ALLEN & MAJOR ASSOCIATES, INC.

SITE LOCUS: 1" = 500'

APPLE HILL ESTATES

31 HUNTING LANE

SHERBORN, MASSACHUSETTS

DRAINAGE REPORT

DATE PREPARED:
NOVEMBER 18, 2020

REVISED:
March 1, 2021

APPLICANT:
BARSKY ESTATE REALTY TRUST
23 HUNTING LANE
SHERBORN, MA 01770

PREPARED BY:
ALLEN & MAJOR ASSOCIATES, INC.
100 COMMERCE WAY, SUITE 5
WOBURN, MASSACHUSETTS 01801

COMMONWEALTH OF MASSACHUSETTS
MICHAEL A. MALYNOWSKI
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REGISTERED PROFESSIONAL ENGINEER

Digitally signed by Michael Malynowski
Date: 2021.03.02 01:02:22 -05'00'

A&M PROJECT NO. : 2513-02

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SECTION 1.0

NARRATIVE

Section 1.0 Narrative

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- **INTRODUCTION**

The purpose of this drainage report is to provide an overview of the proposed stormwater management system for the proposed site development at 31 Hunting Lane in Sherborn, MA. The report will show by means of narrative, calculations and exhibits that the project meets the MassDEP and the Town of Sherborn's Stormwater Management Regulations.

The proposed project consists of the development of a single 16.9 acre parcel shown on Sherborn Assessor's Map 1 as lot 3C. The project includes 27 new single-family residential homes along a roadway constructed to Town of Sherborn subdivision standards. The stormwater management onsite has been designed to meet the treatment requirements of the Town of Sherborn and the Massachusetts Department of Environmental Protection, Stormwater Standards and Stormwater Handbook.

The proposed site preparations include the clearing of trees necessary for the development and removal of the existing driveway and tennis court. After clearing, the site will be rough graded to install the road house pads.

The proposed stormwater management system (SMS) incorporates structural and non-structural BMPs to provide stormwater quality treatment and conveyance. The SMS includes drainage piping and structures, water quality units (proprietary separators), and surface infiltration and detention basins. Roof runoff from each structure onsite will be directed to an individually dedicated leaching catch basin or set of basins.

The proposed development plan will increase the impervious area onsite by approximately 39,830 square feet. The primary mechanisms to mitigate this increase in impervious area is through the proposed infiltration and detention basins. The result is a reduction in the peak rate of stormwater runoff to the Study Points.

(Since roofs are directed to leaching catch basins, they were modeled as grass in the HydroCAD model, to account for that additional infiltration. A total roof area of 47,200 square feet was not shown in HydroCAD.)

- **SITE CATEGORIZATION FOR STORMWATER REGULATIONS**

The proposed site improvements are considered a new development under the Massachusetts Department of Environmental Protection (MADEP) Stormwater Management Standards. A "new development" project is required to meet all ten (10) of the Stormwater Management Standards listed within the MA DEP Stormwater Handbook.

- **SITE LOCATION AND ACCESS**

The site is a single lot with frontage on Hunting Lane, entirely within the Town of Sherborn and is located approximately 0.3 miles from the intersection of Hunting Lane and North Main Street. The site has one existing building at the rear of the site, which will remain. A road with cul-de-sac will be constructed within the site, along which the proposed buildings will be situated. The connection to Hunting Lane will widen compared to the existing driveway but will remain in more or less the same location.

- **WATERSHED**

The site is located within the Charles River Watershed, approximately 2.1 miles from the Charles River. The Charles River Watershed has an area of approximately 308 square miles, encompassing 35 City and cities south and west of Boston Massachusetts. There are 20 dams along the 80-mile long Charles River, which ultimately flows to Boston Harbor. Exhibit 1 shows the limits of the Charles River Watershed.

The existing site discharges untreated stormwater to the north and east which eventually ends up in either the Hunting Lane stormwater infrastructure or the wetlands system to the east of the site. The site being located within the Charles River Watershed requires a TDML goal of a 16% reduction in the total phosphorus load discharged from the proposed site. With the installation of infiltration basins the drainage system reduction goal has been met. Please refer to the loading calculations located in the appendices of this report.

EXHIBIT 1: Charles River Watershed

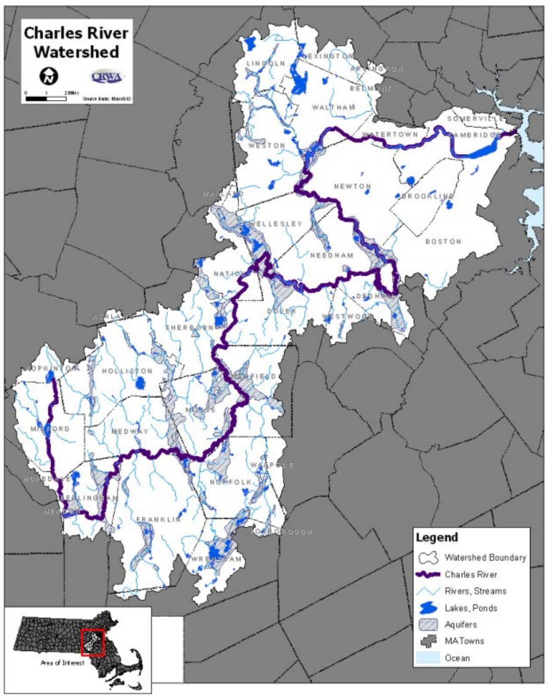

Image Source: Charles River Watershed Association

- **EXISTING SITE CONDITIONS**

The existing house to remain sits on the rear of the site. The site is predominantly wooded with some areas of grass and a paved driveway leading to the house from Hunting Lane. The topography onsite is moderately steep and slopes from the high point in the west to the low point in the east. The high point onsite is along the westerly property line at elevation 326±. The existing house is near the westerly high point and is at elevation 314±. The grades slope easterly towards the offsite wetlands where the lowest point onsite is elevation 200±. The existing driveway connection to Hunting Lane on the north side of the site is elevation 212±.

The surface drainage flows have been analyzed at four (4) Study Points. Study Point #1 is the summation of onsite flows to the rear of 41 Hunting Lane. Study Point #2 is the summation of onsite flows to the rear of 39 Hunting Lane. Study Point #3 is the summation of onsite flows to Hunting Lane. There are two existing catch basins within Hunting Lane adjacent to the site's driveway connection. Stormwater from a large portion of the site overland flows and eventually enters one of these two catch basins and into the municipal stormwater system. Study Point #4 is the summation of onsite flows to the easterly property line adjacent to the property identified on Sherborn Assessor's Map 11 as Lot 3B.

- **EXISTING SOIL CONDITIONS**

The on-site soils have been identified utilizing the USDA Natural Resources Conservation Services (NRCS) Soil Survey for Middlesex County. The eastern side of the site is soil type 307C – Paxton fine sandy loam. The western side of the site is primarily soil type 103C – Charlton-Hollis-Rock outcrop complex but also includes soil types 104C and D – Hollis-Rock outcrop-Charlton complex, and 307B – Paxton fine sandy loam. A copy of the soil map is included in the appendix of this report.

Further investigation on the underlying soils has been conducted by performing four (4) test pits in the location of the proposed leach field. The test pit's show underlying soils to be primarily sandy loam. An exfiltration rate for sandy loam has been determined to be 1.02 inches per hour based upon Table 2.3.3 1982 Rawls Rate, Volume 3: Documenting Compliance with the Massachusetts's Stormwater Handbook.

- **FEMA FLOODPLAIN**

The site is located within the FEMA *Zone "X"* or area outside the 0.2-percent-annual-chance-flood. The official Flood Insurance Rate Map (FIRM) on file with the Town of Sherborn is dated June 4, 2010, community panel 25017C0632E. A copy of this map is provided in the appendix of this report.

- **DRAINAGE ANALYSIS METHODOLOGY**

A peak rate of runoff has been determined using techniques and data found in the following:

1. Urban Hydrology for Small Watersheds – Technical Release 55 by the United States Department of Agriculture Soils Conservation Service, June 1986. Runoff curve numbers and 24-hour precipitation values were obtained from this reference.

2. HydroCAD© Stormwater Modeling System by HydroCAD Software Solutions LLC, version 10.00, 2020. The HydroCAD program was used to generate the runoff hydrographs for the watershed areas, to determine discharge/stage/storage characteristics for the stormwater BMPs, to perform drainage routing and to combine the results of the runoff hydrographs. HydroCAD uses the TR-20 methodology of the SCS Unit Hydrograph procedure (SCS-UH).

3. Soil Survey of Middlesex County Massachusetts by United States Department of Agriculture, NRCS. Soil types and boundaries were obtained from this reference.

- **PEAK RATE OF RUNOFF**

A stormwater runoff analysis has been prepared for both the existing and proposed conditions and includes an estimate of the peak rate of runoff from various rainfall events. Peak runoff rates have been developed using TR-55 Urban Hydrology for Small Watersheds, developed by the U.S. Department of Commerce, Engineering Division and the HydroCAD 10.00 computer program. Further, the analysis has been prepared in accordance with the Town of Sherborn requirements and standard engineering practices. The peak rate and volume of runoff will be estimated for each watershed during the 2, 10, 25 and 100-year storm events.

The stormwater runoff model indicates that the proposed site development reduces the rate of runoff during all storm events at the identified points of analysis. The following tables provide a summary of the estimated peak rate, in Cubic Feet per Second (CFS) at each of the four (4) Study Points for each of the design storm events. The HydroCAD worksheets are included in Section 3 and 4 of this report.

STUDY POINT #1 (on-site flow to 41 Hunting Lane)				
	2-Year	10-Year	25-Year	100-Year
Existing Flow (CFS)	4.57	11.43	17.48	30.96
Proposed Flow (CFS)	4.10	10.28	15.74	27.80
Decrease (CFS)	**0.47**	**1.15**	**1.74**	**3.16**

STUDY POINT #2 (on-site flow to 39 Hunting Lane)				
	2-Year	10-Year	25-Year	100-Year
Existing Flow (CFS)	0.31	0.79	1.21	2.14
Proposed Flow (CFS)	0.24	0.58	0.86	1.49
Decrease (CFS)	**0.07**	**0.21**	**0.35**	**0.65**

STUDY POINT #3 (on-site flow to Hunting Lane)				
	2-Year	10-Year	25-Year	100-Year
Existing Flow (CFS)	2.77	6.69	10.12	17.68
Proposed Flow (CFS)	2.75	6.31	9.44	16.07
Decrease (CFS)	**0.02**	**0.38**	**0.68**	**1.61**

STUDY POINT #4 (on-site flow to Map 11, Lot 3B)				
	2-Year	10-Year	25-Year	100-Year
Existing Flow (CFS)	3.74	9.34	14.28	25.20
Proposed Flow (CFS)	2.87	6.95	11.71	24.95
Decrease (CFS)	**0.87**	**2.39**	**2.57**	**0.25**

- **MA DEP STORMWATER PERFORMANCE STANDARDS**

The MA DEP Stormwater Management Policy was developed to improve water quality by implementing performance standards for storm water management. The intent is to implement the stormwater management standards through the review of Notice of Intent filings by the issuing authority (Conservation Commission or DEP). The following section outlines how the proposed Stormwater Management System meets the standards set forth by the Policy.

BMP's implemented in the design include:

Deep sump Catch Basins
Hydro-dynamic (Proprietary) Separators
Detention/Infiltration Basins
Specific maintenance schedule

Stormwater Best Management Practices (BMP's) have been incorporated into the design of the project to mitigate the anticipated pollutant loading. The stormwater management system incorporates structural and non-structural BMP's to provide stormwater quality treatment and conveyance.

Temporary erosion and sedimentation controls will be incorporated into the construction phase of the project. These temporary controls may include tubular barriers, inlet sediment traps, diversion channels, slope stabilization, and stabilized construction entrances.

The Massachusetts Department of Environmental Protection has established ten (10) Stormwater Management Standards. A project that meets or exceeds the standards is presumed to satisfy the regulatory requirements regarding stormwater management. The Standards are enumerated below as well as a description as to how the Project will comply with the Standards:

1. *No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*

   The proposed development will not introduce any new outfalls with direct discharge to a wetland area or waters of the Commonwealth of Massachusetts. All discharges will be treated for water quality and the rate will not be increased over existing conditions.

2. *Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.*

   The proposed development has been designed so that the post-development peak discharge rates do not exceed the predevelopment peak discharge rates. A summary of the existing and proposed discharge rates is included within this document.

3. *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, stormwater 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 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.*

   The existing annual recharge for the Site will be approximated in the developed condition. Infiltration basins were designed to approximate the loss of annual recharge resulting from the development of the Site. See recharge calculations below;

Existing impervious area	= 37,942± square feet
Proposed impervious area	= 77,772 ± square feet
Change in impervious area	**= 39,830± square feet**

   Total proposed impervious area (taken from HydroCAD model) = 77,772± square feet

   Recharge Volume (Rv) = (F) x (Impervious Area)

   Where:
   Rv = Required Recharge Volume, expressed in cubic feet
   F = Target Depth Factor associated with each Hydrologic Soil Group
   Impervious Area = proposed impervious pavement, sidewalk, rooftop in square feet

Recharge Volume (Rv) = (F) x (Impervious Area)
= (0.60 inches)*(1/12 inches/ft)* (0 square feet) (A Soils)
+ (0.35 inches)*(1/12 inches/ft)*(12,616 square feet) (B Soils)
+ (0.25 inches)*(1/12 inches/ft)*(64,675 square feet) (C Soils)
+ (0.10 inches)*(1/12 inches/ft)*(482 square feet) (D Soils)
= 1,719 cubic feet

Recharge Provided = 1,779 ft^3 (DB-2) (See Appendix)

1,779 ft^3 Provided > 1,719 ft^3 Required

Additional recharge will also be provided by the leaching catch basins dedicated to each structure.

4. *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load 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. Structural stormwater best management practices 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.

   The proposed stormwater management system has been designed such that for each study point, the 80% TSS removal standard has been met. Standard #4 is met when structural stormwater best management practices are sized to capture and treat the required water quality volume and pretreatment is provided in accordance with the Massachusetts Stormwater Handbook. Standard #4 also requires that suitable source control measures are identified in the Long-Term Pollution Prevention Plan.

   The water quality volume (WQV) for the proposed development is captured and treating using deep sump catch basins, proprietary separation devices, and detention/infiltration basins. The TSS removal efficiencies are based on the values assigned in the TSS Removal Efficiencies for Best Management Practices table provided in the Massachusetts Stormwater Handbook. TSS removal calculations are provided in the Appendix of this Report.

5. *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 structural stormwater BMPs determined by the Department to be suitable for such uses 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. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.*

   The site is not considered a source of higher potential pollutant loads.

6. *Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is 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 and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.*

   The project site does not discharge stormwater within a Zone II or Interim Wellhead Protection Area or near a critical area. Critical Areas are Outstanding Resource Waters as designated in 314 CMR 4.00, Special Resource Waters as designated in 314 CMR 4.00, recharge areas for public water supplies as defined in 310 CMR 22.02, bathing beaches as defined in 105 CMR 445.000, cold-water fisheries as defined in 314 CMR 9.02 and 310 CMR 10.04, and shellfish growing areas as defined in 314 CMR 9.02 and 310 CMR 10.04.

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

   The proposed project is not considered a re-development project under the Stormwater Management Handbook guidelines as there is an increase in the amount of total impervious area.

8. *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) shall be developed and implemented.*

   A plan to control construction-related impacts, including erosion, sedimentation and other pollutant sources during construction and land disturbance activities has been developed. A detailed Erosion and Sedimentation Control Plan is included in the Permit Drawings. The proponent will prepare and submit a Stormwater Pollution Prevention Plan (SWPPP) prior to commencement of construction activities that will result in the disturbance of one acre of land or more.

9. *A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.*

   A Long-Term Operation and Maintenance (O&M) Plan has been developed for the proposed stormwater management system and can be found within this drainage report.

10. *All illicit discharges to the stormwater management system are prohibited.*

There are no expected illicit discharges to the stormwater management system. The applicant will submit the Illicit Discharge Compliance Statement prior to the discharge of stormwater runoff to the post-construction stormwater best management practices and prior to the issuance of a Certificate of Compliance.

SECTION 2.0

OPERATION & MAINTENANCE PLAN

Section 2.0 Operation & Maintenance Plan

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- **INTRODUCTION**

In accordance with the standards set forth by the Stormwater Management Policy issued by the Department of Environmental Protection (DEP), Allen & Major Associates, Inc. has prepared the following Operation and Maintenance Plan for the new development of Apple Hill Estates, 31 Hunting Lane in Sherborn, MA.

The plan is broken down into three major sections. The first section describes construction-related erosion and sedimentation controls (Construction Period). The second section describes the long-term pollution prevention measures (Long Term Pollution Prevention Plan). The third section is a post-construction operation and maintenance plan designed to address the long-term maintenance needs of the stormwater management system (Long Term Maintenance Plan).

- **NOTIFICATION PROCEDURES FOR CHANGE OF RESPONSIBILITY FOR O&M**

The Stormwater Management System (SMS) for this project is owned by **Barsky Estate Realty Trust** (owner). The owner shall be legally responsible for the long-term operation and maintenance of this SMS as outlined in this Operation and Maintenance (O&M) Plan.

Should ownership of the SMS change, the owner will continue to be responsible until the succeeding owner shall notify the Commission that the succeeding owner has assumed such responsibility. Upon subsequent transfers, the responsibility shall continue to be that of transferring owner until the transferee owner notifies the Commission of its assumption of responsibility.

In the event the SMS will serve multiple lots/owners, such as the subdivision of the existing parcel or creation of lease areas, the owner(s) shall establish an association on other legally enforceable arrangements under which the association or a single party shall have legal responsibility for the operation and maintenance of the entire SMS. The legal instrument creating such responsibility shall be recorded with the Registry of Deeds and promptly following its recording, a copy thereof shall be furnished to the Commission.

- **CONTACT INFORMATION**

Stormwater Management System Owner: Barsky Estate Realty Trust
23 Hunting Lane
Sherborn, MA 01770
Phone: (617) 794-0001

Emergency Contact Information:

o Barsky Estate Realty Trust (owner/operator)	Phone (617) 794-0001
o Allen & Major Associates, Inc. (Site Civil Engineer)	Phone (781) 935-6889
o Sherborn Public Works	Phone (508) 651-7878
o Sherborn Conservation Commission	Phone (508) 651-7863
o Sherborn Fire Department (non-emergency line)	Phone (508) 653-3270
o DEP Emergency Response (Mass DEP)	Phone (888) 304-1133
o Clean Harbors Inc (24-Hour Line)	Phone (800) 645-8265

- **CONSTRUCTION PERIOD**

1. Contact the Sherborn Engineering Division at least fourteen (14) days prior to start of construction to schedule a pre-construction meeting.

2. Install the tubular barriers and construction fencing as shown on the Site Preparation Plan.

3. Install the construction entrance at the location shown on the Site Preparation Plan.

4. Site access shall be achieved only from the designated construction entrances.

5. Stockpiles shall be stabilized with erosion control matting or temporary seeding whenever practicable.

6. Install silt sacks and/or tubular barriers around each drain inlet prior to any demotion and or construction activities.

7. All erosion control measures shall be inspected weekly and after every rainfall event of 0.5" or more. Records of these inspections shall be kept on site for review.

8. All erosion control measures shall be maintained, repaired or replaced as required or at the direction of the owner's engineer, the Town Engineer, or the Conservation Agent.

9. Sediment accumulation up-gradient of the tubular barriers and stone check dams greater than 6" in depth shall be removed and disposed of in accordance with all applicable regulations.

10. If it appears that sediment is exiting the site, silt sacks shall be installed in all catch basins adjacent to the site. Sediment accumulation on all adjacent catch basin inlets shall be removed and the silt sack replaced if torn or damaged.

11. Install stone check damns on site during construction as needed. Temporary sediment basins combined with stone check dams shall be installed on site during construction to control and collect runoff from upland areas of this site during demolition and construction activities.

12. The contractor shall comply with the General and Erosion Control Notes as shown on the Site Development Plans and Specifications.

13. The stabilized construction entrances shall be inspected weekly by the contractor. The entrances shall be maintained by adding additional clean, angular, durable stone to remove the soil from the construction vehicle's tires when exiting the site. If soil is still leaving the site via the construction vehicle tires, adjacent roadways shall be kept clean by street sweeping.

14. Dust pollution shall be controlled using on-site water trucks and or an approved soil stabilization product.

- **LONG TERM POLLUTION PREVENTION PLAN**

Standard #4 from the MA DEP Stormwater Management Handbook requires that a Long-Term Pollution Prevention Plan (LTPPP) be prepared and incorporated as part of the Operation and Maintenance of the Stormwater Management System. The purpose of the LTPPP is to identify potential sources of pollution that may affect the quality of stormwater discharges, and to describe the implementation of practices to reduce the pollutants in stormwater discharges. The following items describe the source control and proper procedures for the LTPPP.

- HOUSEKEEPING

The proposed site development will be designed to maintain a high level of water quality treatment for all stormwater discharge to the resource areas. An Operation and Maintenance (O&M) plan has been prepared and is included in this section of the report. The owner (or its designee) is responsible for adherence to the O&M plan is a strict and complete manner.

- STORING OF MATERIALS AND WASTE PRODUCTS

Trash and waste will be stored inside each individual house and duplex. A trash contractor will be employed to pick up the waste on a regular basis. The stormwater drainage system has water quality inlets designed to capture trash and debris.

- VEHICLE WASHING

Outdoor vehicle washing has the potential to result in high loads of nutrients, metals, and hydrocarbons during dry weather conditions, as the detergent-rich water used to wash the grime off the vehicle enters the stormwater drainage system. The proposed project does not include any designated vehicle washing areas.

- SPILL PREVENTION AND RESPONSE

Sources of potential spill hazards include vehicle fluids, liquid fuels, pesticides, paints, solvents, and liquid cleaning products. The majority of the spill hazards would likely occur within the building and would not enter the stormwater drainage system. However, there are spill hazards from vehicle fluids or liquid fuels located outside of the buildings. These exterior spill hazards have the potential to enter the stormwater drainage system and are to be addressed as follows:

1. Spill Hazards of pesticides, paints, and solvents shall be remediated using the Manufacturers' recommended spill cleanup protocol.
2. Vehicle fluids and liquid fuel spill shall be remediated according to the local and state regulations governing fuel spills.
3. The owner shall have the following equipment and materials on hand to address a spill clean-up: brooms, dust pans, mops, rags, gloves, absorptive material, sand, sawdust, plastic and metal trash containers.
4. All spills shall be cleaned up immediately after discovery
5. Spills of toxic or hazardous material shall be reported, regardless of size, to the Massachusetts Department of Environmental Protection at 888-304-1133.
6. Should a spill occur, the pollution prevention plan will be adjusted to include measures to prevent another spill of a similar nature. A description of the spill, along with the causes and cleanup measures will be included in the updated pollution prevention plan.

- MAINTENANCE OF LAWNS, GARDENS, AND OTHER LANDSCAPED AREAS

It should be recognized that this is a general guideline towards achieving high quality and well-groomed landscaped areas. The grounds staff / landscape contractor must recognize the shortcomings of a general maintenance plan such as this, and modify and/or augment it based on weekly, monthly, and yearly observations. In order to assure the highest quality conditions, the staff must also recognize and appreciate the need to be aware of the constantly changing conditions of the landscaping and be able to respond to them on a proactive basis. No trees shall be planted over the drain lines or infiltration trenches, and that only shallow rooted plants and shrubs will be allowed.

- **Fertilizer**

Maintenance practices should be aimed at reducing environmental, mechanical and pest stresses to promote healthy and vigorous growth. When necessary, pest outbreaks should be treated with the most sensitive control measure available. Synthetic chemical controls should be used only as a last resort to organic and biological control methods. Fertilizer, synthetic chemical controls and pest management applications (when necessary) shall be performed only by licensed applicators in accordance with the manufacturer's label instructions when environmental conditions are conducive to controlled product application.

Only slow-release organic fertilizers should be used in the planting and mulch areas to limit the amount of nutrients that could enter downstream resource areas. Fertilization of the planting and mulch areas will be performed within manufacturers labeling instructions and shall not exceed an NPK ration of 1:1:1 (i.e. Triple 10 fertilizer mix), considered a low nitrogen mixture. Fertilizers approved for the use under this O&M Plan are as follows:

Type: LESCO® 28-0-12 (Lawn Fertilizer)
MERIT® 0.2 Plus Turf Fertilizer
MOMENTUM™ Force Weed & Feed

- **Suggested Aeration Program**

In-season aeration of lawn areas is good cultural practice, and is recommended whenever feasible. It should be accomplished with a solid thin tine aeration method to reduce disruption to the use of the area. The depth of solid tine aeration is similar to core type, but should be performed when the soil is somewhat drier for a greater overall effect.

Depending on the intensity of use, it can be expected that all landscaped lawn areas will need aeration to reduce compaction at least once per year. The first operation should occur in late May following the spring season. Methods of reducing compaction will vary based on the nature of the compaction. Compaction on newly established landscaped areas is generally limited to the top 2-3" and can be alleviated using hollow core or thin tine aeration methods.

The spring aeration should consist of two passes at opposite directions with 1/4" hollow core tines penetrating 3-5" into the soil profile. Aeration should occur when the soil is moist but not saturated. The soil cores should be shattered in place and dragged or swept back into the turf to control thatch. If desired the cores may also be removed and the area top-dressed with sand or sandy loam. If the area drains on average too slowly, the topdressing should contain a higher percentage of sand. If it is draining on average too quickly, the top dressing should contain a higher percentage of soil and organic matter.

- **Landscape Maintenance Program Practices:**
  - **Lawn**
    1. Mow a minimum of once a week in spring, to a height of 2" to 2 1/2" high. Mowing should be frequent enough so that no more than 1/3 of grass blade is

removed at each mowing. The top growth supports the roots; the shorter the grass is cut, the less the roots will grow. Short cutting also dries out the soil and encourages weeds to germinate.
2. Mow approximately once every two weeks from July 1st to August 15th depending on lawn growth.
3. Mow on a ten-day cycle in fall, when growth is stimulated by cooler nights and increased moisture.
4. Do not remove grass clippings after mowing.
5. Keep mower blades sharp to prevent ragged cuts on grass leaves, which cause a brownish appearance and increase the chance for disease to enter a leaf.

- **Shrubs**
  1. Mulch not more than 3" depth with shredded pine or fir bark.
  2. Hand prune annually, immediately after blooming, to remove 1/3 of the above-ground biomass (older stems). Stem removals to occur within 6" of the ground to open up shrub and maintain two-year wood (the blooming wood).
  3. Hand prune evergreen shrubs only as needed to remove dead and damaged wood and to maintain the naturalistic form of the shrub. Never mechanically shear evergreen shrubs.
- **Trees**
  1. Provide aftercare for new tree plantings for the first three years.
  2. Do not fertilize trees, it artificially stimulates them (unless tree health warrants).
  3. Water once a week for the first year; twice a month the second, once a month the third year.
  4. Prune trees on a four-year cycle.
- **Invasive Species**
  1. Inform the Conservation Commission Agent prior to the removal of invasive species proposed either through hand work or through chemical removal.

o STORAGE AND USE OF HERBICIDES AND PESTICIDES

Integrated Pest Management is the combination of all methods (of pest control) which may prevent, reduce, suppress, eliminate, or repel an insect population. The main requirements necessary to support any pest population are food, shelter and water, and any upset of the balance of these will assist in controlling a pest population. Scientific pest management is the knowledgeable use of all pest control methods (sanitation, mechanical, chemical) to benefit mankind's health, welfare, comfort, property and food. A Pest Management Professional (PMP) will be retained who is licensed with the Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, Department of Agricultural Resources

The site manager will be provided with approved bulletin before entering into or renewing an agreement to apply pesticides for the control of indoor household or structural pests. 333 CMR 13.08.

Before beginning each application, the applicator must post a Department approved notice on all of the entrances to the treated room or area. The applicator must leave such notices posted after the application. The notice will be posted at conspicuous point(s) of access to the area treated. The location and number of signs will be determined by the configuration of the area to be treated based on the applicator's best judgment. It is intended to give sufficient notice that no one comes into an area being treated unaware that the applicator is working and pesticides are being applied. However, if the contracting entity does not want the signs posted, he/she may sign a Department approved waiver indicating this.

The applicator or employer will provide to any person upon their request the following information on previously conducted applications:

1. Name and phone number of pest control company
2. Date and time of the application;
3. Name and license number of the applicator
4. Target pests
5. Name and EPA Registration Number of pesticide products applied

Public Buildings - Applicators or their employers will provide pre-notification to any person upon their request. Pre-notification will include:

1. Name and phone number of the company making the application
2. Proposed date of application
3. Locations to be treated; and
4. Name, EPA Registration Number, and active ingredients of the products being used.

The applicator or their employers shall pre-notify the occupants of residential units between seven (7) days and forty-eight (48) hours prior to any application. The notification must include the following:

1. Name and phone number of company making the application
2. Proposed date and time of application
3. Locations to be treated
4. Product names, EPA Registration Numbers, and active ingredients for the pesticide products that may be used
5. Purpose of application
6. Preparation procedures required by the pesticide label to protect items such as food, utensils, and pests; and
7. Department approved Consumer Information Bulletin

The notification must be made in writing. The intent is so that individuals, who wish to avoid exposure or want to avoid encountering the applicator, can make necessary arrangements. Applicators are required by law to follow all directions on the pesticide label and must take all steps necessary to avoid applications with people present in a room or area to be treated. Individuals occupying a room or area to be treated at the time of application shall be informed of the procedure. Whenever possible, the applicator should not apply pesticides with anyone present. That may mean treating other areas and returning when occupants have left, asking people to leave the area while the work is being done, or treating before or after people occupy the room. If people do not leave, the applicator must make it clear that he is there to apply pesticides. The applicator will be prepared to provide whatever information possible about the pesticides and techniques used.

- PET WASTE MANAGEMENT

The Town of Sherborn has a dog control ordinance and anti-littering ordinance that requires all persons to remove waste material from within any way within the Town. The owner's landscape crew (or designee) shall remove any obvious pet waste that has been left behind by pet owners within the project area. The pet waste shall be disposed of in accordance with local and state regulations.

- Operations and Management of Septic Systems

The existing septic system will be removed. A new wastewater treatment facility (WWTF) is proposed as part of the project. Information regarding operations and maintenance of this facility will be provided by the WWTF designer.

- Management of Deicing Chemicals and Snow

Snow will be stockpiled on site until the accumulated snow becomes a hazard to the daily operations of the site. It will be the responsibility of the snow removal contractor to properly dispose of transported snow according to Massachusetts DEP, Bureau of Resource Protection – Snow Disposal Guideline #BWR G2019-01, governing the proper disposal of snow. It will be the responsibility of the snow removal contractor to follow these guidelines and all applicable laws and regulations.

The owner's maintenance staff (or its designee) will be responsible for the clearing of the sidewalk and building entrances. The owner may be required to use a de-icing agent such as potassium chloride to maintain a safe walking surface. The de-icing agent for the walkways and building entrances will be kept within the storage rooms located within the building. De-icing agents will not be stored outside. The owner's maintenance staff will limit the application of sand and salt.

- **Long Term Maintenance Plan – Facilities Description**

The SMS shall be inspected immediately after construction. A maintenance log will be kept (i.e. report) summarizing inspections, maintenance, and any corrective actions taken. The log will include the date on which each inspection or maintenance task was performed, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. If a maintenance task requires the clean-out of any sediments or debris, the location where the sediment and debris was disposed after removal will be indicated. The log will be made accessible to department staff and a copy provided to the department upon request.

The following is a description of the stormwater management system for the project site.

Stormwater Collection System – On Site:

The stormwater collection system consists of a series of gutter line inlets within the limits of the paved area. Peak flows will be attenuated in a series of detention and infiltration basins. All of the proposed on-site catch basins incorporate a deep sump and hooded outlet. The catch basins are connected by a closed gravity pipe network that pass through proprietary separators prior to entering the detention and infiltration basins. Stormwater overflow from the basins will be directed towards Hunting Lane and the easterly property line so as to mimic flows in the existing conditions. Stormwater from roofs will be collected with gutters and discharge to drywells.

Structural Pretreatment BMPs:

Regular maintenance of these BMPs is especially critical because they typically receive the highest concentration of suspended solids during the first flush of a storm event.

Deep Sump Catch Basins:

Inspect catch basins 4 times per year (specifically after foliage and snow season) to ensure that the catch basins are working in their intended fashion and that they are free of debris. Structures will be skimmed of floatable debris at each inspection and sediment will be removed when or before sump is determined to be 50% full. If the basin outlet is designed with a hood to trap floatable materials (i.e. Snout), check to ensure watertight seal is working.

Proprietary Separators:
Inspect all proprietary separators with the same frequency as catch basins. Remove sediment when the isolated sump has reached 75% of its capacity. Refer to manufacturer's Maintenance Guide for additional information. Sediments and debris removed should be disposed of in accordance with all applicable local, state and federal laws and regulations including M.G.L.c. 21C and 310 CMR 30.00.

Other BMPs and Accessories:

Surface Basins
The detention and infiltration basins shall be inspected within the first three months after construction to ensure proper vegetation is established; thereafter, they shall be inspected two (2) times per year (preferably in Spring and Fall) to ensure they are working in their intended fashion and that they are free of sediment and debris. Vegetated basin areas and buffers will be mowed at least semi-annually and organic matter will be removed. Observed trash and debris will removed at each inspection. Sediment will be removed as necessary.

Culverts:
Inspect culverts 2 times per year (preferably in Spring and Fall) to ensure that the culverts are working in their intended fashion and that they are free of debris. Remove any obstructions to flow; remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit and to repair any erosion damage at the culvert's inlet and outlet.

Vegetated Areas:
Inspect slopes and embankments early in the growing season to identify active or potential erosion problems. Replant bare areas or areas with sparse growth. Where rill erosion is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows.

Roadways and Parking Surfaces:
Clear accumulations of winter sand in parking lots and along roadways at least once a year, preferably in the spring. Accumulations on pavement may be removed by pavement sweeping. Accumulations of sand along road shoulders may be removed by grading excess sand to the pavement edge and removing it manually or by a front-end loader.

Level Spreaders, Check Dams, Rip-Rap:
These accessories will be inspected twice per year for erosion, debris accumulation, and unwanted vegetation. Erosion will be stabilized and sediment, debris, and woody vegetation will be removed.

Mosquito Control Plan:

MA Stormwater Handbook; Volume 2, Chapter 5 (Attached)
Both aboveground and underground stormwater BMPs have the potential to serve as mosquito breeding areas. Good design, proper operation and maintenance, and treatment with larvicides can minimize this potential.

The 2008 technical specifications for BMPs set forth in Volume 2, Chapter 2 of the Massachusetts Stormwater Handbook also concur with this practice by requiring that all stormwater practices designed to drain do so within 72 hours.

- **INSPECTION AND MAINTENANCE FREQUENCY AND CORRECTIVE MEASURES**

In accordance with MA DEP Stormwater Handbook: Volume 2, Chapter 2; the following areas, facilities, and measures will be inspected and the identified deficiencies will be corrected. Clean-out must include the removal and legal disposal of any accumulated sediments, trash, and debris. In any and all cases, operations, inspections, and maintenance activities shall utilize best practical measures to avoid and minimize impacts to wetland resource areas outside the foot print of the SMS.

- **SUPPLEMENTAL INFORMATION**

  - Operation & Maintenance Plan Schedule
  - Massachusetts Stormwater Handbook, Chapter 5, Miscellaneous Stormwater Topics, Mosquito Control in Stormwater Management Practices.
  - CDS Inspection and Maintenance Guide
  - Stormceptor STC Owner's Manual

OPERATION & MAINTENANCE PLAN SCHEDULE

Date:
Party Responsible for O & M Plan: Barsky Estate Realty Trust
Address: 23 Hunting Lane
Sherborn, MA 01770

Project: Apple Hill Estates
Address: 31 Hunting Lane
Sherborn, MA

Structure or Task	Maintenance Activity	Schedule/Notes	Maintenance Cost/Unit	Estimated Maintenance	Estimated Annual Maintenance Cost	Inspection Performed	
						Date:	By:
Street Sweeping	Sweep, power broom or vacuum paved areas.	Perform roadway sweeping following the spring thaw to remove any traction sand applied during the winter months. Perform roadway sweeping in the late fall to remove any leaf litter or debris. Maintain information that confirms that all street sweepings have been disposed in accordance with state and local requirements	$1,500/Sweeping	Semi-annually (Spring & Fall)	$3,000		
Surface Basins	Trash and debris removal, vegetation management	Inspect within first three months after construction and twice per year thereafter. Ensure proper vegetation cover and remove dead or wood vegetation. Mow twice per year Remove trash and sediment as required	$1,000	Semi-annually (Spring & Fall)	$2,000		
Deep Sump CB's	Inspect frames and grates. Empty sumps using a vacuum-truck.	Inspected and cleaned 4 times per year. Sediment and debris shall be removed by a vacuum truck. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations	$500/CB	CBs - quarterly			
Hydrodynamic Separators (CDS)	Inspect frames and covers. Empty sediment storage chamber using a vacuum truck. Refer to Manufacturers maintenance Procedures.	Inspected and cleaned 4 times per year. Sediment should be removed when accumulated to 75% of sump capacity. Sediment and debris shall be removed by a vacuum truck. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations	$500/unit	Semi-annually (Spring & Fall)			
Outfall locations	Inspect for sign of erosion or displaced stone. Replace outlet protection stone if needed.	Inspect twice a year for the first three years of construction and once per year thereafter Check sediment build-up on a yearly basis and clean as needed using hand methods	$500 allowance	Annually			
Mosquito Control	CB management targeted larvicide treatment to CB's and all storm drains including proprietary separators to control mosquitoes in their aquatic stages.	Surveillance is a non chemical inspection method that involves classification of mosquito breeding sites, larval presence, and survey. Apply larvicide if larva growth is detected.	$500 allowance	CBs - quarterly			
Snow Storage	Debris from melted snow shall be cleared from the site and properly disposed of at the end of the snow season, but shall be cleared no later than May 15.	Avoid dumping snow removal over catch basins. Use areas designated on the approved layout plan for snow storage.	$500 allowance	Annually			

Chapter 5
Miscellaneous Stormwater Topics

Mosquito Control in Stormwater Management Practices

Both aboveground and underground stormwater BMPs have the potential to serve as mosquito breeding areas. Good design, proper operation and maintenance and treatment with larvicides can minimize this potential.

EPA recommends that stormwater treatment practices dewater within 3 days (72 hours) to reduce the number of mosquitoes that mature to adults, since the aquatic stage of many mosquito species is 7 to 10 days. Massachusetts has had a 72-hour dewatering rule in its Stormwater Management Standards since 1996. The 2008 technical specifications for BMPs set forth in Volume 2, Chapter 2 of the Massachusetts Stormwater Handbook also concur with this practice by requiring that all stormwater practices designed to drain do so within 72 hours.

Some stormwater practices are designed to include permanent wet pools. These practices – if maintained properly – can limit mosquito breeding by providing habitat for mosquito predators. Additional measures that can be taken to reduce mosquito populations include increasing water circulation, attracting mosquito predators by adding suitable habitat, and applying larvicides.

The Massachusetts State Reclamation and Mosquito Control Board (SRMCB), through the Massachusetts Mosquito Control Districts, can undertake further mosquito control actions specifically for the purpose of mosquito control pursuant to Massachusetts General Law Chapter 252. The Mosquito Control Board, http://www.mass.gov/agr/mosquito/, describes mosquito control methods and is in the process of developing guidance documents that describe Best Management Practices for mosquito control projects.

The SRMCB and Mosquito Control Districts are not responsible for operating and maintaining stormwater BMPs to reduce mosquito populations. The owners of property that construct the stormwater BMPs or municipalities that “accept” them through local subdivision approval are responsible for their maintenance.[1] The SRMCB is composed of officials from MassDEP, Department of Agricultural Resources, and Department of Conservation and Recreation. The nine (9) Mosquito Control Districts overseen by the SRMCB are located throughout Massachusetts, covering 176 municipalities.

Construction Period Best Management Practices for Mosquito Control

To minimize mosquito breeding during construction, it is essential that the following actions be taken to minimize the creation of standing pools by taking the following actions:

- ***Minimize Land Disturbance:*** Minimizing land disturbance reduces the likelihood of mosquito breeding by reducing silt in runoff that will cause construction period controls to clog and retain standing pools of water for more than 72 hours.
- ***Catch Basin inlets:*** Inspect and refresh filter fabric, hay bales, filter socks or stone dams on a regular basis to ensure that any stormwater ponded at the inlet drains within 8 hours after precipitation stops. Shorter periods may be necessary to avoid hydroplaning in roads

[1] MassDEP and MassHighway understand that the numerous stormwater BMPs along state highways pose a unique challenge. To address this challenge, the 2004 MassHighway Stormwater Handbook will provide additional information on appropriate operation and maintenance practices for mosquito control when the Handbook is revised to reflect the 2008 changes to the Stormwater Management Standards..

caused by water ponded at the catch basin inlet. Treat catch basin sumps with larvicides such as *Bacillus sphaericus* (*Bs*) using a licensed pesticide applicator.

