

Notice of Intent
for
15 Liberty Way, Franklin MA 02038
(Map: 320, Parcel: 4)



DATE:

May 25, 2023

ADDRESSED TO:

Municipal Building
Franklin Conservation Commission
355 E. Central Street
Franklin, MA 02038

PREPARED BY:

Goddard Consulting LLC
291 Main Street, Suite 8
Northborough, MA 01532

PREPARED FOR:

Atlantic Oliver 15 Liberty Way LLC
c/o Oliver Street Capital
125 High Street, Suite 220
Boston, MA 02110



Municipal Building
Franklin Conservation Commission
355 E. Central Street
Franklin, MA 02038

May 25, 2023

Re: Notice of Intent - 15 Liberty Way, Franklin MA (Map: 320, Parcel: 4)

Dear Franklin Conservation Commission,

On behalf of Atlantic Oliver 15 Liberty Way LLC (the applicant), Goddard Consulting, LLC (representative) is hereby submitting this Notice of Intent (NOI) application for a project which consists of the expansion of a parking lot and associated stormwater management at 15 Liberty Way, Franklin MA. This report describes existing conditions, proposed conditions, wetlands present on site, and project compliance with the Franklin Wetlands Protection Bylaw. The project site contains no resource areas jurisdictional under the MA Wetlands Protection Act.

The only wetland resources affected by the proposed work are Isolated Vegetated Wetland (IVW) and associated 100' buffer zone. This NOI application is a filing only under the Town of Franklin's Wetlands Protection Bylaw. The original, one additional hardcopy, two full-sized sets of plans, and seven 11"x17" sets of plans have been submitted for your review, along with a digital submittal to both the Conservation Department and the Department of Public Works. A list of enclosed documents is as follows:

- NOI Application (WPA Form 3)
- Copy of Checks
- Affidavit of Service, Notification to Abutters, Certified Abutters List
- Orthophoto View of Site, Goddard Consulting LLC. 3/31/2023
- Orthophoto View of Site with DEP Wetlands, Goddard Consulting LLC. 3/31/2023
- Orthophoto View of Site with FEMA Flood Zones, Goddard Consulting LLC. 3/31/2023
- Orthophoto View of Site with NRCS Soil Survey, Goddard Consulting LLC. 3/31/2023
- USGS of Site, Goddard Consulting LLC. 3/31/2023
- Simple Wildlife Habitat Evaluation Form
- Stormwater Report (includes Stormwater Management Checklist), Level Design Group, 1/13/2023,
- Local Filing Fee Calculation Worksheet
- Resource Area Impact Summary, Property Access Signature Form & Application Process Signature Form
- Request for Variance
- BVW Determination Data Form
- Site Plans: Liberty Parking Expansion, Level Design Group, 1/13/2023

Sincerely,

Goddard Consulting, LLC

Chris Frattaroli

Wetland Scientist

Cc: Daniel Campbell, Level Design Group, 249 South Street, Unit 1, Plainville, MA 02762
Atlantic Oliver 15 Liberty Way LLC, 125 High Street, Suite 220, Boston MA, 02110
MassDEP Central Regional Office, 8 New Bond Street, Worcester, MA 01606

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1.0 EXISTING CONDITIONS

The project site consists of a ±15-acre lot located at 15 Liberty Way in Franklin, MA (Map 320, Lot 4) within Franklin Industrial Park. The project site is currently in use as a commercial trucking warehouse. The northern portion of the lot consists of an area of forested upland. Approximately 58% of the parcel's ±15-acres is comprised of impervious cover including the 92,490SF warehouse building and paved surfaces.

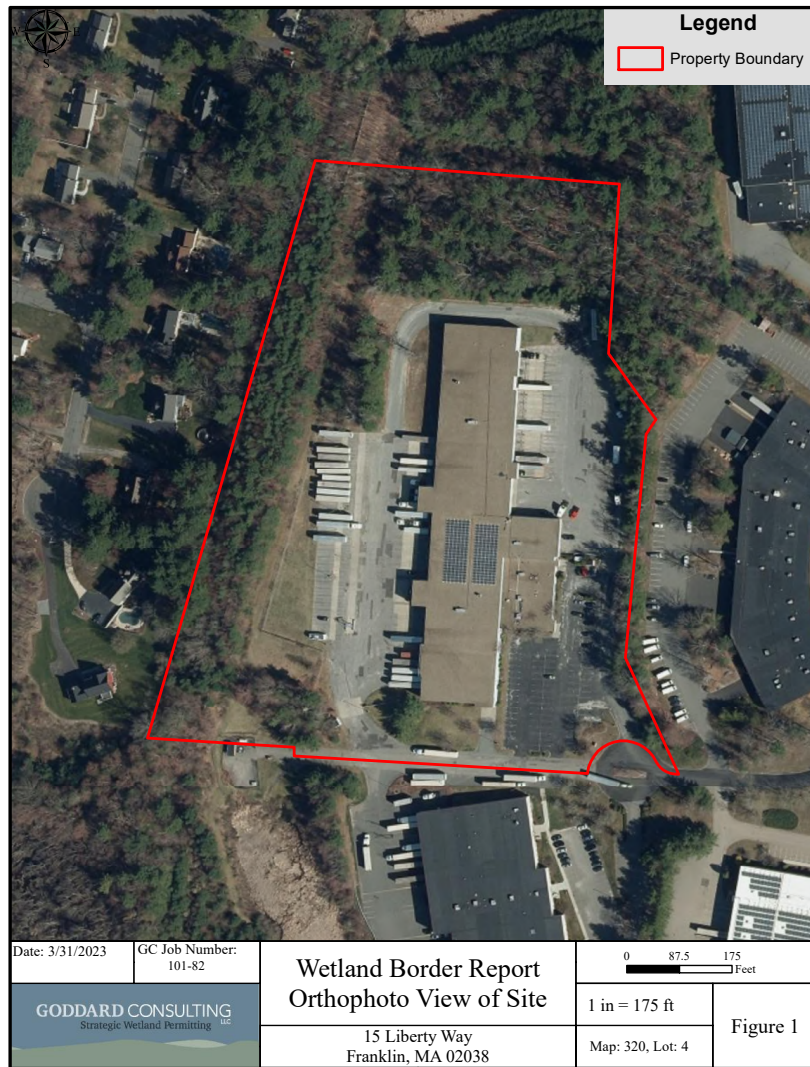


Figure 1: Orthophoto of locus site.

1.1 RESOURCE AREAS ON SITE

The resource area onsite in proximity to the work area is a small IVW and is jurisdictional under the Franklin Wetlands Protection Bylaw, but not under the MA Wetlands Protection Act. This IVW is lined with riprap and was constructed inside a drainage easement as a stormwater management structure. This retention pond has a stormwater ditch (described in section 1.2 of this report) that leads to it, although presently little to no water reaches it via this conduit. The retention pond drains via a 24" reinforced concrete pipe to a larger underground stormwater management system that continues offsite.



Figure 2: Side-by-side historic aerials from 1995 and 2006. Tree clearing for drainage infrastructure is absent in 1995 imagery but visible in 2006 imagery. The offsite stormwater ditch is indicated in red. The location of the IVW is indicated in yellow.

According to historic aerial imagery available for the area, this stormwater infrastructure was constructed in the late 1990s or early 2000s, around the time the industrial park was being developed. No areas jurisdictional under the MA Wetlands Protection Act are present onsite. Therefore, the construction of this feature did not require filing under the WPA at the time of its construction, and similarly does not now.

This IVW is, however, jurisdictional under the Franklin Wetlands Protection Bylaw, thus necessitating this filing. Vegetative cover of the IVW is dominated by red maple (*Acer rubrum*), eastern cottonwood (*Populus deltoides*), Sitka willow (*Salix sitchensis*), multiflora rose (*Rosa multiflora*), sensitive fern (*Onoclea sensibilis*), common reed (*Phragmites australis*) and purple loosestrife (*Lythrum salicaria*). A soil sample taken from this IVW showed a fine sandy loam with matrix color 10YR6/2 from 0-6". At approximately 6", a restrictive layer of riprap is encountered. This IVW has not been flagged in the field. Its boundary is clearly defined by the rip-rap slope that contains it and its extent is accurately depicted on the attached site plans. A BVW Determination Data form for this area is attached to this submittal.



Figure 3: View of riprap lined IVW from concrete pipe outlet, facing north.



Figure 4: Alternate view of riprap lined IVW.

1.2 OTHER JURISDICTIONAL AREAS ON SITE

Offsite to the north of the parcel, there is an unmaintained stormwater ditch with periodic riprap breakers along its length. This ditch originates at a culvert that conveys stormwater from an adjacent property. If it was maintained in good repair, this feature would convey water to the IVW referenced above. However, in its present condition, it does not convey water at all, resulting in stagnant water throughout its course. The Franklin Wetlands Protection Bylaw §181-4 defines a river or stream as “A naturally flowing body of water that empties into any ocean, lake or other river or stream that flows throughout the year.” Therefore, it does not meet the definition of river or stream as defined in the Bylaw and is considered an IVW. This feature casts a jurisdictional buffer zone onto the project site.



Figure 5: Origin of offsite stormwater ditch.



Figure 6: Unmaintained riprap breaker interrupting stormwater ditch.

According to the MassGIS data layers for NHESP, this site is not within Estimated and/or Priority Habitat of Rare Wildlife. There are no potential or certified vernal pools located onsite. The site is not located in an Area of Critical Environmental Concern (ACEC) or an Outstanding Resource Waters Area (ORW). There is no FEMA Flood Zone mapped onsite. There is no DEP mapped wetland onsite.

1.3 NON-JURISDICTIONAL AREAS ON SITE

There is another manmade drainage ditch that runs through the work area, ultimately connecting to the IVW described in section 1.1 of this report. This ditch shows evidence of hand-dug spoils along its banks, discharges from a neighboring parking lot, and does not support a dominance of wetland vegetation. In fact, upland plant species including hay-scented fern (*Dennstaedtia punctilobula*) and Canada mayflower (*Maianthemum canadensis*) are present in this area. Therefore, this ditch is not considered a wetland resource and is not jurisdictional.



Figure 7: Non-jurisdictional drainage ditch in upland area with hay-scented fern and Canada mayflower visible.

2.0 PROPOSED PROJECT

The applicant is proposing to expand the existing parking lot towards the parcel's northern property boundary to provide necessary parking for the building – an increase of approximately 105,320SF. The expanded parking lot will provide stormwater management with an engineered drainage system leading to a Stormtech SC-740 subsurface stormwater collection chamber.



Figure 8: Proposed work area highlighted in yellow.

2.1 EROSION AND SEDIMENTATION CONTROLS

Erosion and Sedimentation (E&S) controls for the site will be utilized so that discharge of sediment is minimized. Implementing these practices limit the amount of storm water entering a disturbed area or trap sediment prior to stormwater leaving the site. Control methods include a 12” Siltsoxx wattle to be installed at the downhill limit of work, and erosion control fencing to be installed around the area to be excavated for the stormwater collection chamber. These E&S controls will minimize sediment migration downslope of the construction area. In addition, Dandy Bags or equivalent will be utilized on existing catch basins to capture sediment before it enters the storm drain. Further, any stockpiled materials will be located outside all jurisdictional areas, covered and stabilized to minimize contact with rain and wind, and have a perimeter sediment barrier.

E&S controls will be maintained weekly and after significant rain events throughout the duration of the construction, including the removal of accumulated sediment once accumulation reaches half the height of the wattle. All E&S controls will remain in place until the site is stabilized. Please see attached site plans for schematic details of E&S controls. The applicant will be responsible for inspecting and maintaining E&S controls and will keep a log of inspections and maintenance.

A portion of the construction activity will require breaching of E&S controls in order to place and backfill underground pipes. This temporary removal of E&S controls will occur only in non-storm events. All E&S controls will be left intact to the greatest extent possible, and E&S controls that need to be removed for such activities will be replaced appropriately before any rain event is forecast to begin.

2.2 STORMWATER MANAGEMENT

The project proposes the use of a Stormtech SC-740 subsurface detention basin to manage stormwater from the proposed parking lot expansion. All runoff from this impervious area will be directed to the subsurface detention basin via deep sump catch basins and trench drains. Overflow from this subsurface detention basin will discharge to the existing riprap lined IVW via HDPE pipe to mimic existing drainage patterns. Additional riprap supplementing the existing riprap lining of the IVW will be placed below the outlet of the two overflow pipes to minimize erosion potential. These two areas total 264SF of IVW alteration. Presently, the areas of riprap addition are almost completely free of woody growth and are primarily covered by oriental bittersweet (*Celastrus orbiculatus*) and common reed (*Phragmites australis*). See the attached Stormwater Report by Level Design Group LLC. dated January 13, 2023 for more information on the stormwater management system and its compliance.

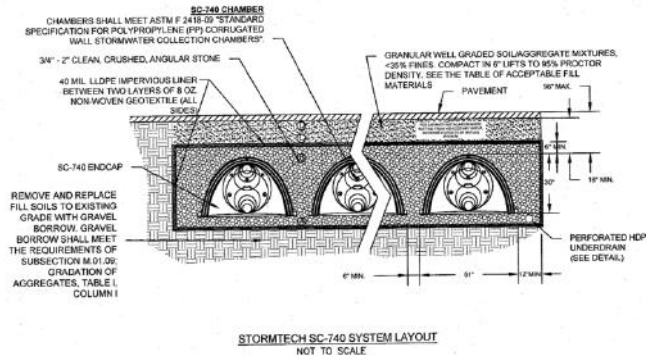


Figure 9: Schematic of Stormtech SC-740 system.



Figure 10: Two photos showing approximate location of proposed supplemental riprap in yellow.

2.3 MITIGATION FOR ALTERATIONS

The project proposes impacts to wetland resources and buffer zones in the form of riprap placement within the resource area, and installation of pavement within the 25-foot buffer zone. Total encroachment into the 25-foot buffer zone is approximately 5,000SF. As mitigation for this encroachment, the applicant proposes the management of invasive plant species in the vicinity of the IVW described in section 1.1 of this report. The area of proposed invasive species management is approximately 11,000SF. Invasive species present in this area include oriental bittersweet (*Celastrus orbiculatus*), multiflora rose (*Rosa multiflora*), purple loosestrife (*Lythrum salicaria*), and common reed (*Phragmites australis*). Please see attached request for variance for alternatives analysis regarding encroachment into resource areas and buffer zones.



Figure 11: Orthophoto of site showing invasive species management area.

2.4 CONSTRUCTION SEQUENCE

The sequence of construction activities will be as follows:

1. Install erosion and sediment controls.
2. Clear, grub and rough grade areas shown to be regraded.
3. Demo existing features in work area not shown to be saved and cut and cap utilities as needed.
4. Install stormwater management system and site utilities.
5. Install binder coat paving.
6. Install landscaping.
7. Fine grade site and loam and seed all disturbed areas.
8. Install topcoat pavement.
9. Project closeout.

3.0 REGULATORY COMPLIANCE WITH FRANKLIN'S WETLANDS PROTECTION BYLAW

3.1 FUNCTIONS AND CHARACTERISTICS STATEMENT

In accordance with §7.10.1 of the Town of Franklin Conservation Commission Regulations, please find below a summary of the proposed project's impacts on the functions and characteristics of floodplains and wetlands. It is Goddard's opinion that the project will have no significant individual or cumulative adverse effects on these functions and characteristics.

1. **Public Water Supplies** – The nearest public well (GP Well 10) is approximately 4,400 feet away from proposed construction activities, and nearly 2,000 feet from the nearest Zone II (primary aquifer recharge area).

2. **Private Water Supplies** – According to MassDEP's Well Drilling Database, the nearest private well that could be identified is located at 760 King Street, approximately 1,700 feet away from the work area. This distance is significantly greater than any setbacks for wells identified in MassDEP's Private Well Guidelines.

3. **Groundwater** – Groundwater onsite is reached at approximately 2.5 to 3 feet of depth, as determined with test pits. The subsurface detention basin proposed for installation was designed to minimize its depth to 2 feet to ensure proper treatment of stormwater runoff.

4. **Flood Control** – No work of any kind is proposed in any FEMA Flood Zones. Compensatory storage is not required to be addressed.

5. **Erosion and Sedimentation** – Erosion and sedimentation controls including Siltsoxx wattles, silt fencing and stone construction entrance will be in place and maintained in good condition throughout construction activities. The proposed stormwater system includes catch basins with separators, Stormceptor treatment units and sediment baffles to ensure proper treatment of stormwater that may carry sediment after construction is completed. Please see sections 2.2 and 2.3 of this report, and the attached Stormwater Report by Level Design Group, LLC, dated January 13, 2023 for further details.

6. **Storm Damage Prevention** – The proposed stormwater management system has been designed to handle the 2-, 10-, 25- and 100-year return periods for Franklin, as well as a 24-hour type III rainfall distribution. Further, nearly all sheet flow stormwater runoff presently flows to the IVW onsite, as it was designed as a stormwater management feature (see Existing Drainage Plan in attached Stormwater Report by Level Design Group, LLC, dated January 13, 2023). Therefore, the proposed stormwater management system will not result in a significant increase in stormwater reaching this feature. In addition, the system will attenuate peak rates of runoff, resulting in less damaging stormwater runoff for the site and surrounding areas.

7. **Water Quality** – There are no surface waters associated with the IVW onsite. The proposed stormwater management system primarily directs runoff to a subsurface detention basin and has been designed to ensure there are no detrimental water quality impacts to any surface waters in the area.

8. **Water Pollution Control** – During construction, erosion and sediment controls as described above will minimize any potential water pollution. The proposed stormwater management system has been designed to separate sediment and chemical pollutants such as oil and gas from the water it receives, which will ensure that such chemical pollutants are satisfactorily removed. No biological pollution (e.g. bacteria or viruses) is expected to occur as a result of construction activities or post-construction use of the site.

9. **Fisheries** – No work is proposed adjacent to ponds, perennial streams, or any other fishery habitat.

10. **Shellfish** - Not applicable in Franklin.

11. **Wildlife Habitat** – The natural community present on the site, as described in MassWildlife’s Classification of the Natural Communities of Massachusetts, is White Pine – Oak Forest. This type of natural community is assigned an SRank of S5, which means it is “demonstrably secure in Massachusetts” and is “common, widespread, and abundant.”

According to MassWildlife’s BioMap, the work area is not considered either Core Habitat (areas that are critical for the long-term persistence of rare species, exemplary natural communities, and resilient ecosystems) or Critical Natural Landscape (large landscape blocks that are minimally impacted by development and buffers to core habitats and coastal areas). The Index of Ecological Integrity (IEI) provided by UMass Amherst, which quantifies wildlife habitat and biodiversity value, identifies the area as having 0% ecological integrity.

Although not required for this filing, a site visit was conducted for the purpose of completing a Simplified Wildlife Habitat Evaluation as described in the MA Wildlife Habitat Protection Guidance for Inland Wetlands. The site and proposed project meet the criteria for zero (0) of the twenty-three (23) items on this evaluation (see attached).

12. **Rare Species Habitat (including rare plant species)** – No rare species are mapped on or near the project site. The nearest Estimated Habitat of Rare Wildlife or Priority Habitat of Rare Species is approximately 2.5 miles from the site. There are no mapped potential or certified vernal pools onsite or on any abutting parcels.

13. **Agriculture** – The project site is not located in proximity to any agricultural operations. In addition, the soil unit mapped on site (Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony - 312B) is considered not prime farmland by the NRCS Soil Survey.

14. **Aquaculture** – There are no aquaculture operations on or near the project site.

15. **Recreation** – Neither active nor passive recreational uses will be impacted by construction activities or post-construction conditions on the site. The work area does not contain any playing fields, walking paths, swimming areas, or other recreational areas. Its position in an industrial park makes it a poor location for recreation of any kind.

4.0 CONCLUSION

In summary, Goddard Consulting believes that the proposed project will not have any adverse impacts on the interests protected by the Town of Franklin’s Wetlands Protection Bylaw. The proposed project meets all regulatory compliance standards identified therein and has proposed mitigation for its impacts. Goddard Consulting respectfully requests that the Franklin Conservation Commission issue an Order of Conditions approving the proposed project.

Please feel free to contact us if you have any questions about this Notice of Intent submission.

Sincerely,
Goddard Consulting LLC



Chris Frattaroli
Wetland Scientist



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 3 – Notice of Intent
Franklin Wetlands Protection Bylaw

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Franklin

City/Town

Important:

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



Note:
Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

15 Liberty Way

a. Street Address

Franklin

b. City/Town

02038

c. Zip Code

Latitude and Longitude:

42.05651470143494

d. Latitude

-71.4045326672725

e. Longitude

320

f. Assessors Map/Plat Number

4

g. Parcel /Lot Number

2. Applicant:

John

a. First Name

Adair

b. Last Name

Atlantic Oliver 15 Liberty Way LLC

c. Organization

125 High St. Suite 220

d. Street Address

Boston

e. City/Town

MA

f. State

02110

g. Zip Code

571-216-2878

h. Phone Number

i. Fax Number

adair@oliverst.com

j. Email Address

3. Property owner (required if different from applicant): Check if more than one owner

a. First Name

b. Last Name

c. Organization

d. Street Address

e. City/Town

f. State

g. Zip Code

h. Phone Number

i. Fax Number

j. Email address

4. Representative (if any):

Scott

a. First Name

Goddard

b. Last Name

Goddard Consulting LLC

c. Company

291 Main St

d. Street Address

Northborough

e. City/Town

MA

f. State

01532

g. Zip Code

508-393-3784

h. Phone Number

i. Fax Number

scott@goddardconsultingllc.com

j. Email address

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

(\$600 bylaw)

a. Total Fee Paid

(\$600 bylaw)

c. City/Town Fee Paid

b. State Fee Paid



Massachusetts Department of Environmental Protection
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A. General Information (continued)

6. General Project Description:

Expansion of parking lot associated with warehouse building within Buffer Zone to IVW.

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

- 1. Single Family Home
- 2. Residential Subdivision
- 3. Commercial/Industrial
- 4. Dock/Pier
- 5. Utilities
- 6. Coastal engineering Structure
- 7. Agriculture (e.g., cranberries, forestry)
- 8. Transportation
- 9. Other

7b. Is any portion of the proposed activity eligible to be treated as a limited project (including Ecological Restoration Limited Project) subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

- 1. Yes No If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

2. Limited Project Type

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

Norfolk

a. County

39279

c. Book

b. Certificate # (if registered land)

278

d. Page Number

B. Buffer Zone & Resource Area Impacts (temporary & permanent)

- 1. Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
- 2. Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.



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B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

<u>Resource Area</u>	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
a. <input type="checkbox"/> Bank	1. linear feet _____	2. linear feet _____
b. <input type="checkbox"/> Bordering Vegetated Wetland	1. square feet _____	2. square feet _____
c. <input type="checkbox"/> Land Under Waterbodies and Waterways	1. square feet _____	2. square feet _____
	3. cubic yards dredged _____	

<u>Resource Area</u>	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
d. <input type="checkbox"/> Bordering Land Subject to Flooding	1. square feet _____	2. square feet _____
	3. cubic feet of flood storage lost _____	4. cubic feet replaced _____
e. <input type="checkbox"/> Isolated Land Subject to Flooding	1. square feet _____	
	2. cubic feet of flood storage lost _____	3. cubic feet replaced _____
f. <input type="checkbox"/> Riverfront Area	1. Name of Waterway (if available) - specify coastal or inland _____	

2. Width of Riverfront Area (check one):

- 25 ft. - Designated Densely Developed Areas only
- 100 ft. - New agricultural projects only
- 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: _____ square feet

4. Proposed alteration of the Riverfront Area:

a. total square feet _____ b. square feet within 100 ft. _____ c. square feet between 100 ft. and 200 ft. _____

5. Has an alternatives analysis been done and is it attached to this NOI? Yes No

6. Was the lot where the activity is proposed created prior to August 1, 1996? Yes No

3. Coastal Resource Areas: (See 310 CMR 10.25-10.35)

Note: for coastal riverfront areas, please complete **Section B.2.f.** above.

Franklin Bylaw Isolated Vegetated Wetland 264 SF



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B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users:
Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

<u>Resource Area</u>	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
a. <input type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. <input type="checkbox"/> Land Under the Ocean	_____	
	1. square feet	

	2. cubic yards dredged	
c. <input type="checkbox"/> Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. <input type="checkbox"/> Coastal Beaches	_____	_____
	1. square feet	2. cubic yards beach nourishment
e. <input type="checkbox"/> Coastal Dunes	_____	_____
	1. square feet	2. cubic yards dune nourishment

	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
f. <input type="checkbox"/> Coastal Banks	_____	
	1. linear feet	
g. <input type="checkbox"/> Rocky Intertidal Shores	_____	
	1. square feet	
h. <input type="checkbox"/> Salt Marshes	_____	_____
	1. square feet	2. sq ft restoration, rehab., creation
i. <input type="checkbox"/> Land Under Salt Ponds	_____	
	1. square feet	

	2. cubic yards dredged	
j. <input type="checkbox"/> Land Containing Shellfish	_____	
	1. square feet	
k. <input type="checkbox"/> Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above	

	1. cubic yards dredged	
l. <input type="checkbox"/> Land Subject to Coastal Storm Flowage	_____	
	1. square feet	

4. Restoration/Enhancement
If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here.

_____	_____
a. square feet of BVW	b. square feet of Salt Marsh

5. Project Involves Stream Crossings

_____	_____
a. number of new stream crossings	b. number of replacement stream crossings



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C. Other Applicable Standards and Requirements

- This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Limited Project Checklists – Required Actions (310 CMR 10.11).

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

- Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

- a. Yes No **If yes, include proof of mailing or hand delivery of NOI to:**

**Natural Heritage and Endangered Species Program
Division of Fisheries and Wildlife
1 Rabbit Hill Road
Westborough, MA 01581**

- August 2021
b. Date of map

If yes, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); OR complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

- c. Submit Supplemental Information for Endangered Species Review*

- Percentage/acreage of property to be altered:
 - (a) within wetland Resource Area _____ percentage/acreage
 - (b) outside Resource Area _____ percentage/acreage

- Assessor's Map or right-of-way plan of site

- Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **
 - (a) Project description (including description of impacts outside of wetland resource area & buffer zone)
 - (b) Photographs representative of the site

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see <https://www.mass.gov/endangered-species-act-mesa-regulatory-review>).

Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.



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City/Town

C. Other Applicable Standards and Requirements (cont'd)

- (c) MESA filing fee (fee information available at <https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review>).
Make check payable to "Commonwealth of Massachusetts - NHESP" and **mail to NHESP** at above address

Projects altering 10 or more acres of land, also submit:

- (d) Vegetation cover type map of site
(e) Project plans showing Priority & Estimated Habitat boundaries
(f) OR Check One of the Following

1. Project is exempt from MESA review.
Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, <https://www.mass.gov/service-details/exemptions-from-review-for-projectsactivities-in-priority-habitat>; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2. Separate MESA review ongoing. a. NHESP Tracking # b. Date submitted to NHESP

3. Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

3. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?
a. Not applicable – project is in inland resource area only b. Yes No

If yes, include proof of mailing, hand delivery, or electronic delivery of NOI to either:

South Shore - Cohasset to Rhode Island border, and
the Cape & Islands:

North Shore - Hull to New Hampshire border:

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
836 South Rodney French Blvd.
New Bedford, MA 02744
Email: dmf.envreview-south@mass.gov

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: dmf.envreview-north@mass.gov

Also if yes, the project may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional Office.

- c. Is this an aquaculture project? d. Yes No

If yes, include a copy of the Division of Marine Fisheries Certification Letter (M.G.L. c. 130, § 57).



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Franklin Wetlands Protection Bylaw

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Franklin

City/Town

C. Other Applicable Standards and Requirements (cont'd)

Online Users:

Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?
- a. Yes No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.
- b. ACEC
5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?
- a. Yes No
6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?
- a. Yes No
7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?
- a. Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:
1. Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)
 2. A portion of the site constitutes redevelopment
 3. Proprietary BMPs are included in the Stormwater Management System.
- b. No. Check why the project is exempt:
1. Single-family house
 2. Emergency road repair
 3. Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

- This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

1. USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)
2. Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Franklin Wetlands Protection Bylaw

Provided by MassDEP:	
MassDEP File Number	
Document Transaction Number	
Franklin	
City/Town	

D. Additional Information (cont'd)

3. Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. List the titles and dates for all plans and other materials submitted with this NOI.

Liberty Parking Expansion

a. Plan Title

Level Design Group

b. Prepared By

1/13/2023

d. Final Revision Date

Daniel Campbell

c. Signed and Stamped by

1"=40'

e. Scale

f. Additional Plan or Document Title

g. Date

5. If there is more than one property owner, please attach a list of these property owners not listed on this form.

6. Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.

7. Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.

8. Attach NOI Wetland Fee Transmittal Form

9. Attach Stormwater Report, if needed.

E. Fees

1. Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

007581

2. Municipal Check Number

5/19/2023

3. Check date

4. State Check Number

Sarah

6. Payor name on check: First Name

5. Check date

Campbell

7. Payor name on check: Last Name



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Town of Franklin Wetlands Protection Bylaw

Provided by MassDEP:

MassDEP File Number


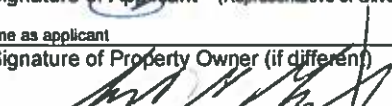

Document Transaction Number

Franklin
City/Town

F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

 1. Signature of Applicant (Representative of Oliver Street Capital)	5/23/2023 2. Date
Same as applicant	
 3. Signature of Property Owner (if different)	4. Date
 5. Signature of Representative (Scott Goddard, Goddard Consulting LLC)	5/23/23 6. Date

For Conservation Commission:

Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:

One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a copy of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:

If the applicant has checked the "yes" box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
NOI Wetland Fee Transmittal Form
 Franklin Wetlands Protection Bylaw

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



A. Applicant Information

1. Location of Project:

15 Liberty Way

a. Street Address

(no check to DEP, town check #007581)

c. Check number

Franklin

b. City/Town

(\$600 bylaw only)

d. Fee amount

2. Applicant Mailing Address:

a. First Name

Atlantic Oliver 15 Liberty Way LLC

c. Organization

125 High Street Suite 220

d. Mailing Address

Boston

e. City/Town

MA

f. State

02110

g. Zip Code

h. Phone Number

i. Fax Number

j. Email Address

3. Property Owner (if different):

a. First Name

b. Last Name

c. Organization

d. Mailing Address

e. City/Town

f. State

g. Zip Code

h. Phone Number

i. Fax Number

j. Email Address

B. Fees

Fee should be calculated using the following process & worksheet. **Please see Instructions before filling out worksheet.**

Step 1/Type of Activity: Describe each type of activity that will occur in wetland resource area and buffer zone.

Step 2/Number of Activities: Identify the number of each type of activity.

Step 3/Individual Activity Fee: Identify each activity fee from the six project categories listed in the instructions.

Step 4/Subtotal Activity Fee: Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

Step 5/Total Project Fee: Determine the total project fee by adding the subtotal amounts from Step 4.

Step 6/Fee Payments: To calculate the state share of the fee, divide the total fee in half and subtract \$12.50. To calculate the city/town share of the fee, divide the total fee in half and add \$12.50.

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
NOI Wetland Fee Transmittal Form
 Franklin Wetlands Protection Bylaw

B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
Commercial/industrial base fee - see local filing fee worksheet	1	\$600	\$600
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Step 5/Total Project Fee: _____

Step 6/Fee Payments:

Total Project Fee:	<u>(\$600 bylaw only)</u>
State share of filing Fee:	a. Total Fee from Step 5 <u>none</u>
City/Town share of filling Fee:	b. 1/2 Total Fee less \$12.50 <u>(\$600 bylaw only)</u> c. 1/2 Total Fee plus \$12.50

C. Submittal Requirements

- a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
 Box 4062
 Boston, MA 02211

- b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

To MassDEP Regional Office (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

AFFIDAVIT OF SERVICE

Under the Franklin Wetlands Protection Bylaw:

I, Chris Frattaroli, hereby certify under the pains and penalties of perjury that on May 24, 2023, I gave notification to abutters in Compliance with the second paragraph of Massachusetts General Law Chapter 131, Section 40, the DEP Guide to Abutter Notification dating April 8, 1994, and the Franklin Wetlands Protection Bylaw in connection with the following matter:

A Notice of Intent (NOI) was filed under the Franklin Wetlands Protection Bylaw by Oliver Street Capital with the Franklin Conservation Commission on May 24, 2023 for the property located at 15 Liberty Way, Franklin MA (Map: 320, Parcel: 4)

The form of the notification, and the list of abutters to whom it was given, and their addresses, are attached to this Affidavit of Service.

(Name)

(Date)

Chris Frattaroli, Goddard Consulting LLC

5/24/23

Notification to Abutters

By Hand Delivery, Certified Mail (return receipt requested), or Certificates of Mailing

This is a notification required by law. You are receiving this notification because you have been identified as the owner of land abutting another parcel of land for which certain activities are proposed. Those activities require a permit under the Franklin Wetlands Protection Bylaw.

In accordance with the Franklin Wetlands Protection Bylaw (§181-6), you are hereby notified that:

- A. A Notice of Intent was filed with the Franklin Conservation Commission on May 24, 2023, seeking permission to remove, fill, dredge, or alter an area subject to protection under the Franklin Wetlands Protection Bylaw. The following is a description of the proposed activity/activities:

Expansion of an existing parking lot and stormwater management system associated with a warehouse building within a locally jurisdictional Isolated Vegetated Wetland and its buffer zone.

- B. The name of the applicant is: Atlantic Oliver 15 Liberty Way LLC
- C. The address of the land where the activity is proposed is: 15 Liberty Way, Franklin MA (Map 320, Parcel 4)
- D. Copies of the Notice of Intent may be examined or obtained at the office of the Franklin Conservation Commission, located at 355 E. Central Street, Franklin, MA. The regular business hours of the Commission are Monday-Thursday, 8am-4pm and Friday, 8am-1pm, and the Commission may be reached at (508) 520-4929.
- E. Copies of the Notice of Intent may be obtained from the applicant or their representative by calling Goddard Consulting, LLC at (508) 393-3784. An administrative fee may be applied for providing copies of the NOI and plans.
- F. Information regarding the date, time, and location of the public hearing regarding the Notice of Intent may be obtained from the Franklin Conservation Commission. Notice of the public hearing will be published at least five business days in advance, in the Franklin Observer.



15 LIBERTY WAY - 300' ABUTTERS

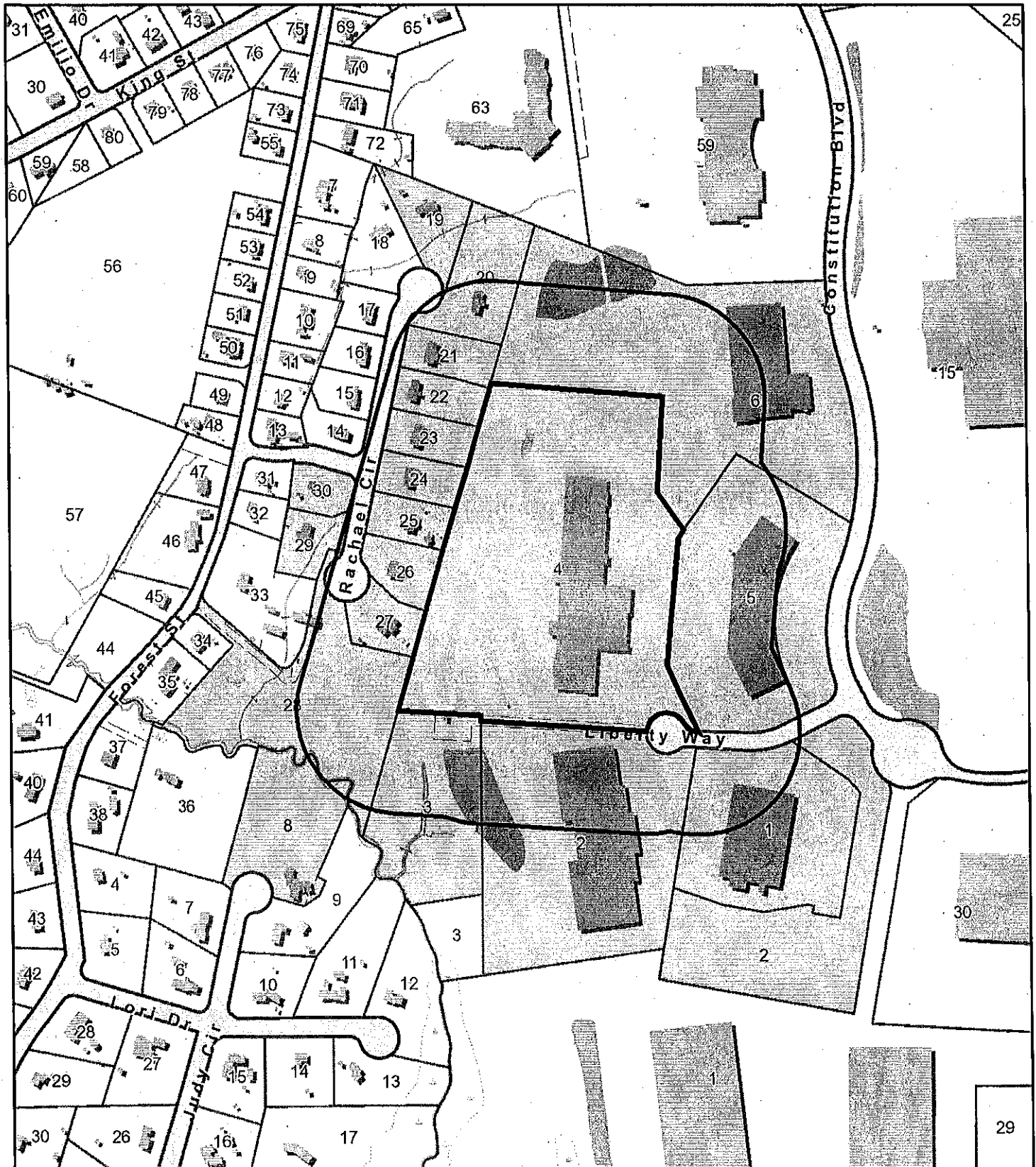
Franklin, MA



February 3, 2023

1 inch = 400 Feet

www.cai-tech.com



This information is believed to be correct but is subject to change and is not warranted.



300 foot Abutters List Report

Franklin, MA
February 03, 2023

Subject Property:

Parcel Number: 320-004-000
CAMA Number: 320-004-000-000
Property Address: 15 LIBERTY WAY

Mailing Address: ATLANTIC OLIVER 15 LIBERTY WAY LLC
C/O OLIVER STREET CAPITAL LLC
125 HIGH ST - SUITE 220
BOSTON, MA 02110

Abutters:

Parcel Number: 320-001-000
CAMA Number: 320-001-000-000
Property Address: 10 LIBERTY WAY

Mailing Address: LRF2 BOS LIBERTY WAY LLC C/O
LONGPOINT REALTY PARTNERS
13218 WEST BROWARD BOULEVARD
PLANTATION, FL 33325

Parcel Number: 320-002-000
CAMA Number: 320-002-000-000
Property Address: 20 LIBERTY WAY

Mailing Address: STANNAH PROPERTY LLC C/O LINCOLN
PROPERTY COMPANY
25 MALL RD SUITE 402
BURLINGTON, MA 01803

Parcel Number: 320-003-000
CAMA Number: 320-003-000-000
Property Address: 32 LIBERTY WAY

Mailing Address: FRANKLIN TOWN OF
355 EAST CENTRAL STREET
FRANKLIN, MA 02038

Parcel Number: 320-004-000
CAMA Number: 320-004-000-000
Property Address: 15 LIBERTY WAY

Mailing Address: ATLANTIC OLIVER 15 LIBERTY WAY LLC
C/O OLIVER STREET CAPITAL LLC
125 HIGH ST - SUITE 220
BOSTON, MA 02110

Parcel Number: 320-005-000
CAMA Number: 320-005-000-000
Property Address: 101 CONSTITUTION BLVD

Mailing Address: 101 CONSTITUTION BLVD LLC C/O
KEYPOINT PARTNERS LLC
ONE VAN DE GRAAFF DRIVE - SUITE
402
BURLINGTON, MA 01803

Parcel Number: 320-006-000
CAMA Number: 320-006-000-000
Property Address: 77 CONSTITUTION BLVD

Mailing Address: IRON MOUNTAIN INFO MANAGEMENT
ONE FEDERAL ST
BOSTON, MA 02110

Parcel Number: 320-019-000
CAMA Number: 320-019-000-000
Property Address: 1 RACHAEL CIR

Mailing Address: MURPHEY ROBERT W MURPHEY
JANICE L
1 RACHAEL CIR
FRANKLIN, MA 02038

Parcel Number: 320-020-000
CAMA Number: 320-020-000-000
Property Address: 2 RACHAEL CIR

Mailing Address: PECORA BRIAN F & INNA TRS PECORA
LIVING TRUST
2 RACHAEL CIR
FRANKLIN, MA 02038

Parcel Number: 320-021-000
CAMA Number: 320-021-000-000
Property Address: 4 RACHAEL CIR

Mailing Address: COOKE ROBERT D COOKE PATRICIA E
4 RACHAEL CIR
FRANKLIN, MA 02038

Parcel Number: 320-022-000
CAMA Number: 320-022-000-000
Property Address: 6 RACHAEL CIR

Mailing Address: HARDING GRANT E MURPHY MAURA B
6 RACHAEL CIR
FRANKLIN, MA 02038



www.cai-tech.com

This information is believed to be correct but is subject to change and is not warranted.

2/3/2023

Page 1 of 2



300 foot Abutters List Report

Franklin, MA
February 03, 2023

Parcel Number: 320-023-000 CAMA Number: 320-023-000-000 Property Address: 8 RACHAEL CIR	Mailing Address: SMITH ANDREW J JR SMITH PAULA E 8 RACHAEL CIR FRANKLIN, MA 02038
Parcel Number: 320-024-000 CAMA Number: 320-024-000-000 Property Address: 10 RACHAEL CIR	Mailing Address: PISANI CHRISTOPHER J PISANI ANNMARIE 10 RACHAEL CIR FRANKLIN, MA 02038
Parcel Number: 320-025-000 CAMA Number: 320-025-000-000 Property Address: 12 RACHAEL CIR	Mailing Address: CROOK JAMES CORMIER VALERIE 12 RACHAEL CIR FRANKLIN, MA 02038
Parcel Number: 320-026-000 CAMA Number: 320-026-000-000 Property Address: 14 RACHAEL CIR	Mailing Address: PATIL KEDAR SANJAY MEHTA JANVI DHARMESHKUMAR 14 RACHAEL CIR FRANKLIN, MA 02038
Parcel Number: 320-027-000 CAMA Number: 320-027-000-000 Property Address: 16 RACHAEL CIR	Mailing Address: GLYNN DEBORAH A 16 RACHAEL CIR FRANKLIN, MA 02038
Parcel Number: 320-028-000 CAMA Number: 320-028-000-000 Property Address: 17 RACHAEL CIR	Mailing Address: LORUSSO JOSEPH A LORUSSO JESSICA A 17 RACHAEL CIR FRANKLIN, MA 02038
Parcel Number: 320-029-000 CAMA Number: 320-029-000-000 Property Address: 15 RACHAEL CIR	Mailing Address: MINOR PETER W MINOR NADINE R 15 RACHAEL CIR FRANKLIN, MA 02038
Parcel Number: 320-030-000 CAMA Number: 320-030-000-000 Property Address: 1 LORUSSO DR	Mailing Address: REBELLO STEPHEN E REBELLO CHRISTINE A 1 LORUSSO DR FRANKLIN, MA 02038
Parcel Number: 329-002-000 CAMA Number: 329-002-000-000 Property Address: 105 CONSTITUTION BLVD	Mailing Address: APG FRANKLIN LLC C/O AVENTINE PROPERTY GROUP IN 111 SOUTH WACKER DR SUITE 3350 CHICAGO, IL 60606
Parcel Number: 329-008-000 CAMA Number: 329-008-000-000 Property Address: 10 JUDY CIR	Mailing Address: CROMWELL, JILL K TR FLECK, ROBERT A TR ROBERT & JILL FLECK LIV TRUST 10 JUDY CIR FRANKLIN, MA 02038

Kevin M. Doyle, 2-3-2023



www.cai-tech.com

This information is believed to be correct but is subject to change and is not warranted.

