STORMWATER REPORT

THORNDIKE PLACE
DOROTHY ROAD
ARLINGTON, MA

NOVEMBER 2020
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Owner/Applicant:

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BSC Job Number: 23407.00

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SECTION 1.0

PROJECT INFORMATION

1.01 PROJECT DESCRIPTION

Arlington Realty, LLC (The Applicant) is seeking to construct a new age restricted multi-family housing and assisted living development in Arlington, Massachusetts, hereinafter referred to as "the Project." The total property area is approximately 17.66 acres and is located off Dorothy Road near the intersection with Littlejohn Street. The project is bounded on the north by Dorothy Road, on the east by residential properties and Thorndike Field, and bounded on the south and west by Concord Turnpike (Route 2).

The Project consists of clearing and grubbing of the northwest section of the property and construction of one 4-story assisted living residential building with a lower level parking garage, six duplex townhouses with covered carports, as well as surface parking, walkways, utility services, and a stormwater management system. The buildings have a combined footprint of approximately 43,100 square feet.

The Project is designed to comply with the Massachusetts General Laws (M.G.L.) Chapter 40B, which allows developers to override certain aspects of municipal zoning bylaws by providing a certain percentage of affordable housing, as well as the Department of Environmental Protection's Stormwater Management Standards. There are wetland resource areas in the south, west and east portions of the property. The Project is concentrated in the northwest area of the property and minimizes impacts to the 100-foot wetland buffer zones, which are regulated by the Arlington Wetlands Bylaw as Adjacent Upland Resource Areas (AURA's). Part of the site is located within the 1% Chance Annual Flood as defined by FEMA which is regulated under the Wetlands Protection Act and the Arlington Wetlands Bylaw as Bordering Land Subject to Flooding (BLSF). Compensatory flood storage is proved at a 2:1 ratio as described in section 2.12 below.

1.02 PRE-DEVELOPMENT CONDITIONS

The existing site topography generally slopes southeast across the property towards the wetlands located on the property with slopes ranging from 0-15%. The current site is comprised of forest and the primary soil classification identified by the NRCS Web Soil Survey is udorthents (655), which accounts for the majority of the property and all of the project area. On November 25, 2020, BSC Group conducted three test pits on the site, the locations of which are noted on the Grading and Drainage plan, and the test pit logs are attached in Appendix D. The test pits consisted primarily of fill material to a depth of 9-11 feet generally conforming with the soils mapping. Even though the material was fill, all samples textured as sandy loam in test pits TP-1 and TP-2, closest to the proposed stormwater management systems. At the bottom of test pit TP-3, a layer of clay material was found. Based on the fill materials found, runoff calculations have been performed using curve numbers corresponding to Hydrologic Soil Group (HSG) C.

The existing site being largely undeveloped has no existing drainage facilities and the majority of the stormwater runoff is directed to the wetlands on the property. A small portion of the site discharges to the north to Dorothy 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 4-story building (approximately 15,900 square feet) will be temporarily detained on the roof of the building. This collected runoff will be released at controlled rates through roof drains to an underground infiltration system in the adjacent driveway and drop-off area. The majority of the 4-story building roof will discharge at grade directly to the surface and flow overland towards the wetlands to the south.

Stormwater runoff from the site driveway and small parking/drop-off area at the main entrance to the building will be collected via a deep sump catch basin, conveyed through a water quality unit before being directed to the underground infiltration system. Stormwater runoff from the driveway into the garage below the building will be collected via a trench drain and conveyed through a water quality unit before being directed to the underground system. Due to its

elevation difference, this leg of the system has been provided with a backflow preventer device. In addition, runoff from the townhouse and carport roofs, as well as the landscaped areas between the townhouses and 4-story building will be collected and routed to the underground infiltration area. This underground infiltration system provides for recharge to groundwater and provides peak flow rate attenuation. In larger storm events, this system will overflow through an outlet control structure to a flared end section with a rip-rap apron to the south.

Stormwater runoff from the townhouse driveways along Dorothy Rd will be collected via individual trench drains and routed to small underground infiltration chamber systems beneath each driveway. Each system is designed to completely hold and infiltrate the 100-year, 24-hour storm event.

Although all soils sampled in test pits TP-1 and TP-2 were identified as sandy loam (see above), the infiltration rate for loam (0.52-inches per hour) has been used in the infiltration system design to account for the materials found being primarily fill. Based upon the test pit data performed in November 2020 (see above), the estimated seasonal high groundwater elevation ranges between elevations 0 and 2. As such the infiltration systems have been set with a bottom elevation of 6.0 and higher to provide the minimum 2-feet of clearance above groundwater and account for any groundwater fluctuations that may occur.

To provide emergency access to the sides and rear of the building, a reinforced grass access lane will be installed. A portion of this access lane will include a 6-foot wide, porous asphalt walkway to allow residents to have ADA/AAB accessible access the rear of the site. Both the reinforced grass and porous asphalt will allow stormwater runoff to freely infiltrate back to the ground and will result in negligible runoff.

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 10.00, 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.

In accordance with previous peer review comments received from BETA Group, Inc., and to account for impacts from climate change, stormwater runoff was modeled using data from the NOAA 14+ rainfall data. In accordance with BETA Group's letter, the following rainfall values have been used:

Storm Frequency	NOAA 14+ Rainfall (Inches)
2-year	3.64
10-year	5.79
25-year	7.49
50-year	8.72
100-year	10.35

As detailed in BETA Group's review letter, these values are greater than, in some cases significantly so, than the rainfall required by either the DEP's Stormwater Handbook or the Arlington Wetlands Bylaw.

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 1L – Flow to Wetlands

Storm Event	Pre-Development Peak Discharge Rate (cfs)	Post-Development Peak Discharge Rate (cfs)	Change in Peak Discharge Rate (cfs)
2-Year	2.9	2.9	0.0
10-Year	7.6	5.7	-1.9
25-Year	11.7	8.5	-3.2
50-Year	14.8	11.8	-3.0
100-Year	19.0	16.1	-2.9

Node 2L – Flow Towards Street

Storm Event	Pre-Development Peak Discharge Rate (cfs)	Post-Development Peak Discharge Rate (cfs)	Change in Peak Discharge Rate (cfs)
2-Year	0.2	0.2	0.0
10-Year	0.6	0.5	-0.1
25-Year	0.8	0.8	0.0
50-Year	1.0	0.9	-0.1
100-Year	1.3	1.2	-0.1

Node 100L – Total Flows

Storm Event	Pre-Development Peak Discharge Rate (cfs)	Post-Development Peak Discharge Rate (cfs)	Change in Peak Discharge Rate (cfs)
2-Year	3.1	3.1	0.0
10-Year	7.9	6.2	-1.7
25-Year	12.1	9.1	-3.0
50-Year	15.3	12.5	-2.8
100-Year	19.7	17.0	-2.7

2.03 Stormwater Standard 3 – Groundwater Recharge

Groundwater recharge is provided on site via an underground structural infiltration system beneath the surface parking area to the north of the building, and smaller systems beneath each individual driveway of the duplex townhouses. 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.

As the infiltration system has more than 2-feet but less than 4-feet separation to estimated seasonal high groundwater, a mounding analysis has been performed in accordance with the Hantoush Method to ensure that a groundwater mound does not extend into the bottom of the infiltration system preventing infiltration of the required recharge volume. This analysis is included in Section 6.0 of this Report.

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
- Proprietary Hydrodynamic Separators
- Underground Stormwater Infiltration Systems

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 underground infiltration system 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 and the Town of Arlington Wetlands Protection Bylaw and Regulations. Through the construction of the aforementioned stormwater systems, the project will provide peak rate attenuation, TSS removal and groundwater recharge.

2.12 Compensatory Flood Storage

A portion of the project site is located within the 1% Chance Annual Flood as defined by FEMA, which is regulated under the Wetlands Protection Act and Arlington Wetlands Bylaw as Bordering Land Subject to Flooding (BLSF). In order to protect the values provided by BLSF and prevent downstream flooding impacts, the project is required to provide compensatory flood storage on a 1-foot incremental basis to match whatever is lost due to the project's development. Further, Arlington requires compensatory flood storage to be provided at a 2 to 1 ratio for any flood storage lost. In order to provide this compensatory flood storage, the project will minimize the area of BLSF impacted and regrade a portion of the project property southeast of the proposed building as shown on the Plans. A breakdown of the flood storage impacts and compensatory storage provided is shown below:

Elevations	Existing Incremental Available Flood Storage (CU.FT.)	Incremental Available Flood Storage with No Compensatory Storage (CU.FT.)	Incremental Flood Storage Change w/No Compensatory Storage (CU.FT.)	Proposed Incremental Compensatory Storage (CU.FT.)	Ratio of Compensatory Storage to Storage Lost
5.0 - 6.0	**136.0**	**67.5**	**-68.5**	**146.0**	**2.1**
6.0 - 6.8	**9,327.6**	**5,003.2**	**-4,324.4**	**9,014.8**	**2.1**

As shown above, the project will exceed the 2 to 1 ratio of compensatory flood storage for all flood storage lost due to the project development. In addition, as shown on the Plans, the proposed compensatory storage is hydrologically connected to the flood plain impacted by the project. Therefore, the project as proposed meets the applicable requirements for BLSF in both the Wetlands Protection Act and the Arlington Wetlands Bylaw and Regulations.

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 **Thorndike Place, in Arlington, 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 <u>not</u> 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
Arlington Land Realty, LLC
84 Sherman Street, 2nd Floor
Cambridge, MA 02140

Contractor
To be determined

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

Contact: Dominic Rinaldi, P.E.
Phone: (617) 896–4300
Email: drinaldi@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 total project area is approximately 17.66 acres and is located off Dorothy Road. The project is bounded on the north by Dorothy Road, bounded on the east by residential properties, and bounded on the south and west by Concord Turnpike (Route 2).

The current site is comprised of forest and the primary soil classification identified by the NRCS Web Soil Survey is udorthents (655), which accounts for the majority of the property and all of the project area. On November 25, 2020, BSC Group conducted three test pits on the site, the locations of which are noted on the Grading and Drainage plan, and the test pit logs are attached in Appendix D. The test pits consisted of primarily fill material to a depth of 9-11 feet generally conforming with the soils mapping. Even though the material was fill, it all samples textured as sandy loam in test pits TP-1 and TP-2, closest to the proposed stormwater management systems. At the bottom of test pit TP-3, a layer of clay material was found. Based on the fill materials found, runoff calculations have been performed using curve numbers corresponding to Hydrologic Soil Group (HSG) C.

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 one (1) multi-family housing building and six (6) duplex townhouses with associated parking, driveways, walkways, and retaining walls,
- The construction of stormwater management systems,

- Site grading and compensatory flood storage creation, and
- Utility connections and installation.

The proposed project will disturb a total of approximately 175,000± S.F. (4.02± acres).

Soil disturbing activities will include site demolition, installing stabilized construction exits, installation of erosion and sedimentation controls, grading, storm drain inlets, stormwater management systems, utilities, building foundation, 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

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 haybales 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, haybales, 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, Haybales, 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 haybales.

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

Dorothy 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. Vehicular refueling or maintenance shall not be allowed within the Adjacent Upland Resource Area (AURA) or in any protected wetland resource areas as defined by the Town of Arlington Regulations for Wetland Protection. 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	Thorndike Place		
NPDES Tracking No. (if applicable)		**Location**	Dorothy Road Arlington, 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, Arlington Land Realty, 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;

Haybales, 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.

Water Quality Treatment Units

The water quality treatment structures require periodic inspection and cleaning to maintain operation and function. Owners should have these units inspected on a semi-annual basis and after periods of intense precipitation. Inspections can be done by using a clear Plexiglas tube ("sludge judge") to extract a water column sample. When sediment accumulation reaches 15% of storage capacity, cleaning of the unit is required.

These water quality structures must and will be checked and cleaned immediately after petroleum spills; contact appropriate regulatory agencies.

Maintenance of these units should be done by a vacuum truck that will remove the water, sediment, debris, floating hydrocarbons and other materials in unit. Proper cleaning and disposal of the removed materials and liquid must be followed.

Underground Infiltration System

Maintenance is required for the proper operation of the underground infiltration system. Infiltration systems are prone to failure due to clogging if the upstream water quality units are not maintained. The use of pretreatment BMPs will minimize failure and maintenance requirements.

After construction, the infiltration system shall be inspected after every major storm for the first few months to ensure proper stabilization and function. Water levels in the access ports shall be recorded over several days to check the drainage of the systems. It is recommended that a log book be maintained showing the depth of water in the detention/infiltration systems at each observation in order to determine the rate at which the system dewaters after runoff producing storm events. Once the performance characteristics of the detention/infiltration have been verified, the monitoring schedule can be reduced to an annual basis, unless the performance data suggests that a more frequent schedule is required.

Preventive maintenance on the infiltration system shall be performed at least twice a year, and sediment shall be removed from any and all pretreatment and collection structures. Sediment shall be removed when deposits approach within six inches of the invert heights of connecting pipes between unit rows, or in sumped inlet structures. Ponded water inside the systems (as visible from the access ports) that remains after several days most likely indicates that the bottom of the system is clogged and will require cleaning or replacement.

The system is designed with a defined top portal area at the "down-flow" end of the chamber that can be cut out to accept up to a 10-inch diameter riser pipe. The 10-inch riser can be used as an observation well and as access for a vacuum truck tube for use in removing sediment. The "down flow" ends of the units have end walls that are closed on the bottom. The closed bottom functions like a coffer dam, with most of the sediment depositing prior to flowing into the next chamber, facilitating its removal through the riser pipe, which is positioned directly above this area.

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.

C. Lawn Areas - Turf Systems

Mowing – Proper mowing is an integral part of any good turf maintenance program. Without it, the finest in fertilization, watering and other vital maintenance practices would be completely ineffective. Proper mowing will help control dicot weeds; help the turf survive during periods of extreme heat, and gain strength and vigor to resist disease and other infestations.

Mowing height – The proper mowing height will vary somewhat according to the type of grass. The most common type of seed & sod lawns contain a mixture of bluegrass, fine fescue and perennial rye, which should be mowed at 2-3 inches.

Mowing frequency – The basic rule of thumb for mowing frequency is to never remove more than 1/3 of the grass blade in one mowing. Example: if you want to mow your turf at 2 inches, you should cut it when it reaches 3 inches. Removing more than ½ of the grass plant at a time can put the plant into shock, thus making it more susceptible to stress disease and weed infestation.

Mowing frequency will vary with the growing season and should be set by the plant height and not a set date. It will often be necessary to mow twice a week during periods of surge growth to help maintain plant health and color. Mowing should be cut back during periods of stress.

Grass clippings should be removed whenever they are thick enough to layer the turf. The return of clippings to the soil actually adds nutrients and helps retain moisture. Heavily clumped grass clippings are a sign of infrequent mowing, calling for an adjustment in the mowing schedule.

When mowing any area, try to alternate mowing patterns. This tends to keep grass blades more erect and assures an even cut. A dull mower will cause color loss due to tearing of the turf plant, and since mowing will ultimately determine the appearance of any turf area there is an absolute necessity for a clean sharp cut.

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			
		Water Quality Units	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.

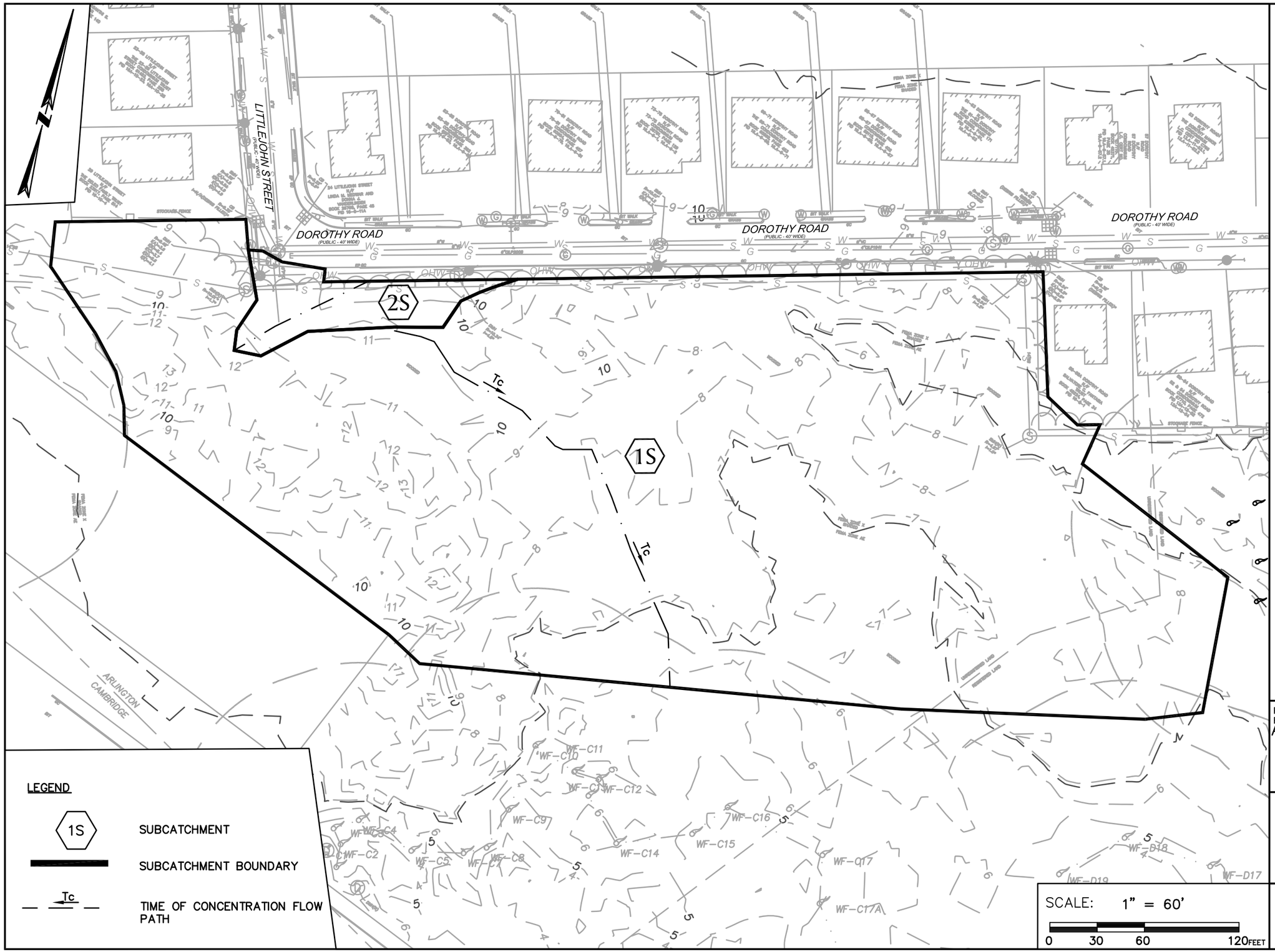
3. Limited or no use of sodium chloride salts, fertilizers or pesticides recommended.

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



THORNDIKE PLACE

DOROTHY ROAD

ARLINGTON
MASSACHUSETTS
(MIDDLESEX COUNTY)

EXISTING WATERSHED PLAN

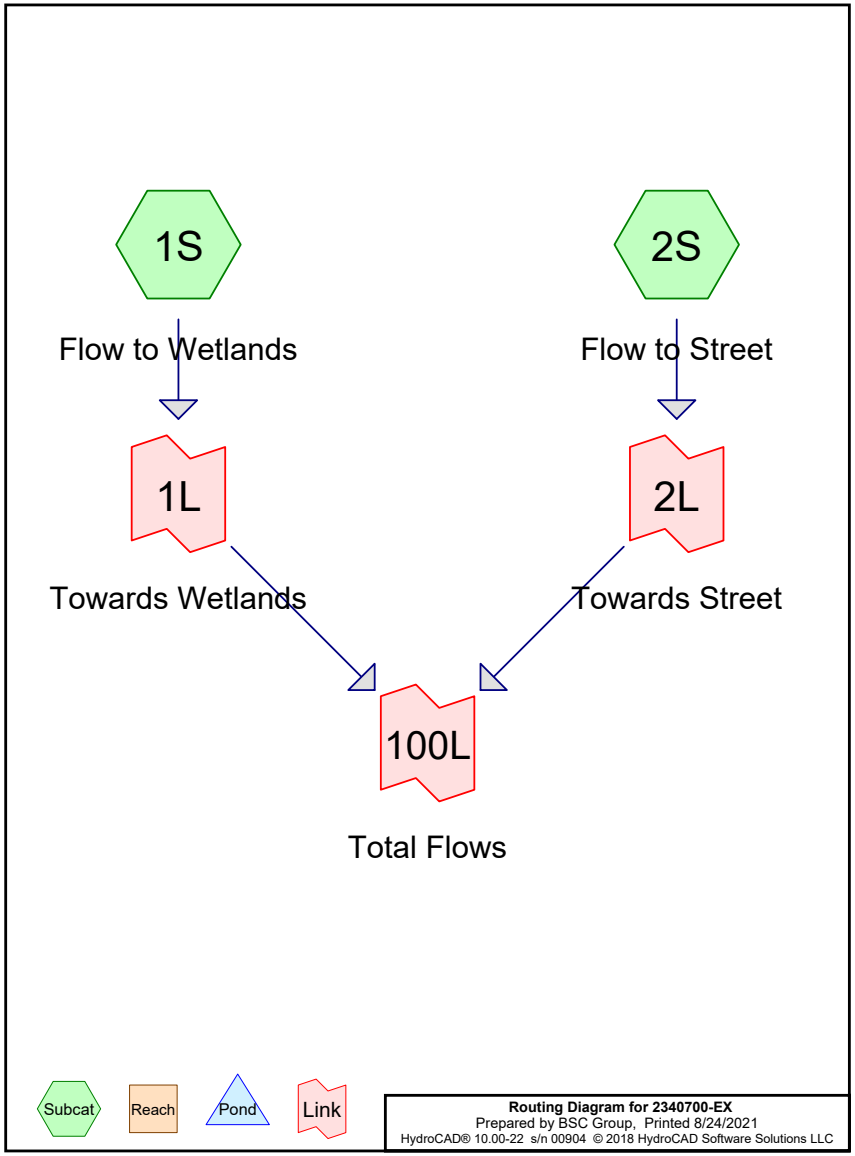
NOVEMBER 3, 2020

PREPARED FOR:
ARLINGTON LAND REALTY
84 SHERMAN STREET
CAMBRIDGE, MA

BSC GROUP
803 Summer Street
Boston, Massachusetts
02127
617 896 4300

Job No.: 23407.00 Date: 11/3/2020
Scale: 1" = 60' Revised: 08/18/2021
Dwg No: EXW
File: C\DRAINAGE DESIGN\2340700-EXW

5.02 EXISTING HYDROLOGY CALCULATIONS (HYDROCAD™ PRINTOUTS)



Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
925	98	Paved parking, HSG C (2S)
157,761	70	Woods, Good, HSG C (1S, 2S)
158,686	**70**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
158,686	HSG C	1S, 2S
0	HSG D	
0	Other	
158,686		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
0	0	925	0	0	925	Paved parking	2S
0	0	157,761	0	0	157,761	Woods, Good	1S, 2S
0	**0**	**158,686**	**0**	**0**	**158,686**	**TOTAL AREA**	

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Flow to Wetlands Runoff Area=151,732 sf 0.00% Impervious Runoff Depth>1.09"
Flow Length=310' Tc=17.5 min CN=70 Runoff=2.9 cfs 13,786 cf

Subcatchment 2S: Flow to Street Runoff Area=6,954 sf 13.30% Impervious Runoff Depth>1.34"
Flow Length=95' Tc=6.0 min CN=74 Runoff=0.2 cfs 774 cf

Link 1L: Towards Wetlands Inflow=2.9 cfs 13,786 cf
Primary=2.9 cfs 13,786 cf

Link 2L: Towards Street Inflow=0.2 cfs 774 cf
Primary=0.2 cfs 774 cf

Link 100L: Total Flows Inflow=3.1 cfs 14,560 cf
Primary=3.1 cfs 14,560 cf

Total Runoff Area = 158,686 sf Runoff Volume = 14,560 cf Average Runoff Depth = 1.10"
99.42% Pervious = 157,761 sf 0.58% Impervious = 925 sf

Summary for Subcatchment 1S: Flow to Wetlands

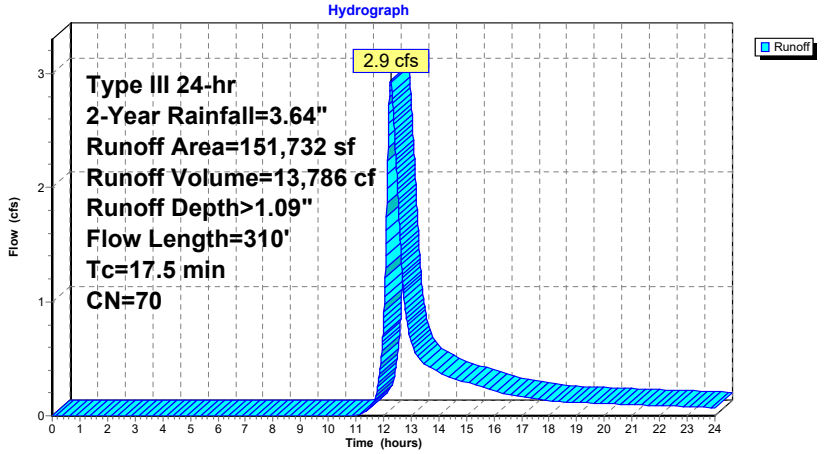
Runoff = 2.9 cfs @ 12.27 hrs, Volume= 13,786 cf, Depth> 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.64"

Area (sf)	CN	Description
151,732	70	Woods, Good, HSG C
151,732		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	50	0.0240	0.07		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.23"
6.1	260	0.0200	0.71		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
17.5	310	Total			

Subcatchment 1S: Flow to Wetlands



Summary for Subcatchment 2S: Flow to Street

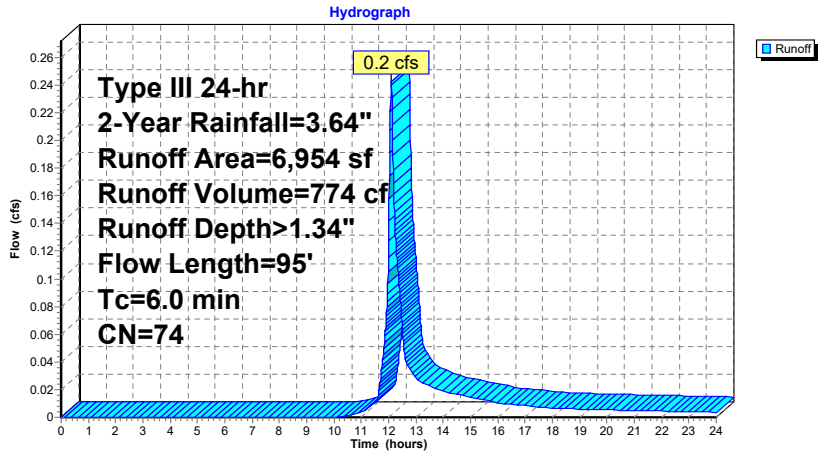
Runoff = 0.2 cfs @ 12.09 hrs, Volume= 774 cf, Depth> 1.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.64"

Area (sf)	CN	Description
6,029	70	Woods, Good, HSG C
925	98	Paved parking, HSG C
6,954	74	Weighted Average
6,029		86.70% Pervious Area
925		13.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	20	0.0750	0.10		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.23"
1.8	75	0.0200	0.71		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
5.3	95	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Flow to Street

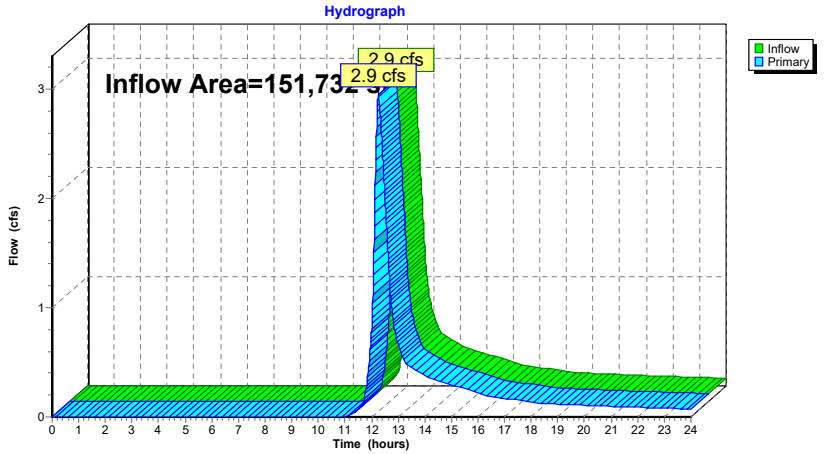


Summary for Link 1L: Towards Wetlands

Inflow Area = 151,732 sf, 0.00% Impervious, Inflow Depth > 1.09" for 2-Year event
Inflow = 2.9 cfs @ 12.27 hrs, Volume= 13,786 cf
Primary = 2.9 cfs @ 12.27 hrs, Volume= 13,786 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Towards Wetlands

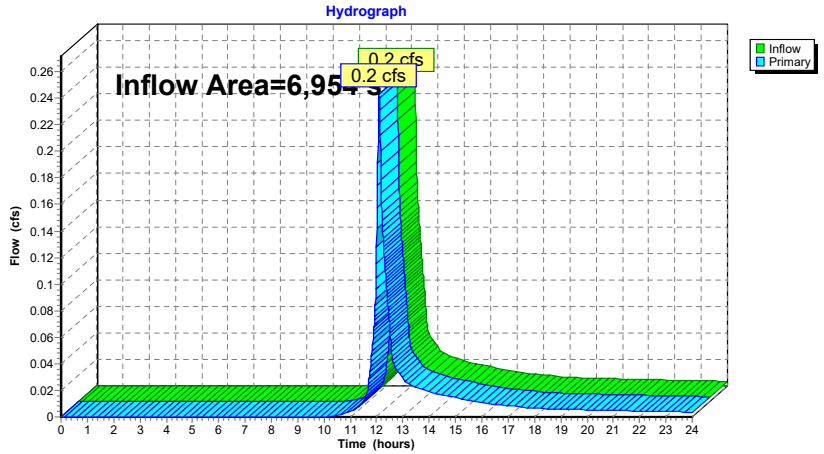


Summary for Link 2L: Towards Street

Inflow Area = 6,954 sf, 13.30% Impervious, Inflow Depth > 1.34" for 2-Year event
Inflow = 0.2 cfs @ 12.09 hrs, Volume= 774 cf
Primary = 0.2 cfs @ 12.09 hrs, Volume= 774 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 2L: Towards Street

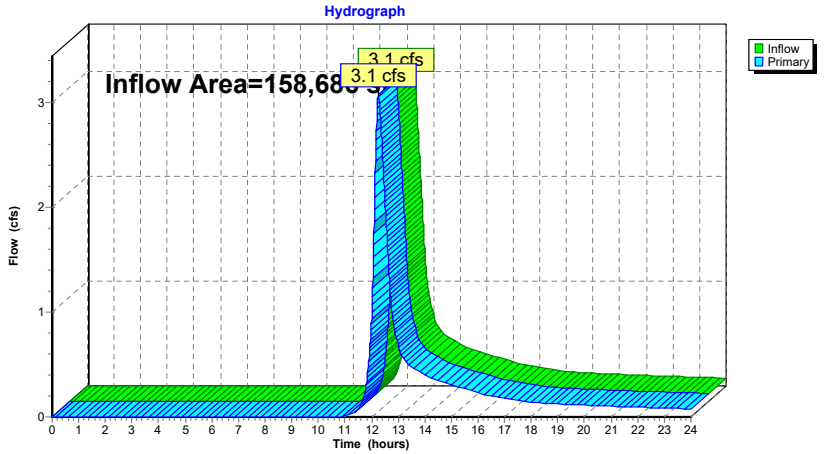


Summary for Link 100L: Total Flows

Inflow Area = 158,686 sf, 0.58% Impervious, Inflow Depth > 1.10" for 2-Year event
Inflow = 3.1 cfs @ 12.26 hrs, Volume= 14,560 cf
Primary = 3.1 cfs @ 12.26 hrs, Volume= 14,560 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 100L: Total Flows



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Flow to Wetlands Runoff Area=151,732 sf 0.00% Impervious Runoff Depth>2.63"
Flow Length=310' Tc=17.5 min CN=70 Runoff=7.6 cfs 33,243 cf

Subcatchment 2S: Flow to Street Runoff Area=6,954 sf 13.30% Impervious Runoff Depth>3.01"
Flow Length=95' Tc=6.0 min CN=74 Runoff=0.6 cfs 1,742 cf

Link 1L: Towards Wetlands Inflow=7.6 cfs 33,243 cf
Primary=7.6 cfs 33,243 cf

Link 2L: Towards Street Inflow=0.6 cfs 1,742 cf
Primary=0.6 cfs 1,742 cf

Link 100L: Total Flows Inflow=7.9 cfs 34,985 cf
Primary=7.9 cfs 34,985 cf

Total Runoff Area = 158,686 sf Runoff Volume = 34,985 cf Average Runoff Depth = 2.65"
99.42% Pervious = 157,761 sf 0.58% Impervious = 925 sf

Summary for Subcatchment 1S: Flow to Wetlands

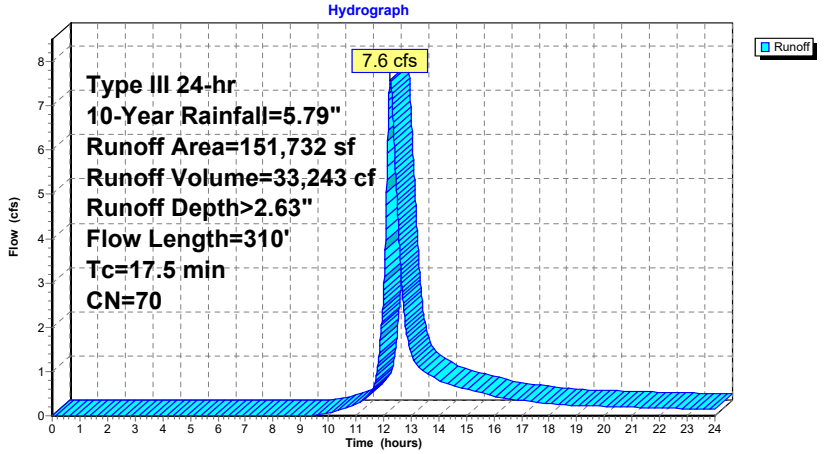
Runoff = 7.6 cfs @ 12.25 hrs, Volume= 33,243 cf, Depth> 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.79"

Area (sf)	CN	Description
151,732	70	Woods, Good, HSG C
151,732		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	50	0.0240	0.07		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.23"
6.1	260	0.0200	0.71		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
17.5	310	Total			

Subcatchment 1S: Flow to Wetlands



Summary for Subcatchment 2S: Flow to Street

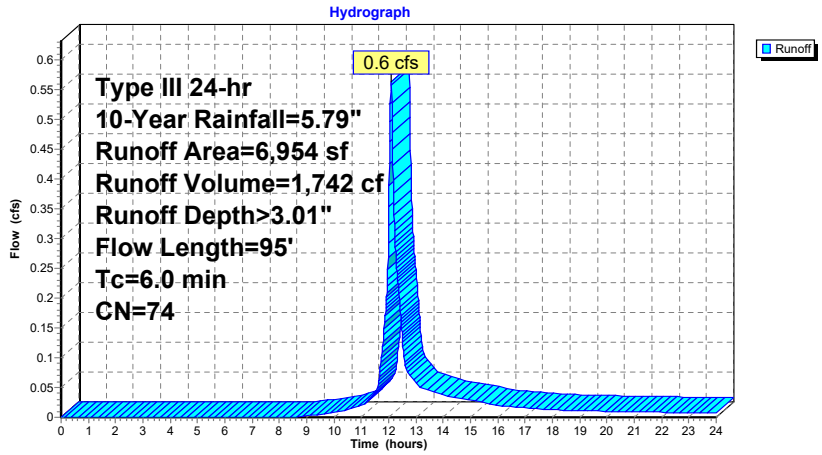
Runoff = 0.6 cfs @ 12.09 hrs, Volume= 1,742 cf, Depth> 3.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.79"

Area (sf)	CN	Description
6,029	70	Woods, Good, HSG C
925	98	Paved parking, HSG C
6,954	74	Weighted Average
6,029		86.70% Pervious Area
925		13.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	20	0.0750	0.10		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.23"
1.8	75	0.0200	0.71		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
5.3	95	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Flow to Street

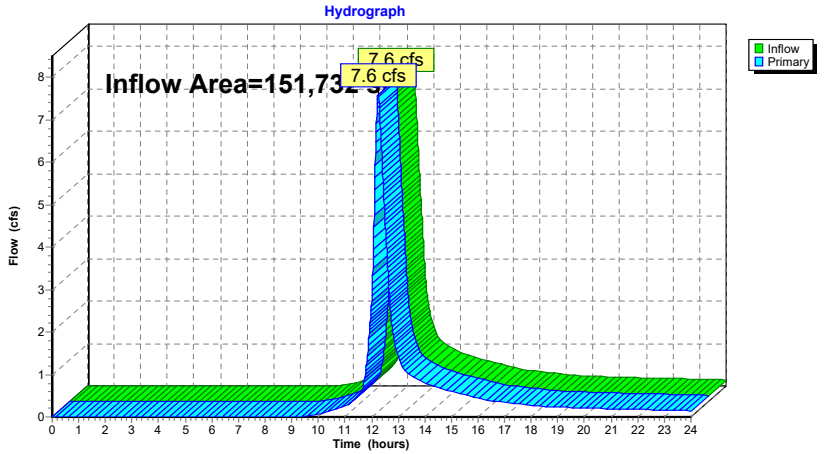


Summary for Link 1L: Towards Wetlands

Inflow Area = 151,732 sf, 0.00% Impervious, Inflow Depth > 2.63" for 10-Year event
Inflow = 7.6 cfs @ 12.25 hrs, Volume= 33,243 cf
Primary = 7.6 cfs @ 12.25 hrs, Volume= 33,243 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Towards Wetlands

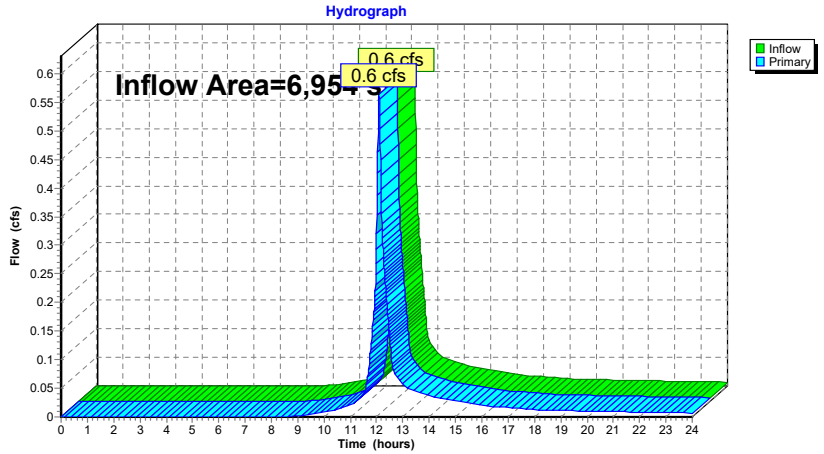


Summary for Link 2L: Towards Street

Inflow Area = 6,954 sf, 13.30% Impervious, Inflow Depth > 3.01" for 10-Year event
Inflow = 0.6 cfs @ 12.09 hrs, Volume= 1,742 cf
Primary = 0.6 cfs @ 12.09 hrs, Volume= 1,742 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 2L: Towards Street

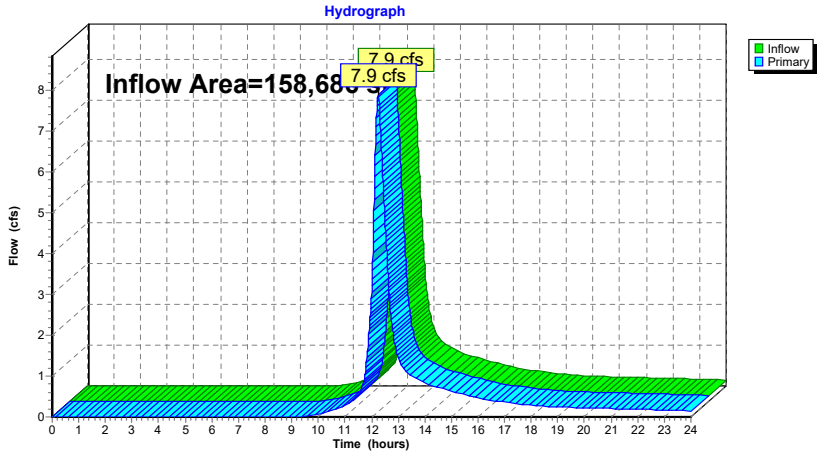


Summary for Link 100L: Total Flows

Inflow Area = 158,686 sf, 0.58% Impervious, Inflow Depth > 2.65" for 10-Year event
Inflow = 7.9 cfs @ 12.24 hrs, Volume= 34,985 cf
Primary = 7.9 cfs @ 12.24 hrs, Volume= 34,985 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 100L: Total Flows



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Flow to Wetlands Runoff Area=151,732 sf 0.00% Impervious Runoff Depth>4.01"
Flow Length=310' Tc=17.5 min CN=70 Runoff=11.7 cfs 50,764 cf

Subcatchment 2S: Flow to Street Runoff Area=6,954 sf 13.30% Impervious Runoff Depth>4.47"
Flow Length=95' Tc=6.0 min CN=74 Runoff=0.8 cfs 2,589 cf

Link 1L: Towards Wetlands Inflow=11.7 cfs 50,764 cf
Primary=11.7 cfs 50,764 cf

Link 2L: Towards Street Inflow=0.8 cfs 2,589 cf
Primary=0.8 cfs 2,589 cf

Link 100L: Total Flows Inflow=12.1 cfs 53,353 cf
Primary=12.1 cfs 53,353 cf

Total Runoff Area = 158,686 sf Runoff Volume = 53,353 cf Average Runoff Depth = 4.03"
99.42% Pervious = 157,761 sf 0.58% Impervious = 925 sf

Summary for Subcatchment 1S: Flow to Wetlands

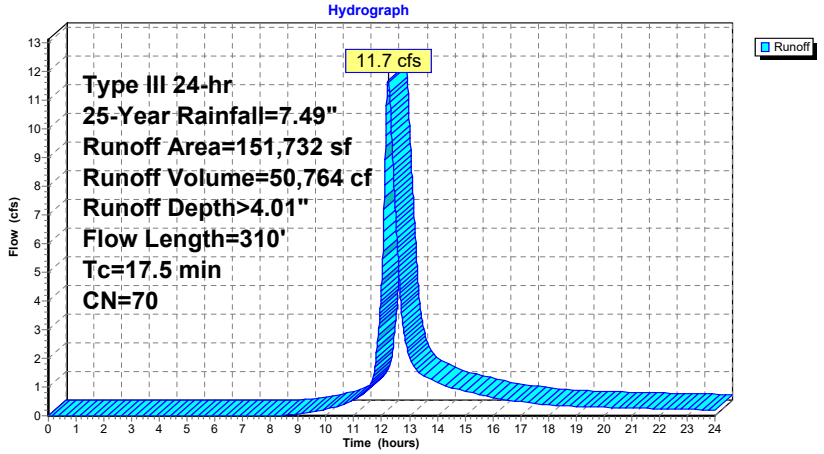
Runoff = 11.7 cfs @ 12.24 hrs, Volume= 50,764 cf, Depth> 4.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=7.49"

Area (sf)	CN	Description
151,732	70	Woods, Good, HSG C
151,732		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	50	0.0240	0.07		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.23"
6.1	260	0.0200	0.71		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
17.5	310	Total			

Subcatchment 1S: Flow to Wetlands



Summary for Subcatchment 2S: Flow to Street

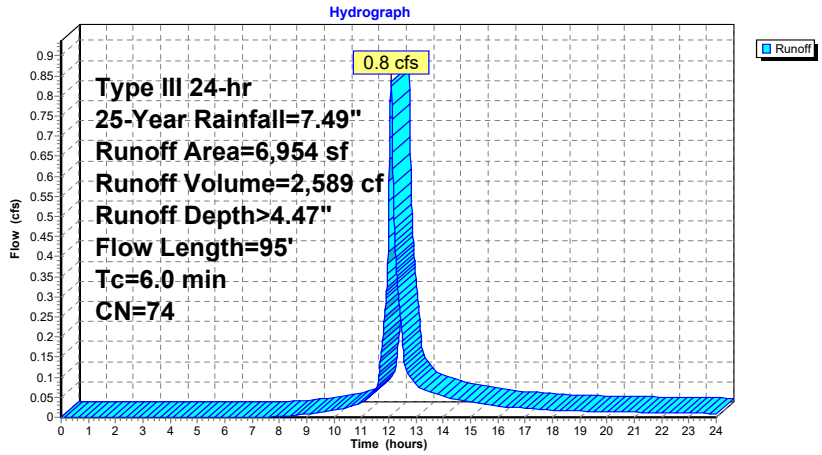
Runoff = 0.8 cfs @ 12.09 hrs, Volume= 2,589 cf, Depth> 4.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=7.49"

Area (sf)	CN	Description
6,029	70	Woods, Good, HSG C
925	98	Paved parking, HSG C
6,954	74	Weighted Average
6,029		86.70% Pervious Area
925		13.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	20	0.0750	0.10		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.23"
1.8	75	0.0200	0.71		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
5.3	95	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Flow to Street

