ASB design group

September 27, 2022

Town of Rowley Conservation Commission
Town of Rowley
39 Central Street
P.O. Box 714
Rowley MA. 01969

Re: **Summary Letter**
Notice of Intent (NOI) – Roadway
Definitive Subdivision: Osprey Court – 510 Newburyport Turnpike (Route 1)
Rowley, MA. 01969
Job No. 2020-10
Map 12 Block 8 Lot 4A
MAPDEP No. 063-0701 ANARD

Dear Members,

On behalf of our client, Taylor Lane LLC, **ASB** design group, LLC (ASB) is submitting the following Summary Letter regarding the Notice of Intent for the Osprey Court Definitive Subdivision located at 510 Newburyport Turnpike (Route 1) for your review, comment, and approval. This NOI addresses the impacts of the roadway construction. Notice of Intents will be filed for Lots 1, 3, 4, 5, and 6 prior to the Application for the Building Permit.

The applicant will also be applying/submitting for the following additional approvals:

- NPDES General Site Permit.
- Massachusetts Department of Transportation (MADOT) Access Permit
- *In addition, final Septic System Design Plans will be submitted to the Rowley Board of Health for review and approval. The Septic System Design Plans will be submitted once the approvals for the Definitive Subdivision and Notice of Intent have been issued. Individual Notices of Intent for Lots 1 and 6 will be submitted to the Rowley Conservation Commission. The final Septic System Design Plans and Lot Notices of Intent will show:*

  - Final building foundation plans and driveway layouts which will not increase from the building footprints shown on the proposed Subdivision Plans,
  - Final Septic System Plans,
  - Final stormwater roof infiltration systems required to comply with Standard 3 – Recharge on the Stormwater Checklist will also be shown on the final septic system plans.

This submittal includes:

- Summary Letter

- Response to Comments – Rowley Planning Board (Revised Plans Revision #2):
  - VHB (Vanasse Hangen Brustlin, Inc.).
  - Town of Rowley Fire Department: Fire Chief James C. Broderick.
  - Town of Rowley Police Department: Police Chief Scott A. Dumas
- Operation and Maintenance Plan – Construction and Post Construction Phase

Appendix A

- Figure 1: Hydrologic Soil Group Map
- Figure DP1 Pre- Construction Hydrology
- Figure DP2 Post Construction Hydrology
- TSS Work Sheet
- HydroCAD Print Out [1]
- Massachusetts Department of Environmental Protection Stormwater Checklist Summary
- Massachusetts Department of Environmental Protection Stormwater Checklist

Accompanying the Project Data Report

- Sheets C1 – C7: Notice Intent Plans

1 HydroCAD Node Listing and Totals are provided for the 2, 10- and 25-year storm events. Summary printouts are provided for the 100-year storm event. The Roof Infiltration Summary is shown on Page 40 in the HydroCAD Print Out

Design Team

The Design Team for the proposed project includes:

- Attorney
  Mann and Mann, P.C.
  191 South Main Street
  Middleton, MA. 01949-2515
  978-762-6238
- Civil and Traffic Engineer
  ASB design group llc
  363 Boston Street
  Topsfield, MA. 01983
  978-500-8419
- Surveyor
  Donohoe Survey, Inc.
  363 Boston Street

Topsfield, MA. 01983
978-887-6161

- Wetlands
  Norse Environmental Services, Inc.
  92 Middlesex Road
  Unit 4
  Tyngsboro, MA. 01879
  978-649-9932

PROJECT OVERVIEW

Existing Conditions

The 33.3± - acre site is located on the westerly side of the Newburyport Turnpike (Route 1) approximately 700' north of the Wethersfield and Newburyport Turnpike (Route 1) intersection. Currently the site is undeveloped. A portion of the site is bounded by the Mill River as shown on Sheet C1. The site is forested. Sheets C2 shows the existing conditions topographic survey, wetland, and riverfront resource areas along with their buffer zones.

Town of Rowley water is located on the westerly edge of the Newburyport Turnpike.

Wetland Resource Areas

Norse Environmental Services, Inc., Inc flagged the bordering vegetated wetlands and river front area on February 25, 2020. All the wetland boundaries have been verified by the Rowley Conservation Commission (MAPDEP No. 063-0701 ANARD). The state and local wetland resource area buffer zones are shown on Sheets C2 and C3. They are:

- 25' No Cut No Disturbance Zone (Town of Rowley Setback By Law)
- 100' Buffer Zone to BVW (State and Town of Rowley By Law)
- 100' Inner Riparian Zone
- 200' Riverfront Area

Norse Environmental Services, Inc. will be filing a Notice of Intent (NOI) with the Rowley Conservation Commission for the Definitive Subdivision and individual Lots 1 and 6.

An Abbreviated Notice of Resource Area Delineation (ANRAD) was filed with the Rowley Conservation Commission (Massachusetts Department of Environmental Protection (MADEP) File Number 063-0701. The ANRAD was approved by the Rowley Conservation Commission in November 2020.

The upland area that will be developed does not lie within a flood hazard area or aquifer protection district.

Soils

The Natural Resources Conservation Service (NRCS) Soils and Hydrologic Soils Group Map depicts the soil classification for the onsite soils (see Figure 5). There are 5 soil types that fall with the project site. They are:

- 12A: Maybid Silt Loam (0 to 3 percent slopes) with a Hydrologic Soil Group (HSG) Classification of C/D.
- 301B: Montauk Muck (0 to 8 percent slopes) with a Hydrologic Soil Group (HSG) Classification of C.
- 411B: Sutton Fine Sandy Loam (0 to 8 percent slopes) with a Hydrologic Soil Group (HSG) Classification of B/D.
- 711B: Charlton-Rock-Hollis Complex (3 to 8 percent slopes) with a Hydrologic Soil Group (HSG) Classification of B.
- 711C: Charlton-Rock-Hollis Complex (8 to 15 percent slopes) with a Hydrologic Soil Group (HSG) Classification of A.

Soil testing was conducted at the site on January 1, 2021, June 14, 2022, and June 28, 2022, for the purpose of determining soil suitability for the design of an onsite subsurface disposal systems (septic system) and the design of stormwater management Best Management Practice Ponds. The soil testing locations are shown on Sheets C2. Additional soil testing was conducted on July 29, 2022, for the purpose of determining the depth of fill placed in the area of the wetland replication area (see Sheet C6).

Proposed Conditions

The proposed development project will include the following items:

- Construction of a new paved roadway 24’ wide and 8+90’ long road with a 4’ wide Low Impact Design grassed swale. The new roadway will end with a 100’ diameter paved cul-de-sac.
- Construction of 6 new single-family homes with:
    - Driveways,
    - Subsurface Disposal Systems,
    - Stormwater Infiltration System(s) for roof runoff,
    - And associated landscaping.
- Construction of a new 8” water main with 2 fire hydrants.
- Street Lighting.
- Construction of 4 Stormwater Best Management Practice Ponds (BMP’S).

Sheet C2 show the proposed site development.

The site will be serviced by Town of Rowley water. A new 8” water main will be installed with 2 hydrants. New water services will be provided to the residential units. Telephone, electric/communications will be installed from Newburyport Turnpike (Route 1).

Please note the following:

- As with all new developments the final service connections to the single-family homes will be coordinate with the individual utility providers at the time of construction.

- The single-family homes shown on the plans are for planning purposes. Final building footprints will be coordinated during the design and submission of the Subsurface Disposal Systems for review and approval by the Rowley Board of Heath.

- The septic system layouts shown on the plans are sized for 4 bedrooms homes. Grading shown for the septic systems are based on the Seasonal Hight Water Table and Percolation Rate determined in the field for each lot and witnessed by the Rowley Board of Health.

Pre- and Post-Development Drainage

Methodology

The pre and post hydrology study was conducted using ***HydroCAD*** a ***Stormwater Modeling System***. The Runoff Curve Numbers were selected from the tables listed within the ***Soil Conservation Service Technical Release 55***. The terminology used by ***HydroCAD*** is summarized below.

1. ***Subcatchment*** - refers to a relatively homogenous area of land that drains into a single reach or pond.
2. ***Reach***- refers to a uniform stream, Channel, or pipe that conveys water from one point to another reach or pond.
3. ***Pond***- refers to a pond, swamp, dam, or other impoundment that fills with water from one or more sources and empties in a manner determined by a weir, culvert, ex-filtration or devise(s) at its outlet.
4. A ***Link*** may be used to:
   - Enter a Hydrograph generated outside of HydroCAD,
   - Interconnect several routing diagrams,
   - Scale a hydrograph,
   - Split a hydrograph into two components for independent routing,
   - Define a fixed or tidal tailwater elevation.”

Four storm events were analyzed as part of the pre-development drainage study. They are the 2, 10, 25, and 100-year twenty-four-hour rainfall events based on the National Oceanic and Atmospheric Administrative (NOAA) 24 Hour Rainfall events. They are:

- 2 Year 24 Hour Rain Fall Event = 3.27”
- 10 Year 24 Hour Rain Fall Event = 5.17”
- 25 Year 24 Hour Rain Fall Event = 6.35”
- 100 Year 24 Hour Rain Fall Event = 8.18”

Pre - Development Drainage:

Figure D1 defines the drainage subcatchment areas under existing conditions (E1 – E5 and E1-2)). The stormwater runoff from the existing and proposed site flows to three Design Points. They are:

Design Point 1 (DP1) – Stormwater that flows to the existing drainage swale along the westerly side of the Newburyport Turnpike – Route 1 (Subcatchment Area E1).

Please note that this project will require a *Curb Cut Permit (CCP)* from the Massachusetts Department of Transportation (MADOT). As part of that Permit MDOT will be responsible for the review and approval of all drainage improvements and mitigations that impact their drainage system. The drainage calculations and details shown on these plans will be submitted to MDOT as part of the Curb Cut Permit.

Design Pont 1A (DP1A) – Stormwater that flows to the existing wetland area as shown on Figure D1. Subcatchments E2 to E5 define the total area the contributes stormwater flow to DP1A.

Design Pont 2 (DP2) – Stormwater that flows to the abutting lot (Subcatchment E1-2).

Please note that DP1 and DP1A hydrologically connect – DP1 flows to DP1A.

With the soil type, existing surface conditions, and hydrologic soil group, the runoff curve numbers can be determined. (See Existing Conditions HydroCAD Printout, Appendix A).

The 2, 10, 25, and 100-year 24-hour storm events were run. Table 1 summarizes the peak flows to Design Points 1, 1A - 2 for the Pre – Development conditions in cubic feet per second.

Table 1: Pre-Development Peak Flows (cfs) to Design Points 1, 1A and 2

Storm Event	Design Point 1 Peak Flow (cfs)	Design Point 1A Peak Flow (cfs)	Design Point 2 Peak Flow (cfs)
2-year storm event (3.27")	1.46 cfs	2.53 cfs	.00 cfs
10-year storm event (5.17")	3.63 cfs	6.72 cfs	.00 cfs
25-year storm event (6.35")	3.79 cfs	10.00 cfs	.00 cfs
100-year storm event (8.18")	6.92 cfs	16.79 cfs	.04 cfs

Peak Flows – Cubic Feet Per Second (c.f.s.)

Post - Development Drainage:

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Under the proposed development the site broke down into 19 drainage subcatchments (as shown in Figure D2. The stormwater runoff generated from the new site development will be mitigated by 4 Best Management Practice Ponds (BMP 1A, 1B, 2 and 3). BMP's 1A, 1B, 2 and 3 located to mitigate the stormwater runoff that flows to DP1A.

The Post Development Flow (stormwater runoff) to DP1 was decreased by minimizing the drainage subcatchment area that contributes to the existing drainage swale along the westerly side of the Newburyport Turnpike – Route 1.

Please Note:

- When engineers refer to the CN Value or Runoff Curve Number, they area describing a soil type (in our case 5 soil types as discussed above), existing surface conditions (grass, roof, pavement) and the soils Hydrologic Soil Group (in our case A and B). With this information the Natural Resources Conservation Service (NRCS) Runoff Curve Numbers can be determined (CN Value).

  The NRCS CN value is related to soil type, soil infiltration capability, land use (grass, roof pavement), and the depth of the seasonal high-water table. Pavement has a CN value of 98 or 98% of the water runs off the surface when it is thoroughly wetted. Grass, in good condition (grass over 75% of the surface - which is less than your typical lawn), and a Hydrologic Soil Group Classification of B has a CN value of 61 or 39% of the stormwater infiltrates when the soil is thoroughly wetted.

4 Best Management Practice Ponds (BMP's) have been introduced to control and treat the stormwater runoff from the proposed development. In addition, a 4' wide Low Impact Design grass swale will capture the roadway runoff and direct it to BMP's 1A, 1B, 2, 3 and the proposed Sedimentation Basin #1 located at Design Point 1. There will also be deep sump catch basins (30" diameter CB's within the grass swales and full size catch basins for CB 3 and CB 4) placed

within the grassed swales to provide additional stormwater treatment (TSS Removal). Each BMP is summarized below.

- *BMP 1A* is located along the left side of the new roadway (Roadway Station 3+30 to 4+00 ±). BMP 1A will capture, detain, and treat the stormwater runoff generated from the left side of new roadway along with associated driveways, roofs and landscape areas from Roadway Station 1+00 to Station 7+70 (±).

- *BMP 1B* is located along the right side of the new roadway (Roadway Station 3+30 to 4+00 ±). BMP 1B will capture, detain, and treat the stormwater runoff generated from the right side of new roadway along with associated landscape areas from Roadway Station 1+00 to Station 5+50 (±).

- *BMP* 2 is located along the right side of the new roadway (Roadway Station 5+40 to 5+80 ±). BMP 2 will capture, detain, and treat the stormwater runoff generated from the right side of new roadway along with associated driveways, roofs and landscape areas from Roadway Station 5+50 to Station 7+50 (±).

- *BMP* 3 is located along the right side of the new roadway (Roadway Station 7+65 to 8+20 ±). BMP 3 will capture, detain, and treat the stormwater runoff generated from the right side of new roadway and upper half of the cul-de-sac along with associated driveways, roofs and landscape areas beginning at Roadway Station 7+50 and extending to the upper portion of the cul-de-sac.

The Low Impact Design 4' wide grass drainage swale being proposed will direct the stormwater runoff to BMP's 1A, 1B, 2, 3 and Sedimentation Basin #1. The grass swale will be wide with flat side slopes that with will:

- Promote a less concentrated stormwater runoff flow generated from the proposed roadway.
- This will reduce the stormwater velocity.
- The reduced stormwater velocity will allow for greater stormwater infiltration and water quality treatment.
- Will fit in to the natural grassed landscape areas associated with the house development.
- Allow for easier maintenance with simple lawn mowing.

Each BMP will be vegetated with wetland plants within the basin and upland plants on the slopes as part of the overall landscape for the site as detailed on Sheets C6 and 7. Final plantings will be coordinated by Norse Environmental Services Inc.

Please note that any subcatchment that resulted in a Time of Concentration (Tc) of less than 5 minutes was entered as Direct Entry with a corresponding Tc of 5 minutes. For these subcatchments the Longest Flow Paths are not shown.

The same 2, 10, 25, and 100-year 24-hour storm events were run for the Post Development Conditions. Table 2 summarizes the peak flows to Design Points 1, 1A and 2 for Post – Development conditions in cubic feet per second.

Each house will have the roof stormwater runoff directed to Cultec Infiltration Chamber systems. No credit has been taken for this roof runoff infiltration in the HydroCAD Drainage Model.

The results of the Post Development Drainage Study are summarized below in Table 2. For the storm events 10, 25, and 100-year there was a decrease in the peak rate of runoff which does not include additional mitigation from the roof runoff that will be directed to the infiltration systems.

Table 2: Post Development Peak Flows (cfs) to Design Points 1, 1A and 2

Storm Event	Design Point 1 Peak Flow (cfs)	Design Point 1A Peak Flow (cfs)	Design Point 2 Peak Flow (cfs)
2-year storm event (3.27")	1.35 c.f.s –.11 cfs	1.55 c.f.s. – .98 cfs	.00 c.f.s. – .00 cfs
10-year storm event (5.17")	3.00 c.f.s. – .63 cfs	4.70 c.f.s – 2.02 cfs	.00 c.f.s – .00 cfs
25-year storm event (6.35")	3.79 c.f.s, – 1.32 cfs	10.00 c.f.s – .1.38 cfs	.01 c.f.s – .01 cfs
100-year storm event (8.18")	6.92 c.f.s – .58 cfs	16.79 c.f.s – .68 cfs	.04 c.f.s – .03 cfs

Decrease shown in red

Waivers – Rowley Planning Board

VHB Comment: Waivers were indicated on the plan cover sheet; however, a separate letter could not be located. A separate letter specifically discussion waivers for board approval and to be voted on should be provided.

ASB Response: The following is a list of all the Waivers being requested by the Petitioner.

1. §3.3.2.6 Tree Plan. Location and species of all proposed street trees and location of all existing trees with trunks over 12' in diameter shall be shown on the definitive plan.

   The Applicant is requesting a waiver pursuant to Section 6.1.1 from the requirement to locate and identify all existing trees within the minimum setback area.

2. *§4.1.6.2 Dead-End Streets. A dead-end street may not exceed five hundred (500) feet in length.*

   The Applicant is requesting a waiver pursuant to Section 6.1.1 from the 500' restriction to allow instead a dead-end street with a length of 890'. A waiver from strict compliance is in the public's best interests and is not inconsistent with the Subdivision Control Law. Access to the developable uplands, requires a wetland crossing. By granting the waiver, the Board will allow the Applicant to avoid increasing the amount of wetland disturbance. The waiver will not

impact safe access to the homes. The Fire Department and Police Department did not object to the length of the way and requested that a hydrant to be relocated and that the Petitioner construct all driveways to withstand the weight of a fire truck.

3. *§4.9.1. and §5.15.1 Fire Alarm Box and System*.

The Applicant is requesting a waiver pursuant to Section 6.1.1 from requirement to install one fire alarm box for each 1,000 linear feet and a fire system for the Subdivision.

4. *§5.2.2.1 Pavement.*

The Applicant is requesting a waiver pursuant to Section 6.1.1 from the 26' wide width of pavement requirement to allow a reduced width of 24'. A waiver from strict compliance is in the public's best interests and is not inconsistent with the Subdivision Control Law. By granting the waiver the Board will allow the Applicant to reduce the impervious areas being created which will benefit to the environment and reduce the amount of stormwater runoff and the amount of wetland disturbance resulting from the crossing.

5. *§5.4.1.1.b Surface and Sub-Surface Water; Culvert, Storm Drains and Sewer Pipes*

The Applicant is requesting a waiver pursuant to Section 6.1.1 from the requirement that all pipes be reinforced concrete pipe and to allow instead he use of high-density polyethylene (HDPE) pipe.

6. *§5.5.1 Sidewalks.*

The Applicant is requesting a waiver pursuant to Section 6.1.1 from the requirement to install sidewalks on both sides of the street and to allow a sidewalk on only one side. Applicant further requests that the Board waive the requirement that the sidewalk extend from the Newburyport Turnpike to the wetland crossing and allow the sidewalk to be limited to the area where the lots have their driveway access.

§5.7.1 Curbs.

The Applicant is requesting a waiver pursuant to Section 6.1.1 from the requirement to install sloped granite curbing along the edge of the roadway on both sides of the street and to allow instead that no curbing will be required. A waiver from compliance is in the public's best interests and is not inconsistent with the Subdivision Control Law. By granting the waiver the Board will allow the Applicant to use low impact development techniques for its stormwater management systems.

Review Comments

Plan Revisions Overview

The following revisions have been incorporated into the Plans for Revision #2.

- On June 14 and 28 ASB conducted onsite soil testing with the Town of Rowley's Board of Health for Septic System Design. The Septic Systems shown on the revised plans are designed to meet the Town of Rowley's Board of Health regulations and Massachusetts Title V. Each Septic System shown is based on the longest percolation rate and Seasonal High-Water Table specific to each lot. All septic systems have been designed

for a minimum of 4 bedrooms. Please note that final septic system plans will be submitted to the Rowley Board of Health for review and approval.

- The proposed roadway was shortened by 30'± (from Station 9+29 to Station 8+90).
- The lotting was revised so that open space could be deeded to the Town of Rowley's Conservation Commission (see revised lotting prepared by Donohoe Survey Inc.).
- The wetland replication area was relocated to the easterly side of the proposed site along wetland flags 16A to 26A.
- The Name of the Subdivision has been revised to Osprey Landing and the roadway name changed to Osprey Court.

Town of Rowley Fire Department:

Comment 1: The first hydrant in front of lot #6 should be relocated to a position before that driveway.

Response: The Hydrant has been relocated as shown on Sheet C7-2 and C10.

Comment 2: Driveways must withstand the weight of fire apparatus.

Response: Driveways have been designed to withstand the weight of fire apparatus – see Sheet C13.

Town of Rowley Police Department:

Comment 1: Construction Phase - Care must be taken to road construction material being dragged out onto route 1 from Katie Lane, particularly gravel and rock. The speed limit on route 1 is 50 MPH and that type of material has the potential to cause property damage if not attended to on a regular basis. – ADDRESSED UNDER CONSTRUCTION ENTRANCE, Summary Letter page 13 Signs on route 1 indicating construction vehicles turning and entering Katie Lane entrance should have a street light.

Response: The proposed roadway requires a Massachusetts Department of Transportation (MADOT) Access Permit. The applicant will be filing the access permit with MADOT (see Sheets C1 and C2 – MADOT Access Permit). All construction activities and Traffic Management Plans will be in accordance with MADOT Standards and will ensure that the travel way will not be affected by the construction materials. Also – see Erosion Control Notes on Sheet C16.

A streetlight is shown on Sheet C8-1.

Comment 2: Post Construction: Signs on route 1 indicating turning traffic or upcoming road.

Response: Signage has been added to Sheets C8-1, C16 and C1 (MADOT Curb Cut Permit). A Sign Detail has been added to Sheet C12. Signs will be place 200' north and south of the new intersection.

VHB (Vanasse Hangen Brustlin, Inc.)

- *Waiver Requests:*

3.3.2.1 A Definitive Plan shall contain the following information:

(k) A document shall be filed requesting Planning Board's approval for any waivers from the requirements of the Rules and Regulations. Please note that this Waiver Request shall be in the form or a separate letter addressed to the Board listing each section that the applicant is seeking a waiver from.

