**STORMWATER MANAGEMENT REPORT**
PREPARED FOR PROPERTY KNOWN AS
**EXAMPLE PLAN – RESIDENTIAL SITE**
PREPARED FOR
**DNREC – SEDIMENT & STORMWATER PROGRAM**
**DIVISION OF WATERSHED STEWARDSHIP**
Dated: 08/29/11

***Preliminary Sediment & Stormwater Management Plan Review Checklist***

**DATE RECEIVED:** _____ **PROJECT NUMBER:** _____

**PROJECT NAME:** Example Plan - Residential Site

**General Information:**

1. X Completed application signed by the owner, review fee, one set of plans and reports, and a completed checklist must be submitted for review. Electronic plan and report program files (i.e., AutoCAD, Microstation, DURMM, HydroCAD, and/or equal/similar) shall be transmitted upon agency request.
2. N/A Provide a copy of the notice to DelDOT, a municipality, or a private entity (i.e., neighboring Homeowner's Association) for the intent to discharge or connect to their stormwater system. The notice shall indicate the proposed condition and that any comments regarding the discharge shall be returned within 30 calendar days, and if no comments are received than consent to discharge is assumed. If directly copied on the notice, indicate the date of the notice and the reviewer copied: _____.
3. X Hydraulic and Hydrology computations shall reflect the proposed site conditions.
4. X All plans should be submitted on 24" x 36" (minimum) sheets unless otherwise approved.
5. X When two (2) or more sheets are used to illustrate the plan view, an index sheet is required, illustrating the entire project on one (1) 24" x 36" (minimum) sheet.
6. X Provide a north arrow on all plans.
7. X Provide all plan views to a defined scale with a scale bar.
8. X Provide names of adjacent property owners on all plans.
9. X Provide existing and proposed contours (if provided) based on NAVD 88 vertical datum at one (1) foot intervals (2 foot intervals can be provided for offsite drainage information based on the latest Lidar information).
10. N/A For small projects less than ½ acre of disturbance, provide existing and proposed spot elevations based on NAVD 88 vertical datum on a fifty-foot grid system. Include high and low points.
11. X Locate the site in NAD83 horizontal datum.
12. X Provide the contact information for the person or entity responsible for preparing the plans and report, including name, company, address and telephone number. Locate on both the plans and report.
13. X Provide the seal of a Licensed Professional in the State of Delaware on all submitted plans and reports.
14. X Provide the Preliminary Sediment and Stormwater Management plans in the following order and title. The sheet list is to appear on the Coversheet, and on each plan sheet shall be respectively titled (include the title of the plan within the title block or lower righthand corner of the sheet):
    a. X Coversheet
    b. N/A Schematic Pre-Construction Site Stormwater Management Plan
    c. N/A Schematic Construction Site Stormwater Management Plan
    d. X Contributing Drainage Area Plan
    e. N/A Pre-Limit of Disturbance Drainage Area Plan
    f. X Post Limit of Disturbance Drainage Area Plan

**Coversheet:**

15. _X_ Project Header (to duplicate in the title block on each sheet):
    a. _X_ Project Name (and Phase, if applicable).
    b. _X_ Title of Plan Set: Preliminary Sediment and Stormwater Management Plans
    c. _X_ Project Location (including watershed, hundred, town, county, etc., as applicable).
    d. _X_ Project tax map identification number(s).
16. _X_ Legend indicating plan symbols and lines, including but not limited to, soils, drainage area information, grading and site information.
17. _X_ Provide a vicinity map with a scale either at 1" = ½ mile or 1" = 1 mile, depending on project size, and indicate the site boundary within the map. The map shall be no smaller than 4"x4" in size.
18. _X_ Project Notes:
    a. Parcel Data:
        i. _X_ Tax Map Number(s)
        ii. _X_ PLUS Number (if applicable)
        iii. _X_ DNREC Sediment and Stormwater Program [or relevant Delegated Agency] Number
        iv. _X_ Site Address (or Nearest Intersecting Street and Distance between)
        v. _X_ Latitude and Longitude State Plane coordinates, with approximate geographical location (ie, Benchmark #1, Northeast Site Corner, etc). Provide in degree decimal format.
        vi. _X_ Existing Site Area
        vii. _X_ Proposed Site Area
        viii. _X_ Existing Wetland Area
        ix. _____ Proposed Discharge Location(s)
        x. _____ Proposed Total Limit of Disturbance per Discharge Location
    b. Contact Data:
        i. Owner's Name, Title: _X_ Owner _X_ Land Developer _X_ Designer
        ii. Company/LLC: _X_ Owner _X_ Land Developer _X_ Designer
        iii. Full Street Address: _X_ Owner _X_ Land Developer _X_ Designer
        iv. Phone Number: _X_ Owner _X_ Land Developer _X_ Designer
        v. Fax Number: _X_ Owner _X_ Land Developer _X_ Designer
19. _X_ Include a Site Designer Certification that states "I hereby certify that this plan has been prepared under my supervision and to the best of my knowledge complies with the applicable state and local regulations and ordinances." <u>This shall be signed in ink or an original reproducible.</u>
20. _X_ Provide a list of all sheets and their corresponding sheet number for all Preliminary Sediment and Stormwater Management Plans.

**Schematic Construction Site Stormwater Management Plans:**

The purpose of the Schematic Construction Site Stormwater Management Plan is to provide a preliminary design of the site's phasing in relation to the site's existing conditions and it's construction and stormwater facility locations. It will eventually be further developed into the Pre-Construction and Construction Site Stormwater Management Plan for the full plan submittal.

21. N/A Schematic Pre-Construction Site Stormwater Management Plan (if required, as determined at the SAS review meeting):
    a. _____ Include the entire site boundary in an existing conditions plan view (i.e., site boundary, existing contours, wetlands, treelines, existing structures/utilities to remain or to be removed, etc).
    b. _____ Indicate the approximate limit of disturbance per phase of construction. Provide a legend indicating the total disturbed acreage per limit of construction.
    c. _____ Indicate the location of all perimeter controls, stockpile locations, sediment trapping facilities, and other construction stormwater management controls needed for demolition and bulk grading (i.e., silt fence, stabilized construction entrances, temporary swales, sediment basins, etc).
    d. _____ Proposed contours are not required.
    e. _____ Provide a legend indicating the lines and symbols used to define the site and construction stormwater controls.
22. N/A Schematic Construction Site Stormwater Management Plan:
    a. _____ Include the entire site boundary in an existing conditions plan view (i.e., site boundary, existing contours, wetlands, treelines, existing structures to remain, etc).
    b. _____ Include a preliminary site plan view overlaid with the existing conditions. Include all lot and/or building outlines; right-of-ways and/or paved areas (whichever is less constrictive); and proposed stormwater locations including facilities, structures and pipes.
    c. _____ Indicate the approximate limit of disturbance per phase of construction. Provide a legend indicating the total disturbed acreage per limit of construction.
    d. _____ Indicate the location of all construction site stormwater controls, including perimeter controls, sediment controls, water controls, and pollution prevention controls. (i.e., silt fence, stabilized construction entrances, temporary swales, sediment basins, etc).
    e. _____ Proposed contours are not required, but should be included when available. If not flow arrows showing the drainage intent can suffice.
    f. _____ Provide a legend indicating the lines and symbols used to define the site and construction stormwater controls.

**Drainage Area Plans:**

The drainage area plans shall provide a graphic portrayal of the information that is contained with the DURMM worksheets. Any additional hydraulic or hydrologic computations that are required to show compliance with the *Delaware Sediment and Stormwater Regulations* may require additional drainage area or watershed plans (i.e., to satisfy the Cv and Fv requirements). These plans are not prescribed below, but shall follow similar guidelines, clearly indicate the parameters used within the calculations, and be contained within the plan Sediment and Stormwater Management Plan set.

23. __X__ Contributing Drainage Area Plan
    a. __X__ Provide a plan correlating to the Contributing Area RCN worksheet (post development model for the entire drainage area) for each subarea (subareas may be combined onto the same sheet, so long as they are clearly distinguishable).
    b. __X__ Provide soils mapping on the plan, using the latest NRCS soil information, with a general description of each soil.
    c. __X__ Indicate the LOD and the OLOD contributing areas, separated per their respective land cover and soil type classification. Provide the area of each designation.
    d. __X__ Provide a legend indicating the various landuse covers (a hatch shall be provided for each type of landuse).
    e. __X__ Provide a summary table indicating the sub-areas and their respective point of analysis, total area, and RCN.
    f. __N/A__ Show the Tc path for the area outside the LOD as used in the OLOD worksheet.
    g. __X__ Show the Tc path for any other areas that require further analysis using other H&H software.
24. __N/A__ Pre-Limit of Disturbance Drainage Area Plan
    a. _____ Provide a plan correlating to the Pre LOD information requested in the LOD worksheet (location of woods and meadow condition within the LOD per sub-area prior to disturbance) for each subarea (subareas may be combined onto the same sheet, so long as they are clearly distinguishable).
    b. _____ Provide soils mapping on the plan, using the latest NRCS soil information, with a general description of each soil.
    c. _____ Indicate the areas of woods and/or meadow condition per soil type classification. Provide the area of each designation.
    d. _____ Provide a legend indicating the various landuse covers (a hatch shall be provided for each type of landuse).
    e. _____ Provide a summary table indicating the sub-areas and their respective point of analysis, total area, and RCN.
25. __X__ Post Limit of Disturbance Drainage Area Plan
    a. __X__ Provide a plan correlating to the Post LOD information requested in the LOD worksheet (location of all impervious areas). This should only be done if the LOD and OLOD cannot be shown on the Contributing Area Plan due to sizing.
    b. __X__ Provide soils mapping on plan, using the latest NRCS soil information, with a general description of each soil.
    c. __X__ Indicate the impervious area with the subarea. Provide the area of each designation.
    d. __X__ Provide a legend indicating the various landuse covers (a hatch shall be provided for each type of landuse).
    e. __X__ Provide a summary table indicating the sub-areas and their respective point of analysis, total area, and RCN.

**Stormwater Management Report:**

26. __X__ Provide information in the report in the following order:
    - a. __X__ Coverpage
    - b. __X__ Table of Contents
    - c. __X__ Site Narrative:
        - a. __X__ Introduction
        - b. __X__ Existing Conditions describing the drainage patterns, landuse(s), and existing features. Include 2007 site aerial, photos of site conditions and at all discharge locations.
        - c. __X__ Existing Soils description per the NRCS Web Soil Survey including the hydrologic soil group; and soil testing results from on-site soil testing.
        - d. __X__ Post Development Conditions, including summary of the proposed development, the proposed drainage system, indication of why the standards or performance approach was utilized, methods for RPv, Cv, and Fv compliance, requests for waivers and/or offsets, etc.
        - e. _____ Construction Site Conditions, describing methods to prevent sediment and pollution discharge and illicit transportation.
        - f. __X__ Conclusion
    - d. __X__ DURMM computations
    - e. __N/A__ Additional hydraulic and hydrologic computations, such as pond and discharge pipe/swale routings.
    - f. __N/A__ Supplementary Construction Site computations (i.e., temporary sediment basin design worksheet, anti-seep collar sizing, forebay sizing, etc).
    - g. __N/A__ Soil report(s) including boring locations and log reports.
    - h. __X__ Appendix containing any supplemental information (information previously included within the Stormwater Assessment Study report does not need to be duplicated).
27. __X__ Provide drainage calculations for the RPv, Cv, and Fv events using the latest DURMM model and other approved H&H software as required.
28. __X__ All inputted data must be supported by surveys, Lidar information, photos, aerials, maps, etc. and shall be referenced in the report and/or drainage area plans. Information previously included within the Stormwater Assessment Study submittal is acceptable and does not need to be duplicated.
29. __N/A__ All hydrologic computations shall be accomplished using the most recent version of USDA, Soil Conservation Service TR-20 or TR-55. The storm duration for computational purposes shall be the 24-hour rainfall event. For projects south of the Chesapeake and Delaware (C&D) Canal, the Delmarva Unit Hydrograph shall be used.
30. __X__ The pre-development condition shall be based off of the 2007 aerial photography provided by the State of Delaware, through the Delaware DataMIL and online GIS mapping. This may not directly correlate to current site conditions if the landuse has changed; however, the 2007 landuse shall be used regardless if more or less conservative than the current landuse.
31. __N/A__ The pre-development peak discharge rate shall be computed assuming that all land uses in the site to be developed are in good hydrologic conditions.

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**APPROVED:** _____

PROFESSIONAL ENGINEER DATE

## STORMWATER REPORT NARRATIVE

### a) Introduction

Merestone Consultants, Inc. has been contracted by the State of Delaware, DNREC to develop a Preliminary Sediment and Stormwater Plan including the necessary hydrologic and/or hydraulic computations for a Residential Example Site. The design will be performed in accordance with the proposed methodology of the *Revised* Delaware Sediment and Stormwater Regulations.

The site being utilized for the example is located west of Fenwick Island on Bayard Road in the Inland Bays, Little Assawoman Bay Watershed, Sussex County, Delaware. The parcel used for this endeavor is approximately 55 acres and has received preliminary plan approval by Sussex County as a 110 lot single-family residential development with amenities. The parcel is bound to the south by Batson Branch, a tributary of Dirickson Creek and is bisected by a north/south tax ditch prong of Batson Branch. Due to time and budgetary constraints, the scope of this project will be limited to the watershed areas draining into the north/south ditch with the Point of Interest (POI) for the H & H-1 Analysis being the terminus at Batson Creek.

The Department of Natural Resources and Environmental Control (Department) is responsible for the statewide implementation and supervision of the Delaware Sediment and Stormwater Program which is established by 7 **Del.C.** Ch. 40. In addition, the DNREC Sediment and Stormwater Program has been delegated the responsibility of implementing the Federal NPDES general permitting program for stormwater discharges associated with construction activities. All land development projects in Delaware which require a detailed Sediment and Stormwater Plan must also submit a Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity to DNREC in order to gain federal permit coverage.

The *Revised* Delaware Sediment and Stormwater Regulations require the Resource Protection Event Volume (RPv) of runoff, which is the volume generated by the 1-year 24-hour rainfall event, to be reduced through recharge or reuse. Recharge and reuse of the 10- and 100-year storm runoff volume must be maximized on sites as well.

All hydrologic computations shall be in accordance with Natural Resource Conservation Service (NRCS) methodologies. In addition, the Delmarva Unit Hydrograph shall be used for all projects south of the Chesapeake and Delaware (C&D) canal. Computations for estimating annual runoff shall be based on the methodologies from the Source Loading and Management Model (WinSLAMM). Any hydrologic or hydraulic software program proposed for performing computations to comply with the *Revised* Delaware Sediment & Stormwater Regulations must be endorsed by the Department. The USACE HEC-HMS and HEC-RAS software programs shall be used as the standards to resolve conflicting computational results between different software programs.

**Resource Protection Event**
The design parameter for the Resource Protection Event shall be the annualized runoff volume produced by a storm having a 99% probability of occurring annually (i.e., the 1-YR event) based on post-developed conditions.

**Conveyance Event**
The primary design parameter for the Conveyance Event shall be the additional runoff volume (above the RPv) produced by a storm having a 10% probability of occurring annually (i.e., the 10-YR event) based on post-developed conditions. The peak discharge may be considered a secondary design parameter under certain circumstances.

**Flooding Event**
The primary design parameter for the Flooding Event shall be the additional runoff volume (above the Cv) produced by a storm having a 1% probability of occurring annually (i.e., the 100-YR event) based on post-developed conditions. The peak discharge may be considered a secondary design parameter under certain circumstances.

The Conveyance Event volume (Cv) and the Flooding Event volume (Fv) shall be determined using the NRCS runoff equation. Peak discharge for the Conveyance and Flooding Events shall be based on the NRCS Type II, 24-HR design storm.

## b) Existing Site Conditions

### I. Land Use

This approximate 55-acre site is located on the west side of Bayard Road (County Road No. 384) north of Zion Church Road, in Sussex County, Delaware. Across Bayard Road to the east is the subdivision of the Hamlet at Dirickson Pond, a development containing 81 single-family units with a possible expansion to 90 lots pending Sussex County sewer availability. The Developer and owners, Mathew and Ira Brittingham, have applied for subdivision approval in accordance with the County's AR-1 Cluster Development Option and the requirements of Sussex County. The site lies within the County's Environmentally Sensitive District Overlay Zone.

This site has historically been farmed as agricultural lands, most recently in "straight -row" crops. The parcel is bound on the south by Batson Branch, a tributary of Dirickson Creek and is bisected by a tax ditch prong of Batson Branch that runs north/south. The most westerly portion of the site is forested as is the riparian areas adjacent to Batson Branch.

### II. Existing Features

Portions of the site lie within the 100 year floodplain, zone AE (elevation 5.0) as designated on the Flood Insurance Rate Map (FIRM) Number 10005C0635J, dated January 2005. Generally these areas are located within the stream banks of Batson Branch.

A wetlands reconnaissance survey by Ben Kulp of Merestone Consultants, Inc. has determined that approximately 5.8 acres of federal "404 non-tidal" wetlands exist within the parcel boundary. These areas have been delineated, located and are shown on the plan. The wetland area adjacent to Batson Branch appears to be a more significant palustrine forested riparian wetlands area which continues offsite. Land slopes of less than 2% characterize the majority of the site.

### III. Drainage Patterns

Generally, the land tends to slope to the existing tax and farm ditches before eventually entering Batson Branch. Batson Branch, a tributary of Dirickson Creek, drains to the east crossing under Bayard Road through twin 72-inch culverts. By all accounts, just east of Bayard Road, the creek becomes tidal. A portion of the easterly part of the site drains east towards Bayard Road and enters an existing 15-inch culvert under the road.

## c) Existing Soil Descriptions

There are areas onsite that are mapped as poorly drained soils with high seasonal water tables and may have limitations regarding development (see Web Soil Survey Exhibits for soil properties). Soils testing will be performed to determine the extent of these areas and appropriate stormwater, flood proofing and building techniques will be implemented in those areas. Most of the proposed lots are situated outside of the anticipated poor soils and all of the lots are situated outside of the floodplain area. The stormwater management and bulk grading design will insure that lot flooding from the regulatory design rainfall events will be avoided.

**Map Unit Legend**

**Sussex County, Delaware (DE005)**

| Map Unit Symbol | Map Unit Name | Hydrologic Soil Group | Percent % |
|---|---|---|---|
| HuA | Hurlock loamy sand, 0 to 2 percent slopes | B/D | 16.2 |
| LO | Longmarsh and Indiantown soils, frequently flooded | D | 7.1 |
| MuA | Mullica-Berryland complex, 0 to 2 percent slopes | B | 6.4 |
| PpA | Pepperbox loamy sand, 0 to 2 percent slopes | C | 16.8 |
| PsA | Pepperbox-Rosedale complex, 0 to 2 percent slopes | A/C | 30.7 |
| PsB | Pepperbox-Rosedale complex, 2 to 5 percent slopes | A/C | 2.9 |

Dual Hydrologic Soil Group (HSG) designations are representative of the drained/undrained condition. For calculation purposes the lower HSG classification has been used.

**Sussex County, Delaware**
**Description Category:** SOI

**Map Unit:** HmA—Hammonton loamy sand, 0 to 2 percent slopes

Hammonton component makes up 80 percent of the map unit. All areas are prime farmland. The assigned Kw erodibility factor is .15. This soil is moderately well drained. The slowest permeability within 60 inches is moderately rapid. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is none ponded. The top of the seasonal high water table is at 24 inches. There are no saline horizons. It is in the irrigated land capability class 2w. It is in nonirrigated land capability class 2w. This component is not a hydric soil.

**Map Unit:** HuA—Hurlock loamy sand, 0 to 2 percent slopes

Hurlock, undrained component, makes up 40 percent of the map unit. Farmland of statewide importance. The assigned Kw erodibility factor is .02. This soil is poorly drained. The slowest permeability within 60 inches is moderate. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is occasionally ponded. The top of the seasonal high water table is at 5 inches. There are no saline horizons. It is in nonirrigated land capability class 4w. This component is a hydric soil.

Hurlock, drained component, makes up 40 percent of the map unit. Farmland of statewide importance. The assigned Kw erodibility factor is .15. This soil is poorly drained. The slowest permeability within 60 inches is moderate. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is rarely ponded. The top of the seasonal high water table is at 14 inches. There are no saline horizons. It is in nonirrigated land capability class 3w. This component is a hydric soil.

**Map Unit:** KsA—Klej loamy sand, 0 to 2 percent slopes

Klej component makes up 70 percent of the map unit. Farmland of statewide importance. The assigned Kw erodibility factor is .10. This soil is somewhat poorly drained. The slowest permeability within 60 inches is moderate. Available water capacity is high and shrink swell potential is low. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. There are no saline horizons. It is in the irrigated land capability class 3w. It is in nonirrigated land capability class 3w. This component is not a hydric soil.

**Map Unit:** LO—Longmarsh and Indiantown soils, frequently flooded

Longmarsh component makes up 40 percent of the map unit. The assigned Kw erodibility factor is .02. This soil is very poorly drained. The slowest permeability within 60 inches is moderate. Available water capacity is very high and shrink swell potential is low. This soil is frequently flooded and is frequently ponded. The top of the seasonal high water table is at 5 inches. There are no saline horizons. It is in nonirrigated land capability class 5w. This component is a hydric soil.

Indiantown component makes up 40 percent of the map unit. The assigned Kw erodibility factor is .37. This soil is very poorly drained. The slowest permeability within 60 inches is moderate. Available water capacity is very high and shrink swell potential is low. This soil is frequently flooded and is frequently ponded. The top of the seasonal high water table is at 5 inches. There are no saline horizons. It is in nonirrigated land capability class 5w. This component is a hydric soil.

**Map Unit:** MuA—Mullica-Berryland complex, 0 to 2 percent slopes

Berryland, drained component, makes up 25 percent of the map unit. Prime farmland if drained. The assigned Kw erodibility factor is .10. This soil is very poorly drained. The slowest permeability within 60 inches is rapid. Available water capacity is high and shrink swell potential is low. This soil is not flooded and is rarely ponded. The top of the seasonal high water table is at 5 inches. There are no saline horizons. It is in the irrigated land capability class 2w. It is in nonirrigated land capability class 2w. This component is a hydric soil.

Mullica, drained component, makes up 25 percent of the map unit. Prime farmland if drained. The assigned Kw erodibility factor is .15. This soil is very poorly drained. The slowest permeability within 60 inches is moderately rapid. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is rarely ponded. The top of the seasonal high water table is at 5 inches. There are no saline horizons. It is in the irrigated land capability class 2w. It is in nonirrigated land capability class 2w. This component is a hydric soil.

Berryland, undrained component, makes up 15 percent of the map unit. Prime farmland if drained. The assigned Kw erodibility factor is .02. This soil is very poorly drained. The slowest permeability within 60 inches is rapid. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is frequently ponded. The top of the seasonal high water table is at 2 inches. There are no saline horizons. It is in nonirrigated land capability class 4w. This component is a hydric soil.

Mullica, undrained component, makes up 15 percent of the map unit. Prime farmland if drained. The assigned Kw erodibility factor is .02. This soil is very poorly drained. The slowest permeability within 60 inches is moderately rapid. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is frequently ponded. The top of the seasonal high water table is at 2 inches. There are no saline horizons. It is in nonirrigated land capability class 4w. This component is a hydric soil.

**Map Unit:** PpA—Pepperbox loamy sand, 0 to 2 percent slopes

Pepperbox component makes up 80 percent of the map unit. Prime farmland if irrigated. The assigned Kw erodibility factor is .15. This soil is moderately well drained. The slowest permeability within 60 inches is moderately slow. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is none ponded. The top of the seasonal high water table is at 24 inches. There are no saline horizons. It is in the irrigated land capability class 2w. It is in nonirrigated land capability class 2w. This component is not a hydric soil.

**Map Unit:** PsA—Pepperbox-Rosedale complex, 0 to 2 percent slopes

Rosedale component makes up 45 percent of the map unit. Prime farmland if irrigated. The assigned Kw erodibility factor is .10. This soil is well drained. The slowest permeability within 60 inches is moderate. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is none ponded. The top of the seasonal high water table is at 45 inches. There are no saline horizons. It is in the irrigated land capability class 2s. It is in nonirrigated land capability class 2s. This component is not a hydric soil.

Pepperbox component makes up 45 percent of the map unit. Prime farmland if irrigated. The assigned Kw erodibility factor is .15. This soil is moderately well drained. The slowest permeability within 60 inches is moderately slow. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is none ponded. The top of the seasonal high water table is at 24 inches. There are no saline horizons. It is in the irrigated land capability class 2w. It is in nonirrigated land capability class 2w. This component is not a hydric soil.

**Map Unit:** PsB—Pepperbox-Rosedale complex, 2 to 5 percent slopes

Pepperbox component makes up 45 percent of the map unit. Prime farmland if irrigated. The assigned Kw erodibility factor is .10. This soil is moderately well drained. The slowest permeability within 60 inches is moderately slow. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is none ponded. The top of the seasonal high water table is at 24 inches. There are no saline horizons. It is in the irrigated land capability class 2e. It is in nonirrigated land capability class 2e. This component is not a hydric soil.

Rosedale component makes up 45 percent of the map unit. Prime farmland if irrigated. The assigned Kw erodibility factor is .10. This soil is well drained. The slowest permeability within 60 inches is moderate. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is none ponded. The top of the seasonal high water table is at 45 inches. There are no saline horizons. It is in the irrigated land capability class 2e. It is in nonirrigated land capability class 2e. This component is not a hydric soil.

## d) Post-Development Conditions

### I. Proposed Development Features

The Developer and owners, Mathew and Ira Brittingham, have applied for subdivision approval in accordance with the County's AR-1 Cluster Development Option and the requirements of Sussex County. The site lies within the County's Environmentally Sensitive District Overlay Zone. The proposal is to develop the site with 110 single-family building lots, at a gross density of 1.99 units per acre, with a development community area, a perimeter walking trail and related site improvements in accordance with the concepts depicted on the Preliminary Subdivision Plan. By utilizing the County's Cluster Development Option the developer has been able to design the subdivision layout to provide for the protection of wetlands; provide for the preservation of all of the existing forested areas; maximize inter-connectivity within the community by utilizing sidewalks and pathways; and create community areas consisting of a club house and pool for social and recreational activities. The plan proposes to protect the wetland areas with no forest removal proposed for stormwater purposes. The plan proposes no disturbance to these

wetland areas other than one (1) roadway crossing necessary to provide access to proposed lots. No wetlands exist within any lot boundaries.

**II. Drainage System Overview**

The community will be serviced with centralized public sewer and water. The County, through the subdivision review process, required the Developer to provide sidewalks on both sides of the streets. This in conjunction with flat land slopes and seasonal high groundwater conditions has required us to opt for a curb & gutter street section with closed drainage system over an open-swaled road section.

**III. RPv, Cv & Fv Compliance Rationale**

The Resource Protection volume (RPv) for the subareas, draining to the Point of Interest (POI), were calculated using DURMMv2. The drainage areas under the scope of this project consist of 12 subareas that total 18.76 acres within the site's LOD. Generally, the RPv will be managed through impervious disconnection and filter strips for most of the rear lot drainage. Front lot and street drainage will be collected and treated in dry, extended detention basins. A small bio-retention area (with underdrain) will be utilized for the community area. The composite runoff reduction for the RPv event is achieved at the common POI as required by the *Revised* Regulations.

It appears that instituting peak discharge controls and quantity management would exacerbate downstream flooding due to the site's geographic location within the watershed and therefore a Performance Based approach utilizing Hydrologic & Hydraulic (H&H) Level-1 Analysis was chosen to determine compliance with the *Revised* Regulations. The Hydrologic & Hydraulic (H&H) Analysis couples field collected data with desktop watershed modeling methodology to provide a tool for stormwater management agencies to help determine the most appropriate method to manage stormwater runoff from developing sites based on "No Adverse Impact" principles.

Land Use & Soil Descriptions; Watershed Statistics; and Peak Flow estimates were calculated for the upstream (offsite) watershed area contributing to the north/south tax ditch prong utilizing GISHydro (Release Version Date May 1, 2008). A composite Runoff Curve Number (RCN) was calculated from the DURMM results for the subareas within and outside the LOD that drain to the POI and a representative time of concentration was calculated using the SCS Method. A HEC-HMS analysis was performed for both the Conveyance Event Cv & Flooding Event (Fv). In both instances it was determined that the developed site hydrograph is less than, and the inflection point occurs before, the peak of the upstream hydrograph indicating that the site is in compliance with the *Revised* Regulations for both the Cv & Fv events.

**IV. Waivers and/or Offsets**

**None Proposed.**

## e) Construction Site Conditions {Intentionally Left Blank}

## f) Conclusion

It is my belief the plan provides for an element of creativity in regards to design concepts which provides a superior design over and above a standard lot development option while affording a degree of protection of significant natural features and resources and therefore satisfactorily complies with the *Revised* Regulations. By utilizing the County's Cluster Development Option the developer has been able to design the subdivision layout to provide for the protection of streams, wetlands and riparian areas; and provides for the preservation of all of forested areas (100 percent).

The use of Green Technology BMP's including impervious disconnection, filter strips, extended detention basins

and bio-retention will be incorporated into the overall stormwater management strategy reducing pollutants such as TSS, nitrogen and phosphorus prior to reaching receiving waters and wetlands. A significant riparian buffer adjacent to Batson Creek of widths greater then100 feet will be protected and left in its natural state. Even though the site soils are poorly drained and there is a high seasonal water table; these techniques will reduce the runoff volume generated by the Resource Protection Event Volume (RPv) through recharge or reuse and the site meets the requirements of the *Revised* Regulations. The result of volume management over peak discharge management system is a more stable stream system that does not experience the prolonged, eroding flows. In addition, the problem with increased hydrograph volume coinciding with peak discharges and exasperating downstream flooding is minimized.

A Performance Based approach utilizing Hydrologic & Hydraulic (H&H) Level-1 Analysis was performed to determine the impacts of the post-developed site on the timing and hydrograph volume of the upstream watershed contributing to the tax ditch prong (POI – "A"). It was determined that instituting peak discharge controls and quantity management would exacerbate downstream flooding due to the site's geographic location within the watershed. The developed site hydrograph peak is less than, and the inflection point occurs before, the peak of the upstream hydrograph and therefore the site complies with the *Revised* Regulations regarding "No Adverse Impact".

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 1A |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**CONTRIBUTING AREA RUNOFF CURVE NUMBER (C.A. RCN) WORKSHEET**

| Cover Type | Treatment | Hydrologic Condition | Curve Numbers for Hydrologic Soil Type A Acres | A RCN | B Acres | B RCN | C Acres | C RCN | D Acres | D RCN |
|---|---|---|---|---|---|---|---|---|---|---|
| **CULTIVATED AGRICULTURAL LANDS** | | | | | | | | | | |
| Fallow | Bare soil | ---- | | 77 | | 86 | | 91 | | 94 |
| | Crop residue (CR) | poor | | 76 | | 85 | | 90 | | 93 |
| | Crop residue (CR) | good | | 74 | | 83 | | 88 | | 90 |
| Row Crops | Straight row (SR) | poor | | 72 | | 81 | | 88 | | 91 |
| | Straight row (SR) | good | | 67 | | 78 | | 85 | | 89 |
| | SR + Crop residue | poor | | 71 | | 80 | | 87 | | 90 |
| | SR + Crop residue | good | | 64 | | 75 | | 82 | | 85 |
| | Contoured (C) | poor | | 70 | | 79 | | 84 | | 88 |
| | Contoured (C) | good | | 65 | | 75 | | 82 | | 86 |
| | C + Crop residue | poor | | 69 | | 78 | | 83 | | 87 |
| | C + Crop residue | good | | 64 | | 74 | | 81 | | 85 |
| | Cont & terraced(C&T) | poor | | 66 | | 74 | | 80 | | 82 |
| | Cont & terraced(C&T) | good | | 62 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 65 | | 73 | | 79 | | 81 |
| | C&T + Crop residue | good | | 61 | | 70 | | 77 | | 80 |
| Small Grain | Straight row (SR) | poor | | 65 | | 76 | | 84 | | 88 |
| | Straight row (SR) | good | | 63 | | 75 | | 83 | | 87 |
| | SR + Crop residue | poor | | 64 | | 75 | | 83 | | 86 |
| | SR + Crop residue | good | | 60 | | 72 | | 80 | | 84 |
| | Contoured (C) | poor | | 63 | | 74 | | 82 | | 85 |
| | Contoured (C) | good | | 61 | | 73 | | 81 | | 84 |
| | C + Crop residue | poor | | 62 | | 73 | | 81 | | 84 |
| | C + Crop residue | good | | 60 | | 72 | | 80 | | 83 |
| | Cont & terraced(C&T) | poor | | 61 | | 72 | | 79 | | 82 |
| | Cont & terraces(C&T) | good | | 59 | | 70 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 60 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | good | | 58 | | 69 | | 77 | | 80 |
| Close-seeded | Straight row | poor | | 66 | | 77 | | 85 | | 89 |
| or broadcast | Straight row | good | | 58 | | 72 | | 81 | | 85 |
| legumes or | Contoured | poor | | 64 | | 75 | | 83 | | 85 |
| rotation | Contoured | good | | 55 | | 69 | | 78 | | 83 |
| meadow | Cont & terraced | poor | | 63 | | 73 | | 80 | | 83 |
| | Cont & terraced | good | | 51 | | 67 | | 76 | | 80 |
| **OTHER AGRICULTURAL LANDS** | | | | | | | | | | |
| | Pasture, grassland or range | poor | | 68 | | 79 | | 86 | | 89 |
| | | fair | | 49 | | 69 | | 79 | | 84 |
| | | good | | 39 | | 61 | | 74 | | 80 |
| | Meadow -cont. grass (non grazed) | ---- | | 30 | | 58 | | 71 | | 78 |
| | Brush - brush, weed, grass mix | poor | | 48 | | 67 | | 77 | | 83 |
| | | fair | | 35 | | 56 | | 70 | | 77 |
| | | good | | 30 | | 48 | | 65 | | 73 |
| | Woods - grass combination | poor | | 57 | | 73 | | 82 | | 86 |
| | | fair | | 43 | | 65 | | 76 | | 82 |
| | | good | | 32 | | 58 | | 72 | | 79 |
| | Woods | poor | | 45 | | 66 | | 77 | | 83 |
| | | fair | | 36 | | 60 | | 73 | | 79 |
| | | good | | 30 | | 55 | | 70 | | 77 |
| | Farmsteads | ---- | | 59 | | 74 | | 82 | | 86 |
| **FULLY DEVELOPED URBAN AREAS (Veg Established)** | | | | | | | | | | |
| Open space (Lawns,parks etc.) | | | | | | | | | | |
| | Poor condition; grass cover < 50% | | | 68 | | 79 | | 86 | | 89 |
| | Fair condition; grass cover 50% to 75 % | | | 49 | | 69 | | 79 | | 84 |
| | Good condition; grass cover > 75% | | | 39 | | 61 | 0.24 | 74 | 0.25 | 80 |
| Impervious Areas | | | | | | | | | | |
| | Paved parking lots, roofs, driveways | | | 98 | | 98 | 0.07 | 98 | 0.06 | 98 |
| | Streets and roads | | | | | | | | | |
| | Paved; curbs and storm sewers | | | 98 | | 98 | | 98 | | 98 |
| | Paved; open ditches (w/right-of-way) | | | 83 | | 89 | | 92 | | 93 |
| | Gravel (w/ right-of-way) | | | 76 | | 85 | | 89 | | 91 |
| | Dirt (w/ right-of-way) | | | 72 | | 82 | | 87 | | 89 |
| Urban Districts | | Avg % impervious | | | | | | | | |
| | Commercial & business | 85 | | 89 | | 92 | | 94 | | 95 |
| | Industrial | 72 | | 81 | | 88 | | 91 | | 93 |
| Residential districts by average lot size | | Avg % impervious | | | | | | | | |
| | 1/8 acre (town houses) | 65 | | 77 | | 85 | | 90 | | 92 |
| | 1/4 acre | 38 | | 61 | | 75 | | 83 | | 87 |
| | 1/3 acre | 30 | | 57 | | 72 | | 81 | | 86 |
| | 1/2 acre | 25 | | 54 | | 70 | | 80 | | 85 |
| | 1 acre | 20 | | 51 | | 68 | | 79 | | 84 |
| | 2 acre | 12 | | 46 | | 65 | | 77 | | 82 |
| **DEVELOPING URBAN AREA (No Vegetation)** | | | | | | | | | | |
| | Newly graded area (pervious only) | | | 77 | | 86 | | 91 | | 94 |
| **USER DEFINED** | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| Subarea Contributing Area per Soil Type (ac) | A | B | C | D |
|---|---|---|---|---|
| | 0 | 0 | 0.31 | 0.31 |