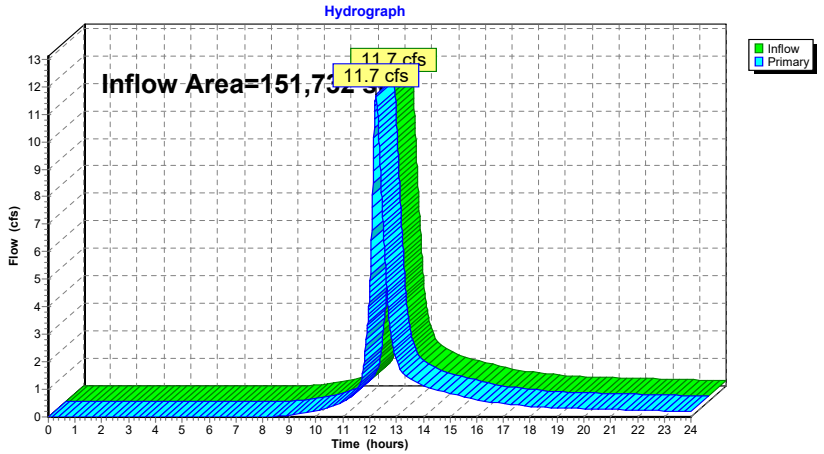


Summary for Link 1L: Towards Wetlands

Inflow Area = 151,732 sf, 0.00% Impervious, Inflow Depth > 4.01" for 25-Year event
Inflow = 11.7 cfs @ 12.24 hrs, Volume= 50,764 cf
Primary = 11.7 cfs @ 12.24 hrs, Volume= 50,764 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Towards Wetlands

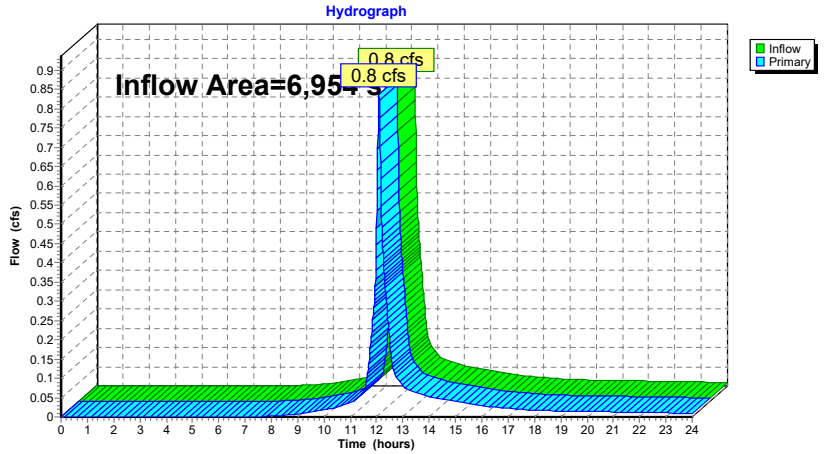


Summary for Link 2L: Towards Street

Inflow Area = 6,954 sf, 13.30% Impervious, Inflow Depth > 4.47" for 25-Year event
Inflow = 0.8 cfs @ 12.09 hrs, Volume= 2,589 cf
Primary = 0.8 cfs @ 12.09 hrs, Volume= 2,589 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 2L: Towards Street

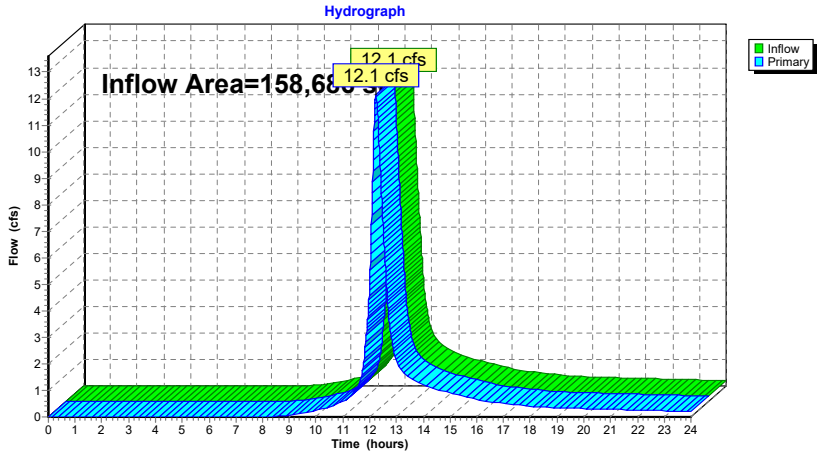


Summary for Link 100L: Total Flows

Inflow Area = 158,686 sf, 0.58% Impervious, Inflow Depth > 4.03" for 25-Year event
Inflow = 12.1 cfs @ 12.23 hrs, Volume= 53,353 cf
Primary = 12.1 cfs @ 12.23 hrs, Volume= 53,353 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 100L: Total Flows



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Flow to Wetlands Runoff Area=151,732 sf 0.00% Impervious Runoff Depth>5.07"
Flow Length=310' Tc=17.5 min CN=70 Runoff=14.8 cfs 64,125 cf

Subcatchment 2S: Flow to Street Runoff Area=6,954 sf 13.30% Impervious Runoff Depth>5.57"
Flow Length=95' Tc=6.0 min CN=74 Runoff=1.0 cfs 3,227 cf

Link 1L: Towards Wetlands Inflow=14.8 cfs 64,125 cf
Primary=14.8 cfs 64,125 cf

Link 2L: Towards Street Inflow=1.0 cfs 3,227 cf
Primary=1.0 cfs 3,227 cf

Link 100L: Total Flows Inflow=15.3 cfs 67,352 cf
Primary=15.3 cfs 67,352 cf

Total Runoff Area = 158,686 sf Runoff Volume = 67,352 cf Average Runoff Depth = 5.09"
99.42% Pervious = 157,761 sf 0.58% Impervious = 925 sf

Summary for Subcatchment 1S: Flow to Wetlands

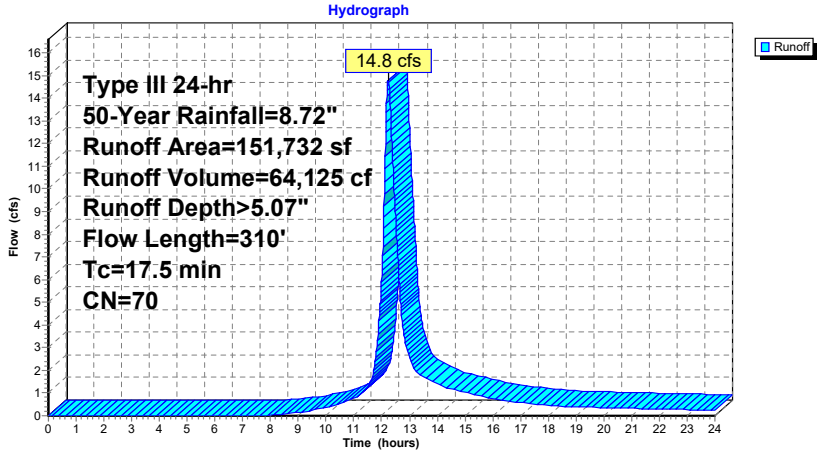
Runoff = 14.8 cfs @ 12.23 hrs, Volume= 64,125 cf, Depth> 5.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=8.72"

Area (sf)	CN	Description
151,732	70	Woods, Good, HSG C
151,732		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	50	0.0240	0.07		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.23"
6.1	260	0.0200	0.71		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
17.5	310	Total			

Subcatchment 1S: Flow to Wetlands



Summary for Subcatchment 2S: Flow to Street

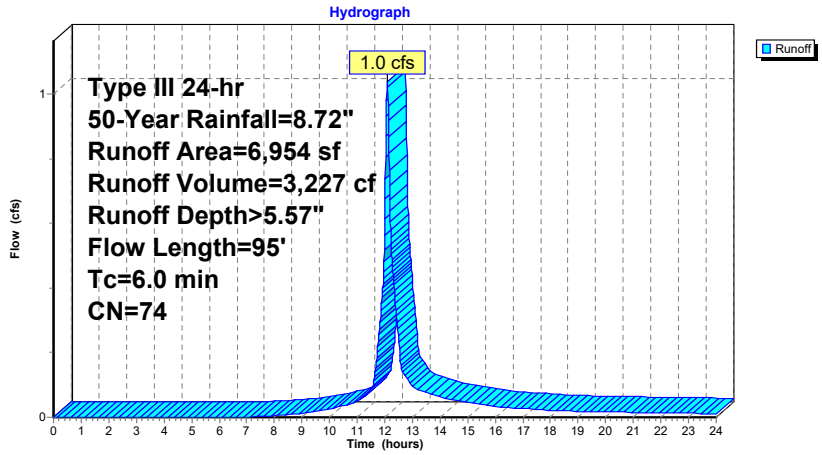
Runoff = 1.0 cfs @ 12.09 hrs, Volume= 3,227 cf, Depth> 5.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=8.72"

Area (sf)	CN	Description
6,029	70	Woods, Good, HSG C
925	98	Paved parking, HSG C
6,954	74	Weighted Average
6,029		86.70% Pervious Area
925		13.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	20	0.0750	0.10		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.23"
1.8	75	0.0200	0.71		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
5.3	95	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Flow to Street

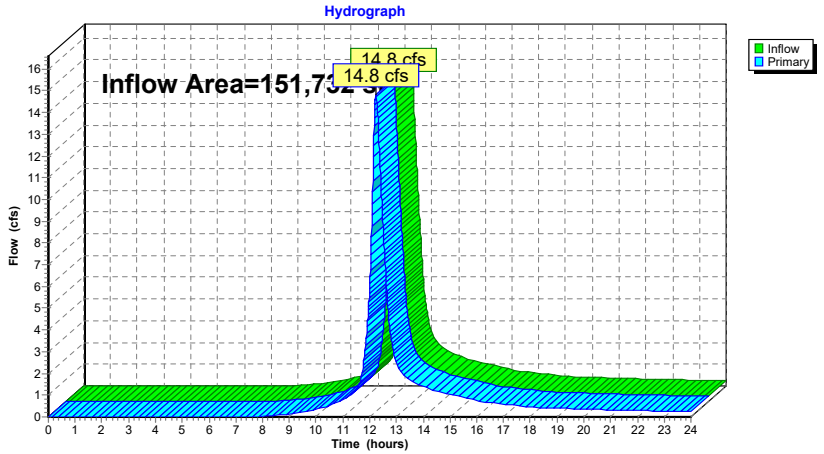


Summary for Link 1L: Towards Wetlands

Inflow Area = 151,732 sf, 0.00% Impervious, Inflow Depth > 5.07" for 50-Year event
Inflow = 14.8 cfs @ 12.23 hrs, Volume= 64,125 cf
Primary = 14.8 cfs @ 12.23 hrs, Volume= 64,125 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Towards Wetlands

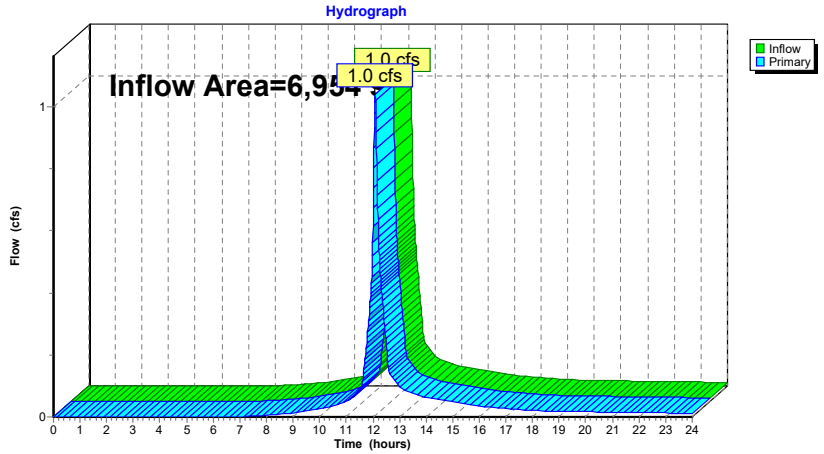


Summary for Link 2L: Towards Street

Inflow Area = 6,954 sf, 13.30% Impervious, Inflow Depth > 5.57" for 50-Year event
Inflow = 1.0 cfs @ 12.09 hrs, Volume= 3,227 cf
Primary = 1.0 cfs @ 12.09 hrs, Volume= 3,227 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 2L: Towards Street

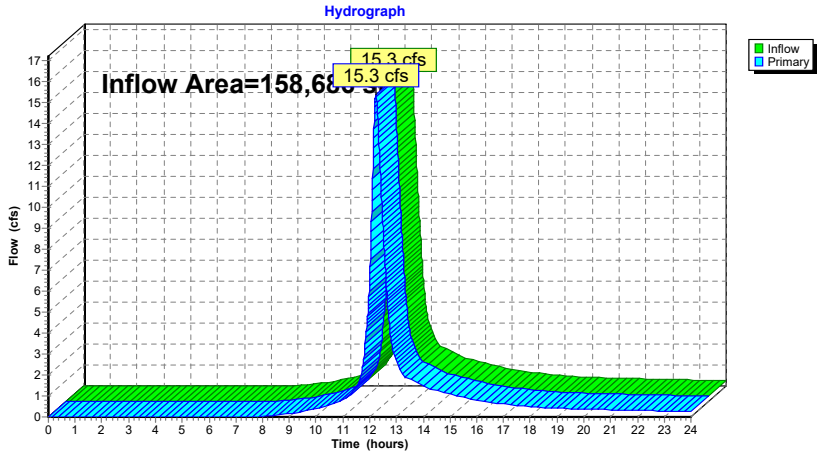


Summary for Link 100L: Total Flows

Inflow Area = 158,686 sf, 0.58% Impervious, Inflow Depth > 5.09" for 50-Year event
Inflow = 15.3 cfs @ 12.23 hrs, Volume= 67,352 cf
Primary = 15.3 cfs @ 12.23 hrs, Volume= 67,352 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 100L: Total Flows



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Flow to Wetlands Runoff Area=151,732 sf 0.00% Impervious Runoff Depth>6.52"
Flow Length=310' Tc=17.5 min CN=70 Runoff=19.0 cfs 82,424 cf

Subcatchment 2S: Flow to Street Runoff Area=6,954 sf 13.30% Impervious Runoff Depth>7.06"
Flow Length=95' Tc=6.0 min CN=74 Runoff=1.3 cfs 4,094 cf

Link 1L: Towards Wetlands Inflow=19.0 cfs 82,424 cf
Primary=19.0 cfs 82,424 cf

Link 2L: Towards Street Inflow=1.3 cfs 4,094 cf
Primary=1.3 cfs 4,094 cf

Link 100L: Total Flows Inflow=19.7 cfs 86,518 cf
Primary=19.7 cfs 86,518 cf

Total Runoff Area = 158,686 sf Runoff Volume = 86,518 cf Average Runoff Depth = 6.54"
99.42% Pervious = 157,761 sf 0.58% Impervious = 925 sf

Summary for Subcatchment 1S: Flow to Wetlands

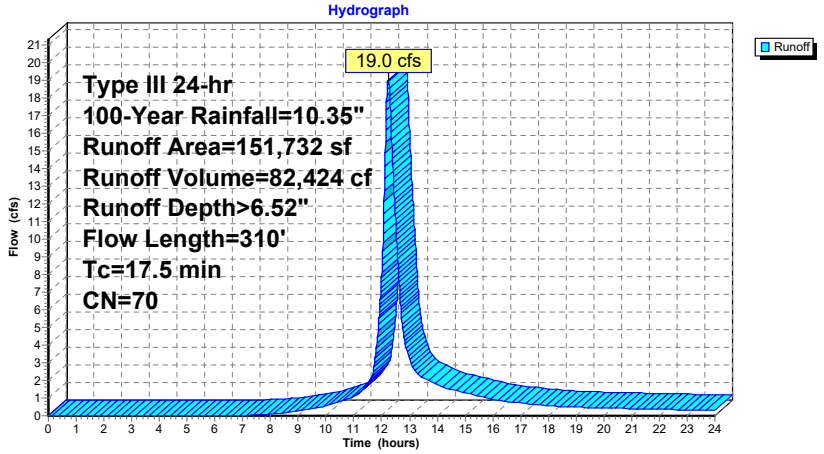
Runoff = 19.0 cfs @ 12.23 hrs, Volume= 82,424 cf, Depth> 6.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=10.35"

Area (sf)	CN	Description
151,732	70	Woods, Good, HSG C
151,732		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	50	0.0240	0.07		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.23"
6.1	260	0.0200	0.71		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
17.5	310	Total			

Subcatchment 1S: Flow to Wetlands



Summary for Subcatchment 2S: Flow to Street

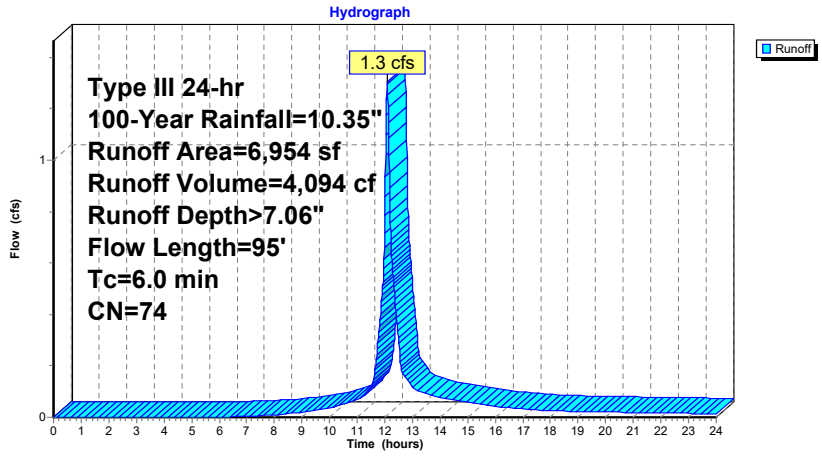
Runoff = 1.3 cfs @ 12.09 hrs, Volume= 4,094 cf, Depth> 7.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=10.35"

Area (sf)	CN	Description
6,029	70	Woods, Good, HSG C
925	98	Paved parking, HSG C
6,954	74	Weighted Average
6,029		86.70% Pervious Area
925		13.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	20	0.0750	0.10		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.23"
1.8	75	0.0200	0.71		**Shallow Concentrated Flow, B to C** Woodland Kv= 5.0 fps
5.3	95	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Flow to Street

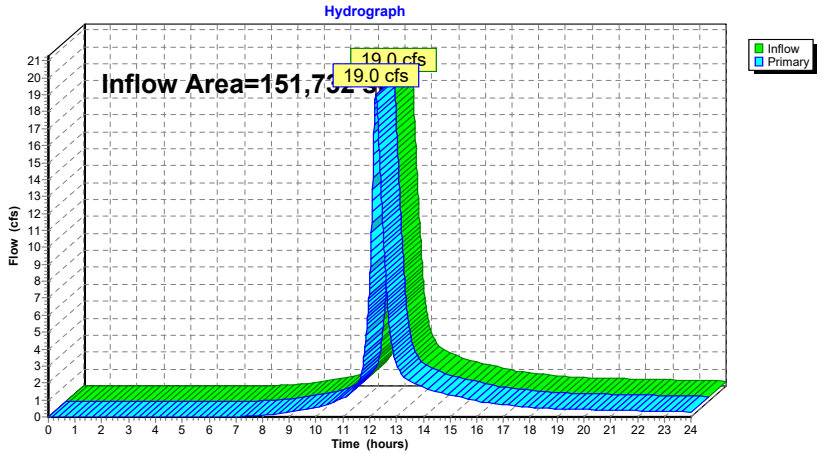


Summary for Link 1L: Towards Wetlands

Inflow Area = 151,732 sf, 0.00% Impervious, Inflow Depth > 6.52" for 100-Year event
Inflow = 19.0 cfs @ 12.23 hrs, Volume= 82,424 cf
Primary = 19.0 cfs @ 12.23 hrs, Volume= 82,424 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Towards Wetlands

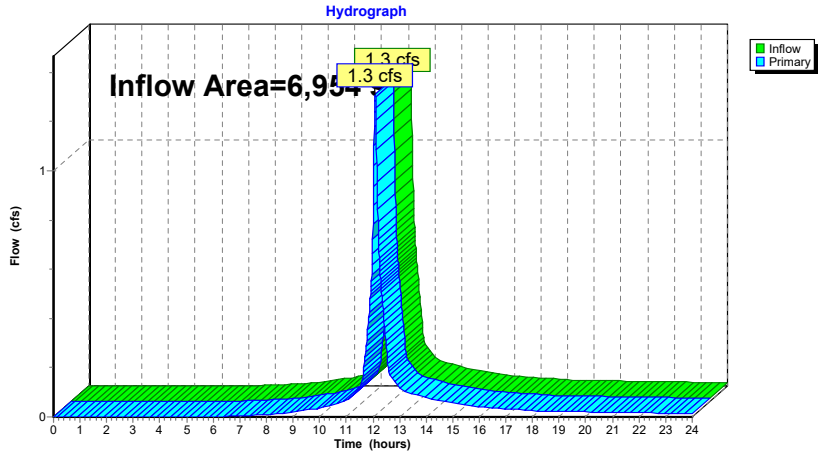


Summary for Link 2L: Towards Street

Inflow Area = 6,954 sf, 13.30% Impervious, Inflow Depth > 7.06" for 100-Year event
Inflow = 1.3 cfs @ 12.09 hrs, Volume= 4,094 cf
Primary = 1.3 cfs @ 12.09 hrs, Volume= 4,094 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 2L: Towards Street

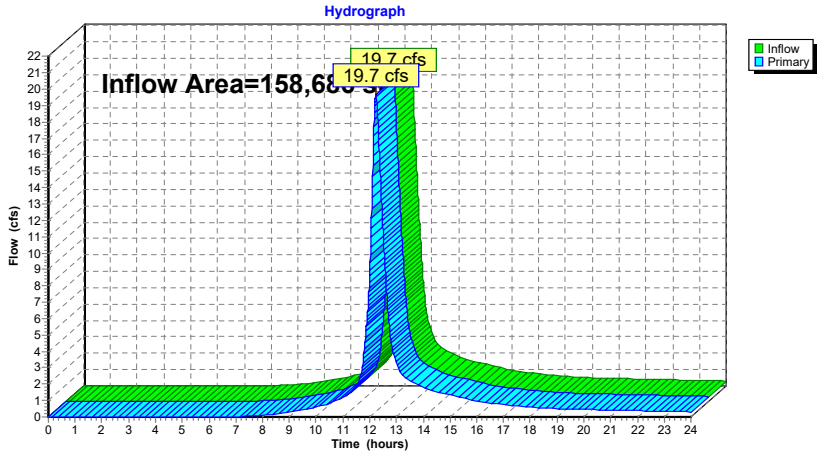


Summary for Link 100L: Total Flows

Inflow Area = 158,686 sf, 0.58% Impervious, Inflow Depth > 6.54" for 100-Year event
Inflow = 19.7 cfs @ 12.23 hrs, Volume= 86,518 cf
Primary = 19.7 cfs @ 12.23 hrs, Volume= 86,518 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 100L: Total Flows



5.03 PROPOSED WATERSHED PLAN

LITTLEJOHN STREET
(PUBLIC - 40' WIDE)

DOROTHY ROAD
(PUBLIC - 40' WIDE)

DOROTHY ROAD
(PUBLIC - 40' WIDE)

DOROTHY ROAD
(PUBLIC - 40' WIDE)

ARLINGTON
CAMBRIDGE

1S
2S
2.1S
3S
3S
3.1S
4S
4S
4S
4S
4S
5S
6S
6S
6S
6.1S
7S
7S
Tc
Tc

LEGEND

1S — SUBCATCHMENT

SUBCATCHMENT BOUNDARY

Tc — TIME OF CONCENTRATION FLOW PATH

SCALE: 1" = 60'

0 30 60 120 FEET

THORNDIKE PLACE

DOROTHY ROAD

ARLINGTON
MASSACHUSETTS
(MIDDLESEX COUNTY)

PROPOSED WATERSHED PLAN

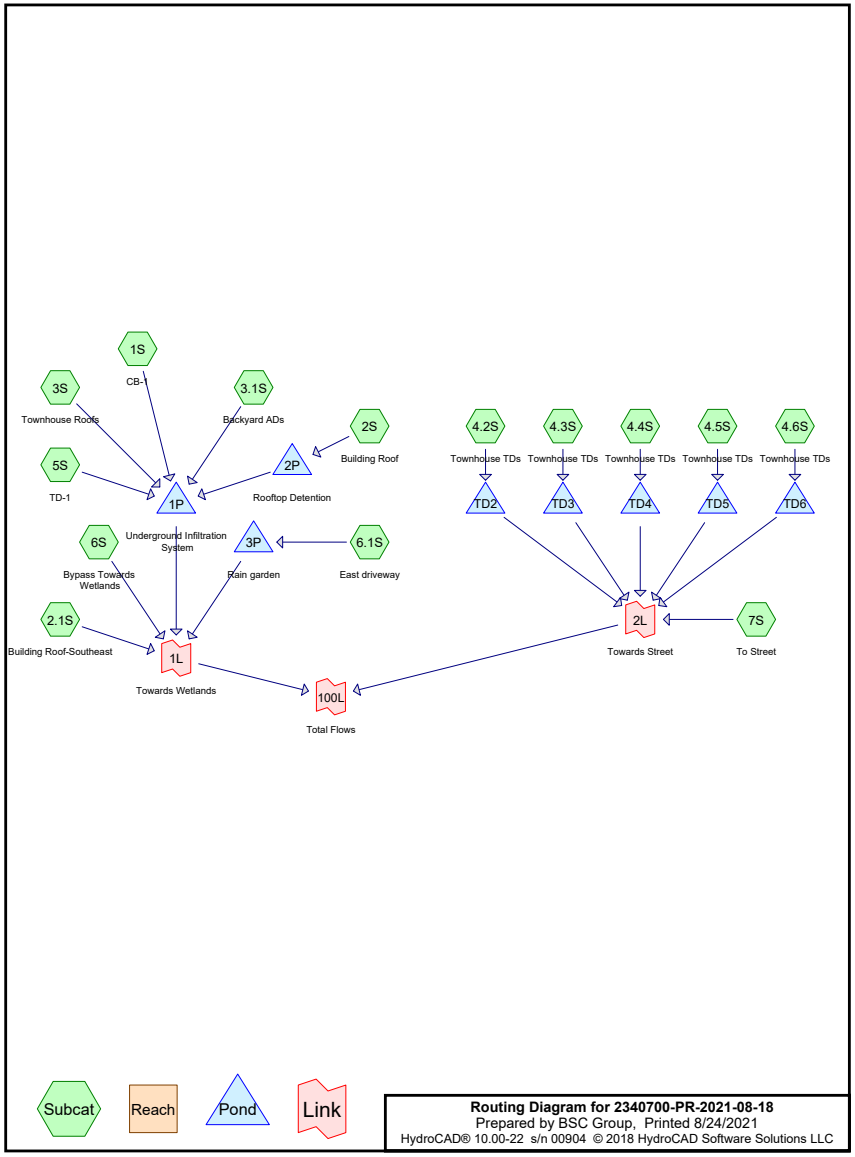
NOVEMBER 3, 2020

PREPARED FOR:
ARLINGTON LAND REALTY
84 SHERMAN STREET
CAMBRIDGE, MA

BSC GROUP
803 Summer Street
Boston, Massachusetts
02127
617 896 4300

Job No.: 23407.00 Date: 11/3/2020
Scale: 1" = 60' Revised: 08/18/2021
Dwg No: PRW
File: C\DRAINAGE DESIGN\2340700-PRW

5.04 PROPOSED HYDROLOGY CALCULATIONS (HYDROCAD™ PRINTOUTS)



Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
74,444	74	>75% Grass cover, Good, HSG C (1S, 3.1S, 4.2S, 4.3S, 4.4S, 4.5S, 4.6S, 5S, 6.1S, 6S, 7S)
220	89	Gravel roads, HSG C (6.1S)
411	89	Gravel sidewalk, HSG C (3.1S)
25,811	98	Paved parking, HSG C (1S, 4.2S, 4.3S, 4.4S, 4.5S, 4.6S, 5S, 7S)
6,444	98	Paved roads w/curbs & sewers, HSG C (6.1S)
46,099	98	Roofs, HSG C (2.1S, 2S, 3S, 6S)
272	98	Unconnected pavement, HSG C (3.1S)
4,985	70	Woods, Good, HSG C (6S)
158,686	**86**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
158,686	HSG C	1S, 2.1S, 2S, 3.1S, 3S, 4.2S, 4.3S, 4.4S, 4.5S, 4.6S, 5S, 6.1S, 6S, 7S
0	HSG D	
0	Other	
158,686		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	0	74,444	0	0	74,444	>75% Grass cover, Good
0	0	220	0	0	220	Gravel roads
0	0	411	0	0	411	Gravel sidewalk
0	0	25,811	0	0	25,811	Paved parking
0	0	6,444	0	0	6,444	Paved roads w/curbs & sewers
0	0	46,099	0	0	46,099	Roofs
0	0	272	0	0	272	Unconnected pavement
0	0	4,985	0	0	4,985	Woods, Good
0	**0**	**158,686**	**0**	**0**	**158,686**	**TOTAL AREA**

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

Subcatchment 1S: CB-1 Runoff Area=22,742 sf 72.16% Impervious Runoff Depth=2.67"
Tc=6.0 min CN=91 Runoff=1.6 cfs 5,068 cf

Subcatchment 2.1S: Building Runoff Area=14,140 sf 100.00% Impervious Runoff Depth=3.41"
Tc=6.0 min CN=98 Runoff=1.2 cfs 4,013 cf

Subcatchment 2S: Building Roof Runoff Area=18,785 sf 100.00% Impervious Runoff Depth=3.41"
Tc=6.0 min CN=98 Runoff=1.5 cfs 5,332 cf

Subcatchment 3.1S: Backyard ADs Runoff Area=8,985 sf 3.03% Impervious Runoff Depth=1.40"
Flow Length=147' Tc=10.3 min CN=75 Runoff=0.3 cfs 1,050 cf

Subcatchment 3S: Townhouse Roofs Runoff Area=13,067 sf 100.00% Impervious Runoff Depth=3.41"
Tc=6.0 min CN=98 Runoff=1.1 cfs 3,709 cf

Subcatchment 4.2S: Townhouse TDs Runoff Area=1,112 sf 95.68% Impervious Runoff Depth=3.29"
Tc=6.0 min CN=97 Runoff=0.1 cfs 305 cf

Subcatchment 4.3S: Townhouse TDs Runoff Area=1,105 sf 97.29% Impervious Runoff Depth=3.29"
Tc=6.0 min CN=97 Runoff=0.1 cfs 303 cf

Subcatchment 4.4S: Townhouse TDs Runoff Area=1,104 sf 97.46% Impervious Runoff Depth=3.29"
Tc=6.0 min CN=97 Runoff=0.1 cfs 303 cf

Subcatchment 4.5S: Townhouse TDs Runoff Area=1,082 sf 98.06% Impervious Runoff Depth=3.41"
Tc=6.0 min CN=98 Runoff=0.1 cfs 307 cf

Subcatchment 4.6S: Townhouse TDs Runoff Area=1,056 sf 99.24% Impervious Runoff Depth=3.41"
Tc=6.0 min CN=98 Runoff=0.1 cfs 300 cf

Subcatchment 5S: TD-1 Runoff Area=5,851 sf 51.63% Impervious Runoff Depth=2.22"
Tc=6.0 min CN=86 Runoff=0.3 cfs 1,084 cf

Subcatchment 6.1S: East driveway Runoff Area=12,275 sf 52.50% Impervious Runoff Depth=2.31"
Tc=6.0 min CN=87 Runoff=0.8 cfs 2,362 cf

Subcatchment 6S: Bypass Towards Runoff Area=51,539 sf 0.21% Impervious Runoff Depth=1.34"
Flow Length=125' Tc=14.0 min CN=74 Runoff=1.4 cfs 5,744 cf

Subcatchment 7S: To Street Runoff Area=5,843 sf 18.07% Impervious Runoff Depth=1.60"
Tc=6.0 min CN=78 Runoff=0.2 cfs 781 cf

Pond 1P: Underground Infiltration System Peak Elev=7.61' Storage=10,475 cf Inflow=3.4 cfs 16,242 cf
Discarded=0.1 cfs 15,514 cf Primary=0.1 cfs 727 cf Outflow=0.1 cfs 16,242 cf

Pond 2P: Rooftop Detention Peak Elev=57.31' Storage=2,295 cf Inflow=1.5 cfs 5,332 cf
Outflow=0.2 cfs 5,332 cf

Pond 3P: Rain garden Peak Elev=6.36' Storage=194 cf Inflow=0.8 cfs 2,362 cf
Discarded=0.0 cfs 405 cf Primary=0.8 cfs 1,957 cf Outflow=0.8 cfs 2,362 cf

Pond TD2: Peak Elev=6.54' Storage=163 cf Inflow=0.1 cfs 305 cf
Discarded=0.0 cfs 305 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 305 cf

Pond TD3: Peak Elev=6.53' Storage=162 cf Inflow=0.1 cfs 303 cf
Discarded=0.0 cfs 303 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 303 cf

Pond TD4: Peak Elev=6.53' Storage=161 cf Inflow=0.1 cfs 303 cf
Discarded=0.0 cfs 303 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 303 cf

Pond TD5: Peak Elev=6.03' Storage=161 cf Inflow=0.1 cfs 307 cf
Discarded=0.0 cfs 307 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 307 cf

Pond TD6: Peak Elev=6.00' Storage=155 cf Inflow=0.1 cfs 300 cf
Discarded=0.0 cfs 300 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 300 cf

Link 1L: Towards Wetlands Inflow=2.9 cfs 12,442 cf
Primary=2.9 cfs 12,442 cf

Link 2L: Towards Street Inflow=0.2 cfs 781 cf
Primary=0.2 cfs 781 cf

Link 100L: Total Flows Inflow=3.1 cfs 13,223 cf
Primary=3.1 cfs 13,223 cf

Total Runoff Area = 158,686 sf Runoff Volume = 30,661 cf Average Runoff Depth = 2.32"
50.45% Pervious = 80,060 sf 49.55% Impervious = 78,626 sf

Summary for Subcatchment 1S: CB-1

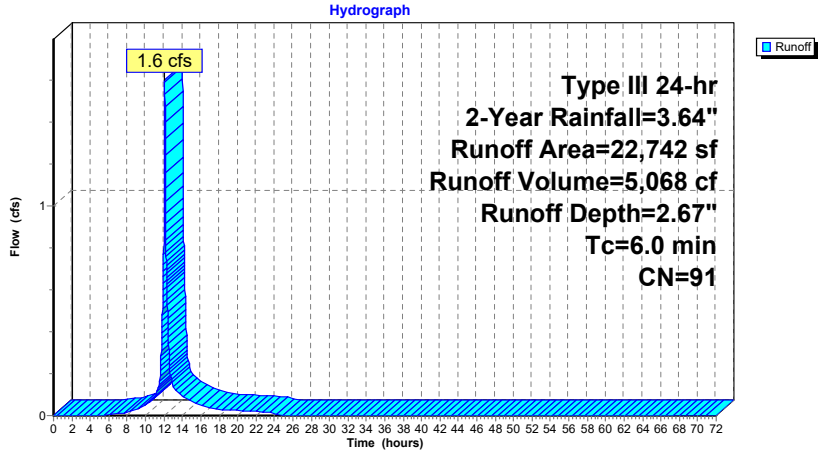
Runoff = 1.6 cfs @ 12.09 hrs, Volume= 5,068 cf, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.64"

Area (sf)	CN	Description
16,410	98	Paved parking, HSG C
6,332	74	>75% Grass cover, Good, HSG C
22,742	91	Weighted Average
6,332		27.84% Pervious Area
16,410		72.16% Impervious Area

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

Subcatchment 1S: CB-1



Summary for Subcatchment 2.1S: Building Roof-Southeast

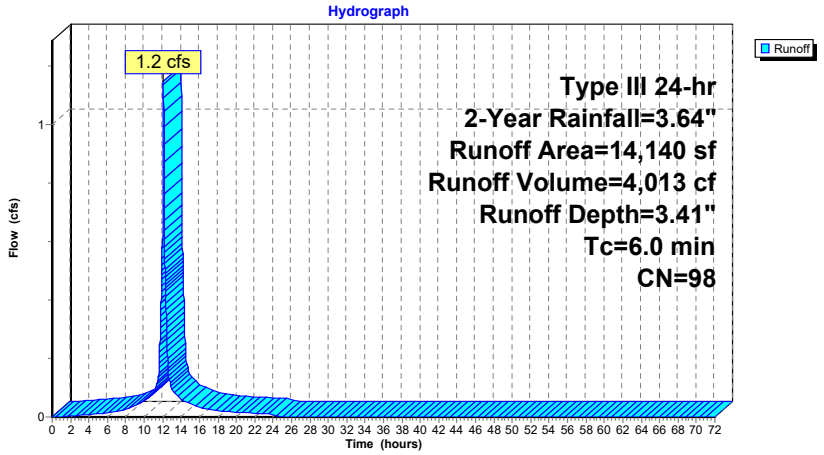
Runoff = 1.2 cfs @ 12.08 hrs, Volume= 4,013 cf, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.64"

Area (sf)	CN	Description
14,140	98	Roofs, HSG C
14,140		100.00% Impervious Area

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

Subcatchment 2.1S: Building Roof-Southeast



Summary for Subcatchment 2S: Building Roof

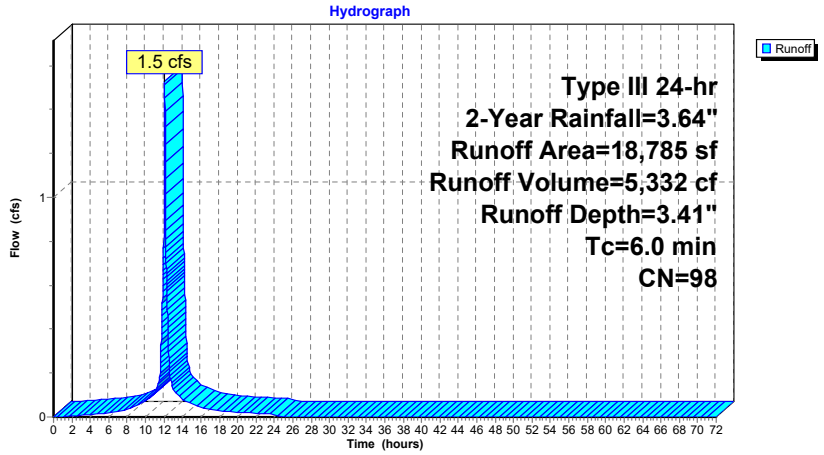
Runoff = 1.5 cfs @ 12.08 hrs, Volume= 5,332 cf, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.64"

Area (sf)	CN	Description
18,785	98	Roofs, HSG C
18,785		100.00% Impervious Area

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

Subcatchment 2S: Building Roof



Summary for Subcatchment 3.1S: Backyard ADs

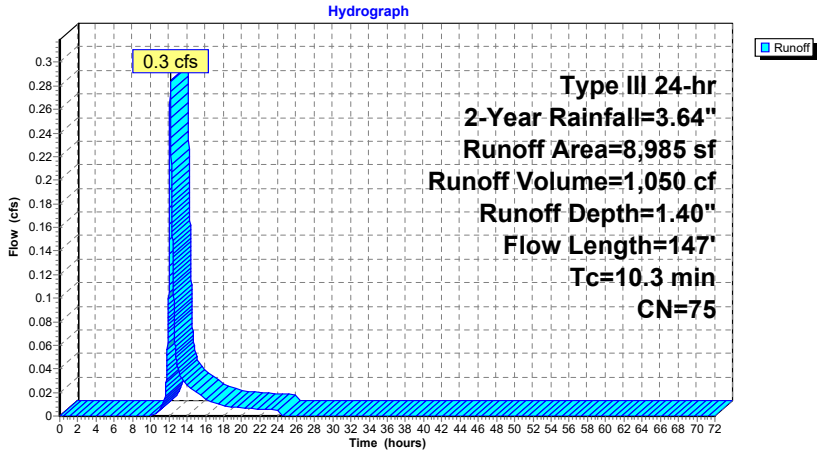
Runoff = 0.3 cfs @ 12.15 hrs, Volume= 1,050 cf, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.64"

	Area (sf)	CN	Description
	272	98	Unconnected pavement, HSG C
	8,302	74	>75% Grass cover, Good, HSG C
*	411	89	Gravel sidewalk, HSG C
	8,985	75	Weighted Average
	8,713		96.97% Pervious Area
	272		3.03% Impervious Area
	272		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	50	0.0142	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.23"
0.9	97	0.0154	1.86		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
10.3	147	Total			

Subcatchment 3.1S: Backyard ADs



Summary for Subcatchment 3S: Townhouse Roofs

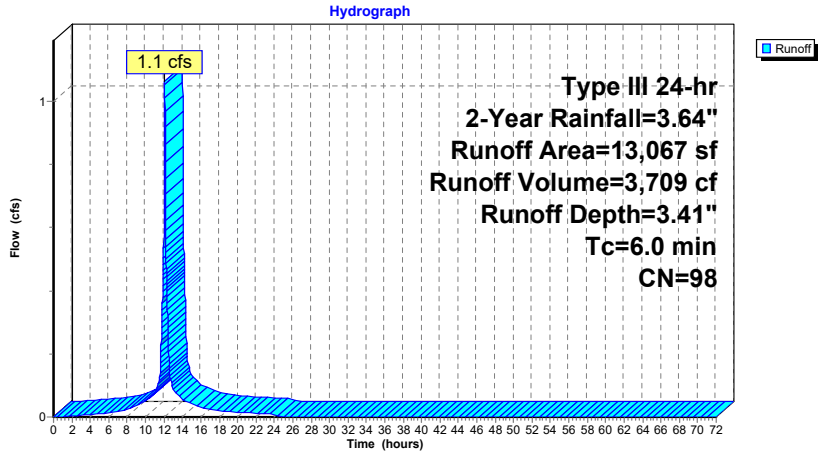
Runoff = 1.1 cfs @ 12.08 hrs, Volume= 3,709 cf, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.64"

Area (sf)	CN	Description
13,067	98	Roofs, HSG C
13,067		100.00% Impervious Area

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

Subcatchment 3S: Townhouse Roofs



Summary for Subcatchment 4.2S: Townhouse TDs

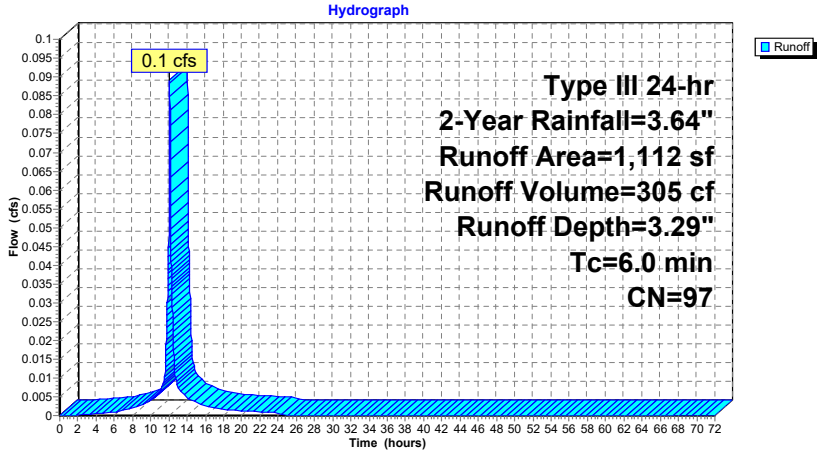
Runoff = 0.1 cfs @ 12.08 hrs, Volume= 305 cf, Depth= 3.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.64"

Area (sf)	CN	Description
1,064	98	Paved parking, HSG C
48	74	>75% Grass cover, Good, HSG C
1,112	97	Weighted Average
48		4.32% Pervious Area
1,064		95.68% Impervious Area

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

Subcatchment 4.2S: Townhouse TDs



Summary for Subcatchment 4.3S: Townhouse TDs

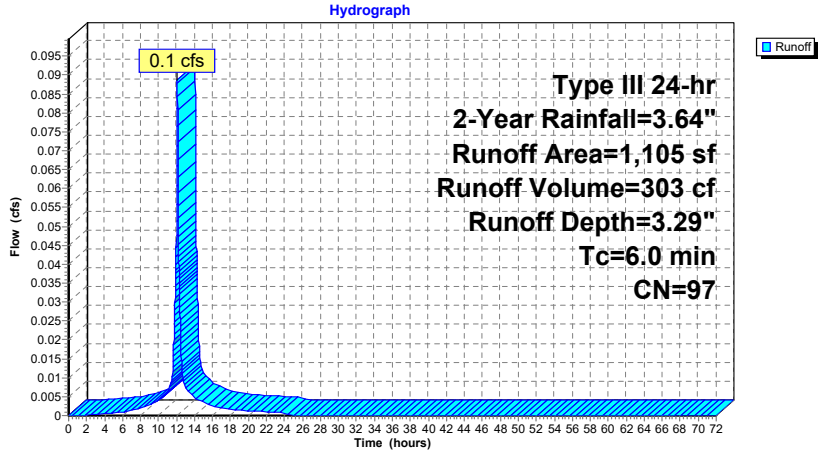
Runoff = 0.1 cfs @ 12.08 hrs, Volume= 303 cf, Depth= 3.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.64"

Area (sf)	CN	Description
1,075	98	Paved parking, HSG C
30	74	>75% Grass cover, Good, HSG C
1,105	97	Weighted Average
30		2.71% Pervious Area
1,075		97.29% Impervious Area