VHB Comment: Waivers were indicated on the plan cover sheet; however, a separate letter could not be located. A separate letter specifically discussion waivers for board approval and to be voted on should be provided.

Response: See above for a list of waivers prepared.

Section 4.1.6.2 A dead-end street may not exceed five hundred (500) feet in length, except that, where a greater length is necessitated by topography or other local conditions, the Planning Board may approve a dead-end street in excess of five hundred (500) feet, but only as part of an Open Space Residential Development approved under Section 5.4 of the Rowley Protective Zoning By-Laws.

The applicant indicates that a waiver to increase the maximum length for a cul-de-sac was accepted for Falcon Ridge for 950'.

VHB Comment: We need the boards interpretation on this. It is our interpretation that a cu-de-sac can only be extended over 500' as part of an OSRD.

Response: The Subdivision Rules and Regulation do provide specific authorization to waive the length of roadway for an OSRD, however it also provides the Board with a catch all variance authority under Section 6.1.1 – Variation. The Section does not exclude the right to waive length of dead-end street or limit the Board's authority. Section 6.1.1 – Variation is as follows: "Strict compliance with [all] requirements … may be waived when in the judgement of the Board such action is in the public interest and no inconsistent with the Subdivision Control Law." The Board has the power and authority to waive any subdivision requirement (including the dead-end street limitation) provided the Board determines that it is in the public's best interest and is consistent with the Subdivision Control Law.

Section 5.2.2.1 Table of Pavement Width Requirements: Minor Street 26'.

The applicant indicates that a waiver to decrease pavement width was accepted for Falcon Ridge for 24'.

VHB Comment: Applicant should discuss with the Board, but VHB takes no exception with this request if the Board agrees.

Response: No Response required.

Section 5.4.1.1.b Culvert, Storm Drains and Sewer Pipes (Section 230) 1) All pipes except sub-drains shall be reinforced concrete pipe and shall be installed in accordance with the size and location on the approved plan.

The applicant indicates that a waiver change drainage pipe material to ADS N12 was accepted for Falcon Ridge.

VHB Comment: Applicant should discuss with the Board, but VHB takes no exception with this request if the board agrees.

Response: No Response required.

Section 5.5.1 Sidewalks shall be constructed within the Subdivision along the full length of each side of each street and around the outside of each turnaround, and at other locations within the subdivision as shown on the approved Definitive Plan, except as provided in Section 4.10 of these Rules and Regulations. (5.5.2.1) Along a minor street (4) feet.

The applicant indicates that a waiver change for no sidewalks was accepted for Falcon Ridge. However, a sidewalk was required on one side of the roadway as part of the final board approval.

VHB Comment: Although the proposed roadways seem to be designed to provide safe vehicular travel, sidewalks for pedestrians are not provided. Planning Board may consider a waiver for this requirement; however, we recommend that a sidewalk be provided on at least one side of the roadway to provide pedestrian accommodations outside the roadway pavement. If existing conditions prevent the installation of a sidewalk, the Applicant can consider requesting a waiver from this requirement. VHB will defer to the Board on this waiver request based on previous discussions and recommendations by the board with the applicant, however given current Massachusetts Communities Complete Streets policies, we recommend that pedestrian accommodations be provided as part of this subdivision development.

Response: A sidewalk was added to the interior of the site development. The sidewalk begins at Station 5+65 (LT) at the far side of the driveway on Lot 6 and would extend round the roadway to the far side of the driveway on Lot 1, at Station 7+32 (RT), where it ends. This connects all 6 of the houses.

The proposed sidewalk is not shown on the current plans. However, the sidewalk was laid out so that if it is required it can be added to the plans without any revisions to the drainage calculations. The impervious surface for the sidewalk was incorporated in the post development drainage calculations as well as the calculations for Storm Water Recharge under the Massachusetts Department of Environmental Protections Storm Water Checklist – Standard 3.

We would not recommend extending the sidewalk to Newburyport Turnpike (Route 1). There are currently no sidewalks on Route 1 nor are any proposed. Accordingly, having a sidewalk that leads to the intersection with the Newburyport Turnpike does not further the purposes of the complete streets policies. In addition, it is not safe to promote pedestrian movement at the Osprey Court and Route 1 Intersection. A waiver from strict compliance is in the public's best interests and is consistent with the Subdivision Control Law.

Section 5.7.1 Unless otherwise specified by the Board, sloped granite curbs of the dimensions given for Granite Edgestone (Section M9.04.2) Type SA in the Standard Specifications shall be provided along each edge of the roadway for the full length of the street. Such curbs shall be installed in accordance with the construction methods outlined under Curb, Curb Inlets, Curb Corners and Edging (Section 501).

The applicant indicates that a waiver change for no curb was accepted for Falcon Ridge.

VHB Comment: Applicant should discuss with the Board, but VHB takes no exception with this request if the board agrees.

Response: No Response required.

- *Conformance with Planning Board Rules and Regulations*

3.3.2.1 A Definitive Plan shall contain the following information:

(k) A document shall be filed requesting Planning Board's approval for any waivers from the requirements of the Rules and Regulations. Please note that this Waiver Request shall be in the form or a separate letter addressed to the Board listing each section that the applicant is seeking a waiver from.

Waivers were indicated on the plan cover sheet; however a separate letter could not be located. A separate letter specifically discussion waivers for board approval and to be voted on should be provided.

Response: See the above "List of Waivers".

3.3.2.4 Provide details and calculations for sewage disposal systems compliant with the Rowley Rules and Regulations as well as Board of Health regulations.

Indicate water main size and confirm it is sufficient in size. Confirm the existing main in Route 1 has sufficient capacity for this project. Confirm hydrant, valve connection types and locations are approved by the Water and Fire Department.

Response: Size of water main is shown on Sheets C8-1, C8-2, C8 and C10. The applicant coordinated with the Rowley Water Department and confirmed that there was adequate water capacity at this location. The Fire Department requested that the Hydrant be relocated as shown on Sheet C7-2 and C10. The applicant will request a letter from the Rowley Water Department confirming the water systems capacity and layout.

On the Summary Letter ASB indicates that final Septic System Design Plans will be submitted to the Rowley Board of Health for review and approval. The Septic System Design Plans will be submitted once the approvals for the Definitive Subdivision and Notice of Intent have been issued.

Response: Soil has been completed for all six lots.

3.3.2.6 Provide location and species of all proposed street trees and of all existing trees with trunks over twelve inches in diameter measured 4 feet above the finished grade.

Response: See the above "List of Waivers" that includes a request to waive this requirement.

3.3.2.10 (d) Provide detail for proposed stockpile of topsoil.

Response: Sheets C8-1 to 3 have specific Erosion Control Notes. Note 2 address the material stockpile area. As stated in the note Lots 2, 3 and 5 can be used for material stockpile areas. The note also states that the stockpile areas shall be surrounded by an erosion control barrier.

3.3.2.11 Provide cut and fill analysis; how topsoil will be handled in areas of cut and fill; disposition of topsoil on the site.

Response: Erosion Control Note 3 states that all loam is to remain on site until the site has been stabilized with loam and seed. All excess loam will be removed once it is confirmed that the site has been stabilized (two mowing's).

The grading plan provides sufficient information to demonstrate that the site work will require construction fill to be imported to the site.

3.3.4.1 (b) Applicant shall provide percolation test results for review in accordance with this requirement. Minimum percolation rate should be 1 inch per 10 minutes.

Response: On site soil and percolation testing was completed for all lots and witnessed by the Rowley Board of Health as outlined above in the Plan Revisions Overview.

4.1.1.1 All streets in the subdivision shall be designed so that, in the opinion of the Board, they will provide safe vehicular and pedestrian travel and an attractive street pattern through curvilinear street layout whenever possible.

Although the proposed roadways seem to be designed to provide safe vehicular travel, sidewalks for pedestrians are not provided. Planning Board may consider a waiver for this requirement; however, a sidewalk should be provided on one side of the roadway at a minimum to provide pedestrian accommodations outside the roadway. If existing conditions prevent the installation of a sidewalk, the Applicant can consider requesting a waiver from this requirement. A similar waiver is requested under section 5.5.1.

Response: As noted earlier in this response, a sidewalk has been designed for the interior of the site development. The sidewalk would connect all 6 of the houses but would not extend to the Newburyport Turnpike (Route 1). We feel it would not be safe to promote pedestrian movement at the Katie Lane and Route 1 Intersection and that the waiver is consistent with the requirements of the complete streets policy.

4.1.6.2 A dead-end street may not exceed five hundred (500) feet in length, except that, where a greater length is necessitated by topography or other local conditions, the Planning Board may approve a dead-end street in excess of five hundred (500) feet, but only as part of an Open Space Residential Development approved under Section 5.4 of the Rowley Protective Zoning By-Laws.

The applicant indicates that a waiver to increase the maximum length for a cul-de-sac was accepted for Falcon Ridge for 950'.

Refer to waiver section above. Based on the wording of the above, a dead-end street can only exceed 500' as part of an OSRD. VH request the Planning Boards interpretation of this item.

4.7.2.1. On-site septic tanks and leaching fields may be located in either the front or rear yard of the building served. Lot (1.) are non-conformant to this regulation.

However, the Rowley Board of Health confirmed in the review of Falcon Ridge that side yards are not prohibited in either the Rowley BOH regulations or title 5 regulations. VHB is indifferent and defers to the Board on this issue.

Response: No Response required.

4.9.1. One fire alarm box shall be provided for each 1,000 linear feet.

A waiver for this was granted on Falcon Ridge. The applicant should formally request this waiver since it is not shown on the plan.

Response: A waiver request has been added to the plans and letter – See Sheet C1. See also above "List of Waivers" that includes a request to waive this requirement.

4.10.1 Sidewalks shall be provided on both sides of each street, except where one side is sufficient per Planning Board opinion.

Response: See response for sidewalk above.

Section 5.2.2.1 Table of Pavement Width Requirements: Minor Street 26'

The applicant indicates that a waiver to decrease pavement width was accepted for Falcon Ridge for 24'.

Refer to waiver section above. VHB take no exception to this waiver request.

Response: No Response required.

Section 5.4.1.1.b Culvert, Storm Drains and Sewer Pipes (Section 230) 1) All pipes except sub-drains shall be reinforced concrete pipe and shall be installed in accordance with the size and location on the approved plan.

The applicant indicates that a waiver change drainage pipe material to ADS N12 was accepted for Falcon Ridge.

Refer to waiver section above. VHB take no exception to this waiver request.

Response: No Response required.

Section 5.5.1 Sidewalks shall be constructed within the Subdivision along the full length of each side of each street and around the outside of each turnaround, and at other locations within the subdivision as shown on the approved Definitive Plan, except as provided in Section 4.10 of these Rules and Regulations. (5.5.2.1) Along a minor street (4) feet.

The applicant indicates that a waiver change for no sidewalks was accepted for Falcon Ridge.

Refer to waiver section above. This statement is incorrect; a sidewalk should be provided on at least one side of the roadway.

Response: See response for sidewalk above. VHB is correct that the Falcon Ridge Subdivision was required to install sidewalks on only one side of the street.

Section 5.7.1 Unless otherwise specified by the Board, sloped granite curbs of the dimensions given for Granite Edgestone (Section M9.04.2) Type SA in the Standard Specifications shall be provided along each edge of the roadway for the full length of the street. Such curbs shall be installed in accordance with the construction methods outlined under Curb, Curb Inlets, Curb Corners and Edging (Section 501).

The applicant indicates that a waiver change for no curb was accepted for Falcon Ridge.

Refer to waiver section above. VHB take no exception to this waiver request.

Response: No Response required.

- *Stormwater Management Comments*

1. According to the MA DEP Stormwater Management Regulations Volume 2, Chapter 2 one soil boring or one test pit for every 5,000 feet of basin area, with a minimum of three borings for each infiltration basin. The applicant is currently not showing any data within or near the basin footprint. The applicant should provide data in this area. *VHB cannot adequately review the provided stormwater analysis and report until some groundwater evidence and soil characteristics are provided in the area of the underground infiltration basins. TPs 9-13 are shown on the plan, but the logs are not provided the closest log to the homes is TP-8 and shows ESHGW 4' below the surface and is approximately 400' away from the Lot 4's drainage system. This could also impact septic system design Although the HGS soils map indicates type A soils this is just a general estimate of soils that may be encountered, and test pits are needed to confirm soil textural class and estimated seasonal high groundwater.*

   Response: Soil Logs have been attached to this response letter. Soil testing for BMP #3 was conducted on June 14, 2022 and the soil log has been added to this letter.

2. As reported in the Stormwater Report, the Applicant used Type III rainfall intensities that is 27-years old and has been superseded by NOAA Atlas-14; providing a more accurate representation of current rainfall intensities. VHB recommends that Applicant revises HydroCAD and rational models to reflect this more recent rainfall data, which can be found at: http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=pa/ Additionally, it is our understanding that the Conservation Commission's Bylaw requires the use of NOAA Atlas-14.

   Professionals Engineers should be using the most current and up to date DATA for any source in the Engineering Calculations. Using outdated data that could arrive at a conclusion that is not in the best interest of the general public, or the environment, and does not acting in a responsible manner. VHB believes that this Comment has not been addressed but will defer to the Planning Board relative to this issue. This same comment was made on the Falcon Ridge Project.

   Response: The drainage study has been revised and includes the additional impervious area that was created with the new sidewalk.

3. There does not appear to be calculations to support Standard 1 and that outlets have been designed so that there is no erosion or scour to wetlands.

   Response: Each outlet has been designed with a rip-rap sump the discharge point to dissipate the velocity and disperse the flow (see Outlet Detail Sheet C14). This will prevent erosion and scouring. Outlets to BMP'S 1B and 2 also have vegetated velocity reducers as detailed on C17.

4. In the summary letter Table 2: Post Development Peak Flows shows an increase in flow rate for design point 2 in both the 25-year storm event and the 100-year storm event. The MA DEP Stormwater Standard 2 states that Stormwater management systems shall be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates. However, VHB agrees with ASB that this is a diminutive increase and should not have an impact to this area.

   Response: No Response required.

5. Applicant should provide the Standard 3 requirement calculation showing infiltration BMPs will drain in 72 hours.

   Response: Calculations have been attached to this Summary Letter.

6. Provide full Geotechnical report for review, and for the Planning Boards records.

   Response: We are unsure of why a Geotechnical Report would be required. We request clarification on this request.

7. O&M plan should also include: **Response:** For Items a through e please refer to revised O&M plan.

a. O&M Compliance Statement with responsible party signature,

b. Training section,

c. Vehicle washing during construction guidelines,

d. Storage and Use of Fertilizers and Pesticides,

e. Snow and Deicing Chemical Management.

8. VHB is under the assumption that the proposed detention/wetland areas shown were designed as constructed wetlands. It is unclear if the intent of the BMP design was to design gravel wetlands. More information is needed for clarification and for VHB to complete its review. Please provide more detail of what type of wetland BMP is being proposed and include a cross section showing layers below surface.

   Response: The BMP's have been designed as Wetland Basins – see wetland seed mix sheet C20. Also please note that Norse Environmental Services Inc. will be supervising the wetland

plantings and BMP stabilization. The dry-stone beds are part of the overall wetland design. A Notice of Intent will also be submitted to the Town Rowley Conservation Commission for their review and approval.

9. Sediment forebays are required in all constructed stormwater wetlands per MA Stormwater Handbook. Please provide calculations that demonstrate proper forebay sizing.

   Response: See sizing calculations on Sheet C21.

10. The inlet and outlet for BMP 1A are very close and stormwater may potentially short circuit the treatment BMP. Applicant should consider moving the outlet further away from the inlet to provide proper circulation and treatment in the stormwater BMP.

    Response: See revised BMP 1A outlet.

11. Applicant should consider lowering the constructed wetland BMPs and replicated wetlands to intercept seasonal high groundwater table to better replicate ecological functions of a natural wetland as demonstrated in the MA Stormwater Handbook. Additional grading detail should be provided to establish permanent pools, low and high marshes as shown in the MA Stormwater Handbook.

    Response: See revised BMP grading.

12. The plans are providing 6" outlets to the BMPs, however the hydrocad is providing 4" outlets. The applicant should adjust this and resubmit their hydrocad report for review.

    Response: See revised HydroCAD Report.

- *General Engineering & Plan Comments*

1. The plans do not indicate location for electrical equipment including transformers and switches.

   Response: Final Electrical equipment will be coordinated with the Rowley Electrical Department at the time of construction. This will also include the final location for all streetlights. The CAD file has been forwarded to the Rowley Electrical Department for their layout and design.

2. Is there gas service to be associated with the project? It mentions gas on the cover sheet but is not shown on plans.

   Response: At this time, the applicant will not be bringing gas into the site.

3. Given that this will be a Subdivision Roadway, has the Town DPW accepted the segmental block retaining wall on each side of the culvert and the proposed "headwalls" vs a typical cast in place or precast headwall or culvert wingwall? All of these structures appear that they will be within the proposed future Town Layout. When will the final design of the retaining wall and culvert headwalls be provided? Do these structures require a building permit based on their height?

   Response: The segmented block retaining wall is the same one used at Falcon Ridge which was accepted by the Town of Rowley DPW.

4. The photograph provided on page C13 is misleading and does not match the proposed project cross sections in which the retaining wall is proposed to be raised higher than the edge of roadway elevation. It additionally shows Guardrail that is not being proposed. This is further discussed in a comment below.

   Response: The Photograph is intended only to convey the type of wall being used (will clarify that on Sheet C13). The wall will extend above finished grade like the wall construction at Falcon Ridge.

5. Has this culvert been sized to confirm it is adequate to handle the 100-year storm?

   Response: The Culvert is providing a hydraulic connection to each side of a wetland that ponds and then dries out for much of the year.

6. Typical pavement detail and typical cross section conflict on pavement course depths. Our understanding is most of the Commonwealth has switched to Superpave bituminous concrete at most asphalt plants. We recommend that you modify the pavement notes to reflect the current Superpave depth and requirements.

   Response: A note has been added to the typical cross section.

7. Has a detail for the interface of each residential driveway with the roadway been provided, to assure that roadway runoff not run down the residential driveways? Depending on gradings, sometimes a small 3' wide "hump, 3" high is required to prevent runoff from entering the residential driveway.

   Response: This will not be an issue since all driveways flow towards the road/grass swale.

8. We have been informed that a Planting Plan is forthcoming. The Applicant should provide a Landscape and Planting Plan with their next submission. We strongly recommend that this project not be approved with a condition that a planting plan be provide at a future time. We recommend that a planting plan be provided as part of the approved project plans.

   Response: Please see Sheets C19 and C20. Also so see Wetland Restoration Rendering

9. There appears to be some areas where buried utility lines intercept estimated seasonally high groundwater. The applicant should consider providing anti-seep collars to prevent flow along the utility trenches.

   Response: Electrical lines are now located within the roadway.

10. Lot 2 is showing a drain outlet running through the building and septic system. Is this just a drafting error?

    Response: Yes – this is just a drafting error.

11. Some type of AASHTO approved guardrail system with appropriate end treatments should be provided between the roadway edge and the segmental block retaining walls that are being proposed above the roadway edge grade on both sides of the roadway between stations 3+80+/- and 5+50+/-. These proposed segmental block retain walls will be a blunt end that need to be protected to prevent vehicular impact to the ends of the retaining wall. Unless it can be demonstrated that the retaining walls are outside the clear zone of the roadway path of travel,

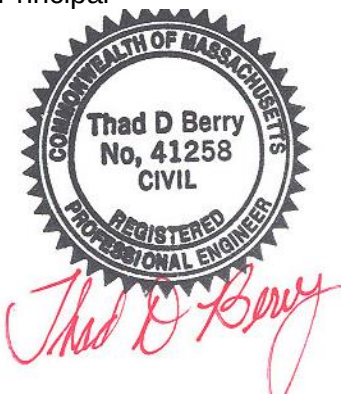
some type of AASHTO accepted guardrail protection system should be provided between the edge of roadway and these retaining walls.

Response: The wall layout is similar to the one constructed at Falcon Ridge which does not have a guardrail. There is a 4' wide grass strip from the edge of pavement to the front face of the segmented block retaining wall.

If you have any questions and or concerns, please feel free to contact me at 978-500-8419.

Sincerely,

ASB design group, LLC
Thad D. Berry, P.E.
Principal



ASB design group

Osprey Court Operation and Maintenance Plans

A. OPERATION & MAINTENANCE PLAN: CONSTRUCTION PHASE

MA DEP STORMWATER REPORT STANDARDS 4 & 8
RESPONSIBILITY: CONTRACTOR

STATEMENT OF INTENT:

This operation and maintenance plan (O&M) identifies inspection and maintenance requirements for the proposed project. The plan addresses requirements contained in the stormwater management policy developed by the Massachusetts Department of Environmental Protection (MADEP) and Coastal Zone Management (CZM).

The erosion and sedimentation control program to be implemented for the project is intended to prevent impacts to existing wetlands, existing driveways, and surrounding sites during construction. The program incorporates the Best Management Practices (BMPs) as specified in the guidelines developed by MADEP and the Environmental Protection Agency and complies with the requirements of the National Pollution Discharge Elimination System (NPDES) General Permit for stormwater discharges for construction activities. This does not preclude any requirements for additional controls identified in these drawings or support documents or any other appropriate techniques to limit erosion and sedimentation off the site. Also, any measures deemed necessary by the Town / town planning board, conservation commission, zoning board, or the Town/town's representative shall be part of the erosion control plans and this operation and maintenance plan. All responsibility for implementing the operation and maintenance plan during the construction phase of this project shall be borne by the contractor and/or the contractor's representative.

Every effort has been made to provide a comprehensive Operation and Maintenance (O&M) plan for this project. All measures and guidelines presented within this plan are considered to be the minimum efforts required to achieve the intent of the erosion and sedimentation control program and minimize off-site impacts. Should any omissions or inconsistencies arise in the plan, the contractor and/or contractor's representative, applicant/owner, and governing officials are expected to use reasonable and experienced judgment in the field relative to evaluating and implementing measures based on the intent of this plan.