**UPSTREAM CONTRIBUTING AREAS**

| | Subarea ID | Acres | RCN |
|---|---|---|---|
| Upstream Contributing Area 1 | | | |
| Upstream Contributing Area 2 | | | |
| Upstream Contributing Area 3 | | | |
| Upstream Contributing Area 4 | | | |

| | |
|---|---|
| **Total Contributing Area (ac)** | **0.62** |
| **Weighted Runoff Curve Number (RCN)** | **81** |

**County**

Kent
New Castle
Sussex

**Unit Hydrograph**

DMV
STD

Effective April 2016

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 1A |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**LIMIT OF DISTURBANCE (LOD) WORKSHEET**

| **Step 1 - Subarea LOD Data** | **HSG A** | **HSG B** | **HSG C** | **HSG D** |
|---|---|---|---|---|
| 1.1 HSG Area Within LOD (ac) | | | 0.31 | 0.31 |
| 1.2 Pre-Developed Woods/Meadow Within LOD (ac) | | | | |
| 1.3 Pre-Developed Impervious Within LOD (ac) | | | | |
| 1.4.a Post-Developed Imperviousness Within LOD, Option #1 (ac); ***OR*** | | | 0.07 | 0.06 |
| 1.4.b Post-Developed Imperviousness Within LOD, Option #2 (%) | 0% | 0% | 23% | 19% |

| **Step 2 - Subarea LOD Runoff Calculations** | | | | |
|---|---|---|---|---|
| 2.1 RCN per HSG | 0.00 | 0.00 | 79.42 | 83.48 |
| 2.2 RPv per HSG (in.) | 0.00 | 0.00 | 1.36 | 1.57 |
| 2.3 Target Runoff per HSG (in.) | 0.00 | 0.00 | 1.10 | 1.39 |
| 2.4 Cv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 0.75 | 0.75 |
| 2.5 Fv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 2.25 | 2.25 |
| 2.6 Subarea LOD (ac) | 0.62 | | | |
| 2.7 Subarea Weighted RCN | 81.45 | | | |
| 2.8 Subarea Weighted RPv (in.) | 1.47 | | | |
| 2.9 Subarea Weighted Target Runoff (in.) | 1.25 | | | |

RPv Target Runoff (in.)

| Soil | Woods |
|---|---|
| HSG A | 0.00 |
| HSG B | 0.12 |
| HSG C | 0.55 |
| HSG D | 0.87 |

| **Step 3 - Upstream LOD Areas** *(from previous DURMM Report as applicable)* | **Area 1** | **Area 2** | **Area 3** | **Area 4** |
|---|---|---|---|---|
| 3.1 Upstream Subarea ID | | | | |
| 3.2 Upstream LOD Area (ac) | | | | |
| 3.3 Target Runoff for Upstream Area (in.) | | | | |
| 3.4 Adjusted CN after all reductions | | | | |
| 3.5 Adjusted RPv (in.) | | | | |
| 3.6 Adjusted Cv (in.) | | | | |
| 3.7 Adjusted Fv (in.) | | | | |

Cv/Fv Unit Discharge

Woodland/Meadow (HSG A)
10-YR: 0 cfs/ac
100-YR: 0.25 cfs/ac

Woodland/Meadow (HSG B,C,D)
10-YR: 0.375 cfs/ac
100-YR: 1.25 cfs/ac

Non-Woodland/Non-Meadow
10-YR: 0.75 cfs/ac
100-YR: 2.25 cfs/ac

| **Step 4 - RPv Calculations for Combined LOD** | |
|---|---|
| 4.1 Combined LOD (ac) | 0.62 |
| 4.2 Weighted RCN | 81.45 |
| 4.3 Weighted RPv (in.) | 1.47 |
| 4.4 Weighted Target Runoff (in.) | 1.25 |
| 4.5 Estimated Annual Runoff (in.) | 19.51 |
| 4.6 Req'd Runoff Reduction within LOD (in.) | 0.22 |
| 4.7 Req'd Runoff Reduction within LOD (%) | 15% |

| **Step 5 - Cv Unit Discharge** | |
|---|---|
| 5. LOD Allowable Unit Discharge (cfs/ac) | 0.75 |

| **Step 6 - Fv Unit Discharge** | |
|---|---|
| 6. LOD Allowable Unit Discharge (cfs/ac) | 2.25 |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 1A
**LOCATION (County):** Sussex

**RESOURCE PROTECTION EVENT (RPv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Impervious disconnection | Type | Filter strip | Type | -- | Type | -- | Type | -- |
| ***Step 1 - Calculate Initial RPv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 0.62 | | 0.62 | | 0.62 | | 0.62 | | 0.62 | |
| 1.2 *Reserved* | | | | | | | | | | |
| 1.3 Initial RCN | 81.45 | | | | | | | | | |
| 1.4 RPv for Contributing Area (in.) | 1.47 | | | | | | | | | |
| 1.5 Req'd RPv Reduction for Contributing Area (in.) | 0.22 | | | | | | | | | |
| 1.6 Req'd RPv Reduction for Contributing Area (%) | 15% | | | | | | | | | |
| 1.7 RPv allowable discharge rate (cfs) | 0.04 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | | | | | | | | | | |
| 2.2 Retention reduction allowance (%) | 0% | | 0% | | N/A | | N/A | | N/A | |
| 2.3 Retention reduction volume (ac-ft) | 0.00 | | 0.00 | | N/A | | N/A | | N/A | |
| 2.4 Retention reduction volume (in.) | 0.00 | | 0.00 | | N/A | | N/A | | N/A | |
| 2.5 Runoff volume after retention reduction (in.) | 1.47 | | 1.34 | | N/A | | N/A | | N/A | |
| 2.6 Adjusted CN* | 81.49 | | 79.04 | | N/A | | N/A | | N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Annual CN (ACN) | 81.45 | | 79.04 | | N/A | | N/A | | N/A | |
| 3.2 Annual runoff (in.) | 19.51 | | 17.56 | | N/A | | N/A | | N/A | |
| 3.3 Proportion A/B soils in BMP footprint (%) | | | | | | | | | | |
| 3.4 Annual runoff reduction allowance (%) | 10% | | 15% | | N/A | | N/A | | N/A | |
| 3.5 Annual runoff after reduction (in.) | 17.56 | | 14.92 | | N/A | | N/A | | N/A | |
| 3.6 Adjusted ACN | 79.04 | | 75.45 | | N/A | | N/A | | N/A | |
| 3.7 Annual Runoff Reduction Allowance for RPv (in.) | 0.13 | | 0.30 | | N/A | | N/A | | N/A | |
| ***Step 4 - Calculate RPv with BMP Reductions*** | | | | | | | | | | |
| 4.1 RPv runoff volume after all reductions (in.) | 1.34 | | 1.16 | | N/A | | N/A | | N/A | |
| 4.2 Total RPv runoff reduction (in.) | 0.13 | | 0.30 | | N/A | | N/A | | N/A | |
| 4.3 Total RPv runoff reduction (%) | 9% | | 21% | | N/A | | N/A | | N/A | |
| 4.4 Adjusted CN after all reductions | 79.04 | | 75.45 | | N/A | | N/A | | N/A | |
| 4.5 Equivalent TR-55 RCN for H&H modeling | 84.98 | | 82.27 | | N/A | | N/A | | N/A | |
| 4.6 Req'd reduction met? | No | | OK | | N/A | | N/A | | N/A | |
| ***Step 5 - Determine Runoff Reduction Offset*** | | | | | | | | | | |
| 5.1 Runoff Reduction Shortfall (in.) | 0.09 | | N/A | | N/A | | N/A | | N/A | |
| 5.2 Runoff Reduction Shortfall (cu.ft./ac) | 339 | | N/A | | N/A | | N/A | | N/A | |
| 5.3 Total Offset Volume (cu.ft.) | 210 | | N/A | | N/A | | N/A | | N/A | |

**DURMM BMP Name**

--
Infiltration w/sand or vegetation
Infiltration w/o sand or vegetation
Bioretention w/underdrain
Permeable pave w/sand or vegetation
Permeable pave w/o sand or vegetation
Vegetated roof
Rainwater harvesting
Impervious disconnection
Bioswale
Vegetated open channel
Filter strip
Riparian forest buffer
Urban tree planting
Soil amendment
Sheetflow to turf open space
Sheetflow to forest open space
Wet swale
Ephemeral wetland
--
Dry ED basin
Dry detention pond
Hydrodynamic structure
Urban filtering practice
Wet pond
Constructed wetland
--
Nutrient management
Street sweeping
--
Urban stream restoration

Effective April 2016

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 1A
**LANDUSE TYPE:** Residential
**TMDL WATERSHED:** Little Assawoman Bay

## TOTAL MAXIMUM DAILY LOAD (TMDL) WORKSHEET

| | BMP 1 | | | | BMP 2 | | | | BMP 3 | | | | BMP 4 | | | | BMP 5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Impervious disconnection | | | Type: | Filter strip | | | Type: | -- | | | Type: | -- | | | Type: | -- | | |
| ***Step 1 - Calculate Annual Runoff Volume*** | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS |
| 1.1 Total contributing area to BMP (ac) | 0.62 | | | | | | | | | | | | | | | | | | | |
| 1.2 Initial RCN | 81 | | | | | | | | | | | | | | | | | | | |
| 1.3 Annual runoff volume (in.) | 19.51 | | | | | | | | | | | | | | | | | | | |
| 1.4 Annual runoff volume (liters) | 1.24E+06 | | | | | | | | | | | | | | | | | | | |
| ***Step 2 - Calculate Annual Pollutant Load*** | | | | | | | | | | | | | | | | | | | | |
| 2.1 EMC (mg/L) | | 2.00 | 0.27 | 60 | | | | | | | | | | | | | | | | |
| 2.2 Load (mg/yr) | | 2.49E+06 | 3.36E+05 | 7.46E+07 | | | | | | | | | | | | | | | | |
| 2.4 Stormwater Load (lb/ac/yr) | | 8.84 | 1.19 | 265 | | 7.96 | 1.07 | 239 | | 6.76 | 0.91 | 203 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 3 - Adjust for Runoff Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 3.1 BMP Runoff Reduction (%) | 10% | | | | 15% | | | | N/A | | | | N/A | | | | N/A | | | |
| 3.2 BMP Removal Efficiency (%) | | 10% | 10% | 10% | | 15% | 15% | 15% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 3.3 Adjusted load (lb/ac/yr) | | 7.96 | 1.07 | 239 | | 6.76 | 0.91 | 203 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 4 - Calculate Pollutant Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 4.1 TMDL (lb/ac/yr) | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A |
| 4.2 Reduction met? | | No | No | OK | | No | No | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK |
| ***Step 5 - Determine TMDL Offset*** | | | | | | | | | | | | | | | | | | | | |
| 5.1 TMDL Shortfall (lb/ac/yr) | | 2.26 | 0.84 | 0 | | 1.06 | 0.68 | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 |
| 5.2 TMDL Shortfall (%) | | 28% | 79% | 0% | | 16% | 75% | 0% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.3 Residual RPv Volume (in) | | 1.34 | 1.34 | 1.34 | | 1.16 | 1.16 | 1.16 | | N/A | N/A | N/A | | N/A | N/A | N/A | | N/A | N/A | N/A |
| 5.4 Req'd Additional RR to meet TMDL (in)* | | 0.38 | 1.05 | 0.00 | | 0.18 | 0.87 | 0.00 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.5 Req'd Additional RR to meet TMDL (cu.ft./ac) | | 1379 | 3819 | 0 | | 665 | 3161 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.6 Total Offset Volume (cu.ft.) | | 855 | 2368 | 0 | | 412 | 1960 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 1A
**LOCATION (County):** Sussex

**CONVEYANCE EVENT (Cv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Impervious disconnection | Type: | Filter strip | Type: | -- | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Cv*** | **Data** | | **Data** | | **Data** | | **Data** | | **Data** | |
| 1.1 Total contributing area to BMP (ac) | 0.62 | | 0.62 | | 0.62 | | 0.62 | | 0.62 | |
| 1.2 Initial RCN | 81.45 | | | | | | | | | |
| 1.3 **10-YR** Rainfall (in.) | 5.3 | | | | | | | | | |
| 1.4 Cv runoff volume (in.) | 3.30 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 0.75 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | 0.00 | | | | | | | | | |
| 1.7 Cv allowable discharge rate (cfs) | 0.47 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 3.30 | | 3.23 | | 3.16 | | #N/A | | #N/A | |
| 2.5 CN* | 81.45 | | 80.77 | | 80.09 | | #N/A | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 2% | | 2% | | #N/A | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 3.23 | | 3.16 | | #N/A | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 80.77 | | 80.09 | | #N/A | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.07 | | 0.13 | | #N/A | | #N/A | | #N/A | |
| ***Step 4 - Calculate Cv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Cv runoff volume after all reductions (in.) | 3.23 | | 3.16 | | #N/A | | #N/A | | #N/A | |
| 4.2 Total Cv runoff reduction (%) | 2% | | 4% | | #N/A | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 80.77 | | 80.09 | | #N/A | | #N/A | | #N/A | |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 1A
**LOCATION (County):** Sussex

**FLOODING EVENT (Fv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Impervious disconnection | Type: | Filter strip | Type: | -- | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Fv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 0.62 | | 0.62 | | 0.62 | | 0.62 | | 0.62 | |
| 1.2 Initial RCN | 81.45 | | | | | | | | | |
| 1.3 **100-YR** Rainfall (in.) | 9.2 | | | | | | | | | |
| 1.4 Fv runoff volume (in.) | 6.94 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 2.25 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | 0.00 | | | | | | | | | |
| 1.7 Fv allowable discharge rate (cfs) | 1.40 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 6.94 | | 6.94 | | 6.94 | | #N/A | | #N/A | |
| 2.5 CN* | 81.45 | | 81.45 | | 81.45 | | #N/A | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 0% | | 0% | | #N/A | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 6.94 | | 6.94 | | #N/A | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 81.45 | | 81.45 | | #N/A | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.00 | | 0.00 | | #N/A | | #N/A | | #N/A | |
| ***Step 4 - Calculate Fv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Fv runoff volume after all reductions (in.) | 6.94 | | 6.94 | | #N/A | | #N/A | | #N/A | |
| 4.2 Total Fv runoff reduction (%) | 0% | | 0% | | #N/A | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 81.45 | | 81.45 | | #N/A | | #N/A | | #N/A | |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 1A |
| **TMDL Watershed:** | Little Assawoman Bay |

**DURMM OUTPUT WORKSHEET**

DURMM v2.beta.110802

***Site Data***

| | | | | | |
|---|---|---|---|---|---|
| Contributing Area to BMPs (ac.) | 0.62 | | | | |
| C.A. RCN | 81 | | | | |
| Subarea LOD (ac.) | 0.62 | | | | |
| Upstream Subarea ID | 0 | 0 | 0 | 0 | |
| Upstream Subarea LOD (ac.) | 0.00 | 0.00 | 0.00 | 0.00 | |
| Combined LOD with Upstream Areas (ac.) | 0.62 | | | | |
| Combined RCN with Upstream Areas (ac.) | 81.45 | | | | |
| TMDL-TN (lb/ac/yr) | 5.70 | | | | |
| TMDL-TP (lb/ac/yr) | 0.23 | | | | |
| TMDL-TSS (lb/ac/yr) | N/A | | | | |

| BMP Selection | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| | Impervious disconnection | Filter strip | -- | -- | -- |

***Resource Protection Event (RPV)***

| | | | | | |
|---|---|---|---|---|---|
| RPv for Contributing Area (in.) | 1.47 | | | | |
| Req'd RPv Reduction for Contributing Area (in.) | 0.22 | | | | |
| Req'd RPv Reduction for Contributing Area (%) | 15% | | | | |
| C.A. allowable discharge rate (cfs) | 0.04 | | | | |
| Unmanaged Polluant load, TN (lbs/ac/yr) | 8.84 | | | | |
| Unmanaged Polluant load, TP (lbs/ac/yr) | 1.19 | | | | |
| Unmanaged Polluant load, TSS (lbs/ac/yr) | 265 | | | | |

| BMP Runoff Reduction Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| RPv runoff volume after all reductions (in.) | 1.34 | 1.16 | N/A | N/A | N/A |
| Total RPv runoff reduction (in.) | 0.13 | 0.30 | N/A | N/A | N/A |
| Total RPv runoff reduction (%) | 9% | 0.21 | N/A | N/A | N/A |
| Req'd runoff reduction met? | No | OK | N/A | N/A | N/A |

| BMP TMDL Performance | | | | | |
|---|---|---|---|---|---|
| Adjusted pollutant load, TN (lb/ac/yr) | 7.96 | 6.76 | #N/A | #N/A | #N/A |
| Adjusted pollutant load, TP (lb/ac/yr) | 1.07 | 0.91 | #N/A | #N/A | #N/A |
| Adjusted pollutant load, TSS (lb/ac/yr) | 239 | 203 | #N/A | #N/A | #N/A |
| Offsets Requirements | | | | | |
| RPv Offset (cu. ft.) | 210 | N/A | N/A | N/A | N/A |

***Conveyance Event (Cv)***

| | | | | | |
|---|---|---|---|---|---|
| Cv runoff volume (in.) | 3.30 | | | | |
| Stds-based allowable discharge (cfs) | 0.47 | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Cv runoff volume after all reductions (in.) | 3.23 | 3.16 | #N/A | #N/A | #N/A |

***Flooding Event (Fv)***

| | | | | | |
|---|---|---|---|---|---|
| Fv runoff volume (in.) | 6.94 | | | | |
| Stds-based allowable discharge (cfs) | 1.40 | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Fv runoff volume after all reductions (in.) | 6.94 | 6.94 | #N/A | #N/A | #N/A |

***Adjusted Subarea Data for Downstream DURMM Modeling***

| | |
|---|---|
| Contributing Area (ac.) | 0.62 |
| C.A. RCN | 81 |
| LOD Area (ac.) | 0.62 |
| Weighted Target Runoff (in.) | 1.25 |
| Adjusted CN after all reductions | 75.45 |
| Adjusted RPv (in.) | 1.16 |
| Adjusted Cv (in.) | |
| Adjusted Fv (in.) | |

***Adjusted Subarea Data for H&H Modeling***

| | Rain (in.) | RCN |
|---|---|---|
| Resource Protection Event, RPv | 2.7 | N/A |
| Conveyance Event, Cv | 5.3 | 80.09 |
| Flooding Event, Fv | 9.2 | 81.45 |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 1A+1B |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**CONTRIBUTING AREA RUNOFF CURVE NUMBER (C.A. RCN) WORKSHEET**

| Cover Type | Treatment | Hydrologic Condition | Curve Numbers for Hydrologic Soil Type A Acres | A RCN | B Acres | B RCN | C Acres | C RCN | D Acres | D RCN |
|---|---|---|---|---|---|---|---|---|---|---|
| **CULTIVATED AGRICULTURAL LANDS** | | | | | | | | | | |
| Fallow | Bare soil | ---- | | 77 | | 86 | | 91 | | 94 |
| | Crop residue (CR) | poor | | 76 | | 85 | | 90 | | 93 |
| | Crop residue (CR) | good | | 74 | | 83 | | 88 | | 90 |
| Row Crops | Straight row (SR) | poor | | 72 | | 81 | | 88 | | 91 |
| | Straight row (SR) | good | | 67 | | 78 | | 85 | | 89 |
| | SR + Crop residue | poor | | 71 | | 80 | | 87 | | 90 |
| | SR + Crop residue | good | | 64 | | 75 | | 82 | | 85 |
| | Contoured (C) | poor | | 70 | | 79 | | 84 | | 88 |
| | Contoured (C) | good | | 65 | | 75 | | 82 | | 86 |
| | C + Crop residue | poor | | 69 | | 78 | | 83 | | 87 |
| | C + Crop residue | good | | 64 | | 74 | | 81 | | 85 |
| | Cont & terraced(C&T) | poor | | 66 | | 74 | | 80 | | 82 |
| | Cont & terraced(C&T) | good | | 62 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 65 | | 73 | | 79 | | 81 |
| | C&T + Crop residue | good | | 61 | | 70 | | 77 | | 80 |
| Small Grain | Straight row (SR) | poor | | 65 | | 76 | | 84 | | 88 |
| | Straight row (SR) | good | | 63 | | 75 | | 83 | | 87 |
| | SR + Crop residue | poor | | 64 | | 75 | | 83 | | 86 |
| | SR + Crop residue | good | | 60 | | 72 | | 80 | | 84 |
| | Contoured (C) | poor | | 63 | | 74 | | 82 | | 85 |
| | Contoured (C) | good | | 61 | | 73 | | 81 | | 84 |
| | C + Crop residue | poor | | 62 | | 73 | | 81 | | 84 |
| | C + Crop residue | good | | 60 | | 72 | | 80 | | 83 |
| | Cont & terraced(C&T) | poor | | 61 | | 72 | | 79 | | 82 |
| | Cont & terraces(C&T) | good | | 59 | | 70 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 60 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | good | | 58 | | 69 | | 77 | | 80 |
| Close-seeded | Straight row | poor | | 66 | | 77 | | 85 | | 89 |
| or broadcast | Straight row | good | | 58 | | 72 | | 81 | | 85 |
| legumes or | Contoured | poor | | 64 | | 75 | | 83 | | 85 |
| rotation | Contoured | good | | 55 | | 69 | | 78 | | 83 |
| meadow | Cont & terraced | poor | | 63 | | 73 | | 80 | | 83 |
| | Cont & terraced | good | | 51 | | 67 | | 76 | | 80 |
| **OTHER AGRICULTURAL LANDS** | | | | | | | | | | |
| | Pasture, grassland or range | poor | | 68 | | 79 | | 86 | | 89 |
| | | fair | | 49 | | 69 | | 79 | | 84 |
| | | good | | 39 | | 61 | | 74 | | 80 |
| | Meadow -cont. grass (non grazed) | ---- | | 30 | | 58 | | 71 | | 78 |
| | Brush - brush, weed, grass mix | poor | | 48 | | 67 | | 77 | | 83 |
| | | fair | | 35 | | 56 | | 70 | | 77 |
| | | good | | 30 | | 48 | | 65 | | 73 |
| | Woods - grass combination | poor | | 57 | | 73 | | 82 | | 86 |
| | | fair | | 43 | | 65 | | 76 | | 82 |
| | | good | | 32 | | 58 | | 72 | | 79 |
| | Woods | poor | | 45 | | 66 | | 77 | | 83 |
| | | fair | | 36 | | 60 | | 73 | | 79 |
| | | good | | 30 | | 55 | | 70 | | 77 |
| | Farmsteads | ---- | | 59 | | 74 | | 82 | | 86 |
| **FULLY DEVELOPED URBAN AREAS (Veg Established)** | | | | | | | | | | |
| Open space (Lawns,parks etc.) | | | | | | | | | | |
| | Poor condition; grass cover < 50% | | | 68 | | 79 | | 86 | | 89 |
| | Fair condition; grass cover 50% to 75 % | | | 49 | | 69 | | 79 | | 84 |
| | Good condition; grass cover > 75% | | | 39 | | 61 | 0.74 | 74 | 0.31 | 80 |
| Impervious Areas | | | | | | | | | | |
| | Paved parking lots, roofs, driveways | | | 98 | | 98 | 0.56 | 98 | 0.06 | 98 |
| | Streets and roads | | | | | | | | | |
| | Paved; curbs and storm sewers | | | 98 | | 98 | | 98 | | 98 |
| | Paved; open ditches (w/right-of-way) | | | 83 | | 89 | | 92 | | 93 |
| | Gravel (w/ right-of-way) | | | 76 | | 85 | | 89 | | 91 |
| | Dirt (w/ right-of-way) | | | 72 | | 82 | | 87 | | 89 |
| Urban Districts | | Avg % impervious | | | | | | | | |
| | Commercial & business | 85 | | 89 | | 92 | | 94 | | 95 |
| | Industrial | 72 | | 81 | | 88 | | 91 | | 93 |
| Residential districts by average lot size | | Avg % impervious | | | | | | | | |
| | 1/8 acre (town houses) | 65 | | 77 | | 85 | | 90 | | 92 |
| | 1/4 acre | 38 | | 61 | | 75 | | 83 | | 87 |
| | 1/3 acre | 30 | | 57 | | 72 | | 81 | | 86 |
| | 1/2 acre | 25 | | 54 | | 70 | | 80 | | 85 |
| | 1 acre | 20 | | 51 | | 68 | | 79 | | 84 |
| | 2 acre | 12 | | 46 | | 65 | | 77 | | 82 |
| **DEVELOPING URBAN AREA (No Vegetation)** | | | | | | | | | | |
| | Newly graded area (pervious only) | | | 77 | | 86 | | 91 | | 94 |
| **USER DEFINED** | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | **Subarea Contributing Area per Soil Type (ac)** | | 0 | | 0 | | 1.3 | | 0.37 | |

**UPSTREAM CONTRIBUTING AREAS**

| | Subarea ID | Acres | RCN |
|---|---|---|---|
| Upstream Contributing Area 1 | 1A | 0.62 | 81 |
| Upstream Contributing Area 2 | | | |
| Upstream Contributing Area 3 | | | |
| Upstream Contributing Area 4 | | | |

| | |
|---|---|
| **Total Contributing Area (ac)** | **2.29** |
| **Weighted Runoff Curve Number (RCN)** | **83** |

**County**

Kent
New Castle
Sussex

**Unit Hydrograph**

DMV
STD

Effective April 2016

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 1A+1B |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**LIMIT OF DISTURBANCE (LOD) WORKSHEET**

| **Step 1 - Subarea LOD Data** | **HSG A** | **HSG B** | **HSG C** | **HSG D** |
|---|---|---|---|---|
| 1.1 HSG Area Within LOD (ac) | | | 1.3 | 0.37 |
| 1.2 Pre-Developed Woods/Meadow Within LOD (ac) | | | | |
| 1.3 Pre-Developed Impervious Within LOD (ac) | | | | |
| 1.4.a Post-Developed Imperviousness Within LOD, Option #1 (ac); ***OR*** | | | 0.56 | 0.06 |
| 1.4.b Post-Developed Imperviousness Within LOD, Option #2 (%) | 0% | 0% | 43% | 16% |

| **Step 2 - Subarea LOD Runoff Calculations** | | | | |
|---|---|---|---|---|
| 2.1 RCN per HSG | 0.00 | 0.00 | 84.34 | 82.92 |
| 2.2 RPv per HSG (in.) | 0.00 | 0.00 | 1.62 | 1.54 |
| 2.3 Target Runoff per HSG (in.) | 0.00 | 0.00 | 1.10 | 1.39 |
| 2.4 Cv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 0.75 | 0.75 |
| 2.5 Fv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 2.25 | 2.25 |
| 2.6 Subarea LOD (ac) | 1.67 | | | |
| 2.7 Subarea Weighted RCN | 84.02 | | | |
| 2.8 Subarea Weighted RPv (in.) | 1.60 | | | |
| 2.9 Subarea Weighted Target Runoff (in.) | 1.17 | | | |

| RPv Target Runoff (in.) | |
|---|---|
| Soil | Woods |
| HSG A | 0.00 |
| HSG B | 0.12 |
| HSG C | 0.55 |
| HSG D | 0.87 |

| **Step 3 - Upstream LOD Areas** *(from previous DURMM Report as applicable)* | **Area 1** | **Area 2** | **Area 3** | **Area 4** |
|---|---|---|---|---|
| 3.1 Upstream Subarea ID | 1A | | | |
| 3.2 Upstream LOD Area (ac) | 0.62 | | | |
| 3.3 Target Runoff for Upstream Area (in.) | 1.25 | | | |
| 3.4 Adjusted CN after all reductions | 75.45 | | | |
| 3.5 Adjusted RPv (in.) | 1.16 | | | |
| 3.6 Adjusted Cv (in.) | | | | |
| 3.7 Adjusted Fv (in.) | | | | |

| **Step 4 - RPv Calculations for Combined LOD** | |
|---|---|
| 4.1 Combined LOD (ac) | 2.29 |
| 4.2 Weighted RCN | 81.70 |
| 4.3 Weighted RPv (in.) | 1.48 |
| 4.4 Weighted Target Runoff (in.) | 1.19 |
| 4.5 Estimated Annual Runoff (in.) | 19.72 |
| 4.6 Req'd Runoff Reduction within LOD (in.) | 0.29 |
| 4.7 Req'd Runoff Reduction within LOD (%) | 20% |

| **Step 5 - Cv Unit Discharge** | |
|---|---|
| 5. LOD Allowable Unit Discharge (cfs/ac) | 0.75 |

| **Step 6 - Fv Unit Discharge** | |
|---|---|
| 6. LOD Allowable Unit Discharge (cfs/ac) | 2.25 |

Cv/Fv Unit Discharge

Woodland/Meadow (HSG A)
- 10-YR: 0 cfs/ac
- 100-YR: 0.25 cfs/ac

Woodland/Meadow (HSG B,C,D)
- 10-YR: 0.375 cfs/ac
- 100-YR: 1.25 cfs/ac

Non-Woodland/Non-Meadow
- 10-YR: 0.75 cfs/ac
- 100-YR: 2.25 cfs/ac

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 1A+1B
**LOCATION (County):** Sussex

**RESOURCE PROTECTION EVENT (RPv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Dry ED basin | Type | -- | Type | -- | Type | -- | Type | -- |
| ***Step 1 - Calculate Initial RPv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 2.29 | | 2.29 | | 2.29 | | 2.29 | | 2.29 | |
| 1.2 *Reserved* | | | | | | | | | | |
| 1.3 Initial RCN | 81.70 | | | | | | | | | |
| 1.4 RPv for Contributing Area (in.) | 1.48 | | | | | | | | | |
| 1.5 Req'd RPv Reduction for Contributing Area (in.) | 0.29 | | | | | | | | | |
| 1.6 Req'd RPv Reduction for Contributing Area (%) | 20% | | | | | | | | | |
| 1.7 RPv allowable discharge rate (cfs) | 0.14 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | | | | | | | | | | |
| 2.2 Retention reduction allowance (%) | 0% | | N/A | | N/A | | N/A | | N/A | |
| 2.3 Retention reduction volume (ac-ft) | 0.00 | | N/A | | N/A | | N/A | | N/A | |
| 2.4 Retention reduction volume (in.) | 0.00 | | N/A | | N/A | | N/A | | N/A | |
| 2.5 Runoff volume after retention reduction (in.) | 1.48 | | N/A | | N/A | | N/A | | N/A | |
| 2.6 Adjusted CN* | 81.81 | | N/A | | N/A | | N/A | | N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Annual CN (ACN) | 81.70 | | N/A | | N/A | | N/A | | N/A | |
| 3.2 Annual runoff (in.) | 19.72 | | N/A | | N/A | | N/A | | N/A | |
| 3.3 Proportion A/B soils in BMP footprint (%) | | | | | | | | | | |
| 3.4 Annual runoff reduction allowance (%) | 10% | | N/A | | N/A | | N/A | | N/A | |
| 3.5 Annual runoff after reduction (in.) | 17.75 | | N/A | | N/A | | N/A | | N/A | |
| 3.6 Adjusted ACN | 79.28 | | N/A | | N/A | | N/A | | N/A | |
| 3.7 Annual Runoff Reduction Allowance for RPv (in.) | 0.13 | | N/A | | N/A | | N/A | | N/A | |
| ***Step 4 - Calculate RPv with BMP Reductions*** | | | | | | | | | | |
| 4.1 RPv runoff volume after all reductions (in.) | 1.35 | | N/A | | N/A | | N/A | | N/A | |
| 4.2 Total RPv runoff reduction (in.) | 0.13 | | N/A | | N/A | | N/A | | N/A | |
| 4.3 Total RPv runoff reduction (%) | 9% | | N/A | | N/A | | N/A | | N/A | |
| 4.4 Adjusted CN after all reductions | 79.28 | | N/A | | N/A | | N/A | | N/A | |
| 4.5 Equivalent TR-55 RCN for H&H modeling | 85.17 | | N/A | | N/A | | N/A | | N/A | |
| 4.6 Req'd reduction met? | No | | N/A | | N/A | | N/A | | N/A | |
| ***Step 5 - Determine Runoff Reduction Offset*** | | | | | | | | | | |
| 5.1 Runoff Reduction Shortfall (in.) | 0.16 | | N/A | | N/A | | N/A | | N/A | |
| 5.2 Runoff Reduction Shortfall (cu.ft./ac) | 591 | | N/A | | N/A | | N/A | | N/A | |
| 5.3 Total Offset Volume (cu.ft.) | 1354 | | N/A | | N/A | | N/A | | N/A | |

**DURMM BMP Name**

--
Infiltration w/sand or vegetation
Infiltration w/o sand or vegetation
Bioretention w/underdrain
Permeable pave w/sand or vegetation
Permeable pave w/o sand or vegetation
Vegetated roof
Rainwater harvesting
Impervious disconnection
Bioswale
Vegetated open channel
Filter strip
Riparian forest buffer
Urban tree planting
Soil amendment
Sheetflow to turf open space
Sheetflow to forest open space
Wet swale
Ephemeral wetland
--
Dry ED basin
Dry detention pond
Hydrodynamic structure
Urban filtering practice
Wet pond
Constructed wetland
--
Nutrient management
Street sweeping
--
Urban stream restoration

Effective April 2016

| | |
|---|---|
| **PROJECT:** | **Batson Creek Estates** |
| **DRAINAGE SUBAREA ID:** | **1A+1B** |
| **LANDUSE TYPE:** | **Residential** |
| **TMDL WATERSHED:** | **Little Assawoman Bay** |

**TOTAL MAXIMUM DAILY LOAD (TMDL) WORKSHEET**

| | BMP 1 | | | | BMP 2 | | | | BMP 3 | | | | BMP 4 | | | | BMP 5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Dry ED basin | | | Type: | -- | | | Type: | -- | | | Type: | -- | | | Type: | -- | | |
| ***Step 1 - Calculate Annual Runoff Volume*** | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS |
| 1.1 Total contributing area to BMP (ac) | 2.29 | | | | | | | | | | | | | | | | | | | |
| 1.2 Initial RCN | 82 | | | | | | | | | | | | | | | | | | | |
| 1.3 Annual runoff volume (in.) | 19.72 | | | | | | | | | | | | | | | | | | | |
| 1.4 Annual runoff volume (liters) | 4.64E+06 | | | | | | | | | | | | | | | | | | | |
| ***Step 2 - Calculate Annual Pollutant Load*** | | | | | | | | | | | | | | | | | | | | |
| 2.1 EMC (mg/L) | | 2.00 | 0.27 | 60 | | | | | | | | | | | | | | | | |
| 2.2 Load (mg/yr) | | 9.28E+06 | 1.25E+06 | 2.78E+08 | | | | | | | | | | | | | | | | |
| 2.4 Stormwater Load (lb/ac/yr) | | 8.94 | 1.21 | 268 | | 7.15 | 0.97 | 107 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 3 - Adjust for Runoff Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 3.1 BMP Runoff Reduction (%) | 10% | | | | N/A | | | | N/A | | | | N/A | | | | N/A | | | |
| 3.2 BMP Removal Efficiency (%) | | 20% | 20% | 60% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 3.3 Adjusted load (lb/ac/yr) | | 7.15 | 0.97 | 107 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 4 - Calculate Pollutant Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 4.1 TMDL (lb/ac/yr) | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A |
| 4.2 Reduction met? | | No | No | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK |
| ***Step 5 - Determine TMDL Offset*** | | | | | | | | | | | | | | | | | | | | |
| 5.1 TMDL Shortfall (lb/ac/yr) | | 1.45 | 0.74 | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 |
| 5.2 TMDL Shortfall (%) | | 20% | 76% | 0% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.3 Residual RPv Volume (in) | | 1.35 | 1.35 | 1.35 | | N/A | N/A | N/A | | N/A | N/A | N/A | | N/A | N/A | N/A | | N/A | N/A | N/A |
| 5.4 Req'd Additional RR to meet TMDL (in)* | | 0.27 | 1.03 | 0.00 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.5 Req'd Additional RR to meet TMDL (cu.ft./ac) | | 995 | 3736 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.6 Total Offset Volume (cu.ft.) | | 2279 | 8554 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 1A+1B
**LOCATION (County):** Sussex