2/3/2023

Page 2 of 2

101 CONSTITUTION BLVD LLC
C/O KEYPOINT PARTNERS LLC
ONE VAN DE GRAAFF DRIVE -
SUITE 402
BURLINGTON, MA 01803

LORUSSO JOSEPH A
LORUSSO JESSICA A
17 RACHAEL CIR
FRANKLIN, MA 02038

APG FRANKLIN LLC
C/O AVENTINE PROPERTY GRO
111 SOUTH WACKER DR SUITE
3350
CHICAGO, IL 60606

LRF2 BOS LIBERTY WAY LLC
C/O LONGPOINT REALTY PART
13218 WEST BROWARD
BOULEVARD
PLANTATION, FL 33325

ATLANTIC OLIVER 15 LIBERT
C/O OLIVER STREET CAPITAL
125 HIGH ST - SUITE 220
BOSTON, MA 02110

MINOR PETER W
MINOR NADINE R
15 RACHAEL CIR
FRANKLIN, MA 02038

COOKE ROBERT D
COOKE PATRICIA E
4 RACHAEL CIR
FRANKLIN, MA 02038

MURPHEY ROBERT W
MURPHEY JANICE L
1 RACHAEL CIR
FRANKLIN, MA 02038

CROMWELL, JILL K TR FLECK
ROBERT & JILL FLECK LIV T
10 JUDY CIR
FRANKLIN, MA 02038

PATIL KEDAR SANJAY
MEHTA JANVI DHARMESHKUMAR
14 RACHAEL CIR
FRANKLIN, MA 02038

CROOK JAMES
CORMIER VALERIE
12 RACHAEL CIR
FRANKLIN, MA 02038

PECORA BRIAN F & INNA TRS
PECORA LIVING TRUST
2 RACHAEL CIR
FRANKLIN, MA 02038

FRANKLIN TOWN OF
355 EAST CENTRAL STREET
FRANKLIN, MA 02038

PISANI CHRISTOPHER J
PISANI ANNMARIE
10 RACHAEL CIR
FRANKLIN, MA 02038

GLYNN DEBORAH A
16 RACHAEL CIR
FRANKLIN, MA 02038

REBELLO STEPHEN E
REBELLO CHRISTINE A
1 LORUSSO DR
FRANKLIN, MA 02038

HARDING GRANT E
MURPHY MAURA B
6 RACHAEL CIR
FRANKLIN, MA 02038

SMITH ANDREW J JR
SMITH PAULA E
8 RACHAEL CIR
FRANKLIN, MA 02038

IRON MOUNTAIN INFO MANAGE
ONE FEDERAL ST
BOSTON, MA 02110

STANNAH PROPERTY LLC
C/O LINCOLN PROPERTY COMP
25 MALL RD SUITE 402
BURLINGTON, MA 01803



Legend

 Property Boundary



Date: 3/31/2023

GC Job Number:
101-82

Wetland Border Report Orthophoto View of Site

0 87.5 175
Feet

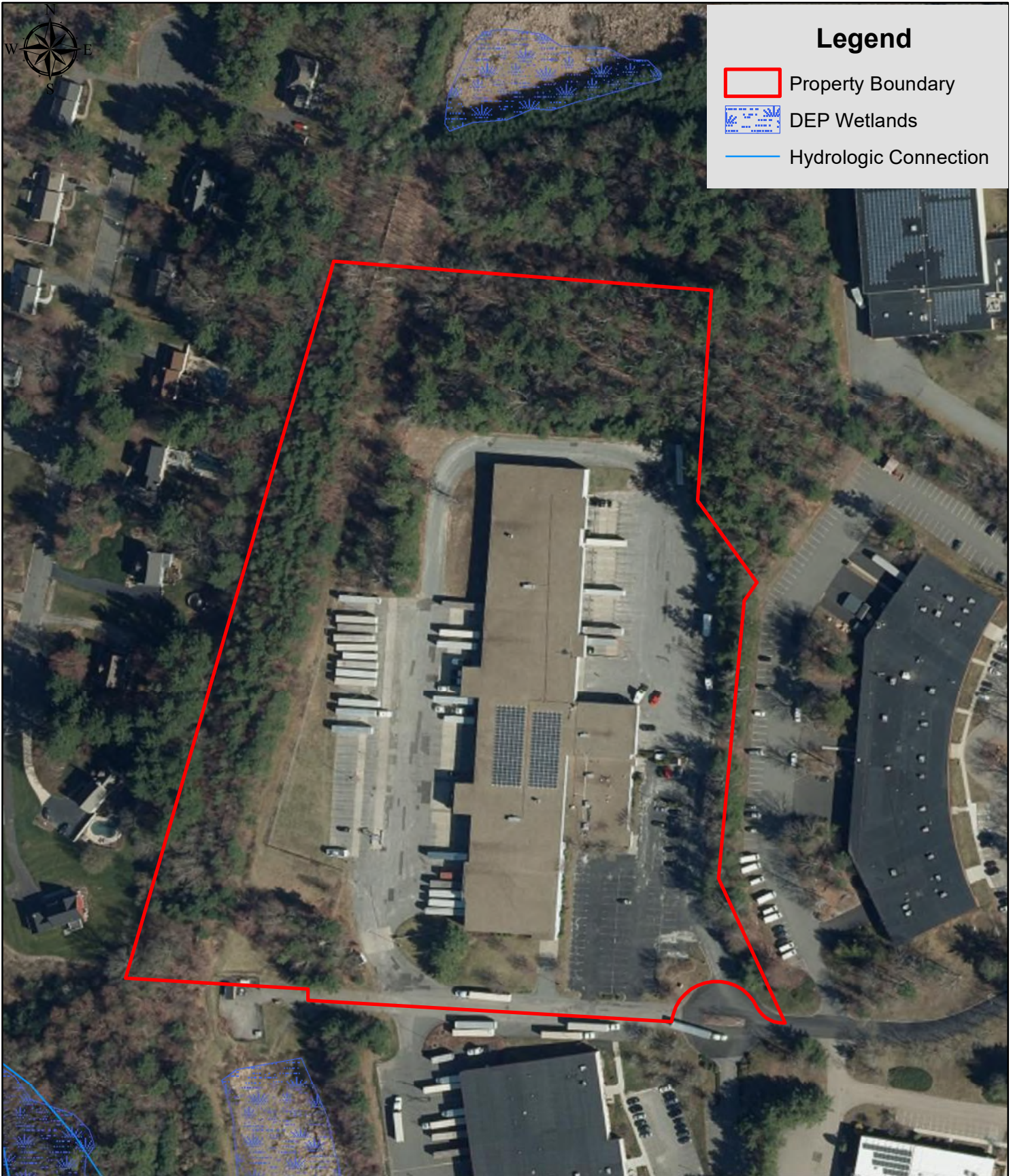


15 Liberty Way
Franklin, MA 02038

1 in = 175 ft

Map: 320, Lot: 4

Figure 1



Date: 3/31/2023

GC Job Number:
101-82

Wetland Border Report Orthophoto View of Site

0 87.5 175
Feet



15 Liberty Way
Franklin, MA 02038


1 in = 175 ft

Map: 320, Lot: 4


Figure 1



Legend

 Property Boundary

FEMA National Flood Hazard Layer

 A: 1% Annual Chance of Flooding, no BFE



Date: 3/31/2023

GC Job Number:
101-82

Wetland Border Report Orthophoto View of Site With FEMA Flood Zone

15 Liberty Way
Franklin, MA 02038

0 87.5 175
Feet

1 in = 175 ft

Map: 320, Lot: 4

Figure 2

GODDARD CONSULTING
Strategic Wetland Permitting LLC



Date: 3/31/2023

GC Job Number:
101-82

**Wetland Border Report
Orthophoto View of Site
With NRCS Soil Survey**

15 Liberty Way
Franklin, MA 02038

0 87.5 175
Feet

1 in = 175 ft

Map: 320, Lot: 4

Figure 3





Legend

Property Boundary

Date: 3/31/2023

GC Job Number:
101-82

**Wetland Border Report
USGS of Site**

0 100 200
Feet



15 Liberty Way
Franklin, MA 02038

1 in = 200 ft

Map: 320, Lot: 4

Figure 4



Wildlife Habitat Protection Guidance

Appendix A: Simplified Wildlife Habitat Evaluation

Project Information

15 Liberty Way, Franklin MA

Project Location (from NOI)

Chris Frattaroli, Ryan Roseen

5/22/2023

Name of Person Completing Form

Date

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



Important Habitat Features

Direct alterations to the following important habitat features in resource areas may be permitted only if they will have no adverse effect (refer to Section V).

- Habitat for state-listed animal species (receipt of a positive opinion or permit from MNHESP shall be presumed to be correct. Do not refer to Section V).
- Sphagnum hummocks and pools suitable to serve as nesting habitat for four-toed salamanders
- Trees with large cavities (≥ 18 " tree diameter at cavity entrance)
- Existing beaver, mink or otter dens
- Areas within 100 feet of existing beaver, mink or otter dens (if significant disturbance)
- Existing nest trees for birds that traditionally reuse nests (bald eagle, osprey, great blue heron)
- Land containing freshwater mussel beds
- Wetlands and waterbodies known to contain open water in winter with the capacity to serve as waterfowl winter habitat
- Turtle nesting areas
- Vertical sandy banks (bank swallows, rough-winged swallows or kingfishers)

The following habitat characteristics when not commonly encountered in the surrounding area:

- Stream bed riffle zones (e.g. in eastern MA)
- Springs
- Gravel stream bottoms (trout and salmon nesting substrate)
- Plunge pools (deep holes) in rivers or streams
- Medium to large, flat rock substrates in streams



Wildlife Habitat Protection Guidance

Appendix A: Simplified Wildlife Habitat Evaluation

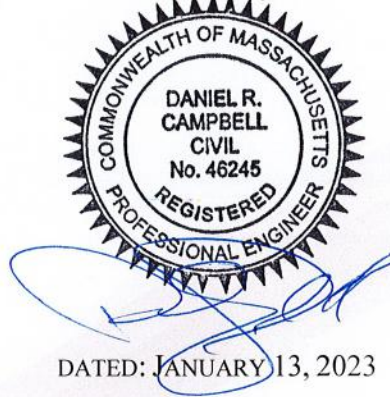
Activities

When any one of the following activities is proposed within resource areas, applicants should complete a Detailed Wildlife Habitat Evaluation (refer to Appendix B).

- Activities located in mapped “Habitat of Potential Regional or Statewide Importance”
- Activities affecting certified or documented vernal pool habitat, including habitat within 100’ of a certified or documented vernal pool when within a resource area
- Activities in bank, land under water, bordering land subject to flooding (presumed significant) where alterations are more than twice the size of thresholds
- Activities affecting vegetated wetlands >5000 sq. ft. occurring in resource areas other than Bordering Vegetated Wetland
- Activities affecting the sole connector between habitats >50 acres in size
- Installation of structures that prevent animal movement
- Activities for the purpose of bank stabilization using hard structure solutions that significantly affect ability of stream channel to shift and meander, or disrupt continuity in cover that would inhibit animal passage
- Dredging (greater than 5,000 sf)

STORMWATER REPORT

FOR
**15 LIBERTY WAY
FRANKLIN, MA**



DATED: JANUARY 13, 2023

Prepared By:

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LDG Project No.: 2081.00

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HYDROLOGIC SUMMARY

METHODOLOGY

The HydroCAD computer program (Hydro CAD) was used to model the existing and proposed hydrology of the site and design a stormwater management system. HydroCAD generates flood hydrographs dependent upon the type of land use, vegetation, soil types, land slope, watershed areas and rainfall data. HydroCAD also takes into account the antecedent moisture condition of the soil. The peak rate of runoff and volume of runoff are projected for the input storm frequency events (design storms).

Rainfall data was obtained from the Northeast Regional Climate Center and are based on Extreme Precipitation Events for the 2-, 10-, 25- and 100-year return periods for Franklin, Massachusetts. A 24-hour type III rainfall distribution was used in the HydroCAD analysis as prescribed for New England by the Northeast Regional Climate Center. A copy of the precipitation table is included herein.

PRE-DEVELOPMENT CONDITIONS

The existing site property is located at 15 Liberty Way between Constitution Boulevard and Rachael Circle. The existing property is developed and contains an approximately 95,000 square foot warehouse, paved driveway, and paved parking areas for cars and for trailer trucks. For the purposes of hydrological calculations, the proposed development consists of approximately 105,320 square feet located at the rear of the existing warehouse as shown on the site plans.

The existing topography of the site generally slopes from east to west and directs runoff to an existing stormwater basin located onsite. The southeastern corner of the site slopes south directing runoff to the existing paved driveway and parking area to the site east of the existing warehouse. The land cover is mostly wooded area and also includes pavement from the rear portion of the existing driveway and some grass areas.

Test pits were dug on-site in the areas of the proposed detention basin to verify the groundwater elevation. Groundwater depth in the area of the detention basin varies between approximately 2.5-feet to 3-feet below the surface. The soil logs of the test pits are attached.

The on-site soils as classified by the Soil Survey for Norfolk County Massachusetts are:

312B – Woodbridge fine sandy loam; 0 to 8 percent slopes; Hydrologic Soil Group (HSG) C/D

See the attached SCS soils documentation herein for additional soil details

POST-DEVELOPMENT CONDITIONS

The Applicant is proposing construct a new paved area to provide additional driveway and trailer parking area at the rear of the site. The project will also include the installation of a new stormwater management system and associated grading for this development.

A new fully compliant stormwater management system has been designed to mitigate the impacts of the proposed site redevelopment. Runoff from the impervious areas will be directed to new catch basins and trench drains which will convey runoff to a subsurface detention basin. The subsurface detention basin will provide water quality treatment as well as attenuate peak rates of runoff.

A fully compliant stormwater management system for the entire site addressing compliance with the 10 MADEP Stormwater Standards will be part of the site redevelopment. Site improvements have been made to the maximum extent practicable in accordance with MADEP Stormwater Regulations.

STANDARD 1: Untreated Discharges

Stormwater Management Standard 1 requires that, “No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth”.

This standard is met by the proposed redevelopment not creating any new non-treated stormwater discharges and improving an existing residential site with no existing stormwater management system. All surface runoff from proposed impervious areas, with the exception of a redeveloped portion of the existing driveway, is collected in deep sump catch basins and trench drains and directed to a Stormceptor treatment unit prior to discharging to a subsurface detention basin. Overflow from the subsurface detention basin discharges from an outlet control structure to the existing detention basin through a 15” HPDE pipe. All discharges are designed to be placed in areas which mimic existing drainage flow patterns.

Redevelopment: The project has been designed to fully comply with Massachusetts Stormwater Regulations for Standard 1.

Full compliance with Standard 1 is required for new outfalls.

- What BMPs are proposed to ensure that all new discharges associated with the discharge are adequately treated? Proprietary Treatment Units, Subsurface detention basin
- What BMPs are proposed to ensure that no new discharges cause erosion in wetlands or waters of the Commonwealth? rip rap outlets are proposed in the existing stormwater basin designed to prevent erosion.
- Will the proposed discharge comply with all applicable requirements of the Massachusetts Clean Waters Act and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00? yes

Existing outfalls shall be brought into compliance with Standard 1 to the maximum extent practicable.

- Are there any existing discharges associated with the redevelopment project for which new treatment could be provided? No existing outfalls
- If so, the proponent shall specify the stormwater BMP retrofit measures that have been considered to ensure that the discharges are adequately treated and indicate the reasons for adopting or rejecting those measures. (See Section entitled “Retrofit of Existing BMPs”.) N/A
- What BMPs have been considered to prevent erosion from existing stormwater discharges? N/A

STANDARD 2: Peak Rate Control and Flood Prevention

Stormwater Management Standard 2 requires that, “Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for land subject to coastal storm flowage.”

This standard is met by the proposed development mitigating the post-development peak discharge rates at the designated control points for all design storm events. This is accomplished by directing stormwater flow to a subsurface detention basin. Below is a description of the design points used in the hydrologic analysis and a summary of pre- and post- development discharge rates. The proposed development will reduce the peak rate of runoff at all the design points and provide ample groundwater recharge.

Redevelopment: The project has been designed to fully comply with Massachusetts Stormwater Regulations for Standard 2.

Compliance to the Maximum Extent Practicable:

- Does the redevelopment design meet Standard 2, comparing post-development to pre-development conditions? Yes
- If not, the applicant shall document an analysis of alternative approaches for meeting the Standard. (See Menu of Strategies to Reduce Runoff and Peak Flows and/or Increase Recharge Menu included at the end of this chapter.) N/A

Improvement of existing conditions:

- Does the project reduce the volume and/or rate of runoff to less than current estimated conditions? Has the applicant considered all the alternatives for reducing the volume and/or rate of runoff from the site? (See Menu.) Yes
- Is the project located within a watershed subject to damage by flooding during the 2-year or 10-year 24-hour storm event? If so, does the project design provide for attenuation of the 2-year and 10-year 24-hour storm event to less than current estimated conditions? Have measures been implemented to reduce the volume of runoff from the site resulting from the 2 year or 10 year 24 hour storm event? (See Menu.) N/A
- Is the project located adjacent to a water body or watercourse subject to adverse impacts from flooding during the 100-year 24-hour storm event? If so, are portions of the site available to increase flood storage adjacent to existing Bordering Land Subject to Flooding (BLSF)? N/A
- Have measures been implemented to attenuate peak rates of discharge during the 100-year 24-hour storm event to less than the peak rates under current estimated conditions? Have measures been implemented to reduce the volume of runoff from the site resulting from the 100-year 24-hour storm event? (See Menu.) Yes

SUMMARY OF PEAK STORMWATER RUNOFF (CFS)

Three design points were utilized to analyze the runoff characteristics of the site. Design Point 1 (DP-1) is the existing detention basin. Design Point 2 (DP-2) is the existing paved driveway and parking area to the east of the existing warehouse. Design Point 3 (DP-3) is the northwestern corner of the property. The pre- and post- development peak discharge rates for all analyzed design storms is summarized in the following table:

Design Point 1 (DP-1)		
Storm	Pre-Dev. Flow	Post-Dev. Flow
2-yr	1.49 cfs	1.40 cfs
10-yr	4.53 cfs	4.29 cfs
25-yr	6.49 cfs	5.91 cfs
100-yr	9.57 cfs	8.86 cfs
Design Point 2 (DP-2)		
	Pre-Dev. Flow	Post-Dev. Flow
2-yr	0.41 cfs	0.41 cfs
10-yr	0.94 cfs	0.70 cfs
25-yr	1.26 cfs	0.86 cfs
100-yr	1.73 cfs	1.11 cfs
Design Point 3 (DP-3)		
2-yr	0.05 cfs	0.03 cfs
10-yr	0.13 cfs	0.08 cfs
25-yr	0.19 cfs	0.10 cfs
100-yr	0.27 cfs	0.14 cfs

The net peak discharge for DP-1 is controlled by the subsurface detention basin and does not increase flows off site for any of the evaluated design storms. The net peak discharges for both DP-2 and DP-3 are un-controlled and flow off-site overland as occurs in existing conditions. Based on the proposed grading and the locations of new catch basins and trench drains, there is a reduction in total area contributing to both DP-2 and DP-3 and the proposed development does not increase flows to these design points for any of the evaluated design storms from existing conditions.

STANDARD 3: Recharge to Groundwater

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

GROUND WATER RECHARGE

The proposed project will result in an increase in impervious area to a total of approximately 80,078 square feet. The on-site soils of the areas contributing to the proposed subsurface detention system as classified by the Soil Survey for Norfolk County Massachusetts are 312B – Woodbridge fine sandy loam 0 to 8 percent slopes with a hydrologic soil group classification of HSG C/D. On-site soil textures are sandy loam based on test pits performed by Level Design Group, LLC. Based on the HSA “C/D” soil classification, the shallow depth to groundwater, and the existing and proposed topography, infiltration systems conforming to Massachusetts Stormwater Regulations are not practical and no infiltration is proposed for the site. Instead, A Subsurface detention system is proposed that is partially located within the Estimated Seasonal High Groundwater Table. This system is proposed to be wrapped in linear low density polyethylene liner.

ALTERNATIVE ANALYSIS

Due to site constraints including low permeability soils and shallow groundwater depth, infiltration is not proposed at the site. Porous pavement was considered as a potential alternative to provide infiltration, however, because the pavement will primarily be used by trailer trucks, this option was not practical. Site infiltration measures will be provided through both the proposed rip rap swale and the existing detention basin. No changes are proposed to the existing detention basin however it is being utilized as an outlet for the proposed stormwater improvements for the development. Post development flows to the basin are decreased from pre development conditions.

Redevelopment: The project has been designed comply with Massachusetts Stormwater Regulations for Standard 3 to the Maximum Extent Practicable.

Compliance to the Maximum Extent Practicable:

- Does the redevelopment design meet Standard 3, comparing post-development to pre-development conditions? No
- If not, the applicant shall document an analysis of alternative approaches for meeting the Standard? See Alternatives Analysis above.
- What soil types are present on the site? Is the site is comprised solely of C and D soils and bedrock at the land surface? Solely of C and D soils
- Does the project include sites where recharge is proposed at or adjacent to an area classified as contaminated, sites where contamination has been capped in place, sites that have an Activity and Use Limitation (AUL) that precludes inducing runoff to the groundwater, pursuant to MGL Chapter 21E and the Massachusetts Contingency Plan 310 CMR 40.0000; sites that are the location of a solid waste landfill as defined in 310 CMR 19.000; or sites where groundwater from the recharge location flows directly toward a solid waste landfill or 21E site?¹ N/A
- Is the stormwater runoff from a land use with a higher potential pollutant load? N/A
- Is the discharge to the ground located within the Zone II or Interim Wellhead Protection Area of a public water supply? No
- Does the site have an infiltration rate greater than 2.4 inches per hour? No

Improvements to Existing Conditions:

¹ A mounding analysis is needed if a site falls within this category. See Volume 3.

- Does the project increase the required recharge volume over existing (developed) conditions? If so, can the project be redesigned to reduce the required recharge volume by decreasing impervious surfaces (make building higher, put parking under the building, narrower roads, sidewalks on only one side of street, etc.) or using low impact development techniques such as porous pavement? The site increases the recharge volume requirement. Porous pavement was considered as an alternative to provide infiltration but is not practical based on it being primarily utilized by trailer trucks.
- Is the project located within a basin or sub-basin that has been categorized as under high or medium stress by the Massachusetts Water Resources Commission, or where there is other evidence that there are rivers and streams experiencing low flow problems? If so, have measures been considered to replace the natural recharge lost as a result of the prior development? (See Menu.) N/A
- Has the applicant evaluated measures for reducing site runoff? (See Menu.)
Yes, See Alternatives Analysis above.

STANDARD 4: 80% TSS Removal

Stormwater Management Standard 4 requires that, “Stormwater management systems must be designed to remove 80% of the average annual post-construction of Total Suspended Solids (TSS). This standard is met when:

- a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan and thereafter are implemented and maintained;
- b. Stormwater BMPs are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook and;
- c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook”

To achieve the required 80% TSS removal, new stormwater BMP’s will be installed. A subsurface detention basin is proposed which will collect runoff from all impervious areas within Drainage Area P-1a and provide the maximum level of stormwater treatment practicable. A proprietary stormwater treatment unit is proposed which provides treatment prior to discharge to the subsurface detention basin. MADEP TSS Removal Sheets are included herein which show 80% TSS removal by the proprietary stormwater treatment unit and the subsurface detention basin meeting the requirements for total treatment.

Water Quality Calculations:

CDS Stormwater Treatment Unit Sizing

Water quality treatment is provided by using CDS treatment units. The CDS Units are sized using the *Massachusetts Department of Environmental Protection Wetlands Program – Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices*.

The water quality flow calculations are detailed below:

Flow to DHM-2/CDS

$$Q_{1.0}=(q_u)(A)(WQV)$$

$qu=774$ csm/in for a T_c of 0.1 hours (taken from Figure 2 of the Massachusetts Department of Environmental Protection Wetlands program - Standard Method to Convert Required Water Quality Volume to a Discharge Rate)

$A=1.633$ Acres

$WQV=1.0$ inches

$Q_{1.0} = (774 \text{ csm/in}) (1.633 \text{ acres}) (0.0015625 \text{ sq. mi / acre}) (1.0 \text{ inch})$

$Q_{1.0} = 1.97 \text{ cfs} < \text{CDS Model 2020-5 Inlet Unit with a Treatment Capacity} = 2.20 \text{ cfs}$

Flow to CB-3/STC-450i

$Q_{1.0}=(qu)(A)(WQV)$

$qu=774$ csm/in for a T_c of 0.1 hours (taken from Figure 2 of the Massachusetts Department of Environmental Protection Wetlands program - Standard Method to Convert Required Water Quality Volume to a Discharge Rate)

$A=0.071$ Acres

$WQV=1.0$ inches

$Q_{1.0} = (774 \text{ csm/in}) (0.071 \text{ acres}) (0.0015625 \text{ sq. mi / acre}) (1.0 \text{ inch})$

$Q_{1.0} = 0.09 \text{ cfs} < \text{STC-450i with a Treatment Capacity} = 0.40 \text{ cfs}$

Redevelopment: The project has been designed to fully comply with Massachusetts Stormwater Regulations for Standard 4.

Full compliance for any component that is not a redevelopment

Full compliance with the long-term pollution plan requirement for new developments and redevelopments.

- Has the proponent developed a long-term pollution plan that fully meets the requirements of Standard 4? A Long Term Pollution Prevention Plan is provided
- Does the pollution prevention plan include the following source control measures?
 - Street sweeping - yes
 - Proper management of snow, salt, sand and other deicing chemicals – yes
 - Proper management of fertilizers, herbicides and pesticides - yes
 - Stabilization of existing eroding surfaces - yes

Compliance to the Maximum Extent Practicable for the other requirements:

- Does the redevelopment design provide for treatment of all runoff from existing (as well as new) impervious areas to achieve 80% TSS removal? If 80% TSS removal is not achieved, has the stormwater management system been designed to remove TSS to the maximum extent practicable? 80% TSS removal achieved
- Have the proposed stormwater BMPs been properly sized to capture the prescribed runoff volume? Yes

- One inch rule applies for discharge
 - within a Zone II or Interim Wellhead Protection Area, - N/A
 - near or to another critical area, - N/A
 - from a land use with a higher potential pollutant load - N/A
 - to the ground where the infiltration rate is greater than 2.4 inches per hour - N/A
- Has adequate pretreatment been proposed?
 - 44% TSS Removal Pretreatment Requirement applies if:
 - Stormwater runoff is from a land use with a higher potential pollutant load
 - Stormwater is discharged - Yes, 44% TSS removal achieved (Zone II and rapid infiltration)
 - To the ground within the Zone II or Interim Wellhead Protection Area of a Public Water Supply - N/A
 - To the ground with an infiltration rate greater than 2.4 inches per hour - N/A
 - Near or to an Outstanding Resource Water, Special Resource Water, Cold-Water Fishery, Shellfish Growing Area, or Bathing Beach. - N/A
- If the stormwater BMPs do not meet all the requirements set forth above, the applicant shall document an analysis of alternative approaches for meeting these requirements. (See Section on Retrofitting Existing BMPs (the “Retrofit Section”). N/A

Improvements to Existing Conditions:

- Have measures been provided to achieve at least partial compliance with the TSS removal standard? Fully complies
- Have any of the best management practices in the Retrofit Section been considered? N/A
- Have any of the following pollution prevention measures been considered?
Operation & Maintenance and Long Term Pollution Prevention Plans have been prepared for the site in accordance with Massachusetts Stormwater regulations and are included in the Stormwater Report.
 - Reduction or elimination of winter sanding, where safe and prudent to do so
 - Tighter controls over the application of fertilizers, herbicides, and pesticides
 - Landscaping that reduces the need for fertilizer, herbicides and pesticides
 - High frequency sweeping of paved surfaces using vacuum sweepers
 - Improved catch basin cleaning
 - Waterfowl control programs

Are there any discharges (new or existing) to impaired waters? If so, see TMDL section. N/A

STANDARD 5: Higher Potential Pollutant Loads

Stormwater Management Standard 5 requires that, “For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention, all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt and stormwater runoff, the proponent shall use the specific stormwater BMPs determined by the

Department to be suitable for such use as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 2, §26-53, and the regulations promulgated thereunder at 314 CMF 3.00, 314 CMR 4.00 and 314 CMR 5.00.”

The proposed use is not considered a use that would generate Higher Potential Pollutant Loads.

Redevelopment: The project use is not considered a use that would generate Higher Potential Pollutant Loads.

STANDARD 6: Critical Areas

Stormwater Management Standard 6 requires that Stormwater discharge to a Zone II Interim Wellhead Protection Area of a public water supply and stormwater discharges near any other critical area require the use of specific source control and pollution prevention measures and the specific stormwater best management practices determined by the Department to be suitable for managing discharges to such area, as provided in the Massachusetts Stormwater Handbook. A discharge near a critical area, if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters or Special Resource Waters shall be set back from the receiving water and receive the highest and best practical method of treatment. A “stormwater discharge,” as defined in 314 CMR 3.04(2)(a)1. or (b), to an Outstanding Resource Waters or Special Resource Waters shall comply with 314 CMF 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A area prohibited unless essential to the operation of the public water supply.”

The development site is not located within a Critical Area as defined by the Massachusetts Stormwater Handbook.

Redevelopment: The project is not located in a critical area as defined by the Massachusetts Stormwater Regulations for Standard 6.

STANDARD 7: Redevelopment and Other Projects Subject to the Standards only to the Maximum Extent Practicable

The definition of a Redevelopment Project under the definition provided in the MADEP Stormwater Handbook for Standard 7 is listed below:

“Development rehabilitation, expansion and phased projected on previously developed sites, provided that redevelopment results in no net increase in impervious area.”

The proposed development is not considered a Redevelopment Project and fully complies with the requirements of the MADEP Stormwater Management Standards.

STANDARD 8: Erosion and Sediment Control

Stormwater Management Standard 8 requires that, “A plan to control construction-related impacts, including erosion sedimentation and other pollutant sources during construction and land disturbance

activities (construction period erosion, sedimentation, and pollution prevention plan), must be developed and implemented.”

This standard is met through the type and style of construction. The existing driveway will, to the extent possible, remain intact until the proposed driveway is to be graded and paved. This will provide a pad for wheel cleaning prior to the vehicle exit on Washington Street. The site is self-contained with abutting properties draining overland to the rear of the subject property. Thereby there will be no additional erosion from this property to abutting properties. With careful construction the project will limit erosion potential through the development itself and no additional structural measures, passive or active, are proposed. A Construction Period Pollution and Erosion & Sedimentation Control Plan has also been prepared and is included as part of the Stormwater Report.

Redevelopment: The project has been designed to fully comply with Massachusetts Stormwater Regulations for Standard 8.

All redevelopment projects shall fully comply with Standard 8.

- Has the proponent submitted a construction period erosion, sedimentation and pollution prevention plan that meets the requirements of Standard 8?
A draft Stormwater Pollution Prevention Plan is included with the stormwater report and will be finalized prior to the start of construction.

STANDARD 9: Operation and Maintenance

Stormwater Management Standard 9 requires that, “A long-term operation and maintenance plan must be developed and implemented to ensure that stormwater management systems function as designed”.

This standard is fully met with development and implementation of an Operation and Maintenance Plan is included in Stormwater Management Report.

Redevelopment: The project has been designed to fully comply with Massachusetts Stormwater Regulations for Standard 9.

All redevelopment projects shall fully comply with Standard 9.

- Has the proponent submitted a long-term Operation and Maintenance plan that meets the requirements of Standard 9?
O&M included in Stormwater Report

STANDARD 10: Illicit Discharges

Stormwater Management Standard 10 requires that, “All illicit discharges to the stormwater management system are prohibited”.

This standard is fully met with development and implementation of a Long-Term Pollution Prevention which is included in the Stormwater Management Report. An Illicit Discharge statement has been prepared and is included herein.

Redevelopment: The project has been designed to fully comply with Massachusetts Stormwater Regulations for Standard 10.

All redevelopment projects shall fully comply with Standard 10.

- Are there any known or suspected illicit discharges to the stormwater management system at the redevelopment project site? No
- Has an illicit connection detection program been implemented using visual screening, dye or smoke testing? No
- Have an Illicit Discharge Compliance Statement and associated site map been submitted verifying that there are no illicit discharges to the stormwater management system at the site?
Yes

Improvements to Existing Conditions:

- Once all illicit discharges are removed, has the proponent implemented any measures to prevent additional illicit discharges? N/A

CONCLUSION

The proposed redevelopment of this parcel will be a significant improvement to the area and to the resource area on and adjacent to the site. The proposed 2081 redevelopment meets or exceeds the current MADEP Stormwater Management Standards and Guidelines and provides a stormwater management system that will maintain water quality while attenuating peak rates of runoff at the control points. This was achieved by using pretreatment BMPs and directing the stormwater runoff to a subsurface detention basin which attenuates peak flows while providing a high level of TSS removal. An Operation and Maintenance Plan for post-construction maintenance of the Stormwater Management System has been developed and is included with this report.

MADEP Stormwater Report Checklist



Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

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

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

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

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

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



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- New development
- Redevelopment
- Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- No disturbance to any Wetland Resource Areas
- Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- Reduced Impervious Area (Redevelopment Only)
- Minimizing disturbance to existing trees and shrubs
- LID Site Design Credit Requested:
 - Credit 1
 - Credit 2
 - Credit 3
- Use of "country drainage" versus curb and gutter conveyance and pipe
- Bioretention Cells (includes Rain Gardens)
- Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- Treebox Filter
- Water Quality Swale
- Grass Channel
- Green Roof
- Other (describe): _____

Standard 1: No New Untreated Discharges

- No new untreated discharges
- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - Static
 - Simple Dynamic
 - Dynamic Field¹
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - Site is comprised solely of C and D soils and/or bedrock at the land surface
 - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - Solid Waste Landfill pursuant to 310 CMR 19.000
 - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - is within the Zone II or Interim Wellhead Protection Area
 - is near or to other critical areas
 - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - involves runoff from land uses with higher potential pollutant loads.
 - The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
 - The ½" or 1" Water Quality Volume or
 - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does **not** cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

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

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - Limited Project
 - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - Bike Path and/or Foot Path
 - Redevelopment Project
- Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- The project is **not** covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - Name of the stormwater management system owners;
 - Party responsible for operation and maintenance;
 - Schedule for implementation of routine and non-routine maintenance tasks;
 - Plan showing the location of all stormwater BMPs maintenance access areas;
 - Description and delineation of public safety features;
 - Estimated operation and maintenance budget; and
 - Operation and Maintenance Log Form.
- The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

Aerial Photograph (MAGIS)



15 Liberty Way

Franklin, MA

1 inch = 300 Feet



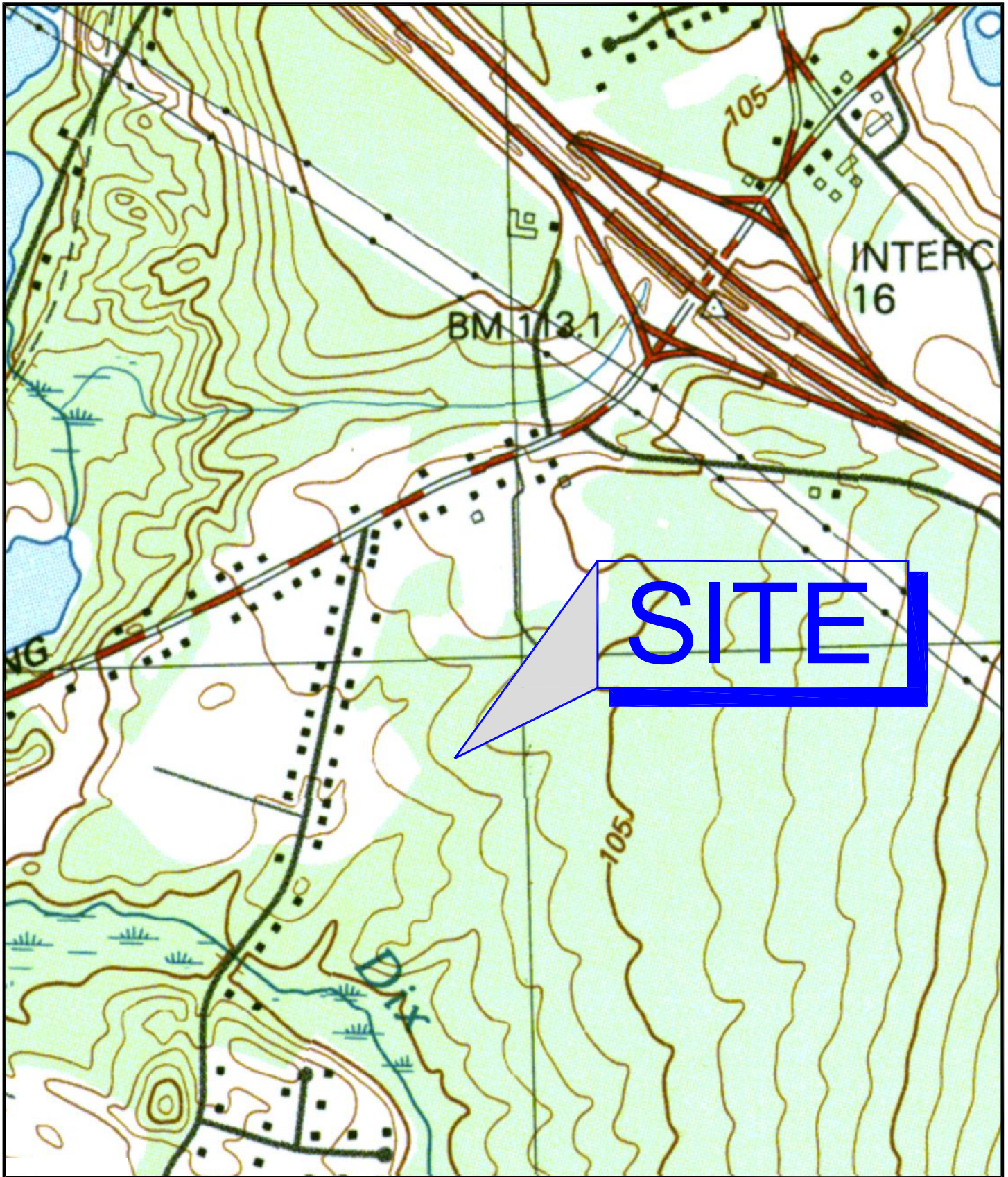
January 17, 2023

www.cai-tech.com

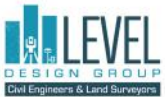


This information is believed to be correct but is subject to change and is not warranted.

USGS Topographic Map (MAGIS)



USGS LOCUS MAP



On-Site Soils Documentation

Project No: 2081.00
Project: 15 Liberty Way Franklin
Date of Testing 11/16/22

Soil Evaluator Adam Hunt E.I.T. SE# 12794
Temp 48F Rain

Test Hole No.: TH-1 Ground Elevation at Hole = 334.70
Time: 10:15 AM Groundwater Elevation = 331.78

Depth (inches)	Horizon	Color	Texture	Redox Depth	Redox Color	Comments
0-10	A	10YR 2/2	SL			
10-24	B	10YR 5/6	SL			
24-108	C1	2.5Y 6/3	SL	35"		Very Compact
Weeping Observed				none		
Standing Water Observed				none		
Redox Observed				35"		

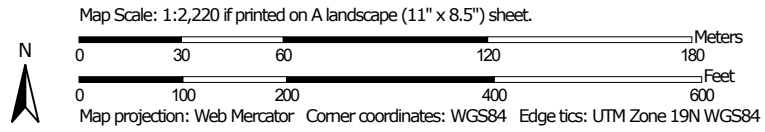
Test Hole No.: TH-2 Ground Elevation at Hole = 331.05
Time: 11:00 AM Groundwater Elevation = 328.38

Depth (inches)	Horizon	Color	Texture	Redox Depth	Redox Color	Comments
0-12	A	10YR 2/2	SL			
12-24	B	10YR 5/6	SL			
24-120	C1	2.5Y 6/3	SL	32"		Very Compact
Weeping Observed				none		
Standing Water Observed				none		
Redox Observed				32"		

Test Hole No.: TH-3 Ground Elevation at Hole = 328.50
Time: 11:45 AM Groundwater Elevation = 326.00

Depth (inches)	Horizon	Color	Texture	Redox Depth	Redox Color	Comments
0-12	A	10YR 2/2	SL			
12-28	B	10YR 5/6	SL			
28-72	C1	2.5Y 6/3	SL	30"		Very Compact
Weeping Observed				none		
Standing Water Observed				none		
Redox Observed				30"		

Hydrologic Soil Group—Norfolk and Suffolk Counties, Massachusetts
(15 Liberty Way Franklin, MA)



MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils

Soil Rating Polygons





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

Soil Rating Lines

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

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
 Survey Area Data: Version 18, Sep 9, 2022

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C/D	0.3	1.5%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	C/D	18.8	98.5%
Totals for Area of Interest			19.0	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

MADEP TSS Removal Calculation Sheets

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location:

TSS Removal Calculation Worksheet

A BMP ¹	B TSS Removal Rate ¹	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump & Hooded CBs	0.25	1.00	0.25	0.75
CDS Unit	0.74	0.75	0.55	0.20

Total TSS Removal =

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project:
 Prepared By:
 Date:

*Equals remaining load from previous BMP (E) which enters the BMP

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location:

TSS Removal Calculation Worksheet

A BMP ¹	B TSS Removal Rate ¹	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
CDS Unit	0.74	1.00	0.74	0.26

Total TSS Removal =

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project:
 Prepared By:
 Date:

*Equals remaining load from previous BMP (E) which enters the BMP

Illicit Discharge Statement

Illicit Discharge Statement

Under the Massachusetts Wetlands Protection Act – Stormwater Management Standards

For

15 LIBERTY WAY

FRANKLIN, MA

All illicit discharges to the Stormwater Management System are prohibited. The Stormwater Management System is the system for conveying, treating, and infiltrating stormwater. Illicit discharges to Stormwater Management Systems are discharges that are not entirely comprised of stormwater, but do not include discharges from the following activities or facilities:

- Firefighting
- Water Line Flushing
- Potable Water Sources
- Landscape Irrigation
- Potable Water Sources
- Uncontaminated Groundwater
- Air-conditioning Condensation
- Dechlorinated Water from Swimming Pools
- Water used for street washing
- Water used for clean residential buildings without detergents
- Foundation Drains

The site will be operated and maintained in accordance with the Operation and Maintenance Plan dated January 13, 2023 prepared by Level Design Group, LLC.

I, _____ (*Applicant*) do hereby agree to comply with requirements set forth within the Illicit Discharge Statement and will not knowingly discharge illicit materials to the stormwater management system once it is brought online **upon** completion of construction.

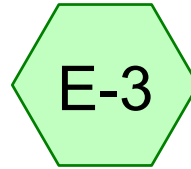
Signature: _____

Date: _____

Existing Drainage Plan & HydroCAD Diagram



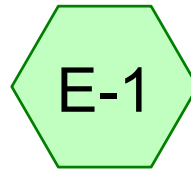
Off-site West



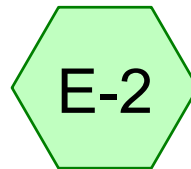
Flow off-site West



Basin



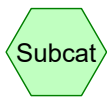
Flow to Existing Basin



Flow onsite Southeast



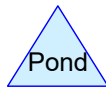
Onsite southeast



Subcat



Reach



Pond



Link

Routing Diagram for Existing-2

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HydroCAD Analysis
Existing Conditions - 2 Year Storm

Existing-2

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Page 1

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
9,896	79	50-75% Grass cover, Fair, HSG C (E-1, E-2, E-3)
10,479	98	Paved parking (E-1, E-2)
84,992	70	Woods, Good, HSG C (E-1, E-2, E-3)
105,367	74	TOTAL AREA

Existing-2

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Page 2

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
94,888	HSG C	E-1, E-2, E-3
0	HSG D	
10,479	Other	E-1, E-2
105,367		TOTAL AREA

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Page 3

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	9,896	0	0	9,896	50-75% Grass cover, Fair	E-1, E-2, E-3
0	0	0	0	10,479	10,479	Paved parking	E-1, E-2
0	0	84,992	0	0	84,992	Woods, Good	E-1, E-2, E-3
0	0	94,888	0	10,479	105,367	TOTAL AREA	

Existing-2Prepared by {enter your company name here}
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Type III 24-hr 2-Year Rainfall=3.05"

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Page 4

Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Flow to Existing Basin

Runoff Area=90,103 sf 6.06% Impervious Runoff Depth=0.84"
 Flow Length=553' Tc=12.0 min CN=72 Runoff=1.49 cfs 6,292 cf

Subcatchment E-2: Flow onsite Southeast

Runoff Area=13,159 sf 38.16% Impervious Runoff Depth=1.42"
 Flow Length=140' Tc=11.3 min CN=82 Runoff=0.42 cfs 1,555 cf

Subcatchment E-3: Flow off-site West

Runoff Area=2,105 sf 0.00% Impervious Runoff Depth=0.89"
 Tc=6.0 min CN=73 Runoff=0.05 cfs 156 cf

Reach DP-1: Basin

Inflow=1.49 cfs 6,292 cf
 Outflow=1.49 cfs 6,292 cf

Reach DP-2: Onsite southeast

Inflow=0.42 cfs 1,555 cf
 Outflow=0.42 cfs 1,555 cf

Reach DP-3: Off-site West

Inflow=0.05 cfs 156 cf
 Outflow=0.05 cfs 156 cf

Total Runoff Area = 105,367 sf Runoff Volume = 8,003 cf Average Runoff Depth = 0.91"
90.05% Pervious = 94,888 sf 9.95% Impervious = 10,479 sf

Existing-2

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Type III 24-hr 2-Year Rainfall=3.05"

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Page 5

Summary for Subcatchment E-1: Flow to Existing Basin

Runoff = 1.49 cfs @ 12.19 hrs, Volume= 6,292 cf, Depth= 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.05"

Area (sf)	CN	Description
* 5,457	98	Paved parking
76,777	70	Woods, Good, HSG C
7,869	79	50-75% Grass cover, Fair, HSG C
90,103	72	Weighted Average
84,646		93.94% Pervious Area
5,457		6.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	50	0.0530	0.10		Sheet Flow, Sheet Flow
3.4	503	0.0240	2.49		Woods: Light underbrush n= 0.400 P2= 3.05" Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
12.0	553	Total			

Existing-2

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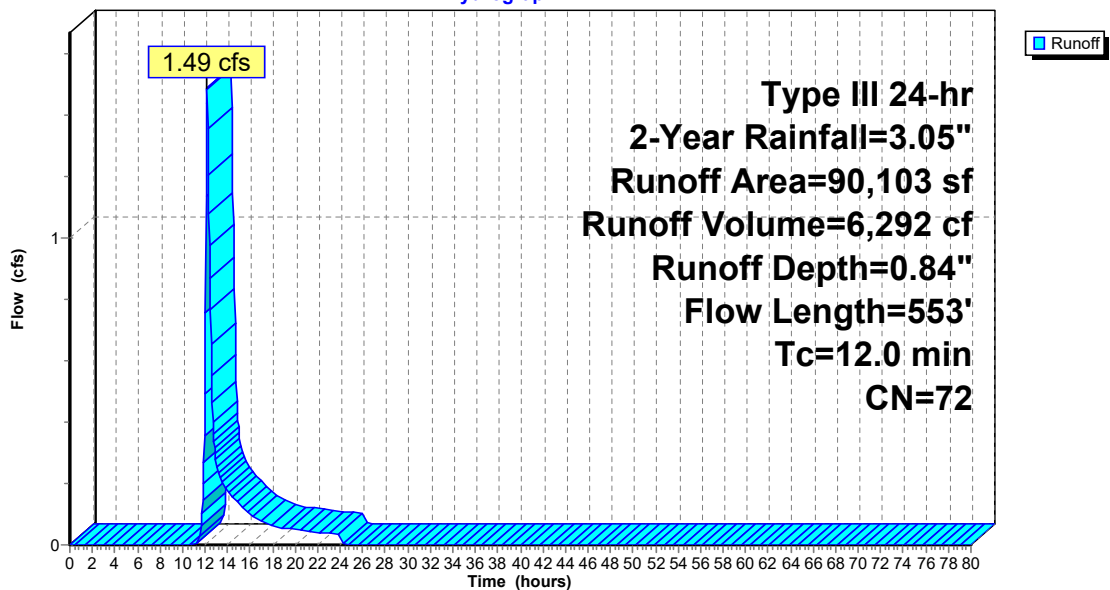
Type III 24-hr 2-Year Rainfall=3.05"

Printed 2/1/2023

Page 6

Subcatchment E-1: Flow to Existing Basin

Hydrograph



Existing-2

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Type III 24-hr 2-Year Rainfall=3.05"

Printed 2/1/2023

Page 7

Summary for Subcatchment E-2: Flow onsite Southeast

Runoff = 0.42 cfs @ 12.16 hrs, Volume= 1,555 cf, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.05"

Area (sf)	CN	Description
5,022	98	Paved parking
6,746	70	Woods, Good, HSG C
1,391	79	50-75% Grass cover, Fair, HSG C
13,159	82	Weighted Average
8,137		61.84% Pervious Area
5,022		38.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	50	0.0280	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.05"
0.1	45	0.1750	6.74		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.0	11	0.1640	6.52		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.2	34	0.0240	3.14		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.3	140	Total			

Existing-2

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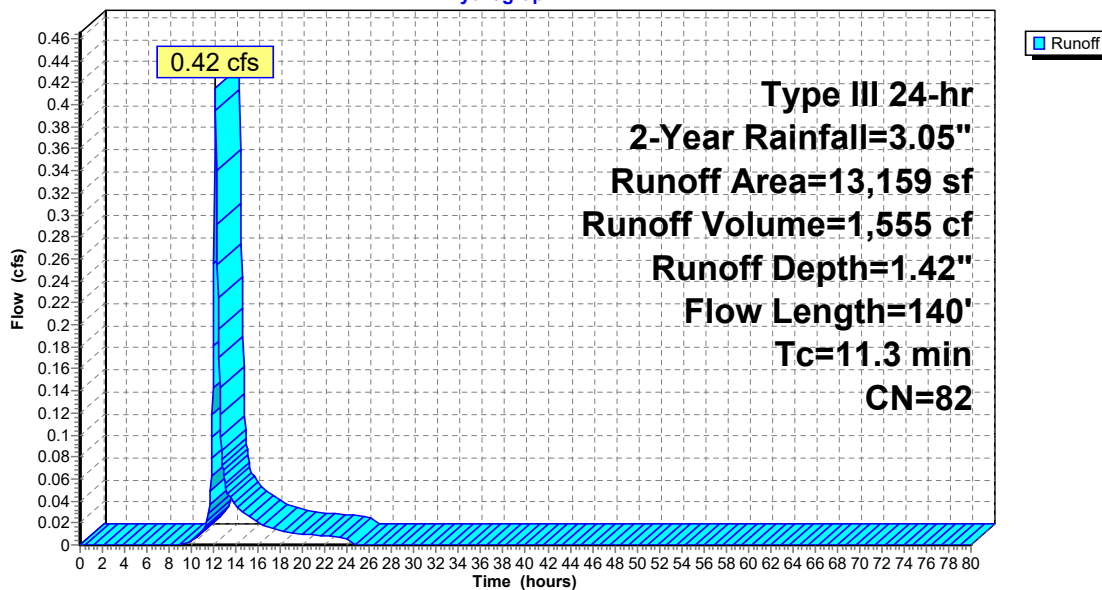
Type III 24-hr 2-Year Rainfall=3.05"