Please note that not all of the items outlined in this plan may be applicable to this project. *It is the contractor's responsibility to become acquainted with the project by (at the minimum) reviewing the entire document along with the associated plans, details, Conditions of Approvals, Order of Conditions and conduct a site walk prior to the start of construction.*

PROJECT IDENTIFICATION

Project Name: Osprey Court Definitive Subdivision and Notice of Intent

Project Location: Map 19 and Lot 4A
Newburyport Turnpike - Route 1
Rowley MA., Massachusetts 01969

Applicant: Taylor Lane LLC

Applicant Address: 357 North Street
Georgetown, Massachusetts 01945

Owner: 510 Newburyport Realty Trust

Owner Address: 8 Doaks Lane
Marblehead, Massachusetts 01833

Prior to start of construction, the project identification (MADEP Number) be posted on site with copy of order of conditions and all contractor and local emergency contact information. This project will require an NPDES General Permit.

DESIGN TEAM

Attorney: Mann and Mann, P.C.
191 South Main Street
Middleton, MA. 01949-2515
978-762-6238

Civil Engineer: ASB Design Group, LLC
363 Boston Street
Topsfield, MA 01983
978-500-8419

Surveyor: Donohoe Survey
363 Boston Street
Topsfield, MA. 01983
987-887-6161

Wetlands: Norse Environmental Services, Inc.
92 Middlesex Road
Unit 4
Tyngsboro, MA. 01879
978-649-9932

Contractor shall also post on-site all phone numbers for the applicant/owner and/or their representative, design team, and the Town/town officials and/or their representative.

DOCUMENTS:

Prior to construction, contractor shall confirm that no additional documents or drawings have been issued, revised, or needed to be implemented for the construction phase.

-Site Plans- Sheets C1-C21 – Revision #2 Dated 9.20.2022
-Site Plans NOI - Sheets C1-C7 – Dated 9.26.2022

By: ASB Design Group, LLC and Donohoe Survey, LLC Date: 1.19.2022

-Project Design Report

By: ASB Design Group, LLC Date: 1.19.2022

-Notice of Intent

By: Norse Environmental Services, Inc. Date: 9.27.2022

- Town of Rowley Conditions of Approvals

Planning Board – Definitive Subdivision Plans Date: **T.B.D**
Conservation Commission – Notice of Intent Date: **T.B.D.**
Board off Health – Septic Systems Date: **T.B.D.**

-NPDES General Permit Date: **T.B.D.**

MADOT Curb Cut Permit Date: **T.B.D.**

Contractor is responsible for filing and obtaining the NPDES General Permit prior to start of construction unless otherwise directed.

TEMPORARY OPERATION AND MAINTENANCE ITEMS:
(Construction Phase)

Note 1: See SWPP details (Stormwater Pollution Prevention Details – Sheets C5) for proposed individual BMP measures to be implemented.

Note 2: All sediment will be disposed of on-site, if applicable, or at an off-site location in accordance with all applicable local, state, and federal regulations.

CONSTRUCTION SEQUENCE:

Prior to construction the contractor shall submit a construction sequence for review and approval by the Rowley Community Planning Board and Conservation Commission. The contractor is responsible for providing plans and documents concerning any revisions to the construction sequence 72 hours prior to implementation for review and approval.

TRAINING:

Prior to the start of construction, the Contractor responsible for implementing the Construction Phase Operation and Maintenance Plan shall review all documents that would include but not limited to:

- Final approved plans,

- All town condition of approvals (Planning Board, Conservation Commission, Board of Heath, and Department of Public Works)
- Construction Phase Operation and Maintenance Plan.

The contractor is responsible to make sure that they identify the individual who will be responsible for daily inspections and that individual is familiar with and understands the Construction Phase Operation and Maintenance Plan requirements.

SWPPP IMPLEMENTATION:

Contractor shall install all erosion control measures as required for each construction area for inspection prior to the start of construction. Contractor shall identify an individual who will be responsible for compliance with SWPPP and daily inspections. SWPPP and supporting documents shall be kept on site at all times.

DUST CONTROL

To reduce emission of fugitive dust and to minimize impacts on the environment, the contractor shall adhere to a number of strictly enforced mitigation measures, including the following:

- When needed wetting agents will be used to control and suppress dust that has the potential to become airborne by wind.
- All trucks used for transportation of construction debris will be fully covered.
- Storage of construction debris will be located within the fenced-in site. All storage containers will be covered at the end of the workday.
- Construction practices will be monitored to ensure that unnecessary transfers and mechanical disturbances of loose materials are minimized and that any emissions of dust are negligible.
- Street cleaning shall be provided by mechanical street sweepers as required, to maintain clean roadways in the vicinity of the site.
- Sidewalks will be cleaned regularly to minimize dust accumulations.
- If any contaminated soil is encountered during excavation a Licensed Site Professional (LSP) will be onsite to oversee work associated with handling, treatment, stockpiling, and removal of soil.

CONSTRUCTION NOISE

Every reasonable effort will be made to minimize the noise impact of construction activities. Mitigation measures will include:

- No idling" signs will be posted at all loading/delivery areas, pick-up/drop-off areas, and at surface parking spaces. Trucks may not idle at the site for more than 5 minutes unless their operation is dependent on the vehicle running. The contractor shall follow the regulations in the Massachusetts State Anti-Idling Law.
- The contractor will place noisy equipment as far as possible from sensitive areas.

- Identifying and maintaining truck routes to minimize traffic and noise throughout the project and surrounding streets.
- Replacing specific construction techniques by less noisy ones where feasible (e.g., using vibration pile driving instead of impact driving, if practical).
- Work shall be performed as to prevent nuisance noise conditions that are preventable (e.g., un-maintained equipment, brake squeal, act.).
- NO WORK, including equipment warm-up and truck queuing or idling, will be permitted at the site or on the community streets prior to 7:00 A.M.

CONCRETE WASHOUT AREA:

The contractor shall provide a designated area onsite to be the concrete washout area. All washout of concrete trucks and the cleaning of concrete tools and equipment must be done in this area. The concrete washout area must provide necessary treatment and meet all applicable local, state, and federal laws and regulations. The location of concrete washout area may need to be relocated to accommodate the construction phasing.

All concrete washout shall be disposed of offsite in accordance with the Massachusetts Department of Environmental Protections (MassDEP) Rules and Regulations.

HAZARDOUS AND MIXED WASTE:

Store, treat, and/or dispose of hazardous or mixed wastes in accordance with all applicable laws and regulations. Do not bury construction waste, sanitary waste, or trash onsite.

Perform all washout of concrete trucks and the cleaning of concrete tools and equipment in a designated area onsite that provides necessary treatment and meets all applicable laws and regulations.

Stormwater discharges shall not cause or contribute to a violation of the water quality standard for pH in the receiving water. Temporary BMP's shall be used to prevent or treat contamination of stormwater runoff by pH modifying sources. These sources include, but are not limited to, bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, and concrete pumping and mixer washout waters. Construction sites with significant concrete work shall adjust the pH of stormwater as necessary to prevent violations of water quality standards.

MATERIAL STOCKPILE AREA:

Contractor shall locate the material storage and stockpiling areas within the limits of the proposed site and outside of the 100' buffer zone. This area, at a minimum, should be surrounded by a single row of hay bales, siltation fencing, and/or erosion control socks. Contractor shall monitor all erosion activities within the stockpile area and remove and repair siltation devices as required. Lots 1 (near BMP 1B) and 5 will be utilized for material stockpile

areas. The material stockpile areas will be located in areas that will be cleared to home and general site construction.

CONSTRUCTION ENTRANCE:

The contractor shall place a construction entrance (a temporary stone-stabilization pad located at points of vehicular ingress and egress from the construction site and/or staging area onto public roads - see SWPPP plan/details) at the site entrance of off Newburyport Turnpike – Route 1 (See Sheet C8, C16 and 18). The entrance should be maintained in a condition that will prevent the tracking or flowing of sediment onto public rights-of-way. This may require periodic top dressing with additional stone. Inspect entrance/exit pad and sediment disposal area weekly and after heavy rains or use. Remove mud and sediment tracked or washed onto public driveways immediately. Complete replacement of pad may be required if the pad becomes completely clogged. If washing facilities are used, the sediment traps should be cleaned out as often as necessary to ensure adequate storage and trapping efficiency occurs. Vegetative filter strips should be maintained to insure a vigorous stand of vegetation at all times. Repair broken pavement immediately.

VEGETATION – TREE PROTECTION:

Prior to the start of construction, the contractor shall identify and mark all trees to be preserved as shown on Sheets C8 – C10. If required, all tree pruning will be in completed in accordance with horticultural standards.

All excavation that occurs around the existing trees to be preserved shall be managed in accordance with horticultural standards.

The contractor shall keep heavy equipment away from the trees that will be preserved.

If the site remains idle for more than 30 days, the disturbed areas shall be hydroseeded.

Site stabilization for loam and seeding will mean that the grassed areas have been mowed at least two times.

EROSION CONTROL SOCK:

Place erosion control sock as may be required as part of the SWPP Plan (see SWPPP Plan/Details). Inspect erosion control sock immediately after each rainfall and at least daily during prolonged rainfall. Remove sediment deposits promptly to provide adequate storage volume. Avoid undermining during cleaning. Repair decompositions and failures immediately.

INLET PROTECTION - CATCH BASINS:

Total catch basins (CB inlets) on-site: 10 - See Sheet C2

Contractor shall provide proper inlet protection for all existing and proposed catch basins that will be impacted by construction as detailed on Sheet C18 (also see Sheet C12 for Catch Basin Type).

Place inlet protection will be required as part of the SWPP Plan (see SWPPP Plan/Details). All trapping devices and structures that protect CB inlets should be inspected after every rainstorm. Sediment should be removed when sediment has reached a maximum of one-half the depth to the top of the protection device.

Once the site has been stabilized with loam and seed (*two mowing's*) the Catch Basin Inlet Protection shall be removed. Any siltation that may have entered the catch basin sump shall be removed and disposed of offsite.

All sedimentation removal shall be disposed of offsite in accordance with the Massachusetts Department of Environmental Protections (MADEP) Rules and Regulations.

SEMI-PERVIOUS STRAW BALE OR SOCK BARRIER:

Place semi-pervious straw bale or sock barrier as shown on Sheets C8-10 (see SWPPP Plan/Details Sheet C18). Inspect semi-pervious straw bale or sock barrier immediately after each rainfall and at least daily during prolonged rainfall (grass swale and BMP's 1A, 1B, 2, 3 and Sedimentation Basin #1). Remove sediment deposits promptly to provide adequate storage volume. Avoid undermining during cleaning. Repair decompositions and failures immediately. Contractor shall have extra bales or siltation sock on-site for repair purposes. Remove semi-pervious straw bale or sock barrier when site has been stabilized and all sediment deposits removed.

STREET SWEEPING:

Paved areas shall be swept throughout construction to prevent excess sediment from flowing to the proposed drainage system. Maintain inlet protection (catch basins) until final pavement surface has been placed and all disturbed areas have been accepted as stabilized.

SNOW REMOVAL

The contractor is responsible for all snow removal during the winter months. Snow shall be removed from all areas affected by their work. This will be done daily as necessary, to ensure that all sidewalks are clear of snow and ice. Under no condition shall snow be plowed onto the adjacent streets (Route 1 – Newburyport Turnpike) or disposed of on public property.

SOLID WASTE:

The project site and surrounding areas shall be kept clear of debris and garbage. Temporary on-site receptacle(s) shall be provided and by the contractor and shall be disposed of off-site at an approved waste facility.

SPILL CONTROL AND RESPONSE:

The contractor will maintain equipment and storage containers and/or perform repairs or modifications as necessary to prevent spills.

In the event of a spill, immediately notify the resident construction inspector who will contact emergency response. The contractor shall be responsible for remediation of any spill.

Store all fuels, lubricants, chemical storage, material stockpiles, and other potential pollutants in a designated area on-site.

PROHIBITION OF ILLICIT DISCHARGES:

MADEP Stormwater Report Standard 10:
There shall be no illegal discharges of any material from this site to the proposed drainage and/or sewerage systems.

SANITIZING FACILITIES:

Contractor shall provide/or assure adequate onsite sanitary facilities for all workers in accordance with all federal, state, local requirements, and board of health.

REPORTS AND INSPECTIONS:

Contractor shall keep on-site all records of inspections, reports, and repairs throughout construction. Contractor shall coordinate with local, state, and federal agencies regarding weekly issuance of said reports or inspections. All records will become part of the final as-built plans when requested.

The contractor is responsible for ensuring that all persons responsible for the implementation, inspections, and reporting on this O&M shall be appropriately trained and familiar with this and all other O&M-related items on-site.

FINAL APPROVAL:

Contractor shall coordinate with all local, state, and federal agencies involved with the construction phase for final approval at the completion of work. At a minimum, all disturbed areas shall be stabilized, debris and sediment removed and disposed of, and BMP's stabilized, planted, and functioning. At a minimum, the binder pavement course must be in-place. All temporary erosion control devices shall be removed and disposed of off-site unless otherwise directed. As-built plans must be completed and accepted by applicable authorities, as required. If the project requires a notice of intent, the contractor and applicant/owner shall request a certificate of compliance from the city/town conservation commission. Upon final approval, responsibility for the permanent operation and maintenance plan of the construction area will become responsibility of the final owner(s).

CONSTRUCTION SEQUENCING

The construction for this project will occur in the following general sequence:

Erosion Control:

- Install perimeter erosion control barriers as shown on the SWPPP plan and SWPPP details, and as described in the project data report.
- Have installation inspected and approved by city/town engineering department and/or conservation commission representative prior to the start of construction.

- Place DEP file number at the driveway entrance to the construction site – Chestnut Street and Flint Street

Roadway, BMP and site construction (also see Sheets C8-C18).

The following construction sequence is an example. The final construction sequence shall be provided to the Town of Rowley Planning Board and Conservation Commission for review and approval prior to construction.

1. Post DEP sign in visible location. Install all erosion control, including construction entrance (see above for construction entrance), as detailed on Sheet C8, C16 and C18. Keep copy of NPDES General Permit and Order of Conditions on site.

2. If required install all temporary construction fencing and signage (for vehicular and pedestrian traffic).

3. Record and document all construction inspections and field reports.

4. Coordinate all required inspections with the Town of Rowley. Provide Town of Rowley with a detailed construction and inspection schedule.

5. Coordinated with Surveyor for all Construction Layout.

6. Stake roadway, temporary stockpile areas, and BMP's. Lots 1 and 5 will be used for temporary stockpile areas

7. Have site cleared of trees, brush, and stumps.

8. Tap water line in Newburyport Turnpike – Route 1. Install all underground utilities and street lighting.

9. Construction drainage and BMP's.

10. Coordinate with Norse Environmental Services, Inc. for BMP plantings and vegetation.

11. Construct new roadway.

12. Install binder course.

13. Loam and seed all grass areas and BMP's. Install all final site landscaping (street trees) and BMP vegetation.

14. Place finish pavement course.

15. Remove all siltation (clean catch basins and inspect bmp's) from the site.

16. Perform as-built drawing for roadway, utilities and BMPs for submission to the Town of Rowley Planning Board and Conservation Commission.

B. OPERATION & MAINTENANCE PLAN: POST CONSTRUCTION

MA DEP STORMWATER REPORT STANDARDS 4 & 8
RESPONSIBILITY: TOWN OF ROWLEY

DESIGN TEAM

See Operation and Maintenance Plan: Construction Phase.

STATEMENT OF INTENT

This operation and maintenance plan (O&M) identifies the inspection and maintenance requirements. The plan addresses requirements contained in the stormwater management policy developed by the Massachusetts Department of Environmental Protection (MADEP) and Coastal Zone Management.

The operation and maintenance program is intended to prevent impacts to existing wetlands, existing driveways, and surrounding sites after the completion of the construction – Post Construction. The guidelines incorporate best management practices (BMP's) as specified in the guidelines developed by MADEP and the environmental protection agency and complies with the requirements of the National Pollution Discharge Elimination System (NPDES) General Permit for stormwater discharges for construction activities. This does not preclude any requirements for additional controls identified in these drawings or support documents or any other appropriate techniques to limit erosion and sedimentation off the site. Also, any measures deemed necessary by the Town /town planning board, conservation commission, zoning board, or the Town/town's representative shall be part of operation and maintenance plan.

Every effort has been made to provide a comprehensive O&M plan. All measures and guidelines presented within this plan are considered to be the minimum efforts required to achieve the intent of the stormwater control program and minimize off-site impacts. Should any omissions or inconsistencies arise in the plan, Blue Standard Show Stables, are expected to use reasonable and experienced judgment in the field relative to evaluating and implementing measures based on the intent of this plan.

PROJECT IDENTIFICATION

Project Name: Osprey Court Definitive Subdivision and Notice of Intent

Project Location: Map 19 Lot 4A
Newburyport Turnpike – Route 1
Rowley MA., Massachusetts 01969

DOCUMENTS:

Homeowners Shall Refer to the following Documents:

- As -Built Drawings DATE: TBD

- Town of Rowley Planning Board Conditions of Approval DATE: TBD
- Town of Rowley Conservation Commission Conditions of Approval DATE: TBD
- NPDES General Permit DATE: TBD
- Approved Plan Sheets C1-C7 DATE: TBD
- MADOT Curb Cut Permit DATE: TBD

INTRODUCTION

The purpose of this **Operation and Maintenance Guide** (OMG) is to provide a comprehensive and cost-effective program for implementing the long-term maintenance of the Storm Water Facilities. The OMG will identify:

- Town of Rowley Department of Public Works Responsibility
- Stormwater BMP Description
- Maintenance Schedule,
- Maintenance Requirements/Methods,
- Record Keeping,
- Estimated Costs

PERMANENT OPERATION AND MAINTENANCE ITEMS – CRESTVIEW ESTATES:

All sediment must be disposed of on-site, if applicable, or at an off-site location in accordance with all applicable local, state, and federal regulations.

BMP's 1A, 1B, 2 and 3 – RESPONSIBILITY TOWN OF ROWLEY

BMP's 1A, 1B, 2 and 3 are stormwater treatment facilities intended to trap, detain, retain, and slowly release stormwater runoff generated by the roadway, driveways, and roof areas. The stormwater runoff is generated from the impervious surfaces (roadways, driveways, and roof as well as the lawn and naturally vegetated areas.

They are intended to handle and treat the stormwater that has a higher TSS and pollutant level (oils, nutrients). These areas typically contain impervious surfaces such as driveways and parking lots or areas that need to be treated and controlled during the construction process. The BMP's provides stormwater treatment for these areas as well as decreasing the Peak Rate of Stormwater Runoff that will leave the site because of the development. The increase in the peak rate of stormwater runoff is associated with the increase in impervious surfaces – driveway, buildings, parking areas, walkways, driveways etc.

MAINTENANCE SCHEDULE – Osprey Court

Maintenance of the stormwater facilities should occur in the spring (when weather conditions allow) and late fall of each year (after the leaves fall).

BMP's 1A, 1B, 2 and 3 are comprised of a wetland basin with both upland and wetland plantings. The BMP's work in concert with the grassed swales and deep sump catch basins. The BMP's are constructed with a series sedimentation traps or forebays and plantings. Training of the maintenance personnel on requirements of the Operation and Maintenance Program will be required.

The spring season maintenance would include:

- Inspect inlets and outlets to BMP's 1A, 1B, 2 and 3. Remove any sand/sediment. Sediment and sand should be removed and disposed off-site.
- Mow the grass areas on a weekly basis in the spring and then as need during the summer and fall months. Do not cut fine lawn grass shorter than 2½". Mulch grass in place or collect for composting.
- Clear inlets and outlets of leaves or blockage (see below).
- Remove sediment for sedimentation forebays/traps and refresh the grass surface as may be required.
- Inspect fine lawn and native grass areas for erosion or gullying. Top dress, re-grade, and re-seed as necessary.
- Maintain plantings – prune/trim and replace if needed.

Fall maintenance would include:

- Leaf removal.
- Final lawn mowing.
- Inspect all outlets and clean as maybe required.

RECORD KEEPING – Osprey Court

The owners of Osprey Court should keep records of all Operation and Maintenance activities. Keep digital pictures and create a summery letter outlining the Operation and Maintenance activities. Submit to the Town of Rowley Conservation Commission if required.

CATCH BASINS: RESPONSIBILITY TOWN OF ROWLEY DEPARTMENT OF PUBLIC WORKS

The Town of Rowley will clean the catch basins in accordance with their Town wide Operation and Maintenance Program.

ROADWAY SNOW PLOWING AND STREET SWEEPING: RESPONSIBILITY TOWN OF ROWLEY DEPARTMENT OF PUBLIC WORKS

After construction and before the Town accepts the road, the developer will need to sweep, plow, maintain basins and flush hydrants

At the time of the roadway acceptance the Town of Rowley will plow and sweep Osprey Court in accordance with their Town wide Operation and Maintenance Program. Hydrants will be flushed as part of the towns water system maintenance program.

GRASSED SWALE: RESPONSIBILITY HOMEOWNER

MAINTENANCE SCHEDULE – GRASSED SWALE

Maintenance of the grassed swale will occur throughout the spring, summer, and fall

The spring. summer and fall maintenance would include:

- Removal of any sand/sediment. Sediment and sand should be removed and disposed off-site and/or composted.
- Mow the grass areas on a weekly basis in the spring and then as need during the spring, summer and fall months. Do not cut fine lawn grass shorter than 2½". Mulch grass in place or collect for composting.
- Clear driveway culvert inlets and outlets of leaves or blockage (see below).
- Remove sediment from inlet outlet at driveway culverts
- Inspect fine lawn and native grass areas for erosion or gullying. Top dress, re-grade, and re-seed as necessary.

Fall maintenance would include:

- Leaf removal.
- Final lawn mowing.
- Inspect all driveway culvert inlets and outlets and clean as maybe required.

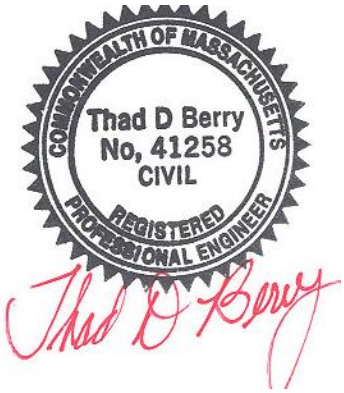
PROHIBITION OF ILLICIT DISCHARGES:

MADEP Stormwater Report Standard 10:
There shall be no illegal discharges of any material from this site to the proposed drainage and/or sewerage systems.