- ***Check Dams:*** If temporary check dams are used during the construction period to lag peak rate of runoff or pond runoff for exfiltration, inspect and repair the check dams on a regular basis to ensure that any stormwater ponded behind the check dam drains within 72 hours.
- ***Design construction period sediment traps*** to dewater within 72 hours after precipitation. Because these traps are subject to high silt loads and tend to clog, treat them with the larvicide *Bs* after it rains from June through October, until the first frost occurs.
- ***Construction period open conveyances:*** When temporary manmade ditches are used for channelizing construction period runoff, inspect them on a regular basis to remove any accumulated sediment to restore flow capacity to the temporary ditch.
- ***Revegetating Disturbed Surfaces:*** Revegetating disturbed surfaces reduces sediment in runoff that will cause construction period controls to clog and retain standing pools of water for greater than 72 hours.
- ***Sediment fences/hay bale barriers:*** When inspections find standing pools of water beyond the 24-hour period after a storm, take action to restore barrier to its normal function.

<u>Post-Construction Stormwater Treatment Practices</u>

- Mosquito control begins with the environmentally sensitive site design. Environmentally sensitive site design that minimizes impervious surfaces reduces the amount of stormwater runoff. Disconnecting runoff using the LID Site Design credits outlined in the Massachusetts Stormwater Handbook reduces the amount of stormwater that must be conveyed to a treatment practice. Utilizing green roofs minimizes runoff from smaller storms. Storage media must be designed to dewater within 72 hours after precipitation.
- Mosquito control continues with the selection of structural stormwater BMPs that are unlikely to become breeding grounds for mosquitoes, such as:
    - ***Bioretention Areas/Rain Gardens/Sand Filter:*** These practices tend not to result in mosquito breeding. If any level spreaders, weirs or sediment forebays are used as part of the design, inspect them and correct them as necessary to prevent standing pools of water for more than 72 hours.
    - ***Infiltration Trenches:*** This practice tends not to result in mosquito breeding. If any level spreaders, weirs, or sediment forebays are used as part of the design, inspect them and correct them as necessary to prevent standing pools of water for more than 72 hours.
- Another mosquito control strategy is to select BMPs that can become habitats for mosquito predators, such as:
    - ***Constructed Stormwater Wetlands:*** Habitat features can be incorporated in constructed stormwater wetlands to attract dragonflies, amphibians, turtles, birds, bats, and other natural predators of mosquitoes.
    - ***Wet Basins:*** Wet basins can be designed to incorporate fish habitat features, such as deep pools. Introduce fish in consultation with Massachusetts Division of Fisheries and Wildlife. Vegetation within wet basins designed as fish habitat must be properly managed to ensure that vegetation does not overtake the habitat. Proper design to ensure that no low circulation or "dead" zones are created may reduce the potential for mosquito breeding. Introducing bubblers may increase water circulation in the wet basin.

Effective mosquito controls require proponents to design structural BMPs to prevent ponding and facilitate maintenance and, if necessary, the application of larvicides. Examples of such design practices include the following:

- ***Basins:*** Provide perimeter access around wet basins, extended dry detention basins and dry detention basins for both larviciding and routine maintenance. Control vegetation to ensure that access pathways stay open.
- ***BMPs without a permanent pool of water:*** All structural BMPs that do not rely on a permanent pool of water must drain and completely dewater within 72 hours after precipitation. This includes dry detention basins, extended dry detention basins, infiltration basins, and dry water quality swales. Use underdrains at extended dry detention basins to drain the small pools that form due to accumulation of silts. Wallace indicates that extended dry extended detention basins may breed more mosquitoes than wet basins. It is, therefore, imperative to design outlets from extended dry detention basins to completely dewater within the 72-hour period.
- ***Energy Dissipators and Flow Spreaders:*** Currier and Moeller, 2000 indicate that shallow recesses in energy dissipators and flow spreaders trap water where mosquitoes breed. Set the riprap in grout to reduce the shallow recesses and minimize mosquito breeding.
- ***Outlet control structures:*** Debris trapped in small orifices or on trash racks of outlet control structures such as multiple stage outlet risers may clog the orifices or the trash rack, causing a standing pool of water. Optimize the orifice size or trash rack mesh size to provide required peak rate attenuation/water quality detention/retention time while minimizing clogging.
- ***Rain Barrels and Cisterns:*** Seal lids to reduce the likelihood of mosquitoes laying eggs in standing water. Install mosquito netting over inlets. The cistern system should be designed to ensure that all collected water is drained into it within 72 hours.
- ***Subsurface Structures, Deep Sump Catch Basins, Oil Grit Separators, and Leaching Catch Basins:*** Seal all manhole covers to reduce likelihood of mosquitoes laying eggs in standing water. Install mosquito netting over the outlet (CALTRANS 2004).

The Operation and Maintenance Plan should provide for mosquito prevention and control.

- ***Check dams:*** Inspect permanent check dams on the schedule set forth in the O&M Plan. Inspect check dams 72 hours after storms for standing water ponding behind the dam. Take corrective action if standing water is found.
- ***Cisterns:*** Apply *Bs* larvicide in the cistern if any evidence of mosquitoes is found. The Operation and Maintenance Plan shall specify how often larvicides should be applied to waters in the cistern.
- ***Water quality swales:*** Remove and properly dispose of any accumulated sediment as scheduled in the Operation and Maintenance Plan.
- ***Larvicide Treatment:*** The Operation and Maintenance Plan must include measures to minimize mosquito breeding, including larviciding.
- The party identified in the Operation and Maintenance Plan as responsible for maintenance shall see that larvicides are applied as necessary to the following stormwater treatment practices: catch basins, oil/grit separators, wet basins, wet water quality swales, dry extended detention basins, infiltration basins, and constructed stormwater wetlands. The Operation and Maintenance Plan must ensure that all larvicides are applied by a licensed pesticide applicator and in compliance with all pesticide label requirements.
- The Operation and Maintenance Plan should identify the appropriate larvicide and the time and method of application. For example, *Bacillus sphaericus (Bs*), the preferred

larvicide for stormwater BMPs, should be hand-broadcast.[2] Alternatively, Altosid, a Methopren product, may be used. Because some practices are designed to dewater between storms, such as dry extended detention and infiltration basins, the Operation and Maintenance Plan should provide that larviciding must be conducted during or immediately after wet weather, when the detention or infiltration basin has a standing pool of water, unless a product is used that can withstand extended dry periods.

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[2] *Bacillus thuringienis israelensis* or *Bti* is usually applied by helicopter to wetlands and floodplains

Roads and Stormwater BMPs

In general, the stormwater BMPs used for land development projects can also be used for new roadways and roadway improvement projects. However, for improvement of existing roads, there are often constraints that limit the choice of BMP. These constraints derive from the linear configuration of the road, the limited area within the existing right-of-way, the structural and safety requirements attendant to good roadway design, and the long-term maintainability of the roadway drainage systems. The MassHighway Handbook provides strategies for dealing with the constraints associated with providing stormwater BMPs for roadway redevelopment projects.

Roadway design can minimize impacts caused by stormwater. Reducing roadway width reduces the total and peak volume of runoff. Designing a road with country drainage (no road shoulders or curbs) disconnects roadway runoff. Disconnection of roadway runoff is eligible for the Low Impact Site Design Credit provided the drainage is disconnected in accordance with specifications outlined in Volume 3.

Like other parties, municipalities that work within wetlands jurisdictional areas and adjacent buffer zones must design and implement structural stormwater best management practices in accordance with the Stormwater Management Standards and the Stormwater Management Handbook. In addition, in municipalities and areas where state agencies operate stormwater systems, the DPWs (or other town or state agencies) must meet the "good housekeeping" requirement of the municipality's or agency's MS4 permit.

MassHighway has taken stormwater management one step further by working with MassDEP to develop the MassHighway Storm Water Handbook for Highways and Bridges. The purpose of the MassHighway Handbook is to provide guidance for persons involved in the design, permitting, review and implementation of state highway projects, especially those involving existing roadways where physical constraints often limit the stormwater management options available. These constraints, like those common to redevelopment sites, may make it difficult to comply precisely with the requirements of the Stormwater Management Standards and the Massachusetts Stormwater Handbook.[3] In response to these constraints, MassDEP and MHD developed specific design, permitting, review and implementation practices that meet the unique challenges of providing environmental protection for existing state roads. The information in the MassHighway Handbook may also aid in the planning and design of projects to build new highways and to add lanes to existing highways, since they may face similar difficulties in meeting the requirements of the Stormwater Management Standards.

Although it is very useful, the MassHighway Handbook does not allow MassHighway projects to proceed without individual review and approval by the issuing authority when subject to the Wetlands Protection Act Regulations, 310 CMR 10.00, or the 401 Water Quality Certification Regulations, 314 CMR 9.00. For example, MassHighway must provide a Conservation Commission with a project-specific Operation and Maintenance Plan in accordance with Standard 9 that documents how the project's post-construction BMPs will be operated and maintained.[4]

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[3] The 2004 MassHighway Handbook outlines standardized methods for dealing with these constraints as they apply to highway redevelopment projects. MassDEP and MassHighway intend to work together to provide guidance for add a lane projects when the 2004 Handbook is revised to reflect the 2008 changes to the Stormwater Management Standards.

[4] The general permit for municipal separate storm sewer systems (the MS4 Permit) requires MassHighway to develop and implement procedures for the proper operation and maintenance of stormwater BMPs. To

Some municipalities have asked if the MassHighway Handbook governs municipal road projects. The answer is no.[5] The MassHighway Handbook was developed in response to the unique problems and challenges arising out of the management of the state highway system. Like other project proponents, cities and towns planning road or other projects in areas subject to jurisdiction under the Wetlands Protection Act must design and implement LID, non-structural and structural best management practices in accordance with the Stormwater Management Standards and the Massachusetts Stormwater Handbook.

avoid duplication of effort, MassHighway may be able rely on the same procedures to fulfill the operation and maintenance requirements of Standard 9 and the MS 4 Permit.

[5] Although the MassHighway Handbook does not govern municipal road projects, cities and towns may find some of the information presented in the Handbook useful.

CDS® Inspection and Maintenance Guide

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	yd3	m3
CDS2015-4	4	1.2	3.0	0.9	0.5	0.4
CDS2015	5	1.5	3.0	0.9	1.3	1.0
CDS2020	5	1.5	3.5	1.1	1.3	1.0
CDS2025	5	1.5	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

CONTECH Construction Products Inc. provides site solutions for the civil engineering industry. CONTECH's portfolio includes bridges, drainage, sanitary sewer, stormwater and earth stabilization products. For information on other CONTECH division offerings, visit contech-cpi.com or call 800.338.1122

The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; 7,517,450 related foreign patents or other patents pending.

CONTECH CONSTRUCTION PRODUCTS INC.
800.925.5240
contechstormwater.com

CDS Inspection & Maintenance Log

CDS Model: ______________________ Location: ______________________

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than eighteen inches the system should be cleaned out. **Note: To avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

CONTECH ENGINEERED SOLUTIONS

Stormceptor® STC Owner's Manual

Stormceptor® STC

Table of Contents

For patent information, go to www.ContechES.com/ip.

Your selection of a Stormceptor® means that you have chosen the most recognized and efficient stormwater oil/sediment separator available for protecting the environment. Stormceptor is a pollution control device often referred to as a "Hydrodynamic Separator (HDS)" or an "Oil Grit Separator (OGS)", engineered to remove and retain pollutants from stormwater runoff to protect our lakes, rivers and streams from the harmful effects of non-point source pollution.

1 – Stormceptor Overview

Stormceptor is a patented stormwater quality structure most often utilized as a treatment component of the underground storm drain network for stormwater pollution prevention. Stormceptor is designed to remove sediment, total suspended solids (TSS), other pollutants attached to sediment, hydrocarbons and free oil from stormwater runoff. Collectively the Stormceptor provides spill protection and prevents non-point source pollution from entering downstream waterways.

Key benefits of Stormceptor include:

- Removes sediment, suspended solids, debris, nutrients, heavy metals, and hydrocarbons (oil and grease) from runoff and snowmelt.
- Will not scour or re-suspend trapped pollutants.
- Provides sediment and oil storage.
- Provides spill control for accidents, commercial and industrial developments.
- Easy to inspect and maintain (vacuum truck).
- "STORMCEPTOR" is clearly marked on the access cover (excluding inlet designs).
- Relatively small footprint.
- 3rd Party tested and independently verified.
- Dedicated team of experts available to provide support.

Model Types:

- STC (Standard)
- EOS (Extended Oil Storage)
- OSR (Oil and Sand Removal)
- MAX (Custom designed unit, specific to site)

Configuration Types:

- Inlet unit (accommodates inlet flow entry, and multi-pipe entry)
- In-Line (accommodates multi-pipe entry)
- Submerged Unit (accommodates the site's tailwater conditions)
- Series Unit (combines treatment in two systems)

PLEASE MAINTAIN YOUR STORMCEPTOR

To ensure long-term environmental protection through continued performance as originally designed for your site, Stormceptor must be maintained, as any stormwater treatment practice does. The need for maintenance is determined through inspection of the Stormceptor. Procedures for inspection are provided within this document. Maintenance of the Stormceptor is performed from the surface via vacuum truck.

If you require information about Stormceptor, or assistance in finding resources to facilitate inspections or maintenance of your Stormceptor please call Contech at 1-800-338-1122.

2 – Stormceptor Operation and Components

Stormceptor is a flexibly designed underground stormwater quality treatment device that is unparalleled in its effectiveness for pollutant capture and retention using patented flow separation technology. Stormceptor creates a non-turbulent treatment environment below the insert platform within the system. The insert diverts water into the lower chamber, allowing free oils and debris to rise, and sediment to settle under relatively low velocity conditions. These pollutants are trapped and stored below the insert and protected from large runoff events for later removal during the maintenance procedure.

With thousands of units operating worldwide, Stormceptor delivers reliable protection every day, in every storm. The patented Stormceptor design prohibits the scour and release of captured pollutants, ensuring superior water quality treatment and protection during even the most extreme storm events. Stormceptor's proven performance is backed by the longest record of lab and field verification in the industry.

Stormceptor Schematic and Component Functions

Below are schematics of two common Stormceptor configurations with key components identified and their functions briefly described.

- **Manhole access cover** – provides access to the subsurface components
- **Precast reinforced concrete structure** – provides the vessel's watertight structural support
- **Fiberglass insert** – separates vessel into upper and lower chambers
- **Weir** – directs incoming stormwater and oil spills into the lower chamber
- **Orifice plate** – prevents scour of accumulated pollutants
- **Inlet drop tee** – conveys stormwater into the lower chamber
- **Fiberglass skirt** – provides double-wall containment of hydrocarbons
- **Outlet riser pipe** – conveys treated water to the upper chamber; primary vacuum line access port for sediment removal
- **Oil inspection port** – primary access for measuring oil depth and oil removal
- **Safety grate** – safety measure to cover riser pipe in the event of manned entry into vessel

Figure 1.

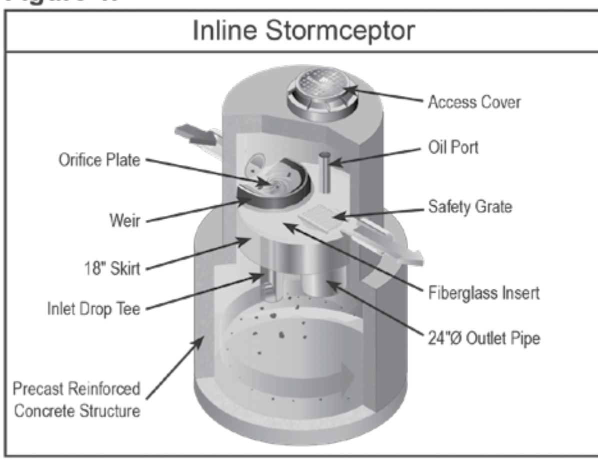
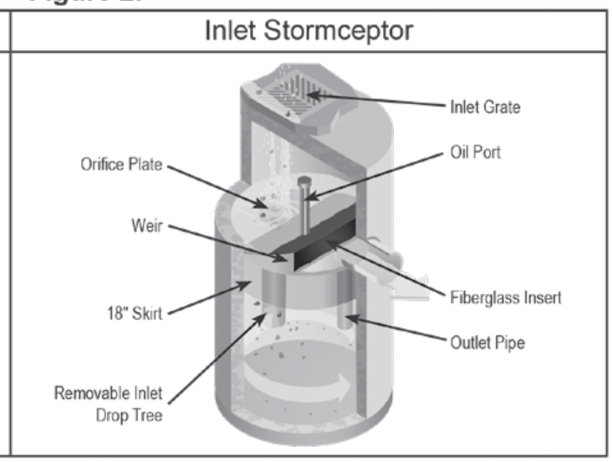


Figure 2.



3 – Stormceptor Identification

Stormceptor is available in both precast concrete and fiberglass vessels, with precast concrete often being the dominant material of construction.

In the Stormceptor, a patented, engineered fiberglass insert separates the structure into an upper chamber and lower chamber. The lower chamber will remain full of water, as this is where the pollutants are sequestered for later removal. Multiple Stormceptor model (STC, OSR, EOS and MAX) configurations exist, each to be inspected and maintained in a similar fashion.

Each unit is easily identifiable as a Stormceptor by the trade name "Stormceptor" embossed on each access cover at the surface. To determine the location of "inlet" Stormceptor units with horizontal catch basin inlet, look down into the grate as the Stormceptor insert will be visible. The name "Stormceptor" is not embossed on inlet models due to the variability of inlet grates used/approved across North America.

Once the location of the Stormceptor is determined, the model number may be identified by comparing the measured depth from the fiberglass insert level at the outlet pipe's invert (water level) to the bottom of the tank using Table 1.

In addition, starting in 1996 a metal serial number tag containing the model number has been affixed to the inside of the unit, on the fiberglass insert. If the unit does not have a serial number, or if there is any uncertainty regarding the size of the unit using depth measurements, please contact your local Contech Representative for assistance.

Sizes/Models

Typical general dimensions and capacities of the standard precast STC, EOS and OSR Stormceptor models are provided in Tables 1 and 2. Typical rim to invert measurements are provided later in this document. The total depth for cleaning will be the sum of the depth from outlet pipe invert (generally the water level) to rim (grade) and the depth from outlet pipe invert to the precast bottom of the unit. Note that depths and capacities may vary slightly between regions.

Table 1. Stormceptor Dimensions - Insert to Base of Structure

STC Model	Insert to Base (in.)
450	60
900	55
1200	71
1800	105
2400	94
3600	134
4800	128
6000	150
7200	134
11000*	128
13000*	150
16000*	134

Notes:
1. Depth Below Pipe Inlet Invert to the Inside Top Base Slab can vary slightly by manufacturing facility, and can be modified to accommodate specific site designs, pollutant loads or site conditions. Contact your local representative for assistance.
**Consist of two chamber structures in series.*

Table 2. Storage Capacities

STC Model	Hydrocarbon Storage Capacity (gal)	Sediment Capacity (ft^3)
450	86	46
900	251	89
1200	251	127
1800	251	207
2400	840	205
3600	840	373
4800	909	543
6000	909	687
7200	1059	839
11000*	2797	1089
13000*	2797	1374
16000*	3055	1677

Notes:
1. Hydrocarbon and Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.
**Consist of two chamber structures in series*

4 – Stormceptor Inspection and Maintenance

Regular inspection and maintenance is a proven, cost-effective way to maximize water resource protection for all stormwater pollution control practices, and is required to insure proper functioning of the Stormceptor. Both inspection and maintenance of the Stormceptor is easily performed from the surface. Stormceptor's patented technology has no moving parts, simplifying the inspection and maintenance process.

Please refer to the following information and guidelines before conducting inspection and maintenance activities.

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess the sediment accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

When is maintenance cleaning needed?

- For optimum performance, the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, which is approximately 15% of the unit's total storage capacity (see Table 3). The frequency should be adjusted based on historical inspection results due to variable site pollutant loading.
- Sediment removal is easier when removed on a regular basis at or prior to the recommended maintenance sediment depths, as sediment build-up can compact making removal more difficult.
- The unit should be cleaned out immediately after an oil, fuel or chemical spill.

What conditions can compromise Stormceptor performance?

- If construction sediment and debris is not removed prior to activating the Stormceptor unit, maintenance frequency may be reduced.
- If the system is not maintained regularly and fills with sediment and debris beyond the capacity as indicated in Table 2, pollutant removal efficiency may be reduced.
- If an oil spill(s) exceeds the oil capacity of the system, subsequent spills may not be captured.
- If debris clogs the inlet of the system, removal efficiency of sediment and hydrocarbons may be reduced.
- If a downstream blockage occurs, a backwater condition may occur for the Stormceptor and removal efficiency of sediment and hydrocarbons may be reduced.

What training is required?

The Stormceptor is to be inspected and maintained by professional vacuum cleaning service providers with experience in the maintenance of underground tanks, sewers and catch basins.

For typical inspection and maintenance activities, no specific supplemental training is required

Recommended Stormceptor Inspection Procedure:

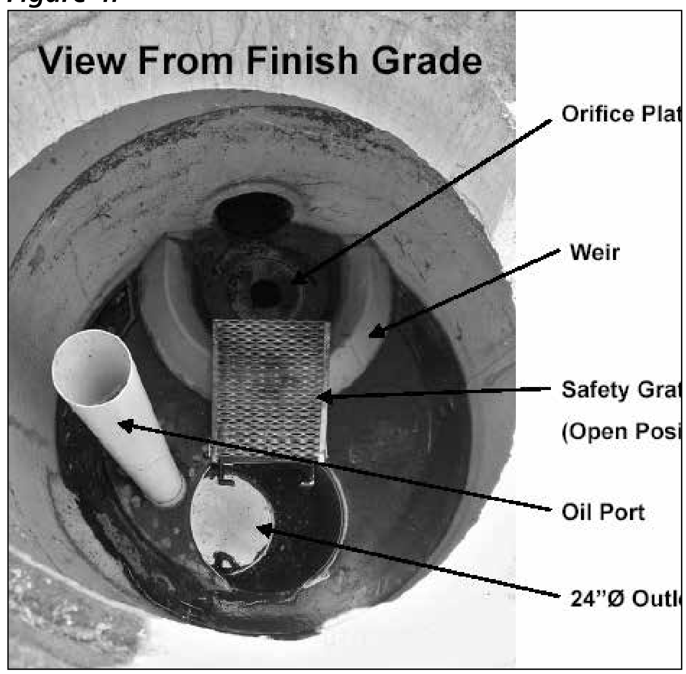
- Stormceptor is to be inspected from grade through a standard surface manhole access cover.
- Sediment and oil depth inspections are performed with a sediment probe and oil dipstick.
- Oil depth is measured through the oil inspection port, either a 4-inch or 6-inch diameter port.
- Sediment depth can be measured through the oil inspection port or the 24-inch diameter outlet riser pipe.
- Inspections also involve a visual inspection of the internal components of the system.

What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, hoist and safety harness for specially trained personnel if confined space entry is required

Figure 3.

Figure 4.



Recommended Stormceptor Maintenance Procedure

Maintenance of Stormceptor is performed using a vacuum truck. No entry into the unit is required for maintenance. DO NOT ENTER THE STORMCEPTOR CHAMBER unless you have the proper personal safety equipment, have been trained and are qualified to enter a confined space, as identified by local Occupational Safety and Health Regulations (e.g. 29 CFR 1910.146). Without the proper equipment, training and permit, entry into confined spaces can result in serious bodily harm and potentially death. Consult local and/or state regulations to determine the requirements for confined space entry. Be aware, and take precaution that the Stormceptor fiberglass insert may be slippery. In addition, be aware that some units do not have a safety grate to cover the outlet riser pipe that leads to the submerged, lower chamber.

- Ideally maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is to be maintained through a standard surface manhole access cover.
- Insert the oil dipstick into the oil inspection port. If oil is present, pump off the oil layer into separate containment using a small pump and tubing.
- Maintenance cleaning of accumulated sediment is performed with a vacuum truck.
  - » For 6-ft diameter models and larger, the vacuum hose is inserted into the lower chamber via the 24-inch outlet riser pipe (See Fig. 5).
  - » For 4-ft diameter model, the removable drop tee is lifted out, and the vacuum hose is inserted into the lower chamber via the 12-inch drop tee hole (See Fig. 6).

Figure 5.

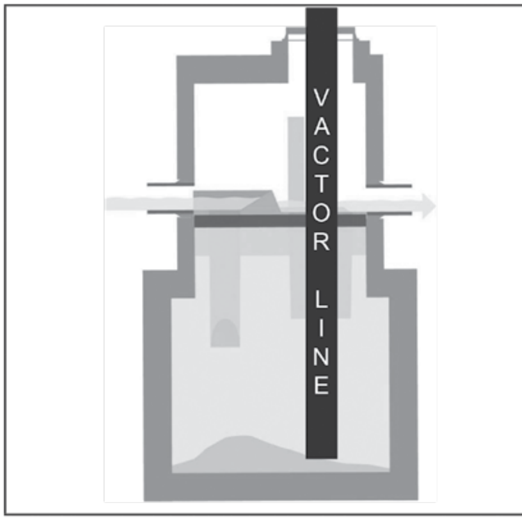
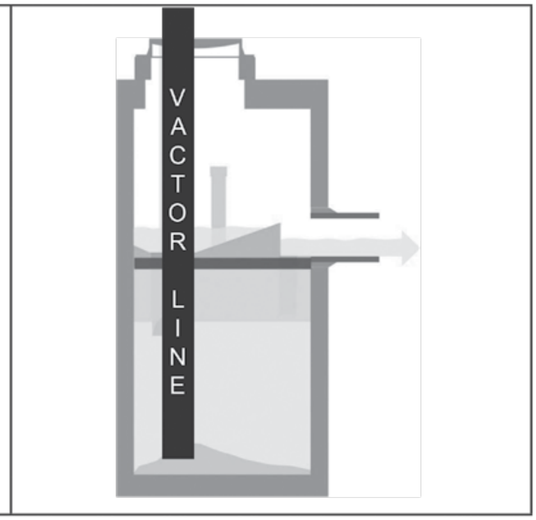


Figure 6.



- Using the vacuum hose, decant the water from the lower chamber into a separate containment tank or to the sanitary sewer, if permitted by the local regulating authority.
- Remove the sediment sludge from the bottom of the unit using the vacuum hose. For large Stormceptor units, a flexible hose is often connected to the primary vacuum line for ease of movement in the lower chamber.
- Units that have not been maintained regularly, have surpassed the maximum recommended sediment capacity, or contain damaged components may require manned entry by trained personnel using safe and proper confined space entry procedures.

What is required for proper disposal?

The requirements for the disposal of material removed from Stormceptor units are similar to that of any other stormwater treatment Best Management Practices (BMP). Local guidelines should be consulted prior to disposal of the separator contents. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste. This could be site and pollutant dependent. In some cases, approval from the disposal facility operator/agency may be required.

What about oil spills?

Stormceptor is often implemented in areas where there is high potential for oil, fuel or other hydrocarbon or chemical spills. Stormceptor units should be cleaned immediately after a spill occurs by a licensed liquid waste hauler. You should also notify the appropriate regulatory agencies as required in the event of a spill.

What if I see an oil rainbow or sheen at the Stormceptor outlet?

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a hydrocarbon rainbow or sheen can be seen at very small oil concentrations (< 10 ppm). Stormceptor is effective at removing 95% of free oil, and the appearance of a sheen at the outlet with high influent oil concentrations does not mean unit is not working to this level of removal. In addition, if the influent oil is emulsified, the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified or dissolved oil conditions.

What factors affect the costs involved with inspection/maintenance?

The Vacuum Service Industry for stormwater drainage and sewer systems is a well-established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean Stormceptor units will vary. Inspection and maintenance costs are most often based on unit size, the number of units on a site, sediment/oil/hazardous material loads, transportation distances, tipping fees, disposal requirements and other local regulations.

What factors predict maintenance frequency?

Maintenance frequency will vary with the amount of pollution on your site (number of hydrocarbon spills, amount of sediment, site activity and use, etc.). It is recommended that the frequency of maintenance be increased or reduced based on local conditions. If the sediment load is high from an unstable site or sediment loads transported from upstream catchments, maintenance may be required semi-annually. Conversely once a site has stabilized, maintenance may be required less frequently (for example: two to seven year, site and situation dependent). Maintenance should be performed immediately after an oil spill or once the sediment depth in Stormceptor reaches the value specified in Table 3 based on the unit size.

Table 3. Recommended Sediment Depths Indicating Maintenance

STC Model	Maintenance Sediment Depth (in)
450	8
900	8
1200	10
1800	15
2400	12
3600	17
4800	15
6000	18
7200	15
11000*	17
13000*	20
16000*	17

Notes:
1. The values above are for typical standard units.
** Per structure.*

Replacement parts

Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. Therefore, inspection and maintenance activities are generally focused on pollutant removal. However, if replacements parts are necessary, they may be purchased by contacting your local Contech Representative or call 800-338-1122.

The benefits of regular inspection and maintenance are many – from ensuring maximum operation efficiency, to keeping maintenance costs low, to the continued protection of natural waterways – and provide the key to Stormceptor's long and effective service life.

Stormceptor Inspection and Maintenance Log

Stormceptor Model No: ______________________________

Allowable Sediment Depth: ______________________________

Serial Number: ______________________________

Installation Date: ______________________________

Location Description of Unit: ______________________________

Other Comments: ______________________________

5 – Contact Information

Questions regarding the Stormceptor can be addressed by contacting your local Contech representative or by calling 800-338-1122.

SUPPORT

- Drawings and specifications are available at www.ContechES.com.
- Site-specific design support is available from our engineers.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, and earth stabilization products. For information, visit www.ContechES.com or call 800.338.1122

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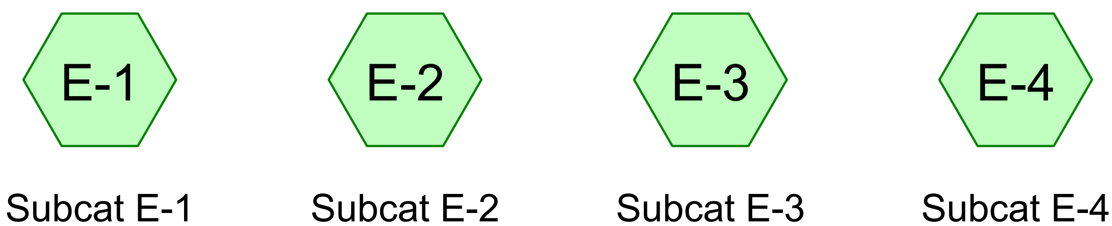
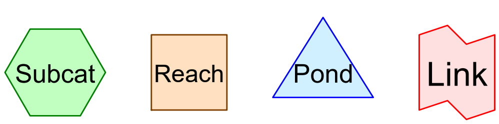
SECTION 3.0

HYROCAD WORKSHEETS……………….EXISTING CONDITIONS





Routing Diagram for 2513-02 - Existing HydroCAD
Prepared by Allen & Major Associates, Inc., Printed 11/13/2020

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
54,887	61	>75% Grass cover, Good, HSG B (E-1, E-3, E-4)
32,088	74	>75% Grass cover, Good, HSG C (E-1, E-2, E-3, E-4)
620	80	>75% Grass cover, Good, HSG D (E-1)
19,809	98	Paved parking, HSG B (E-1, E-3, E-4)
12,339	98	Paved parking, HSG C (E-3, E-4)
482	98	Paved parking, HSG D (E-1)
5,312	98	Roofs, HSG B (E-1, E-3)
104,070	55	Woods, Good, HSG B (E-1, E-3, E-4)
444,292	70	Woods, Good, HSG C (E-1, E-2, E-3, E-4)
155,494	77	Woods, Good, HSG D (E-1, E-4)
829,392	**70**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
184,078	HSG B	E-1, E-3, E-4
488,719	HSG C	E-1, E-2, E-3, E-4
156,595	HSG D	E-1, E-4
0	Other	
829,392		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	54,887	32,088	620	0	87,595	>75% Grass cover, Good	
0	19,809	12,339	482	0	32,630	Paved parking	
0	5,312	0	0	0	5,312	Roofs	
0	104,070	444,292	155,494	0	703,856	Woods, Good	
0	**184,078**	**488,719**	**156,595**	**0**	**829,392**	**TOTAL AREA**	

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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: Subcat E-1 Runoff Area=319,884 sf 4.40% Impervious Runoff Depth=0.82"
Flow Length=844' Tc=16.3 min CN=70 Runoff=4.57 cfs 21,919 cf

Subcatchment E-2: Subcat E-2 Runoff Area=19,655 sf 0.00% Impervious Runoff Depth=0.82"
Flow Length=138' Tc=11.8 min CN=70 Runoff=0.31 cfs 1,347 cf

Subcatchment E-3: Subcat E-3 Runoff Area=206,021 sf 9.02% Impervious Runoff Depth=0.87"
Flow Length=1,516' Tc=23.2 min CN=71 Runoff=2.77 cfs 14,972 cf

Subcatchment E-4: Subcat E-4 Runoff Area=283,833 sf 1.86% Impervious Runoff Depth=0.82"
Flow Length=845' Tc=20.1 min CN=70 Runoff=3.74 cfs 19,449 cf

Total Runoff Area = 829,392 sf Runoff Volume = 57,687 cf Average Runoff Depth = 0.83"
95.43% Pervious = 791,450 sf 4.57% Impervious = 37,942 sf

Summary for Subcatchment E-1: Subcat E-1

Runoff = 4.57 cfs @ 12.26 hrs, Volume= 21,919 cf, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
4,296	98	Roofs, HSG B
9,307	98	Paved parking, HSG B
32,039	61	>75% Grass cover, Good, HSG B
76,085	55	Woods, Good, HSG B
482	98	Paved parking, HSG D
620	80	>75% Grass cover, Good, HSG D
155,338	77	Woods, Good, HSG D
38,171	70	Woods, Good, HSG C
3,545	74	>75% Grass cover, Good, HSG C
319,884	70	Weighted Average
305,799		95.60% Pervious Area
14,085		4.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0625	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
8.4	794	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.3	844	Total			

Summary for Subcatchment E-2: Subcat E-2

Runoff = 0.31 cfs @ 12.19 hrs, Volume= 1,347 cf, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
548	74	>75% Grass cover, Good, HSG C
19,107	70	Woods, Good, HSG C
19,655	70	Weighted Average
19,655		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0330	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
1.5	88	0.0400	1.00		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
11.8	138	Total			

Summary for Subcatchment E-3: Subcat E-3

Runoff = 2.77 cfs @ 12.36 hrs, Volume= 14,972 cf, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
1,016	98	Roofs, HSG B
9,435	98	Paved parking, HSG B
21,519	61	>75% Grass cover, Good, HSG B
18,762	55	Woods, Good, HSG B
8,128	98	Paved parking, HSG C
125,472	70	Woods, Good, HSG C
21,689	74	>75% Grass cover, Good, HSG C
206,021	71	Weighted Average
187,442		90.98% Pervious Area
18,579		9.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
1.1	119	0.0670	1.81		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.8	99	0.1600	2.00		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
1.8	177	0.0560	1.66		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
13.8	1,071	0.0670	1.29		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
23.2	1,516	Total			

Summary for Subcatchment E-4: Subcat E-4

Runoff = 3.74 cfs @ 12.32 hrs, Volume= 19,449 cf, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
156	77	Woods, Good, HSG D
1,067	98	Paved parking, HSG B
1,328	61	>75% Grass cover, Good, HSG B
9,223	55	Woods, Good, HSG B
261,542	70	Woods, Good, HSG C
4,210	98	Paved parking, HSG C
6,306	74	>75% Grass cover, Good, HSG C
283,833	70	Weighted Average
278,555		98.14% Pervious Area
5,278		1.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
7.6	795	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
20.1	845	Total			

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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: Subcat E-1 Runoff Area=319,884 sf 4.40% Impervious Runoff Depth=1.87"
Flow Length=844' Tc=16.3 min CN=70 Runoff=11.43 cfs 49,974 cf

Subcatchment E-2: Subcat E-2 Runoff Area=19,655 sf 0.00% Impervious Runoff Depth=1.87"
Flow Length=138' Tc=11.8 min CN=70 Runoff=0.79 cfs 3,071 cf

Subcatchment E-3: Subcat E-3 Runoff Area=206,021 sf 9.02% Impervious Runoff Depth=1.95"
Flow Length=1,516' Tc=23.2 min CN=71 Runoff=6.69 cfs 33,507 cf

Subcatchment E-4: Subcat E-4 Runoff Area=283,833 sf 1.86% Impervious Runoff Depth=1.87"
Flow Length=845' Tc=20.1 min CN=70 Runoff=9.34 cfs 44,342 cf

Total Runoff Area = 829,392 sf Runoff Volume = 130,894 cf Average Runoff Depth = 1.89"
95.43% Pervious = 791,450 sf 4.57% Impervious = 37,942 sf

Summary for Subcatchment E-1: Subcat E-1

Runoff = 11.43 cfs @ 12.24 hrs, Volume= 49,974 cf, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
4,296	98	Roofs, HSG B
9,307	98	Paved parking, HSG B
32,039	61	>75% Grass cover, Good, HSG B
76,085	55	Woods, Good, HSG B
482	98	Paved parking, HSG D
620	80	>75% Grass cover, Good, HSG D
155,338	77	Woods, Good, HSG D
38,171	70	Woods, Good, HSG C
3,545	74	>75% Grass cover, Good, HSG C
319,884	70	Weighted Average
305,799		95.60% Pervious Area
14,085		4.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0625	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
8.4	794	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.3	844	Total			

Summary for Subcatchment E-2: Subcat E-2

Runoff = 0.79 cfs @ 12.17 hrs, Volume= 3,071 cf, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
548	74	>75% Grass cover, Good, HSG C
19,107	70	Woods, Good, HSG C
19,655	70	Weighted Average
19,655		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0330	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
1.5	88	0.0400	1.00		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
11.8	138	Total			

Summary for Subcatchment E-3: Subcat E-3

Runoff = 6.69 cfs @ 12.34 hrs, Volume= 33,507 cf, Depth= 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
1,016	98	Roofs, HSG B
9,435	98	Paved parking, HSG B
21,519	61	>75% Grass cover, Good, HSG B
18,762	55	Woods, Good, HSG B
8,128	98	Paved parking, HSG C
125,472	70	Woods, Good, HSG C
21,689	74	>75% Grass cover, Good, HSG C
206,021	71	Weighted Average
187,442		90.98% Pervious Area
18,579		9.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
1.1	119	0.0670	1.81		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.8	99	0.1600	2.00		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
1.8	177	0.0560	1.66		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
13.8	1,071	0.0670	1.29		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
23.2	1,516	Total			

Summary for Subcatchment E-4: Subcat E-4

Runoff = 9.34 cfs @ 12.29 hrs, Volume= 44,342 cf, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
156	77	Woods, Good, HSG D
1,067	98	Paved parking, HSG B
1,328	61	>75% Grass cover, Good, HSG B
9,223	55	Woods, Good, HSG B
261,542	70	Woods, Good, HSG C
4,210	98	Paved parking, HSG C
6,306	74	>75% Grass cover, Good, HSG C
283,833	70	Weighted Average
278,555		98.14% Pervious Area
5,278		1.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
7.6	795	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
20.1	845	Total			

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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: Subcat E-1 Runoff Area=319,884 sf 4.40% Impervious Runoff Depth=2.81"
Flow Length=844' Tc=16.3 min CN=70 Runoff=17.48 cfs 74,990 cf

Subcatchment E-2: Subcat E-2 Runoff Area=19,655 sf 0.00% Impervious Runoff Depth=2.81"
Flow Length=138' Tc=11.8 min CN=70 Runoff=1.21 cfs 4,608 cf

Subcatchment E-3: Subcat E-3 Runoff Area=206,021 sf 9.02% Impervious Runoff Depth=2.91"
Flow Length=1,516' Tc=23.2 min CN=71 Runoff=10.12 cfs 49,905 cf

Subcatchment E-4: Subcat E-4 Runoff Area=283,833 sf 1.86% Impervious Runoff Depth=2.81"
Flow Length=845' Tc=20.1 min CN=70 Runoff=14.28 cfs 66,538 cf

Total Runoff Area = 829,392 sf Runoff Volume = 196,041 cf Average Runoff Depth = 2.84"
95.43% Pervious = 791,450 sf 4.57% Impervious = 37,942 sf

Summary for Subcatchment E-1: Subcat E-1

Runoff = 17.48 cfs @ 12.23 hrs, Volume= 74,990 cf, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
4,296	98	Roofs, HSG B
9,307	98	Paved parking, HSG B
32,039	61	>75% Grass cover, Good, HSG B
76,085	55	Woods, Good, HSG B
482	98	Paved parking, HSG D
620	80	>75% Grass cover, Good, HSG D
155,338	77	Woods, Good, HSG D
38,171	70	Woods, Good, HSG C
3,545	74	>75% Grass cover, Good, HSG C
319,884	70	Weighted Average
305,799		95.60% Pervious Area
14,085		4.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0625	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
8.4	794	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.3	844	Total			

Summary for Subcatchment E-2: Subcat E-2

Runoff = 1.21 cfs @ 12.17 hrs, Volume= 4,608 cf, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
548	74	>75% Grass cover, Good, HSG C
19,107	70	Woods, Good, HSG C
19,655	70	Weighted Average
19,655		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0330	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
1.5	88	0.0400	1.00		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
11.8	138	Total			

