STORMWATER REPORT

GREAT OAK ROAD SUBDIVISION
GREAK OAK ROAD
MASHPEE, MA

JANUARY 2024

Owner/Applicant:

NEW SEABURY HOMES, LLC
22 Seanest Drive
Mashpee, MA 02649

BSC Job Number: 50774.00

Prepared by:

BSC GROUP

803 Summer Street
Boston, MA 02127

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SECTION 1.0

PROJECT INFORMATION

1.01 PROJECT DESCRIPTION

New Seabury Homes, LLC (The Applicant) is seeking to subdivide six (6) parcels into seven (7) new lots off Great Oak Road and Red Brook Road in Mashpee, Massachusetts, hereinafter referred to as "the Project". The total property area is approximately 7.48 acres and is located off Great Oak Road and Red Brook Road. The project is bounded on the north by Red Brook Road, on the east by Great Oak Road, and bounded on the south and west by forest and residential properties.

The Project consists of clearing and grubbing approximately 3.9 acres of the property and the construction of a cul-de-sac leading into the proposed subdivided lots. In addition, the existing sixteen (16) foot depression in the southwest portion of the property shall be regraded into an infiltration basin to capture runoff from the site. The seven lots consists of approximately 2.6 acres of the proposed limit of work.

The Project is designed to comply with the Massachusetts Wetland Protection Act (310 CMR 10.00) regulations, the Department of Environmental Protection's (MassDEP) Stormwater Management Standards as well as local regulations, standards, and By Laws.

1.02 PRE-DEVELOPMENT CONDITIONS

The existing site topography generally slopes towards the three (3) depressions on the property, two towards the north and one towards the south with slopes ranging from 0-25%. The current site is comprised of forest and the primary soil classification identified by the NRCS Web Soil Survey is Carver coarse sand (252A), which accounts for the entire property and all of the project area. On October 30, 2023, BSC Group conducted one test pit on the site, the location of which is noted on the Grading and Drainage plan, and the test pit log is attached in Appendix D. The test pit was dug at the lowest elevation of the depression in the southwest portion of the site where the proposed infiltration basin is located. The test pits consisted primarily of loamy sand and coarse sand to a depth of 8-15 feet, generally conforming with the soils mapping. Based on the fill materials found, runoff calculations have been performed using curve numbers corresponding to Hydrologic Soil Group (HSG)A.

The existing site being largely undeveloped has no existing drainage facilities and the majority of the stormwater runoff is directed to the depressions on the property. A small portion of the site discharges to the southeast to Greak Oak Road.

1.03 POST-DEVELOPMENT CONDITIONS

The proposed stormwater management system has been designed in a manner that will meet or exceed the provisions of the Department of Environmental Protection (DEP) Stormwater Management Standards for a new construction project.

Stormwater runoff from a portion of the site (approximately 1.9 acres) will be routed towards the redefined infiltration basin to the southwest. 4.27 acres will continue to be routed toward the depressions in the northern portion of the property, and 1.13 acres will continue to be routed off-site to the existing drainage system on Great Oak Road.

Stormwater runoff from the proposed cul-de-sac will be collected via three (3) deep sump catch basins that are piped toward the infiltration basin, discharging from a flared end section with a rip-rap apron. The infiltration basin provides recharge to groundwater and provides peak flow rate attenuation. In addition, it is designed to completely hold and infiltrate the 100-year, 24-hour storm event.

Specifics of the project's compliance with the Stormwater Standards are discussed in detail in the following sections.

SECTION 2.0

DRAINAGE SUMMARY

2.01 Stormwater Standard 1 – New Stormwater Conveyances

Per Massachusetts Stormwater Management Standard #1, no new outfalls may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. No new untreated stormwater discharges are proposed. Rip-rap outlet protection sizing calculations are included in Section 6.0 of this Report.

2.02 Stormwater Standard 2 – Stormwater Runoff Rates

Watershed modeling was performed using HydroCAD Stormwater Modeling Software version 10.20, a computer aided design program that combines SCS runoff methodology with standard hydraulic calculations. A model of the site's hydrology was developed for both pre- and post-development conditions to assess the effects of the proposed development on the project site and surrounding areas.

Stormwater runoff was modeled using data from the NOAA 14 rainfall atlas. The following rainfall values have been used in our analysis and the NOAA 14 data is included in Appendix E:

Storm Frequency	NOAA 14 Rainfall (Inches)
2-year	3.42
10-year	4.98
25-year	5.96
50-year	6.70
100-year	7.46

The stormwater management system for the project has been designed such that the post-development conditions result in no increase to peak runoff rates off the property for the 2, 10, 25, 50, and 100-year, 24-hour storm events, as detailed in the table below.

Peak Flow Discharge Rates

Node 1R – On-Site Flow

Storm Event	Pre-Development Peak Discharge Rate (cfs)	Post-Development Peak Discharge Rate (cfs)	Change in Peak Discharge Rate (cfs)
2-Year	0.00	0.00	0.00
10-Year	0.09	0.04	-0.05
25-Year	0.39	0.21	-0.18
50-Year	1.00	0.48	-0.52
100-Year	1.87	0.92	-0.95

Node 2R – Off-Site Flow

Storm Event	Pre-Development Peak Discharge Rate (cfs)	Post-Development Peak Discharge Rate (cfs)	Change in Peak Discharge Rate (cfs)
2-Year	0.00	0.00	0.00
10-Year	0.02	0.01	-0.01
25-Year	0.07	0.06	-0.01
50-Year	0.18	0.15	-0.03
100-Year	0.33	0.28	-0.05

Node TS – Total Flows

Storm Event	Pre-Development Peak Discharge Rate (cfs)	Post-Development Peak Discharge Rate (cfs)	Change in Peak Discharge Rate (cfs)
2-Year	0.00	0.00	0.00
10-Year	0.10	0.05	-0.05
25-Year	0.44	0.24	-0.20
50-Year	1.16	0.58	-0.58
100-Year	2.18	1.06	-1.12

2.03 Stormwater Standard 3 – Groundwater Recharge

Groundwater recharge is provided on site via an infiltration basin located in the southwest portion of the property. Overall, the project will result in no loss of annual recharge to groundwater as required by Standard 3. Refer to Section 6.0 of this Report for groundwater recharge information.

2.04 Stormwater Standard 4 – TSS Removal

As a new development, the Project stormwater management system will achieve a TSS removal greater than 80%. The proposed stormwater management system has been designed to provide treatment of runoff in order to reduce suspended solids prior to discharge off-site through the implementation of the following best management practices:

- Deep Sump Hooded Catch Basins
- Infiltration Basin

The water quality volume is defined as the runoff volume requiring TSS Removal for the site and is equal to 0.5-inches of runoff over the total impervious area of the post-development site. The required water quality volume for the project is provided in Section 6.0 of this Report.

The infiltration basin has been sized to treat the required water quality volume and calculations are included in Section 6.0 of this Report.

A long-term pollution prevention plan complying with the requirements of Standard 4 is included in Section 4.0 of this Report.

2.05 Stormwater Standard 5 – Land Uses with Higher Potential Pollutant Loads

This standard is not applicable as the project site is not a land use with higher potential pollutant loads (LUHPPL).

2.06 Stormwater Standard 6 – Stormwater Discharges to a Critical Area

This standard is not applicable as runoff from the project site does not discharge to a critical area.

2.07 Stormwater Standard 7 – Redevelopment Projects

This project is a new development and therefore has been designed to fully comply with the Stormwater Management Standards.

2.08 Stormwater Standard 8 – Sedimentation and Erosion Control Plan

Erosion and sedimentation controls are shown on the Project Plans. Additionally, a Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan is included in Section 3.0 of this Report.

2.09 Stormwater Standard 9 – Long Term Operation and Maintenance Plan

A Long-Term Operation and Maintenance Plan is included in Section 4.0 of this Report.

2.10 Stormwater Standard 10 – Illicit Discharges

There are no known illicit discharges on the project site, and none are proposed. An illicit discharge compliance statement is included in Section 6.0 and will be signed by the Applicant prior to issuance of any permits.

2.11 Conclusion

The project has been designed in accordance with DEP Stormwater Management Standards. Through the construction of the aforementioned stormwater systems, the project will provide peak rate attenuation, TSS removal and groundwater recharge.

SECTION 3.0

CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN

3.0 CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN

This Section specifies requirements and suggestions for implementation of a Stormwater Pollution Prevention Plan (SWPPP) for Great Oak Road Subdivision**, in Mashpee, Massachusetts**. The SWPPP shall be provided and maintained on-site by the Contractor(s) during all construction activities. The SWPPP shall be updated as required to reflect changes to construction activity.

The stormwater pollution prevention measures contained in the SWPPP shall be at least the minimum required by Local Regulations. The Contractor shall provide additional measures to prevent pollution from stormwater discharges in compliance with the National Pollution Discharge Elimination System (NPDES) Phase II permit requirements and all other local, state and federal requirements.

The SWPPP shall include provisions for, but not be limited to, the following:

1. Construction Trailers
2. Lay-down Areas
3. Equipment Storage Areas
4. Stockpile Areas
5. Disturbed Areas

The Contractor shall NOT begin construction without submitting evidence that a NPDES Notice of Intent (NOI) governing the discharge of stormwater from the construction site for the entire construction period has been filed **at least fourteen (14) days prior to construction**. It is the Contractor's responsibility to complete and file the NOI, unless otherwise determined by the project team.

The cost of any fines, construction delays and remedial actions resulting from the Contractor's failure to comply with all provisions of local regulations and Federal NPDES permit requirements shall be paid for by the Contractor at no additional cost to the Owner.

As a requirement of the EPA's NPDES permitting program, each Contractor and Subcontractor responsible for implementing and maintaining stormwater Best Management Practices shall execute a Contractor's Certification form.

Erosion and Sedimentation Control

The Contractor shall be solely responsible for erosion and sedimentation control at the site. The Contractor shall utilize a system of operations and all necessary erosion and sedimentation control measures, even if not specified herein or elsewhere, to minimize erosion damage at the site to prevent the migration of sediment into environmentally sensitive areas. Environmentally sensitive areas include all wetland resource areas within, and downstream of, the site, and those areas of the site that are not being altered.

Erosion and sedimentation control shall be in accordance with this Section, the design drawings, and the following:

- "National Pollutant Discharge Elimination System General Permit for Discharges from Construction Activities (EPA Construction General Permit February 16, 2017).
- Massachusetts Stormwater Management Policy Handbook issued by the Massachusetts Department of Environmental Protection, January 2008.
- Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, A Guide for Planners, Designers and Municipal Officials, March 1997.

The BMP's presented herein should be used as a guide for erosion and sedimentation control and are not intended to be considered specifications for construction. The most important BMP is maintaining a rapid

construction process, resulting in prompt stabilization of surfaces, thereby reducing erosion potential. Given the primacy of rapid construction, these guidelines have been designed to allow construction to progress with essentially no hindrance by the erosion control methods prescribed. These guidelines have also been designed with sufficient flexibility to allow the Contractor to modify the suggested methods as required to suit seasonal, atmospheric, and site-specific physical constraints.

Another important BMP is the prevention of concentrated water flow. Sheet flow does not have the erosive potential of a concentrated rivulet. These guidelines recommend construction methods that allow localized erosion control and a system of construction, which inhibits the development of shallow concentrated flow. These BMP's shall be maintained throughout the construction process.

CONTACT INFORMATION AND RESPONSIBLE PARTIES

The following is a list of all project-associated parties:

Owner
New Seabury Homes, LLC
22 Seanest Drive
Mashpee, MA 02649

Contractor
To be determined

Environmental Consultant
BSC Group, Inc.
803 Summer Street
Boston, MA 02127

Contact: Brian Yergatian, P.E.
Phone: (617) 896–4590
Email: byergatian@bscgroup.com

Qualified SWPPP Inspectors
To Be Determined

3.1 Procedural Conditions of the Construction General Permit (CGP)

The following list outlines the Stormwater Responsibilities for all construction operators working on the Project. The operators below agree through a cooperative agreement to abide by the following conditions throughout the duration of the construction project, effective the date of signature of the required SWPPP. These conditions apply to all operators on the project site.

The project is subject to EPA's NPDES General Permit through the CGP. The goal of this permit is to prevent the discharge of pollutants associated with construction activity from entering the existing and proposed storm drain system or surface waters.

All contractors/operators involved in clearing, grading and excavation construction activities must sign the appropriate certification statement required, which will remain with the SWPPP. The owner must also sign a certification, which is to remain with the SWPPP in accordance with the signatory requirements of the SWPPP.

Once the SWPPP is finalized, a signed copy, plus supporting documents, must be held at the project site during construction. A copy must remain available to EPA, State and Local agencies, and other interested parties during normal business hours.

The following items associated with this SWPPP must be posted in a prominent place at the construction site until final stabilization has been achieved:

- The completed/submitted NOI form
- Location where the public can view the SWPPP during normal business hours
- A copy of the signed/submitted NOI, permit number issued by the EPA and a copy of the current CGP.

Project specific SWPPP documents are not submitted to the US EPA unless the agency specifically requests a copy for review. SWPPP documents requested by a permitting authority, the permitee(s) will submit it in a timely manner.

EPA inspectors will be allowed free and unrestricted access to the project site and all related documentation and records kept under the conditions of the permit.

The permitee is expected to keep all BMP's and Stormwater controls operating correctly and maintained regularly.

Any additions to the project which will significantly change the anticipated discharges of pollutants, must be reported to the EPA. The EPA should also be notified in advance of any anticipated events of noncompliance. The permitee must also orally inform the EPA of any discharge, which may endanger health or the environment within 24 hours, with a written report following within 5 days.

In maintaining the SWPPP, all records and supporting documents will be compiled together in an orderly fashion. Inspection reports and amendments to the SWPPP must remain with the document. Federal regulations require permitee(s) to keep their Project Specific SWPPP and all reports and documents for at least three (3) years after the project is complete.

3.2 Existing Site and Soil Conditions

The existing site topography generally slopes towards the three (3) depressions on the property, two towards the north and one towards the south with slopes ranging from 0-25%. The current site is comprised of forest and the primary soil classification identified by the NRCS Web Soil Survey is Carver coarse sand (252A), which accounts for the entire property and all the project area. On October 30, 2023, BSC Group conducted one test pit on the site, the locations of which are noted on the Grading and Drainage plan, and the test pit log is attached in Appendix D. The test pit was dug at the lowest elevation of the depression in the southwest portion of the site where the proposed infiltration basin is located. The test pits consisted primarily of loamy sand and coarse sand to a depth of 8-15 feet generally conforming with the soils mapping. Based on the fill materials found, runoff calculations have been performed using curve numbers corresponding to Hydrologic Soil Group (HSG)A.

The existing site being largely undeveloped has no existing drainage facilities and the majority of the stormwater runoff is directed to the depressions on the property. A small portion of the site discharges to the southeast to Greak Oak Road.

3.3 Project Description and Intended Construction Sequence

The site is currently comprised of woods. The proposed activities will include the following major components:

- The construction of the cul-de-sac
- Site grading, and

- Utility connections and installation.

The proposed project will disturb a total of approximately 170,304± S.F. (3.91± acres).

Soil disturbing activities will include site demolition, installing stabilized construction exits, installation of erosion and sedimentation controls, grading, storm drain inlets, utilities, construction of site driveways and preparation for final landscaping. Please refer to Table 1 for the projects anticipated construction timetable. A description of BMP's associated with project timetable and construction-phasing elements is provided in this Erosion and Sediment Control Plan.

Table 1 – Anticipated Construction Timetable

Construction Phasing Activity	Anticipated Timetable
Grubbing and Stripping of Limits of Construction Phase	To be determined
Rough Site Grading and Site Utilities	To be determined
Utility Plan Construction	To be determined
Landscaping	To be determined
Construction Phase	

3.4 Potential Sources of Pollution

Any project site activities that have the potential to add pollutants to runoff are subject to the requirements of the SWPPP. Listed below are a description of potential sources of pollution from both sedimentation to Stormwater runoff, and pollutants from sources other than sedimentation.

Table 2 – Potential Sources of Sediment to Stormwater Runoff

Potential Source	Activities/Comments
Construction Site Entrance and Site Vehicles	Vehicles leaving the site can track soils onto public roadways. Site Vehicles can readily transport exposed soils throughout the site and off-site areas.
Grading Operations	Exposed soils have the potential for erosion and discharge of sediment to off-site areas.
Material Excavation, Relocation, and Stockpiling	Stockpiling of materials during excavation and relocation of soils can contribute to erosion and sedimentation. In addition, fugitive dust from stockpiled material, vehicle transport and site grading can be deposited in wetlands and waterway.
Landscaping Operations	Landscaping operations specifically associated with exposed soils can contribute to erosion and sedimentation. Hydroseeding, if not properly applied, can runoff to adjacent wetlands and waterways.

Table 3 – Potential Pollutants and Sources, other than Sediment to Stormwater Runoff

Potential Source	Activities/Comments
Staging Areas and Construction Vehicles	Vehicle refueling, minor equipment maintenance, sanitary facilities and hazardous waste storage
Materials Storage Area	General building materials, solvents, adhesives, paving materials, paints, aggregates, trash, etc.
Construction Activities	Construction, paving, curb/gutter installation, concrete pouring/mortar/stucco

3.5 Erosion and Sedimentation Control Best Management Practices

All construction activities will implement Best Management Practices (BMP's) in order to minimize overall site disturbance and impacts to the sites natural features. Please refer to the following sections for a detailed description of site specific BMP's. In addition, an Erosion and Sedimentation Control Plan is provided in the Site Plans.

3.6 Timetable and Construction Phasing

This section provides the Owner and Contractor with a suggested order of construction that shall minimize erosion and the transport of sediments. The individual objectives of the construction techniques described herein shall be considered an integral component of the project design intent of each project phase. The construction sequence is not intended to prescribe definitive construction methods and should not be interpreted as a construction specification document. However, the Contractor shall follow the general construction phase principles provided below:

- Protect and maintain existing vegetation wherever possible.
- Minimize the area of disturbance.
- To the extent possible, route unpolluted flows around disturbed areas.
- Install mitigation devices as early as possible.
- Minimize the time disturbed areas are left unstabilized.
- Maintain siltation control devices in proper condition.
- The contractor should use the suggested sequence and techniques as a general guide and modify the suggested methods and procedures as required to best suit seasonal, atmospheric, and site specific physical constraints for the purpose of minimizing the environmental impact of construction.

Demolition, Grubbing and Stripping of Limits of Construction Phase

- Install Temporary Erosion Control (TEC) devices as required to prevent sediment transport into resource areas.
- Place a ring of silt socks and/or strawbales around stockpiles.
- Stabilize all exposed surfaces that will not be under immediate construction.
- Store and/or dispose all pavement and building demolition debris as indicated in accordance with all applicable local, state, and federal regulations.

Driveway Area Sub-Base Construction

- Install temporary culverts and diversion ditches and additional TEC devices as required by individual construction area constraints to direct potential runoff toward detention areas designated for the current construction phase.
- Compact gravel as work progresses to control erosion potential.
- Apply water to control air suspension of dust.
- Avoid creating an erosive condition due to over-watering.
- Install piped utility systems as required as work progresses, keeping all inlets sealed until all downstream drainage system components are functional.

Binder Construction

- Fine grade gravel base and install processed gravel to the design grades.
- Compact pavement base as work progresses.
- Install pavement binder coat starting from the downhill end of the site and work toward the top.

Finish Paving

- Repair and stabilize damaged side slopes.
- Clean inverts of drainage structures.
- Install final top coat of pavement.

Final Clean-up

- Clean inverts of culverts and catch basins.
- Remove sediment and debris from rip-rap outlet areas.
- Remove TEC devices only after permanent vegetation and erosion control has been fully established.

3.7 Site Stabilization

Grubbing Stripping and Grading

- Erosion control devices shall be in place as shown on the design plans before grading commences.
- Stripping shall be done in a manner, which will not concentrate runoff. If precipitation is expected, earthen berms shall be constructed around the area being stripped, with a silt sock, silt fence or haybale dike situated in an arc at the low point of the berm.
- If intense precipitation is anticipated, silt socks, strawbales, dikes and /or silt fences shall be used as required to prevent erosion and sediment transport. The materials required shall be stored on site at all time.
- If water is required for soil compaction, it shall be added in a uniform manner that does not allow excess water to flow off the area being compacted.
- Dust shall be held at a minimum by sprinkling exposed soil with an appropriate amount of water.

Maintenance of Disturbed Surfaces

- Runoff shall be diverted from disturbed side slopes in both cut and fill.
- Mulching may be used for temporary stabilization.
- Silt sock, haybale or silt fences shall be set where required to trap products of erosion and shall be maintained on a continuing basis during the construction process.

Loaming and Seeding

- Loam shall not be placed unless it is to be seeded directly thereafter.
- All disturbed areas shall have a minimum of 4" of loam placed before seeded and mulched.
- Consideration shall be given to hydro-mulching, especially on slopes in excess of 3 to 1.
- Loamed and seeded slopes shall be protected from washout by mulching or other acceptable slope protection until vegetation begins to grow.

Stormwater Collection System Installation

- The Stormwater drainage system shall be installed from the downstream end up and in a manner which will not allow runoff from disturbed areas to enter pipes.
- Excavation for the drainage system shall not be left open when rainfall is expected overnight. If left open under other circumstances, pipe ends shall be closed by a staked board or by an equivalent method.
- All catch basin openings shall be covered by a silt bag between the grate and the frame or protected from sediment by silt fence surrounding the catch basin grate.

Completion of Paved Areas

- During the placement of sub-base and pavement, the entrance to the Stormwater drainage systems shall be sealed when rain is expected. When these entrances are closed, consideration must be given to the direction of run-off and measures shall be undertaken to minimize erosion and to provide for the collection of sediment.
- In some situations, it may be necessary to keep catch basins open.
- Appropriate arrangements shall be made downstream to remove all sediment deposition.

Stabilization of Surfaces

- Stabilization of surfaces includes the placement of pavement, rip-rap, wood bark mulch and the establishment of vegetated surfaces.
- Upon completion of construction, all surfaces shall be stabilized even though it is apparent that future construction efforts will cause their disturbance.
- Vegetated cover shall be established during the proper growing season and shall be enhanced by soil adjustment for proper pH, nutrients and moisture content.
- Surfaces that are disturbed by erosion processes or vandalism shall be stabilized as soon as possible.
- Areas where construction activities have permanently or temporarily ceased shall be stabilized within 14 days from the last construction activity, except when construction activity will resume within 21 days (e.g., the total time period that construction activity is temporarily ceased is less than 21 days).
- Hydro-mulching of grass surfaces is recommended, especially if seeding of the surfaces is required outside the normal growing season.
- Hay mulch is an effective method of temporarily stabilizing surfaces, but only if it is properly secured by branches, weighted snow fences or weighted chicken wire.

3.8 Temporary Structural Erosion Control Measures

Temporary erosion control measures serve to minimize construction-associated impacts to wetland resource and undisturbed areas. Please refer to the following sections for a description of temporary erosion control measures implemented as part of the project and this sample SWPPP.

3.8.1 Silt Socks, Strawbales, and Silt Fencing

The siltation barriers will demarcate the limit of work, form a work envelope and provide additional assurance that construction equipment will not enter the adjacent wetlands or undisturbed portions of the site. All barriers will remain in place until disturbed areas are stabilized.

3.8.2 Temporary Stormwater Diversion Swale

A temporary diversion swale is an effective practice for temporarily diverting stormwater flows and to reduce stormwater runoff velocities during storm events. The swale channel can be installed before infrastructure construction begins at the site, or as needed throughout the construction process. The diversion swale should be routinely compacted or seeded to minimize the amount of exposed soil.

3.8.3 Dewatering Basins

Dewatering may be required during stormwater system, foundation construction and utility installation. Should the need for dewatering arise, groundwater will be pumped directly into a temporary settling basin, which will act as a sediment trap during construction. All temporary settling basins will be located within close proximity of daily work activities. Prior to discharge, all groundwater will be treated by means of the settling basin or acceptable substitute. Discharges from sediment basins will be free of visible floating, suspended and settleable solids that would impair the functions of a wetland or degrade the chemical

composition of the wetland resource area receiving ground or surface water flows and will be to the combined system.

3.8.4 Material Stockpiling Locations

Piping and trench excavate associated with the subsurface utility work will be contained with a single row of silt socks and/or strawbales.

3.9 Permanent Structural Erosion Control Measures

Permanent erosion control measures serve to minimize post-construction impacts to wetland resource areas and undisturbed areas. Please refer to the Site Plans and Long-Term Operations and Maintenance Plan for a description of permanent erosion control measures implemented as part of the project and this SWPPP.

3.10 Good Housekeeping Best Management Practices

3.10.1 Street Sweeping

Great Oak Road in front of the project property shall be swept clean on a daily basis of any soils tracked onto it from the project site. All sweepings shall be disposed of off-site in accordance with all applicable laws and regulations.

3.10.2 Material Handling and Waste Management

Solid waste generation during the construction period will be primarily construction debris. The debris will include scrap lumber (used forming and shoring pallets and other shipping containers), waste packaging materials (plastic sheeting and cardboard), scrap cable and wire, roll-off containers (or dumpsters) and will be removed by a contract hauler to a properly licensed landfill. The roll-off containers will be covered with a properly secured tarp before the hauler exits the site. In addition to construction debris, the construction work force will generate some amount of household-type wastes (food packing, soft drink containers, and other paper). Trash containers for these wastes will be located around the site and will be emptied regularly so as to prevent wind-blown litter. This waste will also be removed by a contract hauler.

All hazardous waste material such as oil filters, petroleum products, paint and equipment maintenance fluids will be stored in structurally sound and sealed shipping containers in the hazardous-materials storage area and segregated from other non-waste materials. Secondary containment will be provided for all materials in the hazardous materials storage area and will consist of commercially available spill pallets. Additionally, all hazardous materials will be disposed of in accordance with federal, state and municipal regulations.

Two temporary sanitary facilities (portable toilets) will be provided at the site in the combined staging area. The toilets will be away from a concentrated flow path and traffic flow and will have collection pans underneath as secondary treatment. All sanitary waste will be collected from an approved party at a minimum of three times per week.

3.10.3 Building Material Staging Areas

Construction equipment and maintenance materials will be stored at the combined staging area and materials storage areas. Silt fence will be installed around the perimeter to designate the staging and materials storage area. A watertight shipping container will be used to store hand tools, small parts and other construction materials.

Non-hazardous building materials such as packaging material (wood, plastic and glass) and construction scrap material (brick, wood, steel, metal scraps, and pine cuttings) will be stored in a separate covered storage facility adjacent to other stored materials. All hazardous-waste materials such as oil filters,

petroleum products, paint and equipment maintenance fluids will be stored in structurally sound and sealed containers under cover within the hazardous materials storage area.

Large items such as framing materials and stockpiled lumber will be stored in the open storage area. Such materials will be elevated on wood blocks to minimize contact with runoff.

The combined storage areas are expected to remain clean, well-organized and equipped with ample cleaning supplies as appropriate for the materials being stored. Perimeter controls such as containment structures, covers and liners will be repaired or replaced as necessary to maintain proper function.

3.10.4 Designated Washout Areas

Designated temporary, below-ground concrete washout areas will be constructed, as required, to minimize the pollution potential associated with concrete, paint, stucco, mixers etc. Signs will, if required, be posted marking the location of the washout area to ensure that concrete equipment operators use the proper facility. Concrete pours will not be conducted during or before an anticipated precipitation event. All excess concrete and concrete washout slurries from the concrete mixer trucks and chutes will be discharged to the washout area or hauled off-site for disposal.

3.10.5 Equipment/Vehicle Maintenance and Fueling Areas

Several types of vehicles and equipment will be used on-site throughout the project including graders, scrapers, excavators, loaders, paving equipment, rollers, trucks and trailers, backhoes and forklifts. All major equipment/vehicle fueling and maintenance will be performed off-site. A small, 20-gallon pickup bed fuel tank will be kept on-site in the combined staging area. When vehicle fueling must occur on-site, the fueling activity will occur in the staging area. Only minor equipment maintenance will occur on-site. All equipment fluids generated from maintenance activities will be disposed of into designated drums stored on spill pallets. Absorbent, spill-cleanup materials and spill kits will be available at the combined staging and materials storage area. Drip pans will be placed under all equipment receiving maintenance and vehicles and equipment parked overnight.

3.10.6 Equipment/Vehicle Wash down Area

All equipment and vehicle washing will be performed off-site.

3.10.7 Spill Prevention Plan

A spill containment kit will be kept on-site in the Contractor's trailer and/or the designated staging area throughout the duration of construction. Should there be an accidental release of petroleum product into a resource area, the appropriate agencies will be immediately notified.

3.10.8 Inspections

Maintenance of existing and proposed BMP's to address stormwater management facilities during construction is an on-going process. The purpose of the inspections is to observe all sources of stormwater or non-stormwater discharge as identified in the SWPPP as well as the status of the receiving waters and fulfill the requirements of the Order of Conditions. The following sections describe the appropriate inspection measures to adequately implement the project's SWPPP. A blank inspection form is provided at the end of this section. Completed inspection forms are to be maintained on site.

Inspection Personnel

The owner's appointed representative will be responsible for performing regular inspections of erosion controls and ordering repairs as necessary.

Inspection Frequency

Inspections will be performed by qualified personnel once every 7 days, in accordance with the CGP. The inspections must be documented on the inspection form provided at the end of this section, and completed forms will be provided to the on-site supervisor and maintained at the Owner's office throughout the entire duration of construction.

Inspection Reporting

Each inspection report will summarize the scope of the inspection, name(s) and qualifications of personnel making the inspection, and major observations relating to the implementation of the SWPPP, including compliance and non-compliance items. Completed inspection reports will remain with the completed SWPPP on site.

3.10.9 Amendment Requirements

The final SWPPP is intended to be a working document that is utilized regularly on the construction site, and provides guidance to the Contractor. It must reflect changes made to the originally proposed plan and will be updated to include project specific activities and ensure that they are in compliance with the NPDES General Permit and state and local laws and regulations. It should be amended whenever there is a change in design, construction, operation or maintenance that affects discharge of pollutants. The following items should be addressed should an amendment to the SWPPP occur:

- Dates of certain construction activities such as major grading activities, clearing and initiation of and completion of stabilization measures should be recorded.
- Future amendments to the SWPPP will be recorded as required. As this SWPPP is amended, all amendments will be kept on site and made part of the SWPPP.
- Upon completion of site stabilization (completed as designed and/or 70% background vegetative cover), it can be documented and marked on the plans. Inspections are no longer required at this time.
- Inspections often identify areas not included in the original SWPPP, which will require the SWPPP to be amended. These updates should be made within seven days of being recognized by the inspector.

3.11 SWPPP Inspection and Maintenance Report

The following form is an example to be used for SWPPP Inspection Reporting.

Stormwater Construction Site Inspection and Maintenance Report

TO BE COMPLETED AT LEAST EVERY 7 DAYS. AFTER SITE STABILIZATION, TO BE COMPLETED AT LEAST ONCE PER MONTH FOR THREE YEARS OR UNTIL A NOTICE OF TERMINATION IS FILED (IF APPLICABLE).

General Information			
Project Name	Great Oak Road Subdivision		
NPDES Tracking No. (if applicable)		**Location**	Great Oak Road Mashpee, MA
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications			
Describe present phase of construction			
Type of Inspection: ❑ Regular ❑ Pre-storm event ❑ During storm event ❑ Post-storm event			
Weather Information			
Has there been a storm event since the last inspection? ❑Yes ❑No **If yes, provide:** Storm Start Date & Time: Storm Duration (hrs): Approximate Amount of Precipitation (in):			
Weather at time of this inspection? ❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds ❑ Other: Temperature:			
Have any discharges occurred since the last inspection? ❑Yes ❑No **If yes, describe:**			
Are there any discharges at the time of inspection? ❑Yes ❑No **If yes, describe:**			

Site-specific BMPs

- *Number the structural and non-structural BMPs identified in your SWPPP on your site map and list them below (add as many BMPs as necessary). Carry a copy of the numbered site map with you during your inspections. This list will ensure that you are inspecting all required BMPs at your site.*
- *Describe corrective actions initiated, date completed, and note the person that completed the work in the Corrective Action Log.*

	BMP	**BMP Installed?**	**BMP Maintenance Required?**	**Corrective Action Needed and Notes Action required by whom and when**
1	Catch Basin Protection	❑Yes ❑No	❑Yes ❑No	

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes Action required by whom and when
2	Haybale & Silt Fencing	❑Yes ❑No	❑Yes ❑No	
3	Straw Wattles	❑Yes ❑No	❑Yes ❑No	
4	Construction Entrance	❑Yes ❑No	❑Yes ❑No	
5	Sediment Basins	❑Yes ❑No	❑Yes ❑No	
6	Dewatering Pit	❑Yes ❑No	❑Yes ❑No	
7		❑Yes ❑No	❑Yes ❑No	

Overall Site Issues

Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes Action required by whom and when
1	Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No	
2	Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No	
3	Are perimeter controls and sediment barriers adequately installed	❑Yes ❑No	❑Yes ❑No	

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes Action required by whom and when
	(keyed into substrate) and maintained?			
4	Are discharge points and receiving waters free of any sediment deposits?	❑Yes ❑No	❑Yes ❑No	
5	Are storm drain inlets properly protected?	❑Yes ❑No	❑Yes ❑No	
6	Is the construction exit preventing sediment from being tracked into the street?	❑Yes ❑No	❑Yes ❑No	
7	Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No	
8	Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	❑Yes ❑No	❑Yes ❑No	
9	Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No	Vehicle Maintenance not allowed on site
10	Are materials that are potential stormwater contaminants stored inside or under cover?	❑Yes ❑No	❑Yes ❑No	
11	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No	
12	(Other)	❑Yes ❑No	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance not described above:

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title: _____
(Qualified Person Performing the Inspection)

Signature:_____ **Date:** _____

Print name and title: _____
(Contractor/Operator)

Signature:_____ **Date:**_____

SECTION 4.0

LONG-TERM POLLUTION PREVENTION & OPERATION AND MAINTENANCE PLAN

4.0 LONG-TERM POLLUTION PREVENTION & OPERATION AND MAINTENANCE PLAN

As required by Standard #4 of the Stormwater Management Policy, this Long-Term Pollution Prevention Plan has been developed for source control and pollution prevention at the site after construction.

MAINTENANCE RESPONSIBILITY

Ensuring that the provisions of the Long-Term Pollution Prevention Plan are followed will be the responsibility of The Applicant, New Seabury Homes, LLC.

GOOD HOUSEKEEPING PRACTICES

The site to be kept clean of trash and debris at all times. Trash, junk, etc. is not to be left outside.

VEHICLE WASHING CONTROLS

The following BMP's, or equivalent measures, methods or practices are required if you are engaged in vehicle washing and/or steam cleaning:

It is allowable to rinse down the body or a vehicle, including the bed of a truck, with just water without doing any wash water control BMP's.

If you wash (with mild detergents) on an area that infiltrates water, such as gravel, grass, or loose soil, it is acceptable to let the wash water infiltrate as long as you only wash the body of vehicles.

However, if you wash on a paved area and use detergents or other cleansers, or if you wash/rinse the engine compartment or the underside of vehicles, you must take the vehicles to a commercial vehicle wash.

REQUIREMENTS FOR ROUTINE INSPECTIONS AND MAINTENANCE OF STORMWATER BMPS

All stormwater BMPs are to be inspected and maintain as follows;

Strawbales, Silt Fence, and other temporary measures

The temporary erosion control measures will be installed up gradient of any wetland resource area where any disturbance or alteration might otherwise allow for erosion or sedimentation. They will be regularly inspected to ensure that they are functioning adequately. Additional supplies of these temporary measures will be stockpiled on site for any immediate needs or routine replacement.

Deep Sump Hooded Catch Basins

Regular maintenance is essential. Catch basins remain effective at removing pollutants only if they are cleaned out frequently. Inspect or clean basins at least four times per year and at the end of the foliage and snow removal seasons. Sediments must also be removed four times per year or whenever the depth of the deposits in the catch basin sump is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.

Infiltration Basin

Maintenance is required for the proper operation of the infiltration basin. Infiltration basins are prone to failure due to clogging if the upstream catch basins are not maintained. The use of pretreatment BMPs will minimize failure and maintenance requirements.

After construction, the infiltration basin shall be inspected after every major storm for the first few months to ensure proper stabilization and function, take note of the level of standing water. Once the performance characteristics of the infiltration have been verified, the monitoring schedule can be reduced to a bi-annual basis. The basin shall be inspected for the following: signs of differential settlement, cracking, erosion, leakage in the embankments, tree growth in the embankments, condition of riprap, sediment accumulation, and the health of the turf.

Preventive maintenance on the infiltration basin shall be performed at least twice a year, and sediment shall be removed from the basin as necessary once the floor is thoroughly dry. Additional maintenance of the basin includes mowing the side slopes and basin bottom and removing grass clippings and accumulated organic matter twice a year. Pretreatment devices shall be inspected and cleaned twice a year as well, ideally every other month.

Pipe Outlet Protection

The outlet protection should be checked at least annually and after every major storm. If the rip-rap has been displaced, undermined or damaged, it should be repaired immediately. The channel immediately below the outlet should be checked to see that erosion is not occurring. The downstream channel should be kept clear of obstructions such as fallen trees, debris, and sediment that could change flow patterns and/or tailwater depths on the pipes. Repairs must be carried out immediately to avoid additional damage to the outlet protection apron.

PROVISIONS FOR MAINTENANCE OF LAWNS, GARDENS AND OTHER LANDSCAPE AREAS

Suggested Maintenance Operations

A. Trees and Shrubs

Disease and Pest Management - Prevention of disease or infestation is the first step of Pest Management. A plant that is in overall good health is far less susceptible to disease. Good general landscape maintenance can reduce problems from disease.

Inspections of plant materials for signs of disease or infestation are to be performed monthly by the Landscape Maintenance Contractor's Certified Arborist. This is a critical step for early diagnosis. Trees and Shrubs that have been diagnosed to have a plant disease or an infestation of insect pests are to be treated promptly with an appropriate material by a licensed applicator.

Fertilization - Trees and shrubs live outside their natural environment and should be given proper care to maintain health and vigor. Fertilizing trees and shrubs provides the plants with nutrients needed to resist insect attack, to resist drought and to grow thicker foliage. Fertilizing of new and old trees may be done in one of three ways, in either the early spring or the late fall.

- Systemic Injection of new and existing trees on trees 2 inches or greater in diameter. You must be licensed to apply this method.
- Soil Injection – a liquid fertilizer with a product such as Arbor Green or Rapid Grow injected into the soil under the drip zone of a tree or shrub. Material must be used according to manufacturers' specifications to be effective. Outside contracting is recommended.
- Punch Bar Method – a dry fertilizer such as 10-10-10, may be used by punched holes in the drip zone of the tree 12-18" deep, two feet apart around the circumference, to the edge of the drip line. Three pounds of fertilizer should be used per diameter inch for trees with trunks six inches or more in diameter.
- Fertilizer of shrubs – use a fertilizer such as 10-10-10, broadcast over the planting area according to the manufacturers' rate and water in.
- All fertilization must be noted on daily maintenance log.

Watering - Trees and Shrubs will need supplemental watering to remain in vigorous health. All new plants need to be watered once a week in cool weather, twice a week during warm weather, and up to three times in a week during periods of extreme heat and drought. Trees and shrubs should be watered in such a manner as to totally saturate the soil in the root zone area. Over-watering or constant saturation of the soil must be avoided as this could lead to root rot and other disease problems. The use of a soil moisture meter can help you monitor the soil's water intake.

Plant Replacement - Unhealthy plants that may cause widespread infestation of other nearby plants shall be immediately removed from the site. Any vegetation removed from the site must be recorded and submitted with the

daily maintenance log. The area shall be treated to prevent further infestation. The plant shall then be replaced with a healthy specimen of the same species and size. This work shall have a pre-established budget allowance for the year.

A spring inspection of all plant materials shall be performed to identify those plant materials that are not in vigorously healthy condition. Unhealthy plant materials shall be evaluated. If the problem is determined to be minor the plant material shall be given appropriate restorative care in accordance with this maintenance guideline until it is restored to a vigorously healthy condition. Unhealthy plant materials that do not respond to restorative care or are determined to be beyond saving shall be replaced with a healthy specimen of the same species and size. In the case of the necessity of replacing extremely large plant materials the Landscape Architect shall determine the size of the replacement plant.

Pruning - Proper pruning is the selective removal of branches without changing the plant's natural appearance, or habit of growth. All tree pruning is to be performed by a licensed Arborist. All branches that are dead, broken, scared or crossing should be removed. All cuts should be made at the collar and not cut flush with the base.

Pruning on the site shall be done for the following purposes;

- To maintain or reduce the size of a tree or shrub
- To remove dead, diseased or damaged branches
- To rejuvenate old shrubs and encourage new growth
- To stimulate future flower and fruit development
- To maximize the visibility of twig color
- To prevent damage and reduce hazards to people and properties

All shrubs are recommended to be pruned on an annual basis to prevent the shrub from becoming overgrown and eliminate the need for drastic pruning. There are several types of pruning for deciduous shrubs. Hand snips should be used to maintain a more natural look or hand shears can be used for a more formal appearance.

Winter Protection - All trees and shrubs are to be watered, fertilized, and mulched before the first frost. All stakes should be checked and ties adjusted. Damaged branches should be pruned.

Broadleaf and Coniferous Evergreen plant materials are to be sprayed with an anti-desiccant product to prevent winter burn. The application shall be repeated during a suitable mid-winter thaw.

Shrubs located in areas likely to be piled with snow during snow removal (but not designated as Snow Storage Areas) shall be marked by six-foot high poles with bright green banner flags. Stockpiles of snow are not to be located in these areas due to potential damage to the plant materials from both the weight of the snow and the snow melting chemicals.

At the fall landscape maintenance conference parameters will be discussed between the Landscape Maintenance Contractor and the snow removal contractor to assure minimal damage and loss of landscape amenities during the winter season.

Seasonal Clean Up - A thorough spring cleanup is to be performed. This includes the removal and replacement of dead or unhealthy plant materials and the cleanup of plant debris and any general debris that has accumulated over the winter season. Mulch is to be lightly raked to clean debris from the surface without removing any mulch. Twigs and debris are to be removed from the planting beds throughout the growing season.

Mulching - Planting beds shall be mulched with a treated shredded hardwood mulch free from dirt, debris, and insects. A sample of this mulch shall be given to the Owner for approval prior to installation.

Maintain a 2-3" maximum depth and keep free of weeds either by hand weeding or by the use of a pre-emergent weed control such as Treflan or Serfian. Seasonal re-mulching shall occur as necessary in the spring and the fall to maintain this minimum depth. When new mulch is added to the planting bed it shall be spread to create a total depth of no more than three inches. Edges should be maintained in a cleanly edged fashion.

Mulch shall not be placed directly against the trunk of any tree or shrub.

B. Groundcover and Perennials

Disease and Pest Management – Pesticides and herbicides should be applied only as problems occur, with the proper chemical applied only by a trained professional or in the case of pesticide, a Certified Pesticide Applicator. Plants should be monitored weekly and treated accordingly.

Fertilizer – The health of the plants can be maintained or improved, and their growth encouraged by an application of complete fertilizer. Apply a fertilizer such as 4-12-4 as growth becomes apparent and before mulching. Apply to all groundcover and perennial planting areas by hand and avoid letting the fertilizer come in contact with the foliage, or use a liquid fertilizer and apply by soaking the soil. Apply according to the manufacturers' specifications.

Fertilization shall stop at the end of July.

Water – Groundcovers and Perennials will need supplemental watering in order to become established, healthy plants. All new plants need to be watered once a week in cool weather, twice a week during warm weather, and up to three times in a week during periods of extreme heat and drought. Until established, groundcovers and perennials should be watered in such a manner as to totally saturate the soil in the root zone area, to a depth of 6 inches. Once established, perennials shall continue to be watered as necessary to maintain them in a vigorous healthy condition. Over-watering or constant saturation of the soil must be avoided as this could lead to root rot and other disease problems. The use of a soil moisture meter can help you monitor the soil's water intake.

On-site water shall be furnished by the Owner. Hose and other watering equipment shall be furnished by the Landscape Maintenance Contractor.

Replacement – Any unhealthy plant/s that may cause widespread infestation of other nearby plants shall be immediately removed from the site. Any vegetation removed from the site must be recorded and submitted with the landscape maintenance log. The area shall be treated to prevent further infestation. The plant/s shall then be replaced with healthy specimen/s of the same species and size. Old Forge shall have a pre-established budget allowance for this type of replacement, each year.

Plant material that is damaged as a result of other landscape maintenance activities, such as mowing, shall be replaced with healthy specimens of the same species and size, at no additional cost to the owner.

Deadheading – Perennials shall be checked on a weekly basis and dead-headed once flowers have faded or as necessary based on plant type and duration of flower. Spent flowers can be pinched off with the thumb and forefinger. Continue to remove all faded flowers until Fall. All associated debris shall be removed from site daily.

Staking – Upright-growing perennials need support especially when in flower. Use of bamboo stakes, galvanized wire hoops or mesh may be necessary for their support. Supports should be put in place before they have become too difficult to handle. The supports should not be taller than the mature height of the perennial plant.

Division of Perennials – Two or three-year-old perennials are easily divided in the spring if more plants are needed. To divide, cut out the entire section of plant to be divided, including roots. The larger divisions (those with three or more shoots), can be set out immediately in their permanent location, where they can be expected to bloom the same season. Smaller divisions are best planted in an out-of-the-way planting bed until the following autumn or spring, when they can be moved to their permanent location.

