ALLEN & MAJOR ASSOCIATES, INC.

SITE LOCUS: 1" = 500'

APPLE HILL ESTATES

31 HUNTING LANE

SHERBORN, MASSACHUSETTS

DRAINAGE REPORT

DATE PREPARED:
NOVEMBER 18, 2020

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

Digitally signed by Michael Malynowski
Date: 2020.11.23 08:26:03-05'00'

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 28 multifamily residential units along a roadway constructed to Town of Sherborn Subdivision standards. The 28 units will be housed within thirteen new duplex structures, one new single family building, and an existing house to remain. 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 89,785 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 41,196 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

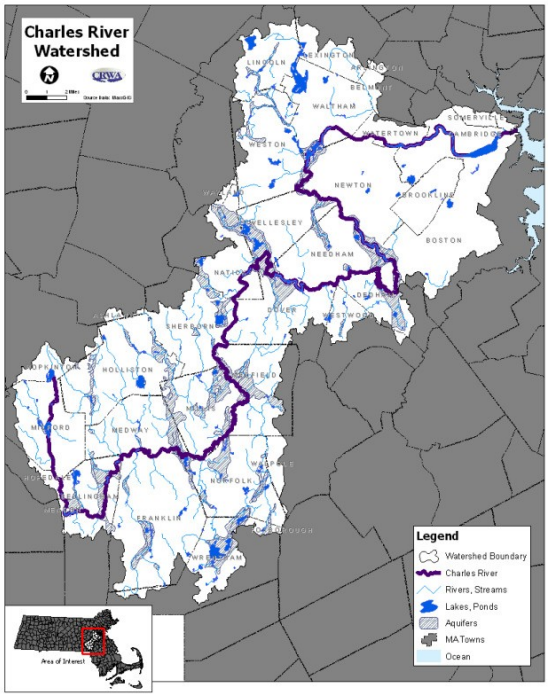

Image Source: Charles River Watershed Association

- **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)	4.15	9.78	14.60	25.40
Decrease (CFS)	**0.42**	**1.65**	**2.88**	**5.56**

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)	0.12	0.31	0.47	0.83
Decrease (CFS)	**0.19**	**0.48**	**0.74**	**1.31**

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)	1.16	3.17	8.35	14.83
Decrease (CFS)	**1.61**	**3.52**	**1.77**	**2.85**

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)	2.34	7.28	11.69	24.62
Decrease (CFS)	**1.40**	**2.06**	**2.59**	**0.58**

- **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	= 127,727 ± square feet
Change in impervious area	**= 89,785± square feet**

   Total proposed impervious area (taken from HydroCAD model) = 127,727 ± 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)*(36,899 square feet) (B Soils)
+ (0.25 inches)*(1/12 inches/ft)*(90,346 square feet) (C Soils)
+ (0.10 inches)*(1/12 inches/ft)*(482 square feet) (D Soils)
= 2,962 cubic feet

Recharge Provided = 4,075 ft^3 (DB-2) (See Appendix)
+1,800 ft^3 (DB-3)
5,875 ft^3

5,875 ft^3 Provided > 2,962 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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SECTION 2.0 OPERATION & MAINTENANCE PLAN 2-1

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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.	$1,500/Sweeping	Semi-annually (Spring & Fall)	$3,000		
		Maintain information that confirms that all street sweepings have been disposed in accordance with state and local requirements					
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	$1,000	Semi-annually (Spring & Fall)	$2,000		
		Remove trash and sediment as required					
Deep Sump CB's	Inspect frames and grates. Empty sumps using a vacuum-truck.	Inspected and cleaned 4 times per year.	$500/CB	CBs - quarterly			
		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					
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.	$500/unit	Semi-annually (Spring & Fall)			
		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					
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	$500 allowance	Annually			
		Check sediment build-up on a yearly basis and clean as needed using hand methods					
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.

Post-Construction Stormwater Treatment Practices

- 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]

[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.

CONTECH®
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CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

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

Inspection

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

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

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

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

Cleaning

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

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

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

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	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

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

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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.

Inline Stormceptor

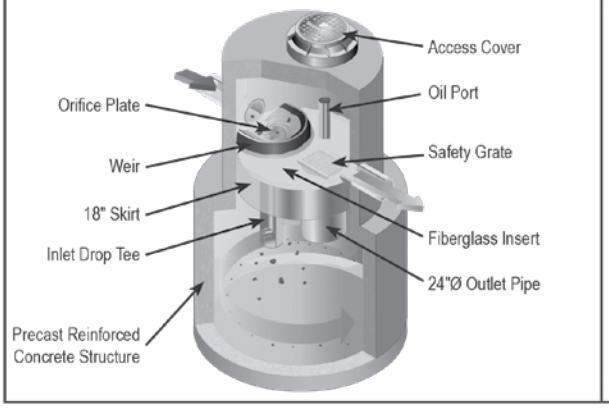
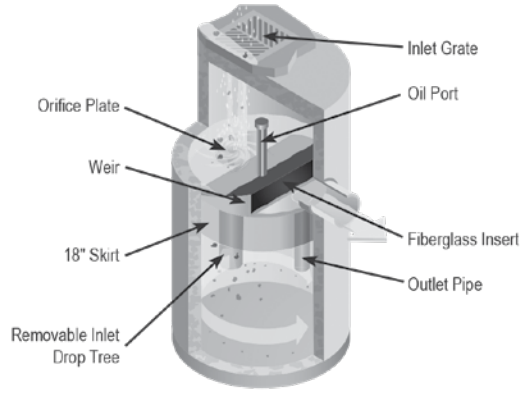


Figure 2.

Inlet Stormceptor



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:

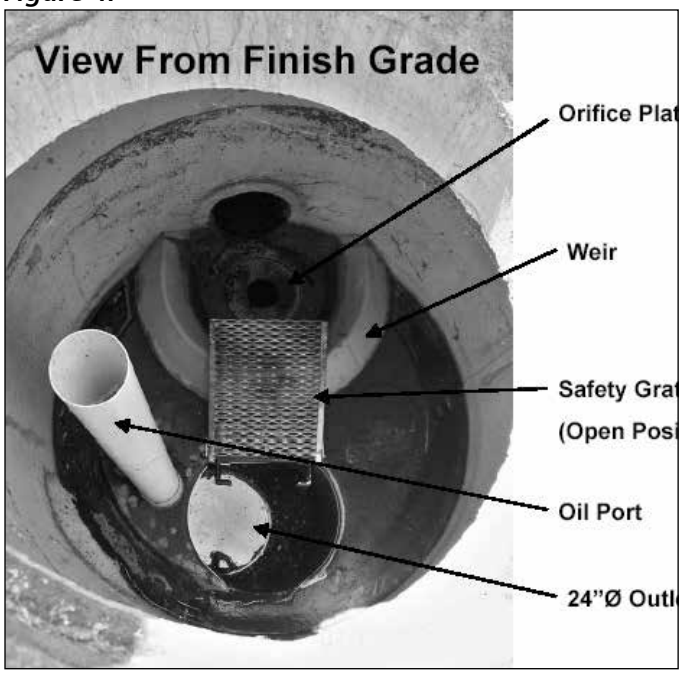
- Stormceptor is to be inspected from grade through a standard surface manhole access cover.
- Sediment and oil depth inspections are performed with a sediment probe and oil dipstick.
- Oil depth is measured through the oil inspection port, either a 4-inch or 6-inch diameter port.
- Sediment depth can 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.

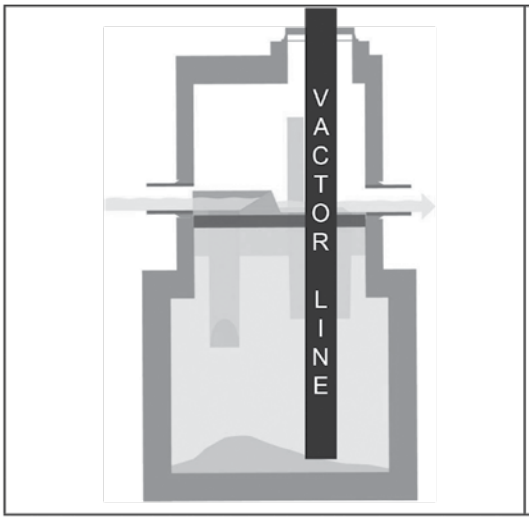
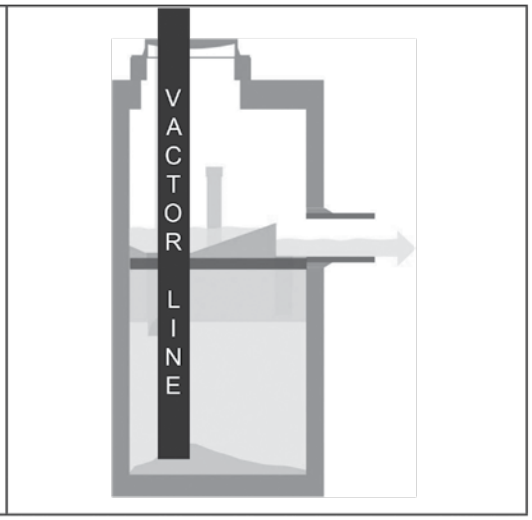


Figure 6.



- 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

Subcat Reach Pond Link

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 11/13/2020
HydroCAD® 10.00-26 s/n 02947 © 2020 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
95,367	61	>75% Grass cover, Good, HSG B (P-1, P-4, P-4A, P-4B, P-4C)
276,063	74	>75% Grass cover, Good, HSG C (P-1, P-2, P-3A, P-3B, P-3D, P-3E, P-3F, P-3G, P-3H, P-3I, P-3L, P-4, P-4A, P-4B, P-4C, P-4D, P-4E)
24,002	80	>75% Grass cover, Good, HSG D (P-1)
23,354	98	Paved parking, HSG B (P-1, P-4, P-4B, P-4C)
62,695	98	Paved parking, HSG C (P-3A, P-3B, P-3C, P-3D, P-3E, P-3F, P-3G, P-3H, P-3I, P-3J, P-3K, P-3L, P-4, P-4A, P-4B, P-4C, P-4D, P-4E)
482	98	Paved parking, HSG D (P-1)
65,357	55	Woods, Good, HSG B (P-1, P-4)
149,961	70	Woods, Good, HSG C (P-1, P-2, P-3A, P-3H, P-3I, P-3L, P-4, P-4E)
132,111	77	Woods, Good, HSG D (P-1, P-4)
829,392	**73**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
184,078	HSG B	P-1, P-4, P-4A, P-4B, P-4C
488,719	HSG C	P-1, P-2, P-3A, P-3B, P-3C, P-3D, P-3E, P-3F, P-3G, P-3H, P-3I, P-3J, P-3K, P-3L, P-4, P-4A, P-4B, P-4C, P-4D, P-4E
156,595	HSG D	P-1, P-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	95,367	276,063	24,002	0	395,432	>75% Grass cover, Good	
0	23,354	62,695	482	0	86,531	Paved parking	
0	65,357	149,961	132,111	0	347,429	Woods, Good	
0	**184,078**	**488,719**	**156,595**	**0**	**829,392**	**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	cb-02	265.25	264.50	50.0	0.0150	0.013	12.0	0.0	0.0
2	cb-03	264.25	263.75	46.0	0.0109	0.013	15.0	0.0	0.0
3	cb-05	260.80	260.50	20.0	0.0150	0.013	12.0	0.0	0.0
4	cb-06	256.30	249.80	128.0	0.0508	0.013	12.0	0.0	0.0
5	cb-07a	241.89	241.55	11.0	0.0309	0.013	12.0	0.0	0.0
6	cb-07b	241.80	241.55	19.0	0.0132	0.013	12.0	0.0	0.0
7	cb-08a	227.30	226.80	12.0	0.0417	0.013	12.0	0.0	0.0
8	cb-08b	227.30	226.80	18.0	0.0278	0.013	12.0	0.0	0.0
9	cb-09a	218.18	217.89	10.0	0.0290	0.013	12.0	0.0	0.0
10	cb-09b	218.80	218.43	37.0	0.0100	0.013	12.0	0.0	0.0
11	cb-10	208.50	208.00	43.0	0.0116	0.013	15.0	0.0	0.0
12	cb-11a	234.14	233.80	17.0	0.0200	0.013	12.0	0.0	0.0
13	cb-11b	234.10	233.80	15.0	0.0200	0.013	12.0	0.0	0.0
14	DB1	204.75	204.50	50.0	0.0050	0.013	15.0	0.0	0.0
15	DB2	245.00	237.80	131.0	0.0550	0.013	12.0	0.0	0.0
16	DB3	263.00	262.00	50.0	0.0200	0.013	24.0	0.0	0.0
17	DB4	209.00	208.60	40.0	0.0100	0.013	15.0	0.0	0.0
18	dmh-03	260.00	256.80	96.0	0.0333	0.013	24.0	0.0	0.0
19	dmh-04	249.70	241.30	136.0	0.0618	0.013	12.0	0.0	0.0
20	dmh-05	241.05	233.30	153.0	0.0507	0.013	15.0	0.0	0.0
21	dmh-06	233.05	226.30	149.0	0.0453	0.013	18.0	0.0	0.0
22	dmh-07	223.35	217.64	188.0	0.0304	0.013	18.0	0.0	0.0
23	dmh-08	217.14	216.88	10.0	0.0260	0.013	24.0	0.0	0.0
24	dmh-09	251.82	247.00	96.0	0.0502	0.013	24.0	0.0	0.0
25	dmh-10	237.55	235.80	161.0	0.0109	0.013	15.0	0.0	0.0
26	dmh-11	230.87	229.00	37.0	0.0505	0.013	15.0	0.0	0.0
27	dmh-12	209.80	208.00	72.0	0.0250	0.013	24.0	0.0	0.0

Time span=0.00-72.00 hrs, dt=0.02 hrs, 3601 points
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=250,444 sf 2.13% Impervious Runoff Depth=0.92"
Flow Length=844' Tc=16.3 min CN=72 Runoff=4.17 cfs 19,273 cf

Subcatchment P-2: Subcat P-2 Runoff Area=7,960 sf 0.00% Impervious Runoff Depth=0.82"
Flow Length=81' Tc=13.0 min CN=70 Runoff=0.12 cfs 545 cf

Subcatchment P-3A: Subcat P-3A Runoff Area=48,251 sf 7.27% Impervious Runoff Depth=0.98"
Flow Length=511' Tc=10.2 min CN=73 Runoff=1.02 cfs 3,926 cf

Subcatchment P-3B: Subcat P-3B Runoff Area=11,466 sf 22.34% Impervious Runoff Depth=1.33"
Tc=6.0 min CN=79 Runoff=0.40 cfs 1,270 cf

Subcatchment P-3C: Subcat P-3C Runoff Area=3,275 sf 100.00% Impervious Runoff Depth=2.96"
Tc=6.0 min CN=98 Runoff=0.23 cfs 807 cf

Subcatchment P-3D: Subcat P-3D Runoff Area=6,772 sf 50.52% Impervious Runoff Depth=1.83"
Tc=6.0 min CN=86 Runoff=0.33 cfs 1,031 cf

Subcatchment P-3E: Subcat P-3E Runoff Area=10,604 sf 28.17% Impervious Runoff Depth=1.46"
Tc=6.0 min CN=81 Runoff=0.41 cfs 1,291 cf

Subcatchment P-3F: Subcat P-3F Runoff Area=3,510 sf 86.55% Impervious Runoff Depth=2.64"
Tc=6.0 min CN=95 Runoff=0.24 cfs 771 cf

Subcatchment P-3G: Subcat P-3G Runoff Area=7,921 sf 49.94% Impervious Runoff Depth=1.83"
Tc=6.0 min CN=86 Runoff=0.39 cfs 1,206 cf

Subcatchment P-3H: Subcat P-3H Runoff Area=33,391 sf 11.40% Impervious Runoff Depth=1.20"
Tc=6.0 min CN=77 Runoff=1.05 cfs 3,352 cf

Subcatchment P-3I: Subcat P-3I Runoff Area=23,285 sf 12.45% Impervious Runoff Depth=1.15"
Tc=6.0 min CN=76 Runoff=0.69 cfs 2,222 cf

Subcatchment P-3J: Subcat P-3J Runoff Area=2,248 sf 100.00% Impervious Runoff Depth=2.96"
Tc=6.0 min CN=98 Runoff=0.16 cfs 554 cf

Subcatchment P-3K: Subcat P-3K Runoff Area=3,123 sf 100.00% Impervious Runoff Depth=2.96"
Tc=6.0 min CN=98 Runoff=0.22 cfs 770 cf

Subcatchment P-3L: Subcat P-3L Runoff Area=35,377 sf 4.79% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=74 Runoff=0.93 cfs 3,039 cf

Subcatchment P-4: Subcat P-4 Runoff Area=210,752 sf 2.26% Impervious Runoff Depth=0.73"
Flow Length=845' Tc=20.5 min CN=68 Runoff=2.34 cfs 12,771 cf

Subcatchment P-4A: Subcat P-4A Runoff Area=35,777 sf 1.45% Impervious Runoff Depth=0.87"
Tc=6.0 min CN=71 Runoff=0.76 cfs 2,600 cf

Subcatchment P-4B: Subcat P-4B Runoff Area=32,221 sf 46.28% Impervious Runoff Depth=1.60"
Tc=6.0 min CN=83 Runoff=1.38 cfs 4,299 cf

Subcatchment P-4C: Subcat P-4C Runoff Area=21,590 sf 56.23% Impervious Runoff Depth=1.53"
Tc=6.0 min CN=82 Runoff=0.88 cfs 2,753 cf

Subcatchment P-4D: Subcat P-4D Runoff Area=6,238 sf 78.70% Impervious Runoff Depth=2.44"
Tc=6.0 min CN=93 Runoff=0.40 cfs 1,266 cf

Subcatchment P-4E: Subcat P-4E Runoff Area=75,187 sf 9.91% Impervious Runoff Depth=1.15"
Tc=6.0 min CN=76 Runoff=2.23 cfs 7,174 cf

Reach SP-3: SP-3 Inflow=1.16 cfs 20,223 cf
Outflow=1.16 cfs 20,223 cf

Reach SP-4: SP-4 Inflow=2.34 cfs 16,956 cf
Outflow=2.34 cfs 16,956 cf

Pond cb-02: cb Peak Elev=265.73' Inflow=0.88 cfs 2,753 cf
12.0" Round Culvert n=0.013 L=50.0' S=0.0150 '/' Outflow=0.88 cfs 2,753 cf

Pond cb-03: cb Peak Elev=264.88' Inflow=1.38 cfs 4,299 cf
15.0" Round Culvert n=0.013 L=46.0' S=0.0109 '/' Outflow=1.38 cfs 4,299 cf

Pond cb-05: cb Peak Elev=261.11' Inflow=0.40 cfs 1,266 cf
12.0" Round Culvert n=0.013 L=20.0' S=0.0150 '/' Outflow=0.40 cfs 1,266 cf

Pond cb-06: cb Peak Elev=256.61' Inflow=0.40 cfs 1,270 cf
12.0" Round Culvert n=0.013 L=128.0' S=0.0508 '/' Outflow=0.40 cfs 1,270 cf

Pond cb-07a: cb Peak Elev=242.13' Inflow=0.23 cfs 807 cf
12.0" Round Culvert n=0.013 L=11.0' S=0.0309 '/' Outflow=0.23 cfs 807 cf

Pond cb-07b: cb Peak Elev=242.09' Inflow=0.33 cfs 1,031 cf
12.0" Round Culvert n=0.013 L=19.0' S=0.0132 '/' Outflow=0.33 cfs 1,031 cf

Pond cb-08a: cb Peak Elev=227.61' Inflow=0.39 cfs 1,206 cf
12.0" Round Culvert n=0.013 L=12.0' S=0.0417 '/' Outflow=0.39 cfs 1,206 cf

Pond cb-08b: cb Peak Elev=227.83' Inflow=1.05 cfs 3,352 cf
12.0" Round Culvert n=0.013 L=18.0' S=0.0278 '/' Outflow=1.05 cfs 3,352 cf

Pond cb-09a: cb Peak Elev=218.65' Inflow=0.85 cfs 2,776 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0290 '/' Outflow=0.85 cfs 2,776 cf

Pond cb-09b: cb Peak Elev=219.24' Inflow=0.69 cfs 2,222 cf
12.0" Round Culvert n=0.013 L=37.0' S=0.0100 '/' Outflow=0.69 cfs 2,222 cf

Pond cb-10: cb Peak Elev=208.99' Inflow=1.06 cfs 4,695 cf
15.0" Round Culvert n=0.013 L=43.0' S=0.0116 '/' Outflow=1.06 cfs 4,695 cf

Pond cb-11a: cb Peak Elev=234.46' Inflow=0.41 cfs 1,291 cf
12.0" Round Culvert n=0.013 L=17.0' S=0.0200 '/' Outflow=0.41 cfs 1,291 cf

Pond cb-11b: cb Peak Elev=234.34' Inflow=0.24 cfs 771 cf
12.0" Round Culvert n=0.013 L=15.0' S=0.0200 '/' Outflow=0.24 cfs 771 cf

Pond DB1: DB1 Peak Elev=206.76' Storage=6,958 cf Inflow=5.64 cfs 20,238 cf
Outflow=1.16 cfs 20,223 cf

Pond DB2: DB2 Peak Elev=246.26' Storage=5,308 cf Inflow=2.65 cfs 13,370 cf
Discarded=0.14 cfs 9,184 cf Primary=0.36 cfs 4,185 cf Secondary=0.00 cfs 0 cf Outflow=0.50 cfs 13,370 cf

Pond DB3: DB3 Peak Elev=264.87' Storage=3,946 cf Inflow=3.02 cfs 9,652 cf
Discarded=0.07 cfs 4,723 cf Primary=0.35 cfs 4,929 cf Secondary=0.00 cfs 0 cf Outflow=0.43 cfs 9,652 cf

Pond DB4: DB4 Peak Elev=209.48' Storage=247 cf Inflow=1.02 cfs 3,926 cf
Outflow=0.94 cfs 3,926 cf

Pond dmh-03: dmh Peak Elev=260.28' Inflow=0.47 cfs 6,195 cf
24.0" Round Culvert n=0.013 L=96.0' S=0.0333 '/' Outflow=0.47 cfs 6,195 cf

Pond dmh-04: dmh Peak Elev=250.01' Inflow=0.40 cfs 1,270 cf
12.0" Round Culvert n=0.013 L=136.0' S=0.0618 '/' Outflow=0.40 cfs 1,270 cf

Pond dmh-05: dmh Peak Elev=241.52' Inflow=0.97 cfs 3,108 cf
15.0" Round Culvert n=0.013 L=153.0' S=0.0507 '/' Outflow=0.97 cfs 3,108 cf

Pond dmh-06: dmh Peak Elev=233.63' Inflow=1.62 cfs 5,170 cf
18.0" Round Culvert n=0.013 L=149.0' S=0.0453 '/' Outflow=1.62 cfs 5,170 cf

Pond dmh-07: dmh Peak Elev=224.17' Inflow=3.05 cfs 9,728 cf
18.0" Round Culvert n=0.013 L=188.0' S=0.0304 '/' Outflow=3.05 cfs 9,728 cf

Pond dmh-08: dmh Peak Elev=218.02' Inflow=3.90 cfs 12,504 cf
24.0" Round Culvert n=0.013 L=10.0' S=0.0260 '/' Outflow=3.90 cfs 12,504 cf

Pond dmh-09: dmh Peak Elev=252.10' Inflow=0.47 cfs 6,195 cf
24.0" Round Culvert n=0.013 L=96.0' S=0.0502 '/' Outflow=0.47 cfs 6,195 cf

Pond dmh-10: dmh Peak Elev=237.82' Inflow=0.36 cfs 4,185 cf
15.0" Round Culvert n=0.013 L=161.0' S=0.0109 '/' Outflow=0.36 cfs 4,185 cf

Pond dmh-11: dmh Peak Elev=231.14' Inflow=0.36 cfs 4,185 cf
15.0" Round Culvert n=0.013 L=37.0' S=0.0505 '/' Outflow=0.36 cfs 4,185 cf

Pond dmh-12: dmh Peak Elev=210.64' Inflow=3.90 cfs 12,504 cf
24.0" Round Culvert n=0.013 L=72.0' S=0.0250 '/' Outflow=3.90 cfs 12,504 cf

Pond G: gabion Peak Elev=229.04' Storage=0 cf Inflow=0.36 cfs 4,185 cf
Outflow=0.36 cfs 4,185 cf

Total Runoff Area = 829,392 sf Runoff Volume = 70,920 cf Average Runoff Depth = 1.03"
89.57% Pervious = 742,861 sf 10.43% Impervious = 86,531 sf

Summary for Subcatchment P-1: Subcat P-1

Runoff = 4.17 cfs @ 12.25 hrs, Volume= 19,273 cf, Depth= 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
4,841	98	Paved parking, HSG B
45,769	55	Woods, Good, HSG B
14,862	61	>75% Grass cover, Good, HSG B
24,002	80	>75% Grass cover, Good, HSG D
482	98	Paved parking, HSG D
131,956	77	Woods, Good, HSG D
7,031	74	>75% Grass cover, Good, HSG C
21,502	70	Woods, Good, HSG C
250,444	72	Weighted Average
245,121		97.87% Pervious Area
5,322		2.13% 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 = 0.12 cfs @ 12.20 hrs, Volume= 545 cf, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
7,044	70	Woods, Good, HSG C
916	74	>75% Grass cover, Good, HSG C
7,960	70	Weighted Average
7,960		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 = 1.02 cfs @ 12.15 hrs, Volume= 3,926 cf, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
3,510	98	Paved parking, HSG C
28,784	70	Woods, Good, HSG C
15,958	74	>75% Grass cover, Good, HSG C
48,251	73	Weighted Average
44,742		92.73% Pervious Area
3,510		7.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0900	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
2.9	313	0.1300	1.80		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.4	148	0.0600	5.75	11.51	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=0.50' Z= 4.0 '/' Top.W=6.00' n= 0.030 Earth, grassed & winding
10.2	511	Total			

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

Runoff = 0.40 cfs @ 12.09 hrs, Volume= 1,270 cf, Depth= 1.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
8,905	74	>75% Grass cover, Good, HSG C
2,561	98	Paved parking, HSG C
11,466	79	Weighted Average
8,905		77.66% Pervious Area
2,561		22.34% Impervious Area

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

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

Runoff = 0.23 cfs @ 12.08 hrs, Volume= 807 cf, Depth= 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
3,275	98	Paved parking, HSG C
3,275		100.00% Impervious Area

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

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

Runoff = 0.33 cfs @ 12.09 hrs, Volume= 1,031 cf, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
3,351	74	>75% Grass cover, Good, HSG C
3,421	98	Paved parking, HSG C
6,772	86	Weighted Average
3,351		49.48% Pervious Area
3,421		50.52% Impervious Area

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

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

Runoff = 0.41 cfs @ 12.09 hrs, Volume= 1,291 cf, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
7,617	74	>75% Grass cover, Good, HSG C
2,987	98	Paved parking, HSG C
10,604	81	Weighted Average
7,617		71.83% Pervious Area
2,987		28.17% Impervious Area

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

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

Runoff = 0.24 cfs @ 12.08 hrs, Volume= 771 cf, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
472	74	>75% Grass cover, Good, HSG C
3,038	98	Paved parking, HSG C
3,510	95	Weighted Average
472		13.45% Pervious Area
3,038		86.55% Impervious Area

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

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

Runoff = 0.39 cfs @ 12.09 hrs, Volume= 1,206 cf, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
3,965	74	>75% Grass cover, Good, HSG C
3,956	98	Paved parking, HSG C
7,921	86	Weighted Average
3,965		50.06% Pervious Area
3,956		49.94% Impervious Area

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

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

Runoff = 1.05 cfs @ 12.09 hrs, Volume= 3,352 cf, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
29,484	74	>75% Grass cover, Good, HSG C
3,806	98	Paved parking, HSG C
100	70	Woods, Good, HSG C
33,391	77	Weighted Average
29,585		88.60% Pervious Area
3,806		11.40% Impervious Area

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

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

Runoff = 0.69 cfs @ 12.09 hrs, Volume= 2,222 cf, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
2,899	98	Paved parking, HSG C
3,195	70	Woods, Good, HSG C
17,191	74	>75% Grass cover, Good, HSG C
23,285	76	Weighted Average
20,386		87.55% Pervious Area
2,899		12.45% Impervious Area

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

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

Runoff = 0.16 cfs @ 12.08 hrs, Volume= 554 cf, Depth= 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
2,248	98	Paved parking, HSG C
2,248		100.00% Impervious Area

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

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

Runoff = 0.22 cfs @ 12.08 hrs, Volume= 770 cf, Depth= 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
3,123	98	Paved parking, HSG C
3,123		100.00% Impervious Area