Summary for Subcatchment E-3: Subcat E-3

Runoff = 10.12 cfs @ 12.33 hrs, Volume= 49,905 cf, Depth= 2.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
1,016	98	Roofs, HSG B
9,435	98	Paved parking, HSG B
21,519	61	>75% Grass cover, Good, HSG B
18,762	55	Woods, Good, HSG B
8,128	98	Paved parking, HSG C
125,472	70	Woods, Good, HSG C
21,689	74	>75% Grass cover, Good, HSG C
206,021	71	Weighted Average
187,442		90.98% Pervious Area
18,579		9.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
1.1	119	0.0670	1.81		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.8	99	0.1600	2.00		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
1.8	177	0.0560	1.66		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
13.8	1,071	0.0670	1.29		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
23.2	1,516	Total			

Summary for Subcatchment E-4: Subcat E-4

Runoff = 14.28 cfs @ 12.29 hrs, Volume= 66,538 cf, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
156	77	Woods, Good, HSG D
1,067	98	Paved parking, HSG B
1,328	61	>75% Grass cover, Good, HSG B
9,223	55	Woods, Good, HSG B
261,542	70	Woods, Good, HSG C
4,210	98	Paved parking, HSG C
6,306	74	>75% Grass cover, Good, HSG C
283,833	70	Weighted Average
278,555		98.14% Pervious Area
5,278		1.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
7.6	795	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
20.1	845	Total			

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 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: Subcat E-1 Runoff Area=319,884 sf 4.40% Impervious Runoff Depth=4.92"
Flow Length=844' Tc=16.3 min CN=70 Runoff=30.96 cfs 131,234 cf

Subcatchment E-2: Subcat E-2 Runoff Area=19,655 sf 0.00% Impervious Runoff Depth=4.92"
Flow Length=138' Tc=11.8 min CN=70 Runoff=2.14 cfs 8,063 cf

Subcatchment E-3: Subcat E-3 Runoff Area=206,021 sf 9.02% Impervious Runoff Depth=5.04"
Flow Length=1,516' Tc=23.2 min CN=71 Runoff=17.68 cfs 86,575 cf

Subcatchment E-4: Subcat E-4 Runoff Area=283,833 sf 1.86% Impervious Runoff Depth=4.92"
Flow Length=845' Tc=20.1 min CN=70 Runoff=25.20 cfs 116,444 cf

Total Runoff Area = 829,392 sf Runoff Volume = 342,316 cf Average Runoff Depth = 4.95"
95.43% Pervious = 791,450 sf 4.57% Impervious = 37,942 sf

Summary for Subcatchment E-1: Subcat E-1

Runoff = 30.96 cfs @ 12.22 hrs, Volume= 131,234 cf, Depth= 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
4,296	98	Roofs, HSG B
9,307	98	Paved parking, HSG B
32,039	61	>75% Grass cover, Good, HSG B
76,085	55	Woods, Good, HSG B
482	98	Paved parking, HSG D
620	80	>75% Grass cover, Good, HSG D
155,338	77	Woods, Good, HSG D
38,171	70	Woods, Good, HSG C
3,545	74	>75% Grass cover, Good, HSG C
319,884	70	Weighted Average
305,799		95.60% Pervious Area
14,085		4.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0625	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
8.4	794	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.3	844	Total			

Summary for Subcatchment E-2: Subcat E-2

Runoff = 2.14 cfs @ 12.17 hrs, Volume= 8,063 cf, Depth= 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
548	74	>75% Grass cover, Good, HSG C
19,107	70	Woods, Good, HSG C
19,655	70	Weighted Average
19,655		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0330	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
1.5	88	0.0400	1.00		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
11.8	138	Total			

Summary for Subcatchment E-3: Subcat E-3

Runoff = 17.68 cfs @ 12.32 hrs, Volume= 86,575 cf, Depth= 5.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
1,016	98	Roofs, HSG B
9,435	98	Paved parking, HSG B
21,519	61	>75% Grass cover, Good, HSG B
18,762	55	Woods, Good, HSG B
8,128	98	Paved parking, HSG C
125,472	70	Woods, Good, HSG C
21,689	74	>75% Grass cover, Good, HSG C
206,021	71	Weighted Average
187,442		90.98% Pervious Area
18,579		9.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
1.1	119	0.0670	1.81		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.8	99	0.1600	2.00		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
1.8	177	0.0560	1.66		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
13.8	1,071	0.0670	1.29		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
23.2	1,516	Total			

Summary for Subcatchment E-4: Subcat E-4

Runoff = 25.20 cfs @ 12.28 hrs, Volume= 116,444 cf, Depth= 4.92"

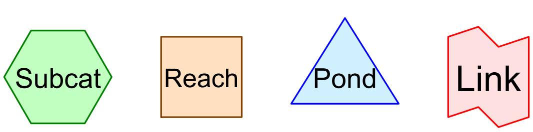
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
156	77	Woods, Good, HSG D
1,067	98	Paved parking, HSG B
1,328	61	>75% Grass cover, Good, HSG B
9,223	55	Woods, Good, HSG B
261,542	70	Woods, Good, HSG C
4,210	98	Paved parking, HSG C
6,306	74	>75% Grass cover, Good, HSG C
283,833	70	Weighted Average
278,555		98.14% Pervious Area
5,278		1.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
7.6	795	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
20.1	845	Total			

SECTION 4.0

HYROCAD WORKSHEETS………………PROPOSED CONDITIONS



Routing Diagram for 2513-02 - Proposed HydroCAD
Prepared by Allen & Major Associates, Inc., Printed 3/1/2021

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
74,131	61	>75% Grass cover, Good, HSG B (P-1, P-3B, P-4a, P-4b)
291,723	74	>75% Grass cover, Good, HSG C (P-1, P-2, P-3A, P-3B, P-3c, P-4a, P-4b, P-4c, P-5a, P-5b, P-5c, P-5d, P-5e, P-5f, P-6, P-7)
24,002	80	>75% Grass cover, Good, HSG D (P-1)
12,616	98	Paved parking, HSG B (P-1, P-4a)
64,675	98	Paved parking, HSG C (P-3A, P-3B, P-3c, P-4a, P-5a, P-5b, P-5c, P-5d, P-5e, P-5f, P-6, P-7)
482	98	Paved parking, HSG D (P-1)
97,331	55	Woods, Good, HSG B (P-1, P-4a, P-4b)
132,322	70	Woods, Good, HSG C (P-1, P-2, P-4a, P-4b, P-4c, P-5d, P-5e, P-5f, P-6, P-7)
132,112	77	Woods, Good, HSG D (P-1, P-4c)
829,394	**73**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
184,078	HSG B	P-1, P-3B, P-4a, P-4b
488,720	HSG C	P-1, P-2, P-3A, P-3B, P-3c, P-4a, P-4b, P-4c, P-5a, P-5b, P-5c, P-5d, P-5e, P-5f, P-6, P-7
156,595	HSG D	P-1, P-4c
0	Other	
829,394		**TOTAL AREA**

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	CB10	234.69	234.60	9.0	0.0100	0.013	15.0	0.0	0.0
2	CB12	229.29	229.10	19.0	0.0100	0.013	15.0	0.0	0.0
3	CB14	223.98	223.35	21.0	0.0300	0.013	15.0	0.0	0.0
4	CB16	217.40	217.06	15.0	0.0227	0.013	15.0	0.0	0.0
5	CB18	210.30	209.93	37.0	0.0100	0.013	15.0	0.0	0.0
6	CB2	255.50	255.10	22.0	0.0182	0.013	15.0	0.0	0.0
7	CB4	257.46	256.80	22.0	0.0300	0.013	15.0	0.0	0.0
8	CB6	250.61	250.50	11.0	0.0100	0.013	15.0	0.0	0.0
9	CB8	243.40	243.06	17.0	0.0200	0.013	15.0	0.0	0.0
10	DB1	204.75	204.50	50.0	0.0050	0.013	15.0	0.0	0.0
11	DB2	239.55	234.80	95.0	0.0500	0.013	12.0	0.0	0.0
12	DMH1	251.51	249.59	64.0	0.0300	0.013	15.0	0.0	0.0
13	DMH10	211.19	208.93	113.0	0.0200	0.013	24.0	0.0	0.0
14	DMH11	208.83	208.00	62.0	0.0134	0.013	24.0	0.0	0.0
15	DMH12	234.70	230.60	76.0	0.0539	0.013	15.0	0.0	0.0
16	DMH2	251.84	249.59	75.0	0.0300	0.013	15.0	0.0	0.0
17	DMH3	250.40	249.85	55.0	0.0100	0.013	15.0	0.0	0.0
18	DMH4	248.85	246.00	159.0	0.0179	0.013	18.0	0.0	0.0
19	DMH5	233.65	229.00	143.0	0.0325	0.013	15.0	0.0	0.0
20	DMH6	242.96	234.60	146.0	0.0573	0.013	15.0	0.0	0.0
21	DMH7	234.35	228.85	140.0	0.0393	0.013	18.0	0.0	0.0
22	DMH8	227.21	223.10	137.0	0.0300	0.013	24.0	0.0	0.0
23	DMH9	219.49	216.55	147.0	0.0200	0.013	24.0	0.0	0.0

Time span=5.00-36.00 hrs, dt=0.05 hrs, 621 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P-1: Subcat P-1 Runoff Area=286,240 sf 1.87% Impervious Runoff Depth=0.82"
Flow Length=844' Tc=16.3 min CN=70 Runoff=4.09 cfs 19,614 cf

Subcatchment P-2: Subcat P-2 Runoff Area=13,434 sf 0.00% Impervious Runoff Depth=0.92"
Flow Length=81' Tc=13.0 min CN=72 Runoff=0.24 cfs 1,034 cf

Subcatchment P-3A: Subcat P-3A Runoff Area=14,378 sf 37.99% Impervious Runoff Depth=1.60"
Tc=6.0 min CN=83 Runoff=0.61 cfs 1,918 cf

Subcatchment P-3B: Subcat P-3B Runoff Area=14,663 sf 31.46% Impervious Runoff Depth=1.46"
Tc=6.0 min CN=81 Runoff=0.56 cfs 1,785 cf

Subcatchment P-3c: Subcat P-3c Runoff Area=21,845 sf 33.05% Impervious Runoff Depth=1.53"
Tc=6.0 min CN=82 Runoff=0.88 cfs 2,785 cf

Subcatchment P-4a: Subcat P-4a Runoff Area=98,231 sf 8.23% Impervious Runoff Depth=0.55"
Flow Length=350' Tc=11.5 min CN=64 Runoff=0.89 cfs 4,539 cf

Subcatchment P-4b: Subcat P-4b Runoff Area=26,294 sf 0.00% Impervious Runoff Depth=0.92"
Flow Length=422' Tc=9.1 min CN=72 Runoff=0.53 cfs 2,023 cf

Subcatchment P-4c: Subcat P-4c Runoff Area=89,064 sf 0.00% Impervious Runoff Depth=0.92"
Flow Length=415' Tc=16.2 min CN=72 Runoff=1.48 cfs 6,854 cf

Subcatchment P-5a: Subcat P-5a Runoff Area=24,643 sf 37.64% Impervious Runoff Depth=1.60"
Tc=6.0 min CN=83 Runoff=1.04 cfs 3,288 cf

Subcatchment P-5b: Subcat P-5b Runoff Area=32,723 sf 25.12% Impervious Runoff Depth=1.39"
Tc=6.0 min CN=80 Runoff=1.19 cfs 3,802 cf

Subcatchment P-5c: Subcat P-5c Runoff Area=31,664 sf 28.13% Impervious Runoff Depth=1.46"
Tc=6.0 min CN=81 Runoff=1.21 cfs 3,856 cf

Subcatchment P-5d: Subcat P-5d Runoff Area=33,498 sf 16.51% Impervious Runoff Depth=1.20"
Tc=6.0 min CN=77 Runoff=1.04 cfs 3,363 cf

Subcatchment P-5e: Subcat P-5e Runoff Area=33,846 sf 15.72% Impervious Runoff Depth=1.15"
Tc=6.0 min CN=76 Runoff=0.99 cfs 3,230 cf

Subcatchment P-5f: Subcat P-5f Runoff Area=27,195 sf 21.01% Impervious Runoff Depth=1.20"
Tc=6.0 min CN=77 Runoff=0.84 cfs 2,730 cf

Subcatchment P-6: Subcat P-6 Runoff Area=49,382 sf 7.70% Impervious Runoff Depth=1.15"
Tc=6.0 min CN=76 Runoff=1.44 cfs 4,712 cf

Subcatchment P-7: Subcat P-7 Runoff Area=32,294 sf 0.82% Impervious Runoff Depth=0.98"
Tc=6.0 min CN=73 Runoff=0.78 cfs 2,628 cf

Reach 9001R: Routing sheet flow through a subcatchment Avg. Flow Depth=0.01' Max Vel=0.19 fps Inflow=0.72 cfs 4,539 cf
n=0.150 L=680.0' S=0.0941 '/' Capacity=463.86 cfs Outflow=0.28 cfs 4,539 cf

Reach 9002R: Routing sheet flow through a subcatchment Avg. Flow Depth=0.01' Max Vel=0.21 fps Inflow=0.53 cfs 2,023 cf
n=0.150 L=345.0' S=0.1420 '/' Capacity=569.83 cfs Outflow=0.26 cfs 2,023 cf

Reach SP-1: SP-1 Inflow=4.09 cfs 19,614 cf
Outflow=4.09 cfs 19,614 cf

Reach SP-2: SP-2 Inflow=0.24 cfs 1,034 cf
Outflow=0.24 cfs 1,034 cf

Reach SP-3: SP-3 Inflow=2.75 cfs 22,872 cf
Outflow=2.75 cfs 22,872 cf

Reach SP-4: SP-4
Inflow=2.87 cfs 19,571 cf
Outflow=2.87 cfs 19,571 cf

Reach SW1: Swale
Avg. Flow Depth=0.23' Max Vel=0.46 fps Inflow=0.89 cfs 4,539 cf
n=0.080 L=267.0' S=0.0050 '/' Capacity=37.23 cfs Outflow=0.72 cfs 4,539 cf

Pond CB10: CB
Peak Elev=235.30' Inflow=1.19 cfs 3,802 cf
15.0" Round Culvert n=0.013 L=9.0' S=0.0100 '/' Outflow=1.19 cfs 3,802 cf

Pond CB12: CB
Peak Elev=229.87' Inflow=1.21 cfs 3,856 cf
15.0" Round Culvert n=0.013 L=19.0' S=0.0100 '/' Outflow=1.21 cfs 3,856 cf

Pond CB14: CB
Peak Elev=224.46' Inflow=1.04 cfs 3,363 cf
15.0" Round Culvert n=0.013 L=21.0' S=0.0300 '/' Outflow=1.04 cfs 3,363 cf

Pond CB16: CB
Peak Elev=217.87' Inflow=0.99 cfs 3,230 cf
15.0" Round Culvert n=0.013 L=15.0' S=0.0227 '/' Outflow=0.99 cfs 3,230 cf

Pond CB18: CB
Peak Elev=210.75' Inflow=0.84 cfs 2,730 cf
15.0" Round Culvert n=0.013 L=37.0' S=0.0100 '/' Outflow=0.84 cfs 2,730 cf

Pond CB2: CB
Peak Elev=255.86' Inflow=0.61 cfs 1,918 cf
15.0" Round Culvert n=0.013 L=22.0' S=0.0182 '/' Outflow=0.61 cfs 1,918 cf

Pond CB4: CB
Peak Elev=257.81' Inflow=0.56 cfs 1,785 cf
15.0" Round Culvert n=0.013 L=22.0' S=0.0300 '/' Outflow=0.56 cfs 1,785 cf

Pond CB6: CB
Peak Elev=251.11' Inflow=0.88 cfs 2,785 cf
15.0" Round Culvert n=0.013 L=11.0' S=0.0100 '/' Outflow=0.88 cfs 2,785 cf

Pond CB8: CB
Peak Elev=243.88' Inflow=1.04 cfs 3,288 cf
15.0" Round Culvert n=0.013 L=17.0' S=0.0200 '/' Outflow=1.04 cfs 3,288 cf

Pond DB1: DB1
Peak Elev=208.18' Storage=5,558 cf Inflow=7.10 cfs 22,896 cf
Primary=2.75 cfs 22,872 cf Secondary=0.00 cfs 0 cf Outflow=2.75 cfs 22,872 cf

Pond DB2: DB2
Peak Elev=246.73' Storage=3,519 cf Inflow=3.49 cfs 11,201 cf
Discarded=0.10 cfs 4,952 cf Primary=1.19 cfs 6,161 cf Secondary=0.00 cfs 0 cf Outflow=1.29 cfs 11,113 cf

Pond DMH1: DMH
Peak Elev=251.87' Inflow=0.61 cfs 1,918 cf
15.0" Round Culvert n=0.013 L=64.0' S=0.0300 '/' Outflow=0.61 cfs 1,918 cf

Pond DMH10: DMH
Peak Elev=212.20' Inflow=5.47 cfs 17,538 cf
24.0" Round Culvert n=0.013 L=113.0' S=0.0200 '/' Outflow=5.47 cfs 17,538 cf

Pond DMH11: DMH
Peak Elev=209.93' Inflow=6.32 cfs 20,268 cf
24.0" Round Culvert n=0.013 L=62.0' S=0.0134 '/' Outflow=6.32 cfs 20,268 cf

Pond DMH12: DMH
Peak Elev=235.22' Inflow=1.19 cfs 6,161 cf
15.0" Round Culvert n=0.013 L=76.0' S=0.0539 '/' Outflow=1.19 cfs 6,161 cf

Pond DMH2: DMH
Peak Elev=252.19' Inflow=0.56 cfs 1,785 cf
15.0" Round Culvert n=0.013 L=75.0' S=0.0300 '/' Outflow=0.56 cfs 1,785 cf

Pond DMH3: DMH
Peak Elev=250.85' Inflow=0.88 cfs 2,785 cf
15.0" Round Culvert n=0.013 L=55.0' S=0.0100 '/' Outflow=0.88 cfs 2,785 cf

Pond DMH4: DMH
Peak Elev=249.51' Inflow=2.05 cfs 6,489 cf
18.0" Round Culvert n=0.013 L=159.0' S=0.0179 '/' Outflow=2.05 cfs 6,489 cf

Pond DMH5: DMH
Peak Elev=234.17' Inflow=1.19 cfs 6,161 cf
15.0" Round Culvert n=0.013 L=143.0' S=0.0325 '/' Outflow=1.19 cfs 6,161 cf

Pond DMH6: DMH
Peak Elev=243.44' Inflow=1.04 cfs 3,288 cf
15.0" Round Culvert n=0.013 L=146.0' S=0.0573 '/' Outflow=1.04 cfs 3,288 cf

Pond DMH7: DMH Peak Elev=235.04' Inflow=2.23 cfs 7,090 cf
18.0" Round Culvert n=0.013 L=140.0' S=0.0393 '/' Outflow=2.23 cfs 7,090 cf

Pond DMH8: DMH Peak Elev=227.99' Inflow=3.45 cfs 10,945 cf
24.0" Round Culvert n=0.013 L=137.0' S=0.0300 '/' Outflow=3.45 cfs 10,945 cf

Pond DMH9: DMH Peak Elev=220.40' Inflow=4.49 cfs 14,308 cf
24.0" Round Culvert n=0.013 L=147.0' S=0.0200 '/' Outflow=4.49 cfs 14,308 cf

Pond G: gabion Peak Elev=229.06' Storage=1 cf Inflow=1.19 cfs 6,161 cf
Discarded=0.00 cfs 6 cf Primary=1.19 cfs 6,155 cf Outflow=1.19 cfs 6,161 cf

Link 1L: (new Link) Inflow=0.46 cfs 6,563 cf
Primary=0.46 cfs 6,563 cf

Total Runoff Area = 829,394 sf Runoff Volume = 68,161 cf Average Runoff Depth = 0.99"
90.62% Pervious = 751,622 sf 9.38% Impervious = 77,772 sf

Summary for Subcatchment P-1: Subcat P-1

Runoff = 4.09 cfs @ 12.26 hrs, Volume= 19,614 cf, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
4,874	98	Paved parking, HSG B
13,247	61	>75% Grass cover, Good, HSG B
72,656	55	Woods, Good, HSG B
131,956	77	Woods, Good, HSG D
482	98	Paved parking, HSG D
24,002	80	>75% Grass cover, Good, HSG D
34,297	70	Woods, Good, HSG C
4,728	74	>75% Grass cover, Good, HSG C
286,240	70	Weighted Average
280,885		98.13% Pervious Area
5,355		1.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0625	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
8.4	794	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.3	844	Total			

Summary for Subcatchment P-2: Subcat P-2

Runoff = 0.24 cfs @ 12.20 hrs, Volume= 1,034 cf, Depth= 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
6,580	74	>75% Grass cover, Good, HSG C
6,854	70	Woods, Good, HSG C
13,434	72	Weighted Average
13,434		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
0.5	31	0.0465	1.08		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
13.0	81	Total			

Summary for Subcatchment P-3A: Subcat P-3A

Runoff = 0.61 cfs @ 12.09 hrs, Volume= 1,918 cf, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
5,462	98	Paved parking, HSG C
8,916	74	>75% Grass cover, Good, HSG C
14,378	83	Weighted Average
8,916		62.01% Pervious Area
5,462		37.99% Impervious Area

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

Summary for Subcatchment P-3B: Subcat P-3B

Runoff = 0.56 cfs @ 12.10 hrs, Volume= 1,785 cf, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
1,086	61	>75% Grass cover, Good, HSG B
4,612	98	Paved parking, HSG C
8,964	74	>75% Grass cover, Good, HSG C
14,663	81	Weighted Average
10,051		68.54% Pervious Area
4,612		31.46% Impervious Area

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

Summary for Subcatchment P-3c: Subcat P-3c

Runoff = 0.88 cfs @ 12.09 hrs, Volume= 2,785 cf, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
7,221	98	Paved parking, HSG C
14,624	74	>75% Grass cover, Good, HSG C
21,845	82	Weighted Average
14,624		66.95% Pervious Area
7,221		33.05% Impervious Area

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

Summary for Subcatchment P-4a: Subcat P-4a

Runoff = 0.89 cfs @ 12.21 hrs, Volume= 4,539 cf, Depth= 0.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
7,742	98	Paved parking, HSG B
59,202	61	>75% Grass cover, Good, HSG B
23,518	55	Woods, Good, HSG B
343	98	Paved parking, HSG C
7,410	74	>75% Grass cover, Good, HSG C
16	70	Woods, Good, HSG C
98,231	64	Weighted Average
90,146		91.77% Pervious Area
8,085		8.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
2.8	300	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.5	350	Total			

Summary for Subcatchment P-4b: Subcat P-4b

Runoff = 0.53 cfs @ 12.15 hrs, Volume= 2,023 cf, Depth= 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
596	61	>75% Grass cover, Good, HSG B
1,158	55	Woods, Good, HSG B
18,108	74	>75% Grass cover, Good, HSG C
6,433	70	Woods, Good, HSG C
26,294	72	Weighted Average
26,294		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	30	0.0500	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
3.3	392	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.1	422	Total			

Summary for Subcatchment P-4c: Subcat P-4c

Runoff = 1.48 cfs @ 12.25 hrs, Volume= 6,854 cf, Depth= 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
156	77	Woods, Good, HSG D
42,661	74	>75% Grass cover, Good, HSG C
0	98	Paved parking, HSG C
46,247	70	Woods, Good, HSG C
89,064	72	Weighted Average
89,064		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
3.7	365	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.2	415	Total			

Summary for Subcatchment P-5a: Subcat P-5a

Runoff = 1.04 cfs @ 12.09 hrs, Volume= 3,288 cf, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
9,276	98	Paved parking, HSG C
15,367	74	>75% Grass cover, Good, HSG C
24,643	83	Weighted Average
15,367		62.36% Pervious Area
9,276		37.64% Impervious Area

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

Summary for Subcatchment P-5b: Subcat P-5b

Runoff = 1.19 cfs @ 12.10 hrs, Volume= 3,802 cf, Depth= 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
8,220	98	Paved parking, HSG C
24,503	74	>75% Grass cover, Good, HSG C
32,723	80	Weighted Average
24,503		74.88% Pervious Area
8,220		25.12% Impervious Area

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

Summary for Subcatchment P-5c: Subcat P-5c

Runoff = 1.21 cfs @ 12.10 hrs, Volume= 3,856 cf, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
8,906	98	Paved parking, HSG C
22,759	74	>75% Grass cover, Good, HSG C
31,664	81	Weighted Average
22,759		71.87% Pervious Area
8,906		28.13% Impervious Area

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

Summary for Subcatchment P-5d: Subcat P-5d

Runoff = 1.04 cfs @ 12.10 hrs, Volume= 3,363 cf, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
22,327	74	>75% Grass cover, Good, HSG C
5,531	98	Paved parking, HSG C
5,640	70	Woods, Good, HSG C
33,498	77	Weighted Average
27,967		83.49% Pervious Area
5,531		16.51% Impervious Area

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

Summary for Subcatchment P-5e: Subcat P-5e

Runoff = 0.99 cfs @ 12.10 hrs, Volume= 3,230 cf, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
13,931	74	>75% Grass cover, Good, HSG C
5,320	98	Paved parking, HSG C
14,594	70	Woods, Good, HSG C
33,846	76	Weighted Average
28,525		84.28% Pervious Area
5,320		15.72% Impervious Area

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

Summary for Subcatchment P-5f: Subcat P-5f

Runoff = 0.84 cfs @ 12.10 hrs, Volume= 2,730 cf, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
5,715	98	Paved parking, HSG C
10,921	74	>75% Grass cover, Good, HSG C
10,559	70	Woods, Good, HSG C
27,195	77	Weighted Average
21,480		78.99% Pervious Area
5,715		21.01% Impervious Area

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

Summary for Subcatchment P-6: Subcat P-6

Runoff = 1.44 cfs @ 12.10 hrs, Volume= 4,712 cf, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
45,537	74	>75% Grass cover, Good, HSG C
42	70	Woods, Good, HSG C
3,802	98	Paved parking, HSG C
49,382	76	Weighted Average
45,580		92.30% Pervious Area
3,802		7.70% Impervious Area

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

Summary for Subcatchment P-7: Subcat P-7

Runoff = 0.78 cfs @ 12.10 hrs, Volume= 2,628 cf, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
24,388	74	>75% Grass cover, Good, HSG C
266	98	Paved parking, HSG C
7,640	70	Woods, Good, HSG C
32,294	73	Weighted Average
32,028		99.18% Pervious Area
266		0.82% Impervious Area

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

Summary for Reach 9001R: Routing sheet flow through a subcatchment

A subcatchment performs runoff calculations, including the associated Tc anc CN determinations. It does not have any facility for routing an inflow hydrograph from another source. However, a reach may be used to perform this type of specialized routing.

This reach demonstrates a procedure for performing a sheet-flow routing through a subcatchment area. In this case, the "reach" is defined as a wide channel with very low side slopes. The Manning's value of 0.15 is selected from the table of sheet flow roughness coefficients, which are much higher than normal Manning's values, in order to allow for the greater frictional losses of shallow flow. This value is comparable to the Manning's value for "very weedy reaches".

This example assumes that sheet flow occurs evenly over the entire 100' channel width, and that the flow depth is therefore very small. If the flow is concentrated or forms channels, the description and Manning's value must be adjusted accordingly.

Inflow Area = 98,231 sf, 8.23% Impervious, Inflow Depth = 0.55" for 2-year event
Inflow = 0.72 cfs @ 12.37 hrs, Volume= 4,539 cf
Outflow = 0.28 cfs @ 12.91 hrs, Volume= 4,539 cf, Atten= 60%, Lag= 32.7 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 0.19 fps, Min. Travel Time= 59.2 min
Avg. Velocity = 0.14 fps, Avg. Travel Time= 79.2 min

Peak Storage= 1,011 cf @ 12.91 hrs
Average Depth at Peak Storage= 0.01'
Bank-Full Depth= 1.00' Flow Area= 200.0 sf, Capacity= 463.86 cfs

100.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 100.0 '/' Top Width= 300.00'
Length= 680.0' Slope= 0.0941 '/'
Inlet Invert= 264.00', Outlet Invert= 200.00'

‡

Summary for Reach 9002R: Routing sheet flow through a subcatchment

A subcatchment performs runoff calculations, including the associated Tc anc CN determinations. It does not have any facility for routing an inflow hydrograph from another source. However, a reach may be used to perform this type of specialized routing.

This reach demonstrates a procedure for performing a sheet-flow routing through a subcatchment area. In this case, the "reach" is defined as a wide channel with very low side slopes. The Manning's value of 0.15 is selected from the table of sheet flow roughness coefficients, which are much higher than normal Manning's values, in order to allow for the greater frictional losses of shallow flow. This value is comparable to the Manning's value for "very weedy reaches".

This example assumes that sheet flow occurs evenly over the entire 100' channel width, and that the flow depth is therefore very small.
If the flow is concentrated or forms channels, the description and Manning's value must be adjusted accordingly.

Inflow Area = 26,294 sf, 0.00% Impervious, Inflow Depth = 0.92" for 2-year event
Inflow = 0.53 cfs @ 12.15 hrs, Volume= 2,023 cf
Outflow = 0.26 cfs @ 12.43 hrs, Volume= 2,023 cf, Atten= 51%, Lag= 17.1 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 0.21 fps, Min. Travel Time= 27.5 min
Avg. Velocity = 0.17 fps, Avg. Travel Time= 33.2 min

Peak Storage= 430 cf @ 12.43 hrs
Average Depth at Peak Storage= 0.01'
Bank-Full Depth= 1.00' Flow Area= 200.0 sf, Capacity= 569.83 cfs

100.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 100.0 '/' Top Width= 300.00'
Length= 345.0' Slope= 0.1420 '/'
Inlet Invert= 249.00', Outlet Invert= 200.00'

‡

Summary for Reach SP-1: SP-1

Inflow Area = 286,240 sf, 1.87% Impervious, Inflow Depth = 0.82" for 2-year event
Inflow = 4.09 cfs @ 12.26 hrs, Volume= 19,614 cf
Outflow = 4.09 cfs @ 12.26 hrs, Volume= 19,614 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Summary for Reach SP-2: SP-2

Inflow Area = 13,434 sf, 0.00% Impervious, Inflow Depth = 0.92" for 2-year event
Inflow = 0.24 cfs @ 12.20 hrs, Volume= 1,034 cf
Outflow = 0.24 cfs @ 12.20 hrs, Volume= 1,034 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Summary for Reach SP-3: SP-3

Inflow Area = 215,863 sf, 20.03% Impervious, Inflow Depth > 1.27" for 2-year event
Inflow = 2.75 cfs @ 12.39 hrs, Volume= 22,872 cf
Outflow = 2.75 cfs @ 12.39 hrs, Volume= 22,872 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Summary for Reach SP-4: SP-4

Inflow Area = 313,856 sf, 9.30% Impervious, Inflow Depth = 0.75" for 2-year event
Inflow = 2.87 cfs @ 12.30 hrs, Volume= 19,571 cf
Outflow = 2.87 cfs @ 12.30 hrs, Volume= 19,571 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Summary for Reach SW1: Swale

Inflow Area = 98,231 sf, 8.23% Impervious, Inflow Depth = 0.55" for 2-year event
Inflow = 0.89 cfs @ 12.21 hrs, Volume= 4,539 cf
Outflow = 0.72 cfs @ 12.37 hrs, Volume= 4,539 cf, Atten= 20%, Lag= 9.7 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 0.46 fps, Min. Travel Time= 9.7 min
Avg. Velocity = 0.17 fps, Avg. Travel Time= 26.4 min

Peak Storage= 415 cf @ 12.37 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 37.23 cfs

6.00' x 2.00' deep channel, n= 0.080 Earth, long dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 18.00'
Length= 267.0' Slope= 0.0050 '/'
Inlet Invert= 267.33', Outlet Invert= 266.00'

Summary for Pond CB10: CB

Inflow Area = 32,723 sf, 25.12% Impervious, Inflow Depth = 1.39" for 2-year event
Inflow = 1.19 cfs @ 12.10 hrs, Volume= 3,802 cf
Outflow = 1.19 cfs @ 12.10 hrs, Volume= 3,802 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.19 cfs @ 12.10 hrs, Volume= 3,802 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 235.30' @ 12.10 hrs
Flood Elev= 239.42'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.69'	**15.0" Round Culvert** L= 9.0' Ke= 0.500 Inlet / Outlet Invert= 234.69' / 234.60' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.18 cfs @ 12.10 hrs HW=235.29' TW=235.03' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 1.18 cfs @ 2.95 fps)

Summary for Pond CB12: CB

Inflow Area = 31,664 sf, 28.13% Impervious, Inflow Depth = 1.46" for 2-year event
Inflow = 1.21 cfs @ 12.10 hrs, Volume= 3,856 cf
Outflow = 1.21 cfs @ 12.10 hrs, Volume= 3,856 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.21 cfs @ 12.10 hrs, Volume= 3,856 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 229.87' @ 12.10 hrs
Flood Elev= 233.72'

Device	Routing	Invert	Outlet Devices
#1	Primary	229.29'	**15.0" Round Culvert** L= 19.0' Ke= 0.500 Inlet / Outlet Invert= 229.29' / 229.10' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.20 cfs @ 12.10 hrs HW=229.87' TW=227.99' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 1.20 cfs @ 3.18 fps)

Summary for Pond CB14: CB

Inflow Area = 33,498 sf, 16.51% Impervious, Inflow Depth = 1.20" for 2-year event
Inflow = 1.04 cfs @ 12.10 hrs, Volume= 3,363 cf
Outflow = 1.04 cfs @ 12.10 hrs, Volume= 3,363 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.04 cfs @ 12.10 hrs, Volume= 3,363 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 224.46' @ 12.10 hrs
Flood Elev= 227.69'

Device	Routing	Invert	Outlet Devices
#1	Primary	223.98'	**15.0" Round Culvert** L= 21.0' Ke= 0.500 Inlet / Outlet Invert= 223.98' / 223.35' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.03 cfs @ 12.10 hrs HW=224.46' TW=220.39' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.03 cfs @ 2.36 fps)

Summary for Pond CB16: CB

Inflow Area = 33,846 sf, 15.72% Impervious, Inflow Depth = 1.15" for 2-year event
Inflow = 0.99 cfs @ 12.10 hrs, Volume= 3,230 cf
Outflow = 0.99 cfs @ 12.10 hrs, Volume= 3,230 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.99 cfs @ 12.10 hrs, Volume= 3,230 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 217.87' @ 12.10 hrs
Flood Elev= 220.61'

Device	Routing	Invert	Outlet Devices
#1	Primary	217.40'	**15.0" Round Culvert** L= 15.0' Ke= 0.500 Inlet / Outlet Invert= 217.40' / 217.06' S= 0.0227 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.99 cfs @ 12.10 hrs HW=217.87' TW=212.20' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.99 cfs @ 2.34 fps)

Summary for Pond CB18: CB

Inflow Area = 27,195 sf, 21.01% Impervious, Inflow Depth = 1.20" for 2-year event
Inflow = 0.84 cfs @ 12.10 hrs, Volume= 2,730 cf
Outflow = 0.84 cfs @ 12.10 hrs, Volume= 2,730 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.84 cfs @ 12.10 hrs, Volume= 2,730 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 210.75' @ 12.10 hrs
Flood Elev= 213.83'

Device	Routing	Invert	Outlet Devices
#1	Primary	210.30'	**15.0" Round Culvert** L= 37.0' Ke= 0.500 Inlet / Outlet Invert= 210.30' / 209.93' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.84 cfs @ 12.10 hrs HW=210.75' TW=209.93' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.84 cfs @ 3.15 fps)

Summary for Pond CB2: CB

Inflow Area = 14,378 sf, 37.99% Impervious, Inflow Depth = 1.60" for 2-year event
Inflow = 0.61 cfs @ 12.09 hrs, Volume= 1,918 cf
Outflow = 0.61 cfs @ 12.09 hrs, Volume= 1,918 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.61 cfs @ 12.09 hrs, Volume= 1,918 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Peak Elev= 255.86' @ 12.09 hrs
Flood Elev= 258.73'

Device	Routing	Invert	Outlet Devices
#1	Primary	255.50'	**15.0" Round Culvert** L= 22.0' Ke= 0.500 Inlet / Outlet Invert= 255.50' / 255.10' S= 0.0182 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.60 cfs @ 12.09 hrs HW=255.86' TW=251.87' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.60 cfs @ 2.04 fps)

Summary for Pond CB4: CB

Inflow Area = 14,663 sf, 31.46% Impervious, Inflow Depth = 1.46" for 2-year event
Inflow = 0.56 cfs @ 12.10 hrs, Volume= 1,785 cf
Outflow = 0.56 cfs @ 12.10 hrs, Volume= 1,785 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.56 cfs @ 12.10 hrs, Volume= 1,785 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 257.81' @ 12.10 hrs
Flood Elev= 261.26'

Device	Routing	Invert	Outlet Devices
#1	Primary	257.46'	**15.0" Round Culvert** L= 22.0' Ke= 0.500 Inlet / Outlet Invert= 257.46' / 256.80' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.55 cfs @ 12.10 hrs HW=257.81' TW=252.19' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.55 cfs @ 2.00 fps)

Summary for Pond CB6: CB

Inflow Area = 21,845 sf, 33.05% Impervious, Inflow Depth = 1.53" for 2-year event
Inflow = 0.88 cfs @ 12.09 hrs, Volume= 2,785 cf
Outflow = 0.88 cfs @ 12.09 hrs, Volume= 2,785 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.88 cfs @ 12.09 hrs, Volume= 2,785 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 251.11' @ 12.09 hrs
Flood Elev= 254.22'

Device	Routing	Invert	Outlet Devices
#1	Primary	250.61'	**15.0" Round Culvert** L= 11.0' Ke= 0.500 Inlet / Outlet Invert= 250.61' / 250.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.87 cfs @ 12.09 hrs HW=251.11' TW=250.84' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.87 cfs @ 2.80 fps)

Summary for Pond CB8: CB

Inflow Area = 24,643 sf, 37.64% Impervious, Inflow Depth = 1.60" for 2-year event
Inflow = 1.04 cfs @ 12.09 hrs, Volume= 3,288 cf
Outflow = 1.04 cfs @ 12.09 hrs, Volume= 3,288 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.04 cfs @ 12.09 hrs, Volume= 3,288 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 243.88' @ 12.09 hrs
Flood Elev= 246.68'

Device	Routing	Invert	Outlet Devices
#1	Primary	243.40'	**15.0" Round Culvert** L= 17.0' Ke= 0.500 Inlet / Outlet Invert= 243.40' / 243.06' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.02 cfs @ 12.09 hrs HW=243.88' TW=243.44' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.02 cfs @ 2.36 fps)

Summary for Pond DB1: DB1

Groundwater must be verified with test pit

Inflow Area = 215,863 sf, 20.03% Impervious, Inflow Depth = 1.27" for 2-year event
Inflow = 7.10 cfs @ 12.10 hrs, Volume= 22,896 cf
Outflow = 2.75 cfs @ 12.39 hrs, Volume= 22,872 cf, Atten= 61%, Lag= 17.7 min
Primary = 2.75 cfs @ 12.39 hrs, Volume= 22,872 cf
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 208.18' @ 12.39 hrs Surf.Area= 4,120 sf Storage= 5,558 cf
Flood Elev= 212.20' Surf.Area= 11,169 sf Storage= 32,544 cf

Plug-Flow detention time= 34.9 min calculated for 22,836 cf (100% of inflow)
Center-of-Mass det. time= 34.9 min (882.9 - 847.9)

Volume	Invert	Avail.Storage	Storage Description
#1	206.50'	32,544 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
206.50	2,580	292.7	0	0	2,580
208.00	3,931	343.8	4,848	4,848	5,212
210.00	6,340	407.4	10,175	15,023	9,087
212.00	9,234	471.0	15,484	30,507	13,619
212.20	11,169	496.1	2,037	32,544	15,553

Device	Routing	Invert	Outlet Devices
#1	Primary	204.75'	**15.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 204.75' / 204.50' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	206.50'	**6.0" Vert. Vertical Orifice X 2.00** C= 0.600
#3	Device 1	207.90'	**8.0" Vert. Vertical Orifice X 2.00** C= 0.600
#4	Device 1	209.90'	**48.0" Horiz. Horizonal Orifice** C= 0.600 Limited to weir flow at low heads
#5	Secondary	211.00'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=2.74 cfs @ 12.39 hrs HW=208.18' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.74 cfs of 9.39 cfs potential flow)
 ├─**2=Vertical Orifice** (Orifice Controls 2.26 cfs @ 5.75 fps)
 ├─**3=Vertical Orifice** (Orifice Controls 0.49 cfs @ 1.79 fps)
 └─**4=Horizonal Orifice** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=206.50' TW=0.00' (Dynamic Tailwater)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DB2: DB2

Soil type 307C (sandy loam) Rawls infiltration rate = 1.02 inches per hour
Groundwater elevation must be verified with test pit

Inflow Area = 100,268 sf, 21.04% Impervious, Inflow Depth = 1.34" for 2-year event
Inflow = 3.49 cfs @ 12.10 hrs, Volume= 11,201 cf
Outflow = 1.29 cfs @ 12.40 hrs, Volume= 11,113 cf, Atten= 63%, Lag= 18.3 min
Discarded = 0.10 cfs @ 12.40 hrs, Volume= 4,952 cf
Primary = 1.19 cfs @ 12.40 hrs, Volume= 6,161 cf
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 246.73' @ 12.40 hrs Surf.Area= 2,539 sf Storage= 3,519 cf
Flood Elev= 250.00' Surf.Area= 6,476 sf Storage= 17,872 cf