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

Subcatchment 4.3S: Townhouse TDs



Summary for Subcatchment 4.4S: Townhouse TDs

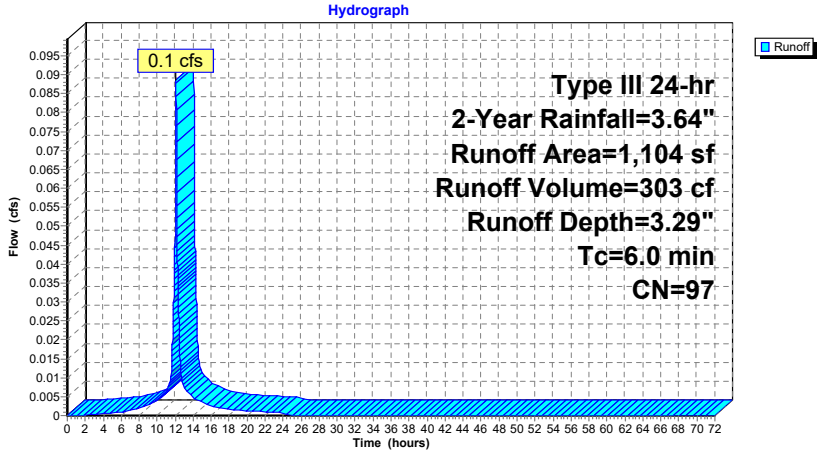
Runoff = 0.1 cfs @ 12.08 hrs, Volume= 303 cf, Depth= 3.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.64"

Area (sf)	CN	Description
1,076	98	Paved parking, HSG C
28	74	>75% Grass cover, Good, HSG C
1,104	97	Weighted Average
28		2.54% Pervious Area
1,076		97.46% Impervious Area

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

Subcatchment 4.4S: Townhouse TDs



Summary for Subcatchment 4.5S: Townhouse TDs

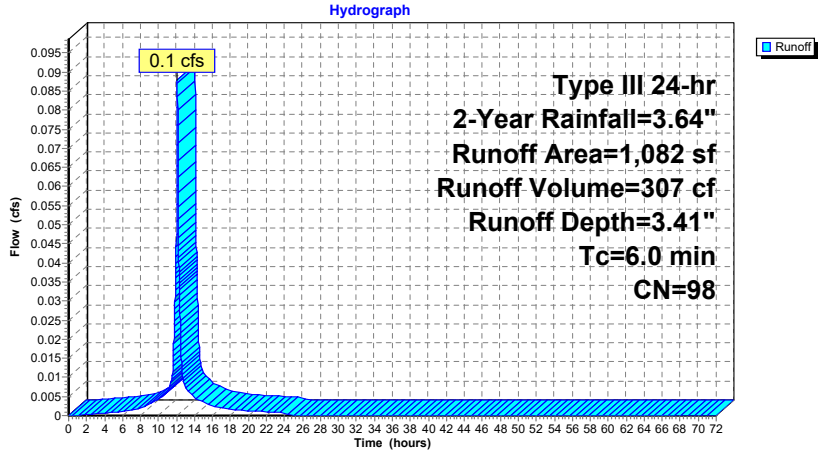
Runoff = 0.1 cfs @ 12.08 hrs, Volume= 307 cf, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.64"

Area (sf)	CN	Description
1,061	98	Paved parking, HSG C
21	74	>75% Grass cover, Good, HSG C
1,082	98	Weighted Average
21		1.94% Pervious Area
1,061		98.06% Impervious Area

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

Subcatchment 4.5S: Townhouse TDs



Summary for Subcatchment 4.6S: Townhouse TDs

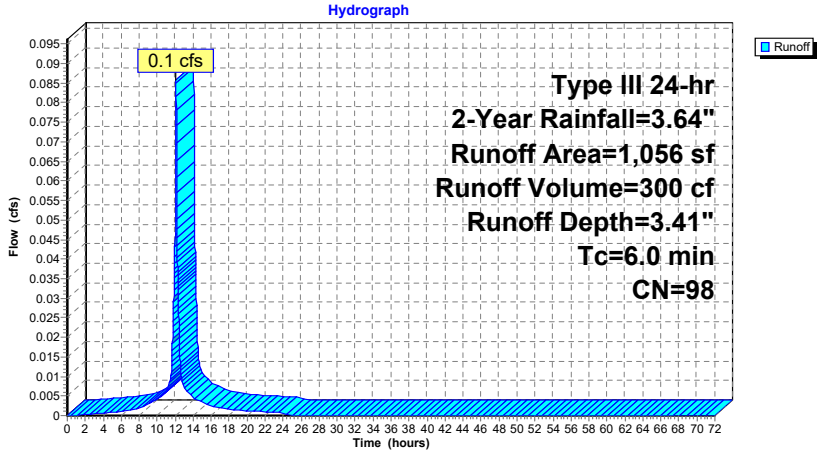
Runoff = 0.1 cfs @ 12.08 hrs, Volume= 300 cf, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.64"

Area (sf)	CN	Description
1,048	98	Paved parking, HSG C
8	74	>75% Grass cover, Good, HSG C
1,056	98	Weighted Average
8		0.76% Pervious Area
1,048		99.24% Impervious Area

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

Subcatchment 4.6S: Townhouse TDs



Summary for Subcatchment 5S: TD-1

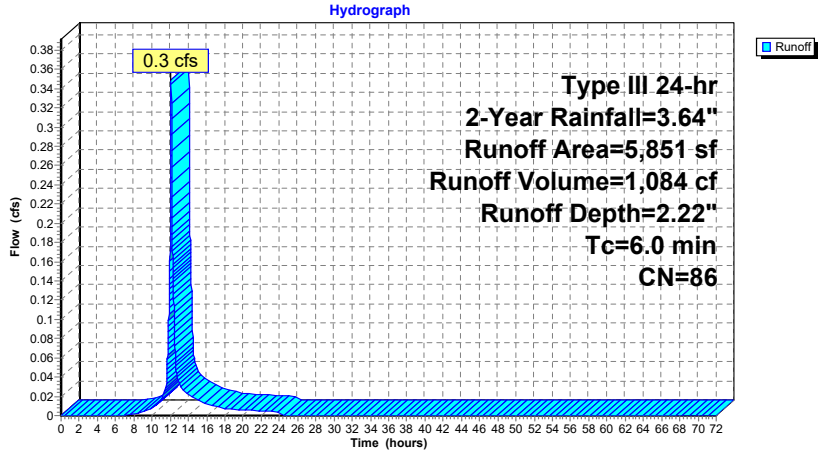
Runoff = 0.3 cfs @ 12.09 hrs, Volume= 1,084 cf, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.64"

Area (sf)	CN	Description
3,021	98	Paved parking, HSG C
2,830	74	>75% Grass cover, Good, HSG C
5,851	86	Weighted Average
2,830		48.37% Pervious Area
3,021		51.63% Impervious Area

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

Subcatchment 5S: TD-1



Summary for Subcatchment 6.1S: East driveway

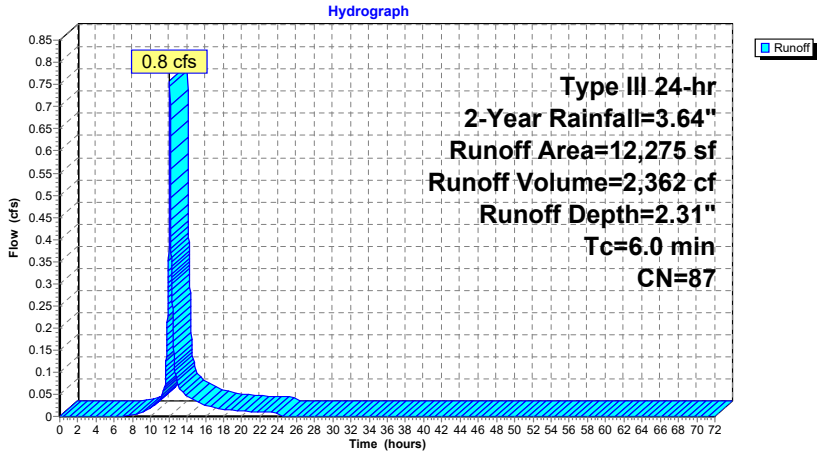
Runoff = 0.8 cfs @ 12.09 hrs, Volume= 2,362 cf, Depth= 2.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.64"

Area (sf)	CN	Description
5,611	74	>75% Grass cover, Good, HSG C
6,444	98	Paved roads w/curbs & sewers, HSG C
220	89	Gravel roads, HSG C
12,275	87	Weighted Average
5,831		47.50% Pervious Area
6,444		52.50% Impervious Area

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

Subcatchment 6.1S: East driveway



Summary for Subcatchment 6S: Bypass Towards Wetlands

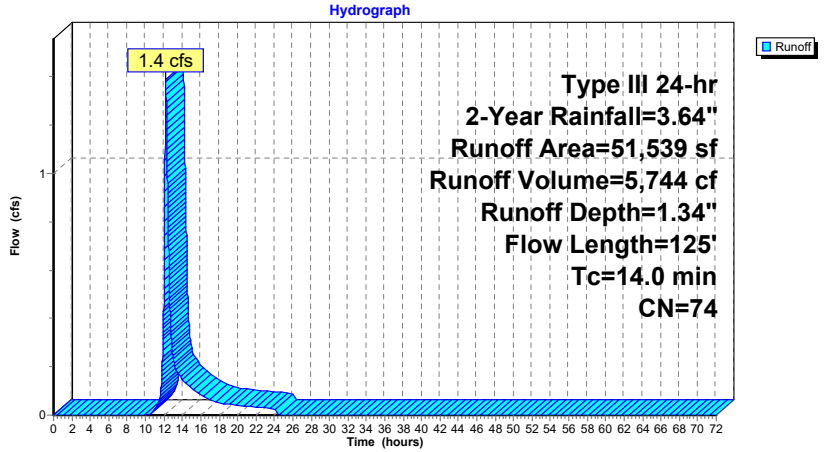
Runoff = 1.4 cfs @ 12.21 hrs, Volume= 5,744 cf, Depth= 1.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.64"

Area (sf)	CN	Description
4,985	70	Woods, Good, HSG C
46,447	74	>75% Grass cover, Good, HSG C
107	98	Roofs, HSG C
51,539	74	Weighted Average
51,432		99.79% Pervious Area
107		0.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0220	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.23"
2.2	75	0.0133	0.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.0	125	Total			

Subcatchment 6S: Bypass Towards Wetlands



Summary for Subcatchment 7S: To Street

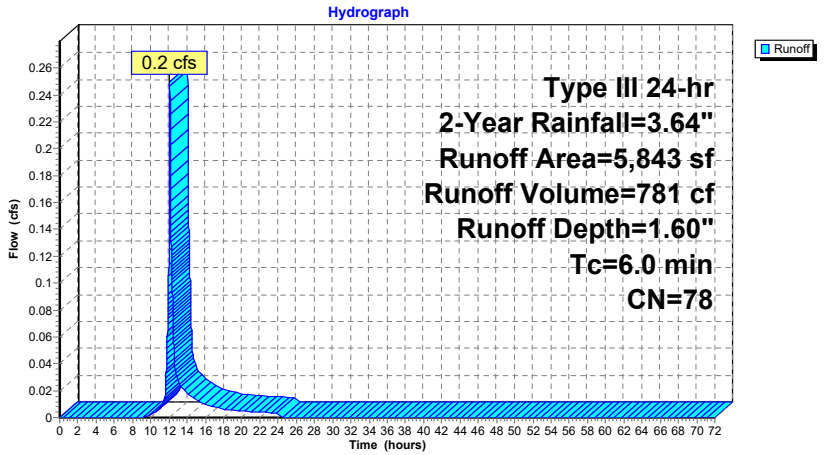
Runoff = 0.2 cfs @ 12.09 hrs, Volume= 781 cf, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.64"

Area (sf)	CN	Description
1,056	98	Paved parking, HSG C
4,787	74	>75% Grass cover, Good, HSG C
5,843	78	Weighted Average
4,787		81.93% Pervious Area
1,056		18.07% Impervious Area

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

Subcatchment 7S: To Street



Summary for Pond 1P: Underground Infiltration System

Inflow Area = 69,430 sf, 74.25% Impervious, Inflow Depth = 2.81" for 2-Year event
Inflow = 3.4 cfs @ 12.09 hrs, Volume= 16,242 cf
Outflow = 0.1 cfs @ 17.55 hrs, Volume= 16,242 cf, Atten= 96%, Lag= 327.6 min
Discarded = 0.1 cfs @ 9.37 hrs, Volume= 15,514 cf
Primary = 0.1 cfs @ 17.55 hrs, Volume= 727 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 7.61' @ 17.55 hrs Surf.Area= 7,556 sf Storage= 10,475 cf

Plug-Flow detention time= 993.8 min calculated for 16,239 cf (100% of inflow)
Center-of-Mass det. time= 993.7 min (1,822.2 - 828.5)

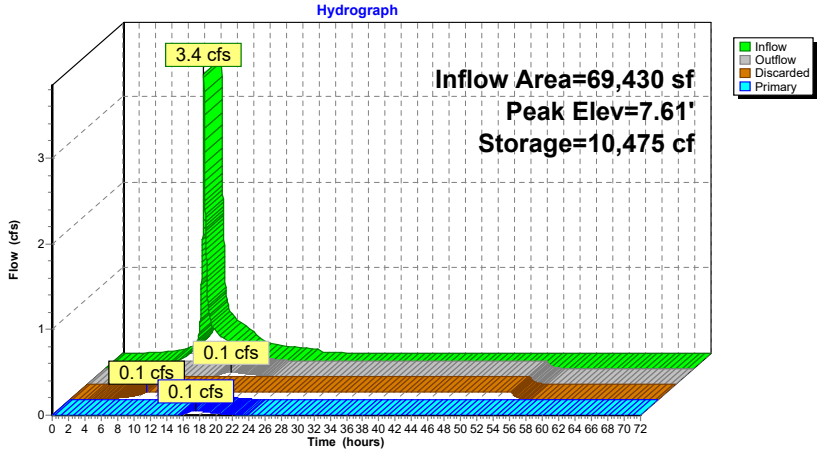
Volume	Invert	Avail.Storage	Storage Description
#1	6.00'	19,495 cf	**6.89'W x 14.06'L x 3.00'H StormTrap ST-1 Units (Irregular Shape)** x 78 22,668 cf Overall x 86.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	7.50'	**15.0" Round Culvert** L= 190.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 7.50' / 6.00' S= 0.0079 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Discarded OutFlow Max=0.1 cfs @ 9.37 hrs HW=6.03' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.1 cfs @ 17.55 hrs HW=7.61' (Free Discharge)
↑**2=Culvert** (Barrel Controls 0.1 cfs @ 1.44 fps)

Pond 1P: Underground Infiltration System



Summary for Pond 2P: Rooftop Detention

Inflow Area = 18,785 sf,100.00% Impervious, Inflow Depth = 3.41" for 2-Year event
Inflow = 1.5 cfs @ 12.08 hrs, Volume= 5,332 cf
Outflow = 0.2 cfs @ 12.56 hrs, Volume= 5,332 cf, Atten= 85%, Lag= 28.9 min
Primary = 0.2 cfs @ 12.56 hrs, Volume= 5,332 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 57.31' @ 12.56 hrs Surf.Area= 7,500 sf Storage= 2,295 cf

Plug-Flow detention time= 152.7 min calculated for 5,331 cf (100% of inflow)
Center-of-Mass det. time= 153.0 min (906.8 - 753.8)

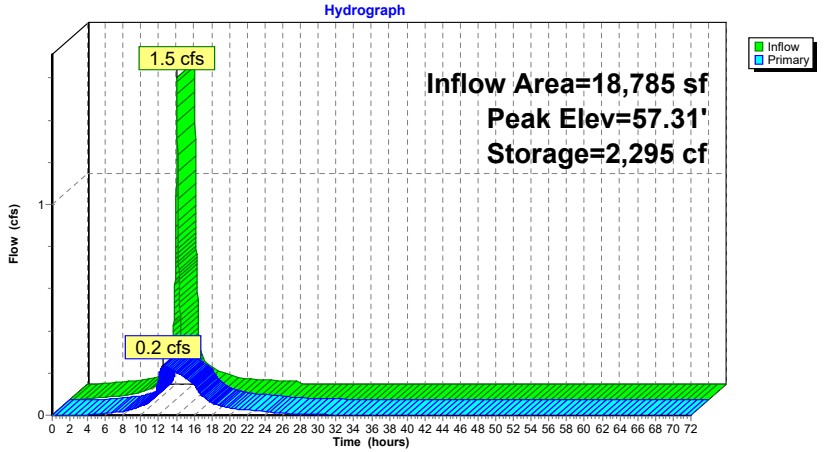
Volume	Invert	Avail.Storage	Storage Description
#1	57.00'	7,500 cf	**Rooftop Detention (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
57.00	7,500	0	0
58.00	7,500	7,500	7,500

Device	Routing	Invert	Outlet Devices
#1	Primary	8.02'	**12.0" Round Roof Drain** L= 16.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 8.02' / 7.70' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	57.00'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.2 cfs @ 12.56 hrs HW=57.31' (Free Discharge)
└**1=Roof Drain** (Passes 0.2 cfs of 23.3 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 2.66 fps)

Pond 2P: Rooftop Detention



Summary for Pond 3P: Rain garden

Inflow Area = 12,275 sf, 52.50% Impervious, Inflow Depth = 2.31" for 2-Year event
Inflow = 0.8 cfs @ 12.09 hrs, Volume= 2,362 cf
Outflow = 0.8 cfs @ 12.09 hrs, Volume= 2,362 cf, Atten= 0%, Lag= 0.3 min
Discarded = 0.0 cfs @ 12.09 hrs, Volume= 405 cf
Primary = 0.8 cfs @ 12.09 hrs, Volume= 1,957 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 6.36' @ 12.09 hrs Surf.Area= 381 sf Storage= 194 cf

Plug-Flow detention time= 91.1 min calculated for 2,361 cf (100% of inflow)
Center-of-Mass det. time= 91.2 min (904.7 - 813.5)

Volume	Invert	Avail.Storage	Storage Description
#1	5.60'	253 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

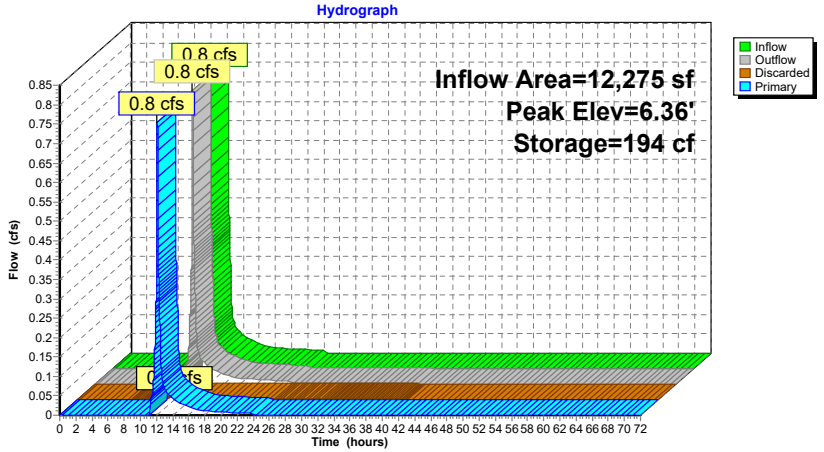
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.60	125	46.0	0	0	125
6.00	276	66.0	78	78	305
6.30	350	73.0	94	172	385
6.50	460	87.0	81	253	564

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.60'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	6.30'	**22.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.0 cfs @ 12.09 hrs HW=6.36' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.8 cfs @ 12.09 hrs HW=6.36' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 0.8 cfs @ 0.57 fps)

Pond 3P: Rain garden



Summary for Pond TD2:

Inflow Area = 1,112 sf, 95.68% Impervious, Inflow Depth = 3.29" for 2-Year event
Inflow = 0.1 cfs @ 12.08 hrs, Volume= 305 cf
Outflow = 0.0 cfs @ 9.85 hrs, Volume= 305 cf, Atten= 96%, Lag= 0.0 min
Discarded = 0.0 cfs @ 9.85 hrs, Volume= 305 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 6.54' @ 15.22 hrs Surf.Area= 278 sf Storage= 163 cf

Plug-Flow detention time= 431.8 min calculated for 305 cf (100% of inflow)
Center-of-Mass det. time= 431.8 min (1,194.7 - 762.9)

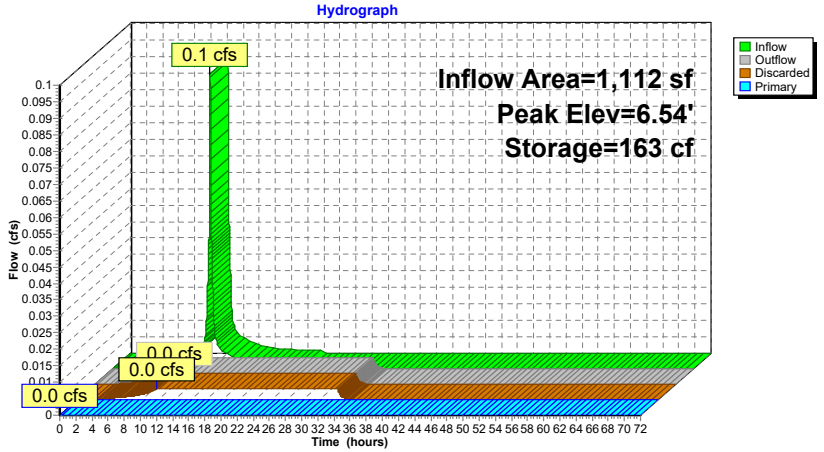
Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.50'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	10.00'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 9.85 hrs HW=5.55' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD2:



Summary for Pond TD3:

Inflow Area = 1,105 sf, 97.29% Impervious, Inflow Depth = 3.29" for 2-Year event
Inflow = 0.1 cfs @ 12.08 hrs, Volume= 303 cf
Outflow = 0.0 cfs @ 9.90 hrs, Volume= 303 cf, Atten= 96%, Lag= 0.0 min
Discarded = 0.0 cfs @ 9.90 hrs, Volume= 303 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 6.53' @ 15.20 hrs Surf.Area= 278 sf Storage= 162 cf

Plug-Flow detention time= 429.4 min calculated for 303 cf (100% of inflow)
Center-of-Mass det. time= 429.4 min (1,192.3 - 762.9)

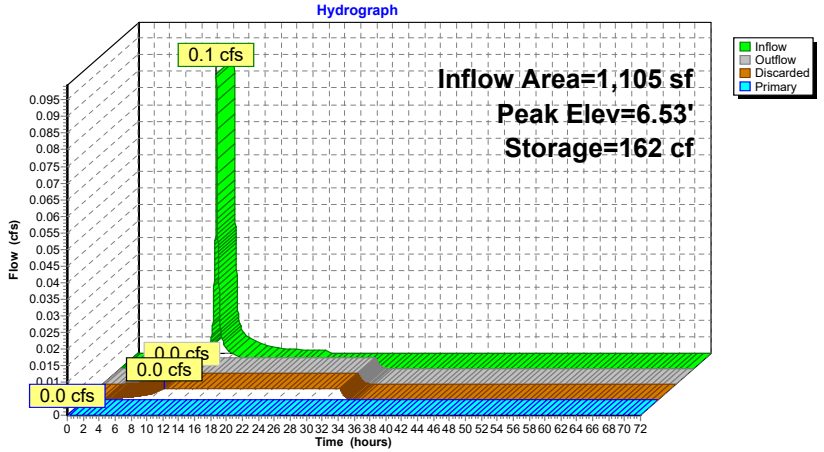
Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.50'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	10.30'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 9.90 hrs HW=5.55' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD3:



Summary for Pond TD4:

Inflow Area = 1,104 sf, 97.46% Impervious, Inflow Depth = 3.29" for 2-Year event
Inflow = 0.1 cfs @ 12.08 hrs, Volume= 303 cf
Outflow = 0.0 cfs @ 9.89 hrs, Volume= 303 cf, Atten= 96%, Lag= 0.0 min
Discarded = 0.0 cfs @ 9.89 hrs, Volume= 303 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 6.53' @ 15.20 hrs Surf.Area= 278 sf Storage= 161 cf

Plug-Flow detention time= 428.3 min calculated for 303 cf (100% of inflow)
Center-of-Mass det. time= 428.4 min (1,191.2 - 762.9)

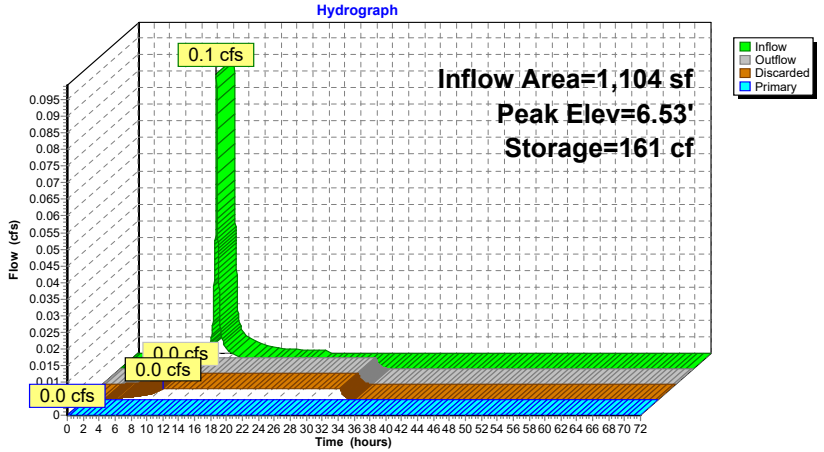
Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.50'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	10.20'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 9.89 hrs HW=5.55' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD4:



Summary for Pond TD5:

Inflow Area = 1,082 sf, 98.06% Impervious, Inflow Depth = 3.41" for 2-Year event
Inflow = 0.1 cfs @ 12.08 hrs, Volume= 307 cf
Outflow = 0.0 cfs @ 9.74 hrs, Volume= 307 cf, Atten= 96%, Lag= 0.0 min
Discarded = 0.0 cfs @ 9.74 hrs, Volume= 307 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 6.03' @ 15.15 hrs Surf.Area= 278 sf Storage= 161 cf

Plug-Flow detention time= 420.2 min calculated for 307 cf (100% of inflow)
Center-of-Mass det. time= 420.2 min (1,174.0 - 753.8)

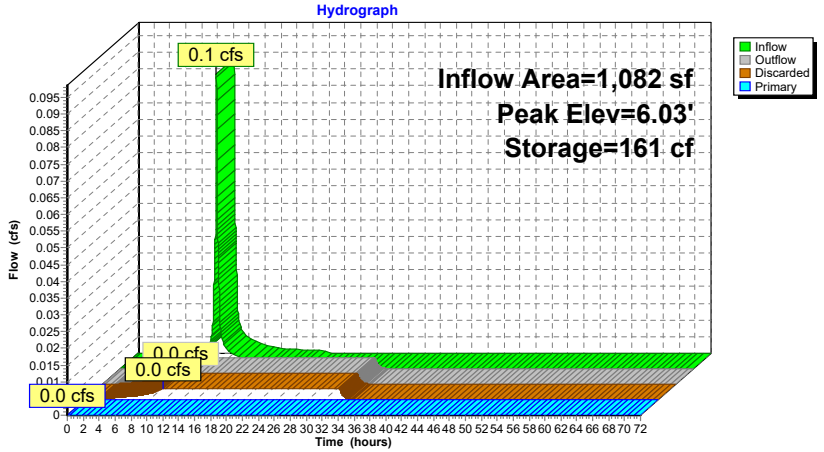
Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	5.50'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.00'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	9.80'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 9.74 hrs HW=5.05' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.00' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD5:



Summary for Pond TD6:

Inflow Area = 1,056 sf, 99.24% Impervious, Inflow Depth = 3.41" for 2-Year event
Inflow = 0.1 cfs @ 12.08 hrs, Volume= 300 cf
Outflow = 0.0 cfs @ 9.79 hrs, Volume= 300 cf, Atten= 96%, Lag= 0.0 min
Discarded = 0.0 cfs @ 9.79 hrs, Volume= 300 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 6.00' @ 15.07 hrs Surf.Area= 278 sf Storage= 155 cf

Plug-Flow detention time= 404.2 min calculated for 300 cf (100% of inflow)
Center-of-Mass det. time= 404.2 min (1,158.0 - 753.8)

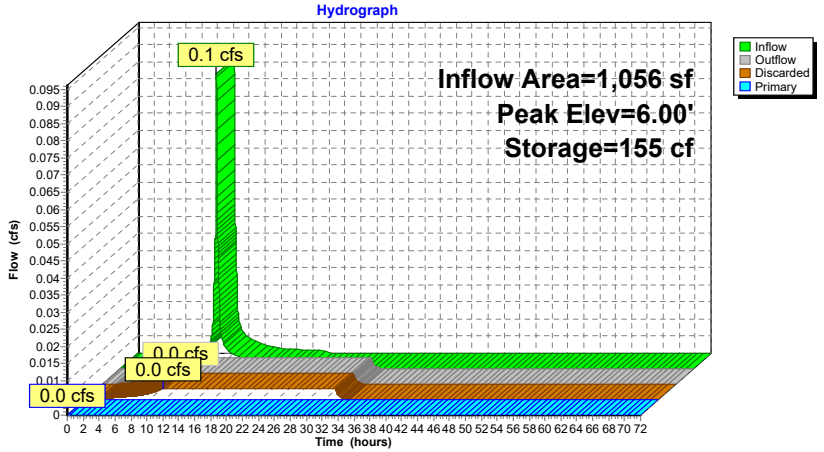
Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	5.50'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.00'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	9.50'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 9.79 hrs HW=5.05' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.00' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD6:

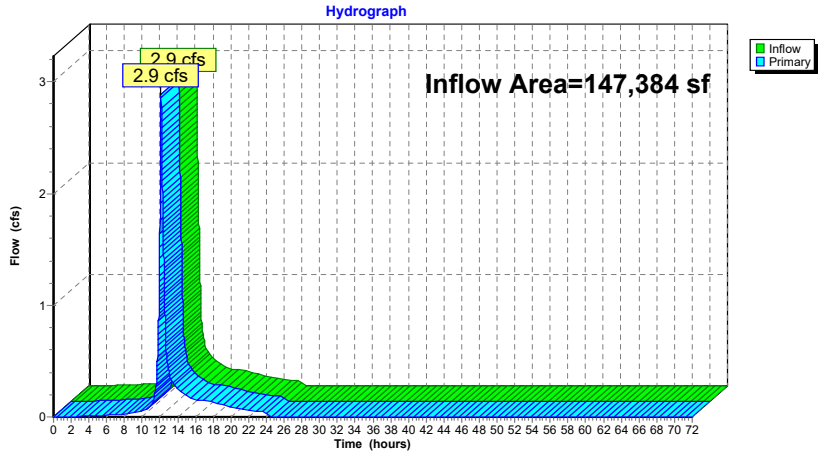


Summary for Link 1L: Towards Wetlands

Inflow Area = 147,384 sf, 49.02% Impervious, Inflow Depth = 1.01" for 2-Year event
Inflow = 2.9 cfs @ 12.11 hrs, Volume= 12,442 cf
Primary = 2.9 cfs @ 12.11 hrs, Volume= 12,442 cf, Atten= 0%, Lag= 0.0 min

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

Link 1L: Towards Wetlands

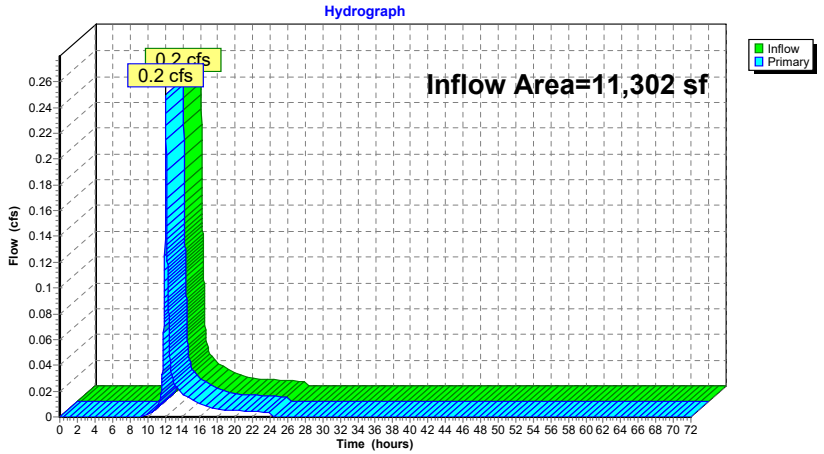


Summary for Link 2L: Towards Street

Inflow Area = 11,302 sf, 56.45% Impervious, Inflow Depth = 0.83" for 2-Year event
Inflow = 0.2 cfs @ 12.09 hrs, Volume= 781 cf
Primary = 0.2 cfs @ 12.09 hrs, Volume= 781 cf, Atten= 0%, Lag= 0.0 min

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

Link 2L: Towards Street

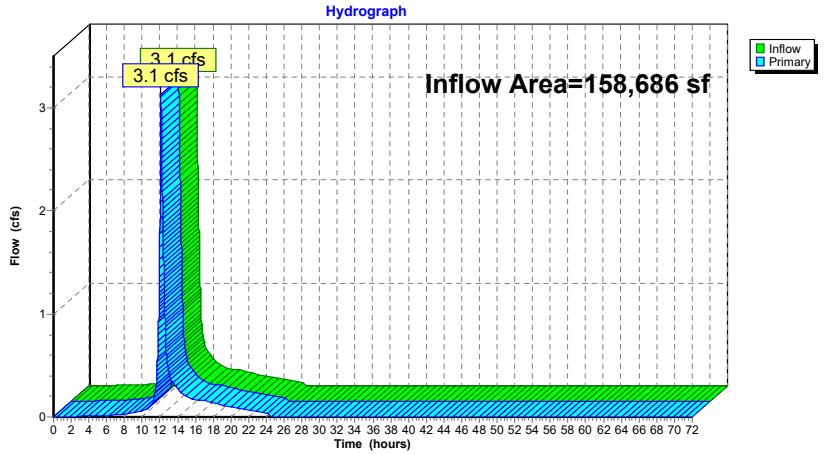


Summary for Link 100L: Total Flows

Inflow Area = 158,686 sf, 49.55% Impervious, Inflow Depth = 1.00" for 2-Year event
Inflow = 3.1 cfs @ 12.11 hrs, Volume= 13,223 cf
Primary = 3.1 cfs @ 12.11 hrs, Volume= 13,223 cf, Atten= 0%, Lag= 0.0 min

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

Link 100L: Total Flows



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

Subcatchment 1S: CB-1 Runoff Area=22,742 sf 72.16% Impervious Runoff Depth=4.75"
Tc=6.0 min CN=91 Runoff=2.8 cfs 9,005 cf

Subcatchment 2.1S: Building Runoff Area=14,140 sf 100.00% Impervious Runoff Depth=5.55"
Tc=6.0 min CN=98 Runoff=1.8 cfs 6,542 cf

Subcatchment 2S: Building Roof Runoff Area=18,785 sf 100.00% Impervious Runoff Depth=5.55"
Tc=6.0 min CN=98 Runoff=2.4 cfs 8,691 cf

Subcatchment 3.1S: Backyard ADs Runoff Area=8,985 sf 3.03% Impervious Runoff Depth=3.10"
Flow Length=147' Tc=10.3 min CN=75 Runoff=0.6 cfs 2,324 cf

Subcatchment 3S: Townhouse Roofs Runoff Area=13,067 sf 100.00% Impervious Runoff Depth=5.55"
Tc=6.0 min CN=98 Runoff=1.7 cfs 6,046 cf

Subcatchment 4.2S: Townhouse TDs Runoff Area=1,112 sf 95.68% Impervious Runoff Depth=5.43"
Tc=6.0 min CN=97 Runoff=0.1 cfs 504 cf

Subcatchment 4.3S: Townhouse TDs Runoff Area=1,105 sf 97.29% Impervious Runoff Depth=5.43"
Tc=6.0 min CN=97 Runoff=0.1 cfs 500 cf

Subcatchment 4.4S: Townhouse TDs Runoff Area=1,104 sf 97.46% Impervious Runoff Depth=5.43"
Tc=6.0 min CN=97 Runoff=0.1 cfs 500 cf

Subcatchment 4.5S: Townhouse TDs Runoff Area=1,082 sf 98.06% Impervious Runoff Depth=5.55"
Tc=6.0 min CN=98 Runoff=0.1 cfs 501 cf

Subcatchment 4.6S: Townhouse TDs Runoff Area=1,056 sf 99.24% Impervious Runoff Depth=5.55"
Tc=6.0 min CN=98 Runoff=0.1 cfs 489 cf

Subcatchment 5S: TD-1 Runoff Area=5,851 sf 51.63% Impervious Runoff Depth=4.21"
Tc=6.0 min CN=86 Runoff=0.6 cfs 2,053 cf

Subcatchment 6.1S: East driveway Runoff Area=12,275 sf 52.50% Impervious Runoff Depth=4.32"
Tc=6.0 min CN=87 Runoff=1.4 cfs 4,415 cf

Subcatchment 6S: Bypass Towards Runoff Area=51,539 sf 0.21% Impervious Runoff Depth=3.01"
Flow Length=125' Tc=14.0 min CN=74 Runoff=3.2 cfs 12,924 cf

Subcatchment 7S: To Street Runoff Area=5,843 sf 18.07% Impervious Runoff Depth=3.39"
Tc=6.0 min CN=78 Runoff=0.5 cfs 1,653 cf

Pond 1P: Underground Infiltration System Peak Elev=7.90' Storage=12,342 cf Inflow=5.9 cfs 28,119 cf
Discarded=0.1 cfs 16,675 cf Primary=0.7 cfs 11,444 cf Outflow=0.8 cfs 28,119 cf

Pond 2P: Rooftop Detention Peak Elev=57.50' Storage=3,785 cf Inflow=2.4 cfs 8,691 cf
Outflow=0.3 cfs 8,691 cf

Pond 3P: Rain garden Peak Elev=6.39' Storage=205 cf Inflow=1.4 cfs 4,415 cf
Discarded=0.0 cfs 435 cf Primary=1.4 cfs 3,980 cf Outflow=1.4 cfs 4,415 cf

Pond TD2: Peak Elev=7.30' Storage=315 cf Inflow=0.1 cfs 504 cf
Discarded=0.0 cfs 504 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 504 cf

Pond TD3: Peak Elev=7.28' Storage=313 cf Inflow=0.1 cfs 500 cf
Discarded=0.0 cfs 500 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 500 cf

Pond TD4: Peak Elev=7.28' Storage=312 cf Inflow=0.1 cfs 500 cf
Discarded=0.0 cfs 500 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 500 cf

Pond TD5: Peak Elev=6.76' Storage=308 cf Inflow=0.1 cfs 501 cf
Discarded=0.0 cfs 501 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 501 cf

Pond TD6: Peak Elev=6.71' Storage=298 cf Inflow=0.1 cfs 489 cf
Discarded=0.0 cfs 489 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 489 cf

Link 1L: Towards Wetlands Inflow=5.7 cfs 34,891 cf
Primary=5.7 cfs 34,891 cf

Link 2L: Towards Street Inflow=0.5 cfs 1,653 cf
Primary=0.5 cfs 1,653 cf

Link 100L: Total Flows Inflow=6.2 cfs 36,543 cf
Primary=6.2 cfs 36,543 cf

Total Runoff Area = 158,686 sf Runoff Volume = 56,147 cf Average Runoff Depth = 4.25"
50.45% Pervious = 80,060 sf 49.55% Impervious = 78,626 sf

Summary for Subcatchment 1S: CB-1

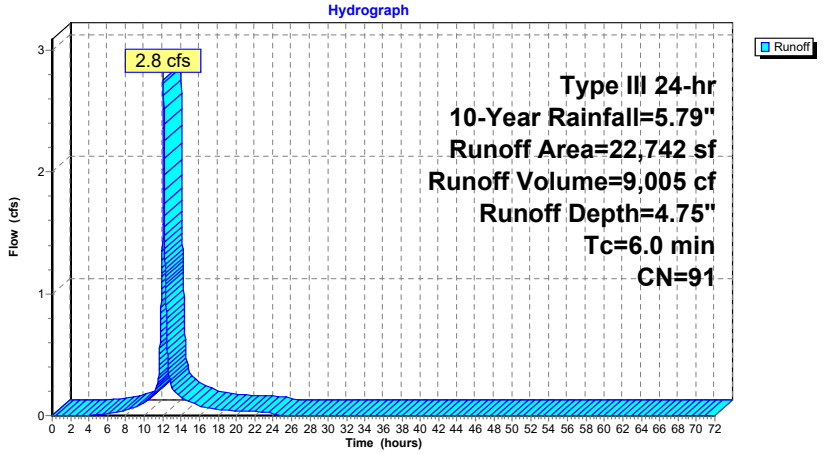
Runoff = 2.8 cfs @ 12.08 hrs, Volume= 9,005 cf, Depth= 4.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.79"

Area (sf)	CN	Description
16,410	98	Paved parking, HSG C
6,332	74	>75% Grass cover, Good, HSG C
22,742	91	Weighted Average
6,332		27.84% Pervious Area
16,410		72.16% Impervious Area

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

Subcatchment 1S: CB-1



Summary for Subcatchment 2.1S: Building Roof-Southeast

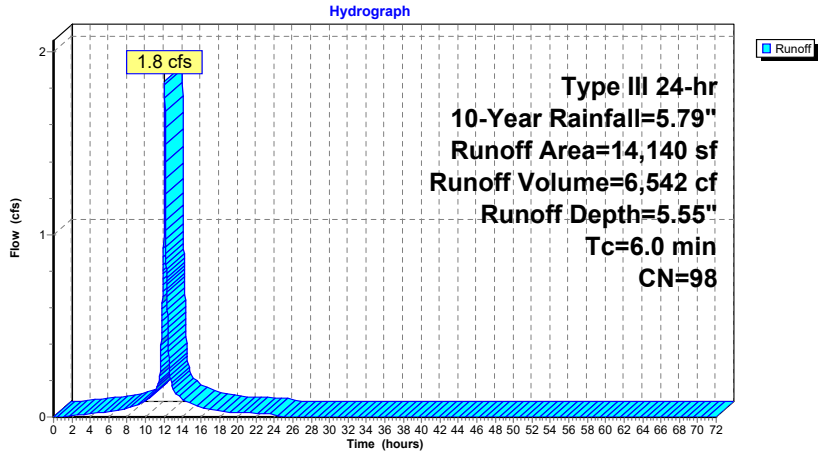
Runoff = 1.8 cfs @ 12.08 hrs, Volume= 6,542 cf, Depth= 5.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.79"

Area (sf)	CN	Description
14,140	98	Roofs, HSG C
14,140		100.00% Impervious Area

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

Subcatchment 2.1S: Building Roof-Southeast



Summary for Subcatchment 2S: Building Roof

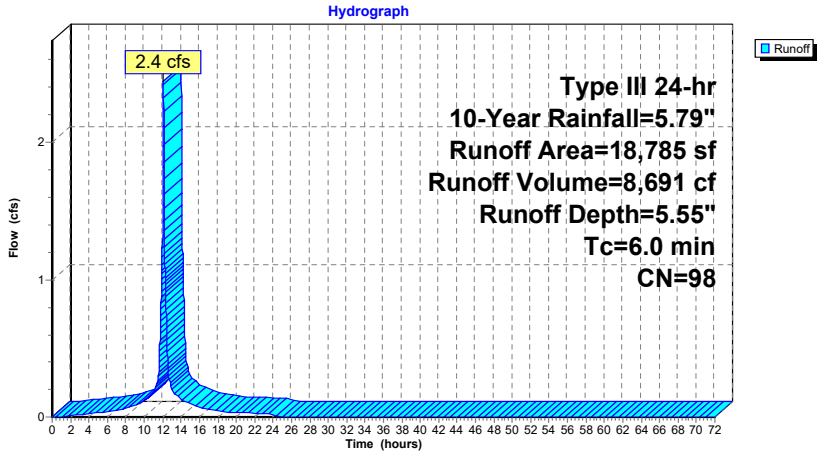
Runoff = 2.4 cfs @ 12.08 hrs, Volume= 8,691 cf, Depth= 5.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.79"

Area (sf)	CN	Description
18,785	98	Roofs, HSG C
18,785		100.00% Impervious Area

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

Subcatchment 2S: Building Roof



Summary for Subcatchment 3.1S: Backyard ADs

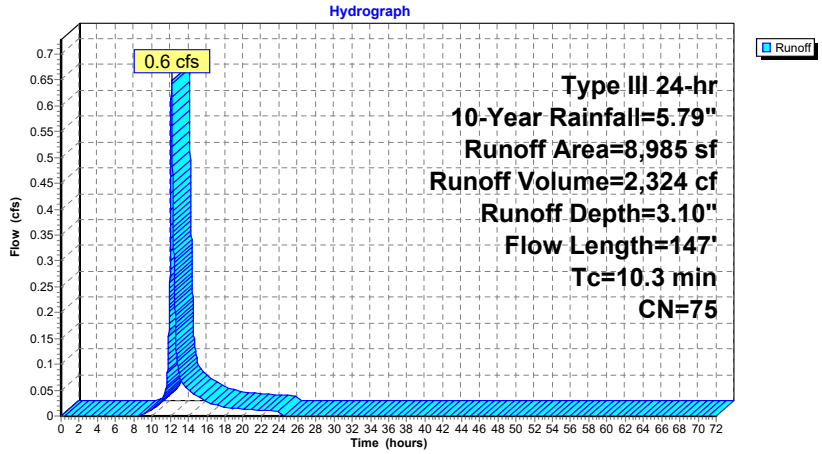
Runoff = 0.6 cfs @ 12.14 hrs, Volume= 2,324 cf, Depth= 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.79"

	Area (sf)	CN	Description
	272	98	Unconnected pavement, HSG C
	8,302	74	>75% Grass cover, Good, HSG C
*	411	89	Gravel sidewalk, HSG C
	8,985	75	Weighted Average
	8,713		96.97% Pervious Area
	272		3.03% Impervious Area
	272		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	50	0.0142	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.23"
0.9	97	0.0154	1.86		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
10.3	147	Total			