If you have any questions and or concerns, please feel free to contact me at 978-500-8419

Sincerely,

ASB design group, LLC
Thad D. Berry, P.E.
Principal


COMMONWEALTH OF MASSACHUSETTS
Thad D Berry
No, 41258
CIVIL
REGISTERED
PROFESSIONAL ENGINEER

Appendix A

Figure 1: Hydrologic Soil Group Map

Figure DP1 Pre- Construction Hydrology

Figure DP2 Post Construction Hydrology

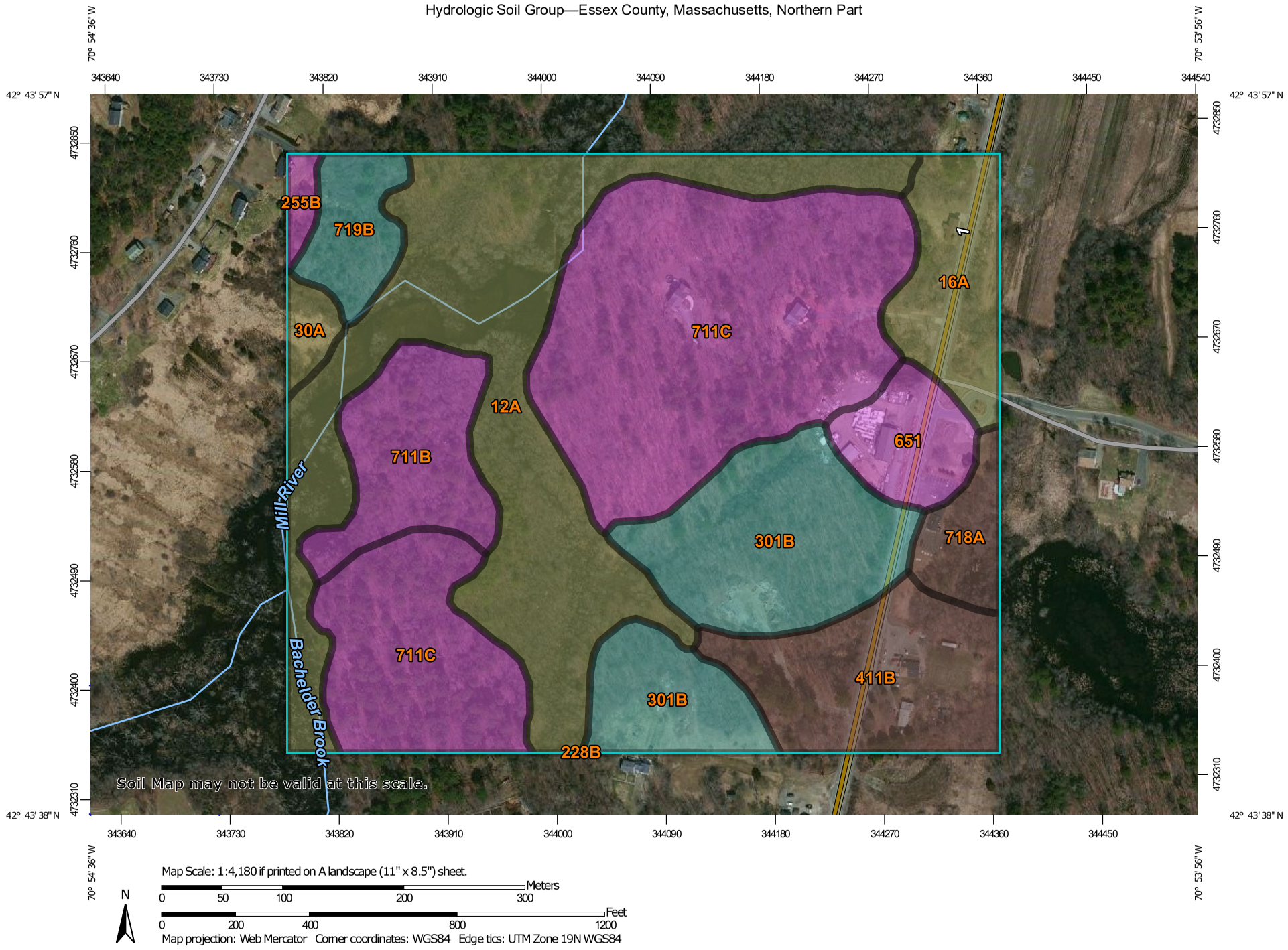
TSS Work Sheet

HydroCAD Print Out

Massachusetts Department of Environmental Protection Stormwater Checklist Summary

Massachusetts Department of Environmental Protection Stormwater Checklist

Figure 1: Hydrologic Soil Group (HSG) Soils Map.



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 1:15,800.

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: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 16, 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: Mar 30, 2011—Apr 8, 2011

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
12A	Maybid silt loam, 0 to 3 percent slopes	C/D	17.8	24.7%
16A	Scantic silt loam, 0 to 3 percent slopes	C/D	3.9	5.4%
30A	Raynham silt loam, 0 to 3 percent slopes	C/D	0.8	1.1%
228B	Buxton silt loam, 3 to 8 percent slopes	D	0.0	0.0%
255B	Windsor loamy sand, 3 to 8 percent slopes	A	0.5	0.7%
301B	Montauk fine sandy loam, 0 to 8 percent slopes, very stony	C	9.9	13.8%
411B	Sutton fine sandy loam, 0 to 8 percent slopes, very stony	B/D	6.2	8.6%
651	Udorthents, smoothed	A	2.5	3.4%
711B	Charlton-Rock outcrop-Hollis complex, 3 to 8 percent slopes	A	4.5	6.2%
711C	Charlton-Rock outcrop-Hollis complex, 8 to 15 percent slopes	A	22.0	30.6%
718A	Saco variant silt loam, 0 to 3 percent slopes	B/D	1.8	2.4%
719B	Suffield silt loam, 3 to 8 percent slopes	C	2.2	3.0%
Totals for Area of Interest			**71.9**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

ASB design group LLC

LOCATION: 510 Newburyport Turnpike - Route 1 Rowley MA. 01969 JOB #: 2020-10

TSS Removal Calculation Worksheet

A BMP	B TSS Removal Rate (%)	C Starting TSS Load *	D Amount Removed (*B* x *C*)	E Remaining Load (*C* - *D*)
Grass Swale	50.0%	**1.00**	0.50	0.50
Catch Basins	25.0%	0.50	0.13	0.38
Constructed Wetlands	80.0%	0.38	0.30	0.08
	0.0%	0.08	0.00	0.08
	0.0%	0.08	0.00	0.08
	Total TSS Removal =		**92.5%**	

Project: Osprey Court Subdivision

Prepared By: ASB design group llc

Date: September 27, 2022

Comments:

* equals remaining load from previous BMP (*E*) that enters this BMP

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	8R	49.50	48.14	160.0	0.0085	0.010	0.0	12.0	0.0
2	11R	48.50	48.14	36.0	0.0100	0.010	0.0	8.0	0.0
3	12R	48.14	48.00	8.0	0.0175	0.010	0.0	12.0	0.0
4	15R	48.50	48.14	63.0	0.0057	0.010	0.0	12.0	0.0
5	CB#1	42.25	41.75	48.0	0.0104	0.013	0.0	12.0	0.0
6	CB#2	42.25	41.75	51.0	0.0098	0.013	0.0	12.0	0.0
7	CB#3	38.00	37.70	24.0	0.0125	0.013	0.0	12.0	0.0
8	CB#4	38.00	37.70	24.0	0.0125	0.013	0.0	12.0	0.0
9	CB#5	39.62	39.40	22.0	0.0100	0.013	0.0	12.0	0.0
10	CB#6	39.00	38.91	9.0	0.0100	0.013	0.0	12.0	0.0
11	CB#7	41.00	40.18	82.0	0.0100	0.013	0.0	12.0	0.0
12	DMH#1	41.75	37.70	218.0	0.0186	0.013	0.0	12.0	0.0
13	DMH#2	37.70	36.20	25.0	0.0600	0.013	0.0	12.0	0.0
14	DMH#3	39.40	37.70	162.0	0.0105	0.013	0.0	12.0	0.0
15	RCP	34.41	34.40	36.0	0.0003	0.011	0.0	36.0	0.0
16	BMP #1A	35.50	35.43	7.0	0.0100	0.013	0.0	4.0	0.0
17	BMP #1B	38.50	38.43	7.0	0.0100	0.013	0.0	4.0	0.0
18	BMP #2	39.00	38.96	4.0	0.0100	0.013	0.0	4.0	0.0
19	BMP#3	48.50	45.99	251.0	0.0100	0.013	0.0	6.0	0.0
20	S1	41.00	40.50	42.0	0.0119	0.022	0.0	18.0	12.0

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 10A: Flow to MCB#8 Runoff Area=4,496 sf 62.86% Impervious Runoff Depth>1.13"
Tc=5.0 min CN=76 Runoff=0.21 cfs 422 cf

Subcatchment E1: Flow to D.P.#1 Runoff Area=43,088 sf 9.13% Impervious Runoff Depth>0.91"
Flow Length=329' Slope=0.0400 '/' Tc=8.2 min CN=72 Runoff=1.46 cfs 3,252 cf

Subcatchment E2: Flow to D.P.#2 Runoff Area=74,980 sf 0.00% Impervious Runoff Depth>0.81"
Flow Length=360' Slope=0.0400 '/' Tc=9.4 min CN=70 Runoff=2.08 cfs 5,032 cf

Subcatchment E3: Flow to D.P.#2 Runoff Area=120,639 sf 0.00% Impervious Runoff Depth>0.01"
Flow Length=436' Slope=0.0900 '/' Tc=15.4 min CN=41 Runoff=0.00 cfs 54 cf

Subcatchment E4: Flow to D.P.#2 Runoff Area=186,826 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=322' Slope=0.0900 '/' Tc=15.1 min CN=33 Runoff=0.00 cfs 0 cf

Subcatchment E5: Flow to D.P.#2 Runoff Area=15,860 sf 0.00% Impervious Runoff Depth>0.81"
Flow Length=120' Slope=0.0400 '/' Tc=5.0 min CN=70 Runoff=0.53 cfs 1,066 cf

Subcatchment E6: Flow to D.P.#3 Runoff Area=9,089 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=30 Runoff=0.00 cfs 0 cf

Subcatchment P1: Flow to D.P.#1 Runoff Area=23,110 sf 18.55% Impervious Runoff Depth>1.13"
Tc=5.0 min CN=76 Runoff=1.10 cfs 2,169 cf

Subcatchment P1-2: Flow to D.P.#3 Runoff Area=1,245 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=30 Runoff=0.00 cfs 0 cf

Subcatchment P10: Flow to BMP #3 Runoff Area=17,020 sf 15.35% Impervious Runoff Depth>0.05"
Tc=5.0 min CN=46 Runoff=0.01 cfs 75 cf

Subcatchment P11: Flow to CB#9 Runoff Area=13,619 sf 37.10% Impervious Runoff Depth>0.43"
Flow Length=200' Slope=0.0300 '/' Tc=8.5 min CN=61 Runoff=0.17 cfs 486 cf

Subcatchment P11A: Flow to CB#7 Runoff Area=22,791 sf 18.68% Impervious Runoff Depth>0.12"
Flow Length=203' Slope=0.0300 '/' Tc=11.4 min CN=50 Runoff=0.03 cfs 229 cf

Subcatchment P12: Flow to CB#5 Runoff Area=9,527 sf 36.76% Impervious Runoff Depth>1.58"
Tc=5.0 min CN=83 Runoff=0.64 cfs 1,253 cf

Subcatchment P13: Flow to CB#4 Runoff Area=5,880 sf 69.56% Impervious Runoff Depth>2.22"
Tc=5.0 min CN=91 Runoff=0.53 cfs 1,090 cf

Subcatchment P14: Flow to MCB#10 Runoff Area=19,912 sf 47.52% Impervious Runoff Depth>0.67"
Tc=5.0 min CN=67 Runoff=0.54 cfs 1,108 cf

Subcatchment P15: Flow to D.P.#2 Runoff Area=11,231 sf 0.00% Impervious Runoff Depth>0.81"
Tc=5.0 min CN=70 Runoff=0.38 cfs 755 cf

Subcatchment P16: Flow to BMP #1A Runoff Area=17,728 sf 14.90% Impervious Runoff Depth>1.25"
Flow Length=252' Slope=0.0500 '/' Tc=5.0 min CN=78 Runoff=0.94 cfs 1,841 cf

Subcatchment P17: Flow to CB#2 Runoff Area=1,817 sf 45.35% Impervious Runoff Depth>1.73"
Tc=5.0 min CN=85 Runoff=0.13 cfs 261 cf

Subcatchment P18: Flow to D.P.#2 Runoff Area=177,665 sf 4.23% Impervious Runoff Depth>0.00"
Flow Length=263' Slope=0.0600 '/' Tc=12.9 min CN=40 Runoff=0.00 cfs 25 cf

Subcatchment P2: Flow to D.P.#1 Runoff Area=8,652 sf 29.53% Impervious Runoff Depth>1.07"
Tc=5.0 min CN=75 Runoff=0.39 cfs 771 cf

Subcatchment P3: Flow to CB#1 Runoff Area=7,782 sf 10.20% Impervious Runoff Depth>0.96"
Tc=5.0 min CN=73 Runoff=0.31 cfs 622 cf

Subcatchment P4: Flow to BMP #1B Runoff Area=21,446 sf 12.32% Impervious Runoff Depth>1.01"
Flow Length=246' Slope=0.0400 '/' Tc=6.2 min CN=74 Runoff=0.89 cfs 1,810 cf

Subcatchment P5: Flow to D.P.#2 Runoff Area=38,136 sf 0.00% Impervious Runoff Depth>0.81"
Flow Length=341' Slope=0.0400 '/' Tc=9.0 min CN=70 Runoff=1.07 cfs 2,560 cf

Subcatchment P6: Flow to CB#3 Runoff Area=2,722 sf 76.56% Impervious Runoff Depth>2.32"
Tc=5.0 min CN=92 Runoff=0.25 cfs 525 cf

Subcatchment P7: Flow to D.P.#2 Runoff Area=17,046 sf 0.00% Impervious Runoff Depth>0.43"
Flow Length=341' Slope=0.0400 '/' Tc=11.3 min CN=61 Runoff=0.19 cfs 607 cf

Subcatchment P8: Flow to BMP #2 Runoff Area=16,325 sf 4.27% Impervious Runoff Depth>0.05"
Flow Length=135' Slope=0.0500 '/' Tc=7.1 min CN=46 Runoff=0.01 cfs 72 cf

Subcatchment P9: Flow to CB#6 Runoff Area=12,332 sf 29.15% Impervious Runoff Depth>0.36"
Tc=5.0 min CN=59 Runoff=0.14 cfs 370 cf

Reach 1R: Grass Swale Avg. Flow Depth=0.01' Max Vel=0.61 fps Inflow=0.03 cfs 229 cf
n=0.030 L=170.0' S=0.0600 '/' Capacity=18.74 cfs Outflow=0.03 cfs 226 cf

Reach 2R: Grass Swale Avg. Flow Depth=0.03' Max Vel=0.90 fps Inflow=0.14 cfs 370 cf
n=0.030 L=130.0' S=0.0327 '/' Capacity=13.83 cfs Outflow=0.12 cfs 368 cf

Reach 3R: Grass Swale Avg. Flow Depth=0.11' Max Vel=1.25 fps Inflow=0.64 cfs 1,253 cf
n=0.030 L=66.0' S=0.0136 '/' Capacity=8.93 cfs Outflow=0.61 cfs 1,251 cf

Reach 4R: Grass Swale Avg. Flow Depth=0.06' Max Vel=1.29 fps Inflow=0.39 cfs 771 cf
n=0.030 L=168.0' S=0.0336 '/' Capacity=63.13 cfs Outflow=0.36 cfs 768 cf

Reach 7R: Grass Swale Avg. Flow Depth=0.11' Max Vel=1.73 fps Inflow=1.10 cfs 2,169 cf
n=0.030 L=204.0' S=0.0247 '/' Capacity=54.16 cfs Outflow=1.00 cfs 2,161 cf

Reach 8R: CB #10 Avg. Flow Depth=0.24' Max Vel=3.71 fps Inflow=0.54 cfs 1,108 cf
12.0" Round Pipe n=0.010 L=160.0' S=0.0085 '/' Capacity=4.27 cfs Outflow=0.51 cfs 1,106 cf

Reach 9R: Grass Swale Avg. Flow Depth=0.09' Max Vel=2.26 fps Inflow=0.89 cfs 1,810 cf
n=0.030 L=132.0' S=0.0583 '/' Capacity=18.47 cfs Outflow=0.83 cfs 1,806 cf

Reach 11R: MCB#8 Avg. Flow Depth=0.16' Max Vel=3.06 fps Inflow=0.20 cfs 421 cf
8.0" Round Pipe n=0.010 L=36.0' S=0.0100 '/' Capacity=1.57 cfs Outflow=0.20 cfs 421 cf

Reach 12R: DMH#4 Avg. Flow Depth=0.24' Max Vel=5.33 fps Inflow=0.78 cfs 2,011 cf
12.0" Round Pipe n=0.010 L=8.0' S=0.0175 '/' Capacity=6.13 cfs Outflow=0.78 cfs 2,011 cf

Reach 13R: Grass Swale Avg. Flow Depth=0.04' Max Vel=1.25 fps Inflow=0.21 cfs 422 cf
n=0.030 L=110.0' S=0.0482 '/' Capacity=16.79 cfs Outflow=0.20 cfs 421 cf

Reach 14R: Grass Swale Avg. Flow Depth=0.04' Max Vel=1.16 fps Inflow=0.17 cfs 486 cf
n=0.030 L=106.0' S=0.0500 '/' Capacity=17.10 cfs Outflow=0.16 cfs 484 cf

Reach 15R: MCB#9 Avg. Flow Depth=0.15' Max Vel=2.26 fps Inflow=0.16 cfs 484 cf
12.0" Round Pipe n=0.010 L=63.0' S=0.0057 '/' Capacity=3.50 cfs Outflow=0.16 cfs 484 cf

Reach 16R: Grass Swale Avg. Flow Depth=0.05' Max Vel=1.62 fps Inflow=0.38 cfs 755 cf
n=0.030 L=154.0' S=0.0565 '/' Capacity=18.18 cfs Outflow=0.34 cfs 752 cf

Reach CB#1: CB #1 Avg. Flow Depth=0.20' Max Vel=2.82 fps Inflow=0.31 cfs 622 cf
12.0" Round Pipe n=0.013 L=48.0' S=0.0104 '/' Capacity=3.64 cfs Outflow=0.31 cfs 622 cf

Reach CB#2: CB#2 Avg. Flow Depth=0.13' Max Vel=2.12 fps Inflow=0.13 cfs 261 cf
12.0" Round Pipe n=0.013 L=51.0' S=0.0098 '/' Capacity=3.53 cfs Outflow=0.13 cfs 261 cf

Reach CB#3: CB #3 Avg. Flow Depth=0.17' Max Vel=2.81 fps Inflow=0.25 cfs 525 cf
12.0" Round Pipe n=0.013 L=24.0' S=0.0125 '/' Capacity=3.98 cfs Outflow=0.25 cfs 525 cf

Reach CB#4: CB #4 Avg. Flow Depth=0.24' Max Vel=3.49 fps Inflow=0.53 cfs 1,090 cf
12.0" Round Pipe n=0.013 L=24.0' S=0.0125 '/' Capacity=3.98 cfs Outflow=0.52 cfs 1,089 cf

Reach CB#5: CB #5 Avg. Flow Depth=0.28' Max Vel=3.38 fps Inflow=0.61 cfs 1,251 cf
12.0" Round Pipe n=0.013 L=22.0' S=0.0100 '/' Capacity=3.56 cfs Outflow=0.60 cfs 1,251 cf

Reach CB#6: CB #6 Avg. Flow Depth=0.13' Max Vel=2.09 fps Inflow=0.12 cfs 368 cf
12.0" Round Pipe n=0.013 L=9.0' S=0.0100 '/' Capacity=3.56 cfs Outflow=0.12 cfs 368 cf

Reach CB#7: CB #7 Avg. Flow Depth=0.06' Max Vel=1.35 fps Inflow=0.03 cfs 226 cf
12.0" Round Pipe n=0.013 L=82.0' S=0.0100 '/' Capacity=3.56 cfs Outflow=0.03 cfs 226 cf

Reach DMH#1: DMH #1 Avg. Flow Depth=0.20' Max Vel=3.83 fps Inflow=0.44 cfs 883 cf
12.0" Round Pipe n=0.013 L=218.0' S=0.0186 '/' Capacity=4.86 cfs Outflow=0.41 cfs 882 cf

Reach DMH#2: DMH #2 Avg. Flow Depth=0.30' Max Vel=8.60 fps Inflow=1.70 cfs 3,971 cf
12.0" Round Pipe n=0.013 L=25.0' S=0.0600 '/' Capacity=8.73 cfs Outflow=1.70 cfs 3,971 cf

Reach DMH#3: DMH #3 Avg. Flow Depth=0.27' Max Vel=3.42 fps Inflow=0.60 cfs 1,477 cf
12.0" Round Pipe n=0.013 L=162.0' S=0.0105 '/' Capacity=3.65 cfs Outflow=0.57 cfs 1,475 cf

Reach RCP: 36" RCP Culvert Avg. Flow Depth=0.62' Max Vel=1.17 fps Inflow=1.24 cfs 3,289 cf
36.0" Round Pipe n=0.011 L=36.0' S=0.0003 '/' Capacity=13.14 cfs Outflow=1.23 cfs 3,285 cf

Pond BMP #1A: BMP #1A Peak Elev=35.89' Storage=3,777 cf Inflow=2.61 cfs 5,812 cf
Primary=0.18 cfs 2,953 cf Secondary=0.00 cfs 0 cf Outflow=0.18 cfs 2,953 cf

Pond BMP #1B: BMP #1B Peak Elev=38.56' Storage=1,739 cf Inflow=0.83 cfs 1,806 cf
Primary=0.01 cfs 66 cf Secondary=0.00 cfs 0 cf Outflow=0.01 cfs 66 cf

Pond BMP #2: BMP #2 Peak Elev=39.05' Storage=385 cf Inflow=0.12 cfs 440 cf
Primary=0.01 cfs 55 cf Secondary=0.00 cfs 0 cf Outflow=0.01 cfs 55 cf

Pond BMP#3: BMP #3 Peak Elev=48.58' Storage=1,920 cf Inflow=0.78 cfs 2,086 cf
Primary=0.02 cfs 166 cf Secondary=0.00 cfs 0 cf Outflow=0.02 cfs 166 cf

Pond S1: Sedimentation Basin #1 Peak Elev=42.26' Storage=204 cf Inflow=1.00 cfs 2,161 cf
18.0" Round Culvert w/ 12.0" inside fill x 2.00 n=0.022 L=42.0' S=0.0119 '/' Outflow=0.99 cfs 2,025 cf

Link D.P. #1: Flow To MASSDOT Drainage Swale Inflow=1.35 cfs 2,793 cf
Primary=1.35 cfs 2,793 cf

Link D.P. #2: Flow To Existing Wetlands Inflow=1.55 cfs 7,180 cf
Primary=1.55 cfs 7,180 cf

Link D.P.#1: Flow To MASSDOT Drainage Swale Inflow=1.46 cfs 3,252 cf
Primary=1.46 cfs 3,252 cf

Link D.P.#2: Flow To Existing Wetlands Inflow=2.53 cfs 6,151 cf
Primary=2.53 cfs 6,151 cf

Link D.P.#3: Flow To Abutting Lot Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 10A: Flow to MCB#8 Runoff Area=4,496 sf 62.86% Impervious Runoff Depth>2.54"
Tc=5.0 min CN=76 Runoff=0.48 cfs 950 cf

Subcatchment E1: Flow to D.P.#1 Runoff Area=43,088 sf 9.13% Impervious Runoff Depth>2.20"
Flow Length=329' Slope=0.0400 '/' Tc=8.2 min CN=72 Runoff=3.63 cfs 7,887 cf

Subcatchment E2: Flow to D.P.#2 Runoff Area=74,980 sf 0.00% Impervious Runoff Depth>2.03"
Flow Length=360' Slope=0.0400 '/' Tc=9.4 min CN=70 Runoff=5.51 cfs 12,711 cf

Subcatchment E3: Flow to D.P.#2 Runoff Area=120,639 sf 0.00% Impervious Runoff Depth>0.27"
Flow Length=436' Slope=0.0900 '/' Tc=15.4 min CN=41 Runoff=0.38 cfs 2,723 cf

Subcatchment E4: Flow to D.P.#2 Runoff Area=186,826 sf 0.00% Impervious Runoff Depth>0.04"
Flow Length=322' Slope=0.0900 '/' Tc=15.1 min CN=33 Runoff=0.03 cfs 637 cf

Subcatchment E5: Flow to D.P.#2 Runoff Area=15,860 sf 0.00% Impervious Runoff Depth>2.04"
Flow Length=120' Slope=0.0400 '/' Tc=5.0 min CN=70 Runoff=1.37 cfs 2,692 cf

Subcatchment E6: Flow to D.P.#3 Runoff Area=9,089 sf 0.00% Impervious Runoff Depth>0.00"
Tc=5.0 min CN=30 Runoff=0.00 cfs 4 cf

Subcatchment P1: Flow to D.P.#1 Runoff Area=23,110 sf 18.55% Impervious Runoff Depth>2.54"
Tc=5.0 min CN=76 Runoff=2.47 cfs 4,884 cf

Subcatchment P1-2: Flow to D.P.#3 Runoff Area=1,245 sf 0.00% Impervious Runoff Depth>0.00"
Tc=5.0 min CN=30 Runoff=0.00 cfs 0 cf

Subcatchment P10: Flow to BMP #3 Runoff Area=17,020 sf 15.35% Impervious Runoff Depth>0.49"
Tc=5.0 min CN=46 Runoff=0.24 cfs 694 cf

Subcatchment P11: Flow to CB#9 Runoff Area=13,619 sf 37.10% Impervious Runoff Depth>1.37"
Flow Length=200' Slope=0.0300 '/' Tc=8.5 min CN=61 Runoff=0.68 cfs 1,552 cf

Subcatchment P11A: Flow to CB#7 Runoff Area=22,791 sf 18.68% Impervious Runoff Depth>0.69"
Flow Length=203' Slope=0.0300 '/' Tc=11.4 min CN=50 Runoff=0.40 cfs 1,311 cf

Subcatchment P12: Flow to CB#5 Runoff Area=9,527 sf 36.76% Impervious Runoff Depth>3.17"
Tc=5.0 min CN=83 Runoff=1.24 cfs 2,520 cf

Subcatchment P13: Flow to CB#4 Runoff Area=5,880 sf 69.56% Impervious Runoff Depth>3.98"
Tc=5.0 min CN=91 Runoff=0.91 cfs 1,951 cf

Subcatchment P14: Flow to MCB#10 Runoff Area=19,912 sf 47.52% Impervious Runoff Depth>1.80"
Tc=5.0 min CN=67 Runoff=1.52 cfs 2,993 cf

Subcatchment P15: Flow to D.P.#2 Runoff Area=11,231 sf 0.00% Impervious Runoff Depth>2.04"
Tc=5.0 min CN=70 Runoff=0.97 cfs 1,906 cf

Subcatchment P16: Flow to BMP #1A Runoff Area=17,728 sf 14.90% Impervious Runoff Depth>2.71"
Flow Length=252' Slope=0.0500 '/' Tc=5.0 min CN=78 Runoff=2.02 cfs 4,007 cf

Subcatchment P17: Flow to CB#2 Runoff Area=1,817 sf 45.35% Impervious Runoff Depth>3.37"
Tc=5.0 min CN=85 Runoff=0.25 cfs 510 cf

Subcatchment P18: Flow to D.P.#2 Runoff Area=177,665 sf 4.23% Impervious Runoff Depth>0.23"
Flow Length=263' Slope=0.0600 '/' Tc=12.9 min CN=40 Runoff=0.46 cfs 3,465 cf

Subcatchment P2: Flow to D.P.#1 Runoff Area=8,652 sf 29.53% Impervious Runoff Depth>2.45"
Tc=5.0 min CN=75 Runoff=0.90 cfs 1,766 cf

Subcatchment P3: Flow to CB#1 Runoff Area=7,782 sf 10.20% Impervious Runoff Depth>2.28"
Tc=5.0 min CN=73 Runoff=0.75 cfs 1,479 cf

Subcatchment P4: Flow to BMP #1B Runoff Area=21,446 sf 12.32% Impervious Runoff Depth>2.36"
Flow Length=246' Slope=0.0400 '/' Tc=6.2 min CN=74 Runoff=2.08 cfs 4,225 cf

Subcatchment P5: Flow to D.P.#2 Runoff Area=38,136 sf 0.00% Impervious Runoff Depth>2.03"
Flow Length=341' Slope=0.0400 '/' Tc=9.0 min CN=70 Runoff=2.87 cfs 6,466 cf

Subcatchment P6: Flow to CB#3 Runoff Area=2,722 sf 76.56% Impervious Runoff Depth>4.09"
Tc=5.0 min CN=92 Runoff=0.43 cfs 927 cf

Subcatchment P7: Flow to D.P.#2 Runoff Area=17,046 sf 0.00% Impervious Runoff Depth>1.37"
Flow Length=341' Slope=0.0400 '/' Tc=11.3 min CN=61 Runoff=0.76 cfs 1,941 cf

Subcatchment P8: Flow to BMP #2 Runoff Area=16,325 sf 4.27% Impervious Runoff Depth>0.49"
Flow Length=135' Slope=0.0500 '/' Tc=7.1 min CN=46 Runoff=0.19 cfs 664 cf

Subcatchment P9: Flow to CB#6 Runoff Area=12,332 sf 29.15% Impervious Runoff Depth>1.23"
Tc=5.0 min CN=59 Runoff=0.63 cfs 1,269 cf

Reach 1R: Grass Swale Avg. Flow Depth=0.06' Max Vel=1.71 fps Inflow=0.40 cfs 1,311 cf
n=0.030 L=170.0' S=0.0600 '/' Capacity=18.74 cfs Outflow=0.39 cfs 1,306 cf

Reach 2R: Grass Swale Avg. Flow Depth=0.09' Max Vel=1.66 fps Inflow=0.63 cfs 1,269 cf
n=0.030 L=130.0' S=0.0327 '/' Capacity=13.83 cfs Outflow=0.58 cfs 1,265 cf

Reach 3R: Grass Swale Avg. Flow Depth=0.17' Max Vel=1.57 fps Inflow=1.24 cfs 2,520 cf
n=0.030 L=66.0' S=0.0136 '/' Capacity=8.93 cfs Outflow=1.20 cfs 2,517 cf

Reach 4R: Grass Swale Avg. Flow Depth=0.09' Max Vel=1.77 fps Inflow=0.90 cfs 1,766 cf
n=0.030 L=168.0' S=0.0336 '/' Capacity=63.13 cfs Outflow=0.82 cfs 1,762 cf

Reach 7R: Grass Swale Avg. Flow Depth=0.18' Max Vel=2.30 fps Inflow=2.47 cfs 4,884 cf
n=0.030 L=204.0' S=0.0247 '/' Capacity=54.16 cfs Outflow=2.28 cfs 4,871 cf

Reach 8R: CB #10 Avg. Flow Depth=0.41' Max Vel=4.96 fps Inflow=1.52 cfs 2,993 cf
12.0" Round Pipe n=0.010 L=160.0' S=0.0085 '/' Capacity=4.27 cfs Outflow=1.49 cfs 2,990 cf

Reach 9R: Grass Swale Avg. Flow Depth=0.15' Max Vel=3.07 fps Inflow=2.08 cfs 4,225 cf
n=0.030 L=132.0' S=0.0583 '/' Capacity=18.47 cfs Outflow=2.00 cfs 4,219 cf

Reach 11R: MCB#8 Avg. Flow Depth=0.25' Max Vel=3.89 fps Inflow=0.45 cfs 948 cf
8.0" Round Pipe n=0.010 L=36.0' S=0.0100 '/' Capacity=1.57 cfs Outflow=0.45 cfs 948 cf

Reach 12R: DMH#4 Avg. Flow Depth=0.44' Max Vel=7.37 fps Inflow=2.46 cfs 5,487 cf
12.0" Round Pipe n=0.010 L=8.0' S=0.0175 '/' Capacity=6.13 cfs Outflow=2.46 cfs 5,487 cf

Reach 13R: Grass Swale Avg. Flow Depth=0.07' Max Vel=1.69 fps Inflow=0.48 cfs 950 cf
n=0.030 L=110.0' S=0.0482 '/' Capacity=16.79 cfs Outflow=0.45 cfs 948 cf

Reach 14R: Grass Swale Avg. Flow Depth=0.08' Max Vel=1.94 fps Inflow=0.68 cfs 1,552 cf
n=0.030 L=106.0' S=0.0500 '/' Capacity=17.10 cfs Outflow=0.65 cfs 1,549 cf

Reach 15R: MCB#9 Avg. Flow Depth=0.29' Max Vel=3.41 fps Inflow=0.65 cfs 1,549 cf
12.0" Round Pipe n=0.010 L=63.0' S=0.0057 '/' Capacity=3.50 cfs Outflow=0.64 cfs 1,548 cf

Reach 16R: Grass Swale Avg. Flow Depth=0.10' Max Vel=2.31 fps Inflow=0.97 cfs 1,906 cf
n=0.030 L=154.0' S=0.0565 '/' Capacity=18.18 cfs Outflow=0.92 cfs 1,902 cf

Reach CB#1: CB #1 Avg. Flow Depth=0.31' Max Vel=3.61 fps Inflow=0.75 cfs 1,479 cf
12.0" Round Pipe n=0.013 L=48.0' S=0.0104 '/' Capacity=3.64 cfs Outflow=0.75 cfs 1,479 cf

Reach CB#2: CB#2 Avg. Flow Depth=0.18' Max Vel=2.56 fps Inflow=0.25 cfs 510 cf
12.0" Round Pipe n=0.013 L=51.0' S=0.0098 '/' Capacity=3.53 cfs Outflow=0.24 cfs 510 cf

Reach CB#3: CB #3 Avg. Flow Depth=0.22' Max Vel=3.29 fps Inflow=0.43 cfs 927 cf
12.0" Round Pipe n=0.013 L=24.0' S=0.0125 '/' Capacity=3.98 cfs Outflow=0.42 cfs 927 cf

Reach CB#4: CB #4 Avg. Flow Depth=0.32' Max Vel=4.08 fps Inflow=0.91 cfs 1,951 cf
12.0" Round Pipe n=0.013 L=24.0' S=0.0125 '/' Capacity=3.98 cfs Outflow=0.90 cfs 1,951 cf

Reach CB#5: CB #5 Avg. Flow Depth=0.40' Max Vel=4.08 fps Inflow=1.20 cfs 2,517 cf
12.0" Round Pipe n=0.013 L=22.0' S=0.0100 '/' Capacity=3.56 cfs Outflow=1.19 cfs 2,517 cf

Reach CB#6: CB #6 Avg. Flow Depth=0.27' Max Vel=3.32 fps Inflow=0.58 cfs 1,265 cf
12.0" Round Pipe n=0.013 L=9.0' S=0.0100 '/' Capacity=3.56 cfs Outflow=0.58 cfs 1,265 cf

Reach CB#7: CB #7 Avg. Flow Depth=0.22' Max Vel=2.98 fps Inflow=0.39 cfs 1,306 cf
12.0" Round Pipe n=0.013 L=82.0' S=0.0100 '/' Capacity=3.56 cfs Outflow=0.39 cfs 1,305 cf

Reach DMH#1: DMH #1 Avg. Flow Depth=0.31' Max Vel=4.84 fps Inflow=0.99 cfs 1,989 cf
12.0" Round Pipe n=0.013 L=218.0' S=0.0186 '/' Capacity=4.86 cfs Outflow=0.95 cfs 1,987 cf

Reach DMH#2: DMH #2 Avg. Flow Depth=0.43' Max Vel=10.41 fps Inflow=3.39 cfs 8,683 cf
12.0" Round Pipe n=0.013 L=25.0' S=0.0600 '/' Capacity=8.73 cfs Outflow=3.39 cfs 8,683 cf

Reach DMH#3: DMH #3 Avg. Flow Depth=0.41' Max Vel=4.22 fps Inflow=1.27 cfs 3,822 cf
12.0" Round Pipe n=0.013 L=162.0' S=0.0105 '/' Capacity=3.65 cfs Outflow=1.23 cfs 3,818 cf

Reach RCP: 36" RCP Culvert Avg. Flow Depth=1.07' Max Vel=1.57 fps Inflow=3.58 cfs 12,255 cf
36.0" Round Pipe n=0.011 L=36.0' S=0.0003 '/' Capacity=13.14 cfs Outflow=3.51 cfs 12,247 cf

Pond BMP #1A: BMP #1A Peak Elev=36.74' Storage=7,956 cf Inflow=5.35 cfs 12,690 cf
Primary=0.44 cfs 9,163 cf Secondary=0.00 cfs 0 cf Outflow=0.44 cfs 9,163 cf

Pond BMP #1B: BMP #1B Peak Elev=38.91' Storage=2,601 cf Inflow=2.00 cfs 4,219 cf
Primary=0.18 cfs 2,352 cf Secondary=0.00 cfs 0 cf Outflow=0.18 cfs 2,352 cf

Pond BMP #2: BMP #2 Peak Elev=39.36' Storage=755 cf Inflow=0.77 cfs 1,929 cf
Primary=0.16 cfs 1,497 cf Secondary=0.00 cfs 0 cf Outflow=0.16 cfs 1,497 cf

Pond BMP#3: BMP #3 Peak Elev=48.99' Storage=2,999 cf Inflow=2.70 cfs 6,180 cf
Primary=0.46 cfs 4,147 cf Secondary=0.00 cfs 0 cf Outflow=0.46 cfs 4,147 cf

Pond S1: Sedimentation Basin #1 Peak Elev=42.52' Storage=286 cf Inflow=2.28 cfs 4,871 cf
18.0" Round Culvert w/ 12.0" inside fill x 2.00 n=0.022 L=42.0' S=0.0119 '/' Outflow=2.20 cfs 4,732 cf

Link D.P. #1: Flow To MASSDOT Drainage Swale Inflow=3.00 cfs 6,494 cf
Primary=3.00 cfs 6,494 cf

Link D.P. #2: Flow To Existing Wetlands Inflow=4.70 cfs 30,924 cf
Primary=4.70 cfs 30,924 cf

Link D.P.#1: Flow To MASSDOT Drainage Swale Inflow=3.63 cfs 7,887 cf
Primary=3.63 cfs 7,887 cf

Link D.P.#2: Flow To Existing Wetlands Inflow=6.72 cfs 18,762 cf
Primary=6.72 cfs 18,762 cf

Link D.P.#3: Flow To Abutting Lot Inflow=0.00 cfs 4 cf
Primary=0.00 cfs 4 cf

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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 10A: Flow to MCB#8 Runoff Area=4,496 sf 62.86% Impervious Runoff Depth>3.50"
Tc=5.0 min CN=76 Runoff=0.66 cfs 1,312 cf

Subcatchment E1: Flow to D.P.#1 Runoff Area=43,088 sf 9.13% Impervious Runoff Depth>3.11"
Flow Length=329' Slope=0.0400 '/' Tc=8.2 min CN=72 Runoff=5.11 cfs 11,157 cf

Subcatchment E2: Flow to D.P.#2 Runoff Area=74,980 sf 0.00% Impervious Runoff Depth>2.91"
Flow Length=360' Slope=0.0400 '/' Tc=9.4 min CN=70 Runoff=7.89 cfs 18,213 cf

Subcatchment E3: Flow to D.P.#2 Runoff Area=120,639 sf 0.00% Impervious Runoff Depth>0.60"
Flow Length=436' Slope=0.0900 '/' Tc=15.4 min CN=41 Runoff=1.31 cfs 6,032 cf

Subcatchment E4: Flow to D.P.#2 Runoff Area=186,826 sf 0.00% Impervious Runoff Depth>0.19"
Flow Length=322' Slope=0.0900 '/' Tc=15.1 min CN=33 Runoff=0.31 cfs 2,986 cf

Subcatchment E5: Flow to D.P.#2 Runoff Area=15,860 sf 0.00% Impervious Runoff Depth>2.92"
Flow Length=120' Slope=0.0400 '/' Tc=5.0 min CN=70 Runoff=1.96 cfs 3,857 cf

Subcatchment E6: Flow to D.P.#3 Runoff Area=9,089 sf 0.00% Impervious Runoff Depth>0.09"
Tc=5.0 min CN=30 Runoff=0.00 cfs 66 cf

Subcatchment P1: Flow to D.P.#1 Runoff Area=23,110 sf 18.55% Impervious Runoff Depth>3.50"
Tc=5.0 min CN=76 Runoff=3.38 cfs 6,746 cf

Subcatchment P1-2: Flow to D.P.#3 Runoff Area=1,245 sf 0.00% Impervious Runoff Depth>0.09"
Tc=5.0 min CN=30 Runoff=0.00 cfs 9 cf

Subcatchment P10: Flow to BMP #3 Runoff Area=17,020 sf 15.35% Impervious Runoff Depth>0.93"
Tc=5.0 min CN=46 Runoff=0.58 cfs 1,314 cf

Subcatchment P11: Flow to CB#9 Runoff Area=13,619 sf 37.10% Impervious Runoff Depth>2.10"
Flow Length=200' Slope=0.0300 '/' Tc=8.5 min CN=61 Runoff=1.07 cfs 2,382 cf

Subcatchment P11A: Flow to CB#7 Runoff Area=22,791 sf 18.68% Impervious Runoff Depth>1.21"
Flow Length=203' Slope=0.0300 '/' Tc=11.4 min CN=50 Runoff=0.83 cfs 2,298 cf

Subcatchment P12: Flow to CB#5 Runoff Area=9,527 sf 36.76% Impervious Runoff Depth>4.22"
Tc=5.0 min CN=83 Runoff=1.63 cfs 3,353 cf

Subcatchment P13: Flow to CB#4 Runoff Area=5,880 sf 69.56% Impervious Runoff Depth>5.09"
Tc=5.0 min CN=91 Runoff=1.14 cfs 2,495 cf

Subcatchment P14: Flow to MCB#10 Runoff Area=19,912 sf 47.52% Impervious Runoff Depth>2.64"
Tc=5.0 min CN=67 Runoff=2.23 cfs 4,377 cf

Subcatchment P15: Flow to D.P.#2 Runoff Area=11,231 sf 0.00% Impervious Runoff Depth>2.92"
Tc=5.0 min CN=70 Runoff=1.39 cfs 2,731 cf

Subcatchment P16: Flow to BMP #1A Runoff Area=17,728 sf 14.90% Impervious Runoff Depth>3.70"
Flow Length=252' Slope=0.0500 '/' Tc=5.0 min CN=78 Runoff=2.72 cfs 5,473 cf

Subcatchment P17: Flow to CB#2 Runoff Area=1,817 sf 45.35% Impervious Runoff Depth>4.44"
Tc=5.0 min CN=85 Runoff=0.32 cfs 672 cf

Subcatchment P18: Flow to D.P.#2 Runoff Area=177,665 sf 4.23% Impervious Runoff Depth>0.54"
Flow Length=263' Slope=0.0600 '/' Tc=12.9 min CN=40 Runoff=1.72 cfs 8,021 cf

Subcatchment P2: Flow to D.P.#1 Runoff Area=8,652 sf 29.53% Impervious Runoff Depth>3.40"
Tc=5.0 min CN=75 Runoff=1.23 cfs 2,454 cf

Subcatchment P3: Flow to CB#1 Runoff Area=7,782 sf 10.20% Impervious Runoff Depth>3.21"
Tc=5.0 min CN=73 Runoff=1.05 cfs 2,080 cf

Subcatchment P4: Flow to BMP #1B Runoff Area=21,446 sf 12.32% Impervious Runoff Depth>3.30"
Flow Length=246' Slope=0.0400 '/' Tc=6.2 min CN=74 Runoff=2.88 cfs 5,904 cf

Subcatchment P5: Flow to D.P.#2 Runoff Area=38,136 sf 0.00% Impervious Runoff Depth>2.92"
Flow Length=341' Slope=0.0400 '/' Tc=9.0 min CN=70 Runoff=4.11 cfs 9,265 cf

Subcatchment P6: Flow to CB#3 Runoff Area=2,722 sf 76.56% Impervious Runoff Depth>5.20"
Tc=5.0 min CN=92 Runoff=0.53 cfs 1,180 cf

Subcatchment P7: Flow to D.P.#2 Runoff Area=17,046 sf 0.00% Impervious Runoff Depth>2.10"
Flow Length=341' Slope=0.0400 '/' Tc=11.3 min CN=61 Runoff=1.20 cfs 2,979 cf

Subcatchment P8: Flow to BMP #2 Runoff Area=16,325 sf 4.27% Impervious Runoff Depth>0.93"
Flow Length=135' Slope=0.0500 '/' Tc=7.1 min CN=46 Runoff=0.50 cfs 1,260 cf

Subcatchment P9: Flow to CB#6 Runoff Area=12,332 sf 29.15% Impervious Runoff Depth>1.93"
Tc=5.0 min CN=59 Runoff=1.00 cfs 1,983 cf

Reach 1R: Grass Swale Avg. Flow Depth=0.08' Max Vel=2.21 fps Inflow=0.83 cfs 2,298 cf
n=0.030 L=170.0' S=0.0600 '/' Capacity=18.74 cfs Outflow=0.80 cfs 2,291 cf

Reach 2R: Grass Swale Avg. Flow Depth=0.11' Max Vel=1.96 fps Inflow=1.00 cfs 1,983 cf
n=0.030 L=130.0' S=0.0327 '/' Capacity=13.83 cfs Outflow=0.94 cfs 1,979 cf

Reach 3R: Grass Swale Avg. Flow Depth=0.19' Max Vel=1.72 fps Inflow=1.63 cfs 3,353 cf
n=0.030 L=66.0' S=0.0136 '/' Capacity=8.93 cfs Outflow=1.57 cfs 3,350 cf

Reach 4R: Grass Swale Avg. Flow Depth=0.11' Max Vel=1.98 fps Inflow=1.23 cfs 2,454 cf
n=0.030 L=168.0' S=0.0336 '/' Capacity=63.13 cfs Outflow=1.14 cfs 2,449 cf

Reach 7R: Grass Swale Avg. Flow Depth=0.22' Max Vel=2.56 fps Inflow=3.38 cfs 6,746 cf
n=0.030 L=204.0' S=0.0247 '/' Capacity=54.16 cfs Outflow=3.14 cfs 6,731 cf

Reach 8R: CB #10 Avg. Flow Depth=0.51' Max Vel=5.46 fps Inflow=2.23 cfs 4,377 cf
12.0" Round Pipe n=0.010 L=160.0' S=0.0085 '/' Capacity=4.27 cfs Outflow=2.18 cfs 4,374 cf

Reach 9R: Grass Swale Avg. Flow Depth=0.18' Max Vel=3.43 fps Inflow=2.88 cfs 5,904 cf
n=0.030 L=132.0' S=0.0583 '/' Capacity=18.47 cfs Outflow=2.78 cfs 5,897 cf

Reach 11R: MCB#8 Avg. Flow Depth=0.29' Max Vel=4.24 fps Inflow=0.63 cfs 1,310 cf
8.0" Round Pipe n=0.010 L=36.0' S=0.0100 '/' Capacity=1.57 cfs Outflow=0.62 cfs 1,310 cf

Reach 12R: DMH#4 Avg. Flow Depth=0.56' Max Vel=8.15 fps Inflow=3.67 cfs 8,061 cf
12.0" Round Pipe n=0.010 L=8.0' S=0.0175 '/' Capacity=6.13 cfs Outflow=3.67 cfs 8,061 cf

Reach 13R: Grass Swale Avg. Flow Depth=0.08' Max Vel=1.89 fps Inflow=0.66 cfs 1,312 cf
n=0.030 L=110.0' S=0.0482 '/' Capacity=16.79 cfs Outflow=0.63 cfs 1,310 cf

Reach 14R: Grass Swale Avg. Flow Depth=0.10' Max Vel=2.27 fps Inflow=1.07 cfs 2,382 cf
n=0.030 L=106.0' S=0.0500 '/' Capacity=17.10 cfs Outflow=1.02 cfs 2,378 cf

Reach 15R: MCB#9 Avg. Flow Depth=0.37' Max Vel=3.87 fps Inflow=1.02 cfs 2,378 cf
12.0" Round Pipe n=0.010 L=63.0' S=0.0057 '/' Capacity=3.50 cfs Outflow=1.01 cfs 2,377 cf

Reach 16R: Grass Swale Avg. Flow Depth=0.12' Max Vel=2.62 fps Inflow=1.39 cfs 2,731 cf
n=0.030 L=154.0' S=0.0565 '/' Capacity=18.18 cfs Outflow=1.32 cfs 2,726 cf

Reach CB#1: CB #1 Avg. Flow Depth=0.37' Max Vel=3.96 fps Inflow=1.05 cfs 2,080 cf
12.0" Round Pipe n=0.013 L=48.0' S=0.0104 '/' Capacity=3.64 cfs Outflow=1.04 cfs 2,079 cf

Reach CB#2: CB#2 Avg. Flow Depth=0.20' Max Vel=2.76 fps Inflow=0.32 cfs 672 cf
12.0" Round Pipe n=0.013 L=51.0' S=0.0098 '/' Capacity=3.53 cfs Outflow=0.32 cfs 672 cf

Reach CB#3: CB #3 Avg. Flow Depth=0.25' Max Vel=3.51 fps Inflow=0.53 cfs 1,180 cf
12.0" Round Pipe n=0.013 L=24.0' S=0.0125 '/' Capacity=3.98 cfs Outflow=0.53 cfs 1,180 cf

Reach CB#4: CB #4 Avg. Flow Depth=0.37' Max Vel=4.35 fps Inflow=1.14 cfs 2,495 cf
12.0" Round Pipe n=0.013 L=24.0' S=0.0125 '/' Capacity=3.98 cfs Outflow=1.13 cfs 2,495 cf

Reach CB#5: CB #5 Avg. Flow Depth=0.47' Max Vel=4.38 fps Inflow=1.57 cfs 3,350 cf
12.0" Round Pipe n=0.013 L=22.0' S=0.0100 '/' Capacity=3.56 cfs Outflow=1.57 cfs 3,349 cf

Reach CB#6: CB #6 Avg. Flow Depth=0.35' Max Vel=3.83 fps Inflow=0.94 cfs 1,979 cf
12.0" Round Pipe n=0.013 L=9.0' S=0.0100 '/' Capacity=3.56 cfs Outflow=0.94 cfs 1,978 cf

Reach CB#7: CB #7 Avg. Flow Depth=0.32' Max Vel=3.66 fps Inflow=0.80 cfs 2,291 cf
12.0" Round Pipe n=0.013 L=82.0' S=0.0100 '/' Capacity=3.56 cfs Outflow=0.79 cfs 2,290 cf

Reach DMH#1: DMH #1 Avg. Flow Depth=0.36' Max Vel=5.28 fps Inflow=1.35 cfs 2,751 cf
12.0" Round Pipe n=0.013 L=218.0' S=0.0186 '/' Capacity=4.86 cfs Outflow=1.31 cfs 2,748 cf

Reach DMH#2: DMH #2 Avg. Flow Depth=0.52' Max Vel=11.31 fps Inflow=4.69 cfs 12,057 cf
12.0" Round Pipe n=0.013 L=25.0' S=0.0600 '/' Capacity=8.73 cfs Outflow=4.69 cfs 12,056 cf

Reach DMH#3: DMH #3 Avg. Flow Depth=0.52' Max Vel=4.70 fps Inflow=1.95 cfs 5,639 cf
12.0" Round Pipe n=0.013 L=162.0' S=0.0105 '/' Capacity=3.65 cfs Outflow=1.89 cfs 5,634 cf

Reach RCP: 36" RCP Culvert Avg. Flow Depth=1.35' Max Vel=1.77 fps Inflow=5.44 cfs 19,011 cf
36.0" Round Pipe n=0.011 L=36.0' S=0.0003 '/' Capacity=13.14 cfs Outflow=5.40 cfs 19,001 cf

Pond BMP #1A: BMP #1A Peak Elev=37.29' Storage=11,300 cf Inflow=7.31 cfs 17,529 cf
Primary=0.53 cfs 12,686 cf Secondary=0.00 cfs 0 cf Outflow=0.53 cfs 12,686 cf

Pond BMP #1B: BMP #1B Peak Elev=39.21' Storage=3,504 cf Inflow=2.78 cfs 5,897 cf
Primary=0.30 cfs 3,985 cf Secondary=0.00 cfs 0 cf Outflow=0.30 cfs 3,985 cf

Pond BMP #2: BMP #2 Peak Elev=39.69' Storage=1,244 cf Inflow=1.45 cfs 3,238 cf
Primary=0.30 cfs 2,783 cf Secondary=0.00 cfs 0 cf Outflow=0.30 cfs 2,783 cf

Pond BMP#3: BMP #3 Peak Elev=49.51' Storage=4,643 cf Inflow=4.24 cfs 9,375 cf
Primary=0.59 cfs 7,290 cf Secondary=0.00 cfs 0 cf Outflow=0.59 cfs 7,290 cf

Pond S1: Sedimentation Basin #1 Peak Elev=42.92' Storage=434 cf Inflow=3.14 cfs 6,731 cf
18.0" Round Culvert w/ 12.0" inside fill x 2.00 n=0.022 L=42.0' S=0.0119 '/' Outflow=2.74 cfs 6,591 cf

Link D.P. #1: Flow To MASSDOT Drainage Swale Inflow=3.79 cfs 9,039 cf
Primary=3.79 cfs 9,039 cf

Link D.P. #2: Flow To Existing Wetlands Inflow=8.62 cfs 49,724 cf
Primary=8.62 cfs 49,724 cf

Link D.P.#1: Flow To MASSDOT Drainage Swale Inflow=5.11 cfs 11,157 cf
Primary=5.11 cfs 11,157 cf

Link D.P.#2: Flow To Existing Wetlands Inflow=10.00 cfs 31,089 cf
Primary=10.00 cfs 31,089 cf

Link D.P.#3: Flow To Abutting Lot Inflow=0.00 cfs 66 cf
Primary=0.00 cfs 66 cf

Summary for Subcatchment 10A: Flow to MCB#8

Runoff = 0.94 cfs @ 12.12 hrs, Volume= 1,903 cf, Depth> 5.08"
Routed to Reach 13R : Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

	Area (sf)	CN	Description
	1,670	39	>75% Grass cover, Good, HSG A
*	2,826	98	Pavement, HSG A
	4,496	76	Weighted Average
	1,670		37.14% Pervious Area
	2,826		62.86% Impervious Area

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

Summary for Subcatchment E1: Flow to D.P.#1

Runoff = 7.50 cfs @ 12.15 hrs, Volume= 16,567 cf, Depth> 4.61"
Routed to Link D.P.#1 : Flow To MASSDOT Drainage Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

	Area (sf)	CN	Description
*	3,933	98	Paved road, HSG C
	968	61	>75% Grass cover, Good, HSG B
	1,452	74	>75% Grass cover, Good, HSG C
	2,742	55	Woods, Good, HSG B
	33,993	70	Woods, Good, HSG C
	43,088	72	Weighted Average
	39,155		90.87% Pervious Area
	3,933		9.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	329	0.0400	0.66		**Lag/CN Method, Overland Flow**

Summary for Subcatchment E2: Flow to D.P.#2

Runoff = 11.78 cfs @ 12.17 hrs, Volume= 27,393 cf, Depth> 4.38"
Routed to Link D.P.#2 : Flow To Existing Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

Area (sf)	CN	Description
74,980	70	Woods, Good, HSG C
74,980		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	360	0.0400	0.64		**Lag/CN Method, Overland Flow**

Summary for Subcatchment E3: Flow to D.P.#2

Runoff = 3.81 cfs @ 12.28 hrs, Volume= 13,056 cf, Depth> 1.30"
Routed to Link D.P.#2 : Flow To Existing Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

Area (sf)	CN	Description
87,089	30	Woods, Good, HSG A
33,550	70	Woods, Good, HSG C
120,639	41	Weighted Average
120,639		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	436	0.0900	0.47		**Lag/CN Method, Overland Flow**

Summary for Subcatchment E4: Flow to D.P.#2

Runoff = 1.75 cfs @ 12.36 hrs, Volume= 9,503 cf, Depth> 0.61"
Routed to Link D.P.#2 : Flow To Existing Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

Area (sf)	CN	Description
172,365	30	Woods, Good, HSG A
14,461	70	Woods, Good, HSG C
186,826	33	Weighted Average
186,826		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.1	322	0.0900	0.35		**Lag/CN Method, Overland Flow**

Summary for Subcatchment E5: Flow to D.P.#2

Runoff = 2.91 cfs @ 12.12 hrs, Volume= 5,801 cf, Depth> 4.39"
Routed to Link D.P.#2 : Flow To Existing Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

Area (sf)	CN	Description
15,860	70	Woods, Good, HSG C
15,860		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	120	0.0400	0.51		**Lag/CN Method, Overland Flow**
1.1					**Direct Entry, Overland Flow**
5.0	120	Total			

Summary for Subcatchment E6: Flow to D.P.#3

Runoff = 0.04 cfs @ 12.29 hrs, Volume= 300 cf, Depth> 0.40"
Routed to Link D.P.#3 : Flow To Abutting Lot

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

Area (sf)	CN	Description
9,089	30	Woods, Good, HSG A
9,089		100.00% Pervious Area

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

Summary for Subcatchment P1: Flow to D.P.#1

Runoff = 4.82 cfs @ 12.12 hrs, Volume= 9,779 cf, Depth> 5.08"
Routed to Reach 7R : Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

	Area (sf)	CN	Description
*	4,286	98	Paved road, HSG C
	14,827	70	Woods, Good, HSG C
	3,997	74	>75% Grass cover, Good, HSG C
	23,110	76	Weighted Average
	18,824		81.45% Pervious Area
	4,286		18.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, 0verland Flow**

Summary for Subcatchment P1-2: Flow to D.P.#3

Runoff = 0.01 cfs @ 12.29 hrs, Volume= 41 cf, Depth> 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

Area (sf)	CN	Description
1,245	30	Woods, Good, HSG A
1,245		100.00% Pervious Area

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

Summary for Subcatchment P10: Flow to BMP #3

Runoff = 1.24 cfs @ 12.13 hrs, Volume= 2,538 cf, Depth> 1.79"
Routed to Pond BMP#3 : BMP #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

	Area (sf)	CN	Description
	3,561	30	Woods, Good, HSG A
	10,846	39	>75% Grass cover, Good, HSG A
*	826	98	Pavement, HSG A
*	592	98	Sidewalk, HSG A
	1,195	98	Roofs, HSG A
	17,020	46	Weighted Average
	14,407		84.65% Pervious Area
	2,613		15.35% Impervious Area

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

Summary for Subcatchment P11: Flow to CB#9

Runoff = 1.73 cfs @ 12.16 hrs, Volume= 3,830 cf, Depth> 3.37"
Routed to Reach 14R : Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

	Area (sf)	CN	Description
*	575	98	Roofs, HSG A
*	307	98	Walk Ways, HSG A
*	468	98	Sidewalks, HSG A
*	3,702	98	Pavement, HSG A
	8,567	39	>75% Grass cover, Good, HSG A
	13,619	61	Weighted Average
	8,567		62.90% Pervious Area
	5,052		37.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	200	0.0300	0.39		**Lag/CN Method, Overland Flow**

Summary for Subcatchment P11A: Flow to CB#7

Runoff = 1.63 cfs @ 12.21 hrs, Volume= 4,163 cf, Depth> 2.19"
Routed to Reach 1R : Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

	Area (sf)	CN	Description
*	876	98	Roofs, HSG A
*	474	98	Walk Ways, HSG A
*	372	98	Sidewalks, HSG A
*	2,535	98	Pavement, HSG A
	18,534	39	>75% Grass cover, Good, HSG A
	22,791	50	Weighted Average
	18,534		81.32% Pervious Area
	4,257		18.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	203	0.0300	0.30		**Lag/CN Method, Overland Flow**

Summary for Subcatchment P12: Flow to CB#5

Runoff = 2.23 cfs @ 12.11 hrs, Volume= 4,679 cf, Depth> 5.89"
Routed to Reach 3R : Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

	Area (sf)	CN	Description
	1,039	98	Roofs, HSG A
*	1,970	98	Pavement, HSG A
*	302	98	Sidewalks, HSG A
*	191	98	Walk Ways, HSG A
*	6,025	74	>75% Grass cover, Good, HSG A
	9,527	83	Weighted Average
	6,025		63.24% Pervious Area
	3,502		36.76% Impervious Area

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

Summary for Subcatchment P13: Flow to CB#4

Runoff = 1.50 cfs @ 12.11 hrs, Volume= 3,342 cf, Depth> 6.82"
Routed to Reach CB#4 : CB #4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

	Area (sf)	CN	Description
	202	98	Roofs, HSG A
	224	98	Roofs, HSG C
*	187	98	Pavement, HSG A
*	3,477	98	Pavement, HSG C
	1,790	74	>75% Grass cover, Good, HSG C
	5,880	91	Weighted Average
	1,790		30.44% Pervious Area
	4,090		69.56% Impervious Area

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

Summary for Subcatchment P14: Flow to MCB#10

Runoff = 3.40 cfs @ 12.12 hrs, Volume= 6,718 cf, Depth> 4.05"
Routed to Reach 8R : CB #10

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

	Area (sf)	CN	Description
	2,823	98	Roofs, HSG A
*	388	98	Walk Ways, HSG A
*	276	98	Sidewalks, HSG A
*	5,976	98	Pavement, HSG A
	10,449	39	>75% Grass cover, Good, HSG A
	19,912	67	Weighted Average
	10,449		52.48% Pervious Area
	9,463		47.52% Impervious Area

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

Summary for Subcatchment P15: Flow to D.P.#2

Runoff = 2.06 cfs @ 12.12 hrs, Volume= 4,108 cf, Depth> 4.39"
Routed to Reach 16R : Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

Area (sf)	CN	Description
11,231	70	Woods, Good, HSG C
11,231		100.00% Pervious Area

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

Summary for Subcatchment P16: Flow to BMP #1A

Runoff = 3.83 cfs @ 12.11 hrs, Volume= 7,844 cf, Depth> 5.31"
Routed to Pond BMP #1A : BMP #1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

	Area (sf)	CN	Description
*	2,642	98	Pavement, HSG C
	15,086	74	>75% Grass cover, Good, HSG C
	17,728	78	Weighted Average
	15,086		85.10% Pervious Area
	2,642		14.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	252	0.0500	0.84		**Lag/CN Method, Overland Flow**

Summary for Subcatchment P17: Flow to CB#2

Runoff = 0.44 cfs @ 12.11 hrs, Volume= 928 cf, Depth> 6.13"
Routed to Reach CB#2 : CB#2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

	Area (sf)	CN	Description
*	824	98	Pavement, HSG C
	993	74	>75% Grass cover, Good, HSG C
	1,817	85	Weighted Average
	993		54.65% Pervious Area
	824		45.35% Impervious Area

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

Summary for Subcatchment P18: Flow to D.P.#2

Runoff = 5.51 cfs @ 12.25 hrs, Volume= 17,877 cf, Depth> 1.21"
Routed to Link D.P. #2 : Flow To Existing Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

	Area (sf)	CN	Description
*	4,814	98	Roofs, HSG A
	102	98	Roofs, HSG C
*	2,595	98	Pavement HSG A
	44,665	39	>75% Grass cover, Good, HSG A
	2,125	74	>75% Grass cover, Good, HSG C
	103,137	30	Woods, Good, HSG A
	20,227	70	Woods, Good, HSG C
	177,665	40	Weighted Average
	170,154		95.77% Pervious Area
	7,511		4.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	263	0.0600	0.34		**Lag/CN Method, Overland flow**

Summary for Subcatchment P2: Flow to D.P.#1

Runoff = 1.77 cfs @ 12.12 hrs, Volume= 3,578 cf, Depth> 4.96"
Routed to Reach 4R : Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

	Area (sf)	CN	Description
*	2,555	98	Paved road, HSG C
	1,436	55	Woods, Good, HSG B
	1,987	70	Woods, Good, HSG C
	1,608	61	>75% Grass cover, Good, HSG B
	1,066	74	>75% Grass cover, Good, HSG C
	8,652	75	Weighted Average
	6,097		70.47% Pervious Area
	2,555		29.53% Impervious Area

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

Summary for Subcatchment P3: Flow to CB#1

Runoff = 1.53 cfs @ 12.12 hrs, Volume= 3,069 cf, Depth> 4.73"
Routed to Reach CB#1 : CB #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

Area (sf)	CN	Description
6,040	70	Woods, Good, HSG C
948	74	>75% Grass cover, Good, HSG C
794	98	Paved road, HSG C
7,782	73	Weighted Average
6,988		89.80% Pervious Area
794		10.20% Impervious Area

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

Summary for Subcatchment P4: Flow to BMP #1B

Runoff = 4.16 cfs @ 12.13 hrs, Volume= 8,660 cf, Depth> 4.85"
Routed to Reach 9R : Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

Area (sf)	CN	Description
8,835	70	Woods, Good, HSG C
3,024	65	Brush, Good, HSG C
6,945	74	>75% Grass cover, Good, HSG C
2,642	98	Paved road, HSG C
21,446	74	Weighted Average
18,804		87.68% Pervious Area
2,642		12.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	246	0.0400	0.66		**Lag/CN Method, Overland Flow**

Summary for Subcatchment P5: Flow to D.P.#2

Runoff = 6.13 cfs @ 12.16 hrs, Volume= 13,934 cf, Depth> 4.38"
Routed to Reach RCP : 36" RCP Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

Area (sf)	CN	Description
7,492	71	Meadow, non-grazed, HSG C
4,743	65	Brush, Good, HSG C
25,901	70	Woods, Good, HSG C
38,136	70	Weighted Average
38,136		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	341	0.0400	0.63		**Lag/CN Method, Overland Flow**

Summary for Subcatchment P6: Flow to CB#3

Runoff = 0.70 cfs @ 12.11 hrs, Volume= 1,572 cf, Depth> 6.93"
Routed to Reach CB#3 : CB #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

Area (sf)	CN	Description
638	74	>75% Grass cover, Good, HSG C
2,084	98	Paved roads w/curbs & sewers, HSG C
2,722	92	Weighted Average
638		23.44% Pervious Area
2,084		76.56% Impervious Area

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

Summary for Subcatchment P7: Flow to D.P.#2

Runoff = 1.95 cfs @ 12.20 hrs, Volume= 4,790 cf, Depth> 3.37"
Routed to Reach RCP : 36" RCP Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

Area (sf)	CN	Description
3,712	30	Woods, Good, HSG A
2,193	65	Brush, Good, HSG C
11,141	70	Woods, Good, HSG C
17,046	61	Weighted Average
17,046		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	341	0.0400	0.50		**Lag/CN Method, Overland Flow**

Summary for Subcatchment P8: Flow to BMP #2

Runoff = 1.11 cfs @ 12.16 hrs, Volume= 2,432 cf, Depth> 1.79"
Routed to Pond BMP #2 : BMP #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

Area (sf)	CN	Description
697	98	Roofs, HSG A
9,593	39	>75% Grass cover, Good, HSG A
2,761	74	>75% Grass cover, Good, HSG C
3,274	30	Woods, Good, HSG A
16,325	46	Weighted Average
15,628		95.73% Pervious Area
697		4.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	135	0.0500	0.32		**Lag/CN Method, Overland Flow**

Summary for Subcatchment P9: Flow to CB#6

Runoff = 1.65 cfs @ 12.12 hrs, Volume= 3,245 cf, Depth> 3.16"
Routed to Reach 2R : Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr A 100 Year Storm Event Rainfall=8.18"

	Area (sf)	CN	Description
*	3,033	98	Pavement, HSG A
	394	98	Roofs, HSG A
*	168	98	Walk Ways, HSGA
	7,807	39	>75% Grass cover, Good, HSG A
	930	74	>75% Grass cover, Good, HSG C
	12,332	59	Weighted Average
	8,737		70.85% Pervious Area
	3,595		29.15% Impervious Area

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

Summary for Reach 1R: Grass Swale

Inflow Area = 22,791 sf, 18.68% Impervious, Inflow Depth > 2.19" for 100 Year Storm Event event
Inflow = 1.63 cfs @ 12.21 hrs, Volume= 4,163 cf
Outflow = 1.57 cfs @ 12.24 hrs, Volume= 4,154 cf, Atten= 4%, Lag= 1.9 min
Routed to Reach CB#7 : CB #7

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.82 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.93 fps, Avg. Travel Time= 3.0 min

Peak Storage= 97 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.13' , Surface Width= 5.01'
Bank-Full Depth= 0.50' Flow Area= 3.0 sf, Capacity= 18.74 cfs

4.00' x 0.50' deep channel, n= 0.030 Short grass
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 170.0' Slope= 0.0600 '/'
Inlet Invert= 0.00', Outlet Invert= -10.20'

‡

Summary for Reach 2R: Grass Swale

Inflow Area = 12,332 sf, 29.15% Impervious, Inflow Depth > 3.16" for 100 Year Storm Event event
Inflow = 1.65 cfs @ 12.12 hrs, Volume= 3,245 cf
Outflow = 1.58 cfs @ 12.15 hrs, Volume= 3,239 cf, Atten= 5%, Lag= 1.6 min
Routed to Reach CB#6 : CB #6

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.33 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 3.3 min

Peak Storage= 92 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.15' , Surface Width= 5.22'
Bank-Full Depth= 0.50' Flow Area= 3.0 sf, Capacity= 13.83 cfs

4.00' x 0.50' deep channel, n= 0.030 Short grass
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 130.0' Slope= 0.0327 '/'
Inlet Invert= 46.25', Outlet Invert= 42.00'

‡

Summary for Reach 3R: Grass Swale

Inflow Area = 9,527 sf, 36.76% Impervious, Inflow Depth > 5.89" for 100 Year Storm Event event
Inflow = 2.23 cfs @ 12.11 hrs, Volume= 4,679 cf
Outflow = 2.15 cfs @ 12.13 hrs, Volume= 4,675 cf, Atten= 3%, Lag= 1.2 min
Routed to Reach CB#5 : CB #5

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.90 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 2.4 min

Peak Storage= 76 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.23' , Surface Width= 5.86'
Bank-Full Depth= 0.50' Flow Area= 3.0 sf, Capacity= 8.93 cfs

4.00' x 0.50' deep channel, n= 0.030 Short grass
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 66.0' Slope= 0.0136 '/'
Inlet Invert= 44.00', Outlet Invert= 43.10'

‡

Summary for Reach 4R: Grass Swale

Inflow Area = 8,652 sf, 29.53% Impervious, Inflow Depth > 4.96" for 100 Year Storm Event event
Inflow = 1.77 cfs @ 12.12 hrs, Volume= 3,578 cf
Outflow = 1.66 cfs @ 12.15 hrs, Volume= 3,571 cf, Atten= 6%, Lag= 2.1 min
Routed to Link D.P. #1 : Flow To MASSDOT Drainage Swale

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.26 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.59 fps, Avg. Travel Time= 4.7 min

Peak Storage= 129 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.14' , Surface Width= 6.11'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 63.13 cfs

5.00' x 1.00' deep channel, n= 0.030 Short grass
Side Slope Z-value= 4.0 '/' Top Width= 13.00'
Length= 168.0' Slope= 0.0336 '/'
Inlet Invert= 0.00', Outlet Invert= -5.64'

‡

Summary for Reach 7R: Grass Swale

Inflow Area = 23,110 sf, 18.55% Impervious, Inflow Depth > 5.08" for 100 Year Storm Event event
Inflow = 4.82 cfs @ 12.12 hrs, Volume= 9,779 cf
Outflow = 4.52 cfs @ 12.15 hrs, Volume= 9,761 cf, Atten= 6%, Lag= 2.0 min
Routed to Pond S1 : Sedimentation Basin #1

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.88 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 4.6 min

Peak Storage= 334 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.27' , Surface Width= 7.16'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 54.16 cfs

5.00' x 1.00' deep channel, n= 0.030 Short grass
Side Slope Z-value= 4.0 '/' Top Width= 13.00'
Length= 204.0' Slope= 0.0247 '/'
Inlet Invert= 0.00', Outlet Invert= -5.04'

‡

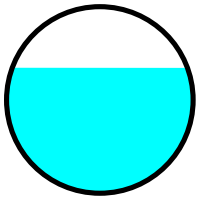
Summary for Reach 8R: CB #10

Inflow Area = 19,912 sf, 47.52% Impervious, Inflow Depth > 4.05" for 100 Year Storm Event event
Inflow = 3.40 cfs @ 12.12 hrs, Volume= 6,718 cf
Outflow = 3.32 cfs @ 12.13 hrs, Volume= 6,714 cf, Atten= 2%, Lag= 1.0 min
Routed to Reach 12R : DMH#4

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.00 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.16 fps, Avg. Travel Time= 1.2 min

Peak Storage= 90 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.67' , Surface Width= 0.94'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.27 cfs

12.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 160.0' Slope= 0.0085 '/'
Inlet Invert= 49.50', Outlet Invert= 48.14'



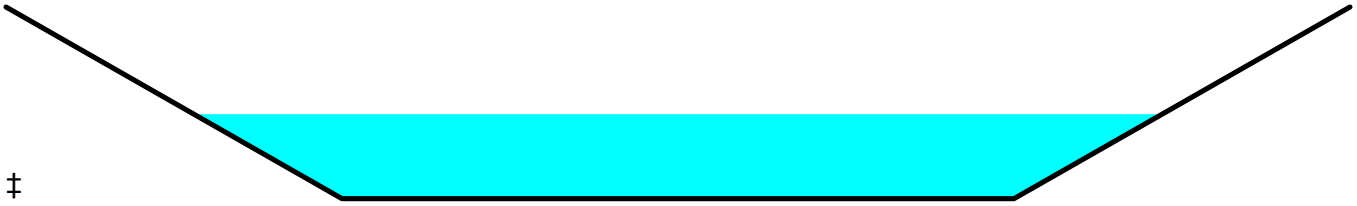
Summary for Reach 9R: Grass Swale

Inflow Area = 21,446 sf, 12.32% Impervious, Inflow Depth > 4.85" for 100 Year Storm Event event
Inflow = 4.16 cfs @ 12.13 hrs, Volume= 8,660 cf
Outflow = 4.04 cfs @ 12.15 hrs, Volume= 8,652 cf, Atten= 3%, Lag= 0.8 min
Routed to Pond BMP #1B : BMP #1B

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.87 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.00 fps, Avg. Travel Time= 2.2 min

Peak Storage= 142 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.22' , Surface Width= 5.76'
Bank-Full Depth= 0.50' Flow Area= 3.0 sf, Capacity= 18.47 cfs

4.00' x 0.50' deep channel, n= 0.030 Short grass
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 132.0' Slope= 0.0583 '/'
Inlet Invert= 47.70', Outlet Invert= 40.00'



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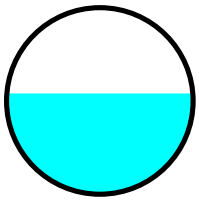
Summary for Reach 11R: MCB#8

Inflow Area = 4,496 sf, 62.86% Impervious, Inflow Depth > 5.07" for 100 Year Storm Event event
Inflow = 0.90 cfs @ 12.14 hrs, Volume= 1,900 cf
Outflow = 0.89 cfs @ 12.14 hrs, Volume= 1,899 cf, Atten= 1%, Lag= 0.2 min
Routed to Reach 12R : DMH#4

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.64 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.53 fps, Avg. Travel Time= 0.4 min

Peak Storage= 7 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.36' , Surface Width= 0.66'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.57 cfs

8.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 36.0' Slope= 0.0100 '/'
Inlet Invert= 48.50', Outlet Invert= 48.14'



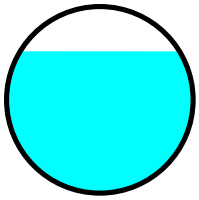
Summary for Reach 12R: DMH#4

Inflow Area = 38,027 sf, 45.60% Impervious, Inflow Depth > 3.92" for 100 Year Storm Event event
Inflow = 5.68 cfs @ 12.15 hrs, Volume= 12,437 cf
Outflow = 5.67 cfs @ 12.15 hrs, Volume= 12,437 cf, Atten= 0%, Lag= 0.0 min
Routed to Pond BMP#3 : BMP #3

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.86 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.99 fps, Avg. Travel Time= 0.0 min

Peak Storage= 5 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.76' , Surface Width= 0.85'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.13 cfs

12.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 8.0' Slope= 0.0175 '/'
Inlet Invert= 48.14', Outlet Invert= 48.00'



Summary for Reach 13R: Grass Swale

Inflow Area = 4,496 sf, 62.86% Impervious, Inflow Depth > 5.08" for 100 Year Storm Event event
Inflow = 0.94 cfs @ 12.12 hrs, Volume= 1,903 cf
Outflow = 0.90 cfs @ 12.14 hrs, Volume= 1,900 cf, Atten= 4%, Lag= 1.5 min
Routed to Reach 11R : MCB#8

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.15 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.54 fps, Avg. Travel Time= 3.4 min

Peak Storage= 47 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.10' , Surface Width= 4.78'
Bank-Full Depth= 0.50' Flow Area= 3.0 sf, Capacity= 16.79 cfs

4.00' x 0.50' deep channel, n= 0.030 Short grass
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 110.0' Slope= 0.0482 '/'
Inlet Invert= 56.15', Outlet Invert= 50.85'

‡

Summary for Reach 14R: Grass Swale

Inflow Area = 13,619 sf, 37.10% Impervious, Inflow Depth > 3.37" for 100 Year Storm Event event
Inflow = 1.73 cfs @ 12.16 hrs, Volume= 3,830 cf
Outflow = 1.66 cfs @ 12.18 hrs, Volume= 3,825 cf, Atten= 4%, Lag= 1.3 min
Routed to Reach 15R : MCB#9

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.70 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 2.2 min

Peak Storage= 67 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.14' , Surface Width= 5.10'
Bank-Full Depth= 0.50' Flow Area= 3.0 sf, Capacity= 17.10 cfs

4.00' x 0.50' deep channel, n= 0.030 Short grass
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 106.0' Slope= 0.0500 '/'
Inlet Invert= 56.15', Outlet Invert= 50.85'

‡

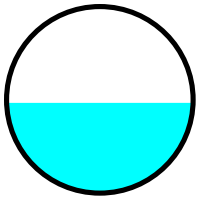
Summary for Reach 15R: MCB#9

Inflow Area = 13,619 sf, 37.10% Impervious, Inflow Depth > 3.37" for 100 Year Storm Event event
Inflow = 1.66 cfs @ 12.18 hrs, Volume= 3,825 cf
Outflow = 1.65 cfs @ 12.19 hrs, Volume= 3,824 cf, Atten= 1%, Lag= 0.4 min
Routed to Reach 12R : DMH#4

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.39 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.66 fps, Avg. Travel Time= 0.6 min

Peak Storage= 24 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.49' , Surface Width= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.50 cfs

12.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 63.0' Slope= 0.0057 '/'
Inlet Invert= 48.50', Outlet Invert= 48.14'



Summary for Reach 16R: Grass Swale

Inflow Area = 11,231 sf, 0.00% Impervious, Inflow Depth > 4.39" for 100 Year Storm Event event
Inflow = 2.06 cfs @ 12.12 hrs, Volume= 4,108 cf
Outflow = 1.97 cfs @ 12.14 hrs, Volume= 4,101 cf, Atten= 4%, Lag= 1.5 min
Routed to Link D.P. #2 : Flow To Existing Wetlands

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.00 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.78 fps, Avg. Travel Time= 3.3 min

Peak Storage= 105 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.15' , Surface Width= 5.18'
Bank-Full Depth= 0.50' Flow Area= 3.0 sf, Capacity= 18.18 cfs

4.00' x 0.50' deep channel, n= 0.030 Short grass
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 154.0' Slope= 0.0565 '/'
Inlet Invert= 47.70', Outlet Invert= 39.00'

‡

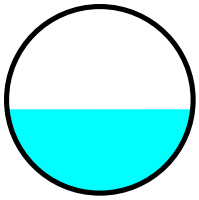
Summary for Reach CB#1: CB #1

Inflow Area = 7,782 sf, 10.20% Impervious, Inflow Depth > 4.73" for 100 Year Storm Event event
Inflow = 1.53 cfs @ 12.12 hrs, Volume= 3,069 cf
Outflow = 1.50 cfs @ 12.12 hrs, Volume= 3,068 cf, Atten= 2%, Lag= 0.5 min
Routed to Reach DMH#1 : DMH #1

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.39 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.45 fps, Avg. Travel Time= 0.6 min

Peak Storage= 16 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.45' , Surface Width= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.64 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 48.0' Slope= 0.0104 '/'
Inlet Invert= 42.25', Outlet Invert= 41.75'



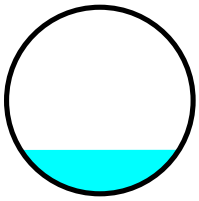
Summary for Reach CB#2: CB#2

Inflow Area = 1,817 sf, 45.35% Impervious, Inflow Depth > 6.13" for 100 Year Storm Event event
Inflow = 0.44 cfs @ 12.11 hrs, Volume= 928 cf
Outflow = 0.42 cfs @ 12.12 hrs, Volume= 928 cf, Atten= 3%, Lag= 0.7 min
Routed to Reach DMH#1 : DMH #1

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.02 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 0.91 fps, Avg. Travel Time= 0.9 min

Peak Storage= 7 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 0.85'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.53 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 51.0' Slope= 0.0098 '/'
Inlet Invert= 42.25', Outlet Invert= 41.75'



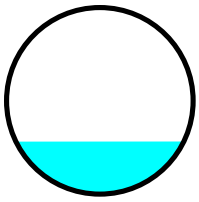
Summary for Reach CB#3: CB #3

Inflow Area = 2,722 sf, 76.56% Impervious, Inflow Depth > 6.93" for 100 Year Storm Event event
Inflow = 0.70 cfs @ 12.11 hrs, Volume= 1,572 cf
Outflow = 0.69 cfs @ 12.12 hrs, Volume= 1,572 cf, Atten= 1%, Lag= 0.2 min
Routed to Reach DMH#2 : DMH #2

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.80 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.19 fps, Avg. Travel Time= 0.3 min

Peak Storage= 4 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.28' , Surface Width= 0.90'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.98 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 24.0' Slope= 0.0125 '/'
Inlet Invert= 38.00', Outlet Invert= 37.70'



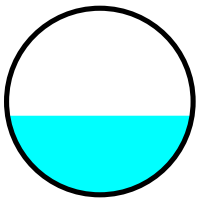
Summary for Reach CB#4: CB #4

Inflow Area = 5,880 sf, 69.56% Impervious, Inflow Depth > 6.82" for 100 Year Storm Event event
Inflow = 1.50 cfs @ 12.11 hrs, Volume= 3,342 cf
Outflow = 1.48 cfs @ 12.12 hrs, Volume= 3,341 cf, Atten= 1%, Lag= 0.2 min
Routed to Reach DMH#2 : DMH #2

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.69 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.48 fps, Avg. Travel Time= 0.3 min

Peak Storage= 8 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.42' , Surface Width= 0.99'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.98 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 24.0' Slope= 0.0125 '/'
Inlet Invert= 38.00', Outlet Invert= 37.70'



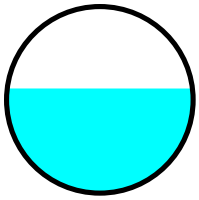
Summary for Reach CB#5: CB #5

Inflow Area = 9,527 sf, 36.76% Impervious, Inflow Depth > 5.89" for 100 Year Storm Event event
Inflow = 2.15 cfs @ 12.13 hrs, Volume= 4,675 cf
Outflow = 2.15 cfs @ 12.13 hrs, Volume= 4,674 cf, Atten= 0%, Lag= 0.1 min
Routed to Reach DMH#3 : DMH #3

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.73 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.49 fps, Avg. Travel Time= 0.2 min

Peak Storage= 10 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.56' , Surface Width= 0.99'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 22.0' Slope= 0.0100 '/'
Inlet Invert= 39.62', Outlet Invert= 39.40'



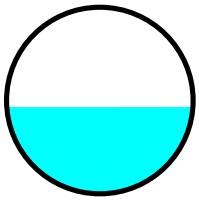
Summary for Reach CB#6: CB #6

Inflow Area = 12,332 sf, 29.15% Impervious, Inflow Depth > 3.15" for 100 Year Storm Event event
Inflow = 1.58 cfs @ 12.15 hrs, Volume= 3,239 cf
Outflow = 1.57 cfs @ 12.15 hrs, Volume= 3,239 cf, Atten= 0%, Lag= 0.0 min
Routed to Pond BMP #2 : BMP #2

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.40 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.62 fps, Avg. Travel Time= 0.1 min

Peak Storage= 3 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.47' , Surface Width= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 9.0' Slope= 0.0100 '/'
Inlet Invert= 39.00', Outlet Invert= 38.91'



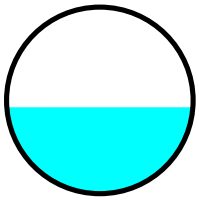
Summary for Reach CB#7: CB #7

Inflow Area = 22,791 sf, 18.68% Impervious, Inflow Depth > 2.19" for 100 Year Storm Event event
Inflow = 1.57 cfs @ 12.24 hrs, Volume= 4,154 cf
Outflow = 1.56 cfs @ 12.25 hrs, Volume= 4,152 cf, Atten= 1%, Lag= 0.6 min
Routed to Reach DMH#3 : DMH #3

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.39 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.84 fps, Avg. Travel Time= 0.7 min

Peak Storage= 29 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.46' , Surface Width= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 82.0' Slope= 0.0100 '/'
Inlet Invert= 41.00', Outlet Invert= 40.18'



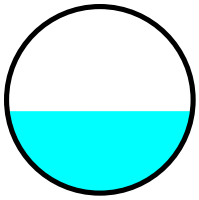
Summary for Reach DMH#1: DMH #1

Inflow Area = 9,599 sf, 16.86% Impervious, Inflow Depth > 5.00" for 100 Year Storm Event event
Inflow = 1.92 cfs @ 12.12 hrs, Volume= 3,996 cf
Outflow = 1.88 cfs @ 12.14 hrs, Volume= 3,993 cf, Atten= 2%, Lag= 1.0 min
Routed to Reach DMH#2 : DMH #2

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.80 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.68 fps, Avg. Travel Time= 2.2 min

Peak Storage= 72 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.44' , Surface Width= 0.99'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.86 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 218.0' Slope= 0.0186 '/'
Inlet Invert= 41.75', Outlet Invert= 37.70'



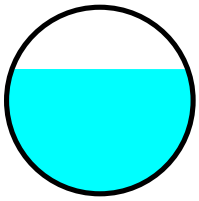
Summary for Reach DMH#2: DMH #2

Inflow Area = 50,519 sf, 30.78% Impervious, Inflow Depth > 4.21" for 100 Year Storm Event event
Inflow = 6.88 cfs @ 12.14 hrs, Volume= 17,726 cf
Outflow = 6.87 cfs @ 12.14 hrs, Volume= 17,725 cf, Atten= 0%, Lag= 0.1 min
Routed to Pond BMP #1A : BMP #1A

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 12.31 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 4.08 fps, Avg. Travel Time= 0.1 min

Peak Storage= 14 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.67' , Surface Width= 0.94'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.73 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 25.0' Slope= 0.0600 '/'
Inlet Invert= 37.70', Outlet Invert= 36.20'



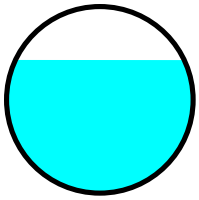
Summary for Reach DMH#3: DMH #3

Inflow Area = 32,318 sf, 24.01% Impervious, Inflow Depth > 3.28" for 100 Year Storm Event event
Inflow = 3.16 cfs @ 12.16 hrs, Volume= 8,826 cf
Outflow = 3.05 cfs @ 12.18 hrs, Volume= 8,820 cf, Atten= 3%, Lag= 1.1 min
Routed to Reach DMH#2 : DMH #2

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.21 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.82 fps, Avg. Travel Time= 1.5 min

Peak Storage= 97 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.71' , Surface Width= 0.90'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.65 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 162.0' Slope= 0.0105 '/'
Inlet Invert= 39.40', Outlet Invert= 37.70'



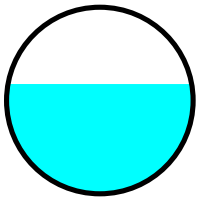
Summary for Reach RCP: 36" RCP Culvert

Inflow Area = 105,285 sf, 6.59% Impervious, Inflow Depth > 3.48" for 100 Year Storm Event event
Inflow = 8.62 cfs @ 12.17 hrs, Volume= 30,567 cf
Outflow = 8.48 cfs @ 12.19 hrs, Volume= 30,554 cf, Atten= 2%, Lag= 0.7 min
Routed to Link D.P. #2 : Flow To Existing Wetlands

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.97 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 0.7 min

Peak Storage= 156 cf @ 12.18 hrs
Average Depth at Peak Storage= 1.77' , Surface Width= 2.95'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 13.14 cfs

36.0" Round Pipe
n= 0.011 Concrete pipe, straight & clean
Length= 36.0' Slope= 0.0003 '/'
Inlet Invert= 34.41', Outlet Invert= 34.40'



Summary for Pond BMP #1A: BMP #1A

Inflow Area = 68,247 sf, 26.66% Impervious, Inflow Depth > 4.50" for 100 Year Storm Event event
Inflow = 10.54 cfs @ 12.13 hrs, Volume= 25,570 cf
Outflow = 0.65 cfs @ 13.40 hrs, Volume= 16,914 cf, Atten= 94%, Lag= 76.2 min
Primary = 0.65 cfs @ 13.40 hrs, Volume= 16,914 cf
Routed to Link D.P. #2 : Flow To Existing Wetlands
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Link D.P. #2 : Flow To Existing Wetlands

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 38.07' @ 13.40 hrs Surf.Area= 8,098 sf Storage= 17,098 cf

Plug-Flow detention time= 232.4 min calculated for 16,858 cf (66% of inflow)
Center-of-Mass det. time= 178.1 min (947.1 - 769.1)

Volume	Invert	Avail.Storage	Storage Description
#1	34.50'	20,727 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.50	1,108	0	0
35.00	2,384	873	873
36.00	4,322	3,353	4,226
38.00	7,996	12,318	16,544
38.50	8,736	4,183	20,727

Device	Routing	Invert	Outlet Devices
#1	Primary	35.50'	**4.0" Round Culvert** L= 7.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 35.50' / 35.43' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf
#2	Secondary	38.25'	**10.0' long x 7.0' 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) 2.40 2.52 2.70 2.68 2.68 2.67 2.66 2.65 2.65 2.65 2.66 2.65 2.66 2.68 2.70 2.73 2.78

Primary OutFlow Max=0.65 cfs @ 13.40 hrs HW=38.07' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.65 cfs @ 7.46 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=34.50' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond BMP #1B: BMP #1B

Inflow Area = 21,446 sf, 12.32% Impervious, Inflow Depth > 4.84" for 100 Year Storm Event event
Inflow = 4.04 cfs @ 12.15 hrs, Volume= 8,652 cf
Outflow = 0.43 cfs @ 12.82 hrs, Volume= 6,662 cf, Atten= 89%, Lag= 40.3 min
Primary = 0.43 cfs @ 12.82 hrs, Volume= 6,662 cf
Routed to Reach RCP : 36" RCP Culvert
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Reach RCP : 36" RCP Culvert

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 39.71' @ 12.82 hrs Surf.Area= 3,688 sf Storage= 5,195 cf

Plug-Flow detention time= 158.7 min calculated for 6,662 cf (77% of inflow)
Center-of-Mass det. time= 112.4 min (886.1 - 773.8)

Volume	Invert	Avail.Storage	Storage Description
#1	37.25'	8,482 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
37.25	245	0	0
37.50	645	111	111
38.00	1,541	547	658
39.00	2,880	2,211	2,868
40.00	4,021	3,451	6,319
40.50	4,633	2,164	8,482

Device	Routing	Invert	Outlet Devices
#1	Primary	38.50'	**4.0" Round Culvert** L= 7.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 38.50' / 38.43' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf
#2	Secondary	40.25'	**10.0' long x 7.0' 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) 2.40 2.52 2.70 2.68 2.68 2.67 2.66 2.65 2.65 2.65 2.66 2.65 2.66 2.68 2.70 2.73 2.78

Primary OutFlow Max=0.43 cfs @ 12.82 hrs HW=39.71' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 0.43 cfs @ 4.91 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=37.25' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond BMP #2: BMP #2

Inflow Area = 28,657 sf, 14.98% Impervious, Inflow Depth > 2.37" for 100 Year Storm Event event
Inflow = 2.68 cfs @ 12.15 hrs, Volume= 5,671 cf
Outflow = 0.45 cfs @ 12.66 hrs, Volume= 5,181 cf, Atten= 83%, Lag= 30.4 min
Primary = 0.45 cfs @ 12.66 hrs, Volume= 5,181 cf
Routed to Reach RCP : 36" RCP Culvert
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Reach RCP : 36" RCP Culvert

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 40.31' @ 12.66 hrs Surf.Area= 2,203 sf Storage= 2,447 cf

Plug-Flow detention time= 84.2 min calculated for 5,181 cf (91% of inflow)
Center-of-Mass det. time= 56.4 min (855.7 - 799.3)

Volume	Invert	Avail.Storage	Storage Description
#1	38.50'	2,872 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
38.50	305	0	0
39.00	1,022	332	332
40.00	1,915	1,469	1,800
40.50	2,373	1,072	2,872

Device	Routing	Invert	Outlet Devices
#1	Primary	39.00'	**4.0" Round Culvert** L= 4.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 39.00' / 38.96' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf
#2	Secondary	40.35'	**6.0' 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=0.45 cfs @ 12.66 hrs HW=40.31' (Free Discharge)
1=Culvert (Inlet Controls 0.45 cfs @ 5.16 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=38.50' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond BMP#3: BMP #3

Inflow Area = 55,047 sf, 36.25% Impervious, Inflow Depth > 3.26" for 100 Year Storm Event event
Inflow = 6.90 cfs @ 12.14 hrs, Volume= 14,974 cf
Outflow = 0.75 cfs @ 12.93 hrs, Volume= 12,812 cf, Atten= 89%, Lag= 47.4 min
Primary = 0.67 cfs @ 12.93 hrs, Volume= 12,720 cf
Routed to Link D.P. #2 : Flow To Existing Wetlands
Secondary = 0.08 cfs @ 12.93 hrs, Volume= 93 cf
Routed to Link D.P. #2 : Flow To Existing Wetlands

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 50.37' @ 12.93 hrs Surf.Area= 4,735 sf Storage= 8,275 cf

Plug-Flow detention time= 146.1 min calculated for 12,812 cf (86% of inflow)
Center-of-Mass det. time= 107.1 min (894.0 - 786.9)

Volume	Invert	Avail.Storage	Storage Description
#1	47.50'	8,894 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
47.50	813	0	0
48.00	1,892	676	676
49.00	2,813	2,353	3,029
50.00	4,318	3,566	6,594
50.50	4,879	2,299	8,894

Device	Routing	Invert	Outlet Devices
#1	Primary	48.50'	**6.0" Round Culvert** L= 251.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 48.50' / 45.99' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#2	Secondary	50.35'	**8.0' long x 2.0' 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 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.67 cfs @ 12.93 hrs HW=50.37' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.67 cfs @ 3.42 fps)

Secondary OutFlow Max=0.06 cfs @ 12.93 hrs HW=50.37' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 0.06 cfs @ 0.37 fps)

Summary for Pond S1: Sedimentation Basin #1

Inflow Area = 23,110 sf, 18.55% Impervious, Inflow Depth > 5.07" for 100 Year Storm Event event
Inflow = 4.52 cfs @ 12.15 hrs, Volume= 9,761 cf
Outflow = 5.27 cfs @ 12.15 hrs, Volume= 9,620 cf, Atten= 0%, Lag= 0.1 min
Primary = 5.27 cfs @ 12.15 hrs, Volume= 9,620 cf
Routed to Link D.P. #1 : Flow To MASSDOT Drainage Swale

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 45.42' @ 12.15 hrs Surf.Area= 406 sf Storage= 464 cf

Plug-Flow detention time= 9.7 min calculated for 9,620 cf (99% of inflow)
Center-of-Mass det. time= 4.0 min (775.8 - 771.8)

Volume	Invert	Avail.Storage	Storage Description
#1	41.00'	464 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
41.00	10	0	0
42.00	256	133	133
43.00	406	331	464

Device	Routing	Invert	Outlet Devices
#1	Primary	42.00'	**18.0" Round Culvert X 2.00 w/ 12.0" inside fill** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 41.00' / 40.50' S= 0.0119 '/' Cc= 0.900 n= 0.022 Earth, clean & straight, Flow Area= 0.52 sf

Primary OutFlow Max=5.21 cfs @ 12.15 hrs HW=45.35' (Free Discharge)
└**1=Culvert** (Barrel Controls 5.21 cfs @ 5.05 fps)

Summary for Link D.P. #1: Flow To MASSDOT Drainage Swale

Inflow Area = 31,762 sf, 21.54% Impervious, Inflow Depth > 4.98" for 100 Year Storm Event event
Inflow = 6.92 cfs @ 12.15 hrs, Volume= 13,191 cf
Primary = 6.92 cfs @ 12.15 hrs, Volume= 13,191 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 17L

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link D.P. #2: Flow To Existing Wetlands

Inflow Area = 417,475 sf, 12.60% Impervious, Inflow Depth > 2.36" for 100 Year Storm Event event
Inflow = 16.11 cfs @ 12.20 hrs, Volume= 82,259 cf
Primary = 16.11 cfs @ 12.20 hrs, Volume= 82,259 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link D.P.#1: Flow To MASSDOT Drainage Swale

Inflow Area = 43,088 sf, 9.13% Impervious, Inflow Depth > 4.61" for 100 Year Storm Event event
Inflow = 7.50 cfs @ 12.15 hrs, Volume= 16,567 cf
Primary = 7.50 cfs @ 12.15 hrs, Volume= 16,567 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link D.P.#2: Flow To Existing Wetlands

Inflow Area = 398,305 sf, 0.00% Impervious, Inflow Depth > 1.68" for 100 Year Storm Event event
Inflow = 16.79 cfs @ 12.18 hrs, Volume= 55,753 cf
Primary = 16.79 cfs @ 12.18 hrs, Volume= 55,753 cf, Atten= 0%, Lag= 0.0 min

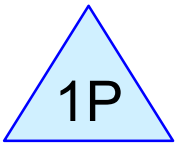
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link D.P.#3: Flow To Abutting Lot

Inflow Area = 9,089 sf, 0.00% Impervious, Inflow Depth > 0.40" for 100 Year Storm Event event
Inflow = 0.04 cfs @ 12.29 hrs, Volume= 300 cf
Primary = 0.04 cfs @ 12.29 hrs, Volume= 300 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

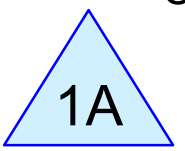
Total Stormwater Recharge Required = 2,310.1 C.F.



Recharge Volume Required for Each Lot

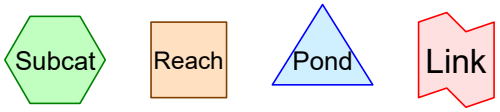
Stormwater Recharge Required for each Lot (6 Lots x 385.1 C.F./Lot = 2,310.6 C.F. > 2,310.1 C.F.

Stormwater Recharge Required Provided for each Lot - 4 Chamber System (6 Lots x 392.2 C.F./Lot = 2353.2 C.F. > 2,310.1 C.F.



Recharge Volume Required for Each Lot

Stormwater Recharge Required Provided for each Lot - 2 Chamber System (12 Lots x 200.7 C.F./Lot = 2408.4 C.F. > 2,310.1C.F.



Pond 1A: Recharge Volume Required for Each Lot - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 2 rows

33.0" Wide + 18.0" Spacing = 51.0" C-C Row Spacing

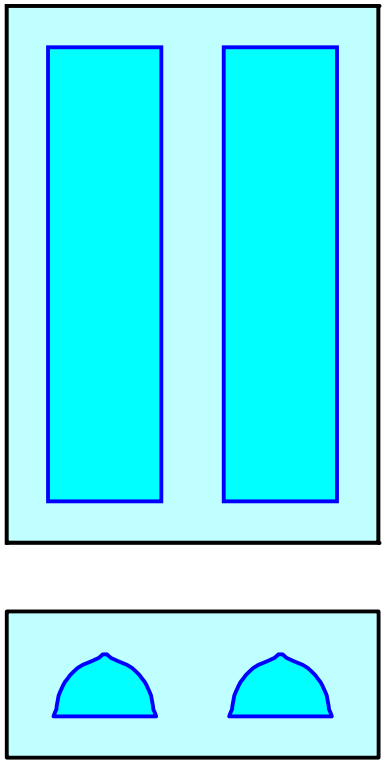
1 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 11.00' Row Length +12.0" End Stone x 2 = 13.00' Base Length
2 Rows x 33.0" Wide + 18.0" Spacing x 1 + 12.0" Side Stone x 2 = 9.00' Base Width
12.0" Stone Base + 18.5" Chamber Height + 12.0" Stone Cover = 3.54' Field Height

2 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 2 Rows = 58.3 cf Chamber Storage

414.4 cf Field - 58.3 cf Chambers = 356.1 cf Stone x 40.0% Voids = 142.4 cf Stone Storage

Chamber Storage + Stone Storage = 200.7 cf = 0.005 af
Overall Storage Efficiency = 48.4%
Overall System Size = 13.00' x 9.00' x 3.54'

2 Chambers
15.3 cy Field
13.2 cy Stone



Pond 1P: Recharge Volume Required for Each Lot - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 4 rows

33.0" Wide + 18.0" Spacing = 51.0" C-C Row Spacing

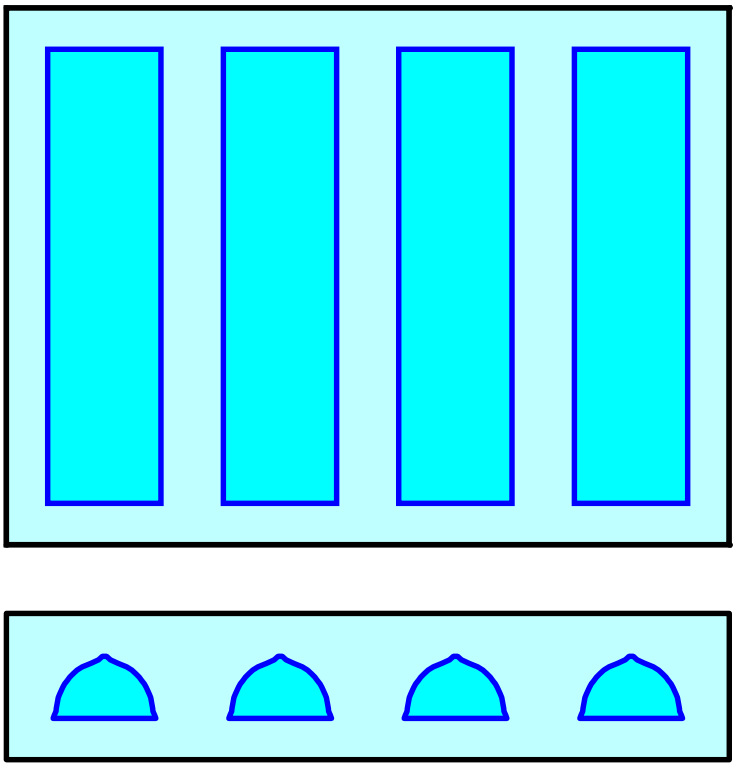
1 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 11.00' Row Length +12.0" End Stone x 2 = 13.00' Base Length
4 Rows x 33.0" Wide + 18.0" Spacing x 3 + 12.0" Side Stone x 2 = 17.50' Base Width
12.0" Stone Base + 18.5" Chamber Height + 12.0" Stone Cover = 3.54' Field Height

4 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 4 Rows = 116.6 cf Chamber Storage

805.7 cf Field - 116.6 cf Chambers = 689.2 cf Stone x 40.0% Voids = 275.7 cf Stone Storage

Chamber Storage + Stone Storage = 392.2 cf = 0.009 af
Overall Storage Efficiency = 48.7%
Overall System Size = 13.00' x 17.50' x 3.54'

4 Chambers
29.8 cy Field
25.5 cy Stone



ASB design group

September 27, 2022

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Re: **Summary Report Accompanying the Stormwater Checklist**
Katie Lane – Definitive Subdivision and Notice of Intent
510 Newburyport Turnpike – Route 1
Rowley, MA. 01969
Job No.: 2020-10
Map 19 Lot 4A
DEP #: TBD

See Notice of Intent Prepared By: Norse Environmental Services, Inc.

Checklist

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

The project will be considered a new development.

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

LID Measures

- Country drainage will be used to direct the stormwater runoff to Stormwater BMP's
- The country drainage will include a 4' wide grassed channel.
- There will be a total of 4 Constructed Stormwater Wetland BMP's.

Standard 1: No New Untreated Discharges

All new discharges will prevent erosion and scouring to the adjacent wetlands. The stormwater design will result in a TSS Removal Rate of a minimum of 90%.

Standard 2: Peak Rate Attenuation

The proposed project has been designed to prevent increases in the pre and post development peak rate (cubic feet per second – c.f.s.) of stormwater runoff for the 2, 10, 25, and 100-year storm events.

Standard 3: Recharge

Storm Water Recharge has been provided for through roof infiltration. The Recharge Requirements are:

Impervious Area Summary

Total Proposed Impervious Area = **56,446 s.f.**

Total Proposed Impervious Area HSG A Soil = **38,666 s.f.**

Total Proposed Impervious Area HSG B Soil = **764 s.f.**

Total Proposed Impervious Area HSG C Soil = **17016 s.f.**

Recharge Volume Calculation

HSG A Recharge Volume Calculation:

Total Recharge Volume (c.f.) = (Impervious Area) x (0.6 inch) / (12 inch) = (38,666) x (0.0.6) / 12 = **1,933.3 c.f.**

HSG B Recharge Volume Calculation:

Total Recharge Volume (c.f.) = (Impervious Area) x (0.35 inch) / (12 inch) = (764) x (0.35) / 12 = **22.3 c.f.**

HSG C Recharge Volume Calculation:

Total Recharge Volume (c.f.) = (Impervious Area) x (0.25 inch) / (12 inch) = (17,016) x (0.25) / 12 = **354.5 c.f.**

Total Recharge Volume Required = 2,310.1 c.f. (minimum)

Recharge Volume Per House Lot Calculation:

Recharge per lot = 2,310 c.f./6 = 385.00 c.f.
Recharge Provided Per Lot = 392 c.f. = 2,352 c.f.

Recharge Volume per House Lot Provided = 392 c.f. > 385.00 c.f. (see HydroCAD)
*Final recharge system layout and approval will be incorporated into the final septic system design plans. HydroCAD depicts a typical single infiltration system chamber layout. The final infiltration system layout can be split into multiple systems to accommodate downspout locations. However, the total recharge volume per lot shall remain at least 392 c.f. as a minimum.

Standard 4: Water Quality
The stormwater design will result in a TSS Removal Rate of a minimum of 90%. The required treatment volume is:

- Total Impervious Surface x .5"/12 = 37,093 (pavement) s.f. x .5"/12 = 1,546 c.f.

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

Standard 5 is not applicable to this project.

Standard 6: Critical Areas

Standard 6 is not applicable to this project.

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

Standard 7 is not applicable to this project.

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

See Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan provided within the Summary Letter.

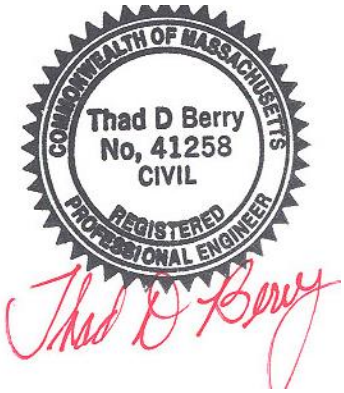
Standard 9: Operation and Maintenance Plan.

See Post Construction Operation and Maintenance Plan provided within the Summary Letter.

Standard 10: Prohibition of Illicit Discharges.

See Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan and Post Construction Operation and Maintenance Plan provided within the Summary Letter.

ASB design group, LLC
Thad D. Berry, P.E.
Principal

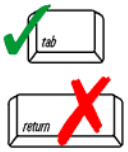

COMMONWEALTH OF MASSACHUSETTS
Thad D Berry
No, 41258
CIVIL
REGISTERED
PROFESSIONAL ENGINEER

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

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

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

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

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

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

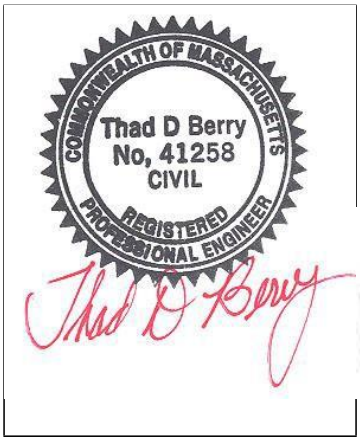
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



Signature

January 18, 2022

Date

Checklist

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

- [x] New development
- [ ] Redevelopment
- [ ] Mix of New Development and Redevelopment

Checklist (continued)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

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

- [ ] No disturbance to any Wetland Resource Areas
- [ ] Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- [ ] Reduced Impervious Area (Redevelopment Only)
- [ ] Minimizing disturbance to existing trees and shrubs
- [ ] LID Site Design Credit Requested:
  - [ ] Credit 1
  - [ ] Credit 2
  - [ ] Credit 3
- [x] Use of "country drainage" versus curb and gutter conveyance and pipe. **No curbs being used – see grass swale below**
- [ ] Bioretention Cells (includes Rain Gardens)
- [x] Constructed Stormwater Wetlands (includes Gravel Wetlands designs) **BMP's 1A, 1B, 2 and 3 Constructed Stormwater Wetlands**
- [ ] Tree box Filter
- [ ] Water Quality Swale
- [x] Grass Channel **Four -foot-wide grass channel**
- [ ] Green Roof
- [ ] Other (describe):

Standard 1: No New Untreated Discharges

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

Checklist (continued)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided. **See Soils Map Figure 1**

☒ Required Recharge Volume calculation provided. **Accomplished by Roof Runoff Infiltration**

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☒ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

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

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☐ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

☒ The ½" or *1"* Water Quality Volume or

The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long-term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

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

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report. **See Attached Summary Letter.**

Checklist (continued)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

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

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☒ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan **See Attached Summary Letter.**

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges See Attached Summary Letter.

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.