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Subcatchment E-2: Flow onsite Southeast

Hydrograph



Existing-2

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Type III 24-hr 2-Year Rainfall=3.05"

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Summary for Subcatchment E-3: Flow off-site West

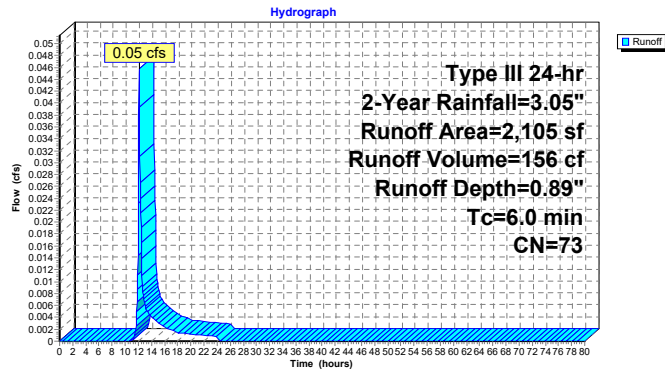
Runoff = 0.05 cfs @ 12.10 hrs, Volume= 156 cf, Depth= 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.05"

Area (sf)	CN	Description
1,469	70	Woods, Good, HSG C
636	79	50-75% Grass cover, Fair, HSG C
2,105	73	Weighted Average
2,105		100.00% Pervious Area

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

Subcatchment E-3: Flow off-site West



Existing-2

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Type III 24-hr 2-Year Rainfall=3.05"

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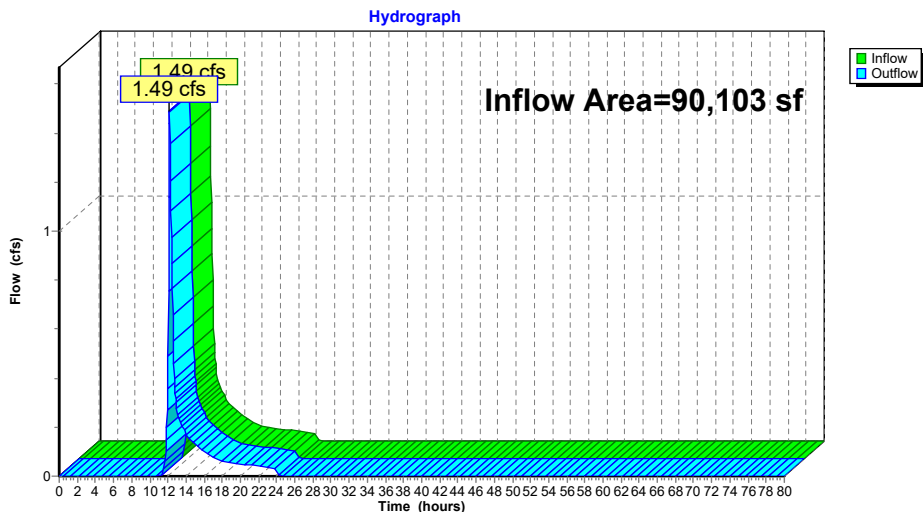
Summary for Reach DP-1: Basin

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

Inflow Area = 90,103 sf, 6.06% Impervious, Inflow Depth = 0.84" for 2-Year event
 Inflow = 1.49 cfs @ 12.19 hrs, Volume= 6,292 cf
 Outflow = 1.49 cfs @ 12.19 hrs, Volume= 6,292 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-1: Basin



Existing-2

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Type III 24-hr 2-Year Rainfall=3.05"

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Summary for Reach DP-2: Onsite southeast

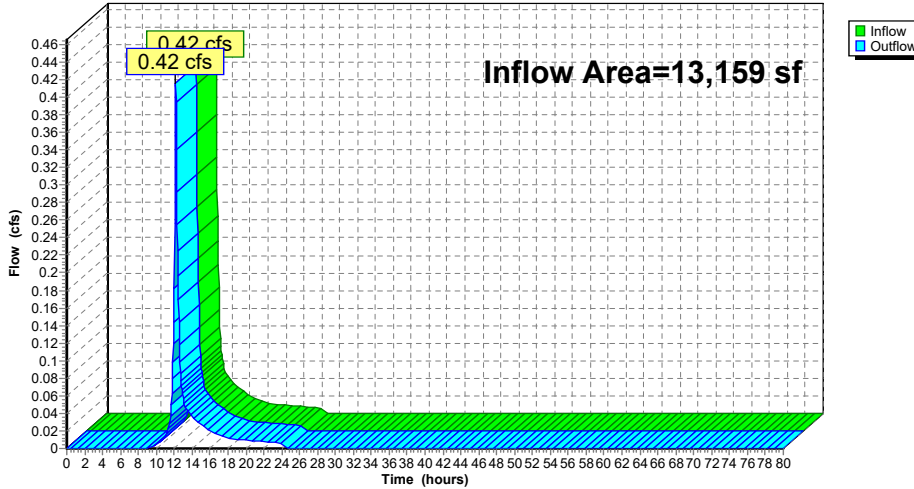
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 13,159 sf, 38.16% Impervious, Inflow Depth = 1.42" for 2-Year event
Inflow = 0.42 cfs @ 12.16 hrs, Volume= 1,555 cf
Outflow = 0.42 cfs @ 12.16 hrs, Volume= 1,555 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-2: Onsite southeast

Hydrograph



Existing-2

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Type III 24-hr 2-Year Rainfall=3.05"

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Summary for Reach DP-3: Off-site West

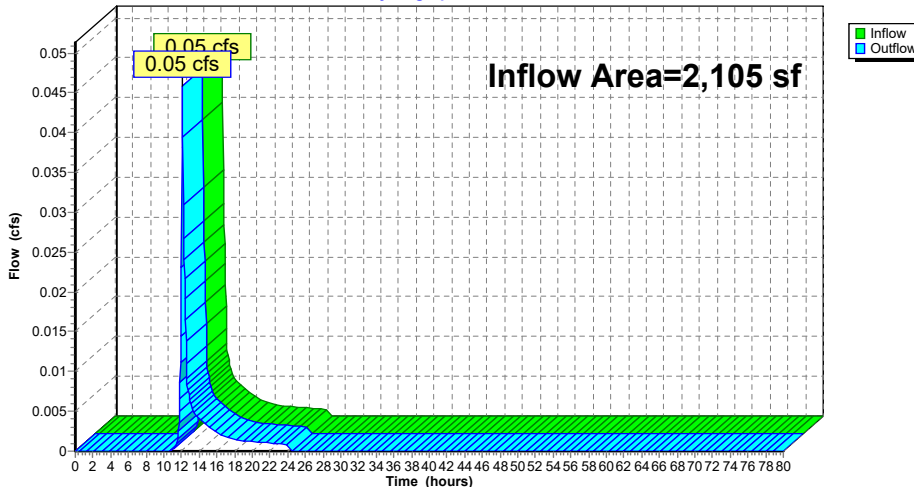
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2,105 sf, 0.00% Impervious, Inflow Depth = 0.89" for 2-Year event
Inflow = 0.05 cfs @ 12.10 hrs, Volume= 156 cf
Outflow = 0.05 cfs @ 12.10 hrs, Volume= 156 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-3: Off-site West

Hydrograph



HydroCAD Analysis
Existing Conditions - 10 Year Storm

Existing-2

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Page 1

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
9,896	79	50-75% Grass cover, Fair, HSG C (E-1, E-2, E-3)
10,479	98	Paved parking (E-1, E-2)
84,992	70	Woods, Good, HSG C (E-1, E-2, E-3)
105,367	74	TOTAL AREA

Existing-2

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Page 2

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
94,888	HSG C	E-1, E-2, E-3
0	HSG D	
10,479	Other	E-1, E-2
105,367		TOTAL AREA

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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	9,896	0	0	9,896	50-75% Grass cover, Fair	E-1, E-2, E-3
0	0	0	0	10,479	10,479	Paved parking	E-1, E-2
0	0	84,992	0	0	84,992	Woods, Good	E-1, E-2, E-3
0	0	94,888	0	10,479	105,367	TOTAL AREA	

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Type III 24-hr 10-Year Rainfall=5.15"

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Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Flow to Existing Basin

Runoff Area=90,103 sf 6.06% Impervious Runoff Depth=2.31"
 Flow Length=553' Tc=12.0 min CN=72 Runoff=4.53 cfs 17,375 cf

Subcatchment E-2: Flow onsite Southeast

Runoff Area=13,159 sf 38.16% Impervious Runoff Depth=3.21"
 Flow Length=140' Tc=11.3 min CN=82 Runoff=0.95 cfs 3,524 cf

Subcatchment E-3: Flow off-site West

Runoff Area=2,105 sf 0.00% Impervious Runoff Depth=2.40"
 Tc=6.0 min CN=73 Runoff=0.13 cfs 421 cf

Reach DP-1: Basin

Inflow=4.53 cfs 17,375 cf
 Outflow=4.53 cfs 17,375 cf

Reach DP-2: Onsite southeast

Inflow=0.95 cfs 3,524 cf
 Outflow=0.95 cfs 3,524 cf

Reach DP-3: Off-site West

Inflow=0.13 cfs 421 cf
 Outflow=0.13 cfs 421 cf

Total Runoff Area = 105,367 sf Runoff Volume = 21,320 cf Average Runoff Depth = 2.43"
90.05% Pervious = 94,888 sf 9.95% Impervious = 10,479 sf

Existing-2

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Type III 24-hr 10-Year Rainfall=5.15"

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Summary for Subcatchment E-1: Flow to Existing Basin

Runoff = 4.53 cfs @ 12.17 hrs, Volume= 17,375 cf, Depth= 2.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

Area (sf)	CN	Description
* 5,457	98	Paved parking
76,777	70	Woods, Good, HSG C
7,869	79	50-75% Grass cover, Fair, HSG C
90,103	72	Weighted Average
84,646		93.94% Pervious Area
5,457		6.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	50	0.0530	0.10		Sheet Flow, Sheet Flow
3.4	503	0.0240	2.49		Woods: Light underbrush n= 0.400 P2= 3.05" Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
12.0	553	Total			

Existing-2

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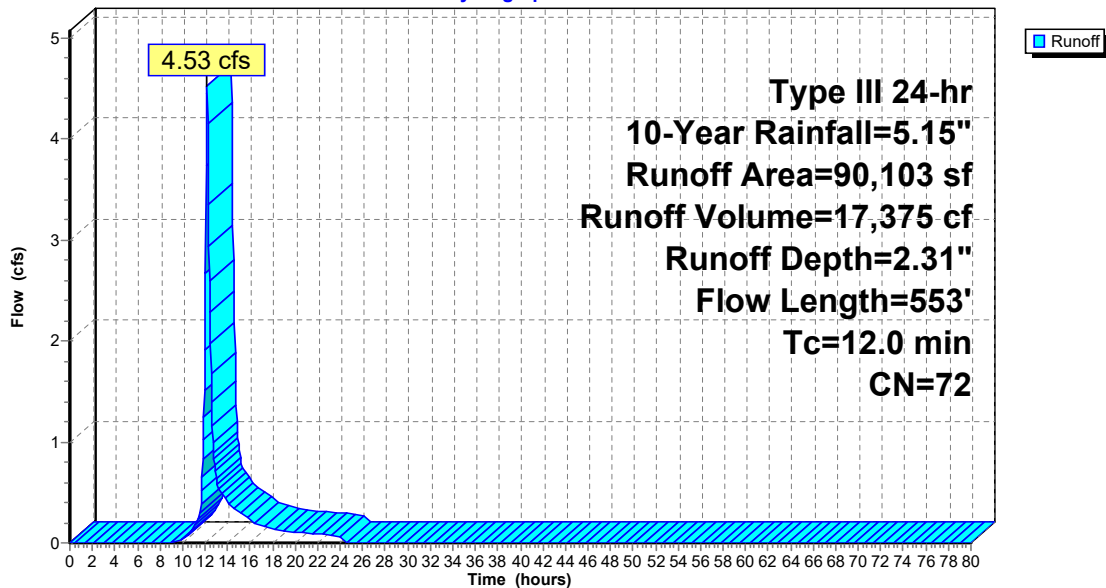
Type III 24-hr 10-Year Rainfall=5.15"

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Subcatchment E-1: Flow to Existing Basin

Hydrograph



Existing-2

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Type III 24-hr 10-Year Rainfall=5.15"

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Summary for Subcatchment E-2: Flow onsite Southeast

Runoff = 0.95 cfs @ 12.16 hrs, Volume= 3,524 cf, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

Area (sf)	CN	Description
* 5,022	98	Paved parking
6,746	70	Woods, Good, HSG C
1,391	79	50-75% Grass cover, Fair, HSG C
13,159	82	Weighted Average
8,137		61.84% Pervious Area
5,022		38.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	50	0.0280	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.05"
0.1	45	0.1750	6.74		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.0	11	0.1640	6.52		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.2	34	0.0240	3.14		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.3	140	Total			

Existing-2

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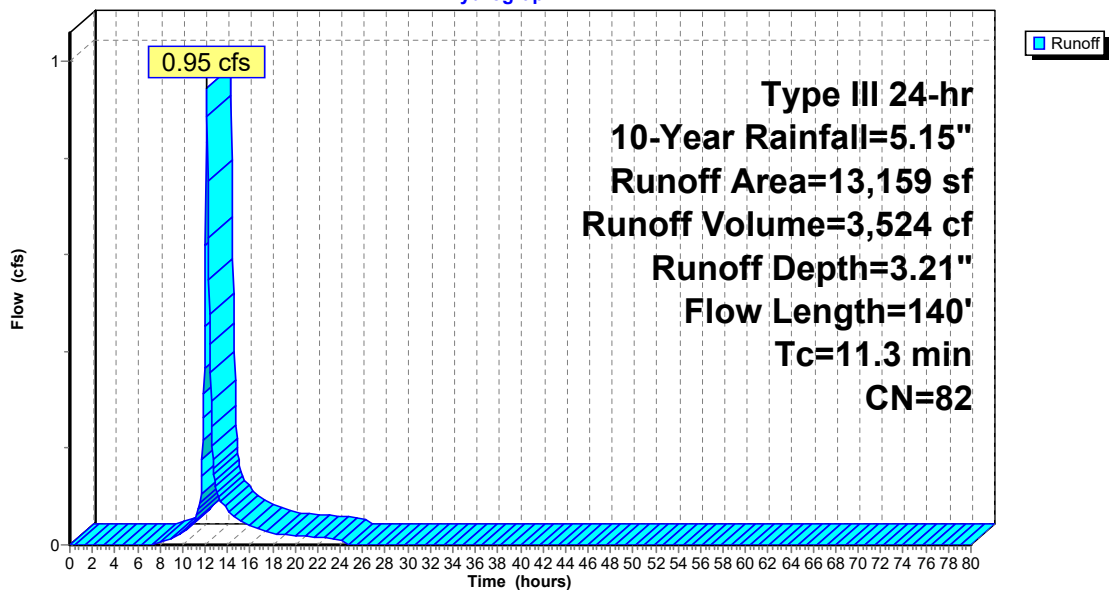
Type III 24-hr 10-Year Rainfall=5.15"

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Subcatchment E-2: Flow onsite Southeast

Hydrograph



Existing-2

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Type III 24-hr 10-Year Rainfall=5.15"

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Summary for Subcatchment E-3: Flow off-site West

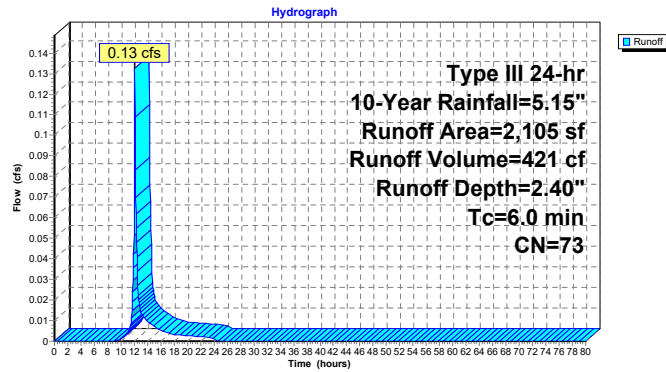
Runoff = 0.13 cfs @ 12.10 hrs, Volume= 421 cf, Depth= 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

Area (sf)	CN	Description
1,469	70	Woods, Good, HSG C
636	79	50-75% Grass cover, Fair, HSG C
2,105	73	Weighted Average
2,105		100.00% Pervious Area

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

Subcatchment E-3: Flow off-site West



Existing-2

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Type III 24-hr 10-Year Rainfall=5.15"

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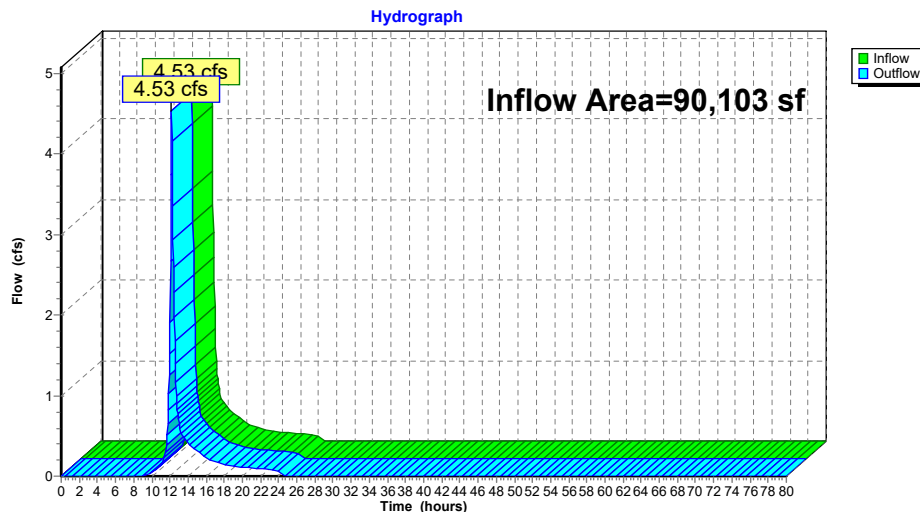
Summary for Reach DP-1: Basin

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

Inflow Area = 90,103 sf, 6.06% Impervious, Inflow Depth = 2.31" for 10-Year event
Inflow = 4.53 cfs @ 12.17 hrs, Volume= 17,375 cf
Outflow = 4.53 cfs @ 12.17 hrs, Volume= 17,375 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-1: Basin



Existing-2

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Type III 24-hr 10-Year Rainfall=5.15"

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Summary for Reach DP-2: Onsite southeast

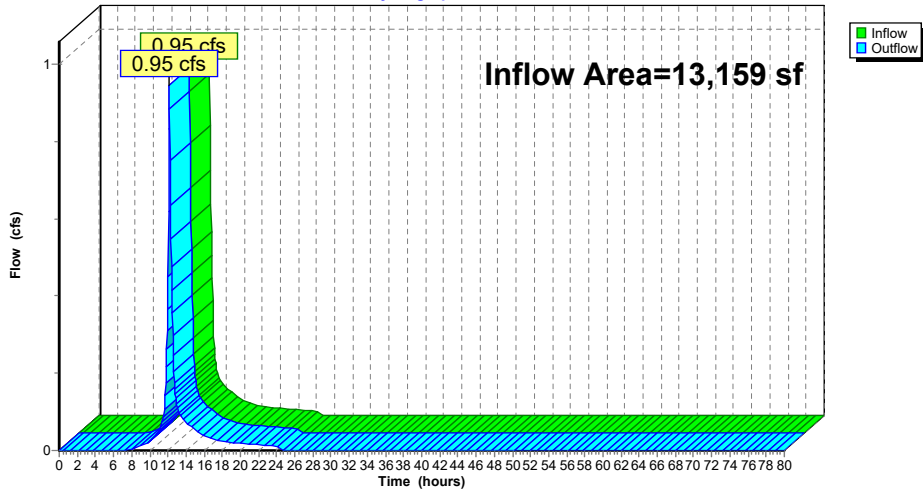
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 13,159 sf, 38.16% Impervious, Inflow Depth = 3.21" for 10-Year event
Inflow = 0.95 cfs @ 12.16 hrs, Volume= 3,524 cf
Outflow = 0.95 cfs @ 12.16 hrs, Volume= 3,524 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-2: Onsite southeast

Hydrograph



Existing-2

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Summary for Reach DP-3: Off-site West

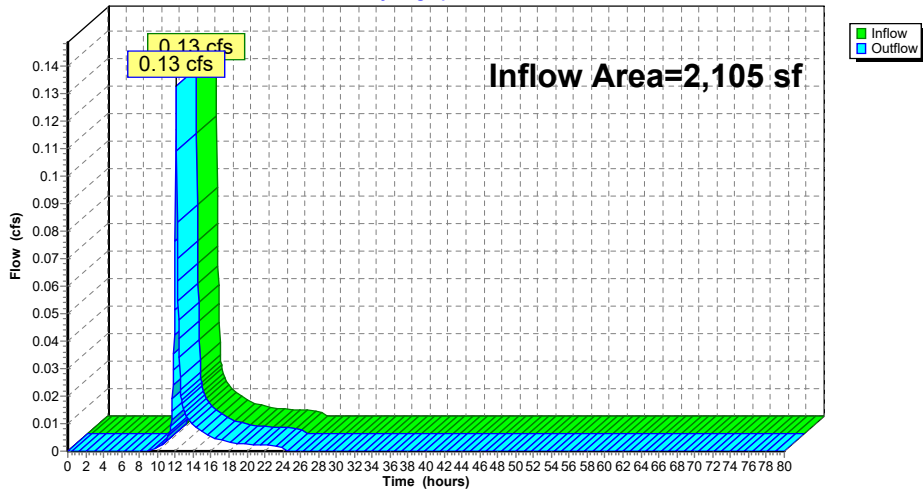
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2,105 sf, 0.00% Impervious, Inflow Depth = 2.40" for 10-Year event
Inflow = 0.13 cfs @ 12.10 hrs, Volume= 421 cf
Outflow = 0.13 cfs @ 12.10 hrs, Volume= 421 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-3: Off-site West

Hydrograph



HydroCAD Analysis
Existing Conditions - 25 Year Storm

Existing-2

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Page 1

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
9,896	79	50-75% Grass cover, Fair, HSG C (E-1, E-2, E-3)
10,479	98	Paved parking (E-1, E-2)
84,992	70	Woods, Good, HSG C (E-1, E-2, E-3)
105,367	74	TOTAL AREA

Existing-2

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Page 2

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
94,888	HSG C	E-1, E-2, E-3
0	HSG D	
10,479	Other	E-1, E-2
105,367		TOTAL AREA

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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	9,896	0	0	9,896	50-75% Grass cover, Fair	E-1, E-2, E-3
0	0	0	0	10,479	10,479	Paved parking	E-1, E-2
0	0	84,992	0	0	84,992	Woods, Good	E-1, E-2, E-3
0	0	94,888	0	10,479	105,367	TOTAL AREA	

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Type III 24-hr 25-Year Rainfall=6.35"

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Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Flow to Existing Basin

Runoff Area=90,103 sf 6.06% Impervious Runoff Depth=3.28"
 Flow Length=553' Tc=12.0 min CN=72 Runoff=6.49 cfs 24,642 cf

Subcatchment E-2: Flow onsite Southeast

Runoff Area=13,159 sf 38.16% Impervious Runoff Depth=4.31"
 Flow Length=140' Tc=11.3 min CN=82 Runoff=1.26 cfs 4,727 cf

Subcatchment E-3: Flow off-site West

Runoff Area=2,105 sf 0.00% Impervious Runoff Depth=3.38"
 Tc=6.0 min CN=73 Runoff=0.19 cfs 593 cf

Reach DP-1: Basin

Inflow=6.49 cfs 24,642 cf
 Outflow=6.49 cfs 24,642 cf

Reach DP-2: Onsite southeast

Inflow=1.26 cfs 4,727 cf
 Outflow=1.26 cfs 4,727 cf

Reach DP-3: Off-site West

Inflow=0.19 cfs 593 cf
 Outflow=0.19 cfs 593 cf

Total Runoff Area = 105,367 sf Runoff Volume = 29,962 cf Average Runoff Depth = 3.41"
90.05% Pervious = 94,888 sf 9.95% Impervious = 10,479 sf

Existing-2

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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Subcatchment E-1: Flow to Existing Basin

Runoff = 6.49 cfs @ 12.17 hrs, Volume= 24,642 cf, Depth= 3.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
* 5,457	98	Paved parking
76,777	70	Woods, Good, HSG C
7,869	79	50-75% Grass cover, Fair, HSG C
90,103	72	Weighted Average
84,646		93.94% Pervious Area
5,457		6.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	50	0.0530	0.10		Sheet Flow, Sheet Flow
3.4	503	0.0240	2.49		Woods: Light underbrush n= 0.400 P2= 3.05" Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
12.0	553	Total			

Existing-2

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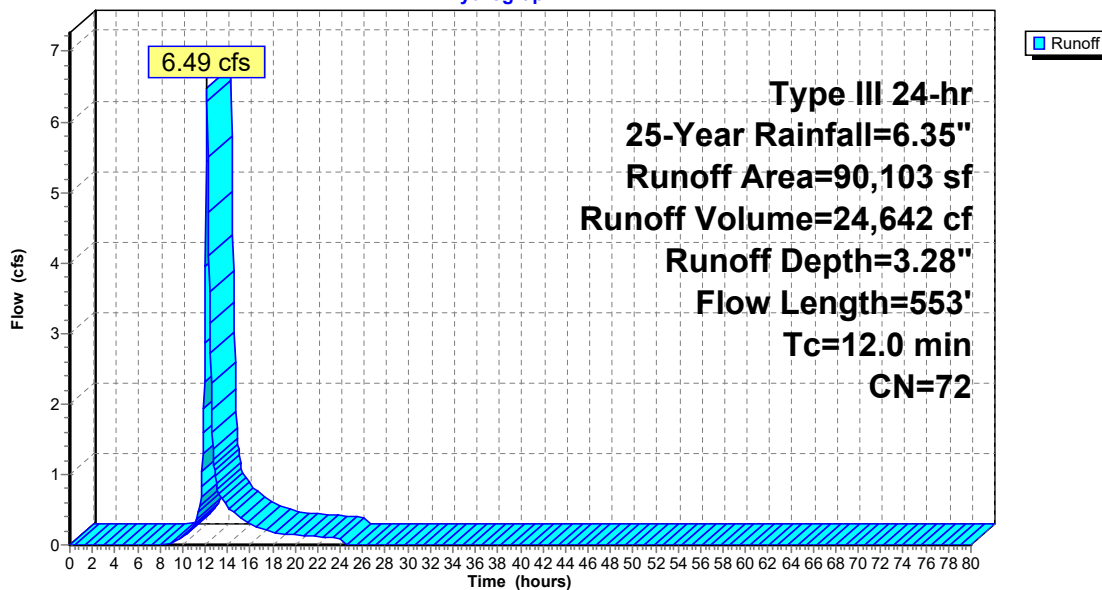
Type III 24-hr 25-Year Rainfall=6.35"

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Subcatchment E-1: Flow to Existing Basin

Hydrograph



Existing-2

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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Subcatchment E-2: Flow onsite Southeast

Runoff = 1.26 cfs @ 12.16 hrs, Volume= 4,727 cf, Depth= 4.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
* 5,022	98	Paved parking
6,746	70	Woods, Good, HSG C
1,391	79	50-75% Grass cover, Fair, HSG C
13,159	82	Weighted Average
8,137		61.84% Pervious Area
5,022		38.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	50	0.0280	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.05"
0.1	45	0.1750	6.74		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.0	11	0.1640	6.52		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.2	34	0.0240	3.14		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.3	140	Total			

Existing-2

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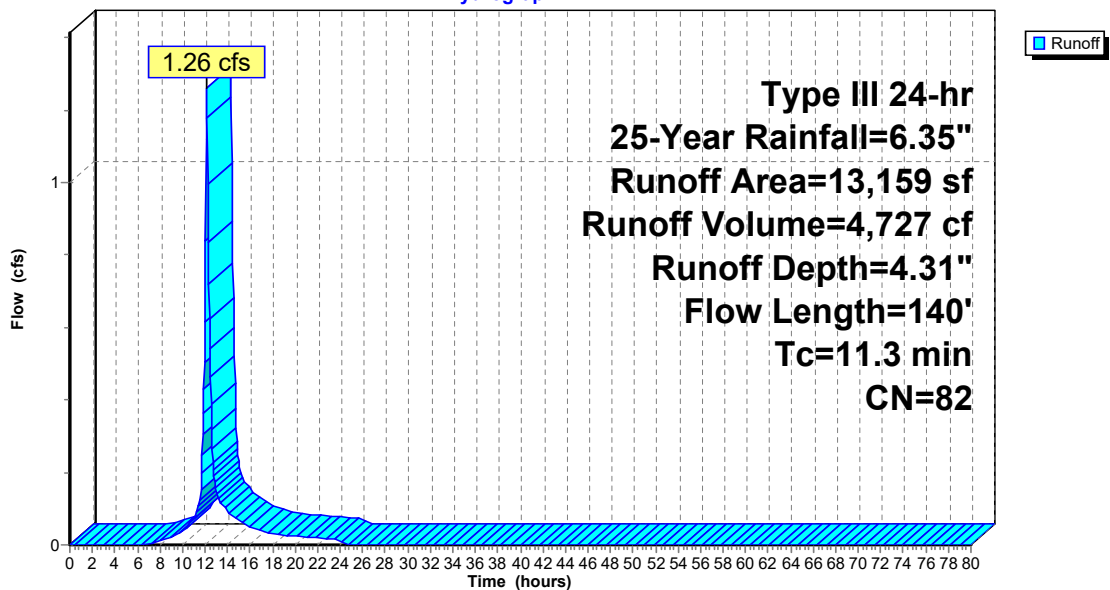
Type III 24-hr 25-Year Rainfall=6.35"

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Subcatchment E-2: Flow onsite Southeast

Hydrograph



Existing-2

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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Subcatchment E-3: Flow off-site West

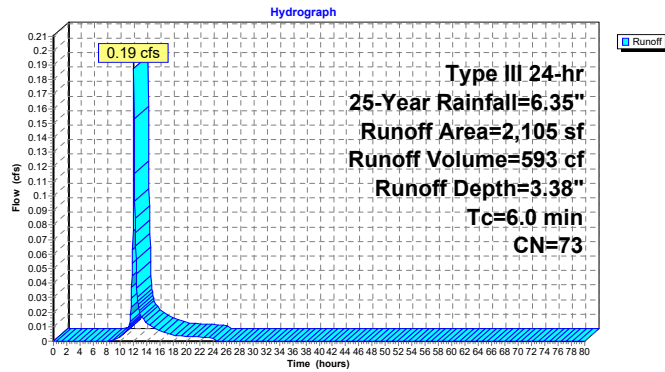
Runoff = 0.19 cfs @ 12.09 hrs, Volume= 593 cf, Depth= 3.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
1,469	70	Woods, Good, HSG C
636	79	50-75% Grass cover, Fair, HSG C
2,105	73	Weighted Average
2,105		100.00% Pervious Area

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

Subcatchment E-3: Flow off-site West



Existing-2

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Type III 24-hr 25-Year Rainfall=6.35"

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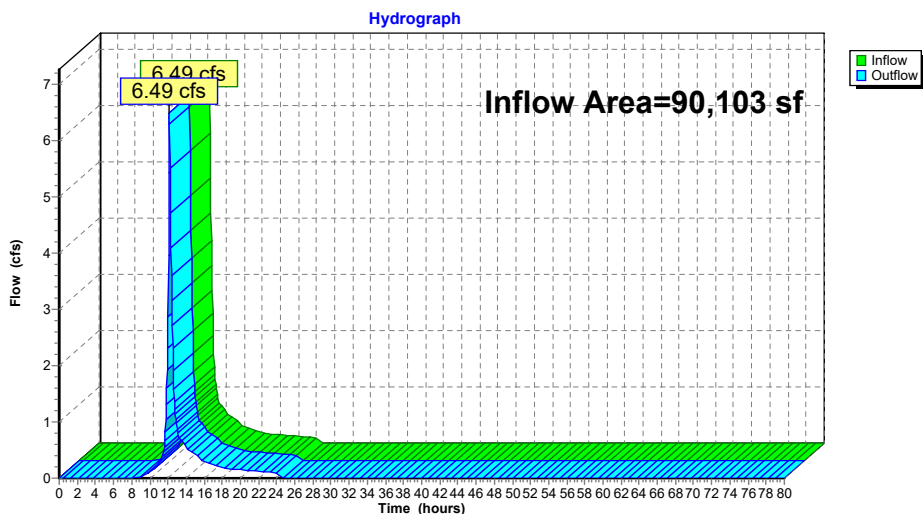
Summary for Reach DP-1: Basin

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

Inflow Area = 90,103 sf, 6.06% Impervious, Inflow Depth = 3.28" for 25-Year event
Inflow = 6.49 cfs @ 12.17 hrs, Volume= 24,642 cf
Outflow = 6.49 cfs @ 12.17 hrs, Volume= 24,642 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-1: Basin



Existing-2

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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Reach DP-2: Onsite southeast

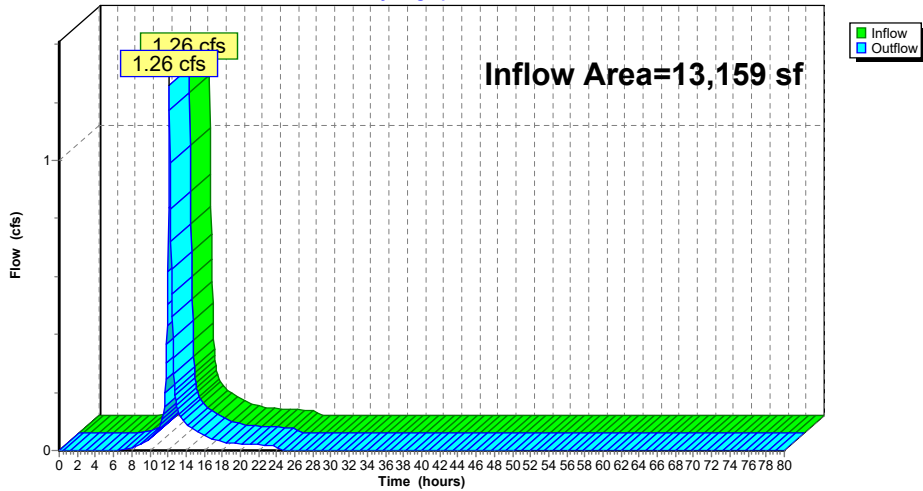
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 13,159 sf, 38.16% Impervious, Inflow Depth = 4.31" for 25-Year event
Inflow = 1.26 cfs @ 12.16 hrs, Volume= 4,727 cf
Outflow = 1.26 cfs @ 12.16 hrs, Volume= 4,727 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-2: Onsite southeast

Hydrograph



Existing-2

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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Reach DP-3: Off-site West

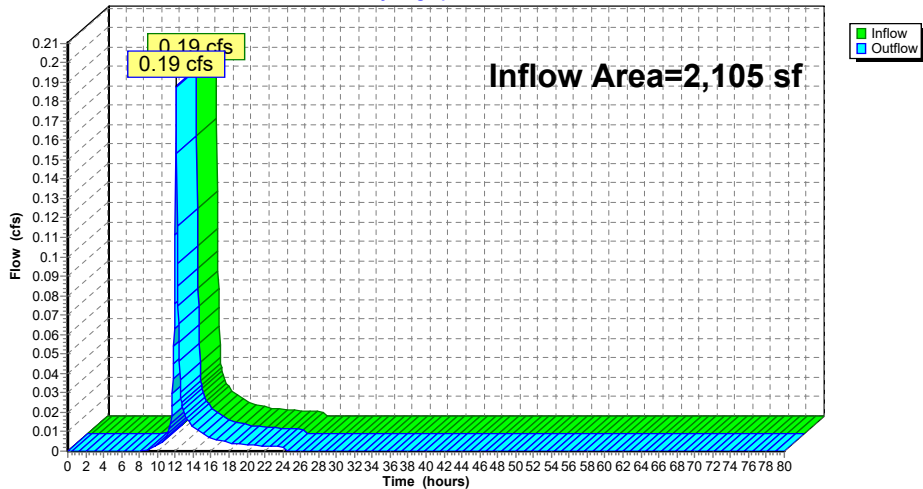
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2,105 sf, 0.00% Impervious, Inflow Depth = 3.38" for 25-Year event
Inflow = 0.19 cfs @ 12.09 hrs, Volume= 593 cf
Outflow = 0.19 cfs @ 12.09 hrs, Volume= 593 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-3: Off-site West

Hydrograph



HydroCAD Analysis
Existing Conditions - 100 Year Storm

Existing-2

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
9,896	79	50-75% Grass cover, Fair, HSG C (E-1, E-2, E-3)
10,479	98	Paved parking (E-1, E-2)
84,992	70	Woods, Good, HSG C (E-1, E-2, E-3)
105,367	74	TOTAL AREA

Existing-2

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
94,888	HSG C	E-1, E-2, E-3
0	HSG D	
10,479	Other	E-1, E-2
105,367		TOTAL AREA

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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	9,896	0	0	9,896	50-75% Grass cover, Fair	E-1, E-2, E-3
0	0	0	0	10,479	10,479	Paved parking	E-1, E-2
0	0	84,992	0	0	84,992	Woods, Good	E-1, E-2, E-3
0	0	94,888	0	10,479	105,367	TOTAL AREA	

Existing-2Prepared by {enter your company name here}
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Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Flow to Existing Basin

Runoff Area=90,103 sf 6.06% Impervious Runoff Depth=4.84"
 Flow Length=553' Tc=12.0 min CN=72 Runoff=9.57 cfs 36,305 cf

Subcatchment E-2: Flow onsite Southeast

Runoff Area=13,159 sf 38.16% Impervious Runoff Depth=6.01"
 Flow Length=140' Tc=11.3 min CN=82 Runoff=1.74 cfs 6,592 cf

Subcatchment E-3: Flow off-site West

Runoff Area=2,105 sf 0.00% Impervious Runoff Depth=4.95"
 Tc=6.0 min CN=73 Runoff=0.27 cfs 869 cf

Reach DP-1: Basin

Inflow=9.57 cfs 36,305 cf
 Outflow=9.57 cfs 36,305 cf

Reach DP-2: Onsite southeast

Inflow=1.74 cfs 6,592 cf
 Outflow=1.74 cfs 6,592 cf

Reach DP-3: Off-site West

Inflow=0.27 cfs 869 cf
 Outflow=0.27 cfs 869 cf

Total Runoff Area = 105,367 sf Runoff Volume = 43,766 cf Average Runoff Depth = 4.98"
90.05% Pervious = 94,888 sf 9.95% Impervious = 10,479 sf

Existing-2

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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Subcatchment E-1: Flow to Existing Basin

Runoff = 9.57 cfs @ 12.17 hrs, Volume= 36,305 cf, Depth= 4.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
5,457	98	Paved parking
76,777	70	Woods, Good, HSG C
7,869	79	50-75% Grass cover, Fair, HSG C
90,103	72	Weighted Average
84,646		93.94% Pervious Area
5,457		6.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	50	0.0530	0.10		Sheet Flow, Sheet Flow
3.4	503	0.0240	2.49		Woods: Light underbrush n= 0.400 P2= 3.05" Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
12.0	553	Total			

Existing-2

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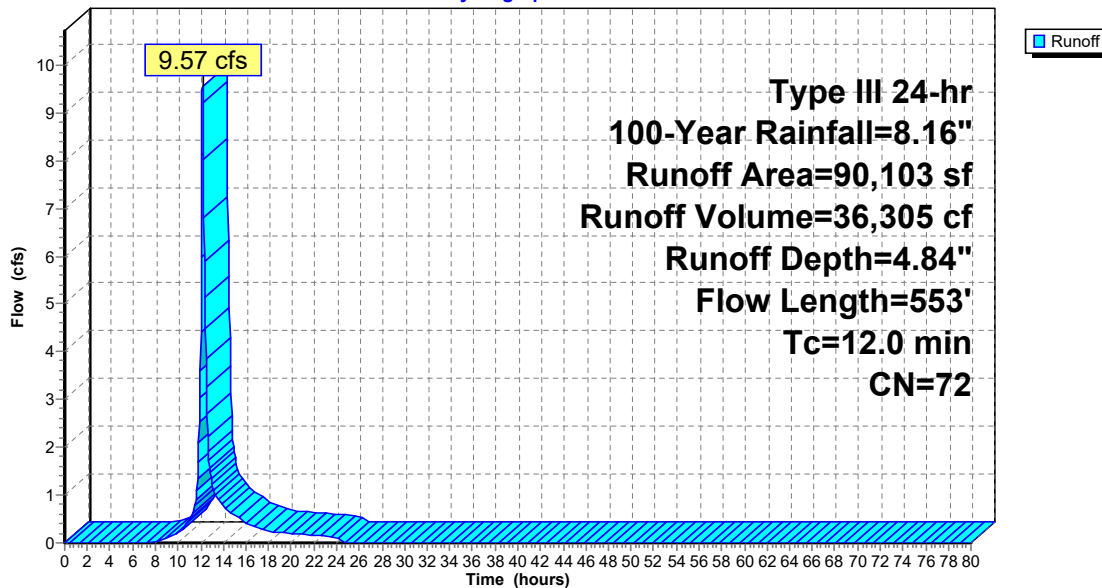
Type III 24-hr 100-Year Rainfall=8.16"

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Subcatchment E-1: Flow to Existing Basin

Hydrograph



Existing-2

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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Subcatchment E-2: Flow onsite Southeast

Runoff = 1.74 cfs @ 12.16 hrs, Volume= 6,592 cf, Depth= 6.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
* 5,022	98	Paved parking
6,746	70	Woods, Good, HSG C
1,391	79	50-75% Grass cover, Fair, HSG C
13,159	82	Weighted Average
8,137		61.84% Pervious Area
5,022		38.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	50	0.0280	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.05"
0.1	45	0.1750	6.74		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.0	11	0.1640	6.52		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.2	34	0.0240	3.14		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.3	140	Total			

Existing-2

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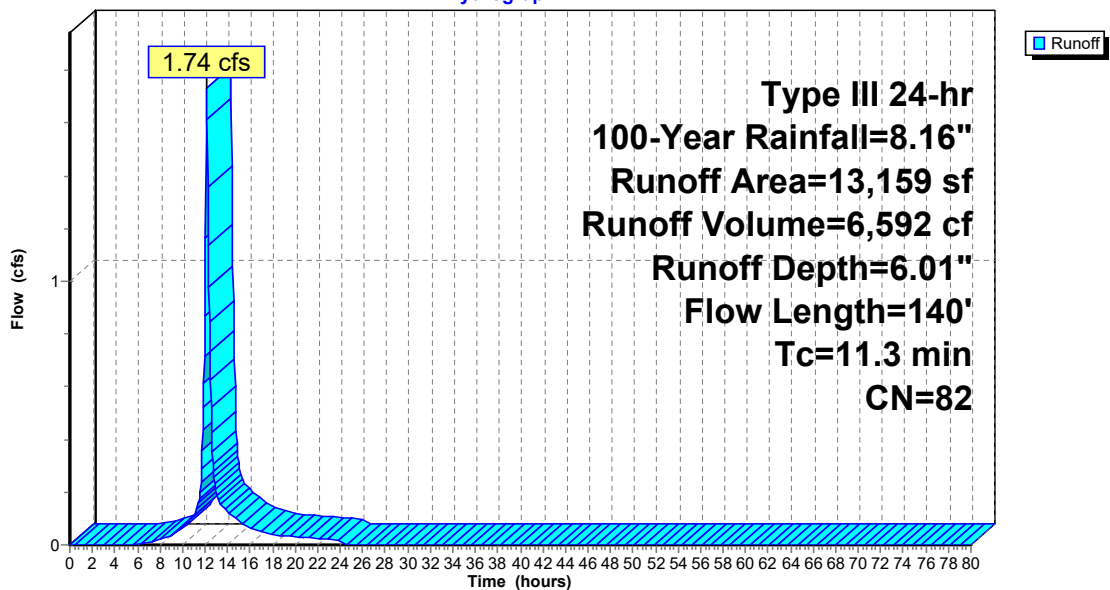
Type III 24-hr 100-Year Rainfall=8.16"

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Subcatchment E-2: Flow onsite Southeast

Hydrograph



Existing-2

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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Subcatchment E-3: Flow off-site West

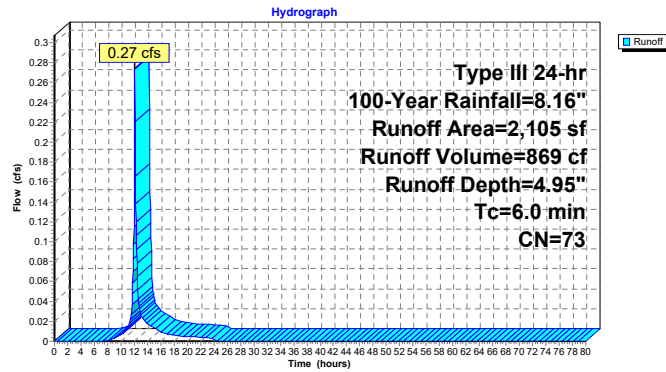
Runoff = 0.27 cfs @ 12.09 hrs, Volume= 869 cf, Depth= 4.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
1,469	70	Woods, Good, HSG C
636	79	50-75% Grass cover, Fair, HSG C
2,105	73	Weighted Average
2,105		100.00% Pervious Area

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

Subcatchment E-3: Flow off-site West



Existing-2

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Type III 24-hr 100-Year Rainfall=8.16"

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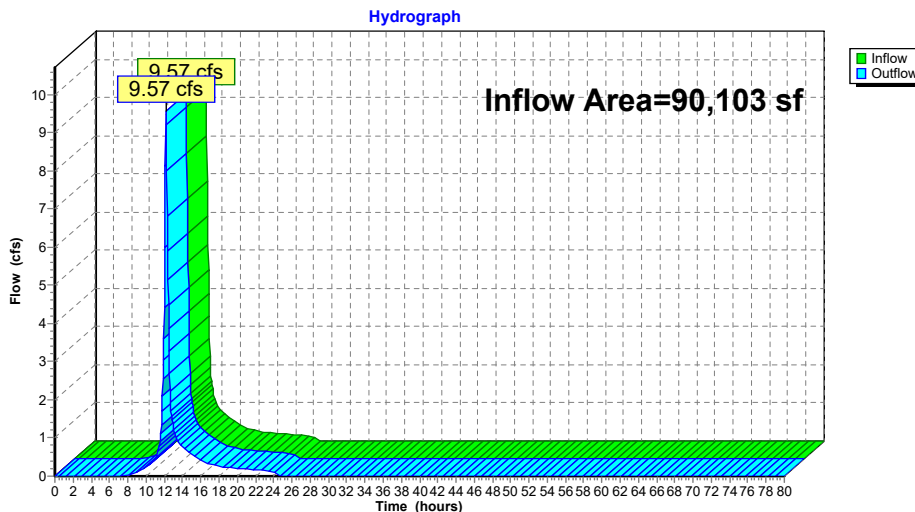
Summary for Reach DP-1: Basin

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

Inflow Area = 90,103 sf, 6.06% Impervious, Inflow Depth = 4.84" for 100-Year event
 Inflow = 9.57 cfs @ 12.17 hrs, Volume= 36,305 cf
 Outflow = 9.57 cfs @ 12.17 hrs, Volume= 36,305 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-1: Basin



Existing-2

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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Reach DP-2: Onsite southeast