Subcatchment 3.1S: Backyard ADs



Summary for Subcatchment 3S: Townhouse Roofs

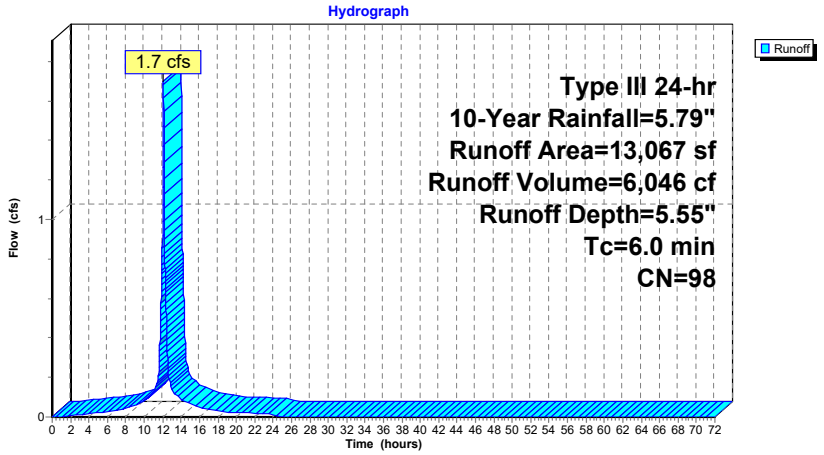
Runoff = 1.7 cfs @ 12.08 hrs, Volume= 6,046 cf, Depth= 5.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.79"

Area (sf)	CN	Description
13,067	98	Roofs, HSG C
13,067		100.00% Impervious Area

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

Subcatchment 3S: Townhouse Roofs



Summary for Subcatchment 4.2S: Townhouse TDs

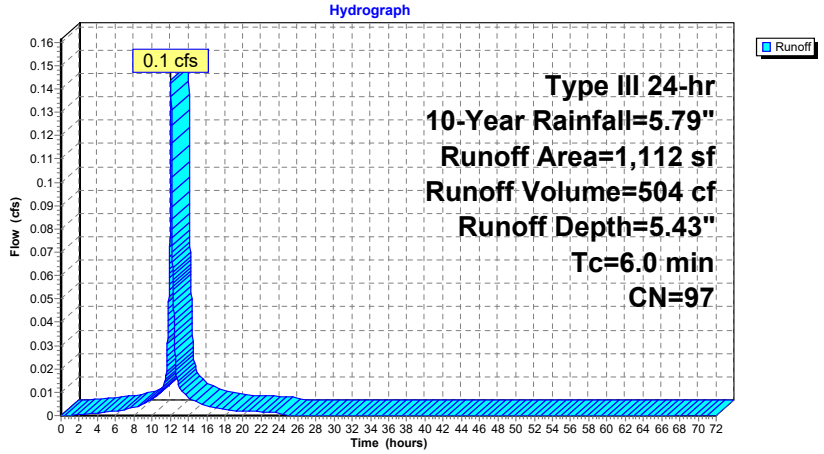
Runoff = 0.1 cfs @ 12.08 hrs, Volume= 504 cf, Depth= 5.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.79"

Area (sf)	CN	Description
1,064	98	Paved parking, HSG C
48	74	>75% Grass cover, Good, HSG C
1,112	97	Weighted Average
48		4.32% Pervious Area
1,064		95.68% Impervious Area

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

Subcatchment 4.2S: Townhouse TDs



Summary for Subcatchment 4.3S: Townhouse TDs

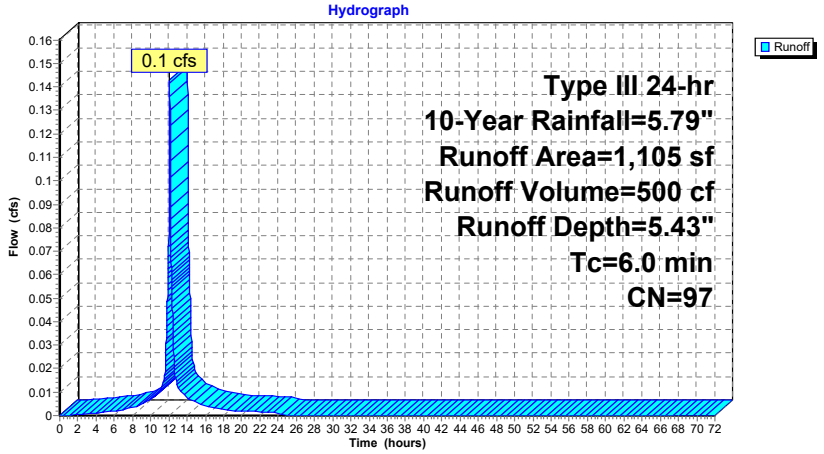
Runoff = 0.1 cfs @ 12.08 hrs, Volume= 500 cf, Depth= 5.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.79"

Area (sf)	CN	Description
1,075	98	Paved parking, HSG C
30	74	>75% Grass cover, Good, HSG C
1,105	97	Weighted Average
30		2.71% Pervious Area
1,075		97.29% Impervious Area

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

Subcatchment 4.3S: Townhouse TDs



Summary for Subcatchment 4.4S: Townhouse TDs

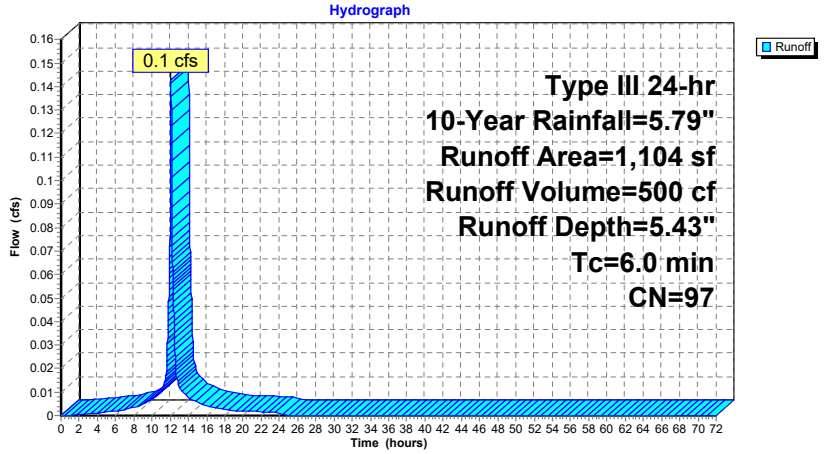
Runoff = 0.1 cfs @ 12.08 hrs, Volume= 500 cf, Depth= 5.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.79"

Area (sf)	CN	Description
1,076	98	Paved parking, HSG C
28	74	>75% Grass cover, Good, HSG C
1,104	97	Weighted Average
28		2.54% Pervious Area
1,076		97.46% Impervious Area

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

Subcatchment 4.4S: Townhouse TDs



Summary for Subcatchment 4.5S: Townhouse TDs

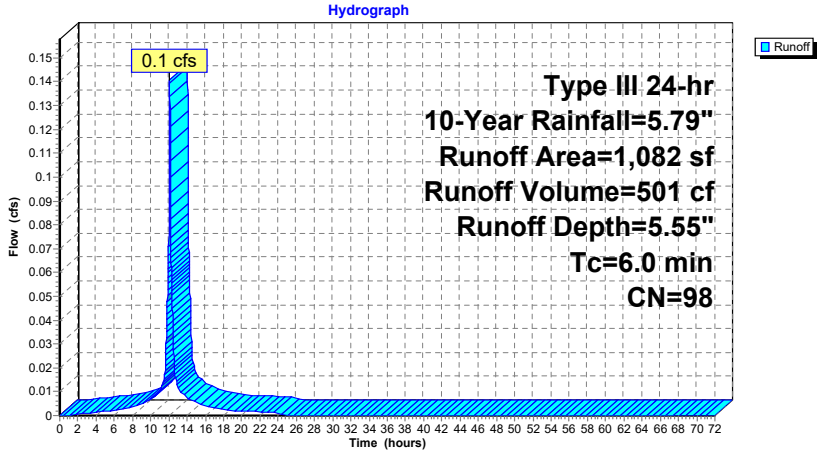
Runoff = 0.1 cfs @ 12.08 hrs, Volume= 501 cf, Depth= 5.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.79"

Area (sf)	CN	Description
1,061	98	Paved parking, HSG C
21	74	>75% Grass cover, Good, HSG C
1,082	98	Weighted Average
21		1.94% Pervious Area
1,061		98.06% Impervious Area

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

Subcatchment 4.5S: Townhouse TDs



Summary for Subcatchment 4.6S: Townhouse TDs

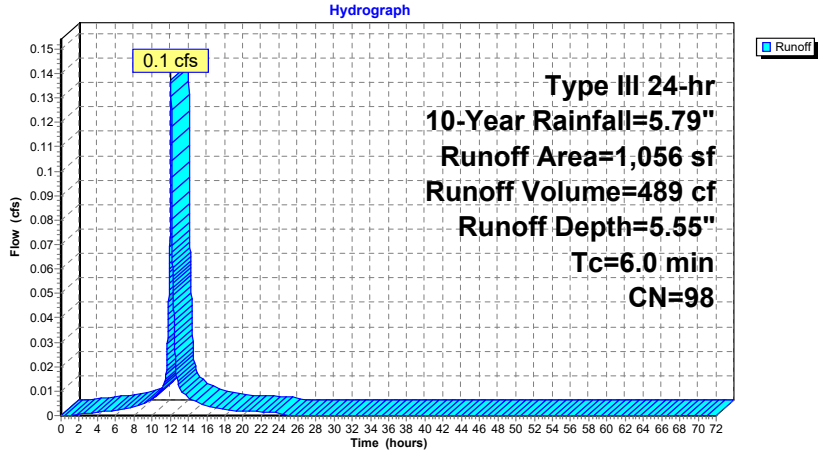
Runoff = 0.1 cfs @ 12.08 hrs, Volume= 489 cf, Depth= 5.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.79"

Area (sf)	CN	Description
1,048	98	Paved parking, HSG C
8	74	>75% Grass cover, Good, HSG C
1,056	98	Weighted Average
8		0.76% Pervious Area
1,048		99.24% Impervious Area

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

Subcatchment 4.6S: Townhouse TDs



Summary for Subcatchment 5S: TD-1

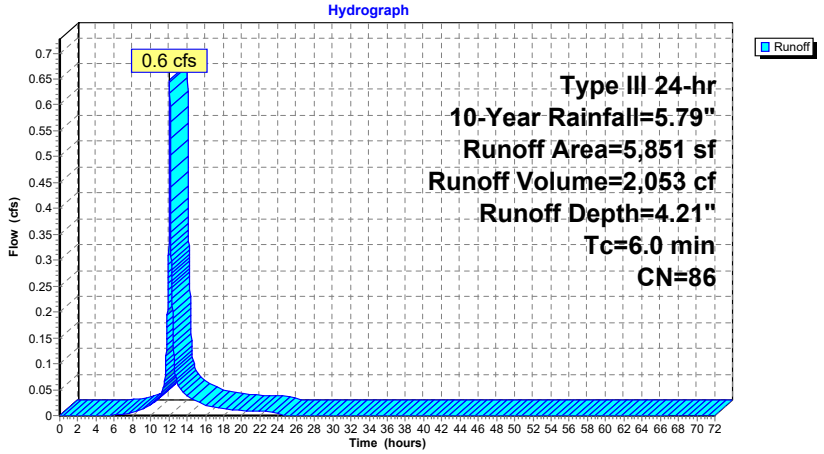
Runoff = 0.6 cfs @ 12.09 hrs, Volume= 2,053 cf, Depth= 4.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.79"

Area (sf)	CN	Description
3,021	98	Paved parking, HSG C
2,830	74	>75% Grass cover, Good, HSG C
5,851	86	Weighted Average
2,830		48.37% Pervious Area
3,021		51.63% Impervious Area

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

Subcatchment 5S: TD-1



Summary for Subcatchment 6.1S: East driveway

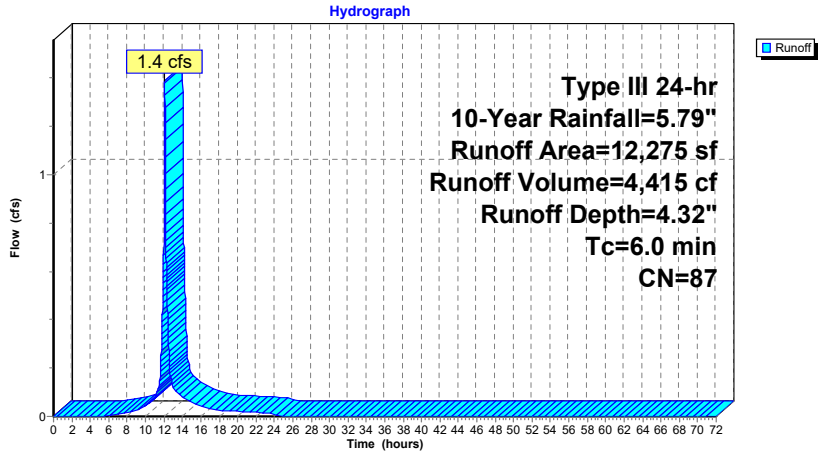
Runoff = 1.4 cfs @ 12.09 hrs, Volume= 4,415 cf, Depth= 4.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.79"

Area (sf)	CN	Description
5,611	74	>75% Grass cover, Good, HSG C
6,444	98	Paved roads w/curbs & sewers, HSG C
220	89	Gravel roads, HSG C
12,275	87	Weighted Average
5,831		47.50% Pervious Area
6,444		52.50% Impervious Area

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

Subcatchment 6.1S: East driveway



Summary for Subcatchment 6S: Bypass Towards Wetlands

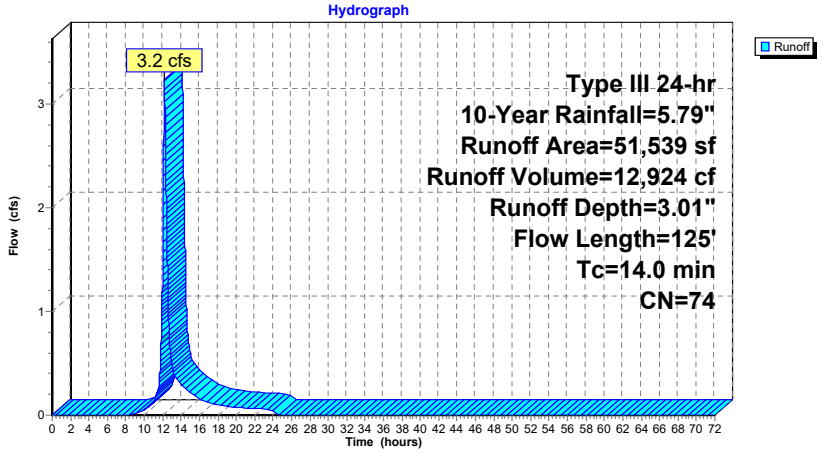
Runoff = 3.2 cfs @ 12.19 hrs, Volume= 12,924 cf, Depth= 3.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.79"

Area (sf)	CN	Description
4,985	70	Woods, Good, HSG C
46,447	74	>75% Grass cover, Good, HSG C
107	98	Roofs, HSG C
51,539	74	Weighted Average
51,432		99.79% Pervious Area
107		0.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0220	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.23"
2.2	75	0.0133	0.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.0	125	Total			

Subcatchment 6S: Bypass Towards Wetlands



Summary for Subcatchment 7S: To Street

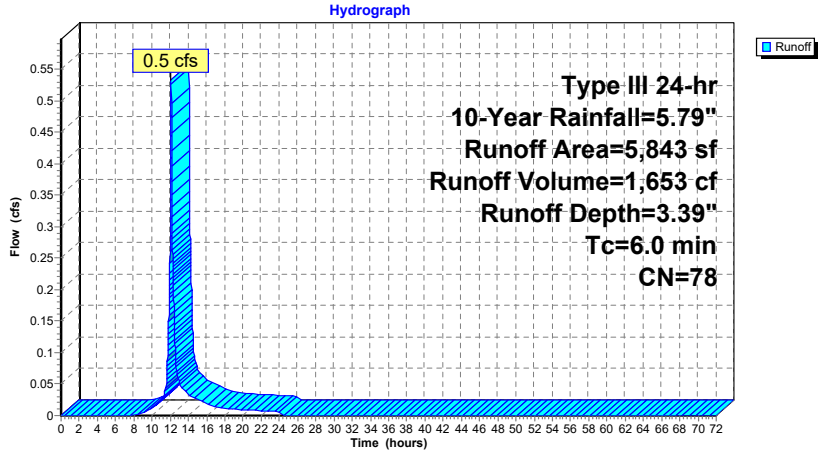
Runoff = 0.5 cfs @ 12.09 hrs, Volume= 1,653 cf, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.79"

Area (sf)	CN	Description
1,056	98	Paved parking, HSG C
4,787	74	>75% Grass cover, Good, HSG C
5,843	78	Weighted Average
4,787		81.93% Pervious Area
1,056		18.07% Impervious Area

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

Subcatchment 7S: To Street



Summary for Pond 1P: Underground Infiltration System

Inflow Area = 69,430 sf, 74.25% Impervious, Inflow Depth = 4.86" for 10-Year event
Inflow = 5.9 cfs @ 12.09 hrs, Volume= 28,119 cf
Outflow = 0.8 cfs @ 13.06 hrs, Volume= 28,119 cf, Atten= 87%, Lag= 58.2 min
Discarded = 0.1 cfs @ 7.57 hrs, Volume= 16,675 cf
Primary = 0.7 cfs @ 13.06 hrs, Volume= 11,444 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 7.90' @ 13.06 hrs Surf.Area= 7,556 sf Storage= 12,342 cf

Plug-Flow detention time= 659.9 min calculated for 28,119 cf (100% of inflow)
Center-of-Mass det. time= 659.9 min (1,479.8 - 819.8)

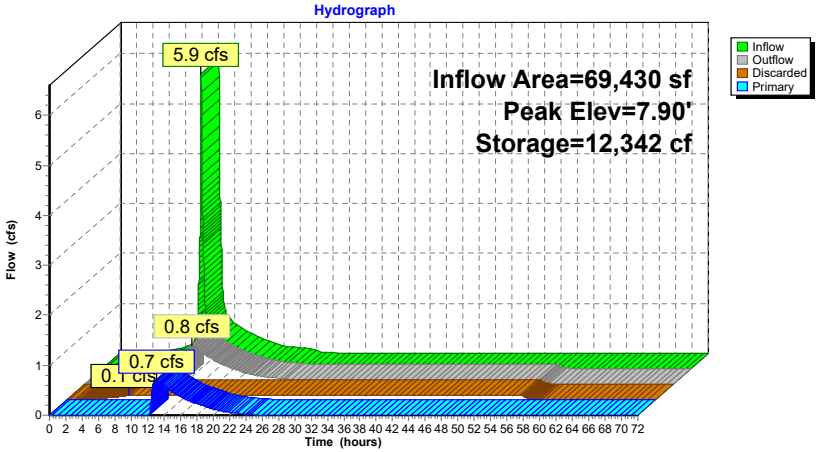
Volume	Invert	Avail.Storage	Storage Description
#1	6.00'	19,495 cf	**6.89'W x 14.06'L x 3.00'H StormTrap ST-1 Units (Irregular Shape)** x 78 22,668 cf Overall x 86.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	7.50'	**15.0" Round Culvert** L= 190.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 7.50' / 6.00' S= 0.0079 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Discarded OutFlow Max=0.1 cfs @ 7.57 hrs HW=6.03' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.7 cfs @ 13.06 hrs HW=7.90' (Free Discharge)
↑**2=Culvert** (Barrel Controls 0.7 cfs @ 3.06 fps)

Pond 1P: Underground Infiltration System



Summary for Pond 2P: Rooftop Detention

Inflow Area = 18,785 sf,100.00% Impervious, Inflow Depth = 5.55" for 10-Year event
Inflow = 2.4 cfs @ 12.08 hrs, Volume= 8,691 cf
Outflow = 0.3 cfs @ 12.64 hrs, Volume= 8,691 cf, Atten= 88%, Lag= 33.4 min
Primary = 0.3 cfs @ 12.64 hrs, Volume= 8,691 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 57.50' @ 12.64 hrs Surf.Area= 7,500 sf Storage= 3,785 cf

Plug-Flow detention time= 166.1 min calculated for 8,690 cf (100% of inflow)
Center-of-Mass det. time= 166.4 min (912.1 - 745.7)

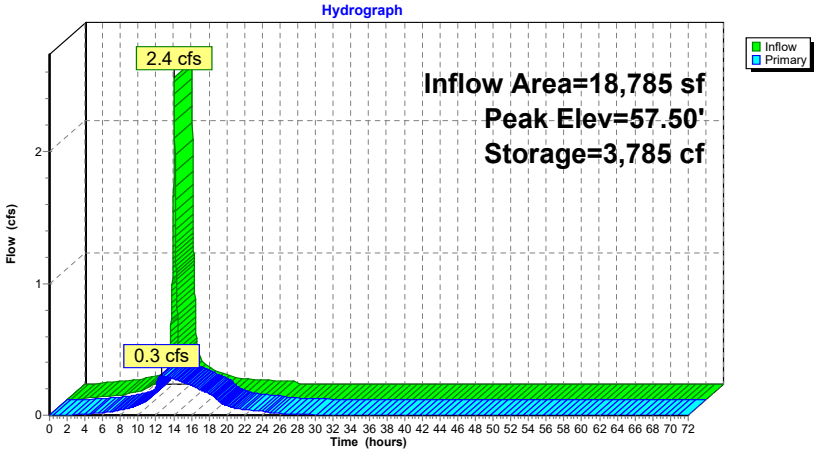
Volume	Invert	Avail.Storage	Storage Description
#1	57.00'	7,500 cf	**Rooftop Detention (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
57.00	7,500	0	0
58.00	7,500	7,500	7,500

Device	Routing	Invert	Outlet Devices
#1	Primary	8.02'	**12.0" Round Roof Drain** L= 16.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 8.02' / 7.70' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	57.00'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.3 cfs @ 12.64 hrs HW=57.50' (Free Discharge)
↑**1=Roof Drain** (Passes 0.3 cfs of 23.4 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 0.3 cfs @ 3.42 fps)

Pond 2P: Rooftop Detention



Summary for Pond 3P: Rain garden

Inflow Area = 12,275 sf, 52.50% Impervious, Inflow Depth = 4.32" for 10-Year event
Inflow = 1.4 cfs @ 12.09 hrs, Volume= 4,415 cf
Outflow = 1.4 cfs @ 12.09 hrs, Volume= 4,415 cf, Atten= 0%, Lag= 0.3 min
Discarded = 0.0 cfs @ 12.09 hrs, Volume= 435 cf
Primary = 1.4 cfs @ 12.09 hrs, Volume= 3,980 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 6.39' @ 12.09 hrs Surf.Area= 397 sf Storage= 205 cf

Plug-Flow detention time= 53.3 min calculated for 4,415 cf (100% of inflow)
Center-of-Mass det. time= 53.3 min (849.2 - 795.9)

Volume	Invert	Avail.Storage	Storage Description
#1	5.60'	253 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

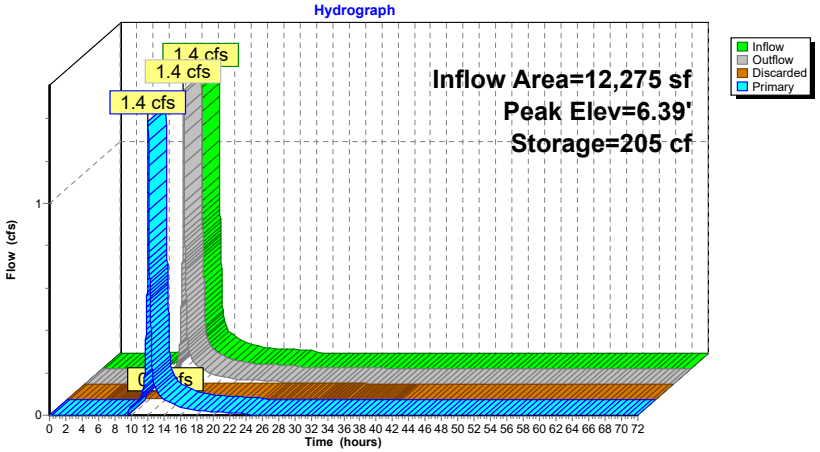
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.60	125	46.0	0	0	125
6.00	276	66.0	78	78	305
6.30	350	73.0	94	172	385
6.50	460	87.0	81	253	564

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.60'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	6.30'	**22.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.0 cfs @ 12.09 hrs HW=6.39' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=1.4 cfs @ 12.09 hrs HW=6.39' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 1.4 cfs @ 0.70 fps)

Pond 3P: Rain garden



Summary for Pond TD2:

Inflow Area = 1,112 sf, 95.68% Impervious, Inflow Depth = 5.43" for 10-Year event
Inflow = 0.1 cfs @ 12.08 hrs, Volume= 504 cf
Outflow = 0.0 cfs @ 8.34 hrs, Volume= 504 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.0 cfs @ 8.34 hrs, Volume= 504 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 7.30' @ 16.79 hrs Surf.Area= 278 sf Storage= 315 cf

Plug-Flow detention time= 825.7 min calculated for 504 cf (100% of inflow)
Center-of-Mass det. time= 825.8 min (1,578.6 - 752.8)

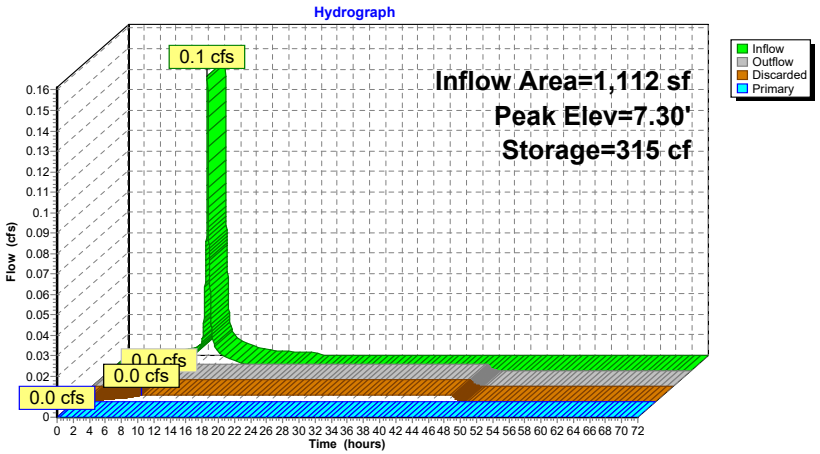
Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.50'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	10.00'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 8.34 hrs HW=5.55' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD2:



Summary for Pond TD3:

Inflow Area = 1,105 sf, 97.29% Impervious, Inflow Depth = 5.43" for 10-Year event
Inflow = 0.1 cfs @ 12.08 hrs, Volume= 500 cf
Outflow = 0.0 cfs @ 8.38 hrs, Volume= 500 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.0 cfs @ 8.38 hrs, Volume= 500 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 7.28' @ 16.76 hrs Surf.Area= 278 sf Storage= 313 cf

Plug-Flow detention time= 820.3 min calculated for 500 cf (100% of inflow)
Center-of-Mass det. time= 820.4 min (1,573.3 - 752.8)

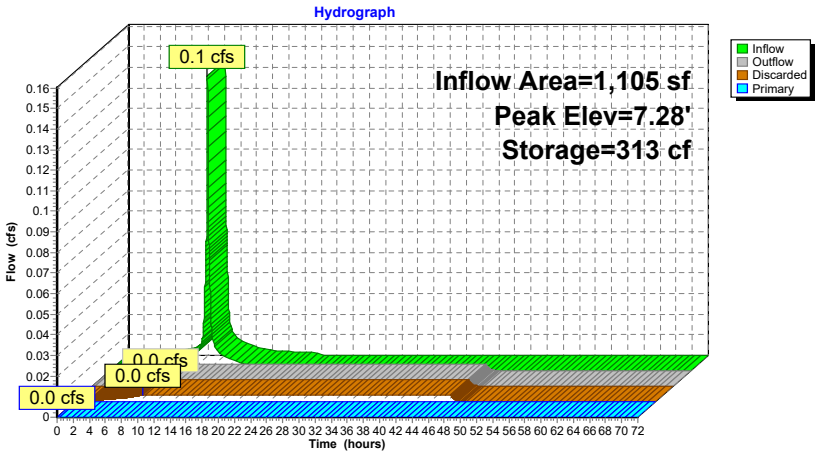
Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.50'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	10.30'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 8.38 hrs HW=5.55' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD3:



Summary for Pond TD4:

Inflow Area = 1,104 sf, 97.46% Impervious, Inflow Depth = 5.43" for 10-Year event
Inflow = 0.1 cfs @ 12.08 hrs, Volume= 500 cf
Outflow = 0.0 cfs @ 8.38 hrs, Volume= 500 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.0 cfs @ 8.38 hrs, Volume= 500 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 7.28' @ 16.76 hrs Surf.Area= 278 sf Storage= 312 cf

Plug-Flow detention time= 818.9 min calculated for 500 cf (100% of inflow)
Center-of-Mass det. time= 819.0 min (1,571.8 - 752.8)

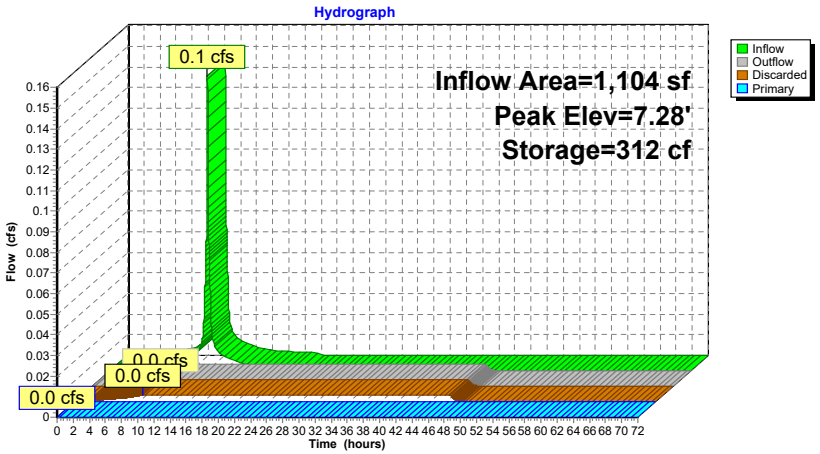
Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.50'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	10.20'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 8.38 hrs HW=5.55' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD4:



Summary for Pond TD5:

Inflow Area = 1,082 sf, 98.06% Impervious, Inflow Depth = 5.55" for 10-Year event
Inflow = 0.1 cfs @ 12.08 hrs, Volume= 501 cf
Outflow = 0.0 cfs @ 8.25 hrs, Volume= 501 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.0 cfs @ 8.25 hrs, Volume= 501 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 6.76' @ 16.67 hrs Surf.Area= 278 sf Storage= 308 cf

Plug-Flow detention time= 799.7 min calculated for 501 cf (100% of inflow)
Center-of-Mass det. time= 799.8 min (1,545.5 - 745.7)

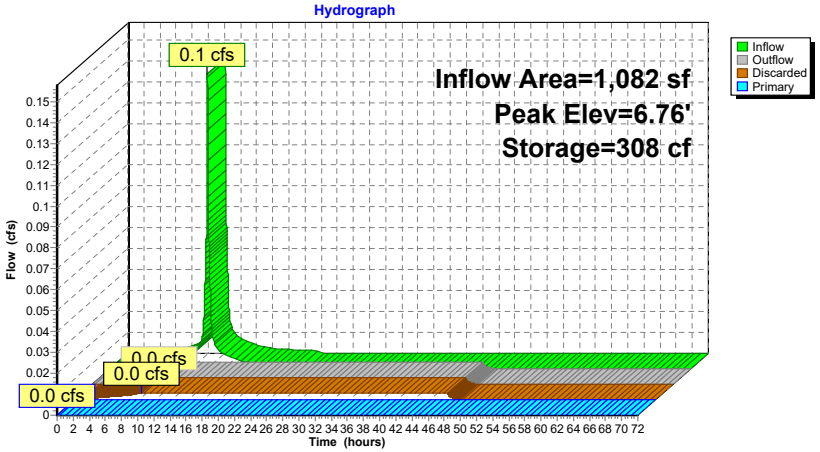
Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	5.50'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.00'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	9.80'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 8.25 hrs HW=5.05' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.00' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD5:



Summary for Pond TD6:

Inflow Area = 1,056 sf, 99.24% Impervious, Inflow Depth = 5.55" for 10-Year event
Inflow = 0.1 cfs @ 12.08 hrs, Volume= 489 cf
Outflow = 0.0 cfs @ 8.31 hrs, Volume= 489 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.0 cfs @ 8.31 hrs, Volume= 489 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 6.71' @ 16.56 hrs Surf.Area= 278 sf Storage= 298 cf

Plug-Flow detention time= 772.7 min calculated for 489 cf (100% of inflow)
Center-of-Mass det. time= 772.8 min (1,518.5 - 745.7)

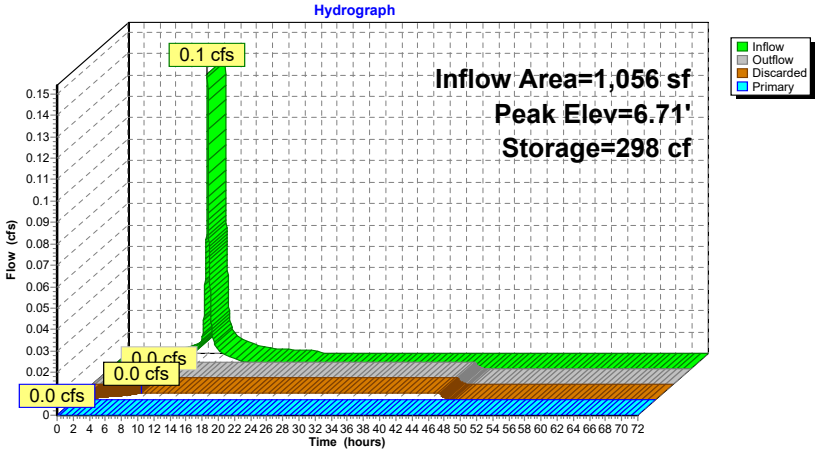
Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	5.50'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.00'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	9.50'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 8.31 hrs HW=5.05' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.00' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD6:

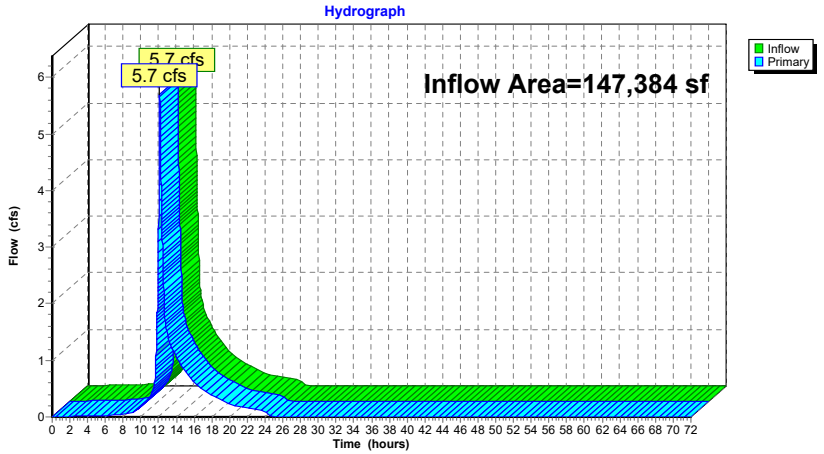


Summary for Link 1L: Towards Wetlands

Inflow Area = 147,384 sf, 49.02% Impervious, Inflow Depth = 2.84" for 10-Year event
Inflow = 5.7 cfs @ 12.12 hrs, Volume= 34,891 cf
Primary = 5.7 cfs @ 12.12 hrs, Volume= 34,891 cf, Atten= 0%, Lag= 0.0 min

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

Link 1L: Towards Wetlands

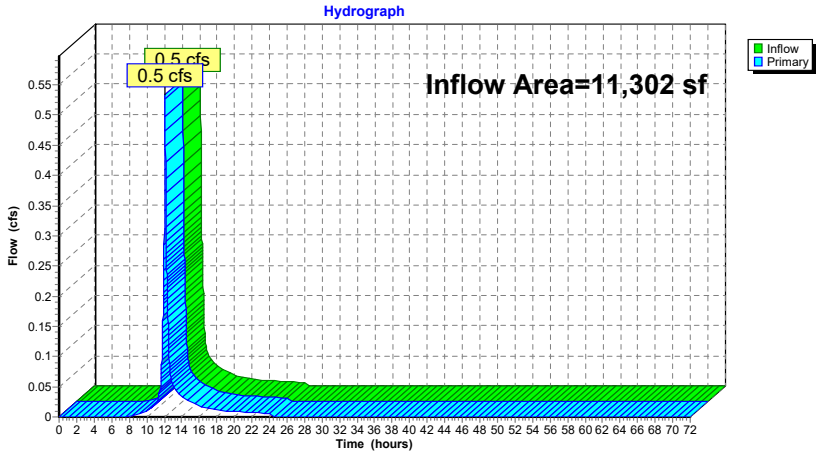


Summary for Link 2L: Towards Street

Inflow Area = 11,302 sf, 56.45% Impervious, Inflow Depth = 1.75" for 10-Year event
Inflow = 0.5 cfs @ 12.09 hrs, Volume= 1,653 cf
Primary = 0.5 cfs @ 12.09 hrs, Volume= 1,653 cf, Atten= 0%, Lag= 0.0 min

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

Link 2L: Towards Street

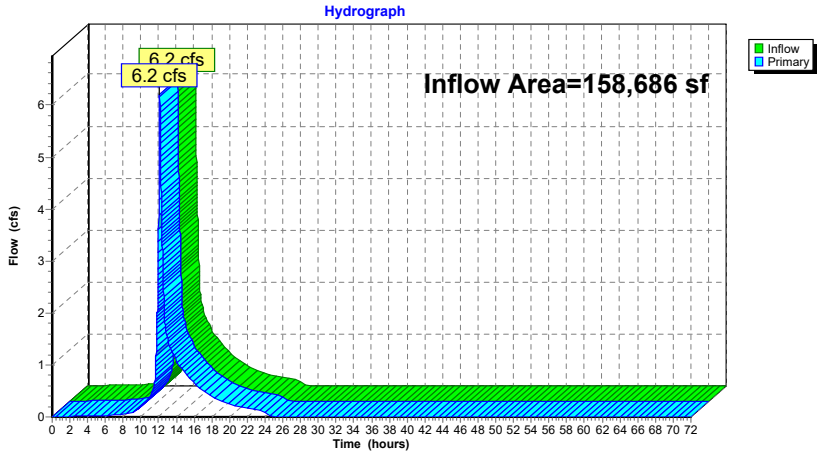


Summary for Link 100L: Total Flows

Inflow Area = 158,686 sf, 49.55% Impervious, Inflow Depth = 2.76" for 10-Year event
Inflow = 6.2 cfs @ 12.11 hrs, Volume= 36,543 cf
Primary = 6.2 cfs @ 12.11 hrs, Volume= 36,543 cf, Atten= 0%, Lag= 0.0 min

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

Link 100L: Total Flows



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

Subcatchment 1S: CB-1 Runoff Area=22,742 sf 72.16% Impervious Runoff Depth=6.42"
Tc=6.0 min CN=91 Runoff=3.7 cfs 12,169 cf

Subcatchment 2.1S: Building Runoff Area=14,140 sf 100.00% Impervious Runoff Depth=7.25"
Tc=6.0 min CN=98 Runoff=2.4 cfs 8,544 cf

Subcatchment 2S: Building Roof Runoff Area=18,785 sf 100.00% Impervious Runoff Depth=7.25"
Tc=6.0 min CN=98 Runoff=3.2 cfs 11,350 cf

Subcatchment 3.1S: Backyard ADs Runoff Area=8,985 sf 3.03% Impervious Runoff Depth=4.58"
Flow Length=147' Tc=10.3 min CN=75 Runoff=1.0 cfs 3,432 cf

Subcatchment 3S: Townhouse Roofs Runoff Area=13,067 sf 100.00% Impervious Runoff Depth=7.25"
Tc=6.0 min CN=98 Runoff=2.2 cfs 7,895 cf

Subcatchment 4.2S: Townhouse TDs Runoff Area=1,112 sf 95.68% Impervious Runoff Depth=7.13"
Tc=6.0 min CN=97 Runoff=0.2 cfs 661 cf

Subcatchment 4.3S: Townhouse TDs Runoff Area=1,105 sf 97.29% Impervious Runoff Depth=7.13"
Tc=6.0 min CN=97 Runoff=0.2 cfs 657 cf

Subcatchment 4.4S: Townhouse TDs Runoff Area=1,104 sf 97.46% Impervious Runoff Depth=7.13"
Tc=6.0 min CN=97 Runoff=0.2 cfs 656 cf

Subcatchment 4.5S: Townhouse TDs Runoff Area=1,082 sf 98.06% Impervious Runoff Depth=7.25"
Tc=6.0 min CN=98 Runoff=0.2 cfs 654 cf

Subcatchment 4.6S: Townhouse TDs Runoff Area=1,056 sf 99.24% Impervious Runoff Depth=7.25"
Tc=6.0 min CN=98 Runoff=0.2 cfs 638 cf

Subcatchment 5S: TD-1 Runoff Area=5,851 sf 51.63% Impervious Runoff Depth=5.84"
Tc=6.0 min CN=86 Runoff=0.9 cfs 2,846 cf

Subcatchment 6.1S: East driveway Runoff Area=12,275 sf 52.50% Impervious Runoff Depth=5.95"
Tc=6.0 min CN=87 Runoff=1.9 cfs 6,090 cf

Subcatchment 6S: Bypass Towards Runoff Area=51,539 sf 0.21% Impervious Runoff Depth=4.47"
Flow Length=125' Tc=14.0 min CN=74 Runoff=4.8 cfs 19,208 cf

Subcatchment 7S: To Street Runoff Area=5,843 sf 18.07% Impervious Runoff Depth=4.92"
Tc=6.0 min CN=78 Runoff=0.8 cfs 2,396 cf

Pond 1P: Underground Infiltration System Peak Elev=8.24' Storage=14,532 cf Inflow=7.8 cfs 37,693 cf
Discarded=0.1 cfs 17,250 cf Primary=2.1 cfs 20,443 cf Outflow=2.2 cfs 37,693 cf

Pond 2P: Rooftop Detention Peak Elev=57.67' Storage=5,027 cf Inflow=3.2 cfs 11,350 cf
Outflow=0.3 cfs 11,350 cf

Pond 3P: Rain garden Peak Elev=6.41' Storage=214 cf Inflow=1.9 cfs 6,090 cf
Discarded=0.0 cfs 452 cf Primary=1.9 cfs 5,638 cf Outflow=1.9 cfs 6,090 cf

Pond TD2: Peak Elev=7.95' Storage=445 cf Inflow=0.2 cfs 661 cf
Discarded=0.0 cfs 661 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 661 cf

Pond TD3: Peak Elev=7.93' Storage=442 cf Inflow=0.2 cfs 657 cf
Discarded=0.0 cfs 657 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 657 cf

Pond TD4: Peak Elev=7.93' Storage=442 cf Inflow=0.2 cfs 656 cf
Discarded=0.0 cfs 656 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 656 cf

Pond TD5: Peak Elev=7.39' Storage=435 cf Inflow=0.2 cfs 654 cf
Discarded=0.0 cfs 654 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 654 cf

Pond TD6: Peak Elev=7.32' Storage=421 cf Inflow=0.2 cfs 638 cf
Discarded=0.0 cfs 638 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 638 cf

Link 1L: Towards Wetlands Inflow=8.5 cfs 53,833 cf
Primary=8.5 cfs 53,833 cf

Link 2L: Towards Street Inflow=0.8 cfs 2,396 cf
Primary=0.8 cfs 2,396 cf

Link 100L: Total Flows Inflow=9.1 cfs 56,229 cf
Primary=9.1 cfs 56,229 cf

Total Runoff Area = 158,686 sf Runoff Volume = 77,197 cf Average Runoff Depth = 5.84"
50.45% Pervious = 80,060 sf 49.55% Impervious = 78,626 sf

Summary for Subcatchment 1S: CB-1

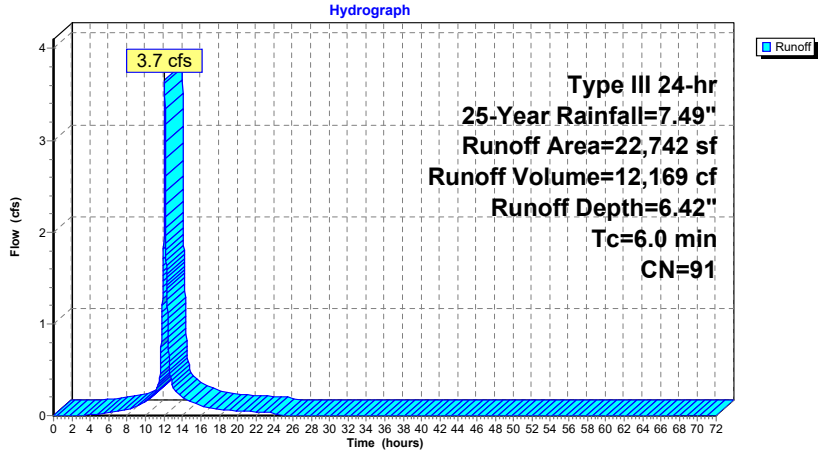
Runoff = 3.7 cfs @ 12.08 hrs, Volume= 12,169 cf, Depth= 6.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=7.49"

Area (sf)	CN	Description
16,410	98	Paved parking, HSG C
6,332	74	>75% Grass cover, Good, HSG C
22,742	91	Weighted Average
6,332		27.84% Pervious Area
16,410		72.16% Impervious Area