Weeding – All planting beds should be kept weed-free. Weed either by hand or with a pre-emergent herbicide such as Treflen used according to manufacturers' specifications. Manual weeding is to be used in combination with the use of spot applications of herbicides. Both live and dead weeds are to be pulled and removed from the site.

All herbicide applications shall be documented in the Landscape Maintenance Log. The actual product label or the manufacturer's product specification sheet for the specific product shall also be included in the Log.

Only personnel with appropriate applicator licenses shall supervise and/or perform the application of pesticide products requiring a license.

Winterizing – Perennial gardens should be cleaned-up when growth ceases in the fall. Remove foliage of plants that normally die down to the ground. Divide and replant over-grown clumps.

Weed & Pest Control and Fertilizing- In order to maintain turf grass health, vigor color, and nutrients, fertilizer must be added to the soil. Recommendations for fertilization of lawn areas are as follows; fertilize at the rate of one (1) pound of nitrogen per thousand square feet, per year is optimum. Fertilizer should be a balanced slow release, sulfur coated type fertilizer.

Weed Control - All turf areas will require some weed control, for both weed grasses and dicot weeds. Weeds should be treated at the appropriate time and with a material labeled for the target weed. Please refer to the fertilizer weed and pest schedule for timing.

Pest Control - All turf areas will require some pest control. Pests should be treated at the appropriate time with a material labeled for the target pest. Please refer to the fertilizer, weed and pest schedule for timing.

Lime - A common cause for an unhealthy lawn is acidic soil. When the pH is below the neutral range (between 6-7) vital plant nutrients become fixed in the soil and cannot be absorbed by the grass plant. Lime corrects an acid soil condition, supplies calcium for plant growth and improves air and water circulation. Limestone applied at the rate of 50 lbs. per thousand square feet will adjust the soil pH one point over a period of 6-9 months.

D. Fertilizer, Weed & Pest Control Schedule – Turf Systems

Spring - (April)	Fertilize one (1) pound of nitrogen per 1,000 square feet Pre-emergent weed grass control Broadleaf weed control
Late Spring - (June)	Fertilize one (1) pound of nitrogen per 1,000 square feet Pre-emergent weed grass control Broadleaf weed control Insect Control (if needed)
*Summer - (August)	Fertilize one (1) pound of nitrogen per 1,000 square feet Broadleaf weed control (if needed) Insect Control (if needed)
Fall - (September)	Fertilize one (1) pound of nitrogen per 1,000 square feet

*Omit if area is not to be irrigated

Lawn Maintenance Task Schedule

MARCH (Weather permitting)
- Clean up winter debris, sand, leaves, trash etc.
- Re-edge mulch beds, maintain at 2-3" maximum.
- Fertilize plants
- Aerate and thatch turf (conditions permitting)

APRIL
- Reseed or sod all areas needing attention.
- Fertilize and weed control
- Lime

- Start mowing when grass reaches 2-1/2", mow to 2"

MAY
- Mow turf to 2-2-1/2"
- Weed as necessary.
- Check for disease and pest problems in both turf and plants.

JUNE
- Mow turf to 2-1/2" – 3"
- Fertilize and weed control.
- Weed
- Check for disease and pest problems in both turf and plants, treat as necessary.

PROVISIONS FOR SOLID WASTE MANAGEMENT (SITE TRASH)

Trash will be placed in on-site dumpsters and the Owner will make provisions for its regular and timely removal.

SNOW DISPOSAL AND PLOWING PLANS

The purpose of the snow and snowmelt management plan is to provide guidelines regarding snow disposal site selection, site preparation and maintenance that are acceptable to the Department of Environmental Protection. For the areas that require snow removal, snow storage onsite will largely be accomplished by using pervious areas along the shoulder of the roadway and development as windrowed by plows.

- Avoid dumping of snow into any water body, including rivers, ponds, or wetlands. In addition to water quality impacts and flooding, snow disposed of in open water can cause navigational hazards when it freezes into ice blocks.
- Avoid disposing of snow on top of storm drain catch basins or in stormwater basins. Snow combined with sand and debris may block a storm drainage system, causing localized flooding. A high volume of sand, sediment, and litter released from melting snow also may be quickly transported through the system into surface water.
- In significant storm events, the melting or off-site trucking of snow may be implemented. These activities shall be conducted in accordance with all local, state and federal regulations.
- Snow shall be removed from the areas around on-site fire-hydrants to maintain emergency access to hydrants at all times. Removable flags or markers should be placed on hydrants to allow snow removal crews to more easily locate hydrants and not damage them with plows or other snow removal equipment.

WINTER ROAD SALT AND/OR SAND USE AND STORAGE RESTRICTIONS

The applicant will be responsible for sanding and salting the site. No storage on site.

STREET SWEEPING SCHEDULES

There are three types of sweepers: Mechanical, Regenerative Air, and Vacuum Filter.

1) Mechanical: Mechanical sweepers use brooms or rotary brushes to scour the pavement.
2) Regenerative Air: These sweepers blow air onto the road or parking lot surface, causing fines to rise where they are vacuumed.
3) Vacuum filter: These sweepers remove fines along roads. Two general types of vacuum filter sweepers are available - wet and dry. The dry type uses a broom in combination with the vacuum. The wet type uses water for dust suppression

Regardless of the type chosen, the efficiency of street sweeping is increased when sweepers are operated in tandem.

This project has not included street sweeping as part of the TSS removal calculations. However, it is recommended that street sweeping of the parking areas occur four times a year, including once after the spring snow melt.

Reuse and Disposal of Street Sweepings

Once removed from paved surfaces, the sweepings must be handled and disposed of properly. Mass DEP's Bureau of Waste Prevention has issued a written policy regarding the reuse and disposal of street sweepings. These sweepings are regulated as a solid waste, and can be used in three ways:

- In one of the ways already approved by Mass DEP (e.g., daily cover in a landfill, additive to compost, fill in a public way)
- If approved under a Beneficial Use Determination
- Disposed in a landfill

TRAINING OF STAFF OR PERSONNEL INVOLVED WITH IMPLEMENTING LONG-TERM POLLUTION PREVENTION PLAN

The Long-Term Pollution Prevention Plan is to be implemented by property owner of the site. Trained and, if required, licensed Professionals are to be hired by the owner as applicable to implement the Long-Term Pollution Prevention Plan.

LIST OF EMERGENCY CONTACTS FOR IMPLEMENTING LONG-TERM POLLUTION PREVENTION PLAN

The applicant will be required to implement the Long-Term Pollution Prevention Plan and will create and maintain a list of emergency contacts.

POST CONSTRUCTION PHASE INSPECTION SCHEDULE AND EVALUATION CHECKLIST

Inspection Date	Inspector	BMP Inspected	Inspection Frequency Requirements	Comments	Recommendation	Follow-up Inspection Required (yes/no)
		Catch Basin	Four times a year			
		Infiltration System	Twice a year			
		Pipe Outlet Protection	Once a year			

1. Refer to the Massachusetts Stormwater Handbook Volume Two: Stormwater Technical Handbook (February 2008) for recommendations regarding frequency for inspections and maintenance of specific BMP's

2. Inspections to be conducted by a qualified professional such as an environmental scientist or civil engineer.

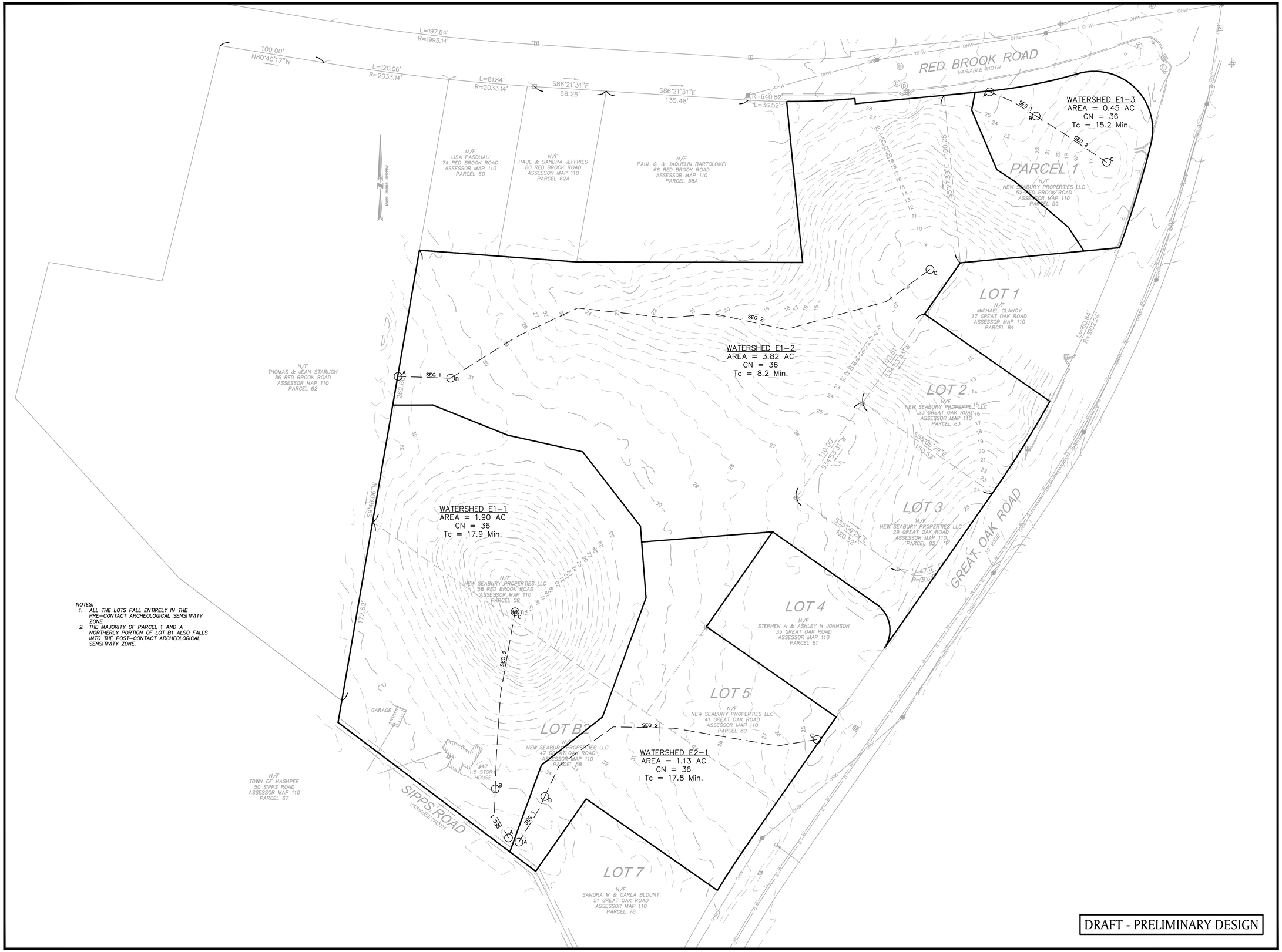
3. Limited or no use of sodium chloride salts, fertilizers or pesticides recommended.

4. Other Notes: (Include deviations from Conservation Commission Approvals, Planning Board Approvals and Approved Plans)

SECTION 5.0

HYDROLOGY CALCULATIONS

5.01 EXISTING WATERSHED PLAN



NOTES:
1. ALL THE LOTS FALL ENTIRELY IN THE PRE-CONTACT ARCHEOLOGICAL SENSITIVITY ZONE.
2. THE MAJORITY OF PARCEL 1 AND A NORTHERLY PORTION OF LOT B1 ALSO FALLS INTO THE POST-CONTACT ARCHEOLOGICAL SENSITIVITY ZONE.

GREAT OAK ROAD PRELIMINARY SUBDIVISION - JANUARY 8, 2023

BRIAN YERGATIAN NO. 46206

GREAT OAK ROAD PRELIMINARY SUBDIVISION

GREAT OAK ROAD

IN

MASHPEE
MASSACHUSETTS

EXISTING WATERSHED AREA MAP

JANUARY 8, 2023

REVISIONS:

PREPARED FOR:
NEW SEABURY HOMES, LLC
22 SEANEST DRIVE
MASHPEE, MA 02649

BSC GROUP
349 Main Street Route 28
West Yarmouth, Massachusetts 02673
508 778 8919

SCALE: 1" = 40'

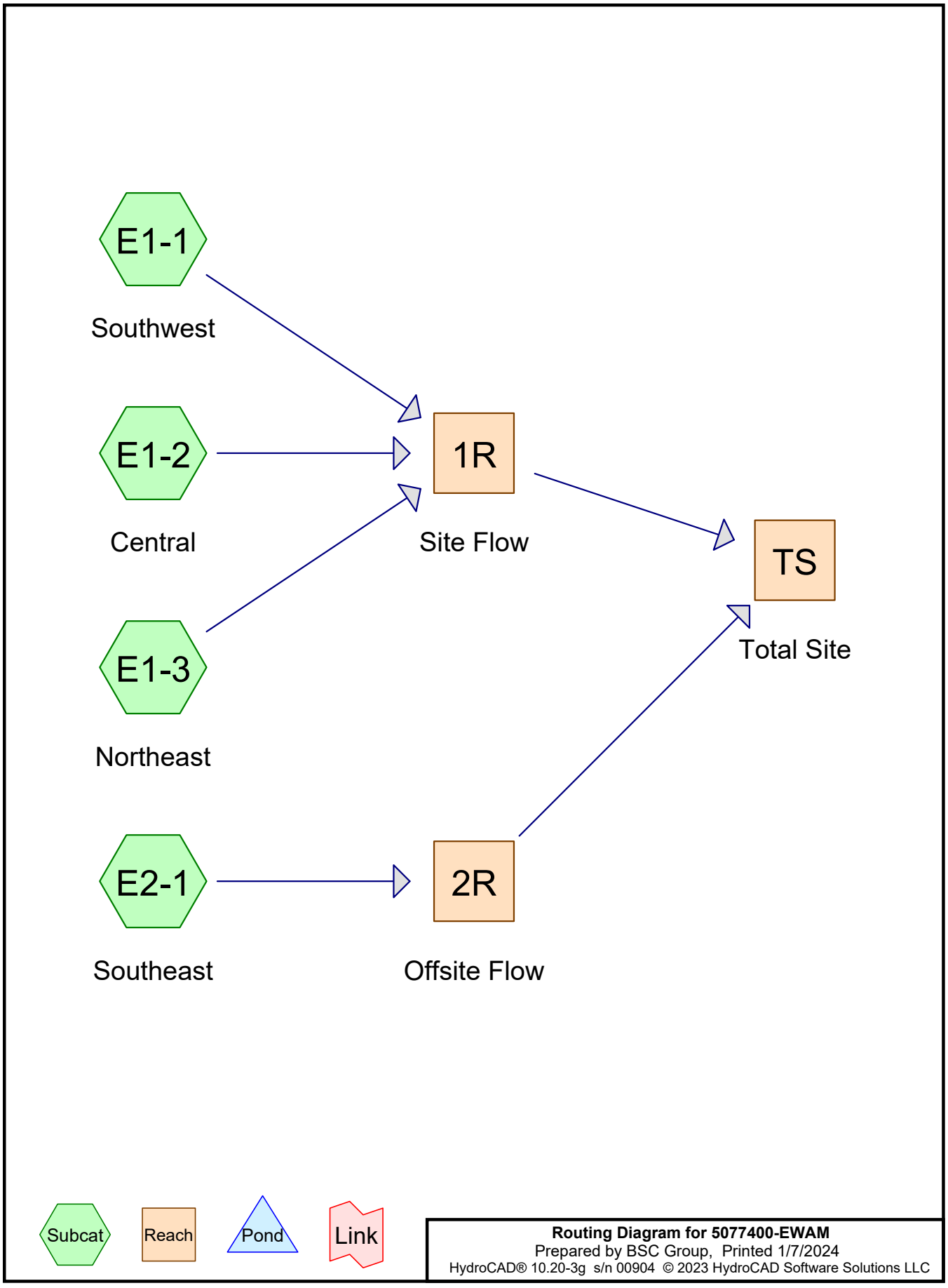
0 20 40 80 FEET

FILE: 5077400-EWAM.DWG

DWG. NO: EWAM

JOB. NO: 50774.00

5.02 EXISTING HYDROLOGY CALCULATIONS (HYDROCAD™ PRINTOUTS)



Routing Diagram for 5077400-EWAM
Prepared by BSC Group, Printed 1/7/2024

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	Type III 24-hr		Default	24.00	1	3.42	2
2	10-year	Type III 24-hr		Default	24.00	1	4.98	2
3	25-year	Type III 24-hr		Default	24.00	1	5.96	2
4	50-year	Type III 24-hr		Default	24.00	1	6.70	2
5	100-year	Type III 24-hr		Default	24.00	1	7.47	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
7.301	36	Woods, Fair, HSG A (E1-1, E1-2, E1-3, E2-1)
7.301	**36**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
7.301	HSG A	E1-1, E1-2, E1-3, E2-1
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
7.301		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
7.301	0.000	0.000	0.000	0.000	7.301	Woods, Fair	E1-1, E1-2, E1-3, E2-1
7.301	**0.000**	**0.000**	**0.000**	**0.000**	**7.301**	**TOTAL AREA**	

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1-1: Southwest Runoff Area=82,847 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=220' Tc=17.9 min CN=36 Runoff=0.00 cfs 0.000 af

Subcatchment E1-2: Central Runoff Area=166,236 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=539' Tc=8.2 min CN=36 Runoff=0.00 cfs 0.000 af

Subcatchment E1-3: Northeast Runoff Area=19,535 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=130' Tc=15.2 min CN=36 Runoff=0.00 cfs 0.000 af

Subcatchment E2-1: Southeast Runoff Area=49,393 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=342' Tc=17.8 min CN=36 Runoff=0.00 cfs 0.000 af

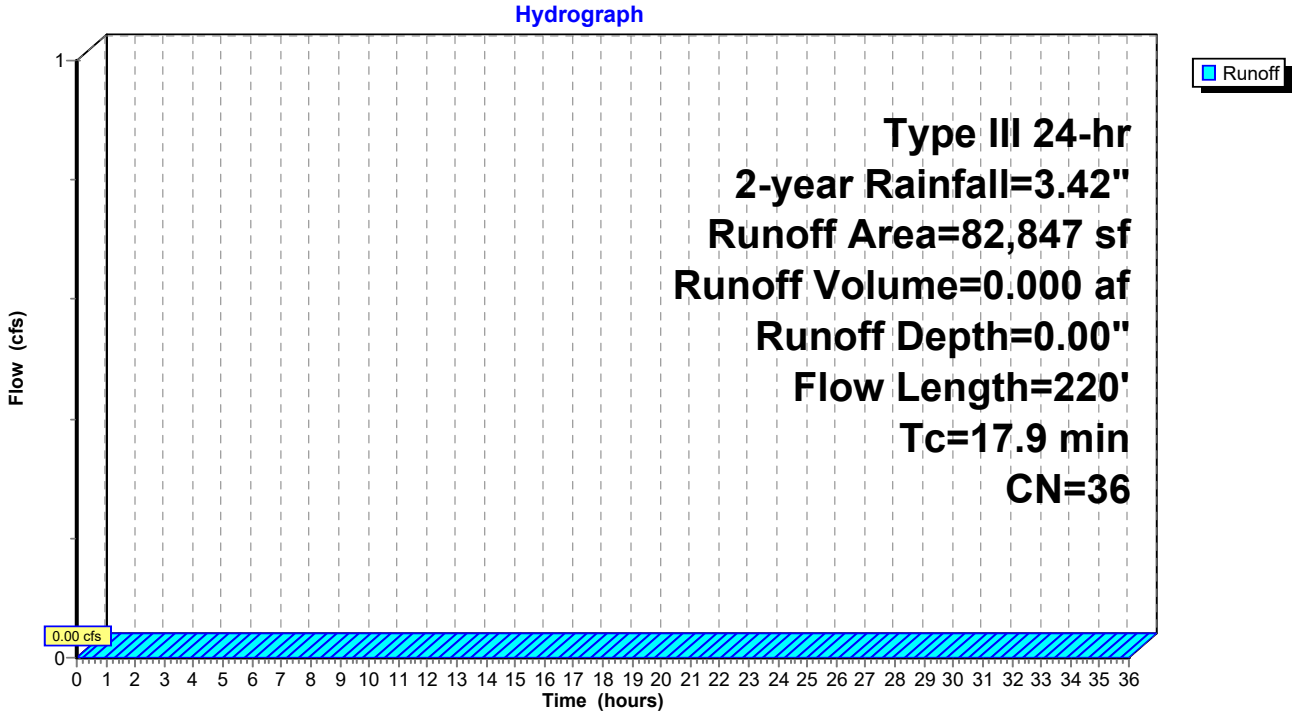
Reach 1R: Site Flow Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach 2R: Offsite Flow Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

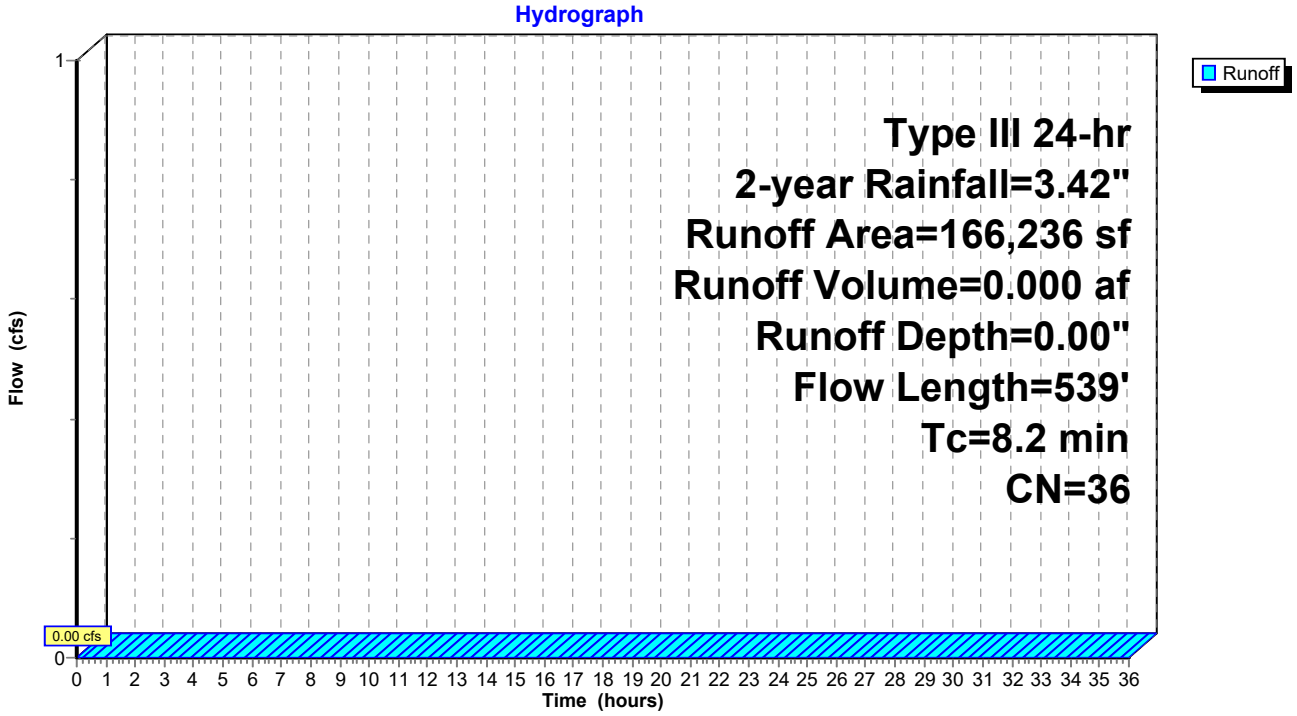
Reach TS: Total Site Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 7.301 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.00"
100.00% Pervious = 7.301 ac 0.00% Impervious = 0.000 ac

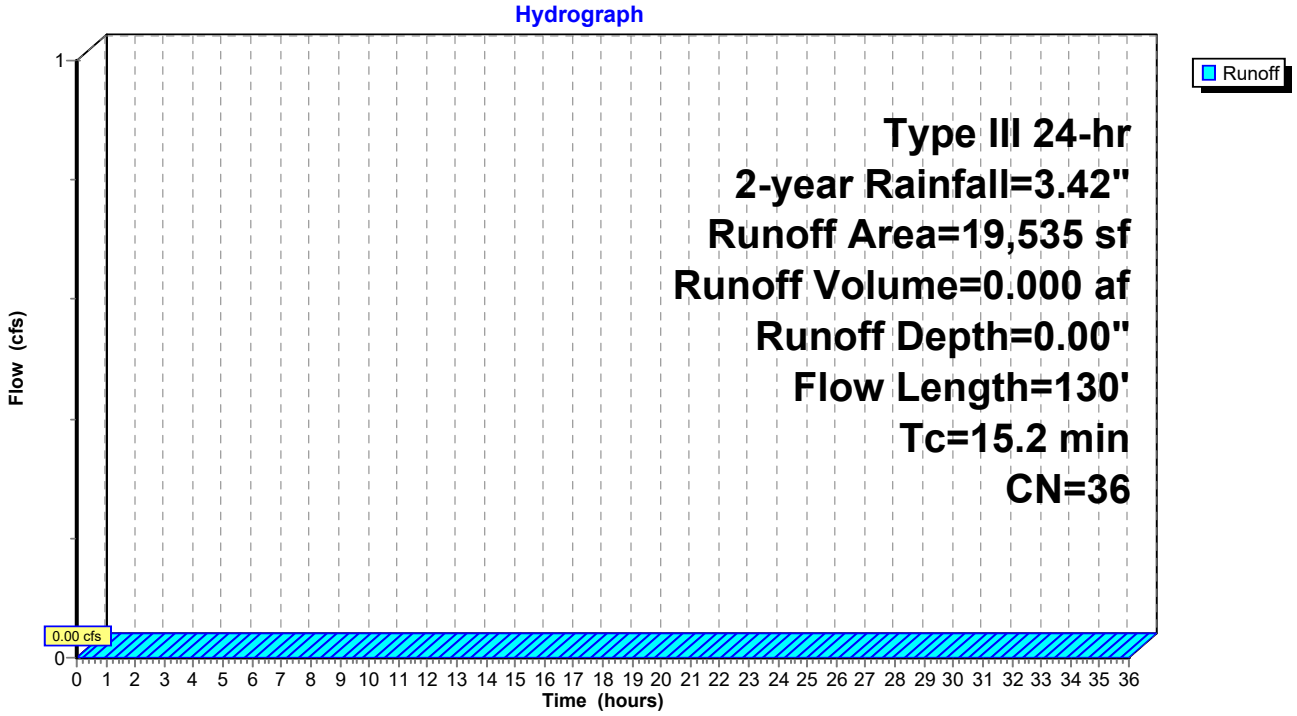
Subcatchment E1-1: Southwest



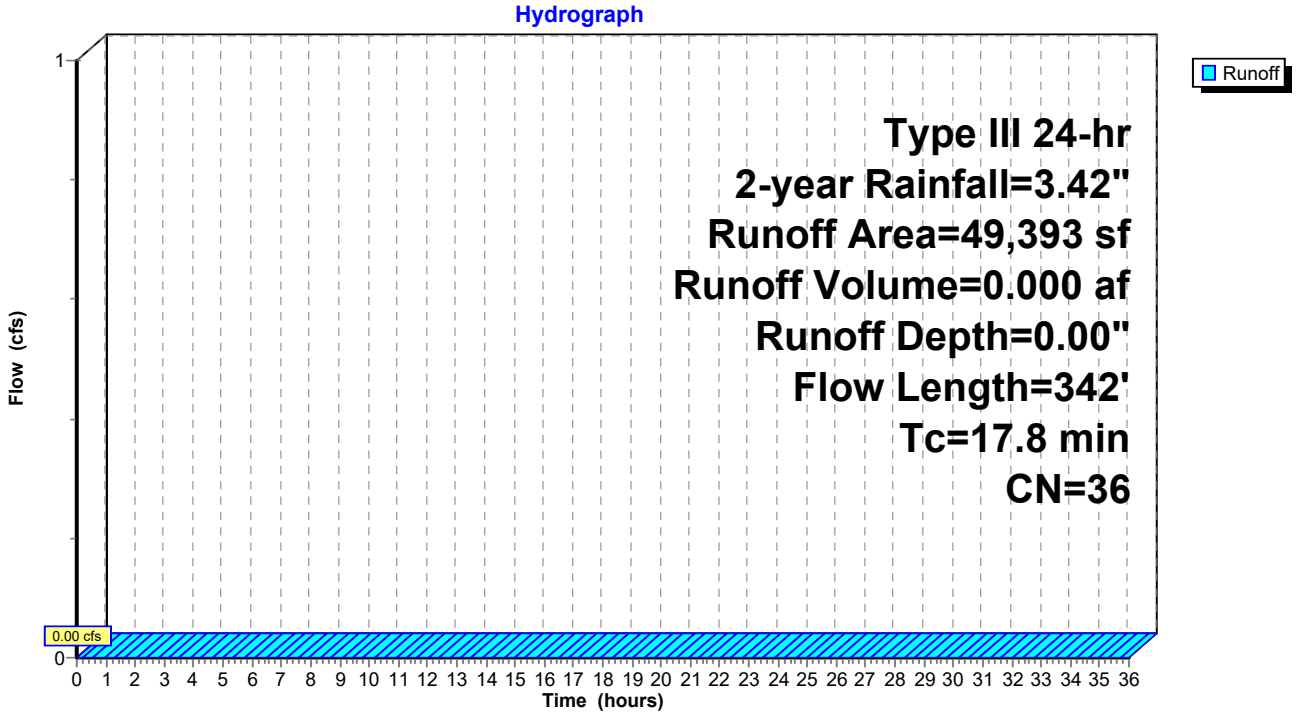
Subcatchment E1-2: Central



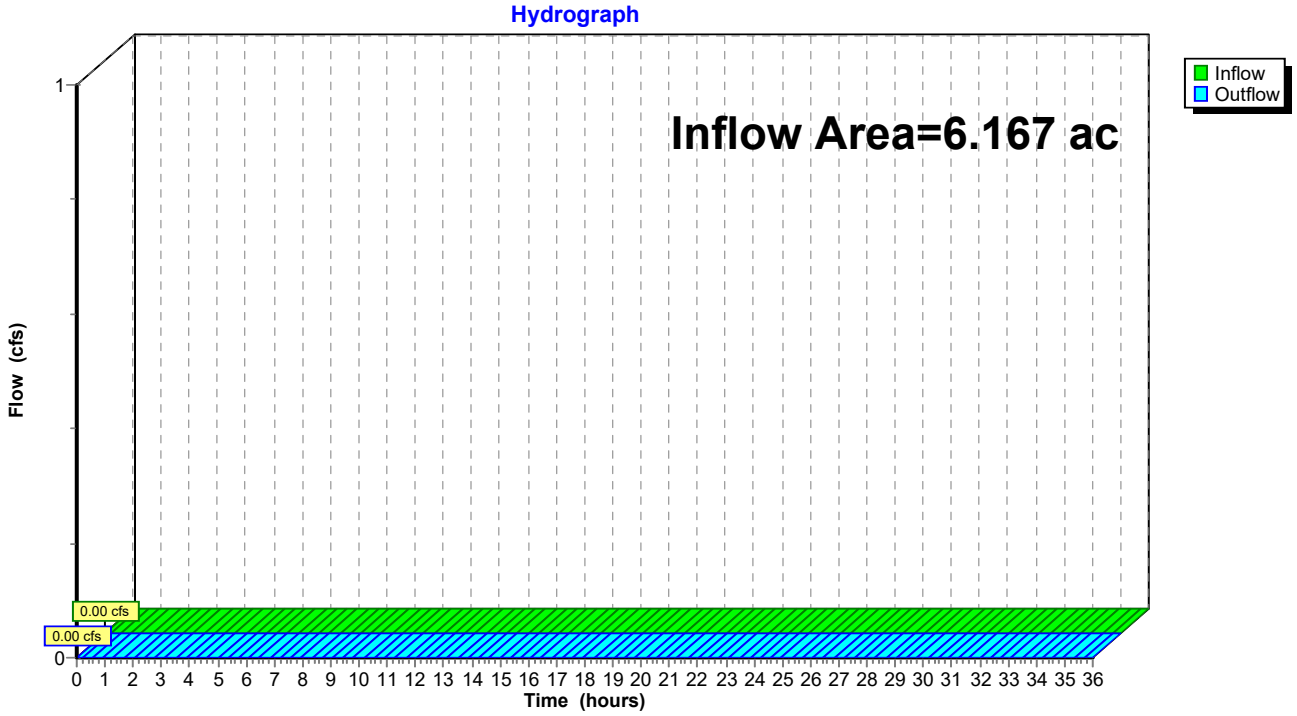
Subcatchment E1-3: Northeast



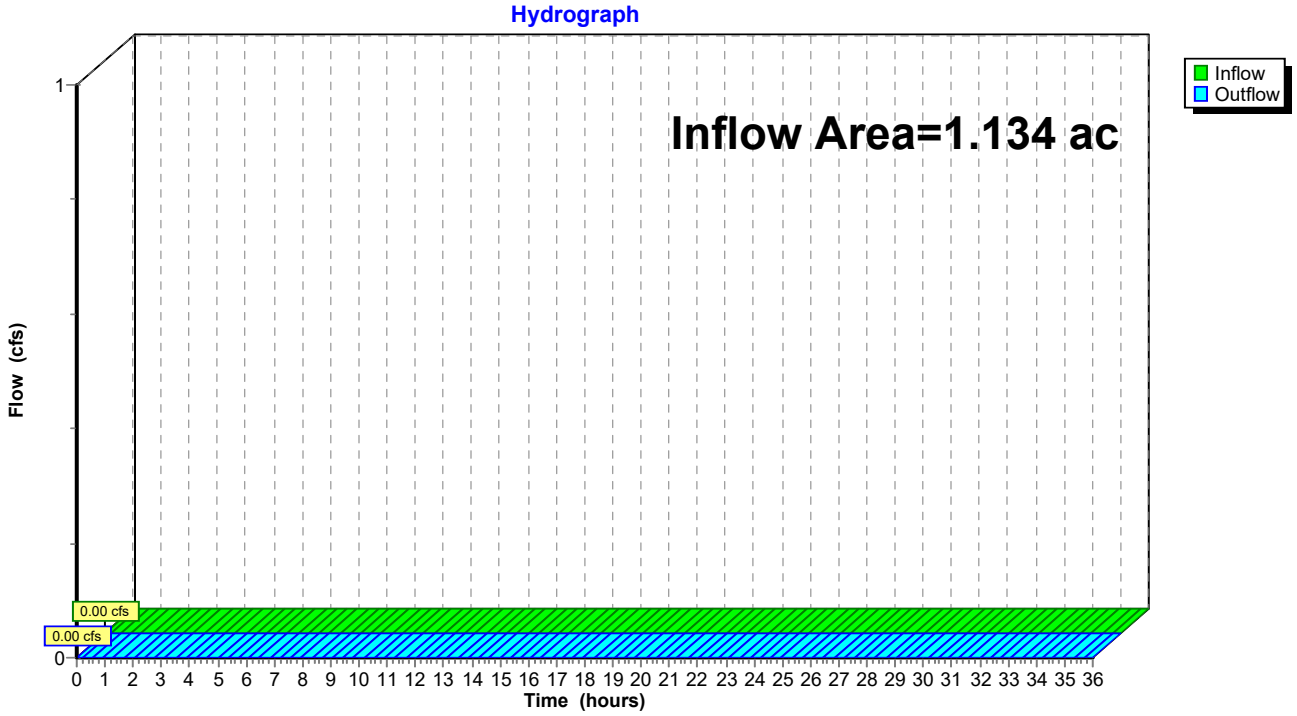
Subcatchment E2-1: Southeast



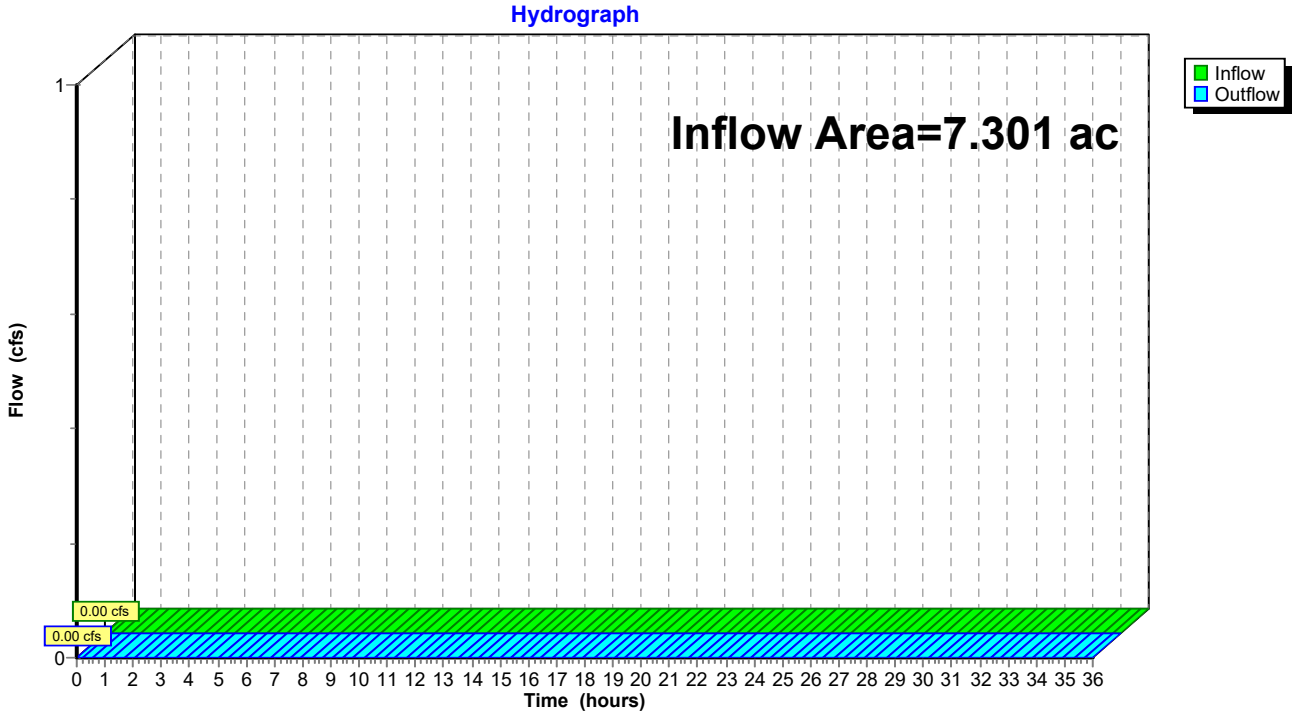
Reach 1R: Site Flow



Reach 2R: Offsite Flow



Reach TS: Total Site



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1-1: Southwest Runoff Area=82,847 sf 0.00% Impervious Runoff Depth=0.11"
Flow Length=220' Tc=17.9 min CN=36 Runoff=0.03 cfs 0.017 af

Subcatchment E1-2: Central Runoff Area=166,236 sf 0.00% Impervious Runoff Depth=0.11"
Flow Length=539' Tc=8.2 min CN=36 Runoff=0.05 cfs 0.034 af

Subcatchment E1-3: Northeast Runoff Area=19,535 sf 0.00% Impervious Runoff Depth=0.11"
Flow Length=130' Tc=15.2 min CN=36 Runoff=0.01 cfs 0.004 af

Subcatchment E2-1: Southeast Runoff Area=49,393 sf 0.00% Impervious Runoff Depth=0.11"
Flow Length=342' Tc=17.8 min CN=36 Runoff=0.02 cfs 0.010 af

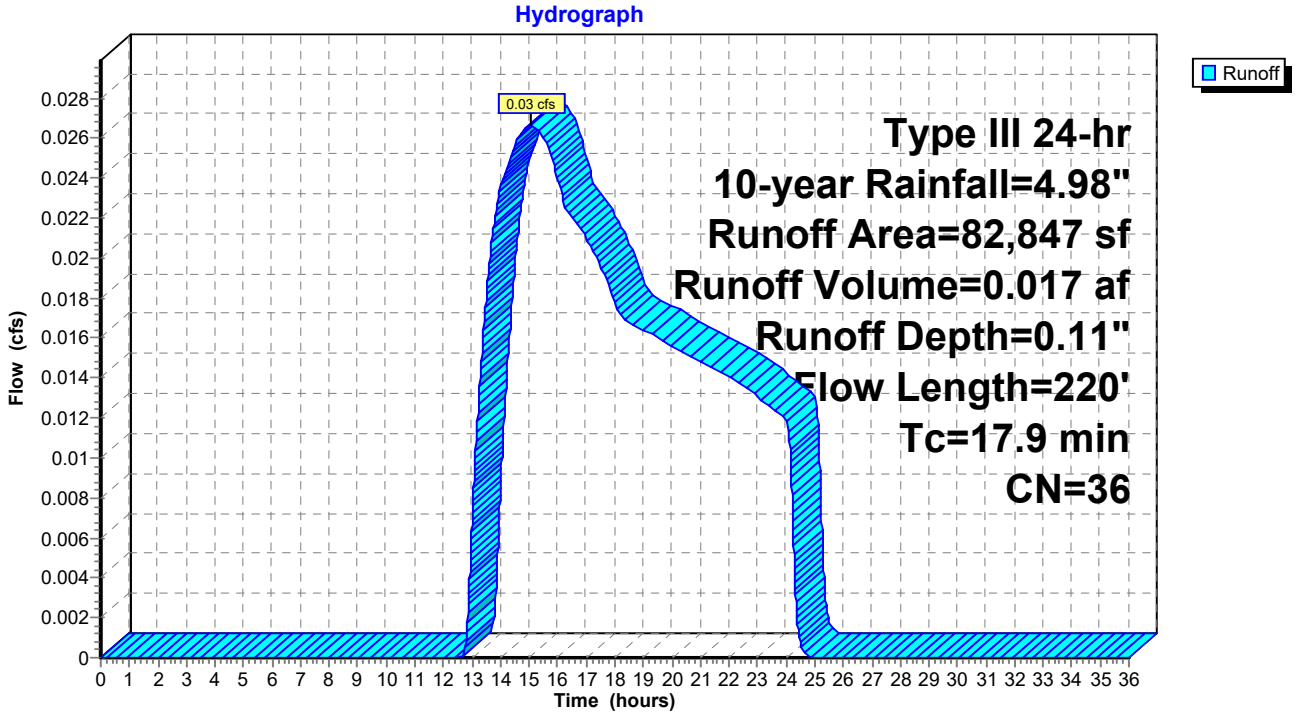
Reach 1R: Site Flow Inflow=0.09 cfs 0.054 af
Outflow=0.09 cfs 0.054 af

Reach 2R: Offsite Flow Inflow=0.02 cfs 0.010 af
Outflow=0.02 cfs 0.010 af

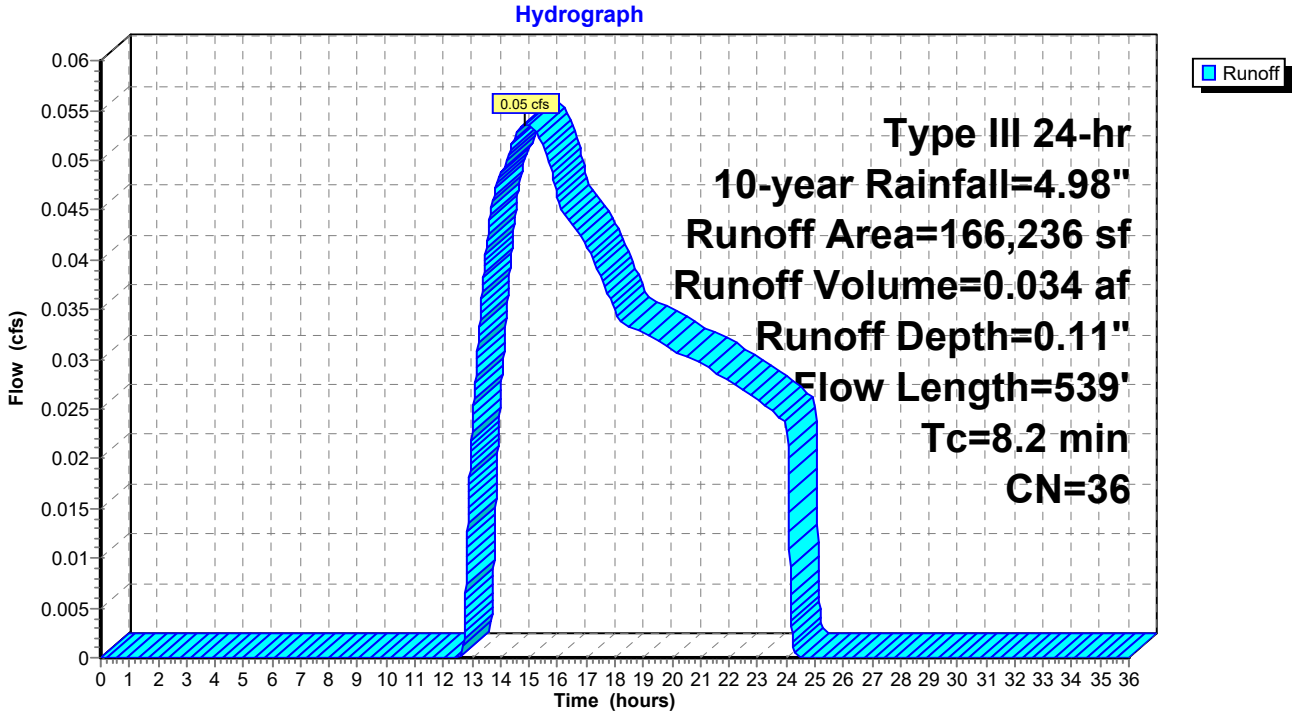
Reach TS: Total Site Inflow=0.10 cfs 0.064 af
Outflow=0.10 cfs 0.064 af

Total Runoff Area = 7.301 ac Runoff Volume = 0.064 af Average Runoff Depth = 0.11"
100.00% Pervious = 7.301 ac 0.00% Impervious = 0.000 ac

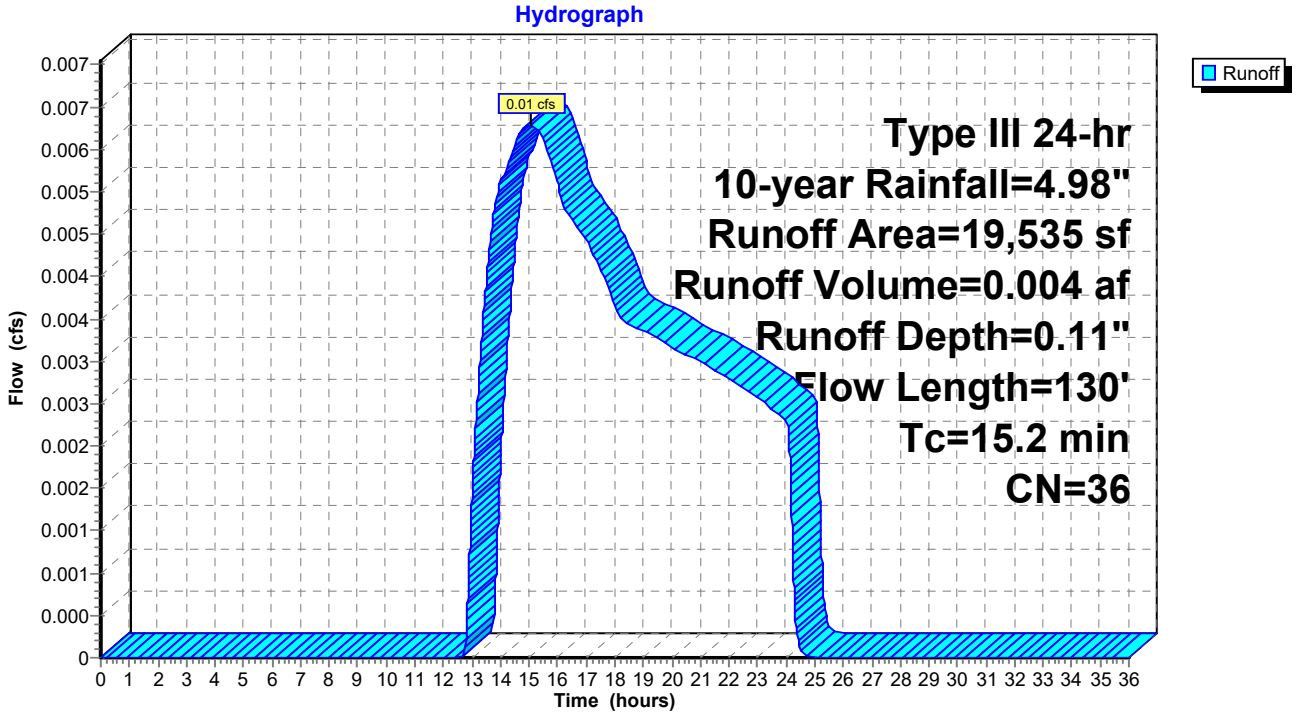
Subcatchment E1-1: Southwest



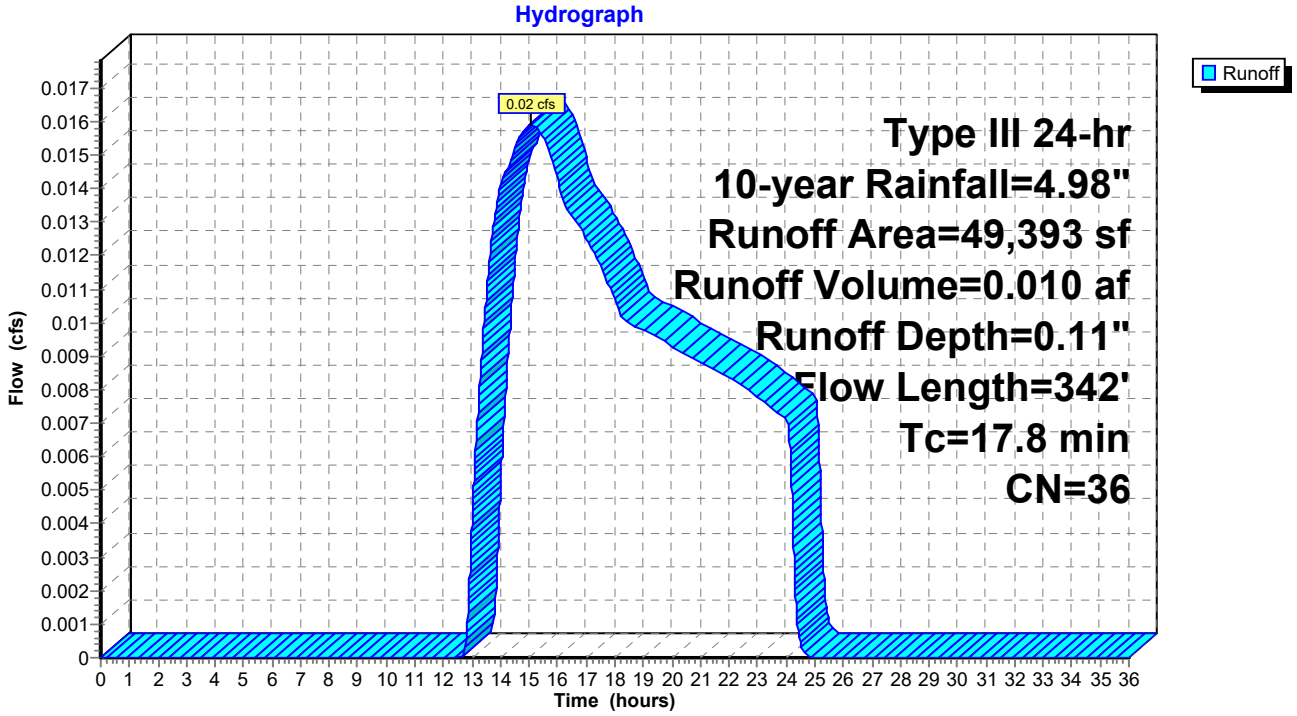
Subcatchment E1-2: Central



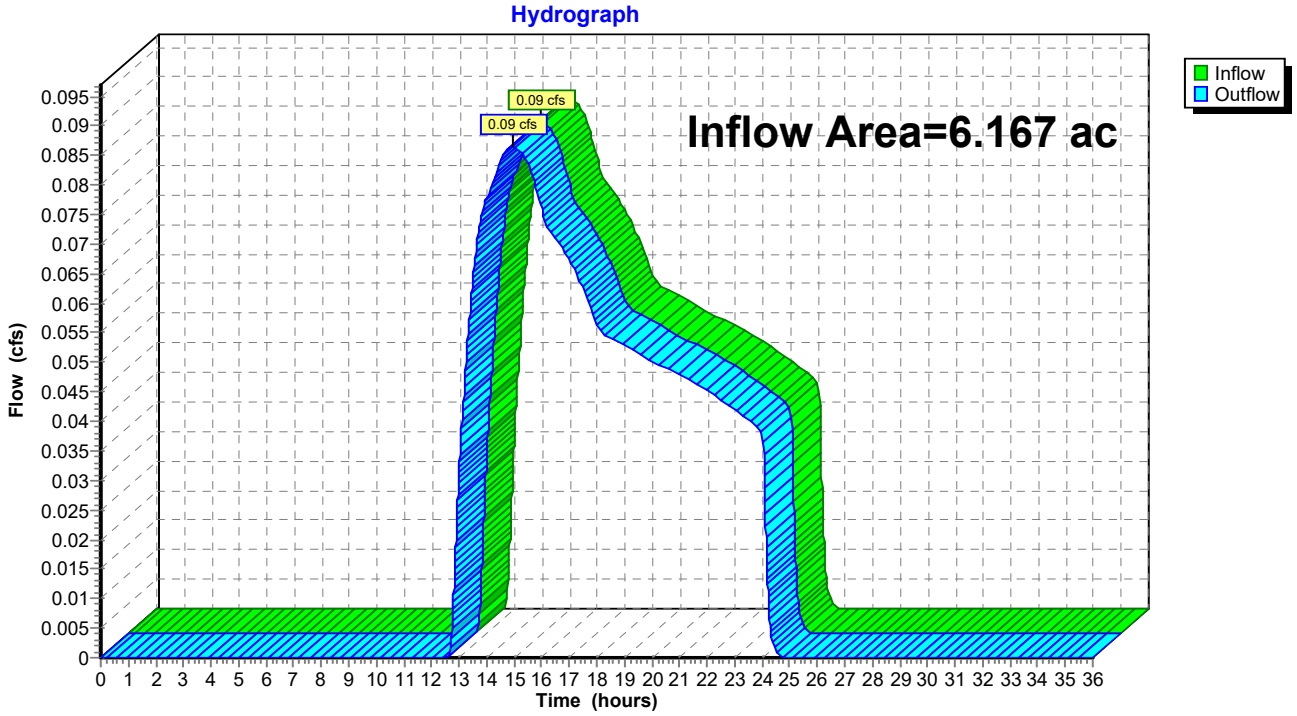
Subcatchment E1-3: Northeast



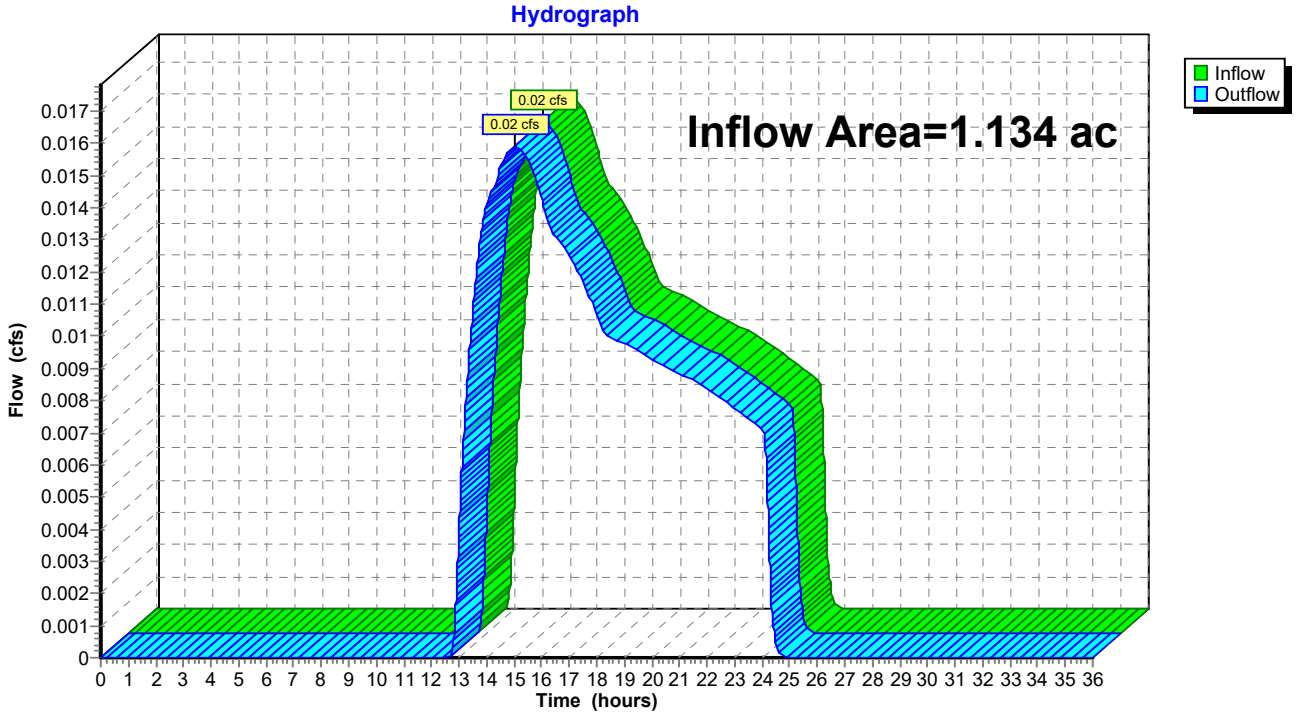
Subcatchment E2-1: Southeast



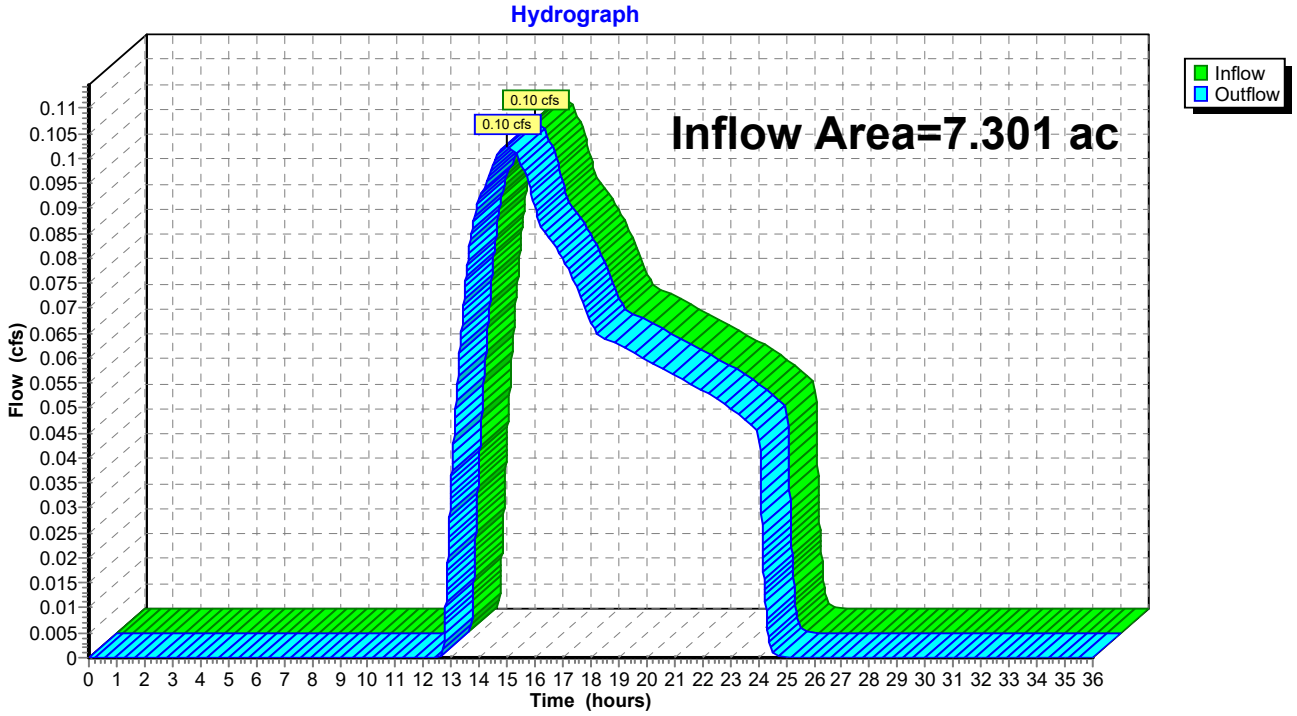
Reach 1R: Site Flow



Reach 2R: Offsite Flow



Reach TS: Total Site



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1-1: Southwest Runoff Area=82,847 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=220' Tc=17.9 min CN=36 Runoff=0.11 cfs 0.045 af

Subcatchment E1-2: Central Runoff Area=166,236 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=539' Tc=8.2 min CN=36 Runoff=0.27 cfs 0.091 af

Subcatchment E1-3: Northeast Runoff Area=19,535 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=130' Tc=15.2 min CN=36 Runoff=0.03 cfs 0.011 af

Subcatchment E2-1: Southeast Runoff Area=49,393 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=342' Tc=17.8 min CN=36 Runoff=0.07 cfs 0.027 af

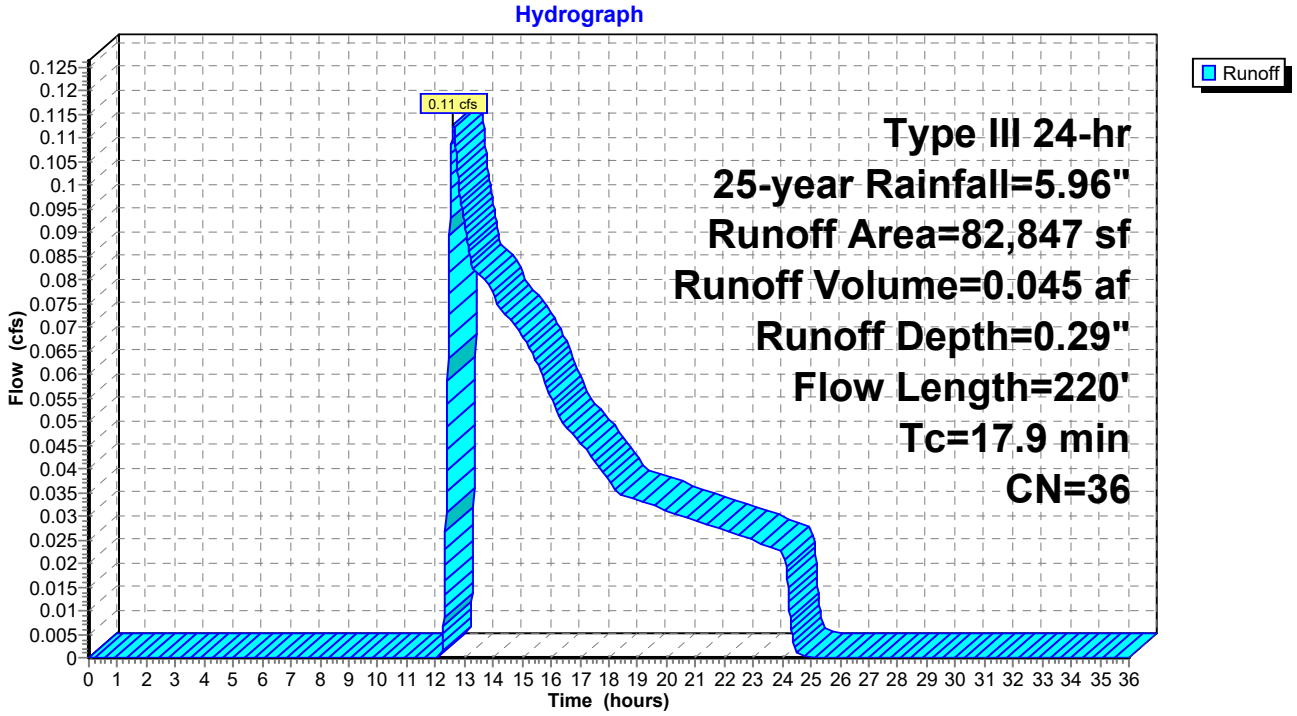
Reach 1R: Site Flow Inflow=0.39 cfs 0.147 af
Outflow=0.39 cfs 0.147 af

Reach 2R: Offsite Flow Inflow=0.07 cfs 0.027 af
Outflow=0.07 cfs 0.027 af

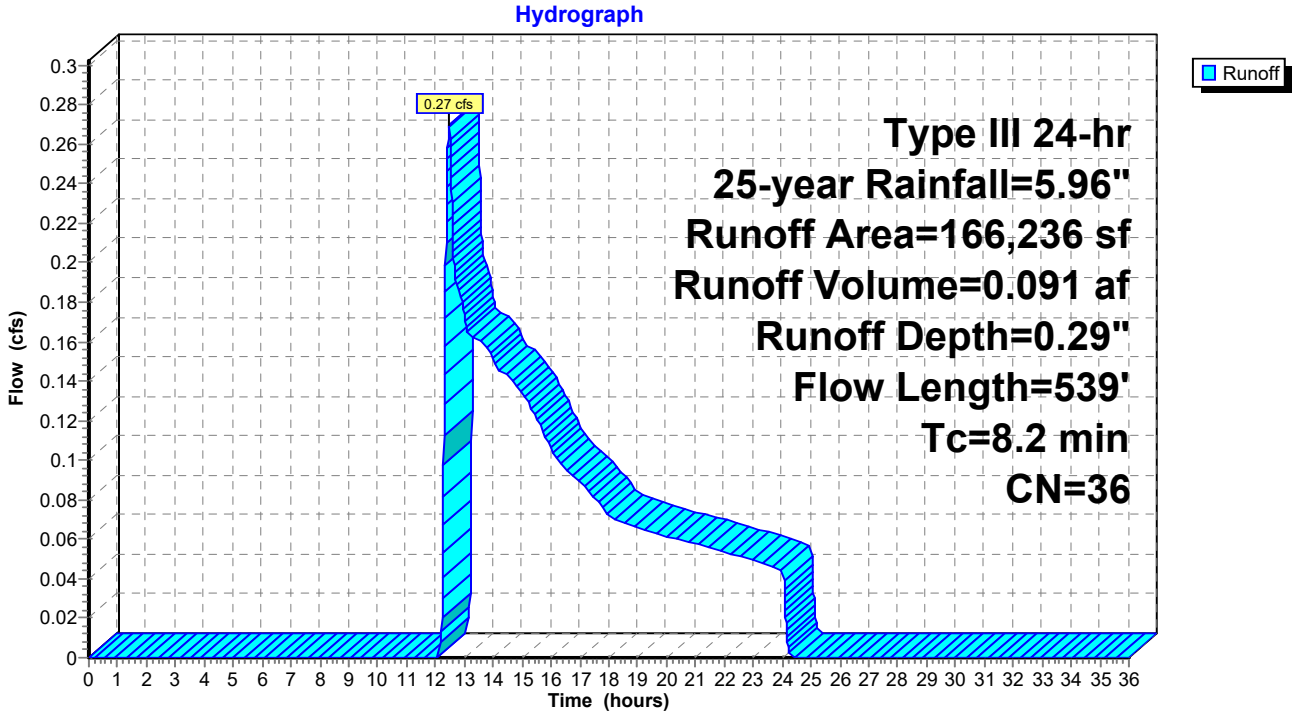
Reach TS: Total Site Inflow=0.44 cfs 0.174 af
Outflow=0.44 cfs 0.174 af

Total Runoff Area = 7.301 ac Runoff Volume = 0.174 af Average Runoff Depth = 0.29"
100.00% Pervious = 7.301 ac 0.00% Impervious = 0.000 ac

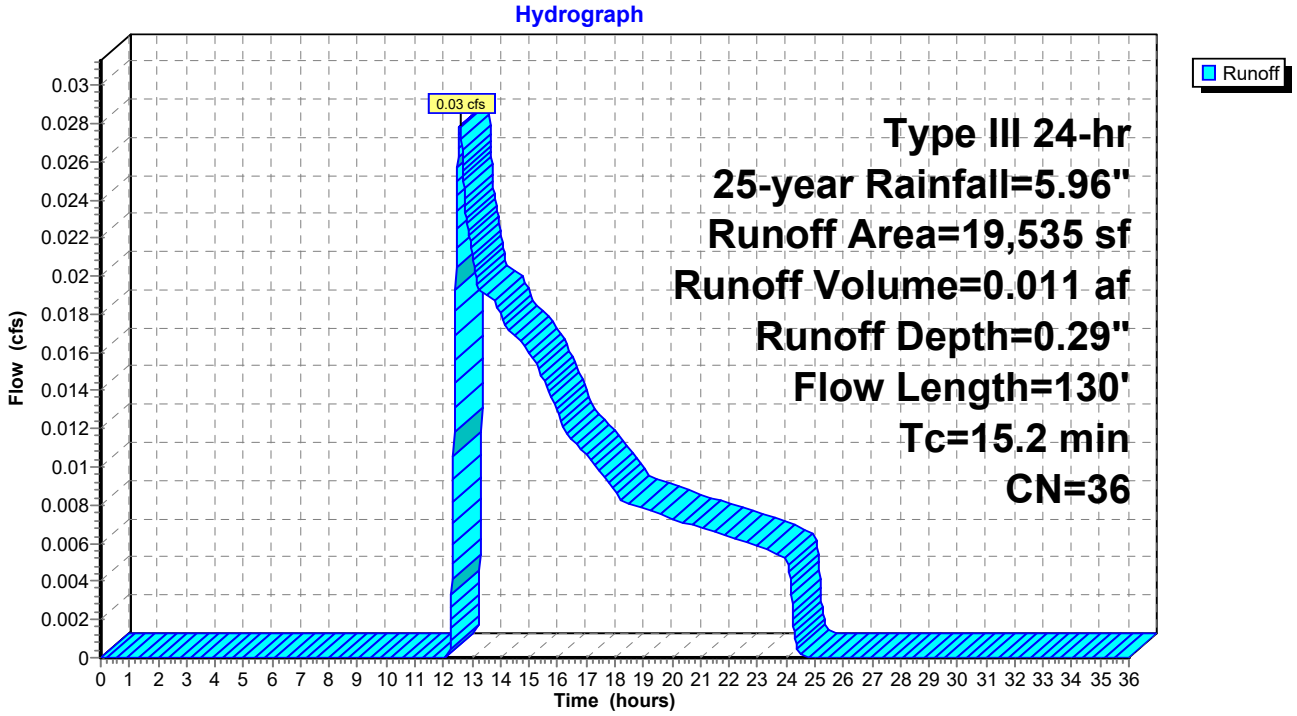
Subcatchment E1-1: Southwest



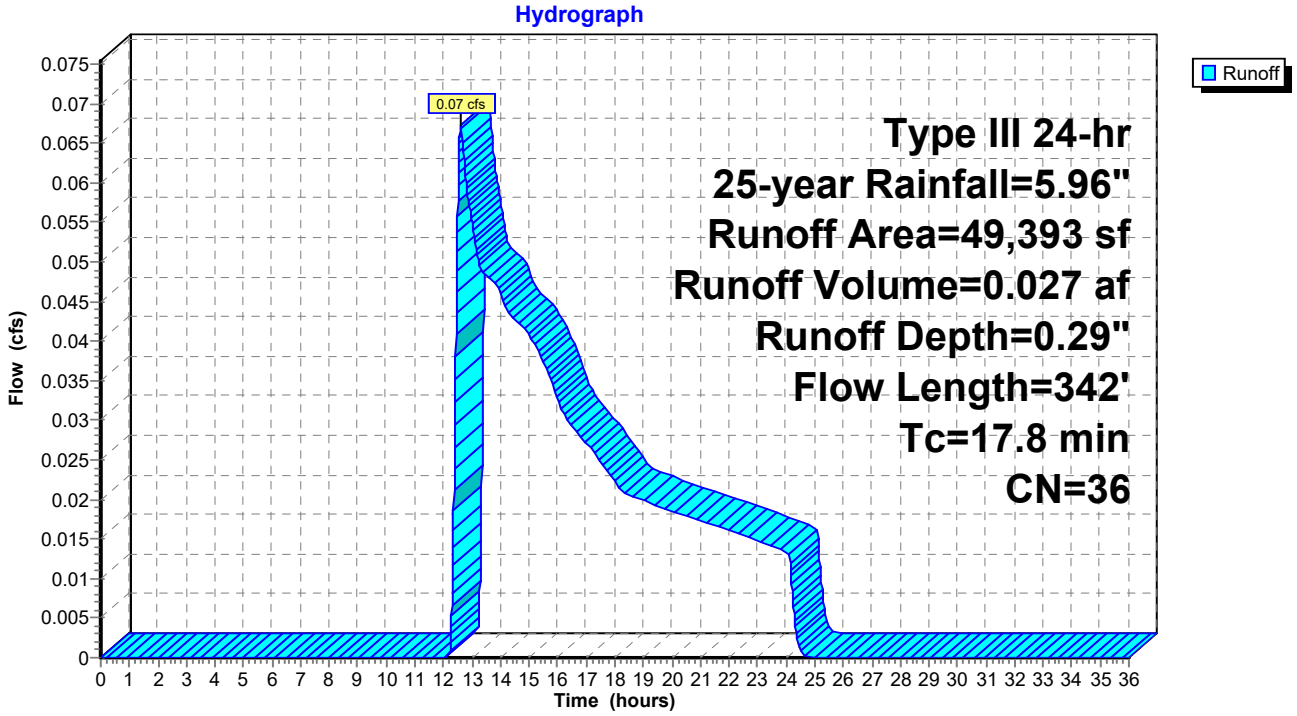
Subcatchment E1-2: Central



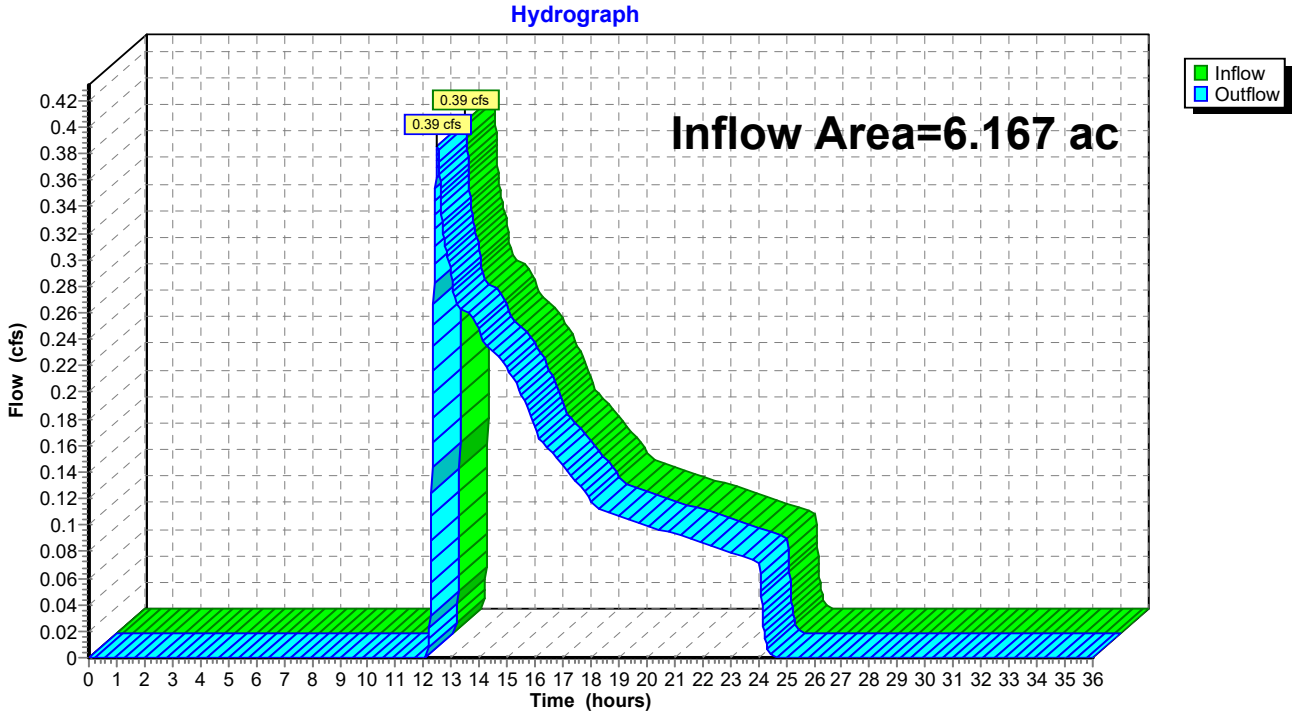
Subcatchment E1-3: Northeast



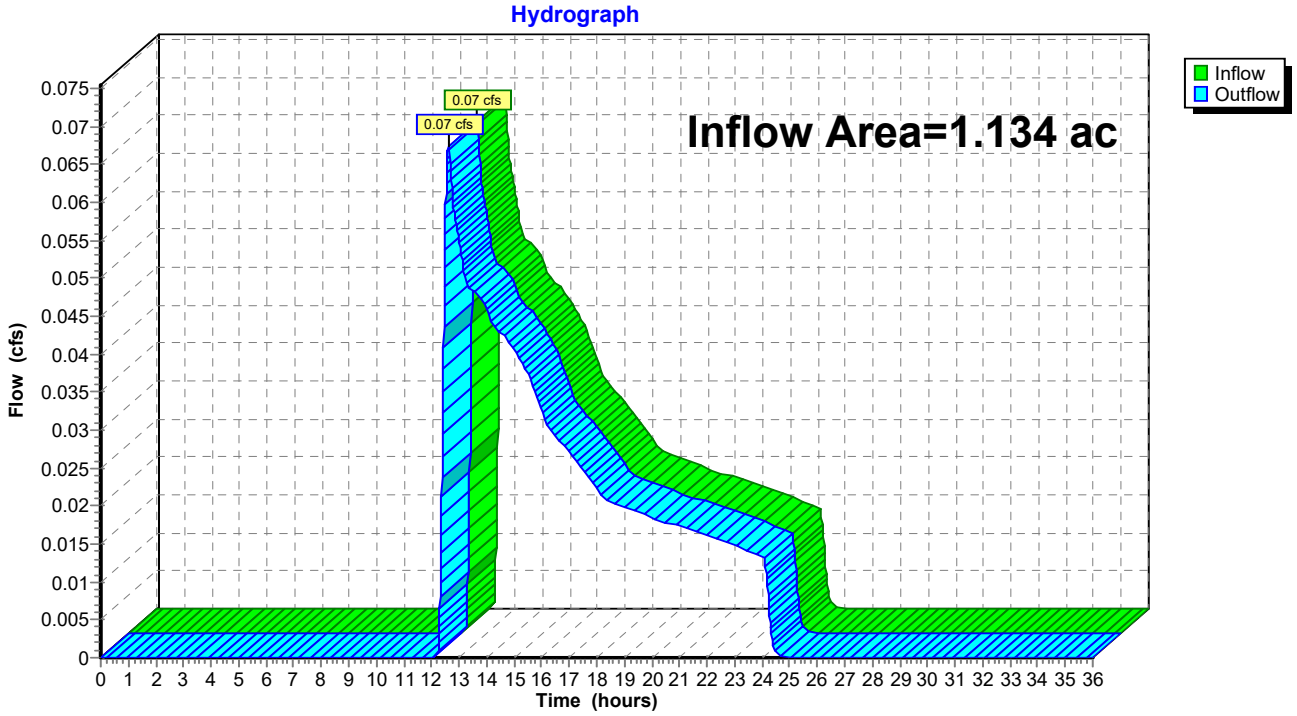
Subcatchment E2-1: Southeast



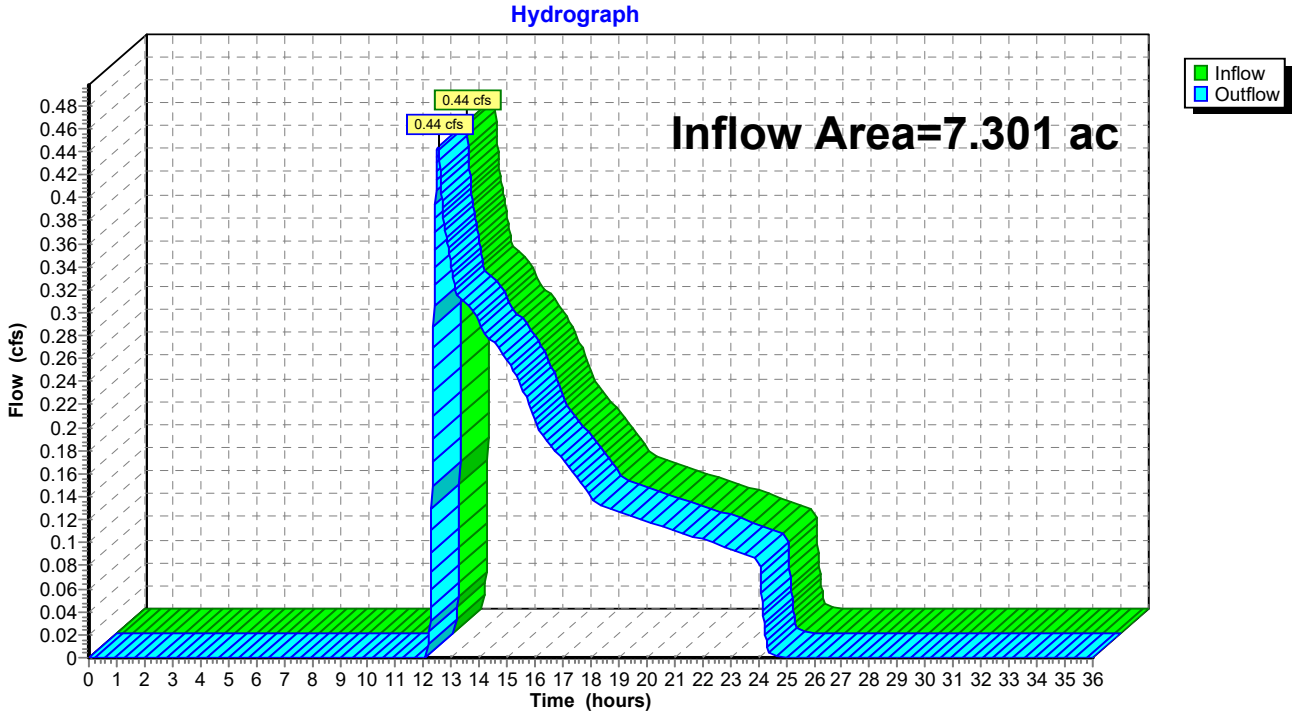
Reach 1R: Site Flow



Reach 2R: Offsite Flow



Reach TS: Total Site



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1-1: Southwest Runoff Area=82,847 sf 0.00% Impervious Runoff Depth=0.47"
Flow Length=220' Tc=17.9 min CN=36 Runoff=0.29 cfs 0.075 af

Subcatchment E1-2: Central Runoff Area=166,236 sf 0.00% Impervious Runoff Depth=0.47"
Flow Length=539' Tc=8.2 min CN=36 Runoff=0.68 cfs 0.150 af

Subcatchment E1-3: Northeast Runoff Area=19,535 sf 0.00% Impervious Runoff Depth=0.47"
Flow Length=130' Tc=15.2 min CN=36 Runoff=0.07 cfs 0.018 af

Subcatchment E2-1: Southeast Runoff Area=49,393 sf 0.00% Impervious Runoff Depth=0.47"
Flow Length=342' Tc=17.8 min CN=36 Runoff=0.18 cfs 0.045 af

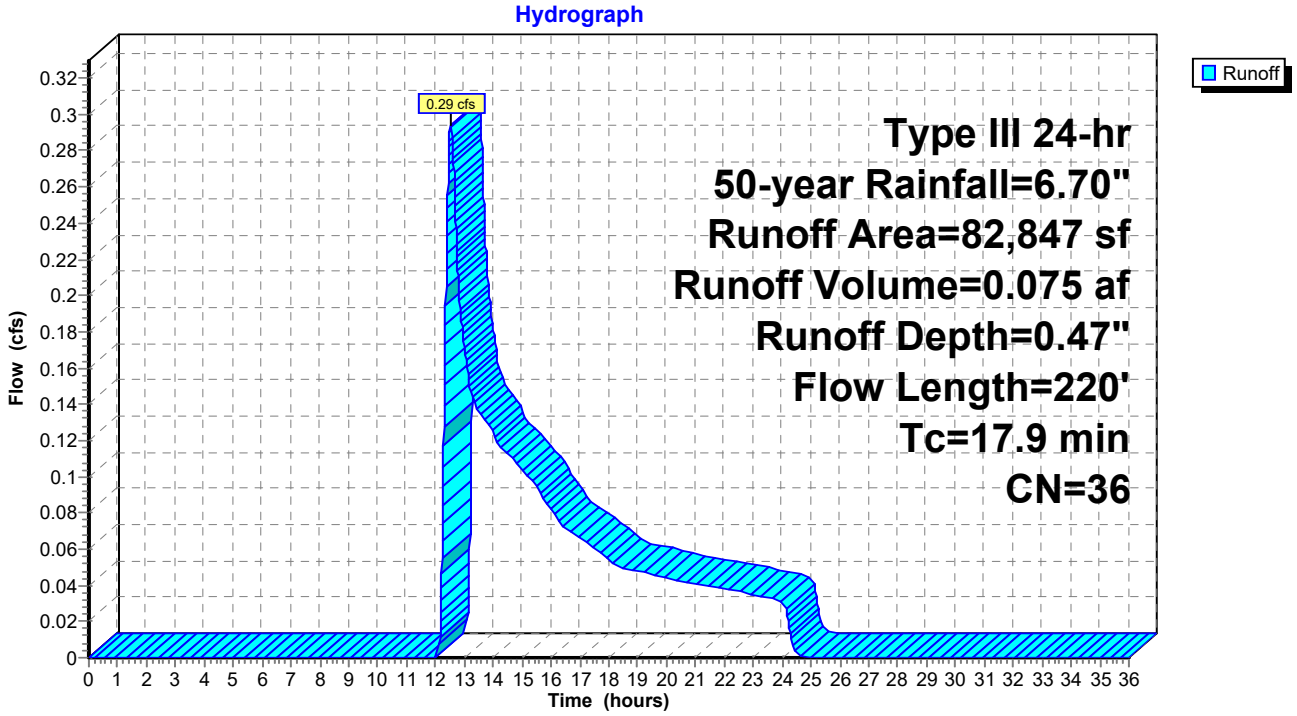
Reach 1R: Site Flow Inflow=1.00 cfs 0.243 af
Outflow=1.00 cfs 0.243 af

Reach 2R: Offsite Flow Inflow=0.18 cfs 0.045 af
Outflow=0.18 cfs 0.045 af

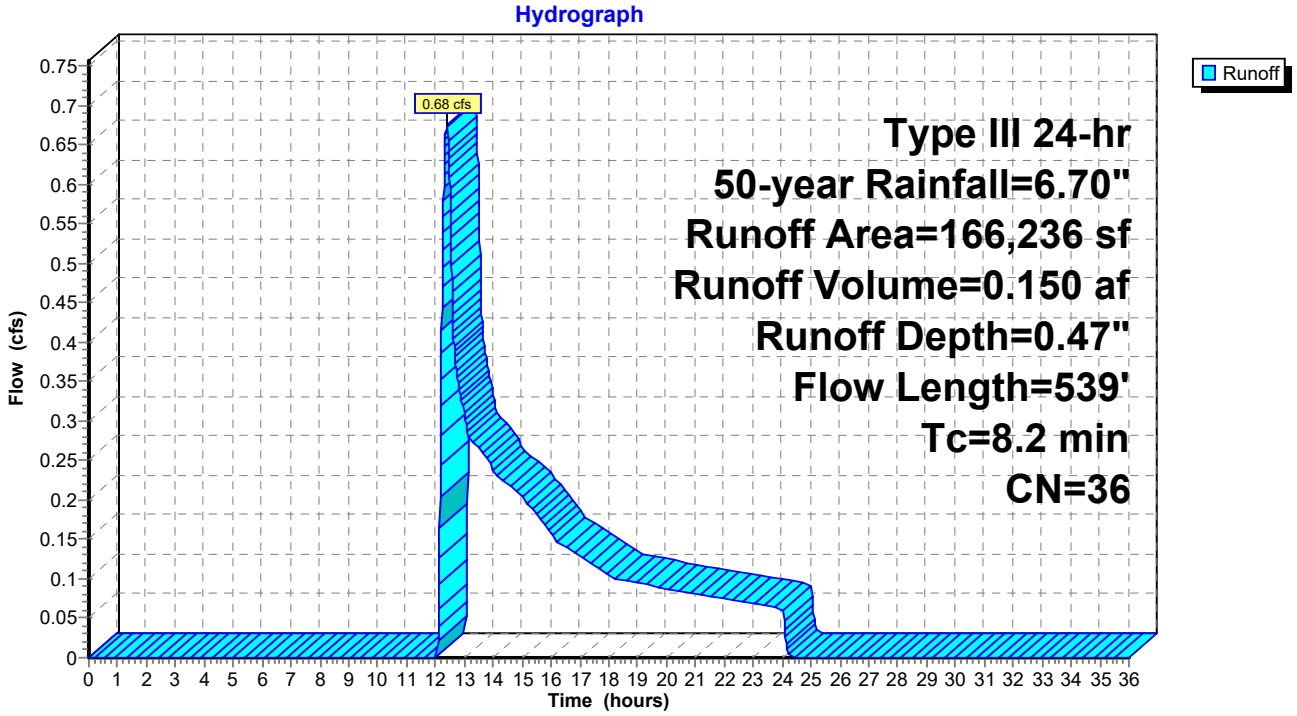
Reach TS: Total Site Inflow=1.16 cfs 0.288 af
Outflow=1.16 cfs 0.288 af

Total Runoff Area = 7.301 ac Runoff Volume = 0.288 af Average Runoff Depth = 0.47"
100.00% Pervious = 7.301 ac 0.00% Impervious = 0.000 ac

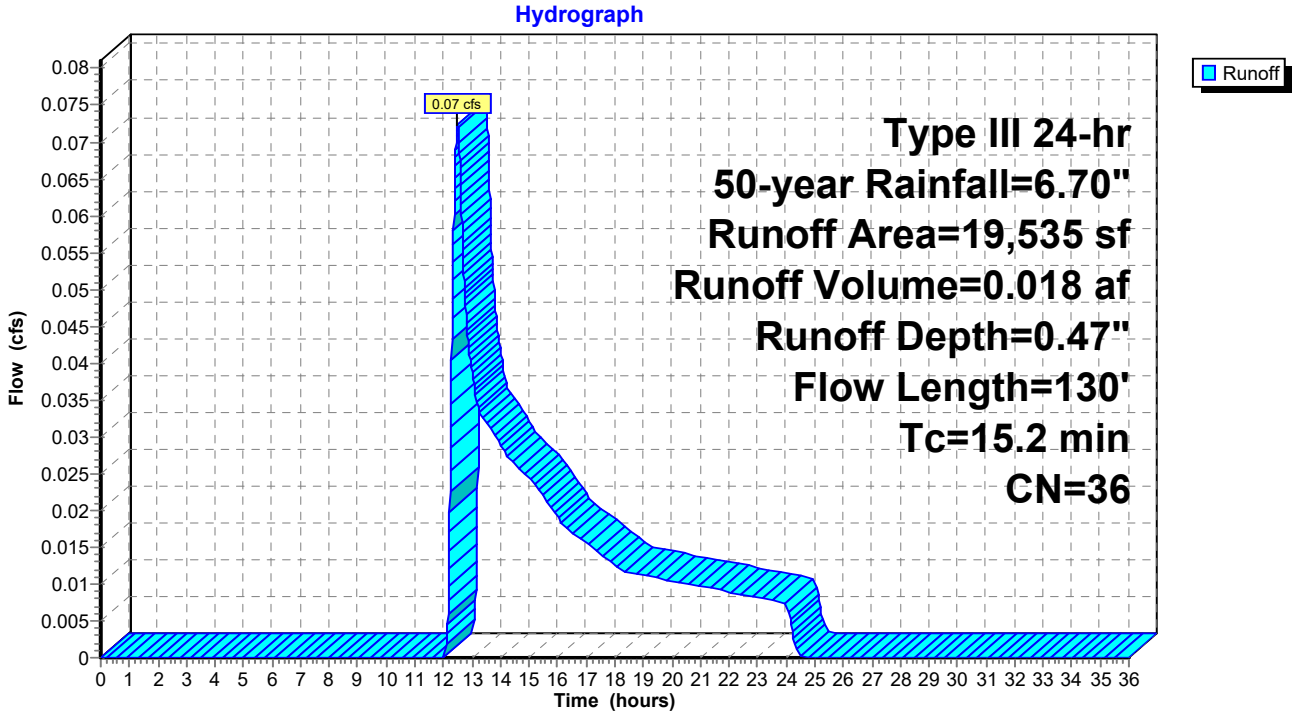
Subcatchment E1-1: Southwest



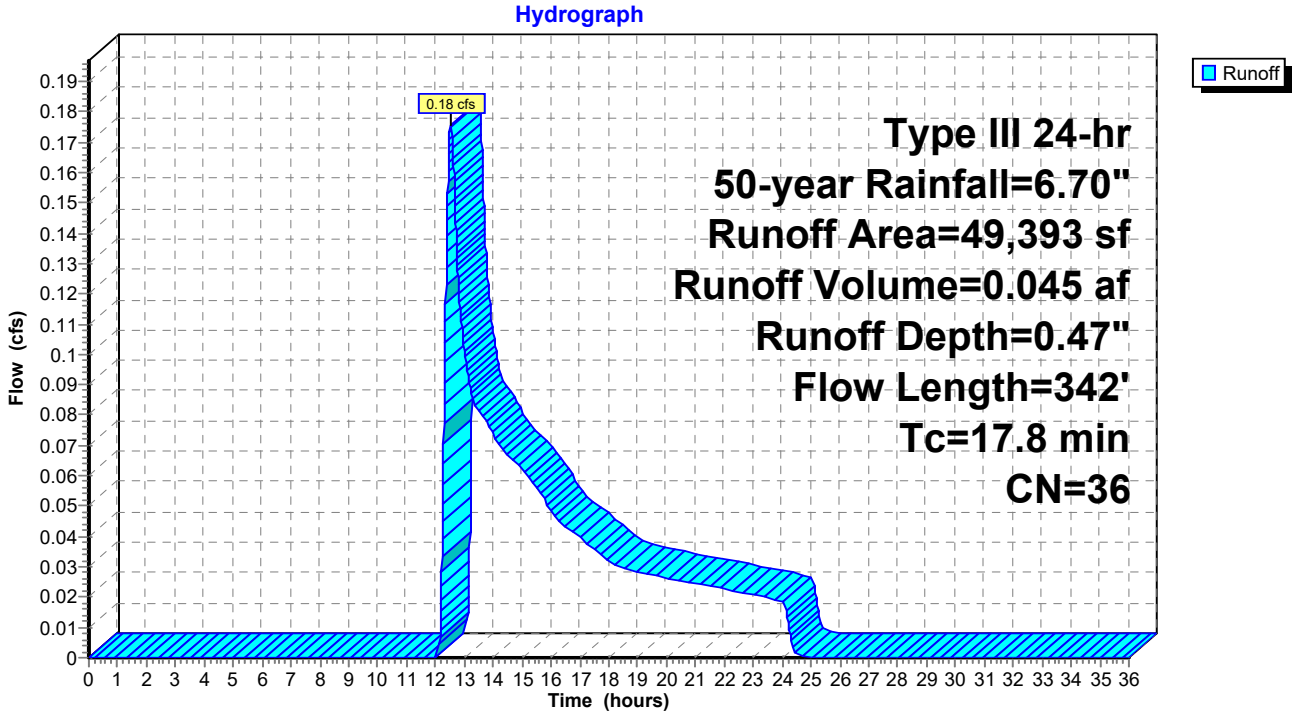
Subcatchment E1-2: Central



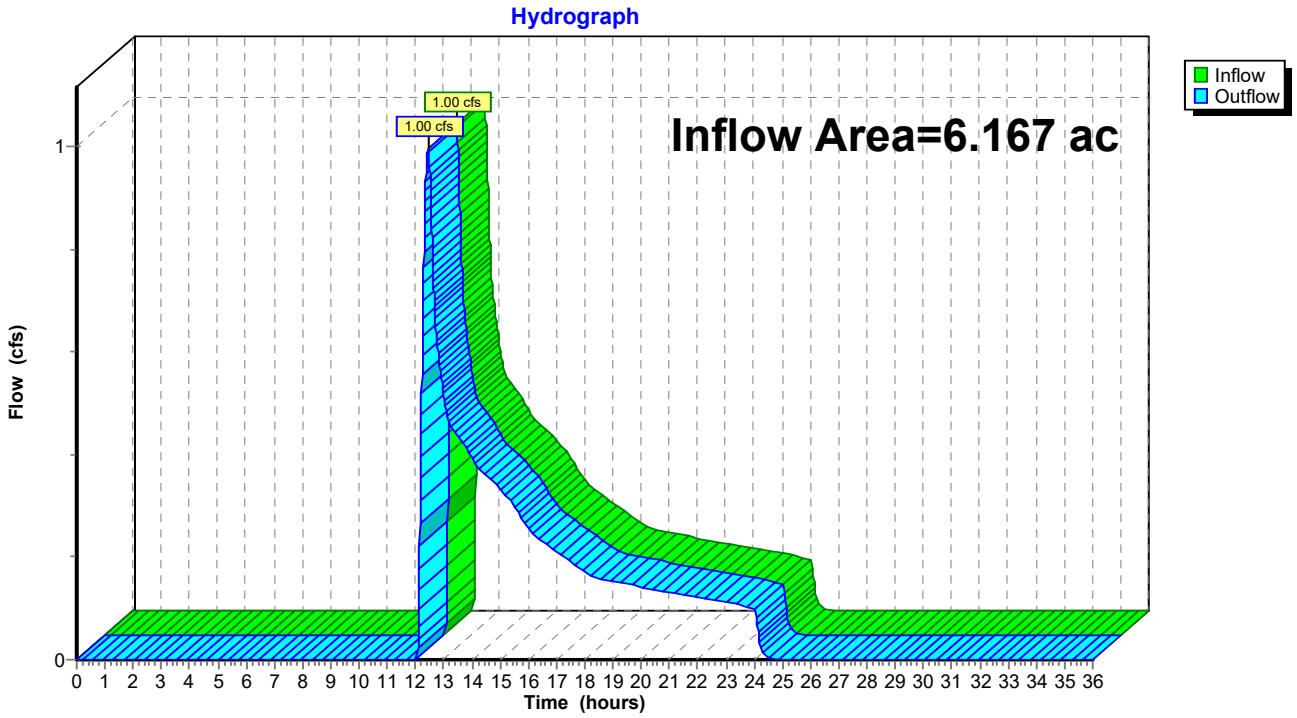
Subcatchment E1-3: Northeast



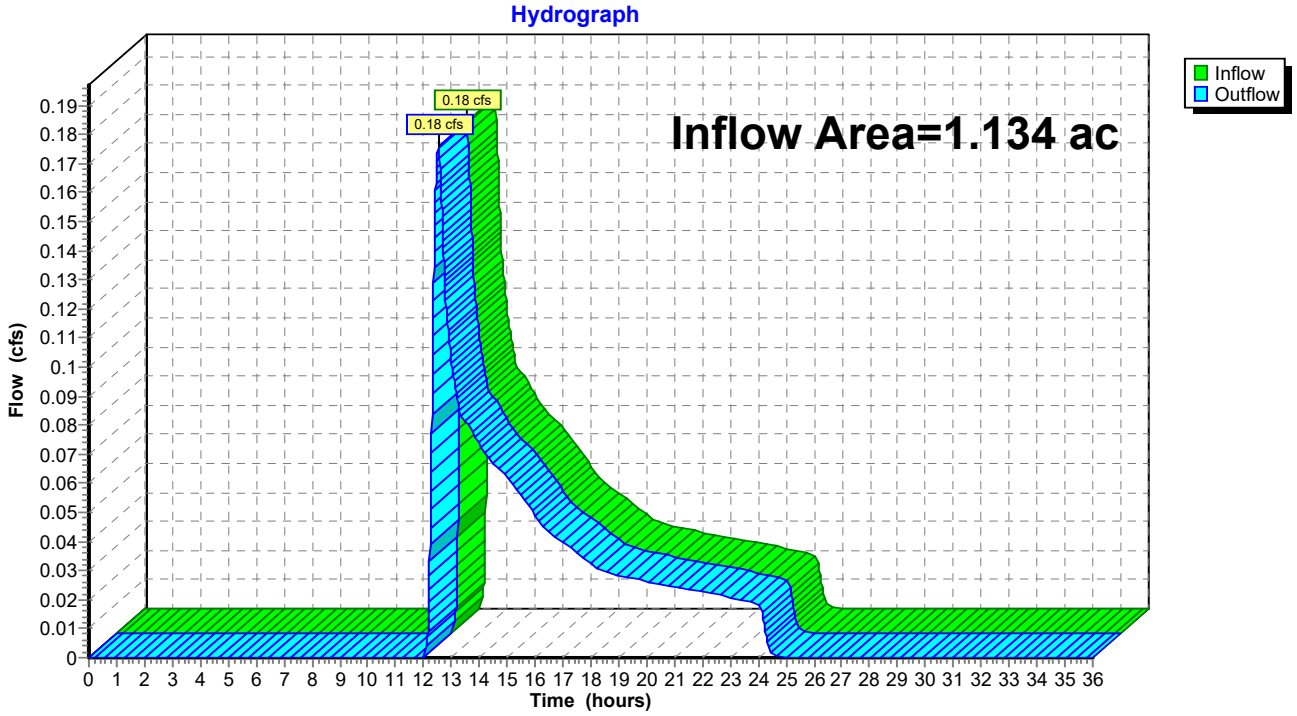
Subcatchment E2-1: Southeast



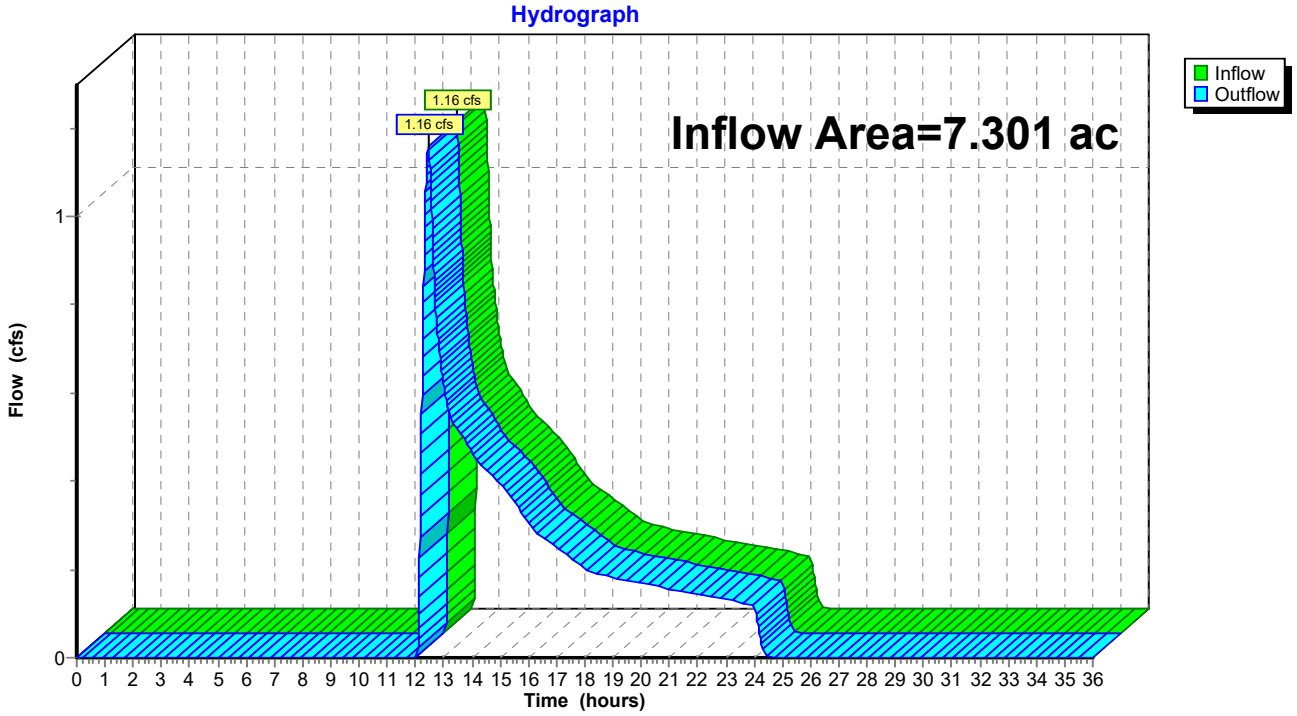
Reach 1R: Site Flow



Reach 2R: Offsite Flow



Reach TS: Total Site



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1-1: Southwest Runoff Area=82,847 sf 0.00% Impervious Runoff Depth=0.71"
Flow Length=220' Tc=17.9 min CN=36 Runoff=0.56 cfs 0.112 af

Subcatchment E1-2: Central Runoff Area=166,236 sf 0.00% Impervious Runoff Depth=0.71"
Flow Length=539' Tc=8.2 min CN=36 Runoff=1.24 cfs 0.225 af

Subcatchment E1-3: Northeast Runoff Area=19,535 sf 0.00% Impervious Runoff Depth=0.71"
Flow Length=130' Tc=15.2 min CN=36 Runoff=0.14 cfs 0.026 af

Subcatchment E2-1: Southeast Runoff Area=49,393 sf 0.00% Impervious Runoff Depth=0.71"
Flow Length=342' Tc=17.8 min CN=36 Runoff=0.33 cfs 0.067 af

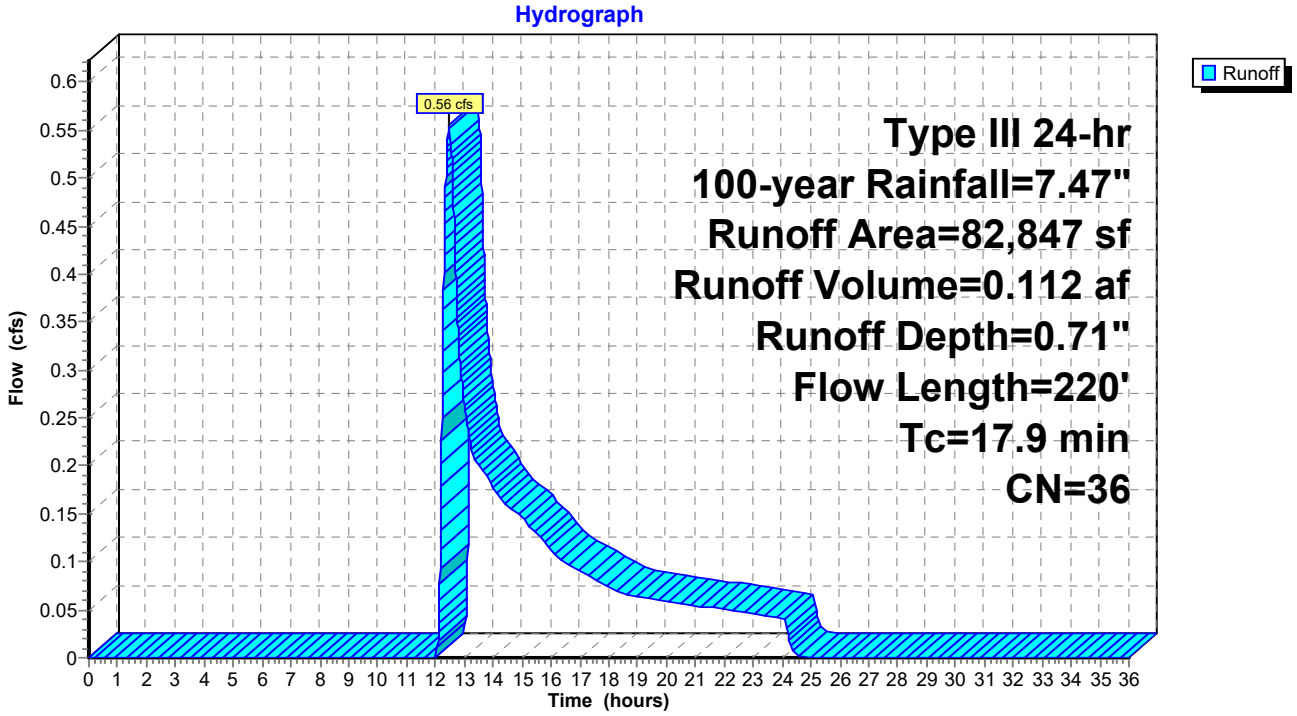
Reach 1R: Site Flow Inflow=1.87 cfs 0.363 af
Outflow=1.87 cfs 0.363 af

Reach 2R: Offsite Flow Inflow=0.33 cfs 0.067 af
Outflow=0.33 cfs 0.067 af

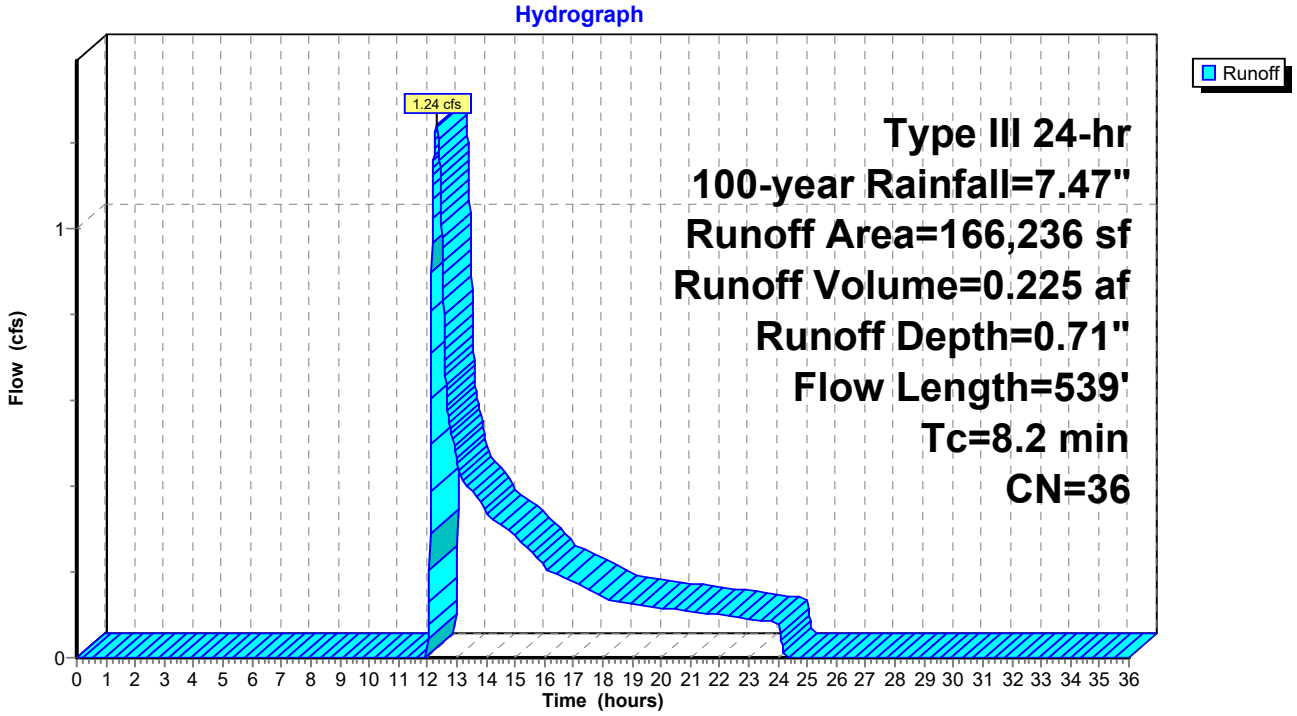
Reach TS: Total Site Inflow=2.18 cfs 0.430 af
Outflow=2.18 cfs 0.430 af

Total Runoff Area = 7.301 ac Runoff Volume = 0.430 af Average Runoff Depth = 0.71"
100.00% Pervious = 7.301 ac 0.00% Impervious = 0.000 ac

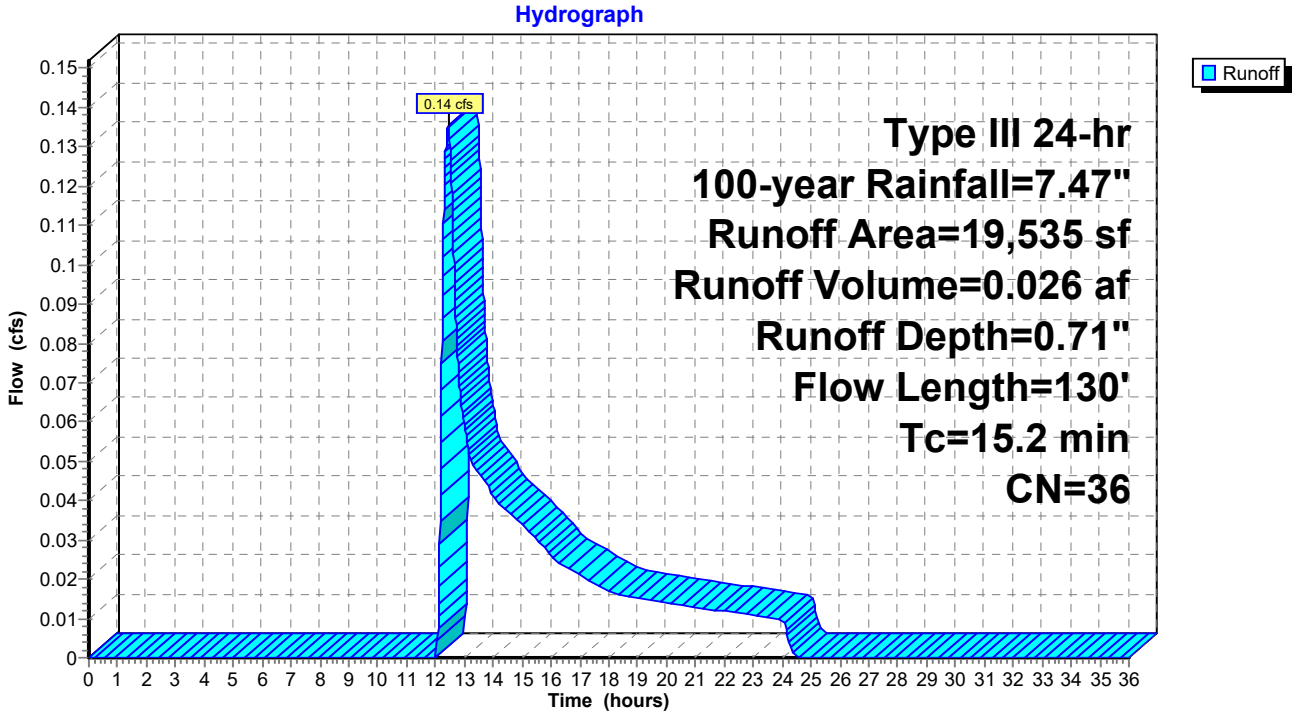
Subcatchment E1-1: Southwest



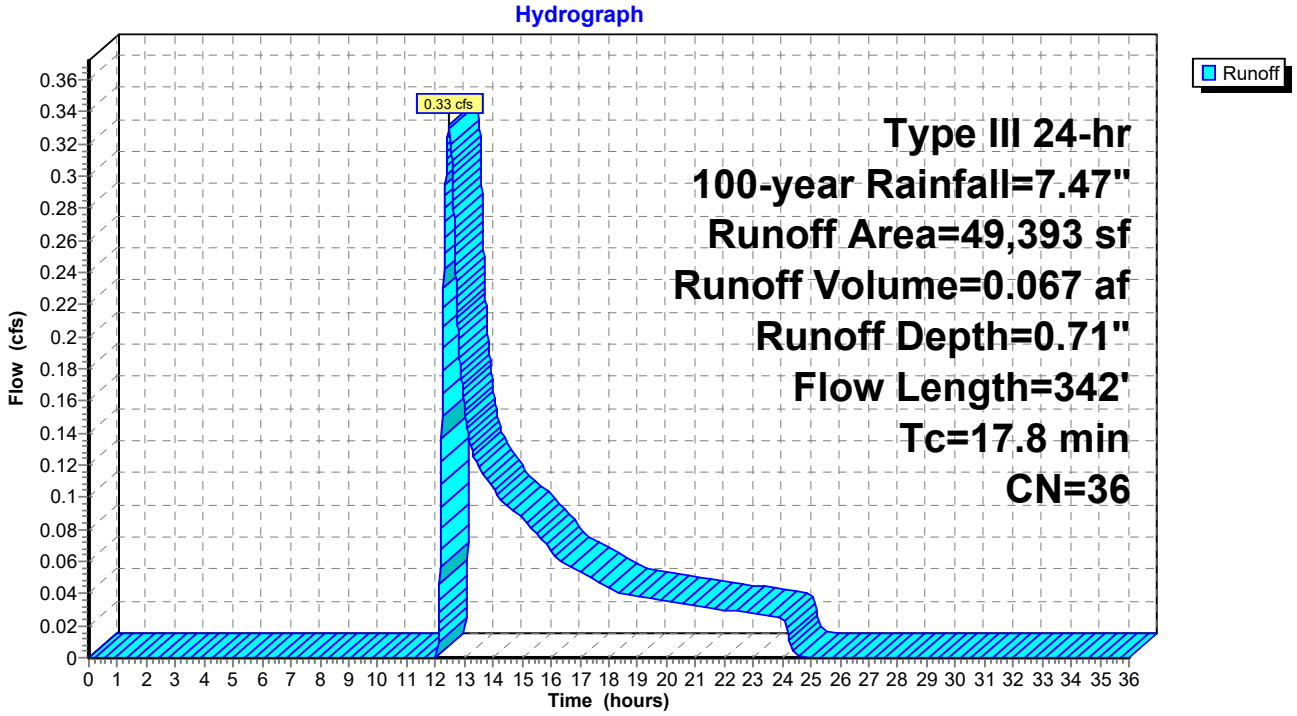
Subcatchment E1-2: Central



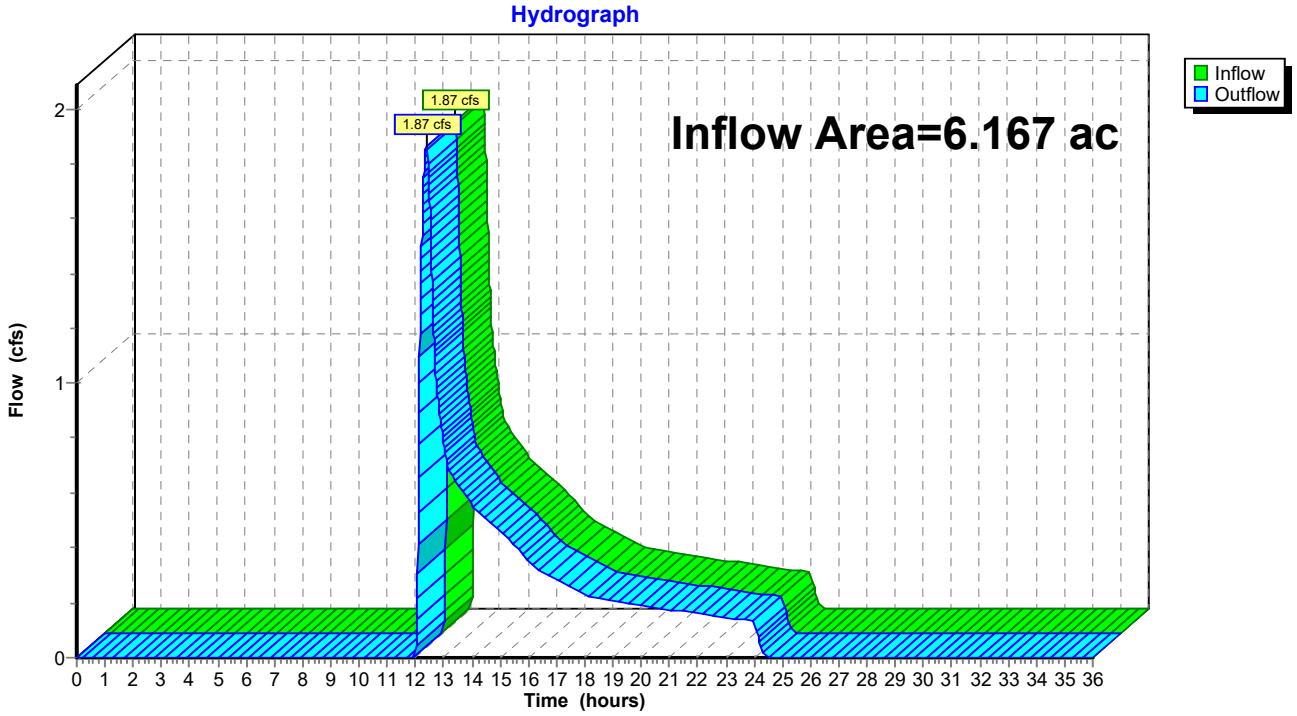
Subcatchment E1-3: Northeast



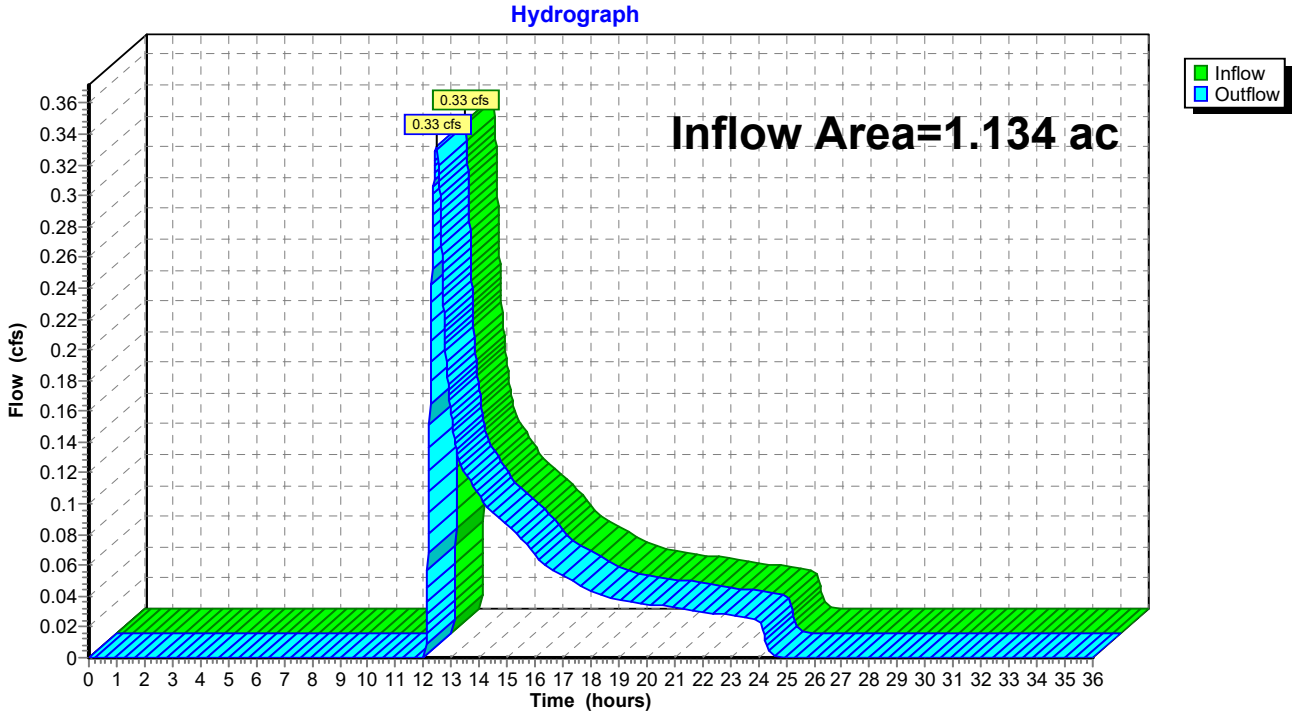
Subcatchment E2-1: Southeast



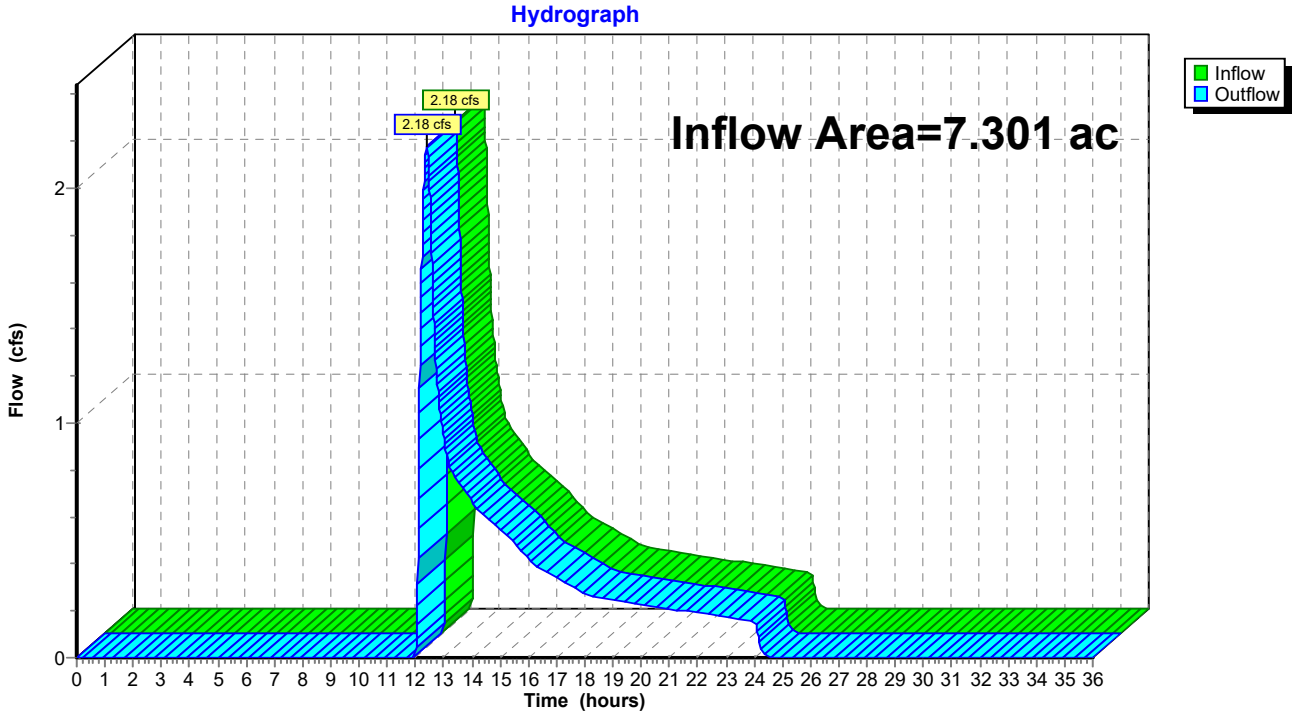
Reach 1R: Site Flow



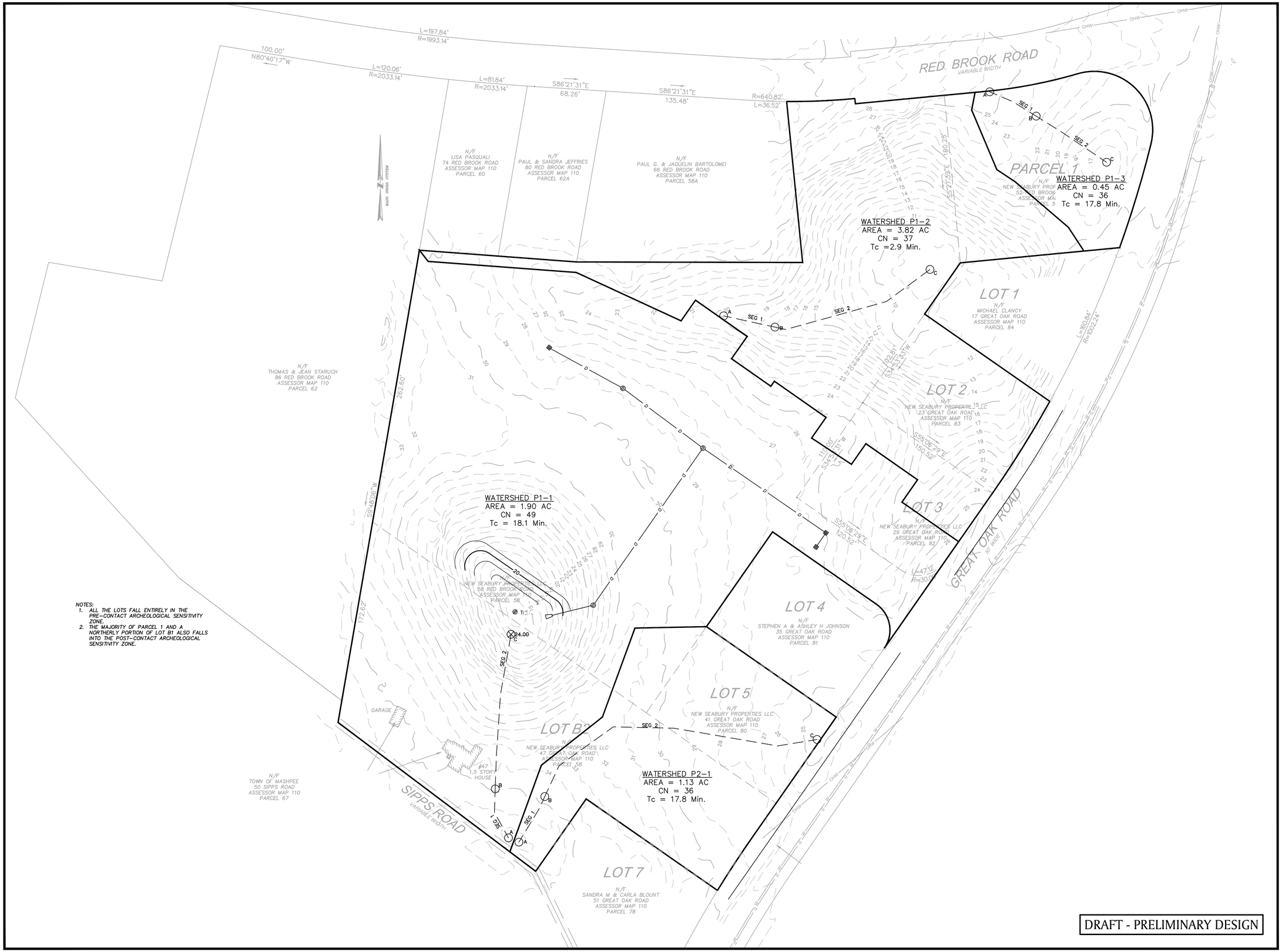
Reach 2R: Offsite Flow



Reach TS: Total Site



5.03 PROPOSED WATERSHED PLAN



NOTES:
1. ALL THE LOTS FALL ENTIRELY IN THE PRE-CONTACT ARCHEOLOGICAL SENSITIVITY ZONE.
2. THE MAJORITY OF PARCEL 1 AND A NORTHERLY PORTION OF LOT B1 ALSO FALLS INTO THE POST-CONTACT ARCHEOLOGICAL SENSITIVITY ZONE.

DRAFT - PRELIMINARY DESIGN

GREAT OAK ROAD PRELIMINARY SUBDIVISION - JANUARY 8, 2023

BRIAN YERGATIAN NO. 46206

GREAT OAK ROAD PRELIMINARY SUBDIVISION

GREAT OAK ROAD

IN

MASHPEE
MASSACHUSETTS

PROPOSED WATERSHED AREA MAP

JANUARY 8, 2023

REVISIONS:

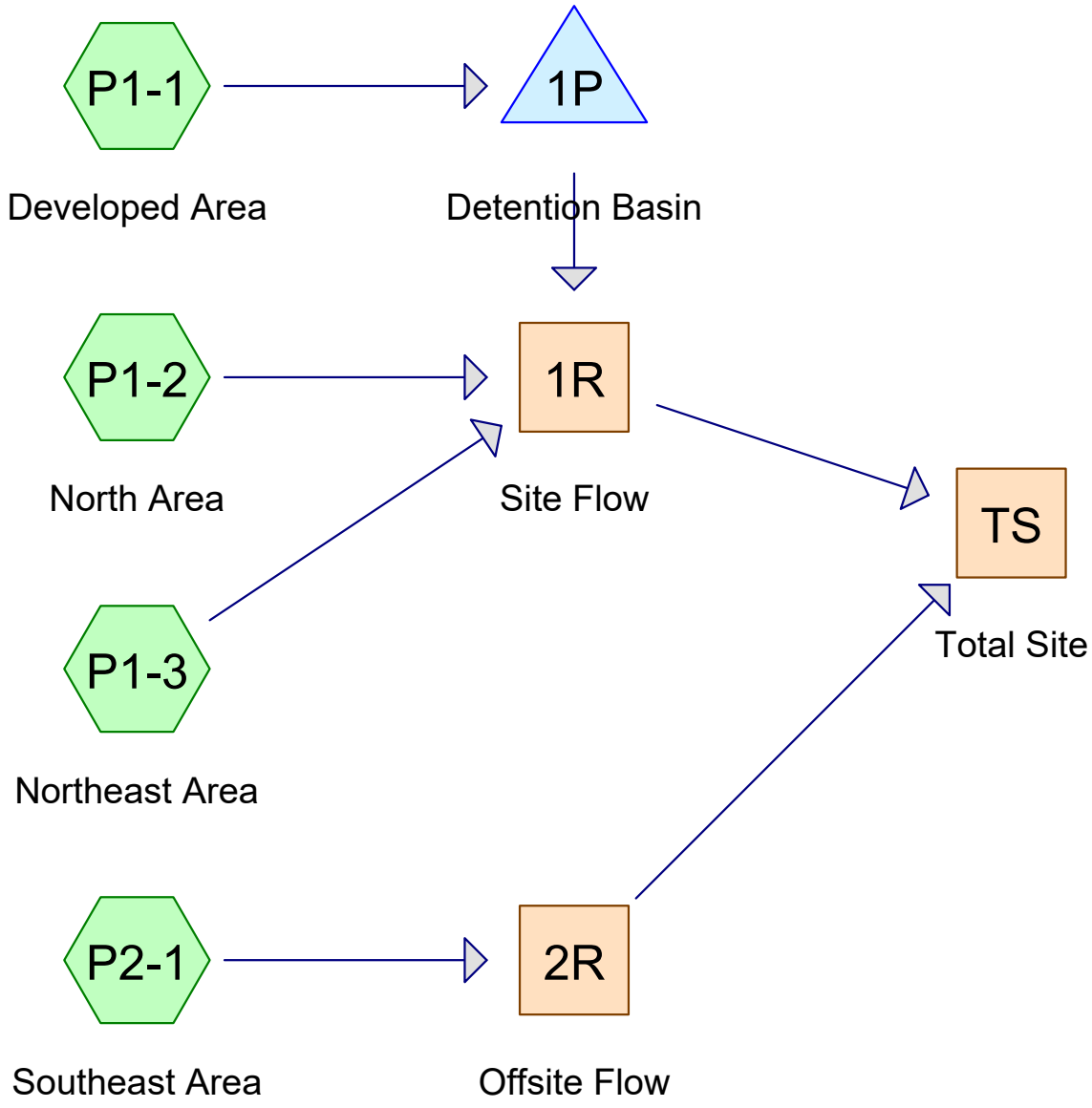
PREPARED FOR:
NEW SEABURY HOMES, LLC
22 SEANEST DRIVE
MASHPEE, MA 02649

BSC GROUP
349 Main Street Route 28
West Yarmouth, Massachusetts 02673
508 778 8919

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

FILE: 5077400-PWAM.DWG
DWG. NO:
JOB. NO: 50774.00
PWAM

5.04 PROPOSED HYDROLOGY CALCULATIONS (HYDROCAD™ PRINTOUTS)



Subcat Reach Pond Link

Routing Diagram for 5077400-PWAM
Prepared by BSC Group, Printed 1/25/2024

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	Type III 24-hr		Default	24.00	1	3.42	2
2	10-year	Type III 24-hr		Default	24.00	1	4.99	2
3	25-year	Type III 24-hr		Default	24.00	1	5.96	2
4	50-year	Type III 24-hr		Default	24.00	1	6.70	2
5	100-year	Type III 24-hr		Default	24.00	1	7.47	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.352	39	>75% Grass cover, Good, HSG A (P1-1, P1-2, P2-1)
0.776	98	Paved parking, HSG A (P1-1)
4.173	36	Woods, Fair, HSG A (P1-1, P1-2, P1-3, P2-1)
7.300	**44**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
7.300	HSG A	P1-1, P1-2, P1-3, P2-1
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
7.300		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
2.352	0.000	0.000	0.000	0.000	2.352	>75% Grass cover, Good	P1-1, P1-2, P2-1
0.776	0.000	0.000	0.000	0.000	0.776	Paved parking	P1-1
4.173	0.000	0.000	0.000	0.000	4.173	Woods, Fair	P1-1, P1-2, P1-3, P2-1
7.300	**0.000**	**0.000**	**0.000**	**0.000**	**7.300**	**TOTAL AREA**	

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1-1: Developed Area Runoff Area=172,242 sf 19.61% Impervious Runoff Depth=0.15"
Flow Length=196' Tc=18.1 min CN=49 Runoff=0.11 cfs 0.050 af

Subcatchment P1-2: North Area Runoff Area=84,594 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=211' Slope=0.0500 '/' Tc=2.9 min CN=37 Runoff=0.00 cfs 0.000 af

Subcatchment P1-3: Northeast Area Runoff Area=19,535 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=130' Tc=15.2 min CN=36 Runoff=0.00 cfs 0.000 af

Subcatchment P2-1: Southeast Area Runoff Area=41,636 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=342' Tc=17.8 min CN=36 Runoff=0.00 cfs 0.000 af

Reach 1R: Site Flow Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach 2R: Offsite Flow Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach TS: Total Site Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1P: Detention Basin Peak Elev=14.12' Storage=52 cf Inflow=0.11 cfs 0.050 af
Outflow=0.09 cfs 0.050 af

Total Runoff Area = 7.300 ac Runoff Volume = 0.050 af Average Runoff Depth = 0.08"
89.38% Pervious = 6.525 ac 10.62% Impervious = 0.776 ac

Summary for Subcatchment P1-1: Developed Area

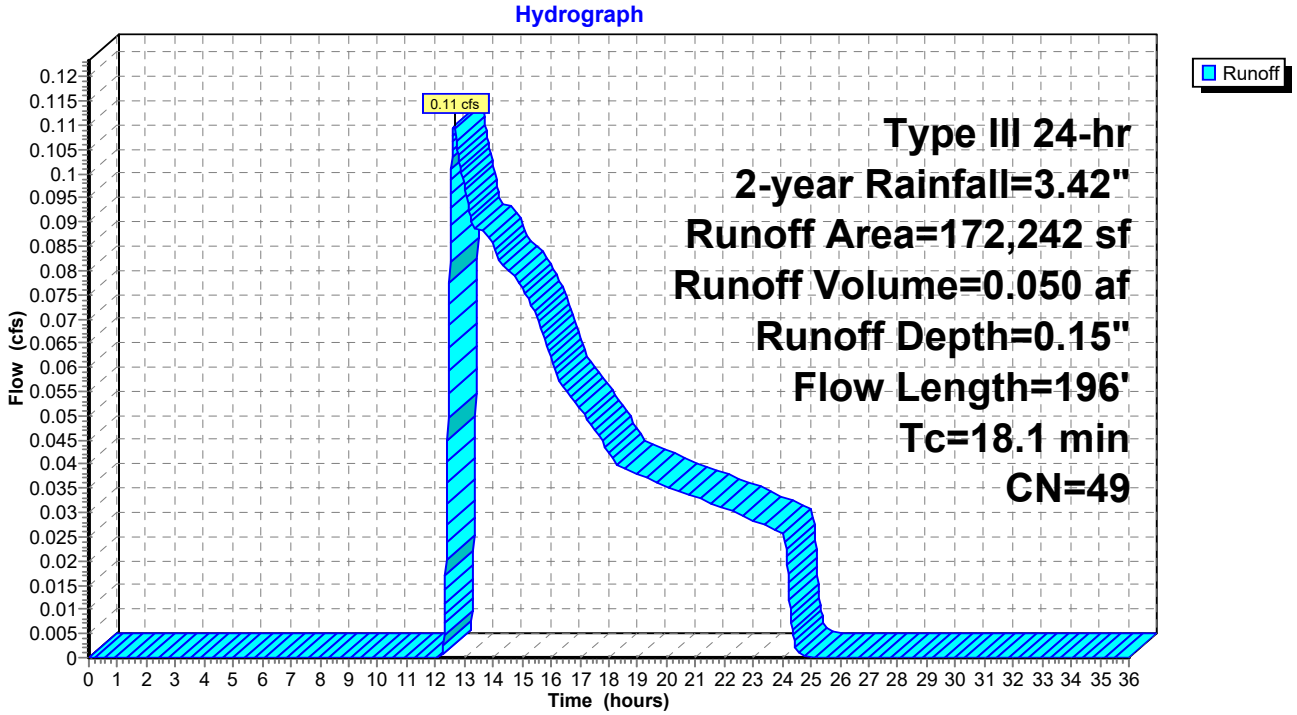
Runoff = 0.11 cfs @ 12.65 hrs, Volume= 0.050 af, Depth= 0.15"
Routed to Pond 1P : Detention Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.42"

Area (sf)	CN	Description
61,707	36	Woods, Fair, HSG A
76,753	39	>75% Grass cover, Good, HSG A
33,782	98	Paved parking, HSG A
172,242	49	Weighted Average
138,460		80.39% Pervious Area
33,782		19.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.6	50	0.0350	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.42"
1.5	146	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.1	196	Total			

Subcatchment P1-1: Developed Area



Summary for Subcatchment P1-2: North Area

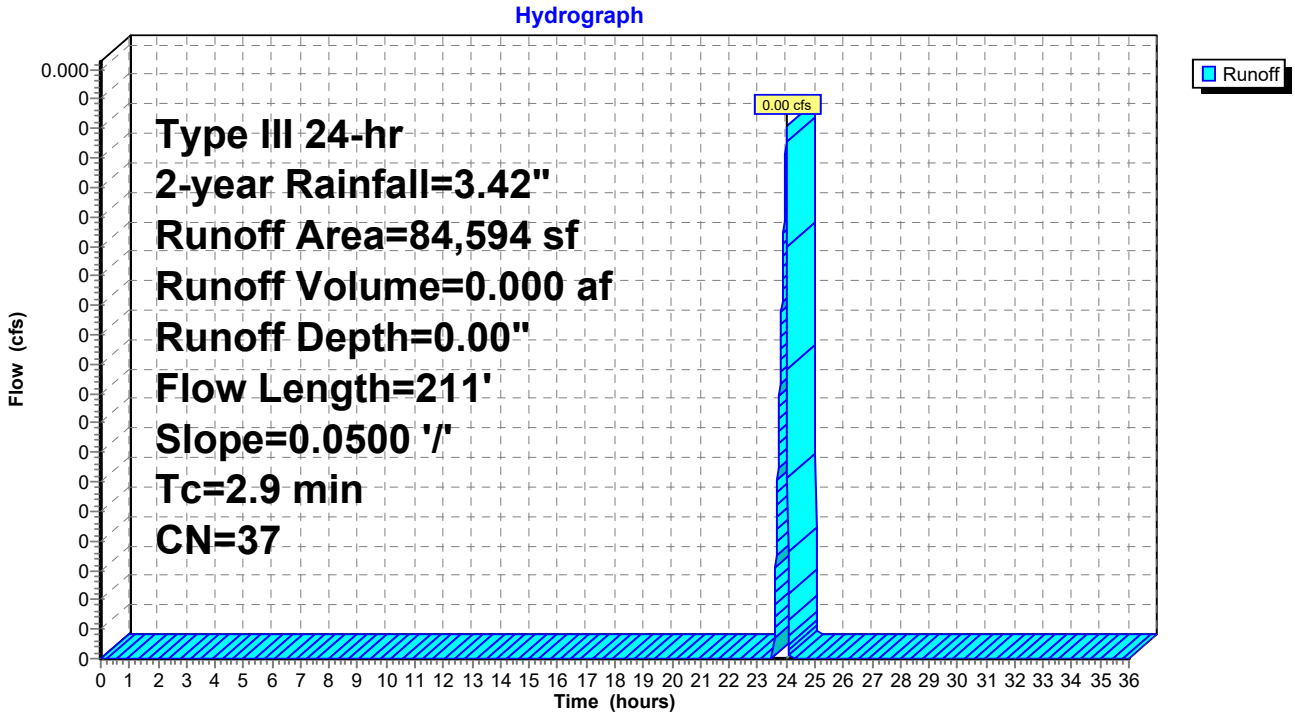
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1R : Site Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.42"

Area (sf)	CN	Description
59,996	36	Woods, Fair, HSG A
24,598	39	>75% Grass cover, Good, HSG A
84,594	37	Weighted Average
84,594		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0500	1.79		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.42"
2.4	161	0.0500	1.12		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
2.9	211	Total			

Subcatchment P1-2: North Area



Summary for Subcatchment P1-3: Northeast Area

[45] Hint: Runoff=Zero

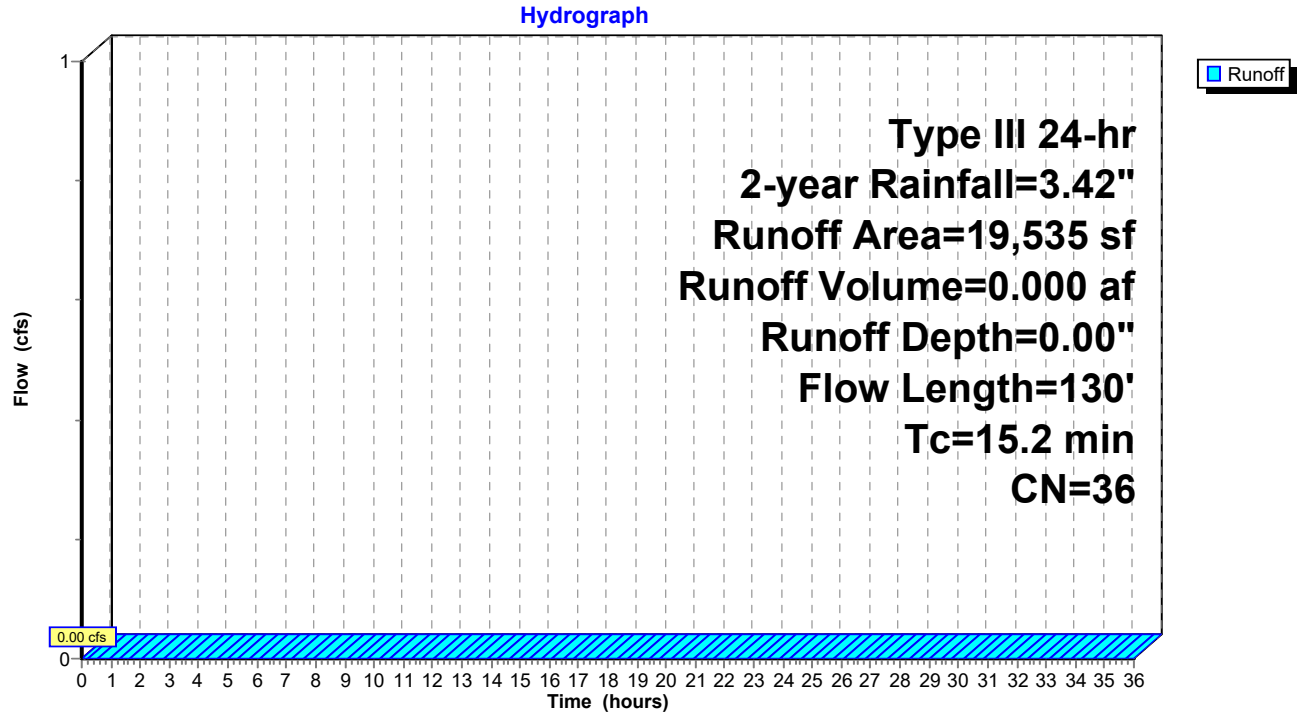
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 1R : Site Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.42"

Area (sf)	CN	Description
19,535	36	Woods, Fair, HSG A
19,535		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	50	0.0500	0.06		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.42"
0.8	80	0.1050	1.62		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.2	130	Total			

Subcatchment P1-3: Northeast Area



Summary for Subcatchment P2-1: Southeast Area

[45] Hint: Runoff=Zero

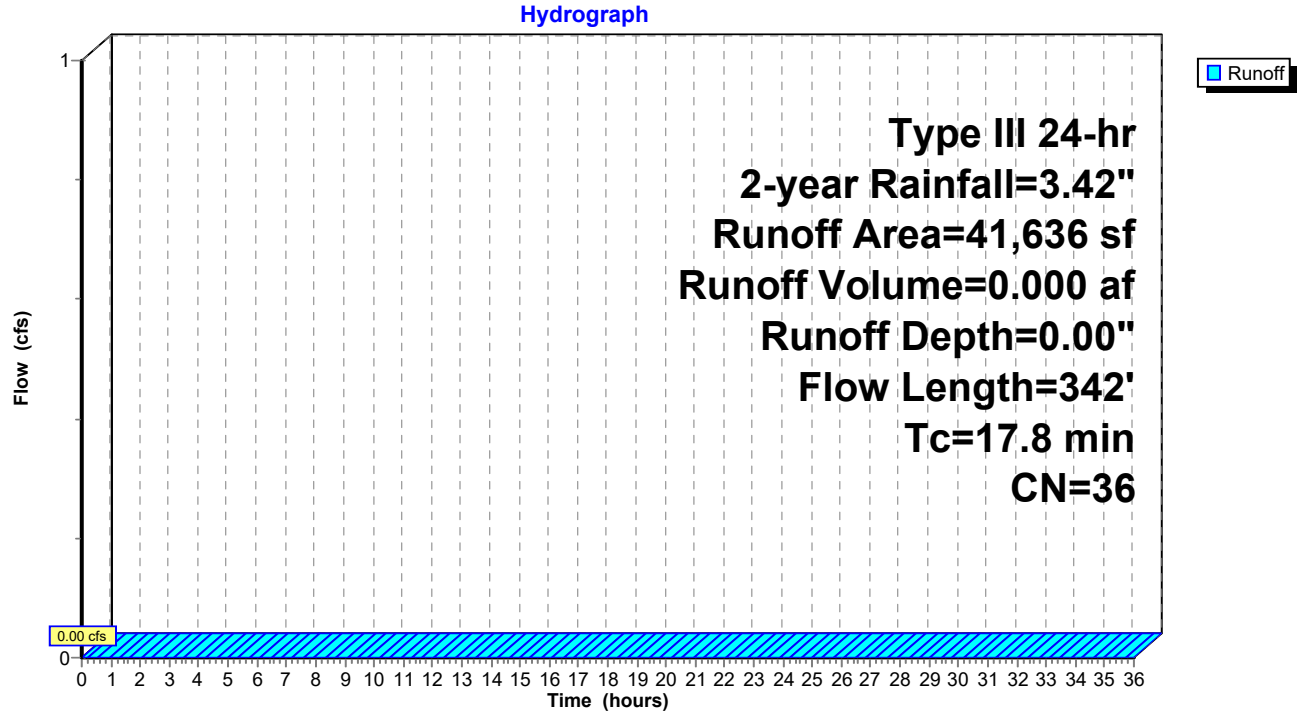
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 2R : Offsite Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.42"

Area (sf)	CN	Description
40,536	36	Woods, Fair, HSG A
1,100	39	>75% Grass cover, Good, HSG A
41,636	36	Weighted Average
41,636		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.2	50	0.0625	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.42"
4.6	292	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.8	342	Total			

Subcatchment P2-1: Southeast Area



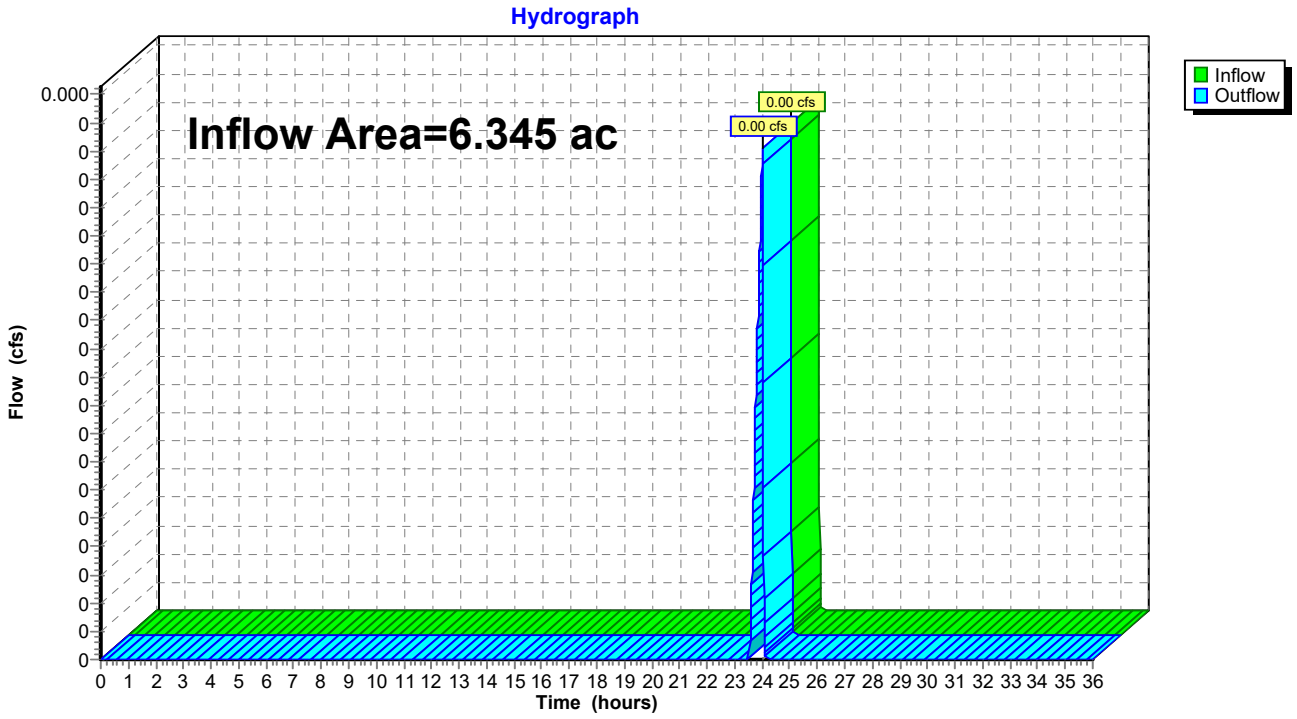
Summary for Reach 1R: Site Flow

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

Inflow Area = 6.345 ac, 12.22% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Reach TS : Total Site

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 1R: Site Flow



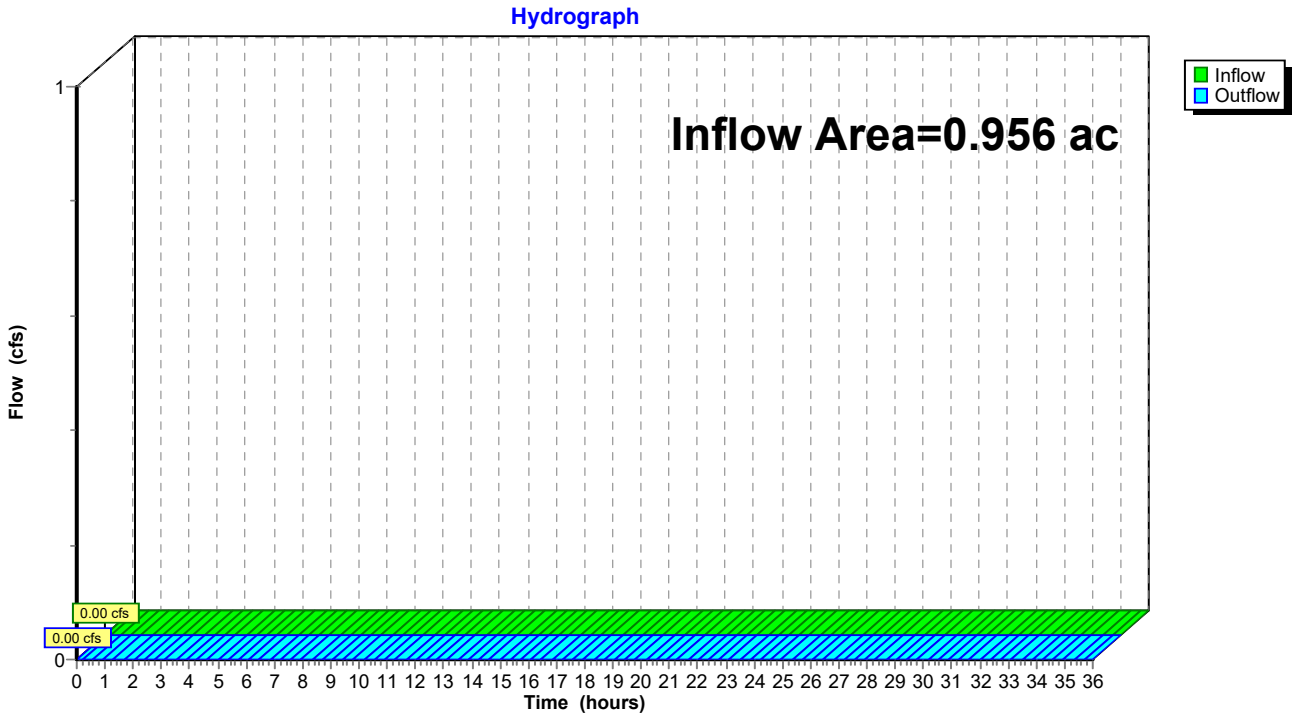
Summary for Reach 2R: Offsite Flow

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

Inflow Area = 0.956 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-year 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
Routed to Reach TS : Total Site

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 2R: Offsite Flow



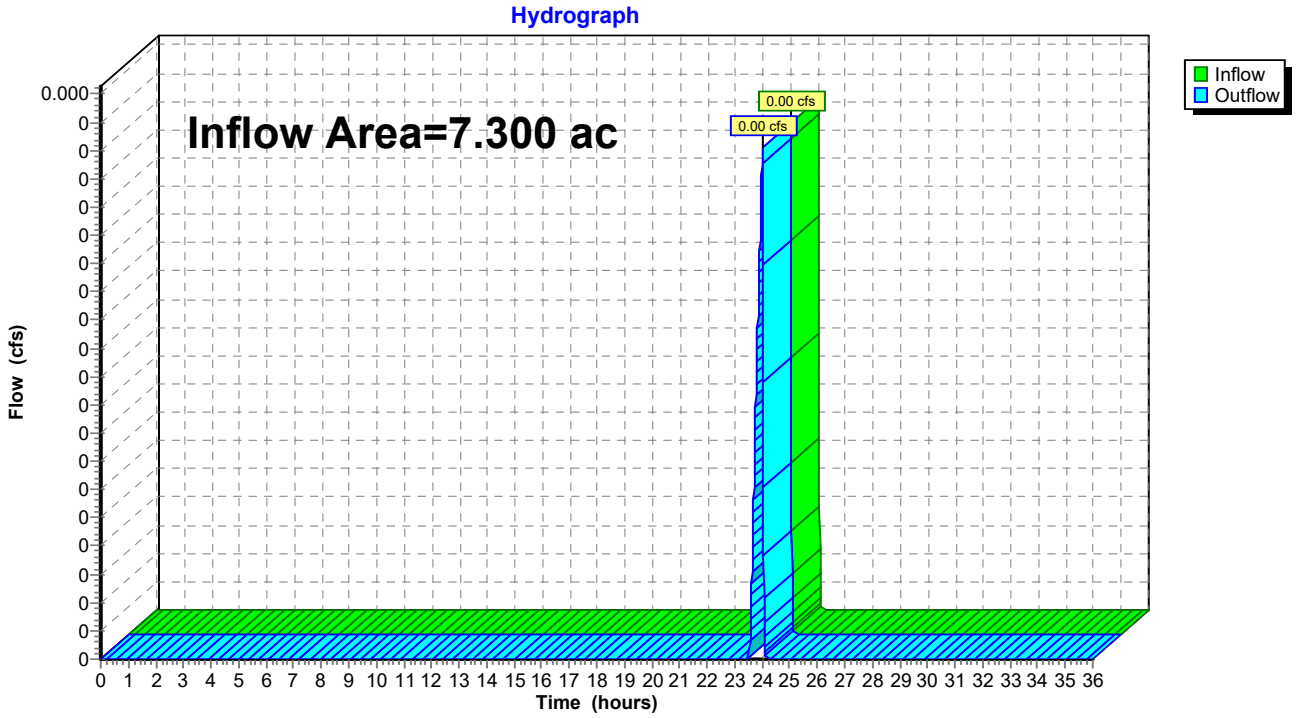
Summary for Reach TS: Total Site

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

Inflow Area = 7.300 ac, 10.62% Impervious, Inflow Depth = 0.00" for 2-year event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach TS: Total Site



Summary for Pond 1P: Detention Basin

Inflow Area = 3.954 ac, 19.61% Impervious, Inflow Depth = 0.15" for 2-year event
Inflow = 0.11 cfs @ 12.65 hrs, Volume= 0.050 af
Outflow = 0.09 cfs @ 13.16 hrs, Volume= 0.050 af, Atten= 16%, Lag= 31.0 min
Discarded = 0.09 cfs @ 13.16 hrs, Volume= 0.050 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 14.12' @ 13.16 hrs Surf.Area= 482 sf Storage= 52 cf

Plug-Flow detention time= 7.1 min calculated for 0.050 af (100% of inflow)
Center-of-Mass det. time= 7.1 min (1,019.3 - 1,012.2)

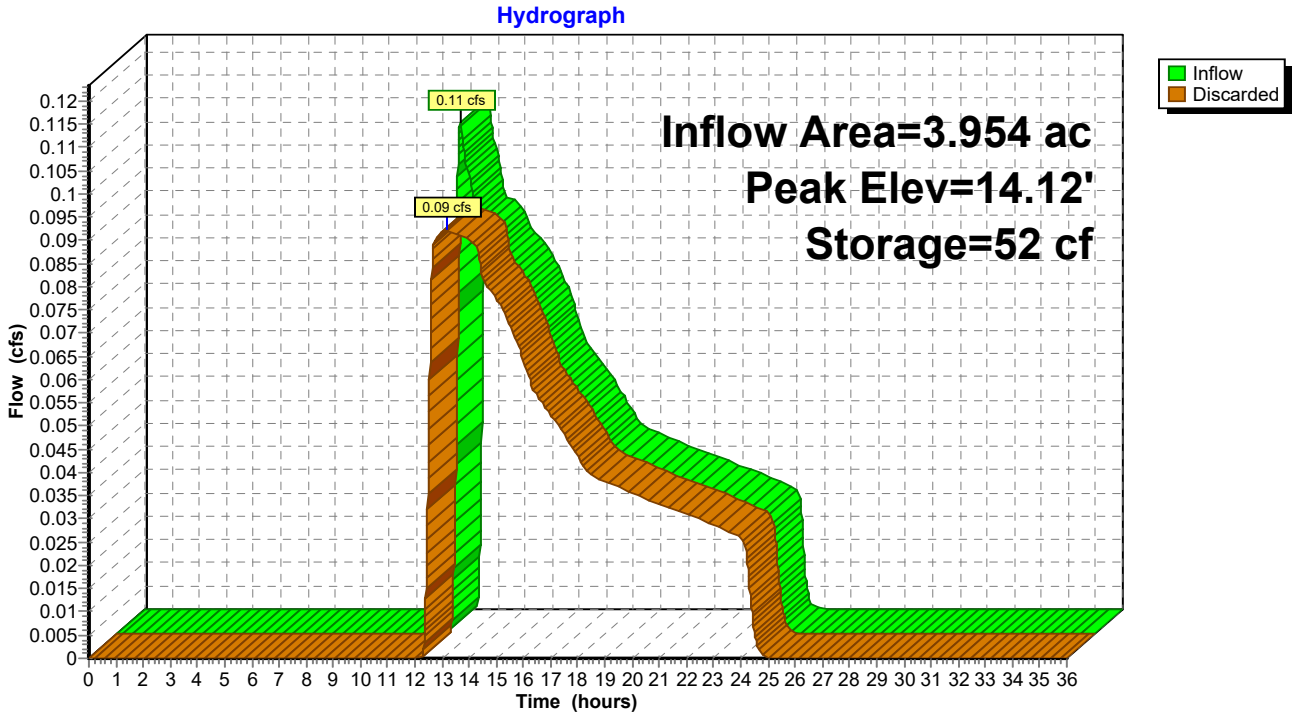
Volume	Invert	Avail.Storage	Storage Description
#1	14.00'	34,290 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
14.00	421	79.2	0	0	421
16.00	2,068	182.6	2,281	2,281	2,591
18.00	4,162	259.0	6,109	8,391	5,312
20.00	6,437	316.8	10,517	18,907	8,022
22.00	9,018	367.6	15,383	34,290	10,872

Device	Routing	Invert	Outlet Devices
#1	Discarded	14.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.09 cfs @ 13.16 hrs HW=14.12' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Pond 1P: Detention Basin



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1-1: Developed Area Runoff Area=172,242 sf 19.61% Impervious Runoff Depth=0.64"
Flow Length=196' Tc=18.1 min CN=49 Runoff=1.26 cfs 0.209 af

Subcatchment P1-2: North Area Runoff Area=84,594 sf 0.00% Impervious Runoff Depth=0.13"
Flow Length=211' Slope=0.0500 '/' Tc=2.9 min CN=37 Runoff=0.04 cfs 0.022 af

Subcatchment P1-3: Northeast Area Runoff Area=19,535 sf 0.00% Impervious Runoff Depth=0.11"
Flow Length=130' Tc=15.2 min CN=36 Runoff=0.01 cfs 0.004 af

Subcatchment P2-1: Southeast Area Runoff Area=41,636 sf 0.00% Impervious Runoff Depth=0.11"
Flow Length=342' Tc=17.8 min CN=36 Runoff=0.01 cfs 0.009 af

Reach 1R: Site Flow Inflow=0.04 cfs 0.026 af
Outflow=0.04 cfs 0.026 af

Reach 2R: Offsite Flow Inflow=0.01 cfs 0.009 af
Outflow=0.01 cfs 0.009 af

Reach TS: Total Site Inflow=0.05 cfs 0.034 af
Outflow=0.05 cfs 0.034 af

Pond 1P: Detention Basin Peak Elev=15.89' Storage=2,053 cf Inflow=1.26 cfs 0.209 af
Outflow=0.37 cfs 0.209 af

Total Runoff Area = 7.300 ac Runoff Volume = 0.244 af Average Runoff Depth = 0.40"
89.38% Pervious = 6.525 ac 10.62% Impervious = 0.776 ac

Summary for Subcatchment P1-1: Developed Area

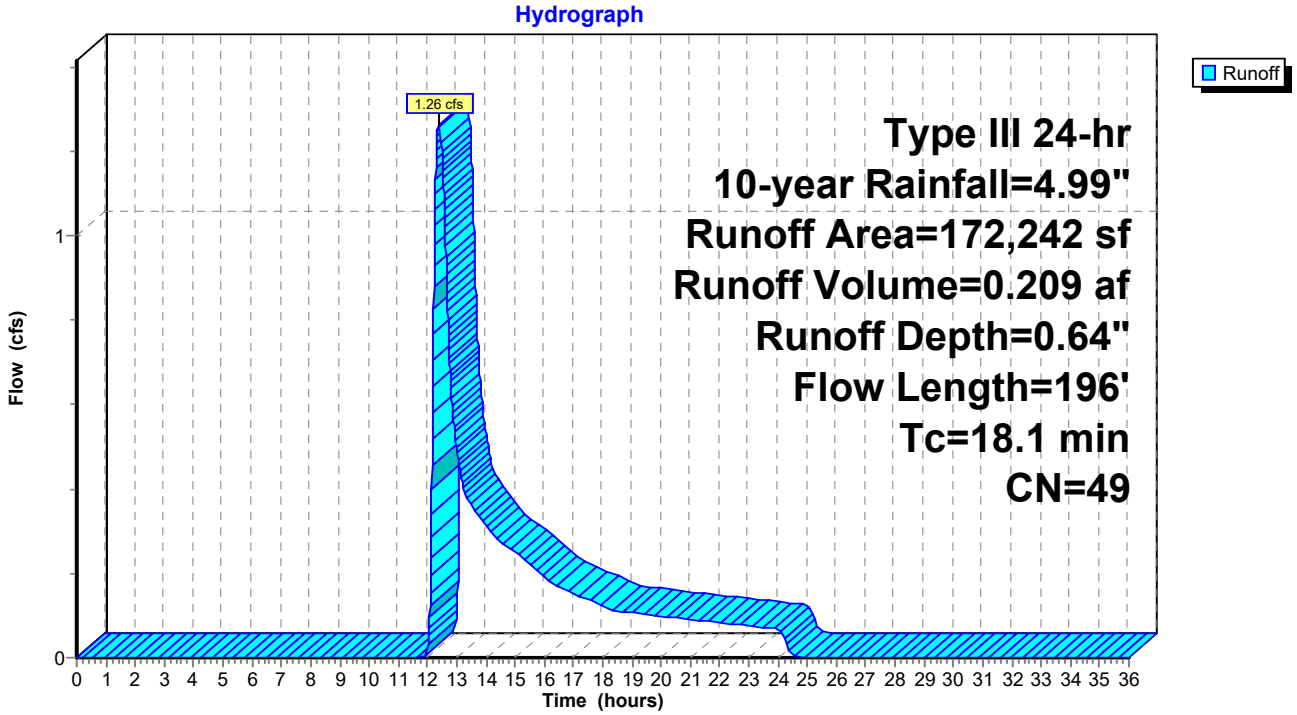
Runoff = 1.26 cfs @ 12.39 hrs, Volume= 0.209 af, Depth= 0.64"
Routed to Pond 1P : Detention Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.99"

Area (sf)	CN	Description
61,707	36	Woods, Fair, HSG A
76,753	39	>75% Grass cover, Good, HSG A
33,782	98	Paved parking, HSG A
172,242	49	Weighted Average
138,460		80.39% Pervious Area
33,782		19.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.6	50	0.0350	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.42"
1.5	146	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.1	196	Total			

Subcatchment P1-1: Developed Area



Summary for Subcatchment P1-2: North Area

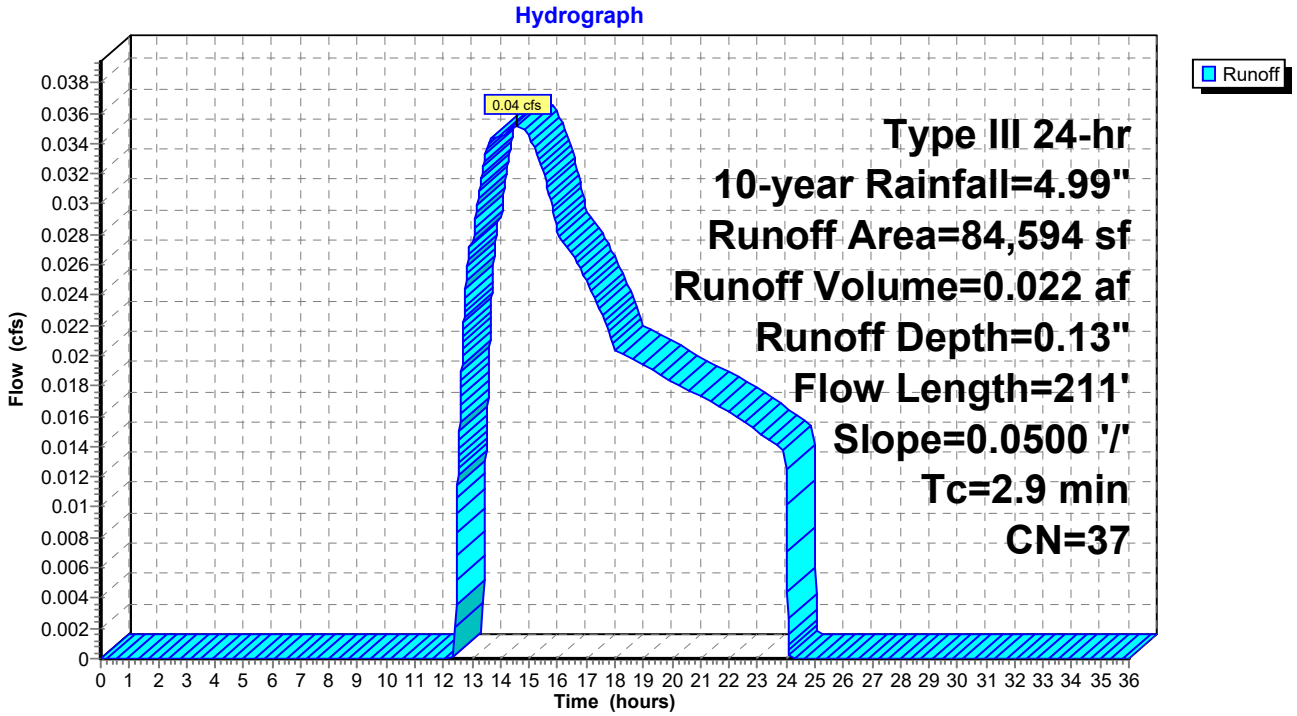
Runoff = 0.04 cfs @ 14.57 hrs, Volume= 0.022 af, Depth= 0.13"
Routed to Reach 1R : Site Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.99"

Area (sf)	CN	Description
59,996	36	Woods, Fair, HSG A
24,598	39	>75% Grass cover, Good, HSG A
84,594	37	Weighted Average
84,594		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0500	1.79		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.42"
2.4	161	0.0500	1.12		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
2.9	211	Total			

Subcatchment P1-2: North Area



Summary for Subcatchment P1-3: Northeast Area

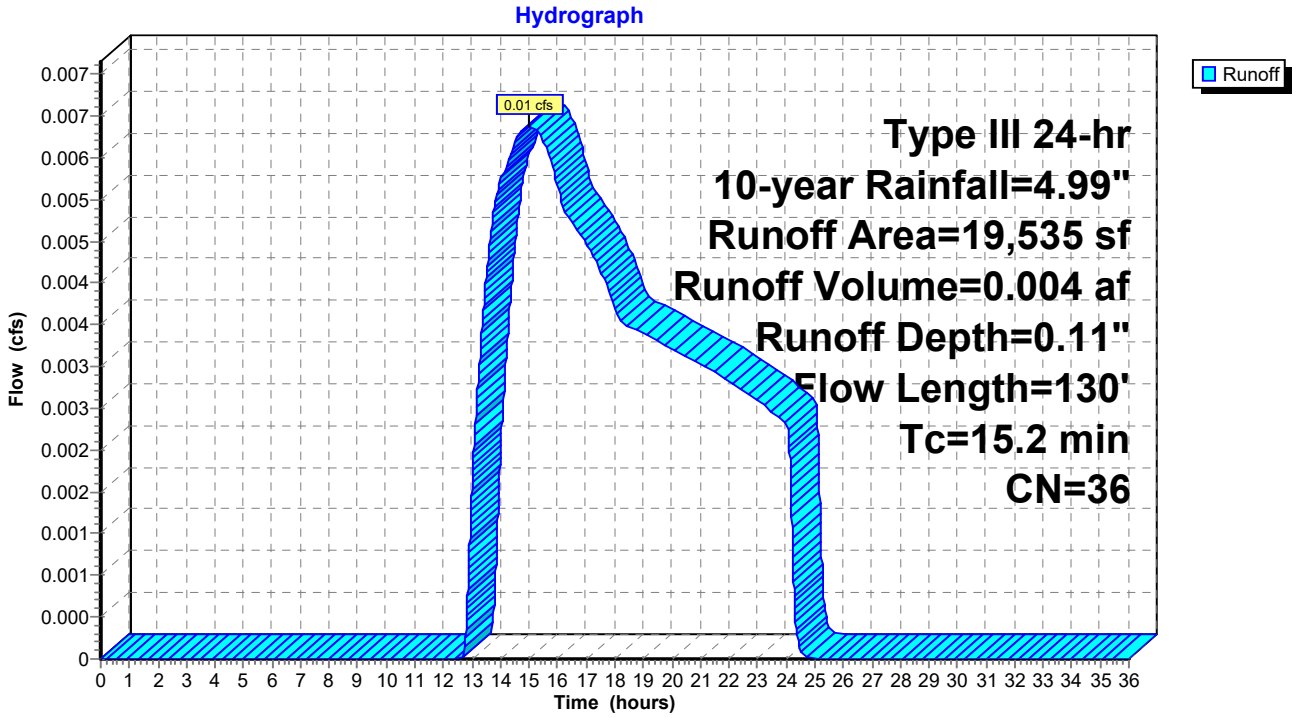
Runoff = 0.01 cfs @ 14.98 hrs, Volume= 0.004 af, Depth= 0.11"
Routed to Reach 1R : Site Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.99"

Area (sf)	CN	Description
19,535	36	Woods, Fair, HSG A
19,535		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	50	0.0500	0.06		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.42"
0.8	80	0.1050	1.62		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.2	130	Total			

Subcatchment P1-3: Northeast Area



Summary for Subcatchment P2-1: Southeast Area

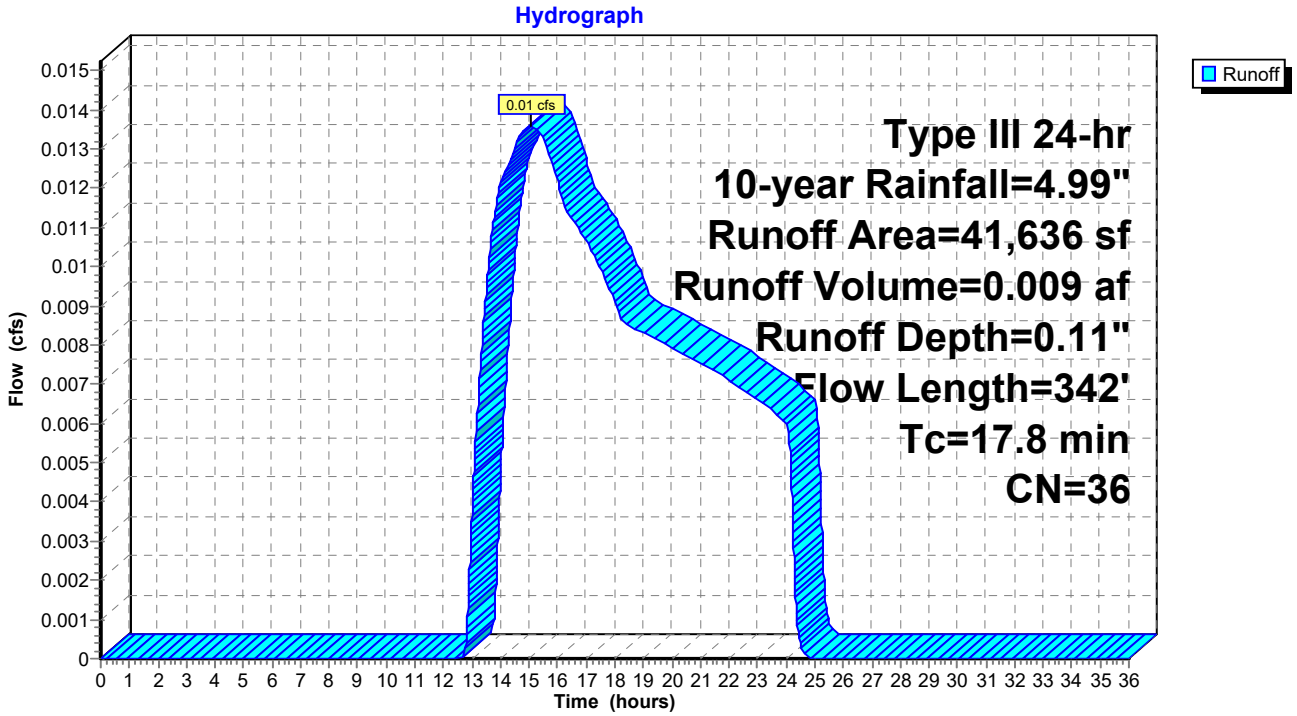
Runoff = 0.01 cfs @ 15.05 hrs, Volume= 0.009 af, Depth= 0.11"
Routed to Reach 2R : Offsite Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.99"

Area (sf)	CN	Description
40,536	36	Woods, Fair, HSG A
1,100	39	>75% Grass cover, Good, HSG A
41,636	36	Weighted Average
41,636		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.2	50	0.0625	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.42"
4.6	292	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.8	342	Total			

Subcatchment P2-1: Southeast Area



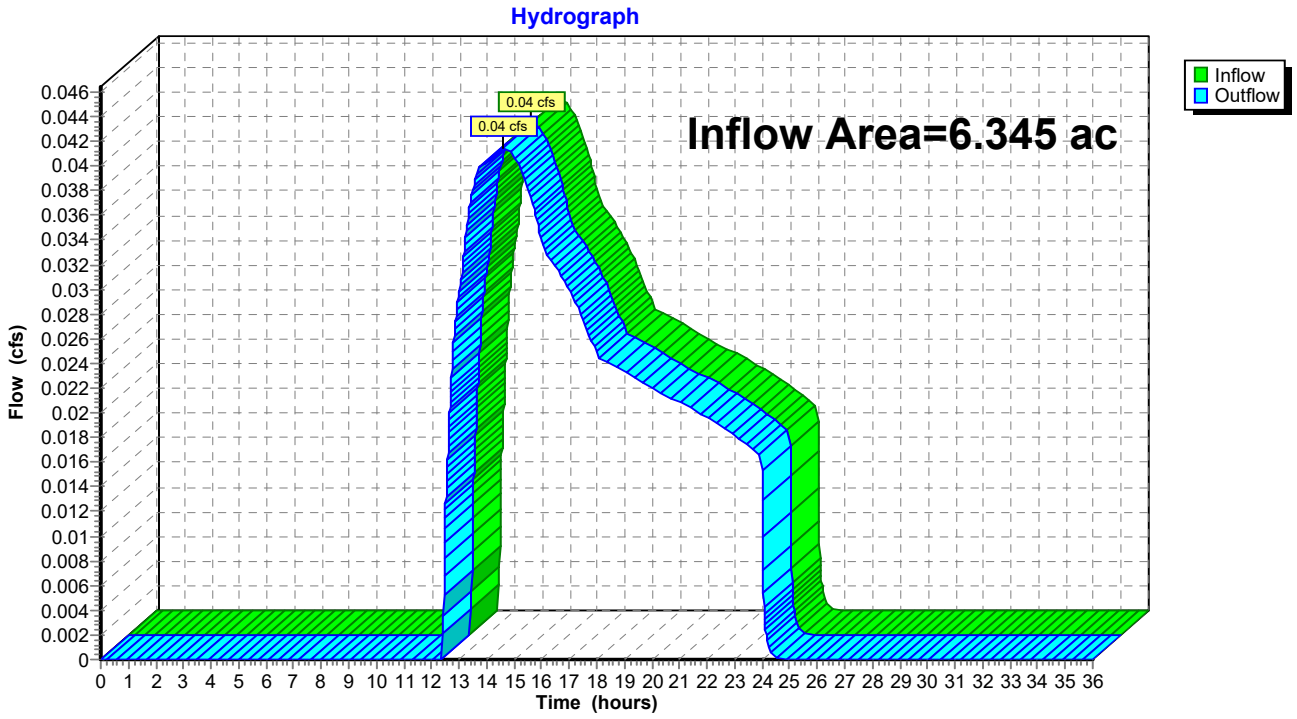
Summary for Reach 1R: Site Flow

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

Inflow Area = 6.345 ac, 12.22% Impervious, Inflow Depth = 0.05" for 10-year event
Inflow = 0.04 cfs @ 14.61 hrs, Volume= 0.026 af
Outflow = 0.04 cfs @ 14.61 hrs, Volume= 0.026 af, Atten= 0%, Lag= 0.0 min
Routed to Reach TS : Total Site

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 1R: Site Flow



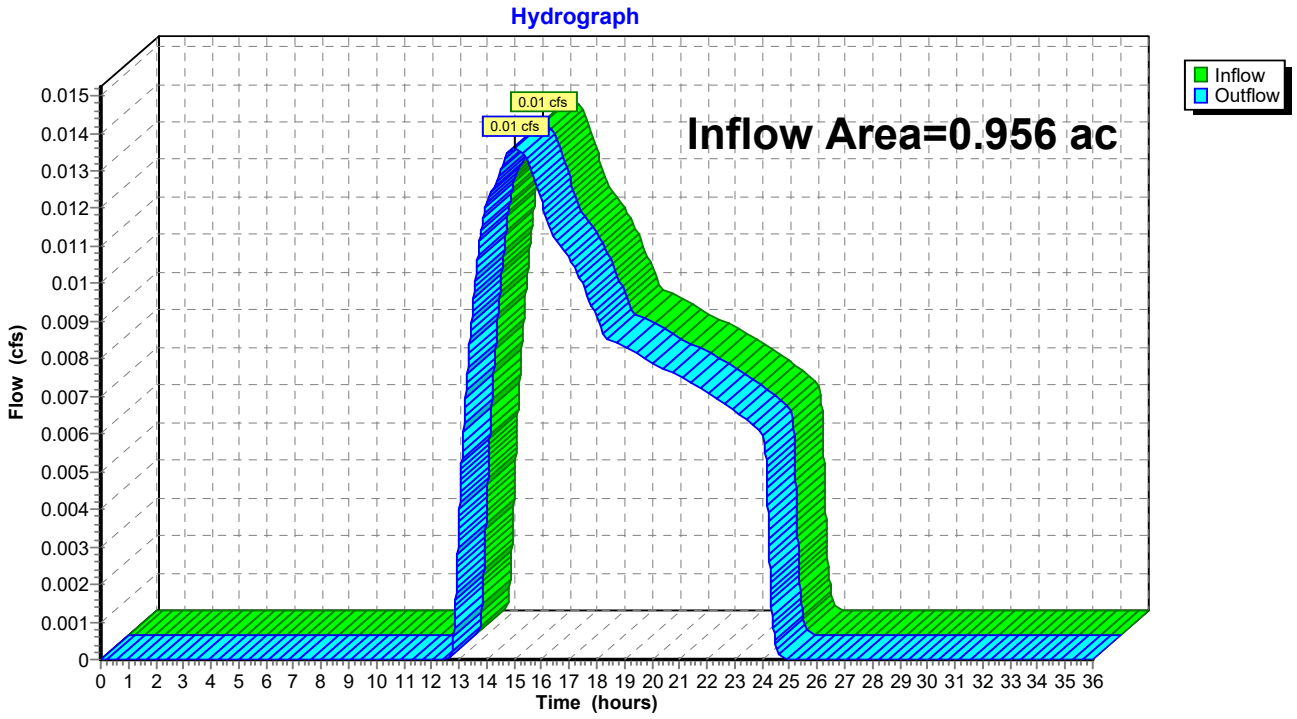
Summary for Reach 2R: Offsite Flow

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

Inflow Area = 0.956 ac, 0.00% Impervious, Inflow Depth = 0.11" for 10-year event
Inflow = 0.01 cfs @ 15.05 hrs, Volume= 0.009 af
Outflow = 0.01 cfs @ 15.05 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min
Routed to Reach TS : Total Site

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 2R: Offsite Flow



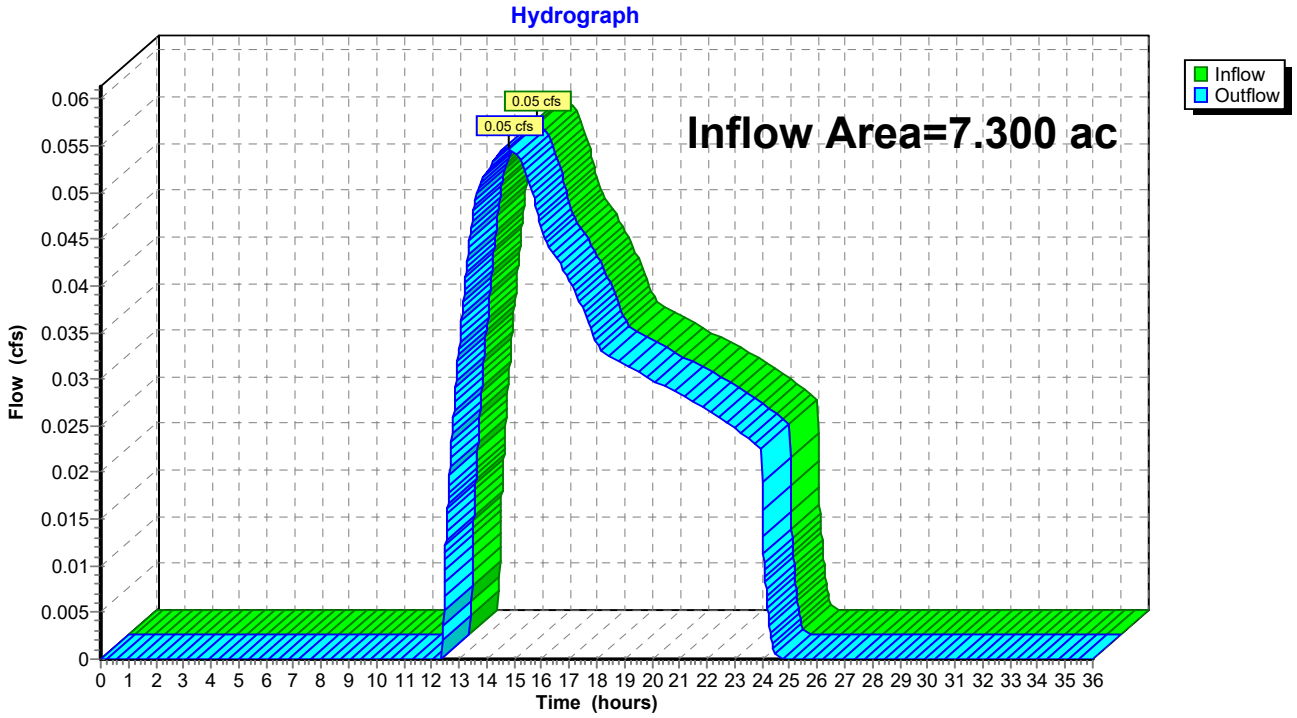
Summary for Reach TS: Total Site

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

Inflow Area = 7.300 ac, 10.62% Impervious, Inflow Depth = 0.06" for 10-year event
Inflow = 0.05 cfs @ 14.77 hrs, Volume= 0.034 af
Outflow = 0.05 cfs @ 14.77 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach TS: Total Site



Summary for Pond 1P: Detention Basin

Inflow Area = 3.954 ac, 19.61% Impervious, Inflow Depth = 0.64" for 10-year event
Inflow = 1.26 cfs @ 12.39 hrs, Volume= 0.209 af
Outflow = 0.37 cfs @ 13.39 hrs, Volume= 0.209 af, Atten= 71%, Lag= 60.2 min
Discarded = 0.37 cfs @ 13.39 hrs, Volume= 0.209 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 15.89' @ 13.39 hrs Surf.Area= 1,941 sf Storage= 2,053 cf

Plug-Flow detention time= 65.5 min calculated for 0.209 af (100% of inflow)
Center-of-Mass det. time= 65.5 min (997.3 - 931.8)

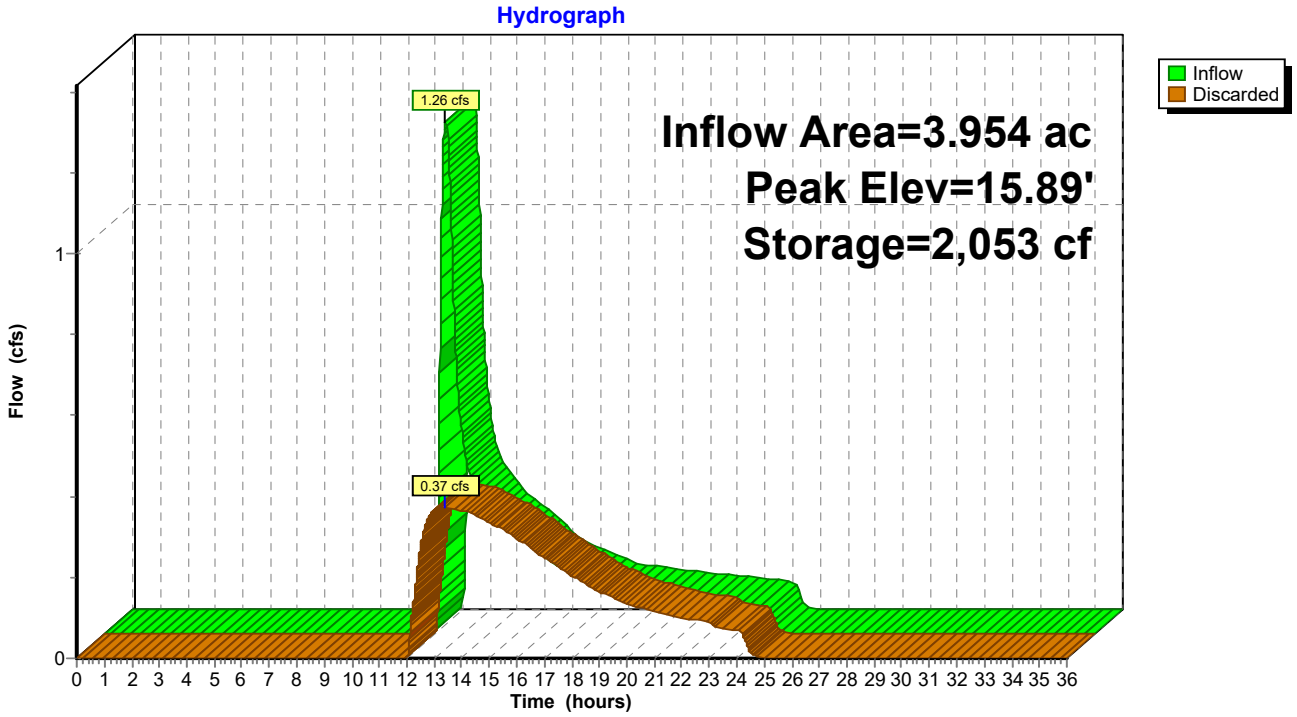
Volume	Invert	Avail.Storage	Storage Description
#1	14.00'	34,290 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
14.00	421	79.2	0	0	421
16.00	2,068	182.6	2,281	2,281	2,591
18.00	4,162	259.0	6,109	8,391	5,312
20.00	6,437	316.8	10,517	18,907	8,022
22.00	9,018	367.6	15,383	34,290	10,872

Device	Routing	Invert	Outlet Devices
#1	Discarded	14.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.37 cfs @ 13.39 hrs HW=15.89' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.37 cfs)

Pond 1P: Detention Basin



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1-1: Developed Area Runoff Area=172,242 sf 19.61% Impervious Runoff Depth=1.05"
Flow Length=196' Tc=18.1 min CN=49 Runoff=2.58 cfs 0.347 af

Subcatchment P1-2: North Area Runoff Area=84,594 sf 0.00% Impervious Runoff Depth=0.33"
Flow Length=211' Slope=0.0500 '/' Tc=2.9 min CN=37 Runoff=0.20 cfs 0.054 af

Subcatchment P1-3: Northeast Area Runoff Area=19,535 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=130' Tc=15.2 min CN=36 Runoff=0.03 cfs 0.011 af

Subcatchment P2-1: Southeast Area Runoff Area=41,636 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=342' Tc=17.8 min CN=36 Runoff=0.06 cfs 0.023 af

Reach 1R: Site Flow Inflow=0.21 cfs 0.065 af
Outflow=0.21 cfs 0.065 af

Reach 2R: Offsite Flow Inflow=0.06 cfs 0.023 af
Outflow=0.06 cfs 0.023 af

Reach TS: Total Site Inflow=0.24 cfs 0.087 af
Outflow=0.24 cfs 0.087 af

Pond 1P: Detention Basin Peak Elev=16.89' Storage=4,474 cf Inflow=2.58 cfs 0.347 af
Outflow=0.56 cfs 0.347 af

Total Runoff Area = 7.300 ac Runoff Volume = 0.434 af Average Runoff Depth = 0.71"
89.38% Pervious = 6.525 ac 10.62% Impervious = 0.776 ac

Summary for Subcatchment P1-1: Developed Area

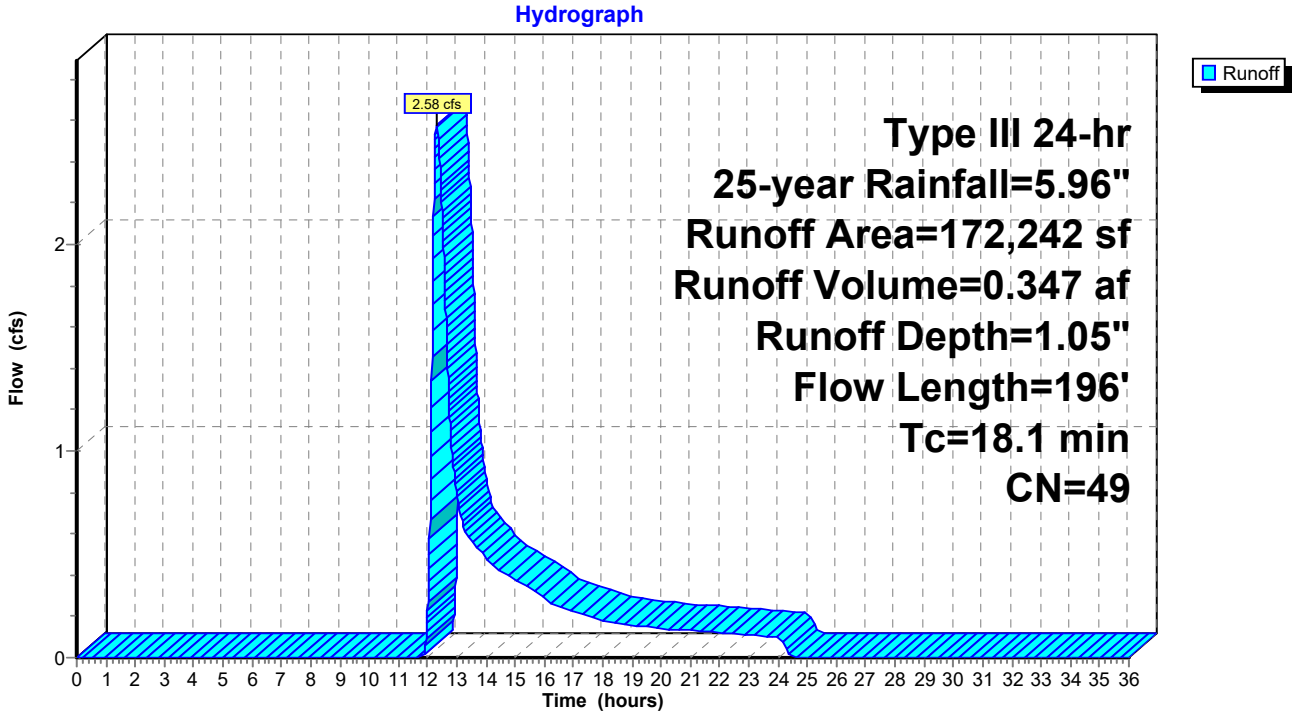
Runoff = 2.58 cfs @ 12.32 hrs, Volume= 0.347 af, Depth= 1.05"
Routed to Pond 1P : Detention Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.96"

Area (sf)	CN	Description
61,707	36	Woods, Fair, HSG A
76,753	39	>75% Grass cover, Good, HSG A
33,782	98	Paved parking, HSG A
172,242	49	Weighted Average
138,460		80.39% Pervious Area
33,782		19.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.6	50	0.0350	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.42"
1.5	146	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.1	196	Total			

Subcatchment P1-1: Developed Area



Summary for Subcatchment P1-2: North Area

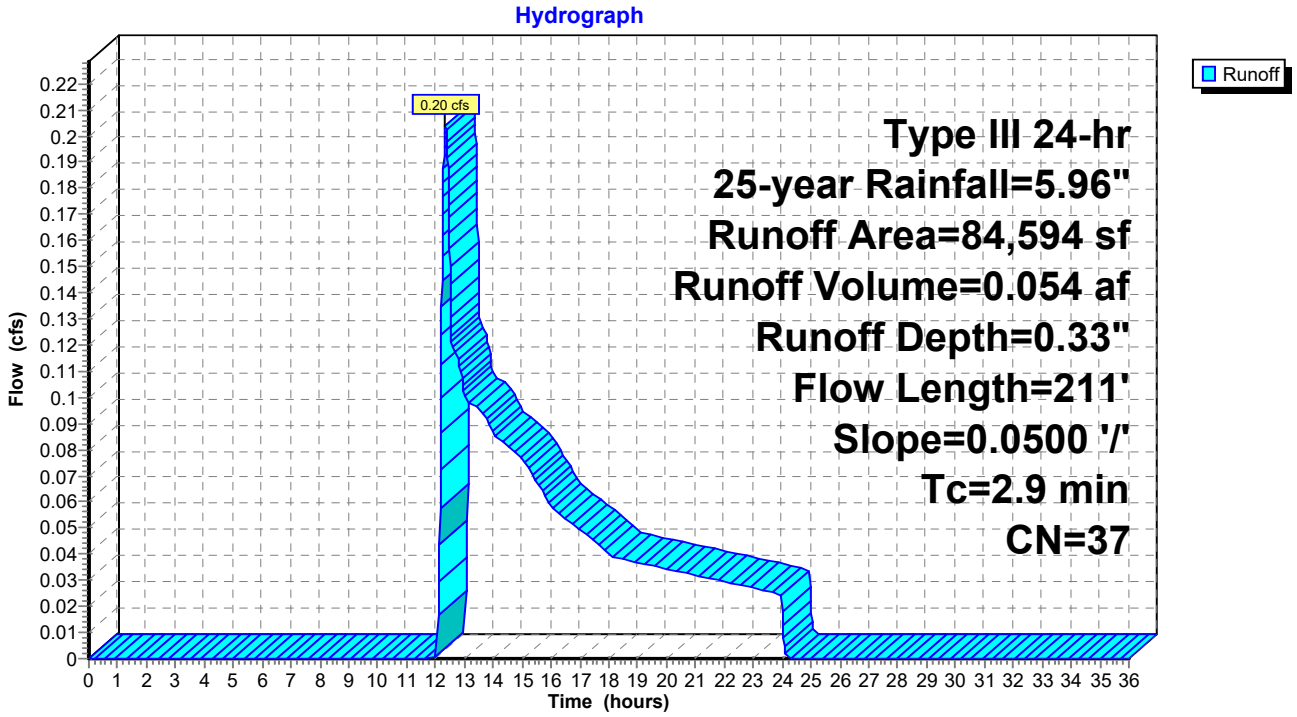
Runoff = 0.20 cfs @ 12.35 hrs, Volume= 0.054 af, Depth= 0.33"
Routed to Reach 1R : Site Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.96"

Area (sf)	CN	Description
59,996	36	Woods, Fair, HSG A
24,598	39	>75% Grass cover, Good, HSG A
84,594	37	Weighted Average
84,594		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0500	1.79		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.42"
2.4	161	0.0500	1.12		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
2.9	211	Total			

Subcatchment P1-2: North Area



Summary for Subcatchment P1-3: Northeast Area

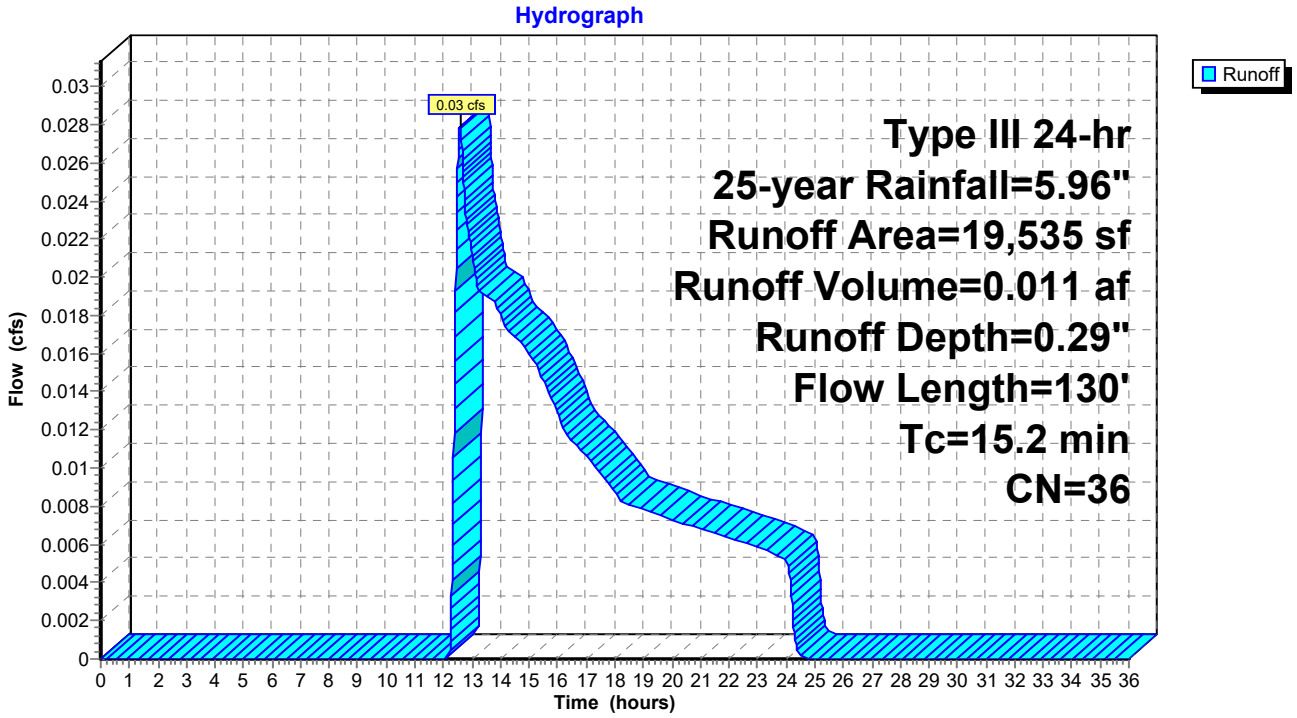
Runoff = 0.03 cfs @ 12.58 hrs, Volume= 0.011 af, Depth= 0.29"
Routed to Reach 1R : Site Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.96"

Area (sf)	CN	Description
19,535	36	Woods, Fair, HSG A
19,535		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	50	0.0500	0.06		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.42"
0.8	80	0.1050	1.62		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.2	130	Total			

Subcatchment P1-3: Northeast Area



Summary for Subcatchment P2-1: Southeast Area

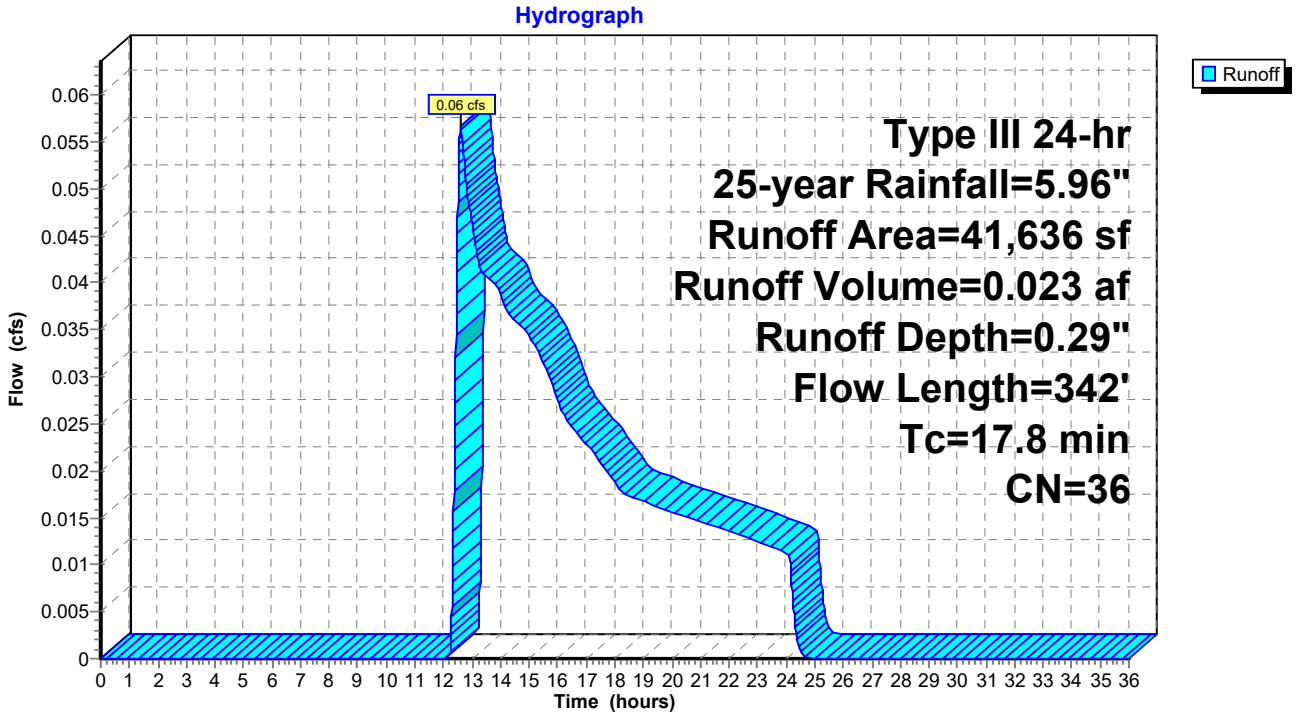
Runoff = 0.06 cfs @ 12.62 hrs, Volume= 0.023 af, Depth= 0.29"
Routed to Reach 2R : Offsite Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.96"

Area (sf)	CN	Description
40,536	36	Woods, Fair, HSG A
1,100	39	>75% Grass cover, Good, HSG A
41,636	36	Weighted Average
41,636		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.2	50	0.0625	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.42"
4.6	292	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.8	342	Total			

Subcatchment P2-1: Southeast Area



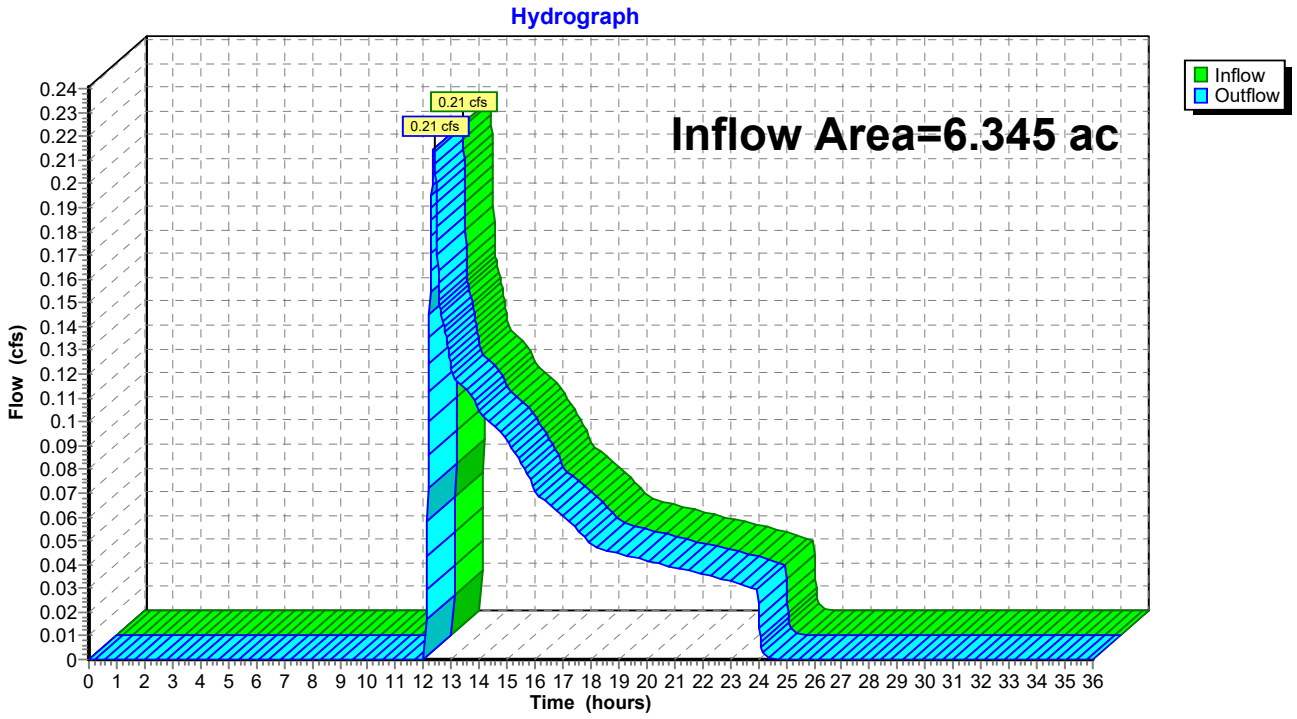
Summary for Reach 1R: Site Flow

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

Inflow Area = 6.345 ac, 12.22% Impervious, Inflow Depth = 0.12" for 25-year event
Inflow = 0.21 cfs @ 12.38 hrs, Volume= 0.065 af
Outflow = 0.21 cfs @ 12.38 hrs, Volume= 0.065 af, Atten= 0%, Lag= 0.0 min
Routed to Reach TS : Total Site

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 1R: Site Flow



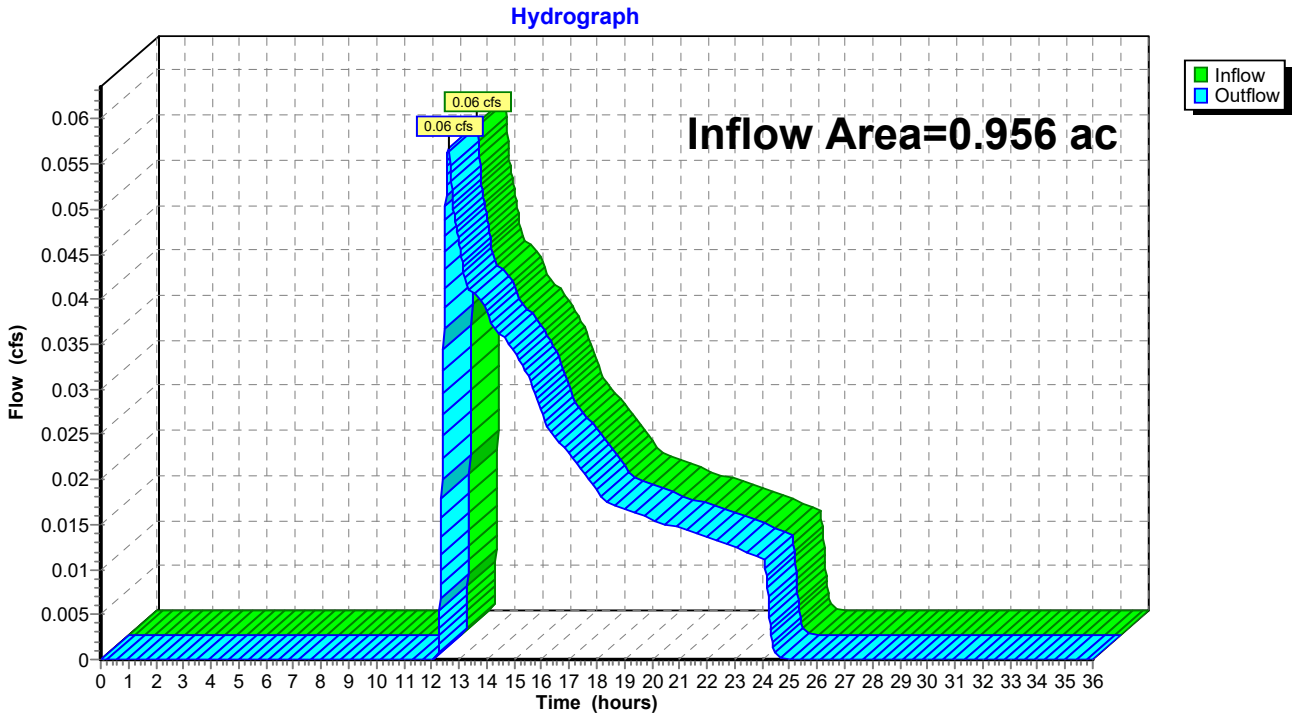
Summary for Reach 2R: Offsite Flow

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

Inflow Area = 0.956 ac, 0.00% Impervious, Inflow Depth = 0.29" for 25-year event
Inflow = 0.06 cfs @ 12.62 hrs, Volume= 0.023 af
Outflow = 0.06 cfs @ 12.62 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min
Routed to Reach TS : Total Site

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 2R: Offsite Flow



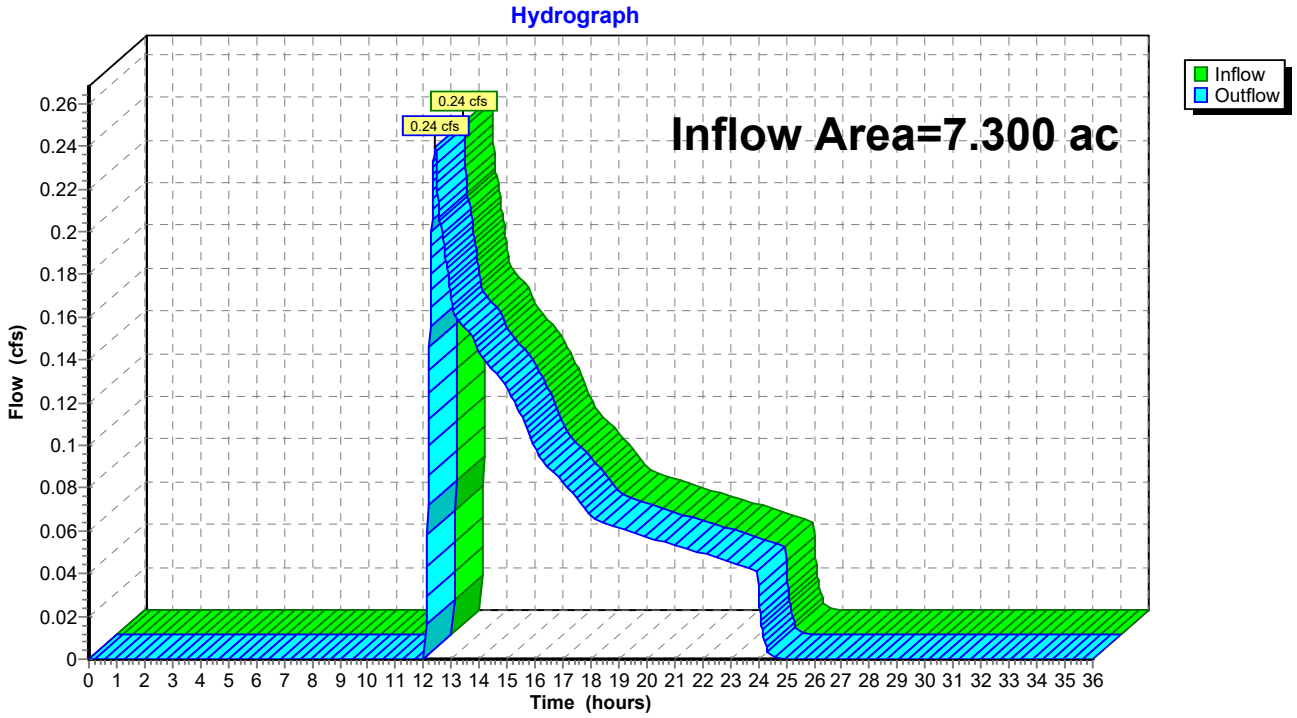
Summary for Reach TS: Total Site

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

Inflow Area = 7.300 ac, 10.62% Impervious, Inflow Depth = 0.14" for 25-year event
Inflow = 0.24 cfs @ 12.42 hrs, Volume= 0.087 af
Outflow = 0.24 cfs @ 12.42 hrs, Volume= 0.087 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach TS: Total Site



Summary for Pond 1P: Detention Basin

Inflow Area = 3.954 ac, 19.61% Impervious, Inflow Depth = 1.05" for 25-year event
Inflow = 2.58 cfs @ 12.32 hrs, Volume= 0.347 af
Outflow = 0.56 cfs @ 13.54 hrs, Volume= 0.347 af, Atten= 78%, Lag= 73.4 min
Discarded = 0.56 cfs @ 13.54 hrs, Volume= 0.347 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 16.89' @ 13.54 hrs Surf.Area= 2,906 sf Storage= 4,474 cf

Plug-Flow detention time= 99.8 min calculated for 0.347 af (100% of inflow)
Center-of-Mass det. time= 99.7 min (1,010.1 - 910.4)

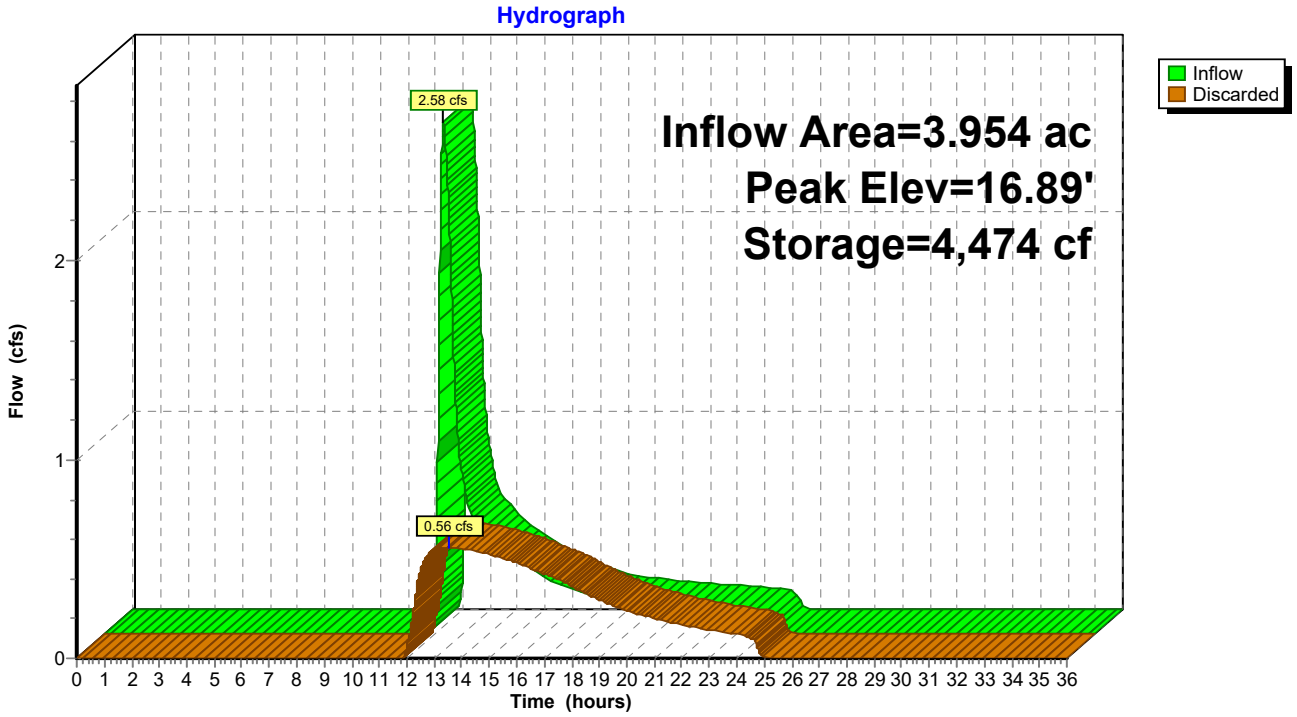
Volume	Invert	Avail.Storage	Storage Description
#1	14.00'	34,290 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
14.00	421	79.2	0	0	421
16.00	2,068	182.6	2,281	2,281	2,591
18.00	4,162	259.0	6,109	8,391	5,312
20.00	6,437	316.8	10,517	18,907	8,022
22.00	9,018	367.6	15,383	34,290	10,872

Device	Routing	Invert	Outlet Devices
#1	Discarded	14.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.56 cfs @ 13.54 hrs HW=16.89' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.56 cfs)

Pond 1P: Detention Basin



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1-1: Developed Area Runoff Area=172,242 sf 19.61% Impervious Runoff Depth=1.42"
Flow Length=196' Tc=18.1 min CN=49 Runoff=3.80 cfs 0.468 af

Subcatchment P1-2: North Area Runoff Area=84,594 sf 0.00% Impervious Runoff Depth=0.53"
Flow Length=211' Slope=0.0500 '/' Tc=2.9 min CN=37 Runoff=0.44 cfs 0.086 af

Subcatchment P1-3: Northeast Area Runoff Area=19,535 sf 0.00% Impervious Runoff Depth=0.47"
Flow Length=130' Tc=15.2 min CN=36 Runoff=0.07 cfs 0.018 af

Subcatchment P2-1: Southeast Area Runoff Area=41,636 sf 0.00% Impervious Runoff Depth=0.47"
Flow Length=342' Tc=17.8 min CN=36 Runoff=0.15 cfs 0.038 af

Reach 1R: Site Flow Inflow=0.48 cfs 0.104 af
Outflow=0.48 cfs 0.104 af

Reach 2R: Offsite Flow Inflow=0.15 cfs 0.038 af
Outflow=0.15 cfs 0.038 af

Reach TS: Total Site Inflow=0.58 cfs 0.142 af
Outflow=0.58 cfs 0.142 af

Pond 1P: Detention Basin Peak Elev=17.60' Storage=6,825 cf Inflow=3.80 cfs 0.468 af
Outflow=0.71 cfs 0.468 af

Total Runoff Area = 7.300 ac Runoff Volume = 0.609 af Average Runoff Depth = 1.00"
89.38% Pervious = 6.525 ac 10.62% Impervious = 0.776 ac

Summary for Subcatchment P1-1: Developed Area

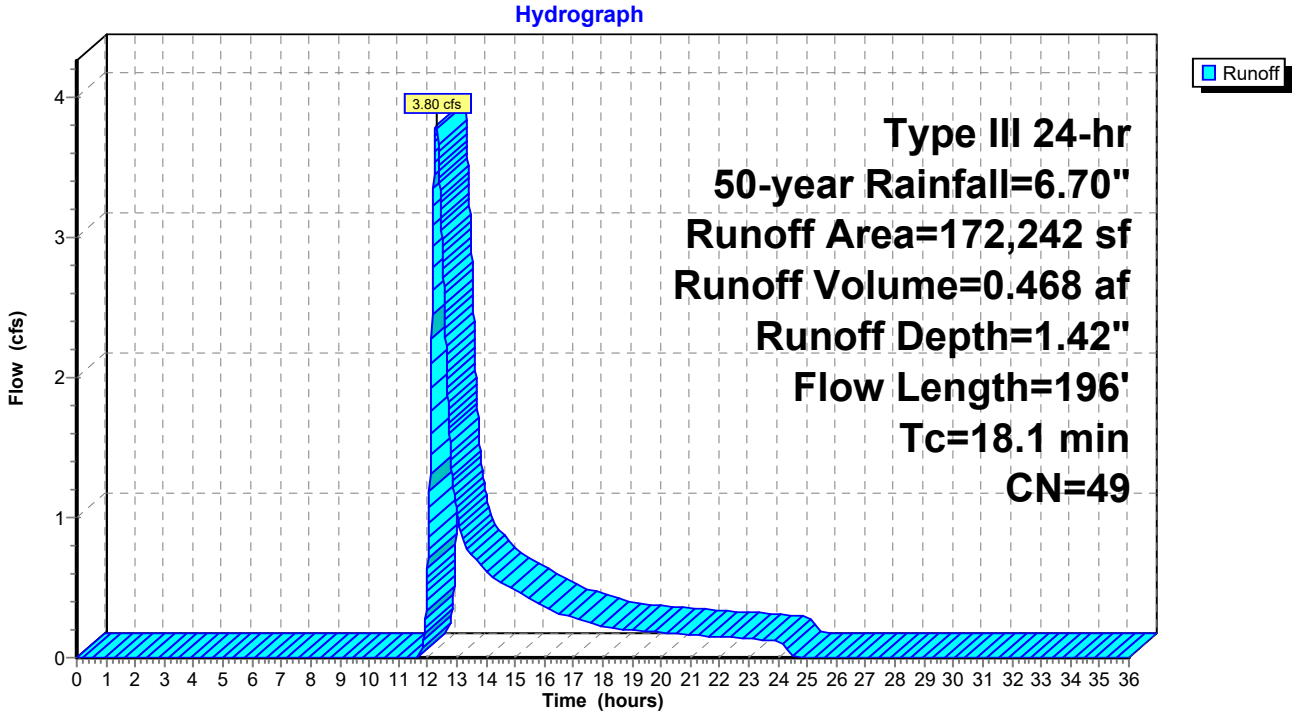
Runoff = 3.80 cfs @ 12.29 hrs, Volume= 0.468 af, Depth= 1.42"
Routed to Pond 1P : Detention Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=6.70"

Area (sf)	CN	Description
61,707	36	Woods, Fair, HSG A
76,753	39	>75% Grass cover, Good, HSG A
33,782	98	Paved parking, HSG A
172,242	49	Weighted Average
138,460		80.39% Pervious Area
33,782		19.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.6	50	0.0350	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.42"
1.5	146	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.1	196	Total			

Subcatchment P1-1: Developed Area



Summary for Subcatchment P1-2: North Area

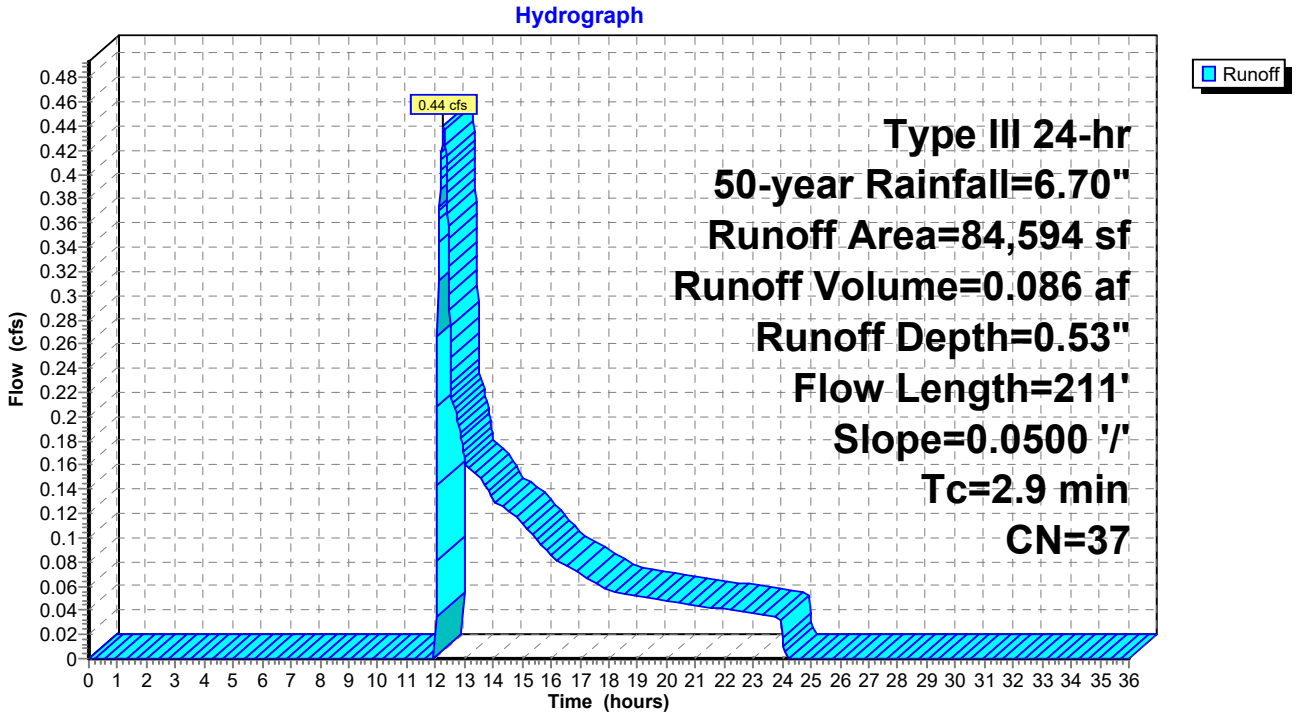
Runoff = 0.44 cfs @ 12.28 hrs, Volume= 0.086 af, Depth= 0.53"
Routed to Reach 1R : Site Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=6.70"

Area (sf)	CN	Description
59,996	36	Woods, Fair, HSG A
24,598	39	>75% Grass cover, Good, HSG A
84,594	37	Weighted Average
84,594		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0500	1.79		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.42"
2.4	161	0.0500	1.12		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
2.9	211	Total			

Subcatchment P1-2: North Area



Summary for Subcatchment P1-3: Northeast Area

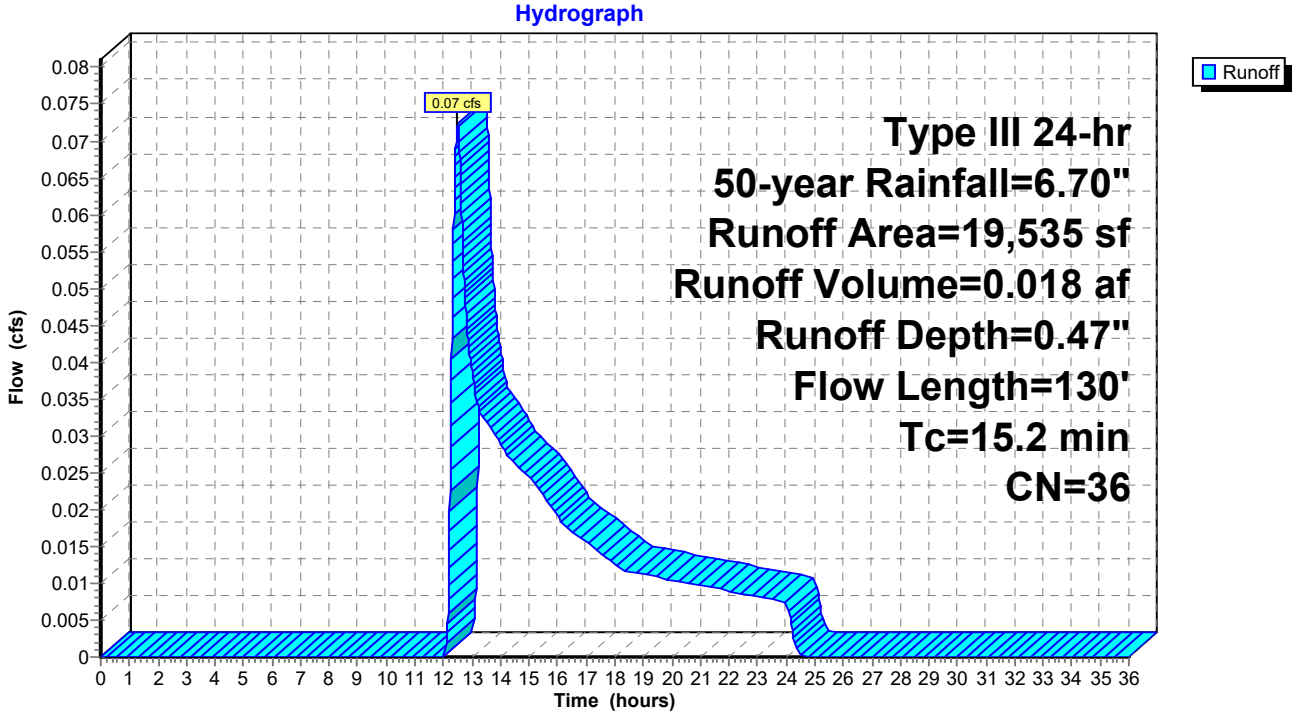
Runoff = 0.07 cfs @ 12.50 hrs, Volume= 0.018 af, Depth= 0.47"
Routed to Reach 1R : Site Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=6.70"

Area (sf)	CN	Description
19,535	36	Woods, Fair, HSG A
19,535		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	50	0.0500	0.06		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.42"
0.8	80	0.1050	1.62		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.2	130	Total			

Subcatchment P1-3: Northeast Area



Summary for Subcatchment P2-1: Southeast Area

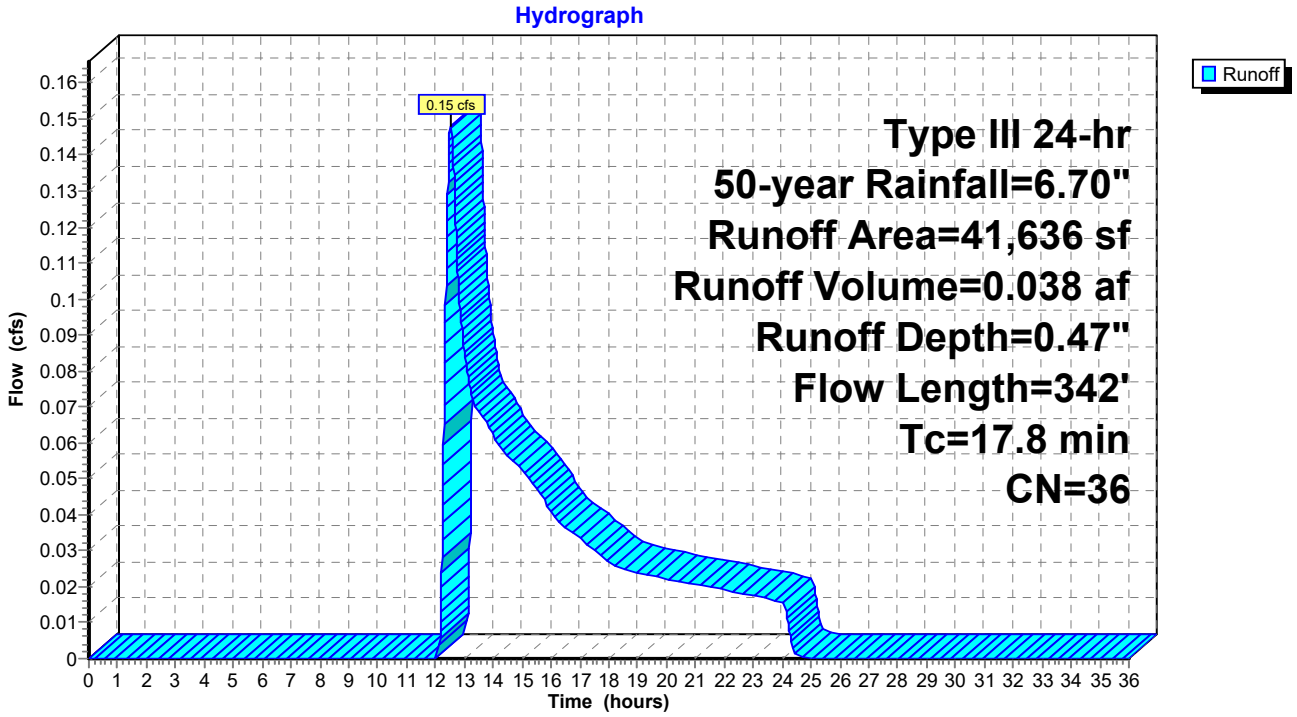
Runoff = 0.15 cfs @ 12.53 hrs, Volume= 0.038 af, Depth= 0.47"
Routed to Reach 2R : Offsite Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=6.70"

Area (sf)	CN	Description
40,536	36	Woods, Fair, HSG A
1,100	39	>75% Grass cover, Good, HSG A
41,636	36	Weighted Average
41,636		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.2	50	0.0625	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.42"
4.6	292	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.8	342	Total			

Subcatchment P2-1: Southeast Area



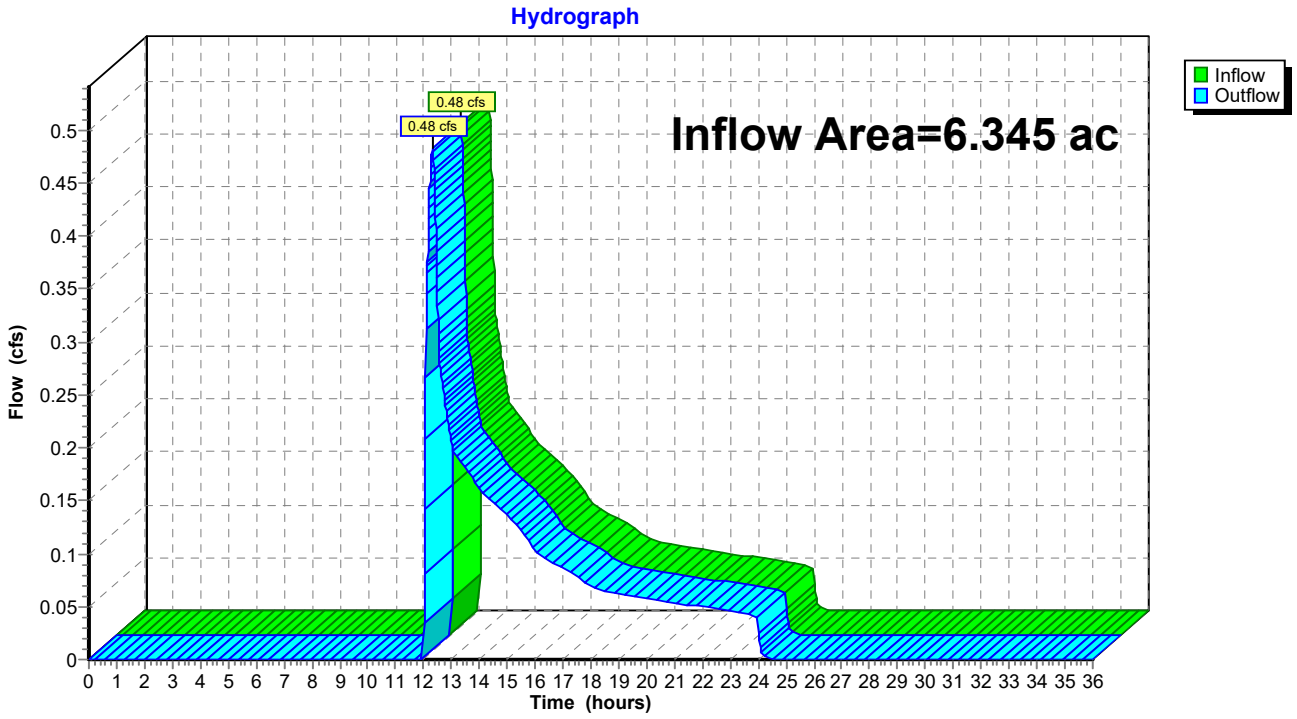
Summary for Reach 1R: Site Flow

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

Inflow Area = 6.345 ac, 12.22% Impervious, Inflow Depth = 0.20" for 50-year event
Inflow = 0.48 cfs @ 12.31 hrs, Volume= 0.104 af
Outflow = 0.48 cfs @ 12.31 hrs, Volume= 0.104 af, Atten= 0%, Lag= 0.0 min
Routed to Reach TS : Total Site

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 1R: Site Flow



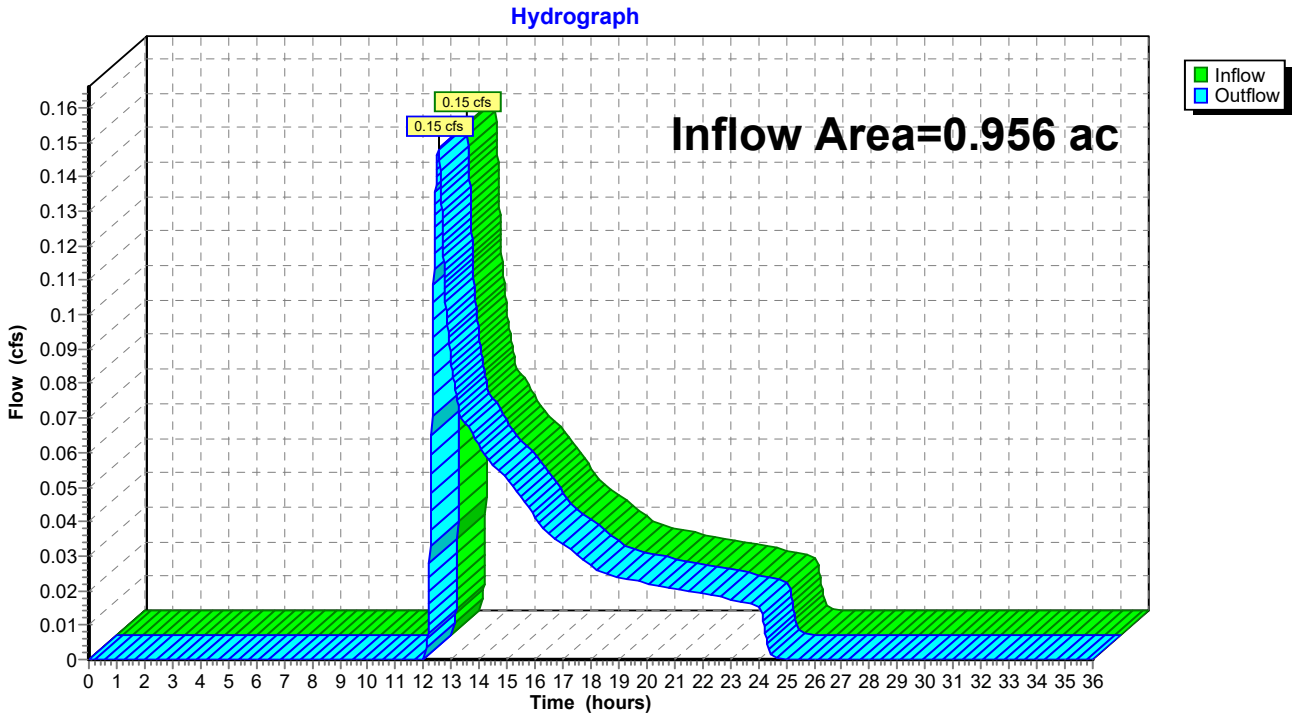
Summary for Reach 2R: Offsite Flow

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

Inflow Area = 0.956 ac, 0.00% Impervious, Inflow Depth = 0.47" for 50-year event
Inflow = 0.15 cfs @ 12.53 hrs, Volume= 0.038 af
Outflow = 0.15 cfs @ 12.53 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min
Routed to Reach TS : Total Site

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 2R: Offsite Flow



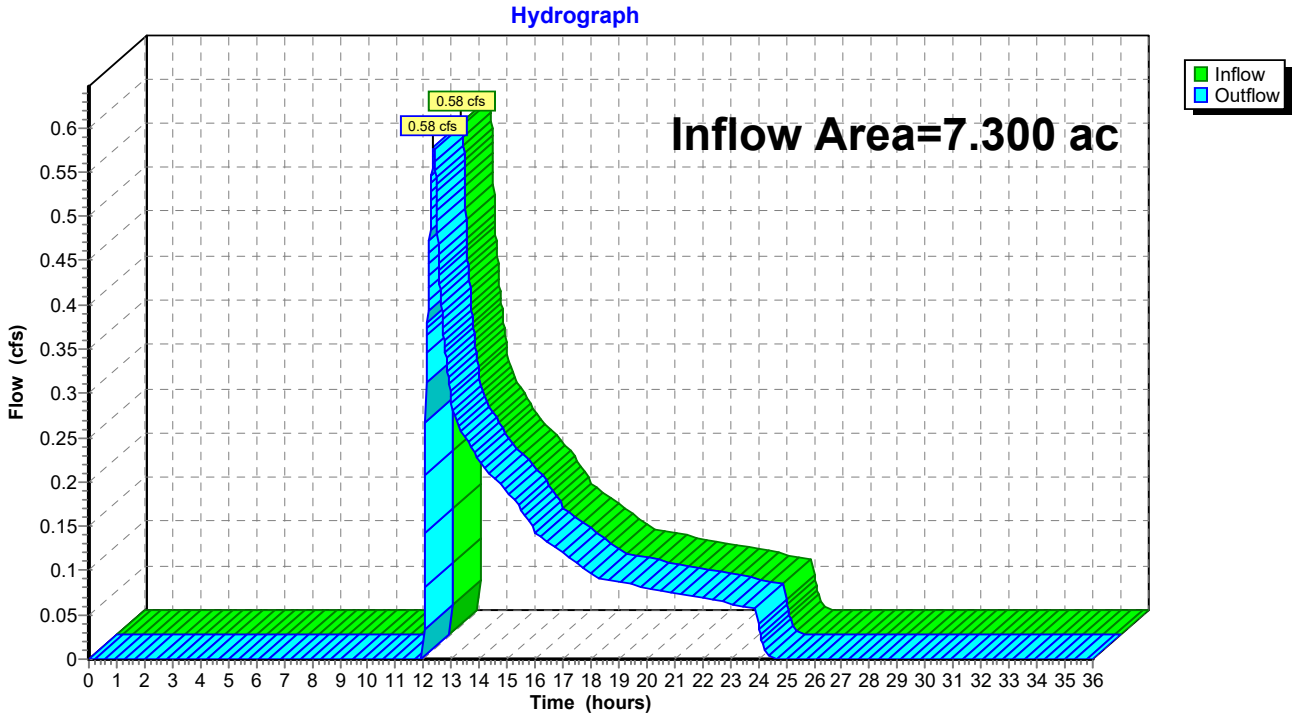
Summary for Reach TS: Total Site

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

Inflow Area = 7.300 ac, 10.62% Impervious, Inflow Depth = 0.23" for 50-year event
Inflow = 0.58 cfs @ 12.37 hrs, Volume= 0.142 af
Outflow = 0.58 cfs @ 12.37 hrs, Volume= 0.142 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach TS: Total Site



Summary for Pond 1P: Detention Basin

Inflow Area = 3.954 ac, 19.61% Impervious, Inflow Depth = 1.42" for 50-year event
Inflow = 3.80 cfs @ 12.29 hrs, Volume= 0.468 af
Outflow = 0.71 cfs @ 13.62 hrs, Volume= 0.468 af, Atten= 81%, Lag= 79.5 min
Discarded = 0.71 cfs @ 13.62 hrs, Volume= 0.468 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 17.60' @ 13.62 hrs Surf.Area= 3,686 sf Storage= 6,825 cf

Plug-Flow detention time= 123.2 min calculated for 0.468 af (100% of inflow)
Center-of-Mass det. time= 123.2 min (1,022.3 - 899.1)

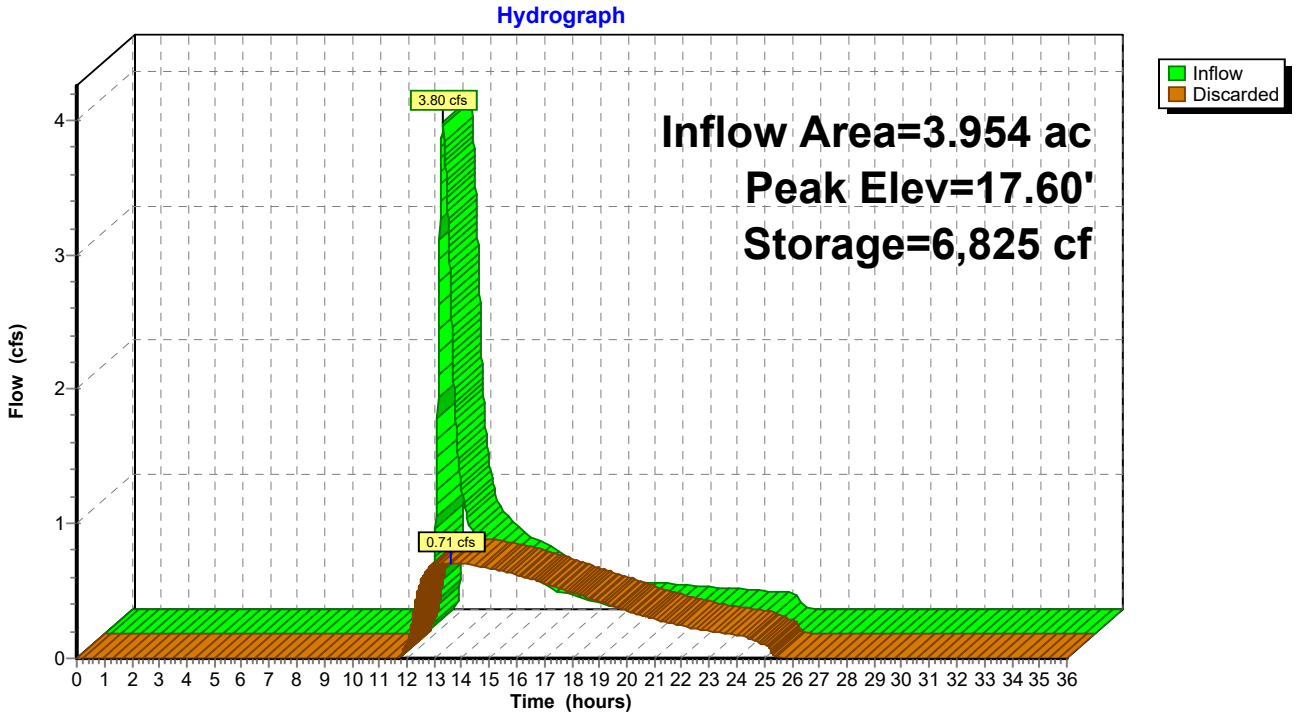
Volume	Invert	Avail.Storage	Storage Description
#1	14.00'	34,290 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
14.00	421	79.2	0	0	421
16.00	2,068	182.6	2,281	2,281	2,591
18.00	4,162	259.0	6,109	8,391	5,312
20.00	6,437	316.8	10,517	18,907	8,022
22.00	9,018	367.6	15,383	34,290	10,872

Device	Routing	Invert	Outlet Devices
#1	Discarded	14.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.71 cfs @ 13.62 hrs HW=17.60' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.71 cfs)

Pond 1P: Detention Basin



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1-1: Developed Area Runoff Area=172,242 sf 19.61% Impervious Runoff Depth=1.84"
Flow Length=196' Tc=18.1 min CN=49 Runoff=5.22 cfs 0.606 af

Subcatchment P1-2: North Area Runoff Area=84,594 sf 0.00% Impervious Runoff Depth=0.78"
Flow Length=211' Slope=0.0500 '/' Tc=2.9 min CN=37 Runoff=0.91 cfs 0.127 af

Subcatchment P1-3: Northeast Area Runoff Area=19,535 sf 0.00% Impervious Runoff Depth=0.71"
Flow Length=130' Tc=15.2 min CN=36 Runoff=0.14 cfs 0.026 af

Subcatchment P2-1: Southeast Area Runoff Area=41,636 sf 0.00% Impervious Runoff Depth=0.71"
Flow Length=342' Tc=17.8 min CN=36 Runoff=0.28 cfs 0.056 af

Reach 1R: Site Flow Inflow=0.92 cfs 0.153 af
Outflow=0.92 cfs 0.153 af

Reach 2R: Offsite Flow Inflow=0.28 cfs 0.056 af
Outflow=0.28 cfs 0.056 af

Reach TS: Total Site Inflow=1.06 cfs 0.209 af
Outflow=1.06 cfs 0.209 af

Pond 1P: Detention Basin Peak Elev=18.30' Storage=9,685 cf Inflow=5.22 cfs 0.606 af
Outflow=0.86 cfs 0.606 af

Total Runoff Area = 7.300 ac Runoff Volume = 0.815 af Average Runoff Depth = 1.34"
89.38% Pervious = 6.525 ac 10.62% Impervious = 0.776 ac

Summary for Subcatchment P1-1: Developed Area

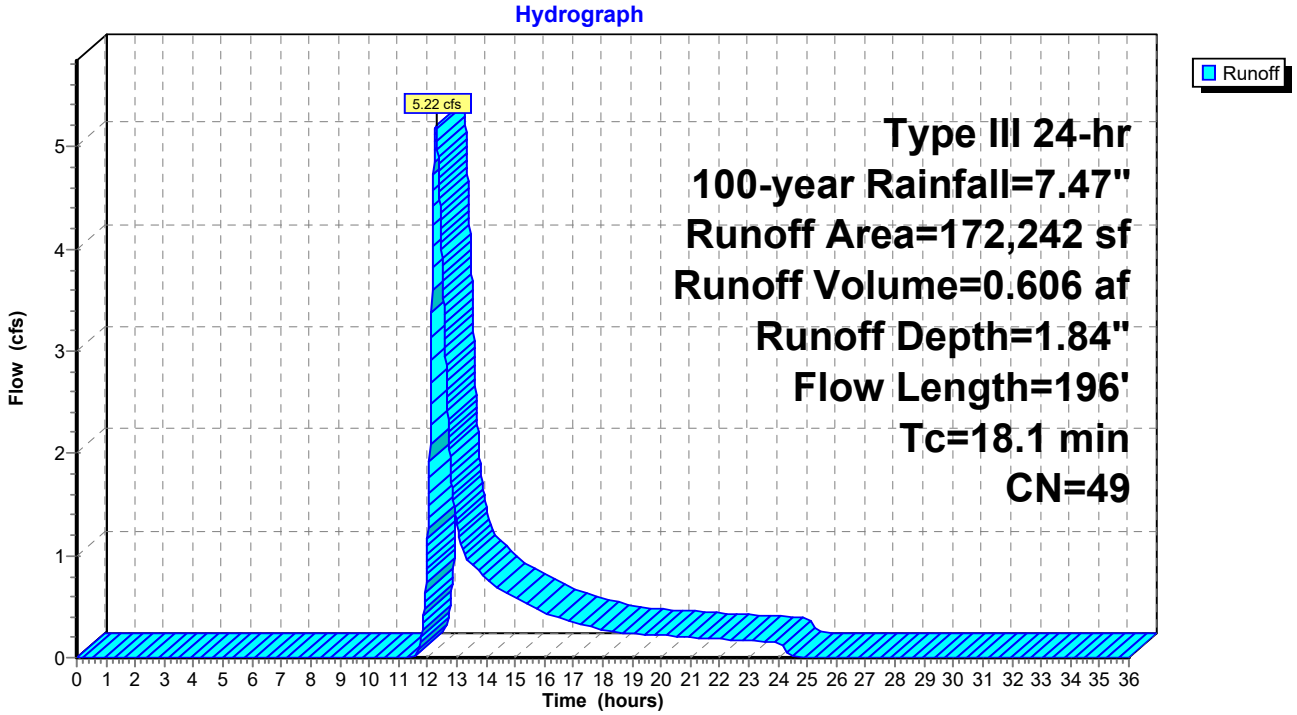
Runoff = 5.22 cfs @ 12.29 hrs, Volume= 0.606 af, Depth= 1.84"
Routed to Pond 1P : Detention Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.47"

Area (sf)	CN	Description
61,707	36	Woods, Fair, HSG A
76,753	39	>75% Grass cover, Good, HSG A
33,782	98	Paved parking, HSG A
172,242	49	Weighted Average
138,460		80.39% Pervious Area
33,782		19.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.6	50	0.0350	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.42"
1.5	146	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.1	196	Total			

Subcatchment P1-1: Developed Area



Summary for Subcatchment P1-2: North Area

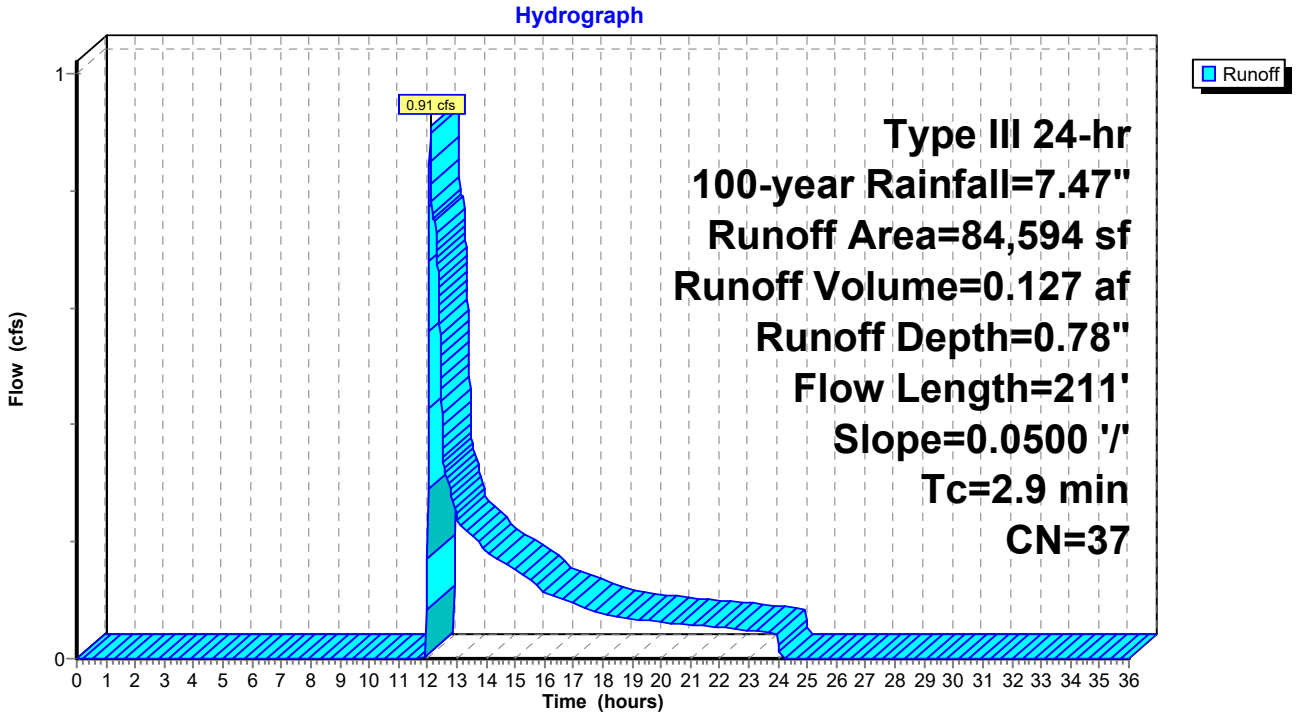
Runoff = 0.91 cfs @ 12.09 hrs, Volume= 0.127 af, Depth= 0.78"
Routed to Reach 1R : Site Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.47"

Area (sf)	CN	Description
59,996	36	Woods, Fair, HSG A
24,598	39	>75% Grass cover, Good, HSG A
84,594	37	Weighted Average
84,594		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0500	1.79		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.42"
2.4	161	0.0500	1.12		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
2.9	211	Total			

Subcatchment P1-2: North Area



Summary for Subcatchment P1-3: Northeast Area

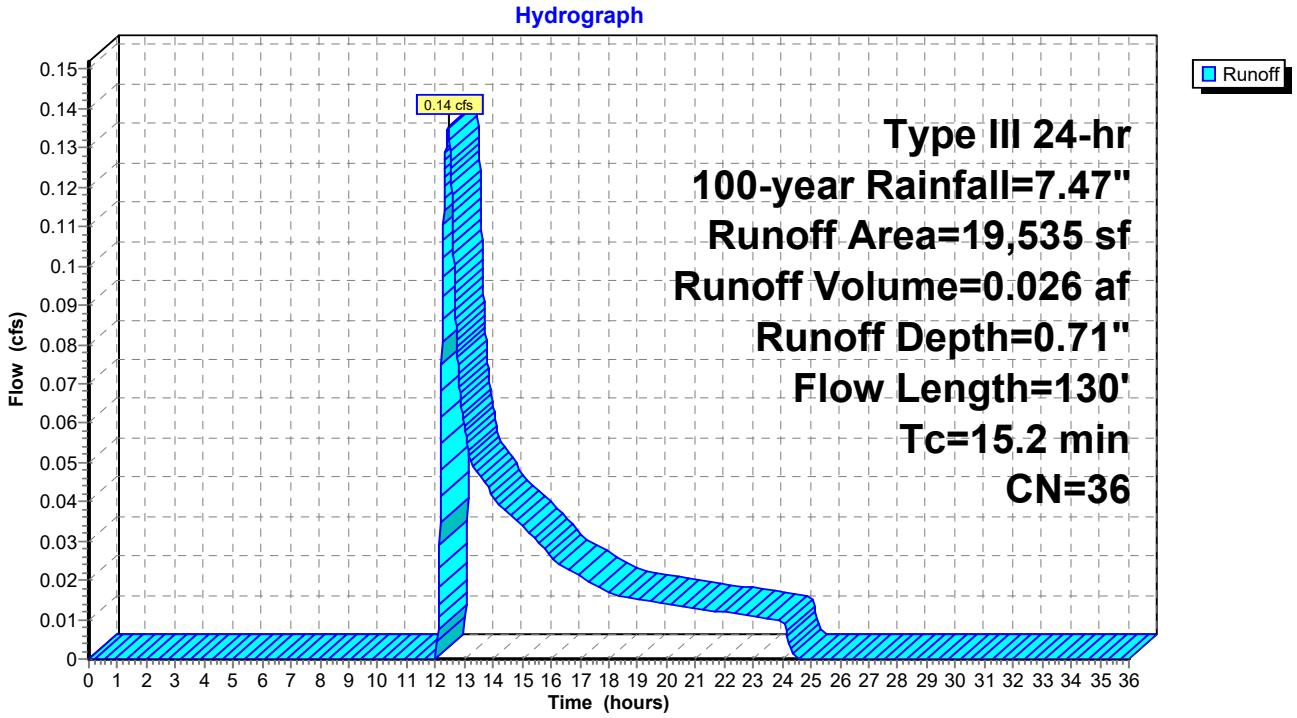
Runoff = 0.14 cfs @ 12.44 hrs, Volume= 0.026 af, Depth= 0.71"
Routed to Reach 1R : Site Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.47"

Area (sf)	CN	Description
19,535	36	Woods, Fair, HSG A
19,535		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	50	0.0500	0.06		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.42"
0.8	80	0.1050	1.62		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.2	130	Total			

Subcatchment P1-3: Northeast Area



Summary for Subcatchment P2-1: Southeast Area

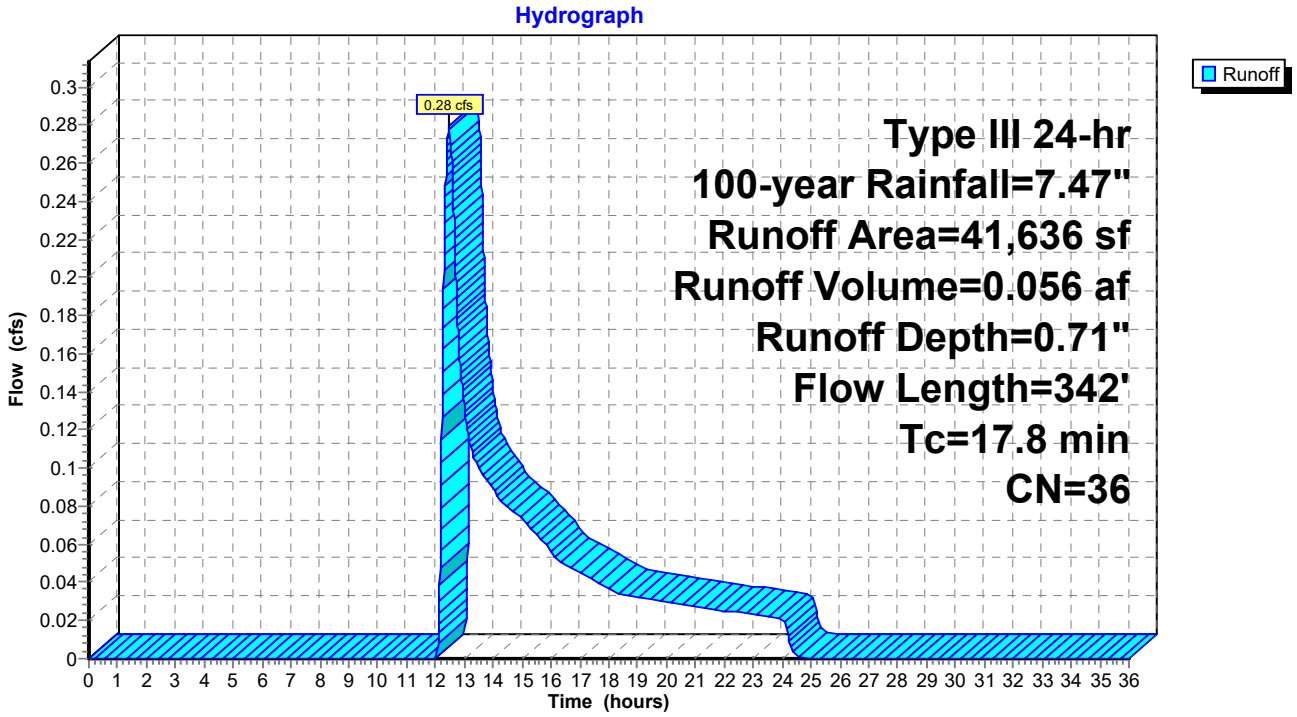
Runoff = 0.28 cfs @ 12.48 hrs, Volume= 0.056 af, Depth= 0.71"
Routed to Reach 2R : Offsite Flow

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.47"

Area (sf)	CN	Description
40,536	36	Woods, Fair, HSG A
1,100	39	>75% Grass cover, Good, HSG A
41,636	36	Weighted Average
41,636		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.2	50	0.0625	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.42"
4.6	292	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.8	342	Total			

Subcatchment P2-1: Southeast Area



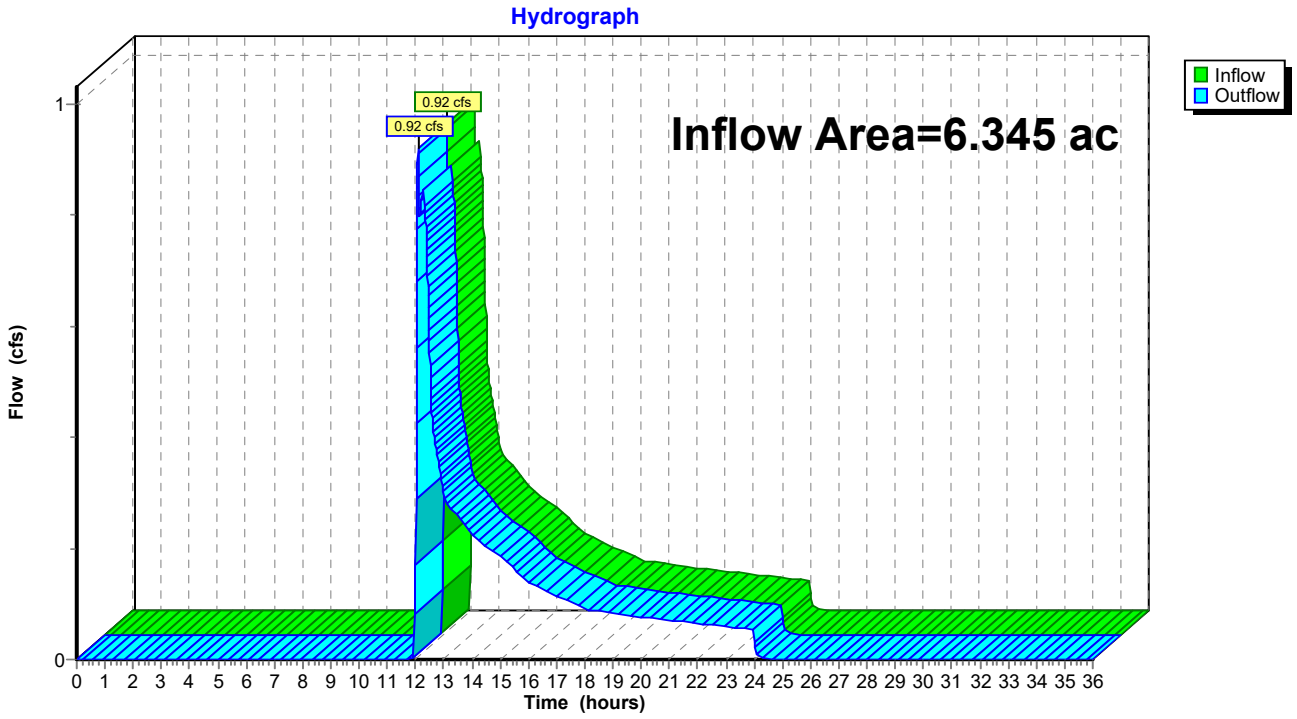
Summary for Reach 1R: Site Flow

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

Inflow Area = 6.345 ac, 12.22% Impervious, Inflow Depth = 0.29" for 100-year event
Inflow = 0.92 cfs @ 12.10 hrs, Volume= 0.153 af
Outflow = 0.92 cfs @ 12.10 hrs, Volume= 0.153 af, Atten= 0%, Lag= 0.0 min
Routed to Reach TS : Total Site

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 1R: Site Flow



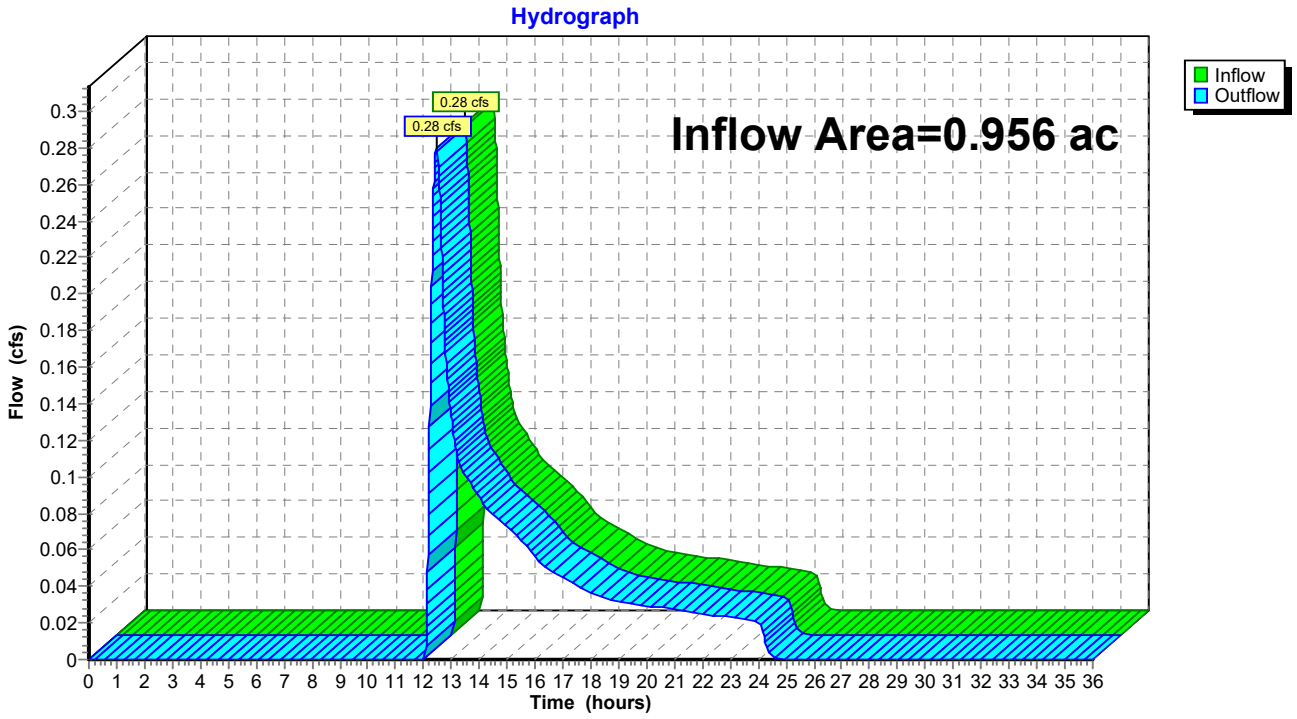
Summary for Reach 2R: Offsite Flow

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

Inflow Area = 0.956 ac, 0.00% Impervious, Inflow Depth = 0.71" for 100-year event
Inflow = 0.28 cfs @ 12.48 hrs, Volume= 0.056 af
Outflow = 0.28 cfs @ 12.48 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min
Routed to Reach TS : Total Site

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 2R: Offsite Flow



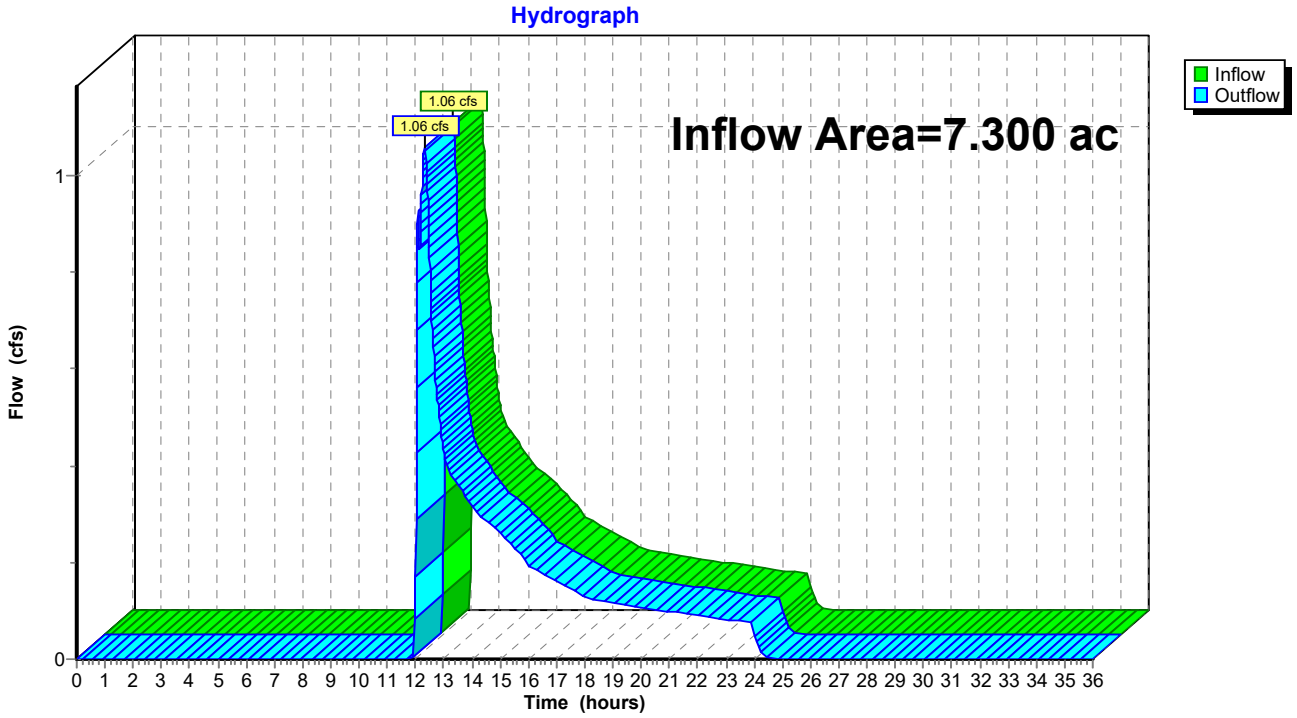
Summary for Reach TS: Total Site

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

Inflow Area = 7.300 ac, 10.62% Impervious, Inflow Depth = 0.34" for 100-year event
Inflow = 1.06 cfs @ 12.32 hrs, Volume= 0.209 af
Outflow = 1.06 cfs @ 12.32 hrs, Volume= 0.209 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach TS: Total Site



Summary for Pond 1P: Detention Basin

Inflow Area = 3.954 ac, 19.61% Impervious, Inflow Depth = 1.84" for 100-year event
Inflow = 5.22 cfs @ 12.29 hrs, Volume= 0.606 af
Outflow = 0.86 cfs @ 13.71 hrs, Volume= 0.606 af, Atten= 84%, Lag= 85.4 min
Discarded = 0.86 cfs @ 13.71 hrs, Volume= 0.606 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 18.30' @ 13.71 hrs Surf.Area= 4,472 sf Storage= 9,685 cf

Plug-Flow detention time= 145.5 min calculated for 0.605 af (100% of inflow)
Center-of-Mass det. time= 145.5 min (1,035.5 - 890.0)

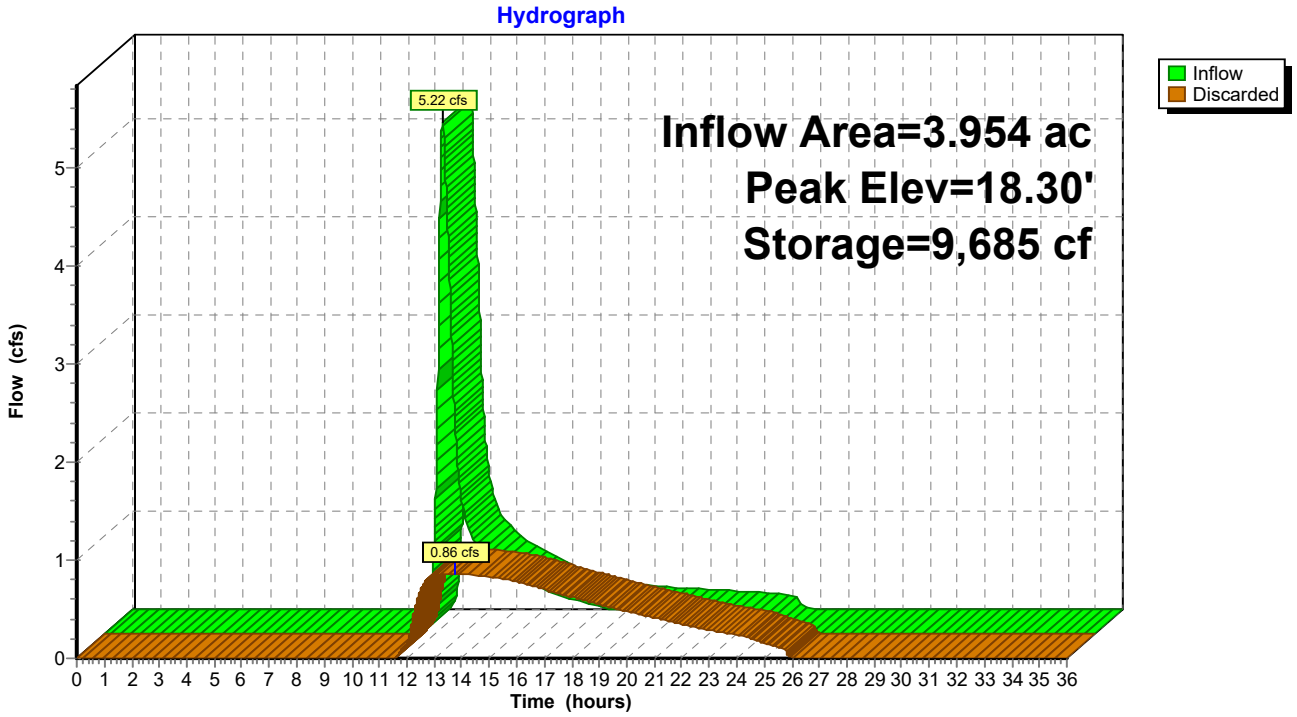
Volume	Invert	Avail.Storage	Storage Description
#1	14.00'	34,290 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
14.00	421	79.2	0	0	421
16.00	2,068	182.6	2,281	2,281	2,591
18.00	4,162	259.0	6,109	8,391	5,312
20.00	6,437	316.8	10,517	18,907	8,022
22.00	9,018	367.6	15,383	34,290	10,872

Device	Routing	Invert	Outlet Devices
#1	Discarded	14.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.86 cfs @ 13.71 hrs HW=18.30' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.86 cfs)

Pond 1P: Detention Basin



SECTION 6.0

ADDITIONAL DRAINAGE CALCULATIONS

6.01 TSS REMOVAL CALCULATIONS

TSS Removal Calculation Worksheet

Location: Mashpee, MA

Project: Great Oak Road

Prepared By: M. Morrison

Date: 1/5/2024

AREA 1

Subcatchment 1

Total Impervious Area, Acres= 0.775

A	B	C	D	E
BMP	TSS Removal Rate	Starting TSS Load*	Amount Removed (BxC)	Remaining Load (C-D)
Deep Sump and Hooded Catchbasins	0.25	1.00	0.25	0.75
Infiltration Basin	0.8	0.75	0.60	0.15

TSS Removal = 0.85

WEIGHTED AVERAGE

Total Site TSS Removal = [(0.370*0.87)+(0.397*0.80)] / (0.370+0.397)

Total Site TSS Removal = 0.85

*Equals remaining load from previous BMP (E)

6.02 GROUNDWATER RECHARGE VOLUME CALCULATIONS

Required Recharge Volume

Rv = F x Impervious Area

Where:

Rv = Recharge Volume

F=Target Depth Factor associated with each Hydrologic Soil Group

(F=0.60-inch for Soil Type A)

Impervious Area = Proposed Pavement and Rooftop area on-site

$$Rv = \left(\frac{0.60in}{12}\right)(33{,}782sft) =$$

Total Rv = 1,689 cf (required recharge volume)

Storage Provided

- Infiltration Basin= 93,207 cubic feet provided.
  Refer to the HydroCAD storage table provided for more information.

Drawdown Within 72-Hours

Pond 1P

Rv = Recharge Volume, cu.ft. (see above)

K = Saturated Hydraulic Conductivity, in/hr (from Rawls Table)

Bottom Area = Area of Infiltration System Bottom, sq.ft.

$$Time = \frac{Rv}{(K)(Bottom\ Area)}$$

$$Time = \left(\frac{77{,}092\ \ cu.ft.}{(0.181\ ft/hr)(6{,}540\ sq.ft.)}\right) =$$

$$Time = 64\ hours$$

- 64 hours < 72 hours

6.03 WATER QUALITY VOLUME CALCULATIONS

Water Quality Volume Calculation

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

V_{WQ} = Required Water Quality Volume (in cubic feet)
D_{WQ} = Water Quality Depth: **0.5-inch**
A_{IMP} = Total Impervious Area (in acres) used for driveways, parking, etc.

Infiltration Basin
A_{IMP} = 33,782 sq.ft.

V_{WQ} = (0.5 inches/12 inches/foot) * (33,782 sq.ft.)

V_{WQ} = 1,408 cubic feet (required volume), provided volume = 10,497 cubic feet in Infiltration Basin (refer to the HydroCAD storage tables provided in groundwater recharge section).

6.04 RIP-RAP OUTLET PROTECTION SIZING

OUTLET PROTECTION SIZING

BSC GROUP
BUILD | SUPPORT | CONNECT

Project No.	50774.00	**Calc By**	M. Morrison
Subject	Great Oak Road Subdivision	**Date**	1/7/2023
Location	Mashpee, MA	**Checked by**	
		Date	

FES-1

Q=Design Discharge, (ft^3/s) = 1.51 cfs
D=Culvert Diameter, (ft) = 1.00 ft
TW=Tailwater Depth, (ft) = 0.4 ft, (0.4xD for unknow tailwater, or enter known tailwater)
(Tailwater depth is to be limited to between 0.4D and 1.0D)

Riprap Rock Sizing

$$D_{50} = 0.2D\left[\frac{Q}{\sqrt{gD^{2.5}}}\right]^{4/3}\left[\frac{D}{TW}\right]$$

g=32.2 fps
D_{50} = median rock size, ft

$$D_{50} = 0.2\left[\frac{1.51}{5.67}\right]^{(4/3)}\left[\frac{1.00}{0.40}\right] = 0.09 \text{ ft}$$

= 1 inches

Table 1 : Riprap Classes and Apron Dimensions

Class	D_{50} (in)	Apron Length	Apron Depth
1	**5**	**4D**	**3.5D_{50}**
2	6	4D	3.5D_{50}
3	10	5D	3.3D_{50}
4	14	6D	2.2D_{50}
5	20	7D	2.0D_{50}
6	22	8D	2.0D_{50}

Use Class 1

Apron Dimensions

Length, L=7D = **6 ft**
Depth=2.0D_{50} = **2.00 Inches**
Width=3D+(2/3)L = **7.00 ft** (at apron end)

Riprap Rock Sizing Gradation

% of Weight Smaller than Given Size	Size of Stone, inches		
100	**2**	to	**2**
85	**1**	to	**2**
50	**1**	to	**2**
15	**1**	to	**1**

Reference Note: Sizing based in accordance with HEC #14 as required by MassHighway Design Manual

6.05 ILLICIT DISCHARGE COMPLIANCE STATEMENT

Illicit Discharge Compliance Statement

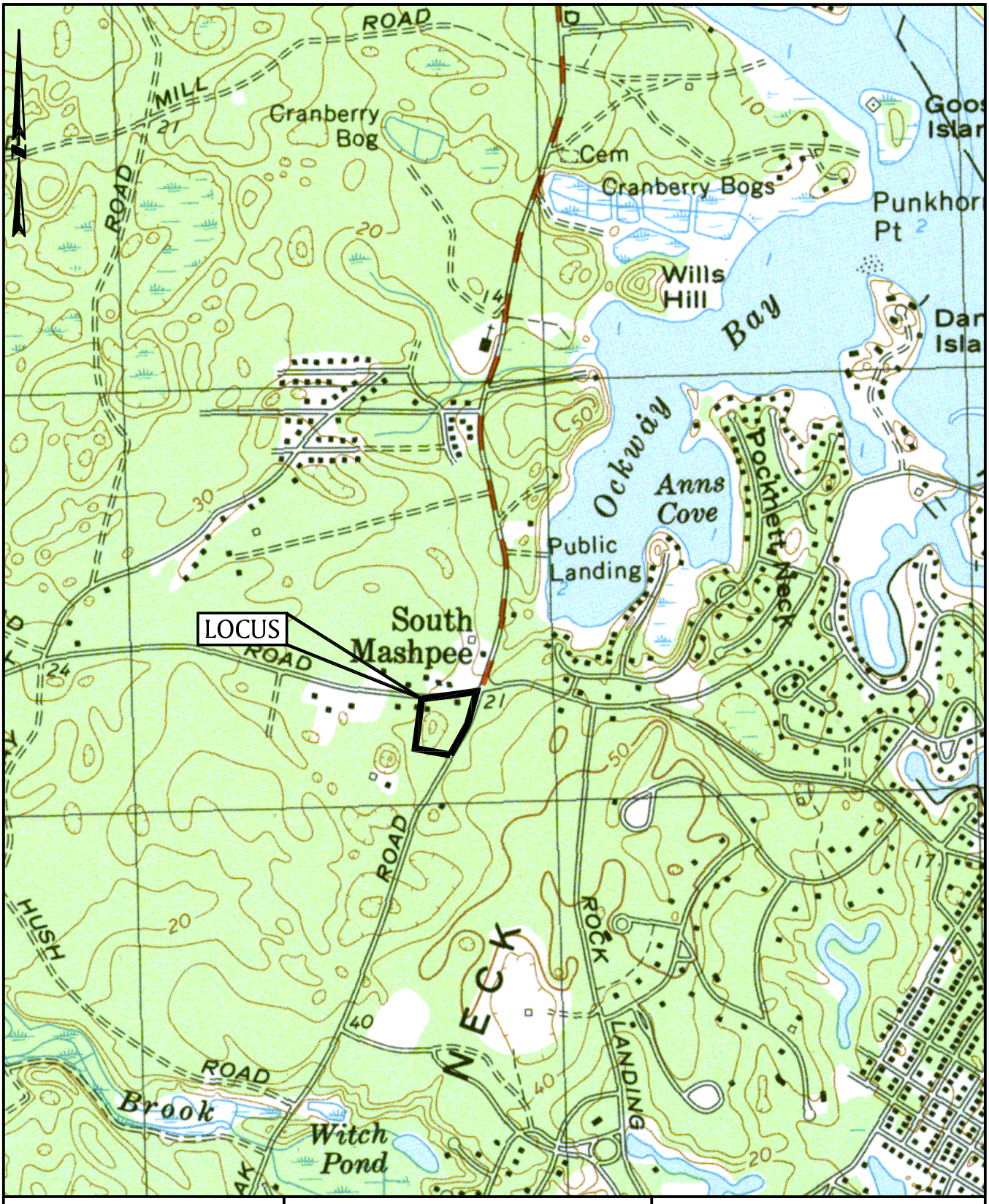
This statement is to document that, to the best of my knowledge and belief, there are no and will be no illicit discharges to the stormwater management systems or protected wetland resource areas for the Great Oak Road Subdivision on Great Oak Road in Mashpee, Massachusetts.

_____
Authorized Signature/Title

_____
Date

APPENDIX A

USGS LOCUS MAP



PREPARED FOR:

NEW SEABURY
HOMES, LLC
22 SEANEST DRIVE
MASHPEE, MA 02649

USGS LOCUS MAP

GREAT OAK ROAD
PRELIMINARY SUBDIVISION
GREAT OAK ROAD
MASHPEE, MA

BSC GROUP
349 Main Street Route 28 West
Yarmouth, Massachusetts
02649
508 778 8919

Job No.: 50774.00 Date: 01/08/2024
Scale: 1"=1000' Revised:
Dwg. No: Figure:

File: 5077400/C/R/SW/A

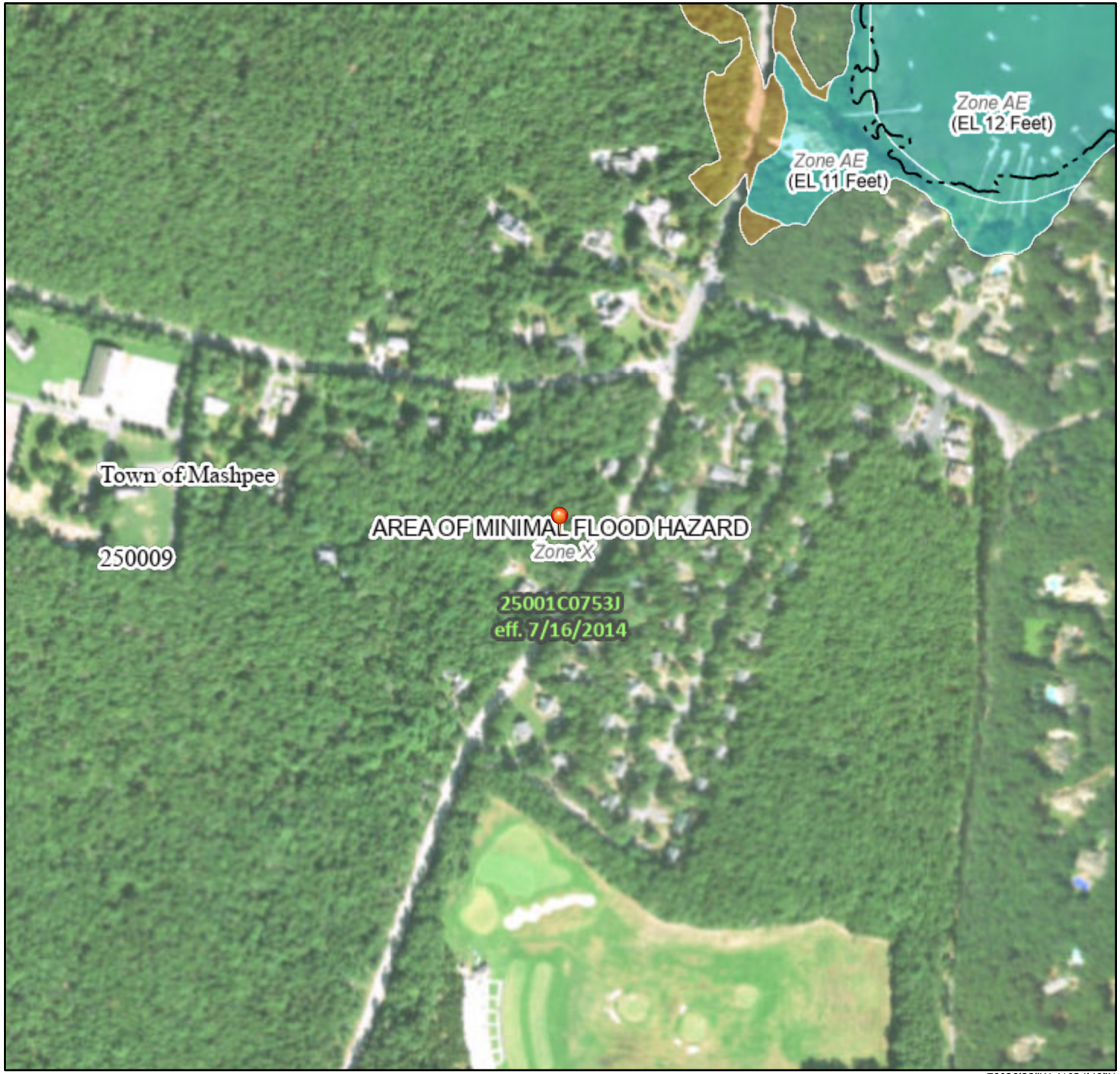
APPENDIX B

FEMA MAP

National Flood Hazard Layer FIRMette

FEMA

70°29'1"W 41°35'7"N



70°28'23"W 41°34'40"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

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

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 1/7/2024 at 8:41 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

APPENDIX C

WEB SOIL SURVEY

Map Scale: 1:1,650 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

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

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

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

Soil Survey Area: Barnstable County, Massachusetts
Survey Area Data: Version 20, Sep 12, 2023

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

Date(s) aerial images were photographed: Jun 10, 2022—Jun 30, 2022

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
252B	Carver coarse sand, 3 to 8 percent slopes	A	12.6	100.0%
Totals for Area of Interest			**12.6**	**100.0%**

Description

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

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

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX D

TEST PIT LOGS

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

New Seabury Properties, LLC
Owner Name

58 Red Brook Road
Street Address

Parcel Id: 110-58-0
Map/Lot #

Mashpee
City

MA
State

02649
Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade

2. Soil Survey — Web Soil Survey (Source); 252B (Soil Map Unit); Carver coarse Sand, 3 to 8% Slope (Soil Series)
   Outwash Plains, Moraines (Landform); More than 80 Inches (Soil Limitations)
   Sandy glaciofluvial deposits (Soil Parent material)

3. Surficial Geological Report — Stone/DiGiacomo-Cohen 2018 (175 Cotuit) (Year Published/Source); Coarse Deposits (Map Unit)
   Consists of gravel deposits, sand and gravel deposits, and sand deposits. (Description of Geologic Map Unit:)

4. Flood Rate Insurance Map — Within a regulatory floodway? [ ] Yes [X] No

5. Within a velocity zone? [ ] Yes [X] No

6. Within a Mapped Wetland Area? [ ] Yes [X] No — If yes, MassGIS Wetland Data Layer: N/A (Wetland Type)

7. Current Water Resource Conditions (USGS): 10/31/23 (Month/Day/ Year) Range: [ ] Above Normal [X] Normal [ ] Below Normal

8. Other references reviewed: (Zone II, IWPA, Zone A, EEA Data Portal, etc.)
   Quashnet River at Waquoit Village, MA (USGS 011058837), Zone II

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C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-1 (Hole #) | 10/30/23 (Date) | 9:00 a.m. (Time) | Cloudy/Rainy, 50F (Weather) | ------ (Latitude) | ----- (Longitude)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) | Trees, dense underbrush (Vegetation) | None (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 10-15% (Slope (%))

Description of Location: 200' Southwest of 35 Great Oak Road property marker

2. Soil Parent Material: glaciofluvial deposits | Outwash Plain (Landform) | Plain (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >50 feet | Drainage Way 25 feet | Wetlands >50 feet | Property Line 50 feet | Drinking Water Well >50 feet | Other N/A feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: _____ Depth to Weeping in Hole | 15' Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-12"	O	Loamy Sand	10YR 3/3		Cnc : Dpl:		1%	2%	massive	Friable	
12-64"	Ap	Loamy Sand	7.5YR 4/6		Cnc : Dpl:		1%	2%	massive	Friable	
64-96"	Bw	Coarse Sand	10YR 8/6		Cnc : Dpl:		2%	3%	Granular	Very Friable	
96-180"	C	Coarse Sand	2.5Y 7/4		Cnc : Dpl:		3%	5%	Granular	Very Friable	
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: Observed Ground water at 180"

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D. Determination of High Groundwater Elevation

1. Method Used (Choose one):

	Obs. Hole # TP-1	Obs. Hole # _____
☐ Depth to soil redoximorphic features	_____ inches	_____ inches
☒ Depth to observed standing water in observation hole	180 inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

Index Well Number _____ Reading Date _____

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

   ☒ Yes ☐ No

   b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 96 inches Lower boundary: 180 inches

   c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

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F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator	Date: 10/31/2023
Typed or Printed Name of Soil Evaluator / License #: Kyle Merchant/SE14662	Expiration Date of License: 11/1/2025
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

APPENDIX E

NOAA 14 PRECIPITATION TABLES

NOAA Atlas 14, Volume 10, Version 3
Location name: Mashpee, Massachusetts, USA*
Latitude: 41.5814°, Longitude: -70.4783°
Elevation: 20 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	**0.280** (0.227-0.346)	**0.350** (0.284-0.434)	**0.465** (0.376-0.578)	**0.560** (0.450-0.698)	**0.692** (0.535-0.895)	**0.790** (0.597-1.04)	**0.895** (0.654-1.22)	**1.02** (0.694-1.39)	**1.21** (0.787-1.69)	**1.37** (0.867-1.94)
10-min	**0.396** (0.322-0.491)	**0.496** (0.402-0.614)	**0.659** (0.532-0.818)	**0.794** (0.637-0.990)	**0.980** (0.758-1.27)	**1.12** (0.845-1.47)	**1.27** (0.927-1.72)	**1.44** (0.983-1.97)	**1.71** (1.11-2.39)	**1.94** (1.23-2.75)
15-min	**0.466** (0.379-0.577)	**0.584** (0.473-0.723)	**0.776** (0.627-0.964)	**0.935** (0.749-1.16)	**1.15** (0.891-1.49)	**1.32** (0.994-1.73)	**1.49** (1.09-2.03)	**1.70** (1.16-2.31)	**2.02** (1.31-2.81)	**2.28** (1.44-3.23)
30-min	**0.680** (0.552-0.841)	**0.849** (0.689-1.05)	**1.13** (0.909-1.40)	**1.36** (1.09-1.69)	**1.67** (1.29-2.17)	**1.91** (1.44-2.51)	**2.16** (1.58-2.94)	**2.47** (1.68-3.36)	**2.93** (1.91-4.09)	**3.33** (2.11-4.71)
60-min	**0.893** (0.725-1.10)	**1.12** (0.904-1.38)	**1.48** (1.19-1.84)	**1.78** (1.43-2.22)	**2.19** (1.70-2.84)	**2.50** (1.89-3.30)	**2.83** (2.08-3.86)	**3.24** (2.20-4.40)	**3.85** (2.50-5.37)	**4.37** (2.77-6.18)
2-hr	**1.24** (1.02-1.53)	**1.54** (1.26-1.89)	**2.02** (1.64-2.49)	**2.42** (1.95-2.99)	**2.97** (2.32-3.81)	**3.38** (2.58-4.41)	**3.82** (2.83-5.16)	**4.35** (3.00-5.88)	**5.17** (3.40-7.15)	**5.87** (3.76-8.23)
3-hr	**1.48** (1.22-1.81)	**1.82** (1.49-2.23)	**2.37** (1.94-2.91)	**2.83** (2.30-3.49)	**3.46** (2.71-4.42)	**3.93** (3.02-5.11)	**4.44** (3.30-5.95)	**5.05** (3.50-6.78)	**5.97** (3.96-8.22)	**6.76** (4.37-9.43)
6-hr	**1.93** (1.60-2.34)	**2.34** (1.93-2.84)	**3.01** (2.47-3.66)	**3.56** (2.91-4.35)	**4.32** (3.41-5.47)	**4.89** (3.78-6.29)	**5.50** (4.12-7.28)	**6.22** (4.36-8.27)	**7.28** (4.89-9.92)	**8.18** (5.35-11.3)
12-hr	**2.42** (2.01-2.91)	**2.89** (2.40-3.48)	**3.65** (3.03-4.41)	**4.28** (3.53-5.20)	**5.16** (4.10-6.45)	**5.81** (4.52-7.38)	**6.50** (4.90-8.48)	**7.28** (5.17-9.60)	**8.40** (5.72-11.3)	**9.33** (6.19-12.8)
24-hr	**2.90** (2.43-3.47)	**3.42** (2.87-4.09)	**4.27** (3.57-5.13)	**4.98** (4.14-6.00)	**5.96** (4.77-7.38)	**6.70** (5.24-8.40)	**7.46** (5.65-9.59)	**8.29** (5.96-10.8)	**9.46** (6.53-12.6)	**10.4** (6.99-14.1)
2-day	**3.36** (2.84-3.99)	**3.93** (3.32-4.67)	**4.87** (4.09-5.79)	**5.64** (4.72-6.74)	**6.71** (5.42-8.23)	**7.52** (5.94-9.35)	**8.35** (6.39-10.6)	**9.25** (6.74-12.0)	**10.5** (7.34-13.9)	**11.5** (7.84-15.4)
3-day	**3.68** (3.12-4.34)	**4.26** (3.62-5.04)	**5.22** (4.41-6.19)	**6.02** (5.06-7.16)	**7.11** (5.78-8.68)	**7.94** (6.31-9.83)	**8.80** (6.77-11.1)	**9.72** (7.13-12.5)	**11.0** (7.75-14.5)	**12.0** (8.26-16.0)
4-day	**3.94** (3.36-4.64)	**4.54** (3.86-5.34)	**5.50** (4.67-6.50)	**6.31** (5.32-7.48)	**7.42** (6.05-9.02)	**8.26** (6.59-10.2)	**9.12** (7.05-11.5)	**10.1** (7.41-12.9)	**11.3** (8.04-14.9)	**12.4** (8.56-16.4)
7-day	**4.62** (3.95-5.40)	**5.23** (4.47-6.12)	**6.23** (5.31-7.31)	**7.06** (5.99-8.31)	**8.20** (6.73-9.89)	**9.08** (7.29-11.1)	**9.96** (7.75-12.4)	**10.9** (8.11-13.8)	**12.1** (8.71-15.8)	**13.1** (9.18-17.3)
10-day	**5.25** (4.51-6.12)	**5.88** (5.05-6.86)	**6.92** (5.93-8.09)	**7.79** (6.63-9.13)	**8.97** (7.40-10.8)	**9.89** (7.98-12.0)	**10.8** (8.44-13.4)	**11.7** (8.80-14.8)	**13.0** (9.37-16.8)	**13.9** (9.81-18.2)
20-day	**7.17** (6.21-8.29)	**7.90** (6.83-9.14)	**9.09** (7.84-10.5)	**10.1** (8.65-11.7)	**11.4** (9.50-13.6)	**12.5** (10.2-15.0)	**13.5** (10.6-16.5)	**14.5** (11.0-18.2)	**15.7** (11.5-20.2)	**16.6** (11.9-21.6)
30-day	**8.82** (7.68-10.2)	**9.63** (8.37-11.1)	**11.0** (9.50-12.6)	**12.1** (10.4-14.0)	**13.6** (11.3-16.0)	**14.8** (12.1-17.6)	**15.9** (12.6-19.2)	**16.9** (13.0-21.1)	**18.2** (13.5-23.2)	**19.1** (13.8-24.6)
45-day	**10.9** (9.55-12.5)	**11.8** (10.3-13.6)	**13.3** (11.6-15.3)	**14.6** (12.6-16.8)	**16.3** (13.7-19.1)	**17.7** (14.5-20.9)	**18.9** (15.0-22.7)	**20.1** (15.5-24.8)	**21.4** (15.9-27.0)	**22.2** (16.2-28.5)
60-day	**12.7** (11.2-14.6)	**13.7** (12.0-15.7)	**15.4** (13.4-17.6)	**16.8** (14.6-19.2)	**18.6** (15.7-21.8)	**20.1** (16.6-23.7)	**21.5** (17.1-25.7)	**22.7** (17.6-28.0)	**24.1** (18.1-30.3)	**25.0** (18.3-31.9)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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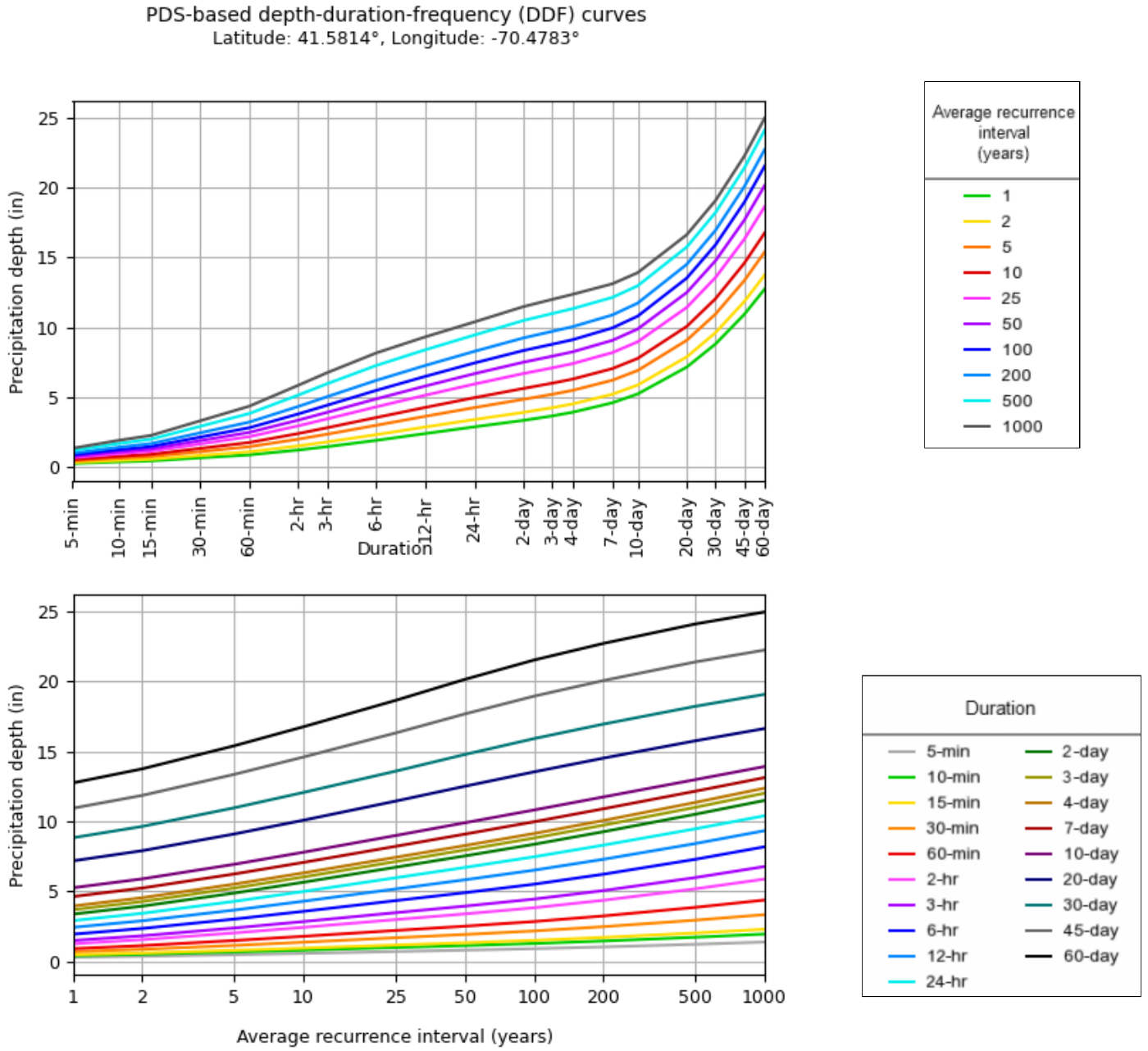
PF graphical



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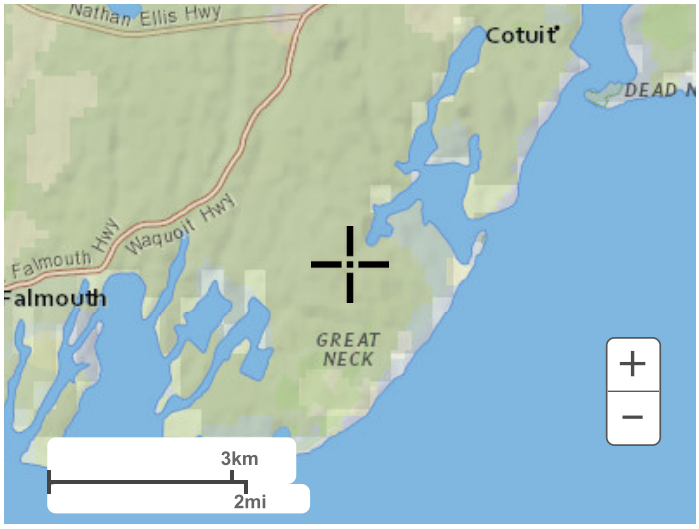
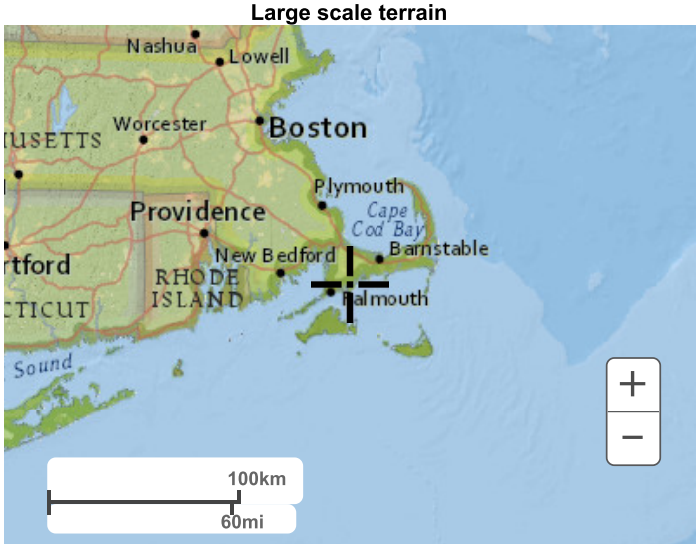
Maps & aerials

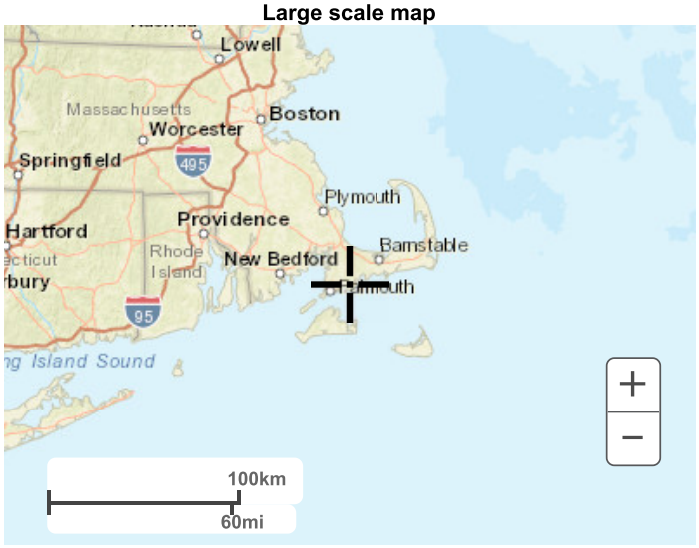
Small scale terrain



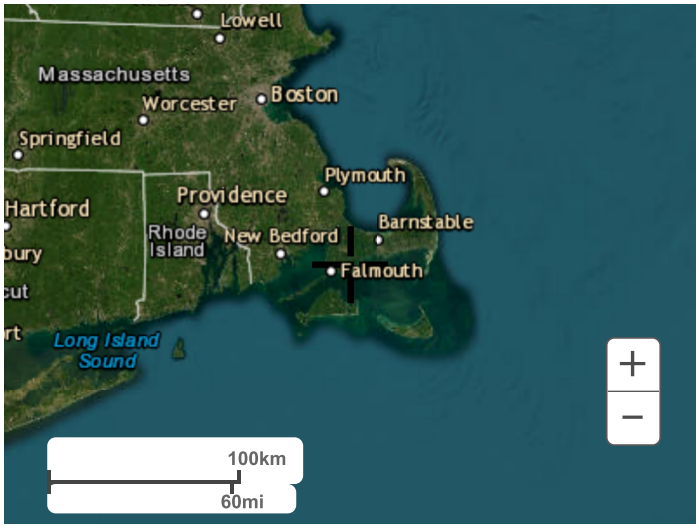
Large scale terrain



Large scale map



Large scale aerial



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