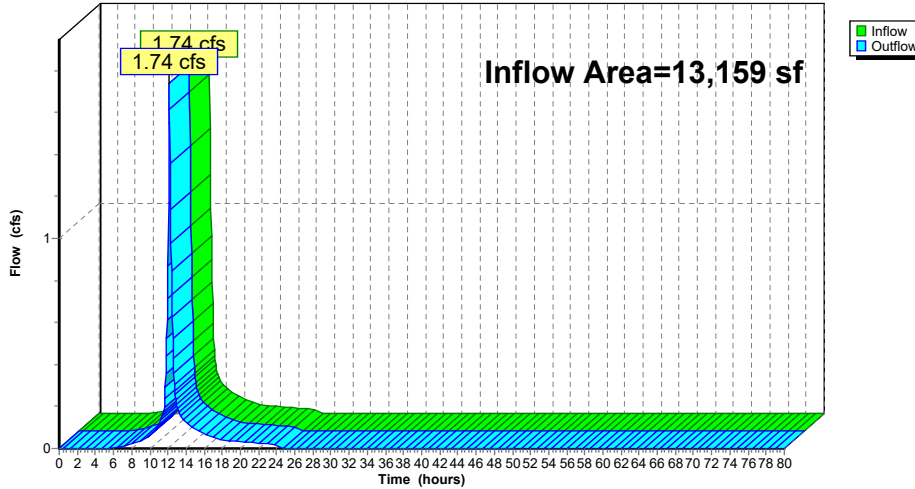
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 13,159 sf, 38.16% Impervious, Inflow Depth = 6.01" for 100-Year event
Inflow = 1.74 cfs @ 12.16 hrs, Volume= 6,592 cf
Outflow = 1.74 cfs @ 12.16 hrs, Volume= 6,592 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-2: Onsite southeast

Hydrograph



Existing-2

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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Reach DP-3: Off-site West

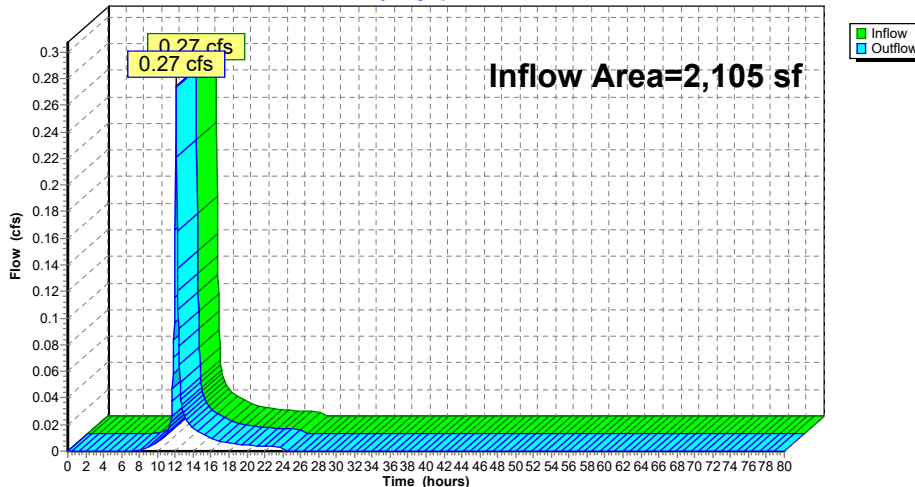
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2,105 sf, 0.00% Impervious, Inflow Depth = 4.95" for 100-Year event
Inflow = 0.27 cfs @ 12.09 hrs, Volume= 869 cf
Outflow = 0.27 cfs @ 12.09 hrs, Volume= 869 cf, Atten= 0%, Lag= 0.0 min

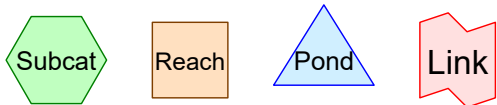
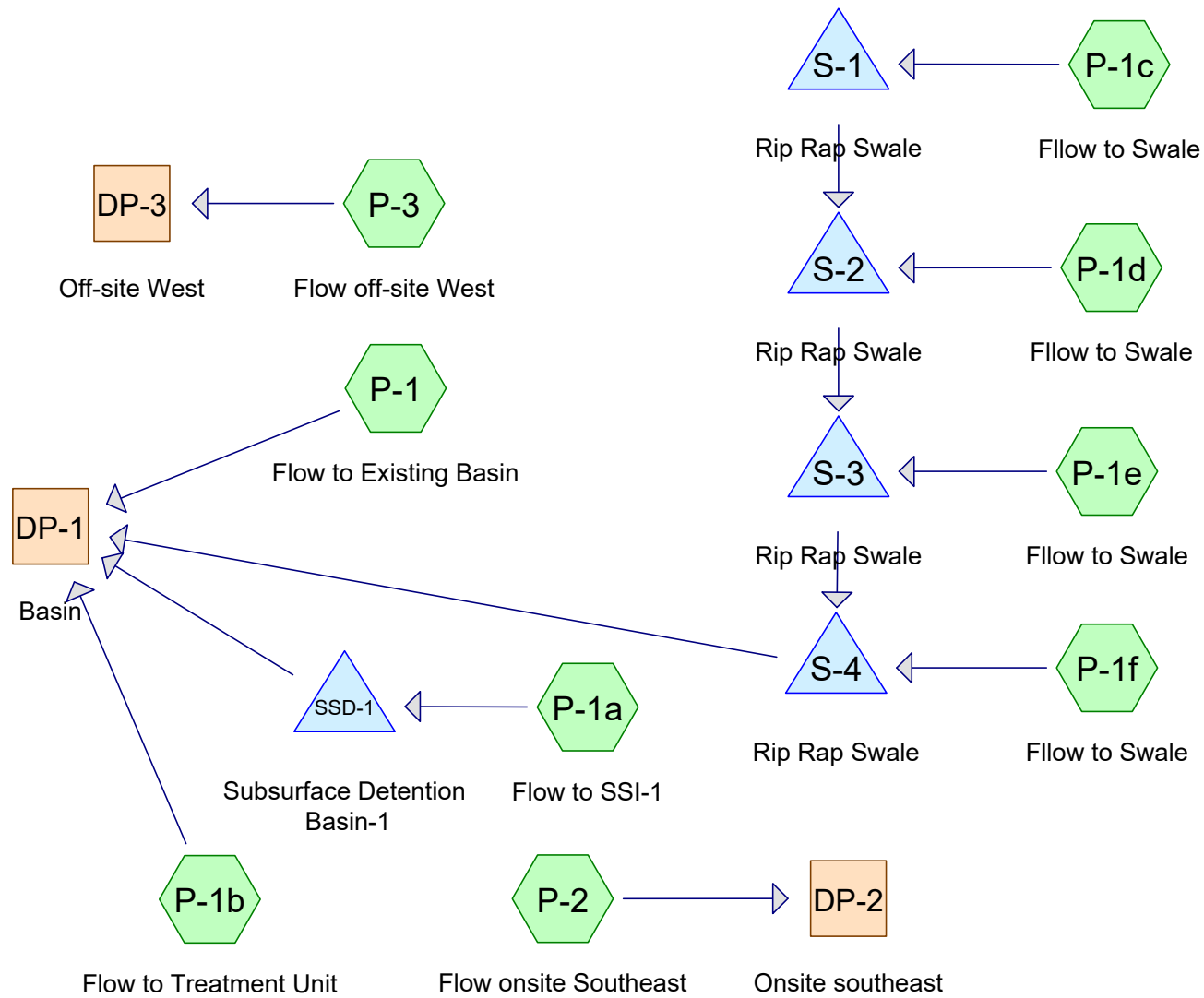
Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-3: Off-site West

Hydrograph



Proposed Drainage Plan & HydroCAD Diagram



Routing Diagram for Proposed-6

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HydroCAD Analysis
Proposed Conditions - 2 Year Storm

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Page 1**Area Listing (all nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
18,555	79	50-75% Grass cover, Fair, HSG C (P-1, P-1a, P-1b, P-1c, P-1d, P-1e, P-1f, P-2, P-3)
80,078	98	Paved parking (P-1a, P-1b, P-2)
1,396	66	Rip Rap Swale (P-1c, P-1d, P-1e, P-1f)
5,338	70	Woods, Good, HSG C (P-1, P-1c, P-1d, P-1e, P-1f, P-3)
105,367	93	TOTAL AREA

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Page 2**Soil Listing (all nodes)**

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
23,893	HSG C	P-1, P-1a, P-1b, P-1c, P-1d, P-1e, P-1f, P-2, P-3
0	HSG D	
81,474	Other	P-1a, P-1b, P-1c, P-1d, P-1e, P-1f, P-2
105,367		TOTAL AREA

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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	18,555	0	0	18,555	50-75% Grass cover, Fair	P-1, P-1a, P-1b, P-1c, P-1d, P-1e, P-1f, P-2, P-3
0	0	0	0	80,078	80,078	Paved parking	P-1a, P-1b, P-2
0	0	0	0	1,396	1,396	Rip Rap Swale	P-1c, P-1d, P-1e, P-1f
0	0	5,338	0	0	5,338	Woods, Good	P-1, P-1c, P-1d, P-1e, P-1f, P-3
0	0	23,893	0	81,474	105,367	TOTAL AREA	

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	SSD-1	322.50	322.00	21.3	0.0235	0.013	15.0	0.0	0.0

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Type III 24-hr 2-Year Rainfall=3.05"

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Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: Flow to Existing Basin	Runoff Area=18,417 sf 0.00% Impervious Runoff Depth=1.11" Flow Length=461' Tc=10.0 min CN=77 Runoff=0.46 cfs 1,697 cf
Subcatchment P-1a: Flow to SSI-1	Runoff Area=71,428 sf 99.59% Impervious Runoff Depth=2.82" Tc=6.0 min CN=98 Runoff=4.74 cfs 16,774 cf
Subcatchment P-1b: Flow to Treatment Unit	Runoff Area=3,571 sf 87.17% Impervious Runoff Depth=2.60" Tc=6.0 min CN=96 Runoff=0.23 cfs 774 cf
Subcatchment P-1c: Flow to Swale	Runoff Area=1,317 sf 0.00% Impervious Runoff Depth=0.84" Tc=6.0 min CN=72 Runoff=0.03 cfs 92 cf
Subcatchment P-1d: Flow to Swale	Runoff Area=1,184 sf 0.00% Impervious Runoff Depth=0.94" Tc=6.0 min CN=74 Runoff=0.03 cfs 93 cf
Subcatchment P-1e: Flow to Swale	Runoff Area=1,184 sf 0.00% Impervious Runoff Depth=0.99" Tc=6.0 min CN=75 Runoff=0.03 cfs 98 cf
Subcatchment P-1f: Flow to Swale	Runoff Area=1,071 sf 0.00% Impervious Runoff Depth=0.94" Tc=6.0 min CN=74 Runoff=0.03 cfs 84 cf
Subcatchment P-2: Flow onsite Southeast	Runoff Area=6,213 sf 93.87% Impervious Runoff Depth=2.71" Tc=6.0 min CN=97 Runoff=0.41 cfs 1,402 cf
Subcatchment P-3: Flow off-site West	Runoff Area=982 sf 0.00% Impervious Runoff Depth=1.23" Tc=6.0 min CN=79 Runoff=0.03 cfs 100 cf
Reach DP-1: Basin	Inflow=1.40 cfs 17,732 cf Outflow=1.40 cfs 17,732 cf
Reach DP-2: Onsite southeast	Inflow=0.41 cfs 1,402 cf Outflow=0.41 cfs 1,402 cf

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Type III 24-hr 2-Year Rainfall=3.05"

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Reach DP-3: Off-site West	Inflow=0.03 cfs 100 cf Outflow=0.03 cfs 100 cf
Pond S-1: Rip Rap Swale	Peak Elev=333.17' Storage=92 cf Inflow=0.03 cfs 92 cf Outflow=0.00 cfs 0 cf
Pond S-2: Rip Rap Swale	Peak Elev=331.73' Storage=93 cf Inflow=0.03 cfs 93 cf Outflow=0.00 cfs 0 cf
Pond S-3: Rip Rap Swale	Peak Elev=330.29' Storage=98 cf Inflow=0.03 cfs 98 cf Outflow=0.00 cfs 0 cf
Pond S-4: Rip Rap Swale	Peak Elev=328.70' Storage=84 cf Inflow=0.03 cfs 84 cf Outflow=0.00 cfs 0 cf
Pond SSD-1: Subsurface Detention Basin-1	Peak Elev=323.63' Storage=8,316 cf Inflow=4.74 cfs 16,774 cf Outflow=1.01 cfs 15,261 cf

Total Runoff Area = 105,367 sf Runoff Volume = 21,114 cf Average Runoff Depth = 2.40"
24.00% Pervious = 25,289 sf 76.00% Impervious = 80,078 sf

Proposed-6

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Type III 24-hr 2-Year Rainfall=3.05"

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Summary for Subcatchment P-1: Flow to Existing Basin

Runoff = 0.46 cfs @ 12.15 hrs, Volume= 1,697 cf, Depth= 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.05"

Area (sf)	CN	Description
4,454	70	Woods, Good, HSG C
13,963	79	50-75% Grass cover, Fair, HSG C
18,417	77	Weighted Average
18,417		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0800	0.11		Sheet Flow, Sheet Flow Woods: Light underbrush n= 0.400 P2= 3.05"
2.7	411	0.0240	2.49		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
10.0	461	Total			

Proposed-6

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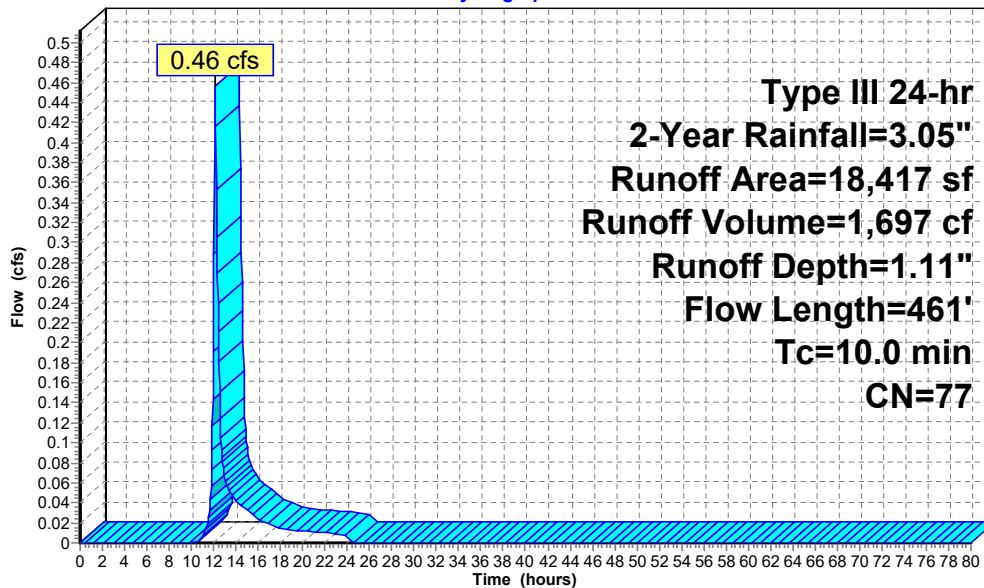
Type III 24-hr 2-Year Rainfall=3.05"

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Subcatchment P-1: Flow to Existing Basin

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.05"

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Summary for Subcatchment P-1a: Flow to SSI-1

Runoff = 4.74 cfs @ 12.09 hrs, Volume= 16,774 cf, Depth= 2.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.05"

Area (sf)	CN	Description
* 71,133	98	Paved parking
295	79	50-75% Grass cover, Fair, HSG C
71,428	98	Weighted Average
295		0.41% Pervious Area
71,133		99.59% Impervious Area

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

Proposed-6

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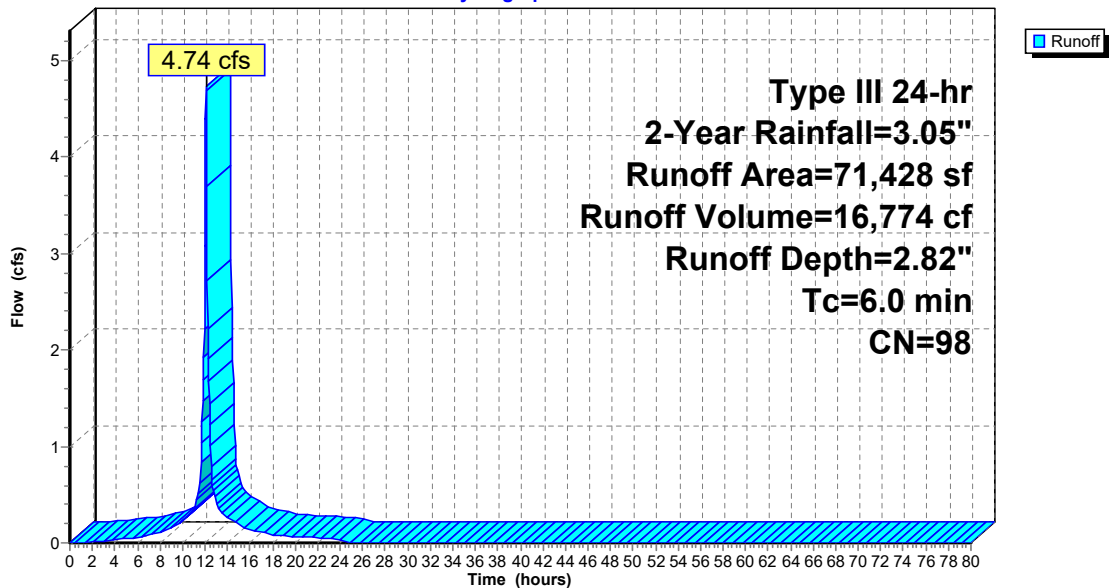
Type III 24-hr 2-Year Rainfall=3.05"

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Subcatchment P-1a: Flow to SSI-1

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.05"

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Summary for Subcatchment P-1b: Flow to Treatment Unit

Runoff = 0.23 cfs @ 12.09 hrs, Volume= 774 cf, Depth= 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.05"

Area (sf)	CN	Description
3,113	98	Paved parking
458	79	50-75% Grass cover, Fair, HSG C
3,571	96	Weighted Average
458		12.83% Pervious Area
3,113		87.17% Impervious Area

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

Proposed-6

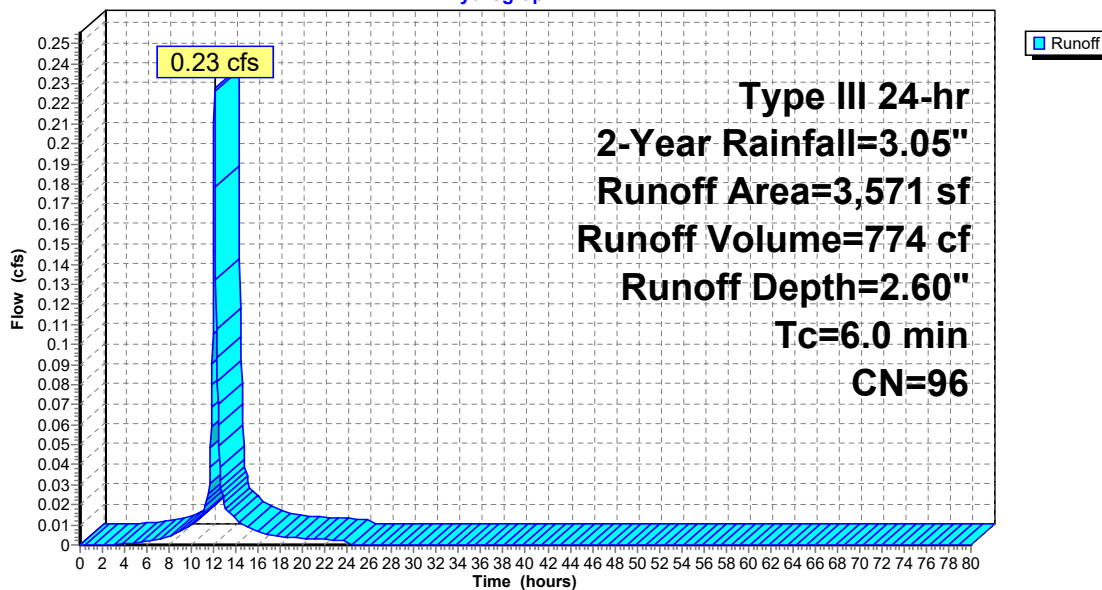
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Type III 24-hr 2-Year Rainfall=3.05"

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Subcatchment P-1b: Flow to Treatment Unit

Hydrograph



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Summary for Subcatchment P-1c: Fllow to Swale

Runoff = 0.03 cfs @ 12.10 hrs, Volume= 92 cf, Depth= 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.05"

Area (sf)	CN	Description
339	66	Rip Rap Swale
476	70	Woods, Good, HSG C
502	79	50-75% Grass cover, Fair, HSG C
1,317	72	Weighted Average
1,317		100.00% Pervious Area

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

Proposed-6

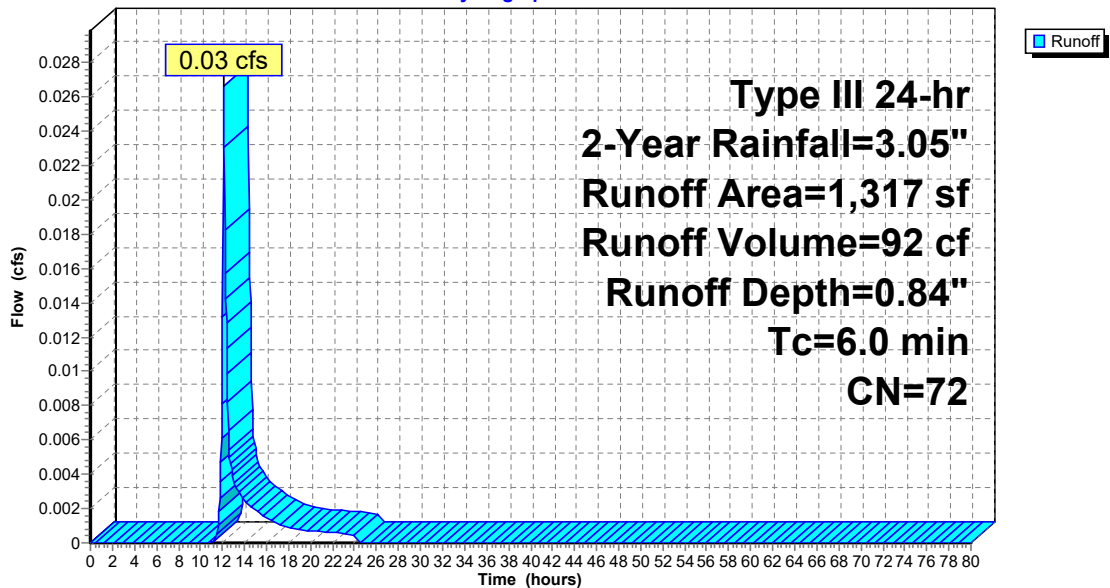
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Subcatchment P-1c: Fllow to Swale

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Summary for Subcatchment P-1d: Fllow to Swale

Runoff = 0.03 cfs @ 12.10 hrs, Volume= 93 cf, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.05"

Area (sf)	CN	Description
350	66	Rip Rap Swale
216	70	Woods, Good, HSG C
618	79	50-75% Grass cover, Fair, HSG C
1,184	74	Weighted Average
1,184		100.00% Pervious Area

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

Proposed-6

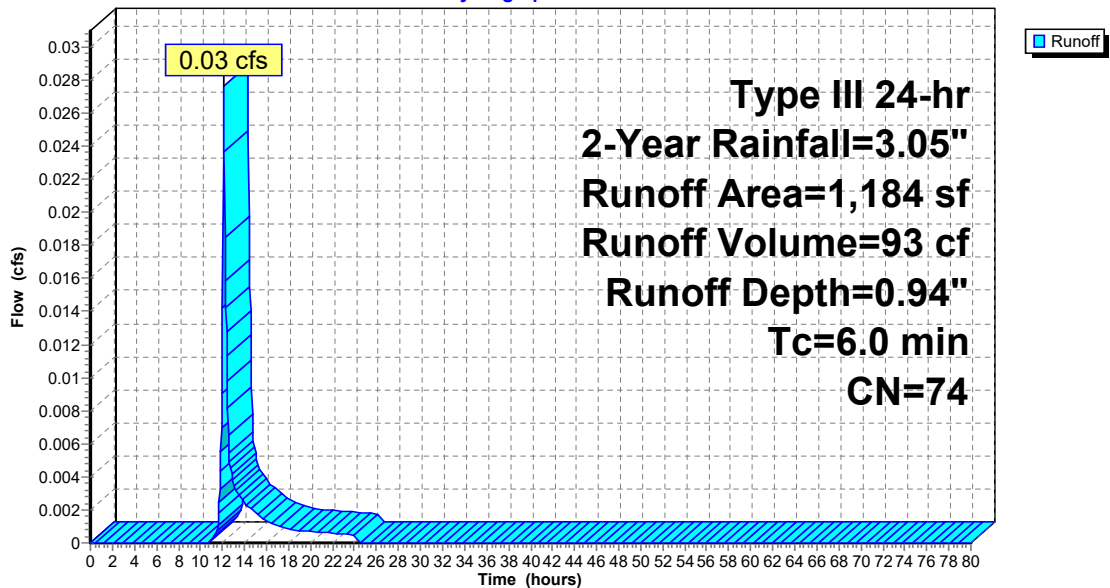
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Subcatchment P-1d: Fllow to Swale

Hydrograph



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Summary for Subcatchment P-1e: Fllow to Swale

Runoff = 0.03 cfs @ 12.10 hrs, Volume= 98 cf, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.05"

Area (sf)	CN	Description
* 350	66	Rip Rap Swale
58	70	Woods, Good, HSG C
776	79	50-75% Grass cover, Fair, HSG C
1,184	75	Weighted Average
1,184		100.00% Pervious Area

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

Proposed-6

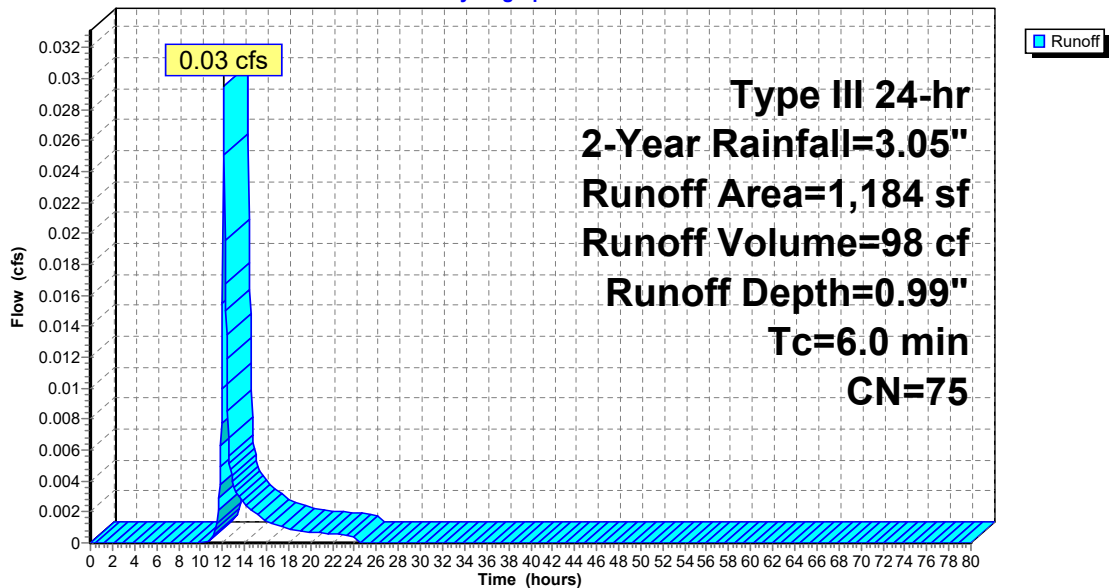
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Subcatchment P-1e: Fllow to Swale

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.05"

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Summary for Subcatchment P-1f: Filow to Swale

Runoff = 0.03 cfs @ 12.10 hrs, Volume= 84 cf, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.05"

Area (sf)	CN	Description
*	357	66 Rip Rap Swale
	124	70 Woods, Good, HSG C
	590	79 50-75% Grass cover, Fair, HSG C
1,071	74	Weighted Average
1,071		100.00% Pervious Area

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

Proposed-6

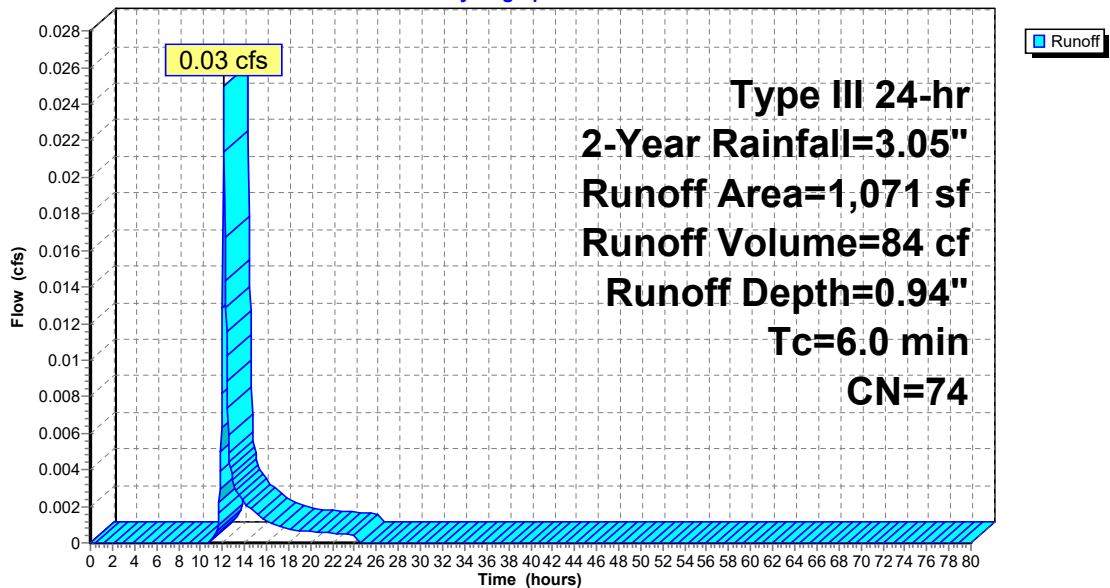
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Type III 24-hr 2-Year Rainfall=3.05"

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Subcatchment P-1f: Filow to Swale

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.05"

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Summary for Subcatchment P-2: Flow onsite Southeast

Runoff = 0.41 cfs @ 12.09 hrs, Volume= 1,402 cf, Depth= 2.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.05"

Area (sf)	CN	Description
5,832	98	Paved parking
381	79	50-75% Grass cover, Fair, HSG C
6,213	97	Weighted Average
381		6.13% Pervious Area
5,832		93.87% Impervious Area

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

Proposed-6

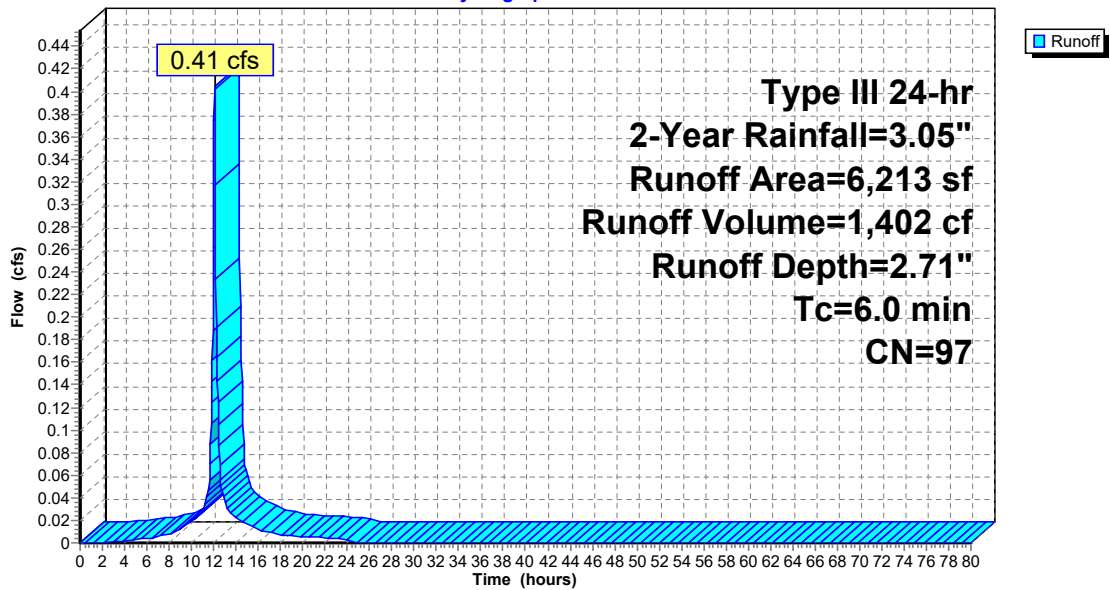
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Subcatchment P-2: Flow onsite Southeast

Hydrograph



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Summary for Subcatchment P-3: Flow off-site West

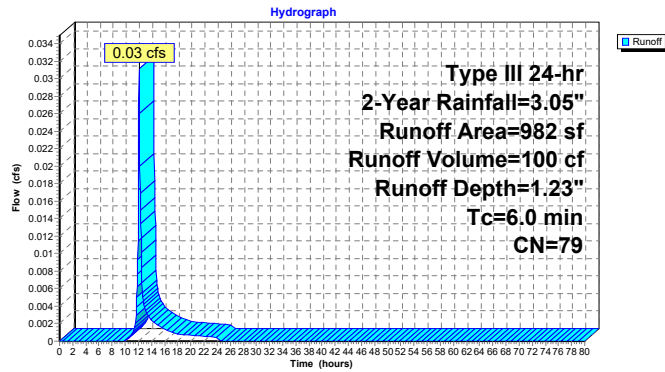
Runoff = 0.03 cfs @ 12.10 hrs, Volume= 100 cf, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.05"

Area (sf)	CN	Description
10	70	Woods, Good, HSG C
972	79	50-75% Grass cover, Fair, HSG C
982	79	Weighted Average
982		100.00% Pervious Area

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

Subcatchment P-3: Flow off-site West



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Type III 24-hr 2-Year Rainfall=3.05"

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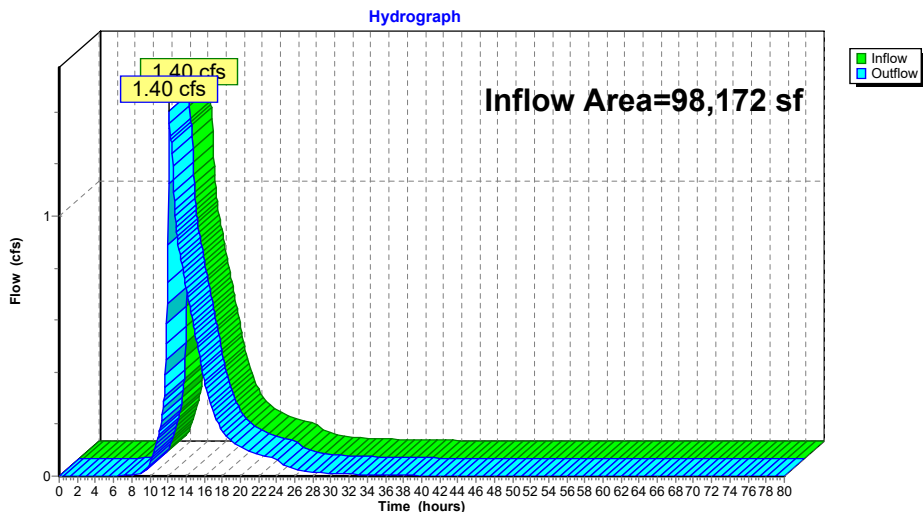
Summary for Reach DP-1: Basin

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

Inflow Area = 98,172 sf, 75.63% Impervious, Inflow Depth > 2.17" for 2-Year event
 Inflow = 1.40 cfs @ 12.15 hrs, Volume= 17,732 cf
 Outflow = 1.40 cfs @ 12.15 hrs, Volume= 17,732 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-1: Basin



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Summary for Reach DP-2: Onsite southeast

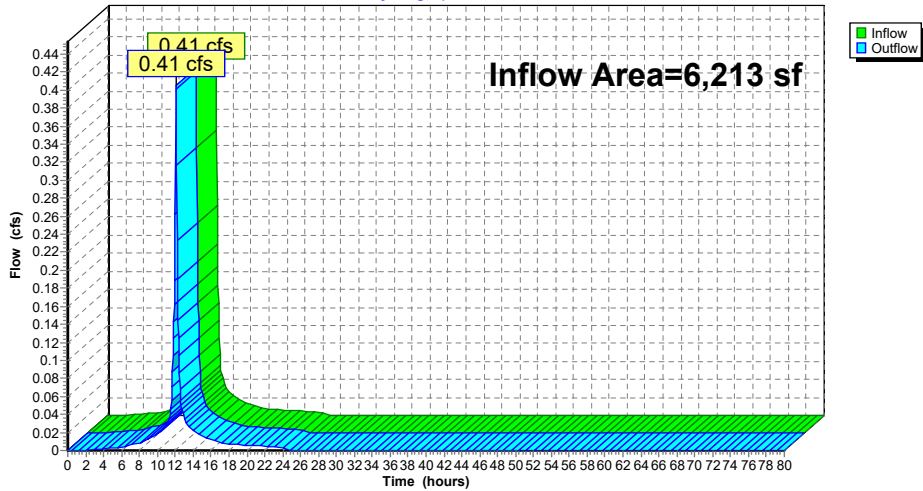
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6,213 sf, 93.87% Impervious, Inflow Depth = 2.71" for 2-Year event
Inflow = 0.41 cfs @ 12.09 hrs, Volume= 1,402 cf
Outflow = 0.41 cfs @ 12.09 hrs, Volume= 1,402 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-2: Onsite southeast

Hydrograph



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Summary for Reach DP-3: Off-site West

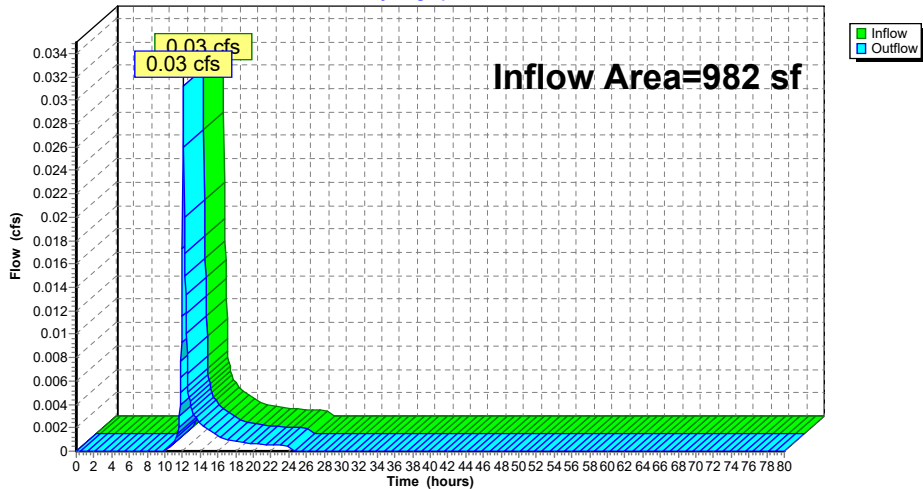
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 982 sf, 0.00% Impervious, Inflow Depth = 1.23" for 2-Year event
Inflow = 0.03 cfs @ 12.10 hrs, Volume= 100 cf
Outflow = 0.03 cfs @ 12.10 hrs, Volume= 100 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-3: Off-site West

Hydrograph



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Summary for Pond S-1: Rip Rap Swale

Inflow Area = 1,317 sf, 0.00% Impervious, Inflow Depth = 0.84" for 2-Year event
 Inflow = 0.03 cfs @ 12.10 hrs, Volume= 92 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
 Peak Elev= 333.17' @ 24.40 hrs Surf.Area= 200 sf Storage= 92 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	331.15'	120 cf	Custom Stage Data (Irregular) Listed below (Recalc) 414 cf Overall - 114 cf Embedded = 300 cf x 40.0% Voids
#2	332.65'	114 cf	Custom Stage Data (Irregular) Listed below (Recalc) Inside #1
			234 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
331.15	0	0.0	0	0	0
331.50	21	27.2	2	2	59
332.50	171	99.3	84	86	788
332.65	200	104.4	28	114	872
334.15	200	104.4	300	414	1,028

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
332.65	0	0.0	0	0	0
333.00	21	27.2	2	2	59
334.00	171	99.3	84	86	788
334.15	200	104.4	28	114	872

Device	Routing	Invert	Outlet Devices
#1	Primary	334.05'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

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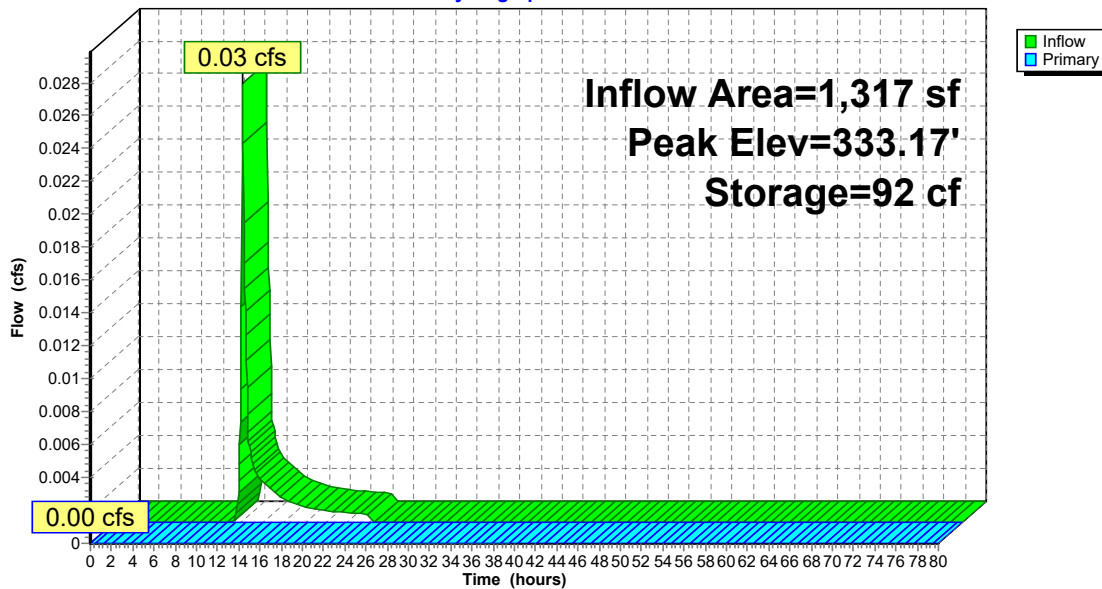
Type III 24-hr 2-Year Rainfall=3.05"

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Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=331.15' (Free Discharge)
 1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond S-1: Rip Rap Swale

Hydrograph



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Summary for Pond S-2: Rip Rap Swale

Inflow Area = 2,501 sf, 0.00% Impervious, Inflow Depth = 0.45" for 2-Year event
 Inflow = 0.03 cfs @ 12.10 hrs, Volume= 93 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
 Peak Elev= 331.73' @ 24.40 hrs Surf.Area= 200 sf Storage= 93 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	329.65'	120 cf	Custom Stage Data (Irregular) Listed below (Recalc) 407 cf Overall - 107 cf Embedded = 300 cf x 40.0% Voids
#2	331.15'	107 cf	Custom Stage Data (Irregular) Listed below (Recalc) Inside #1
		227 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
329.65	0	0.0	0	0	0
330.50	74	61.1	21	21	298
331.15	200	104.5	86	107	873
332.65	200	104.5	300	407	1,029

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
331.15	0	0.0	0	0	0
332.00	74	61.1	21	21	298
332.65	200	104.5	86	107	873

Device	Routing	Invert	Outlet Devices
#1	Primary	332.50'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

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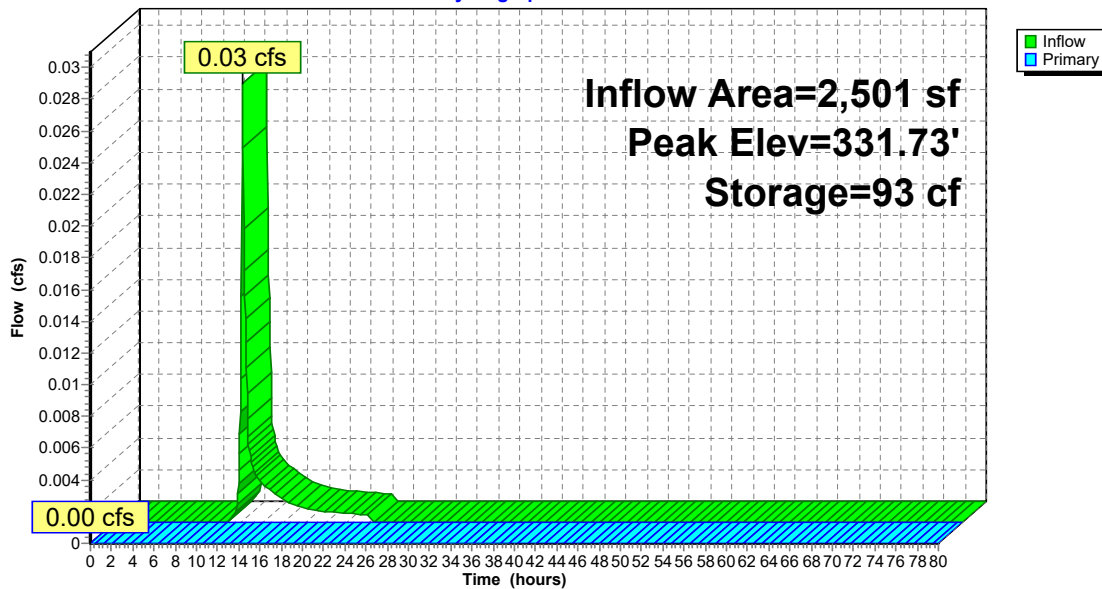
Type III 24-hr 2-Year Rainfall=3.05"

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Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=329.65' (Free Discharge)
 1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond S-2: Rip Rap Swale

Hydrograph



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Summary for Pond S-3: Rip Rap Swale

Inflow Area = 3,685 sf, 0.00% Impervious, Inflow Depth = 0.32" for 2-Year event
 Inflow = 0.03 cfs @ 12.10 hrs, Volume= 98 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
 Peak Elev= 330.29' @ 24.40 hrs Surf.Area= 200 sf Storage= 98 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	329.70'	112 cf	Custom Stage Data (Irregular) Listed below (Recalc) Inside #2
#2	328.20'	120 cf	Custom Stage Data (Irregular) Listed below (Recalc)
			412 cf Overall - 112 cf Embedded = 300 cf x 40.0% Voids
			232 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
329.70	0	0.0	0	0	0
330.00	16	23.0	2	2	42
331.00	158	95.1	75	76	722
331.20	200	104.5	36	112	873

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
328.20	0	0.0	0	0	0
328.50	16	23.0	2	2	42
329.50	158	95.1	75	76	722
329.70	200	104.5	36	112	873
331.20	200	104.5	300	412	1,030

Device	Routing	Invert	Outlet Devices
#1	Primary	331.00'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