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

Subcatchment 1S: CB-1



Summary for Subcatchment 2.1S: Building Roof-Southeast

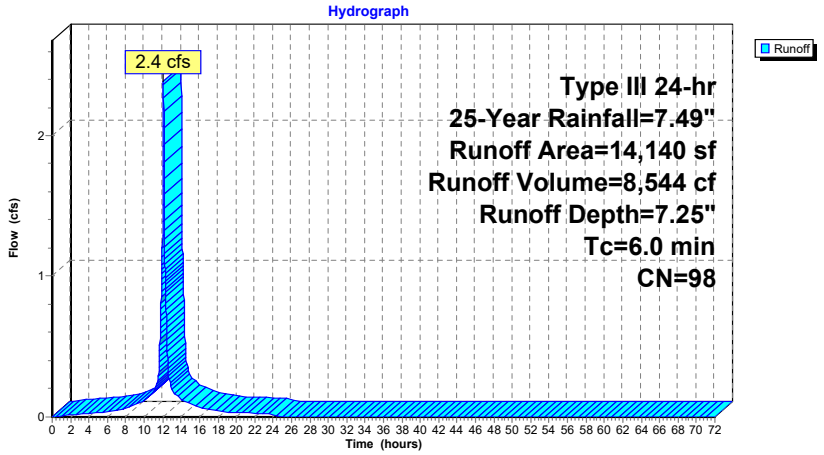
Runoff = 2.4 cfs @ 12.08 hrs, Volume= 8,544 cf, Depth= 7.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=7.49"

Area (sf)	CN	Description
14,140	98	Roofs, HSG C
14,140		100.00% Impervious Area

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

Subcatchment 2.1S: Building Roof-Southeast



Summary for Subcatchment 2S: Building Roof

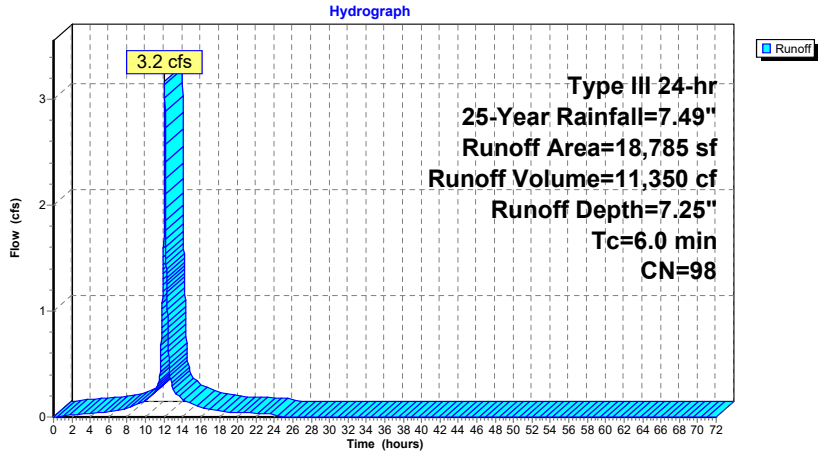
Runoff = 3.2 cfs @ 12.08 hrs, Volume= 11,350 cf, Depth= 7.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=7.49"

Area (sf)	CN	Description
18,785	98	Roofs, HSG C
18,785		100.00% Impervious Area

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

Subcatchment 2S: Building Roof



Summary for Subcatchment 3.1S: Backyard ADs

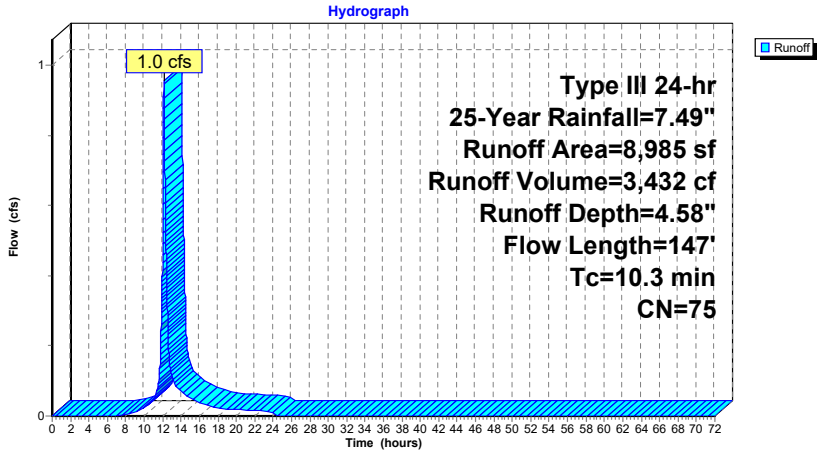
Runoff = 1.0 cfs @ 12.14 hrs, Volume= 3,432 cf, Depth= 4.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=7.49"

	Area (sf)	CN	Description
	272	98	Unconnected pavement, HSG C
	8,302	74	>75% Grass cover, Good, HSG C
*	411	89	Gravel sidewalk, HSG C
	8,985	75	Weighted Average
	8,713		96.97% Pervious Area
	272		3.03% Impervious Area
	272		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	50	0.0142	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.23"
0.9	97	0.0154	1.86		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
10.3	147	Total			

Subcatchment 3.1S: Backyard ADs



Summary for Subcatchment 3S: Townhouse Roofs

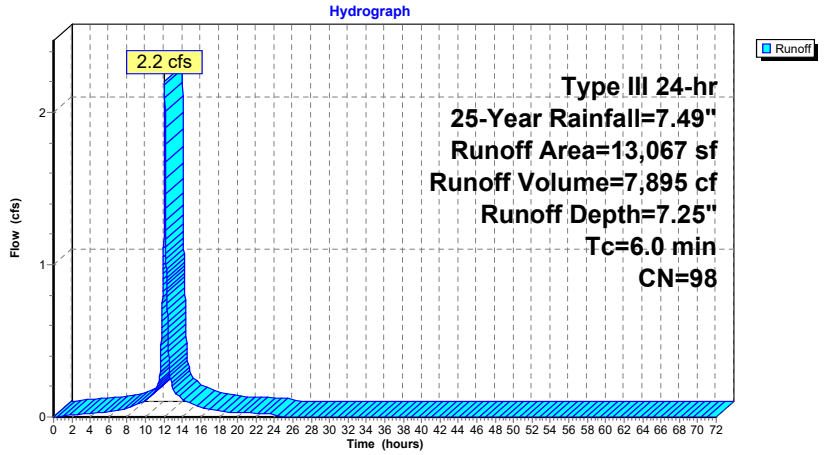
Runoff = 2.2 cfs @ 12.08 hrs, Volume= 7,895 cf, Depth= 7.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=7.49"

Area (sf)	CN	Description
13,067	98	Roofs, HSG C
13,067		100.00% Impervious Area

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

Subcatchment 3S: Townhouse Roofs



Summary for Subcatchment 4.2S: Townhouse TDs

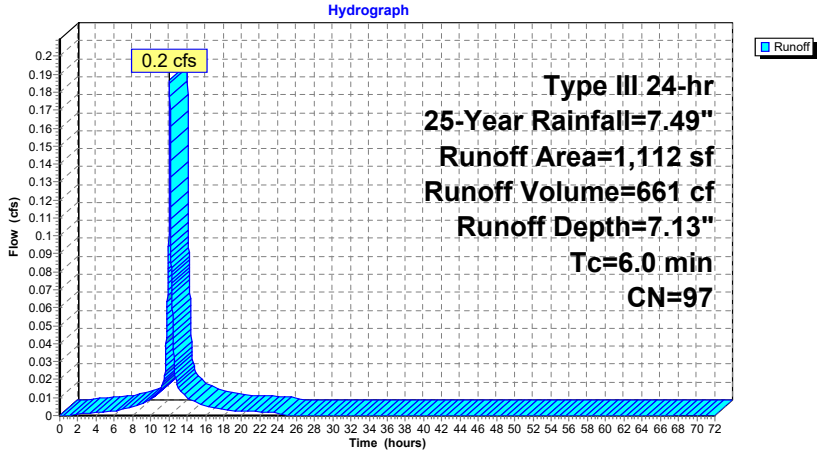
Runoff = 0.2 cfs @ 12.08 hrs, Volume= 661 cf, Depth= 7.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=7.49"

Area (sf)	CN	Description
1,064	98	Paved parking, HSG C
48	74	>75% Grass cover, Good, HSG C
1,112	97	Weighted Average
48		4.32% Pervious Area
1,064		95.68% Impervious Area

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

Subcatchment 4.2S: Townhouse TDs



Summary for Subcatchment 4.3S: Townhouse TDs

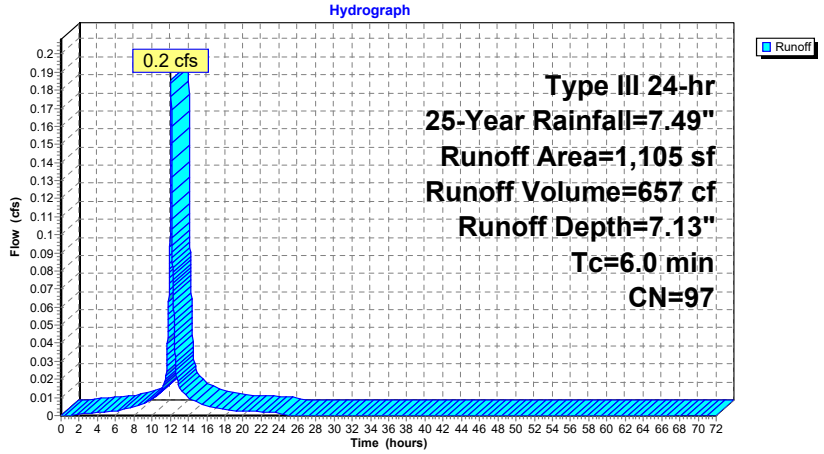
Runoff = 0.2 cfs @ 12.08 hrs, Volume= 657 cf, Depth= 7.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=7.49"

Area (sf)	CN	Description
1,075	98	Paved parking, HSG C
30	74	>75% Grass cover, Good, HSG C
1,105	97	Weighted Average
30		2.71% Pervious Area
1,075		97.29% Impervious Area

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

Subcatchment 4.3S: Townhouse TDs



Summary for Subcatchment 4.4S: Townhouse TDs

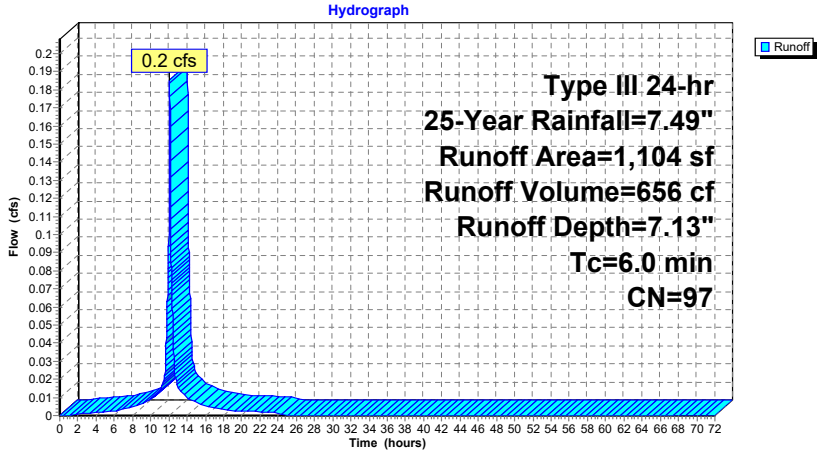
Runoff = 0.2 cfs @ 12.08 hrs, Volume= 656 cf, Depth= 7.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=7.49"

Area (sf)	CN	Description
1,076	98	Paved parking, HSG C
28	74	>75% Grass cover, Good, HSG C
1,104	97	Weighted Average
28		2.54% Pervious Area
1,076		97.46% Impervious Area

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

Subcatchment 4.4S: Townhouse TDs



Summary for Subcatchment 4.5S: Townhouse TDs

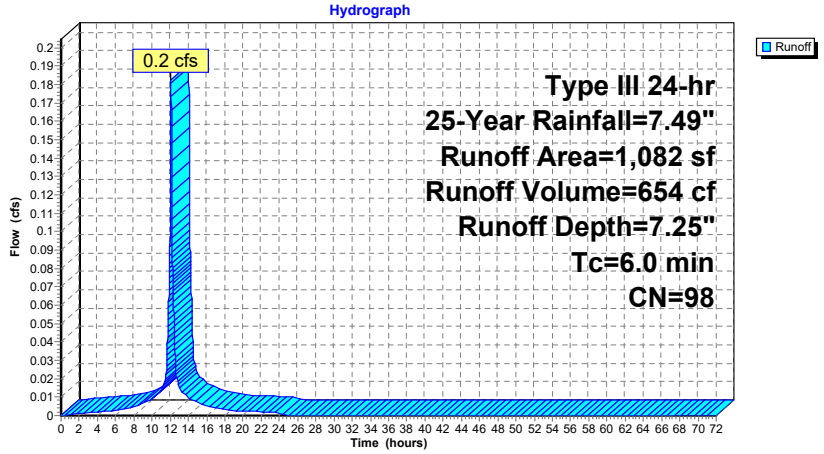
Runoff = 0.2 cfs @ 12.08 hrs, Volume= 654 cf, Depth= 7.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=7.49"

Area (sf)	CN	Description
1,061	98	Paved parking, HSG C
21	74	>75% Grass cover, Good, HSG C
1,082	98	Weighted Average
21		1.94% Pervious Area
1,061		98.06% Impervious Area

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

Subcatchment 4.5S: Townhouse TDs



Summary for Subcatchment 4.6S: Townhouse TDs

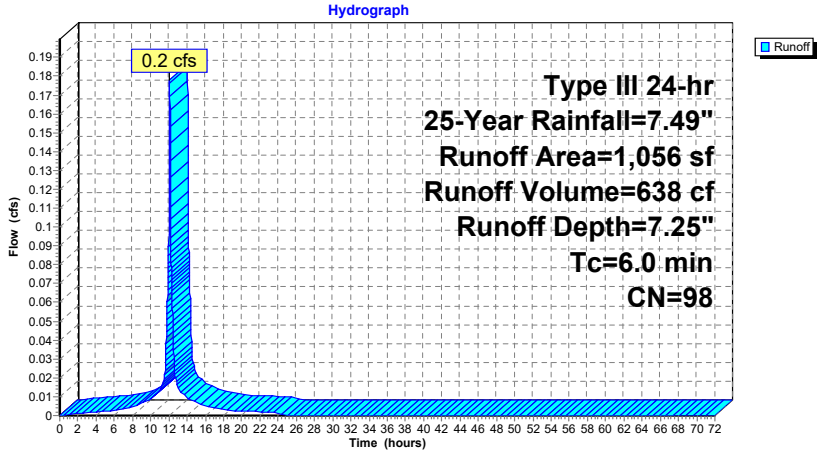
Runoff = 0.2 cfs @ 12.08 hrs, Volume= 638 cf, Depth= 7.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=7.49"

Area (sf)	CN	Description
1,048	98	Paved parking, HSG C
8	74	>75% Grass cover, Good, HSG C
1,056	98	Weighted Average
8		0.76% Pervious Area
1,048		99.24% Impervious Area

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

Subcatchment 4.6S: Townhouse TDs



Summary for Subcatchment 5S: TD-1

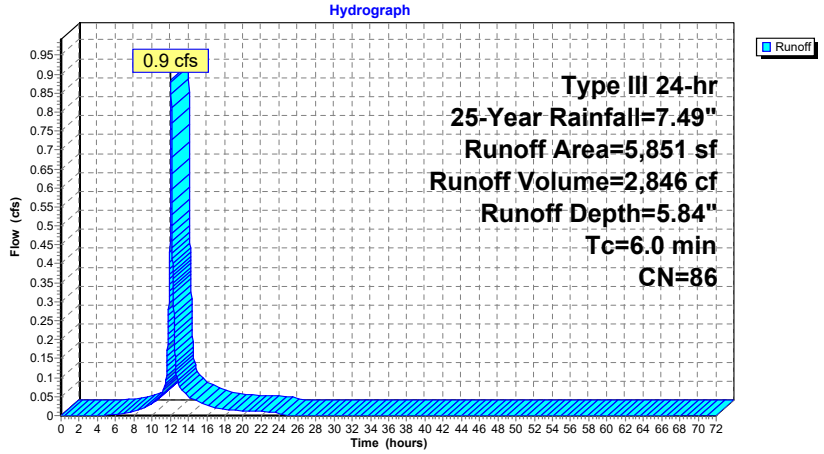
Runoff = 0.9 cfs @ 12.09 hrs, Volume= 2,846 cf, Depth= 5.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=7.49"

Area (sf)	CN	Description
3,021	98	Paved parking, HSG C
2,830	74	>75% Grass cover, Good, HSG C
5,851	86	Weighted Average
2,830		48.37% Pervious Area
3,021		51.63% Impervious Area

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

Subcatchment 5S: TD-1



Summary for Subcatchment 6.1S: East driveway

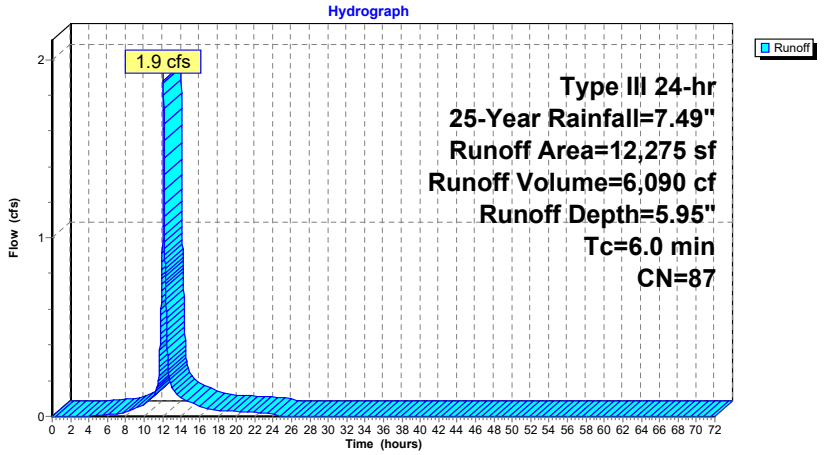
Runoff = 1.9 cfs @ 12.08 hrs, Volume= 6,090 cf, Depth= 5.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=7.49"

Area (sf)	CN	Description
5,611	74	>75% Grass cover, Good, HSG C
6,444	98	Paved roads w/curbs & sewers, HSG C
220	89	Gravel roads, HSG C
12,275	87	Weighted Average
5,831		47.50% Pervious Area
6,444		52.50% Impervious Area

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

Subcatchment 6.1S: East driveway



Summary for Subcatchment 6S: Bypass Towards Wetlands

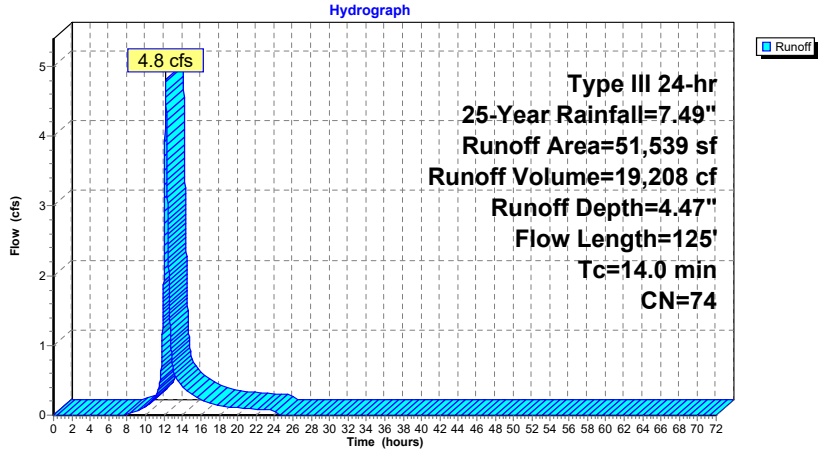
Runoff = 4.8 cfs @ 12.19 hrs, Volume= 19,208 cf, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=7.49"

Area (sf)	CN	Description
4,985	70	Woods, Good, HSG C
46,447	74	>75% Grass cover, Good, HSG C
107	98	Roofs, HSG C
51,539	74	Weighted Average
51,432		99.79% Pervious Area
107		0.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0220	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.23"
2.2	75	0.0133	0.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.0	125	Total			

Subcatchment 6S: Bypass Towards Wetlands



Summary for Subcatchment 7S: To Street

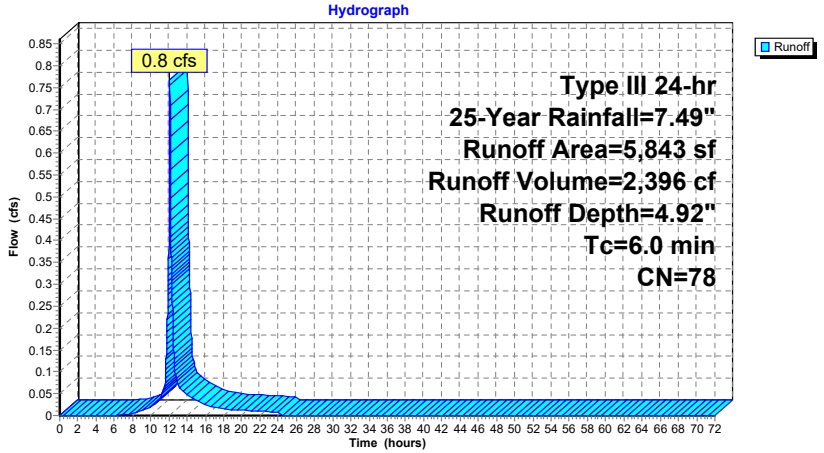
Runoff = 0.8 cfs @ 12.09 hrs, Volume= 2,396 cf, Depth= 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=7.49"

Area (sf)	CN	Description
1,056	98	Paved parking, HSG C
4,787	74	>75% Grass cover, Good, HSG C
5,843	78	Weighted Average
4,787		81.93% Pervious Area
1,056		18.07% Impervious Area

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

Subcatchment 7S: To Street



Summary for Pond 1P: Underground Infiltration System

Inflow Area = 69,430 sf, 74.25% Impervious, Inflow Depth = 6.51" for 25-Year event
Inflow = 7.8 cfs @ 12.09 hrs, Volume= 37,693 cf
Outflow = 2.2 cfs @ 12.48 hrs, Volume= 37,693 cf, Atten= 72%, Lag= 23.4 min
Discarded = 0.1 cfs @ 6.41 hrs, Volume= 17,250 cf
Primary = 2.1 cfs @ 12.48 hrs, Volume= 20,443 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 8.24' @ 12.48 hrs Surf.Area= 7,556 sf Storage= 14,532 cf

Plug-Flow detention time= 520.8 min calculated for 37,693 cf (100% of inflow)
Center-of-Mass det. time= 520.8 min (1,338.6 - 817.7)

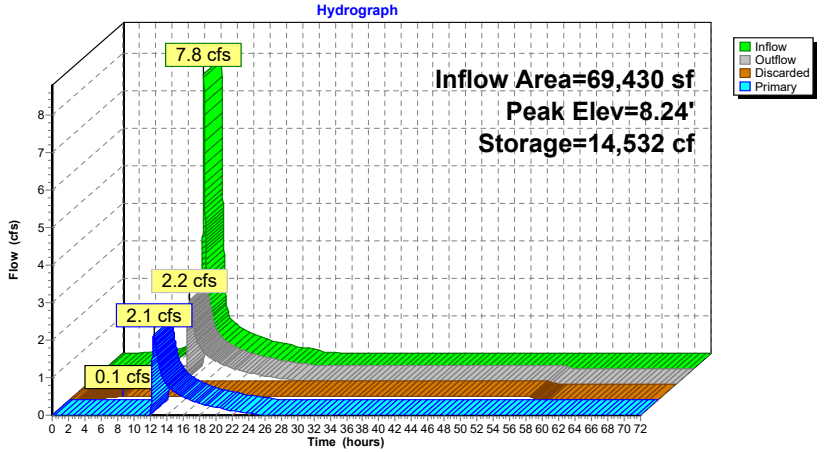
Volume	Invert	Avail.Storage	Storage Description
#1	6.00'	19,495 cf	**6.89'W x 14.06'L x 3.00'H StormTrap ST-1 Units (Irregular Shape)** x 78 22,668 cf Overall x 86.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	7.50'	**15.0" Round Culvert** L= 190.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 7.50' / 6.00' S= 0.0079 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Discarded OutFlow Max=0.1 cfs @ 6.41 hrs HW=6.03' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=2.1 cfs @ 12.48 hrs HW=8.24' (Free Discharge)
└**2=Culvert** (Barrel Controls 2.1 cfs @ 4.10 fps)

Pond 1P: Underground Infiltration System



Summary for Pond 2P: Rooftop Detention

Inflow Area = 18,785 sf,100.00% Impervious, Inflow Depth = 7.25" for 25-Year event
Inflow = 3.2 cfs @ 12.08 hrs, Volume= 11,350 cf
Outflow = 0.3 cfs @ 12.74 hrs, Volume= 11,350 cf, Atten= 89%, Lag= 39.4 min
Primary = 0.3 cfs @ 12.74 hrs, Volume= 11,350 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 57.67' @ 12.74 hrs Surf.Area= 7,500 sf Storage= 5,027 cf

Plug-Flow detention time= 180.4 min calculated for 11,348 cf (100% of inflow)
Center-of-Mass det. time= 180.7 min (922.8 - 742.1)

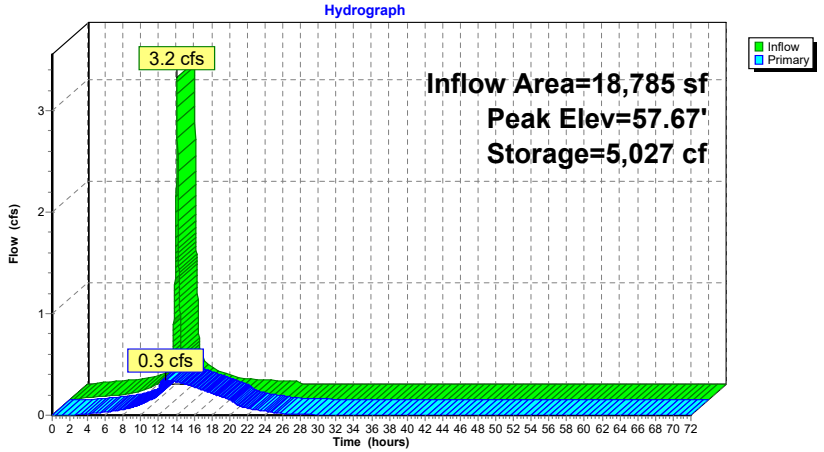
Volume	Invert	Avail.Storage	Storage Description
#1	57.00'	7,500 cf	**Rooftop Detention (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
57.00	7,500	0	0
58.00	7,500	7,500	7,500

Device	Routing	Invert	Outlet Devices
#1	Primary	8.02'	**12.0" Round Roof Drain** L= 16.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 8.02' / 7.70' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	57.00'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.3 cfs @ 12.74 hrs HW=57.67' (Free Discharge)
└─**1=Roof Drain** (Passes 0.3 cfs of 23.4 cfs potential flow)
└─**2=Orifice/Grate** (Orifice Controls 0.3 cfs @ 3.94 fps)

Pond 2P: Rooftop Detention



Summary for Pond 3P: Rain garden

Inflow Area = 12,275 sf, 52.50% Impervious, Inflow Depth = 5.95" for 25-Year event
Inflow = 1.9 cfs @ 12.08 hrs, Volume= 6,090 cf
Outflow = 1.9 cfs @ 12.09 hrs, Volume= 6,090 cf, Atten= 0%, Lag= 0.3 min
Discarded = 0.0 cfs @ 12.09 hrs, Volume= 452 cf
Primary = 1.9 cfs @ 12.09 hrs, Volume= 5,638 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 6.41' @ 12.09 hrs Surf.Area= 409 sf Storage= 214 cf

Plug-Flow detention time= 40.5 min calculated for 6,090 cf (100% of inflow)
Center-of-Mass det. time= 40.7 min (827.8 - 787.1)

Volume	Invert	Avail.Storage	Storage Description
#1	5.60'	253 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

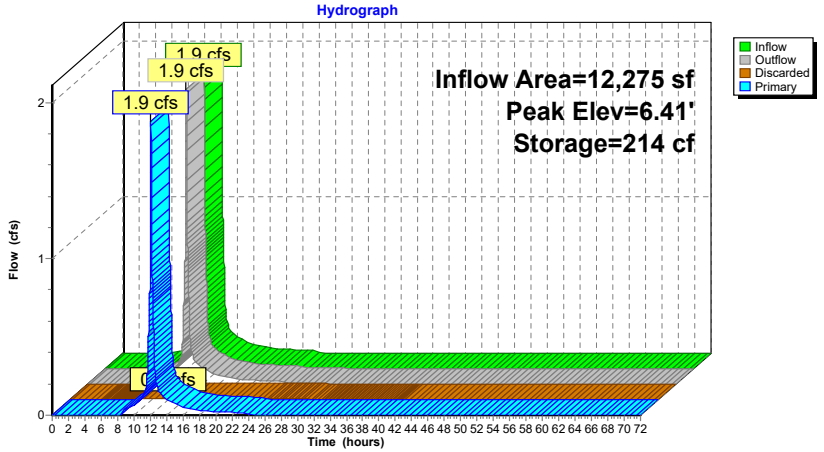
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.60	125	46.0	0	0	125
6.00	276	66.0	78	78	305
6.30	350	73.0	94	172	385
6.50	460	87.0	81	253	564

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.60'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	6.30'	**22.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.0 cfs @ 12.09 hrs HW=6.41' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=1.9 cfs @ 12.09 hrs HW=6.41' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 1.9 cfs @ 0.78 fps)

Pond 3P: Rain garden



Summary for Pond TD2:

Inflow Area = 1,112 sf, 95.68% Impervious, Inflow Depth = 7.13" for 25-Year event
Inflow = 0.2 cfs @ 12.08 hrs, Volume= 661 cf
Outflow = 0.0 cfs @ 7.25 hrs, Volume= 661 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.0 cfs @ 7.25 hrs, Volume= 661 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 7.95' @ 17.82 hrs Surf.Area= 278 sf Storage= 445 cf

Plug-Flow detention time= 1,156.2 min calculated for 661 cf (100% of inflow)
Center-of-Mass det. time= 1,156.4 min (1,904.6 - 748.2)

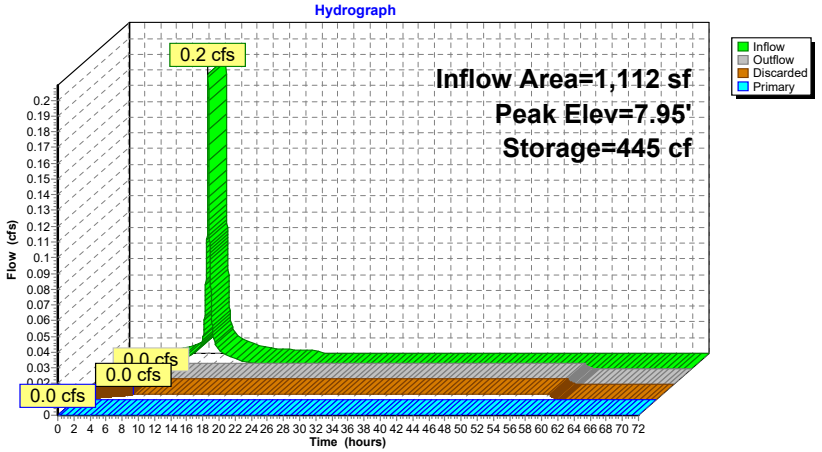
Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.50'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	10.00'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 7.25 hrs HW=5.55' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD2:



Summary for Pond TD3:

Inflow Area = 1,105 sf, 97.29% Impervious, Inflow Depth = 7.13" for 25-Year event
Inflow = 0.2 cfs @ 12.08 hrs, Volume= 657 cf
Outflow = 0.0 cfs @ 7.29 hrs, Volume= 657 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.0 cfs @ 7.29 hrs, Volume= 657 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 7.93' @ 17.79 hrs Surf.Area= 278 sf Storage= 442 cf

Plug-Flow detention time= 1,148.4 min calculated for 657 cf (100% of inflow)
Center-of-Mass det. time= 1,148.6 min (1,896.8 - 748.2)

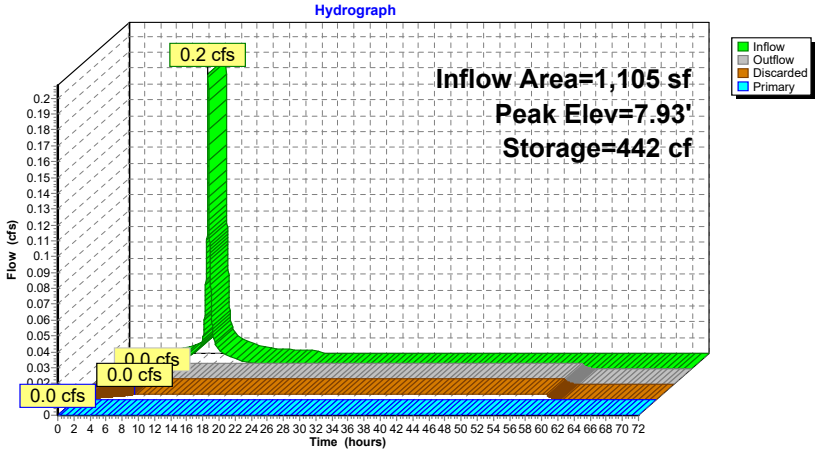
Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.50'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	10.30'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 7.29 hrs HW=5.55' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD3:



Summary for Pond TD4:

Inflow Area = 1,104 sf, 97.46% Impervious, Inflow Depth = 7.13" for 25-Year event
Inflow = 0.2 cfs @ 12.08 hrs, Volume= 656 cf
Outflow = 0.0 cfs @ 7.29 hrs, Volume= 656 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.0 cfs @ 7.29 hrs, Volume= 656 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 7.93' @ 17.79 hrs Surf.Area= 278 sf Storage= 442 cf

Plug-Flow detention time= 1,146.6 min calculated for 656 cf (100% of inflow)
Center-of-Mass det. time= 1,146.8 min (1,895.0 - 748.2)

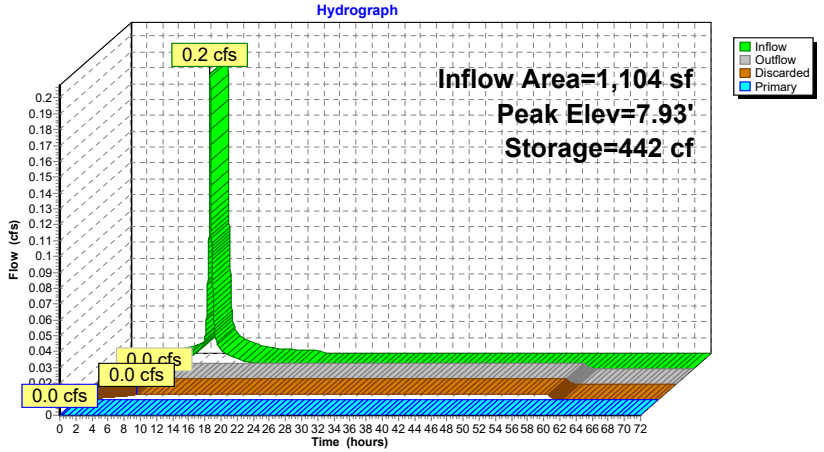
Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.50'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	10.20'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 7.29 hrs HW=5.55' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD4:



Summary for Pond TD5:

Inflow Area = 1,082 sf, 98.06% Impervious, Inflow Depth = 7.25" for 25-Year event
Inflow = 0.2 cfs @ 12.08 hrs, Volume= 654 cf
Outflow = 0.0 cfs @ 7.14 hrs, Volume= 654 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.0 cfs @ 7.14 hrs, Volume= 654 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 7.39' @ 17.72 hrs Surf.Area= 278 sf Storage= 435 cf

Plug-Flow detention time= 1,119.4 min calculated for 654 cf (100% of inflow)
Center-of-Mass det. time= 1,119.5 min (1,861.6 - 742.1)

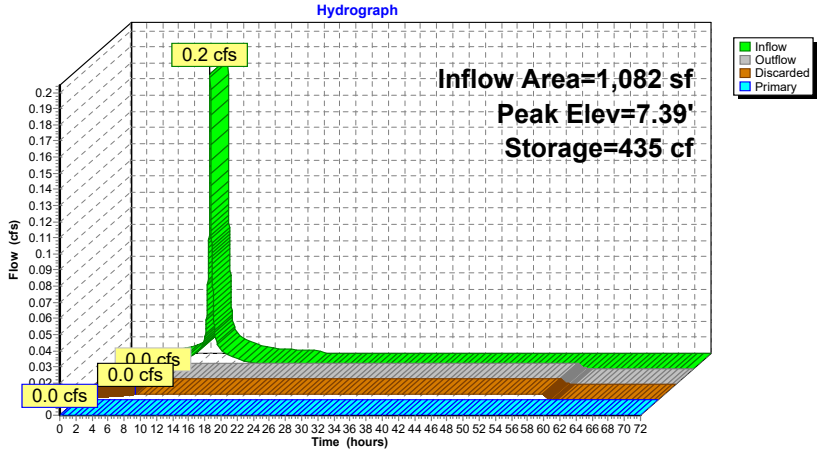
Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	5.50'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.00'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	9.80'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 7.14 hrs HW=5.05' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.00' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD5:



Summary for Pond TD6:

Inflow Area = 1,056 sf, 99.24% Impervious, Inflow Depth = 7.25" for 25-Year event
Inflow = 0.2 cfs @ 12.08 hrs, Volume= 638 cf
Outflow = 0.0 cfs @ 7.20 hrs, Volume= 638 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.0 cfs @ 7.20 hrs, Volume= 638 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 7.32' @ 17.64 hrs Surf.Area= 278 sf Storage= 421 cf

Plug-Flow detention time= 1,083.3 min calculated for 638 cf (100% of inflow)
Center-of-Mass det. time= 1,083.5 min (1,825.5 - 742.1)

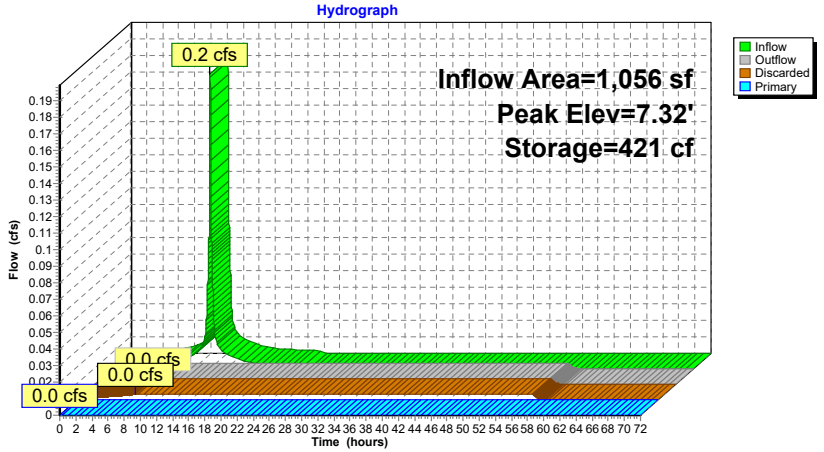
Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	5.50'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.00'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	9.50'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 7.20 hrs HW=5.05' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.00' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD6:

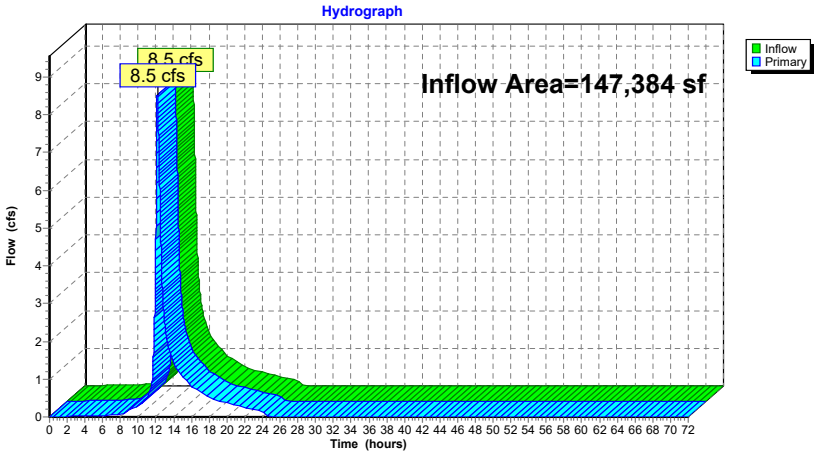


Summary for Link 1L: Towards Wetlands

Inflow Area = 147,384 sf, 49.02% Impervious, Inflow Depth = 4.38" for 25-Year event
Inflow = 8.5 cfs @ 12.15 hrs, Volume= 53,833 cf
Primary = 8.5 cfs @ 12.15 hrs, Volume= 53,833 cf, Atten= 0%, Lag= 0.0 min

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

Link 1L: Towards Wetlands

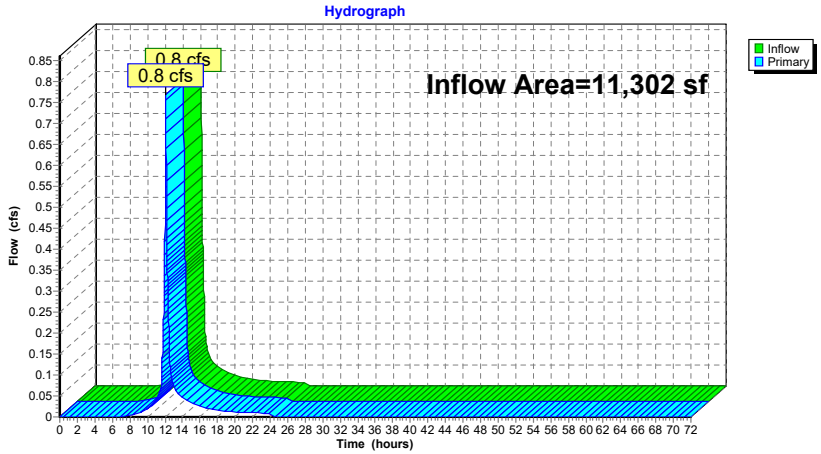


Summary for Link 2L: Towards Street

Inflow Area = 11,302 sf, 56.45% Impervious, Inflow Depth = 2.54" for 25-Year event
Inflow = 0.8 cfs @ 12.09 hrs, Volume= 2,396 cf
Primary = 0.8 cfs @ 12.09 hrs, Volume= 2,396 cf, Atten= 0%, Lag= 0.0 min

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

Link 2L: Towards Street

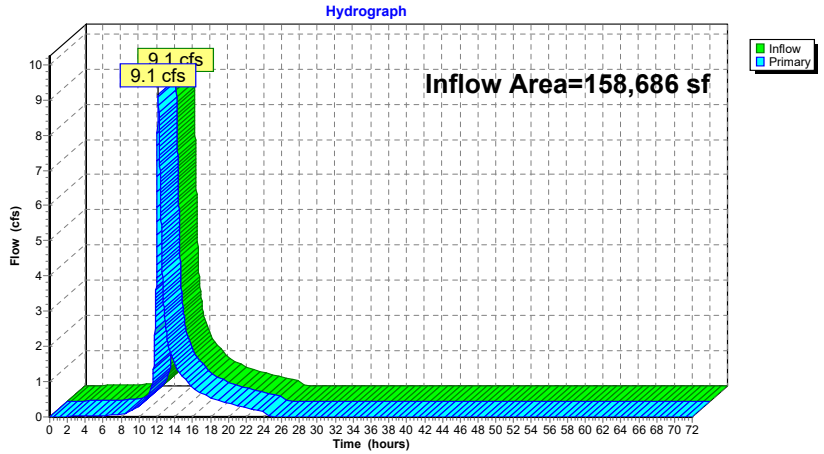


Summary for Link 100L: Total Flows

Inflow Area = 158,686 sf, 49.55% Impervious, Inflow Depth = 4.25" for 25-Year event
Inflow = 9.1 cfs @ 12.14 hrs, Volume= 56,229 cf
Primary = 9.1 cfs @ 12.14 hrs, Volume= 56,229 cf, Atten= 0%, Lag= 0.0 min

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

Link 100L: Total Flows



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

Subcatchment 1S: CB-1 Runoff Area=22,742 sf 72.16% Impervious Runoff Depth=7.64"
Tc=6.0 min CN=91 Runoff=4.3 cfs 14,472 cf

Subcatchment 2.1S: Building Runoff Area=14,140 sf 100.00% Impervious Runoff Depth=8.48"
Tc=6.0 min CN=98 Runoff=2.8 cfs 9,992 cf

Subcatchment 2S: Building Roof Runoff Area=18,785 sf 100.00% Impervious Runoff Depth=8.48"
Tc=6.0 min CN=98 Runoff=3.7 cfs 13,274 cf

Subcatchment 3.1S: Backyard ADs Runoff Area=8,985 sf 3.03% Impervious Runoff Depth=5.70"
Flow Length=147' Tc=10.3 min CN=75 Runoff=1.2 cfs 4,265 cf

Subcatchment 3S: Townhouse Roofs Runoff Area=13,067 sf 100.00% Impervious Runoff Depth=8.48"
Tc=6.0 min CN=98 Runoff=2.6 cfs 9,234 cf

Subcatchment 4.2S: Townhouse TDs Runoff Area=1,112 sf 95.68% Impervious Runoff Depth=8.36"
Tc=6.0 min CN=97 Runoff=0.2 cfs 775 cf

Subcatchment 4.3S: Townhouse TDs Runoff Area=1,105 sf 97.29% Impervious Runoff Depth=8.36"
Tc=6.0 min CN=97 Runoff=0.2 cfs 770 cf

Subcatchment 4.4S: Townhouse TDs Runoff Area=1,104 sf 97.46% Impervious Runoff Depth=8.36"
Tc=6.0 min CN=97 Runoff=0.2 cfs 769 cf

Subcatchment 4.5S: Townhouse TDs Runoff Area=1,082 sf 98.06% Impervious Runoff Depth=8.48"
Tc=6.0 min CN=98 Runoff=0.2 cfs 765 cf