**CONVEYANCE EVENT (Cv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Dry ED basin | Type: | -- | Type: | -- | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Cv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 2.29 | | 2.29 | | 2.29 | | 2.29 | | 2.29 | |
| 1.2 Initial RCN | 81.70 | | | | | | | | | |
| 1.3 **10-YR** Rainfall (in.) | 5.3 | | | | | | | | | |
| 1.4 Cv runoff volume (in.) | 3.32 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 0.75 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | #NUM! | | | | | | | | | |
| 1.7 Cv allowable discharge rate (cfs) | #NUM! | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 3.32 | | 3.29 | | #N/A | | #N/A | | #N/A | |
| 2.5 CN* | 81.70 | | 81.36 | | #N/A | | #N/A | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 1% | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 3.29 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 81.36 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.03 | | #N/A | | #N/A | | #N/A | | #N/A | |
| ***Step 4 - Calculate Cv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Cv runoff volume after all reductions (in.) | 3.29 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 4.2 Total Cv runoff reduction (%) | 1% | | #N/A | | #N/A | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 81.36 | | #N/A | | #N/A | | #N/A | | #N/A | |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 1A+1B
**LOCATION (County):** Sussex

**FLOODING EVENT (Fv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Dry ED basin | Type: | -- | Type: | -- | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Fv*** | **Data** | | **Data** | | **Data** | | **Data** | | **Data** | |
| 1.1 Total contributing area to BMP (ac) | 2.29 | | 2.29 | | 2.29 | | 2.29 | | 2.29 | |
| 1.2 Initial RCN | 81.70 | | | | | | | | | |
| 1.3 **100-YR** Rainfall (in.) | 9.2 | | | | | | | | | |
| 1.4 Fv runoff volume (in.) | 6.97 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 2.25 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | #NUM! | | | | | | | | | |
| 1.7 Fv allowable discharge rate (cfs) | #NUM! | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 6.97 | | 6.97 | | #N/A | | #N/A | | #N/A | |
| 2.5 CN* | 81.70 | | 81.70 | | #N/A | | #N/A | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 0% | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 6.97 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 81.70 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.00 | | #N/A | | #N/A | | #N/A | | #N/A | |
| ***Step 4 - Calculate Fv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Fv runoff volume after all reductions (in.) | 6.97 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 4.2 Total Fv runoff reduction (%) | 0% | | #N/A | | #N/A | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 81.70 | | #N/A | | #N/A | | #N/A | | #N/A | |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 1A+1B |
| **TMDL Watershed:** | Little Assawoman Bay |

**DURMM OUTPUT WORKSHEET**

DURMM v2.beta.110802

***Site Data***

| | | | | | |
|---|---|---|---|---|---|
| Contributing Area to BMPs (ac.) | 2.29 | | | | |
| C.A. RCN | 83 | | | | |
| Subarea LOD (ac.) | 1.67 | | | | |
| Upstream Subarea ID | 1A | 0 | 0 | 0 | |
| Upstream Subarea LOD (ac.) | 0.62 | 0.00 | 0.00 | 0.00 | |
| Combined LOD with Upstream Areas (ac.) | 2.29 | | | | |
| Combined RCN with Upstream Areas (ac.) | 81.70 | | | | |
| TMDL-TN (lb/ac/yr) | 5.70 | | | | |
| TMDL-TP (lb/ac/yr) | 0.23 | | | | |
| TMDL-TSS (lb/ac/yr) | N/A | | | | |

| BMP Selection | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| | Dry ED basin | -- | -- | -- | -- |

***Resource Protection Event (RPV)***

| | | | | | |
|---|---|---|---|---|---|
| RPv for Contributing Area (in.) | 1.48 | | | | |
| Req'd RPv Reduction for Contributing Area (in.) | 0.29 | | | | |
| Req'd RPv Reduction for Contributing Area (%) | 20% | | | | |
| C.A. allowable discharge rate (cfs) | 0.14 | | | | |
| Unmanaged Polluant load, TN (lbs/ac/yr) | 8.94 | | | | |
| Unmanaged Polluant load, TP (lbs/ac/yr) | 1.21 | | | | |
| Unmanaged Polluant load, TSS (lbs/ac/yr) | 268 | | | | |

| BMP Runoff Reduction Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| RPv runoff volume after all reductions (in.) | 1.35 | N/A | N/A | N/A | N/A |
| Total RPv runoff reduction (in.) | 0.13 | N/A | N/A | N/A | N/A |
| Total RPv runoff reduction (%) | 9% | N/A | N/A | N/A | N/A |
| Req'd runoff reduction met? | No | N/A | N/A | N/A | N/A |

| BMP TMDL Performance | | | | | |
|---|---|---|---|---|---|
| Adjusted pollutant load, TN (lb/ac/yr) | 7.15 | #N/A | #N/A | #N/A | #N/A |
| Adjusted pollutant load, TP (lb/ac/yr) | 0.97 | #N/A | #N/A | #N/A | #N/A |
| Adjusted pollutant load, TSS (lb/ac/yr) | 107 | #N/A | #N/A | #N/A | #N/A |
| Offsets Requirements | | | | | |
| RPv Offset (cu. ft.) | 1354 | N/A | N/A | N/A | N/A |

***Conveyance Event (Cv)***

| | | | | | |
|---|---|---|---|---|---|
| Cv runoff volume (in.) | 3.32 | | | | |
| Stds-based allowable discharge (cfs) | #NUM! | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Cv runoff volume after all reductions (in.) | 3.29 | #N/A | #N/A | #N/A | #N/A |

***Flooding Event (Fv)***

| | | | | | |
|---|---|---|---|---|---|
| Fv runoff volume (in.) | 6.97 | | | | |
| Stds-based allowable discharge (cfs) | #NUM! | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Fv runoff volume after all reductions (in.) | 6.97 | #N/A | #N/A | #N/A | #N/A |

***Adjusted Subarea Data for Downstream DURMM Modeling***

| | |
|---|---|
| Contributing Area (ac.) | 2.29 |
| C.A. RCN | 83 |
| LOD Area (ac.) | 2.29 |
| Weighted Target Runoff (in.) | 1.19 |
| Adjusted CN after all reductions | 79.28 |
| Adjusted RPv (in.) | 1.35 |
| Adjusted Cv (in.) | |
| Adjusted Fv (in.) | |

***Adjusted Subarea Data for H&H Modeling***

| | Rain (in.) | RCN |
|---|---|---|
| Resource Protection Event, RPv | 2.7 | N/A |
| Conveyance Event, Cv | 5.3 | 81.36 |
| Flooding Event, Fv | 9.2 | 81.70 |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 2A |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**CONTRIBUTING AREA RUNOFF CURVE NUMBER (C.A. RCN) WORKSHEET**

| Cover Type | Treatment | Hydrologic Condition | Curve Numbers for Hydrologic Soil Type A Acres | A RCN | B Acres | B RCN | C Acres | C RCN | D Acres | D RCN |
|---|---|---|---|---|---|---|---|---|---|---|
| **CULTIVATED AGRICULTURAL LANDS** | | | | | | | | | | |
| Fallow | Bare soil | ---- | | 77 | | 86 | | 91 | | 94 |
| | Crop residue (CR) | poor | | 76 | | 85 | | 90 | | 93 |
| | Crop residue (CR) | good | | 74 | | 83 | | 88 | | 90 |
| Row Crops | Straight row (SR) | poor | | 72 | | 81 | | 88 | | 91 |
| | Straight row (SR) | good | | 67 | | 78 | | 85 | | 89 |
| | SR + Crop residue | poor | | 71 | | 80 | | 87 | | 90 |
| | SR + Crop residue | good | | 64 | | 75 | | 82 | | 85 |
| | Contoured (C) | poor | | 70 | | 79 | | 84 | | 88 |
| | Contoured (C) | good | | 65 | | 75 | | 82 | | 86 |
| | C + Crop residue | poor | | 69 | | 78 | | 83 | | 87 |
| | C + Crop residue | good | | 64 | | 74 | | 81 | | 85 |
| | Cont & terraced(C&T) | poor | | 66 | | 74 | | 80 | | 82 |
| | Cont & terraced(C&T) | good | | 62 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 65 | | 73 | | 79 | | 81 |
| | C&T + Crop residue | good | | 61 | | 70 | | 77 | | 80 |
| Small Grain | Straight row (SR) | poor | | 65 | | 76 | | 84 | | 88 |
| | Straight row (SR) | good | | 63 | | 75 | | 83 | | 87 |
| | SR + Crop residue | poor | | 64 | | 75 | | 83 | | 86 |
| | SR + Crop residue | good | | 60 | | 72 | | 80 | | 84 |
| | Contoured (C) | poor | | 63 | | 74 | | 82 | | 85 |
| | Contoured (C) | good | | 61 | | 73 | | 81 | | 84 |
| | C + Crop residue | poor | | 62 | | 73 | | 81 | | 84 |
| | C + Crop residue | good | | 60 | | 72 | | 80 | | 83 |
| | Cont & terraced(C&T) | poor | | 61 | | 72 | | 79 | | 82 |
| | Cont & terraces(C&T) | good | | 59 | | 70 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 60 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | good | | 58 | | 69 | | 77 | | 80 |
| Close-seeded | Straight row | poor | | 66 | | 77 | | 85 | | 89 |
| or broadcast | Straight row | good | | 58 | | 72 | | 81 | | 85 |
| legumes or | Contoured | poor | | 64 | | 75 | | 83 | | 85 |
| rotation | Contoured | good | | 55 | | 69 | | 78 | | 83 |
| meadow | Cont & terraced | poor | | 63 | | 73 | | 80 | | 83 |
| | Cont & terraced | good | | 51 | | 67 | | 76 | | 80 |
| **OTHER AGRICULTURAL LANDS** | | | | | | | | | | |
| | Pasture, grassland or range | poor | | 68 | | 79 | | 86 | | 89 |
| | | fair | | 49 | | 69 | | 79 | | 84 |
| | | good | | 39 | | 61 | | 74 | | 80 |
| | Meadow -cont. grass (non grazed) | ---- | | 30 | | 58 | | 71 | | 78 |
| | Brush - brush, weed, grass mix | poor | | 48 | | 67 | | 77 | | 83 |
| | | fair | | 35 | | 56 | | 70 | | 77 |
| | | good | | 30 | | 48 | | 65 | | 73 |
| | Woods - grass combination | poor | | 57 | | 73 | | 82 | | 86 |
| | | fair | | 43 | | 65 | | 76 | | 82 |
| | | good | | 32 | | 58 | | 72 | | 79 |
| | Woods | poor | | 45 | | 66 | | 77 | | 83 |
| | | fair | | 36 | | 60 | | 73 | | 79 |
| | | good | | 30 | | 55 | | 70 | | 77 |
| | Farmsteads | ---- | | 59 | | 74 | | 82 | | 86 |
| **FULLY DEVELOPED URBAN AREAS (Veg Established)** | | | | | | | | | | |
| Open space (Lawns,parks etc.) | | | | | | | | | | |
| | Poor condition; grass cover < 50% | | | 68 | | 79 | | 86 | | 89 |
| | Fair condition; grass cover 50% to 75 % | | | 49 | | 69 | | 79 | | 84 |
| | Good condition; grass cover > 75% | | | 39 | | 61 | 0.04 | 74 | 0.17 | 80 |
| Impervious Areas | | | | | | | | | | |
| | Paved parking lots, roofs, driveways | | | 98 | | 98 | 0.15 | 98 | 0.05 | 98 |
| | Streets and roads | | | | | | | | | |
| | Paved; curbs and storm sewers | | | 98 | | 98 | | 98 | | 98 |
| | Paved; open ditches (w/right-of-way) | | | 83 | | 89 | | 92 | | 93 |
| | Gravel (w/ right-of-way) | | | 76 | | 85 | | 89 | | 91 |
| | Dirt (w/ right-of-way) | | | 72 | | 82 | | 87 | | 89 |
| Urban Districts | | Avg % impervious | | | | | | | | |
| | Commercial & business | 85 | | 89 | | 92 | | 94 | | 95 |
| | Industrial | 72 | | 81 | | 88 | | 91 | | 93 |
| Residential districts by average lot size | | Avg % impervious | | | | | | | | |
| | 1/8 acre (town houses) | 65 | | 77 | | 85 | | 90 | | 92 |
| | 1/4 acre | 38 | | 61 | | 75 | | 83 | | 87 |
| | 1/3 acre | 30 | | 57 | | 72 | | 81 | | 86 |
| | 1/2 acre | 25 | | 54 | | 70 | | 80 | | 85 |
| | 1 acre | 20 | | 51 | | 68 | | 79 | | 84 |
| | 2 acre | 12 | | 46 | | 65 | | 77 | | 82 |
| **DEVELOPING URBAN AREA (No Vegetation)** | | | | | | | | | | |
| | Newly graded area (pervious only) | | | 77 | | 86 | | 91 | | 94 |
| **USER DEFINED** | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| Subarea Contributing Area per Soil Type (ac) | A | B | C | D |
|---|---|---|---|---|
| | 0 | 0 | 0.19 | 0.22 |

**UPSTREAM CONTRIBUTING AREAS**

| | Subarea ID | Acres | RCN |
|---|---|---|---|
| Upstream Contributing Area 1 | | | |
| Upstream Contributing Area 2 | | | |
| Upstream Contributing Area 3 | | | |
| Upstream Contributing Area 4 | | | |

| | |
|---|---|
| **Total Contributing Area (ac)** | **0.41** |
| **Weighted Runoff Curve Number (RCN)** | **88** |

**County**

Kent
New Castle
Sussex

**Unit Hydrograph**

DMV
STD

Effective April 2016

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 2A |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**LIMIT OF DISTURBANCE (LOD) WORKSHEET**

| **Step 1 - Subarea LOD Data** | **HSG A** | **HSG B** | **HSG C** | **HSG D** |
|---|---|---|---|---|
| 1.1 HSG Area Within LOD (ac) | | | 0.19 | 0.22 |
| 1.2 Pre-Developed Woods/Meadow Within LOD (ac) | | | | |
| 1.3 Pre-Developed Impervious Within LOD (ac) | | | | |
| 1.4.a Post-Developed Imperviousness Within LOD, Option #1 (ac); ***OR*** | | | 0.15 | 0.05 |
| 1.4.b Post-Developed Imperviousness Within LOD, Option #2 (%) | 0% | 0% | 79% | 23% |

| **Step 2 - Subarea LOD Runoff Calculations** | | | | |
|---|---|---|---|---|
| 2.1 RCN per HSG | 0.00 | 0.00 | 92.95 | 84.09 |
| 2.2 RPv per HSG (in.) | 0.00 | 0.00 | 2.13 | 1.61 |
| 2.3 Target Runoff per HSG (in.) | 0.00 | 0.00 | 1.10 | 1.39 |
| 2.4 Cv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 0.75 | 0.75 |
| 2.5 Fv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 2.25 | 2.25 |
| 2.6 Subarea LOD (ac) | 0.41 | | | |
| 2.7 Subarea Weighted RCN | 88.20 | | | |
| 2.8 Subarea Weighted RPv (in.) | 1.85 | | | |
| 2.9 Subarea Weighted Target Runoff (in.) | 1.26 | | | |

| RPv Target Runoff (in.) | |
|---|---|
| Soil | Woods |
| HSG A | 0.00 |
| HSG B | 0.12 |
| HSG C | 0.55 |
| HSG D | 0.87 |

| **Step 3 - Upstream LOD Areas** *(from previous DURMM Report as applicable)* | **Area 1** | **Area 2** | **Area 3** | **Area 4** |
|---|---|---|---|---|
| 3.1 Upstream Subarea ID | | | | |
| 3.2 Upstream LOD Area (ac) | | | | |
| 3.3 Target Runoff for Upstream Area (in.) | | | | |
| 3.4 Adjusted CN after all reductions | | | | |
| 3.5 Adjusted RPv (in.) | | | | |
| 3.6 Adjusted Cv (in.) | | | | |
| 3.7 Adjusted Fv (in.) | | | | |

| **Step 4 - RPv Calculations for Combined LOD** | |
|---|---|
| 4.1 Combined LOD (ac) | 0.41 |
| 4.2 Weighted RCN | 88.20 |
| 4.3 Weighted RPv (in.) | 1.85 |
| 4.4 Weighted Target Runoff (in.) | 1.26 |
| 4.5 Estimated Annual Runoff (in.) | 25.77 |
| 4.6 Req'd Runoff Reduction within LOD (in.) | 0.59 |
| 4.7 Req'd Runoff Reduction within LOD (%) | 32% |

| **Step 5 - Cv Unit Discharge** | |
|---|---|
| 5. LOD Allowable Unit Discharge (cfs/ac) | 0.75 |

| **Step 6 - Fv Unit Discharge** | |
|---|---|
| 6. LOD Allowable Unit Discharge (cfs/ac) | 2.25 |

Cv/Fv Unit Discharge

Woodland/Meadow (HSG A)
10-YR: 0 cfs/ac
100-YR: 0.25 cfs/ac

Woodland/Meadow (HSG B,C,D)
10-YR: 0.375 cfs/ac
100-YR: 1.25 cfs/ac

Non-Woodland/Non-Meadow
10-YR: 0.75 cfs/ac
100-YR: 2.25 cfs/ac

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 2A
**LOCATION (County):** Sussex

**RESOURCE PROTECTION EVENT (RPv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Bioretention w/underdrain | Type | -- | Type | -- | Type | -- | Type | -- |
| ***Step 1 - Calculate Initial RPv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 0.41 | | 0.41 | | 0.41 | | 0.41 | | 0.41 | |
| 1.2 *Reserved* | | | | | | | | | | |
| 1.3 Initial RCN | 88.20 | | | | | | | | | |
| 1.4 RPv for Contributing Area (in.) | 1.85 | | | | | | | | | |
| 1.5 Req'd RPv Reduction for Contributing Area (in.) | 0.59 | | | | | | | | | |
| 1.6 Req'd RPv Reduction for Contributing Area (%) | 32% | | | | | | | | | |
| 1.7 RPv allowable discharge rate (cfs) | 0.03 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 2000 | | | | | | | | | |
| 2.2 Retention reduction allowance (%) | 50% | | N/A | | N/A | | N/A | | N/A | |
| 2.3 Retention reduction volume (ac-ft) | 0.02 | | N/A | | N/A | | N/A | | N/A | |
| 2.4 Retention reduction volume (in.) | 0.67 | | N/A | | N/A | | N/A | | N/A | |
| 2.5 Runoff volume after retention reduction (in.) | 1.18 | | N/A | | N/A | | N/A | | N/A | |
| 2.6 Adjusted CN* | 75.73 | | N/A | | N/A | | N/A | | N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Annual CN (ACN) | 88.20 | | N/A | | N/A | | N/A | | N/A | |
| 3.2 Annual runoff (in.) | 25.77 | | N/A | | N/A | | N/A | | N/A | |
| 3.3 Proportion A/B soils in BMP footprint (%) | | | | | | | | | | |
| 3.4 Annual runoff reduction allowance (%) | 0% | | N/A | | N/A | | N/A | | N/A | |
| 3.5 Annual runoff after reduction (in.) | 25.77 | | N/A | | N/A | | N/A | | N/A | |
| 3.6 Adjusted ACN | 88.20 | | N/A | | N/A | | N/A | | N/A | |
| 3.7 Annual Runoff Reduction Allowance for RPv (in.) | 0.01 | | N/A | | N/A | | N/A | | N/A | |
| ***Step 4 - Calculate RPv with BMP Reductions*** | | | | | | | | | | |
| 4.1 RPv runoff volume after all reductions (in.) | 1.17 | | N/A | | N/A | | N/A | | N/A | |
| 4.2 Total RPv runoff reduction (in.) | 0.68 | | N/A | | N/A | | N/A | | N/A | |
| 4.3 Total RPv runoff reduction (%) | 37% | | N/A | | N/A | | N/A | | N/A | |
| 4.4 Adjusted CN after all reductions | 75.73 | | N/A | | N/A | | N/A | | N/A | |
| 4.5 Equivalent TR-55 RCN for H&H modeling | 82.34 | | N/A | | N/A | | N/A | | N/A | |
| 4.6 Req'd reduction met? | OK | | N/A | | N/A | | N/A | | N/A | |
| ***Step 5 - Determine Runoff Reduction Offset*** | | | | | | | | | | |
| 5.1 Runoff Reduction Shortfall (in.) | N/A | | N/A | | N/A | | N/A | | N/A | |
| 5.2 Runoff Reduction Shortfall (cu.ft./ac) | N/A | | N/A | | N/A | | N/A | | N/A | |
| 5.3 Total Offset Volume (cu.ft.) | N/A | | N/A | | N/A | | N/A | | N/A | |

**DURMM BMP Name**
--
Infiltration w/sand or vegetation
Infiltration w/o sand or vegetation
Bioretention w/underdrain
Permeable pave w/sand or vegetation
Permeable pave w/o sand or vegetation
Vegetated roof
Rainwater harvesting
Impervious disconnection
Bioswale
Vegetated open channel
Filter strip
Riparian forest buffer
Urban tree planting
Soil amendment
Sheetflow to turf open space
Sheetflow to forest open space
Wet swale
Ephemeral wetland
--
Dry ED basin
Dry detention pond
Hydrodynamic structure
Urban filtering practice
Wet pond
Constructed wetland
--
Nutrient management
Street sweeping
--
Urban stream restoration

Effective April 2016

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 2A
**LANDUSE TYPE:** Residential
**TMDL WATERSHED:** Little Assawoman Bay

## TOTAL MAXIMUM DAILY LOAD (TMDL) WORKSHEET

| | BMP 1 | | | | BMP 2 | | | | BMP 3 | | | | BMP 4 | | | | BMP 5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Bioretention w/underdrain | | | Type: | -- | | | Type: | -- | | | Type: | -- | | | Type: | -- | | |
| ***Step 1 - Calculate Annual Runoff Volume*** | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS |
| 1.1 Total contributing area to BMP (ac) | 0.41 | | | | | | | | | | | | | | | | | | | |
| 1.2 Initial RCN | 88 | | | | | | | | | | | | | | | | | | | |
| 1.3 Annual runoff volume (in.) | 25.77 | | | | | | | | | | | | | | | | | | | |
| 1.4 Annual runoff volume (liters) | 1.09E+06 | | | | | | | | | | | | | | | | | | | |
| ***Step 2 - Calculate Annual Pollutant Load*** | | | | | | | | | | | | | | | | | | | | |
| 2.1 EMC (mg/L) | | 2.00 | 0.27 | 60 | | | | | | | | | | | | | | | | |
| 2.2 Load (mg/yr) | | 2.17E+06 | 2.93E+05 | 6.52E+07 | | | | | | | | | | | | | | | | |
| 2.4 Stormwater Load (lb/ac/yr) | | 11.68 | 1.58 | 350 | | 7.38 | 1.00 | 221 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 3 - Adjust for Runoff Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 3.1 BMP Runoff Reduction (%) | 37% | | | | N/A | | | | N/A | | | | N/A | | | | N/A | | | |
| 3.2 BMP Removal Efficiency (%) | | 37% | 37% | 37% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 3.3 Adjusted load (lb/ac/yr) | | 7.38 | 1.00 | 221 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 4 - Calculate Pollutant Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 4.1 TMDL (lb/ac/yr) | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A |
| 4.2 Reduction met? | | No | No | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK |
| ***Step 5 - Determine TMDL Offset*** | | | | | | | | | | | | | | | | | | | | |
| 5.1 TMDL Shortfall (lb/ac/yr) | | 1.68 | 0.77 | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 |
| 5.2 TMDL Shortfall (%) | | 23% | 77% | 0% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.3 Residual RPv Volume (in) | | 1.17 | 1.17 | 1.17 | | N/A | N/A | N/A | | N/A | N/A | N/A | | N/A | N/A | N/A | | N/A | N/A | N/A |
| 5.4 Req'd Additional RR to meet TMDL (in)* | | 0.27 | 0.90 | 0.00 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.5 Req'd Additional RR to meet TMDL (cu.ft./ac) | | 964 | 3260 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.6 Total Offset Volume (cu.ft.) | | 395 | 1337 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 2A
**LOCATION (County):** Sussex

**CONVEYANCE EVENT (Cv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Bioretention w/underdrain | Type: | -- | Type: | -- | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Cv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 0.41 | | 0.41 | | 0.41 | | 0.41 | | 0.41 | |
| 1.2 Initial RCN | 88.20 | | | | | | | | | |
| 1.3 **10-YR** Rainfall (in.) | 5.3 | | | | | | | | | |
| 1.4 Cv runoff volume (in.) | 3.98 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 0.75 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | 0.00 | | | | | | | | | |
| 1.7 Cv allowable discharge rate (cfs) | 0.31 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 2000.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.05 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 1.34 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 2.63 | | 2.63 | | #N/A | | #N/A | | #N/A | |
| 2.5 CN* | 74.29 | | 74.29 | | #N/A | | #N/A | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 0% | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 3.98 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 88.20 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.00 | | #N/A | | #N/A | | #N/A | | #N/A | |
| ***Step 4 - Calculate Cv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Cv runoff volume after all reductions (in.) | 2.63 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 4.2 Total Cv runoff reduction (%) | 34% | | #N/A | | #N/A | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 74.29 | | #N/A | | #N/A | | #N/A | | #N/A | |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 2A
**LOCATION (County):** Sussex

**FLOODING EVENT (Fv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Bioretention w/underdrain | Type: | -- | Type: | -- | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Fv*** | **Data** | | **Data** | | **Data** | | **Data** | | **Data** | |
| 1.1 Total contributing area to BMP (ac) | 0.41 | | 0.41 | | 0.41 | | 0.41 | | 0.41 | |
| 1.2 Initial RCN | 88.20 | | | | | | | | | |
| 1.3 **100-YR** Rainfall (in.) | 9.2 | | | | | | | | | |
| 1.4 Fv runoff volume (in.) | 7.77 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 2.25 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | 0.00 | | | | | | | | | |
| 1.7 Fv allowable discharge rate (cfs) | 0.92 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 2000.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.05 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 1.34 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 6.42 | | 6.42 | | #N/A | | #N/A | | #N/A | |
| 2.5 CN* | 77.31 | | 77.31 | | #N/A | | #N/A | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 0% | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 7.77 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 88.20 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.00 | | #N/A | | #N/A | | #N/A | | #N/A | |
| ***Step 4 - Calculate Fv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Fv runoff volume after all reductions (in.) | 6.42 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 4.2 Total Fv runoff reduction (%) | 17% | | #N/A | | #N/A | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 77.31 | | #N/A | | #N/A | | #N/A | | #N/A | |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 2A |
| **TMDL Watershed:** | Little Assawoman Bay |

**DURMM OUTPUT WORKSHEET**

***Site Data***

DURMM v2.beta.110802

| | | | | | |
|---|---|---|---|---|---|
| Contributing Area to BMPs (ac.) | 0.41 | | | | |
| C.A. RCN | 88 | | | | |
| Subarea LOD (ac.) | 0.41 | | | | |
| Upstream Subarea ID | 0 | 0 | 0 | 0 | |
| Upstream Subarea LOD (ac.) | 0.00 | 0.00 | 0.00 | 0.00 | |
| Combined LOD with Upstream Areas (ac.) | 0.41 | | | | |
| Combined RCN with Upstream Areas (ac.) | 88.20 | | | | |
| TMDL-TN (lb/ac/yr) | 5.70 | | | | |
| TMDL-TP (lb/ac/yr) | 0.23 | | | | |
| TMDL-TSS (lb/ac/yr) | N/A | | | | |

| BMP Selection | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| | Bioretention w/underdrain | -- | -- | -- | -- |

***Resource Protection Event (RPV)***

| | | | | | |
|---|---|---|---|---|---|
| RPv for Contributing Area (in.) | 1.85 | | | | |
| Req'd RPv Reduction for Contributing Area (in.) | 0.59 | | | | |
| Req'd RPv Reduction for Contributing Area (%) | 32% | | | | |
| C.A. allowable discharge rate (cfs) | 0.03 | | | | |
| Unmanaged Polluant load, TN (lbs/ac/yr) | 11.68 | | | | |
| Unmanaged Polluant load, TP (lbs/ac/yr) | 1.58 | | | | |
| Unmanaged Polluant load, TSS (lbs/ac/yr) | 350 | | | | |

| BMP Runoff Reduction Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| RPv runoff volume after all reductions (in.) | 1.17 | N/A | N/A | N/A | N/A |
| Total RPv runoff reduction (in.) | 0.68 | N/A | N/A | N/A | N/A |
| Total RPv runoff reduction (%) | 37% | N/A | N/A | N/A | N/A |
| Req'd runoff reduction met? | OK | N/A | N/A | N/A | N/A |

| BMP TMDL Performance | | | | | |
|---|---|---|---|---|---|
| Adjusted pollutant load, TN (lb/ac/yr) | 7.38 | #N/A | #N/A | #N/A | #N/A |
| Adjusted pollutant load, TP (lb/ac/yr) | 1.00 | #N/A | #N/A | #N/A | #N/A |
| Adjusted pollutant load, TSS (lb/ac/yr) | 221 | #N/A | #N/A | #N/A | #N/A |
| Offsets Requirements | | | | | |
| RPv Offset (cu. ft.) | N/A | N/A | N/A | N/A | N/A |

***Conveyance Event (Cv)***

| | | | | | |
|---|---|---|---|---|---|
| Cv runoff volume (in.) | 3.98 | | | | |
| Stds-based allowable discharge (cfs) | 0.31 | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Cv runoff volume after all reductions (in.) | 2.63 | #N/A | #N/A | #N/A | #N/A |

***Flooding Event (Fv)***

| | | | | | |
|---|---|---|---|---|---|
| Fv runoff volume (in.) | 7.77 | | | | |
| Stds-based allowable discharge (cfs) | 0.92 | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Fv runoff volume after all reductions (in.) | 6.42 | #N/A | #N/A | #N/A | #N/A |

***Adjusted Subarea Data for Downstream DURMM Modeling***

| | |
|---|---|
| Contributing Area (ac.) | 0.41 |
| C.A. RCN | 88 |
| LOD Area (ac.) | 0.41 |
| Weighted Target Runoff (in.) | 1.26 |
| Adjusted CN after all reductions | 75.73 |
| Adjusted RPv (in.) | 1.17 |
| Adjusted Cv (in.) | |
| Adjusted Fv (in.) | |

| ***Adjusted Subarea Data for H&H Modeling*** | Rain (in.) | RCN |
|---|---|---|
| Resource Protection Event, RPv | 2.7 | N/A |
| Conveyance Event, Cv | 5.3 | 74.29 |
| Flooding Event, Fv | 9.2 | 77.31 |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 2B |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**CONTRIBUTING AREA RUNOFF CURVE NUMBER (C.A. RCN) WORKSHEET**

| Cover Type | Treatment | Hydrologic Condition | Curve Numbers for Hydrologic Soil Type A Acres | A RCN | B Acres | B RCN | C Acres | C RCN | D Acres | D RCN |
|---|---|---|---|---|---|---|---|---|---|---|
| **CULTIVATED AGRICULTURAL LANDS** | | | | | | | | | | |
| Fallow | Bare soil | ---- | | 77 | | 86 | | 91 | | 94 |
| | Crop residue (CR) | poor | | 76 | | 85 | | 90 | | 93 |
| | Crop residue (CR) | good | | 74 | | 83 | | 88 | | 90 |
| Row Crops | Straight row (SR) | poor | | 72 | | 81 | | 88 | | 91 |
| | Straight row (SR) | good | | 67 | | 78 | | 85 | | 89 |
| | SR + Crop residue | poor | | 71 | | 80 | | 87 | | 90 |
| | SR + Crop residue | good | | 64 | | 75 | | 82 | | 85 |
| | Contoured (C) | poor | | 70 | | 79 | | 84 | | 88 |
| | Contoured (C) | good | | 65 | | 75 | | 82 | | 86 |
| | C + Crop residue | poor | | 69 | | 78 | | 83 | | 87 |
| | C + Crop residue | good | | 64 | | 74 | | 81 | | 85 |
| | Cont & terraced(C&T) | poor | | 66 | | 74 | | 80 | | 82 |
| | Cont & terraced(C&T) | good | | 62 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 65 | | 73 | | 79 | | 81 |
| | C&T + Crop residue | good | | 61 | | 70 | | 77 | | 80 |
| Small Grain | Straight row (SR) | poor | | 65 | | 76 | | 84 | | 88 |
| | Straight row (SR) | good | | 63 | | 75 | | 83 | | 87 |
| | SR + Crop residue | poor | | 64 | | 75 | | 83 | | 86 |
| | SR + Crop residue | good | | 60 | | 72 | | 80 | | 84 |
| | Contoured (C) | poor | | 63 | | 74 | | 82 | | 85 |
| | Contoured (C) | good | | 61 | | 73 | | 81 | | 84 |
| | C + Crop residue | poor | | 62 | | 73 | | 81 | | 84 |
| | C + Crop residue | good | | 60 | | 72 | | 80 | | 83 |
| | Cont & terraced(C&T) | poor | | 61 | | 72 | | 79 | | 82 |
| | Cont & terraces(C&T) | good | | 59 | | 70 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 60 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | good | | 58 | | 69 | | 77 | | 80 |
| Close-seeded | Straight row | poor | | 66 | | 77 | | 85 | | 89 |
| or broadcast | Straight row | good | | 58 | | 72 | | 81 | | 85 |
| legumes or | Contoured | poor | | 64 | | 75 | | 83 | | 85 |
| rotation | Contoured | good | | 55 | | 69 | | 78 | | 83 |
| meadow | Cont & terraced | poor | | 63 | | 73 | | 80 | | 83 |
| | Cont & terraced | good | | 51 | | 67 | | 76 | | 80 |
| **OTHER AGRICULTURAL LANDS** | | | | | | | | | | |
| | Pasture, grassland or range | poor | | 68 | | 79 | | 86 | | 89 |
| | | fair | | 49 | | 69 | | 79 | | 84 |
| | | good | | 39 | | 61 | | 74 | | 80 |
| | Meadow -cont. grass (non grazed) | ---- | | 30 | | 58 | | 71 | | 78 |
| | Brush - brush, weed, grass mix | poor | | 48 | | 67 | | 77 | | 83 |
| | | fair | | 35 | | 56 | | 70 | | 77 |
| | | good | | 30 | | 48 | | 65 | | 73 |
| | Woods - grass combination | poor | | 57 | | 73 | | 82 | | 86 |
| | | fair | | 43 | | 65 | | 76 | | 82 |
| | | good | | 32 | | 58 | | 72 | | 79 |
| | Woods | poor | | 45 | | 66 | | 77 | | 83 |
| | | fair | | 36 | | 60 | | 73 | | 79 |
| | | good | | 30 | | 55 | | 70 | | 77 |
| | Farmsteads | ---- | | 59 | | 74 | | 82 | | 86 |
| **FULLY DEVELOPED URBAN AREAS (Veg Established)** | | | | | | | | | | |
| Open space (Lawns,parks etc.) | | | | | | | | | | |
| | Poor condition; grass cover < 50% | | | 68 | | 79 | | 86 | | 89 |
| | Fair condition; grass cover 50% to 75 % | | | 49 | | 69 | | 79 | | 84 |
| | Good condition; grass cover > 75% | | | 39 | | 61 | 0.25 | 74 | 0.07 | 80 |
| Impervious Areas | | | | | | | | | | |
| | Paved parking lots, roofs, driveways | | | 98 | | 98 | 0.08 | 98 | 0.01 | 98 |
| | Streets and roads | | | | | | | | | |
| | Paved; curbs and storm sewers | | | 98 | | 98 | | 98 | | 98 |
| | Paved; open ditches (w/right-of-way) | | | 83 | | 89 | | 92 | | 93 |
| | Gravel (w/ right-of-way) | | | 76 | | 85 | | 89 | | 91 |
| | Dirt (w/ right-of-way) | | | 72 | | 82 | | 87 | | 89 |
| Urban Districts | | Avg % impervious | | | | | | | | |
| | Commercial & business | 85 | | 89 | | 92 | | 94 | | 95 |
| | Industrial | 72 | | 81 | | 88 | | 91 | | 93 |
| Residential districts by average lot size | | Avg % impervious | | | | | | | | |
| | 1/8 acre (town houses) | 65 | | 77 | | 85 | | 90 | | 92 |
| | 1/4 acre | 38 | | 61 | | 75 | | 83 | | 87 |
| | 1/3 acre | 30 | | 57 | | 72 | | 81 | | 86 |
| | 1/2 acre | 25 | | 54 | | 70 | | 80 | | 85 |
| | 1 acre | 20 | | 51 | | 68 | | 79 | | 84 |
| | 2 acre | 12 | | 46 | | 65 | | 77 | | 82 |
| **DEVELOPING URBAN AREA (No Vegetation)** | | | | | | | | | | |
| | Newly graded area (pervious only) | | | 77 | | 86 | | 91 | | 94 |
| **USER DEFINED** | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| Subarea Contributing Area per Soil Type (ac) | A | B | C | D |
|---|---|---|---|---|
| | 0 | 0 | 0.33 | 0.08 |