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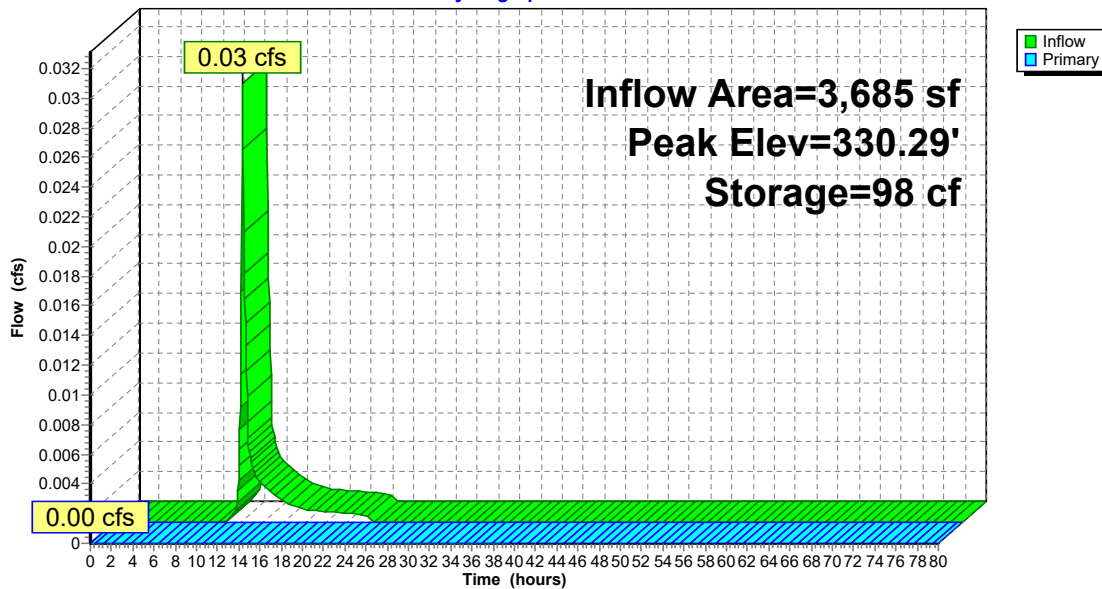
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Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=328.20' (Free Discharge)
 1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond S-3: Rip Rap Swale

Hydrograph



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Summary for Pond S-4: Rip Rap Swale

Inflow Area = 4,756 sf, 0.00% Impervious, Inflow Depth = 0.21" for 2-Year event
 Inflow = 0.03 cfs @ 12.10 hrs, Volume= 84 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
 Peak Elev= 328.70' @ 24.40 hrs Surf.Area= 188 sf Storage= 84 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	328.20'	108 cf	Custom Stage Data (Irregular) Listed below (Recalc) Inside #2
#2	326.70'	113 cf	Custom Stage Data (Irregular) Listed below (Recalc)
			390 cf Overall - 108 cf Embedded = 282 cf x 40.0% Voids
			221 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
328.20	0	0.0	0	0	0
329.00	71	56.9	19	19	259
329.25	112	76.4	23	42	466
329.70	188	102.0	67	108	832

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
326.70	0	0.0	0	0	0
327.50	71	56.9	19	19	259
327.75	112	76.4	23	42	466
328.20	188	102.0	67	108	832
329.70	188	102.0	282	390	985

Device	Routing	Invert	Outlet Devices
#1	Primary	329.25'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

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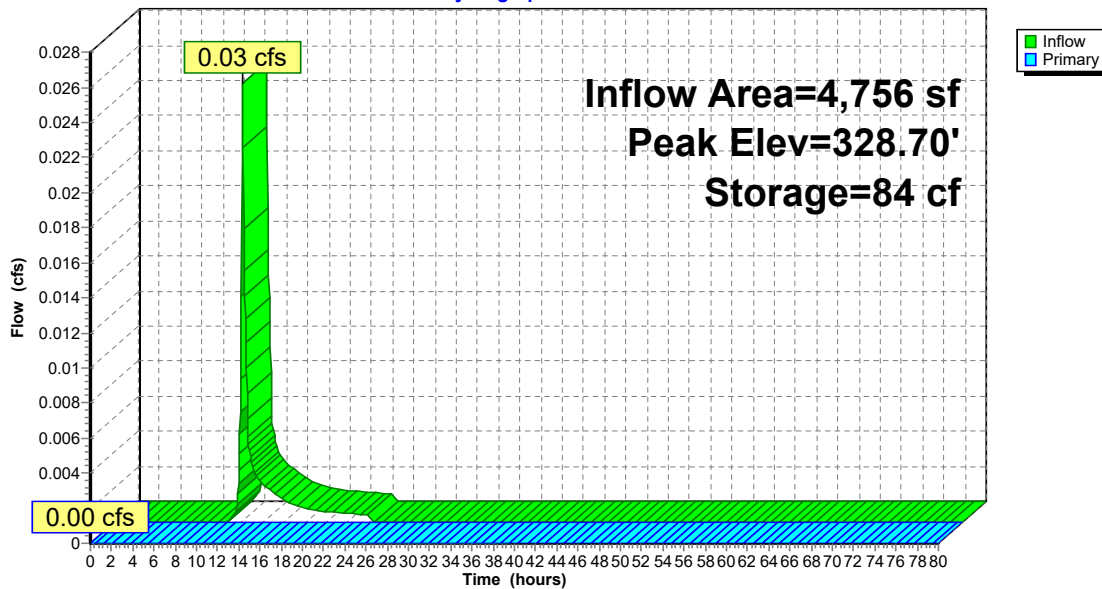
Type III 24-hr 2-Year Rainfall=3.05"

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Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=326.70' (Free Discharge)
 1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond S-4: Rip Rap Swale

Hydrograph



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Summary for Pond SSD-1: Subsurface Detention Basin-1

Inflow Area = 71,428 sf, 99.59% Impervious, Inflow Depth = 2.82" for 2-Year event
 Inflow = 4.74 cfs @ 12.09 hrs, Volume= 16,774 cf
 Outflow = 1.01 cfs @ 12.50 hrs, Volume= 15,261 cf, Atten= 79%, Lag= 24.8 min
 Primary = 1.01 cfs @ 12.50 hrs, Volume= 15,261 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 9
 Peak Elev= 323.63' @ 12.50 hrs Surf.Area= 7,434 sf Storage= 8,316 cf

Plug-Flow detention time= 234.6 min calculated for 15,261 cf (91% of inflow)
 Center-of-Mass det. time= 188.6 min (946.0 - 757.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	322.00'	6,586 cf	63.25'W x 117.54'L x 3.50'H Field A 26,020 cf Overall - 9,556 cf Embedded = 16,464 cf x 40.0% Voids
#2A	322.50'	9,556 cf	ADS_StormTech SC-740 +Cap x 208 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 208 Chambers in 13 Rows
		16,141 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	322.50'	15.0" Round Culvert L= 21.3' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 322.50' / 322.00' S= 0.0235 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	325.25'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#3	Device 1	324.25'	6.0" Vert. Orifice/Grate C= 0.600
#4	Device 1	323.50'	8.0" Vert. Orifice/Grate X 2.00 C= 0.600
#5	Device 1	322.50'	6.0" Vert. Orifice/Grate C= 0.600

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Type III 24-hr 2-Year Rainfall=3.05"

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Primary OutFlow Max=1.01 cfs @ 12.50 hrs HW=323.63' (Free Discharge)

- 1=Culvert (Passes 1.01 cfs of 4.23 cfs potential flow)
- 2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)
- 3=Orifice/Grate (Controls 0.00 cfs)
- 4=Orifice/Grate (Orifice Controls 0.12 cfs @ 1.23 fps)
- 5=Orifice/Grate (Orifice Controls 0.89 cfs @ 4.52 fps)

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Type III 24-hr 2-Year Rainfall=3.05"

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Pond SSD-1: Subsurface Detention Basin-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

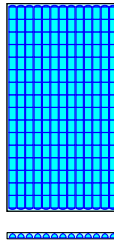
16 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 115.54' Row Length +12.0" End Stone x 2 = 117.54' Base Length
13 Rows x 51.0" Wide + 6.0" Spacing x 12 + 12.0" Side Stone x 2 = 63.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

208 Chambers x 45.9 cf = 9,555.5 cf Chamber Storage

26,019.7 cf Field - 9,555.5 cf Chambers = 16,464.2 cf Stone x 40.0% Voids = 6,585.7 cf Stone Storage

Chamber Storage + Stone Storage = 16,141.2 cf = 0.371 af
Overall Storage Efficiency = 62.0%
Overall System Size = 117.54' x 63.25' x 3.50'

208 Chambers
963.7 cy Field
609.8 cy Stone



Proposed-6

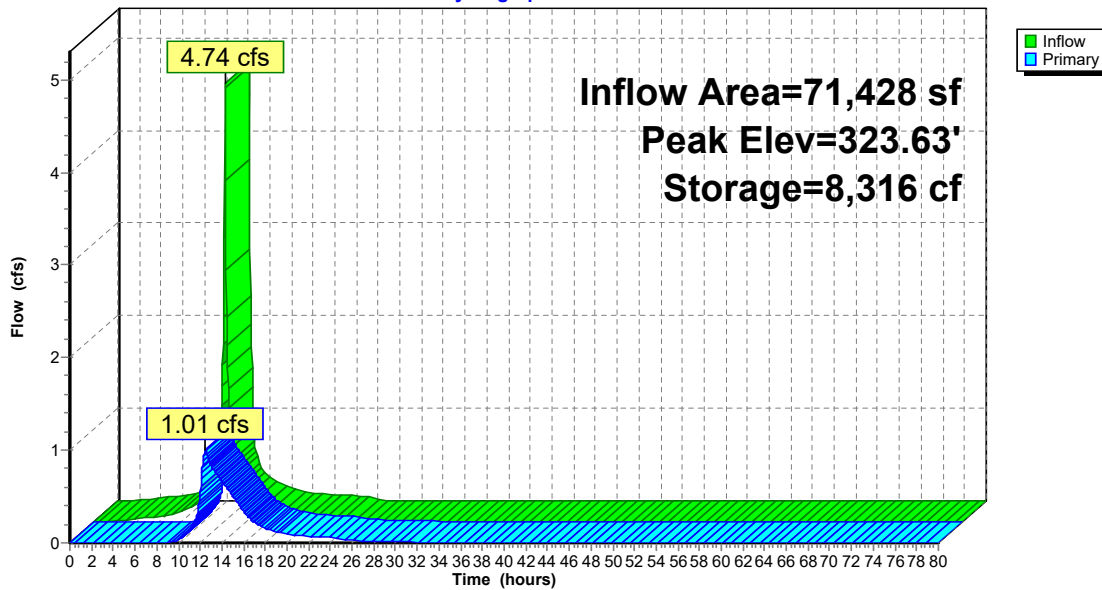
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Pond SSD-1: Subsurface Detention Basin-1

Hydrograph



HydroCAD Analysis
Proposed Conditions - 10 Year Storm

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Page 1**Area Listing (all nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
18,555	79	50-75% Grass cover, Fair, HSG C (P-1, P-1a, P-1b, P-1c, P-1d, P-1e, P-1f, P-2, P-3)
80,078	98	Paved parking (P-1a, P-1b, P-2)
1,396	66	Rip Rap Swale (P-1c, P-1d, P-1e, P-1f)
5,338	70	Woods, Good, HSG C (P-1, P-1c, P-1d, P-1e, P-1f, P-3)
105,367	93	TOTAL AREA

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Page 2**Soil Listing (all nodes)**

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
23,893	HSG C	P-1, P-1a, P-1b, P-1c, P-1d, P-1e, P-1f, P-2, P-3
0	HSG D	
81,474	Other	P-1a, P-1b, P-1c, P-1d, P-1e, P-1f, P-2
105,367		TOTAL AREA

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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	18,555	0	0	18,555	50-75% Grass cover, Fair	P-1, P-1a, P-1b, P-1c, P-1d, P-1e, P-1f, P-2, P-3
0	0	0	0	80,078	80,078	Paved parking	P-1a, P-1b, P-2
0	0	0	0	1,396	1,396	Rip Rap Swale	P-1c, P-1d, P-1e, P-1f
0	0	5,338	0	0	5,338	Woods, Good	P-1, P-1c, P-1d, P-1e, P-1f, P-3
0	0	23,893	0	81,474	105,367	TOTAL AREA	

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	SSD-1	322.50	322.00	21.3	0.0235	0.013	15.0	0.0	0.0

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Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: Flow to Existing Basin	Runoff Area=18,417 sf 0.00% Impervious Runoff Depth=2.75" Flow Length=461' Tc=10.0 min CN=77 Runoff=1.18 cfs 4,219 cf
Subcatchment P-1a: Flow to SSI-1	Runoff Area=71,428 sf 99.59% Impervious Runoff Depth=4.91" Tc=6.0 min CN=98 Runoff=8.07 cfs 29,243 cf
Subcatchment P-1b: Flow to Treatment Unit	Runoff Area=3,571 sf 87.17% Impervious Runoff Depth=4.68" Tc=6.0 min CN=96 Runoff=0.40 cfs 1,393 cf
Subcatchment P-1c: Flow to Swale	Runoff Area=1,317 sf 0.00% Impervious Runoff Depth=2.31" Tc=6.0 min CN=72 Runoff=0.08 cfs 254 cf
Subcatchment P-1d: Flow to Swale	Runoff Area=1,184 sf 0.00% Impervious Runoff Depth=2.48" Tc=6.0 min CN=74 Runoff=0.08 cfs 245 cf
Subcatchment P-1e: Flow to Swale	Runoff Area=1,184 sf 0.00% Impervious Runoff Depth=2.57" Tc=6.0 min CN=75 Runoff=0.08 cfs 254 cf
Subcatchment P-1f: Flow to Swale	Runoff Area=1,071 sf 0.00% Impervious Runoff Depth=2.48" Tc=6.0 min CN=74 Runoff=0.07 cfs 222 cf
Subcatchment P-2: Flow onsite Southeast	Runoff Area=6,213 sf 93.87% Impervious Runoff Depth=4.80" Tc=6.0 min CN=97 Runoff=0.70 cfs 2,483 cf
Subcatchment P-3: Flow off-site West	Runoff Area=982 sf 0.00% Impervious Runoff Depth=2.93" Tc=6.0 min CN=79 Runoff=0.08 cfs 240 cf
Reach DP-1: Basin	Inflow=4.29 cfs 33,560 cf Outflow=4.29 cfs 33,560 cf
Reach DP-2: Onsite southeast	Inflow=0.70 cfs 2,483 cf Outflow=0.70 cfs 2,483 cf

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Reach DP-3: Off-site West	Inflow=0.08 cfs 240 cf Outflow=0.08 cfs 240 cf
Pond S-1: Rip Rap Swale	Peak Elev=334.05' Storage=215 cf Inflow=0.08 cfs 254 cf Outflow=0.00 cfs 39 cf
Pond S-2: Rip Rap Swale	Peak Elev=332.50' Storage=198 cf Inflow=0.08 cfs 284 cf Outflow=0.00 cfs 86 cf
Pond S-3: Rip Rap Swale	Peak Elev=331.00' Storage=195 cf Inflow=0.08 cfs 340 cf Outflow=0.01 cfs 145 cf
Pond S-4: Rip Rap Swale	Peak Elev=329.25' Storage=148 cf Inflow=0.07 cfs 367 cf Outflow=0.01 cfs 219 cf
Pond SSD-1: Subsurface Detention Basin-1	Peak Elev=324.20' Storage=11,384 cf Inflow=8.07 cfs 29,243 cf Outflow=3.18 cfs 27,728 cf

Total Runoff Area = 105,367 sf Runoff Volume = 38,553 cf Average Runoff Depth = 4.39"
24.00% Pervious = 25,289 sf 76.00% Impervious = 80,078 sf

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Summary for Subcatchment P-1: Flow to Existing Basin

Runoff = 1.18 cfs @ 12.15 hrs, Volume= 4,219 cf, Depth= 2.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

Area (sf)	CN	Description
4,454	70	Woods, Good, HSG C
13,963	79	50-75% Grass cover, Fair, HSG C
18,417	77	Weighted Average
18,417		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0800	0.11		Sheet Flow, Sheet Flow Woods: Light underbrush n= 0.400 P2= 3.05"
2.7	411	0.0240	2.49		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
10.0	461	Total			

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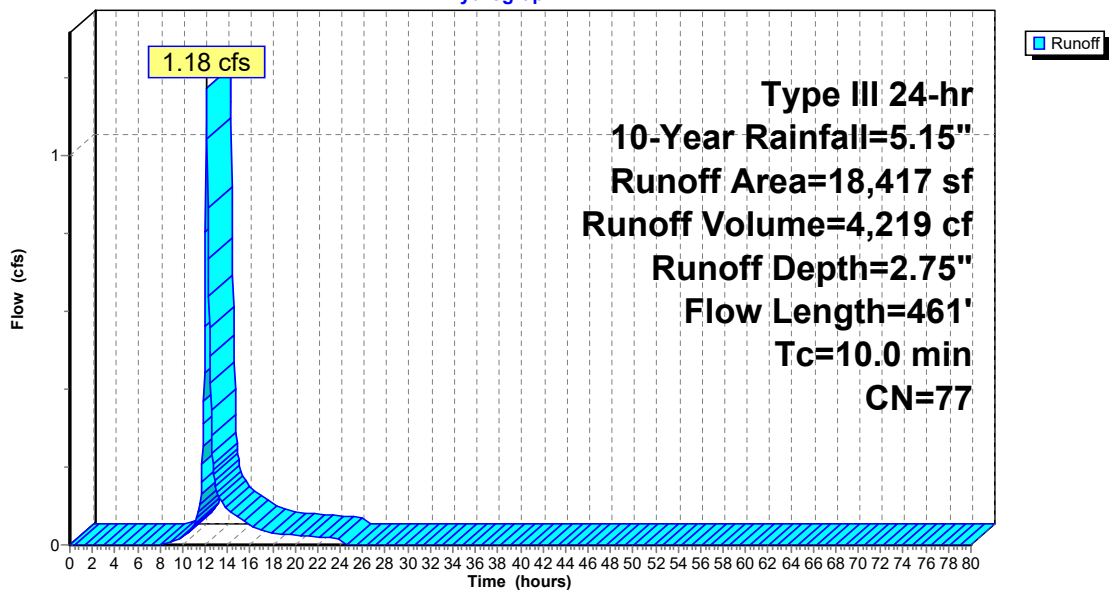
Type III 24-hr 10-Year Rainfall=5.15"

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Subcatchment P-1: Flow to Existing Basin

Hydrograph



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Summary for Subcatchment P-1a: Flow to SSI-1

Runoff = 8.07 cfs @ 12.09 hrs, Volume= 29,243 cf, Depth= 4.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

Area (sf)	CN	Description
* 71,133	98	Paved parking
295	79	50-75% Grass cover, Fair, HSG C
71,428	98	Weighted Average
295		0.41% Pervious Area
71,133		99.59% Impervious Area

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

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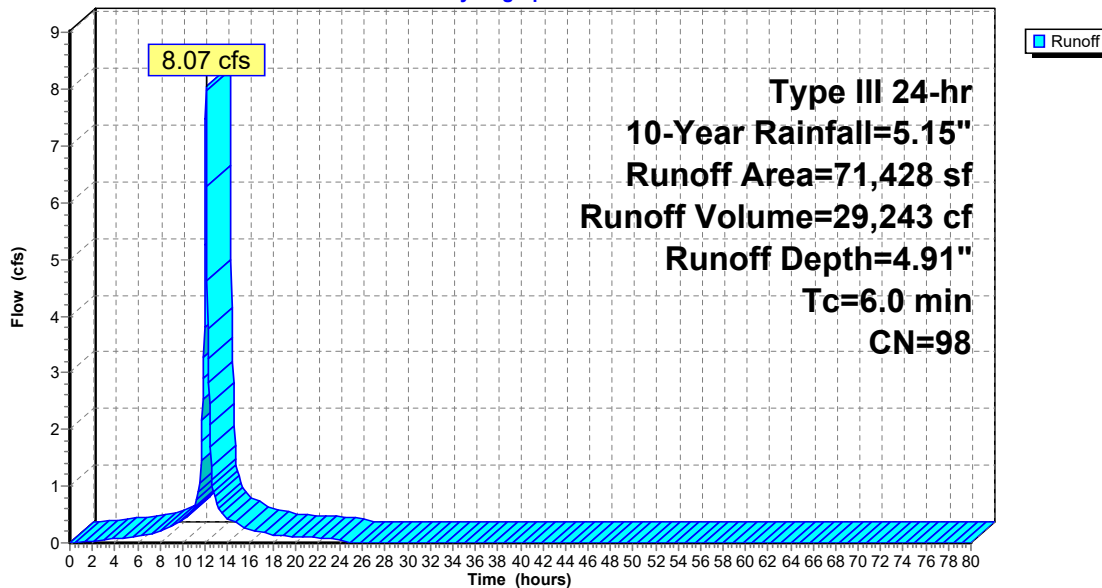
Type III 24-hr 10-Year Rainfall=5.15"

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Subcatchment P-1a: Flow to SSI-1

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Summary for Subcatchment P-1b: Flow to Treatment Unit

Runoff = 0.40 cfs @ 12.09 hrs, Volume= 1,393 cf, Depth= 4.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

Area (sf)	CN	Description
3,113	98	Paved parking
458	79	50-75% Grass cover, Fair, HSG C
3,571	96	Weighted Average
458		12.83% Pervious Area
3,113		87.17% Impervious Area

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

Proposed-6

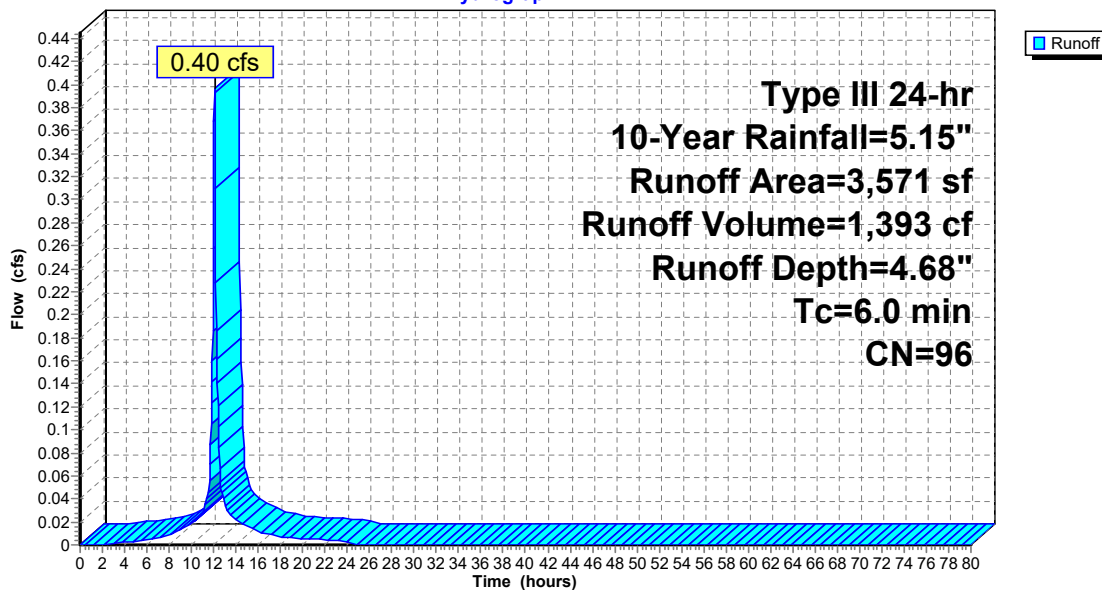
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Subcatchment P-1b: Flow to Treatment Unit

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Summary for Subcatchment P-1c: Fllow to Swale

Runoff = 0.08 cfs @ 12.10 hrs, Volume= 254 cf, Depth= 2.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

Area (sf)	CN	Description
* 339	66	Rip Rap Swale
476	70	Woods, Good, HSG C
502	79	50-75% Grass cover, Fair, HSG C
1,317	72	Weighted Average
1,317		100.00% Pervious Area

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

Proposed-6

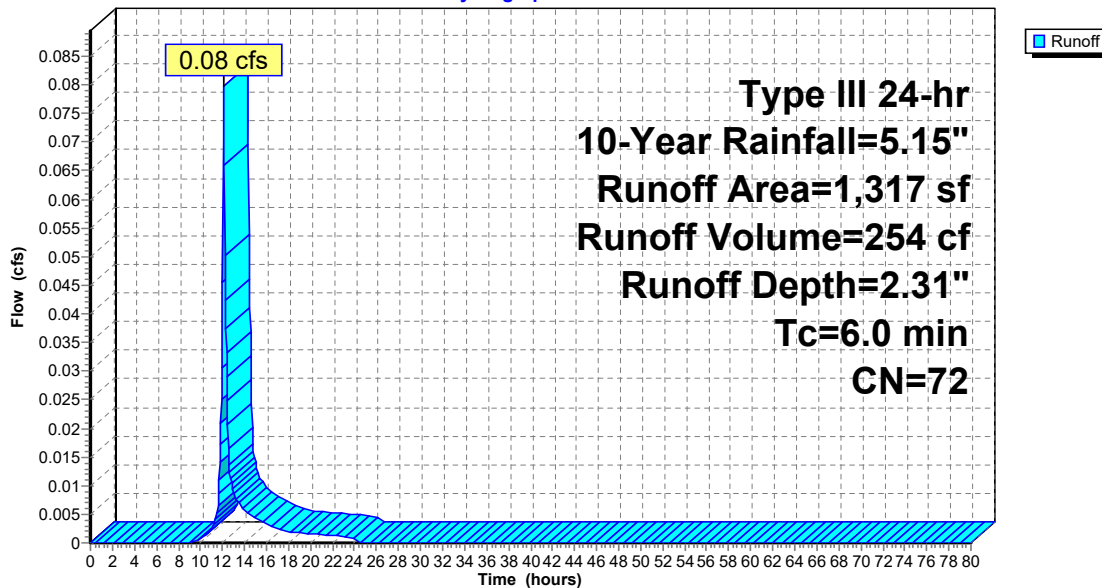
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Subcatchment P-1c: Fllow to Swale

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Summary for Subcatchment P-1d: Fllow to Swale

Runoff = 0.08 cfs @ 12.09 hrs, Volume= 245 cf, Depth= 2.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

Area (sf)	CN	Description
* 350	66	Rip Rap Swale
216	70	Woods, Good, HSG C
618	79	50-75% Grass cover, Fair, HSG C
1,184	74	Weighted Average
1,184		100.00% Pervious Area

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

Proposed-6

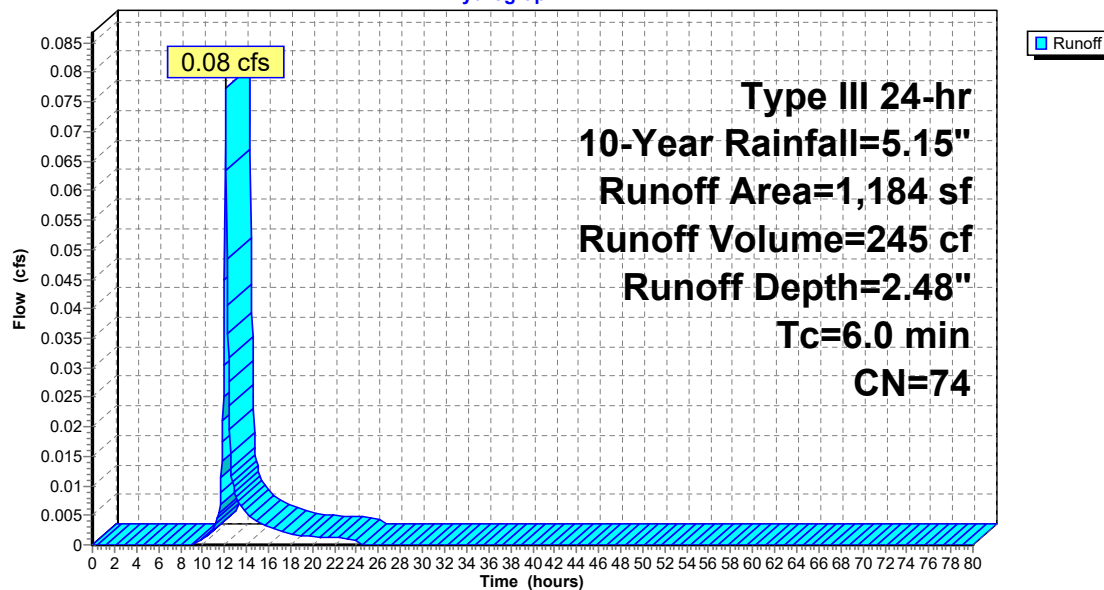
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Subcatchment P-1d: Fllow to Swale

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Summary for Subcatchment P-1e: Fllow to Swale

Runoff = 0.08 cfs @ 12.09 hrs, Volume= 254 cf, Depth= 2.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

Area (sf)	CN	Description
* 350	66	Rip Rap Swale
58	70	Woods, Good, HSG C
776	79	50-75% Grass cover, Fair, HSG C
1,184	75	Weighted Average
1,184		100.00% Pervious Area

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

Proposed-6

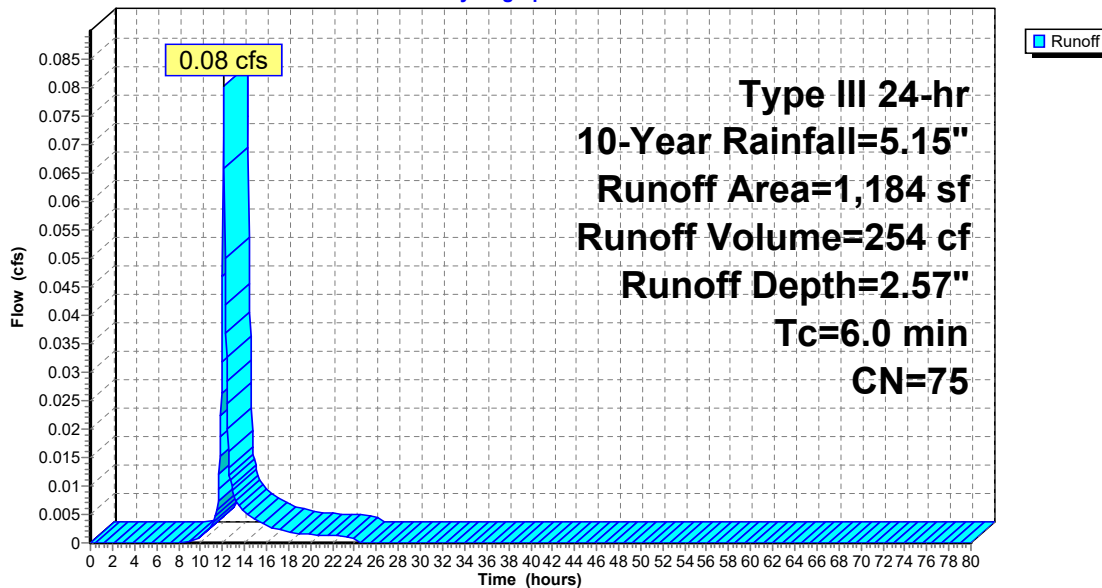
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Subcatchment P-1e: Fllow to Swale

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Summary for Subcatchment P-1f: Filtow to Swale

Runoff = 0.07 cfs @ 12.09 hrs, Volume= 222 cf, Depth= 2.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

Area (sf)	CN	Description
* 357	66	Rip Rap Swale
124	70	Woods, Good, HSG C
590	79	50-75% Grass cover, Fair, HSG C
1,071	74	Weighted Average
1,071		100.00% Pervious Area

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

Proposed-6

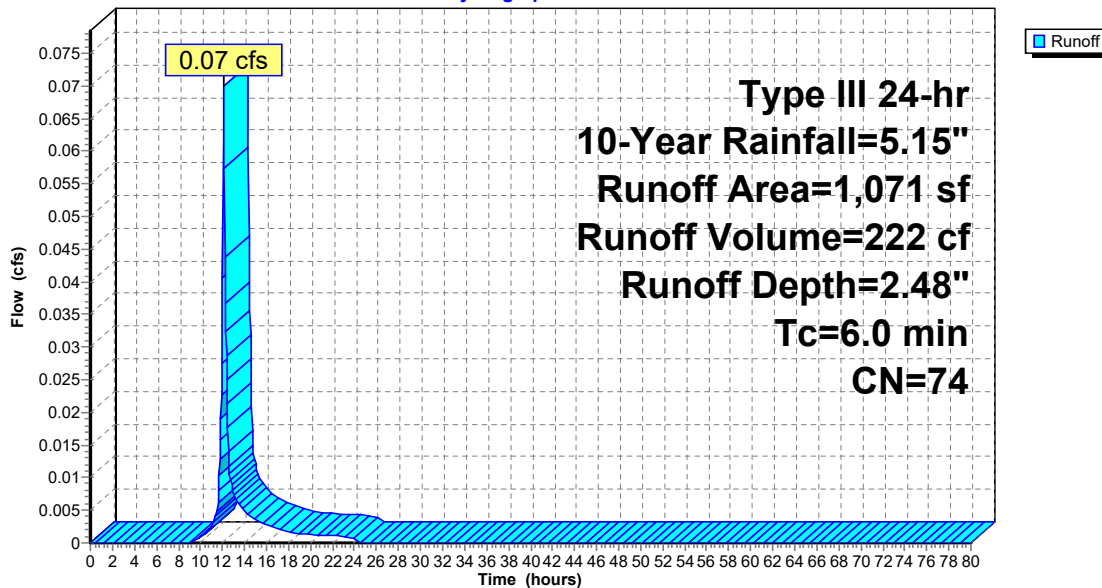
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Type III 24-hr 10-Year Rainfall=5.15"

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Subcatchment P-1f: Filtow to Swale

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Summary for Subcatchment P-2: Flow onsite Southeast

Runoff = 0.70 cfs @ 12.09 hrs, Volume= 2,483 cf, Depth= 4.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.15"

Area (sf)	CN	Description
5,832	98	Paved parking
381	79	50-75% Grass cover, Fair, HSG C
6,213	97	Weighted Average
381		6.13% Pervious Area
5,832		93.87% Impervious Area

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

Proposed-6

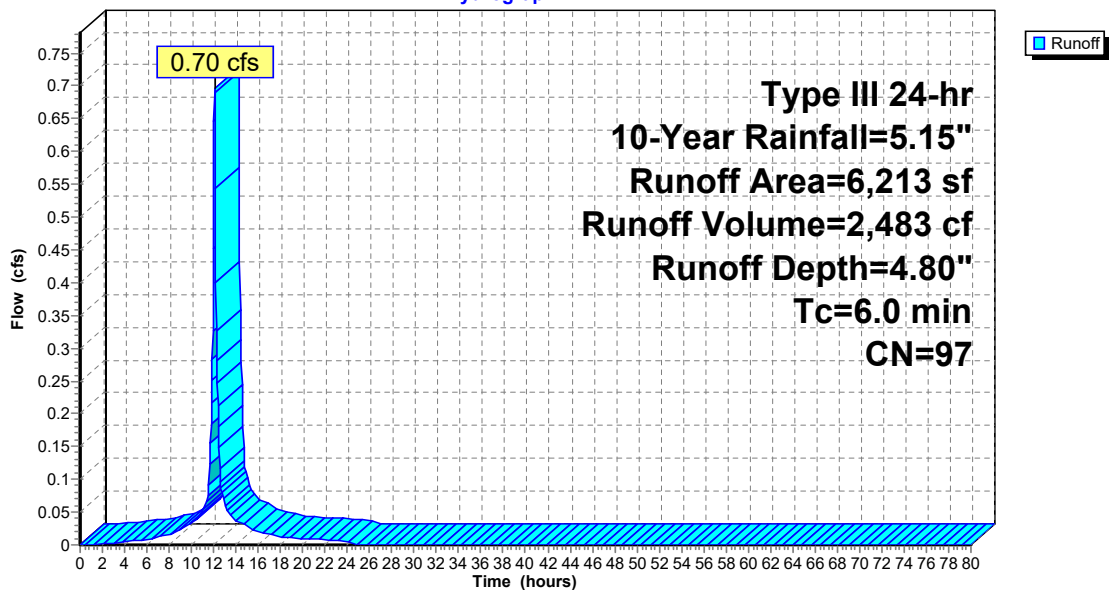
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Subcatchment P-2: Flow onsite Southeast

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Summary for Subcatchment P-3: Flow off-site West

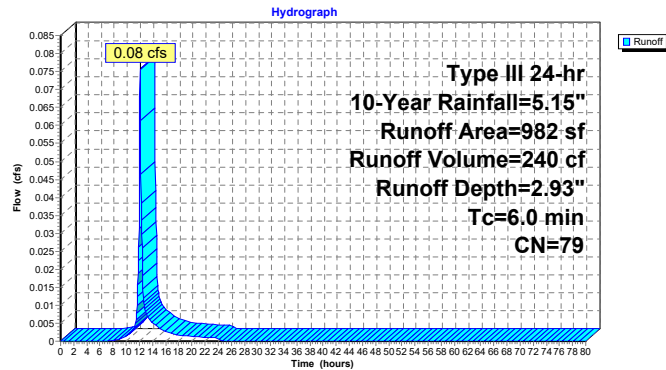
Runoff = 0.08 cfs @ 12.09 hrs, Volume= 240 cf, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=5.15"

Area (sf)	CN	Description
10	70	Woods, Good, HSG C
972	79	50-75% Grass cover, Fair, HSG C
982	79	Weighted Average
982		100.00% Pervious Area

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

Subcatchment P-3: Flow off-site West



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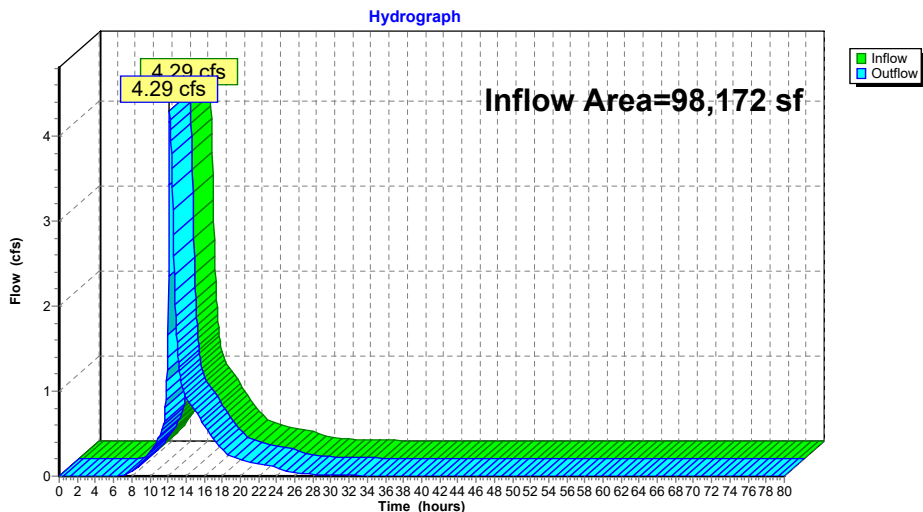
Summary for Reach DP-1: Basin

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

Inflow Area = 98,172 sf, 75.63% Impervious, Inflow Depth = 4.10" for 10-Year event
 Inflow = 4.29 cfs @ 12.20 hrs, Volume= 33,560 cf
 Outflow = 4.29 cfs @ 12.20 hrs, Volume= 33,560 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-1: Basin



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Summary for Reach DP-2: Onsite southeast

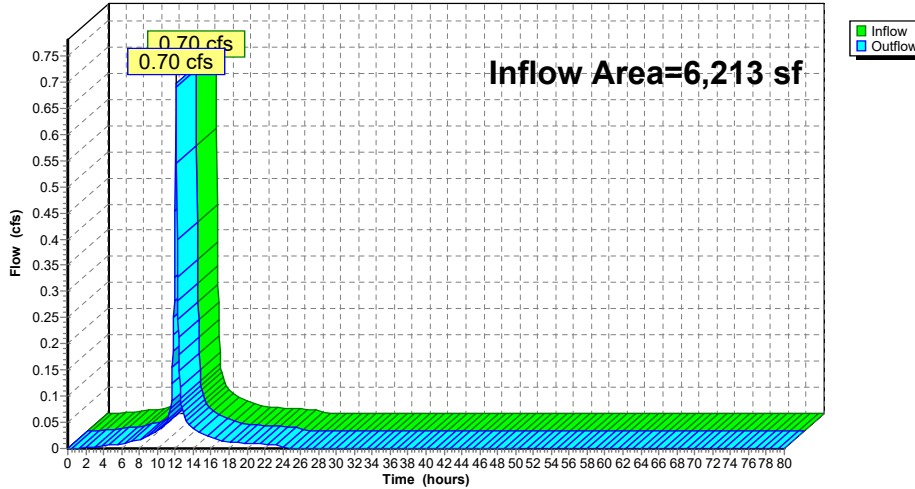
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6,213 sf, 93.87% Impervious, Inflow Depth = 4.80" for 10-Year event
Inflow = 0.70 cfs @ 12.09 hrs, Volume= 2,483 cf
Outflow = 0.70 cfs @ 12.09 hrs, Volume= 2,483 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-2: Onsite southeast

Hydrograph



Proposed-6

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Type III 24-hr 10-Year Rainfall=5.15"

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Summary for Reach DP-3: Off-site West

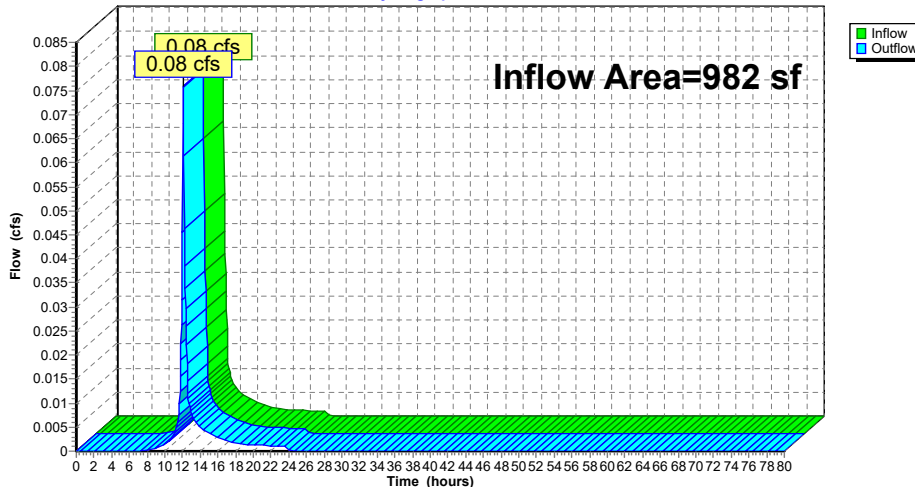
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 982 sf, 0.00% Impervious, Inflow Depth = 2.93" for 10-Year event
Inflow = 0.08 cfs @ 12.09 hrs, Volume= 240 cf
Outflow = 0.08 cfs @ 12.09 hrs, Volume= 240 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-3: Off-site West

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Type III 24-hr 10-Year Rainfall=5.15"

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Summary for Pond S-1: Rip Rap Swale

Inflow Area = 1,317 sf, 0.00% Impervious, Inflow Depth = 2.31" for 10-Year event
 Inflow = 0.08 cfs @ 12.10 hrs, Volume= 254 cf
 Outflow = 0.00 cfs @ 17.20 hrs, Volume= 39 cf, Atten= 97%, Lag= 306.3 min
 Primary = 0.00 cfs @ 17.20 hrs, Volume= 39 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
 Peak Elev= 334.05' @ 17.20 hrs Surf.Area= 200 sf Storage= 215 cf

Plug-Flow detention time= 517.4 min calculated for 39 cf (15% of inflow)
 Center-of-Mass det. time= 369.3 min (1,210.3 - 841.0)

Volume	Invert	Avail.Storage	Storage Description
#1	331.15'	120 cf	Custom Stage Data (Irregular) Listed below (Recalc) 414 cf Overall - 114 cf Embedded = 300 cf x 40.0% Voids
#2	332.65'	114 cf	Custom Stage Data (Irregular) Listed below (Recalc) Inside #1
			234 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
331.15	0	0.0	0	0	0
331.50	21	27.2	2	2	59
332.50	171	99.3	84	86	788
332.65	200	104.4	28	114	872
334.15	200	104.4	300	414	1,028

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
332.65	0	0.0	0	0	0
333.00	21	27.2	2	2	59
334.00	171	99.3	84	86	788
334.15	200	104.4	28	114	872

Device	Routing	Invert	Outlet Devices
#1	Primary	334.05'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

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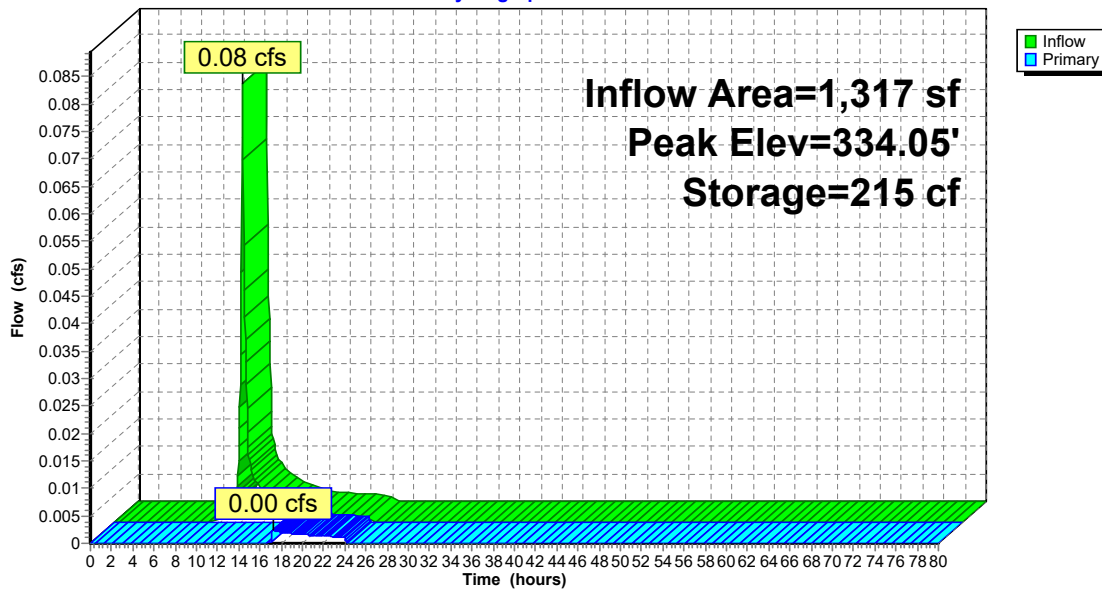
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Primary OutFlow Max=0.00 cfs @ 17.20 hrs HW=334.05' (Free Discharge)
 ↳1=Sharp-Crested Rectangular Weir (Weir Controls 0.00 cfs @ 0.11 fps)

Pond S-1: Rip Rap Swale

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Summary for Pond S-2: Rip Rap Swale

Inflow Area = 2,501 sf, 0.00% Impervious, Inflow Depth = 1.36" for 10-Year event
 Inflow = 0.08 cfs @ 12.09 hrs, Volume= 284 cf
 Outflow = 0.00 cfs @ 17.23 hrs, Volume= 86 cf, Atten= 94%, Lag= 308.2 min
 Primary = 0.00 cfs @ 17.23 hrs, Volume= 86 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
 Peak Elev= 332.50' @ 17.23 hrs Surf.Area= 200 sf Storage= 198 cf

Plug-Flow detention time= 475.9 min calculated for 86 cf (30% of inflow)
 Center-of-Mass det. time= 296.3 min (1,183.8 - 887.5)

Volume	Invert	Avail.Storage	Storage Description
#1	329.65'	120 cf	Custom Stage Data (Irregular) Listed below (Recalc) 407 cf Overall - 107 cf Embedded = 300 cf x 40.0% Voids
#2	331.15'	107 cf	Custom Stage Data (Irregular) Listed below (Recalc) Inside #1
			227 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
329.65	0	0.0	0	0	0
330.50	74	61.1	21	21	298
331.15	200	104.5	86	107	873
332.65	200	104.5	300	407	1,029

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
331.15	0	0.0	0	0	0
332.00	74	61.1	21	21	298
332.65	200	104.5	86	107	873

Device	Routing	Invert	Outlet Devices
#1	Primary	332.50'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

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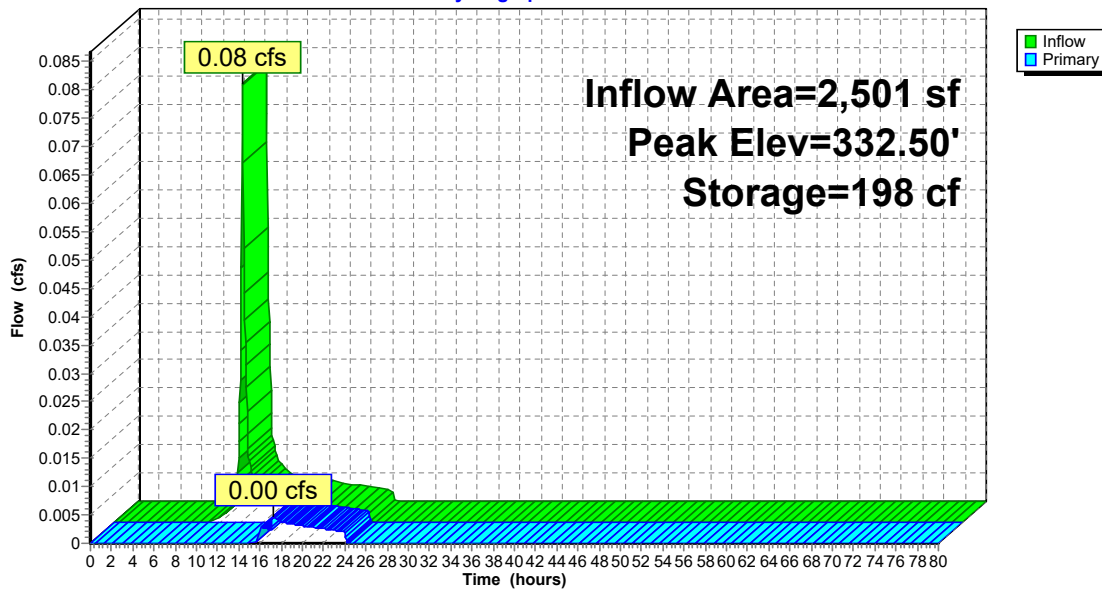
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Primary OutFlow Max=0.00 cfs @ 17.23 hrs HW=332.50' (Free Discharge)
 ↳1=Sharp-Crested Rectangular Weir (Weir Controls 0.00 cfs @ 0.11 fps)

Pond S-2: Rip Rap Swale

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Summary for Pond S-3: Rip Rap Swale

Inflow Area = 3,685 sf, 0.00% Impervious, Inflow Depth = 1.11" for 10-Year event
 Inflow = 0.08 cfs @ 12.09 hrs, Volume= 340 cf
 Outflow = 0.01 cfs @ 17.26 hrs, Volume= 145 cf, Atten= 91%, Lag= 309.9 min
 Primary = 0.01 cfs @ 17.26 hrs, Volume= 145 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
 Peak Elev= 331.00' @ 17.26 hrs Surf.Area= 200 sf Storage= 195 cf

Plug-Flow detention time= 438.1 min calculated for 145 cf (43% of inflow)
 Center-of-Mass det. time= 235.3 min (1,157.5 - 922.2)

Volume	Invert	Avail.Storage	Storage Description
#1	329.70'	112 cf	Custom Stage Data (Irregular) Listed below (Recalc) Inside #2
#2	328.20'	120 cf	Custom Stage Data (Irregular) Listed below (Recalc)
			412 cf Overall - 112 cf Embedded = 300 cf x 40.0% Voids
			232 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
329.70	0	0.0	0	0	0
330.00	16	23.0	2	2	42
331.00	158	95.1	75	76	722
331.20	200	104.5	36	112	873

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
328.20	0	0.0	0	0	0
328.50	16	23.0	2	2	42
329.50	158	95.1	75	76	722
329.70	200	104.5	36	112	873
331.20	200	104.5	300	412	1,030

Device	Routing	Invert	Outlet Devices
#1	Primary	331.00'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

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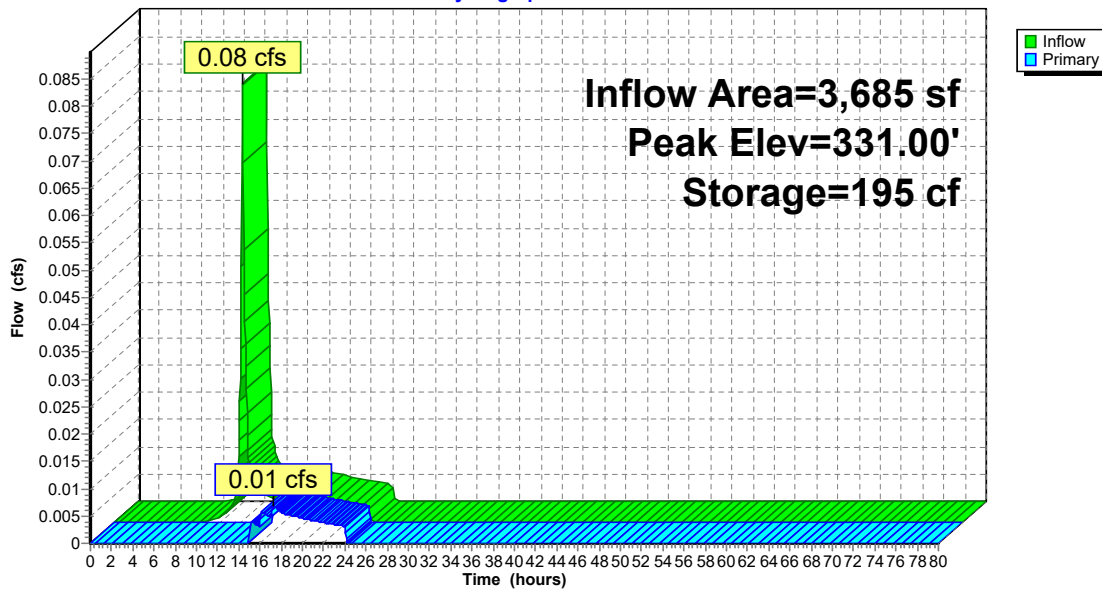
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Primary OutFlow Max=0.00 cfs @ 17.26 hrs HW=331.00' (Free Discharge)
 ↳ Sharp-Crested Rectangular Weir (Weir Controls 0.00 cfs @ 0.15 fps)

Pond S-3: Rip Rap Swale

Hydrograph



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Type III 24-hr 10-Year Rainfall=5.15"

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Summary for Pond S-4: Rip Rap Swale

Inflow Area = 4,756 sf, 0.00% Impervious, Inflow Depth = 0.93" for 10-Year event
 Inflow = 0.07 cfs @ 12.09 hrs, Volume= 367 cf
 Outflow = 0.01 cfs @ 17.27 hrs, Volume= 219 cf, Atten= 87%, Lag= 310.3 min
 Primary = 0.01 cfs @ 17.27 hrs, Volume= 219 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
 Peak Elev= 329.25' @ 17.27 hrs Surf.Area= 188 sf Storage= 148 cf

Plug-Flow detention time= 320.0 min calculated for 219 cf (60% of inflow)
 Center-of-Mass det. time= 155.6 min (1,118.7 - 963.1)

Volume	Invert	Avail.Storage	Storage Description
#1	328.20'	108 cf	Custom Stage Data (Irregular) Listed below (Recalc) Inside #2
#2	326.70'	113 cf	Custom Stage Data (Irregular) Listed below (Recalc)
			390 cf Overall - 108 cf Embedded = 282 cf x 40.0% Voids
			221 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
328.20	0	0.0	0	0	0
329.00	71	56.9	19	19	259
329.25	112	76.4	23	42	466
329.70	188	102.0	67	108	832

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
326.70	0	0.0	0	0	0
327.50	71	56.9	19	19	259
327.75	112	76.4	23	42	466
328.20	188	102.0	67	108	832
329.70	188	102.0	282	390	985

Device	Routing	Invert	Outlet Devices
#1	Primary	329.25'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

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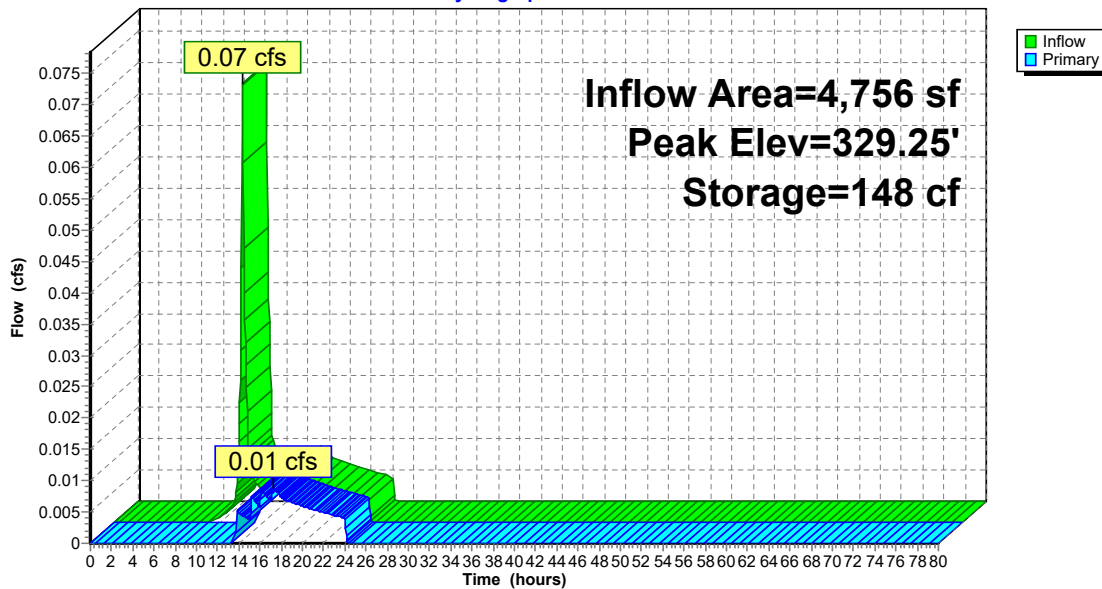
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Primary OutFlow Max=0.00 cfs @ 17.27 hrs HW=329.25' (Free Discharge)
 ↳1=Sharp-Crested Rectangular Weir (Weir Controls 0.00 cfs @ 0.15 fps)

Pond S-4: Rip Rap Swale

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Summary for Pond SSD-1: Subsurface Detention Basin-1

Inflow Area = 71,428 sf, 99.59% Impervious, Inflow Depth = 4.91" for 10-Year event
 Inflow = 8.07 cfs @ 12.09 hrs, Volume= 29,243 cf
 Outflow = 3.18 cfs @ 12.31 hrs, Volume= 27,728 cf, Atten= 61%, Lag= 13.5 min
 Primary = 3.18 cfs @ 12.31 hrs, Volume= 27,728 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 9
 Peak Elev= 324.20' @ 12.31 hrs Surf.Area= 7,434 sf Storage= 11,384 cf

Plug-Flow detention time= 174.8 min calculated for 27,728 cf (95% of inflow)
 Center-of-Mass det. time= 144.7 min (892.2 - 747.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	322.00'	6,586 cf	63.25'W x 117.54'L x 3.50'H Field A 26,020 cf Overall - 9,556 cf Embedded = 16,464 cf x 40.0% Voids
#2A	322.50'	9,556 cf	ADS_StormTech SC-740 +Cap x 208 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 208 Chambers in 13 Rows
		16,141 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	322.50'	15.0" Round Culvert L= 21.3' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 322.50' / 322.00' S= 0.0235 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	325.25'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#3	Device 1	324.25'	6.0" Vert. Orifice/Grate C= 0.600
#4	Device 1	323.50'	8.0" Vert. Orifice/Grate X 2.00 C= 0.600
#5	Device 1	322.50'	6.0" Vert. Orifice/Grate C= 0.600

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Primary OutFlow Max=3.17 cfs @ 12.31 hrs HW=324.20' (Free Discharge)

- 1=Culvert (Passes 3.17 cfs of 6.13 cfs potential flow)
- 2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)
- 3=Orifice/Grate (Controls 0.00 cfs)
- 4=Orifice/Grate (Orifice Controls 2.03 cfs @ 2.91 fps)
- 5=Orifice/Grate (Orifice Controls 1.14 cfs @ 5.80 fps)

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Pond SSD-1: Subsurface Detention Basin-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

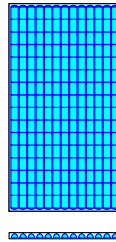
16 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 115.54' Row Length +12.0" End Stone x 2 = 117.54' Base Length
13 Rows x 51.0" Wide + 6.0" Spacing x 12 + 12.0" Side Stone x 2 = 63.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

208 Chambers x 45.9 cf = 9,555.5 cf Chamber Storage

26,019.7 cf Field - 9,555.5 cf Chambers = 16,464.2 cf Stone x 40.0% Voids = 6,585.7 cf Stone Storage

Chamber Storage + Stone Storage = 16,141.2 cf = 0.371 af
Overall Storage Efficiency = 62.0%
Overall System Size = 117.54' x 63.25' x 3.50'

208 Chambers
963.7 cy Field
609.8 cy Stone



Proposed-6

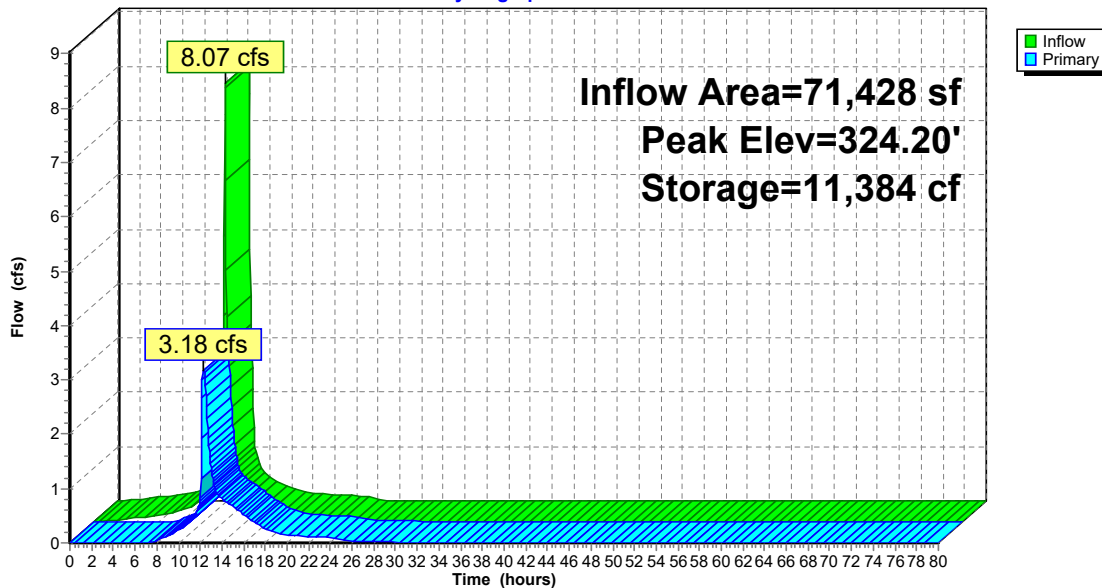
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Pond SSD-1: Subsurface Detention Basin-1

Hydrograph



HydroCAD Analysis
Proposed Conditions - 25 Year Storm

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Page 1**Area Listing (all nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
18,555	79	50-75% Grass cover, Fair, HSG C (P-1, P-1a, P-1b, P-1c, P-1d, P-1e, P-1f, P-2, P-3)
80,078	98	Paved parking (P-1a, P-1b, P-2)
1,396	66	Rip Rap Swale (P-1c, P-1d, P-1e, P-1f)
5,338	70	Woods, Good, HSG C (P-1, P-1c, P-1d, P-1e, P-1f, P-3)
105,367	93	TOTAL AREA

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Page 2**Soil Listing (all nodes)**

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
23,893	HSG C	P-1, P-1a, P-1b, P-1c, P-1d, P-1e, P-1f, P-2, P-3
0	HSG D	
81,474	Other	P-1a, P-1b, P-1c, P-1d, P-1e, P-1f, P-2
105,367		TOTAL AREA

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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	18,555	0	0	18,555	50-75% Grass cover, Fair	P-1, P-1a, P-1b, P-1c, P-1d, P-1e, P-1f, P-2, P-3
0	0	0	0	80,078	80,078	Paved parking	P-1a, P-1b, P-2
0	0	0	0	1,396	1,396	Rip Rap Swale	P-1c, P-1d, P-1e, P-1f
0	0	5,338	0	0	5,338	Woods, Good	P-1, P-1c, P-1d, P-1e, P-1f, P-3
0	0	23,893	0	81,474	105,367	TOTAL AREA	

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	SSD-1	322.50	322.00	21.3	0.0235	0.013	15.0	0.0	0.0

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Type III 24-hr 25-Year Rainfall=6.35"

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Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: Flow to Existing Basin	Runoff Area=18,417 sf 0.00% Impervious Runoff Depth=3.79" Flow Length=461' Tc=10.0 min CN=77 Runoff=1.62 cfs 5,811 cf
Subcatchment P-1a: Flow to SSI-1	Runoff Area=71,428 sf 99.59% Impervious Runoff Depth=6.11" Tc=6.0 min CN=98 Runoff=9.97 cfs 36,378 cf
Subcatchment P-1b: Flow to Treatment Unit	Runoff Area=3,571 sf 87.17% Impervious Runoff Depth=5.88" Tc=6.0 min CN=96 Runoff=0.49 cfs 1,749 cf
Subcatchment P-1c: Flow to Swale	Runoff Area=1,317 sf 0.00% Impervious Runoff Depth=3.28" Tc=6.0 min CN=72 Runoff=0.11 cfs 360 cf
Subcatchment P-1d: Flow to Swale	Runoff Area=1,184 sf 0.00% Impervious Runoff Depth=3.48" Tc=6.0 min CN=74 Runoff=0.11 cfs 343 cf
Subcatchment P-1e: Flow to Swale	Runoff Area=1,184 sf 0.00% Impervious Runoff Depth=3.58" Tc=6.0 min CN=75 Runoff=0.11 cfs 353 cf
Subcatchment P-1f: Flow to Swale	Runoff Area=1,071 sf 0.00% Impervious Runoff Depth=3.48" Tc=6.0 min CN=74 Runoff=0.10 cfs 311 cf
Subcatchment P-2: Flow onsite Southeast	Runoff Area=6,213 sf 93.87% Impervious Runoff Depth=5.99" Tc=6.0 min CN=97 Runoff=0.86 cfs 3,103 cf
Subcatchment P-3: Flow off-site West	Runoff Area=982 sf 0.00% Impervious Runoff Depth=3.99" Tc=6.0 min CN=79 Runoff=0.10 cfs 327 cf
Reach DP-1: Basin	Inflow=5.91 cfs 43,035 cf Outflow=5.91 cfs 43,035 cf
Reach DP-2: Onsite southeast	Inflow=0.86 cfs 3,103 cf Outflow=0.86 cfs 3,103 cf

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Type III 24-hr 25-Year Rainfall=6.35"

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Reach DP-3: Off-site West	Inflow=0.10 cfs 327 cf Outflow=0.10 cfs 327 cf
Pond S-1: Rip Rap Swale	Peak Elev=334.06' Storage=216 cf Inflow=0.11 cfs 360 cf Outflow=0.01 cfs 145 cf
Pond S-2: Rip Rap Swale	Peak Elev=332.51' Storage=199 cf Inflow=0.11 cfs 489 cf Outflow=0.02 cfs 291 cf
Pond S-3: Rip Rap Swale	Peak Elev=331.01' Storage=196 cf Inflow=0.11 cfs 644 cf Outflow=0.03 cfs 450 cf
Pond S-4: Rip Rap Swale	Peak Elev=329.26' Storage=149 cf Inflow=0.10 cfs 761 cf Outflow=0.04 cfs 615 cf
Pond SSD-1: Subsurface Detention Basin-1	Peak Elev=324.55' Storage=13,040 cf Inflow=9.97 cfs 36,378 cf Outflow=4.35 cfs 34,861 cf

Total Runoff Area = 105,367 sf Runoff Volume = 48,735 cf Average Runoff Depth = 5.55"
24.00% Pervious = 25,289 sf 76.00% Impervious = 80,078 sf

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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Subcatchment P-1: Flow to Existing Basin

Runoff = 1.62 cfs @ 12.14 hrs, Volume= 5,811 cf, Depth= 3.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
4,454	70	Woods, Good, HSG C
13,963	79	50-75% Grass cover, Fair, HSG C
18,417	77	Weighted Average
18,417		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0800	0.11		Sheet Flow, Sheet Flow Woods: Light underbrush n= 0.400 P2= 3.05"
2.7	411	0.0240	2.49		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
10.0	461	Total			

Proposed-6

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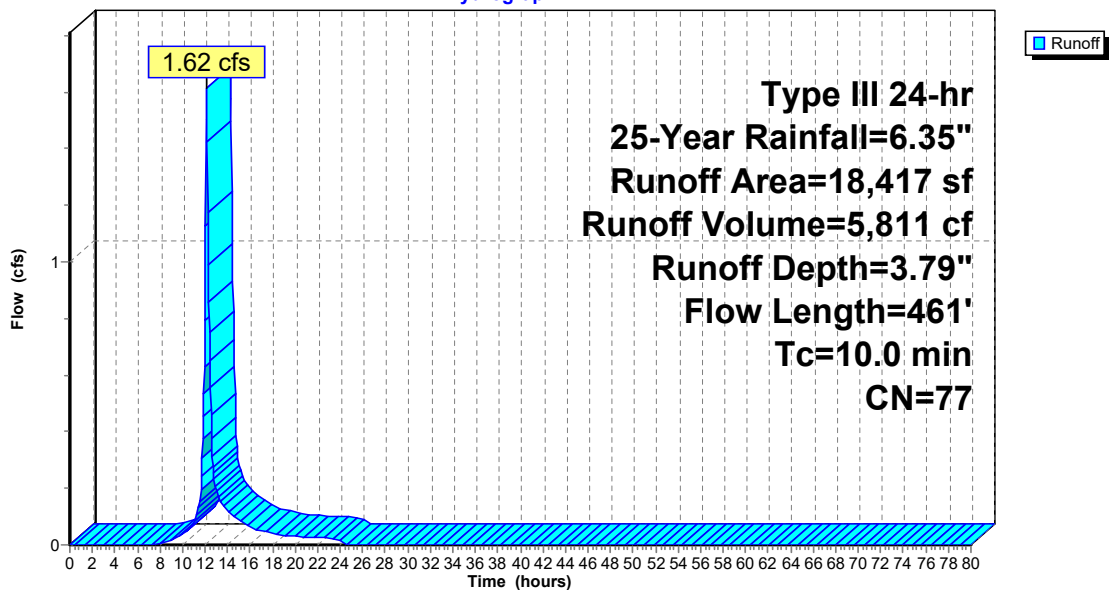
Type III 24-hr 25-Year Rainfall=6.35"

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Subcatchment P-1: Flow to Existing Basin

Hydrograph



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Summary for Subcatchment P-1a: Flow to SSI-1

Runoff = 9.97 cfs @ 12.09 hrs, Volume= 36,378 cf, Depth= 6.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
* 71,133	98	Paved parking
295	79	50-75% Grass cover, Fair, HSG C
71,428	98	Weighted Average
295		0.41% Pervious Area
71,133		99.59% Impervious Area

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

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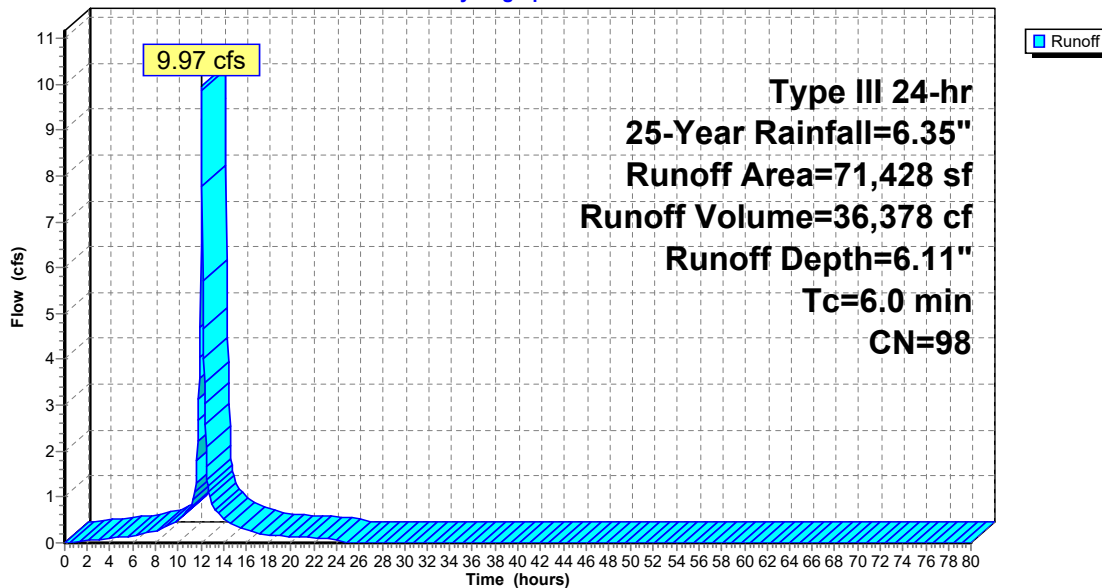
Type III 24-hr 25-Year Rainfall=6.35"

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Subcatchment P-1a: Flow to SSI-1

Hydrograph



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Summary for Subcatchment P-1b: Flow to Treatment Unit

Runoff = 0.49 cfs @ 12.09 hrs, Volume= 1,749 cf, Depth= 5.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
3,113	98	Paved parking
458	79	50-75% Grass cover, Fair, HSG C
3,571	96	Weighted Average
458		12.83% Pervious Area
3,113		87.17% Impervious Area

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

Proposed-6

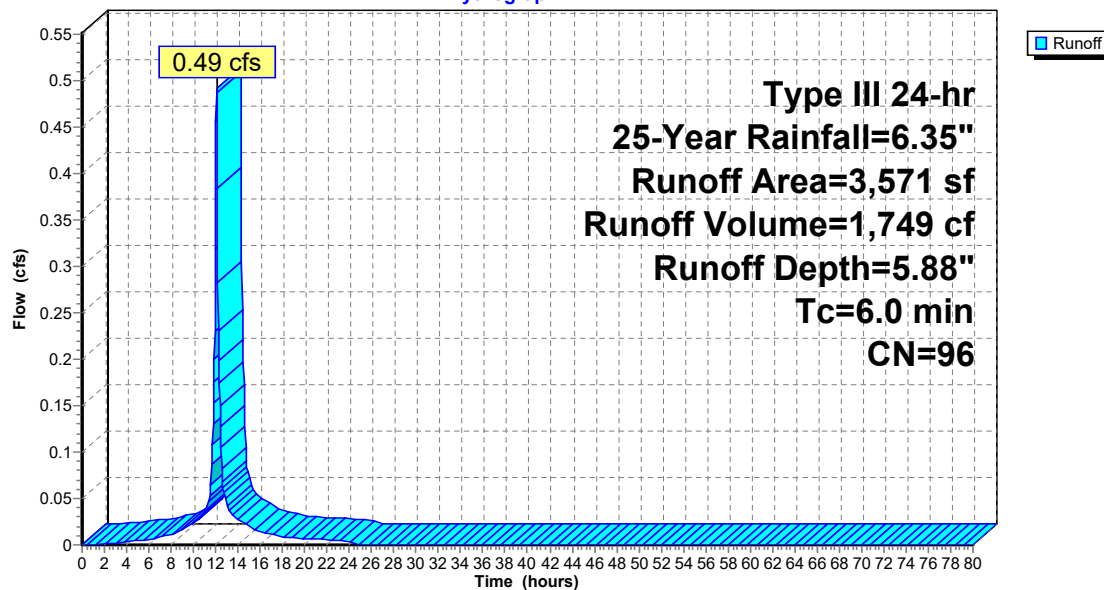
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Subcatchment P-1b: Flow to Treatment Unit

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Summary for Subcatchment P-1c: Fllow to Swale

Runoff = 0.11 cfs @ 12.09 hrs, Volume= 360 cf, Depth= 3.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
* 339	66	Rip Rap Swale
476	70	Woods, Good, HSG C
502	79	50-75% Grass cover, Fair, HSG C
1,317	72	Weighted Average
1,317		100.00% Pervious Area

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

Proposed-6

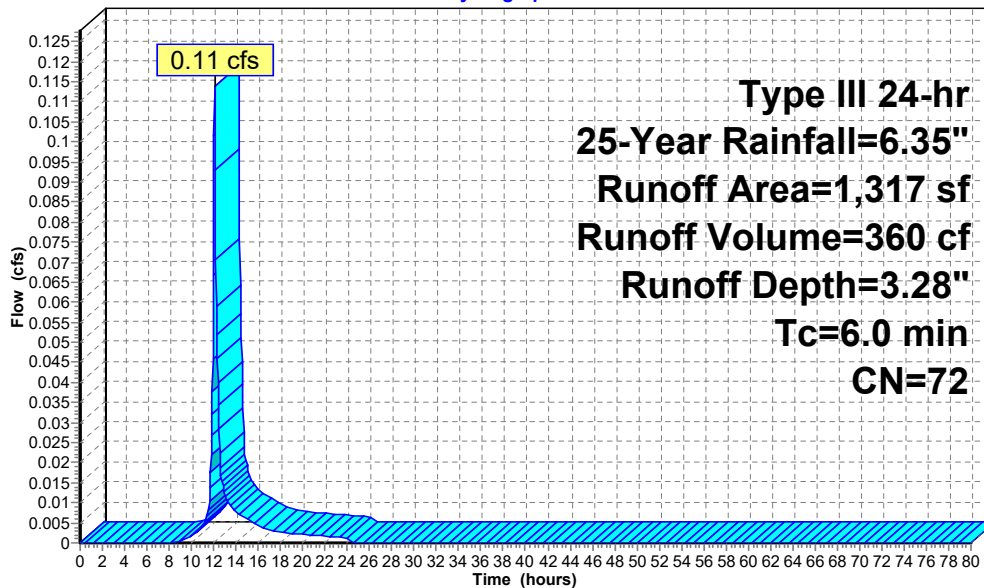
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Type III 24-hr 25-Year Rainfall=6.35"

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Subcatchment P-1c: Fllow to Swale

Hydrograph



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Summary for Subcatchment P-1d: Fllow to Swale

Runoff = 0.11 cfs @ 12.09 hrs, Volume= 343 cf, Depth= 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
* 350	66	Rip Rap Swale
216	70	Woods, Good, HSG C
618	79	50-75% Grass cover, Fair, HSG C
1,184	74	Weighted Average
1,184		100.00% Pervious Area

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

Proposed-6

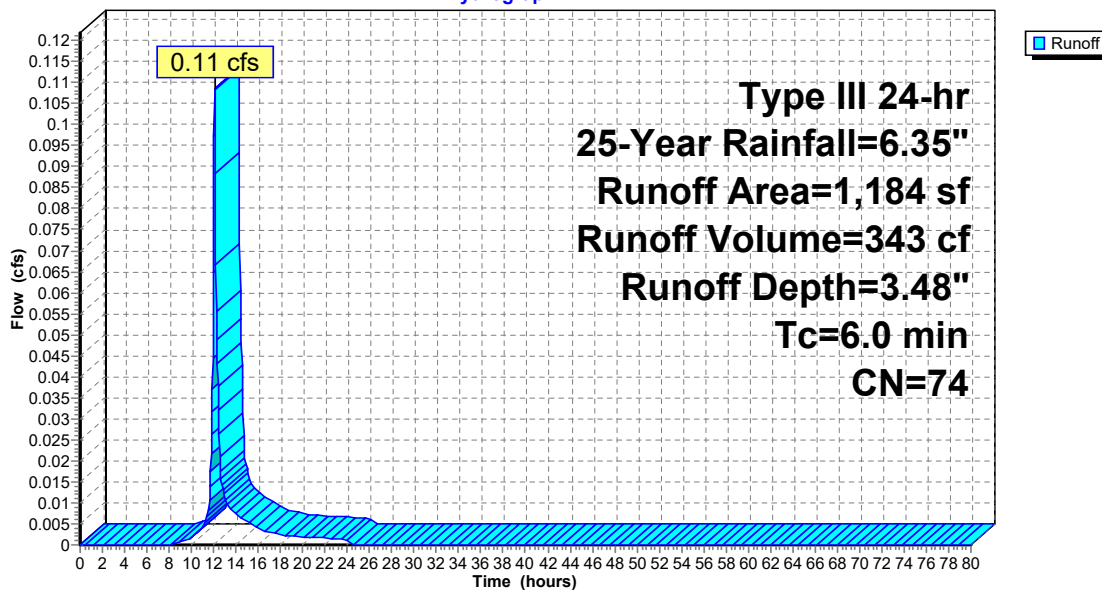
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Type III 24-hr 25-Year Rainfall=6.35"

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Subcatchment P-1d: Fllow to Swale

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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Subcatchment P-1e: Fllow to Swale

Runoff = 0.11 cfs @ 12.09 hrs, Volume= 353 cf, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
* 350	66	Rip Rap Swale
58	70	Woods, Good, HSG C
776	79	50-75% Grass cover, Fair, HSG C
1,184	75	Weighted Average
1,184		100.00% Pervious Area

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

Proposed-6

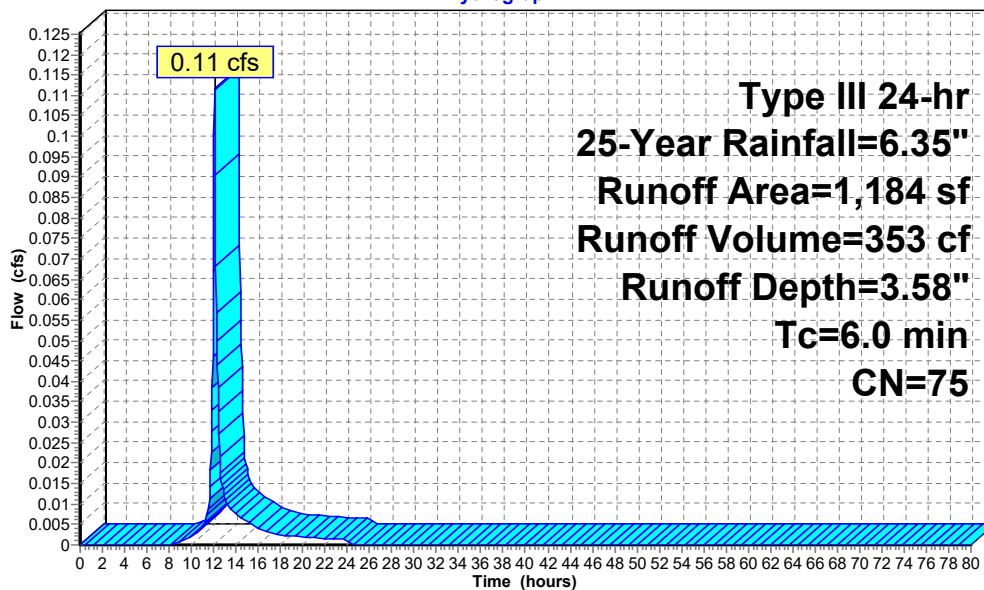
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Subcatchment P-1e: Fllow to Swale

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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Subcatchment P-1f: Filtow to Swale

Runoff = 0.10 cfs @ 12.09 hrs, Volume= 311 cf, Depth= 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
* 357	66	Rip Rap Swale
124	70	Woods, Good, HSG C
590	79	50-75% Grass cover, Fair, HSG C
1,071	74	Weighted Average
1,071		100.00% Pervious Area

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

Proposed-6

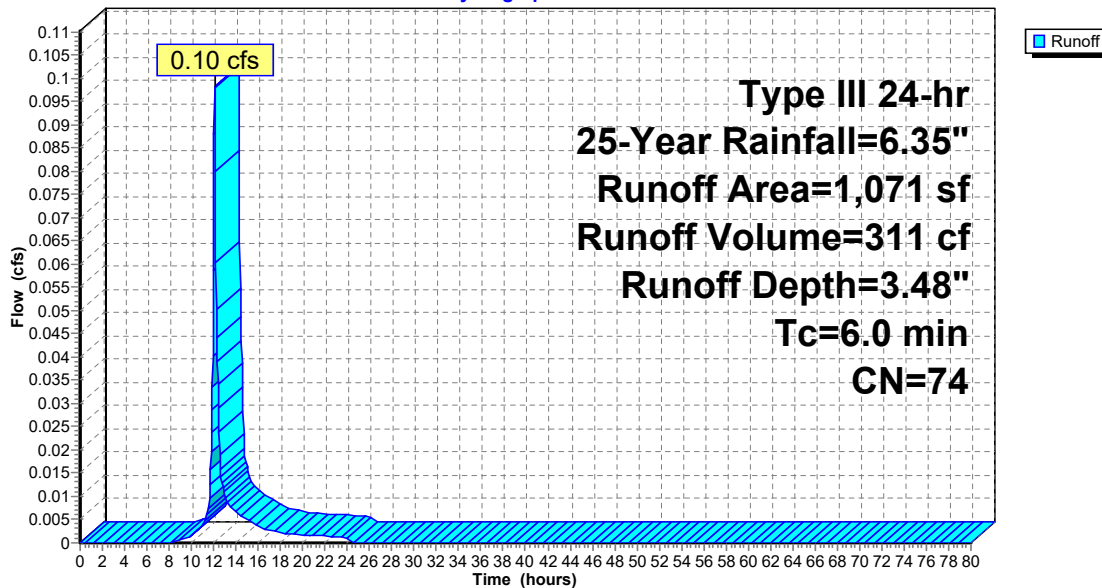
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Type III 24-hr 25-Year Rainfall=6.35"

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Subcatchment P-1f: Filtow to Swale

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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Subcatchment P-2: Flow onsite Southeast

Runoff = 0.86 cfs @ 12.09 hrs, Volume= 3,103 cf, Depth= 5.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
5,832	98	Paved parking
381	79	50-75% Grass cover, Fair, HSG C
6,213	97	Weighted Average
381		6.13% Pervious Area
5,832		93.87% Impervious Area

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

Proposed-6

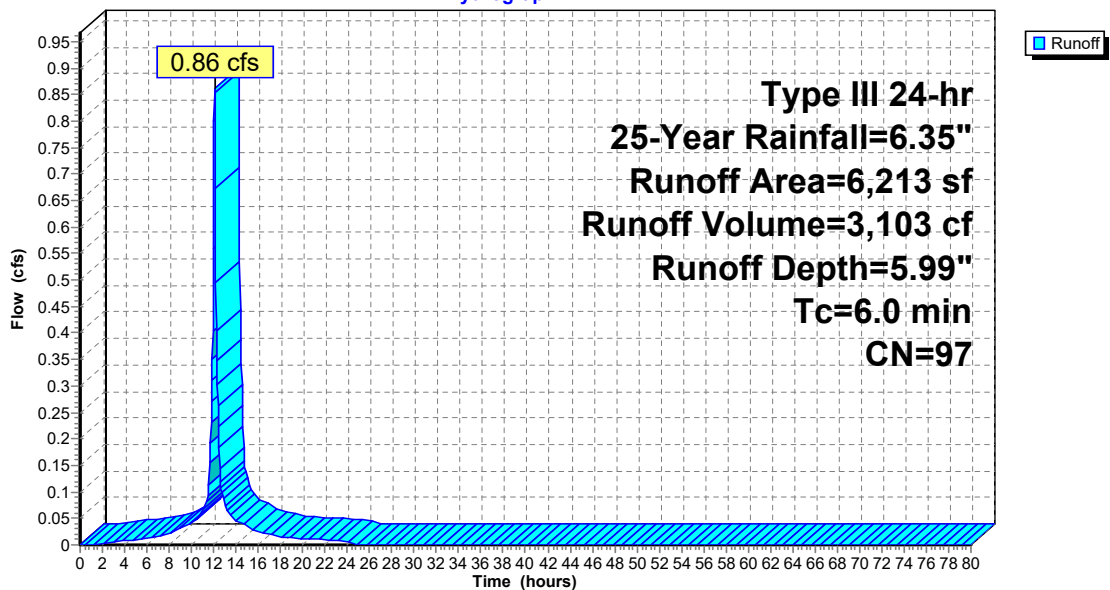
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Type III 24-hr 25-Year Rainfall=6.35"

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Subcatchment P-2: Flow onsite Southeast

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Subcatchment P-3: Flow off-site West

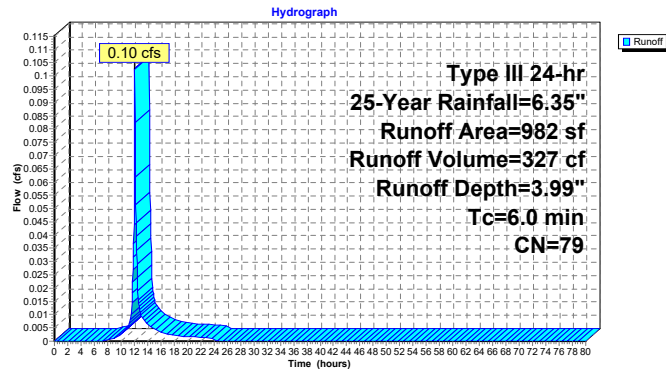
Runoff = 0.10 cfs @ 12.09 hrs, Volume= 327 cf, Depth= 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-Year Rainfall=6.35"

Area (sf)	CN	Description
10	70	Woods, Good, HSG C
972	79	50-75% Grass cover, Fair, HSG C
982	79	Weighted Average
982		100.00% Pervious Area

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

Subcatchment P-3: Flow off-site West



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Type III 24-hr 25-Year Rainfall=6.35"

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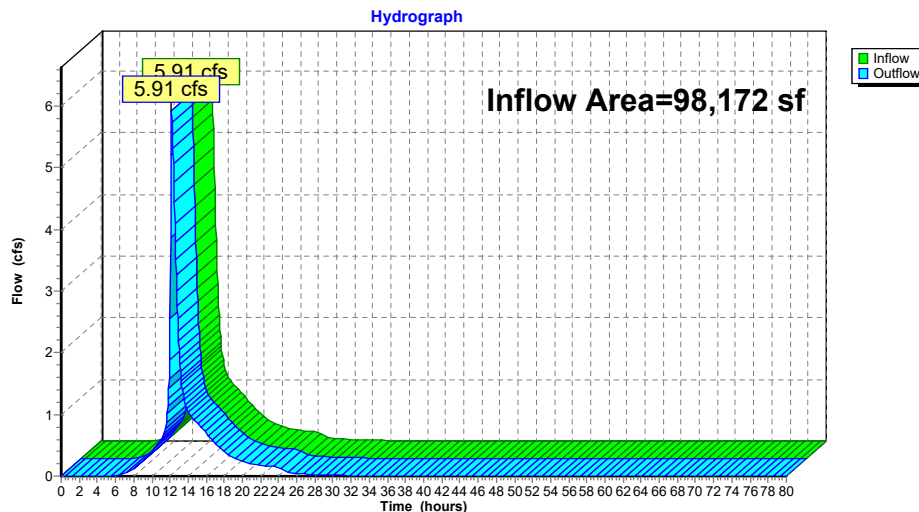
Summary for Reach DP-1: Basin

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

Inflow Area = 98,172 sf, 75.63% Impervious, Inflow Depth = 5.26" for 25-Year event
 Inflow = 5.91 cfs @ 12.19 hrs, Volume= 43,035 cf
 Outflow = 5.91 cfs @ 12.19 hrs, Volume= 43,035 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-1: Basin



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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Reach DP-2: Onsite southeast

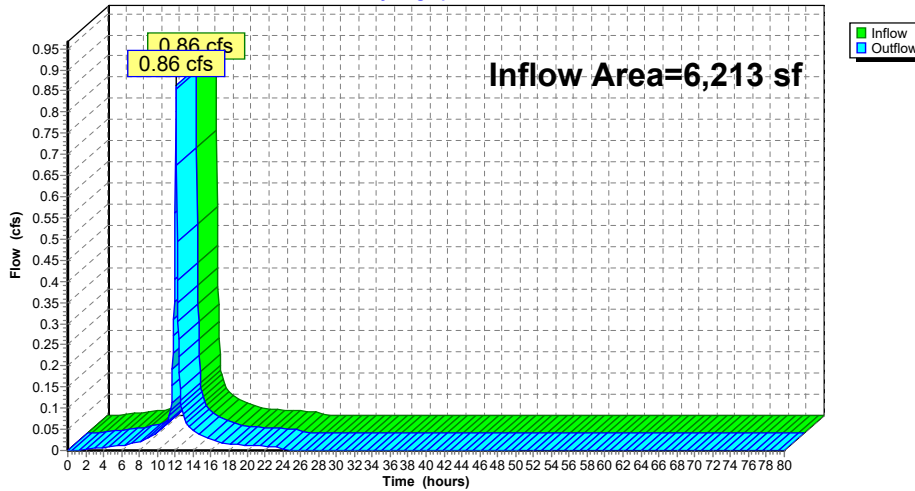
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6,213 sf, 93.87% Impervious, Inflow Depth = 5.99" for 25-Year event
Inflow = 0.86 cfs @ 12.09 hrs, Volume= 3,103 cf
Outflow = 0.86 cfs @ 12.09 hrs, Volume= 3,103 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-2: Onsite southeast

Hydrograph



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Summary for Reach DP-3: Off-site West

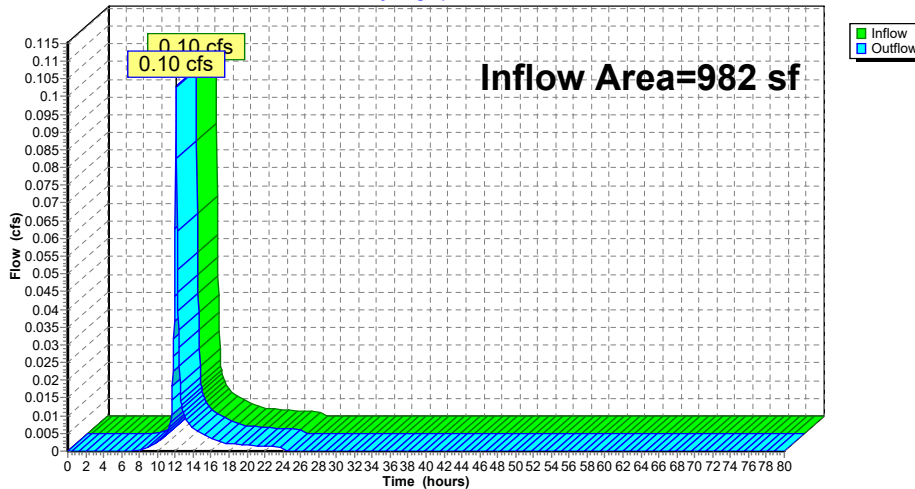
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 982 sf, 0.00% Impervious, Inflow Depth = 3.99" for 25-Year event
Inflow = 0.10 cfs @ 12.09 hrs, Volume= 327 cf
Outflow = 0.10 cfs @ 12.09 hrs, Volume= 327 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-3: Off-site West

Hydrograph



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Summary for Pond S-1: Rip Rap Swale

Inflow Area = 1,317 sf, 0.00% Impervious, Inflow Depth = 3.28" for 25-Year event
 Inflow = 0.11 cfs @ 12.09 hrs, Volume= 360 cf
 Outflow = 0.01 cfs @ 13.04 hrs, Volume= 145 cf, Atten= 90%, Lag= 56.7 min
 Primary = 0.01 cfs @ 13.04 hrs, Volume= 145 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
 Peak Elev= 334.06' @ 13.04 hrs Surf.Area= 200 sf Storage= 216 cf

Plug-Flow detention time= 288.6 min calculated for 145 cf (40% of inflow)
 Center-of-Mass det. time= 164.1 min (994.9 - 830.9)

Volume	Invert	Avail.Storage	Storage Description
#1	331.15'	120 cf	Custom Stage Data (Irregular) Listed below (Recalc) 414 cf Overall - 114 cf Embedded = 300 cf x 40.0% Voids
#2	332.65'	114 cf	Custom Stage Data (Irregular) Listed below (Recalc) Inside #1
			234 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
331.15	0	0.0	0	0	0
331.50	21	27.2	2	2	59
332.50	171	99.3	84	86	788
332.65	200	104.4	28	114	872
334.15	200	104.4	300	414	1,028

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
332.65	0	0.0	0	0	0
333.00	21	27.2	2	2	59
334.00	171	99.3	84	86	788
334.15	200	104.4	28	114	872

Device	Routing	Invert	Outlet Devices
#1	Primary	334.05'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

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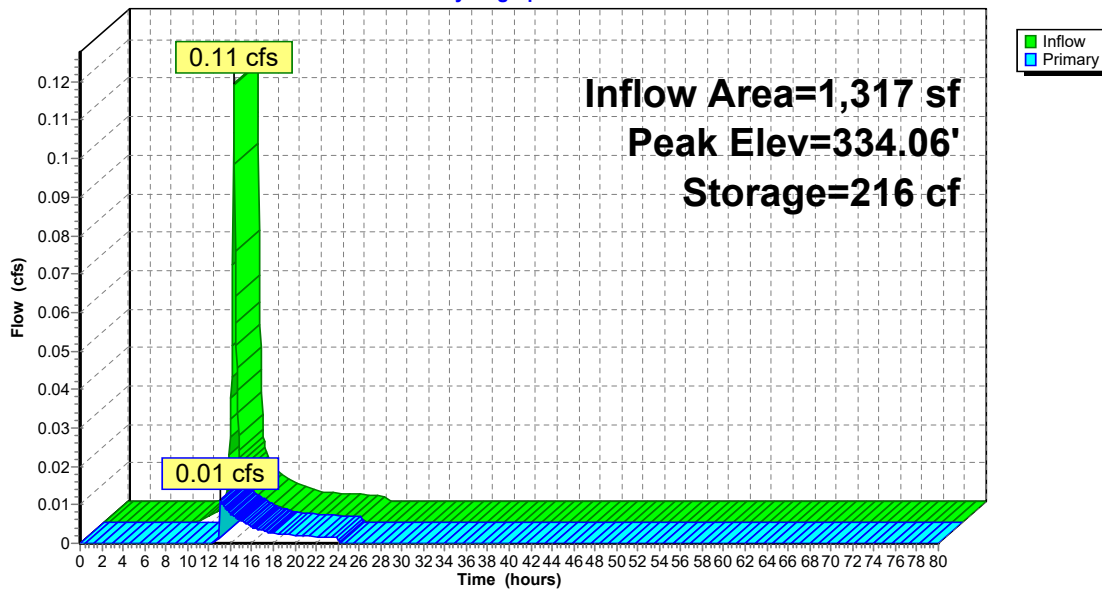
Type III 24-hr 25-Year Rainfall=6.35"

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Primary OutFlow Max=0.01 cfs @ 13.04 hrs HW=334.05' (Free Discharge)
 1=Sharp-Crested Rectangular Weir (Weir Controls 0.01 cfs @ 0.23 fps)

Pond S-1: Rip Rap Swale

Hydrograph



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Summary for Pond S-2: Rip Rap Swale

Inflow Area = 2,501 sf, 0.00% Impervious, Inflow Depth = 2.35" for 25-Year event
 Inflow = 0.11 cfs @ 12.09 hrs, Volume= 489 cf
 Outflow = 0.02 cfs @ 13.06 hrs, Volume= 291 cf, Atten= 80%, Lag= 57.8 min
 Primary = 0.02 cfs @ 13.06 hrs, Volume= 291 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
 Peak Elev= 332.51' @ 13.06 hrs Surf.Area= 200 sf Storage= 199 cf

Plug-Flow detention time= 242.6 min calculated for 291 cf (59% of inflow)
 Center-of-Mass det. time= 110.2 min (986.7 - 876.4)

Volume	Invert	Avail.Storage	Storage Description
#1	329.65'	120 cf	Custom Stage Data (Irregular) Listed below (Recalc) 407 cf Overall - 107 cf Embedded = 300 cf x 40.0% Voids
#2	331.15'	107 cf	Custom Stage Data (Irregular) Listed below (Recalc) Inside #1
			227 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
329.65	0	0.0	0	0	0
330.50	74	61.1	21	21	298
331.15	200	104.5	86	107	873
332.65	200	104.5	300	407	1,029

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
331.15	0	0.0	0	0	0
332.00	74	61.1	21	21	298
332.65	200	104.5	86	107	873

Device	Routing	Invert	Outlet Devices
#1	Primary	332.50'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

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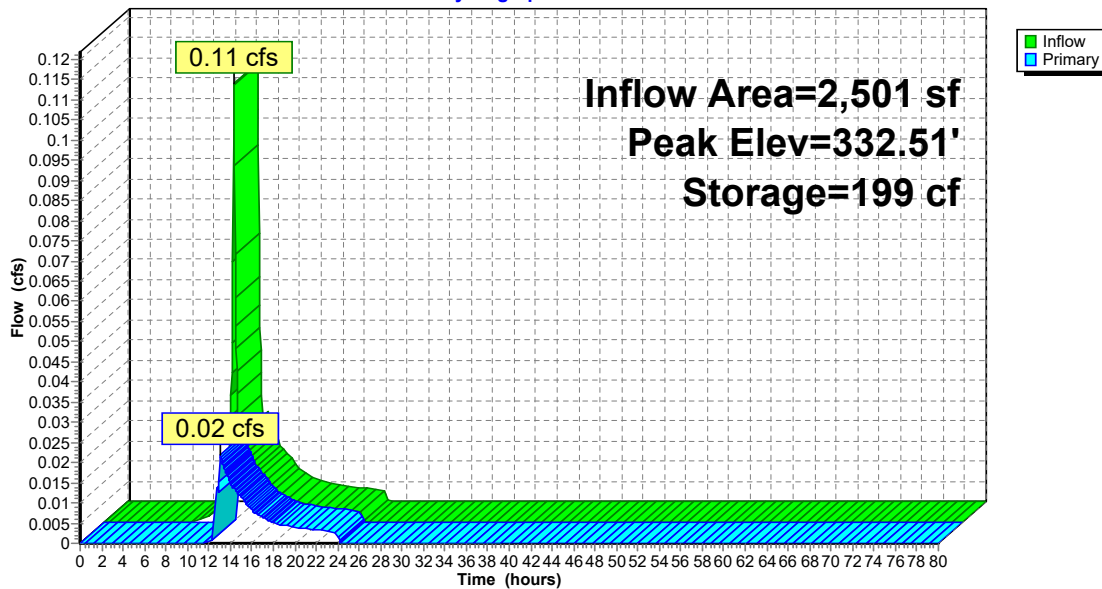
Type III 24-hr 25-Year Rainfall=6.35"

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Primary OutFlow Max=0.01 cfs @ 13.06 hrs HW=332.51' (Free Discharge)
 ↳1=Sharp-Crested Rectangular Weir (Weir Controls 0.01 cfs @ 0.24 fps)

Pond S-2: Rip Rap Swale

Hydrograph



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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Pond S-3: Rip Rap Swale

Inflow Area = 3,685 sf, 0.00% Impervious, Inflow Depth = 2.10" for 25-Year event
 Inflow = 0.11 cfs @ 12.09 hrs, Volume= 644 cf
 Outflow = 0.03 cfs @ 13.06 hrs, Volume= 450 cf, Atten= 71%, Lag= 58.2 min
 Primary = 0.03 cfs @ 13.06 hrs, Volume= 450 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
 Peak Elev= 331.01' @ 13.06 hrs Surf.Area= 200 sf Storage= 196 cf

Plug-Flow detention time= 192.8 min calculated for 450 cf (70% of inflow)
 Center-of-Mass det. time= 81.0 min (978.3 - 897.4)

Volume	Invert	Avail.Storage	Storage Description
#1	329.70'	112 cf	Custom Stage Data (Irregular) Listed below (Recalc) Inside #2
#2	328.20'	120 cf	Custom Stage Data (Irregular) Listed below (Recalc)
			412 cf Overall - 112 cf Embedded = 300 cf x 40.0% Voids
			232 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
329.70	0	0.0	0	0	0
330.00	16	23.0	2	2	42
331.00	158	95.1	75	76	722
331.20	200	104.5	36	112	873

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
328.20	0	0.0	0	0	0
328.50	16	23.0	2	2	42
329.50	158	95.1	75	76	722
329.70	200	104.5	36	112	873
331.20	200	104.5	300	412	1,030

Device	Routing	Invert	Outlet Devices
#1	Primary	331.00'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

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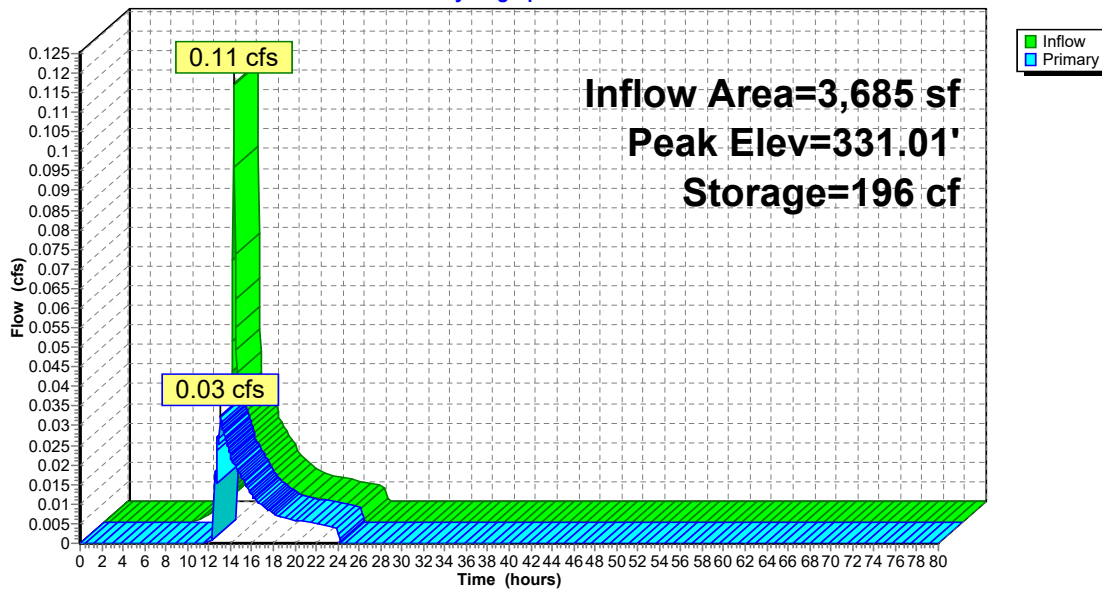
Type III 24-hr 25-Year Rainfall=6.35"

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Primary OutFlow Max=0.02 cfs @ 13.06 hrs HW=331.01' (Free Discharge)
 ↳ Sharp-Crested Rectangular Weir (Weir Controls 0.02 cfs @ 0.33 fps)

Pond S-3: Rip Rap Swale

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Type III 24-hr 25-Year Rainfall=6.35"

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Summary for Pond S-4: Rip Rap Swale

Inflow Area = 4,756 sf, 0.00% Impervious, Inflow Depth = 1.92" for 25-Year event
 Inflow = 0.10 cfs @ 12.09 hrs, Volume= 761 cf
 Outflow = 0.04 cfs @ 13.06 hrs, Volume= 615 cf, Atten= 57%, Lag= 58.2 min
 Primary = 0.04 cfs @ 13.06 hrs, Volume= 615 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
 Peak Elev= 329.26' @ 13.06 hrs Surf.Area= 188 sf Storage= 149 cf

Plug-Flow detention time= 131.6 min calculated for 615 cf (81% of inflow)
 Center-of-Mass det. time= 50.0 min (966.2 - 916.2)

Volume	Invert	Avail.Storage	Storage Description
#1	328.20'	108 cf	Custom Stage Data (Irregular) Listed below (Recalc) Inside #2
#2	326.70'	113 cf	Custom Stage Data (Irregular) Listed below (Recalc)
			390 cf Overall - 108 cf Embedded = 282 cf x 40.0% Voids
			221 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
328.20	0	0.0	0	0	0
329.00	71	56.9	19	19	259
329.25	112	76.4	23	42	466
329.70	188	102.0	67	108	832

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
326.70	0	0.0	0	0	0
327.50	71	56.9	19	19	259
327.75	112	76.4	23	42	466
328.20	188	102.0	67	108	832
329.70	188	102.0	282	390	985

Device	Routing	Invert	Outlet Devices
#1	Primary	329.25'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

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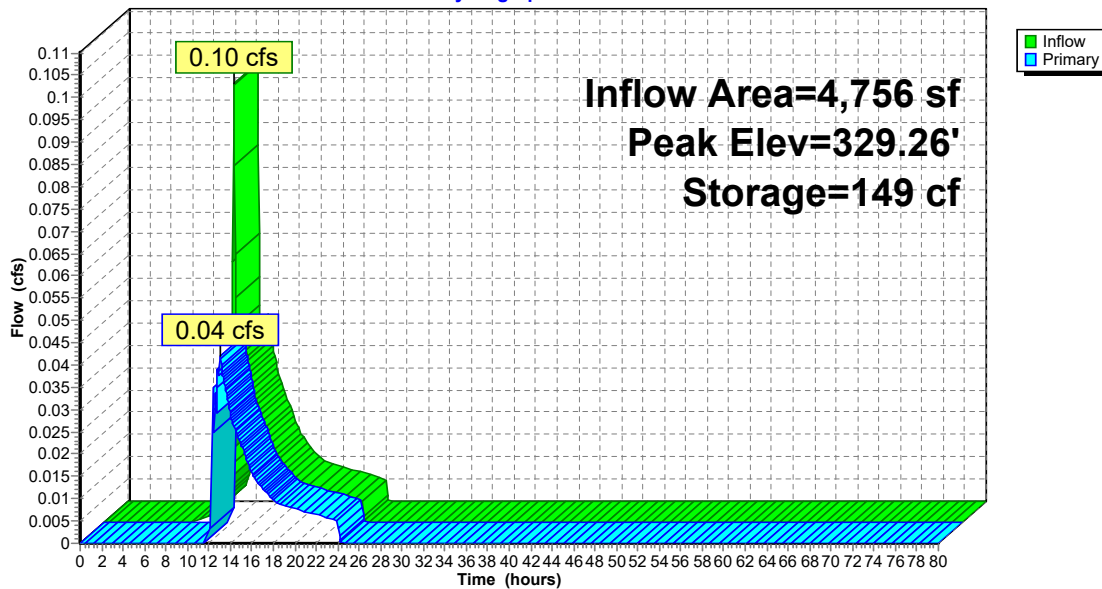
Type III 24-hr 25-Year Rainfall=6.35"

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Primary OutFlow Max=0.02 cfs @ 13.06 hrs HW=329.26' (Free Discharge)
 ↳ Sharp-Crested Rectangular Weir (Weir Controls 0.02 cfs @ 0.34 fps)

Pond S-4: Rip Rap Swale

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Type III 24-hr 25-Year Rainfall=6.35"

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Page 35**Summary for Pond SSD-1: Subsurface Detention Basin-1**

Inflow Area = 71,428 sf, 99.59% Impervious, Inflow Depth = 6.11" for 25-Year event
 Inflow = 9.97 cfs @ 12.09 hrs, Volume= 36,378 cf
 Outflow = 4.35 cfs @ 12.27 hrs, Volume= 34,861 cf, Atten= 56%, Lag= 11.3 min
 Primary = 4.35 cfs @ 12.27 hrs, Volume= 34,861 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 9
 Peak Elev= 324.55' @ 12.27 hrs Surf.Area= 7,434 sf Storage= 13,040 cf

Plug-Flow detention time= 153.8 min calculated for 34,839 cf (96% of inflow)
 Center-of-Mass det. time= 130.5 min (874.8 - 744.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	322.00'	6,586 cf	63.25'W x 117.54'L x 3.50'H Field A 26,020 cf Overall - 9,556 cf Embedded = 16,464 cf x 40.0% Voids
#2A	322.50'	9,556 cf	ADS_StormTech SC-740 +Cap x 208 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 208 Chambers in 13 Rows
		16,141 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	322.50'	15.0" Round Culvert L= 21.3' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 322.50' / 322.00' S= 0.0235 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	325.25'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#3	Device 1	324.25'	6.0" Vert. Orifice/Grate C= 0.600
#4	Device 1	323.50'	8.0" Vert. Orifice/Grate X 2.00 C= 0.600
#5	Device 1	322.50'	6.0" Vert. Orifice/Grate C= 0.600

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Primary OutFlow Max=4.33 cfs @ 12.27 hrs HW=324.55' (Free Discharge)

- 1=Culvert (Passes 4.33 cfs of 7.05 cfs potential flow)
- 2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)
- 3=Orifice/Grate (Orifice Controls 0.23 cfs @ 1.86 fps)
- 4=Orifice/Grate (Orifice Controls 2.84 cfs @ 4.07 fps)
- 5=Orifice/Grate (Orifice Controls 1.27 cfs @ 6.46 fps)

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Pond SSD-1: Subsurface Detention Basin-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

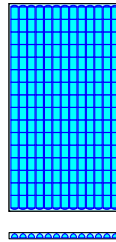
16 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 115.54' Row Length +12.0" End Stone x 2 = 117.54' Base Length
13 Rows x 51.0" Wide + 6.0" Spacing x 12 + 12.0" Side Stone x 2 = 63.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

208 Chambers x 45.9 cf = 9,555.5 cf Chamber Storage

26,019.7 cf Field - 9,555.5 cf Chambers = 16,464.2 cf Stone x 40.0% Voids = 6,585.7 cf Stone Storage

Chamber Storage + Stone Storage = 16,141.2 cf = 0.371 af
Overall Storage Efficiency = 62.0%
Overall System Size = 117.54' x 63.25' x 3.50'

208 Chambers
963.7 cy Field
609.8 cy Stone



Proposed-6

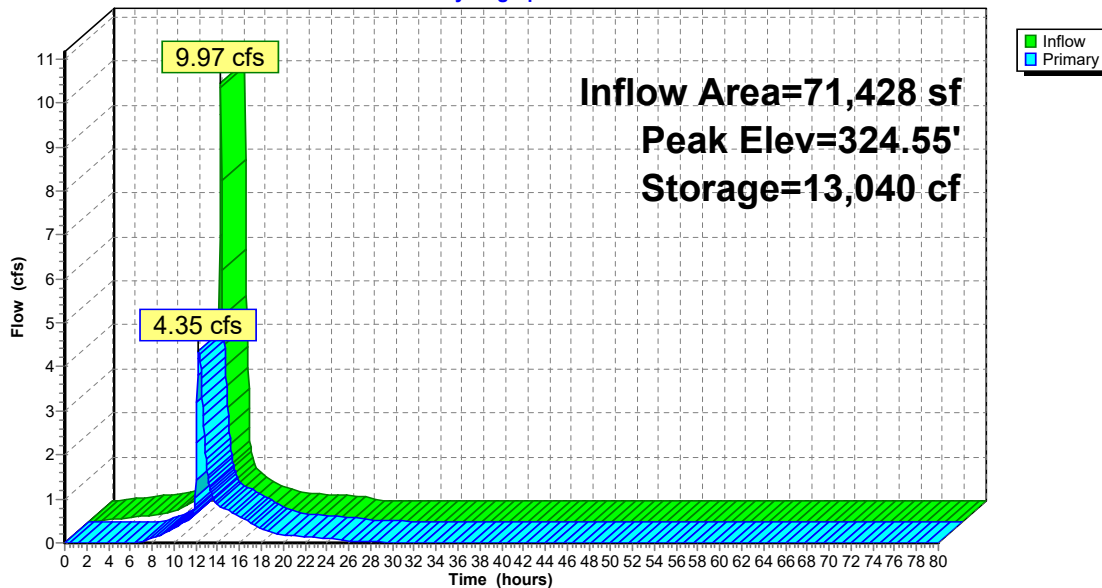
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Pond SSD-1: Subsurface Detention Basin-1

Hydrograph



HydroCAD Analysis
Proposed Conditions - 100 Year Storm

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Page 1**Area Listing (all nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
18,555	79	50-75% Grass cover, Fair, HSG C (P-1, P-1a, P-1b, P-1c, P-1d, P-1e, P-1f, P-2, P-3)
80,078	98	Paved parking (P-1a, P-1b, P-2)
1,396	66	Rip Rap Swale (P-1c, P-1d, P-1e, P-1f)
5,338	70	Woods, Good, HSG C (P-1, P-1c, P-1d, P-1e, P-1f, P-3)
105,367	93	TOTAL AREA

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Page 2**Soil Listing (all nodes)**

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
23,893	HSG C	P-1, P-1a, P-1b, P-1c, P-1d, P-1e, P-1f, P-2, P-3
0	HSG D	
81,474	Other	P-1a, P-1b, P-1c, P-1d, P-1e, P-1f, P-2
105,367		TOTAL AREA

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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	18,555	0	0	18,555	50-75% Grass cover, Fair	P-1, P-1a, P-1b, P-1c, P-1d, P-1e, P-1f, P-2, P-3
0	0	0	0	80,078	80,078	Paved parking	P-1a, P-1b, P-2
0	0	0	0	1,396	1,396	Rip Rap Swale	P-1c, P-1d, P-1e, P-1f
0	0	5,338	0	0	5,338	Woods, Good	P-1, P-1c, P-1d, P-1e, P-1f, P-3
0	0	23,893	0	81,474	105,367	TOTAL AREA	

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	SSD-1	322.50	322.00	21.3	0.0235	0.013	15.0	0.0	0.0

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Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: Flow to Existing Basin	Runoff Area=18,417 sf 0.00% Impervious Runoff Depth=5.42" Flow Length=461' Tc=10.0 min CN=77 Runoff=2.30 cfs 8,320 cf
Subcatchment P-1a: Flow to SSI-1	Runoff Area=71,428 sf 99.59% Impervious Runoff Depth=7.92" Tc=6.0 min CN=98 Runoff=12.83 cfs 47,143 cf
Subcatchment P-1b: Flow to Treatment Unit	Runoff Area=3,571 sf 87.17% Impervious Runoff Depth=7.68" Tc=6.0 min CN=96 Runoff=0.64 cfs 2,286 cf
Subcatchment P-1c: Flow to Swale	Runoff Area=1,317 sf 0.00% Impervious Runoff Depth=4.84" Tc=6.0 min CN=72 Runoff=0.17 cfs 531 cf
Subcatchment P-1d: Flow to Swale	Runoff Area=1,184 sf 0.00% Impervious Runoff Depth=5.07" Tc=6.0 min CN=74 Runoff=0.16 cfs 500 cf
Subcatchment P-1e: Flow to Swale	Runoff Area=1,184 sf 0.00% Impervious Runoff Depth=5.19" Tc=6.0 min CN=75 Runoff=0.16 cfs 512 cf
Subcatchment P-1f: Flow to Swale	Runoff Area=1,071 sf 0.00% Impervious Runoff Depth=5.07" Tc=6.0 min CN=74 Runoff=0.14 cfs 452 cf
Subcatchment P-2: Flow onsite Southeast	Runoff Area=6,213 sf 93.87% Impervious Runoff Depth=7.80" Tc=6.0 min CN=97 Runoff=1.11 cfs 4,039 cf
Subcatchment P-3: Flow off-site West	Runoff Area=982 sf 0.00% Impervious Runoff Depth=5.66" Tc=6.0 min CN=79 Runoff=0.14 cfs 463 cf
Reach DP-1: Basin	Inflow=8.86 cfs 57,484 cf Outflow=8.86 cfs 57,484 cf
Reach DP-2: Onsite southeast	Inflow=1.11 cfs 4,039 cf Outflow=1.11 cfs 4,039 cf

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Reach DP-3: Off-site West	Inflow=0.14 cfs 463 cf Outflow=0.14 cfs 463 cf
Pond S-1: Rip Rap Swale	Peak Elev=334.07' Storage=219 cf Inflow=0.17 cfs 531 cf Outflow=0.09 cfs 319 cf
Pond S-2: Rip Rap Swale	Peak Elev=332.54' Storage=205 cf Inflow=0.18 cfs 819 cf Outflow=0.17 cfs 619 cf
Pond S-3: Rip Rap Swale	Peak Elev=331.05' Storage=203 cf Inflow=0.27 cfs 1,131 cf Outflow=0.25 cfs 940 cf
Pond S-4: Rip Rap Swale	Peak Elev=329.31' Storage=156 cf Inflow=0.34 cfs 1,392 cf Outflow=0.32 cfs 1,248 cf
Pond SSD-1: Subsurface Detention Basin-1	Peak Elev=325.21' Storage=15,266 cf Inflow=12.83 cfs 47,143 cf Outflow=6.21 cfs 45,629 cf

Total Runoff Area = 105,367 sf Runoff Volume = 64,245 cf Average Runoff Depth = 7.32"
24.00% Pervious = 25,289 sf 76.00% Impervious = 80,078 sf

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Summary for Subcatchment P-1: Flow to Existing Basin

Runoff = 2.30 cfs @ 12.14 hrs, Volume= 8,320 cf, Depth= 5.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
4,454	70	Woods, Good, HSG C
13,963	79	50-75% Grass cover, Fair, HSG C
18,417	77	Weighted Average
18,417		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0800	0.11		Sheet Flow, Sheet Flow Woods: Light underbrush n= 0.400 P2= 3.05"
2.7	411	0.0240	2.49		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
10.0	461	Total			

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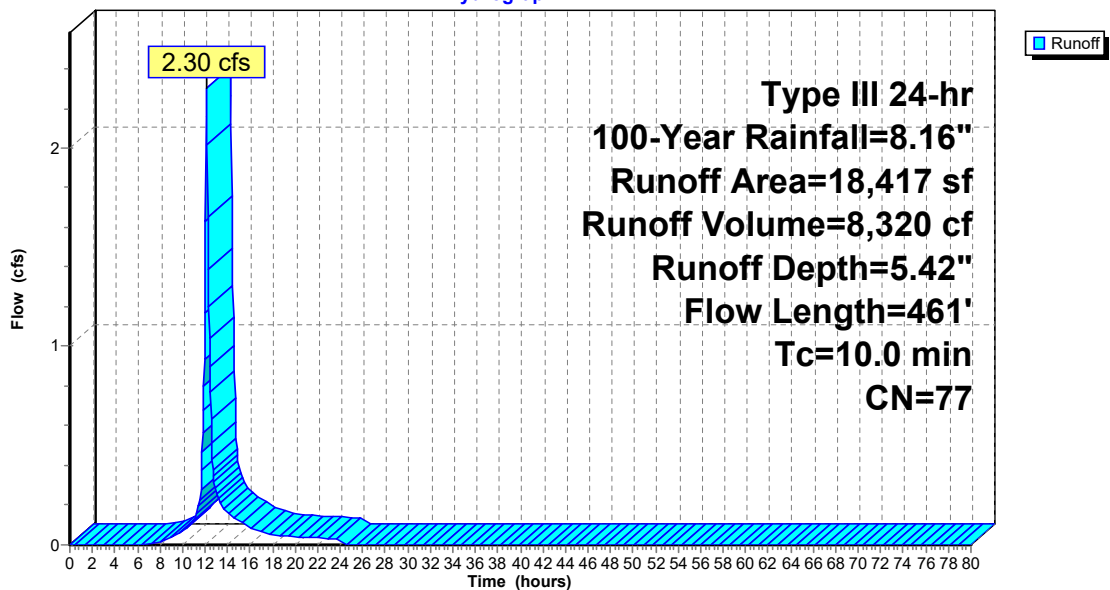
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Subcatchment P-1: Flow to Existing Basin

Hydrograph



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Summary for Subcatchment P-1a: Flow to SSI-1

Runoff = 12.83 cfs @ 12.09 hrs, Volume= 47,143 cf, Depth= 7.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
* 71,133	98	Paved parking
295	79	50-75% Grass cover, Fair, HSG C
71,428	98	Weighted Average
295		0.41% Pervious Area
71,133		99.59% Impervious Area

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

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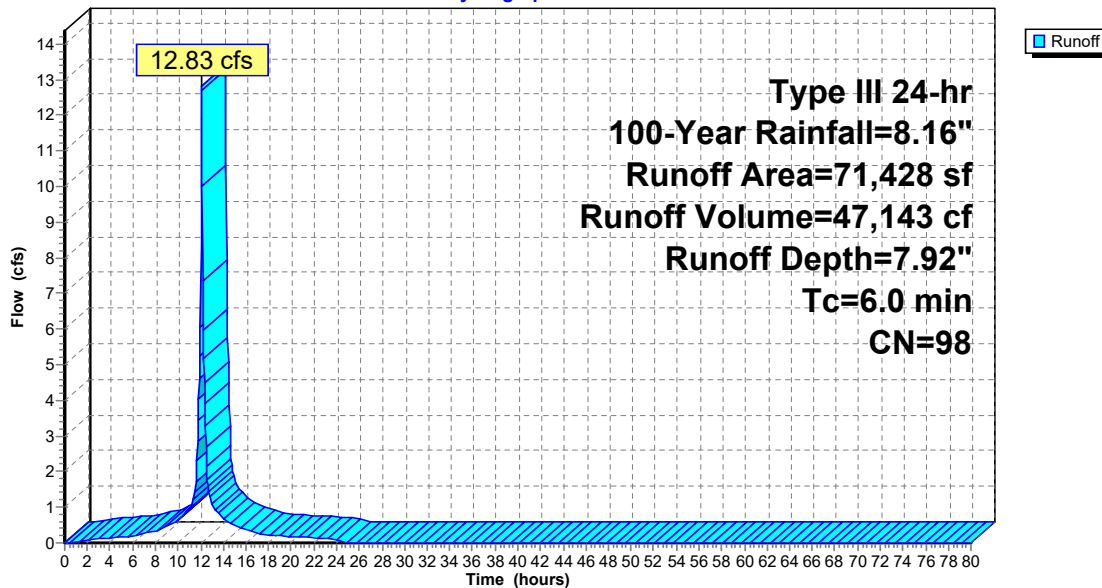
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Subcatchment P-1a: Flow to SSI-1

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Summary for Subcatchment P-1b: Flow to Treatment Unit

Runoff = 0.64 cfs @ 12.09 hrs, Volume= 2,286 cf, Depth= 7.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
3,113	98	Paved parking
458	79	50-75% Grass cover, Fair, HSG C
3,571	96	Weighted Average
458		12.83% Pervious Area
3,113		87.17% Impervious Area

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

Proposed-6

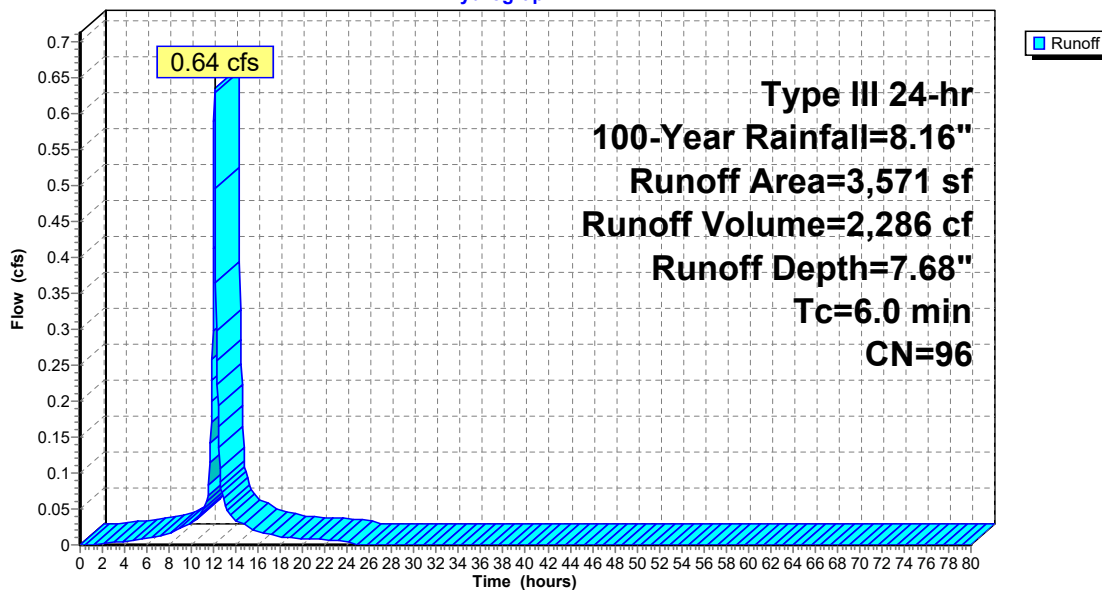
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Subcatchment P-1b: Flow to Treatment Unit

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Summary for Subcatchment P-1c: Fllow to Swale

Runoff = 0.17 cfs @ 12.09 hrs, Volume= 531 cf, Depth= 4.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
* 339	66	Rip Rap Swale
476	70	Woods, Good, HSG C
502	79	50-75% Grass cover, Fair, HSG C
1,317	72	Weighted Average
1,317		100.00% Pervious Area

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

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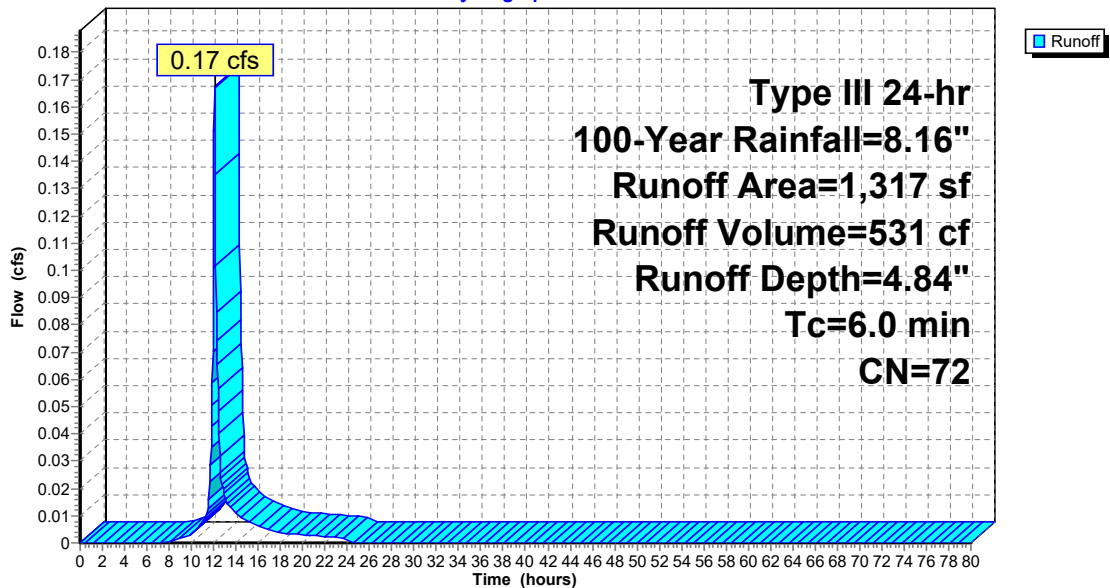
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Subcatchment P-1c: Fllow to Swale

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Summary for Subcatchment P-1d: Fllow to Swale

Runoff = 0.16 cfs @ 12.09 hrs, Volume= 500 cf, Depth= 5.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
* 350	66	Rip Rap Swale
216	70	Woods, Good, HSG C
618	79	50-75% Grass cover, Fair, HSG C
1,184	74	Weighted Average
1,184		100.00% Pervious Area

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

Proposed-6

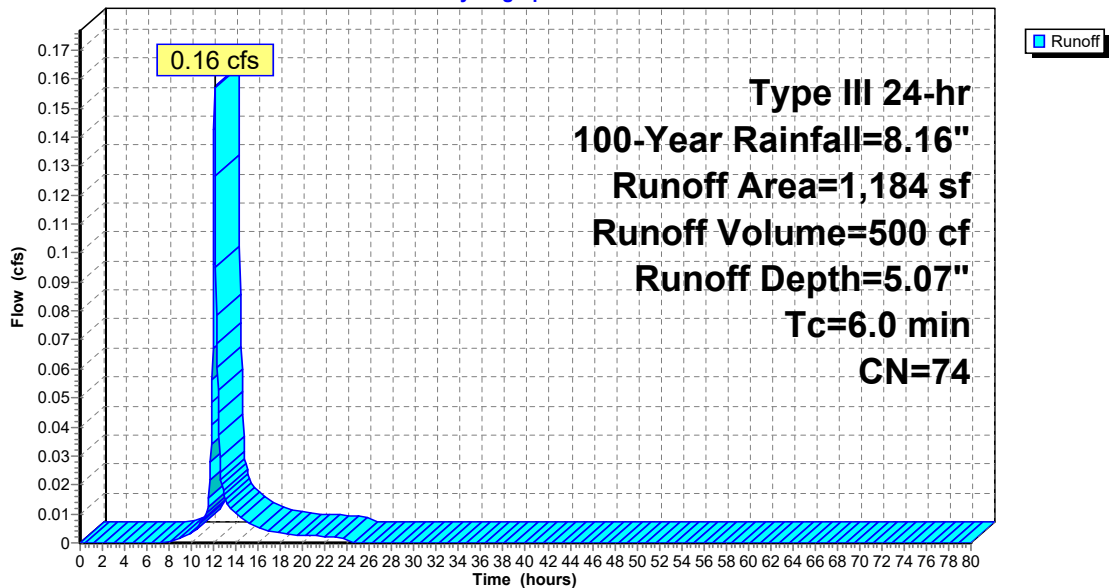
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Subcatchment P-1d: Fllow to Swale

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Summary for Subcatchment P-1e: Fllow to Swale

Runoff = 0.16 cfs @ 12.09 hrs, Volume= 512 cf, Depth= 5.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
* 350	66	Rip Rap Swale
58	70	Woods, Good, HSG C
776	79	50-75% Grass cover, Fair, HSG C
1,184	75	Weighted Average
1,184		100.00% Pervious Area

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

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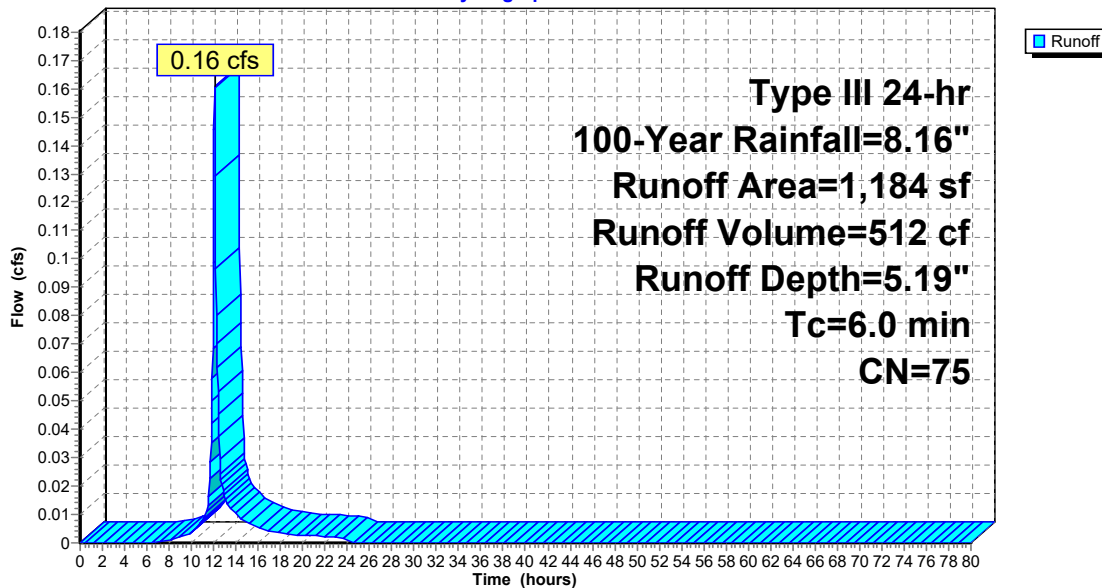
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Subcatchment P-1e: Fllow to Swale

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Summary for Subcatchment P-1f: Filow to Swale

Runoff = 0.14 cfs @ 12.09 hrs, Volume= 452 cf, Depth= 5.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
*	357	66 Rip Rap Swale
	124	70 Woods, Good, HSG C
	590	79 50-75% Grass cover, Fair, HSG C
1,071	74	Weighted Average
1,071		100.00% Pervious Area

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

Proposed-6

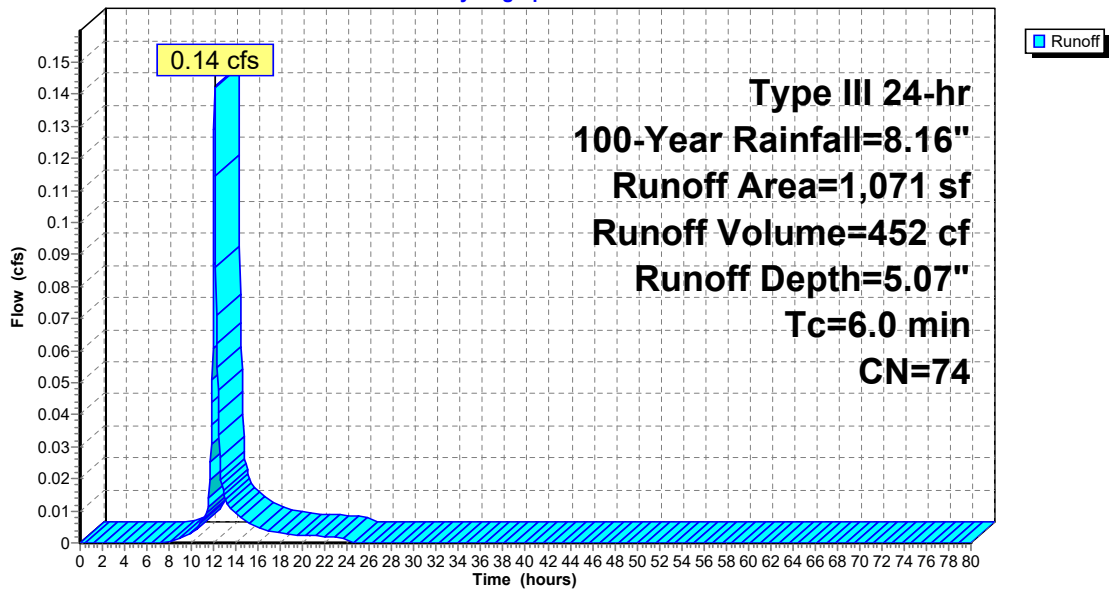
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Subcatchment P-1f: Filow to Swale

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Summary for Subcatchment P-2: Flow onsite Southeast

Runoff = 1.11 cfs @ 12.09 hrs, Volume= 4,039 cf, Depth= 7.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
5,832	98	Paved parking
381	79	50-75% Grass cover, Fair, HSG C
6,213	97	Weighted Average
381		6.13% Pervious Area
5,832		93.87% Impervious Area

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

Proposed-6

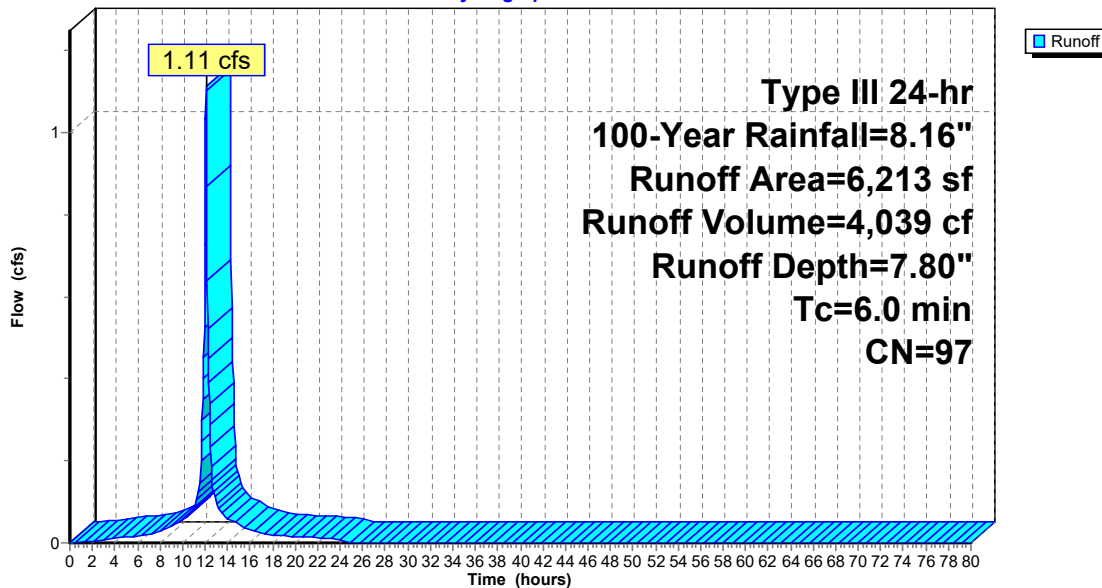
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Subcatchment P-2: Flow onsite Southeast

Hydrograph



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Summary for Subcatchment P-3: Flow off-site West

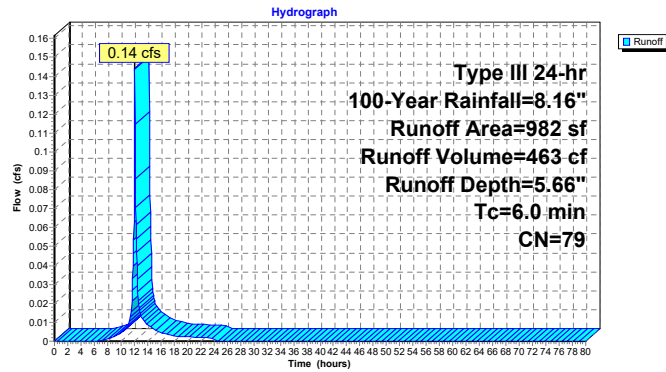
Runoff = 0.14 cfs @ 12.09 hrs, Volume= 463 cf, Depth= 5.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=8.16"

Area (sf)	CN	Description
10	70	Woods, Good, HSG C
972	79	50-75% Grass cover, Fair, HSG C
982	79	Weighted Average
982		100.00% Pervious Area

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

Subcatchment P-3: Flow off-site West



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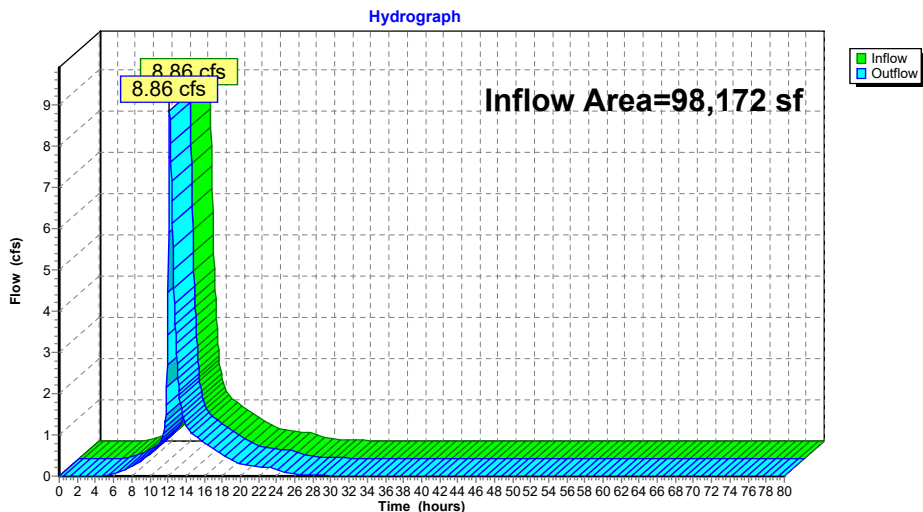
Summary for Reach DP-1: Basin