Subcatchment 4.6S: Townhouse TDs Runoff Area=1,056 sf 99.24% Impervious Runoff Depth=8.48"
Tc=6.0 min CN=98 Runoff=0.2 cfs 746 cf

Subcatchment 5S: TD-1 Runoff Area=5,851 sf 51.63% Impervious Runoff Depth=7.03"
Tc=6.0 min CN=86 Runoff=1.1 cfs 3,428 cf

Subcatchment 6.1S: East driveway Runoff Area=12,275 sf 52.50% Impervious Runoff Depth=7.15"
Tc=6.0 min CN=87 Runoff=2.2 cfs 7,316 cf

Subcatchment 6S: Bypass Towards Runoff Area=51,539 sf 0.21% Impervious Runoff Depth=5.57"
Flow Length=125' Tc=14.0 min CN=74 Runoff=6.0 cfs 23,941 cf

Subcatchment 7S: To Street Runoff Area=5,843 sf 18.07% Impervious Runoff Depth=6.06"
Tc=6.0 min CN=78 Runoff=0.9 cfs 2,951 cf

Pond 1P: Underground Infiltration System Peak Elev=8.47' Storage=16,066 cf Inflow=9.3 cfs 44,673 cf
Discarded=0.1 cfs 17,581 cf Primary=3.4 cfs 27,092 cf Outflow=3.5 cfs 44,673 cf

Pond 2P: Rooftop Detention Peak Elev=57.80' Storage=5,966 cf Inflow=3.7 cfs 13,274 cf
Outflow=0.4 cfs 13,274 cf

Pond 3P: Rain garden Peak Elev=6.42' Storage=219 cf Inflow=2.2 cfs 7,316 cf
Discarded=0.0 cfs 462 cf Primary=2.2 cfs 6,854 cf Outflow=2.2 cfs 7,316 cf

Pond TD2: Peak Elev=8.43' Storage=543 cf Inflow=0.2 cfs 775 cf
Discarded=0.0 cfs 775 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 775 cf

Pond TD3: Peak Elev=8.41' Storage=539 cf Inflow=0.2 cfs 770 cf
Discarded=0.0 cfs 770 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 770 cf

Pond TD4: Peak Elev=8.41' Storage=538 cf Inflow=0.2 cfs 769 cf
Discarded=0.0 cfs 769 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 769 cf

Pond TD5: Peak Elev=7.87' Storage=529 cf Inflow=0.2 cfs 765 cf
Discarded=0.0 cfs 765 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 765 cf

Pond TD6: Peak Elev=7.78' Storage=513 cf Inflow=0.2 cfs 746 cf
Discarded=0.0 cfs 746 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 746 cf

Link 1L: Towards Wetlands Inflow=11.8 cfs 67,879 cf
Primary=11.8 cfs 67,879 cf

Link 2L: Towards Street Inflow=0.9 cfs 2,951 cf
Primary=0.9 cfs 2,951 cf

Link 100L: Total Flows Inflow=12.5 cfs 70,830 cf
Primary=12.5 cfs 70,830 cf

Total Runoff Area = 158,686 sf Runoff Volume = 92,697 cf Average Runoff Depth = 7.01"
50.45% Pervious = 80,060 sf 49.55% Impervious = 78,626 sf

Summary for Subcatchment 1S: CB-1

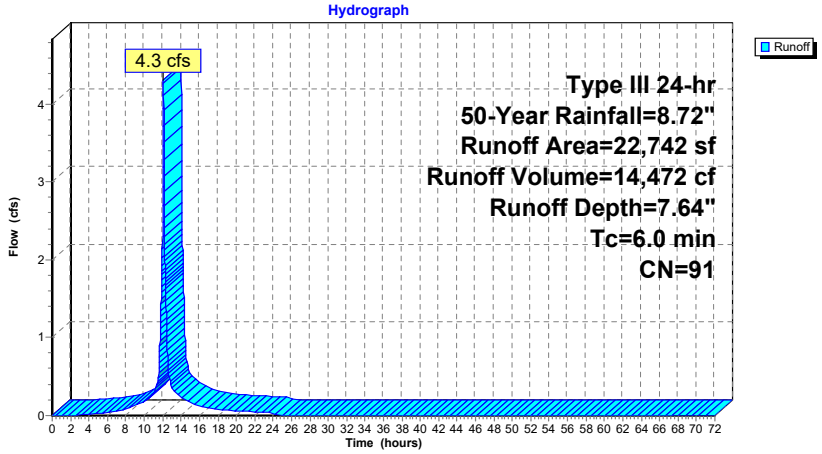
Runoff = 4.3 cfs @ 12.08 hrs, Volume= 14,472 cf, Depth= 7.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=8.72"

Area (sf)	CN	Description
16,410	98	Paved parking, HSG C
6,332	74	>75% Grass cover, Good, HSG C
22,742	91	Weighted Average
6,332		27.84% Pervious Area
16,410		72.16% Impervious Area

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

Subcatchment 1S: CB-1



Summary for Subcatchment 2.1S: Building Roof-Southeast

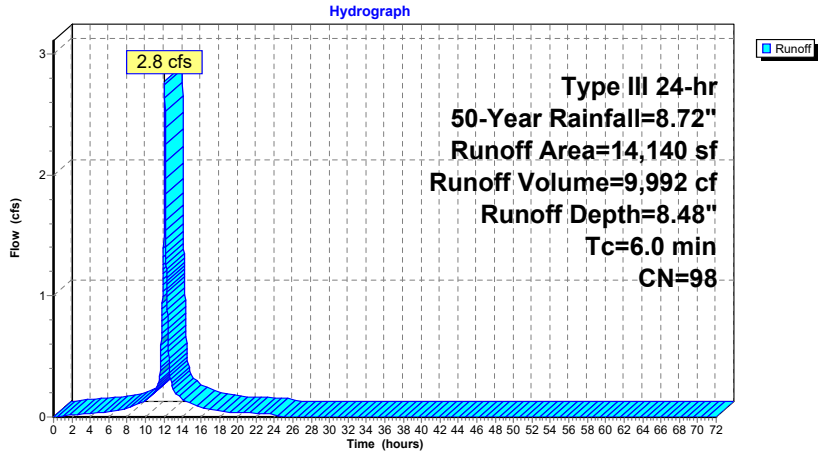
Runoff = 2.8 cfs @ 12.08 hrs, Volume= 9,992 cf, Depth= 8.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=8.72"

Area (sf)	CN	Description
14,140	98	Roofs, HSG C
14,140		100.00% Impervious Area

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

Subcatchment 2.1S: Building Roof-Southeast



Summary for Subcatchment 2S: Building Roof

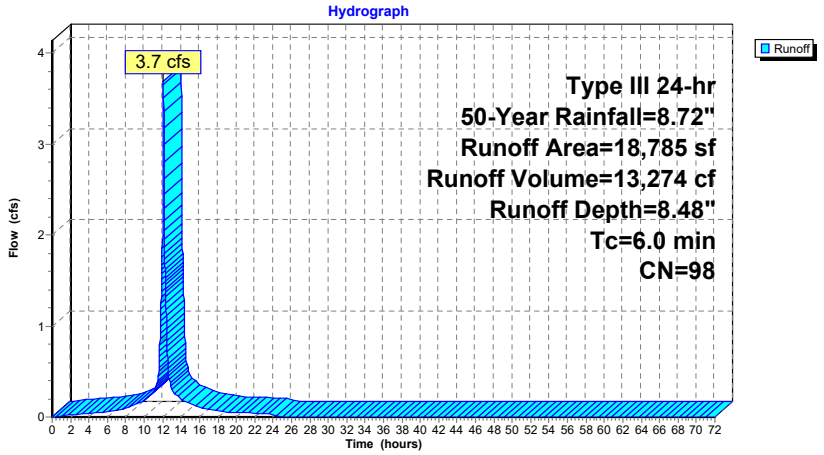
Runoff = 3.7 cfs @ 12.08 hrs, Volume= 13,274 cf, Depth= 8.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=8.72"

Area (sf)	CN	Description
18,785	98	Roofs, HSG C
18,785		100.00% Impervious Area

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

Subcatchment 2S: Building Roof



Summary for Subcatchment 3.1S: Backyard ADs

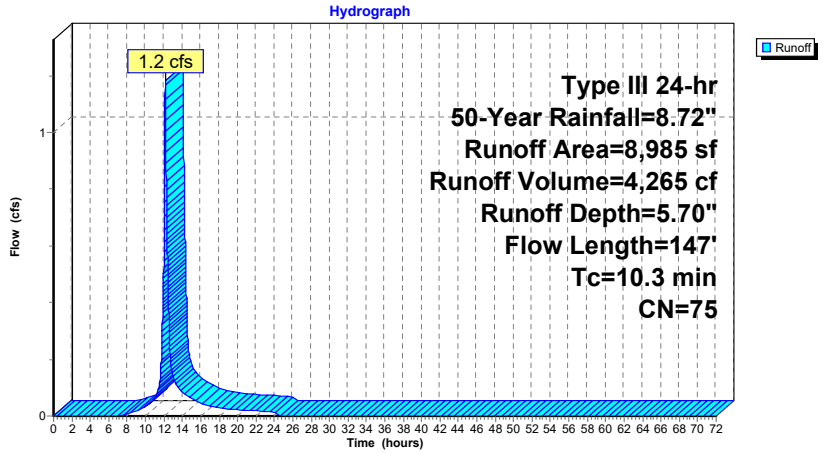
Runoff = 1.2 cfs @ 12.14 hrs, Volume= 4,265 cf, Depth= 5.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=8.72"

	Area (sf)	CN	Description
	272	98	Unconnected pavement, HSG C
	8,302	74	>75% Grass cover, Good, HSG C
*	411	89	Gravel sidewalk, HSG C
	8,985	75	Weighted Average
	8,713		96.97% Pervious Area
	272		3.03% Impervious Area
	272		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	50	0.0142	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.23"
0.9	97	0.0154	1.86		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
10.3	147	Total			

Subcatchment 3.1S: Backyard ADs



Summary for Subcatchment 3S: Townhouse Roofs

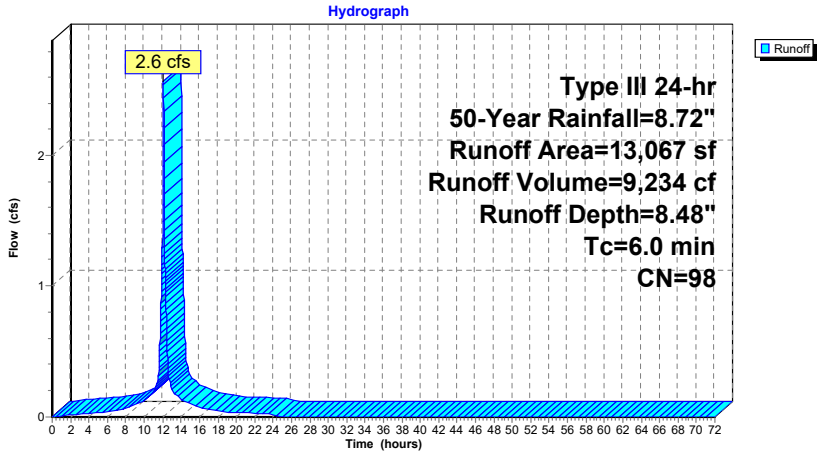
Runoff = 2.6 cfs @ 12.08 hrs, Volume= 9,234 cf, Depth= 8.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=8.72"

Area (sf)	CN	Description
13,067	98	Roofs, HSG C
13,067		100.00% Impervious Area

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

Subcatchment 3S: Townhouse Roofs



Summary for Subcatchment 4.2S: Townhouse TDs

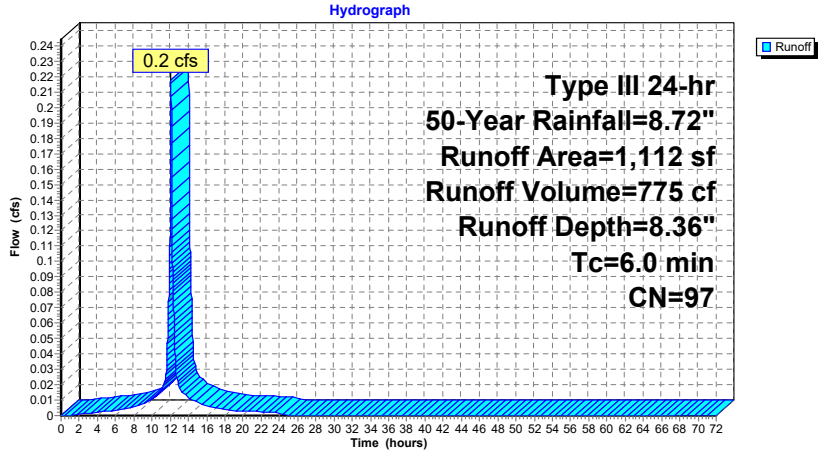
Runoff = 0.2 cfs @ 12.08 hrs, Volume= 775 cf, Depth= 8.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=8.72"

Area (sf)	CN	Description
1,064	98	Paved parking, HSG C
48	74	>75% Grass cover, Good, HSG C
1,112	97	Weighted Average
48		4.32% Pervious Area
1,064		95.68% Impervious Area

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

Subcatchment 4.2S: Townhouse TDs



Summary for Subcatchment 4.3S: Townhouse TDs

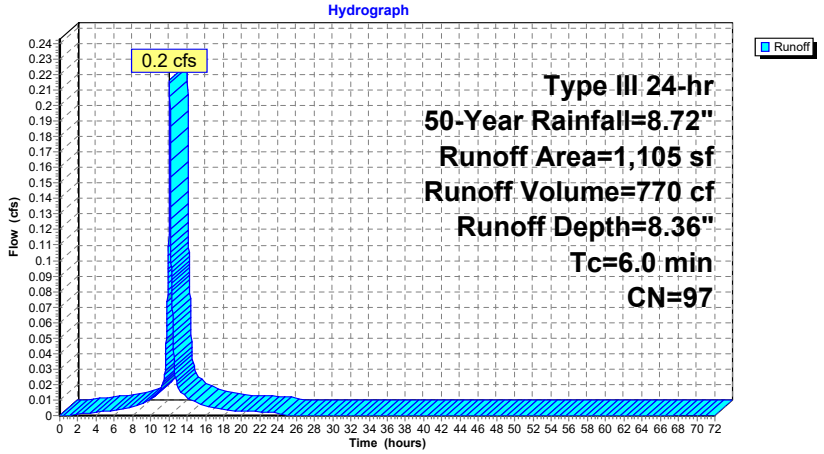
Runoff = 0.2 cfs @ 12.08 hrs, Volume= 770 cf, Depth= 8.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=8.72"

Area (sf)	CN	Description
1,075	98	Paved parking, HSG C
30	74	>75% Grass cover, Good, HSG C
1,105	97	Weighted Average
30		2.71% Pervious Area
1,075		97.29% Impervious Area

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

Subcatchment 4.3S: Townhouse TDs



Summary for Subcatchment 4.4S: Townhouse TDs

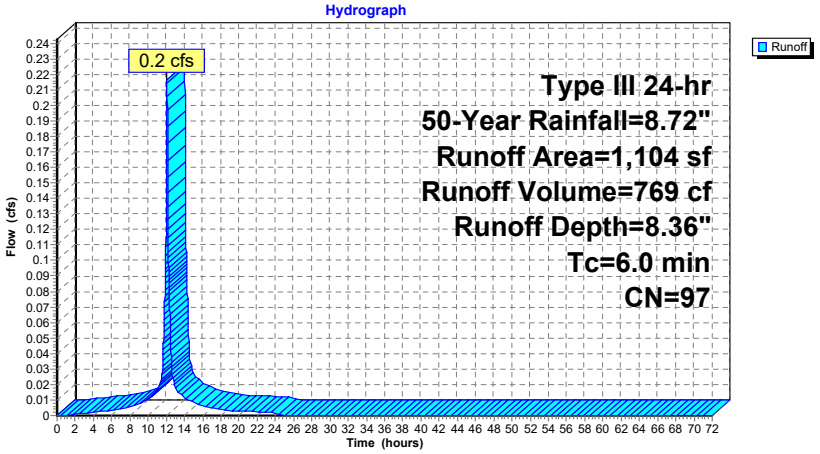
Runoff = 0.2 cfs @ 12.08 hrs, Volume= 769 cf, Depth= 8.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=8.72"

Area (sf)	CN	Description
1,076	98	Paved parking, HSG C
28	74	>75% Grass cover, Good, HSG C
1,104	97	Weighted Average
28		2.54% Pervious Area
1,076		97.46% Impervious Area

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

Subcatchment 4.4S: Townhouse TDs



Summary for Subcatchment 4.5S: Townhouse TDs

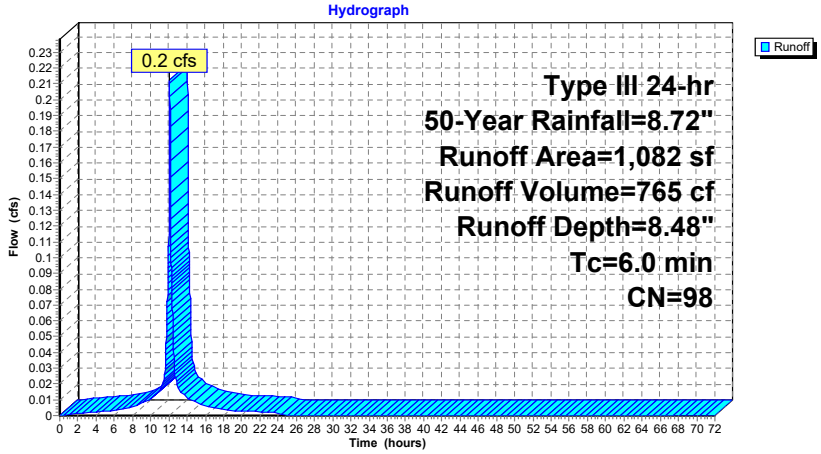
Runoff = 0.2 cfs @ 12.08 hrs, Volume= 765 cf, Depth= 8.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=8.72"

Area (sf)	CN	Description
1,061	98	Paved parking, HSG C
21	74	>75% Grass cover, Good, HSG C
1,082	98	Weighted Average
21		1.94% Pervious Area
1,061		98.06% Impervious Area

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

Subcatchment 4.5S: Townhouse TDs



Summary for Subcatchment 4.6S: Townhouse TDs

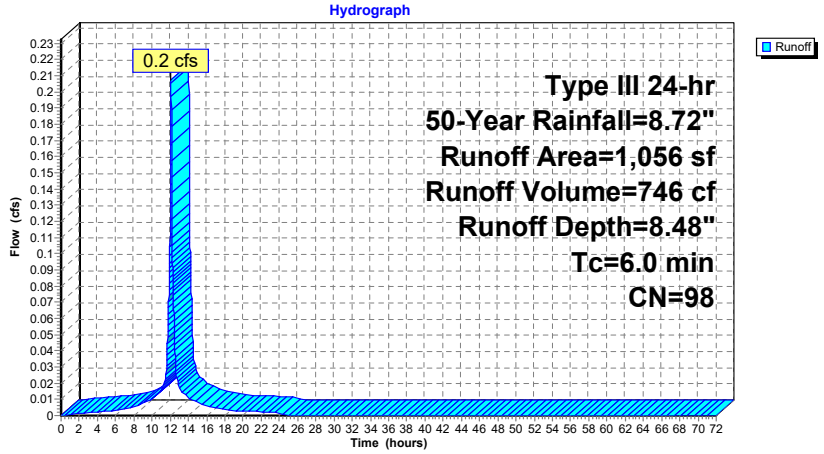
Runoff = 0.2 cfs @ 12.08 hrs, Volume= 746 cf, Depth= 8.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=8.72"

Area (sf)	CN	Description
1,048	98	Paved parking, HSG C
8	74	>75% Grass cover, Good, HSG C
1,056	98	Weighted Average
8		0.76% Pervious Area
1,048		99.24% Impervious Area

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

Subcatchment 4.6S: Townhouse TDs



Summary for Subcatchment 5S: TD-1

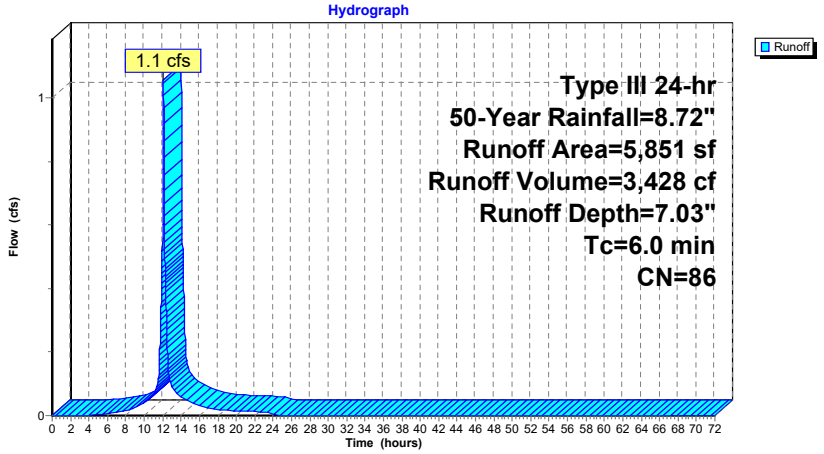
Runoff = 1.1 cfs @ 12.08 hrs, Volume= 3,428 cf, Depth= 7.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=8.72"

Area (sf)	CN	Description
3,021	98	Paved parking, HSG C
2,830	74	>75% Grass cover, Good, HSG C
5,851	86	Weighted Average
2,830		48.37% Pervious Area
3,021		51.63% Impervious Area

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

Subcatchment 5S: TD-1



Summary for Subcatchment 6.1S: East driveway

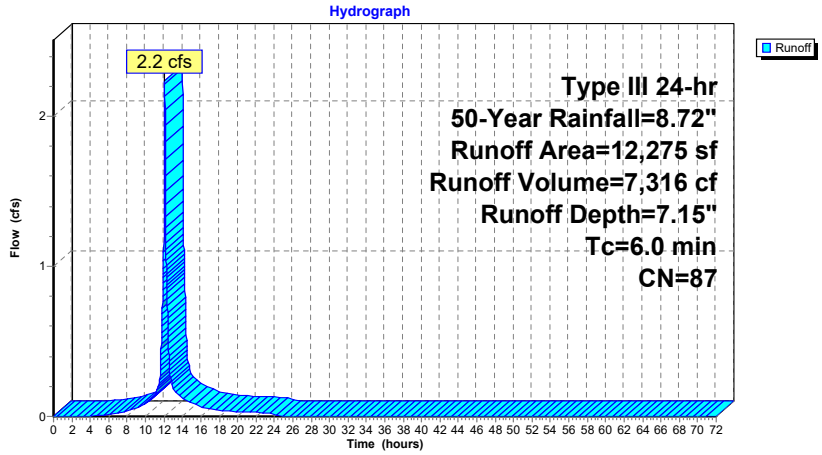
Runoff = 2.2 cfs @ 12.08 hrs, Volume= 7,316 cf, Depth= 7.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=8.72"

Area (sf)	CN	Description
5,611	74	>75% Grass cover, Good, HSG C
6,444	98	Paved roads w/curbs & sewers, HSG C
220	89	Gravel roads, HSG C
12,275	87	Weighted Average
5,831		47.50% Pervious Area
6,444		52.50% Impervious Area

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

Subcatchment 6.1S: East driveway



Summary for Subcatchment 6S: Bypass Towards Wetlands

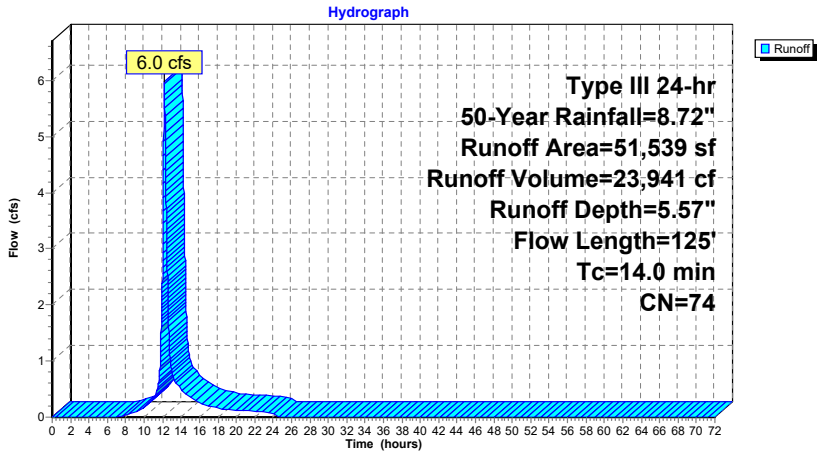
Runoff = 6.0 cfs @ 12.19 hrs, Volume= 23,941 cf, Depth= 5.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=8.72"

Area (sf)	CN	Description
4,985	70	Woods, Good, HSG C
46,447	74	>75% Grass cover, Good, HSG C
107	98	Roofs, HSG C
51,539	74	Weighted Average
51,432		99.79% Pervious Area
107		0.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0220	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.23"
2.2	75	0.0133	0.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.0	125	Total			

Subcatchment 6S: Bypass Towards Wetlands



Summary for Subcatchment 7S: To Street

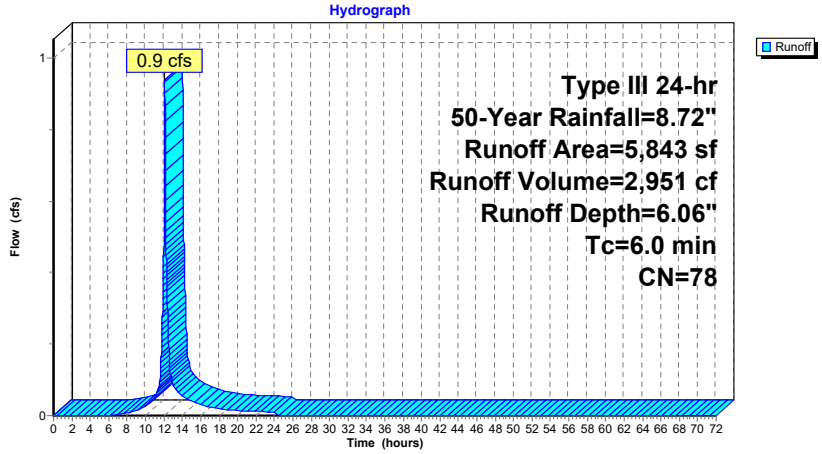
Runoff = 0.9 cfs @ 12.09 hrs, Volume= 2,951 cf, Depth= 6.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=8.72"

Area (sf)	CN	Description
1,056	98	Paved parking, HSG C
4,787	74	>75% Grass cover, Good, HSG C
5,843	78	Weighted Average
4,787		81.93% Pervious Area
1,056		18.07% Impervious Area

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

Subcatchment 7S: To Street



Summary for Pond 1P: Underground Infiltration System

Inflow Area = 69,430 sf, 74.25% Impervious, Inflow Depth = 7.72" for 50-Year event
Inflow = 9.3 cfs @ 12.09 hrs, Volume= 44,673 cf
Outflow = 3.5 cfs @ 12.38 hrs, Volume= 44,673 cf, Atten= 63%, Lag= 17.4 min
Discarded = 0.1 cfs @ 5.56 hrs, Volume= 17,581 cf
Primary = 3.4 cfs @ 12.38 hrs, Volume= 27,092 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 8.47' @ 12.38 hrs Surf.Area= 7,556 sf Storage= 16,066 cf

Plug-Flow detention time= 455.4 min calculated for 44,673 cf (100% of inflow)
Center-of-Mass det. time= 455.5 min (1,273.0 - 817.5)

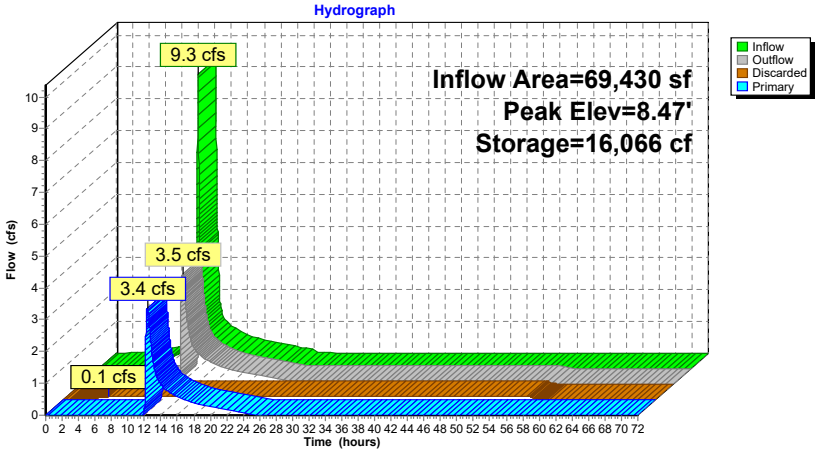
Volume	Invert	Avail.Storage	Storage Description
#1	6.00'	19,495 cf	**6.89'W x 14.06'L x 3.00'H StormTrap ST-1 Units (Irregular Shape)** x 78 22,668 cf Overall x 86.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	7.50'	**15.0" Round Culvert** L= 190.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 7.50' / 6.00' S= 0.0079 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Discarded OutFlow Max=0.1 cfs @ 5.56 hrs HW=6.03' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=3.4 cfs @ 12.38 hrs HW=8.47' (Free Discharge)
└**2=Culvert** (Barrel Controls 3.4 cfs @ 4.55 fps)

Pond 1P: Underground Infiltration System



Summary for Pond 2P: Rooftop Detention

Inflow Area = 18,785 sf,100.00% Impervious, Inflow Depth = 8.48" for 50-Year event
Inflow = 3.7 cfs @ 12.08 hrs, Volume= 13,274 cf
Outflow = 0.4 cfs @ 12.81 hrs, Volume= 13,274 cf, Atten= 90%, Lag= 43.7 min
Primary = 0.4 cfs @ 12.81 hrs, Volume= 13,274 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 57.80' @ 12.81 hrs Surf.Area= 7,500 sf Storage= 5,966 cf

Plug-Flow detention time= 192.1 min calculated for 13,274 cf (100% of inflow)
Center-of-Mass det. time= 192.1 min (932.2 - 740.2)

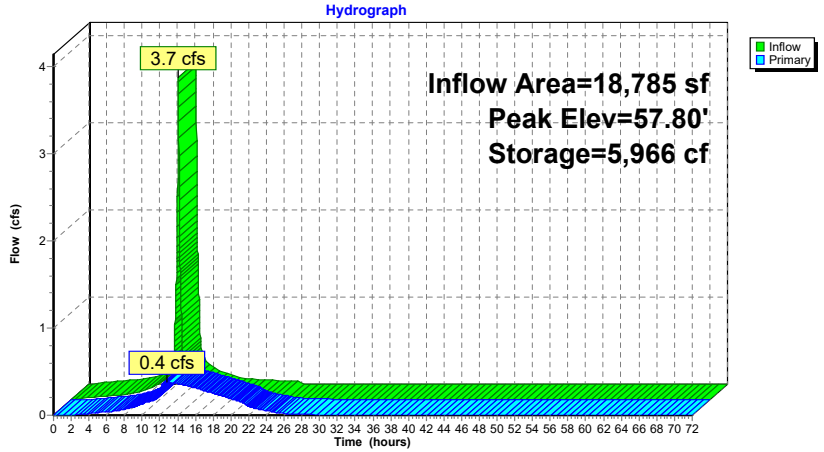
Volume	Invert	Avail.Storage	Storage Description
#1	57.00'	7,500 cf	**Rooftop Detention (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
57.00	7,500	0	0
58.00	7,500	7,500	7,500

Device	Routing	Invert	Outlet Devices
#1	Primary	8.02'	**12.0" Round Roof Drain** L= 16.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 8.02' / 7.70' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	57.00'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.4 cfs @ 12.81 hrs HW=57.80' (Free Discharge)
└**1=Roof Drain** (Passes 0.4 cfs of 23.4 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 0.4 cfs @ 4.29 fps)

Pond 2P: Rooftop Detention



Summary for Pond 3P: Rain garden

Inflow Area = 12,275 sf, 52.50% Impervious, Inflow Depth = 7.15" for 50-Year event
Inflow = 2.2 cfs @ 12.08 hrs, Volume= 7,316 cf
Outflow = 2.2 cfs @ 12.09 hrs, Volume= 7,316 cf, Atten= 0%, Lag= 0.3 min
Discarded = 0.0 cfs @ 12.09 hrs, Volume= 462 cf
Primary = 2.2 cfs @ 12.09 hrs, Volume= 6,854 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 6.42' @ 12.09 hrs Surf.Area= 416 sf Storage= 219 cf

Plug-Flow detention time= 34.9 min calculated for 7,316 cf (100% of inflow)
Center-of-Mass det. time= 34.9 min (817.1 - 782.2)

Volume	Invert	Avail.Storage	Storage Description
#1	5.60'	253 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

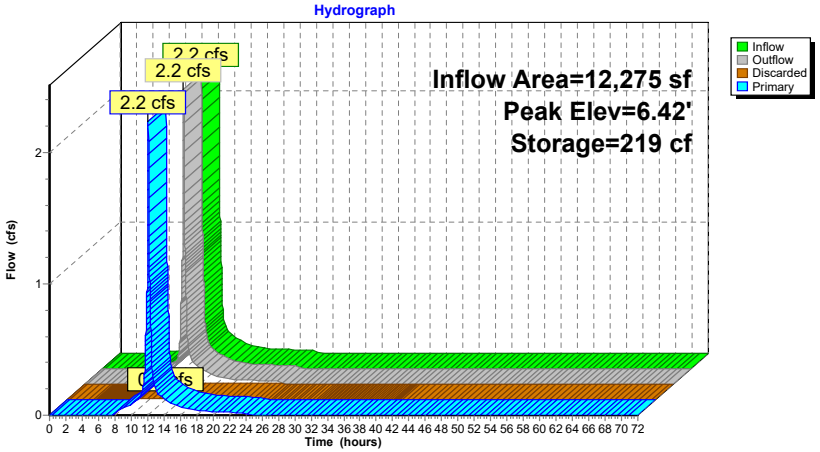
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.60	125	46.0	0	0	125
6.00	276	66.0	78	78	305
6.30	350	73.0	94	172	385
6.50	460	87.0	81	253	564

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.60'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	6.30'	**22.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.0 cfs @ 12.09 hrs HW=6.42' (Free Discharge)
↑└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=2.2 cfs @ 12.09 hrs HW=6.42' (Free Discharge)
↑└**2=Broad-Crested Rectangular Weir** (Weir Controls 2.2 cfs @ 0.82 fps)

Pond 3P: Rain garden



Summary for Pond TD2:

Inflow Area = 1,112 sf, 95.68% Impervious, Inflow Depth = 8.36" for 50-Year event
Inflow = 0.2 cfs @ 12.08 hrs, Volume= 775 cf
Outflow = 0.0 cfs @ 6.62 hrs, Volume= 775 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.0 cfs @ 6.62 hrs, Volume= 775 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 8.43' @ 18.81 hrs Surf.Area= 278 sf Storage= 543 cf

Plug-Flow detention time= 1,403.3 min calculated for 775 cf (100% of inflow)
Center-of-Mass det. time= 1,403.3 min (2,149.1 - 745.8)

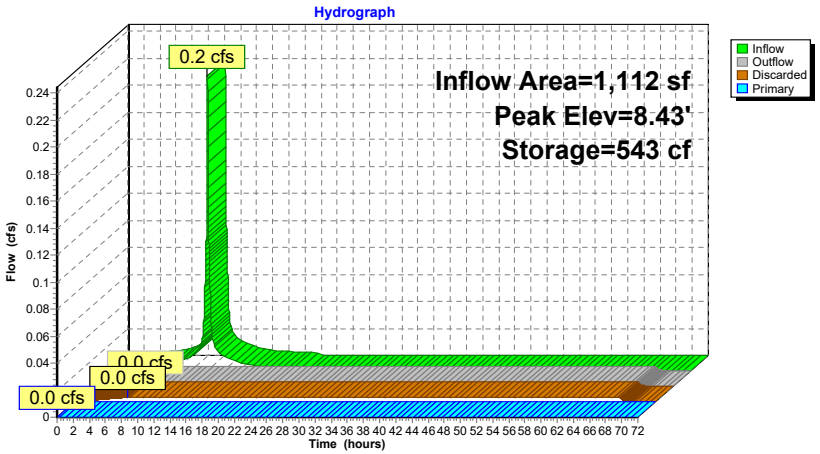
Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.50'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	10.00'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 6.62 hrs HW=5.55' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD2:



Summary for Pond TD3:

Inflow Area = 1,105 sf, 97.29% Impervious, Inflow Depth = 8.36" for 50-Year event
Inflow = 0.2 cfs @ 12.08 hrs, Volume= 770 cf
Outflow = 0.0 cfs @ 6.66 hrs, Volume= 770 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.0 cfs @ 6.66 hrs, Volume= 770 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 8.41' @ 18.75 hrs Surf.Area= 278 sf Storage= 539 cf

Plug-Flow detention time= 1,393.8 min calculated for 770 cf (100% of inflow)
Center-of-Mass det. time= 1,393.8 min (2,139.6 - 745.8)

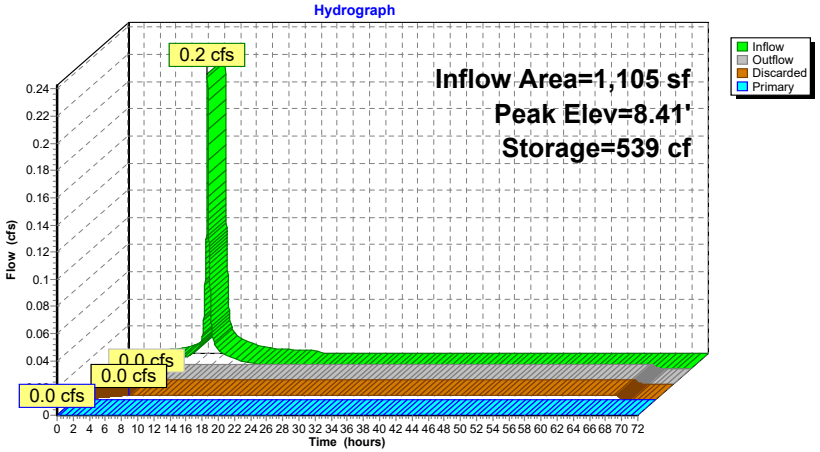
Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.50'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	10.30'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 6.66 hrs HW=5.55' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD3:



Summary for Pond TD4:

Inflow Area = 1,104 sf, 97.46% Impervious, Inflow Depth = 8.36" for 50-Year event
Inflow = 0.2 cfs @ 12.08 hrs, Volume= 769 cf
Outflow = 0.0 cfs @ 6.66 hrs, Volume= 769 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.0 cfs @ 6.66 hrs, Volume= 769 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 8.41' @ 18.74 hrs Surf.Area= 278 sf Storage= 538 cf

Plug-Flow detention time= 1,391.5 min calculated for 769 cf (100% of inflow)
Center-of-Mass det. time= 1,391.7 min (2,137.5 - 745.8)

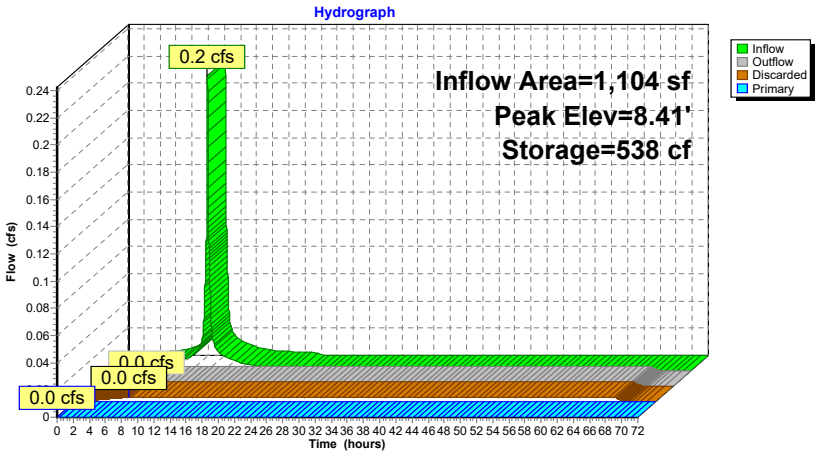
Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.50'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	10.20'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 6.66 hrs HW=5.55' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD4:



Summary for Pond TD5:

Inflow Area = 1,082 sf, 98.06% Impervious, Inflow Depth = 8.48" for 50-Year event
Inflow = 0.2 cfs @ 12.08 hrs, Volume= 765 cf
Outflow = 0.0 cfs @ 6.50 hrs, Volume= 765 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.0 cfs @ 6.50 hrs, Volume= 765 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 7.87' @ 18.54 hrs Surf.Area= 278 sf Storage= 529 cf

Plug-Flow detention time= 1,358.4 min calculated for 764 cf (100% of inflow)
Center-of-Mass det. time= 1,358.6 min (2,098.8 - 740.2)

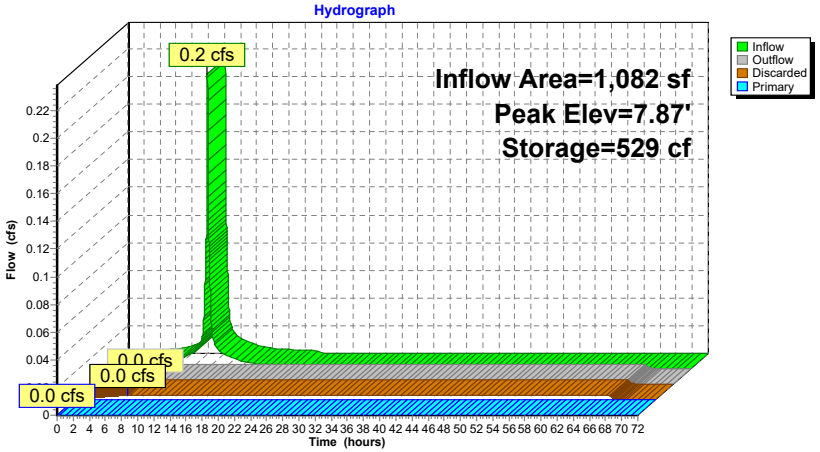
Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	5.50'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.00'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	9.80'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 6.50 hrs HW=5.05' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.00' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD5:



Summary for Pond TD6:

Inflow Area = 1,056 sf, 99.24% Impervious, Inflow Depth = 8.48" for 50-Year event
Inflow = 0.2 cfs @ 12.08 hrs, Volume= 746 cf
Outflow = 0.0 cfs @ 6.58 hrs, Volume= 746 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.0 cfs @ 6.58 hrs, Volume= 746 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 7.78' @ 18.29 hrs Surf.Area= 278 sf Storage= 513 cf

Plug-Flow detention time= 1,315.8 min calculated for 746 cf (100% of inflow)
Center-of-Mass det. time= 1,315.9 min (2,056.1 - 740.2)

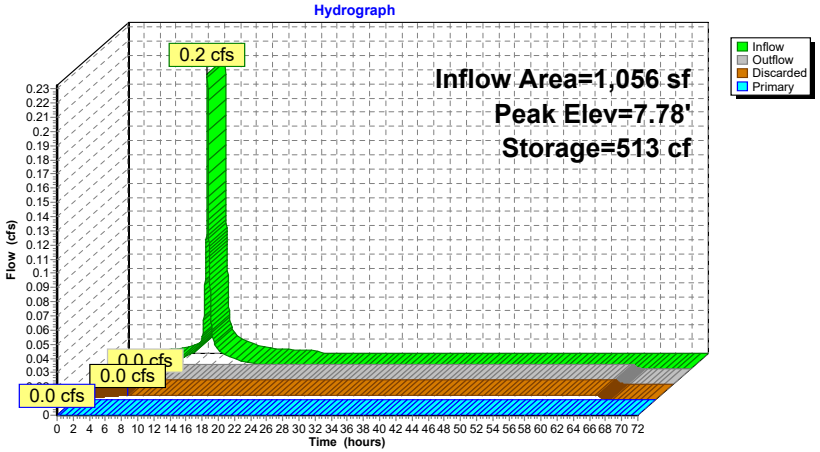
Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	5.50'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.00'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	9.50'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 6.58 hrs HW=5.05' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.00' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD6:

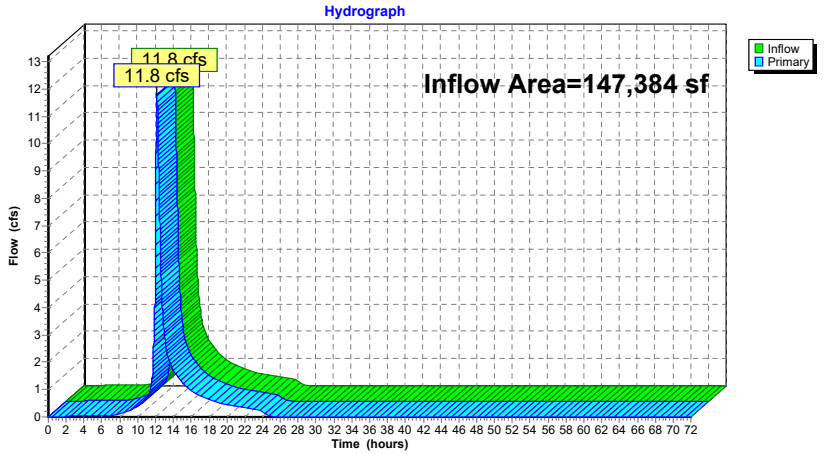


Summary for Link 1L: Towards Wetlands

Inflow Area = 147,384 sf, 49.02% Impervious, Inflow Depth = 5.53" for 50-Year event
Inflow = 11.8 cfs @ 12.16 hrs, Volume= 67,879 cf
Primary = 11.8 cfs @ 12.16 hrs, Volume= 67,879 cf, Atten= 0%, Lag= 0.0 min