**UPSTREAM CONTRIBUTING AREAS**

| | Subarea ID | Acres | RCN |
|---|---|---|---|
| Upstream Contributing Area 1 | | | |
| Upstream Contributing Area 2 | | | |
| Upstream Contributing Area 3 | | | |
| Upstream Contributing Area 4 | | | |

| | |
|---|---|
| **Total Contributing Area (ac)** | **0.41** |
| **Weighted Runoff Curve Number (RCN)** | **80** |

**County**

Kent
New Castle
Sussex

**Unit Hydrograph**

DMV
STD

Effective April 2016

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 2B |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**LIMIT OF DISTURBANCE (LOD) WORKSHEET**

| **Step 1 - Subarea LOD Data** | **HSG A** | **HSG B** | **HSG C** | **HSG D** |
|---|---|---|---|---|
| 1.1 HSG Area Within LOD (ac) | | | 0.33 | 0.08 |
| 1.2 Pre-Developed Woods/Meadow Within LOD (ac) | | | | |
| 1.3 Pre-Developed Impervious Within LOD (ac) | | | | |
| 1.4.a Post-Developed Imperviousness Within LOD, Option #1 (ac); ***OR*** | | | 0.08 | 0.01 |
| 1.4.b Post-Developed Imperviousness Within LOD, Option #2 (%) | 0% | 0% | 24% | 13% |

| **Step 2 - Subarea LOD Runoff Calculations** | | | | |
|---|---|---|---|---|
| 2.1 RCN per HSG | 0.00 | 0.00 | 79.82 | 82.25 |
| 2.2 RPv per HSG (in.) | 0.00 | 0.00 | 1.38 | 1.51 |
| 2.3 Target Runoff per HSG (in.) | 0.00 | 0.00 | 1.10 | 1.39 |
| 2.4 Cv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 0.75 | 0.75 |
| 2.5 Fv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 2.25 | 2.25 |
| 2.6 Subarea LOD (ac) | 0.41 | | | |
| 2.7 Subarea Weighted RCN | 80.29 | | | |
| 2.8 Subarea Weighted RPv (in.) | 1.40 | | | |
| 2.9 Subarea Weighted Target Runoff (in.) | 1.16 | | | |

| RPv Target Runoff (in.) | |
|---|---|
| Soil | Woods |
| HSG A | 0.00 |
| HSG B | 0.12 |
| HSG C | 0.55 |
| HSG D | 0.87 |

| **Step 3 - Upstream LOD Areas** *(from previous DURMM Report as applicable)* | **Area 1** | **Area 2** | **Area 3** | **Area 4** |
|---|---|---|---|---|
| 3.1 Upstream Subarea ID | | | | |
| 3.2 Upstream LOD Area (ac) | | | | |
| 3.3 Target Runoff for Upstream Area (in.) | | | | |
| 3.4 Adjusted CN after all reductions | | | | |
| 3.5 Adjusted RPv (in.) | | | | |
| 3.6 Adjusted Cv (in.) | | | | |
| 3.7 Adjusted Fv (in.) | | | | |

| **Step 4 - RPv Calculations for Combined LOD** | |
|---|---|
| 4.1 Combined LOD (ac) | 0.41 |
| 4.2 Weighted RCN | 80.29 |
| 4.3 Weighted RPv (in.) | 1.40 |
| 4.4 Weighted Target Runoff (in.) | 1.16 |
| 4.5 Estimated Annual Runoff (in.) | 18.55 |
| 4.6 Req'd Runoff Reduction within LOD (in.) | 0.25 |
| 4.7 Req'd Runoff Reduction within LOD (%) | 18% |

| **Step 5 - Cv Unit Discharge** | |
|---|---|
| 5. LOD Allowable Unit Discharge (cfs/ac) | 0.75 |

| **Step 6 - Fv Unit Discharge** | |
|---|---|
| 6. LOD Allowable Unit Discharge (cfs/ac) | 2.25 |

Cv/Fv Unit Discharge

Woodland/Meadow (HSG A)
- 10-YR: 0 cfs/ac
- 100-YR: 0.25 cfs/ac

Woodland/Meadow (HSG B,C,D)
- 10-YR: 0.375 cfs/ac
- 100-YR: 1.25 cfs/ac

Non-Woodland/Non-Meadow
- 10-YR: 0.75 cfs/ac
- 100-YR: 2.25 cfs/ac

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 2B
**LOCATION (County):** Sussex

**RESOURCE PROTECTION EVENT (RPv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Impervious disconnection | Type | Filter strip | Type | -- | Type | -- | Type | -- |
| ***Step 1 - Calculate Initial RPv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 0.41 | | 0.41 | | 0.41 | | 0.41 | | 0.41 | |
| 1.2 *Reserved* | | | | | | | | | | |
| 1.3 Initial RCN | 80.29 | | | | | | | | | |
| 1.4 RPv for Contributing Area (in.) | 1.40 | | | | | | | | | |
| 1.5 Req'd RPv Reduction for Contributing Area (in.) | 0.25 | | | | | | | | | |
| 1.6 Req'd RPv Reduction for Contributing Area (%) | 18% | | | | | | | | | |
| 1.7 RPv allowable discharge rate (cfs) | 0.02 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | | | | | | | | | | |
| 2.2 Retention reduction allowance (%) | 0% | | 0% | | N/A | | N/A | | N/A | |
| 2.3 Retention reduction volume (ac-ft) | 0.00 | | 0.00 | | N/A | | N/A | | N/A | |
| 2.4 Retention reduction volume (in.) | 0.00 | | 0.00 | | N/A | | N/A | | N/A | |
| 2.5 Runoff volume after retention reduction (in.) | 1.40 | | 1.28 | | N/A | | N/A | | N/A | |
| 2.6 Adjusted CN* | 80.30 | | 77.91 | | N/A | | N/A | | N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Annual CN (ACN) | 80.29 | | 77.91 | | N/A | | N/A | | N/A | |
| 3.2 Annual runoff (in.) | 18.55 | | 16.70 | | N/A | | N/A | | N/A | |
| 3.3 Proportion A/B soils in BMP footprint (%) | | | | | | | | | | |
| 3.4 Annual runoff reduction allowance (%) | 10% | | 15% | | N/A | | N/A | | N/A | |
| 3.5 Annual runoff after reduction (in.) | 16.70 | | 14.19 | | N/A | | N/A | | N/A | |
| 3.6 Adjusted ACN | 77.91 | | 74.38 | | N/A | | N/A | | N/A | |
| 3.7 Annual Runoff Reduction Allowance for RPv (in.) | 0.12 | | 0.29 | | N/A | | N/A | | N/A | |
| ***Step 4 - Calculate RPv with BMP Reductions*** | | | | | | | | | | |
| 4.1 RPv runoff volume after all reductions (in.) | 1.28 | | 1.11 | | N/A | | N/A | | N/A | |
| 4.2 Total RPv runoff reduction (in.) | 0.12 | | 0.29 | | N/A | | N/A | | N/A | |
| 4.3 Total RPv runoff reduction (%) | 9% | | 21% | | N/A | | N/A | | N/A | |
| 4.4 Adjusted CN after all reductions | 77.91 | | 74.38 | | N/A | | N/A | | N/A | |
| 4.5 Equivalent TR-55 RCN for H&H modeling | 84.14 | | 81.44 | | N/A | | N/A | | N/A | |
| 4.6 Req'd reduction met? | No | | OK | | N/A | | N/A | | N/A | |
| ***Step 5 - Determine Runoff Reduction Offset*** | | | | | | | | | | |
| 5.1 Runoff Reduction Shortfall (in.) | 0.13 | | N/A | | N/A | | N/A | | N/A | |
| 5.2 Runoff Reduction Shortfall (cu.ft./ac) | 454 | | N/A | | N/A | | N/A | | N/A | |
| 5.3 Total Offset Volume (cu.ft.) | 186 | | N/A | | N/A | | N/A | | N/A | |

**DURMM BMP Name**

--
Infiltration w/sand or vegetation
Infiltration w/o sand or vegetation
Bioretention w/underdrain
Permeable pave w/sand or vegetation
Permeable pave w/o sand or vegetation
Vegetated roof
Rainwater harvesting
Impervious disconnection
Bioswale
Vegetated open channel
Filter strip
Riparian forest buffer
Urban tree planting
Soil amendment
Sheetflow to turf open space
Sheetflow to forest open space
Wet swale
Ephemeral wetland
--
Dry ED basin
Dry detention pond
Hydrodynamic structure
Urban filtering practice
Wet pond
Constructed wetland
--
Nutrient management
Street sweeping
--
Urban stream restoration

Effective April 2016

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 2B
**LANDUSE TYPE:** Residential
**TMDL WATERSHED:** Little Assawoman Bay

## TOTAL MAXIMUM DAILY LOAD (TMDL) WORKSHEET

| | BMP 1 | | | | BMP 2 | | | | BMP 3 | | | | BMP 4 | | | | BMP 5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Impervious disconnection | | | Type: | Filter strip | | | Type: | -- | | | Type: | -- | | | Type: | -- | | |
| ***Step 1 - Calculate Annual Runoff Volume*** | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS |
| 1.1 Total contributing area to BMP (ac) | 0.41 | | | | | | | | | | | | | | | | | | | |
| 1.2 Initial RCN | 80 | | | | | | | | | | | | | | | | | | | |
| 1.3 Annual runoff volume (in.) | 18.55 | | | | | | | | | | | | | | | | | | | |
| 1.4 Annual runoff volume (liters) | 7.82E+05 | | | | | | | | | | | | | | | | | | | |
| ***Step 2 - Calculate Annual Pollutant Load*** | | | | | | | | | | | | | | | | | | | | |
| 2.1 EMC (mg/L) | | 2.00 | 0.27 | 60 | | | | | | | | | | | | | | | | |
| 2.2 Load (mg/yr) | | 1.56E+06 | 2.11E+05 | 4.69E+07 | | | | | | | | | | | | | | | | |
| 2.4 Stormwater Load (lb/ac/yr) | | 8.41 | 1.14 | 252 | | 7.57 | 1.02 | 227 | | 6.43 | 0.87 | 193 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 3 - Adjust for Runoff Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 3.1 BMP Runoff Reduction (%) | 10% | | | | 15% | | | | N/A | | | | N/A | | | | N/A | | | |
| 3.2 BMP Removal Efficiency (%) | | 10% | 10% | 10% | | 15% | 15% | 15% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 3.3 Adjusted load (lb/ac/yr) | | 7.57 | 1.02 | 227 | | 6.43 | 0.87 | 193 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 4 - Calculate Pollutant Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 4.1 TMDL (lb/ac/yr) | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A |
| 4.2 Reduction met? | | No | No | OK | | No | No | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK |
| ***Step 5 - Determine TMDL Offset*** | | | | | | | | | | | | | | | | | | | | |
| 5.1 TMDL Shortfall (lb/ac/yr) | | 1.87 | 0.79 | 0 | | 0.73 | 0.64 | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 |
| 5.2 TMDL Shortfall (%) | | 25% | 77% | 0% | | 11% | 74% | 0% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.3 Residual RPv Volume (in) | | 1.28 | 1.28 | 1.28 | | 1.11 | 1.11 | 1.11 | | N/A | N/A | N/A | | N/A | N/A | N/A | | N/A | N/A | N/A |
| 5.4 Req'd Additional RR to meet TMDL (in)* | | 0.32 | 0.99 | 0.00 | | 0.13 | 0.82 | 0.00 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.5 Req'd Additional RR to meet TMDL (cu.ft./ac) | | 1150 | 3608 | 0 | | 461 | 2972 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.6 Total Offset Volume (cu.ft.) | | 471 | 1479 | 0 | | 189 | 1219 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 2B
**LOCATION (County):** Sussex

**CONVEYANCE EVENT (Cv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Impervious disconnection | Type: | Filter strip | Type: | -- | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Cv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 0.41 | | 0.41 | | 0.41 | | 0.41 | | 0.41 | |
| 1.2 Initial RCN | 80.29 | | | | | | | | | |
| 1.3 **10-YR** Rainfall (in.) | 5.3 | | | | | | | | | |
| 1.4 Cv runoff volume (in.) | 3.18 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 0.75 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | 0.00 | | | | | | | | | |
| 1.7 Cv allowable discharge rate (cfs) | 0.31 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 3.18 | | 3.12 | | 3.06 | | #N/A | | #N/A | |
| 2.5 CN* | 80.29 | | 79.62 | | 78.96 | | #N/A | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 2% | | 2% | | #N/A | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 3.12 | | 3.06 | | #N/A | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 79.62 | | 78.96 | | #N/A | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.06 | | 0.13 | | #N/A | | #N/A | | #N/A | |
| ***Step 4 - Calculate Cv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Cv runoff volume after all reductions (in.) | 3.12 | | 3.06 | | #N/A | | #N/A | | #N/A | |
| 4.2 Total Cv runoff reduction (%) | 2% | | 4% | | #N/A | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 79.62 | | 78.96 | | #N/A | | #N/A | | #N/A | |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 2B
**LOCATION (County):** Sussex

**FLOODING EVENT (Fv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Impervious disconnection | Type: | Filter strip | Type: | -- | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Fv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 0.41 | | 0.41 | | 0.41 | | 0.41 | | 0.41 | |
| 1.2 Initial RCN | 80.29 | | | | | | | | | |
| 1.3 **100-YR** Rainfall (in.) | 9.2 | | | | | | | | | |
| 1.4 Fv runoff volume (in.) | 6.79 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 2.25 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | 0.00 | | | | | | | | | |
| 1.7 Fv allowable discharge rate (cfs) | 0.92 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 6.79 | | 6.79 | | 6.79 | | #N/A | | #N/A | |
| 2.5 CN* | 80.29 | | 80.29 | | 80.29 | | #N/A | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 0% | | 0% | | #N/A | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 6.79 | | 6.79 | | #N/A | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 80.29 | | 80.29 | | #N/A | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.00 | | 0.00 | | #N/A | | #N/A | | #N/A | |
| ***Step 4 - Calculate Fv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Fv runoff volume after all reductions (in.) | 6.79 | | 6.79 | | #N/A | | #N/A | | #N/A | |
| 4.2 Total Fv runoff reduction (%) | 0% | | 0% | | #N/A | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 80.29 | | 80.29 | | #N/A | | #N/A | | #N/A | |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 2B |
| **TMDL Watershed:** | Little Assawoman Bay |

**DURMM OUTPUT WORKSHEET**

DURMM v2.beta.110802

***Site Data***

| | | | | | |
|---|---|---|---|---|---|
| Contributing Area to BMPs (ac.) | 0.41 | | | | |
| C.A. RCN | 80 | | | | |
| Subarea LOD (ac.) | 0.41 | | | | |
| Upstream Subarea ID | 0 | 0 | 0 | 0 | |
| Upstream Subarea LOD (ac.) | 0.00 | 0.00 | 0.00 | 0.00 | |
| Combined LOD with Upstream Areas (ac.) | 0.41 | | | | |
| Combined RCN with Upstream Areas (ac.) | 80.29 | | | | |
| TMDL-TN (lb/ac/yr) | 5.70 | | | | |
| TMDL-TP (lb/ac/yr) | 0.23 | | | | |
| TMDL-TSS (lb/ac/yr) | N/A | | | | |

| BMP Selection | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| | Impervious disconnection | Filter strip | -- | -- | -- |

***Resource Protection Event (RPV)***

| | | | | | |
|---|---|---|---|---|---|
| RPv for Contributing Area (in.) | 1.40 | | | | |
| Req'd RPv Reduction for Contributing Area (in.) | 0.25 | | | | |
| Req'd RPv Reduction for Contributing Area (%) | 18% | | | | |
| C.A. allowable discharge rate (cfs) | 0.02 | | | | |
| Unmanaged Polluant load, TN (lbs/ac/yr) | 8.41 | | | | |
| Unmanaged Polluant load, TP (lbs/ac/yr) | 1.14 | | | | |
| Unmanaged Polluant load, TSS (lbs/ac/yr) | 252 | | | | |

| BMP Runoff Reduction Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| RPv runoff volume after all reductions (in.) | 1.28 | 1.11 | N/A | N/A | N/A |
| Total RPv runoff reduction (in.) | 0.12 | 0.29 | N/A | N/A | N/A |
| Total RPv runoff reduction (%) | 9% | 0.21 | N/A | N/A | N/A |
| Req'd runoff reduction met? | No | OK | N/A | N/A | N/A |

| BMP TMDL Performance | | | | | |
|---|---|---|---|---|---|
| Adjusted pollutant load, TN (lb/ac/yr) | 7.57 | 6.43 | #N/A | #N/A | #N/A |
| Adjusted pollutant load, TP (lb/ac/yr) | 1.02 | 0.87 | #N/A | #N/A | #N/A |
| Adjusted pollutant load, TSS (lb/ac/yr) | 227 | 193 | #N/A | #N/A | #N/A |

| Offsets Requirements | | | | | |
|---|---|---|---|---|---|
| RPv Offset (cu. ft.) | 186 | N/A | N/A | N/A | N/A |

***Conveyance Event (Cv)***

| | | | | | |
|---|---|---|---|---|---|
| Cv runoff volume (in.) | 3.18 | | | | |
| Stds-based allowable discharge (cfs) | 0.31 | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Cv runoff volume after all reductions (in.) | 3.12 | 3.06 | #N/A | #N/A | #N/A |

***Flooding Event (Fv)***

| | | | | | |
|---|---|---|---|---|---|
| Fv runoff volume (in.) | 6.79 | | | | |
| Stds-based allowable discharge (cfs) | 0.92 | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Fv runoff volume after all reductions (in.) | 6.79 | 6.79 | #N/A | #N/A | #N/A |

***Adjusted Subarea Data for Downstream DURMM Modeling***

| | |
|---|---|
| Contributing Area (ac.) | 0.41 |
| C.A. RCN | 80 |
| LOD Area (ac.) | 0.41 |
| Weighted Target Runoff (in.) | 1.16 |
| Adjusted CN after all reductions | 74.38 |
| Adjusted RPv (in.) | 1.11 |
| Adjusted Cv (in.) | |
| Adjusted Fv (in.) | |

| ***Adjusted Subarea Data for H&H Modeling*** | Rain (in.) | RCN |
|---|---|---|
| Resource Protection Event, RPv | 2.7 | N/A |
| Conveyance Event, Cv | 5.3 | 78.96 |
| Flooding Event, Fv | 9.2 | 80.29 |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 2C |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**CONTRIBUTING AREA RUNOFF CURVE NUMBER (C.A. RCN) WORKSHEET**

| Cover Type | Treatment | Hydrologic Condition | Curve Numbers for Hydrologic Soil Type A Acres | A RCN | B Acres | B RCN | C Acres | C RCN | D Acres | D RCN |
|---|---|---|---|---|---|---|---|---|---|---|
| **CULTIVATED AGRICULTURAL LANDS** | | | | | | | | | | |
| Fallow | Bare soil | ---- | | 77 | | 86 | | 91 | | 94 |
| | Crop residue (CR) | poor | | 76 | | 85 | | 90 | | 93 |
| | Crop residue (CR) | good | | 74 | | 83 | | 88 | | 90 |
| Row Crops | Straight row (SR) | poor | | 72 | | 81 | | 88 | | 91 |
| | Straight row (SR) | good | | 67 | | 78 | | 85 | | 89 |
| | SR + Crop residue | poor | | 71 | | 80 | | 87 | | 90 |
| | SR + Crop residue | good | | 64 | | 75 | | 82 | | 85 |
| | Contoured (C) | poor | | 70 | | 79 | | 84 | | 88 |
| | Contoured (C) | good | | 65 | | 75 | | 82 | | 86 |
| | C + Crop residue | poor | | 69 | | 78 | | 83 | | 87 |
| | C + Crop residue | good | | 64 | | 74 | | 81 | | 85 |
| | Cont & terraced(C&T) | poor | | 66 | | 74 | | 80 | | 82 |
| | Cont & terraced(C&T) | good | | 62 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 65 | | 73 | | 79 | | 81 |
| | C&T + Crop residue | good | | 61 | | 70 | | 77 | | 80 |
| Small Grain | Straight row (SR) | poor | | 65 | | 76 | | 84 | | 88 |
| | Straight row (SR) | good | | 63 | | 75 | | 83 | | 87 |
| | SR + Crop residue | poor | | 64 | | 75 | | 83 | | 86 |
| | SR + Crop residue | good | | 60 | | 72 | | 80 | | 84 |
| | Contoured (C) | poor | | 63 | | 74 | | 82 | | 85 |
| | Contoured (C) | good | | 61 | | 73 | | 81 | | 84 |
| | C + Crop residue | poor | | 62 | | 73 | | 81 | | 84 |
| | C + Crop residue | good | | 60 | | 72 | | 80 | | 83 |
| | Cont & terraced(C&T) | poor | | 61 | | 72 | | 79 | | 82 |
| | Cont & terraces(C&T) | good | | 59 | | 70 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 60 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | good | | 58 | | 69 | | 77 | | 80 |
| Close-seeded | Straight row | poor | | 66 | | 77 | | 85 | | 89 |
| or broadcast | Straight row | good | | 58 | | 72 | | 81 | | 85 |
| legumes or | Contoured | poor | | 64 | | 75 | | 83 | | 85 |
| rotation | Contoured | good | | 55 | | 69 | | 78 | | 83 |
| meadow | Cont & terraced | poor | | 63 | | 73 | | 80 | | 83 |
| | Cont & terraced | good | | 51 | | 67 | | 76 | | 80 |
| **OTHER AGRICULTURAL LANDS** | | | | | | | | | | |
| | Pasture, grassland or range | poor | | 68 | | 79 | | 86 | | 89 |
| | | fair | | 49 | | 69 | | 79 | | 84 |
| | | good | | 39 | | 61 | | 74 | | 80 |
| | Meadow -cont. grass (non grazed) | ---- | | 30 | | 58 | | 71 | | 78 |
| | Brush - brush, weed, grass mix | poor | | 48 | | 67 | | 77 | | 83 |
| | | fair | | 35 | | 56 | | 70 | | 77 |
| | | good | | 30 | | 48 | | 65 | | 73 |
| | Woods - grass combination | poor | | 57 | | 73 | | 82 | | 86 |
| | | fair | | 43 | | 65 | | 76 | | 82 |
| | | good | | 32 | | 58 | | 72 | | 79 |
| | Woods | poor | | 45 | | 66 | | 77 | | 83 |
| | | fair | | 36 | | 60 | | 73 | | 79 |
| | | good | | 30 | | 55 | | 70 | | 77 |
| | Farmsteads | ---- | | 59 | | 74 | | 82 | | 86 |
| **FULLY DEVELOPED URBAN AREAS (Veg Established)** | | | | | | | | | | |
| Open space (Lawns,parks etc.) | | | | | | | | | | |
| | Poor condition; grass cover < 50% | | | 68 | | 79 | | 86 | | 89 |
| | Fair condition; grass cover 50% to 75 % | | | 49 | | 69 | | 79 | | 84 |
| | Good condition; grass cover > 75% | | | 39 | | 61 | | 74 | 0.79 | 80 |
| Impervious Areas | | | | | | | | | | |
| | Paved parking lots, roofs, driveways | | | 98 | | 98 | | 98 | 0.17 | 98 |
| | Streets and roads | | | | | | | | | |
| | Paved; curbs and storm sewers | | | 98 | | 98 | | 98 | | 98 |
| | Paved; open ditches (w/right-of-way) | | | 83 | | 89 | | 92 | | 93 |
| | Gravel (w/ right-of-way) | | | 76 | | 85 | | 89 | | 91 |
| | Dirt (w/ right-of-way) | | | 72 | | 82 | | 87 | | 89 |
| Urban Districts | | Avg % impervious | | | | | | | | |
| | Commercial & business | 85 | | 89 | | 92 | | 94 | | 95 |
| | Industrial | 72 | | 81 | | 88 | | 91 | | 93 |
| Residential districts by average lot size | | Avg % impervious | | | | | | | | |
| | 1/8 acre (town houses) | 65 | | 77 | | 85 | | 90 | | 92 |
| | 1/4 acre | 38 | | 61 | | 75 | | 83 | | 87 |
| | 1/3 acre | 30 | | 57 | | 72 | | 81 | | 86 |
| | 1/2 acre | 25 | | 54 | | 70 | | 80 | | 85 |
| | 1 acre | 20 | | 51 | | 68 | | 79 | | 84 |
| | 2 acre | 12 | | 46 | | 65 | | 77 | | 82 |
| **DEVELOPING URBAN AREA (No Vegetation)** | | | | | | | | | | |
| | Newly graded area (pervious only) | | | 77 | | 86 | | 91 | | 94 |
| **USER DEFINED** | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| Subarea Contributing Area per Soil Type (ac) | A | B | C | D |
|---|---|---|---|---|
| | 0 | 0 | 0 | 0.96 |

**UPSTREAM CONTRIBUTING AREAS**

| | Subarea ID | Acres | RCN |
|---|---|---|---|
| Upstream Contributing Area 1 | | | |
| Upstream Contributing Area 2 | | | |
| Upstream Contributing Area 3 | | | |
| Upstream Contributing Area 4 | | | |

| | |
|---|---|
| **Total Contributing Area (ac)** | **0.96** |
| **Weighted Runoff Curve Number (RCN)** | **83** |

**County**

Kent
New Castle
Sussex

**Unit Hydrograph**

DMV
STD

Effective April 2016

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 2C |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**LIMIT OF DISTURBANCE (LOD) WORKSHEET**

| **Step 1 - Subarea LOD Data** | **HSG A** | **HSG B** | **HSG C** | **HSG D** |
|---|---|---|---|---|
| 1.1 HSG Area Within LOD (ac) | | | | 0.96 |
| 1.2 Pre-Developed Woods/Meadow Within LOD (ac) | | | | |
| 1.3 Pre-Developed Impervious Within LOD (ac) | | | | |
| 1.4.a Post-Developed Imperviousness Within LOD, Option #1 (ac); ***OR*** | | | | 0.17 |
| 1.4.b Post-Developed Imperviousness Within LOD, Option #2 (%) | 0% | 0% | 0% | 18% |

| **Step 2 - Subarea LOD Runoff Calculations** | | | | |
|---|---|---|---|---|
| 2.1 RCN per HSG | 0.00 | 0.00 | 0.00 | 83.19 |
| 2.2 RPv per HSG (in.) | 0.00 | 0.00 | 0.00 | 1.56 |
| 2.3 Target Runoff per HSG (in.) | 0.00 | 0.00 | 0.00 | 1.39 |
| 2.4 Cv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 0.00 | 0.75 |
| 2.5 Fv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 0.00 | 2.25 |
| 2.6 Subarea LOD (ac) | 0.96 | | | |
| 2.7 Subarea Weighted RCN | 83.19 | | | |
| 2.8 Subarea Weighted RPv (in.) | 1.56 | | | |
| 2.9 Subarea Weighted Target Runoff (in.) | 1.39 | | | |

| RPv Target Runoff (in.) | |
|---|---|
| Soil | Woods |
| HSG A | 0.00 |
| HSG B | 0.12 |
| HSG C | 0.55 |
| HSG D | 0.87 |

| **Step 3 - Upstream LOD Areas** *(from previous DURMM Report as applicable)* | **Area 1** | **Area 2** | **Area 3** | **Area 4** |
|---|---|---|---|---|
| 3.1 Upstream Subarea ID | | | | |
| 3.2 Upstream LOD Area (ac) | | | | |
| 3.3 Target Runoff for Upstream Area (in.) | | | | |
| 3.4 Adjusted CN after all reductions | | | | |
| 3.5 Adjusted RPv (in.) | | | | |
| 3.6 Adjusted Cv (in.) | | | | |
| 3.7 Adjusted Fv (in.) | | | | |

| **Step 4 - RPv Calculations for Combined LOD** | |
|---|---|
| 4.1 Combined LOD (ac) | 0.96 |
| 4.2 Weighted RCN | 83.19 |
| 4.3 Weighted RPv (in.) | 1.56 |
| 4.4 Weighted Target Runoff (in.) | 1.39 |
| 4.5 Estimated Annual Runoff (in.) | 21.00 |
| 4.6 Req'd Runoff Reduction within LOD (in.) | 0.17 |
| 4.7 Req'd Runoff Reduction within LOD (%) | 11% |

| **Step 5 - Cv Unit Discharge** | |
|---|---|
| 5. LOD Allowable Unit Discharge (cfs/ac) | 0.75 |

| **Step 6 - Fv Unit Discharge** | |
|---|---|
| 6. LOD Allowable Unit Discharge (cfs/ac) | 2.25 |

| Cv/Fv Unit Discharge |
|---|
| Woodland/Meadow (HSG A) |
| 10-YR: 0 cfs/ac |
| 100-YR: 0.25 cfs/ac |
| Woodland/Meadow (HSG B,C,D) |
| 10-YR: 0.375 cfs/ac |
| 100-YR: 1.25 cfs/ac |
| Non-Woodland/Non-Meadow |
| 10-YR: 0.75 cfs/ac |
| 100-YR: 2.25 cfs/ac |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 2C
**LOCATION (County):** Sussex

**RESOURCE PROTECTION EVENT (RPv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Impervious disconnection | Type | Filter strip | Type | -- | Type | -- | Type | -- |
| ***Step 1 - Calculate Initial RPv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 0.96 | | 0.96 | | 0.96 | | 0.96 | | 0.96 | |
| 1.2 *Reserved* | | | | | | | | | | |
| 1.3 Initial RCN | 83.19 | | | | | | | | | |
| 1.4 RPv for Contributing Area (in.) | 1.56 | | | | | | | | | |
| 1.5 Req'd RPv Reduction for Contributing Area (in.) | 0.17 | | | | | | | | | |
| 1.6 Req'd RPv Reduction for Contributing Area (%) | 11% | | | | | | | | | |
| 1.7 RPv allowable discharge rate (cfs) | 0.06 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | | | | | | | | | | |
| 2.2 Retention reduction allowance (%) | 0% | | 0% | | N/A | | N/A | | N/A | |
| 2.3 Retention reduction volume (ac-ft) | 0.00 | | 0.00 | | N/A | | N/A | | N/A | |
| 2.4 Retention reduction volume (in.) | 0.00 | | 0.00 | | N/A | | N/A | | N/A | |
| 2.5 Runoff volume after retention reduction (in.) | 1.56 | | 1.42 | | N/A | | N/A | | N/A | |
| 2.6 Adjusted CN* | 83.19 | | 80.72 | | N/A | | N/A | | N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Annual CN (ACN) | 83.19 | | 80.72 | | N/A | | N/A | | N/A | |
| 3.2 Annual runoff (in.) | 21.00 | | 18.90 | | N/A | | N/A | | N/A | |
| 3.3 Proportion A/B soils in BMP footprint (%) | | | | | | | | | | |
| 3.4 Annual runoff reduction allowance (%) | 10% | | 15% | | N/A | | N/A | | N/A | |
| 3.5 Annual runoff after reduction (in.) | 18.90 | | 16.07 | | N/A | | N/A | | N/A | |
| 3.6 Adjusted ACN | 80.72 | | 77.06 | | N/A | | N/A | | N/A | |
| 3.7 Annual Runoff Reduction Allowance for RPv (in.) | 0.13 | | 0.32 | | N/A | | N/A | | N/A | |
| ***Step 4 - Calculate RPv with BMP Reductions*** | | | | | | | | | | |
| 4.1 RPv runoff volume after all reductions (in.) | 1.42 | | 1.24 | | N/A | | N/A | | N/A | |
| 4.2 Total RPv runoff reduction (in.) | 0.13 | | 0.32 | | N/A | | N/A | | N/A | |
| 4.3 Total RPv runoff reduction (%) | 8% | | 20% | | N/A | | N/A | | N/A | |
| 4.4 Adjusted CN after all reductions | 80.72 | | 77.06 | | N/A | | N/A | | N/A | |
| 4.5 Equivalent TR-55 RCN for H&H modeling | 86.23 | | 83.50 | | N/A | | N/A | | N/A | |
| 4.6 Req'd reduction met? | No | | OK | | N/A | | N/A | | N/A | |
| ***Step 5 - Determine Runoff Reduction Offset*** | | | | | | | | | | |
| 5.1 Runoff Reduction Shortfall (in.) | 0.04 | | N/A | | N/A | | N/A | | N/A | |
| 5.2 Runoff Reduction Shortfall (cu.ft./ac) | 128 | | N/A | | N/A | | N/A | | N/A | |
| 5.3 Total Offset Volume (cu.ft.) | 123 | | N/A | | N/A | | N/A | | N/A | |

**DURMM BMP Name**

--
Infiltration w/sand or vegetation
Infiltration w/o sand or vegetation
Bioretention w/underdrain
Permeable pave w/sand or vegetation
Permeable pave w/o sand or vegetation
Vegetated roof
Rainwater harvesting
Impervious disconnection
Bioswale
Vegetated open channel
Filter strip
Riparian forest buffer
Urban tree planting
Soil amendment
Sheetflow to turf open space
Sheetflow to forest open space
Wet swale
Ephemeral wetland
--
Dry ED basin
Dry detention pond
Hydrodynamic structure
Urban filtering practice
Wet pond
Constructed wetland
--
Nutrient management
Street sweeping
--
Urban stream restoration

Effective April 2016

| | |
|---|---|
| **PROJECT:** | **Batson Creek Estates** |
| **DRAINAGE SUBAREA ID:** | **2C** |
| **LANDUSE TYPE:** | **Residential** |
| **TMDL WATERSHED:** | **Little Assawoman Bay** |

**TOTAL MAXIMUM DAILY LOAD (TMDL) WORKSHEET**

| | BMP 1 | | | | BMP 2 | | | | BMP 3 | | | | BMP 4 | | | | BMP 5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Impervious disconnection | | | Type: | Filter strip | | | Type: | -- | | | Type: | -- | | | Type: | -- | | |
| ***Step 1 - Calculate Annual Runoff Volume*** | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS |
| 1.1 Total contributing area to BMP (ac) | 0.96 | | | | | | | | | | | | | | | | | | | |
| 1.2 Initial RCN | 83 | | | | | | | | | | | | | | | | | | | |
| 1.3 Annual runoff volume (in.) | 21.00 | | | | | | | | | | | | | | | | | | | |
| 1.4 Annual runoff volume (liters) | 2.07E+06 | | | | | | | | | | | | | | | | | | | |
| ***Step 2 - Calculate Annual Pollutant Load*** | | | | | | | | | | | | | | | | | | | | |
| 2.1 EMC (mg/L) | | 2.00 | 0.27 | 60 | | | | | | | | | | | | | | | | |
| 2.2 Load (mg/yr) | | 4.14E+06 | 5.60E+05 | 1.24E+08 | | | | | | | | | | | | | | | | |
| 2.4 Stormwater Load (lb/ac/yr) | | 9.52 | 1.29 | 286 | | 8.57 | 1.16 | 257 | | 7.28 | 0.98 | 218 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 3 - Adjust for Runoff Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 3.1 BMP Runoff Reduction (%) | 10% | | | | 15% | | | | N/A | | | | N/A | | | | N/A | | | |
| 3.2 BMP Removal Efficiency (%) | | 10% | 10% | 10% | | 15% | 15% | 15% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 3.3 Adjusted load (lb/ac/yr) | | 8.57 | 1.16 | 257 | | 7.28 | 0.98 | 218 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 4 - Calculate Pollutant Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 4.1 TMDL (lb/ac/yr) | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A |
| 4.2 Reduction met? | | No | No | OK | | No | No | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK |
| ***Step 5 - Determine TMDL Offset*** | | | | | | | | | | | | | | | | | | | | |
| 5.1 TMDL Shortfall (lb/ac/yr) | | 2.87 | 0.93 | 0 | | 1.58 | 0.75 | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 |
| 5.2 TMDL Shortfall (%) | | 33% | 80% | 0% | | 22% | 77% | 0% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.3 Residual RPv Volume (in) | | 1.42 | 1.42 | 1.42 | | 1.24 | 1.24 | 1.24 | | N/A | N/A | N/A | | N/A | N/A | N/A | | N/A | N/A | N/A |
| 5.4 Req'd Additional RR to meet TMDL (in)* | | 0.48 | 1.14 | 0.00 | | 0.27 | 0.95 | 0.00 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.5 Req'd Additional RR to meet TMDL (cu.ft./ac) | | 1732 | 4144 | 0 | | 979 | 3450 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.6 Total Offset Volume (cu.ft.) | | 1662 | 3978 | 0 | | 940 | 3312 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 2C
**LOCATION (County):** Sussex

**CONVEYANCE EVENT (Cv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Impervious disconnection | Type: | Filter strip | Type: | -- | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Cv*** | **Data** | | **Data** | | **Data** | | **Data** | | **Data** | |
| 1.1 Total contributing area to BMP (ac) | 0.96 | | 0.96 | | 0.96 | | 0.96 | | 0.96 | |
| 1.2 Initial RCN | 83.19 | | | | | | | | | |
| 1.3 **10-YR** Rainfall (in.) | 5.3 | | | | | | | | | |
| 1.4 Cv runoff volume (in.) | 3.47 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 0.75 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | 0.00 | | | | | | | | | |
| 1.7 Cv allowable discharge rate (cfs) | 0.72 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 3.47 | | 3.40 | | 3.33 | | #N/A | | #N/A | |
| 2.5 CN* | 83.19 | | 82.48 | | 81.79 | | #N/A | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 2% | | 2% | | #N/A | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 3.40 | | 3.33 | | #N/A | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 82.48 | | 81.79 | | #N/A | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.07 | | 0.14 | | #N/A | | #N/A | | #N/A | |
| ***Step 4 - Calculate Cv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Cv runoff volume after all reductions (in.) | 3.40 | | 3.33 | | #N/A | | #N/A | | #N/A | |
| 4.2 Total Cv runoff reduction (%) | 2% | | 4% | | #N/A | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 82.48 | | 81.79 | | #N/A | | #N/A | | #N/A | |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 2C
**LOCATION (County):** Sussex

**FLOODING EVENT (Fv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Impervious disconnection | Type: | Filter strip | Type: | -- | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Fv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 0.96 | | 0.96 | | 0.96 | | 0.96 | | 0.96 | |
| 1.2 Initial RCN | 83.19 | | | | | | | | | |
| 1.3 **100-YR** Rainfall (in.) | 9.2 | | | | | | | | | |
| 1.4 Fv runoff volume (in.) | 7.15 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 2.25 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | 0.00 | | | | | | | | | |
| 1.7 Fv allowable discharge rate (cfs) | 2.16 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 7.15 | | 7.15 | | 7.15 | | #N/A | | #N/A | |
| 2.5 CN* | 83.19 | | 83.19 | | 83.19 | | #N/A | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 0% | | 0% | | #N/A | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 7.15 | | 7.15 | | #N/A | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 83.19 | | 83.19 | | #N/A | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.00 | | 0.00 | | #N/A | | #N/A | | #N/A | |
| ***Step 4 - Calculate Fv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Fv runoff volume after all reductions (in.) | 7.15 | | 7.15 | | #N/A | | #N/A | | #N/A | |
| 4.2 Total Fv runoff reduction (%) | 0% | | 0% | | #N/A | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 83.19 | | 83.19 | | #N/A | | #N/A | | #N/A | |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 2C |
| **TMDL Watershed:** | Little Assawoman Bay |

**DURMM OUTPUT WORKSHEET**

DURMM v2.beta.110802

***Site Data***

| | | | | | |
|---|---|---|---|---|---|
| Contributing Area to BMPs (ac.) | 0.96 | | | | |
| C.A. RCN | 83 | | | | |
| Subarea LOD (ac.) | 0.96 | | | | |
| Upstream Subarea ID | 0 | 0 | 0 | 0 | |
| Upstream Subarea LOD (ac.) | 0.00 | 0.00 | 0.00 | 0.00 | |
| Combined LOD with Upstream Areas (ac.) | 0.96 | | | | |
| Combined RCN with Upstream Areas (ac.) | 83.19 | | | | |
| TMDL-TN (lb/ac/yr) | 5.70 | | | | |
| TMDL-TP (lb/ac/yr) | 0.23 | | | | |
| TMDL-TSS (lb/ac/yr) | N/A | | | | |

| BMP Selection | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| | Impervious disconnection | Filter strip | -- | -- | -- |

***Resource Protection Event (RPV)***

| | | | | | |
|---|---|---|---|---|---|
| RPv for Contributing Area (in.) | 1.56 | | | | |
| Req'd RPv Reduction for Contributing Area (in.) | 0.17 | | | | |
| Req'd RPv Reduction for Contributing Area (%) | 11% | | | | |
| C.A. allowable discharge rate (cfs) | 0.06 | | | | |
| Unmanaged Polluant load, TN (lbs/ac/yr) | 9.52 | | | | |
| Unmanaged Polluant load, TP (lbs/ac/yr) | 1.29 | | | | |
| Unmanaged Polluant load, TSS (lbs/ac/yr) | 286 | | | | |

| BMP Runoff Reduction Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| RPv runoff volume after all reductions (in.) | 1.42 | 1.24 | N/A | N/A | N/A |
| Total RPv runoff reduction (in.) | 0.13 | 0.32 | N/A | N/A | N/A |
| Total RPv runoff reduction (%) | 8% | 0.20 | N/A | N/A | N/A |
| Req'd runoff reduction met? | No | OK | N/A | N/A | N/A |

| BMP TMDL Performance | | | | | |
|---|---|---|---|---|---|
| Adjusted pollutant load, TN (lb/ac/yr) | 8.57 | 7.28 | #N/A | #N/A | #N/A |
| Adjusted pollutant load, TP (lb/ac/yr) | 1.16 | 0.98 | #N/A | #N/A | #N/A |
| Adjusted pollutant load, TSS (lb/ac/yr) | 257 | 218 | #N/A | #N/A | #N/A |
| Offsets Requirements | | | | | |
| RPv Offset (cu. ft.) | 123 | N/A | N/A | N/A | N/A |

***Conveyance Event (Cv)***

| | | | | | |
|---|---|---|---|---|---|
| Cv runoff volume (in.) | 3.47 | | | | |
| Stds-based allowable discharge (cfs) | 0.72 | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Cv runoff volume after all reductions (in.) | 3.40 | 3.33 | #N/A | #N/A | #N/A |

***Flooding Event (Fv)***

| | | | | | |
|---|---|---|---|---|---|
| Fv runoff volume (in.) | 7.15 | | | | |
| Stds-based allowable discharge (cfs) | 2.16 | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Fv runoff volume after all reductions (in.) | 7.15 | 7.15 | #N/A | #N/A | #N/A |

***Adjusted Subarea Data for Downstream DURMM Modeling***

| | |
|---|---|
| Contributing Area (ac.) | 0.96 |
| C.A. RCN | 83 |
| LOD Area (ac.) | 0.96 |
| Weighted Target Runoff (in.) | 1.39 |
| Adjusted CN after all reductions | 77.06 |
| Adjusted RPv (in.) | 1.24 |
| Adjusted Cv (in.) | |
| Adjusted Fv (in.) | |

***Adjusted Subarea Data for H&H Modeling***

| | Rain (in.) | RCN |
|---|---|---|
| Resource Protection Event, RPv | 2.7 | N/A |
| Conveyance Event, Cv | 5.3 | 81.79 |
| Flooding Event, Fv | 9.2 | 83.19 |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 3A |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**CONTRIBUTING AREA RUNOFF CURVE NUMBER (C.A. RCN) WORKSHEET**

| Cover Type | Treatment | Hydrologic Condition | Curve Numbers for Hydrologic Soil Type A Acres | A RCN | B Acres | B RCN | C Acres | C RCN | D Acres | D RCN |
|---|---|---|---|---|---|---|---|---|---|---|
| **CULTIVATED AGRICULTURAL LANDS** | | | | | | | | | | |
| Fallow | Bare soil | ---- | | 77 | | 86 | | 91 | | 94 |
| | Crop residue (CR) | poor | | 76 | | 85 | | 90 | | 93 |
| | Crop residue (CR) | good | | 74 | | 83 | | 88 | | 90 |
| Row Crops | Straight row (SR) | poor | | 72 | | 81 | | 88 | | 91 |
| | Straight row (SR) | good | | 67 | | 78 | | 85 | | 89 |
| | SR + Crop residue | poor | | 71 | | 80 | | 87 | | 90 |
| | SR + Crop residue | good | | 64 | | 75 | | 82 | | 85 |
| | Contoured (C) | poor | | 70 | | 79 | | 84 | | 88 |
| | Contoured (C) | good | | 65 | | 75 | | 82 | | 86 |
| | C + Crop residue | poor | | 69 | | 78 | | 83 | | 87 |
| | C + Crop residue | good | | 64 | | 74 | | 81 | | 85 |
| | Cont & terraced(C&T) | poor | | 66 | | 74 | | 80 | | 82 |
| | Cont & terraced(C&T) | good | | 62 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 65 | | 73 | | 79 | | 81 |
| | C&T + Crop residue | good | | 61 | | 70 | | 77 | | 80 |
| Small Grain | Straight row (SR) | poor | | 65 | | 76 | | 84 | | 88 |
| | Straight row (SR) | good | | 63 | | 75 | | 83 | | 87 |
| | SR + Crop residue | poor | | 64 | | 75 | | 83 | | 86 |
| | SR + Crop residue | good | | 60 | | 72 | | 80 | | 84 |
| | Contoured (C) | poor | | 63 | | 74 | | 82 | | 85 |
| | Contoured (C) | good | | 61 | | 73 | | 81 | | 84 |
| | C + Crop residue | poor | | 62 | | 73 | | 81 | | 84 |
| | C + Crop residue | good | | 60 | | 72 | | 80 | | 83 |
| | Cont & terraced(C&T) | poor | | 61 | | 72 | | 79 | | 82 |
| | Cont & terraces(C&T) | good | | 59 | | 70 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 60 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | good | | 58 | | 69 | | 77 | | 80 |
| Close-seeded | Straight row | poor | | 66 | | 77 | | 85 | | 89 |
| or broadcast | Straight row | good | | 58 | | 72 | | 81 | | 85 |
| legumes or | Contoured | poor | | 64 | | 75 | | 83 | | 85 |
| rotation | Contoured | good | | 55 | | 69 | | 78 | | 83 |
| meadow | Cont & terraced | poor | | 63 | | 73 | | 80 | | 83 |
| | Cont & terraced | good | | 51 | | 67 | | 76 | | 80 |
| **OTHER AGRICULTURAL LANDS** | | | | | | | | | | |
| | Pasture, grassland or range | poor | | 68 | | 79 | | 86 | | 89 |
| | | fair | | 49 | | 69 | | 79 | | 84 |
| | | good | | 39 | | 61 | | 74 | | 80 |
| | Meadow -cont. grass (non grazed) | ---- | | 30 | | 58 | | 71 | | 78 |
| | Brush - brush, weed, grass mix | poor | | 48 | | 67 | | 77 | | 83 |
| | | fair | | 35 | | 56 | | 70 | | 77 |
| | | good | | 30 | | 48 | | 65 | | 73 |
| | Woods - grass combination | poor | | 57 | | 73 | | 82 | | 86 |
| | | fair | | 43 | | 65 | | 76 | | 82 |
| | | good | | 32 | | 58 | | 72 | | 79 |
| | Woods | poor | | 45 | | 66 | | 77 | | 83 |
| | | fair | | 36 | | 60 | | 73 | | 79 |
| | | good | | 30 | | 55 | | 70 | | 77 |
| | Farmsteads | ---- | | 59 | | 74 | | 82 | | 86 |
| **FULLY DEVELOPED URBAN AREAS (Veg Established)** | | | | | | | | | | |
| Open space (Lawns,parks etc.) | | | | | | | | | | |
| | Poor condition; grass cover < 50% | | | 68 | | 79 | | 86 | | 89 |
| | Fair condition; grass cover 50% to 75 % | | | 49 | | 69 | | 79 | | 84 |
| | Good condition; grass cover > 75% | | | 39 | | 61 | 0.79 | 74 | 0.04 | 80 |
| Impervious Areas | | | | | | | | | | |
| | Paved parking lots, roofs, driveways | | | 98 | | 98 | 0.13 | 98 | | 98 |
| | Streets and roads | | | | | | | | | |
| | Paved; curbs and storm sewers | | | 98 | | 98 | | 98 | | 98 |
| | Paved; open ditches (w/right-of-way) | | | 83 | | 89 | | 92 | | 93 |
| | Gravel (w/ right-of-way) | | | 76 | | 85 | | 89 | | 91 |
| | Dirt (w/ right-of-way) | | | 72 | | 82 | | 87 | | 89 |
| Urban Districts | | Avg % impervious | | | | | | | | |
| | Commercial & business | 85 | | 89 | | 92 | | 94 | | 95 |
| | Industrial | 72 | | 81 | | 88 | | 91 | | 93 |
| Residential districts by average lot size | | Avg % impervious | | | | | | | | |
| | 1/8 acre (town houses) | 65 | | 77 | | 85 | | 90 | | 92 |
| | 1/4 acre | 38 | | 61 | | 75 | | 83 | | 87 |
| | 1/3 acre | 30 | | 57 | | 72 | | 81 | | 86 |
| | 1/2 acre | 25 | | 54 | | 70 | | 80 | | 85 |
| | 1 acre | 20 | | 51 | | 68 | | 79 | | 84 |
| | 2 acre | 12 | | 46 | | 65 | | 77 | | 82 |
| **DEVELOPING URBAN AREA (No Vegetation)** | | | | | | | | | | |
| | Newly graded area (pervious only) | | | 77 | | 86 | | 91 | | 94 |
| **USER DEFINED** | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| Subarea Contributing Area per Soil Type (ac) | A | B | C | D |
|---|---|---|---|---|
| | 0 | 0 | 0.92 | 0.04 |

| **UPSTREAM CONTRIBUTING AREAS** | *Subarea ID* | *Acres* | *RCN* |
|---|---|---|---|
| Upstream Contributing Area 1 | | | |
| Upstream Contributing Area 2 | | | |
| Upstream Contributing Area 3 | | | |
| Upstream Contributing Area 4 | | | |

| | |
|---|---|
| **Total Contributing Area (ac)** | **0.96** |
| **Weighted Runoff Curve Number (RCN)** | **78** |

**County**

Kent
New Castle
Sussex

**Unit Hydrograph**

DMV
STD

Effective April 2016

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 3A |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**LIMIT OF DISTURBANCE (LOD) WORKSHEET**

| **Step 1 - Subarea LOD Data** | **HSG A** | **HSG B** | **HSG C** | **HSG D** |
|---|---|---|---|---|
| 1.1 HSG Area Within LOD (ac) | | | 0.92 | 0.04 |
| 1.2 Pre-Developed Woods/Meadow Within LOD (ac) | | | | |
| 1.3 Pre-Developed Impervious Within LOD (ac) | | | | |
| 1.4.a Post-Developed Imperviousness Within LOD, Option #1 (ac); ***OR*** | | | 0.13 | |
| 1.4.b Post-Developed Imperviousness Within LOD, Option #2 (%) | 0% | 0% | 14% | 0% |

| **Step 2 - Subarea LOD Runoff Calculations** | | | | |
|---|---|---|---|---|
| 2.1 RCN per HSG | 0.00 | 0.00 | 77.39 | 80.00 |
| 2.2 RPv per HSG (in.) | 0.00 | 0.00 | 1.26 | 1.39 |
| 2.3 Target Runoff per HSG (in.) | 0.00 | 0.00 | 1.10 | 1.39 |
| 2.4 Cv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 0.75 | 0.75 |
| 2.5 Fv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 2.25 | 2.25 |
| 2.6 Subarea LOD (ac) | 0.96 | | | |
| 2.7 Subarea Weighted RCN | 77.50 | | | |
| 2.8 Subarea Weighted RPv (in.) | 1.26 | | | |
| 2.9 Subarea Weighted Target Runoff (in.) | 1.11 | | | |

| RPv Target Runoff (in.) | |
|---|---|
| Soil | Woods |
| HSG A | 0.00 |
| HSG B | 0.12 |
| HSG C | 0.55 |
| HSG D | 0.87 |

| **Step 3 - Upstream LOD Areas** ***(from previous DURMM Report as applicable)*** | **Area 1** | **Area 2** | **Area 3** | **Area 4** |
|---|---|---|---|---|
| 3.1 Upstream Subarea ID | | | | |
| 3.2 Upstream LOD Area (ac) | | | | |
| 3.3 Target Runoff for Upstream Area (in.) | | | | |
| 3.4 Adjusted CN after all reductions | | | | |
| 3.5 Adjusted RPv (in.) | | | | |
| 3.6 Adjusted Cv (in.) | | | | |
| 3.7 Adjusted Fv (in.) | | | | |

| **Step 4 - RPv Calculations for Combined LOD** | |
|---|---|
| 4.1 Combined LOD (ac) | 0.96 |
| 4.2 Weighted RCN | 77.50 |
| 4.3 Weighted RPv (in.) | 1.26 |
| 4.4 Weighted Target Runoff (in.) | 1.11 |
| 4.5 Estimated Annual Runoff (in.) | 16.39 |
| 4.6 Req'd Runoff Reduction within LOD (in.) | 0.15 |
| 4.7 Req'd Runoff Reduction within LOD (%) | 12% |

| **Step 5 - Cv Unit Discharge** | |
|---|---|
| 5. LOD Allowable Unit Discharge (cfs/ac) | 0.75 |

| **Step 6 - Fv Unit Discharge** | |
|---|---|
| 6. LOD Allowable Unit Discharge (cfs/ac) | 2.25 |

| Cv/Fv Unit Discharge |
|---|
| Woodland/Meadow (HSG A) |
| 10-YR: 0 cfs/ac |
| 100-YR: 0.25 cfs/ac |
| Woodland/Meadow (HSG B,C,D) |
| 10-YR: 0.375 cfs/ac |
| 100-YR: 1.25 cfs/ac |
| Non-Woodland/Non-Meadow |
| 10-YR: 0.75 cfs/ac |
| 100-YR: 2.25 cfs/ac |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 3A
**LOCATION (County):** Sussex

**RESOURCE PROTECTION EVENT (RPv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Impervious disconnection | Type | Filter strip | Type | Vegetated open channel | Type | -- | Type | -- |
| ***Step 1 - Calculate Initial RPv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 0.96 | | 0.96 | | 0.96 | | 0.96 | | 0.96 | |
| 1.2 *Reserved* | | | | | | | | | | |
| 1.3 Initial RCN | 77.50 | | | | | | | | | |
| 1.4 RPv for Contributing Area (in.) | 1.26 | | | | | | | | | |
| 1.5 Req'd RPv Reduction for Contributing Area (in.) | 0.15 | | | | | | | | | |
| 1.6 Req'd RPv Reduction for Contributing Area (%) | 12% | | | | | | | | | |
| 1.7 RPv allowable discharge rate (cfs) | 0.05 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | | | | | | | | | | |
| 2.2 Retention reduction allowance (%) | 0% | | 0% | | 0% | | N/A | | N/A | |
| 2.3 Retention reduction volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | N/A | | N/A | |
| 2.4 Retention reduction volume (in.) | 0.00 | | 0.00 | | 0.00 | | N/A | | N/A | |
| 2.5 Runoff volume after retention reduction (in.) | 1.26 | | 1.15 | | 1.00 | | N/A | | N/A | |
| 2.6 Adjusted CN* | 77.50 | | 75.20 | | 71.79 | | N/A | | N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Annual CN (ACN) | 77.50 | | 75.20 | | 71.79 | | N/A | | N/A | |
| 3.2 Annual runoff (in.) | 16.39 | | 14.75 | | 12.54 | | N/A | | N/A | |
| 3.3 Proportion A/B soils in BMP footprint (%) | | | | | | | | | | |
| 3.4 Annual runoff reduction allowance (%) | 10% | | 15% | | 10% | | N/A | | N/A | |
| 3.5 Annual runoff after reduction (in.) | 14.75 | | 12.54 | | 11.29 | | N/A | | N/A | |
| 3.6 Adjusted ACN | 75.20 | | 71.79 | | 69.66 | | N/A | | N/A | |
| 3.7 Annual Runoff Reduction Allowance for RPv (in.) | 0.11 | | 0.26 | | 0.36 | | N/A | | N/A | |
| ***Step 4 - Calculate RPv with BMP Reductions*** | | | | | | | | | | |
| 4.1 RPv runoff volume after all reductions (in.) | 1.15 | | 1.00 | | 0.91 | | N/A | | N/A | |
| 4.2 Total RPv runoff reduction (in.) | 0.11 | | 0.26 | | 0.36 | | N/A | | N/A | |
| 4.3 Total RPv runoff reduction (%) | 9% | | 21% | | 28% | | N/A | | N/A | |
| 4.4 Adjusted CN after all reductions | 75.20 | | 71.79 | | 69.66 | | N/A | | N/A | |
| 4.5 Equivalent TR-55 RCN for H&H modeling | 82.08 | | 79.43 | | 77.74 | | N/A | | N/A | |
| 4.6 Req'd reduction met? | No | | OK | | OK | | N/A | | N/A | |
| ***Step 5 - Determine Runoff Reduction Offset*** | | | | | | | | | | |
| 5.1 Runoff Reduction Shortfall (in.) | 0.04 | | N/A | | N/A | | N/A | | N/A | |
| 5.2 Runoff Reduction Shortfall (cu.ft./ac) | 142 | | N/A | | N/A | | N/A | | N/A | |
| 5.3 Total Offset Volume (cu.ft.) | 136 | | N/A | | N/A | | N/A | | N/A | |

**DURMM BMP Name**

--
Infiltration w/sand or vegetation
Infiltration w/o sand or vegetation
Bioretention w/underdrain
Permeable pave w/sand or vegetation
Permeable pave w/o sand or vegetation
Vegetated roof
Rainwater harvesting
Impervious disconnection
Bioswale
Vegetated open channel
Filter strip
Riparian forest buffer
Urban tree planting
Soil amendment
Sheetflow to turf open space
Sheetflow to forest open space
Wet swale
Ephemeral wetland
--
Dry ED basin
Dry detention pond
Hydrodynamic structure
Urban filtering practice
Wet pond
Constructed wetland
--
Nutrient management
Street sweeping
--
Urban stream restoration

Effective April 2016

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 3A
**LANDUSE TYPE:** Residential
**TMDL WATERSHED:** Little Assawoman Bay

## TOTAL MAXIMUM DAILY LOAD (TMDL) WORKSHEET

| | BMP 1 | | | | BMP 2 | | | | BMP 3 | | | | BMP 4 | | | | BMP 5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Impervious disconnection | | | Type: | Filter strip | | | Type: | Vegetated open channel | | | Type: | -- | | | Type: | -- | | |
| ***Step 1 - Calculate Annual Runoff Volume*** | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS |
| 1.1 Total contributing area to BMP (ac) | 0.96 | | | | | | | | | | | | | | | | | | | |
| 1.2 Initial RCN | 78 | | | | | | | | | | | | | | | | | | | |
| 1.3 Annual runoff volume (in.) | 16.39 | | | | | | | | | | | | | | | | | | | |
| 1.4 Annual runoff volume (liters) | 1.62E+06 | | | | | | | | | | | | | | | | | | | |
| ***Step 2 - Calculate Annual Pollutant Load*** | | | | | | | | | | | | | | | | | | | | |
| 2.1 EMC (mg/L) | | 2.00 | 0.27 | 60 | | | | | | | | | | | | | | | | |
| 2.2 Load (mg/yr) | | 3.23E+06 | 4.37E+05 | 9.70E+07 | | | | | | | | | | | | | | | | |
| 2.4 Stormwater Load (lb/ac/yr) | | 7.43 | 1.00 | 223 | | 6.69 | 0.90 | 201 | | 5.68 | 0.77 | 171 | | 5.12 | 0.69 | 153 | | #N/A | #N/A | #N/A |
| ***Step 3 - Adjust for Runoff Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 3.1 BMP Runoff Reduction (%) | 10% | | | | 15% | | | | 10% | | | | N/A | | | | N/A | | | |
| 3.2 BMP Removal Efficiency (%) | | 10% | 10% | 10% | | 15% | 15% | 15% | | 10% | 10% | 10% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 3.3 Adjusted load (lb/ac/yr) | | 6.69 | 0.90 | 201 | | 5.68 | 0.77 | 171 | | 5.12 | 0.69 | 153 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 4 - Calculate Pollutant Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 4.1 TMDL (lb/ac/yr) | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A |
| 4.2 Reduction met? | | No | No | OK | | OK | No | OK | | OK | No | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK |
| ***Step 5 - Determine TMDL Offset*** | | | | | | | | | | | | | | | | | | | | |
| 5.1 TMDL Shortfall (lb/ac/yr) | | 0.99 | 0.67 | 0 | | 0.00 | 0.54 | 0 | | 0.00 | 0.46 | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 |
| 5.2 TMDL Shortfall (%) | | 15% | 75% | 0% | | 0% | 70% | 0% | | 0% | 67% | 0% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.3 Residual RPv Volume (in) | | 1.15 | 1.15 | 1.15 | | 1.00 | 1.00 | 1.00 | | 0.91 | 0.91 | 0.91 | | N/A | N/A | N/A | | N/A | N/A | N/A |
| 5.4 Req'd Additional RR to meet TMDL (in)* | | 0.17 | 0.86 | 0.00 | | 0.00 | 0.70 | 0.00 | | 0.00 | 0.60 | 0.00 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.5 Req'd Additional RR to meet TMDL (cu.ft./ac) | | 617 | 3117 | 0 | | 0 | 2536 | 0 | | 0 | 2195 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.6 Total Offset Volume (cu.ft.) | | 593 | 2992 | 0 | | 0 | 2435 | 0 | | 0 | 2108 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 3A
**LOCATION (County):** Sussex

**CONVEYANCE EVENT (Cv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Impervious disconnection | Type: | Filter strip | Type: | Vegetated open channel | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Cv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 0.96 | | 0.96 | | 0.96 | | 0.96 | | 0.96 | |
| 1.2 Initial RCN | 77.50 | | | | | | | | | |
| 1.3 **10-YR** Rainfall (in.) | 5.3 | | | | | | | | | |
| 1.4 Cv runoff volume (in.) | 2.92 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 0.75 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | 0.00 | | | | | | | | | |
| 1.7 Cv allowable discharge rate (cfs) | 0.72 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 2.92 | | 2.86 | | 2.81 | | 2.75 | | #N/A | |
| 2.5 CN* | 77.50 | | 76.86 | | 76.24 | | 75.62 | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 2% | | 2% | | 2% | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 2.86 | | 2.81 | | 2.75 | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 76.86 | | 76.24 | | 75.62 | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.06 | | 0.12 | | 0.17 | | #N/A | | #N/A | |
| ***Step 4 - Calculate Cv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Cv runoff volume after all reductions (in.) | 2.86 | | 2.81 | | 2.75 | | #N/A | | #N/A | |
| 4.2 Total Cv runoff reduction (%) | 2% | | 4% | | 6% | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 76.86 | | 76.24 | | 75.62 | | #N/A | | #N/A | |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 3A
**LOCATION (County):** Sussex

**FLOODING EVENT (Fv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Impervious disconnection | Type: | Filter strip | Type: | Vegetated open channel | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Fv*** | **Data** | | **Data** | | **Data** | | **Data** | | **Data** | |
| 1.1 Total contributing area to BMP (ac) | 0.96 | | 0.96 | | 0.96 | | 0.96 | | 0.96 | |
| 1.2 Initial RCN | 77.50 | | | | | | | | | |
| 1.3 **100-YR** Rainfall (in.) | 9.2 | | | | | | | | | |
| 1.4 Fv runoff volume (in.) | 6.45 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 2.25 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | 0.00 | | | | | | | | | |
| 1.7 Fv allowable discharge rate (cfs) | 2.16 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 6.45 | | 6.45 | | 6.45 | | 6.45 | | #N/A | |
| 2.5 CN* | 77.50 | | 77.50 | | 77.50 | | 77.50 | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 0% | | 0% | | 0% | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 6.45 | | 6.45 | | 6.45 | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 77.50 | | 77.50 | | 77.50 | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.00 | | 0.00 | | 0.00 | | #N/A | | #N/A | |
| ***Step 4 - Calculate Fv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Fv runoff volume after all reductions (in.) | 6.45 | | 6.45 | | 6.45 | | #N/A | | #N/A | |
| 4.2 Total Fv runoff reduction (%) | 0% | | 0% | | 0% | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 77.50 | | 77.50 | | 77.50 | | #N/A | | #N/A | |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 3A
**TMDL Watershed:** Little Assawoman Bay

**DURMM OUTPUT WORKSHEET**

***Site Data***

DURMM v2.beta.110802

| | | | | | |
|---|---|---|---|---|---|
| Contributing Area to BMPs (ac.) | 0.96 | | | | |
| C.A. RCN | 78 | | | | |
| Subarea LOD (ac.) | 0.96 | | | | |
| Upstream Subarea ID | 0 | 0 | 0 | 0 | |
| Upstream Subarea LOD (ac.) | 0.00 | 0.00 | 0.00 | 0.00 | |
| Combined LOD with Upstream Areas (ac.) | 0.96 | | | | |
| Combined RCN with Upstream Areas (ac.) | 77.50 | | | | |
| TMDL-TN (lb/ac/yr) | 5.70 | | | | |
| TMDL-TP (lb/ac/yr) | 0.23 | | | | |
| TMDL-TSS (lb/ac/yr) | N/A | | | | |

| BMP Selection | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| | Impervious disconnection | Filter strip | Vegetated open channel | -- | -- |

***Resource Protection Event (RPV)***

| | | | | | |
|---|---|---|---|---|---|
| RPv for Contributing Area (in.) | 1.26 | | | | |
| Req'd RPv Reduction for Contributing Area (in.) | 0.15 | | | | |
| Req'd RPv Reduction for Contributing Area (%) | 12% | | | | |
| C.A. allowable discharge rate (cfs) | 0.05 | | | | |
| Unmanaged Polluant load, TN (lbs/ac/yr) | 7.43 | | | | |
| Unmanaged Polluant load, TP (lbs/ac/yr) | 1.00 | | | | |
| Unmanaged Polluant load, TSS (lbs/ac/yr) | 223 | | | | |

| BMP Runoff Reduction Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| RPv runoff volume after all reductions (in.) | 1.15 | 1.00 | 0.91 | N/A | N/A |
| Total RPv runoff reduction (in.) | 0.11 | 0.26 | 0.36 | N/A | N/A |
| Total RPv runoff reduction (%) | 9% | 0.21 | 0.28 | N/A | N/A |
| Req'd runoff reduction met? | No | OK | OK | N/A | N/A |

| BMP TMDL Performance | | | | | |
|---|---|---|---|---|---|
| Adjusted pollutant load, TN (lb/ac/yr) | 6.69 | 5.68 | 5.12 | #N/A | #N/A |
| Adjusted pollutant load, TP (lb/ac/yr) | 0.90 | 0.77 | 0.69 | #N/A | #N/A |
| Adjusted pollutant load, TSS (lb/ac/yr) | 201 | 171 | 153 | #N/A | #N/A |
| Offsets Requirements | | | | | |
| RPv Offset (cu. ft.) | 136 | N/A | N/A | N/A | N/A |

***Conveyance Event (Cv)***

| | | | | | |
|---|---|---|---|---|---|
| Cv runoff volume (in.) | 2.92 | | | | |
| Stds-based allowable discharge (cfs) | 0.72 | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Cv runoff volume after all reductions (in.) | 2.86 | 2.81 | 2.75 | #N/A | #N/A |

***Flooding Event (Fv)***

| | | | | | |
|---|---|---|---|---|---|
| Fv runoff volume (in.) | 6.45 | | | | |
| Stds-based allowable discharge (cfs) | 2.16 | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Fv runoff volume after all reductions (in.) | 6.45 | 6.45 | 6.45 | #N/A | #N/A |

***Adjusted Subarea Data for Downstream DURMM Modeling***

| | |
|---|---|
| Contributing Area (ac.) | 0.96 |
| C.A. RCN | 78 |
| LOD Area (ac.) | 0.96 |
| Weighted Target Runoff (in.) | 1.11 |
| Adjusted CN after all reductions | 69.66 |
| Adjusted RPv (in.) | 0.91 |
| Adjusted Cv (in.) | |
| Adjusted Fv (in.) | |

| ***Adjusted Subarea Data for H&H Modeling*** | Rain (in.) | RCN |
|---|---|---|
| Resource Protection Event, RPv | 2.7 | N/A |
| Conveyance Event, Cv | 5.3 | 75.62 |
| Flooding Event, Fv | 9.2 | 77.50 |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 3A+3B |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**CONTRIBUTING AREA RUNOFF CURVE NUMBER (C.A. RCN) WORKSHEET**

| Cover Type | Treatment | Hydrologic Condition | Curve Numbers for Hydrologic Soil Type A Acres | A RCN | B Acres | B RCN | C Acres | C RCN | D Acres | D RCN |
|---|---|---|---|---|---|---|---|---|---|---|
| **CULTIVATED AGRICULTURAL LANDS** | | | | | | | | | | |
| Fallow | Bare soil | ---- | | 77 | | 86 | | 91 | | 94 |
| | Crop residue (CR) | poor | | 76 | | 85 | | 90 | | 93 |
| | Crop residue (CR) | good | | 74 | | 83 | | 88 | | 90 |
| Row Crops | Straight row (SR) | poor | | 72 | | 81 | | 88 | | 91 |
| | Straight row (SR) | good | | 67 | | 78 | | 85 | | 89 |
| | SR + Crop residue | poor | | 71 | | 80 | | 87 | | 90 |
| | SR + Crop residue | good | | 64 | | 75 | | 82 | | 85 |
| | Contoured (C) | poor | | 70 | | 79 | | 84 | | 88 |
| | Contoured (C) | good | | 65 | | 75 | | 82 | | 86 |
| | C + Crop residue | poor | | 69 | | 78 | | 83 | | 87 |
| | C + Crop residue | good | | 64 | | 74 | | 81 | | 85 |
| | Cont & terraced(C&T) | poor | | 66 | | 74 | | 80 | | 82 |
| | Cont & terraced(C&T) | good | | 62 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 65 | | 73 | | 79 | | 81 |
| | C&T + Crop residue | good | | 61 | | 70 | | 77 | | 80 |
| Small Grain | Straight row (SR) | poor | | 65 | | 76 | | 84 | | 88 |
| | Straight row (SR) | good | | 63 | | 75 | | 83 | | 87 |
| | SR + Crop residue | poor | | 64 | | 75 | | 83 | | 86 |
| | SR + Crop residue | good | | 60 | | 72 | | 80 | | 84 |
| | Contoured (C) | poor | | 63 | | 74 | | 82 | | 85 |
| | Contoured (C) | good | | 61 | | 73 | | 81 | | 84 |
| | C + Crop residue | poor | | 62 | | 73 | | 81 | | 84 |
| | C + Crop residue | good | | 60 | | 72 | | 80 | | 83 |
| | Cont & terraced(C&T) | poor | | 61 | | 72 | | 79 | | 82 |
| | Cont & terraces(C&T) | good | | 59 | | 70 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 60 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | good | | 58 | | 69 | | 77 | | 80 |
| Close-seeded | Straight row | poor | | 66 | | 77 | | 85 | | 89 |
| or broadcast | Straight row | good | | 58 | | 72 | | 81 | | 85 |
| legumes or | Contoured | poor | | 64 | | 75 | | 83 | | 85 |
| rotation | Contoured | good | | 55 | | 69 | | 78 | | 83 |
| meadow | Cont & terraced | poor | | 63 | | 73 | | 80 | | 83 |
| | Cont & terraced | good | | 51 | | 67 | | 76 | | 80 |
| **OTHER AGRICULTURAL LANDS** | | | | | | | | | | |
| | Pasture, grassland or range | poor | | 68 | | 79 | | 86 | | 89 |
| | | fair | | 49 | | 69 | | 79 | | 84 |
| | | good | | 39 | | 61 | | 74 | | 80 |
| | Meadow -cont. grass (non grazed) | ---- | | 30 | | 58 | | 71 | | 78 |
| | Brush - brush, weed, grass mix | poor | | 48 | | 67 | | 77 | | 83 |
| | | fair | | 35 | | 56 | | 70 | | 77 |
| | | good | | 30 | | 48 | | 65 | | 73 |
| | Woods - grass combination | poor | | 57 | | 73 | | 82 | | 86 |
| | | fair | | 43 | | 65 | | 76 | | 82 |
| | | good | | 32 | | 58 | | 72 | | 79 |
| | Woods | poor | | 45 | | 66 | | 77 | | 83 |
| | | fair | | 36 | | 60 | | 73 | | 79 |
| | | good | | 30 | | 55 | | 70 | | 77 |
| | Farmsteads | ---- | | 59 | | 74 | | 82 | | 86 |
| **FULLY DEVELOPED URBAN AREAS (Veg Established)** | | | | | | | | | | |
| Open space (Lawns,parks etc.) | | | | | | | | | | |
| | Poor condition; grass cover < 50% | | | 68 | | 79 | | 86 | | 89 |
| | Fair condition; grass cover 50% to 75 % | | | 49 | | 69 | | 79 | | 84 |
| | Good condition; grass cover > 75% | | | 39 | | 61 | 1.2 | 74 | 0.57 | 80 |
| Impervious Areas | | | | | | | | | | |
| | Paved parking lots, roofs, driveways | | | 98 | | 98 | 0.33 | 98 | 0.25 | 98 |
| | Streets and roads | | | | | | | | | |
| | Paved; curbs and storm sewers | | | 98 | | 98 | | 98 | | 98 |
| | Paved; open ditches (w/right-of-way) | | | 83 | | 89 | | 92 | | 93 |
| | Gravel (w/ right-of-way) | | | 76 | | 85 | | 89 | | 91 |
| | Dirt (w/ right-of-way) | | | 72 | | 82 | | 87 | | 89 |
| Urban Districts | | Avg % impervious | | | | | | | | |
| | Commercial & business | 85 | | 89 | | 92 | | 94 | | 95 |
| | Industrial | 72 | | 81 | | 88 | | 91 | | 93 |
| Residential districts by average lot size | | Avg % impervious | | | | | | | | |
| | 1/8 acre (town houses) | 65 | | 77 | | 85 | | 90 | | 92 |
| | 1/4 acre | 38 | | 61 | | 75 | | 83 | | 87 |
| | 1/3 acre | 30 | | 57 | | 72 | | 81 | | 86 |
| | 1/2 acre | 25 | | 54 | | 70 | | 80 | | 85 |
| | 1 acre | 20 | | 51 | | 68 | | 79 | | 84 |
| | 2 acre | 12 | | 46 | | 65 | | 77 | | 82 |
| **DEVELOPING URBAN AREA (No Vegetation)** | | | | | | | | | | |
| | Newly graded area (pervious only) | | | 77 | | 86 | | 91 | | 94 |
| **USER DEFINED** | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | **Subarea Contributing Area per Soil Type (ac)** | | 0 | | 0 | | 1.53 | | 0.82 | |

**UPSTREAM CONTRIBUTING AREAS**

| | Subarea ID | Acres | RCN |
|---|---|---|---|
| Upstream Contributing Area 1 | 3A | 0.96 | 78 |
| Upstream Contributing Area 2 | | | |
| Upstream Contributing Area 3 | | | |
| Upstream Contributing Area 4 | | | |

| | |
|---|---|
| **Total Contributing Area (ac)** | **3.31** |
| **Weighted Runoff Curve Number (RCN)** | **80** |

**County**

Kent
New Castle
Sussex

**Unit Hydrograph**

DMV
STD

Effective April 2016

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 3A+3B |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**LIMIT OF DISTURBANCE (LOD) WORKSHEET**

| **Step 1 - Subarea LOD Data** | **HSG A** | **HSG B** | **HSG C** | **HSG D** |
|---|---|---|---|---|
| 1.1 HSG Area Within LOD (ac) | | | 1.53 | 0.82 |
| 1.2 Pre-Developed Woods/Meadow Within LOD (ac) | | | | |
| 1.3 Pre-Developed Impervious Within LOD (ac) | | | | |
| 1.4.a Post-Developed Imperviousness Within LOD, Option #1 (ac); ***OR*** | | | 0.34 | 0.24 |
| 1.4.b Post-Developed Imperviousness Within LOD, Option #2 (%) | 0% | 0% | 22% | 29% |

| **Step 2 - Subarea LOD Runoff Calculations** | | | | |
|---|---|---|---|---|
| 2.1 RCN per HSG | 0.00 | 0.00 | 79.33 | 85.27 |
| 2.2 RPv per HSG (in.) | 0.00 | 0.00 | 1.35 | 1.67 |
| 2.3 Target Runoff per HSG (in.) | 0.00 | 0.00 | 1.10 | 1.39 |
| 2.4 Cv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 0.75 | 0.75 |
| 2.5 Fv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 2.25 | 2.25 |
| 2.6 Subarea LOD (ac) | 2.35 | | | |
| 2.7 Subarea Weighted RCN | 81.40 | | | |
| 2.8 Subarea Weighted RPv (in.) | 1.46 | | | |
| 2.9 Subarea Weighted Target Runoff (in.) | 1.20 | | | |

| RPv Target Runoff (in.) | |
|---|---|
| Soil | Woods |
| HSG A | 0.00 |
| HSG B | 0.12 |
| HSG C | 0.55 |
| HSG D | 0.87 |

| **Step 3 - Upstream LOD Areas** *(from previous DURMM Report as applicable)* | **Area 1** | **Area 2** | **Area 3** | **Area 4** |
|---|---|---|---|---|
| 3.1 Upstream Subarea ID | 3A | | | |
| 3.2 Upstream LOD Area (ac) | 0.96 | | | |
| 3.3 Target Runoff for Upstream Area (in.) | 1.11 | | | |
| 3.4 Adjusted CN after all reductions | 69.66 | | | |
| 3.5 Adjusted RPv (in.) | 0.91 | | | |
| 3.6 Adjusted Cv (in.) | | | | |
| 3.7 Adjusted Fv (in.) | | | | |

| Cv/Fv Unit Discharge |
|---|
| Woodland/Meadow (HSG A) |
| 10-YR: 0 cfs/ac |
| 100-YR: 0.25 cfs/ac |
| Woodland/Meadow (HSG B,C,D) |
| 10-YR: 0.375 cfs/ac |
| 100-YR: 1.25 cfs/ac |
| Non-Woodland/Non-Meadow |
| 10-YR: 0.75 cfs/ac |
| 100-YR: 2.25 cfs/ac |

| **Step 4 - RPv Calculations for Combined LOD** | |
|---|---|
| 4.1 Combined LOD (ac) | 3.31 |
| 4.2 Weighted RCN | 78.00 |
| 4.3 Weighted RPv (in.) | 1.30 |
| 4.4 Weighted Target Runoff (in.) | 1.18 |
| 4.5 Estimated Annual Runoff (in.) | 16.76 |
| 4.6 Req'd Runoff Reduction within LOD (in.) | 0.13 |
| 4.7 Req'd Runoff Reduction within LOD (%) | 10% |

| **Step 5 - Cv Unit Discharge** | |
|---|---|
| 5. LOD Allowable Unit Discharge (cfs/ac) | 0.75 |

| **Step 6 - Fv Unit Discharge** | |
|---|---|
| 6. LOD Allowable Unit Discharge (cfs/ac) | 2.25 |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 3A+3B
**LOCATION (County):** Sussex

**RESOURCE PROTECTION EVENT (RPv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Dry ED basin | Type | -- | Type | -- | Type | -- | Type | -- |
| ***Step 1 - Calculate Initial RPv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 3.31 | | 3.31 | | 3.31 | | 3.31 | | 3.31 | |
| 1.2 *Reserved* | | | | | | | | | | |
| 1.3 Initial RCN | 78.00 | | | | | | | | | |
| 1.4 RPv for Contributing Area (in.) | 1.30 | | | | | | | | | |
| 1.5 Req'd RPv Reduction for Contributing Area (in.) | 0.13 | | | | | | | | | |
| 1.6 Req'd RPv Reduction for Contributing Area (%) | 10% | | | | | | | | | |
| 1.7 RPv allowable discharge rate (cfs) | 0.18 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | | | | | | | | | | |
| 2.2 Retention reduction allowance (%) | 0% | | N/A | | N/A | | N/A | | N/A | |
| 2.3 Retention reduction volume (ac-ft) | 0.00 | | N/A | | N/A | | N/A | | N/A | |
| 2.4 Retention reduction volume (in.) | 0.00 | | N/A | | N/A | | N/A | | N/A | |
| 2.5 Runoff volume after retention reduction (in.) | 1.30 | | N/A | | N/A | | N/A | | N/A | |
| 2.6 Adjusted CN* | 78.34 | | N/A | | N/A | | N/A | | N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Annual CN (ACN) | 78.00 | | N/A | | N/A | | N/A | | N/A | |
| 3.2 Annual runoff (in.) | 16.76 | | N/A | | N/A | | N/A | | N/A | |
| 3.3 Proportion A/B soils in BMP footprint (%) | | | | | | | | | | |
| 3.4 Annual runoff reduction allowance (%) | 10% | | N/A | | N/A | | N/A | | N/A | |
| 3.5 Annual runoff after reduction (in.) | 15.09 | | N/A | | N/A | | N/A | | N/A | |
| 3.6 Adjusted ACN | 75.69 | | N/A | | N/A | | N/A | | N/A | |
| 3.7 Annual Runoff Reduction Allowance for RPv (in.) | 0.13 | | N/A | | N/A | | N/A | | N/A | |
| ***Step 4 - Calculate RPv with BMP Reductions*** | | | | | | | | | | |
| 4.1 RPv runoff volume after all reductions (in.) | 1.17 | | N/A | | N/A | | N/A | | N/A | |
| 4.2 Total RPv runoff reduction (in.) | 0.13 | | N/A | | N/A | | N/A | | N/A | |
| 4.3 Total RPv runoff reduction (%) | 10% | | N/A | | N/A | | N/A | | N/A | |
| 4.4 Adjusted CN after all reductions | 75.69 | | N/A | | N/A | | N/A | | N/A | |
| 4.5 Equivalent TR-55 RCN for H&H modeling | 82.45 | | N/A | | N/A | | N/A | | N/A | |
| 4.6 Req'd reduction met? | OK | | N/A | | N/A | | N/A | | N/A | |
| ***Step 5 - Determine Runoff Reduction Offset*** | | | | | | | | | | |
| 5.1 Runoff Reduction Shortfall (in.) | N/A | | N/A | | N/A | | N/A | | N/A | |
| 5.2 Runoff Reduction Shortfall (cu.ft./ac) | N/A | | N/A | | N/A | | N/A | | N/A | |
| 5.3 Total Offset Volume (cu.ft.) | N/A | | N/A | | N/A | | N/A | | N/A | |

**DURMM BMP Name**
--
Infiltration w/sand or vegetation
Infiltration w/o sand or vegetation
Bioretention w/underdrain
Permeable pave w/sand or vegetation
Permeable pave w/o sand or vegetation
Vegetated roof
Rainwater harvesting
Impervious disconnection
Bioswale
Vegetated open channel
Filter strip
Riparian forest buffer
Urban tree planting
Soil amendment
Sheetflow to turf open space
Sheetflow to forest open space
Wet swale
Ephemeral wetland
--
Dry ED basin
Dry detention pond
Hydrodynamic structure
Urban filtering practice
Wet pond
Constructed wetland
--
Nutrient management
Street sweeping
--
Urban stream restoration

Effective April 2016

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 3A+3B
**LANDUSE TYPE:** Residential
**TMDL WATERSHED:** Little Assawoman Bay

## TOTAL MAXIMUM DAILY LOAD (TMDL) WORKSHEET

| | BMP 1 | | | | BMP 2 | | | | BMP 3 | | | | BMP 4 | | | | BMP 5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Dry ED basin | | | Type: | -- | | | Type: | -- | | | Type: | -- | | | Type: | -- | | |
| ***Step 1 - Calculate Annual Runoff Volume*** | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS |
| 1.1 Total contributing area to BMP (ac) | 3.31 | | | | | | | | | | | | | | | | | | | |
| 1.2 Initial RCN | 78 | | | | | | | | | | | | | | | | | | | |
| 1.3 Annual runoff volume (in.) | 16.76 | | | | | | | | | | | | | | | | | | | |
| 1.4 Annual runoff volume (liters) | 5.70E+06 | | | | | | | | | | | | | | | | | | | |
| ***Step 2 - Calculate Annual Pollutant Load*** | | | | | | | | | | | | | | | | | | | | |
| 2.1 EMC (mg/L) | | 2.00 | 0.27 | 60 | | | | | | | | | | | | | | | | |
| 2.2 Load (mg/yr) | | 1.14E+07 | 1.54E+06 | 3.42E+08 | | | | | | | | | | | | | | | | |
| 2.4 Stormwater Load (lb/ac/yr) | | 7.60 | 1.03 | 228 | | 6.08 | 0.82 | 91 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 3 - Adjust for Runoff Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 3.1 BMP Runoff Reduction (%) | 10% | | | | N/A | | | | N/A | | | | N/A | | | | N/A | | | |
| 3.2 BMP Removal Efficiency (%) | | 20% | 20% | 60% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 3.3 Adjusted load (lb/ac/yr) | | 6.08 | 0.82 | 91 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 4 - Calculate Pollutant Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 4.1 TMDL (lb/ac/yr) | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A |
| 4.2 Reduction met? | | No | No | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK |
| ***Step 5 - Determine TMDL Offset*** | | | | | | | | | | | | | | | | | | | | |
| 5.1 TMDL Shortfall (lb/ac/yr) | | 0.38 | 0.59 | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 |
| 5.2 TMDL Shortfall (%) | | 6% | 72% | 0% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.3 Residual RPv Volume (in) | | 1.17 | 1.17 | 1.17 | | N/A | N/A | N/A | | N/A | N/A | N/A | | N/A | N/A | N/A | | N/A | N/A | N/A |
| 5.4 Req'd Additional RR to meet TMDL (in)* | | 0.07 | 0.85 | 0.00 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.5 Req'd Additional RR to meet TMDL (cu.ft./ac) | | 266 | 3070 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.6 Total Offset Volume (cu.ft.) | | 880 | 10160 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 3A+3B
**LOCATION (County):** Sussex

**CONVEYANCE EVENT (Cv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Dry ED basin | Type: | -- | Type: | -- | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Cv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 3.31 | | 3.31 | | 3.31 | | 3.31 | | 3.31 | |
| 1.2 Initial RCN | 78.00 | | | | | | | | | |
| 1.3 **10-YR** Rainfall (in.) | 5.3 | | | | | | | | | |
| 1.4 Cv runoff volume (in.) | 2.97 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 0.75 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | #NUM! | | | | | | | | | |
| 1.7 Cv allowable discharge rate (cfs) | #NUM! | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 2.97 | | 2.94 | | #N/A | | #N/A | | #N/A | |
| 2.5 CN* | 78.00 | | 77.68 | | #N/A | | #N/A | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 1% | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 2.94 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 77.68 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.03 | | #N/A | | #N/A | | #N/A | | #N/A | |
| ***Step 4 - Calculate Cv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Cv runoff volume after all reductions (in.) | 2.94 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 4.2 Total Cv runoff reduction (%) | 1% | | #N/A | | #N/A | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 77.68 | | #N/A | | #N/A | | #N/A | | #N/A | |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 3A+3B
**LOCATION (County):** Sussex

**FLOODING EVENT (Fv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Dry ED basin | Type: | -- | Type: | -- | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Fv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 3.31 | | 3.31 | | 3.31 | | 3.31 | | 3.31 | |
| 1.2 Initial RCN | 78.00 | | | | | | | | | |
| 1.3 **100-YR** Rainfall (in.) | 9.2 | | | | | | | | | |
| 1.4 Fv runoff volume (in.) | 6.51 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 2.25 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | #NUM! | | | | | | | | | |
| 1.7 Fv allowable discharge rate (cfs) | #NUM! | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 6.51 | | 6.51 | | #N/A | | #N/A | | #N/A | |
| 2.5 CN* | 78.00 | | 78.00 | | #N/A | | #N/A | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 0% | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 6.51 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 78.00 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.00 | | #N/A | | #N/A | | #N/A | | #N/A | |
| ***Step 4 - Calculate Fv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Fv runoff volume after all reductions (in.) | 6.51 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 4.2 Total Fv runoff reduction (%) | 0% | | #N/A | | #N/A | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 78.00 | | #N/A | | #N/A | | #N/A | | #N/A | |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 3A+3B |
| **TMDL Watershed:** | Little Assawoman Bay |

**DURMM OUTPUT WORKSHEET**

DURMM v2.beta.110802

***Site Data***

| | | | | | |
|---|---|---|---|---|---|
| Contributing Area to BMPs (ac.) | 3.31 | | | | |
| C.A. RCN | 80 | | | | |
| Subarea LOD (ac.) | 2.35 | | | | |
| Upstream Subarea ID | 3A | 0 | 0 | 0 | |
| Upstream Subarea LOD (ac.) | 0.96 | 0.00 | 0.00 | 0.00 | |
| Combined LOD with Upstream Areas (ac.) | 3.31 | | | | |
| Combined RCN with Upstream Areas (ac.) | 78.00 | | | | |
| TMDL-TN (lb/ac/yr) | 5.70 | | | | |
| TMDL-TP (lb/ac/yr) | 0.23 | | | | |
| TMDL-TSS (lb/ac/yr) | N/A | | | | |

| BMP Selection | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| | Dry ED basin | -- | -- | -- | -- |

***Resource Protection Event (RPV)***

| | | | | | |
|---|---|---|---|---|---|
| RPv for Contributing Area (in.) | 1.30 | | | | |
| Req'd RPv Reduction for Contributing Area (in.) | 0.13 | | | | |
| Req'd RPv Reduction for Contributing Area (%) | 10% | | | | |
| C.A. allowable discharge rate (cfs) | 0.18 | | | | |
| Unmanaged Polluant load, TN (lbs/ac/yr) | 7.60 | | | | |
| Unmanaged Polluant load, TP (lbs/ac/yr) | 1.03 | | | | |
| Unmanaged Polluant load, TSS (lbs/ac/yr) | 228 | | | | |

| BMP Runoff Reduction Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| RPv runoff volume after all reductions (in.) | 1.17 | N/A | N/A | N/A | N/A |
| Total RPv runoff reduction (in.) | 0.13 | N/A | N/A | N/A | N/A |
| Total RPv runoff reduction (%) | 10% | N/A | N/A | N/A | N/A |
| Req'd runoff reduction met? | OK | N/A | N/A | N/A | N/A |

| BMP TMDL Performance | | | | | |
|---|---|---|---|---|---|
| Adjusted pollutant load, TN (lb/ac/yr) | 6.08 | #N/A | #N/A | #N/A | #N/A |
| Adjusted pollutant load, TP (lb/ac/yr) | 0.82 | #N/A | #N/A | #N/A | #N/A |
| Adjusted pollutant load, TSS (lb/ac/yr) | 91 | #N/A | #N/A | #N/A | #N/A |
| Offsets Requirements | | | | | |
| RPv Offset (cu. ft.) | N/A | N/A | N/A | N/A | N/A |

***Conveyance Event (Cv)***

| | | | | | |
|---|---|---|---|---|---|
| Cv runoff volume (in.) | 2.97 | | | | |
| Stds-based allowable discharge (cfs) | #NUM! | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Cv runoff volume after all reductions (in.) | 2.94 | #N/A | #N/A | #N/A | #N/A |

***Flooding Event (Fv)***

| | | | | | |
|---|---|---|---|---|---|
| Fv runoff volume (in.) | 6.51 | | | | |
| Stds-based allowable discharge (cfs) | #NUM! | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Fv runoff volume after all reductions (in.) | 6.51 | #N/A | #N/A | #N/A | #N/A |

***Adjusted Subarea Data for Downstream DURMM Modeling***

| | |
|---|---|
| Contributing Area (ac.) | 3.31 |
| C.A. RCN | 80 |
| LOD Area (ac.) | 3.31 |
| Weighted Target Runoff (in.) | 1.18 |
| Adjusted CN after all reductions | 75.69 |
| Adjusted RPv (in.) | 1.17 |
| Adjusted Cv (in.) | |
| Adjusted Fv (in.) | |

| ***Adjusted Subarea Data for H&H Modeling*** | Rain (in.) | RCN |
|---|---|---|
| Resource Protection Event, RPv | 2.7 | N/A |
| Conveyance Event, Cv | 5.3 | 77.68 |
| Flooding Event, Fv | 9.2 | 78.00 |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 4A |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**CONTRIBUTING AREA RUNOFF CURVE NUMBER (C.A. RCN) WORKSHEET**

| Cover Type | Treatment | Hydrologic Condition | Curve Numbers for Hydrologic Soil Type A Acres | A RCN | B Acres | B RCN | C Acres | C RCN | D Acres | D RCN |
|---|---|---|---|---|---|---|---|---|---|---|
| **CULTIVATED AGRICULTURAL LANDS** | | | | | | | | | | |
| Fallow | Bare soil | ---- | | 77 | | 86 | | 91 | | 94 |
| | Crop residue (CR) | poor | | 76 | | 85 | | 90 | | 93 |
| | Crop residue (CR) | good | | 74 | | 83 | | 88 | | 90 |
| Row Crops | Straight row (SR) | poor | | 72 | | 81 | | 88 | | 91 |
| | Straight row (SR) | good | | 67 | | 78 | | 85 | | 89 |
| | SR + Crop residue | poor | | 71 | | 80 | | 87 | | 90 |
| | SR + Crop residue | good | | 64 | | 75 | | 82 | | 85 |
| | Contoured (C) | poor | | 70 | | 79 | | 84 | | 88 |
| | Contoured (C) | good | | 65 | | 75 | | 82 | | 86 |
| | C + Crop residue | poor | | 69 | | 78 | | 83 | | 87 |
| | C + Crop residue | good | | 64 | | 74 | | 81 | | 85 |
| | Cont & terraced(C&T) | poor | | 66 | | 74 | | 80 | | 82 |
| | Cont & terraced(C&T) | good | | 62 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 65 | | 73 | | 79 | | 81 |
| | C&T + Crop residue | good | | 61 | | 70 | | 77 | | 80 |
| Small Grain | Straight row (SR) | poor | | 65 | | 76 | | 84 | | 88 |
| | Straight row (SR) | good | | 63 | | 75 | | 83 | | 87 |
| | SR + Crop residue | poor | | 64 | | 75 | | 83 | | 86 |
| | SR + Crop residue | good | | 60 | | 72 | | 80 | | 84 |
| | Contoured (C) | poor | | 63 | | 74 | | 82 | | 85 |
| | Contoured (C) | good | | 61 | | 73 | | 81 | | 84 |
| | C + Crop residue | poor | | 62 | | 73 | | 81 | | 84 |
| | C + Crop residue | good | | 60 | | 72 | | 80 | | 83 |
| | Cont & terraced(C&T) | poor | | 61 | | 72 | | 79 | | 82 |
| | Cont & terraces(C&T) | good | | 59 | | 70 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 60 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | good | | 58 | | 69 | | 77 | | 80 |
| Close-seeded | Straight row | poor | | 66 | | 77 | | 85 | | 89 |
| or broadcast | Straight row | good | | 58 | | 72 | | 81 | | 85 |
| legumes or | Contoured | poor | | 64 | | 75 | | 83 | | 85 |
| rotation | Contoured | good | | 55 | | 69 | | 78 | | 83 |
| meadow | Cont & terraced | poor | | 63 | | 73 | | 80 | | 83 |
| | Cont & terraced | good | | 51 | | 67 | | 76 | | 80 |
| **OTHER AGRICULTURAL LANDS** | | | | | | | | | | |
| | Pasture, grassland or range | poor | | 68 | | 79 | | 86 | | 89 |
| | | fair | | 49 | | 69 | | 79 | | 84 |
| | | good | | 39 | | 61 | | 74 | | 80 |
| | Meadow -cont. grass (non grazed) | ---- | | 30 | | 58 | | 71 | | 78 |
| | Brush - brush, weed, grass mix | poor | | 48 | | 67 | | 77 | | 83 |
| | | fair | | 35 | | 56 | | 70 | | 77 |
| | | good | | 30 | | 48 | | 65 | | 73 |
| | Woods - grass combination | poor | | 57 | | 73 | | 82 | | 86 |
| | | fair | | 43 | | 65 | | 76 | | 82 |
| | | good | | 32 | | 58 | | 72 | | 79 |
| | Woods | poor | | 45 | | 66 | | 77 | | 83 |
| | | fair | | 36 | | 60 | | 73 | | 79 |
| | | good | | 30 | | 55 | | 70 | | 77 |
| | Farmsteads | ---- | | 59 | | 74 | | 82 | | 86 |
| **FULLY DEVELOPED URBAN AREAS (Veg Established)** | | | | | | | | | | |
| Open space (Lawns,parks etc.) | | | | | | | | | | |
| | Poor condition; grass cover < 50% | | | 68 | | 79 | | 86 | | 89 |
| | Fair condition; grass cover 50% to 75 % | | | 49 | | 69 | | 79 | | 84 |
| | Good condition; grass cover > 75% | | | 39 | | 61 | 0.49 | 74 | | 80 |
| Impervious Areas | | | | | | | | | | |
| | Paved parking lots, roofs, driveways | | | 98 | | 98 | 0.12 | 98 | | 98 |
| | Streets and roads | | | | | | | | | |
| | Paved; curbs and storm sewers | | | 98 | | 98 | | 98 | | 98 |
| | Paved; open ditches (w/right-of-way) | | | 83 | | 89 | | 92 | | 93 |
| | Gravel (w/ right-of-way) | | | 76 | | 85 | | 89 | | 91 |
| | Dirt (w/ right-of-way) | | | 72 | | 82 | | 87 | | 89 |
| Urban Districts | | Avg % impervious | | | | | | | | |
| | Commercial & business | 85 | | 89 | | 92 | | 94 | | 95 |
| | Industrial | 72 | | 81 | | 88 | | 91 | | 93 |
| Residential districts by average lot size | | Avg % impervious | | | | | | | | |
| | 1/8 acre (town houses) | 65 | | 77 | | 85 | | 90 | | 92 |
| | 1/4 acre | 38 | | 61 | | 75 | | 83 | | 87 |
| | 1/3 acre | 30 | | 57 | | 72 | | 81 | | 86 |
| | 1/2 acre | 25 | | 54 | | 70 | | 80 | | 85 |
| | 1 acre | 20 | | 51 | | 68 | | 79 | | 84 |
| | 2 acre | 12 | | 46 | | 65 | | 77 | | 82 |
| **DEVELOPING URBAN AREA (No Vegetation)** | | | | | | | | | | |
| | Newly graded area (pervious only) | | | 77 | | 86 | | 91 | | 94 |
| **USER DEFINED** | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| Subarea Contributing Area per Soil Type (ac) | A | B | C | D |
|---|---|---|---|---|
| | 0 | 0 | 0.61 | 0 |

**UPSTREAM CONTRIBUTING AREAS**

| | Subarea ID | Acres | RCN |
|---|---|---|---|
| Upstream Contributing Area 1 | | | |
| Upstream Contributing Area 2 | | | |
| Upstream Contributing Area 3 | | | |
| Upstream Contributing Area 4 | | | |

| | |
|---|---|
| **Total Contributing Area (ac)** | **0.61** |
| **Weighted Runoff Curve Number (RCN)** | **79** |

**County**

Kent
New Castle
Sussex

**Unit Hydrograph**

DMV
STD

Effective April 2016

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 4A |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**LIMIT OF DISTURBANCE (LOD) WORKSHEET**

| **Step 1 - Subarea LOD Data** | **HSG A** | **HSG B** | **HSG C** | **HSG D** |
|---|---|---|---|---|
| 1.1 HSG Area Within LOD (ac) | | | 0.61 | |
| 1.2 Pre-Developed Woods/Meadow Within LOD (ac) | | | | |
| 1.3 Pre-Developed Impervious Within LOD (ac) | | | | |
| 1.4.a Post-Developed Imperviousness Within LOD, Option #1 (ac); ***OR*** | | | 0.12 | |
| 1.4.b Post-Developed Imperviousness Within LOD, Option #2 (%) | 0% | 0% | 20% | 0% |

| **Step 2 - Subarea LOD Runoff Calculations** | | | | |
|---|---|---|---|---|
| 2.1 RCN per HSG | 0.00 | 0.00 | 78.72 | 0.00 |
| 2.2 RPv per HSG (in.) | 0.00 | 0.00 | 1.32 | 0.00 |
| 2.3 Target Runoff per HSG (in.) | 0.00 | 0.00 | 1.10 | 0.00 |
| 2.4 Cv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 0.75 | 0.00 |
| 2.5 Fv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 2.25 | 0.00 |
| 2.6 Subarea LOD (ac) | 0.61 | | | |
| 2.7 Subarea Weighted RCN | 78.72 | | | |
| 2.8 Subarea Weighted RPv (in.) | 1.32 | | | |
| 2.9 Subarea Weighted Target Runoff (in.) | 1.10 | | | |

| RPv Target Runoff (in.) | |
|---|---|
| Soil | Woods |
| HSG A | 0.00 |
| HSG B | 0.12 |
| HSG C | 0.55 |
| HSG D | 0.87 |

| **Step 3 - Upstream LOD Areas** ***(from previous DURMM Report as applicable)*** | **Area 1** | **Area 2** | **Area 3** | **Area 4** |
|---|---|---|---|---|
| 3.1 Upstream Subarea ID | | | | |
| 3.2 Upstream LOD Area (ac) | | | | |
| 3.3 Target Runoff for Upstream Area (in.) | | | | |
| 3.4 Adjusted CN after all reductions | | | | |
| 3.5 Adjusted RPv (in.) | | | | |
| 3.6 Adjusted Cv (in.) | | | | |
| 3.7 Adjusted Fv (in.) | | | | |

| **Step 4 - RPv Calculations for Combined LOD** | |
|---|---|
| 4.1 Combined LOD (ac) | 0.61 |
| 4.2 Weighted RCN | 78.72 |
| 4.3 Weighted RPv (in.) | 1.32 |
| 4.4 Weighted Target Runoff (in.) | 1.10 |
| 4.5 Estimated Annual Runoff (in.) | 17.31 |
| 4.6 Req'd Runoff Reduction within LOD (in.) | 0.22 |
| 4.7 Req'd Runoff Reduction within LOD (%) | 17% |

| **Step 5 - Cv Unit Discharge** | |
|---|---|
| 5. LOD Allowable Unit Discharge (cfs/ac) | 0.75 |

| **Step 6 - Fv Unit Discharge** | |
|---|---|
| 6. LOD Allowable Unit Discharge (cfs/ac) | 2.25 |

| Cv/Fv Unit Discharge |
|---|
| Woodland/Meadow (HSG A) |
| 10-YR: 0 cfs/ac |
| 100-YR: 0.25 cfs/ac |
| Woodland/Meadow (HSG B,C,D) |
| 10-YR: 0.375 cfs/ac |
| 100-YR: 1.25 cfs/ac |
| Non-Woodland/Non-Meadow |
| 10-YR: 0.75 cfs/ac |
| 100-YR: 2.25 cfs/ac |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 4A
**LOCATION (County):** Sussex

**RESOURCE PROTECTION EVENT (RPv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Impervious disconnection | Type | Filter strip | Type | Vegetated open channel | Type | -- | Type | -- |
| ***Step 1 - Calculate Initial RPv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 0.61 | | 0.61 | | 0.61 | | 0.61 | | 0.61 | |
| 1.2 *Reserved* | | | | | | | | | | |
| 1.3 Initial RCN | 78.72 | | | | | | | | | |
| 1.4 RPv for Contributing Area (in.) | 1.32 | | | | | | | | | |
| 1.5 Req'd RPv Reduction for Contributing Area (in.) | 0.22 | | | | | | | | | |
| 1.6 Req'd RPv Reduction for Contributing Area (%) | 17% | | | | | | | | | |
| 1.7 RPv allowable discharge rate (cfs) | 0.03 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | | | | | | | | | | |
| 2.2 Retention reduction allowance (%) | 0% | | 0% | | 0% | | N/A | | N/A | |
| 2.3 Retention reduction volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | N/A | | N/A | |
| 2.4 Retention reduction volume (in.) | 0.00 | | 0.00 | | 0.00 | | N/A | | N/A | |
| 2.5 Runoff volume after retention reduction (in.) | 1.32 | | 1.21 | | 1.05 | | N/A | | N/A | |
| 2.6 Adjusted CN* | 78.72 | | 76.39 | | 72.92 | | N/A | | N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Annual CN (ACN) | 78.72 | | 76.39 | | 72.92 | | N/A | | N/A | |
| 3.2 Annual runoff (in.) | 17.31 | | 15.58 | | 13.24 | | N/A | | N/A | |
| 3.3 Proportion A/B soils in BMP footprint (%) | | | | | | | | | | |
| 3.4 Annual runoff reduction allowance (%) | 10% | | 15% | | 10% | | N/A | | N/A | |
| 3.5 Annual runoff after reduction (in.) | 15.58 | | 13.24 | | 11.92 | | N/A | | N/A | |
| 3.6 Adjusted ACN | 76.39 | | 72.92 | | 70.76 | | N/A | | N/A | |
| 3.7 Annual Runoff Reduction Allowance for RPv (in.) | 0.11 | | 0.28 | | 0.37 | | N/A | | N/A | |
| ***Step 4 - Calculate RPv with BMP Reductions*** | | | | | | | | | | |
| 4.1 RPv runoff volume after all reductions (in.) | 1.21 | | 1.05 | | 0.95 | | N/A | | N/A | |
| 4.2 Total RPv runoff reduction (in.) | 0.11 | | 0.28 | | 0.37 | | N/A | | N/A | |
| 4.3 Total RPv runoff reduction (%) | 9% | | 21% | | 28% | | N/A | | N/A | |
| 4.4 Adjusted CN after all reductions | 76.39 | | 72.92 | | 70.76 | | N/A | | N/A | |
| 4.5 Equivalent TR-55 RCN for H&H modeling | 82.99 | | 80.31 | | 78.61 | | N/A | | N/A | |
| 4.6 Req'd reduction met? | No | | OK | | OK | | N/A | | N/A | |
| ***Step 5 - Determine Runoff Reduction Offset*** | | | | | | | | | | |
| 5.1 Runoff Reduction Shortfall (in.) | 0.11 | | N/A | | N/A | | N/A | | N/A | |
| 5.2 Runoff Reduction Shortfall (cu.ft./ac) | 389 | | N/A | | N/A | | N/A | | N/A | |
| 5.3 Total Offset Volume (cu.ft.) | 237 | | N/A | | N/A | | N/A | | N/A | |

**DURMM BMP Name**

--
Infiltration w/sand or vegetation
Infiltration w/o sand or vegetation
Bioretention w/underdrain
Permeable pave w/sand or vegetation
Permeable pave w/o sand or vegetation
Vegetated roof
Rainwater harvesting
Impervious disconnection
Bioswale
Vegetated open channel
Filter strip
Riparian forest buffer
Urban tree planting
Soil amendment
Sheetflow to turf open space
Sheetflow to forest open space
Wet swale
Ephemeral wetland
--
Dry ED basin
Dry detention pond
Hydrodynamic structure
Urban filtering practice
Wet pond
Constructed wetland
--
Nutrient management
Street sweeping
--
Urban stream restoration

Effective April 2016

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 4A
**LANDUSE TYPE:** Residential
**TMDL WATERSHED:** Little Assawoman Bay

## TOTAL MAXIMUM DAILY LOAD (TMDL) WORKSHEET

| | BMP 1 | | | | BMP 2 | | | | BMP 3 | | | | BMP 4 | | | | BMP 5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Impervious disconnection | | | Type: | Filter strip | | | Type: | Vegetated open channel | | | Type: | -- | | | Type: | -- | | |
| ***Step 1 - Calculate Annual Runoff Volume*** | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS |
| 1.1 Total contributing area to BMP (ac) | 0.61 | | | | | | | | | | | | | | | | | | | |
| 1.2 Initial RCN | 79 | | | | | | | | | | | | | | | | | | | |
| 1.3 Annual runoff volume (in.) | 17.31 | | | | | | | | | | | | | | | | | | | |
| 1.4 Annual runoff volume (liters) | 1.09E+06 | | | | | | | | | | | | | | | | | | | |
| ***Step 2 - Calculate Annual Pollutant Load*** | | | | | | | | | | | | | | | | | | | | |
| 2.1 EMC (mg/L) | | 2.00 | 0.27 | 60 | | | | | | | | | | | | | | | | |
| 2.2 Load (mg/yr) | | 2.17E+06 | 2.93E+05 | 6.51E+07 | | | | | | | | | | | | | | | | |
| 2.4 Stormwater Load (lb/ac/yr) | | 7.85 | 1.06 | 235 | | 7.06 | 0.95 | 212 | | 6.00 | 0.81 | 180 | | 5.40 | 0.73 | 162 | | #N/A | #N/A | #N/A |
| ***Step 3 - Adjust for Runoff Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 3.1 BMP Runoff Reduction (%) | 10% | | | | 15% | | | | 10% | | | | N/A | | | | N/A | | | |
| 3.2 BMP Removal Efficiency (%) | | 10% | 10% | 10% | | 15% | 15% | 15% | | 10% | 10% | 10% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 3.3 Adjusted load (lb/ac/yr) | | 7.06 | 0.95 | 212 | | 6.00 | 0.81 | 180 | | 5.40 | 0.73 | 162 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 4 - Calculate Pollutant Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 4.1 TMDL (lb/ac/yr) | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A |
| 4.2 Reduction met? | | No | No | OK | | No | No | OK | | OK | No | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK |
| ***Step 5 - Determine TMDL Offset*** | | | | | | | | | | | | | | | | | | | | |
| 5.1 TMDL Shortfall (lb/ac/yr) | | 1.36 | 0.72 | 0 | | 0.30 | 0.58 | 0 | | 0.00 | 0.50 | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 |
| 5.2 TMDL Shortfall (%) | | 19% | 76% | 0% | | 5% | 72% | 0% | | 0% | 68% | 0% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.3 Residual RPv Volume (in) | | 1.21 | 1.21 | 1.21 | | 1.05 | 1.05 | 1.05 | | 0.95 | 0.95 | 0.95 | | N/A | N/A | N/A | | N/A | N/A | N/A |
| 5.4 Req'd Additional RR to meet TMDL (in)* | | 0.23 | 0.92 | 0.00 | | 0.05 | 0.75 | 0.00 | | 0.00 | 0.65 | 0.00 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.5 Req'd Additional RR to meet TMDL (cu.ft./ac) | | 847 | 3328 | 0 | | 193 | 2724 | 0 | | 0 | 2369 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.6 Total Offset Volume (cu.ft.) | | 516 | 2030 | 0 | | 117 | 1662 | 0 | | 0 | 1445 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |

**PROJECT:** Batson Creek Estates

**DRAINAGE SUBAREA ID:** 4A

**LOCATION (County):** Sussex

**CONVEYANCE EVENT (Cv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Impervious disconnection | Type: | Filter strip | Type: | Vegetated open channel | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Cv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 0.61 | | 0.61 | | 0.61 | | 0.61 | | 0.61 | |
| 1.2 Initial RCN | 78.72 | | | | | | | | | |
| 1.3 **10-YR** Rainfall (in.) | 5.3 | | | | | | | | | |
| 1.4 Cv runoff volume (in.) | 3.04 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 0.75 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | 0.00 | | | | | | | | | |
| 1.7 Cv allowable discharge rate (cfs) | 0.46 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 3.04 | | 2.97 | | 2.92 | | 2.86 | | #N/A | |
| 2.5 CN* | 78.72 | | 78.07 | | 77.43 | | 76.79 | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 2% | | 2% | | 2% | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 2.97 | | 2.92 | | 2.86 | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 78.07 | | 77.43 | | 76.79 | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.06 | | 0.12 | | 0.18 | | #N/A | | #N/A | |
| ***Step 4 - Calculate Cv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Cv runoff volume after all reductions (in.) | 2.97 | | 2.92 | | 2.86 | | #N/A | | #N/A | |
| 4.2 Total Cv runoff reduction (%) | 2% | | 4% | | 6% | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 78.07 | | 77.43 | | 76.79 | | #N/A | | #N/A | |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 4A
**LOCATION (County):** Sussex

**FLOODING EVENT (Fv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Impervious disconnection | Type: | Filter strip | Type: | Vegetated open channel | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Fv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 0.61 | | 0.61 | | 0.61 | | 0.61 | | 0.61 | |
| 1.2 Initial RCN | 78.72 | | | | | | | | | |
| 1.3 **100-YR** Rainfall (in.) | 9.2 | | | | | | | | | |
| 1.4 Fv runoff volume (in.) | 6.60 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 2.25 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | 0.00 | | | | | | | | | |
| 1.7 Fv allowable discharge rate (cfs) | 1.37 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 6.60 | | 6.60 | | 6.60 | | 6.60 | | #N/A | |
| 2.5 CN* | 78.72 | | 78.72 | | 78.72 | | 78.72 | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 0% | | 0% | | 0% | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 6.60 | | 6.60 | | 6.60 | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 78.72 | | 78.72 | | 78.72 | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.00 | | 0.00 | | 0.00 | | #N/A | | #N/A | |
| ***Step 4 - Calculate Fv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Fv runoff volume after all reductions (in.) | 6.60 | | 6.60 | | 6.60 | | #N/A | | #N/A | |
| 4.2 Total Fv runoff reduction (%) | 0% | | 0% | | 0% | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 78.72 | | 78.72 | | 78.72 | | #N/A | | #N/A | |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 4A |
| **TMDL Watershed:** | Little Assawoman Bay |

**DURMM OUTPUT WORKSHEET**

DURMM v2.beta.110802

***Site Data***

| | | | | | |
|---|---|---|---|---|---|
| Contributing Area to BMPs (ac.) | 0.61 | | | | |
| C.A. RCN | 79 | | | | |
| Subarea LOD (ac.) | 0.61 | | | | |
| Upstream Subarea ID | 0 | 0 | 0 | 0 | |
| Upstream Subarea LOD (ac.) | 0.00 | 0.00 | 0.00 | 0.00 | |
| Combined LOD with Upstream Areas (ac.) | 0.61 | | | | |
| Combined RCN with Upstream Areas (ac.) | 78.72 | | | | |
| TMDL-TN (lb/ac/yr) | 5.70 | | | | |
| TMDL-TP (lb/ac/yr) | 0.23 | | | | |
| TMDL-TSS (lb/ac/yr) | N/A | | | | |

| BMP Selection | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| | Impervious disconnection | Filter strip | Vegetated open channel | -- | -- |

***Resource Protection Event (RPV)***

| | | | | | |
|---|---|---|---|---|---|
| RPv for Contributing Area (in.) | 1.32 | | | | |
| Req'd RPv Reduction for Contributing Area (in.) | 0.22 | | | | |
| Req'd RPv Reduction for Contributing Area (%) | 17% | | | | |
| C.A. allowable discharge rate (cfs) | 0.03 | | | | |
| Unmanaged Polluant load, TN (lbs/ac/yr) | 7.85 | | | | |
| Unmanaged Polluant load, TP (lbs/ac/yr) | 1.06 | | | | |
| Unmanaged Polluant load, TSS (lbs/ac/yr) | 235 | | | | |

| BMP Runoff Reduction Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| RPv runoff volume after all reductions (in.) | 1.21 | 1.05 | 0.95 | N/A | N/A |
| Total RPv runoff reduction (in.) | 0.11 | 0.28 | 0.37 | N/A | N/A |
| Total RPv runoff reduction (%) | 9% | 0.21 | 0.28 | N/A | N/A |
| Req'd runoff reduction met? | No | OK | OK | N/A | N/A |
| BMP TMDL Performance | | | | | |
| Adjusted pollutant load, TN (lb/ac/yr) | 7.06 | 6.00 | 5.40 | #N/A | #N/A |
| Adjusted pollutant load, TP (lb/ac/yr) | 0.95 | 0.81 | 0.73 | #N/A | #N/A |
| Adjusted pollutant load, TSS (lb/ac/yr) | 212 | 180 | 162 | #N/A | #N/A |
| Offsets Requirements | | | | | |
| RPv Offset (cu. ft.) | 237 | N/A | N/A | N/A | N/A |

***Conveyance Event (Cv)***

| | | | | | |
|---|---|---|---|---|---|
| Cv runoff volume (in.) | 3.04 | | | | |
| Stds-based allowable discharge (cfs) | 0.46 | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Cv runoff volume after all reductions (in.) | 2.97 | 2.92 | 2.86 | #N/A | #N/A |

***Flooding Event (Fv)***

| | | | | | |
|---|---|---|---|---|---|
| Fv runoff volume (in.) | 6.60 | | | | |
| Stds-based allowable discharge (cfs) | 1.37 | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Fv runoff volume after all reductions (in.) | 6.60 | 6.60 | 6.60 | #N/A | #N/A |

***Adjusted Subarea Data for Downstream DURMM Modeling***

| | |
|---|---|
| Contributing Area (ac.) | 0.61 |
| C.A. RCN | 79 |
| LOD Area (ac.) | 0.61 |
| Weighted Target Runoff (in.) | 1.10 |
| Adjusted CN after all reductions | 70.76 |
| Adjusted RPv (in.) | 0.95 |
| Adjusted Cv (in.) | |
| Adjusted Fv (in.) | |

| ***Adjusted Subarea Data for H&H Modeling*** | Rain (in.) | RCN |
|---|---|---|
| Resource Protection Event, RPv | 2.7 | N/A |
| Conveyance Event, Cv | 5.3 | 76.79 |
| Flooding Event, Fv | 9.2 | 78.72 |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 4A+4B |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**CONTRIBUTING AREA RUNOFF CURVE NUMBER (C.A. RCN) WORKSHEET**

| Cover Type | Treatment | Hydrologic Condition | Curve Numbers for Hydrologic Soil Type A Acres | A RCN | B Acres | B RCN | C Acres | C RCN | D Acres | D RCN |
|---|---|---|---|---|---|---|---|---|---|---|
| **CULTIVATED AGRICULTURAL LANDS** | | | | | | | | | | |
| Fallow | Bare soil | ---- | | 77 | | 86 | | 91 | | 94 |
| | Crop residue (CR) | poor | | 76 | | 85 | | 90 | | 93 |
| | Crop residue (CR) | good | | 74 | | 83 | | 88 | | 90 |
| Row Crops | Straight row (SR) | poor | | 72 | | 81 | | 88 | | 91 |
| | Straight row (SR) | good | | 67 | | 78 | | 85 | | 89 |
| | SR + Crop residue | poor | | 71 | | 80 | | 87 | | 90 |
| | SR + Crop residue | good | | 64 | | 75 | | 82 | | 85 |
| | Contoured (C) | poor | | 70 | | 79 | | 84 | | 88 |
| | Contoured (C) | good | | 65 | | 75 | | 82 | | 86 |
| | C + Crop residue | poor | | 69 | | 78 | | 83 | | 87 |
| | C + Crop residue | good | | 64 | | 74 | | 81 | | 85 |
| | Cont & terraced(C&T) | poor | | 66 | | 74 | | 80 | | 82 |
| | Cont & terraced(C&T) | good | | 62 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 65 | | 73 | | 79 | | 81 |
| | C&T + Crop residue | good | | 61 | | 70 | | 77 | | 80 |
| Small Grain | Straight row (SR) | poor | | 65 | | 76 | | 84 | | 88 |
| | Straight row (SR) | good | | 63 | | 75 | | 83 | | 87 |
| | SR + Crop residue | poor | | 64 | | 75 | | 83 | | 86 |
| | SR + Crop residue | good | | 60 | | 72 | | 80 | | 84 |
| | Contoured (C) | poor | | 63 | | 74 | | 82 | | 85 |
| | Contoured (C) | good | | 61 | | 73 | | 81 | | 84 |
| | C + Crop residue | poor | | 62 | | 73 | | 81 | | 84 |
| | C + Crop residue | good | | 60 | | 72 | | 80 | | 83 |
| | Cont & terraced(C&T) | poor | | 61 | | 72 | | 79 | | 82 |
| | Cont & terraces(C&T) | good | | 59 | | 70 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 60 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | good | | 58 | | 69 | | 77 | | 80 |
| Close-seeded | Straight row | poor | | 66 | | 77 | | 85 | | 89 |
| or broadcast | Straight row | good | | 58 | | 72 | | 81 | | 85 |
| legumes or | Contoured | poor | | 64 | | 75 | | 83 | | 85 |
| rotation | Contoured | good | | 55 | | 69 | | 78 | | 83 |
| meadow | Cont & terraced | poor | | 63 | | 73 | | 80 | | 83 |
| | Cont & terraced | good | | 51 | | 67 | | 76 | | 80 |
| **OTHER AGRICULTURAL LANDS** | | | | | | | | | | |
| | Pasture, grassland or range | poor | | 68 | | 79 | | 86 | | 89 |
| | | fair | | 49 | | 69 | | 79 | | 84 |
| | | good | | 39 | | 61 | | 74 | | 80 |
| | Meadow -cont. grass (non grazed) | ---- | | 30 | | 58 | | 71 | | 78 |
| | Brush - brush, weed, grass mix | poor | | 48 | | 67 | | 77 | | 83 |
| | | fair | | 35 | | 56 | | 70 | | 77 |
| | | good | | 30 | | 48 | | 65 | | 73 |
| | Woods - grass combination | poor | | 57 | | 73 | | 82 | | 86 |
| | | fair | | 43 | | 65 | | 76 | | 82 |
| | | good | | 32 | | 58 | | 72 | | 79 |
| | Woods | poor | | 45 | | 66 | | 77 | | 83 |
| | | fair | | 36 | | 60 | | 73 | | 79 |
| | | good | | 30 | | 55 | | 70 | | 77 |
| | Farmsteads | ---- | | 59 | | 74 | | 82 | | 86 |
| **FULLY DEVELOPED URBAN AREAS (Veg Established)** | | | | | | | | | | |
| Open space (Lawns,parks etc.) | | | | | | | | | | |
| | Poor condition; grass cover < 50% | | | 68 | | 79 | | 86 | | 89 |
| | Fair condition; grass cover 50% to 75 % | | | 49 | | 69 | | 79 | | 84 |
| | Good condition; grass cover > 75% | | | 39 | | 61 | 0.94 | 74 | 0.02 | 80 |
| Impervious Areas | | | | | | | | | | |
| | Paved parking lots, roofs, driveways | | | 98 | | 98 | 0.47 | 98 | 0.03 | 98 |
| | Streets and roads | | | | | | | | | |
| | Paved; curbs and storm sewers | | | 98 | | 98 | | 98 | | 98 |
| | Paved; open ditches (w/right-of-way) | | | 83 | | 89 | | 92 | | 93 |
| | Gravel (w/ right-of-way) | | | 76 | | 85 | | 89 | | 91 |
| | Dirt (w/ right-of-way) | | | 72 | | 82 | | 87 | | 89 |
| Urban Districts | | Avg % impervious | | | | | | | | |
| | Commercial & business | 85 | | 89 | | 92 | | 94 | | 95 |
| | Industrial | 72 | | 81 | | 88 | | 91 | | 93 |
| Residential districts by average lot size | | Avg % impervious | | | | | | | | |
| | 1/8 acre (town houses) | 65 | | 77 | | 85 | | 90 | | 92 |
| | 1/4 acre | 38 | | 61 | | 75 | | 83 | | 87 |
| | 1/3 acre | 30 | | 57 | | 72 | | 81 | | 86 |
| | 1/2 acre | 25 | | 54 | | 70 | | 80 | | 85 |
| | 1 acre | 20 | | 51 | | 68 | | 79 | | 84 |
| | 2 acre | 12 | | 46 | | 65 | | 77 | | 82 |
| **DEVELOPING URBAN AREA (No Vegetation)** | | | | | | | | | | |
| | Newly graded area (pervious only) | | | 77 | | 86 | | 91 | | 94 |
| **USER DEFINED** | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | **Subarea Contributing Area per Soil Type (ac)** | | 0 | | 0 | | 1.41 | | 0.05 | |

**UPSTREAM CONTRIBUTING AREAS**

| | Subarea ID | Acres | RCN |
|---|---|---|---|
| Upstream Contributing Area 1 | 4A | 0.61 | 79 |
| Upstream Contributing Area 2 | | | |
| Upstream Contributing Area 3 | | | |
| Upstream Contributing Area 4 | | | |

| | |
|---|---|
| **Total Contributing Area (ac)** | **2.07** |
| **Weighted Runoff Curve Number (RCN)** | **81** |

**County**

Kent
New Castle
Sussex

**Unit Hydrograph**

DMV
STD

Effective April 2016

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 4A+4B |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**LIMIT OF DISTURBANCE (LOD) WORKSHEET**

| **Step 1 - Subarea LOD Data** | **HSG A** | **HSG B** | **HSG C** | **HSG D** |
|---|---|---|---|---|
| 1.1 HSG Area Within LOD (ac) | | | 1.41 | 0.05 |
| 1.2 Pre-Developed Woods/Meadow Within LOD (ac) | | | | |
| 1.3 Pre-Developed Impervious Within LOD (ac) | | | | |
| 1.4.a Post-Developed Imperviousness Within LOD, Option #1 (ac); ***OR*** | | | 0.47 | 0.03 |
| 1.4.b Post-Developed Imperviousness Within LOD, Option #2 (%) | 0% | 0% | 33% | 60% |

| **Step 2 - Subarea LOD Runoff Calculations** | | | | |
|---|---|---|---|---|
| 2.1 RCN per HSG | 0.00 | 0.00 | 82.00 | 90.80 |
| 2.2 RPv per HSG (in.) | 0.00 | 0.00 | 1.49 | 2.00 |
| 2.3 Target Runoff per HSG (in.) | 0.00 | 0.00 | 1.10 | 1.39 |
| 2.4 Cv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 0.75 | 0.75 |
| 2.5 Fv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 2.25 | 2.25 |
| 2.6 Subarea LOD (ac) | 1.46 | | | |
| 2.7 Subarea Weighted RCN | 82.30 | | | |
| 2.8 Subarea Weighted RPv (in.) | 1.51 | | | |
| 2.9 Subarea Weighted Target Runoff (in.) | 1.11 | | | |

| RPv Target Runoff (in.) | |
|---|---|
| Soil | Woods |
| HSG A | 0.00 |
| HSG B | 0.12 |
| HSG C | 0.55 |
| HSG D | 0.87 |

| **Step 3 - Upstream LOD Areas** *(from previous DURMM Report as applicable)* | **Area 1** | **Area 2** | **Area 3** | **Area 4** |
|---|---|---|---|---|
| 3.1 Upstream Subarea ID | 4A | | | |
| 3.2 Upstream LOD Area (ac) | 0.61 | | | |
| 3.3 Target Runoff for Upstream Area (in.) | 1.10 | | | |
| 3.4 Adjusted CN after all reductions | 70.76 | | | |
| 3.5 Adjusted RPv (in.) | 0.95 | | | |
| 3.6 Adjusted Cv (in.) | | | | |
| 3.7 Adjusted Fv (in.) | | | | |

| **Step 4 - RPv Calculations for Combined LOD** | |
|---|---|
| 4.1 Combined LOD (ac) | 2.07 |
| 4.2 Weighted RCN | 78.90 |
| 4.3 Weighted RPv (in.) | 1.34 |
| 4.4 Weighted Target Runoff (in.) | 1.11 |
| 4.5 Estimated Annual Runoff (in.) | 17.45 |
| 4.6 Req'd Runoff Reduction within LOD (in.) | 0.24 |
| 4.7 Req'd Runoff Reduction within LOD (%) | 18% |

| **Step 5 - Cv Unit Discharge** | |
|---|---|
| 5. LOD Allowable Unit Discharge (cfs/ac) | 0.75 |

| **Step 6 - Fv Unit Discharge** | |
|---|---|
| 6. LOD Allowable Unit Discharge (cfs/ac) | 2.25 |

Cv/Fv Unit Discharge

Woodland/Meadow (HSG A)
- 10-YR: 0 cfs/ac
- 100-YR: 0.25 cfs/ac

Woodland/Meadow (HSG B,C,D)
- 10-YR: 0.375 cfs/ac
- 100-YR: 1.25 cfs/ac

Non-Woodland/Non-Meadow
- 10-YR: 0.75 cfs/ac
- 100-YR: 2.25 cfs/ac

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 4A+4B
**LOCATION (County):** Sussex

**RESOURCE PROTECTION EVENT (RPv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Dry ED basin | Type | -- | Type | -- | Type | -- | Type | -- |
| ***Step 1 - Calculate Initial RPv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 2.07 | | 2.07 | | 2.07 | | 2.07 | | 2.07 | |
| 1.2 *Reserved* | | | | | | | | | | |
| 1.3 Initial RCN | 78.90 | | | | | | | | | |
| 1.4 RPv for Contributing Area (in.) | 1.34 | | | | | | | | | |
| 1.5 Req'd RPv Reduction for Contributing Area (in.) | 0.24 | | | | | | | | | |
| 1.6 Req'd RPv Reduction for Contributing Area (%) | 18% | | | | | | | | | |
| 1.7 RPv allowable discharge rate (cfs) | 0.12 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 2500 | | | | | | | | | |
| 2.2 Retention reduction allowance (%) | 0% | | N/A | | N/A | | N/A | | N/A | |
| 2.3 Retention reduction volume (ac-ft) | 0.00 | | N/A | | N/A | | N/A | | N/A | |
| 2.4 Retention reduction volume (in.) | 0.00 | | N/A | | N/A | | N/A | | N/A | |
| 2.5 Runoff volume after retention reduction (in.) | 1.34 | | N/A | | N/A | | N/A | | N/A | |
| 2.6 Adjusted CN* | 79.15 | | N/A | | N/A | | N/A | | N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Annual CN (ACN) | 78.90 | | N/A | | N/A | | N/A | | N/A | |
| 3.2 Annual runoff (in.) | 17.45 | | N/A | | N/A | | N/A | | N/A | |
| 3.3 Proportion A/B soils in BMP footprint (%) | | | | | | | | | | |
| 3.4 Annual runoff reduction allowance (%) | 10% | | N/A | | N/A | | N/A | | N/A | |
| 3.5 Annual runoff after reduction (in.) | 15.71 | | N/A | | N/A | | N/A | | N/A | |
| 3.6 Adjusted ACN | 76.56 | | N/A | | N/A | | N/A | | N/A | |
| 3.7 Annual Runoff Reduction Allowance for RPv (in.) | 0.13 | | N/A | | N/A | | N/A | | N/A | |
| ***Step 4 - Calculate RPv with BMP Reductions*** | | | | | | | | | | |
| 4.1 RPv runoff volume after all reductions (in.) | 1.22 | | N/A | | N/A | | N/A | | N/A | |
| 4.2 Total RPv runoff reduction (in.) | 0.13 | | N/A | | N/A | | N/A | | N/A | |
| 4.3 Total RPv runoff reduction (%) | 10% | | N/A | | N/A | | N/A | | N/A | |
| 4.4 Adjusted CN after all reductions | 76.56 | | N/A | | N/A | | N/A | | N/A | |
| 4.5 Equivalent TR-55 RCN for H&H modeling | 83.12 | | N/A | | N/A | | N/A | | N/A | |
| 4.6 Req'd reduction met? | No | | N/A | | N/A | | N/A | | N/A | |
| ***Step 5 - Determine Runoff Reduction Offset*** | | | | | | | | | | |
| 5.1 Runoff Reduction Shortfall (in.) | 0.11 | | N/A | | N/A | | N/A | | N/A | |
| 5.2 Runoff Reduction Shortfall (cu.ft./ac) | 395 | | N/A | | N/A | | N/A | | N/A | |
| 5.3 Total Offset Volume (cu.ft.) | 818 | | N/A | | N/A | | N/A | | N/A | |

**DURMM BMP Name**

--
Infiltration w/sand or vegetation
Infiltration w/o sand or vegetation
Bioretention w/underdrain
Permeable pave w/sand or vegetation
Permeable pave w/o sand or vegetation
Vegetated roof
Rainwater harvesting
Impervious disconnection
Bioswale
Vegetated open channel
Filter strip
Riparian forest buffer
Urban tree planting
Soil amendment
Sheetflow to turf open space
Sheetflow to forest open space
Wet swale
Ephemeral wetland
--
Dry ED basin
Dry detention pond
Hydrodynamic structure
Urban filtering practice
Wet pond
Constructed wetland
--
Nutrient management
Street sweeping
--
Urban stream restoration

Effective April 2016

| | |
|---|---|
| **PROJECT:** | **Batson Creek Estates** |
| **DRAINAGE SUBAREA ID:** | **4A+4B** |
| **LANDUSE TYPE:** | **Residential** |
| **TMDL WATERSHED:** | **Little Assawoman Bay** |

**TOTAL MAXIMUM DAILY LOAD (TMDL) WORKSHEET**

| | BMP 1 | | | | BMP 2 | | | | BMP 3 | | | | BMP 4 | | | | BMP 5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Dry ED basin | | | Type: | -- | | | Type: | -- | | | Type: | -- | | | Type: | -- | | |
| ***Step 1 - Calculate Annual Runoff Volume*** | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS |
| 1.1 Total contributing area to BMP (ac) | 2.07 | | | | | | | | | | | | | | | | | | | |
| 1.2 Initial RCN | 79 | | | | | | | | | | | | | | | | | | | |
| 1.3 Annual runoff volume (in.) | 17.45 | | | | | | | | | | | | | | | | | | | |
| 1.4 Annual runoff volume (liters) | 3.71E+06 | | | | | | | | | | | | | | | | | | | |
| ***Step 2 - Calculate Annual Pollutant Load*** | | | | | | | | | | | | | | | | | | | | |
| 2.1 EMC (mg/L) | | 2.00 | 0.27 | 60 | | | | | | | | | | | | | | | | |
| 2.2 Load (mg/yr) | | 7.43E+06 | 1.00E+06 | 2.23E+08 | | | | | | | | | | | | | | | | |
| 2.4 Stormwater Load (lb/ac/yr) | | 7.91 | 1.07 | 237 | | 6.33 | 0.85 | 95 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 3 - Adjust for Runoff Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 3.1 BMP Runoff Reduction (%) | 10% | | | | N/A | | | | N/A | | | | N/A | | | | N/A | | | |
| 3.2 BMP Removal Efficiency (%) | | 20% | 20% | 60% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 3.3 Adjusted load (lb/ac/yr) | | 6.33 | 0.85 | 95 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 4 - Calculate Pollutant Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 4.1 TMDL (lb/ac/yr) | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A |
| 4.2 Reduction met? | | No | No | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK |
| ***Step 5 - Determine TMDL Offset*** | | | | | | | | | | | | | | | | | | | | |
| 5.1 TMDL Shortfall (lb/ac/yr) | | 0.63 | 0.62 | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 |
| 5.2 TMDL Shortfall (%) | | 10% | 73% | 0% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.3 Residual RPv Volume (in) | | 1.22 | 1.22 | 1.22 | | N/A | N/A | N/A | | N/A | N/A | N/A | | N/A | N/A | N/A | | N/A | N/A | N/A |
| 5.4 Req'd Additional RR to meet TMDL (in)* | | 0.12 | 0.89 | 0.00 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.5 Req'd Additional RR to meet TMDL (cu.ft./ac) | | 439 | 3227 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.6 Total Offset Volume (cu.ft.) | | 908 | 6681 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 4A+4B
**LOCATION (County):** Sussex

**CONVEYANCE EVENT (Cv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Dry ED basin | Type: | -- | Type: | -- | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Cv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 2.07 | | 2.07 | | 2.07 | | 2.07 | | 2.07 | |
| 1.2 Initial RCN | 78.90 | | | | | | | | | |
| 1.3 **10-YR** Rainfall (in.) | 5.3 | | | | | | | | | |
| 1.4 Cv runoff volume (in.) | 3.05 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 0.75 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | #NUM! | | | | | | | | | |
| 1.7 Cv allowable discharge rate (cfs) | #NUM! | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 2500.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.06 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.33 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 2.72 | | 2.69 | | #N/A | | #N/A | | #N/A | |
| 2.5 CN* | 75.28 | | 74.94 | | #N/A | | #N/A | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 1% | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 3.02 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 78.57 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.03 | | #N/A | | #N/A | | #N/A | | #N/A | |
| ***Step 4 - Calculate Cv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Cv runoff volume after all reductions (in.) | 2.69 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 4.2 Total Cv runoff reduction (%) | 12% | | #N/A | | #N/A | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 74.94 | | #N/A | | #N/A | | #N/A | | #N/A | |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 4A+4B
**LOCATION (County):** Sussex

**FLOODING EVENT (Fv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Dry ED basin | Type: | -- | Type: | -- | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Fv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 2.07 | | 2.07 | | 2.07 | | 2.07 | | 2.07 | |
| 1.2 Initial RCN | 78.90 | | | | | | | | | |
| 1.3 **100-YR** Rainfall (in.) | 9.2 | | | | | | | | | |
| 1.4 Fv runoff volume (in.) | 6.62 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 2.25 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | #NUM! | | | | | | | | | |
| 1.7 Fv allowable discharge rate (cfs) | #NUM! | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 2500.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.06 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.33 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 6.29 | | 6.29 | | #N/A | | #N/A | | #N/A | |
| 2.5 CN* | 76.22 | | 76.22 | | #N/A | | #N/A | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 0% | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 6.62 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 78.90 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.00 | | #N/A | | #N/A | | #N/A | | #N/A | |
| ***Step 4 - Calculate Fv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Fv runoff volume after all reductions (in.) | 6.29 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 4.2 Total Fv runoff reduction (%) | 5% | | #N/A | | #N/A | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 76.22 | | #N/A | | #N/A | | #N/A | | #N/A | |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 4A+4B |
| **TMDL Watershed:** | Little Assawoman Bay |

**DURMM OUTPUT WORKSHEET**

DURMM v2.beta.110802

***Site Data***

| | | | | | |
|---|---|---|---|---|---|
| Contributing Area to BMPs (ac.) | 2.07 | | | | |
| C.A. RCN | 81 | | | | |
| Subarea LOD (ac.) | 1.46 | | | | |
| Upstream Subarea ID | 4A | 0 | 0 | 0 | |
| Upstream Subarea LOD (ac.) | 0.61 | 0.00 | 0.00 | 0.00 | |
| Combined LOD with Upstream Areas (ac.) | 2.07 | | | | |
| Combined RCN with Upstream Areas (ac.) | 78.90 | | | | |
| TMDL-TN (lb/ac/yr) | 5.70 | | | | |
| TMDL-TP (lb/ac/yr) | 0.23 | | | | |
| TMDL-TSS (lb/ac/yr) | N/A | | | | |

| BMP Selection | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| | Dry ED basin | -- | -- | -- | -- |

***Resource Protection Event (RPV)***

| | | | | | |
|---|---|---|---|---|---|
| RPv for Contributing Area (in.) | 1.34 | | | | |
| Req'd RPv Reduction for Contributing Area (in.) | 0.24 | | | | |
| Req'd RPv Reduction for Contributing Area (%) | 18% | | | | |
| C.A. allowable discharge rate (cfs) | 0.12 | | | | |
| Unmanaged Polluant load, TN (lbs/ac/yr) | 7.91 | | | | |
| Unmanaged Polluant load, TP (lbs/ac/yr) | 1.07 | | | | |
| Unmanaged Polluant load, TSS (lbs/ac/yr) | 237 | | | | |

| BMP Runoff Reduction Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| RPv runoff volume after all reductions (in.) | 1.22 | N/A | N/A | N/A | N/A |
| Total RPv runoff reduction (in.) | 0.13 | N/A | N/A | N/A | N/A |
| Total RPv runoff reduction (%) | 10% | N/A | N/A | N/A | N/A |
| Req'd runoff reduction met? | No | N/A | N/A | N/A | N/A |

| BMP TMDL Performance | | | | | |
|---|---|---|---|---|---|
| Adjusted pollutant load, TN (lb/ac/yr) | 6.33 | #N/A | #N/A | #N/A | #N/A |
| Adjusted pollutant load, TP (lb/ac/yr) | 0.85 | #N/A | #N/A | #N/A | #N/A |
| Adjusted pollutant load, TSS (lb/ac/yr) | 95 | #N/A | #N/A | #N/A | #N/A |
| Offsets Requirements | | | | | |
| RPv Offset (cu. ft.) | 818 | N/A | N/A | N/A | N/A |

***Conveyance Event (Cv)***

| | | | | | |
|---|---|---|---|---|---|
| Cv runoff volume (in.) | 3.05 | | | | |
| Stds-based allowable discharge (cfs) | #NUM! | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Cv runoff volume after all reductions (in.) | 2.69 | #N/A | #N/A | #N/A | #N/A |

***Flooding Event (Fv)***

| | | | | | |
|---|---|---|---|---|---|
| Fv runoff volume (in.) | 6.62 | | | | |
| Stds-based allowable discharge (cfs) | #NUM! | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Fv runoff volume after all reductions (in.) | 6.29 | #N/A | #N/A | #N/A | #N/A |

***Adjusted Subarea Data for Downstream DURMM Modeling***

| | |
|---|---|
| Contributing Area (ac.) | 2.07 |
| C.A. RCN | 81 |
| LOD Area (ac.) | 2.07 |
| Weighted Target Runoff (in.) | 1.11 |
| Adjusted CN after all reductions | 76.56 |
| Adjusted RPv (in.) | 1.22 |
| Adjusted Cv (in.) | |
| Adjusted Fv (in.) | |

| ***Adjusted Subarea Data for H&H Modeling*** | Rain (in.) | RCN |
|---|---|---|
| Resource Protection Event, RPv | 2.7 | N/A |
| Conveyance Event, Cv | 5.3 | 74.94 |
| Flooding Event, Fv | 9.2 | 76.22 |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 5 |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**CONTRIBUTING AREA RUNOFF CURVE NUMBER (C.A. RCN) WORKSHEET**

| Cover Type | Treatment | Hydrologic Condition | Curve Numbers for Hydrologic Soil Type A Acres | A RCN | B Acres | B RCN | C Acres | C RCN | D Acres | D RCN |
|---|---|---|---|---|---|---|---|---|---|---|
| **CULTIVATED AGRICULTURAL LANDS** | | | | | | | | | | |
| Fallow | Bare soil | ---- | | 77 | | 86 | | 91 | | 94 |
| | Crop residue (CR) | poor | | 76 | | 85 | | 90 | | 93 |
| | Crop residue (CR) | good | | 74 | | 83 | | 88 | | 90 |
| Row Crops | Straight row (SR) | poor | | 72 | | 81 | | 88 | | 91 |
| | Straight row (SR) | good | | 67 | | 78 | | 85 | | 89 |
| | SR + Crop residue | poor | | 71 | | 80 | | 87 | | 90 |
| | SR + Crop residue | good | | 64 | | 75 | | 82 | | 85 |
| | Contoured (C) | poor | | 70 | | 79 | | 84 | | 88 |
| | Contoured (C) | good | | 65 | | 75 | | 82 | | 86 |
| | C + Crop residue | poor | | 69 | | 78 | | 83 | | 87 |
| | C + Crop residue | good | | 64 | | 74 | | 81 | | 85 |
| | Cont & terraced(C&T) | poor | | 66 | | 74 | | 80 | | 82 |
| | Cont & terraced(C&T) | good | | 62 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 65 | | 73 | | 79 | | 81 |
| | C&T + Crop residue | good | | 61 | | 70 | | 77 | | 80 |
| Small Grain | Straight row (SR) | poor | | 65 | | 76 | | 84 | | 88 |
| | Straight row (SR) | good | | 63 | | 75 | | 83 | | 87 |
| | SR + Crop residue | poor | | 64 | | 75 | | 83 | | 86 |
| | SR + Crop residue | good | | 60 | | 72 | | 80 | | 84 |
| | Contoured (C) | poor | | 63 | | 74 | | 82 | | 85 |
| | Contoured (C) | good | | 61 | | 73 | | 81 | | 84 |
| | C + Crop residue | poor | | 62 | | 73 | | 81 | | 84 |
| | C + Crop residue | good | | 60 | | 72 | | 80 | | 83 |
| | Cont & terraced(C&T) | poor | | 61 | | 72 | | 79 | | 82 |
| | Cont & terraces(C&T) | good | | 59 | | 70 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 60 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | good | | 58 | | 69 | | 77 | | 80 |
| Close-seeded | Straight row | poor | | 66 | | 77 | | 85 | | 89 |
| or broadcast | Straight row | good | | 58 | | 72 | | 81 | | 85 |
| legumes or | Contoured | poor | | 64 | | 75 | | 83 | | 85 |
| rotation | Contoured | good | | 55 | | 69 | | 78 | | 83 |
| meadow | Cont & terraced | poor | | 63 | | 73 | | 80 | | 83 |
| | Cont & terraced | good | | 51 | | 67 | | 76 | | 80 |
| **OTHER AGRICULTURAL LANDS** | | | | | | | | | | |
| | Pasture, grassland or range | poor | | 68 | | 79 | | 86 | | 89 |
| | | fair | | 49 | | 69 | | 79 | | 84 |
| | | good | | 39 | | 61 | | 74 | | 80 |
| | Meadow -cont. grass (non grazed) | ---- | | 30 | | 58 | | 71 | | 78 |
| | Brush - brush, weed, grass mix | poor | | 48 | | 67 | | 77 | | 83 |
| | | fair | | 35 | | 56 | | 70 | | 77 |
| | | good | | 30 | | 48 | | 65 | | 73 |
| | Woods - grass combination | poor | | 57 | | 73 | | 82 | | 86 |
| | | fair | | 43 | | 65 | | 76 | | 82 |
| | | good | | 32 | | 58 | | 72 | | 79 |
| | Woods | poor | | 45 | | 66 | | 77 | | 83 |
| | | fair | | 36 | | 60 | | 73 | | 79 |
| | | good | | 30 | | 55 | | 70 | | 77 |
| | Farmsteads | ---- | | 59 | | 74 | | 82 | | 86 |
| **FULLY DEVELOPED URBAN AREAS (Veg Established)** | | | | | | | | | | |
| Open space (Lawns,parks etc.) | | | | | | | | | | |
| | Poor condition; grass cover < 50% | | | 68 | | 79 | | 86 | | 89 |
| | Fair condition; grass cover 50% to 75 % | | | 49 | | 69 | | 79 | | 84 |
| | Good condition; grass cover > 75% | | | 39 | | 61 | 0.82 | 74 | 0.49 | 80 |
| Impervious Areas | | | | | | | | | | |
| | Paved parking lots, roofs, driveways | | | 98 | | 98 | 0.22 | 98 | 0.15 | 98 |
| | Streets and roads | | | | | | | | | |
| | Paved; curbs and storm sewers | | | 98 | | 98 | | 98 | | 98 |
| | Paved; open ditches (w/right-of-way) | | | 83 | | 89 | | 92 | | 93 |
| | Gravel (w/ right-of-way) | | | 76 | | 85 | | 89 | | 91 |
| | Dirt (w/ right-of-way) | | | 72 | | 82 | | 87 | | 89 |
| Urban Districts | | Avg % impervious | | | | | | | | |
| | Commercial & business | 85 | | 89 | | 92 | | 94 | | 95 |
| | Industrial | 72 | | 81 | | 88 | | 91 | | 93 |
| Residential districts by average lot size | | Avg % impervious | | | | | | | | |
| | 1/8 acre (town houses) | 65 | | 77 | | 85 | | 90 | | 92 |
| | 1/4 acre | 38 | | 61 | | 75 | | 83 | | 87 |
| | 1/3 acre | 30 | | 57 | | 72 | | 81 | | 86 |
| | 1/2 acre | 25 | | 54 | | 70 | | 80 | | 85 |
| | 1 acre | 20 | | 51 | | 68 | | 79 | | 84 |
| | 2 acre | 12 | | 46 | | 65 | | 77 | | 82 |
| **DEVELOPING URBAN AREA (No Vegetation)** | | | | | | | | | | |
| | Newly graded area (pervious only) | | | 77 | | 86 | | 91 | | 94 |
| **USER DEFINED** | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | **Subarea Contributing Area per Soil Type (ac)** | | 0 | | 0 | | 1.04 | | 0.64 | |