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

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

Runoff = 0.93 cfs @ 12.10 hrs, Volume= 3,039 cf, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
1,694	98	Paved parking, HSG C
7,044	70	Woods, Good, HSG C
26,638	74	>75% Grass cover, Good, HSG C
35,377	74	Weighted Average
33,682		95.21% Pervious Area
1,694		4.79% Impervious Area

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

Summary for Subcatchment P-4: Subcat P-4

Runoff = 2.34 cfs @ 12.33 hrs, Volume= 12,771 cf, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
156	77	Woods, Good, HSG D
2,827	98	Paved parking, HSG B
56,148	61	>75% Grass cover, Good, HSG B
19,587	55	Woods, Good, HSG B
1,932	98	Paved parking, HSG C
47,810	74	>75% Grass cover, Good, HSG C
82,292	70	Woods, Good, HSG C
210,752	68	Weighted Average
205,993		97.74% Pervious Area
4,758		2.26% 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"
8.0	795	0.1100	1.66		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
20.5	845	Total			

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

Runoff = 0.76 cfs @ 12.10 hrs, Volume= 2,600 cf, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
8,875	61	>75% Grass cover, Good, HSG B
520	98	Paved parking, HSG C
26,382	74	>75% Grass cover, Good, HSG C
35,777	71	Weighted Average
35,258		98.55% Pervious Area
520		1.45% Impervious Area

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

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

Runoff = 1.38 cfs @ 12.09 hrs, Volume= 4,299 cf, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
4,728	98	Paved parking, HSG B
6,266	61	>75% Grass cover, Good, HSG B
10,183	98	Paved parking, HSG C
11,044	74	>75% Grass cover, Good, HSG C
32,221	83	Weighted Average
17,310		53.72% Pervious Area
14,911		46.28% Impervious Area

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

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

Runoff = 0.88 cfs @ 12.09 hrs, Volume= 2,753 cf, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
10,959	98	Paved parking, HSG B
9,216	61	>75% Grass cover, Good, HSG B
1,182	98	Paved parking, HSG C
233	74	>75% Grass cover, Good, HSG C
21,590	82	Weighted Average
9,449		43.77% Pervious Area
12,141		56.23% Impervious Area

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

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

Runoff = 0.40 cfs @ 12.09 hrs, Volume= 1,266 cf, Depth= 2.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
4,909	98	Paved parking, HSG C
1,329	74	>75% Grass cover, Good, HSG C
6,238	93	Weighted Average
1,329		21.30% Pervious Area
4,909		78.70% Impervious Area

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

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

Runoff = 2.23 cfs @ 12.09 hrs, Volume= 7,174 cf, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (sf)	CN	Description
67,736	74	>75% Grass cover, Good, HSG C
7,451	98	Paved parking, HSG C
1	70	Woods, Good, HSG C
75,187	76	Weighted Average
67,736		90.09% Pervious Area
7,451		9.91% Impervious Area

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

Summary for Reach SP-3: SP-3

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

Inflow Area = 189,224 sf, 19.30% Impervious, Inflow Depth = 1.28" for 2-year event
Inflow = 1.16 cfs @ 12.62 hrs, Volume= 20,223 cf
Outflow = 1.16 cfs @ 12.62 hrs, Volume= 20,223 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach SP-4: SP-4

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

Inflow Area = 381,765 sf, 11.71% Impervious, Inflow Depth = 0.53" for 2-year event
Inflow = 2.34 cfs @ 12.33 hrs, Volume= 16,956 cf
Outflow = 2.34 cfs @ 12.33 hrs, Volume= 16,956 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Pond cb-02: cb

Inflow Area = 21,590 sf, 56.23% Impervious, Inflow Depth = 1.53" for 2-year event
Inflow = 0.88 cfs @ 12.09 hrs, Volume= 2,753 cf
Outflow = 0.88 cfs @ 12.09 hrs, Volume= 2,753 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.88 cfs @ 12.09 hrs, Volume= 2,753 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 265.73' @ 12.09 hrs
Flood Elev= 268.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	265.25'	**12.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 265.25' / 264.50' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.88 cfs @ 12.09 hrs HW=265.73' TW=264.07' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.88 cfs @ 2.36 fps)

Summary for Pond cb-03: cb

Inflow Area = 32,221 sf, 46.28% Impervious, Inflow Depth = 1.60" for 2-year event
Inflow = 1.38 cfs @ 12.09 hrs, Volume= 4,299 cf
Outflow = 1.38 cfs @ 12.09 hrs, Volume= 4,299 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.38 cfs @ 12.09 hrs, Volume= 4,299 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 264.88' @ 12.74 hrs
Flood Elev= 268.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	264.25'	**15.0" Round Culvert** L= 46.0' Ke= 0.500 Inlet / Outlet Invert= 264.25' / 263.75' S= 0.0109 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.37 cfs @ 12.09 hrs HW=264.82' TW=264.07' (Dynamic Tailwater)
1=Culvert (Barrel Controls 1.37 cfs @ 3.69 fps)

Summary for Pond cb-05: cb

Inflow Area = 6,238 sf, 78.70% Impervious, Inflow Depth = 2.44" for 2-year event
Inflow = 0.40 cfs @ 12.09 hrs, Volume= 1,266 cf
Outflow = 0.40 cfs @ 12.09 hrs, Volume= 1,266 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.40 cfs @ 12.09 hrs, Volume= 1,266 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 261.11' @ 12.09 hrs
Flood Elev= 264.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.80'	**12.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 260.80' / 260.50' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.39 cfs @ 12.09 hrs HW=261.11' TW=260.26' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.39 cfs @ 1.90 fps)

Summary for Pond cb-06: cb

Inflow Area = 11,466 sf, 22.34% Impervious, Inflow Depth = 1.33" for 2-year event
Inflow = 0.40 cfs @ 12.09 hrs, Volume= 1,270 cf
Outflow = 0.40 cfs @ 12.09 hrs, Volume= 1,270 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.40 cfs @ 12.09 hrs, Volume= 1,270 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 256.61' @ 12.09 hrs
Flood Elev= 259.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	256.30'	**12.0" Round Culvert** L= 128.0' Ke= 0.500

Inlet / Outlet Invert= 256.30' / 249.80' S= 0.0508 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.40 cfs @ 12.09 hrs HW=256.61' TW=250.01' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.40 cfs @ 1.90 fps)

Summary for Pond cb-07a: cb

Inflow Area = 3,275 sf,100.00% Impervious, Inflow Depth = 2.96" for 2-year event
Inflow = 0.23 cfs @ 12.08 hrs, Volume= 807 cf
Outflow = 0.23 cfs @ 12.08 hrs, Volume= 807 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.23 cfs @ 12.08 hrs, Volume= 807 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 242.13' @ 12.08 hrs
Flood Elev= 245.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	241.89'	**12.0" Round Culvert** L= 11.0' Ke= 0.500 Inlet / Outlet Invert= 241.89' / 241.55' S= 0.0309 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.23 cfs @ 12.08 hrs HW=242.12' TW=241.51' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.23 cfs @ 1.65 fps)

Summary for Pond cb-07b: cb

Inflow Area = 6,772 sf, 50.52% Impervious, Inflow Depth = 1.83" for 2-year event
Inflow = 0.33 cfs @ 12.09 hrs, Volume= 1,031 cf
Outflow = 0.33 cfs @ 12.09 hrs, Volume= 1,031 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.33 cfs @ 12.09 hrs, Volume= 1,031 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 242.09' @ 12.09 hrs
Flood Elev= 245.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	241.80'	**12.0" Round Culvert** L= 19.0' Ke= 0.500 Inlet / Outlet Invert= 241.80' / 241.55' S= 0.0132 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.33 cfs @ 12.09 hrs HW=242.09' TW=241.51' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.33 cfs @ 2.65 fps)

Summary for Pond cb-08a: cb

Inflow Area = 7,921 sf, 49.94% Impervious, Inflow Depth = 1.83" for 2-year event
Inflow = 0.39 cfs @ 12.09 hrs, Volume= 1,206 cf
Outflow = 0.39 cfs @ 12.09 hrs, Volume= 1,206 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.39 cfs @ 12.09 hrs, Volume= 1,206 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 227.61' @ 12.09 hrs
Flood Elev= 230.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	227.30'	**12.0" Round Culvert** L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 227.30' / 226.80' S= 0.0417 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.39 cfs @ 12.09 hrs HW=227.61' TW=224.17' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.39 cfs @ 1.89 fps)

Summary for Pond cb-08b: cb

Inflow Area = 33,391 sf, 11.40% Impervious, Inflow Depth = 1.20" for 2-year event
Inflow = 1.05 cfs @ 12.09 hrs, Volume= 3,352 cf
Outflow = 1.05 cfs @ 12.09 hrs, Volume= 3,352 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.05 cfs @ 12.09 hrs, Volume= 3,352 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 227.83' @ 12.09 hrs
Flood Elev= 230.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	227.30'	**12.0" Round Culvert** L= 18.0' Ke= 0.500 Inlet / Outlet Invert= 227.30' / 226.80' S= 0.0278 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.04 cfs @ 12.09 hrs HW=227.83' TW=224.17' (Dynamic Tailwater)
1=Culvert (Inlet Controls 1.04 cfs @ 2.48 fps)

Summary for Pond cb-09a: cb

Inflow Area = 25,533 sf, 20.16% Impervious, Inflow Depth = 1.30" for 2-year event
Inflow = 0.85 cfs @ 12.09 hrs, Volume= 2,776 cf
Outflow = 0.85 cfs @ 12.09 hrs, Volume= 2,776 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.85 cfs @ 12.09 hrs, Volume= 2,776 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 218.65' @ 12.09 hrs
Flood Elev= 221.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	218.18'	**12.0" Round Culvert** L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 218.18' / 217.89' S= 0.0290 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.84 cfs @ 12.09 hrs HW=218.65' TW=218.02' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.84 cfs @ 2.33 fps)

Summary for Pond cb-09b: cb

Inflow Area = 23,285 sf, 12.45% Impervious, Inflow Depth = 1.15" for 2-year event
Inflow = 0.69 cfs @ 12.09 hrs, Volume= 2,222 cf
Outflow = 0.69 cfs @ 12.09 hrs, Volume= 2,222 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.69 cfs @ 12.09 hrs, Volume= 2,222 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 219.24' @ 12.09 hrs
Flood Elev= 222.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	218.80'	**12.0" Round Culvert** L= 37.0' Ke= 0.500 Inlet / Outlet Invert= 218.80' / 218.43' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.69 cfs @ 12.09 hrs HW=219.24' TW=218.65' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.69 cfs @ 3.08 fps)

Summary for Pond cb-10: cb

Inflow Area = 51,375 sf, 12.91% Impervious, Inflow Depth = 1.10" for 2-year event
Inflow = 1.06 cfs @ 12.19 hrs, Volume= 4,695 cf
Outflow = 1.06 cfs @ 12.19 hrs, Volume= 4,695 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.06 cfs @ 12.19 hrs, Volume= 4,695 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 208.99' @ 12.19 hrs
Flood Elev= 212.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	208.50'	**15.0" Round Culvert** L= 43.0' Ke= 0.500 Inlet / Outlet Invert= 208.50' / 208.00' S= 0.0116 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.06 cfs @ 12.19 hrs HW=208.99' TW=206.32' (Dynamic Tailwater)
1=Culvert (Inlet Controls 1.06 cfs @ 2.38 fps)

Summary for Pond cb-11a: cb

Inflow Area = 10,604 sf, 28.17% Impervious, Inflow Depth = 1.46" for 2-year event
Inflow = 0.41 cfs @ 12.09 hrs, Volume= 1,291 cf
Outflow = 0.41 cfs @ 12.09 hrs, Volume= 1,291 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.41 cfs @ 12.09 hrs, Volume= 1,291 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 234.46' @ 12.09 hrs
Flood Elev= 237.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.14'	**12.0" Round Culvert** L= 17.0' Ke= 0.500

Inlet / Outlet Invert= 234.14' / 233.80' S= 0.0200 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.41 cfs @ 12.09 hrs HW=234.46' TW=233.62' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.41 cfs @ 1.92 fps)

Summary for Pond cb-11b: cb

Inflow Area = 3,510 sf, 86.55% Impervious, Inflow Depth = 2.64" for 2-year event
Inflow = 0.24 cfs @ 12.08 hrs, Volume= 771 cf
Outflow = 0.24 cfs @ 12.08 hrs, Volume= 771 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.24 cfs @ 12.08 hrs, Volume= 771 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 234.34' @ 12.08 hrs
Flood Elev= 237.83'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.10'	**12.0" Round Culvert** L= 15.0' Ke= 0.500 Inlet / Outlet Invert= 234.10' / 233.80' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.23 cfs @ 12.08 hrs HW=234.34' TW=233.62' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.23 cfs @ 1.65 fps)

Summary for Pond DB1: DB1

Groundwater must be verified with test pit

Inflow Area = 189,224 sf, 19.30% Impervious, Inflow Depth = 1.28" for 2-year event
Inflow = 5.64 cfs @ 12.10 hrs, Volume= 20,238 cf
Outflow = 1.16 cfs @ 12.62 hrs, Volume= 20,223 cf, Atten= 79%, Lag= 31.3 min
Primary = 1.16 cfs @ 12.62 hrs, Volume= 20,223 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 206.76' @ 12.62 hrs Surf.Area= 5,021 sf Storage= 6,958 cf
Flood Elev= 210.00' Surf.Area= 9,766 sf Storage= 30,615 cf

Plug-Flow detention time= 84.9 min calculated for 20,217 cf (100% of inflow)
Center-of-Mass det. time= 84.9 min (927.5 - 842.5)

Volume	Invert	Avail.Storage	Storage Description
#1	205.00'	30,615 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)
205.00	2,930	279.0	0	0	2,930
206.00	4,095	304.0	3,496	3,496	4,126
208.00	6,730	355.0	10,716	14,213	6,880
210.00	9,766	405.0	16,402	30,615	9,998

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	205.00'	**6.0" Vert. Vertical Orifice** C= 0.600
#3	Device 1	207.90'	**24.0" Horiz. Horizonal Orifice** C= 0.600 Limited to weir flow at low heads
#4	Primary	209.00'	**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=1.16 cfs @ 12.62 hrs HW=206.76' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Passes 1.16 cfs of 6.06 cfs potential flow)
  - **2=Vertical Orifice** (Orifice Controls 1.16 cfs @ 5.92 fps)
  - **3=Horizonal Orifice** (Controls 0.00 cfs)
- **4=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 =	171,013 sf,	23.35% Impervious,	Inflow Depth =	0.94"	for 2-year event
Inflow =	2.65 cfs @	12.10 hrs,	Volume=	13,370 cf	
Outflow =	0.50 cfs @	14.04 hrs,	Volume=	13,370 cf,	Atten= 81%, Lag= 116.2 min
Discarded =	0.14 cfs @	14.04 hrs,	Volume=	9,184 cf	
Primary =	0.36 cfs @	14.04 hrs,	Volume=	4,185 cf	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 246.26' @ 14.04 hrs Surf.Area= 4,905 sf Storage= 5,308 cf
Flood Elev= 250.00' Surf.Area= 9,884 sf Storage= 32,513 cf

Plug-Flow detention time= 288.7 min calculated for 13,370 cf (100% of inflow)
Center-of-Mass det. time= 288.7 min (1,147.6 - 859.0)

Volume	Invert	Avail.Storage	Storage Description
#1	245.00'	32,513 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)
245.00	3,554	254.0	0	0	3,554
246.00	4,619	279.0	4,075	4,075	4,647
248.00	7,050	329.0	11,584	15,659	7,142
250.00	9,884	379.0	16,854	32,513	10,046

Device	Routing	Invert	Outlet Devices
#1	Primary	245.00'	**12.0" Round Culvert** L= 131.0' Ke= 0.500 Inlet / Outlet Invert= 245.00' / 237.80' S= 0.0550 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	246.00'	**6.0" Vert. Vertical Orifice** C= 0.600
#3	Device 1	246.00'	**6.0" Vert. Vertical Orifice** C= 0.600
#4	Device 1	247.70'	**24.0" Horiz. Horizontal Orifice** C= 0.600 Limited to weir flow at low heads
#5	Secondary	249.00'	**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	245.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 240.00' Phase-In= 0.01'

Discarded OutFlow Max=0.14 cfs @ 14.04 hrs HW=246.26' (Free Discharge)
└**6=Exfiltration** (Controls 0.14 cfs)

Primary OutFlow Max=0.36 cfs @ 14.04 hrs HW=246.26' TW=237.82' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.36 cfs of 3.29 cfs potential flow)
  ├**2=Vertical Orifice** (Orifice Controls 0.18 cfs @ 1.73 fps)
  ├**3=Vertical Orifice** (Orifice Controls 0.18 cfs @ 1.73 fps)
  └**4=Horizontal Orifice** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=245.00' TW=218.80' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DB3: DB3

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

Inflow Area =	89,589 sf,	30.78% Impervious,	Inflow Depth =	1.29"	for 2-year event
Inflow =	3.02 cfs @	12.09 hrs,	Volume=	9,652 cf	
Outflow =	0.43 cfs @	12.75 hrs,	Volume=	9,652 cf,	Atten= 86%, Lag= 39.6 min
Discarded =	0.07 cfs @	12.75 hrs,	Volume=	4,723 cf	
Primary =	0.35 cfs @	12.75 hrs,	Volume=	4,929 cf	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 264.87' @ 12.75 hrs Surf.Area= 2,785 sf Storage= 3,946 cf
Flood Elev= 268.00' Surf.Area= 5,752 sf Storage= 17,031 cf

Plug-Flow detention time= 246.3 min calculated for 9,652 cf (100% of inflow)
Center-of-Mass det. time= 246.3 min (1,090.9 - 844.6)

Volume	Invert	Avail.Storage	Storage Description
#1	263.00'	17,031 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)
263.00	1,483	151.0	0	0	1,483
264.00	2,137	176.0	1,800	1,800	2,154
266.00	3,744	266.0	5,806	7,606	5,350
268.00	5,752	277.0	9,424	17,031	6,072

Device	Routing	Invert	Outlet Devices
#1	Primary	263.00'	**24.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 263.00' / 262.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	264.00'	**4.0" Vert. Vertical Orifice** C= 0.600
#3	Device 1	266.30'	**24.0" Horiz. Horizontal Orifice** C= 0.600 Limited to weir flow at low heads
#4	Secondary	267.00'	**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
#5	Discarded	263.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 250.00' Phase-In= 0.01'

Discarded OutFlow Max=0.07 cfs @ 12.75 hrs HW=264.87' (Free Discharge)
└**5=Exfiltration** (Controls 0.07 cfs)

Primary OutFlow Max=0.35 cfs @ 12.75 hrs HW=264.87' TW=260.25' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.35 cfs of 14.26 cfs potential flow)
  ├**2=Vertical Orifice** (Orifice Controls 0.35 cfs @ 4.05 fps)
  └**3=Horizontal Orifice** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=263.00' TW=260.80' (Dynamic Tailwater)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DB4: DB4

Groundwater must be verified with test pit

Inflow Area = 48,251 sf, 7.27% Impervious, Inflow Depth = 0.98" for 2-year event
Inflow = 1.02 cfs @ 12.15 hrs, Volume= 3,926 cf
Outflow = 0.94 cfs @ 12.20 hrs, Volume= 3,926 cf, Atten= 8%, Lag= 3.0 min
Primary = 0.94 cfs @ 12.20 hrs, Volume= 3,926 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 209.48' @ 12.21 hrs Surf.Area= 599 sf Storage= 247 cf
Flood Elev= 212.00' Surf.Area= 1,900 sf Storage= 3,240 cf

Plug-Flow detention time= 11.2 min calculated for 3,925 cf (100% of inflow)
Center-of-Mass det. time= 11.5 min (881.0 - 869.5)

Volume	Invert	Avail.Storage	Storage Description
#1	209.00'	3,240 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)
209.00	433	86.0	0	0	433
212.00	1,900	161.0	3,240	3,240	1,953

Device	Routing	Invert	Outlet Devices
#1	Primary	209.00'	**15.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 209.00' / 208.60' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Primary	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=0.94 cfs @ 12.20 hrs HW=209.48' TW=208.99' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.94 cfs @ 3.19 fps)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond dmh-03: dmh

Inflow Area = 95,827 sf, 33.90% Impervious, Inflow Depth = 0.78" for 2-year event
Inflow = 0.47 cfs @ 12.15 hrs, Volume= 6,195 cf
Outflow = 0.47 cfs @ 12.15 hrs, Volume= 6,195 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.47 cfs @ 12.15 hrs, Volume= 6,195 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 260.28' @ 12.15 hrs
Flood Elev= 264.22'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.00'	**24.0" Round Culvert** L= 96.0' Ke= 0.500 Inlet / Outlet Invert= 260.00' / 256.80' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=0.47 cfs @ 12.15 hrs HW=260.28' TW=252.10' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.47 cfs @ 1.79 fps)

Summary for Pond dmh-04: dmh

Inflow Area = 11,466 sf, 22.34% Impervious, Inflow Depth = 1.33" for 2-year event
Inflow = 0.40 cfs @ 12.09 hrs, Volume= 1,270 cf
Outflow = 0.40 cfs @ 12.09 hrs, Volume= 1,270 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.40 cfs @ 12.09 hrs, Volume= 1,270 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Peak Elev= 250.01' @ 12.09 hrs
Flood Elev= 253.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	249.70'	**12.0" Round Culvert** L= 136.0' Ke= 0.500 Inlet / Outlet Invert= 249.70' / 241.30' S= 0.0618 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.40 cfs @ 12.09 hrs HW=250.01' TW=241.51' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.40 cfs @ 1.90 fps)

Summary for Pond dmh-05: dmh

Inflow Area = 21,513 sf, 43.03% Impervious, Inflow Depth = 1.73" for 2-year event
Inflow = 0.97 cfs @ 12.09 hrs, Volume= 3,108 cf
Outflow = 0.97 cfs @ 12.09 hrs, Volume= 3,108 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.97 cfs @ 12.09 hrs, Volume= 3,108 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 241.52' @ 12.09 hrs
Flood Elev= 245.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	241.05'	**15.0" Round Culvert** L= 153.0' Ke= 0.500 Inlet / Outlet Invert= 241.05' / 233.30' S= 0.0507 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.96 cfs @ 12.09 hrs HW=241.51' TW=233.62' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.96 cfs @ 2.32 fps)

Summary for Pond dmh-06: dmh

Inflow Area = 35,627 sf, 42.89% Impervious, Inflow Depth = 1.74" for 2-year event
Inflow = 1.62 cfs @ 12.09 hrs, Volume= 5,170 cf
Outflow = 1.62 cfs @ 12.09 hrs, Volume= 5,170 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.62 cfs @ 12.09 hrs, Volume= 5,170 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 233.63' @ 12.09 hrs
Flood Elev= 237.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	233.05'	**18.0" Round Culvert** L= 149.0' Ke= 0.500 Inlet / Outlet Invert= 233.05' / 226.30' S= 0.0453 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=1.60 cfs @ 12.09 hrs HW=233.62' TW=224.17' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 1.60 cfs @ 2.58 fps)

Summary for Pond dmh-07: dmh

Inflow Area = 76,939 sf, 29.95% Impervious, Inflow Depth = 1.52" for 2-year event
Inflow = 3.05 cfs @ 12.09 hrs, Volume= 9,728 cf
Outflow = 3.05 cfs @ 12.09 hrs, Volume= 9,728 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.05 cfs @ 12.09 hrs, Volume= 9,728 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 224.17' @ 12.09 hrs
Flood Elev= 230.44'

Device	Routing	Invert	Outlet Devices
#1	Primary	223.35'	**18.0" Round Culvert** L= 188.0' Ke= 0.500 Inlet / Outlet Invert= 223.35' / 217.64' S= 0.0304 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=3.03 cfs @ 12.09 hrs HW=224.17' TW=218.02' (Dynamic Tailwater)
1=Culvert (Inlet Controls 3.03 cfs @ 3.08 fps)

Summary for Pond dmh-08: dmh

Inflow Area = 102,472 sf, 27.51% Impervious, Inflow Depth = 1.46" for 2-year event
Inflow = 3.90 cfs @ 12.09 hrs, Volume= 12,504 cf
Outflow = 3.90 cfs @ 12.09 hrs, Volume= 12,504 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.90 cfs @ 12.09 hrs, Volume= 12,504 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 218.02' @ 12.09 hrs
Flood Elev= 221.85'

Device	Routing	Invert	Outlet Devices
#1	Primary	217.14'	**24.0" Round Culvert** L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 217.14' / 216.88' S= 0.0260 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=3.87 cfs @ 12.09 hrs HW=218.02' TW=210.64' (Dynamic Tailwater)
1=Culvert (Barrel Controls 3.87 cfs @ 4.28 fps)

Summary for Pond dmh-09: dmh

Inflow Area = 95,827 sf, 33.90% Impervious, Inflow Depth = 0.78" for 2-year event
Inflow = 0.47 cfs @ 12.15 hrs, Volume= 6,195 cf
Outflow = 0.47 cfs @ 12.15 hrs, Volume= 6,195 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.47 cfs @ 12.15 hrs, Volume= 6,195 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 252.10' @ 12.15 hrs
Flood Elev= 261.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.82'	**24.0" Round Culvert** L= 96.0' Ke= 0.500

Inlet / Outlet Invert= 251.82' / 247.00' S= 0.0502 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=0.47 cfs @ 12.15 hrs HW=252.10' TW=245.51' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.47 cfs @ 1.79 fps)

Summary for Pond dmh-10: dmh

Inflow Area = 171,013 sf, 23.35% Impervious, Inflow Depth = 0.29" for 2-year event
Inflow = 0.36 cfs @ 14.04 hrs, Volume= 4,185 cf
Outflow = 0.36 cfs @ 14.04 hrs, Volume= 4,185 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.36 cfs @ 14.04 hrs, Volume= 4,185 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 237.82' @ 14.04 hrs
Flood Elev= 251.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	237.55'	**15.0" Round Culvert** L= 161.0' Ke= 0.500 Inlet / Outlet Invert= 237.55' / 235.80' S= 0.0109 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.36 cfs @ 14.04 hrs HW=237.82' TW=231.14' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.36 cfs @ 1.78 fps)

Summary for Pond dmh-11: dmh

Inflow Area = 171,013 sf, 23.35% Impervious, Inflow Depth = 0.29" for 2-year event
Inflow = 0.36 cfs @ 14.04 hrs, Volume= 4,185 cf
Outflow = 0.36 cfs @ 14.04 hrs, Volume= 4,185 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.36 cfs @ 14.04 hrs, Volume= 4,185 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 231.14' @ 14.04 hrs
Flood Elev= 239.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	230.87'	**15.0" Round Culvert** L= 37.0' Ke= 0.500 Inlet / Outlet Invert= 230.87' / 229.00' S= 0.0505 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.36 cfs @ 14.04 hrs HW=231.14' TW=229.04' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.36 cfs @ 1.78 fps)

Summary for Pond dmh-12: dmh

Inflow Area = 102,472 sf, 27.51% Impervious, Inflow Depth = 1.46" for 2-year event
Inflow = 3.90 cfs @ 12.09 hrs, Volume= 12,504 cf
Outflow = 3.90 cfs @ 12.09 hrs, Volume= 12,504 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.90 cfs @ 12.09 hrs, Volume= 12,504 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 210.64' @ 12.09 hrs
Flood Elev= 220.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	209.80'	**24.0" Round Culvert** L= 72.0' Ke= 0.500 Inlet / Outlet Invert= 209.80' / 208.00' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=3.87 cfs @ 12.09 hrs HW=210.64' TW=205.97' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 3.87 cfs @ 3.11 fps)

Summary for Pond G: gabion

Inflow Area = 171,013 sf, 23.35% Impervious, Inflow Depth = 0.29" for 2-year event
Inflow = 0.36 cfs @ 14.04 hrs, Volume= 4,185 cf
Outflow = 0.36 cfs @ 14.04 hrs, Volume= 4,185 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.36 cfs @ 14.04 hrs, Volume= 4,185 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 229.04' @ 14.04 hrs Surf.Area= 13 sf Storage= 0 cf
Flood Elev= 230.25' Surf.Area= 0 sf Storage= 37 cf

Plug-Flow detention time= 0.0 min calculated for 4,184 cf (100% of inflow)
Center-of-Mass det. time= 0.0 min (901.3 - 901.3)

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. 3" outlet holes X 30.00** C= 0.600
#2	Primary	229.00'	**2.0" Horiz. 2" outlet holes X 30.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.36 cfs @ 14.04 hrs HW=229.04' TW=0.00' (Dynamic Tailwater)
└**1=3" outlet holes** (Controls 0.00 cfs)
└**2=2" outlet holes** (Weir Controls 0.36 cfs @ 0.62 fps)