Plug-Flow detention time= 176.0 min calculated for 11,113 cf (99% of inflow)
Center-of-Mass det. time= 171.4 min (1,015.9 - 844.5)

Volume	Invert	Avail.Storage	Storage Description
#1	244.50'	17,872 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
244.50	762	148.0	0	0	762
245.00	1,072	161.0	456	456	1,091
246.00	1,868	209.0	1,452	1,908	2,516
247.00	2,807	247.0	2,322	4,230	3,914
248.00	3,902	286.0	3,340	7,569	5,589
249.00	5,141	321.0	4,507	12,076	7,307
250.00	6,476	346.0	5,796	17,872	8,675

Device	Routing	Invert	Outlet Devices
#1	Primary	239.55'	**12.0" Round Culvert** L= 95.0' Ke= 0.500 Inlet / Outlet Invert= 239.55' / 234.80' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	245.90'	**8.0" Vert. Vertical Orifice** C= 0.600
#3	Device 1	247.70'	**6.0" Vert. Vertical Orifice X 2.00** C= 0.600
#4	Device 1	248.60'	**24.0" x 24.0" Horiz. Horizontal Orifice** C= 0.600 Limited to weir flow at low heads
#5	Secondary	249.70'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#6	Discarded	244.50'	**1.020 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 240.00' Phase-In= 0.01'

Discarded OutFlow Max=0.10 cfs @ 12.40 hrs HW=246.73' (Free Discharge)
└─**6=Exfiltration** (Controls 0.10 cfs)

Primary OutFlow Max=1.19 cfs @ 12.40 hrs HW=246.73' TW=235.22' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.19 cfs of 9.78 cfs potential flow)
  ├─**2=Vertical Orifice** (Orifice Controls 1.19 cfs @ 3.41 fps)
  ├─**3=Vertical Orifice** (Controls 0.00 cfs)
  └─**4=Horizontal Orifice** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=244.50' TW=223.98' (Dynamic Tailwater)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DMH1: DMH

Inflow Area = 14,378 sf, 37.99% Impervious, Inflow Depth = 1.60" for 2-year event
Inflow = 0.61 cfs @ 12.09 hrs, Volume= 1,918 cf
Outflow = 0.61 cfs @ 12.09 hrs, Volume= 1,918 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.61 cfs @ 12.09 hrs, Volume= 1,918 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 251.87' @ 12.09 hrs
Flood Elev= 258.52'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.51'	**15.0" Round Culvert** L= 64.0' Ke= 0.500 Inlet / Outlet Invert= 251.51' / 249.59' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.60 cfs @ 12.09 hrs HW=251.87' TW=249.50' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.60 cfs @ 2.04 fps)

Summary for Pond DMH10: DMH

Inflow Area = 156,374 sf, 23.82% Impervious, Inflow Depth = 1.35" for 2-year event
Inflow = 5.47 cfs @ 12.10 hrs, Volume= 17,538 cf
Outflow = 5.47 cfs @ 12.10 hrs, Volume= 17,538 cf, Atten= 0%, Lag= 0.0 min
Primary = 5.47 cfs @ 12.10 hrs, Volume= 17,538 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 212.20' @ 12.10 hrs
Flood Elev= 227.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	211.19'	**24.0" Round Culvert** L= 113.0' Ke= 0.500 Inlet / Outlet Invert= 211.19' / 208.93' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=5.42 cfs @ 12.10 hrs HW=212.20' TW=209.92' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 5.42 cfs @ 3.42 fps)

Summary for Pond DMH11: DMH

Inflow Area = 183,569 sf, 23.41% Impervious, Inflow Depth = 1.32" for 2-year event
Inflow = 6.32 cfs @ 12.10 hrs, Volume= 20,268 cf
Outflow = 6.32 cfs @ 12.10 hrs, Volume= 20,268 cf, Atten= 0%, Lag= 0.0 min
Primary = 6.32 cfs @ 12.10 hrs, Volume= 20,268 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 209.93' @ 12.10 hrs
Flood Elev= 215.34'

Device	Routing	Invert	Outlet Devices
#1	Primary	208.83'	**24.0" Round Culvert** L= 62.0' Ke= 0.500 Inlet / Outlet Invert= 208.83' / 208.00' S= 0.0134 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=6.26 cfs @ 12.10 hrs HW=209.92' TW=207.63' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 6.26 cfs @ 3.56 fps)

Summary for Pond DMH12: DMH

Inflow Area = 100,268 sf, 21.04% Impervious, Inflow Depth = 0.74" for 2-year event
Inflow = 1.19 cfs @ 12.40 hrs, Volume= 6,161 cf
Outflow = 1.19 cfs @ 12.40 hrs, Volume= 6,161 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.19 cfs @ 12.40 hrs, Volume= 6,161 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 235.22' @ 12.40 hrs
Flood Elev= 238.03'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.70'	**15.0" Round Culvert** L= 76.0' Ke= 0.500 Inlet / Outlet Invert= 234.70' / 230.60' S= 0.0539 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.19 cfs @ 12.40 hrs HW=235.22' TW=234.17' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.19 cfs @ 2.46 fps)

Summary for Pond DMH2: DMH

Inflow Area = 14,663 sf, 31.46% Impervious, Inflow Depth = 1.46" for 2-year event
Inflow = 0.56 cfs @ 12.10 hrs, Volume= 1,785 cf
Outflow = 0.56 cfs @ 12.10 hrs, Volume= 1,785 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.56 cfs @ 12.10 hrs, Volume= 1,785 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Peak Elev= 252.19' @ 12.10 hrs
Flood Elev= 260.66'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.84'	**15.0" Round Culvert** L= 75.0' Ke= 0.500 Inlet / Outlet Invert= 251.84' / 249.59' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.55 cfs @ 12.10 hrs HW=252.19' TW=249.50' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.55 cfs @ 2.00 fps)

Summary for Pond DMH3: DMH

Inflow Area = 21,845 sf, 33.05% Impervious, Inflow Depth = 1.53" for 2-year event
Inflow = 0.88 cfs @ 12.09 hrs, Volume= 2,785 cf
Outflow = 0.88 cfs @ 12.09 hrs, Volume= 2,785 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.88 cfs @ 12.09 hrs, Volume= 2,785 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 250.85' @ 12.09 hrs
Flood Elev= 254.76'

Device	Routing	Invert	Outlet Devices
#1	Primary	250.40'	**15.0" Round Culvert** L= 55.0' Ke= 0.500 Inlet / Outlet Invert= 250.40' / 249.85' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.87 cfs @ 12.09 hrs HW=250.84' TW=249.50' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.87 cfs @ 3.29 fps)

Summary for Pond DMH4: DMH

Inflow Area = 50,886 sf, 33.99% Impervious, Inflow Depth = 1.53" for 2-year event
Inflow = 2.05 cfs @ 12.09 hrs, Volume= 6,489 cf
Outflow = 2.05 cfs @ 12.09 hrs, Volume= 6,489 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.05 cfs @ 12.09 hrs, Volume= 6,489 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 249.51' @ 12.09 hrs
Flood Elev= 257.23'

Device	Routing	Invert	Outlet Devices
#1	Primary	248.85'	**18.0" Round Culvert** L= 159.0' Ke= 0.500 Inlet / Outlet Invert= 248.85' / 246.00' S= 0.0179 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=2.02 cfs @ 12.09 hrs HW=249.50' TW=246.26' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.02 cfs @ 2.75 fps)

Summary for Pond DMH5: DMH

Inflow Area = 100,268 sf, 21.04% Impervious, Inflow Depth = 0.74" for 2-year event
Inflow = 1.19 cfs @ 12.40 hrs, Volume= 6,161 cf
Outflow = 1.19 cfs @ 12.40 hrs, Volume= 6,161 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.19 cfs @ 12.40 hrs, Volume= 6,161 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 234.17' @ 12.40 hrs
Flood Elev= 237.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	233.65'	**15.0" Round Culvert** L= 143.0' Ke= 0.500 Inlet / Outlet Invert= 233.65' / 229.00' S= 0.0325 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.19 cfs @ 12.40 hrs HW=234.17' TW=229.06' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.19 cfs @ 2.46 fps)

Summary for Pond DMH6: DMH

Inflow Area = 24,643 sf, 37.64% Impervious, Inflow Depth = 1.60" for 2-year event
Inflow = 1.04 cfs @ 12.09 hrs, Volume= 3,288 cf
Outflow = 1.04 cfs @ 12.09 hrs, Volume= 3,288 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.04 cfs @ 12.09 hrs, Volume= 3,288 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 243.44' @ 12.09 hrs
Flood Elev= 246.62'

Device	Routing	Invert	Outlet Devices
#1	Primary	242.96'	**15.0" Round Culvert** L= 146.0' Ke= 0.500 Inlet / Outlet Invert= 242.96' / 234.60' S= 0.0573 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.02 cfs @ 12.09 hrs HW=243.44' TW=235.03' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.02 cfs @ 2.36 fps)

Summary for Pond DMH7: DMH

Inflow Area = 57,366 sf, 30.50% Impervious, Inflow Depth = 1.48" for 2-year event
Inflow = 2.23 cfs @ 12.10 hrs, Volume= 7,090 cf
Outflow = 2.23 cfs @ 12.10 hrs, Volume= 7,090 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.23 cfs @ 12.10 hrs, Volume= 7,090 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 235.04' @ 12.09 hrs
Flood Elev= 246.62'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.35'	**18.0" Round Culvert** L= 140.0' Ke= 0.500 Inlet / Outlet Invert= 234.35' / 228.85' S= 0.0393 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=2.20 cfs @ 12.10 hrs HW=235.03' TW=227.99' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.20 cfs @ 2.81 fps)

Summary for Pond DMH8: DMH

Inflow Area = 89,031 sf, 29.66% Impervious, Inflow Depth = 1.48" for 2-year event
Inflow = 3.45 cfs @ 12.10 hrs, Volume= 10,945 cf
Outflow = 3.45 cfs @ 12.10 hrs, Volume= 10,945 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.45 cfs @ 12.10 hrs, Volume= 10,945 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 227.99' @ 12.09 hrs
Flood Elev= 233.28'

Device	Routing	Invert	Outlet Devices
#1	Primary	227.21'	**24.0" Round Culvert** L= 137.0' Ke= 0.500 Inlet / Outlet Invert= 227.21' / 223.10' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=3.40 cfs @ 12.10 hrs HW=227.99' TW=220.39' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 3.40 cfs @ 3.00 fps)

Summary for Pond DMH9: DMH

Inflow Area = 122,529 sf, 26.06% Impervious, Inflow Depth = 1.40" for 2-year event
Inflow = 4.49 cfs @ 12.10 hrs, Volume= 14,308 cf
Outflow = 4.49 cfs @ 12.10 hrs, Volume= 14,308 cf, Atten= 0%, Lag= 0.0 min
Primary = 4.49 cfs @ 12.10 hrs, Volume= 14,308 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 220.40' @ 12.10 hrs
Flood Elev= 227.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	219.49'	**24.0" Round Culvert** L= 147.0' Ke= 0.500 Inlet / Outlet Invert= 219.49' / 216.55' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=4.43 cfs @ 12.10 hrs HW=220.39' TW=212.20' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 4.43 cfs @ 3.23 fps)

Summary for Pond G: gabion

Inflow Area = 100,268 sf, 21.04% Impervious, Inflow Depth = 0.74" for 2-year event
Inflow = 1.19 cfs @ 12.40 hrs, Volume= 6,161 cf
Outflow = 1.19 cfs @ 12.40 hrs, Volume= 6,161 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 12.40 hrs, Volume= 6 cf
Primary = 1.19 cfs @ 12.40 hrs, Volume= 6,155 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 229.06' @ 12.40 hrs Surf.Area= 16 sf Storage= 1 cf
Flood Elev= 230.25' Surf.Area= 0 sf Storage= 37 cf

Plug-Flow detention time= 0.0 min calculated for 6,151 cf (100% of inflow)
Center-of-Mass det. time= 0.0 min (818.7 - 818.7)

Volume	Invert	Avail.Storage	Storage Description
#1	229.00'	37 cf	**15.0" Round Pipe Storage** L= 30.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	229.63'	**3.0" Vert. outlet holes X 30.00** C= 0.600
#2	Primary	229.00'	**3.0" Horiz. outlet holes X 30.00** C= 0.600 Limited to weir flow at low heads
#3	Discarded	229.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.00 cfs @ 12.40 hrs HW=229.06' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=1.19 cfs @ 12.40 hrs HW=229.06' TW=0.00' (Dynamic Tailwater)
├─**1=outlet holes** (Controls 0.00 cfs)
└─**2=outlet holes** (Weir Controls 1.19 cfs @ 0.81 fps)

Summary for Link 1L: (new Link)

Inflow Area = 124,524 sf, 6.49% Impervious, Inflow Depth = 0.63" for 2-year event
Inflow = 0.46 cfs @ 12.66 hrs, Volume= 6,563 cf
Primary = 0.46 cfs @ 12.66 hrs, Volume= 6,563 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs

Time span=5.00-36.00 hrs, dt=0.05 hrs, 621 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P-1: Subcat P-1 Runoff Area=286,240 sf 1.87% Impervious Runoff Depth=1.87"
Flow Length=844' Tc=16.3 min CN=70 Runoff=10.23 cfs 44,718 cf

Subcatchment P-2: Subcat P-2 Runoff Area=13,434 sf 0.00% Impervious Runoff Depth=2.03"
Flow Length=81' Tc=13.0 min CN=72 Runoff=0.57 cfs 2,272 cf

Subcatchment P-3A: Subcat P-3A Runoff Area=14,378 sf 37.99% Impervious Runoff Depth=2.98"
Tc=6.0 min CN=83 Runoff=1.12 cfs 3,565 cf

Subcatchment P-3B: Subcat P-3B Runoff Area=14,663 sf 31.46% Impervious Runoff Depth=2.79"
Tc=6.0 min CN=81 Runoff=1.08 cfs 3,411 cf

Subcatchment P-3c: Subcat P-3c Runoff Area=21,845 sf 33.05% Impervious Runoff Depth=2.88"
Tc=6.0 min CN=82 Runoff=1.66 cfs 5,248 cf

Subcatchment P-4a: Subcat P-4a Runoff Area=98,231 sf 8.23% Impervious Runoff Depth=1.44"
Flow Length=350' Tc=11.5 min CN=64 Runoff=2.92 cfs 11,784 cf

Subcatchment P-4b: Subcat P-4b Runoff Area=26,294 sf 0.00% Impervious Runoff Depth=2.03"
Flow Length=422' Tc=9.1 min CN=72 Runoff=1.25 cfs 4,448 cf

Subcatchment P-4c: Subcat P-4c Runoff Area=89,064 sf 0.00% Impervious Runoff Depth=2.03"
Flow Length=415' Tc=16.2 min CN=72 Runoff=3.49 cfs 15,066 cf

Subcatchment P-5a: Subcat P-5a Runoff Area=24,643 sf 37.64% Impervious Runoff Depth=2.98"
Tc=6.0 min CN=83 Runoff=1.93 cfs 6,111 cf

Subcatchment P-5b: Subcat P-5b Runoff Area=32,723 sf 25.12% Impervious Runoff Depth=2.70"
Tc=6.0 min CN=80 Runoff=2.33 cfs 7,368 cf

Subcatchment P-5c: Subcat P-5c Runoff Area=31,664 sf 28.13% Impervious Runoff Depth=2.79"
Tc=6.0 min CN=81 Runoff=2.33 cfs 7,367 cf

Subcatchment P-5d: Subcat P-5d Runoff Area=33,498 sf 16.51% Impervious Runoff Depth=2.44"
Tc=6.0 min CN=77 Runoff=2.16 cfs 6,811 cf

Subcatchment P-5e: Subcat P-5e Runoff Area=33,846 sf 15.72% Impervious Runoff Depth=2.36"
Tc=6.0 min CN=76 Runoff=2.10 cfs 6,643 cf

Subcatchment P-5f: Subcat P-5f Runoff Area=27,195 sf 21.01% Impervious Runoff Depth=2.44"
Tc=6.0 min CN=77 Runoff=1.75 cfs 5,530 cf

Subcatchment P-6: Subcat P-6 Runoff Area=49,382 sf 7.70% Impervious Runoff Depth=2.36"
Tc=6.0 min CN=76 Runoff=3.06 cfs 9,693 cf

Subcatchment P-7: Subcat P-7 Runoff Area=32,294 sf 0.82% Impervious Runoff Depth=2.11"
Tc=6.0 min CN=73 Runoff=1.78 cfs 5,677 cf

Reach 9001R: Routing sheet flow through a subcatchment Avg. Flow Depth=0.04' Max Vel=0.34 fps Inflow=2.56 cfs 11,784 cf
n=0.150 L=680.0' S=0.0941 '/' Capacity=463.86 cfs Outflow=1.34 cfs 11,784 cf

Reach 9002R: Routing sheet flow through a subcatchment Avg. Flow Depth=0.02' Max Vel=0.31 fps Inflow=1.25 cfs 4,448 cf
n=0.150 L=345.0' S=0.1420 '/' Capacity=569.83 cfs Outflow=0.77 cfs 4,448 cf

Reach SP-1: SP-1 Inflow=10.23 cfs 44,718 cf
Outflow=10.23 cfs 44,718 cf

Reach SP-2: SP-2 Inflow=0.57 cfs 2,272 cf
Outflow=0.57 cfs 2,272 cf

Reach SP-3: SP-3 Inflow=6.31 cfs 45,483 cf
Outflow=6.31 cfs 45,483 cf

Reach SP-4: SP-4 Inflow=6.95 cfs 47,306 cf
Outflow=6.95 cfs 47,306 cf

Reach SW1: Swale Avg. Flow Depth=0.48' Max Vel=0.71 fps Inflow=2.92 cfs 11,784 cf
n=0.080 L=267.0' S=0.0050 '/' Capacity=37.23 cfs Outflow=2.56 cfs 11,784 cf

Pond CB10: CB Peak Elev=235.63' Inflow=2.33 cfs 7,368 cf
15.0" Round Culvert n=0.013 L=9.0' S=0.0100 '/' Outflow=2.33 cfs 7,368 cf

Pond CB12: CB Peak Elev=230.15' Inflow=2.33 cfs 7,367 cf
15.0" Round Culvert n=0.013 L=19.0' S=0.0100 '/' Outflow=2.33 cfs 7,367 cf

Pond CB14: CB Peak Elev=224.71' Inflow=2.16 cfs 6,811 cf
15.0" Round Culvert n=0.013 L=21.0' S=0.0300 '/' Outflow=2.16 cfs 6,811 cf

Pond CB16: CB Peak Elev=218.12' Inflow=2.10 cfs 6,643 cf
15.0" Round Culvert n=0.013 L=15.0' S=0.0227 '/' Outflow=2.10 cfs 6,643 cf

Pond CB18: CB Peak Elev=211.01' Inflow=1.75 cfs 5,530 cf
15.0" Round Culvert n=0.013 L=37.0' S=0.0100 '/' Outflow=1.75 cfs 5,530 cf

Pond CB2: CB Peak Elev=256.01' Inflow=1.12 cfs 3,565 cf
15.0" Round Culvert n=0.013 L=22.0' S=0.0182 '/' Outflow=1.12 cfs 3,565 cf

Pond CB4: CB Peak Elev=257.95' Inflow=1.08 cfs 3,411 cf
15.0" Round Culvert n=0.013 L=22.0' S=0.0300 '/' Outflow=1.08 cfs 3,411 cf

Pond CB6: CB Peak Elev=251.34' Inflow=1.66 cfs 5,248 cf
15.0" Round Culvert n=0.013 L=11.0' S=0.0100 '/' Outflow=1.66 cfs 5,248 cf

Pond CB8: CB Peak Elev=244.11' Inflow=1.93 cfs 6,111 cf
15.0" Round Culvert n=0.013 L=17.0' S=0.0200 '/' Outflow=1.93 cfs 6,111 cf

Pond DB1: DB1 Peak Elev=209.22' Storage=10,466 cf Inflow=14.38 cfs 45,506 cf
Primary=6.31 cfs 45,483 cf Secondary=0.00 cfs 0 cf Outflow=6.31 cfs 45,483 cf

Pond DB2: DB2 Peak Elev=247.84' Storage=6,969 cf Inflow=6.92 cfs 21,918 cf
Discarded=0.17 cfs 5,757 cf Primary=2.25 cfs 16,019 cf Secondary=0.00 cfs 0 cf Outflow=2.42 cfs 21,776 cf

Pond DMH1: DMH Peak Elev=252.02' Inflow=1.12 cfs 3,565 cf
15.0" Round Culvert n=0.013 L=64.0' S=0.0300 '/' Outflow=1.12 cfs 3,565 cf

Pond DMH10: DMH Peak Elev=212.72' Inflow=10.84 cfs 34,300 cf
24.0" Round Culvert n=0.013 L=113.0' S=0.0200 '/' Outflow=10.84 cfs 34,300 cf

Pond DMH11: DMH Peak Elev=210.53' Inflow=12.59 cfs 39,830 cf
24.0" Round Culvert n=0.013 L=62.0' S=0.0134 '/' Outflow=12.59 cfs 39,830 cf

Pond DMH12: DMH Peak Elev=235.45' Inflow=2.25 cfs 16,019 cf
15.0" Round Culvert n=0.013 L=76.0' S=0.0539 '/' Outflow=2.25 cfs 16,019 cf

Pond DMH2: DMH Peak Elev=252.33' Inflow=1.08 cfs 3,411 cf
15.0" Round Culvert n=0.013 L=75.0' S=0.0300 '/' Outflow=1.08 cfs 3,411 cf

Pond DMH3: DMH Peak Elev=251.04' Inflow=1.66 cfs 5,248 cf
15.0" Round Culvert n=0.013 L=55.0' S=0.0100 '/' Outflow=1.66 cfs 5,248 cf

Pond DMH4: DMH Peak Elev=249.79' Inflow=3.86 cfs 12,225 cf
18.0" Round Culvert n=0.013 L=159.0' S=0.0179 '/' Outflow=3.86 cfs 12,225 cf

Pond DMH5: DMH Peak Elev=234.40' Inflow=2.25 cfs 16,019 cf
15.0" Round Culvert n=0.013 L=143.0' S=0.0325 '/' Outflow=2.25 cfs 16,019 cf

Pond DMH6: DMH Peak Elev=243.64' Inflow=1.93 cfs 6,111 cf
15.0" Round Culvert n=0.013 L=146.0' S=0.0573 '/' Outflow=1.93 cfs 6,111 cf

Pond DMH7: DMH Peak Elev=235.35' Inflow=4.26 cfs 13,479 cf
18.0" Round Culvert n=0.013 L=140.0' S=0.0393 '/' Outflow=4.26 cfs 13,479 cf

Pond DMH8: DMH Peak Elev=228.34' Inflow=6.59 cfs 20,845 cf
24.0" Round Culvert n=0.013 L=137.0' S=0.0300 '/' Outflow=6.59 cfs 20,845 cf

Pond DMH9: DMH Peak Elev=220.82' Inflow=8.74 cfs 27,657 cf
24.0" Round Culvert n=0.013 L=147.0' S=0.0200 '/' Outflow=8.74 cfs 27,657 cf

Pond G: gabion Peak Elev=229.10' Storage=1 cf Inflow=2.25 cfs 16,019 cf
Discarded=0.00 cfs 10 cf Primary=2.25 cfs 16,009 cf Outflow=2.25 cfs 16,019 cf

Link 1L: (new Link) Inflow=1.92 cfs 16,232 cf
Primary=1.92 cfs 16,232 cf

Total Runoff Area = 829,394 sf Runoff Volume = 145,712 cf Average Runoff Depth = 2.11"
90.62% Pervious = 751,622 sf 9.38% Impervious = 77,772 sf

Summary for Subcatchment P-1: Subcat P-1

Runoff = 10.23 cfs @ 12.24 hrs, Volume= 44,718 cf, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
4,874	98	Paved parking, HSG B
13,247	61	>75% Grass cover, Good, HSG B
72,656	55	Woods, Good, HSG B
131,956	77	Woods, Good, HSG D
482	98	Paved parking, HSG D
24,002	80	>75% Grass cover, Good, HSG D
34,297	70	Woods, Good, HSG C
4,728	74	>75% Grass cover, Good, HSG C
286,240	70	Weighted Average
280,885		98.13% Pervious Area
5,355		1.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0625	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
8.4	794	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.3	844	Total			

Summary for Subcatchment P-2: Subcat P-2

Runoff = 0.57 cfs @ 12.19 hrs, Volume= 2,272 cf, Depth= 2.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
6,580	74	>75% Grass cover, Good, HSG C
6,854	70	Woods, Good, HSG C
13,434	72	Weighted Average
13,434		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
0.5	31	0.0465	1.08		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
13.0	81	Total			

Summary for Subcatchment P-3A: Subcat P-3A

Runoff = 1.12 cfs @ 12.09 hrs, Volume= 3,565 cf, Depth= 2.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
5,462	98	Paved parking, HSG C
8,916	74	>75% Grass cover, Good, HSG C
14,378	83	Weighted Average
8,916		62.01% Pervious Area
5,462		37.99% Impervious Area

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

Summary for Subcatchment P-3B: Subcat P-3B

Runoff = 1.08 cfs @ 12.09 hrs, Volume= 3,411 cf, Depth= 2.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
1,086	61	>75% Grass cover, Good, HSG B
4,612	98	Paved parking, HSG C
8,964	74	>75% Grass cover, Good, HSG C
14,663	81	Weighted Average
10,051		68.54% Pervious Area
4,612		31.46% Impervious Area

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

Summary for Subcatchment P-3c: Subcat P-3c

Runoff = 1.66 cfs @ 12.09 hrs, Volume= 5,248 cf, Depth= 2.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
7,221	98	Paved parking, HSG C
14,624	74	>75% Grass cover, Good, HSG C
21,845	82	Weighted Average
14,624		66.95% Pervious Area
7,221		33.05% Impervious Area

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

Summary for Subcatchment P-4a: Subcat P-4a

Runoff = 2.92 cfs @ 12.17 hrs, Volume= 11,784 cf, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
7,742	98	Paved parking, HSG B
59,202	61	>75% Grass cover, Good, HSG B
23,518	55	Woods, Good, HSG B
343	98	Paved parking, HSG C
7,410	74	>75% Grass cover, Good, HSG C
16	70	Woods, Good, HSG C
98,231	64	Weighted Average
90,146		91.77% Pervious Area
8,085		8.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
2.8	300	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.5	350	Total			

Summary for Subcatchment P-4b: Subcat P-4b

Runoff = 1.25 cfs @ 12.14 hrs, Volume= 4,448 cf, Depth= 2.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
596	61	>75% Grass cover, Good, HSG B
1,158	55	Woods, Good, HSG B
18,108	74	>75% Grass cover, Good, HSG C
6,433	70	Woods, Good, HSG C
26,294	72	Weighted Average
26,294		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	30	0.0500	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
3.3	392	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.1	422	Total			

Summary for Subcatchment P-4c: Subcat P-4c

Runoff = 3.49 cfs @ 12.23 hrs, Volume= 15,066 cf, Depth= 2.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
156	77	Woods, Good, HSG D
42,661	74	>75% Grass cover, Good, HSG C
0	98	Paved parking, HSG C
46,247	70	Woods, Good, HSG C
89,064	72	Weighted Average
89,064		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
3.7	365	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.2	415	Total			

Summary for Subcatchment P-5a: Subcat P-5a

Runoff = 1.93 cfs @ 12.09 hrs, Volume= 6,111 cf, Depth= 2.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
9,276	98	Paved parking, HSG C
15,367	74	>75% Grass cover, Good, HSG C
24,643	83	Weighted Average
15,367		62.36% Pervious Area
9,276		37.64% Impervious Area

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

Summary for Subcatchment P-5b: Subcat P-5b

Runoff = 2.33 cfs @ 12.09 hrs, Volume= 7,368 cf, Depth= 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
8,220	98	Paved parking, HSG C
24,503	74	>75% Grass cover, Good, HSG C
32,723	80	Weighted Average
24,503		74.88% Pervious Area
8,220		25.12% Impervious Area

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

Summary for Subcatchment P-5c: Subcat P-5c

Runoff = 2.33 cfs @ 12.09 hrs, Volume= 7,367 cf, Depth= 2.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
8,906	98	Paved parking, HSG C
22,759	74	>75% Grass cover, Good, HSG C
31,664	81	Weighted Average
22,759		71.87% Pervious Area
8,906		28.13% Impervious Area

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

Summary for Subcatchment P-5d: Subcat P-5d

Runoff = 2.16 cfs @ 12.09 hrs, Volume= 6,811 cf, Depth= 2.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
22,327	74	>75% Grass cover, Good, HSG C
5,531	98	Paved parking, HSG C
5,640	70	Woods, Good, HSG C
33,498	77	Weighted Average
27,967		83.49% Pervious Area
5,531		16.51% Impervious Area

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

Summary for Subcatchment P-5e: Subcat P-5e

Runoff = 2.10 cfs @ 12.09 hrs, Volume= 6,643 cf, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
13,931	74	>75% Grass cover, Good, HSG C
5,320	98	Paved parking, HSG C
14,594	70	Woods, Good, HSG C
33,846	76	Weighted Average
28,525		84.28% Pervious Area
5,320		15.72% Impervious Area

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

Summary for Subcatchment P-5f: Subcat P-5f

Runoff = 1.75 cfs @ 12.09 hrs, Volume= 5,530 cf, Depth= 2.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
5,715	98	Paved parking, HSG C
10,921	74	>75% Grass cover, Good, HSG C
10,559	70	Woods, Good, HSG C
27,195	77	Weighted Average
21,480		78.99% Pervious Area
5,715		21.01% Impervious Area

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

Summary for Subcatchment P-6: Subcat P-6

Runoff = 3.06 cfs @ 12.09 hrs, Volume= 9,693 cf, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
45,537	74	>75% Grass cover, Good, HSG C
42	70	Woods, Good, HSG C
3,802	98	Paved parking, HSG C
49,382	76	Weighted Average
45,580		92.30% Pervious Area
3,802		7.70% Impervious Area

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

Summary for Subcatchment P-7: Subcat P-7

Runoff = 1.78 cfs @ 12.10 hrs, Volume= 5,677 cf, Depth= 2.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
24,388	74	>75% Grass cover, Good, HSG C
266	98	Paved parking, HSG C
7,640	70	Woods, Good, HSG C
32,294	73	Weighted Average
32,028		99.18% Pervious Area
266		0.82% Impervious Area

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

Summary for Reach 9001R: Routing sheet flow through a subcatchment

A subcatchment performs runoff calculations, including the associated Tc anc CN determinations. It does not have any facility for routing an inflow hydrograph from another source. However, a reach may be used to perform this type of specialized routing.

This reach demonstrates a procedure for performing a sheet-flow routing through a subcatchment area. In this case, the "reach" is defined as a wide channel with very low side slopes. The Manning's value of 0.15 is selected from the table of sheet flow roughness coefficients, which are much higher than normal Manning's values, in order to allow for the greater frictional losses of shallow flow. This value is comparable to the Manning's value for "very weedy reaches".

This example assumes that sheet flow occurs evenly over the entire 100' channel width, and that the flow depth is therefore very small. If the flow is concentrated or forms channels, the description and Manning's value must be adjusted accordingly.

Inflow Area = 98,231 sf, 8.23% Impervious, Inflow Depth = 1.44" for 10-year event
Inflow = 2.56 cfs @ 12.26 hrs, Volume= 11,784 cf
Outflow = 1.34 cfs @ 12.60 hrs, Volume= 11,784 cf, Atten= 48%, Lag= 20.3 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 0.34 fps, Min. Travel Time= 33.5 min
Avg. Velocity = 0.16 fps, Avg. Travel Time= 72.6 min

Peak Storage= 2,691 cf @ 12.60 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 1.00' Flow Area= 200.0 sf, Capacity= 463.86 cfs

100.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 100.0 '/' Top Width= 300.00'
Length= 680.0' Slope= 0.0941 '/'
Inlet Invert= 264.00', Outlet Invert= 200.00'

‡

Summary for Reach 9002R: Routing sheet flow through a subcatchment

A subcatchment performs runoff calculations, including the associated Tc anc CN determinations. It does not have any facility for routing an inflow hydrograph from another source. However, a reach may be used to perform this type of specialized routing.

This reach demonstrates a procedure for performing a sheet-flow routing through a subcatchment area. In this case, the "reach" is defined as a wide channel with very low side slopes. The Manning's value of 0.15 is selected from the table of sheet flow roughness coefficients, which are much higher than normal Manning's values, in order to allow for the greater frictional losses of shallow flow. This value is comparable to the Manning's value for "very weedy reaches".

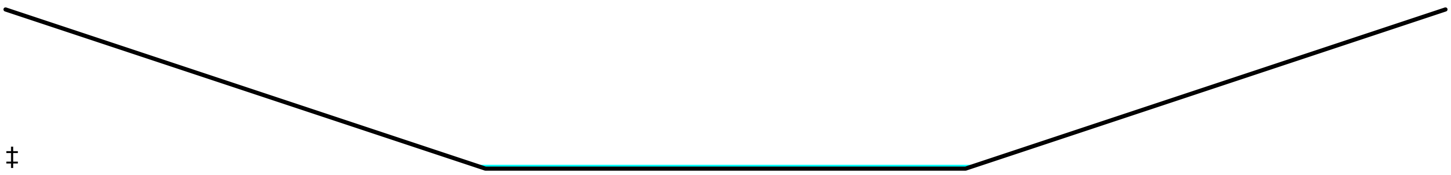
This example assumes that sheet flow occurs evenly over the entire 100' channel width, and that the flow depth is therefore very small.
If the flow is concentrated or forms channels, the description and Manning's value must be adjusted accordingly.

Inflow Area = 26,294 sf, 0.00% Impervious, Inflow Depth = 2.03" for 10-year event
Inflow = 1.25 cfs @ 12.14 hrs, Volume= 4,448 cf
Outflow = 0.77 cfs @ 12.30 hrs, Volume= 4,448 cf, Atten= 38%, Lag= 9.9 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 0.31 fps, Min. Travel Time= 18.4 min
Avg. Velocity = 0.18 fps, Avg. Travel Time= 32.4 min

Peak Storage= 850 cf @ 12.30 hrs
Average Depth at Peak Storage= 0.02'
Bank-Full Depth= 1.00' Flow Area= 200.0 sf, Capacity= 569.83 cfs

100.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 100.0 '/' Top Width= 300.00'
Length= 345.0' Slope= 0.1420 '/'
Inlet Invert= 249.00', Outlet Invert= 200.00'



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Summary for Reach SP-1: SP-1

Inflow Area = 286,240 sf, 1.87% Impervious, Inflow Depth = 1.87" for 10-year event
Inflow = 10.23 cfs @ 12.24 hrs, Volume= 44,718 cf
Outflow = 10.23 cfs @ 12.24 hrs, Volume= 44,718 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Summary for Reach SP-2: SP-2

Inflow Area = 13,434 sf, 0.00% Impervious, Inflow Depth = 2.03" for 10-year event
Inflow = 0.57 cfs @ 12.19 hrs, Volume= 2,272 cf
Outflow = 0.57 cfs @ 12.19 hrs, Volume= 2,272 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Summary for Reach SP-3: SP-3

Inflow Area = 215,863 sf, 20.03% Impervious, Inflow Depth = 2.53" for 10-year event
Inflow = 6.31 cfs @ 12.31 hrs, Volume= 45,483 cf
Outflow = 6.31 cfs @ 12.31 hrs, Volume= 45,483 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Summary for Reach SP-4: SP-4

Inflow Area = 313,856 sf, 9.30% Impervious, Inflow Depth = 1.81" for 10-year event
Inflow = 6.95 cfs @ 12.30 hrs, Volume= 47,306 cf
Outflow = 6.95 cfs @ 12.30 hrs, Volume= 47,306 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Summary for Reach SW1: Swale

Inflow Area = 98,231 sf, 8.23% Impervious, Inflow Depth = 1.44" for 10-year event
Inflow = 2.92 cfs @ 12.17 hrs, Volume= 11,784 cf
Outflow = 2.56 cfs @ 12.26 hrs, Volume= 11,784 cf, Atten= 12%, Lag= 5.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 0.71 fps, Min. Travel Time= 6.3 min
Avg. Velocity = 0.22 fps, Avg. Travel Time= 20.7 min

Peak Storage= 962 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.48'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 37.23 cfs

6.00' x 2.00' deep channel, n= 0.080 Earth, long dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 18.00'
Length= 267.0' Slope= 0.0050 '/'
Inlet Invert= 267.33', Outlet Invert= 266.00'

Summary for Pond CB10: CB

Inflow Area = 32,723 sf, 25.12% Impervious, Inflow Depth = 2.70" for 10-year event
Inflow = 2.33 cfs @ 12.09 hrs, Volume= 7,368 cf
Outflow = 2.33 cfs @ 12.09 hrs, Volume= 7,368 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.33 cfs @ 12.09 hrs, Volume= 7,368 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 235.63' @ 12.09 hrs
Flood Elev= 239.42'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.69'	**15.0" Round Culvert** L= 9.0' Ke= 0.500 Inlet / Outlet Invert= 234.69' / 234.60' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.29 cfs @ 12.09 hrs HW=235.62' TW=235.34' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 2.29 cfs @ 3.26 fps)

Summary for Pond CB12: CB

Inflow Area = 31,664 sf, 28.13% Impervious, Inflow Depth = 2.79" for 10-year event
Inflow = 2.33 cfs @ 12.09 hrs, Volume= 7,367 cf
Outflow = 2.33 cfs @ 12.09 hrs, Volume= 7,367 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.33 cfs @ 12.09 hrs, Volume= 7,367 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 230.15' @ 12.09 hrs
Flood Elev= 233.72'

Device	Routing	Invert	Outlet Devices
#1	Primary	229.29'	**15.0" Round Culvert** L= 19.0' Ke= 0.500 Inlet / Outlet Invert= 229.29' / 229.10' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.29 cfs @ 12.09 hrs HW=230.14' TW=228.32' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 2.29 cfs @ 3.65 fps)

Summary for Pond CB14: CB

Inflow Area = 33,498 sf, 16.51% Impervious, Inflow Depth = 2.44" for 10-year event
Inflow = 2.16 cfs @ 12.09 hrs, Volume= 6,811 cf
Outflow = 2.16 cfs @ 12.09 hrs, Volume= 6,811 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.16 cfs @ 12.09 hrs, Volume= 6,811 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 224.71' @ 12.09 hrs
Flood Elev= 227.69'

Device	Routing	Invert	Outlet Devices
#1	Primary	223.98'	**15.0" Round Culvert** L= 21.0' Ke= 0.500 Inlet / Outlet Invert= 223.98' / 223.35' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.12 cfs @ 12.09 hrs HW=224.70' TW=220.81' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.12 cfs @ 2.89 fps)

Summary for Pond CB16: CB

Inflow Area = 33,846 sf, 15.72% Impervious, Inflow Depth = 2.36" for 10-year event
Inflow = 2.10 cfs @ 12.09 hrs, Volume= 6,643 cf
Outflow = 2.10 cfs @ 12.09 hrs, Volume= 6,643 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.10 cfs @ 12.09 hrs, Volume= 6,643 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 218.12' @ 12.09 hrs
Flood Elev= 220.61'

Device	Routing	Invert	Outlet Devices
#1	Primary	217.40'	**15.0" Round Culvert** L= 15.0' Ke= 0.500 Inlet / Outlet Invert= 217.40' / 217.06' S= 0.0227 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.07 cfs @ 12.09 hrs HW=218.11' TW=212.70' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.07 cfs @ 2.87 fps)

Summary for Pond CB18: CB

Inflow Area = 27,195 sf, 21.01% Impervious, Inflow Depth = 2.44" for 10-year event
Inflow = 1.75 cfs @ 12.09 hrs, Volume= 5,530 cf
Outflow = 1.75 cfs @ 12.09 hrs, Volume= 5,530 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.75 cfs @ 12.09 hrs, Volume= 5,530 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 211.01' @ 12.10 hrs
Flood Elev= 213.83'

Device	Routing	Invert	Outlet Devices
#1	Primary	210.30'	**15.0" Round Culvert** L= 37.0' Ke= 0.500 Inlet / Outlet Invert= 210.30' / 209.93' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.73 cfs @ 12.09 hrs HW=211.00' TW=210.51' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.73 cfs @ 3.55 fps)

Summary for Pond CB2: CB

Inflow Area = 14,378 sf, 37.99% Impervious, Inflow Depth = 2.98" for 10-year event
Inflow = 1.12 cfs @ 12.09 hrs, Volume= 3,565 cf
Outflow = 1.12 cfs @ 12.09 hrs, Volume= 3,565 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.12 cfs @ 12.09 hrs, Volume= 3,565 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Peak Elev= 256.01' @ 12.09 hrs
Flood Elev= 258.73'

Device	Routing	Invert	Outlet Devices
#1	Primary	255.50'	**15.0" Round Culvert** L= 22.0' Ke= 0.500 Inlet / Outlet Invert= 255.50' / 255.10' S= 0.0182 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.10 cfs @ 12.09 hrs HW=256.00' TW=252.01' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.10 cfs @ 2.41 fps)

Summary for Pond CB4: CB

Inflow Area = 14,663 sf, 31.46% Impervious, Inflow Depth = 2.79" for 10-year event
Inflow = 1.08 cfs @ 12.09 hrs, Volume= 3,411 cf
Outflow = 1.08 cfs @ 12.09 hrs, Volume= 3,411 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.08 cfs @ 12.09 hrs, Volume= 3,411 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 257.95' @ 12.09 hrs
Flood Elev= 261.26'