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

Inflow Area = 98,172 sf, 75.63% Impervious, Inflow Depth = 7.03" for 100-Year event
 Inflow = 8.86 cfs @ 12.18 hrs, Volume= 57,484 cf
 Outflow = 8.86 cfs @ 12.18 hrs, Volume= 57,484 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-1: Basin



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Summary for Reach DP-2: Onsite southeast

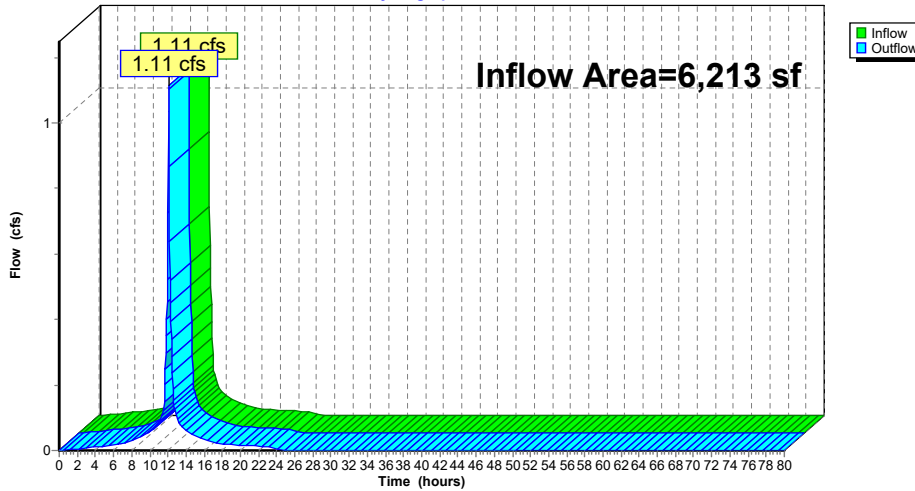
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6,213 sf, 93.87% Impervious, Inflow Depth = 7.80" for 100-Year event
Inflow = 1.11 cfs @ 12.09 hrs, Volume= 4,039 cf
Outflow = 1.11 cfs @ 12.09 hrs, Volume= 4,039 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-2: Onsite southeast

Hydrograph



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Summary for Reach DP-3: Off-site West

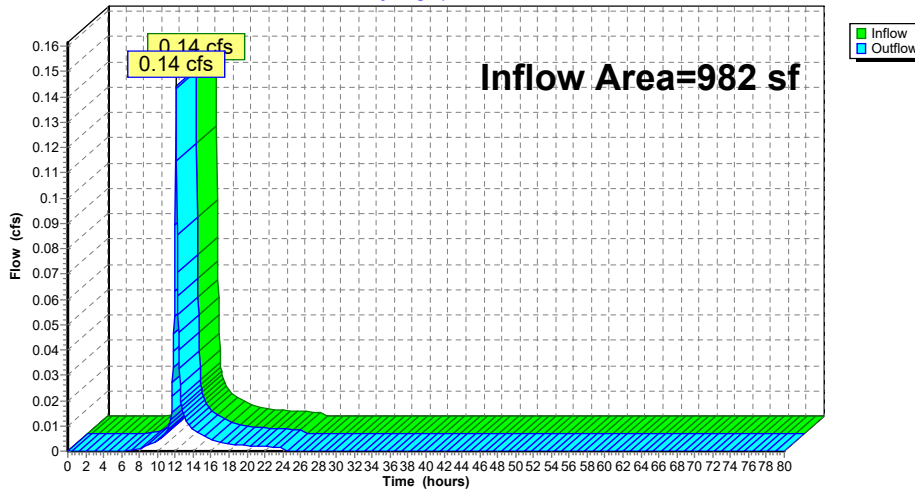
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 982 sf, 0.00% Impervious, Inflow Depth = 5.66" for 100-Year event
Inflow = 0.14 cfs @ 12.09 hrs, Volume= 463 cf
Outflow = 0.14 cfs @ 12.09 hrs, Volume= 463 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Reach DP-3: Off-site West

Hydrograph



Proposed-6

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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Pond S-1: Rip Rap Swale

Inflow Area = 1,317 sf, 0.00% Impervious, Inflow Depth = 4.84" for 100-Year event
 Inflow = 0.17 cfs @ 12.09 hrs, Volume= 531 cf
 Outflow = 0.09 cfs @ 12.25 hrs, Volume= 319 cf, Atten= 48%, Lag= 9.4 min
 Primary = 0.09 cfs @ 12.25 hrs, Volume= 319 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
 Peak Elev= 334.07' @ 12.25 hrs Surf.Area= 200 sf Storage= 219 cf

Plug-Flow detention time= 188.5 min calculated for 319 cf (60% of inflow)
 Center-of-Mass det. time= 82.2 min (901.9 - 819.7)

Volume	Invert	Avail.Storage	Storage Description
#1	331.15'	120 cf	Custom Stage Data (Irregular) Listed below (Recalc) 414 cf Overall - 114 cf Embedded = 300 cf x 40.0% Voids
#2	332.65'	114 cf	Custom Stage Data (Irregular) Listed below (Recalc) Inside #1
			234 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
331.15	0	0.0	0	0	0
331.50	21	27.2	2	2	59
332.50	171	99.3	84	86	788
332.65	200	104.4	28	114	872
334.15	200	104.4	300	414	1,028

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
332.65	0	0.0	0	0	0
333.00	21	27.2	2	2	59
334.00	171	99.3	84	86	788
334.15	200	104.4	28	114	872

Device	Routing	Invert	Outlet Devices
#1	Primary	334.05'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Proposed-6

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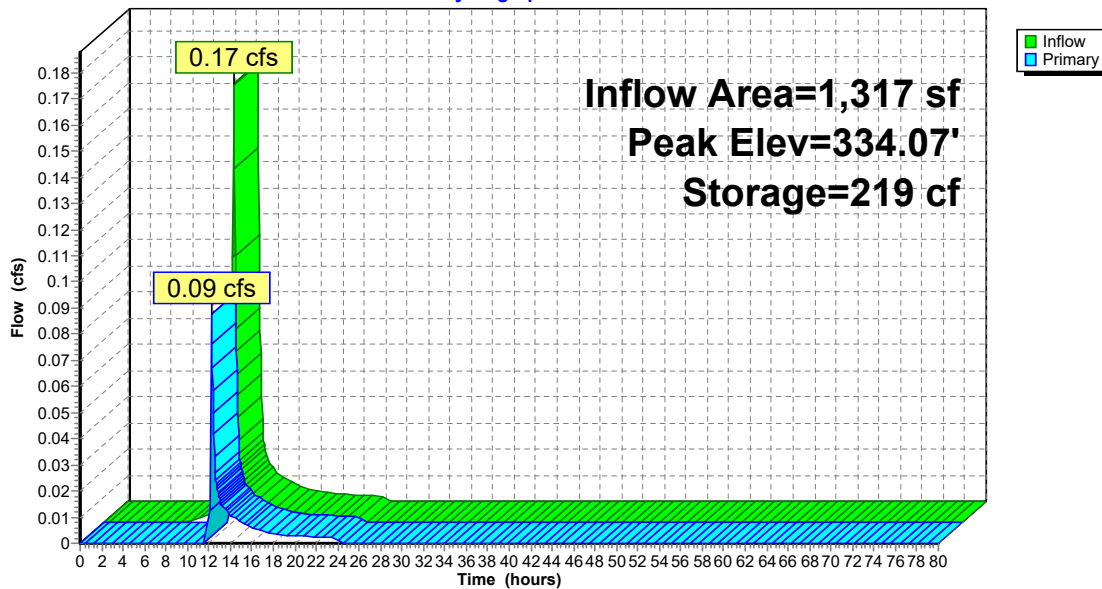
Type III 24-hr 100-Year Rainfall=8.16"

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Primary OutFlow Max=0.08 cfs @ 12.25 hrs HW=334.07' (Free Discharge)
 ↳ Sharp-Crested Rectangular Weir (Weir Controls 0.08 cfs @ 0.49 fps)

Pond S-1: Rip Rap Swale

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Pond S-2: Rip Rap Swale

Inflow Area = 2,501 sf, 0.00% Impervious, Inflow Depth = 3.93" for 100-Year event
 Inflow = 0.18 cfs @ 12.22 hrs, Volume= 819 cf
 Outflow = 0.17 cfs @ 12.23 hrs, Volume= 619 cf, Atten= 4%, Lag= 0.7 min
 Primary = 0.17 cfs @ 12.23 hrs, Volume= 619 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
 Peak Elev= 332.54' @ 12.23 hrs Surf.Area= 200 sf Storage= 205 cf

Plug-Flow detention time= 142.4 min calculated for 619 cf (76% of inflow)
 Center-of-Mass det. time= 51.0 min (900.2 - 849.2)

Volume	Invert	Avail.Storage	Storage Description
#1	329.65'	120 cf	Custom Stage Data (Irregular) Listed below (Recalc) 407 cf Overall - 107 cf Embedded = 300 cf x 40.0% Voids
#2	331.15'	107 cf	Custom Stage Data (Irregular) Listed below (Recalc) Inside #1
			227 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
329.65	0	0.0	0	0	0
330.50	74	61.1	21	21	298
331.15	200	104.5	86	107	873
332.65	200	104.5	300	407	1,029

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
331.15	0	0.0	0	0	0
332.00	74	61.1	21	21	298
332.65	200	104.5	86	107	873

Device	Routing	Invert	Outlet Devices
#1	Primary	332.50'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Proposed-6

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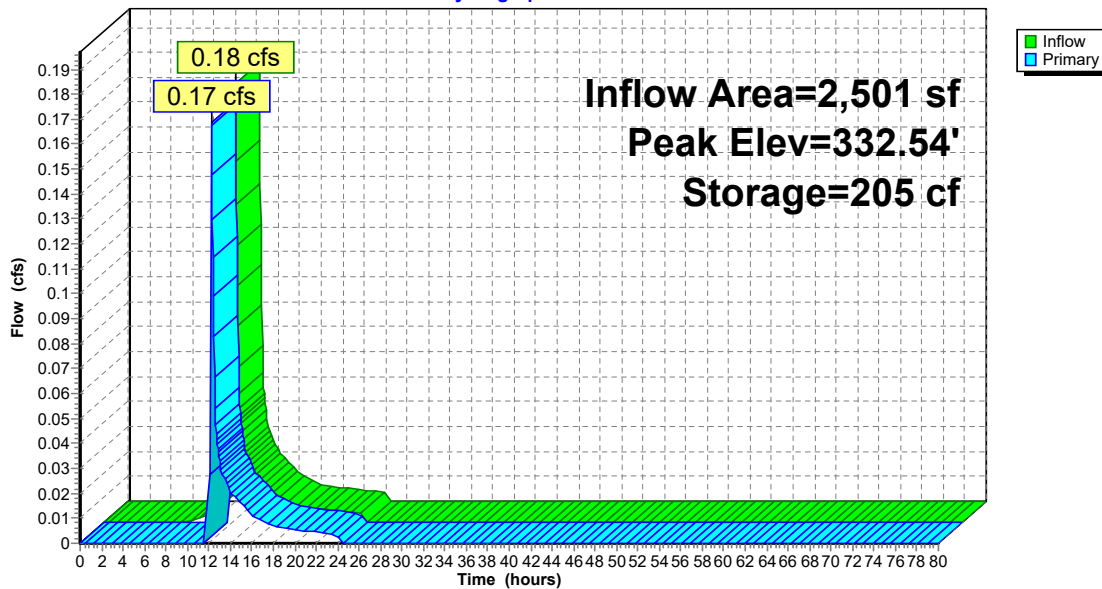
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Primary OutFlow Max=0.16 cfs @ 12.23 hrs HW=332.54' (Free Discharge)
 ↳ Sharp-Crested Rectangular Weir (Weir Controls 0.16 cfs @ 0.63 fps)

Pond S-2: Rip Rap Swale

Hydrograph



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Type III 24-hr 100-Year Rainfall=8.16"

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Summary for Pond S-3: Rip Rap Swale

Inflow Area = 3,685 sf, 0.00% Impervious, Inflow Depth = 3.68" for 100-Year event
 Inflow = 0.27 cfs @ 12.22 hrs, Volume= 1,131 cf
 Outflow = 0.25 cfs @ 12.24 hrs, Volume= 940 cf, Atten= 8%, Lag= 1.0 min
 Primary = 0.25 cfs @ 12.24 hrs, Volume= 940 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
 Peak Elev= 331.05' @ 12.24 hrs Surf.Area= 200 sf Storage= 203 cf

Plug-Flow detention time= 108.5 min calculated for 940 cf (83% of inflow)
 Center-of-Mass det. time= 35.7 min (896.6 - 860.9)

Volume	Invert	Avail.Storage	Storage Description
#1	329.70'	112 cf	Custom Stage Data (Irregular) Listed below (Recalc) Inside #2
#2	328.20'	120 cf	Custom Stage Data (Irregular) Listed below (Recalc)
			412 cf Overall - 112 cf Embedded = 300 cf x 40.0% Voids
			232 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
329.70	0	0.0	0	0	0
330.00	16	23.0	2	2	42
331.00	158	95.1	75	76	722
331.20	200	104.5	36	112	873

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
328.20	0	0.0	0	0	0
328.50	16	23.0	2	2	42
329.50	158	95.1	75	76	722
329.70	200	104.5	36	112	873
331.20	200	104.5	300	412	1,030

Device	Routing	Invert	Outlet Devices
#1	Primary	331.00'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

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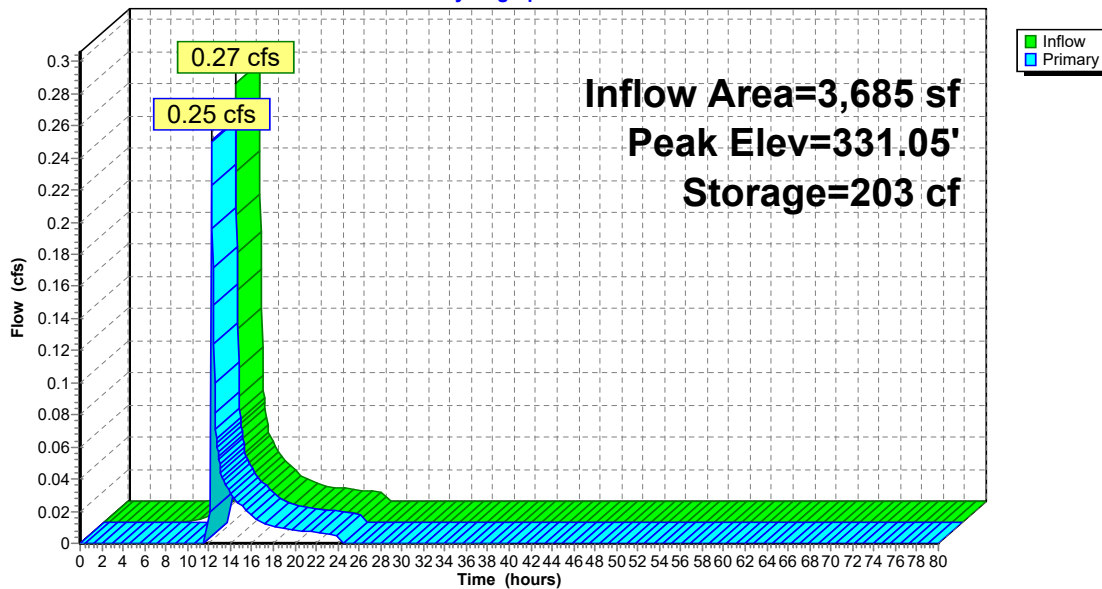
Type III 24-hr 100-Year Rainfall=8.16"

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Primary OutFlow Max=0.25 cfs @ 12.24 hrs HW=331.05' (Free Discharge)
 ↳ Sharp-Crested Rectangular Weir (Weir Controls 0.25 cfs @ 0.72 fps)

Pond S-3: Rip Rap Swale

Hydrograph



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Summary for Pond S-4: Rip Rap Swale

Inflow Area = 4,756 sf, 0.00% Impervious, Inflow Depth = 3.51" for 100-Year event
 Inflow = 0.34 cfs @ 12.22 hrs, Volume= 1,392 cf
 Outflow = 0.32 cfs @ 12.23 hrs, Volume= 1,248 cf, Atten= 5%, Lag= 0.7 min
 Primary = 0.32 cfs @ 12.23 hrs, Volume= 1,248 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 6
 Peak Elev= 329.31' @ 12.23 hrs Surf.Area= 188 sf Storage= 156 cf

Plug-Flow detention time= 72.3 min calculated for 1,248 cf (90% of inflow)
 Center-of-Mass det. time= 21.9 min (892.2 - 870.3)

Volume	Invert	Avail.Storage	Storage Description
#1	328.20'	108 cf	Custom Stage Data (Irregular) Listed below (Recalc) Inside #2
#2	326.70'	113 cf	Custom Stage Data (Irregular) Listed below (Recalc)
			390 cf Overall - 108 cf Embedded = 282 cf x 40.0% Voids
			221 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
328.20	0	0.0	0	0	0
329.00	71	56.9	19	19	259
329.25	112	76.4	23	42	466
329.70	188	102.0	67	108	832

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
326.70	0	0.0	0	0	0
327.50	71	56.9	19	19	259
327.75	112	76.4	23	42	466
328.20	188	102.0	67	108	832
329.70	188	102.0	282	390	985

Device	Routing	Invert	Outlet Devices
#1	Primary	329.25'	7.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Proposed-6

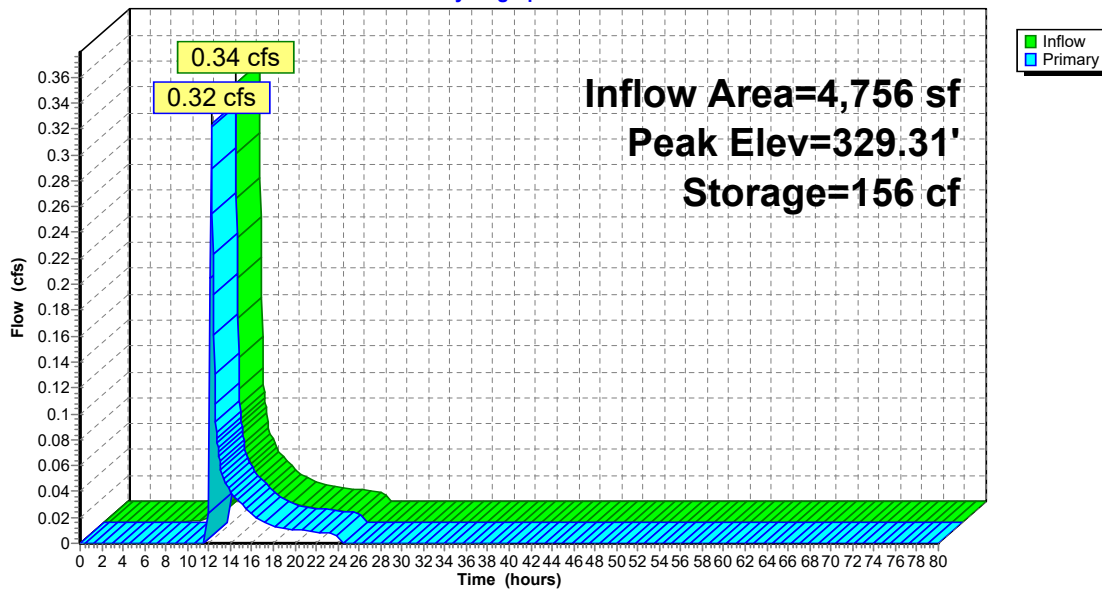
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Primary OutFlow Max=0.32 cfs @ 12.23 hrs HW=329.31' (Free Discharge)
 ↳ Sharp-Crested Rectangular Weir (Weir Controls 0.32 cfs @ 0.79 fps)

Pond S-4: Rip Rap Swale
Hydrograph



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Summary for Pond SSD-1: Subsurface Detention Basin-1

Inflow Area = 71,428 sf, 99.59% Impervious, Inflow Depth = 7.92" for 100-Year event
 Inflow = 12.83 cfs @ 12.09 hrs, Volume= 47,143 cf
 Outflow = 6.21 cfs @ 12.25 hrs, Volume= 45,629 cf, Atten= 52%, Lag= 9.6 min
 Primary = 6.21 cfs @ 12.25 hrs, Volume= 45,629 cf

Routing by Stor-Ind method, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs / 9
 Peak Elev= 325.21' @ 12.25 hrs Surf.Area= 7,434 sf Storage= 15,266 cf

Plug-Flow detention time= 135.8 min calculated for 45,629 cf (97% of inflow)
 Center-of-Mass det. time= 115.6 min (856.6 - 741.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	322.00'	6,586 cf	63.25'W x 117.54'L x 3.50'H Field A 26,020 cf Overall - 9,556 cf Embedded = 16,464 cf x 40.0% Voids
#2A	322.50'	9,556 cf	ADS_StormTech SC-740 +Cap x 208 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 208 Chambers in 13 Rows
		16,141 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	322.50'	15.0" Round Culvert L= 21.3' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 322.50' / 322.00' S= 0.0235 '/ S= 0.0235 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	325.25'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#3	Device 1	324.25'	6.0" Vert. Orifice/Grate C= 0.600
#4	Device 1	323.50'	8.0" Vert. Orifice/Grate X 2.00 C= 0.600
#5	Device 1	322.50'	6.0" Vert. Orifice/Grate C= 0.600

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Primary OutFlow Max=6.21 cfs @ 12.25 hrs HW=325.20' (Free Discharge)

- 1=Culvert (Passes 6.21 cfs of 8.52 cfs potential flow)
- 2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)
- 3=Orifice/Grate (Orifice Controls 0.79 cfs @ 4.04 fps)
- 4=Orifice/Grate (Orifice Controls 3.94 cfs @ 5.64 fps)
- 5=Orifice/Grate (Orifice Controls 1.48 cfs @ 7.54 fps)

Proposed-6

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Pond SSD-1: Subsurface Detention Basin-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

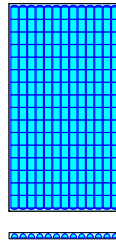
16 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 115.54' Row Length +12.0" End Stone x 2 = 117.54' Base Length
13 Rows x 51.0" Wide + 6.0" Spacing x 12 + 12.0" Side Stone x 2 = 63.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

208 Chambers x 45.9 cf = 9,555.5 cf Chamber Storage

26,019.7 cf Field - 9,555.5 cf Chambers = 16,464.2 cf Stone x 40.0% Voids = 6,585.7 cf Stone Storage

Chamber Storage + Stone Storage = 16,141.2 cf = 0.371 af
Overall Storage Efficiency = 62.0%
Overall System Size = 117.54' x 63.25' x 3.50'

208 Chambers
963.7 cy Field
609.8 cy Stone



Proposed-6

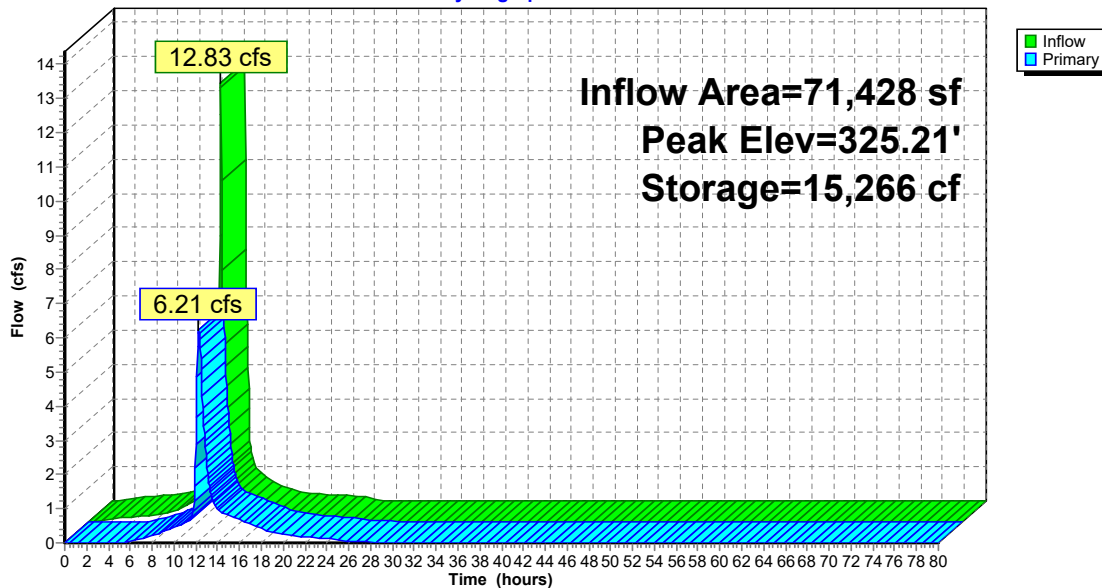
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Pond SSD-1: Subsurface Detention Basin-1

Hydrograph



Operation and Maintenance Plan



OPERATION AND MAINTENANCE PLAN
FOR
15 LIBERTY WAY
FRANKLIN, MA

DATED: JANUARY 17, 2023

Prepared By:
Level Design Group, L.L.C.
249 South Street, Unit 1
Plainville, MA 02762

Prepared For:
Oliver Street Capital
125 High Street, Suite 220
Boston, MA 02110

LDG Project No.:
2081.00

The proposed Stormwater Management System is designed to function properly provided that routine maintenance is performed. It is the responsibility during construction and until purchase of the units and turnover of the project to a Home Owners Association to be formed, that the Owner and Developer, Oliver Street Capital, shall be responsible for the long-term maintenance and to provide the required maintenance outlined in this plan for the site infiltration systems as well as the remainder of the on-site storm drainage system.

Upon completion of construction and the formation of the Home Owners Association, maintenance of driveways and the stormwater appurtenances required to ensure that sedimentation and pollution is controlled and that storm water detention and infiltration capacity is sustained are the on-going responsibility of the Home Owners Association. To ensure the proper functioning of these facilities the following maintenance practices will be used:

DRIVEWAYS AND PARKING AREAS

Spring Maintenance

Driveways and Parking Areas are to be swept monthly to remove sand which has accumulated. Sand shall be removed from the site and legally disposed of.

Summer & Fall Maintenance

Leaves and debris which accumulates within the Driveways and Parking Areas during the summer and fall shall be collected and legally disposed of.

Winter Maintenance & Snow Removal

Snow removal within Driveways and Parking Area shall be stockpiled in the designated Snow Stockpile Areas outside of the traveled driveways. These areas should be located within or adjacent to the parking surface and should drain to the stormwater management system. Under no circumstances shall snow be directed onto abutting parcels or into the on-site resource areas (wetlands, wetland buffer zone, and riverfront areas).

Estimated Yearly Cost \$1,000.00 (not including cost for snow plowing)

DEEP SUMP CATCH BASINS

Catch basins shall be inspected and cleaned four times per year or when the sumps are 50% full.

Spring Maintenance

Catch basins require the removal of sediment each spring. This procedure is comprised of removing the catch basin grate followed by removal of sediment trapped in the structure with a clamshell shovel. The outlet pipe from the catch basin shall be inspected and any obstructions are to be removed. The sediment and debris removed from the catch basin shall be legally disposed of.

Fall Maintenance

Catch basin grates shall be cleared of leaves and debris so they may function properly.

Estimated Yearly Cost \$2,000.00

SUBSURFACE DETENTION BASIN

Spring Maintenance

The subsurface detention basin requires monthly inspections for accumulations of settled solids. If these materials have accumulated to a point where removal is necessary this shall be completed immediately. Accumulated trash and debris shall also be removed and legally disposed of during the monthly inspections.

Estimated Yearly Cost \$500.00

PUBLIC SAFETY FEATURES

Many of the Public Safety Features of the Stormwater Management System are incorporated into its design. The Infiltration basin was designed to minimize its depth to 2-feet deep. This combined with sediment forebay being approximately 1-foot deep provide for a safe and effective system.

Despite all the well-designed safety features within the Stormwater Management System all components of the system must be properly maintained to be effective. All maintenance procedures detailed above must be done on schedule and documented. Standing or stagnant water provides mosquito-breeding habitat and increases the potential for disease transmission. The basin is designed to fully infiltrate within 72 hours after a storm even which will prevent standing water from becoming a safety hazard. Routine monitoring for and management of mosquito-breeding conditions by qualified maintenance staff is required during the peak breeding season between April and September ensure that unforeseen conditions do not develop.

While risks can be mitigated through proper design and maintenance, it is impossible to entirely eliminate risk. Therefore, education regarding stormwater management facilities and their inherent risks is valuable and should be a part of every community's activity. Employees and tenants of the Facility shall be given an overview of the Stormwater System and which areas to avoid. Public participation also increases the level of maintenance as community members can notify staff if a component of the stormwater system is not functioning properly.

The O&M shall be recorded with the Home Owners Agreement or other approving maintenance agreement to properly notify future owners of maintenance requirements.

STORMWATER MANAGEMENT OPERATIONS AND MAINTENANCE LOG

It is the responsibility of the owner and developer, Oliver Street Capital, to provide the maintenance of the Stormwater Management System Maintenance in accordance with the Town of Franklin Stormwater Management Standards until such time as an entity is created for overall site management at which time the agreement will spell out responsibility with appropriate contact information for all parties. The log form below is a template and shall be reproduced as needed. Copies of all log forms shall be kept on file for a minimum of three years from the date of inspection.

Name of Inspector:
Date and Time of Inspection:
Weather Conditions:

Stormwater BMP	Observations	Action Required

Long Term Pollution Prevention Plan



LONG TERM POLLUTION PREVENTION PLAN
FOR
15 LIBERTY WAY
FRANKLIN, MA

DATED: JANUARY 13, 2023

Prepared By:
Level Design Group, L.L.C.
249 South Street, Unit 1
Plainville, MA 02762

Prepared For:
Oliver Street Capital
125 High Street, Suite 220
Boston, MA 02110

LDG Project No.:
2081.00

GOOD HOUSEKEEPING PRACTICES

It is the responsibility of the developer, Oliver Street Capital, to provide for maintenance of the parking areas and the storm drainage system until the site is turned over to the condominium association which will be created prior to the sale of any units. The Owner shall utilize good housekeeping practices as outlined in the Operation and Maintenance Plan required for the maintenance of the Stormwater Management System.

PROVISIONS FOR STORAGE OF MATERIALS AND WASTE PRODUCTS INSIDE OR UNDER COVER

The storage of hazardous materials and waste is prohibited from being stored outdoor at the site. Any hazardous materials shall be stored under cover.

VEHICLE WASHING CONTROLS

Outdoor vehicle washing is allowed only for occupants of the condominium development for non-commercial vehicles owned by the residents of the units. No commercial vehicle washing operations is allowed in this area.

REQUIREMENTS FOR ROUTINE INSPECTION AND MAINTENANCE OF STORMWATER BMPS

The Owner / Operator shall keep a Maintenance Log Sheets of scheduled tasks outlined Operation and Maintenance Plan.

SPILL PREVENTION AND RESPONSE PLANS

The risk of significant spills requiring action at this site is limited and will most likely be associated with motor vehicle use or maintenance. In the event of a significant spill contact:

Massachusetts Department of Environmental Protection 24-hour emergency response notification line – (888) 304-1133

PROVISIONS FOR MAINTENANCE OF LAWNS, GARDENS, AND OTHER LANDSCAPED AREAS

The use of chemical fertilizers shall not be used on-site. If chemical fertilizers are required to be used, the fertilizers must be worked into the soil to prevent washouts and stormwater contamination of fertilizers.

REQUIREMENTS FOR STORAGE AND USE OF FERTILIZERS, HERBICIDES, AND PESTICIDES

If fertilizers, herbicides, and pesticides are to be used and stored on site they are to be stored in their original containers and keep in a dry, safe area where children do not have access to.

PROVISIONS SOLID WASTE MANAGEMENT

Solid waste and recycling is to be disposed in designated areas in enclosed dumpsters and receptacles with covers and hauled by private certified waste management service operators. Solid waste management systems shall be inspected and maintained in accordance with state, local, and federal solid waste management regulations.

EMERGENCY AND REGULATORY CONTACTS

Franklin Fire Department:	911 / (508) 528-2323
Franklin Police Department:	911 / (508) 528-1212
Massachusetts Department of Environmental Protection – Central Regional Office:	(508) 792-7650
United State Environmental Protection Agency:	(617) 918-1111

Town of Franklin Conservation Commission

LOCAL FILING FEE CALCULATION WORKSHEET

1. NOTICE OF INTENT (NOI)

1.1. New Individual Single Family Home (SFH) \$200.00 _____
This includes all projects associated with a SFH

1.2. Work Associated with Existing Residential Property \$50.00 _____
Above-ground pools, fences or other incidental projects involving land disturbance that are not covered by the MBZA

1.3. Control of Nuisance Vegetation \$50.00 _____
This category shall not apply to any non-natural deposition of material e.g. vegetative debris

1.4. Subdivisions

Base Fee \$600.00 _____
Infrastructure in Buffer Zone **or** Resource Area
Roads _____ linear feet x \$2.00 = _____
*Drainage Structures _____ X \$10.00 each = _____
Wetland Resource Area Disturbed _____ square feet x \$0.50= _____

(If single family homes are proposed as part of a subdivision application, for each house in jurisdiction, individual NOI fees will apply.)

1.5. Multifamily Dwellings, including Condominium Units:
_____ MFDU x \$100.00 _____

1.6. Commercial/Industrial

Base Fee \$600.00 \$600.00
Infrastructure in Buffer Zone **or** Resource Area

Roads	___ linear feet x \$2.00	= _____
*Drainage Structures	___ X \$10.00 each	= _____
Wetland Resource Area Disturbed	___ square feet x \$0.50	= _____
Buildings	___ X \$125 each	= _____
All Accessory Improvements	\$100.00	= _____

2. REQUEST FOR DETERMINATION (RDA) \$100.00

3. MINOR BUFFER ZONE ACTIVITY (MBZA) \$50.00

4. ABBREVIATED NOTICE OF RESOURCE AREA DETERMINATION (ANRAD)

\$0.50/foot/resource area: = _____

5. OTHER PERMITS/SERVICES

Order of Conditions Extension	\$50.00	_____
Certificate of Compliance Request	\$50.00	_____
Certificate Re-Inspection	\$50.00	_____
Status Letter for Financial Institution	\$100.00	_____
Permit Amendment	\$100.00	_____

6. FILING FEE CALCULATION

Town Share of State Fees (See NOI Wetland Fee Transmittal Form) \$ _____

Local Filing Fee Calculated Above \$ **600** _____

TOTAL Due Town of Franklin (Check No.1) \$ _____

State Share of Filing Fee (See NOI Wetland Fee Transmittal Form)

TOTAL Due DEP (Check No. 2) \$ _____

7. ADVERTISING FEE (Check No. 3) **TBD**

The fee will be the exact amount the newspaper charges for that specific advertisement. Once the advertisement is placed with the paper, by the Conservation Commission, the applicant will be notified of the cost and will be expected to submit a check for that exact amount, payable to the Town of Franklin, to the Conservation Department prior to the first hearing.

*Drainage structures: catch basins, manholes, leaching basins, gutter inlet or any other man-made structure (other than a pipe) for purposes of controlling drainage.

Town of Franklin Conservation Commission

PROPERTY ACCESS SIGNATURE FORM

I hereby request that the Franklin Conservation Commission review this NOI/RDA/ANRAD application. I (we) grant authority to the Franklin Conservation Commission members and agents to go onto my (our) property solely for purposes directly related to the inspection and approval of this application and for follow-up compliance with the permit conditions.



Signature of Property Owner



Date

Scott Goddard on behalf of applicant

Town of Franklin Conservation Commission

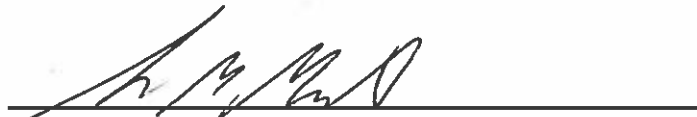
APPLICATION PROCESS SIGNATURE FORM

There are three different applications that can be submitted to undertake work in a jurisdictional area: a Notice of Intent (NOI), a Request for Determination (RDA) and a Minor Buffer Zone Activity (MBZA). All three applications have different criteria for submission and approval and the NOI and RDA are governed by both the state law and the local bylaw. The MBZA is issued under the local bylaw only.

When a potential applicant requests advice from the Conservation Agent on which application to file, the opinion of the Agent is based on the information given by the potential applicant and any other information available to the Agent, e.g. the town's GIS system. The Agent has no legal right to go onto private property at any time until after an application is filed or permission of the property owner is given.

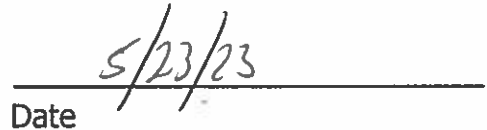
It is important that all applicants understand that after an application is filed, additional information may come to light e.g. via a field inspection or a review of the application, that may impact the scope of the submitted application and the approval process. **Therefore, it is the ultimate responsibility of the applicant to decide which application to file.**

In light of the above, please sign below indicating an understanding of this policy and submit it with the application.



Signature of Property Owner

Scott Goddard on behalf of applicant



Date

Town of Franklin Conservation Commission

RESOURCE AREA IMPACT SUMMARY FORM

**The Franklin Wetlands Protection Bylaw
Franklin Town Code Section 181**

Resource Area	Alteration Proposed	Mitigation Proposed
Bordering Vegetated Wetland (SF)	0	0
Bank (LF)	0	0
Land Under Water Bodies (SF)	0	0
Isolated Wetland (SF)	264	1,000 (invasive species management)
Vernal Pool (SF)	0	0
<i>25-foot</i> Buffer Zone (SF)	5,000	10,000 (invasive species management)
Riverfront (SF)	0	0
100-Year Floodplain (CF)	0	0
(SF) = Square Feet (LF) = Linear Feet (CF) = Cubic Feet Flood Storage		

May 24, 2023

Municipal Building
Franklin Conservation Commission
355 E. Central Street
Franklin, MA 02038

Re: Request for Variance - 15 Liberty Way, Franklin MA (Map: 320, Parcel: 4)

Dear Franklin Conservation Commission,

On behalf of Atlantic Oliver 15 Liberty Way LLC (the applicant), Goddard Consulting, LLC (representative) is hereby submitting this request for variance for a project which consists of the expansion of a parking lot and associated stormwater management at 15 Liberty Way, Franklin MA. This report is a supplement to the Notice of Intent application submitted concurrently as required by the Franklin Wetlands Protection Bylaw. Site constraints, including zoning requirements for provided parking area and the lack of usable space on the lot, make it unfeasible to relocate or scale back the proposed parking and driveway expansion.

As noted in this Notice of Intent submittal, the proposed project requires alteration to the existing IVW onsite. This will be in the form of supplemental riprap added to the existing riprap present in the IVW. This alteration totals 264SF. In addition, encroachment of pavement into the 25-foot buffer zone is required to provide the necessary parking. This alteration of the 25-foot buffer zone totals approximately 5,000SF.

As mitigation for these alterations, the applicant proposes to manage invasive plant species in the IVW and surrounding area. The proposed invasive species management area is approximately 11,000SF. Invasive species present in this area include oriental bittersweet (*Celastrus orbiculatus*), multiflora rose (*Rosa multiflora*), purple loosestrife (*Lythrum salicaria*), and common reed (*Phragmites australis*). These species are known to outcompete native plant species that are important to native wildlife for food and habitat. Management of these species will allow native vegetation present in the area to thrive. It is Goddard's opinion that the proposed mitigation will result in a net improvement of habitat value in this area.



Figure 1: Photo showing proliferation of invasive plant species in proposed invasive species management area.

Below is a table summarizing potential alternatives to the proposed work.

Summary of Alternatives			
Alternative option	Impact to wetland resources and buffer zone	Mitigation	Cost
Alternative 1: No change to existing conditions	No impacts to buffer zone or wetland resources.	None required. Project would not include invasive species management or improvement of stormwater management as proposed.	No cost, but applicant is unable to develop land as needed.
Alternative 2: Scale back proposed parking and driveway area to avoid buffer zones	No impacts to buffer zone, but proposed alteration to IVW onsite would still be necessary to support stormwater management system for the area.	Project would provide significantly scaled-back mitigation.	Similar cost, but applicant is unable to develop land to extent needed.
Alternative 3: Current proposal	Impacts to buffer zone and IVW onsite as described.	Project provides approx. 11,000SF of invasive species management, improving habitat value of the wetland resource and surrounding area.	Current design is most costly but meets the needs of the applicant.

In summary, the proposed project provides an opportunity to improve the IVW onsite and its surrounding area over existing conditions. Based on the above analysis, Goddard believes that adverse impacts to wetland resources and buffer zones have been avoided to the greatest extent practicable, and respectfully requests that the Commission approve this request for variance.

Sincerely,
Goddard Consulting, LLC



Chris Frattaroli
Wetland Scientist

DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

 Applicant: Atlantic Oliver 15 Liberty

 Prepared by: Goddard Consulting LLC

 Project location: 15 Liberty Way Franklin MA

DEP File #: _____

Check all that apply:

- | | |
|-------------------------------------|---|
| <input type="checkbox"/> | Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only |
| <input checked="" type="checkbox"/> | Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II |
| <input type="checkbox"/> | Method other than dominance test used (attach additional information) |

Section I. Vegetation	Observation Plot Number:	Transect Number: <u>Upgradient</u>	Date of Delineation:		
Sample Layer and Plant Species	Scientific name	% Cover	% Dominance	Dominant Plant (yes or no)	Wetland Indicator Category*
<u>Tree Layer</u>					
white pine	<i>Pinus strobus</i>	38%	55.1%	Yes	FACU
red maple	<i>Acer rubrum</i>	21%	29.7%	Yes	FAC*
northern white oak	<i>Quercus alba</i>	11%	15.2%	No	FACU
<u>Sapling Layer</u>					
northern white oak	<i>Quercus alba</i>	3%	50.0%	Yes	FACU
white pine	<i>Pinus strobus</i>	3%	50.0%	Yes	FACU
<u>Shrub Layer</u>					
<u>Climbing Woody Vine</u>					
<u>Ground Cover</u>					
green brier	<i>Smilax rotundifolia</i>	3%	50.0%	Yes	FAC*
late lowbush blueberry	<i>Vaccinium angustifolium</i>	3%	50.0%	Yes	FACU
Remarks: * An asterisk after common plant name indicates stunted growth; ** indicates extremely stunted growth					
Morphological Adaptations: <u>0</u>		Description: _____			
* An asterisk after indicator status denotes wetlands plants: plants listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus Sphagnum; or plants listed as FAC, FACW, or OBL.					
Vegetation conclusion:					
Number of dominant wetland indicator plants: 2			Number of dominant non-wetland indicator plants: 4		
Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? no					

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent.

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? yes no
 title/date: Soil Survey of Norfolk and Suffolk Counties - 1989
 map number: MA616
 soil type mapped: Woodbridge FSL 312B
 hydric soil inclusions: yes

Are field observations consistent with soil survey? yes no

Remarks: _____

2. Soil Description

<u>Horizon</u>	<u>Depth (inches)</u>	<u>Matrix Color</u>	<u>Mottles Color or Texture</u>
O	0-4	10YR3/4	FSL
A	4-8	10YR3/2	FSL
B	8-24	10YR4/1	FSL

25% concentrations 10YR6/8

Remarks: _____

3. Other: _____

Conclusion: Is soil hydric? yes no

Other Indicators of Hydrology: (check all that apply and describe)

- Site inundated: _____
- Depth to free water in observation hole: _____
- Depth to soil saturation in observation hole: _____
- Water marks: _____
- Drift Lines: _____
- Sediment deposits: _____
- Drainage patterns in BVW: _____
- Oxidized rhizospheres: _____
- Water-stained leaves: _____
- Recorded data (stream, lake, or tidal gauge; aerial photo; other):

- Other: _____

Vegetation and Hydrology Conclusion for Upgradient of		
	<u>yes</u>	<u>no</u>
Number of wetland indicator plants		
>= number of non-wetland plants		X
Wetland hydrology present:		
hydric soils present	X	
other indicators of hydrology present		X
Sample location is in a BVW		X

Submit this form with the Request for Determination of Applicability or Notice of Intent

DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

 Applicant: Atlantic Oliver 15 Liberty

 Prepared by: Goddard Consulting LLC

 Project location: 15 Liberty Way Franklin MA

DEP File #: _____

Check all that apply:

- | | |
|-------------------------------------|---|
| <input type="checkbox"/> | Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only |
| <input checked="" type="checkbox"/> | Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II |
| <input type="checkbox"/> | Method other than dominance test used (attach additional information) |

Section I. Vegetation	Observation Plot Number:	Transect Number: Downgradient	Date of Delineation:		
Sample Layer and Plant Species	Scientific name	% Cover	% Dominance	Dominant Plant (yes or no)	Wetland Indicator Category*
<u>Tree Layer</u>					
red maple	<i>Acer rubrum</i>	21%	87.2%	yes	FAC*
eastern cottonwood	<i>Populus deltoides</i>	3%	12.8%	no	FAC*
<u>Sapling Layer</u>					
sitka willow	<i>Salix sitchensis</i>	21%	87.2%	yes	NI
pin oak	<i>Quercus palustris</i>	3%	12.8%	no	FACW*
<u>Shrub Layer</u>					
sweet pepperbush	<i>Clethra alnifolia</i>	11%	43.8%	yes	FAC*
rambler rose	<i>Rosa multiflora</i>	11%	43.8%	yes	FACU
white meadowsweet	<i>Spiraea alba</i>	3%	12.5%	no	FACW*
<u>Climbing Woody Vine</u>					
<u>Ground Cover</u>					
sensitive fern	<i>Onoclea sensibilis</i>	21%	38.7%	Yes	FACW*
sedge	<i>Carex sp.</i>	3%	5.7%	no	FACW*
common reed	<i>Phragmites australis</i>	21%	38.7%	yes	FACW*
jewelweed	<i>Impatiens capensis</i>	3%	5.7%	no	FACW*
purple loosestrife	<i>Lythrum salicaria</i>	3%	5.7%	no	OBL*
eastern poison ivy	<i>Toxicodendron radicans</i>	3%	5.7%	no	FAC*
Remarks: * An asterisk after common plant name indicates stunted growth; ** indicates extremely stunted growth					
Morphological Adaptations: 0		Description: _____			
* An asterisk after indicator status denotes wetlands plants: plants listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus Sphagnum; or plants listed as FAC, FACW, or OBL.					
Vegetation conclusion:					
Number of dominant wetland indicator plants: 4			Number of dominant non-wetland indicator plants: 2		
Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? yes					

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent.

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? yes no
 title/date: Soil Survey of Norfolk and Suffolk Counties - 1989
 map number: MA616
 soil type mapped: Woodbridge FSL 312B
 hydric soil inclusions: Yes

Are field observations consistent with soil survey? yes no

Remarks: _____

2. Soil Description

<u>Horizon</u>	<u>Depth (inches)</u>	<u>Matrix Color</u>	<u>Mottles Color or Texture</u>
A	0-6	10YR6/1	FSL

Remarks: _____

3. Other: _____

Conclusion: Is soil hydric? yes no

Other Indicators of Hydrology: (check all that apply and describe)

- Site inundated: _____
- Depth to free water in observation hole: surface
- Depth to soil saturation in observation hole: surface
- Water marks: _____
- Drift Lines: _____
- Sediment deposits: _____
- Drainage patterns in BVW: _____
- Oxidized rhizospheres: _____
- Water-stained leaves: _____
- Recorded data (stream, lake, or tidal gauge; aerial photo; other):

- Other: _____

Vegetation and Hydrology Conclusion for Downgradient of		
	<u>yes</u>	<u>no</u>
Number of wetland indicator plants		
>= number of non-wetland plants	X	
Wetland hydrology present:		
hydric soils present		X
other indicators of hydrology present	X	
Sample location is in a BVW	X	

Submit this form with the Request for Determination of Applicability or Notice of Intent