Time span=0.00-72.00 hrs, dt=0.02 hrs, 3601 points
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=250,444 sf 2.13% Impervious Runoff Depth=2.03"
Flow Length=844' Tc=16.3 min CN=72 Runoff=9.84 cfs 42,364 cf

Subcatchment P-2: Subcat P-2 Runoff Area=7,960 sf 0.00% Impervious Runoff Depth=1.87"
Flow Length=81' Tc=13.0 min CN=70 Runoff=0.31 cfs 1,243 cf

Subcatchment P-3A: Subcat P-3A Runoff Area=48,251 sf 7.27% Impervious Runoff Depth=2.11"
Flow Length=511' Tc=10.2 min CN=73 Runoff=2.35 cfs 8,481 cf

Subcatchment P-3B: Subcat P-3B Runoff Area=11,466 sf 22.34% Impervious Runoff Depth=2.61"
Tc=6.0 min CN=79 Runoff=0.81 cfs 2,497 cf

Subcatchment P-3C: Subcat P-3C Runoff Area=3,275 sf 100.00% Impervious Runoff Depth=4.54"
Tc=6.0 min CN=98 Runoff=0.35 cfs 1,240 cf

Subcatchment P-3D: Subcat P-3D Runoff Area=6,772 sf 50.52% Impervious Runoff Depth=3.26"
Tc=6.0 min CN=86 Runoff=0.59 cfs 1,841 cf

Subcatchment P-3E: Subcat P-3E Runoff Area=10,604 sf 28.17% Impervious Runoff Depth=2.79"
Tc=6.0 min CN=81 Runoff=0.80 cfs 2,467 cf

Subcatchment P-3F: Subcat P-3F Runoff Area=3,510 sf 86.55% Impervious Runoff Depth=4.20"
Tc=6.0 min CN=95 Runoff=0.37 cfs 1,229 cf

Subcatchment P-3G: Subcat P-3G Runoff Area=7,921 sf 49.94% Impervious Runoff Depth=3.26"
Tc=6.0 min CN=86 Runoff=0.69 cfs 2,153 cf

Subcatchment P-3H: Subcat P-3H Runoff Area=33,391 sf 11.40% Impervious Runoff Depth=2.44"
Tc=6.0 min CN=77 Runoff=2.19 cfs 6,790 cf

Subcatchment P-3I: Subcat P-3I Runoff Area=23,285 sf 12.45% Impervious Runoff Depth=2.36"
Tc=6.0 min CN=76 Runoff=1.47 cfs 4,571 cf

Subcatchment P-3J: Subcat P-3J Runoff Area=2,248 sf 100.00% Impervious Runoff Depth=4.54"
Tc=6.0 min CN=98 Runoff=0.24 cfs 851 cf

Subcatchment P-3K: Subcat P-3K Runoff Area=3,123 sf 100.00% Impervious Runoff Depth=4.54"
Tc=6.0 min CN=98 Runoff=0.33 cfs 1,183 cf

Subcatchment P-3L: Subcat P-3L Runoff Area=35,377 sf 4.79% Impervious Runoff Depth=2.19"
Tc=6.0 min CN=74 Runoff=2.07 cfs 6,456 cf

Subcatchment P-4: Subcat P-4 Runoff Area=210,752 sf 2.26% Impervious Runoff Depth=1.72"
Flow Length=845' Tc=20.5 min CN=68 Runoff=6.26 cfs 30,289 cf

Subcatchment P-4A: Subcat P-4A Runoff Area=35,777 sf 1.45% Impervious Runoff Depth=1.95"
Tc=6.0 min CN=71 Runoff=1.84 cfs 5,819 cf

Subcatchment P-4B: Subcat P-4B Runoff Area=32,221 sf 46.28% Impervious Runoff Depth=2.98"
Tc=6.0 min CN=83 Runoff=2.57 cfs 7,990 cf

Subcatchment P-4C: Subcat P-4C Runoff Area=21,590 sf 56.23% Impervious Runoff Depth=2.88"
Tc=6.0 min CN=82 Runoff=1.67 cfs 5,187 cf

Subcatchment P-4D: Subcat P-4D Runoff Area=6,238 sf 78.70% Impervious Runoff Depth=3.98"
Tc=6.0 min CN=93 Runoff=0.63 cfs 2,070 cf

Subcatchment P-4E: Subcat P-4E Runoff Area=75,187 sf 9.91% Impervious Runoff Depth=2.36"
Tc=6.0 min CN=76 Runoff=4.74 cfs 14,758 cf

Reach SP-3: SP-3 Inflow=3.17 cfs 39,743 cf
Outflow=3.17 cfs 39,743 cf

Reach SP-4: SP-4 Inflow=7.28 cfs 49,060 cf
Outflow=7.28 cfs 49,060 cf

Pond cb-02: cb Peak Elev=266.27' Inflow=1.67 cfs 5,187 cf
12.0" Round Culvert n=0.013 L=50.0' S=0.0150 '/' Outflow=1.67 cfs 5,187 cf

Pond cb-03: cb Peak Elev=266.27' Inflow=2.57 cfs 7,990 cf
15.0" Round Culvert n=0.013 L=46.0' S=0.0109 '/' Outflow=2.57 cfs 7,990 cf

Pond cb-05: cb Peak Elev=261.20' Inflow=0.63 cfs 2,070 cf
12.0" Round Culvert n=0.013 L=20.0' S=0.0150 '/' Outflow=0.63 cfs 2,070 cf

Pond cb-06: cb Peak Elev=256.76' Inflow=0.81 cfs 2,497 cf
12.0" Round Culvert n=0.013 L=128.0' S=0.0508 '/' Outflow=0.81 cfs 2,497 cf

Pond cb-07a: cb Peak Elev=242.18' Inflow=0.35 cfs 1,240 cf
12.0" Round Culvert n=0.013 L=11.0' S=0.0309 '/' Outflow=0.35 cfs 1,240 cf

Pond cb-07b: cb Peak Elev=242.20' Inflow=0.59 cfs 1,841 cf
12.0" Round Culvert n=0.013 L=19.0' S=0.0132 '/' Outflow=0.59 cfs 1,841 cf

Pond cb-08a: cb Peak Elev=227.72' Inflow=0.69 cfs 2,153 cf
12.0" Round Culvert n=0.013 L=12.0' S=0.0417 '/' Outflow=0.69 cfs 2,153 cf

Pond cb-08b: cb Peak Elev=228.14' Inflow=2.19 cfs 6,790 cf
12.0" Round Culvert n=0.013 L=18.0' S=0.0278 '/' Outflow=2.19 cfs 6,790 cf

Pond cb-09a: cb Peak Elev=218.89' Inflow=1.71 cfs 5,422 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0290 '/' Outflow=1.71 cfs 5,422 cf

Pond cb-09b: cb Peak Elev=219.48' Inflow=1.47 cfs 4,571 cf
12.0" Round Culvert n=0.013 L=37.0' S=0.0100 '/' Outflow=1.47 cfs 4,571 cf

Pond cb-10: cb Peak Elev=209.28' Inflow=2.37 cfs 9,664 cf
15.0" Round Culvert n=0.013 L=43.0' S=0.0116 '/' Outflow=2.37 cfs 9,664 cf

Pond cb-11a: cb Peak Elev=234.59' Inflow=0.80 cfs 2,467 cf
12.0" Round Culvert n=0.013 L=17.0' S=0.0200 '/' Outflow=0.80 cfs 2,467 cf

Pond cb-11b: cb Peak Elev=234.40' Inflow=0.37 cfs 1,229 cf
12.0" Round Culvert n=0.013 L=15.0' S=0.0200 '/' Outflow=0.37 cfs 1,229 cf

Pond DB1: DB1 Peak Elev=208.08' Storage=14,760 cf Inflow=11.41 cfs 39,759 cf
Outflow=3.17 cfs 39,743 cf

Pond DB2: DB2 Peak Elev=246.70' Storage=7,575 cf Inflow=5.79 cfs 30,002 cf
Discarded=0.16 cfs 11,231 cf Primary=1.27 cfs 18,771 cf Secondary=0.00 cfs 0 cf Outflow=1.43 cfs 30,002 cf

Pond DB3: DB3 Peak Elev=266.27' Storage=8,650 cf Inflow=6.08 cfs 18,996 cf
Discarded=0.11 cfs 5,822 cf Primary=0.61 cfs 13,174 cf Secondary=0.00 cfs 0 cf Outflow=0.72 cfs 18,996 cf

Pond DB4: DB4 Peak Elev=209.80' Storage=460 cf Inflow=2.35 cfs 8,481 cf
Outflow=2.17 cfs 8,481 cf

Pond dmh-03: dmh Peak Elev=260.42' Inflow=1.05 cfs 15,244 cf
24.0" Round Culvert n=0.013 L=96.0' S=0.0333 '/' Outflow=1.05 cfs 15,244 cf

Pond dmh-04: dmh Peak Elev=250.16' Inflow=0.81 cfs 2,497 cf
12.0" Round Culvert n=0.013 L=136.0' S=0.0618 '/' Outflow=0.81 cfs 2,497 cf

Pond dmh-05: dmh Peak Elev=241.69' Inflow=1.74 cfs 5,578 cf
15.0" Round Culvert n=0.013 L=153.0' S=0.0507 '/' Outflow=1.74 cfs 5,578 cf

Pond dmh-06: dmh Peak Elev=233.85' Inflow=2.90 cfs 9,274 cf
18.0" Round Culvert n=0.013 L=149.0' S=0.0453 '/' Outflow=2.90 cfs 9,274 cf

Pond dmh-07: dmh Peak Elev=224.57' Inflow=5.78 cfs 18,217 cf
18.0" Round Culvert n=0.013 L=188.0' S=0.0304 '/' Outflow=5.78 cfs 18,217 cf

Pond dmh-08: dmh Peak Elev=218.46' Inflow=7.49 cfs 23,639 cf
24.0" Round Culvert n=0.013 L=10.0' S=0.0260 '/' Outflow=7.49 cfs 23,639 cf

Pond dmh-09: dmh Peak Elev=252.24' Inflow=1.05 cfs 15,244 cf
24.0" Round Culvert n=0.013 L=96.0' S=0.0502 '/' Outflow=1.05 cfs 15,244 cf

Pond dmh-10: dmh Peak Elev=238.09' Inflow=1.27 cfs 18,771 cf
15.0" Round Culvert n=0.013 L=161.0' S=0.0109 '/' Outflow=1.27 cfs 18,771 cf

Pond dmh-11: dmh Peak Elev=231.41' Inflow=1.27 cfs 18,771 cf
15.0" Round Culvert n=0.013 L=37.0' S=0.0505 '/' Outflow=1.27 cfs 18,771 cf

Pond dmh-12: dmh Peak Elev=211.01' Inflow=7.49 cfs 23,639 cf
24.0" Round Culvert n=0.013 L=72.0' S=0.0250 '/' Outflow=7.49 cfs 23,639 cf

Pond G: gabion Peak Elev=229.16' Storage=3 cf Inflow=1.27 cfs 18,771 cf
Outflow=1.27 cfs 18,771 cf

Total Runoff Area = 829,392 sf Runoff Volume = 149,479 cf Average Runoff Depth = 2.16"
89.57% Pervious = 742,861 sf 10.43% Impervious = 86,531 sf

Summary for Subcatchment P-1: Subcat P-1

Runoff = 9.84 cfs @ 12.23 hrs, Volume= 42,364 cf, Depth= 2.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
4,841	98	Paved parking, HSG B
45,769	55	Woods, Good, HSG B
14,862	61	>75% Grass cover, Good, HSG B
24,002	80	>75% Grass cover, Good, HSG D
482	98	Paved parking, HSG D
131,956	77	Woods, Good, HSG D
7,031	74	>75% Grass cover, Good, HSG C
21,502	70	Woods, Good, HSG C
250,444	72	Weighted Average
245,121		97.87% Pervious Area
5,322		2.13% 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 = 0.31 cfs @ 12.19 hrs, Volume= 1,243 cf, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
7,044	70	Woods, Good, HSG C
916	74	>75% Grass cover, Good, HSG C
7,960	70	Weighted Average
7,960		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 = 2.35 cfs @ 12.15 hrs, Volume= 8,481 cf, Depth= 2.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
3,510	98	Paved parking, HSG C
28,784	70	Woods, Good, HSG C
15,958	74	>75% Grass cover, Good, HSG C
48,251	73	Weighted Average
44,742		92.73% Pervious Area
3,510		7.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0900	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
2.9	313	0.1300	1.80		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.4	148	0.0600	5.75	11.51	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=0.50' Z= 4.0 '/' Top.W=6.00' n= 0.030 Earth, grassed & winding
10.2	511	Total			

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

Runoff = 0.81 cfs @ 12.09 hrs, Volume= 2,497 cf, Depth= 2.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
8,905	74	>75% Grass cover, Good, HSG C
2,561	98	Paved parking, HSG C
11,466	79	Weighted Average
8,905		77.66% Pervious Area
2,561		22.34% Impervious Area

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

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

Runoff = 0.35 cfs @ 12.08 hrs, Volume= 1,240 cf, Depth= 4.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
3,275	98	Paved parking, HSG C
3,275		100.00% Impervious Area

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

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

Runoff = 0.59 cfs @ 12.09 hrs, Volume= 1,841 cf, Depth= 3.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
3,351	74	>75% Grass cover, Good, HSG C
3,421	98	Paved parking, HSG C
6,772	86	Weighted Average
3,351		49.48% Pervious Area
3,421		50.52% Impervious Area

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

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

Runoff = 0.80 cfs @ 12.09 hrs, Volume= 2,467 cf, Depth= 2.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
7,617	74	>75% Grass cover, Good, HSG C
2,987	98	Paved parking, HSG C
10,604	81	Weighted Average
7,617		71.83% Pervious Area
2,987		28.17% Impervious Area

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

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

Runoff = 0.37 cfs @ 12.08 hrs, Volume= 1,229 cf, Depth= 4.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
472	74	>75% Grass cover, Good, HSG C
3,038	98	Paved parking, HSG C
3,510	95	Weighted Average
472		13.45% Pervious Area
3,038		86.55% Impervious Area

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

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

Runoff = 0.69 cfs @ 12.09 hrs, Volume= 2,153 cf, Depth= 3.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
3,965	74	>75% Grass cover, Good, HSG C
3,956	98	Paved parking, HSG C
7,921	86	Weighted Average
3,965		50.06% Pervious Area
3,956		49.94% Impervious Area

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

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

Runoff = 2.19 cfs @ 12.09 hrs, Volume= 6,790 cf, Depth= 2.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
29,484	74	>75% Grass cover, Good, HSG C
3,806	98	Paved parking, HSG C
100	70	Woods, Good, HSG C
33,391	77	Weighted Average
29,585		88.60% Pervious Area
3,806		11.40% Impervious Area

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

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

Runoff = 1.47 cfs @ 12.09 hrs, Volume= 4,571 cf, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
2,899	98	Paved parking, HSG C
3,195	70	Woods, Good, HSG C
17,191	74	>75% Grass cover, Good, HSG C
23,285	76	Weighted Average
20,386		87.55% Pervious Area
2,899		12.45% Impervious Area

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

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

Runoff = 0.24 cfs @ 12.08 hrs, Volume= 851 cf, Depth= 4.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
2,248	98	Paved parking, HSG C
2,248		100.00% Impervious Area

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

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

Runoff = 0.33 cfs @ 12.08 hrs, Volume= 1,183 cf, Depth= 4.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
3,123	98	Paved parking, HSG C
3,123		100.00% Impervious Area

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

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

Runoff = 2.07 cfs @ 12.09 hrs, Volume= 6,456 cf, Depth= 2.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
1,694	98	Paved parking, HSG C
7,044	70	Woods, Good, HSG C
26,638	74	>75% Grass cover, Good, HSG C
35,377	74	Weighted Average
33,682		95.21% Pervious Area
1,694		4.79% Impervious Area

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

Summary for Subcatchment P-4: Subcat P-4

Runoff = 6.26 cfs @ 12.30 hrs, Volume= 30,289 cf, Depth= 1.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
156	77	Woods, Good, HSG D
2,827	98	Paved parking, HSG B
56,148	61	>75% Grass cover, Good, HSG B
19,587	55	Woods, Good, HSG B
1,932	98	Paved parking, HSG C
47,810	74	>75% Grass cover, Good, HSG C
82,292	70	Woods, Good, HSG C
210,752	68	Weighted Average
205,993		97.74% Pervious Area
4,758		2.26% 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"
8.0	795	0.1100	1.66		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
20.5	845	Total			

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

Runoff = 1.84 cfs @ 12.09 hrs, Volume= 5,819 cf, Depth= 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
8,875	61	>75% Grass cover, Good, HSG B
520	98	Paved parking, HSG C
26,382	74	>75% Grass cover, Good, HSG C
35,777	71	Weighted Average
35,258		98.55% Pervious Area
520		1.45% Impervious Area

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

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

Runoff = 2.57 cfs @ 12.09 hrs, Volume= 7,990 cf, Depth= 2.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
4,728	98	Paved parking, HSG B
6,266	61	>75% Grass cover, Good, HSG B
10,183	98	Paved parking, HSG C
11,044	74	>75% Grass cover, Good, HSG C
32,221	83	Weighted Average
17,310		53.72% Pervious Area
14,911		46.28% Impervious Area

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

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

Runoff = 1.67 cfs @ 12.09 hrs, Volume= 5,187 cf, Depth= 2.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
10,959	98	Paved parking, HSG B
9,216	61	>75% Grass cover, Good, HSG B
1,182	98	Paved parking, HSG C
233	74	>75% Grass cover, Good, HSG C
21,590	82	Weighted Average
9,449		43.77% Pervious Area
12,141		56.23% Impervious Area

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

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

Runoff = 0.63 cfs @ 12.08 hrs, Volume= 2,070 cf, Depth= 3.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
4,909	98	Paved parking, HSG C
1,329	74	>75% Grass cover, Good, HSG C
6,238	93	Weighted Average
1,329		21.30% Pervious Area
4,909		78.70% Impervious Area

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

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

Runoff = 4.74 cfs @ 12.09 hrs, Volume= 14,758 cf, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-year Rainfall=4.78"

Area (sf)	CN	Description
67,736	74	>75% Grass cover, Good, HSG C
7,451	98	Paved parking, HSG C
1	70	Woods, Good, HSG C
75,187	76	Weighted Average
67,736		90.09% Pervious Area
7,451		9.91% Impervious Area

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

Summary for Reach SP-3: SP-3

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

Inflow Area = 189,224 sf, 19.30% Impervious, Inflow Depth = 2.52" for 10-year event
Inflow = 3.17 cfs @ 12.52 hrs, Volume= 39,743 cf
Outflow = 3.17 cfs @ 12.52 hrs, Volume= 39,743 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach SP-4: SP-4

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

Inflow Area = 381,765 sf, 11.71% Impervious, Inflow Depth = 1.54" for 10-year event
Inflow = 7.28 cfs @ 12.32 hrs, Volume= 49,060 cf
Outflow = 7.28 cfs @ 12.32 hrs, Volume= 49,060 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Pond cb-02: cb

Inflow Area = 21,590 sf, 56.23% Impervious, Inflow Depth = 2.88" for 10-year event
Inflow = 1.67 cfs @ 12.09 hrs, Volume= 5,187 cf
Outflow = 1.67 cfs @ 12.09 hrs, Volume= 5,187 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.67 cfs @ 12.09 hrs, Volume= 5,187 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 266.27' @ 12.85 hrs
Flood Elev= 268.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	265.25'	**12.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 265.25' / 264.50' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.66 cfs @ 12.09 hrs HW=265.95' TW=265.15' (Dynamic Tailwater)
1=Culvert (Inlet Controls 1.66 cfs @ 2.84 fps)

Summary for Pond cb-03: cb

Inflow Area = 32,221 sf, 46.28% Impervious, Inflow Depth = 2.98" for 10-year event
Inflow = 2.57 cfs @ 12.09 hrs, Volume= 7,990 cf
Outflow = 2.57 cfs @ 12.09 hrs, Volume= 7,990 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.57 cfs @ 12.09 hrs, Volume= 7,990 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 266.27' @ 12.85 hrs
Flood Elev= 268.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	264.25'	**15.0" Round Culvert** L= 46.0' Ke= 0.500 Inlet / Outlet Invert= 264.25' / 263.75' S= 0.0109 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.98 cfs @ 12.09 hrs HW=265.34' TW=265.15' (Dynamic Tailwater)
1=Culvert (Outlet Controls 1.98 cfs @ 2.32 fps)

Summary for Pond cb-05: cb

Inflow Area = 6,238 sf, 78.70% Impervious, Inflow Depth = 3.98" for 10-year event
Inflow = 0.63 cfs @ 12.08 hrs, Volume= 2,070 cf
Outflow = 0.63 cfs @ 12.08 hrs, Volume= 2,070 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.63 cfs @ 12.08 hrs, Volume= 2,070 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 261.20' @ 12.08 hrs
Flood Elev= 264.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.80'	**12.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 260.80' / 260.50' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.63 cfs @ 12.08 hrs HW=261.20' TW=260.42' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.63 cfs @ 3.18 fps)

Summary for Pond cb-06: cb

Inflow Area = 11,466 sf, 22.34% Impervious, Inflow Depth = 2.61" for 10-year event
Inflow = 0.81 cfs @ 12.09 hrs, Volume= 2,497 cf
Outflow = 0.81 cfs @ 12.09 hrs, Volume= 2,497 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.81 cfs @ 12.09 hrs, Volume= 2,497 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 256.76' @ 12.09 hrs
Flood Elev= 259.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	256.30'	**12.0" Round Culvert** L= 128.0' Ke= 0.500

Inlet / Outlet Invert= 256.30' / 249.80' S= 0.0508 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.80 cfs @ 12.09 hrs HW=256.76' TW=250.16' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.80 cfs @ 2.30 fps)

Summary for Pond cb-07a: cb

Inflow Area = 3,275 sf,100.00% Impervious, Inflow Depth = 4.54" for 10-year event
Inflow = 0.35 cfs @ 12.08 hrs, Volume= 1,240 cf
Outflow = 0.35 cfs @ 12.08 hrs, Volume= 1,240 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.35 cfs @ 12.08 hrs, Volume= 1,240 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 242.18' @ 12.08 hrs
Flood Elev= 245.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	241.89'	**12.0" Round Culvert** L= 11.0' Ke= 0.500 Inlet / Outlet Invert= 241.89' / 241.55' S= 0.0309 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.35 cfs @ 12.08 hrs HW=242.18' TW=241.69' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.35 cfs @ 1.84 fps)

Summary for Pond cb-07b: cb

Inflow Area = 6,772 sf, 50.52% Impervious, Inflow Depth = 3.26" for 10-year event
Inflow = 0.59 cfs @ 12.09 hrs, Volume= 1,841 cf
Outflow = 0.59 cfs @ 12.09 hrs, Volume= 1,841 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.59 cfs @ 12.09 hrs, Volume= 1,841 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 242.20' @ 12.09 hrs
Flood Elev= 245.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	241.80'	**12.0" Round Culvert** L= 19.0' Ke= 0.500 Inlet / Outlet Invert= 241.80' / 241.55' S= 0.0132 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.58 cfs @ 12.09 hrs HW=242.19' TW=241.69' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.58 cfs @ 2.99 fps)

Summary for Pond cb-08a: cb

Inflow Area = 7,921 sf, 49.94% Impervious, Inflow Depth = 3.26" for 10-year event
Inflow = 0.69 cfs @ 12.09 hrs, Volume= 2,153 cf
Outflow = 0.69 cfs @ 12.09 hrs, Volume= 2,153 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.69 cfs @ 12.09 hrs, Volume= 2,153 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 227.72' @ 12.09 hrs
Flood Elev= 230.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	227.30'	**12.0" Round Culvert** L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 227.30' / 226.80' S= 0.0417 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.68 cfs @ 12.09 hrs HW=227.72' TW=224.56' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.68 cfs @ 2.20 fps)

Summary for Pond cb-08b: cb

Inflow Area = 33,391 sf, 11.40% Impervious, Inflow Depth = 2.44" for 10-year event
Inflow = 2.19 cfs @ 12.09 hrs, Volume= 6,790 cf
Outflow = 2.19 cfs @ 12.09 hrs, Volume= 6,790 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.19 cfs @ 12.09 hrs, Volume= 6,790 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 228.14' @ 12.09 hrs
Flood Elev= 230.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	227.30'	**12.0" Round Culvert** L= 18.0' Ke= 0.500 Inlet / Outlet Invert= 227.30' / 226.80' S= 0.0278 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.17 cfs @ 12.09 hrs HW=228.13' TW=224.56' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 2.17 cfs @ 3.11 fps)

Summary for Pond cb-09a: cb

Inflow Area = 25,533 sf, 20.16% Impervious, Inflow Depth = 2.55" for 10-year event
Inflow = 1.71 cfs @ 12.09 hrs, Volume= 5,422 cf
Outflow = 1.71 cfs @ 12.09 hrs, Volume= 5,422 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.71 cfs @ 12.09 hrs, Volume= 5,422 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 218.89' @ 12.09 hrs
Flood Elev= 221.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	218.18'	**12.0" Round Culvert** L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 218.18' / 217.89' S= 0.0290 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.68 cfs @ 12.09 hrs HW=218.89' TW=218.45' (Dynamic Tailwater)
↑**1=Culvert** (Outlet Controls 1.68 cfs @ 3.96 fps)

Summary for Pond cb-09b: cb

Inflow Area = 23,285 sf, 12.45% Impervious, Inflow Depth = 2.36" for 10-year event
Inflow = 1.47 cfs @ 12.09 hrs, Volume= 4,571 cf
Outflow = 1.47 cfs @ 12.09 hrs, Volume= 4,571 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.47 cfs @ 12.09 hrs, Volume= 4,571 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 219.48' @ 12.09 hrs
Flood Elev= 222.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	218.80'	**12.0" Round Culvert** L= 37.0' Ke= 0.500 Inlet / Outlet Invert= 218.80' / 218.43' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.46 cfs @ 12.09 hrs HW=219.48' TW=218.89' (Dynamic Tailwater)
1=Culvert (Barrel Controls 1.46 cfs @ 3.63 fps)

Summary for Pond cb-10: cb

Inflow Area = 51,375 sf, 12.91% Impervious, Inflow Depth = 2.26" for 10-year event
Inflow = 2.37 cfs @ 12.18 hrs, Volume= 9,664 cf
Outflow = 2.37 cfs @ 12.18 hrs, Volume= 9,664 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.37 cfs @ 12.18 hrs, Volume= 9,664 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 209.28' @ 12.18 hrs
Flood Elev= 212.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	208.50'	**15.0" Round Culvert** L= 43.0' Ke= 0.500 Inlet / Outlet Invert= 208.50' / 208.00' S= 0.0116 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.37 cfs @ 12.18 hrs HW=209.28' TW=207.43' (Dynamic Tailwater)
1=Culvert (Barrel Controls 2.37 cfs @ 4.18 fps)

Summary for Pond cb-11a: cb

Inflow Area = 10,604 sf, 28.17% Impervious, Inflow Depth = 2.79" for 10-year event
Inflow = 0.80 cfs @ 12.09 hrs, Volume= 2,467 cf
Outflow = 0.80 cfs @ 12.09 hrs, Volume= 2,467 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.80 cfs @ 12.09 hrs, Volume= 2,467 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 234.59' @ 12.09 hrs
Flood Elev= 237.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.14'	**12.0" Round Culvert** L= 17.0' Ke= 0.500

Inlet / Outlet Invert= 234.14' / 233.80' S= 0.0200 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.79 cfs @ 12.09 hrs HW=234.59' TW=233.84' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.79 cfs @ 2.29 fps)

Summary for Pond cb-11b: cb

Inflow Area = 3,510 sf, 86.55% Impervious, Inflow Depth = 4.20" for 10-year event
Inflow = 0.37 cfs @ 12.08 hrs, Volume= 1,229 cf
Outflow = 0.37 cfs @ 12.08 hrs, Volume= 1,229 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.37 cfs @ 12.08 hrs, Volume= 1,229 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 234.40' @ 12.08 hrs
Flood Elev= 237.83'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.10'	**12.0" Round Culvert** L= 15.0' Ke= 0.500 Inlet / Outlet Invert= 234.10' / 233.80' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.36 cfs @ 12.08 hrs HW=234.40' TW=233.84' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.36 cfs @ 1.86 fps)

Summary for Pond DB1: DB1

Groundwater must be verified with test pit

Inflow Area = 189,224 sf, 19.30% Impervious, Inflow Depth = 2.52" for 10-year event
Inflow = 11.41 cfs @ 12.10 hrs, Volume= 39,759 cf
Outflow = 3.17 cfs @ 12.52 hrs, Volume= 39,743 cf, Atten= 72%, Lag= 25.3 min
Primary = 3.17 cfs @ 12.52 hrs, Volume= 39,743 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 208.08' @ 12.52 hrs Surf.Area= 6,841 sf Storage= 14,760 cf
Flood Elev= 210.00' Surf.Area= 9,766 sf Storage= 30,615 cf

Plug-Flow detention time= 102.3 min calculated for 39,732 cf (100% of inflow)
Center-of-Mass det. time= 102.5 min (928.4 - 825.8)

Volume	Invert	Avail.Storage	Storage Description
#1	205.00'	30,615 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)
205.00	2,930	279.0	0	0	2,930
206.00	4,095	304.0	3,496	3,496	4,126
208.00	6,730	355.0	10,716	14,213	6,880
210.00	9,766	405.0	16,402	30,615	9,998

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	205.00'	**6.0" Vert. Vertical Orifice** C= 0.600
#3	Device 1	207.90'	**24.0" Horiz. Horizonal Orifice** C= 0.600 Limited to weir flow at low heads
#4	Primary	209.00'	**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=3.17 cfs @ 12.52 hrs HW=208.08' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Passes 3.17 cfs of 9.21 cfs potential flow)
  - **2=Vertical Orifice** (Orifice Controls 1.59 cfs @ 8.10 fps)
  - **3=Horizonal Orifice** (Weir Controls 1.57 cfs @ 1.39 fps)
- **4=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 =	171,013 sf,	23.35% Impervious,	Inflow Depth =	2.11"	for 10-year event
Inflow =	5.79 cfs @	12.09 hrs,	Volume=	30,002 cf	
Outflow =	1.43 cfs @	12.62 hrs,	Volume=	30,002 cf,	Atten= 75%, Lag= 31.5 min
Discarded =	0.16 cfs @	12.62 hrs,	Volume=	11,231 cf	
Primary =	1.27 cfs @	12.62 hrs,	Volume=	18,771 cf	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 246.70' @ 12.62 hrs Surf.Area= 5,410 sf Storage= 7,575 cf
Flood Elev= 250.00' Surf.Area= 9,884 sf Storage= 32,513 cf

Plug-Flow detention time= 174.9 min calculated for 29,993 cf (100% of inflow)
Center-of-Mass det. time= 175.0 min (1,050.3 - 875.3)

Volume	Invert	Avail.Storage	Storage Description
#1	245.00'	32,513 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)
245.00	3,554	254.0	0	0	3,554
246.00	4,619	279.0	4,075	4,075	4,647
248.00	7,050	329.0	11,584	15,659	7,142
250.00	9,884	379.0	16,854	32,513	10,046

Device	Routing	Invert	Outlet Devices
#1	Primary	245.00'	**12.0" Round Culvert** L= 131.0' Ke= 0.500 Inlet / Outlet Invert= 245.00' / 237.80' S= 0.0550 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	246.00'	**6.0" Vert. Vertical Orifice** C= 0.600
#3	Device 1	246.00'	**6.0" Vert. Vertical Orifice** C= 0.600
#4	Device 1	247.70'	**24.0" Horiz. Horizontal Orifice** C= 0.600 Limited to weir flow at low heads
#5	Secondary	249.00'	**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	245.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 240.00' Phase-In= 0.01'

Discarded OutFlow Max=0.16 cfs @ 12.62 hrs HW=246.70' (Free Discharge)
└**6=Exfiltration** (Controls 0.16 cfs)

Primary OutFlow Max=1.27 cfs @ 12.62 hrs HW=246.70' TW=238.09' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.27 cfs of 4.14 cfs potential flow)
  ├**2=Vertical Orifice** (Orifice Controls 0.63 cfs @ 3.22 fps)
  ├**3=Vertical Orifice** (Orifice Controls 0.63 cfs @ 3.22 fps)
  └**4=Horizontal Orifice** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=245.00' TW=218.80' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DB3: DB3

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

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[80] Warning: Exceeded Pond cb-03 by 0.01' @ 12.38 hrs (0.49 cfs 628 cf)

Inflow Area = 89,589 sf, 30.78% Impervious, Inflow Depth = 2.54" for 10-year event
Inflow = 6.08 cfs @ 12.09 hrs, Volume= 18,996 cf
Outflow = 0.72 cfs @ 12.84 hrs, Volume= 18,996 cf, Atten= 88%, Lag= 45.1 min
Discarded = 0.11 cfs @ 12.84 hrs, Volume= 5,822 cf
Primary = 0.61 cfs @ 12.84 hrs, Volume= 13,174 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 266.27' @ 12.84 hrs Surf.Area= 3,990 sf Storage= 8,650 cf
Flood Elev= 268.00' Surf.Area= 5,752 sf Storage= 17,031 cf

Plug-Flow detention time= 207.1 min calculated for 18,991 cf (100% of inflow)
Center-of-Mass det. time= 207.2 min (1,033.2 - 825.9)

Volume	Invert	Avail.Storage	Storage Description
#1	263.00'	17,031 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)
263.00	1,483	151.0	0	0	1,483
264.00	2,137	176.0	1,800	1,800	2,154
266.00	3,744	266.0	5,806	7,606	5,350
268.00	5,752	277.0	9,424	17,031	6,072

Device	Routing	Invert	Outlet Devices
#1	Primary	263.00'	**24.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 263.00' / 262.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	264.00'	**4.0" Vert. Vertical Orifice** C= 0.600
#3	Device 1	266.30'	**24.0" Horiz. Horizontal Orifice** C= 0.600 Limited to weir flow at low heads
#4	Secondary	267.00'	**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
#5	Discarded	263.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 250.00' Phase-In= 0.01'

Discarded OutFlow Max=0.11 cfs @ 12.84 hrs HW=266.27' (Free Discharge)
└**5=Exfiltration** (Controls 0.11 cfs)

Primary OutFlow Max=0.61 cfs @ 12.84 hrs HW=266.27' TW=260.33' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.61 cfs of 22.79 cfs potential flow)
  ├**2=Vertical Orifice** (Orifice Controls 0.61 cfs @ 6.98 fps)
  └**3=Horizontal Orifice** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=263.00' TW=260.80' (Dynamic Tailwater)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DB4: DB4

Groundwater must be verified with test pit

Inflow Area = 48,251 sf, 7.27% Impervious, Inflow Depth = 2.11" for 10-year event
Inflow = 2.35 cfs @ 12.15 hrs, Volume= 8,481 cf
Outflow = 2.17 cfs @ 12.19 hrs, Volume= 8,481 cf, Atten= 8%, Lag= 2.6 min
Primary = 2.17 cfs @ 12.19 hrs, Volume= 8,481 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 209.80' @ 12.19 hrs Surf.Area= 724 sf Storage= 460 cf
Flood Elev= 212.00' Surf.Area= 1,900 sf Storage= 3,240 cf

Plug-Flow detention time= 8.0 min calculated for 8,479 cf (100% of inflow)
Center-of-Mass det. time= 8.2 min (854.3 - 846.2)

Volume	Invert	Avail.Storage	Storage Description
#1	209.00'	3,240 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)
209.00	433	86.0	0	0	433
212.00	1,900	161.0	3,240	3,240	1,953

Device	Routing	Invert	Outlet Devices
#1	Primary	209.00'	**15.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 209.00' / 208.60' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Primary	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=2.16 cfs @ 12.19 hrs HW=209.80' TW=209.28' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 2.16 cfs @ 3.69 fps)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond dmh-03: dmh

Inflow Area = 95,827 sf, 33.90% Impervious, Inflow Depth = 1.91" for 10-year event
Inflow = 1.05 cfs @ 12.10 hrs, Volume= 15,244 cf
Outflow = 1.05 cfs @ 12.10 hrs, Volume= 15,244 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.05 cfs @ 12.10 hrs, Volume= 15,244 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 260.42' @ 12.10 hrs
Flood Elev= 264.22'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.00'	**24.0" Round Culvert** L= 96.0' Ke= 0.500 Inlet / Outlet Invert= 260.00' / 256.80' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=1.05 cfs @ 12.10 hrs HW=260.42' TW=252.24' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.05 cfs @ 2.20 fps)

Summary for Pond dmh-04: dmh

Inflow Area = 11,466 sf, 22.34% Impervious, Inflow Depth = 2.61" for 10-year event
Inflow = 0.81 cfs @ 12.09 hrs, Volume= 2,497 cf
Outflow = 0.81 cfs @ 12.09 hrs, Volume= 2,497 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.81 cfs @ 12.09 hrs, Volume= 2,497 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Peak Elev= 250.16' @ 12.09 hrs
Flood Elev= 253.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	249.70'	**12.0" Round Culvert** L= 136.0' Ke= 0.500 Inlet / Outlet Invert= 249.70' / 241.30' S= 0.0618 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.80 cfs @ 12.09 hrs HW=250.16' TW=241.69' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.80 cfs @ 2.30 fps)

Summary for Pond dmh-05: dmh

Inflow Area = 21,513 sf, 43.03% Impervious, Inflow Depth = 3.11" for 10-year event
Inflow = 1.74 cfs @ 12.09 hrs, Volume= 5,578 cf
Outflow = 1.74 cfs @ 12.09 hrs, Volume= 5,578 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.74 cfs @ 12.09 hrs, Volume= 5,578 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 241.69' @ 12.09 hrs
Flood Elev= 245.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	241.05'	**15.0" Round Culvert** L= 153.0' Ke= 0.500 Inlet / Outlet Invert= 241.05' / 233.30' S= 0.0507 '/' 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=241.69' TW=233.84' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.73 cfs @ 2.73 fps)

Summary for Pond dmh-06: dmh

Inflow Area = 35,627 sf, 42.89% Impervious, Inflow Depth = 3.12" for 10-year event
Inflow = 2.90 cfs @ 12.09 hrs, Volume= 9,274 cf
Outflow = 2.90 cfs @ 12.09 hrs, Volume= 9,274 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.90 cfs @ 12.09 hrs, Volume= 9,274 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 233.85' @ 12.09 hrs
Flood Elev= 237.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	233.05'	**18.0" Round Culvert** L= 149.0' Ke= 0.500 Inlet / Outlet Invert= 233.05' / 226.30' S= 0.0453 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=2.88 cfs @ 12.09 hrs HW=233.84' TW=224.56' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.88 cfs @ 3.03 fps)

Summary for Pond dmh-07: dmh

Inflow Area = 76,939 sf, 29.95% Impervious, Inflow Depth = 2.84" for 10-year event
Inflow = 5.78 cfs @ 12.09 hrs, Volume= 18,217 cf
Outflow = 5.78 cfs @ 12.09 hrs, Volume= 18,217 cf, Atten= 0%, Lag= 0.0 min
Primary = 5.78 cfs @ 12.09 hrs, Volume= 18,217 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 224.57' @ 12.09 hrs
Flood Elev= 230.44'

Device	Routing	Invert	Outlet Devices
#1	Primary	223.35'	**18.0" Round Culvert** L= 188.0' Ke= 0.500 Inlet / Outlet Invert= 223.35' / 217.64' S= 0.0304 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=5.73 cfs @ 12.09 hrs HW=224.56' TW=218.45' (Dynamic Tailwater)
1=Culvert (Inlet Controls 5.73 cfs @ 3.75 fps)

Summary for Pond dmh-08: dmh

Inflow Area = 102,472 sf, 27.51% Impervious, Inflow Depth = 2.77" for 10-year event
Inflow = 7.49 cfs @ 12.09 hrs, Volume= 23,639 cf
Outflow = 7.49 cfs @ 12.09 hrs, Volume= 23,639 cf, Atten= 0%, Lag= 0.0 min
Primary = 7.49 cfs @ 12.09 hrs, Volume= 23,639 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 218.46' @ 12.09 hrs
Flood Elev= 221.85'

Device	Routing	Invert	Outlet Devices
#1	Primary	217.14'	**24.0" Round Culvert** L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 217.14' / 216.88' S= 0.0260 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=7.43 cfs @ 12.09 hrs HW=218.45' TW=211.01' (Dynamic Tailwater)
1=Culvert (Barrel Controls 7.43 cfs @ 4.83 fps)

Summary for Pond dmh-09: dmh

Inflow Area = 95,827 sf, 33.90% Impervious, Inflow Depth = 1.91" for 10-year event
Inflow = 1.05 cfs @ 12.10 hrs, Volume= 15,244 cf
Outflow = 1.05 cfs @ 12.10 hrs, Volume= 15,244 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.05 cfs @ 12.10 hrs, Volume= 15,244 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 252.24' @ 12.10 hrs
Flood Elev= 261.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.82'	**24.0" Round Culvert** L= 96.0' Ke= 0.500

Inlet / Outlet Invert= 251.82' / 247.00' S= 0.0502 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=1.05 cfs @ 12.10 hrs HW=252.24' TW=246.05' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 1.05 cfs @ 2.20 fps)

Summary for Pond dmh-10: dmh

Inflow Area = 171,013 sf, 23.35% Impervious, Inflow Depth = 1.32" for 10-year event
Inflow = 1.27 cfs @ 12.62 hrs, Volume= 18,771 cf
Outflow = 1.27 cfs @ 12.62 hrs, Volume= 18,771 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.27 cfs @ 12.62 hrs, Volume= 18,771 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 238.09' @ 12.62 hrs
Flood Elev= 251.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	237.55'	**15.0" Round Culvert** L= 161.0' Ke= 0.500 Inlet / Outlet Invert= 237.55' / 235.80' S= 0.0109 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.27 cfs @ 12.62 hrs HW=238.09' TW=231.41' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 1.27 cfs @ 2.50 fps)

Summary for Pond dmh-11: dmh

Inflow Area = 171,013 sf, 23.35% Impervious, Inflow Depth = 1.32" for 10-year event
Inflow = 1.27 cfs @ 12.62 hrs, Volume= 18,771 cf
Outflow = 1.27 cfs @ 12.62 hrs, Volume= 18,771 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.27 cfs @ 12.62 hrs, Volume= 18,771 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 231.41' @ 12.62 hrs
Flood Elev= 239.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	230.87'	**15.0" Round Culvert** L= 37.0' Ke= 0.500 Inlet / Outlet Invert= 230.87' / 229.00' S= 0.0505 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.27 cfs @ 12.62 hrs HW=231.41' TW=229.16' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 1.27 cfs @ 2.50 fps)

Summary for Pond dmh-12: dmh

Inflow Area = 102,472 sf, 27.51% Impervious, Inflow Depth = 2.77" for 10-year event
Inflow = 7.49 cfs @ 12.09 hrs, Volume= 23,639 cf
Outflow = 7.49 cfs @ 12.09 hrs, Volume= 23,639 cf, Atten= 0%, Lag= 0.0 min
Primary = 7.49 cfs @ 12.09 hrs, Volume= 23,639 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 211.01' @ 12.09 hrs
Flood Elev= 220.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	209.80'	**24.0" Round Culvert** L= 72.0' Ke= 0.500 Inlet / Outlet Invert= 209.80' / 208.00' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=7.43 cfs @ 12.09 hrs HW=211.01' TW=206.88' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 7.43 cfs @ 3.74 fps)

Summary for Pond G: gabion

Inflow Area = 171,013 sf, 23.35% Impervious, Inflow Depth = 1.32" for 10-year event
Inflow = 1.27 cfs @ 12.62 hrs, Volume= 18,771 cf
Outflow = 1.27 cfs @ 12.62 hrs, Volume= 18,771 cf, Atten= 0%, Lag= 0.1 min
Primary = 1.27 cfs @ 12.62 hrs, Volume= 18,771 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 229.16' @ 12.62 hrs Surf.Area= 25 sf Storage= 3 cf
Flood Elev= 230.25' Surf.Area= 0 sf Storage= 37 cf

Plug-Flow detention time= 0.0 min calculated for 18,766 cf (100% of inflow)
Center-of-Mass det. time= 0.0 min (908.3 - 908.3)

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. 3" outlet holes X 30.00** C= 0.600
#2	Primary	229.00'	**2.0" Horiz. 2" outlet holes X 30.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.27 cfs @ 12.62 hrs HW=229.16' TW=0.00' (Dynamic Tailwater)
└**1=3" outlet holes** (Controls 0.00 cfs)
└**2=2" outlet holes** (Orifice Controls 1.27 cfs @ 1.93 fps)

Time span=0.00-72.00 hrs, dt=0.02 hrs, 3601 points
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=250,444 sf 2.13% Impervious Runoff Depth=3.00"
Flow Length=844' Tc=16.3 min CN=72 Runoff=14.77 cfs 62,640 cf

Subcatchment P-2: Subcat P-2 Runoff Area=7,960 sf 0.00% Impervious Runoff Depth=2.81"
Flow Length=81' Tc=13.0 min CN=70 Runoff=0.48 cfs 1,866 cf

Subcatchment P-3A: Subcat P-3A Runoff Area=48,251 sf 7.27% Impervious Runoff Depth=3.10"
Flow Length=511' Tc=10.2 min CN=73 Runoff=3.48 cfs 12,452 cf

Subcatchment P-3B: Subcat P-3B Runoff Area=11,466 sf 22.34% Impervious Runoff Depth=3.69"
Tc=6.0 min CN=79 Runoff=1.13 cfs 3,524 cf

Subcatchment P-3C: Subcat P-3C Runoff Area=3,275 sf 100.00% Impervious Runoff Depth=5.77"
Tc=6.0 min CN=98 Runoff=0.44 cfs 1,575 cf

Subcatchment P-3D: Subcat P-3D Runoff Area=6,772 sf 50.52% Impervious Runoff Depth=4.42"
Tc=6.0 min CN=86 Runoff=0.79 cfs 2,494 cf

Subcatchment P-3E: Subcat P-3E Runoff Area=10,604 sf 28.17% Impervious Runoff Depth=3.89"
Tc=6.0 min CN=81 Runoff=1.10 cfs 3,440 cf

Subcatchment P-3F: Subcat P-3F Runoff Area=3,510 sf 86.55% Impervious Runoff Depth=5.42"
Tc=6.0 min CN=95 Runoff=0.46 cfs 1,586 cf

Subcatchment P-3G: Subcat P-3G Runoff Area=7,921 sf 49.94% Impervious Runoff Depth=4.42"
Tc=6.0 min CN=86 Runoff=0.92 cfs 2,917 cf

Subcatchment P-3H: Subcat P-3H Runoff Area=33,391 sf 11.40% Impervious Runoff Depth=3.49"
Tc=6.0 min CN=77 Runoff=3.13 cfs 9,705 cf

Subcatchment P-3I: Subcat P-3I Runoff Area=23,285 sf 12.45% Impervious Runoff Depth=3.39"
Tc=6.0 min CN=76 Runoff=2.12 cfs 6,576 cf

Subcatchment P-3J: Subcat P-3J Runoff Area=2,248 sf 100.00% Impervious Runoff Depth=5.77"
Tc=6.0 min CN=98 Runoff=0.30 cfs 1,081 cf

Subcatchment P-3K: Subcat P-3K Runoff Area=3,123 sf 100.00% Impervious Runoff Depth=5.77"
Tc=6.0 min CN=98 Runoff=0.42 cfs 1,502 cf

Subcatchment P-3L: Subcat P-3L Runoff Area=35,377 sf 4.79% Impervious Runoff Depth=3.19"
Tc=6.0 min CN=74 Runoff=3.04 cfs 9,414 cf

Subcatchment P-4: Subcat P-4 Runoff Area=210,752 sf 2.26% Impervious Runoff Depth=2.63"
Flow Length=845' Tc=20.5 min CN=68 Runoff=9.80 cfs 46,164 cf

Subcatchment P-4A: Subcat P-4A Runoff Area=35,777 sf 1.45% Impervious Runoff Depth=2.91"
Tc=6.0 min CN=71 Runoff=2.78 cfs 8,667 cf

Subcatchment P-4B: Subcat P-4B Runoff Area=32,221 sf 46.28% Impervious Runoff Depth=4.10"
Tc=6.0 min CN=83 Runoff=3.51 cfs 11,011 cf

Subcatchment P-4C: Subcat P-4C Runoff Area=21,590 sf 56.23% Impervious Runoff Depth=4.00"
Tc=6.0 min CN=82 Runoff=2.30 cfs 7,190 cf

Subcatchment P-4D: Subcat P-4D Runoff Area=6,238 sf 78.70% Impervious Runoff Depth=5.19"
Tc=6.0 min CN=93 Runoff=0.81 cfs 2,699 cf

Subcatchment P-4E: Subcat P-4E Runoff Area=75,187 sf 9.91% Impervious Runoff Depth=3.39"
Tc=6.0 min CN=76 Runoff=6.85 cfs 21,232 cf

Reach SP-3: SP-3 Inflow=8.35 cfs 56,250 cf
Outflow=8.35 cfs 56,250 cf

Reach SP-4: SP-4 Inflow=11.69 cfs 78,320 cf
Outflow=11.69 cfs 78,320 cf

Pond cb-02: cb Peak Elev=266.65' Inflow=2.30 cfs 7,190 cf
12.0" Round Culvert n=0.013 L=50.0' S=0.0150 '/' Outflow=2.30 cfs 7,190 cf

Pond cb-03: cb Peak Elev=266.64' Inflow=3.51 cfs 11,011 cf
15.0" Round Culvert n=0.013 L=46.0' S=0.0109 '/' Outflow=3.51 cfs 11,011 cf

Pond cb-05: cb Peak Elev=261.26' Inflow=0.81 cfs 2,699 cf
12.0" Round Culvert n=0.013 L=20.0' S=0.0150 '/' Outflow=0.81 cfs 2,699 cf

Pond cb-06: cb Peak Elev=256.85' Inflow=1.13 cfs 3,524 cf
12.0" Round Culvert n=0.013 L=128.0' S=0.0508 '/' Outflow=1.13 cfs 3,524 cf

Pond cb-07a: cb Peak Elev=242.22' Inflow=0.44 cfs 1,575 cf
12.0" Round Culvert n=0.013 L=11.0' S=0.0309 '/' Outflow=0.44 cfs 1,575 cf

Pond cb-07b: cb Peak Elev=242.27' Inflow=0.79 cfs 2,494 cf
12.0" Round Culvert n=0.013 L=19.0' S=0.0132 '/' Outflow=0.79 cfs 2,494 cf

Pond cb-08a: cb Peak Elev=227.79' Inflow=0.92 cfs 2,917 cf
12.0" Round Culvert n=0.013 L=12.0' S=0.0417 '/' Outflow=0.92 cfs 2,917 cf

Pond cb-08b: cb Peak Elev=228.48' Inflow=3.13 cfs 9,705 cf
12.0" Round Culvert n=0.013 L=18.0' S=0.0278 '/' Outflow=3.13 cfs 9,705 cf

Pond cb-09a: cb Peak Elev=219.17' Inflow=2.42 cfs 7,657 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0290 '/' Outflow=2.42 cfs 7,657 cf

Pond cb-09b: cb Peak Elev=219.69' Inflow=2.12 cfs 6,576 cf
12.0" Round Culvert n=0.013 L=37.0' S=0.0100 '/' Outflow=2.12 cfs 6,576 cf

Pond cb-10: cb Peak Elev=209.50' Inflow=3.45 cfs 13,954 cf
15.0" Round Culvert n=0.013 L=43.0' S=0.0116 '/' Outflow=3.45 cfs 13,954 cf

Pond cb-11a: cb Peak Elev=234.69' Inflow=1.10 cfs 3,440 cf
12.0" Round Culvert n=0.013 L=17.0' S=0.0200 '/' Outflow=1.10 cfs 3,440 cf

Pond cb-11b: cb Peak Elev=234.44' Inflow=0.46 cfs 1,586 cf
12.0" Round Culvert n=0.013 L=15.0' S=0.0200 '/' Outflow=0.46 cfs 1,586 cf

Pond DB1: DB1 Peak Elev=208.37' Storage=16,820 cf Inflow=16.16 cfs 56,266 cf
Outflow=8.35 cfs 56,250 cf

Pond DB2: DB2 Peak Elev=247.72' Storage=13,716 cf Inflow=8.21 cfs 44,494 cf
Discarded=0.22 cfs 12,338 cf Primary=2.34 cfs 32,157 cf Secondary=0.00 cfs 0 cf Outflow=2.55 cfs 44,494 cf

Pond DB3: DB3 Peak Elev=266.57' Storage=9,908 cf Inflow=8.59 cfs 26,867 cf
Discarded=0.12 cfs 6,304 cf Primary=3.61 cfs 20,563 cf Secondary=0.00 cfs 0 cf Outflow=3.72 cfs 26,867 cf

Pond DB4: DB4 Peak Elev=210.05' Storage=647 cf Inflow=3.48 cfs 12,452 cf
Outflow=3.19 cfs 12,452 cf

Pond dmh-03: dmh Peak Elev=260.84' Inflow=3.93 cfs 23,262 cf
24.0" Round Culvert n=0.013 L=96.0' S=0.0333 '/' Outflow=3.93 cfs 23,262 cf

Pond dmh-04: dmh Peak Elev=250.25' Inflow=1.13 cfs 3,524 cf
12.0" Round Culvert n=0.013 L=136.0' S=0.0618 '/' Outflow=1.13 cfs 3,524 cf

Pond dmh-05: dmh Peak Elev=241.82' Inflow=2.36 cfs 7,593 cf
15.0" Round Culvert n=0.013 L=153.0' S=0.0507 '/' Outflow=2.36 cfs 7,593 cf

Pond dmh-06: dmh Peak Elev=234.00' Inflow=3.93 cfs 12,619 cf
18.0" Round Culvert n=0.013 L=149.0' S=0.0453 '/' Outflow=3.93 cfs 12,619 cf

Pond dmh-07: dmh Peak Elev=224.98' Inflow=7.98 cfs 25,241 cf
18.0" Round Culvert n=0.013 L=188.0' S=0.0304 '/' Outflow=7.98 cfs 25,241 cf

Pond dmh-08: dmh Peak Elev=218.77' Inflow=10.40 cfs 32,898 cf
24.0" Round Culvert n=0.013 L=10.0' S=0.0260 '/' Outflow=10.40 cfs 32,898 cf

Pond dmh-09: dmh Peak Elev=252.66' Inflow=3.93 cfs 23,262 cf
24.0" Round Culvert n=0.013 L=96.0' S=0.0502 '/' Outflow=3.93 cfs 23,262 cf

Pond dmh-10: dmh Peak Elev=238.31' Inflow=2.34 cfs 32,157 cf
15.0" Round Culvert n=0.013 L=161.0' S=0.0109 '/' Outflow=2.34 cfs 32,157 cf

Pond dmh-11: dmh Peak Elev=231.63' Inflow=2.34 cfs 32,157 cf
15.0" Round Culvert n=0.013 L=37.0' S=0.0505 '/' Outflow=2.34 cfs 32,157 cf

Pond dmh-12: dmh Peak Elev=211.29' Inflow=10.40 cfs 32,898 cf
24.0" Round Culvert n=0.013 L=72.0' S=0.0250 '/' Outflow=10.40 cfs 32,898 cf

Pond G: gabion Peak Elev=229.55' Storage=16 cf Inflow=2.34 cfs 32,157 cf
Outflow=2.34 cfs 32,157 cf

Total Runoff Area = 829,392 sf Runoff Volume = 217,736 cf Average Runoff Depth = 3.15"
89.57% Pervious = 742,861 sf 10.43% Impervious = 86,531 sf

Summary for Subcatchment P-1: Subcat P-1

Runoff = 14.77 cfs @ 12.23 hrs, Volume= 62,640 cf, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
4,841	98	Paved parking, HSG B
45,769	55	Woods, Good, HSG B
14,862	61	>75% Grass cover, Good, HSG B
24,002	80	>75% Grass cover, Good, HSG D
482	98	Paved parking, HSG D
131,956	77	Woods, Good, HSG D
7,031	74	>75% Grass cover, Good, HSG C
21,502	70	Woods, Good, HSG C
250,444	72	Weighted Average
245,121		97.87% Pervious Area
5,322		2.13% 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 = 0.48 cfs @ 12.18 hrs, Volume= 1,866 cf, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
7,044	70	Woods, Good, HSG C
916	74	>75% Grass cover, Good, HSG C
7,960	70	Weighted Average
7,960		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 = 3.48 cfs @ 12.14 hrs, Volume= 12,452 cf, Depth= 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
3,510	98	Paved parking, HSG C
28,784	70	Woods, Good, HSG C
15,958	74	>75% Grass cover, Good, HSG C
48,251	73	Weighted Average
44,742		92.73% Pervious Area
3,510		7.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0900	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
2.9	313	0.1300	1.80		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.4	148	0.0600	5.75	11.51	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=0.50' Z= 4.0 '/' Top.W=6.00' n= 0.030 Earth, grassed & winding
10.2	511	Total			

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

Runoff = 1.13 cfs @ 12.09 hrs, Volume= 3,524 cf, Depth= 3.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
8,905	74	>75% Grass cover, Good, HSG C
2,561	98	Paved parking, HSG C
11,466	79	Weighted Average
8,905		77.66% Pervious Area
2,561		22.34% Impervious Area

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

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

Runoff = 0.44 cfs @ 12.08 hrs, Volume= 1,575 cf, Depth= 5.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
3,275	98	Paved parking, HSG C
3,275		100.00% Impervious Area

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

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

Runoff = 0.79 cfs @ 12.09 hrs, Volume= 2,494 cf, Depth= 4.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
3,351	74	>75% Grass cover, Good, HSG C
3,421	98	Paved parking, HSG C
6,772	86	Weighted Average
3,351		49.48% Pervious Area
3,421		50.52% Impervious Area

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

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

Runoff = 1.10 cfs @ 12.09 hrs, Volume= 3,440 cf, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
7,617	74	>75% Grass cover, Good, HSG C
2,987	98	Paved parking, HSG C
10,604	81	Weighted Average
7,617		71.83% Pervious Area
2,987		28.17% Impervious Area

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

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

Runoff = 0.46 cfs @ 12.08 hrs, Volume= 1,586 cf, Depth= 5.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
472	74	>75% Grass cover, Good, HSG C
3,038	98	Paved parking, HSG C
3,510	95	Weighted Average
472		13.45% Pervious Area
3,038		86.55% Impervious Area

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

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

Runoff = 0.92 cfs @ 12.09 hrs, Volume= 2,917 cf, Depth= 4.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
3,965	74	>75% Grass cover, Good, HSG C
3,956	98	Paved parking, HSG C
7,921	86	Weighted Average
3,965		50.06% Pervious Area
3,956		49.94% Impervious Area

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

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

Runoff = 3.13 cfs @ 12.09 hrs, Volume= 9,705 cf, Depth= 3.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
29,484	74	>75% Grass cover, Good, HSG C
3,806	98	Paved parking, HSG C
100	70	Woods, Good, HSG C
33,391	77	Weighted Average
29,585		88.60% Pervious Area
3,806		11.40% Impervious Area

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

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

Runoff = 2.12 cfs @ 12.09 hrs, Volume= 6,576 cf, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
2,899	98	Paved parking, HSG C
3,195	70	Woods, Good, HSG C
17,191	74	>75% Grass cover, Good, HSG C
23,285	76	Weighted Average
20,386		87.55% Pervious Area
2,899		12.45% Impervious Area

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

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

Runoff = 0.30 cfs @ 12.08 hrs, Volume= 1,081 cf, Depth= 5.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
2,248	98	Paved parking, HSG C
2,248		100.00% Impervious Area

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

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

Runoff = 0.42 cfs @ 12.08 hrs, Volume= 1,502 cf, Depth= 5.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
3,123	98	Paved parking, HSG C
3,123		100.00% Impervious Area

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

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

Runoff = 3.04 cfs @ 12.09 hrs, Volume= 9,414 cf, Depth= 3.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
1,694	98	Paved parking, HSG C
7,044	70	Woods, Good, HSG C
26,638	74	>75% Grass cover, Good, HSG C
35,377	74	Weighted Average
33,682		95.21% Pervious Area
1,694		4.79% Impervious Area

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

Summary for Subcatchment P-4: Subcat P-4

Runoff = 9.80 cfs @ 12.29 hrs, Volume= 46,164 cf, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
156	77	Woods, Good, HSG D
2,827	98	Paved parking, HSG B
56,148	61	>75% Grass cover, Good, HSG B
19,587	55	Woods, Good, HSG B
1,932	98	Paved parking, HSG C
47,810	74	>75% Grass cover, Good, HSG C
82,292	70	Woods, Good, HSG C
210,752	68	Weighted Average
205,993		97.74% Pervious Area
4,758		2.26% 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"
8.0	795	0.1100	1.66		**Shallow Concentrated Flow, B-C**
					Woodland Kv= 5.0 fps
20.5	845	Total			

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

Runoff = 2.78 cfs @ 12.09 hrs, Volume= 8,667 cf, Depth= 2.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
8,875	61	>75% Grass cover, Good, HSG B
520	98	Paved parking, HSG C
26,382	74	>75% Grass cover, Good, HSG C
35,777	71	Weighted Average
35,258		98.55% Pervious Area
520		1.45% Impervious Area

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

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

Runoff = 3.51 cfs @ 12.09 hrs, Volume= 11,011 cf, Depth= 4.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
4,728	98	Paved parking, HSG B
6,266	61	>75% Grass cover, Good, HSG B
10,183	98	Paved parking, HSG C
11,044	74	>75% Grass cover, Good, HSG C
32,221	83	Weighted Average
17,310		53.72% Pervious Area
14,911		46.28% Impervious Area

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

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

Runoff = 2.30 cfs @ 12.09 hrs, Volume= 7,190 cf, Depth= 4.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
10,959	98	Paved parking, HSG B
9,216	61	>75% Grass cover, Good, HSG B
1,182	98	Paved parking, HSG C
233	74	>75% Grass cover, Good, HSG C
21,590	82	Weighted Average
9,449		43.77% Pervious Area
12,141		56.23% Impervious Area

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

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

Runoff = 0.81 cfs @ 12.08 hrs, Volume= 2,699 cf, Depth= 5.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
4,909	98	Paved parking, HSG C
1,329	74	>75% Grass cover, Good, HSG C
6,238	93	Weighted Average
1,329		21.30% Pervious Area
4,909		78.70% Impervious Area

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

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

Runoff = 6.85 cfs @ 12.09 hrs, Volume= 21,232 cf, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-year Rainfall=6.01"

Area (sf)	CN	Description
67,736	74	>75% Grass cover, Good, HSG C
7,451	98	Paved parking, HSG C
1	70	Woods, Good, HSG C
75,187	76	Weighted Average
67,736		90.09% Pervious Area
7,451		9.91% Impervious Area

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

Summary for Reach SP-3: SP-3

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

Inflow Area = 189,224 sf, 19.30% Impervious, Inflow Depth = 3.57" for 25-year event
Inflow = 8.35 cfs @ 12.31 hrs, Volume= 56,250 cf
Outflow = 8.35 cfs @ 12.31 hrs, Volume= 56,250 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach SP-4: SP-4

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

Inflow Area = 381,765 sf, 11.71% Impervious, Inflow Depth = 2.46" for 25-year event
Inflow = 11.69 cfs @ 12.30 hrs, Volume= 78,320 cf
Outflow = 11.69 cfs @ 12.30 hrs, Volume= 78,320 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Pond cb-02: cb

Inflow Area = 21,590 sf, 56.23% Impervious, Inflow Depth = 4.00" for 25-year event
Inflow = 2.30 cfs @ 12.09 hrs, Volume= 7,190 cf
Outflow = 2.30 cfs @ 12.09 hrs, Volume= 7,190 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.30 cfs @ 12.09 hrs, Volume= 7,190 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 266.65' @ 12.28 hrs
Flood Elev= 268.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	265.25'	**12.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 265.25' / 264.50' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.93 cfs @ 12.09 hrs HW=266.27' TW=265.89' (Dynamic Tailwater)
1=Culvert (Outlet Controls 1.93 cfs @ 2.99 fps)

Summary for Pond cb-03: cb

Inflow Area = 32,221 sf, 46.28% Impervious, Inflow Depth = 4.10" for 25-year event
Inflow = 3.51 cfs @ 12.09 hrs, Volume= 11,011 cf
Outflow = 3.51 cfs @ 12.09 hrs, Volume= 11,011 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.51 cfs @ 12.09 hrs, Volume= 11,011 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 266.64' @ 12.29 hrs
Flood Elev= 268.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	264.25'	**15.0" Round Culvert** L= 46.0' Ke= 0.500 Inlet / Outlet Invert= 264.25' / 263.75' S= 0.0109 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.59 cfs @ 12.09 hrs HW=266.08' TW=265.89' (Dynamic Tailwater)
1=Culvert (Inlet Controls 2.59 cfs @ 2.11 fps)

Summary for Pond cb-05: cb

Inflow Area = 6,238 sf, 78.70% Impervious, Inflow Depth = 5.19" for 25-year event
Inflow = 0.81 cfs @ 12.08 hrs, Volume= 2,699 cf
Outflow = 0.81 cfs @ 12.08 hrs, Volume= 2,699 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.81 cfs @ 12.08 hrs, Volume= 2,699 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 261.26' @ 12.08 hrs
Flood Elev= 264.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.80'	**12.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 260.80' / 260.50' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.80 cfs @ 12.08 hrs HW=261.26' TW=260.48' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.80 cfs @ 3.34 fps)

Summary for Pond cb-06: cb

Inflow Area = 11,466 sf, 22.34% Impervious, Inflow Depth = 3.69" for 25-year event
Inflow = 1.13 cfs @ 12.09 hrs, Volume= 3,524 cf
Outflow = 1.13 cfs @ 12.09 hrs, Volume= 3,524 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.13 cfs @ 12.09 hrs, Volume= 3,524 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 256.85' @ 12.09 hrs
Flood Elev= 259.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	256.30'	**12.0" Round Culvert** L= 128.0' Ke= 0.500

Inlet / Outlet Invert= 256.30' / 249.80' S= 0.0508 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.13 cfs @ 12.09 hrs HW=256.85' TW=250.25' (Dynamic Tailwater)
1=Culvert (Inlet Controls 1.13 cfs @ 2.53 fps)

Summary for Pond cb-07a: cb

Inflow Area = 3,275 sf,100.00% Impervious, Inflow Depth = 5.77" for 25-year event
Inflow = 0.44 cfs @ 12.08 hrs, Volume= 1,575 cf
Outflow = 0.44 cfs @ 12.08 hrs, Volume= 1,575 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.44 cfs @ 12.08 hrs, Volume= 1,575 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 242.22' @ 12.08 hrs
Flood Elev= 245.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	241.89'	**12.0" Round Culvert** L= 11.0' Ke= 0.500 Inlet / Outlet Invert= 241.89' / 241.55' S= 0.0309 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.44 cfs @ 12.08 hrs HW=242.22' TW=241.82' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.44 cfs @ 1.95 fps)

Summary for Pond cb-07b: cb

Inflow Area = 6,772 sf, 50.52% Impervious, Inflow Depth = 4.42" for 25-year event
Inflow = 0.79 cfs @ 12.09 hrs, Volume= 2,494 cf
Outflow = 0.79 cfs @ 12.09 hrs, Volume= 2,494 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.79 cfs @ 12.09 hrs, Volume= 2,494 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 242.27' @ 12.09 hrs
Flood Elev= 245.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	241.80'	**12.0" Round Culvert** L= 19.0' Ke= 0.500 Inlet / Outlet Invert= 241.80' / 241.55' S= 0.0132 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.78 cfs @ 12.09 hrs HW=242.27' TW=241.82' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.78 cfs @ 3.18 fps)

Summary for Pond cb-08a: cb

Inflow Area = 7,921 sf, 49.94% Impervious, Inflow Depth = 4.42" for 25-year event
Inflow = 0.92 cfs @ 12.09 hrs, Volume= 2,917 cf
Outflow = 0.92 cfs @ 12.09 hrs, Volume= 2,917 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.92 cfs @ 12.09 hrs, Volume= 2,917 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 227.79' @ 12.09 hrs
Flood Elev= 230.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	227.30'	**12.0" Round Culvert** L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 227.30' / 226.80' S= 0.0417 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.91 cfs @ 12.09 hrs HW=227.79' TW=224.97' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.91 cfs @ 2.38 fps)

Summary for Pond cb-08b: cb

Inflow Area = 33,391 sf, 11.40% Impervious, Inflow Depth = 3.49" for 25-year event
Inflow = 3.13 cfs @ 12.09 hrs, Volume= 9,705 cf
Outflow = 3.13 cfs @ 12.09 hrs, Volume= 9,705 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.13 cfs @ 12.09 hrs, Volume= 9,705 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 228.48' @ 12.09 hrs
Flood Elev= 230.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	227.30'	**12.0" Round Culvert** L= 18.0' Ke= 0.500 Inlet / Outlet Invert= 227.30' / 226.80' S= 0.0278 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.11 cfs @ 12.09 hrs HW=228.47' TW=224.97' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 3.11 cfs @ 3.95 fps)

Summary for Pond cb-09a: cb

Inflow Area = 25,533 sf, 20.16% Impervious, Inflow Depth = 3.60" for 25-year event
Inflow = 2.42 cfs @ 12.09 hrs, Volume= 7,657 cf
Outflow = 2.42 cfs @ 12.09 hrs, Volume= 7,657 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.42 cfs @ 12.09 hrs, Volume= 7,657 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 219.17' @ 12.10 hrs
Flood Elev= 221.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	218.18'	**12.0" Round Culvert** L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 218.18' / 217.89' S= 0.0290 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.32 cfs @ 12.09 hrs HW=219.15' TW=218.76' (Dynamic Tailwater)
↑**1=Culvert** (Outlet Controls 2.32 cfs @ 3.79 fps)

Summary for Pond cb-09b: cb

Inflow Area = 23,285 sf, 12.45% Impervious, Inflow Depth = 3.39" for 25-year event
Inflow = 2.12 cfs @ 12.09 hrs, Volume= 6,576 cf
Outflow = 2.12 cfs @ 12.09 hrs, Volume= 6,576 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.12 cfs @ 12.09 hrs, Volume= 6,576 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 219.69' @ 12.10 hrs
Flood Elev= 222.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	218.80'	**12.0" Round Culvert** L= 37.0' Ke= 0.500 Inlet / Outlet Invert= 218.80' / 218.43' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.02 cfs @ 12.09 hrs HW=219.67' TW=219.15' (Dynamic Tailwater)
1=Culvert (Outlet Controls 2.02 cfs @ 3.70 fps)

Summary for Pond cb-10: cb

Inflow Area = 51,375 sf, 12.91% Impervious, Inflow Depth = 3.26" for 25-year event
Inflow = 3.45 cfs @ 12.18 hrs, Volume= 13,954 cf
Outflow = 3.45 cfs @ 12.18 hrs, Volume= 13,954 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.45 cfs @ 12.18 hrs, Volume= 13,954 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 209.50' @ 12.18 hrs
Flood Elev= 212.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	208.50'	**15.0" Round Culvert** L= 43.0' Ke= 0.500 Inlet / Outlet Invert= 208.50' / 208.00' S= 0.0116 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.45 cfs @ 12.18 hrs HW=209.50' TW=208.20' (Dynamic Tailwater)
1=Culvert (Barrel Controls 3.45 cfs @ 4.51 fps)

Summary for Pond cb-11a: cb

Inflow Area = 10,604 sf, 28.17% Impervious, Inflow Depth = 3.89" for 25-year event
Inflow = 1.10 cfs @ 12.09 hrs, Volume= 3,440 cf
Outflow = 1.10 cfs @ 12.09 hrs, Volume= 3,440 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.10 cfs @ 12.09 hrs, Volume= 3,440 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 234.69' @ 12.09 hrs
Flood Elev= 237.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.14'	**12.0" Round Culvert** L= 17.0' Ke= 0.500

Inlet / Outlet Invert= 234.14' / 233.80' S= 0.0200 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.09 cfs @ 12.09 hrs HW=234.68' TW=234.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 1.09 cfs @ 2.51 fps)

Summary for Pond cb-11b: cb

Inflow Area = 3,510 sf, 86.55% Impervious, Inflow Depth = 5.42" for 25-year event
Inflow = 0.46 cfs @ 12.08 hrs, Volume= 1,586 cf
Outflow = 0.46 cfs @ 12.08 hrs, Volume= 1,586 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.46 cfs @ 12.08 hrs, Volume= 1,586 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 234.44' @ 12.08 hrs
Flood Elev= 237.83'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.10'	**12.0" Round Culvert** L= 15.0' Ke= 0.500 Inlet / Outlet Invert= 234.10' / 233.80' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.46 cfs @ 12.08 hrs HW=234.44' TW=234.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.46 cfs @ 1.98 fps)

Summary for Pond DB1: DB1

Groundwater must be verified with test pit

Inflow Area = 189,224 sf, 19.30% Impervious, Inflow Depth = 3.57" for 25-year event
Inflow = 16.16 cfs @ 12.10 hrs, Volume= 56,266 cf
Outflow = 8.35 cfs @ 12.31 hrs, Volume= 56,250 cf, Atten= 48%, Lag= 12.7 min
Primary = 8.35 cfs @ 12.31 hrs, Volume= 56,250 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 208.37' @ 12.31 hrs Surf.Area= 7,253 sf Storage= 16,820 cf
Flood Elev= 210.00' Surf.Area= 9,766 sf Storage= 30,615 cf

Plug-Flow detention time= 89.4 min calculated for 56,250 cf (100% of inflow)
Center-of-Mass det. time= 89.1 min (906.1 - 817.0)

Volume	Invert	Avail.Storage	Storage Description
#1	205.00'	30,615 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)
205.00	2,930	279.0	0	0	2,930
206.00	4,095	304.0	3,496	3,496	4,126
208.00	6,730	355.0	10,716	14,213	6,880
210.00	9,766	405.0	16,402	30,615	9,998

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	205.00'	**6.0" Vert. Vertical Orifice** C= 0.600
#3	Device 1	207.90'	**24.0" Horiz. Horizonal Orifice** C= 0.600 Limited to weir flow at low heads
#4	Primary	209.00'	**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=8.34 cfs @ 12.31 hrs HW=208.37' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Passes 8.34 cfs of 9.77 cfs potential flow)
  - **2=Vertical Orifice** (Orifice Controls 1.67 cfs @ 8.51 fps)
  - **3=Horizonal Orifice** (Weir Controls 6.67 cfs @ 2.25 fps)
- **4=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 =	171,013 sf,	23.35% Impervious,	Inflow Depth =	3.12"	for 25-year event
Inflow =	8.21 cfs @	12.09 hrs,	Volume=	44,494 cf	
Outflow =	2.55 cfs @	12.65 hrs,	Volume=	44,494 cf,	Atten= 69%, Lag= 33.9 min
Discarded =	0.22 cfs @	12.65 hrs,	Volume=	12,338 cf	
Primary =	2.34 cfs @	12.65 hrs,	Volume=	32,157 cf	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 247.72' @ 12.65 hrs Surf.Area= 6,675 sf Storage= 13,716 cf
Flood Elev= 250.00' Surf.Area= 9,884 sf Storage= 32,513 cf

Plug-Flow detention time= 143.0 min calculated for 44,482 cf (100% of inflow)
Center-of-Mass det. time= 143.1 min (1,004.9 - 861.8)

Volume	Invert	Avail.Storage	Storage Description
#1	245.00'	32,513 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)
245.00	3,554	254.0	0	0	3,554
246.00	4,619	279.0	4,075	4,075	4,647
248.00	7,050	329.0	11,584	15,659	7,142
250.00	9,884	379.0	16,854	32,513	10,046

Device	Routing	Invert	Outlet Devices
#1	Primary	245.00'	**12.0" Round Culvert** L= 131.0' Ke= 0.500 Inlet / Outlet Invert= 245.00' / 237.80' S= 0.0550 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	246.00'	**6.0" Vert. Vertical Orifice** C= 0.600
#3	Device 1	246.00'	**6.0" Vert. Vertical Orifice** C= 0.600
#4	Device 1	247.70'	**24.0" Horiz. Horizontal Orifice** C= 0.600 Limited to weir flow at low heads
#5	Secondary	249.00'	**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	245.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 240.00' Phase-In= 0.01'

Discarded OutFlow Max=0.22 cfs @ 12.65 hrs HW=247.72' (Free Discharge)
└**6=Exfiltration** (Controls 0.22 cfs)

Primary OutFlow Max=2.33 cfs @ 12.65 hrs HW=247.72' TW=238.31' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.33 cfs of 5.63 cfs potential flow)
  ├**2=Vertical Orifice** (Orifice Controls 1.15 cfs @ 5.83 fps)
  ├**3=Vertical Orifice** (Orifice Controls 1.15 cfs @ 5.83 fps)
  └**4=Horizontal Orifice** (Weir Controls 0.04 cfs @ 0.42 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=245.00' TW=218.80' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DB3: DB3

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

Inflow Area =	89,589 sf,	30.78% Impervious,	Inflow Depth =	3.60"	for 25-year event
Inflow =	8.59 cfs @	12.09 hrs,	Volume=	26,867 cf	
Outflow =	3.72 cfs @	12.30 hrs,	Volume=	26,867 cf,	Atten= 57%, Lag= 12.7 min
Discarded =	0.12 cfs @	12.30 hrs,	Volume=	6,304 cf	
Primary =	3.61 cfs @	12.30 hrs,	Volume=	20,563 cf	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 266.57' @ 12.30 hrs Surf.Area= 4,277 sf Storage= 9,908 cf
Flood Elev= 268.00' Surf.Area= 5,752 sf Storage= 17,031 cf

Plug-Flow detention time= 170.3 min calculated for 26,867 cf (100% of inflow)
Center-of-Mass det. time= 170.3 min (986.7 - 816.5)

Volume	Invert	Avail.Storage	Storage Description
#1	263.00'	17,031 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)
263.00	1,483	151.0	0	0	1,483
264.00	2,137	176.0	1,800	1,800	2,154
266.00	3,744	266.0	5,806	7,606	5,350
268.00	5,752	277.0	9,424	17,031	6,072

Device	Routing	Invert	Outlet Devices
#1	Primary	263.00'	**24.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 263.00' / 262.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	264.00'	**4.0" Vert. Vertical Orifice** C= 0.600
#3	Device 1	266.30'	**24.0" Horiz. Horizontal Orifice** C= 0.600 Limited to weir flow at low heads
#4	Secondary	267.00'	**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
#5	Discarded	263.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 250.00' Phase-In= 0.01'

Discarded OutFlow Max=0.12 cfs @ 12.30 hrs HW=266.57' (Free Discharge)
└**5=Exfiltration** (Controls 0.12 cfs)

Primary OutFlow Max=3.60 cfs @ 12.30 hrs HW=266.57' TW=260.84' (Dynamic Tailwater)
└**1=Culvert** (Passes 3.60 cfs of 24.27 cfs potential flow)
  ├**2=Vertical Orifice** (Orifice Controls 0.65 cfs @ 7.47 fps)
  └**3=Horizontal Orifice** (Weir Controls 2.95 cfs @ 1.71 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=263.00' TW=260.80' (Dynamic Tailwater)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DB4: DB4

Groundwater must be verified with test pit

Inflow Area = 48,251 sf, 7.27% Impervious, Inflow Depth = 3.10" for 25-year event
Inflow = 3.48 cfs @ 12.14 hrs, Volume= 12,452 cf
Outflow = 3.19 cfs @ 12.19 hrs, Volume= 12,452 cf, Atten= 8%, Lag= 2.6 min
Primary = 3.19 cfs @ 12.19 hrs, Volume= 12,452 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 210.05' @ 12.19 hrs Surf.Area= 826 sf Storage= 647 cf
Flood Elev= 212.00' Surf.Area= 1,900 sf Storage= 3,240 cf

Plug-Flow detention time= 6.9 min calculated for 12,449 cf (100% of inflow)
Center-of-Mass det. time= 7.0 min (842.0 - 835.0)

Volume	Invert	Avail.Storage	Storage Description
#1	209.00'	3,240 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)
209.00	433	86.0	0	0	433
212.00	1,900	161.0	3,240	3,240	1,953

Device	Routing	Invert	Outlet Devices
#1	Primary	209.00'	**15.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 209.00' / 208.60' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Primary	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=3.18 cfs @ 12.19 hrs HW=210.04' TW=209.49' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 3.18 cfs @ 3.93 fps)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond dmh-03: dmh

Inflow Area = 95,827 sf, 33.90% Impervious, Inflow Depth = 2.91" for 25-year event
Inflow = 3.93 cfs @ 12.29 hrs, Volume= 23,262 cf
Outflow = 3.93 cfs @ 12.29 hrs, Volume= 23,262 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.93 cfs @ 12.29 hrs, Volume= 23,262 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 260.84' @ 12.29 hrs
Flood Elev= 264.22'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.00'	**24.0" Round Culvert** L= 96.0' Ke= 0.500 Inlet / Outlet Invert= 260.00' / 256.80' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=3.93 cfs @ 12.29 hrs HW=260.84' TW=252.66' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 3.93 cfs @ 3.12 fps)

Summary for Pond dmh-04: dmh

Inflow Area = 11,466 sf, 22.34% Impervious, Inflow Depth = 3.69" for 25-year event
Inflow = 1.13 cfs @ 12.09 hrs, Volume= 3,524 cf
Outflow = 1.13 cfs @ 12.09 hrs, Volume= 3,524 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.13 cfs @ 12.09 hrs, Volume= 3,524 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Peak Elev= 250.25' @ 12.09 hrs
Flood Elev= 253.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	249.70'	**12.0" Round Culvert** L= 136.0' Ke= 0.500 Inlet / Outlet Invert= 249.70' / 241.30' S= 0.0618 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.13 cfs @ 12.09 hrs HW=250.25' TW=241.81' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 1.13 cfs @ 2.53 fps)

Summary for Pond dmh-05: dmh

Inflow Area = 21,513 sf, 43.03% Impervious, Inflow Depth = 4.24" for 25-year event
Inflow = 2.36 cfs @ 12.09 hrs, Volume= 7,593 cf
Outflow = 2.36 cfs @ 12.09 hrs, Volume= 7,593 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.36 cfs @ 12.09 hrs, Volume= 7,593 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 241.82' @ 12.09 hrs
Flood Elev= 245.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	241.05'	**15.0" Round Culvert** L= 153.0' Ke= 0.500 Inlet / Outlet Invert= 241.05' / 233.30' S= 0.0507 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.35 cfs @ 12.09 hrs HW=241.82' TW=234.00' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 2.35 cfs @ 2.98 fps)

Summary for Pond dmh-06: dmh

Inflow Area = 35,627 sf, 42.89% Impervious, Inflow Depth = 4.25" for 25-year event
Inflow = 3.93 cfs @ 12.09 hrs, Volume= 12,619 cf
Outflow = 3.93 cfs @ 12.09 hrs, Volume= 12,619 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.93 cfs @ 12.09 hrs, Volume= 12,619 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 234.00' @ 12.09 hrs
Flood Elev= 237.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	233.05'	**18.0" Round Culvert** L= 149.0' Ke= 0.500 Inlet / Outlet Invert= 233.05' / 226.30' S= 0.0453 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=3.90 cfs @ 12.09 hrs HW=234.00' TW=224.97' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 3.90 cfs @ 3.32 fps)

Summary for Pond dmh-07: dmh

Inflow Area = 76,939 sf, 29.95% Impervious, Inflow Depth = 3.94" for 25-year event
Inflow = 7.98 cfs @ 12.09 hrs, Volume= 25,241 cf
Outflow = 7.98 cfs @ 12.09 hrs, Volume= 25,241 cf, Atten= 0%, Lag= 0.0 min
Primary = 7.98 cfs @ 12.09 hrs, Volume= 25,241 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 224.98' @ 12.09 hrs
Flood Elev= 230.44'

Device	Routing	Invert	Outlet Devices
#1	Primary	223.35'	**18.0" Round Culvert** L= 188.0' Ke= 0.500 Inlet / Outlet Invert= 223.35' / 217.64' S= 0.0304 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=7.92 cfs @ 12.09 hrs HW=224.97' TW=218.76' (Dynamic Tailwater)
1=Culvert (Inlet Controls 7.92 cfs @ 4.48 fps)

Summary for Pond dmh-08: dmh

Inflow Area = 102,472 sf, 27.51% Impervious, Inflow Depth = 3.85" for 25-year event
Inflow = 10.40 cfs @ 12.09 hrs, Volume= 32,898 cf
Outflow = 10.40 cfs @ 12.09 hrs, Volume= 32,898 cf, Atten= 0%, Lag= 0.0 min
Primary = 10.40 cfs @ 12.09 hrs, Volume= 32,898 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 218.77' @ 12.09 hrs
Flood Elev= 221.85'

Device	Routing	Invert	Outlet Devices
#1	Primary	217.14'	**24.0" Round Culvert** L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 217.14' / 216.88' S= 0.0260 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=10.33 cfs @ 12.09 hrs HW=218.76' TW=211.28' (Dynamic Tailwater)
1=Culvert (Barrel Controls 10.33 cfs @ 5.16 fps)

Summary for Pond dmh-09: dmh

Inflow Area = 95,827 sf, 33.90% Impervious, Inflow Depth = 2.91" for 25-year event
Inflow = 3.93 cfs @ 12.29 hrs, Volume= 23,262 cf
Outflow = 3.93 cfs @ 12.29 hrs, Volume= 23,262 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.93 cfs @ 12.29 hrs, Volume= 23,262 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 252.66' @ 12.29 hrs
Flood Elev= 261.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.82'	**24.0" Round Culvert** L= 96.0' Ke= 0.500

Inlet / Outlet Invert= 251.82' / 247.00' S= 0.0502 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=3.93 cfs @ 12.29 hrs HW=252.66' TW=247.24' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 3.93 cfs @ 3.12 fps)

Summary for Pond dmh-10: dmh

Inflow Area = 171,013 sf, 23.35% Impervious, Inflow Depth = 2.26" for 25-year event
Inflow = 2.34 cfs @ 12.65 hrs, Volume= 32,157 cf
Outflow = 2.34 cfs @ 12.65 hrs, Volume= 32,157 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.34 cfs @ 12.65 hrs, Volume= 32,157 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 238.31' @ 12.65 hrs
Flood Elev= 251.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	237.55'	**15.0" Round Culvert** L= 161.0' Ke= 0.500 Inlet / Outlet Invert= 237.55' / 235.80' S= 0.0109 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.33 cfs @ 12.65 hrs HW=238.31' TW=231.63' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 2.33 cfs @ 2.97 fps)

Summary for Pond dmh-11: dmh

Inflow Area = 171,013 sf, 23.35% Impervious, Inflow Depth = 2.26" for 25-year event
Inflow = 2.34 cfs @ 12.65 hrs, Volume= 32,157 cf
Outflow = 2.34 cfs @ 12.65 hrs, Volume= 32,157 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.34 cfs @ 12.65 hrs, Volume= 32,157 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 231.63' @ 12.65 hrs
Flood Elev= 239.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	230.87'	**15.0" Round Culvert** L= 37.0' Ke= 0.500 Inlet / Outlet Invert= 230.87' / 229.00' S= 0.0505 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.33 cfs @ 12.65 hrs HW=231.63' TW=229.55' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 2.33 cfs @ 2.97 fps)

Summary for Pond dmh-12: dmh

Inflow Area = 102,472 sf, 27.51% Impervious, Inflow Depth = 3.85" for 25-year event
Inflow = 10.40 cfs @ 12.09 hrs, Volume= 32,898 cf
Outflow = 10.40 cfs @ 12.09 hrs, Volume= 32,898 cf, Atten= 0%, Lag= 0.0 min
Primary = 10.40 cfs @ 12.09 hrs, Volume= 32,898 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 211.29' @ 12.09 hrs
Flood Elev= 220.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	209.80'	**24.0" Round Culvert** L= 72.0' Ke= 0.500 Inlet / Outlet Invert= 209.80' / 208.00' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=10.33 cfs @ 12.09 hrs HW=211.28' TW=207.59' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 10.33 cfs @ 4.14 fps)

Summary for Pond G: gabion

Inflow Area = 171,013 sf, 23.35% Impervious, Inflow Depth = 2.26" for 25-year event
Inflow = 2.34 cfs @ 12.65 hrs, Volume= 32,157 cf
Outflow = 2.34 cfs @ 12.66 hrs, Volume= 32,157 cf, Atten= 0%, Lag= 0.3 min
Primary = 2.34 cfs @ 12.66 hrs, Volume= 32,157 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 229.55' @ 12.66 hrs Surf.Area= 37 sf Storage= 16 cf
Flood Elev= 230.25' Surf.Area= 0 sf Storage= 37 cf

Plug-Flow detention time= 0.1 min calculated for 32,148 cf (100% of inflow)
Center-of-Mass det. time= 0.1 min (904.0 - 903.9)

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. 3" outlet holes X 30.00** C= 0.600
#2	Primary	229.00'	**2.0" Horiz. 2" outlet holes X 30.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.34 cfs @ 12.66 hrs HW=229.55' TW=0.00' (Dynamic Tailwater)
└**1=3" outlet holes** (Controls 0.00 cfs)
└**2=2" outlet holes** (Orifice Controls 2.34 cfs @ 3.57 fps)

Time span=0.00-72.00 hrs, dt=0.02 hrs, 3601 points
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=250,444 sf 2.13% Impervious Runoff Depth=5.16"
Flow Length=844' Tc=16.3 min CN=72 Runoff=25.48 cfs 107,743 cf

Subcatchment P-2: Subcat P-2 Runoff Area=7,960 sf 0.00% Impervious Runoff Depth=4.92"
Flow Length=81' Tc=13.0 min CN=70 Runoff=0.84 cfs 3,265 cf

Subcatchment P-3A: Subcat P-3A Runoff Area=48,251 sf 7.27% Impervious Runoff Depth=5.28"
Flow Length=511' Tc=10.2 min CN=73 Runoff=5.94 cfs 21,240 cf

Subcatchment P-3B: Subcat P-3B Runoff Area=11,466 sf 22.34% Impervious Runoff Depth=6.00"
Tc=6.0 min CN=79 Runoff=1.82 cfs 5,736 cf

Subcatchment P-3C: Subcat P-3C Runoff Area=3,275 sf 100.00% Impervious Runoff Depth=8.29"
Tc=6.0 min CN=98 Runoff=0.63 cfs 2,262 cf

Subcatchment P-3D: Subcat P-3D Runoff Area=6,772 sf 50.52% Impervious Runoff Depth=6.85"
Tc=6.0 min CN=86 Runoff=1.19 cfs 3,863 cf

Subcatchment P-3E: Subcat P-3E Runoff Area=10,604 sf 28.17% Impervious Runoff Depth=6.24"
Tc=6.0 min CN=81 Runoff=1.74 cfs 5,518 cf

Subcatchment P-3F: Subcat P-3F Runoff Area=3,510 sf 86.55% Impervious Runoff Depth=7.93"
Tc=6.0 min CN=95 Runoff=0.67 cfs 2,319 cf

Subcatchment P-3G: Subcat P-3G Runoff Area=7,921 sf 49.94% Impervious Runoff Depth=6.85"
Tc=6.0 min CN=86 Runoff=1.39 cfs 4,519 cf

Subcatchment P-3H: Subcat P-3H Runoff Area=33,391 sf 11.40% Impervious Runoff Depth=5.76"
Tc=6.0 min CN=77 Runoff=5.12 cfs 16,035 cf

Subcatchment P-3I: Subcat P-3I Runoff Area=23,285 sf 12.45% Impervious Runoff Depth=5.64"
Tc=6.0 min CN=76 Runoff=3.50 cfs 10,949 cf

Subcatchment P-3J: Subcat P-3J Runoff Area=2,248 sf 100.00% Impervious Runoff Depth=8.29"
Tc=6.0 min CN=98 Runoff=0.43 cfs 1,553 cf

Subcatchment P-3K: Subcat P-3K Runoff Area=3,123 sf 100.00% Impervious Runoff Depth=8.29"
Tc=6.0 min CN=98 Runoff=0.60 cfs 2,158 cf

Subcatchment P-3L: Subcat P-3L Runoff Area=35,377 sf 4.79% Impervious Runoff Depth=5.40"
Tc=6.0 min CN=74 Runoff=5.11 cfs 15,926 cf

Subcatchment P-4: Subcat P-4 Runoff Area=210,752 sf 2.26% Impervious Runoff Depth=4.68"
Flow Length=845' Tc=20.5 min CN=68 Runoff=17.73 cfs 82,266 cf

Subcatchment P-4A: Subcat P-4A Runoff Area=35,777 sf 1.45% Impervious Runoff Depth=5.04"
Tc=6.0 min CN=71 Runoff=4.85 cfs 15,035 cf

Subcatchment P-4B: Subcat P-4B Runoff Area=32,221 sf 46.28% Impervious Runoff Depth=6.48"
Tc=6.0 min CN=83 Runoff=5.44 cfs 17,412 cf

Subcatchment P-4C: Subcat P-4C Runoff Area=21,590 sf 56.23% Impervious Runoff Depth=6.36"
Tc=6.0 min CN=82 Runoff=3.60 cfs 11,451 cf

Subcatchment P-4D: Subcat P-4D Runoff Area=6,238 sf 78.70% Impervious Runoff Depth=7.69"
Tc=6.0 min CN=93 Runoff=1.17 cfs 3,997 cf

Subcatchment P-4E: Subcat P-4E Runoff Area=75,187 sf 9.91% Impervious Runoff Depth=5.64"
Tc=6.0 min CN=76 Runoff=11.31 cfs 35,353 cf

Reach SP-3: SP-3 Inflow=14.83 cfs 92,092 cf
Outflow=14.83 cfs 92,092 cf

Reach SP-4: SP-4 Inflow=24.62 cfs 144,519 cf
Outflow=24.62 cfs 144,519 cf

Pond cb-02: cb Peak Elev=267.80' Inflow=3.60 cfs 11,451 cf
12.0" Round Culvert n=0.013 L=50.0' S=0.0150 '/' Outflow=3.60 cfs 11,451 cf

Pond cb-03: cb Peak Elev=267.66' Inflow=5.44 cfs 17,412 cf
15.0" Round Culvert n=0.013 L=46.0' S=0.0109 '/' Outflow=5.44 cfs 17,412 cf

Pond cb-05: cb Peak Elev=261.75' Inflow=1.17 cfs 3,997 cf
12.0" Round Culvert n=0.013 L=20.0' S=0.0150 '/' Outflow=1.17 cfs 3,997 cf

Pond cb-06: cb Peak Elev=257.04' Inflow=1.82 cfs 5,736 cf
12.0" Round Culvert n=0.013 L=128.0' S=0.0508 '/' Outflow=1.82 cfs 5,736 cf

Pond cb-07a: cb Peak Elev=242.32' Inflow=0.63 cfs 2,262 cf
12.0" Round Culvert n=0.013 L=11.0' S=0.0309 '/' Outflow=0.63 cfs 2,262 cf

Pond cb-07b: cb Peak Elev=242.42' Inflow=1.19 cfs 3,863 cf
12.0" Round Culvert n=0.013 L=19.0' S=0.0132 '/' Outflow=1.19 cfs 3,863 cf

Pond cb-08a: cb Peak Elev=227.93' Inflow=1.39 cfs 4,519 cf
12.0" Round Culvert n=0.013 L=12.0' S=0.0417 '/' Outflow=1.39 cfs 4,519 cf

Pond cb-08b: cb Peak Elev=229.63' Inflow=5.12 cfs 16,035 cf
12.0" Round Culvert n=0.013 L=18.0' S=0.0278 '/' Outflow=5.12 cfs 16,035 cf

Pond cb-09a: cb Peak Elev=220.46' Inflow=3.93 cfs 12,531 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0290 '/' Outflow=3.93 cfs 12,531 cf

Pond cb-09b: cb Peak Elev=221.25' Inflow=3.50 cfs 10,978 cf
12.0" Round Culvert n=0.013 L=37.0' S=0.0100 '/' Outflow=3.50 cfs 10,978 cf

Pond cb-10: cb Peak Elev=210.01' Inflow=5.34 cfs 23,397 cf
15.0" Round Culvert n=0.013 L=43.0' S=0.0116 '/' Outflow=5.34 cfs 23,397 cf

Pond cb-11a: cb Peak Elev=234.86' Inflow=1.74 cfs 5,518 cf
12.0" Round Culvert n=0.013 L=17.0' S=0.0200 '/' Outflow=1.74 cfs 5,518 cf

Pond cb-11b: cb Peak Elev=234.56' Inflow=0.67 cfs 2,319 cf
12.0" Round Culvert n=0.013 L=15.0' S=0.0200 '/' Outflow=0.67 cfs 2,319 cf

Pond DB1: DB1 Peak Elev=209.27' Storage=23,940 cf Inflow=26.09 cfs 92,108 cf
Outflow=14.83 cfs 92,092 cf

Pond DB2: DB2 Peak Elev=249.02' Storage=23,587 cf Inflow=22.77 cfs 76,161 cf
Discarded=0.30 cfs 13,879 cf Primary=7.10 cfs 62,253 cf Secondary=0.10 cfs 29 cf Outflow=7.50 cfs 76,161 cf

Pond DB3: DB3 Peak Elev=266.95' Storage=11,580 cf Inflow=13.88 cfs 43,897 cf
Discarded=0.13 cfs 7,086 cf Primary=11.45 cfs 36,811 cf Secondary=0.00 cfs 0 cf Outflow=11.58 cfs 43,897 cf

Pond DB4: DB4 Peak Elev=210.64' Storage=1,220 cf Inflow=5.94 cfs 21,240 cf
Outflow=5.00 cfs 21,240 cf

Pond dmh-03: dmh Peak Elev=261.68' Inflow=12.41 cfs 40,808 cf
24.0" Round Culvert n=0.013 L=96.0' S=0.0333 '/' Outflow=12.41 cfs 40,808 cf

Pond dmh-04: dmh Peak Elev=250.44' Inflow=1.82 cfs 5,736 cf
12.0" Round Culvert n=0.013 L=136.0' S=0.0618 '/' Outflow=1.82 cfs 5,736 cf

Pond dmh-05: dmh Peak Elev=242.06' Inflow=3.64 cfs 11,862 cf
15.0" Round Culvert n=0.013 L=153.0' S=0.0507 '/' Outflow=3.64 cfs 11,862 cf

Pond dmh-06: dmh Peak Elev=234.31' Inflow=6.04 cfs 19,699 cf
18.0" Round Culvert n=0.013 L=149.0' S=0.0453 '/' Outflow=6.04 cfs 19,699 cf

Pond dmh-07: dmh Peak Elev=226.28' Inflow=12.55 cfs 40,253 cf
18.0" Round Culvert n=0.013 L=188.0' S=0.0304 '/' Outflow=12.55 cfs 40,253 cf

Pond dmh-08: dmh Peak Elev=219.41' Inflow=16.49 cfs 52,784 cf
24.0" Round Culvert n=0.013 L=10.0' S=0.0260 '/' Outflow=16.49 cfs 52,784 cf

Pond dmh-09: dmh Peak Elev=253.50' Inflow=12.41 cfs 40,808 cf
24.0" Round Culvert n=0.013 L=96.0' S=0.0502 '/' Outflow=12.41 cfs 40,808 cf

Pond dmh-10: dmh Peak Elev=239.78' Inflow=7.10 cfs 62,253 cf
15.0" Round Culvert n=0.013 L=161.0' S=0.0109 '/' Outflow=7.10 cfs 62,253 cf

Pond dmh-11: dmh Peak Elev=232.94' Inflow=7.10 cfs 62,253 cf
15.0" Round Culvert n=0.013 L=37.0' S=0.0505 '/' Outflow=7.10 cfs 62,253 cf

Pond dmh-12: dmh Peak Elev=211.99' Inflow=16.49 cfs 52,784 cf
24.0" Round Culvert n=0.013 L=72.0' S=0.0250 '/' Outflow=16.49 cfs 52,784 cf

Pond G: gabion Peak Elev=230.05' Storage=33 cf Inflow=7.10 cfs 62,253 cf
Outflow=7.10 cfs 62,253 cf

Total Runoff Area = 829,392 sf Runoff Volume = 368,600 cf Average Runoff Depth = 5.33"
89.57% Pervious = 742,861 sf 10.43% Impervious = 86,531 sf

Summary for Subcatchment P-1: Subcat P-1

Runoff = 25.48 cfs @ 12.22 hrs, Volume= 107,743 cf, Depth= 5.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
4,841	98	Paved parking, HSG B
45,769	55	Woods, Good, HSG B
14,862	61	>75% Grass cover, Good, HSG B
24,002	80	>75% Grass cover, Good, HSG D
482	98	Paved parking, HSG D
131,956	77	Woods, Good, HSG D
7,031	74	>75% Grass cover, Good, HSG C
21,502	70	Woods, Good, HSG C
250,444	72	Weighted Average
245,121		97.87% Pervious Area
5,322		2.13% 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 = 0.84 cfs @ 12.18 hrs, Volume= 3,265 cf, Depth= 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
7,044	70	Woods, Good, HSG C
916	74	>75% Grass cover, Good, HSG C
7,960	70	Weighted Average
7,960		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 = 5.94 cfs @ 12.14 hrs, Volume= 21,240 cf, Depth= 5.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
3,510	98	Paved parking, HSG C
28,784	70	Woods, Good, HSG C
15,958	74	>75% Grass cover, Good, HSG C
48,251	73	Weighted Average
44,742		92.73% Pervious Area
3,510		7.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0900	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
2.9	313	0.1300	1.80		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.4	148	0.0600	5.75	11.51	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=0.50' Z= 4.0 '/' Top.W=6.00' n= 0.030 Earth, grassed & winding
10.2	511	Total			

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

Runoff = 1.82 cfs @ 12.09 hrs, Volume= 5,736 cf, Depth= 6.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
8,905	74	>75% Grass cover, Good, HSG C
2,561	98	Paved parking, HSG C
11,466	79	Weighted Average
8,905		77.66% Pervious Area
2,561		22.34% Impervious Area

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

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

Runoff = 0.63 cfs @ 12.08 hrs, Volume= 2,262 cf, Depth= 8.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
3,275	98	Paved parking, HSG C
3,275		100.00% Impervious Area

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

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

Runoff = 1.19 cfs @ 12.08 hrs, Volume= 3,863 cf, Depth= 6.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
3,351	74	>75% Grass cover, Good, HSG C
3,421	98	Paved parking, HSG C
6,772	86	Weighted Average
3,351		49.48% Pervious Area
3,421		50.52% Impervious Area

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

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

Runoff = 1.74 cfs @ 12.09 hrs, Volume= 5,518 cf, Depth= 6.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
7,617	74	>75% Grass cover, Good, HSG C
2,987	98	Paved parking, HSG C
10,604	81	Weighted Average
7,617		71.83% Pervious Area
2,987		28.17% Impervious Area

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

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

Runoff = 0.67 cfs @ 12.08 hrs, Volume= 2,319 cf, Depth= 7.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
472	74	>75% Grass cover, Good, HSG C
3,038	98	Paved parking, HSG C
3,510	95	Weighted Average
472		13.45% Pervious Area
3,038		86.55% Impervious Area

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

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

Runoff = 1.39 cfs @ 12.08 hrs, Volume= 4,519 cf, Depth= 6.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
3,965	74	>75% Grass cover, Good, HSG C
3,956	98	Paved parking, HSG C
7,921	86	Weighted Average
3,965		50.06% Pervious Area
3,956		49.94% Impervious Area

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

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

Runoff = 5.12 cfs @ 12.09 hrs, Volume= 16,035 cf, Depth= 5.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
29,484	74	>75% Grass cover, Good, HSG C
3,806	98	Paved parking, HSG C
100	70	Woods, Good, HSG C
33,391	77	Weighted Average
29,585		88.60% Pervious Area
3,806		11.40% Impervious Area

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

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

Runoff = 3.50 cfs @ 12.09 hrs, Volume= 10,949 cf, Depth= 5.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
2,899	98	Paved parking, HSG C
3,195	70	Woods, Good, HSG C
17,191	74	>75% Grass cover, Good, HSG C
23,285	76	Weighted Average
20,386		87.55% Pervious Area
2,899		12.45% Impervious Area

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

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

Runoff = 0.43 cfs @ 12.08 hrs, Volume= 1,553 cf, Depth= 8.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
2,248	98	Paved parking, HSG C
2,248		100.00% Impervious Area

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

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

Runoff = 0.60 cfs @ 12.08 hrs, Volume= 2,158 cf, Depth= 8.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
3,123	98	Paved parking, HSG C
3,123		100.00% Impervious Area

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

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

Runoff = 5.11 cfs @ 12.09 hrs, Volume= 15,926 cf, Depth= 5.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
1,694	98	Paved parking, HSG C
7,044	70	Woods, Good, HSG C
26,638	74	>75% Grass cover, Good, HSG C
35,377	74	Weighted Average
33,682		95.21% Pervious Area
1,694		4.79% Impervious Area

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

Summary for Subcatchment P-4: Subcat P-4

Runoff = 17.73 cfs @ 12.28 hrs, Volume= 82,266 cf, Depth= 4.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
156	77	Woods, Good, HSG D
2,827	98	Paved parking, HSG B
56,148	61	>75% Grass cover, Good, HSG B
19,587	55	Woods, Good, HSG B
1,932	98	Paved parking, HSG C
47,810	74	>75% Grass cover, Good, HSG C
82,292	70	Woods, Good, HSG C
210,752	68	Weighted Average
205,993		97.74% Pervious Area
4,758		2.26% 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"
8.0	795	0.1100	1.66		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
20.5	845	Total			

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

Runoff = 4.85 cfs @ 12.09 hrs, Volume= 15,035 cf, Depth= 5.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
8,875	61	>75% Grass cover, Good, HSG B
520	98	Paved parking, HSG C
26,382	74	>75% Grass cover, Good, HSG C
35,777	71	Weighted Average
35,258		98.55% Pervious Area
520		1.45% Impervious Area

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

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

Runoff = 5.44 cfs @ 12.09 hrs, Volume= 17,412 cf, Depth= 6.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
4,728	98	Paved parking, HSG B
6,266	61	>75% Grass cover, Good, HSG B
10,183	98	Paved parking, HSG C
11,044	74	>75% Grass cover, Good, HSG C
32,221	83	Weighted Average
17,310		53.72% Pervious Area
14,911		46.28% Impervious Area

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

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

Runoff = 3.60 cfs @ 12.09 hrs, Volume= 11,451 cf, Depth= 6.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
10,959	98	Paved parking, HSG B
9,216	61	>75% Grass cover, Good, HSG B
1,182	98	Paved parking, HSG C
233	74	>75% Grass cover, Good, HSG C
21,590	82	Weighted Average
9,449		43.77% Pervious Area
12,141		56.23% Impervious Area

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

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

Runoff = 1.17 cfs @ 12.08 hrs, Volume= 3,997 cf, Depth= 7.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
4,909	98	Paved parking, HSG C
1,329	74	>75% Grass cover, Good, HSG C
6,238	93	Weighted Average
1,329		21.30% Pervious Area
4,909		78.70% Impervious Area

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

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

Runoff = 11.31 cfs @ 12.09 hrs, Volume= 35,353 cf, Depth= 5.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-year Rainfall=8.53"

Area (sf)	CN	Description
67,736	74	>75% Grass cover, Good, HSG C
7,451	98	Paved parking, HSG C
1	70	Woods, Good, HSG C
75,187	76	Weighted Average
67,736		90.09% Pervious Area
7,451		9.91% Impervious Area

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

Summary for Reach SP-3: SP-3

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

Inflow Area = 189,224 sf, 19.30% Impervious, Inflow Depth = 5.84" for 100-year event
Inflow = 14.83 cfs @ 12.26 hrs, Volume= 92,092 cf
Outflow = 14.83 cfs @ 12.26 hrs, Volume= 92,092 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Reach SP-4: SP-4

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

Inflow Area = 381,765 sf, 11.71% Impervious, Inflow Depth = 4.54" for 100-year event
Inflow = 24.62 cfs @ 12.29 hrs, Volume= 144,519 cf
Outflow = 24.62 cfs @ 12.29 hrs, Volume= 144,519 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Summary for Pond cb-02: cb

Inflow Area = 21,590 sf, 56.23% Impervious, Inflow Depth = 6.36" for 100-year event
Inflow = 3.60 cfs @ 12.09 hrs, Volume= 11,451 cf
Outflow = 3.60 cfs @ 12.09 hrs, Volume= 11,451 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.60 cfs @ 12.09 hrs, Volume= 11,451 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 267.80' @ 12.10 hrs
Flood Elev= 268.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	265.25'	**12.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 265.25' / 264.50' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.42 cfs @ 12.09 hrs HW=267.76' TW=266.85' (Dynamic Tailwater)
1=Culvert (Outlet Controls 3.42 cfs @ 4.35 fps)

Summary for Pond cb-03: cb

Inflow Area = 32,221 sf, 46.28% Impervious, Inflow Depth = 6.48" for 100-year event
Inflow = 5.44 cfs @ 12.09 hrs, Volume= 17,412 cf
Outflow = 5.44 cfs @ 12.09 hrs, Volume= 17,412 cf, Atten= 0%, Lag= 0.0 min
Primary = 5.44 cfs @ 12.09 hrs, Volume= 17,412 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 267.66' @ 12.10 hrs
Flood Elev= 268.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	264.25'	**15.0" Round Culvert** L= 46.0' Ke= 0.500 Inlet / Outlet Invert= 264.25' / 263.75' S= 0.0109 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=5.13 cfs @ 12.09 hrs HW=267.61' TW=266.85' (Dynamic Tailwater)
1=Culvert (Inlet Controls 5.13 cfs @ 4.18 fps)

Summary for Pond cb-05: cb

Inflow Area = 6,238 sf, 78.70% Impervious, Inflow Depth = 7.69" for 100-year event
Inflow = 1.17 cfs @ 12.08 hrs, Volume= 3,997 cf
Outflow = 1.17 cfs @ 12.08 hrs, Volume= 3,997 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.17 cfs @ 12.08 hrs, Volume= 3,997 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 261.75' @ 12.15 hrs
Flood Elev= 264.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.80'	**12.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 260.80' / 260.50' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.58 cfs @ 12.08 hrs HW=261.52' TW=261.47' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.58 cfs @ 1.33 fps)

Summary for Pond cb-06: cb

Inflow Area = 11,466 sf, 22.34% Impervious, Inflow Depth = 6.00" for 100-year event
Inflow = 1.82 cfs @ 12.09 hrs, Volume= 5,736 cf
Outflow = 1.82 cfs @ 12.09 hrs, Volume= 5,736 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.82 cfs @ 12.09 hrs, Volume= 5,736 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 257.04' @ 12.09 hrs
Flood Elev= 259.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	256.30'	**12.0" Round Culvert** L= 128.0' Ke= 0.500

Inlet / Outlet Invert= 256.30' / 249.80' S= 0.0508 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.81 cfs @ 12.09 hrs HW=257.04' TW=250.44' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 1.81 cfs @ 2.92 fps)

Summary for Pond cb-07a: cb

Inflow Area = 3,275 sf,100.00% Impervious, Inflow Depth = 8.29" for 100-year event
Inflow = 0.63 cfs @ 12.08 hrs, Volume= 2,262 cf
Outflow = 0.63 cfs @ 12.08 hrs, Volume= 2,262 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.63 cfs @ 12.08 hrs, Volume= 2,262 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 242.32' @ 12.10 hrs
Flood Elev= 245.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	241.89'	**12.0" Round Culvert** L= 11.0' Ke= 0.500 Inlet / Outlet Invert= 241.89' / 241.55' S= 0.0309 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.60 cfs @ 12.08 hrs HW=242.31' TW=242.06' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.60 cfs @ 2.82 fps)

Summary for Pond cb-07b: cb

Inflow Area = 6,772 sf, 50.52% Impervious, Inflow Depth = 6.85" for 100-year event
Inflow = 1.19 cfs @ 12.08 hrs, Volume= 3,863 cf
Outflow = 1.19 cfs @ 12.08 hrs, Volume= 3,863 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.19 cfs @ 12.08 hrs, Volume= 3,863 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 242.42' @ 12.10 hrs
Flood Elev= 245.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	241.80'	**12.0" Round Culvert** L= 19.0' Ke= 0.500 Inlet / Outlet Invert= 241.80' / 241.55' S= 0.0132 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.15 cfs @ 12.08 hrs HW=242.41' TW=242.06' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 1.15 cfs @ 3.27 fps)

Summary for Pond cb-08a: cb

Inflow Area = 7,921 sf, 49.94% Impervious, Inflow Depth = 6.85" for 100-year event
Inflow = 1.39 cfs @ 12.08 hrs, Volume= 4,519 cf
Outflow = 1.39 cfs @ 12.08 hrs, Volume= 4,519 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.39 cfs @ 12.08 hrs, Volume= 4,519 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 227.93' @ 12.08 hrs
Flood Elev= 230.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	227.30'	**12.0" Round Culvert** L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 227.30' / 226.80' S= 0.0417 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.38 cfs @ 12.08 hrs HW=227.92' TW=226.25' (Dynamic Tailwater)
1=Culvert (Inlet Controls 1.38 cfs @ 2.69 fps)

Summary for Pond cb-08b: cb

Inflow Area = 33,391 sf, 11.40% Impervious, Inflow Depth = 5.76" for 100-year event
Inflow = 5.12 cfs @ 12.09 hrs, Volume= 16,035 cf
Outflow = 5.12 cfs @ 12.09 hrs, Volume= 16,035 cf, Atten= 0%, Lag= 0.0 min
Primary = 5.12 cfs @ 12.09 hrs, Volume= 16,035 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 229.63' @ 12.09 hrs
Flood Elev= 230.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	227.30'	**12.0" Round Culvert** L= 18.0' Ke= 0.500 Inlet / Outlet Invert= 227.30' / 226.80' S= 0.0278 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=5.08 cfs @ 12.09 hrs HW=229.61' TW=226.25' (Dynamic Tailwater)
1=Culvert (Inlet Controls 5.08 cfs @ 6.47 fps)

Summary for Pond cb-09a: cb

Inflow Area = 25,533 sf, 20.16% Impervious, Inflow Depth = 5.89" for 100-year event
Inflow = 3.93 cfs @ 12.09 hrs, Volume= 12,531 cf
Outflow = 3.93 cfs @ 12.09 hrs, Volume= 12,531 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.93 cfs @ 12.09 hrs, Volume= 12,531 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 220.46' @ 12.10 hrs
Flood Elev= 221.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	218.18'	**12.0" Round Culvert** L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 218.18' / 217.89' S= 0.0290 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.81 cfs @ 12.09 hrs HW=220.41' TW=219.40' (Dynamic Tailwater)
1=Culvert (Inlet Controls 3.81 cfs @ 4.85 fps)

Summary for Pond cb-09b: cb

Inflow Area = 23,285 sf, 12.45% Impervious, Inflow Depth = 5.66" for 100-year event
Inflow = 3.50 cfs @ 12.09 hrs, Volume= 10,978 cf
Outflow = 3.50 cfs @ 12.09 hrs, Volume= 10,978 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.50 cfs @ 12.09 hrs, Volume= 10,978 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 221.25' @ 12.11 hrs
Flood Elev= 222.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	218.80'	**12.0" Round Culvert** L= 37.0' Ke= 0.500 Inlet / Outlet Invert= 218.80' / 218.43' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.01 cfs @ 12.09 hrs HW=221.05' TW=220.41' (Dynamic Tailwater)
1=Culvert (Inlet Controls 3.01 cfs @ 3.83 fps)

Summary for Pond cb-10: cb

Inflow Area = 51,375 sf, 12.91% Impervious, Inflow Depth = 5.47" for 100-year event
Inflow = 5.34 cfs @ 12.19 hrs, Volume= 23,397 cf
Outflow = 5.34 cfs @ 12.19 hrs, Volume= 23,397 cf, Atten= 0%, Lag= 0.0 min
Primary = 5.34 cfs @ 12.19 hrs, Volume= 23,397 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 210.01' @ 12.24 hrs
Flood Elev= 212.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	208.50'	**15.0" Round Culvert** L= 43.0' Ke= 0.500 Inlet / Outlet Invert= 208.50' / 208.00' S= 0.0116 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=5.14 cfs @ 12.19 hrs HW=209.97' TW=209.22' (Dynamic Tailwater)
1=Culvert (Inlet Controls 5.14 cfs @ 4.19 fps)

Summary for Pond cb-11a: cb

Inflow Area = 10,604 sf, 28.17% Impervious, Inflow Depth = 6.24" for 100-year event
Inflow = 1.74 cfs @ 12.09 hrs, Volume= 5,518 cf
Outflow = 1.74 cfs @ 12.09 hrs, Volume= 5,518 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.74 cfs @ 12.09 hrs, Volume= 5,518 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 234.86' @ 12.09 hrs
Flood Elev= 237.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.14'	**12.0" Round Culvert** L= 17.0' Ke= 0.500

Inlet / Outlet Invert= 234.14' / 233.80' S= 0.0200 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.73 cfs @ 12.09 hrs HW=234.85' TW=234.30' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 1.73 cfs @ 2.88 fps)

Summary for Pond cb-11b: cb

Inflow Area = 3,510 sf, 86.55% Impervious, Inflow Depth = 7.93" for 100-year event
Inflow = 0.67 cfs @ 12.08 hrs, Volume= 2,319 cf
Outflow = 0.67 cfs @ 12.08 hrs, Volume= 2,319 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.67 cfs @ 12.08 hrs, Volume= 2,319 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 234.56' @ 12.10 hrs
Flood Elev= 237.83'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.10'	**12.0" Round Culvert** L= 15.0' Ke= 0.500 Inlet / Outlet Invert= 234.10' / 233.80' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.62 cfs @ 12.08 hrs HW=234.55' TW=234.30' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.62 cfs @ 2.68 fps)

Summary for Pond DB1: DB1

Groundwater must be verified with test pit

Inflow Area = 189,224 sf, 19.30% Impervious, Inflow Depth = 5.84" for 100-year event
Inflow = 26.09 cfs @ 12.09 hrs, Volume= 92,108 cf
Outflow = 14.83 cfs @ 12.26 hrs, Volume= 92,092 cf, Atten= 43%, Lag= 10.3 min
Primary = 14.83 cfs @ 12.26 hrs, Volume= 92,092 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 209.27' @ 12.26 hrs Surf.Area= 8,596 sf Storage= 23,940 cf
Flood Elev= 210.00' Surf.Area= 9,766 sf Storage= 30,615 cf

Plug-Flow detention time= 75.3 min calculated for 92,092 cf (100% of inflow)
Center-of-Mass det. time= 75.1 min (879.5 - 804.4)

Volume	Invert	Avail.Storage	Storage Description
#1	205.00'	30,615 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)
205.00	2,930	279.0	0	0	2,930
206.00	4,095	304.0	3,496	3,496	4,126
208.00	6,730	355.0	10,716	14,213	6,880
210.00	9,766	405.0	16,402	30,615	9,998

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	205.00'	**6.0" Vert. Vertical Orifice** C= 0.600
#3	Device 1	207.90'	**24.0" Horiz. Horizonal Orifice** C= 0.600 Limited to weir flow at low heads
#4	Primary	209.00'	**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=14.82 cfs @ 12.26 hrs HW=209.27' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Barrel Controls 11.32 cfs @ 9.22 fps)
  - **2=Vertical Orifice** (Passes < 1.90 cfs potential flow)
  - **3=Horizonal Orifice** (Passes < 17.72 cfs potential flow)
- **4=Broad-Crested Rectangular Weir** (Weir Controls 3.50 cfs @ 1.29 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 = 171,013 sf, 23.35% Impervious, Inflow Depth = 5.34" for 100-year event
Inflow = 22.77 cfs @ 12.11 hrs, Volume= 76,161 cf
Outflow = 7.50 cfs @ 12.47 hrs, Volume= 76,161 cf, Atten= 67%, Lag= 21.3 min
Discarded = 0.30 cfs @ 12.47 hrs, Volume= 13,879 cf
Primary = 7.10 cfs @ 12.47 hrs, Volume= 62,253 cf
Secondary = 0.10 cfs @ 12.47 hrs, Volume= 29 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 249.02' @ 12.47 hrs Surf.Area= 8,443 sf Storage= 23,587 cf
Flood Elev= 250.00' Surf.Area= 9,884 sf Storage= 32,513 cf

Plug-Flow detention time= 104.4 min calculated for 76,140 cf (100% of inflow)
Center-of-Mass det. time= 104.6 min (945.9 - 841.3)

Volume	Invert	Avail.Storage	Storage Description
#1	245.00'	32,513 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)
245.00	3,554	254.0	0	0	3,554
246.00	4,619	279.0	4,075	4,075	4,647
248.00	7,050	329.0	11,584	15,659	7,142
250.00	9,884	379.0	16,854	32,513	10,046

Device	Routing	Invert	Outlet Devices
#1	Primary	245.00'	**12.0" Round Culvert** L= 131.0' Ke= 0.500 Inlet / Outlet Invert= 245.00' / 237.80' S= 0.0550 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	246.00'	**6.0" Vert. Vertical Orifice** C= 0.600
#3	Device 1	246.00'	**6.0" Vert. Vertical Orifice** C= 0.600
#4	Device 1	247.70'	**24.0" Horiz. Horizontal Orifice** C= 0.600 Limited to weir flow at low heads
#5	Secondary	249.00'	**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	245.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 240.00' Phase-In= 0.01'

Discarded OutFlow Max=0.30 cfs @ 12.47 hrs HW=249.02' (Free Discharge)
└**6=Exfiltration** (Controls 0.30 cfs)

Primary OutFlow Max=7.10 cfs @ 12.47 hrs HW=249.02' TW=239.78' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 7.10 cfs @ 9.04 fps)
  ├**2=Vertical Orifice** (Passes < 1.57 cfs potential flow)
  ├**3=Vertical Orifice** (Passes < 1.57 cfs potential flow)
  └**4=Horizontal Orifice** (Passes < 17.41 cfs potential flow)

Secondary OutFlow Max=0.10 cfs @ 12.47 hrs HW=249.02' TW=219.34' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir** (Weir Controls 0.10 cfs @ 0.40 fps)

Summary for Pond DB3: DB3

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

Inflow Area = 89,589 sf, 30.78% Impervious, Inflow Depth = 5.88" for 100-year event
Inflow = 13.88 cfs @ 12.09 hrs, Volume= 43,897 cf
Outflow = 11.58 cfs @ 12.14 hrs, Volume= 43,897 cf, Atten= 17%, Lag= 3.3 min
Discarded = 0.13 cfs @ 12.14 hrs, Volume= 7,086 cf
Primary = 11.45 cfs @ 12.14 hrs, Volume= 36,811 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 266.95' @ 12.14 hrs Surf.Area= 4,644 sf Storage= 11,580 cf
Flood Elev= 268.00' Surf.Area= 5,752 sf Storage= 17,031 cf

Plug-Flow detention time= 127.9 min calculated for 43,885 cf (100% of inflow)
Center-of-Mass det. time= 128.1 min (931.2 - 803.1)

Volume	Invert	Avail.Storage	Storage Description
#1	263.00'	17,031 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)
263.00	1,483	151.0	0	0	1,483
264.00	2,137	176.0	1,800	1,800	2,154
266.00	3,744	266.0	5,806	7,606	5,350
268.00	5,752	277.0	9,424	17,031	6,072

Device	Routing	Invert	Outlet Devices
#1	Primary	263.00'	**24.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 263.00' / 262.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	264.00'	**4.0" Vert. Vertical Orifice** C= 0.600
#3	Device 1	266.30'	**24.0" Horiz. Horizontal Orifice** C= 0.600 Limited to weir flow at low heads
#4	Secondary	267.00'	**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
#5	Discarded	263.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 250.00' Phase-In= 0.01'

Discarded OutFlow Max=0.13 cfs @ 12.14 hrs HW=266.95' (Free Discharge)
└**5=Exfiltration** (Controls 0.13 cfs)

Primary OutFlow Max=11.44 cfs @ 12.14 hrs HW=266.95' TW=261.68' (Dynamic Tailwater)
└**1=Culvert** (Passes 11.44 cfs of 25.98 cfs potential flow)
  ├**2=Vertical Orifice** (Orifice Controls 0.70 cfs @ 8.03 fps)
  └**3=Horizontal Orifice** (Weir Controls 10.74 cfs @ 2.63 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=263.00' TW=260.80' (Dynamic Tailwater)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DB4: DB4

Groundwater must be verified with test pit

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[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area = 48,251 sf, 7.27% Impervious, Inflow Depth = 5.28" for 100-year event
Inflow = 5.94 cfs @ 12.14 hrs, Volume= 21,240 cf
Outflow = 5.00 cfs @ 12.20 hrs, Volume= 21,240 cf, Atten= 16%, Lag= 3.3 min
Primary = 5.00 cfs @ 12.20 hrs, Volume= 21,240 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 210.64' @ 12.22 hrs Surf.Area= 1,106 sf Storage= 1,220 cf
Flood Elev= 212.00' Surf.Area= 1,900 sf Storage= 3,240 cf

Plug-Flow detention time= 5.9 min calculated for 21,234 cf (100% of inflow)
Center-of-Mass det. time= 6.0 min (825.7 - 819.7)

Volume	Invert	Avail.Storage	Storage Description
#1	209.00'	3,240 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)
209.00	433	86.0	0	0	433
212.00	1,900	161.0	3,240	3,240	1,953

Device	Routing	Invert	Outlet Devices
#1	Primary	209.00'	**15.0" Round Culvert** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 209.00' / 208.60' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Primary	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=4.73 cfs @ 12.20 hrs HW=210.62' TW=209.98' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 4.73 cfs @ 3.85 fps)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond dmh-03: dmh

Inflow Area = 95,827 sf, 33.90% Impervious, Inflow Depth = 5.11" for 100-year event
Inflow = 12.41 cfs @ 12.14 hrs, Volume= 40,808 cf
Outflow = 12.41 cfs @ 12.14 hrs, Volume= 40,808 cf, Atten= 0%, Lag= 0.0 min
Primary = 12.41 cfs @ 12.14 hrs, Volume= 40,808 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 261.68' @ 12.14 hrs
Flood Elev= 264.22'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.00'	**24.0" Round Culvert** L= 96.0' Ke= 0.500 Inlet / Outlet Invert= 260.00' / 256.80' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=12.37 cfs @ 12.14 hrs HW=261.67' TW=253.49' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 12.37 cfs @ 4.41 fps)

Summary for Pond dmh-04: dmh

Inflow Area = 11,466 sf, 22.34% Impervious, Inflow Depth = 6.00" for 100-year event
Inflow = 1.82 cfs @ 12.09 hrs, Volume= 5,736 cf
Outflow = 1.82 cfs @ 12.09 hrs, Volume= 5,736 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.82 cfs @ 12.09 hrs, Volume= 5,736 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Peak Elev= 250.44' @ 12.09 hrs
Flood Elev= 253.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	249.70'	**12.0" Round Culvert** L= 136.0' Ke= 0.500 Inlet / Outlet Invert= 249.70' / 241.30' S= 0.0618 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.81 cfs @ 12.09 hrs HW=250.44' TW=242.06' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 1.81 cfs @ 2.92 fps)

Summary for Pond dmh-05: dmh

Inflow Area = 21,513 sf, 43.03% Impervious, Inflow Depth = 6.62" for 100-year event
Inflow = 3.64 cfs @ 12.09 hrs, Volume= 11,862 cf
Outflow = 3.64 cfs @ 12.09 hrs, Volume= 11,862 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.64 cfs @ 12.09 hrs, Volume= 11,862 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 242.06' @ 12.09 hrs
Flood Elev= 245.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	241.05'	**15.0" Round Culvert** L= 153.0' Ke= 0.500 Inlet / Outlet Invert= 241.05' / 233.30' S= 0.0507 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.62 cfs @ 12.09 hrs HW=242.06' TW=234.30' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 3.62 cfs @ 3.42 fps)

Summary for Pond dmh-06: dmh

Inflow Area = 35,627 sf, 42.89% Impervious, Inflow Depth = 6.64" for 100-year event
Inflow = 6.04 cfs @ 12.09 hrs, Volume= 19,699 cf
Outflow = 6.04 cfs @ 12.09 hrs, Volume= 19,699 cf, Atten= 0%, Lag= 0.0 min
Primary = 6.04 cfs @ 12.09 hrs, Volume= 19,699 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 234.31' @ 12.09 hrs
Flood Elev= 237.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	233.05'	**18.0" Round Culvert** L= 149.0' Ke= 0.500 Inlet / Outlet Invert= 233.05' / 226.30' S= 0.0453 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=6.01 cfs @ 12.09 hrs HW=234.30' TW=226.25' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 6.01 cfs @ 3.81 fps)

Summary for Pond dmh-07: dmh

Inflow Area = 76,939 sf, 29.95% Impervious, Inflow Depth = 6.28" for 100-year event
Inflow = 12.55 cfs @ 12.09 hrs, Volume= 40,253 cf
Outflow = 12.55 cfs @ 12.09 hrs, Volume= 40,253 cf, Atten= 0%, Lag= 0.0 min
Primary = 12.55 cfs @ 12.09 hrs, Volume= 40,253 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 226.28' @ 12.09 hrs
Flood Elev= 230.44'

Device	Routing	Invert	Outlet Devices
#1	Primary	223.35'	**18.0" Round Culvert** L= 188.0' Ke= 0.500 Inlet / Outlet Invert= 223.35' / 217.64' S= 0.0304 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=12.48 cfs @ 12.09 hrs HW=226.25' TW=219.40' (Dynamic Tailwater)
1=Culvert (Inlet Controls 12.48 cfs @ 7.06 fps)

Summary for Pond dmh-08: dmh

Inflow Area = 102,472 sf, 27.51% Impervious, Inflow Depth = 6.18" for 100-year event
Inflow = 16.49 cfs @ 12.09 hrs, Volume= 52,784 cf
Outflow = 16.49 cfs @ 12.09 hrs, Volume= 52,784 cf, Atten= 0%, Lag= 0.0 min
Primary = 16.49 cfs @ 12.09 hrs, Volume= 52,784 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 219.41' @ 12.09 hrs
Flood Elev= 221.85'

Device	Routing	Invert	Outlet Devices
#1	Primary	217.14'	**24.0" Round Culvert** L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 217.14' / 216.88' S= 0.0260 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=16.38 cfs @ 12.09 hrs HW=219.40' TW=211.97' (Dynamic Tailwater)
1=Culvert (Barrel Controls 16.38 cfs @ 5.77 fps)

Summary for Pond dmh-09: dmh

Inflow Area = 95,827 sf, 33.90% Impervious, Inflow Depth = 5.11" for 100-year event
Inflow = 12.41 cfs @ 12.14 hrs, Volume= 40,808 cf
Outflow = 12.41 cfs @ 12.14 hrs, Volume= 40,808 cf, Atten= 0%, Lag= 0.0 min
Primary = 12.41 cfs @ 12.14 hrs, Volume= 40,808 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 253.50' @ 12.14 hrs
Flood Elev= 261.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.82'	**24.0" Round Culvert** L= 96.0' Ke= 0.500

Inlet / Outlet Invert= 251.82' / 247.00' S= 0.0502 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=12.37 cfs @ 12.14 hrs HW=253.49' TW=248.13' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 12.37 cfs @ 4.41 fps)

Summary for Pond dmh-10: dmh

Inflow Area = 171,013 sf, 23.35% Impervious, Inflow Depth = 4.37" for 100-year event
Inflow = 7.10 cfs @ 12.47 hrs, Volume= 62,253 cf
Outflow = 7.10 cfs @ 12.47 hrs, Volume= 62,253 cf, Atten= 0%, Lag= 0.0 min
Primary = 7.10 cfs @ 12.47 hrs, Volume= 62,253 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 239.78' @ 12.47 hrs
Flood Elev= 251.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	237.55'	**15.0" Round Culvert** L= 161.0' Ke= 0.500 Inlet / Outlet Invert= 237.55' / 235.80' S= 0.0109 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=7.10 cfs @ 12.47 hrs HW=239.78' TW=232.94' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 7.10 cfs @ 5.79 fps)

Summary for Pond dmh-11: dmh

Inflow Area = 171,013 sf, 23.35% Impervious, Inflow Depth = 4.37" for 100-year event
Inflow = 7.10 cfs @ 12.47 hrs, Volume= 62,253 cf
Outflow = 7.10 cfs @ 12.47 hrs, Volume= 62,253 cf, Atten= 0%, Lag= 0.0 min
Primary = 7.10 cfs @ 12.47 hrs, Volume= 62,253 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 232.94' @ 12.47 hrs
Flood Elev= 239.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	230.87'	**15.0" Round Culvert** L= 37.0' Ke= 0.500 Inlet / Outlet Invert= 230.87' / 229.00' S= 0.0505 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=7.10 cfs @ 12.47 hrs HW=232.94' TW=230.05' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 7.10 cfs @ 5.79 fps)

Summary for Pond dmh-12: dmh

Inflow Area = 102,472 sf, 27.51% Impervious, Inflow Depth = 6.18" for 100-year event
Inflow = 16.49 cfs @ 12.09 hrs, Volume= 52,784 cf
Outflow = 16.49 cfs @ 12.09 hrs, Volume= 52,784 cf, Atten= 0%, Lag= 0.0 min
Primary = 16.49 cfs @ 12.09 hrs, Volume= 52,784 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 211.99' @ 12.09 hrs
Flood Elev= 220.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	209.80'	**24.0" Round Culvert** L= 72.0' Ke= 0.500 Inlet / Outlet Invert= 209.80' / 208.00' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=16.38 cfs @ 12.09 hrs HW=211.97' TW=208.68' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 16.38 cfs @ 5.21 fps)

Summary for Pond G: gabion

Inflow Area = 171,013 sf, 23.35% Impervious, Inflow Depth = 4.37" for 100-year event
Inflow = 7.10 cfs @ 12.47 hrs, Volume= 62,253 cf
Outflow = 7.10 cfs @ 12.47 hrs, Volume= 62,253 cf, Atten= 0%, Lag= 0.3 min
Primary = 7.10 cfs @ 12.47 hrs, Volume= 62,253 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 230.05' @ 12.47 hrs Surf.Area= 27 sf Storage= 33 cf
Flood Elev= 230.25' Surf.Area= 0 sf Storage= 37 cf

Plug-Flow detention time= 0.1 min calculated for 62,235 cf (100% of inflow)
Center-of-Mass det. time= 0.1 min (881.8 - 881.7)

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. 3" outlet holes X 30.00** C= 0.600
#2	Primary	229.00'	**2.0" Horiz. 2" outlet holes X 30.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.10 cfs @ 12.47 hrs HW=230.05' TW=0.00' (Dynamic Tailwater)
└**1=3" outlet holes** (Orifice Controls 3.87 cfs @ 2.63 fps)
└**2=2" outlet holes** (Orifice Controls 3.23 cfs @ 4.94 fps)

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**

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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

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

1:6,000

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 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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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,590 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.

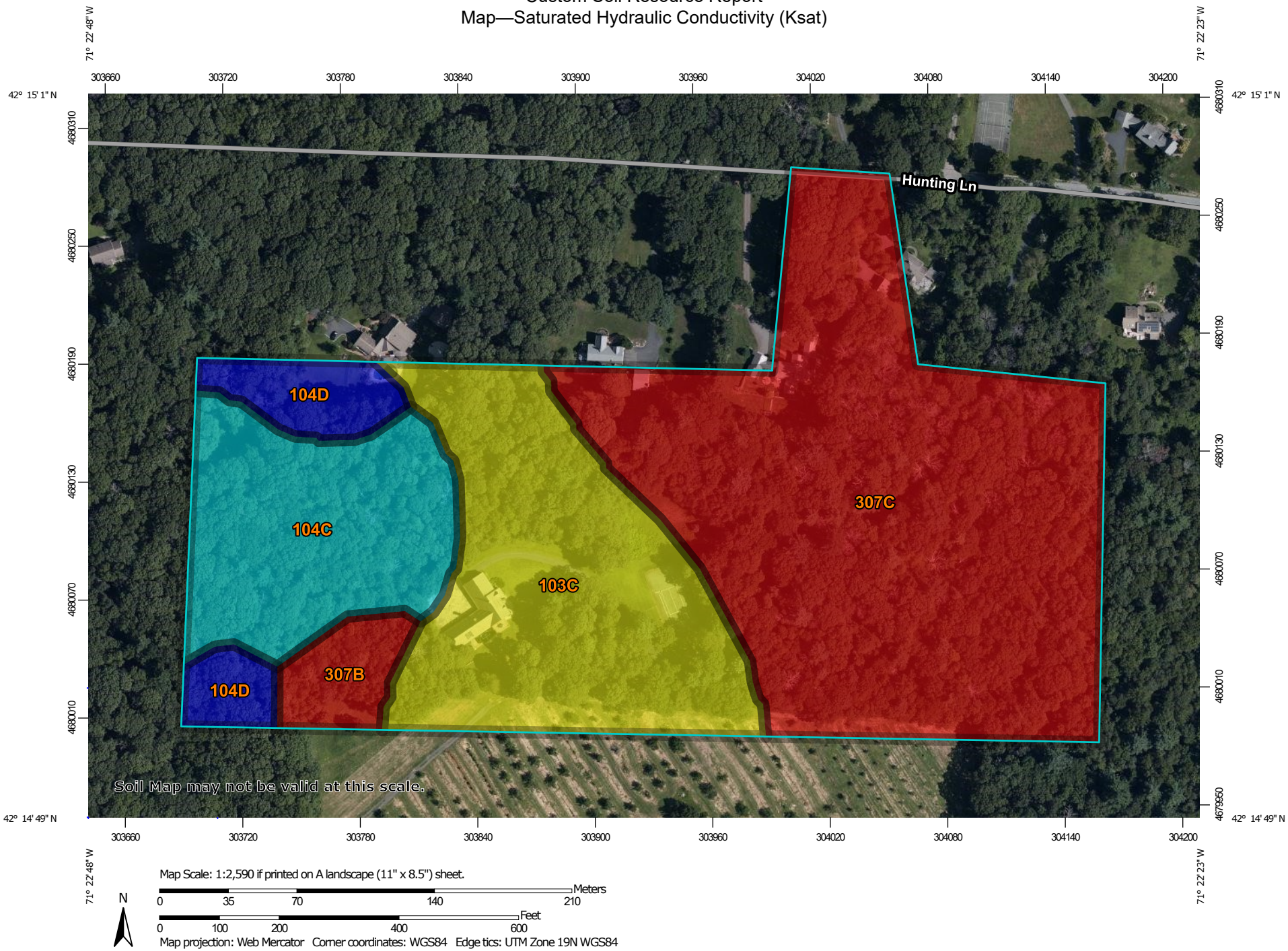
Saturated Hydraulic Conductivity (Ksat)

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.

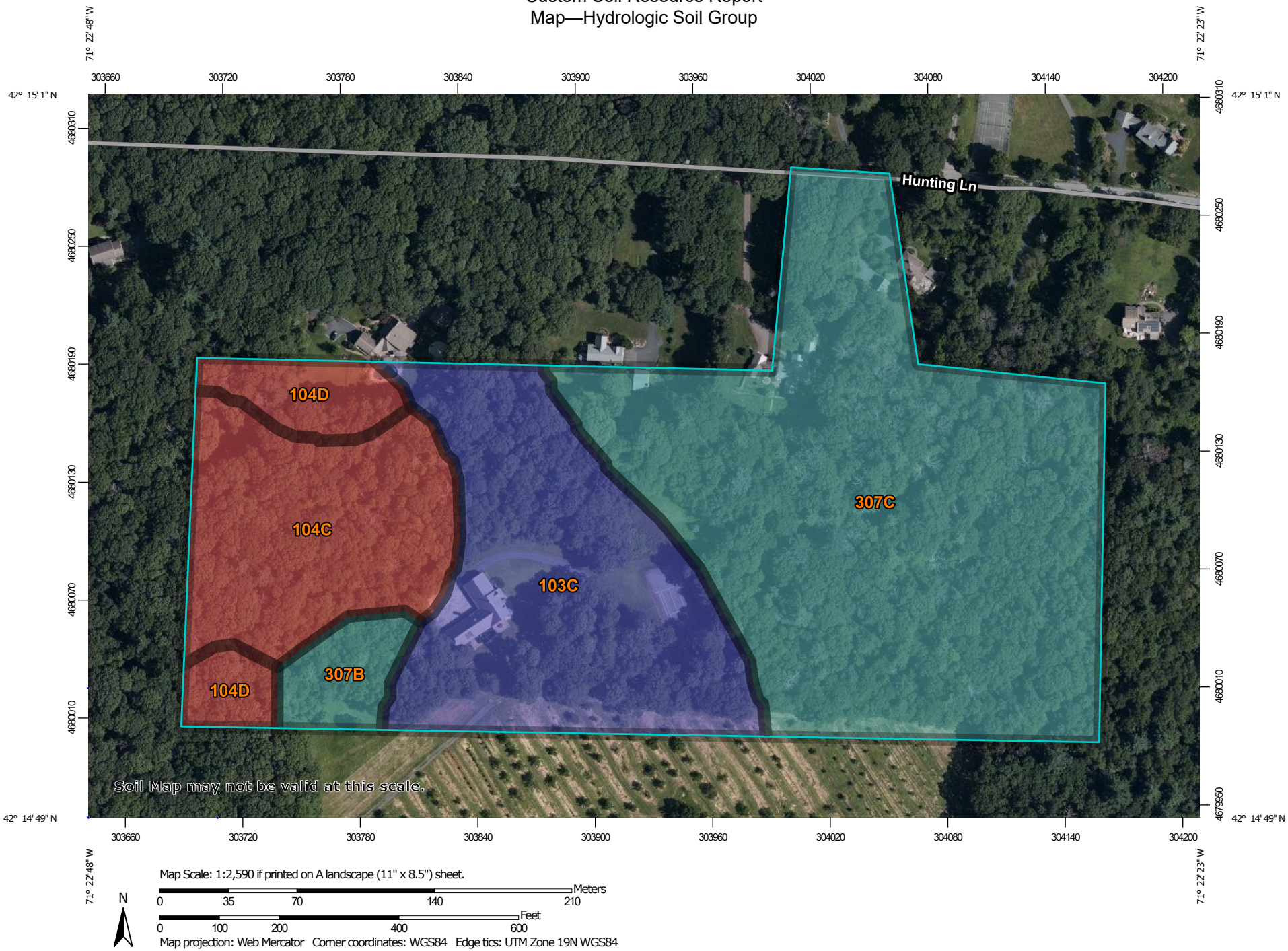
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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.

Custom Soil Resource Report
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

References

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ALLEN & MAJOR ASSOCIATES, INC.

Project No.	2513-02	**Sheet**	1 of 2
Project Description	Apple Hill Estates		
	Sherborn, MA		
Calculated By	SM	**Date**	11/06/20
Checked By		**Date**	

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)	Storage (cubic-feet)
245.00	3,554	0
245.05	3,604	179
245.10	3,654	360
245.15	3,705	544
245.20	3,756	731
245.25	3,807	920
245.30	3,859	1,112
245.35	3,911	1,306
245.40	3,963	1,503
245.45	4,016	1,702
245.50	4,069	1,904
245.55	4,123	2,109
245.60	4,176	2,317
245.65	4,230	2,527
245.70	4,285	2,740
245.75	4,340	2,955
245.80	4,395	3,174
245.85	4,450	3,395
245.90	4,506	3,619
245.95	4,562	3,845
246.00	4,619	4,075
246.05	4,674	4,307
246.10	4,728	4,542
246.15	4,784	4,780
246.20	4,839	5,021
246.25	4,895	5,264
246.30	4,951	5,510
246.35	5,007	5,759
246.40	5,064	6,011
246.45	5,121	6,265
246.50	5,179	6,523
246.55	5,236	6,783
246.60	5,295	7,047
246.65	5,353	7,313
246.70	5,412	7,582
246.75	5,471	7,854
246.80	5,530	8,129
246.85	5,590	8,407
246.90	5,650	8,688
246.95	5,710	8,972
247.00	5,770	9,259
247.05	5,831	9,549
247.10	5,893	9,842
247.15	5,954	10,138
247.20	6,016	10,438
247.25	6,078	10,740
247.30	6,141	11,045
247.35	6,204	11,354
247.40	6,267	11,666
247.45	6,330	11,981
247.50	6,394	12,299
247.55	6,458	12,620
247.60	6,523	12,945
247.65	6,588	13,272
247.70	6,653	13,603
247.75	6,718	13,938
247.80	6,784	14,275
247.85	6,850	14,616
247.90	6,916	14,960
247.95	6,983	15,308
248.00	7,050	15,659
248.05	7,115	16,013
248.10	7,180	16,370
248.15	7,246	16,731
248.20	7,312	17,095
248.25	7,378	17,462
248.30	7,445	17,832
248.35	7,511	18,206
248.40	7,579	18,584
248.45	7,646	18,964
248.50	7,714	19,348
248.55	7,782	19,736
248.60	7,850	20,126
248.65	7,919	20,521
248.70	7,988	20,918
248.75	8,057	21,319
248.80	8,126	21,724
248.85	8,196	22,132
248.90	8,266	22,544
248.95	8,337	22,959
249.00	8,407	23,377
249.05	8,478	23,799
249.10	8,550	24,225
249.15	8,621	24,654
249.20	8,693	25,087
249.25	8,765	25,524
249.30	8,838	25,964
249.35	8,911	26,407
249.40	8,984	26,855
249.45	9,057	27,306
249.50	9,131	27,760
249.55	9,205	28,219
249.60	9,279	28,681
249.65	9,354	29,147
249.70	9,428	29,616
249.75	9,504	30,090
249.80	9,579	30,567
249.85	9,655	31,048
249.90	9,731	31,532
249.95	9,807	32,021
250.00	**9,884**	**32,513**

Stage-Area-Storage for Pond DB3: DB3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
263.00	1,483	0
263.05	1,513	75
263.10	1,543	151
263.15	1,574	229
263.20	1,604	309
263.25	1,635	390
263.30	1,667	472
263.35	1,698	556
263.40	1,730	642
263.45	1,763	729
263.50	1,795	818
263.55	1,828	909
263.60	1,861	1,001
263.65	1,895	1,095
263.70	1,928	1,191
263.75	1,962	1,288
263.80	1,997	1,387
263.85	2,031	1,487
263.90	2,066	1,590
263.95	2,101	1,694
264.00	2,137	1,800
264.05	2,172	1,908
264.10	2,207	2,017
264.15	2,242	2,128
264.20	2,278	2,241
264.25	2,313	2,356
264.30	2,350	2,473
264.35	2,386	2,591
264.40	2,423	2,711
264.45	2,460	2,833
264.50	2,497	2,957
264.55	2,534	3,083
264.60	2,572	3,211
264.65	2,610	3,340
264.70	2,649	3,472
264.75	2,687	3,605
264.80	2,726	3,741
264.85	2,765	3,878
264.90	2,805	4,017
264.95	2,845	4,158
265.00	2,885	4,302
265.05	2,925	4,447
265.10	2,965	4,594
265.15	3,006	4,743
265.20	3,047	4,895
265.25	3,089	5,048
265.30	3,131	5,204
265.35	3,173	5,361
265.40	3,215	5,521
265.45	3,257	5,683
265.50	3,300	5,847
265.55	3,343	6,013
265.60	3,387	6,181
265.65	3,430	6,351
265.70	3,474	6,524
265.75	3,519	6,699
265.80	3,563	6,876
265.85	3,608	7,055
265.90	3,653	7,237
265.95	3,698	7,420
266.00	3,744	7,606
266.05	3,789	7,795
266.10	3,834	7,985
266.15	3,880	8,178
266.20	3,925	8,373
266.25	3,972	8,571
266.30	4,018	8,770
266.35	4,064	8,973
266.40	4,111	9,177
266.45	4,158	9,384
266.50	4,206	9,593
266.55	4,253	9,804
266.60	4,301	10,018
266.65	4,349	10,234
266.70	4,398	10,453
266.75	4,447	10,674
266.80	4,496	10,898
266.85	4,545	11,124
266.90	4,594	11,352
266.95	4,644	11,583
267.00	4,694	11,817
267.05	4,745	12,053
267.10	4,795	12,291
267.15	4,846	12,532
267.20	4,897	12,776
267.25	4,949	13,022
267.30	5,000	13,271
267.35	5,052	13,522
267.40	5,105	13,776
267.45	5,157	14,032
267.50	5,210	14,292
267.55	5,263	14,553
267.60	5,316	14,818
267.65	5,370	15,085
267.70	5,423	15,355
267.75	5,478	15,627
267.80	5,532	15,903
267.85	5,587	16,181
267.90	5,641	16,461
267.95	5,697	16,745
268.00	**5,752**	**17,031**

Project: Apple Hill Estates
Location: Sherborn, MA
Prepared For: Allen & Major

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

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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

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD

APPLE HILL ESTATES
SHERBORN, MA

Area	**0.34 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

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Sizing Details

Drainage Area	
Total Area (acres)	0.11
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

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:	11/13/2020

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}	$Q_{full} \geq Q_{design}$	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)	
CB-02 TO DMH-01	2.30	0.013	12	0.79	3.14	0.25	0.015	4.36	OK	5.56	0.53	1.01	5.61	OK
CB-03 TO HW-02	3.51	0.013	15	1.23	3.93	0.31	0.011	6.71	OK	5.47	0.52	1.00	5.47	OK
CB-05 TO DMH-03	0.81	0.013	12	0.79	3.14	0.25	0.015	4.41	OK	5.61	0.18	0.73	4.10	OK
CB-06 TO DMH-04	1.13	0.013	12	0.79	3.14	0.25	0.051	8.04	OK	10.23	0.14	0.65	6.65	OK
CB-07A TO DMH-05	0.44	0.013	12	0.79	3.14	0.25	0.030	6.17	OK	7.86	0.07	0.53	4.16	OK
CB-07B TO DMH-05	0.79	0.013	12	0.79	3.14	0.25	0.013	4.12	OK	5.25	0.19	0.74	3.89	OK
CB-08A TO DMH-07	0.92	0.013	12	0.79	3.14	0.25	0.042	7.29	OK	9.29	0.13	0.64	5.94	OK
CB-08B TO DMH-07	3.13	0.013	12	0.79	3.14	0.25	0.027	5.89	OK	7.50	0.53	1.01	7.57	OK
CB-09A TO DMH-08	2.42	0.013	12	0.79	3.14	0.25	0.030	6.17	OK	7.86	0.39	0.91	7.15	OK
CB-09B TO CB-09A	2.12	0.013	12	0.79	3.14	0.25	0.010	3.56	OK	4.54	0.60	1.04	4.72	OK
CB-10 TO FES-04	3.45	0.013	15	1.23	3.93	0.31	0.012	6.93	OK	5.64	0.50	0.99	5.59	OK
CB-11A TO DMH-06	1.10	0.013	12	0.79	3.14	0.25	0.020	5.04	OK	6.42	0.22	0.78	5.00	OK
CB-11B TO DMH-06	0.46	0.013	12	0.79	3.14	0.25	0.020	5.04	OK	6.42	0.09	0.58	3.72	OK
DMH-03 TO DMH-09	3.93	0.013	24	3.14	6.28	0.50	0.033	41.34	OK	13.16	0.10	0.59	7.76	OK
DMH-04 TO DMH-05	1.13	0.013	12	0.79	3.14	0.25	0.062	8.87	OK	11.30	0.13	0.64	7.23	OK
DMH-05 TO DMH-06	2.36	0.013	15	1.23	3.93	0.31	0.051	14.52	OK	11.83	0.16	0.69	8.16	OK
DMH-06 TO DMH-07	3.93	0.013	18	1.77	4.71	0.38	0.045	22.36	OK	12.65	0.18	0.73	9.24	OK
DMH-07 TO DMH-08	7.98	0.013	18	1.77	4.71	0.38	0.030	18.31	OK	10.36	0.44	0.95	9.85	OK
DMH-08 TO FES-03	10.40	0.013	24	3.14	6.28	0.50	0.025	35.77	OK	11.39	0.29	0.84	9.56	OK
DMH-09 TO HW-03A	3.35	0.013	24	3.14	6.28	0.50	0.050	50.59	OK	16.10	0.07	0.53	8.53	OK
DMH-10 TO DMH-11	2.34	0.013	15	1.23	3.93	0.31	0.011	6.74	OK	5.50	0.35	0.89	4.89	OK
DMH-11 TO GABION-01	2.34	0.013	15	1.23	3.93	0.31	0.050	14.44	OK	11.77	0.16	0.69	8.12	OK
DMH-12 TO FES-03	10.40	0.013	24	3.14	6.28	0.50	0.025	35.77	OK	11.39	0.29	0.84	9.56	OK
FES-05 TO CB-10	3.19	0.013	15	1.23	3.93	0.31	0.010	6.46	OK	5.26	0.49	0.98	5.16	OK
OCS-01 TO DMH-03	3.61	0.013	24	3.14	6.28	0.50	0.031	39.96	OK	12.72	0.09	0.58	7.38	OK
OCS-02 TO DMH-10	2.34	0.013	12	0.79	3.14	0.25	0.055	8.35	OK	10.63	0.28	0.84	8.93	OK
OCS-03 TO EX-CB	8.35	0.013	15	1.23	3.93	0.31	0.005	4.57	*	3.72	1.83	0.47	1.75	*

*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:	SM	**Date**:	11/13/20
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	2.93	4.46
Open Space Soil Type B	0.12	1.88	0.23
Open Space Soil Type C	0.21	5.70	1.20
Open Space Soil Type D	0.37	0.55	0.20
Forest	0.13	7.98	1.04
	Total	**19.04**	**7.12**

Phosphorus Reduction Requirement					
Phosphorus Reduction Requirement	=	Proposed Phosphours Load x 16%*			
	=	7.12	x	0.16	
	=	**1.14**	**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-4D, P-4E)	Infiltration Basin	1.07	0.90	0.96
Basin #3 (P-4A, P-4B, P-4C)	Infiltration Basin	1.53	0.60	0.92
			Total	**1.88**

**Table 3-13, Appendx F, MA MS4 General Permit

***See Page 2 for additional information

Percent Reduction (Phosphorus Removed / Proposed Phosphorus Load)	**26.45%**			
	1.88	**>**	**1.14**	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: 11/13/20
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-4D, P-4E)				Area to Basin 2	81,425	S.F.
Low Density Residential	1.52	0.52	0.79	Volume Treated	4,075	C.F.
Open Space Soil Type B	0.12		0.00	Depth of runoff treated	0.60	IN.
Open Space Soil Type C	0.21	1.35	0.28			
Open Space Soil Type D	0.37		0.00			
Forest	0.13		0.00			
	total	**1.87**	**1.07**			
	Phosphorus Load by Land Use (lbs/ac/yr)	Area (Acres	Proposed Phosphorus Load (lbs/yr)			
Basin #3 (P-4A, P-4B, P-4C)				Area to Basin 3	89,588	S.F.
Low Density Residential	1.52	0.87	1.32	Volume Treated	1,800	C.F.
Open Space Soil Type B	0.12	0.40	0.05	Depth of runoff treated	0.24	IN.
Open Space Soil Type C	0.21	0.79	0.17			
Open Space Soil Type D	0.37	0.00	0.00			
Forest	0.13	0.00	0.00			
	total	**2.06**	**1.53**			

available to the public for public comment during Phase 1 Plan development. EPA encourages the permittee to post the Phase I Plan online to facilitate public involvement.

Performance Evaluation –The permittee shall evaluate the effectiveness of the PCP by tracking the phosphorus reductions achieved through implementation of structural and non-structural BMPs[6] and tracking increases resulting from development. Phosphorus reductions shall be calculated consistent with Attachment 2 to Appendix F (non-structural BMP performance) and Attachment 3 to Appendix F (structural BMP performance) for all BMPs implemented to date. Phosphorus export increases since 2005 due to development shall be calculated consistent with Attachment 1 to Appendix F. Phosphorus loading increases and reductions in unit of mass/yr shall be added or subtracted from the applicable Baseline Phosphorus Load given in Table F-2 or Table F-3 depending on the Scope of PCP chosen to estimate the yearly phosphorous export rate from the PCP Area. The permittee shall also include all information required in part I.2 of this Appendix in each performance evaluation. Performance evaluations will be included as part of each permittee's annual report as required by part 4.4 of the Permit.

Community Annual Stormwater Phosphorus Load Reduction by Permittee, Charles River Watershed

Community	Baseline Phosphorus Load, kg/yr	Stormwater Phosphorus Load Reduction Requirement kg/yr	Allowable Phosphorus Load, kg/yr	Stormwater Percent Reduction in Phosphorus Load (%)
Arlington	106	57	49	53%
Ashland	67	23	44	34%
Bellingham	947	331	616	35%
Belmont	202	86	116	42%
Brookline	1,635	789	846	48 %
Cambridge	512	263	249	51%
Dedham	805	325	480	40%
Dover	831	137	694	17%
Foxborough	2	0	2	0%
Franklin	2,344	818	1,526	35%

[6] In meeting its phosphorus reduction requirements a permittee may quantify phosphorus reductions by actions undertaken by another entity, except where those actions are credited to MassDOT or another permittee identified in Appendix F Table F-2 or F-3.

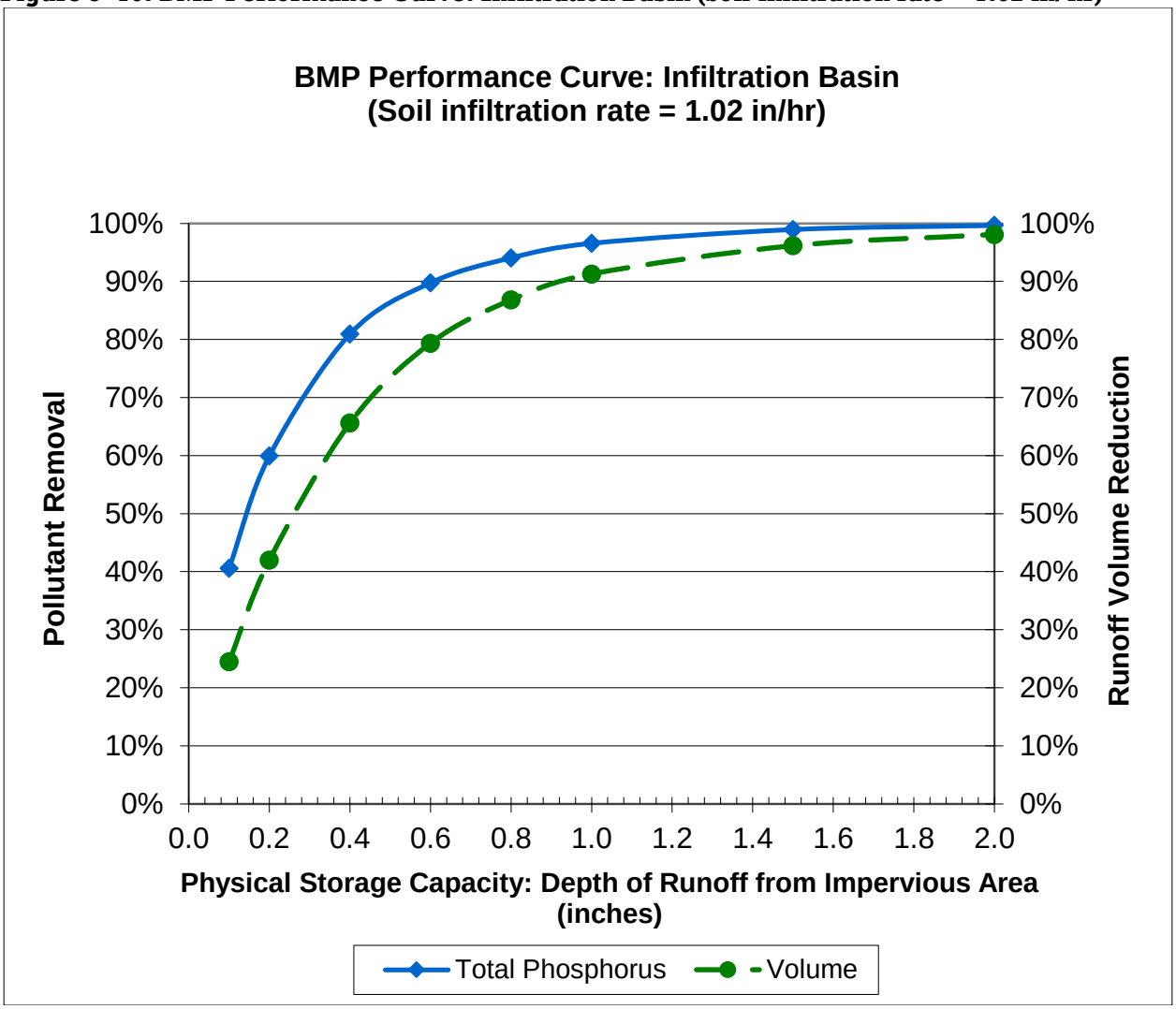
Community Annual Stormwater Phosphorus Load Reduction by Permittee, Charles River Watershed				
Community	**Baseline Phosphorus Load, kg/yr**	**Stormwater Phosphorus Load Reduction Requirement kg/yr**	**Allowable Phosphorus Load, kg/yr**	**Stormwater Percent Reduction in Phosphorus Load (%)**
Holliston	1,543	395	1,148	26%
Hopedale	107	37	70	35%
Hopkinton	292	66	226	22%
Lexington	530	194	336	37%
Lincoln	593	101	492	17%
Medfield	955	277	678	29%
Medway	1,063	314	749	30%
Mendon	29	9	20	31%
Milford	1,611	663	948	41%
Millis	969	248	721	26%
Natick	1,108	385	723	35%
Needham	1,772	796	976	45%
Newton	3,884	1,941	1,943	50%
Norfolk	1,004	232	772	23%
Somerville	646	331	315	51%
Sherborn	846	131	715	16%
Walpole	159	28	131	18%
Waltham	2,901	1,461	1,400	50%
Watertown	1,127	582	545	52%
Wayland	46	15	31	33%
Wellesley	1,431	661	770	46%
Weston	1,174	281	893	24%
Westwood	376	114	262	30%
Wrentham	618	171	447	28%
Mass-DCR	421	91	330	22%

Table F-2: Baseline Phosphorus Load, Phosphorus Reduction Requirement, Allowable Phosphorus Load and Percent Reduction in Phosphorus Load from Charles River Watershed. For use when PCP Area is chosen to be the entire community within the Charles River Watershed.

Table 3- 13: Infiltration Basin (1.02 in/hr) BMP Performance Table

Infiltration Basin (1.02 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	24.5%	42.0%	65.6%	79.4%	86.8%	91.3%	96.2%	98.1%
Cumulative Phosphorus Load Reduction	41%	60%	81%	90%	94%	97%	99%	100%

Figure 3- 10: BMP Performance Curve: Infiltration Basin (Soil infiltration rate = 1.02 in/hr)



SECTION 6.0

WATERSHED PLANS

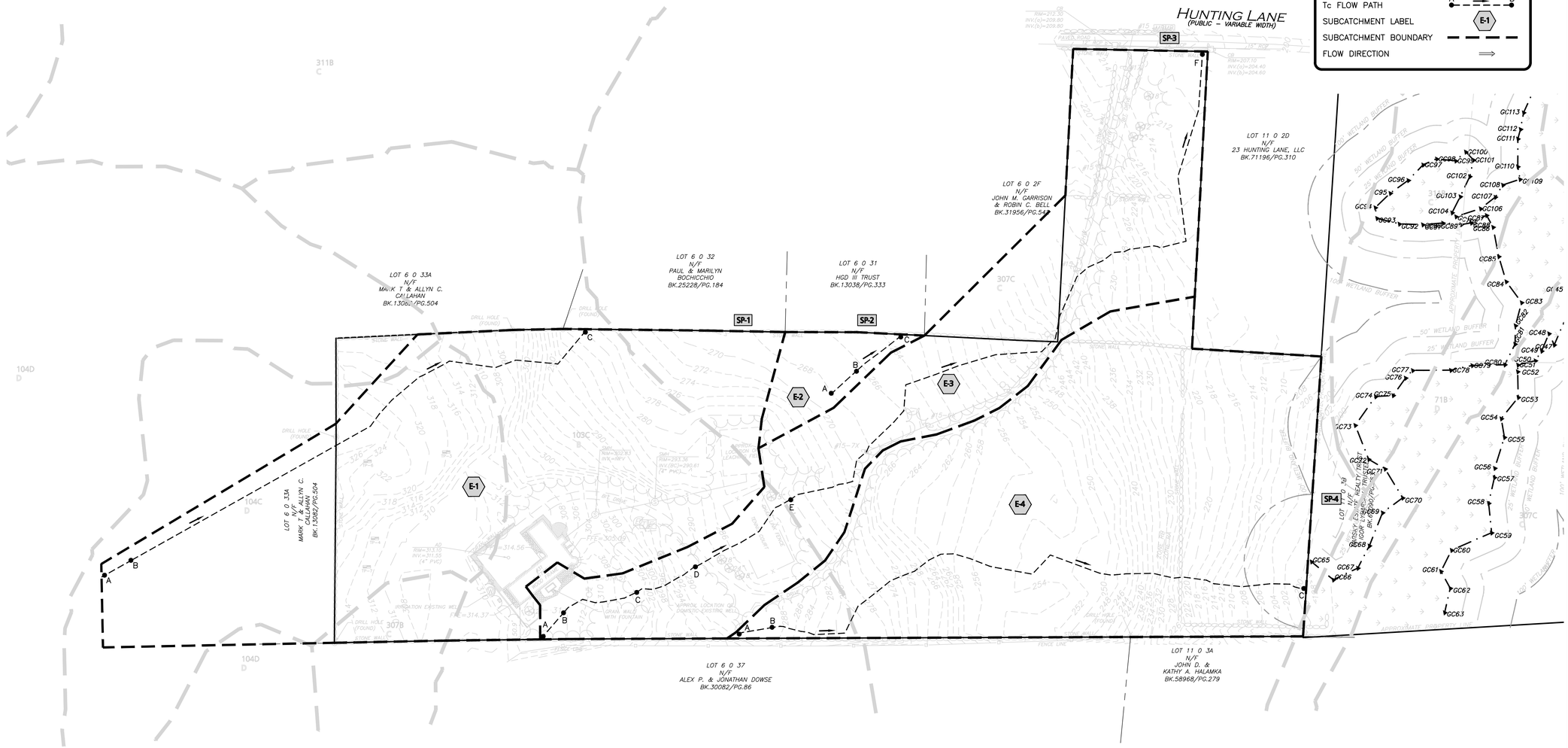
NOTES:

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

3. THE INFORMATION SHOWN ON THIS PLAN IS THE SOLE PROPERTY OF ALLEN & MAJOR ASSOCIATES, INC. ITS INTENDED USE IS TO PROVIDE INFORMATION. ANY ALTERATION, MISUSE, OR RECALCULATION OF INFORMATION OR DATA WITHOUT THE EXPRESSED, WRITTEN CONSENT OF ALLEN & MAJOR ASSOCIATES, INC. IS STRICTLY PROHIBITED.



LEGEND

- SCS SOILS BOUNDARY
- Tc FLOW PATH (A - B)
- SUBCATCHMENT LABEL (E-1)
- SUBCATCHMENT BOUNDARY
- FLOW DIRECTION

GRAPHIC SCALE

80 0 40 80 160 320

(IN FEET)
1 inch = 80 ft.

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_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:

ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ◆ land surveying
environmental consulting ◆ landscape architecture
www.allenmajor.com
100 COMMERCE WAY
WOBURN MA 01801
TEL: (781) 935-6889
FAX: (781) 935-2896

WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE:

EXISTING WATERSHED PLAN

SHEET No.

WS-1

NOTES:

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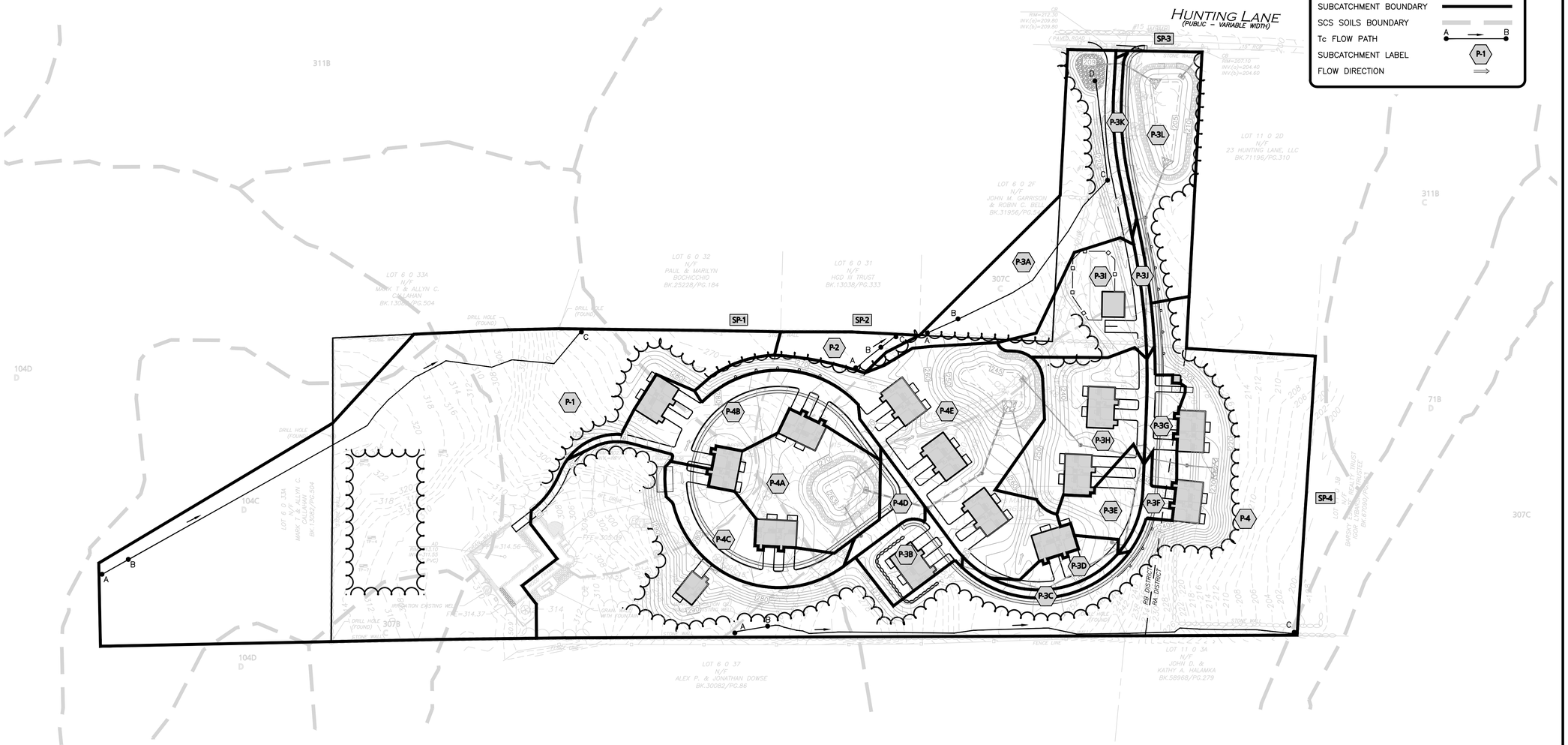

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GRAPHIC SCALE

80 0 40 80 160 320

(IN FEET)
1 inch = 80 ft.

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WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE:

PROPOSED WATERSHED PLAN

SHEET No.

WS-2

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