Device	Routing	Invert	Outlet Devices
#1	Primary	257.46'	**15.0" Round Culvert** L= 22.0' Ke= 0.500 Inlet / Outlet Invert= 257.46' / 256.80' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.06 cfs @ 12.09 hrs HW=257.95' TW=252.33' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.06 cfs @ 2.38 fps)

Summary for Pond CB6: CB

Inflow Area = 21,845 sf, 33.05% Impervious, Inflow Depth = 2.88" for 10-year event
Inflow = 1.66 cfs @ 12.09 hrs, Volume= 5,248 cf
Outflow = 1.66 cfs @ 12.09 hrs, Volume= 5,248 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.66 cfs @ 12.09 hrs, Volume= 5,248 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 251.34' @ 12.09 hrs
Flood Elev= 254.22'

Device	Routing	Invert	Outlet Devices
#1	Primary	250.61'	**15.0" Round Culvert** L= 11.0' Ke= 0.500 Inlet / Outlet Invert= 250.61' / 250.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.62 cfs @ 12.09 hrs HW=251.33' TW=251.03' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.62 cfs @ 3.22 fps)

Summary for Pond CB8: CB

Inflow Area = 24,643 sf, 37.64% Impervious, Inflow Depth = 2.98" for 10-year event
Inflow = 1.93 cfs @ 12.09 hrs, Volume= 6,111 cf
Outflow = 1.93 cfs @ 12.09 hrs, Volume= 6,111 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.93 cfs @ 12.09 hrs, Volume= 6,111 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 244.11' @ 12.09 hrs
Flood Elev= 246.68'

Device	Routing	Invert	Outlet Devices
#1	Primary	243.40'	**15.0" Round Culvert** L= 17.0' Ke= 0.500 Inlet / Outlet Invert= 243.40' / 243.06' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.89 cfs @ 12.09 hrs HW=244.10' TW=243.63' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.89 cfs @ 3.89 fps)

Summary for Pond DB1: DB1

Groundwater must be verified with test pit

Inflow Area = 215,863 sf, 20.03% Impervious, Inflow Depth = 2.53" for 10-year event
Inflow = 14.38 cfs @ 12.09 hrs, Volume= 45,506 cf
Outflow = 6.31 cfs @ 12.31 hrs, Volume= 45,483 cf, Atten= 56%, Lag= 13.3 min
Primary = 6.31 cfs @ 12.31 hrs, Volume= 45,483 cf
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 209.22' @ 12.31 hrs Surf.Area= 5,330 sf Storage= 10,466 cf
Flood Elev= 212.20' Surf.Area= 11,169 sf Storage= 32,544 cf

Plug-Flow detention time= 31.1 min calculated for 45,483 cf (100% of inflow)
Center-of-Mass det. time= 30.6 min (858.8 - 828.2)

Volume	Invert	Avail.Storage	Storage Description
#1	206.50'	32,544 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
206.50	2,580	292.7	0	0	2,580
208.00	3,931	343.8	4,848	4,848	5,212
210.00	6,340	407.4	10,175	15,023	9,087
212.00	9,234	471.0	15,484	30,507	13,619
212.20	11,169	496.1	2,037	32,544	15,553

Device	Routing	Invert	Outlet Devices
#1	Primary	204.75'	**15.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 204.75' / 204.50' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	206.50'	**6.0" Vert. Vertical Orifice X 2.00** C= 0.600
#3	Device 1	207.90'	**8.0" Vert. Vertical Orifice X 2.00** C= 0.600
#4	Device 1	209.90'	**48.0" Horiz. Horizonal Orifice** C= 0.600 Limited to weir flow at low heads
#5	Secondary	211.00'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=6.30 cfs @ 12.31 hrs HW=209.21' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 6.30 cfs of 11.23 cfs potential flow)
  ├─**2=Vertical Orifice** (Orifice Controls 2.97 cfs @ 7.56 fps)
  ├─**3=Vertical Orifice** (Orifice Controls 3.33 cfs @ 4.77 fps)
  └─**4=Horizonal Orifice** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=206.50' TW=0.00' (Dynamic Tailwater)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DB2: DB2

Soil type 307C (sandy loam) Rawls infiltration rate = 1.02 inches per hour
Groundwater elevation must be verified with test pit

Inflow Area = 100,268 sf, 21.04% Impervious, Inflow Depth = 2.62" for 10-year event
Inflow = 6.92 cfs @ 12.09 hrs, Volume= 21,918 cf
Outflow = 2.42 cfs @ 12.40 hrs, Volume= 21,776 cf, Atten= 65%, Lag= 18.3 min
Discarded = 0.17 cfs @ 12.40 hrs, Volume= 5,757 cf
Primary = 2.25 cfs @ 12.40 hrs, Volume= 16,019 cf
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 247.84' @ 12.40 hrs Surf.Area= 3,717 sf Storage= 6,969 cf
Flood Elev= 250.00' Surf.Area= 6,476 sf Storage= 17,872 cf

Plug-Flow detention time= 110.8 min calculated for 21,741 cf (99% of inflow)
Center-of-Mass det. time= 107.9 min (933.2 - 825.3)

Volume	Invert	Avail.Storage	Storage Description
#1	244.50'	17,872 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
244.50	762	148.0	0	0	762
245.00	1,072	161.0	456	456	1,091
246.00	1,868	209.0	1,452	1,908	2,516
247.00	2,807	247.0	2,322	4,230	3,914
248.00	3,902	286.0	3,340	7,569	5,589
249.00	5,141	321.0	4,507	12,076	7,307
250.00	6,476	346.0	5,796	17,872	8,675

Device	Routing	Invert	Outlet Devices
#1	Primary	239.55'	**12.0" Round Culvert** L= 95.0' Ke= 0.500 Inlet / Outlet Invert= 239.55' / 234.80' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	245.90'	**8.0" Vert. Vertical Orifice** C= 0.600
#3	Device 1	247.70'	**6.0" Vert. Vertical Orifice X 2.00** C= 0.600
#4	Device 1	248.60'	**24.0" x 24.0" Horiz. Horizontal Orifice** C= 0.600 Limited to weir flow at low heads
#5	Secondary	249.70'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#6	Discarded	244.50'	**1.020 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 240.00' Phase-In= 0.01'

Discarded OutFlow Max=0.17 cfs @ 12.40 hrs HW=247.84' (Free Discharge)
└─**6=Exfiltration** (Controls 0.17 cfs)

Primary OutFlow Max=2.25 cfs @ 12.40 hrs HW=247.84' TW=235.45' (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.25 cfs of 10.33 cfs potential flow)
  ├─**2=Vertical Orifice** (Orifice Controls 2.13 cfs @ 6.11 fps)
  ├─**3=Vertical Orifice** (Orifice Controls 0.12 cfs @ 1.28 fps)
  └─**4=Horizontal Orifice** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=244.50' TW=223.98' (Dynamic Tailwater)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DMH1: DMH

Inflow Area = 14,378 sf, 37.99% Impervious, Inflow Depth = 2.98" for 10-year event
Inflow = 1.12 cfs @ 12.09 hrs, Volume= 3,565 cf
Outflow = 1.12 cfs @ 12.09 hrs, Volume= 3,565 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.12 cfs @ 12.09 hrs, Volume= 3,565 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 252.02' @ 12.09 hrs
Flood Elev= 258.52'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.51'	**15.0" Round Culvert** L= 64.0' Ke= 0.500 Inlet / Outlet Invert= 251.51' / 249.59' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.10 cfs @ 12.09 hrs HW=252.01' TW=249.78' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.10 cfs @ 2.41 fps)

Summary for Pond DMH10: DMH

Inflow Area = 156,374 sf, 23.82% Impervious, Inflow Depth = 2.63" for 10-year event
Inflow = 10.84 cfs @ 12.09 hrs, Volume= 34,300 cf
Outflow = 10.84 cfs @ 12.09 hrs, Volume= 34,300 cf, Atten= 0%, Lag= 0.0 min
Primary = 10.84 cfs @ 12.09 hrs, Volume= 34,300 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 212.72' @ 12.09 hrs
Flood Elev= 227.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	211.19'	**24.0" Round Culvert** L= 113.0' Ke= 0.500 Inlet / Outlet Invert= 211.19' / 208.93' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=10.65 cfs @ 12.09 hrs HW=212.70' TW=210.50' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 10.65 cfs @ 4.18 fps)

Summary for Pond DMH11: DMH

Inflow Area = 183,569 sf, 23.41% Impervious, Inflow Depth = 2.60" for 10-year event
Inflow = 12.59 cfs @ 12.09 hrs, Volume= 39,830 cf
Outflow = 12.59 cfs @ 12.09 hrs, Volume= 39,830 cf, Atten= 0%, Lag= 0.0 min
Primary = 12.59 cfs @ 12.09 hrs, Volume= 39,830 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 210.53' @ 12.09 hrs
Flood Elev= 215.34'

Device	Routing	Invert	Outlet Devices
#1	Primary	208.83'	**24.0" Round Culvert** L= 62.0' Ke= 0.500 Inlet / Outlet Invert= 208.83' / 208.00' S= 0.0134 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=12.38 cfs @ 12.09 hrs HW=210.50' TW=208.64' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 12.38 cfs @ 4.41 fps)

Summary for Pond DMH12: DMH

Inflow Area = 100,268 sf, 21.04% Impervious, Inflow Depth = 1.92" for 10-year event
Inflow = 2.25 cfs @ 12.40 hrs, Volume= 16,019 cf
Outflow = 2.25 cfs @ 12.40 hrs, Volume= 16,019 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.25 cfs @ 12.40 hrs, Volume= 16,019 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 235.45' @ 12.40 hrs
Flood Elev= 238.03'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.70'	**15.0" Round Culvert** L= 76.0' Ke= 0.500 Inlet / Outlet Invert= 234.70' / 230.60' S= 0.0539 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.25 cfs @ 12.40 hrs HW=235.45' TW=234.40' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.25 cfs @ 2.94 fps)

Summary for Pond DMH2: DMH

Inflow Area = 14,663 sf, 31.46% Impervious, Inflow Depth = 2.79" for 10-year event
Inflow = 1.08 cfs @ 12.09 hrs, Volume= 3,411 cf
Outflow = 1.08 cfs @ 12.09 hrs, Volume= 3,411 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.08 cfs @ 12.09 hrs, Volume= 3,411 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Peak Elev= 252.33' @ 12.09 hrs
Flood Elev= 260.66'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.84'	**15.0" Round Culvert** L= 75.0' Ke= 0.500 Inlet / Outlet Invert= 251.84' / 249.59' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.06 cfs @ 12.09 hrs HW=252.33' TW=249.78' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.06 cfs @ 2.38 fps)

Summary for Pond DMH3: DMH

Inflow Area = 21,845 sf, 33.05% Impervious, Inflow Depth = 2.88" for 10-year event
Inflow = 1.66 cfs @ 12.09 hrs, Volume= 5,248 cf
Outflow = 1.66 cfs @ 12.09 hrs, Volume= 5,248 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.66 cfs @ 12.09 hrs, Volume= 5,248 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 251.04' @ 12.09 hrs
Flood Elev= 254.76'

Device	Routing	Invert	Outlet Devices
#1	Primary	250.40'	**15.0" Round Culvert** L= 55.0' Ke= 0.500 Inlet / Outlet Invert= 250.40' / 249.85' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.62 cfs @ 12.09 hrs HW=251.03' TW=249.78' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.62 cfs @ 3.80 fps)

Summary for Pond DMH4: DMH

Inflow Area = 50,886 sf, 33.99% Impervious, Inflow Depth = 2.88" for 10-year event
Inflow = 3.86 cfs @ 12.09 hrs, Volume= 12,225 cf
Outflow = 3.86 cfs @ 12.09 hrs, Volume= 12,225 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.86 cfs @ 12.09 hrs, Volume= 12,225 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 249.79' @ 12.09 hrs
Flood Elev= 257.23'

Device	Routing	Invert	Outlet Devices
#1	Primary	248.85'	**18.0" Round Culvert** L= 159.0' Ke= 0.500 Inlet / Outlet Invert= 248.85' / 246.00' S= 0.0179 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=3.78 cfs @ 12.09 hrs HW=249.78' TW=247.24' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 3.78 cfs @ 3.28 fps)

Summary for Pond DMH5: DMH

Inflow Area = 100,268 sf, 21.04% Impervious, Inflow Depth = 1.92" for 10-year event
Inflow = 2.25 cfs @ 12.40 hrs, Volume= 16,019 cf
Outflow = 2.25 cfs @ 12.40 hrs, Volume= 16,019 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.25 cfs @ 12.40 hrs, Volume= 16,019 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 234.40' @ 12.40 hrs
Flood Elev= 237.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	233.65'	**15.0" Round Culvert** L= 143.0' Ke= 0.500 Inlet / Outlet Invert= 233.65' / 229.00' S= 0.0325 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.25 cfs @ 12.40 hrs HW=234.40' TW=229.10' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 2.25 cfs @ 2.94 fps)

Summary for Pond DMH6: DMH

Inflow Area = 24,643 sf, 37.64% Impervious, Inflow Depth = 2.98" for 10-year event
Inflow = 1.93 cfs @ 12.09 hrs, Volume= 6,111 cf
Outflow = 1.93 cfs @ 12.09 hrs, Volume= 6,111 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.93 cfs @ 12.09 hrs, Volume= 6,111 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 243.64' @ 12.09 hrs
Flood Elev= 246.62'

Device	Routing	Invert	Outlet Devices
#1	Primary	242.96'	**15.0" Round Culvert** L= 146.0' Ke= 0.500 Inlet / Outlet Invert= 242.96' / 234.60' S= 0.0573 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.89 cfs @ 12.09 hrs HW=243.63' TW=235.34' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 1.89 cfs @ 2.80 fps)

Summary for Pond DMH7: DMH

Inflow Area = 57,366 sf, 30.50% Impervious, Inflow Depth = 2.82" for 10-year event
Inflow = 4.26 cfs @ 12.09 hrs, Volume= 13,479 cf
Outflow = 4.26 cfs @ 12.09 hrs, Volume= 13,479 cf, Atten= 0%, Lag= 0.0 min
Primary = 4.26 cfs @ 12.09 hrs, Volume= 13,479 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 235.35' @ 12.09 hrs
Flood Elev= 246.62'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.35'	**18.0" Round Culvert** L= 140.0' Ke= 0.500 Inlet / Outlet Invert= 234.35' / 228.85' S= 0.0393 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=4.18 cfs @ 12.09 hrs HW=235.34' TW=228.32' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 4.18 cfs @ 3.38 fps)

Summary for Pond DMH8: DMH

Inflow Area = 89,031 sf, 29.66% Impervious, Inflow Depth = 2.81" for 10-year event
Inflow = 6.59 cfs @ 12.09 hrs, Volume= 20,845 cf
Outflow = 6.59 cfs @ 12.09 hrs, Volume= 20,845 cf, Atten= 0%, Lag= 0.0 min
Primary = 6.59 cfs @ 12.09 hrs, Volume= 20,845 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 228.34' @ 12.09 hrs
Flood Elev= 233.28'

Device	Routing	Invert	Outlet Devices
#1	Primary	227.21'	**24.0" Round Culvert** L= 137.0' Ke= 0.500 Inlet / Outlet Invert= 227.21' / 223.10' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=6.46 cfs @ 12.09 hrs HW=228.32' TW=220.81' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 6.46 cfs @ 3.59 fps)

Summary for Pond DMH9: DMH

Inflow Area = 122,529 sf, 26.06% Impervious, Inflow Depth = 2.71" for 10-year event
Inflow = 8.74 cfs @ 12.09 hrs, Volume= 27,657 cf
Outflow = 8.74 cfs @ 12.09 hrs, Volume= 27,657 cf, Atten= 0%, Lag= 0.0 min
Primary = 8.74 cfs @ 12.09 hrs, Volume= 27,657 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 220.82' @ 12.09 hrs
Flood Elev= 227.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	219.49'	**24.0" Round Culvert** L= 147.0' Ke= 0.500 Inlet / Outlet Invert= 219.49' / 216.55' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=8.58 cfs @ 12.09 hrs HW=220.81' TW=212.70' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 8.58 cfs @ 3.91 fps)

Summary for Pond G: gabion

Inflow Area = 100,268 sf, 21.04% Impervious, Inflow Depth = 1.92" for 10-year event
Inflow = 2.25 cfs @ 12.40 hrs, Volume= 16,019 cf
Outflow = 2.25 cfs @ 12.40 hrs, Volume= 16,019 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 12.40 hrs, Volume= 10 cf
Primary = 2.25 cfs @ 12.40 hrs, Volume= 16,009 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 229.10' @ 12.40 hrs Surf.Area= 20 sf Storage= 1 cf
Flood Elev= 230.25' Surf.Area= 0 sf Storage= 37 cf

Plug-Flow detention time= 0.0 min calculated for 15,993 cf (100% of inflow)
Center-of-Mass det. time= 0.0 min (832.5 - 832.5)

Volume	Invert	Avail.Storage	Storage Description
#1	229.00'	37 cf	**15.0" Round Pipe Storage** L= 30.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	229.63'	**3.0" Vert. outlet holes X 30.00** C= 0.600
#2	Primary	229.00'	**3.0" Horiz. outlet holes X 30.00** C= 0.600 Limited to weir flow at low heads
#3	Discarded	229.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.00 cfs @ 12.40 hrs HW=229.10' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=2.25 cfs @ 12.40 hrs HW=229.10' TW=0.00' (Dynamic Tailwater)
├─**1=outlet holes** (Controls 0.00 cfs)
└─**2=outlet holes** (Orifice Controls 2.25 cfs @ 1.53 fps)

Summary for Link 1L: (new Link)

Inflow Area = 124,524 sf, 6.49% Impervious, Inflow Depth = 1.56" for 10-year event
Inflow = 1.92 cfs @ 12.51 hrs, Volume= 16,232 cf
Primary = 1.92 cfs @ 12.51 hrs, Volume= 16,232 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs

Time span=5.00-36.00 hrs, dt=0.05 hrs, 621 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P-1: Subcat P-1 Runoff Area=286,240 sf 1.87% Impervious Runoff Depth=2.81"
Flow Length=844' Tc=16.3 min CN=70 Runoff=15.64 cfs 67,103 cf

Subcatchment P-2: Subcat P-2 Runoff Area=13,434 sf 0.00% Impervious Runoff Depth=3.00"
Flow Length=81' Tc=13.0 min CN=72 Runoff=0.85 cfs 3,360 cf

Subcatchment P-3A: Subcat P-3A Runoff Area=14,378 sf 37.99% Impervious Runoff Depth=4.10"
Tc=6.0 min CN=83 Runoff=1.53 cfs 4,913 cf

Subcatchment P-3B: Subcat P-3B Runoff Area=14,663 sf 31.46% Impervious Runoff Depth=3.89"
Tc=6.0 min CN=81 Runoff=1.49 cfs 4,757 cf

Subcatchment P-3c: Subcat P-3c Runoff Area=21,845 sf 33.05% Impervious Runoff Depth=4.00"
Tc=6.0 min CN=82 Runoff=2.28 cfs 7,275 cf

Subcatchment P-4a: Subcat P-4a Runoff Area=98,231 sf 8.23% Impervious Runoff Depth=2.27"
Flow Length=350' Tc=11.5 min CN=64 Runoff=4.82 cfs 18,586 cf

Subcatchment P-4b: Subcat P-4b Runoff Area=26,294 sf 0.00% Impervious Runoff Depth=3.00"
Flow Length=422' Tc=9.1 min CN=72 Runoff=1.87 cfs 6,577 cf

Subcatchment P-4c: Subcat P-4c Runoff Area=89,064 sf 0.00% Impervious Runoff Depth=3.00"
Flow Length=415' Tc=16.2 min CN=72 Runoff=5.23 cfs 22,276 cf

Subcatchment P-5a: Subcat P-5a Runoff Area=24,643 sf 37.64% Impervious Runoff Depth=4.10"
Tc=6.0 min CN=83 Runoff=2.63 cfs 8,421 cf

Subcatchment P-5b: Subcat P-5b Runoff Area=32,723 sf 25.12% Impervious Runoff Depth=3.79"
Tc=6.0 min CN=80 Runoff=3.26 cfs 10,336 cf

Subcatchment P-5c: Subcat P-5c Runoff Area=31,664 sf 28.13% Impervious Runoff Depth=3.89"
Tc=6.0 min CN=81 Runoff=3.23 cfs 10,272 cf

Subcatchment P-5d: Subcat P-5d Runoff Area=33,498 sf 16.51% Impervious Runoff Depth=3.49"
Tc=6.0 min CN=77 Runoff=3.08 cfs 9,736 cf

Subcatchment P-5e: Subcat P-5e Runoff Area=33,846 sf 15.72% Impervious Runoff Depth=3.39"
Tc=6.0 min CN=76 Runoff=3.03 cfs 9,558 cf

Subcatchment P-5f: Subcat P-5f Runoff Area=27,195 sf 21.01% Impervious Runoff Depth=3.49"
Tc=6.0 min CN=77 Runoff=2.50 cfs 7,904 cf

Subcatchment P-6: Subcat P-6 Runoff Area=49,382 sf 7.70% Impervious Runoff Depth=3.39"
Tc=6.0 min CN=76 Runoff=4.41 cfs 13,945 cf

Subcatchment P-7: Subcat P-7 Runoff Area=32,294 sf 0.82% Impervious Runoff Depth=3.10"
Tc=6.0 min CN=73 Runoff=2.64 cfs 8,334 cf

Reach 9001R: Routing sheet flow through a subcatchment Avg. Flow Depth=0.06' Max Vel=0.43 fps Inflow=4.32 cfs 18,586 cf
n=0.150 L=680.0' S=0.0941 '/' Capacity=463.86 cfs Outflow=2.58 cfs 18,586 cf

Reach 9002R: Routing sheet flow through a subcatchment Avg. Flow Depth=0.03' Max Vel=0.38 fps Inflow=1.87 cfs 6,577 cf
n=0.150 L=345.0' S=0.1420 '/' Capacity=569.83 cfs Outflow=1.27 cfs 6,577 cf

Reach SP-1: SP-1 Inflow=15.64 cfs 67,103 cf
Outflow=15.64 cfs 67,103 cf

Reach SP-2: SP-2 Inflow=0.85 cfs 3,360 cf
Outflow=0.85 cfs 3,360 cf

Reach SP-3: SP-3 Inflow=9.44 cfs 64,538 cf
Outflow=9.44 cfs 64,538 cf

Reach SP-4: SP-4
Inflow=11.71 cfs 71,878 cf
Outflow=11.71 cfs 71,878 cf

Reach SW1: Swale
Avg. Flow Depth=0.65' Max Vel=0.84 fps Inflow=4.82 cfs 18,586 cf
n=0.080 L=267.0' S=0.0050 '/' Capacity=37.23 cfs Outflow=4.32 cfs 18,586 cf

Pond CB10: CB
Peak Elev=235.89' Inflow=3.26 cfs 10,336 cf
15.0" Round Culvert n=0.013 L=9.0' S=0.0100 '/' Outflow=3.26 cfs 10,336 cf

Pond CB12: CB
Peak Elev=230.34' Inflow=3.23 cfs 10,272 cf
15.0" Round Culvert n=0.013 L=19.0' S=0.0100 '/' Outflow=3.23 cfs 10,272 cf

Pond CB14: CB
Peak Elev=224.88' Inflow=3.08 cfs 9,736 cf
15.0" Round Culvert n=0.013 L=21.0' S=0.0300 '/' Outflow=3.08 cfs 9,736 cf

Pond CB16: CB
Peak Elev=218.30' Inflow=3.03 cfs 9,558 cf
15.0" Round Culvert n=0.013 L=15.0' S=0.0227 '/' Outflow=3.03 cfs 9,558 cf

Pond CB18: CB
Peak Elev=211.46' Inflow=2.50 cfs 7,904 cf
15.0" Round Culvert n=0.013 L=37.0' S=0.0100 '/' Outflow=2.50 cfs 7,904 cf

Pond CB2: CB
Peak Elev=256.10' Inflow=1.53 cfs 4,913 cf
15.0" Round Culvert n=0.013 L=22.0' S=0.0182 '/' Outflow=1.53 cfs 4,913 cf

Pond CB4: CB
Peak Elev=258.05' Inflow=1.49 cfs 4,757 cf
15.0" Round Culvert n=0.013 L=22.0' S=0.0300 '/' Outflow=1.49 cfs 4,757 cf

Pond CB6: CB
Peak Elev=251.50' Inflow=2.28 cfs 7,275 cf
15.0" Round Culvert n=0.013 L=11.0' S=0.0100 '/' Outflow=2.28 cfs 7,275 cf

Pond CB8: CB
Peak Elev=244.27' Inflow=2.63 cfs 8,421 cf
15.0" Round Culvert n=0.013 L=17.0' S=0.0200 '/' Outflow=2.63 cfs 8,421 cf

Pond DB1: DB1
Peak Elev=210.01' Storage=15,101 cf Inflow=20.36 cfs 64,561 cf
Primary=9.44 cfs 64,538 cf Secondary=0.00 cfs 0 cf Outflow=9.44 cfs 64,538 cf

Pond DB2: DB2
Peak Elev=248.38' Storage=9,139 cf Inflow=9.72 cfs 30,890 cf
Discarded=0.20 cfs 6,282 cf Primary=3.70 cfs 24,451 cf Secondary=0.00 cfs 0 cf Outflow=3.90 cfs 30,733 cf

Pond DMH1: DMH
Peak Elev=252.11' Inflow=1.53 cfs 4,913 cf
15.0" Round Culvert n=0.013 L=64.0' S=0.0300 '/' Outflow=1.53 cfs 4,913 cf

Pond DMH10: DMH
Peak Elev=213.20' Inflow=15.22 cfs 48,323 cf
24.0" Round Culvert n=0.013 L=113.0' S=0.0200 '/' Outflow=15.22 cfs 48,323 cf

Pond DMH11: DMH
Peak Elev=211.19' Inflow=17.72 cfs 56,227 cf
24.0" Round Culvert n=0.013 L=62.0' S=0.0134 '/' Outflow=17.72 cfs 56,227 cf

Pond DMH12: DMH
Peak Elev=235.72' Inflow=3.70 cfs 24,451 cf
15.0" Round Culvert n=0.013 L=76.0' S=0.0539 '/' Outflow=3.70 cfs 24,451 cf

Pond DMH2: DMH
Peak Elev=252.43' Inflow=1.49 cfs 4,757 cf
15.0" Round Culvert n=0.013 L=75.0' S=0.0300 '/' Outflow=1.49 cfs 4,757 cf

Pond DMH3: DMH
Peak Elev=251.17' Inflow=2.28 cfs 7,275 cf
15.0" Round Culvert n=0.013 L=55.0' S=0.0100 '/' Outflow=2.28 cfs 7,275 cf

Pond DMH4: DMH
Peak Elev=250.00' Inflow=5.31 cfs 16,945 cf
18.0" Round Culvert n=0.013 L=159.0' S=0.0179 '/' Outflow=5.31 cfs 16,945 cf

Pond DMH5: DMH
Peak Elev=234.67' Inflow=3.70 cfs 24,451 cf
15.0" Round Culvert n=0.013 L=143.0' S=0.0325 '/' Outflow=3.70 cfs 24,451 cf

Pond DMH6: DMH
Peak Elev=243.78' Inflow=2.63 cfs 8,421 cf
15.0" Round Culvert n=0.013 L=146.0' S=0.0573 '/' Outflow=2.63 cfs 8,421 cf

Pond DMH7: DMH
Peak Elev=235.58' Inflow=5.89 cfs 18,757 cf
18.0" Round Culvert n=0.013 L=140.0' S=0.0393 '/' Outflow=5.89 cfs 18,757 cf

Pond DMH8: DMH
Peak Elev=228.58' Inflow=9.11 cfs 29,029 cf
24.0" Round Culvert n=0.013 L=137.0' S=0.0300 '/' Outflow=9.11 cfs 29,029 cf

Pond DMH9: DMH
Peak Elev=221.15' Inflow=12.19 cfs 38,765 cf
24.0" Round Culvert n=0.013 L=147.0' S=0.0200 '/' Outflow=12.19 cfs 38,765 cf

Pond G: gabion
Peak Elev=229.27' Storage=6 cf Inflow=3.70 cfs 24,451 cf
Discarded=0.00 cfs 12 cf Primary=3.71 cfs 24,439 cf Outflow=3.71 cfs 24,451 cf

Link 1L: (new Link)
Inflow=3.58 cfs 25,163 cf
Primary=3.58 cfs 25,163 cf

Total Runoff Area = 829,394 sf Runoff Volume = 213,354 cf Average Runoff Depth = 3.09"
90.62% Pervious = 751,622 sf 9.38% Impervious = 77,772 sf

Summary for Subcatchment P-1: Subcat P-1

Runoff = 15.64 cfs @ 12.23 hrs, Volume= 67,103 cf, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
4,874	98	Paved parking, HSG B
13,247	61	>75% Grass cover, Good, HSG B
72,656	55	Woods, Good, HSG B
131,956	77	Woods, Good, HSG D
482	98	Paved parking, HSG D
24,002	80	>75% Grass cover, Good, HSG D
34,297	70	Woods, Good, HSG C
4,728	74	>75% Grass cover, Good, HSG C
286,240	70	Weighted Average
280,885		98.13% Pervious Area
5,355		1.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0625	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
8.4	794	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.3	844	Total			

Summary for Subcatchment P-2: Subcat P-2

Runoff = 0.85 cfs @ 12.19 hrs, Volume= 3,360 cf, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
6,580	74	>75% Grass cover, Good, HSG C
6,854	70	Woods, Good, HSG C
13,434	72	Weighted Average
13,434		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
0.5	31	0.0465	1.08		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
13.0	81	Total			

Summary for Subcatchment P-3A: Subcat P-3A

Runoff = 1.53 cfs @ 12.09 hrs, Volume= 4,913 cf, Depth= 4.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
5,462	98	Paved parking, HSG C
8,916	74	>75% Grass cover, Good, HSG C
14,378	83	Weighted Average
8,916		62.01% Pervious Area
5,462		37.99% Impervious Area

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

Summary for Subcatchment P-3B: Subcat P-3B

Runoff = 1.49 cfs @ 12.09 hrs, Volume= 4,757 cf, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
1,086	61	>75% Grass cover, Good, HSG B
4,612	98	Paved parking, HSG C
8,964	74	>75% Grass cover, Good, HSG C
14,663	81	Weighted Average
10,051		68.54% Pervious Area
4,612		31.46% Impervious Area

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

Summary for Subcatchment P-3c: Subcat P-3c

Runoff = 2.28 cfs @ 12.09 hrs, Volume= 7,275 cf, Depth= 4.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
7,221	98	Paved parking, HSG C
14,624	74	>75% Grass cover, Good, HSG C
21,845	82	Weighted Average
14,624		66.95% Pervious Area
7,221		33.05% Impervious Area

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

Summary for Subcatchment P-4a: Subcat P-4a

Runoff = 4.82 cfs @ 12.17 hrs, Volume= 18,586 cf, Depth= 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
7,742	98	Paved parking, HSG B
59,202	61	>75% Grass cover, Good, HSG B
23,518	55	Woods, Good, HSG B
343	98	Paved parking, HSG C
7,410	74	>75% Grass cover, Good, HSG C
16	70	Woods, Good, HSG C
98,231	64	Weighted Average
90,146		91.77% Pervious Area
8,085		8.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
2.8	300	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.5	350	Total			

Summary for Subcatchment P-4b: Subcat P-4b

Runoff = 1.87 cfs @ 12.13 hrs, Volume= 6,577 cf, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
596	61	>75% Grass cover, Good, HSG B
1,158	55	Woods, Good, HSG B
18,108	74	>75% Grass cover, Good, HSG C
6,433	70	Woods, Good, HSG C
26,294	72	Weighted Average
26,294		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	30	0.0500	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
3.3	392	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.1	422	Total			

Summary for Subcatchment P-4c: Subcat P-4c

Runoff = 5.23 cfs @ 12.23 hrs, Volume= 22,276 cf, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
156	77	Woods, Good, HSG D
42,661	74	>75% Grass cover, Good, HSG C
0	98	Paved parking, HSG C
46,247	70	Woods, Good, HSG C
89,064	72	Weighted Average
89,064		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
3.7	365	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.2	415	Total			

Summary for Subcatchment P-5a: Subcat P-5a

Runoff = 2.63 cfs @ 12.09 hrs, Volume= 8,421 cf, Depth= 4.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
9,276	98	Paved parking, HSG C
15,367	74	>75% Grass cover, Good, HSG C
24,643	83	Weighted Average
15,367		62.36% Pervious Area
9,276		37.64% Impervious Area

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

Summary for Subcatchment P-5b: Subcat P-5b

Runoff = 3.26 cfs @ 12.09 hrs, Volume= 10,336 cf, Depth= 3.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
8,220	98	Paved parking, HSG C
24,503	74	>75% Grass cover, Good, HSG C
32,723	80	Weighted Average
24,503		74.88% Pervious Area
8,220		25.12% Impervious Area

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

Summary for Subcatchment P-5c: Subcat P-5c

Runoff = 3.23 cfs @ 12.09 hrs, Volume= 10,272 cf, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
8,906	98	Paved parking, HSG C
22,759	74	>75% Grass cover, Good, HSG C
31,664	81	Weighted Average
22,759		71.87% Pervious Area
8,906		28.13% Impervious Area

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

Summary for Subcatchment P-5d: Subcat P-5d

Runoff = 3.08 cfs @ 12.09 hrs, Volume= 9,736 cf, Depth= 3.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
22,327	74	>75% Grass cover, Good, HSG C
5,531	98	Paved parking, HSG C
5,640	70	Woods, Good, HSG C
33,498	77	Weighted Average
27,967		83.49% Pervious Area
5,531		16.51% Impervious Area

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

Summary for Subcatchment P-5e: Subcat P-5e

Runoff = 3.03 cfs @ 12.09 hrs, Volume= 9,558 cf, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
13,931	74	>75% Grass cover, Good, HSG C
5,320	98	Paved parking, HSG C
14,594	70	Woods, Good, HSG C
33,846	76	Weighted Average
28,525		84.28% Pervious Area
5,320		15.72% Impervious Area

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

Summary for Subcatchment P-5f: Subcat P-5f

Runoff = 2.50 cfs @ 12.09 hrs, Volume= 7,904 cf, Depth= 3.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
5,715	98	Paved parking, HSG C
10,921	74	>75% Grass cover, Good, HSG C
10,559	70	Woods, Good, HSG C
27,195	77	Weighted Average
21,480		78.99% Pervious Area
5,715		21.01% Impervious Area

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

Summary for Subcatchment P-6: Subcat P-6

Runoff = 4.41 cfs @ 12.09 hrs, Volume= 13,945 cf, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
45,537	74	>75% Grass cover, Good, HSG C
42	70	Woods, Good, HSG C
3,802	98	Paved parking, HSG C
49,382	76	Weighted Average
45,580		92.30% Pervious Area
3,802		7.70% Impervious Area

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

Summary for Subcatchment P-7: Subcat P-7

Runoff = 2.64 cfs @ 12.09 hrs, Volume= 8,334 cf, Depth= 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
24,388	74	>75% Grass cover, Good, HSG C
266	98	Paved parking, HSG C
7,640	70	Woods, Good, HSG C
32,294	73	Weighted Average
32,028		99.18% Pervious Area
266		0.82% Impervious Area

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

Summary for Reach 9001R: Routing sheet flow through a subcatchment

A subcatchment performs runoff calculations, including the associated Tc anc CN determinations. It does not have any facility for routing an inflow hydrograph from another source. However, a reach may be used to perform this type of specialized routing.

This reach demonstrates a procedure for performing a sheet-flow routing through a subcatchment area. In this case, the "reach" is defined as a wide channel with very low side slopes. The Manning's value of 0.15 is selected from the table of sheet flow roughness coefficients, which are much higher than normal Manning's values, in order to allow for the greater frictional losses of shallow flow. This value is comparable to the Manning's value for "very weedy reaches".

This example assumes that sheet flow occurs evenly over the entire 100' channel width, and that the flow depth is therefore very small. If the flow is concentrated or forms channels, the description and Manning's value must be adjusted accordingly.

Inflow Area = 98,231 sf, 8.23% Impervious, Inflow Depth = 2.27" for 25-year event
Inflow = 4.32 cfs @ 12.24 hrs, Volume= 18,586 cf
Outflow = 2.58 cfs @ 12.50 hrs, Volume= 18,586 cf, Atten= 40%, Lag= 15.9 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 0.43 fps, Min. Travel Time= 26.2 min
Avg. Velocity = 0.17 fps, Avg. Travel Time= 68.6 min

Peak Storage= 4,046 cf @ 12.50 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 1.00' Flow Area= 200.0 sf, Capacity= 463.86 cfs

100.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 100.0 '/' Top Width= 300.00'
Length= 680.0' Slope= 0.0941 '/'
Inlet Invert= 264.00', Outlet Invert= 200.00'

Summary for Reach 9002R: Routing sheet flow through a subcatchment

A subcatchment performs runoff calculations, including the associated Tc anc CN determinations. It does not have any facility for routing an inflow hydrograph from another source. However, a reach may be used to perform this type of specialized routing.

This reach demonstrates a procedure for performing a sheet-flow routing through a subcatchment area. In this case, the "reach" is defined as a wide channel with very low side slopes. The Manning's value of 0.15 is selected from the table of sheet flow roughness coefficients, which are much higher than normal Manning's values, in order to allow for the greater frictional losses of shallow flow. This value is comparable to the Manning's value for "very weedy reaches".

This example assumes that sheet flow occurs evenly over the entire 100' channel width, and that the flow depth is therefore very small.
If the flow is concentrated or forms channels, the description and Manning's value must be adjusted accordingly.