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

Link 1L: Towards Wetlands

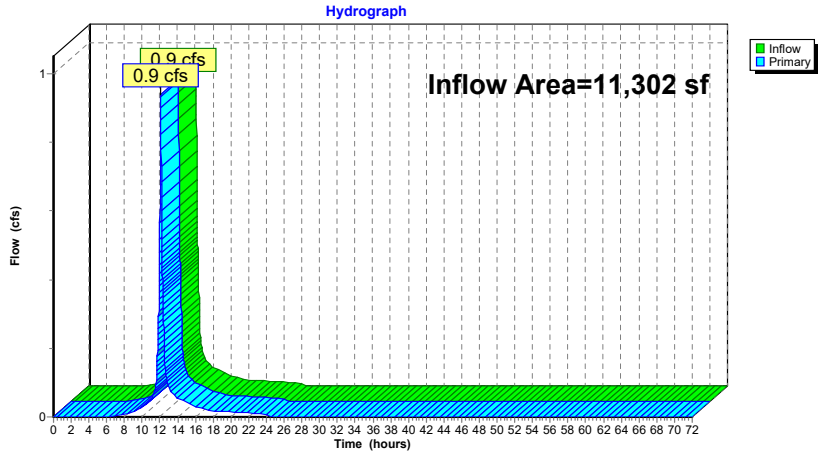


Summary for Link 2L: Towards Street

Inflow Area = 11,302 sf, 56.45% Impervious, Inflow Depth = 3.13" for 50-Year event
Inflow = 0.9 cfs @ 12.09 hrs, Volume= 2,951 cf
Primary = 0.9 cfs @ 12.09 hrs, Volume= 2,951 cf, Atten= 0%, Lag= 0.0 min

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

Link 2L: Towards Street

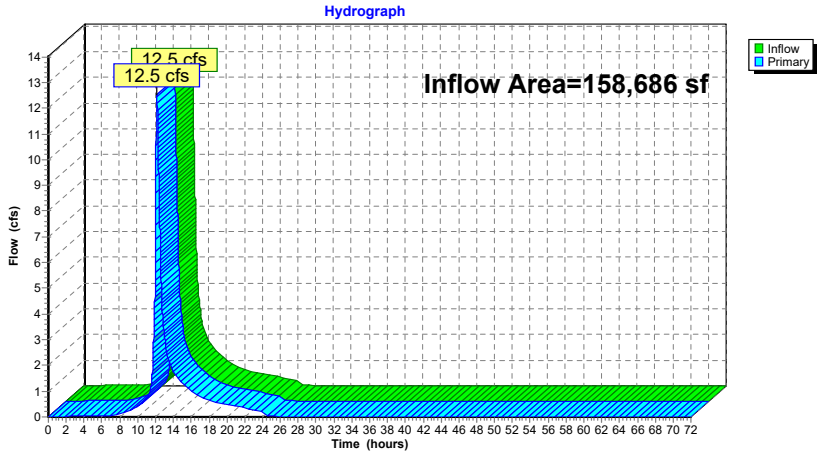


Summary for Link 100L: Total Flows

Inflow Area = 158,686 sf, 49.55% Impervious, Inflow Depth = 5.36" for 50-Year event
Inflow = 12.5 cfs @ 12.15 hrs, Volume= 70,830 cf
Primary = 12.5 cfs @ 12.15 hrs, Volume= 70,830 cf, Atten= 0%, Lag= 0.0 min

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

Link 100L: Total Flows



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

Subcatchment 1S: CB-1 Runoff Area=22,742 sf 72.16% Impervious Runoff Depth=9.25"
Tc=6.0 min CN=91 Runoff=5.2 cfs 17,532 cf

Subcatchment 2.1S: Building Runoff Area=14,140 sf 100.00% Impervious Runoff Depth=10.11"
Tc=6.0 min CN=98 Runoff=3.3 cfs 11,912 cf

Subcatchment 2S: Building Roof Runoff Area=18,785 sf 100.00% Impervious Runoff Depth=10.11"
Tc=6.0 min CN=98 Runoff=4.4 cfs 15,825 cf

Subcatchment 3.1S: Backyard ADs Runoff Area=8,985 sf 3.03% Impervious Runoff Depth=7.20"
Flow Length=147' Tc=10.3 min CN=75 Runoff=1.5 cfs 5,394 cf

Subcatchment 3S: Townhouse Roofs Runoff Area=13,067 sf 100.00% Impervious Runoff Depth=10.11"
Tc=6.0 min CN=98 Runoff=3.1 cfs 11,008 cf

Subcatchment 4.2S: Townhouse TDs Runoff Area=1,112 sf 95.68% Impervious Runoff Depth=9.99"
Tc=6.0 min CN=97 Runoff=0.3 cfs 926 cf

Subcatchment 4.3S: Townhouse TDs Runoff Area=1,105 sf 97.29% Impervious Runoff Depth=9.99"
Tc=6.0 min CN=97 Runoff=0.3 cfs 920 cf

Subcatchment 4.4S: Townhouse TDs Runoff Area=1,104 sf 97.46% Impervious Runoff Depth=9.99"
Tc=6.0 min CN=97 Runoff=0.3 cfs 919 cf

Subcatchment 4.5S: Townhouse TDs Runoff Area=1,082 sf 98.06% Impervious Runoff Depth=10.11"
Tc=6.0 min CN=98 Runoff=0.3 cfs 912 cf

Subcatchment 4.6S: Townhouse TDs Runoff Area=1,056 sf 99.24% Impervious Runoff Depth=10.11"
Tc=6.0 min CN=98 Runoff=0.2 cfs 890 cf

Subcatchment 5S: TD-1 Runoff Area=5,851 sf 51.63% Impervious Runoff Depth=8.62"
Tc=6.0 min CN=86 Runoff=1.3 cfs 4,205 cf

Subcatchment 6.1S: East driveway Runoff Area=12,275 sf 52.50% Impervious Runoff Depth=8.75"
Tc=6.0 min CN=87 Runoff=2.7 cfs 8,951 cf

Subcatchment 6S: Bypass Towards Runoff Area=51,539 sf 0.21% Impervious Runoff Depth=7.07"
Flow Length=125' Tc=14.0 min CN=74 Runoff=7.6 cfs 30,373 cf

Subcatchment 7S: To Street Runoff Area=5,843 sf 18.07% Impervious Runoff Depth=7.60"
Tc=6.0 min CN=78 Runoff=1.2 cfs 3,699 cf

Pond 1P: Underground Infiltration System Peak Elev=8.79' Storage=18,113 cf Inflow=11.1 cfs 53,963 cf
Discarded=0.1 cfs 17,955 cf Primary=4.8 cfs 36,008 cf Outflow=4.9 cfs 53,963 cf

Pond 2P: Rooftop Detention Peak Elev=57.97' Storage=7,252 cf Inflow=4.4 cfs 15,825 cf
Outflow=0.4 cfs 15,825 cf

Pond 3P: Rain garden Peak Elev=6.44' Storage=226 cf Inflow=2.7 cfs 8,951 cf
Discarded=0.0 cfs 473 cf Primary=2.7 cfs 8,478 cf Outflow=2.7 cfs 8,951 cf

Pond TD2: Peak Elev=9.33' Storage=678 cf Inflow=0.3 cfs 926 cf
Discarded=0.0 cfs 832 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 832 cf

Pond TD3: Peak Elev=9.28' Storage=673 cf Inflow=0.3 cfs 920 cf
Discarded=0.0 cfs 831 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 831 cf

Pond TD4: Peak Elev=9.28' Storage=672 cf Inflow=0.3 cfs 919 cf
Discarded=0.0 cfs 831 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 831 cf

Pond TD5: Peak Elev=8.67' Storage=660 cf Inflow=0.3 cfs 912 cf
Discarded=0.0 cfs 836 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 836 cf

Pond TD6: Peak Elev=8.49' Storage=640 cf Inflow=0.2 cfs 890 cf
Discarded=0.0 cfs 836 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 836 cf

Link 1L: Towards Wetlands Inflow=16.1 cfs 86,770 cf
Primary=16.1 cfs 86,770 cf

Link 2L: Towards Street Inflow=1.2 cfs 3,699 cf
Primary=1.2 cfs 3,699 cf

Link 100L: Total Flows Inflow=17.0 cfs 90,469 cf
Primary=17.0 cfs 90,469 cf

Total Runoff Area = 158,686 sf Runoff Volume = 113,463 cf Average Runoff Depth = 8.58"
50.45% Pervious = 80,060 sf 49.55% Impervious = 78,626 sf

Summary for Subcatchment 1S: CB-1

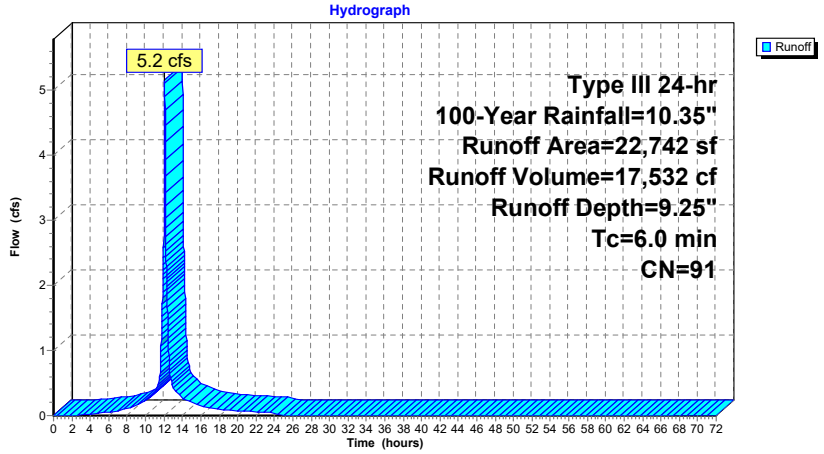
Runoff = 5.2 cfs @ 12.08 hrs, Volume= 17,532 cf, Depth= 9.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=10.35"

Area (sf)	CN	Description
16,410	98	Paved parking, HSG C
6,332	74	>75% Grass cover, Good, HSG C
22,742	91	Weighted Average
6,332		27.84% Pervious Area
16,410		72.16% Impervious Area

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

Subcatchment 1S: CB-1



Summary for Subcatchment 2.1S: Building Roof-Southeast

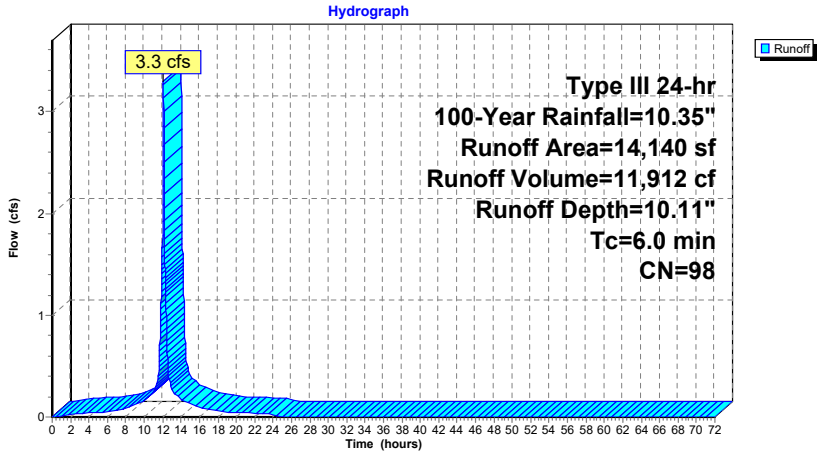
Runoff = 3.3 cfs @ 12.08 hrs, Volume= 11,912 cf, Depth=10.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=10.35"

Area (sf)	CN	Description
14,140	98	Roofs, HSG C
14,140		100.00% Impervious Area

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

Subcatchment 2.1S: Building Roof-Southeast



Summary for Subcatchment 2S: Building Roof

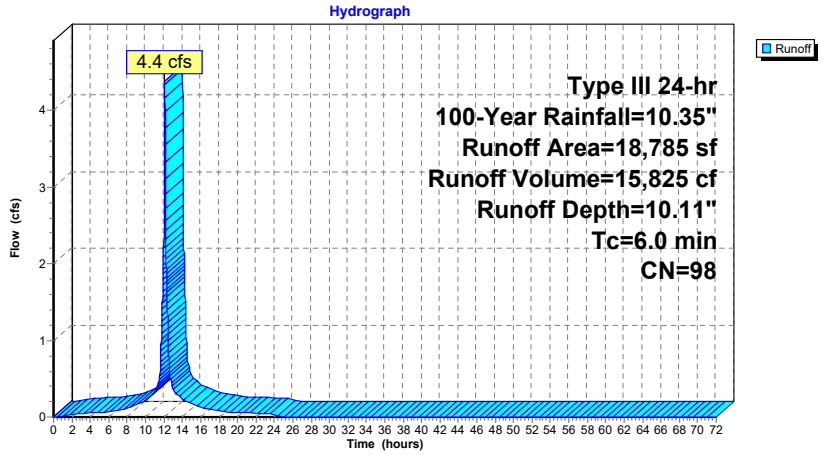
Runoff = 4.4 cfs @ 12.08 hrs, Volume= 15,825 cf, Depth=10.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=10.35"

Area (sf)	CN	Description
18,785	98	Roofs, HSG C
18,785		100.00% Impervious Area

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

Subcatchment 2S: Building Roof



Summary for Subcatchment 3.1S: Backyard ADs

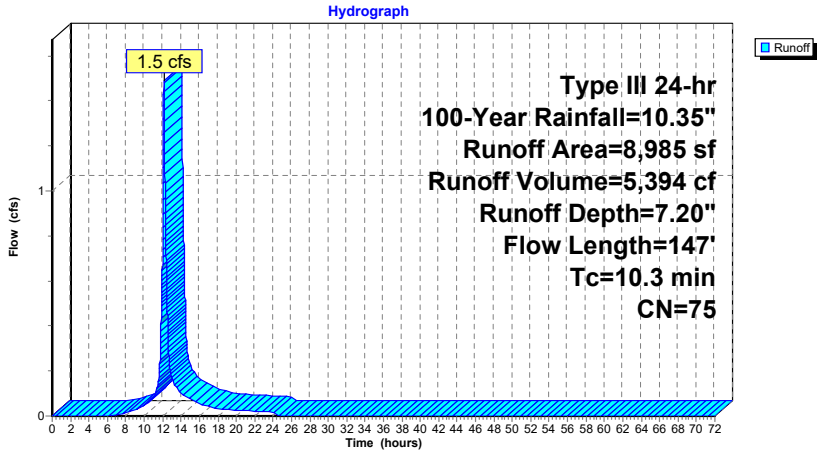
Runoff = 1.5 cfs @ 12.14 hrs, Volume= 5,394 cf, Depth= 7.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=10.35"

	Area (sf)	CN	Description
	272	98	Unconnected pavement, HSG C
	8,302	74	>75% Grass cover, Good, HSG C
*	411	89	Gravel sidewalk, HSG C
	8,985	75	Weighted Average
	8,713		96.97% Pervious Area
	272		3.03% Impervious Area
	272		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	50	0.0142	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.23"
0.9	97	0.0154	1.86		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
10.3	147	Total			

Subcatchment 3.1S: Backyard ADs



Summary for Subcatchment 3S: Townhouse Roofs

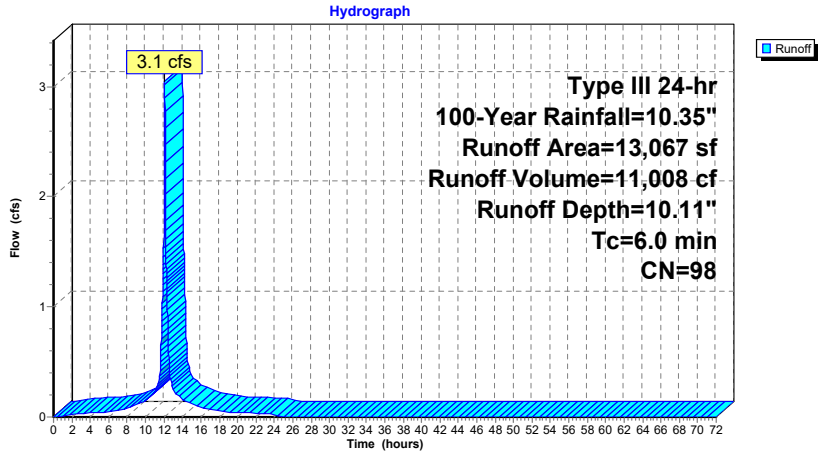
Runoff = 3.1 cfs @ 12.08 hrs, Volume= 11,008 cf, Depth=10.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=10.35"

Area (sf)	CN	Description
13,067	98	Roofs, HSG C
13,067		100.00% Impervious Area

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

Subcatchment 3S: Townhouse Roofs



Summary for Subcatchment 4.2S: Townhouse TDs

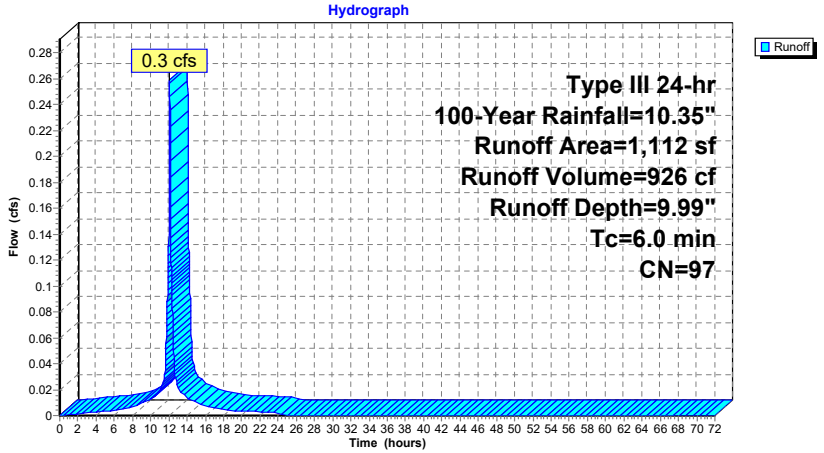
Runoff = 0.3 cfs @ 12.08 hrs, Volume= 926 cf, Depth= 9.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=10.35"

Area (sf)	CN	Description
1,064	98	Paved parking, HSG C
48	74	>75% Grass cover, Good, HSG C
1,112	97	Weighted Average
48		4.32% Pervious Area
1,064		95.68% Impervious Area

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

Subcatchment 4.2S: Townhouse TDs



Summary for Subcatchment 4.3S: Townhouse TDs

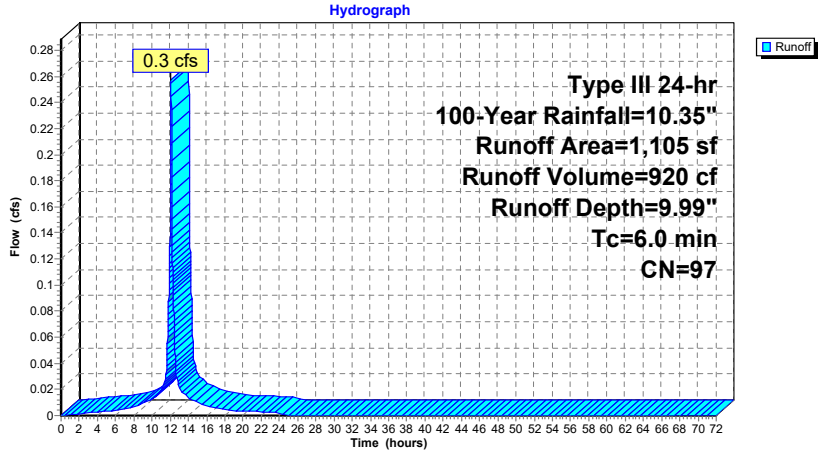
Runoff = 0.3 cfs @ 12.08 hrs, Volume= 920 cf, Depth= 9.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=10.35"

Area (sf)	CN	Description
1,075	98	Paved parking, HSG C
30	74	>75% Grass cover, Good, HSG C
1,105	97	Weighted Average
30		2.71% Pervious Area
1,075		97.29% Impervious Area

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

Subcatchment 4.3S: Townhouse TDs



Summary for Subcatchment 4.4S: Townhouse TDs

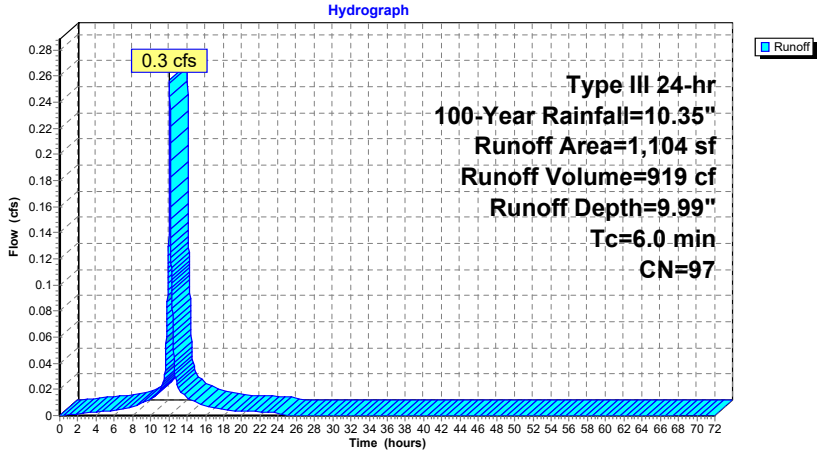
Runoff = 0.3 cfs @ 12.08 hrs, Volume= 919 cf, Depth= 9.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=10.35"

Area (sf)	CN	Description
1,076	98	Paved parking, HSG C
28	74	>75% Grass cover, Good, HSG C
1,104	97	Weighted Average
28		2.54% Pervious Area
1,076		97.46% Impervious Area

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

Subcatchment 4.4S: Townhouse TDs



Summary for Subcatchment 4.5S: Townhouse TDs

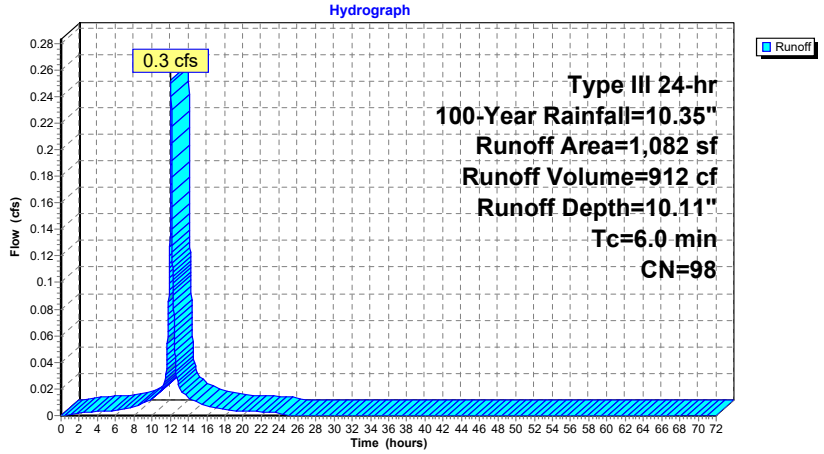
Runoff = 0.3 cfs @ 12.08 hrs, Volume= 912 cf, Depth=10.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=10.35"

Area (sf)	CN	Description
1,061	98	Paved parking, HSG C
21	74	>75% Grass cover, Good, HSG C
1,082	98	Weighted Average
21		1.94% Pervious Area
1,061		98.06% Impervious Area

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

Subcatchment 4.5S: Townhouse TDs



Summary for Subcatchment 4.6S: Townhouse TDs

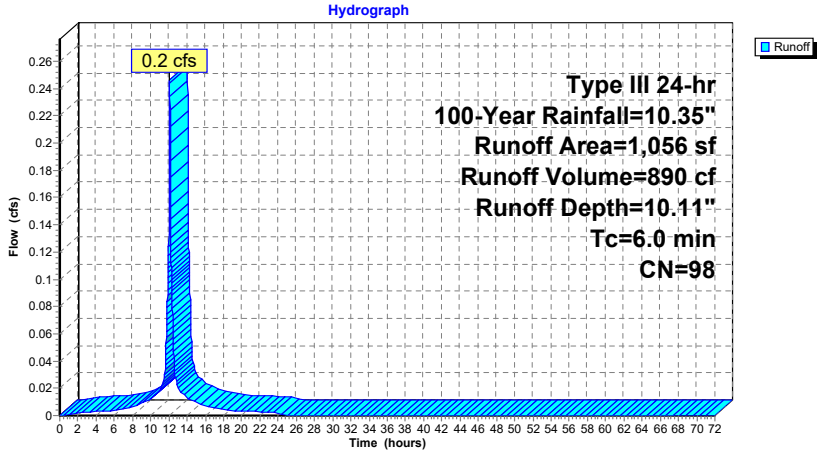
Runoff = 0.2 cfs @ 12.08 hrs, Volume= 890 cf, Depth=10.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=10.35"

Area (sf)	CN	Description
1,048	98	Paved parking, HSG C
8	74	>75% Grass cover, Good, HSG C
1,056	98	Weighted Average
8		0.76% Pervious Area
1,048		99.24% Impervious Area

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

Subcatchment 4.6S: Townhouse TDs



Summary for Subcatchment 5S: TD-1

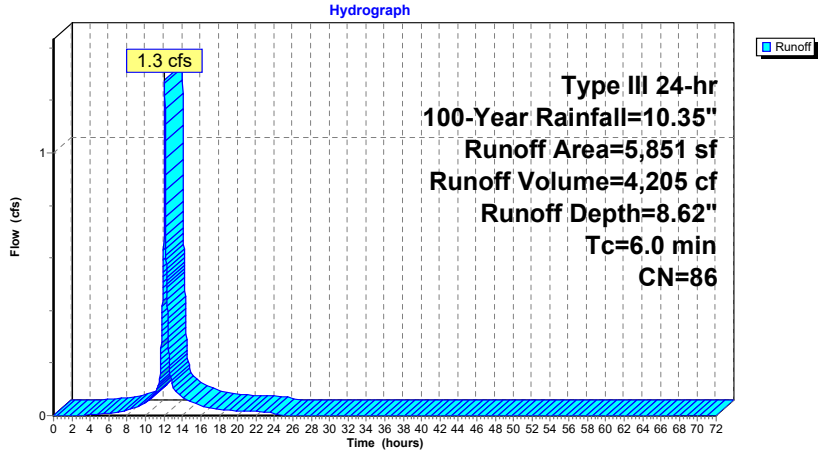
Runoff = 1.3 cfs @ 12.08 hrs, Volume= 4,205 cf, Depth= 8.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=10.35"

Area (sf)	CN	Description
3,021	98	Paved parking, HSG C
2,830	74	>75% Grass cover, Good, HSG C
5,851	86	Weighted Average
2,830		48.37% Pervious Area
3,021		51.63% Impervious Area

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

Subcatchment 5S: TD-1



Summary for Subcatchment 6.1S: East driveway

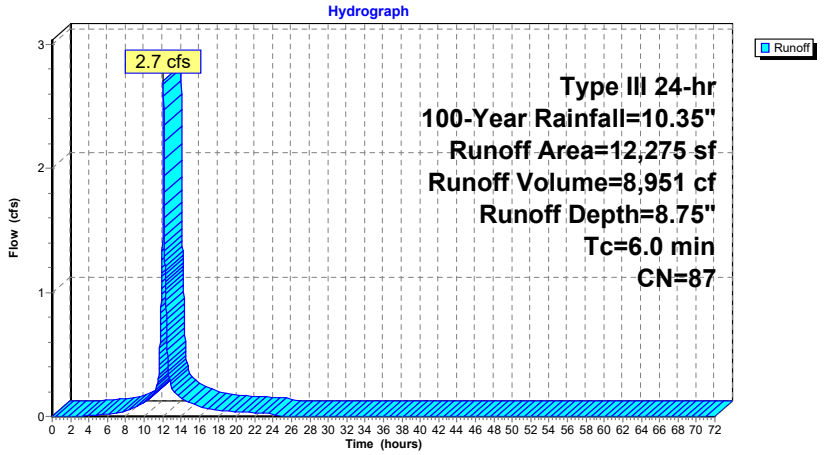
Runoff = 2.7 cfs @ 12.08 hrs, Volume= 8,951 cf, Depth= 8.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=10.35"

Area (sf)	CN	Description
5,611	74	>75% Grass cover, Good, HSG C
6,444	98	Paved roads w/curbs & sewers, HSG C
220	89	Gravel roads, HSG C
12,275	87	Weighted Average
5,831		47.50% Pervious Area
6,444		52.50% Impervious Area

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

Subcatchment 6.1S: East driveway



Summary for Subcatchment 6S: Bypass Towards Wetlands

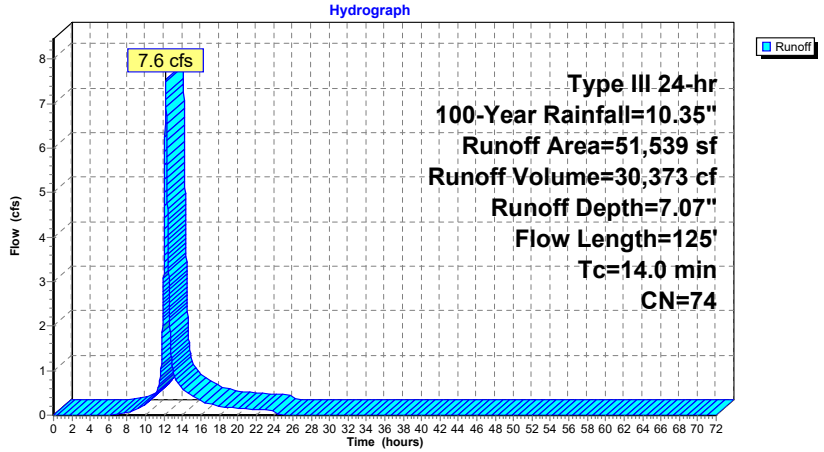
Runoff = 7.6 cfs @ 12.19 hrs, Volume= 30,373 cf, Depth= 7.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=10.35"

Area (sf)	CN	Description
4,985	70	Woods, Good, HSG C
46,447	74	>75% Grass cover, Good, HSG C
107	98	Roofs, HSG C
51,539	74	Weighted Average
51,432		99.79% Pervious Area
107		0.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	50	0.0220	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.23"
2.2	75	0.0133	0.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.0	125	Total			

Subcatchment 6S: Bypass Towards Wetlands



Summary for Subcatchment 7S: To Street

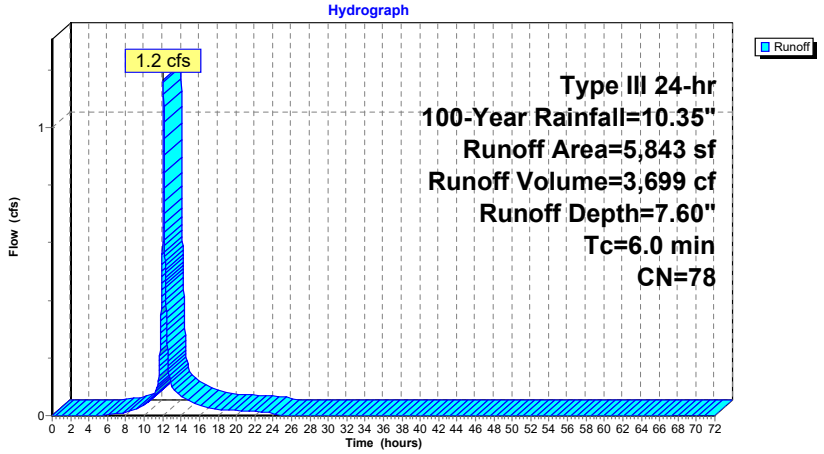
Runoff = 1.2 cfs @ 12.09 hrs, Volume= 3,699 cf, Depth= 7.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=10.35"

Area (sf)	CN	Description
1,056	98	Paved parking, HSG C
4,787	74	>75% Grass cover, Good, HSG C
5,843	78	Weighted Average
4,787		81.93% Pervious Area
1,056		18.07% Impervious Area

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

Subcatchment 7S: To Street



Summary for Pond 1P: Underground Infiltration System

Inflow Area = 69,430 sf, 74.25% Impervious, Inflow Depth = 9.33" for 100-Year event
Inflow = 11.1 cfs @ 12.09 hrs, Volume= 53,963 cf
Outflow = 4.9 cfs @ 12.31 hrs, Volume= 53,963 cf, Atten= 56%, Lag= 13.4 min
Discarded = 0.1 cfs @ 4.68 hrs, Volume= 17,955 cf
Primary = 4.8 cfs @ 12.31 hrs, Volume= 36,008 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 8.79' @ 12.31 hrs Surf.Area= 7,556 sf Storage= 18,113 cf

Plug-Flow detention time= 394.8 min calculated for 53,963 cf (100% of inflow)
Center-of-Mass det. time= 394.8 min (1,213.2 - 818.3)

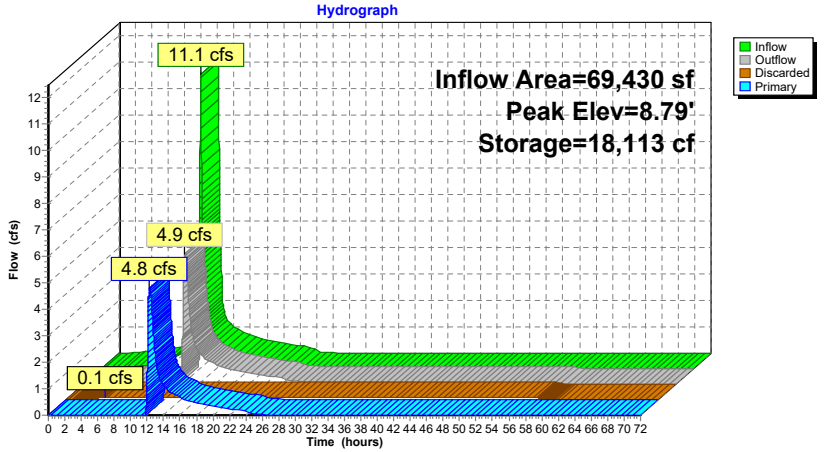
Volume	Invert	Avail.Storage	Storage Description
#1	6.00'	19,495 cf	**6.89'W x 14.06'L x 3.00'H StormTrap ST-1 Units (Irregular Shape)** x 78 22,668 cf Overall x 86.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	7.50'	**15.0" Round Culvert** L= 190.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 7.50' / 6.00' S= 0.0079 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Discarded OutFlow Max=0.1 cfs @ 4.68 hrs HW=6.03' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=4.8 cfs @ 12.31 hrs HW=8.79' (Free Discharge)
↑**2=Culvert** (Inlet Controls 4.8 cfs @ 3.92 fps)

Pond 1P: Underground Infiltration System



Summary for Pond 2P: Rooftop Detention

Inflow Area = 18,785 sf,100.00% Impervious, Inflow Depth = 10.11" for 100-Year event
Inflow = 4.4 cfs @ 12.08 hrs, Volume= 15,825 cf
Outflow = 0.4 cfs @ 12.89 hrs, Volume= 15,825 cf, Atten= 91%, Lag= 48.3 min
Primary = 0.4 cfs @ 12.89 hrs, Volume= 15,825 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 57.97' @ 12.89 hrs Surf.Area= 7,500 sf Storage= 7,252 cf

Plug-Flow detention time= 207.5 min calculated for 15,823 cf (100% of inflow)
Center-of-Mass det. time= 207.8 min (946.0 - 738.3)

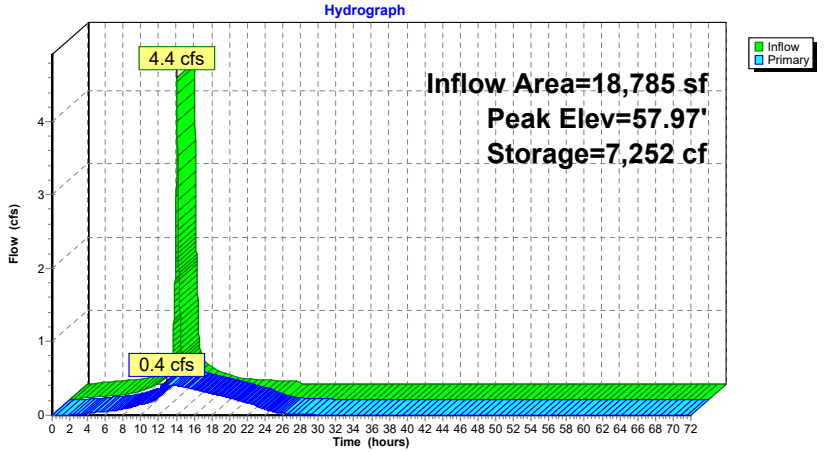
Volume	Invert	Avail.Storage	Storage Description
#1	57.00'	7,500 cf	**Rooftop Detention (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
57.00	7,500	0	0
58.00	7,500	7,500	7,500

Device	Routing	Invert	Outlet Devices
#1	Primary	8.02'	**12.0" Round Roof Drain** L= 16.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 8.02' / 7.70' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	57.00'	**4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.4 cfs @ 12.89 hrs HW=57.97' (Free Discharge)
└**1=Roof Drain** (Passes 0.4 cfs of 23.5 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 0.4 cfs @ 4.73 fps)

Pond 2P: Rooftop Detention



Summary for Pond 3P: Rain garden

Inflow Area = 12,275 sf, 52.50% Impervious, Inflow Depth = 8.75" for 100-Year event
Inflow = 2.7 cfs @ 12.08 hrs, Volume= 8,951 cf
Outflow = 2.7 cfs @ 12.09 hrs, Volume= 8,951 cf, Atten= 0%, Lag= 0.2 min
Discarded = 0.0 cfs @ 12.09 hrs, Volume= 473 cf
Primary = 2.7 cfs @ 12.09 hrs, Volume= 8,478 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 6.44' @ 12.09 hrs Surf.Area= 425 sf Storage= 226 cf

Plug-Flow detention time= 29.5 min calculated for 8,951 cf (100% of inflow)
Center-of-Mass det. time= 29.5 min (806.5 - 777.0)

Volume	Invert	Avail.Storage	Storage Description
#1	5.60'	253 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

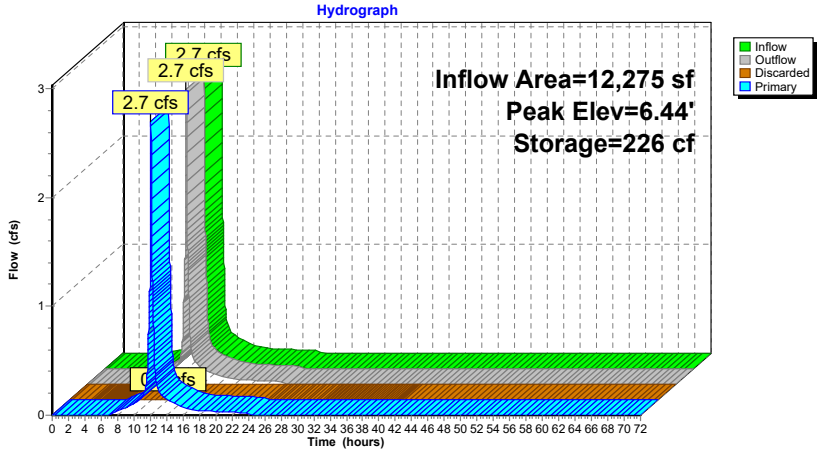
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.60	125	46.0	0	0	125
6.00	276	66.0	78	78	305
6.30	350	73.0	94	172	385
6.50	460	87.0	81	253	564

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.60'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	6.30'	**22.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.0 cfs @ 12.09 hrs HW=6.44' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=2.7 cfs @ 12.09 hrs HW=6.44' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 2.7 cfs @ 0.88 fps)

Pond 3P: Rain garden



Summary for Pond TD2:

Inflow Area = 1,112 sf, 95.68% Impervious, Inflow Depth = 9.99" for 100-Year event
Inflow = 0.3 cfs @ 12.08 hrs, Volume= 926 cf
Outflow = 0.0 cfs @ 5.54 hrs, Volume= 832 cf, Atten= 99%, Lag= 0.0 min
Discarded = 0.0 cfs @ 5.54 hrs, Volume= 832 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 9.33' @ 20.48 hrs Surf.Area= 278 sf Storage= 678 cf

Plug-Flow detention time= 1,555.1 min calculated for 832 cf (90% of inflow)
Center-of-Mass det. time= 1,504.5 min (2,247.8 - 743.3)

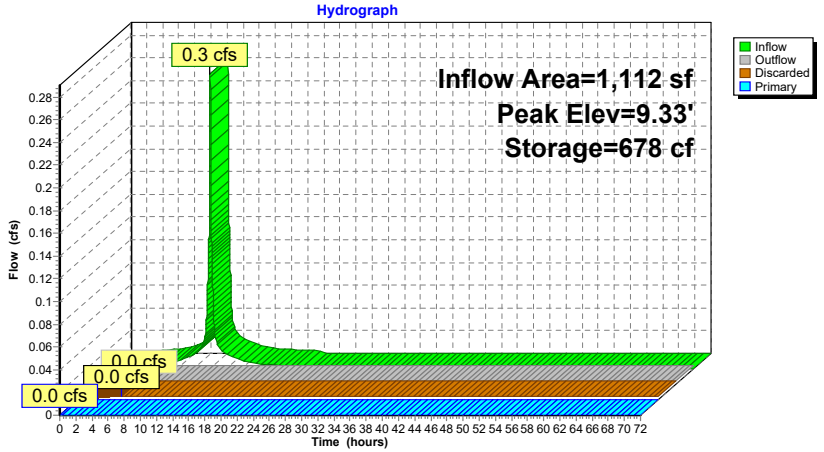
Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.50'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	10.00'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 5.54 hrs HW=5.55' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD2:



Summary for Pond TD3:

Inflow Area = 1,105 sf, 97.29% Impervious, Inflow Depth = 9.99" for 100-Year event
Inflow = 0.3 cfs @ 12.08 hrs, Volume= 920 cf
Outflow = 0.0 cfs @ 5.61 hrs, Volume= 831 cf, Atten= 99%, Lag= 0.0 min
Discarded = 0.0 cfs @ 5.61 hrs, Volume= 831 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 9.28' @ 20.41 hrs Surf.Area= 278 sf Storage= 673 cf

Plug-Flow detention time= 1,554.5 min calculated for 831 cf (90% of inflow)
Center-of-Mass det. time= 1,505.8 min (2,249.0 - 743.3)

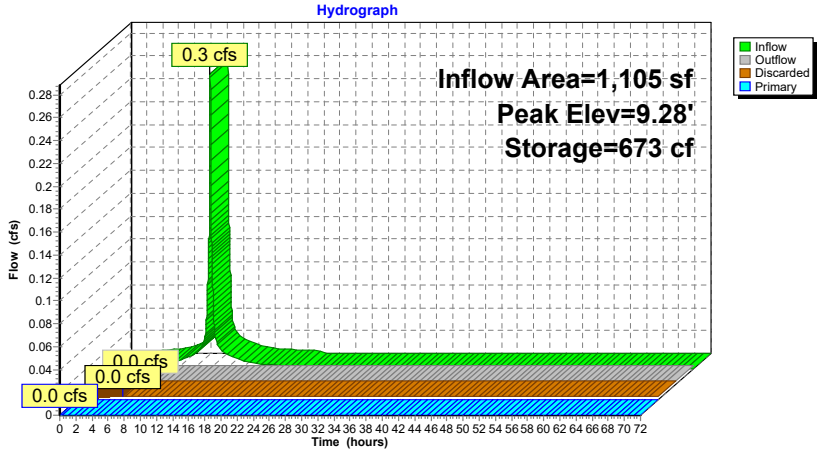
Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.50'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	10.30'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 5.61 hrs HW=5.55' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD3:



Summary for Pond TD4:

Inflow Area = 1,104 sf, 97.46% Impervious, Inflow Depth = 9.99" for 100-Year event
Inflow = 0.3 cfs @ 12.08 hrs, Volume= 919 cf
Outflow = 0.0 cfs @ 5.61 hrs, Volume= 831 cf, Atten= 99%, Lag= 0.0 min
Discarded = 0.0 cfs @ 5.61 hrs, Volume= 831 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 9.28' @ 20.39 hrs Surf.Area= 278 sf Storage= 672 cf

Plug-Flow detention time= 1,554.0 min calculated for 831 cf (90% of inflow)
Center-of-Mass det. time= 1,505.6 min (2,248.9 - 743.3)

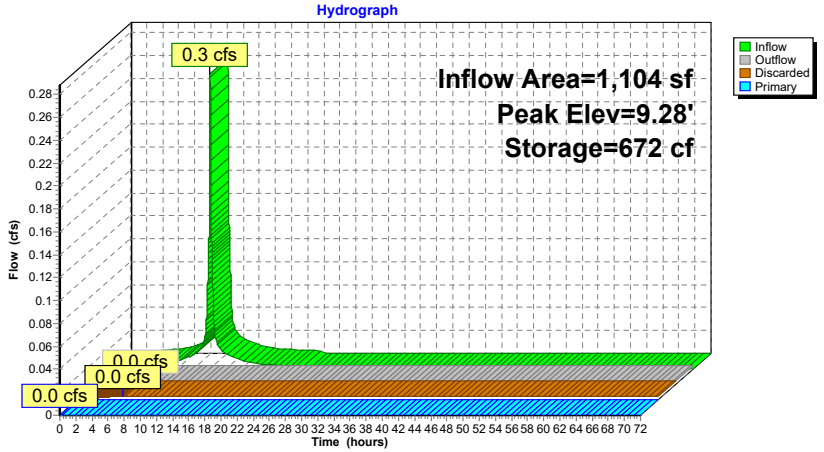
Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.50'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	10.20'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 5.61 hrs HW=5.55' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD4:



Summary for Pond TD5:

Inflow Area = 1,082 sf, 98.06% Impervious, Inflow Depth = 10.11" for 100-Year event
Inflow = 0.3 cfs @ 12.08 hrs, Volume= 912 cf
Outflow = 0.0 cfs @ 5.26 hrs, Volume= 836 cf, Atten= 99%, Lag= 0.0 min
Discarded = 0.0 cfs @ 5.26 hrs, Volume= 836 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 8.67' @ 20.17 hrs Surf.Area= 278 sf Storage= 660 cf

Plug-Flow detention time= 1,541.3 min calculated for 836 cf (92% of inflow)
Center-of-Mass det. time= 1,497.5 min (2,235.8 - 738.3)

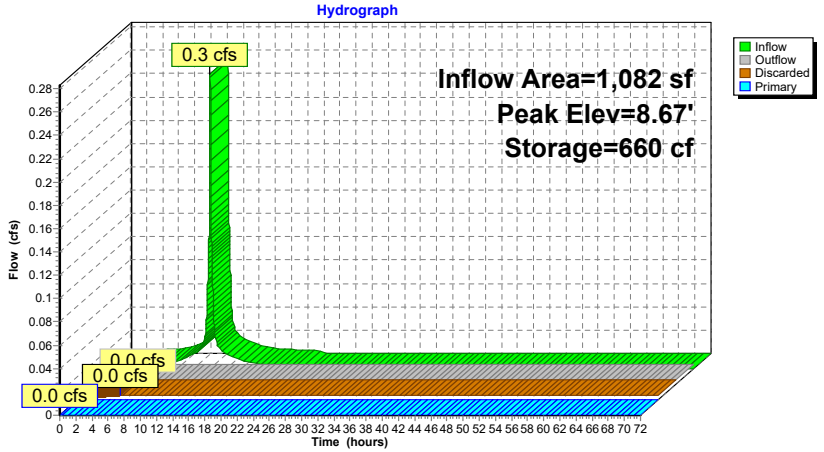
Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	5.50'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.00'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	9.80'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 5.26 hrs HW=5.05' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.00' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD5:



Summary for Pond TD6:

Inflow Area = 1,056 sf, 99.24% Impervious, Inflow Depth = 10.11" for 100-Year event
Inflow = 0.2 cfs @ 12.08 hrs, Volume= 890 cf
Outflow = 0.0 cfs @ 5.41 hrs, Volume= 836 cf, Atten= 99%, Lag= 0.0 min
Discarded = 0.0 cfs @ 5.41 hrs, Volume= 836 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 8.49' @ 19.94 hrs Surf.Area= 278 sf Storage= 640 cf

Plug-Flow detention time= 1,533.3 min calculated for 836 cf (94% of inflow)
Center-of-Mass det. time= 1,498.7 min (2,237.0 - 738.3)

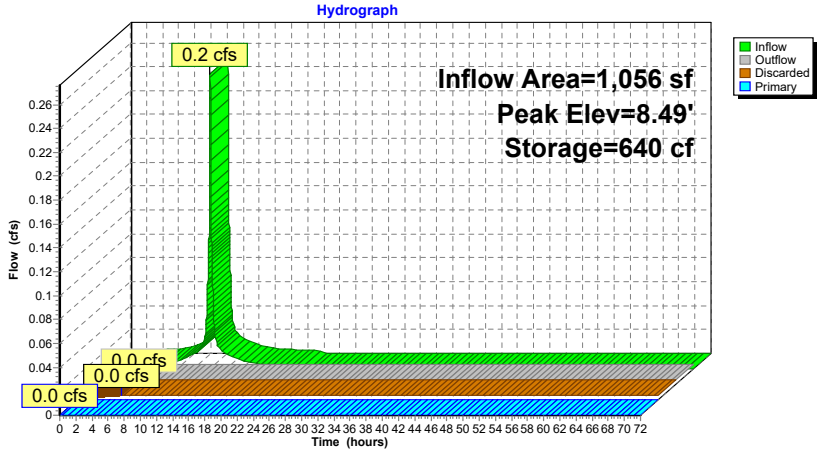
Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	206 cf	**17.06'W x 16.29'L x 3.83'H Stone** 1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	5.50'	472 cf	**6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units** x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.00'	**0.520 in/hr Exfiltration over Surface area**
#2	Primary	9.50'	**6.0" x 240.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 5.41 hrs HW=5.05' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.00' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Pond TD6:

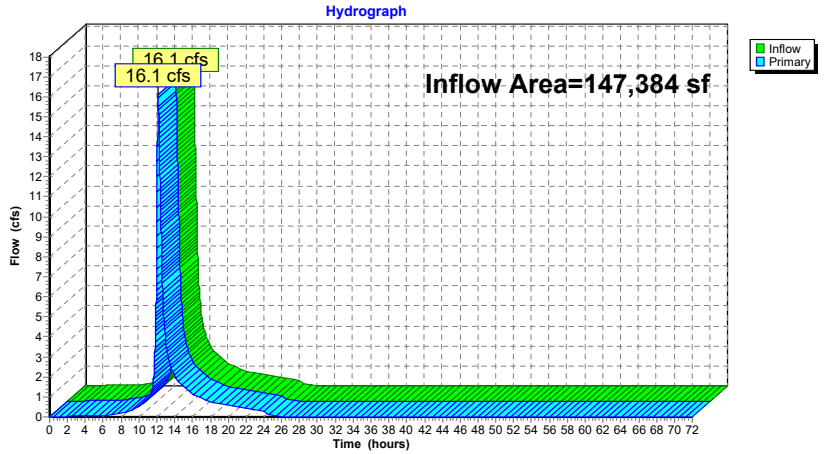


Summary for Link 1L: Towards Wetlands

Inflow Area = 147,384 sf, 49.02% Impervious, Inflow Depth = 7.06" for 100-Year event
Inflow = 16.1 cfs @ 12.15 hrs, Volume= 86,770 cf
Primary = 16.1 cfs @ 12.15 hrs, Volume= 86,770 cf, Atten= 0%, Lag= 0.0 min

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

Link 1L: Towards Wetlands

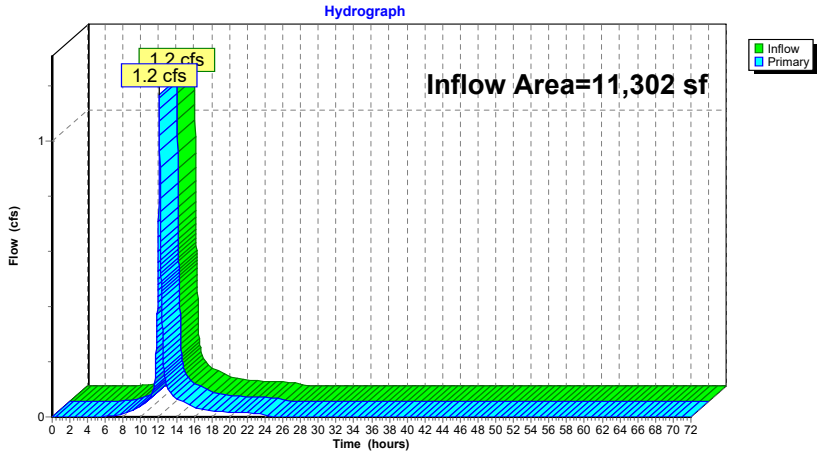


Summary for Link 2L: Towards Street

Inflow Area = 11,302 sf, 56.45% Impervious, Inflow Depth = 3.93" for 100-Year event
Inflow = 1.2 cfs @ 12.09 hrs, Volume= 3,699 cf
Primary = 1.2 cfs @ 12.09 hrs, Volume= 3,699 cf, Atten= 0%, Lag= 0.0 min

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

Link 2L: Towards Street

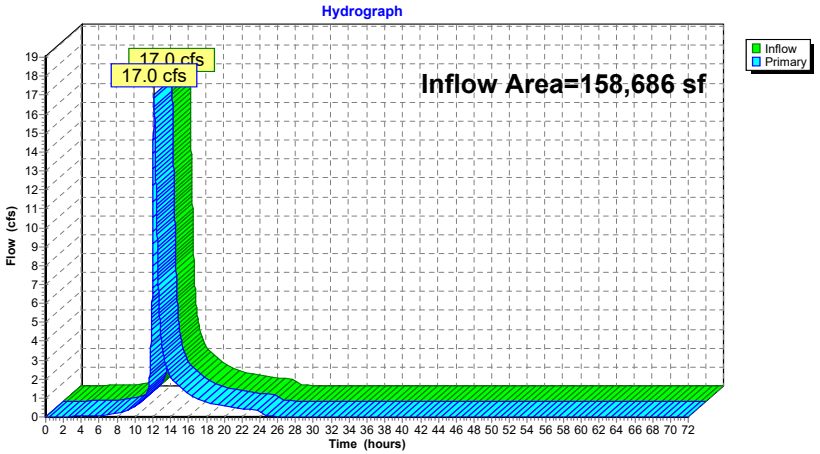


Summary for Link 100L: Total Flows

Inflow Area = 158,686 sf, 49.55% Impervious, Inflow Depth = 6.84" for 100-Year event
Inflow = 17.0 cfs @ 12.14 hrs, Volume= 90,469 cf
Primary = 17.0 cfs @ 12.14 hrs, Volume= 90,469 cf, Atten= 0%, Lag= 0.0 min

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

Link 100L: Total Flows



SECTION 6.0

ADDITIONAL DRAINAGE CALCULATIONS

6.01 TSS REMOVAL CALCULATIONS

TSS Removal Calculation Worksheet

Location: Thorndike Place, Arlington, MA

Project: 23407.00

BSC GROUP

Prepared By: C. Thomas

Date: 8/18/2021

AREA 1 - CB-1

Total Impervious Area, Acres= 0.377

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
Hydrodynamic Separator	0.7	0.75	0.53	0.23
Infiltration Basin	0.8	0.23	0.18	0.05

TSS Removal = 0.96

AREA 2 - TD-1

Total Impervious Area, Acres= 0.069

A	B	C	D	E
BMP	TSS Removal Rate	Starting TSS Load*	Amount Removed (BxC)	Remaining Load (C-D)
Hydrodynamic Separator	0.7	1.00	0.70	0.30
Infiltration Basin	0.8	0.30	0.24	0.06

TSS Removal = 0.94

AREA 3 - TD-2-6

Total Impervious Area, Acres= 0.056

A	B	C	D	E
BMP	TSS Removal Rate	Starting TSS Load*	Amount Removed (BxC)	Remaining Load (C-D)
Infiltration Basin	0.8	1.00	0.80	0.20

TSS Removal = 0.80

AREA 4 - Bypass to Street

Total Impervious Area, Acres= 0.021

A	B	C	D	E
BMP	TSS Removal Rate	Starting TSS Load*	Amount Removed (BxC)	Remaining Load (C-D)
		1.00		

TSS Removal =

AREA 5 - East Driveway

Total Impervious Area, Acres= 0.148

A	B	C	D	E
BMP	TSS Removal Rate	Starting TSS Load*	Amount Removed (BxC)	Remaining Load (C-D)
Rain Garden	0.8	1.00	0.80	0.20

TSS Removal = 0.80

Weighted Annual Average TSS Removal Rate

[TSS Removal-1 (Area-1) + TSS Revoval-2 (Area-2)+ ….] / [Area-1 + Area-2 + ...] = 0.88

Project Site TSS Removal = 0.88

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=0.25-inch for Soil Type C)

Impervious Area = Proposed Pavement and Rooftop area on-site

$$Rv = \left(\frac{0.25in}{12}\right)(78{,}629sft) =$$

Rv = 1,638 cf (required recharge volume)

As not all impervious surfaces are directed to an infiltration BMP, an adjusted Required Volume must be provided. The adjusted Required Volume (Rva) is calculated as:

$$Rva = \frac{Total\ Imp.Area}{Imp.Area\ to\ BMP}\ (\text{Rv}) =$$

$$Rva = \left(\frac{78{,}629sft}{62{,}920sft}\right)(1{,}638cf) =$$

$$Rva = 2{,}047\ cf$$

Storage Provided

- Underground Infiltration System = 9,747 cubic feet provided.
  Rain garden & duplex infiltration systems not required to meet volume, but provide additional infiltration above and beyond that required.
  Refer to the HydroCAD storage table provided for more information.

Stage-Area-Storage for Pond 1P: Underground Infiltration System

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
6.00	**7,556**	0	8.65	7,556	17,220
6.05	7,556	325	8.70	7,556	17,545
6.10	7,556	650	8.75	7,556	17,870
6.15	7,556	975	8.80	7,556	18,195
6.20	7,556	1,300	8.85	7,556	18,520
6.25	7,556	1,625	8.90	7,556	18,845
6.30	7,556	1,949	8.95	7,556	19,170
6.35	7,556	2,274	9.00	7,556	**19,495**
6.40	7,556	2,599			
6.45	7,556	2,924			
6.50	7,556	3,249			
6.55	7,556	3,574			
6.60	7,556	3,899			
6.65	7,556	4,224			
6.70	7,556	4,549			
6.75	7,556	4,874			
6.80	7,556	5,199			
6.85	7,556	5,524			
6.90	7,556	5,848			
6.95	7,556	6,173			
7.00	7,556	6,498			
7.05	7,556	6,823			
7.10	7,556	7,148			
7.15	7,556	7,473			
7.20	7,556	7,798			
7.25	7,556	8,123			
7.30	7,556	8,448			
7.35	7,556	8,773			
7.40	7,556	9,098			
7.45	7,556	9,422			
7.50	7,556	9,747			
7.55	7,556	10,072			
7.60	7,556	10,397			
7.65	7,556	10,722			
7.70	7,556	11,047			
7.75	7,556	11,372			
7.80	7,556	11,697			
7.85	7,556	12,022			
7.90	7,556	12,347			
7.95	7,556	12,672			
8.00	7,556	12,997			
8.05	7,556	13,321			
8.10	7,556	13,646			
8.15	7,556	13,971			
8.20	7,556	14,296			
8.25	7,556	14,621			
8.30	7,556	14,946			
8.35	7,556	15,271			
8.40	7,556	15,596			
8.45	7,556	15,921			
8.50	7,556	16,246			
8.55	7,556	16,571			
8.60	7,556	16,895			

System outlet at elevation 7.50
9,747 cu.ft. > 2,047 cu.ft.

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.

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

$$Time = \left(\frac{9{,}747\ cu.ft.}{(0.043\ ft/hr)(7{,}556 sq.ft.)}\right) =$$

$$Time = 30\ hours$$

- 30 hours < 72 hours

Pond TD2 to TD6

Rv = Recharge Volume, 678 cu.ft. (see HydroCAD)

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

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

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

$$Time = \left(\frac{678\ cu.ft.}{(0.043\ ft/hr)(278 sq.ft.)}\right) =$$

$$Time = 57\ hours$$

- 57 hours < 72 hours

Pond 3P (Rain Garden)

Rv = Recharge Volume, 172 cu.ft. (see HydroCAD)

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

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

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

$$Time = \left(\frac{172\ cu.ft.}{(0.043\ ft/hr)(125 sq.ft.)}\right) =$$

$$Time = 32\ hours$$

- 32 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.

Underground Infiltration Systems and Bio-Retention Areas

A_{IMP} = 78,629 sq.ft.

V_{WQ} = (0.5 inches/12 inches/foot) * (78,629 sq.ft.)

V_{WQ} = 3,276 cubic feet (required volume), provided volume = 9,747 cubic feet in Underground Infiltration System (refer to the HydroCAD storage tables provided in groundwater recharge section). Additional water quality volume provided in duplex infiltration systems and rain garden above and beyond the water quality volume required.

6.04 RIP-RAP OUTLET PROTECTION SIZING

OUTLET PROTECTION SIZING

BSC GROUP

Project No. 23407.00
Subject Outlet Protection Sizing Calcs
Location Arlington, MA

Calc By CRT
Date 8/18/2021
Checked by DRR
Date 8/18/2021

FES-1

Q=Design Discharge, (ft^3/s)	=	4.8	cfs
D=Culvert Diameter, (ft)	=	1.25	ft
TW=Tailwater Depth, (ft)	=	0.5	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

$$D_{50} = 0.28\,\frac{4.80}{9.91}\,(4/3)\,\frac{1.25}{0.50} = 0.27 \text{ ft}$$

= **3.19 inches**

Table 1 : Riprap Classes and Apron Dimensions

Class	D_{50} (in)	Apron Length	Apron Depth	
1	**5**	**4D**	**$3.5D_{50}$**	**Use Class 1**
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	$2.0D_{50}$	

Apron Dimensions

Length, L=5D	=	**6 ft**	
Depth=$3.3D_{50}$	=	**16.50 Inches**	
Width=3D+(2/3)L	=	**7.92 ft**	(at apron end)

Riprap Rock Sizing Gradation

Given Size	Size of Stone, inches		
100	**8**	to	**10**
85	**7**	to	**9**
50	**5**	to	**8**
15	**3**	to	**7**

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

OUTLET PROTECTION SIZING

BSC GROUP

Project No.	23407.00	**Calc By**	CRT
Subject	Outlet Protection Sizing Calcs	**Date**	8/18/2021
Location	Arlington, MA	**Checked by**	DRR
		Date	8/18/2021

Roof Drain

Q=Design Discharge, (ft^3/s)	=	3.3	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

$$D_{50} = 0.28 \frac{3.30}{5.67}^{(4/3)} \frac{1.00}{0.40} = 0.34 \text{ ft}$$

= 4.08 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**	**$3.5D_{50}$**	**Use Class 2**
3	10	5D	$3.3D_{50}$	
4	14	6D	$2.2D_{50}$	
5	20	7D	$2.0D_{50}$	
6	22	8D	$2.0D_{50}$	

Apron Dimensions

Length, L=5D	=	**5 ft**	
Depth=$3.3D_{50}$	=	**19.80 Inches**	
Width=3D+(2/3)L	=	**6.33 ft**	(at apron end)

Riprap Rock Sizing Gradation

Given Size	Size of Stone, inches		
100	**9**	to	**12**
85	**8**	to	**11**
50	**6**	to	**9**
15	**3**	to	**8**

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

6.05 GROUNDWATER MOUNDING ANALYSIS

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
12.12	0.2	103	6.02	0	0	0
12.13	0.2	107	6.02	0.1	0.1	0
12.14	0.2	111	6.02	0.1	0.1	0
12.15	0.1	115	6.02	0.1	0.1	0
12.16	0.1	118	6.02	0.1	0.1	0
12.17	0.1	121	6.02	0.1	0.1	0
12.18	0.1	123	6.02	0.1	0.1	0
12.4	0.1	152	6.02	0.1	0.1	0
12.41	0.1	152	6.02	0.1	0.1	0
12.42	0.1	152	6.02	0.1	0.1	0
12.43	0.1	153	6.02	0.1	0.1	0
12.44	0.1	153	6.02	0.1	0.1	0
12.45	0.1	153	6.02	0.1	0.1	0
12.46	0.1	153	6.02	0.1	0.1	0
12.47	0.1	153	6.02	0.1	0.1	0
12.48	0.1	153	6.02	0.1	0.1	0
12.49	0.1	153	6.02	0.1	0.1	0
12.5	0.1	153	6.02	0.1	0.1	0
13.26	0	111	6.02	0.1	0.1	0
13.27	0	111	6.02	0.1	0.1	0
13.28	0	110	6.02	0.1	0.1	0
13.29	0	110	6.02	0.1	0.1	0
13.3	0	110	6.02	0.1	0.1	0
13.31	0	109	6.02	0.1	0.1	0
13.32	0	109	6.02	0.1	0.1	0
13.33	0	108	6.02	0.1	0.1	0
13.34	0	108	6.02	0.1	0.1	0
13.35	0	107	6.02	0.1	0.1	0
13.36	0	107	6.02	0	0	0

Infiltration System 1P

51555	Impervious Surface (sft)
0.025	Required recharge volume (acre-ft)
0.100	Average infiltration rate (cfs)
8640.00	Average infiltration rate (cft/day)
7556	System bottom area (sft)
	(use 183'L x 41.3'W)
1.143	Percoloation/application rate (ft/day)
12.13	Infiltration start time
13.35	Infiltration end time
1.22	Time (hrs)
0.051	Time (days)
1.04	Hydraulic conductivity (ft/day)
0.138	Specific yield
5	Initial saturated thickness (ft)
0.422	**Increase in hydraulic head (ft)**

Note that full tabular hydrograph not printed for brevity

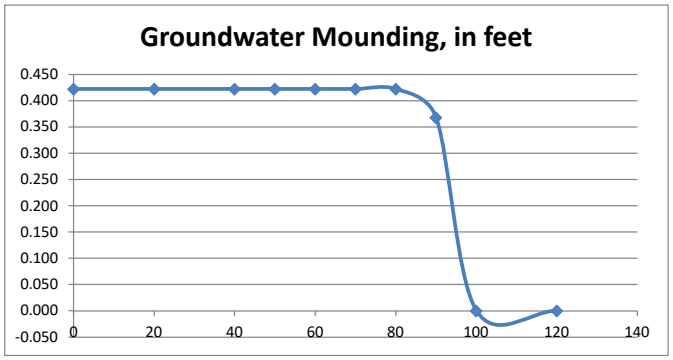
Pond 1P Mounding - Results

Input Values			inch/hour	feet/day	
1.1430	*R*	Recharge (infiltration) rate (feet/day)	0.67	1.33	
0.138	Sy	Specific yield, Sy (dimensionless, between 0 and 1)			
1.04	K	Horizontal hydraulic conductivity, Kh (feet/day)*	2.00	4.00	In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).
91.500	x	1/2 length of basin (x direction, in feet)			
20.650	y	1/2 width of basin (y direction, in feet)	hours	days	
0.051	t	duration of infiltration period (days)	36	1.50	
5.000	hi(0)	initial thickness of saturated zone (feet)			

5.422	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
0.422	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.422	0
0.422	20
0.422	40
0.422	50
0.422	60
0.422	70
0.422	80
0.368	90
0.000	100
0.000	120

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
5.8	0.00001	0	5	0.00000	0.00000	0.00000
5.81	0.00001	0	5	0.00001	0.00001	0.00000
5.82	0.00001	0	5	0.00001	0.00001	0.00000
5.83	0.00001	0	5	0.00001	0.00001	0.00000
5.84	0.00001	0	5	0.00001	0.00001	0.00000
5.85	0.00001	0	5	0.00001	0.00001	0.00000
5.86	0.00001	0	5	0.00001	0.00001	0.00000
15.62	0.00050	1	5.01	0.00060	0.00060	0.00000
15.63	0.00049	1	5.01	0.00060	0.00060	0.00000
15.64	0.00049	1	5.01	0.00059	0.00059	0.00000
15.65	0.00049	1	5.01	0.00059	0.00059	0.00000
15.66	0.00049	1	5.01	0.00059	0.00059	0.00000
15.67	0.00049	1	5.01	0.00059	0.00059	0.00000
15.68	0.00049	1	5.01	0.00058	0.00058	0.00000
15.69	0.00048	1	5.01	0.00058	0.00058	0.00000
15.7	0.00048	1	5.01	0.00058	0.00058	0.00000
15.71	0.00048	1	5.01	0.00058	0.00058	0.00000
15.72	0.00048	1	5.01	0.00058	0.00058	0.00000
25.49	0.00000	0	5	0.00001	0.00001	0.00000
25.5	0.00000	0	5	0.00001	0.00001	0.00000
25.51	0.00000	0	5	0.00001	0.00001	0.00000
25.52	0.00000	0	5	0.00001	0.00001	0.00000
25.53	0.00000	0	5	0.00001	0.00001	0.00000
25.54	0.00000	0	5	0.00001	0.00001	0.00000
25.55	0.00000	0	5	0.00001	0.00001	0.00000
25.56	0.00000	0	5	0.00001	0.00001	0.00000
25.57	0.00000	0	5	0.00001	0.00001	0.00000
25.58	0.00000	0	5	0.00001	0.00001	0.00000
25.59	0.00000	0	5	0.00000	0.00000	0.00000

TD5 representative of duplex systems with least separation to groundwater

Infiltration System TD5

1076	Impervious Surface (sft)
0.001	Required recharge volume (acre-ft)
0.001	Average infiltration rate (cfs)
53.03	Average infiltration rate (cft/day)
278	System bottom area (sft) (use 16.4'L x 17'W)
0.191	Percoloation/application rate (ft/day)
5.81	Infiltration start time
25.58	Infiltration end time
19.77	Time (hrs)
0.824	Time (days)
1.04	Hydraulic conductivity (ft/day)
0.138	Specific yield
5	Initial saturated thickness (ft)
0.846	**Increase in hydraulic head (ft)**

Note that full tabular hydrograph not printed for brevity

Pond 1P Mounding - Results

Input Values

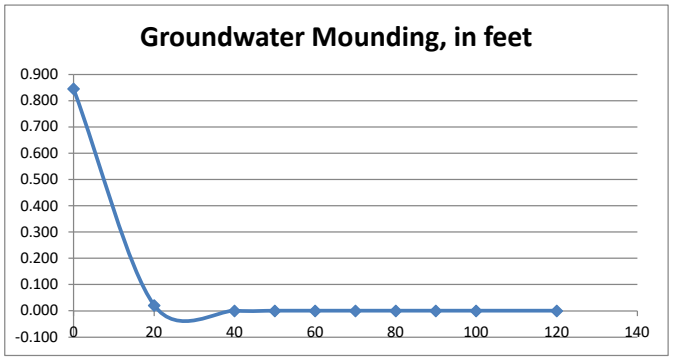
			inch/hour	feet/day
0.1910	R	Recharge (infiltration) rate (feet/day)	0.67	1.33
0.138	Sy	Specific yield, Sy (dimensionless, between 0 and 1)		
1.04	K	Horizontal hydraulic conductivity, Kh (feet/day)*	2.00	4.00
8.200	x	1/2 length of basin (x direction, in feet)		
8.500	y	1/2 width of basin (y direction, in feet)	hours	days
0.824	t	duration of infiltration period (days)	36	1.50
5.000	hi(0)	initial thickness of saturated zone (feet)		

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

5.846	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
0.846	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.846	0
0.021	20
0.000	40
0.000	50
0.000	60
0.000	70
0.000	80
0.000	90
0.000	100
0.000	120

Re-Calculate Now



Disclaimer

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6.06 ILLICIT DISCHARGE COMPLIANCE STATEMENT

Illicit Discharge Compliance Statement

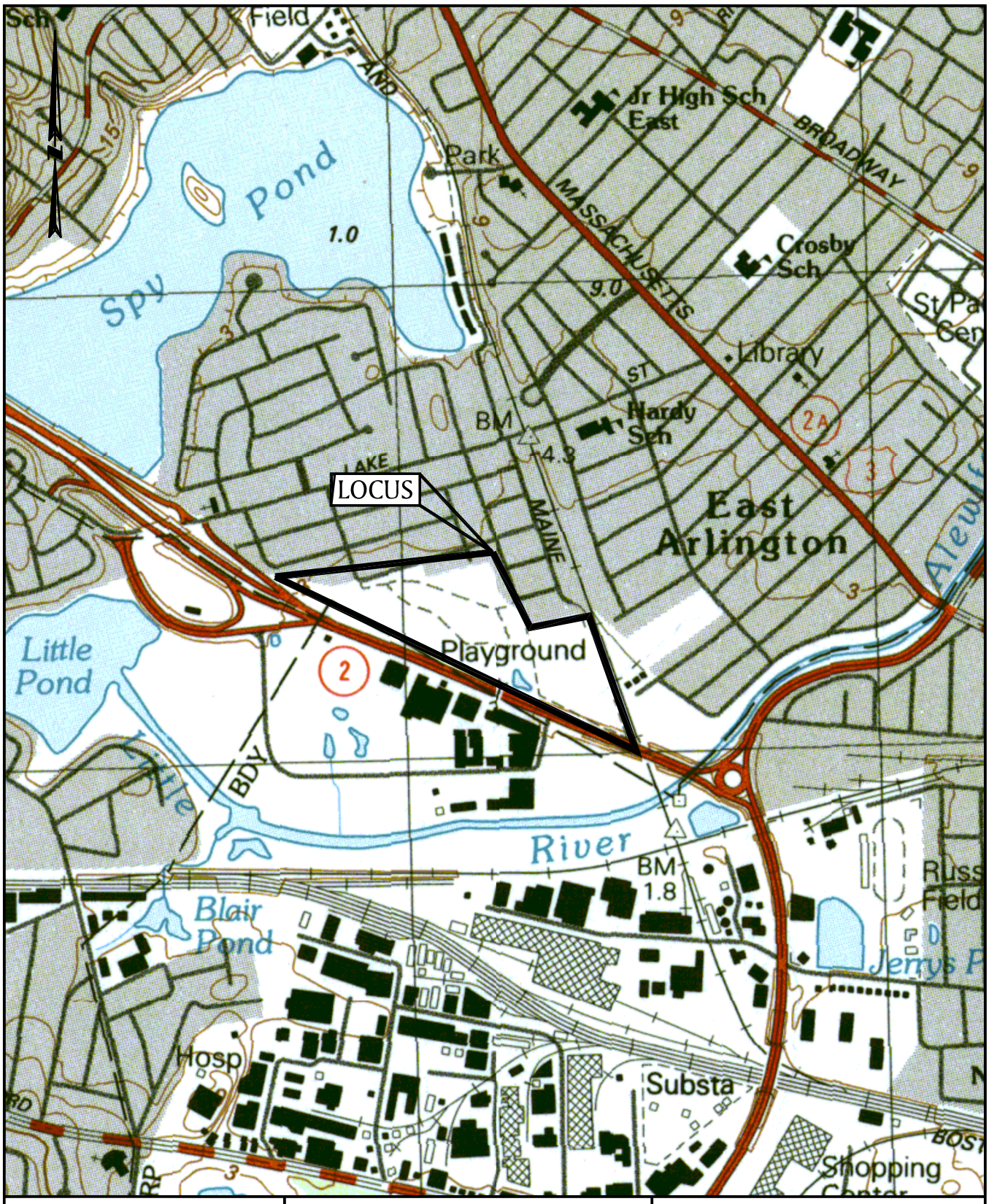
This statement is to document that, to the best of my knowledge and belief, there are no and will be no illicit discharges to the stormwater management systems or protected wetland resource areas for the Thorndike Place residential development on Dorothy Road in Arlington, Massachusetts.

Authorized Signature/Title

Date

APPENDIX A

USGS LOCUS MAP



PREPARED FOR:

ARLINGTON LAND REALTY, LLC
84 SHERMAN ST, 2ND FLOOR
CAMBRIDGE, MA 02140

USGS LOCUS MAP

THORNDIKE PLACE
DOROTHY ROAD
ARLINGTON, MA

BSC GROUP
803 Summer Street
Boston, Massachusetts
02127
617 896 4300

Job No.: 23407.00 Date: 11/3/2020
Scale: 1"=1,000' Revised:
Dwg. No: Figure: 1 OF 1

File: 2340700\C\Drainage\2340700-EX WATERSHED

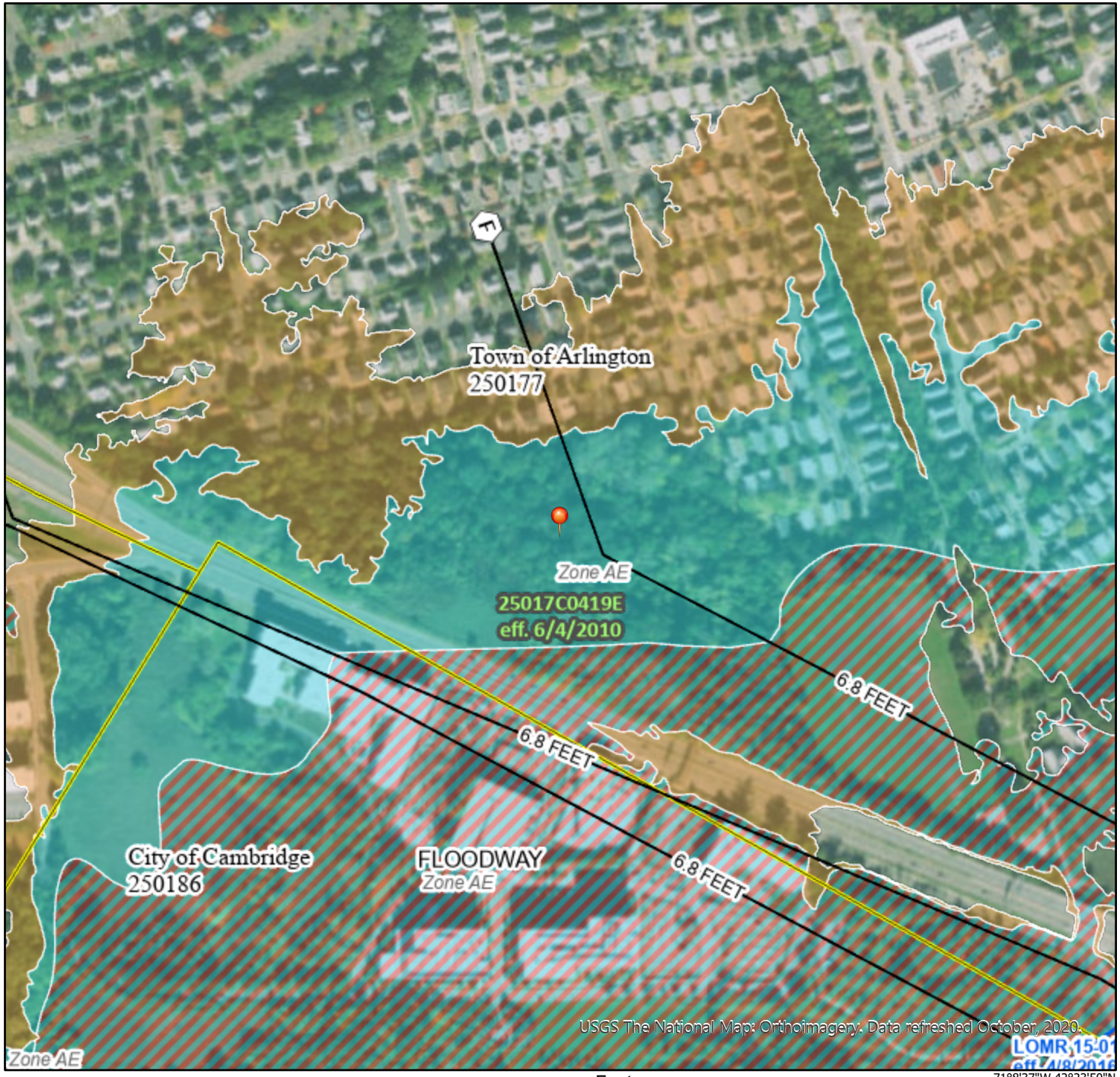
APPENDIX B

FEMA MAP

National Flood Hazard Layer FIRMette

FEMA

71°9'15"W 42°24'17"N



71°8'37"W 42°23'50"N

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

1:6,000

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 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 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 11/2/2020 at 3:34 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

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Middlesex County, Massachusetts

November 2, 2020

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:4,500 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Sep 11, 2019—Oct 5, 2019

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
51A	Swansea muck, 0 to 1 percent slopes	4.3	4.6%
52A	Freetown muck, 0 to 1 percent slopes	10.4	11.2%
603	Urban land, wet substratum	32.1	34.5%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	14.3	15.4%
655	Udorthents, wet substratum	31.9	34.3%
Totals for Area of Interest		**92.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Middlesex County, Massachusetts

51A—Swansea muck, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2trl2
Elevation: 0 to 1,140 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Swansea and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Swansea

Setting

Landform: Swamps, bogs
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material over loose sandy and gravelly glaciofluvial deposits

Typical profile

Oa1 - 0 to 24 inches: muck
Oa2 - 24 to 34 inches: muck
Cg - 34 to 79 inches: coarse sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water capacity: Very high (about 16.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: B/D
Ecological site: F144AY043MA - Acidic Organic Wetlands
Hydric soil rating: Yes

Minor Components

Freetown

Percent of map unit: 10 percent
Landform: Bogs, swamps

Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

52A—Freetown muck, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2t2q9
Elevation: 0 to 1,110 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Freetown and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Freetown

Setting

Landform: Depressions, depressions, bogs, marshes, kettles, swamps
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material

Typical profile

Oe - 0 to 2 inches: mucky peat
Oa - 2 to 79 inches: muck

Properties and qualities

Slope: 0 to 1 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water capacity: Very high (about 19.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F144AY043MA - Acidic Organic Wetlands
Hydric soil rating: Yes

Minor Components

Swansea

Percent of map unit: 5 percent
Landform: Kettles, depressions, depressions, marshes, swamps, bogs
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

603—Urban land, wet substratum

Map Unit Setting

National map unit symbol: 9951
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land over alluvium and/or marine deposits

Minor Components

Udorthents, loamy

Percent of map unit: 10 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 5 percent
Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

626B—Merrimac-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyr9
Elevation: 0 to 820 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Merrimac and similar soils: 45 percent
Urban land: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Eskers, moraines, outwash terraces, outwash plains, kames
Landform position (two-dimensional): Backslope, footslope, summit, shoulder
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water capacity: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Description of Urban Land

Typical profile

M - 0 to 10 inches: cemented material

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 0 inches to manufactured layer

Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water capacity: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Windsor

Percent of map unit: 5 percent
Landform: Dunes, outwash terraces, deltas, outwash plains
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Outwash plains, terraces, deltas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Eskers, kames, deltas, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

655—Udorthents, wet substratum

Map Unit Setting

National map unit symbol: vr1n
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, wet substratum, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Wet Substratum

Setting

Parent material: Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Minor Components

Urban land

Percent of map unit: 8 percent
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear

Freetown

Percent of map unit: 4 percent
Landform: Depressions, bogs
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Swansea

Percent of map unit: 3 percent
Landform: Bogs, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

References

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APPENDIX D

TEST PIT LOGS

Commonwealth of Massachusetts
City/Town of Arlington

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

A. Facility Information

Arlington Land Realty, LLC
Owner Name

Dorothy Road
Street Address

16-8-2, 16-8-3, 16-8-4, 16-8-5, 16-8-6, 16-8-7A
Map/Lot #

Arlington
City

MA
State

02474
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes: Web Soil Survey (Source) 655, 51A (Soil Map Unit)

Udorthents, Swansea Muck
Soil Name

Fill throughout site; clay base layer in one test pit
Soil Limitations

Glaciofluvial deposit
Soil Parent material

Depression
Landform

3. Surficial Geological Report Available? ☒ Yes ☐ No If yes: 2018/USGS (Year Published/Source) Glaciomarine fine deposits, stagnant ice deposits (Map Unit)

fine/very fine sand down to very fine sand, silt, silty clay, and clay
Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☒ Yes ☐ No If yes, MassGIS Wetland Data Layer: Shallow marsh meadow (Wetland Type)

7. Current Water Resource Conditions (USGS): 11/25/2020 (Month/Day/ Year) Range: ☒ Above Normal ☐ Normal ☐ Below Normal

8. Other references reviewed: Not in Zone I, II, or IWPA (OLIVER)

Commonwealth of Massachusetts
City/Town of Arlington

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

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

Deep Observation Hole Number: TP-1 (Hole #) | 11/25/2020 (Date) | 7:45 AM (Time) | Cloudy, 30deg (Weather) | 42.40 N (Latitude) | 71.15 W (Longitude:)

1. Land Use: Woodland adjacent to residential/highway (e.g., woodland, agricultural field, vacant lot, etc.) | Forest (Vegetation) | Some large boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-2% (Slope (%))

Description of Location:

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

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet | Property Line >100 feet | Drinking Water Well >100 feet | Other _____ feet

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

5. Groundwater Observed: ☒ Yes ☐ No If yes: 108" Depth Weeping from Pit | 108" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-10	A	SL	7.5YR 2.5/1	--	--	--	0	0	massive	friable	
10"-36"	B (fill)	gravelly sandy loam	10YR 3/3	--	--	--	10	2-4	massive	very friable	
36"-48"											
48"-108"	C1 (fill)	gravelly sandy loam	10YR 2/1	--	--	--	15-20	4-6	massive	very friable	
36"-78"	C2 (fill)	loamy sand	10YR 5/4	--	--	--	0	0	single grain	loose	sandy layer (only on E side of test pit)
78"-108"	2C2 (fill)	gravelly sandy loam	10YR 2/1	--	--	--	15-20	4-6	massive	very friable	gravelly layer below sandy layer on E side of test pit

Additional Notes:
Elevation of TP-1 = 12.0. Groundwater at bottom of test pit (9' - elevation 3.0). Test pit mostly fill

Commonwealth of Massachusetts
City/Town of Arlington

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

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

Deep Observation Hole Number: TP-2 (Hole #) | 11/25/20 20 | 8:45AM (Time) | Cloudy, 35deg (Weather) | 42.40 N (Latitude) | 71.15 W (Longitude:)

1. Land Use: Woodland adjacent to residential/highway (e.g., woodland, agricultural field, vacant lot, etc.) | Forest (Vegetation) | Some large boulders around (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-2% (Slope (%))

Description of Location:

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

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet
Property Line >100 feet | Drinking Water Well >100 feet | Other _____ feet

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

5. Groundwater Observed: ☐ Yes ☒ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-7	A	sandy loam	10YR 2.5/1	--	--	--	0	0	massive	friable	
7-132	C (fill)	gravelly sandy loam	10YR 3/2	--	--	--	15-20	4-6	massive	friable	

Additional Notes:
Elevation of TP-2 = 11.2. Estimated groundwater elevation (to bottom of test pit) = 0.2. Fill throughout test pit. No groundwater observed

Commonwealth of Massachusetts
City/Town of Arlington

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

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole #TP-1	Obs. Hole #TP-2
☒ Depth observed standing water in observation hole	108 inches	_____ inches
☐ Depth weeping from side of observation hole	_____ inches	_____ inches
☐ Depth to soil redoximorphic features (mottles)	_____ 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 _____

2. Estimated Depth to High Groundwater: 108 inches

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 A and O Horizons)?	Upper boundary:	_____ inches	Lower boundary:	_____ inches
c. If no, at what depth was impervious material observed?	Upper boundary:	108 inches	Lower boundary:	>108 (fill material) inches

Commonwealth of Massachusetts
City/Town of Arlington

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

F. Certification

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

	11/25/2020
Signature of Soil Evaluator	Date
Emily Derrig SE14158	12/1/2020
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
Name of Approving Authority Witness	Approving Authority

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

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Arlington

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

A. Facility Information

Arlington Land Realty, LLC
Owner Name

Dorothy Road
Street Address

16-8-2, 16-8-3, 16-8-4, 16-8-5, 16-8-6, 16-8-7A
Map/Lot #

Arlington
City

MA
State

02474
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes: Web Soil Survey (Source) 655, 51A (Soil Map Unit)

Udorthents, Swansea Muck
Soil Name

Fill throughout site; clay base layer in one test pit
Soil Limitations

Glaciofluvial deposit
Soil Parent material

Depression
Landform

3. Surficial Geological Report Available? ☒ Yes ☐ No If yes: 2018/USGS (Year Published/Source) Glaciomarine fine deposits, stagnant ice deposits (Map Unit)

fine/very fine sand down to very fine sand, silt, silty clay, and clay
Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☒ Yes ☐ No If yes, MassGIS Wetland Data Layer: Shallow marsh meadow (Wetland Type)

7. Current Water Resource Conditions (USGS): 11/25/2020 (Month/Day/ Year) Range: ☒ Above Normal ☐ Normal ☐ Below Normal

8. Other references reviewed: Not in Zone I, II, or IWPA (OLIVER)

Commonwealth of Massachusetts
City/Town of Arlington

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

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

Deep Observation Hole Number: TP-3 (Hole #) | 11/25/2020 (Date) | 9:45 AM (Time) | Cloudy, 40deg (Weather) | 42.40 N (Latitude) | 71.15 W (Longitude:)

1. Land Use: Woodland adjacent to residential/highway (e.g., woodland, agricultural field, vacant lot, etc.) | Forest (Vegetation) | Some large boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-2% (Slope (%))

Description of Location:

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

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet | Property Line >100 feet | Drinking Water Well >100 feet | Other _____ feet

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

5. Groundwater Observed: ☒ Yes ☐ No If yes: 84" Depth Weeping from Pit 144" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-8"	A	SL	10YR 2/1	--	--	--	0	0	massive	very friable	
8"-84"	B	SL	7.5YR 2.5/2	36"	7.5YR 5/8	2-4%	2-4	0	massive	friable	
84"-108"	C1	Sandy Clay Loam	10YR 2/1	--	--	--	0	0	massive	firm	
108"-144"	C2	Clay	GLEY 2 4/5B	--	--	--	0	0	massive	very firm	

Additional Notes:
TP-3 Elevation = 6.5. Groundwater observed at bottom of test pit (12') and weeping from sides at 7' - estimated groundwater elevation = -0.5

Commonwealth of Massachusetts
City/Town of Arlington

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

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

Deep Observation Hole Number: _____ Hole # _____ Date _____ Time _____ Weather _____ Latitude _____ Longitude:

1. Land Use: _____ (e.g., woodland, agricultural field, vacant lot, etc.) _____ Vegetation _____ Surface Stones (e.g., cobbles, stones, boulders, etc.) _____ Slope (%)

   Description of Location: _____

2. Soil Parent Material: _____ _____ Landform _____ Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
   Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

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

5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			

Additional Notes: _____

Commonwealth of Massachusetts
City/Town of Arlington

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

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # TP-3	Obs. Hole # _____
☒ Depth observed standing water in observation hole	132 inches	_____ inches
☒ Depth weeping from side of observation hole	84 inches	_____ inches
☐ Depth to soil redoximorphic features (mottles)	_____ 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 _____

2. Estimated Depth to High Groundwater: 84 inches

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 A and O Horizons)?	Upper boundary:	_____ inches	Lower boundary:	_____ inches
c. If no, at what depth was impervious material observed?	Upper boundary:	84 inches	Lower boundary:	132 inches

Commonwealth of Massachusetts
City/Town of Arlington

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

F. Certification

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

	11/25/2020
Signature of Soil Evaluator	Date
Emily Derrig SE14158	12/1/2020
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
Name of Approving Authority Witness	Approving Authority

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

Field Diagrams: Use this area for field diagrams: