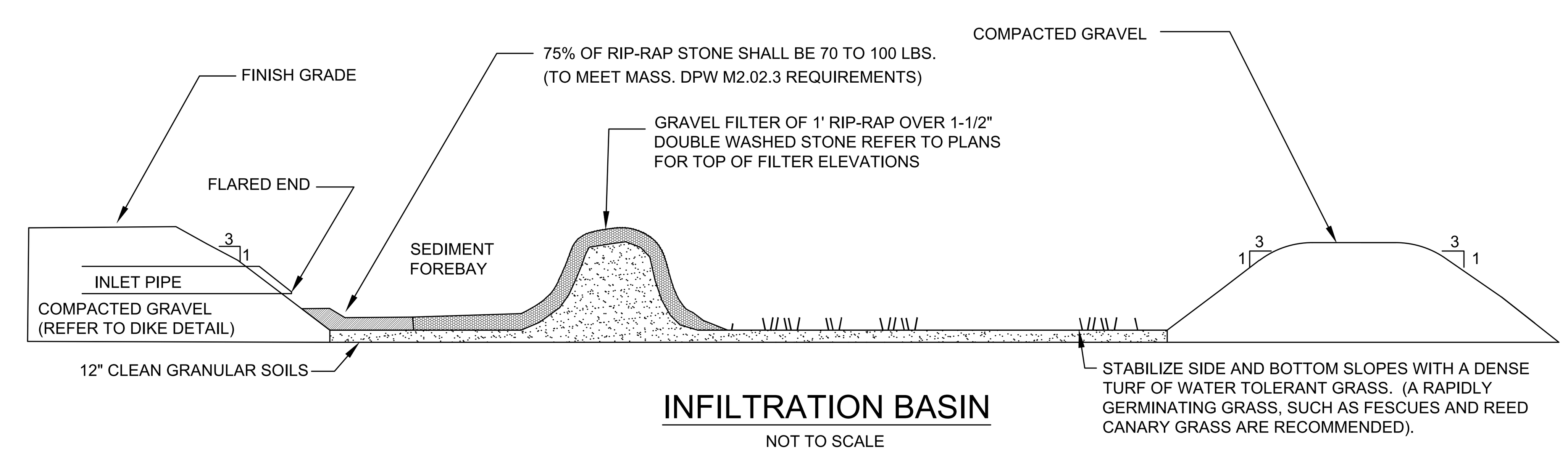
PRECAST DRAIN MANHOLE(H-20)

NOT TO SCALE



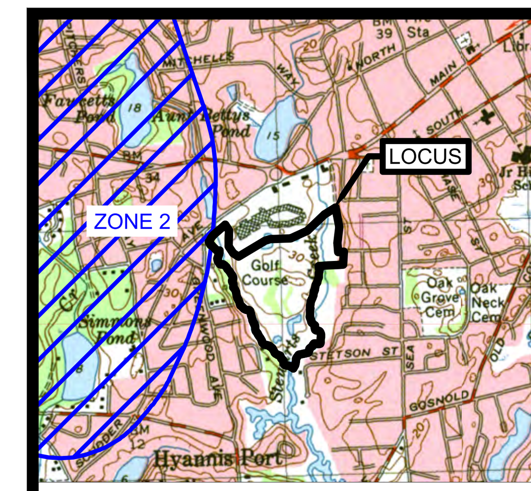
PRECAST SEWER MANHOLE (H-20)

NOT TO SCALE

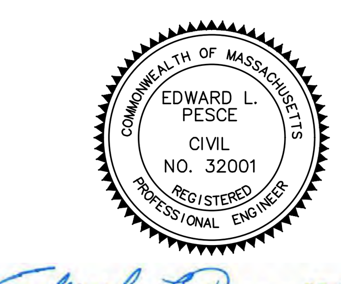


INFILTRATION BASIN

NOT TO SCALE



LOCUS MAP
SCALE 1" = 2000'



Edward L. Pesce 23 SEP 2022

EDWARD L. PESCE, P.E. DATE

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DRAWN: BJW
CHECK: ELP
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SHEET 17 OF 17

Vanasse & Associates inc

Figure 1

Scudder Avenue / West End Rotary / Main Street Safety and Mobility Improvements (Sheet 1 of 3)

Figure 1

Scudder Avenue / West End Rotary / Main Street Safety and Mobility Improvements (Sheet 2 of 3)

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Figure 1

Scudder Avenue / West End Rotary / Main Street Safety and Mobility Improvements (Sheet 3 of 3)

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Figure 1

Potential Cross Connections to Reduce Curb-Cuts

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Emblem-Hyannis Restoration Plan
Barnstable, Massachusetts

December 8, 2022

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Emblem-Hyannis Restoration Plan
Barnstable, Massachusetts

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Emblem-Hyannis Restoration Plan
Barnstable, Massachusetts

1.0 Introduction

The Emblem-Hyannis Restoration Plan provides an outline of work proposed for the restoration of approximately 9.8 acres of land that is presently an active golf course (see Figure 1) as mitigation for the redevelopment of the site. These 9.84 acres will be part of the 20.11 acre open space area that will be protected under a Conservation Restriction (see Figure 2). The restoration area is located between the main tree line which parallels both Joshua's Brook and Stewart's Creek and the limit of the proposed development. The remainder of the CR is vegetated with forested areas, wetlands, and waterways. The revised site plan which clusters development away from the wetlands is shown in Figure 3.

Approximately 9.84 acres of previously disturbed golf course areas will be restored by either allowing for natural revegetation or the planting native species of trees, shrubs, and groundcover to help restore these areas, improve the vegetated buffers, and allow for a more natural appearance and environment. Planting of native species of trees and shrubs along the new community's perimeter in the areas of the existing golf course (which represents degraded habitat), will improve the vegetated buffer and habitat for wildlife, and allow these areas to return to a more natural state. The plantings described in this plan do not include the landscaping proposed for the development.

This plan will be implemented by licensed landscape professionals who have experience in large-scale restoration projects.

The following are goals and objectives of the Restoration Plan:

- Restore managed turf areas with native plantings
- Create a more natural appearing environment
- Enhance buffers between existing natural areas and areas to be developed
- Increase habitat diversity
- Create passive recreation opportunities through development of trail systems
- Develop educational signage program
- Create restored areas that are able to self-maintain without any interventions to allow for natural revegetation

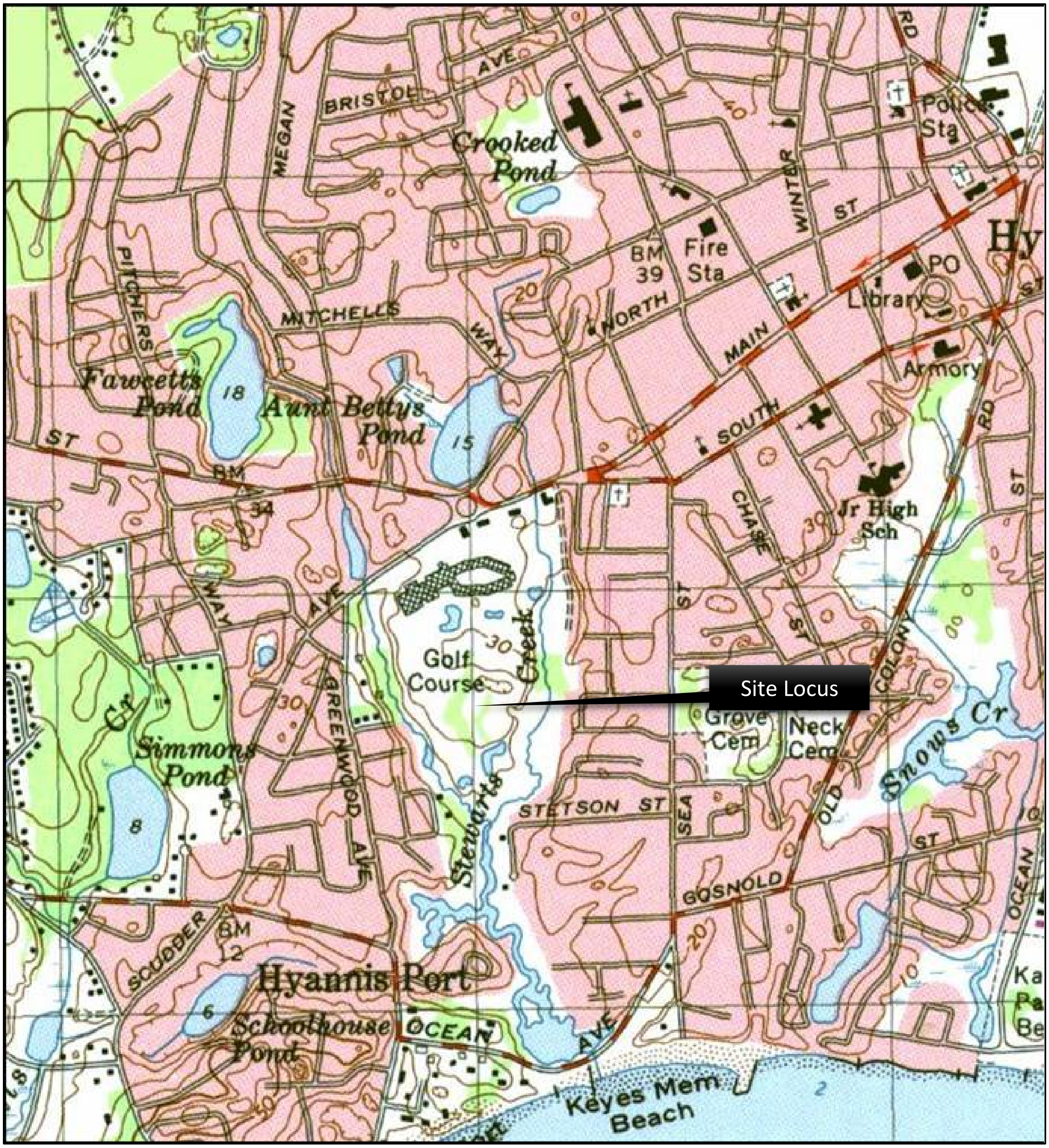


Figure 1: USGS Locus Map

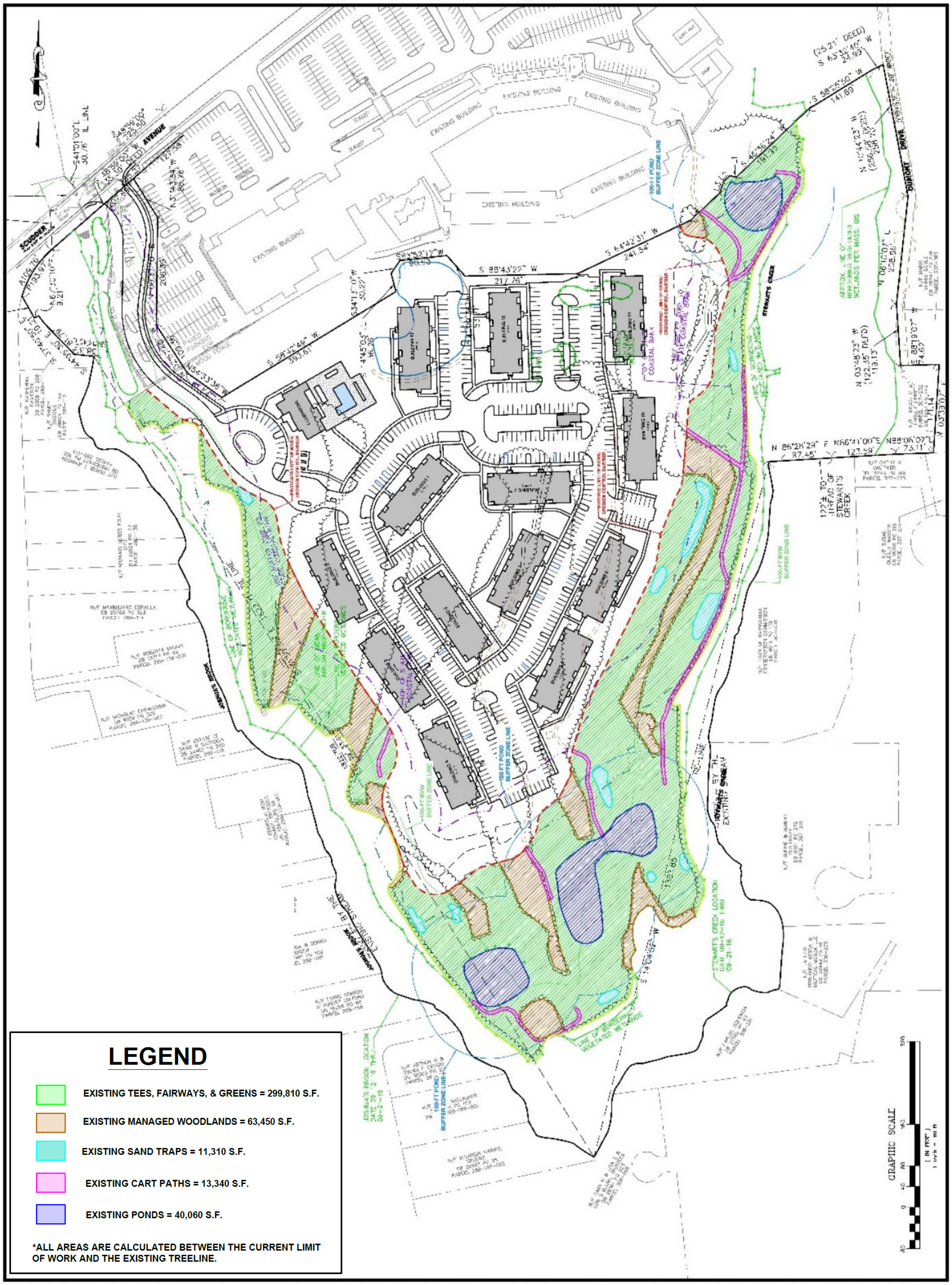


Figure 2: Restoration Area

Figure 3: Revised Layout over Aerial Photo

2.0 Existing Conditions

The topography of the Site is relatively flat (from clearing activities to build the golf course), with some small hills, ranging in surface elevation from approximately 35 feet in elevation above mean sea level (MSL) at the high point near the center, to approximately to 5 feet in elevation along the southeastern side near Stewart's Creek. There are moderate to steep-sided slopes between the uplands and wetlands adjacent to the two perennial streams. The southern tip of the Site is approximately 2,100 feet north of the mean high water line at Hyannis Harbor. The wetlands at the Site are freshwater transitioning to a more estuarine (i.e., salt water) habitat to the south of the Site and are likely freshwater wetlands that are tidally influenced. This section describes the upland and transitional wetland habitats observed at the site which will be used to help guide the type of restoration to be designed. Photographs of existing conditions are provided in Appendix A. A general vegetation cover type map is provided as Figure 4.

Native and non-native invasive vegetation is present on the site. Native species identified are provided in Table 1 and invasive species are provided in Table 2. These lists are not intended to catalog every species at the site but to document the most common species in addition to providing a summary of what habitat those plants are commonly found.

2.1 Uplands

The majority of the Site is a golf course that includes all of the highly managed play areas and landscape features, both vegetated and unvegetated, that typically occur at a golf course including tee boxes, fairways, greens, and roughs (all of which are frequently mowed and irrigated), also sand traps, paved and unpaved cart paths, water features (or "hazards"), and small service structures. In addition to the highly managed play areas, upland cover types include managed woodland "in course" and pitch pine-mixed oak woodland as described below. The restoration involves areas that are presently managed turf, sand traps, and buffer areas between managed areas and natural areas.

- **Managed Woodland "in-course":** Open woodland areas are managed within the golf course that serve as boundaries between many of the numbered fairways. These woodland areas are of various widths and consist primarily of mature hardwood trees with lesser amounts of coniferous trees. Scarlet oak (*Quercus coccinea*) is the predominant hardwood species and pitch pine (*Pinus rigida*) is the predominant coniferous species. Other than mowed grass, a woody understory within these woodland areas is absent.

- **Pitch Pine-Mixed Oak Woodland:** The only unmanaged upland cover type at the golf course is the pitch pine-mixed oak woodland, which comprises only relatively small and narrow portions of the Site. This cover type of comprised of mature, second-growth oak with scattered pines. This cover type is located between the wetlands along Joshua's Brook and the west margin of the golf course and between the wetlands along Stewart's Creek and the east margin of the course. This cover type has a canopy of pitch pine and tree oaks such as black oak (*Quercus velutina*), scarlet oak, chestnut oak (*Q. prinus*), and white oak (*Q. alba*), with blueberries (*Vaccinium angustifolium* and *V. pallidum*), black huckleberry (*Gaylussacia baccata*), and other ericaceous shrubs forming an often continuous low shrub layer.

Table 2-1: Native Vegetation Species Observed on the Site

Common Name	*Scientific Name*	Habitat	Layer
Wild sarsaparilla	*Aralia nudicaulis*	Upland	Herbaceous
Pennsylvania sedge	*Carex pensylvanica*	Upland	Herbaceous
Pink lady's slipper	*Cypripedium acaule*	Upland	Herbaceous
Wintergreen	*Gaultheria procumbens*	Upland	Herbaceous
Spotted touch-me-not	*Impatiens capensis*	Wetland	Herbaceous
Cinnamon fern	*Osmunda cinnamomea*	Wetland	Herbaceous
Royal fern	*Osmunda regalis*	Wetland	Herbaceous
Common reed	*Phragmites australis*	Wetland/Transitional	Herbaceous
Bracken fern	*Pteridium aquilinum*	Upland	Herbaceous
Skunk cabbage	*Symplocarpus foetidus*	Wetland	Herbaceous
Coastal sweet pepperbush	*Clethra alnifolia*	Wetland/Transitional	Shrub
Silky dogwood	*Cornus amomum*	Wetland	Shrub
Black huckleberry	*Gaylussacia baccata*	Wetland/Transitional	Shrub
Hightide bush	*Iva frutescens*	Wetland/Coastal	Shrub
Spicebush	*Lindera benzoin*	Wetland/Transitional	Shrub
Sweet gale	*Myrica gale*	Wetland	Shrub
Swamp azalea	*Rhododendron viscosum*	Wetland	Shrub
Swamp rose	*Rosa palustris*	Wetland	Shrub
Virginia rose	*Rosa virginiana*	Transitional	Shrub
Elderberry	*Sambucus canadensis*	Wetland	Shrub
Lowbush blueberry	*Vaccinium angustifolium*	Upland	Shrub
Highbush blueberry	*Vaccinium corymbosum*	Wetland/Transitional	Shrub
Blue ridge blueberry	*Vaccinium pallidum*	Wetland/Transitional	Shrub
Northern arrowwood	*Viburnum dentatum*	Wetland/Transitional	Shrub
Red maple	*Acer rubrum*	Wetland/Transitional	Tree
Alder	*Alnus spp.*	Wetland	Tree
Black tupelo	*Nyssa sylvatica*	Wetland/Transitional	Tree
White pine	*Pinus strobus*	Upland	Tree
Pitch pine	*Pinus rigida*	Upland	Tree
White oak	*Quercus alba*	Upland	Tree
Scarlet oak	*Quercus coccinea*	Upland	Tree
Scrub oak	*Quercus ilicifolia*	Upland	Tree
Dwarf chestnut oak	*Quercus prinoides*	Upland	Tree
Chestnut oak	*Quercus prinus*	Upland	Tree
Black oak	*Quercus velutina*	Upland	Tree
Catbrier	*Smilax rotundifolia*	Transitional	Vine

Scattered patches of scrub oak (*Q. ilicifolia*) and bear oak (*Q. prinoides*) can be dense. Catbrier and other briers (*Smilax rotundifolia* and Smilax spp.) often make dense barriers around low, dense openings. The herb layer is generally sparse with bracken fern (*Pteridium aquilinum*), wild sarsaparilla (*Aralia nudicaulis*), wintergreen (*Gaultheria procumbens*), Pennsylvania sedge (*Carex pensylvanica*), and, less commonly, pink lady's slipper (*Cypripedium acaule*). Occasional white pine (*Pinus strobus*) and red maple (*Acer rubrum*) contribute to the canopy.

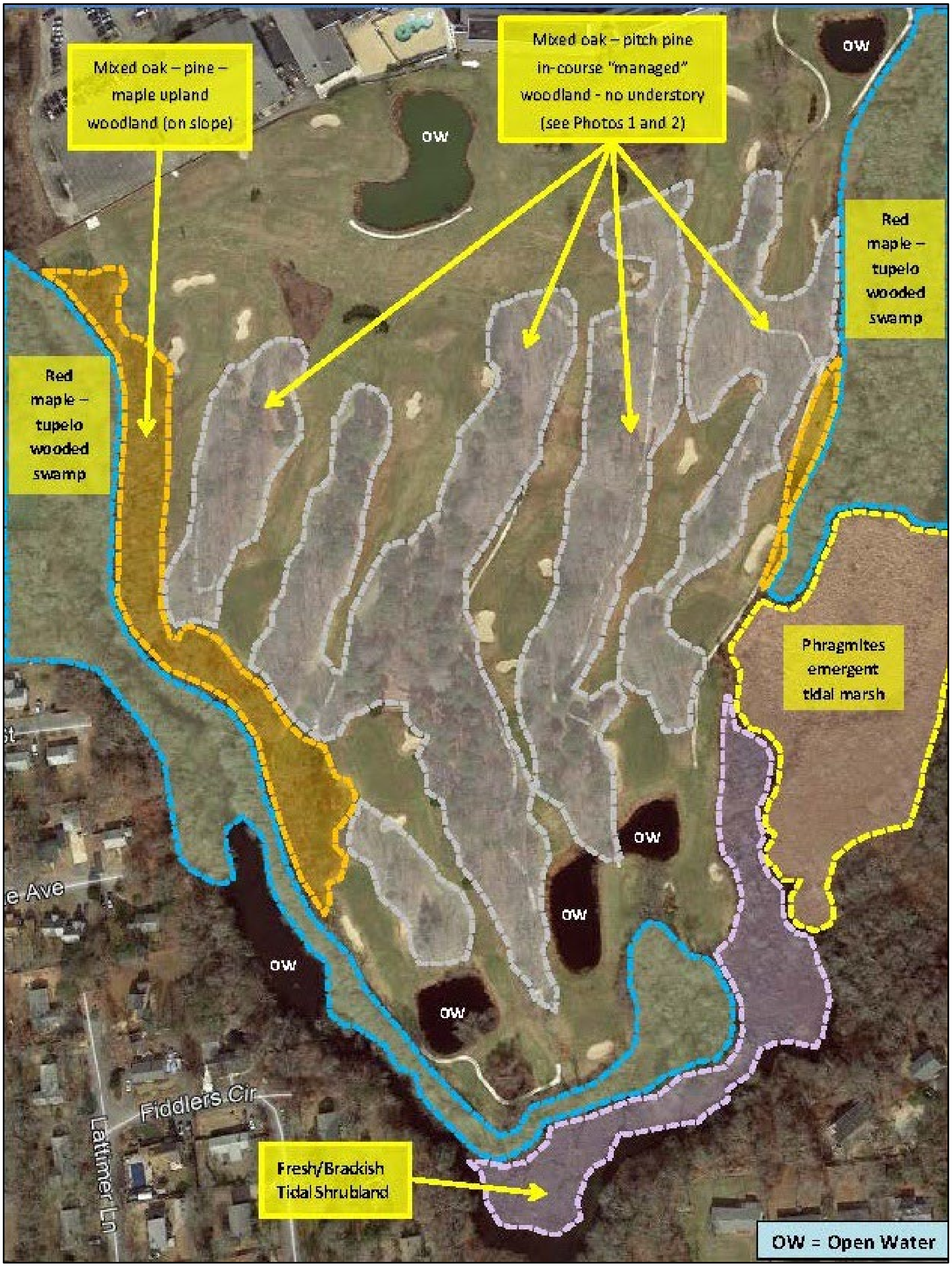


Figure 4: Vegetative Cover Types

2.2 Wetlands

This vegetation cover types found in the wetlands at the Site including red maple-tupelo wooded swamp, phragmites emergent tidal marsh, and fresh/brackish tidal shrubland (scrub-shrub emergent tidal marsh). Wetland resources form the Site's eastern, western, and southern boundaries. Generally, the transition from golf course and other upland areas to wetland habitat in most areas of the Site is abrupt due to existing, moderate to steep-grade slopes and golf course management practices.

- **Red Maple-Tupelo Wooded Swamp:** Forested wetland habitats occurring along and near these streams are red maple and black tupelo (*Nyssa sylvatica*)-dominant woodland habitats. These wooded wetlands habitat exhibit a dense woody understory in most locations and support species including coastal sweet pepperbush (*Clethra alnifolia*), spicebush (*Lindera benzoin*), northern arrowwood (*Viburnum dentatum*), highbush blueberry *(Vaccinium corymbosum*), and swamp azalea (*Rhododendron viscosum*). Where trees are sparse or absent along the streams, dense woody and herbaceous vegetation comprise the wetland habitats. Silky dogwood (*Cornus amomum*), alder (*Alnus spp*.), elderberry (*Sambucus canadensis*), cinnamon fern (*Osmunda cinnamomea*), royal fern (*O. regalis*), skunk cabbage (*Symplocarpus foetidus*),and spotted touch-me-not (*Impatiens capensis*) occur frequently in the more open wetland landscape.

- **Phragmites Emergent Tidal Marsh:** Unlike Joshua's Brook, Stewart's Creek along the eastern boundary of the Site eventually daylights from a wooded swamp into an expansive emergent tidal marsh that is common reed (*Phragmites australis*)-dominant.

- **Fresh/Brackish Tidal Shrubland:** At the southern extent of the Site, where the two waterways converge and where common reed or wooded swamp do not comprise the wetland habitat, a plant community consistent with a fresh/brackish tidal shrubland occurs. Species including hightide bush (*Iva frutescens*), swamp rose (*Rosa palustris*), Virginia rose (*R. virginiana*), and sweet gale (*Myrica gale*). There is no salt marsh located on or near to the Site.

- **Waterways and Water Bodies:** Joshua's Brook and Stewart's Creek are perennial streams that comprise the western and eastern Siteboundaries. Joshua's Brook flows from Fawcett's Pond and Stewart's Creak flows from Aunt Betty's Pond. These streams converge at the southern end of the Site and flow south eventually discharging into Nantucket Sound beneath a culvert at Ocean Avenue. There are artificially created freshwater open water areas within the golf course, all of which serve as water hazards. They are all relatively shallow in depth and each exhibits a relatively narrow band of woody and herbaceous vegetation serving as a buffer between the water margin and mowed golf course area. The vegetated pond margins are comprised of an assemblage of native plant species and invasive plant species including large gray willow (*Salix cinerea / S. atrocinerea*), multiflora rose (*Rosa multiflora*), and Asiatic bittersweet (*Celastrus orbiculatus*).

2.3 Specimen Trees

On September 26, 2022, a count of the specimen trees to be cut within the limit of work were counted for an exact number of trees to be replaced in accordance with the Cape Cod Commission's Wildlife and Plant Habitat Technical Bulletin. Specimen trees are defined as softwoods greater than 18" dbh (diameter at breast height) and hardwoods greater than 12" dbh. The following table provides the data collected.

Table 2-2: Specimen Trees

Type of Tree	Tree Species	Number Counted
Hardwood	Black oak	119
Hardwood	White oak	10
Hardwood	Black cherry	1
Hardwood	Red maple	4
Softwood	Pitch Pine	10
	Total	**144**

Previously, the amount of 375 specimen trees had been provided in documents submitted to the Cape Cod Commission. This amount represents the estimated number of specimen trees on the entire site. Approximately 144 trees (including a mixture of deciduous and evergreen trees) are proposed to be planted over the 9.84 acres restoration area. Additional trees will be planted in the development area so that in total, there will be 350 trees planted on the Site. In addition, there are other vegetation management (or treatment) options as described below. The restoration plantings together with the landscaped plantings will provide greater habitat values in conjunction with each other.

2.4 Invasive Species

Woody invasive species are prevalent at the Site within unmanaged plant communities. Vegetated areas appearing most impacted by invasive plants are along the margins of the two ponds and two surface water bodies and along the margins of in-play golf areas at the Site's perimeter. Invasive species most frequently encountered at the Site are listed in the table below. The species noted below were observed in altered areas and are not as commonly found within the more natural areas on the site.

Table 2-3: Invasive Plants Identified at the Site

Common Name	*Scientific Name*	Habitat	Layer
Multiflora rose	*Rosa multiflora*	Upland	Shrub
Glossy buckthorn	*Frangula alnus*	Upland	Shrub
Large graywillow	*Salix cinerea*	Wetland/Transitional	Tree/shrub
Asiatic bittersweet	*Celastrus orbiculatus*	Upland	Vine
Morrow's honeysuckle	*Lonicera morrowii*	Upland	Shrub
Japanese honeysuckle	*Lonicera japonica*	Upland	Shrub
Norway maple	*Acer platanoides*	Upland	Tree
European privet	*Ligustrum vulgare*	Upland	Shrub
Japanese knotweed	*Fallopia japonica*	Upland	Herbaceous
Common reed	*Phragmites australis*	Wetland/Transition	Herbaceous

2.5 Soils

According to the USDA Natural Resource Conservation Service (NRCS), soils at the Site are comprised primarily as Carver coarse sand for upland areas and as either Freetown coarse sand or Freetown and Swansea mucks for wetland areas along both stream corridors (see Figure 5). For the wetland habitat at the most southern end of the Site, the soil type is mapped as Ipswich - Pawcatuck - Matunuck complex

(0-2% slopes, very frequently flooded). Soil profile observations made during wetland delineation efforts were generally consistent with the descriptions of these identified soil types. None of the soil classes identified for the Site are defined as Prime Farmland, Farmland of Unique Importance, or Farmland of Statewide Importance.

Figure 5: **Soils**

3.0 Management Areas

In order to determine what restoration treatment is to go in what location, we have identified five management areas as described below. Each management area typically includes all or some of the typical features found in a golf course (i.e., tees, fairways, roughs, bunkers, water hazards, cart paths, buildings, putting greens, etc.) Each feature may require specific treatment depending on conditions in the field such as soil compaction, soils chemistry, type of vegetation present including grass used for the different parts of a course, removal of subsurface irrigation, removal of buildings or other structures, etc. This section describes the management areas and the restoration of different habitats. The 9.84 acres has been divided up into five areas (Area A through Area E) as shown on Figure 5. Oblique aerial photos are included for each of the management areas to show more detail of what existing conditions are. These photos are provided in Appendix B. The following table provides an overview of the treatment proposed based on the existing golf course feature.

Table 3-1: Treatment Options by Golf Course Feature

Golf Course Feature	Acreage	Treatment Proposed
Tees and Greens	1.88	• Removal of grass • Aeration of surficial and subsoils • Removal of gravel drainage material if appropriate • Removal of piping if present • Planting of trees and shrubs
Fairways	2.15	• Removal of grass if considered invasive • Determine if surficial and subsoils need aeration • Regrade if needed for more natural landscape • Planting of trees and shrubs
Roughs	2.85	• Allow to revegetate naturally where native grasses are present • If any of the roughs contain invasive grasses, treat like fairways
Bunkers/Sand Traps	0.27	• Determine if areas are compacted, aeration if needed • Maintain some sand traps for diversity of habitat, possible turtle nesting areas if any individuals are nearby
Managed Woodlands	1.46	• Determine if areas are compacted, aeration if needed • Plant some understory • Allow remainder of understory to revegetate naturally • Manage for invasive species
Water Hazards/Ponds	0.92	• Allow edges and buffer zones to revegetate naturally • Supplemental plantings of shrubs and trees • Allow for access to ponds edge in limited areas • Manage for invasive species
Cart Paths	0.31	• Allow unpaved cart paths to remain as walking trails • Remove pavement from paved cart paths and replace with gravel or other similar suitable material • If necessary, remove compacted soils in areas where walking trails are not needed or need to be relocated • Allow natural vegetation to grow along edges of cart paths for a more natural experience • Maintain walking trails per recreational specifications (to be determined)
Structures	NA	• Maintain existing structures which may be used in association with possible recreational trails
TOTAL	**9.84 acres**	

Figure 6: Management Areas

4.0 Testing and Management Options

Management and control methods were selected to avoid or minimize adverse impact on the surrounding plant communities and are organized in the sections below by soil treatment options, vegetation treatment options, and invasive species treatment options. A combination of the treatment options will be utilize to provide for a comprehensive restoration of the landscape.

4.1 Chemical Soil Testing

Chemical soil testing and physical soil testing will occur as described below in order to determine the level of de-compaction that is needed and to determine if any soil supplements will be required as part of the restoration. As noted in the CCC staff report dated June 6, 2022, this section provides details on soil testing that will proceed as part of the Restoration Plan and the details below can be included in the Development Agreement terms and conditions as appropriate.

> Given the site's historical use as a golf course, soil chemistry may be altered, and soils may be compacted. Therefore, prior to any restoration, staff suggests the applicant test the soils for nutrient levels and acidity to help inform appropriate plantings and loosen or de-compact soils to help store water and assist seed establishment. Commission staff recommends that any Development Agreement include terms and conditions to this effect.

A testing plan (including the number and location of test cores) will be developed for the testing of the soils within the restoration area, specifically the areas where open golf course features are located (i.e., fairways, greens, tees, etc.) Testing will also occur within the managed woodlands to a lesser degree. Samples will be taken about 4-6 inches beneath the vegetated surface and placed in a clean container appropriately labelled. Samples may be mixed together for a composite sample from similar areas, if appropriate.

Testing will include standard parameters such as pH, levels of nitrate, phosphorus, potassium, calcium, magnesium, manganese, iron, zinc, salt, etc. Soil texture will help to determine soil moisture potential, nutrient availability, and potential erosion. Percent organic matter in soils is an important test to determine if additional of organic matter will be required to support new plantings. Laboratories used for testing may include the Cape Cod Extension Service, University of Massachusetts Amherst soil testing laboratory, or a commercial laboratory. Chain of custody forms will be used for all samples.

The results of the testing will dictate if any applications of amendments such as lime or other fertilizer is needed. Some laboratory results may even provide recommendations for soil supplements. Once the analyses are received, they will be analyzed to determine the appropriate level of organic matter and other soil supplements like nitrogen, phosphorus, and potassium that need to be added to aid in the success of the restored vegetation. This analysis will also include determination of what needs to be acted on as the new vegetation is planted and if there is any need to continue adding supplements for the near future. The goal is to limit future supplements in order that the restored areas are able to self-maintain without any interventions.

4.2 Physical Soil Testing

Testing of the physical characteristics of the soil at the site will take two forms: soil texture (tested in a laboratory) and soil compaction (tested in the field).

Testing of soil texture will occur as part of the chemical testing (see previous section). Testing of soil compaction is needed in certain areas where there has been past grading or alteration of soils such as tees, greens, etc. The site is comprised of Carver coarse sands which are anticipated to be less disturbed with less compaction in areas such as the managed woodlands. Limited testing of soil particle size (texture) is proposed as the native soil is Carver coarse sands that may have been supplemented with organic matter. For purposes of this restoration plan, the upland restoration areas are presumed to contained sandy soils. Therefore, only half of the samples taken for chemical analysis will be tested for soil particle size in order to confirm existing conditions.

Testing of soil compaction occurs in the field using a specialized tool called the penetrometer. It is likely that portion of the golf course have been compacted during construction and operations of the golf course and will be mostly located in the upper surficial soils. In order to determine this, the penetrometer will be used in transects throughout the site. At each station, the depth of the penetrometer and the pounds per square inch (psi) are recorded. Readings will be taken in areas with more foot traffic from the golf course and compared with areas with less traffic. Once the field work has been completed, the readings will be charted and analyzed. Readings below 30 psi = no compaction; 30 to 50 = slight compaction; 50-75 = moderate compaction, and above 75 psi = severe compaction.

4.3 Soil Treatment Options

Based on these readings, the type of de-compaction treatment can be identified as described below.

4.3.1 Soil Decompaction Treatment

Mechanical treatment of compacted soils will be dependent if the soil readings indicate moderate or severe compaction. No treatment is recommended for areas with no or slight compaction. Specialized equipment may be used including, but not limited to, plug aeration which improves drainage and aeration and reduces compaction and tilling the soil which breaks up and reduces compaction. The depth of the tilling will be based on field readings and typically will be performed within the top six inches but may go deeper if deeper compaction is found. This mechanical treatment reduces compaction of soils, allows for more robust growth of roots by breaking up the compacted soil structure, allows vegetation roots to absorb more oxygen in order to respire, allows the soils for greater uptake of rainfall, increases soil moisture levels, and aids to increase buildup of organic matter over time.

4.3.2 Soil Amendments

As the area is comprised primarily of sand, soil amendments will help to improve the sands ability to hold moisture which in turn will hold more nutrients to be taken up by vegetation. Soil amendments may be needed and the soil tests described previously will determine the type and application rates of amendments. Examples of amendments include compost, manure, other organic matter, and lime (to adjust the soil pH).

If amendments are needed, one single treatment would be preferable at a minimum in the beginning of the restoration work before or during planting of the vegetation. The amendments can be incorporated into the soils using large machinery if the top soil (and grass layer) has been removed. The goal is to limit future supplements in order that the restored areas are able to self-maintain without any interventions.

The use of different mulches will be determined depending on the vegetation type to be planted, topography, and slope. Mulches are used with the initial plantings in order to retain moisture, protect the roots of the plants from extreme heat or cold, and to reduce weed growth.

4.4 Vegetation Management Options

The restoration of the former golf course areas will have new plantings of trees, shrubs and ground cover with native species compatible to the area. Approximately 144 trees (including a mixture of deciduous and evergreen trees) are proposed to be planted over the 9.84 acres restoration area. Additional trees will be planted in the development area so that in total, there will be 350 trees planted on the Site. In addition, there are other vegetation management (or treatment) options as described below.

4.4.1 Removal of Herbaceous and Grass Vegetation

Removal of grass may be used in specific areas such as tees and greens in order to remove the thick layer of grass. Other options may include removing portions of these areas and breaking up the grass mat in others to allow it to grow naturally. The treatment depends on the type of grass to be identified.

4.4.2 Removal of Woody Vegetation

In some instances, there may be the need to remove woody species especially if they are non-native and invasive (i.e., multiflora rose, Norway maple). In these areas where individuals have been removed will be replanted if appropriate. There may be existing native plants nearby that would be able to grow into the space where the invasive species was removed. If larger areas of removal are required, then additional plants will be replanted appropriate to the location on the landscape.

4.4.3 Revegetate Naturally

Where there is already existing natural vegetation within the restoration area, these areas may be left to revegetate naturally with no additional treatment. There may be areas such as the managed woodlands that may be left to revegetate naturally if located on the edge of a restoration area with minimum width.

4.4.4 Seeding of Herbaceous and Grass Seed Mix

In areas such as the greens and the tees, once the soil treatment has occurred, these areas will be revegetated with appropriate seed mixes that contain a variety of native species that can survive in conditions found on Cape Cod. These disturbed areas will be seeded following grading with an upland native seed mix such as the New England Conservation/Wildlife Mix or similar seed mix. The soil will be prepared through tilling or other mechanical means to allow for success of the seeds to be stratified.

4.5 Planting of Native Plant Species

When making the final choices for what is to be planted may depend on what is available at the time of planting. Substitutions for proposed plantings are appropriate if approved by the environmental monitor. All efforts shall be made to avoid cultivars of native plants. Cultivars may be sterile so they are unable to cross-pollinate which may reduce the availability of pollen and nectar food sources to pollinators such as bees and butterflies. Cultivars may also be different from the native species in color, growth form, foliage shape, bloom time, other physical characteristics, and lack genetic diversity. Native wildlife may not be able to utilize the cultivars as they would native species due to the physical and possibly chemical changes of the vegetation. At this time, the revised site plan design including stormwater basins is being finalized. Once completed the following general guidelines will be applied to the restoration areas:

- **Trees:** Tree sizes depends on the site conditions and site accessibility but for the most part it is anticipated that deciduous/hardwood trees will be of approximately 2-inch diameter and evergreen/softwood trees will be approximately 6-feet in height. We have specified small diameter (or caliper) tree sizes for the restoration area compared to the landscaping proposed in the development area as it is generally better to plant smaller sizes which are able to establish and root faster and acclimate better for better survival rate and increased growth rates. In addition, these trees will have less water needs than if planted at a larger size. All materials will depend on availability. Some tree species cannot be located locally of this size, therefore, it should be acknowledged that smaller diameter plants may be substituted as necessary.

  It is recommended that clustering of the trees saplings occur to create a more natural look than planting on a grid system. Based on the number of specimen trees counted as described in Section 2.0, at least 144 trees will be planted in the restoration areas, primarily in the tee and green areas where soils will be de-compacted and planted with wildflower meadow plants. In these areas, depending on the specific shape of the area to be restored, the trees can be clustered at a spacing no less than 10 feet on center for softwoods and 20 feet on center for hardwoods.

- **Shrubs:** Shrub sizes depend on availability of locally grown native species. Most shrubs are available in the #1, #2, and #3 gallon sizes. It is recommended that clustering of the shrubs occur to create a more natural look than planting on a grid system. We propose to plant approximately 350 shrubs to be clustered in groupings similar to how the trees are proposed to be planted in the restoration area. We recommend clustering tree and shrub plantings together or creating areas of just shrubs closely spaced to create wildlife habitat. Please refer to the Landscape Plans and the “bioretention area palette” for a list of shrubs species that are acceptable for plantings. Consultation with the Barnstable Conservation Commission will also inform the final species list and number of shrubs planted.

- **Groundcover:** Groundcovers or other herbaceous vegetation like ferns would be a great addition to the restored areas. These could be planted in amongst both the trees and/or shrubs and are available in 1, #2, and/or #3-gallon size containers.

4.5.1 Site Preparation

The following information has been taken from the Guidelines for Planting within the 100 Foot Buffer[1] by the Barnstable County Extension Service.

- Compost or other organic amendments should be mixed into the back-fill soil to increase water-holding capacity where appropriate.

[1] https://ag.umass.edu/landscape/fact-sheets/guidelines-for-planting-within-100-foot-buffer

- Planting hole depth for trees should be only as deep as measured from the trunk flare to the bottom of the root ball.
- Planting hole width should be a minimum of three times the diameter of the root ball.
- If plant material is balled and burlapped, all burlap should be removed or cut from the top third of the root ball. If large materials are in wire baskets, the top third of the basket should be cut and removed. The trunk flare should be located to insure correct planting depth.
- Large trees may be staked for stability for one growing season.
- All plants should be thoroughly watered in at the time of planting (15-20 gal. per plant).
- Container plants should be planted at the same depth as grown in the container.
- Root balls should be mulched.
- No fertilization is necessary at planting time.

4.5.2 Watering

All newly planted or seeded areas will need to be watered depending on the time of year and weather conditions. Watering can also keep the dust down in areas where the vegetation has not yet established. During the construction phase of the development, water trucks are usually used to keep the dust down and can be easily used to water the new plantings as directed by the landscaper (pending weather conditions).

4.5.3 Fertilizing

Fertilizing will be performed in accordance with the recommendations based on soil chemistry testing. This will allow for site specific treatment to be developed without over-enrichment of the inland and coastal waters at or near the site.

All fertilizing will be performed in accordance with the Barnstable Fertilizer and Phosphorus Control ordinance (Chapter 78) specifically Section 78-5 (Standards of Performance) which outlines best management practices (BMPs). For example:

- The Project will require that the landscaper performing the work at the site has Fertilizer Certified Applicator(s).
- A single application of fertilizer that contains nitrogen shall not exceed one pound of actual nitrogen per thousand square feet and shall consist of 20% slow-release nitrogen fertilizer.

4.6 Wildlife Habitat Features

Some of the trees to be cut and other woody debris from tree removal will be retained and placed within the restoration area to create wildlife habitat features such as habitat piles (piles of smaller trees, tree limbs, stick, etc.), log piles, and downed trees (keep trees on the ground in order to create a micro-habitat, allow to naturally decompose). Also keep dead trees (snags) if possible which provide a variety of habitats and if located away from cart paths for safety reasons.

The site presently has numerous sand traps through the site. Although no turtles were observed at the site it is likely that there may be snapping turtles using the adjacent wetlands. As such, we propose to allow the sand traps to exist and be allowed to naturally revegetate slowly. Approximately five sand traps will be retained. The remainder will be restored in a manner similar to the treatment proposed for fairways and/or roughs. During site inspections and monitoring, wildlife usage, if any, will be identified.

Although the two southern-most ponds were constructed for the golf course and lack the ecological values and functions of a natural pond, they serve a limited function as wildlife habitat for fish, birds, mammals, etc. To improve the value of these ponds, invasive species will be removed from the buffer zones of this area and replaced with native species. No hydraulic or hydrologic physical connections exist between the ponds, which were constructed in connection with the development of the golf course. No significant impacts to existing wildlife in these areas would be anticipated to result from the Redevelopment project. In addition to removing invasive species, a buffer zone restoration area will be created between the ponds.

Unlike the two southern ponds, the northeastern-most pond was likely present before the golf course was constructed. This pond may be a natural pond or maybe associated with historic cranberry bogs at the site. There is presently a culvert connecting the pond to Stewart's Creek, which maintains the hydrologic features of the pond. As with the other ponds, no removal of culverts or manipulation of the hydraulic or hydrologic features of the pond is proposed as this would likely impact the existing habitat that the pond provides.

4.7 Invasive Species Management Options

It is understood that during construction it is important to prevent the introduction and spread of invasive plant species. All proposed plant species, as well as the imported planting/topsoil materials, will be inspected at the source and after placement to guard against the introduction of invasive species.

4.7.1 Herbicide Application

The application of herbicides for the control of invasive species is not proposed at this time due to the fact that there are not significant areas of invasive species that need to be controlled. For example, the common reed is contained to the marsh area and is not likely to take hold in the upland restoration areas. That said, once the restoration work begins, the alteration of the soil surface provides opportunities for invasive species to take hold. Therefore, monitoring of invasive species will be performed throughout the restoration process.

4.7.2 Mechanical Removal

Removal of invasive species encountered during restoration will occur using mechanical methods such as grubbing, flush-cutting, and hand removal. Any invasive species removed will be transferred off-site to an appropriate disposal location so as to not spread any seeds or pieces of vegetation.

4.7.3 Species Specific Treatment

Guidelines will be develop for the invasive species that may be encountered at the site in order to provide guidance on actions needed. The following are examples of what this information may provide

- **Multiflora Rose (*Rosa multiflora*):** Smaller plants may be removed physically by hand pulling. When access is available for mowing or cutting equipment, more extensive thickets of multiflora rose may be treated by cutting or mowing with appropriate equipment. Eradication requires repeated or mowing of the plants three to six (or more) times during the growing season.
- **Morrow Honeysuckle (*Lonicera morrowii*):** Small infestations may be removed by hand-pulling in the spring when the ground is loose and moist. Cutting treatments are effective, but

repeated cuttings of up to 6 to 8 times during the growing season are necessary to obtain optimum control results. A cutting program in combination with herbicide applications is the generally recommended treatment.

- **Privet (*Ligustrum vulgare*):** Manual controls are effective in areas of light infestations where young plants are removed by hand pulling. A combination of cutting and mowing may be used in sensitive areas.
- **Oriental Bittersweet (*Celastrus orbiculatus*):** Young vines can be removed by hand pulling with the proper disposal of the material collected. All root material must be removed for this method to be effective. If fruits are present the vines should be bagged in plastic trash bags and removed to a landfill for disposal. Climbing vines can be cut at breast height to kill the upper portion of the vine and release the tree canopy. Since rooted portions will survive unless cut back repeatedly, physical controls in combination with herbicide treatments are recommended to eradicate Oriental bittersweet.

4.8 Erosion Control

The seed mix shall be sown over designated areas at a rate of 1 pound per 1,250 square feet. Weed-free straw or similar mulch or stabilizer shall be used to cover the seed. Steeper slopes may need erosion control such as mats to protect soils from erosion and to protect the seed. Biodegradable erosion control is recommended as it will degrade over time, will not impede growth of the seed or plants, and will not require follow up maintenance such as removal. More sturdy erosion control such as coir logs may be needed at the base of steeper slopes and/or near to the wetland resource areas including the water hazard ponds.

An erosion control plan will be developed for project including the construction of the restoration areas including the development of a Stormwater Pollution Prevention Plan (SWPPP). At this time, additional detailed information regarding the specific erosion controls to be used and where will be finalized.

5.0 Monitoring and Maintenance

Post-construction monitoring of the areas to be restored is proposed to ensure successful restoration through field inspections of vegetation and assessment of presence of invasive species control. The restored areas will be inspected to monitor the health of the newly planted vegetation. A period of three years for the monitoring is proposed. If additional action items are needed (i.e., due to survival goals not being met), this may be extended for multiple one year periods not to exceed a total of five years. Maintenance activities, if needed, include stabilization of eroded slopes, erosion repairs, supplemental or replacement plantings if individuals have not survived, and control of invasive species, if present. Monitoring will be performed through field surveys and vegetation plots to determine species present and percent cover obtained. This will help to document the survival rate of the planted species.

5.1 Goals

Goals associated with the evaluation of the success of the plantings shall be formalized and may include specific goals such as if new herbaceous cover does not meet or exceed 75% cover after two growing seasons, then additional seeding may be required. A goal of 75% survival of woody species is anticipated within two years. If less than 75% of the woody species survive (counted by individual trees and shrubs) within two years, then a contingency/action plan will be established to replace some of the dead vegetation including an assessment of why they were lost (i.e., insects, wildlife damage, disease, etc.)

5.2 Inspections

An environmental consultant shall be on call during the construction and to visit the site on a regular basis (timing to be determined) and work with the construction contractor(s) to ensure that work follows the guidelines established in this Restoration Plan and other BMPs. The environmental consultant or monitor shall make periodic visits to evaluate the progress of the restoration work as it occurs and be available to address unforeseen circumstances. The environmental consultant shall make the following inspections post-construction:

- Inspection immediately following construction completion of the Restoration Plan to document conditions through photographs and field plots
- Inspection during the spring of the first growing season following construction completion
- Inspection during the fall of the first growing season

5.3 Recommended Monitoring Standards

The monitoring inspection will be performed to document site conditions upon the completion of the landscape restoration activity.

- Restoration work shall be supervised by a landscape professional or environmental monitor.
- Monitoring inspections will be performed annually during the late summer/early fall.
- Monitoring sample plots will be established the first year (marked by stakes).
- Information collected from the plots will include the percent cover of all vegetative layers including herbaceous, shrub, tree, and woody vines following standard methodology.

- An environmental monitor will be on site to evaluate the progress of the landscape restoration effort and address unforeseen environmental issues. The environmental monitor will be responsible for the annual monitoring report.
- A set of dated photographs shall be prepared for each monitoring inspection. Representative photographs shall be submitted with the annual monitoring report.
- Results of the monitoring inspection will be reported to the Natural Resources Coordinator for work performed during the calendar year (December 31st). The monitoring report will be submitted to the Natural Resources Coordinator by January 31st of the next year.
- Corrective measures undertaken will be included in the annual monitoring report.
- Identification and early detection of invasive species is critical in determining what course of action should be taken to control the species (i.e., mechanically, chemically, etc.)
- Identification of wildlife use, marks, etc. should be noted.

5.4 Reporting

Monitoring reports shall be prepared for the property owner and the CR holder to be submitted on a schedule to be established. The inspections will be performed to document site conditions upon the completion of the restoration work including environmental site conditions, general field observations, and an evaluation of the success of the plantings.

Appendix A: Site Photographs

Looking south toward the tee at the 17th hole across the fairway.

Looking at the 16th putting green with western tree line in the background.

Looking to the southeast toward the 14th tee from cart path.

Looking north toward the 14th putting green across the fairway (between two ponds).

Looking south from the 13th putting green over sand trap.

Looking to the east from 12th fairway towards the 5th and 6th holes.

Looking east toward the 6th putting green.

Looking north through managed woodlands.

Appendix B: Management Areas


2
Area A
1
3

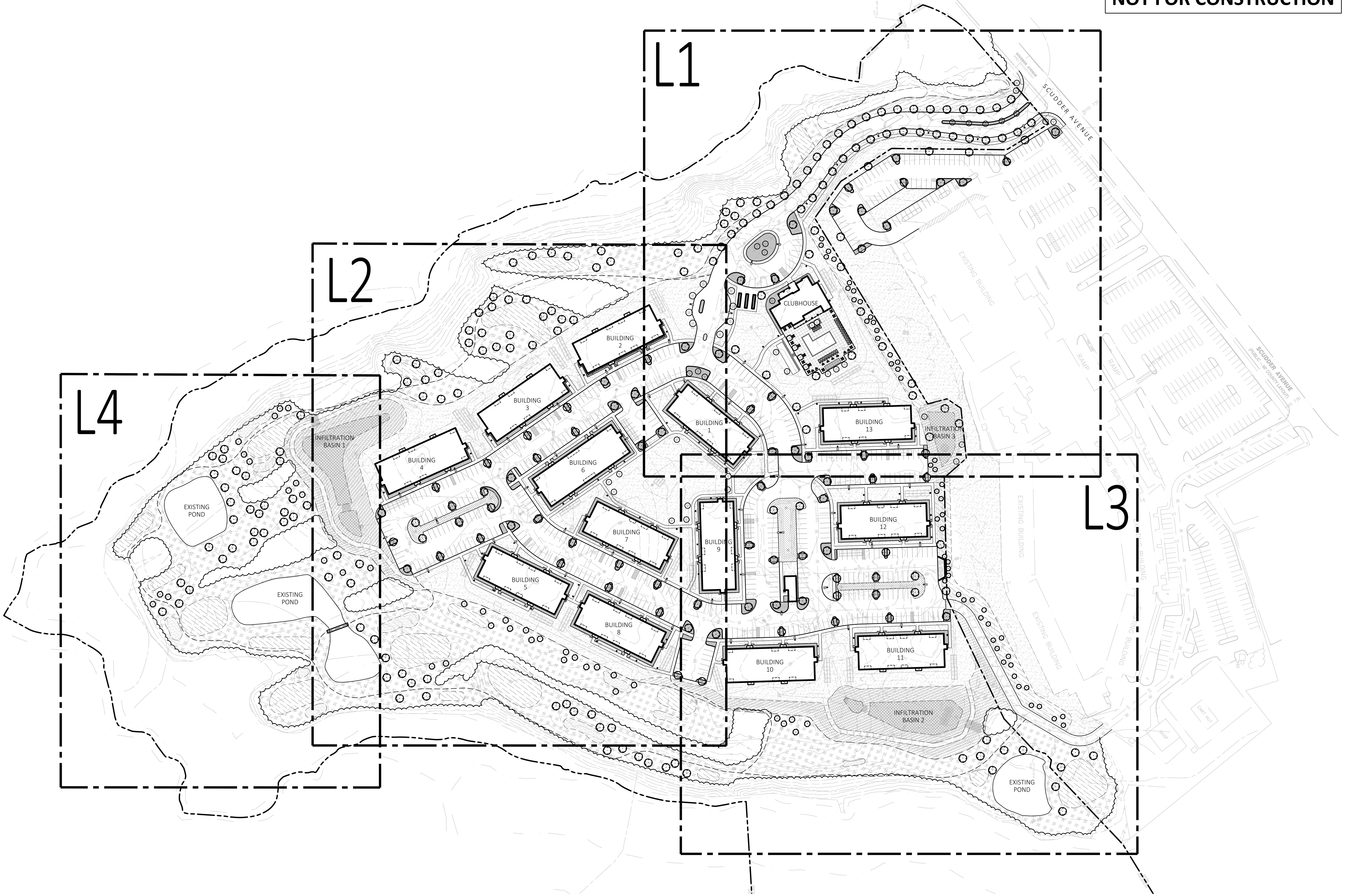

3
Area B
4


Area C
4
6


6
Area D
13
5
14
1


17
Area E
16
15

NOT FOR CONSTRUCTION



1 LAYOUT KEY PLAN
SCALE: 1" = 80'-0"

SCALE: 1" = 80'-0"
160' 80' 40' 20' 0 80' 160'

MDLA
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LANDSCAPE ARCHITECTURE LLC

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EMBLEM HYANNIS
35 SCUDDER AVENUE
HYANNIS, MA

STAMP
MASSACHUSETTS
MICHAEL D'ANGELO
NO. 4006
REGISTERED LANDSCAPE ARCHITECT

REV. NO.	DATE	DESCRIPTION
1	4/1/21	CCC SUBMITTAL
2	10/21/22	CCC RESUBMITTAL

LAYOUT
KEY
PLAN

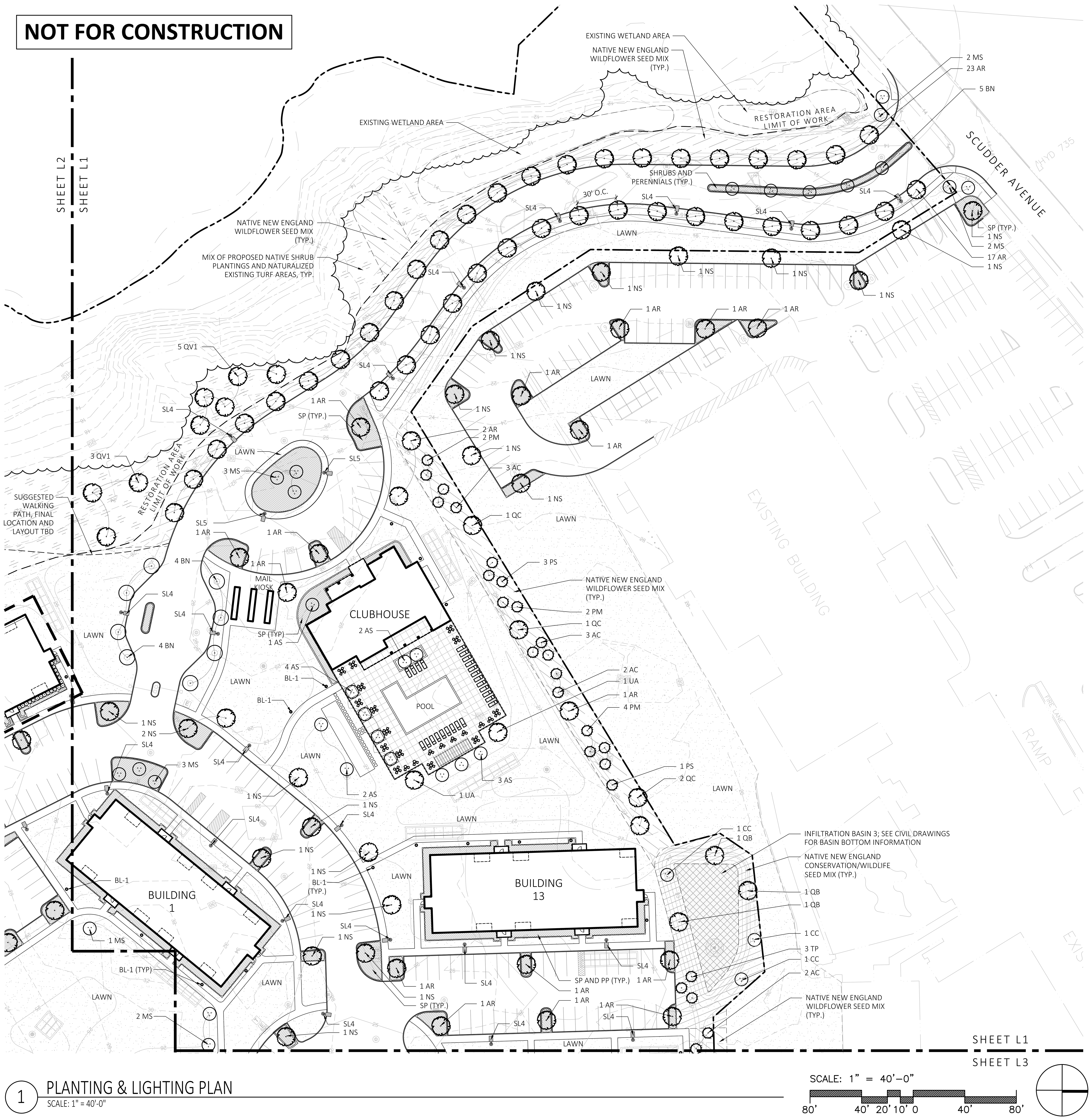
DRAWN
CHECKED
SCALE
AS NOTED
DATE
03/01/21

L0

SHEET 1 OF 10

plot date: 11/2/2022

NOT FOR CONSTRUCTION



1 PLANTING & LIGHTING PLAN
SCALE: 1" = 40'-0"

PLANT SCHEDULE - MAIN SITE					
SYMBOL	QTY.	LATIN NAME	COMMON NAME	SIZE	NOTES
SHADE TREES					
AR	72	ACER RUBRUM 'RED SUNSET'	RED SUNSET MAPLE	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
GT	17	GLEDITSEA TRICANTHOS 'SKYLINE'	SKYLINE HONEYLOCUST	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
NS	39	NYSSA SYLVATICA	BLACK TUPELO	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
QB	3	QUERCUS BICOLOR	SWAMP WHITE OAK	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
QC	4	QUERCUS COCCINEA	SCARLET OAK	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
QO	12	QUERCUS PALUSTRIS	PIN OAK	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
UA	2	ULMUS AMERICANA 'PRINCETON'	PRINCETON ELM	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
ORNAMENTAL TREES					
AS	12	AMELANCHIER 'AUTUMN BRILLIANCE'	SERVICEBERRY	6-7' TALL	B&B, MULTI-STEM
BN	19	BETULA NIGRA 'HERITAGE'	RIVER BIRCH	10-12' TALL	B&B, MULTI-STEM
CC	3	CERCIS CANADENSIS	EASTERN REDBUD	6-7' TALL	B&B, SINGLE AND MULTI-STEM
MS	13	MAGNOLIA STELLATA	STAR MAGNOLIA	6-7' TALL	B&B, SPECIMEN
EVERGREEN TREES					
AC	10	ABIES CONCOLOR	WHITE FIR	7-8' TALL	B&B
JV	5	JUNIPERUS VIRGINIANA	EASTER RED CEDAR	7-8' TALL	B&B
PM	17	PSEUDOTSUGA MENZIESII	DOUGLAS FIR	7-8' TALL	B&B
PO	4	PICEA GLAUCA	WHITE SPRUCE	7-8' TALL	B&B
PS	10	PINUS STROBUS	WHITE PINE	7-8' TALL	B&B
TP	8	THUJA PLICATA 'GREEN GIANT'	GREEN GIANT ARBORVITAE	7-8' TALL	B&B

SHRUBS PALETTE (SP)				
CA	CLETHERA ALNIFOLIA	SUMMERSWEET	3 GALLON	48" O.C. B&B
CS	CORNUS SERICEA 'ARCTIC FIRE'	ARCTIC FIRE DOGWOOD	3 GALLON	48" O.C. B&B
FG	FOTHERGILLA GARDENII	DWARF FOTHERGILLA	3 GALLON	48" O.C. B&B
HA	HYDRANGEA ARBORESCENS 'ANNABELLE'	ANNABELLE HYDRANGEA	3 GALLON	48" O.C. B&B
HP	HYDRANGEA PANICULATA 'LITTLE LIME'	LITTLE LIME HYDRANGEA	3 GALLON	48" O.C. B&B
HQ	HYDRANGEA QUERCIFOLIA	OAKLEAF HYDRANGEA	3 GALLON	48" O.C. B&B
IG	ILEX GLABRA	INKBERRY	3 GALLON	48" O.C. B&B
IV	ILEX VERTICILLATA	WINTERBERRY	3 GALLON	48" O.C. B&B
MP	MYRICA PENSYLVANICA	NORTHERN BAYBERRY	3 GALLON	48" O.C. B&B
RA	RHUS AROMATICA 'GRO LOW'	GRO LOW SUMAC	3 GALLON	48" O.C. B&B
TM	TAXUS X MEDIA 'HICKSII'	HICKS YEW	3 GALLON	48" O.C. B&B
VA	VACCINIUM ANGUSTIFOLIUM	LOWBUSH BLUEBERRY	3 GALLON	48" O.C. B&B
VD	VIBURNUM DENTATUM	ARROWWOOD VIBURNUM	5 GALLON	48" O.C. B&B
PERENNIALS PALETTE (PP)				
AN	ASTER NOVIAE 'ANGLIAE'	NEW ENGLAND ASTER	1 GAL	18" O.C. CONTAINER
DP	DENNSTAEDTIA PUNCTILOBULA	HAYCENTED FERN	1 GAL	18" O.C. CONTAINER
EP	ECHINACEA PURPUREA	PURPLE CONEFLOWER	1 GAL	18" O.C. CONTAINER
HD	HEMEROCALLIS 'HAPPY RETURNS'	DAYLIILY	1 GAL	18" O.C. CONTAINER
LD	LEUCANTHEMUM X SUPERBUM 'BECKY'	BECKY DAISY	1 GAL	18" O.C. CONTAINER
NF	NEPETA X FAASSENII 'WALKERS LOW'	CATMINT	1 GAL	18" O.C. CONTAINER
PL	PEROVSKIA A. 'LITTLE SPIRE'	LITTLE SPIRE RUSSIAN SAGE	1 GAL	18" O.C. CONTAINER
RF	RUDBECKIA FULGIDA 'GOLDSTURM'	BLACK EYE SUSAN	1 GAL	18" O.C. CONTAINER
TC	TIARELLA CORDIFOLIA	HEARTLEAF FOAMFLOWER	1 GAL	18" O.C. CONTAINER
CM	CAREX MORROWII 'ICE DANCE'	JAPANESE SEDGE	1 GAL	18" O.C. CONTAINER
CP	CAREX PENSYLVANICA	PENNSYLVANIA SEDGE	1 GAL	18" O.C. CONTAINER
LS	LIRIOPE SPICATA	LILY TURF	1 GAL	18" O.C. CONTAINER
PV	PANICUM VIRGATUM 'SHENANDOAH'	SWITCH GRASS	2 GAL	30" O.C. CONTAINER
SB	SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM	2 GAL	30" O.C. CONTAINER
PA	PENNISETUM ALOPECUROIDES	FOUNTAIN GRASS	2 GAL	24" O.C. CONTAINER

BIORETENTION AREA PALETTE				
SHRUBS				
CA	CLETHRA ALNIFOLIA	SWEET PEPPERBUSH	3 GAL	48" O.C. CONTAINER
CS	CORNUS STOLONIFERA	REDTWIG DOGWOOD	3 GAL	48" O.C. CONTAINER
IG	ILEX GLABRA	INKBERRY HOLLY	3 GAL	48" O.C. CONTAINER
IV	ILEX VERTICILLATA	WINTERBERRY HOLLY	3 GAL	48" O.C. CONTAINER
IT	ITEA VIRGINICA	VIRGINIA SWEETSPIRE	3 GAL	48" O.C. CONTAINER
VC	VACCINIUM CORYBOSUM	HIGHBUSH BLUEBERRY	3 GAL	48" O.C. CONTAINER
VD	VIBURNUM DENTATUM	ARROWWOOD VIBURNUM	3 GAL	48" O.C. CONTAINER
PERENNIALS				
AT	ASCLEPIAS TUBEROSA	BUTTERFLY MILKWEED	1 GAL	18" O.C. CONTAINER
BA	BAPTISIA AUSTRALIS	FALSE BLUE INDIGO	1 GAL	18" O.C. CONTAINER
EP	ECHINACEA PURPUREA	PURPLE CONEFLOWER	1 GAL	18" O.C. CONTAINER
EJ	EUPATORIUM PURPUREUM	JOE PYE WEED	1 GAL	18" O.C. CONTAINER
BF	IRIS VERSICOLOR	BLUE FLAG IRIS	1 GAL	18" O.C. CONTAINER
LB	LIATRIS LIGULISTYLIS	MEADOW BLAZING STAR	1 GAL	18" O.C. CONTAINER
RH	RUDBECKIA HIRTA	BLACK EYED SUSAN	1 GAL	18" O.C. CONTAINER
PS	PANICUM VIRGATUM 'SHENANDOAH'	SWITCHGRASS	1 GAL	18" O.C. CONTAINER
SS	SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM	1 GAL	18" O.C. CONTAINER
SN	SYMPHYOTRICHUM NOVAE-ANGLIAE	NEW ENGLAND ASTER	1 GAL	18" O.C. CONTAINER
TC	TIARELLA CORDIFOLIA	HEARTLEAF FOAMFLOWER	1 GAL	18" O.C. CONTAINER

MEADOW SEED MIX			
NEW ENGLAND WETLAND PLANTS, INC	"NEW ENGLAND CONSERVATION / WILDLIFE MIX"	25 LB/ACRE	APPLY COVER CROP; FALL: GRAIN RYE, SPRING: OAT; 800-873-3321; OR APPROVED EQUAL
NEW ENGLAND WETLAND PLANTS, INC	"NEW ENGLAND WILDFLOWER MIX	23 LB/ACRE	APPLY COVER CROP; FALL: GRAIN RYE, SPRING: OAT; 800-873-3321; OR APPROVED EQUAL
	INFILTRATION BASIN "BOTTOM"		SEE CIVIL DRAWINGS FOR BASIN BOTTOM INFORMATION

PLANT SCHEDULE - RESTORATION AREA					
SYMBOL	QTY.	LATIN NAME	COMMON NAME	SIZE	NOTES
RESTORATION AREA - SHADE TREES					
AR1	16	ACER RUBRUM	RED MAPLE	1.5"-2" CAL.	B&B, 6' CLEAR BRANCHING
PC1	3	PRUNUS SEROTINA	BLACK CHERRY	1.5"-2" CAL.	B&B, 6' CLEAR BRANCHING
QV1	86	QUERCUS VELUTINA	BLACK OAK	1.5"-2" CAL.	B&B, 6' CLEAR BRANCHING
RESTORATION AREA - EVERGREEN TREES					
PR1	17	PINUS RIGIDA	PITCH PINE	7-8' TALL	B&B
PS1	22	PINUS STROBUS	WHITE PINE	7-8' TALL	B&B
RESTORATION AREA - SHRUBS					
MIX OF PROPOSED NATIVE SHRUBS PLANTINGS AND NATURALIZED EXISTING TURF AREAS. LOCATIONS AND QUANTITIES OF SHRUBS TBD					

*RESTORATION PLANTINGS PROVIDED BY ILEX ENVIRONMENTAL, INC. REFER TO THE "EMBLEM-HYANNIS RESTORATION PLAN" NARRATIVE FOR MORE INFORMATION

LIGHT SCHEDULE						
SYMBOL	LABEL	MODEL	MOUNT	DESCRIPTION	OPTIONS	REP
	SL4	HUBBELL - RATIO SERIES RAR2-480L-185-4K7-4W-U	CONCRETE FOOTING; KEEP 24" ABOVE GRADE	SINGLE	COLOR: BLK	ILLUMINATE 617-947-8996 STEVE PRUDHOMME
	SL5	HUBBELL - RATIO SERIES RAR2-480L-185-4K7-5QW-U	CONCRETE FOOTING; KEEP 24" ABOVE GRADE	SINGLE	COLOR: BLK	
	SL4-2	HUBBELL - RATIO SERIES RAR2-480L-185-4K7-4W-U	CONCRETE FOOTING; KEEP 24" ABOVE GRADE	BACK-BACK	COLOR: BLK	
	BL-1	ARCLUCE - KLOU-IK180 S-KK0204US-12S-0870006D-740-12US	CONCRETE FOOTING; KEEP 3" ABOVE GRADE	SINGLE	COLOR: BLK	

SUBMIT CUT SHEETS FOR APPROVAL; SEE PHOTOMETRIC PLAN PROVIDED WITH THIS DRAWING SET FOR MORE INFORMATION.

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EMBLEM HYANNIS
35 SCUDDER AVENUE
HYANNIS, MA

STAMP
MASSACHUSETTS MICHAEL D'ANGELO NO. 4006 REGISTERED LANDSCAPE ARCHITECT

REV. NO.	DATE	DESCRIPTION
1	4/1/21	CCC SUBMITTAL
2	10/21/22	CCC RESUBMITTAL

PLANTING AND LIGHTING PLAN

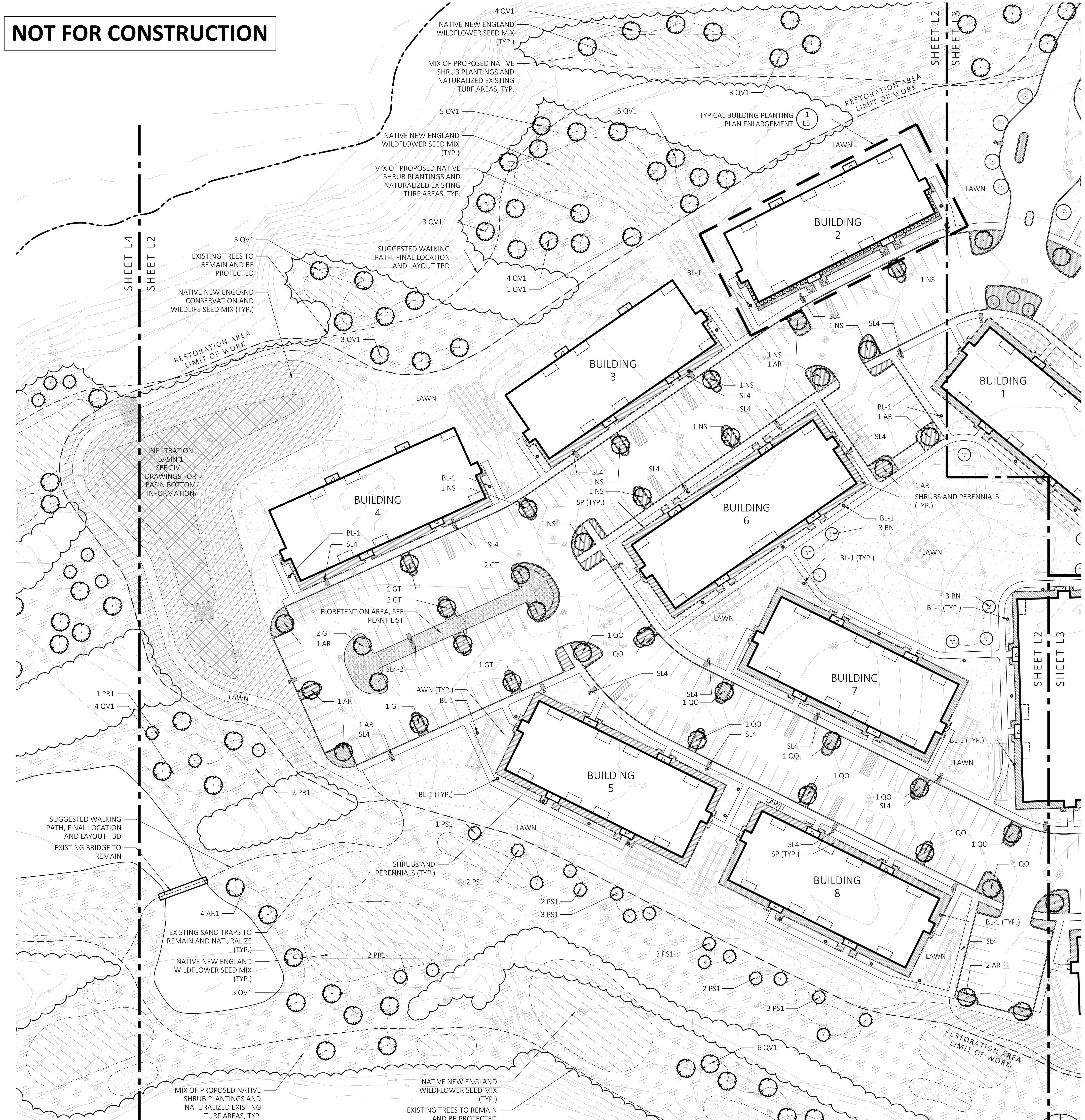
DRAWN
CHECKED
SCALE AS NOTED
DATE 03/01/21

L1

SHEET 2 OF 10

plot date: 11/2/2022

NOT FOR CONSTRUCTION



1 PLANTING & LIGHTING PLAN

SCALE: 1" = 40'-0"

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QC	4	QUERCUS COCCINEA	SCARLET OAK	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
QO	12	QUERCUS PALUSTRIS	PIN OAK	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
UA	2	ULMUS AMERICANA 'PRINCETON'	PRINCETON ELM	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
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CC	3	CERCIS CANADENSIS	EASTERN REDBUD	6-7' TALL	B&B, SINGLE AND MULTI-STEM
MS	13	MAGNOLIA STELLATA	STAR MAGNOLIA	6-7' TALL	B&B, SPECIMEN
EVERGREEN TREES					
AC	10	ABIES CONCOLOR	WHITE FIR	7-8' TALL	B&B
JV	5	JUNIPERUS VIRGINIANA	EASTER RED CEDAR	7-8' TALL	B&B
PM	17	PSEUDOTSUGA MENZIESII	DOUGLAS FIR	7-8' TALL	B&B
PO	4	PICEA GLAUCA	WHITE SPRUCE	7-8' TALL	B&B
PS	10	PINUS STROBUS	WHITE PINE	7-8' TALL	B&B
TP	8	THUJA PLICATA 'GREEN GIANT'	GREEN GIANT ARBORVITAE	7-8' TALL	B&B

SHRUBS PALETTE (SP)				
CA	CLETHERA ALNIFOLIA	SUMMERSWEET	3 GALLON	48" O.C. B&B
CS	CORNUS SERICEA 'ARCTIC FIRE'	ARCTIC FIRE DOGWOOD	3 GALLON	48" O.C. B&B
FG	FOTHERGILLA GARDENII	DWARF FOTHERGILLA	3 GALLON	48" O.C. B&B
HA	HYDRANGEA ARBORESCENS 'ANNABELLE'	ANNABELLE HYDRANGEA	3 GALLON	48" O.C. B&B
HP	HYDRANGEA PANICULATA 'LITTLE LIME'	LITTLE LIME HYDRANGEA	3 GALLON	48" O.C. B&B
HQ	HYDRANGEA QUERCIFOLIA	OAKLEAF HYDRANGEA	3 GALLON	48" O.C. B&B
IG	ILEX GLABRA	INKBERRY	3 GALLON	48" O.C. B&B
IV	ILEX VERTICILLATA	WINTERBERRY	3 GALLON	48" O.C. B&B
MP	MYRICA PENSYLVANICA	NORTHERN BAYBERRY	3 GALLON	48" O.C. B&B
RA	RHUS AROMATICA 'GRO LOW'	GRO LOW SUMAC	3 GALLON	48" O.C. B&B
TM	TAXUS X MEDIA 'HICKSII'	HICKS YEW	3 GALLON	48" O.C. B&B
VA	VACCINIUM ANGUSTIFOLIUM	LOWBUSH BLUEBERRY	3 GALLON	48" O.C. B&B
VD	VIBURNUM DENTATUM	ARROWWOOD VIBURNUM	5 GALLON	48" O.C. B&B
PERENNIALS PALETTE (PP)				
AN	ASTER NOVIAE 'ANGLIAE'	NEW ENGLAND ASTER	1 GAL	18" O.C. CONTAINER
DP	DENNSTAEDTIA PUNCTILOBULA	HAYCENTED FERN	1 GAL	18" O.C. CONTAINER
EP	ECHINACEA PURPUREA	PURPLE CONEFLOWER	1 GAL	18" O.C. CONTAINER
HD	HEMEROCALLIS 'HAPPY RETURNS'	DAYLIILY	1 GAL	18" O.C. CONTAINER
LD	LEUCANTHEMUM X SUPERBUM 'BECKY'	BECKY DAISY	1 GAL	18" O.C. CONTAINER
NF	NEPETA X FAASSENII 'WALKERS LOW'	CATMINT	1 GAL	18" O.C. CONTAINER
PL	PEROVSKIA A. 'LITTLE SPIRE'	LITTLE SPIRE RUSSIAN SAGE	1 GAL	18" O.C. CONTAINER
RF	RUDBECKIA FULGIDA 'GOLDSTURM'	BLACK EYE SUSAN	1 GAL	18" O.C. CONTAINER
TC	TIARELLA CORDIFOLIA	HEARTLEAF FOAMFLOWER	1 GAL	18" O.C. CONTAINER
CM	CAREX MORROWII 'ICE DANCE'	JAPANESE SEDGE	1 GAL	18" O.C. CONTAINER
CP	CAREX PENSYLVANICA	PENNSYLVANIA SEDGE	1 GAL	18" O.C. CONTAINER
LS	LIRIOPE SPICATA	LILY TURF	1 GAL	18" O.C. CONTAINER
PV	PANICUM VIRGATUM 'SHENANDOAH'	SWITCH GRASS	2 GAL	30" O.C. CONTAINER
SB	SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM	2 GAL	30" O.C. CONTAINER
PA	PENNISETUM ALOPECUROIDES	FOUNTAIN GRASS	2 GAL	24" O.C. CONTAINER

BIORETENTION AREA PALETTE				
SHRUBS				
CA	CLETHRA ALNIFOLIA	SWEET PEPPERBUSH	3 GAL	48" O.C. CONTAINER
CS	CORNUS STOLONIFERA	REDTWIG DOGWOOD	3 GAL	48" O.C. CONTAINER
IG	ILEX GLABRA	INKBERRY HOLLY	3 GAL	48" O.C. CONTAINER
IV	ILEX VERTICILLATA	WINTERBERRY HOLLY	3 GAL	48" O.C. CONTAINER
IT	ITEA VIRGINICA	VIRGINIA SWEETSPIRE	3 GAL	48" O.C. CONTAINER
VC	VACCINIUM CORYBOSUM	HIGHBUSH BLUEBERRY	3 GAL	48" O.C. CONTAINER
VD	VIBURNUM DENTATUM	ARROWWOOD VIBURNUM	3 GAL	48" O.C. CONTAINER
PERENNIALS				
AT	ASCLEPIAS TUBEROSA	BUTTERFLY MILKWEED	1 GAL	18" O.C. CONTAINER
BA	BAPTISIA AUSTRALIS	FALSE BLUE INDIGO	1 GAL	18" O.C. CONTAINER
EP	ECHINACEA PURPUREA	PURPLE CONEFLOWER	1 GAL	18" O.C. CONTAINER
EJ	EUPATORIUM PURPUREUM	JOE PYE WEED	1 GAL	18" O.C. CONTAINER
BF	IRIS VERSICOLOR	BLUE FLAG IRIS	1 GAL	18" O.C. CONTAINER
LB	LIATRIS LIGULISTYLIS	MEADOW BLAZING STAR	1 GAL	18" O.C. CONTAINER
RH	RUDBECKIA HIRTA	BLACK EYED SUSAN	1 GAL	18" O.C. CONTAINER
PS	PANICUM VIRGATUM 'SHENANDOAH'	SWITCHGRASS	1 GAL	18" O.C. CONTAINER
SS	SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM	1 GAL	18" O.C. CONTAINER
SN	SYMPHYOTRICHUM NOVAE-ANGLIAE	NEW ENGLAND ASTER	1 GAL	18" O.C. CONTAINER
TC	TIARELLA CORDIFOLIA	HEARTLEAF FOAMFLOWER	1 GAL	18" O.C. CONTAINER

MEADOW SEED MIX			
NEW ENGLAND WETLAND PLANTS, INC	"NEW ENGLAND CONSERVATION / WILDLIFE MIX"	25 LB/ACRE	APPLY COVER CROP; FALL: GRAIN RYE, SPRING: OAT; 800-873-3321; OR APPROVED EQUAL
NEW ENGLAND WETLAND PLANTS, INC	"NEW ENGLAND WILDFLOWER MIX	23 LB/ACRE	APPLY COVER CROP; FALL: GRAIN RYE, SPRING: OAT; 800-873-3321; OR APPROVED EQUAL
	INFILTRATION BASIN "BOTTOM"		SEE CIVIL DRAWINGS FOR BASIN BOTTOM INFORMATION

PLANT SCHEDULE - RESTORATION AREA					
SYMBOL	QTY.	LATIN NAME	COMMON NAME	SIZE	NOTES
RESTORATION AREA - SHADE TREES					
AR1	16	ACER RUBRUM	RED MAPLE	1.5"-2" CAL.	B&B, 6' CLEAR BRANCHING
PC1	3	PRUNUS SEROTINA	BLACK CHERRY	1.5"-2" CAL.	B&B, 6' CLEAR BRANCHING
QV1	86	QUERCUS VELUTINA	BLACK OAK	1.5"-2" CAL.	B&B, 6' CLEAR BRANCHING
RESTORATION AREA - EVERGREEN TREES					
PR1	17	PINUS RIGIDA	PITCH PINE	7-8' TALL	B&B
PS1	22	PINUS STROBUS	WHITE PINE	7-8' TALL	B&B
RESTORATION AREA - SHRUBS					
MIX OF PROPOSED NATIVE SHRUBS PLANTINGS AND NATURALIZED EXISTING TURF AREAS. LOCATIONS AND QUANTITIES OF SHRUBS TBD					

*RESTORATION PLANTINGS PROVIDED BY ILEX ENVIRONMENTAL, INC. REFER TO THE "EMBLEM-HYANNIS RESTORATION PLAN" NARRATIVE FOR MORE INFORMATION

LIGHT SCHEDULE						
SYMBOL	LABEL	MODEL	MOUNT	DESCRIPTION	OPTIONS	REP
	SL4	HUBBELL - RATIO SERIES RAR2-480L-185-4K7-4W-U	CONCRETE FOOTING; KEEP 24" ABOVE GRADE	SINGLE	COLOR: BLK	ILLUMINATE 617-947-8996 STEVE PRUDHOMME
	SL5	HUBBELL - RATIO SERIES RAR2-480L-185-4K7-5QW-U	CONCRETE FOOTING; KEEP 24" ABOVE GRADE	SINGLE	COLOR: BLK	
	SL4-2	HUBBELL - RATIO SERIES RAR2-480L-185-4K7-4W-U	CONCRETE FOOTING; KEEP 24" ABOVE GRADE	BACK-BACK	COLOR: BLK	
	BL-1	ARCLUCE - KLOU-IK180 S-KK0204US-12S-0870006D-740-12US	CONCRETE FOOTING; KEEP 3" ABOVE GRADE	SINGLE	COLOR: BLK	

SUBMIT CUT SHEETS FOR APPROVAL; SEE PHOTOMETRIC PLAN PROVIDED WITH THIS DRAWING SET FOR MORE INFORMATION.

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EMBLEM HYANNIS
35 SCUDDER AVENUE
HYANNIS, MA

STAMP

MASSACHUSETTS MICHAEL D'ANGELO NO. 4006 REGISTERED LANDSCAPE ARCHITECT

REV. NO.	DATE	DESCRIPTION
1	4/1/21	CCC SUBMITTAL
2	10/21/22	CCC RESUBMITTAL

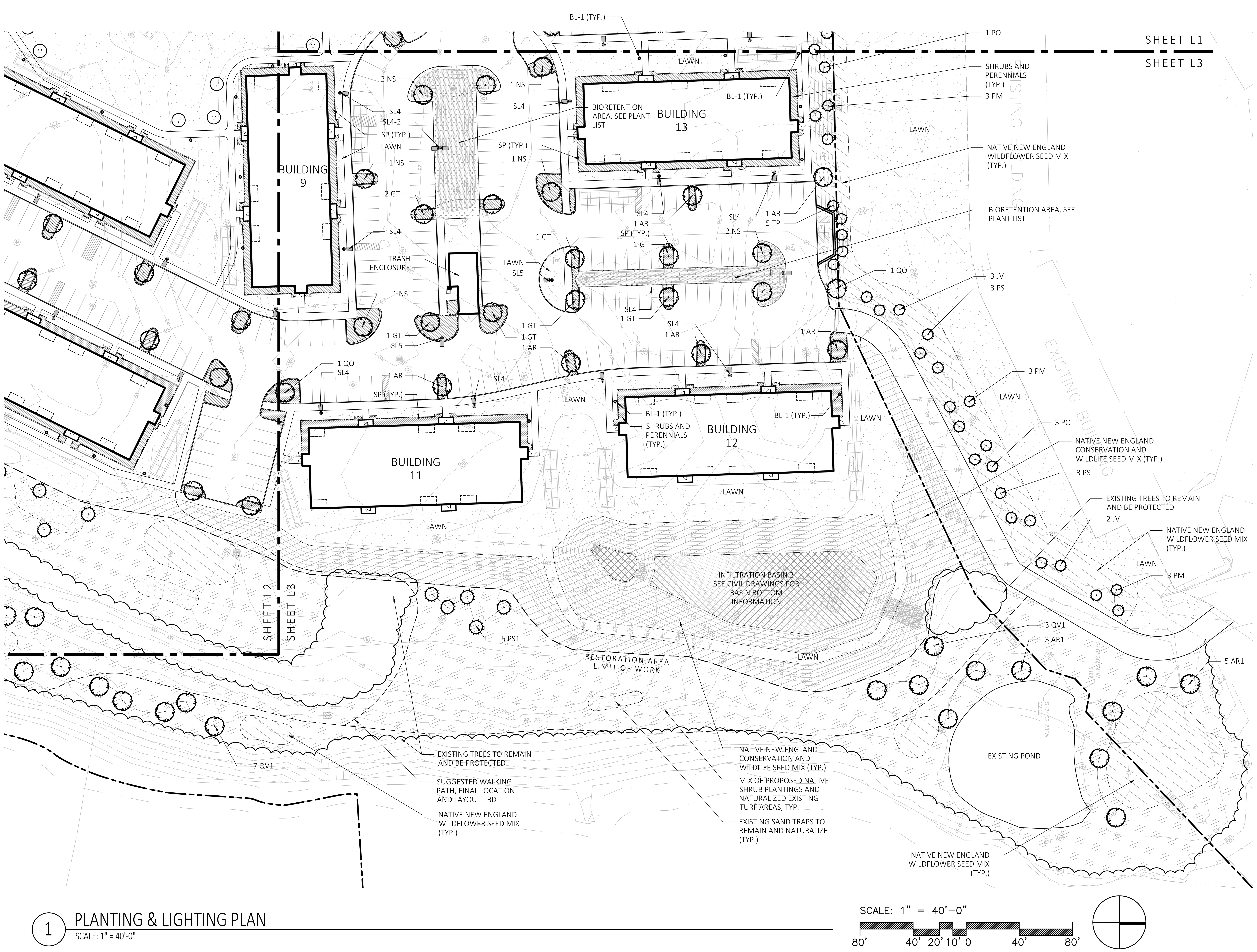
PLANTING AND LIGHTING PLAN

DRAWN
CHECKED
SCALE AS NOTED
DATE 03/01/21

L2

SHEET 3 OF 10

plot date: 11/2/2022



1 PLANTING & LIGHTING PLAN
SCALE: 1" = 40'-0"

PLANT SCHEDULE - MAIN SITE

SYMBOL	QTY.	LATIN NAME	COMMON NAME	SIZE	NOTES
SHADE TREES					
AR	72	ACER RUBRUM 'RED SUNSET'	RED SUNSET MAPLE	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
GT	17	GLEDITSEA TRICANTHOS 'SKYLINE'	SKYLINE HONEYLOCUST	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
NS	39	NYSSA SYLVATICA	BLACK TUPELO	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
QB	3	QUERCUS BICOLOR	SWAMP WHITE OAK	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
QC	4	QUERCUS COCCINEA	SCARLET OAK	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
QO	12	QUERCUS PALUSTRIS	PIN OAK	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
UA	2	ULMUS AMERICANA 'PRINCETON'	PRINCETON ELM	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
ORNAMENTAL TREES					
AS	12	AMELANCHIER 'AUTUMN BRILLIANCE'	SERVICEBERRY	6-7' TALL	B&B, MULTI-STEM
BN	19	BETULA NIGRA 'HERITAGE'	RIVER BIRCH	10-12' TALL	B&B, MULTI-STEM
CC	3	CERCIS CANADENSIS	EASTERN REDBUD	6-7' TALL	B&B, SINGLE AND MULTI-STEM
MS	13	MAGNOLIA STELLATA	STAR MAGNOLIA	6-7' TALL	B&B, SPECIMEN
EVERGREEN TREES					
AC	10	ABIES CONCOLOR	WHITE FIR	7-8' TALL	B&B
JV	5	JUNIPERUS VIRGINIANA	EASTER RED CEDAR	7-8' TALL	B&B
PM	17	PSEUDOTSUGA MENZIESII	DOUGLAS FIR	7-8' TALL	B&B
PO	4	PICEA GLAUCA	WHITE SPRUCE	7-8' TALL	B&B
PS	10	PINUS STROBUS	WHITE PINE	7-8' TALL	B&B
TP	8	THUJA PLICATA 'GREEN GIANT'	GREEN GIANT ARBORVITAE	7-8' TALL	B&B

SHRUBS PALETTE (SP)				
CA	CLETHERA ALNIFOLIA	SUMMERSWEET	3 GALLON	48" O.C. B&B
CS	CORNUS SERICEA 'ARCTIC FIRE'	ARCTIC FIRE DOGWOOD	3 GALLON	48" O.C. B&B
FG	FOTHERGILLA GARDENII	DWARF FOTHERGILLA	3 GALLON	48" O.C. B&B
HA	HYDRANGEA ARBORESCENS 'ANNABELLE'	ANNABELLE HYDRANGEA	3 GALLON	48" O.C. B&B
HP	HYDRANGEA PANICULATA 'LITTLE LIME'	LITTLE LIME HYDRANGEA	3 GALLON	48" O.C. B&B
HQ	HYDRANGEA QUERCIFOLIA	OAKLEAF HYDRANGEA	3 GALLON	48" O.C. B&B
IG	ILEX GLABRA	INKBERRY	3 GALLON	48" O.C. B&B
IV	ILEX VERTICILLATA	WINTERBERRY	3 GALLON	48" O.C. B&B
MP	MYRICA PENSYLVANICA	NORTHERN BAYBERRY	3 GALLON	48" O.C. B&B
RA	RHUS AROMATICA 'GRO LOW'	GRO LOW SUMAC	3 GALLON	48" O.C. B&B
TM	TAXUS X MEDIA 'HICKSII'	HICKS YEW	3 GALLON	48" O.C. B&B
VA	VACCINIUM ANGUSTIFOLIUM	LOWBUSH BLUEBERRY	3 GALLON	48" O.C. B&B
VD	VIBURNUM DENTATUM	ARROWWOOD VIBURNUM	5 GALLON	48" O.C. B&B
PERENNIALS PALETTE (PP)				
AN	ASTER NOVIAE 'ANGLIAE'	NEW ENGLAND ASTER	1 GAL	18" O.C. CONTAINER
DP	DENNSTAEDTIA PUNCTILOBULA	HAYCENTED FERN	1 GAL	18" O.C. CONTAINER
EP	ECHINACEA PURPUREA	PURPLE CONEFLOWER	1 GAL	18" O.C. CONTAINER
HD	HEMEROCALLIS 'HAPPY RETURNS'	DAYLIILY	1 GAL	18" O.C. CONTAINER
LD	LEUCANTHEMUM X SUPERBUM 'BECKY'	BECKY DAISY	1 GAL	18" O.C. CONTAINER
NF	NEPETA X FAASSENII 'WALKERS LOW'	CATMINT	1 GAL	18" O.C. CONTAINER
PL	PEROVSKIA A. 'LITTLE SPIRE'	LITTLE SPIRE RUSSIAN SAGE	1 GAL	18" O.C. CONTAINER
RF	RUDBECKIA FULGIDA 'GOLDSTURM'	BLACK EYE SUSAN	1 GAL	18" O.C. CONTAINER
TC	TIARELLA CORDIFOLIA	HEARTLEAF FOAMFLOWER	1 GAL	18" O.C. CONTAINER
CM	CAREX MORROWII 'ICE DANCE'	JAPANESE SEDGE	1 GAL	18" O.C. CONTAINER
CP	CAREX PENSYLVANICA	PENNSYLVANIA SEDGE	1 GAL	18" O.C. CONTAINER
LS	LIRIOPE SPICATA	LILY TURF	1 GAL	18" O.C. CONTAINER
PV	PANICUM VIRGATUM 'SHENANDOAH'	SWITCH GRASS	2 GAL	30" O.C. CONTAINER
SB	SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM	2 GAL	30" O.C. CONTAINER
PA	PENNISETUM ALOPECUROIDES	FOUNTAIN GRASS	2 GAL	24" O.C. CONTAINER

BIORETENTION AREA PALETTE

SHRUBS				
CA	CLETHRA ALNIFOLIA	SWEET PEPPERBUSH	3 GAL	48" O.C. CONTAINER
CS	CORNUS STOLONIFERA	REDTWIG DOGWOOD	3 GAL	48" O.C. CONTAINER
IG	ILEX GLABRA	INKBERRY HOLLY	3 GAL	48" O.C. CONTAINER
IV	ILEX VERTICILLATA	WINTERBERRY HOLLY	3 GAL	48" O.C. CONTAINER
IT	ITEA VIRGINICA	VIRGINIA SWEETSPIRE	3 GAL	48" O.C. CONTAINER
VC	VACCINIUM CORYBOSUM	HIGHBUSH BLUEBERRY	3 GAL	48" O.C. CONTAINER
VD	VIBURNUM DENTATUM	ARROWWOOD VIBURNUM	3 GAL	48" O.C. CONTAINER
PERENNIALS				
AT	ASCLEPIAS TUBEROSA	BUTTERFLY MILKWEED	1 GAL	18" O.C. CONTAINER
BA	BAPTISIA AUSTRALIS	FALSE BLUE INDIGO	1 GAL	18" O.C. CONTAINER
EP	ECHINACEA PURPUREA	PURPLE CONEFLOWER	1 GAL	18" O.C. CONTAINER
EJ	EUPATORIUM PURPUREUM	JOE PYE WEED	1 GAL	18" O.C. CONTAINER
BF	IRIS VERSICOLOR	BLUE FLAG IRIS	1 GAL	18" O.C. CONTAINER
LB	LIATRIS LIGULISTYLIS	MEADOW BLAZING STAR	1 GAL	18" O.C. CONTAINER
RH	RUDBECKIA HIRTA	BLACK EYED SUSAN	1 GAL	18" O.C. CONTAINER
PS	PANICUM VIRGATUM 'SHENANDOAH'	SWITCHGRASS	1 GAL	18" O.C. CONTAINER
SS	SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM	1 GAL	18" O.C. CONTAINER
SN	SYMPHYOTRICHUM NOVAE-ANGLIAE	NEW ENGLAND ASTER	1 GAL	18" O.C. CONTAINER
TC	TIARELLA CORDIFOLIA	HEARTLEAF FOAMFLOWER	1 GAL	18" O.C. CONTAINER

MEADOW SEED MIX

NEW ENGLAND WETLAND PLANTS, INC	"NEW ENGLAND CONSERVATION / WILDLIFE MIX"	25 LB/ACRE	APPLY COVER CROP; FALL: GRAIN RYE, SPRING: OAT; 800-873-3321; OR APPROVED EQUAL
NEW ENGLAND WETLAND PLANTS, INC	"NEW ENGLAND WILDFLOWER MIX	23 LB/ACRE	APPLY COVER CROP; FALL: GRAIN RYE, SPRING: OAT; 800-873-3321; OR APPROVED EQUAL
	INFILTRATION BASIN "BOTTOM"		SEE CIVIL DRAWINGS FOR BASIN BOTTOM INFORMATION

PLANT SCHEDULE - RESTORATION AREA

SYMBOL	QTY.	LATIN NAME	COMMON NAME	SIZE	NOTES
RESTORATION AREA - SHADE TREES					
AR1	16	ACER RUBRUM	RED MAPLE	1.5"-2" CAL.	B&B, 6' CLEAR BRANCHING
PC1	3	PRUNUS SEROTINA	BLACK CHERRY	1.5"-2" CAL.	B&B, 6' CLEAR BRANCHING
QV1	86	QUERCUS VELUTINA	BLACK OAK	1.5"-2" CAL.	B&B, 6' CLEAR BRANCHING
RESTORATION AREA - EVERGREEN TREES					
PR1	17	PINUS RIGIDA	PITCH PINE	7-8' TALL	B&B
PS1	22	PINUS STROBUS	WHITE PINE	7-8' TALL	B&B
RESTORATION AREA - SHRUBS					
MIX OF PROPOSED NATIVE SHRUBS PLANTINGS AND NATURALIZED EXISTING TURF AREAS. LOCATIONS AND QUANTITIES OF SHRUBS TBD					

*RESTORATION PLANTINGS PROVIDED BY ILEX ENVIRONMENTAL, INC. REFER TO THE "EMBLEM-HYANNIS RESTORATION PLAN" NARRATIVE FOR MORE INFORMATION

LIGHT SCHEDULE

SYMBOL	LABEL	MODEL	MOUNT	DESCRIPTION	OPTIONS	REP
	SL4	HUBBELL - RATIO SERIES RAR2-480L-185-4K7-4W-U	CONCRETE FOOTING; KEEP 24" ABOVE GRADE	SINGLE	COLOR: BLK	ILLUMINATE 617-947-8996 STEVE PRUDHOMME
	SL5	HUBBELL - RATIO SERIES RAR2-480L-185-4K7-5QW-U	CONCRETE FOOTING; KEEP 24" ABOVE GRADE	SINGLE	COLOR: BLK	
	SL4-2	HUBBELL - RATIO SERIES RAR2-480L-185-4K7-4W-U	CONCRETE FOOTING; KEEP 24" ABOVE GRADE	BACK-BACK	COLOR: BLK	
	BL-1	ARCLUCE - KLOU-IK180 S-KK0204US-12S-0870006D-740-12US	CONCRETE FOOTING; KEEP 3" ABOVE GRADE	SINGLE	COLOR: BLK	

SUBMIT CUT SHEETS FOR APPROVAL; SEE PHOTOMETRIC PLAN PROVIDED WITH THIS DRAWING SET FOR MORE INFORMATION.

NOT FOR CONSTRUCTION

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EMBLEM HYANNIS
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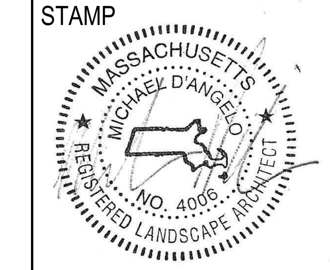
HYANNIS, MA

STAMP



REV. NO.	DATE	DESCRIPTION
1	4/1/21	CCC SUBMITTAL
2	10/21/22	CCC RESUBMITTAL

PLANTING AND LIGHTING PLAN

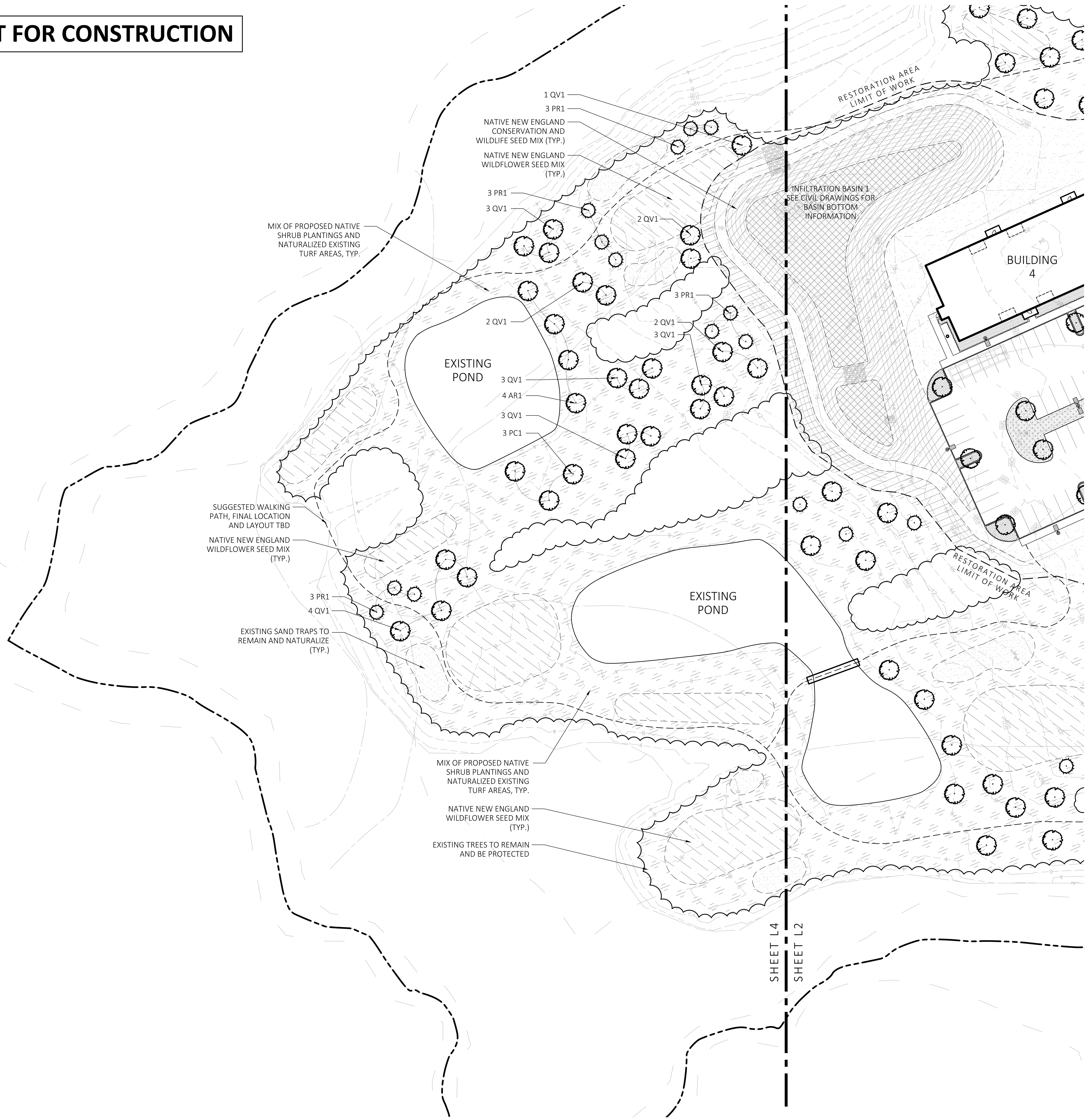
DRAWN
CHECKED
SCALE AS NOTED
DATE 03/01/21

L3

SHEET 4 OF 10

plot date: 11/2/2022

NOT FOR CONSTRUCTION



1 PLANTING & LIGHTING PLAN
SCALE: 1" = 40'-0"

SCALE: 1" = 40'-0"
80' 40' 20' 10' 0 40' 80'

PLANT SCHEDULE - MAIN SITE

SYMBOL	QTY.	LATIN NAME	COMMON NAME	SIZE	NOTES
SHADE TREES					
AR	72	ACER RUBRUM 'RED SUNSET'	RED SUNSET MAPLE	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
GT	17	GLEDITSEA TRICANTHOS 'SKYLINE'	SKYLINE HONEYLOCUST	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
NS	39	NYSSA SYLVATICA	BLACK TUPELO	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
QB	3	QUERCUS BICOLOR	SWAMP WHITE OAK	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
QC	4	QUERCUS COCCINEA	SCARLET OAK	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
QO	12	QUERCUS PALUSTRIS	PIN OAK	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
UA	2	ULMUS AMERICANA 'PRINCETON'	PRINCETON ELM	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
ORNAMENTAL TREES					
AS	12	AMELANCHIER 'AUTUMN BRILLIANCE'	SERVICEBERRY	6-7' TALL	B&B, MULTI-STEM
BN	19	BETULA NIGRA 'HERITAGE'	RIVER BIRCH	10-12' TALL	B&B, MULTI-STEM
CC	3	CERCIS CANADENSIS	EASTERN REDBUD	6-7' TALL	B&B, SINGLE AND MULTI-STEM
MS	13	MAGNOLIA STELLATA	STAR MAGNOLIA	6-7' TALL	B&B, SPECIMEN
EVERGREEN TREES					
AC	10	ABIES CONCOLOR	WHITE FIR	7-8' TALL	B&B
JV	5	JUNIPERUS VIRGINIANA	EASTER RED CEDAR	7-8' TALL	B&B
PM	17	PSEUDOTSUGA MENZIESII	DOUGLAS FIR	7-8' TALL	B&B
PO	4	PICEA GLAUCA	WHITE SPRUCE	7-8' TALL	B&B
PS	10	PINUS STROBUS	WHITE PINE	7-8' TALL	B&B
TP	8	THUJA PLICATA 'GREEN GIANT'	GREEN GIANT ARBORVITAE	7-8' TALL	B&B

SHRUBS PALETTE (SP)				
CA	CLETHERA ALNIFOLIA	SUMMERSWEET	3 GALLON	48" O.C. B&B
CS	CORNUS SERICEA 'ARCTIC FIRE'	ARCTIC FIRE DOGWOOD	3 GALLON	48" O.C. B&B
FG	FOTHERGILLA GARDENII	DWARF FOTHERGILLA	3 GALLON	48" O.C. B&B
HA	HYDRANGEA ARBORESCENS 'ANNABELLE'	ANNABELLE HYDRANGEA	3 GALLON	48" O.C. B&B
HP	HYDRANGEA PANICULATA 'LITTLE LIME'	LITTLE LIME HYDRANGEA	3 GALLON	48" O.C. B&B
HQ	HYDRANGEA QUERCIFOLIA	OAKLEAF HYDRANGEA	3 GALLON	48" O.C. B&B
IG	ILEX GLABRA	INKBERRY	3 GALLON	48" O.C. B&B
IV	ILEX VERTICILLATA	WINTERBERRY	3 GALLON	48" O.C. B&B
MP	MYRICA PENSYLVANICA	NORTHERN BAYBERRY	3 GALLON	48" O.C. B&B
RA	RHUS AROMATICA 'GRO LOW'	GRO LOW SUMAC	3 GALLON	48" O.C. B&B
TM	TAXUS X MEDIA 'HICKSII'	HICKS YEW	3 GALLON	48" O.C. B&B
VA	VACCINIUM ANGUSTIFOLIUM	LOWBUSH BLUEBERRY	3 GALLON	48" O.C. B&B
VD	VIBURNUM DENTATUM	ARROWWOOD VIBURNUM	5 GALLON	48" O.C. B&B
PERENNIALS PALETTE (PP)				
AN	ASTER NOVIAE 'ANGLIAE'	NEW ENGLAND ASTER	1 GAL	18" O.C. CONTAINER
DP	DENNSTAEDTIA PUNCTILOBULA	HAYCENTED FERN	1 GAL	18" O.C. CONTAINER
EP	ECHINACEA PURPUREA	PURPLE CONEFLOWER	1 GAL	18" O.C. CONTAINER
HD	HEMEROCALLIS 'HAPPY RETURNS'	DAYLIILY	1 GAL	18" O.C. CONTAINER
LD	LEUCANTHEMUM X SUPERBUM 'BECKY'	BECKY DAISY	1 GAL	18" O.C. CONTAINER
NF	NEPETA X FAASSENII 'WALKERS LOW'	CATMINT	1 GAL	18" O.C. CONTAINER
PL	PEROVSKIA A. 'LITTLE SPIRE'	LITTLE SPIRE RUSSIAN SAGE	1 GAL	18" O.C. CONTAINER
RF	RUDBECKIA FULGIDA 'GOLDSTURM'	BLACK EYE SUSAN	1 GAL	18" O.C. CONTAINER
TC	TIARELLA CORDIFOLIA	HEARTLEAF FOAMFLOWER	1 GAL	18" O.C. CONTAINER
CM	CAREX MORROWII 'ICE DANCE'	JAPANESE SEDGE	1 GAL	18" O.C. CONTAINER
CP	CAREX PENSYLVANICA	PENNSYLVANIA SEDGE	1 GAL	18" O.C. CONTAINER
LS	LIRIOPE SPICATA	LILY TURF	1 GAL	18" O.C. CONTAINER
PV	PANICUM VIRGATUM 'SHENANDOAH'	SWITCH GRASS	2 GAL	30" O.C. CONTAINER
SB	SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM	2 GAL	30" O.C. CONTAINER
PA	PENNISETUM ALOPECUROIDES	FOUNTAIN GRASS	2 GAL	24" O.C. CONTAINER

BIORETENTION AREA PALETTE

SHRUBS				
CA	CLETHRA ALNIFOLIA	SWEET PEPPERBUSH	3 GAL	48" O.C. CONTAINER
CS	CORNUS STOLONIFERA	REDTWIG DOGWOOD	3 GAL	48" O.C. CONTAINER
IG	ILEX GLABRA	INKBERRY HOLLY	3 GAL	48" O.C. CONTAINER
IV	ILEX VERTICILLATA	WINTERBERRY HOLLY	3 GAL	48" O.C. CONTAINER
IT	ITEA VIRGINICA	VIRGINIA SWEETSPIRE	3 GAL	48" O.C. CONTAINER
VC	VACCINIUM CORYBOSUM	HIGHBUSH BLUEBERRY	3 GAL	48" O.C. CONTAINER
VD	VIBURNUM DENTATUM	ARROWWOOD VIBURNUM	3 GAL	48" O.C. CONTAINER
PERENNIALS				
AT	ASCLEPIAS TUBEROSA	BUTTERFLY MILKWEED	1 GAL	18" O.C. CONTAINER
BA	BAPTISIA AUSTRALIS	FALSE BLUE INDIGO	1 GAL	18" O.C. CONTAINER
EP	ECHINACEA PURPUREA	PURPLE CONEFLOWER	1 GAL	18" O.C. CONTAINER
EJ	EUPATORIUM PURPUREUM	JOE PYE WEED	1 GAL	18" O.C. CONTAINER
BF	IRIS VERSICOLOR	BLUE FLAG IRIS	1 GAL	18" O.C. CONTAINER
LB	LIATRIS LIGULISTYLIS	MEADOW BLAZING STAR	1 GAL	18" O.C. CONTAINER
RH	RUDBECKIA HIRTA	BLACK EYED SUSAN	1 GAL	18" O.C. CONTAINER
PS	PANICUM VIRGATUM 'SHENANDOAH'	SWITCHGRASS	1 GAL	18" O.C. CONTAINER
SS	SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM	1 GAL	18" O.C. CONTAINER
SN	SYMPHYOTRICHUM NOVAE-ANGLIAE	NEW ENGLAND ASTER	1 GAL	18" O.C. CONTAINER
TC	TIARELLA CORDIFOLIA	HEARTLEAF FOAMFLOWER	1 GAL	18" O.C. CONTAINER

MEADOW SEED MIX

NEW ENGLAND WETLAND PLANTS, INC	"NEW ENGLAND CONSERVATION / WILDLIFE MIX"	25 LB/ACRE	APPLY COVER CROP; FALL: GRAIN RYE, SPRING: OAT; 800-873-3321; OR APPROVED EQUAL
NEW ENGLAND WETLAND PLANTS, INC	"NEW ENGLAND WILDFLOWER MIX	23 LB/ACRE	APPLY COVER CROP; FALL: GRAIN RYE, SPRING: OAT; 800-873-3321; OR APPROVED EQUAL
	INFILTRATION BASIN "BOTTOM"		SEE CIVIL DRAWINGS FOR BASIN BOTTOM INFORMATION

PLANT SCHEDULE - RESTORATION AREA

SYMBOL	QTY.	LATIN NAME	COMMON NAME	SIZE	NOTES
RESTORATION AREA - SHADE TREES					
AR1	16	ACER RUBRUM	RED MAPLE	1.5"-2" CAL.	B&B, 6' CLEAR BRANCHING
PC1	3	PRUNUS SEROTINA	BLACK CHERRY	1.5"-2" CAL.	B&B, 6' CLEAR BRANCHING
QV1	86	QUERCUS VELUTINA	BLACK OAK	1.5"-2" CAL.	B&B, 6' CLEAR BRANCHING
RESTORATION AREA - EVERGREEN TREES					
PR1	17	PINUS RIGIDA	PITCH PINE	7-8' TALL	B&B
PS1	22	PINUS STROBUS	WHITE PINE	7-8' TALL	B&B
RESTORATION AREA - SHRUBS					
MIX OF PROPOSED NATIVE SHRUBS PLANTINGS AND NATURALIZED EXISTING TURF AREAS. LOCATIONS AND QUANTITIES OF SHRUBS TBD					

*RESTORATION PLANTINGS PROVIDED BY ILEX ENVIRONMENTAL, INC. REFER TO THE "EMBLEM-HYANNIS RESTORATION PLAN" NARRATIVE FOR MORE INFORMATION

LIGHT SCHEDULE

SYMBOL	LABEL	MODEL	MOUNT	DESCRIPTION	OPTIONS	REP
	SL4	HUBBELL - RATIO SERIES RAR2-480L-185-4K7-4W-U	CONCRETE FOOTING; KEEP 24" ABOVE GRADE	SINGLE	COLOR: BLK	ILLUMINATE 617-947-8996 STEVE PRUDHOMME
	SL5	HUBBELL - RATIO SERIES RAR2-480L-185-4K7-5QW-U	CONCRETE FOOTING; KEEP 24" ABOVE GRADE	SINGLE	COLOR: BLK	
	SL4-2	HUBBELL - RATIO SERIES RAR2-480L-185-4K7-4W-U	CONCRETE FOOTING; KEEP 24" ABOVE GRADE	BACK-BACK	COLOR: BLK	
	BL-1	ARCLUCE - KLOU-IK180 S-KK0204US-125-0870006D-740-12US	CONCRETE FOOTING; KEEP 3" ABOVE GRADE	SINGLE	COLOR: BLK	

SUBMIT CUT SHEETS FOR APPROVAL; SEE PHOTOMETRIC PLAN PROVIDED WITH THIS DRAWING SET FOR MORE INFORMATION.

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REV. NO.	DATE	DESCRIPTION
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2	10/21/22	CCC RESUBMITTAL

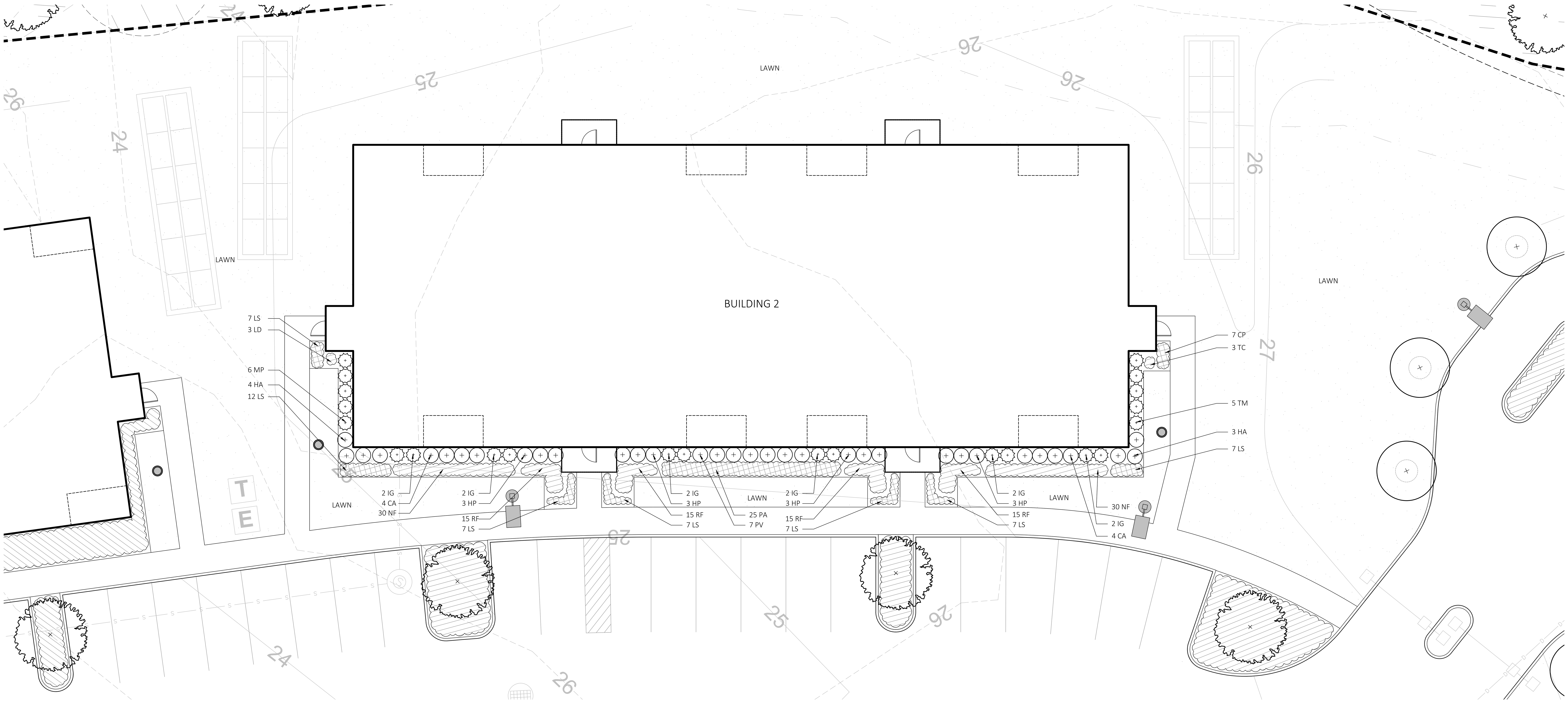
PLANTING AND LIGHTING PLAN

DRAWN
CHECKED
SCALE AS NOTED
DATE 03/01/21

L4

SHEET 5 OF 10

plot date: 11/2/2022



1 TYPICAL BUILDING PLANTING PLAN ENLARGEMENT

SCALE: 1" = 10'-0"

SCALE: 1" = 10'-0"

20' 10' 5' 2.5' 0 10' 20'

PLANT SCHEDULE - MAIN SITE					
SYMBOL	QTY.	LATIN NAME	COMMON NAME	SIZE	NOTES
SHADE TREES					
AR	72	ACER RUBRUM 'RED SUNSET'	RED SUNSET MAPLE	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
GT	17	GLEDITSEA TRICANTHOS 'SKYLINE'	SKYLINE HONEYLOCUST	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
NS	39	NYSSA SYLVATICA	BLACK TUPELO	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
QB	3	QUERCUS BICOLOR	SWAMP WHITE OAK	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
QC	4	QUERCUS COCCINEA	SCARLET OAK	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
QO	12	QUERCUS PALUSTRIS	PIN OAK	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
UA	2	ULMUS AMERICANA 'PRINCETON'	PRINCETON ELM	3"-3.5" CAL.	B&B, 6' CLEAR BRANCHING
ORNAMENTAL TREES					
AS	12	AMELANCHIER 'AUTUMN BRILLIANCE'	SERVICEBERRY	6-7' TALL	B&B, MULTI-STEM
BN	19	BETULA NIGRA 'HERITAGE'	RIVER BIRCH	10-12' TALL	B&B, MULTI-STEM
CC	3	CERCIS CANADENSIS	EASTERN REDBUD	6-7' TALL	B&B, SINGLE AND MULTI-STEM
MS	13	MAGNOLIA STELLATA	STAR MAGNOLIA	6-7' TALL	B&B, SPECIMEN
EVERGREEN TREES					
AC	10	ABIES CONCOLOR	WHITE FIR	7-8' TALL	B&B
JV	5	JUNIPERUS VIRGINIANA	EASTER RED CEDAR	7-8' TALL	B&B
PM	17	PSEUDOTSUGA MENZIESII	DOUGLAS FIR	7-8' TALL	B&B
PO	4	PICEA GLAUCA	WHITE SPRUCE	7-8' TALL	B&B
PS	10	PINUS STROBUS	WHITE PINE	7-8' TALL	B&B
TP	8	THUJA PLICATA 'GREEN GIANT'	GREEN GIANT ARBORVITAE	7-8' TALL	B&B

SHRUBS PALETTE (SP)				
CA	CLETHERA ALNIFOLIA	SUMMERSWEET	3 GALLON	48" O.C. B&B
CS	CORNUS SERICEA 'ARCTIC FIRE'	ARCTIC FIRE DOGWOOD	3 GALLON	48" O.C. B&B
FG	FOTHERGILLA GARDENII	DWARF FOTHERGILLA	3 GALLON	48" O.C. B&B
HA	HYDRANGEA ARBORESCENS 'ANNABELLE'	ANNABELLE HYDRANGEA	3 GALLON	48" O.C. B&B
HP	HYDRANGEA PANICULATA 'LITTLE LIME'	LITTLE LIME HYDRANGEA	3 GALLON	48" O.C. B&B
HQ	HYDRANGEA QUERCIFOLIA	OAKLEAF HYDRANGEA	3 GALLON	48" O.C. B&B
IG	ILEX GLABRA	INKBERRY	3 GALLON	48" O.C. B&B
IV	ILEX VERTICILLATA	WINTERBERRY	3 GALLON	48" O.C. B&B
MP	MYRICA PENSYLVANICA	NORTHERN BAYBERRY	3 GALLON	48" O.C. B&B
RA	RHUS AROMATICA 'GRO LOW'	GRO LOW SUMAC	3 GALLON	48" O.C. B&B
TM	TAXUS X MEDIA 'HICKSII'	HICKS YEW	3 GALLON	48" O.C. B&B
VA	VACCINIUM ANGUSTIFOLIUM	LOWBUSH BLUEBERRY	3 GALLON	48" O.C. B&B
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HD	HEMEROCALLIS 'HAPPY RETURNS'	DAYLIILY	1 GAL	18" O.C. CONTAINER
LD	LEUCANTHEMUM X SUPERBUM 'BECKY'	BECKY DAISY	1 GAL	18" O.C. CONTAINER
NF	NEPETA X FAASSENII 'WALKERS LOW'	CATMINT	1 GAL	18" O.C. CONTAINER
PL	PEROVSKIA A. 'LITTLE SPIRE'	LITTLE SPIRE RUSSIAN SAGE	1 GAL	18" O.C. CONTAINER
RF	RUDBECKIA FULGIDA 'GOLDSTURM'	BLACK EYE SUSAN	1 GAL	18" O.C. CONTAINER
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PV	PANICUM VIRGATUM 'SHENANDOAH'	SWITCH GRASS	2 GAL	30" O.C. CONTAINER
SB	SCHIZACHYRIUM SCOPARIUM	LITTLE BLUESTEM	2 GAL	30" O.C. CONTAINER
PA	PENNISETUM ALOPECUROIDES	FOUNTAIN GRASS	2 GAL	24" O.C. CONTAINER

PLANTING:

1. DURING CONSTRUCTION, PROTECT ALL EXISTING SITE FEATURES, STRUCTURES AND UTILITIES.
2. PLANTS SHALL BE TRUE TO SPECIES AND VARIETY SPECIFIED AND NURSERY GROWN IN ACCORDANCE WITH THE AMERICAN STANDARD FOR NURSERY STOCK UNDER CLIMATIC CONDITIONS SIMILAR TO THOSE IN THE LOCALITY OF THE PROJECT. SUBSTITUTIONS WILL BE PERMITTED ONLY IF APPROVED BY THE LANDSCAPE ARCHITECT.
3. LANDSCAPE ARCHITECT APPROVAL IS REQUIRED BEFORE PLANT MATERIAL IS PURCHASED. LANDSCAPE ARCHITECT RESERVES THE RIGHT TO SEE ALL MATERIAL IN PERSON AT THE NURSERY. IF TRAVEL OUTSIDE OF MA IS REQUIRED, LANDSCAPE ARCHITECT'S TRAVEL COSTS SHALL BE PAID FOR BY THE CONTRACTOR.
4. ALL EXPOSED BURLAP, WIRE BASKETS AND OTHER MATERIALS ATTACHED TO PLANTS SHALL BE REMOVED PRIOR TO PLANTING. CARE SHALL BE TAKEN NOT TO DISTURB THE ROOT BALL OF PLANTS.
5. THOROUGHLY WATER ALL PLANTS IMMEDIATELY AFTER PLANTING.
6. WHERE DISCREPANCIES IN QUANTITIES OCCUR, DRAWINGS SUPERCEDE PLANT NOTES AND SCHEDULE.
7. TRANSPLANTING SHALL BE DONE IN ACCORDANCE WITH THE AMERICAN STANDARD FOR NURSERY STOCK.
8. LOAM USED IN PLANT BEDS SHALL BE UNIFORM IN COMPOSITION, FREE FROM SUBSOIL, STONES LARGER THAN 1", NOXIOUS SEEDS AND SUITABLE FOR THE SUPPORT OF VEGETATIVE GROWTH. THE pH VALUE SHALL BE BETWEEN 5.5 AND 6.5.
9. MULCH IN TREE AND SHRUB BEDS SHALL BE NATURAL, NATIVE HEMLOCK MULCH FREE OF GROWTH OR GERMINATION INHIBITING INGREDIENTS. SUBMIT SAMPLES FOR APPROVAL.
10. LOCATIONS FOR PLANTS AND/OR OUTLINE OF AREAS TO BE PLANTED ARE TO BE STAKED OUT AT THE SITE FOR APPROVAL BY THE LANDSCAPE ARCHITECT.
11. SOIL DEPTHS: a.) SHRUBS AND PERENNIAL BEDS: 18" MIN.; b.) GROUNDCOVER: 6" MIN.; c.) TREES: PER CONSTRUCTION DETAIL; d.) SOD/SEED: 6"MIN.
12. PROVIDE A SUBSURFACE ROOTBALL ANCHOR BY PLATIPUS EARTH ANCHORS, OR APPROVED EQUAL. SIZE FOR CALIPER AND HEIGHT.

NOT FOR CONSTRUCTION

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EMBLEM HYANNIS
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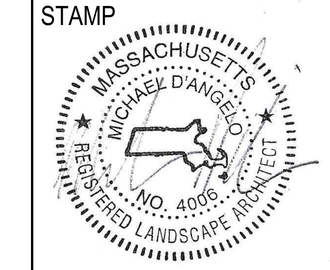
HYANNIS, MA

STAMP



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TYPICAL BUILDING PLANTING PLAN ENLARGEMENT

DRAWN

CHECKED

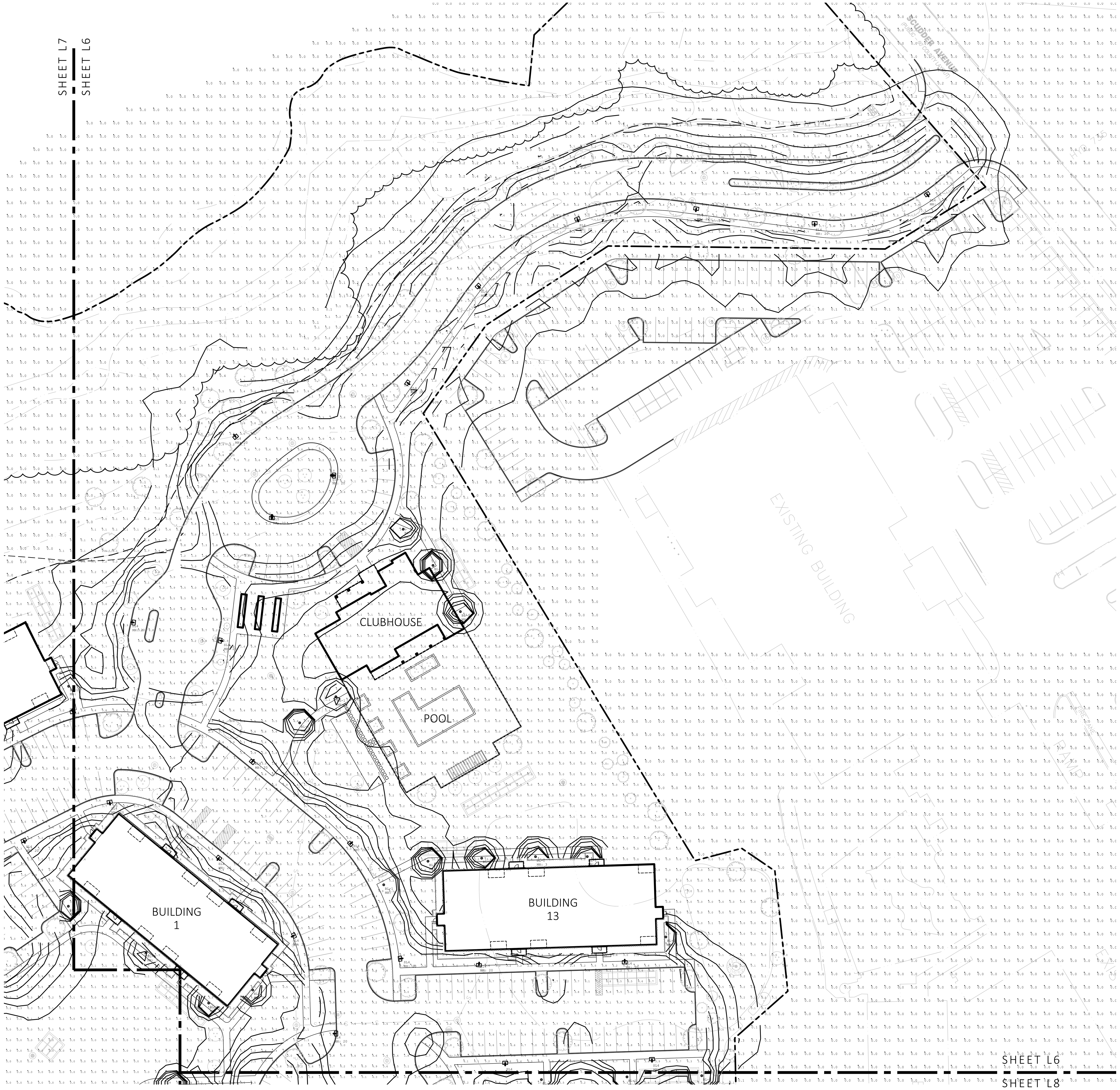
SCALE
AS NOTED

DATE
03/01/21

L5

SHEET 6 OF 10

plot date: 11/2/2022



1 PHOTOMETRIC PLAN
SCALE: 1" = 40'-0"

SCALE: 1" = 40'-0"
80' 40' 20' 10' 0 40' 80'

Luminaire Schedule

Symbol	Qty	Label	Arrangement	LLF	Description	Lum. Lumens
	52	SL4	SINGLE	0.900	RAR2-480L-185-4K7-4W-U	25636
	5	SL5	SINGLE	0.900	RAR2-480L-185-4K7-5QW-U	26266
	2	SL4-2	BACK-BACK	0.900	RAR2-480L-185-4K7-4W-U	25636
	51	BL-1	SINGLE	1.000	S-KK0204US-12S-0870006D-740-12US	1356

Calculation Summary

Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
LANDSCAPE AREAS	Illuminance	Fc	0.82	19.2	0.0	N.A.	N.A.
PARKING + ROADWAYS	Illuminance	Fc	4.26	10.7	0.4	10.65	26.75
SPILL LIGHT	Illuminance	Fc	0.01	3.3	0.0	N.A.	N.A.

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NO. 4006
REGISTERED LANDSCAPE ARCHITECT

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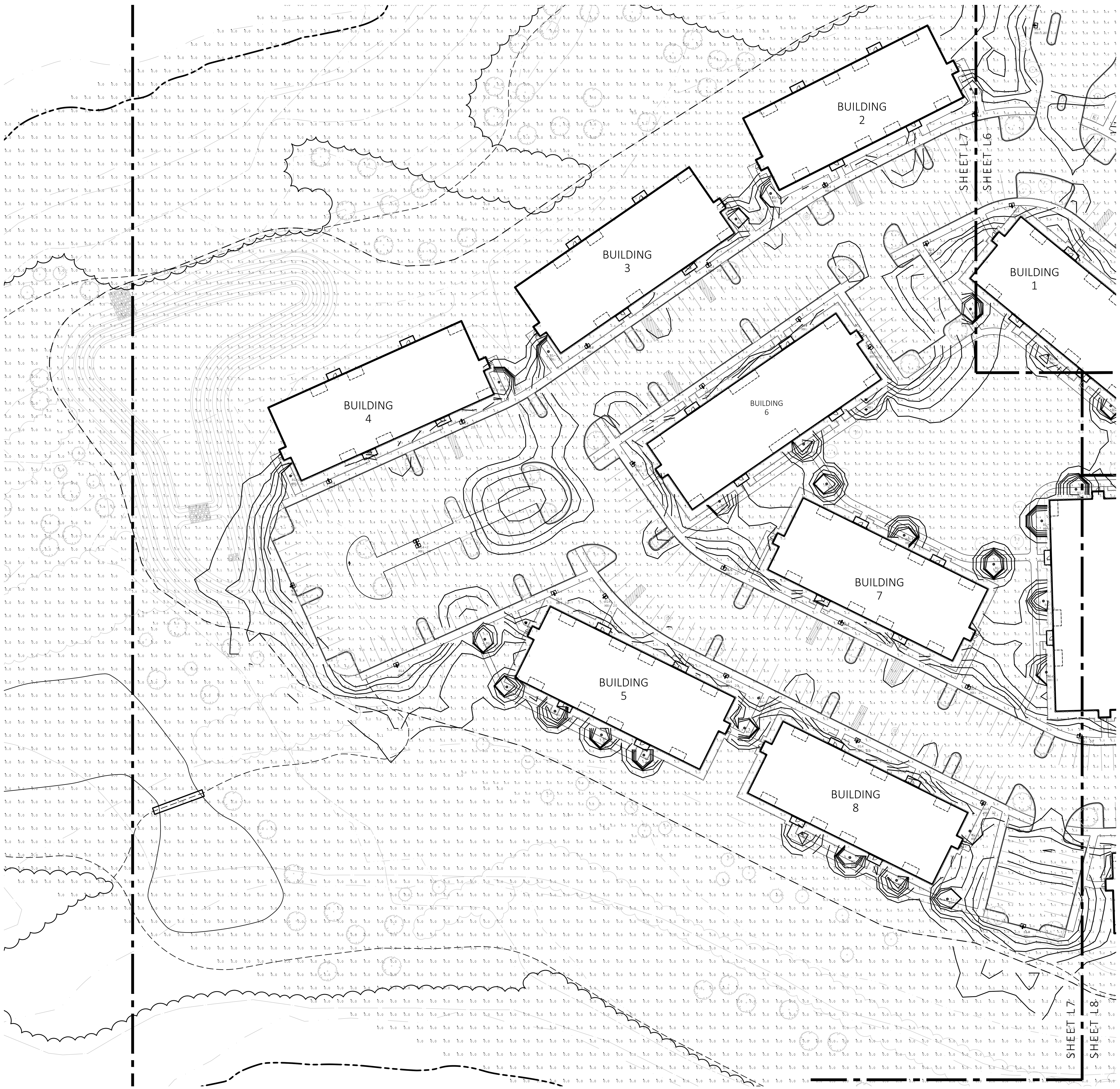
PHOTOMETRIC PLAN

DRAWN
CHECKED
SCALE AS NOTED
DATE 03/01/21

L6

SHEET 7 OF 10

plot date: 11/2/2022



1 PHOTOMETRIC PLAN
SCALE: 1" = 40'-0"

SCALE: 1" = 40'-0"
80' 40' 20' 10' 0 40' 80'

Luminaire Schedule

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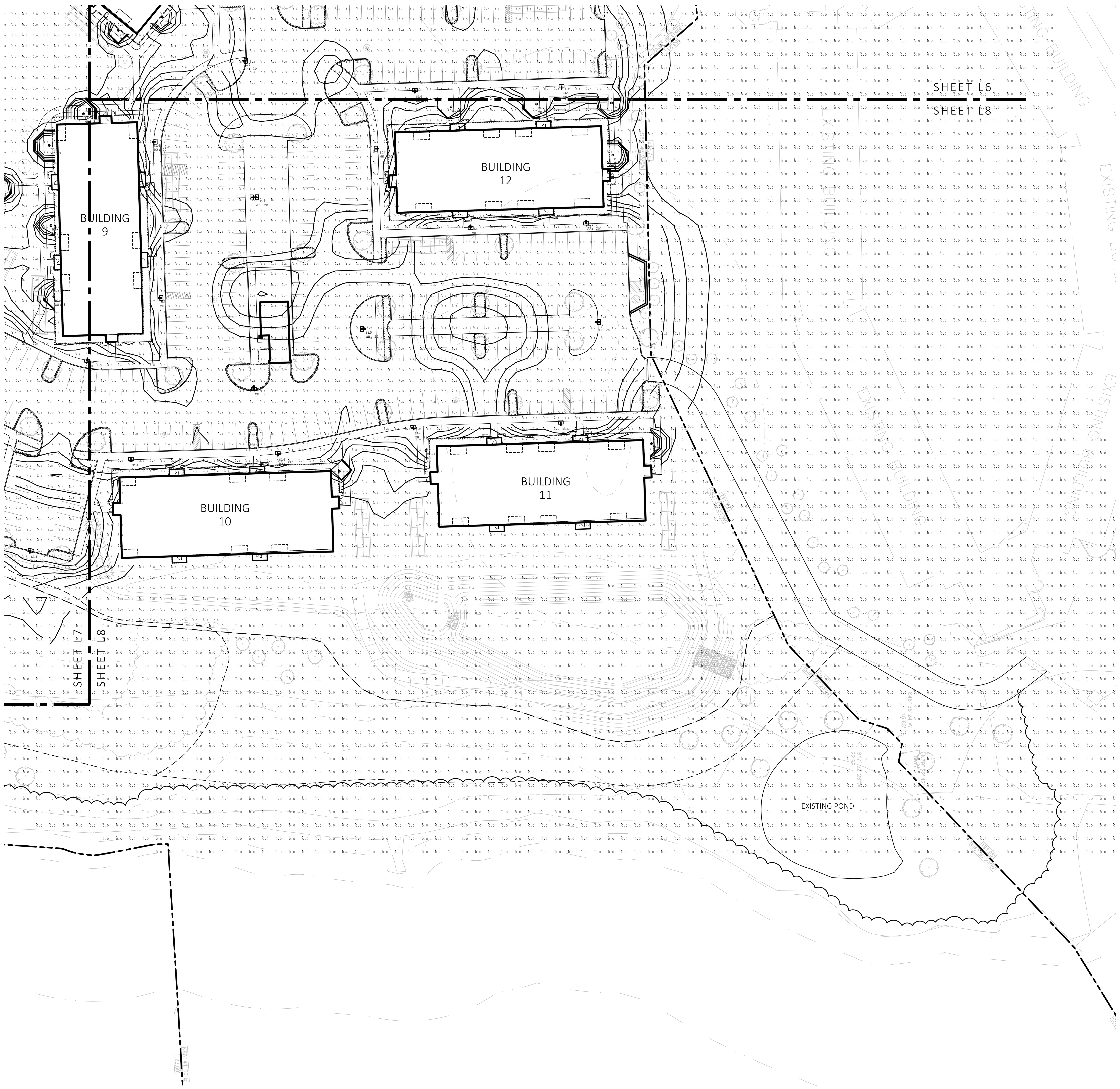
PHOTOMETRIC PLAN

DRAWN
CHECKED
SCALE AS NOTED
DATE 03/01/21

L7

SHEET 8 OF 10

plot date: 11/2/2022



1 PHOTOMETRIC PLAN
SCALE: 1" = 40'-0"

SCALE: 1" = 40'–0"
80' 40' 20' 10' 0 40' 80'

Luminaire Schedule

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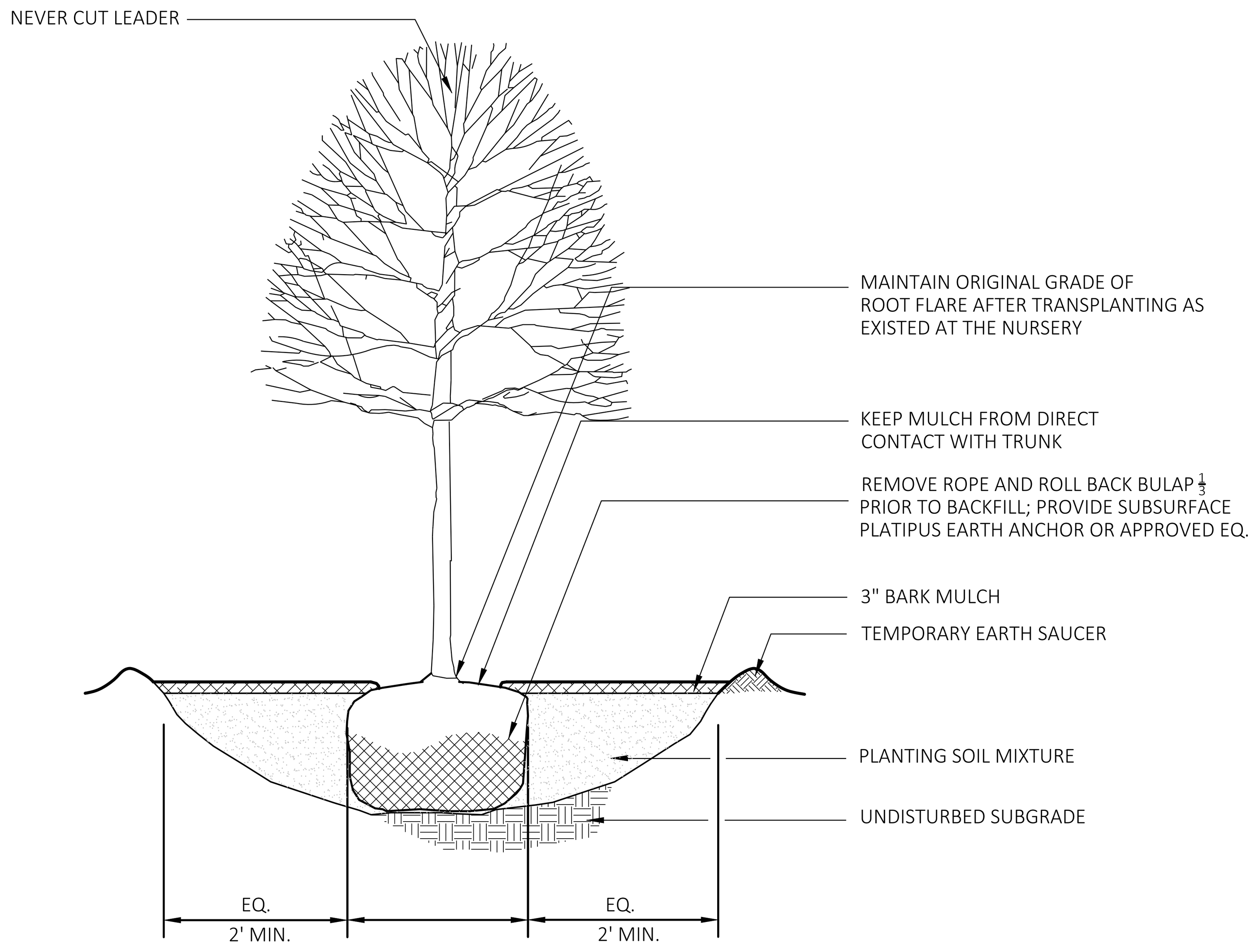
PHOTOMETRIC PLAN

DRAWN
CHECKED
SCALE AS NOTED
DATE 03/01/21

L8

SHEET 9 OF 10

plot date: 11/2/2022



1 DECIDUOUS TREE PLANTING
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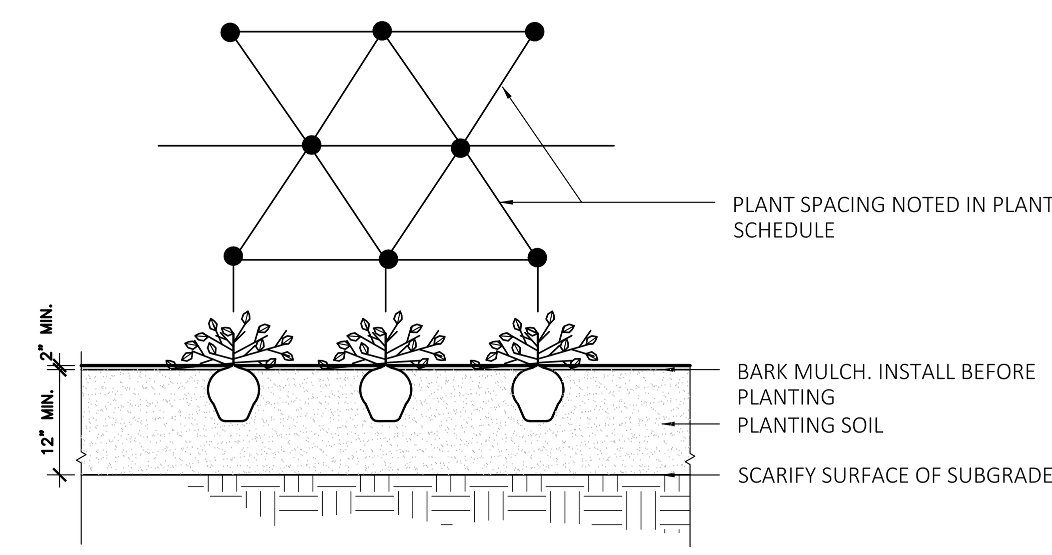
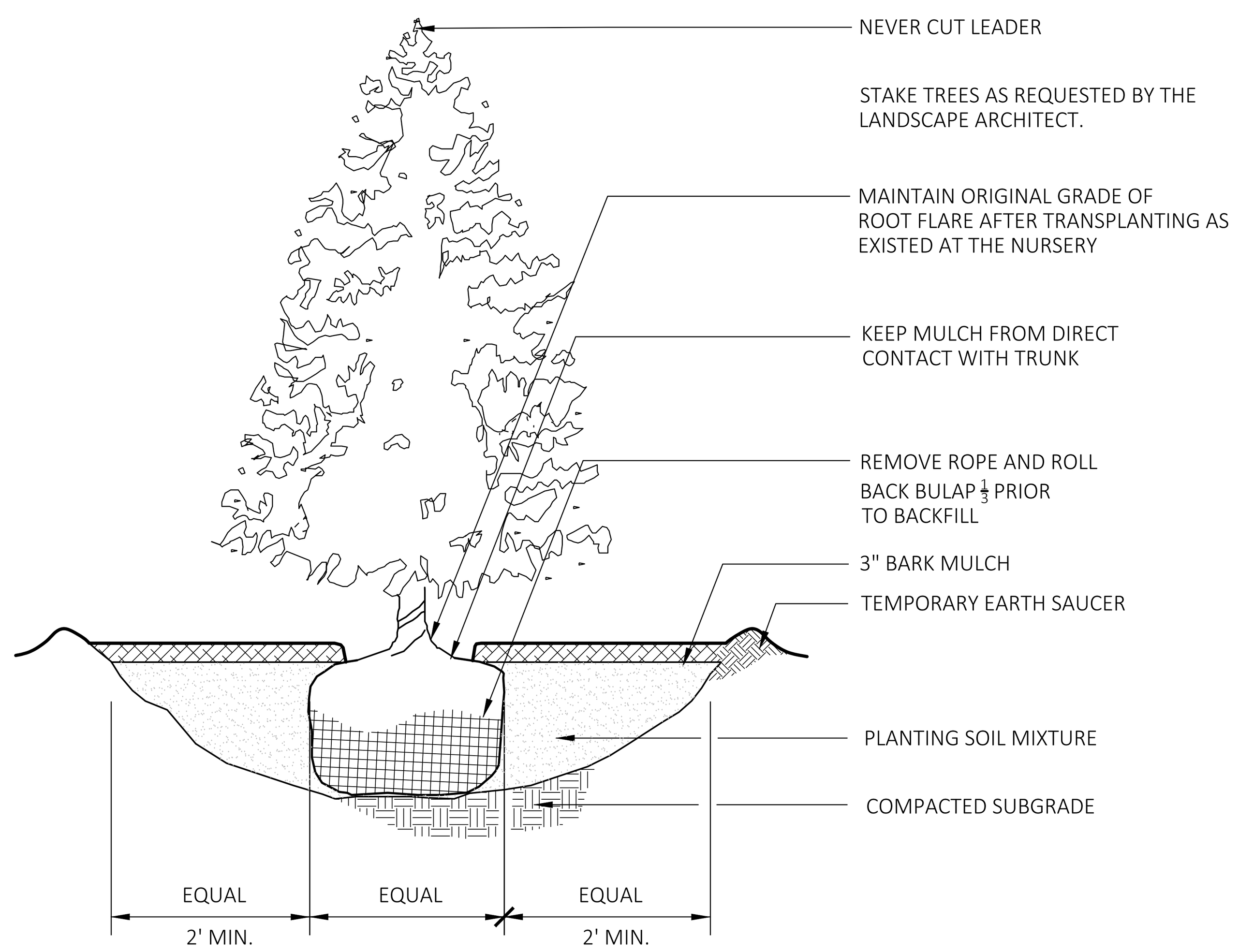
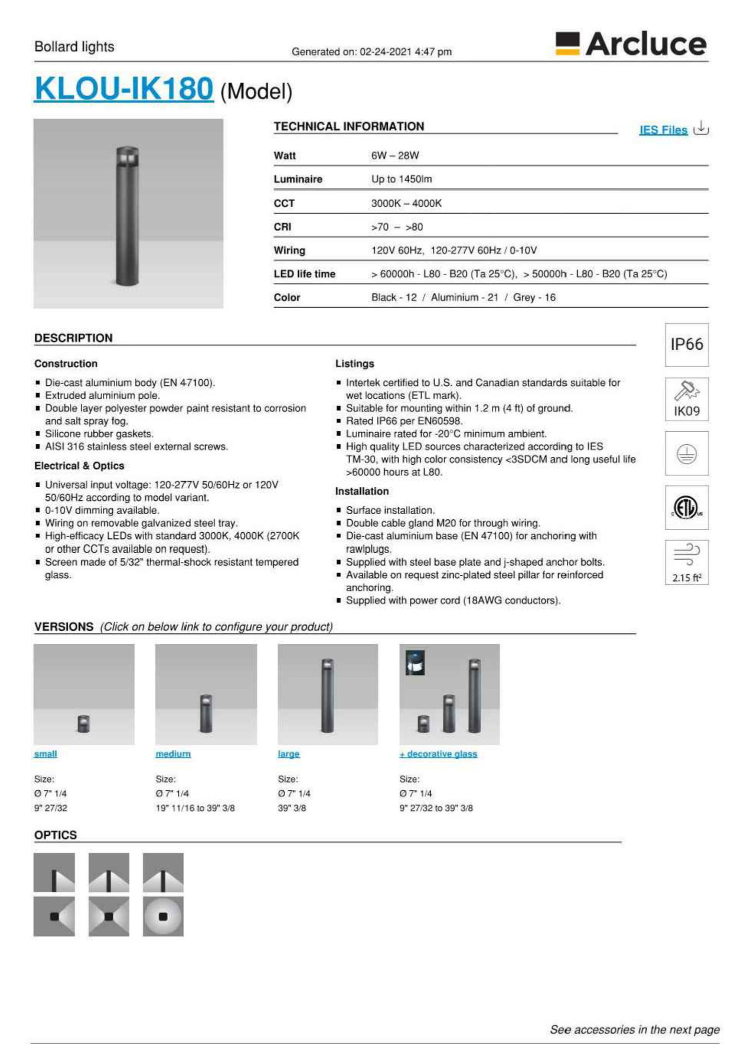


4 GROUNDCOVER PLANTING
SCALE: N.T.S.

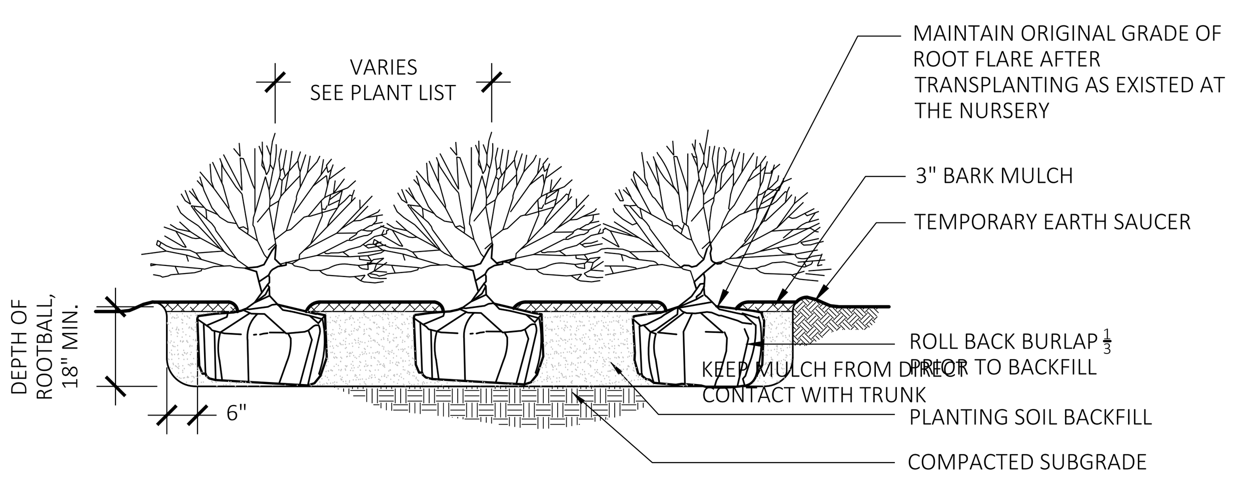
5 SL4, SL4-2 AND SL5 POLE LIGHT
SCALE: N.T.S.



2 EVERGREEN TREE PLANTING
SCALE: N.T.S.



6 BL-1 BOLLARD LIGHT
SCALE: N.T.S.



3 SHRUB PLANTING
SCALE: N.T.S.

PLANTING:

1. DURING CONSTRUCTION, PROTECT ALL EXISTING SITE FEATURES, STRUCTURES AND UTILITIES.
2. PLANTS SHALL BE TRUE TO SPECIES AND VARIETY SPECIFIED AND NURSERY GROWN IN ACCORDANCE WITH THE AMERICAN STANDARD FOR NURSERY STOCK UNDER CLIMATIC CONDITIONS SIMILAR TO THOSE IN THE LOCALITY OF THE PROJECT. SUBSTITUTIONS WILL BE PERMITTED ONLY IF APPROVED BY THE LANDSCAPE ARCHITECT.
3. LANDSCAPE ARCHITECT APPROVAL IS REQUIRED BEFORE PLANT MATERIAL IS PURCHASED. LANDSCAPE ARCHITECT RESERVES THE RIGHT TO SEE ALL MATERIAL IN PERSON AT THE NURSERY. IF TRAVEL OUTSIDE OF MA IS REQUIRED, LANDSCAPE ARCHITECT'S TRAVEL COSTS SHALL BE PAID FOR BY THE CONTRACTOR.
4. ALL EXPOSED BURLAP, WIRE BASKETS AND OTHER MATERIALS ATTACHED TO PLANTS SHALL BE REMOVED PRIOR TO PLANTING. CARE SHALL BE TAKEN NOT TO DISTURB THE ROOT BALL OF PLANTS.
5. THOROUGHLY WATER ALL PLANTS IMMEDIATELY AFTER PLANTING.
6. WHERE DISCREPANCIES IN QUANTITIES OCCUR, DRAWINGS SUPERCEDE PLANT NOTES AND SCHEDULE.
7. TRANSPLANTING SHALL BE DONE IN ACCORDANCE WITH THE AMERICAN STANDARD FOR NURSERY STOCK.
8. LOAM USED IN PLANT BEDS SHALL BE UNIFORM IN COMPOSITION, FREE FROM SUBSOIL, STONES LARGER THAN 1", NOXIOUS SEEDS AND SUITABLE FOR THE SUPPORT OF VEGETATIVE GROWTH. THE pH VALUE SHALL BE BETWEEN 5.5 AND 6.5.
9. MULCH IN TREE AND SHRUB BEDS SHALL BE NATURAL, NATIVE HEMLOCK MULCH FREE OF GROWTH OR GERMINATION INHIBITING INGREDIENTS. SUBMIT SAMPLES FOR APPROVAL.
10. LOCATIONS FOR PLANTS AND/OR OUTLINE OF AREAS TO BE PLANTED ARE TO BE STAKED OUT AT THE SITE FOR APPROVAL BY THE LANDSCAPE ARCHITECT.
11. SOIL DEPTHS: a.) SHRUBS AND PERENNIAL BEDS: 18" MIN.; b.) GROUNDCOVER: 6" MIN.; c.) TREES: PER CONSTRUCTION DETAIL; d.) SOD/SEED: 6" MIN.
12. PROVIDE A SUBSURFACE ROOTBALL ANCHOR BY PLATIPUS EARTH ANCHORS, OR APPROVED EQUAL. SIZE FOR CALIPER AND HEIGHT.

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.

NOTE: NEW ENGLAND WETLAND PLANTS OR APPROVED EQUAL

7 MEADOW SEED MIX - NEW ENGLAND CONSERVATION/WILDLIFE MIX
SCALE: N.T.S.

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 Wildflower Mix

Botanical Name	Common Name	Indicator
Schizachyrium scoparium	Little Bluestem	FACU
Sorghastrum nutans	Indian Grass	UPL
Chamaecrista fasciculata	Partridge Pea	FACU
Elymus virginicus	Virginia Wild Rye	FACW-
Elymus canadensis	Canada Wild Rye	FACU+
Festuca rubra	Red Fescue	FACU
Asclepias tuberosa	Butterfly Milkweed	NI
Vernonia noveboracensis	New York Ironweed	FACW+
Oenothera biennis	Evening Primrose	FACU-
Aster novae-angliae (Symphyotrichum novae-anglia	New England Aster	FACW-
Rudbeckia hirta	Black Eyed Susan	FACU-
Solidago juncea	Early Goldenrod	
Eupatorium fistulosum (Eutrochium fistulosum)	Hollow-Stem Joe Pye Weed	FACW
Aster lateriflorus (Symphyotrichum lateriflorum)	Starved/Calico Aster	FACW

PRICE PER LB. $75.00 MIN. QUANITY 1 LBS. TOTAL: $75.00 APPLY: 23 LBS/ACRE :1900 sq ft/lb

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.

NOTE: NEW ENGLAND WETLAND PLANTS OR APPROVED EQUAL

8 MEADOW SEED MIX - NEW ENGLAND WILDFLOWER MIX
SCALE: N.T.S.

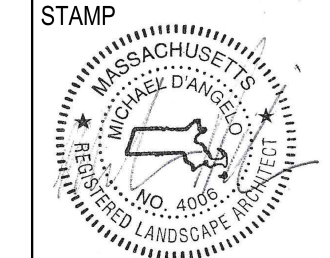
NOT FOR CONSTRUCTION

MDLA
MICHAEL D'ANGELO landscape architecture

MICHAEL D'ANGELO LANDSCAPE ARCHITECTURE LLC
732 EAST BROADWAY #3
BOSTON, MA 02127
t. 203.592.4788
www.m-d-l-a.com

EMBLEM HYANNIS
35 SCUDDER AVENUE
HYANNIS, MA

STAMP



REV. NO.	DATE	DESCRIPTION
1	4/1/21	CCC SUBMITTAL
2	10/21/22	CCC RESUBMITTAL

LANDSCAPE DETAILS

DRAWN
CHECKED
SCALE AS NOTED
DATE 03/01/21

L9

plot date: 11/2/2022

Typical Front & Rear Elevation
Scale: 1/8" = 1'-0"

Typical Side Elevation
Scale: 3/16" = 1'-0"

Quarterra
MULTIFAMILY

ENHANCED AND REDESIGNED BUILDING ELEVATIONS

Emblem Hyannis

Hyannis, MA

BSB DESIGN
BSBDesign.com

December 1, 2022 | MP200099.00

Quarterra MULTIFAMILY

ENHANCED AND REDESIGNED BUILDING ELEVATIONS

Emblem Hyannis

Hyannis, MA

BSB DESIGN BSBDesign.com

December 1, 2022 | MP200099.00

Quarterra
MULTIFAMILY

ENHANCED AND REDESIGNED BUILDING ELEVATION

Emblem Hyannis

Hyannis, MA

BSB DESIGN

November 17, 2022 | MP200099.00

BSBDESIGN.COM

UNANTICIPATED DISCOVERY PLAN

FOR

DEVELOPMENT OF A PARCEL OF LAND AT
35 SCUDDER AVENUE IN
HYANNIS, MASSACHUSETTS

PREPARED FOR

LENNAR MULTIFAMILY COMMUNITIES
99 SUMMER STREET, SUITE 701
BOSTON, MASSACHUSETTS 02110

JULY 2022

Introduction
This Unanticipated Discoveries Plan ("Plan") outlines specific measures to be implemented during the development of a parcel of land at 35 Scudder Avenue in Hyannis, Massachusetts ("Project") to assist the Project proponent (Lennar Multifamily Communities [LMC]) with the avoidance, minimization, or mitigation of potential adverse effects to significant archaeological resources and/or human burials. The parcel will be site of construction of 13 multifamily housing units, a clubhouse, pool, parking areas, and access road leading to the facilities from Scudder Avenue, as well as associated buried infrastructure (e.g., sewar and electrical lines).

Unanticipated Discoveries Plan for Archaeological Resources
LMC understands the unanticipated discovery of archaeological deposits and/or human remains is possible during construction, especially as a result of ground disturbing activities, within the Project parcel in Hyannis, Massachusetts. As LMC is committed to the avoidance and protection of cultural resources, it will follow all federal and state regulations and guidelines regarding the treatment of unanticipated archaeological deposits and/or human remains discovered during Project construction. Applicable federal and state guidelines and regulations include:

- Secretary of the Interior's Standards for Archeology and Historic Preservation (48 CFR 44716-42) (see https://www.nps.gov/history/local-law/arch_stnds_0.htm);

- Advisory Council on Historic Preservation (ACHP): *Policy Statement Regarding Treatment of Burial Sites, Human Remains, and Funerary Objects* (see https://www.achp.gov/digital-library-section-106-landing/achp-policy-statement-regarding-treatment-burial-sites-human);

- *Know How #4: Information and Assistance from the Massachusetts Historical Commission; What to do when Human Burials are Uncovered* (see https://www.sec.state.ma.us/mhc/mhcpdf/knowhow4.pdf);

- Massachusetts General Laws, Chapter 38, Sections 6B & 6C; Chapter 9, Sections 26-27C (950 CMR 70-71); Chapter 7, Section 38A; Chapter 114, Section 17; all as amended by Chapter 659 of the Acts of 1983 and Chapter 386 of the Acts of 1989; and

- The MHC's *Policy and Guidelines for the Disposition of Human Remains Which Are One Hundred Years Old or Older*.

Unanticipated Discovery Plan for Archaeological Resources
LMC understands that the following procedures will be implemented in the event of an unanticipated discovery of archaeological deposits (non-burial locations).

Procedures for Notification of Unanticipated Discoveries
Swift and accurate notification by Project personnel is the key to success in determining the appropriate treatment of an unanticipated discovery of an archaeological site made during construction. Thus, LMC personnel and their contractors will adhere to the following procedures should a unanticipated discovery of archaeological deposits be made during construction of the Project. Upon identification of archaeological deposits:

1) The Contractor performing the construction work will immediately notify the appropriate LMC Construction Representative and will cease all work at the location of the find, directing that all materials are to be left in place;

2) The Contractor will immediately secure the area containing the unanticipated discovery with an appropriate field barrier, preferably protective fencing, to secure the area from damage or looting.

3) Once the Contractor notifies LMC Construction Representative of the unanticipated discovery, the LMC Construction Representative will contact a qualified archaeological consultant and make him/her aware of the find, it's general type, and location;

4) Once notified, the qualified archaeological consultant will visit the location to confirm its nature and make a preliminary assessment of its potential significance of the find applying the National Register of Historic Places (NHRP) criteria for evaluation (36 CFR 60.4 [a-d]).

5) Should the qualified archaeological consultant deem the unanticipated discovery as not that of an archaeological deposit, the LMC Construction Representative and the Contractor will be notified that construction work may resume;

6) If the qualified archaeologists identifies the unanticipated discovery as a potentially significant archaeological resource applying the NHRP criteria for evaluation (36 CFR 60.4 [a-d]), the LMC Construction Representative will be notified immediately and will, in turn, contact the Massachusetts Historical Commission (MHC) and any other regulatory agencies that may be associated with permitting the project to relay the details of the unanticipated discovery within 24 hours of contact from the qualified archaeological consultant. If the find is associated with Native American occupation or use of the area, the LMC Construction Representative also will relay this information to the MHC, who in turn will contact Tribal Historic Preservation Office (THPO) representatives of those Federally-recognized tribes located in the Hyannis area (see below).

7) The LMC Construction Representative will work in consultation with the MHC, as well as any other involved permitting agencies (and/or THPOs), to develop suitable measures to avoid or minimize effects to the archaeological resources, including development and implementation of a site avoidance and protection plan during construction. If avoidance or minimization of impacts cannot be achieved, the LMC Construction Representative will work with the MHC, as well as any other involved permitting agencies (and/or THPOs), to develop a mitigation plan for the resource(s).

8) If the above-refenced agencies determine that the unanticipated discovery comprises a significant archaeological resource and that it cannot be avoid during construction, the LMC Construction Representative (or a qualified archaeological consultant acting as his/her designee), will develop a mitigation plan for the unanticipated discovery in consultation with the MHC, as well as any other involved permitting agencies (and/or THPOs).

9) After review and approval by the MHC, as well as any other involved permitting agencies (and/or THPOs), the qualified archaeological consultant will implement the mitigation plan after securing

an excavation permit from the MHC, and any other permits needed by any of the above-referenced agencies and/or parties.

10) Once the field mitigation has been completed, the qualified archaeological consultant will be required to coordinate a meeting with the LMC Construction Representative personnel and MHC, as well as any other involved permitting agencies (and/or THPOs), to review the effort and ensure that it meets the specification of the approved mitigation plan prior to the re-commencement of construction.

11) Finally, the qualified archaeological consultant will be required to present a professionally completed technical report of the mitigation to the LMC Construction Representative and the MHC, as well as any other involved permitting agencies (and/or THPOs).

Unanticipated Discovery Plan for Human Remains

This Plan also sets forth measures to be implemented in the event of an unanticipated discovery of human remains and will remain in effect for the duration of Project construction. It incorporates elements of and is consistent with 36 CFR § 800.13, the Advisory Council on Historic Preservation's *Policy Statement Regarding Treatment of Burial Sites, Human Remains, and Funerary Objects*, all provisions of Massachusetts' unmarked burial laws (Massachusetts General Laws, Chapter 38, Section 6; Chapter 9, Sections 26A and 27C; and Chapter 7, Section 38A, all as amended), as well as the MHC's *Policy and Guidelines for the Disposition of Human Remains Which Are One Hundred Years Old or Older*.

In preparation for the event that an unanticipated discovery of human remains might be made during construction of the Project, the LMC Construction Representative will have reviewed the Advisory Council on Historic Preservation's *Policy Statement Regarding Treatment of Burial Sites, Human Remains, and Funerary Objects* prior to the commencement of construction (see enclosure). This document assumes that the LMC Construction Representative understands that when burials, human remains, or funerary objects are encountered in the course of any construction, they should be treated with dignity and respect. Furthermore, in the absence of a federal permitting agency involvement, the LMC Construction Representative further understands that the MHC will be responsible for making decisions regarding avoidance of impacts to these resources and that only through consultation, can the federal agency or the MHC make an informed decision concerning the treatment of burial sites, human remains, and funerary objects. Accordingly, federal permitting agencies (if any) and/or the MHC should be informed by and utilize the special expertise of Native American tribes in the documentation and treatment of their ancestors, it the unanticipated discovery is that of a precontact or historical period Native person(s).

Procedures for Notification of Unanticipated Discoveries of Human Remains

In recognition of the above-referenced principles and in keeping with the Advisory Council on Historic Preservation *Policy Statement Regarding Treatment of Burial Sites, Human Remains, and Funerary Objects*, as well as the relevant Massachusetts state laws and guidelines (Massachusetts General Laws, Chapter 38, Sections 6B & 6C; Chapter 9, Sections 26-27C (950 CMR 70-71); Chapter 7, Section 38A; Chapter 114, Section 17; all as amended by Chapter 659 of the Acts of 1983 and Chapter 386 of the Acts of 1989) and the MHC *Policy and Guidelines for the Disposition of Human Remains Which Are One Hundred Years Old or Older* (see enclosure), the LMC Construction Representative and its contractors will employ the following procedures in the event that an unanticipated discovery of human remains is made during construction of the Project:

1) The Contractor who identifies human remains during construction will immediately notify the LMC Construction Representative of the unanticipated discovery;

2) The LMC Construction Representative will instruct the Contractor to cease work in the area and to mark or fence off the unanticipated discovery location so that it is protected from impacts, to cover the remains, and to take measures to ensure that the location is secure from outsider entrance. The Contractor also will be instructed by the LMC Construction Representative that no additional work can be completed in the area until the unanticipated discovery has been treated appropriately;

3) All human remains will be treated with dignity and respect at all times by Project personnel. Furthermore, all associated artifacts will be left undisturbed and in place. Under no circumstances will any skeletal remains or associated materials be handled or removed from the location by the LMC Construction Representative or Contractor personnel until appropriate consultation has taken place and a treatment plan has been developed.

4) The LMC Construction Representative, or a qualified the LMC Construction Representative working on their behalf, will immediately notify the MHC, the federal permitting agency (if any), the local police, the appropriate county/city Medical Examiner's Office of the unanticipated discovery of human remains. The State Archaeologist at the MHC will consult with the Massachusetts Commission on Indian Affairs (MCIA) if the identified burial is determined the State Archaeologist to be Native American.

5) Under the Plan, the LMC Construction Representative will permit local law enforcement and a representative of the Medical Examiner's Office to access the location of the human remains and inspect the remains to determine if they are part of a crime.

6) If the human remains are determined to represent a crime scene, local law enforcement will assume jurisdiction over the location and will be permitted whatever time/access is necessary to investigate and process the location before it will be released for further construction.

7) If the human remains are deemed unrelated to a crime and instead represent a/an historical or Native American individual(s), the LMC Construction Representative will pursue a re-design of the Project to avoid the remains and an leave them in-situ. If avoidance cannot be achieved through a project re-design, the LMC Construction Representative will work to devise a disinterment/re-interment plan that is acceptable to the MHC and the federal permitting agency (if any). Under this action, two alternatives must be considered:

    a) If the remains are older than 100 years old, then the State Archaeologist will be contacted by the Office of the Chief Medical Examiner. If the remains are determined by the State Archaeologist to be Native American, the State Archaeologist will consult with the MCIA, the LMC Construction Representative, and other interested persons, including the any federal permitting agencies and THPOs, to determine whether prudent and feasible alternatives exist to avoid, minimize, or mitigate harm to the burial site. The final plan or agreement shall be in writing, and may include provisions for preservation in place and/or the conducting of additional scientific research and investigation pursuant to MHC approval; and with consent of the site's owner, the execution of a preservation restriction (M.G.L. c. 184, ss 31-33).

b) Any non-Native American human remains shall be treated in accordance with the MHC "Policy and Guidelines for Non-Native Human Remains Which Over 100 Years Old or Older."

c) All burials shall be treated in a manner consistent with the ACHP Policy Statement Regarding Treatment of Burial Sites, Human Remains, and Funerary Objects (February 23, 2007, http://www.achp.gov/docs/hrpolicy0207.pdf)

Points of Contact

The following points of contact are offered in the event of an unanticipated discovery of archaeological or human remains is made during the construction of the Project in Hyannis, Massachusetts:

<u>Massachusetts SHPO & State Archaeologist</u>
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, Massachusetts 02125
Brona Simon, State Archaeologist and SHPO; (617) 727-8470

<u>Massachusetts Office of the Chief Medical Examiner</u>
720 Albany Street
Boston, Massachusetts 02118
Mindy Hull
Chief Medical Examiner
(617) 267-6767

<u>Massachusetts Commission on Indian Affairs</u>
100 Cambridge Street, Suite 300
Boston, Massachusetts 02114
John A. Peters, Jr., Executive Director
(617) 573-1292
john.peters@mass.gov

<u>Wampanoag Tribe of Gay Head (Aquinnah)</u>
Ms. Bettina Washington
Tribal Historic Preservation Officer
20 Black Brook Road
Aquinnah, Massachusetts 02535-1546
(508) 645-9265, ext. 175
bettina@wampanoagtribe.net

<u>Mashpee Wampanoag Tribe</u>
Mr. David Weeden

Interim Tribal Historic Preservation Officer
483 Great Neck Rd. South
Mashpee, Massachusetts 02649
(508) 447-0208, ext. 102
dweeden@mwtribe.com

Hyannis Police Department
1200 Phinneys Lane
Hyannis, Massachusetts 02601
(508) 775-0387

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

POLICY AND GUIDELINES FOR THE DISPOSITION OF NON-NATIVE HUMAN REMAINS WHICH ARE ONE HUNDRED YEARS OLD OR OLDER

INTRODUCTION

The unmarked burial law requires individuals and entities who discover an unmarked human burial or skeletal remains to cease any activity upon the site which would deface, alter, destroy or otherwise impair the integrity of the site until the State Archaeologist has conducted a site evaluation. G.L. c. 9, ss. 27C (1988 ed.). If the State Archaeologist determines that the remains are American Indian, the final disposition of the remains, after any skeletal analysis, may be reinterred at the discretion of the Commission on Indian Affairs. G.L. c.7, ss. 38(A) (1988 ed.). However, if the remains are non-native and are suspected of being one hundred years old or more, the previous section of the law required that such remains be deposited within a curatorial facility. G.L. c. 26A., ss. (7) (1988 ed.). This section of the law has been amended to provide reinterment as an option for non-native human remains. Specifically, Chapter 386 of the Acts of 1989 altered clause seven (7) of the first paragraph of section 26A of chapter 9 of the General laws by striking the sentence which mandates depositing such remains within a curatorial facility and inserting the following:

> The state archaeologist shall determine whether a skeletal analysis of the remains shall be conducted. If he determines that such analysis shall be made after the completion of the said analysis, the state archaeologist shall determine whether the remains shall be deposited in a curatorial facility or reinterred in accordance with the provisions of section forty-three M of chapter one hundred and fourteen. It shall be the responsibility of the person, whose proposed action necessitates the removal of skeletal remains, to conduct and bear the financial costs of said skeletal analysis and reinterment.

Application of this section necessitates the State Archaeologist to make the decision whether such remains will be deposited in a curatorial facility or reinterred. In order to properly take into account all factors for purposes of making such a decision, the Massachusetts Historical Commission hereby implements the following policy:

POLICY

Definitions

With respect to this policy, the following terms are defined:

Remains shall mean the skeletal remains of human non-natives.

Non-Native means those who are not of American Indian descent.

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.sec.state.ma.us/mhc

Reinterment means the reentry of remains into the ground, a tomb or other enclosure for purposes of reburial.

Interested Parties shall include, but not be limited to, those of direct kinship to the deceased, those possessing a cultural, tribal, or religious affiliation, those whose interest stems from a cultural, tribal, or religious affiliation, those whose interest stems from a scientific, environmental, or educational purpose, the owner of the land upon which the burial site is located, and local or state governmental agencies.

Statement of Policy

1. Remains shall be deposited in a curatorial facility unless an interested party files a statement with the State Archaeologist, pursuant to the outlined procedure, requesting that such remains be reinterred.

2. When a request for reinterment is received, the State Archaeologist shall consider all interested parties' views for purposes of issuing a decision as to whether the remains should be curated or reinterred.

3. Where the scientific research value of non-native human remains outweighs any objections that descendants may have to their study such remains will be retained in perpetuity for study in a curatorial facility and will not be reinterred.

4. If it is decided that the remains will be reinterred, the reinterment process should approximate the wishes of the deceased. For purposes of determining the intent of the deceased with respect to the type of reburial, archaeological and historical factors should be evaluated, as well as the methods employed in the original burial.

5. With respect to the reinterment process, the State Archaeologist shall maintain complete records of the archaeological investigation and analysis, the original burial site, and the final burial site.

6. The site chosen for reinterment should be protected from any disturbance to the land as a permanent burial ground or cemetery or by a deed restriction or easement which runs in perpetuity.

7. If it is decided that the remains should be reinterred, the proponent of the project whose action necessitated the removal of such remains shall bear the expense of reinterment.

Procedure

1. *Request for Reinterment:* Interested parties may file a request for reinterment of remains with the State Archaeologist. Such request should be addressed to:

State Archaeologist
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, MA 02125

Such request should include:

A. Statement explaining how you qualify as an interested party with respect to the disposition of such remains.

B. Reasoning as to why such remains should be reinterred.

C. Specification with respect to the preferred reinterment site and reburial procedures.

2. *Statements Favoring Curation Over Reinterment:* Once a request for reinterment is filed, the State Archaeologist will consider any statements from interested parties which favor curation of such remains, as opposed to reinterment. Such statements should contain:

A. Statement explaining how you qualify as an interested party with respect to the disposition of such remains.

B. Reasoning as to why such remains should be curated.

C. Specification as to which curatorial facility the remains should be deposited.

3. *State Archaeologist's Decision to Reinter or Curate:* In response to a request for interment, the State Archaeologist shall consider the following factors in rendering a decision with respect to either curation or reinterment of the remains:

A. Scientific and research value of such remains.

B. The completeness and adequacy of the analysis of the remains.

C. The public interest.

D. If reinterment, the appropriateness of the proposed burial site and procedures.

The State Archaeologist shall issue a written finding to all participating interested parties within sixty (60) days of receipt of a request for reinterment.

4. *Appeal Process:* Any interested party make appeal the decision of the State Archaeologist to the full Massachusetts Historical Commission by filing an appeal within thirty (30) days of the State Archaeologist's finding. Appeals should be addressed to:

Executive Director
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, MA 02125

Such appeal will be discussed at the next meeting of the Massachusetts Historical Commission (Commission). The petitioner will be notified of the time and place of such meeting so that he or she has the opportunity to present arguments.

Once an appeal is filed, no action will be taken by the State Archaeologist with respect to the disposition of the remains until the Commission has rendered a decision on the appeal.

The Commission shall make its decision on the appeal within ninety (90) days of the Commission meeting.

2/14/90

DRAINAGE ANALYSIS REPORT

EMBLEM HYANNIS

Proposed Multifamily Residences

Located at:

35 Scudder Avenue
Hyannis, Massachusetts

Prepared for:

Quarterra

(Formerly Lennar Multifamily Communities)
99 SUMMER STREET, SUITE 701
BOSTON, MA 02110

Prepared by:

Pesce Engineering & Associates, Inc.
43 Porter Lane
West Dennis, MA 02670
epesce@comcast.net
Phone: 508-333-7630

COMMONWEALTH OF MASSACHUSETTS
EDWARD L. PESCE
CIVIL
NO. 32001
REGISTERED PROFESSIONAL ENGINEER

October 11, 2022

Drainage Analysis Report

EMBLEM Hyannis
35 Scudder Ave., Hyannis, MA

October 11, 2022

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Appendix B – Existing Conditions Drainage Areas Plan & HydroCAD Calculations

Appendix C – NOAA Atlas, Volume 10, Version 3, Point Precipitation Frequency Estimates for Hyannis, MA

Appendix D – Proposed Conditions Drainage Areas Plan & HydroCAD Calculations

Appendix E - TSS Removal Worksheet Calculations

Appendix F - Construction Period Pollution Prevention Plan & Stormwater Management System Operations & Maintenance Plan, Contech® CDS Maintenance Guide

Appendix G – MA DEP Standard Method to Convert Water Quality Volume to a Discharge Rate for Sizing Flow based manufactured Proprietary Stormwater Treatment (September 10, 2013)

Appendix H - DEP Checklist for a Stormwater Report

Project Overview, Site Description, Stormwater Management Analysis & Compliance Calculations

Project Overview & Site Description

Quarterra (the Proponent), formerly Lennar Multifamily Communities, proposes to redevelop an existing golf course and construct a new multi-family residential community at 35 Scudder Avenue in the village of Hyannis (see Figure 1) in the Town of Barnstable, Massachusetts, known as "Emblem Hyannis." The Redevelopment is located within walking distance of the west end of downtown Hyannis – an area that has a shortage of year-round housing options for many of Cape Cod's residents. The Redevelopment will provide a diversity of rental housing (from studio to 3-bedroom units), which is vitally needed in the area. The proposed Redevelopment will include the construction of approximately 312 new rental homes located in thirteen (13) three-story multifamily residential buildings (with 24 homes each), together with approximately 493 parking spaces, a recreational clubhouse containing a fitness center, a pool and other amenities, open green space, and improvements that are accessory to such multifamily use.

The Redevelopment site is located within the "RB" Residential Zoning District and will be serviced by municipal water and sewer utilities. No portion of the proposed Redevelopment work is located with a Zone II of public water supply well. The Redevelopment site comprises a portion of the existing 53.8-acre property, which currently includes the Resort and Conference Center at Hyannis (the "Conference Center") at 35 Scudder Avenue, and the Twin Brooks Golf Course. The existing lot will be divided to create two separate lots. One lot, comprised of approximately 14.2 acres, will include the Conference Center and is not part of the Redevelopment Site. The second lot (approximately 39.6 acres) will contain the new redevelopment project.

The Redevelopment Site is bordered by the existing Conference Center and Scudder Avenue to the north, Stewart's Creek to the east, and Joshua's Brook to the west. The main access to the new community will be via a new driveway from Scudder Avenue in the northwest corner of the Redevelopment Site. This new entrance drive will result in less pavement and impervious cover than currently exists. A secondary emergency access drive is located on the northeast side of the Site (See the Civil/Site Plans by Pesce Engineering, as revised dated Sept. 23, 2022).

The topography of the Site is relatively flat (from clearing activities to build the golf course), with some small hills, ranging in surface elevation from approximately 35 feet in elevation above mean sea level (MSL) at the high point near the center, to approximately to 5 feet along the southeastern side near Stewart's Creek. See Figure 2, showing the USGS topographic map (excerpt of the Hyannis Quad.), for the project location.

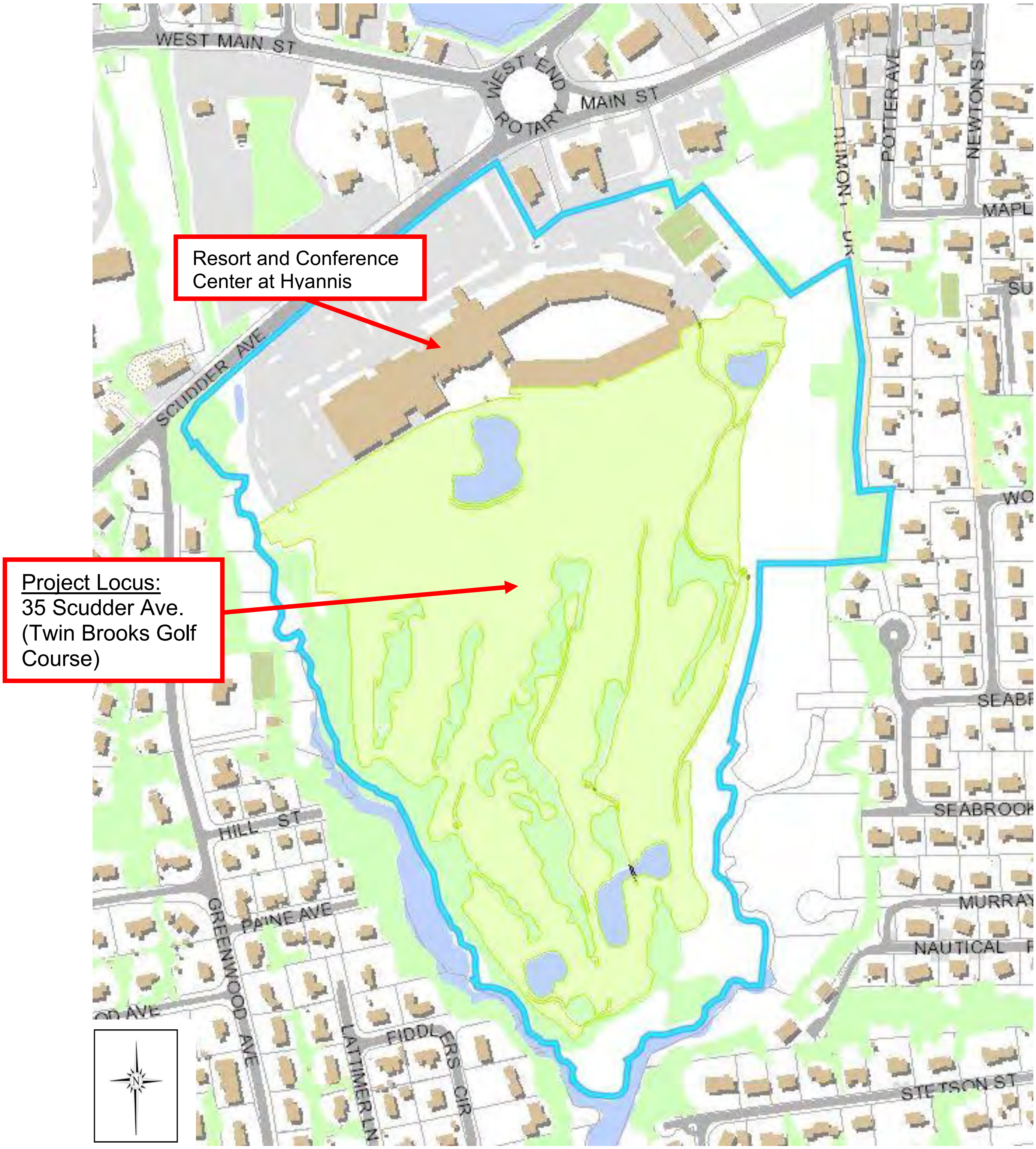


Figure 1. Project Locus – Barnstable GIS - Assessor's Map #289, Parcel #110

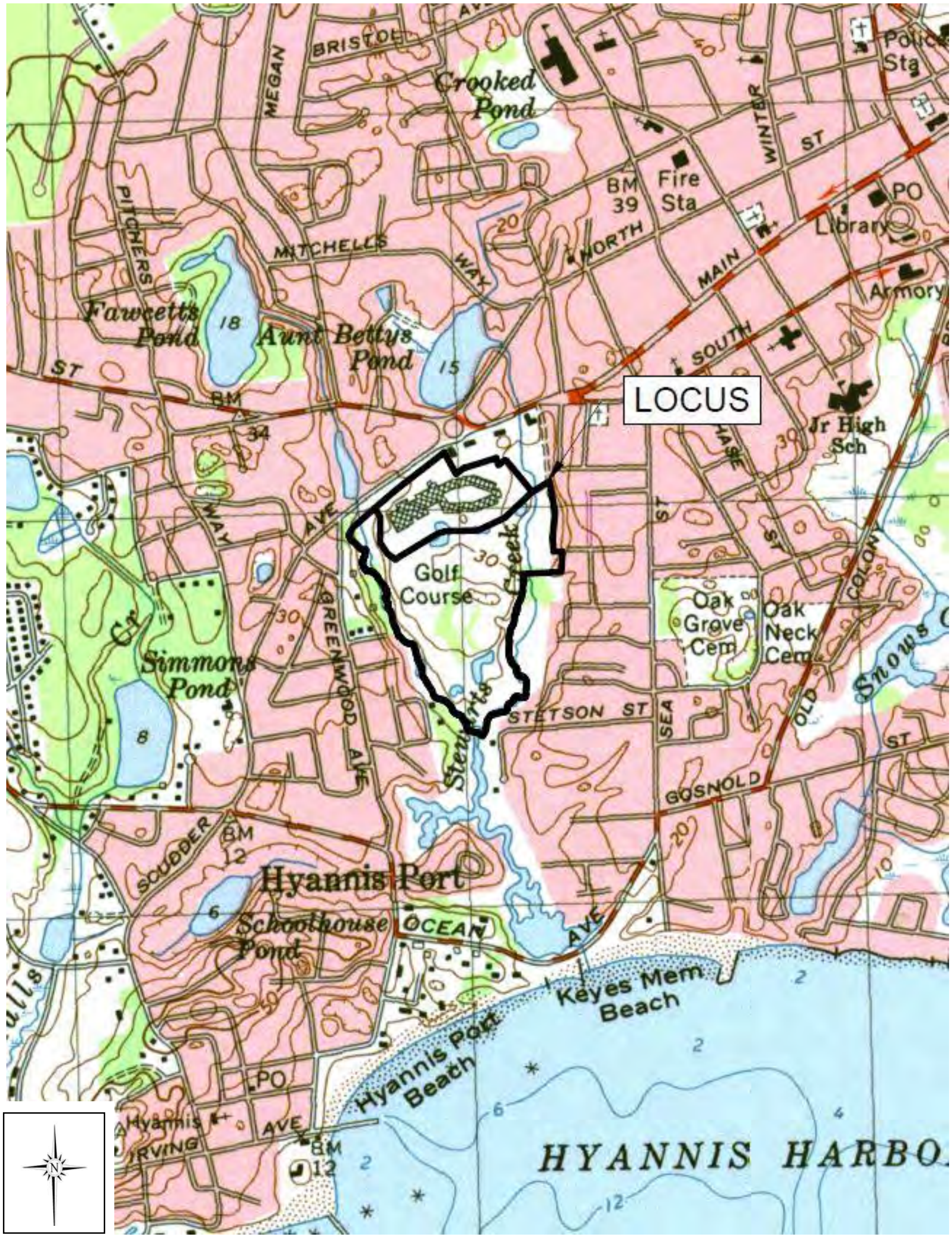


Figure 2. USGS Topographic Map (excerpt of the Hyannis Quadrangle Map)

The proposed Redevelopment Site consists of an 18-hole golf course facility with intermittent and bordering scrub oak and scrub pine tree forest, together with multiple managed turf areas (tees, fairways, and fairway roughs). Waterways and waterbodies on the Site include Joshua's Brook and Stewart's Creek which are perennial streams and 4 ponds, some of which were artificially constructed as part of the golf course). Wetland areas include vegetated wetlands bordering on the streams, coastal flood plain, and coastal bank, which predominate the perimeter areas of the gold course.

General Soils Information

Figure 3. USDA/NRCS Soil Map

Soil Map—Barnstable County, Massachusetts — 35 Scudder Ave., Hyannis, MA

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
54A	Freetown and Swansea mucks, coastal lowland, 0 to 1 percent slopes	2.2	2.6%
55A	Freetown coarse sand, 0 to 3 percent slopes, sanded surface	5.9	6.9%
66A	Ipswich - Pawcatuck - Matunuck complex, 0 to 2 percent slopes, very frequently flooded	8.2	9.7%
252A	Carver coarse sand, 0 to 3 percent slopes	2.7	3.2%
252B	Carver coarse sand, 3 to 8 percent slopes	52.6	61.8%
252D	Carver coarse sand, 15 to 35 percent slopes	7.3	8.6%
602	Urban land	4.3	5.0%
607	Water, saline	1.9	2.3%
Totals for Area of Interest		**85.1**	**100.0%**

Soils in new development area

Figure 3 - Soil Map Unit Legend

Existing soil classifications and hydrologic soil groups for the site were obtained from the USDA Soil Conservation Service, Soil Survey of Barnstable County, Mass., 1993. Figure 3 above shows the soils that are mapped for this site. Additional soils information was also obtained from the Geotechnical Report prepared by LGCI, dated September 24, 2020 (see Appendix A).

The site soils are comprised primarily of Carver coarse sand (252B) for the upland areas, and as either Freetown coarse sand or Freetown and Swansea mucks for wetland areas along both stream corridors (see Figure 3). An excerpt from the Barnstable County Soil survey provides the following soil description for Carver Coarse Sand

Carver Coarse Sand (3-8% slopes)

This very deep, gently sloping, excessively drained soil is in broad areas and on the tops of knobs on outwash plains. It makes up approximately 10.3 percent (26,175 acres) of the survey area. It is mapped mainly in the Carver general soil map unit. Areas are irregular in shape and range from 5 to 1,000 acres in size.

Permeability is very rapid in the subsoil and substratum of the Carver soil. Available water capacity is very low. Depth to the seasonal high water table is more than 6 feet.

Most areas are used as woodland. Many areas have been developed for homesites, and a few areas are used as cropland.

From the soil test pits performed in August 2020 for the geotechnical investigation, the parent soils (C Horizon) for the redevelopment area were clean medium to coarse sands and some gravel (see pages 4-7 & Appendix B test pit logs of the LGCI geotechnical report). Pesce Engineering observed the majority of these test pits, and found no soil mottling evident, and no groundwater was encountered.

Consulting the Barnstable Groundwater Contour Map (Barnstable GIS – 1992), the estimated elevation of the groundwater table is 5-8 feet above mean sea level (moving south to north on the site). Looking at the Existing Conditions Plan (Sheet 2 of 17 of the civil plans), the elevation of the pond on the northeast corner of the site is approximately 9.0 ft., and the pond in the southeast corner is approximately 3.5 ft. Following the USGS Cape Cod Method for estimating seasonal high groundwater elevation, the water level adjustment is 3.3 ft. (Index Well – MIW 29, Zone B, for Aug 2020 when the test pits were witnessed). Therefore, the Estimated Seasonal High Groundwater Elevation (ESHGWE) for this site ranges from 6.8 ft. – 12.3 ft from south to north on the site in the areas for the proposed Infiltration Basins 1 & 2 respectively. The bottom elevations for these 2 infiltration basins are designed as 10.5 ft. (Inf. Basin 1 - south) and 15.50 ft. (Inf. Basin 2 - north). This provides a separation from the bottom of the infiltration basins to the ESHGWE of 3.7 ft. & 3.2 ft. for Infiltration Basins 1 & 2 respectively.

NOTE: Additional soil test pit excavations will be conducted in the actual infiltration basin locations to confirm the soil and groundwater conditions at these sites prior to construction start. This was not performed at this time in order to not interfere with existing golf operations.

Finally, the medium to coarse sand and gravel soils exhibit a hydrological soil group classification of “A” (HSG A), which was used in the follow-on calculations.

Stormwater Management Analysis

<u>Existing Conditions</u>
The site consists of the existing Twin Brooks Golf Course, and has no formal or structural stormwater management system. Stormwater runoff currently flows uncontrolled from the higher topography along the north and center of the parcel (elevation 28’-32’), to the lower elevations in the southeast and southwest to the perennial streams (elevation 5’ – 16’) along the golf course perimeter.

<u>Existing Conditions Drainage Analysis</u>
The existing conditions were modeled using HydroCAD® software, which combines USDA Soil Conservation Service hydrology and hydraulic techniques (commonly known as SCS TR-55 and TR-20) to generate hydrographs. The *Existing Conditions Drainage Area Plan* and the Existing Conditions HydroCAD calculations are provided in the Appendix B of this report. The existing conditions stormwater runoff was evaluated for the 2, 10, 25 & 100-year, Type III, 24-hour storm events.

<u>Proposed Conditions - Methodology & Design Approach</u>
Our design approach is to provide the required DEP compliant stormwater management system for the new impervious surfaces, by collecting and treating the accumulated runoff from the parking areas and providing proper infiltration. The drainage analysis broke down the site area into 3 design points as follows:

1. Design Point 1 – the main entrance area on the north
2. Design Point 2 – the development area draining to the south and west to Infiltration Basin 1 and Joshua’s Brook
3. Design Point 3 – the development area draining to the south and east to Infiltration Basin 2 and Stewart’s Creek

For Design Point 1, the proposed new entrance represents a reduction of impervious paved surfaces of approximately 19,126 sf, as compared to the existing condition. The proposed stormwater management system will consist of deep-sump catch basins (with outlet hoods), flowing to a Contech® CDS Water Quality Unit (WQU - hydrodynamic separator), which allows for the removal of most of the total suspended solids (TSS) in the stormwater.

For Design Points 2 & 3 the proposed stormwater management system will consist of deep-sump catch basins (with outlet hoods), or a Bioretention area (with deep sump outlet structure), connected to piping to discharge to an infiltration basin, constructed with a sediment forebay. All the proposed stormwater management system is sized for the 100-yr storm, and will adequately allow for the treatment of the first ½ - inch of runoff, or the 'first flush" from a storm event.

Additionally, in light of the reality of the changing climate conditions, the design storm events were based on the current NOAA Atlas 14, Volume 10, Version 3, Point Precipitation Frequency Estimates for Hyannis, MA (see Appendix C). These design storm events are as follows:

Design Storm Events

Storm Event	2-Yr. Storm	10-Yr. Storm	25-Yr. Storm	100-Yr. Storm
24-hr. Precipitation (in.)	3.39	4.94	5.91	7.41

<u>Proposed Conditions Drainage Analysis</u>
The proposed conditions were also modeled using HydroCAD®, and again, stormwater runoff was evaluated for the 2, 10, 25 & 100-year, Type III, 24-hour storm events. This stormwater model was used to size the 2 main infiltration basins and roof drain infiltration systems as well. The proposed conditions drainage areas are shown on the *Proposed Drainage Areas Plan* in Appendix D, together with the associated proposed conditions calculations.

The proposed stormwater management system **provides no increase** of the stormwater peak rate of runoff or peak volume from the site, as compared to the existing conditions, for all storm events. The following tables shows the comparison of the pre & post development peak flowrates and volumes.

Table 1 Pre & Post Development Peak Flow Rates

	Peak Flow Rates (cfs)							
	2-year		**10-year**		**25-year**		**100-year**	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
DP-1 (Ex. Stormwater Area)	2.94	0.73	6.90	2.43	9.69	3.72	14.26	5.92
DP-2 (Joshua's Brook)	0.00	0.00	0.08	0.04	0.29	0.19	1.95	1.16
DP-3 (Stewart's Creek)	0.00	0.00	0.08	0.06	0.32	0.29	1.63	1.36

Table 2 Pre & Post Development Peak Volumes

	Peak Volume (acre-ft.)							
	2-year		**10-year**		**25-year**		**100-year**	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
DP-1 (Ex. Stormwater Area)	0.264	0.072	0.569	0.183	0.785	0.268	1.145	0.413
DP-2 (Joshua's Brook)	0.000	0.000	0.050	0.028	0.155	0.084	0.446	0.225
DP-3 (Stewart's Creek)	0.000	0.000	0.047	0.036	0.129	0.098	0.476	0.293

As a final factor of safety in the infiltration basin design, even though site soils observed were medium to coarse sand and highly permeable, a Rawls rate of exfiltration (see Vol. 3, Ch. 1, Pg. 22 of the MA Stormwater Management Handbook) was decreased from 8.27 in./hr. to 2.41 in./hr. We believe that this conservative design also enhances the ability of the infiltration systems to perform well for all storm events over time.

For treatment of total suspended solids (TSS), Appendix E shows the TSS removal calculations for the proposed conditions for all 3 design points. These calculations show a minimum TSS removal of ≥ 90% for this project.

Stormwater Operation & Maintenance (O&M) Plans
Appendix F contains both a Construction Period Pollution Prevention Plan and a Stormwater O&M Plan, along with manufacturer's information for the proper maintenance of the Contech® CDS WQU. Proper routine inspection and maintenance recommendations are included in this manufacturer's guide/manuals.

In summary, the results of this stormwater analysis indicate that the sizing of the proposed infiltration systems is adequate for all design storm events. The proposed peak rates of runoff are less than the existing peak rates of runoff, and do not create any off-site flooding impacts. Additionally, the proposed design will provide excellent TSS removal, and infiltration & recharge of runoff.

DEP STORMWATER MANAGEMENT STANDARDS COMPLIANCE

Since the proposed activity represents a redevelopment project, according to the MA Stormwater Handbook, Volume 2, Chapter 3, Standard 7:

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

Per the above reference, the following information is provided to demonstrate compliance with these regulations, and good engineering practice (please find the completed DEP Checklist for Stormwater Report in Appendix H).

Standard 1: *No New Untreated Discharges*

There are no new untreated discharges.

Standard 2: *Peak Rate Attenuation*
Post-development peak discharges (uncontrolled) do not exceed pre-development rates (uncontrolled) for the 2, 10, 25 & 100-year storms.

***Standard 3**: Recharge*

Infiltration BMP's have been designed using the "static" method to infiltrate the Required Recharge Volume. Based on soil test pits performed, the soils are medium – coarse sand, and represent a hydrologic soil group classification of "A," and accordingly a 0.60-inch Target Depth Factor (F) is used

Recharge Volume Required

Rv = F x Imp

Rv = Recharge Volume required (cubic feet – cf)
F = Target Depth Factor = 0.60 inch
Imp = Impervious area = 8.85 acres (area of paved & concrete surfaces & roofs)

Rv = (F/12) x Impervious area

Rv = (0.60/12) x (8.85 ac x 43,560 sf/acre)

Rv = 19,275.3 cf

The Required Recharge Volume = *19,275.3 cf*, and from the HydroCAD calculations, the volume provided from the 2 infiltration basins alone are as follows (Note: additional infiltration volume is provided in the roof drain infiltration systems):

- Infiltration Basin 1 Available Storage = 61,135 cf
- Infiltration Basin 2 Available Storage = 37,352 cf

Total 98,487 cf

So, more than a total of 98,487 cf of recharge volume is provided, which exceeds the 19,275.3 cf required**: OK**√

Calculations for Drawdown in 72 hours (T) – For Infiltration Basins 1 & 2

$$\boldsymbol{T = Rv / (K \times A_{bottom})}$$

T (drawdown hrs.)
Rv (storage volume cf)
K (saturated hydraulic conductivity) = 8.27 in./hr. *(Rawls Rate - A soils)*
A_{bottom} (bottom area of inf. basin sf)

Infiltration Basin 1
T (drawdown) = 61,135 cf/(8.27/12) X 8,346 sf')

T (Inf. Basin 1) = 10.63 hrs < 72 hours: OK√

Infiltration Basin 2
T (drawdown) = 37,352 cf/(8.27/12) X 7,983 sf')

T (Inf. Basin 2) = 6.79 hrs < 72 hours: OK√

Standard 4: *Required Water Quality Volume (V_{WQ})*

V_{WQ} = (D_{WQ}/12 inches/foot) * (A_{IMP} * 43,560 square feet/acre)

V_{WQ} = *Required Water Quality Volume* (in cubic feet)
D_{WQ} = Water Quality Depth (0.5" or 1.0")
A_{IMP} = Impervious Area treated (in acres)

For D_{WQ}: Hydrologic Group A Soils - Use 1.0" of runoff (for exfiltration to soils with infiltration rate greater than 2.4 in/hr.)

For Infiltration Basin 1

V_{WQ} = 1.0"/12 X (3.12 ac x 43,560 sf/ac)

V_{WQ} required = 11,325.6 cf

Water Quality volume provided in the sediment forebay & basin = 61,135 cf therefore OK√

For Infiltration Basin 2

V_{WQ} = 1.0"/12 X (2.52 ac x 43,560 sf/ac)

V_{WQ} required = 9,147.6 cf

Water Quality volume provided in the sediment forebay & basin = 37,352 cf therefore OK√

For the main entrance area (Design Point 1)

For the new main entrance area, this project will use a proprietary stormwater treatment system via the use of Contech® CDS water quality treatment unit (Model 1515-3). We have followed the DEP guidance for calculations to check the sizing of these units based on the following reference, which is included in Appendix G:

Massachusetts Department of Environmental Protection Wetlands Program Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices (Sept 10, 2013)

Because the site does not drain to, or is located near a critical area, the water quality volume (WQV) used for this calculation is = ½ -inch. This method follows the following equation:

$Q_{0.5}$ = (qu)(A)(WQV)

Where:
$Q_{0.5}$ = flow rate associated with first ½ -inch of runoff

qu = the unit peak discharge, in csm/in.

A = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (½ -inch in this case)

The **qu** is derived from the time of concentration (Tc) and consulting Figure 2 of the referenced DEP guidance. The Impervious Area is found for each subcatchment area. The following table shows the calculations for **$Q_{0.5}$:**

Location with a WQU	Time of Concentration (Tc)	qu (unit peak discharge)	Impervious Area (ac)	$Q_{0.5}$ (cfs)
Entrance (DP 1)	5 min = .083 hrs	773	0.46	**0.28**

From the Contech Product Flow Rates (see below page), the Contech CDS 1515-3 can handle a treatment flowrate of 1.0 cfs, which exceeds the required $Q_{0.5}$ calculated above.

Product Flow Rates

CASCADE

Model	Treatment Rate (cfs)	Sediment Capacity[1] (CF)
CS-4	2.00	19
CS-5	3.50	29
CS-6	5.60	42
CS-8	12.00	75
CS-10	18.00	118

CDS

Model	Treatment Rate[2] (cfs)	Sediment Capacity[1] (CF)
1515-3	1.00	14
2015-4	1.40	25
2015-5	1.40	39
2015-6	1.40	57
2020-5	2.20	39
2020-6	2.20	57
2025-5	3.20	39
2025-6	3.20	57
3020-6	3.90	57
3025-6	5.00	57
3030-6	5.70	57
3035-6	6.50	57
4030-8	7.50	151
4040-8	9.50	151

VORTECHS

Model	Treatment Rate (cfs)	Sediment Capacity[3] (CF)
1000	1.60	16
2000	2.80	32
3000	4.50	49
4000	6.00	65
5000	8.50	86
7000	11.00	108
9000	14.00	130
11000	17.5	151
16000	25	192

STORMCEPTOR STC

Model	Treatment Rate (cfs)	Sediment Capacity[1] (CF)
STC 450i	0.40	46
STC 900	0.89	89
STC 2400	1.58	205
STC 4800	2.47	543
STC 7200	3.56	839
STC 11000	4.94	1086
STC 16000	7.12	1677

Water Quality Unit Selected for Main Entrance (DP-1) Model 1515-3

1 Additional sediment storage capacity available – Check with your local representative for information.
2 Treatment Capacity is based on laboratory testing using OK-110 (average D50 particle size of approximately 100 microns) and a 2400 micron screen.
3 Maintenance recommended when sediment depth has accumulated to within 12-18 inches of the dry weather water surface elevation.

STORMWATER SOLUTIONS
PIPE SOLUTIONS
STRUCTURES SOLUTIONS

Sediment Forebay Sizing

Following the guidance contained in the DEP Stormwater Management Handbook, page 15, Vol. 2, Ch. 2, for the sizing of sediment forebays:

Volume Required = 0.1"/ impervious acre

For Infiltration Basin 1

Vol. req'd. = 0.1"/12 x 3.12 ac x 43,450 sf/ac

Vol. req'd. = 1,132.6 cf

Volume provided: Sediment Forebay Volume = 1,165 cf
Bioretention Area 1 Volume = 448 cf
Total 1,613 cf

The volume provided of 1,612 cf > than the 1,132.6 cf required**: OK**√

For Infiltration Basin 2

Vol. req'd. = 0.1"/12 x 2.52 ac x 43,450 sf/ac

Vol. req'd. = 914.8 cf

Volume provided: Sediment Forebay Volume = 895 cf
Bioretention Area 2 Volume = 1,433 cf
Bioretention Area 3 Volume = 695 cf
Total 3,023 cf

The volume provided of 3,023 cf > than the 914.8 cf required**: OK**√

Groundwater Mounding Analysis

Since the elevation of the bottom of the 2 Infiltration basins is less than 4 ft. from the estimated elevation of the seasonal high groundwater, we have performed the following groundwater mounding analysis using a spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin, and was made available to the general public by the USGS for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102:

Infiltration Basin 1 (see next page):

Infiltration Basin 1

Input Values

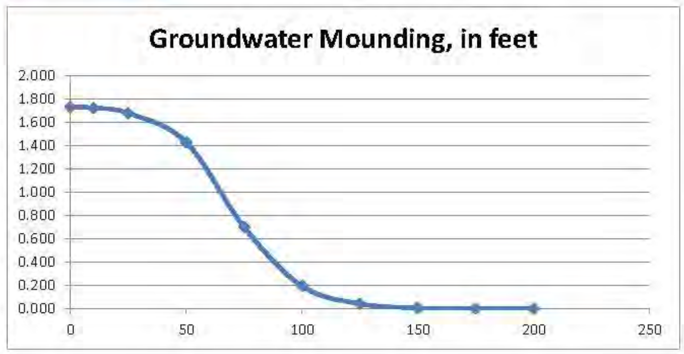
Value	Symbol	Description
16.5400	***R***	Recharge (infiltration) rate (feet/day)
0.300	Sy	Specific yield, Sy (dimensionless, between 0 and 1)
55.00	K	Horizontal hydraulic conductivity, Kh (feet/day)*
70.000	x	1/2 length of basin (x direction, in feet)
32.000	y	1/2 width of basin (y direction, in feet)
0.041	t	duration of infiltration period (days)
100.000	hi(0)	initial thickness of saturated zone (feet)

Max. GW Mounding = 1.73 ft.

Value	Symbol	Description
101.730	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
1.730	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.730	0
1.723	10
1.678	25
1.429	50
0.701	75
0.199	100
0.043	125
0.009	150
0.002	175
0.001	200

Re-Calculate Now



Infiltration Basin 2

Input Values

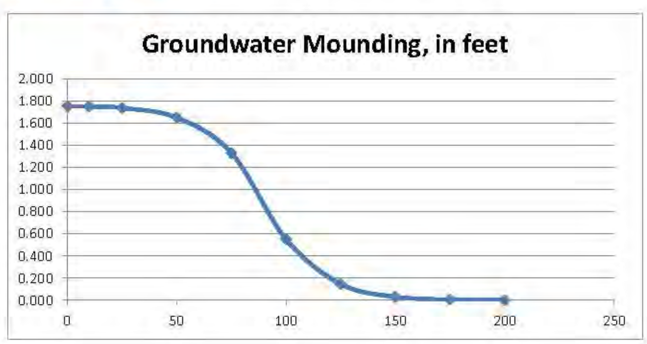
Value	Symbol	Description
16.5400	***R***	Recharge (infiltration) rate (feet/day)
0.300	Sy	Specific yield, Sy (dimensionless, between 0 and 1)
55.00	K	Horizontal hydraulic conductivity, Kh (feet/day)*
90.000	x	1/2 length of basin (x direction, in feet)
32.000	y	1/2 width of basin (y direction, in feet)
0.041	t	duration of infiltration period (days)
100.000	hi(0)	initial thickness of saturated zone (feet)

Max. GW Mounding = 1.75 ft.

Value	Symbol	Description
101.754	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
1.754	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.754	0
1.752	10
1.739	25
1.653	50
1.333	75
0.552	100
0.147	125
0.031	150
0.005	175
0.001	200

Re-Calculate Now



Disclaimer

So, the estimated groundwater mounding from the 2 detention basins is only 1.75 ft. or less, and this mounding drops to approximately 0.147 ft. (1.8"), or less, as you approach 125 ft. away from each basin. This represents a minimal and localized mounding that will not affect the performance of the stormwater management system.

Standard 5: *Land Uses With Higher Potential Pollutant Loads (LUHPPLs)*
Not applicable - this project does not involve a land use with higher potential pollutant loads in stormwater:

Standard 6: *Critical Areas (*Zone II of a public water supply)

Not Applicable - This site is not located within a critical area or a Zone II.

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

This project provides a robust stormwater management system and is sized for the 100-yr. storm, and complies with the DEP Stormwater Management Policy. There are no new discharges that cause or contribute to erosion of wetlands and waters of the Commonwealth.

Standard 8: *Construction Period Pollution Prevention and Erosion and Sedimentation Control.*

See attached Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan in Appendix F.

Standard 9: *Operation and Maintenance Plan*

See attached Stormwater Management System O & M Plan in Appendix F

Standard 10: *Prohibition of Illicit Discharges*

This project does not involve any potential illicit discharges. As required, the Illicit Discharge Compliance Statement will be signed by the applicant and submitted prior to the start of construction.

REFERENCES

HydroCAD® Stormwater Analysis Software, HydroCAD Software Solutions, 2009.

Massachusetts Department of Environmental Protection & Massachusetts Office of Coastal Zone Management, March 1997. *Stormwater Management Handboo*k. Volume 1 & 2.

Massachusetts Department of Environmental Protection, February 2008. *Massachusetts Stormwater Management Handbook (Regulations).*

U.S. Soil Conservation Service, 1981. *Soil Survey of Bristol County*, *Massachusetts.*

U.S. Soil Conservation Service, 1986. *Urban Hydrology for Small Watersheds (Technical Releases 55 & 20)*

APPENDIX A

Geotechnical Report by LGCI, dated September 24, 2020

September 24, 2020

Mr. Dan Lee
Division President, Boston
LMC
99 Summer Street, Suite 701
Boston, MA 02110
Phone: (561) 596-5818
Mobile: (857) 343-8240
E-mail: dan.lee@livelmc.com

Re: **Geotechnical Report**
Proposed Residential Development
Hyannis, Massachusetts
LGCI Project No. 2026-Rev. 2

Dear Mr. Lee:

Lahlaf Geotechnical Consulting, Inc. (LGCI) has completed a geotechnical study for the proposed residential development in Hyannis, Massachusetts. We are submitting this report electronically, please notify us if you need a hard copy.

The soil samples from our explorations are currently stored at LGCI for further analysis, if requested. Unless notified otherwise, we will dispose of the soil samples after three months.

Thank you for choosing LGCI as your geotechnical engineer.

Very truly yours,

Lahlaf Geotechnical Consulting, Inc.

Abdelmadjid M. Lahlaf, Ph.D., P.E.
Principal Engineer

Lahlaf Geotechnical Consulting, Inc.

GEOTECHNICAL REPORT
PROPOSED RESIDENTIAL DEVELOPMENT
HYANNIS, MASSACHUSETTS
LGCI Project No. 2026-Rev. 2
September 1, 2020
Revised September 24, 2020

Prepared for:

LMC
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GEOTECHNICAL REPORT
PROPOSED RESIDENTIAL DEVELOPMENT
HYANNIS, MASSACHUSETTS
LGCI Project No. 2026-Rev. 2
September 1, 2020
Revised September 24, 2020

Prepared for:

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Abdelmadjid M. Lahlaf, Ph.D., P.E.
Principal Engineer

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1. PROJECT INFORMATION

1.1 Project Authorization

This geotechnical report presents the results of the subsurface explorations and a geotechnical evaluation performed by Lahlaf Geotechnical Consulting, Inc. (LGCI) for the proposed residential development in Hyannis, Massachusetts. We performed our services in general accordance with the scope described in our proposal No. 20054 dated July 20, 2020, and in accordance with the terms and conditions of the Consultant Due Diligence Agreement dated July 21, 2020 signed by Mr. Dan Lee of LMC on the same date.

1.2 Purpose and Scope of Services

The purpose of our geotechnical services was to perform subsurface explorations at the site and to provide foundation design and construction recommendations. LGCI performed the following services:

- Coordinated the location of our explorations with Pesce Engineering & Associates, Inc. (PEA), the project Civil Engineer.

- Provided a field engineer to walk the site with PEA to adjust the exploration locations staked by the project surveyor, and notified Dig Safe Systems Inc. (Dig Safe) and the Town of Hyannis for utility clearance.

- Engaged an excavation subcontractor to excavate ten (10) test pits at the site.

- Engaged a drilling subcontractor to advance one (1) deep boring at the site.

- Provided an LGCI geotechnical engineer to observe the test pits and boring, describe the soil samples and prepare field logs.

- Submitted two (2) soil samples for laboratory testing.

- Prepared this geotechnical report containing the results of our subsurface explorations and our recommendations for foundation design and construction.

LGCI did not perform environmental services for this project. LGCI did not perform an assessment to evaluate for the presence or absence of hazardous or toxic materials above or below the ground surface at or around the site. Any statement about the color, odor, or the presence of suspicious materials included in our boring log or report were made by LGCI for information only and to support our geotechnical services. No environmental recommendations and/or opinions are included in this report.

Our scope does not include attending meetings, reviewing specifications and drawings, or performing field services. LGCI would be pleased to perform these services when needed. Recommendations for stormwater management, erosion control, pavement design, slope stability analyses, site specific liquefaction analysis, and detailed cost or quantity estimates are not included in our scope of work.

1.3 Site Description

LGCI's understanding of the site is based on our observations at the site, and on the following drawing:

- "Concept Site Plan at 35 Scudder Avenue in Hyannis, Massachusetts (Barnstable County)," (Concept Site Plan) prepared by PEA, dated July 13, 2020, and provided to LGCI by PEA via e-mail on July 17, 2020.

The site of the proposed development is located at 35 Scudder Avenue in Hyannis, Massachusetts as shown in Figure 1. The site is currently used as a Golf Course (Twin Brooks Golf Course). The site has frontage on Scudder Avenue, and is bordered by Scudder Avenue and an existing resource and conference center building on the northern side, by two brooks on the eastern and western sides, and by wet areas and private residential properties on the southern side.

An existing grading plan of the site was not available at the time of this report. However, based on our field observation, the grades at the site are slightly variable, typical with a golf course.

1.4 Project Description

Our understanding of the proposed construction is based on our discussions with PEA and on the Concept Site Plan.

We understand that the proposed construction will consist of thirteen apartment buildings and a club house. We understand that the size layout and locations of the proposed buildings are preliminary. The proposed construction will include driveways and parking lots. Access to the proposed development will be from a driveway connecting to Scudder Avenue on the western side of the resource and conference center.

Based on information provided to us by PEA, the proposed construction is outside of the buffer zones of nearby brooks and wetlands.

The proposed finished floor elevations and exterior grades have not been established at this time. We understand that the proposed buildings will be designed to require minor cuts and fill and will not have basements.

1.5 Elevation Datum

The ground surface elevations at our test pit and boring locations were provided to us by PEA via e-mail on August 13, 2013. We understand that the elevations are referenced to the National American Vertical Datum of 1988 (NAVD 88) and are in feet.

2. SITE AND SUBSURFACE CONDITIONS

2.1 Surficial Geology

LGCI reviewed a Surficial Geological Map titled: "Surficial Materials Map of the Hyannis Quadrangle, Massachusetts," prepared by Stone, B.D., Stone, J.R., and DiGiacomo-Cohen, M.L., for U.S. Geological Survey, Open File Report 2006-1260-F, 2018.

The Surficial Geological Map indicates that the natural soils in the general vicinity of the site consist of coarse deposits and swamp deposits.

The coarse deposits include gravel deposits, sand and gravel deposits, and sand deposits. The gravel deposits are composed of at least 50 percent gravel-size clasts, cobbles, and boulders. The sand and gravel deposits generally range from 25 to 50 percent gravel particles and from 50 to 75 percent sand particles. The sand deposits are composed mainly of very coarse to fine sand. Coarser layers may contain up to 25 percent gravel, and finer layers may contain fine sand, silt, and clay.

The swamp deposits are shown around the eastern, southern, and western sides along the streams. The swamp deposits are described as organic muck and peat and contain little sand, silt, and clay. The swamp deposits generally overly glacial deposits or bedrock and sometime glacial till. The swamp deposits are described to be at least 3 feet thick but are generally less than 10 feet thick.

The Surficial Geological Map of the site is shown in Figure 2.

2.2 Previous Explorations by Others

PEA provided us with the logs of eight (8) soil borings and sketch showing the profiles for nine (9) test pits performed by Briggs Engineering and Testing at the site in 2016. The previous borings and test pits generally indicated the presence of 1 to 4.5 feet of organic soil overlying natural sand. In one (1) test pit, excavated outside the limits of the site, the organic soil extended to a depth of about 6.5 feet beneath the ground surface.

The logs and locations of the previous explorations are included in Appendix A.

2.3 LGCI's Test Pits and Boring

2.3.1 General

LGCI coordinated our exploration locations with PEA who arranged to have the test pit and boring locations staked in the field by the project surveyor. LGCI visited the site to adjust the staked locations to be outside of the green areas. LGCI notified Dig Safe and the Town of Hyannis for utility clearance prior to starting our explorations at the site.

Unless notified otherwise, we will dispose of the soil samples obtained during our explorations after three months.

2.3.2 LGCI Explorations

2.3.2.1 Test Pits

LGCI engaged Northern Drill Service, Inc. (NDS) of Northborough, Massachusetts to excavate ten (10) test pits at the site (TP-1 to TP-6, TP-8, TP-9, TP-B-2, and TP-B-3) on August 18, 2020. The test pits were excavated using a John Deere 310 SL backhoe, and extended to depths ranging between 8 and 12 feet beneath the ground surface. Test pit TP-7 was not excavated due to access issues. Test pits TP-B-2 and TP-B-3 were substituted for borings B-2 and B-3, respectively as these locations were easier to access with a backhoe.

An LGCI engineer observed and logged the test pits in the field.

Upon completion, the test pit excavations were backfilled with the excavated material which was placed in about 18-inch lifts and tamped with the excavator bucket.

2.3.2.2 Soil Boring

LGCI engaged NDS to advance one (1) boring (B-4) at the site on August 17, 2020. The boring was advanced with a Mobile B-48 track rig using drive and wash techniques using a 4-inch casing. Boring B-4 extended to a depth of 60 feet beneath the ground surface. Upon completion, the borehole was backfilled with the soil cuttings. Our scope was to advance four (4) borings to depths of 20 feet each; however, because of heavy rain before the start of our explorations, the ground was soft, and only one (1) boring was performed.

NDS performed Standard Penetration Tests (SPT) during drilling and obtained split spoon samples in the boring with an automatic hammer at typical depth intervals of 2 feet or 5 feet as noted on the boring log in general accordance with ASTM D-1586.

An LGCI engineer observed and logged the boring in the field.

2.3.3 Test Pit and Boring Logs and Locations

The test pit and boring locations are shown in Figure 3. Appendix B contains LGCI's test pits logs. Appendix C contains LGCI's boring log. Tables 1 and 2 include summaries of LGCI's test pits and boring, respectively.

2.4 Subsurface Conditions

The subsurface description in this report is based on a limited number of test pits and one (1) boring and is intended to highlight the major soil strata encountered during our test pits and boring. The subsurface conditions are known only at the actual test pit and boring locations. Variations may occur and should be expected between test pit and boring locations. The test pit and boring logs represent conditions that we observed at the time of our test pits and boring, and were edited, as appropriate, based on the results of the laboratory test data and inspection of the soil samples in the laboratory. The strata boundaries shown in our test pit and boring logs are based on our interpretations and the actual transitions may be gradual. Graphic soil symbols are for illustration only.

The soil strata encountered in the test pits and boring were as follows, starting at the ground surface.

<u>Topsoil</u> – A layer of topsoil was encountered at the ground surface in all explorations and extended to depths ranging between 0.5 and 1.7 feet beneath the ground surface.

<u>Subsoil</u> – A layer of subsoil was encountered in boring B-4 and in test pit TP-1, and extended to depths of 3 and 4.5 feet beneath the ground surface, respectively. The samples in the subsoil were described as silty sand or poorly graded sand. The fines content ranged in the subsoil up to 30 percent. The subsoil contained between 10 and 25 percent fine to coarse gravel. The subsoil contained traces of organic soil and roots.

<u>Fill</u> – Fill was encountered beneath the topsoil or subsoil in all explorations except in test pit TP-1 and boring B-4, and extended to depths ranging 3.5 and 4.5 feet beneath the ground surface. The samples in the fill were mostly described as poorly graded sand or well graded sand. In one (1) test pit, the fill was described as silty sand. The fines content ranged in the fill up to15 percent and the gravel content ranged between 10 and 40 percent. The fill contained traces of organic soil and roots. The fill may be deeper at locations not explored by LGCI.

<u>Sand</u> – A layer of sand was encountered beneath the topsoil or subsoil in all test pits and in the boring, and extended to the test pit and boring termination depths. The samples in this layer were described as poorly graded sand with up to 10 percent fines and up to 15 percent gravel.

The standard penetration tests SPT N-values in this layer ranged between 9 and 27 blows per foot (bpf) with most values higher than 11 bpf, indicating mostly medium dense sand.

2.5 Groundwater

Groundwater was not encountered in the test pits, and was encountered at a depth of 14 feet during drilling and 19.9 feet beneath the ground surface at the end of drilling in boring B-4 as shown in Table 2 and in the boring log.

The groundwater information reported herein is based on observations made during or shortly after the completion of drilling and excavation, and may not represent the actual groundwater conditions, as additional time may be required for the groundwater levels to stabilize.

The groundwater information presented in this report only represents the conditions encountered at the time and location of the explorations. Seasonal fluctuation should be anticipated.

2.6 Laboratory Test Data

LGCI submitted two (2) soil samples collected from the test pits for grain-size analysis. The results of the grain-size analysis are provided in the test data sheets included in Appendix D and are summarized in the table below.

Grain-Size Analysis Test Results

Test Pit No.	Sample No.	Stratum	Sample depth (ft.)	Percent Gravel	Percent Sand	Percent Fines
TP-1	Grab	Subsoil	0.8 – 4.5	14.5	60.3	25.2
TP-9	Grab	Fill	1.4 – 4.5	28.0	60.3	11.7

3. EVALUATION AND RECOMMENDATIONS

3.1 General

Based on our understanding of the proposed residential development, our observation of the explorations, and the results of our laboratory testing, there are a few issues that we would like to highlight for consideration and discussion.

3.1.1 Surficial Topsoil and Subsoil

The surficial topsoil and subsoil are not suitable to support the proposed buildings and should be entirely removed from under the proposed building footprints. The removal should extend over an area extending beyond the zone of influence of the footings and at a minimum 2 feet outside the proposed building footprint, whichever is greater. The zone of influence is defined as the zone beneath a line starting at the bottom outer edge of the footings and extending outward and downward at a slope of 1H:1V.

In paved areas, we recommend entirely removing the surficial topsoil from within the proposed paved areas. We recommend removing the subsoil to the top of the natural sand, to the top of the existing fill, or to a minimum depth of 18 inches beneath the bottom of the proposed pavement, whichever occurs first. Where the subsoil extends to depths greater than 18 inches beneath the bottom of the proposed pavement, the subsoil deeper than 18 inches beneath the bottom of the proposed pavement may remain in place provided that it is improved in accordance with the recommendations in Section 4.1. The removal should extend 5 feet outside the limits of improvement areas.

3.1.2 Existing Fill

The existing fill is not suitable to support the proposed buildings and should be entirely removed from within the proposed building footprints. We anticipate that the removal will extend to depths of about 4.5 feet beneath the ground surface. The removal should extend over an area extending beyond the zone of influence of the footings and at a minimum 2 feet outside the proposed building footprint, whichever is greater. The zone of influence is defined as the zone beneath a line starting at the bottom outer edge of the footings and extending outward and downward at a slope of 1H:1V. The fill may be deeper at locations not explored by LGCI, especially near the brooks. We recommend engaging LGCI to perform additional explorations at the site to further delineate the limits and thickness of the existing fill.

The existing fill may remain in place within the proposed parking lots and driveways after it is improved in accordance with the recommendation in Section 4.1.

3.1.3 Shallow Foundations and Slab-on-grade

After the surficial topsoil, subsoil, and existing fill are entirely removed from within the proposed building footprint, the proposed building may be supported on shallow footings bearing in the natural sand. Due to the susceptibility of the natural sand to disturbance, we recommend placing footings on minimum of 6 inches of Structural Fill. The proposed slab may be designed as a slab-on-grade supported on Structural Fill placed directly on top of the natural sand.
Our recommendation for footing design and slab-on-grade are presented in Section 3.2 and 3.3, respectively.

3.1.4 Reuse of Onsite Materials

The subsoil is too silty and may not be used as backfill under roadways and buildings. It may be used in landscaped areas; however, the contractor is cautioned that when wet, the subsoil will become very soft and difficult to handle. The natural sand is generally poorly graded and while it may be used as Ordinary Fill (see Section 4.3), it will require to be wetted and will require significant effort to achieve the required relative compaction. Additional recommendations for fill materials and reuse, including amendment/improvement, of onsite materials are presented in Sections 4.3 and 4.4.

3.2 Foundation Recommendations

3.2.1 Footing Design

- For footings supported on a minimum of 6 inches of Structural Fill placed directly over the natural sand after removing the surficial topsoil, the subsoil, and the existing fill, we recommend a net allowable bearing pressure of 4 kips per square foot (ksf).

- Footing subgrades should be prepared in accordance with the recommendations in Section 4.1.

- All foundations should be designed in accordance with *The Commonwealth of Massachusetts State Building Code 780 CMR, ninth Edition* (MSBC 9th Edition).

- Exterior footings and footings in unheated areas should be placed at a minimum depth of 4 feet below the final exterior grade to provide adequate frost protection. Interior footings in heated areas may be designed and constructed at a minimum depth of 2 feet below finished floor grades.

- Wall footings should be designed and constructed with continuous, longitudinal steel reinforcement for greater bending strength to span across small areas of loose or soft soils that may go undetected during construction.

- A representative of LGCI should be engaged to observe that the subgrade has been prepared in accordance with our recommendations.

3.2.2 Settlement Estimate

For footings designed using the net allowable bearing pressure recommended above, we anticipate that the settlement will be about 1 inch and that the differential settlement of the footings will be 3/4 inch or less, over 25 feet. Total and differential settlements of these magnitudes are usually considered tolerable for the anticipated construction. As the design progresses and the settlement estimates are refined, the tolerance of the proposed structure to the predicted total and differential settlements should be assessed by the structural engineer.

3.3 Concrete Slab Considerations

- Floor slabs can be constructed as slabs-on-grade bearing on a minimum of 12 inches of Structural Fill placed directly on top of the natural sand. The subgrade of the slabs should be prepared as described in Section 4.1.

- To reduce the potential for dampness in the proposed floor slabs, the project architect may consider placing a vapor barrier beneath the floor slabs. The vapor barrier should be protected from puncture during construction of the slabs.

- For the design of the floor slabs bearing on the materials described above, we recommend using a modulus of subgrade reaction, k_{s1}, of 80 tons per cubic foot (tcf). Please note that the values of k_{s1} are for a 1 x 1 square foot area. These values should be adjusted for larger areas using the following expression:

$$Modulus\ of\ Subgrade\ \mathrm{Re}action\ (k_s) = k_{s1} * \left(\frac{B+1}{2B}\right)^2$$

where:

k_s = Coefficient of vertical subgrade reaction for loaded area,
k_{s1} = Coefficient of vertical subgrade reaction for 1 x 1 square foot area, and
B = Width of area loaded, in feet.

Please note that cracking of slabs-on-grade can occur as a result of heaving or compression of the underlying soil, but also as a result of concrete curing stresses. To reduce the potential for cracking, the precautions listed below should be closely followed for construction of all slabs-on-grade:

- Construction joints should be provided between the floor slab and the walls and columns in accordance with the American Concrete Institute (ACI) requirements, or other applicable code.

- Backfill in interior utility trenches should be properly compacted.

- In order for the movement of exterior slabs not to be transmitted to new foundations or superstructures, exterior slabs such as approach slabs and sidewalks, should be isolated from the superstructure.

3.4 Under-slab Drains

Based on the current groundwater levels observed in the explorations, we anticipate that under-slab drainage systems will not be required under the proposed buildings.

3.5 Seismic Design

In accordance with Section 1613 of MSBC 9th Edition and International Building Code (2015 IBC) and based on the boring data, the seismic criteria for the site are as follows:

- Site Class: D
- Spectral Response Acceleration at short period (Ss): 0.152g
- Spectral Response Acceleration at 1 sec. (S_1): 0.055g
- Site Coefficient Fa (Table 1613.5.3(1)): 1.6
- Site Coefficient Fv (Table 1613.5.3(2): 2.4
- Adjusted spectral response S_{MS}: 0.242 g
- Adjusted spectral responses S_{M1}: 0.132 g

Based on the boring information, we believe the site soils are not susceptible to liquefaction.

3.6 Lateral Pressures for Wall Design

3.6.1 Lateral Earth Pressures

Lateral earth pressures recommended for design of below grade building walls, if any, or site retaining walls are provided below.

Coefficient of Active Earth Pressure, K_A:	0.33
Coefficient of At-Rest Earth Pressure, K_o:	0.50
Coefficient of Passive Earth Pressure, K_p:	3.0
Total Unit Weight γ:	125 pcf

Note: The values in the table are based on a friction angle for the backfill of 30 degrees and neglecting friction between the backfill and the wall. The design active and passive coefficients are based on horizontal surfaces (non-sloping backfill) on both the active and passive sides, and a vertical wall face.

- Exterior walls of below ground spaces, and retaining walls braced at the top to restrain movement/rotation, should be designed using the "at-rest" pressure coefficient.

- We recommend placing free-draining material within the 3 feet immediately behind retaining walls. We recommend providing weep holes in site walls to promote drainage where possible, or a pipe should be placed at the base of the wall to collect the groundwater. Groundwater collected by the wall drains should be discharged in a lower area if gravity flow is possible.

- Passive earth pressures should only be used at the toe of the wall where special measures or provisions are taken to prevent disturbance or future removal of the soil on the passive side of the wall, or in areas where the wall design includes a key. In any case, the passive pressures should be neglected in the top 2 feet.

- Where a permanent vertical uniform load will be applied on the active side immediately adjacent to the wall, a horizontal surcharge load equal to half of the uniform vertical load should be applied over the height of the wall. At a minimum, a temporary construction surcharge of 100 psf should be applied uniformly over the height of the wall.

- We recommend using an ultimate friction factor of 0.45 between the natural sand and the bottom of the wall. Below grade walls should be designed for minimum factors of safety of 1.5 for sliding and 2.0 for overturning.

3.6.2 Seismic Pressures

In accordance with MSBC 9th Edition, Section 1610, a lateral earthquake force equal to $0.100*(S_s)*(F_a)*\gamma*H^2$ should be included in the design of walls (for horizontal backfill), where S_s is the maximum considered earthquake spectral response acceleration (defined in Section 3.5), F_a is the site coefficient (defined in Section 3.5), γ is the total unit weight of the soil backfill, and H is the height of the wall.

The earthquake force should be distributed as an inverted triangle over the height of the wall. In accordance with MSBC 9th Edition, Section 1610.2, a load factor of 1.43 shall be applied to the earthquake force for wall strength design.

Temporary surcharges should not be included when designing for earthquake loads. Surcharge loads applied for extended periods of time shall be included in the total static lateral soil pressure and their earthquake lateral force shall be computed and added to the force determined above.

3.6.3 Perimeter Drains

- We recommend that free-draining material be placed within 3 feet of the below grade spaces, if any. To reduce the potential for dampness in below-ground spaces, perimeter walls of the proposed below-ground spaces, if any, should be damp-proofed.

- We recommend that drains be provided behind the exterior of walls of below-ground spaces, and behind site retaining walls, if any. The drains should consist of 6-inch perforated PVC pipes installed with the slots facing down. Perimeter drains should be installed at the bottom of the wall in 18 inches of crushed stone wrapped in a geotextile fabric for separation and filtration. Site retaining walls may be designed with weep holes discharging near the bottom of the face of the walls.
- Groundwater collected by the wall drains could be discharged in a lower area if gravity flow is possible. Alternatively, it should be discharged into the street drains. A permit would be required for discharge into street drains.

3.7 Pavement Considerations

3.7.1 General

The subsurface conditions encountered at the site are generally suitable to support the proposed driveways, parking lots, and sidewalks after preparation of the subgrade as described in Section 4.1.

- We recommend entirely removing the topsoil from within the footprint of the proposed driveways and parking lots.

- The subsoil should be removed in accordance with the recommendations in Sections 3.1.1 and 4.1.

- The existing fill should be improved in accordance with the recommendations in Section 4.1.

- Cobbles and boulders should be removed to at least 18 inches below the bottom of the pavement.

3.7.2 Sidewalks

Sidewalks should be placed on a minimum of 12 inches of Structural Fill with less than 5 percent fines. To reduce the potential for heave caused by surface water penetrating under the sidewalk, the joints between the sidewalk concrete sections should be sealed with a waterproof compound. The sidewalks should be sloped away from the building or other vertical surfaces to promote flow of water. To the extent possible, roof leaders should not discharge onto sidewalk surfaces.

3.7.3 Pavement Sections

A typical, minimum, standard-duty pavement section that could be used for parking areas is as follows:

1.5" Asphalt "Top Course"
2.0" Asphalt "Base Course"
8" Processed Gravel for Sub-Base (MassDOT M1.03.1)

A typical, minimum, heavy-duty pavement section that could be used for areas of heavy truck traffic is as follows:

2.0" Asphalt "Top Course"
2.5" Asphalt "Base Course"
12" Processed Gravel for Sub-Base (MassDOT M1.03.1)

The pavement sections shown above represent minimum thicknesses representative of typical local construction practices for similar use. Periodic maintenance should be anticipated.

Pavement material types and construction procedures should conform to specifications of the "Standard Specifications for Highways and Bridges," prepared by the Commonwealth of Massachusetts Department of Public Works and dated 1988 (with the latest Supplemental Specifications).

Areas to receive relatively highly concentrated, sustained loads such as dumpsters, loading areas, and storage bins are typically installed over a rigid pavement section to distribute concentrated loads and reduce the possibility of high stress concentrations on the subgrade. Typical rigid pavement sections consist of 6 inches of concrete placed over a minimum of 12 inches of subbase material.

3.8 Underground Utilities

Boulders at the bottom of utility trenches should be removed to at least 12 inches below the pipe invert and the resulting excavation should be backfilled with suitable backfill. Utilities should be placed on suitable bedding material in accordance with the manufacturer's recommendations. "Cushion" material should be placed, by hand, above the utility pipe in maximum 6-inch lifts. The lift should be compacted by hand to avoid damage to the utility. Where the bedding/cushion material consists of crushed stone, it should be wrapped in a geotextile fabric.

Compaction of fill in utility trenches should be in accordance with our recommendations in Section 4.3. To reduce the potential for damage to utilities, placement and compaction of fill immediately above the utilities should be performed in accordance with the manufacturer's recommendations.

4. CONSTRUCTION CONSIDERATIONS

4.1 Subgrade Preparation

- The surficial topsoil, subsoil, existing fill, and other deleterious matter should be entirely removed from within the proposed building footprint before the start of foundation work.

- Tree stumps, root balls, and roots larger than ½ inch in diameter should be removed and the cavities filled with suitable material and compacted per Section 4.3 of this report.

- Topsoil, root balls, and other deleterious material should be entirely removed from within the proposed paved areas.

- Cobbles and boulders should be removed at least 6 inches from beneath footings, and 24 inches beneath the bottom of proposed slabs and paved areas. The resulting excavations should be backfilled with compacted Structural Fill under the building and with Ordinary Fill under the subbase of paved areas.

- Due to the high susceptibility of the natural soil for disturbance under foot and vehicular traffic, we recommend placing a minimum of 6 inches of Structural Fill at the bottom of the excavation or 4 inches of lean concrete to serve as a working mat.

- The base of the footing excavations in granular soil should be compacted with a dynamic vibratory compactor weighing at least 200 pounds and imparting a minimum of 4 kips of force to the subgrade before placing the required 6 inches of Structural Fill.

- The subgrade of the slabs should be compacted using a vibratory roller compactor imparting a minimum of 40 kips of force to the subgrade before placing Structural Fill.

- Where soft zones are revealed during the preparation of the subgrade, the soft materials or buried organic soil should be removed and replaced with Structural Fill within the building footprint and with Ordinary Fill beneath the subbase of paved areas.

- To reduce the potential of increasing lateral pressures on the retaining walls, fill placed within 3 feet of the walls, if any, should be compacted using a small plate compactor imparting a maximum dynamic effort of 4 kips. The fill within 3 feet of the walls should be placed in maximum 8-inch loose lifts.

- After the surficial topsoil is entirely removed and after the subsoil is removed from within the proposed paved areas in accordance with the recommendations in Section 3.1.1, the existing subsoil deeper than 18 inches beneath the bottom of the proposed pavement and/or the existing fill should be improved by compacting the exposed surface with at least six (6) passes of a vibratory roller compactor imparting a dynamic effort of at least 40 kips. Where soft zones of soil are observed, the soft soil should be removed, and the grade should be restored using Ordinary Fill to the bottom of the proposed subbase layer.

- Fill placed within the footprint of the proposed building should meet the gradation and compaction requirements of Structural Fill shown in Section 4.3.

- Fill placed under the subbase of paved areas, should meet the gradation and compaction requirements of Ordinary Fill shown in Section 4.3.

- Fill placed in the top 12 inches beneath sidewalks and exterior slabs should consist of Structural Fill with less than 5 percent fines.

- When crushed stone is required in the drawings or it is used for the convenience of the contractor, it should be wrapped in a geotextile fabric for separation. The geotextile fabric should not be used under retaining walls as it promotes a plane of sliding.

- An LGCI geotechnical representative should observe the removal of the existing fill and the subgrades of footings and slabs prior to fill and concrete placement to verify that the exposed bearing materials are suitable for the design soil bearing pressure. If soft or loose pockets are encountered in the footing excavations, the soft or loose materials should be removed, and the bottom of the footing should be placed at a lower elevation on firm soil, or the resulting excavation should be backfilled with Structural Fill or crushed stone wrapped in geotextile for separation. The LGCI representative should also observe the improvement of the existing subsoil and/or fill within the proposed paved areas.

4.2 Subgrade Protection

The site soils are frost susceptible. If construction takes place during freezing weather, special measures should be taken to prevent the subgrade from freezing. Such measures should include the use of heat blankets or excavating the final six inches of soil just before pouring concrete. Footings should be backfilled as soon as possible after footing construction. Soil used as backfill should be free of frozen material, as should the ground on which it is placed. Filling operations should be halted during freezing weather.

Materials with high fines contents are typically difficult to handle when wet as they are sensitive to moisture content variations. Subgrade support capacities may deteriorate when such soils become wet and/or disturbed. The contractor should keep exposed subgrades properly drained and free of ponded water. Subgrades should be protected from machine and foot traffic to reduce disturbance.

4.3 Fill Materials

Structural Fill and Ordinary Fill should consist of inert, hard, durable sand and gravel, free from organic matter, clay, surface coatings and deleterious materials, and should conform to the gradation requirements shown below.

4.3.1 Structural Fill

The Structural Fill should have a plasticity index of less than 6 and should meet the gradation requirements shown below. Structural Fill should be compacted in maximum 9-inch loose lifts to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557), with moisture contents within ±2 percentage points of optimum moisture content.

Sieve Size Percent	Passing by Weight
3 inches	100
1 ½ inch	80-100
½ inch	50-100
No. 4	30-85
No. 20	15-60
No. 60	5-35
No. 200*	0-10

* 0 – 5 Under sidewalks, unheated slabs, exterior stairs, ramps, and pads

4.3.2 Ordinary Fill

Ordinary Fill should have a plasticity index of less than 6 and should meet the gradation requirements shown below. Ordinary Fill should be compacted in maximum 9-inch loose lifts to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557) under paved areas and sidewalks, and 92 percent of the Modified Proctor maximum dry density in landscaped areas, with moisture contents within ±2 percentage points of optimum moisture content.

Sieve Size Percent	Passing by Weight
6 inches	100
1 inch	50-100
No. 4	20-100
No. 20	10-70
No. 60	5-45
No. 200	0-20

4.4 Reuse of Onsite Materials

The subsoil is silty and cannot be used as Ordinary or Structural Fill. The subsoil can be used in landscaped areas that do not support structures, pavements, sidewalks, or ramps. Based on our field observations and the results of the grain-size analyses, we anticipate some of the natural soil may be used as Ordinary Fill.

The natural soil and subsoil free of organic matter may be amended/improved by blending with crushed stone to produce Ordinary and Structural Fill.

Suitable imported material and amended/improved materials should be stockpiled separately from unimproved onsite soils. Should reusable materials be encountered during excavation, they should be excavated and stockpiled separately for compliance testing.

Soils with 20 percent or greater fines content are generally very sensitive to moisture content variations and are susceptible to frost. Such soils are very difficult to compact at moisture contents that are much higher or much lower than the optimum moisture content determined from the laboratory compaction test. Therefore, strict moisture control should be implemented during compaction of onsite soils with fines contents of 20 percent or greater. The contractor should be prepared to remove and replace such soils if pumping occurs.

All materials to be used as fill, including blended materials, should first be tested for compliance with the applicable gradation specifications.

4.5 Groundwater Control Procedures

Based on the groundwater levels encountered in our explorations, we do not anticipate that groundwater control procedures will be needed during the excavations to remove the topsoil and subsoil, and the existing fill, and in utility trenches.

We anticipate that filtered sump pumps installed in a series of sump pits located at least three feet below the bottom of the proposed excavations may be sufficient to handle surface runoff that may enter the excavations during wet weather. Please note that the natural soil was fairly permeable. Accordingly, the site contractor should be prepared to use multiple sump pumps during wet weather.

The contractor should be permitted to employ whatever commonly accepted means and practices are necessary to maintain the groundwater level below the bottom of the excavations, and to maintain a dry excavation during wet weather. Groundwater levels should be maintained at a minimum of 1-foot below the bottom of excavations during construction. Placement of reinforcing steel or concrete in standing water should not be permitted.

To reduce the potential for sinkholes developing over sump pump pits after the sump pumps are removed, the crushed stone placed in the sump pump pits should be wrapped in a geotextile fabric. Alternatively, the crushed stone should be entirely removed after the sump pump is no longer in use and the sump pump pit should be restored with suitable backfill.

4.6 Temporary Excavations

All excavations to receive human traffic should be constructed in accordance with the OSHA guidelines.

The site soils should generally be considered Type "C" and should have a maximum allowable slope of 1.5 Horizontal to 1 Vertical (1.5H:1V) for excavations less than 20 feet deep. Deeper excavations, if needed, should have shoring designed by a professional engineer.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of the excavation sides and bottom and to protect existing structures.

5. RECOMMENDATIONS FOR FUTURE WORK

We recommend engaging LGCI to perform the following services:

- Perform additional explorations at the site once the size and locations of the proposed buildings are established.
- Reviewing the geotechnical aspect of the Earth Moving specifications and the foundation drawings and provide written comments.
- Reviewing the geotechnical aspects of contractor submittals and requests for information (RFIs).
- Providing a field representative during construction to observe the subgrades for footings, floor slabs, and paved areas, and submit daily field reports documenting our observations and field recommendations.

6. REPORT LIMITATIONS

Our analysis and recommendations are based on project information provided to us at the time of this report. If changes to the type, size, and location of the proposed structures or to the site grading are made, the recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the conclusions and recommendations modified in writing by LGCI. LGCI cannot accept responsibility for designs based on our recommendations unless we are engaged to review the final plans and specifications to determine whether any changes in the project affect the validity of our recommendations and whether our recommendations have been properly implemented in the design.

It is not part of our scope to perform a more detailed site history; therefore, we have not explored for or researched the locations of buried utilities or other structures in the area of the proposed construction. Our scope did not include environmental services or services related to moisture, mold, or other biological contaminants in or around the site.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from anticipated conditions are encountered, it may be necessary to revise the recommendations in this report. We cannot accept responsibility for designs based on recommendations in this report unless we are engaged to 1) make site visits during construction to check that the subsurface conditions exposed during construction are in general conformance with our design assumptions and 2) ascertain that, in general, the work is being performed in compliance with the contract documents.

Our report has been prepared in accordance with generally accepted engineering practices and in accordance with the terms and conditions set forth in our agreement. No other warranty, expressed or implied, is made. This report has been prepared for the exclusive use of LMC for the specific application to the proposed residential development in Hyannis, Massachusetts as conceived at this time.

7. REFERENCES

In addition to the references included in the text of the report, we used the following references:

The Commonwealth of Massachusetts (2015), "The Massachusetts State Building Code, Ninth Edition," comprised of the International Building Code (IBC-2015) and 780 CMR: Massachusetts Amendments to IBC-2015.

The Department of Labor, Occupational Safety and Health Administration (1989), "Occupational Safety and Health Standards - Excavations; Final Rule," 20 CFR Part 1926, Subpart P.

USGS Hyannis, MA topographic map from http://mapserver.mytopo.com.

Table 1 - Summary of LGCI Test Pits
Proposed Residential Development
Hyannis, Massachusetts
LGCI Project No. 2026

Test Pit No.	Ground Surface Elevation (ft.)[1]	Groundwater[2] Depth / El. (ft.)	Bottom of Topsoil Depth / El. (ft.)	Bottom of Subsoil Depth / El. (ft.)	Bottom of Fill Depth / El. (ft.)	Bottom of Test Pit Depth / El. (ft.)
TP-1	30.7	- / **-**	0.8 / **29.9**	4.5 / **26.2**	- / **-**	10.0 [3]/ **20.7**
TP-2	26.6	- / **-**	0.5 / **26.1**	- / **-**	4.5 / **22.1**	12.0 [3]/ **14.6**
TP-3	20.9	- / **-**	1.2 / **19.7**	- / **-**	3.5 / **17.4**	12.0 [3]/ **8.9**
TP-4	20.2	- / **-**	1.0 / **19.2**	- / **-**	3.5 / **16.7**	11.0 [3]/ **9.2**
TP-5	18.1	- / **-**	1.0 / **17.1**	- / **-**	3.5 / **14.6**	10.0 [3]/ **8.1**
TP-6	22.6	- / **-**	1.0 / **21.6**	- / **-**	4.5 / **18.1**	10.0 [3]/ **12.6**
TP-7[4]	Not performed					
TP-8	21.1	- / **-**	1.0 / **20.1**	- / **-**	3.5 / **17.6**	8.0 [3]/ **13.1**
TP-9	31.3	- / **-**	1.5 / **29.8**	- / **-**	4.5 / **26.8**	8.0 [3]/ **23.3**
TP-B-2[4]	25.2	- / **-**	1.4 / **23.8**	- / **-**	3.5 / **21.7**	12.0 [3]/ **13.2**
TP-B-3[4]	19.0	- / **-**	0.8 / **18.2**	- / **-**	4.0 / **15.0**	10.0 [3]/ **9.0**

1. The ground surface elevations were provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020. The ground surface elevation at test pit TP-1 was adjusted by estimating the difference in elevations between the actual (as excavated) and original locations, and is therefore approximate.
2. "-" means groundwater or layer was not encountered.
3. Test pit terminated in the sand layer.
4. Test Pit TP-7 was not performed due to access issues. Test pits TP-B-2 and TP-B-3 were substituted for borings B-2 and B-3, respectively.

Table 2 - Summary of LGCI Borings
Proposed Residential Development
Hyannis, MA
LGCI Project No. 2026

Boring No.	Ground Surface Elevation (ft.)[1]	Groundwater[2] Depth / El. (ft.)	Bottom of Topsoil Depth / El. (ft.)	Bottom of Subsoil Depth / El. (ft.)	Bottom of Fill[2] Depth / El. (ft.)	Bottom of Boring Depth / El. (ft.)
B-4[4]	32.2	- / **-**	0.7 / **31.5**	3.0 / **29.2**	- / **-**	60.0 [3]/ **-27.8**

1. The ground surface elevation was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020, and was adjusted by estimating the difference in elevations between the actual (as drilled) and the original locations, and is therefore approximate.
2. "-" means layer was not encountered.
3. Boring terminated in the sand layer.
4. Boring B-1 was not performed due to access issues. Borings B-2 and B-3 were substituted by test pits TP-B-2, and TP-B-3, respectively.

N

0 — 0.5 Mi

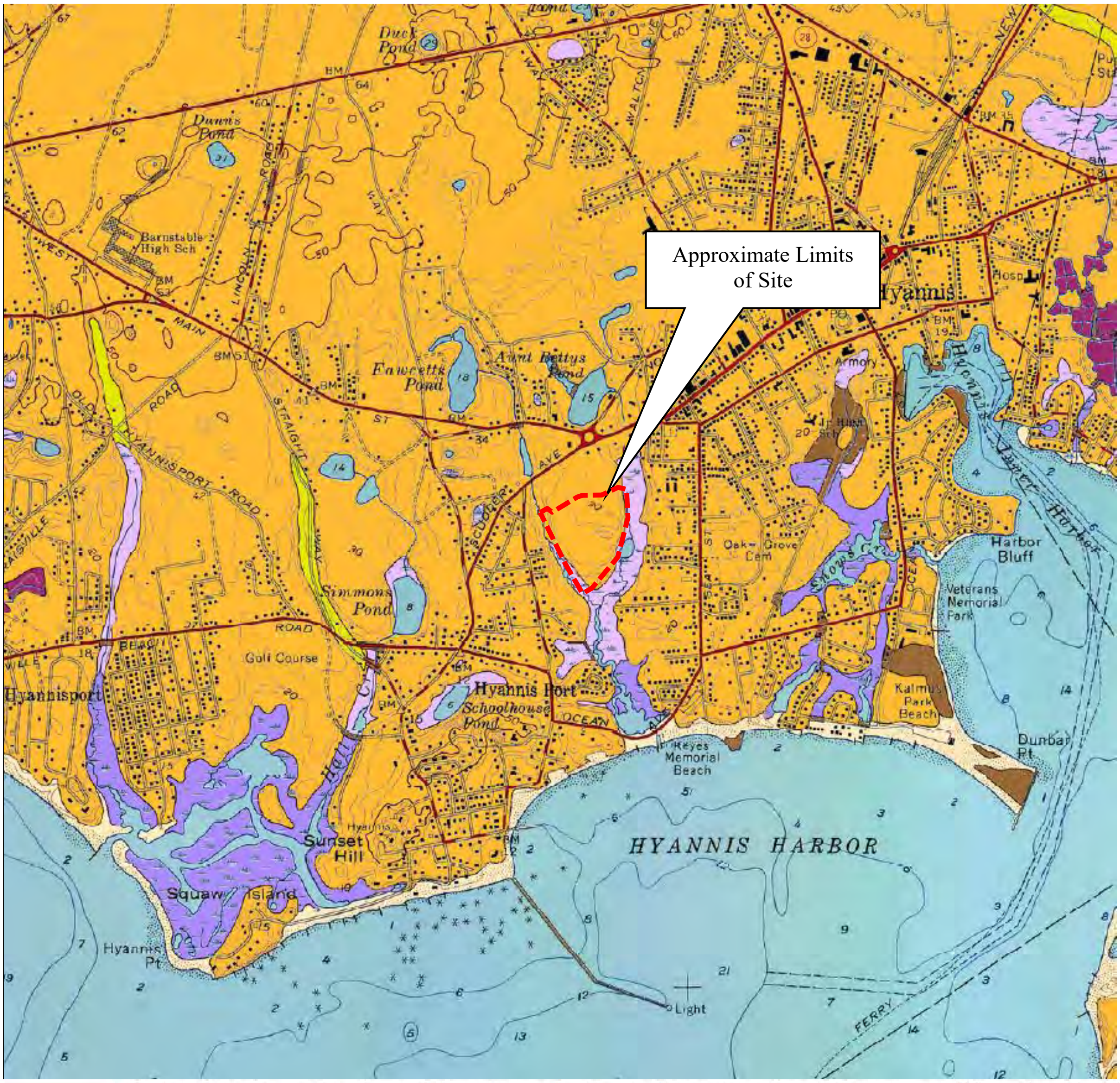
0 — 2000 Ft

Map provided by MyTopo.com

Contour Intervals: 10 feet

Note: Figure based on USGS topographic map of Hyannis, MA obtained from www.mytopo.com/maps

Client: LMC	Project: Proposed Residential Development	Figure 1 – Site Location Map	
LGCI Lahlaf Geotechnical Consulting, Inc.	Project Location: Hyannis, MA	LGCI Project No.: 2026	Date: Sept. 2020



Coarse deposits consist of *gravel deposits*, *sand and gravel deposits*, and *sand deposits*, not differentiated in this report. *Gravel deposits* are composed of at least 50 percent gravel-size clasts; cobbles and boulders predominate; minor amounts of sand occur within gravel beds, and sand comprises a few separate layers. Gravel layers generally are poorly sorted, and bedding commonly is distorted and faulted due to postdepositional collapse related to melting of ice. *Sand and gravel deposits* occur as mixtures of gravel and sand within individual layers and as layers of sand alternating with layers of gravel. Sand and gravel layers generally range between 25 and 50 percent gravel particles and between 50 and 75 percent sand particles. Layers are well sorted to poorly sorted; bedding may be distorted and faulted due to postdepositional collapse. *Sand deposits* are composed mainly of very coarse to fine sand, commonly in well-sorted layers. Coarser layers may contain up to 25 percent gravel particles, generally granules and pebbles; finer layers may contain some very fine sand, silt, and clay

N

Swamp deposits—Organic muck and peat that contain minor amounts of sand, silt, and clay, are stratified and poorly sorted, and occur in swamps and freshwater marshes, in kettle depressions, or in poorly drained areas. Unit is shown only where deposits are estimated to be at least 3 ft thick; most deposits are less than 10 ft thick. Swamp deposits overlie glacial deposits or bedrock. They locally overlie glacial till even where they occur within thin glacial meltwater deposits

Note: Figure based on map titled: "Surficial Materials Map of the Hyannis Quadrangle, Massachusetts," compiled by Byron D. Stone, and Mary L. DiGiacomo-Cohen, for U.S. Geological Survey, Scientific Investigations Map 3402, Quadrangle 176 - Hyannis.

Client: LMC	Project: Proposed Residential Development	Figure 2 – Surficial Geologic Map	
LGCI Lahlaf Geotechnical Consulting, Inc.	Project Location: Hyannis, MA	LGCI Project No.: 2026	Date: Sept. 2020

Legend

Approximate location of boring advanced by Northern Drill Service, Inc. (NDS) of Northborough, MA on August 17, 2020, and observed by Lahlaf Geotechnical Consulting, Inc. (LGCI).

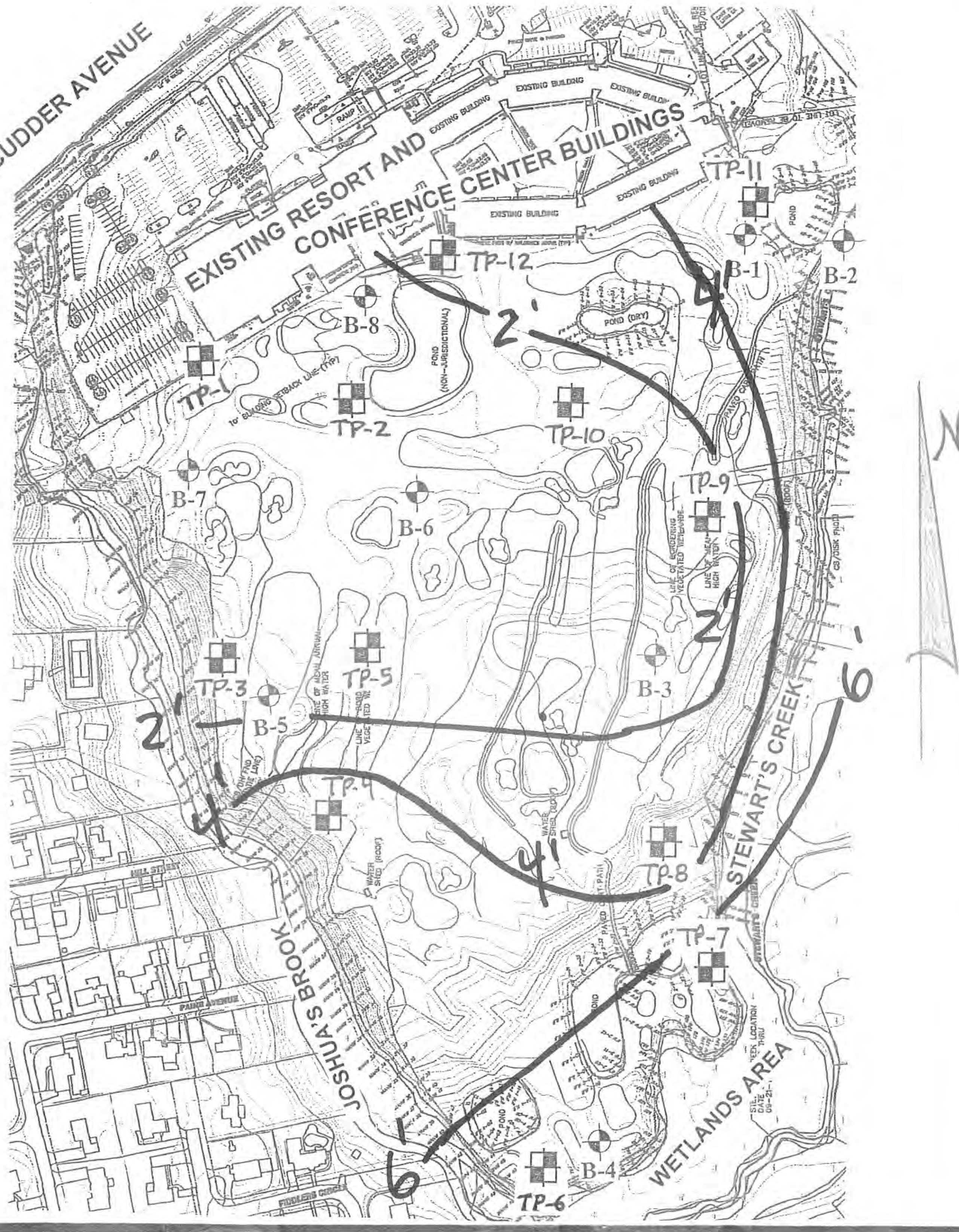
Approximate location of test pits excavated by NDS on August 18, 2020, and observed by LGCI.

Note

Figure based on drawing titled: "Concept Site Plan at 35 Scudder Avenue in Hyannis, Massachusetts (Barnstable County)," prepared by Pesce Engineering & Associates, Inc. (PEA), dated July 20, 2020, and provided to LGCI by PEA via e-mail on September 1, 2020.

Client: LMC	Project: Proposed Residential Development	Figure 3 – Test Pit and Boring Location Plan
LGCI Lahlaf Geotechnical Consulting, Inc.	Project Location: Sandwich, MA	LGCI Project No.: 2026 / Date: Sept. 2020

APPENDIX A - Logs of Previous Explorations by Others

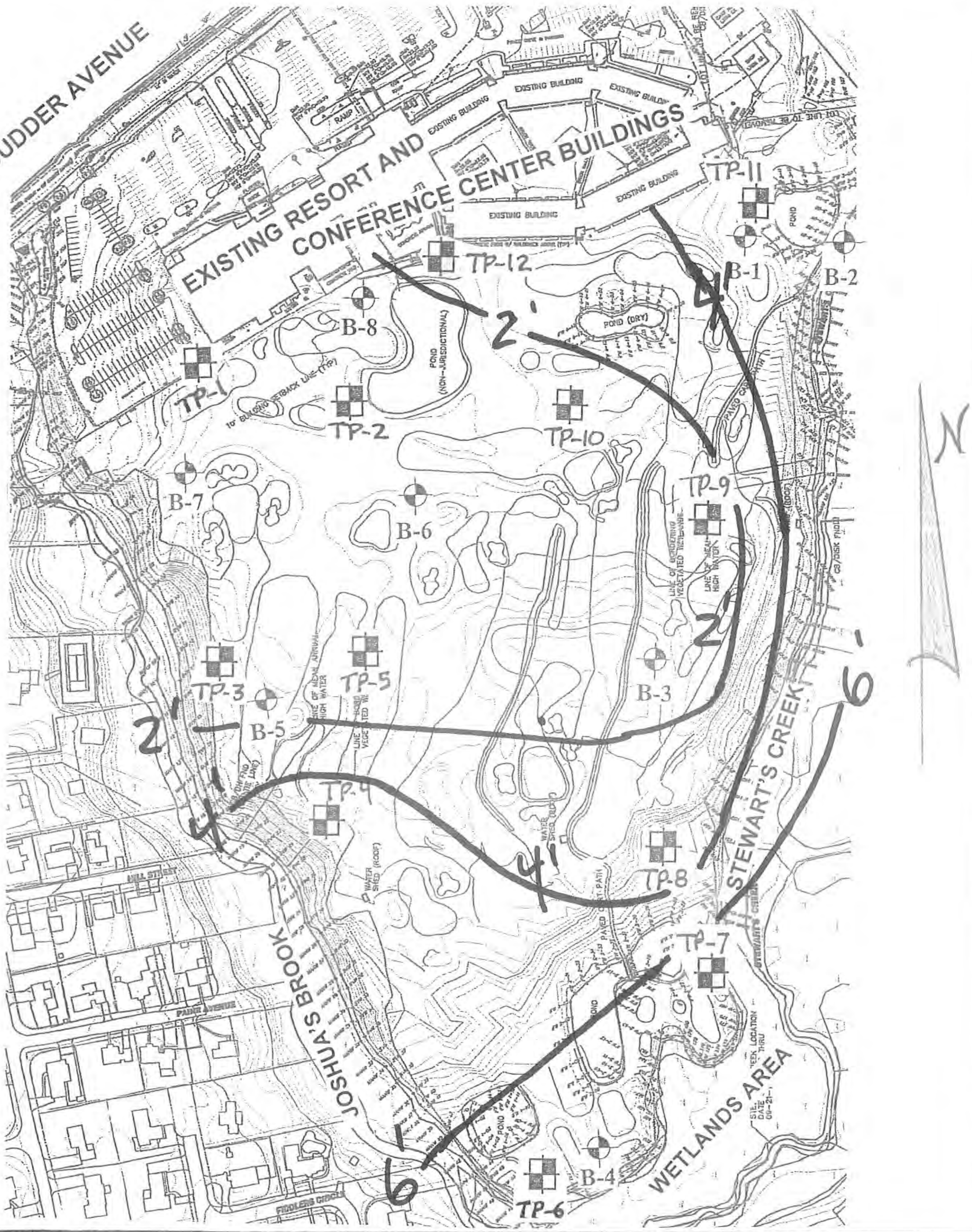


Briggs Engineering & Testing
A Division of PK Associates, Inc.

Symbol	Description
B-7	Test pit number and Approx. location.
TP-2	Test boring no. and Approx. location
4'	Depth Contour from Ground Surface to Undisturbed Inorganic Subgrade

LOCATION PLAN
PROPOSED SITE REDEVELOPMENT
25 SCUDDER AVE., HYANNIS, MA

Scale: N.T.S.	*Drawn:* DWG	FIG. 1
DEC 9, 2016	*Check:* DWG	



Briggs Engineering & Testing *A Division of PK Associates, Inc.*	B-7: Test pit number and Approx. location. TP-2: Test boring no. and Approx. location 4': Depth Contour from Ground Surface to Undisturbed Inorganic Subgrade	LOCATION PLAN PROPOSED SITE REDEVELOPMENT 25 SCUDDER AVE., HYANNIS, MA

Scale: N.T.S.	*Drawn:* DWG	FIG. 1
DEC 9, 2016	*Check:* DWG	

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9,.))*,X	9HZ'6#3&	N7UUSR		!DGW		9' 5	9* $5C
Ā.5ĀR*$HX	9H *.&&*,	Y7TT		BGO		9' 5	9* $5C

9*$5C %5	Ā'($)* 8#H	9*$5CĀ6	V*0H .0	R*6H .0	=)#4&2O	Ā5'5' PC'01 * %5	Ā'($)*Ā 9*&6,.$5.#0
	Ā !	GH @GH GH	@D	!K	J !G L K	GK	Ā !Ā" #$Ā#%Ā'($)*ĀĀ? VĀ? QTĀ0+ Ā+', >Ā3,#4 0Ā%0*Ā6#Ā6#' ,&*ĀĀ789: Ā.5)* Ā.)5Ā5'6*Ā; ,' <*):Ā5'6*Ā#,1'0 .6& =#5Ā#(Ā#%Ā'($)*ĀĀ+,-Ā)##&*Ā.1CĀ3,#4 0Ā%0*Ā6#Ā6#' ,&*Ā&.)5ĀĀ789 :Ā5'6* ; ,' <*):Ā.5)*Ā.)5
E	Ā @	EHG MHB	@D	!J	B B @@		Ā @Ā9, -Ā)##&*Ā.1CĀ3,#4 0Ā%0*Ā6#Ā6#', &*ĀĀ789 :Ā5'6*Ā ; ,' <*):Ā5'6*Ā Ā.)5
!G	Ā B	!GHG !@GH	@D	!K	@@B @		Ā BĀĀ.(.)',Ā5#ĀĀ @
!E	Ā D	!E HG !MHB	@D	@G	B J L !!		Ā DĀĀ.(.)',Ā5#ĀĀ @
@G	Ā E	@HG @@GH	@D	!K	! @L !@		Ā EĀ9, -Ā(*+./(Ā+*0&*Ā).1G5Ā3,#4 0Ā%0*Ā6#Ā(*+./(ĀĀ789 :Ā5'6*Ā Ā.)5
@E	Ā J	@HG @MHB	@D	!K	B L L L	@MG	Ā JĀĀ *5Ā(*+./(Ā+*0&*Ā).1CĀ3,#4 0Ā%0*Ā6#Ā(*+./(ĀĀ789 :Ā5'6*Ā Ā.)5 =#5Ā#(Ā#%ĀF$)#,'5.#0Ā5Ā@MGH
BG							

; ,#/0 +ĀĀ/,%6*Ā5# /&*+ 5C*0

V,#$#,5#0&Ā&*+		P#C*&.<*ĀR#0&.&50 6- =)#4&25				P#C*&.#0)*&&ĀĀ0&.5- =)#4&25		Ā'($)*Ā' -$*
",' 6*	GĀ5#ĀGa	G@	] *,- ĀĀ#%5	L !E	Ā5%%	G!G	T##&*	_V c Y.F*+Ā/.&5#0
T.5)*	!GĀ5#Ā@G	B D	Ā#%5	!J BG	] Ā5%%	!G BG	U 9*0&*	_" c ĀC*)3-Ā' /3 *
Ā#(*	@G5#ĀBE	E K	U Ā5%%	B!^	N' ,+	BGEG	9* 0&*	?S c ? $*0ĀS0+ĀR#+
70+	BE5#ĀEG					EG^	] 9* 0&*	` c BGGWĀC'((*,

**Ā !"#$** !HĀĀ C*Ā&5' 5%6' 5#0Ā)0*&Ā*$,*&'05ĀC*Ā$$,#F.(' 5'Ā3#/ 0+' ,-Ā3*54 **0Ā&#.)Ā5 $*&HĀĀ C*Ā5' 0&5#0Ā(' -Ā3*Ā',' +/')H @ĀĀĀ ' 5',Ā)*<*)Ā' +.01&Ā4 *,*Ā(' +*Ā.0ĀC*Ā+,.)ĀC#)*Ā+/ ,.01Ā#,Ā5ĀC*Ā6#($)*5#0Ā#%Ā+,.)).01HĀĀ C*Ā4' 5',Ā)*<*)Ā(' -Ā65' 5'Ā#<*,Ā5(*H

%"&' () #$ 8? " SXĀĀ7))Ā&#.)Ā*&6,.$5#0&Ā*Ā ('+*Ā.0ĀC*Ā%(*)+Ā3-ĀC*Ā9,.)).01Ā*#,*(' 0HĀĀ8#Ā)'3#,'5 #,- Ā0')-&*&Ā4*,* $*,%#,(*+Ā#%ĀC.&Ā$,$#&*H

=ĀTĀTTĀU @D@Ā0; Ā:ĀN 788 ĀH VZĀ S? T?: @H 9" Ā@22J

; *#)#1.6ĀĀS',5 CĀSF$)#,'5.#0:ĀQ6H

MĀC*,4##+Ā9,.<*
"S TĀEKĀBDĀDBD

8#,%#)>:ĀJ7ĀG@EJ
Y7bĀEGKĀBKDĀDE@

PTGS8" X Ā-,.11&ĀS01.0**,. 01
VR? ZSP" X BEĀ6/++*,Ā7<*0/*
T? P7" Q 8X N-'00.&:ĀJ7

=? RQ3; ĀWX
= D
V7;S
! ?Y !

Y.)*ĀWX	!J@D@		P7 ĀQ3;	Ā7UVTSR	P? RSĀ-7RRST
9' 5ĀĀ5, 5+X	!@2K2J	"[VS	NĀ7	ĀĀ	
9' 5ĀP#($)*5 *+X	!@2K2J	ĀQ\S	BĀ2DO	@O	
9,.))*,X	9HZ'6#3&	N7UUSR		!DGW	
Ā.5ĀR*$HX	9H *.&&*,	Y7TT		BGO	

Ā/,%6*Ā S)*<'5.#0X

Ā55.#0X

; ,#/0 +4'5*, Ā*<*)Ā' +.01&

9' 5 9* $5C

9' 5 9* $5C

9*$5C %5	Ā'($)* 8#H	9*$5CĀ6	V*0H .0	R*6H .0	=)#4&2O	Ā5'5' PC'01 * %5	Ā'($)*Ā 9*&6,.$5.#0
	Ā !	GG @GH !HG	@D	!J	B B E E	!HG	Ā !Ā" #$Ā#%Ā&'($)*ĀĀ+,-Ā)##&*Ā+', >Ā3,#40Ā ? VĀ? QTĀ0+ Ā%0*Ā6#Ā(*+./(Ā7 89: Ā.5)*ĀĀ.)5Ā5' 6*Ā? ,1' 0.6& =#5#(Ā#%Ā&'($)*ĀĀ+,-Ā(*+./(Ā+*0&*Ā3,#40Ā%0*Ā6#Ā6#' ,&*Ā1,'< *))-ĀĀ7 89 :).5)*Ā, ' <*)Ā5'6*Ā Ā.)5
E	Ā @	EHG MHB	@D	!J	@@@@		Ā @Ā *5Ā##&*Ā', >Ā3,#40Ā#Ā3)'6>Ā%0*Ā6#Ā6#' ,&*Ā&.)5ĀĀ7 89 :Ā.5)*ĀĀ.)5Ā5'6* ? ,1'0 .6&
!G	Ā B	!GHG !!HE	!K	D	E B! KG	!@HE	Ā BĀĀ.(.)',Ā5#ĀĀ @ 7/1* ,Ā* %&')Ā'5Ā@EHI =#5#(Ā#%ĀF$)#,'5.#0Ā5Ā@EHI
!E							
@G							
@E							
BG							

; ,#/0 +ĀĀ/,%6*Ā 5# /&*+ 5C*0

V,#$#,5#0&Ā&*+	P#C*&.<*ĀR#0&.&50 6- =)#4&25	P#C*&.#0)*&&9Ā0&.5- =)#4&25	Ā'($)*Ā' -$*
",' 6* GĀ5#ĀGa T.5)* !GĀ5#Ā@6 Ā#(* @GĀ5#ĀBEa 70+ BEĀ5#ĀEGa	G@] *,- ĀĀ#%5 L !E Ā5%% B D Ā#%5 !J BG] Ā5%% E K U Ā5%% B!^ N' ,+	G!G T##&* !G BG U 9*0&* BGEG 9* 0&* EG^] 9* 0&*	_V c Y.F*+Ā/.&#0 _" c ĀC*)3Ā' /3 * ?S c ? $*0Ā50+ĀR#+ ` c BGGWĀC'((*,

Ā !"#$!HĀĀ C*Ā&5' 5%6' 5#0Ā0*&Ā* $,*&* 05ĀC*Ā$$,#F.(' 5'Ā3#/ 0+' ,-Ā3*54**0Ā&#.)Ā5 $*&#ĀĀ C*Ā5' 0&5#0Ā(' -Ā3*Ā1,' +/')H @ĀĀĀ ' 5',Ā*<*)Ā* ' +.01&Ā4 *,*Ā(' +*Ā0ĀC*Ā+,.)ĀC#)*Ā+/ ,.01Ā#,Ā 5ĀC*Ā6#($)*5#0Ā#%Ā+,.))01HĀĀ C*Ā4' 5',Ā*<*)Ā(' -Ā%65' 5Ā#<*,Ā5(*H

%"&' ()#$ 8? " SXĀ7))Ā&#.)Ā*&6,.$5#0&Ā*Ā ('+*Ā.0ĀC*Ā%)+Ā3-ĀC*Ā9,.)).01ĀY#,*(' 0HĀĀ8#Ā)'3#,'5 #,-Ā0')-&*&Ā 4*,* $*,%#,(*+Ā%#,ĀC.&ĀV,$#&*H

=TĀTTĀJ @D@ĀQ: Ā:ĀN 788 QĀH VZĀ S? T?: QH 9" Ā@22J

; *#)#1.6ĀĀS',5 CĀSF$)#,'5.#0:ĀQ06H	PTG8" X Ā+,.11&ĀS01.0**,. 01	=? RQ8; ĀWX
MĀĀC*,4##+Ā9,.<* 8#,%#)>:ĀU7ĀG@EJ "S TĀEKĀBDĀDBD Y7bĀEGKĀBKDĀDĀE@	VR? ZSP" X BEĀ6/++*,Ā7<*0/* T? P7" Q8X N-'00.&:ĀU7	= E V7;S ! ?Y !

Y.)*ĀWX	!J@D@	P7ĀQ8;	Ā7UVTSR	P? RSĀ-7RRST	Ā/,%6*ĀS)*<'5.#0X
9' 5ĀĀ5, 5+X	!@22J	"[VS	NĀ7	ĀĀ	Ā55.#0X
9' 5ĀP#($)*5 *+X	!@22J	ĀQ\S	BĀ2DO	@O	; ,#/0 +4'5*, Ā*<*)Ā' +.01&
9,.))*,X	9HZ'6#3&	N7UUSR		!DGW	9' 5 9* $5C
Ā.5ĀR*$HX	9H *.&&*,	Y7TT		BGO	9' 5 9* $5C

9*$5C %5	Ā'($)* 8#H	9*$5CĀ6	V*0H .0	R*6H .0	=)#4&2O	Ā5'5' PC'01 * %5	Ā'($)*Ā 9*&6,.$5.#0
	Ā !	GH @GH !HD	@D	@D	J ML !!	!HB	Ā !Ā" #$Ā#%Ā&'($)*ĀU*+./(Ā+*0&*Ā3)'6>Ā" ? VĀ? QTĀ0+Ā%0*Ā6#Ā6#' ,&* Ā7 89: Ā.5)*ĀĀ.)5Ā5' 6*Ā? ,1' 0.6 =#5#(Ā#%Ā&'$)*ĀĀ9', >Ā3,#40Ā,'<*))-Ā%0*Ā6#Ā6#',&*ĀĀ7 89 :Ā.5)*Ā, '<*)Ā.5* Ā.)5
E	Ā @	EHG MHB	@D	@D	DJKK		Ā @ĀU*+./(Ā+*0&*Ā).1G5Ā3,#40Ā%0*Ā6#Ā(*+./(ĀĀ7 89 :Ā5'6*Ā Ā.)5ĀĀ5'5.%+
!G	Ā B	!GHG !@GH	@D	@D	EKLL		Ā BĀĀ.(.)',Ā5#ĀĀ D
!E	Ā D	!EHG !MHB	@D	@D	EEE!G		Ā DĀĀ.(.)',Ā5#ĀĀ D
@G	Ā E	@GHG @@GH	@D	@D	JK!@@G		Ā EĀĀ.(.)',Ā5#ĀĀ D
@E	Ā J	@EHG @MHB	@D	@D	!G!J!K!@G	@MG	Ā JĀĀ.(.)',Ā5#ĀĀ D:ĀF6*$5Ā+*0&* =#5#(Ā#%ĀF$)#,'5.#0Ā5Ā@MGH
BG							

; ,#/0 +ĀĀ/,%6*Ā5# ____ /&*+ ____ 5C*0 ____

V,#$#,5#0&Ā&*+	P#C*&.<*ĀR#0&.&50 6- =)#4&25	P#C*&.#0)*&&ĀĀ0&.5- =)#4&25	Ā'($)*Ā -$*
",' 6* GĀ5#ĀGa T.5)* !GĀ5#Ā@6 Ā#(* @Ā5#ĀBEa 70+ BEĀ5#ĀEGa	G@] *,- ĀĀ#%5 L !E Ā5%% B D Ā#%5 !J BG] Ā5%% E K U Ā5%% B!^ N' ,+	G!G T##&* !G BG U 9*0&* BGEG 9* 0&* EG^] 9* 0&*	_V c Y.F*+Ā/.&5#0 _" c ĀC*)3-Ā'/3 * ?S c ? $*0Ā50+ĀR#+ ` c BGGWĀC'((*,

Ā !"#$	!HĀĀ C*Ā5' 5%6 5#0Ā0*&Ā*$,*&*05ĀC*Ā$$,#F.('5Ā3#/0+' ,-Ā3*54**0Ā#.)Ā5$*&#ĀĀC*Ā5' 0&.5#0Ā('-Ā3*Ā,' +/')H @ĀĀĀ'5',Ā*<*)Ā' +.01&Ā4*,*Ā('+*Ā0ĀC*Ā+,.)ĀC#)*Ā+/ ,.01Ā#,Ā5ĀC*Ā6#($)*5#0Ā#%Ā+,.))01HĀĀ C*Ā4'5',Ā*<*)Ā('-Ā65'5ĀĀ<*,Ā5(*H
%"&' ()#$	8? " SXĀĀ7))Ā&#.)Ā*&6,.$5#0&Ā*Ā('+*Ā.0ĀC*Ā%)+Ā3-ĀC*Ā9,.))01ĀY#,*(' 0HĀĀ8#Ā)'3#,'5 #,-Ā0')-&*&Ā4*,* $*,%#,(*+Ā#%,ĀC.&5Ā,$#&*H

=TĀTTĀJ @D@ĀQ; Ā:ĀN 788 ĀH VZĀ S? T? ; @H 9" Ā@22J

; *#)#1.6ĀĀS',5 CĀSF$)#,'5.#0:ĀQ06H

MĀĀC*,4##+Ā9,.<*
"S TĀEKĀBDĀDBD

8#,%#)>:ĀU7ĀG@EJ
Y7bĀEGKĀBKDĀDE@

PTGS8" X Ā=,.11&ĀS01.0**,.01
VR? ZSP" X BEĀ6/++*,Ā7<*0/*
T? P7" Q 8X N-'00.&:ĀU7

=? RQ8; ĀWX
= J
V7;S
! ?Y !

Y.)*ĀWX !J@D@
9' 5ĀĀ5, 5+X !@22J
9' 5ĀP#($)*5 *+X !@22J
9,.))*,X 9HZ'6#3&
Ä.5ĀR*$HX 9H *.&&*,

	P7ÄQ8;	Ä7UVTSR	P? RSĀ=7RRST
"[VS	NÄ7	ÄÄ	
ÄQ\S	BĀ2DO	@O	
N7UUSR		!DGW	
Y7TT		BGO	

Ä/,%6*ĀS)*<'5.#0X
Ä55.#0X
; ,#/0 +4'5*,Ā)*<*)Ā*' +.01&
9' 5 9* $5C
9' 5 9* $5C

9*$5C %5	8#H	9*$5CĀ6	V*0H .0	R*6H .0	=)#4&2O	Ä5'5' PC'01 * %5	Ä'($)*Ā 9*&6,.$5.#0
	Ä !	GH @GH GH	@D	@G	B E MK	GH @GH	Ä !Ā" #$Ā#%&'($)*ĀU*+./(Ā+*0&*Ā3)'6>Ā" ? VÄ? QTĀ0+Ā%0*Ā6#Ā6#' ,&* Ä789: Ā.5)*ĀĀ.)5Ā5' 6*Ā? ,1' 0.6 =#55#(Ā#%&'($)*ĀĀ+' ,>Ā3,#40Ā%0*Ā6#Ā6#' ,&*Ā',<*))-ĀĀ789 :ĀYQTĀ.5)* ; ,' <*):Ā5'6*Ā Ä.)5
E	Ä @	EHG MHG	@D	!D	B D B D		Ä @Ā##&*Ā.1CĀ3,#40Ā%0*Ā6#Ā6#', &*ĀĀ789 :Ā5'6*Ā ; ,' <*):Ā5'6*Ā Ä.)5
!G	Ä B	!GHG !@GH	@D	!K	@B E K		Ä BĀĀ.(.)',Ā5#ĀĀ @ĀĀ5'5.%+
!E	Ä D	!EHG !MHG	@D	!G	E K K L		Ä DĀU*+./(Ā+*0&*Ā.1GĀ3,#40Ā%0*Ā6#Ā(*+./(ĀĀ789 :Ā5'6*Ā Ä.)5ĀĀ5'5.%+
@G	Ä E	@HG @GH	@D	!K	B B @@		Ä EĀĀ.(.)',Ā5#ĀĀ D 4*5Ā3*)#4 Ā@!I
@E	Ä J	@EHG @MHG	@D	!D	D M M J		Ä JĀA *5Ā(*+./(Ā+*0&*Ā.1CĀ3,#40Ā%0*Ā6#Ā6#', &*ĀĀ789 :Ā5'6*Ā Ä.)5 Ä MĀ'($)*Ā55($5+ĀĀ3Ā#%Ā3)#40 .0
BG						BGHG	=#55#(Ā#%ĀF$)#,'5.#0Ā5ĀBGHI

; ,#/0 +ĀĀ/,%6*Ā5# /&*+ 5C*0

V,#$#,5#0&Ā&*+	P#C*&.<*Ā#0&.&50 6- =)#4&25	P#C*&.#0)*&&Ā0&.5- =)#4&25	Ä'($)*Ā -$*
",' 6* GĀ#ĀGa T.5)* !GĀ#Ā@6 Ä#(* @Ā#ĀBEa 70+ BEĀ#ĀEGa	G@] *,- ĀĀ#%5 L !E Ä5%% B D Ä#%5 !J BG] Ä5%% E K U Ä5%% B!^ N' ,+	G!G T##&* !G BG U 9*0&* BGEG 9* 0&* EG] 9* 0&*	_V c Y.F*+Ā/.&5#0 _" c ÄC*)3-Ā'/3 * ?S c ? $*0ĀS0+ĀR#+ ` c BGGWĀC'((*,

**Ä !"#$** !HĀĀC*Ā5' 5%6 5#0Ā0*&Ā*$,*&*05ĀC*Ā$$,#F.('5Ā3#/0+' ,-Ā3*54**0Ā#.)5-$*&ĀĀC*Ā5' 0&5#0Ā ' -Ā3*Ā' ,' +/')H @ĀĀĀ ' 5',Ā*<*)Ā*' +.01&Ā4*,*Ā ' +*Ā0ĀC*Ā+,.))ĀC#)*Ā+/ ,.01Ā#,Ā5ĀC*Ā6#($)*5#0Ā#%Ā,.))01HĀĀC*Ā4' 5',Ā*<*)Ā ' -Ā6<5' 5'Ā#<*,Ā5(*H

%"&' () #$ 8? " SXĀĀ7))Ā#.)Ā*&6,.$5#0&Ā*Ā ('+*Ā.0ĀC*Ā%)+Ā3-ĀC*Ā9,.)).01ĀY#,*(' 0HĀĀ3#Ā)'3#,'5 #,-Ā0')-&*&Ā4*,* $*,%#,(*+Ā#%,ĀC.&ĀV,$#&*H

=TĀTTĀU @DĀQ: Ä:ĀN 788 QH VZĀ S? T? : QH 9" Ā@22J

; *#)#1.6ĀĀS',5 CĀSF$)#,'5.#0:ĀQ6H

MĀĀC*,4 ##+Ā9 ,.<*
"S TĀEKĀBDĀDBD

8#,%#)>:ĀJ7ĀG@EJ
Y7bĀEGKĀBKDĀDE@

PTGS8" X Ā=,.11&ĀS01.0**,. 01
VR? ZSP" X BEĀ6/++*,Ā7 <*0/*
T? P7" Q8X N-'00.&:ĀJ7

=? RQ8; ĀWX
= M
V7;S
! ?Y !

Y.)*ĀWX	!J@D@		P7 ĀQ8;	Ā7 UVTSR	P? RSĀ-7 RRST
9' 5ĀĀ5, 5+X	!@22J	"[VS	NĀ7	ĀĀ	
9' 5ĀP#($)*5 *+X	!@22J	ĀQ\S	BĀ2DO	@O	
9, .))*,X	9HZ'6#3&	N7UUSR		!DGW	
Ā.5ĀR* $HX	9H *.&&*,	Y7TT		BGO	

Ā/,%6*Ā S)*<'5.#0X
Ā55.#0X
; ,#/0 +4'5*, Ā)*<*)Ā*' +.01&
9' 5 9* $5C
9' 5 9* $5C

9*$5C %5	Ā'($)* 8#H	9*$5CĀ5	V*0H .0	R*6H .0	=)#4&2O	Ā5'5' PC'01 * %5	Ā'($)*Ā 9*&6,.$5.#0
	Ā !	GH @GH GH	@D	!G	E E MK	GH @GH	Ā !Ā" #$Ā#%Ā&'($)*ĀĀU*+./(Ā+*0&*Ā3)'6>Ā" ? VĀ? QTĀ0+Ā%0*ĀĀ7 89: Ā.5)* Ā.)5Ā5'6*Ā ? ,1'0 .6 =#5Ā#(Ā#%Ā&'($)*ĀĀ=,#4 0Ā1,'< *))-Ā%0*Ā6#Ā6#',&*ĀĀ7 89: ĀYQT:Ā.5)*Ā ,' <*):).5)*Ā.)5
E	Ā @	EHG MHG	@D	!D	MJ !G ! !		Ā @ĀU*+./(Ā+*0&*Ā).1G5Ā3,#4 0Ā%0*Ā6#Ā(*+./(ĀĀ7 89 :Ā5'6*Ā Ā.)5
!G	Ā B	!GHG !@GH	@D	!J	E E K !!		Ā BĀĀ.(.)',Ā5#ĀĀ @ĀĀ5'5 .%+
!E	Ā D	!EHG !MHG	@D	!K	J MMK		Ā DĀU*+./(Ā+*0&*Ā).1G5Ā3,#4 0Ā%0*Ā6#Ā6#' ,&*ĀĀ7 89: Ā5'6*Ā ; ,' <*):Ā5'6*Ā Ā.)5 Ā5'5 .%+
@G	Ā E	@GHG @@GH	@D	!G	B D E E		Ā EĀĀ.(.)',Ā5#ĀĀ D:ĀF6*$5Ā4 *5
@E	Ā J	@EHG @MHG	@D	K	D J L M		Ā JĀĀ.(.)',Ā5#ĀĀ D:ĀF6*$5Ā4 *5 Ā MĀ55'($5+Ā&'($)*ĀBĀ3)#40 .0
BG						BGHG	=#5Ā#(Ā#%ĀF$)#,'5.#0Ā5ĀBGHI

; ,#/0 +ĀĀ/,%6*Ā 5# /&*+ 5C*0

V,#$#,5#0&Ā&*+		P#C*&.<*ĀR#0&.&5 0 6- =)#4&2O		P#C*&.#0)*&&ĀĀ0&.5- =)#4&2O		Ā'($)*Ā' -$*
" ,' 6*	GĀ#ĀGa	G@] *,- ĀĀ#%5	L !E ĀĀ5%%	G!G	T##&*	_V c Y.F*+Ā/.&5#0
T.5)*	!GĀ#Ā@Ga	B D Ā#%5	!J BG] Ā5%%	!G BG	U 9*0&*	_" c ĀC*)3-Ā'/3 *
Ā#(*	@GĀ#ĀBEa	E K U Ā5%%	B! ^ N' ,+	BGEG	9* 0&*	?S c ? $*0ĀS0+ĀR#+
70+	BEĀ#ĀEGa			EG^	] 9* 0&*	` c BGGWĀC'((*,

Ā !"#$! HĀĀ C*Ā&5' 5%6' 5#0Ā)0*&Ā,*$,*&' 05ĀC*Ā$$,#F.(' 5'Ā3#/0+' ,-Ā3*54* *0Ā&#.)Ā5$*&HĀĀ C*Ā5' 0&5#0Ā(' -Ā3*Ā(,' +/')H @ĀĀ ' 5',Ā)*<*)Ā*' +.01&Ā4*,*Ā(' +*Ā0ĀC*Ā+,.)ĀC#)*Ā+/ ,.01Ā#,Ā 5ĀC*Ā6#($)*5#0Ā#%Ā,.)).01HĀĀ C*Ā4' 5',Ā)*<*)Ā(' -Ā65' ' 5'Ā#<*,Ā5(*H

%"&' () #$ 8? " SXĀ7))Ā&#.)Ā*&6,.$5#0&Ā*Ā ('+*Ā.0ĀC*Ā%)+Ā3-ĀC*Ā9,.)).01ĀY#,*(' 0HĀ8#Ā)'3#,'5 #,-Ā0')-&*&Ā 4*,* $*,%#,(*+Ā%#,ĀC.&ĀV,$#&*H

=ĀTTĀJ @D@ĀQ: Ā:ĀI 788 QĀH VZĀS? T?: QH 9" Ā@22J

; *#)#1.6ĀĀS',5 CĀSF$)#,'5.#0:ĀQ06H

MĀĀC*,4##+Ā9,.<*
"S TĀEKĀBDĀDBD

8#,%#)>:ĀJ7ĀG@EJ
Y7bĀEGKĀBKDĀDE@

PTGS8" X Ā+,.11&ĀS01.0**,. 01

VR? ZSP" X BEĀ6/++*,Ā7<*0/*

T? P7" Q 8X N-'00.&:ĀJ7

=? RQ8; ĀWX
= K

V7;S
! ?Y !

Y.)*ĀWX !J@D@
9' 5ĀĀ5, 5+X !@22J
9' 5ĀP#($)*5 *+X !@22J
9,.))*,X 9HZ'6#3&
Ä.5ĀR*$HX 9H *.&&*,

	P7 ÄQ8;	Ä7UVTSR	P? RSĀ7RRST
"[VS	NÄ7	ÄÄ	
ÄQ\S	BĀ2DO	@O	
N7UUSR		!DGW	
Y7TT		BGO	

Ä/,%6*Ā S)*<'5.#0X
Ä55.#0X
; ,#/0 +4'5*,Ā)*<*)Ā' +.01&
9' 5 9* $5C
9' 5 9* $5C

9*$5C %5	8#H	9*$5CĀ5	V*0H .0	R*6H .0	=)#4&2O	Ä5'5' PC'01 * %5	Ä'($)*Ā 9*&6,.$5.#0
	Ä !	GH @GH GH !HE	@D	!K	B @E E	GE !HE	Ä !Ā" #$Ā#%&'($)*ĀT##&*Ā+' ,>Ā3,#4 0Ā ? VĀ? QĀ0+Ā%0*Ā6#Ā(*+./(Ā7 89 :).5)*Ā.)5Ā5'6*Ā ? ,1'0 .6 U.++)*Ā@ĀĀ9' ,>Ā3,#4 0Ā%0*Ā6#Ā6#" ,&*Ā1,'<*))-ĀĀ7 89 :ĀYQT:Ā.5)*Ā ,'< *): 5'6*Ā Ä.)5 =#5#(Ā#%&'($)*ĀĀ9*0 &*Ā.1CĀ3,#4 0Ā%0*Ā6#Ā6#" ,&*ĀĀ7 89: Ā5'6*Ā ; ,' <*): 5'6*Ā Ä.)5
E	Ä @	EHG MHB	@D	!@	!G ! J !J @G		Ä @ĀĀ.(.)',Ā5#Ā3#5#(Ā#%ĀĀ !: ĀF6*$5Ā.5)*Ā ,'< *)
!G	Ä B	!GHG !@GH	@D	!@	B E J K		Ä BĀJ *+./(Ā+*0&*Ā).1G5Ā3,#4 0Ā%0*Ā6#Ā6#" ,&*ĀĀ7 89: Ā5'6*Ā Ä.)5ĀĀ5' 5%+
!E	Ä D	!EHG !MHB	@D	!K	E ML !!		Ä DĀĀ.(.)',Ā5#ĀĀ B
@G	Ä E	@HG @@GH	@D	!J	D J E E		Ä EĀĀ.(.)',Ā5#ĀĀ B
@E	Ä J	@EG @MHB	@D	!D	E MJ M		Ä JĀĀ.(.)',Ā5#ĀĀ B Ä MĀĀ5'($5+Ā3ĀĀ3)#40 .0
BG						BGHG	=#5#(Ā#%ĀF$)#,'5.#0Ā5ĀBGHI

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V,#$#,5#0&Ā&*+		P#C*&.<*ĀR#0&.&50 6- =)#4&2%5				P#C*&.#0)*&&ĀĀ0&.5- =)#4&2%5		Ä'($)*Ā -$*
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**Ä !"#$** !HĀĀC*Ā&5' 5%6' 5#0Ā)0*&Ā*$,*&' 05ĀC*Ā$$,#F.(' 5'Ā3#/ 0+' ,-Ā3*5 4**0Ā&#.)Ā5$*&HĀĀC*Ā5' 0&5#0Ā(' -Ā3*Ā1,' +/ ')H @ĀĀĀ ' 5',Ā)*<*)Ā)*' +.01&Ā4*,*Ā(' +*Ā.0Ā5C*Ā+,.))C#)*Ā+/ ,.01Ā#,Ā5ĀC*Ā6#($)*5#0Ā#%Ā+,.))01HĀĀC*Ā4' 5',Ā)*<*)Ā(' -Ā%65' 5'Ā#<*,Ā5(*H

%"&' () #$ 8? " SXĀĀ7))Ā&#.)Ā*&6,.$5#0&Ā*Ā ('+*Ā.0ĀC*Ā%5)+Ā3-ĀC*Ā9,.)).01ĀY#,*(' 0HĀĀ8#Ā)'3#,'5 #,-Ā0')-&*&Ā 4*,* $*,%#,(*+Ā#%,ĀC.&Ā$,#&*H

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TEST PIT LOGS
35 SCUDDR AVENUE, HYANNIS, MA

TEST PITS EXCAVATED NOVEMBER 8, 2016
TEST PITS LOGGED BY DAVE GEISSER, BRIGGS E & T

TP-1

Grass and Topsoil - f/c Sand, trace Gravel, some Silt, trace organic, dark brown black to dark brown

0.3 ft

Subsoil – f/c Sand, little Gravel, some Silt Light orange brown

1.7 ft

Sand – f/c little Gravel, trace Silt, stratified light brown

4 ft

Bottom of Excavation (BOE)

TP-2

Grass and Topsoil - f/c Sand, trace Gravel, some Silt, trace organic, dark brown

1.0 ft

Silty Sand Fill – f/c Sand trace Gravel, little Silt light brown

2.7 ft

Sand – f/c little Gravel, trace Silt, stratified light brown

5 ft

BOE

TP-3

Grass and Topsoil - f/c Sand, some Silt, trace organic, dark brown

0.7 ft

Subsoil – f/c Sand trace Gravel, some silt

1.3 ft

Silty Sand – f/c, little Silt, stratified light brown to brown

5 ft

Sand – f/c trace Silt, light brown

8 ft

Note: some means 20 to 35%, little means 10 to 20%, trace means less than 10%

TEST PIT LOGS
35 SCUDDR AVENUE, HYANNIS, MA

TEST PITS EXCAVATED NOVEMBER 8, 2016
TEST PITS LOGGED BY DAVE GEISSER, BRIGGS E & T

TP-4 **TP-5** **TP-6**

Grass and Topsoil - f/c Sand, trace Gravel, some Silt, trace organic, dark brown

0.3 ft 0.3 ft 0.3 ft

Silty Sand Filll- f/c, trace Gravel, little Silt, trace organic dark brown

0.7 ft

Subsoil and Topsoil Fill - – f/c Sand, little Subsoil – f/c Sand Organic, dark brown

Topsoil – f/c Sand, little Silt, trace organic dark brown 1.0 ft

1.3 ft

Subsoil – f/c Sand, some Silt, yellow brown 1.5 ft

Stump Fill with organic silty sands Little f/c Sand, some Organic, black

3.3 ft

Silty Sand – f/c, some Silt, stratified light brown

Subsoil – f/c Sand, some Silt, yellow brown

4 ft

4.3 ft

4.5 ft

Gravelly Sand – f/c little, Gravel, trace Silt, brown

Silty Sand – f/c, little Silt, stratified light brown

Sand – f/c, trace (-) organic trace silt, black

6.5

7 ft

7.5 ft

BOE

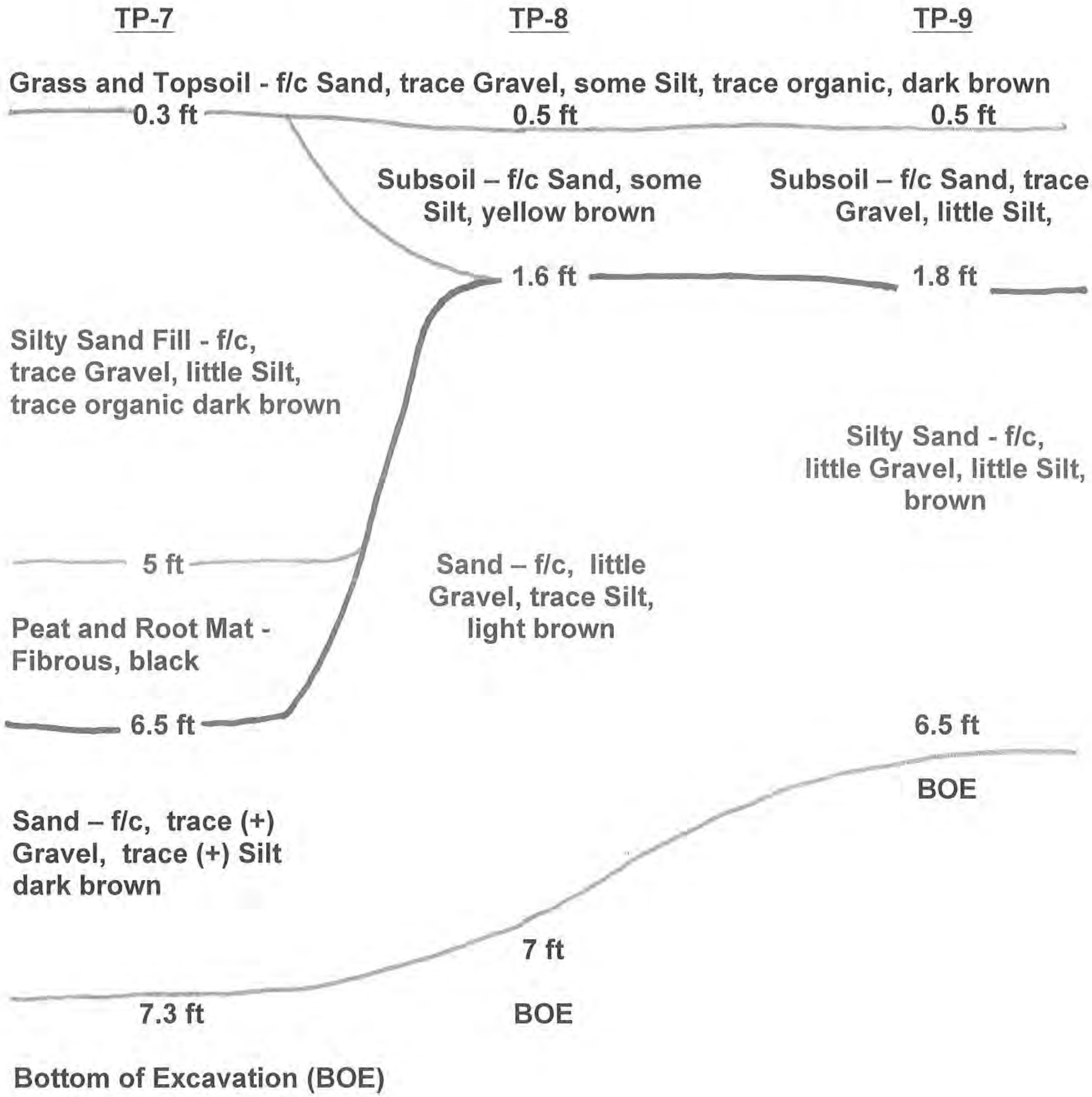
BOE

Bottom of Excavation (BOE)

Note: some means 20 to 35%, little means 10 to 20%, trace means less than 10%

TEST PIT LOGS
35 SCUDDR AVENUE, HYANNIS, MA

TEST PITS EXCAVATED NOVEMBER 8, 2016
TEST PITS LOGGED BY DAVE GEISSER, BRIGGS E & T



Note: some means 20 to 35%, little means 10 to 20%, trace means less than 10%

APPENDIX B - Test Pit Logs

LGCI Lahlaf Geotechnical Consulting, Inc.
100 Chelamsford Road, Suite 2
Billerica, MA 01862
Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-1

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Near Northeastern corner of site
COORDINATES: NA
SURFACE EL.: 30.7 ft. (see note 1) **TOTAL DEPTH:** 10 ft.
GROUNDWATER LEVELS:
∇ **DURING EXCAVATION:** -
▼ **AT END OF EXCAVATION:** -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3' x 6'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
	30.0	E		Topsoil	0.8 / 29.9	0 ft. - 0.8 ft.: Topsoil
2.5	27.5	E		Subsoil	4.5 / 26.2	0.8 ft. - 4.5 ft.: Silty SAND (SM), fine to medium sand, trace coarse, 25-30% fines, 10-15% fine to coarse subrounded gravel, light brown
5.0	25.0	E		Sand		4.5 ft. - 7 ft.: Poorly Graded SAND with Silt and Gravel (SP-SM), medium to coarse, 5-10% fines, ~15% fine to coarse subrounded to subangular gravel, brown, moist (natural)
7.5	22.5	E			10.0	7 ft. - 10 ft.: Poorly Graded SAND (SP), medium to coarse, trace fine, 0-5% fines, light brown, moist (natural)
10.0						Bottom of test pit at 10.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020. The ground surface elevation at test pit TP-1 was adjusted by estimating the elevation difference between the actual, as excavated, and the original location and is therefore approximate.

LGCI Lahlaf Geotechnical Consulting, Inc.

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Telephone: (978) 330-5912
Fax: (978) 330-5056

TEST PIT LOG

TP-2

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Eastern side of site
COORDINATES: NA
SURFACE EL.: 26.6 ft. (see note 1) **TOTAL DEPTH:** 12 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3.5' x 7'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth / El.(ft.)	Material Description
		E		Topsoil	0.5	0 ft. - 0.5 ft.: Topsoil
2.5	25.0 22.5	E		Fill	26.1 4.5	0.5 ft. - 4.5 ft.: Silty SAND (SM), fine, trace medium to coarse, ~15% fines, 10-15% fine to coarse subrounded to angular gravel, trace of organic soil, trace of roots, brown, moist (fill)
5.0 7.5 10.0	20.0 17.5 15.0	E		Sand	22.1 12.0	4.5 ft. - 12 ft.: Poorly Graded SAND (SP), medium to coarse, trace fine, 0-5% fines, 5-10% fine to coarse subrounded gravel, light brown, moist (natural)
						Bottom of test pit at 12.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020.

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Fax: (978) 330-5056

TEST PIT LOG

TP-3

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Eastern side of site
COORDINATES: NA
SURFACE EL.: 20.9 ft. (see note 1) **TOTAL DEPTH:** 12 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3' x 8'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
	20.0	E		Topsoil	1.2	0 ft. - 1.2 ft.: Topsoil
2.5	17.5	E		Fill	19.7 / 3.5	1.2 ft. - 3.5 ft.: Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, ~10% fines, 20-25% fine to coarse subrounded to angular gravel, trace of organic soil, trace of roots, brown, moist (fill)
5.0, 7.5, 10.0	15.0, 12.5, 10.0	E		Sand	17.4 / 12.0	3.5 ft. - 12 ft.: Poorly Graded SAND (SP), medium to coarse, 0-5% fines, 5-10% fine subrounded gravel, light brown, moist (natural)
						Bottom of test pit at 12.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020.

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TEST PIT LOG

TP-4

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Southern side of site
COORDINATES: NA
SURFACE EL.: 20.2 ft. (see note 1) **TOTAL DEPTH:** 11 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3' x 9'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth / El.(ft.)	Material Description
0	20.0	E		Topsoil	1.0 / 19.2	0 ft. - 1 ft.: Topsoil
2.5	17.5	E		Fill	3.5 / 16.7	1 ft. - 3.5 ft.: Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, trace coarse, 10-15% fines, 25-30% fine to corase rounded to angular gravel, trace of organic soil, trace of roots, brown, moist (subsoil or fill)
5.0 / 7.5 / 10.0	15.0 / 12.5 / 10.0	E		Sand	11.0	3.5 ft. - 11 ft.: Poorly Graded SAND (SP), medium to coarse, trace fine, 0-5% fines, 0-5% fine subrounded gravel, light brown, moist (natural)
						Bottom of test pit at 11.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020.

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Fax: (978) 330-5056

TEST PIT LOG

TP-5

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Southern side of site
COORDINATES: NA
SURFACE EL.: 18.1 ft. (see note 1) **TOTAL DEPTH:** 10 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** -
▼ **AT END OF EXCAVATION:** -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3' x 8'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
0 - 1.0	17.5	E		Topsoil	1.0 / 17.1	0 ft. - 1 ft.: Topsoil
1.0 - 3.5 (2.5)	15.0	E		Fill	3.5 / 14.6	1 ft. - 3.5 ft.: Well Graded SAND with Gravel (SW), fine to coarse, 5-10% fines, 35-40% fine to coarse subrounded to angular gravel, trace of organic soil trace of roots, brown, moist (fill)
3.5 - 10.0 (5.0, 7.5, 10.0)	12.5, 10.0	E		Sand	10.0	3.5 ft. - 10 ft.: Poorly Graded SAND (SP), fine to coarse, 0-5% fines, light brown, moist (natural)
						Bottom of test pit at 10.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020.

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TEST PIT LOG

TP-6

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Western side of site
COORDINATES: NA
SURFACE EL.: 22.6 ft. (see note 1) **TOTAL DEPTH:** 10 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3' x 9'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth / El.(ft.)	Material Description
		E		Topsoil	1.0	0 ft. - 1 ft.: Topsoil
2.5	20.0	E		Fill	21.6 / 4.5	1 ft. - 4.5 ft.: Poorly Graded SAND with Gravel (SP), fine to medium, trace coarse, 0-5% fines, 15-20% fine to coarse subrounded gravel, trace of organic soil, trace of roots, brown, moist (fill)
5.0 / 7.5 / 10.0	17.5 / 15.0	E		Sand	18.1 / 10.0	4.5 ft. - 10 ft.: Poorly Graded SAND (SP), medium to coarse, trace fine, 0-5% fines, 5-10% fine to coarse subrounded gravel, light brown, moist (natural)
						Bottom of test pit at 10.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020.

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TEST PIT LOG

TP-8

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Near center of site
COORDINATES: NA
SURFACE EL.: 21.1 ft. (see note 1) **TOTAL DEPTH:** 8 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3' x 8'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
	20.0	E		Topsoil	1.0	0 ft. - 1 ft.: Topsoil
2.5	17.5	E		Fill	20.1 / 3.5	1 ft. - 3.5 ft.: Poorly Graded SAND (SP), fine to coarse, 5-10% fines, 10-15% fine to coarse subrouneded to angular gravel, trace of organic soil, trace of roots, brown, moist (fill)
5.0 / 7.5	15.0	E		Sand	17.6 / 8.0	3.5 ft. - 8 ft.: Poorly Graded SAND (SP), medium to coarse, trace fine, 0-5% fines, 0-5% fine subrounded gravel, light brown, moist (natural)
						Bottom of test pit at 8.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020.

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TEST PIT LOG

TP-9

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Near center of site
COORDINATES: NA
SURFACE EL.: 31.3 ft. (see note 1) **TOTAL DEPTH:** 8 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3' x 8'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
	30.0	E		Topsoil	1.5	0 ft. - 1.5 ft.: Topsoil
2.5	27.5	E		Fill	29.8 / 4.0	1.5 ft. - 4 ft.: Poorly Graded SAND with Silt and Gravel (SP-SM), mostly medium, 10-15% fines, 25-30% fine subrounded gravel, light brown
5.0 / 7.5	25.0	E		Sand	27.3 / 8.0	4 ft. - 8 ft.: Poorly Graded SAND (SP), medium to coarse, trace fine, 0-5% fines, 0-5% fine subrounded gravel, light brown, moist (natural)
						Bottom of test pit at 8.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020.

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TEST PIT LOG

TP-B-2

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Near center of site
COORDINATES: NA
SURFACE EL.: 25.2 ft. (see note 1) **TOTAL DEPTH:** 10 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3' x 8'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth / El.(ft.)	Material Description
0 – 1.4	25.0	E		Topsoil	1.4 / 23.8	0 ft. - 1.4 ft.: Topsoil
1.4 – 3.5 (2.5)	22.5	E		Fill	3.5 / 21.7	1.4 ft. - 3.5 ft.: Poorly Graded SAND (SP), fine to medium, trace coarse, 5-10% fines, 10-15% fine to coarse subrounded to angular gravel, trace of organic soil, trace of roots, brown, moist (fill)
3.5 – 10.0 (5.0, 7.5, 10.0)	20.0, 17.5	E		Sand	10.0	3.5 ft. - 10 ft.: Poorly Graded SAND (SP), medium to coarse, trace fine, 0-5% fines, 5-10% fine to coarse subrounded gravel, light brown, moist (natural)
						Bottom of test pit at 10.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020.

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Fax: (978) 330-5056

TEST PIT LOG

TP-B-3

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/18/20 **DATE COMPLETED:** 8/18/20
TEST PIT LOCATION: Near Northeastern corner of site
COORDINATES: NA
SURFACE EL.: 19 ft. (see note 1) **TOTAL DEPTH:** 10 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: -
AT END OF EXCAVATION: -

EXCAVATION SUBCONTRACTOR: Northern Drill Service, Inc.
EXCAVATION FOREMAN: Dave Edilberti
EXCAVATOR TYPE/MODEL: John Deere 310 SL
WEATHER: 80s, sunny/light rain
TEST PIT DIMENSIONS: 3' x 8'
LOGGED BY: AR **CHECKED BY:**

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth / El.(ft.)	Material Description
0	19	E		Topsoil	0.8 / 18.2	0 ft. - 0.8 ft.: Topsoil
2.5	17.5, 15.0	E		Fill	4.0 / 15.0	0.8 ft. - 4 ft.: Well Graded SAND with Gravel (SW), fine to coarse, 0-5% fines, ~15% fine to coarse subrounded to angular gravel, trace of organic soil, trace of roots, brown, moist (fill)
5.0, 7.5, 10.0	12.5, 10.0	E		Sand	10.0	4 ft. - 10 ft.: Poorly Graded SAND (SP), medium to coarse, 0-5% fines, 0-5% fine subrounded gravel, light brown, moist
						Bottom of test pit at 10.0 feet. Backfilled with excavated material in 1-2' lifts and compacted with excavator bucket.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020.

APPENDIX C – Boring Log

BORING LOG

B-4

Lahlaf Geotechnical Consulting, Inc.

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

DATE STARTED: 8/17/20 **DATE COMPLETED:** 8/17/20
BORING LOCATION: Eastern side of Site
COORDINATES: NA
SURFACE El.: 32.2 ft. (see note 1) **TOTAL DEPTH:** 60 ft.
WEATHER: 70s, sunny
GROUNDWATER LEVELS:
DURING DRILLING: 14.0 ft. / El. 18.2 ft.
AT END OF DRILLING: 19.9 ft. / El. 12.3 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Northern Drill Service, Inc.
DRILLING FOREMAN: John Beirholm
DRILLING METHOD: Drive and wash with 4-inch casing
DRILL RIG TYPE/MODEL: Track Mounted ATV B-48
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: AR **CHECKED BY:** SD

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth / El.(ft.)	Material Description
0		0–2	S1	3-6-7-10 (13)	24/16		Topsoil	0.7 / 31.5	S1 - Top 8": Topsoil Bottom 8": Silty SAND with Gravel (SM), fine to medium, trace coarse, 15-20% fines, 20-25% fine to coarse subrounded to angular gravel, trace of organic soil, trace of roots, light brown, moist (subsoil)
	30.0	2–4	S2	8-11-10-13 (21)	24/18		Subsoil	3.0 / 29.2	S2 - Top 12": Poorly Graded SAND with Gravel (SP), fine to medium, trace coarse, 5-10% fines, ~15% fine to coarse subrounded to angular gravel, light brown, moist Bottom 6": Poorly Graded SAND with Gravel (SP), fine to coarse, 0-5% fines, ~15% fine to coarse subrounded to subangular gravel, light brown, moist (natural sand)
5		4–6	S3	4-7-11-13 (18)	24/6		Sand		S3 - Similar to bottom of S2, medium to coarse, trace fine
	25.0	6–8	S4	15-14-13-13 (27)	24/8				S4 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine to coarse, ~10% fines, ~15% fine to coarse subrounded to angular gravel, light brown, moist
		8–10	S5	6-5-6-6 (11)	24/8				S5 - Poorly Graded SAND (SP), medium to coarse, 0-5% fines, 5-10% fine subrounded to angular gravel, light brown, wet
10		10–12	S6	6-6-8-9 (14)	24/14				S6 - Similar to S5 (moist soil in tip of split spoon)
	20.0								
15		14–16	S7	4-5-5-7 (10)	24/6				S7 - Poorly Graded SAND (SP), fine to coarse, 0-5% fines, trace of fine subrounded gravel, light brown, wet
	15.0								
20		19–21	S8	4-6-9-8 (15)	24/4				S8 - Poorly Graded SAND (SP), fine to medium, 0-5% fines, trace of fine subrounded to angular gravel, light brown, wet
	10.0								
25		24–		4-4-5-4					S9 - No recovery, drove 3" split spoon to collect sample Poorly Graded SAND (SP), fine to coarse, 0-5% fines, 5-10% fine subrounded

GENERAL NOTES:

1. The ground surface elevations was provided to LGCI by Pesce Engineering & Associates, Inc. via e-mail on 8/13/2020. The ground surface elevation at boring B-4 was adjusted by estimating the elevation difference between the actual, as drilled, and the original location and is therefore approximate.

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		24–26	S9	(9)	24/0			29.2	to angular gravel, light brown, wet
	5.0								
30		29–31	S10	5-6-6-7 (12)	24/0				S10 - No recovery
	0.0								
35		34–36	S11	6-5-4-4 (9)	24/0				S11 - No recovery, drove 3" split spoon to collect sample Poorly Graded SAND (SP), medium to coarse, 0-5% fines, 5-10% fine subrounded to angular gravel, light brown, wet
	-5.0								
40		39–40.5	S12	28-70-78	18/5				S12 - Poorly Graded SAND (SP), fine, 0-5% fines, gray, wet
	-10.0						Sand		
45		44–46	S13	5-6-6-7 (12)	24/0				S13 - No recovery
	-15.0								
50		49–51	S14	6-6-5-6 (11)	24/4				S14 - Poorly Graded SAND (SP), medium to coarse, 0-5% fines, 0-5% fine subrounded gravel, gray, wet
	-20.0								
55		54–56	S15	6-11-11-14 (22)	24/6				S15 - Poorly Graded SAND (SP), fine to coarse, 0-5% fines, 5-10% fine subrounded to subangular gravel, light brown, wet
	-25.0								
60						1		60.0	REMARK 1: Advanced roller bit to 60'. Therefore, no sample could be taken

Lahlaf Geotechnical Consulting, Inc.

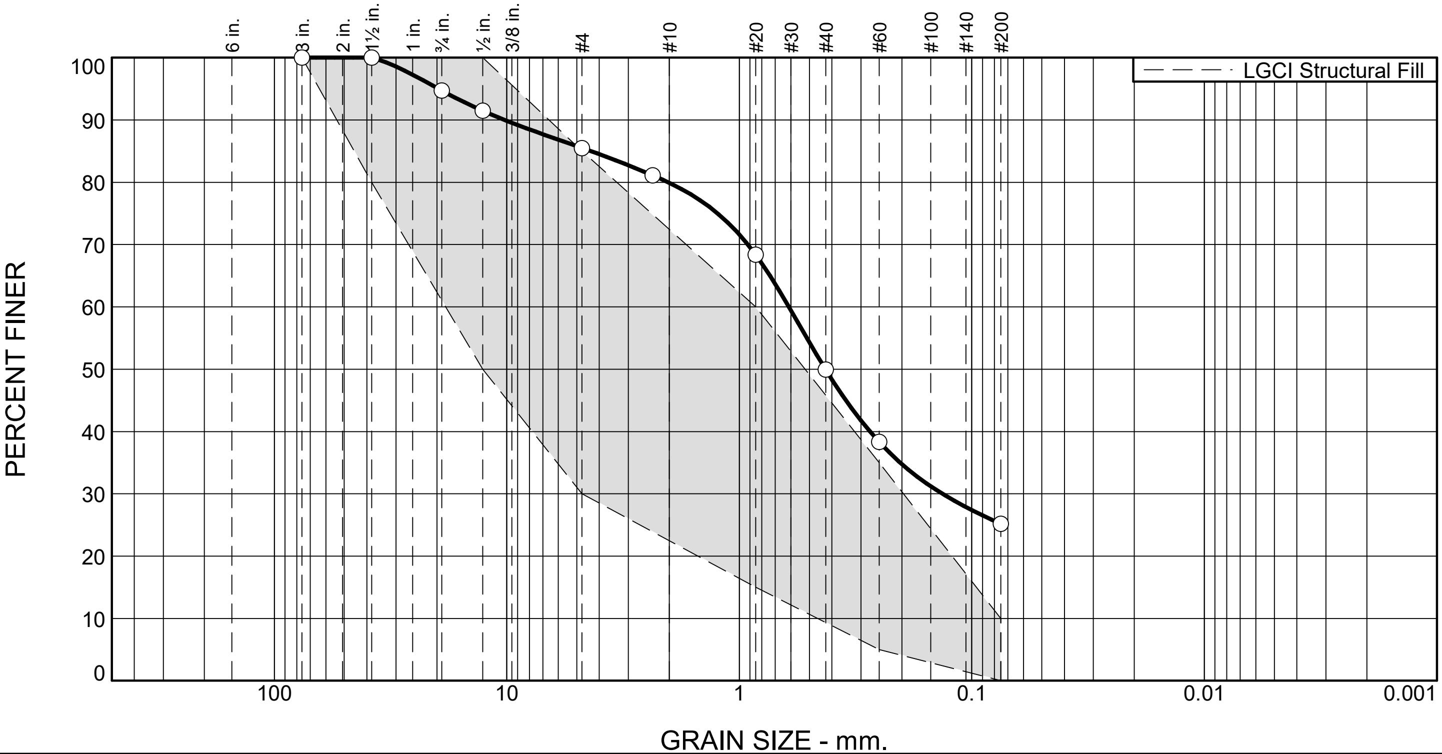
BORING LOG

CLIENT: LMC
PROJECT NAME: Proposed Residential Development
LGCI PROJECT NUMBER: 2026
PROJECT LOCATION: Hyannis, MA

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
									from 60-62'.
									Bottom of borehole at 60.0 feet. Backfilled borehole with drill cuttings.
	-30.0								
65									
	-35.0								
70									
	-40.0								
75									
	-45.0								
80									
	-50.0								
85									
	-55.0								
90									
	-60.0								
95									

APPENDIX D - Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.3	9.2	5.6	30.0	24.7	25.2	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0	100.0	
1.5"	100.0	80.0 - 100.0	
0.75"	94.7		
0.5"	91.5	50.0 - 100.0	
#4	85.5	30.0 - 85.0	X
#8	81.1		
#20	68.4	15.0 - 60.0	X
#40	49.9		
#60	38.3	5.0 - 35.0	X
#200	25.2	0.0 - 10.0	X

* LGCI Structural Fill

Material Description

ASTM (D 2488) Classification: Silty SAND (SM), fine to medium sand, trace coarse, 25-30% fines, 10-15% fine to coarse subrounded gravel, light brown

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 10.1932 D_{85}= 4.3509 D_{60}= 0.6124
D_{50}= 0.4263 D_{30}= 0.1335 D_{15}=
D_{10}= C_u= C_c=

Remarks

Subsoil sample

Date Received: 8/18/2020 **Date Tested:** 8/21/2020

Tested By: OIL

Checked By: AML

Location: Test Pit TP-1
Depth: 0.8' - 4.5'

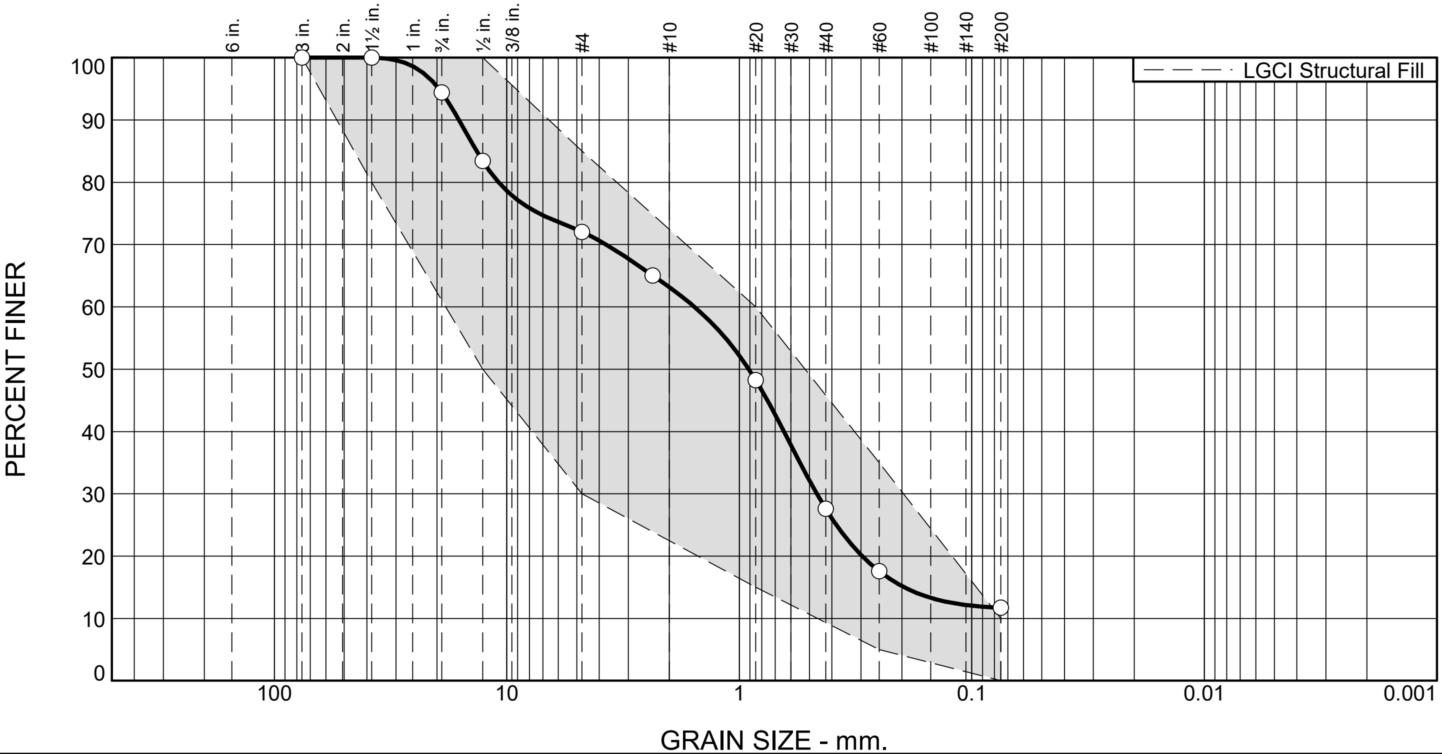
Date Sampled: 8/18/2020

LGCI
Lahlaf Geotechnical Consulting, Inc.

Client: LMC
Project: Proposed Residential Development, Hyannis, MA

Project No: 2026 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.6	22.4	8.8	35.6	15.9	11.7	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0	100.0	
1.5"	100.0	80.0 - 100.0	
0.75"	94.4		
0.5"	83.4	50.0 - 100.0	
#4	72.0	30.0 - 85.0	
#8	65.1		
#20	48.3	15.0 - 60.0	
#40	27.6		
#60	17.6	5.0 - 35.0	
#200	11.7	0.0 - 10.0	X

* LGCI Structural Fill

Material Description

ASTM (D 2488) Classification: Poorly Graded SAND with Silt and Gravel (SP-SM), mostly medium, 10-15% fines, 25-30% fine subrounded gravel, light brown

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 16.0720 D_{85}= 13.4906 D_{60}= 1.5586
D_{50}= 0.9100 D_{30}= 0.4644 D_{15}= 0.1951
D_{10}= C_u= C_c=

Remarks

Subsoil Fill sample

Date Received: 8/18/2020 **Date Tested:** 8/21/2020

Tested By: OIL

Checked By: AML

Location: Test Pit TP-9
Depth: 1.5' - 4.5'

Date Sampled: 8/18/2020

LGCI
Lahlaf Geotechnical Consulting, Inc.

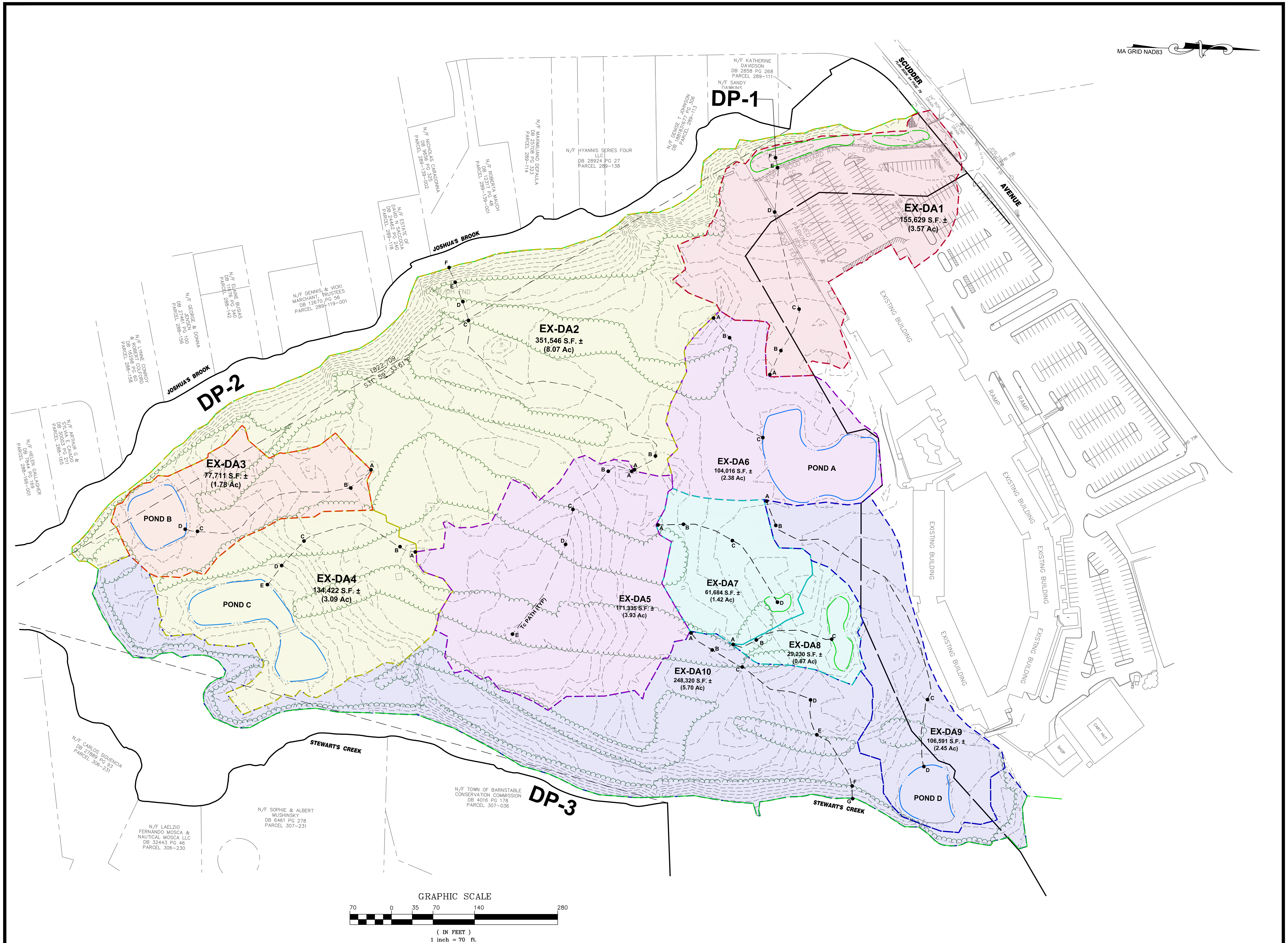
Client: LMC
Project: Proposed Residential Development, Hyannis, MA
Project No: 2026 **Figure**

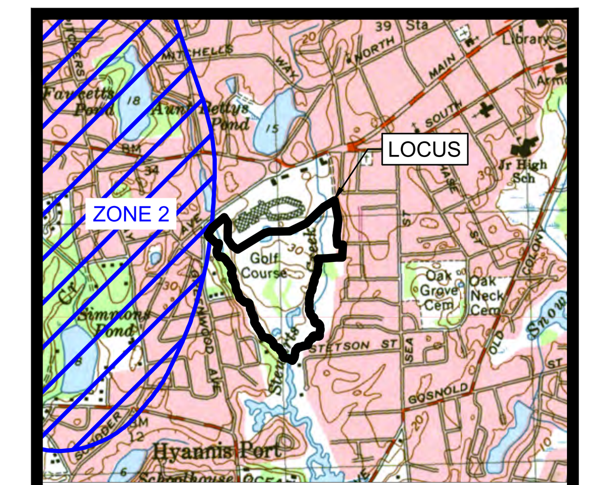
APPENDIX B

EXISTING DRAINAGE AREAS PLAN

&

HydroCAD® CALCULATIONS
For the
EXISTING CONDITIONS





LOCUS MAP
SCALE 1" = 2000'

EDWARD L. PESCE CIVIL NO. 32001 REGISTERED PROFESSIONAL ENGINEER COMMONWEALTH OF MASSACHUSETTS

Edward L. Pesce 23 SEP 2022

EDWARD L. PESCE, P.E. DATE

THE PROPOSED EMBLEM AT HYANNIS RESIDENCES

AT

35 SCUDDER AVENUE

IN

HYANNIS, MASSACHUSETTS

(BARNSTABLE COUNTY)

EXISTING DRAINAGE AREAS PLAN

REVISIONS:

No.	DATE	DESC.
1	9/23/22	Updated Site Layout

PREPARED FOR:
QUARTERRA
99 SUMMER STREET, SUITE 701
BOSTON, MA 02110

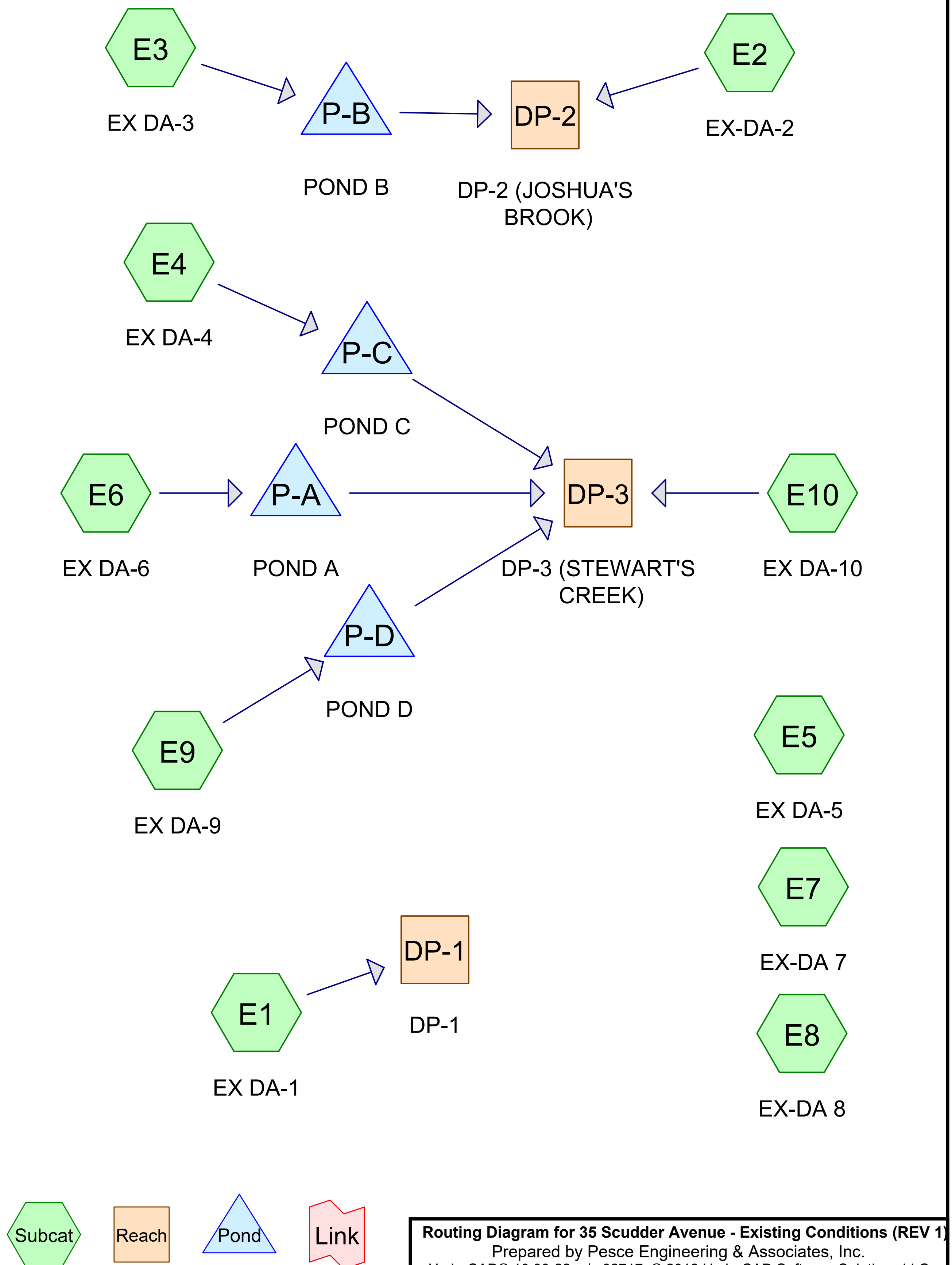
Quarterra

ENGINEERING BY:
PESCE ENGINEERING & ASSOCIATES, INC.
Edward L. Pesce, P.E., LEED® AP
43 Porter Lane
West Dennis, MA 02670
epesce@comcast.net Cell: 508-333-7630

LAND SURVEYING BY:
BAXTER NYE ENGINEERING & SURVEYING
78 NORTH STREET, 3RD FLOOR
HYANNIS, MA 02601

DATE:	JULY 1, 2021
FIELD:	BNE
CALC./DESIGN:	ELP
DRAWN:	BJW
CHECK:	ELP
JOB NO:	5061

SHEET 1 OF 1



Routing Diagram for 35 Scudder Avenue - Existing Conditions (REV 1)
Prepared by Pesce Engineering & Associates, Inc.
HydroCAD® 10.00-22 s/n 02717 © 2018 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
21.019	39	>75% Grass cover, Good, HSG A (E1, E10, E2, E3, E4, E5, E6, E7, E8, E9)
1.653	98	Paved parking, HSG A (E1)
0.130	98	Water Surface, HSG A (E7, E8)
1.667	98	Wetland; Water Surface (E1, E3, E4, E6, E9)
8.243	30	Woods, Good, HSG A (E1, E10, E2, E3, E4, E5, E6, E9)
0.357	30	Woods, Good, HSG A & Sand Area (E7, E8)
33.069	**43**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
31.402	HSG A	E1, E10, E2, E3, E4, E5, E6, E7, E8, E9
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
1.667	Other	E1, E3, E4, E6, E9
33.069		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
21.019	0.000	0.000	0.000	0.000	21.019	>75% Grass cover, Good	E1, E10, E2, E3, E4, E5, E6, E7, E8, E9
1.653	0.000	0.000	0.000	0.000	1.653	Paved parking	E1
0.130	0.000	0.000	0.000	0.000	0.130	Water Surface	E7, E8
0.000	0.000	0.000	0.000	1.667	1.667	Wetland; Water Surface	E1, E3, E4, E6, E9
8.600	0.000	0.000	0.000	0.000	8.600	Woods, Good	E1, E10, E2, E3, E4, E5, E6, E7, E8, E9
31.402	**0.000**	**0.000**	**0.000**	**1.667**	**33.069**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	P-D	9.08	8.16	18.5	0.0497	0.013	12.0	0.0	0.0

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

Subcatchment E1: EX DA-1	Runoff Area=155,629 sf 50.78% Impervious Runoff Depth>0.89" Flow Length=435' Tc=9.6 min CN=69 Runoff=2.94 cfs 0.264 af
Subcatchment E10: EX DA-10	Runoff Area=248,320 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=490' Tc=16.5 min CN=36 Runoff=0.00 cfs 0.000 af
Subcatchment E2: EX-DA-2	Runoff Area=351,546 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=682' Tc=14.4 min CN=35 Runoff=0.00 cfs 0.000 af
Subcatchment E3: EX DA-3	Runoff Area=77,711 sf 13.22% Impervious Runoff Depth>0.08" Flow Length=400' Tc=7.0 min CN=46 Runoff=0.02 cfs 0.013 af
Subcatchment E4: EX DA-4	Runoff Area=134,422 sf 15.48% Impervious Runoff Depth>0.08" Flow Length=341' Tc=7.8 min CN=46 Runoff=0.04 cfs 0.022 af
Subcatchment E5: EX DA-5	Runoff Area=171,335 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=433' Tc=11.9 min CN=36 Runoff=0.00 cfs 0.000 af
Subcatchment E6: EX DA-6	Runoff Area=104,016 sf 24.53% Impervious Runoff Depth>0.25" Flow Length=283' Tc=25.5 min CN=53 Runoff=0.18 cfs 0.049 af
Subcatchment E7: EX-DA 7	Runoff Area=61,684 sf 1.97% Impervious Runoff Depth>0.00" Flow Length=300' Tc=5.9 min CN=38 Runoff=0.00 cfs 0.000 af
Subcatchment E8: EX-DA 8	Runoff Area=29,230 sf 15.19% Impervious Runoff Depth>0.10" Flow Length=200' Tc=8.5 min CN=47 Runoff=0.01 cfs 0.006 af
Subcatchment E9: EX DA-9	Runoff Area=106,591 sf 8.42% Impervious Runoff Depth>0.05" Flow Length=675' Tc=15.0 min CN=44 Runoff=0.02 cfs 0.011 af
Reach DP-1: DP-1	Inflow=2.94 cfs 0.264 af Outflow=2.94 cfs 0.264 af
Reach DP-2: DP-2 (JOSHUA'S BROOK)	Inflow=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af
Reach DP-3: DP-3 (STEWART'S CREEK)	Inflow=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af
Pond P-A: POND A	Peak Elev=24.55' Storage=2,131 cf Inflow=0.18 cfs 0.049 af Outflow=0.00 cfs 0.000 af
Pond P-B: POND B	Peak Elev=2.75' Storage=547 cf Inflow=0.02 cfs 0.013 af Outflow=0.00 cfs 0.000 af
Pond P-C: POND C	Peak Elev=3.65' Storage=946 cf Inflow=0.04 cfs 0.022 af Outflow=0.00 cfs 0.000 af

Pond P-D: POND D Peak Elev=8.06' Storage=459 cf Inflow=0.02 cfs 0.011 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 33.069 ac Runoff Volume = 0.364 af Average Runoff Depth = 0.13"
89.57% Pervious = 29.619 ac 10.43% Impervious = 3.450 ac

Summary for Subcatchment E1: EX DA-1

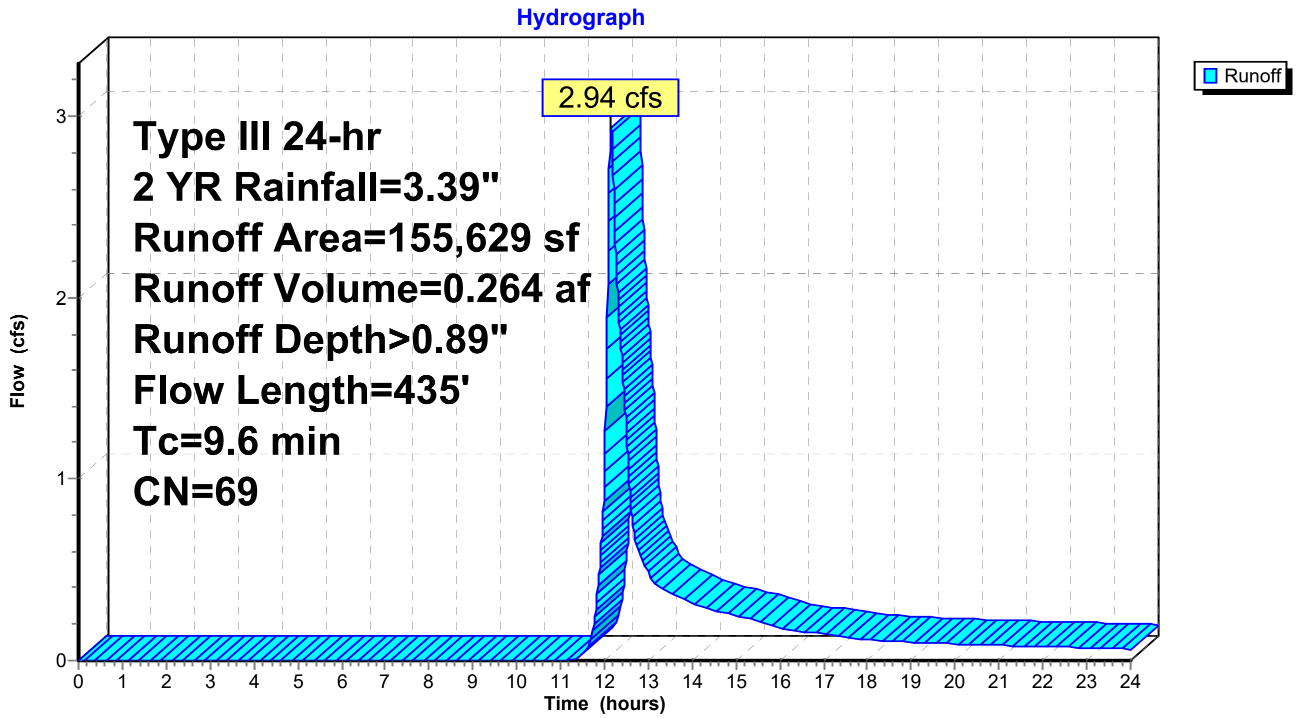
Runoff = 2.94 cfs @ 12.15 hrs, Volume= 0.264 af, Depth> 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	70,869	39	>75% Grass cover, Good, HSG A
	5,725	30	Woods, Good, HSG A
*	7,041	98	Wetland; Water Surface
	71,994	98	Paved parking, HSG A
	155,629	69	Weighted Average
	76,594		49.22% Pervious Area
	79,035		50.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0270	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
2.4	90	0.0077	0.61		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.9	192	0.0550	1.64		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.4	83	0.0260	3.27		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
0.1	20	0.2000	3.13		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
9.6	435	Total			

Subcatchment E1: EX DA-1



Summary for Subcatchment E10: EX DA-10

[45] Hint: Runoff=Zero

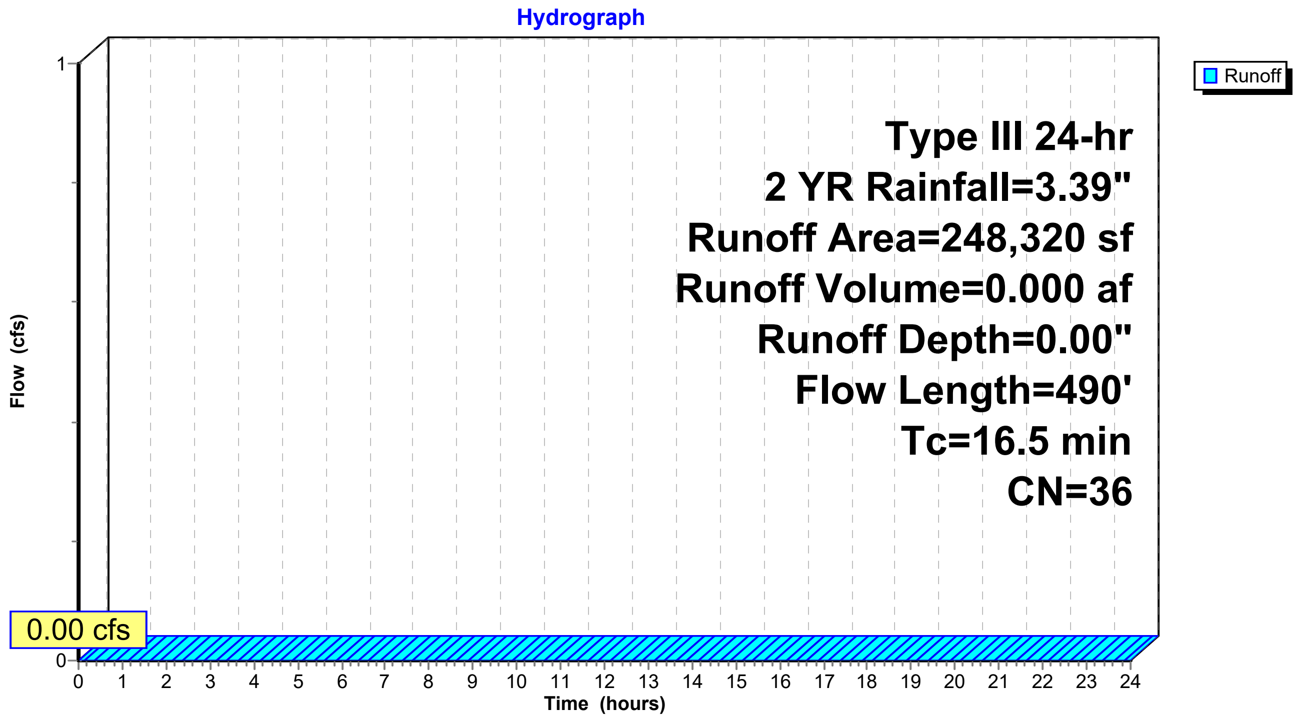
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	166,992	39	>75% Grass cover, Good, HSG A
	81,328	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	248,320	36	Weighted Average
	248,320		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.40"
3.1	70	0.0057	0.38		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.5	150	0.0580	1.69		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
1.6	70	0.0110	0.73		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
1.1	125	0.0680	1.83		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
0.1	25	0.3000	3.83		**Shallow Concentrated Flow, F-G** Short Grass Pasture Kv= 7.0 fps
16.5	490	Total			

Subcatchment E10: EX DA-10



Summary for Subcatchment E2: EX-DA-2

[45] Hint: Runoff=Zero

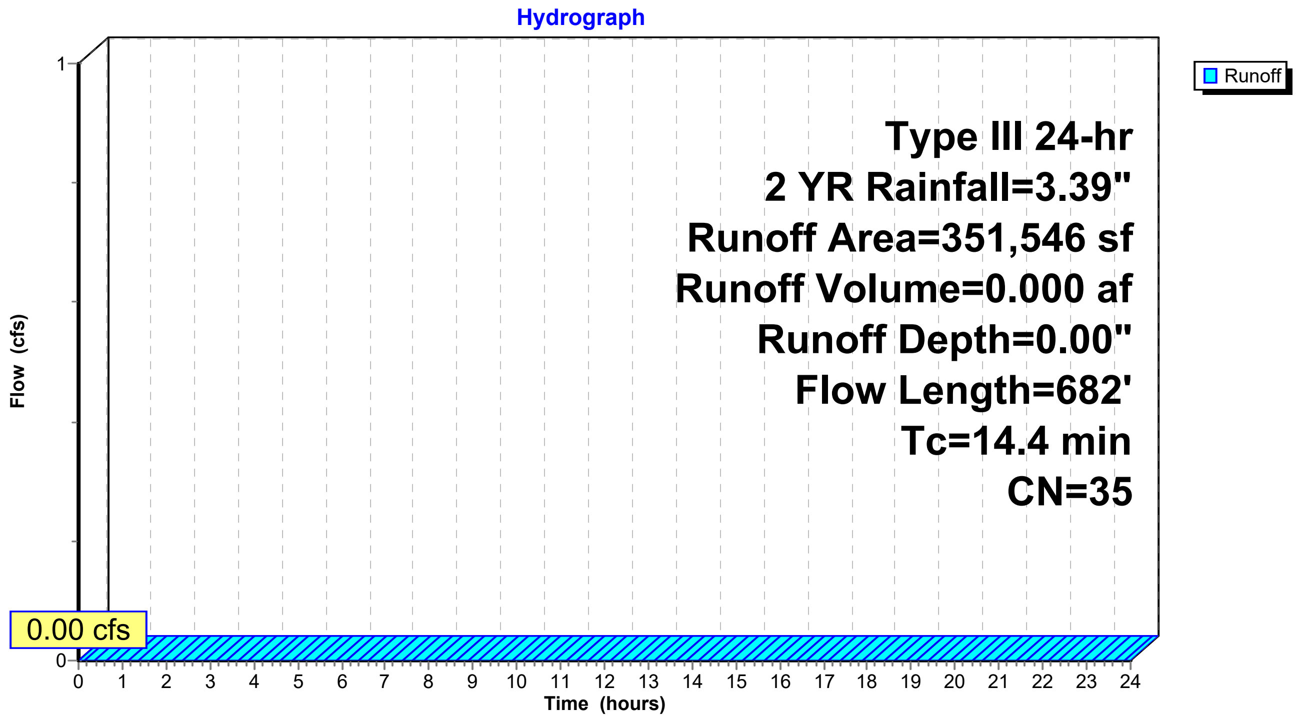
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	195,277	39	>75% Grass cover, Good, HSG A
	156,269	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	351,546	35	Weighted Average
	351,546		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0800	0.27		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
10.1	520	0.0150	0.86		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	40	0.0825	1.44		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.5	40	0.0425	1.44		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.2	32	0.3900	3.12		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
14.4	682	Total			

Subcatchment E2: EX-DA-2



Summary for Subcatchment E3: EX DA-3

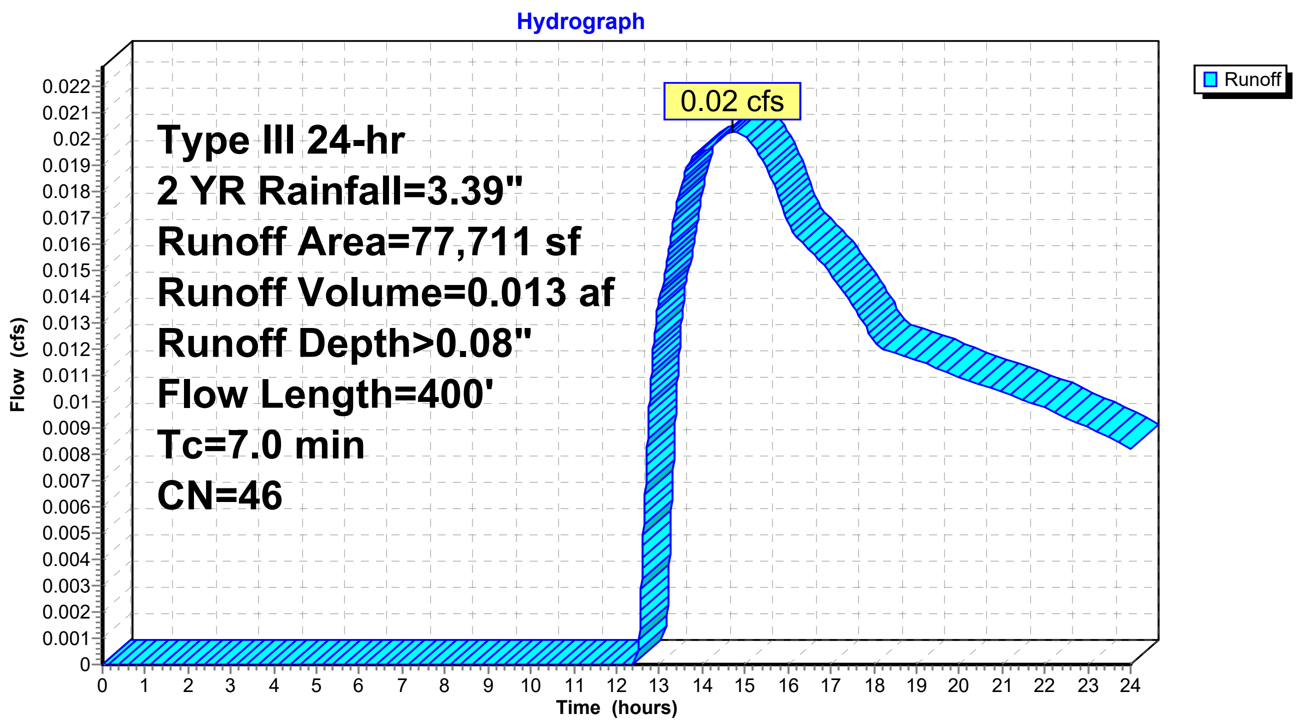
Runoff = 0.02 cfs @ 14.71 hrs, Volume= 0.013 af, Depth> 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	60,103	39	>75% Grass cover, Good, HSG A
	7,335	30	Woods, Good, HSG A
*	10,273	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	77,711	46	Weighted Average
	67,438		86.78% Pervious Area
	10,273		13.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0800	0.27		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
3.7	320	0.0430	1.45		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	30	0.1000	2.21		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
7.0	400	Total			

Subcatchment E3: EX DA-3



Summary for Subcatchment E4: EX DA-4

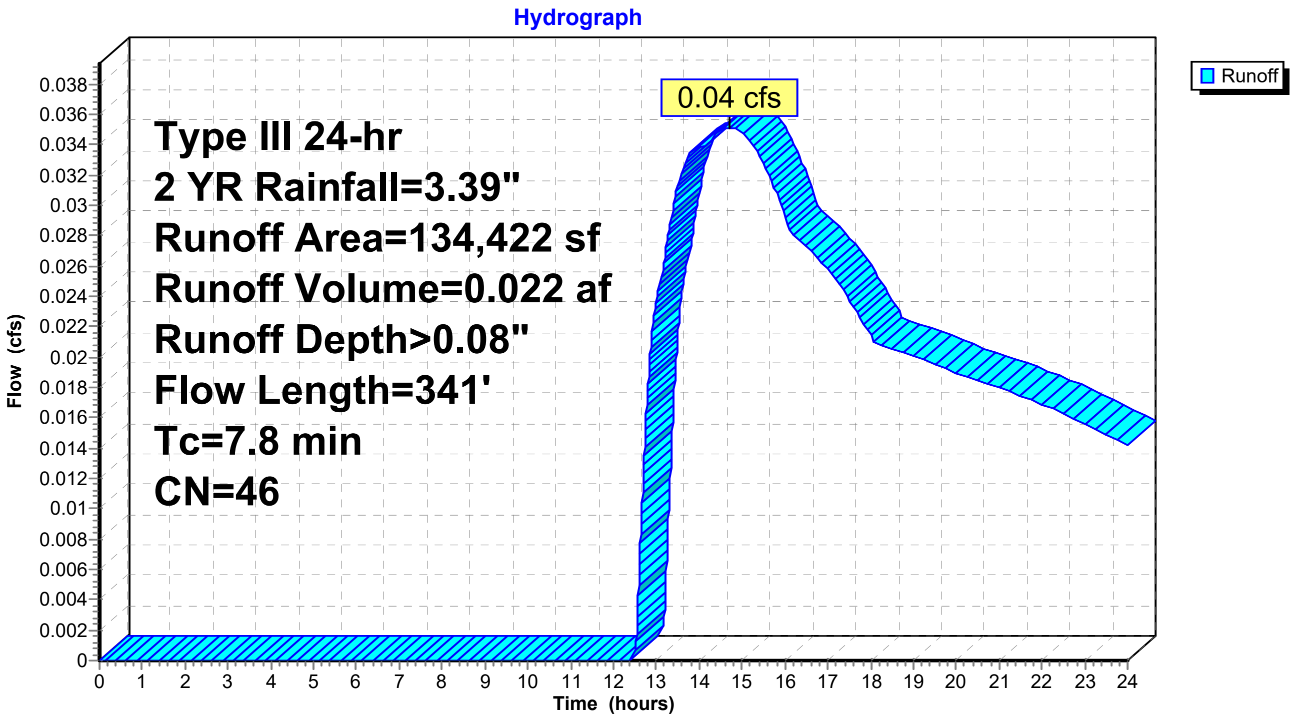
Runoff = 0.04 cfs @ 14.69 hrs, Volume= 0.022 af, Depth> 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	77,263	39	>75% Grass cover, Good, HSG A
	36,347	30	Woods, Good, HSG A
*	20,812	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	134,422	46	Weighted Average
	113,610		84.52% Pervious Area
	20,812		15.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	35	0.1300	0.30		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
5.2	200	0.0165	0.64		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.4	63	0.1550	2.76		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.3	43	0.1160	2.38		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
7.8	341	Total			

Subcatchment E4: EX DA-4



Summary for Subcatchment E5: EX DA-5

[45] Hint: Runoff=Zero

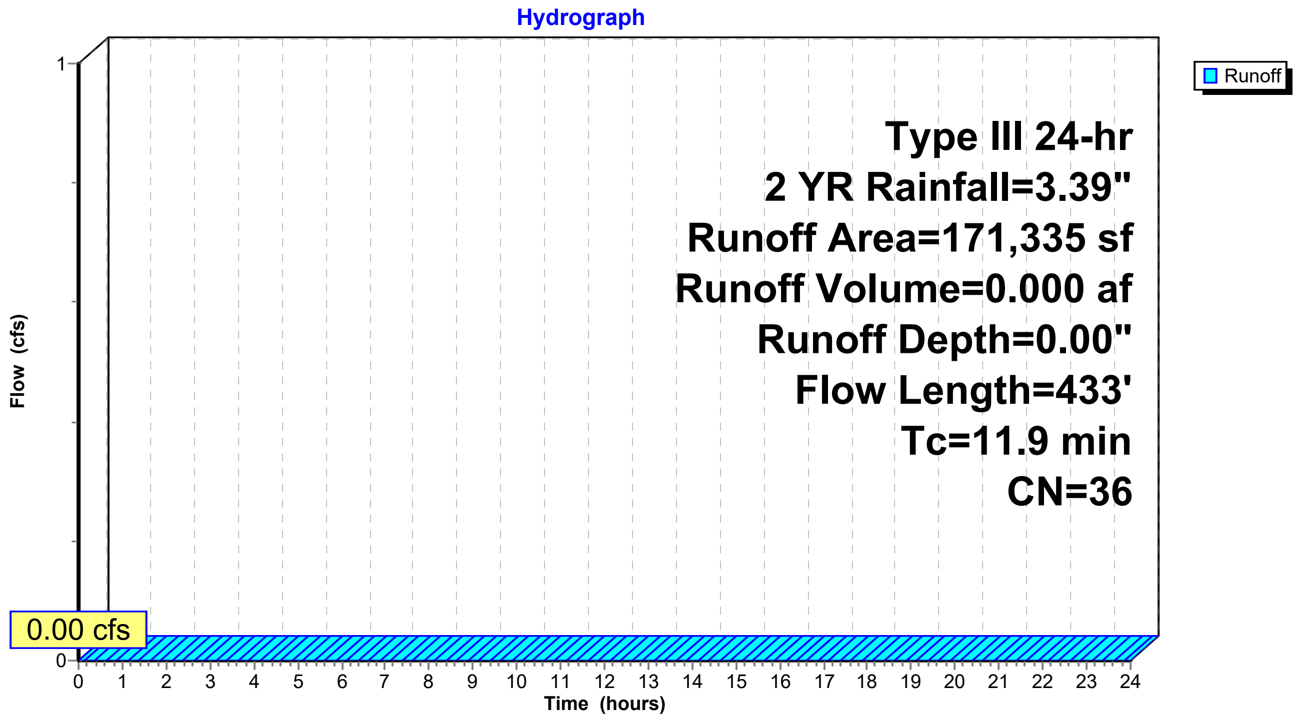
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	109,518	39	>75% Grass cover, Good, HSG A
	61,817	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	171,335	36	Weighted Average
	171,335		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	50	0.1000	0.29		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
1.0	105	0.0620	1.74		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.2	75	0.0460	1.07		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
6.8	203	0.0050	0.49		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
11.9	433	Total			

Subcatchment E5: EX DA-5



Summary for Subcatchment E6: EX DA-6

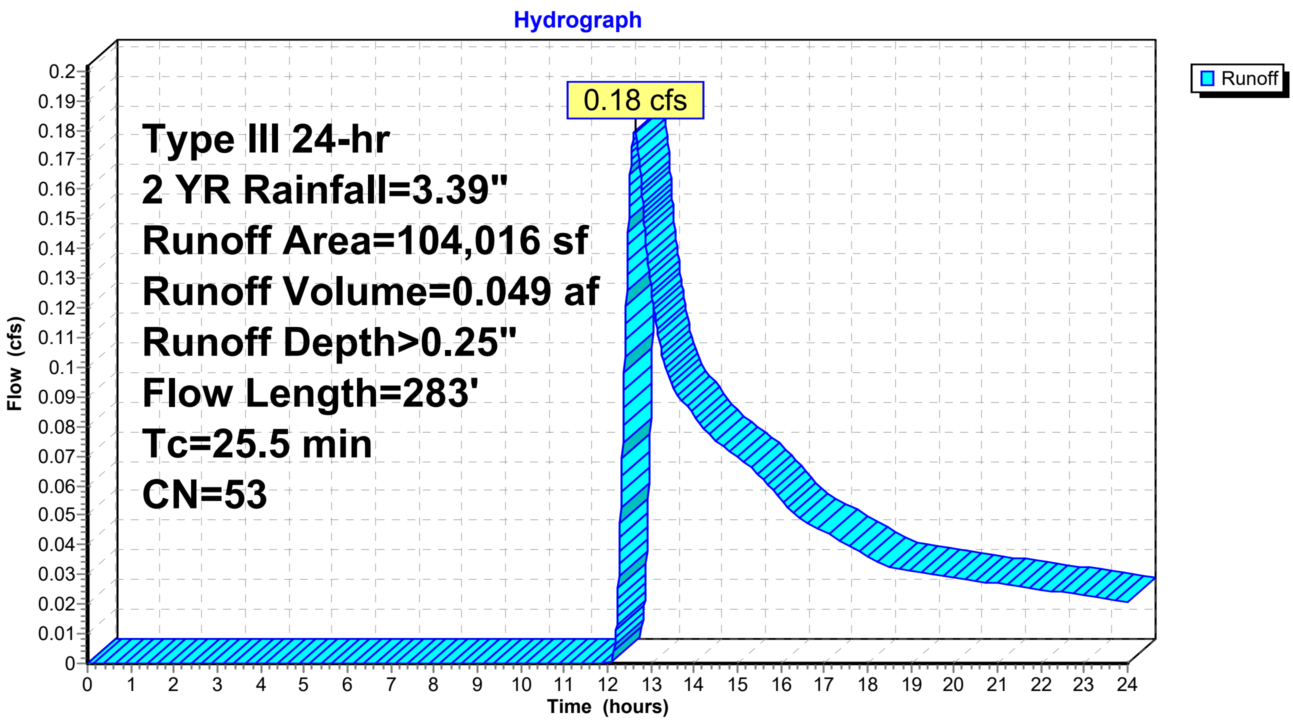
Runoff = 0.18 cfs @ 12.64 hrs, Volume= 0.049 af, Depth> 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	71,752	39	>75% Grass cover, Good, HSG A
	6,746	30	Woods, Good, HSG A
*	25,518	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	104,016	53	Weighted Average
	78,498		75.47% Pervious Area
	25,518		24.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	50	0.1000	0.29		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
22.6	233	0.0006	0.17		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
25.5	283	Total			

Subcatchment E6: EX DA-6



Summary for Subcatchment E7: EX-DA 7

[73] Warning: Peak may fall outside time span

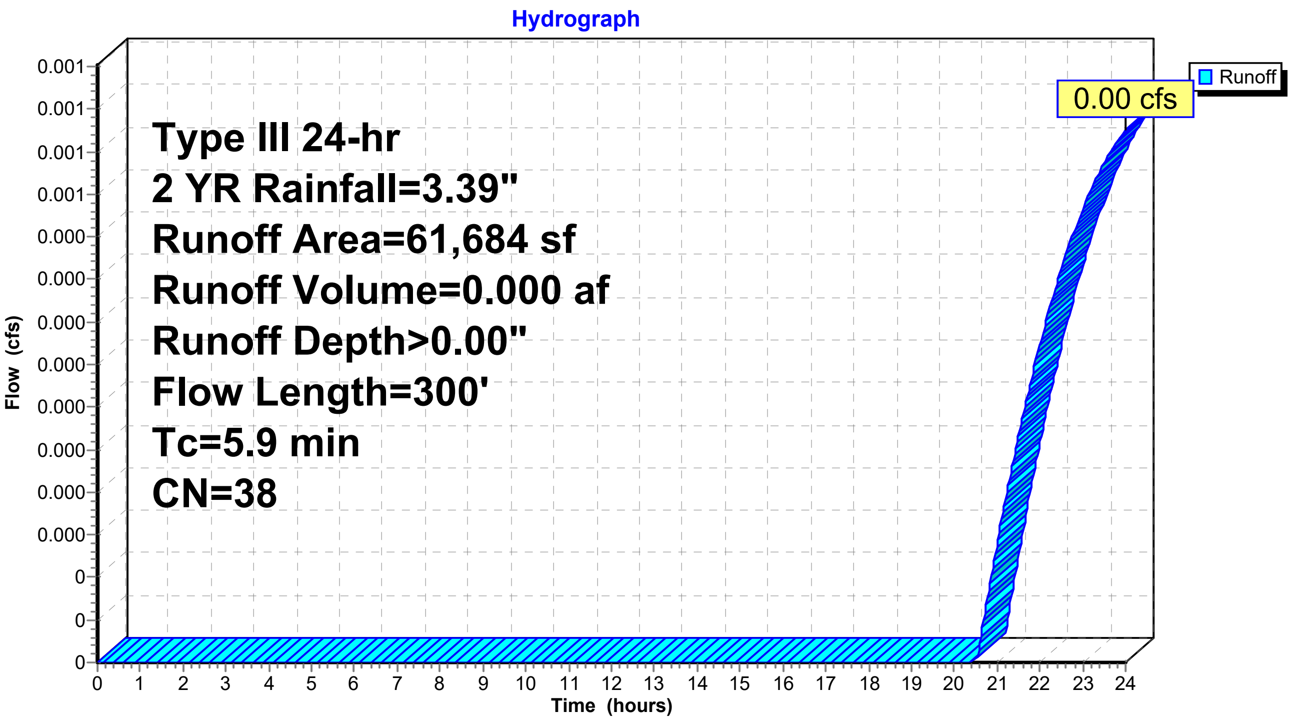
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	47,876	39	>75% Grass cover, Good, HSG A
*	12,590	30	Woods, Good, HSG A & Sand Area
	1,218	98	Water Surface, HSG A
	61,684	38	Weighted Average
	60,466		98.03% Pervious Area
	1,218		1.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0280	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
0.5	100	0.0460	3.45		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.6	150	0.0750	4.41		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
5.9	300	Total			

Subcatchment E7: EX-DA 7



Summary for Subcatchment E8: EX-DA 8

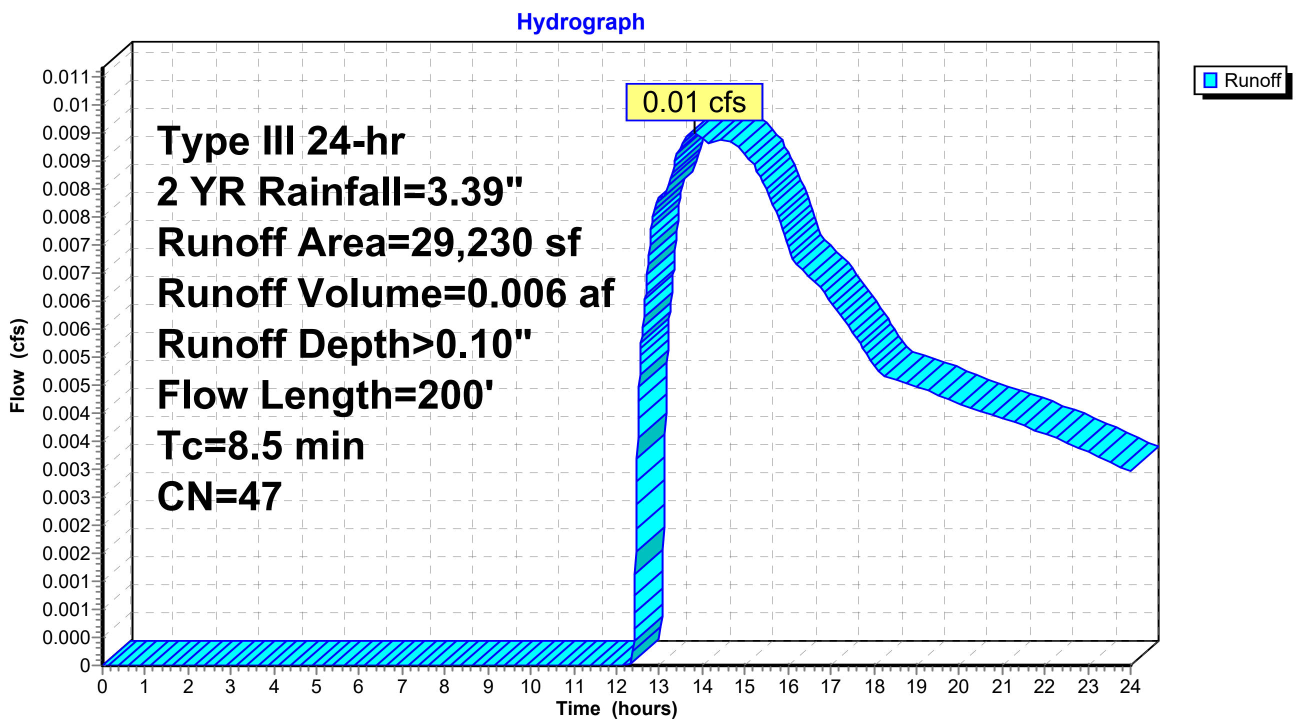
Runoff = 0.01 cfs @ 13.80 hrs, Volume= 0.006 af, Depth> 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	21,837	39	>75% Grass cover, Good, HSG A
*	2,953	30	Woods, Good, HSG A & Sand Area
	4,440	98	Water Surface, HSG A
	29,230	47	Weighted Average
	24,790		84.81% Pervious Area
	4,440		15.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.40"
1.6	150	0.0530	1.61		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
8.5	200	Total			

Subcatchment E8: EX-DA 8



Summary for Subcatchment E9: EX DA-9

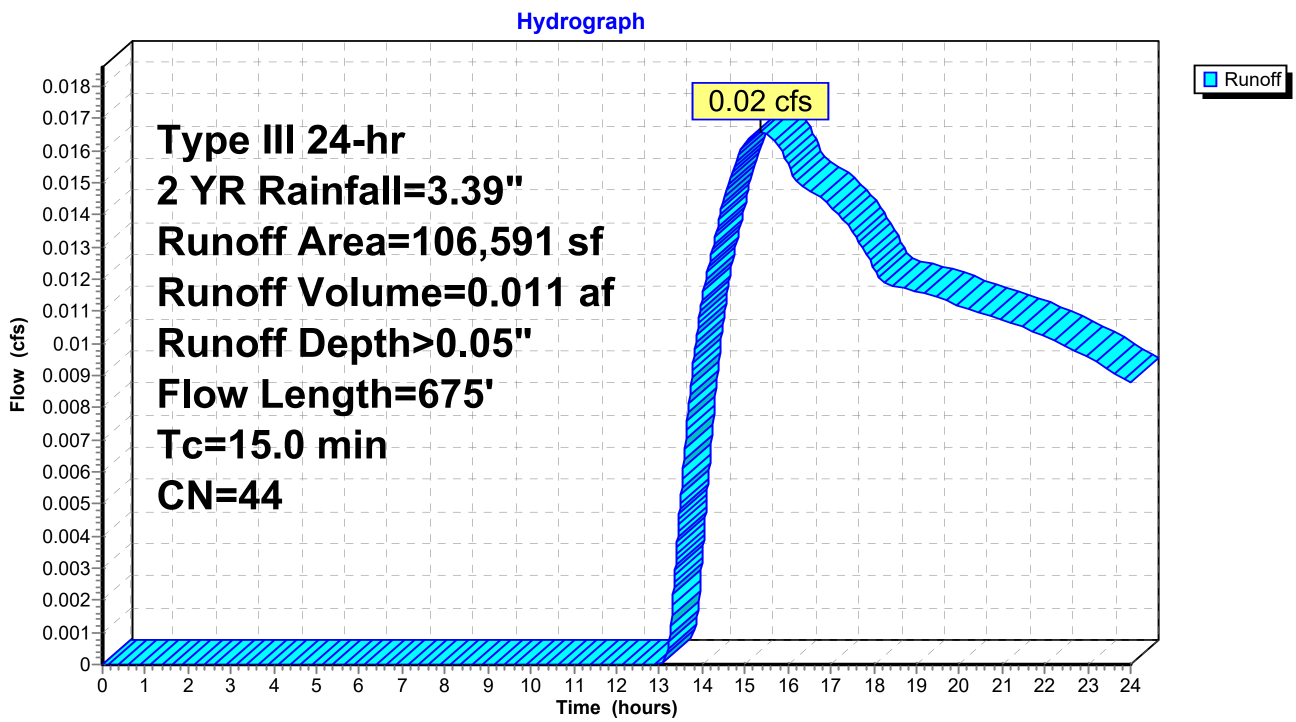
Runoff = 0.02 cfs @ 15.35 hrs, Volume= 0.011 af, Depth> 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	94,116	39	>75% Grass cover, Good, HSG A
	3,500	30	Woods, Good, HSG A
*	8,975	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	106,591	44	Weighted Average
	97,616		91.58% Pervious Area
	8,975		8.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0260	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
8.8	495	0.0180	0.94		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.3	130	0.0540	1.63		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
15.0	675	Total			

Subcatchment E9: EX DA-9

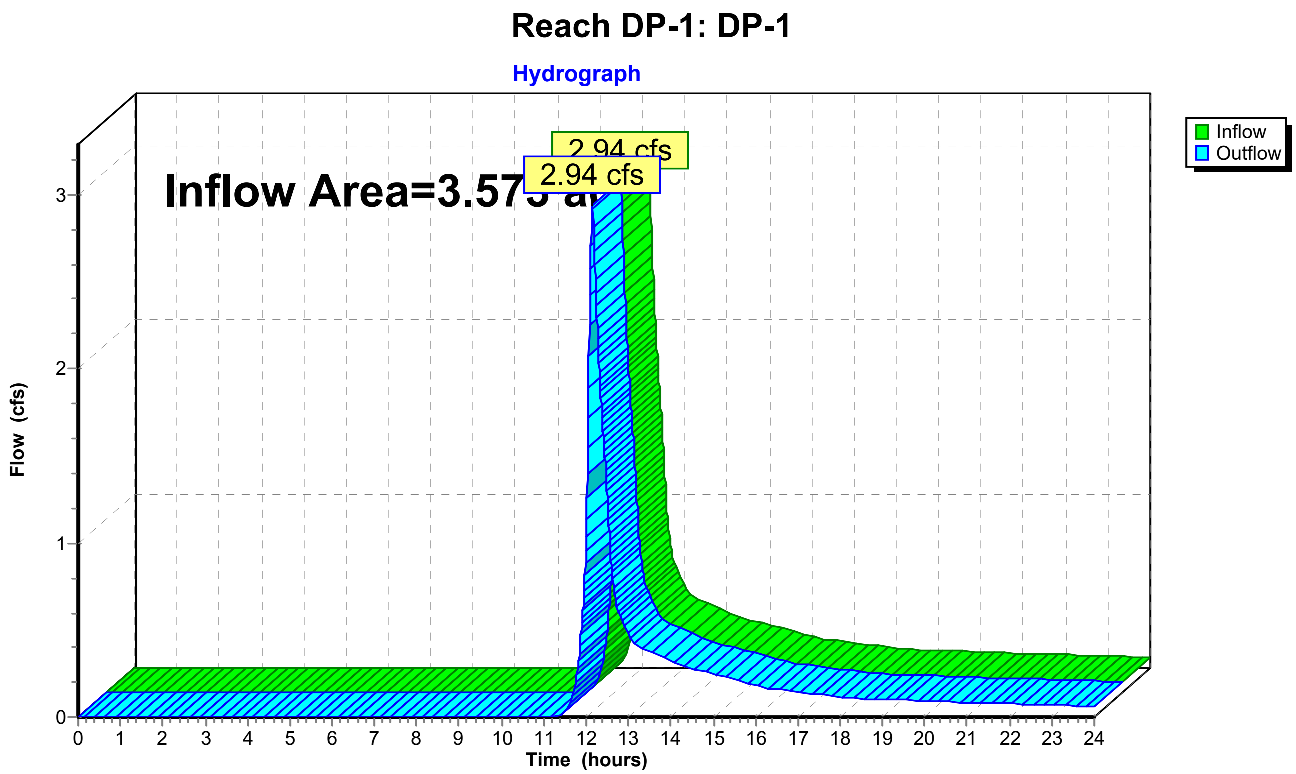


Summary for Reach DP-1: DP-1

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

Inflow Area = 3.573 ac, 50.78% Impervious, Inflow Depth > 0.89" for 2 YR event
Inflow = 2.94 cfs @ 12.15 hrs, Volume= 0.264 af
Outflow = 2.94 cfs @ 12.15 hrs, Volume= 0.264 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



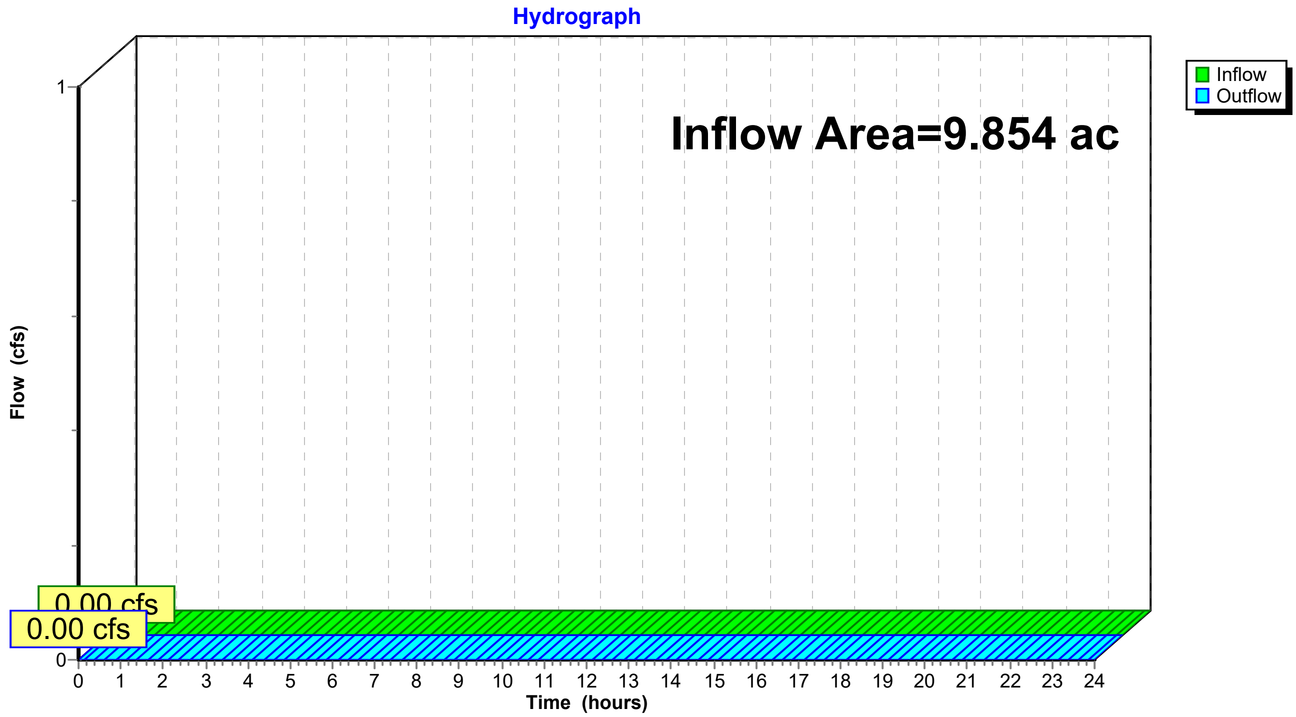
Summary for Reach DP-2: DP-2 (JOSHUA'S BROOK)

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

Inflow Area = 9.854 ac, 2.39% Impervious, Inflow Depth = 0.00" for 2 YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-2: DP-2 (JOSHUA'S BROOK)



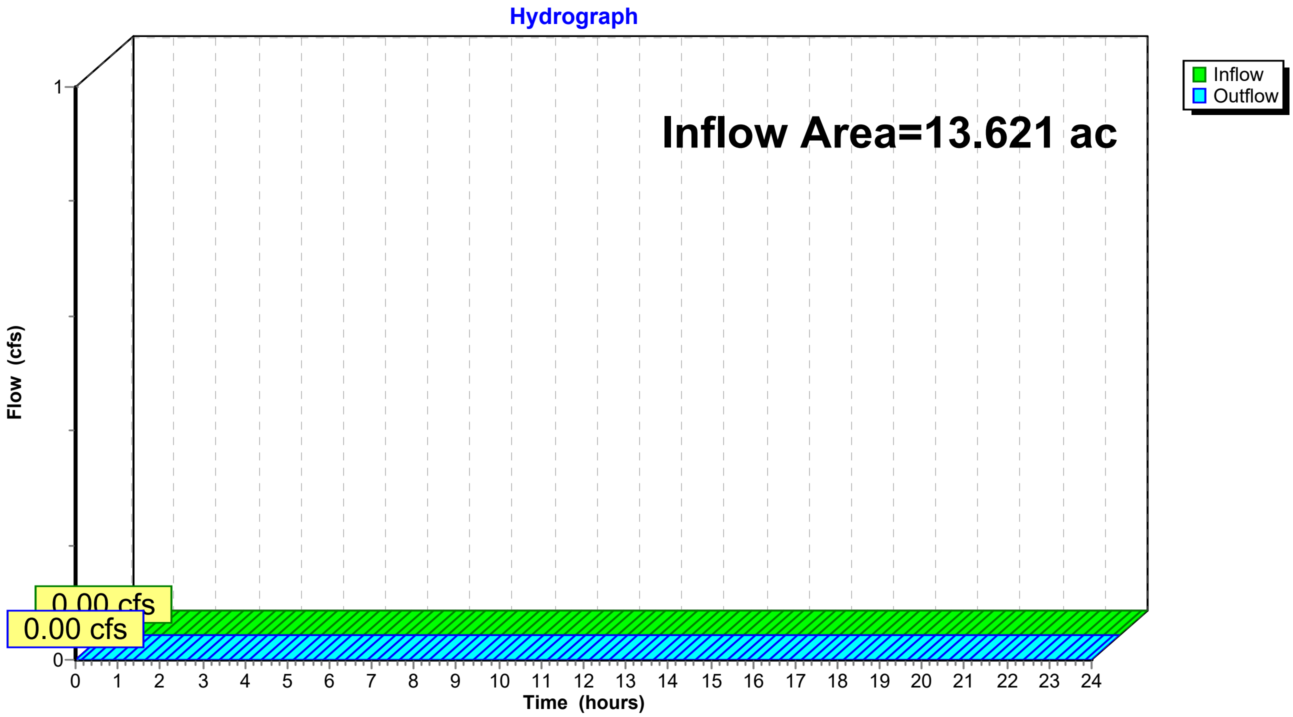
Summary for Reach DP-3: DP-3 (STEWART'S CREEK)

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

Inflow Area = 13.621 ac, 9.32% Impervious, Inflow Depth = 0.00" for 2 YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-3: DP-3 (STEWART'S CREEK)



Summary for Pond P-A: POND A

Inflow Area = 2.388 ac, 24.53% Impervious, Inflow Depth > 0.25" for 2 YR event
Inflow = 0.18 cfs @ 12.64 hrs, Volume= 0.049 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 24.55' @ 24.00 hrs Surf.Area= 20,828 sf Storage= 2,131 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

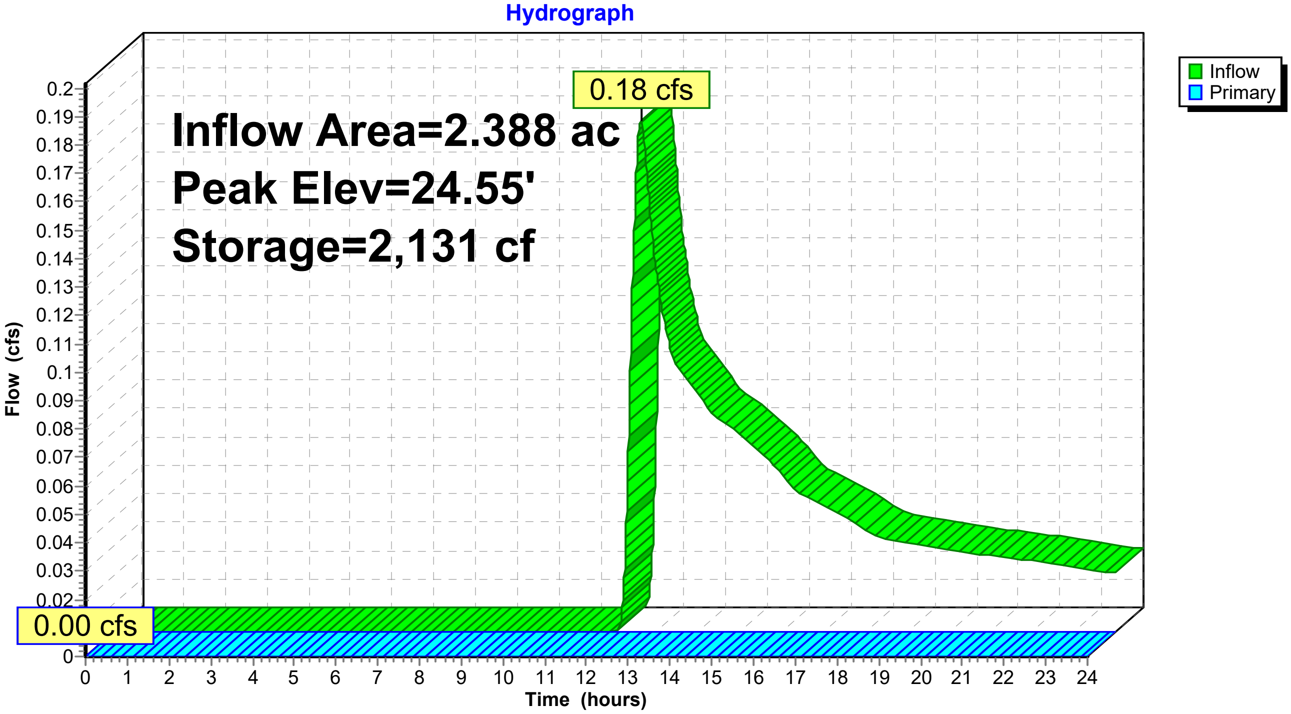
Volume	Invert	Avail.Storage	Storage Description
#1	24.45'	37,030 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.45	20,405	0	0
25.70	25,518	28,702	28,702
26.00	30,000	8,328	37,030

Device	Routing	Invert	Outlet Devices
#1	Primary	25.10'	**45.0 deg x 30.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=24.45' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-A: POND A



Summary for Pond P-B: POND B

Inflow Area = 1.784 ac, 13.22% Impervious, Inflow Depth > 0.08" for 2 YR event
Inflow = 0.02 cfs @ 14.71 hrs, Volume= 0.013 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 2.75' @ 24.00 hrs Surf.Area= 10,415 sf Storage= 547 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

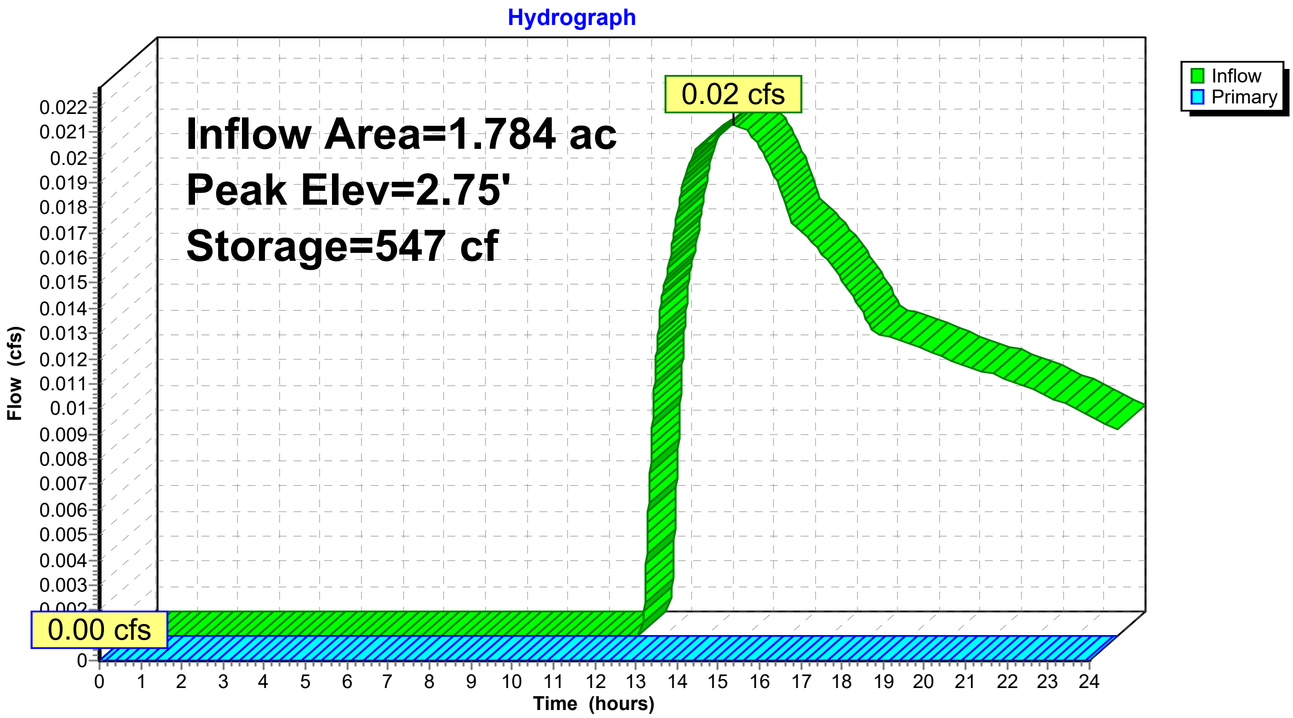
Volume	Invert	Avail.Storage	Storage Description
#1	2.70'	15,021 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2.70	10,273	0	0
3.00	11,080	3,203	3,203
3.40	11,370	4,490	7,693
4.00	13,058	7,328	15,021

Device	Routing	Invert	Outlet Devices
#1	Primary	3.44'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2.70' (Free Discharge)
1=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)

Pond P-B: POND B



Summary for Pond P-C: POND C

Inflow Area = 3.086 ac, 15.48% Impervious, Inflow Depth > 0.08" for 2 YR event
Inflow = 0.04 cfs @ 14.69 hrs, Volume= 0.022 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 3.65' @ 24.00 hrs Surf.Area= 21,115 sf Storage= 946 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

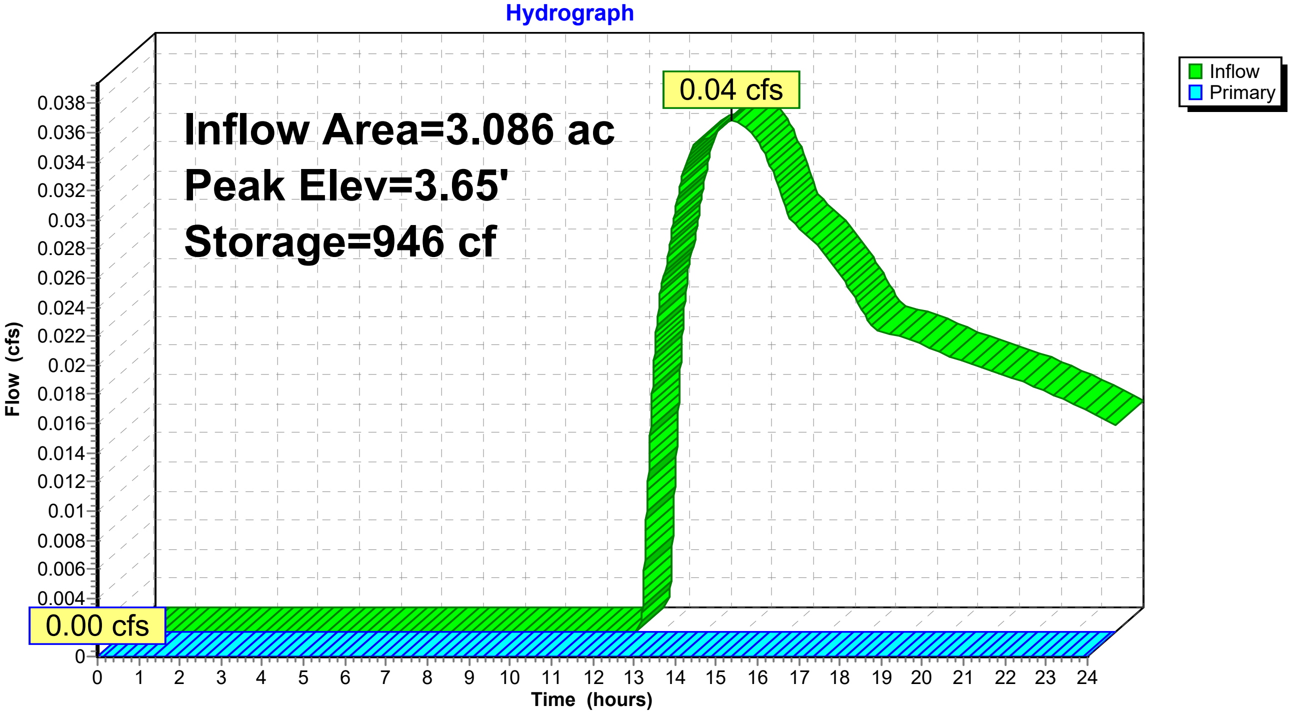
Volume	Invert	Avail.Storage	Storage Description
#1	3.60'	35,172 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.60	20,812	0	0
4.00	23,497	8,862	8,862
5.00	29,124	26,311	35,172

Device	Routing	Invert	Outlet Devices
#1	Primary	4.29'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=3.60' (Free Discharge)
1=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)

Pond P-C: POND C



Summary for Pond P-D: POND D

Inflow Area = 2.447 ac, 8.42% Impervious, Inflow Depth > 0.05" for 2 YR event
Inflow = 0.02 cfs @ 15.35 hrs, Volume= 0.011 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 8.06' @ 24.00 hrs Surf.Area= 7,669 sf Storage= 459 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

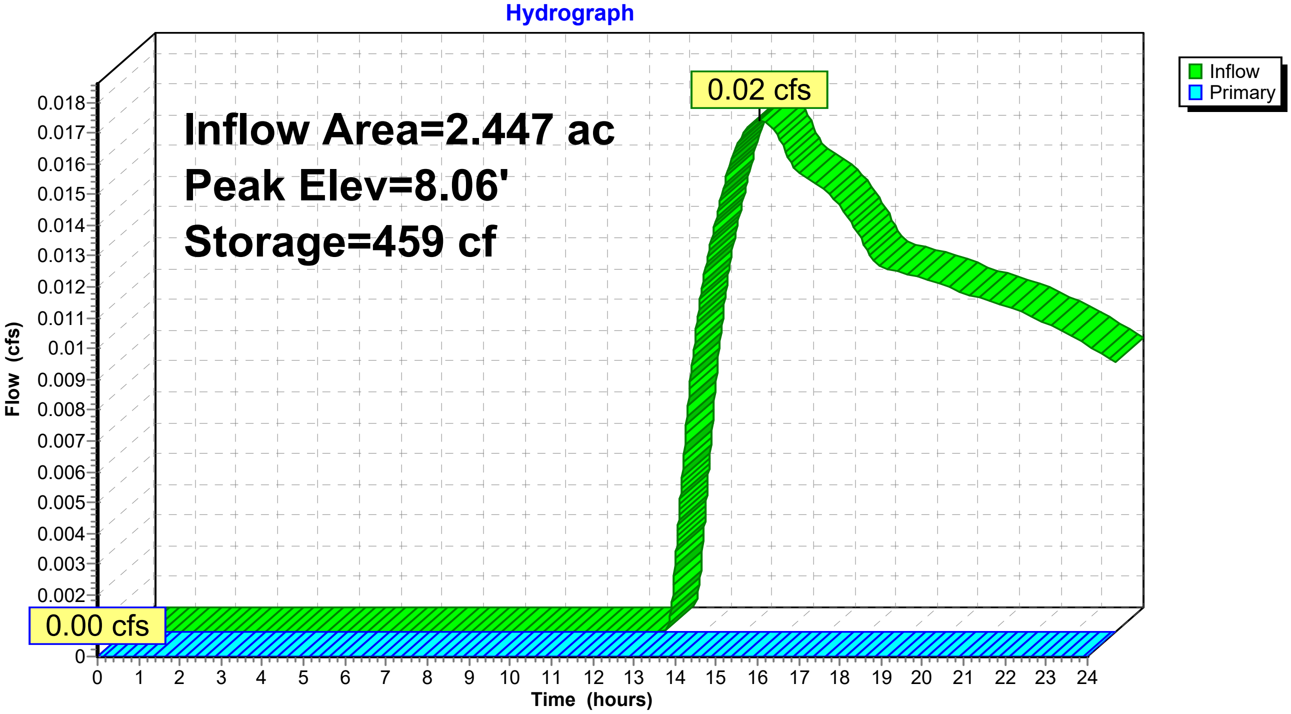
Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	18,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	7,585	0	0
9.00	8,975	8,280	8,280
10.00	12,170	10,573	18,853

Device	Routing	Invert	Outlet Devices
#1	Primary	9.80'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#2	Primary	9.08'	**12.0" Round Culvert** L= 18.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.08' / 8.16' S= 0.0497 '/' Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=8.00' (Free Discharge)
1=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)
2=Culvert (Controls 0.00 cfs)

Pond P-D: POND D



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

Subcatchment E1: EX DA-1 Runoff Area=155,629 sf 50.78% Impervious Runoff Depth>1.91"
Flow Length=435' Tc=9.6 min CN=69 Runoff=6.90 cfs 0.569 af

Subcatchment E10: EX DA-10 Runoff Area=248,320 sf 0.00% Impervious Runoff Depth>0.10"
Flow Length=490' Tc=16.5 min CN=36 Runoff=0.08 cfs 0.047 af

Subcatchment E2: EX-DA-2 Runoff Area=351,546 sf 0.00% Impervious Runoff Depth>0.07"
Flow Length=682' Tc=14.4 min CN=35 Runoff=0.08 cfs 0.050 af

Subcatchment E3: EX DA-3 Runoff Area=77,711 sf 13.22% Impervious Runoff Depth>0.47"
Flow Length=400' Tc=7.0 min CN=46 Runoff=0.39 cfs 0.069 af

Subcatchment E4: EX DA-4 Runoff Area=134,422 sf 15.48% Impervious Runoff Depth>0.47"
Flow Length=341' Tc=7.8 min CN=46 Runoff=0.67 cfs 0.120 af

Subcatchment E5: EX DA-5 Runoff Area=171,335 sf 0.00% Impervious Runoff Depth>0.10"
Flow Length=433' Tc=11.9 min CN=36 Runoff=0.05 cfs 0.032 af

Subcatchment E6: EX DA-6 Runoff Area=104,016 sf 24.53% Impervious Runoff Depth>0.83"
Flow Length=283' Tc=25.5 min CN=53 Runoff=1.06 cfs 0.164 af

Subcatchment E7: EX-DA 7 Runoff Area=61,684 sf 1.97% Impervious Runoff Depth>0.16"
Flow Length=300' Tc=5.9 min CN=38 Runoff=0.03 cfs 0.018 af

Subcatchment E8: EX-DA 8 Runoff Area=29,230 sf 15.19% Impervious Runoff Depth>0.51"
Flow Length=200' Tc=8.5 min CN=47 Runoff=0.17 cfs 0.029 af

Subcatchment E9: EX DA-9 Runoff Area=106,591 sf 8.42% Impervious Runoff Depth>0.38"
Flow Length=675' Tc=15.0 min CN=44 Runoff=0.34 cfs 0.077 af

Reach DP-1: DP-1 Inflow=6.90 cfs 0.569 af
Outflow=6.90 cfs 0.569 af

Reach DP-2: DP-2 (JOSHUA'S BROOK) Inflow=0.08 cfs 0.050 af
Outflow=0.08 cfs 0.050 af

Reach DP-3: DP-3 (STEWART'S CREEK) Inflow=0.08 cfs 0.047 af
Outflow=0.08 cfs 0.047 af

Pond P-A: POND A Peak Elev=24.79' Storage=7,154 cf Inflow=1.06 cfs 0.164 af
Outflow=0.00 cfs 0.000 af

Pond P-B: POND B Peak Elev=2.98' Storage=3,027 cf Inflow=0.39 cfs 0.069 af
Outflow=0.00 cfs 0.000 af

Pond P-C: POND C Peak Elev=3.84' Storage=5,233 cf Inflow=0.67 cfs 0.120 af
Outflow=0.00 cfs 0.000 af

Pond P-D: POND D Peak Elev=8.42' Storage=3,342 cf Inflow=0.34 cfs 0.077 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 33.069 ac Runoff Volume = 1.176 af Average Runoff Depth = 0.43"
89.57% Pervious = 29.619 ac 10.43% Impervious = 3.450 ac

Summary for Subcatchment E1: EX DA-1

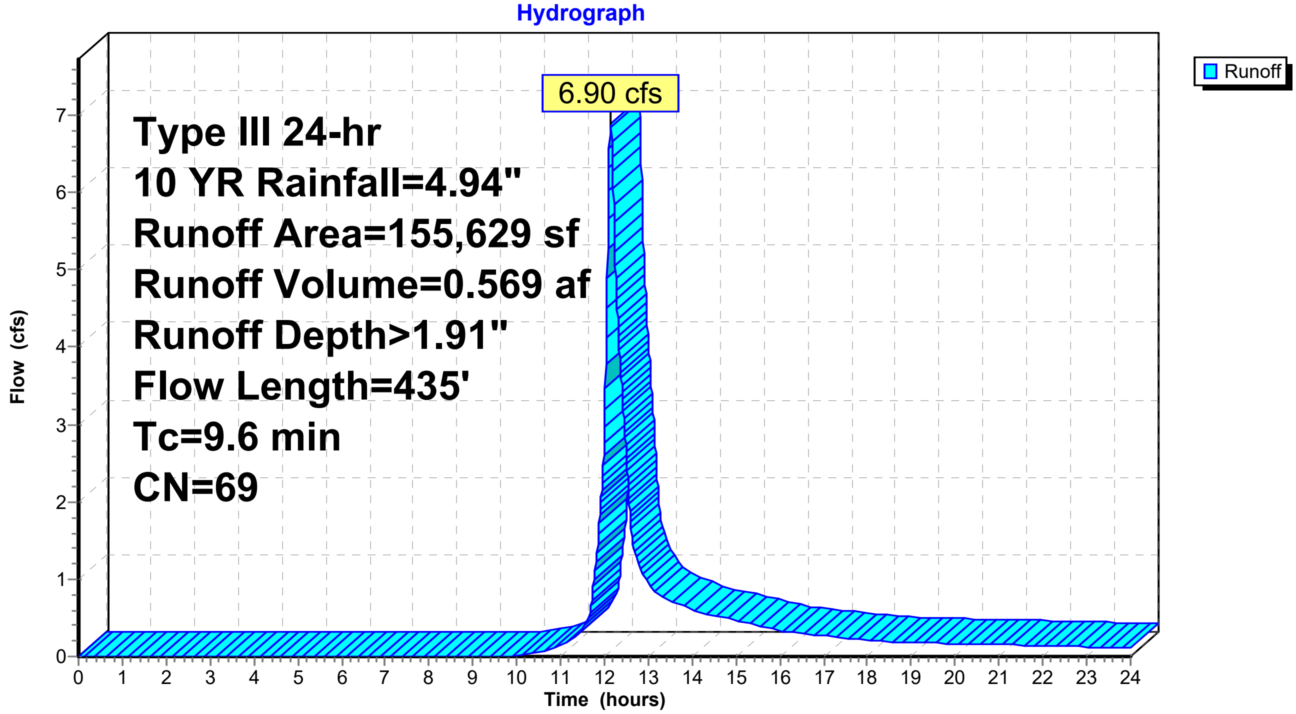
Runoff = 6.90 cfs @ 12.14 hrs, Volume= 0.569 af, Depth> 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	70,869	39	>75% Grass cover, Good, HSG A
	5,725	30	Woods, Good, HSG A
*	7,041	98	Wetland; Water Surface
	71,994	98	Paved parking, HSG A
	155,629	69	Weighted Average
	76,594		49.22% Pervious Area
	79,035		50.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0270	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
2.4	90	0.0077	0.61		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.9	192	0.0550	1.64		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.4	83	0.0260	3.27		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
0.1	20	0.2000	3.13		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
9.6	435	Total			

Subcatchment E1: EX DA-1



Summary for Subcatchment E10: EX DA-10

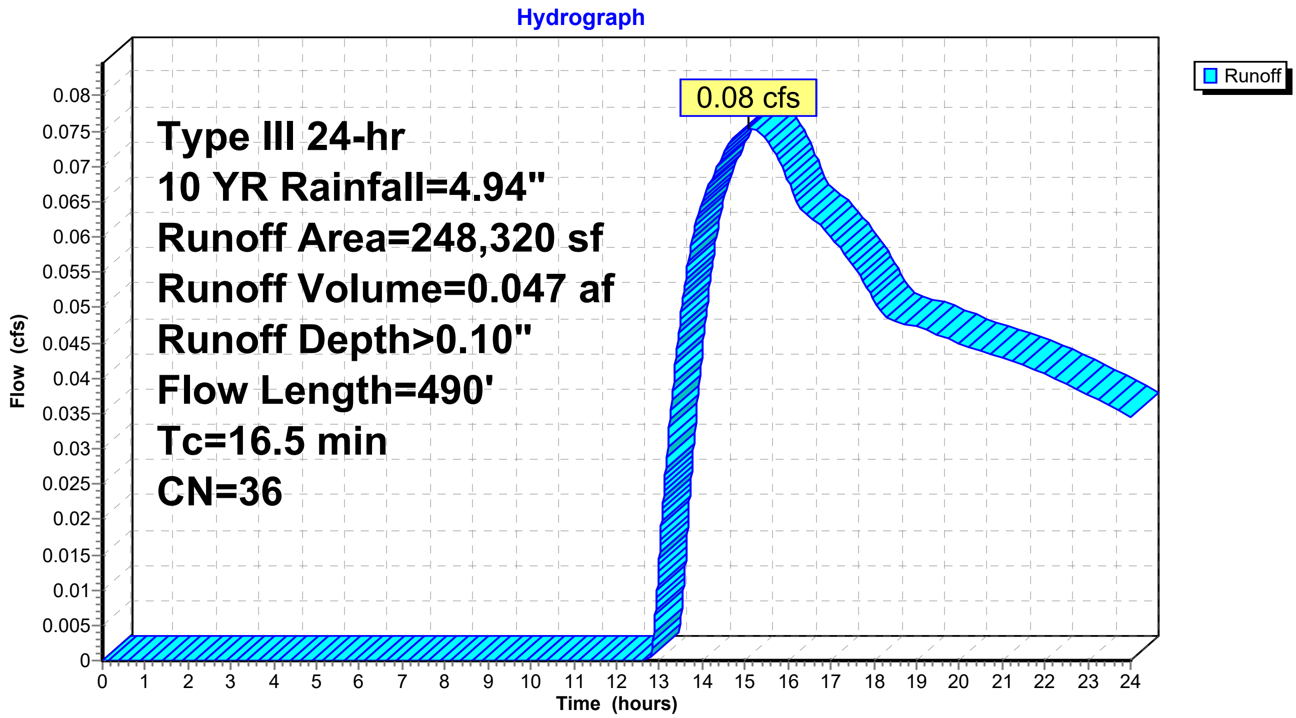
Runoff = 0.08 cfs @ 15.09 hrs, Volume= 0.047 af, Depth> 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	166,992	39	>75% Grass cover, Good, HSG A
	81,328	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	248,320	36	Weighted Average
	248,320		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.40"
3.1	70	0.0057	0.38		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.5	150	0.0580	1.69		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
1.6	70	0.0110	0.73		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
1.1	125	0.0680	1.83		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
0.1	25	0.3000	3.83		**Shallow Concentrated Flow, F-G** Short Grass Pasture Kv= 7.0 fps
16.5	490	Total			

Subcatchment E10: EX DA-10



Summary for Subcatchment E2: EX-DA-2

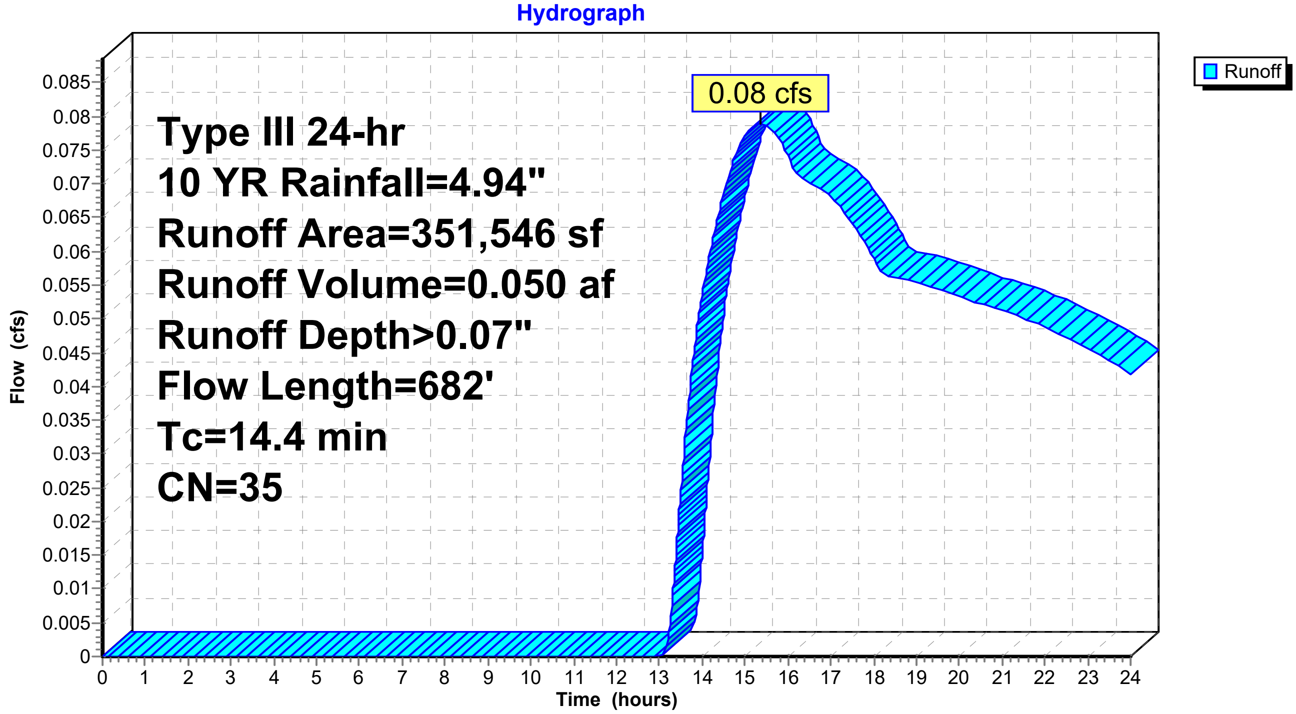
Runoff = 0.08 cfs @ 15.38 hrs, Volume= 0.050 af, Depth> 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	195,277	39	>75% Grass cover, Good, HSG A
	156,269	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	351,546	35	Weighted Average
	351,546		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0800	0.27		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
10.1	520	0.0150	0.86		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	40	0.0825	1.44		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.5	40	0.0425	1.44		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.2	32	0.3900	3.12		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
14.4	682	Total			

Subcatchment E2: EX-DA-2



Summary for Subcatchment E3: EX DA-3

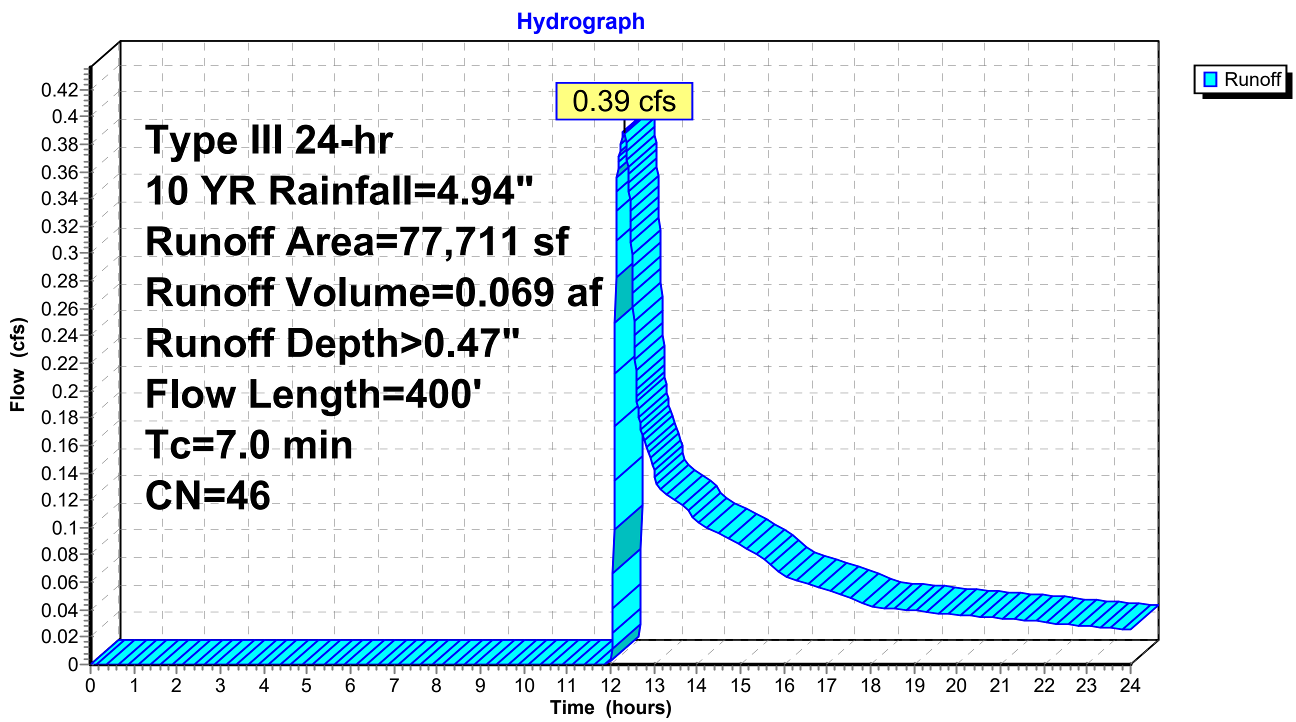
Runoff = 0.39 cfs @ 12.30 hrs, Volume= 0.069 af, Depth> 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	60,103	39	>75% Grass cover, Good, HSG A
	7,335	30	Woods, Good, HSG A
*	10,273	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	77,711	46	Weighted Average
	67,438		86.78% Pervious Area
	10,273		13.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0800	0.27		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
3.7	320	0.0430	1.45		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	30	0.1000	2.21		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
7.0	400	Total			

Subcatchment E3: EX DA-3



Summary for Subcatchment E4: EX DA-4

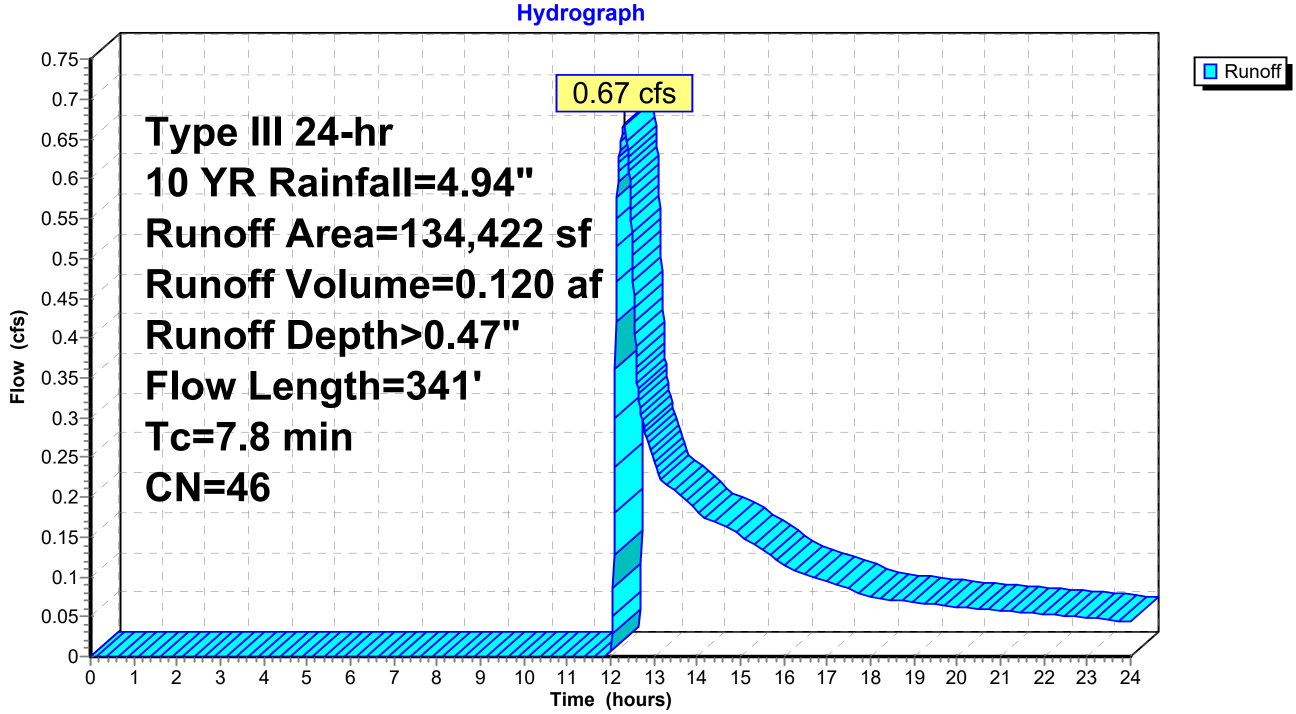
Runoff = 0.67 cfs @ 12.31 hrs, Volume= 0.120 af, Depth> 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	77,263	39	>75% Grass cover, Good, HSG A
	36,347	30	Woods, Good, HSG A
*	20,812	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	134,422	46	Weighted Average
	113,610		84.52% Pervious Area
	20,812		15.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	35	0.1300	0.30		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
5.2	200	0.0165	0.64		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.4	63	0.1550	2.76		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.3	43	0.1160	2.38		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
7.8	341	Total			

Subcatchment E4: EX DA-4



Summary for Subcatchment E5: EX DA-5

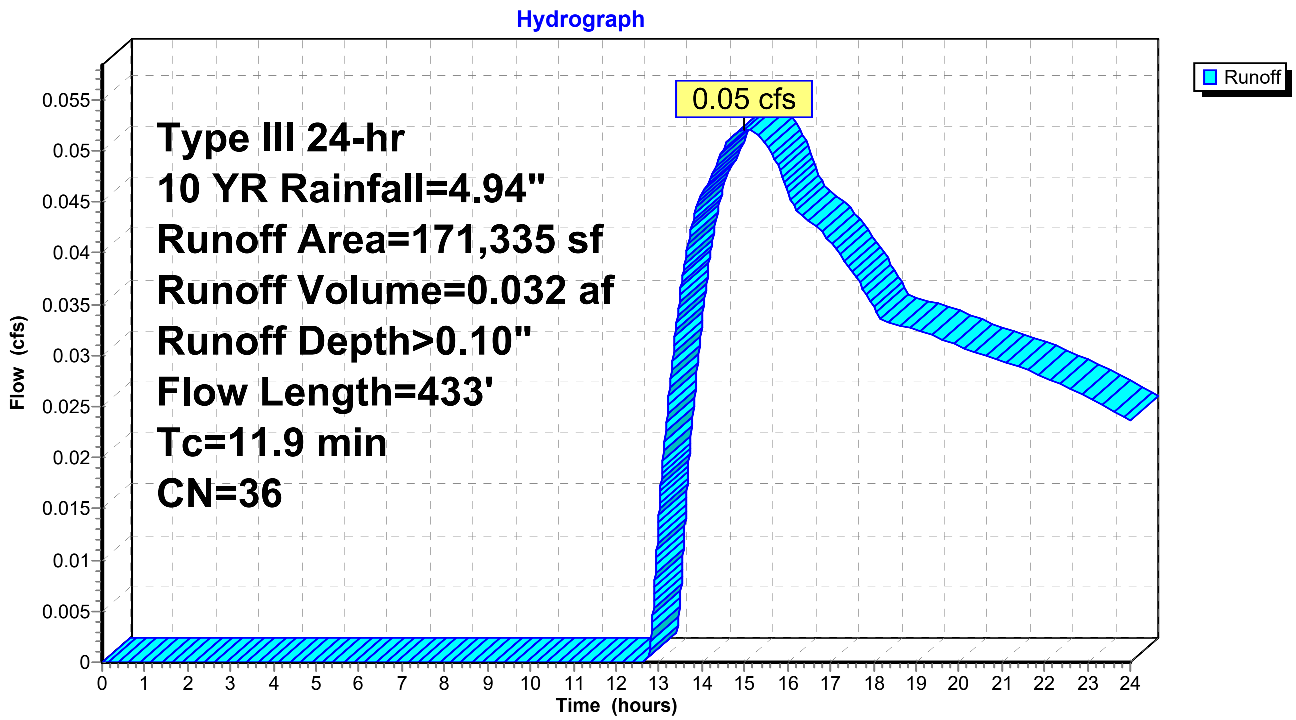
Runoff = 0.05 cfs @ 15.01 hrs, Volume= 0.032 af, Depth> 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	109,518	39	>75% Grass cover, Good, HSG A
	61,817	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	171,335	36	Weighted Average
	171,335		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	50	0.1000	0.29		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
1.0	105	0.0620	1.74		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.2	75	0.0460	1.07		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
6.8	203	0.0050	0.49		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
11.9	433	Total			

Subcatchment E5: EX DA-5



Summary for Subcatchment E6: EX DA-6

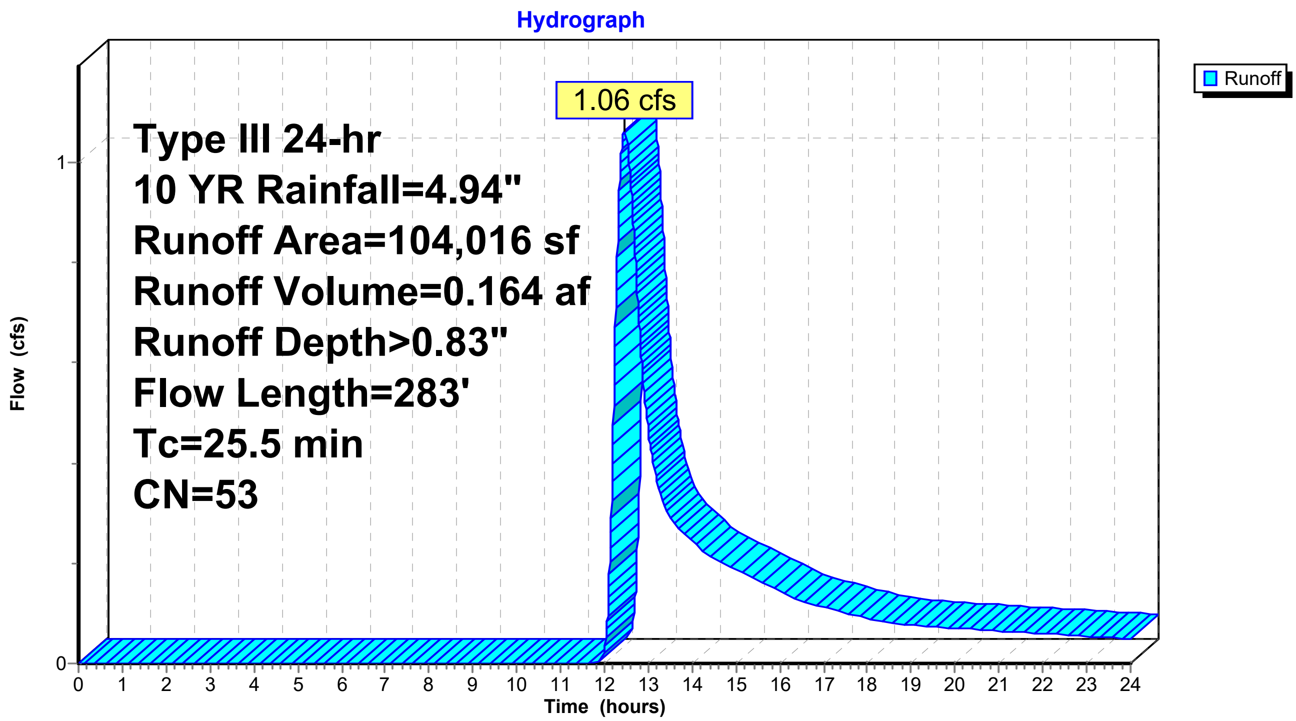
Runoff = 1.06 cfs @ 12.45 hrs, Volume= 0.164 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	71,752	39	>75% Grass cover, Good, HSG A
	6,746	30	Woods, Good, HSG A
*	25,518	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	104,016	53	Weighted Average
	78,498		75.47% Pervious Area
	25,518		24.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	50	0.1000	0.29		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
22.6	233	0.0006	0.17		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
25.5	283	Total			

Subcatchment E6: EX DA-6



Summary for Subcatchment E7: EX-DA 7

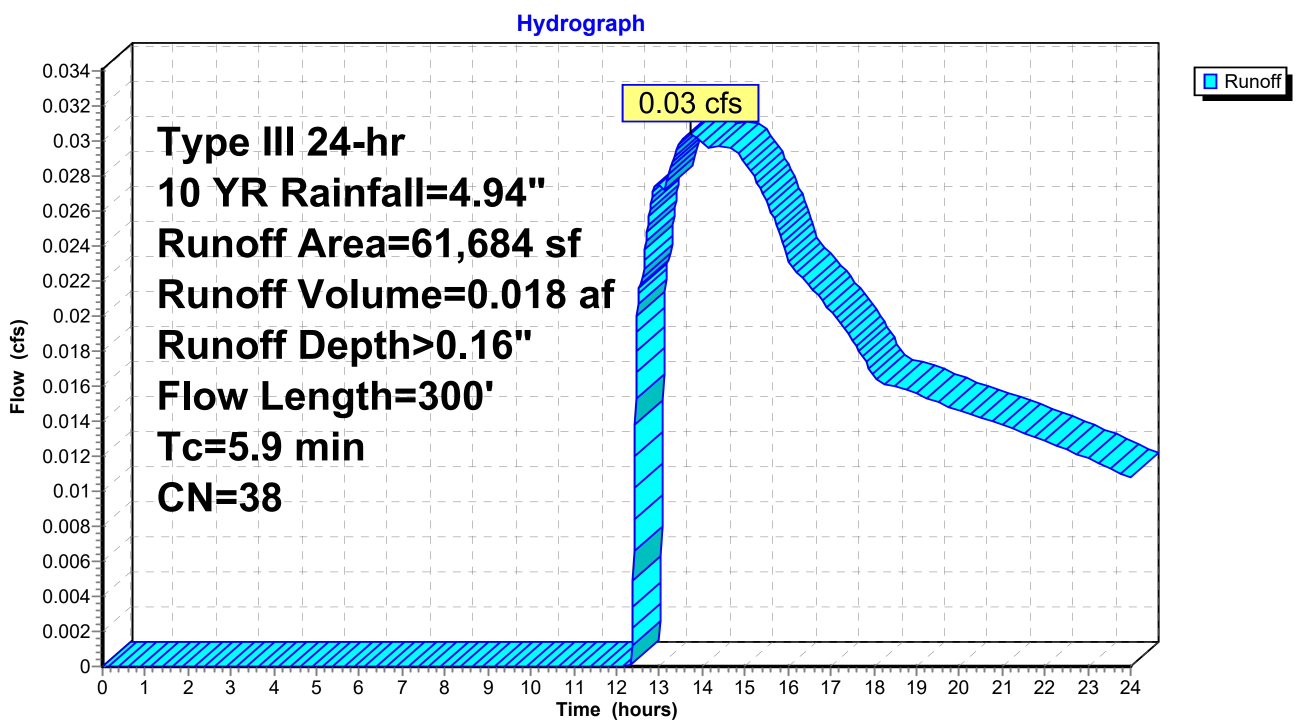
Runoff = 0.03 cfs @ 13.72 hrs, Volume= 0.018 af, Depth> 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	47,876	39	>75% Grass cover, Good, HSG A
*	12,590	30	Woods, Good, HSG A & Sand Area
	1,218	98	Water Surface, HSG A
	61,684	38	Weighted Average
	60,466		98.03% Pervious Area
	1,218		1.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0280	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
0.5	100	0.0460	3.45		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.6	150	0.0750	4.41		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
5.9	300	Total			

Subcatchment E7: EX-DA 7



Summary for Subcatchment E8: EX-DA 8

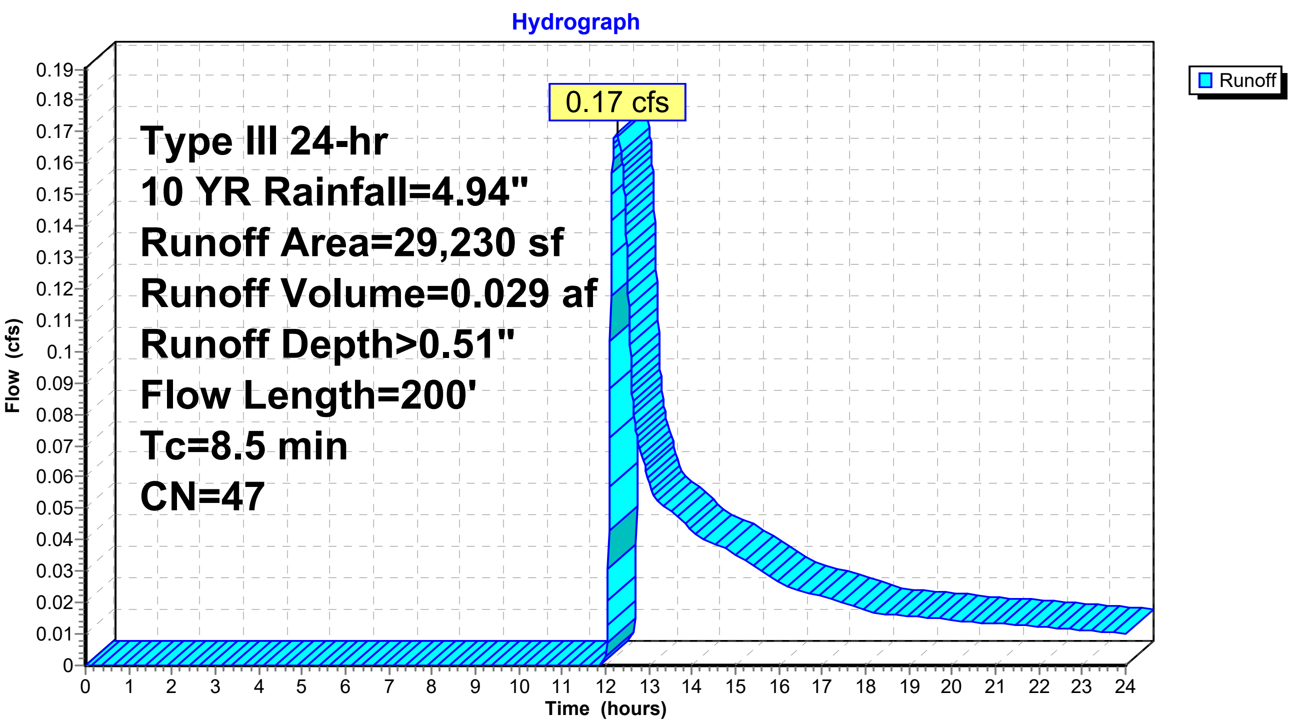
Runoff = 0.17 cfs @ 12.29 hrs, Volume= 0.029 af, Depth> 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	21,837	39	>75% Grass cover, Good, HSG A
*	2,953	30	Woods, Good, HSG A & Sand Area
	4,440	98	Water Surface, HSG A
	29,230	47	Weighted Average
	24,790		84.81% Pervious Area
	4,440		15.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.40"
1.6	150	0.0530	1.61		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
8.5	200	Total			

Subcatchment E8: EX-DA 8



Summary for Subcatchment E9: EX DA-9

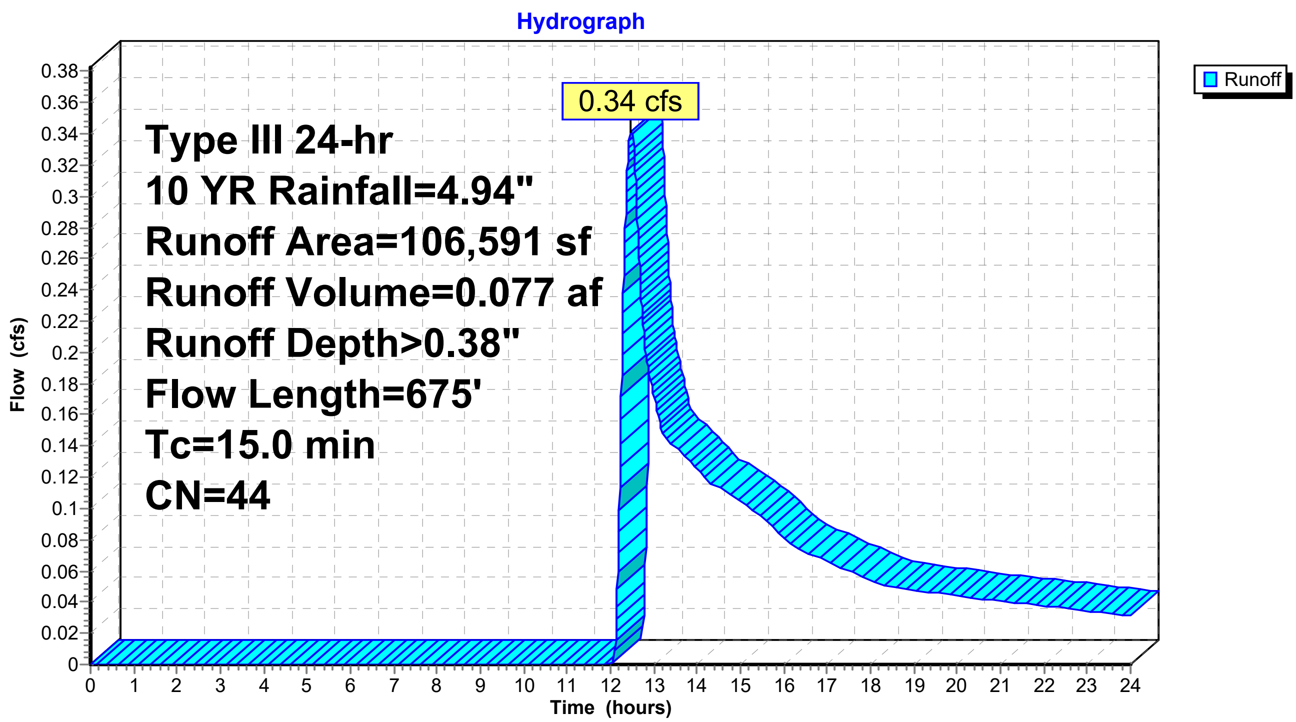
Runoff = 0.34 cfs @ 12.48 hrs, Volume= 0.077 af, Depth> 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	94,116	39	>75% Grass cover, Good, HSG A
	3,500	30	Woods, Good, HSG A
*	8,975	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	106,591	44	Weighted Average
	97,616		91.58% Pervious Area
	8,975		8.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0260	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
8.8	495	0.0180	0.94		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.3	130	0.0540	1.63		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
15.0	675	Total			

Subcatchment E9: EX DA-9

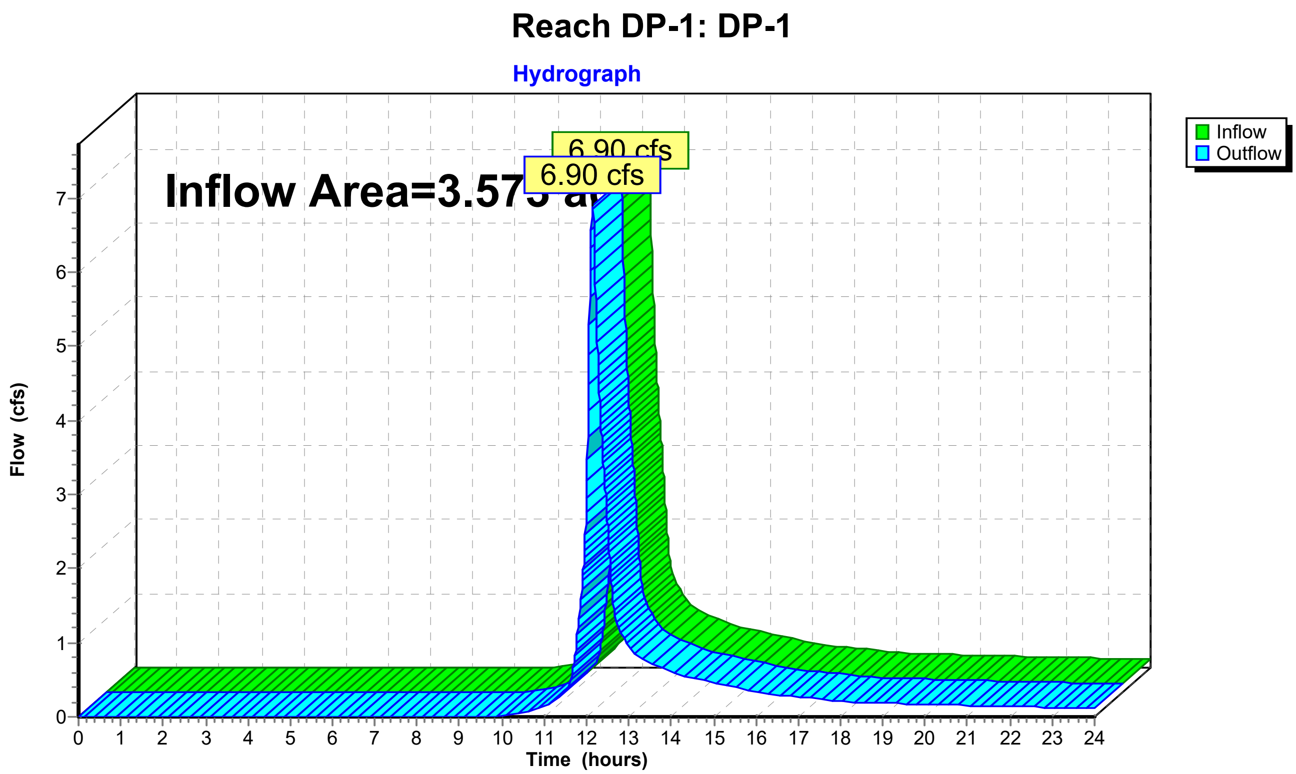


Summary for Reach DP-1: DP-1

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

Inflow Area = 3.573 ac, 50.78% Impervious, Inflow Depth > 1.91" for 10 YR event
Inflow = 6.90 cfs @ 12.14 hrs, Volume= 0.569 af
Outflow = 6.90 cfs @ 12.14 hrs, Volume= 0.569 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

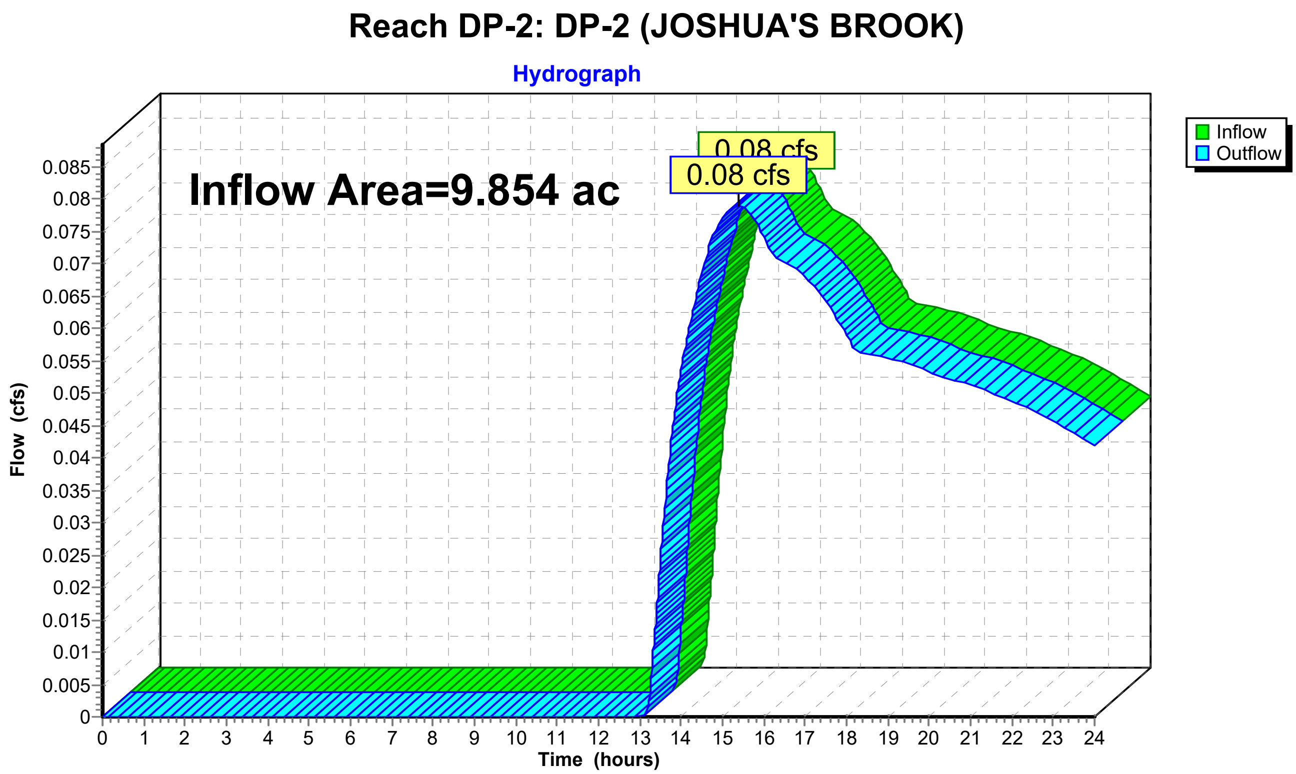


Summary for Reach DP-2: DP-2 (JOSHUA'S BROOK)

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

Inflow Area = 9.854 ac, 2.39% Impervious, Inflow Depth > 0.06" for 10 YR event
Inflow = 0.08 cfs @ 15.38 hrs, Volume= 0.050 af
Outflow = 0.08 cfs @ 15.38 hrs, Volume= 0.050 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



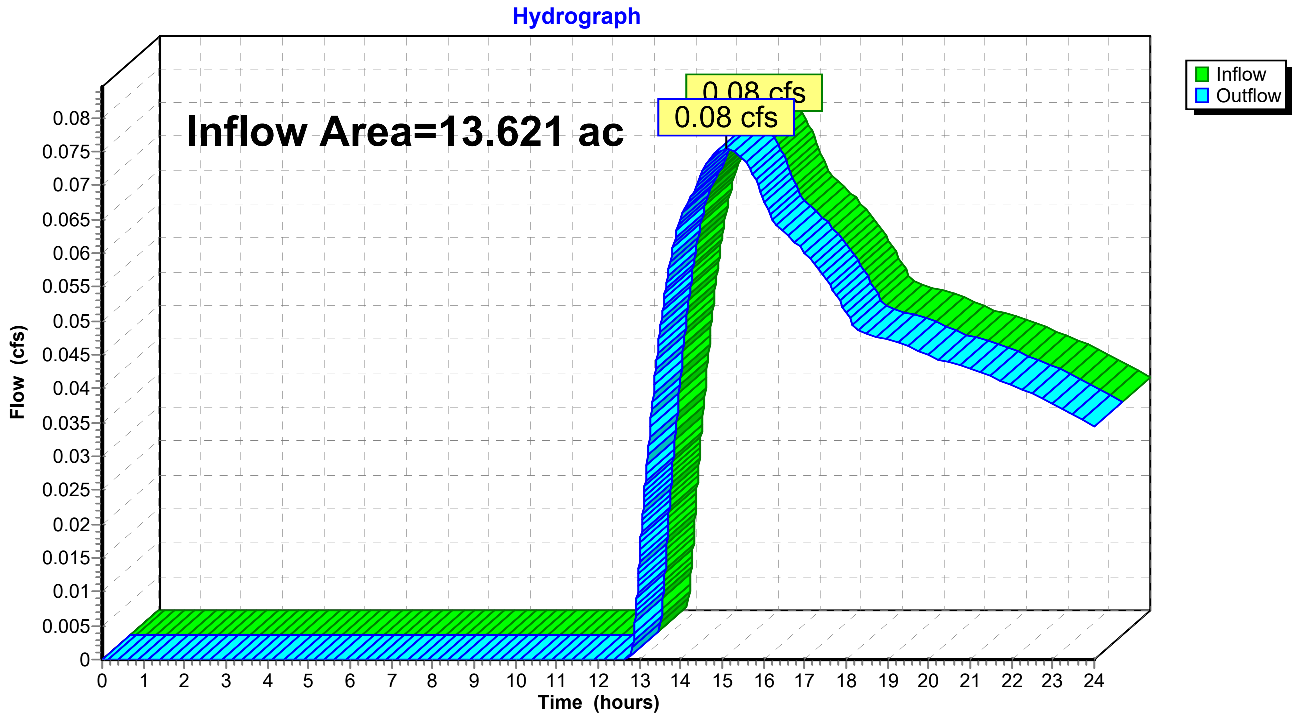
Summary for Reach DP-3: DP-3 (STEWART'S CREEK)

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

Inflow Area =	13.621 ac,	9.32% Impervious, Inflow Depth > 0.04"	for 10 YR event	
Inflow =	0.08 cfs @	15.09 hrs, Volume=	0.047 af	
Outflow =	0.08 cfs @	15.09 hrs, Volume=	0.047 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-3: DP-3 (STEWART'S CREEK)



Summary for Pond P-A: POND A

Inflow Area = 2.388 ac, 24.53% Impervious, Inflow Depth > 0.83" for 10 YR event
Inflow = 1.06 cfs @ 12.45 hrs, Volume= 0.164 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 24.79' @ 24.00 hrs Surf.Area= 21,792 sf Storage= 7,154 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

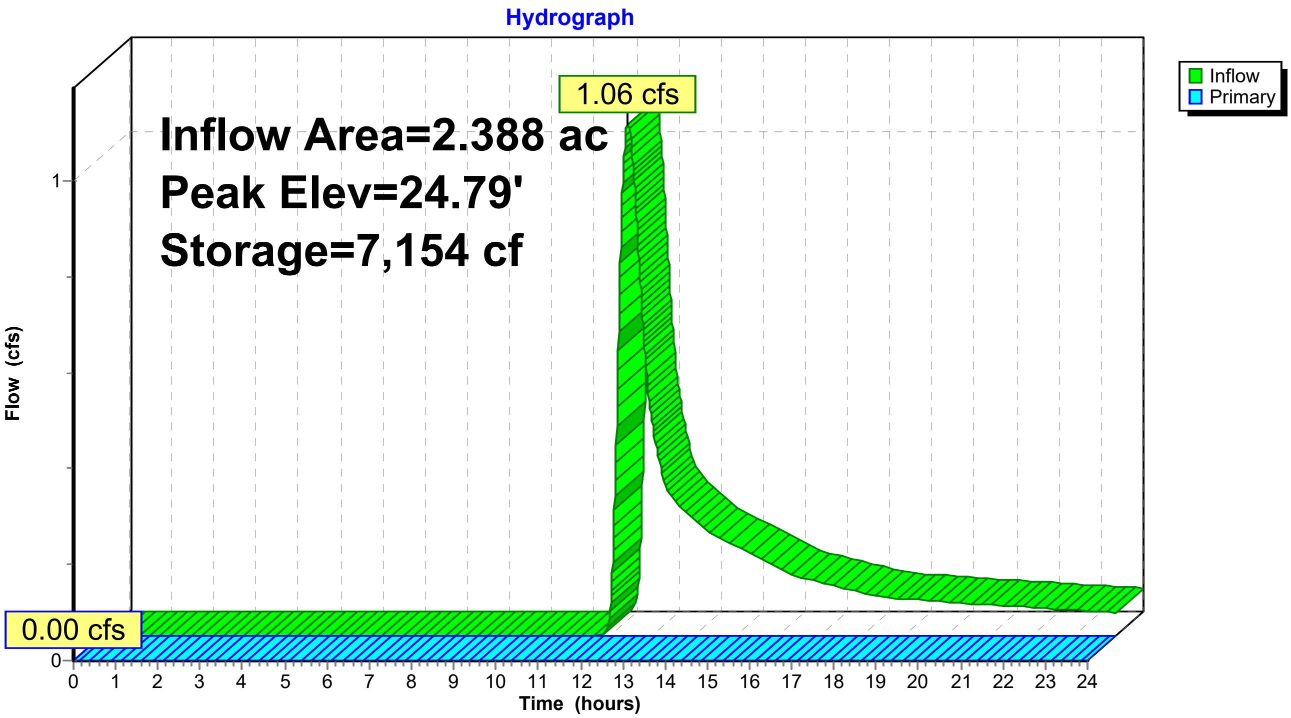
Volume	Invert	Avail.Storage	Storage Description
#1	24.45'	37,030 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.45	20,405	0	0
25.70	25,518	28,702	28,702
26.00	30,000	8,328	37,030

Device	Routing	Invert	Outlet Devices
#1	Primary	25.10'	**45.0 deg x 30.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=24.45' (Free Discharge)
1=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)

Pond P-A: POND A



Summary for Pond P-B: POND B

Inflow Area = 1.784 ac, 13.22% Impervious, Inflow Depth > 0.47" for 10 YR event
Inflow = 0.39 cfs @ 12.30 hrs, Volume= 0.069 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 2.98' @ 24.00 hrs Surf.Area= 11,037 sf Storage= 3,027 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

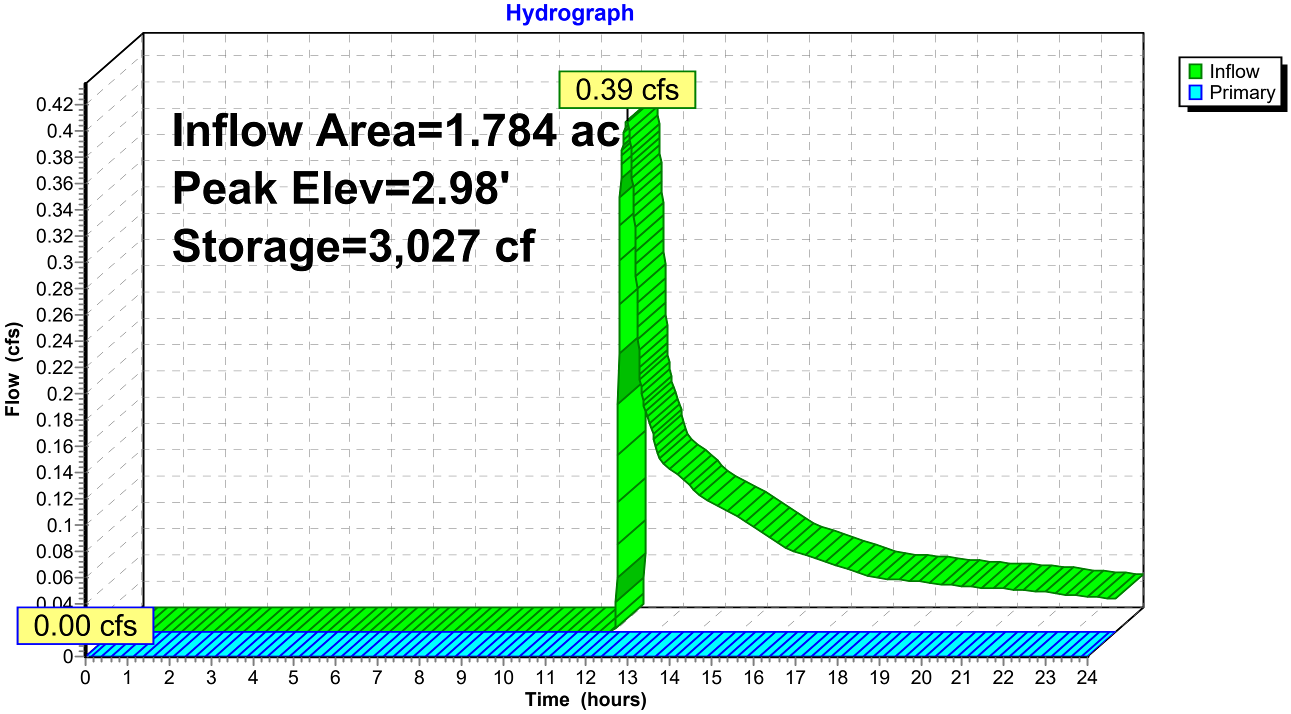
Volume	Invert	Avail.Storage	Storage Description
#1	2.70'	15,021 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2.70	10,273	0	0
3.00	11,080	3,203	3,203
3.40	11,370	4,490	7,693
4.00	13,058	7,328	15,021

Device	Routing	Invert	Outlet Devices
#1	Primary	3.44'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2.70' (Free Discharge)
1=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)

Pond P-B: POND B



Summary for Pond P-C: POND C

Inflow Area = 3.086 ac, 15.48% Impervious, Inflow Depth > 0.47" for 10 YR event
Inflow = 0.67 cfs @ 12.31 hrs, Volume= 0.120 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 3.84' @ 24.00 hrs Surf.Area= 22,436 sf Storage= 5,233 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

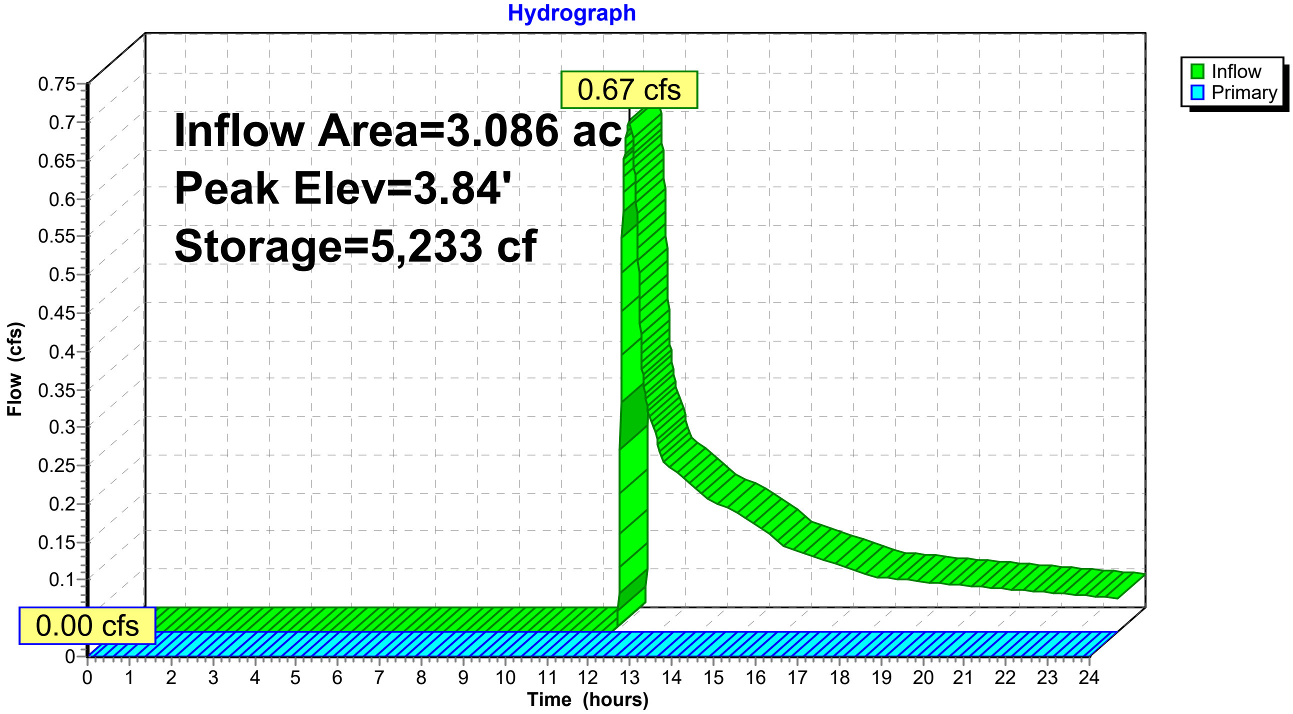
Volume	Invert	Avail.Storage	Storage Description
#1	3.60'	35,172 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.60	20,812	0	0
4.00	23,497	8,862	8,862
5.00	29,124	26,311	35,172

Device	Routing	Invert	Outlet Devices
#1	Primary	4.29'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=3.60' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-C: POND C



Summary for Pond P-D: POND D

Inflow Area = 2.447 ac, 8.42% Impervious, Inflow Depth > 0.38" for 10 YR event
Inflow = 0.34 cfs @ 12.48 hrs, Volume= 0.077 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 8.42' @ 24.00 hrs Surf.Area= 8,175 sf Storage= 3,342 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

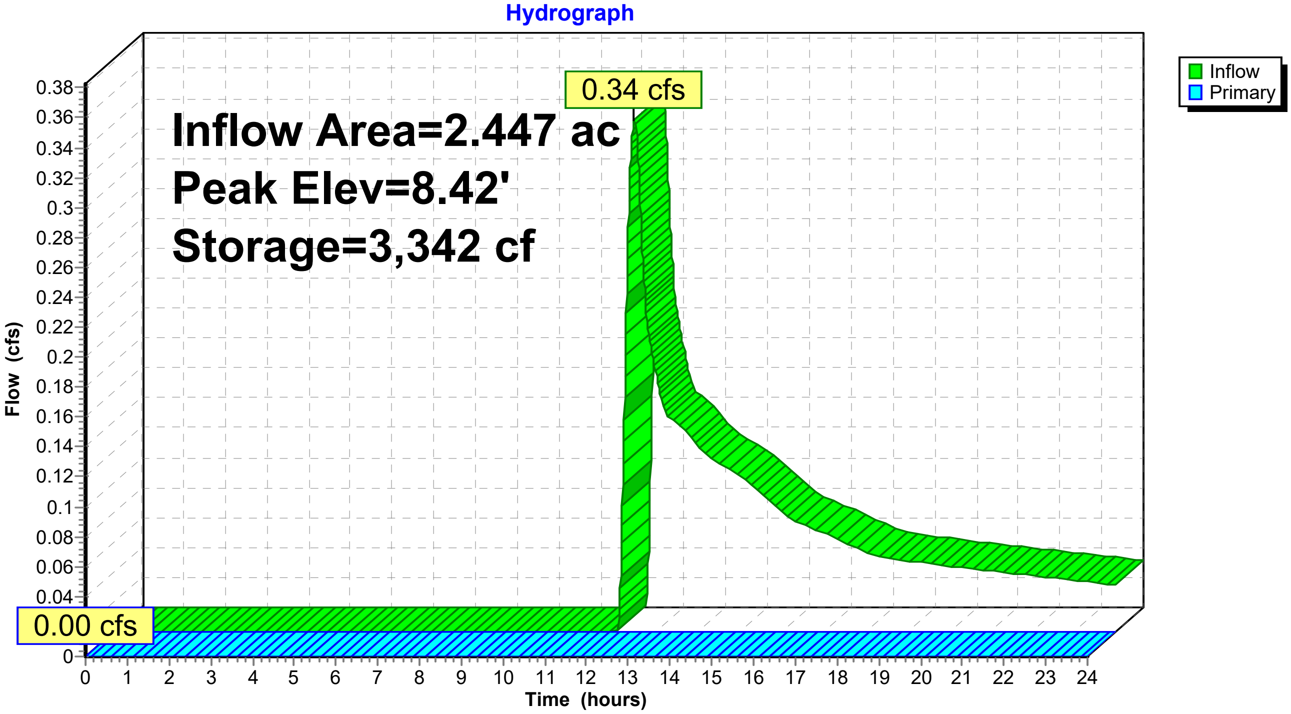
Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	18,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	7,585	0	0
9.00	8,975	8,280	8,280
10.00	12,170	10,573	18,853

Device	Routing	Invert	Outlet Devices
#1	Primary	9.80'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#2	Primary	9.08'	**12.0" Round Culvert** L= 18.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.08' / 8.16' S= 0.0497 '/' Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=8.00' (Free Discharge)
├─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
└─**2=Culvert** (Controls 0.00 cfs)

Pond P-D: POND D



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

Subcatchment E1: EX DA-1	Runoff Area=155,629 sf 50.78% Impervious Runoff Depth>2.64" Flow Length=435' Tc=9.6 min CN=69 Runoff=9.69 cfs 0.785 af
Subcatchment E10: EX DA-10	Runoff Area=248,320 sf 0.00% Impervious Runoff Depth>0.27" Flow Length=490' Tc=16.5 min CN=36 Runoff=0.32 cfs 0.129 af
Subcatchment E2: EX-DA-2	Runoff Area=351,546 sf 0.00% Impervious Runoff Depth>0.23" Flow Length=682' Tc=14.4 min CN=35 Runoff=0.29 cfs 0.155 af
Subcatchment E3: EX DA-3	Runoff Area=77,711 sf 13.22% Impervious Runoff Depth>0.83" Flow Length=400' Tc=7.0 min CN=46 Runoff=1.05 cfs 0.123 af
Subcatchment E4: EX DA-4	Runoff Area=134,422 sf 15.48% Impervious Runoff Depth>0.83" Flow Length=341' Tc=7.8 min CN=46 Runoff=1.76 cfs 0.213 af
Subcatchment E5: EX DA-5	Runoff Area=171,335 sf 0.00% Impervious Runoff Depth>0.27" Flow Length=433' Tc=11.9 min CN=36 Runoff=0.24 cfs 0.090 af
Subcatchment E6: EX DA-6	Runoff Area=104,016 sf 24.53% Impervious Runoff Depth>1.30" Flow Length=283' Tc=25.5 min CN=53 Runoff=1.90 cfs 0.260 af
Subcatchment E7: EX-DA 7	Runoff Area=61,684 sf 1.97% Impervious Runoff Depth>0.37" Flow Length=300' Tc=5.9 min CN=38 Runoff=0.18 cfs 0.043 af
Subcatchment E8: EX-DA 8	Runoff Area=29,230 sf 15.19% Impervious Runoff Depth>0.89" Flow Length=200' Tc=8.5 min CN=47 Runoff=0.43 cfs 0.050 af
Subcatchment E9: EX DA-9	Runoff Area=106,591 sf 8.42% Impervious Runoff Depth>0.70" Flow Length=675' Tc=15.0 min CN=44 Runoff=0.86 cfs 0.143 af
Reach DP-1: DP-1	Inflow=9.69 cfs 0.785 af Outflow=9.69 cfs 0.785 af
Reach DP-2: DP-2 (JOSHUA'S BROOK)	Inflow=0.29 cfs 0.155 af Outflow=0.29 cfs 0.155 af
Reach DP-3: DP-3 (STEWART'S CREEK)	Inflow=0.32 cfs 0.129 af Outflow=0.32 cfs 0.129 af
Pond P-A: POND A	Peak Elev=24.98' Storage=11,310 cf Inflow=1.90 cfs 0.260 af Outflow=0.00 cfs 0.000 af
Pond P-B: POND B	Peak Elev=3.19' Storage=5,356 cf Inflow=1.05 cfs 0.123 af Outflow=0.00 cfs 0.000 af
Pond P-C: POND C	Peak Elev=4.02' Storage=9,261 cf Inflow=1.76 cfs 0.213 af Outflow=0.00 cfs 0.000 af

Pond P-D: POND D Peak Elev=8.76' Storage=6,209 cf Inflow=0.86 cfs 0.143 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 33.069 ac Runoff Volume = 1.990 af Average Runoff Depth = 0.72"
89.57% Pervious = 29.619 ac 10.43% Impervious = 3.450 ac

Summary for Subcatchment E1: EX DA-1

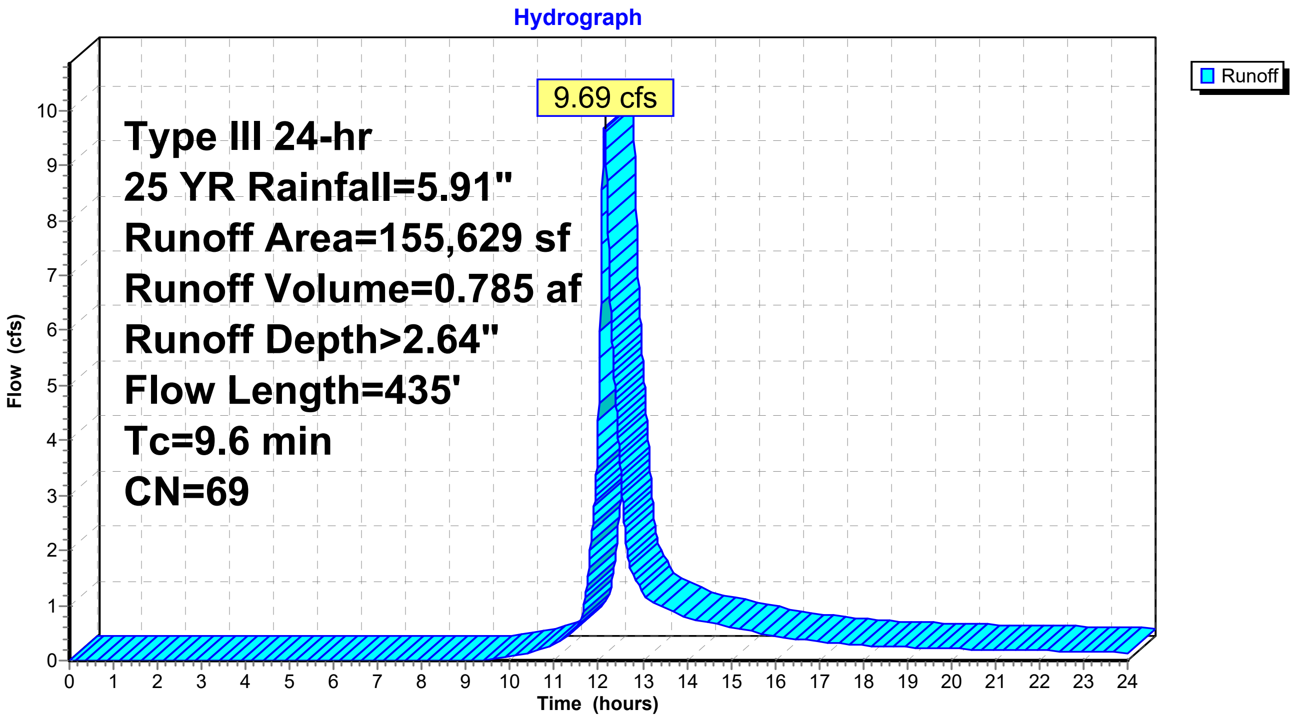
Runoff = 9.69 cfs @ 12.14 hrs, Volume= 0.785 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	70,869	39	>75% Grass cover, Good, HSG A
	5,725	30	Woods, Good, HSG A
*	7,041	98	Wetland; Water Surface
	71,994	98	Paved parking, HSG A
	155,629	69	Weighted Average
	76,594		49.22% Pervious Area
	79,035		50.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0270	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
2.4	90	0.0077	0.61		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.9	192	0.0550	1.64		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.4	83	0.0260	3.27		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
0.1	20	0.2000	3.13		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
9.6	435	Total			

Subcatchment E1: EX DA-1



Summary for Subcatchment E10: EX DA-10

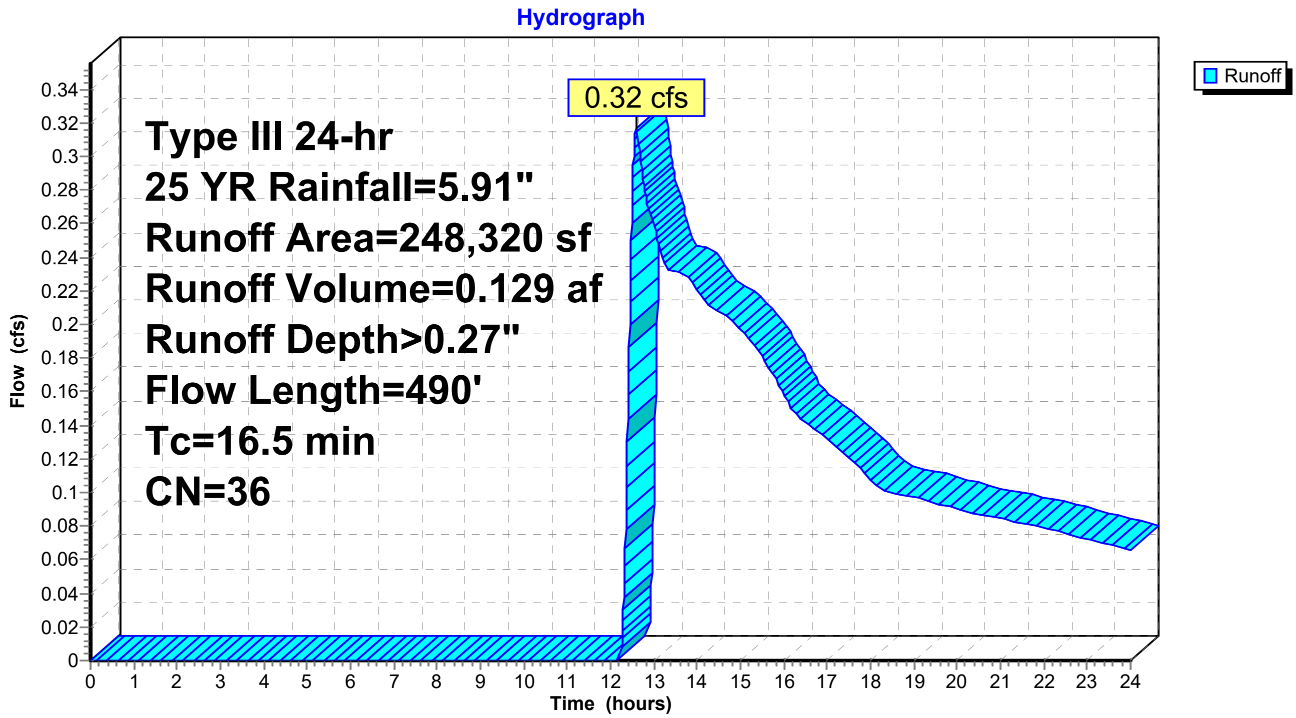
Runoff = 0.32 cfs @ 12.60 hrs, Volume= 0.129 af, Depth> 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	166,992	39	>75% Grass cover, Good, HSG A
	81,328	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	248,320	36	Weighted Average
	248,320		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.40"
3.1	70	0.0057	0.38		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.5	150	0.0580	1.69		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
1.6	70	0.0110	0.73		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
1.1	125	0.0680	1.83		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
0.1	25	0.3000	3.83		**Shallow Concentrated Flow, F-G** Short Grass Pasture Kv= 7.0 fps
16.5	490	Total			

Subcatchment E10: EX DA-10



Summary for Subcatchment E2: EX-DA-2

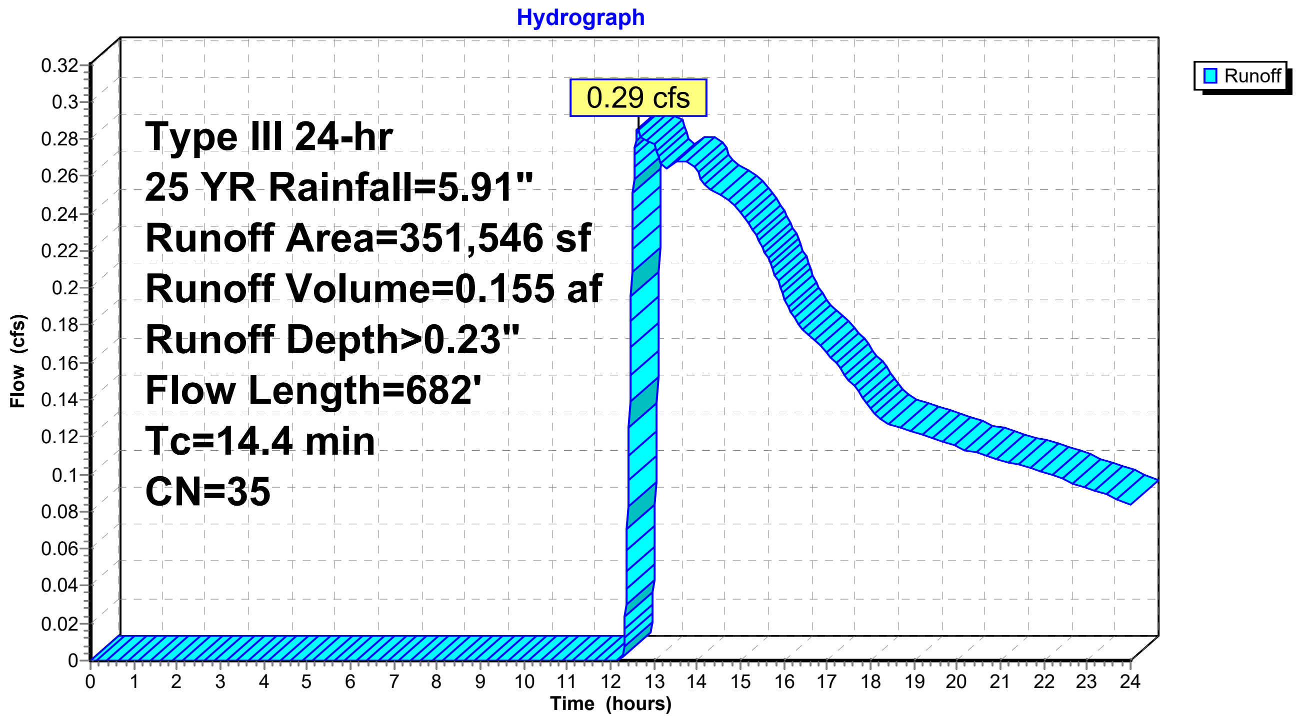
Runoff = 0.29 cfs @ 12.62 hrs, Volume= 0.155 af, Depth> 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	195,277	39	>75% Grass cover, Good, HSG A
	156,269	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	351,546	35	Weighted Average
	351,546		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0800	0.27		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
10.1	520	0.0150	0.86		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	40	0.0825	1.44		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.5	40	0.0425	1.44		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.2	32	0.3900	3.12		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
14.4	682	Total			

Subcatchment E2: EX-DA-2



Summary for Subcatchment E3: EX DA-3

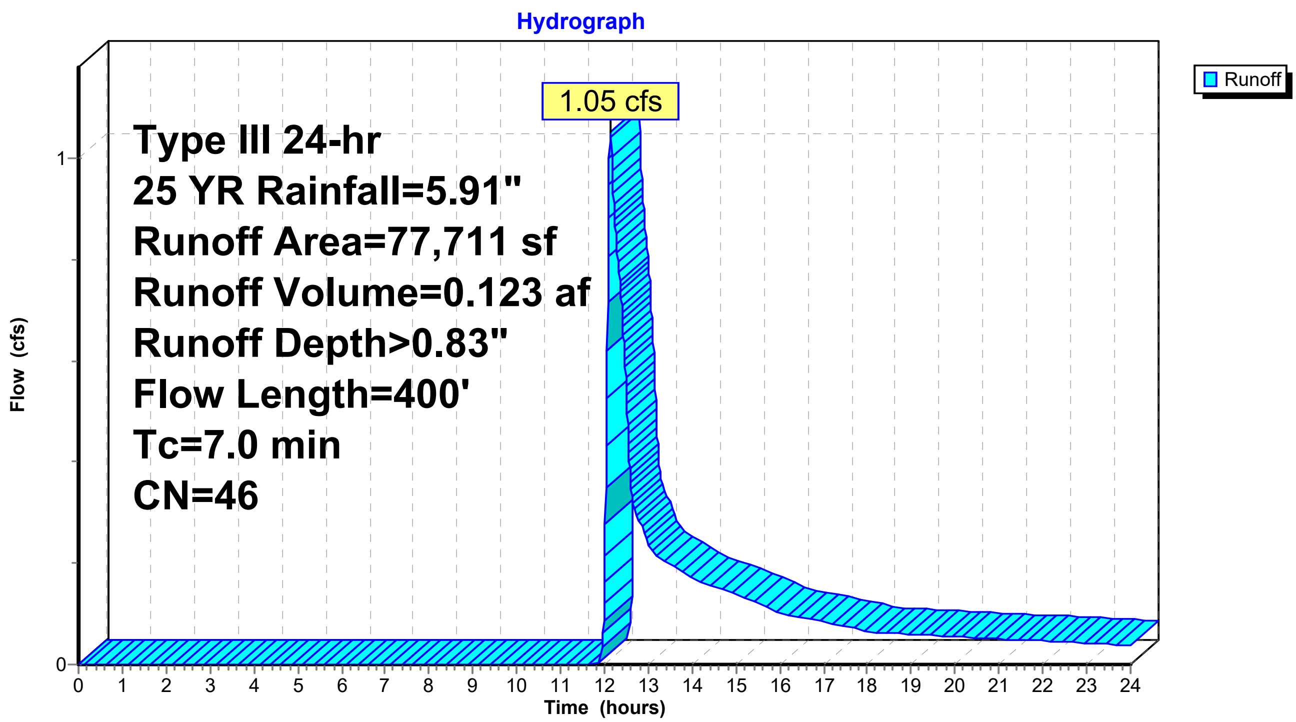
Runoff = 1.05 cfs @ 12.14 hrs, Volume= 0.123 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	60,103	39	>75% Grass cover, Good, HSG A
	7,335	30	Woods, Good, HSG A
*	10,273	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	77,711	46	Weighted Average
	67,438		86.78% Pervious Area
	10,273		13.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0800	0.27		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
3.7	320	0.0430	1.45		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	30	0.1000	2.21		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
7.0	400	Total			

Subcatchment E3: EX DA-3



Summary for Subcatchment E4: EX DA-4

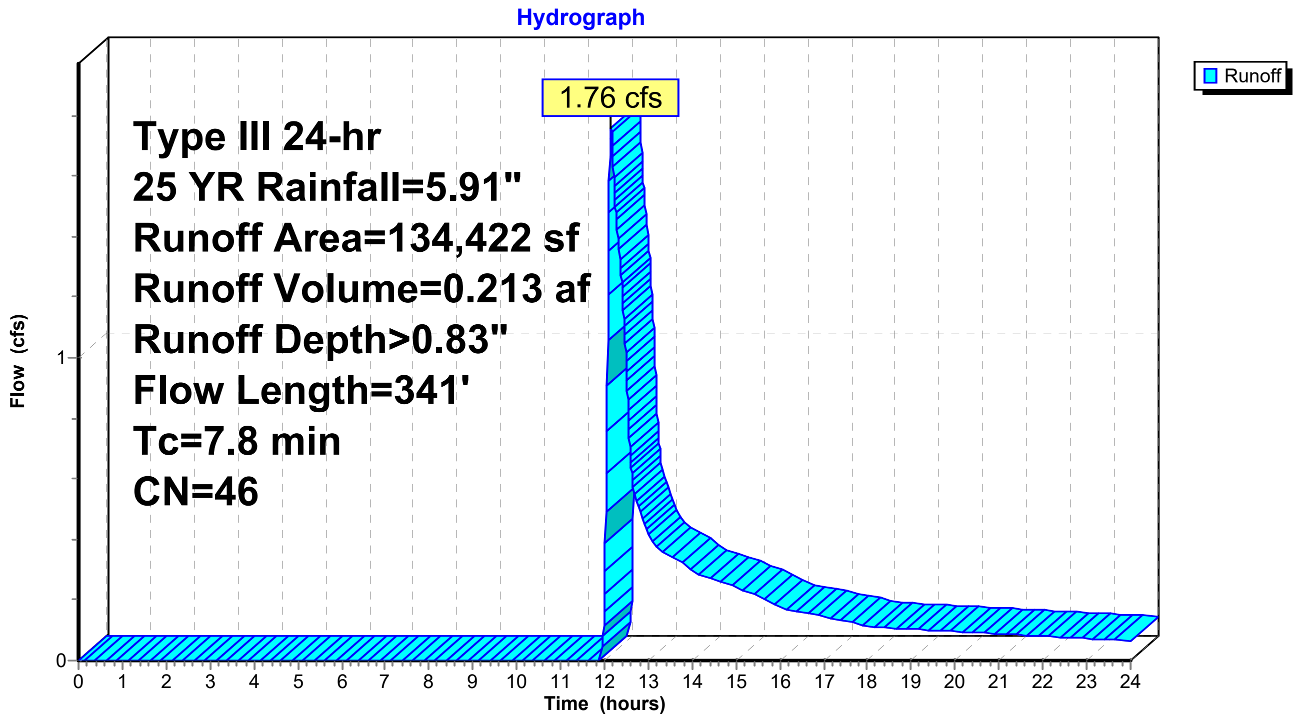
Runoff = 1.76 cfs @ 12.15 hrs, Volume= 0.213 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	77,263	39	>75% Grass cover, Good, HSG A
	36,347	30	Woods, Good, HSG A
*	20,812	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	134,422	46	Weighted Average
	113,610		84.52% Pervious Area
	20,812		15.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	35	0.1300	0.30		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
5.2	200	0.0165	0.64		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.4	63	0.1550	2.76		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.3	43	0.1160	2.38		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
7.8	341	Total			

Subcatchment E4: EX DA-4



Summary for Subcatchment E5: EX DA-5

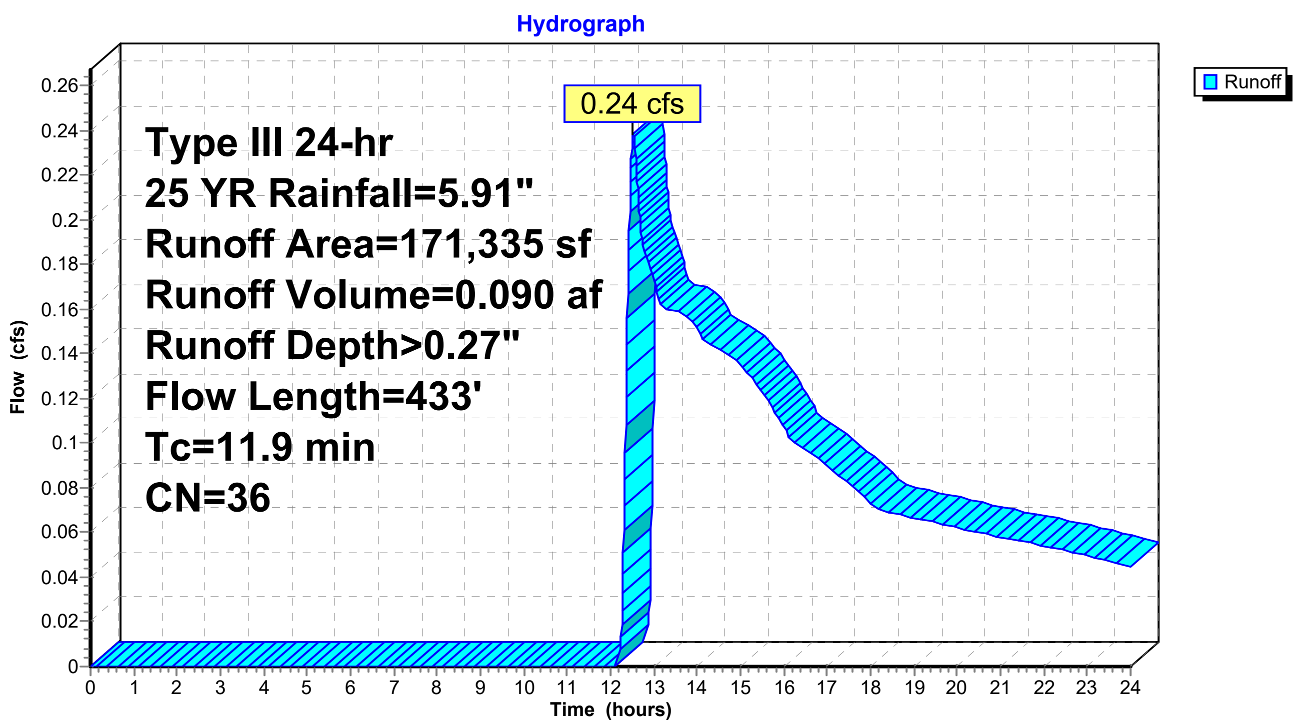
Runoff = 0.24 cfs @ 12.53 hrs, Volume= 0.090 af, Depth> 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	109,518	39	>75% Grass cover, Good, HSG A
	61,817	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	171,335	36	Weighted Average
	171,335		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	50	0.1000	0.29		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
1.0	105	0.0620	1.74		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.2	75	0.0460	1.07		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
6.8	203	0.0050	0.49		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
11.9	433	Total			

Subcatchment E5: EX DA-5



Summary for Subcatchment E6: EX DA-6

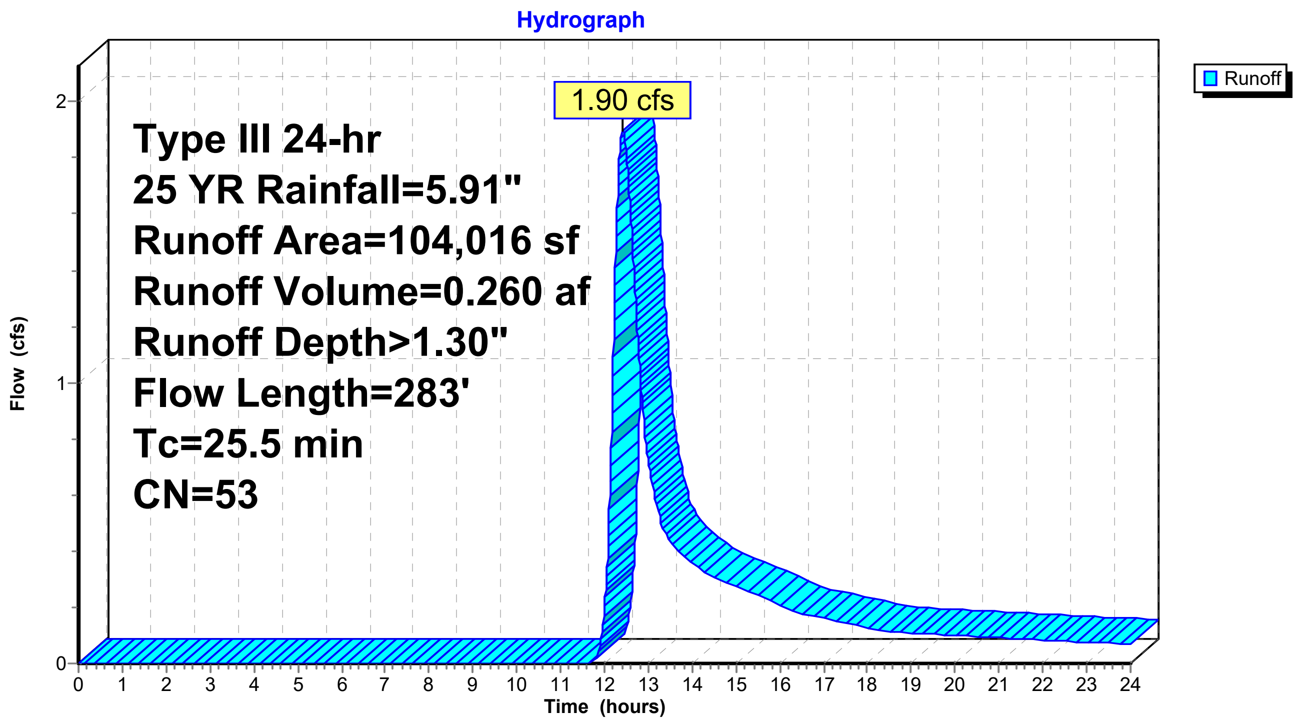
Runoff = 1.90 cfs @ 12.42 hrs, Volume= 0.260 af, Depth> 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	71,752	39	>75% Grass cover, Good, HSG A
	6,746	30	Woods, Good, HSG A
*	25,518	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	104,016	53	Weighted Average
	78,498		75.47% Pervious Area
	25,518		24.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	50	0.1000	0.29		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
22.6	233	0.0006	0.17		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
25.5	283	Total			

Subcatchment E6: EX DA-6



Summary for Subcatchment E7: EX-DA 7

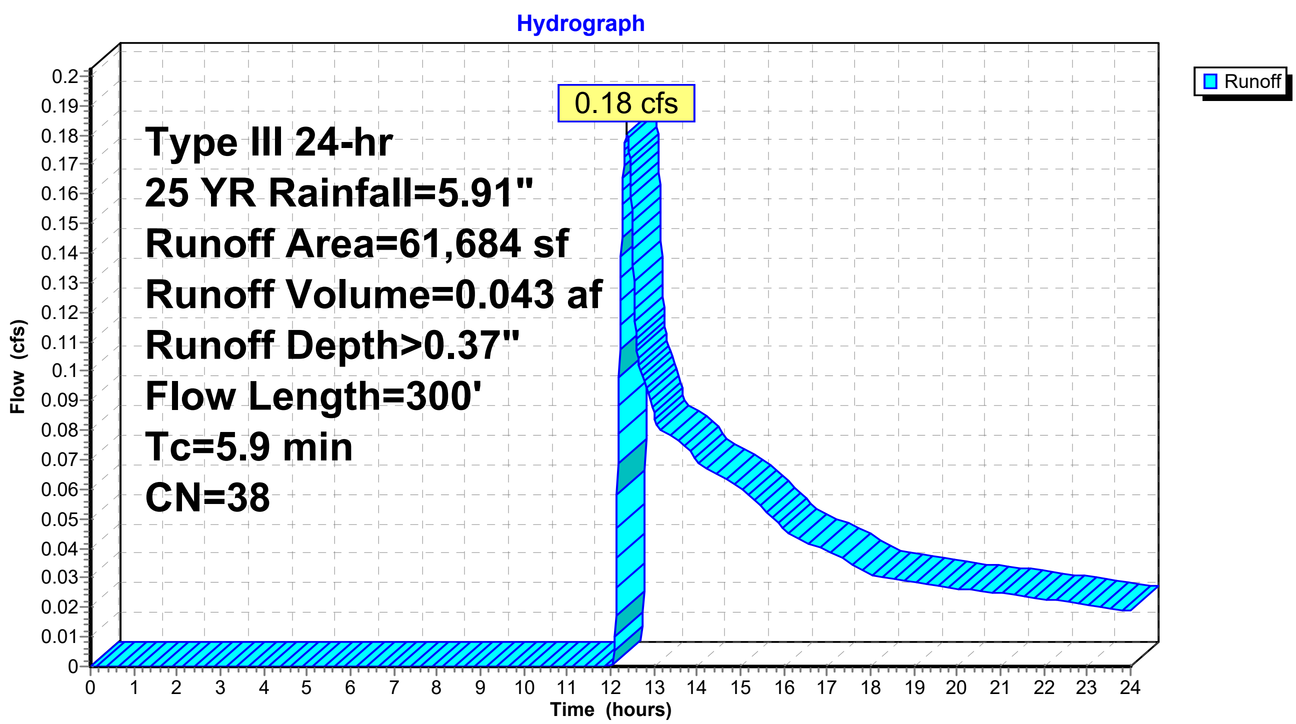
Runoff = 0.18 cfs @ 12.38 hrs, Volume= 0.043 af, Depth> 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	47,876	39	>75% Grass cover, Good, HSG A
*	12,590	30	Woods, Good, HSG A & Sand Area
	1,218	98	Water Surface, HSG A
	61,684	38	Weighted Average
	60,466		98.03% Pervious Area
	1,218		1.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0280	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
0.5	100	0.0460	3.45		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.6	150	0.0750	4.41		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
5.9	300	Total			

Subcatchment E7: EX-DA 7



Summary for Subcatchment E8: EX-DA 8

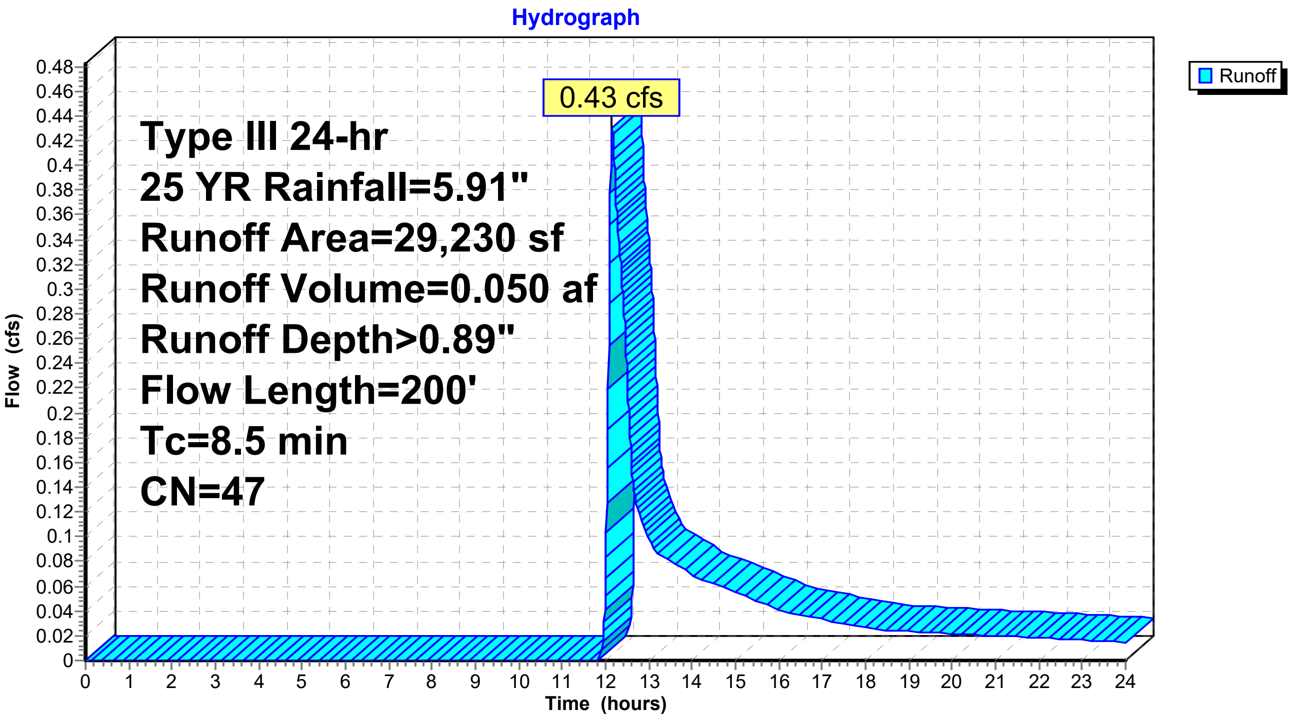
Runoff = 0.43 cfs @ 12.16 hrs, Volume= 0.050 af, Depth> 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	21,837	39	>75% Grass cover, Good, HSG A
*	2,953	30	Woods, Good, HSG A & Sand Area
	4,440	98	Water Surface, HSG A
	29,230	47	Weighted Average
	24,790		84.81% Pervious Area
	4,440		15.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.40"
1.6	150	0.0530	1.61		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
8.5	200	Total			

Subcatchment E8: EX-DA 8



Summary for Subcatchment E9: EX DA-9

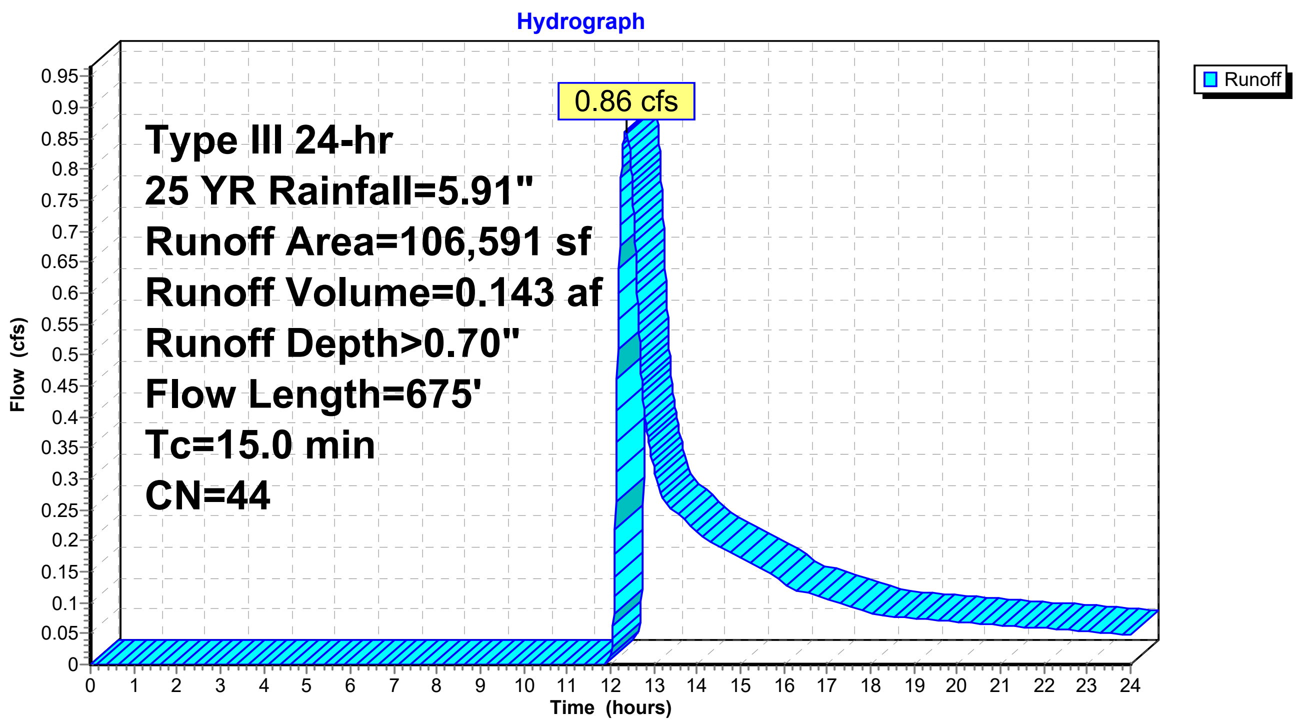
Runoff = 0.86 cfs @ 12.35 hrs, Volume= 0.143 af, Depth> 0.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	94,116	39	>75% Grass cover, Good, HSG A
	3,500	30	Woods, Good, HSG A
*	8,975	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	106,591	44	Weighted Average
	97,616		91.58% Pervious Area
	8,975		8.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0260	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
8.8	495	0.0180	0.94		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.3	130	0.0540	1.63		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
15.0	675	Total			

Subcatchment E9: EX DA-9

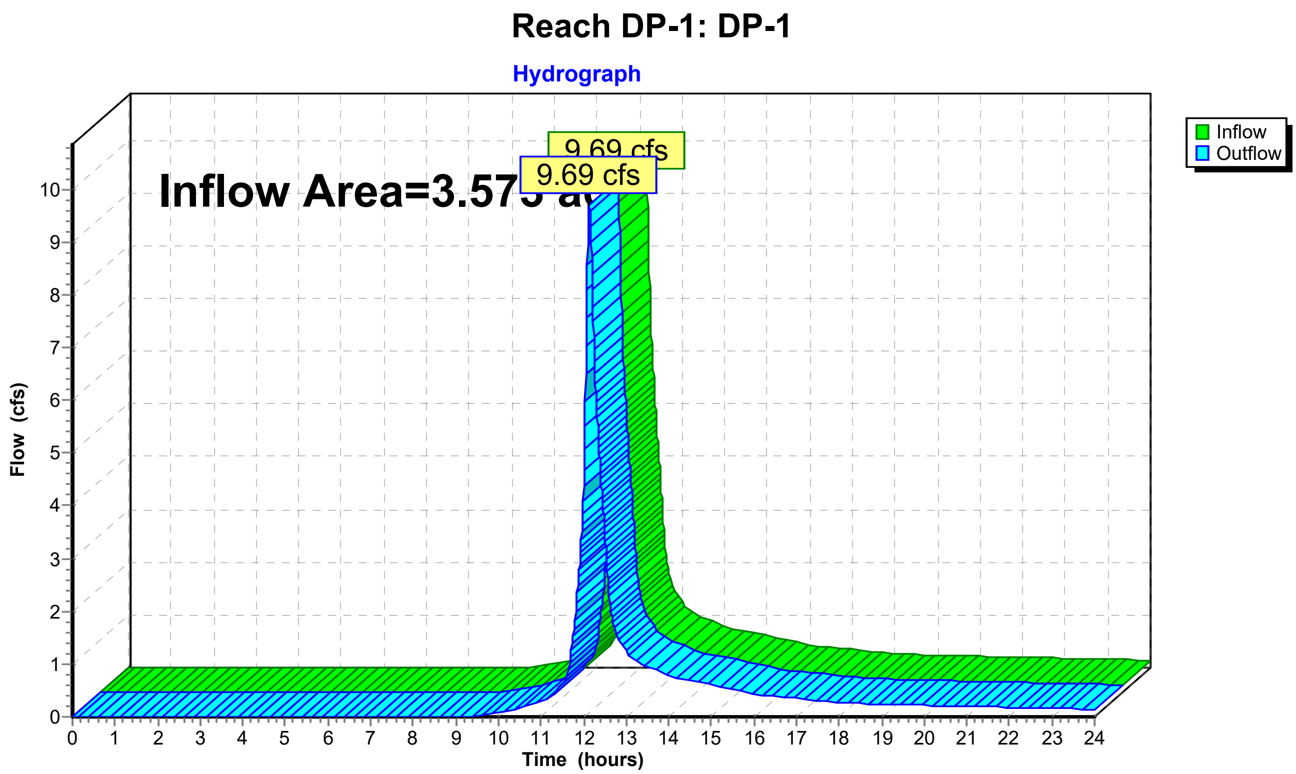


Summary for Reach DP-1: DP-1

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

Inflow Area = 3.573 ac, 50.78% Impervious, Inflow Depth > 2.64" for 25 YR event
Inflow = 9.69 cfs @ 12.14 hrs, Volume= 0.785 af
Outflow = 9.69 cfs @ 12.14 hrs, Volume= 0.785 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

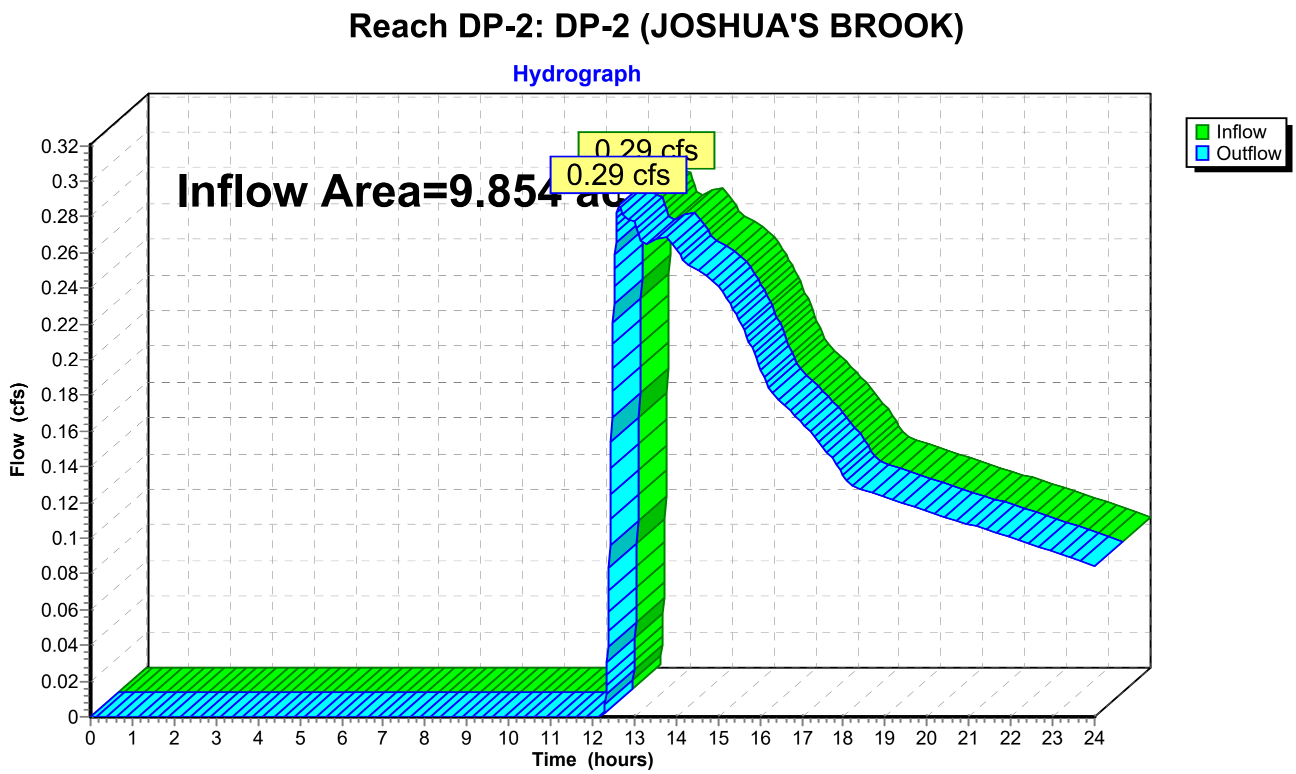


Summary for Reach DP-2: DP-2 (JOSHUA'S BROOK)

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

Inflow Area = 9.854 ac, 2.39% Impervious, Inflow Depth > 0.19" for 25 YR event
Inflow = 0.29 cfs @ 12.62 hrs, Volume= 0.155 af
Outflow = 0.29 cfs @ 12.62 hrs, Volume= 0.155 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



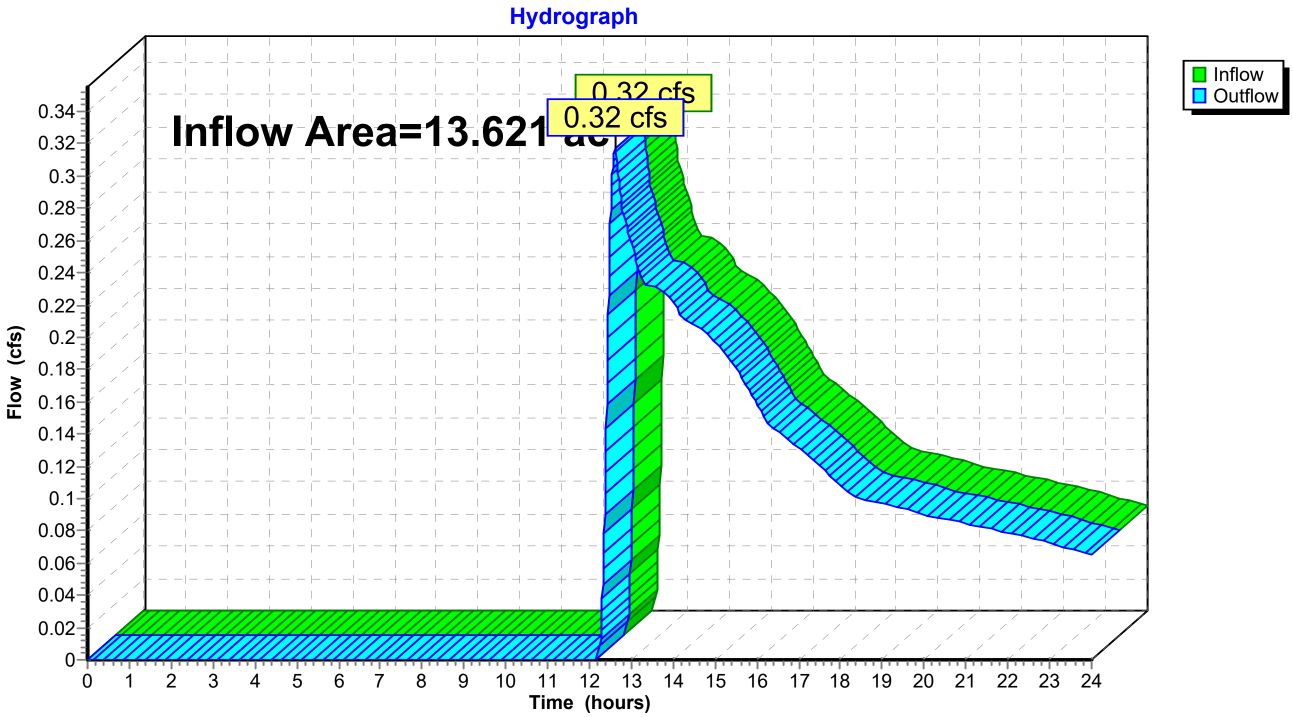
Summary for Reach DP-3: DP-3 (STEWART'S CREEK)

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

Inflow Area =	13.621 ac,	9.32% Impervious, Inflow Depth > 0.11"	for 25 YR event
Inflow =	0.32 cfs @	12.60 hrs, Volume=	0.129 af
Outflow =	0.32 cfs @	12.60 hrs, Volume=	0.129 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-3: DP-3 (STEWART'S CREEK)



Summary for Pond P-A: POND A

Inflow Area = 2.388 ac, 24.53% Impervious, Inflow Depth > 1.30" for 25 YR event
Inflow = 1.90 cfs @ 12.42 hrs, Volume= 0.260 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 24.98' @ 24.00 hrs Surf.Area= 22,559 sf Storage= 11,310 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

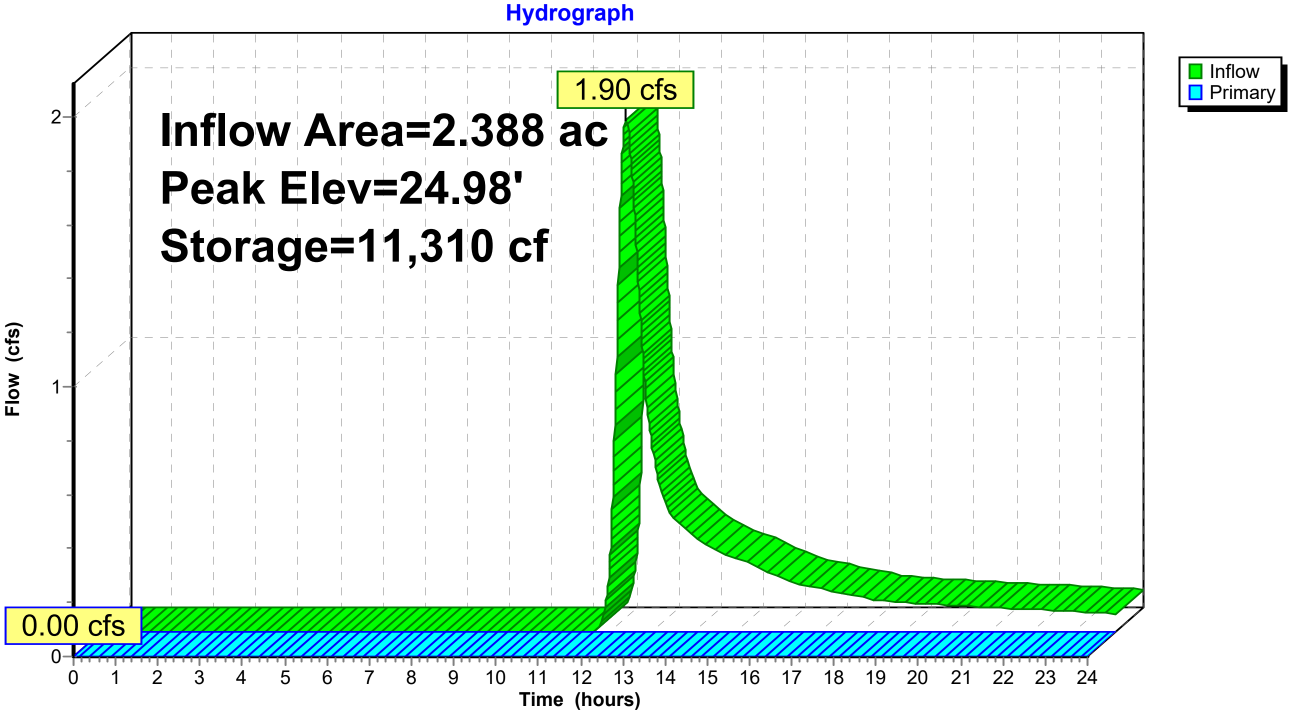
Volume	Invert	Avail.Storage	Storage Description
#1	24.45'	37,030 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.45	20,405	0	0
25.70	25,518	28,702	28,702
26.00	30,000	8,328	37,030

Device	Routing	Invert	Outlet Devices
#1	Primary	25.10'	**45.0 deg x 30.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=24.45' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-A: POND A



Summary for Pond P-B: POND B

Inflow Area = 1.784 ac, 13.22% Impervious, Inflow Depth > 0.83" for 25 YR event
Inflow = 1.05 cfs @ 12.14 hrs, Volume= 0.123 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 3.19' @ 24.00 hrs Surf.Area= 11,220 sf Storage= 5,356 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

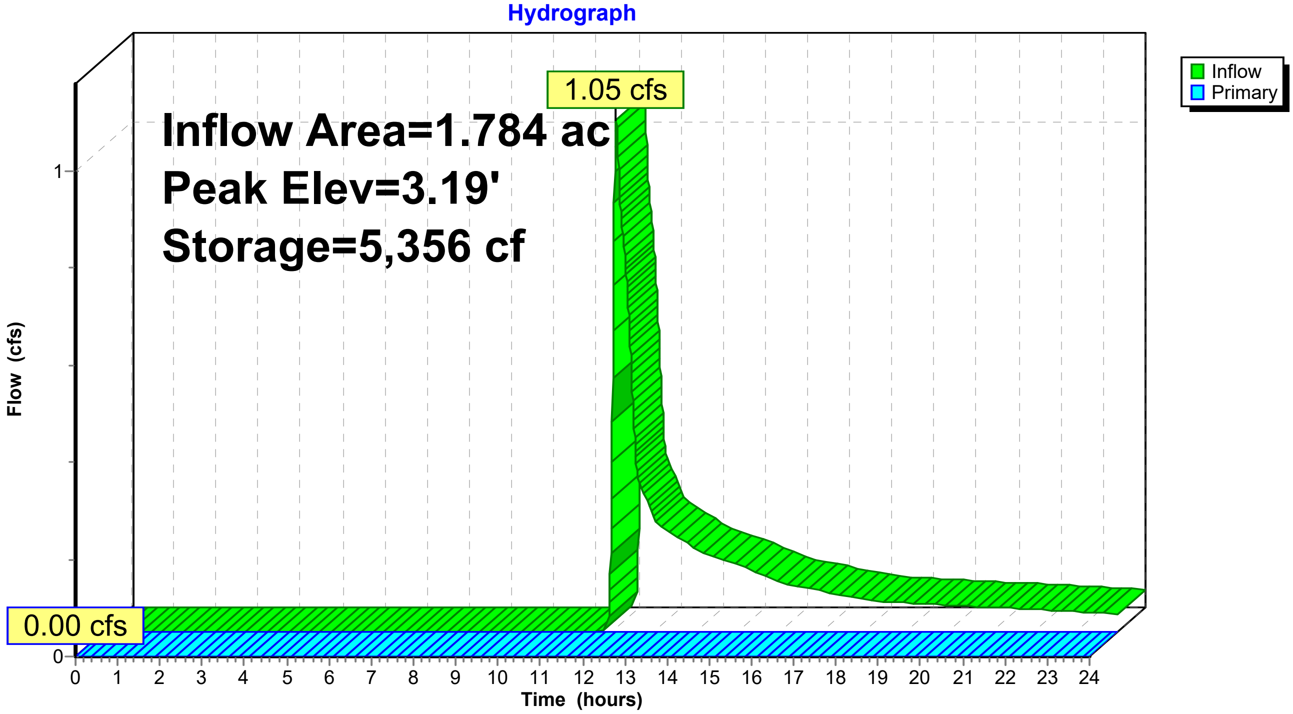
Volume	Invert	Avail.Storage	Storage Description
#1	2.70'	15,021 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2.70	10,273	0	0
3.00	11,080	3,203	3,203
3.40	11,370	4,490	7,693
4.00	13,058	7,328	15,021

Device	Routing	Invert	Outlet Devices
#1	Primary	3.44'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2.70' (Free Discharge)
↑**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-B: POND B



Summary for Pond P-C: POND C

Inflow Area = 3.086 ac, 15.48% Impervious, Inflow Depth > 0.83" for 25 YR event
Inflow = 1.76 cfs @ 12.15 hrs, Volume= 0.213 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 4.02' @ 24.00 hrs Surf.Area= 23,592 sf Storage= 9,261 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

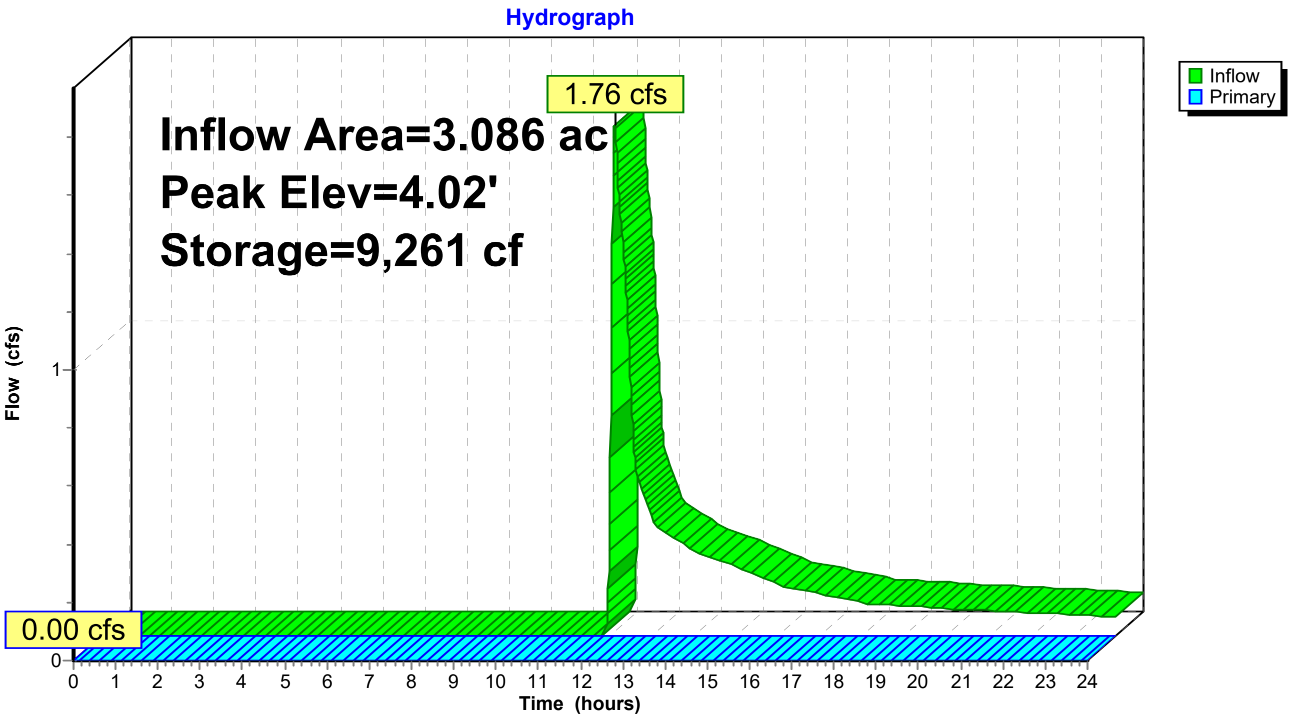
Volume	Invert	Avail.Storage	Storage Description
#1	3.60'	35,172 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.60	20,812	0	0
4.00	23,497	8,862	8,862
5.00	29,124	26,311	35,172

Device	Routing	Invert	Outlet Devices
#1	Primary	4.29'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=3.60' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-C: POND C



Summary for Pond P-D: POND D

Inflow Area = 2.447 ac, 8.42% Impervious, Inflow Depth > 0.70" for 25 YR event
Inflow = 0.86 cfs @ 12.35 hrs, Volume= 0.143 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 8.76' @ 24.00 hrs Surf.Area= 8,648 sf Storage= 6,209 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

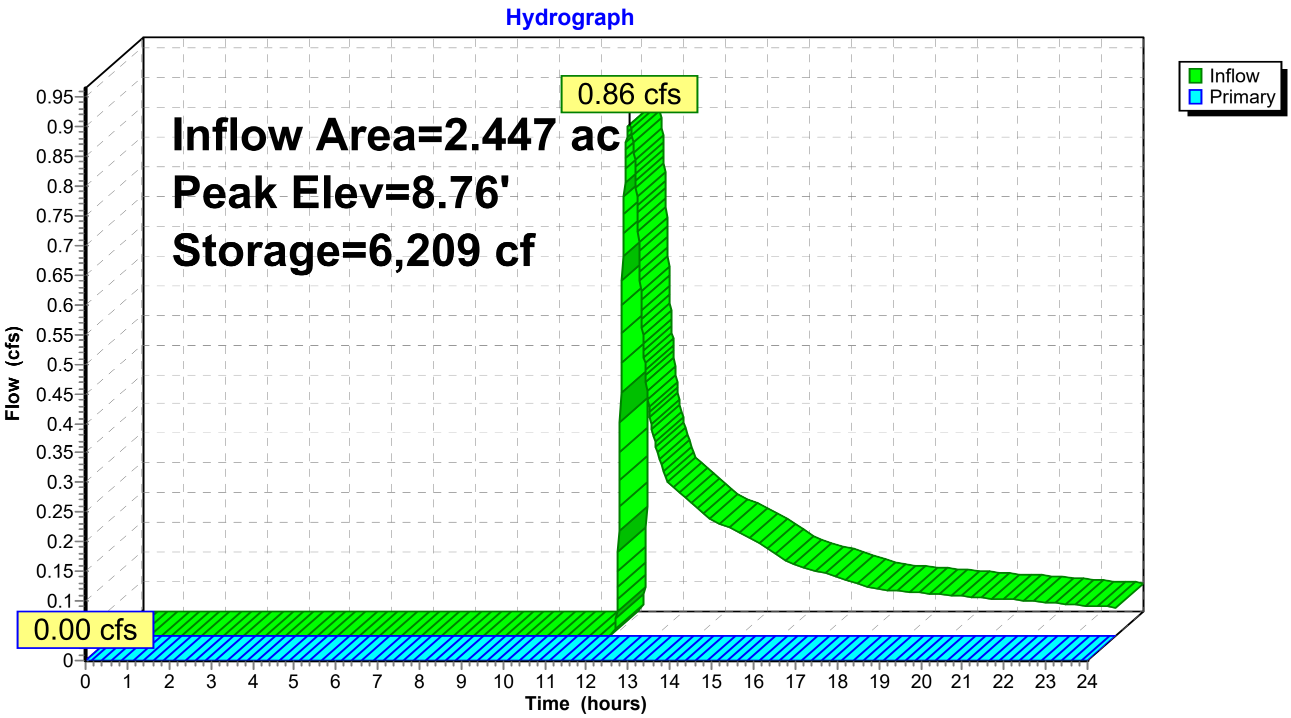
Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	18,853 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	7,585	0	0
9.00	8,975	8,280	8,280
10.00	12,170	10,573	18,853

Device	Routing	Invert	Outlet Devices
#1	Primary	9.80'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#2	Primary	9.08'	**12.0" Round Culvert** L= 18.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.08' / 8.16' S= 0.0497 '/' Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=8.00' (Free Discharge)
1=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)
2=Culvert (Controls 0.00 cfs)

Pond P-D: POND D



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

Subcatchment E1: EX DA-1	Runoff Area=155,629 sf 50.78% Impervious Runoff Depth>3.85" Flow Length=435' Tc=9.6 min CN=69 Runoff=14.26 cfs 1.145 af
Subcatchment E10: EX DA-10	Runoff Area=248,320 sf 0.00% Impervious Runoff Depth>0.68" Flow Length=490' Tc=16.5 min CN=36 Runoff=1.63 cfs 0.324 af
Subcatchment E2: EX-DA-2	Runoff Area=351,546 sf 0.00% Impervious Runoff Depth>0.61" Flow Length=682' Tc=14.4 min CN=35 Runoff=1.95 cfs 0.410 af
Subcatchment E3: EX DA-3	Runoff Area=77,711 sf 13.22% Impervious Runoff Depth>1.52" Flow Length=400' Tc=7.0 min CN=46 Runoff=2.51 cfs 0.226 af
Subcatchment E4: EX DA-4	Runoff Area=134,422 sf 15.48% Impervious Runoff Depth>1.52" Flow Length=341' Tc=7.8 min CN=46 Runoff=4.22 cfs 0.391 af
Subcatchment E5: EX DA-5	Runoff Area=171,335 sf 0.00% Impervious Runoff Depth>0.68" Flow Length=433' Tc=11.9 min CN=36 Runoff=1.19 cfs 0.224 af
Subcatchment E6: EX DA-6	Runoff Area=104,016 sf 24.53% Impervious Runoff Depth>2.17" Flow Length=283' Tc=25.5 min CN=53 Runoff=3.45 cfs 0.433 af
Subcatchment E7: EX-DA 7	Runoff Area=61,684 sf 1.97% Impervious Runoff Depth>0.84" Flow Length=300' Tc=5.9 min CN=38 Runoff=0.70 cfs 0.099 af
Subcatchment E8: EX-DA 8	Runoff Area=29,230 sf 15.19% Impervious Runoff Depth>1.61" Flow Length=200' Tc=8.5 min CN=47 Runoff=0.97 cfs 0.090 af
Subcatchment E9: EX DA-9	Runoff Area=106,591 sf 8.42% Impervious Runoff Depth>1.34" Flow Length=675' Tc=15.0 min CN=44 Runoff=2.21 cfs 0.273 af
Reach DP-1: DP-1	Inflow=14.26 cfs 1.145 af Outflow=14.26 cfs 1.145 af
Reach DP-2: DP-2 (JOSHUA'S BROOK)	Inflow=1.95 cfs 0.446 af Outflow=1.95 cfs 0.446 af
Reach DP-3: DP-3 (STEWART'S CREEK)	Inflow=1.63 cfs 0.476 af Outflow=1.63 cfs 0.476 af
Pond P-A: POND A	Peak Elev=25.12' Storage=14,540 cf Inflow=3.45 cfs 0.433 af Outflow=0.23 cfs 0.104 af
Pond P-B: POND B	Peak Elev=3.46' Storage=8,323 cf Inflow=2.51 cfs 0.226 af Outflow=0.09 cfs 0.036 af
Pond P-C: POND C	Peak Elev=4.31' Storage=16,319 cf Inflow=4.22 cfs 0.391 af Outflow=0.11 cfs 0.017 af

Pond P-D: POND D Peak Elev=9.24' Storage=10,487 cf Inflow=2.21 cfs 0.273 af
Outflow=0.08 cfs 0.032 af

Total Runoff Area = 33.069 ac Runoff Volume = 3.614 af Average Runoff Depth = 1.31"
89.57% Pervious = 29.619 ac 10.43% Impervious = 3.450 ac

Summary for Subcatchment E1: EX DA-1

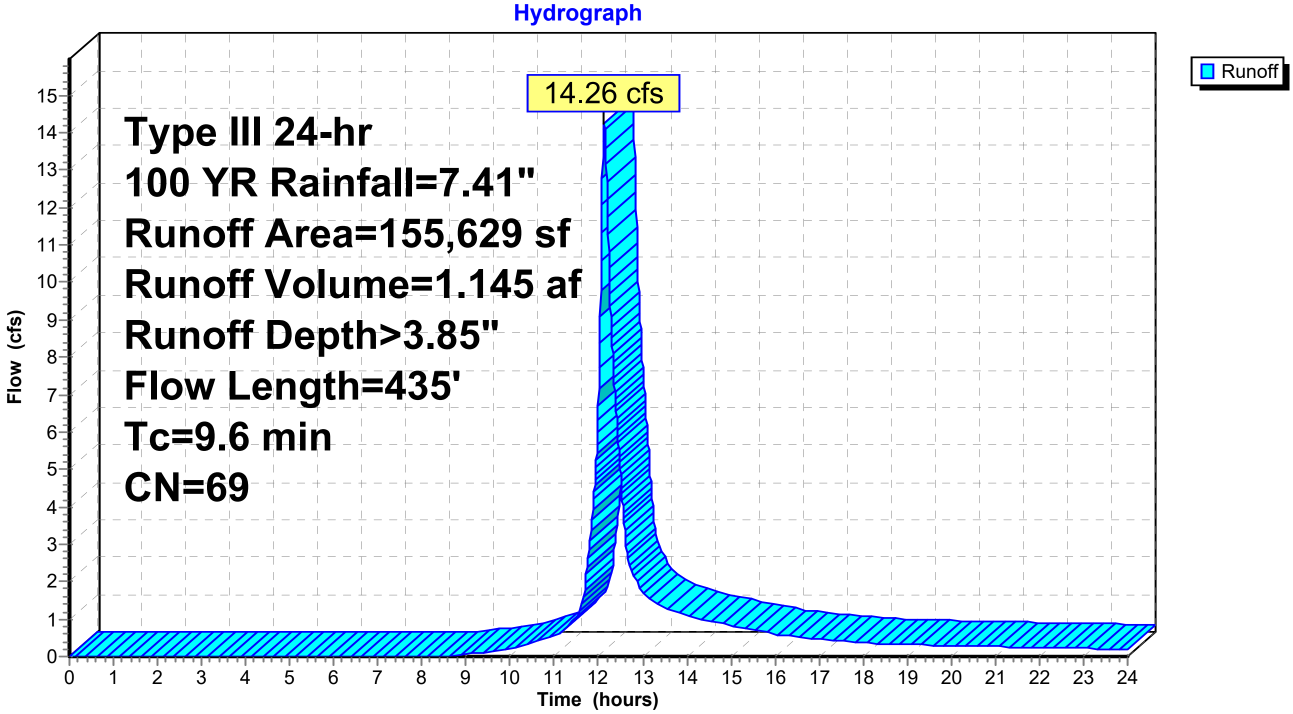
Runoff = 14.26 cfs @ 12.14 hrs, Volume= 1.145 af, Depth> 3.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	70,869	39	>75% Grass cover, Good, HSG A
	5,725	30	Woods, Good, HSG A
*	7,041	98	Wetland; Water Surface
	71,994	98	Paved parking, HSG A
	155,629	69	Weighted Average
	76,594		49.22% Pervious Area
	79,035		50.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0270	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
2.4	90	0.0077	0.61		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.9	192	0.0550	1.64		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.4	83	0.0260	3.27		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
0.1	20	0.2000	3.13		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
9.6	435	Total			

Subcatchment E1: EX DA-1



Summary for Subcatchment E10: EX DA-10

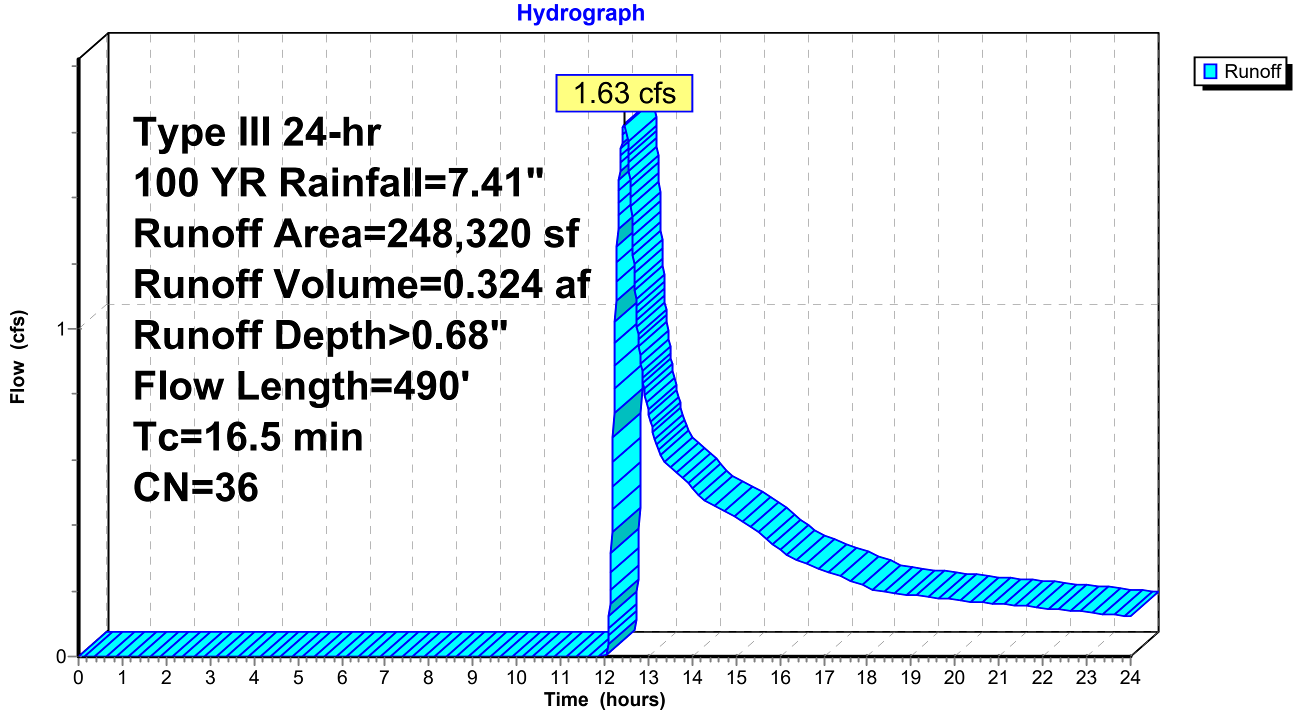
Runoff = 1.63 cfs @ 12.45 hrs, Volume= 0.324 af, Depth> 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	166,992	39	>75% Grass cover, Good, HSG A
	81,328	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	248,320	36	Weighted Average
	248,320		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.40"
3.1	70	0.0057	0.38		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.5	150	0.0580	1.69		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
1.6	70	0.0110	0.73		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
1.1	125	0.0680	1.83		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
0.1	25	0.3000	3.83		**Shallow Concentrated Flow, F-G** Short Grass Pasture Kv= 7.0 fps
16.5	490	Total			

Subcatchment E10: EX DA-10



Summary for Subcatchment E2: EX-DA-2

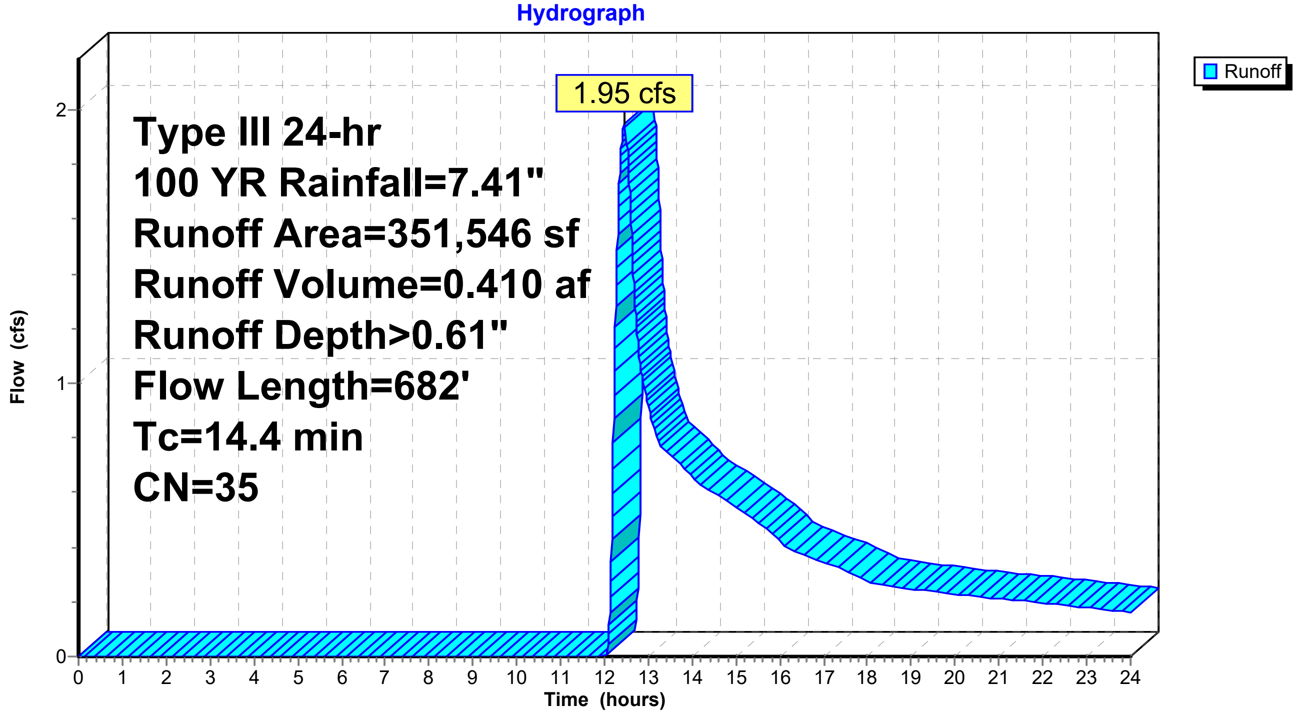
Runoff = 1.95 cfs @ 12.46 hrs, Volume= 0.410 af, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	195,277	39	>75% Grass cover, Good, HSG A
	156,269	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	351,546	35	Weighted Average
	351,546		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0800	0.27		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
10.1	520	0.0150	0.86		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	40	0.0825	1.44		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.5	40	0.0425	1.44		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.2	32	0.3900	3.12		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
14.4	682	Total			

Subcatchment E2: EX-DA-2



Summary for Subcatchment E3: EX DA-3

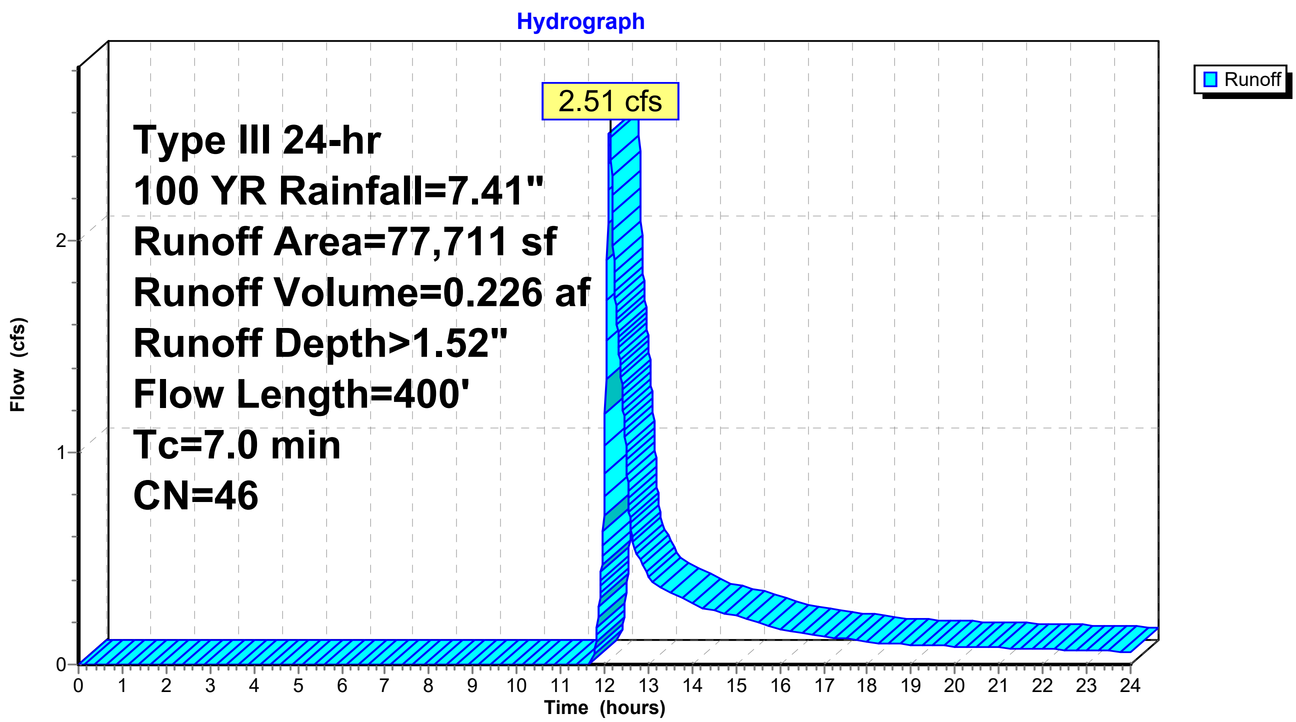
Runoff = 2.51 cfs @ 12.12 hrs, Volume= 0.226 af, Depth> 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	60,103	39	>75% Grass cover, Good, HSG A
	7,335	30	Woods, Good, HSG A
*	10,273	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	77,711	46	Weighted Average
	67,438		86.78% Pervious Area
	10,273		13.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	50	0.0800	0.27		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
3.7	320	0.0430	1.45		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	30	0.1000	2.21		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
7.0	400	Total			

Subcatchment E3: EX DA-3



Summary for Subcatchment E4: EX DA-4

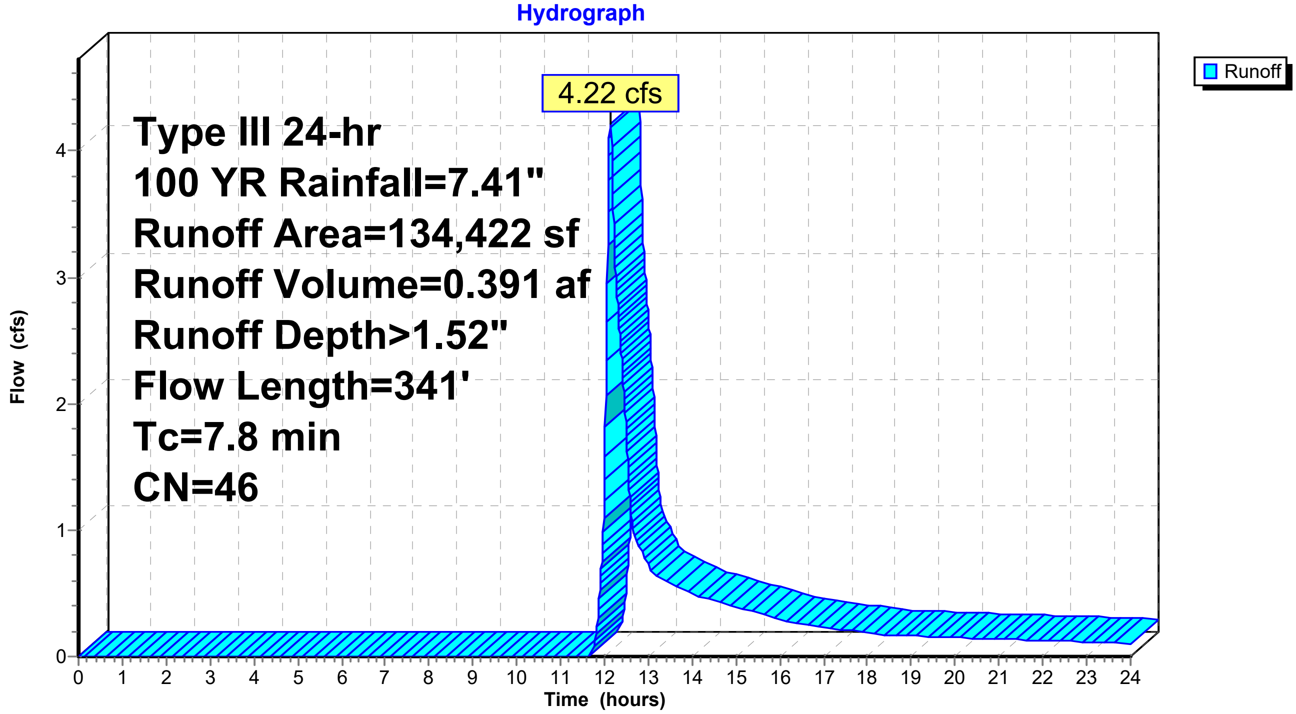
Runoff = 4.22 cfs @ 12.13 hrs, Volume= 0.391 af, Depth> 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	77,263	39	>75% Grass cover, Good, HSG A
	36,347	30	Woods, Good, HSG A
*	20,812	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	134,422	46	Weighted Average
	113,610		84.52% Pervious Area
	20,812		15.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	35	0.1300	0.30		**Sheet Flow, A-B**
					Grass: Short n= 0.150 P2= 3.40"
5.2	200	0.0165	0.64		**Shallow Concentrated Flow, B-C**
					Woodland Kv= 5.0 fps
0.4	63	0.1550	2.76		**Shallow Concentrated Flow, C-D**
					Short Grass Pasture Kv= 7.0 fps
0.3	43	0.1160	2.38		**Shallow Concentrated Flow, D-E**
					Short Grass Pasture Kv= 7.0 fps
7.8	341	Total			

Subcatchment E4: EX DA-4



Summary for Subcatchment E5: EX DA-5

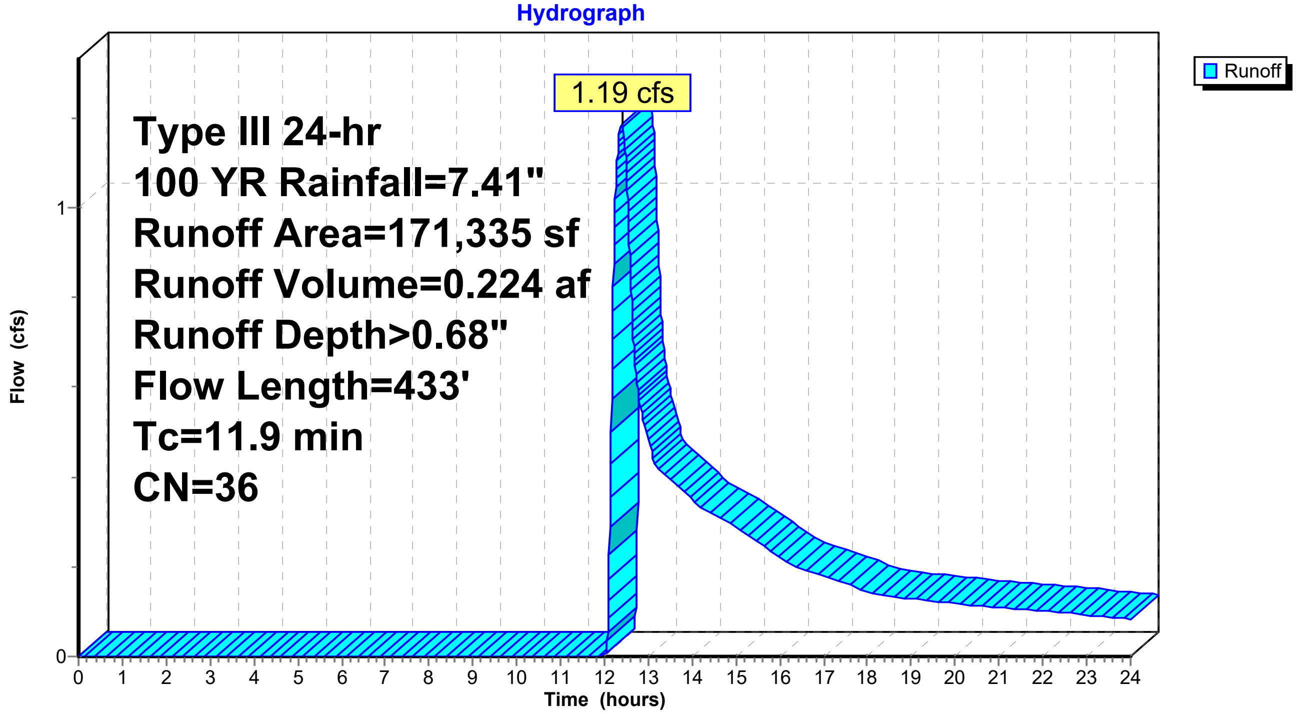
Runoff = 1.19 cfs @ 12.39 hrs, Volume= 0.224 af, Depth> 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	109,518	39	>75% Grass cover, Good, HSG A
	61,817	30	Woods, Good, HSG A
*	0	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	171,335	36	Weighted Average
	171,335		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	50	0.1000	0.29		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
1.0	105	0.0620	1.74		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.2	75	0.0460	1.07		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
6.8	203	0.0050	0.49		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
11.9	433	Total			

Subcatchment E5: EX DA-5



Summary for Subcatchment E6: EX DA-6

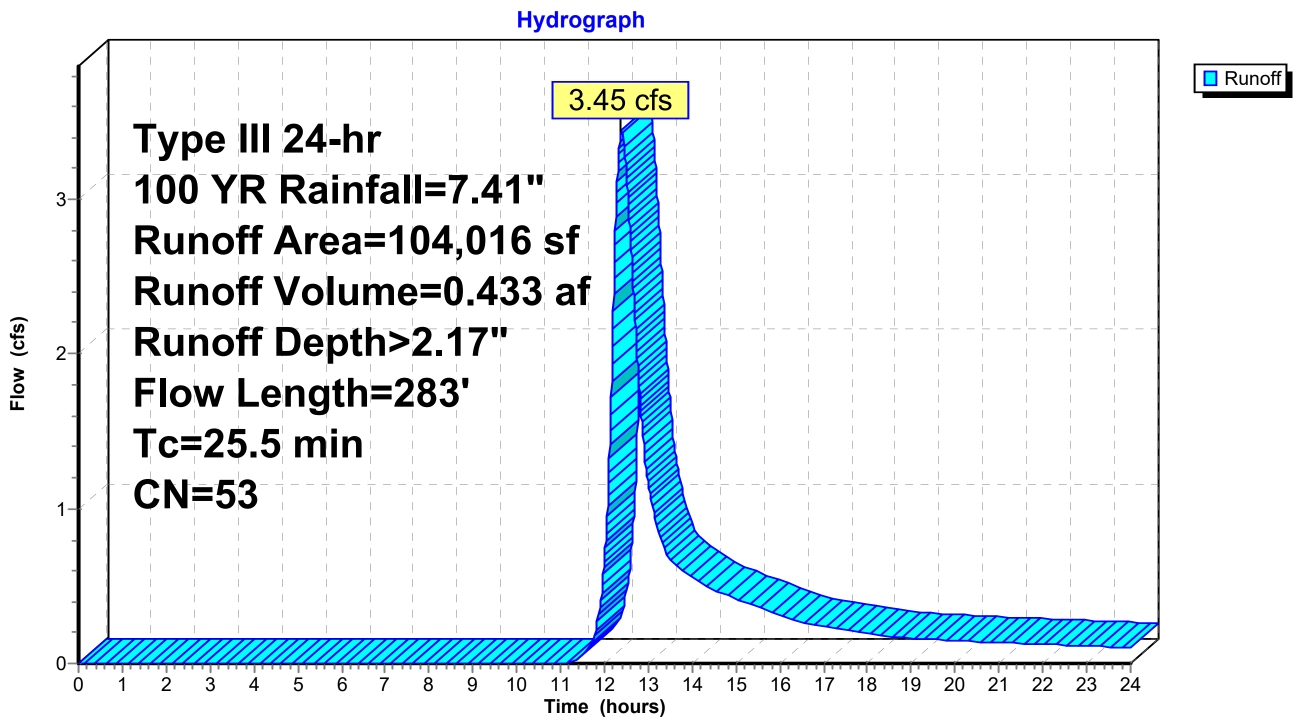
Runoff = 3.45 cfs @ 12.39 hrs, Volume= 0.433 af, Depth> 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	71,752	39	>75% Grass cover, Good, HSG A
	6,746	30	Woods, Good, HSG A
*	25,518	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	104,016	53	Weighted Average
	78,498		75.47% Pervious Area
	25,518		24.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	50	0.1000	0.29		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
22.6	233	0.0006	0.17		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
25.5	283	Total			

Subcatchment E6: EX DA-6



Summary for Subcatchment E7: EX-DA 7

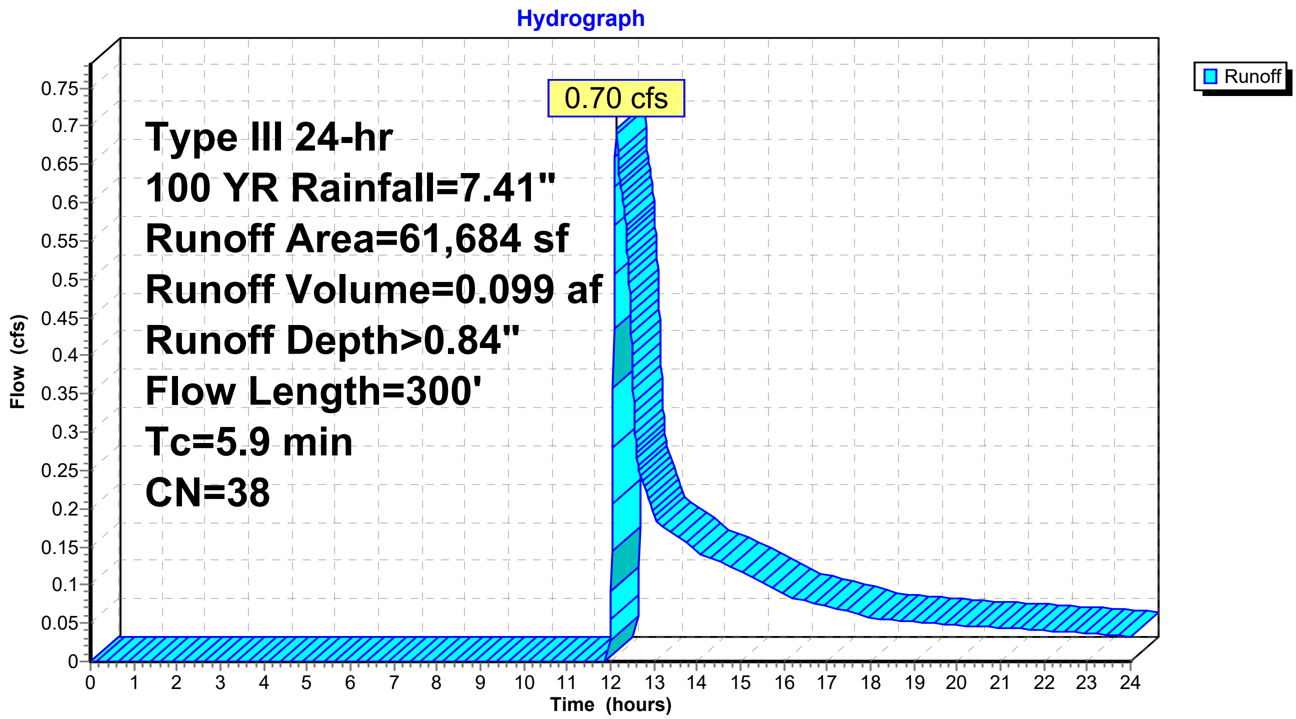
Runoff = 0.70 cfs @ 12.14 hrs, Volume= 0.099 af, Depth> 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	47,876	39	>75% Grass cover, Good, HSG A
*	12,590	30	Woods, Good, HSG A & Sand Area
	1,218	98	Water Surface, HSG A
	61,684	38	Weighted Average
	60,466		98.03% Pervious Area
	1,218		1.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0280	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
0.5	100	0.0460	3.45		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.6	150	0.0750	4.41		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
5.9	300	Total			

Subcatchment E7: EX-DA 7



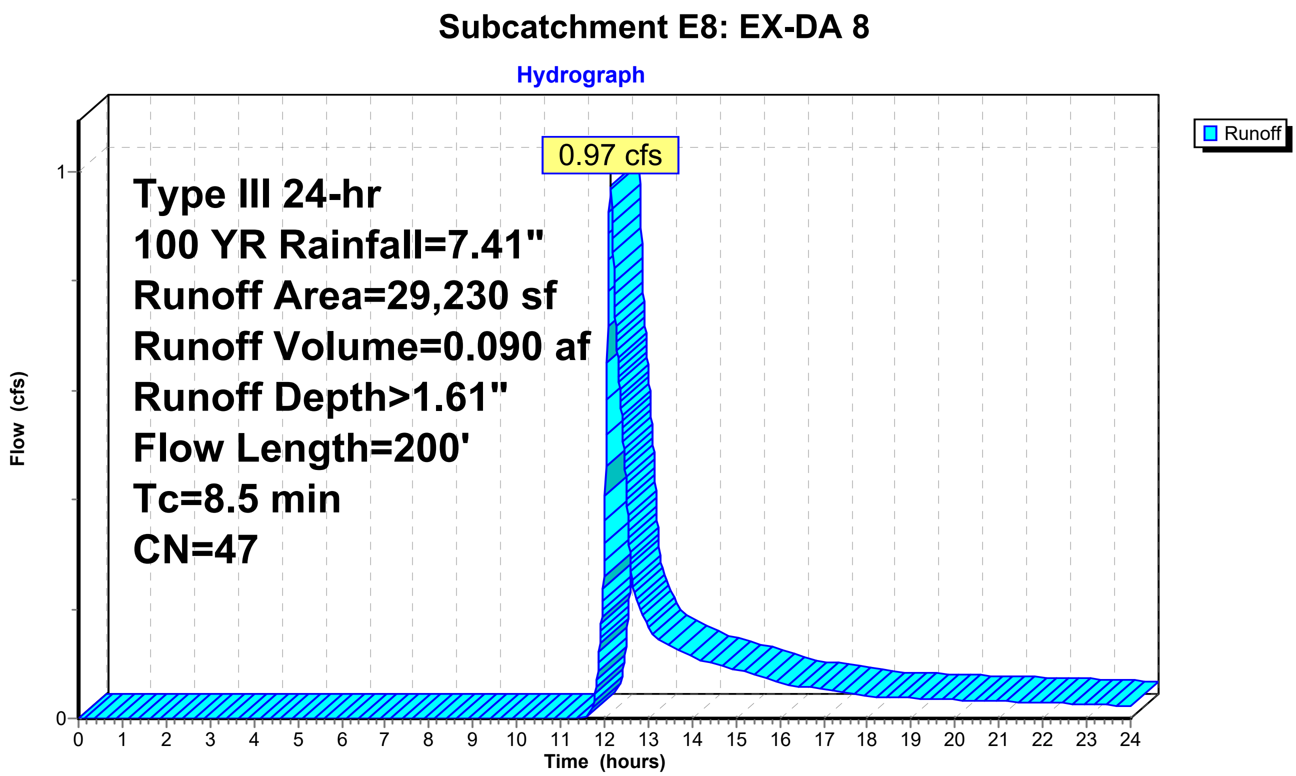
Summary for Subcatchment E8: EX-DA 8

Runoff = 0.97 cfs @ 12.14 hrs, Volume= 0.090 af, Depth> 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	21,837	39	>75% Grass cover, Good, HSG A
*	2,953	30	Woods, Good, HSG A & Sand Area
	4,440	98	Water Surface, HSG A
	29,230	47	Weighted Average
	24,790		84.81% Pervious Area
	4,440		15.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.40"
1.6	150	0.0530	1.61		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
8.5	200	Total			



Summary for Subcatchment E9: EX DA-9

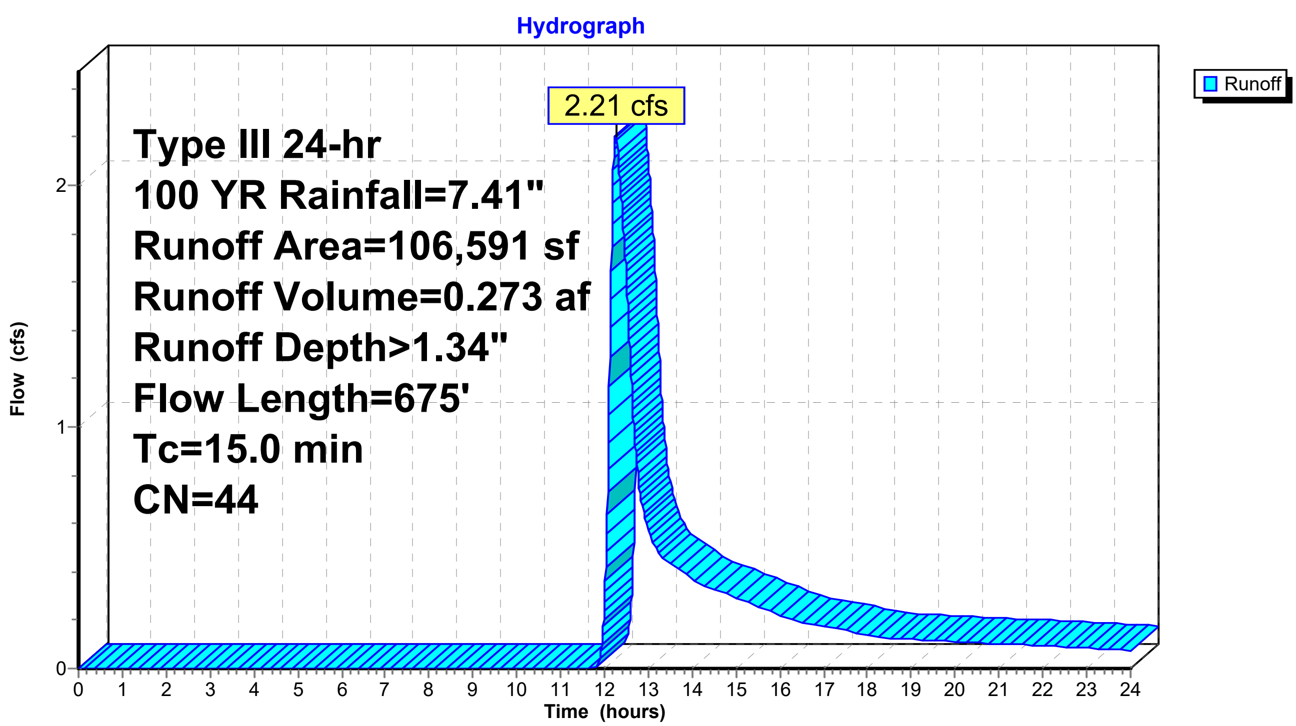
Runoff = 2.21 cfs @ 12.25 hrs, Volume= 0.273 af, Depth> 1.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	94,116	39	>75% Grass cover, Good, HSG A
	3,500	30	Woods, Good, HSG A
*	8,975	98	Wetland; Water Surface
	0	98	Paved parking, HSG A
	106,591	44	Weighted Average
	97,616		91.58% Pervious Area
	8,975		8.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0260	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
8.8	495	0.0180	0.94		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.3	130	0.0540	1.63		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
15.0	675	Total			

Subcatchment E9: EX DA-9

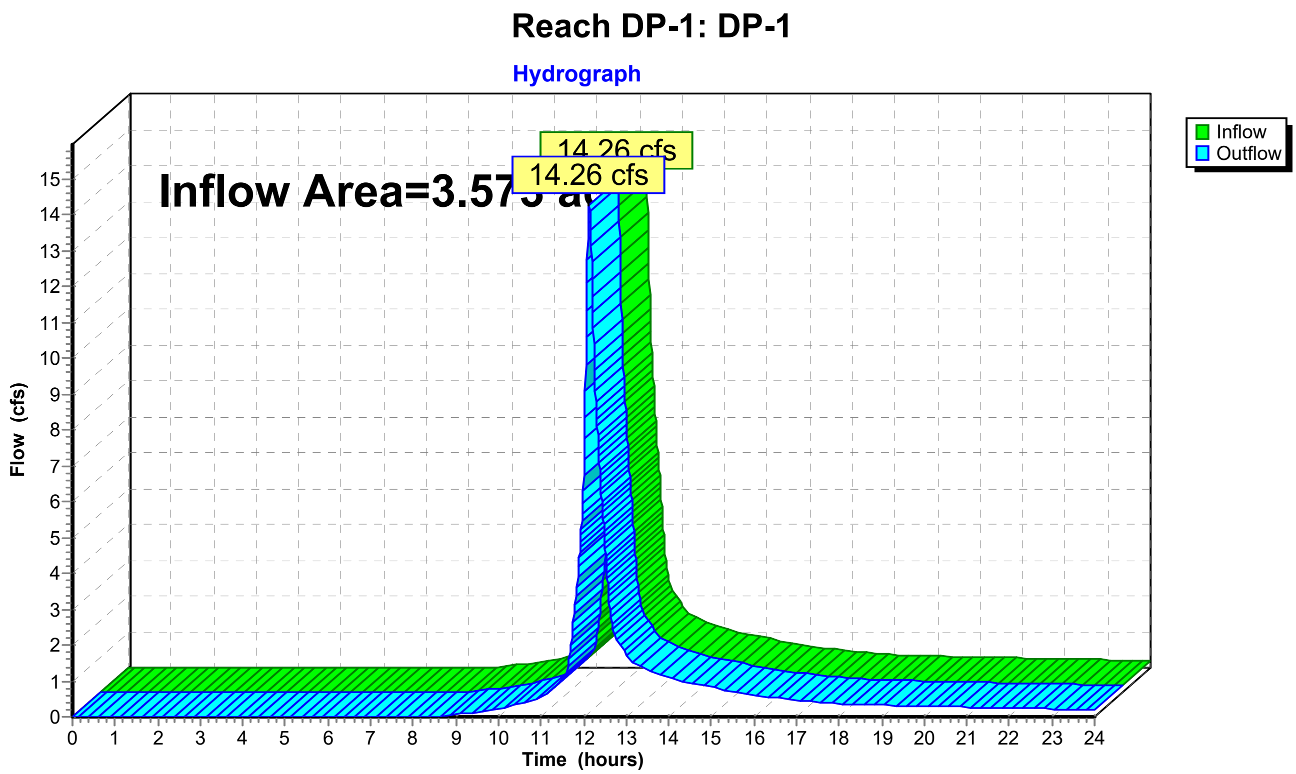


Summary for Reach DP-1: DP-1

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

Inflow Area = 3.573 ac, 50.78% Impervious, Inflow Depth > 3.85" for 100 YR event
Inflow = 14.26 cfs @ 12.14 hrs, Volume= 1.145 af
Outflow = 14.26 cfs @ 12.14 hrs, Volume= 1.145 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



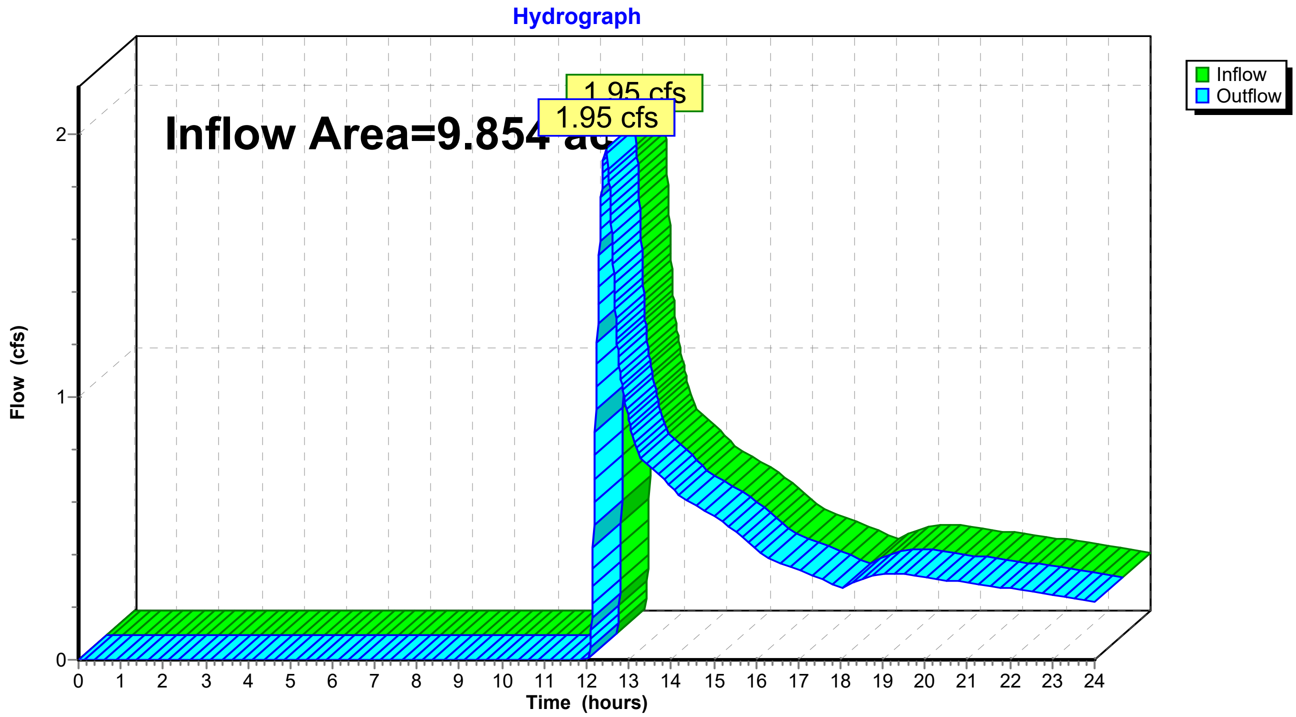
Summary for Reach DP-2: DP-2 (JOSHUA'S BROOK)

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

Inflow Area =	9.854 ac,	2.39% Impervious,	Inflow Depth > 0.54"	for 100 YR event
Inflow =	1.95 cfs @	12.46 hrs, Volume=	0.446 af	
Outflow =	1.95 cfs @	12.46 hrs, Volume=	0.446 af, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-2: DP-2 (JOSHUA'S BROOK)



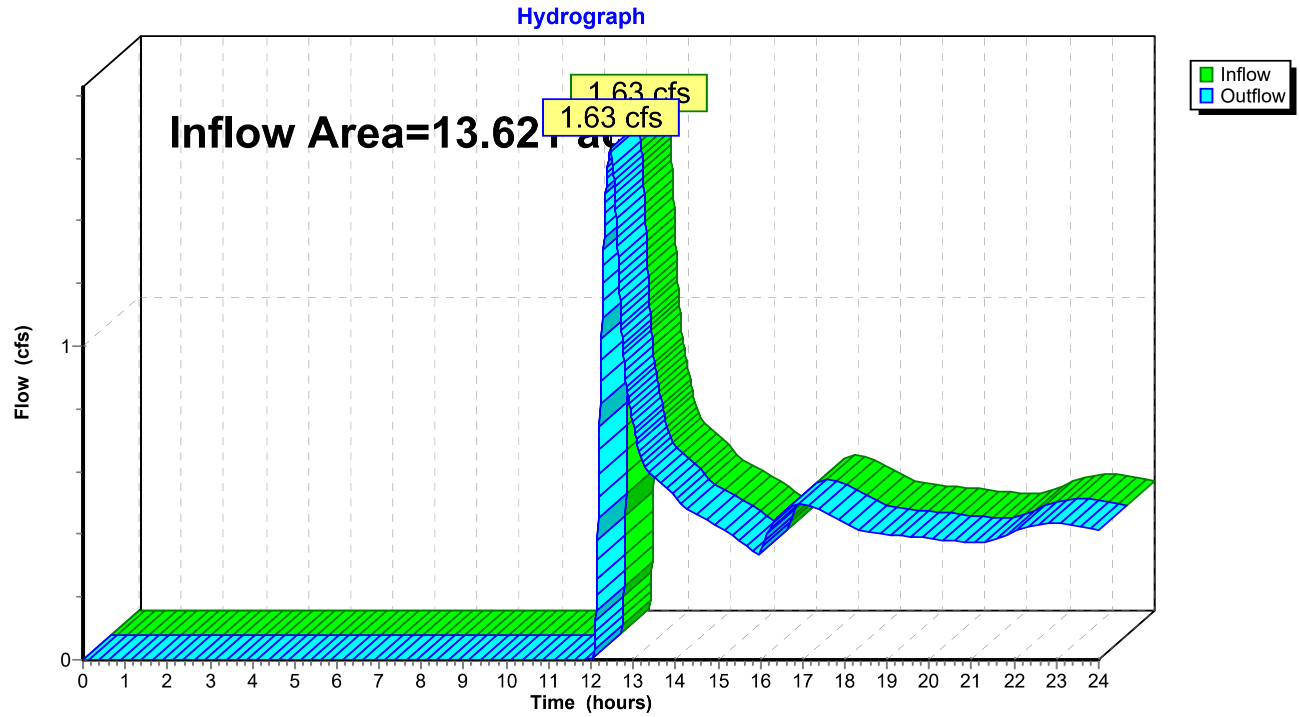
Summary for Reach DP-3: DP-3 (STEWART'S CREEK)

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

Inflow Area = 13.621 ac, 9.32% Impervious, Inflow Depth > 0.42" for 100 YR event
Inflow = 1.63 cfs @ 12.45 hrs, Volume= 0.476 af
Outflow = 1.63 cfs @ 12.45 hrs, Volume= 0.476 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-3: DP-3 (STEWART'S CREEK)



Summary for Pond P-A: POND A

Inflow Area = 2.388 ac, 24.53% Impervious, Inflow Depth > 2.17" for 100 YR event
Inflow = 3.45 cfs @ 12.39 hrs, Volume= 0.433 af
Outflow = 0.23 cfs @ 17.11 hrs, Volume= 0.104 af, Atten= 93%, Lag= 283.6 min
Primary = 0.23 cfs @ 17.11 hrs, Volume= 0.104 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 25.12' @ 17.11 hrs Surf.Area= 23,137 sf Storage= 14,540 cf

Plug-Flow detention time= 440.9 min calculated for 0.104 af (24% of inflow)
Center-of-Mass det. time= 294.2 min (1,175.8 - 881.7)

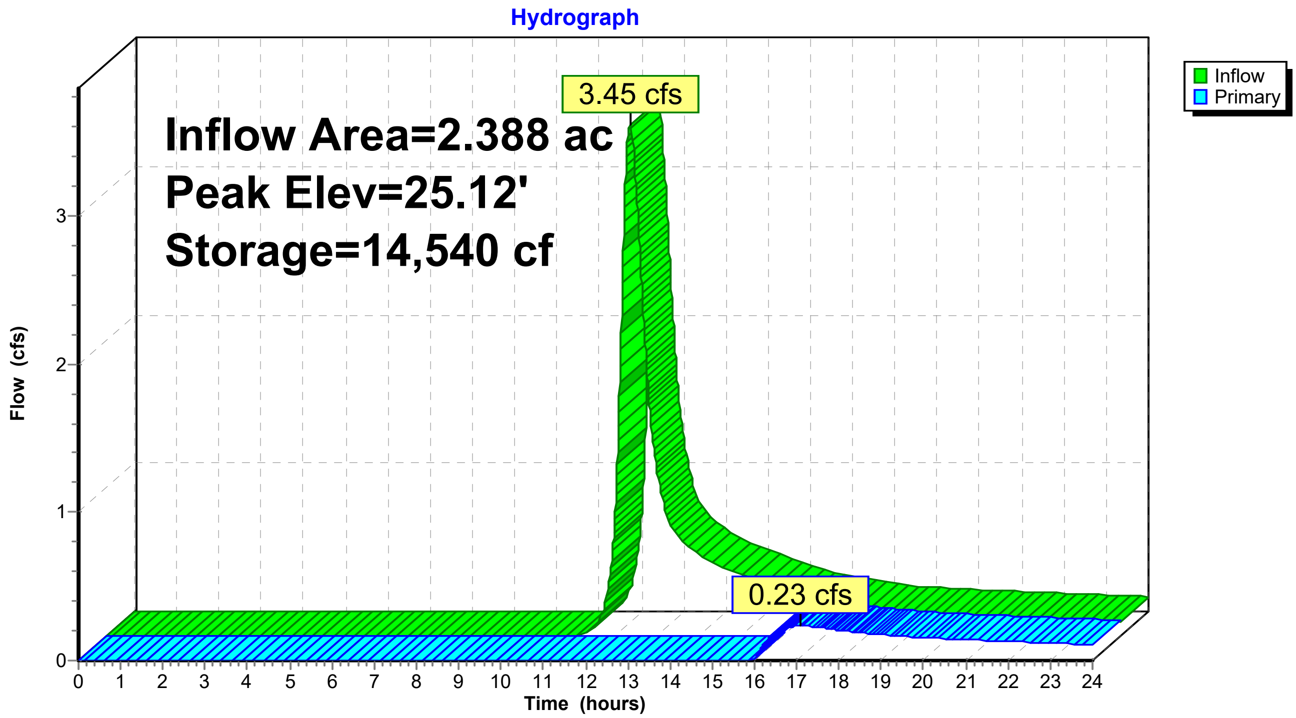
Volume	Invert	Avail.Storage	Storage Description
#1	24.45'	37,030 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.45	20,405	0	0
25.70	25,518	28,702	28,702
26.00	30,000	8,328	37,030

Device	Routing	Invert	Outlet Devices
#1	Primary	25.10'	**45.0 deg x 30.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.23 cfs @ 17.11 hrs HW=25.12' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.23 cfs @ 0.43 fps)

Pond P-A: POND A



Summary for Pond P-B: POND B

Inflow Area = 1.784 ac, 13.22% Impervious, Inflow Depth > 1.52" for 100 YR event
Inflow = 2.51 cfs @ 12.12 hrs, Volume= 0.226 af
Outflow = 0.09 cfs @ 19.59 hrs, Volume= 0.036 af, Atten= 96%, Lag= 448.1 min
Primary = 0.09 cfs @ 19.59 hrs, Volume= 0.036 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 3.46' @ 19.59 hrs Surf.Area= 11,525 sf Storage= 8,323 cf

Plug-Flow detention time= 539.9 min calculated for 0.036 af (16% of inflow)
Center-of-Mass det. time= 374.6 min (1,263.9 - 889.3)

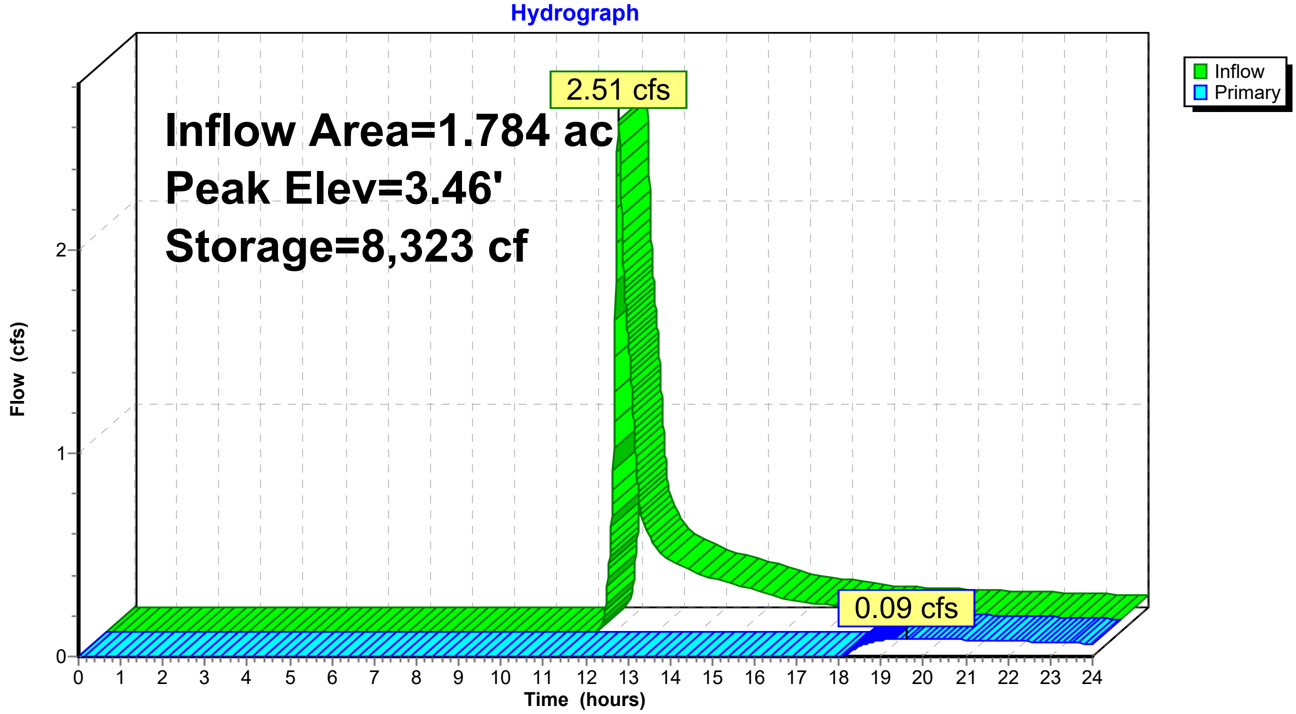
Volume	Invert	Avail.Storage	Storage Description
#1	2.70'	15,021 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2.70	10,273	0	0
3.00	11,080	3,203	3,203
3.40	11,370	4,490	7,693
4.00	13,058	7,328	15,021

Device	Routing	Invert	Outlet Devices
#1	Primary	3.44'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.09 cfs @ 19.59 hrs HW=3.46' (Free Discharge)
↑—**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.09 cfs @ 0.39 fps)

Pond P-B: POND B



Summary for Pond P-C: POND C

Inflow Area = 3.086 ac, 15.48% Impervious, Inflow Depth > 1.52" for 100 YR event
Inflow = 4.22 cfs @ 12.13 hrs, Volume= 0.391 af
Outflow = 0.11 cfs @ 23.71 hrs, Volume= 0.017 af, Atten= 98%, Lag= 694.5 min
Primary = 0.11 cfs @ 23.71 hrs, Volume= 0.017 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 4.31' @ 23.71 hrs Surf.Area= 25,220 sf Storage= 16,319 cf

Plug-Flow detention time= 661.4 min calculated for 0.017 af (4% of inflow)
Center-of-Mass det. time= 489.1 min (1,379.0 - 889.9)

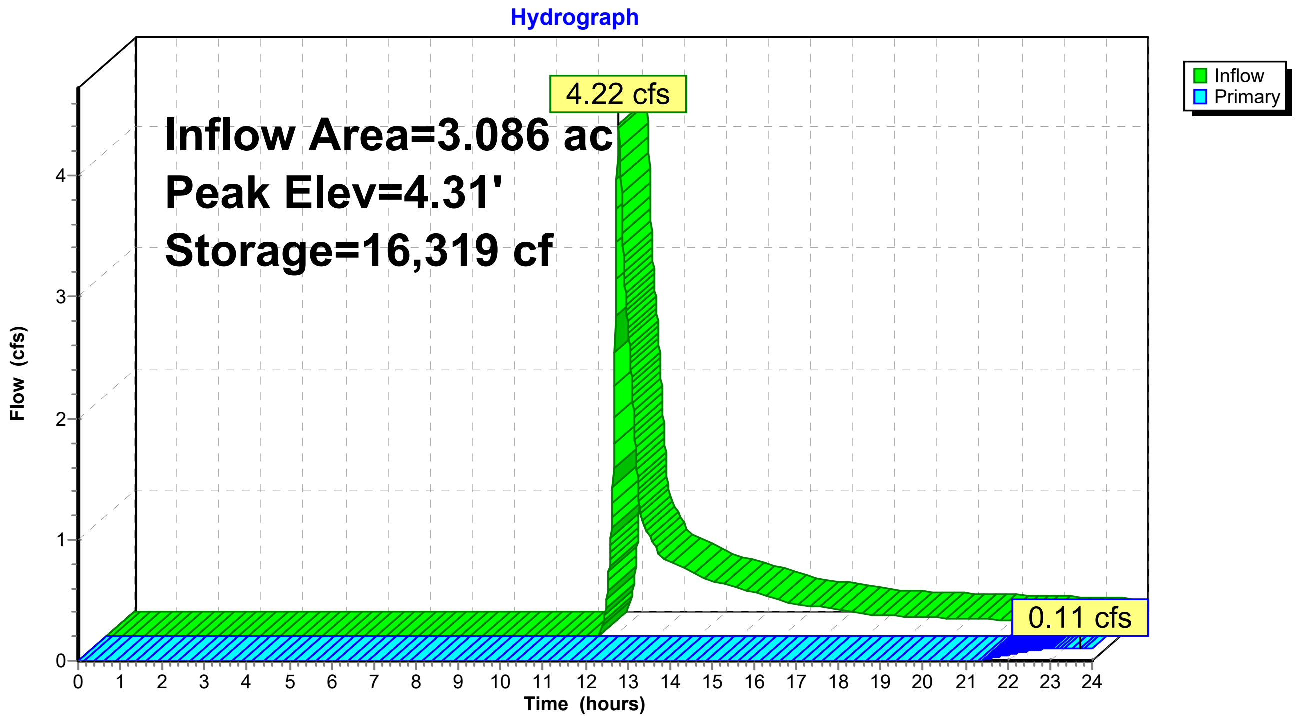
Volume	Invert	Avail.Storage	Storage Description
#1	3.60'	35,172 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.60	20,812	0	0
4.00	23,497	8,862	8,862
5.00	29,124	26,311	35,172

Device	Routing	Invert	Outlet Devices
#1	Primary	4.29'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.10 cfs @ 23.71 hrs HW=4.31' (Free Discharge)
1=Sharp-Crested Vee/Trap Weir (Weir Controls 0.10 cfs @ 0.41 fps)

Pond P-C: POND C



Summary for Pond P-D: POND D

Inflow Area = 2.447 ac, 8.42% Impervious, Inflow Depth > 1.34" for 100 YR event
Inflow = 2.21 cfs @ 12.25 hrs, Volume= 0.273 af
Outflow = 0.08 cfs @ 23.22 hrs, Volume= 0.032 af, Atten= 96%, Lag= 658.0 min
Primary = 0.08 cfs @ 23.22 hrs, Volume= 0.032 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 9.24' @ 23.22 hrs Surf.Area= 9,729 sf Storage= 10,487 cf

Plug-Flow detention time= 557.5 min calculated for 0.032 af (12% of inflow)
Center-of-Mass det. time= 384.5 min (1,287.5 - 903.0)

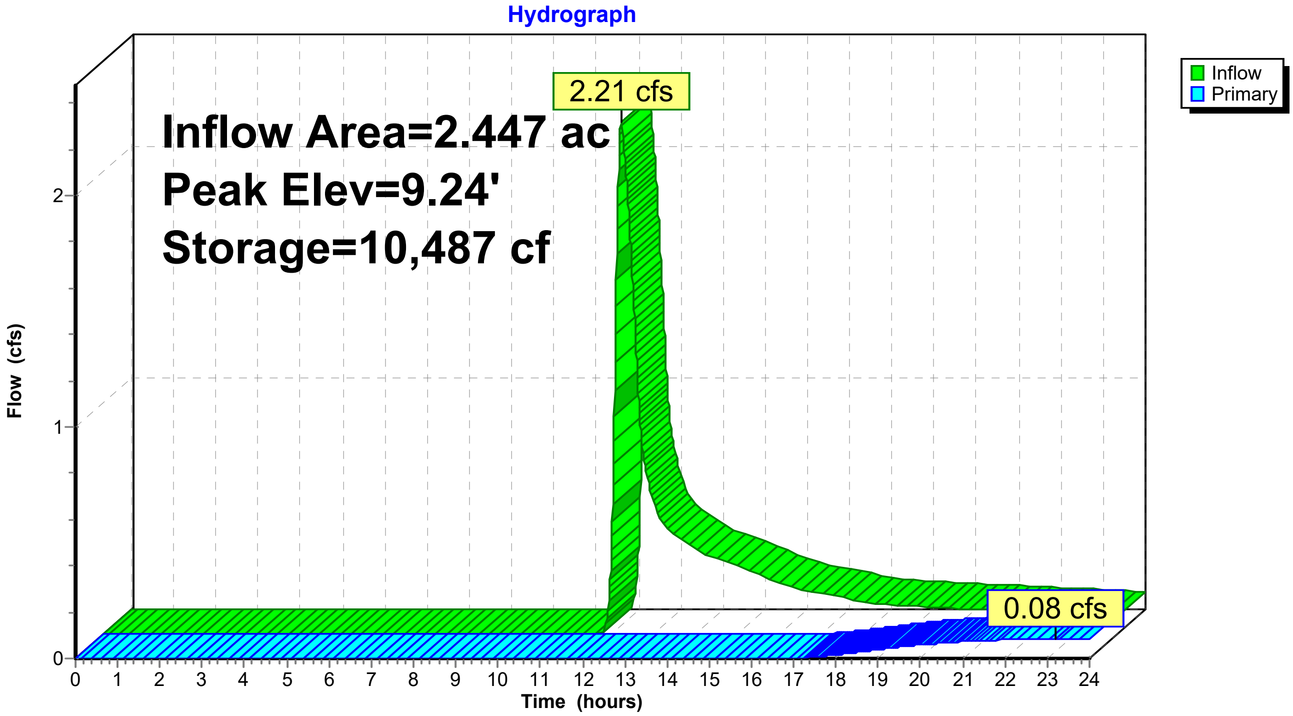
Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	18,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	7,585	0	0
9.00	8,975	8,280	8,280
10.00	12,170	10,573	18,853

Device	Routing	Invert	Outlet Devices
#1	Primary	9.80'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#2	Primary	9.08'	**12.0" Round Culvert** L= 18.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.08' / 8.16' S= 0.0497 '/' Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.79 sf

Primary OutFlow Max=0.08 cfs @ 23.22 hrs HW=9.24' (Free Discharge)
├─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
└─**2=Culvert** (Inlet Controls 0.08 cfs @ 1.06 fps)

Pond P-D: POND D



APPENDIX C

NOAA Atlas, Volume 10, Version 3, Point Precipitation Frequency Estimates for Hyannis, MA

NOAA Atlas 14, Volume 10, Version 3
Location name: Hyannis, Massachusetts, USA*
Latitude: 41.6497°, Longitude: -70.2894°
Elevation: 34.22 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.266 (0.218-0.322)	0.336 (0.275-0.409)	0.451 (0.367-0.550)	0.547 (0.443-0.672)	0.679 (0.529-0.878)	0.777 (0.591-1.03)	0.882 (0.649-1.22)	1.01 (0.687-1.41)	1.20 (0.780-1.74)	1.36 (0.862-2.02)
10-min	0.376 (0.309-0.457)	0.476 (0.390-0.579)	0.640 (0.522-0.779)	0.775 (0.627-0.950)	0.962 (0.749-1.24)	1.10 (0.837-1.46)	1.25 (0.919-1.73)	1.43 (0.974-2.00)	1.70 (1.11-2.46)	1.93 (1.22-2.85)
15-min	0.443 (0.363-0.537)	0.560 (0.459-0.681)	0.752 (0.613-0.917)	0.912 (0.739-1.12)	1.13 (0.882-1.46)	1.30 (0.986-1.72)	1.47 (1.08-2.03)	1.68 (1.15-2.35)	2.00 (1.30-2.90)	2.27 (1.44-3.36)
30-min	0.658 (0.540-0.799)	0.828 (0.679-1.01)	1.11 (0.902-1.35)	1.34 (1.08-1.64)	1.66 (1.29-2.14)	1.89 (1.44-2.50)	2.15 (1.58-2.97)	2.45 (1.67-3.43)	2.92 (1.90-4.23)	3.31 (2.10-4.90)
60-min	0.874 (0.717-1.06)	1.10 (0.898-1.33)	1.46 (1.19-1.78)	1.76 (1.43-2.16)	2.18 (1.70-2.82)	2.49 (1.89-3.29)	2.82 (2.08-3.90)	3.22 (2.20-4.51)	3.83 (2.49-5.56)	4.35 (2.76-6.44)
2-hr	1.23 (1.01-1.48)	1.53 (1.26-1.84)	2.01 (1.65-2.44)	2.41 (1.97-2.94)	2.97 (2.33-3.80)	3.38 (2.59-4.43)	3.82 (2.84-5.24)	4.36 (3.01-6.04)	5.18 (3.41-7.43)	5.89 (3.77-8.60)
3-hr	1.47 (1.22-1.77)	1.81 (1.50-2.18)	2.37 (1.95-2.86)	2.83 (2.32-3.44)	3.47 (2.74-4.42)	3.95 (3.04-5.14)	4.46 (3.33-6.06)	5.07 (3.52-6.97)	6.01 (3.98-8.54)	6.81 (4.38-9.87)
6-hr	1.93 (1.61-2.30)	2.34 (1.95-2.80)	3.02 (2.50-3.62)	3.58 (2.95-4.31)	4.35 (3.45-5.48)	4.93 (3.82-6.34)	5.54 (4.16-7.42)	6.27 (4.39-8.51)	7.35 (4.92-10.3)	8.26 (5.38-11.8)
12-hr	2.42 (2.03-2.86)	2.89 (2.42-3.43)	3.66 (3.06-4.36)	4.30 (3.57-5.15)	5.19 (4.14-6.46)	5.85 (4.56-7.43)	6.55 (4.93-8.61)	7.34 (5.19-9.83)	8.48 (5.74-11.7)	9.42 (6.20-13.3)
24-hr	2.87 (2.43-3.38)	3.39 (2.86-4.00)	4.24 (3.57-5.01)	4.94 (4.13-5.87)	5.91 (4.75-7.28)	6.65 (5.22-8.34)	7.41 (5.60-9.58)	8.23 (5.89-10.9)	9.39 (6.43-12.8)	10.3 (6.87-14.3)
2-day	3.27 (2.78-3.82)	3.82 (3.25-4.47)	4.72 (4.00-5.54)	5.47 (4.60-6.45)	6.50 (5.26-7.92)	7.29 (5.76-9.03)	8.09 (6.16-10.3)	8.94 (6.46-11.7)	10.1 (7.00-13.6)	11.0 (7.43-15.1)
3-day	3.54 (3.03-4.12)	4.10 (3.50-4.78)	5.02 (4.27-5.86)	5.78 (4.88-6.78)	6.82 (5.55-8.27)	7.62 (6.05-9.39)	8.44 (6.46-10.7)	9.30 (6.77-12.1)	10.5 (7.31-14.0)	11.4 (7.74-15.5)
4-day	3.78 (3.24-4.38)	4.34 (3.72-5.04)	5.26 (4.49-6.13)	6.03 (5.11-7.05)	7.08 (5.78-8.55)	7.88 (6.28-9.67)	8.70 (6.69-11.0)	9.58 (7.00-12.4)	10.8 (7.56-14.3)	11.8 (8.01-15.9)
7-day	4.41 (3.80-5.09)	4.98 (4.29-5.75)	5.91 (5.07-6.85)	6.69 (5.70-7.77)	7.75 (6.37-9.29)	8.56 (6.87-10.4)	9.39 (7.28-11.7)	10.3 (7.58-13.1)	11.5 (8.12-15.1)	12.4 (8.56-16.6)
10-day	5.00 (4.33-5.75)	5.59 (4.83-6.44)	6.56 (5.64-7.57)	7.36 (6.29-8.52)	8.46 (6.98-10.1)	9.30 (7.50-11.3)	10.2 (7.90-12.6)	11.1 (8.19-14.0)	12.3 (8.73-16.0)	13.2 (9.15-17.5)
20-day	6.81 (5.93-7.78)	7.50 (6.52-8.57)	8.62 (7.47-9.87)	9.55 (8.23-11.0)	10.8 (9.01-12.8)	11.8 (9.60-14.1)	12.8 (10.0-15.6)	13.8 (10.3-17.3)	15.0 (10.8-19.3)	15.9 (11.1-20.8)
30-day	8.38 (7.32-9.52)	9.15 (7.99-10.4)	10.4 (9.07-11.9)	11.5 (9.93-13.1)	12.9 (10.8-15.1)	14.1 (11.5-16.7)	15.2 (11.9-18.3)	16.2 (12.2-20.1)	17.4 (12.6-22.2)	18.3 (12.9-23.7)
45-day	10.4 (9.13-11.8)	11.3 (9.90-12.8)	12.7 (11.1-14.5)	13.9 (12.1-15.9)	15.6 (13.1-18.1)	16.9 (13.8-19.9)	18.2 (14.3-21.7)	19.3 (14.6-23.8)	20.6 (15.0-26.0)	21.4 (15.2-27.5)
60-day	12.1 (10.7-13.7)	13.1 (11.5-14.8)	14.7 (12.9-16.7)	16.1 (14.0-18.2)	17.9 (15.0-20.7)	19.3 (15.9-22.6)	20.7 (16.3-24.6)	21.9 (16.7-26.8)	23.2 (17.1-29.2)	24.1 (17.2-30.8)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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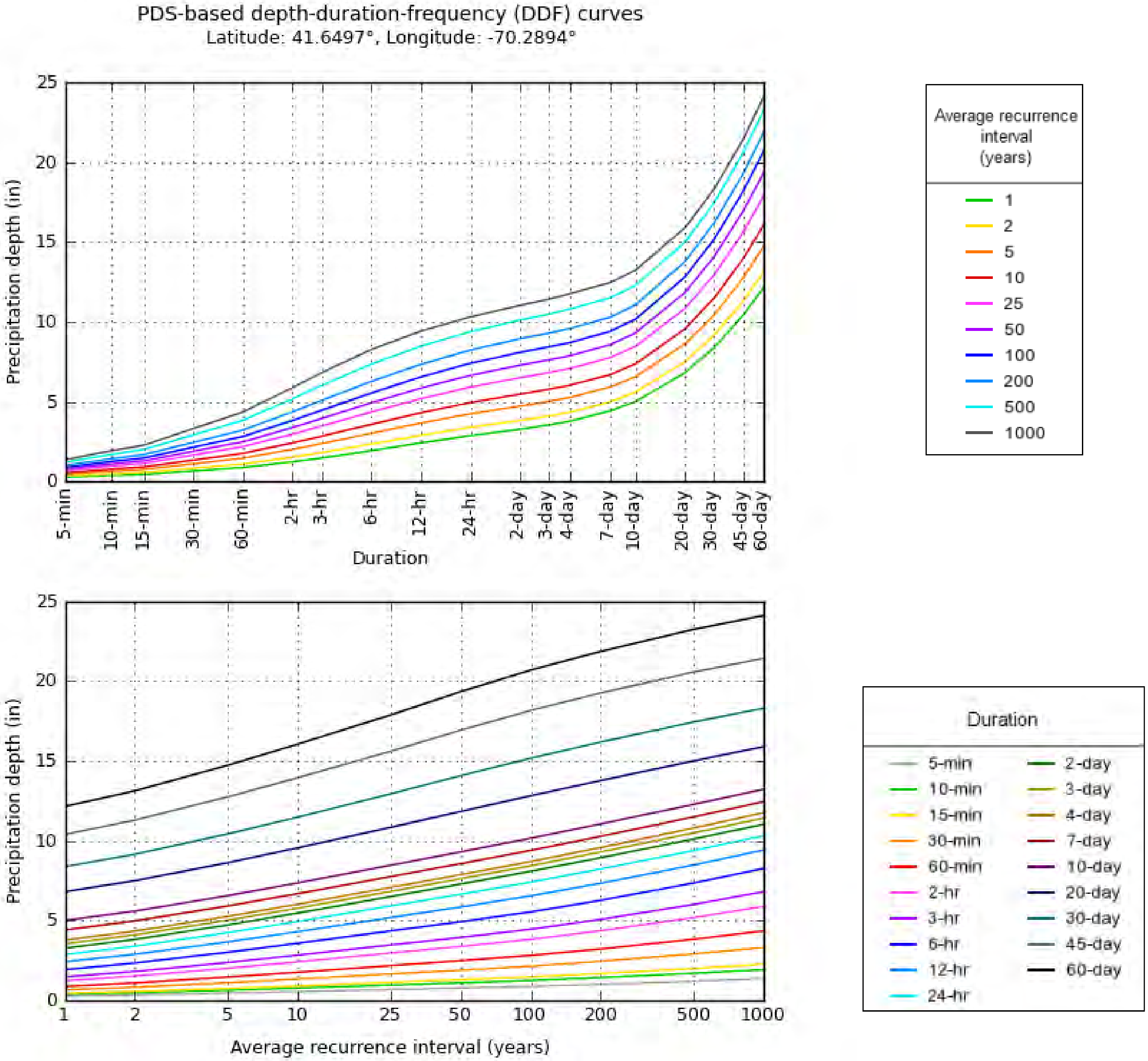
PF graphical



NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Thu Apr 22 22:10:09 2021

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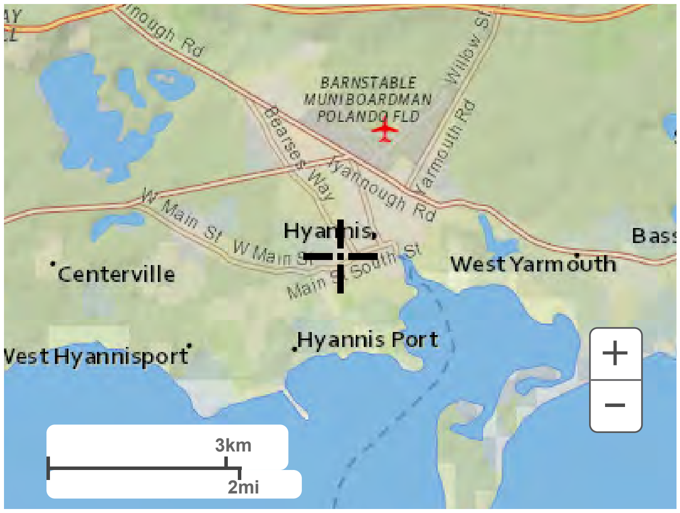
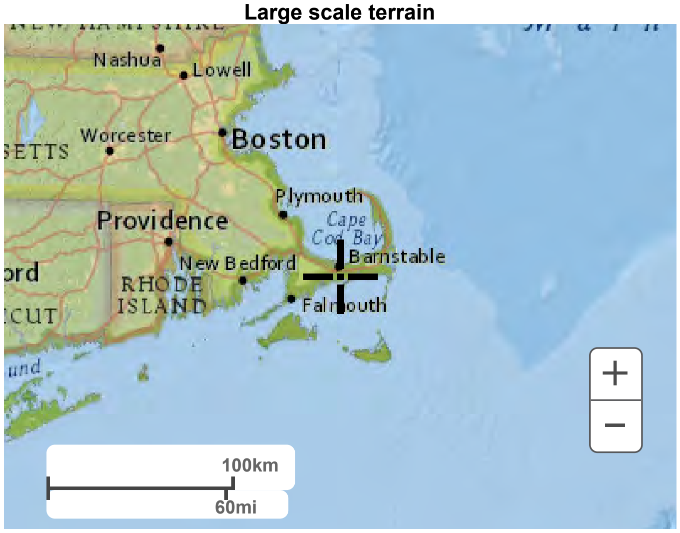
Maps & aerials

Small scale terrain



Large scale terrain



Large scale map

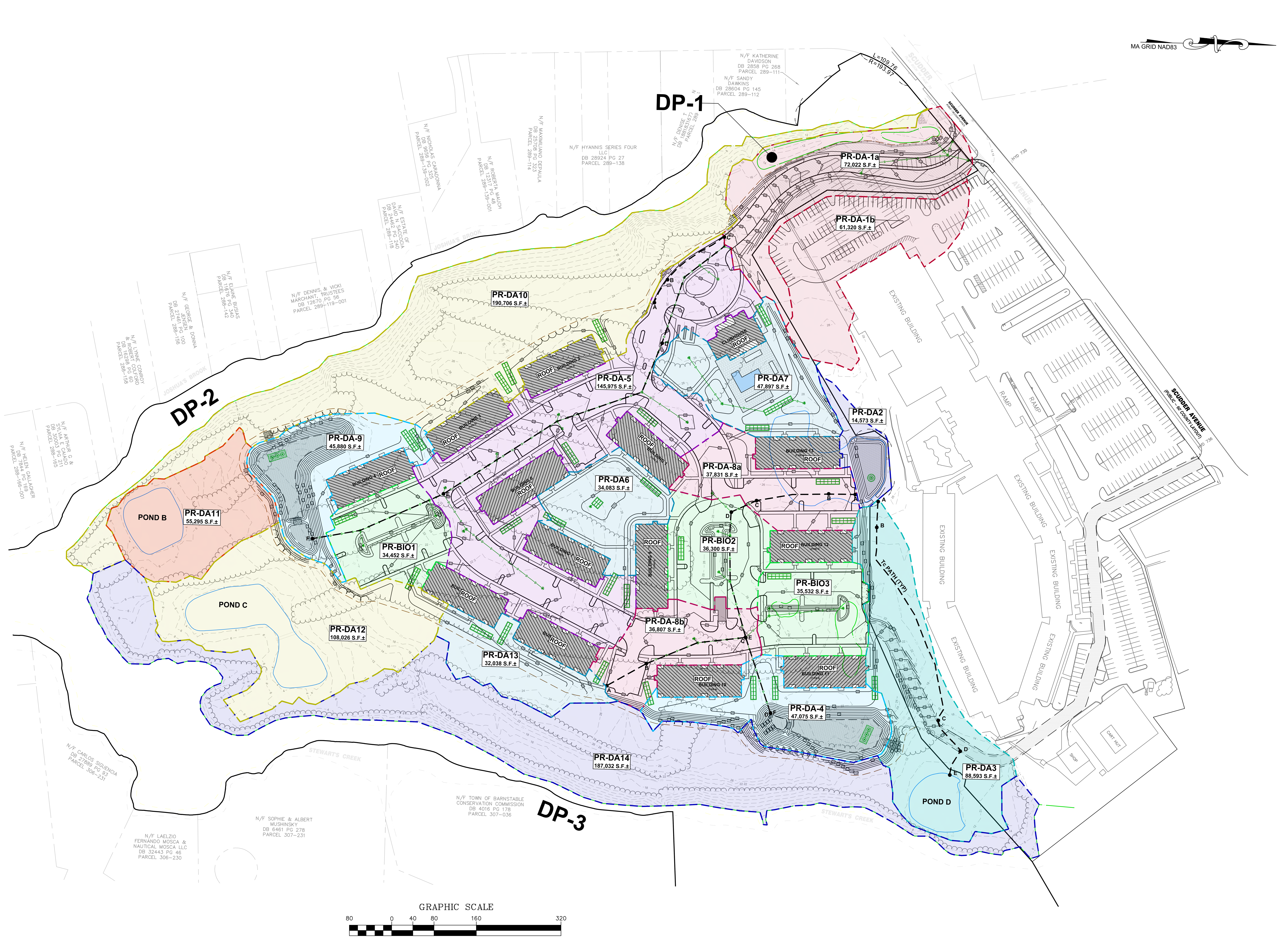
Large scale aerial

APPENDIX D

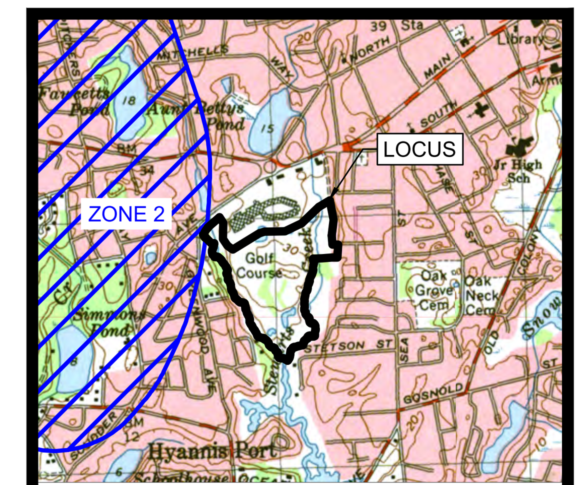
PROPOSED DRAINAGE AREAS PLAN

&

HydroCAD® CALCULATIONS
For the
PROPOSED CONDITIONS



NOTE: Tc PATHS NOT SHOWN ON PLAN ARE ASSUMED TO HAVE A TIME OF CONCENTRATION OF FIVE (5) MINUTES.



LOCUS MAP
SCALE 1" = 2000'

EDWARD L. PESCE, P.E. 23 SEP 2022
DATE

THE PROPOSED EMBLEM AT HYANNIS RESIDENCES

AT

35 SCUDDER AVENUE

IN

HYANNIS, MASSACHUSETTS

(BARNSTABLE COUNTY)

PROPOSED DRAINAGE AREAS PLAN

REVISIONS:

No.	DATE	DESC.
1	9/23/22	Updated Site Layout

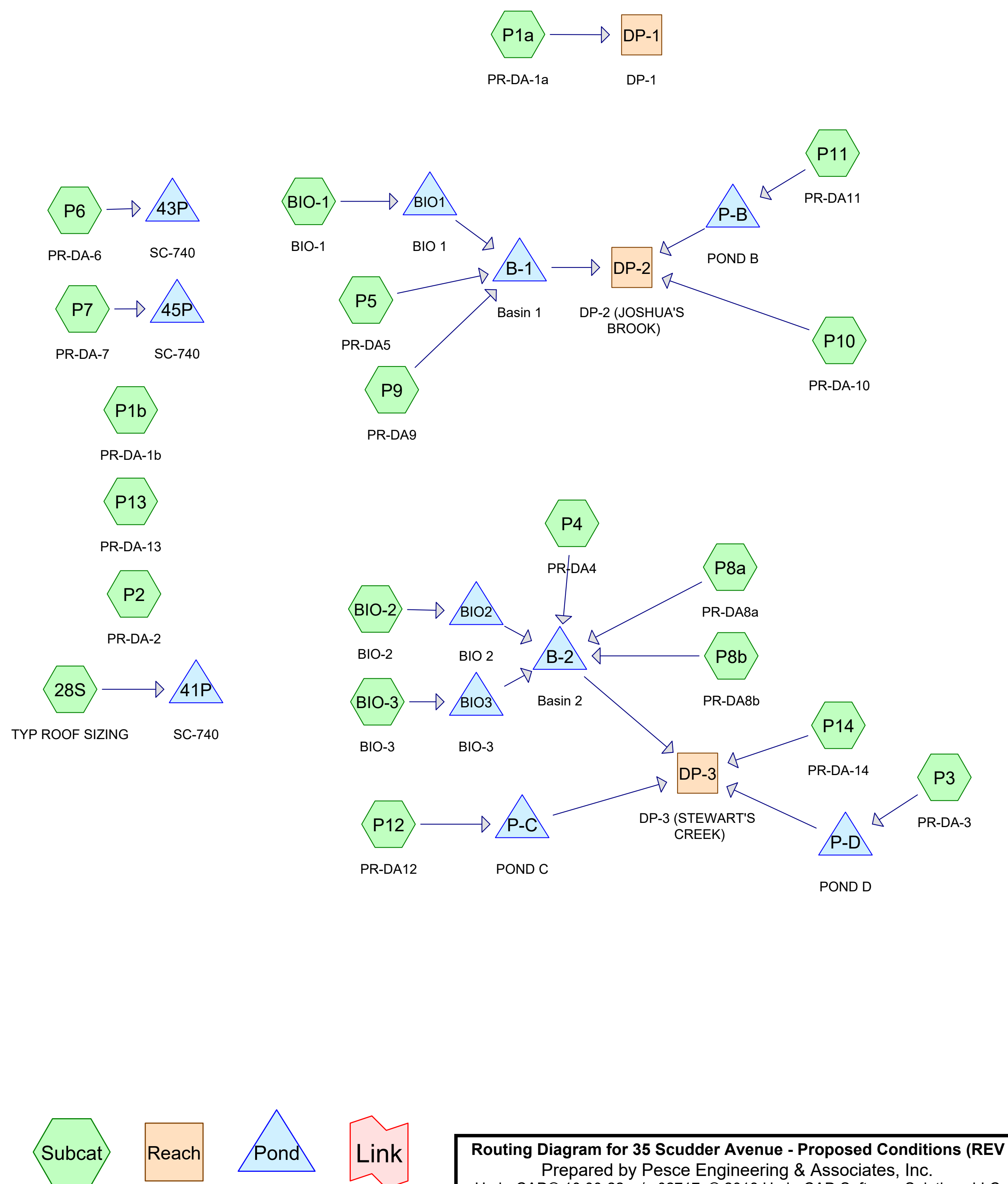
PREPARED FOR:
QUARTERRA
99 SUMMER STREET, SUITE 701
BOSTON, MA 02110

ENGINEERING BY:
PESCE ENGINEERING & ASSOCIATES, INC.
Edward L. Pesce, P.E., LEED AP
43 Porter Lane
West Dennis, MA 02670
epesce@comcast.net Cell:508-333-7630

LAND SURVEYING BY:
BAXTER NYE ENGINEERING & SURVEYING
78 NORTH STREET, 3RD FLOOR
HYANNIS, MA 02601

DATE: SEPTEMBER 23, 2022
FIELD: CB/RB
CALC./DESIGN: ELP
DRAWN: BJW
CHECK: ELP
JOB NO: 5061

SHEET 1 OF 1



Routing Diagram for 35 Scudder Avenue - Proposed Conditions (REV 1)
Prepared by Pesce Engineering & Associates, Inc.
HydroCAD® 10.00-22 s/n 02717 © 2018 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
17.268	39	>75% Grass cover, Good, HSG A (BIO-1, BIO-2, BIO-3, P10, P11, P12, P13, P14, P1a, P1b, P2, P3, P4, P5, P6, P7, P8a, P8b, P9)
0.165	76	Gravel roads, HSG A (P3)
5.600	98	Paved parking, HSG A (BIO-1, BIO-2, BIO-3, P1a, P5, P8a, P8b)
0.149	98	Roofs, HSG A (28S, BIO-2, BIO-3, P8a, P8b)
0.417	98	Stormwater Basin; Water Surface, HSG A (P4, P9)
1.323	98	Unconnected Impervious, HSG A (P13, P1b, P2, P6, P7)
0.020	98	Unconnected impervious, HSG A (P4, P9)
0.031	98	Unconnected roofs, HSG A (P5)
1.081	98	Water Surface, 0% imp, HSG A (P11, P12, P1a, P3)
1.873	30	Woods, Good, HSG A (P11, P12, P13, P14)
2.294	32	Woods/grass comb., Good, HSG A (P10)
30.221	**55**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
30.221	HSG A	28S, BIO-1, BIO-2, BIO-3, P10, P11, P12, P13, P14, P1a, P1b, P2, P3, P4, P5, P6, P7, P8a, P8b, P9
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
30.221		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
17.268	0.000	0.000	0.000	0.000	17.268	>75% Grass cover, Good	BIO-1, BIO-2, BIO-3, P10, P11, P12, P13, P14, P1a, P1b, P2, P3,

Ground Covers (selected nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.165	0.000	0.000	0.000	0.000	0.165	Gravel roads	P3
5.600	0.000	0.000	0.000	0.000	5.600	Paved parking	BIO-1, BIO-2, BIO-3, P1a, P5, P8a, P8b
0.149	0.000	0.000	0.000	0.000	0.149	Roofs	28S, BIO-2, BIO-3, P8a, P8

Ground Covers (selected nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.417	0.000	0.000	0.000	0.000	0.417	Stormwater Basin; Water Surface	P4, P9
1.323	0.000	0.000	0.000	0.000	1.323	Unconnected Impervious	P13, P1b, P2, P6, P7
0.020	0.000	0.000	0.000	0.000	0.020	Unconnected impervious	P4, P9
0.031	0.000	0.000	0.000	0.000	0.031	Unconnected roofs	P5
1.081	0.000	0.000	0.000	0.000	1.081	Water Surface, 0% imp	P11, P12, P1a, P3

Ground Covers (selected nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
1.873	0.000	0.000	0.000	0.000	1.873	Woods, Good	P11, P12, P13, P14
2.294	0.000	0.000	0.000	0.000	2.294	Woods/grass comb., Good	P10
30.221	**0.000**	**0.000**	**0.000**	**0.000**	**30.221**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	P5	0.00	0.00	243.0	0.0050	0.013	12.0	0.0	0.0
2	P5	0.00	0.00	525.0	0.0050	0.013	15.0	0.0	0.0
3	P5	0.00	0.00	260.0	0.0050	0.013	18.0	0.0	0.0
4	P8a	0.00	0.00	48.0	0.0050	0.013	12.0	0.0	0.0
5	P8a	0.00	0.00	241.0	0.0050	0.013	15.0	0.0	0.0
6	P8a	0.00	0.00	150.0	0.0060	0.013	18.0	0.0	0.0
7	P8b	0.00	0.00	196.0	0.0100	0.013	12.0	0.0	0.0
8	P8b	0.00	0.00	150.0	0.0060	0.013	18.0	0.0	0.0
9	P-D	9.08	8.16	18.5	0.0497	0.013	12.0	0.0	0.0

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

Subcatchment 28S: TYP ROOF SIZING Runoff Area=5,000 sf 100.00% Impervious Runoff Depth>3.15"
Tc=5.0 min CN=98 Runoff=0.39 cfs 0.030 af

Subcatchment BIO-1: BIO-1 Runoff Area=34,452 sf 76.51% Impervious Runoff Depth>1.84"
Tc=5.0 min CN=84 Runoff=1.77 cfs 0.121 af

Subcatchment BIO-2: BIO-2 Runoff Area=36,300 sf 68.24% Impervious Runoff Depth>1.48"
Tc=5.0 min CN=79 Runoff=1.48 cfs 0.103 af

Subcatchment BIO-3: BIO-3 Runoff Area=35,532 sf 75.18% Impervious Runoff Depth>1.76"
Tc=5.0 min CN=83 Runoff=1.75 cfs 0.120 af

Subcatchment P10: PR-DA-10 Runoff Area=190,706 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=35 Runoff=0.00 cfs 0.000 af

Subcatchment P11: PR-DA11 Runoff Area=55,295 sf 0.00% Impervious Runoff Depth>0.15"
Tc=5.0 min CN=49 Runoff=0.04 cfs 0.015 af

Subcatchment P12: PR-DA12 Runoff Area=108,026 sf 0.00% Impervious Runoff Depth>0.15"
Tc=5.0 min CN=49 Runoff=0.08 cfs 0.030 af

Subcatchment P13: PR-DA-13 Runoff Area=32,038 sf 3.96% Impervious Runoff Depth>0.01"
Tc=5.0 min UI Adjusted CN=40 Runoff=0.00 cfs 0.001 af

Subcatchment P14: PR-DA-14 Runoff Area=187,032 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=36 Runoff=0.00 cfs 0.000 af

Subcatchment P1a: PR-DA-1a Runoff Area=72,022 sf 28.03% Impervious Runoff Depth>0.52"
Tc=5.0 min CN=61 Runoff=0.73 cfs 0.072 af

Subcatchment P1b: PR-DA-1b Runoff Area=61,320 sf 64.77% Impervious Runoff Depth>1.35"
Tc=5.0 min CN=77 Runoff=2.26 cfs 0.158 af

Subcatchment P2: PR-DA-2 Runoff Area=14,573 sf 0.97% Impervious Runoff Depth>0.00"
Tc=5.0 min UI Adjusted CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment P3: PR-DA-3 Runoff Area=88,593 sf 0.00% Impervious Runoff Depth>0.12"
Flow Length=574' Tc=26.1 min CN=48 Runoff=0.04 cfs 0.021 af

Subcatchment P4: PR-DA4 Runoff Area=47,075 sf 19.25% Impervious Runoff Depth>0.17"
Tc=5.0 min CN=50 Runoff=0.05 cfs 0.015 af

Subcatchment P5: PR-DA5 Runoff Area=145,975 sf 68.19% Impervious Runoff Depth>1.48"
Flow Length=1,208' Tc=6.7 min CN=79 Runoff=5.62 cfs 0.413 af

Subcatchment P6: PR-DA-6 Runoff Area=34,083 sf 11.09% Impervious Runoff Depth>0.03"
Tc=5.0 min UI Adjusted CN=42 Runoff=0.00 cfs 0.002 af

Subcatchment P7: PR-DA-7 Runoff Area=47,897 sf 26.54% Impervious Runoff Depth>0.10"
Tc=5.0 min UI Adjusted CN=47 Runoff=0.02 cfs 0.009 af

Subcatchment P8a: PR-DA8a Runoff Area=37,831 sf 61.05% Impervious Runoff Depth>1.22"
Flow Length=626' Tc=5.0 min CN=75 Runoff=1.25 cfs 0.089 af

Subcatchment P8b: PR-DA8b Runoff Area=36,807 sf 71.01% Impervious Runoff Depth>1.62"
Flow Length=432' Tc=5.0 min CN=81 Runoff=1.66 cfs 0.114 af

Subcatchment P9: PR-DA9 Runoff Area=45,880 sf 21.77% Impervious Runoff Depth>0.22"
Tc=5.0 min CN=52 Runoff=0.08 cfs 0.019 af

Reach DP-1: DP-1 Inflow=0.73 cfs 0.072 af
Outflow=0.73 cfs 0.072 af

Reach DP-2: DP-2 (JOSHUA'S BROOK) Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-3: DP-3 (STEWART'S CREEK) Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 41P: SC-740 Peak Elev=37.40' Storage=253 cf Inflow=0.39 cfs 0.030 af
Outflow=0.09 cfs 0.030 af

Pond 43P: SC-740 Peak Elev=19.50' Storage=0 cf Inflow=0.00 cfs 0.002 af
Outflow=0.00 cfs 0.002 af

Pond 45P: SC-740 Peak Elev=19.51' Storage=2 cf Inflow=0.02 cfs 0.009 af
Outflow=0.02 cfs 0.009 af

Pond B-1: Basin 1 Peak Elev=11.54' Storage=9,795 cf Inflow=7.28 cfs 0.504 af
Discarded=0.60 cfs 0.502 af Primary=0.00 cfs 0.000 af Outflow=0.60 cfs 0.502 af

Pond B-2: Basin 2 Peak Elev=16.12' Storage=5,210 cf Inflow=4.41 cfs 0.288 af
Discarded=0.49 cfs 0.287 af Primary=0.00 cfs 0.000 af Outflow=0.49 cfs 0.287 af

Pond BIO1: BIO 1 Peak Elev=19.69' Storage=448 cf Inflow=1.77 cfs 0.121 af
Discarded=0.06 cfs 0.048 af Primary=1.66 cfs 0.072 af Outflow=1.71 cfs 0.120 af

Pond BIO2: BIO 2 Peak Elev=22.82' Storage=1,433 cf Inflow=1.48 cfs 0.103 af
Discarded=0.12 cfs 0.089 af Primary=0.38 cfs 0.014 af Outflow=0.50 cfs 0.103 af

Pond BIO3: BIO-3 Peak Elev=23.68' Storage=695 cf Inflow=1.75 cfs 0.120 af
Discarded=0.08 cfs 0.063 af Primary=1.56 cfs 0.057 af Outflow=1.64 cfs 0.120 af

Pond P-B: POND B Peak Elev=2.76' Storage=671 cf Inflow=0.04 cfs 0.015 af
Outflow=0.00 cfs 0.000 af

Pond P-C: POND C Peak Elev=3.66' Storage=1,311 cf Inflow=0.08 cfs 0.030 af
Outflow=0.00 cfs 0.000 af

Pond P-D: POND D Peak Elev=8.12' Storage=899 cf Inflow=0.04 cfs 0.021 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 30.221 ac Runoff Volume = 1.333 af Average Runoff Depth = 0.53"
75.05% Pervious = 22.680 ac 24.95% Impervious = 7.541 ac

Summary for Subcatchment 28S: TYP ROOF SIZING

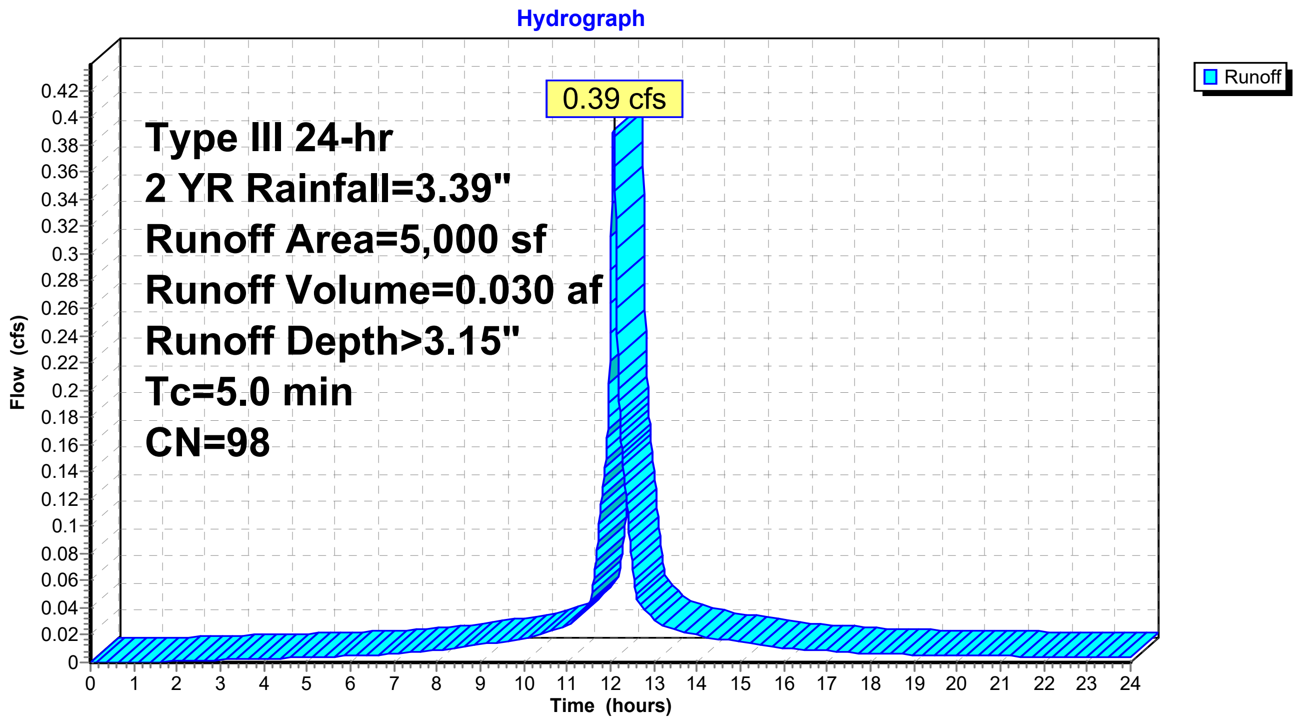
Runoff = 0.39 cfs @ 12.07 hrs, Volume= 0.030 af, Depth> 3.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
5,000	98	Roofs, HSG A
5,000		100.00% Impervious Area

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

Subcatchment 28S: TYP ROOF SIZING



Summary for Subcatchment BIO-1: BIO-1

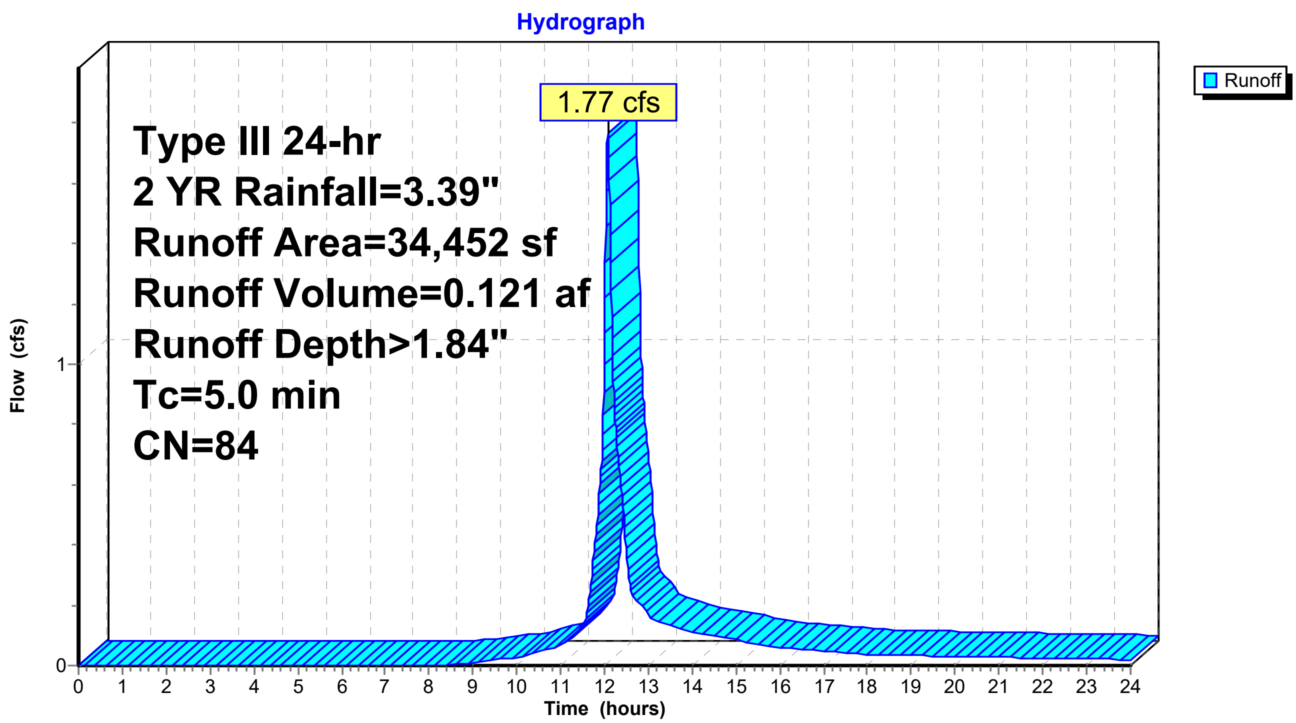
Runoff = 1.77 cfs @ 12.08 hrs, Volume= 0.121 af, Depth> 1.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
8,092	39	>75% Grass cover, Good, HSG A
26,360	98	Paved parking, HSG A
34,452	84	Weighted Average
8,092		23.49% Pervious Area
26,360		76.51% Impervious Area

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

Subcatchment BIO-1: BIO-1



Summary for Subcatchment BIO-2: BIO-2

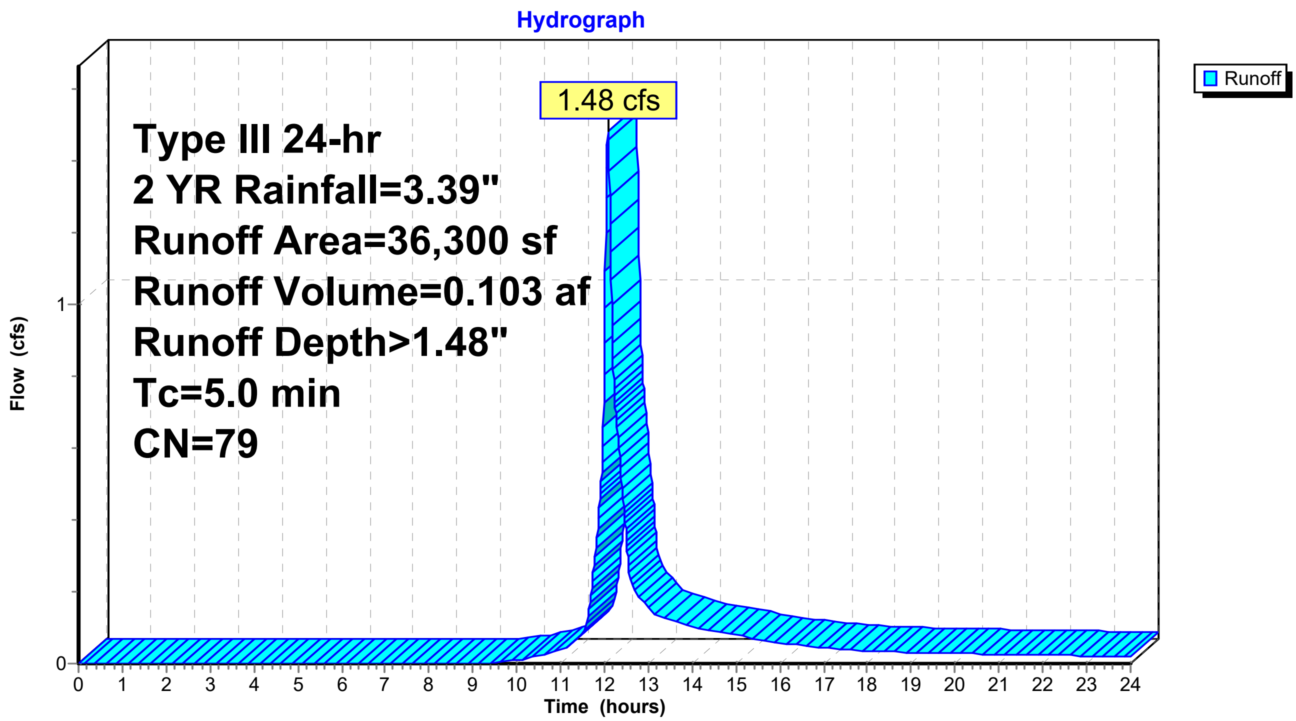
Runoff = 1.48 cfs @ 12.08 hrs, Volume= 0.103 af, Depth> 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
11,530	39	>75% Grass cover, Good, HSG A
24,660	98	Paved parking, HSG A
110	98	Roofs, HSG A
36,300	79	Weighted Average
11,530		31.76% Pervious Area
24,770		68.24% Impervious Area

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

Subcatchment BIO-2: BIO-2



Summary for Subcatchment BIO-3: BIO-3

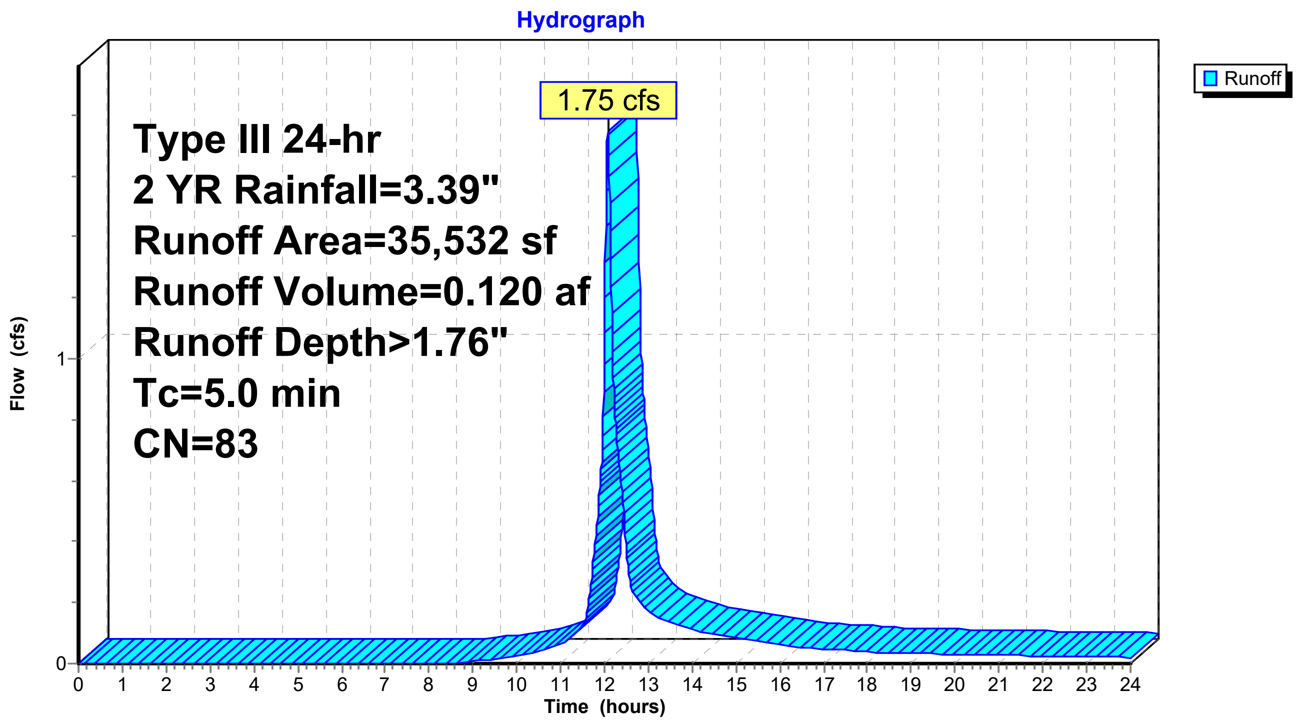
Runoff = 1.75 cfs @ 12.08 hrs, Volume= 0.120 af, Depth> 1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
8,819	39	>75% Grass cover, Good, HSG A
26,493	98	Paved parking, HSG A
220	98	Roofs, HSG A
35,532	83	Weighted Average
8,819		24.82% Pervious Area
26,713		75.18% Impervious Area

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

Subcatchment BIO-3: BIO-3



Summary for Subcatchment P10: PR-DA-10

[45] Hint: Runoff=Zero

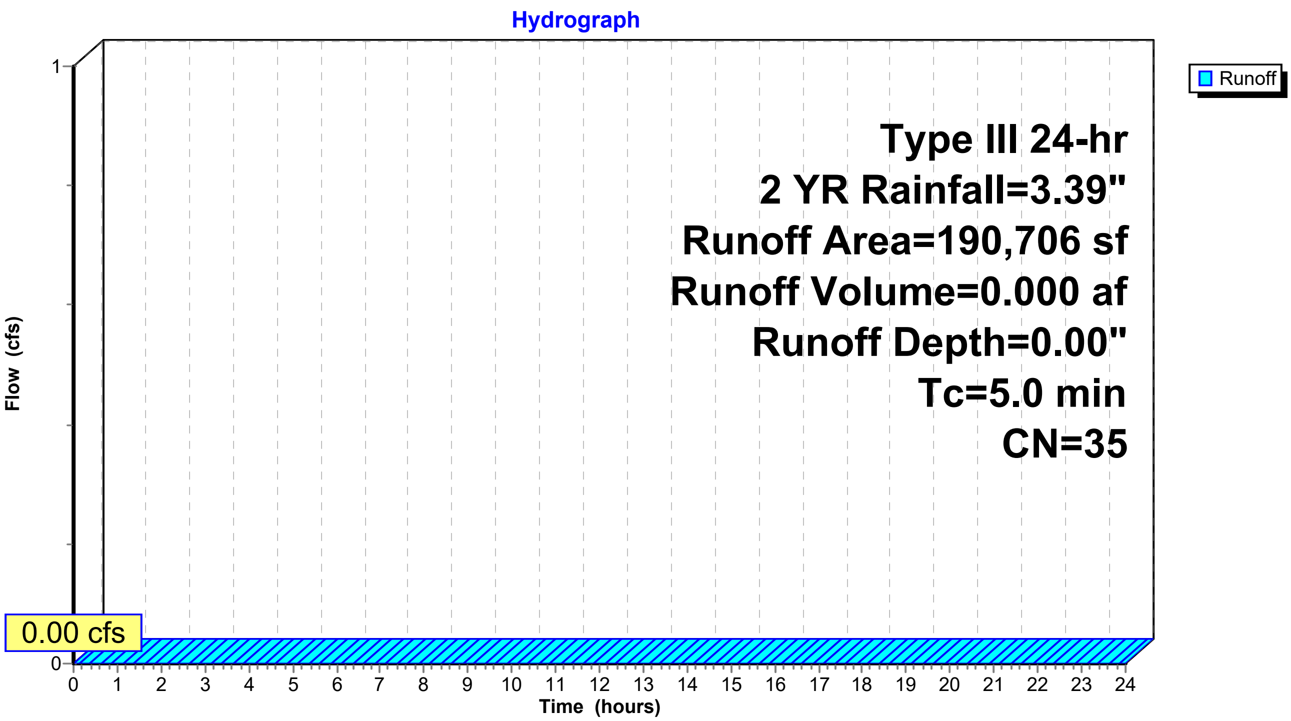
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
90,801	39	>75% Grass cover, Good, HSG A
99,905	32	Woods/grass comb., Good, HSG A
190,706	35	Weighted Average
190,706		100.00% Pervious Area

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

Subcatchment P10: PR-DA-10



Summary for Subcatchment P11: PR-DA11

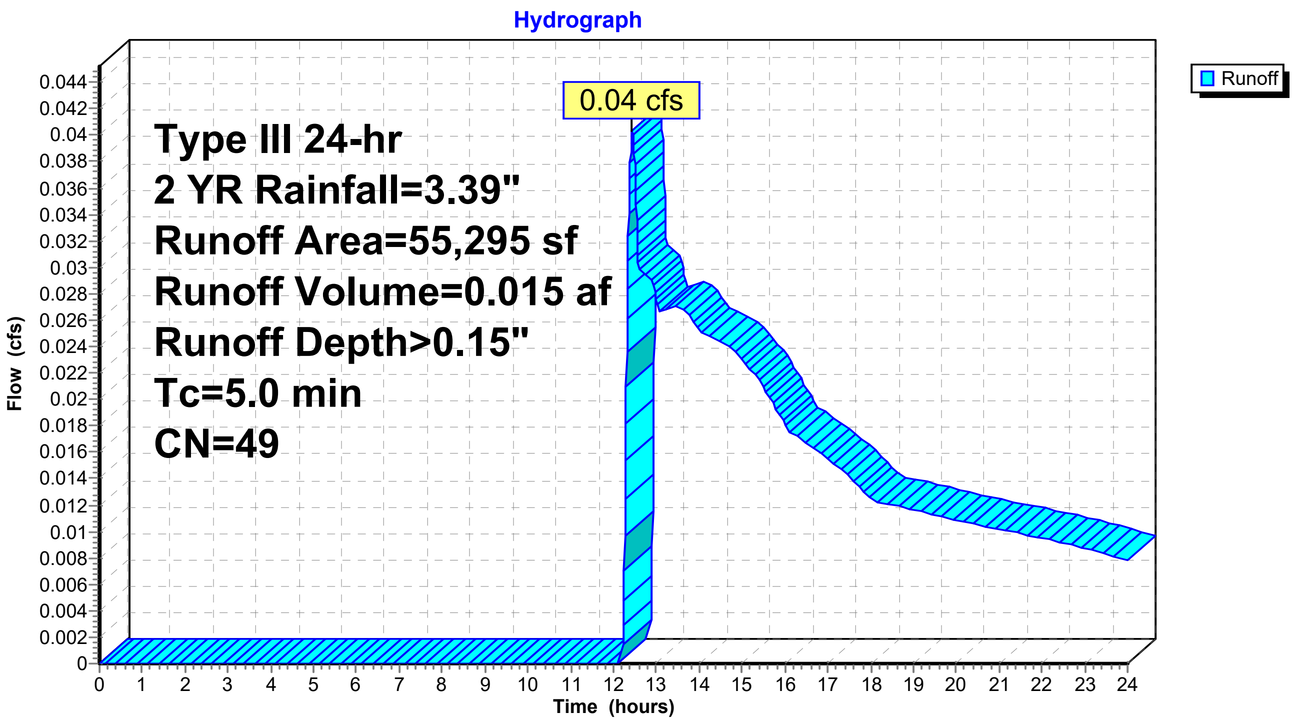
Runoff = 0.04 cfs @ 12.44 hrs, Volume= 0.015 af, Depth> 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
39,962	39	>75% Grass cover, Good, HSG A
5,060	30	Woods, Good, HSG A
10,273	98	Water Surface, 0% imp, HSG A
0	98	Paved parking, HSG A
55,295	49	Weighted Average
55,295		100.00% Pervious Area

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

Subcatchment P11: PR-DA11



Summary for Subcatchment P12: PR-DA12

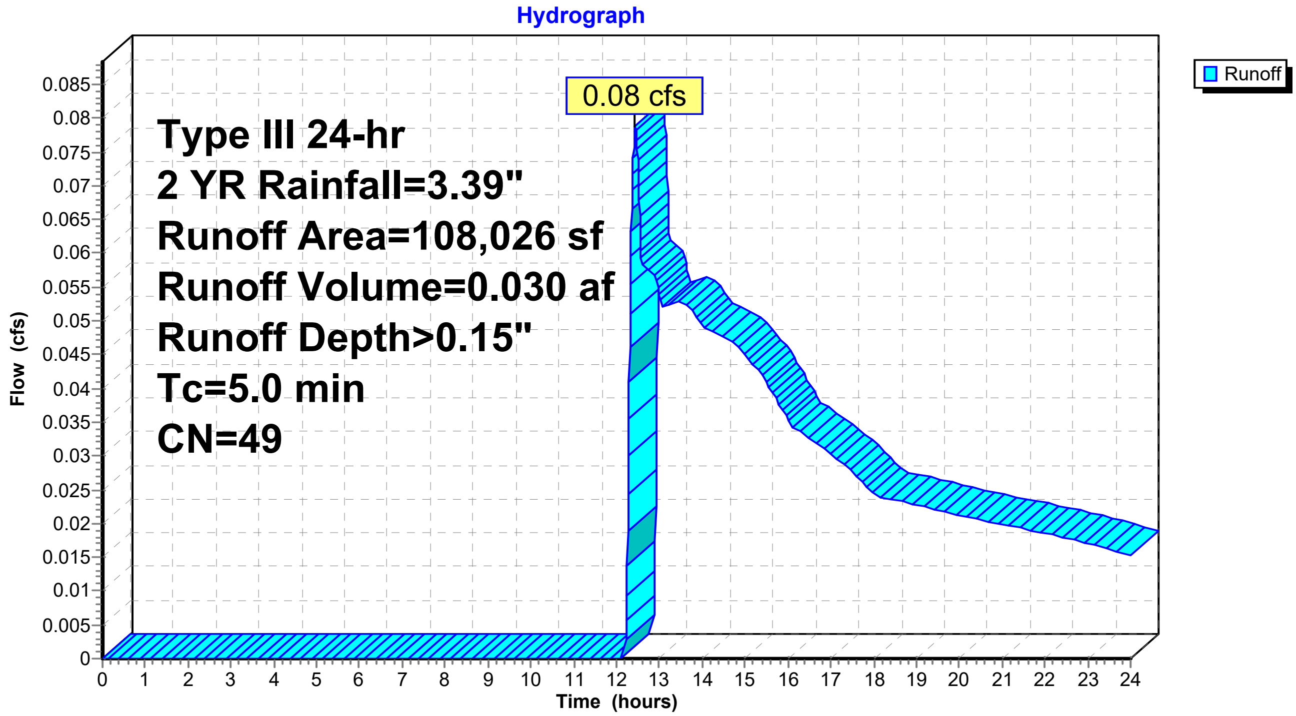
Runoff = 0.08 cfs @ 12.44 hrs, Volume= 0.030 af, Depth> 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
74,064	39	>75% Grass cover, Good, HSG A
13,150	30	Woods, Good, HSG A
20,812	98	Water Surface, 0% imp, HSG A
0	98	Paved parking, HSG A
108,026	49	Weighted Average
108,026		100.00% Pervious Area

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

Subcatchment P12: PR-DA12



Summary for Subcatchment P13: PR-DA-13

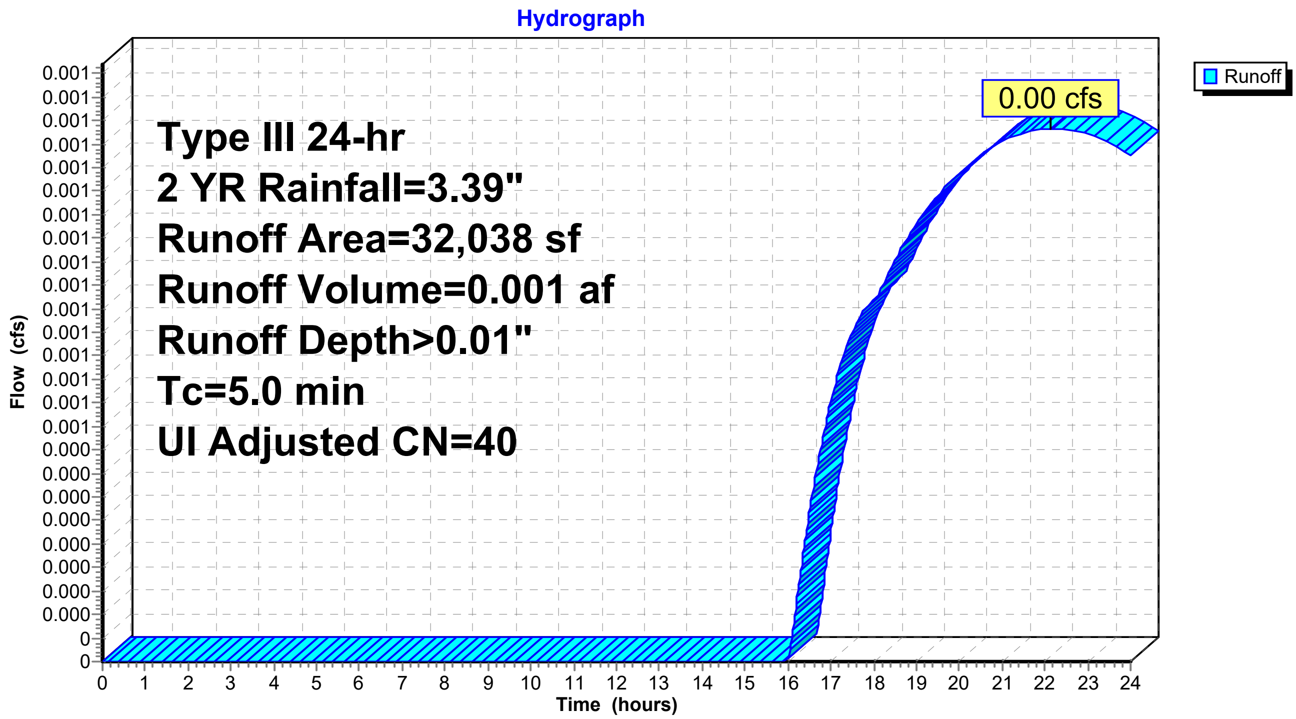
Runoff = 0.00 cfs @ 22.15 hrs, Volume= 0.001 af, Depth> 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Adj	Description
	30,218	39		>75% Grass cover, Good, HSG A
*	1,270	98		Unconnected Impervious, HSG A
	550	30		Woods, Good, HSG A
	32,038	41	40	Weighted Average, UI Adjusted
	30,768			96.04% Pervious Area
	1,270			3.96% Impervious Area
	1,270			100.00% Unconnected

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

Subcatchment P13: PR-DA-13



Summary for Subcatchment P14: PR-DA-14

[45] Hint: Runoff=Zero

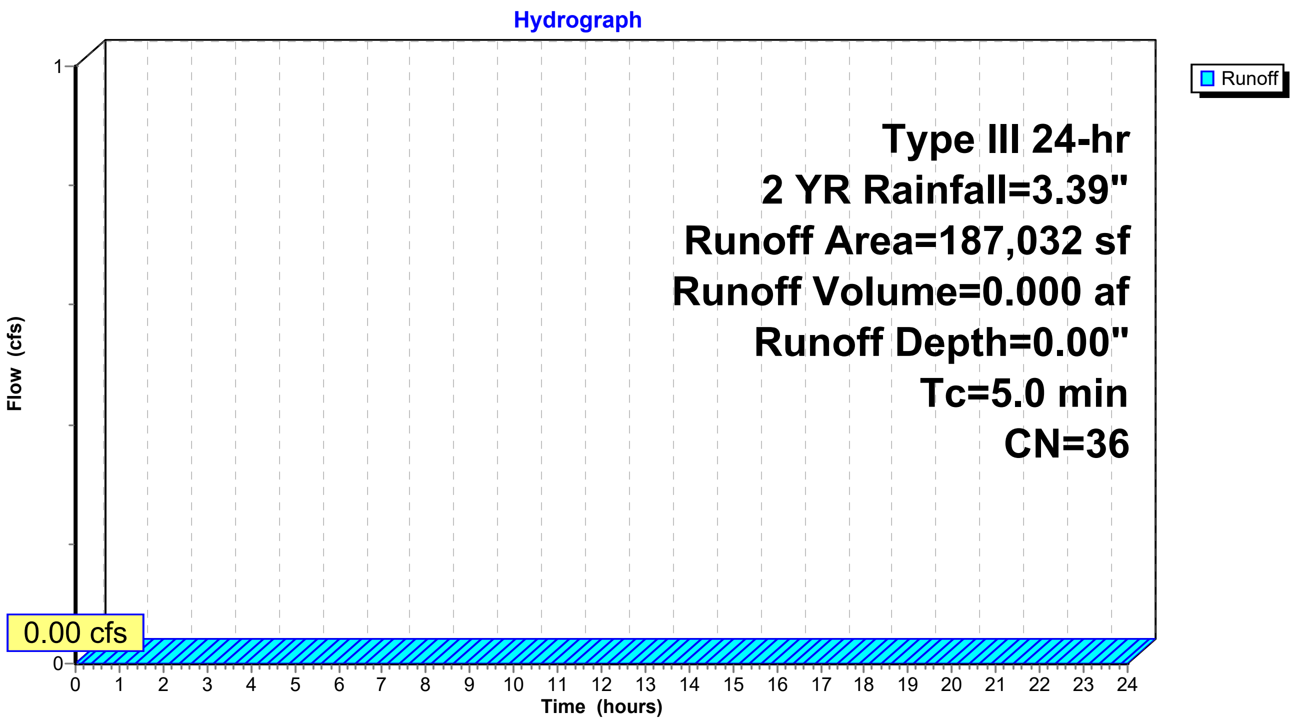
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
124,219	39	>75% Grass cover, Good, HSG A
62,813	30	Woods, Good, HSG A
187,032	36	Weighted Average
187,032		100.00% Pervious Area

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

Subcatchment P14: PR-DA-14



Summary for Subcatchment P1a: PR-DA-1a

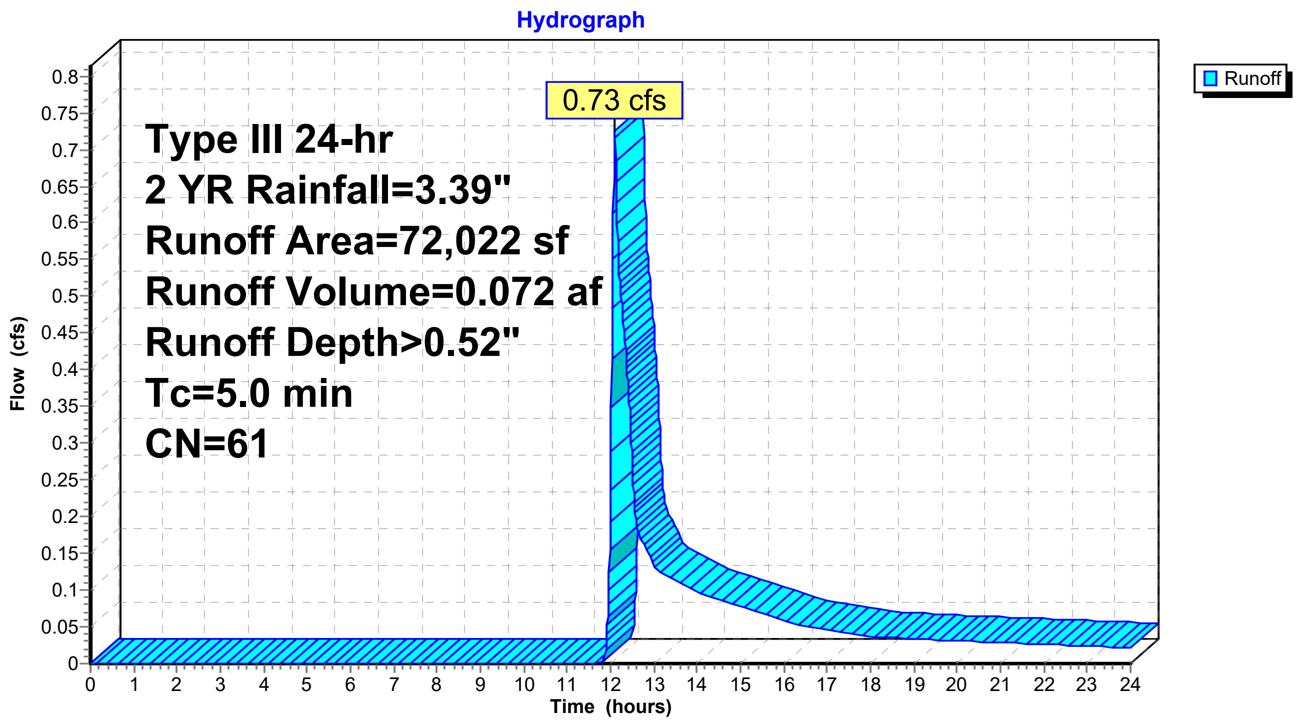
Runoff = 0.73 cfs @ 12.10 hrs, Volume= 0.072 af, Depth> 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
44,791	39	>75% Grass cover, Good, HSG A
20,190	98	Paved parking, HSG A
7,041	98	Water Surface, 0% imp, HSG A
72,022	61	Weighted Average
51,832		71.97% Pervious Area
20,190		28.03% Impervious Area

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

Subcatchment P1a: PR-DA-1a



Summary for Subcatchment P1b: PR-DA-1b

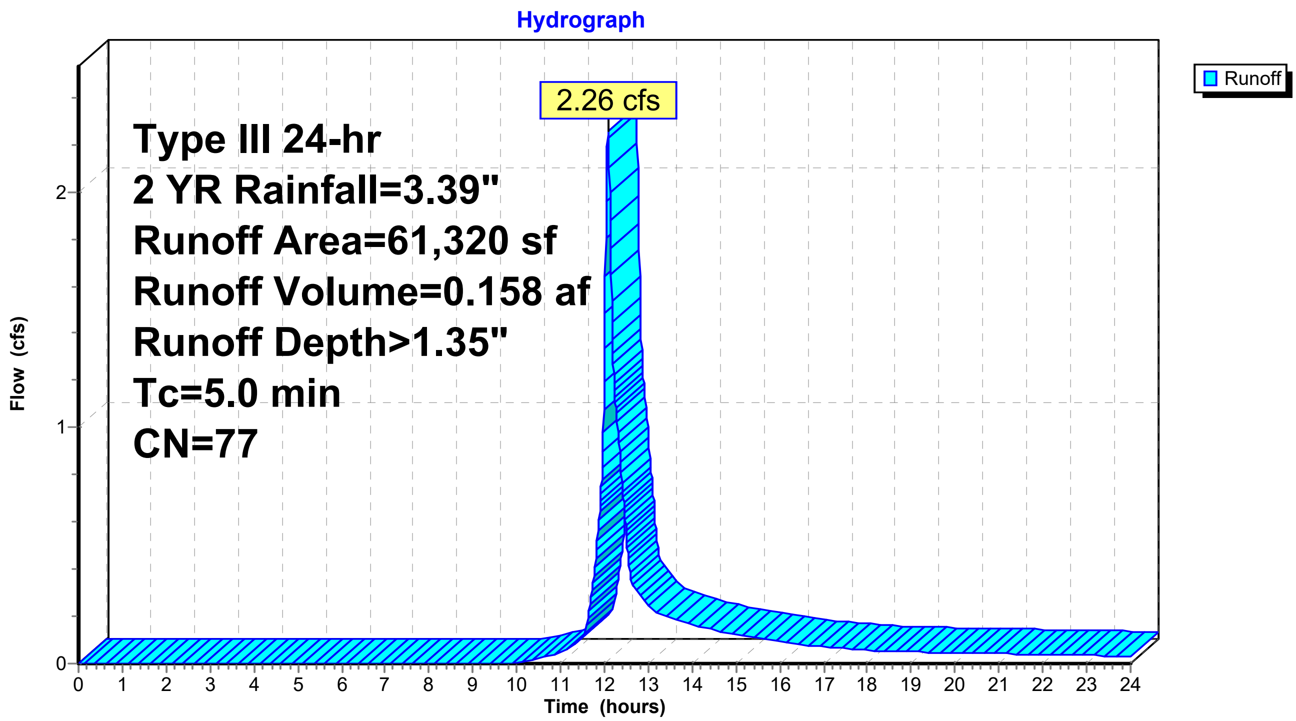
Runoff = 2.26 cfs @ 12.08 hrs, Volume= 0.158 af, Depth> 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	21,600	39	>75% Grass cover, Good, HSG A
*	39,720	98	Unconnected Impervious, HSG A
	61,320	77	Weighted Average
	21,600		35.23% Pervious Area
	39,720		64.77% Impervious Area
	39,720		100.00% Unconnected

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

Subcatchment P1b: PR-DA-1b



Summary for Subcatchment P2: PR-DA-2

[73] Warning: Peak may fall outside time span

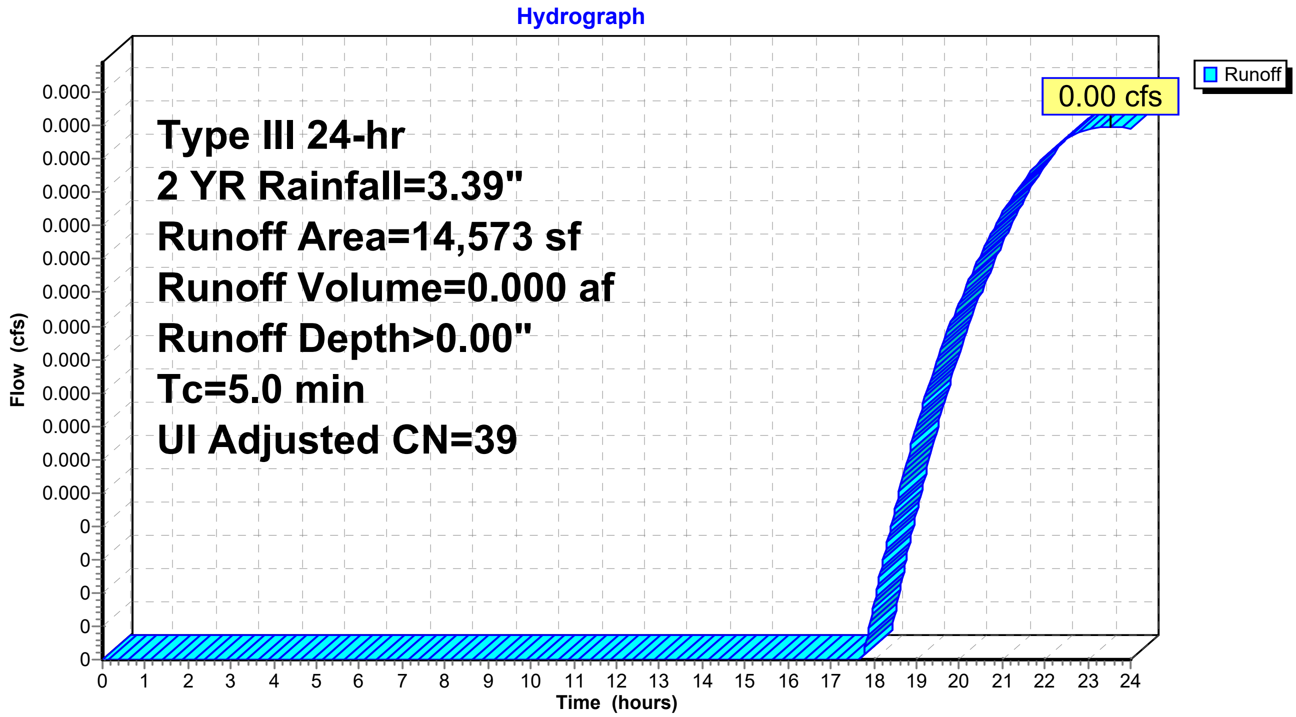
Runoff = 0.00 cfs @ 23.55 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Adj	Description
	14,431	39		>75% Grass cover, Good, HSG A
*	142	98		Unconnected Impervious, HSG A
	14,573	40	39	Weighted Average, UI Adjusted
	14,431			99.03% Pervious Area
	142			0.97% Impervious Area
	142			100.00% Unconnected

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

Subcatchment P2: PR-DA-2



Summary for Subcatchment P3: PR-DA-3

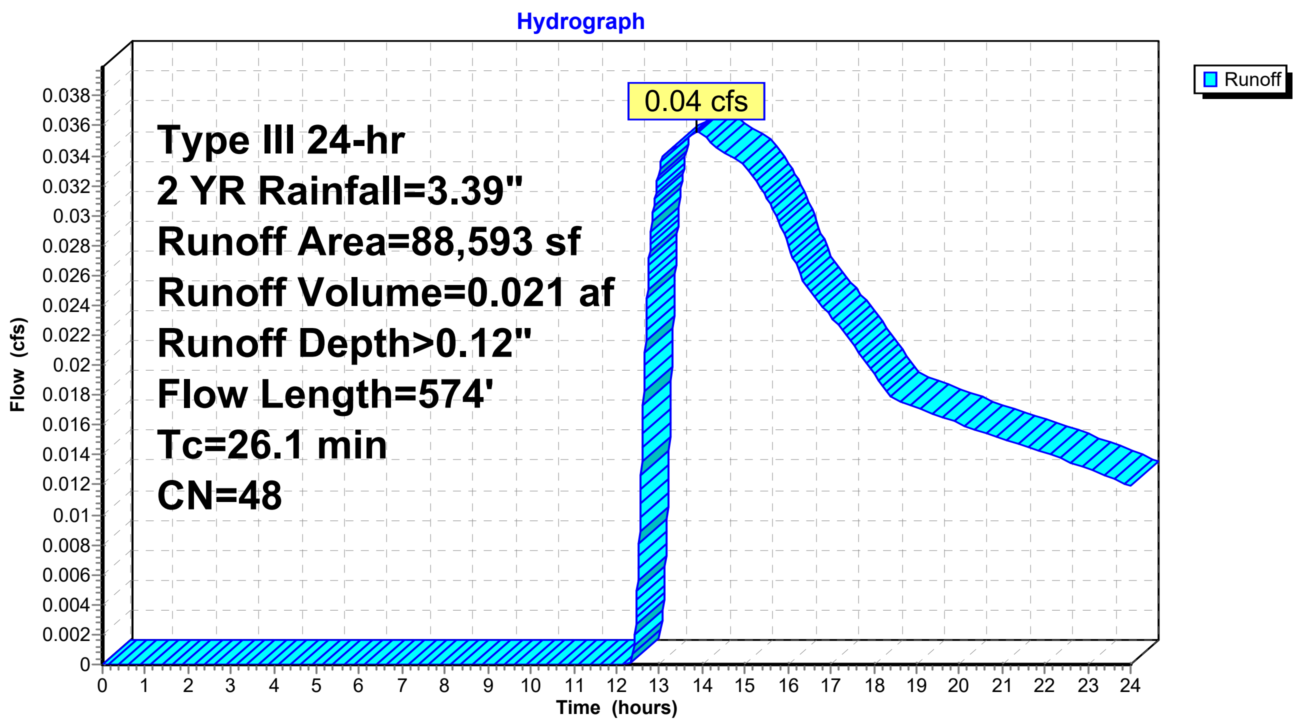
Runoff = 0.04 cfs @ 13.89 hrs, Volume= 0.021 af, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
72,419	39	>75% Grass cover, Good, HSG A
7,200	76	Gravel roads, HSG A
8,974	98	Water Surface, 0% imp, HSG A
88,593	48	Weighted Average
88,593		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	50	0.0380	0.20		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
20.8	400	0.0021	0.32		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	74	0.0270	2.65		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.6	50	0.0400	1.40		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
26.1	574	Total			

Subcatchment P3: PR-DA-3



Summary for Subcatchment P4: PR-DA4

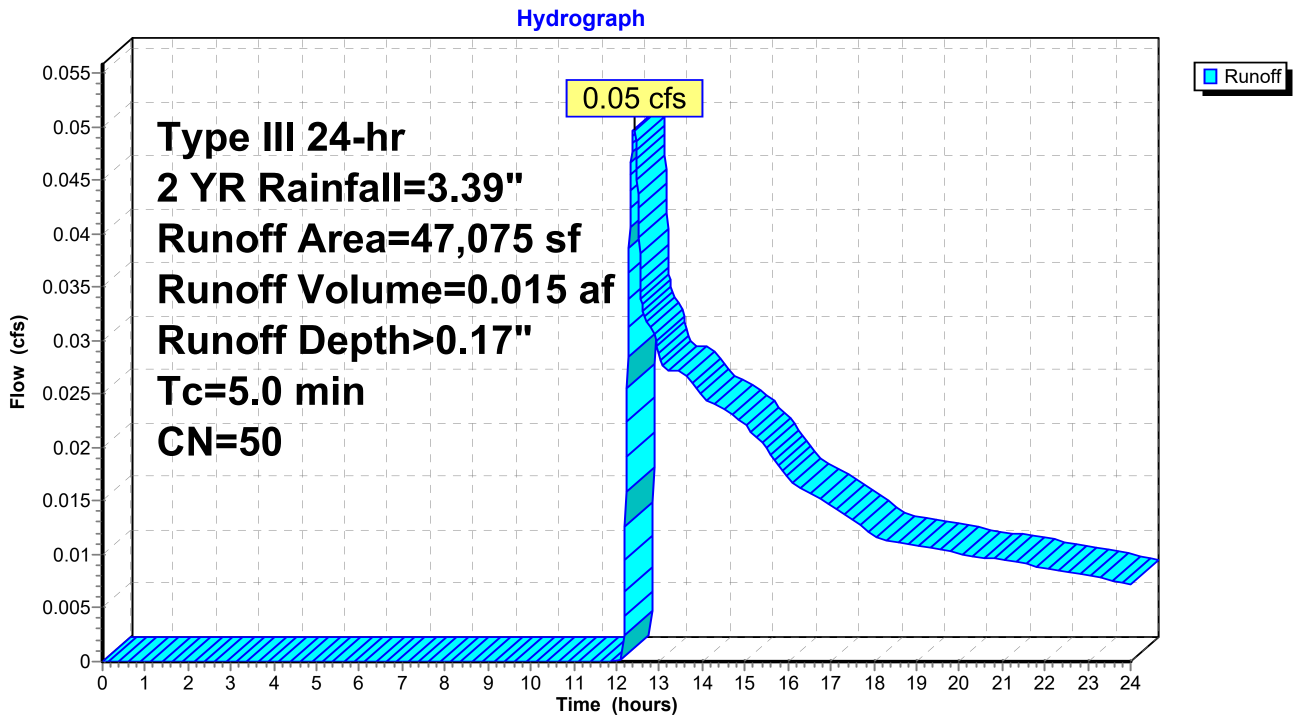
Runoff = 0.05 cfs @ 12.41 hrs, Volume= 0.015 af, Depth> 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	38,011	39	>75% Grass cover, Good, HSG A
*	500	98	Unconnected impervious, HSG A
	8,564	98	Stormwater Basin; Water Surface, HSG A
	47,075	50	Weighted Average
	38,011		80.75% Pervious Area
	9,064		19.25% Impervious Area
	500		5.52% Unconnected

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

Subcatchment P4: PR-DA4



Summary for Subcatchment P5: PR-DA5

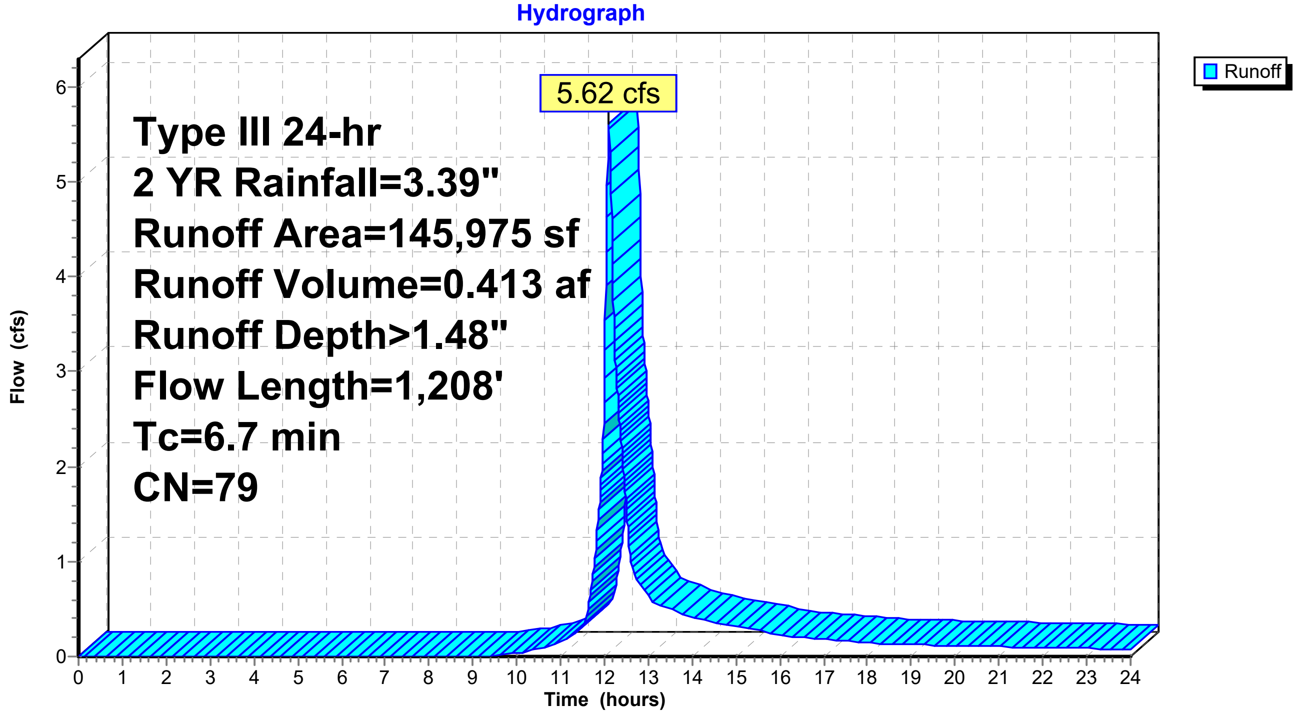
Runoff = 5.62 cfs @ 12.10 hrs, Volume= 0.413 af, Depth> 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
46,436	39	>75% Grass cover, Good, HSG A
98,201	98	Paved parking, HSG A
1,338	98	Unconnected roofs, HSG A
145,975	79	Weighted Average
46,436		31.81% Pervious Area
99,539		68.19% Impervious Area
1,338		1.34% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
1.1	130	0.0100	2.03		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
1.3	243	0.0050	3.21	2.52	**Pipe Channel, C-D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
2.4	525	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
1.0	260	0.0050	4.20	7.43	**Pipe Channel, E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
6.7	1,208	Total			

Subcatchment P5: PR-DA5



Summary for Subcatchment P6: PR-DA-6

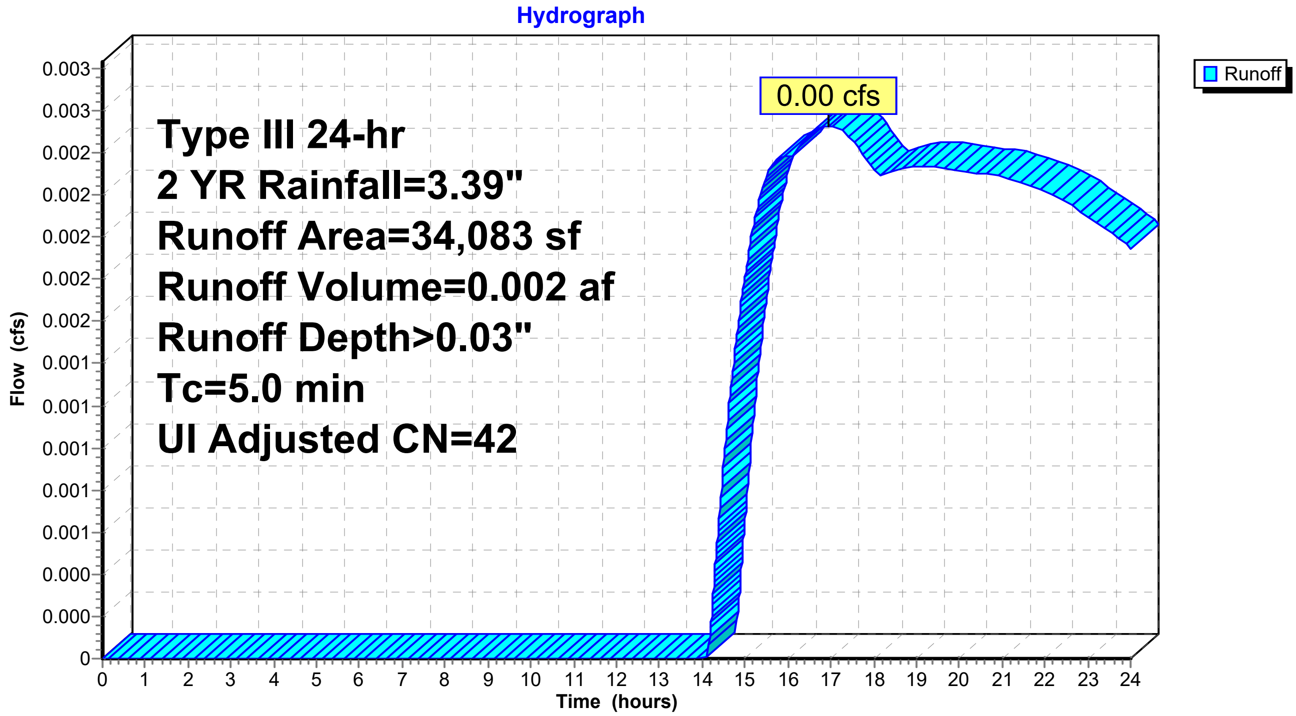
Runoff = 0.00 cfs @ 16.94 hrs, Volume= 0.002 af, Depth> 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Adj	Description
	30,303	39		>75% Grass cover, Good, HSG A
*	3,780	98		Unconnected Impervious, HSG A
	34,083	46	42	Weighted Average, UI Adjusted
	30,303			88.91% Pervious Area
	3,780			11.09% Impervious Area
	3,780			100.00% Unconnected

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

Subcatchment P6: PR-DA-6



Summary for Subcatchment P7: PR-DA-7

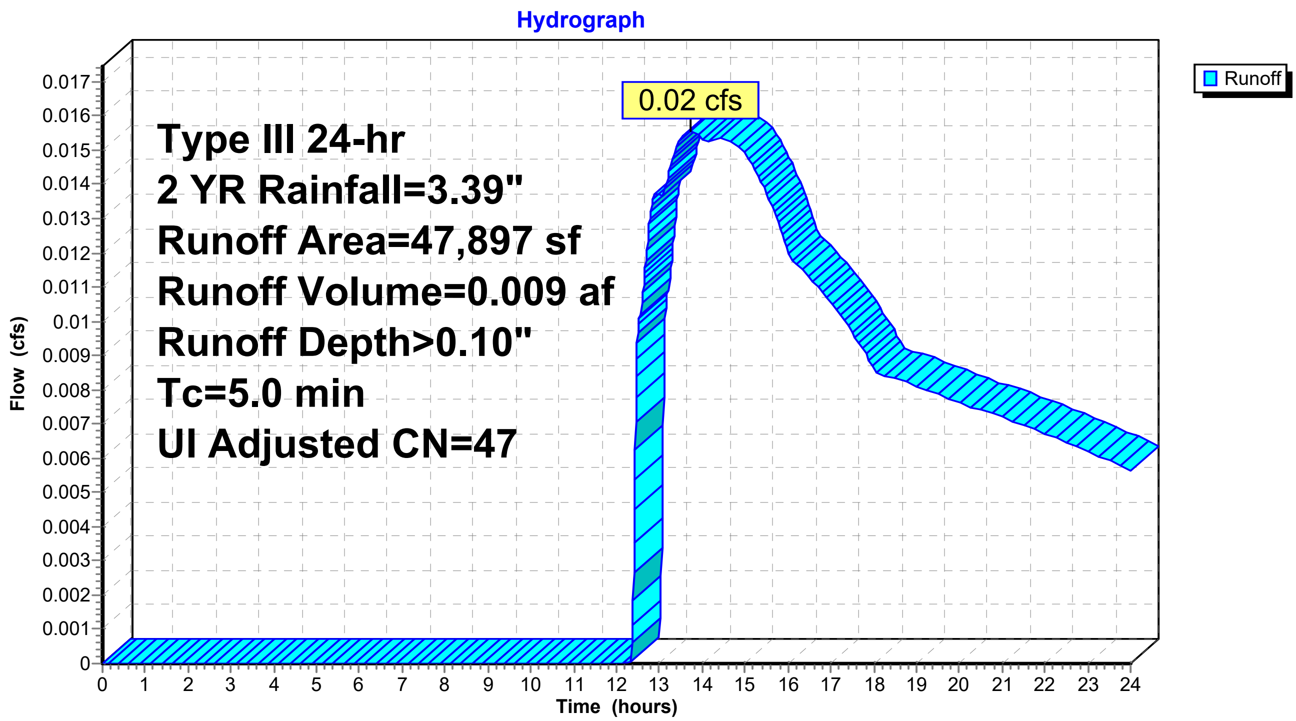
Runoff = 0.02 cfs @ 13.75 hrs, Volume= 0.009 af, Depth> 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Adj	Description
	35,185	39		>75% Grass cover, Good, HSG A
*	12,712	98		Unconnected Impervious, HSG A
	47,897	55	47	Weighted Average, UI Adjusted
	35,185			73.46% Pervious Area
	12,712			26.54% Impervious Area
	12,712			100.00% Unconnected

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

Subcatchment P7: PR-DA-7



Summary for Subcatchment P8a: PR-DA8a

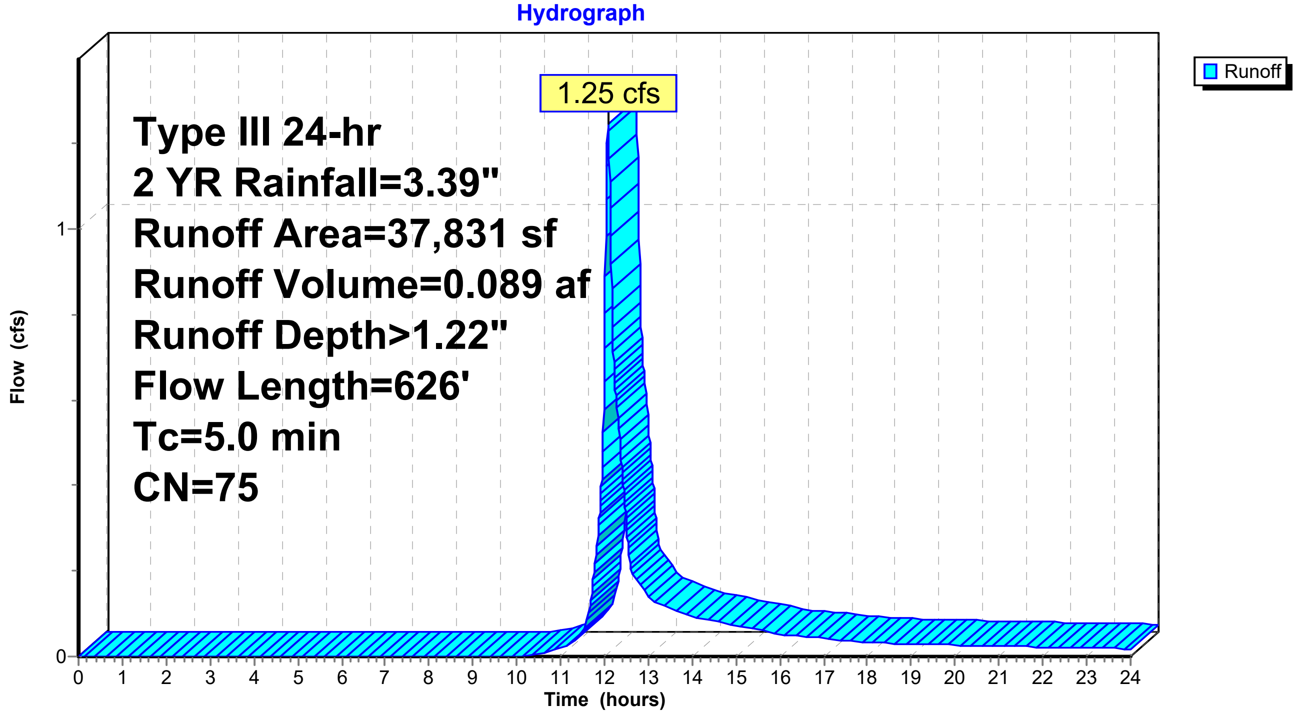
Runoff = 1.25 cfs @ 12.08 hrs, Volume= 0.089 af, Depth> 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
14,737	39	>75% Grass cover, Good, HSG A
22,874	98	Paved parking, HSG A
220	98	Roofs, HSG A
37,831	75	Weighted Average
14,737		38.95% Pervious Area
23,094		61.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
1.1	137	0.0100	2.03		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	48	0.0050	3.21	2.52	**Pipe Channel, C-D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
1.1	241	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.5	150	0.0060	4.60	8.14	**Pipe Channel, E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
1.2					**Direct Entry, Added Tc**
5.0	626	Total			

Subcatchment P8a: PR-DA8a



Summary for Subcatchment P8b: PR-DA8b

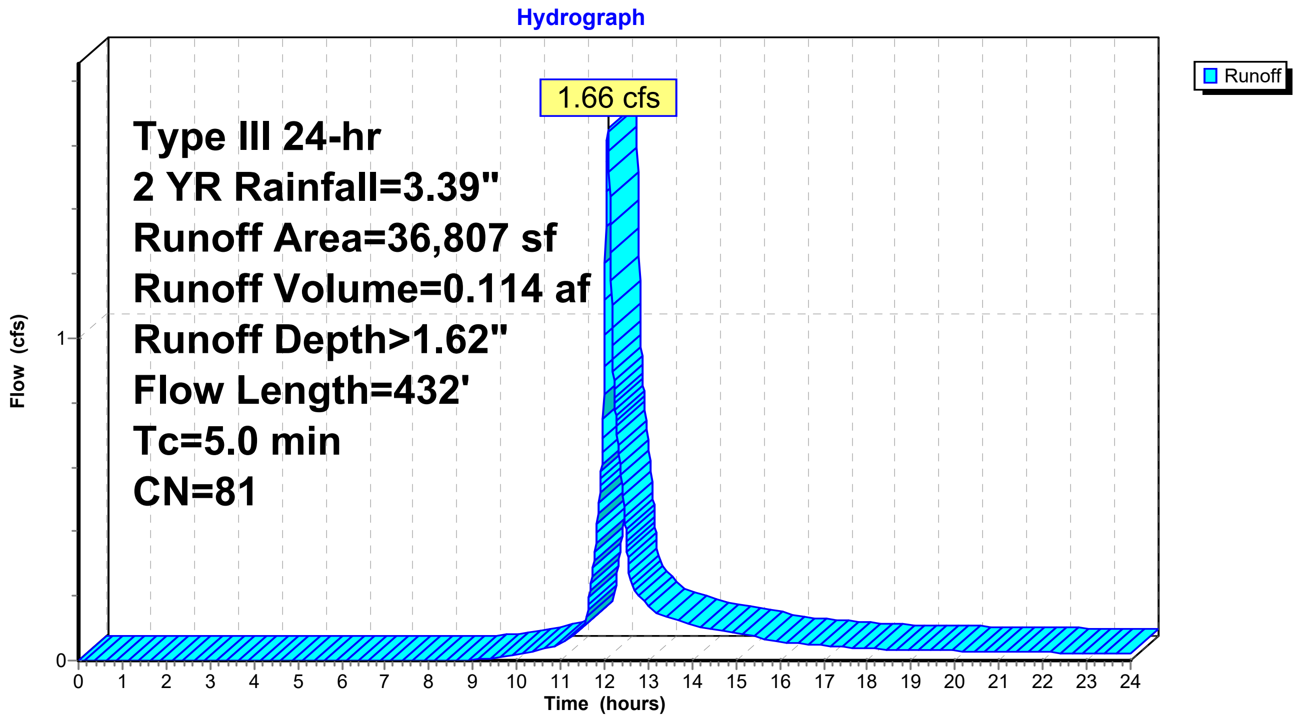
Runoff = 1.66 cfs @ 12.08 hrs, Volume= 0.114 af, Depth> 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

Area (sf)	CN	Description
10,671	39	>75% Grass cover, Good, HSG A
25,176	98	Paved parking, HSG A
960	98	Roofs, HSG A
36,807	81	Weighted Average
10,671		28.99% Pervious Area
26,136		71.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	86	0.0100	1.04		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
0.7	196	0.0100	4.54	3.56	**Pipe Channel, B-C** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.5	150	0.0060	4.60	8.14	**Pipe Channel, C-D** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
2.4					**Direct Entry, Added Tc**
5.0	432	Total			

Subcatchment P8b: PR-DA8b



Summary for Subcatchment P9: PR-DA9

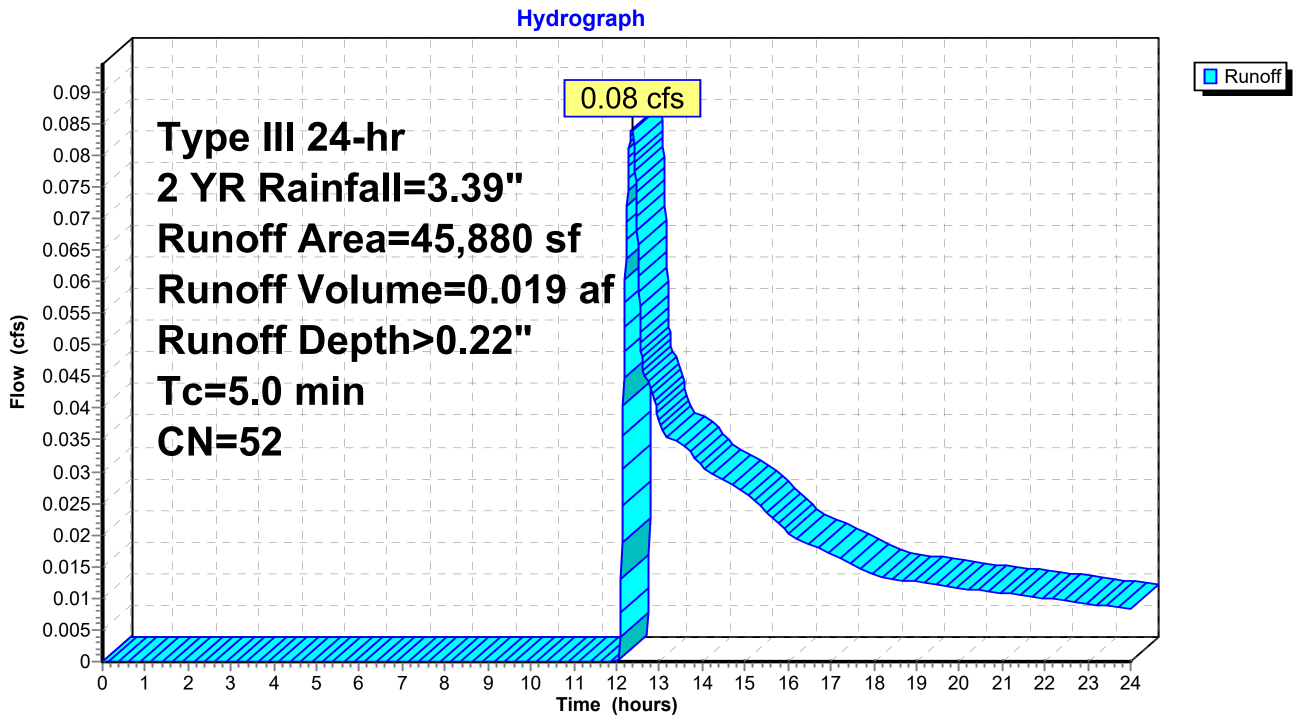
Runoff = 0.08 cfs @ 12.35 hrs, Volume= 0.019 af, Depth> 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.39"

	Area (sf)	CN	Description
	35,890	39	>75% Grass cover, Good, HSG A
*	380	98	Unconnected impervious, HSG A
	9,610	98	Stormwater Basin; Water Surface, HSG A
	45,880	52	Weighted Average
	35,890		78.23% Pervious Area
	9,990		21.77% Impervious Area
	380		3.80% Unconnected

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

Subcatchment P9: PR-DA9



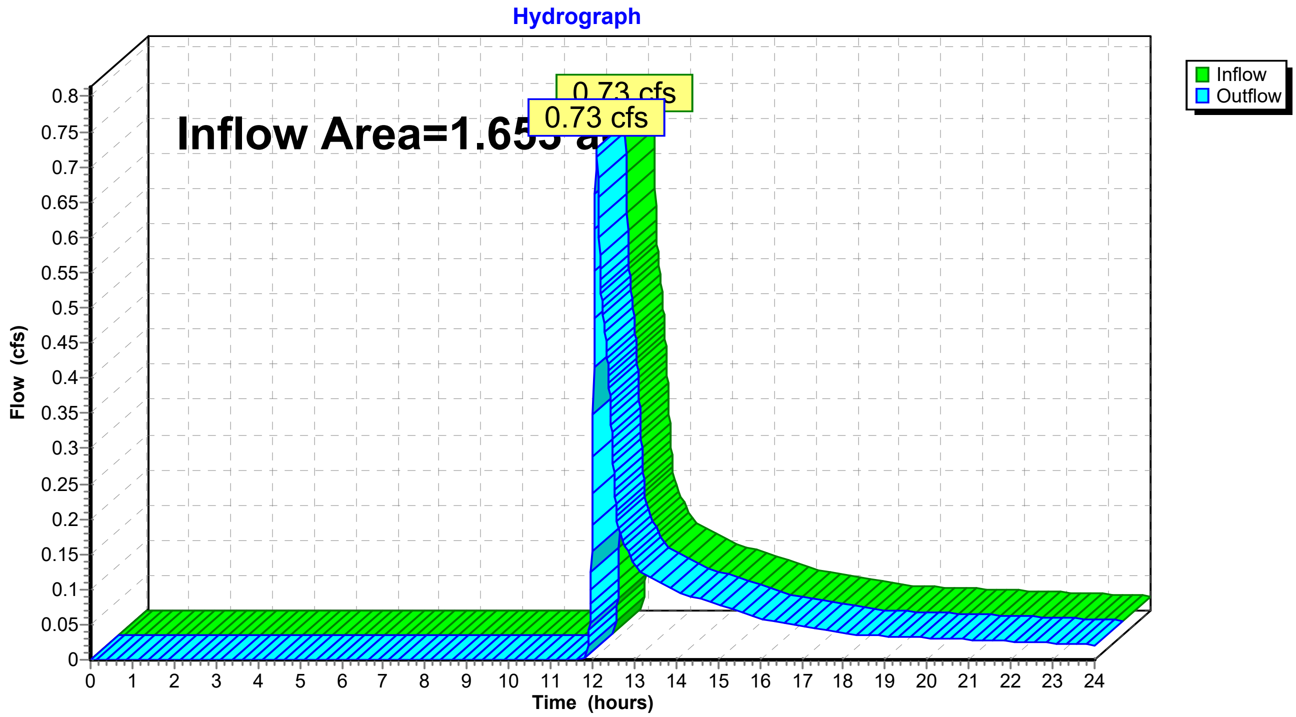
Summary for Reach DP-1: DP-1

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

Inflow Area = 1.653 ac, 28.03% Impervious, Inflow Depth > 0.52" for 2 YR event
Inflow = 0.73 cfs @ 12.10 hrs, Volume= 0.072 af
Outflow = 0.73 cfs @ 12.10 hrs, Volume= 0.072 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-1: DP-1

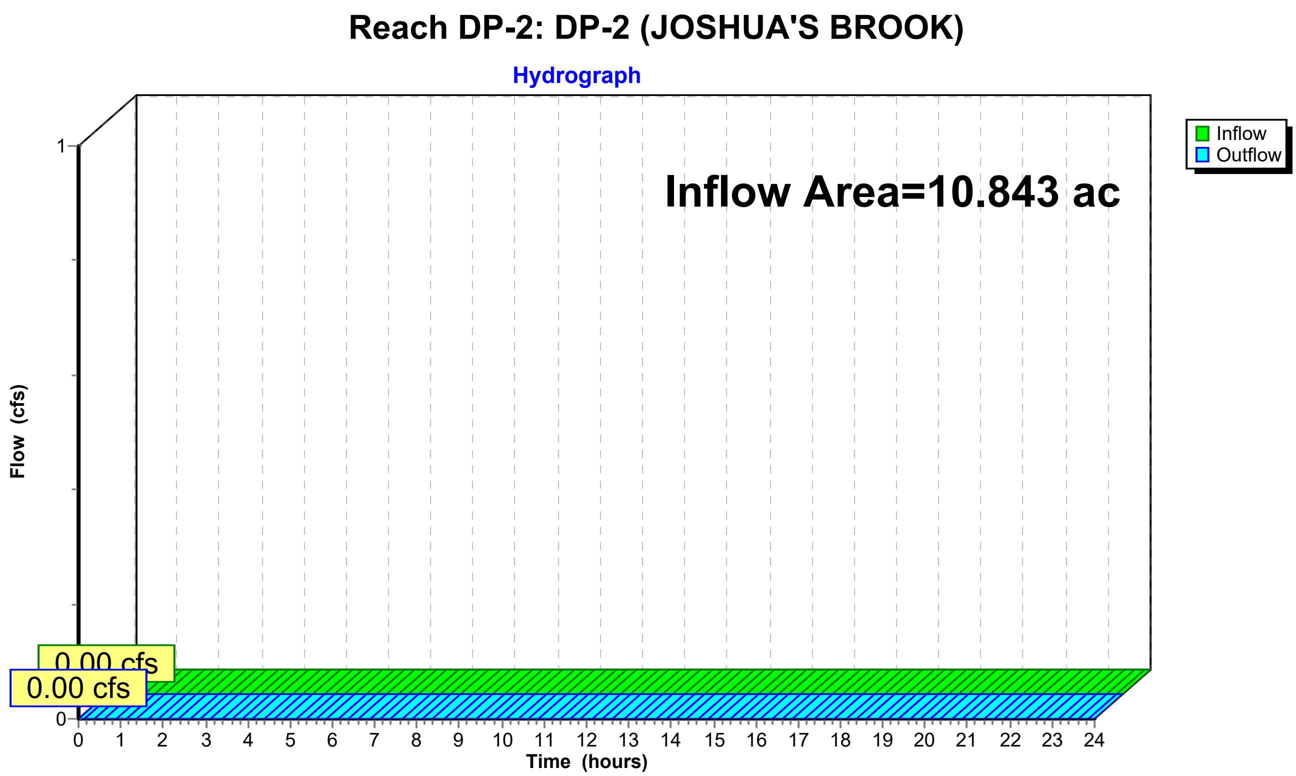


Summary for Reach DP-2: DP-2 (JOSHUA'S BROOK)

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

Inflow Area = 10.843 ac, 28.77% Impervious, Inflow Depth = 0.00" for 2 YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

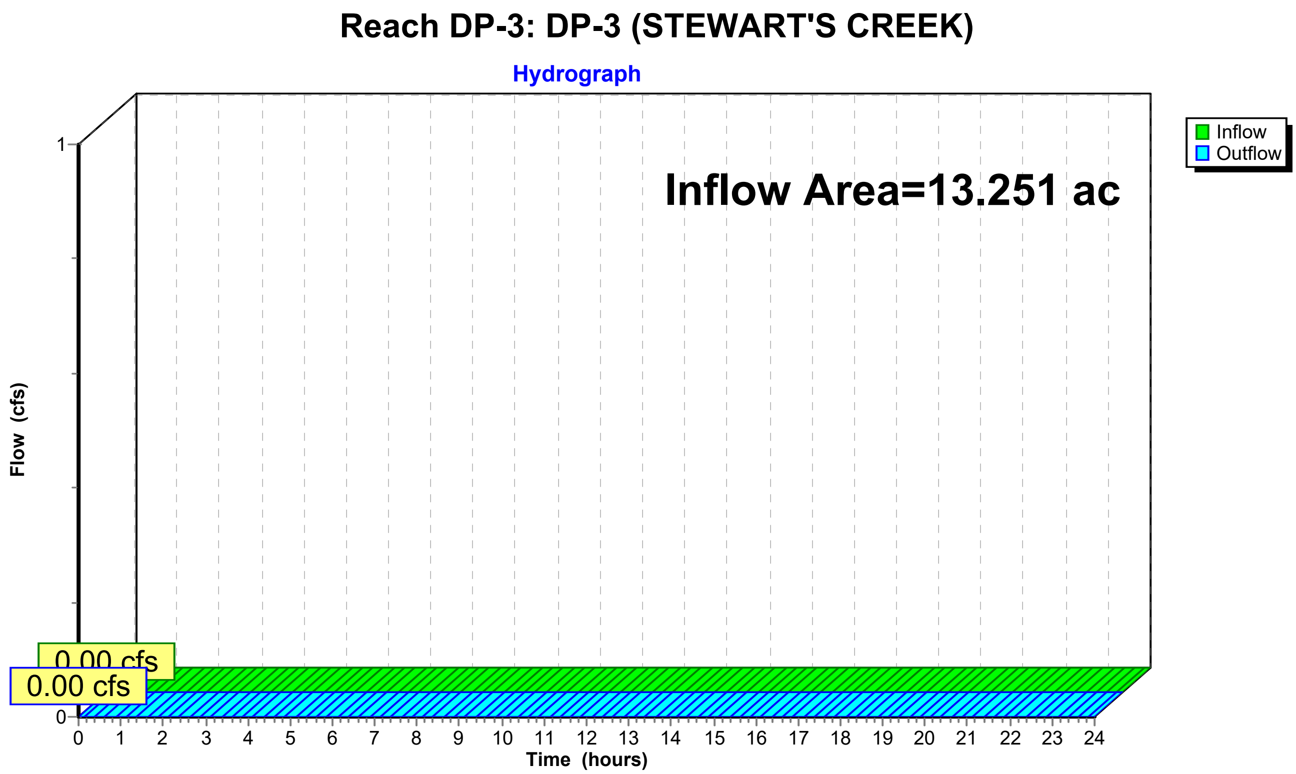


Summary for Reach DP-3: DP-3 (STEWART'S CREEK)

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

Inflow Area = 13.251 ac, 19.02% Impervious, Inflow Depth = 0.00" for 2 YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



Summary for Pond 41P: SC-740

Inflow Area = 0.115 ac,100.00% Impervious, Inflow Depth > 3.15" for 2 YR event
Inflow = 0.39 cfs @ 12.07 hrs, Volume= 0.030 af
Outflow = 0.09 cfs @ 11.75 hrs, Volume= 0.030 af, Atten= 76%, Lag= 0.0 min
Discarded = 0.09 cfs @ 11.75 hrs, Volume= 0.030 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 37.40' @ 12.44 hrs Surf.Area= 492 sf Storage= 253 cf

Plug-Flow detention time= 12.7 min calculated for 0.030 af (100% of inflow)
Center-of-Mass det. time= 12.6 min (766.4 - 753.8)

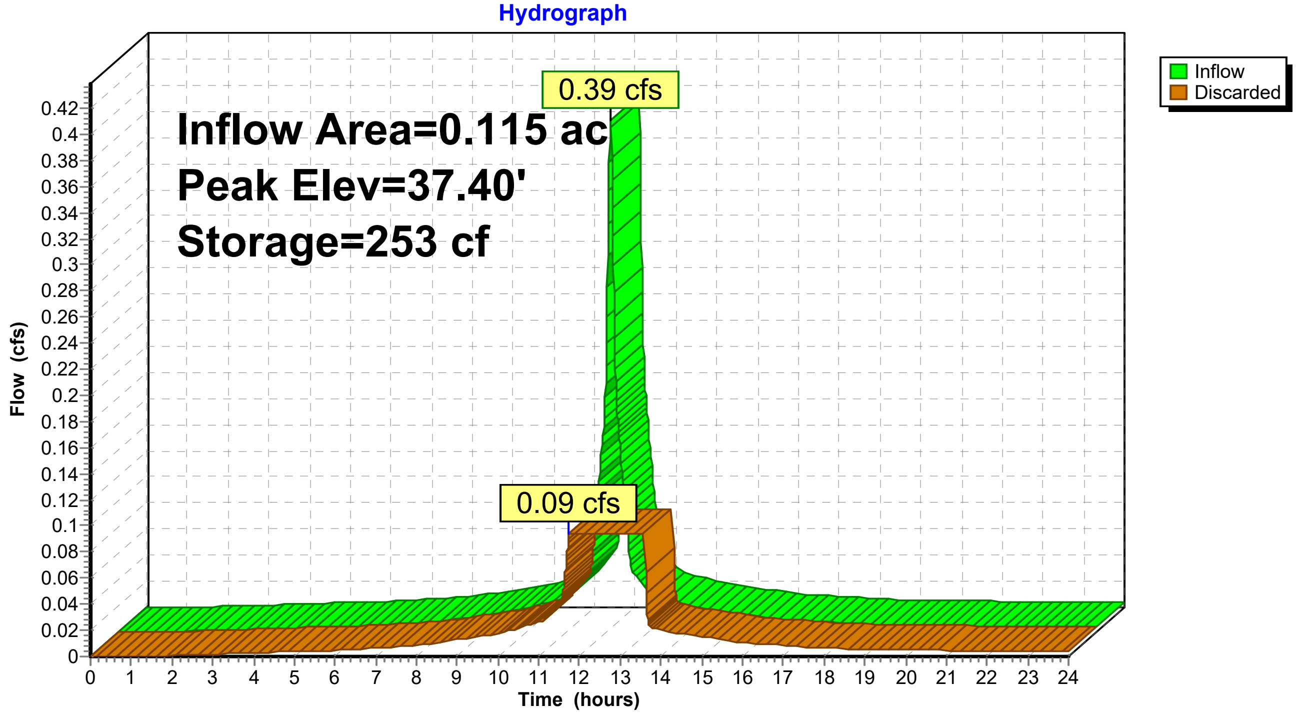
Volume	Invert	Avail.Storage	Storage Description
#1	36.50'	468 cf	**Stone (Prismatic)** Listed below (Recalc) 1,722 cf Overall - 551 cf Embedded = 1,171 cf x 40.0% Voids
#2	37.00'	551 cf	**ADS_StormTech SC-740 +Cap** x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 6 Chambers
		1,020 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
36.50	492	0	0
40.00	492	1,722	1,722

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.09 cfs @ 11.75 hrs HW=36.54' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Pond 41P: SC-740



Summary for Pond 43P: SC-740

Inflow Area = 0.782 ac, 11.09% Impervious, Inflow Depth > 0.03" for 2 YR event
Inflow = 0.00 cfs @ 16.94 hrs, Volume= 0.002 af
Outflow = 0.00 cfs @ 16.96 hrs, Volume= 0.002 af, Atten= 0%, Lag= 1.2 min
Discarded = 0.00 cfs @ 16.96 hrs, Volume= 0.002 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 19.50' @ 16.96 hrs Surf.Area= 256 sf Storage= 0 cf

Plug-Flow detention time= 2.1 min calculated for 0.002 af (100% of inflow)
Center-of-Mass det. time= 1.2 min (1,153.7 - 1,152.5)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	248 cf	**Stone (Prismatic)** Listed below (Recalc) 896 cf Overall - 276 cf Embedded = 620 cf x 40.0% Voids
#2	20.00'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 3 Chambers
#3	24.50'	3,830 cf	**Surface Ponding (Prismatic)** Listed below (Recalc)
		4,353 cf	Total Available Storage

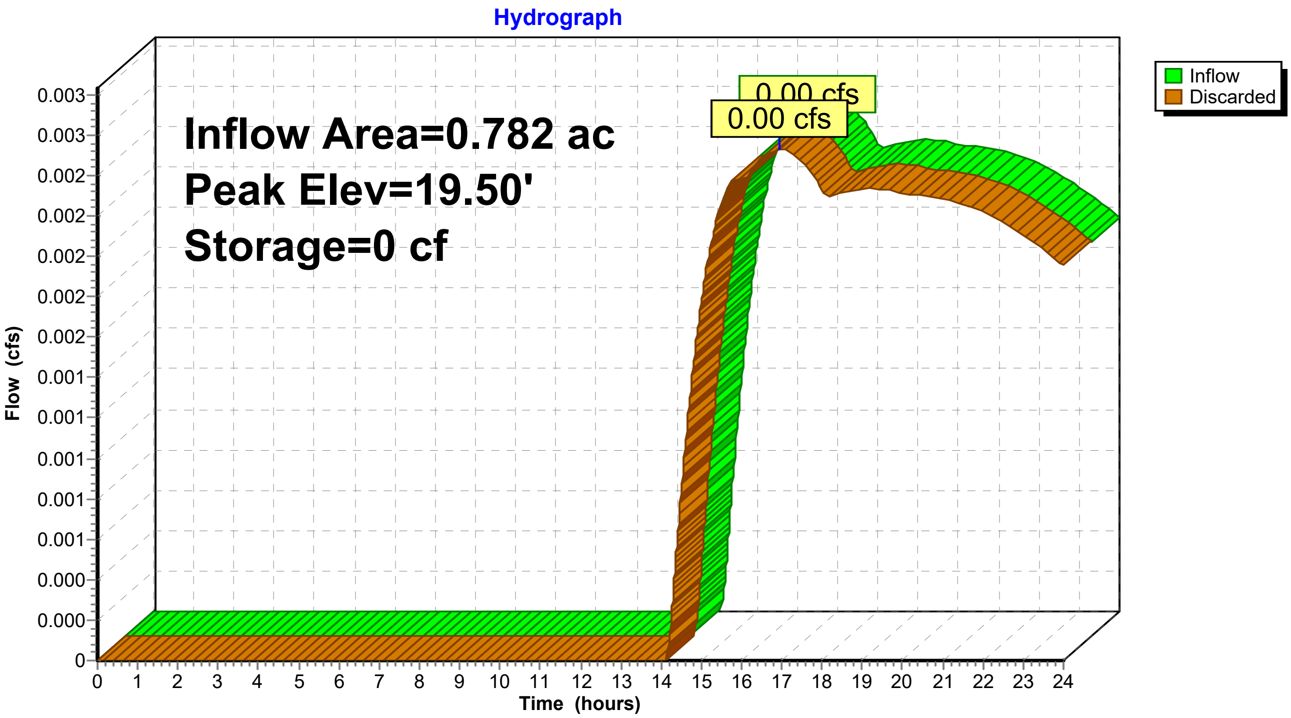
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	256	0	0
23.00	256	896	896

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.50	4	0	0
25.00	3,057	765	765
25.50	9,200	3,064	3,830

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.05 cfs @ 16.96 hrs HW=19.50' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Pond 43P: SC-740



Summary for Pond 45P: SC-740

Inflow Area = 1.100 ac, 26.54% Impervious, Inflow Depth > 0.10" for 2 YR event
Inflow = 0.02 cfs @ 13.75 hrs, Volume= 0.009 af
Outflow = 0.02 cfs @ 13.78 hrs, Volume= 0.009 af, Atten= 0%, Lag= 2.2 min
Discarded = 0.02 cfs @ 13.78 hrs, Volume= 0.009 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 19.51' @ 13.78 hrs Surf.Area= 650 sf Storage= 2 cf

Plug-Flow detention time= 2.5 min calculated for 0.009 af (100% of inflow)
Center-of-Mass det. time= 1.7 min (1,033.3 - 1,031.6)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	616 cf	**Stone (Prismatic)** Listed below (Recalc) 2,275 cf Overall - 735 cf Embedded = 1,540 cf x 40.0% Voids
#2	20.00'	735 cf	**ADS_StormTech SC-740 +Cap** x 16 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 8 Chambers
#3	25.50'	4,609 cf	**Surface Ponding (Prismatic)** Listed below (Recalc)
		5,960 cf	Total Available Storage

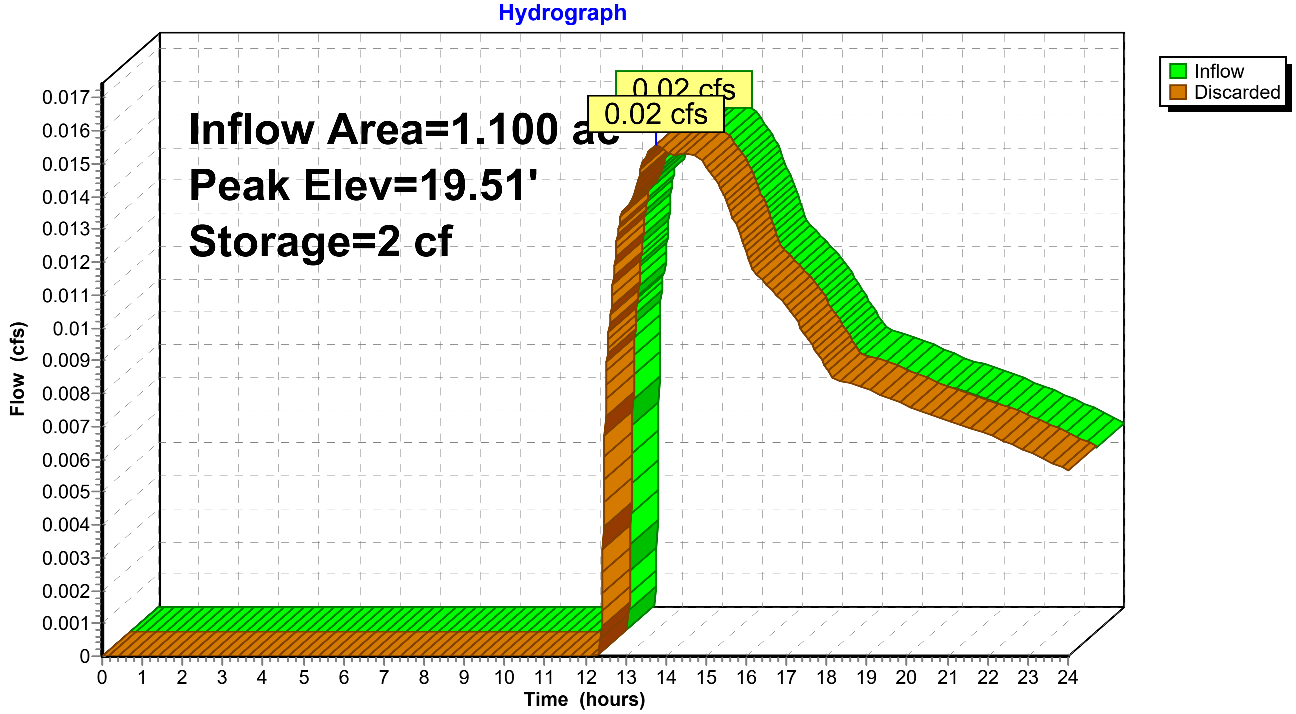
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	650	0	0
23.00	650	2,275	2,275

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
25.50	4	0	0
26.00	2,742	687	687
26.80	7,065	3,923	4,609

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.12 cfs @ 13.78 hrs HW=19.51' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Pond 45P: SC-740



Summary for Pond B-1: Basin 1

Inflow Area = 5.195 ac, 60.05% Impervious, Inflow Depth > 1.16" for 2 YR event
Inflow = 7.28 cfs @ 12.10 hrs, Volume= 0.504 af
Outflow = 0.60 cfs @ 13.61 hrs, Volume= 0.502 af, Atten= 92%, Lag= 90.8 min
Discarded = 0.60 cfs @ 13.61 hrs, Volume= 0.502 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 11.54' @ 13.61 hrs Surf.Area= 10,743 sf Storage= 9,795 cf

Plug-Flow detention time= 171.4 min calculated for 0.502 af (100% of inflow)
Center-of-Mass det. time= 169.5 min (1,004.9 - 835.4)

Volume	Invert	Avail.Storage	Storage Description
#1	10.50'	61,135 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

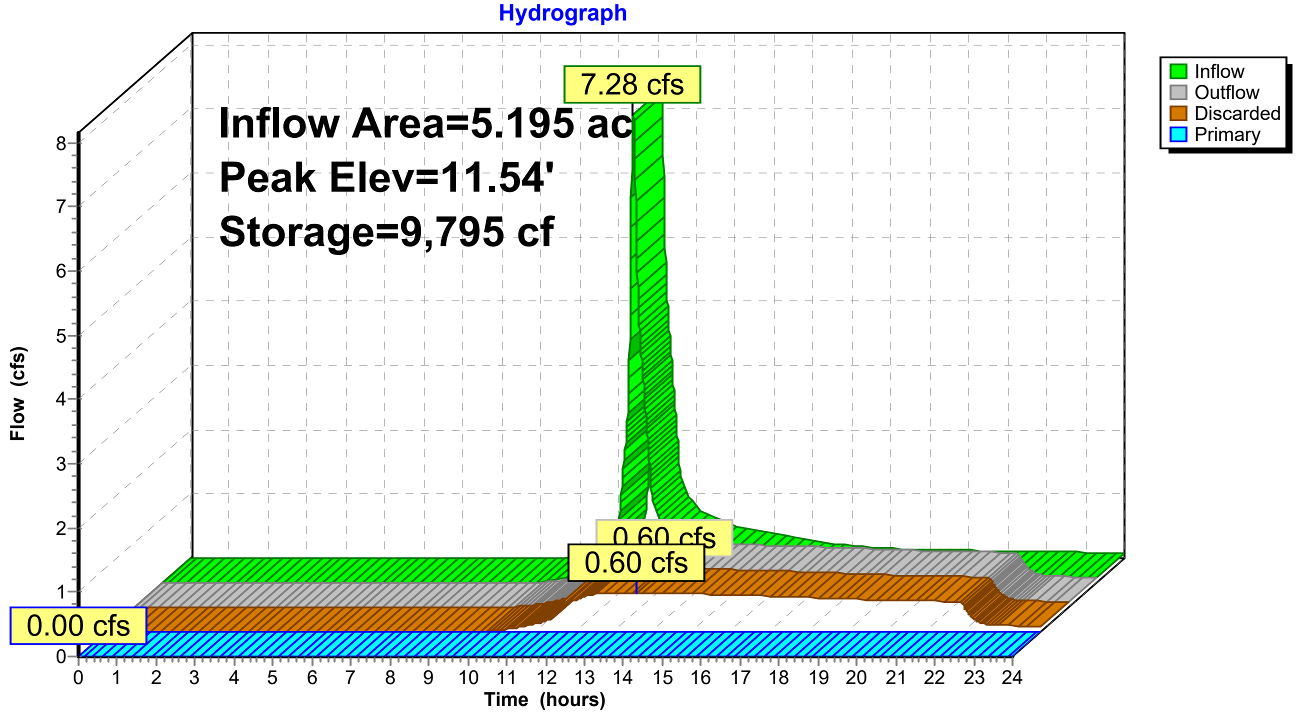
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.50	8,346	0	0
11.00	9,153	4,375	4,375
12.00	12,072	10,613	14,987
13.00	14,291	13,182	28,169
14.00	16,502	15,397	43,565
15.00	18,637	17,570	61,135

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	15.00'	**45.0 deg x 15.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.60 cfs @ 13.61 hrs HW=11.54' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.60 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.50' (Free Discharge)
└**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond B-1: Basin 1



Summary for Pond B-2: Basin 2

Inflow Area = 4.443 ac, 56.72% Impervious, Inflow Depth > 0.78" for 2 YR event
Inflow = 4.41 cfs @ 12.09 hrs, Volume= 0.288 af
Outflow = 0.49 cfs @ 13.03 hrs, Volume= 0.287 af, Atten= 89%, Lag= 56.5 min
Discarded = 0.49 cfs @ 13.03 hrs, Volume= 0.287 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 16.12' @ 13.03 hrs Surf.Area= 8,742 sf Storage= 5,210 cf

Plug-Flow detention time= 97.5 min calculated for 0.287 af (100% of inflow)
Center-of-Mass det. time= 95.9 min (924.8 - 828.9)

Volume	Invert	Avail.Storage	Storage Description
#1	15.50'	37,352 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

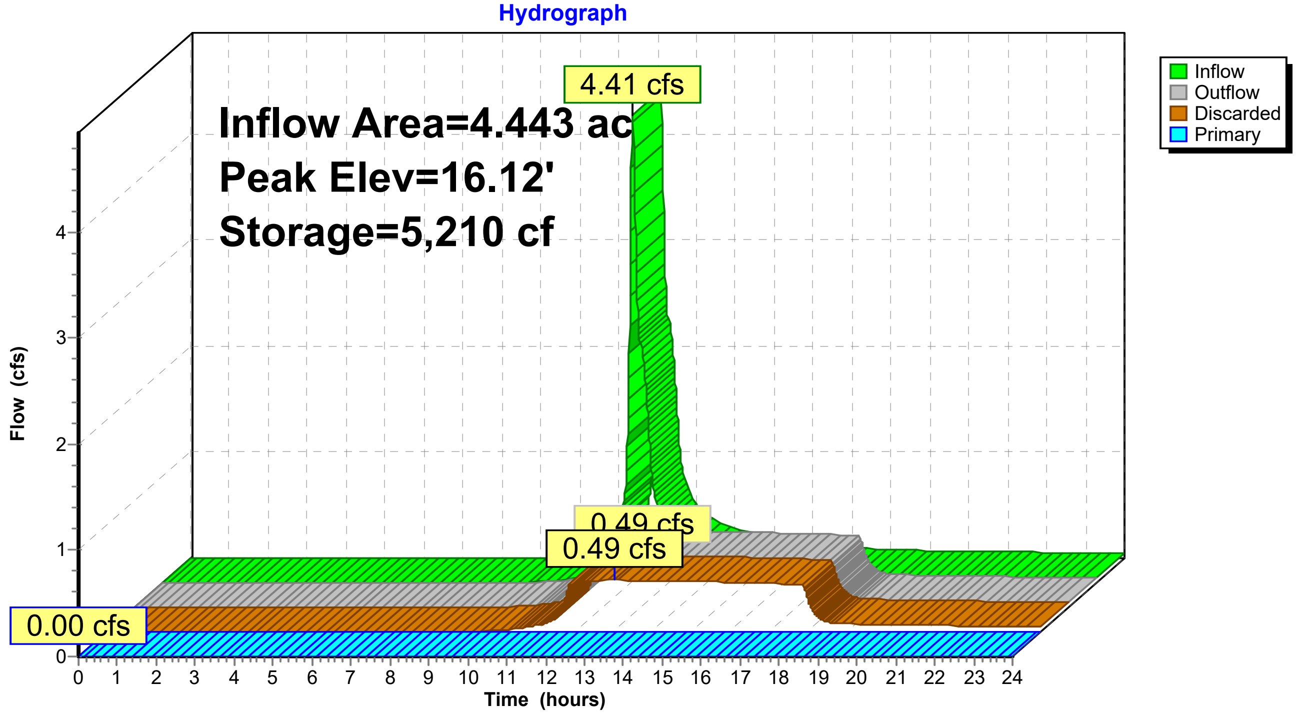
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
15.50	7,983	0	0
16.00	8,588	4,143	4,143
17.00	9,841	9,215	13,357
18.00	12,169	11,005	24,362
19.00	13,810	12,990	37,352

Device	Routing	Invert	Outlet Devices
#1	Discarded	15.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.50'	**45.0 deg x 15.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.49 cfs @ 13.03 hrs HW=16.12' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.49 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.50' (Free Discharge)
↑—**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond B-2: Basin 2



Summary for Pond BIO1: BIO 1

Inflow Area = 0.791 ac, 76.51% Impervious, Inflow Depth > 1.84" for 2 YR event
Inflow = 1.77 cfs @ 12.08 hrs, Volume= 0.121 af
Outflow = 1.71 cfs @ 12.10 hrs, Volume= 0.120 af, Atten= 3%, Lag= 1.2 min
Discarded = 0.06 cfs @ 12.10 hrs, Volume= 0.048 af
Primary = 1.66 cfs @ 12.10 hrs, Volume= 0.072 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 19.69' @ 12.10 hrs Surf.Area= 999 sf Storage= 448 cf

Plug-Flow detention time= 35.1 min calculated for 0.120 af (99% of inflow)
Center-of-Mass det. time= 26.8 min (852.2 - 825.4)

Volume	Invert	Avail.Storage	Storage Description
#1	19.00'	7,359 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

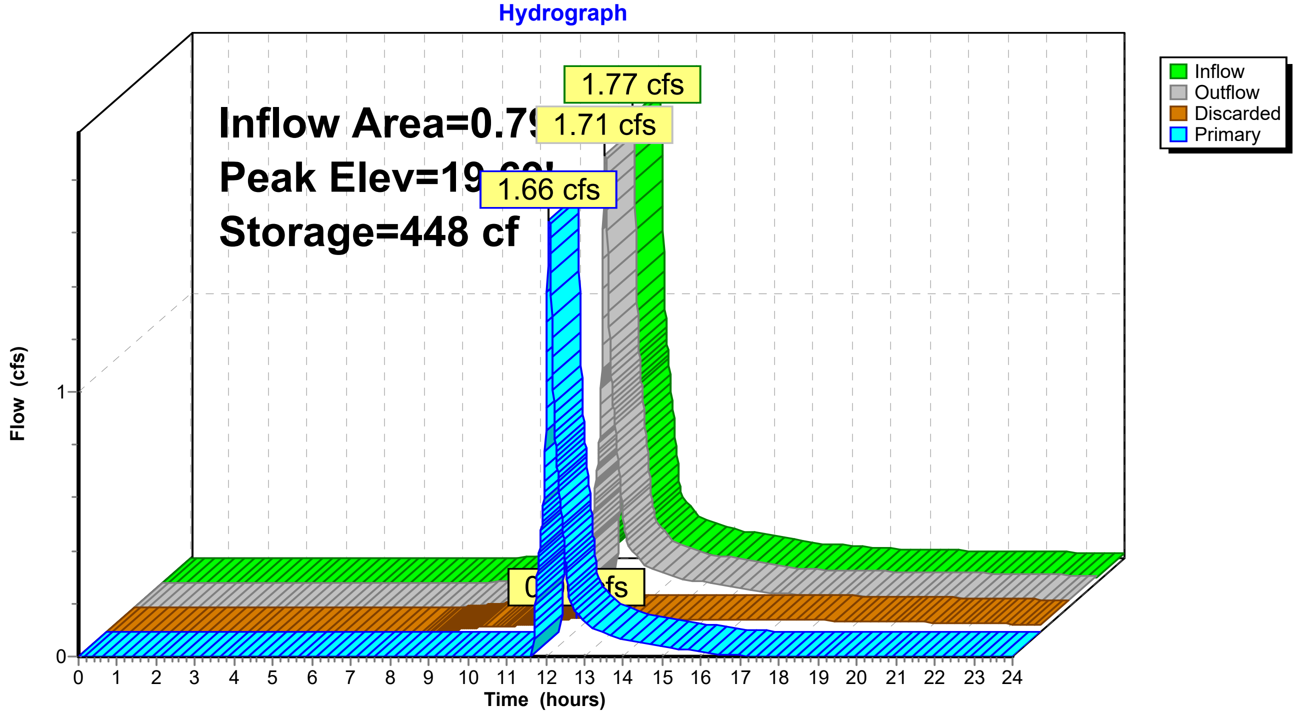
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.00	307	0	0
20.00	1,315	811	811
20.40	2,200	703	1,514
21.00	17,283	5,845	7,359

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	19.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 12.10 hrs HW=19.69' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=1.65 cfs @ 12.10 hrs HW=19.69' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 0.83 cfs @ 1.41 fps)
└─**3=Orifice/Grate** (Weir Controls 0.83 cfs @ 1.41 fps)

Pond BIO1: BIO 1



Summary for Pond BIO2: BIO 2

Inflow Area = 0.833 ac, 68.24% Impervious, Inflow Depth > 1.48" for 2 YR event
Inflow = 1.48 cfs @ 12.08 hrs, Volume= 0.103 af
Outflow = 0.50 cfs @ 12.40 hrs, Volume= 0.103 af, Atten= 66%, Lag= 19.1 min
Discarded = 0.12 cfs @ 12.40 hrs, Volume= 0.089 af
Primary = 0.38 cfs @ 12.40 hrs, Volume= 0.014 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 22.82' @ 12.40 hrs Surf.Area= 2,084 sf Storage= 1,433 cf

Plug-Flow detention time= 103.6 min calculated for 0.103 af (100% of inflow)
Center-of-Mass det. time= 102.7 min (944.1 - 841.4)

Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	4,509 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

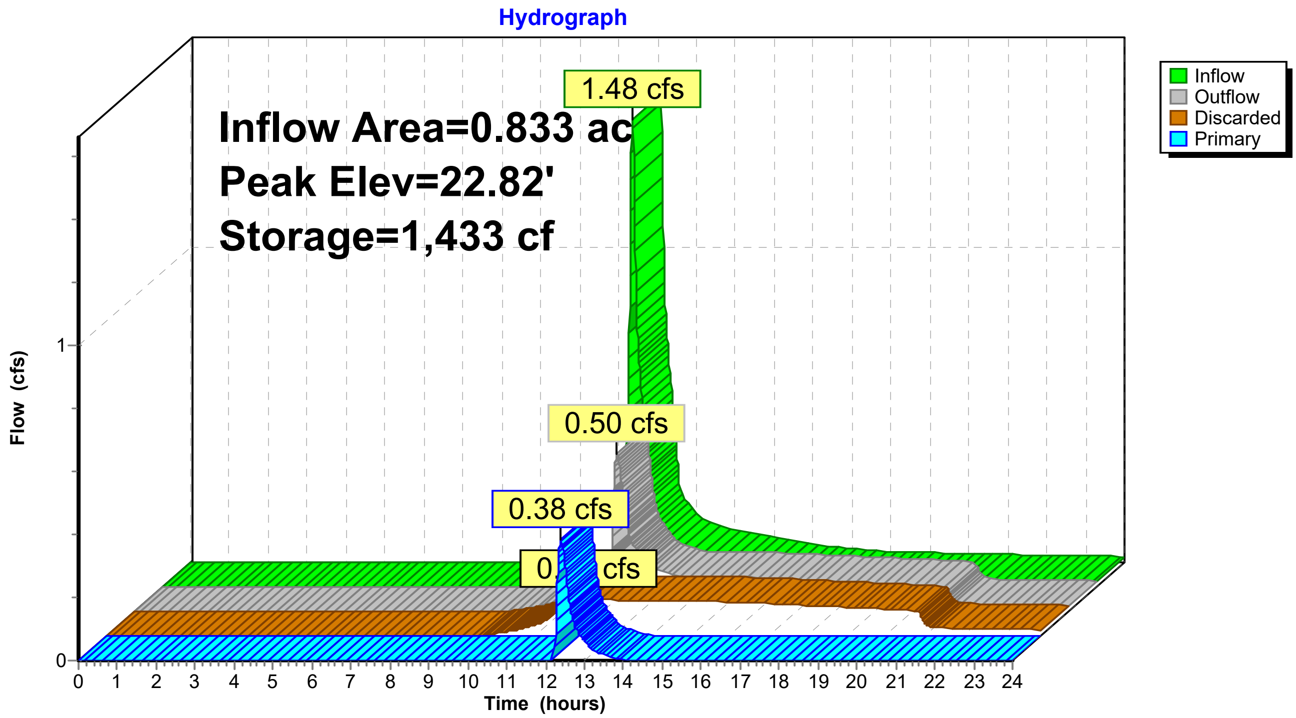
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	1,410	0	0
23.00	2,232	1,821	1,821
24.00	3,143	2,688	4,509

Device	Routing	Invert	Outlet Devices
#1	Discarded	22.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	22.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	22.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.12 cfs @ 12.40 hrs HW=22.82' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.38 cfs @ 12.40 hrs HW=22.82' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 0.19 cfs @ 0.87 fps)
└─**3=Orifice/Grate** (Weir Controls 0.19 cfs @ 0.87 fps)

Pond BIO2: BIO 2



Summary for Pond BIO3: BIO-3

Inflow Area = 0.816 ac, 75.18% Impervious, Inflow Depth > 1.76" for 2 YR event
Inflow = 1.75 cfs @ 12.08 hrs, Volume= 0.120 af
Outflow = 1.64 cfs @ 12.10 hrs, Volume= 0.120 af, Atten= 6%, Lag= 1.7 min
Discarded = 0.08 cfs @ 12.10 hrs, Volume= 0.063 af
Primary = 1.56 cfs @ 12.10 hrs, Volume= 0.057 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 23.68' @ 12.10 hrs Surf.Area= 1,397 sf Storage= 695 cf

Plug-Flow detention time= 43.8 min calculated for 0.120 af (100% of inflow)
Center-of-Mass det. time= 43.2 min (871.9 - 828.7)

Volume	Invert	Avail.Storage	Storage Description
#1	23.00'	2,268 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

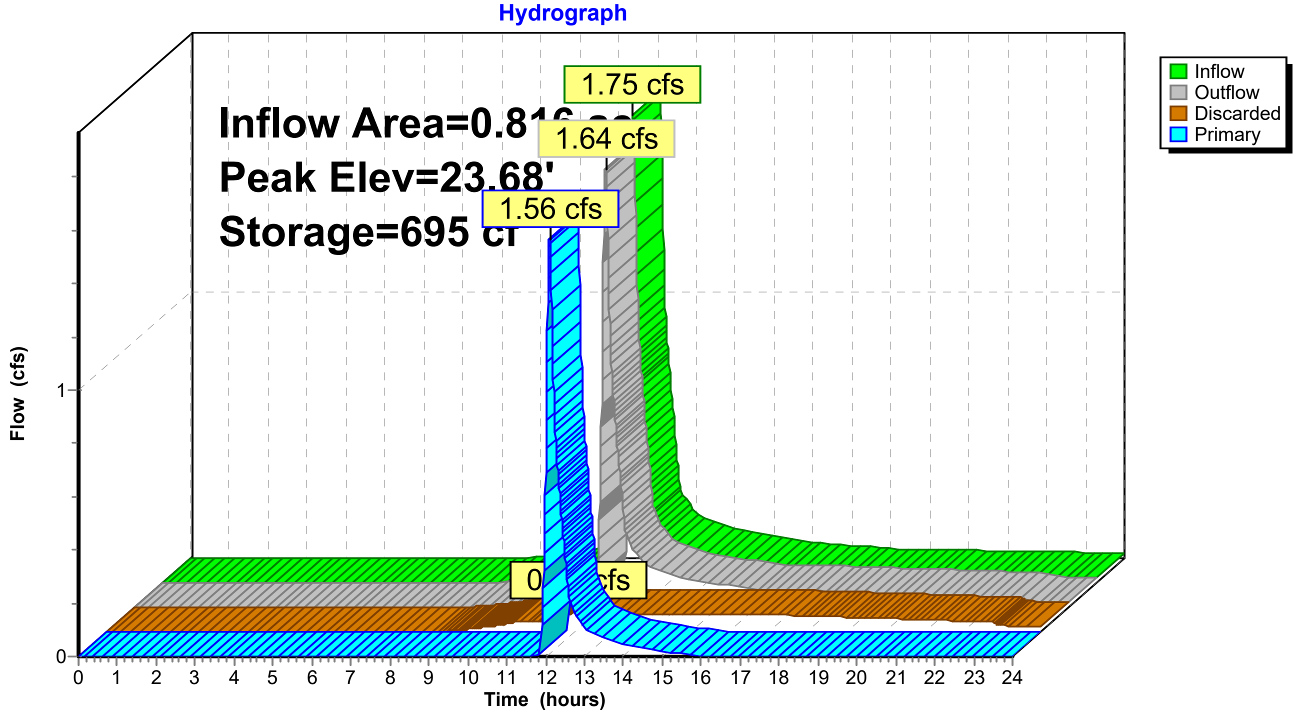
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
23.00	648	0	0
24.00	1,750	1,199	1,199
24.50	2,527	1,069	2,268

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	23.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	23.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.08 cfs @ 12.10 hrs HW=23.68' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=1.56 cfs @ 12.10 hrs HW=23.68' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 0.78 cfs @ 1.38 fps)
└─**3=Orifice/Grate** (Weir Controls 0.78 cfs @ 1.38 fps)

Pond BIO3: BIO-3



Summary for Pond P-B: POND B

Inflow Area = 1.269 ac, 0.00% Impervious, Inflow Depth > 0.15" for 2 YR event
Inflow = 0.04 cfs @ 12.44 hrs, Volume= 0.015 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 2.76' @ 24.00 hrs Surf.Area= 10,447 sf Storage= 671 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

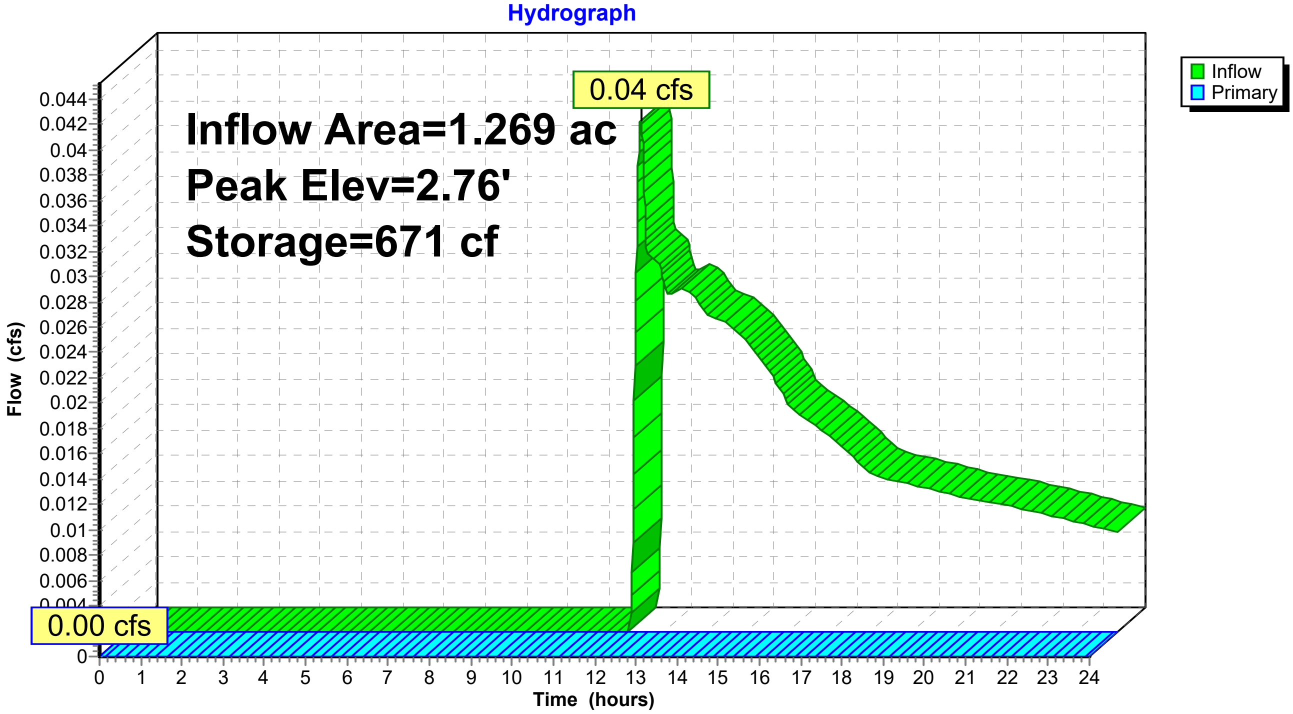
Volume	Invert	Avail.Storage	Storage Description
#1	2.70'	15,021 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2.70	10,273	0	0
3.00	11,080	3,203	3,203
3.40	11,370	4,490	7,693
4.00	13,058	7,328	15,021

Device	Routing	Invert	Outlet Devices
#1	Primary	3.44'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2.70' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-B: POND B



Summary for Pond P-C: POND C

Inflow Area = 2.480 ac, 0.00% Impervious, Inflow Depth > 0.15" for 2 YR event
Inflow = 0.08 cfs @ 12.44 hrs, Volume= 0.030 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 3.66' @ 24.00 hrs Surf.Area= 21,231 sf Storage= 1,311 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

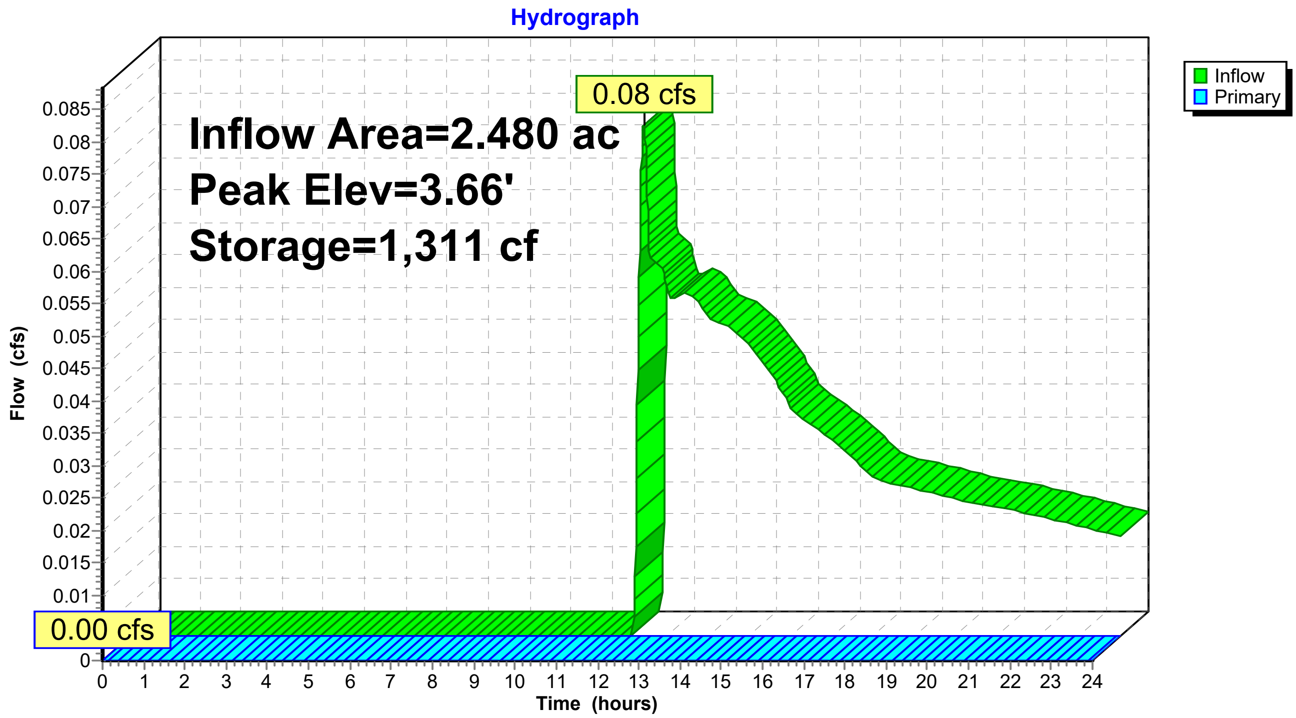
Volume	Invert	Avail.Storage	Storage Description
#1	3.60'	35,172 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.60	20,812	0	0
4.00	23,497	8,862	8,862
5.00	29,124	26,311	35,172

Device	Routing	Invert	Outlet Devices
#1	Primary	4.29'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=3.60' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-C: POND C



Summary for Pond P-D: POND D

Inflow Area = 2.034 ac, 0.00% Impervious, Inflow Depth > 0.12" for 2 YR event
Inflow = 0.04 cfs @ 13.89 hrs, Volume= 0.021 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 8.12' @ 24.00 hrs Surf.Area= 7,748 sf Storage= 899 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

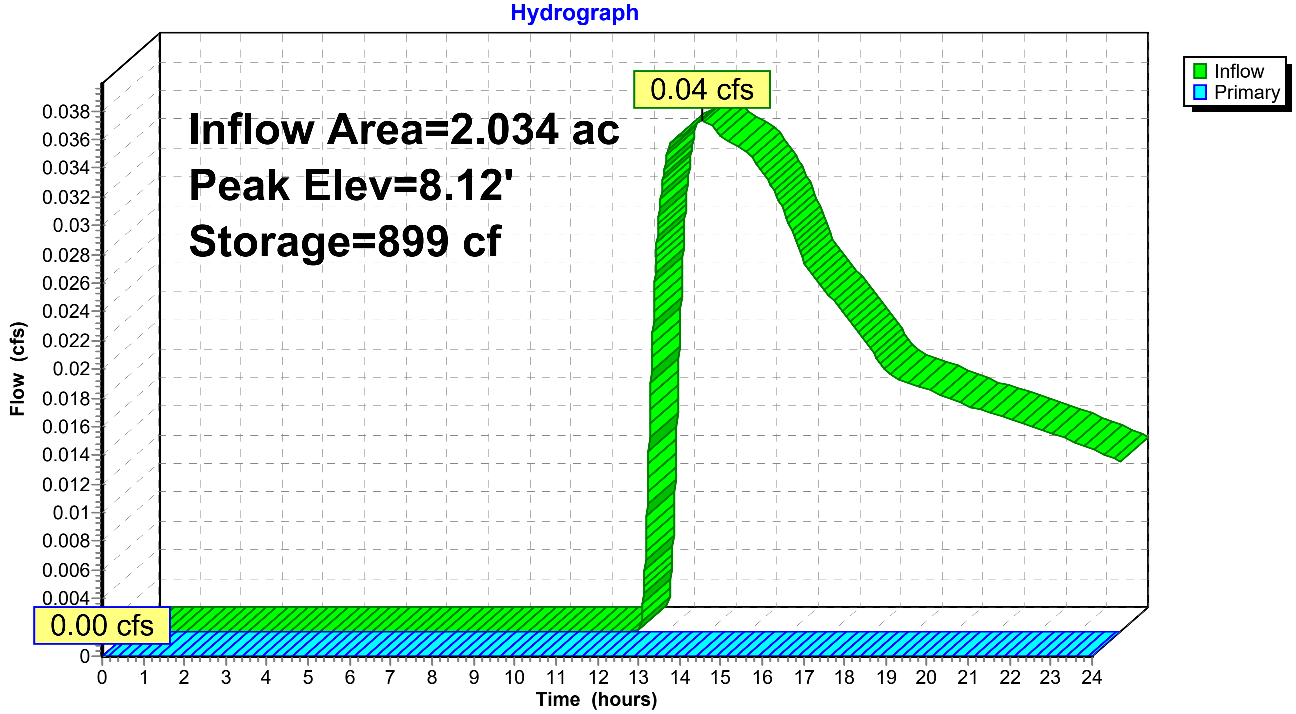
Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	18,853 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	7,585	0	0
9.00	8,975	8,280	8,280
10.00	12,170	10,573	18,853

Device	Routing	Invert	Outlet Devices
#1	Primary	9.80'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#2	Primary	9.08'	**12.0" Round Culvert** L= 18.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.08' / 8.16' S= 0.0497 '/' Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=8.00' (Free Discharge)
1=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)
2=Culvert (Controls 0.00 cfs)

Pond P-D: POND D



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

Subcatchment 28S: TYP ROOF SIZING Runoff Area=5,000 sf 100.00% Impervious Runoff Depth>4.70"
Tc=5.0 min CN=98 Runoff=0.57 cfs 0.045 af

Subcatchment BIO-1: BIO-1 Runoff Area=34,452 sf 76.51% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=84 Runoff=3.07 cfs 0.212 af

Subcatchment BIO-2: BIO-2 Runoff Area=36,300 sf 68.24% Impervious Runoff Depth>2.75"
Tc=5.0 min CN=79 Runoff=2.79 cfs 0.191 af

Subcatchment BIO-3: BIO-3 Runoff Area=35,532 sf 75.18% Impervious Runoff Depth>3.12"
Tc=5.0 min CN=83 Runoff=3.08 cfs 0.212 af

Subcatchment P10: PR-DA-10 Runoff Area=190,706 sf 0.00% Impervious Runoff Depth>0.08"
Tc=5.0 min CN=35 Runoff=0.04 cfs 0.028 af

Subcatchment P11: PR-DA11 Runoff Area=55,295 sf 0.00% Impervious Runoff Depth>0.61"
Tc=5.0 min CN=49 Runoff=0.54 cfs 0.065 af

Subcatchment P12: PR-DA12 Runoff Area=108,026 sf 0.00% Impervious Runoff Depth>0.61"
Tc=5.0 min CN=49 Runoff=1.05 cfs 0.127 af

Subcatchment P13: PR-DA-13 Runoff Area=32,038 sf 3.96% Impervious Runoff Depth>0.22"
Tc=5.0 min UI Adjusted CN=40 Runoff=0.04 cfs 0.014 af

Subcatchment P14: PR-DA-14 Runoff Area=187,032 sf 0.00% Impervious Runoff Depth>0.10"
Tc=5.0 min CN=36 Runoff=0.06 cfs 0.036 af

Subcatchment P1a: PR-DA-1a Runoff Area=72,022 sf 28.03% Impervious Runoff Depth>1.33"
Tc=5.0 min CN=61 Runoff=2.43 cfs 0.183 af

Subcatchment P1b: PR-DA-1b Runoff Area=61,320 sf 64.77% Impervious Runoff Depth>2.57"
Tc=5.0 min CN=77 Runoff=4.40 cfs 0.302 af

Subcatchment P2: PR-DA-2 Runoff Area=14,573 sf 0.97% Impervious Runoff Depth>0.19"
Tc=5.0 min UI Adjusted CN=39 Runoff=0.01 cfs 0.005 af

Subcatchment P3: PR-DA-3 Runoff Area=88,593 sf 0.00% Impervious Runoff Depth>0.56"
Flow Length=574' Tc=26.1 min CN=48 Runoff=0.48 cfs 0.095 af

Subcatchment P4: PR-DA4 Runoff Area=47,075 sf 19.25% Impervious Runoff Depth>0.67"
Tc=5.0 min CN=50 Runoff=0.54 cfs 0.060 af

Subcatchment P5: PR-DA5 Runoff Area=145,975 sf 68.19% Impervious Runoff Depth>2.75"
Flow Length=1,208' Tc=6.7 min CN=79 Runoff=10.55 cfs 0.767 af

Subcatchment P6: PR-DA-6 Runoff Area=34,083 sf 11.09% Impervious Runoff Depth>0.30"
Tc=5.0 min UI Adjusted CN=42 Runoff=0.08 cfs 0.019 af

Subcatchment P7: PR-DA-7	Runoff Area=47,897 sf 26.54% Impervious Runoff Depth>0.52" Tc=5.0 min UI Adjusted CN=47 Runoff=0.31 cfs 0.047 af
Subcatchment P8a: PR-DA8a	Runoff Area=37,831 sf 61.05% Impervious Runoff Depth>2.40" Flow Length=626' Tc=5.0 min CN=75 Runoff=2.53 cfs 0.174 af
Subcatchment P8b: PR-DA8b	Runoff Area=36,807 sf 71.01% Impervious Runoff Depth>2.93" Flow Length=432' Tc=5.0 min CN=81 Runoff=3.01 cfs 0.206 af
Subcatchment P9: PR-DA9	Runoff Area=45,880 sf 21.77% Impervious Runoff Depth>0.78" Tc=5.0 min CN=52 Runoff=0.69 cfs 0.068 af
Reach DP-1: DP-1	Inflow=2.43 cfs 0.183 af Outflow=2.43 cfs 0.183 af
Reach DP-2: DP-2 (JOSHUA'S BROOK)	Inflow=0.04 cfs 0.028 af Outflow=0.04 cfs 0.028 af
Reach DP-3: DP-3 (STEWART'S CREEK)	Inflow=0.06 cfs 0.036 af Outflow=0.06 cfs 0.036 af
Pond 41P: SC-740	Peak Elev=38.06' Storage=496 cf Inflow=0.57 cfs 0.045 af Outflow=0.09 cfs 0.045 af
Pond 43P: SC-740	Peak Elev=19.78' Storage=29 cf Inflow=0.08 cfs 0.019 af Outflow=0.05 cfs 0.019 af
Pond 45P: SC-740	Peak Elev=20.20' Storage=235 cf Inflow=0.31 cfs 0.047 af Outflow=0.12 cfs 0.047 af
Pond B-1: Basin 1	Peak Elev=12.61' Storage=22,799 cf Inflow=14.16 cfs 0.984 af Discarded=0.75 cfs 0.763 af Primary=0.00 cfs 0.000 af Outflow=0.75 cfs 0.763 af
Pond B-2: Basin 2	Peak Elev=17.19' Storage=15,288 cf Inflow=10.56 cfs 0.645 af Discarded=0.57 cfs 0.570 af Primary=0.00 cfs 0.000 af Outflow=0.57 cfs 0.570 af
Pond BIO1: BIO 1	Peak Elev=19.77' Storage=538 cf Inflow=3.07 cfs 0.212 af Discarded=0.06 cfs 0.058 af Primary=2.92 cfs 0.149 af Outflow=2.98 cfs 0.207 af
Pond BIO2: BIO 2	Peak Elev=22.97' Storage=1,754 cf Inflow=2.79 cfs 0.191 af Discarded=0.12 cfs 0.116 af Primary=2.12 cfs 0.074 af Outflow=2.24 cfs 0.191 af
Pond BIO3: BIO-3	Peak Elev=23.77' Storage=822 cf Inflow=3.08 cfs 0.212 af Discarded=0.08 cfs 0.078 af Primary=2.84 cfs 0.130 af Outflow=2.93 cfs 0.209 af
Pond P-B: POND B	Peak Elev=2.97' Storage=2,832 cf Inflow=0.54 cfs 0.065 af Outflow=0.00 cfs 0.000 af
Pond P-C: POND C	Peak Elev=3.86' Storage=5,533 cf Inflow=1.05 cfs 0.127 af Outflow=0.00 cfs 0.000 af
Pond P-D: POND D	Peak Elev=8.52' Storage=4,126 cf Inflow=0.48 cfs 0.095 af Outflow=0.00 cfs 0.000 af

Total Runoff Area = 30.221 ac Runoff Volume = 2.855 af Average Runoff Depth = 1.13"
75.05% Pervious = 22.680 ac 24.95% Impervious = 7.541 ac

Summary for Subcatchment 28S: TYP ROOF SIZING

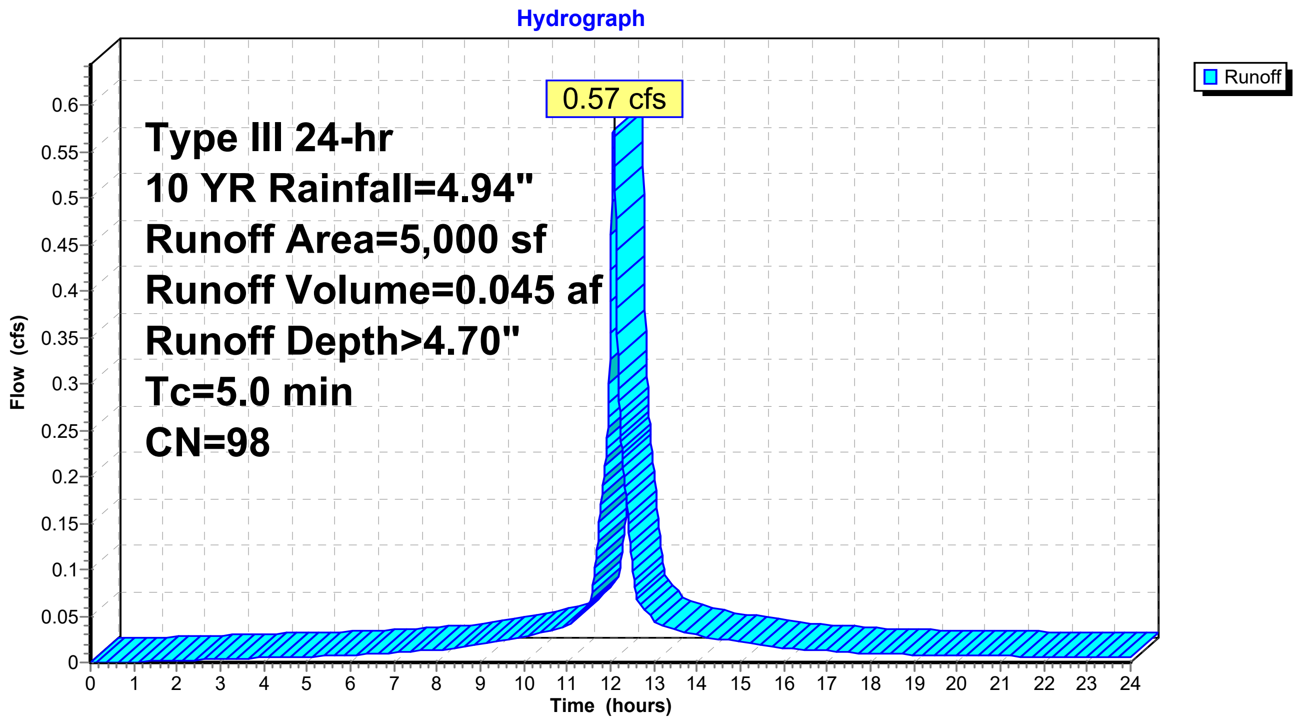
Runoff = 0.57 cfs @ 12.07 hrs, Volume= 0.045 af, Depth> 4.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
5,000	98	Roofs, HSG A
5,000		100.00% Impervious Area

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

Subcatchment 28S: TYP ROOF SIZING



Summary for Subcatchment BIO-1: BIO-1

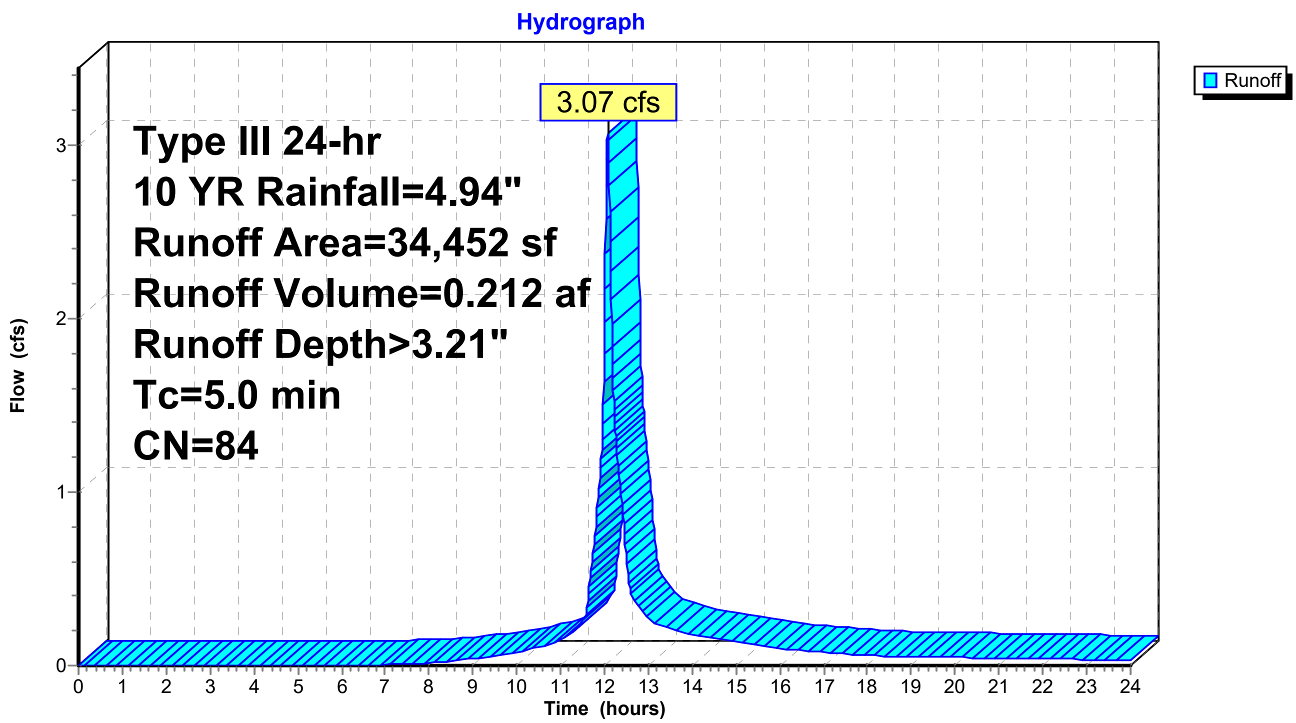
Runoff = 3.07 cfs @ 12.07 hrs, Volume= 0.212 af, Depth> 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
8,092	39	>75% Grass cover, Good, HSG A
26,360	98	Paved parking, HSG A
34,452	84	Weighted Average
8,092		23.49% Pervious Area
26,360		76.51% Impervious Area

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

Subcatchment BIO-1: BIO-1



Summary for Subcatchment BIO-2: BIO-2

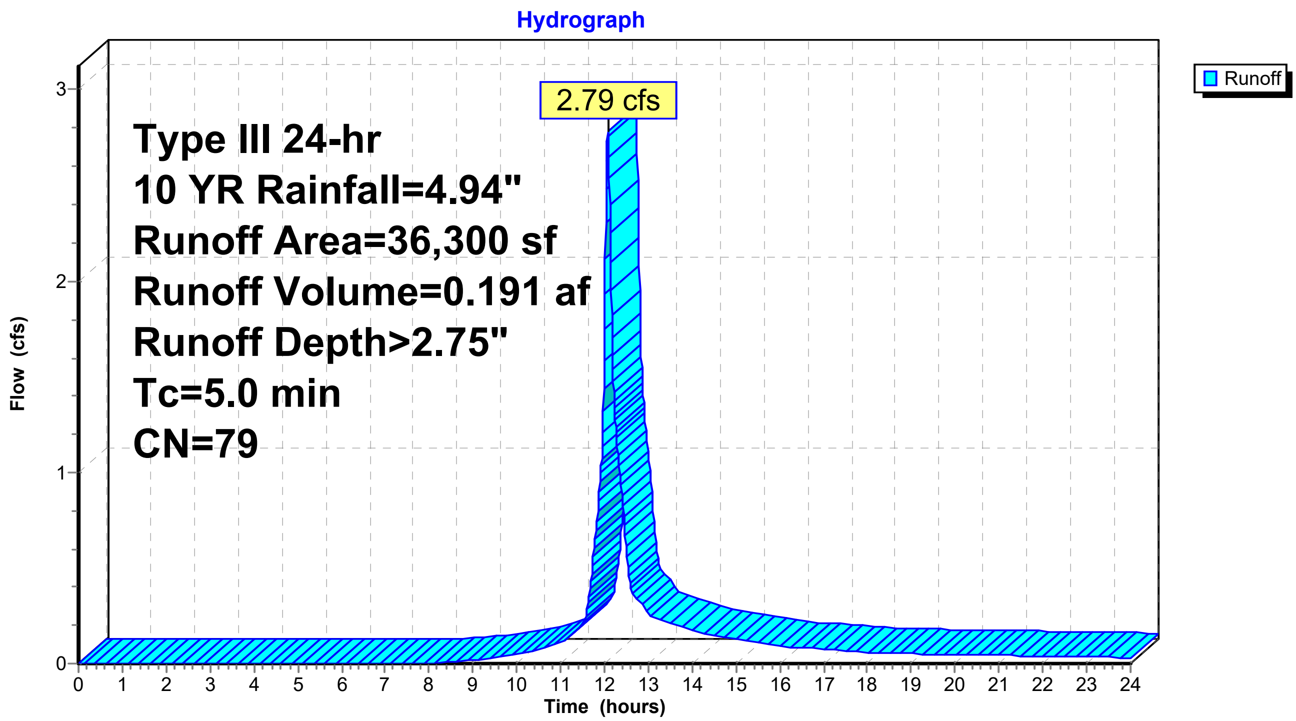
Runoff = 2.79 cfs @ 12.07 hrs, Volume= 0.191 af, Depth> 2.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
11,530	39	>75% Grass cover, Good, HSG A
24,660	98	Paved parking, HSG A
110	98	Roofs, HSG A
36,300	79	Weighted Average
11,530		31.76% Pervious Area
24,770		68.24% Impervious Area

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

Subcatchment BIO-2: BIO-2



Summary for Subcatchment BIO-3: BIO-3

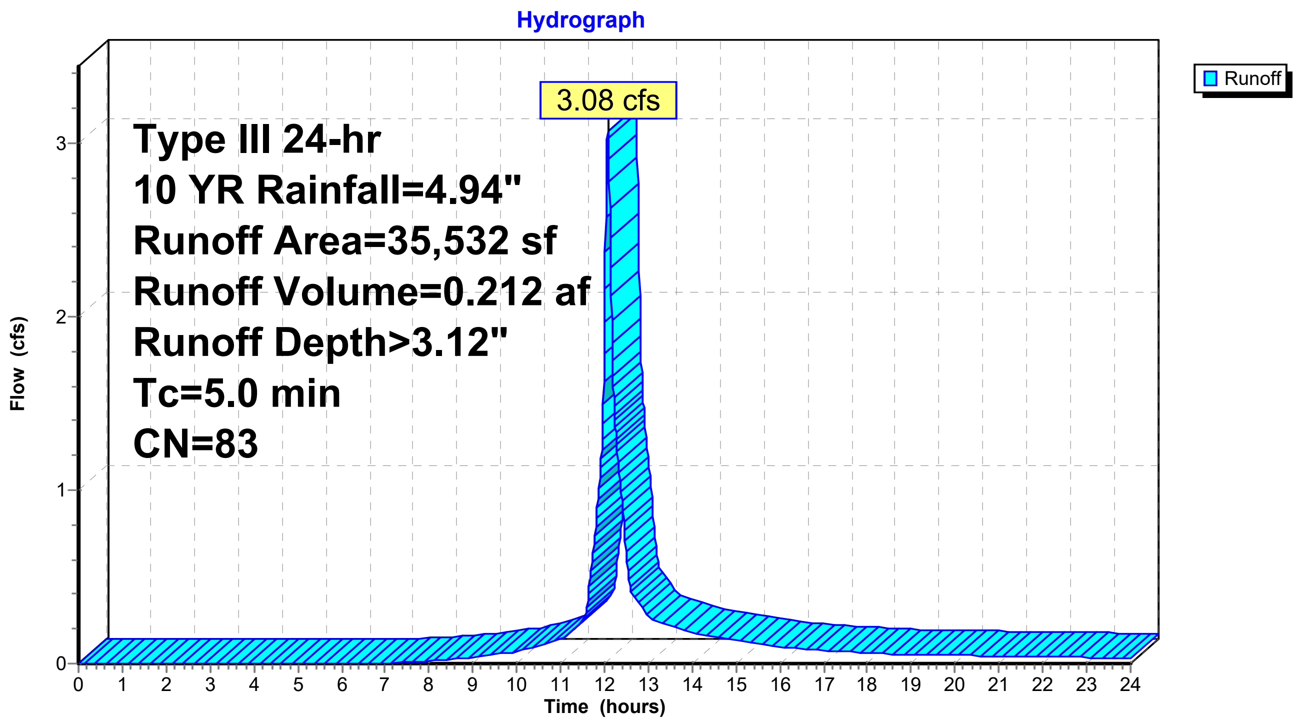
Runoff = 3.08 cfs @ 12.07 hrs, Volume= 0.212 af, Depth> 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
8,819	39	>75% Grass cover, Good, HSG A
26,493	98	Paved parking, HSG A
220	98	Roofs, HSG A
35,532	83	Weighted Average
8,819		24.82% Pervious Area
26,713		75.18% Impervious Area

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

Subcatchment BIO-3: BIO-3



Summary for Subcatchment P10: PR-DA-10

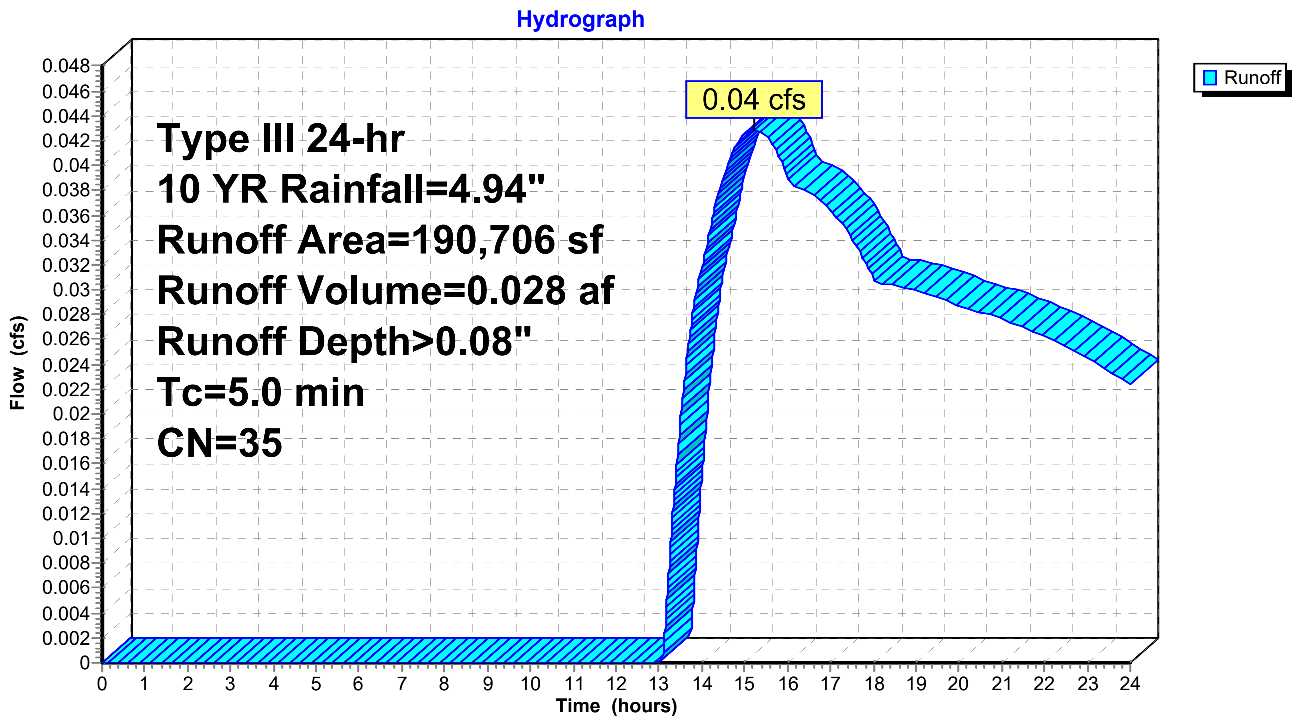
Runoff = 0.04 cfs @ 15.23 hrs, Volume= 0.028 af, Depth> 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
90,801	39	>75% Grass cover, Good, HSG A
99,905	32	Woods/grass comb., Good, HSG A
190,706	35	Weighted Average
190,706		100.00% Pervious Area

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

Subcatchment P10: PR-DA-10



Summary for Subcatchment P11: PR-DA11

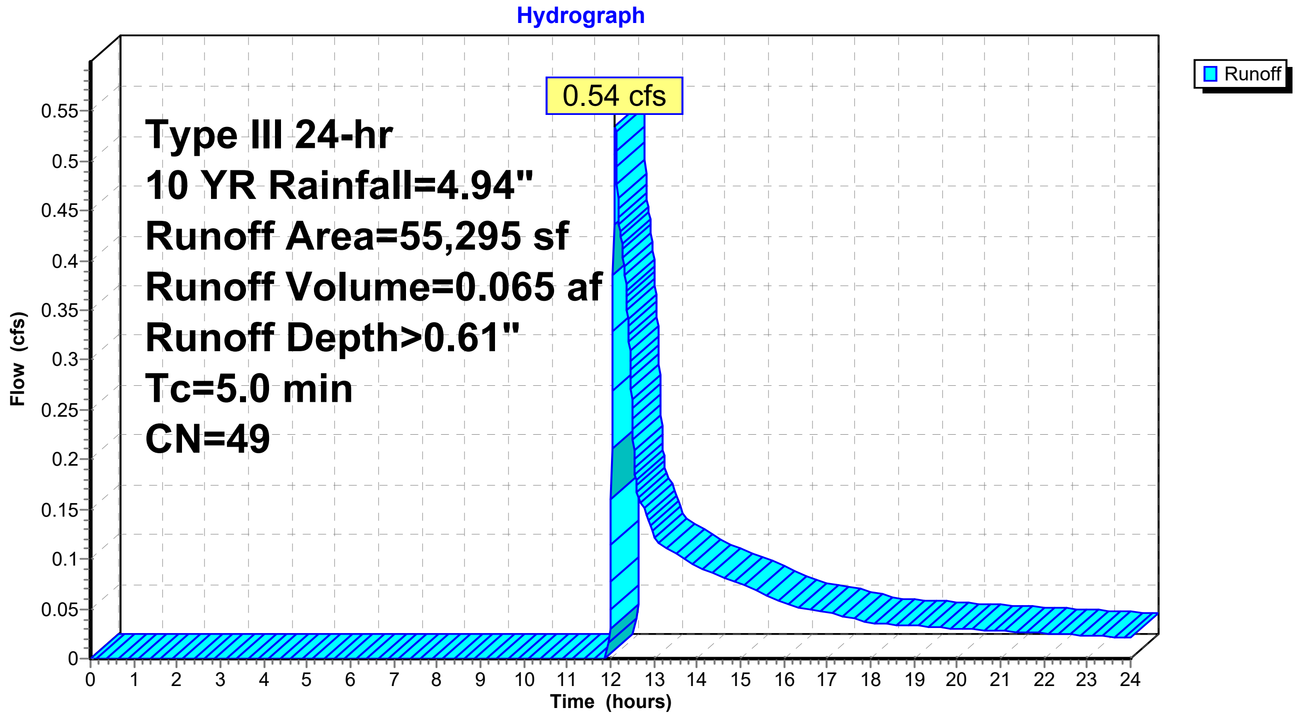
Runoff = 0.54 cfs @ 12.11 hrs, Volume= 0.065 af, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
39,962	39	>75% Grass cover, Good, HSG A
5,060	30	Woods, Good, HSG A
10,273	98	Water Surface, 0% imp, HSG A
0	98	Paved parking, HSG A
55,295	49	Weighted Average
55,295		100.00% Pervious Area

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

Subcatchment P11: PR-DA11



Summary for Subcatchment P12: PR-DA12

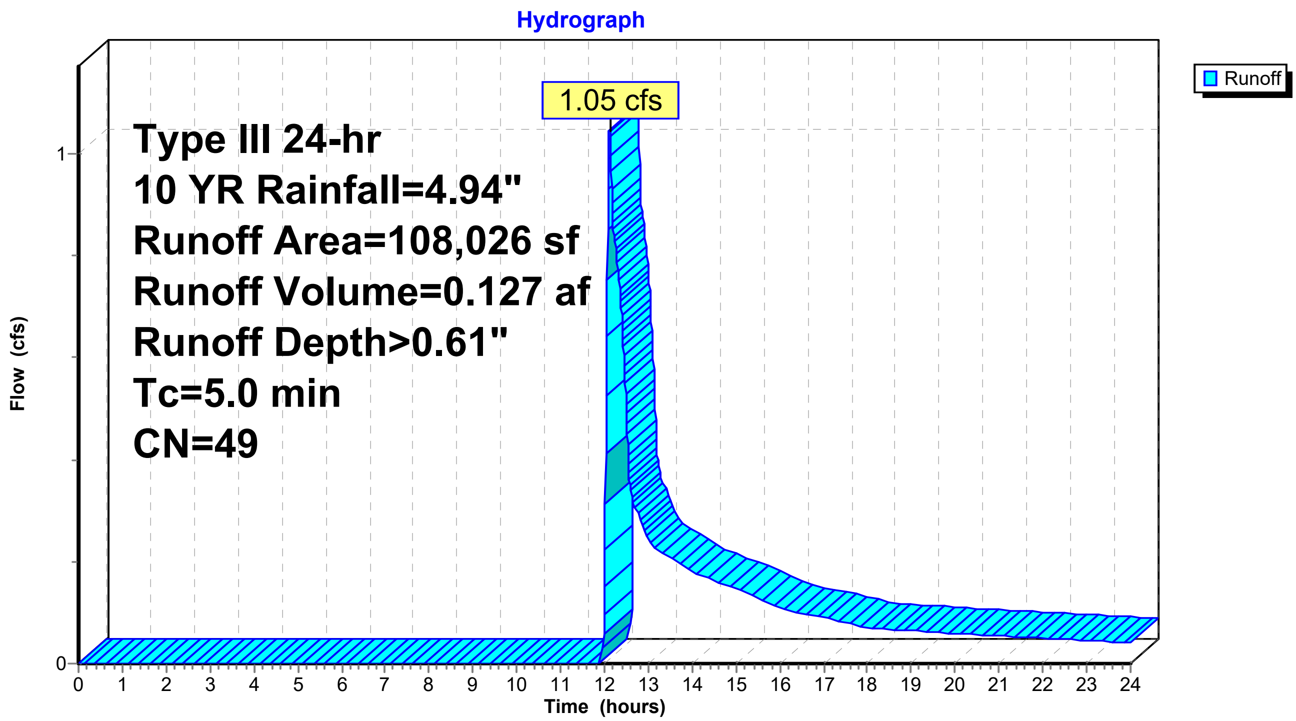
Runoff = 1.05 cfs @ 12.11 hrs, Volume= 0.127 af, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
74,064	39	>75% Grass cover, Good, HSG A
13,150	30	Woods, Good, HSG A
20,812	98	Water Surface, 0% imp, HSG A
0	98	Paved parking, HSG A
108,026	49	Weighted Average
108,026		100.00% Pervious Area

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

Subcatchment P12: PR-DA12



Summary for Subcatchment P13: PR-DA-13

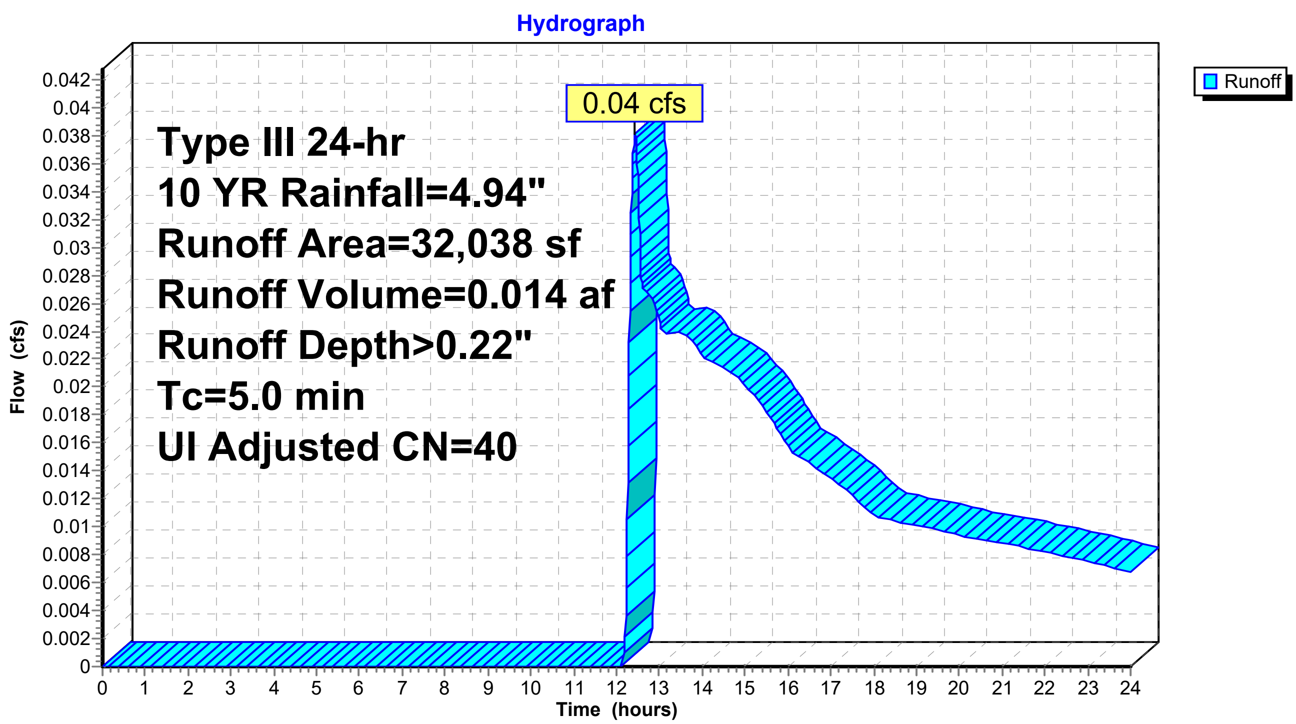
Runoff = 0.04 cfs @ 12.43 hrs, Volume= 0.014 af, Depth> 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Adj	Description
	30,218	39		>75% Grass cover, Good, HSG A
*	1,270	98		Unconnected Impervious, HSG A
	550	30		Woods, Good, HSG A
	32,038	41	40	Weighted Average, UI Adjusted
	30,768			96.04% Pervious Area
	1,270			3.96% Impervious Area
	1,270			100.00% Unconnected

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

Subcatchment P13: PR-DA-13



Summary for Subcatchment P14: PR-DA-14

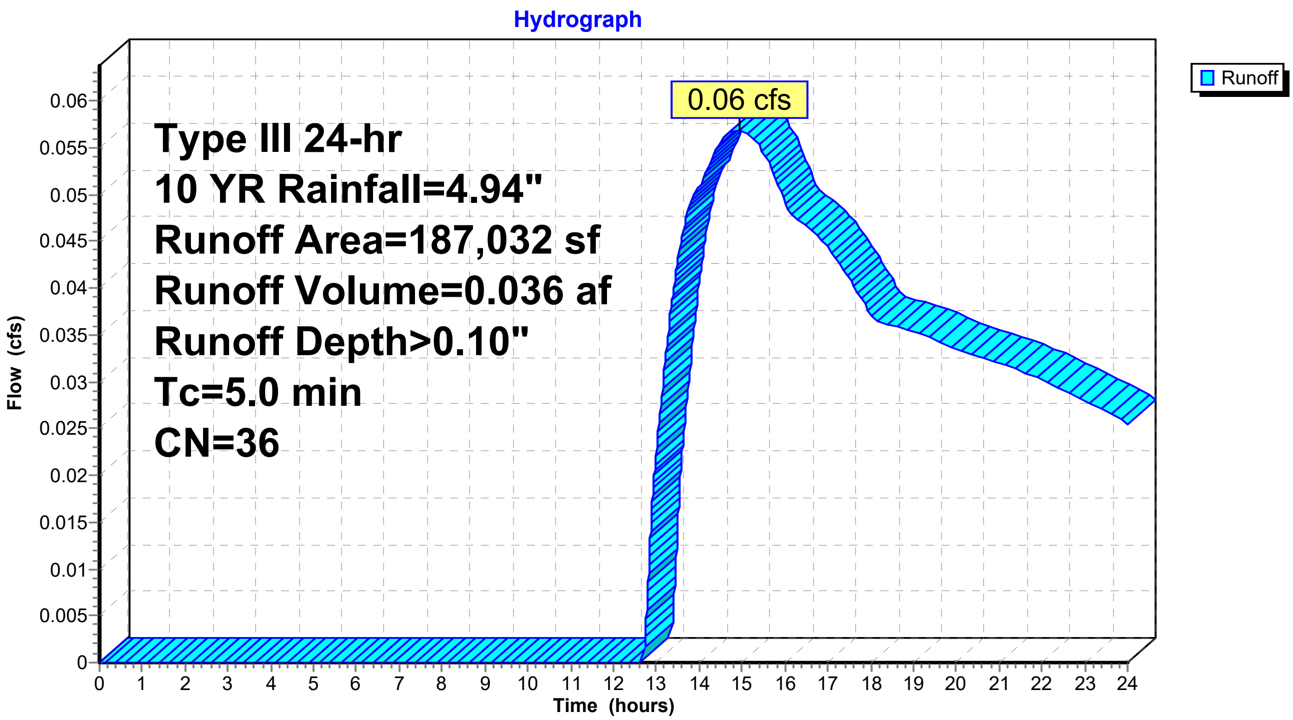
Runoff = 0.06 cfs @ 14.93 hrs, Volume= 0.036 af, Depth> 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
124,219	39	>75% Grass cover, Good, HSG A
62,813	30	Woods, Good, HSG A
187,032	36	Weighted Average
187,032		100.00% Pervious Area

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

Subcatchment P14: PR-DA-14



Summary for Subcatchment P1a: PR-DA-1a

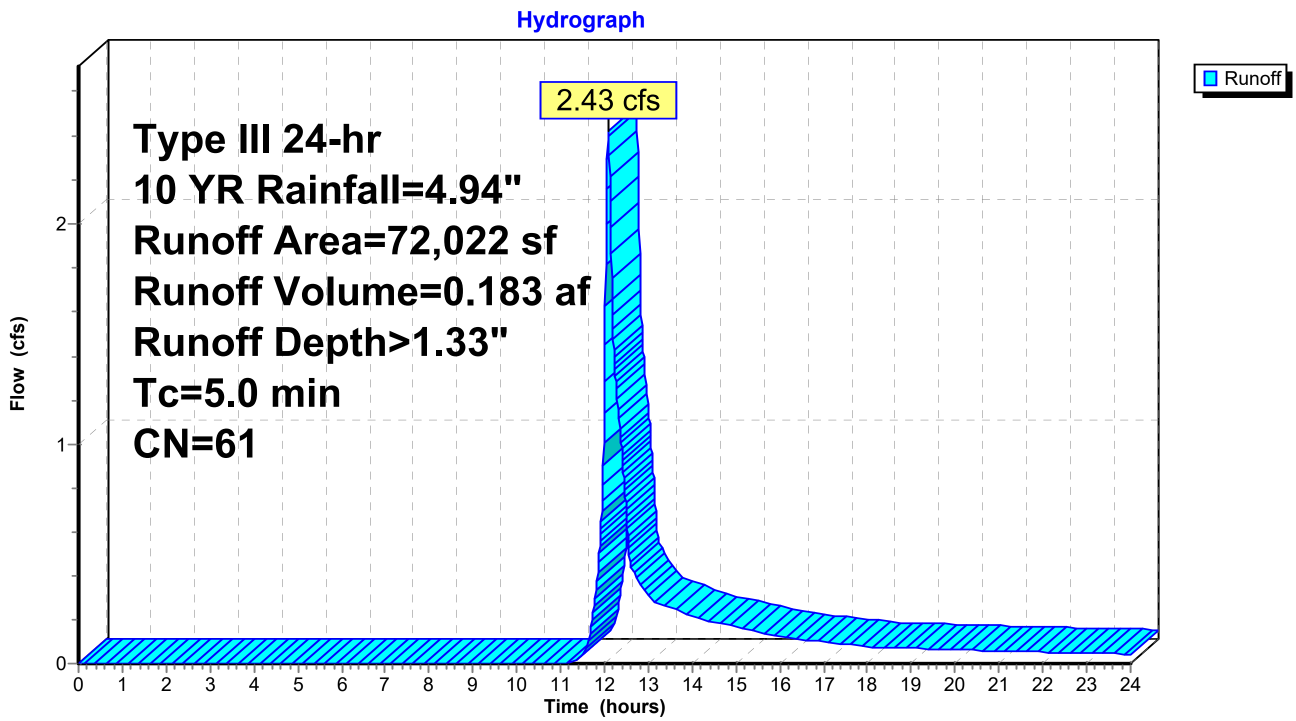
Runoff = 2.43 cfs @ 12.08 hrs, Volume= 0.183 af, Depth> 1.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
44,791	39	>75% Grass cover, Good, HSG A
20,190	98	Paved parking, HSG A
7,041	98	Water Surface, 0% imp, HSG A
72,022	61	Weighted Average
51,832		71.97% Pervious Area
20,190		28.03% Impervious Area

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

Subcatchment P1a: PR-DA-1a



Summary for Subcatchment P1b: PR-DA-1b

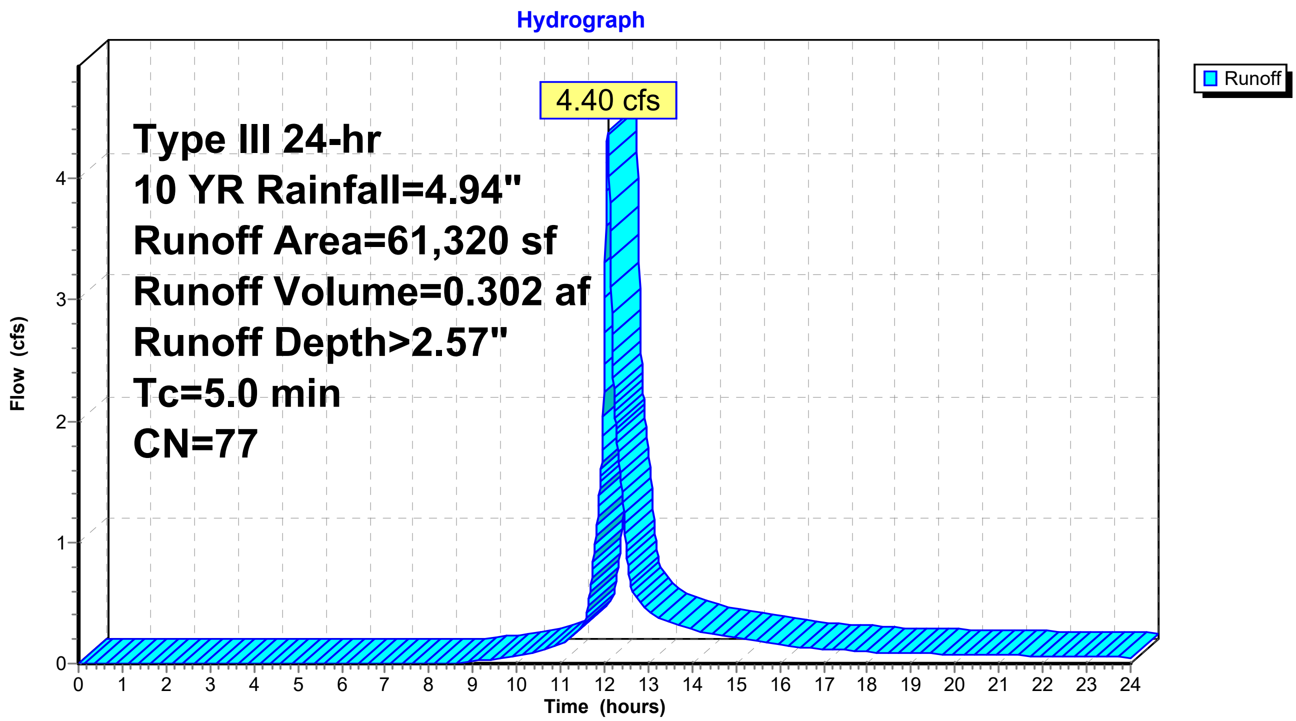
Runoff = 4.40 cfs @ 12.08 hrs, Volume= 0.302 af, Depth> 2.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	21,600	39	>75% Grass cover, Good, HSG A
*	39,720	98	Unconnected Impervious, HSG A
	61,320	77	Weighted Average
	21,600		35.23% Pervious Area
	39,720		64.77% Impervious Area
	39,720		100.00% Unconnected

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

Subcatchment P1b: PR-DA-1b



Summary for Subcatchment P2: PR-DA-2

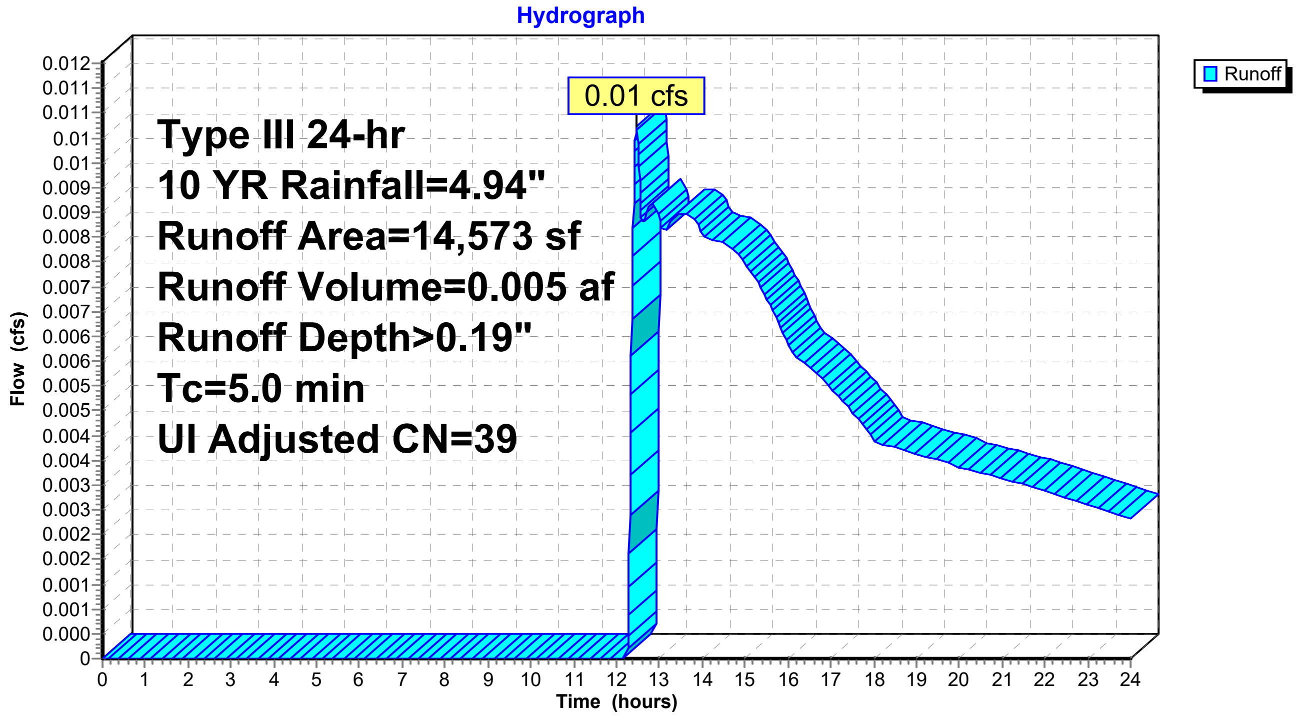
Runoff = 0.01 cfs @ 12.47 hrs, Volume= 0.005 af, Depth> 0.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Adj	Description
	14,431	39		>75% Grass cover, Good, HSG A
*	142	98		Unconnected Impervious, HSG A
	14,573	40	39	Weighted Average, UI Adjusted
	14,431			99.03% Pervious Area
	142			0.97% Impervious Area
	142			100.00% Unconnected

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

Subcatchment P2: PR-DA-2



Summary for Subcatchment P3: PR-DA-3

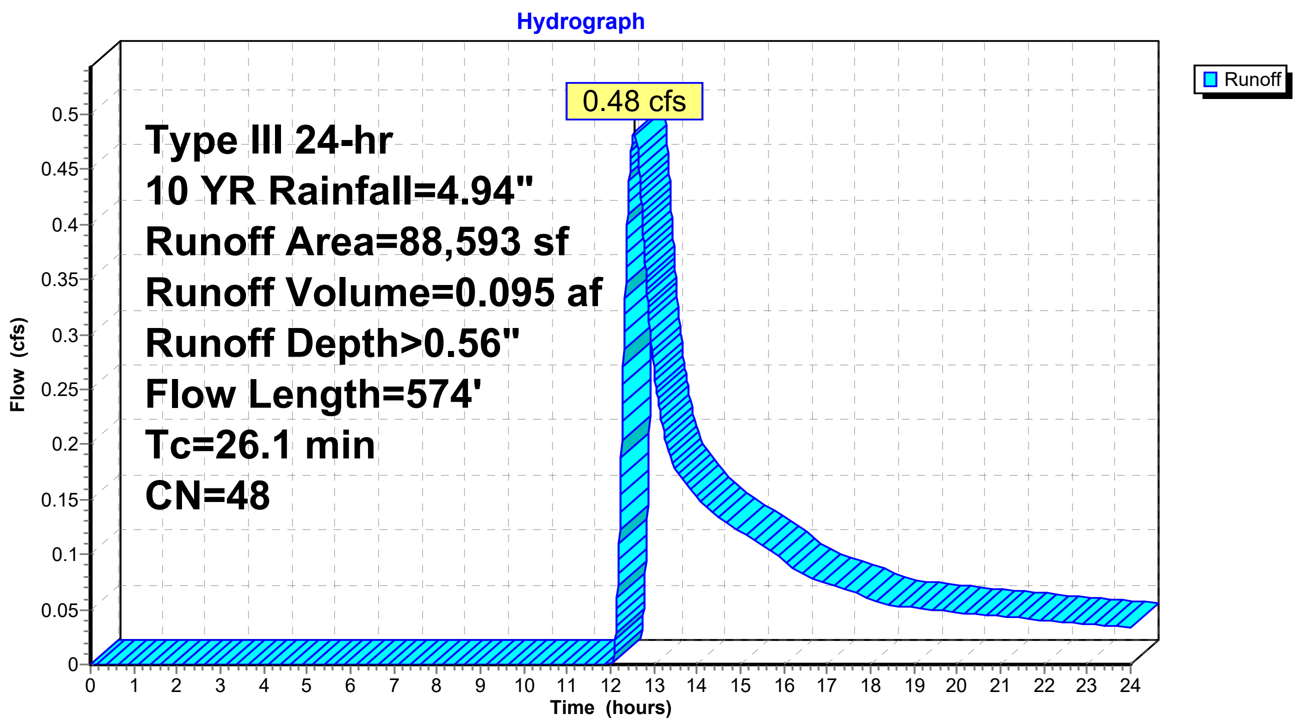
Runoff = 0.48 cfs @ 12.55 hrs, Volume= 0.095 af, Depth> 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
72,419	39	>75% Grass cover, Good, HSG A
7,200	76	Gravel roads, HSG A
8,974	98	Water Surface, 0% imp, HSG A
88,593	48	Weighted Average
88,593		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	50	0.0380	0.20		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
20.8	400	0.0021	0.32		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	74	0.0270	2.65		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.6	50	0.0400	1.40		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
26.1	574	Total			

Subcatchment P3: PR-DA-3



Summary for Subcatchment P4: PR-DA4

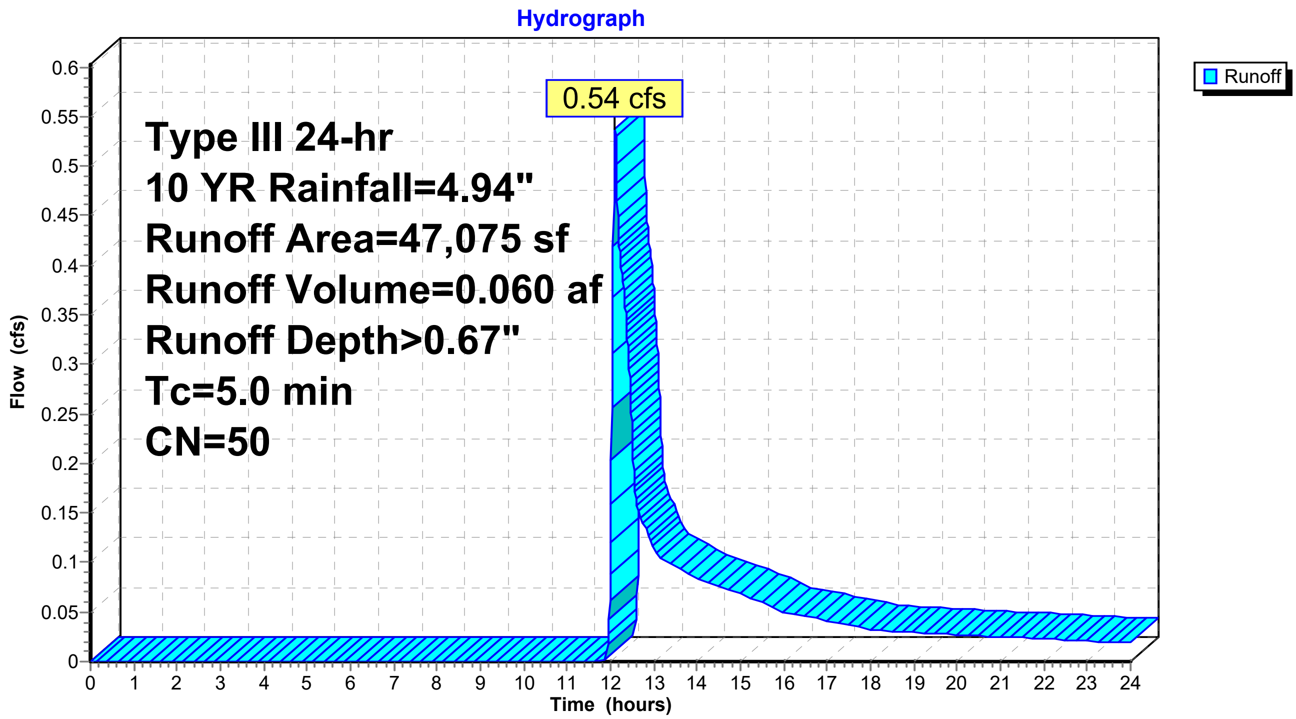
Runoff = 0.54 cfs @ 12.11 hrs, Volume= 0.060 af, Depth> 0.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	38,011	39	>75% Grass cover, Good, HSG A
*	500	98	Unconnected impervious, HSG A
	8,564	98	Stormwater Basin; Water Surface, HSG A
	47,075	50	Weighted Average
	38,011		80.75% Pervious Area
	9,064		19.25% Impervious Area
	500		5.52% Unconnected

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

Subcatchment P4: PR-DA4



Summary for Subcatchment P5: PR-DA5

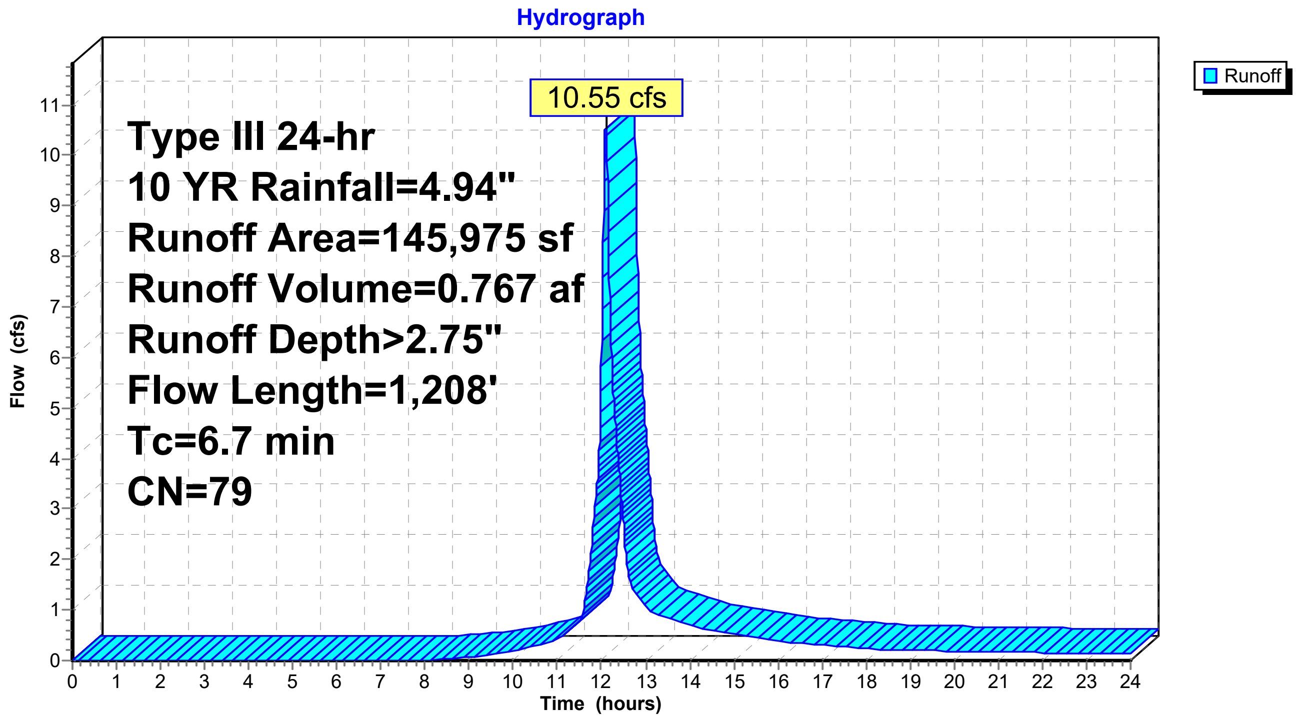
Runoff = 10.55 cfs @ 12.10 hrs, Volume= 0.767 af, Depth> 2.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
46,436	39	>75% Grass cover, Good, HSG A
98,201	98	Paved parking, HSG A
1,338	98	Unconnected roofs, HSG A
145,975	79	Weighted Average
46,436		31.81% Pervious Area
99,539		68.19% Impervious Area
1,338		1.34% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
1.1	130	0.0100	2.03		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
1.3	243	0.0050	3.21	2.52	**Pipe Channel, C-D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
2.4	525	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
1.0	260	0.0050	4.20	7.43	**Pipe Channel, E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
6.7	1,208	Total			

Subcatchment P5: PR-DA5



Summary for Subcatchment P6: PR-DA-6

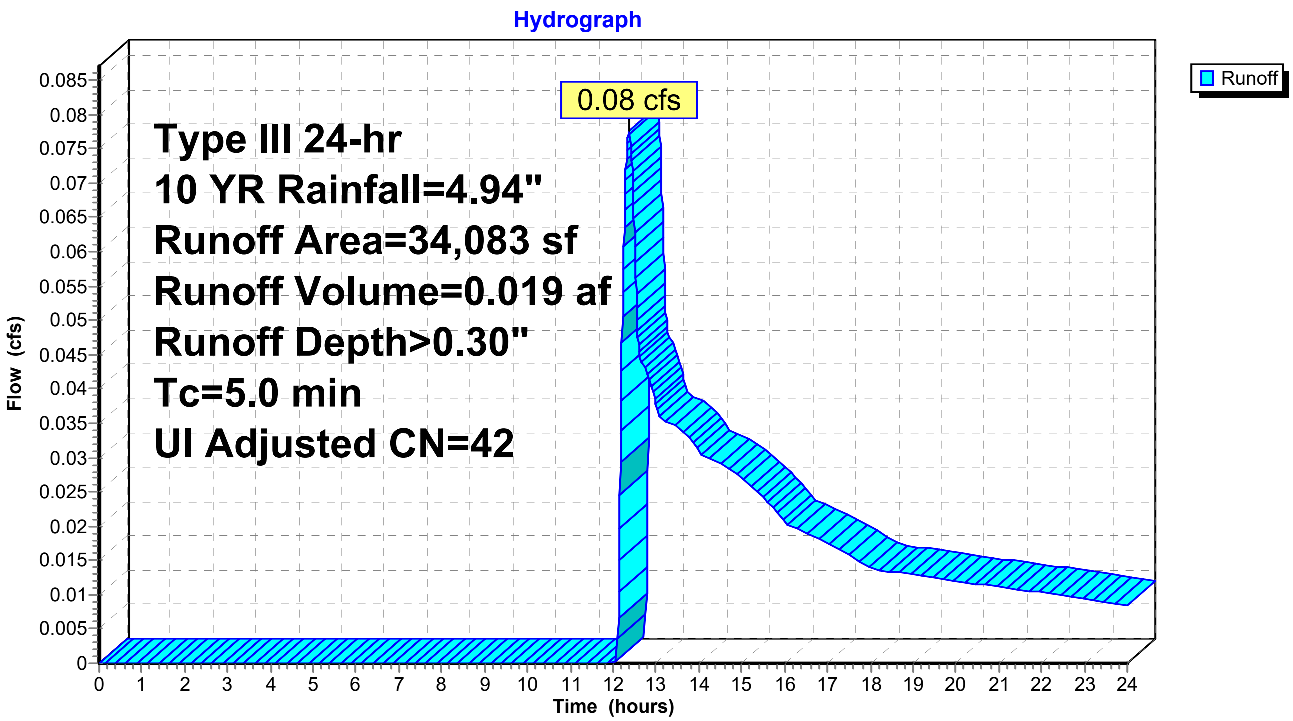
Runoff = 0.08 cfs @ 12.37 hrs, Volume= 0.019 af, Depth> 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Adj	Description
	30,303	39		>75% Grass cover, Good, HSG A
*	3,780	98		Unconnected Impervious, HSG A
	34,083	46	42	Weighted Average, UI Adjusted
	30,303			88.91% Pervious Area
	3,780			11.09% Impervious Area
	3,780			100.00% Unconnected

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

Subcatchment P6: PR-DA-6



Summary for Subcatchment P7: PR-DA-7

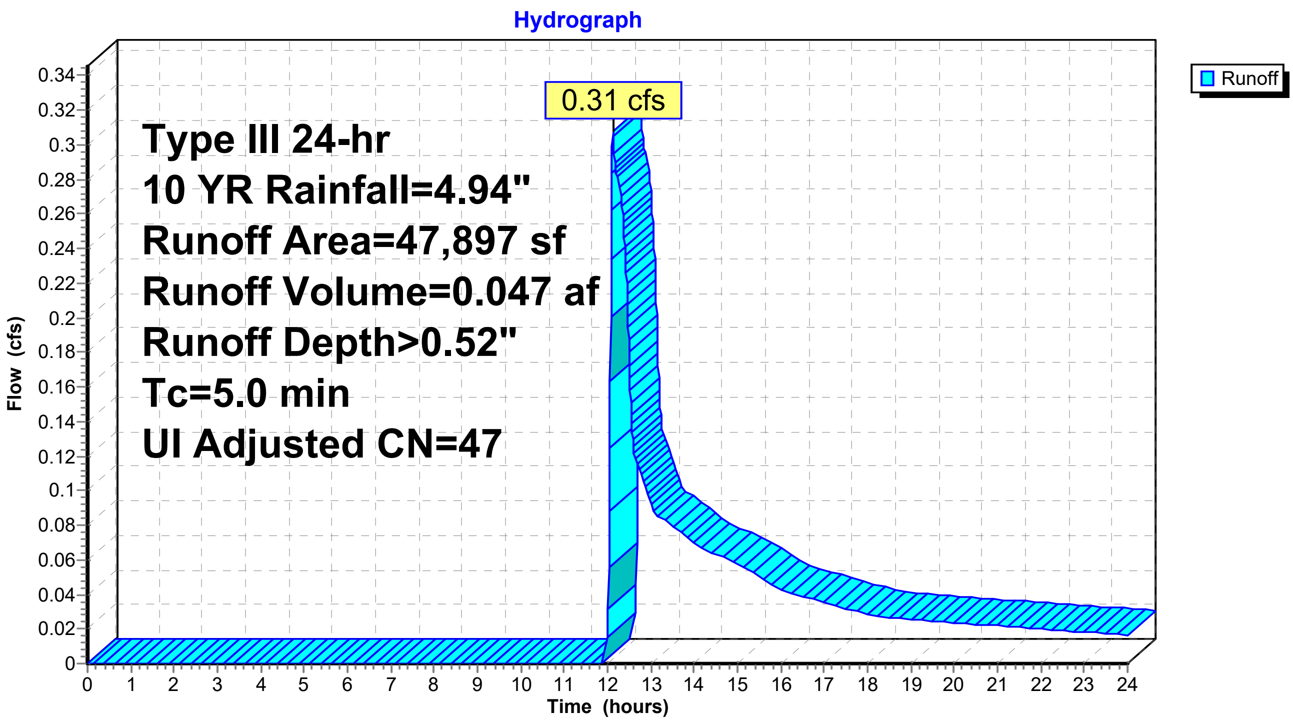
Runoff = 0.31 cfs @ 12.13 hrs, Volume= 0.047 af, Depth> 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Adj	Description
	35,185	39		>75% Grass cover, Good, HSG A
*	12,712	98		Unconnected Impervious, HSG A
	47,897	55	47	Weighted Average, UI Adjusted
	35,185			73.46% Pervious Area
	12,712			26.54% Impervious Area
	12,712			100.00% Unconnected

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

Subcatchment P7: PR-DA-7



Summary for Subcatchment P8a: PR-DA8a

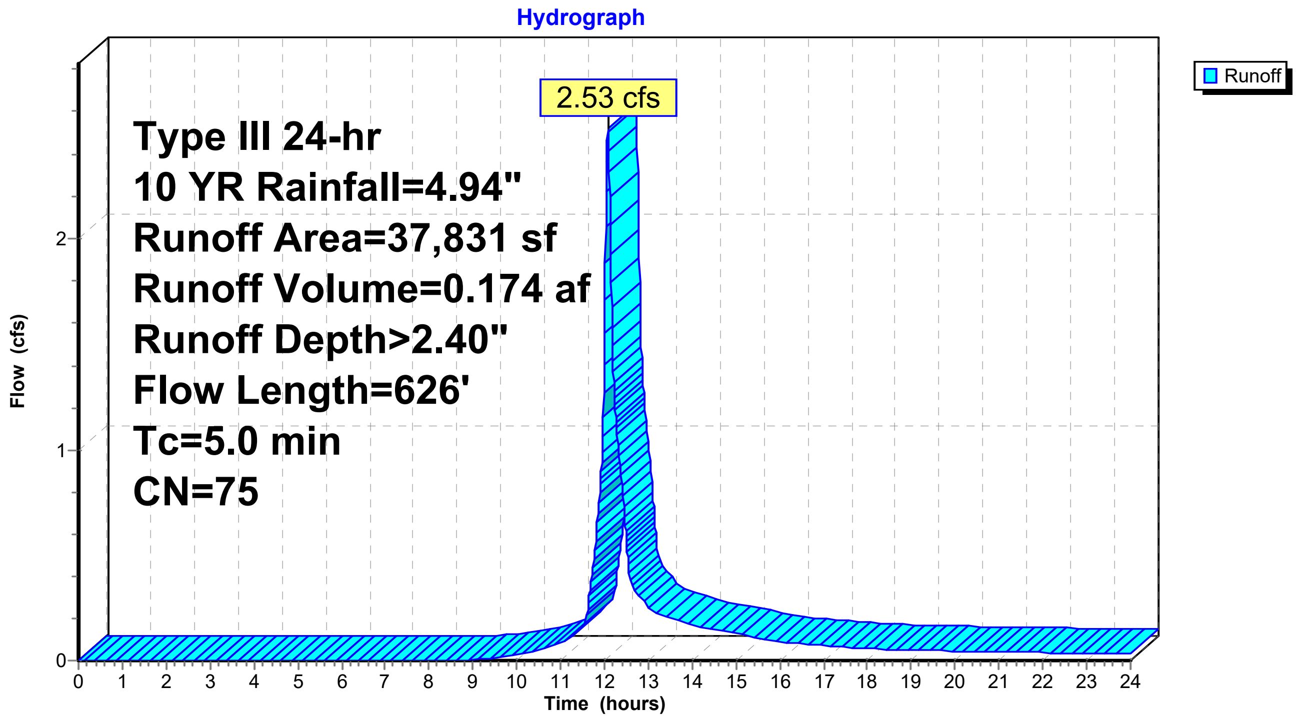
Runoff = 2.53 cfs @ 12.08 hrs, Volume= 0.174 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
14,737	39	>75% Grass cover, Good, HSG A
22,874	98	Paved parking, HSG A
220	98	Roofs, HSG A
37,831	75	Weighted Average
14,737		38.95% Pervious Area
23,094		61.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
1.1	137	0.0100	2.03		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	48	0.0050	3.21	2.52	**Pipe Channel, C-D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
1.1	241	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.5	150	0.0060	4.60	8.14	**Pipe Channel, E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
1.2					**Direct Entry, Added Tc**
5.0	626	Total			

Subcatchment P8a: PR-DA8a



Summary for Subcatchment P8b: PR-DA8b

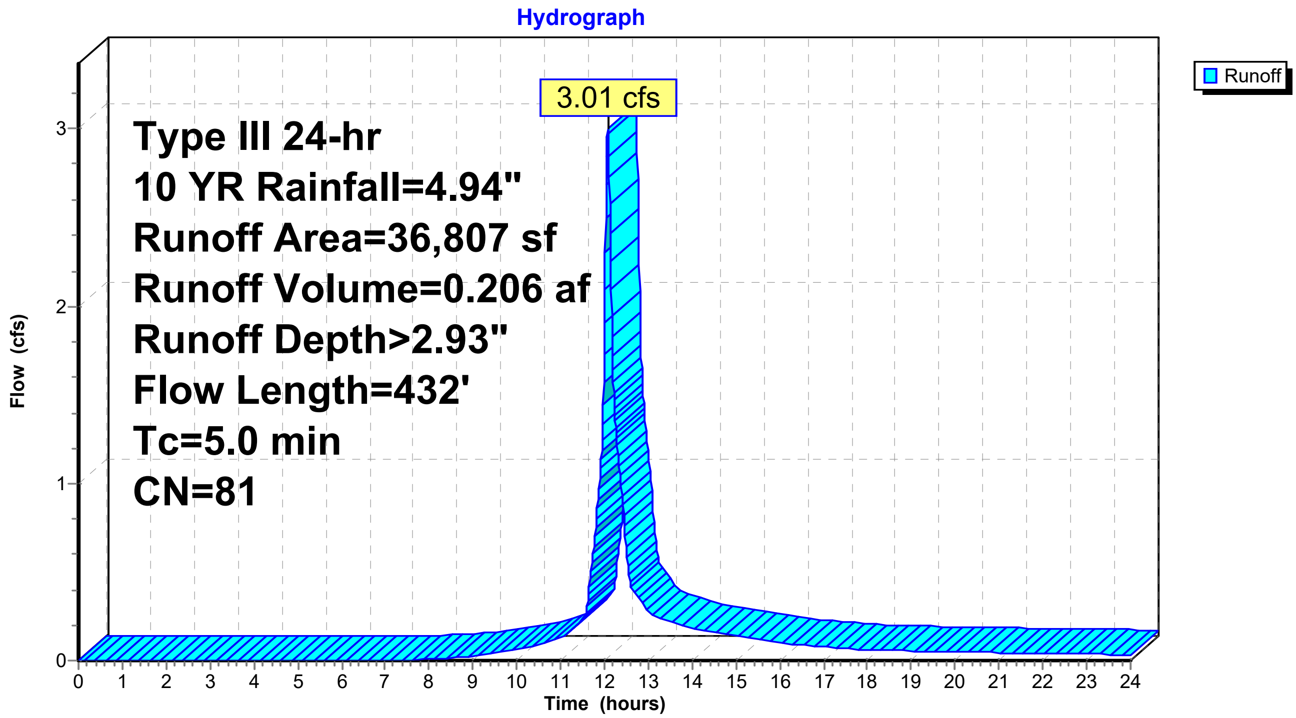
Runoff = 3.01 cfs @ 12.07 hrs, Volume= 0.206 af, Depth> 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

Area (sf)	CN	Description
10,671	39	>75% Grass cover, Good, HSG A
25,176	98	Paved parking, HSG A
960	98	Roofs, HSG A
36,807	81	Weighted Average
10,671		28.99% Pervious Area
26,136		71.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	86	0.0100	1.04		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
0.7	196	0.0100	4.54	3.56	**Pipe Channel, B-C** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.5	150	0.0060	4.60	8.14	**Pipe Channel, C-D** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
2.4					**Direct Entry, Added Tc**
5.0	432	Total			

Subcatchment P8b: PR-DA8b



Summary for Subcatchment P9: PR-DA9

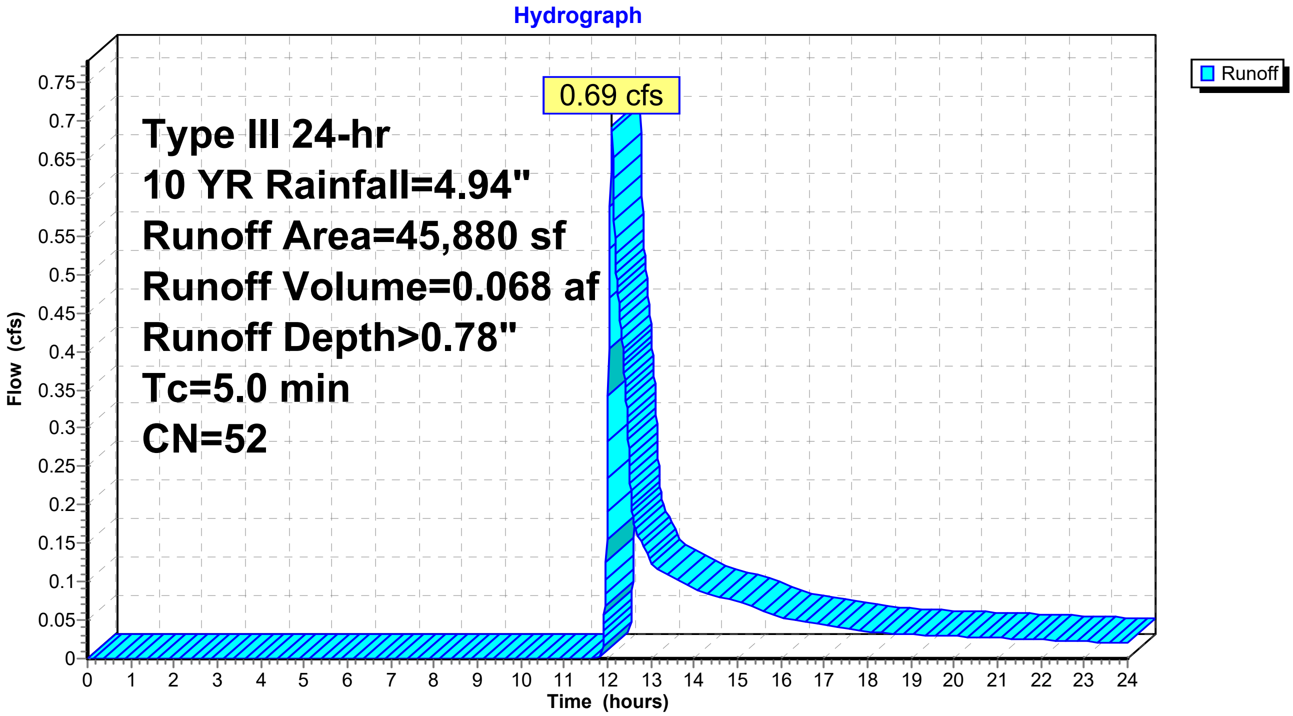
Runoff = 0.69 cfs @ 12.10 hrs, Volume= 0.068 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.94"

	Area (sf)	CN	Description
	35,890	39	>75% Grass cover, Good, HSG A
*	380	98	Unconnected impervious, HSG A
	9,610	98	Stormwater Basin; Water Surface, HSG A
	45,880	52	Weighted Average
	35,890		78.23% Pervious Area
	9,990		21.77% Impervious Area
	380		3.80% Unconnected

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

Subcatchment P9: PR-DA9

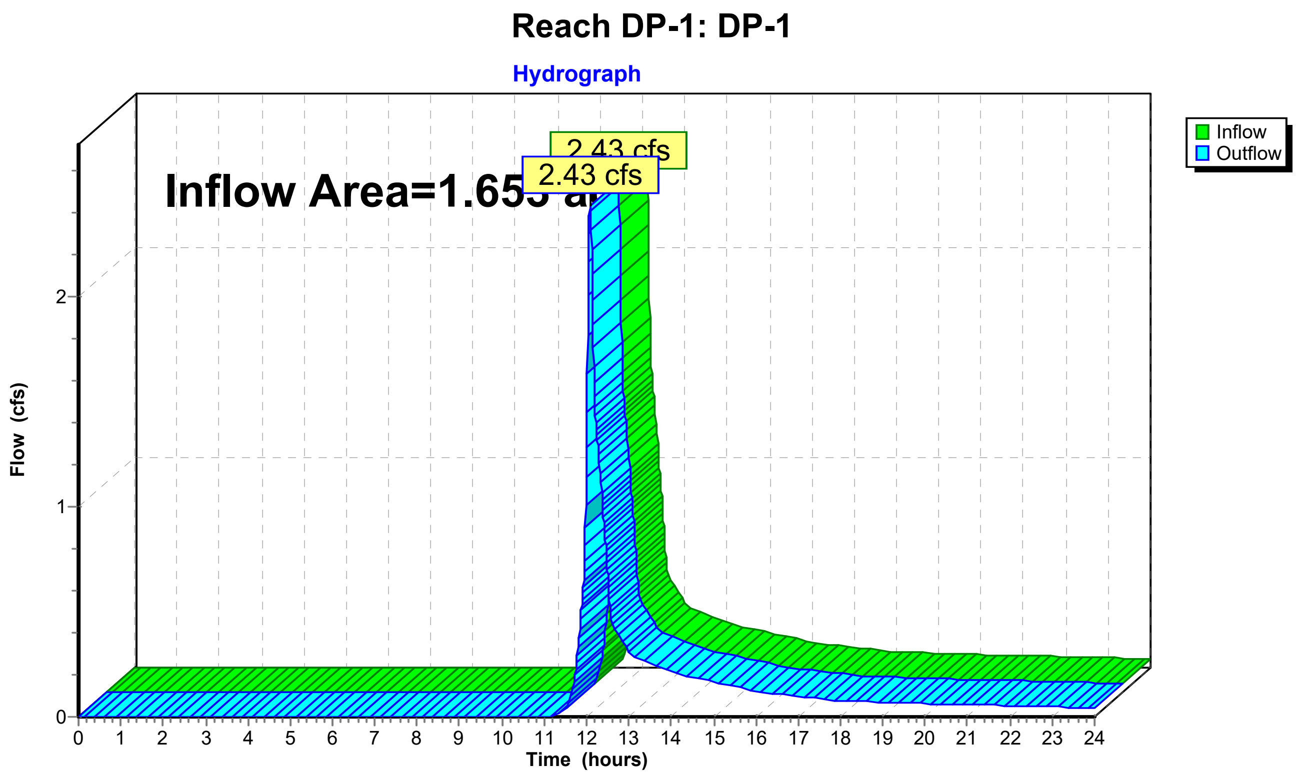


Summary for Reach DP-1: DP-1

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

Inflow Area = 1.653 ac, 28.03% Impervious, Inflow Depth > 1.33" for 10 YR event
Inflow = 2.43 cfs @ 12.08 hrs, Volume= 0.183 af
Outflow = 2.43 cfs @ 12.08 hrs, Volume= 0.183 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



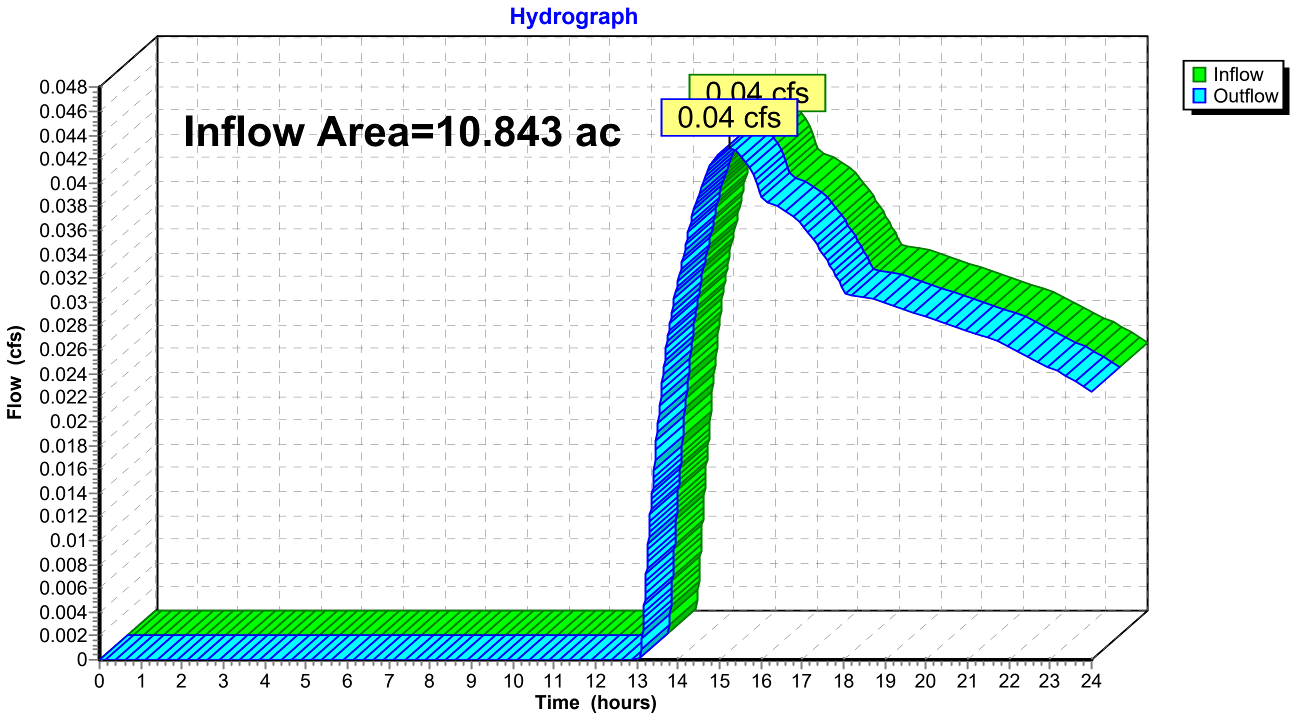
Summary for Reach DP-2: DP-2 (JOSHUA'S BROOK)

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

Inflow Area =	10.843 ac, 28.77% Impervious, Inflow Depth > 0.03"	for 10 YR event	
Inflow =	0.04 cfs @ 15.23 hrs, Volume=	0.028 af	
Outflow =	0.04 cfs @ 15.23 hrs, Volume=	0.028 af, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-2: DP-2 (JOSHUA'S BROOK)



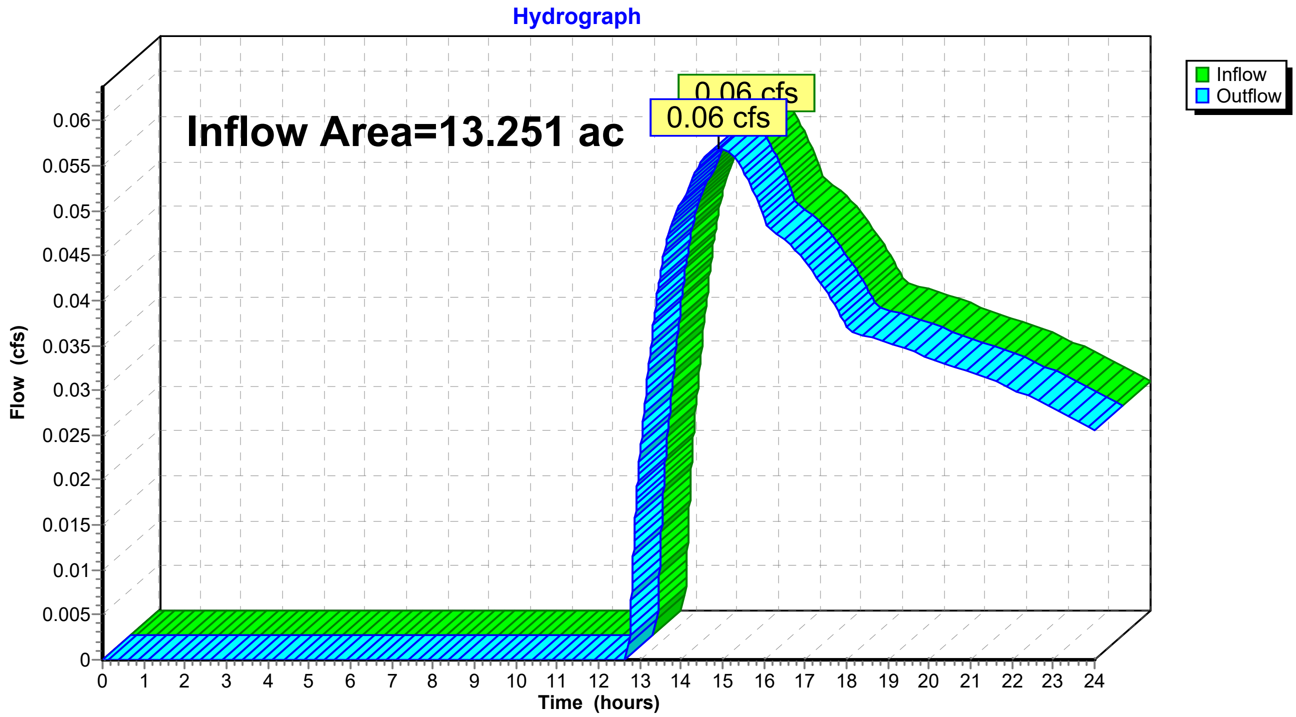
Summary for Reach DP-3: DP-3 (STEWART'S CREEK)

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

Inflow Area = 13.251 ac, 19.02% Impervious, Inflow Depth > 0.03" for 10 YR event
Inflow = 0.06 cfs @ 14.93 hrs, Volume= 0.036 af
Outflow = 0.06 cfs @ 14.93 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-3: DP-3 (STEWART'S CREEK)



Summary for Pond 41P: SC-740

Inflow Area = 0.115 ac,100.00% Impervious, Inflow Depth > 4.70" for 10 YR event
Inflow = 0.57 cfs @ 12.07 hrs, Volume= 0.045 af
Outflow = 0.09 cfs @ 11.65 hrs, Volume= 0.045 af, Atten= 84%, Lag= 0.0 min
Discarded = 0.09 cfs @ 11.65 hrs, Volume= 0.045 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 38.06' @ 12.52 hrs Surf.Area= 492 sf Storage= 496 cf

Plug-Flow detention time= 27.9 min calculated for 0.045 af (100% of inflow)
Center-of-Mass det. time= 27.8 min (774.6 - 746.8)

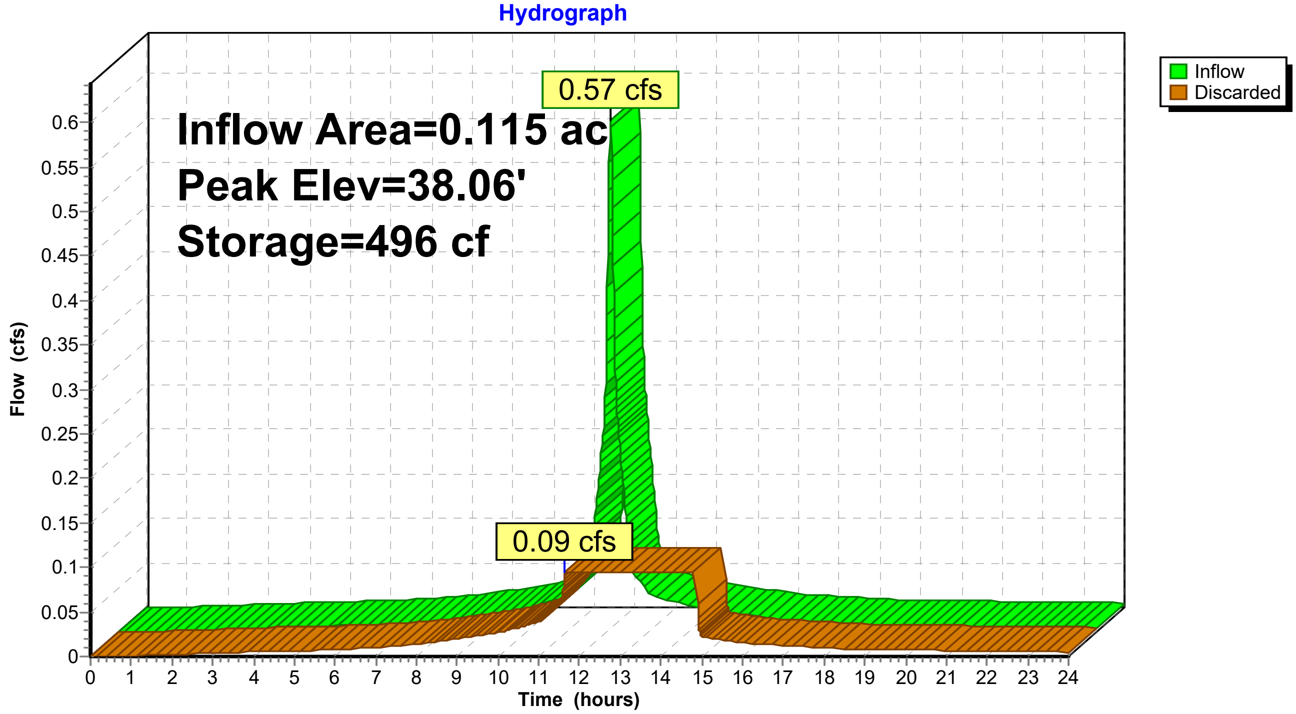
Volume	Invert	Avail.Storage	Storage Description
#1	36.50'	468 cf	**Stone (Prismatic)** Listed below (Recalc) 1,722 cf Overall - 551 cf Embedded = 1,171 cf x 40.0% Voids
#2	37.00'	551 cf	**ADS_StormTech SC-740 +Cap** x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 6 Chambers
		1,020 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
36.50	492	0	0
40.00	492	1,722	1,722

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.09 cfs @ 11.65 hrs HW=36.54' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Pond 41P: SC-740



Summary for Pond 43P: SC-740

Inflow Area = 0.782 ac, 11.09% Impervious, Inflow Depth > 0.30" for 10 YR event
Inflow = 0.08 cfs @ 12.37 hrs, Volume= 0.019 af
Outflow = 0.05 cfs @ 12.26 hrs, Volume= 0.019 af, Atten= 37%, Lag= 0.0 min
Discarded = 0.05 cfs @ 12.26 hrs, Volume= 0.019 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 19.78' @ 12.57 hrs Surf.Area= 256 sf Storage= 29 cf

Plug-Flow detention time= 3.1 min calculated for 0.019 af (100% of inflow)
Center-of-Mass det. time= 2.5 min (976.6 - 974.1)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	248 cf	**Stone (Prismatic)** Listed below (Recalc) 896 cf Overall - 276 cf Embedded = 620 cf x 40.0% Voids
#2	20.00'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 3 Chambers
#3	24.50'	3,830 cf	**Surface Ponding (Prismatic)** Listed below (Recalc)
		4,353 cf	Total Available Storage

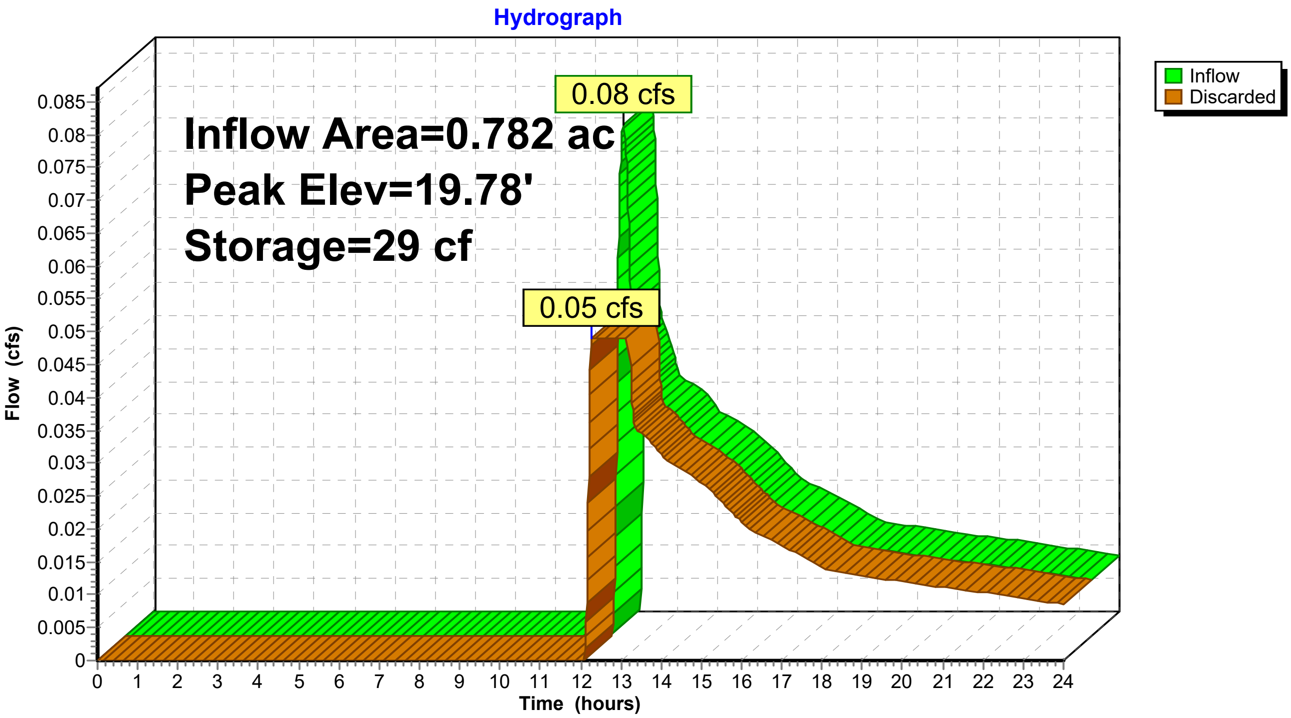
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	256	0	0
23.00	256	896	896

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.50	4	0	0
25.00	3,057	765	765
25.50	9,200	3,064	3,830

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.05 cfs @ 12.26 hrs HW=19.56' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Pond 43P: SC-740



Summary for Pond 45P: SC-740

Inflow Area = 1.100 ac, 26.54% Impervious, Inflow Depth > 0.52" for 10 YR event
Inflow = 0.31 cfs @ 12.13 hrs, Volume= 0.047 af
Outflow = 0.12 cfs @ 12.09 hrs, Volume= 0.047 af, Atten= 60%, Lag= 0.0 min
Discarded = 0.12 cfs @ 12.09 hrs, Volume= 0.047 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 20.20' @ 12.60 hrs Surf.Area= 650 sf Storage= 235 cf

Plug-Flow detention time= 10.5 min calculated for 0.047 af (100% of inflow)
Center-of-Mass det. time= 9.9 min (942.1 - 932.3)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	616 cf	**Stone (Prismatic)** Listed below (Recalc) 2,275 cf Overall - 735 cf Embedded = 1,540 cf x 40.0% Voids
#2	20.00'	735 cf	**ADS_StormTech SC-740 +Cap** x 16 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 8 Chambers
#3	25.50'	4,609 cf	**Surface Ponding (Prismatic)** Listed below (Recalc)
		5,960 cf	Total Available Storage

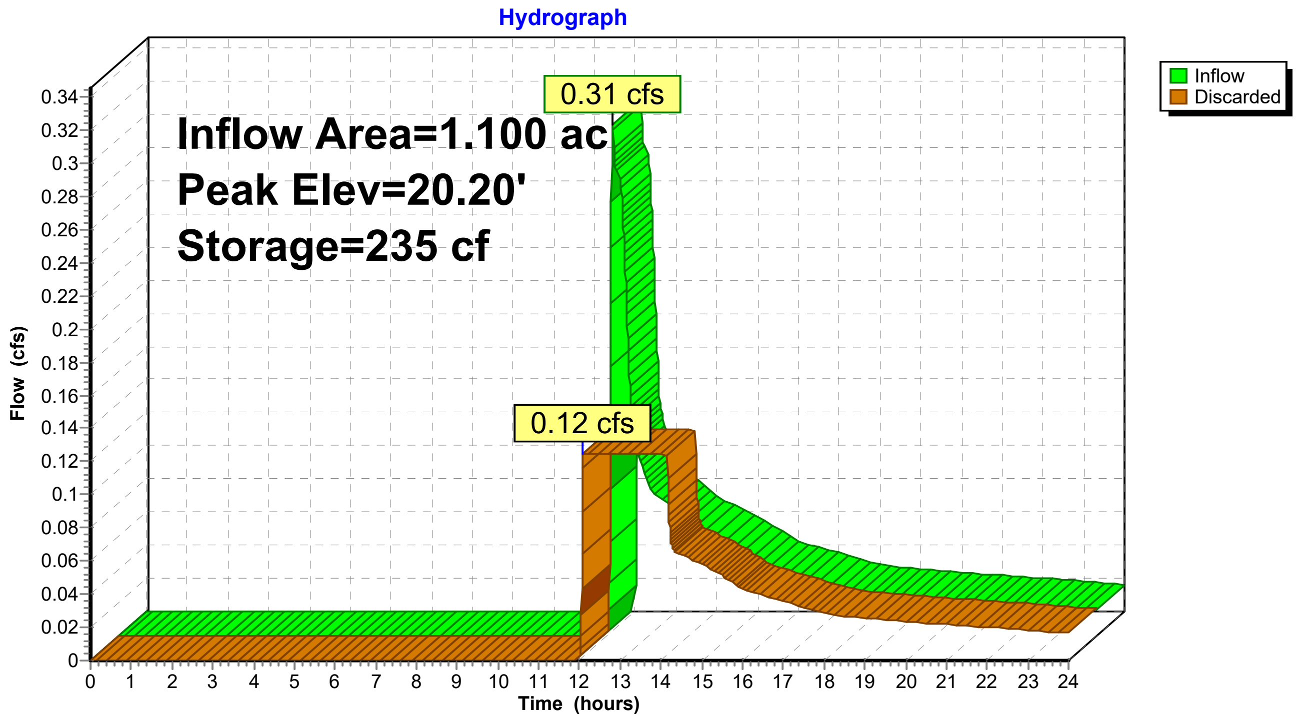
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	650	0	0
23.00	650	2,275	2,275

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
25.50	4	0	0
26.00	2,742	687	687
26.80	7,065	3,923	4,609

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.12 cfs @ 12.09 hrs HW=19.59' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.12 cfs)

Pond 45P: SC-740



Summary for Pond B-1: Basin 1

Inflow Area = 5.195 ac, 60.05% Impervious, Inflow Depth > 2.27" for 10 YR event
Inflow = 14.16 cfs @ 12.10 hrs, Volume= 0.984 af
Outflow = 0.75 cfs @ 14.74 hrs, Volume= 0.763 af, Atten= 95%, Lag= 158.4 min
Discarded = 0.75 cfs @ 14.74 hrs, Volume= 0.763 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 12.61' @ 14.74 hrs Surf.Area= 13,431 sf Storage= 22,799 cf

Plug-Flow detention time= 288.9 min calculated for 0.763 af (78% of inflow)
Center-of-Mass det. time= 210.2 min (1,031.3 - 821.1)

Volume	Invert	Avail.Storage	Storage Description
#1	10.50'	61,135 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

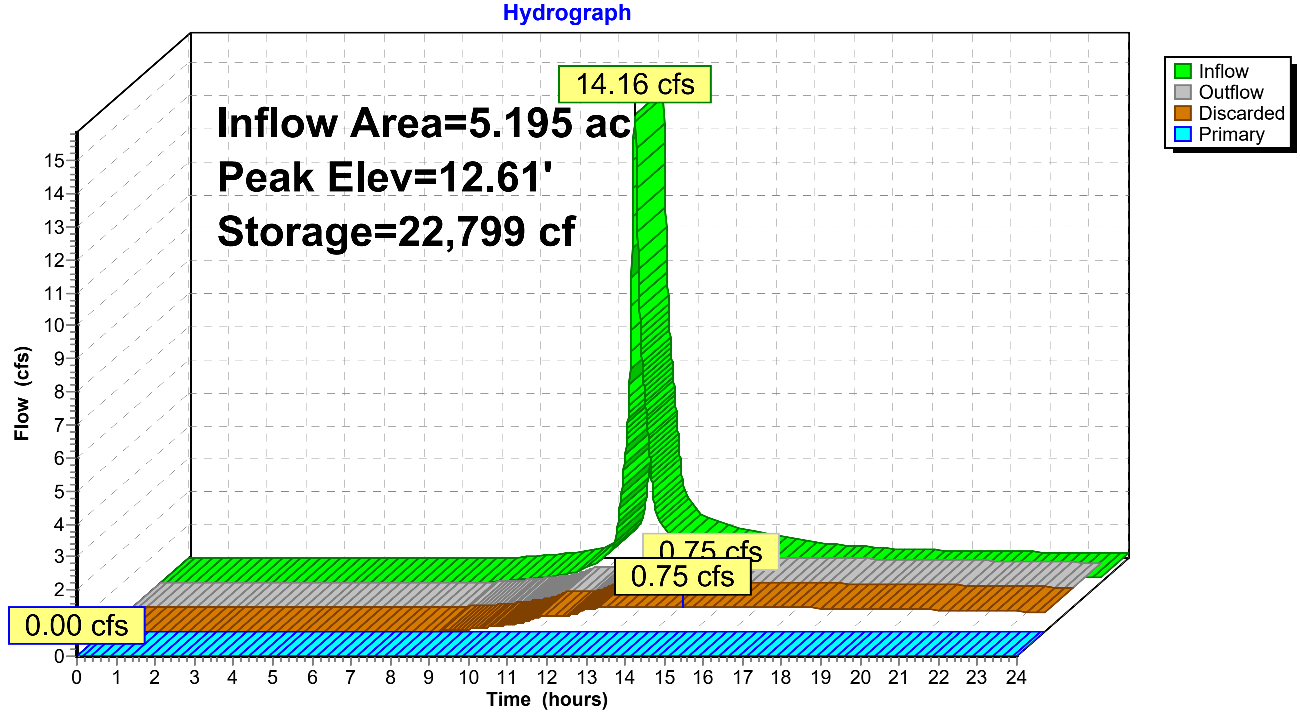
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.50	8,346	0	0
11.00	9,153	4,375	4,375
12.00	12,072	10,613	14,987
13.00	14,291	13,182	28,169
14.00	16,502	15,397	43,565
15.00	18,637	17,570	61,135

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	15.00'	**45.0 deg x 15.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.75 cfs @ 14.74 hrs HW=12.61' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.75 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.50' (Free Discharge)
└─**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond B-1: Basin 1



Summary for Pond B-2: Basin 2

Inflow Area =	4.443 ac, 56.72% Impervious, Inflow Depth > 1.74" for 10 YR event		
Inflow =	10.56 cfs @ 12.10 hrs,	Volume=	0.645 af
Outflow =	0.57 cfs @ 14.13 hrs,	Volume=	0.570 af, Atten= 95%, Lag= 121.7 min
Discarded =	0.57 cfs @ 14.13 hrs,	Volume=	0.570 af
Primary =	0.00 cfs @ 0.00 hrs,	Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 17.19' @ 14.13 hrs Surf.Area= 10,288 sf Storage= 15,288 cf

Plug-Flow detention time= 277.0 min calculated for 0.569 af (88% of inflow)
Center-of-Mass det. time= 227.4 min (1,039.2 - 811.8)

Volume	Invert	Avail.Storage	Storage Description
#1	15.50'	37,352 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

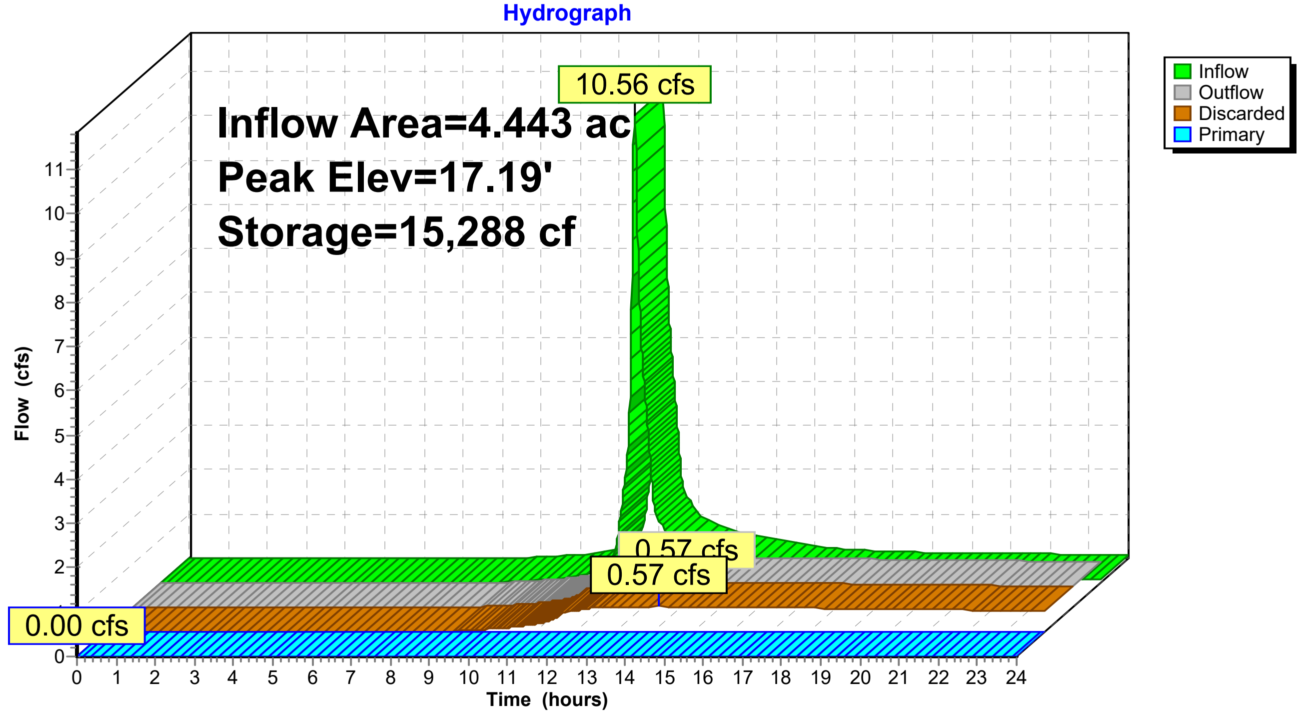
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
15.50	7,983	0	0
16.00	8,588	4,143	4,143
17.00	9,841	9,215	13,357
18.00	12,169	11,005	24,362
19.00	13,810	12,990	37,352

Device	Routing	Invert	Outlet Devices
#1	Discarded	15.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.50'	**45.0 deg x 15.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.57 cfs @ 14.13 hrs HW=17.19' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.57 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.50' (Free Discharge)
└─**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond B-2: Basin 2



Summary for Pond BIO1: BIO 1

Inflow Area = 0.791 ac, 76.51% Impervious, Inflow Depth > 3.21" for 10 YR event
Inflow = 3.07 cfs @ 12.07 hrs, Volume= 0.212 af
Outflow = 2.98 cfs @ 12.09 hrs, Volume= 0.207 af, Atten= 3%, Lag= 1.1 min
Discarded = 0.06 cfs @ 12.09 hrs, Volume= 0.058 af
Primary = 2.92 cfs @ 12.09 hrs, Volume= 0.149 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 19.77' @ 12.09 hrs Surf.Area= 1,086 sf Storage= 538 cf

Plug-Flow detention time= 26.2 min calculated for 0.207 af (98% of inflow)
Center-of-Mass det. time= 12.8 min (822.3 - 809.5)

Volume	Invert	Avail.Storage	Storage Description
#1	19.00'	7,359 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

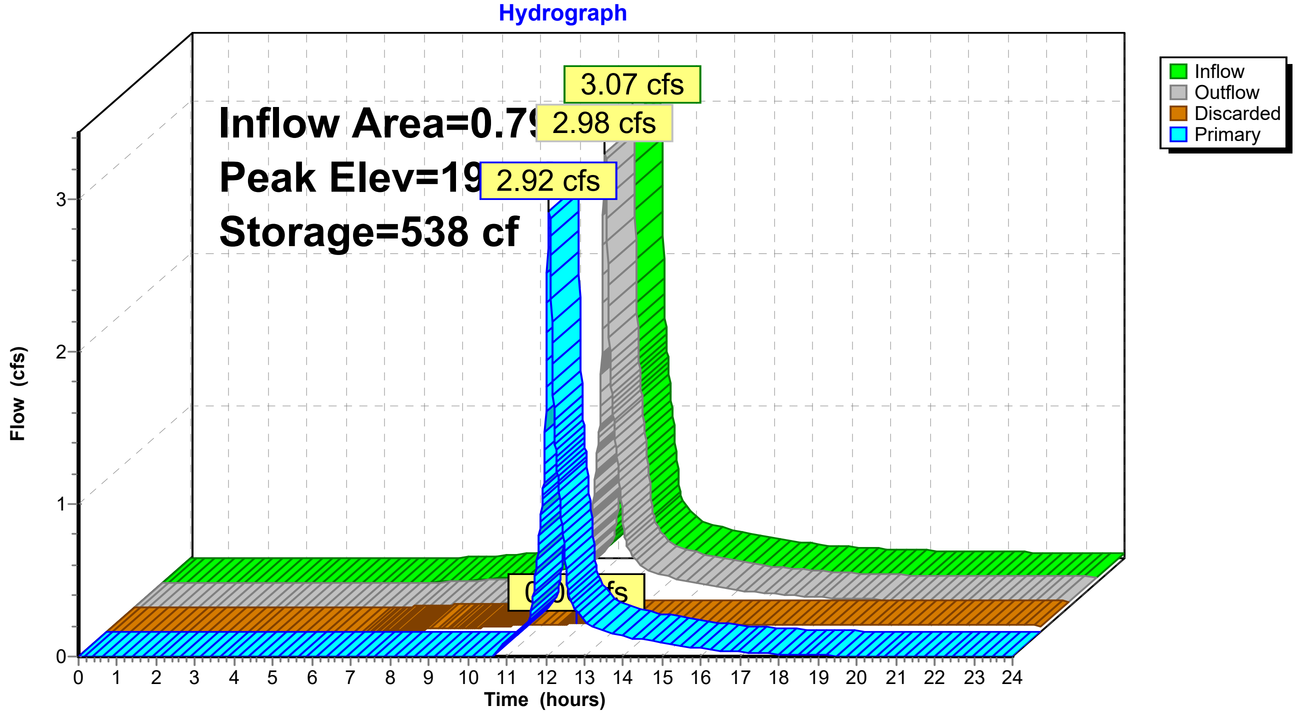
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.00	307	0	0
20.00	1,315	811	811
20.40	2,200	703	1,514
21.00	17,283	5,845	7,359

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	19.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 12.09 hrs HW=19.77' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=2.92 cfs @ 12.09 hrs HW=19.77' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 1.46 cfs @ 1.71 fps)
└─**3=Orifice/Grate** (Weir Controls 1.46 cfs @ 1.71 fps)

Pond BIO1: BIO 1



Summary for Pond BIO2: BIO 2

Inflow Area = 0.833 ac, 68.24% Impervious, Inflow Depth > 2.75" for 10 YR event
Inflow = 2.79 cfs @ 12.07 hrs, Volume= 0.191 af
Outflow = 2.24 cfs @ 12.13 hrs, Volume= 0.191 af, Atten= 20%, Lag= 3.4 min
Discarded = 0.12 cfs @ 12.13 hrs, Volume= 0.116 af
Primary = 2.12 cfs @ 12.13 hrs, Volume= 0.074 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 22.97' @ 12.13 hrs Surf.Area= 2,207 sf Storage= 1,754 cf

Plug-Flow detention time= 79.3 min calculated for 0.190 af (100% of inflow)
Center-of-Mass det. time= 78.4 min (901.9 - 823.5)

Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	4,509 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

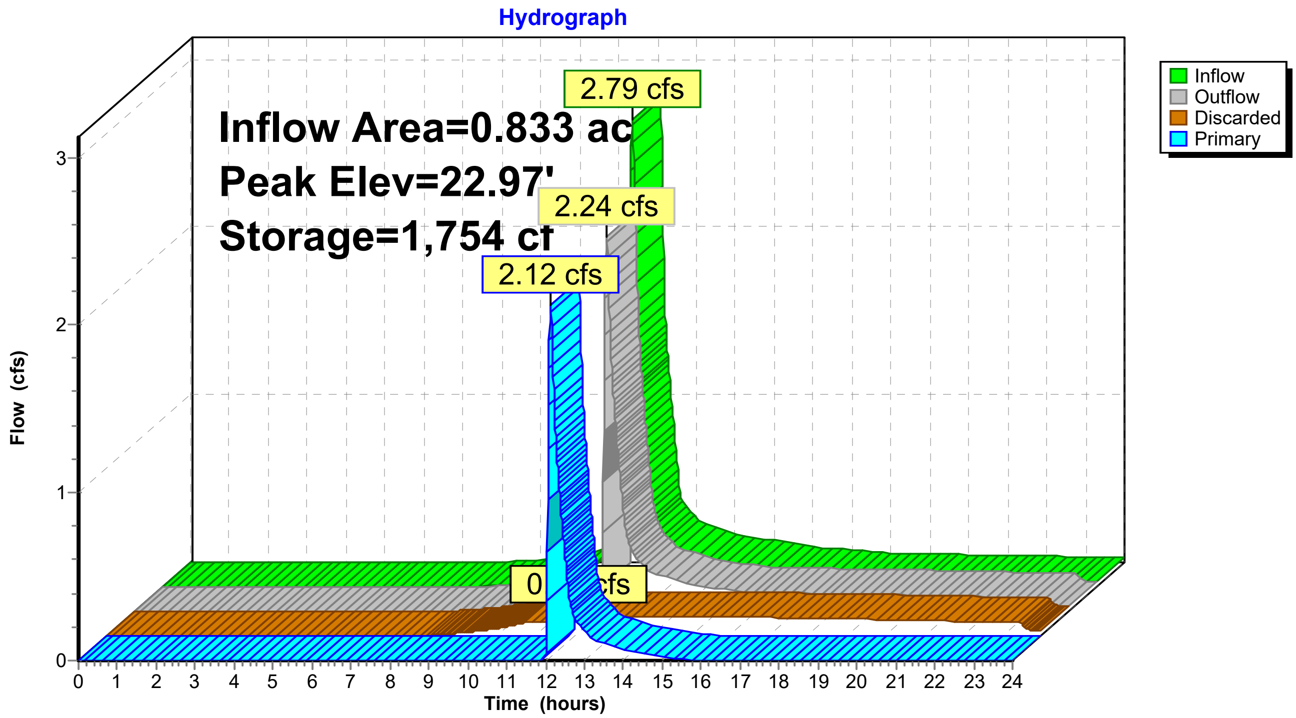
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	1,410	0	0
23.00	2,232	1,821	1,821
24.00	3,143	2,688	4,509

Device	Routing	Invert	Outlet Devices
#1	Discarded	22.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	22.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	22.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.12 cfs @ 12.13 hrs HW=22.97' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=2.11 cfs @ 12.13 hrs HW=22.97' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 1.06 cfs @ 1.53 fps)
└─**3=Orifice/Grate** (Weir Controls 1.06 cfs @ 1.53 fps)

Pond BIO2: BIO 2



Summary for Pond BIO3: BIO-3

Inflow Area = 0.816 ac, 75.18% Impervious, Inflow Depth > 3.12" for 10 YR event
Inflow = 3.08 cfs @ 12.07 hrs, Volume= 0.212 af
Outflow = 2.93 cfs @ 12.10 hrs, Volume= 0.209 af, Atten= 5%, Lag= 1.5 min
Discarded = 0.08 cfs @ 12.10 hrs, Volume= 0.078 af
Primary = 2.84 cfs @ 12.10 hrs, Volume= 0.130 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 23.77' @ 12.10 hrs Surf.Area= 1,494 sf Storage= 822 cf

Plug-Flow detention time= 36.1 min calculated for 0.208 af (98% of inflow)
Center-of-Mass det. time= 26.7 min (839.2 - 812.5)

Volume	Invert	Avail.Storage	Storage Description
#1	23.00'	2,268 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

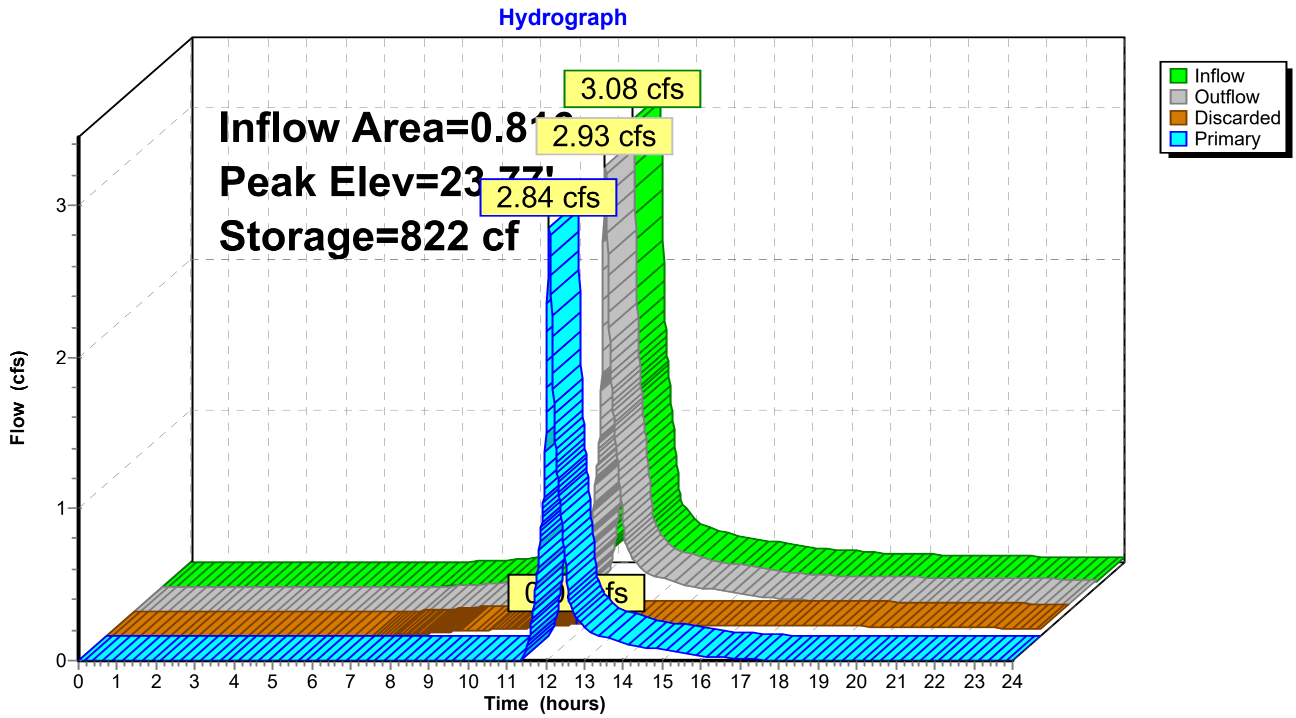
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
23.00	648	0	0
24.00	1,750	1,199	1,199
24.50	2,527	1,069	2,268

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	23.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	23.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.08 cfs @ 12.10 hrs HW=23.77' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=2.84 cfs @ 12.10 hrs HW=23.77' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 1.42 cfs @ 1.69 fps)
└─**3=Orifice/Grate** (Weir Controls 1.42 cfs @ 1.69 fps)

Pond BIO3: BIO-3



Summary for Pond P-B: POND B

Inflow Area = 1.269 ac, 0.00% Impervious, Inflow Depth > 0.61" for 10 YR event
Inflow = 0.54 cfs @ 12.11 hrs, Volume= 0.065 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 2.97' @ 24.00 hrs Surf.Area= 10,990 sf Storage= 2,832 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

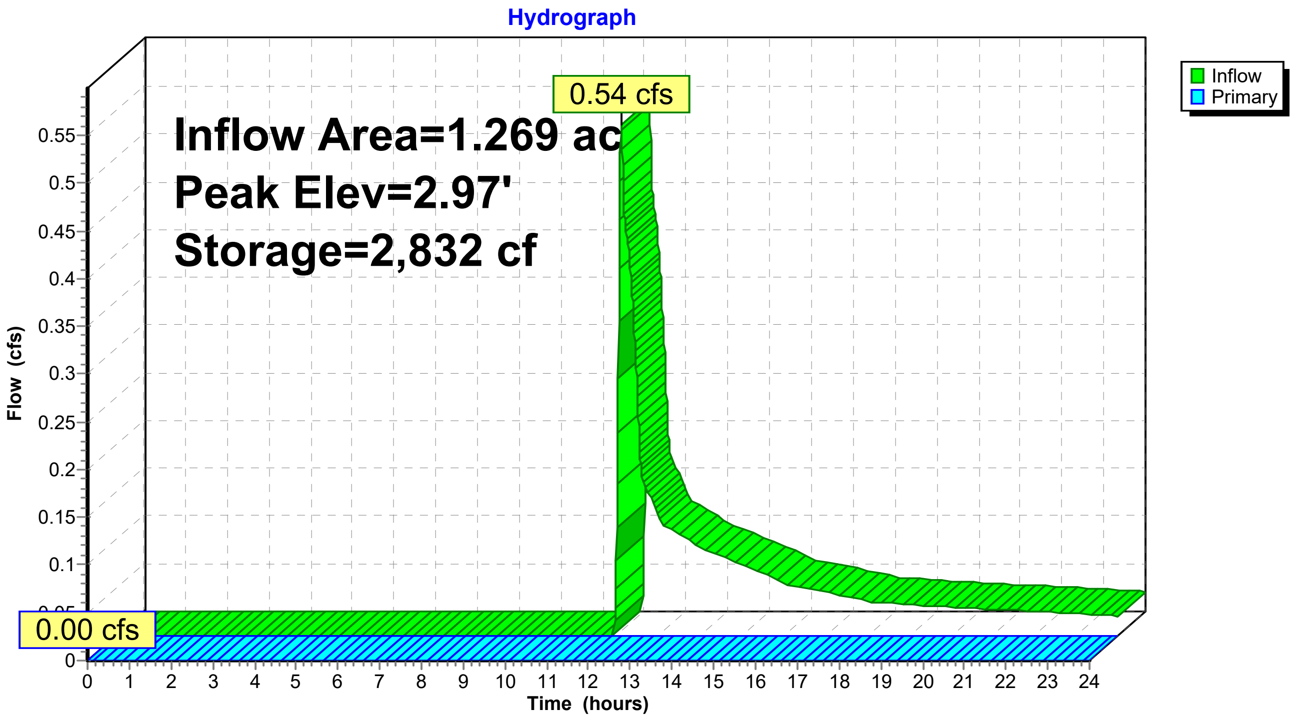
Volume	Invert	Avail.Storage	Storage Description
#1	2.70'	15,021 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2.70	10,273	0	0
3.00	11,080	3,203	3,203
3.40	11,370	4,490	7,693
4.00	13,058	7,328	15,021

Device	Routing	Invert	Outlet Devices
#1	Primary	3.44'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2.70' (Free Discharge)
↑—**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-B: POND B



Summary for Pond P-C: POND C

Inflow Area = 2.480 ac, 0.00% Impervious, Inflow Depth > 0.61" for 10 YR event
Inflow = 1.05 cfs @ 12.11 hrs, Volume= 0.127 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 3.86' @ 24.00 hrs Surf.Area= 22,526 sf Storage= 5,533 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

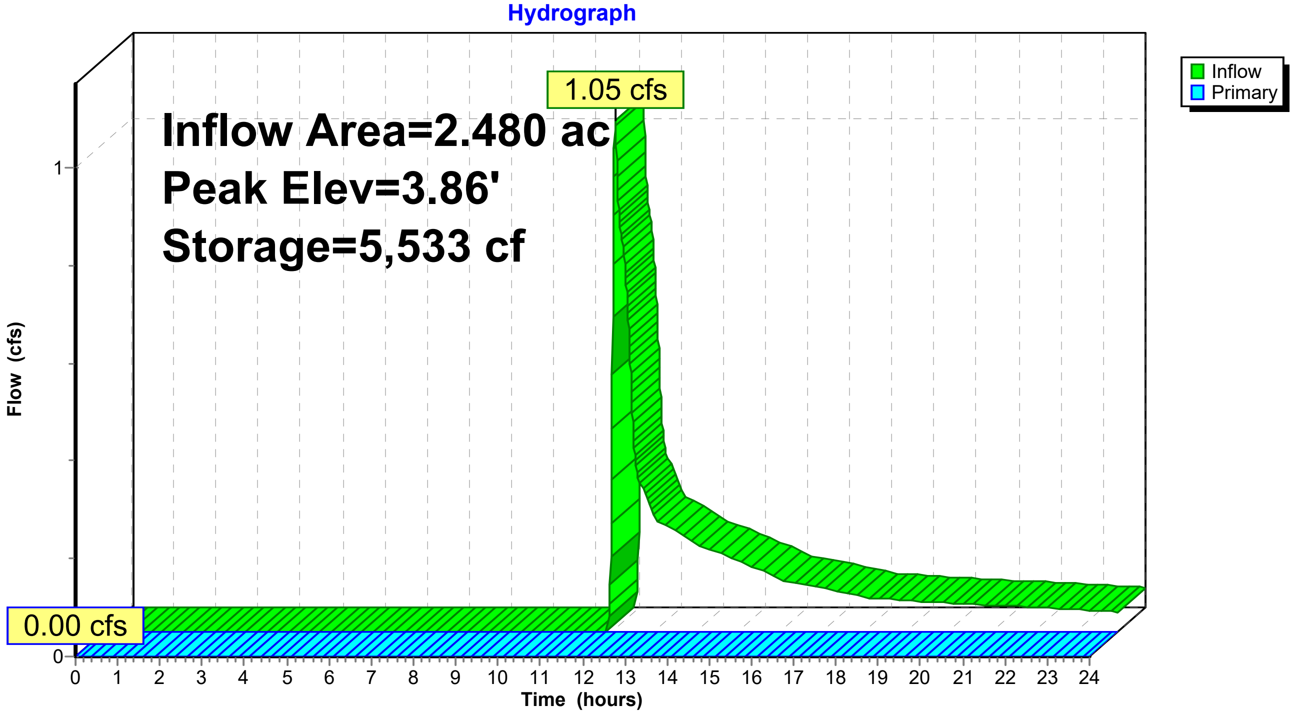
Volume	Invert	Avail.Storage	Storage Description
#1	3.60'	35,172 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.60	20,812	0	0
4.00	23,497	8,862	8,862
5.00	29,124	26,311	35,172

Device	Routing	Invert	Outlet Devices
#1	Primary	4.29'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=3.60' (Free Discharge)
1=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)

Pond P-C: POND C



Summary for Pond P-D: POND D

Inflow Area = 2.034 ac, 0.00% Impervious, Inflow Depth > 0.56" for 10 YR event
Inflow = 0.48 cfs @ 12.55 hrs, Volume= 0.095 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 8.52' @ 24.00 hrs Surf.Area= 8,307 sf Storage= 4,126 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

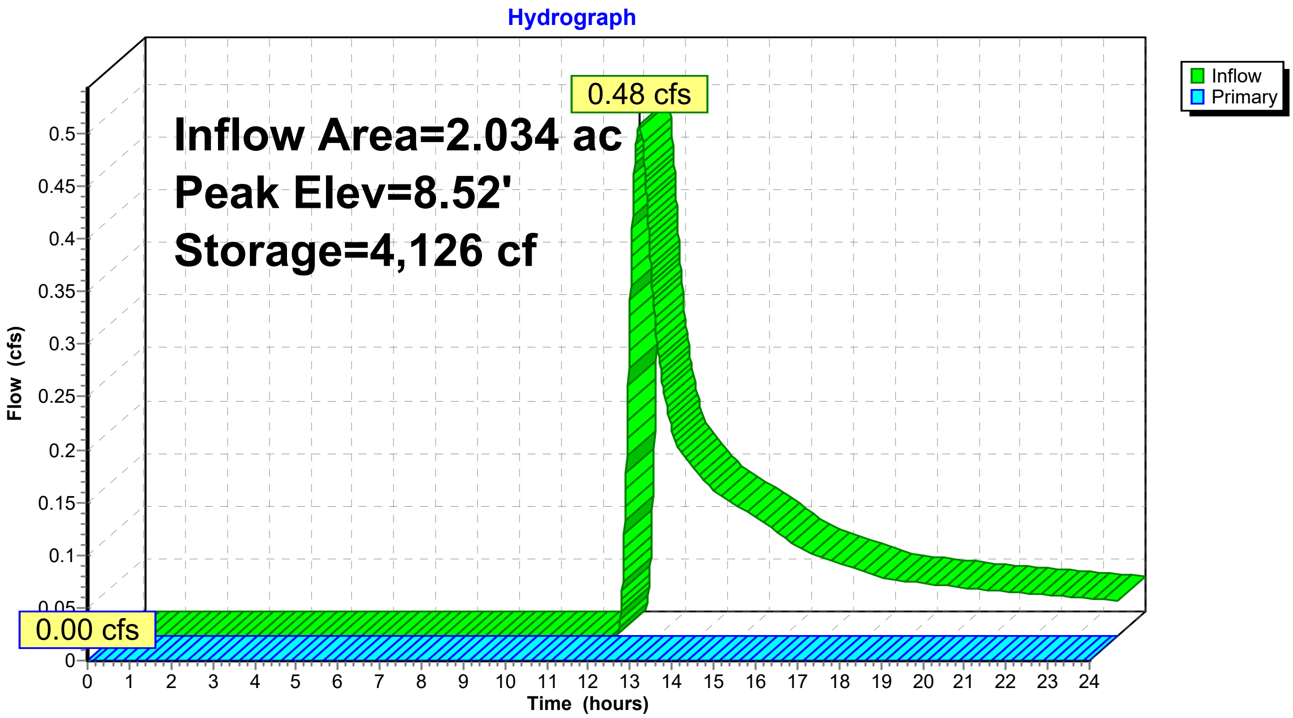
Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	18,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	7,585	0	0
9.00	8,975	8,280	8,280
10.00	12,170	10,573	18,853

Device	Routing	Invert	Outlet Devices
#1	Primary	9.80'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#2	Primary	9.08'	**12.0" Round Culvert** L= 18.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.08' / 8.16' S= 0.0497 '/' Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=8.00' (Free Discharge)
1=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)
2=Culvert (Controls 0.00 cfs)

Pond P-D: POND D



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

Subcatchment 28S: TYP ROOF SIZING Runoff Area=5,000 sf 100.00% Impervious Runoff Depth>5.67"
Tc=5.0 min CN=98 Runoff=0.69 cfs 0.054 af

Subcatchment BIO-1: BIO-1 Runoff Area=34,452 sf 76.51% Impervious Runoff Depth>4.11"
Tc=5.0 min CN=84 Runoff=3.90 cfs 0.271 af

Subcatchment BIO-2: BIO-2 Runoff Area=36,300 sf 68.24% Impervious Runoff Depth>3.60"
Tc=5.0 min CN=79 Runoff=3.64 cfs 0.250 af

Subcatchment BIO-3: BIO-3 Runoff Area=35,532 sf 75.18% Impervious Runoff Depth>4.00"
Tc=5.0 min CN=83 Runoff=3.93 cfs 0.272 af

Subcatchment P10: PR-DA-10 Runoff Area=190,706 sf 0.00% Impervious Runoff Depth>0.23"
Tc=5.0 min CN=35 Runoff=0.19 cfs 0.084 af

Subcatchment P11: PR-DA11 Runoff Area=55,295 sf 0.00% Impervious Runoff Depth>1.03"
Tc=5.0 min CN=49 Runoff=1.19 cfs 0.109 af

Subcatchment P12: PR-DA12 Runoff Area=108,026 sf 0.00% Impervious Runoff Depth>1.03"
Tc=5.0 min CN=49 Runoff=2.32 cfs 0.212 af

Subcatchment P13: PR-DA-13 Runoff Area=32,038 sf 3.96% Impervious Runoff Depth>0.47"
Tc=5.0 min UI Adjusted CN=40 Runoff=0.15 cfs 0.029 af

Subcatchment P14: PR-DA-14 Runoff Area=187,032 sf 0.00% Impervious Runoff Depth>0.27"
Tc=5.0 min CN=36 Runoff=0.29 cfs 0.098 af

Subcatchment P1a: PR-DA-1a Runoff Area=72,022 sf 28.03% Impervious Runoff Depth>1.94"
Tc=5.0 min CN=61 Runoff=3.72 cfs 0.268 af

Subcatchment P1b: PR-DA-1b Runoff Area=61,320 sf 64.77% Impervious Runoff Depth>3.40"
Tc=5.0 min CN=77 Runoff=5.82 cfs 0.399 af

Subcatchment P2: PR-DA-2 Runoff Area=14,573 sf 0.97% Impervious Runoff Depth>0.42"
Tc=5.0 min UI Adjusted CN=39 Runoff=0.05 cfs 0.012 af

Subcatchment P3: PR-DA-3 Runoff Area=88,593 sf 0.00% Impervious Runoff Depth>0.95"
Flow Length=574' Tc=26.1 min CN=48 Runoff=1.02 cfs 0.161 af

Subcatchment P4: PR-DA4 Runoff Area=47,075 sf 19.25% Impervious Runoff Depth>1.10"
Tc=5.0 min CN=50 Runoff=1.12 cfs 0.099 af

Subcatchment P5: PR-DA5 Runoff Area=145,975 sf 68.19% Impervious Runoff Depth>3.59"
Flow Length=1,208' Tc=6.7 min CN=79 Runoff=13.77 cfs 1.004 af

Subcatchment P6: PR-DA-6 Runoff Area=34,083 sf 11.09% Impervious Runoff Depth>0.58"
Tc=5.0 min UI Adjusted CN=42 Runoff=0.23 cfs 0.038 af

Subcatchment P7: PR-DA-7 Runoff Area=47,897 sf 26.54% Impervious Runoff Depth>0.89"
Tc=5.0 min UI Adjusted CN=47 Runoff=0.81 cfs 0.082 af

Subcatchment P8a: PR-DA8a Runoff Area=37,831 sf 61.05% Impervious Runoff Depth>3.20"
Flow Length=626' Tc=5.0 min CN=75 Runoff=3.38 cfs 0.232 af

Subcatchment P8b: PR-DA8b Runoff Area=36,807 sf 71.01% Impervious Runoff Depth>3.80"
Flow Length=432' Tc=5.0 min CN=81 Runoff=3.88 cfs 0.267 af

Subcatchment P9: PR-DA9 Runoff Area=45,880 sf 21.77% Impervious Runoff Depth>1.24"
Tc=5.0 min CN=52 Runoff=1.32 cfs 0.109 af

Reach DP-1: DP-1 Inflow=3.72 cfs 0.268 af
Outflow=3.72 cfs 0.268 af

Reach DP-2: DP-2 (JOSHUA'S BROOK) Inflow=0.19 cfs 0.084 af
Outflow=0.19 cfs 0.084 af

Reach DP-3: DP-3 (STEWART'S CREEK) Inflow=0.29 cfs 0.098 af
Outflow=0.29 cfs 0.098 af

Pond 41P: SC-740 Peak Elev=38.53' Storage=656 cf Inflow=0.69 cfs 0.054 af
Outflow=0.09 cfs 0.054 af

Pond 43P: SC-740 Peak Elev=21.86' Storage=389 cf Inflow=0.23 cfs 0.038 af
Outflow=0.05 cfs 0.038 af

Pond 45P: SC-740 Peak Elev=21.66' Storage=926 cf Inflow=0.81 cfs 0.082 af
Outflow=0.12 cfs 0.082 af

Pond B-1: Basin 1 Peak Elev=13.30' Storage=32,617 cf Inflow=18.81 cfs 1.316 af
Discarded=0.83 cfs 0.880 af Primary=0.00 cfs 0.000 af Outflow=0.83 cfs 0.880 af

Pond B-2: Basin 2 Peak Elev=17.87' Storage=22,768 cf Inflow=14.95 cfs 0.899 af
Discarded=0.66 cfs 0.663 af Primary=0.00 cfs 0.000 af Outflow=0.66 cfs 0.663 af

Pond BIO1: BIO 1 Peak Elev=19.82' Storage=591 cf Inflow=3.90 cfs 0.271 af
Discarded=0.06 cfs 0.061 af Primary=3.73 cfs 0.204 af Outflow=3.79 cfs 0.265 af

Pond BIO2: BIO 2 Peak Elev=23.04' Storage=1,904 cf Inflow=3.64 cfs 0.250 af
Discarded=0.13 cfs 0.126 af Primary=3.16 cfs 0.120 af Outflow=3.28 cfs 0.246 af

Pond BIO3: BIO-3 Peak Elev=23.82' Storage=897 cf Inflow=3.93 cfs 0.272 af
Discarded=0.09 cfs 0.085 af Primary=3.66 cfs 0.182 af Outflow=3.75 cfs 0.266 af

Pond P-B: POND B Peak Elev=3.14' Storage=4,735 cf Inflow=1.19 cfs 0.109 af
Outflow=0.00 cfs 0.000 af

Pond P-C: POND C Peak Elev=4.02' Storage=9,251 cf Inflow=2.32 cfs 0.212 af
Outflow=0.00 cfs 0.000 af

Pond P-D: POND D Peak Elev=8.86' Storage=7,028 cf Inflow=1.02 cfs 0.161 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 30.221 ac Runoff Volume = 4.050 af Average Runoff Depth = 1.61"
75.05% Pervious = 22.680 ac 24.95% Impervious = 7.541 ac

Summary for Subcatchment 28S: TYP ROOF SIZING

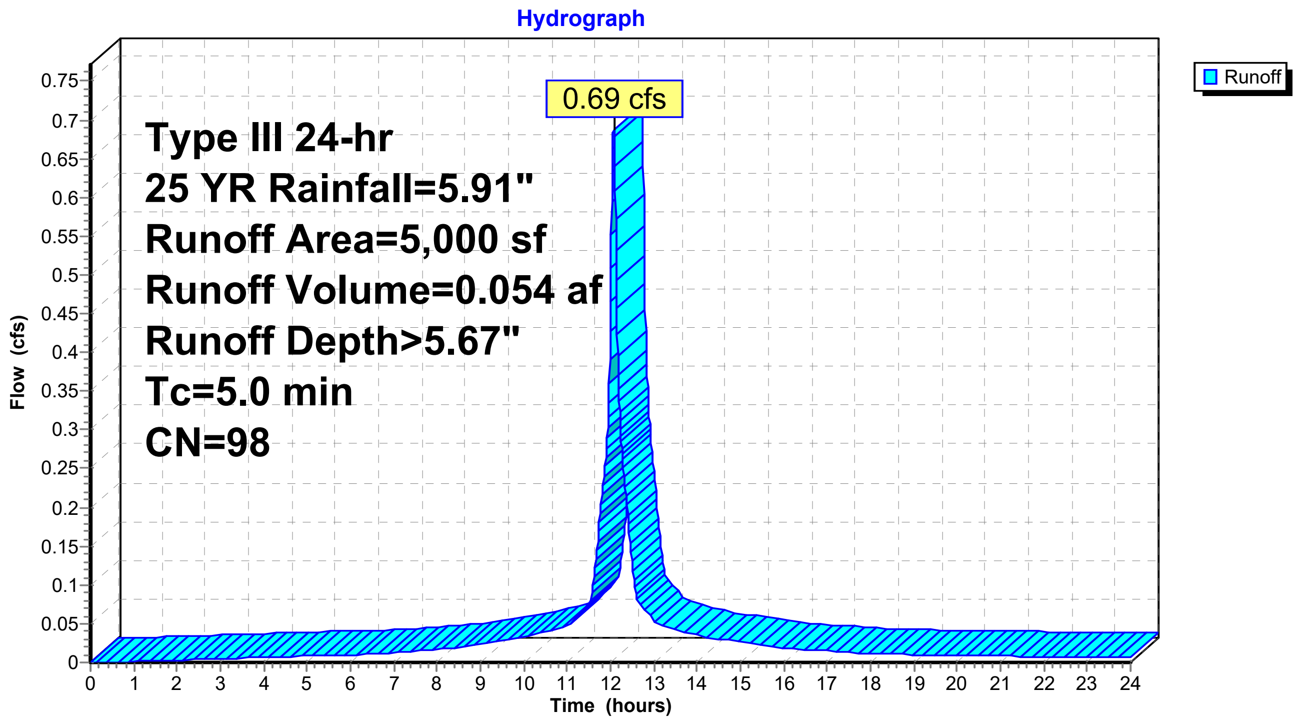
Runoff = 0.69 cfs @ 12.07 hrs, Volume= 0.054 af, Depth> 5.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
5,000	98	Roofs, HSG A
5,000		100.00% Impervious Area

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

Subcatchment 28S: TYP ROOF SIZING



Summary for Subcatchment BIO-1: BIO-1

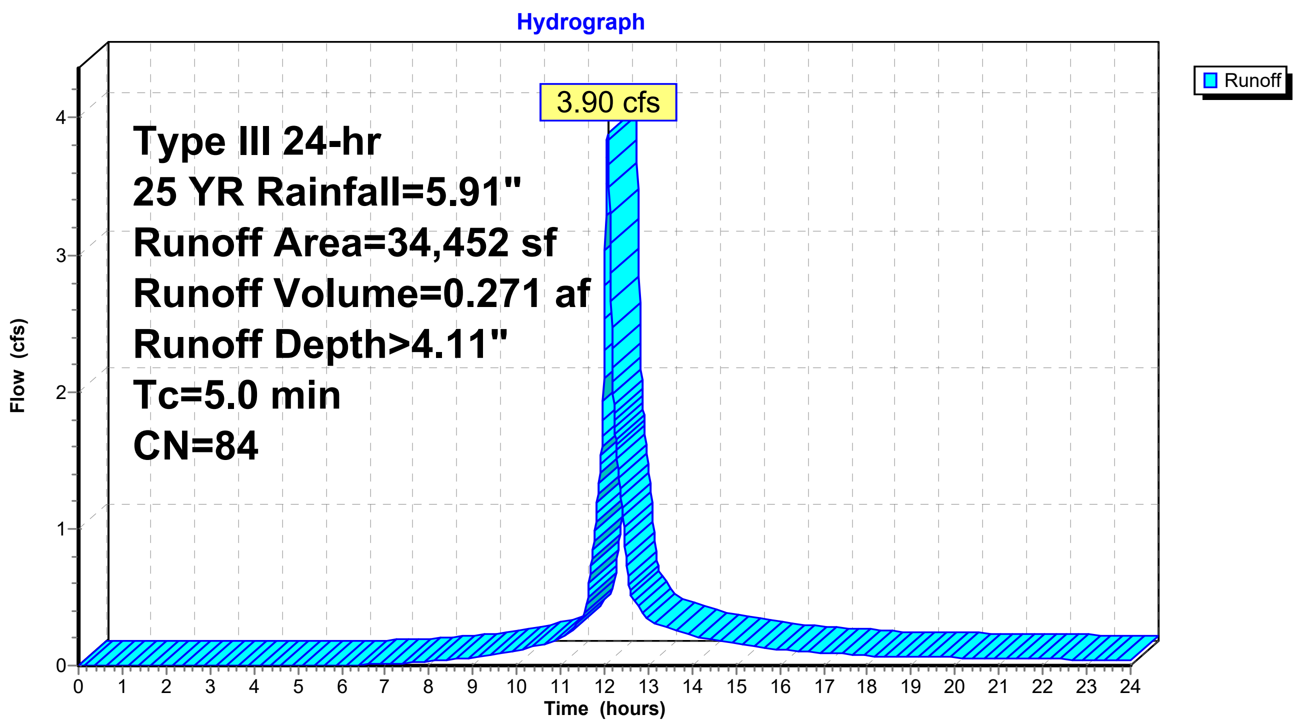
Runoff = 3.90 cfs @ 12.07 hrs, Volume= 0.271 af, Depth> 4.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
8,092	39	>75% Grass cover, Good, HSG A
26,360	98	Paved parking, HSG A
34,452	84	Weighted Average
8,092		23.49% Pervious Area
26,360		76.51% Impervious Area

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

Subcatchment BIO-1: BIO-1



Summary for Subcatchment BIO-2: BIO-2

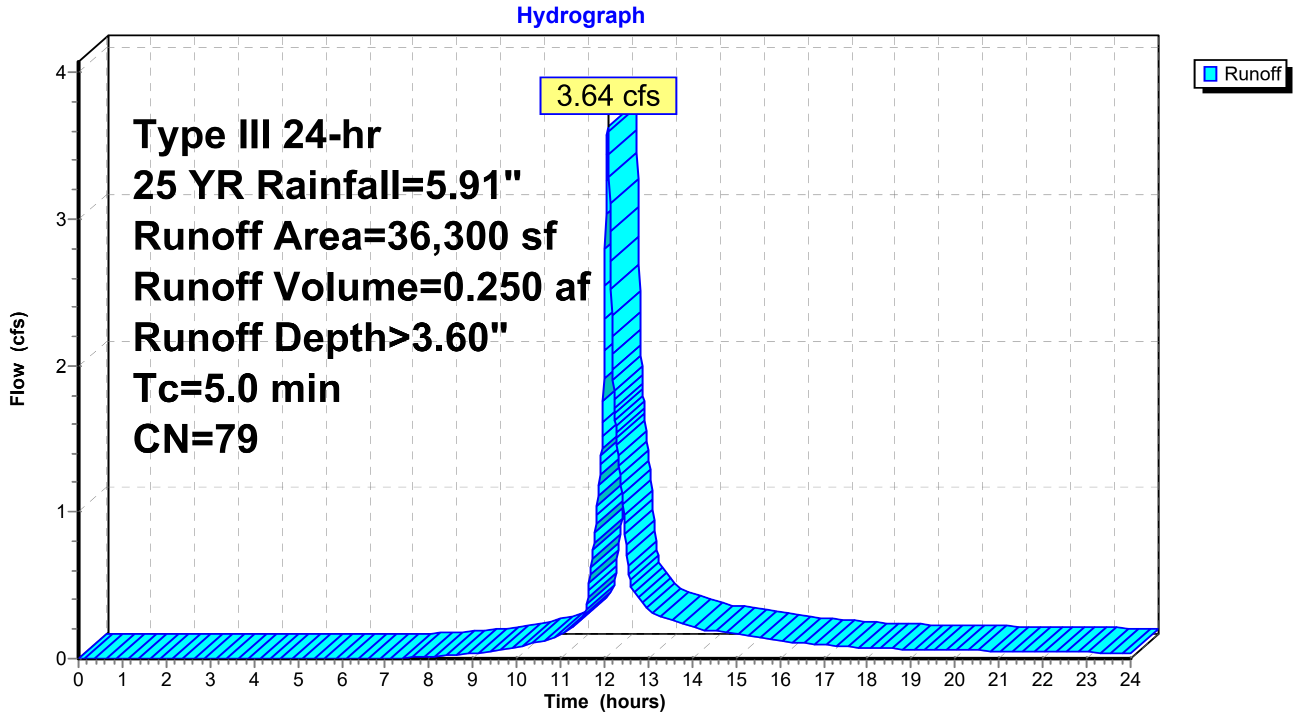
Runoff = 3.64 cfs @ 12.07 hrs, Volume= 0.250 af, Depth> 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
11,530	39	>75% Grass cover, Good, HSG A
24,660	98	Paved parking, HSG A
110	98	Roofs, HSG A
36,300	79	Weighted Average
11,530		31.76% Pervious Area
24,770		68.24% Impervious Area

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

Subcatchment BIO-2: BIO-2



Summary for Subcatchment BIO-3: BIO-3

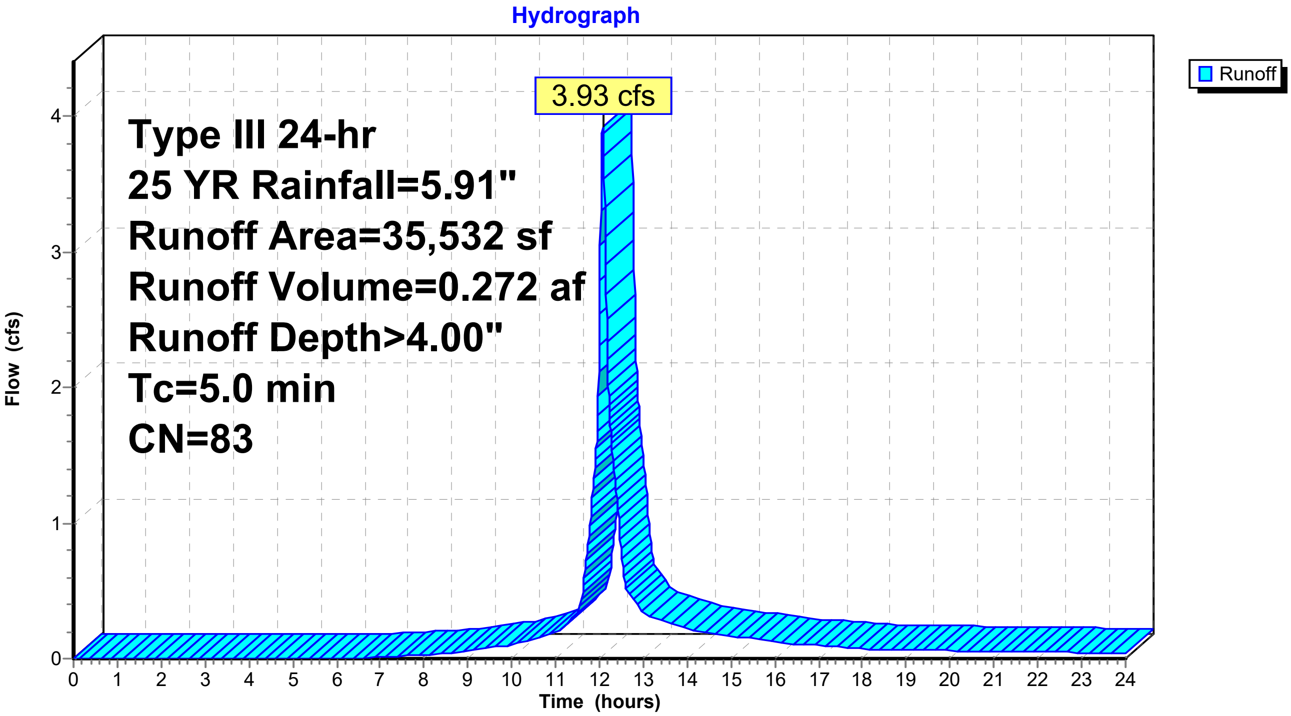
Runoff = 3.93 cfs @ 12.07 hrs, Volume= 0.272 af, Depth> 4.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
8,819	39	>75% Grass cover, Good, HSG A
26,493	98	Paved parking, HSG A
220	98	Roofs, HSG A
35,532	83	Weighted Average
8,819		24.82% Pervious Area
26,713		75.18% Impervious Area

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

Subcatchment BIO-3: BIO-3



Summary for Subcatchment P10: PR-DA-10

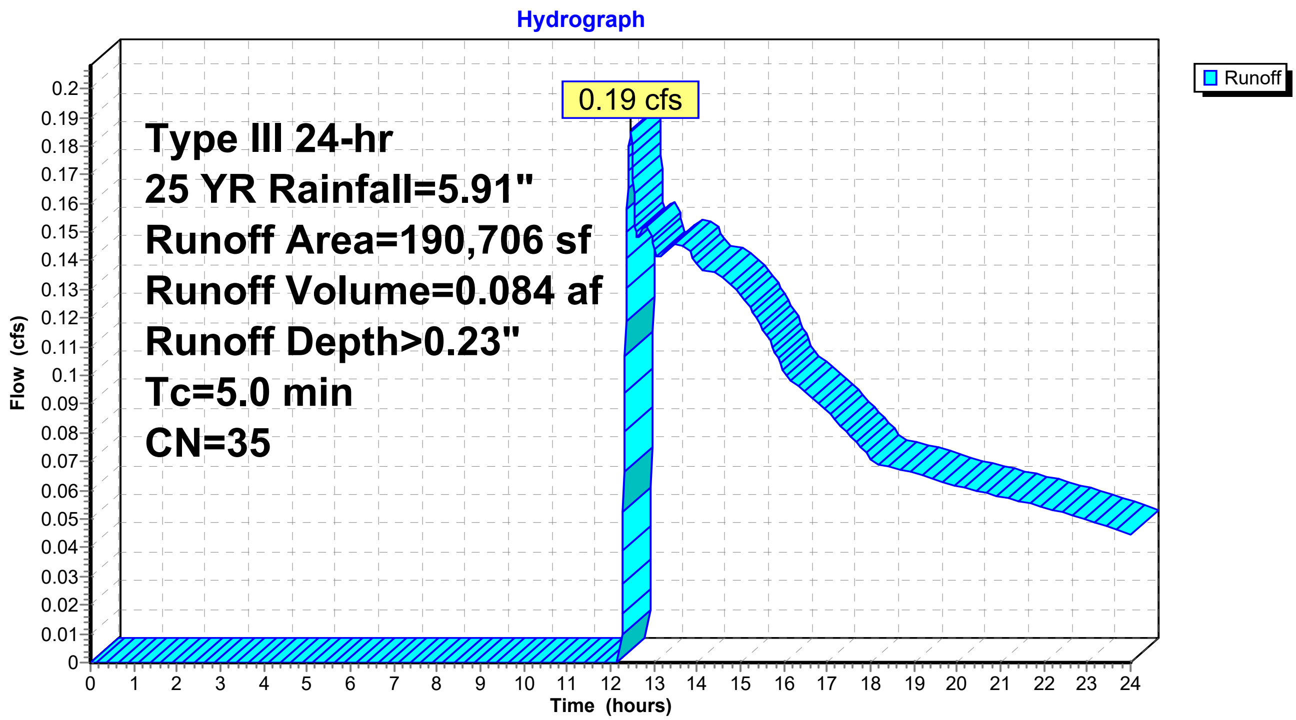
Runoff = 0.19 cfs @ 12.46 hrs, Volume= 0.084 af, Depth> 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
90,801	39	>75% Grass cover, Good, HSG A
99,905	32	Woods/grass comb., Good, HSG A
190,706	35	Weighted Average
190,706		100.00% Pervious Area

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

Subcatchment P10: PR-DA-10



Summary for Subcatchment P11: PR-DA11

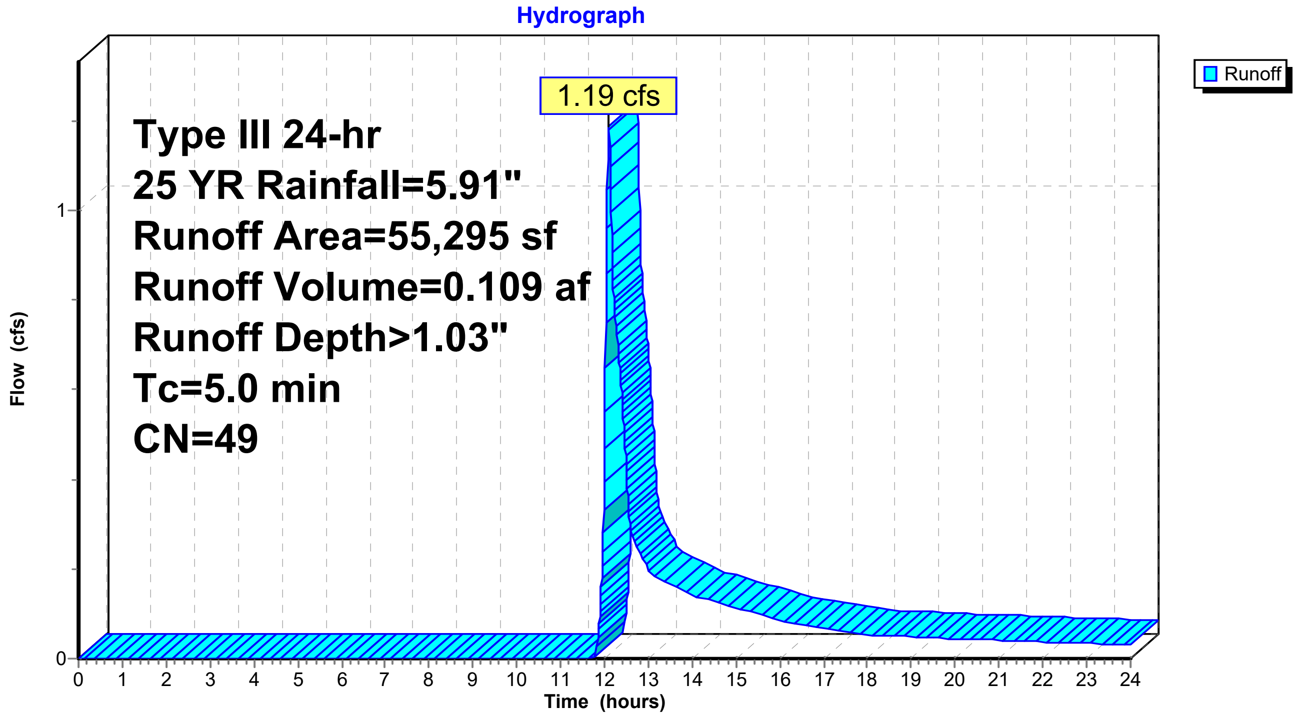
Runoff = 1.19 cfs @ 12.10 hrs, Volume= 0.109 af, Depth> 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
39,962	39	>75% Grass cover, Good, HSG A
5,060	30	Woods, Good, HSG A
10,273	98	Water Surface, 0% imp, HSG A
0	98	Paved parking, HSG A
55,295	49	Weighted Average
55,295		100.00% Pervious Area

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

Subcatchment P11: PR-DA11



Summary for Subcatchment P12: PR-DA12

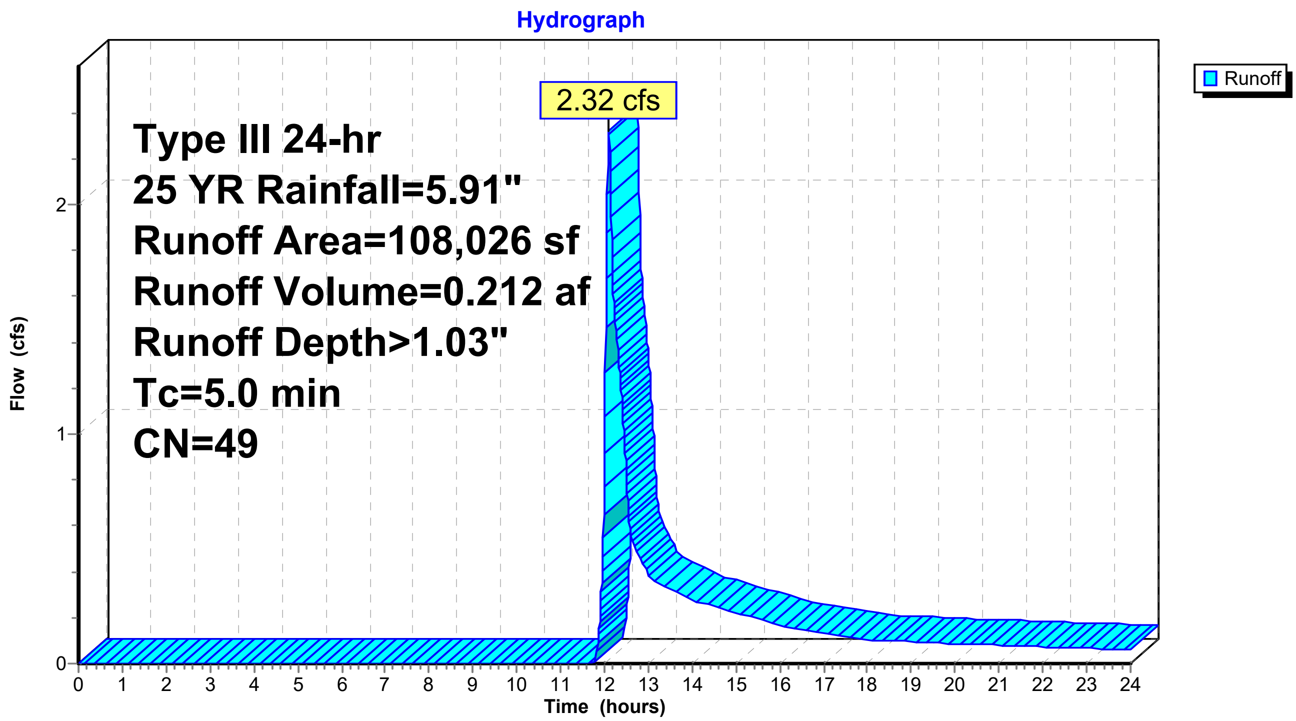
Runoff = 2.32 cfs @ 12.10 hrs, Volume= 0.212 af, Depth> 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
74,064	39	>75% Grass cover, Good, HSG A
13,150	30	Woods, Good, HSG A
20,812	98	Water Surface, 0% imp, HSG A
0	98	Paved parking, HSG A
108,026	49	Weighted Average
108,026		100.00% Pervious Area

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

Subcatchment P12: PR-DA12



Summary for Subcatchment P13: PR-DA-13

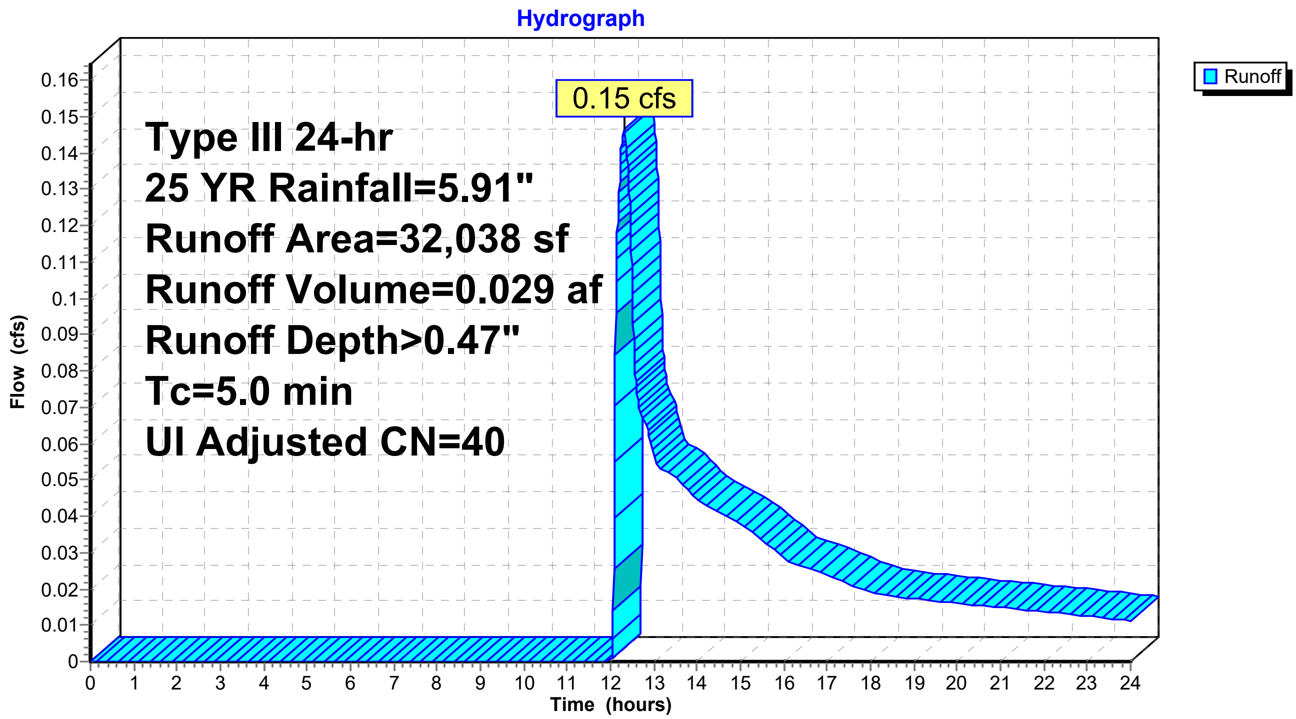
Runoff = 0.15 cfs @ 12.31 hrs, Volume= 0.029 af, Depth> 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Adj	Description
	30,218	39		>75% Grass cover, Good, HSG A
*	1,270	98		Unconnected Impervious, HSG A
	550	30		Woods, Good, HSG A
	32,038	41	40	Weighted Average, UI Adjusted
	30,768			96.04% Pervious Area
	1,270			3.96% Impervious Area
	1,270			100.00% Unconnected

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

Subcatchment P13: PR-DA-13



Summary for Subcatchment P14: PR-DA-14

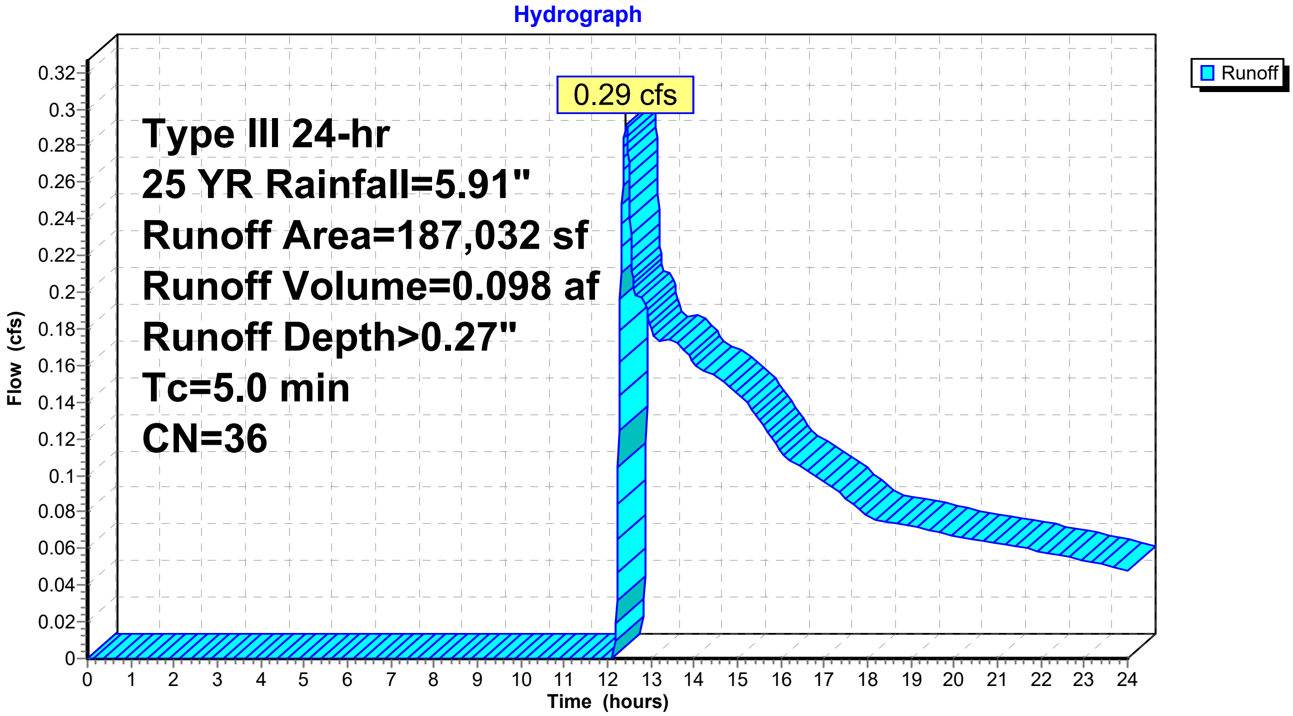
Runoff = 0.29 cfs @ 12.43 hrs, Volume= 0.098 af, Depth> 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
124,219	39	>75% Grass cover, Good, HSG A
62,813	30	Woods, Good, HSG A
187,032	36	Weighted Average
187,032		100.00% Pervious Area