Inflow Area = 26,294 sf, 0.00% Impervious, Inflow Depth = 3.00" for 25-year event
Inflow = 1.87 cfs @ 12.13 hrs, Volume= 6,577 cf
Outflow = 1.27 cfs @ 12.26 hrs, Volume= 6,577 cf, Atten= 32%, Lag= 7.9 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 0.38 fps, Min. Travel Time= 15.3 min
Avg. Velocity = 0.18 fps, Avg. Travel Time= 31.8 min

Peak Storage= 1,160 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.03'
Bank-Full Depth= 1.00' Flow Area= 200.0 sf, Capacity= 569.83 cfs

100.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 100.0 '/' Top Width= 300.00'
Length= 345.0' Slope= 0.1420 '/'
Inlet Invert= 249.00', Outlet Invert= 200.00'

‡

Summary for Reach SP-1: SP-1

Inflow Area = 286,240 sf, 1.87% Impervious, Inflow Depth = 2.81" for 25-year event
Inflow = 15.64 cfs @ 12.23 hrs, Volume= 67,103 cf
Outflow = 15.64 cfs @ 12.23 hrs, Volume= 67,103 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Summary for Reach SP-2: SP-2

Inflow Area = 13,434 sf, 0.00% Impervious, Inflow Depth = 3.00" for 25-year event
Inflow = 0.85 cfs @ 12.19 hrs, Volume= 3,360 cf
Outflow = 0.85 cfs @ 12.19 hrs, Volume= 3,360 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Summary for Reach SP-3: SP-3

Inflow Area = 215,863 sf, 20.03% Impervious, Inflow Depth = 3.59" for 25-year event
Inflow = 9.44 cfs @ 12.29 hrs, Volume= 64,538 cf
Outflow = 9.44 cfs @ 12.29 hrs, Volume= 64,538 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Summary for Reach SP-4: SP-4

Inflow Area = 313,856 sf, 9.30% Impervious, Inflow Depth = 2.75" for 25-year event
Inflow = 11.71 cfs @ 12.28 hrs, Volume= 71,878 cf
Outflow = 11.71 cfs @ 12.28 hrs, Volume= 71,878 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

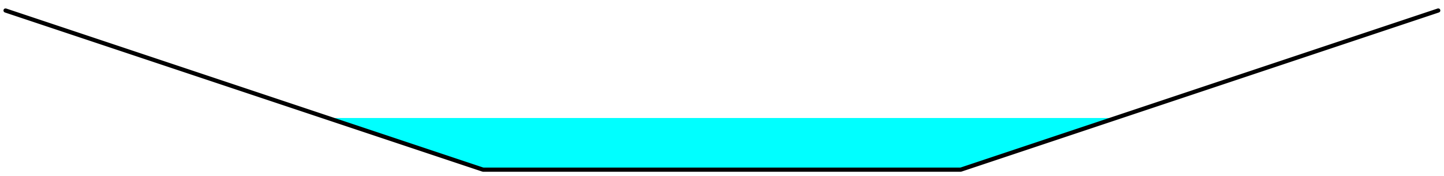
Summary for Reach SW1: Swale

Inflow Area = 98,231 sf, 8.23% Impervious, Inflow Depth = 2.27" for 25-year event
Inflow = 4.82 cfs @ 12.17 hrs, Volume= 18,586 cf
Outflow = 4.32 cfs @ 12.24 hrs, Volume= 18,586 cf, Atten= 10%, Lag= 4.1 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 0.84 fps, Min. Travel Time= 5.3 min
Avg. Velocity = 0.24 fps, Avg. Travel Time= 18.4 min

Peak Storage= 1,377 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.65'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 37.23 cfs

6.00' x 2.00' deep channel, n= 0.080 Earth, long dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 18.00'
Length= 267.0' Slope= 0.0050 '/'
Inlet Invert= 267.33', Outlet Invert= 266.00'



Summary for Pond CB10: CB

Inflow Area = 32,723 sf, 25.12% Impervious, Inflow Depth = 3.79" for 25-year event
Inflow = 3.26 cfs @ 12.09 hrs, Volume= 10,336 cf
Outflow = 3.26 cfs @ 12.09 hrs, Volume= 10,336 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.26 cfs @ 12.09 hrs, Volume= 10,336 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 235.89' @ 12.09 hrs
Flood Elev= 239.42'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.69'	**15.0" Round Culvert** L= 9.0' Ke= 0.500 Inlet / Outlet Invert= 234.69' / 234.60' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.21 cfs @ 12.09 hrs HW=235.87' TW=235.57' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 3.21 cfs @ 2.67 fps)

Summary for Pond CB12: CB

Inflow Area = 31,664 sf, 28.13% Impervious, Inflow Depth = 3.89" for 25-year event
Inflow = 3.23 cfs @ 12.09 hrs, Volume= 10,272 cf
Outflow = 3.23 cfs @ 12.09 hrs, Volume= 10,272 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.23 cfs @ 12.09 hrs, Volume= 10,272 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 230.34' @ 12.09 hrs
Flood Elev= 233.72'

Device	Routing	Invert	Outlet Devices
#1	Primary	229.29'	**15.0" Round Culvert** L= 19.0' Ke= 0.500 Inlet / Outlet Invert= 229.29' / 229.10' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.16 cfs @ 12.09 hrs HW=230.33' TW=228.56' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 3.16 cfs @ 3.93 fps)

Summary for Pond CB14: CB

Inflow Area = 33,498 sf, 16.51% Impervious, Inflow Depth = 3.49" for 25-year event
Inflow = 3.08 cfs @ 12.09 hrs, Volume= 9,736 cf
Outflow = 3.08 cfs @ 12.09 hrs, Volume= 9,736 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.08 cfs @ 12.09 hrs, Volume= 9,736 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 224.88' @ 12.09 hrs
Flood Elev= 227.69'

Device	Routing	Invert	Outlet Devices
#1	Primary	223.98'	**15.0" Round Culvert** L= 21.0' Ke= 0.500 Inlet / Outlet Invert= 223.98' / 223.35' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.02 cfs @ 12.09 hrs HW=224.87' TW=221.12' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 3.02 cfs @ 3.22 fps)

Summary for Pond CB16: CB

Inflow Area = 33,846 sf, 15.72% Impervious, Inflow Depth = 3.39" for 25-year event
Inflow = 3.03 cfs @ 12.09 hrs, Volume= 9,558 cf
Outflow = 3.03 cfs @ 12.09 hrs, Volume= 9,558 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.03 cfs @ 12.09 hrs, Volume= 9,558 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 218.30' @ 12.09 hrs
Flood Elev= 220.61'

Device	Routing	Invert	Outlet Devices
#1	Primary	217.40'	**15.0" Round Culvert** L= 15.0' Ke= 0.500 Inlet / Outlet Invert= 217.40' / 217.06' S= 0.0227 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.97 cfs @ 12.09 hrs HW=218.29' TW=213.17' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 2.97 cfs @ 4.45 fps)

Summary for Pond CB18: CB

Inflow Area = 27,195 sf, 21.01% Impervious, Inflow Depth = 3.49" for 25-year event
Inflow = 2.50 cfs @ 12.09 hrs, Volume= 7,904 cf
Outflow = 2.50 cfs @ 12.09 hrs, Volume= 7,904 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.50 cfs @ 12.09 hrs, Volume= 7,904 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 211.46' @ 12.09 hrs
Flood Elev= 213.83'

Device	Routing	Invert	Outlet Devices
#1	Primary	210.30'	**15.0" Round Culvert** L= 37.0' Ke= 0.500 Inlet / Outlet Invert= 210.30' / 209.93' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.47 cfs @ 12.09 hrs HW=211.42' TW=211.15' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 2.47 cfs @ 2.81 fps)

Summary for Pond CB2: CB

Inflow Area = 14,378 sf, 37.99% Impervious, Inflow Depth = 4.10" for 25-year event
Inflow = 1.53 cfs @ 12.09 hrs, Volume= 4,913 cf
Outflow = 1.53 cfs @ 12.09 hrs, Volume= 4,913 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.53 cfs @ 12.09 hrs, Volume= 4,913 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Peak Elev= 256.10' @ 12.09 hrs
Flood Elev= 258.73'

Device	Routing	Invert	Outlet Devices
#1	Primary	255.50'	**15.0" Round Culvert** L= 22.0' Ke= 0.500 Inlet / Outlet Invert= 255.50' / 255.10' S= 0.0182 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.50 cfs @ 12.09 hrs HW=256.09' TW=252.10' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.50 cfs @ 2.62 fps)

Summary for Pond CB4: CB

Inflow Area = 14,663 sf, 31.46% Impervious, Inflow Depth = 3.89" for 25-year event
Inflow = 1.49 cfs @ 12.09 hrs, Volume= 4,757 cf
Outflow = 1.49 cfs @ 12.09 hrs, Volume= 4,757 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.49 cfs @ 12.09 hrs, Volume= 4,757 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 258.05' @ 12.09 hrs
Flood Elev= 261.26'

Device	Routing	Invert	Outlet Devices
#1	Primary	257.46'	**15.0" Round Culvert** L= 22.0' Ke= 0.500 Inlet / Outlet Invert= 257.46' / 256.80' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.46 cfs @ 12.09 hrs HW=258.04' TW=252.42' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.46 cfs @ 2.60 fps)

Summary for Pond CB6: CB

Inflow Area = 21,845 sf, 33.05% Impervious, Inflow Depth = 4.00" for 25-year event
Inflow = 2.28 cfs @ 12.09 hrs, Volume= 7,275 cf
Outflow = 2.28 cfs @ 12.09 hrs, Volume= 7,275 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.28 cfs @ 12.09 hrs, Volume= 7,275 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 251.50' @ 12.09 hrs
Flood Elev= 254.22'

Device	Routing	Invert	Outlet Devices
#1	Primary	250.61'	**15.0" Round Culvert** L= 11.0' Ke= 0.500 Inlet / Outlet Invert= 250.61' / 250.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.23 cfs @ 12.09 hrs HW=251.48' TW=251.16' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 2.23 cfs @ 3.43 fps)

Summary for Pond CB8: CB

Inflow Area = 24,643 sf, 37.64% Impervious, Inflow Depth = 4.10" for 25-year event
Inflow = 2.63 cfs @ 12.09 hrs, Volume= 8,421 cf
Outflow = 2.63 cfs @ 12.09 hrs, Volume= 8,421 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.63 cfs @ 12.09 hrs, Volume= 8,421 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 244.27' @ 12.09 hrs
Flood Elev= 246.68'

Device	Routing	Invert	Outlet Devices
#1	Primary	243.40'	**15.0" Round Culvert** L= 17.0' Ke= 0.500 Inlet / Outlet Invert= 243.40' / 243.06' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.57 cfs @ 12.09 hrs HW=244.25' TW=243.77' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 2.57 cfs @ 4.07 fps)

Summary for Pond DB1: DB1

Groundwater must be verified with test pit

Inflow Area =	215,863 sf, 20.03% Impervious,	Inflow Depth = 3.59"	for 25-year event
Inflow =	20.36 cfs @ 12.09 hrs,	Volume=	64,561 cf
Outflow =	9.44 cfs @ 12.29 hrs,	Volume=	64,538 cf, Atten= 54%, Lag= 11.7 min
Primary =	9.44 cfs @ 12.29 hrs,	Volume=	64,538 cf
Secondary =	0.00 cfs @ 5.00 hrs,	Volume=	0 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 210.01' @ 12.29 hrs Surf.Area= 6,356 sf Storage= 15,101 cf
Flood Elev= 212.20' Surf.Area= 11,169 sf Storage= 32,544 cf

Plug-Flow detention time= 29.9 min calculated for 64,434 cf (100% of inflow)
Center-of-Mass det. time= 30.1 min (848.4 - 818.3)

Volume	Invert	Avail.Storage	Storage Description
#1	206.50'	32,544 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
206.50	2,580	292.7	0	0	2,580
208.00	3,931	343.8	4,848	4,848	5,212
210.00	6,340	407.4	10,175	15,023	9,087
212.00	9,234	471.0	15,484	30,507	13,619
212.20	11,169	496.1	2,037	32,544	15,553

Device	Routing	Invert	Outlet Devices
#1	Primary	204.75'	**15.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 204.75' / 204.50' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	206.50'	**6.0" Vert. Vertical Orifice X 2.00** C= 0.600
#3	Device 1	207.90'	**8.0" Vert. Vertical Orifice X 2.00** C= 0.600
#4	Device 1	209.90'	**48.0" Horiz. Horizonal Orifice** C= 0.600 Limited to weir flow at low heads
#5	Secondary	211.00'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=9.38 cfs @ 12.29 hrs HW=210.01' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 9.38 cfs of 12.45 cfs potential flow)
  ├─**2=Vertical Orifice** (Orifice Controls 3.41 cfs @ 8.69 fps)
  ├─**3=Vertical Orifice** (Orifice Controls 4.48 cfs @ 6.42 fps)
  └─**4=Horizonal Orifice** (Weir Controls 1.49 cfs @ 1.08 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=206.50' TW=0.00' (Dynamic Tailwater)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DB2: DB2

Soil type 307C (sandy loam) Rawls infiltration rate = 1.02 inches per hour
Groundwater elevation must be verified with test pit

Inflow Area =	100,268 sf, 21.04% Impervious,	Inflow Depth = 3.70"	for 25-year event
Inflow =	9.72 cfs @ 12.09 hrs,	Volume=	30,890 cf
Outflow =	3.90 cfs @ 12.34 hrs,	Volume=	30,733 cf, Atten= 60%, Lag= 14.6 min
Discarded =	0.20 cfs @ 12.34 hrs,	Volume=	6,282 cf
Primary =	3.70 cfs @ 12.34 hrs,	Volume=	24,451 cf
Secondary =	0.00 cfs @ 5.00 hrs,	Volume=	0 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 248.38' @ 12.34 hrs Surf.Area= 4,353 sf Storage= 9,139 cf
Flood Elev= 250.00' Surf.Area= 6,476 sf Storage= 17,872 cf

Plug-Flow detention time= 90.5 min calculated for 30,733 cf (99% of inflow)
Center-of-Mass det. time= 87.4 min (903.0 - 815.7)

Volume	Invert	Avail.Storage	Storage Description
#1	244.50'	17,872 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
244.50	762	148.0	0	0	762
245.00	1,072	161.0	456	456	1,091
246.00	1,868	209.0	1,452	1,908	2,516
247.00	2,807	247.0	2,322	4,230	3,914
248.00	3,902	286.0	3,340	7,569	5,589
249.00	5,141	321.0	4,507	12,076	7,307
250.00	6,476	346.0	5,796	17,872	8,675

Device	Routing	Invert	Outlet Devices
#1	Primary	239.55'	**12.0" Round Culvert** L= 95.0' Ke= 0.500 Inlet / Outlet Invert= 239.55' / 234.80' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	245.90'	**8.0" Vert. Vertical Orifice** C= 0.600
#3	Device 1	247.70'	**6.0" Vert. Vertical Orifice X 2.00** C= 0.600
#4	Device 1	248.60'	**24.0" x 24.0" Horiz. Horizontal Orifice** C= 0.600 Limited to weir flow at low heads
#5	Secondary	249.70'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#6	Discarded	244.50'	**1.020 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 240.00' Phase-In= 0.01'

Discarded OutFlow Max=0.20 cfs @ 12.34 hrs HW=248.38' (Free Discharge)
└─**6=Exfiltration** (Controls 0.20 cfs)

Primary OutFlow Max=3.70 cfs @ 12.34 hrs HW=248.38' TW=235.72' (Dynamic Tailwater)
└─**1=Culvert** (Passes 3.70 cfs of 10.56 cfs potential flow)
  ├─**2=Vertical Orifice** (Orifice Controls 2.46 cfs @ 7.05 fps)
  ├─**3=Vertical Orifice** (Orifice Controls 1.24 cfs @ 3.15 fps)
  └─**4=Horizontal Orifice** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=244.50' TW=223.98' (Dynamic Tailwater)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DMH1: DMH

Inflow Area = 14,378 sf, 37.99% Impervious, Inflow Depth = 4.10" for 25-year event
Inflow = 1.53 cfs @ 12.09 hrs, Volume= 4,913 cf
Outflow = 1.53 cfs @ 12.09 hrs, Volume= 4,913 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.53 cfs @ 12.09 hrs, Volume= 4,913 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 252.11' @ 12.09 hrs
Flood Elev= 258.52'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.51'	**15.0" Round Culvert** L= 64.0' Ke= 0.500 Inlet / Outlet Invert= 251.51' / 249.59' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.50 cfs @ 12.09 hrs HW=252.10' TW=249.98' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.50 cfs @ 2.62 fps)

Summary for Pond DMH10: DMH

Inflow Area = 156,374 sf, 23.82% Impervious, Inflow Depth = 3.71" for 25-year event
Inflow = 15.22 cfs @ 12.09 hrs, Volume= 48,323 cf
Outflow = 15.22 cfs @ 12.09 hrs, Volume= 48,323 cf, Atten= 0%, Lag= 0.0 min
Primary = 15.22 cfs @ 12.09 hrs, Volume= 48,323 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 213.20' @ 12.09 hrs
Flood Elev= 227.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	211.19'	**24.0" Round Culvert** L= 113.0' Ke= 0.500 Inlet / Outlet Invert= 211.19' / 208.93' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=14.97 cfs @ 12.09 hrs HW=213.16' TW=211.15' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 14.97 cfs @ 4.78 fps)

Summary for Pond DMH11: DMH

Inflow Area = 183,569 sf, 23.41% Impervious, Inflow Depth = 3.68" for 25-year event
Inflow = 17.72 cfs @ 12.09 hrs, Volume= 56,227 cf
Outflow = 17.72 cfs @ 12.09 hrs, Volume= 56,227 cf, Atten= 0%, Lag= 0.0 min
Primary = 17.72 cfs @ 12.09 hrs, Volume= 56,227 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 211.19' @ 12.09 hrs
Flood Elev= 215.34'

Device	Routing	Invert	Outlet Devices
#1	Primary	208.83'	**24.0" Round Culvert** L= 62.0' Ke= 0.500 Inlet / Outlet Invert= 208.83' / 208.00' S= 0.0134 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=17.37 cfs @ 12.09 hrs HW=211.15' TW=209.30' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 17.37 cfs @ 5.53 fps)

Summary for Pond DMH12: DMH

Inflow Area = 100,268 sf, 21.04% Impervious, Inflow Depth = 2.93" for 25-year event
Inflow = 3.70 cfs @ 12.34 hrs, Volume= 24,451 cf
Outflow = 3.70 cfs @ 12.34 hrs, Volume= 24,451 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.70 cfs @ 12.34 hrs, Volume= 24,451 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 235.72' @ 12.34 hrs
Flood Elev= 238.03'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.70'	**15.0" Round Culvert** L= 76.0' Ke= 0.500 Inlet / Outlet Invert= 234.70' / 230.60' S= 0.0539 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.70 cfs @ 12.34 hrs HW=235.72' TW=234.67' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 3.70 cfs @ 3.44 fps)

Summary for Pond DMH2: DMH

Inflow Area = 14,663 sf, 31.46% Impervious, Inflow Depth = 3.89" for 25-year event
Inflow = 1.49 cfs @ 12.09 hrs, Volume= 4,757 cf
Outflow = 1.49 cfs @ 12.09 hrs, Volume= 4,757 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.49 cfs @ 12.09 hrs, Volume= 4,757 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Peak Elev= 252.43' @ 12.09 hrs
Flood Elev= 260.66'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.84'	**15.0" Round Culvert** L= 75.0' Ke= 0.500 Inlet / Outlet Invert= 251.84' / 249.59' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.46 cfs @ 12.09 hrs HW=252.42' TW=249.98' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.46 cfs @ 2.60 fps)

Summary for Pond DMH3: DMH

Inflow Area = 21,845 sf, 33.05% Impervious, Inflow Depth = 4.00" for 25-year event
Inflow = 2.28 cfs @ 12.09 hrs, Volume= 7,275 cf
Outflow = 2.28 cfs @ 12.09 hrs, Volume= 7,275 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.28 cfs @ 12.09 hrs, Volume= 7,275 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 251.17' @ 12.09 hrs
Flood Elev= 254.76'

Device	Routing	Invert	Outlet Devices
#1	Primary	250.40'	**15.0" Round Culvert** L= 55.0' Ke= 0.500 Inlet / Outlet Invert= 250.40' / 249.85' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.23 cfs @ 12.09 hrs HW=251.16' TW=249.98' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 2.23 cfs @ 4.07 fps)

Summary for Pond DMH4: DMH

Inflow Area = 50,886 sf, 33.99% Impervious, Inflow Depth = 4.00" for 25-year event
Inflow = 5.31 cfs @ 12.09 hrs, Volume= 16,945 cf
Outflow = 5.31 cfs @ 12.09 hrs, Volume= 16,945 cf, Atten= 0%, Lag= 0.0 min
Primary = 5.31 cfs @ 12.09 hrs, Volume= 16,945 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 250.00' @ 12.09 hrs
Flood Elev= 257.23'

Device	Routing	Invert	Outlet Devices
#1	Primary	248.85'	**18.0" Round Culvert** L= 159.0' Ke= 0.500 Inlet / Outlet Invert= 248.85' / 246.00' S= 0.0179 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=5.19 cfs @ 12.09 hrs HW=249.98' TW=247.80' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 5.19 cfs @ 3.62 fps)

Summary for Pond DMH5: DMH

Inflow Area = 100,268 sf, 21.04% Impervious, Inflow Depth = 2.93" for 25-year event
Inflow = 3.70 cfs @ 12.34 hrs, Volume= 24,451 cf
Outflow = 3.70 cfs @ 12.34 hrs, Volume= 24,451 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.70 cfs @ 12.34 hrs, Volume= 24,451 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 234.67' @ 12.34 hrs
Flood Elev= 237.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	233.65'	**15.0" Round Culvert** L= 143.0' Ke= 0.500 Inlet / Outlet Invert= 233.65' / 229.00' S= 0.0325 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.70 cfs @ 12.34 hrs HW=234.67' TW=229.27' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 3.70 cfs @ 3.44 fps)

Summary for Pond DMH6: DMH

Inflow Area = 24,643 sf, 37.64% Impervious, Inflow Depth = 4.10" for 25-year event
Inflow = 2.63 cfs @ 12.09 hrs, Volume= 8,421 cf
Outflow = 2.63 cfs @ 12.09 hrs, Volume= 8,421 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.63 cfs @ 12.09 hrs, Volume= 8,421 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 243.78' @ 12.09 hrs
Flood Elev= 246.62'

Device	Routing	Invert	Outlet Devices
#1	Primary	242.96'	**15.0" Round Culvert** L= 146.0' Ke= 0.500 Inlet / Outlet Invert= 242.96' / 234.60' S= 0.0573 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.57 cfs @ 12.09 hrs HW=243.77' TW=235.56' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.57 cfs @ 3.06 fps)

Summary for Pond DMH7: DMH

Inflow Area = 57,366 sf, 30.50% Impervious, Inflow Depth = 3.92" for 25-year event
Inflow = 5.89 cfs @ 12.09 hrs, Volume= 18,757 cf
Outflow = 5.89 cfs @ 12.09 hrs, Volume= 18,757 cf, Atten= 0%, Lag= 0.0 min
Primary = 5.89 cfs @ 12.09 hrs, Volume= 18,757 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 235.58' @ 12.09 hrs
Flood Elev= 246.62'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.35'	**18.0" Round Culvert** L= 140.0' Ke= 0.500 Inlet / Outlet Invert= 234.35' / 228.85' S= 0.0393 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=5.76 cfs @ 12.09 hrs HW=235.57' TW=228.56' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 5.76 cfs @ 3.75 fps)

Summary for Pond DMH8: DMH

Inflow Area = 89,031 sf, 29.66% Impervious, Inflow Depth = 3.91" for 25-year event
Inflow = 9.11 cfs @ 12.09 hrs, Volume= 29,029 cf
Outflow = 9.11 cfs @ 12.09 hrs, Volume= 29,029 cf, Atten= 0%, Lag= 0.0 min
Primary = 9.11 cfs @ 12.09 hrs, Volume= 29,029 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 228.58' @ 12.09 hrs
Flood Elev= 233.28'

Device	Routing	Invert	Outlet Devices
#1	Primary	227.21'	**24.0" Round Culvert** L= 137.0' Ke= 0.500 Inlet / Outlet Invert= 227.21' / 223.10' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=8.92 cfs @ 12.09 hrs HW=228.56' TW=221.12' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 8.92 cfs @ 3.95 fps)

Summary for Pond DMH9: DMH

```
Inflow Area =        122,529 sf,  26.06% Impervious,  Inflow Depth =   3.80"    for  25-year event
Inflow      =       12.19 cfs @   12.09 hrs,  Volume=           38,765 cf
Outflow     =       12.19 cfs @   12.09 hrs,  Volume=           38,765 cf,  Atten= 0%,  Lag= 0.0 min
Primary     =       12.19 cfs @   12.09 hrs,  Volume=           38,765 cf
```

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 221.15' @ 12.09 hrs
Flood Elev= 227.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	219.49'	**24.0" Round Culvert** L= 147.0' Ke= 0.500 Inlet / Outlet Invert= 219.49' / 216.55' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=11.94 cfs @ 12.09 hrs HW=221.12' TW=213.16' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 11.94 cfs @ 4.35 fps)

Summary for Pond G: gabion

```
Inflow Area =        100,268 sf,  21.04% Impervious,  Inflow Depth =   2.93"    for  25-year event
Inflow      =        3.70 cfs @   12.34 hrs,  Volume=           24,451 cf
Outflow     =        3.71 cfs @   12.32 hrs,  Volume=           24,451 cf,  Atten= 0%,  Lag= 0.0 min
Discarded   =        0.00 cfs @   12.32 hrs,  Volume=               12 cf
Primary     =        3.71 cfs @   12.32 hrs,  Volume=           24,439 cf
```

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 229.27' @ 12.32 hrs Surf.Area= 31 sf Storage= 6 cf
Flood Elev= 230.25' Surf.Area= 0 sf Storage= 37 cf

Plug-Flow detention time= 0.0 min calculated for 24,412 cf (100% of inflow)
Center-of-Mass det. time= 0.0 min (832.3 - 832.3)

Volume	Invert	Avail.Storage	Storage Description
#1	229.00'	37 cf	**15.0" Round Pipe Storage** L= 30.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	229.63'	**3.0" Vert. outlet holes X 30.00** C= 0.600
#2	Primary	229.00'	**3.0" Horiz. outlet holes X 30.00** C= 0.600 Limited to weir flow at low heads
#3	Discarded	229.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.00 cfs @ 12.32 hrs HW=229.27' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=3.70 cfs @ 12.32 hrs HW=229.27' TW=0.00' (Dynamic Tailwater)
├**1=outlet holes** (Controls 0.00 cfs)
└**2=outlet holes** (Orifice Controls 3.70 cfs @ 2.51 fps)

Summary for Link 1L: (new Link)

```
Inflow Area =        124,524 sf,   6.49% Impervious,  Inflow Depth =   2.42"    for  25-year event
Inflow      =        3.58 cfs @   12.44 hrs,  Volume=           25,163 cf
Primary     =        3.58 cfs @   12.44 hrs,  Volume=           25,163 cf,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs

Time span=5.00-36.00 hrs, dt=0.05 hrs, 621 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P-1: Subcat P-1 Runoff Area=286,240 sf 1.87% Impervious Runoff Depth=4.92"
Flow Length=844' Tc=16.3 min CN=70 Runoff=27.71 cfs 117,431 cf

Subcatchment P-2: Subcat P-2 Runoff Area=13,434 sf 0.00% Impervious Runoff Depth=5.16"
Flow Length=81' Tc=13.0 min CN=72 Runoff=1.47 cfs 5,779 cf

Subcatchment P-3A: Subcat P-3A Runoff Area=14,378 sf 37.99% Impervious Runoff Depth>6.48"
Tc=6.0 min CN=83 Runoff=2.38 cfs 7,768 cf

Subcatchment P-3B: Subcat P-3B Runoff Area=14,663 sf 31.46% Impervious Runoff Depth>6.24"
Tc=6.0 min CN=81 Runoff=2.36 cfs 7,630 cf

Subcatchment P-3c: Subcat P-3c Runoff Area=21,845 sf 33.05% Impervious Runoff Depth>6.36"
Tc=6.0 min CN=82 Runoff=3.56 cfs 11,585 cf

Subcatchment P-4a: Subcat P-4a Runoff Area=98,231 sf 8.23% Impervious Runoff Depth=4.21"
Flow Length=350' Tc=11.5 min CN=64 Runoff=9.19 cfs 34,449 cf

Subcatchment P-4b: Subcat P-4b Runoff Area=26,294 sf 0.00% Impervious Runoff Depth=5.16"
Flow Length=422' Tc=9.1 min CN=72 Runoff=3.22 cfs 11,312 cf

Subcatchment P-4c: Subcat P-4c Runoff Area=89,064 sf 0.00% Impervious Runoff Depth=5.16"
Flow Length=415' Tc=16.2 min CN=72 Runoff=9.06 cfs 38,316 cf

Subcatchment P-5a: Subcat P-5a Runoff Area=24,643 sf 37.64% Impervious Runoff Depth>6.48"
Tc=6.0 min CN=83 Runoff=4.08 cfs 13,314 cf

Subcatchment P-5b: Subcat P-5b Runoff Area=32,723 sf 25.12% Impervious Runoff Depth=6.12"
Tc=6.0 min CN=80 Runoff=5.17 cfs 16,698 cf

Subcatchment P-5c: Subcat P-5c Runoff Area=31,664 sf 28.13% Impervious Runoff Depth>6.24"
Tc=6.0 min CN=81 Runoff=5.09 cfs 16,476 cf

Subcatchment P-5d: Subcat P-5d Runoff Area=33,498 sf 16.51% Impervious Runoff Depth=5.76"
Tc=6.0 min CN=77 Runoff=5.03 cfs 16,086 cf

Subcatchment P-5e: Subcat P-5e Runoff Area=33,846 sf 15.72% Impervious Runoff Depth=5.64"
Tc=6.0 min CN=76 Runoff=4.99 cfs 15,915 cf

Subcatchment P-5f: Subcat P-5f Runoff Area=27,195 sf 21.01% Impervious Runoff Depth=5.76"
Tc=6.0 min CN=77 Runoff=4.08 cfs 13,059 cf

Subcatchment P-6: Subcat P-6 Runoff Area=49,382 sf 7.70% Impervious Runoff Depth=5.64"
Tc=6.0 min CN=76 Runoff=7.28 cfs 23,220 cf

Subcatchment P-7: Subcat P-7 Runoff Area=32,294 sf 0.82% Impervious Runoff Depth=5.28"
Tc=6.0 min CN=73 Runoff=4.48 cfs 14,216 cf

Reach 9001R: Routing sheet flow through a subcatchment Avg. Flow Depth=0.09' Max Vel=0.58 fps Inflow=8.49 cfs 34,449 cf
n=0.150 L=680.0' S=0.0941 '/' Capacity=463.86 cfs Outflow=5.73 cfs 34,448 cf

Reach 9002R: Routing sheet flow through a subcatchment Avg. Flow Depth=0.05' Max Vel=0.48 fps Inflow=3.22 cfs 11,312 cf
n=0.150 L=345.0' S=0.1420 '/' Capacity=569.83 cfs Outflow=2.39 cfs 11,312 cf

Reach SP-1: SP-1 Inflow=27.71 cfs 117,431 cf
Outflow=27.71 cfs 117,431 cf

Reach SP-2: SP-2 Inflow=1.47 cfs 5,779 cf
Outflow=1.47 cfs 5,779 cf

Reach SP-3: SP-3 Inflow=16.07 cfs 105,740 cf
Outflow=16.07 cfs 105,740 cf

Reach SP-4: SP-4
Inflow=24.94 cfs 126,959 cf
Outflow=24.94 cfs 126,959 cf

Reach SW1: Swale
Avg. Flow Depth=0.94' Max Vel=1.02 fps Inflow=9.19 cfs 34,449 cf
n=0.080 L=267.0' S=0.0050 '/' Capacity=37.23 cfs Outflow=8.49 cfs 34,449 cf

Pond CB10: CB
Peak Elev=237.04' Inflow=5.17 cfs 16,698 cf
15.0" Round Culvert n=0.013 L=9.0' S=0.0100 '/' Outflow=5.17 cfs 16,698 cf

Pond CB12: CB
Peak Elev=230.77' Inflow=5.09 cfs 16,476 cf
15.0" Round Culvert n=0.013 L=19.0' S=0.0100 '/' Outflow=5.09 cfs 16,476 cf

Pond CB14: CB
Peak Elev=225.33' Inflow=5.03 cfs 16,086 cf
15.0" Round Culvert n=0.013 L=21.0' S=0.0300 '/' Outflow=5.03 cfs 16,086 cf

Pond CB16: CB
Peak Elev=218.74' Inflow=4.99 cfs 15,915 cf
15.0" Round Culvert n=0.013 L=15.0' S=0.0227 '/' Outflow=4.99 cfs 15,915 cf

Pond CB18: CB
Peak Elev=213.98' Inflow=4.08 cfs 13,059 cf
15.0" Round Culvert n=0.013 L=37.0' S=0.0100 '/' Outflow=4.08 cfs 13,059 cf

Pond CB2: CB
Peak Elev=256.27' Inflow=2.38 cfs 7,768 cf
15.0" Round Culvert n=0.013 L=22.0' S=0.0182 '/' Outflow=2.38 cfs 7,768 cf

Pond CB4: CB
Peak Elev=258.23' Inflow=2.36 cfs 7,630 cf
15.0" Round Culvert n=0.013 L=22.0' S=0.0300 '/' Outflow=2.36 cfs 7,630 cf

Pond CB6: CB
Peak Elev=251.81' Inflow=3.56 cfs 11,585 cf
15.0" Round Culvert n=0.013 L=11.0' S=0.0100 '/' Outflow=3.56 cfs 11,585 cf

Pond CB8: CB
Peak Elev=244.59' Inflow=4.08 cfs 13,314 cf
15.0" Round Culvert n=0.013 L=17.0' S=0.0200 '/' Outflow=4.08 cfs 13,314 cf

Pond DB1: DB1
Peak Elev=211.19' Storage=23,530 cf Inflow=32.92 cfs 105,764 cf
Primary=14.07 cfs 104,625 cf Secondary=2.00 cfs 1,115 cf Outflow=16.07 cfs 105,740 cf

Pond DB2: DB2
Peak Elev=249.00' Storage=12,081 cf Inflow=15.57 cfs 50,202 cf
Discarded=0.24 cfs 7,128 cf Primary=9.93 cfs 42,900 cf Secondary=0.00 cfs 0 cf Outflow=10.17 cfs 50,028 cf

Pond DMH1: DMH
Peak Elev=252.28' Inflow=2.38 cfs 7,768 cf
15.0" Round Culvert n=0.013 L=64.0' S=0.0300 '/' Outflow=2.38 cfs 7,768 cf

Pond DMH10: DMH
Peak Elev=216.20' Inflow=24.36 cfs 78,489 cf
24.0" Round Culvert n=0.013 L=113.0' S=0.0200 '/' Outflow=24.36 cfs 78,489 cf

Pond DMH11: DMH
Peak Elev=214.05' Inflow=28.44 cfs 91,548 cf
24.0" Round Culvert n=0.013 L=62.0' S=0.0134 '/' Outflow=28.44 cfs 91,548 cf

Pond DMH12: DMH
Peak Elev=240.51' Inflow=9.93 cfs 42,900 cf
15.0" Round Culvert n=0.013 L=76.0' S=0.0539 '/' Outflow=9.93 cfs 42,900 cf

Pond DMH2: DMH
Peak Elev=252.61' Inflow=2.36 cfs 7,630 cf
15.0" Round Culvert n=0.013 L=75.0' S=0.0300 '/' Outflow=2.36 cfs 7,630 cf

Pond DMH3: DMH
Peak Elev=251.43' Inflow=3.56 cfs 11,585 cf
15.0" Round Culvert n=0.013 L=55.0' S=0.0100 '/' Outflow=3.56 cfs 11,585 cf

Pond DMH4: DMH
Peak Elev=250.54' Inflow=8.30 cfs 26,982 cf
18.0" Round Culvert n=0.013 L=159.0' S=0.0179 '/' Outflow=8.30 cfs 26,982 cf

Pond DMH5: DMH
Peak Elev=237.04' Inflow=9.93 cfs 42,900 cf
15.0" Round Culvert n=0.013 L=143.0' S=0.0325 '/' Outflow=9.93 cfs 42,900 cf

Pond DMH6: DMH
Peak Elev=244.06' Inflow=4.08 cfs 13,314 cf
15.0" Round Culvert n=0.013 L=146.0' S=0.0573 '/' Outflow=4.08 cfs 13,314 cf

Pond DMH7: DMH Peak Elev=236.28' Inflow=9.25 cfs 30,012 cf
18.0" Round Culvert n=0.013 L=140.0' S=0.0393 '/' Outflow=9.25 cfs 30,012 cf

Pond DMH8: DMH Peak Elev=229.09' Inflow=14.34 cfs 46,488 cf
24.0" Round Culvert n=0.013 L=137.0' S=0.0300 '/' Outflow=14.34 cfs 46,488 cf

Pond DMH9: DMH Peak Elev=222.13' Inflow=19.37 cfs 62,574 cf
24.0" Round Culvert n=0.013 L=147.0' S=0.0200 '/' Outflow=19.37 cfs 62,574 cf

Pond G: gabion Peak Elev=229.94' Storage=30 cf Inflow=9.93 cfs 42,900 cf
Discarded=0.00 cfs 17 cf Primary=9.94 cfs 42,883 cf Outflow=9.94 cfs 42,900 cf

Link 1L: (new Link) Inflow=7.69 cfs 45,760 cf
Primary=7.69 cfs 45,760 cf

Total Runoff Area = 829,394 sf Runoff Volume = 363,253 cf Average Runoff Depth = 5.26"
90.62% Pervious = 751,622 sf 9.38% Impervious = 77,772 sf

Summary for Subcatchment P-1: Subcat P-1

Runoff = 27.71 cfs @ 12.22 hrs, Volume= 117,431 cf, Depth= 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
4,874	98	Paved parking, HSG B
13,247	61	>75% Grass cover, Good, HSG B
72,656	55	Woods, Good, HSG B
131,956	77	Woods, Good, HSG D
482	98	Paved parking, HSG D
24,002	80	>75% Grass cover, Good, HSG D
34,297	70	Woods, Good, HSG C
4,728	74	>75% Grass cover, Good, HSG C
286,240	70	Weighted Average
280,885		98.13% Pervious Area
5,355		1.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0625	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
8.4	794	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.3	844	Total			

Summary for Subcatchment P-2: Subcat P-2

Runoff = 1.47 cfs @ 12.18 hrs, Volume= 5,779 cf, Depth= 5.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
6,580	74	>75% Grass cover, Good, HSG C
6,854	70	Woods, Good, HSG C
13,434	72	Weighted Average
13,434		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
0.5	31	0.0465	1.08		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
13.0	81	Total			

Summary for Subcatchment P-3A: Subcat P-3A

Runoff = 2.38 cfs @ 12.09 hrs, Volume= 7,768 cf, Depth> 6.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
5,462	98	Paved parking, HSG C
8,916	74	>75% Grass cover, Good, HSG C
14,378	83	Weighted Average
8,916		62.01% Pervious Area
5,462		37.99% Impervious Area

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

Summary for Subcatchment P-3B: Subcat P-3B

Runoff = 2.36 cfs @ 12.09 hrs, Volume= 7,630 cf, Depth> 6.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
1,086	61	>75% Grass cover, Good, HSG B
4,612	98	Paved parking, HSG C
8,964	74	>75% Grass cover, Good, HSG C
14,663	81	Weighted Average
10,051		68.54% Pervious Area
4,612		31.46% Impervious Area

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

Summary for Subcatchment P-3c: Subcat P-3c

Runoff = 3.56 cfs @ 12.09 hrs, Volume= 11,585 cf, Depth> 6.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
7,221	98	Paved parking, HSG C
14,624	74	>75% Grass cover, Good, HSG C
21,845	82	Weighted Average
14,624		66.95% Pervious Area
7,221		33.05% Impervious Area

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

Summary for Subcatchment P-4a: Subcat P-4a

Runoff = 9.19 cfs @ 12.16 hrs, Volume= 34,449 cf, Depth= 4.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
7,742	98	Paved parking, HSG B
59,202	61	>75% Grass cover, Good, HSG B
23,518	55	Woods, Good, HSG B
343	98	Paved parking, HSG C
7,410	74	>75% Grass cover, Good, HSG C
16	70	Woods, Good, HSG C
98,231	64	Weighted Average
90,146		91.77% Pervious Area
8,085		8.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
2.8	300	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.5	350	Total			

Summary for Subcatchment P-4b: Subcat P-4b

Runoff = 3.22 cfs @ 12.13 hrs, Volume= 11,312 cf, Depth= 5.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
596	61	>75% Grass cover, Good, HSG B
1,158	55	Woods, Good, HSG B
18,108	74	>75% Grass cover, Good, HSG C
6,433	70	Woods, Good, HSG C
26,294	72	Weighted Average
26,294		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	30	0.0500	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
3.3	392	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.1	422	Total			

Summary for Subcatchment P-4c: Subcat P-4c

Runoff = 9.06 cfs @ 12.22 hrs, Volume= 38,316 cf, Depth= 5.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
156	77	Woods, Good, HSG D
42,661	74	>75% Grass cover, Good, HSG C
0	98	Paved parking, HSG C
46,247	70	Woods, Good, HSG C
89,064	72	Weighted Average
89,064		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
3.7	365	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.2	415	Total			

Summary for Subcatchment P-5a: Subcat P-5a

Runoff = 4.08 cfs @ 12.09 hrs, Volume= 13,314 cf, Depth> 6.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
9,276	98	Paved parking, HSG C
15,367	74	>75% Grass cover, Good, HSG C
24,643	83	Weighted Average
15,367		62.36% Pervious Area
9,276		37.64% Impervious Area

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

Summary for Subcatchment P-5b: Subcat P-5b

Runoff = 5.17 cfs @ 12.09 hrs, Volume= 16,698 cf, Depth= 6.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
8,220	98	Paved parking, HSG C
24,503	74	>75% Grass cover, Good, HSG C
32,723	80	Weighted Average
24,503		74.88% Pervious Area
8,220		25.12% Impervious Area

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

Summary for Subcatchment P-5c: Subcat P-5c

Runoff = 5.09 cfs @ 12.09 hrs, Volume= 16,476 cf, Depth> 6.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
8,906	98	Paved parking, HSG C
22,759	74	>75% Grass cover, Good, HSG C
31,664	81	Weighted Average
22,759		71.87% Pervious Area
8,906		28.13% Impervious Area

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

Summary for Subcatchment P-5d: Subcat P-5d

Runoff = 5.03 cfs @ 12.09 hrs, Volume= 16,086 cf, Depth= 5.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
22,327	74	>75% Grass cover, Good, HSG C
5,531	98	Paved parking, HSG C
5,640	70	Woods, Good, HSG C
33,498	77	Weighted Average
27,967		83.49% Pervious Area
5,531		16.51% Impervious Area

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

Summary for Subcatchment P-5e: Subcat P-5e

Runoff = 4.99 cfs @ 12.09 hrs, Volume= 15,915 cf, Depth= 5.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
13,931	74	>75% Grass cover, Good, HSG C
5,320	98	Paved parking, HSG C
14,594	70	Woods, Good, HSG C
33,846	76	Weighted Average
28,525		84.28% Pervious Area
5,320		15.72% Impervious Area

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

Summary for Subcatchment P-5f: Subcat P-5f

Runoff = 4.08 cfs @ 12.09 hrs, Volume= 13,059 cf, Depth= 5.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
5,715	98	Paved parking, HSG C
10,921	74	>75% Grass cover, Good, HSG C
10,559	70	Woods, Good, HSG C
27,195	77	Weighted Average
21,480		78.99% Pervious Area
5,715		21.01% Impervious Area

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

Summary for Subcatchment P-6: Subcat P-6

Runoff = 7.28 cfs @ 12.09 hrs, Volume= 23,220 cf, Depth= 5.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
45,537	74	>75% Grass cover, Good, HSG C
42	70	Woods, Good, HSG C
3,802	98	Paved parking, HSG C
49,382	76	Weighted Average
45,580		92.30% Pervious Area
3,802		7.70% Impervious Area

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

Summary for Subcatchment P-7: Subcat P-7

Runoff = 4.48 cfs @ 12.09 hrs, Volume= 14,216 cf, Depth= 5.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
24,388	74	>75% Grass cover, Good, HSG C
266	98	Paved parking, HSG C
7,640	70	Woods, Good, HSG C
32,294	73	Weighted Average
32,028		99.18% Pervious Area
266		0.82% Impervious Area

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

Summary for Reach 9001R: Routing sheet flow through a subcatchment

A subcatchment performs runoff calculations, including the associated Tc anc CN determinations. It does not have any facility for routing an inflow hydrograph from another source. However, a reach may be used to perform this type of specialized routing.

This reach demonstrates a procedure for performing a sheet-flow routing through a subcatchment area. In this case, the "reach" is defined as a wide channel with very low side slopes. The Manning's value of 0.15 is selected from the table of sheet flow roughness coefficients, which are much higher than normal Manning's values, in order to allow for the greater frictional losses of shallow flow. This value is comparable to the Manning's value for "very weedy reaches".

This example assumes that sheet flow occurs evenly over the entire 100' channel width, and that the flow depth is therefore very small. If the flow is concentrated or forms channels, the description and Manning's value must be adjusted accordingly.

Inflow Area = 98,231 sf, 8.23% Impervious, Inflow Depth = 4.21" for 100-year event
Inflow = 8.49 cfs @ 12.22 hrs, Volume= 34,449 cf
Outflow = 5.73 cfs @ 12.41 hrs, Volume= 34,448 cf, Atten= 33%, Lag= 11.4 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 0.58 fps, Min. Travel Time= 19.5 min
Avg. Velocity = 0.18 fps, Avg. Travel Time= 61.6 min

Peak Storage= 6,706 cf @ 12.41 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 1.00' Flow Area= 200.0 sf, Capacity= 463.86 cfs

100.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 100.0 '/' Top Width= 300.00'
Length= 680.0' Slope= 0.0941 '/'
Inlet Invert= 264.00', Outlet Invert= 200.00'

Summary for Reach 9002R: Routing sheet flow through a subcatchment

A subcatchment performs runoff calculations, including the associated Tc anc CN determinations. It does not have any facility for routing an inflow hydrograph from another source. However, a reach may be used to perform this type of specialized routing.

This reach demonstrates a procedure for performing a sheet-flow routing through a subcatchment area. In this case, the "reach" is defined as a wide channel with very low side slopes. The Manning's value of 0.15 is selected from the table of sheet flow roughness coefficients, which are much higher than normal Manning's values, in order to allow for the greater frictional losses of shallow flow. This value is comparable to the Manning's value for "very weedy reaches".

This example assumes that sheet flow occurs evenly over the entire 100' channel width, and that the flow depth is therefore very small.
If the flow is concentrated or forms channels, the description and Manning's value must be adjusted accordingly.

Inflow Area = 26,294 sf, 0.00% Impervious, Inflow Depth = 5.16" for 100-year event
Inflow = 3.22 cfs @ 12.13 hrs, Volume= 11,312 cf
Outflow = 2.39 cfs @ 12.23 hrs, Volume= 11,312 cf, Atten= 26%, Lag= 6.1 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 0.48 fps, Min. Travel Time= 12.0 min
Avg. Velocity = 0.19 fps, Avg. Travel Time= 30.7 min

Peak Storage= 1,724 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 1.00' Flow Area= 200.0 sf, Capacity= 569.83 cfs

100.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 100.0 '/' Top Width= 300.00'
Length= 345.0' Slope= 0.1420 '/'
Inlet Invert= 249.00', Outlet Invert= 200.00'

‡

Summary for Reach SP-1: SP-1

Inflow Area = 286,240 sf, 1.87% Impervious, Inflow Depth = 4.92" for 100-year event
Inflow = 27.71 cfs @ 12.22 hrs, Volume= 117,431 cf
Outflow = 27.71 cfs @ 12.22 hrs, Volume= 117,431 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Summary for Reach SP-2: SP-2

Inflow Area = 13,434 sf, 0.00% Impervious, Inflow Depth = 5.16" for 100-year event
Inflow = 1.47 cfs @ 12.18 hrs, Volume= 5,779 cf
Outflow = 1.47 cfs @ 12.18 hrs, Volume= 5,779 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Summary for Reach SP-3: SP-3

Inflow Area = 215,863 sf, 20.03% Impervious, Inflow Depth = 5.88" for 100-year event
Inflow = 16.07 cfs @ 12.26 hrs, Volume= 105,740 cf
Outflow = 16.07 cfs @ 12.26 hrs, Volume= 105,740 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Summary for Reach SP-4: SP-4

Inflow Area = 313,856 sf, 9.30% Impervious, Inflow Depth = 4.85" for 100-year event
Inflow = 24.94 cfs @ 12.25 hrs, Volume= 126,959 cf
Outflow = 24.94 cfs @ 12.25 hrs, Volume= 126,959 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

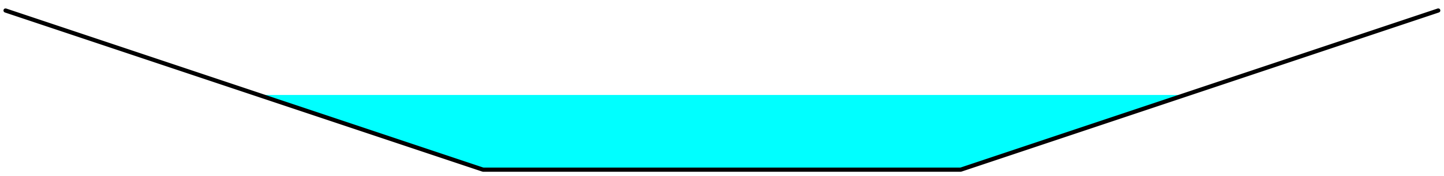
Summary for Reach SW1: Swale

Inflow Area = 98,231 sf, 8.23% Impervious, Inflow Depth = 4.21" for 100-year event
Inflow = 9.19 cfs @ 12.16 hrs, Volume= 34,449 cf
Outflow = 8.49 cfs @ 12.22 hrs, Volume= 34,449 cf, Atten= 8%, Lag= 3.2 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 1.02 fps, Min. Travel Time= 4.3 min
Avg. Velocity = 0.29 fps, Avg. Travel Time= 15.6 min

Peak Storage= 2,208 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.94'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 37.23 cfs

6.00' x 2.00' deep channel, n= 0.080 Earth, long dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 18.00'
Length= 267.0' Slope= 0.0050 '/'
Inlet Invert= 267.33', Outlet Invert= 266.00'



Summary for Pond CB10: CB

Inflow Area = 32,723 sf, 25.12% Impervious, Inflow Depth = 6.12" for 100-year event
Inflow = 5.17 cfs @ 12.09 hrs, Volume= 16,698 cf
Outflow = 5.17 cfs @ 12.09 hrs, Volume= 16,698 cf, Atten= 0%, Lag= 0.0 min
Primary = 5.17 cfs @ 12.09 hrs, Volume= 16,698 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 237.04' @ 12.09 hrs
Flood Elev= 239.42'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.69'	**15.0" Round Culvert** L= 9.0' Ke= 0.500 Inlet / Outlet Invert= 234.69' / 234.60' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=5.06 cfs @ 12.09 hrs HW=236.96' TW=236.23' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 5.06 cfs @ 4.12 fps)

Summary for Pond CB12: CB

Inflow Area = 31,664 sf, 28.13% Impervious, Inflow Depth > 6.24" for 100-year event
Inflow = 5.09 cfs @ 12.09 hrs, Volume= 16,476 cf
Outflow = 5.09 cfs @ 12.09 hrs, Volume= 16,476 cf, Atten= 0%, Lag= 0.0 min
Primary = 5.09 cfs @ 12.09 hrs, Volume= 16,476 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 230.77' @ 12.09 hrs
Flood Elev= 233.72'

Device	Routing	Invert	Outlet Devices
#1	Primary	229.29'	**15.0" Round Culvert** L= 19.0' Ke= 0.500 Inlet / Outlet Invert= 229.29' / 229.10' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=4.97 cfs @ 12.09 hrs HW=230.74' TW=229.06' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 4.97 cfs @ 4.39 fps)

Summary for Pond CB14: CB

Inflow Area = 33,498 sf, 16.51% Impervious, Inflow Depth = 5.76" for 100-year event
Inflow = 5.03 cfs @ 12.09 hrs, Volume= 16,086 cf
Outflow = 5.03 cfs @ 12.09 hrs, Volume= 16,086 cf, Atten= 0%, Lag= 0.0 min
Primary = 5.03 cfs @ 12.09 hrs, Volume= 16,086 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 225.33' @ 12.09 hrs
Flood Elev= 227.69'

Device	Routing	Invert	Outlet Devices
#1	Primary	223.98'	**15.0" Round Culvert** L= 21.0' Ke= 0.500 Inlet / Outlet Invert= 223.98' / 223.35' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=4.92 cfs @ 12.09 hrs HW=225.30' TW=222.06' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 4.92 cfs @ 4.01 fps)

Summary for Pond CB16: CB

Inflow Area = 33,846 sf, 15.72% Impervious, Inflow Depth = 5.64" for 100-year event
Inflow = 4.99 cfs @ 12.09 hrs, Volume= 15,915 cf
Outflow = 4.99 cfs @ 12.09 hrs, Volume= 15,915 cf, Atten= 0%, Lag= 0.0 min
Primary = 4.99 cfs @ 12.09 hrs, Volume= 15,915 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 218.74' @ 12.09 hrs
Flood Elev= 220.61'

Device	Routing	Invert	Outlet Devices
#1	Primary	217.40'	**15.0" Round Culvert** L= 15.0' Ke= 0.500 Inlet / Outlet Invert= 217.40' / 217.06' S= 0.0227 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=4.88 cfs @ 12.09 hrs HW=218.71' TW=215.97' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 4.88 cfs @ 3.97 fps)

Summary for Pond CB18: CB

Inflow Area = 27,195 sf, 21.01% Impervious, Inflow Depth = 5.76" for 100-year event
Inflow = 4.08 cfs @ 12.09 hrs, Volume= 13,059 cf
Outflow = 4.08 cfs @ 12.09 hrs, Volume= 13,059 cf, Atten= 0%, Lag= 0.0 min
Primary = 4.08 cfs @ 12.09 hrs, Volume= 13,059 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 213.98' @ 12.10 hrs
Flood Elev= 213.83'

Device	Routing	Invert	Outlet Devices
#1	Primary	210.30'	**15.0" Round Culvert** L= 37.0' Ke= 0.500 Inlet / Outlet Invert= 210.30' / 209.93' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=213.82' TW=213.83' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Summary for Pond CB2: CB

Inflow Area = 14,378 sf, 37.99% Impervious, Inflow Depth > 6.48" for 100-year event
Inflow = 2.38 cfs @ 12.09 hrs, Volume= 7,768 cf
Outflow = 2.38 cfs @ 12.09 hrs, Volume= 7,768 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.38 cfs @ 12.09 hrs, Volume= 7,768 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Peak Elev= 256.27' @ 12.09 hrs
Flood Elev= 258.73'

Device	Routing	Invert	Outlet Devices
#1	Primary	255.50'	**15.0" Round Culvert** L= 22.0' Ke= 0.500 Inlet / Outlet Invert= 255.50' / 255.10' S= 0.0182 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.32 cfs @ 12.09 hrs HW=256.26' TW=252.27' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.32 cfs @ 2.97 fps)

Summary for Pond CB4: CB

Inflow Area = 14,663 sf, 31.46% Impervious, Inflow Depth > 6.24" for 100-year event
Inflow = 2.36 cfs @ 12.09 hrs, Volume= 7,630 cf
Outflow = 2.36 cfs @ 12.09 hrs, Volume= 7,630 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.36 cfs @ 12.09 hrs, Volume= 7,630 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 258.23' @ 12.09 hrs
Flood Elev= 261.26'

Device	Routing	Invert	Outlet Devices
#1	Primary	257.46'	**15.0" Round Culvert** L= 22.0' Ke= 0.500 Inlet / Outlet Invert= 257.46' / 256.80' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.30 cfs @ 12.09 hrs HW=258.22' TW=252.60' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.30 cfs @ 2.96 fps)

Summary for Pond CB6: CB

Inflow Area = 21,845 sf, 33.05% Impervious, Inflow Depth > 6.36" for 100-year event
Inflow = 3.56 cfs @ 12.09 hrs, Volume= 11,585 cf
Outflow = 3.56 cfs @ 12.09 hrs, Volume= 11,585 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.56 cfs @ 12.09 hrs, Volume= 11,585 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 251.81' @ 12.09 hrs
Flood Elev= 254.22'

Device	Routing	Invert	Outlet Devices
#1	Primary	250.61'	**15.0" Round Culvert** L= 11.0' Ke= 0.500 Inlet / Outlet Invert= 250.61' / 250.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.48 cfs @ 12.09 hrs HW=251.79' TW=251.41' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 3.48 cfs @ 3.76 fps)

Summary for Pond CB8: CB

Inflow Area = 24,643 sf, 37.64% Impervious, Inflow Depth > 6.48" for 100-year event
Inflow = 4.08 cfs @ 12.09 hrs, Volume= 13,314 cf
Outflow = 4.08 cfs @ 12.09 hrs, Volume= 13,314 cf, Atten= 0%, Lag= 0.0 min
Primary = 4.08 cfs @ 12.09 hrs, Volume= 13,314 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 244.59' @ 12.09 hrs
Flood Elev= 246.68'

Device	Routing	Invert	Outlet Devices
#1	Primary	243.40'	**15.0" Round Culvert** L= 17.0' Ke= 0.500 Inlet / Outlet Invert= 243.40' / 243.06' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.98 cfs @ 12.09 hrs HW=244.57' TW=244.04' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 3.98 cfs @ 4.33 fps)

Summary for Pond DB1: DB1

Groundwater must be verified with test pit

Inflow Area =	215,863 sf, 20.03% Impervious,	Inflow Depth > 5.88"	for 100-year event
Inflow =	32.92 cfs @ 12.09 hrs,	Volume=	105,764 cf
Outflow =	16.07 cfs @ 12.26 hrs,	Volume=	105,740 cf, Atten= 51%, Lag= 10.3 min
Primary =	14.07 cfs @ 12.26 hrs,	Volume=	104,625 cf
Secondary =	2.00 cfs @ 12.26 hrs,	Volume=	1,115 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 211.19' @ 12.26 hrs Surf.Area= 7,996 sf Storage= 23,530 cf
Flood Elev= 212.20' Surf.Area= 11,169 sf Storage= 32,544 cf

Plug-Flow detention time= 28.7 min calculated for 105,739 cf (100% of inflow)
Center-of-Mass det. time= 28.3 min (832.8 - 804.5)

Volume	Invert	Avail.Storage	Storage Description
#1	206.50'	32,544 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
206.50	2,580	292.7	0	0	2,580
208.00	3,931	343.8	4,848	4,848	5,212
210.00	6,340	407.4	10,175	15,023	9,087
212.00	9,234	471.0	15,484	30,507	13,619
212.20	11,169	496.1	2,037	32,544	15,553

Device	Routing	Invert	Outlet Devices
#1	Primary	204.75'	**15.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 204.75' / 204.50' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	206.50'	**6.0" Vert. Vertical Orifice X 2.00** C= 0.600
#3	Device 1	207.90'	**8.0" Vert. Vertical Orifice X 2.00** C= 0.600
#4	Device 1	209.90'	**48.0" Horiz. Horizonal Orifice** C= 0.600 Limited to weir flow at low heads
#5	Secondary	211.00'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=14.06 cfs @ 12.26 hrs HW=211.18' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 14.06 cfs @ 11.46 fps)
  ├─**2=Vertical Orifice** (Passes < 3.98 cfs potential flow)
  ├─**3=Vertical Orifice** (Passes < 5.77 cfs potential flow)
  └─**4=Horizonal Orifice** (Passes < 59.74 cfs potential flow)

Secondary OutFlow Max=1.91 cfs @ 12.26 hrs HW=211.18' TW=0.00' (Dynamic Tailwater)
└─**5=Broad-Crested Rectangular Weir** (Weir Controls 1.91 cfs @ 1.04 fps)

Summary for Pond DB2: DB2

Soil type 307C (sandy loam) Rawls infiltration rate = 1.02 inches per hour
Groundwater elevation must be verified with test pit

Inflow Area =	100,268 sf, 21.04% Impervious,	Inflow Depth > 6.01"	for 100-year event
Inflow =	15.57 cfs @ 12.09 hrs,	Volume=	50,202 cf
Outflow =	10.17 cfs @ 12.17 hrs,	Volume=	50,028 cf, Atten= 35%, Lag= 4.8 min
Discarded =	0.24 cfs @ 12.20 hrs,	Volume=	7,128 cf
Primary =	9.93 cfs @ 12.17 hrs,	Volume=	42,900 cf
Secondary =	0.00 cfs @ 5.00 hrs,	Volume=	0 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 249.00' @ 12.20 hrs Surf.Area= 5,142 sf Storage= 12,081 cf
Flood Elev= 250.00' Surf.Area= 6,476 sf Storage= 17,872 cf

Plug-Flow detention time= 66.2 min calculated for 49,947 cf (99% of inflow)
Center-of-Mass det. time= 65.0 min (867.1 - 802.1)

Volume	Invert	Avail.Storage	Storage Description
#1	244.50'	17,872 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
244.50	762	148.0	0	0	762
245.00	1,072	161.0	456	456	1,091
246.00	1,868	209.0	1,452	1,908	2,516
247.00	2,807	247.0	2,322	4,230	3,914
248.00	3,902	286.0	3,340	7,569	5,589
249.00	5,141	321.0	4,507	12,076	7,307
250.00	6,476	346.0	5,796	17,872	8,675

Device	Routing	Invert	Outlet Devices
#1	Primary	239.55'	**12.0" Round Culvert** L= 95.0' Ke= 0.500 Inlet / Outlet Invert= 239.55' / 234.80' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	245.90'	**8.0" Vert. Vertical Orifice** C= 0.600
#3	Device 1	247.70'	**6.0" Vert. Vertical Orifice X 2.00** C= 0.600
#4	Device 1	248.60'	**24.0" x 24.0" Horiz. Horizontal Orifice** C= 0.600 Limited to weir flow at low heads
#5	Secondary	249.70'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#6	Discarded	244.50'	**1.020 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 240.00' Phase-In= 0.01'

Discarded OutFlow Max=0.24 cfs @ 12.20 hrs HW=249.00' (Free Discharge)
└─**6=Exfiltration** (Controls 0.24 cfs)

Primary OutFlow Max=8.97 cfs @ 12.17 hrs HW=248.98' TW=239.89' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 8.97 cfs @ 11.43 fps)
  ├─**2=Vertical Orifice** (Passes < 2.78 cfs potential flow)
  ├─**3=Vertical Orifice** (Passes < 1.92 cfs potential flow)
  └─**4=Horizontal Orifice** (Passes < 6.03 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=244.50' TW=223.98' (Dynamic Tailwater)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DMH1: DMH

Inflow Area = 14,378 sf, 37.99% Impervious, Inflow Depth > 6.48" for 100-year event
Inflow = 2.38 cfs @ 12.09 hrs, Volume= 7,768 cf
Outflow = 2.38 cfs @ 12.09 hrs, Volume= 7,768 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.38 cfs @ 12.09 hrs, Volume= 7,768 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 252.28' @ 12.09 hrs
Flood Elev= 258.52'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.51'	**15.0" Round Culvert** L= 64.0' Ke= 0.500 Inlet / Outlet Invert= 251.51' / 249.59' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.32 cfs @ 12.09 hrs HW=252.27' TW=250.51' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.32 cfs @ 2.97 fps)

Summary for Pond DMH10: DMH

Inflow Area = 156,374 sf, 23.82% Impervious, Inflow Depth > 6.02" for 100-year event
Inflow = 24.36 cfs @ 12.09 hrs, Volume= 78,489 cf
Outflow = 24.36 cfs @ 12.09 hrs, Volume= 78,489 cf, Atten= 0%, Lag= 0.0 min
Primary = 24.36 cfs @ 12.09 hrs, Volume= 78,489 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 216.20' @ 12.10 hrs
Flood Elev= 227.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	211.19'	**24.0" Round Culvert** L= 113.0' Ke= 0.500 Inlet / Outlet Invert= 211.19' / 208.93' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=21.58 cfs @ 12.09 hrs HW=215.95' TW=213.82' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 21.58 cfs @ 6.87 fps)

Summary for Pond DMH11: DMH

Inflow Area = 183,569 sf, 23.41% Impervious, Inflow Depth > 5.98" for 100-year event
Inflow = 28.44 cfs @ 12.09 hrs, Volume= 91,548 cf
Outflow = 28.44 cfs @ 12.09 hrs, Volume= 91,548 cf, Atten= 0%, Lag= 0.0 min
Primary = 28.44 cfs @ 12.09 hrs, Volume= 91,548 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 214.05' @ 12.10 hrs
Flood Elev= 215.34'

Device	Routing	Invert	Outlet Devices
#1	Primary	208.83'	**24.0" Round Culvert** L= 62.0' Ke= 0.500 Inlet / Outlet Invert= 208.83' / 208.00' S= 0.0134 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=27.80 cfs @ 12.09 hrs HW=213.82' TW=210.44' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 27.80 cfs @ 8.85 fps)

Summary for Pond DMH12: DMH

Inflow Area = 100,268 sf, 21.04% Impervious, Inflow Depth = 5.13" for 100-year event
Inflow = 9.93 cfs @ 12.17 hrs, Volume= 42,900 cf
Outflow = 9.93 cfs @ 12.17 hrs, Volume= 42,900 cf, Atten= 0%, Lag= 0.0 min
Primary = 9.93 cfs @ 12.17 hrs, Volume= 42,900 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 240.51' @ 12.17 hrs
Flood Elev= 238.03'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.70'	**15.0" Round Culvert** L= 76.0' Ke= 0.500 Inlet / Outlet Invert= 234.70' / 230.60' S= 0.0539 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=9.55 cfs @ 12.17 hrs HW=239.89' TW=236.81' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 9.55 cfs @ 7.78 fps)

Summary for Pond DMH2: DMH

Inflow Area = 14,663 sf, 31.46% Impervious, Inflow Depth > 6.24" for 100-year event
Inflow = 2.36 cfs @ 12.09 hrs, Volume= 7,630 cf
Outflow = 2.36 cfs @ 12.09 hrs, Volume= 7,630 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.36 cfs @ 12.09 hrs, Volume= 7,630 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2

Peak Elev= 252.61' @ 12.09 hrs
Flood Elev= 260.66'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.84'	**15.0" Round Culvert** L= 75.0' Ke= 0.500 Inlet / Outlet Invert= 251.84' / 249.59' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.30 cfs @ 12.09 hrs HW=252.60' TW=250.51' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.30 cfs @ 2.96 fps)

Summary for Pond DMH3: DMH

Inflow Area =	21,845 sf, 33.05% Impervious,	Inflow Depth > 6.36"	for 100-year event
Inflow =	3.56 cfs @ 12.09 hrs,	Volume=	11,585 cf
Outflow =	3.56 cfs @ 12.09 hrs,	Volume=	11,585 cf, Atten= 0%, Lag= 0.0 min
Primary =	3.56 cfs @ 12.09 hrs,	Volume=	11,585 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 251.43' @ 12.09 hrs
Flood Elev= 254.76'

Device	Routing	Invert	Outlet Devices
#1	Primary	250.40'	**15.0" Round Culvert** L= 55.0' Ke= 0.500 Inlet / Outlet Invert= 250.40' / 249.85' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.48 cfs @ 12.09 hrs HW=251.41' TW=250.51' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 3.48 cfs @ 4.45 fps)

Summary for Pond DMH4: DMH

Inflow Area =	50,886 sf, 33.99% Impervious,	Inflow Depth > 6.36"	for 100-year event
Inflow =	8.30 cfs @ 12.09 hrs,	Volume=	26,982 cf
Outflow =	8.30 cfs @ 12.09 hrs,	Volume=	26,982 cf, Atten= 0%, Lag= 0.0 min
Primary =	8.30 cfs @ 12.09 hrs,	Volume=	26,982 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 250.54' @ 12.09 hrs
Flood Elev= 257.23'

Device	Routing	Invert	Outlet Devices
#1	Primary	248.85'	**18.0" Round Culvert** L= 159.0' Ke= 0.500 Inlet / Outlet Invert= 248.85' / 246.00' S= 0.0179 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=8.10 cfs @ 12.09 hrs HW=250.51' TW=248.65' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 8.10 cfs @ 4.58 fps)

Summary for Pond DMH5: DMH

Inflow Area =	100,268 sf, 21.04% Impervious,	Inflow Depth = 5.13"	for 100-year event
Inflow =	9.93 cfs @ 12.17 hrs,	Volume=	42,900 cf
Outflow =	9.93 cfs @ 12.17 hrs,	Volume=	42,900 cf, Atten= 0%, Lag= 0.0 min
Primary =	9.93 cfs @ 12.17 hrs,	Volume=	42,900 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 237.04' @ 12.17 hrs
Flood Elev= 237.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	233.65'	**15.0" Round Culvert** L= 143.0' Ke= 0.500 Inlet / Outlet Invert= 233.65' / 229.00' S= 0.0325 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=9.41 cfs @ 12.17 hrs HW=236.81' TW=229.90' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 9.41 cfs @ 7.67 fps)

Summary for Pond DMH6: DMH

Inflow Area = 24,643 sf, 37.64% Impervious, Inflow Depth > 6.48" for 100-year event
Inflow = 4.08 cfs @ 12.09 hrs, Volume= 13,314 cf
Outflow = 4.08 cfs @ 12.09 hrs, Volume= 13,314 cf, Atten= 0%, Lag= 0.0 min
Primary = 4.08 cfs @ 12.09 hrs, Volume= 13,314 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 244.06' @ 12.09 hrs
Flood Elev= 246.62'

Device	Routing	Invert	Outlet Devices
#1	Primary	242.96'	**15.0" Round Culvert** L= 146.0' Ke= 0.500 Inlet / Outlet Invert= 242.96' / 234.60' S= 0.0573 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.98 cfs @ 12.09 hrs HW=244.04' TW=236.23' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 3.98 cfs @ 3.54 fps)

Summary for Pond DMH7: DMH

Inflow Area = 57,366 sf, 30.50% Impervious, Inflow Depth > 6.28" for 100-year event
Inflow = 9.25 cfs @ 12.09 hrs, Volume= 30,012 cf
Outflow = 9.25 cfs @ 12.09 hrs, Volume= 30,012 cf, Atten= 0%, Lag= 0.0 min
Primary = 9.25 cfs @ 12.09 hrs, Volume= 30,012 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 236.28' @ 12.09 hrs
Flood Elev= 246.62'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.35'	**18.0" Round Culvert** L= 140.0' Ke= 0.500 Inlet / Outlet Invert= 234.35' / 228.85' S= 0.0393 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=9.03 cfs @ 12.09 hrs HW=236.23' TW=229.06' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 9.03 cfs @ 5.11 fps)

Summary for Pond DMH8: DMH

Inflow Area = 89,031 sf, 29.66% Impervious, Inflow Depth > 6.27" for 100-year event
Inflow = 14.34 cfs @ 12.09 hrs, Volume= 46,488 cf
Outflow = 14.34 cfs @ 12.09 hrs, Volume= 46,488 cf, Atten= 0%, Lag= 0.0 min
Primary = 14.34 cfs @ 12.09 hrs, Volume= 46,488 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 229.09' @ 12.09 hrs
Flood Elev= 233.28'

Device	Routing	Invert	Outlet Devices
#1	Primary	227.21'	**24.0" Round Culvert** L= 137.0' Ke= 0.500 Inlet / Outlet Invert= 227.21' / 223.10' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=14.01 cfs @ 12.09 hrs HW=229.06' TW=222.05' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 14.01 cfs @ 4.62 fps)

Summary for Pond DMH9: DMH

Inflow Area = 122,529 sf, 26.06% Impervious, Inflow Depth > 6.13" for 100-year event
Inflow = 19.37 cfs @ 12.09 hrs, Volume= 62,574 cf
Outflow = 19.37 cfs @ 12.09 hrs, Volume= 62,574 cf, Atten= 0%, Lag= 0.0 min
Primary = 19.37 cfs @ 12.09 hrs, Volume= 62,574 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 222.13' @ 12.09 hrs
Flood Elev= 227.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	219.49'	**24.0" Round Culvert** L= 147.0' Ke= 0.500 Inlet / Outlet Invert= 219.49' / 216.55' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=18.92 cfs @ 12.09 hrs HW=222.06' TW=215.94' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 18.92 cfs @ 6.02 fps)

Summary for Pond G: gabion

Inflow Area = 100,268 sf, 21.04% Impervious, Inflow Depth = 5.13" for 100-year event
Inflow = 9.93 cfs @ 12.17 hrs, Volume= 42,900 cf
Outflow = 9.94 cfs @ 12.17 hrs, Volume= 42,900 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 12.17 hrs, Volume= 17 cf
Primary = 9.94 cfs @ 12.17 hrs, Volume= 42,883 cf

Routing by Dyn-Stor-Ind method, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 229.94' @ 12.17 hrs Surf.Area= 32 sf Storage= 30 cf
Flood Elev= 230.25' Surf.Area= 0 sf Storage= 37 cf

Plug-Flow detention time= 0.0 min calculated for 42,831 cf (100% of inflow)
Center-of-Mass det. time= 0.0 min (823.9 - 823.9)

Volume	Invert	Avail.Storage	Storage Description
#1	229.00'	37 cf	**15.0" Round Pipe Storage** L= 30.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	229.63'	**3.0" Vert. outlet holes X 30.00** C= 0.600
#2	Primary	229.00'	**3.0" Horiz. outlet holes X 30.00** C= 0.600 Limited to weir flow at low heads
#3	Discarded	229.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.00 cfs @ 12.17 hrs HW=229.90' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=9.41 cfs @ 12.17 hrs HW=229.90' TW=0.00' (Dynamic Tailwater)
├─**1=outlet holes** (Orifice Controls 2.69 cfs @ 1.83 fps)
└─**2=outlet holes** (Orifice Controls 6.72 cfs @ 4.56 fps)

Summary for Link 1L: (new Link)

Inflow Area = 124,524 sf, 6.49% Impervious, Inflow Depth = 4.41" for 100-year event
Inflow = 7.69 cfs @ 12.36 hrs, Volume= 45,760 cf
Primary = 7.69 cfs @ 12.36 hrs, Volume= 45,760 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs

Section 5.0

APPENDIX

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	Massachusetts
Location	
Longitude	71.370 degrees West
Latitude	42.249 degrees North
Elevation	0 feet
Date/Time	Mon, 17 Aug 2020 11:52:03 -0400

Extreme Precipitation Estimates

	5min	**10min**	**15min**	**30min**	**60min**	**120min**		**1hr**	**2hr**	**3hr**	**6hr**	**12hr**	**24hr**	**48hr**		**1day**	**2day**	**4day**	**7day**	**10day**	
1yr	0.29	0.44	0.54	0.71	0.89	1.12	**1yr**	0.77	1.06	1.30	1.65	2.09	2.66	2.89	**1yr**	2.36	2.78	3.25	3.90	4.57	**1yr**
2yr	0.35	0.54	0.67	0.89	1.12	1.41	**2yr**	0.97	1.29	1.63	2.04	2.55	3.19	3.51	**2yr**	2.83	3.37	3.88	4.62	5.24	**2yr**
5yr	0.42	0.65	0.82	1.10	1.40	1.78	**5yr**	1.21	1.62	2.07	2.59	3.23	4.02	4.47	**5yr**	3.55	4.30	4.93	5.85	6.53	**5yr**
10yr	0.48	0.75	0.94	1.28	1.67	2.14	**10yr**	1.44	1.91	2.48	3.11	3.86	4.78	5.38	**10yr**	4.23	5.17	5.92	7.00	7.72	**10yr**
25yr	0.57	0.90	1.15	1.58	2.10	2.70	**25yr**	1.81	2.39	3.15	3.95	4.89	6.01	6.87	**25yr**	5.32	6.60	7.55	8.87	9.64	**25yr**
50yr	0.64	1.03	1.32	1.86	2.50	3.25	**50yr**	2.16	2.83	3.80	4.76	5.87	7.16	8.27	**50yr**	6.34	7.95	9.07	10.61	11.41	**50yr**
100yr	0.74	1.19	1.54	2.18	2.98	3.90	**100yr**	2.57	3.36	4.57	5.71	7.02	8.53	9.96	**100yr**	7.55	9.58	10.91	12.70	13.51	**100yr**
200yr	0.86	1.39	1.81	2.58	3.56	4.67	**200yr**	3.07	3.98	5.48	6.84	8.40	10.17	12.00	**200yr**	9.00	11.54	13.12	15.21	16.00	**200yr**
500yr	1.03	1.69	2.21	3.21	4.50	5.95	**500yr**	3.89	4.99	6.99	8.72	10.66	12.85	15.37	**500yr**	11.37	14.78	16.75	19.32	20.02	**500yr**

Lower Confidence Limits

	5min	**10min**	**15min**	**30min**	**60min**	**120min**		**1hr**	**2hr**	**3hr**	**6hr**	**12hr**	**24hr**	**48hr**		**1day**	**2day**	**4day**	**7day**	**10day**	
1yr	0.23	0.35	0.43	0.58	0.71	0.91	**1yr**	0.61	0.89	1.03	1.41	1.83	2.28	2.48	**1yr**	2.02	2.38	2.96	3.33	3.97	**1yr**
2yr	0.34	0.52	0.65	0.87	1.08	1.27	**2yr**	0.93	1.24	1.45	1.92	2.46	3.06	3.35	**2yr**	2.71	3.22	3.69	4.49	5.09	**2yr**
5yr	0.38	0.59	0.73	1.00	1.27	1.52	**5yr**	1.10	1.48	1.73	2.26	2.89	3.59	4.00	**5yr**	3.18	3.84	4.44	5.45	6.06	**5yr**
10yr	0.42	0.65	0.80	1.12	1.45	1.73	**10yr**	1.25	1.69	1.94	2.55	3.24	4.05	4.56	**10yr**	3.58	4.38	5.08	6.18	6.92	**10yr**

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
25yr	0.48	0.73	0.91	1.30	1.71	2.04	**25yr**	1.48	2.00	2.30	3.02	3.80	4.76	5.44	**25yr**	4.21	5.23	6.10	7.41	8.24	**25yr**
50yr	0.53	0.80	1.00	1.44	1.94	2.32	**50yr**	1.67	2.26	2.60	3.41	4.27	5.37	6.22	**50yr**	4.76	5.99	7.00	8.46	9.40	**50yr**
100yr	0.58	0.88	1.10	1.59	2.18	2.63	**100yr**	1.88	2.57	2.94	3.78	4.82	6.10	7.15	**100yr**	5.40	6.87	8.04	9.68	10.73	**100yr**
200yr	0.63	0.95	1.21	1.75	2.44	2.99	**200yr**	2.10	2.92	3.33	4.27	5.43	6.92	8.20	**200yr**	6.13	7.88	9.26	11.09	12.24	**200yr**
500yr	0.71	1.06	1.36	1.98	2.81	3.54	**500yr**	2.43	3.46	3.92	5.01	6.38	8.22	9.91	**500yr**	7.27	9.53	11.16	13.28	14.62	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.32	0.49	0.60	0.81	1.00	1.19	**1yr**	0.86	1.17	1.36	1.79	2.31	3.01	3.22	**1yr**	2.66	3.10	3.51	4.22	5.20	**1yr**
2yr	0.37	0.57	0.70	0.95	1.17	1.37	**2yr**	1.01	1.34	1.58	2.06	2.65	3.37	3.72	**2yr**	2.99	3.58	4.08	4.82	5.43	**2yr**
5yr	0.46	0.71	0.89	1.22	1.55	1.81	**5yr**	1.33	1.77	2.06	2.66	3.36	4.49	4.96	**5yr**	3.97	4.77	5.42	6.29	7.02	**5yr**
10yr	0.56	0.86	1.06	1.49	1.92	2.24	**10yr**	1.66	2.19	2.56	3.22	4.04	5.55	6.22	**10yr**	4.91	5.98	6.78	7.75	8.54	**10yr**
25yr	0.72	1.10	1.37	1.95	2.57	2.97	**25yr**	2.22	2.90	3.38	4.16	5.18	7.39	8.39	**25yr**	6.54	8.07	9.10	10.19	11.05	**25yr**
50yr	0.88	1.33	1.66	2.38	3.21	3.67	**50yr**	2.77	3.59	4.18	5.05	6.23	9.16	10.52	**50yr**	8.11	10.11	11.36	12.55	13.45	**50yr**
100yr	1.07	1.62	2.03	2.93	4.02	4.56	**100yr**	3.47	4.46	5.17	6.25	7.51	11.37	13.14	**100yr**	10.07	12.64	14.18	15.47	16.37	**100yr**
200yr	1.31	1.97	2.49	3.61	5.04	5.65	**200yr**	4.35	5.53	6.40	7.61	9.04	14.11	16.44	**200yr**	12.49	15.81	17.69	19.06	19.93	**200yr**
500yr	1.73	2.57	3.31	4.80	6.83	7.50	**500yr**	5.89	7.33	8.50	9.90	11.56	18.72	22.10	**500yr**	16.57	21.25	23.70	25.15	25.82	**500yr**

Powered by ACIS
Northeast Regional Climate Center

National Flood Hazard Layer FIRMette

FEMA

71°22'58"W 42°15'4"N

71°22'20"W 42°14'37"N

Feet

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

1:6,000

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/26/2020 at 12:49 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Middlesex County, Massachusetts

October 26, 2020

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

Map Scale: 1:2,590 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 35, 70, 140, 210

Feet: 0, 100, 200, 400, 600

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Jul 28, 2019—Aug 15, 2019

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	5.8	24.9%
104C	Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes	3.6	15.6%
104D	Hollis-Rock outcrop-Charlton complex, 15 to 25 percent slopes	1.3	5.4%
307B	Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony	0.8	3.3%
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony	11.8	50.8%
Totals for Area of Interest		**23.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Middlesex County, Massachusetts

103C—Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2wzp1
Elevation: 0 to 1,390 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton, extremely stony, and similar soils: 50 percent
Hollis, extremely stony, and similar soils: 20 percent
Rock outcrop: 10 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton, Extremely Stony

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands

Hydric soil rating: No

Description of Hollis, Extremely Stony

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: gravelly fine sandy loam
Bw - 7 to 16 inches: gravelly fine sandy loam
2R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 23 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Hills, ridges
Parent material: Igneous and metamorphic rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water capacity: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Woodbridge, extremely stony

Percent of map unit: 8 percent
Landform: Drumlins, hills, ground moraines
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Canton, extremely stony

Percent of map unit: 5 percent
Landform: Moraines, ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Chatfield, extremely stony

Percent of map unit: 5 percent
Landform: Hills, ridges
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 2 percent
Landform: Hills, ground moraines, depressions, drumlins, drainageways
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

104C—Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2w69p

Elevation: 0 to 1,270 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Hollis, extremely stony, and similar soils: 35 percent
Charlton, extremely stony, and similar soils: 25 percent
Rock outcrop: 25 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis, Extremely Stony

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: gravelly fine sandy loam
Bw - 7 to 16 inches: gravelly fine sandy loam
2R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 0 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 23 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Charlton, Extremely Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Crest, side slope

Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Hills, ridges
Parent material: Igneous and metamorphic rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water capacity: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Canton, extremely stony

Percent of map unit: 7 percent
Landform: Hills, moraines, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Chatfield, extremely stony

Percent of map unit: 6 percent
Landform: Hills, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Montauk, extremely stony

Percent of map unit: 1 percent
Landform: Recessionial moraines, hills, drumlins, ground moraines
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Scituate, extremely stony

Percent of map unit: 1 percent
Landform: Drumlins, hills, ground moraines
Landform position (two-dimensional): Footslope, backslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

104D—Hollis-Rock outcrop-Charlton complex, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 98yh
Elevation: 0 to 1,530 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Hollis and similar soils: 35 percent
Rock outcrop: 30 percent
Charlton and similar soils: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Crest, head slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable, shallow loamy basal till over granite and gneiss

Typical profile

H1 - 0 to 2 inches: fine sandy loam
H2 - 2 to 14 inches: fine sandy loam
H3 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 25 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Parent material: Granite and gneiss

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s

Description of Charlton

Setting

Landform: Hills
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 5 inches: fine sandy loam
H2 - 5 to 22 inches: sandy loam
H3 - 22 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 15 to 25 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Canton

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Head slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Montauk

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Nose slope, head slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Unnamed

Percent of map unit: 2 percent

307B—Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w675
Elevation: 0 to 1,580 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Paxton, extremely stony, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Paxton, Extremely Stony

Setting

Landform: Drumlins, hills, ground moraines
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 10 inches: fine sandy loam
Bw1 - 10 to 17 inches: fine sandy loam
Bw2 - 17 to 28 inches: fine sandy loam
Cd - 28 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Minor Components

Woodbridge, extremely stony

Percent of map unit: 10 percent
Landform: Ground moraines, drumlins, hills
Landform position (two-dimensional): Backslope, footslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Charlton, extremely stony

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Shoulder, summit, backslope
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 4 percent
Landform: Drainageways, drumlins, hills, ground moraines, depressions
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman, extremely stony

Percent of map unit: 1 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

307C—Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w676
Elevation: 0 to 1,490 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Paxton, extremely stony, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Paxton, Extremely Stony

Setting

Landform: Ground moraines, drumlins, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 10 inches: fine sandy loam
Bw1 - 10 to 17 inches: fine sandy loam
Bw2 - 17 to 28 inches: fine sandy loam
Cd - 28 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Minor Components

Charlton, extremely stony

Percent of map unit: 8 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Woodbridge, extremely stony

Percent of map unit: 6 percent
Landform: Ground moraines, drumlins, hills
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 1 percent
Landform: Ground moraines, depressions, drumlins, drainageways, hills
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Physical Properties

Soil Physical Properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

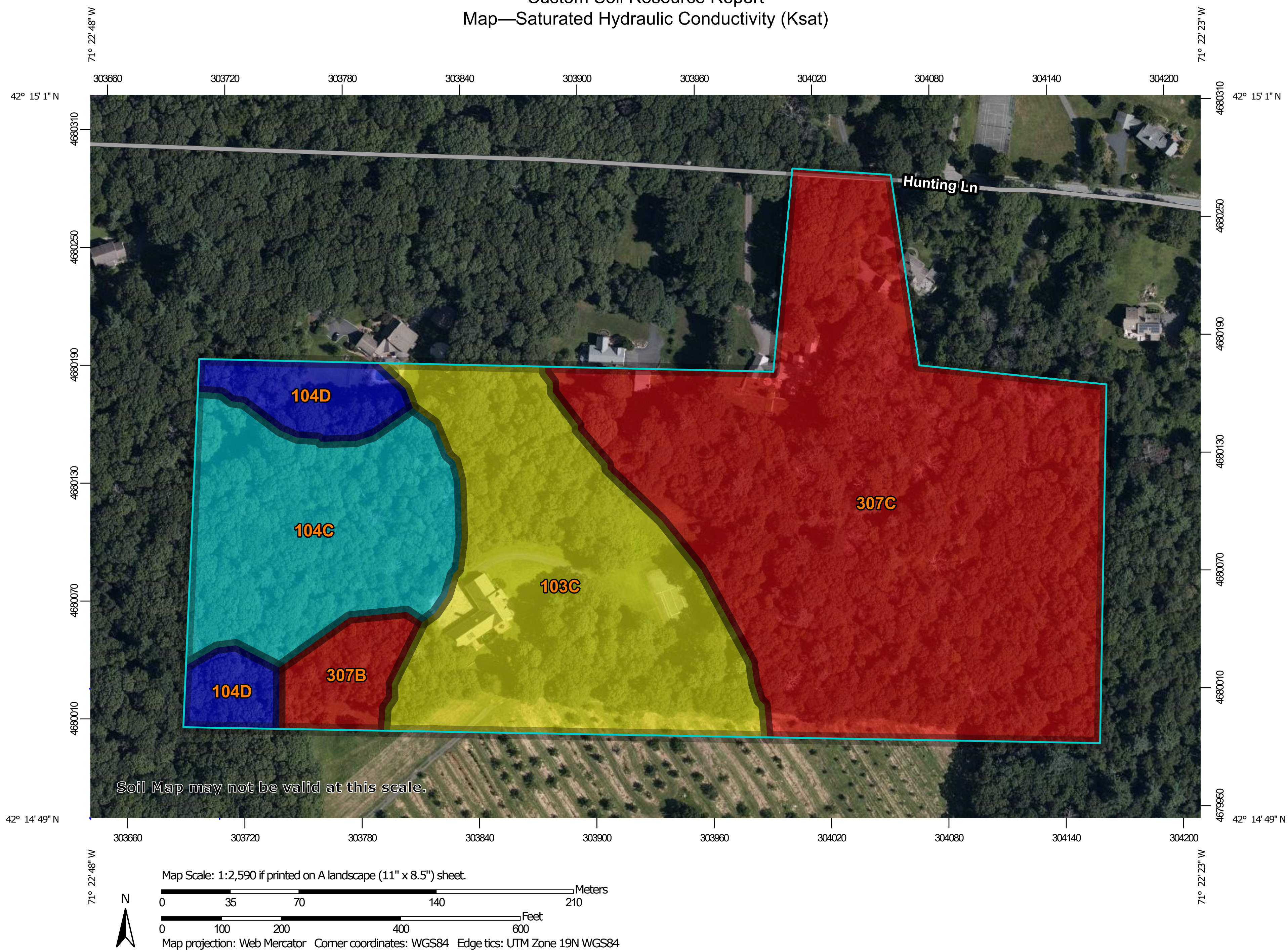
Saturated Hydraulic Conductivity (Ksat)

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits.

Map—Saturated Hydraulic Conductivity (Ksat)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

<= 6.8818

> 6.8818 and <= 12.1818

> 12.1818 and <= 13.0322

> 13.0322 and <= 18.3357

Not rated or not available

Soil Rating Lines

<= 6.8818

> 6.8818 and <= 12.1818

> 12.1818 and <= 13.0322

> 13.0322 and <= 18.3357

Not rated or not available

Soil Rating Points

<= 6.8818

> 6.8818 and <= 12.1818

> 12.1818 and <= 13.0322

> 13.0322 and <= 18.3357

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: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Jul 28, 2019—Aug 15, 2019

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

Table—Saturated Hydraulic Conductivity (Ksat)

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	12.1818	5.8	24.9%
104C	Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes	13.0322	3.6	15.6%
104D	Hollis-Rock outcrop-Charlton complex, 15 to 25 percent slopes	18.3357	1.3	5.4%
307B	Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony	6.8818	0.8	3.3%
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony	6.8818	11.8	50.8%
Totals for Area of Interest			**23.2**	**100.0%**

Rating Options—Saturated Hydraulic Conductivity (Ksat)

Units of Measure: micrometers per second

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Fastest

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): Depth Range (Weighted Average)

Top Depth: 0

Bottom Depth: 100

Units of Measure: Inches

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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.

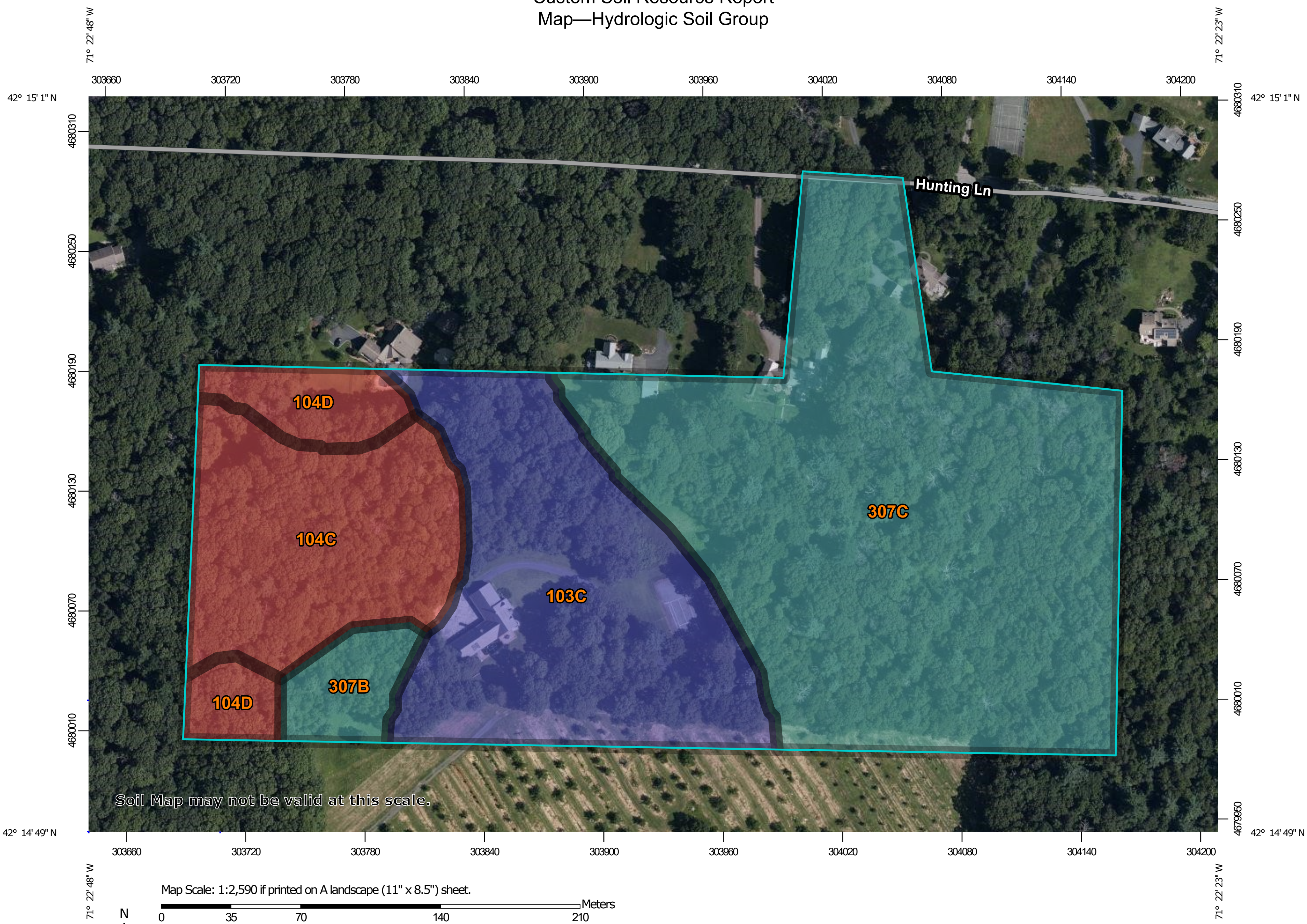
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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.

Map—Hydrologic Soil Group



Map Scale: 1:2,590 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 35, 70, 140, 210

Feet: 0, 100, 200, 400, 600

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Jul 28, 2019—Aug 15, 2019

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

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	B	5.8	24.9%
104C	Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes	D	3.6	15.6%
104D	Hollis-Rock outcrop-Charlton complex, 15 to 25 percent slopes	D	1.3	5.4%
307B	Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony	C	0.8	3.3%
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony	C	11.8	50.8%
Totals for Area of Interest			**23.2**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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Drawdown within 72 hours Analysis for Static Method

Basin #2

Infiltration Rate: 1.02 inches/hour *(From table 2.3.3: Rawls, Brakensiek, Saxton, 1982)*

Volume Provide for Infiltration: 4,075 cf

Basin bottom area: 3,554 sf

$Time_{drawdown}$ = (Required Recharge Volume in cubic feet as determined by the Static Method)(1/Design Infiltration Rate in inches per hour)(conversion for inches to feet)(1/bottom area in feet)

$Time_{drawdown}$ = (4,075 cf) (1 / 1.02 in/hr) (1ft/12 in.) (1 / 3,554 sf)

= 13.49 hours

Drawdown within 72 hours Analysis for Static Method

Basin #3

Infiltration Rate: 1.02 inches/hour *(From table 2.3.3: Rawls, Brakensiek, Saxton, 1982)*

Volume Provide for Infiltration: 1,800 cf

Basin bottom area: 1,483 sf

$Time_{drawdown}$ = (Required Recharge Volume in cubic feet as determined by the Static Method)(1/Design Infiltration Rate in inches per hour)(conversion for inches to feet)(1/bottom area in feet)

$Time_{drawdown}$ = (1,800 cf) (1 / 1.02 in/hr) (1ft/12 in.) (1 / 1,483 sf)

= 14.28 hours

Stage-Area-Storage for Pond DB2: DB2

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
244.50	762	762	0
244.54	785	787	31
244.58	808	813	63
244.62	832	838	96
244.66	855	864	129
244.70	880	890	164
244.74	904	916	200
244.78	929	943	236
244.82	954	969	274
244.86	980	996	313
244.90	1,006	1,023	352
244.94	1,032	1,050	393
244.98	1,059	1,077	435
245.02	1,086	1,116	478
245.06	1,114	1,166	522
245.10	1,142	1,217	567
245.14	1,170	1,268	613
245.18	1,199	1,320	661
245.22	1,228	1,373	709
245.26	1,258	1,426	759
245.30	1,288	1,480	810
245.34	1,318	1,534	862
245.38	1,349	1,589	915
245.42	1,380	1,644	970
245.46	1,411	1,701	1,026
245.50	1,443	1,757	1,083
245.54	1,475	1,815	1,141
245.58	1,507	1,873	1,201
245.62	1,540	1,931	1,262
245.66	1,573	1,990	1,324
245.70	1,606	2,050	1,387
245.74	1,640	2,110	1,452
245.78	1,674	2,171	1,519
245.82	1,709	2,232	1,586
245.86	1,743	2,294	1,655
245.90	1,779	2,357	1,726
245.94	1,814	2,420	1,798
245.98	1,850	2,484	1,871
246.02	1,885	2,542	1,946
246.06	1,919	2,594	2,022
246.10	1,953	2,645	2,099
246.14	1,988	2,698	2,178
246.18	2,023	2,751	2,258
246.22	2,058	2,804	2,340
246.26	2,094	2,857	2,423
246.30	2,130	2,911	2,507
246.34	2,166	2,965	2,593
246.38	2,202	3,020	2,680
246.42	2,239	3,075	2,769
246.46	2,276	3,130	2,860
246.50	2,314	3,186	2,951
246.54	2,351	3,242	3,045
246.58	2,389	3,298	3,140
246.62	2,428	3,355	3,236
246.66	2,466	3,413	3,334
246.70	2,505	3,470	3,433
246.74	2,545	3,528	3,534
246.78	2,584	3,586	3,637
246.82	2,624	3,645	3,741
246.86	2,664	3,704	3,847
246.90	2,705	3,764	3,954
246.94	2,745	3,823	4,063
246.98	2,786	3,884	4,174
247.02	2,827	3,945	4,286
247.06	2,868	4,007	4,400
247.10	2,908	4,070	4,515
247.14	2,949	4,134	4,633
247.18	2,991	4,197	4,751
247.22	3,032	4,261	4,872
247.26	3,074	4,326	4,994
247.30	3,117	4,391	5,118
247.34	3,159	4,456	5,243
247.38	3,202	4,522	5,370
247.42	3,245	4,588	5,499
247.46	3,288	4,654	5,630
247.50	3,332	4,721	5,762
247.54	3,376	4,788	5,897
247.58	3,420	4,856	6,033
247.62	3,465	4,924	6,170
247.66	3,510	4,992	6,310
247.70	3,555	5,061	6,451
247.74	3,600	5,130	6,594
247.78	3,646	5,200	6,739
247.82	3,692	5,270	6,886
247.86	3,738	5,340	7,034
247.90	3,784	5,411	7,185
247.94	3,831	5,482	7,337
247.98	3,878	5,553	7,491
248.02	3,925	5,622	7,647
248.06	3,972	5,687	7,805
248.10	4,018	5,752	7,965
248.14	4,065	5,818	8,127
248.18	4,112	5,884	8,290
248.22	4,160	5,950	8,456
248.26	4,208	6,017	8,623
248.30	4,256	6,084	8,792
248.34	4,304	6,151	8,964
248.38	4,353	6,219	9,137
248.42	4,402	6,287	9,312
248.46	4,451	6,355	9,489
248.50	4,500	6,423	9,668
248.54	4,550	6,492	9,849
248.58	4,600	6,561	10,032
248.62	4,650	6,631	10,217
248.66	4,701	6,701	10,404
248.70	4,751	6,771	10,593
248.74	4,802	6,841	10,784
248.78	4,854	6,912	10,977
248.82	4,905	6,983	11,172
248.86	4,957	7,055	11,370
248.90	5,009	7,126	11,569
248.94	5,062	7,198	11,770
248.98	5,115	7,271	11,974
249.02	5,166	7,333	12,179
249.06	5,217	7,386	12,387
249.10	5,268	7,439	12,597
249.14	5,319	7,492	12,809
249.18	5,370	7,546	13,022
249.22	5,421	7,599	13,238
249.26	5,473	7,653	13,456
249.30	5,525	7,707	13,676
249.34	5,578	7,761	13,898
249.38	5,630	7,815	14,122
249.42	5,683	7,869	14,348
249.46	5,736	7,924	14,577
249.50	5,789	7,978	14,807
249.54	5,843	8,033	15,040
249.58	5,897	8,088	15,275
249.62	5,951	8,143	15,512
249.66	6,005	8,199	15,751
249.70	6,059	8,254	15,992
249.74	6,114	8,310	16,236
249.78	6,169	8,365	16,481
249.82	6,224	8,421	16,729
249.86	6,280	8,478	16,979
249.90	6,336	8,534	17,232
249.94	6,392	8,590	17,486
249.98	**6,448**	**8,647**	**17,743**

Project:	**Apple Hill Estates**
Location:	**Sherborn, MA**
Prepared For:	**Allen & Major**

CONTECH ENGINEERED SOLUTIONS

Purpose: To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1" of runoff from the contributing impervious surface.

Reference: Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

Procedure: Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the tc, read the unit peak discharge (qu) from Figure 1 or Table in Figure 2. qu is expressed in the following units: cfs/mi^2/watershed inches (csm/in).

Compute Q Rate using the following equation:

Q = (qu) (A) (WQV)

where:

Q = flow rate associated with first 1" of runoff
qu = the unit peak discharge, in csm/in.
A = impervious surface drainage area (in square miles)
WQV = water quality volume in watershed inches (1" in this case)

Structure Name	Impv. (acres)	A (miles^2)	t_c (min)	t_c (hr)	WQV (in)	qu (csm/in.)	Q (cfs)
DMH-08	0.65	0.0010112	6.0	0.100	1.00	774.00	0.78
CB-02	0.28	0.0004355	6.0	0.100	1.00	774.00	0.34
CB-03	0.34	0.0005349	6.0	0.100	1.00	774.00	0.41
CB-05	0.11	0.0001761	6.0	0.100	1.00	774.00	0.14

Brief Stormceptor Sizing Report - CB-02

Project Information & Location			
Project Name	Apple Hill Estates	**Project Number**	663085
City	Sherborn	**State/ Province**	Massachusetts
Country	United States of America	**Date**	11/11/2020
Designer Information		**EOR Information (optional)**	
Name	David Adams	**Name**	
Company	Contech	**Company**	Allen & Major
Phone #	207-885-6191	**Phone #**	
Email	dadams@conteches.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	CB-02
Target TSS Removal (%)	80
TSS Removal (%) Provided	92
Recommended Stormceptor Model	STC 450i

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	92
STC 900	96
STC 1200	96
STC 1800	96
STC 2400	97
STC 3600	98
STC 4800	98
STC 6000	98
STC 7200	99
STC 11000	99
STC 13000	99
STC 16000	99

Stormceptor®

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A QUIKRETE COMPANY

Sizing Details

Drainage Area	
Total Area (acres)	0.28
Imperviousness %	100.0

Rainfall	
Station Name	BLUE HILL
State/Province	Massachusetts
Station ID #	0736
Years of Records	58
Latitude	42°12'44"N
Longitude	71°6'53"W

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Storage	
Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cfs)	

Particle Size Distribution (PSD) The selected PSD defines TSS removal		
OK-110		
Particle Diameter (microns)	Distribution %	Specific Gravity
1.0	0.0	2.65
53.0	3.0	2.65
75.0	15.0	2.65
88.0	25.0	2.65
106.0	41.0	2.65
125.0	15.0	2.65
150.0	1.0	2.65
212.0	0.0	2.65

Notes

• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
• For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD

APPLE HILL ESTATES
SHERBORN, MA

Area	**0.34 ac**	Unit Site Designation	**CB-03**
Weighted C	**0.9**	Rainfall Station #	**68**
t_c	**6 min**		
CDS Model	**1515-3**	CDS Treatment Capacity	**1.0 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	9.3%	9.3%	0.01	0.01	9.0
0.04	9.5%	18.8%	0.01	0.01	9.1
0.06	8.7%	27.5%	0.02	0.02	8.4
0.08	10.1%	37.6%	0.02	0.02	9.6
0.10	7.2%	44.8%	0.03	0.03	6.8
0.12	6.0%	50.8%	0.04	0.04	5.7
0.14	6.3%	57.1%	0.04	0.04	5.9
0.16	5.6%	62.7%	0.05	0.05	5.3
0.18	4.7%	67.4%	0.06	0.06	4.4
0.20	3.6%	71.0%	0.06	0.06	3.4
0.25	8.2%	79.1%	0.08	0.08	7.5
0.50	14.9%	94.0%	0.15	0.15	12.9
0.75	3.2%	97.3%	0.23	0.23	2.6
1.00	1.2%	98.5%	0.31	0.31	0.9
1.50	0.7%	99.2%	0.46	0.46	0.5
2.00	0.8%	100.0%	0.61	0.61	0.4
					92.5
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.5%
				Predicted Net Annual Load Removal Efficiency =	**86.1%**

1 - Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Brief Stormceptor Sizing Report - CB-05

Project Information & Location			
Project Name	Apple Hill Estates	**Project Number**	663085
City	Sherborn	**State/ Province**	Massachusetts
Country	United States of America	**Date**	11/11/2020
Designer Information		**EOR Information (optional)**	
Name	David Adams	**Name**	
Company	Contech	**Company**	Allen & Major
Phone #	207-885-6191	**Phone #**	
Email	dadams@conteches.com	**Email**	

Stormwater Treatment Recommendation
The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	CB-05
Target TSS Removal (%)	80
TSS Removal (%) Provided	96
Recommended Stormceptor Model	STC 450i

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary

Stormceptor Model	% TSS Removal Provided
STC 450i	96
STC 900	98
STC 1200	98
STC 1800	98
STC 2400	99
STC 3600	99
STC 4800	99
STC 6000	99
STC 7200	99
STC 11000	100
STC 13000	100
STC 16000	100

Sizing Details

Drainage Area	
Total Area (acres)	0.11
Imperviousness %	100.0

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Rainfall	
Station Name	BLUE HILL
State/Province	Massachusetts
Station ID #	0736
Years of Records	58
Latitude	42°12'44"N
Longitude	71°6'53"W

Up Stream Storage	
Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cfs)	

Particle Size Distribution (PSD) The selected PSD defines TSS removal		
OK-110		
Particle Diameter (microns)	Distribution %	Specific Gravity
1.0	0.0	2.65
53.0	3.0	2.65
75.0	15.0	2.65
88.0	25.0	2.65
106.0	41.0	2.65
125.0	15.0	2.65
150.0	1.0	2.65
212.0	0.0	2.65

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

APPLE HILL ESTATES SHERBORN, MA

Area	**0.65 ac**	Unit Site Designation	**DMH-08**
Weighted C	**0.9**	Rainfall Station #	**68**
t_c	**6 min**		
CDS Model	**2015-4**	CDS Treatment Capacity	**1.4 cfs**

Rainfall Intensity[1] (in/hr)	**Percent Rainfall Volume[1]**	**Cumulative Rainfall Volume**	**Total Flowrate (cfs)**	**Treated Flowrate (cfs)**	**Incremental Removal (%)**
0.02	9.3%	9.3%	0.01	0.01	9.0
0.04	9.5%	18.8%	0.02	0.02	9.1
0.06	8.7%	27.5%	0.03	0.03	8.3
0.08	10.1%	37.6%	0.05	0.05	9.6
0.10	7.2%	44.8%	0.06	0.06	6.8
0.12	6.0%	50.8%	0.07	0.07	5.6
0.14	6.3%	57.1%	0.08	0.08	5.9
0.16	5.6%	62.7%	0.09	0.09	5.2
0.18	4.7%	67.4%	0.10	0.10	4.3
0.20	3.6%	71.0%	0.12	0.12	3.3
0.25	8.2%	79.1%	0.15	0.15	7.4
0.50	14.9%	94.0%	0.29	0.29	12.4
0.75	3.2%	97.3%	0.44	0.44	2.4
1.00	1.2%	98.5%	0.58	0.58	0.9
1.50	0.7%	99.2%	0.87	0.87	0.4
2.00	0.8%	100.0%	1.16	1.16	0.3
					90.9
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.5%
				Predicted Net Annual Load Removal Efficiency =	**84.4%**

1 - Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

ALLEN & MAJOR ASSOCIATES, INC.

DRAINAGE PIPE DESIGN ANALYSIS

A&M Job No.	2513-02
Date:	3/1/2021

Project Location:
Apple Hill Estates
Hunting Lane
Sherborn, MA

Prepared For:
Barsky Estate Realty Trust

Manning's Formula

$V=1.486/n*R^{2/3}*S^{1/2}$
Q = V*A
(25-Year storm)

Where: V is the velocity in Ft/sec.
n is Mannings coefficient of friction
R is the Hydraulic Radius
S is the slope of the pipe

R=Area/Wetted Perimeter

Where: Area=Pi*(R/12)2
Wetted Perimeter=2*Pi*R/12

PIPE	Q_{design}	n	Diameter	A	Wp	R	S	Q_{full}	Q_{full} ≥ Q_{design}	V_{full}	Q_d/Q_f	Results	V_{design}	2.5 ft/s ≤ V_{design} ≤ 10 ft/s
	(cfs)		(inches)	(ft^2)	(ft)	(ft)	(feet/foot)	(cfs)		(ft/s)		Fig. 4-4A	(ft/s)	
CB10	3.26	0.013	15	1.23	3.93	0.31	0.010	6.46	OK	5.26	0.50	0.99	5.21	OK
CB12	3.23	0.013	15	1.23	3.93	0.31	0.010	6.46	OK	5.26	0.50	0.99	5.21	OK
CB14	3.08	0.013	15	1.23	3.93	0.31	0.030	11.19	OK	9.12	0.28	0.84	7.66	OK
CB16	3.03	0.013	15	1.23	3.93	0.31	0.023	9.73	OK	7.93	0.31	0.85	6.74	OK
CB18	2.50	0.013	15	1.23	3.93	0.31	0.010	6.46	OK	5.26	0.39	0.91	4.79	OK
CB2	1.53	0.013	15	1.23	3.93	0.31	0.018	8.71	OK	7.10	0.18	0.73	5.18	OK
CB4	1.49	0.013	15	1.23	3.93	0.31	0.030	11.19	OK	9.12	0.13	0.64	5.84	OK
CB6	2.28	0.013	15	1.23	3.93	0.31	0.010	6.46	OK	5.26	0.35	0.89	4.68	OK
CB8	2.63	0.013	15	1.23	3.93	0.31	0.020	9.14	OK	7.44	0.29	0.84	6.25	OK
DB1	9.44	0.013	15	1.23	3.93	0.31	0.011	6.78	NO GOOD	5.52	1.39	0.47	2.59	OK
DB2	3.90	0.013	12	0.79	3.14	0.25	0.050	7.97	OK	10.14	0.49	0.98	9.94	OK
DMH1	1.53	0.013	15	1.23	3.93	0.31	0.030	11.19	OK	9.12	0.14	0.65	5.93	OK
DMH10	15.22	0.013	24	3.14	6.28	0.50	0.020	31.99	OK	10.18	0.48	0.98	9.98	OK
DMH11	17.72	0.013	24	3.14	6.28	0.50	0.013	26.19	OK	8.34	0.68	1.07	8.92	OK
DMH12	3.70	0.013	15	1.23	3.93	0.31	0.054	15.00	OK	12.22	0.25	0.81	9.90	OK
DMH2	1.49	0.013	15	1.23	3.93	0.31	0.030	11.19	OK	9.12	0.13	0.64	5.84	OK
DMH3	2.28	0.013	15	1.23	3.93	0.31	0.010	6.46	OK	5.26	0.35	0.89	4.68	OK
DMH4	5.31	0.013	18	1.77	4.71	0.38	0.018	14.05	OK	7.95	0.38	0.90	7.16	OK
DMH5	3.70	0.013	15	1.23	3.93	0.31	0.033	11.65	OK	9.49	0.32	0.86	8.16	OK
DMH6	2.63	0.013	15	1.23	3.93	0.31	0.057	15.46	OK	12.60	0.17	0.70	8.82	OK
DMH7	5.89	0.013	18	1.77	4.71	0.38	0.039	20.82	OK	11.78	0.28	0.84	9.90	OK
DMH8	9.11	0.013	24	3.14	6.28	0.50	0.030	39.18	OK	12.47	0.23	0.79	9.85	OK
DMH9	12.19	0.013	24	3.14	6.28	0.50	0.020	31.99	OK	10.18	0.38	0.90	9.17	OK

*OCS-03 discharges to an existing catch basin, then to an existing 15" pipe in Hunting Lane. Use of a larger pipe would just inundate the existing municipal system

ALLEN & MAJOR ASSOCIATES, INC.

Project No.	2513-02	**Sheet:** 1 of 2	
Project Desciprtion:	Apple Hill Estates, Hunting Lane, Sherborn MA		
Calculated By:	MM	**Date**: 03-01-21	
Checked By:		**Date:**	

ESTIMATION FOR PHOSPHORUS REMOVAL

Existing Condition Phosphrous Loading

Site Use	Phosphorus Load by Land Use (lbs/ac/yr)	Area (Acres)	Existing Phosphorus Load (lbs/yr)
Low Density Residential	0.30	0.87	0.26
Open Space	0.26	2.01	0.52
Forest	0.12	16.16	1.94
	Total	**19.04**	**2.72**

Proposed Condition Phosphrous Loading

Site Use	Phosphorus Load by Land Use (lbs/ac/yr)	Area (Acres)	Proposed Phosphorus Load (lbs/yr)
Low Density Residential	1.52	4.57	6.94
Open Space Soil Type B	0.12	1.70	0.20
Open Space Soil Type C	0.21	3.92	0.82
Open Space Soil Type D	0.37	0.55	0.20
Forest	0.13	8.30	1.08
	Total	**19.04**	**9.25**

Phosphorus Reduction Requirement

Phosphorus Reduction Requirement	=	Proposed Phosphours Load x 16%*		
	=	9.25	x	0.16
	=	**1.48**	**lbs/year**	

*Table F-2, Appendx F, MA MS4 General Permit

Proposed Condition Phosphrous Loading Reduction

BMP (Subcatchment)	BMP	Total Phosphorous Load to BMP (lbs/yr)***	BMP Removal %**	Phosphorus Removed by BMPs (lbs/year)
Basin #2 (P-6, P-3a,3b,3c)	Infiltration Basin	2.77	0.90	2.50
			Total	**2.50**

**Table 3-13, Appendx F, MA MS4 General Permit

***See Page 2 for additional information

Percent Reduction (Phosphorus Removed / Proposed Phosphorus Load)	**26.98%**		
	2.50	**>**	**1.48**

Requirement is met

ALLEN & MAJOR ASSOCIATES, INC.

Project No.	2513-02	**Sheet:** 2 of 2	
Project Desciprtion:	Apple Hill Estates, Hunting Lane, Sherborn MA		
Calculated By:	SM	Date: 03-01-21	
Checked By:		**Date:**	

Phosphorus Calculations Per BMP

	Phosphorus Load by Land Use (lbs/ac/yr)	Area (Acres)	Proposed Phosphorus Load (lbs/yr)			
Basin #2 (P-6, P-3a,3b,3c)				Area to Basin 2	101,268	S.F.
Low Density Residential	1.52	1.74	2.65	Volume Treated	4,075	C.F.
Open Space Soil Type B	0.12		0.00	Depth of runoff treated	0.48	IN.
Open Space Soil Type C	0.21	0.58	0.12			
Open Space Soil Type D	0.37		0.00			
Forest	0.13		0.00			
	total	**2.32**	**2.77**			

SECTION 6.0

WATERSHED PLANS

NOTES:

1. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
2. THE CONTRACTOR SHALL CONTACT "DIGSAFE" AND THE TOWN OF SHERBORN DEPARTMENT OF PUBLIC WORKS AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION WORK TO REQUEST THE LOCATION OF THE EXISTING UTILITIES.

   DIGSAFE: 1-800-344-7233
   SHERBORN DEPARTMENT OF PUBLIC WORKS: 508-651-7878

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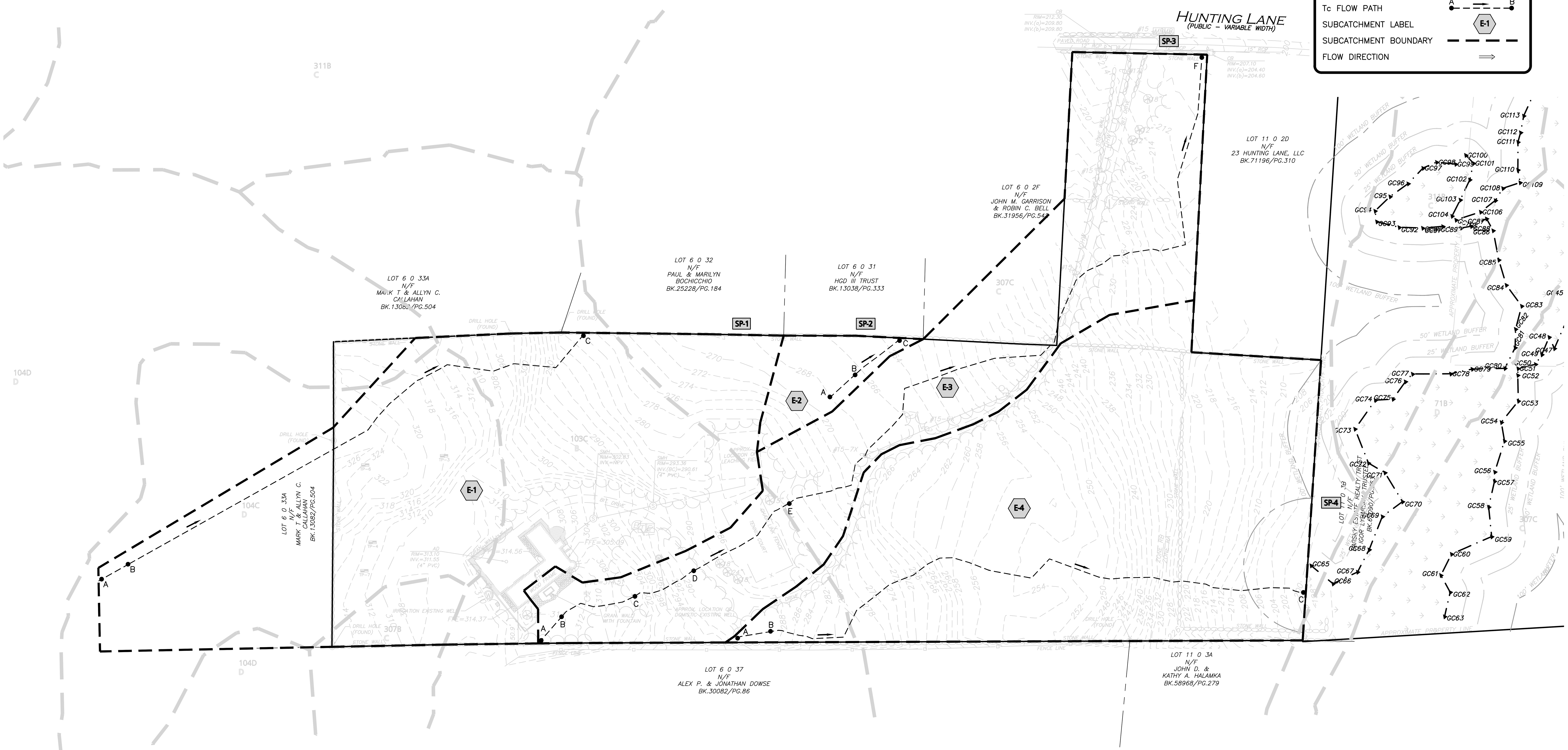

LEGEND

SCS SOILS BOUNDARY	
Tc FLOW PATH	A - B
SUBCATCHMENT LABEL	E-1
SUBCATCHMENT BOUNDARY	
FLOW DIRECTION	⟹

DIG SAFE

BEFORE YOU DIG
CALL 811 OR
1-888-DIG-SAFE
1-888-344-7233

GRAPHIC SCALE

80 0 40 80 160 320

(IN FEET)
1 inch = 80 ft.

R:\PROJECTS\2513-02\CIVIL\DRAWINGS\CURRENT\C-2513-02_WATERSHED-EXISTING.DWG

REV	DATE	DESCRIPTION

APPLICANT\OWNER:

BARSKY ESTATE REALTY TRUST
23 HUNTING LANE
SHERBORN, MA 01770

PROJECT:

APPLE HILL ESTATES
31 HUNTING LANE
SHERBORN, MA 01770

PROJECT NO.	2513-02	DATE:	11-09-20
SCALE:	1" = 80'	DWG. NAME:	C2513-02
DESIGNED BY:	SM	CHECKED BY:	MAM

PREPARED BY:

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environmental consulting ◆ landscape architecture
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WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

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DRAWING TITLE:	SHEET No.
EXISTING WATERSHED PLAN	WS-1

NOTES:

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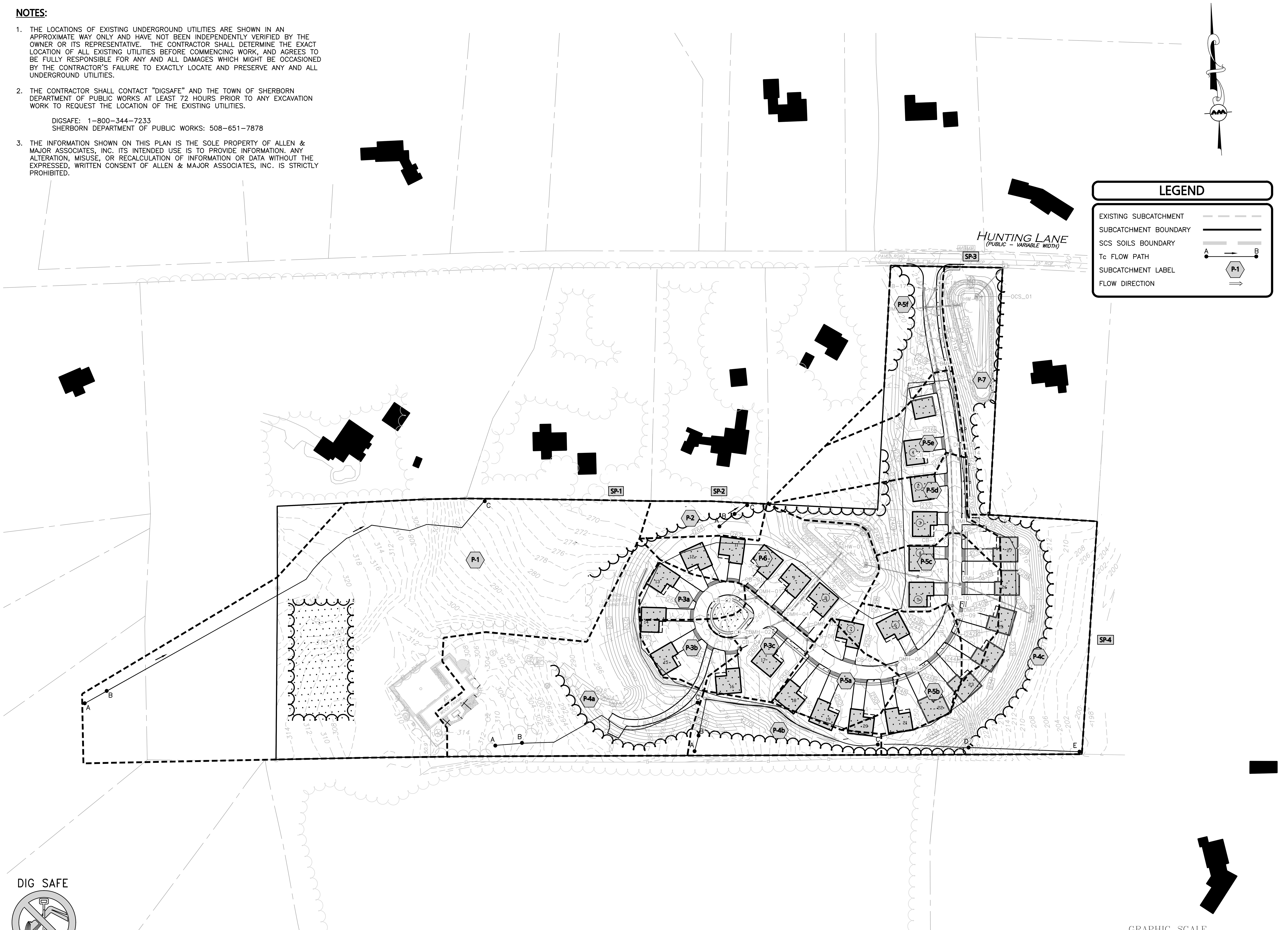

LEGEND

EXISTING SUBCATCHMENT	
SUBCATCHMENT BOUNDARY	
SCS SOILS BOUNDARY	
Tc FLOW PATH	A → B
SUBCATCHMENT LABEL	P-1
FLOW DIRECTION	⇒

DIG SAFE

BEFORE YOU DIG
CALL 811 OR
1-888-DIG-SAFE
1-888-344-7233

R:\PROJECTS\2513-02\CIVIL\DRAWINGS\CURRENT\C-2513-02_WATERSHED-PROPOSED.DWG

REV	DATE	DESCRIPTION
4	02-25-2021	CONVERSION TO SINGLE FAMILY HOMES
3	10-01-2020	ISSUED FOR ZBA APPLICATION
2	05-19-2020	MISC. REV. PER MASSHOUSING & ABUTTER WALK
1	01-21-2020	MISCELLANEOUS REVISIONS

APPLICANT\OWNER:

BARSKY ESTATE REALTY TRUST
23 HUNTING LANE
SHERBORN, MA 01770

PROJECT:

APPLE HILL ESTATES

31 HUNTING LANE
SHERBORN, MA 01770

PROJECT NO.	2513-02	DATE:	11-09-20
SCALE:	1" = 80'	DWG. NAME:	C2513-02
DESIGNED BY:	SM	CHECKED BY:	MAM

PREPARED BY:

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DRAWING TITLE: PROPOSED WATERSHED PLAN

SHEET No. WS-2