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

Subcatchment P14: PR-DA-14



Summary for Subcatchment P1a: PR-DA-1a

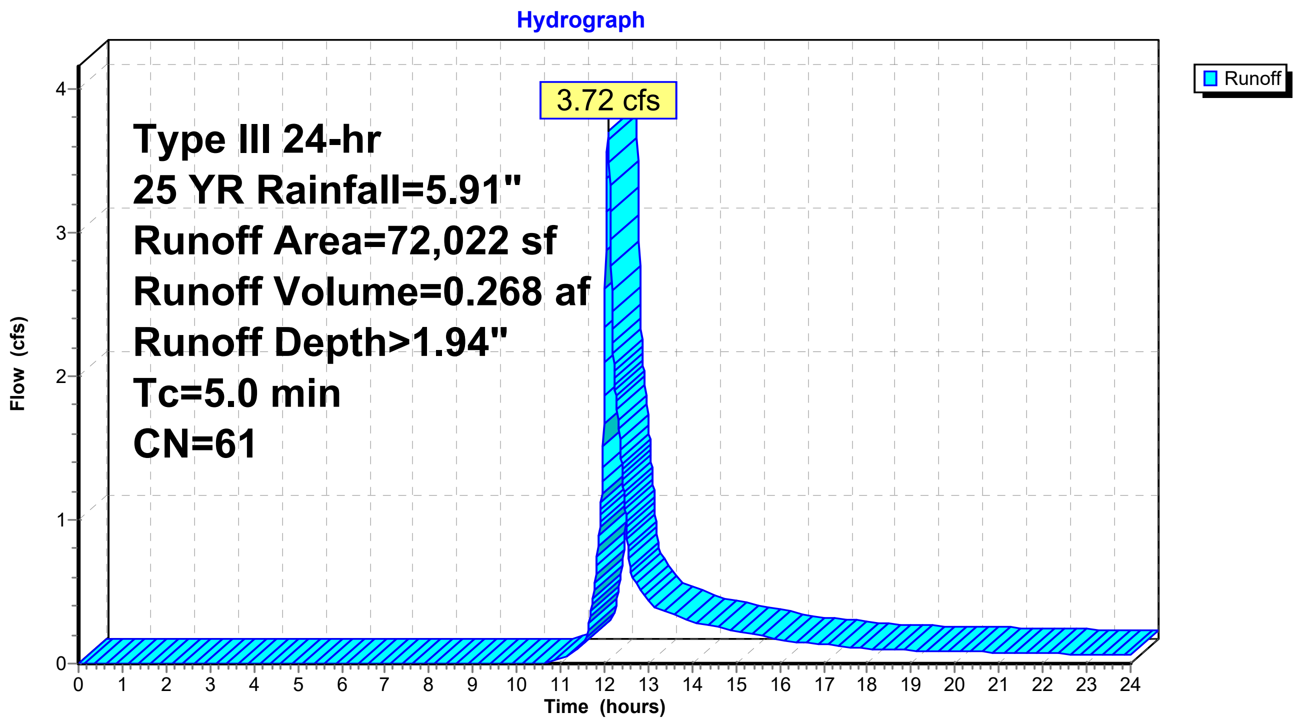
Runoff = 3.72 cfs @ 12.08 hrs, Volume= 0.268 af, Depth> 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
44,791	39	>75% Grass cover, Good, HSG A
20,190	98	Paved parking, HSG A
7,041	98	Water Surface, 0% imp, HSG A
72,022	61	Weighted Average
51,832		71.97% Pervious Area
20,190		28.03% Impervious Area

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

Subcatchment P1a: PR-DA-1a



Summary for Subcatchment P1b: PR-DA-1b

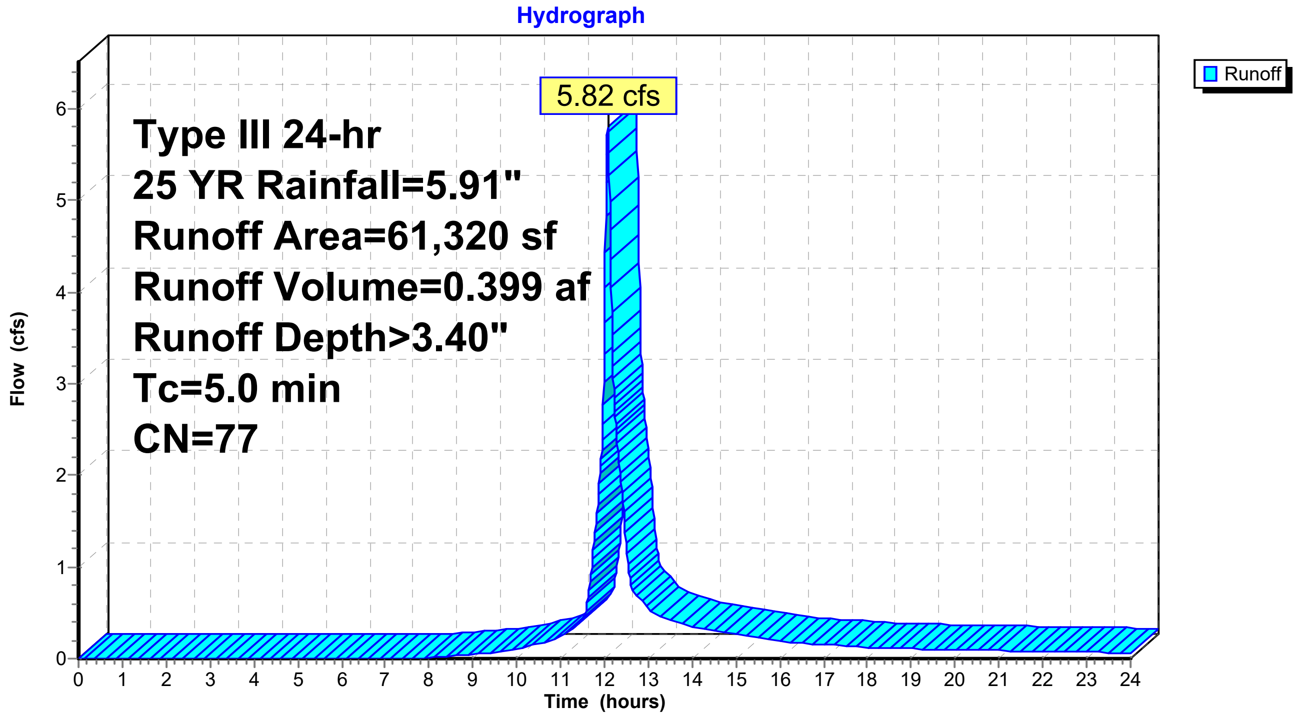
Runoff = 5.82 cfs @ 12.07 hrs, Volume= 0.399 af, Depth> 3.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	21,600	39	>75% Grass cover, Good, HSG A
*	39,720	98	Unconnected Impervious, HSG A
	61,320	77	Weighted Average
	21,600		35.23% Pervious Area
	39,720		64.77% Impervious Area
	39,720		100.00% Unconnected

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

Subcatchment P1b: PR-DA-1b



Summary for Subcatchment P2: PR-DA-2

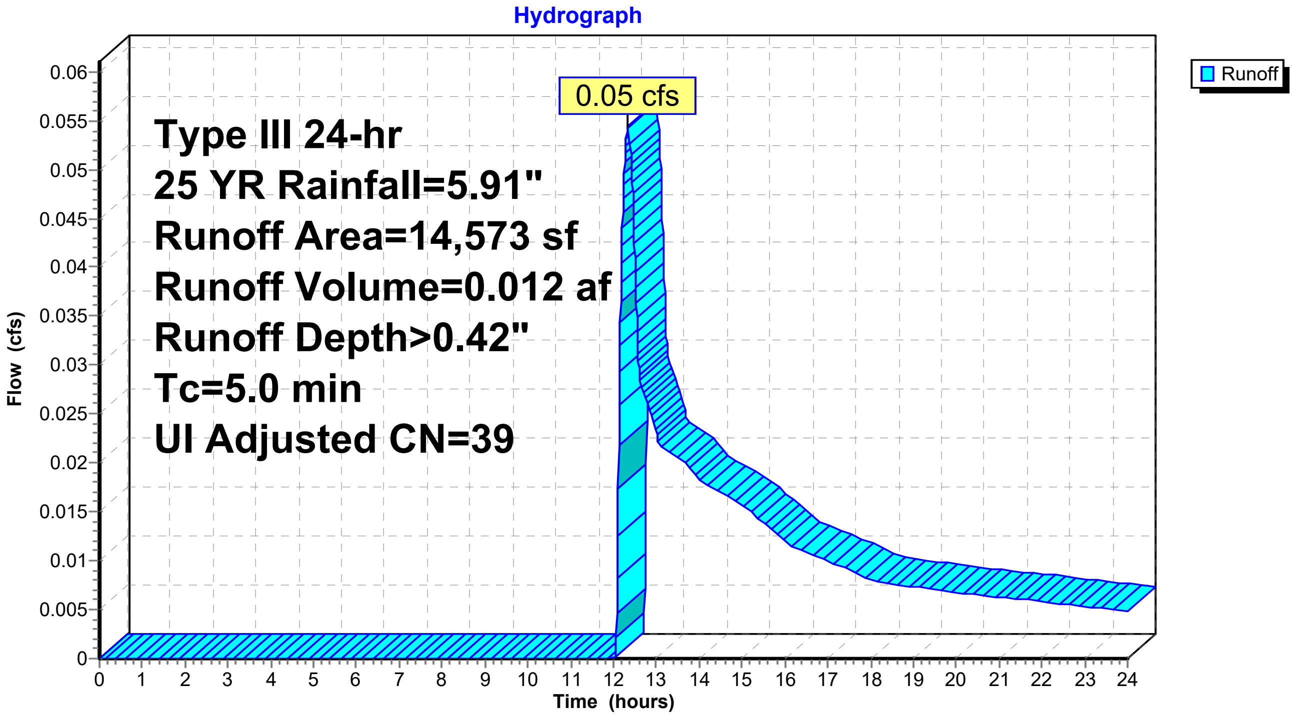
Runoff = 0.05 cfs @ 12.34 hrs, Volume= 0.012 af, Depth> 0.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Adj	Description
	14,431	39		>75% Grass cover, Good, HSG A
*	142	98		Unconnected Impervious, HSG A
	14,573	40	39	Weighted Average, UI Adjusted
	14,431			99.03% Pervious Area
	142			0.97% Impervious Area
	142			100.00% Unconnected

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

Subcatchment P2: PR-DA-2



Summary for Subcatchment P3: PR-DA-3

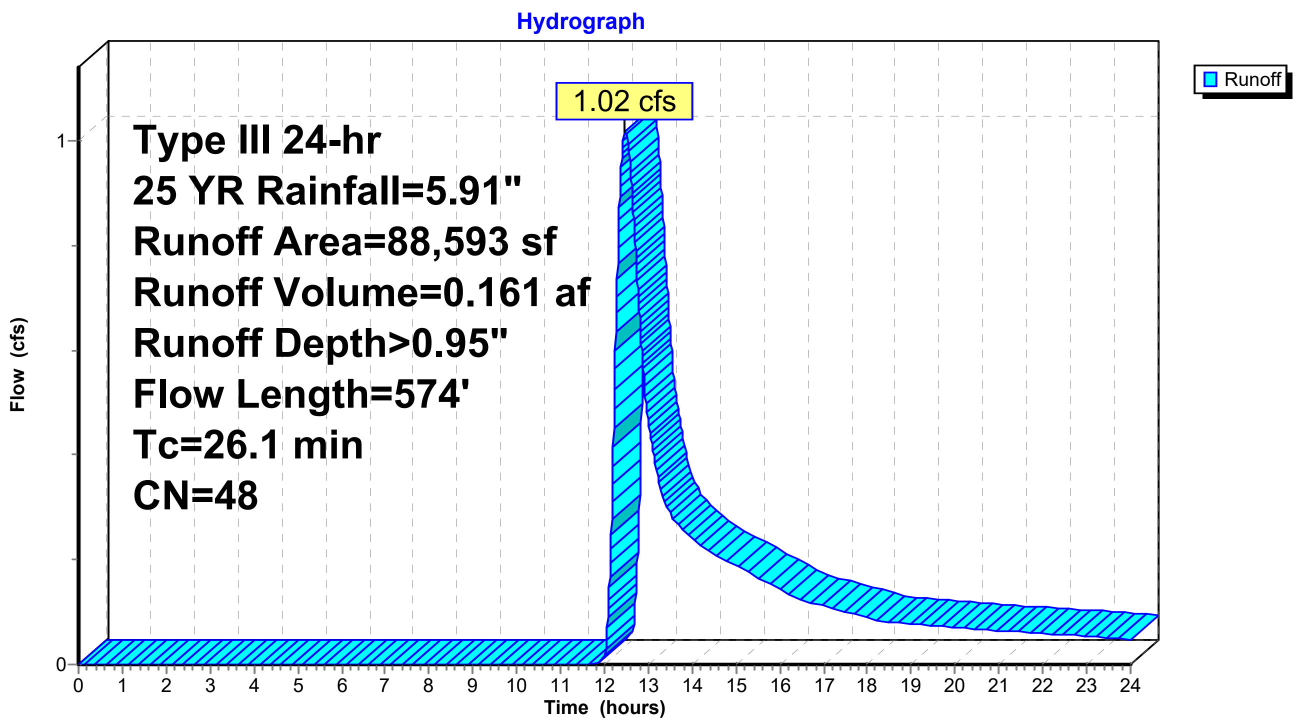
Runoff = 1.02 cfs @ 12.47 hrs, Volume= 0.161 af, Depth> 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
72,419	39	>75% Grass cover, Good, HSG A
7,200	76	Gravel roads, HSG A
8,974	98	Water Surface, 0% imp, HSG A
88,593	48	Weighted Average
88,593		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	50	0.0380	0.20		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
20.8	400	0.0021	0.32		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	74	0.0270	2.65		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.6	50	0.0400	1.40		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
26.1	574	Total			

Subcatchment P3: PR-DA-3



Summary for Subcatchment P4: PR-DA4

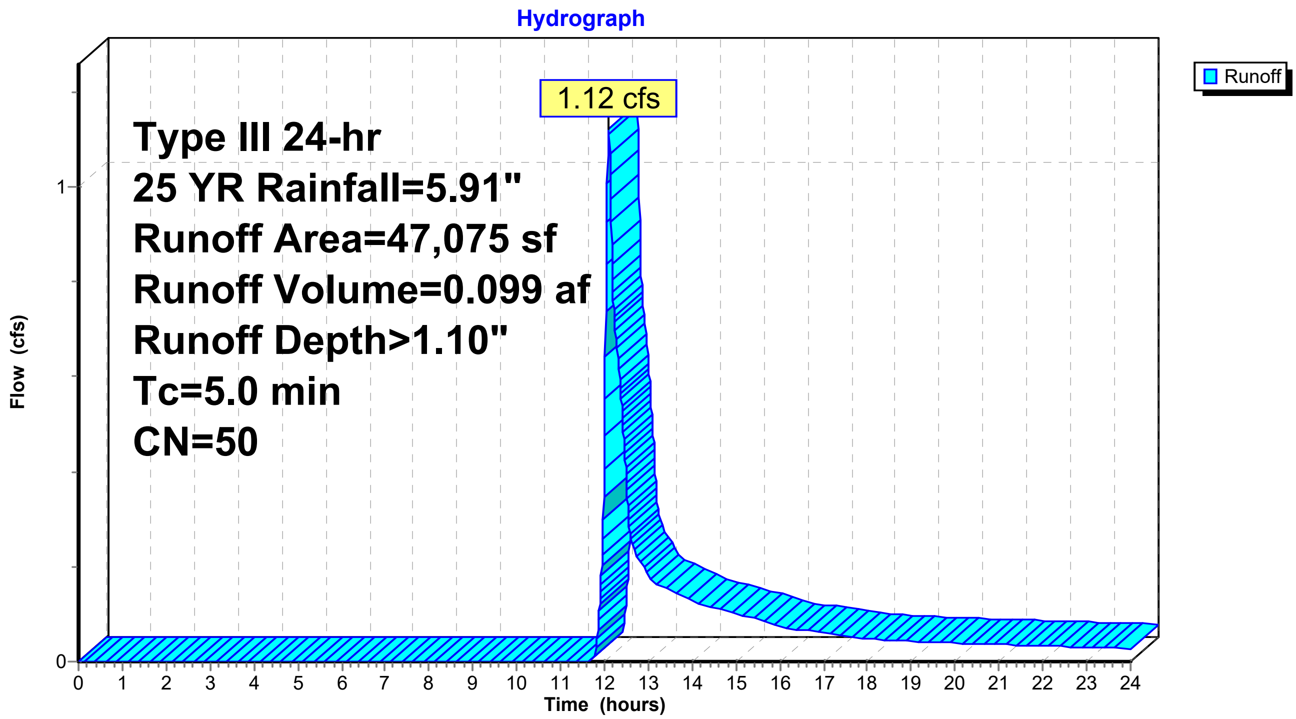
Runoff = 1.12 cfs @ 12.09 hrs, Volume= 0.099 af, Depth> 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	38,011	39	>75% Grass cover, Good, HSG A
*	500	98	Unconnected impervious, HSG A
	8,564	98	Stormwater Basin; Water Surface, HSG A
	47,075	50	Weighted Average
	38,011		80.75% Pervious Area
	9,064		19.25% Impervious Area
	500		5.52% Unconnected

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

Subcatchment P4: PR-DA4



Summary for Subcatchment P5: PR-DA5

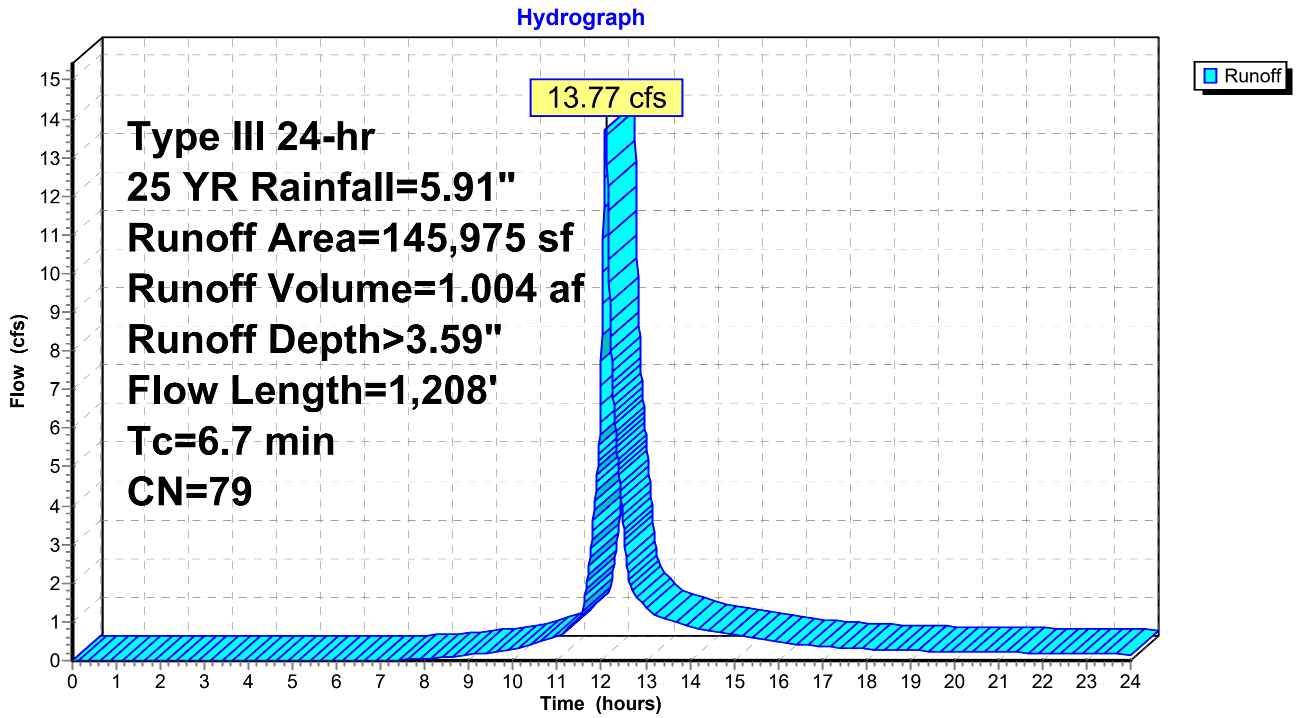
Runoff = 13.77 cfs @ 12.10 hrs, Volume= 1.004 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
46,436	39	>75% Grass cover, Good, HSG A
98,201	98	Paved parking, HSG A
1,338	98	Unconnected roofs, HSG A
145,975	79	Weighted Average
46,436		31.81% Pervious Area
99,539		68.19% Impervious Area
1,338		1.34% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
1.1	130	0.0100	2.03		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
1.3	243	0.0050	3.21	2.52	**Pipe Channel, C-D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
2.4	525	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
1.0	260	0.0050	4.20	7.43	**Pipe Channel, E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
6.7	1,208	Total			

Subcatchment P5: PR-DA5



Summary for Subcatchment P6: PR-DA-6

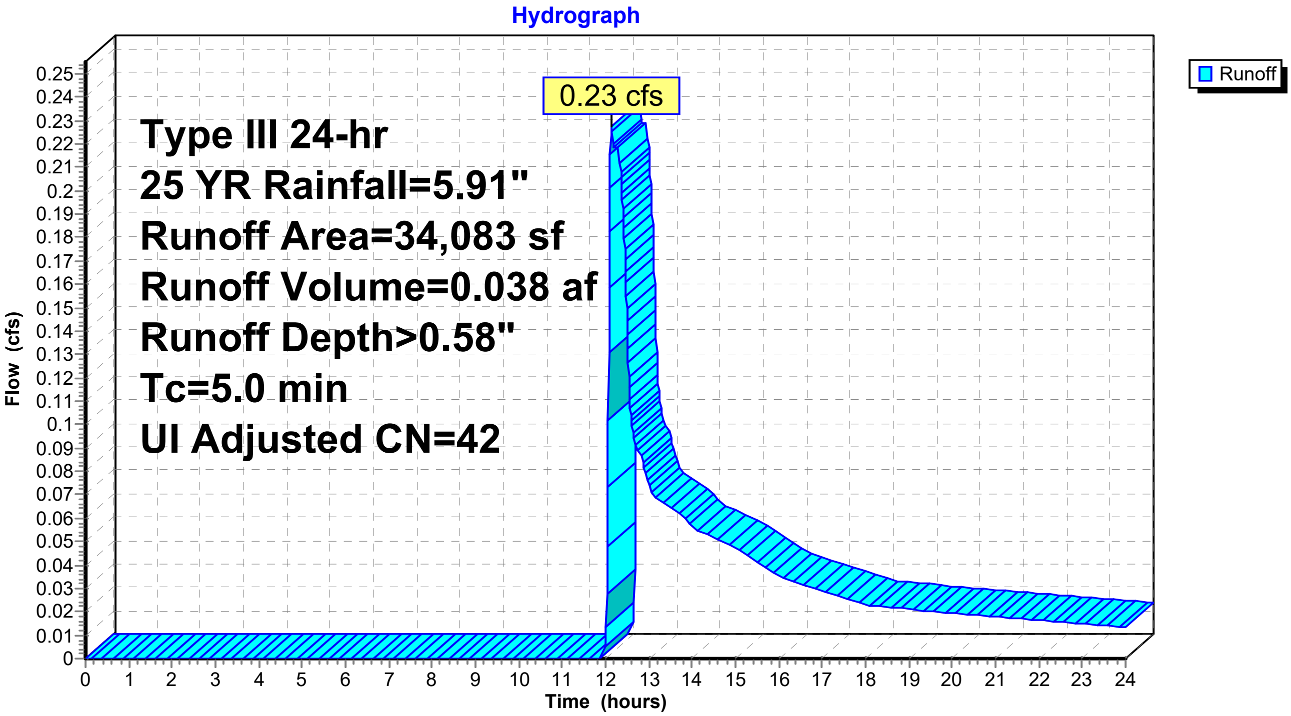
Runoff = 0.23 cfs @ 12.14 hrs, Volume= 0.038 af, Depth> 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Adj	Description
	30,303	39		>75% Grass cover, Good, HSG A
*	3,780	98		Unconnected Impervious, HSG A
	34,083	46	42	Weighted Average, UI Adjusted
	30,303			88.91% Pervious Area
	3,780			11.09% Impervious Area
	3,780			100.00% Unconnected

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

Subcatchment P6: PR-DA-6



Summary for Subcatchment P7: PR-DA-7

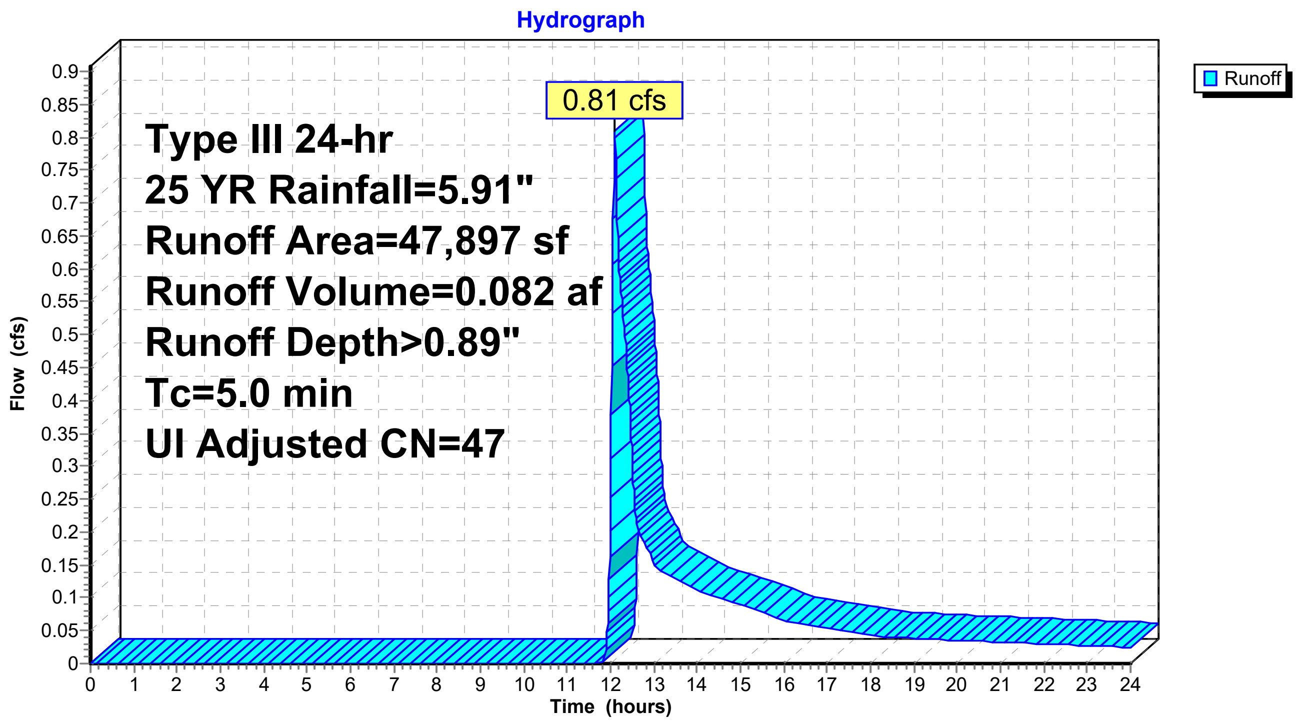
Runoff = 0.81 cfs @ 12.10 hrs, Volume= 0.082 af, Depth> 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Adj	Description
	35,185	39		>75% Grass cover, Good, HSG A
*	12,712	98		Unconnected Impervious, HSG A
	47,897	55	47	Weighted Average, UI Adjusted
	35,185			73.46% Pervious Area
	12,712			26.54% Impervious Area
	12,712			100.00% Unconnected

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

Subcatchment P7: PR-DA-7



Summary for Subcatchment P8a: PR-DA8a

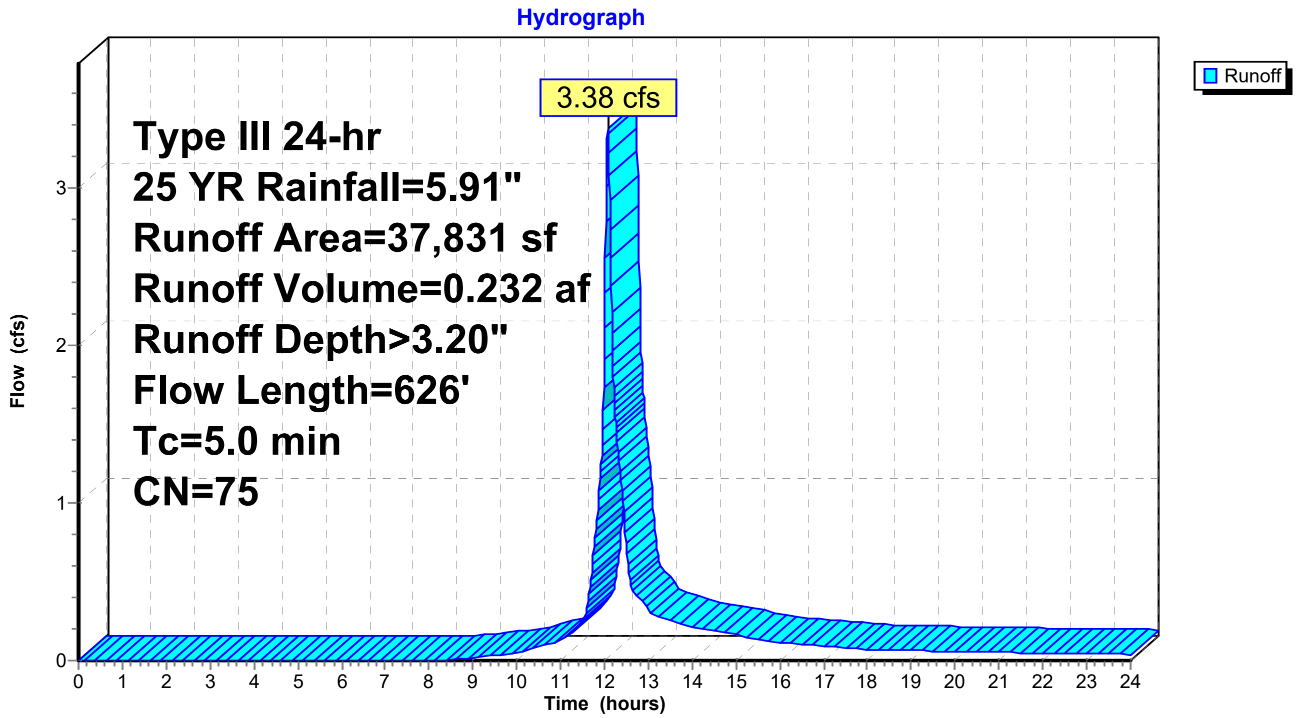
Runoff = 3.38 cfs @ 12.08 hrs, Volume= 0.232 af, Depth> 3.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
14,737	39	>75% Grass cover, Good, HSG A
22,874	98	Paved parking, HSG A
220	98	Roofs, HSG A
37,831	75	Weighted Average
14,737		38.95% Pervious Area
23,094		61.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
1.1	137	0.0100	2.03		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	48	0.0050	3.21	2.52	**Pipe Channel, C-D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
1.1	241	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.5	150	0.0060	4.60	8.14	**Pipe Channel, E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
1.2					**Direct Entry, Added Tc**
5.0	626	Total			

Subcatchment P8a: PR-DA8a



Summary for Subcatchment P8b: PR-DA8b

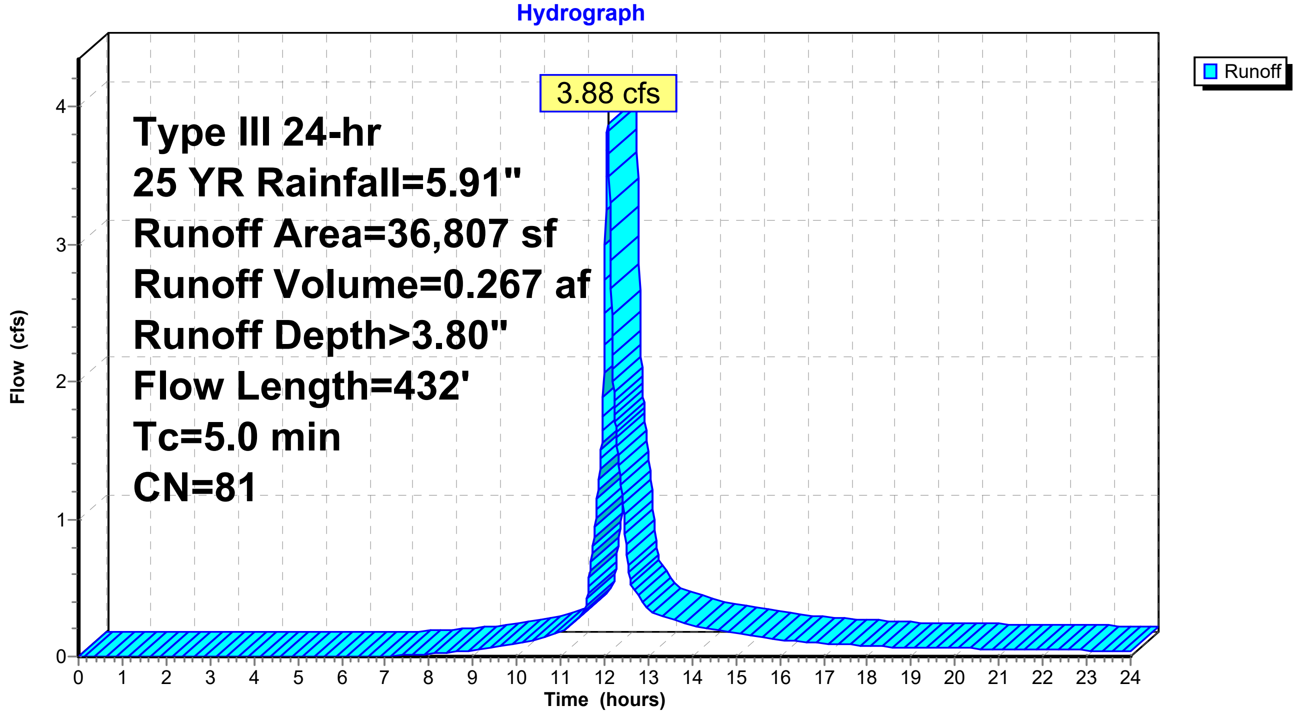
Runoff = 3.88 cfs @ 12.07 hrs, Volume= 0.267 af, Depth> 3.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

Area (sf)	CN	Description
10,671	39	>75% Grass cover, Good, HSG A
25,176	98	Paved parking, HSG A
960	98	Roofs, HSG A
36,807	81	Weighted Average
10,671		28.99% Pervious Area
26,136		71.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	86	0.0100	1.04		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
0.7	196	0.0100	4.54	3.56	**Pipe Channel, B-C** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.5	150	0.0060	4.60	8.14	**Pipe Channel, C-D** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
2.4					**Direct Entry, Added Tc**
5.0	432	Total			

Subcatchment P8b: PR-DA8b



Summary for Subcatchment P9: PR-DA9

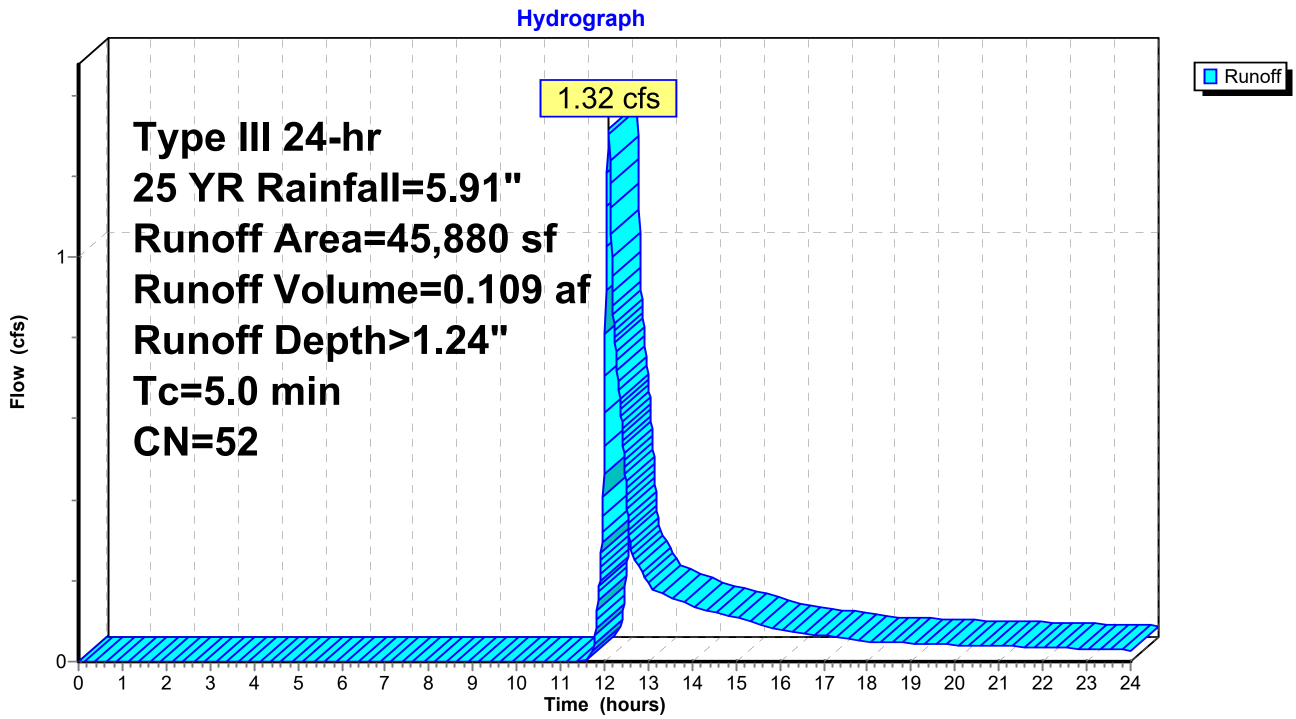
Runoff = 1.32 cfs @ 12.09 hrs, Volume= 0.109 af, Depth> 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.91"

	Area (sf)	CN	Description
	35,890	39	>75% Grass cover, Good, HSG A
*	380	98	Unconnected impervious, HSG A
	9,610	98	Stormwater Basin; Water Surface, HSG A
	45,880	52	Weighted Average
	35,890		78.23% Pervious Area
	9,990		21.77% Impervious Area
	380		3.80% Unconnected

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

Subcatchment P9: PR-DA9



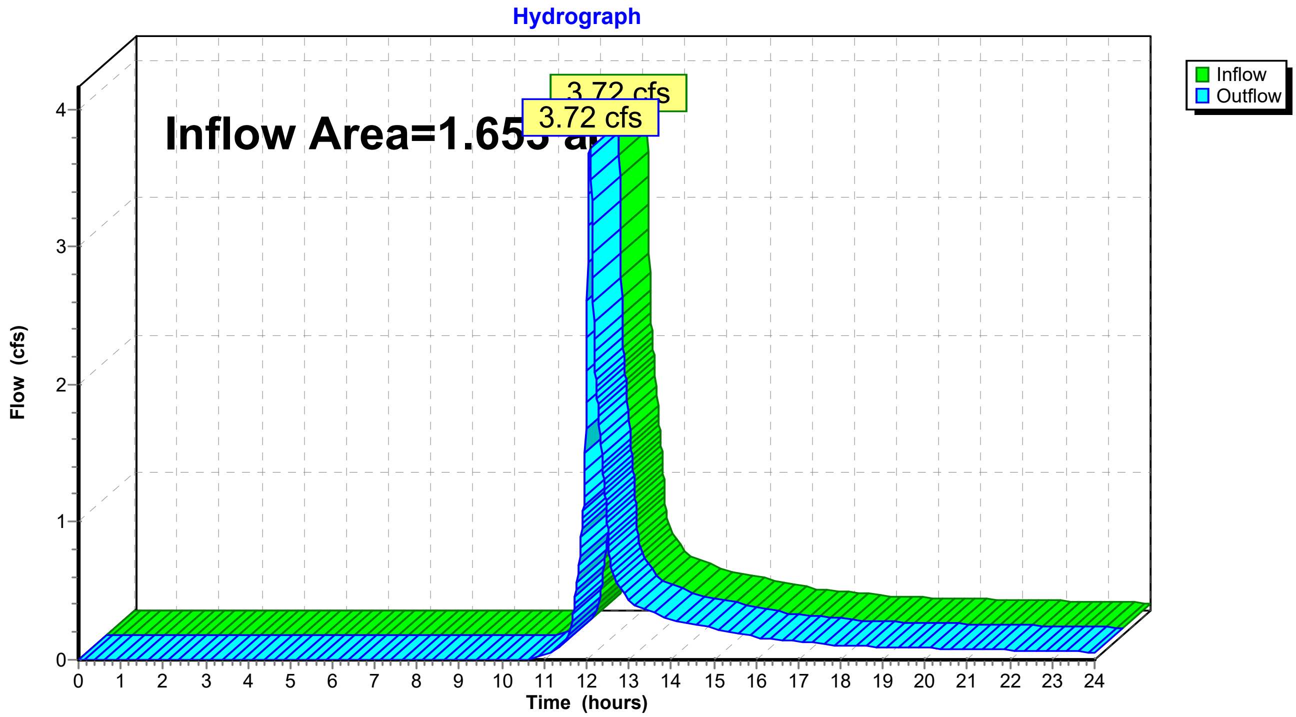
Summary for Reach DP-1: DP-1

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

Inflow Area =	1.653 ac, 28.03% Impervious, Inflow Depth > 1.94"	for 25 YR event	
Inflow =	3.72 cfs @ 12.08 hrs, Volume=	0.268 af	
Outflow =	3.72 cfs @ 12.08 hrs, Volume=	0.268 af, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-1: DP-1



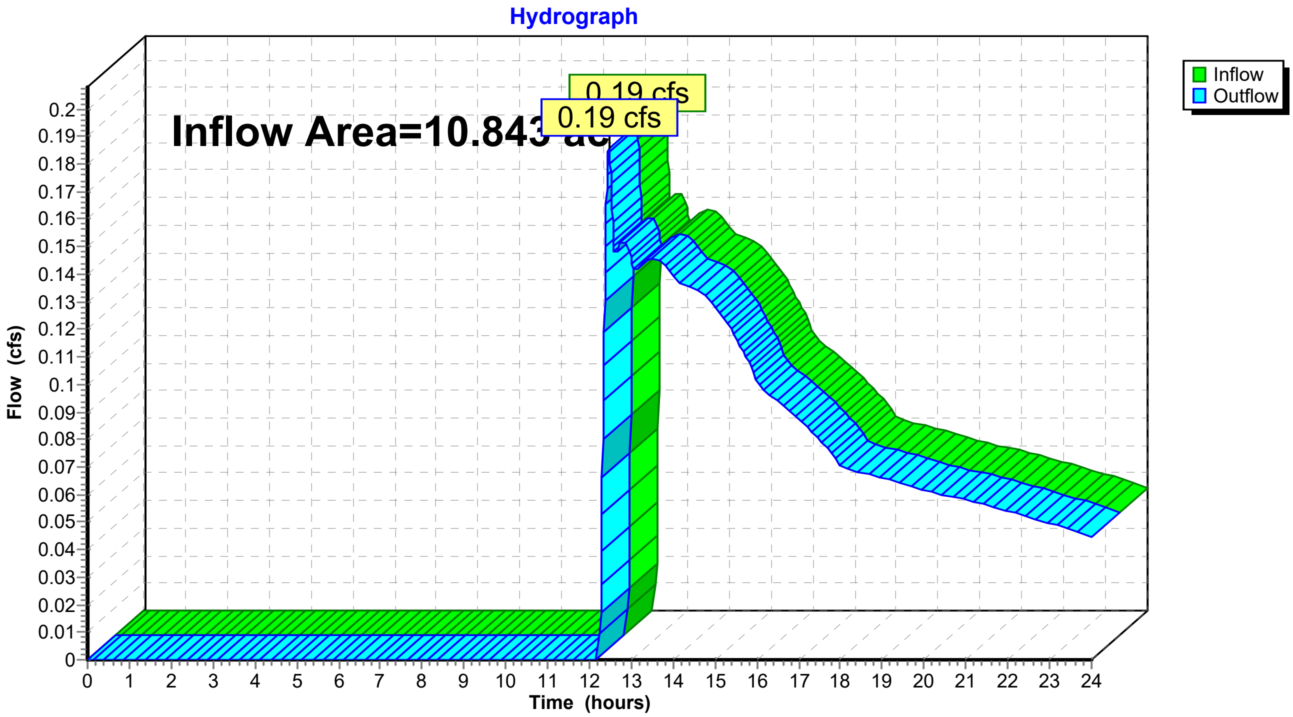
Summary for Reach DP-2: DP-2 (JOSHUA'S BROOK)

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

Inflow Area = 10.843 ac, 28.77% Impervious, Inflow Depth > 0.09" for 25 YR event
Inflow = 0.19 cfs @ 12.46 hrs, Volume= 0.084 af
Outflow = 0.19 cfs @ 12.46 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-2: DP-2 (JOSHUA'S BROOK)



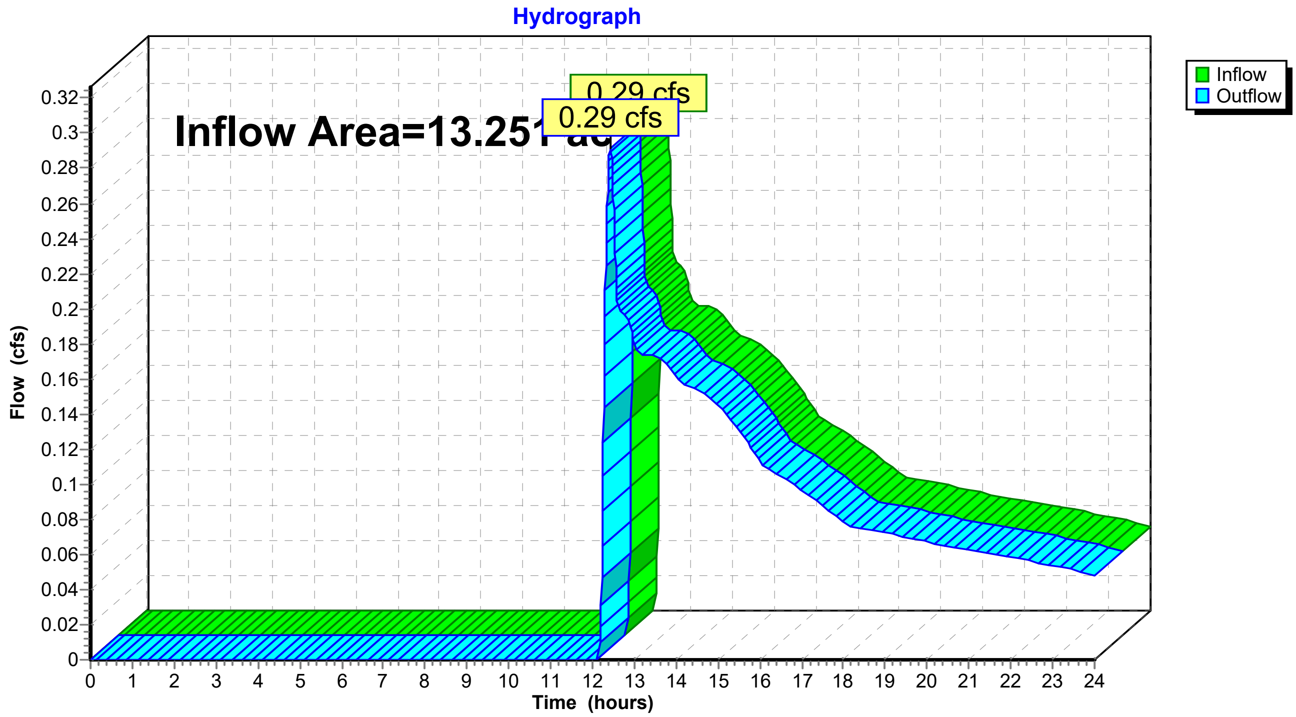
Summary for Reach DP-3: DP-3 (STEWART'S CREEK)

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

Inflow Area = 13.251 ac, 19.02% Impervious, Inflow Depth > 0.09" for 25 YR event
Inflow = 0.29 cfs @ 12.43 hrs, Volume= 0.098 af
Outflow = 0.29 cfs @ 12.43 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-3: DP-3 (STEWART'S CREEK)



Summary for Pond 41P: SC-740

Inflow Area = 0.115 ac,100.00% Impervious, Inflow Depth > 5.67" for 25 YR event
Inflow = 0.69 cfs @ 12.07 hrs, Volume= 0.054 af
Outflow = 0.09 cfs @ 11.62 hrs, Volume= 0.054 af, Atten= 86%, Lag= 0.0 min
Discarded = 0.09 cfs @ 11.62 hrs, Volume= 0.054 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 38.53' @ 12.56 hrs Surf.Area= 492 sf Storage= 656 cf

Plug-Flow detention time= 39.5 min calculated for 0.054 af (100% of inflow)
Center-of-Mass det. time= 39.3 min (783.3 - 744.0)

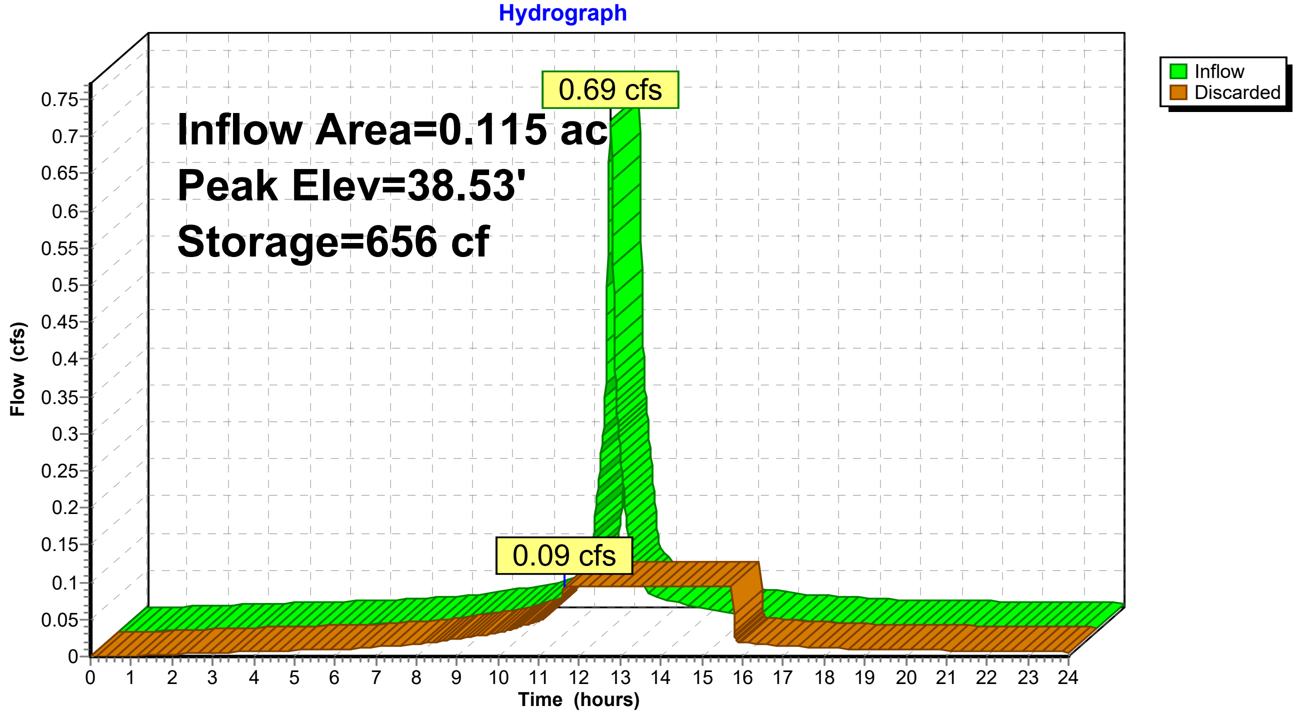
Volume	Invert	Avail.Storage	Storage Description
#1	36.50'	468 cf	**Stone (Prismatic)** Listed below (Recalc) 1,722 cf Overall - 551 cf Embedded = 1,171 cf x 40.0% Voids
#2	37.00'	551 cf	**ADS_StormTech SC-740 +Cap** x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 6 Chambers
		1,020 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
36.50	492	0	0
40.00	492	1,722	1,722

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.09 cfs @ 11.62 hrs HW=36.54' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Pond 41P: SC-740



Summary for Pond 43P: SC-740

Inflow Area = 0.782 ac, 11.09% Impervious, Inflow Depth > 0.58" for 25 YR event
Inflow = 0.23 cfs @ 12.14 hrs, Volume= 0.038 af
Outflow = 0.05 cfs @ 12.07 hrs, Volume= 0.038 af, Atten= 78%, Lag= 0.0 min
Discarded = 0.05 cfs @ 12.07 hrs, Volume= 0.038 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 21.86' @ 14.79 hrs Surf.Area= 256 sf Storage= 389 cf

Plug-Flow detention time= 78.3 min calculated for 0.038 af (100% of inflow)
Center-of-Mass det. time= 77.8 min (1,013.9 - 936.2)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	248 cf	**Stone (Prismatic)** Listed below (Recalc) 896 cf Overall - 276 cf Embedded = 620 cf x 40.0% Voids
#2	20.00'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 3 Chambers
#3	24.50'	3,830 cf	**Surface Ponding (Prismatic)** Listed below (Recalc)
		4,353 cf	Total Available Storage

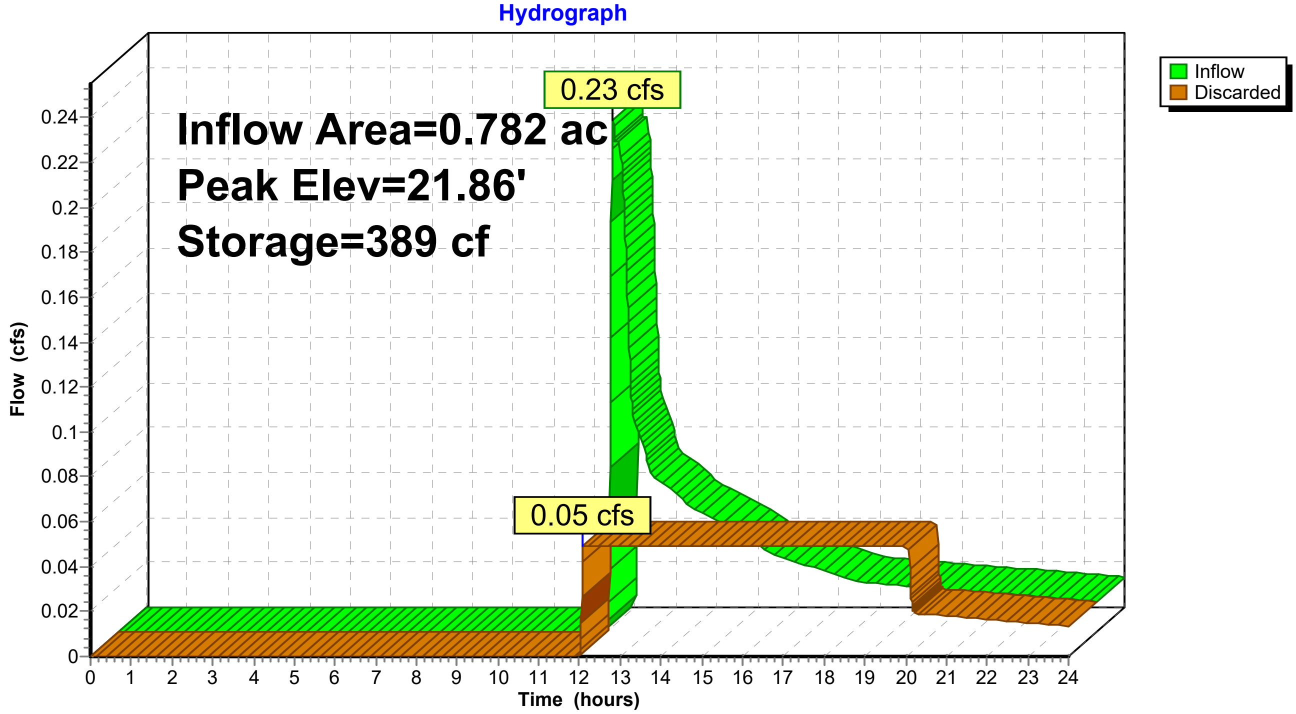
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	256	0	0
23.00	256	896	896

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.50	4	0	0
25.00	3,057	765	765
25.50	9,200	3,064	3,830

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.05 cfs @ 12.07 hrs HW=19.58' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Pond 43P: SC-740



Summary for Pond 45P: SC-740

Inflow Area = 1.100 ac, 26.54% Impervious, Inflow Depth > 0.89" for 25 YR event
Inflow = 0.81 cfs @ 12.10 hrs, Volume= 0.082 af
Outflow = 0.12 cfs @ 12.00 hrs, Volume= 0.082 af, Atten= 85%, Lag= 0.0 min
Discarded = 0.12 cfs @ 12.00 hrs, Volume= 0.082 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 21.66' @ 13.65 hrs Surf.Area= 650 sf Storage= 926 cf

Plug-Flow detention time= 69.1 min calculated for 0.082 af (100% of inflow)
Center-of-Mass det. time= 68.6 min (975.7 - 907.2)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	616 cf	**Stone (Prismatic)** Listed below (Recalc) 2,275 cf Overall - 735 cf Embedded = 1,540 cf x 40.0% Voids
#2	20.00'	735 cf	**ADS_StormTech SC-740 +Cap** x 16 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 8 Chambers
#3	25.50'	4,609 cf	**Surface Ponding (Prismatic)** Listed below (Recalc)
		5,960 cf	Total Available Storage

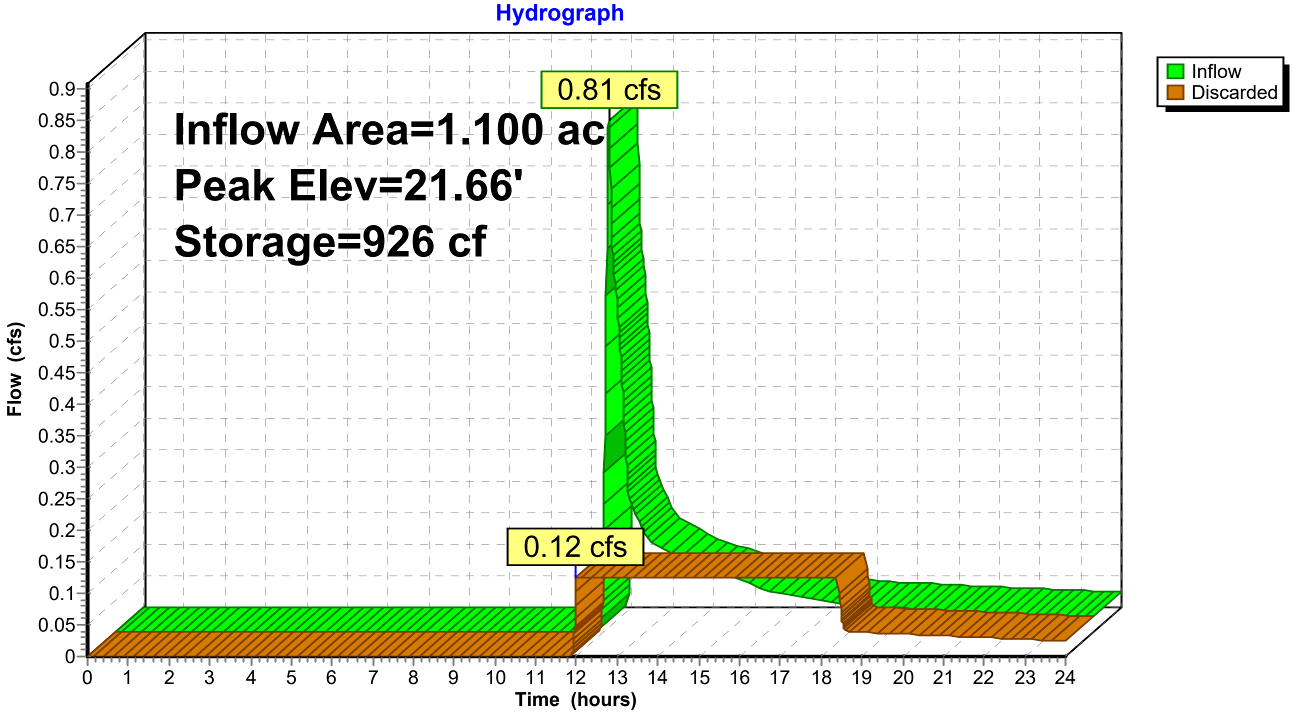
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	650	0	0
23.00	650	2,275	2,275

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
25.50	4	0	0
26.00	2,742	687	687
26.80	7,065	3,923	4,609

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.12 cfs @ 12.00 hrs HW=19.58' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Pond 45P: SC-740



Summary for Pond B-1: Basin 1

Inflow Area = 5.195 ac, 60.05% Impervious, Inflow Depth > 3.04" for 25 YR event
Inflow = 18.81 cfs @ 12.10 hrs, Volume= 1.316 af
Outflow = 0.83 cfs @ 15.22 hrs, Volume= 0.880 af, Atten= 96%, Lag= 187.6 min
Discarded = 0.83 cfs @ 15.22 hrs, Volume= 0.880 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 13.30' @ 15.22 hrs Surf.Area= 14,963 sf Storage= 32,617 cf

Plug-Flow detention time= 305.3 min calculated for 0.880 af (67% of inflow)
Center-of-Mass det. time= 211.0 min (1,026.3 - 815.3)

Volume	Invert	Avail.Storage	Storage Description
#1	10.50'	61,135 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

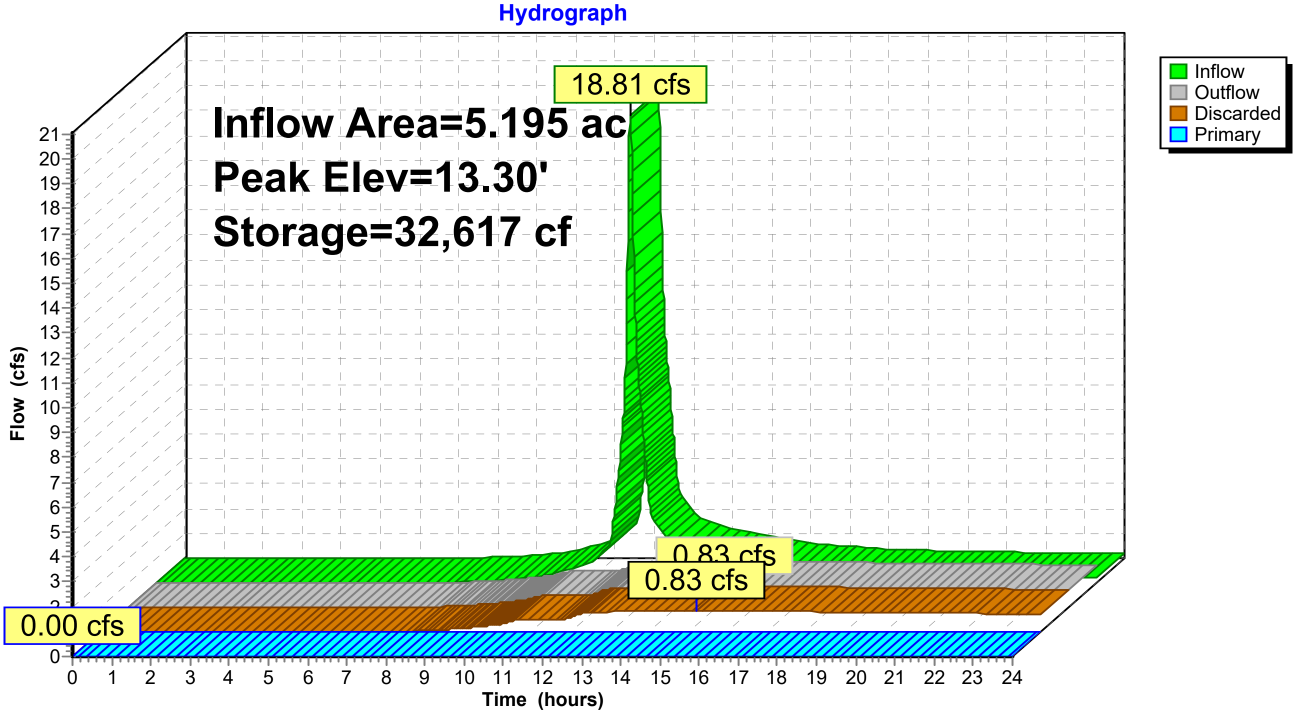
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.50	8,346	0	0
11.00	9,153	4,375	4,375
12.00	12,072	10,613	14,987
13.00	14,291	13,182	28,169
14.00	16,502	15,397	43,565
15.00	18,637	17,570	61,135

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	15.00'	**45.0 deg x 15.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.83 cfs @ 15.22 hrs HW=13.30' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.83 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.50' (Free Discharge)
└**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond B-1: Basin 1



Summary for Pond B-2: Basin 2

Inflow Area = 4.443 ac, 56.72% Impervious, Inflow Depth > 2.43" for 25 YR event
Inflow = 14.95 cfs @ 12.09 hrs, Volume= 0.899 af
Outflow = 0.66 cfs @ 14.69 hrs, Volume= 0.663 af, Atten= 96%, Lag= 155.9 min
Discarded = 0.66 cfs @ 14.69 hrs, Volume= 0.663 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 17.87' @ 14.69 hrs Surf.Area= 11,860 sf Storage= 22,768 cf

Plug-Flow detention time= 298.5 min calculated for 0.663 af (74% of inflow)
Center-of-Mass det. time= 223.2 min (1,029.4 - 806.1)

Volume	Invert	Avail.Storage	Storage Description
#1	15.50'	37,352 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

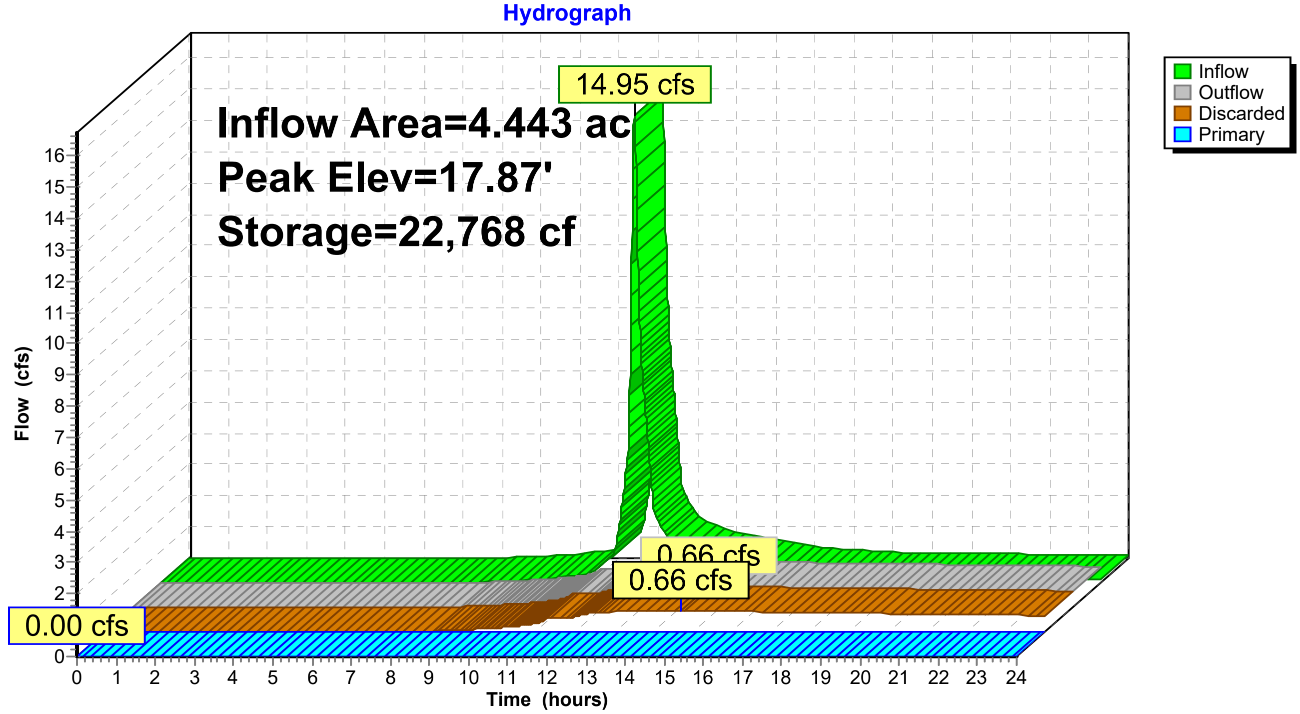
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
15.50	7,983	0	0
16.00	8,588	4,143	4,143
17.00	9,841	9,215	13,357
18.00	12,169	11,005	24,362
19.00	13,810	12,990	37,352

Device	Routing	Invert	Outlet Devices
#1	Discarded	15.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.50'	**45.0 deg x 15.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.66 cfs @ 14.69 hrs HW=17.87' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.66 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.50' (Free Discharge)
└─**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond B-2: Basin 2



Summary for Pond BIO1: BIO 1

Inflow Area =	0.791 ac, 76.51% Impervious,	Inflow Depth > 4.11"	for 25 YR event	
Inflow =	3.90 cfs @	12.07 hrs, Volume=	0.271 af	
Outflow =	3.79 cfs @	12.09 hrs, Volume=	0.265 af,	Atten= 3%, Lag= 1.1 min
Discarded =	0.06 cfs @	12.09 hrs, Volume=	0.061 af	
Primary =	3.73 cfs @	12.09 hrs, Volume=	0.204 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 19.82' @ 12.09 hrs Surf.Area= 1,134 sf Storage= 591 cf

Plug-Flow detention time= 22.1 min calculated for 0.265 af (98% of inflow)
Center-of-Mass det. time= 8.8 min (811.4 - 802.6)

Volume	Invert	Avail.Storage	Storage Description
#1	19.00'	7,359 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

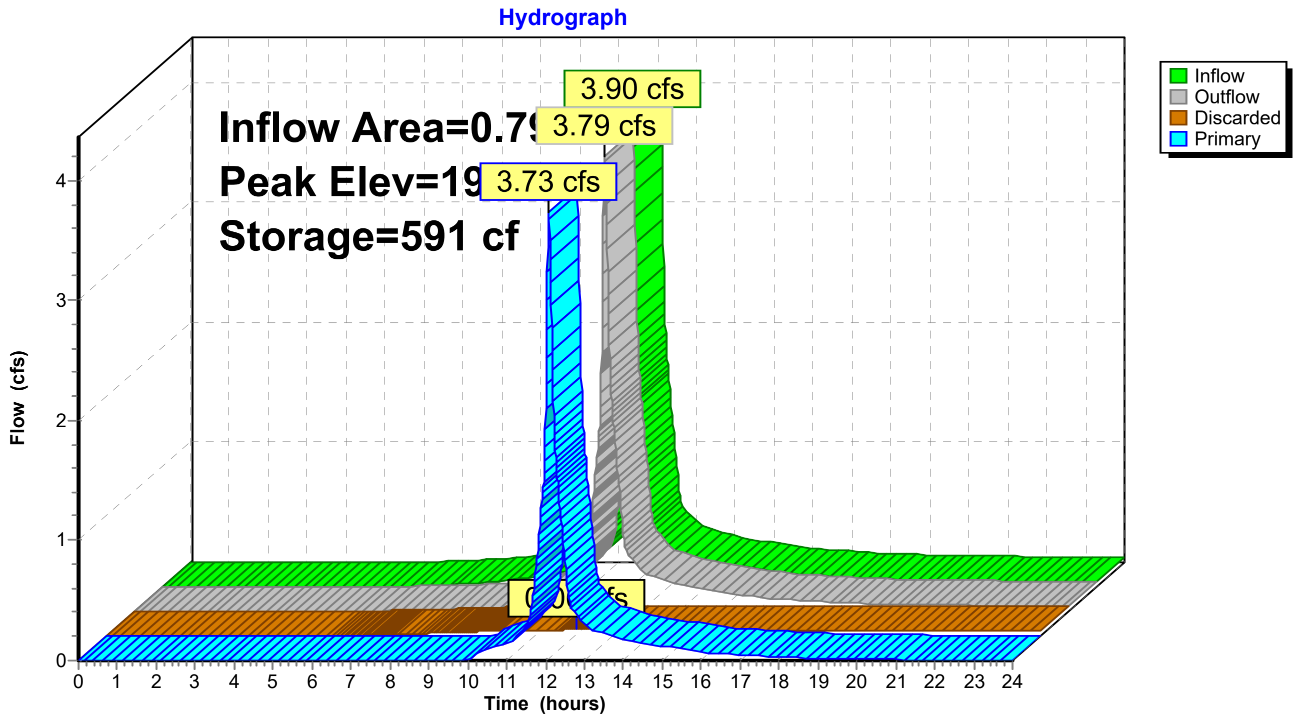
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.00	307	0	0
20.00	1,315	811	811
20.40	2,200	703	1,514
21.00	17,283	5,845	7,359

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	19.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 12.09 hrs HW=19.82' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=3.73 cfs @ 12.09 hrs HW=19.82' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 1.86 cfs @ 1.85 fps)
└─**3=Orifice/Grate** (Weir Controls 1.86 cfs @ 1.85 fps)

Pond BIO1: BIO 1



Summary for Pond BIO2: BIO 2

Inflow Area = 0.833 ac, 68.24% Impervious, Inflow Depth > 3.60" for 25 YR event
Inflow = 3.64 cfs @ 12.07 hrs, Volume= 0.250 af
Outflow = 3.28 cfs @ 12.11 hrs, Volume= 0.246 af, Atten= 10%, Lag= 2.2 min
Discarded = 0.13 cfs @ 12.11 hrs, Volume= 0.126 af
Primary = 3.16 cfs @ 12.11 hrs, Volume= 0.120 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 23.04' @ 12.11 hrs Surf.Area= 2,266 sf Storage= 1,904 cf

Plug-Flow detention time= 71.1 min calculated for 0.245 af (98% of inflow)
Center-of-Mass det. time= 61.0 min (876.8 - 815.8)

Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	4,509 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

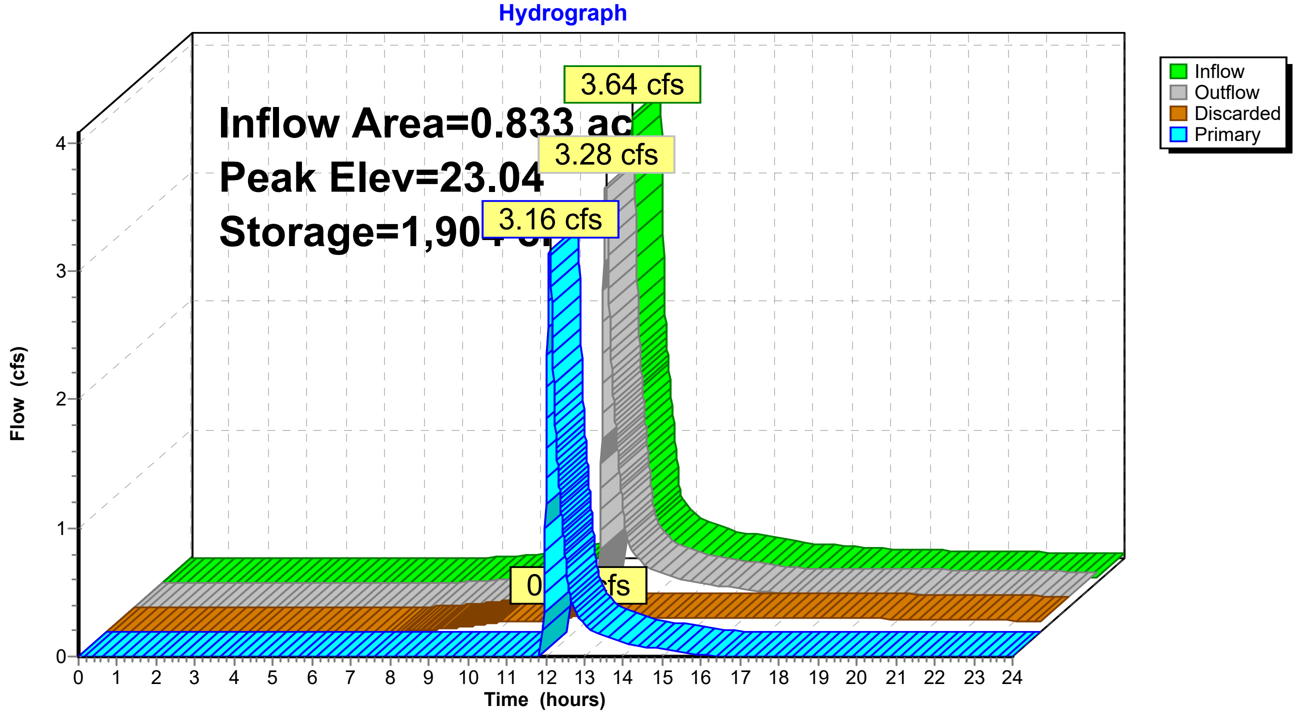
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	1,410	0	0
23.00	2,232	1,821	1,821
24.00	3,143	2,688	4,509

Device	Routing	Invert	Outlet Devices
#1	Discarded	22.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	22.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	22.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.13 cfs @ 12.11 hrs HW=23.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=3.15 cfs @ 12.11 hrs HW=23.04' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 1.58 cfs @ 1.75 fps)
└─**3=Orifice/Grate** (Weir Controls 1.58 cfs @ 1.75 fps)

Pond BIO2: BIO 2



Summary for Pond BIO3: BIO-3

Inflow Area = 0.816 ac, 75.18% Impervious, Inflow Depth > 4.00" for 25 YR event
Inflow = 3.93 cfs @ 12.07 hrs, Volume= 0.272 af
Outflow = 3.75 cfs @ 12.10 hrs, Volume= 0.266 af, Atten= 5%, Lag= 1.4 min
Discarded = 0.09 cfs @ 12.10 hrs, Volume= 0.085 af
Primary = 3.66 cfs @ 12.10 hrs, Volume= 0.182 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 23.82' @ 12.10 hrs Surf.Area= 1,548 sf Storage= 897 cf

Plug-Flow detention time= 32.1 min calculated for 0.266 af (98% of inflow)
Center-of-Mass det. time= 19.1 min (824.5 - 805.4)

Volume	Invert	Avail.Storage	Storage Description
#1	23.00'	2,268 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

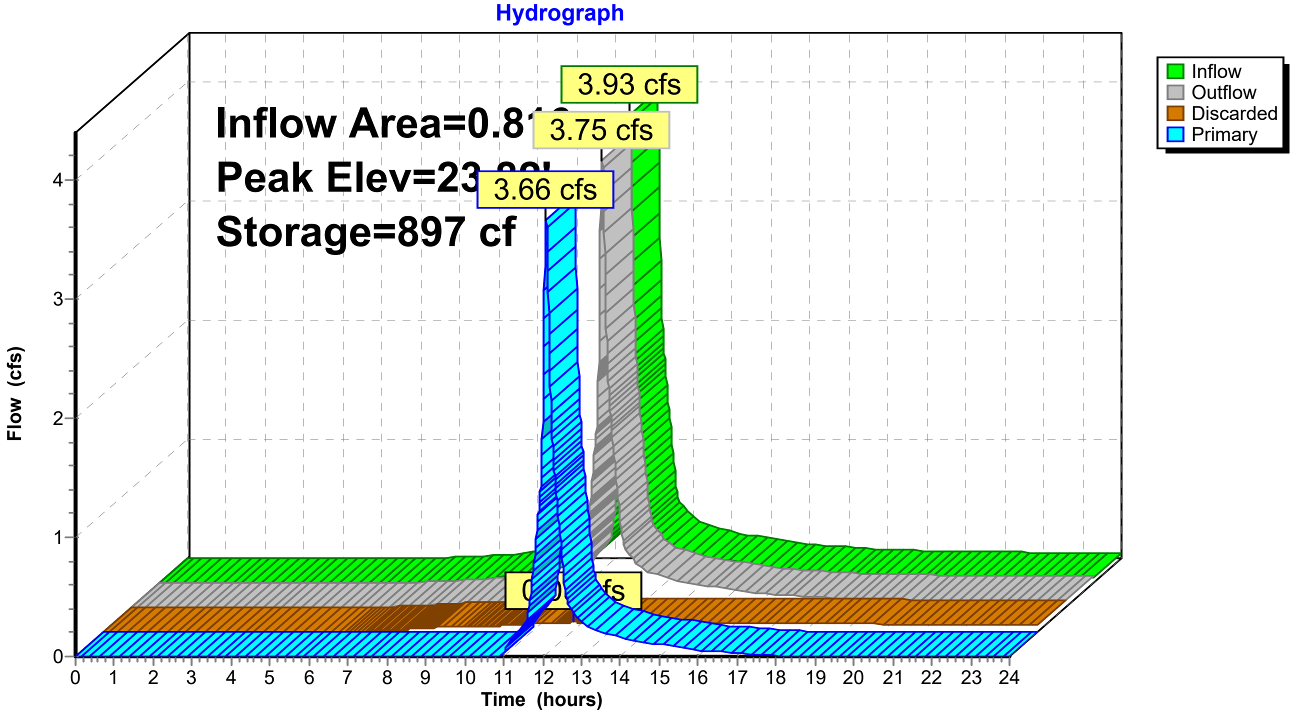
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
23.00	648	0	0
24.00	1,750	1,199	1,199
24.50	2,527	1,069	2,268

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	23.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	23.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.09 cfs @ 12.10 hrs HW=23.82' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=3.66 cfs @ 12.10 hrs HW=23.82' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 1.83 cfs @ 1.84 fps)
└─**3=Orifice/Grate** (Weir Controls 1.83 cfs @ 1.84 fps)

Pond BIO3: BIO-3



Summary for Pond P-B: POND B

Inflow Area = 1.269 ac, 0.00% Impervious, Inflow Depth > 1.03" for 25 YR event
Inflow = 1.19 cfs @ 12.10 hrs, Volume= 0.109 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 3.14' @ 24.00 hrs Surf.Area= 11,180 sf Storage= 4,735 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

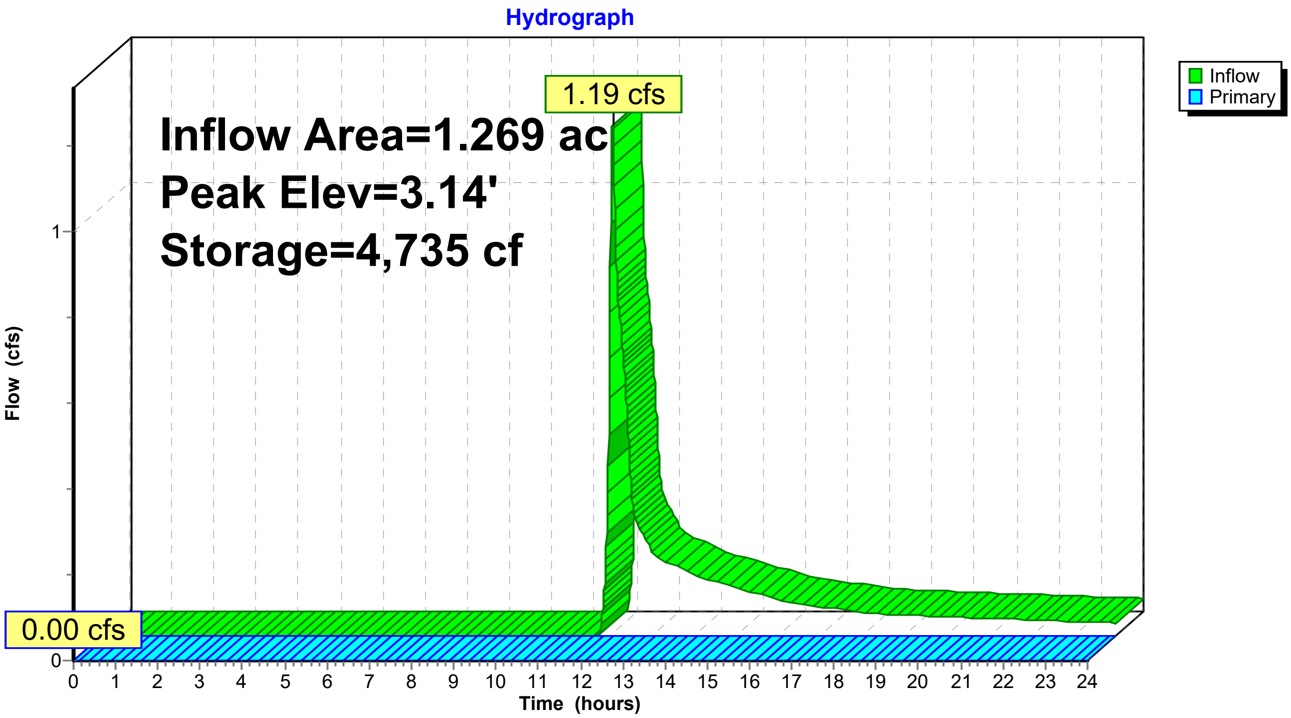
Volume	Invert	Avail.Storage	Storage Description
#1	2.70'	15,021 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2.70	10,273	0	0
3.00	11,080	3,203	3,203
3.40	11,370	4,490	7,693
4.00	13,058	7,328	15,021

Device	Routing	Invert	Outlet Devices
#1	Primary	3.44'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2.70' (Free Discharge)
↑—**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-B: POND B



Summary for Pond P-C: POND C

Inflow Area = 2.480 ac, 0.00% Impervious, Inflow Depth > 1.03" for 25 YR event
Inflow = 2.32 cfs @ 12.10 hrs, Volume= 0.212 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 4.02' @ 24.00 hrs Surf.Area= 23,590 sf Storage= 9,251 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

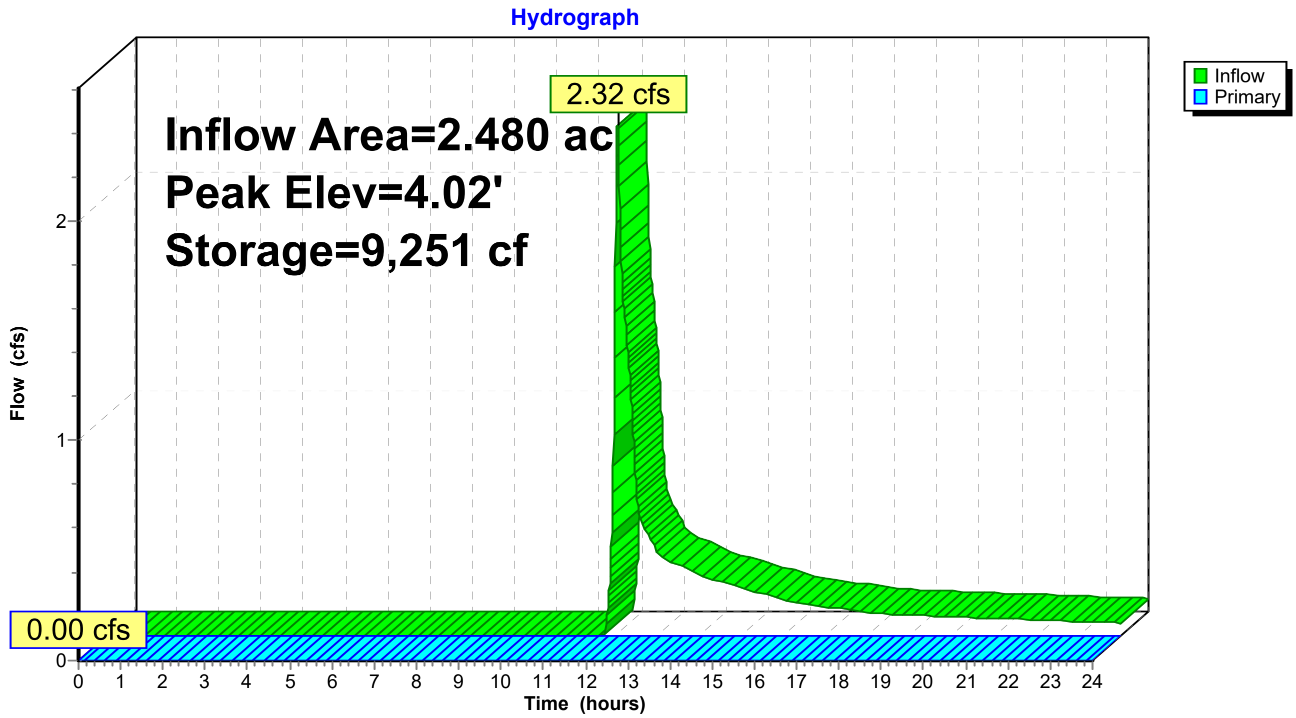
Volume	Invert	Avail.Storage	Storage Description
#1	3.60'	35,172 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.60	20,812	0	0
4.00	23,497	8,862	8,862
5.00	29,124	26,311	35,172

Device	Routing	Invert	Outlet Devices
#1	Primary	4.29'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=3.60' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond P-C: POND C



Summary for Pond P-D: POND D

Inflow Area = 2.034 ac, 0.00% Impervious, Inflow Depth > 0.95" for 25 YR event
Inflow = 1.02 cfs @ 12.47 hrs, Volume= 0.161 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 8.86' @ 24.00 hrs Surf.Area= 8,779 sf Storage= 7,028 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

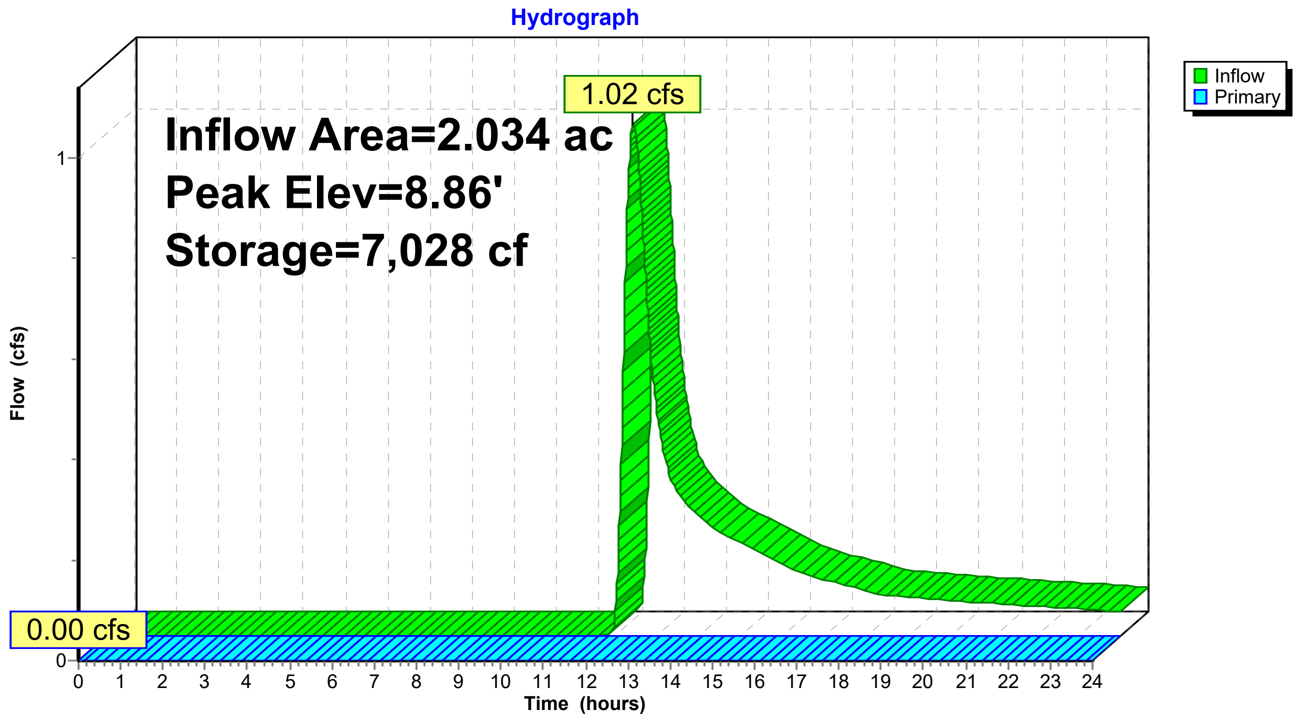
Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	18,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	7,585	0	0
9.00	8,975	8,280	8,280
10.00	12,170	10,573	18,853

Device	Routing	Invert	Outlet Devices
#1	Primary	9.80'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#2	Primary	9.08'	**12.0" Round Culvert** L= 18.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.08' / 8.16' S= 0.0497 '/' Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=8.00' (Free Discharge)
1=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)
2=Culvert (Controls 0.00 cfs)

Pond P-D: POND D



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

Subcatchment 28S: TYP ROOF SIZING Runoff Area=5,000 sf 100.00% Impervious Runoff Depth>7.17"
Tc=5.0 min CN=98 Runoff=0.86 cfs 0.069 af

Subcatchment BIO-1: BIO-1 Runoff Area=34,452 sf 76.51% Impervious Runoff Depth>5.53"
Tc=5.0 min CN=84 Runoff=5.17 cfs 0.364 af

Subcatchment BIO-2: BIO-2 Runoff Area=36,300 sf 68.24% Impervious Runoff Depth>4.96"
Tc=5.0 min CN=79 Runoff=4.98 cfs 0.344 af

Subcatchment BIO-3: BIO-3 Runoff Area=35,532 sf 75.18% Impervious Runoff Depth>5.41"
Tc=5.0 min CN=83 Runoff=5.25 cfs 0.368 af

Subcatchment P10: PR-DA-10 Runoff Area=190,706 sf 0.00% Impervious Runoff Depth>0.61"
Tc=5.0 min CN=35 Runoff=1.16 cfs 0.223 af

Subcatchment P11: PR-DA11 Runoff Area=55,295 sf 0.00% Impervious Runoff Depth>1.80"
Tc=5.0 min CN=49 Runoff=2.44 cfs 0.191 af

Subcatchment P12: PR-DA12 Runoff Area=108,026 sf 0.00% Impervious Runoff Depth>1.80"
Tc=5.0 min CN=49 Runoff=4.77 cfs 0.372 af

Subcatchment P13: PR-DA-13 Runoff Area=32,038 sf 3.96% Impervious Runoff Depth>1.00"
Tc=5.0 min UI Adjusted CN=40 Runoff=0.55 cfs 0.061 af

Subcatchment P14: PR-DA-14 Runoff Area=187,032 sf 0.00% Impervious Runoff Depth>0.69"
Tc=5.0 min CN=36 Runoff=1.36 cfs 0.245 af

Subcatchment P1a: PR-DA-1a Runoff Area=72,022 sf 28.03% Impervious Runoff Depth>3.00"
Tc=5.0 min CN=61 Runoff=5.92 cfs 0.413 af

Subcatchment P1b: PR-DA-1b Runoff Area=61,320 sf 64.77% Impervious Runoff Depth>4.73"
Tc=5.0 min CN=77 Runoff=8.06 cfs 0.555 af

Subcatchment P2: PR-DA-2 Runoff Area=14,573 sf 0.97% Impervious Runoff Depth>0.92"
Tc=5.0 min UI Adjusted CN=39 Runoff=0.21 cfs 0.026 af

Subcatchment P3: PR-DA-3 Runoff Area=88,593 sf 0.00% Impervious Runoff Depth>1.70"
Flow Length=574' Tc=26.1 min CN=48 Runoff=2.11 cfs 0.287 af

Subcatchment P4: PR-DA4 Runoff Area=47,075 sf 19.25% Impervious Runoff Depth>1.90"
Tc=5.0 min CN=50 Runoff=2.23 cfs 0.171 af

Subcatchment P5: PR-DA5 Runoff Area=145,975 sf 68.19% Impervious Runoff Depth>4.96"
Flow Length=1,208' Tc=6.7 min CN=79 Runoff=18.84 cfs 1.384 af

Subcatchment P6: PR-DA-6 Runoff Area=34,083 sf 11.09% Impervious Runoff Depth>1.17"
Tc=5.0 min UI Adjusted CN=42 Runoff=0.78 cfs 0.076 af

Subcatchment P7: PR-DA-7 Runoff Area=47,897 sf 26.54% Impervious Runoff Depth>1.61"
Tc=5.0 min UI Adjusted CN=47 Runoff=1.82 cfs 0.148 af

Subcatchment P8a: PR-DA8a Runoff Area=37,831 sf 61.05% Impervious Runoff Depth>4.51"
Flow Length=626' Tc=5.0 min CN=75 Runoff=4.75 cfs 0.326 af

Subcatchment P8b: PR-DA8b Runoff Area=36,807 sf 71.01% Impervious Runoff Depth>5.18"
Flow Length=432' Tc=5.0 min CN=81 Runoff=5.25 cfs 0.365 af

Subcatchment P9: PR-DA9 Runoff Area=45,880 sf 21.77% Impervious Runoff Depth>2.09"
Tc=5.0 min CN=52 Runoff=2.46 cfs 0.183 af

Reach DP-1: DP-1 Inflow=5.92 cfs 0.413 af
Outflow=5.92 cfs 0.413 af

Reach DP-2: DP-2 (JOSHUA'S BROOK) Inflow=1.16 cfs 0.225 af
Outflow=1.16 cfs 0.225 af

Reach DP-3: DP-3 (STEWART'S CREEK) Inflow=1.36 cfs 0.293 af
Outflow=1.36 cfs 0.293 af

Pond 41P: SC-740 Peak Elev=39.46' Storage=913 cf Inflow=0.86 cfs 0.069 af
Outflow=0.09 cfs 0.069 af

Pond 43P: SC-740 Peak Elev=24.72' Storage=675 cf Inflow=0.78 cfs 0.076 af
Outflow=0.31 cfs 0.074 af

Pond 45P: SC-740 Peak Elev=25.86' Storage=1,708 cf Inflow=1.82 cfs 0.148 af
Outflow=0.50 cfs 0.148 af

Pond B-1: Basin 1 Peak Elev=14.35' Storage=49,437 cf Inflow=26.09 cfs 1.860 af
Discarded=0.96 cfs 1.046 af Primary=0.00 cfs 0.000 af Outflow=0.96 cfs 1.046 af

Pond B-2: Basin 2 Peak Elev=18.90' Storage=36,038 cf Inflow=21.16 cfs 1.325 af
Discarded=0.76 cfs 0.809 af Primary=0.00 cfs 0.000 af Outflow=0.76 cfs 0.809 af

Pond BIO1: BIO 1 Peak Elev=19.90' Storage=690 cf Inflow=5.17 cfs 0.364 af
Discarded=0.07 cfs 0.065 af Primary=4.81 cfs 0.292 af Outflow=4.88 cfs 0.358 af

Pond BIO2: BIO 2 Peak Elev=23.11' Storage=2,075 cf Inflow=4.98 cfs 0.344 af
Discarded=0.13 cfs 0.137 af Primary=4.45 cfs 0.196 af Outflow=4.58 cfs 0.333 af

Pond BIO3: BIO-3 Peak Elev=23.90' Storage=1,025 cf Inflow=5.25 cfs 0.368 af
Discarded=0.09 cfs 0.092 af Primary=4.77 cfs 0.267 af Outflow=4.86 cfs 0.359 af

Pond P-B: POND B Peak Elev=3.45' Storage=8,230 cf Inflow=2.44 cfs 0.191 af
Outflow=0.04 cfs 0.002 af

Pond P-C: POND C Peak Elev=4.30' Storage=16,139 cf Inflow=4.77 cfs 0.372 af
Outflow=0.04 cfs 0.002 af

Pond P-D: POND D Peak Elev=9.25' Storage=10,577 cf Inflow=2.11 cfs 0.287 af
Outflow=0.09 cfs 0.046 af

Total Runoff Area = 30.221 ac Runoff Volume = 6.172 af Average Runoff Depth = 2.45"
75.05% Pervious = 22.680 ac 24.95% Impervious = 7.541 ac

Summary for Subcatchment 28S: TYP ROOF SIZING

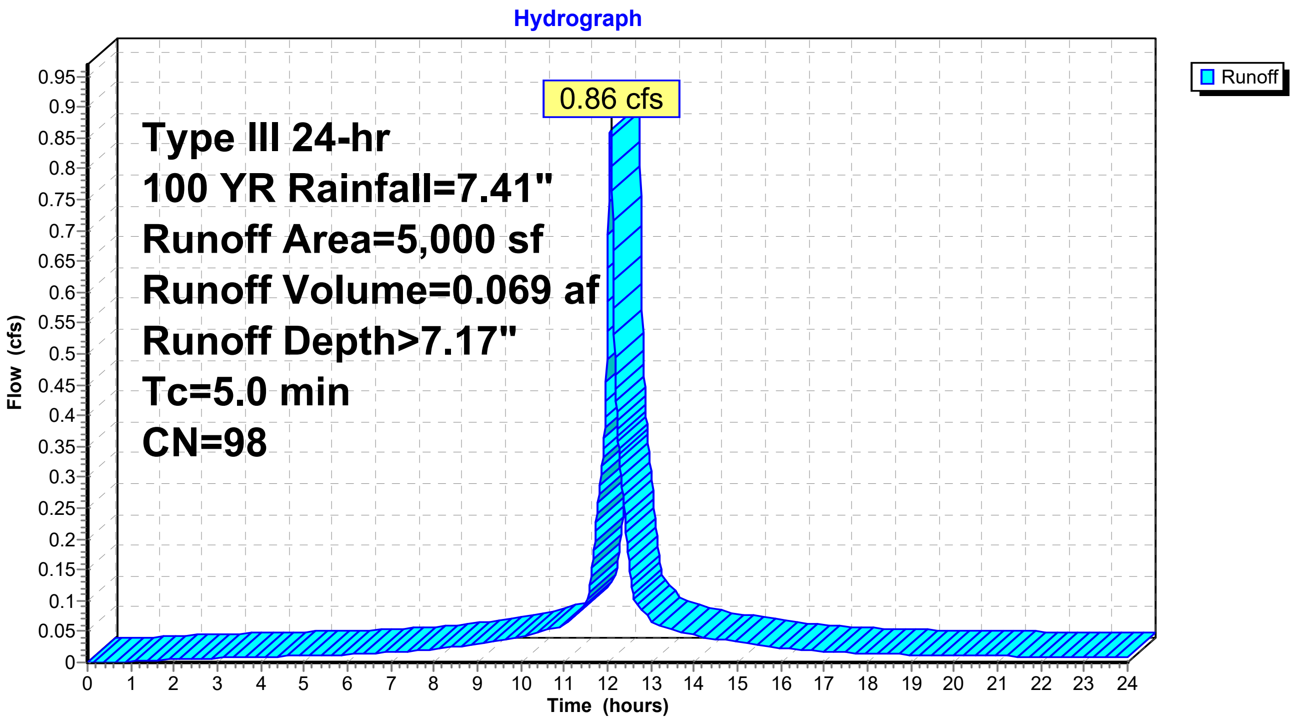
Runoff = 0.86 cfs @ 12.07 hrs, Volume= 0.069 af, Depth> 7.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
5,000	98	Roofs, HSG A
5,000		100.00% Impervious Area

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

Subcatchment 28S: TYP ROOF SIZING



Summary for Subcatchment BIO-1: BIO-1

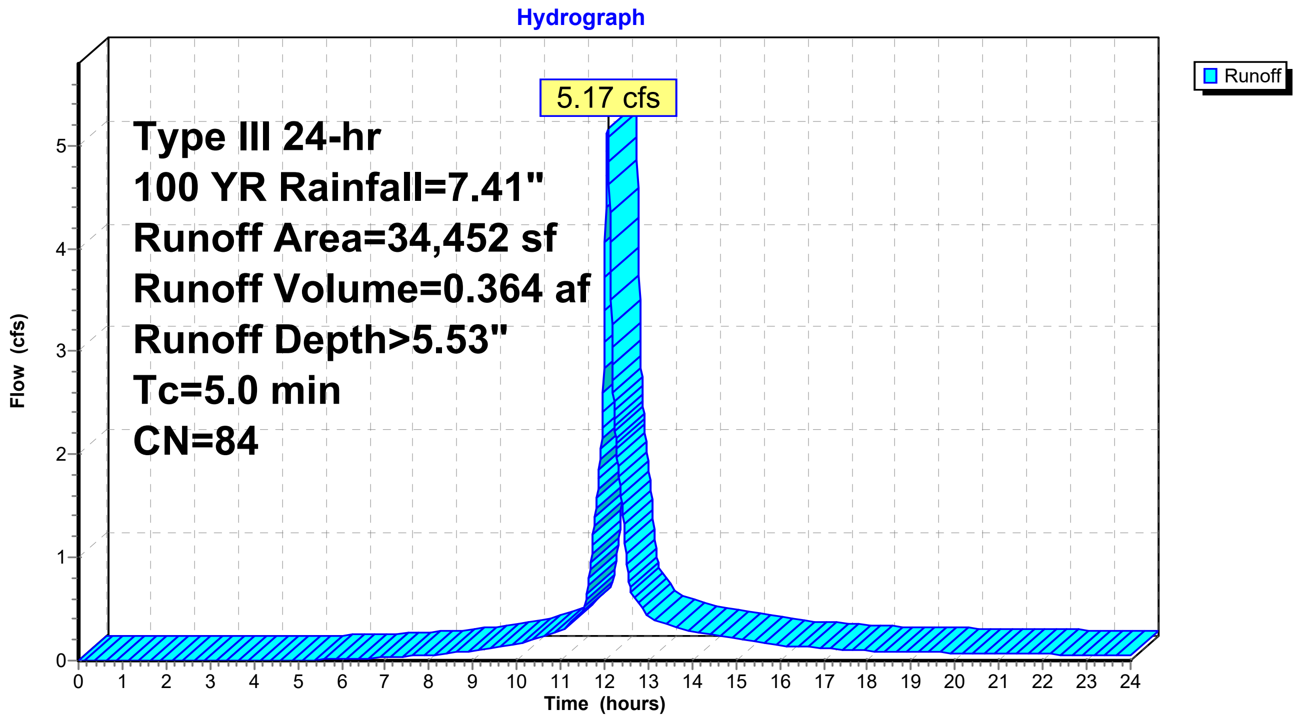
Runoff = 5.17 cfs @ 12.07 hrs, Volume= 0.364 af, Depth> 5.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
8,092	39	>75% Grass cover, Good, HSG A
26,360	98	Paved parking, HSG A
34,452	84	Weighted Average
8,092		23.49% Pervious Area
26,360		76.51% Impervious Area

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

Subcatchment BIO-1: BIO-1



Summary for Subcatchment BIO-2: BIO-2

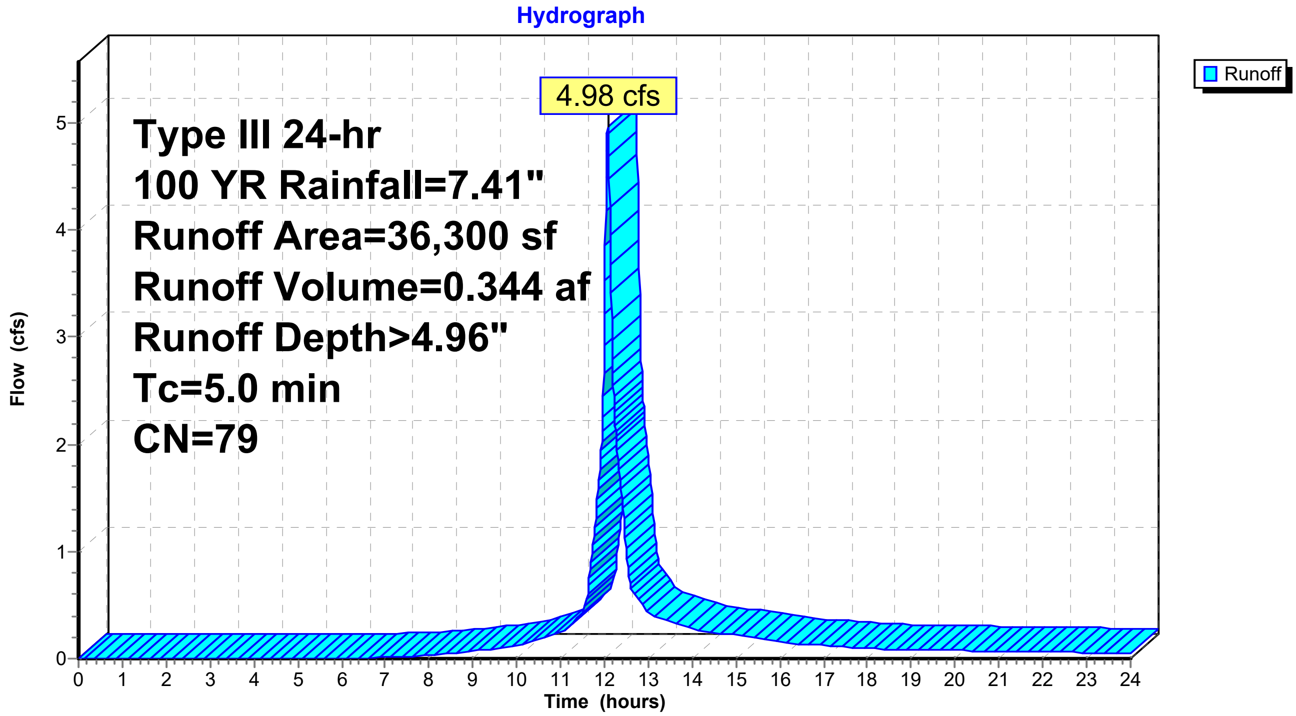
Runoff = 4.98 cfs @ 12.07 hrs, Volume= 0.344 af, Depth> 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
11,530	39	>75% Grass cover, Good, HSG A
24,660	98	Paved parking, HSG A
110	98	Roofs, HSG A
36,300	79	Weighted Average
11,530		31.76% Pervious Area
24,770		68.24% Impervious Area

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

Subcatchment BIO-2: BIO-2



Summary for Subcatchment BIO-3: BIO-3

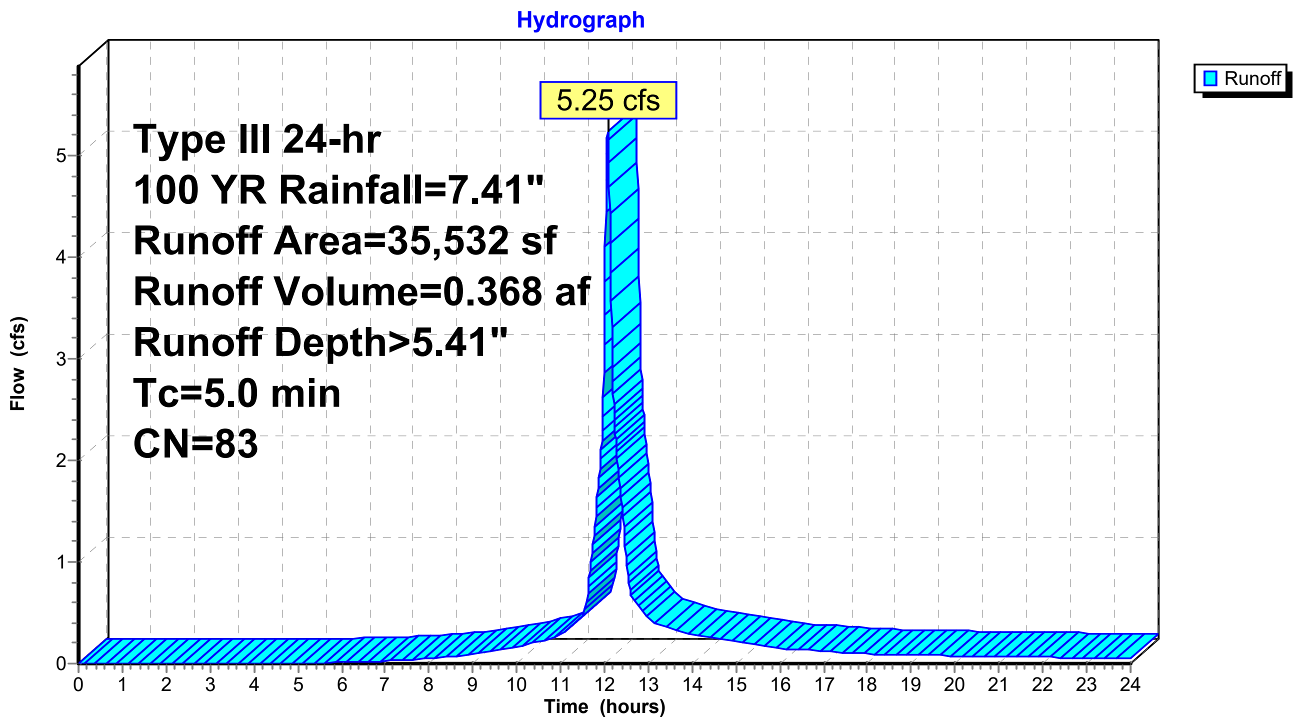
Runoff = 5.25 cfs @ 12.07 hrs, Volume= 0.368 af, Depth> 5.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
8,819	39	>75% Grass cover, Good, HSG A
26,493	98	Paved parking, HSG A
220	98	Roofs, HSG A
35,532	83	Weighted Average
8,819		24.82% Pervious Area
26,713		75.18% Impervious Area

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

Subcatchment BIO-3: BIO-3



Summary for Subcatchment P10: PR-DA-10

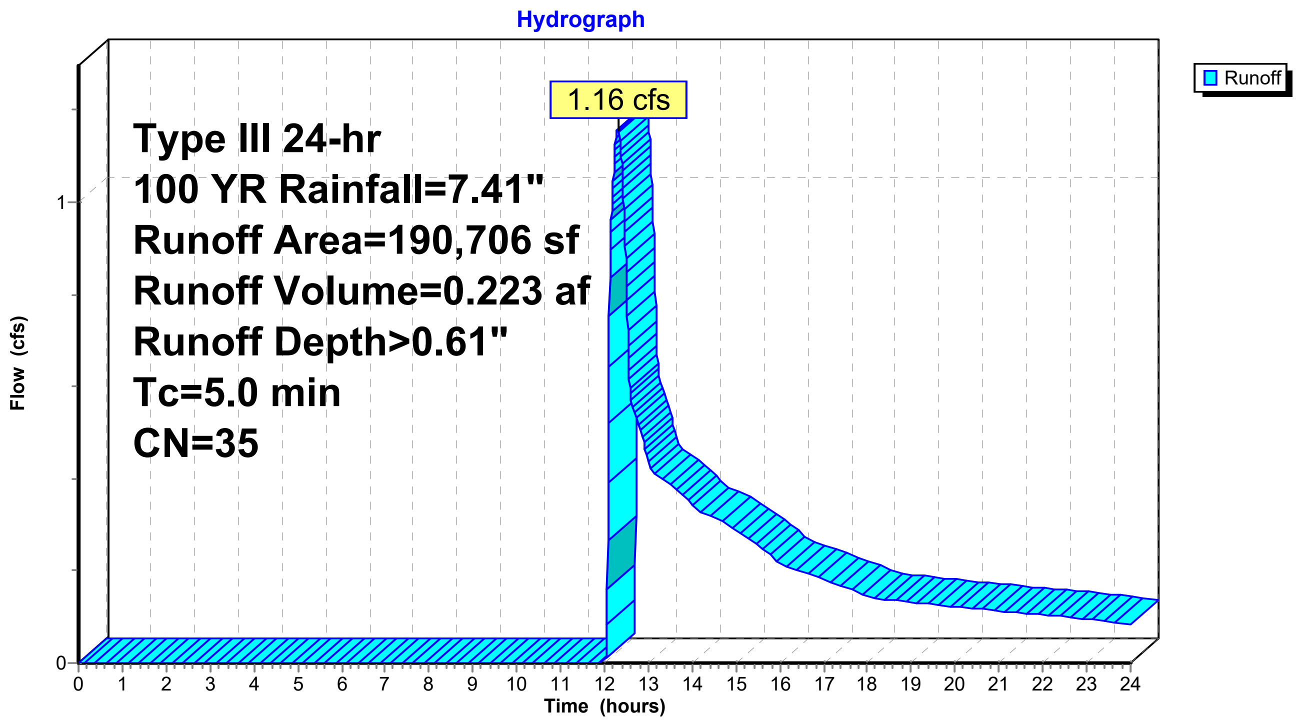
Runoff = 1.16 cfs @ 12.30 hrs, Volume= 0.223 af, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
90,801	39	>75% Grass cover, Good, HSG A
99,905	32	Woods/grass comb., Good, HSG A
190,706	35	Weighted Average
190,706		100.00% Pervious Area

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

Subcatchment P10: PR-DA-10



Summary for Subcatchment P11: PR-DA11

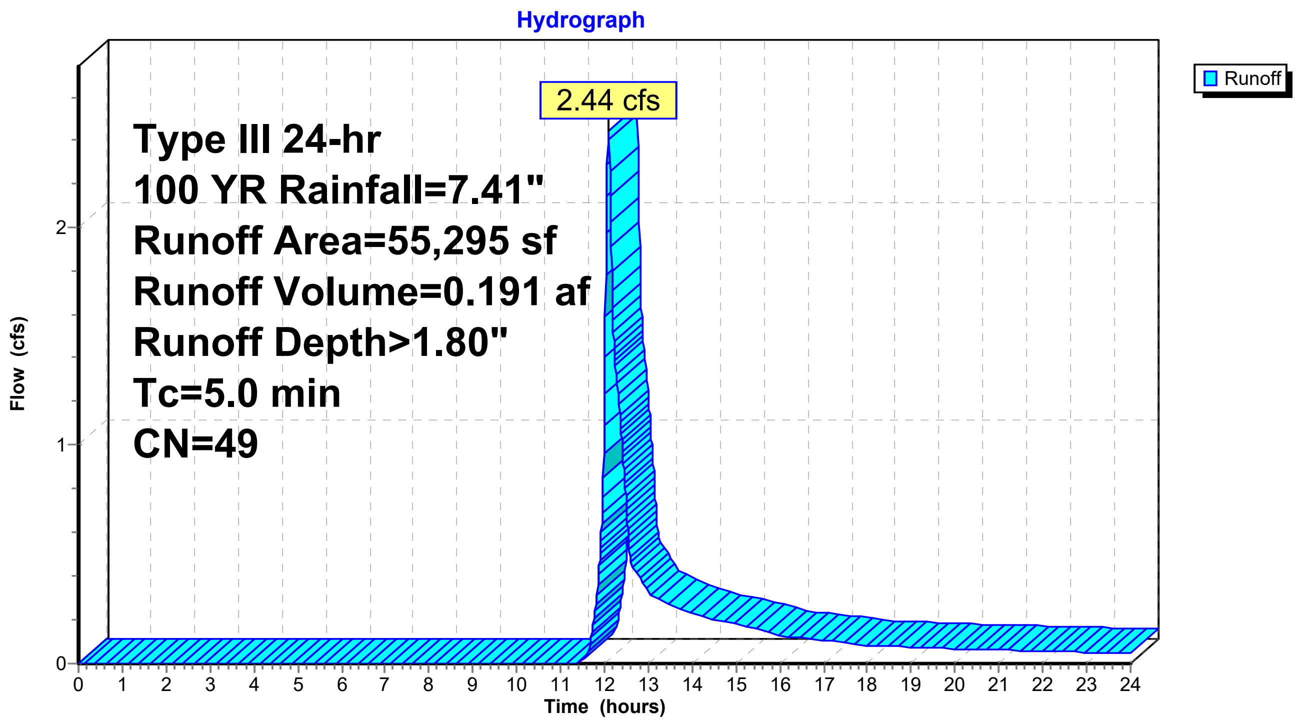
Runoff = 2.44 cfs @ 12.09 hrs, Volume= 0.191 af, Depth> 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
39,962	39	>75% Grass cover, Good, HSG A
5,060	30	Woods, Good, HSG A
10,273	98	Water Surface, 0% imp, HSG A
0	98	Paved parking, HSG A
55,295	49	Weighted Average
55,295		100.00% Pervious Area

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

Subcatchment P11: PR-DA11



Summary for Subcatchment P12: PR-DA12

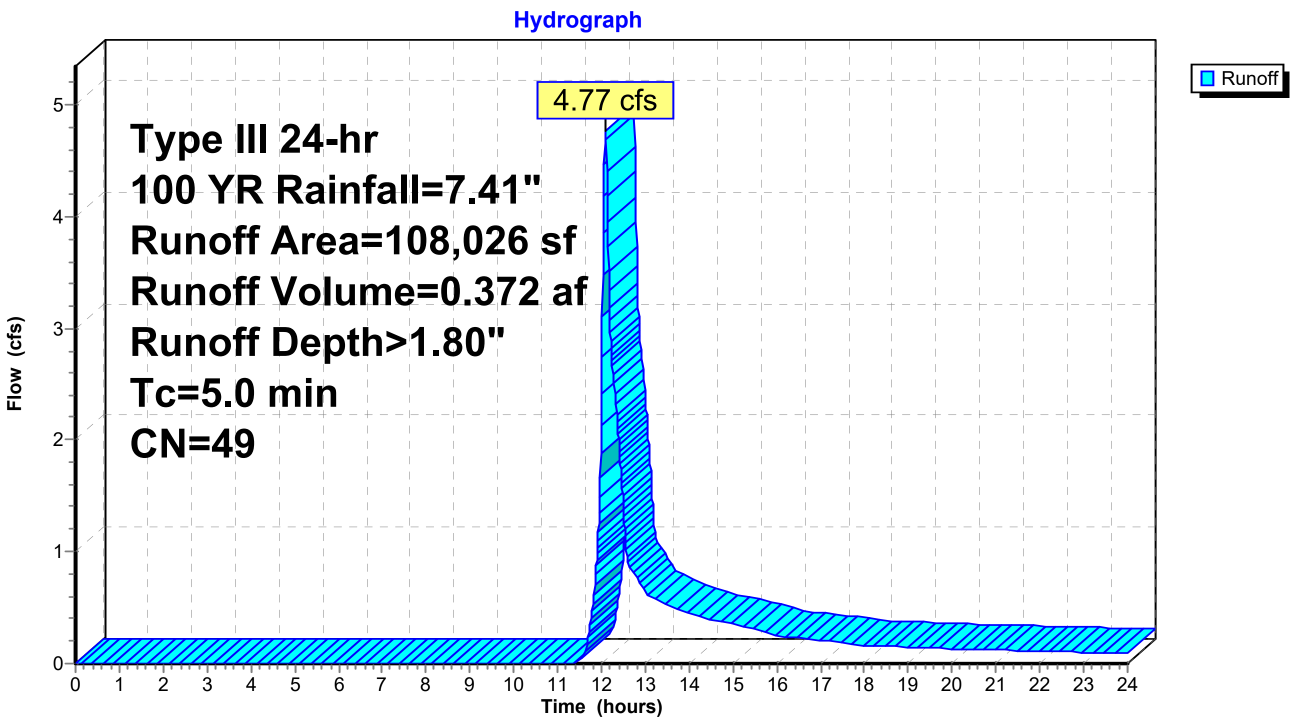
Runoff = 4.77 cfs @ 12.09 hrs, Volume= 0.372 af, Depth> 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
74,064	39	>75% Grass cover, Good, HSG A
13,150	30	Woods, Good, HSG A
20,812	98	Water Surface, 0% imp, HSG A
0	98	Paved parking, HSG A
108,026	49	Weighted Average
108,026		100.00% Pervious Area

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

Subcatchment P12: PR-DA12



Summary for Subcatchment P13: PR-DA-13

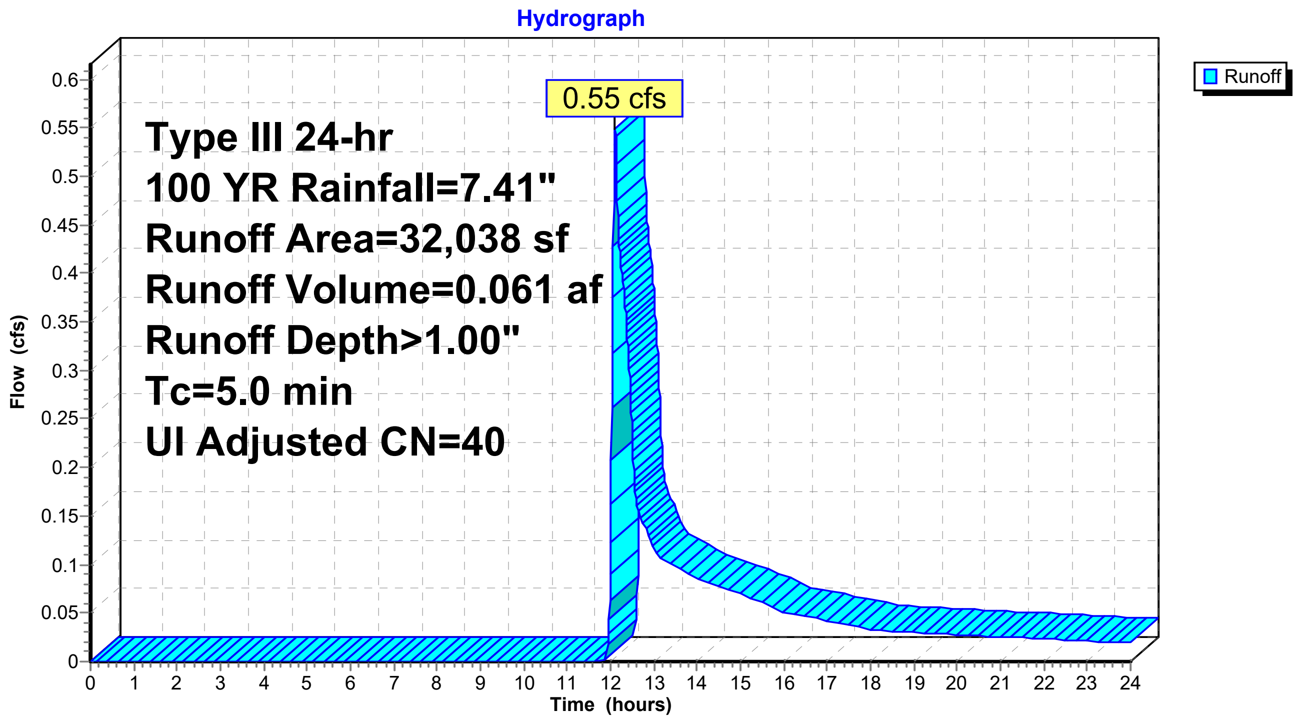
Runoff = 0.55 cfs @ 12.11 hrs, Volume= 0.061 af, Depth> 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Adj	Description
	30,218	39		>75% Grass cover, Good, HSG A
*	1,270	98		Unconnected Impervious, HSG A
	550	30		Woods, Good, HSG A
	32,038	41	40	Weighted Average, UI Adjusted
	30,768			96.04% Pervious Area
	1,270			3.96% Impervious Area
	1,270			100.00% Unconnected

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

Subcatchment P13: PR-DA-13



Summary for Subcatchment P14: PR-DA-14

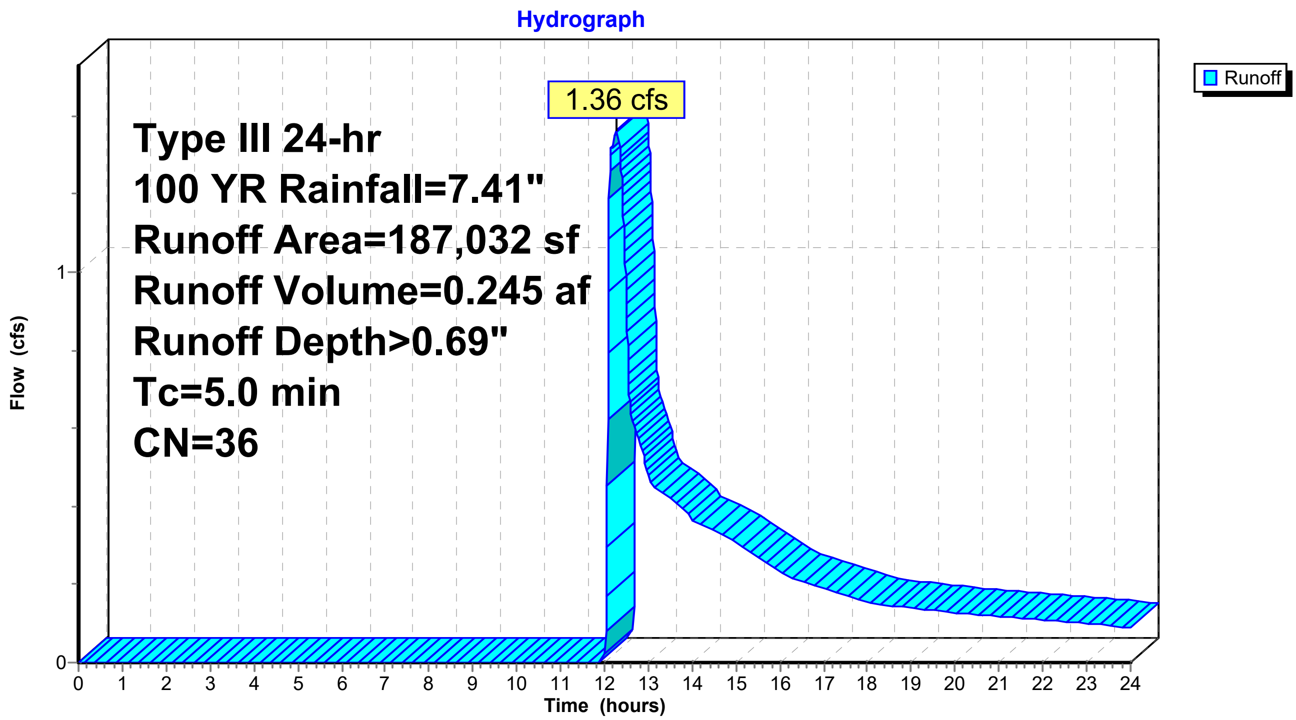
Runoff = 1.36 cfs @ 12.28 hrs, Volume= 0.245 af, Depth> 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
124,219	39	>75% Grass cover, Good, HSG A
62,813	30	Woods, Good, HSG A
187,032	36	Weighted Average
187,032		100.00% Pervious Area

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

Subcatchment P14: PR-DA-14



Summary for Subcatchment P1a: PR-DA-1a

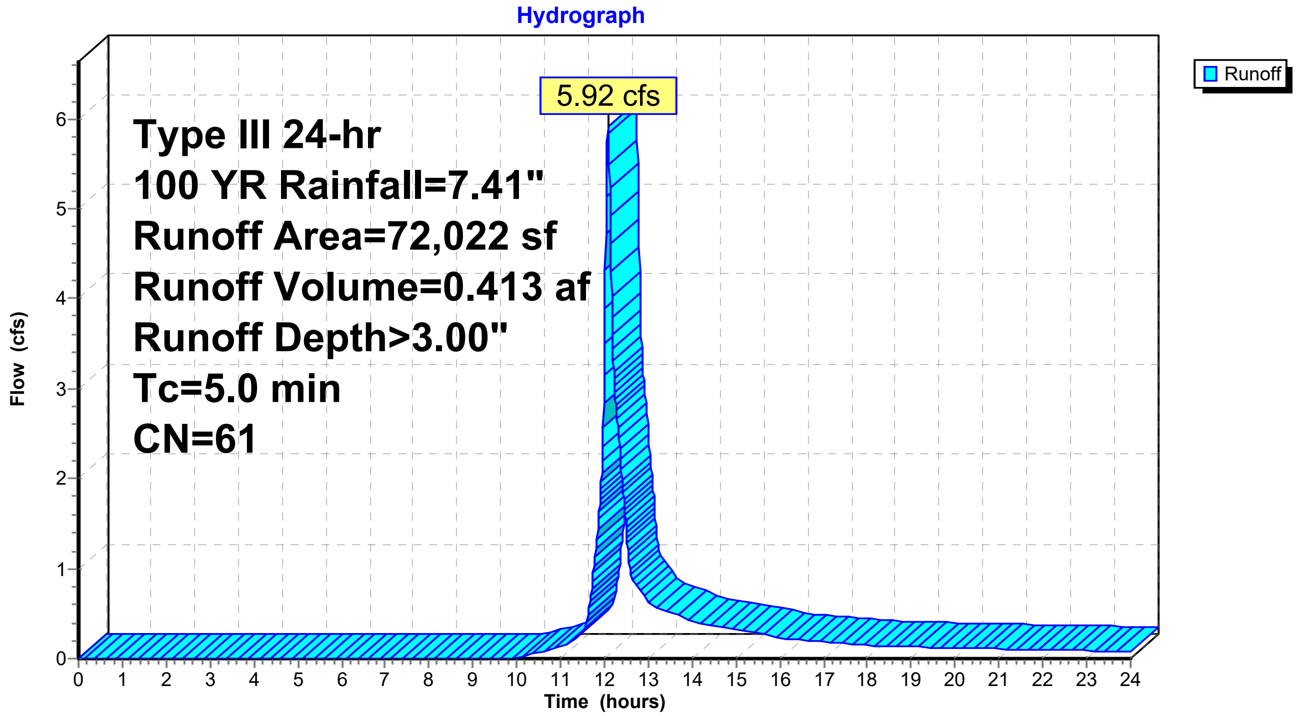
Runoff = 5.92 cfs @ 12.08 hrs, Volume= 0.413 af, Depth> 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
44,791	39	>75% Grass cover, Good, HSG A
20,190	98	Paved parking, HSG A
7,041	98	Water Surface, 0% imp, HSG A
72,022	61	Weighted Average
51,832		71.97% Pervious Area
20,190		28.03% Impervious Area

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

Subcatchment P1a: PR-DA-1a



Summary for Subcatchment P1b: PR-DA-1b

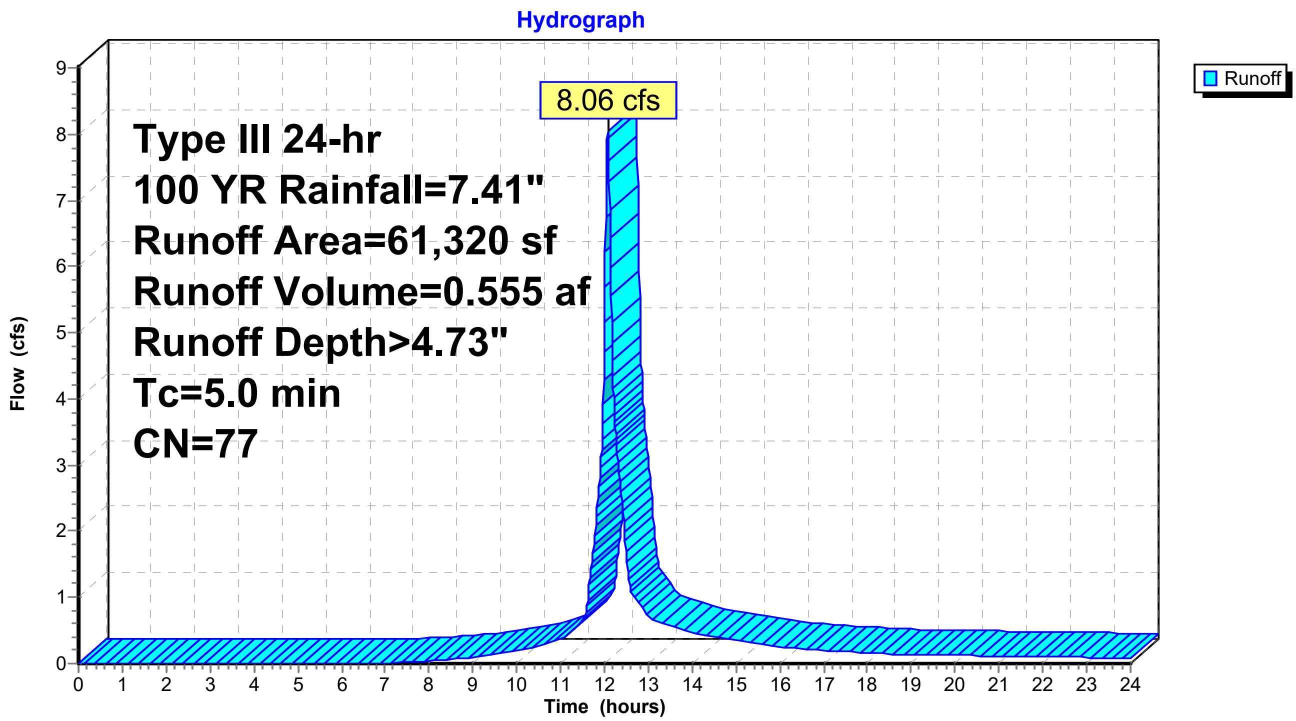
Runoff = 8.06 cfs @ 12.07 hrs, Volume= 0.555 af, Depth> 4.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	21,600	39	>75% Grass cover, Good, HSG A
*	39,720	98	Unconnected Impervious, HSG A
	61,320	77	Weighted Average
	21,600		35.23% Pervious Area
	39,720		64.77% Impervious Area
	39,720		100.00% Unconnected

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

Subcatchment P1b: PR-DA-1b



Summary for Subcatchment P2: PR-DA-2

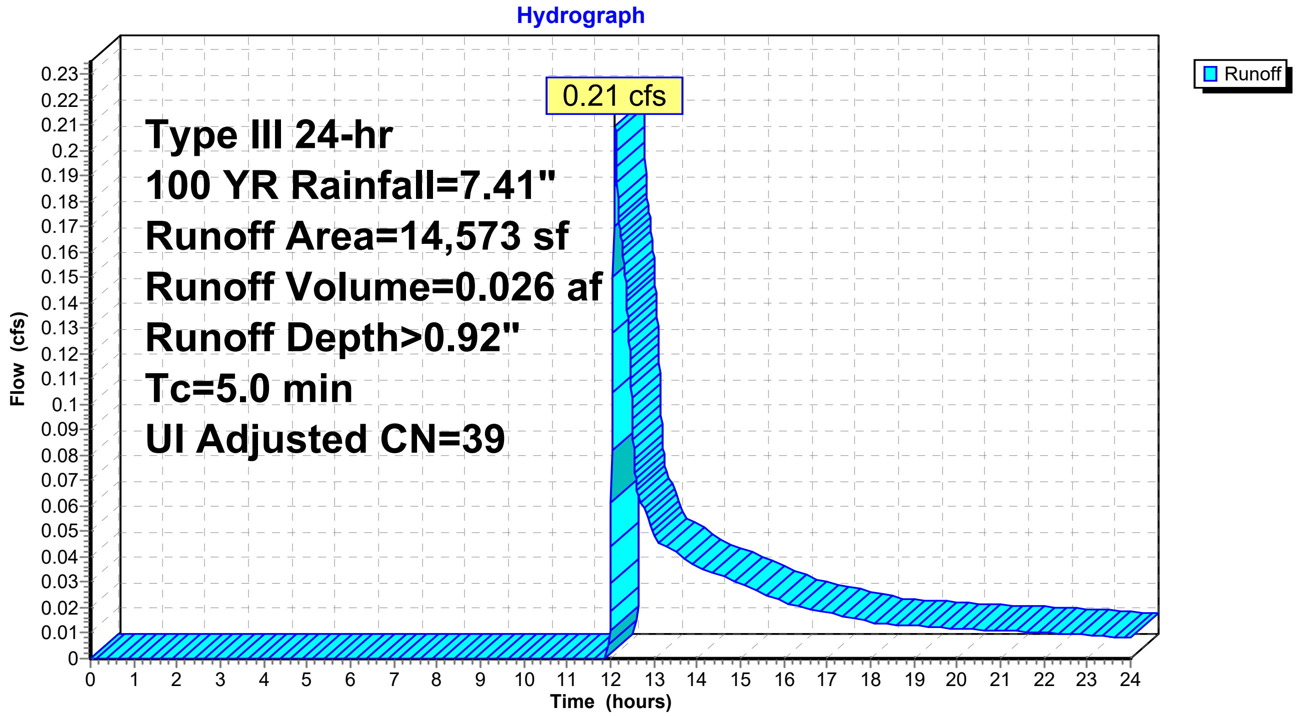
Runoff = 0.21 cfs @ 12.11 hrs, Volume= 0.026 af, Depth> 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Adj	Description
	14,431	39		>75% Grass cover, Good, HSG A
*	142	98		Unconnected Impervious, HSG A
	14,573	40	39	Weighted Average, UI Adjusted
	14,431			99.03% Pervious Area
	142			0.97% Impervious Area
	142			100.00% Unconnected

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

Subcatchment P2: PR-DA-2



Summary for Subcatchment P3: PR-DA-3

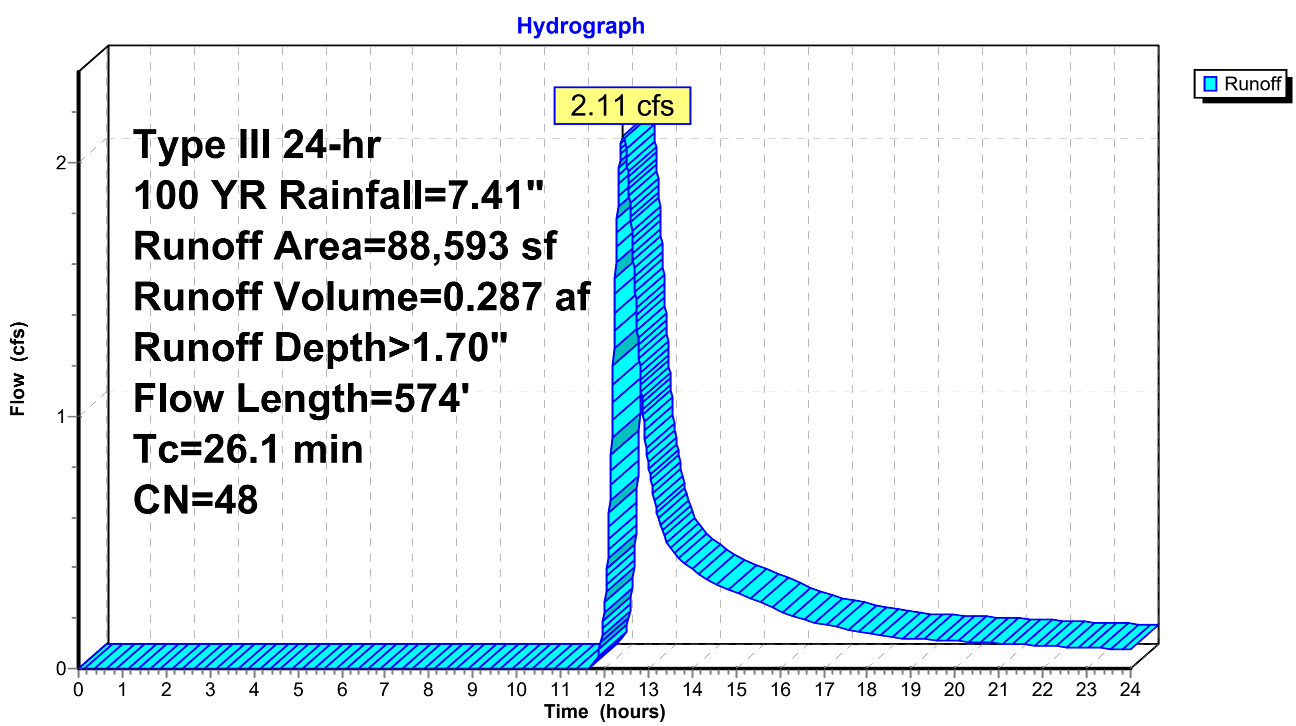
Runoff = 2.11 cfs @ 12.43 hrs, Volume= 0.287 af, Depth> 1.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
72,419	39	>75% Grass cover, Good, HSG A
7,200	76	Gravel roads, HSG A
8,974	98	Water Surface, 0% imp, HSG A
88,593	48	Weighted Average
88,593		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	50	0.0380	0.20		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
20.8	400	0.0021	0.32		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	74	0.0270	2.65		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.6	50	0.0400	1.40		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
26.1	574	Total			

Subcatchment P3: PR-DA-3



Summary for Subcatchment P4: PR-DA4

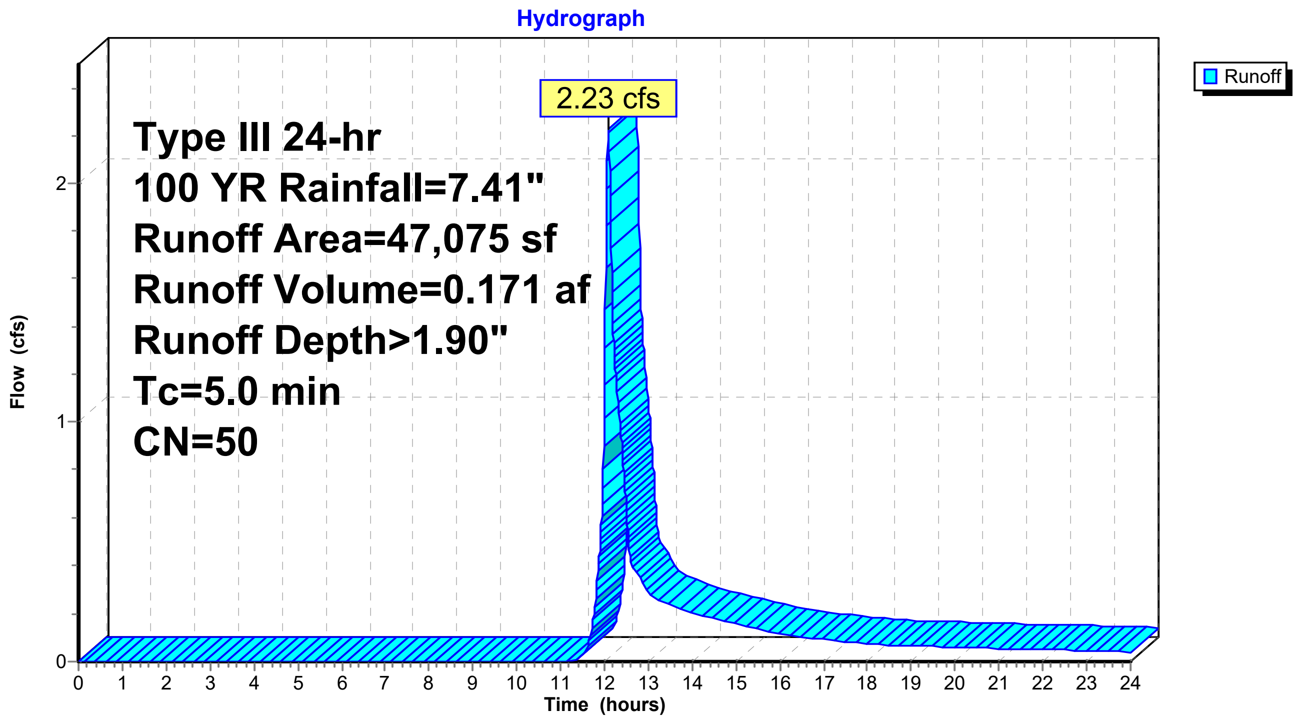
Runoff = 2.23 cfs @ 12.09 hrs, Volume= 0.171 af, Depth> 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	38,011	39	>75% Grass cover, Good, HSG A
*	500	98	Unconnected impervious, HSG A
	8,564	98	Stormwater Basin; Water Surface, HSG A
	47,075	50	Weighted Average
	38,011		80.75% Pervious Area
	9,064		19.25% Impervious Area
	500		5.52% Unconnected

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

Subcatchment P4: PR-DA4



Summary for Subcatchment P5: PR-DA5

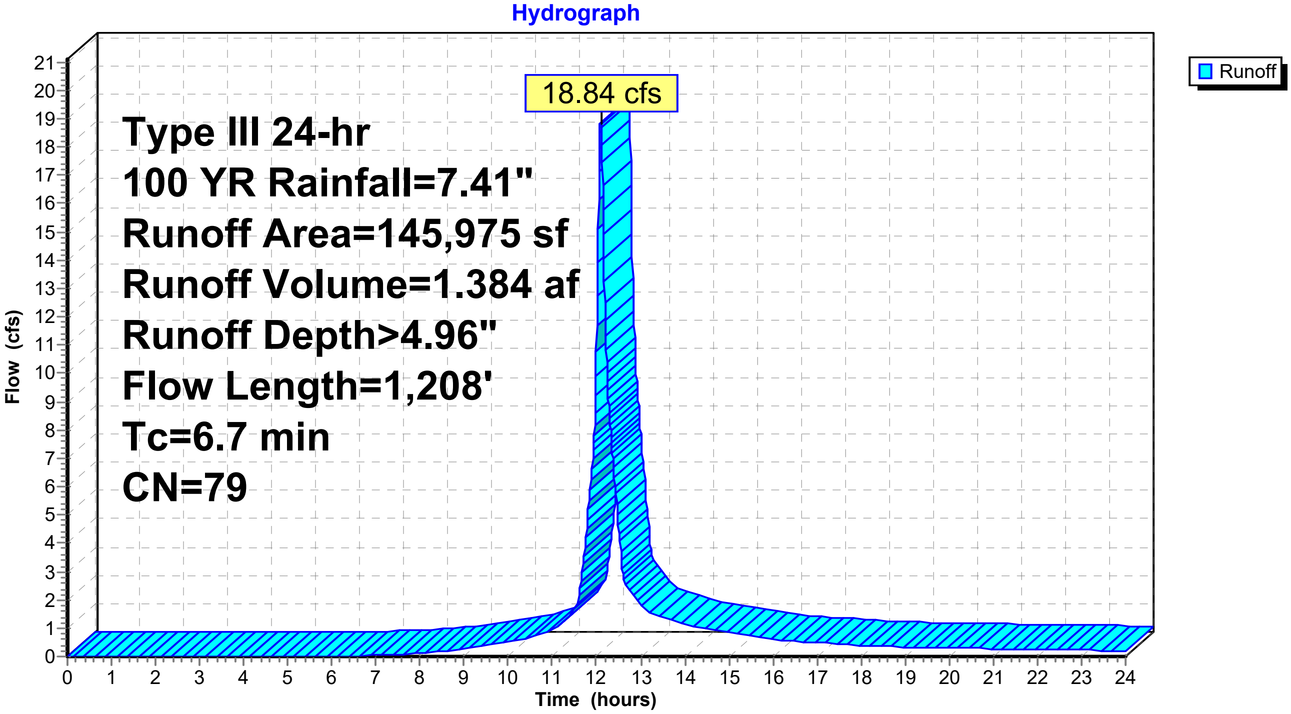
Runoff = 18.84 cfs @ 12.10 hrs, Volume= 1.384 af, Depth> 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
46,436	39	>75% Grass cover, Good, HSG A
98,201	98	Paved parking, HSG A
1,338	98	Unconnected roofs, HSG A
145,975	79	Weighted Average
46,436		31.81% Pervious Area
99,539		68.19% Impervious Area
1,338		1.34% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
1.1	130	0.0100	2.03		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
1.3	243	0.0050	3.21	2.52	**Pipe Channel, C-D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
2.4	525	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
1.0	260	0.0050	4.20	7.43	**Pipe Channel, E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
6.7	1,208	Total			

Subcatchment P5: PR-DA5



Summary for Subcatchment P6: PR-DA-6

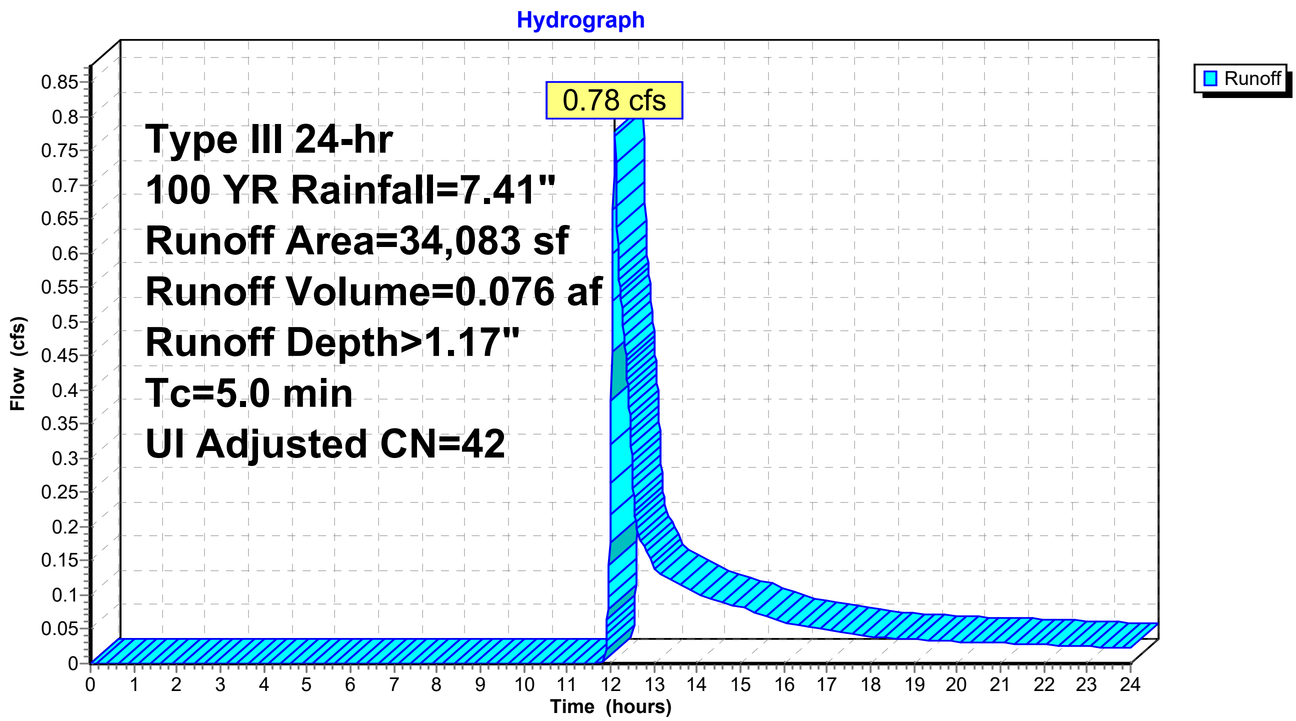
Runoff = 0.78 cfs @ 12.10 hrs, Volume= 0.076 af, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Adj	Description
	30,303	39		>75% Grass cover, Good, HSG A
*	3,780	98		Unconnected Impervious, HSG A
	34,083	46	42	Weighted Average, UI Adjusted
	30,303			88.91% Pervious Area
	3,780			11.09% Impervious Area
	3,780			100.00% Unconnected

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

Subcatchment P6: PR-DA-6



Summary for Subcatchment P7: PR-DA-7

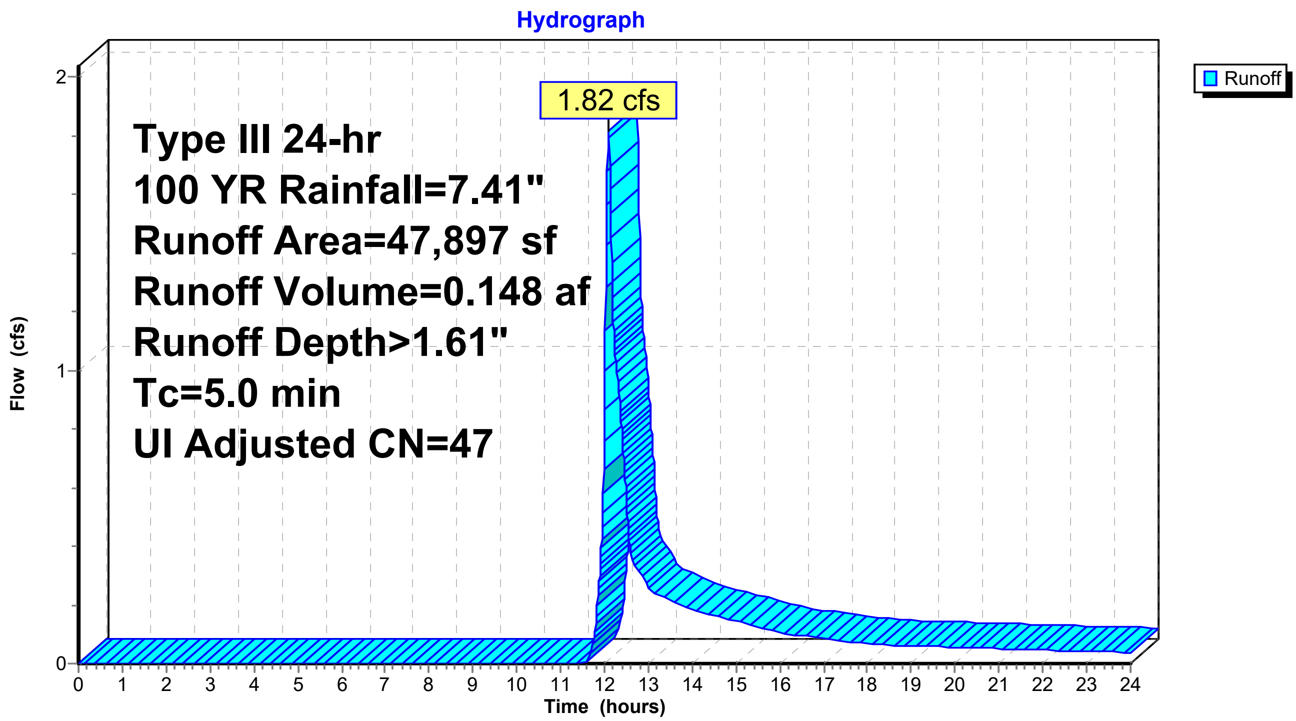
Runoff = 1.82 cfs @ 12.09 hrs, Volume= 0.148 af, Depth> 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Adj	Description
	35,185	39		>75% Grass cover, Good, HSG A
*	12,712	98		Unconnected Impervious, HSG A
	47,897	55	47	Weighted Average, UI Adjusted
	35,185			73.46% Pervious Area
	12,712			26.54% Impervious Area
	12,712			100.00% Unconnected

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

Subcatchment P7: PR-DA-7



Summary for Subcatchment P8a: PR-DA8a

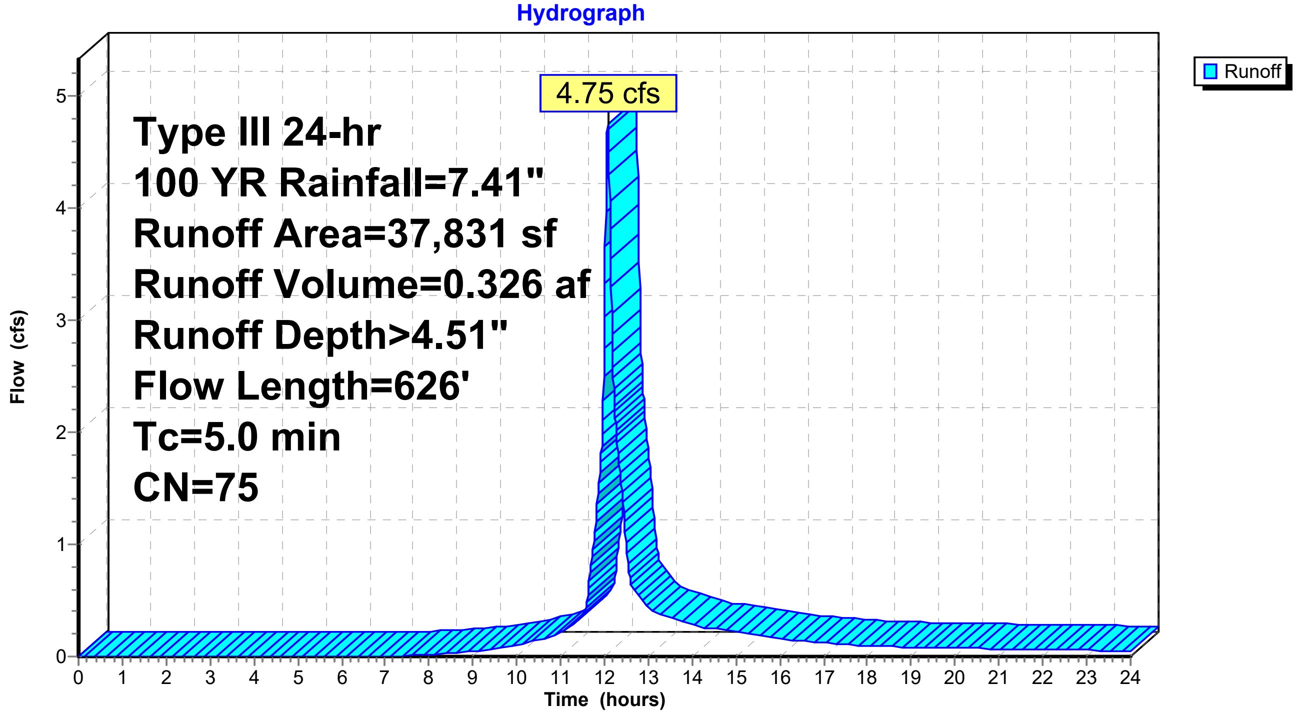
Runoff = 4.75 cfs @ 12.07 hrs, Volume= 0.326 af, Depth> 4.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
14,737	39	>75% Grass cover, Good, HSG A
22,874	98	Paved parking, HSG A
220	98	Roofs, HSG A
37,831	75	Weighted Average
14,737		38.95% Pervious Area
23,094		61.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
1.1	137	0.0100	2.03		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	48	0.0050	3.21	2.52	**Pipe Channel, C-D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
1.1	241	0.0050	3.72	4.57	**Pipe Channel, D-E** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.5	150	0.0060	4.60	8.14	**Pipe Channel, E-F** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
1.2					**Direct Entry, Added Tc**
5.0	626	Total			

Subcatchment P8a: PR-DA8a



Summary for Subcatchment P8b: PR-DA8b

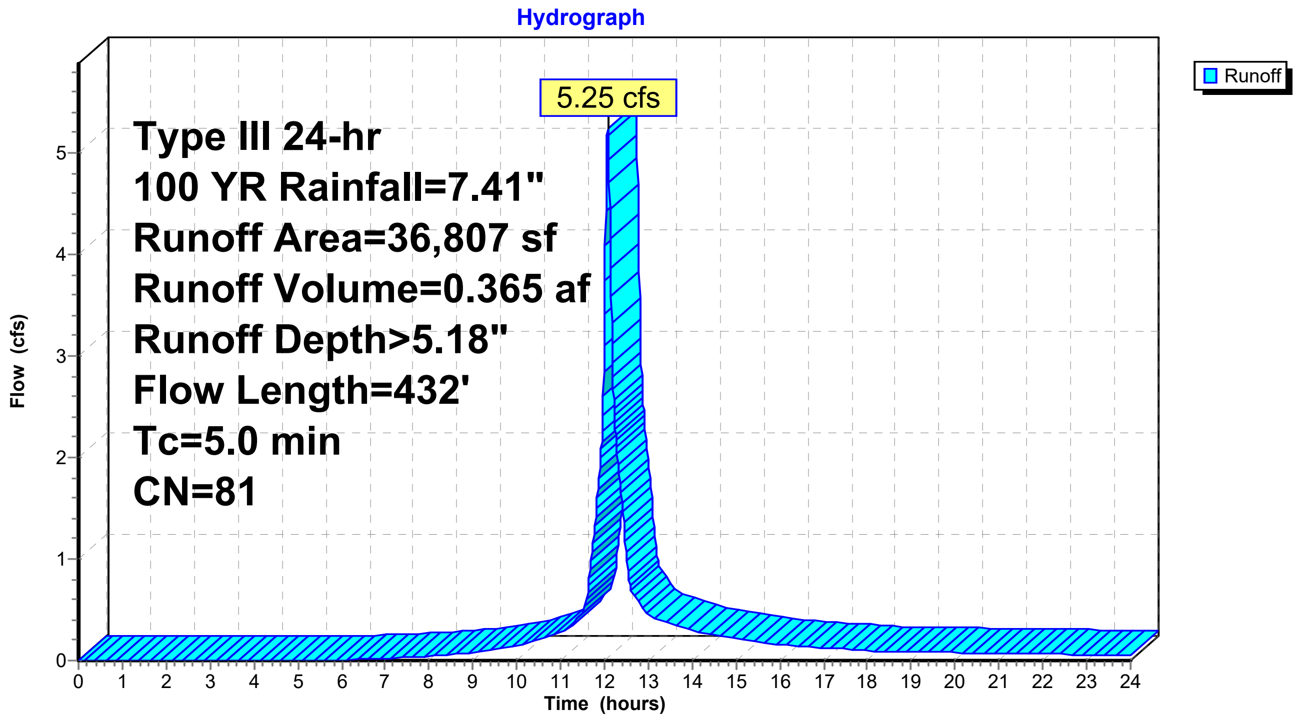
Runoff = 5.25 cfs @ 12.07 hrs, Volume= 0.365 af, Depth> 5.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

Area (sf)	CN	Description
10,671	39	>75% Grass cover, Good, HSG A
25,176	98	Paved parking, HSG A
960	98	Roofs, HSG A
36,807	81	Weighted Average
10,671		28.99% Pervious Area
26,136		71.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	86	0.0100	1.04		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.40"
0.7	196	0.0100	4.54	3.56	**Pipe Channel, B-C** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.5	150	0.0060	4.60	8.14	**Pipe Channel, C-D** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
2.4					**Direct Entry, Added Tc**
5.0	432	Total			

Subcatchment P8b: PR-DA8b



Summary for Subcatchment P9: PR-DA9

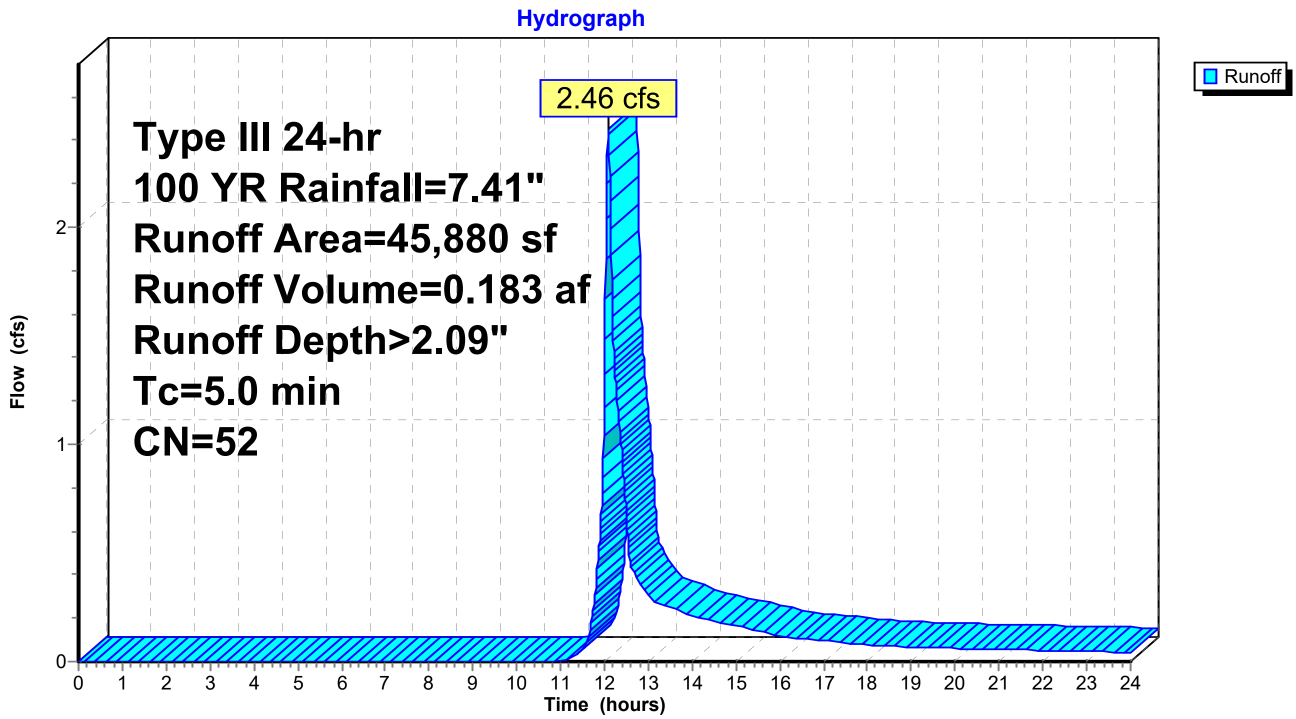
Runoff = 2.46 cfs @ 12.08 hrs, Volume= 0.183 af, Depth> 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=7.41"

	Area (sf)	CN	Description
	35,890	39	>75% Grass cover, Good, HSG A
*	380	98	Unconnected impervious, HSG A
	9,610	98	Stormwater Basin; Water Surface, HSG A
	45,880	52	Weighted Average
	35,890		78.23% Pervious Area
	9,990		21.77% Impervious Area
	380		3.80% Unconnected

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

Subcatchment P9: PR-DA9

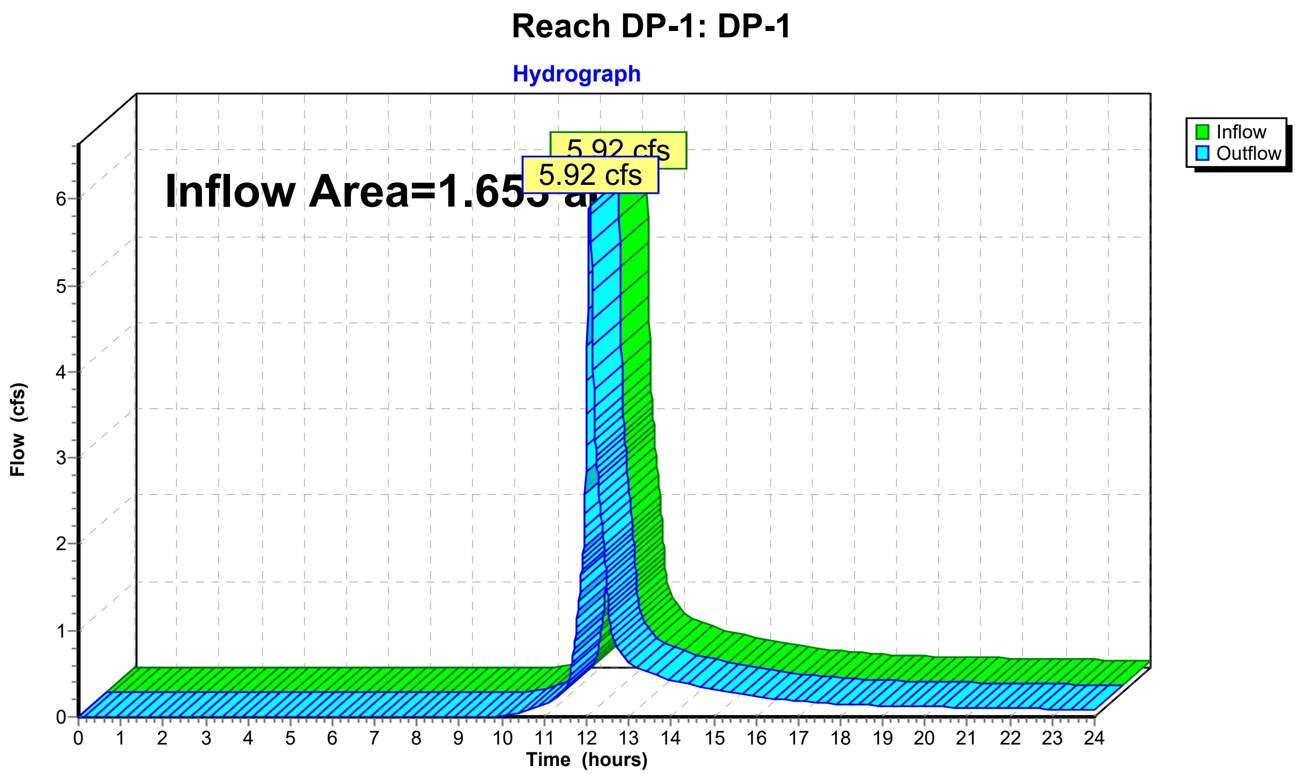


Summary for Reach DP-1: DP-1

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

Inflow Area = 1.653 ac, 28.03% Impervious, Inflow Depth > 3.00" for 100 YR event
Inflow = 5.92 cfs @ 12.08 hrs, Volume= 0.413 af
Outflow = 5.92 cfs @ 12.08 hrs, Volume= 0.413 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



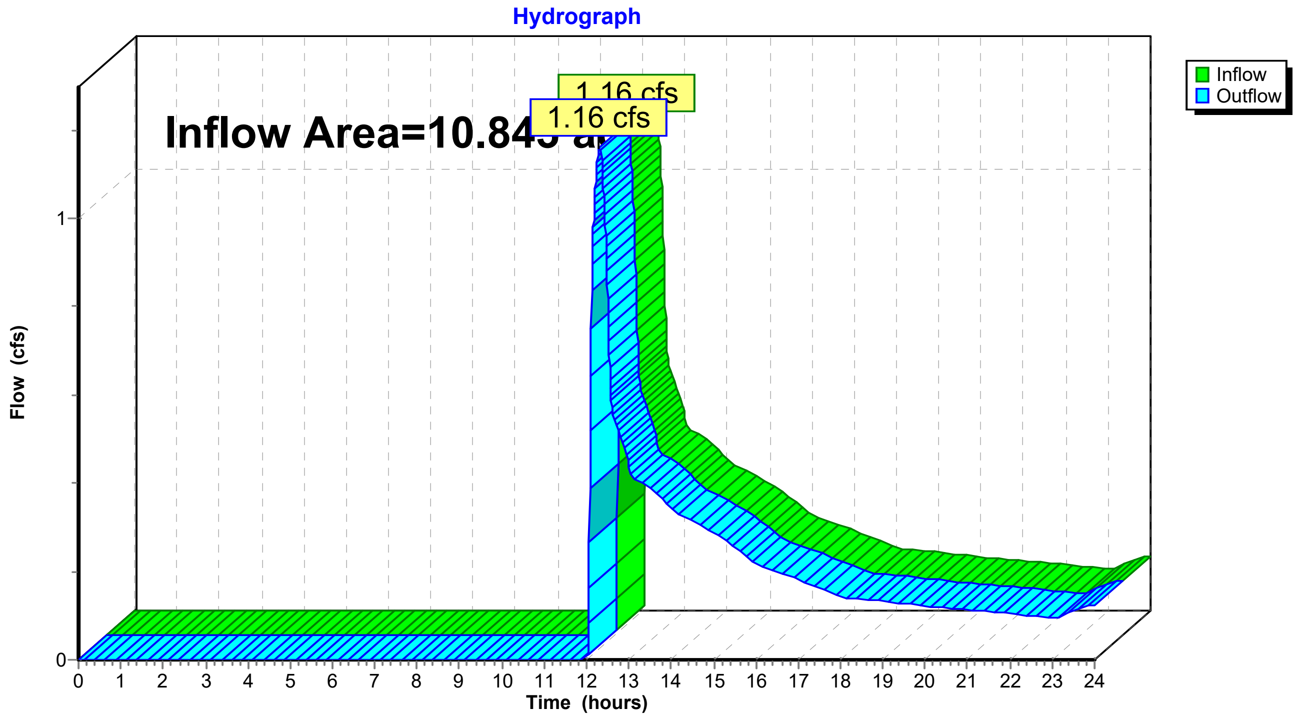
Summary for Reach DP-2: DP-2 (JOSHUA'S BROOK)

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

Inflow Area = 10.843 ac, 28.77% Impervious, Inflow Depth > 0.25" for 100 YR event
Inflow = 1.16 cfs @ 12.30 hrs, Volume= 0.225 af
Outflow = 1.16 cfs @ 12.30 hrs, Volume= 0.225 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-2: DP-2 (JOSHUA'S BROOK)



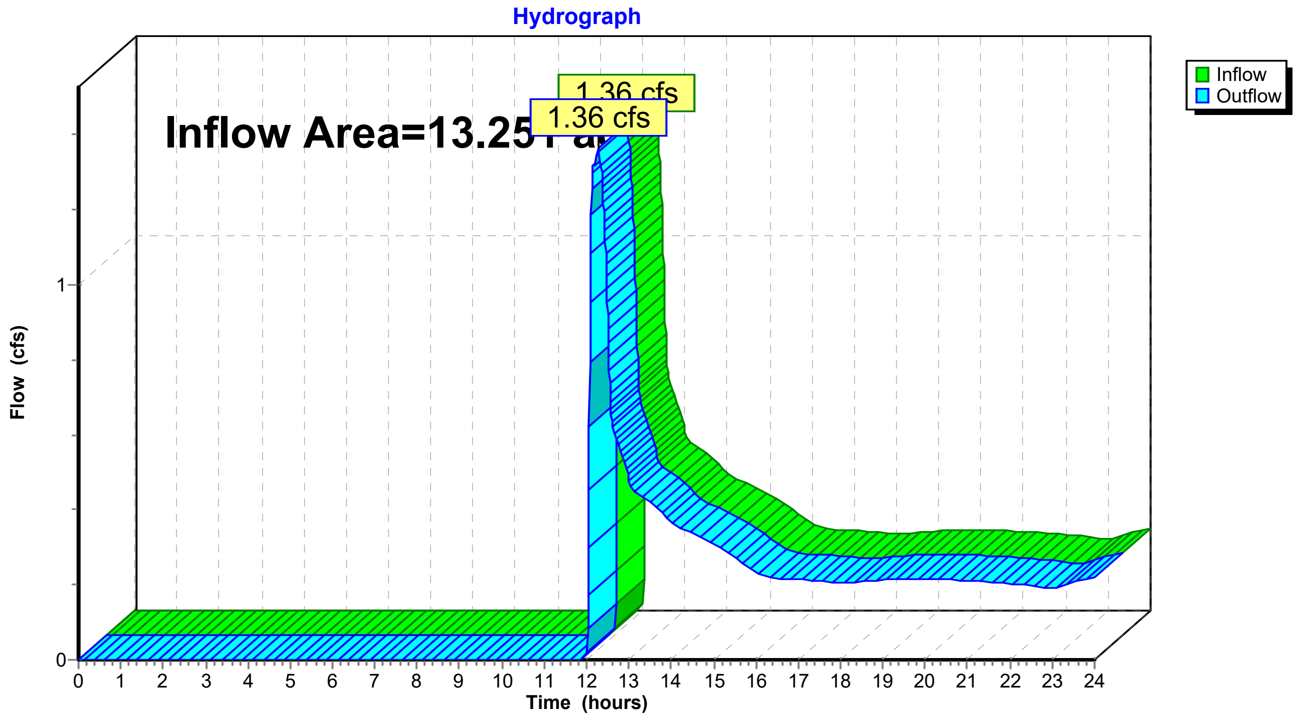
Summary for Reach DP-3: DP-3 (STEWART'S CREEK)

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

Inflow Area = 13.251 ac, 19.02% Impervious, Inflow Depth > 0.27" for 100 YR event
Inflow = 1.36 cfs @ 12.28 hrs, Volume= 0.293 af
Outflow = 1.36 cfs @ 12.28 hrs, Volume= 0.293 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Reach DP-3: DP-3 (STEWART'S CREEK)



Summary for Pond 41P: SC-740

Inflow Area = 0.115 ac,100.00% Impervious, Inflow Depth > 7.17" for 100 YR event
Inflow = 0.86 cfs @ 12.07 hrs, Volume= 0.069 af
Outflow = 0.09 cfs @ 11.51 hrs, Volume= 0.069 af, Atten= 89%, Lag= 0.0 min
Discarded = 0.09 cfs @ 11.51 hrs, Volume= 0.069 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 39.46' @ 12.68 hrs Surf.Area= 492 sf Storage= 913 cf

Plug-Flow detention time= 59.8 min calculated for 0.069 af (100% of inflow)
Center-of-Mass det. time= 59.6 min (800.5 - 740.8)

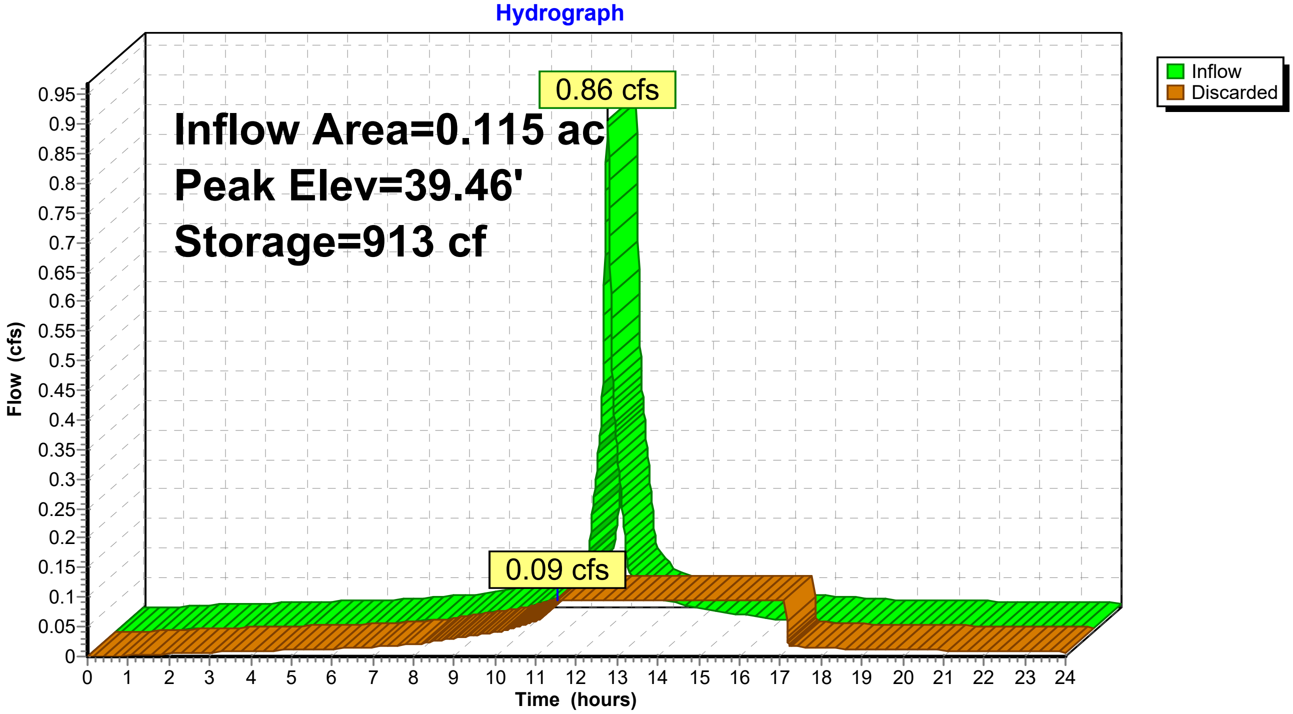
Volume	Invert	Avail.Storage	Storage Description
#1	36.50'	468 cf	**Stone (Prismatic)** Listed below (Recalc) 1,722 cf Overall - 551 cf Embedded = 1,171 cf x 40.0% Voids
#2	37.00'	551 cf	**ADS_StormTech SC-740 +Cap** x 12 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 6 Chambers
		1,020 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
36.50	492	0	0
40.00	492	1,722	1,722

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.09 cfs @ 11.51 hrs HW=36.54' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Pond 41P: SC-740



Summary for Pond 43P: SC-740

Inflow Area = 0.782 ac, 11.09% Impervious, Inflow Depth > 1.17" for 100 YR event
Inflow = 0.78 cfs @ 12.10 hrs, Volume= 0.076 af
Outflow = 0.31 cfs @ 12.49 hrs, Volume= 0.074 af, Atten= 60%, Lag= 23.2 min
Discarded = 0.31 cfs @ 12.49 hrs, Volume= 0.074 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 24.72' @ 12.49 hrs Surf.Area= 1,613 sf Storage= 675 cf

Plug-Flow detention time= 94.8 min calculated for 0.074 af (97% of inflow)
Center-of-Mass det. time= 80.2 min (984.6 - 904.4)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	248 cf	**Stone (Prismatic)** Listed below (Recalc)
			896 cf Overall - 276 cf Embedded = 620 cf x 40.0% Voids
#2	20.00'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1
			Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
			Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
			2 Rows of 3 Chambers
#3	24.50'	3,830 cf	**Surface Ponding (Prismatic)** Listed below (Recalc)
		4,353 cf	Total Available Storage

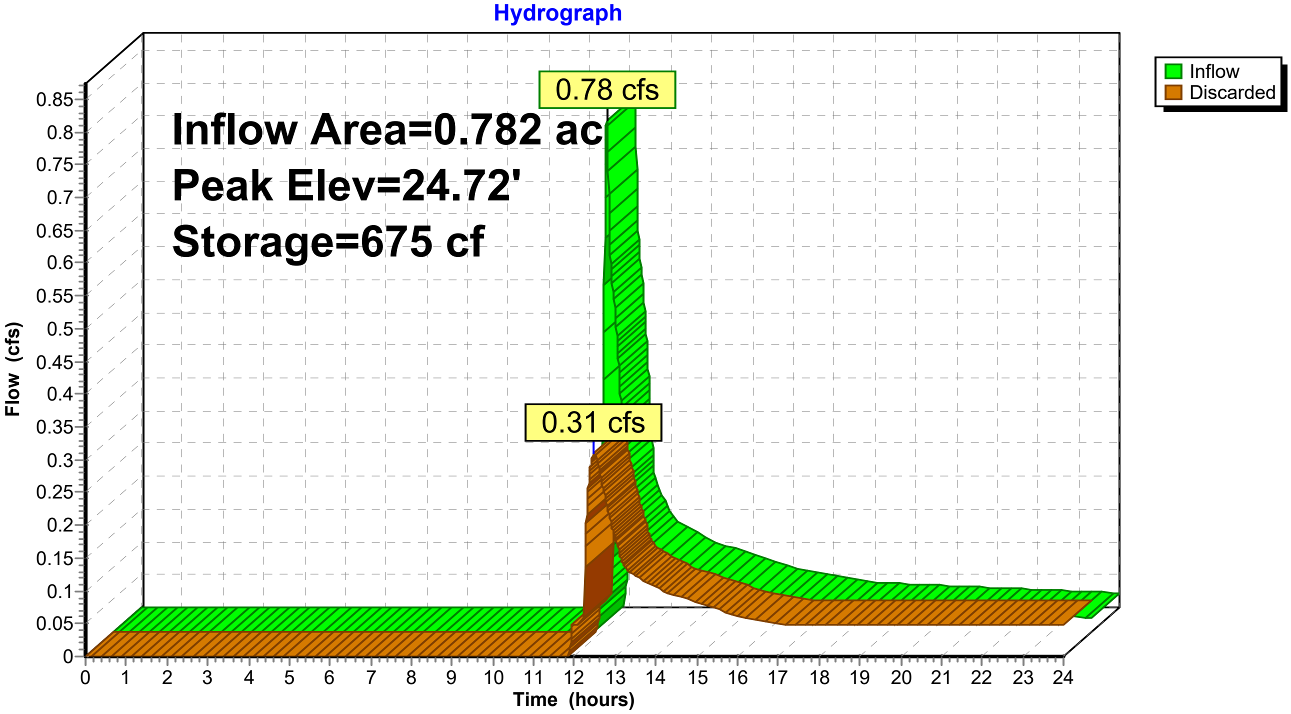
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	256	0	0
23.00	256	896	896

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.50	4	0	0
25.00	3,057	765	765
25.50	9,200	3,064	3,830

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.31 cfs @ 12.49 hrs HW=24.72' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.31 cfs)

Pond 43P: SC-740



Summary for Pond 45P: SC-740

Inflow Area = 1.100 ac, 26.54% Impervious, Inflow Depth > 1.61" for 100 YR event
Inflow = 1.82 cfs @ 12.09 hrs, Volume= 0.148 af
Outflow = 0.50 cfs @ 12.52 hrs, Volume= 0.148 af, Atten= 72%, Lag= 25.9 min
Discarded = 0.50 cfs @ 12.52 hrs, Volume= 0.148 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 25.86' @ 12.52 hrs Surf.Area= 2,627 sf Storage= 1,708 cf

Plug-Flow detention time= 96.1 min calculated for 0.148 af (100% of inflow)
Center-of-Mass det. time= 95.5 min (979.8 - 884.3)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	616 cf	**Stone (Prismatic)** Listed below (Recalc) 2,275 cf Overall - 735 cf Embedded = 1,540 cf x 40.0% Voids
#2	20.00'	735 cf	**ADS_StormTech SC-740 +Cap** x 16 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 8 Chambers
#3	25.50'	4,609 cf	**Surface Ponding (Prismatic)** Listed below (Recalc)
		5,960 cf	Total Available Storage

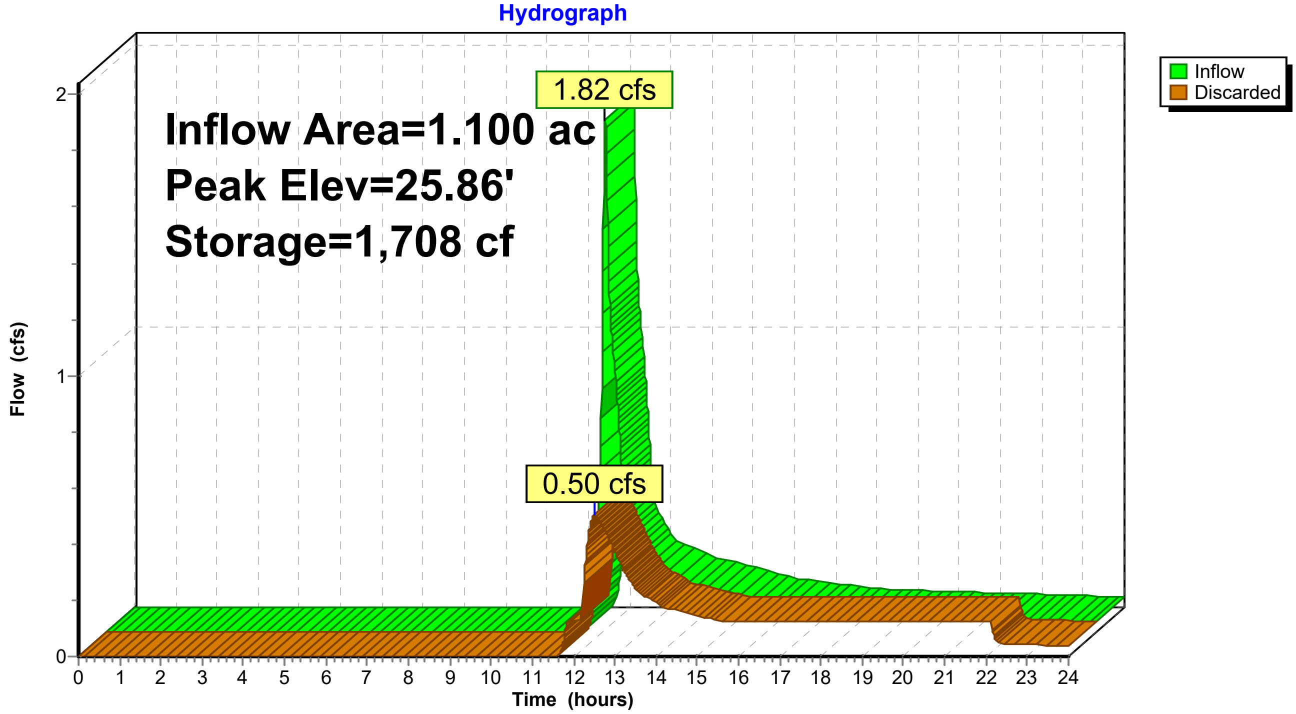
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	650	0	0
23.00	650	2,275	2,275

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
25.50	4	0	0
26.00	2,742	687	687
26.80	7,065	3,923	4,609

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.50 cfs @ 12.52 hrs HW=25.86' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.50 cfs)

Pond 45P: SC-740



Summary for Pond B-1: Basin 1

Inflow Area = 5.195 ac, 60.05% Impervious, Inflow Depth > 4.30" for 100 YR event
Inflow = 26.09 cfs @ 12.09 hrs, Volume= 1.860 af
Outflow = 0.96 cfs @ 15.67 hrs, Volume= 1.046 af, Atten= 96%, Lag= 214.7 min
Discarded = 0.96 cfs @ 15.67 hrs, Volume= 1.046 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 14.35' @ 15.67 hrs Surf.Area= 17,245 sf Storage= 49,437 cf

Plug-Flow detention time= 314.1 min calculated for 1.046 af (56% of inflow)
Center-of-Mass det. time= 210.4 min (1,018.9 - 808.6)

Volume	Invert	Avail.Storage	Storage Description
#1	10.50'	61,135 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

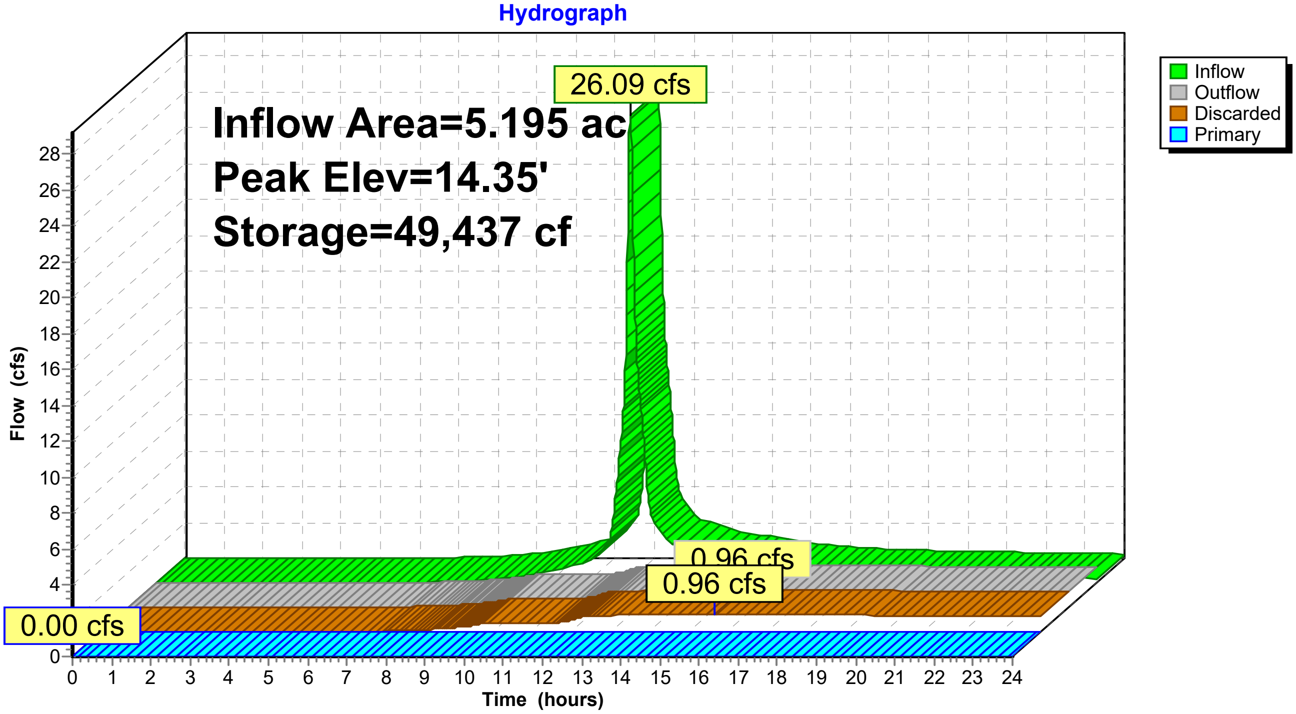
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.50	8,346	0	0
11.00	9,153	4,375	4,375
12.00	12,072	10,613	14,987
13.00	14,291	13,182	28,169
14.00	16,502	15,397	43,565
15.00	18,637	17,570	61,135

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	15.00'	**45.0 deg x 15.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.96 cfs @ 15.67 hrs HW=14.35' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.96 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.50' (Free Discharge)
└─**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond B-1: Basin 1



Summary for Pond B-2: Basin 2

Inflow Area =	4.443 ac,	56.72% Impervious,	Inflow Depth > 3.58"	for 100 YR event	
Inflow =	21.16 cfs @	12.08 hrs,	Volume=	1.325 af	
Outflow =	0.76 cfs @	15.32 hrs,	Volume=	0.809 af,	Atten= 96%, Lag= 194.4 min
Discarded =	0.76 cfs @	15.32 hrs,	Volume=	0.809 af	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 18.90' @ 15.32 hrs Surf.Area= 13,653 sf Storage= 36,038 cf

Plug-Flow detention time= 311.5 min calculated for 0.809 af (61% of inflow)
Center-of-Mass det. time= 225.2 min (1,025.6 - 800.4)

Volume	Invert	Avail.Storage	Storage Description
#1	15.50'	37,352 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

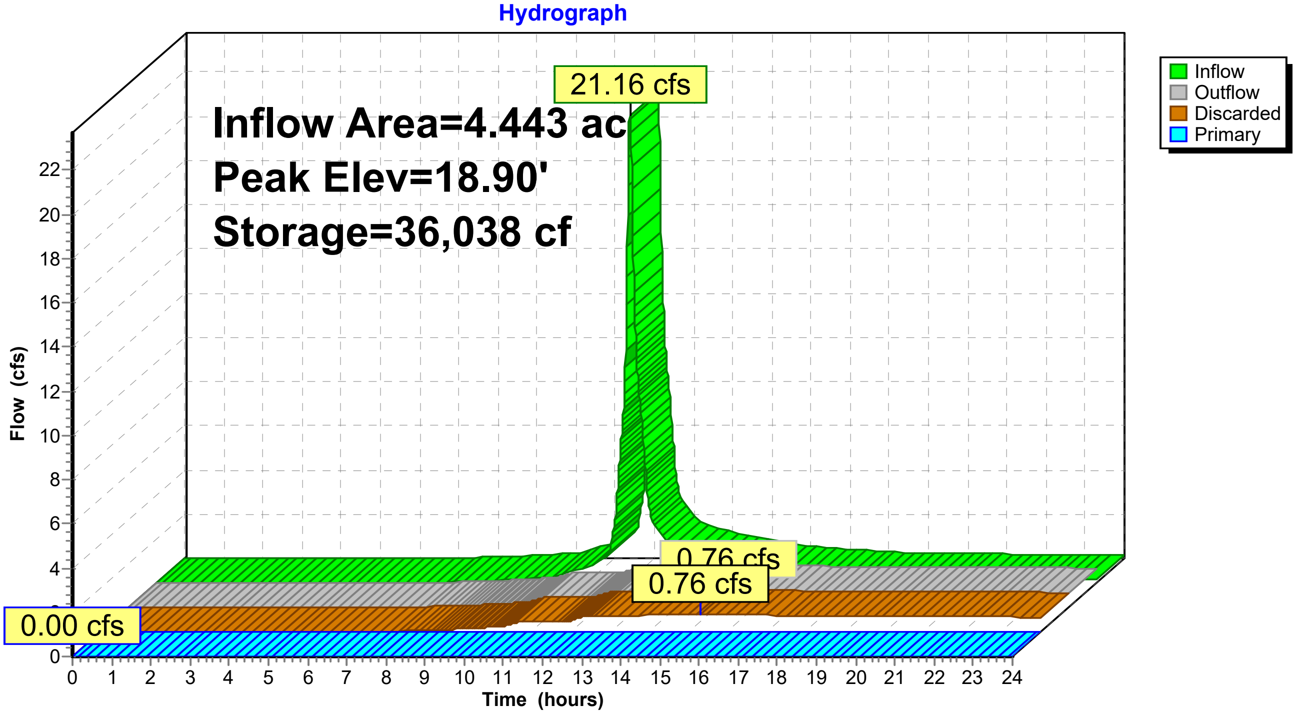
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
15.50	7,983	0	0
16.00	8,588	4,143	4,143
17.00	9,841	9,215	13,357
18.00	12,169	11,005	24,362
19.00	13,810	12,990	37,352

Device	Routing	Invert	Outlet Devices
#1	Discarded	15.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.50'	**45.0 deg x 15.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Discarded OutFlow Max=0.76 cfs @ 15.32 hrs HW=18.90' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.76 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.50' (Free Discharge)
└─**2=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond B-2: Basin 2



Summary for Pond BIO1: BIO 1

Inflow Area = 0.791 ac, 76.51% Impervious, Inflow Depth > 5.53" for 100 YR event
Inflow = 5.17 cfs @ 12.07 hrs, Volume= 0.364 af
Outflow = 4.88 cfs @ 12.10 hrs, Volume= 0.358 af, Atten= 6%, Lag= 1.6 min
Discarded = 0.07 cfs @ 12.10 hrs, Volume= 0.065 af
Primary = 4.81 cfs @ 12.10 hrs, Volume= 0.292 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 19.90' @ 12.10 hrs Surf.Area= 1,219 sf Storage= 690 cf

Plug-Flow detention time= 17.9 min calculated for 0.358 af (98% of inflow)
Center-of-Mass det. time= 7.1 min (801.4 - 794.3)

Volume	Invert	Avail.Storage	Storage Description
#1	19.00'	7,359 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

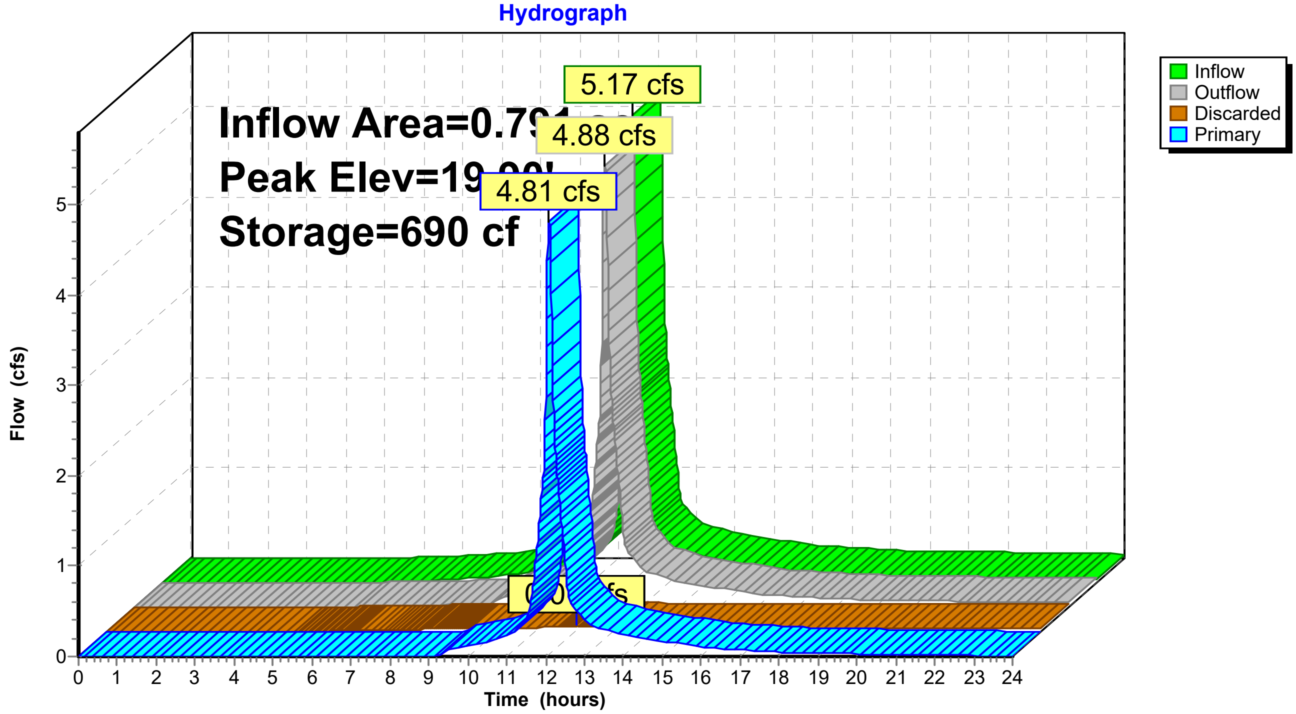
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.00	307	0	0
20.00	1,315	811	811
20.40	2,200	703	1,514
21.00	17,283	5,845	7,359

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	19.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	19.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 12.10 hrs HW=19.90' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=4.81 cfs @ 12.10 hrs HW=19.90' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 2.40 cfs @ 3.06 fps)
└─**3=Orifice/Grate** (Orifice Controls 2.40 cfs @ 3.06 fps)

Pond BIO1: BIO 1



Summary for Pond BIO2: BIO 2

Inflow Area = 0.833 ac, 68.24% Impervious, Inflow Depth > 4.96" for 100 YR event
Inflow = 4.98 cfs @ 12.07 hrs, Volume= 0.344 af
Outflow = 4.58 cfs @ 12.11 hrs, Volume= 0.333 af, Atten= 8%, Lag= 1.9 min
Discarded = 0.13 cfs @ 12.11 hrs, Volume= 0.137 af
Primary = 4.45 cfs @ 12.11 hrs, Volume= 0.196 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 23.11' @ 12.11 hrs Surf.Area= 2,333 sf Storage= 2,075 cf

Plug-Flow detention time= 60.1 min calculated for 0.333 af (97% of inflow)
Center-of-Mass det. time= 40.7 min (847.4 - 806.7)

Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	4,509 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

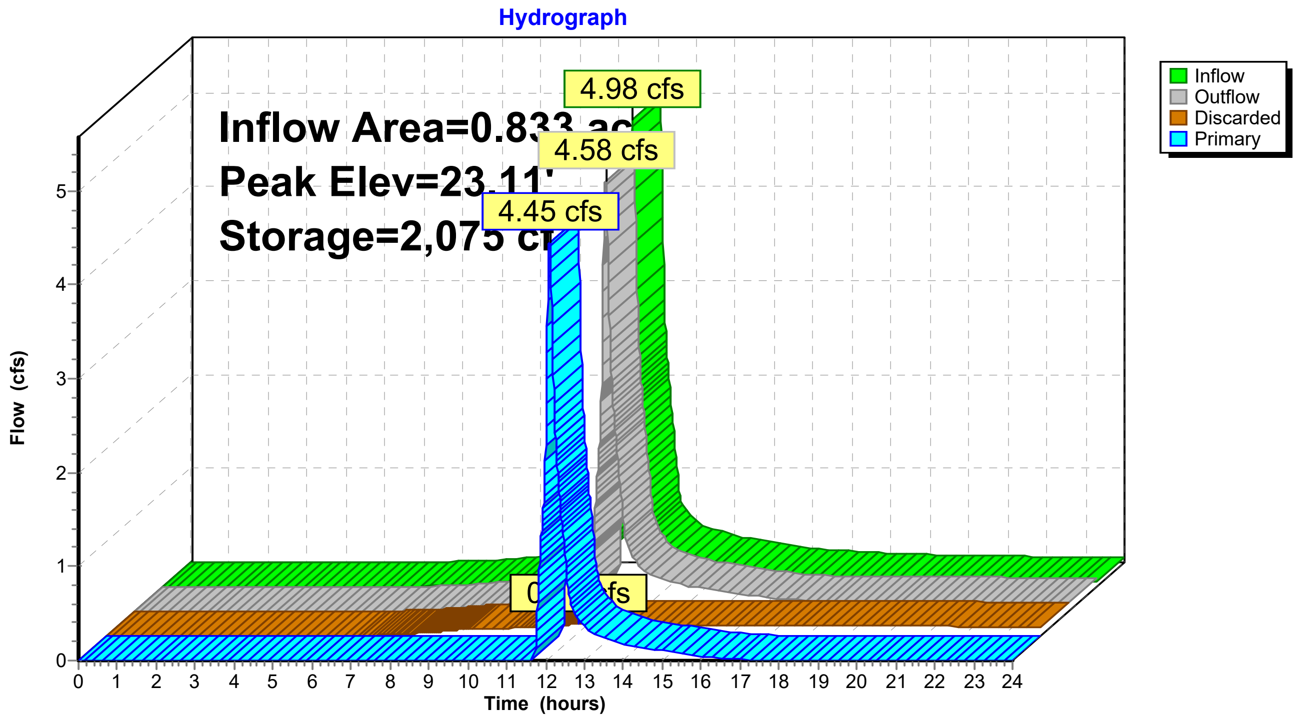
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	1,410	0	0
23.00	2,232	1,821	1,821
24.00	3,143	2,688	4,509

Device	Routing	Invert	Outlet Devices
#1	Discarded	22.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	22.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	22.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.13 cfs @ 12.11 hrs HW=23.11' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=4.46 cfs @ 12.11 hrs HW=23.11' (Free Discharge)
├─**2=Orifice/Grate** (Weir Controls 2.23 cfs @ 1.96 fps)
└─**3=Orifice/Grate** (Weir Controls 2.23 cfs @ 1.96 fps)

Pond BIO2: BIO 2



Summary for Pond BIO3: BIO-3

Inflow Area = 0.816 ac, 75.18% Impervious, Inflow Depth > 5.41" for 100 YR event
Inflow = 5.25 cfs @ 12.07 hrs, Volume= 0.368 af
Outflow = 4.86 cfs @ 12.10 hrs, Volume= 0.359 af, Atten= 7%, Lag= 1.8 min
Discarded = 0.09 cfs @ 12.10 hrs, Volume= 0.092 af
Primary = 4.77 cfs @ 12.10 hrs, Volume= 0.267 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 23.90' @ 12.10 hrs Surf.Area= 1,637 sf Storage= 1,025 cf

Plug-Flow detention time= 26.6 min calculated for 0.359 af (98% of inflow)
Center-of-Mass det. time= 12.0 min (808.9 - 796.9)

Volume	Invert	Avail.Storage	Storage Description
#1	23.00'	2,268 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

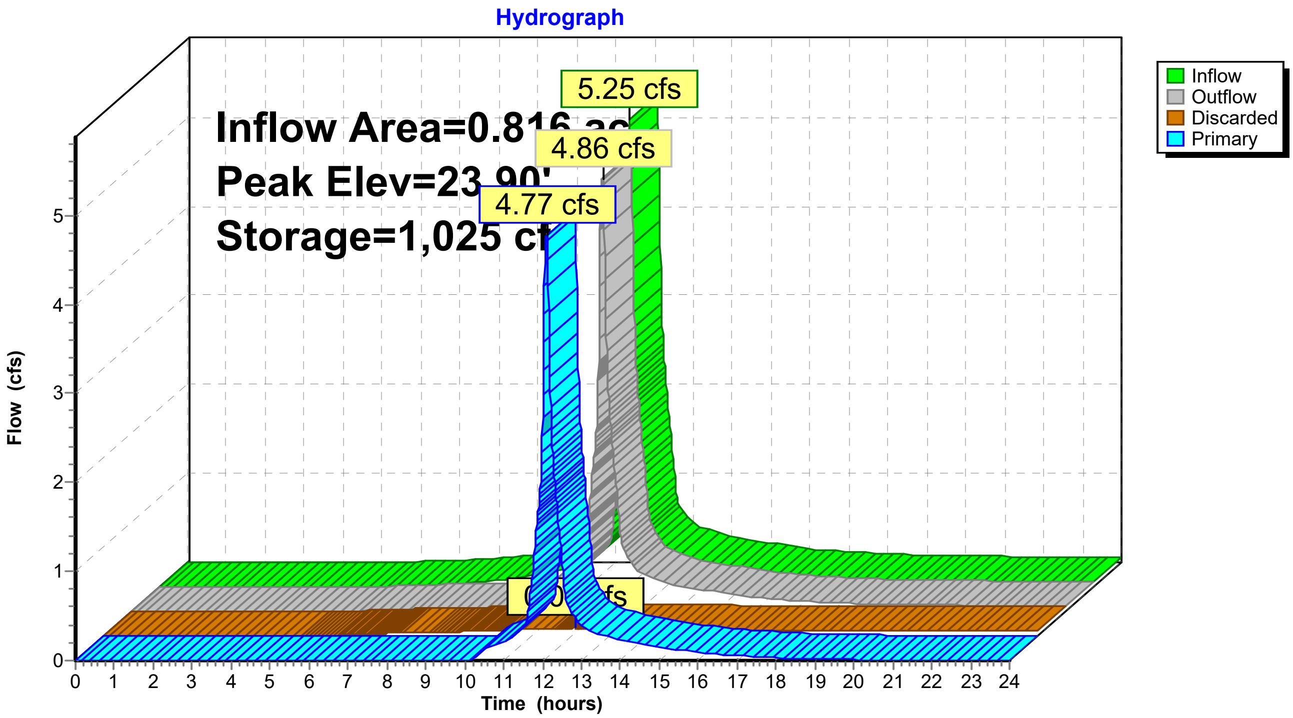
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
23.00	648	0	0
24.00	1,750	1,199	1,199
24.50	2,527	1,069	2,268

Device	Routing	Invert	Outlet Devices
#1	Discarded	23.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	23.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	23.50'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.09 cfs @ 12.10 hrs HW=23.90' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=4.76 cfs @ 12.10 hrs HW=23.90' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 2.38 cfs @ 3.03 fps)
└─**3=Orifice/Grate** (Orifice Controls 2.38 cfs @ 3.03 fps)

Pond BIO3: BIO-3



Summary for Pond P-B: POND B

Inflow Area = 1.269 ac, 0.00% Impervious, Inflow Depth > 1.80" for 100 YR event
Inflow = 2.44 cfs @ 12.09 hrs, Volume= 0.191 af
Outflow = 0.04 cfs @ 24.00 hrs, Volume= 0.002 af, Atten= 98%, Lag= 714.8 min
Primary = 0.04 cfs @ 24.00 hrs, Volume= 0.002 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 3.45' @ 24.00 hrs Surf.Area= 11,502 sf Storage= 8,230 cf

Plug-Flow detention time= 720.9 min calculated for 0.002 af (1% of inflow)
Center-of-Mass det. time= 544.0 min (1,421.7 - 877.7)

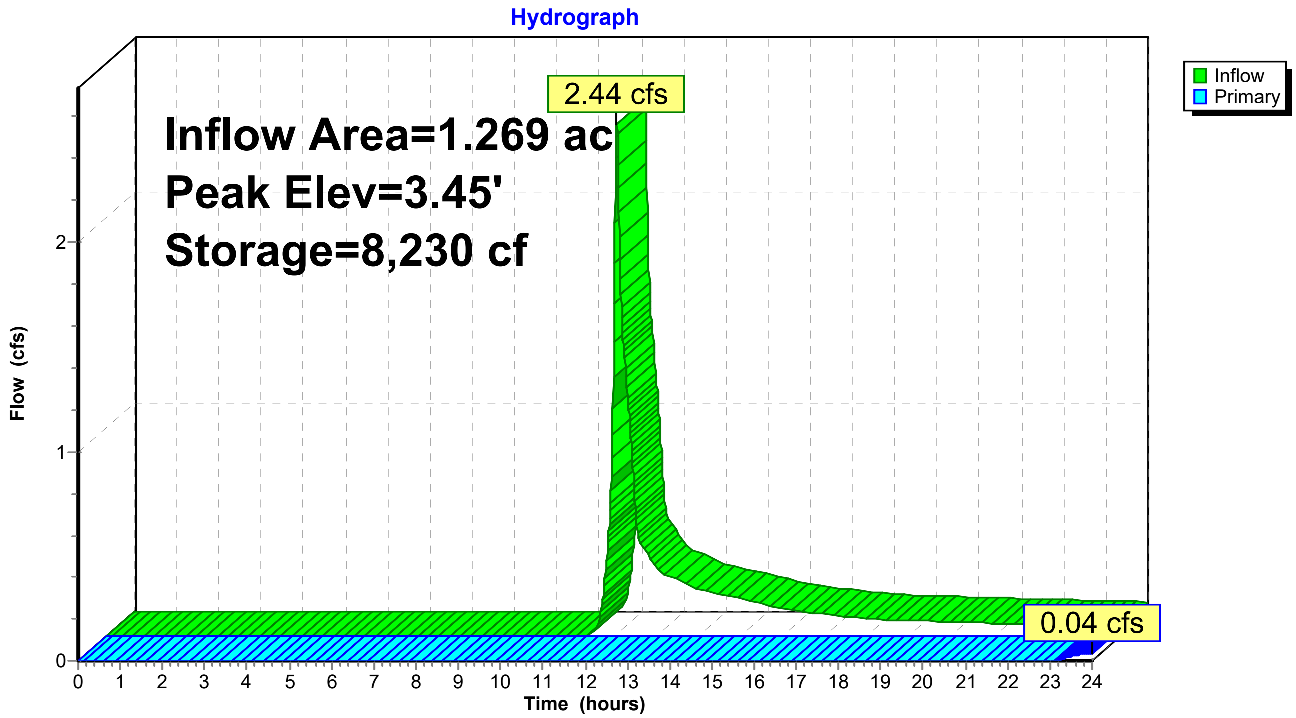
Volume	Invert	Avail.Storage	Storage Description
#1	2.70'	15,021 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2.70	10,273	0	0
3.00	11,080	3,203	3,203
3.40	11,370	4,490	7,693
4.00	13,058	7,328	15,021

Device	Routing	Invert	Outlet Devices
#1	Primary	3.44'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.03 cfs @ 24.00 hrs HW=3.45' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.03 cfs @ 0.27 fps)

Pond P-B: POND B



Summary for Pond P-C: POND C

Inflow Area = 2.480 ac, 0.00% Impervious, Inflow Depth > 1.80" for 100 YR event
Inflow = 4.77 cfs @ 12.09 hrs, Volume= 0.372 af
Outflow = 0.04 cfs @ 24.00 hrs, Volume= 0.002 af, Atten= 99%, Lag= 714.8 min
Primary = 0.04 cfs @ 24.00 hrs, Volume= 0.002 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 4.30' @ 24.00 hrs Surf.Area= 25,179 sf Storage= 16,139 cf

Plug-Flow detention time= 723.2 min calculated for 0.002 af (0% of inflow)
Center-of-Mass det. time= 543.6 min (1,421.2 - 877.7)

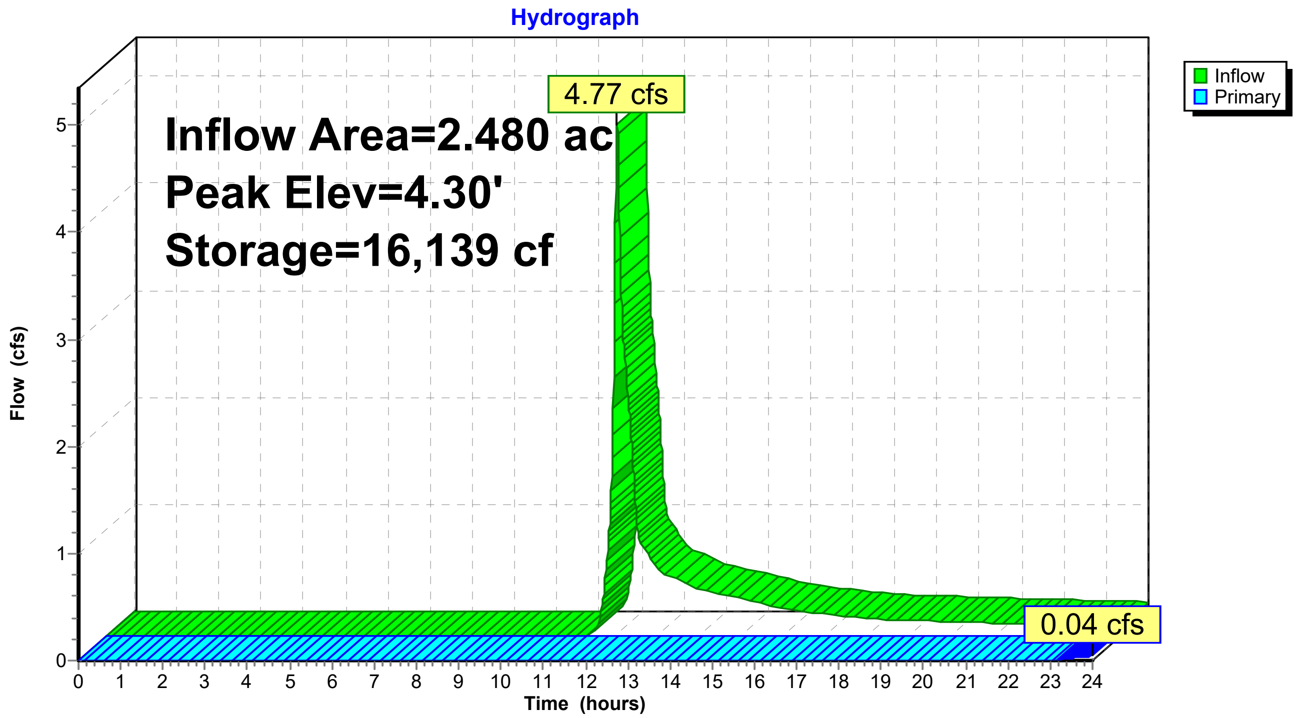
Volume	Invert	Avail.Storage	Storage Description
#1	3.60'	35,172 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
3.60	20,812	0	0
4.00	23,497	8,862	8,862
5.00	29,124	26,311	35,172

Device	Routing	Invert	Outlet Devices
#1	Primary	4.29'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.04 cfs @ 24.00 hrs HW=4.30' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.04 cfs @ 0.30 fps)

Pond P-C: POND C



Summary for Pond P-D: POND D

Inflow Area = 2.034 ac, 0.00% Impervious, Inflow Depth > 1.70" for 100 YR event
Inflow = 2.11 cfs @ 12.43 hrs, Volume= 0.287 af
Outflow = 0.09 cfs @ 21.78 hrs, Volume= 0.046 af, Atten= 96%, Lag= 561.0 min
Primary = 0.09 cfs @ 21.78 hrs, Volume= 0.046 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 9.25' @ 21.78 hrs Surf.Area= 9,759 sf Storage= 10,577 cf

Plug-Flow detention time= 515.1 min calculated for 0.046 af (16% of inflow)
Center-of-Mass det. time= 354.3 min (1,251.0 - 896.7)

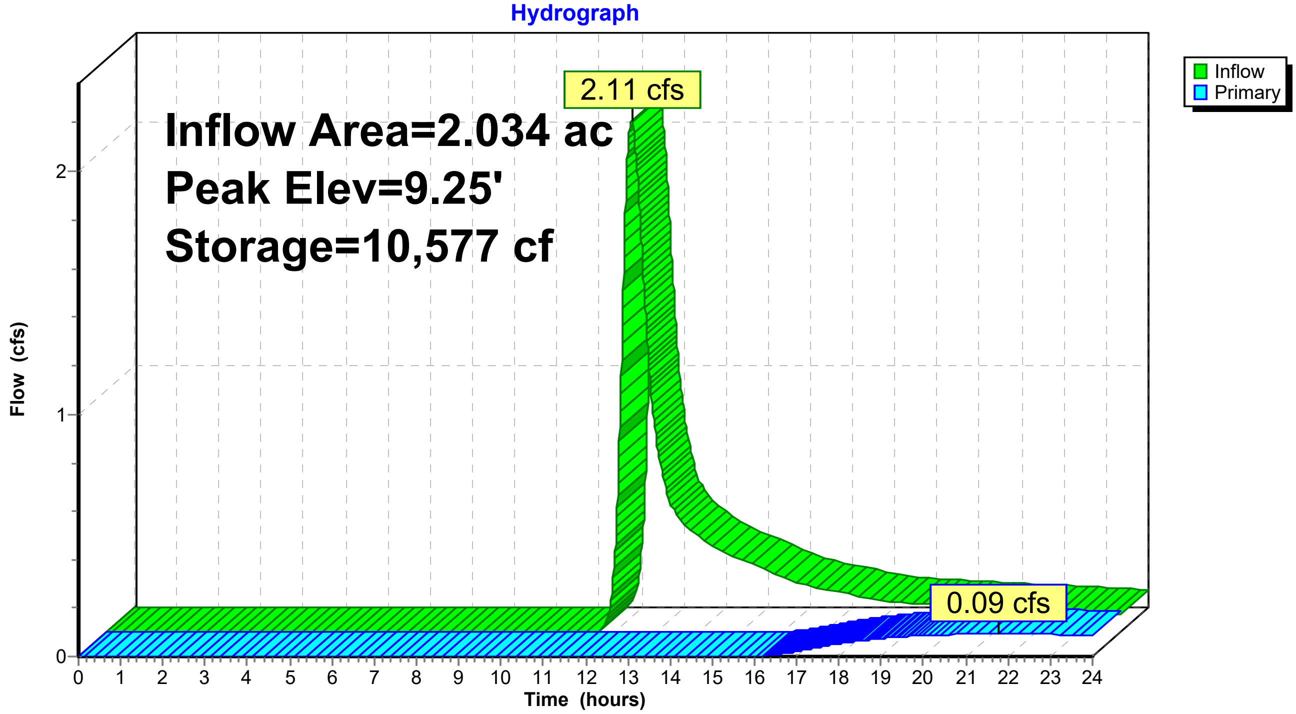
Volume	Invert	Avail.Storage	Storage Description
#1	8.00'	18,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.00	7,585	0	0
9.00	8,975	8,280	8,280
10.00	12,170	10,573	18,853

Device	Routing	Invert	Outlet Devices
#1	Primary	9.80'	**45.0 deg x 15.0' long x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#2	Primary	9.08'	**12.0" Round Culvert** L= 18.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.08' / 8.16' S= 0.0497 '/' Cc= 0.900 n= 0.013 Clay tile, Flow Area= 0.79 sf

Primary OutFlow Max=0.09 cfs @ 21.78 hrs HW=9.25' (Free Discharge)
├─**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
└─**2=Culvert** (Inlet Controls 0.09 cfs @ 1.09 fps)

Pond P-D: POND D



APPENDIX E

TSS REMOVAL WORKSHEET CALCULATIONS

PESCE ENGINEERING & ASSOCIATES, INC.
34 Porter Lane
West Dennis, MA 02670

BMP System: **Front Entrance System (Design Point # 1)**
Project: **Emblem Hyannis**
Prepared By: ELP
Date: 6/15/2022

TSS Removal Calculation Worksheet

A BMP	B TSS Removal Rate	C* Starting TSS Load*	D Amount Removed (BxC)	E Remaining Load (C-D)
Street Sweeping	10%	1.00	0.10	0.90
Deep Sump Catch Basin	25%	0.90	0.23	0.67
Contech® CDS Water Quality Unit	25%	0.67	0.17	0.50
Infiltration Basin	80%	0.50	0.40	0.10
		Total TSS Removal =	90%	

*Note: Column C Equals remaining load from previous BMP (Column E), which enters the following BMP

PESCE ENGINEERING & ASSOCIATES, INC.
34 Porter Lane
West Dennis, MA 02670

BMP System: **Infiltration Basin Systems (Infiltration Basins 1 & 2 with Sediment Forebay)**
Project: **Emblem Hyannis**
Prepared By: ELP
Date: 6/15/2022

TSS Removal
Calculation Worksheet

A BMP	B TSS Removal Rate	C* Starting TSS Load*	D Amount Removed (BxC)	E Remaining Load (C-D)
Street Sweeping	10%	1.00	0.10	0.90
Deep Sump Catch Basin	25%	0.90	0.23	0.67
Sediment Forebay	25%	0.67	0.17	0.50
Infiltration Basin	80%	0.50	0.40	0.10
		Total TSS Removal =	90%	

*Note: Column C Equals remaining load from previous BMP (Column E), which enters the following BMP

APPENDIX F

CONSTRUCTION PERIOD POLLUTION PREVENTION and EROSION AND SEDIMENTATION CONTROL PLAN

and

STORMWATER MANAGEMENT SYSTEM OPERATIONS & MAINTENANCE PLAN

Including

Contech® CDS Maintenance Guide

CONSTRUCTION PERIOD POLLUTION PREVENTION and EROSION AND SEDIMENTATION CONTROL PLAN

Proposed EMBLEM Hyannis Development
35 Scudder Ave., Hyannis, MA

PREPARED FOR (Operator & Responsible Party):
Quarterra
99 Summer Street, Suite 701
Boston, MA 02110

The construction period should take approximately 18-30 months after receipt of a Building Permit.

CONSTRUCTION PERIOD POLLUTION CONTROL MEASURES
Appropriate erosion control and construction methods shall be employed to prevent sediment erosion & dust during construction. A permit will be sought through the EPA for a Stormwater NPDES permit, and a Stormwater pollution Prevention Plan will be prepared, prior to construction start.

EROSION CONTROL AND INPSECTION SCHEDULE
Staked hay bales and silt fence shall be located at all down gradient areas of construction activity as shown on the site plans (see Sheet 13 of 17, Erosion Control Plan of the site plan set). Erosion controls shall be inspected weekly and after significant rainfalls (1- inch or greater) and replaced where necessary. Double rows of hay bales may be required in isolated areas where site conditions require this additional protection.

Additional silt fencing may also be required, as directed by the Engineer. All finished slopes and graded areas are to be stabilized with landscaping. Temporary measures such as mulching of slopes during non-planting seasons will be required.

A temporary construction entrance will be installed consisting of a 20' x 50' x 6-inch deep (min.) rip-rap crushed stone tracking pad, in order to minimize the tracking of soils/sediment to any off-site areas (see the Erosion Control Plan (sheet 13 of 17) for locations).

Shoulders and seeded side slopes shall be protected with mulch, hay, jute matting, or other acceptable method until all slopes are permanently stabilized.

STORMWATER MANAGEMENT CONTROLS

The proposed catch basins on the site, together with the existing catch basins on Scudder Avenue will be fitted with a new "Silt Sack" as shown on the above-mentioned Erosion Control Plan to protect the existing and new drainage systems from sediment accumulation during construction. They shall be serviced/emptied monthly, or as needed to allow proper function. The contractor shall conduct periodic (weekly) street sweeping as needed.

VEGETATION PLANNING

Proposed vegetation consists of various plantings and loam & seed over the landscaped areas. Appropriate erosion controls (jute matting, etc.) will be required to maintain slopes or provide erosion control of seeded areas, as required by the contractor.

CONSTRUCTION SEQUENCING PLAN

Construction sequencing for this project shall be as follows:

1. Install erosion control barriers; rip-rap construction entrance (tracking pad); Silt Sacks in catch basins
2. Conduct limited demolition operations in the limit of work
3. Excavate for the proposed foundations and parking garages
4. Conduct new concrete foundation and building construction.
5. Install new utilities infrastructure
6. Excavate existing parking to sub base level and construct new parking area surface per plan
7. Loam and seed disturbed areas; plant trees/shrubs
8. Remove erosion control after vegetation has established.

INSPECTION SCHEDULE

All work shall be inspected by the design Engineer prior to backfilling. Erosion control measures to be inspected prior to any earthwork. The contractor shall be responsible for adhering to this plan and applicable Town of Barnstable regulations or permit conditions. The Town Engineer/DPW or Water District Inspector shall inspect/approve each new water & sewer utility connection as required.

GENERAL (Stockpile areas)

Stockpile areas for subsoil shall be located in an area away from the drainage and wetland areas with erosion controls to prevent soils from entering the drainage systems. This erosion control will include as a minimum, the perimeter of stockpile areas staked with silt fence and/or hay bales, as required or directed by the Engineer.

STORMWATER MANAGEMENT SYSTEM OPERATION AND MAINTENANCE PLAN

Proposed EMBLEM Hyannis Development

35 Scudder Ave., Hyannis, MA

PREPARED FOR (Operator & Responsible Party):
Quarterra
99 Summer Street, Suite 701
Boston, MA 02110

The following is the Stormwater Management Operations and Maintenance Plan with a maintenance inspection report for this project:

Facility Description:
The Stormwater Management System components for the paved areas consist of the following:

- Deep sump catch basin (drives & parking areas)
- One (1) Contech® CDS treatment structure (shown as a WQU on the plans for the front entrance system)
- Infiltration Basis #1 and #2 with sediment forebays, and 3 Bioretention areas that precede the infiltration basins.

Routine Maintenance:
The routine maintenance program shall begin only after the following:

- New building construction and slope stabilization is complete;
- All disturbed areas are adequately vegetated and stabilized;
- All catch basins, and the oil/water separator have been pumped and completely cleaned;
- The system has been completely inspected by the design Engineer and found to be functioning as designed (no clogging of the leaching system has occurred during construction)

Routine maintenance shall consist of the following:

1. Street Sweeping shall be conducted 2 times per year, and as a minimum, shall occur after the spring thaw to avoid excessive accumulation of sediment into the drainage system

2. The deep sump catch basin shall be inspected and pumped & cleaned annually, or when the sediment collected in the sump reaches 2 ft. in depth, whichever comes first;

3. The infiltration/leaching systems shall be inspected annually;

4. The Contech® CDS treatment structure shall be inspected and pumped in accordance with the attached manufacturer's O & M Manual. All waste removed will be disposed of in accordance with State and Federal laws.

5. The bioretention areas, infiltration basins & sediment forebays shall be inspected annually, and excess debris, trash or sediment removed.

NOTE; See the attached manufacturer's recommended O&M information from for the Contech® CDS structure..

Construction Certification
The Engineer of Record (Pesce Engineering) shall inspect stormwater system and shall certify in writing to the Owner/Operator staff that it has been constructed in accordance with the approved plans (as shown on the record plans).

Owner/Operator's O & M Responsibilities
To assure that the requirements of this Stormwater Operation and Maintenance Plan (O&M Plan) are met in all seasons and for the life of the project, the following are the responsibilities of the Operator (operator of record):

1) The operator of record is responsible for the Stormwater System as outlined in the O&M Plan including inspection, maintenance and repairs.

2) The operator of record (and or tenants) will authorize funds for inspection, maintenance and emergency repairs as needed. Funding will be released for any and all repairs of stormwater systems identified in the O&M Plan within 30 calendar days of an inspection by a certified engineer that reveals any defect.

3) The operator of record will keep records of stormwater inspections, maintenance and repairs, and such records will be made available within 21 business days upon written request.

4) The requirements of the O&M Plan, including those for on-going inspection, maintenance and repairs as outlined in this plan applies to all successors and assigns as long as the proposed project is in operation.

Owner/Operator's Endorsement

Signature: __________________________________ Date: ____________
Quarterra
99 Summer Street, Suite 701, Boston, MA 02110

Stormwater Management System Inspection Report

Address: EMBLEM Hyannis, Scudder Ave., Hyannis, MA

Inspector: ______________________________ **Date:** ___________

	Description	Yes	No*	N/A
1	Are all erosion control devices in place and functioning in accordance with the erosion and control plan? (NOTE: Applies to Construction Period only)			
2	Are Catch Basins functioning properly (not more than 24 inches of sediment present, and not exhibiting excess oil or floatable debris)?			
3.	Is there evidence that Street Sweeping been performed on a routine basis (twice per year minimum)?			
4	Is the ConTech CDS® Separator functioning properly (Not showing excessive sediment or floatable oil/debris?			
5	Inspection of the Infiltration Basins & Sediment Forebay, or Bioretention Areas: Is there any evidence of debris, erosion or sediment build-up?			
6	Other (explain below)			

*If any answer is "No", describe needed corrections(s) below. Indicate the location of needed corrections(s), along with the date corrections are estimated to be made.

Inspector's Signature: ____

CONTECH
ENGINEERED SOLUTIONS

CDS® Inspection and Maintenance Guide

CDS
TECHNOLOGIES

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y³	m³
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.3	3.0	0.9	1.3	1.0
CDS2020	5	1.3	3.5	1.1	1.3	1.0
CDS2025	5	1.3	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

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

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

The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; 7,517,450 related foreign patents or other patents pending.

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CDS Inspection & Maintenance Log

CDS Model: ______________________ Location: ______________________

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

APPENDIX G

MA DEP STANDARD METHOD TO CONVERT WATER QUALITY VOLUME TO A DISCHARGE RATE FOR SIZING FLOW BASED MANUFACTURED PROPRIETARY STORMWATER TREATMENT
(SEPTEMBER 10, 2013)

Massachusetts Department of Environmental Protection Wetlands Program

Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices

Effective October 15, 2013, computations following the standardized method must be submitted with a Wetlands Notice of Intent (NOI) when a proprietary manufactured stormwater treatment device sized using a flow rate is proposed in connection with work proposed in a wetland resource area or associated buffer zone. The computational method will primarily affect the sizing of the proprietary manufactured stormwater treatment separators, and not other types of stormwater treatment practices that are volume based (such as extended detention basins) or proprietary stormwater treatment filters sized using the Water Quality Volume (WQV).

Stormwater Standard No. 4 requires structural stormwater management practices to be sized to capture the required WQV in accordance with the Massachusetts Stormwater Handbook (310 CMR 10.05(6)(k)(4) and 314 CMR 9.06(6)(a)(4)) . Stormwater Standard No. 4 requires that the full WQV be captured and treated to remove 80% of the Total Suspended Solid (TSS) load.

Since manufactured proprietary stormwater separators are sized using discharge rates and not volume, MassDEP is requiring the standardized method described below be used to convert the required WQV to a discharge rate (Q). No other methods are allowed to convert the WQV to the Q rate. This will ensure that flow rate based manufactured proprietary stormwater treatment practices are sized consistently from manufacturer to manufacturer. This section contains the following: caveats for method use, method description, examples of how to use the method, and documentation describing how the method was derived. This method will be incorporated into the Massachusetts Stormwater Handbook.

The following caveats apply to use of the method:

- Device sized using the Q rate must only be used as pretreatment practice.
- Device sized using this method shall be designed to be "offline", unless approved otherwise through written reciprocity granted by MassDEP to a final certification pursuant to the Technology Acceptance Reciprocity Partnership (TARP). This means the device must be sized at a minimum to fully treat the Q rate without any overflow, by-pass, surcharge of runoff, or scouring of sediments or oils previously trapped or entrained in the device.
- The computations described below must be provided in the Stormwater Report accompanying Wetlands Notice of Intent or application for 401 Water Quality Certification.
- MassDEP reserves ability to revise this method in the future as may be needed to reflect documented increases to precipitation intensity (Douglas 2011), updates to design intensity storms currently being considered by the National Weather Service or Northeast Climate Center (NECC)[1] to Technical Paper 40 (upon which this methodology is based), NRCS revisions to the WinTR55/TR20 methods,[2] or changes to the National Pollution Discharge Elimination System (NPDES) permits issued by EPA for Massachusetts.

[1] On web, see precipitation intensities at http://precip.net

[2] On web, See MA-NRCS description at: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_013763.pdf

METHOD

1. Determine if the WQV is the first ½-inch or 1-inch of runoff. If WQV is the first ½ -inch, go to STEP 2. If WQV is the first 1-inch of runoff, go to STEP 7.

FOR FIRST ½ INCH RUNOFF WQV

2. Use Curve Number (CN) 98 to represent the runoff potential for impervious surfaces (see Method Derivation section below for explanation regarding how CN 98 was obtained).

   Only use impervious surfaces for these computations. Runoff from pervious surfaces should not be included in the WQV computations for the Q rate. The WQV required by the Massachusetts Wetlands Protection (310 CMR 10.05(6)(k)(4)) and 401 Water Quality Certification (314 CMR 9.06(6)(a)(4)) regulations for Stormwater Standard No. 4 is based only on impervious surfaces.

3. Compute the time of concentration (tc) using the methods described in TR-55 1986, Chapter 3.

4. Refer to Figure 1, Ia/P Curve = 0.058

5. Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the tc determined in STEP 3, read the unit peak discharge (qu) from Figure 1 or Table in Figure 2. qu is expressed in the following units: cfs/mi²/watershed inches (csm/in).

6. Compute Q rate using the following equation:

$$Q_{0.5} = (qu)(A)(WQV)$$

   Where:

   $Q_{0.5}$ = flow rate associated with first ½ -inch of runoff

   qu = the unit peak discharge, in csm/in.

   A = impervious surface drainage area (in square miles)

   WQV = water quality volume in watershed inches (½ -inch in this case)

See Example 1, page 8 applying use of the method to convert first ½ -inch WQV to minimum $Q_{0.5}$ rate.

Figure 1: For First ½-inch Runoff, Ia/P Curve = 0.058, Relationship Between Unit Peak Discharge and Time of Concentration for NRCS Type III Storm Distribution.

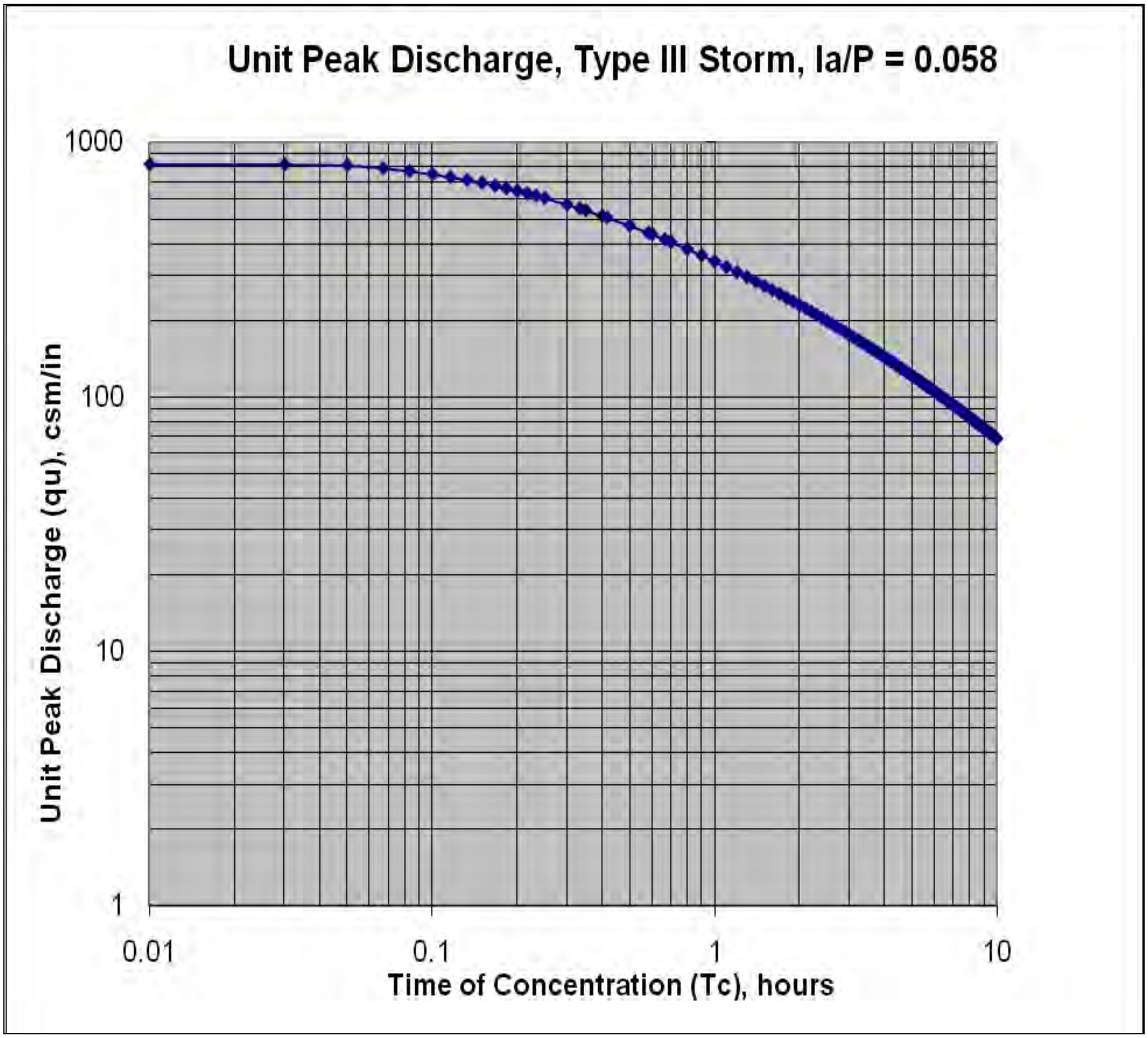

Figure 2: For First ½-inch of Runoff, Table of qu values for Ia/P Curve = 0.0.058, listed by tc, for Type III Storm Distribution

Tc (Hours)	qu (csm/in)
0.01	821
0.03	821
0.05	813
0.067	794
0.083	773
0.1	752
0.116	733
0.133	713
0.15	694
0.167	677
0.183	662
0.2	646
0.217	632
0.233	619
0.25	606
0.3	572
0.333	552
0.35	542
0.4	516
0.416	508
0.5	472
0.583	443
0.6	437
0.667	417
0.7	408
0.8	383
0.9	361
1	342
1.1	325
1.2	311
1.3	297
1.4	285
1.5	274
1.6	264
1.7	254
1.8	246
1.9	238
2	230
2.1	223
2.2	217
2.3	211
2.4	205
2.5	200
2.6	194
2.7	190
2.8	185
2.9	181
3	176
3.1	173
3.2	169
3.3	165
3.4	162
3.5	158
3.6	155
3.7	152
3.8	149
3.9	147
4	144
4.1	141
4.2	139
4.3	136
4.4	134
4.5	132
4.6	130
4.7	128
4.8	126
4.9	124
5	122
5.1	120
5.2	118
5.3	116
5.4	115
5.5	113
5.6	112
5.7	110
5.8	109
5.9	107
6	106
6.1	104
6.2	103
6.3	102
6.4	100
6.5	99
6.6	98
6.7	97
6.8	96
6.9	94
7	93
7.1	92
7.2	91
7.3	90
7.4	89
7.5	88
7.6	87
7.7	86
7.8	85
7.9	84
8	84
8.1	83
8.2	82
8.3	81
8.4	80
8.5	79
8.6	79
8.7	78
8.8	77
8.9	76
9	76
9.1	75
9.2	74
9.3	74
9.4	73
9.5	72
9.6	72
9.7	71
9.8	70
9.9	70
10	69

FOR FIRST 1-INCH RUNOFF WQV

7. Use Curve Number (CN) 98 to represent the runoff potential for impervious surfaces (see Method Derivation section below for explanation regarding how CN 98 was obtained).

   Only use impervious surfaces for these computations. Runoff from pervious surfaces should not be included in the WQV computations for peak WQF. The WQV required by the Massachusetts Wetlands Protection (310 CMR 10.05(6)(k)(4)) and 401 Water Quality Certification (314 CMR 9.06(6)(a)(4)) regulations for Stormwater Standard No. 4 is based only on impervious surfaces.

8. Compute the time of concentration (tc) using the methods described in TR-55 1986, Chapter 3.

9. Refer to Ia/P Curve = 0.034 (Figure 3)

10. Determine unit peak discharge using Figure 3 or 4. Figure 4 is in tabular form so is preferred. Using the tc determined in STEP 8, read the unit peak discharge (qu) from Figure 2 or from Table in Figure 4. qu is expressed in the following units: cfs/mi²/watershed inches (csm/in).

11. Compute the water quality flow (WQF) using the following equation:

$$Q_1 = (qu)(A)(WQV)$$

Where:

Q_1 = peak flow rate associated with first 1-inch of runoff

qu = the unit peak discharge, in csm/in.

A = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (1.0-inches in this case)

See Example 2, page 8 applying use of the method to convert first 1-inch WQV to minimum Q_1 rate.

Figure 3: For First 1-inch Runoff, Ia/P Curve = 0.034, Relationship Between Unit Peak Discharge and Time of Concentration for NRCS Type III Storm Distribution

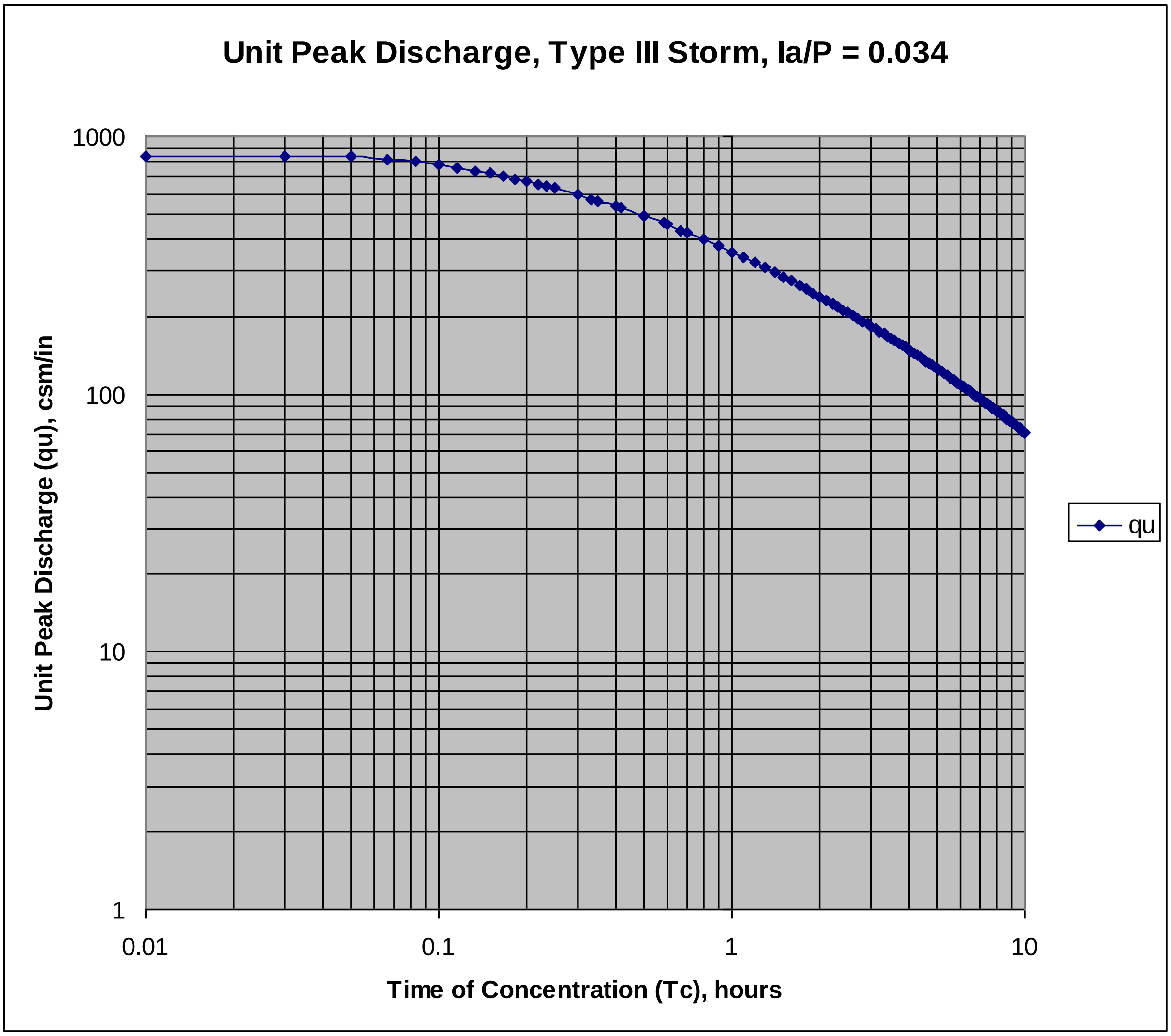

Figure 4: for First 1-inch Runoff, Table of qu values for Ia/P Curve = 0.034, listed by tc, for Type III Storm Distribution

Tc (Hours)	qu (csm/in)	Tc (Hours)	qu (csm/in)	Tc (Hours)	qu (csm/in)
0.01	835	2.7	197	7.1	95
0.03	835	2.8	192	7.2	94
0.05	831	2.9	187	7.3	93
0.067	814	3	183	7.4	92
0.083	795	3.1	179	7.5	91
0.1	774	3.2	175	7.6	90
0.116	755	3.3	171	7.7	89
0.133	736	3.4	168	7.8	88
0.15	717	3.5	164	7.9	87
0.167	700	3.6	161	8	86
0.183	685	3.7	158	8.1	85
0.2	669	3.8	155	8.2	84
0.217	654	3.9	152	8.3	84
0.233	641	4	149	8.4	83
0.25	628	4.1	146	8.5	82
0.3	593	4.2	144	8.6	81
0.333	572	4.3	141	8.7	80
0.35	563	4.4	139	8.8	79
0.4	536	4.5	137	8.9	79
0.416	528	4.6	134	9	78
0.5	491	4.7	132	9.1	77
0.583	460	4.8	130	9.2	76
0.6	454	4.9	128	9.3	76
0.667	433	5	126	9.4	75
0.7	424	5.1	124	9.5	74
0.8	398	5.2	122	9.6	74
0.9	376	5.3	120	9.7	73
1	356	5.4	119	9.8	72
1.1	339	5.5	117	9.9	72
1.2	323	5.6	115	10	71
1.3	309	5.7	114		
1.4	296	5.8	112		
1.5	285	5.9	111		
1.6	274	6	109		
1.7	264	6.1	108		
1.8	255	6.2	106		
1.9	247	6.3	105		
2	239	6.4	104		
2.1	232	6.5	102		
2.2	225	6.6	101		
2.3	219	6.7	100		
2.4	213	6.8	99		
2.5	207	6.9	98		
2.6	202	7	96		

Examples

Example 1: 2.28-acre asphalt parking lot (impervious surface), with time of concentration equal to 0.25 hours. The proposed parking lot drains to a wetland resource area, which is not a critical area, nor is the site located "near" a critical area. A proprietary separator is proposed to pretreat runoff to be directed to an Extended Detention Basin.

Because site does not drain to or located near a critical area, WQV = ½ -inch

1-acre = 0.0015625 mi^2

Step 1: Use CN = 98 to represent the 2.28-acre impervious surface.

Step 2: Determine tc

tc = 0.25 hours (given).

Step 3: Determine qu using Figure 2

With tc = 0.25 hours, qu is determined to be 606 csm/inch using Table in Figure 2.

Step 4 (Final Step): Determine $Q_{0.5}$

$$Q_{0.5} = (qu)(A)(WQV)$$

$$Q_{0.5} = (606\ \text{csm/in})(2.28\text{-acre})(0.0015625\ \text{mi}^2/\text{acre})(\ ½\ \text{-inch})$$

$$Q_{0.5} \approx 1.1\ \text{CFS}$$

Example 2: One-acre site composed entirely of impervious surfaces, with time of concentration equal to 6 minutes. The proposed impervious surfaces are to be drained to a stream located in Zone II of a public drinking water supply. A proprietary separator is proposed to pretreat runoff to be directed to an Infiltration Basin.

Because site drains to a critical area, WQV = 1-inch

1-acre = 0.0015625 mi^2

Step 1: Use CN = 98 to represent the 1-acre impervious surface.

Step 2: Determine tc

tc = 6 minutes (given).

Convert minutes to hours

tc = (6 minutes) /(60 minutes/hr) = 0.1 hours

Step 3: Determine qu using Table in Figure 4

Using the tc column, read down to find tc = 0.1 hours. Read to the right of tc = 0.1 hours to find the qu value which is 774 csm/inch.

Alternatively, you may use Figure 3 (Ia/P curve = 0.034). Find tc = 0.1 hours, read up to the Ia/P curve, then follow intersecting line to the left to interpolate the qu value. You'll note that using Figure 4 is quicker in so far as no interpolation is required. In cases where the tc is not listed in Figure 4, you may need to use Figure 3. In such instances, Figure 4 may still assist you in bracketing the qu values to interpolate.

Step 4 (Final Step): Determine Q_1

$$Q_1 = (qu)(A)(WQV)$$

$$Q_1 = (774\ \text{csm/in})(1\text{-acre})(0.0015625\ \text{mi}^2/\text{acre})(1\text{-inch})$$

$$Q_1 \approx 1.2\ \text{CFS}$$

If the conversion factor to convert acres to square miles is not included, the result will not be correct. As different units are used in the computations, double check your units to ensure the result is correct.

Method Derivation

The Stormwater Advisory Committee convened to assist MassDEP with the 2008 stormwater revisions to the Wetlands and 401 Water Quality Certification regulations. The Advisory Committee tabled a method proposed at that time and asked its Proprietary BMP subcommittee to study the issue further. Subsequently, the Proprietary BMP subcommittee met from 2008 to 2011, examining multiple methods. Among the methods reviewed included the Rational Method used by New Jersey DEP, Ahlfeld et al 2004, Winkler et al 2001, Claytor and Scheuler 1996, Imbrium PCSWMM, and Bryant. The Ahlfeld and Winkler methods were funded by MassDEP through 319 funds and developed using Massachusetts precipitation data. The Claytor method is based on SCS TR-55 graphical methods. The PCSWMM method is a proprietary version of the EPA SWMM method, based on Mannings equation. The Bryant method was based on precipitation data compiled in the Ahlfeld and Winkler methods.

To assist in selecting a method, Rees and Schoen 2009 conducted third party review of the different approaches. Rees and Schoen found that the various methods produced different peak rate flows.

Differences were also found between peak flow rates in coastal and inland areas. With some methods, the precipitation intensity associated with the ½-inch water quality volume produced a greater flow rate than the 1-inch water quality volume. The study concluded that the Claytor and Schueler 1996 method was the most complete in attempting to transform the Water Quality Volume to a flow rate.

Subsequent to the study, flow rate results from the Claytor and Schueler method were adapted for use in Massachusetts using both the first ½ - inch and 1-inch Water Quality Volumes. Flow rates were found to bypass a portion of the Water Quality Volume for the both the first ½ -inch and 1-inch of runoff depending on drainage area and treatment device size. As bypassed runoff is not treated, the Proprietary BMP Subcommittee agreed on meeting held in March 2011 that practices sized using the flow conversion method must be restricted to pretreatment only and directed to stormwater treatment practices. The Proprietary BMP Subcommittee subsequently recommended the Claytor and Schueler 1996 method be used, as adapted for use in Massachusetts, to the Stormwater Advisory Committee in May 2011.

The Claytor and Schueler 1996 approach in part utilizes the U.S. Natural Resource and Conservation Service Technical Release 55 (TR-55) Graphical Peak Discharge Method (NRCS / SCS 1986), adapted for small storm hydrology (Pitt 1999). It was adapted for use in Massachusetts by determining the precipitation values that generate the first ½ -inch and 1-inch of runoff, using the NRCS / SCS 1986 equations as described below.

1. The Massachusetts Stormwater Standard No. 4 sets the required WQV equal to 0.5-inch or 1.0- inch, depending if the discharge is to or near a critical area, Land Use with Higher Potential Pollutant Load (LUHPPL), or soil with rapid infiltration rate.
2. The Claytor and Scheuler 1996 method requires a Curve Number (CN) be determined to represent the ability of a surface to effectively convey runoff. CN 98 was derived for impervious surfaces using small storm hydrology using the following equation (NRCS / SCS 1986). The precipitation depth associated with the first 1.0-inch of runoff is 1.2 watershed inches based on Figure 4 (NRCS 1986 Table 2-1) and Figure 5 (NRCS 1986 Figure 2-1). The precipitation depth associated with the first ½ -inch of runoff is 0.7 watershed inches.

½-inch WQV Derivation:

Solve for P_t

$$CN = \frac{1000}{10 + 5P_t + 10Q_{WQV} - 10(Q_{WQV}{}^2 + 1.25Q_{WQV}P_t)^{0.5}}$$

Where:

CN = Runoff Curve Number = 98 for runoff impervious surfaces

P_t = Precipitation depth

Q_{WQV} = Runoff depth related to Water Quality Volume = 0.5 watershed inches

This equation produces the result **P_t = 0.7** inches, when CN = 98 and Q_{WQV} = 0.5 inches.

1-inch WQV Derivation

$$CN = \frac{1000}{10 + 5P_t + 10Q_{WQV} - 10(Q_{WQV}{}^2 + 1.25Q_{WQV}P_t)^{0.5}}$$

Where:

- CN = Runoff Curve Number = 98 for runoff from impervious surfaces

P_t = Precipitation depth

Q_{WQV} = Runoff depth related to Water Quality Volume = 1.0 watershed inches

This equation produces the result **P_t = 1.2** inches, when CN = 98 and Q_{WQV} = 1.0 inches

3. Potential maximum retention (S) in inches was derived using the following equation (NRCS 1986):

½-inch WQV Derivation / 1-inch WQV Derivation (result same for both):

S = (1000/CN) – 10

This equation produces the result S = 0.204 when the CN = 98

4. The initial abstraction (Ia) was derived using the following equation (NRCS 1986):

½-inch WQV Derivation / 1-inch WQV Derivation (result same for both):

Ia = 0.2S

This equation produces the result Ia = 0.041, when S = 0.204

Also See Figure 6 (NRCS 1986, Table 4-1), where Ia = 0.041, for CN = 98

5. The Ia/P Ratio was derived using the following equation (NRCS 1986):

½-inch WQV Derivation

Solve for Ia/P Ratio using the following equation (NRCS 1986):

Ia/P Ratio = Ia/ P_t

Where:

Ia = 0.041 (for CN = 98)

P_t = 0.7 watershed inches

Ia/P Ratio = 0.041/ 0.7 = 0.058

1-inch WQV Derivation

$$Ia/P \text{ Ratio} = Ia/\ P_t$$

Where:

$Ia = 0.041$ (for $CN = 98$)

$P_t = 1.2$ watershed inches

$$Ia/P \text{ Ratio} = 0.041/\ 1.2 = 0.034$$

6. For the first ½ -inch runoff, Ia/P curve for 0.058 ratio (Figure 1) and corresponding table (Figure 2) were generated using coefficients C_0, C_1 and C_2 derived from regression of coefficients published in Appendix F in NRCS / SCS TR-55 1986.
7. For the first 1-inch runoff, Ia/P curve for 0.034 ratio (Figure 3) and corresponding table (Figure 4) were generated using coefficients C_0, C_1 and C_2 derived from regression of coefficients published in Appendix F in NRCS / SCS TR-55 1986.

Figures Used for Method Derivation

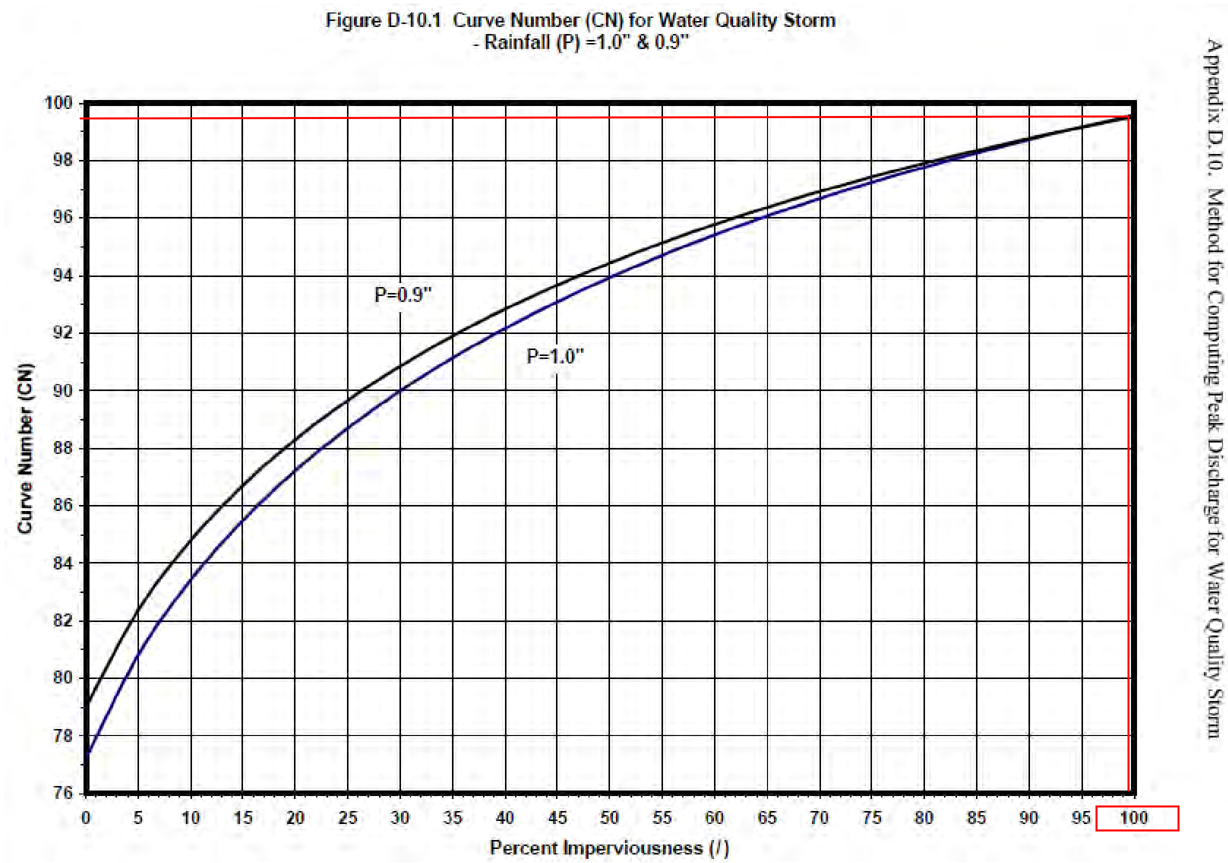

Figure 5: Graph Depicting CN to Percent Impervious Relationship by Precipitation Depth (MD 2000, Figure D-10.1). Note at 100% imperviousness, precipitation depths coincide, making corresponding Runoff CN greater than 98.

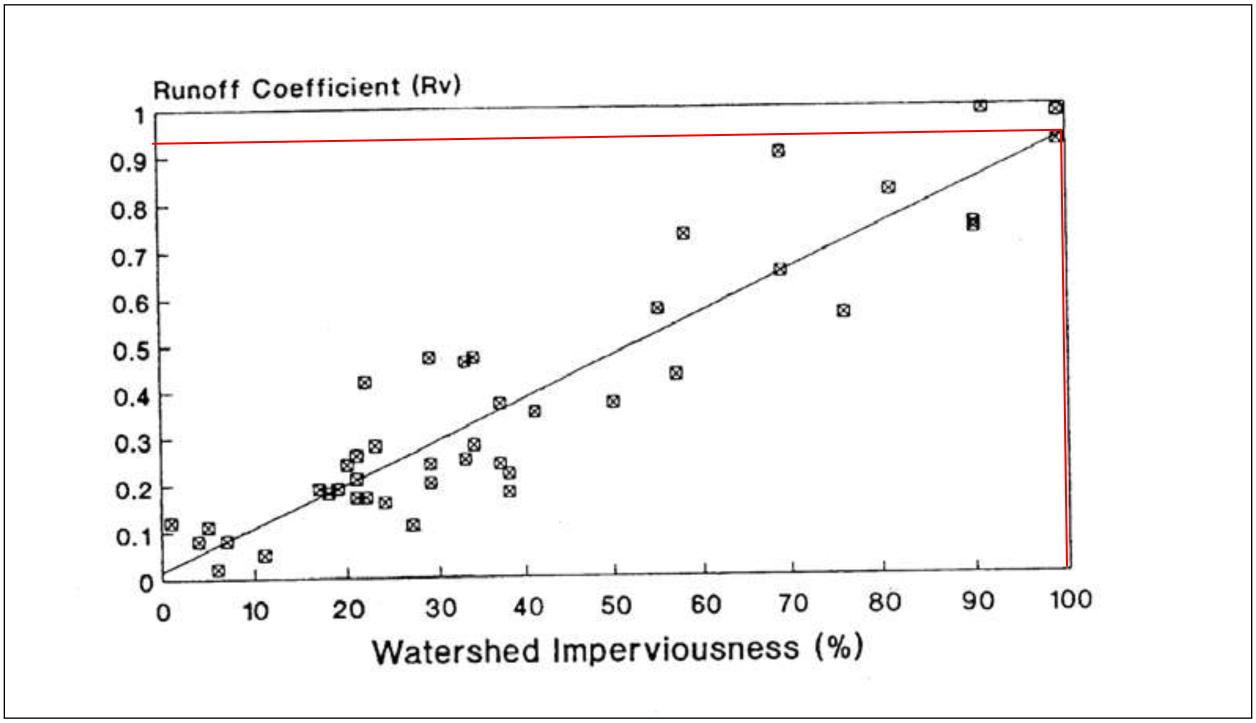

Figure 6: Relationship Between Impervious Cover & Runoff Coefficient (Vermont 2002, from Schueler, 1987). Note at 100% imperviousness, Rv is between 0.9 and 1, meaning that most of the precipitation effectively becomes runoff.

Table 2-1 Runoff depth for selected CN's and rainfall amounts 1/

Rainfall	Runoff depth for curve number of—												
	40	45	50	55	60	65	70	75	80	85	90	95	98
	inches												
1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.08	0.17	0.32	0.56	0.79
1.2	.00	.00	.00	.00	.00	.00	.03	.07	.15	.27	.46	.74	.99
1.4	.00	.00	.00	.00	.00	.02	.06	.13	.24	.39	.61	.92	1.18
1.6	.00	.00	.00	.00	.01	.05	.11	.20	.34	.52	.76	1.11	1.38
1.8	.00	.00	.00	.00	.03	.09	.17	.29	.44	.65	.93	1.29	1.58
2.0	.00	.00	.00	.02	.06	.14	.24	.38	.56	.80	1.09	1.48	1.77
2.5	.00	.00	.02	.08	.17	.30	.46	.65	.89	1.18	1.53	1.96	2.27
3.0	.00	.02	.09	.19	.33	.51	.71	.96	1.25	1.59	1.98	2.45	2.77
3.5	.02	.08	.20	.35	.53	.75	1.01	1.30	1.64	2.02	2.45	2.94	3.27
4.0	.06	.18	.33	.53	.76	1.03	1.33	1.67	2.04	2.46	2.92	3.43	3.77
4.5	.14	.30	.50	.74	1.02	1.33	1.67	2.05	2.46	2.91	3.40	3.92	4.26
5.0	.24	.44	.69	.98	1.30	1.65	2.04	2.45	2.89	3.37	3.88	4.42	4.76
6.0	.50	.80	1.14	1.52	1.92	2.35	2.81	3.28	3.78	4.30	4.85	5.41	5.76
7.0	.84	1.24	1.68	2.12	2.60	3.10	3.62	4.15	4.69	5.25	5.82	6.41	6.76
8.0	1.25	1.74	2.25	2.78	3.33	3.89	4.46	5.04	5.63	6.21	6.81	7.40	7.76
9.0	1.71	2.29	2.88	3.49	4.10	4.72	5.33	5.95	6.57	7.18	7.79	8.40	8.76
10.0	2.23	2.89	3.56	4.23	4.90	5.56	6.22	6.88	7.52	8.16	8.78	9.40	9.76
11.0	2.78	3.52	4.26	5.00	5.72	6.43	7.13	7.81	8.48	9.13	9.77	10.39	10.76
12.0	3.38	4.19	5.00	5.79	6.56	7.32	8.05	8.76	9.45	10.11	10.76	11.39	11.76
13.0	4.00	4.89	5.76	6.61	7.42	8.21	8.98	9.71	10.42	11.10	11.76	12.39	12.76
14.0	4.65	5.62	6.55	7.44	8.30	9.12	9.91	10.67	11.39	12.08	12.75	13.39	13.76
15.0	5.33	6.36	7.35	8.29	9.19	10.04	10.85	11.63	12.37	13.07	13.74	14.39	14.76

Figure 7: Table Depicting Relationship Between Precipitation (P) and Direct Runoff (Q) by Curve Number (NRCS 1986, Table 2-1). 1.2 inches of precipitation effectively becomes 0.99-inch of runoff.

Figure 2-1 Solution of runoff equation.

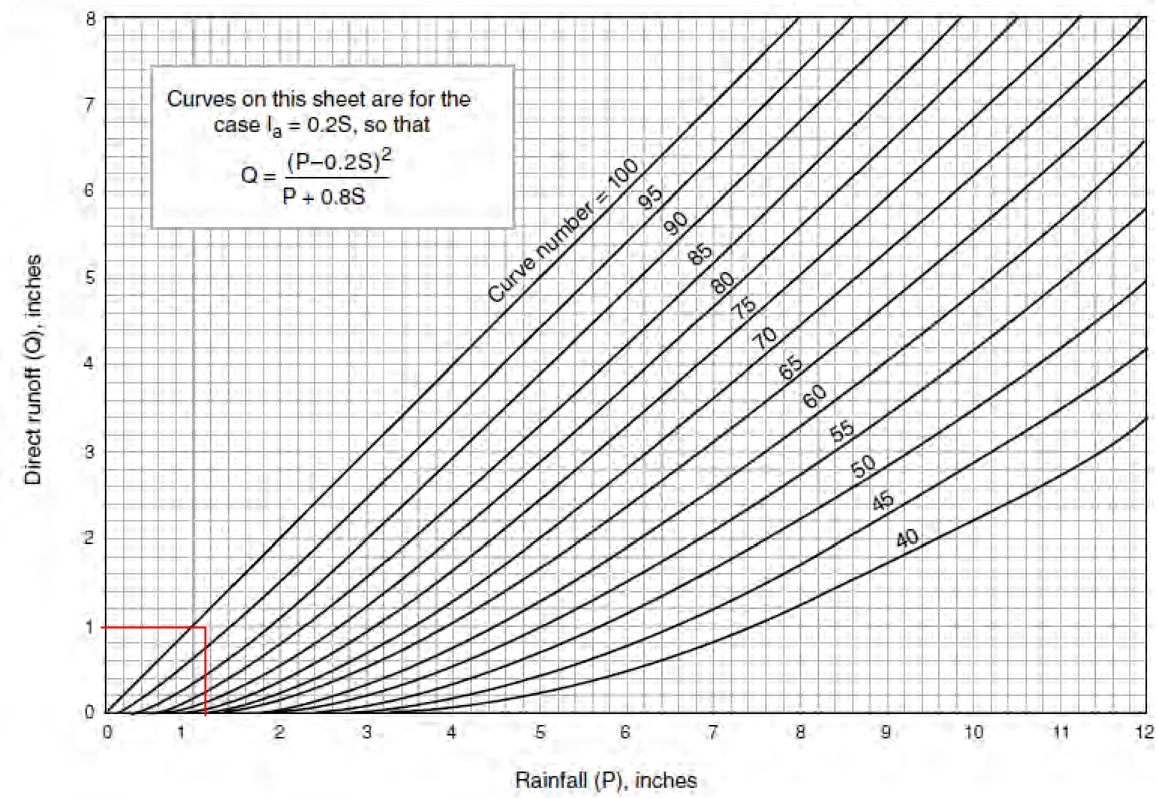

Figure 8: Graph Depicting Relationship Between Precipitation (P) and Direct Runoff (Q) by Curve Number (NRCS 1986, Figure 2-1). This indicates that for a CN 98 (representing impervious surfaces), 1.2 inches of precipitation effectively equals 1-inch of direct runoff.

Table 4-1 I_a values for runoff curve numbers

Curve number	I_a (in)	Curve number	I_a (in)
40	3.000	70	0.857
41	2.878	71	0.817
42	2.762	72	0.778
43	2.651	73	0.740
44	2.545	74	0.703
45	2.444	75	0.667
46	2.348	76	0.632
47	2.255	77	0.597
48	2.167	78	0.564
49	2.082	79	0.532
50	2.000	80	0.500
51	1.922	81	0.469
52	1.846	82	0.439
53	1.774	83	0.410
54	1.704	84	0.381
55	1.636	85	0.353
56	1.571	86	0.326
57	1.509	87	0.299
58	1.448	88	0.273
59	1.390	89	0.247
60	1.333	90	0.222
61	1.279	91	0.198
62	1.226	92	0.174
63	1.175	93	0.151
64	1.125	94	0.128
65	1.077	95	0.105
66	1.030	96	0.083
67	0.985	97	0.062
68	0.941	98	0.041
69	0.899		

Figure 9: Table Listing Ia by CN (NRCS 1986, Table 4-1). This indicates Initial Abstraction (Ia) for CN 98 = 0.041

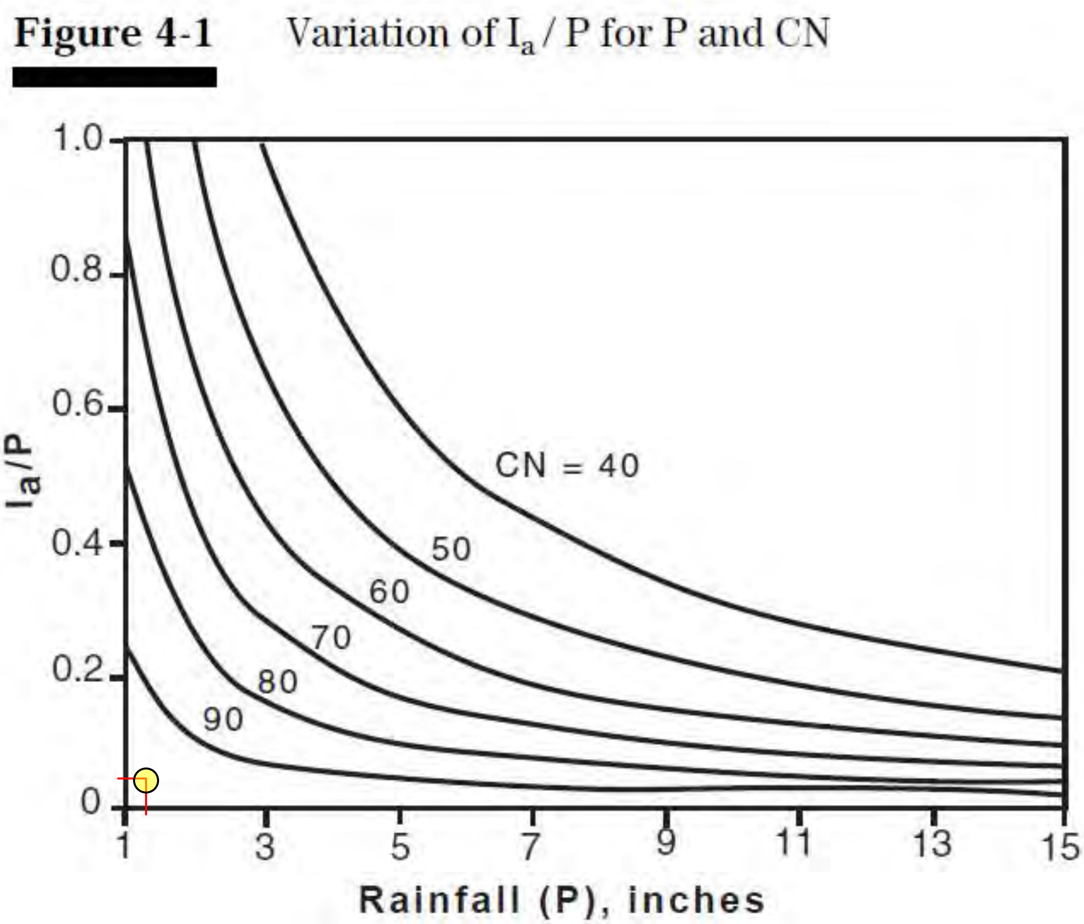

Figure 10: Graph Depicting Ia/P to Precipitation Relationship by CN (NRCS 1986, Figure 4-1). Ia/P ratio of 0.034 corresponding to 1.2 inches of precipitation added. Ia/P ratio determined for CN 98, using Ia = 0.041, P = 1.2

Exhibit 4-III Unit peal discharge (q_u) for NRCS (SCS) type III rainfall distribution

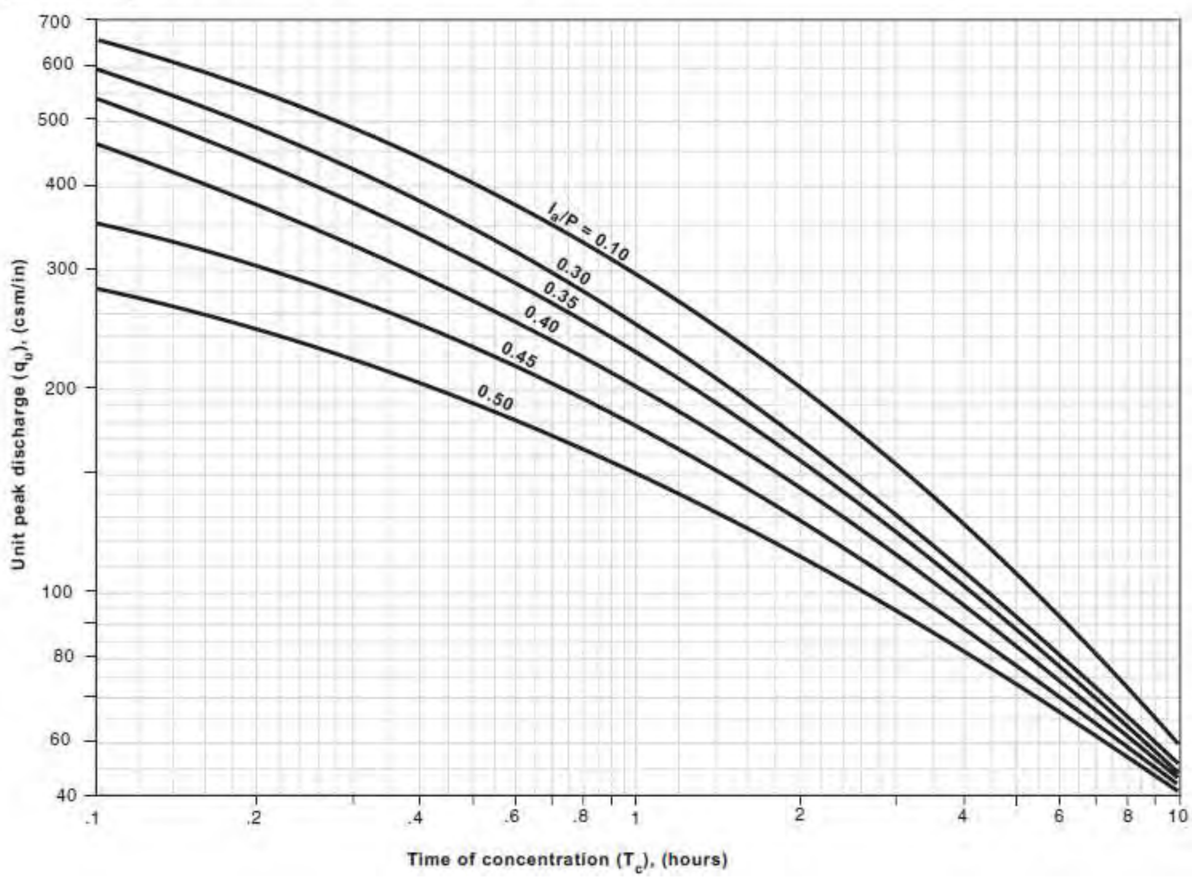

Figure 11: Relationship Between Time of Concentration and Unit Peak Discharge for Ia/P Ratios from 0.10 to 0.50 for NRCS Type III Storm Distribution (NRCS 1986, Exhibit 4-III). NRCS / SCS 1986 specifies Type III storm distribution (tropical influenced storms) for Massachusetts. See Figure 3 and 4 for Ia/P Ratio = 0.034

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APPENDIX H

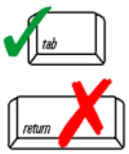
DEP CHECKLIST FOR STORMWATER REPORT

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

---

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

October 11, 2022

Signature and Date

Checklist

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

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☐ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☒ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☒ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

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

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

 ☐ is within the Zone II or Interim Wellhead Protection Area

 ☐ is near or to other critical areas

 ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)

 ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist (continued)

Standard 4: Water Quality (continued)

☐ The BMP is sized (and calculations provided) based on:

- ☒ The ½” or 1” Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist (continued)

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

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☒ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist (continued)

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

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

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CAPE COD
COMMISSION

REGIONAL POLICY PLAN CONSISTENCY BY ISSUE AREA OF THE REGIONAL POLICY PLAN

Housing Goal

The Housing Goal of the RPP is to promote the production of an adequate supply of ownership and rental housing that is safe, healthy, and attainable for people with different income levels and diverse needs.

Objectives HOU1, HOU2, HOU3 and HOU4 are applicable, material, and regionally significant.

HOU1 – promote an increase in housing diversity and choice

- The Project will create small-scale housing units, contributing to variety of housing types to meet a range of life stage and other social needs, consistent with HOU1.

HOU2 – promote an increase in year-round housing supply

- The Project will offer year-round rentals (no short-term rentals), consistent with HOU2.

HOU3 – protect and improve existing housing stock

- The Project will not result in any loss of housing units at the site. LMC will construct 312 new housing units in Barnstable, increasing the number of net existing housing units in the region, consistent with HOU3.

HOU4 – increase housing affordability

- The typical requirement for consistency with this objective is to provide 10% of units as affordable and/or workforce housing. The Project will provide 13% of units to be affordable – 10% (31 units) at 65% AMI and an additional 3% (10 units) at 80% AMI, consistent with HOU4. This exceeds the typical requirement.

Water Resources

The Water Resources Goal of the RPP is to maintain a sustainable supply of high-quality untreated drinking water and protect, preserve or restore the ecological integrity of Cape Cod's fresh and marine surface water resources.

Objectives WR1, WR3, and WR4 are applicable, material, and regionally significant.

WR1 – Protect and preserve groundwater quality

- Objective WR1 requires site-wide nitrogen loading concentration to be less than 5 parts per million (ppm). Nitrogen loading calculations for the proposed Project indicate that the Project will have a site-wide nitrogen loading concentration of less than 5ppm, consistent with WR1.

- The Project is anticipated to result in a net decrease in on-site nitrogen loading compared to current conditions, which were determined using a standardized methodology that incorporates specific fertilizer application rates for the various turf types present on a golf course. The decrease in sitewide nitrogen loading will be achieved by reducing managed turf area, treatment of stormwater runoff from new impervious surfaces, and connection of new buildings to the Barnstable municipal sewer system.

WR3 – Protect, preserve and restore marine water resources

- While reducing on-site nitrogen loading, the Project will contribute additional nitrogen to Lewis Bay compared to the current development because the Project's wastewater will be treated at the Barnstable Water Pollution Control Facility (WPCF), which discharges treated wastewater effluent to the same watershed the Project site is located within. This effectively transfers the obligation for removing approximately 350 kg of additional wastewater nitrogen generated by the Project from the applicant to the Town and through its Comprehensive Wastewater Management Plan.
- Objective WR3 applies to the Project, requiring a monetary contribution to address water quality problems in the affected surface waters. Consistent with WR3, as a condition to the Development Agreement, LMC will offset its nitrogen addition through a $175,000 contribution.

WR4 – Manage and treat stormwater to protect and preserve water quality

- For redevelopment projects, such as the Project, Objective WR4 requires a project to reduce impervious coverage and improve site conditions to enhance stormwater retention, water quality treatment and recharge over existing conditions. In addition, a redevelopment project must include natural areas in its stormwater system design. The proposed redevelopment from golf course to housing use is inconsistent with WR4 because it results in an increase in impervious cover in order to build the structures, parking, and roadways required to serve the proposed housing units, such that it would not be possible to create additional housing on the Project Site without adding to the impervious surface coverage.
- While the Project will result in greater impervious coverage compared to current conditions, it will reduce fertilized turf area and will reduce the amount of impervious coverage within the areas of the site within the Wellhead Protection Overlay District.
- The proposed stormwater management system will improve stormwater management on site by reducing peak discharge rates, and providing storage and treatment capacity sufficient to store, treat, and infiltrate all runoff from parking areas and roadways onsite. The current design routes the majority of runoff to two infiltration basins located at the edges of the site and proximate to wetlands resources. This has the effect of reducing untreated surface runoff to those wetland areas but also concentrates groundwater recharge at the locations of the two infiltration basins. Although different from current hydrologic conditions where recharge is dispersed throughout the golf course, the proposed system is not anticipated to impact the hydrologic function of the wetlands resources.
- The Project has proposed the following mitigation:
    - The Project utilizes a clustered building site design to reduce the overall amount of impervious area created

- The Project reduces the amount of impervious area within the portion of the site mapped as Wellhead Protection Area
    - Runoff from building roof areas will be directly infiltrated to provide recharge throughout the site and reduce the required size of stormwater treatment facilities
    - Bioretention areas have been incorporated into parking and roadway areas to provide treatment for associated stormwater runoff
    - The stormwater system has been designed according to Massachusetts Stormwater Handbook standards to reduce runoff from the site to adjacent water resources under conditions up to and including the 100-year storm
    - By reducing fertilized turf area and treating stormwater runoff generated by new impervious surfaces, the Project will reduce overall sitewide nitrogen loading relative to current conditions.
- While the project is inconsistent with the portion of Objective WR4 related to the reduction of impervious area coverage on the site, that inconsistency is necessary to enable a substantial segment of the population to secure adequate opportunities for housing and the interests protected by the Act and the Regional Policy Plan can be advanced or protected by the alternate approach which shall include appropriate mitigation, including:
    - clustering development on the site,
    - directly infiltrating roof runoff,
    - Reducing impervious area in Wellhead Protection Overlay district,
    - incorporating bioretention areas in parking and roadway areas,
    - designing the stormwater system design according to Massachusetts Stormwater Handbook standards,
    - reducing fertilized turf and treats stormwater runoff to reduce sitewide nitrogen loading over current conditions and
    - Additional bioretention capacity within the clubhouse traffic circle.

Wetlands Resources

The Wetlands Resources Goal of the RPP is to protect, preserve, or restore the quality and natural values and functions of inland and coastal wetlands and their buffers.

Objectives WET1, WET2, WET3, and WET4 are applicable, material, and regionally significant.

WET1 – Protect wetlands and their buffers from vegetation and grade changes

In practice, meeting this objective means not proposing or conducting work within wetland resource or buffer areas. The Project proposes development within 100’ wetland buffers in areas of existing development, and to fill an isolated vegetated wetland to accommodate two proposed buildings and associated parking. Objective WET1 is to protect wetlands and their buffers from vegetation and grade changes.

In order for the Project to be consistent with WET1, the Commission must find that there is a public benefit to the Project, there is no feasible alternative to the design, and that the impacts from the alteration are minimized and mitigated; and further find that the proposed development either reduces impacts or improves wetland functions. Since the Project as designed does not meet these limited specific purposes, the Project is inconsistent with the RPP as to Objective WET1 of the Wetland Resource section of the RPP as it relates to the isolated vegetated wetland.

In this case, the Project will mitigate impacts to wetlands by permanently protecting 20 acres of the property as open space and implementing a restoration plan within these 20 acres of the property. Proposed restoration activities include removing existing golf course development from 9.84 acres of the open space area, replanting with native species of plants, and removing invasive species.

WET2 – Protect wetlands from changes in hydrology

- Although proposed stormwater management for the Project may result in occasional discharge to the wetland buffer area during the 100-year storm event, the proposed stormwater management system nonetheless represents an improvement over existing conditions, under which fertilizer and other potential pollutants are carried by stormwater toward and through wetlands and their buffers.
- Consistent with WET2, stormwater runoff from development activities will not alter wetland hydrology.

WET3 – Protect wetlands from stormwater discharges

- Although proposed stormwater management from the Project may result in occasional discharge to the wetland buffer area during the 100-year storm event, the Project nonetheless represents an improvement over existing conditions by reducing the flow of fertilizers and other potential pollutants via stormwater toward and through wetlands and their buffers.
- Consistent with WET3, stormwater runoff from the Project will be directed away from wetlands and their 100-foot buffers.

WET4 – Promote the restoration of degraded wetland resource areas

- The Project proposes to restore degraded wetlands within the existing developed golf course by removing the golf course development from wetland resource and flood hazard areas, removing invasive species from wetland resource areas, and planting native trees, shrubs and herbaceous plants where such restoration planting will improve the natural functions of the wetland.
- Consistent with WET4, the planned restoration will improve the natural wetland functions, restore native vegetation, and/or improve habitat for native species.

Community Design

The Community Design Goal of the RPP is to protect and enhance the unique character of the region's built and natural environment based on the local context.

Objectives CD1 and CD2 are applicable, material, and regionally significant.

CD1 – Promote context sensitive building and site design

- The Project will be accessed from Scudder Avenue through a curvilinear drive located along the western edge of the Site. The entrance leads to the clubhouse building, a one-story building which will likely be visible from the streetscape. The clubhouse structure is similar in height and scale to small commercial structures in the vicinity, and is designed with shake siding, hipped and gable roof forms, whitewashed trim, a widow's walk, and a cupola, incorporating some regionally appropriate forms and materials, consistent with CD1.
- The residential buildings are to the rear of the Hotel and Conference Center and therefore will be screened from regional roadways and are not expected to impact the current streetscape. The residential buildings incorporate some regionally appropriate forms and materials, using siding that mimics traditional building materials and design elements distinct to the region, such as gable and hip roof forms, projecting entries, inset areas, and white trim. The combined screening of the buildings from regional roadways and the use of some traditional building design elements will make it likely that the buildings, if seen, will mirror the character of surrounding development, consistent with CD1.
- All Site lighting will use LED luminaries and will be required to be "Dark Sky" compliant, with 90-degree vertical cutoff.
- Landscaping proposed within the site includes tree plantings along circulation drives and within parking areas, and additional plantings adjacent to the residential buildings. In addition, new plantings along the southeastern portion of the proposed development will provide additional landscape screening adjacent to wooded wetland areas.
- The Project screens parking from the street and divides it into a series of small parking lots where it does not adversely impact visual character of the area, consistent with CD1.

CD2 – Minimize the amount of newly disturbed land and impervious surfaces

- Residential buildings have been clustered mostly within developed areas of the existing golf course to preserve existing mature trees and shrubs along the perimeter, and to provide a partial vegetated screen and buffer to adjacent wetland areas and to adjacent neighborhoods to the south, east, and west.
- The buildings are designed as 3-story structures which minimizes the overall size of the development footprint, consistent with CD2.
- Proposed parking has been minimized, proposed to be below the number of spaced required by zoning, consistent with CD2.
- The Project will revegetate some disturbed areas of the Property under the Restoration Plan.

Economy

The Economy Goal of the RPP is to promote a sustainable regional economy comprised of a broad range of businesses providing employment opportunities to a diverse workforce.

Objectives EC1, EC2, and EC4 are applicable, material, and regionally significant.

EC1 – Protect and build on the Cape's competitive advantages

- Consistent with the intent of Objective EC1 to preserve and protect assets that make Cape Cod a desirable region for residents and visitors, the Project will restore portions of the Property that are in Natural Areas and protect a large area of the site as open space.
- The Project will also establish multifamily housing in a Community Activity Center and redevelops in an area with existing infrastructure, protecting more sensitive areas.

EC2 – Use resources and infrastructure efficiently

- Consistent with Objective EC2, the Project uses resources efficiently by constructing a redevelopment project, where infrastructure is available. The Project will be accessible by multiple modes of transportation and its location within a Community Activity Center will provide access to many amenities and services, including local businesses in downtown Hyannis.

EC4 – Encourage industries that provide living wage jobs to a diverse workforce

- Consistent with the methods for Objective EC4, the Project may help to address the region's high cost of living as the proposed 312 new housing units would provide year-round housing opportunities that could support the regional workforce.

Waste Management

The Waste Management Goal of the RPP is to promote a sustainable solid waste management system for the region that protects public health, safety, and the environment and supports the economy

Objective WM1 is applicable, material, and regionally significant.

WM1 – to reduce waste and waste disposal by promoting waste diversion and other Zero Waste Initiatives

- Consistent with the methods for Objective WM1, as conditioned the Project will incorporate alternatives to disposal.
- LMC proposes to incorporate building materials that include recycled content and source materials regionally, where feasible. During the construction phase, construction debris management and the separation of building materials will be provided.
- Once constructed, waste disposal and collection of recyclables will be provided through a local commercial waste management firm. The Project will have an on-site recycling program for residents to divert common household recyclables from the waste disposal stream, consistent with WM1.

Cultural Heritage

The Cultural Heritage Goal is to protect and preserve the significant cultural, historic, and archaeological values and resources of Cape Cod.

Objective CH2 is applicable, material, and regionally significant.

CH2 – Protect and preserve archaeological resources and assets from alteration or relocation

- While there are no known historic or archaeological resources on the Project Site or in its vicinity, the Project will be conditioned to require contractor teams to follow an “unexpected archaeological find” protocol during construction to ensure any archaeological resources are protected and/or documented, consistent with the methods for Objective CH2.

Coastal Resiliency

The Coastal Resiliency Goal of the RPP is to prevent or minimize human suffering and loss of life and property or environmental damage resulting from storms, flooding, erosion, and relative sea level rise, including but not limited to that associated with climate change.

Objectives CR1, CR2, and CR3 are applicable, material, and regionally significant.

The applicant has not yet sought resource area delineations or determinations of applicability from the Barnstable Conservation Commission for the majority of the wetland resources on the Project Site. To the extent the Conservation Commission determines that the wetland resource areas on the Project Site are different from that presented to the Commission, the Applicant may need to return to the Commission for a modification.

CR1 – Minimize development in the floodplain

- Consistent with CR1, there is no new development in the V zone and redevelopment in the A zone is limited to a small construction area for the proposed access drive. The access drive is located within an existing paved parking area and has been located further from the floodplain boundary than the existing limit of pavement. A secondary emergency access drive is proposed on the northeast side of the site. Both accesses and associated portions of Scudder Avenue are vulnerable to storm surge from hurricanes. Although these access drives are vulnerable to flooding, the Project will not place new structures in the floodplain.

CR2 – Plan for sea level rise, erosion, and floods

- Redevelopment may be permitted on or within 100 feet of a coastal bank provided there is no feasible alternative, that there is no increase in impacts to the natural functions of coastal resources, and that the redevelopment is designed to address anticipated sea level rise. The coastal bank on this site is vegetated and is not eroding. All of the buildings and all but a small area of paved parking at the southern extent of the development are located outside of the 100 ft buffer to the coastal bank. The proposed area of pavement, and the proposed stormwater structures located within the 100 ft buffer will not adversely impact the ability of the vegetated coastal bank to provide its natural beneficial functions as a sediment source. The Project’s design addresses sea level rise in siting the buildings at >20' elevations. The redevelopment area is sited in the north and central area of the site (where the higher elevations, between 20 and 30 ft, exist) in a manner to accommodate potential sea level rise, consistent with CR2.

CR3 – Reduce vulnerability of built environment to coastal hazards

- The Project removes existing golf course development in coastal resource areas and avoids or minimizes siting new development in the coastal resource areas on the site, consistent with CR3. The Project also plans to restore or rehabilitate floodplain and restore the ability for coastal resources to migrate naturally through the proposed open space / restoration area.

Wildlife And Plant Habitat

The Wildlife and Plant Habitat Goal of the RPP is to protect, preserve, or restore wildlife and plant habitat to maintain the region's natural diversity

Objectives WPH1, WPH2, WPH4, and WPH5 are applicable, material, and regionally significant.

WPH1 – Maintain existing plant and wildlife populations and species diversity

- As required by WPH1, the Project minimizes clearing of vegetation and altering topography by utilizing existing disturbed areas, clustering the development to the north and center of the site, protecting an approximately 20-acre, contiguous area, and clustering development away from the most sensitive portions of the site.
- The Property contains both managed and unmanaged woodland areas. The woodland areas provide habitat for common plant and wildlife species as documented in the NRI; however, the managed areas provide limited habitat value. Invasive species were also documented on the Property further limiting its already limited habitat value. Although there will likely be temporary disturbance to and displacement of plant and wildlife species present during construction of the Project, the remaining and restored wetland and woodland areas will continue to provide habitat for these species.
- As shown on the plans submitted by the applicant, the Project protects most of the 100' buffers and portions of the 200' buffers to the streams, minimizes fragmentation of wildlife and plant habitat, and protects a riparian wildlife corridor, consistent with WPH1.
- While specimen trees will be removed in the development area, specimen trees in the open space/restoration area will be protected and the landscape and restoration plans include native vegetation to enhance or restore wildlife habitat.
- Consistent with WPH1, the Project avoids development in Key Sites as defined in the State Wildlife Action Plan, and BioMap Core Habitat and Critical Natural Landscapes as defined by the Massachusetts Natural Heritage and Endangered Species Program.

WPH2 – Restore degraded habitats through use of native plant communities

- The applicant has submitted a restoration plan for the currently developed golf course areas. Consistent with WPH2, the restoration plan identifies the nature of the restoration, including grading changes, quantities and types of native species to be planted, plans to ensure establishment, and provides a narrative discussing the purpose and objectives of the restoration, and monitoring. As part of the restoration plan, LMC will restore golf course area or other altered or degraded area on site, as ecologically appropriate under the plan. Consistent with WPH2, this restoration will be completed through the use of native plantings appropriate to the site. To the extent that the restoration plan is modified following review by the Barnstable Conservation Commission, any revised restoration plan will require further review by the Commission in accordance with the terms of the Development Agreement.

WPH4 – Manage invasive species

- Consistent with WPH4, the Project will implement an invasive species management and restoration plan, including construction best management practices, which details the management and, where possible, eradication of the invasive species present, and the proposed revegetation of the site with native species.

WPH5 – Promote best management practices to protect wildlife and plant habitat from the adverse impacts of development

- The redevelopment is clustered in the north central portion of the site within a proposed limit of work that limits the extent of site alteration and disturbance to the minimum areas needed for the project.
- Consistent with Objective WPH5, the Project will use erosion control barriers during construction and LMC has provided an "Environmental Management System Protocol" for use by the General Contractor during construction.

Open Space

The Open Space Goal of the RPP is to conserve, preserve, or enhance a network of open space that contributes to the region's natural and community resources and systems.

Objectives OS1, OS2, and OS3 are applicable, material, and regionally significant.

OS1 – Protect and preserve natural, cultural, and recreational resources

- The Project will cluster the development to site the development close to existing development and minimize the development footprint. The Project will protect and preserve those areas with the highest natural resource value on the site, which are lands adjacent to Stewart's Creek and Joshua's Brook and wildlife corridors, consistent with OS1, by maintaining and/or restoring all portions of the Project Site that are not included within the area to be developed within a contiguous block of open space to allow these areas to return to a more natural state. Most of the redevelopment is sited outside of Natural Areas.
- To preserve the open space that benefits natural and community systems, the Project is providing a landscaped and restored buffer that will maintain at least 350 feet of separation between the proposed buildings and the nearest abutting residential dwellings and will increase the natural buffer to Stewart's Creek and Joshua's Brook. The Project will provide recreational areas, including a proposed walking path through the proposed open space/restoration area, consistent with OS1.

OS2- Maintain or increase the connectivity of open space

- The Project protects open space contiguous to undeveloped lands or protected open space, including wildlife corridors. The Project proposes to establish a recreational trail through the open space for residents, consistent with OS2.

OS3 – Protect or provide open space appropriate to context

- The Project is providing open space according to the Area of Development Impact and Placetype ratios indicated in the RPP Open Space Technical Bulletin. The Project is providing and protecting open space appropriate to context with proposed permanent protection of approximately 20 acres of open space on site, consistent with OS3.

- The open space contains lands with high natural resource value, including buffers to wetlands, connection to existing open space, plant and wildlife habitat, and wildlife corridor, and will benefit natural and community systems through the permanent protection of these resources. The Project will also restore degraded areas on site to a natural state, consistent with OS3.

Transportation

The Transportation Goal of the RPP is to provide and promote a safe, reliable, and multi-modal transportation system

Objectives TR1, TR2, and TR3 are applicable, material, and regionally significant.

TR1 – Improve safety and eliminate hazards for all users of Cape Cod's transportation system

- Based on its Transportation Impact Assessment (TIA) the proposed site driveway meets the minimum safety requirements to provide safe stopping sight distance and has been designed appropriately to meet access management guidance in the Transportation Technical Bulletin.
- The Project will implement appropriate safety improvements based on a detailed analysis of off-site safety impacts of the development and consistent with TR1.

TR2 – Provide and promote a balanced and efficient transportation system that includes healthy transportation options and appropriate connections for all users

- Consistent with TR2, Project includes an internal sidewalk network connecting to Scudder Avenue, installation of secure bicycling parking, and implementation Transportation Demand Management (TDM) best practices.
- The Project will implement off-site multimodal improvements on Scudder Avenue, North Street, Main Street, and at the West End Rotary to improve connectivity and support healthy transportation options.
- The Project's location, with its close proximity to the Hyannis Main Street area and nearby connections to CCRTA transit service on North Street, has the potential to reduce reliance on vehicles and support healthy transportation, consistent with TR2.

TR3 – Provide an efficient and reliable transportation system that will serve the current and future needs of the region and its people

- As conditioned, the Project will mitigate off-site congestion impacts through a combination of fair-share payments and physical improvements that will be made in the area of Scudder Avenue and the West End Rotary, consistent with TR3.

Energy

The Energy Goal of the RPP is to provide an adequate, reliable, and diverse supply of energy to serve the communities and economies of Cape Cod

Objectives EN1, EN2, and EN3 are applicable, material, and regionally significant.

EN1 – Support renewable energy development that is context-sensitive

- The residential buildings will have solar-ready rooftops. If solar panels are not installed prior to occupancy of the buildings, LMC will execute a Power Purchase Agreement or arrangements with Net Metering Credit Purchase Agreement for Renewable Energy Certificates (RECs) to provide 25% of on-site energy usage, consistent with EN1.

EN2 – Increase resiliency of energy generation and delivery

- Consistent with EN2, the Project will support energy delivery resilience with utilities for the residential buildings located underground.

EN3 – Minimize energy consumption through planning and design (including energy efficiency and conservation measures)

- Consistent with the purpose of Objective EN3 to promote energy conservation, the Project's building design will meet "Stretch code" and it will incorporate energy efficient appliances and fixtures. There will also be submetering of electricity in residential units, consistent with EN3.

Climate Mitigation

The Climate Mitigation Goal of the RPP is to support, advance and contribute as a region to the Commonwealth's interim and long-term greenhouse gas reduction goals and initiatives, including a state-wide net zero carbon target by 2050.

Objectives CM1, CM2, CM3, and CM4 are applicable, material, and regionally significant.

CM1 - Promote low or no carbon transportation alternatives and technologies

- Consistent with CM1, the Project provides bicycle sharing, racks, or storage and advances the accommodation of pedestrians, bicyclists, and transit users in the transportation system by including sidewalks, and/or connections to multi-use paths
- The Project incorporates dedicated spaces for EVs and EV charging stations within parking facilities

CM2 – Promote low or no carbon technologies for building energy use, including appliances, lighting, and heating, ventilation, and cooling (HVAC) systems

- The Project includes ground or air source electric heat pumps, in place of fossil fuel HVAC systems, consistent with CM2.
- The Project includes energy efficient appliances and methods to reduce peak-demand electricity usage, consistent with CM2.

CM3 – Promote carbon sequestration and other emissions removal practices and technologies as appropriate to context

- Consistent with CM3, the Project proposes tree planting as part of landscaping plan and restoration of the golf course areas with native vegetation, including trees in appropriate habitat settings.

CM4 – Promote low or no carbon energy generation technologies as appropriate to context

- The Project is EV ready, solar-ready, and commits to the generation or purchase of renewable energy, consistent with CM4.

Town of Barnstable
Planning & Development Department
www.townofbarnstable.us/planninganddevelopment

March 22, 2022

Jordan Velozo, Chief Regulatory Officer
Cape Cod Commission
3225 Main Street
Barnstable, MA 02630

RE: 35 Scudder Avenue (CCC File No. 20065)

In response to the request to comment by the Cape Cod Commission for the Development Agreement application filed by Lennar Multifamily Communities, LLC for a 312 unit multifamily residential development on a portion of the 53.8 acre +/- parcel known as 35 Scudder Avenue in the Village of Hyannis, the Town of Barnstable Planning & Development Department offers the following comments in regard to the project's consistency with the adopted Local Comprehensive Plan and municipal development ordinances.

Consistency with Local Comprehensive Plan

The proposed 312 multifamily residential development in Hyannis as proposed has the potential to align with land use strategies found within the Town's 2010 Local Comprehensive Plan, which seeks to provide additional housing options in downtown Hyannis that could provide multimodal connectivity to the downtown economic center and potentially protect environmentally sensitive areas and preserve undisturbed natural areas.

The proposal, as presented, has the potential to increase typical development density in an area served by municipal sewer that offers diversity and affordability in housing type and opportunity. The proposed use, and its proximity to the economic center of Hyannis, provides an opportunity for added pedestrian traffic and support to the local small business community that maintains its main street character. The proposal also depicts an opportunity to formally enhance environmental protection along portions of the site that currently do not exist today.

While each of these proposed improvements have the potential to align with the 2010 Local Comprehensive Plan, the Town of Barnstable shall further review the project proposal in greater detail and seek to enhance each opportunity during the local permitting process to the greatest extent practicable.

Consistency with Municipal Development Ordinances

The subject property is currently located within the Residential "B" RB zoning district which permits single-family residential dwellings as a by-right principal permitted use. The application as proposed before the Commission locates the project within the Regulatory Agreement District. As such, this Applicant may seek zoning relief through Barnstable General Ordinances, Chapter 168, Regulatory Agreement. In addition, this project would be subject to Barnstable General Ordinances, Chapter 9 Inclusionary Affordable Housing Requirements which requires that for any development consisting of 10 of more units, at least 10% of the residential units constructed shall be dedicated by deed restriction to affordable housing units.

Site Plan Review

Prior to seeking a Regulatory Agreement the Town of Barnstable shall require the Applicant to apply for Site Plan Review. At Site Plan Review the Applicant shall be required to meet with various applicable department staff to better understand the proposal presented, any conflicts with existing regulations and ordinances, and define the path to permitting, if any. The Town of Barnstable shall not comment on the related project's potential impacts at this time and reserve the right for local review upon receipt of an application as well as peer review as defined under M.G.L ch.44 §53G.

Summary

The Town does not take a position on the proposal submitted to the Cape Cod Commission and reserves our right to further comment. We look forward to working with the Applicant, if an application is made locally, to make a positive improvement to the Town of Barnstable.

Sincerely,

Elizabeth S. Jenkins
Director of Planning & Development
Town of Barnstable