**UPSTREAM CONTRIBUTING AREAS**

| | Subarea ID | Acres | RCN |
|---|---|---|---|
| Upstream Contributing Area 1 | | | |
| Upstream Contributing Area 2 | | | |
| Upstream Contributing Area 3 | | | |
| Upstream Contributing Area 4 | | | |

| | |
|---|---|
| **Total Contributing Area (ac)** | 1.68 |
| **Weighted Runoff Curve Number (RCN)** | 81 |

**County**

Kent
New Castle
Sussex

**Unit Hydrograph**

DMV
STD

Effective April 2016

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 5 |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**LIMIT OF DISTURBANCE (LOD) WORKSHEET**

| **Step 1 - Subarea LOD Data** | **HSG A** | **HSG B** | **HSG C** | **HSG D** |
|---|---|---|---|---|
| 1.1 HSG Area Within LOD (ac) | | | 1.04 | 0.64 |
| 1.2 Pre-Developed Woods/Meadow Within LOD (ac) | | | | |
| 1.3 Pre-Developed Impervious Within LOD (ac) | | | | |
| 1.4.a Post-Developed Imperviousness Within LOD, Option #1 (ac); ***OR*** | | | 0.22 | 0.15 |
| 1.4.b Post-Developed Imperviousness Within LOD, Option #2 (%) | 0% | 0% | 21% | 23% |

| **Step 2 - Subarea LOD Runoff Calculations** | | | | |
|---|---|---|---|---|
| 2.1 RCN per HSG | 0.00 | 0.00 | 79.08 | 84.22 |
| 2.2 RPv per HSG (in.) | 0.00 | 0.00 | 1.34 | 1.61 |
| 2.3 Target Runoff per HSG (in.) | 0.00 | 0.00 | 1.10 | 1.39 |
| 2.4 Cv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 0.75 | 0.75 |
| 2.5 Fv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 2.25 | 2.25 |
| 2.6 Subarea LOD (ac) | 1.68 | | | |
| 2.7 Subarea Weighted RCN | 81.04 | | | |
| 2.8 Subarea Weighted RPv (in.) | 1.44 | | | |
| 2.9 Subarea Weighted Target Runoff (in.) | 1.21 | | | |

| RPv Target Runoff (in.) | |
|---|---|
| Soil | Woods |
| HSG A | 0.00 |
| HSG B | 0.12 |
| HSG C | 0.55 |
| HSG D | 0.87 |

| **Step 3 - Upstream LOD Areas** *(from previous DURMM Report as applicable)* | **Area 1** | **Area 2** | **Area 3** | **Area 4** |
|---|---|---|---|---|
| 3.1 Upstream Subarea ID | | | | |
| 3.2 Upstream LOD Area (ac) | | | | |
| 3.3 Target Runoff for Upstream Area (in.) | | | | |
| 3.4 Adjusted CN after all reductions | | | | |
| 3.5 Adjusted RPv (in.) | | | | |
| 3.6 Adjusted Cv (in.) | | | | |
| 3.7 Adjusted Fv (in.) | | | | |

| Cv/Fv Unit Discharge |
|---|
| Woodland/Meadow (HSG A) |
| 10-YR: 0 cfs/ac |
| 100-YR: 0.25 cfs/ac |
| Woodland/Meadow (HSG B,C,D) |
| 10-YR: 0.375 cfs/ac |
| 100-YR: 1.25 cfs/ac |
| Non-Woodland/Non-Meadow |
| 10-YR: 0.75 cfs/ac |
| 100-YR: 2.25 cfs/ac |

| **Step 4 - RPv Calculations for Combined LOD** | |
|---|---|
| 4.1 Combined LOD (ac) | 1.68 |
| 4.2 Weighted RCN | 81.04 |
| 4.3 Weighted RPv (in.) | 1.44 |
| 4.4 Weighted Target Runoff (in.) | 1.21 |
| 4.5 Estimated Annual Runoff (in.) | 19.16 |
| 4.6 Req'd Runoff Reduction within LOD (in.) | 0.23 |
| 4.7 Req'd Runoff Reduction within LOD (%) | 16% |

| **Step 5 - Cv Unit Discharge** | |
|---|---|
| 5. LOD Allowable Unit Discharge (cfs/ac) | 0.75 |

| **Step 6 - Fv Unit Discharge** | |
|---|---|
| 6. LOD Allowable Unit Discharge (cfs/ac) | 2.25 |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 5
**LOCATION (County):** Sussex

**RESOURCE PROTECTION EVENT (RPv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Impervious disconnection | Type | Filter strip | Type | -- | Type | -- | Type | -- |
| ***Step 1 - Calculate Initial RPv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 1.68 | | 1.68 | | 1.68 | | 1.68 | | 1.68 | |
| 1.2 *Reserved* | | | | | | | | | | |
| 1.3 Initial RCN | 81.04 | | | | | | | | | |
| 1.4 RPv for Contributing Area (in.) | 1.44 | | | | | | | | | |
| 1.5 Req'd RPv Reduction for Contributing Area (in.) | 0.23 | | | | | | | | | |
| 1.6 Req'd RPv Reduction for Contributing Area (%) | 16% | | | | | | | | | |
| 1.7 RPv allowable discharge rate (cfs) | 0.10 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | | | | | | | | | | |
| 2.2 Retention reduction allowance (%) | 0% | | 0% | | N/A | | N/A | | N/A | |
| 2.3 Retention reduction volume (ac-ft) | 0.00 | | 0.00 | | N/A | | N/A | | N/A | |
| 2.4 Retention reduction volume (in.) | 0.00 | | 0.00 | | N/A | | N/A | | N/A | |
| 2.5 Runoff volume after retention reduction (in.) | 1.44 | | 1.32 | | N/A | | N/A | | N/A | |
| 2.6 Adjusted CN* | 81.09 | | 78.63 | | N/A | | N/A | | N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Annual CN (ACN) | 81.04 | | 78.63 | | N/A | | N/A | | N/A | |
| 3.2 Annual runoff (in.) | 19.16 | | 17.25 | | N/A | | N/A | | N/A | |
| 3.3 Proportion A/B soils in BMP footprint (%) | | | | | | | | | | |
| 3.4 Annual runoff reduction allowance (%) | 10% | | 15% | | N/A | | N/A | | N/A | |
| 3.5 Annual runoff after reduction (in.) | 17.25 | | 14.66 | | N/A | | N/A | | N/A | |
| 3.6 Adjusted ACN | 78.63 | | 75.06 | | N/A | | N/A | | N/A | |
| 3.7 Annual Runoff Reduction Allowance for RPv (in.) | 0.13 | | 0.30 | | N/A | | N/A | | N/A | |
| ***Step 4 - Calculate RPv with BMP Reductions*** | | | | | | | | | | |
| 4.1 RPv runoff volume after all reductions (in.) | 1.32 | | 1.15 | | N/A | | N/A | | N/A | |
| 4.2 Total RPv runoff reduction (in.) | 0.13 | | 0.30 | | N/A | | N/A | | N/A | |
| 4.3 Total RPv runoff reduction (%) | 9% | | 21% | | N/A | | N/A | | N/A | |
| 4.4 Adjusted CN after all reductions | 78.63 | | 75.06 | | N/A | | N/A | | N/A | |
| 4.5 Equivalent TR-55 RCN for H&H modeling | 84.68 | | 81.98 | | N/A | | N/A | | N/A | |
| 4.6 Req'd reduction met? | No | | OK | | N/A | | N/A | | N/A | |
| ***Step 5 - Determine Runoff Reduction Offset*** | | | | | | | | | | |
| 5.1 Runoff Reduction Shortfall (in.) | 0.11 | | N/A | | N/A | | N/A | | N/A | |
| 5.2 Runoff Reduction Shortfall (cu.ft./ac) | 390 | | N/A | | N/A | | N/A | | N/A | |
| 5.3 Total Offset Volume (cu.ft.) | 655 | | N/A | | N/A | | N/A | | N/A | |

**DURMM BMP Name**

--
Infiltration w/sand or vegetation
Infiltration w/o sand or vegetation
Bioretention w/underdrain
Permeable pave w/sand or vegetation
Permeable pave w/o sand or vegetation
Vegetated roof
Rainwater harvesting
Impervious disconnection
Bioswale
Vegetated open channel
Filter strip
Riparian forest buffer
Urban tree planting
Soil amendment
Sheetflow to turf open space
Sheetflow to forest open space
Wet swale
Ephemeral wetland
--
Dry ED basin
Dry detention pond
Hydrodynamic structure
Urban filtering practice
Wet pond
Constructed wetland
--
Nutrient management
Street sweeping
--
Urban stream restoration

Effective April 2016

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 5
**LANDUSE TYPE:** Residential
**TMDL WATERSHED:** Little Assawoman Bay

## TOTAL MAXIMUM DAILY LOAD (TMDL) WORKSHEET

| | BMP 1 | | | | BMP 2 | | | | BMP 3 | | | | BMP 4 | | | | BMP 5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Impervious disconnection | | | Type: | Filter strip | | | Type: | -- | | | Type: | -- | | | Type: | -- | | |
| ***Step 1 - Calculate Annual Runoff Volume*** | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS |
| 1.1 Total contributing area to BMP (ac) | 1.68 | | | | | | | | | | | | | | | | | | | |
| 1.2 Initial RCN | 81 | | | | | | | | | | | | | | | | | | | |
| 1.3 Annual runoff volume (in.) | 19.16 | | | | | | | | | | | | | | | | | | | |
| 1.4 Annual runoff volume (liters) | 3.31E+06 | | | | | | | | | | | | | | | | | | | |
| ***Step 2 - Calculate Annual Pollutant Load*** | | | | | | | | | | | | | | | | | | | | |
| 2.1 EMC (mg/L) | | 2.00 | 0.27 | 60 | | | | | | | | | | | | | | | | |
| 2.2 Load (mg/yr) | | 6.62E+06 | 8.93E+05 | 1.99E+08 | | | | | | | | | | | | | | | | |
| 2.4 Stormwater Load (lb/ac/yr) | | 8.69 | 1.17 | 261 | | 7.82 | 1.06 | 235 | | 6.64 | 0.90 | 199 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 3 - Adjust for Runoff Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 3.1 BMP Runoff Reduction (%) | 10% | | | | 15% | | | | N/A | | | | N/A | | | | N/A | | | |
| 3.2 BMP Removal Efficiency (%) | | 10% | 10% | 10% | | 15% | 15% | 15% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 3.3 Adjusted load (lb/ac/yr) | | 7.82 | 1.06 | 235 | | 6.64 | 0.90 | 199 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 4 - Calculate Pollutant Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 4.1 TMDL (lb/ac/yr) | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A |
| 4.2 Reduction met? | | No | No | OK | | No | No | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK |
| ***Step 5 - Determine TMDL Offset*** | | | | | | | | | | | | | | | | | | | | |
| 5.1 TMDL Shortfall (lb/ac/yr) | | 2.12 | 0.83 | 0 | | 0.94 | 0.67 | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 |
| 5.2 TMDL Shortfall (%) | | 27% | 78% | 0% | | 14% | 74% | 0% | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.3 Residual RPv Volume (in) | | 1.32 | 1.32 | 1.32 | | 1.15 | 1.15 | 1.15 | | N/A | N/A | N/A | | N/A | N/A | N/A | | N/A | N/A | N/A |
| 5.4 Req'd Additional RR to meet TMDL (in)* | | 0.36 | 1.03 | 0.00 | | 0.16 | 0.85 | 0.00 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.5 Req'd Additional RR to meet TMDL (cu.ft./ac) | | 1296 | 3743 | 0 | | 591 | 3093 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.6 Total Offset Volume (cu.ft.) | | 2178 | 6288 | 0 | | 993 | 5195 | 0 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 5
**LOCATION (County):** Sussex

**CONVEYANCE EVENT (Cv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Impervious disconnection | Type: | Filter strip | Type: | -- | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Cv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 1.68 | | 1.68 | | 1.68 | | 1.68 | | 1.68 | |
| 1.2 Initial RCN | 81.04 | | | | | | | | | |
| 1.3 **10-YR** Rainfall (in.) | 5.3 | | | | | | | | | |
| 1.4 Cv runoff volume (in.) | 3.26 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 0.75 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | 0.00 | | | | | | | | | |
| 1.7 Cv allowable discharge rate (cfs) | 1.26 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 3.26 | | 3.19 | | 3.13 | | #N/A | | #N/A | |
| 2.5 CN* | 81.04 | | 80.36 | | 79.69 | | #N/A | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 2% | | 2% | | #N/A | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 3.19 | | 3.13 | | #N/A | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 80.36 | | 79.69 | | #N/A | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.07 | | 0.13 | | #N/A | | #N/A | | #N/A | |
| ***Step 4 - Calculate Cv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Cv runoff volume after all reductions (in.) | 3.19 | | 3.13 | | #N/A | | #N/A | | #N/A | |
| 4.2 Total Cv runoff reduction (%) | 2% | | 4% | | #N/A | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 80.36 | | 79.69 | | #N/A | | #N/A | | #N/A | |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 5
**LOCATION (County):** Sussex

**FLOODING EVENT (Fv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | Impervious disconnection | Type: | Filter strip | Type: | -- | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Fv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 1.68 | | 1.68 | | 1.68 | | 1.68 | | 1.68 | |
| 1.2 Initial RCN | 81.04 | | | | | | | | | |
| 1.3 **100-YR** Rainfall (in.) | 9.2 | | | | | | | | | |
| 1.4 Fv runoff volume (in.) | 6.89 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 2.25 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | 0.00 | | | | | | | | | |
| 1.7 Fv allowable discharge rate (cfs) | 3.78 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 6.89 | | 6.89 | | 6.89 | | #N/A | | #N/A | |
| 2.5 CN* | 81.04 | | 81.04 | | 81.04 | | #N/A | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | 0% | | 0% | | #N/A | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | 6.89 | | 6.89 | | #N/A | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | 81.04 | | 81.04 | | #N/A | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | 0.00 | | 0.00 | | #N/A | | #N/A | | #N/A | |
| ***Step 4 - Calculate Fv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Fv runoff volume after all reductions (in.) | 6.89 | | 6.89 | | #N/A | | #N/A | | #N/A | |
| 4.2 Total Fv runoff reduction (%) | 0% | | 0% | | #N/A | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | 81.04 | | 81.04 | | #N/A | | #N/A | | #N/A | |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 5 |
| **TMDL Watershed:** | Little Assawoman Bay |

**DURMM OUTPUT WORKSHEET**

DURMM v2.beta.110802

***Site Data***

| | | | | | |
|---|---|---|---|---|---|
| Contributing Area to BMPs (ac.) | 1.68 | | | | |
| C.A. RCN | 81 | | | | |
| Subarea LOD (ac.) | 1.68 | | | | |
| Upstream Subarea ID | 0 | 0 | 0 | 0 | |
| Upstream Subarea LOD (ac.) | 0.00 | 0.00 | 0.00 | 0.00 | |
| Combined LOD with Upstream Areas (ac.) | 1.68 | | | | |
| Combined RCN with Upstream Areas (ac.) | 81.04 | | | | |
| TMDL-TN (lb/ac/yr) | 5.70 | | | | |
| TMDL-TP (lb/ac/yr) | 0.23 | | | | |
| TMDL-TSS (lb/ac/yr) | N/A | | | | |

| BMP Selection | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| | Impervious disconnection | Filter strip | -- | -- | -- |

***Resource Protection Event (RPV)***

| | | | | | |
|---|---|---|---|---|---|
| RPv for Contributing Area (in.) | 1.44 | | | | |
| Req'd RPv Reduction for Contributing Area (in.) | 0.23 | | | | |
| Req'd RPv Reduction for Contributing Area (%) | 16% | | | | |
| C.A. allowable discharge rate (cfs) | 0.10 | | | | |
| Unmanaged Polluant load, TN (lbs/ac/yr) | 8.69 | | | | |
| Unmanaged Polluant load, TP (lbs/ac/yr) | 1.17 | | | | |
| Unmanaged Polluant load, TSS (lbs/ac/yr) | 261 | | | | |

| BMP Runoff Reduction Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| RPv runoff volume after all reductions (in.) | 1.32 | 1.15 | N/A | N/A | N/A |
| Total RPv runoff reduction (in.) | 0.13 | 0.30 | N/A | N/A | N/A |
| Total RPv runoff reduction (%) | 9% | 0.21 | N/A | N/A | N/A |
| Req'd runoff reduction met? | No | OK | N/A | N/A | N/A |

| BMP TMDL Performance | | | | | |
|---|---|---|---|---|---|
| Adjusted pollutant load, TN (lb/ac/yr) | 7.82 | 6.64 | #N/A | #N/A | #N/A |
| Adjusted pollutant load, TP (lb/ac/yr) | 1.06 | 0.90 | #N/A | #N/A | #N/A |
| Adjusted pollutant load, TSS (lb/ac/yr) | 235 | 199 | #N/A | #N/A | #N/A |
| Offsets Requirements | | | | | |
| RPv Offset (cu. ft.) | 655 | N/A | N/A | N/A | N/A |

***Conveyance Event (Cv)***

| | | | | | |
|---|---|---|---|---|---|
| Cv runoff volume (in.) | 3.26 | | | | |
| Stds-based allowable discharge (cfs) | 1.26 | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Cv runoff volume after all reductions (in.) | 3.19 | 3.13 | #N/A | #N/A | #N/A |

***Flooding Event (Fv)***

| | | | | | |
|---|---|---|---|---|---|
| Fv runoff volume (in.) | 6.89 | | | | |
| Stds-based allowable discharge (cfs) | 3.78 | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Fv runoff volume after all reductions (in.) | 6.89 | 6.89 | #N/A | #N/A | #N/A |

***Adjusted Subarea Data for Downstream DURMM Modeling***

| | |
|---|---|
| Contributing Area (ac.) | 1.68 |
| C.A. RCN | 81 |
| LOD Area (ac.) | 1.68 |
| Weighted Target Runoff (in.) | 1.21 |
| Adjusted CN after all reductions | 75.06 |
| Adjusted RPv (in.) | 1.15 |
| Adjusted Cv (in.) | |
| Adjusted Fv (in.) | |

| ***Adjusted Subarea Data for H&H Modeling*** | Rain (in.) | RCN |
|---|---|---|
| Resource Protection Event, RPv | 2.7 | N/A |
| Conveyance Event, Cv | 5.3 | 79.69 |
| Flooding Event, Fv | 9.2 | 81.04 |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 11 |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**CONTRIBUTING AREA RUNOFF CURVE NUMBER (C.A. RCN) WORKSHEET**

| Cover Type | Treatment | Hydrologic Condition | Curve Numbers for Hydrologic Soil Type A Acres | A RCN | B Acres | B RCN | C Acres | C RCN | D Acres | D RCN |
|---|---|---|---|---|---|---|---|---|---|---|
| **CULTIVATED AGRICULTURAL LANDS** | | | | | | | | | | |
| Fallow | Bare soil | ---- | | 77 | | 86 | | 91 | | 94 |
| | Crop residue (CR) | poor | | 76 | | 85 | | 90 | | 93 |
| | Crop residue (CR) | good | | 74 | | 83 | | 88 | | 90 |
| Row Crops | Straight row (SR) | poor | | 72 | | 81 | | 88 | | 91 |
| | Straight row (SR) | good | | 67 | | 78 | | 85 | | 89 |
| | SR + Crop residue | poor | | 71 | | 80 | | 87 | | 90 |
| | SR + Crop residue | good | | 64 | | 75 | | 82 | | 85 |
| | Contoured (C) | poor | | 70 | | 79 | | 84 | | 88 |
| | Contoured (C) | good | | 65 | | 75 | | 82 | | 86 |
| | C + Crop residue | poor | | 69 | | 78 | | 83 | | 87 |
| | C + Crop residue | good | | 64 | | 74 | | 81 | | 85 |
| | Cont & terraced(C&T) | poor | | 66 | | 74 | | 80 | | 82 |
| | Cont & terraced(C&T) | good | | 62 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 65 | | 73 | | 79 | | 81 |
| | C&T + Crop residue | good | | 61 | | 70 | | 77 | | 80 |
| Small Grain | Straight row (SR) | poor | | 65 | | 76 | | 84 | | 88 |
| | Straight row (SR) | good | | 63 | | 75 | 2.17 | 83 | 1.64 | 87 |
| | SR + Crop residue | poor | | 64 | | 75 | | 83 | | 86 |
| | SR + Crop residue | good | | 60 | | 72 | | 80 | | 84 |
| | Contoured (C) | poor | | 63 | | 74 | | 82 | | 85 |
| | Contoured (C) | good | | 61 | | 73 | | 81 | | 84 |
| | C + Crop residue | poor | | 62 | | 73 | | 81 | | 84 |
| | C + Crop residue | good | | 60 | | 72 | | 80 | | 83 |
| | Cont & terraced(C&T) | poor | | 61 | | 72 | | 79 | | 82 |
| | Cont & terraces(C&T) | good | | 59 | | 70 | | 78 | | 81 |
| | C&T + Crop residue | poor | | 60 | | 71 | | 78 | | 81 |
| | C&T + Crop residue | good | | 58 | | 69 | | 77 | | 80 |
| Close-seeded | Straight row | poor | | 66 | | 77 | | 85 | | 89 |
| or broadcast | Straight row | good | | 58 | | 72 | | 81 | | 85 |
| legumes or | Contoured | poor | | 64 | | 75 | | 83 | | 85 |
| rotation | Contoured | good | | 55 | | 69 | | 78 | | 83 |
| meadow | Cont & terraced | poor | | 63 | | 73 | | 80 | | 83 |
| | Cont & terraced | good | | 51 | | 67 | | 76 | | 80 |
| **OTHER AGRICULTURAL LANDS** | | | | | | | | | | |
| | Pasture, grassland or range | poor | | 68 | | 79 | | 86 | | 89 |
| | | fair | | 49 | | 69 | | 79 | | 84 |
| | | good | | 39 | | 61 | | 74 | | 80 |
| | Meadow -cont. grass (non grazed) | ---- | | 30 | | 58 | | 71 | | 78 |
| | Brush - brush, weed, grass mix | poor | | 48 | | 67 | | 77 | | 83 |
| | | fair | | 35 | | 56 | | 70 | | 77 |
| | | good | | 30 | | 48 | 2.18 | 65 | 1.64 | 73 |
| | Woods - grass combination | poor | | 57 | | 73 | | 82 | | 86 |
| | | fair | | 43 | | 65 | | 76 | | 82 |
| | | good | | 32 | | 58 | | 72 | | 79 |
| | Woods | poor | | 45 | | 66 | | 77 | | 83 |
| | | fair | | 36 | | 60 | | 73 | | 79 |
| | | good | | 30 | | 55 | | 70 | | 77 |
| | Farmsteads | ---- | | 59 | | 74 | | 82 | | 86 |
| **FULLY DEVELOPED URBAN AREAS (Veg Established)** | | | | | | | | | | |
| Open space (Lawns,parks etc.) | | | | | | | | | | |
| | Poor condition; grass cover < 50% | | | 68 | | 79 | | 86 | | 89 |
| | Fair condition; grass cover 50% to 75 % | | | 49 | | 69 | | 79 | | 84 |
| | Good condition; grass cover > 75% | | | 39 | | 61 | | 74 | | 80 |
| Impervious Areas | | | | | | | | | | |
| | Paved parking lots, roofs, driveways | | | 98 | | 98 | | 98 | | 98 |
| | Streets and roads | | | | | | | | | |
| | Paved; curbs and storm sewers | | | 98 | | 98 | | 98 | | 98 |
| | Paved; open ditches (w/right-of-way) | | | 83 | | 89 | | 92 | | 93 |
| | Gravel (w/ right-of-way) | | | 76 | | 85 | | 89 | | 91 |
| | Dirt (w/ right-of-way) | | | 72 | | 82 | | 87 | | 89 |
| Urban Districts | | Avg % impervious | | | | | | | | |
| | Commercial & business | 85 | | 89 | | 92 | | 94 | | 95 |
| | Industrial | 72 | | 81 | | 88 | | 91 | | 93 |
| Residential districts by average lot size | | Avg % impervious | | | | | | | | |
| | 1/8 acre (town houses) | 65 | | 77 | | 85 | | 90 | | 92 |
| | 1/4 acre | 38 | | 61 | | 75 | | 83 | | 87 |
| | 1/3 acre | 30 | | 57 | | 72 | | 81 | | 86 |
| | 1/2 acre | 25 | | 54 | | 70 | | 80 | | 85 |
| | 1 acre | 20 | | 51 | | 68 | | 79 | | 84 |
| | 2 acre | 12 | | 46 | | 65 | | 77 | | 82 |
| **DEVELOPING URBAN AREA (No Vegetation)** | | | | | | | | | | |
| | Newly graded area (pervious only) | | | 77 | | 86 | | 91 | | 94 |
| **USER DEFINED** | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| **Subarea Contributing Area per Soil Type (ac)** | | | 0 | | 0 | | 4.35 | | 3.28 | |

**UPSTREAM CONTRIBUTING AREAS**

| | Subarea ID | Acres | RCN |
|---|---|---|---|
| Upstream Contributing Area 1 | | | |
| Upstream Contributing Area 2 | | | |
| Upstream Contributing Area 3 | | | |
| Upstream Contributing Area 4 | | | |

| | |
|---|---|
| **Total Contributing Area (ac)** | 7.63 |
| **Weighted Runoff Curve Number (RCN)** | 77 |

**County**

Kent
New Castle
Sussex

**Unit Hydrograph**

DMV
STD

Effective April 2016

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 11 |
| **LOCATION (County):** | Sussex |
| **UNIT HYDROGRAPH:** | DMV |

**LIMIT OF DISTURBANCE (LOD) WORKSHEET**

| **Step 1 - Subarea LOD Data** | **HSG A** | **HSG B** | **HSG C** | **HSG D** |
|---|---|---|---|---|
| 1.1 HSG Area Within LOD (ac) | | | 4.38 | 3.25 |
| 1.2 Pre-Developed Woods/Meadow Within LOD (ac) | | | | |
| 1.3 Pre-Developed Impervious Within LOD (ac) | | | | |
| 1.4.a Post-Developed Imperviousness Within LOD, Option #1 (ac); ***OR*** | | | | |
| 1.4.b Post-Developed Imperviousness Within LOD, Option #2 (%) | 0% | 0% | 0% | 0% |

| **Step 2 - Subarea LOD Runoff Calculations** | | | | |
|---|---|---|---|---|
| 2.1 RCN per HSG | 0.00 | 0.00 | 74.00 | 80.00 |
| 2.2 RPv per HSG (in.) | 0.00 | 0.00 | 1.10 | 1.39 |
| 2.3 Target Runoff per HSG (in.) | 0.00 | 0.00 | 1.10 | 1.39 |
| 2.4 Cv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 0.75 | 0.75 |
| 2.5 Fv Weighted Unit Discharge per HSG (cfs/ac) | 0.00 | 0.00 | 2.25 | 2.25 |
| 2.6 Subarea LOD (ac) | 7.63 | | | |
| 2.7 Subarea Weighted RCN | 76.56 | | | |
| 2.8 Subarea Weighted RPv (in.) | 1.22 | | | |
| 2.9 Subarea Weighted Target Runoff (in.) | 1.22 | | | |

| RPv Target Runoff (in.) | |
|---|---|
| Soil | Woods |
| HSG A | 0.00 |
| HSG B | 0.12 |
| HSG C | 0.55 |
| HSG D | 0.87 |

| **Step 3 - Upstream LOD Areas** *(from previous DURMM Report as applicable)* | **Area 1** | **Area 2** | **Area 3** | **Area 4** |
|---|---|---|---|---|
| 3.1 Upstream Subarea ID | | | | |
| 3.2 Upstream LOD Area (ac) | | | | |
| 3.3 Target Runoff for Upstream Area (in.) | | | | |
| 3.4 Adjusted CN after all reductions | | | | |
| 3.5 Adjusted RPv (in.) | | | | |
| 3.6 Adjusted Cv (in.) | | | | |
| 3.7 Adjusted Fv (in.) | | | | |

| **Step 4 - RPv Calculations for Combined LOD** | |
|---|---|
| 4.1 Combined LOD (ac) | 7.63 |
| 4.2 Weighted RCN | 76.56 |
| 4.3 Weighted RPv (in.) | 1.22 |
| 4.4 Weighted Target Runoff (in.) | 1.22 |
| 4.5 Estimated Annual Runoff (in.) | 15.70 |
| 4.6 Req'd Runoff Reduction within LOD (in.) | 0.00 |
| 4.7 Req'd Runoff Reduction within LOD (%) | 0% |

| **Step 5 - Cv Unit Discharge** | |
|---|---|
| 5. LOD Allowable Unit Discharge (cfs/ac) | 0.75 |

| **Step 6 - Fv Unit Discharge** | |
|---|---|
| 6. LOD Allowable Unit Discharge (cfs/ac) | 2.25 |

| Cv/Fv Unit Discharge |
|---|
| Woodland/Meadow (HSG A) |
| 10-YR: 0 cfs/ac |
| 100-YR: 0.25 cfs/ac |
| Woodland/Meadow (HSG B,C,D) |
| 10-YR: 0.375 cfs/ac |
| 100-YR: 1.25 cfs/ac |
| Non-Woodland/Non-Meadow |
| 10-YR: 0.75 cfs/ac |
| 100-YR: 2.25 cfs/ac |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 11
**LOCATION (County):** Sussex

**RESOURCE PROTECTION EVENT (RPv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | -- | Type | -- | Type | -- | Type | -- | Type | -- |
| ***Step 1 - Calculate Initial RPv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 7.63 | | 7.63 | | 7.63 | | 7.63 | | 7.63 | |
| 1.2 *Reserved* | | | | | | | | | | |
| 1.3 Initial RCN | 76.56 | | | | | | | | | |
| 1.4 RPv for Contributing Area (in.) | 1.22 | | | | | | | | | |
| 1.5 Req'd RPv Reduction for Contributing Area (in.) | 0.00 | | | | | | | | | |
| 1.6 Req'd RPv Reduction for Contributing Area (%) | 0% | | | | | | | | | |
| 1.7 RPv allowable discharge rate (cfs) | 0.39 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | | | | | | | | | | |
| 2.2 Retention reduction allowance (%) | N/A | | N/A | | N/A | | N/A | | N/A | |
| 2.3 Retention reduction volume (ac-ft) | N/A | | N/A | | N/A | | N/A | | N/A | |
| 2.4 Retention reduction volume (in.) | N/A | | N/A | | N/A | | N/A | | N/A | |
| 2.5 Runoff volume after retention reduction (in.) | N/A | | N/A | | N/A | | N/A | | N/A | |
| 2.6 Adjusted CN* | N/A | | N/A | | N/A | | N/A | | N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Annual CN (ACN) | 76.56 | | N/A | | N/A | | N/A | | N/A | |
| 3.2 Annual runoff (in.) | 15.70 | | N/A | | N/A | | N/A | | N/A | |
| 3.3 Proportion A/B soils in BMP footprint (%) | | | | | | | | | | |
| 3.4 Annual runoff reduction allowance (%) | N/A | | N/A | | N/A | | N/A | | N/A | |
| 3.5 Annual runoff after reduction (in.) | N/A | | N/A | | N/A | | N/A | | N/A | |
| 3.6 Adjusted ACN | N/A | | N/A | | N/A | | N/A | | N/A | |
| 3.7 Annual Runoff Reduction Allowance for RPv (in.) | N/A | | N/A | | N/A | | N/A | | N/A | |
| ***Step 4 - Calculate RPv with BMP Reductions*** | | | | | | | | | | |
| 4.1 RPv runoff volume after all reductions (in.) | N/A | | N/A | | N/A | | N/A | | N/A | |
| 4.2 Total RPv runoff reduction (in.) | N/A | | N/A | | N/A | | N/A | | N/A | |
| 4.3 Total RPv runoff reduction (%) | N/A | | N/A | | N/A | | N/A | | N/A | |
| 4.4 Adjusted CN after all reductions | N/A | | N/A | | N/A | | N/A | | N/A | |
| 4.5 Equivalent TR-55 RCN for H&H modeling | N/A | | N/A | | N/A | | N/A | | N/A | |
| 4.6 Req'd reduction met? | N/A | | N/A | | N/A | | N/A | | N/A | |
| ***Step 5 - Determine Runoff Reduction Offset*** | | | | | | | | | | |
| 5.1 Runoff Reduction Shortfall (in.) | N/A | | N/A | | N/A | | N/A | | N/A | |
| 5.2 Runoff Reduction Shortfall (cu.ft./ac) | N/A | | N/A | | N/A | | N/A | | N/A | |
| 5.3 Total Offset Volume (cu.ft.) | N/A | | N/A | | N/A | | N/A | | N/A | |

**DURMM BMP Name**
--
Infiltration w/sand or vegetation
Infiltration w/o sand or vegetation
Bioretention w/underdrain
Permeable pave w/sand or vegetation
Permeable pave w/o sand or vegetation
Vegetated roof
Rainwater harvesting
Impervious disconnection
Bioswale
Vegetated open channel
Filter strip
Riparian forest buffer
Urban tree planting
Soil amendment
Sheetflow to turf open space
Sheetflow to forest open space
Wet swale
Ephemeral wetland
--
Dry ED basin
Dry detention pond
Hydrodynamic structure
Urban filtering practice
Wet pond
Constructed wetland
--
Nutrient management
Street sweeping
--
Urban stream restoration

Effective April 2016

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 11
**LANDUSE TYPE:** Residential
**TMDL WATERSHED:** Little Assawoman Bay

## TOTAL MAXIMUM DAILY LOAD (TMDL) WORKSHEET

| | BMP 1 | | | | BMP 2 | | | | BMP 3 | | | | BMP 4 | | | | BMP 5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | -- | | | Type: | -- | | | Type: | -- | | | Type: | -- | | | Type: | -- | | |
| ***Step 1 - Calculate Annual Runoff Volume*** | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS | Data | TN | TP | TSS |
| 1.1 Total contributing area to BMP (ac) | 7.63 | | | | | | | | | | | | | | | | | | | |
| 1.2 Initial RCN | 77 | | | | | | | | | | | | | | | | | | | |
| 1.3 Annual runoff volume (in.) | 15.70 | | | | | | | | | | | | | | | | | | | |
| 1.4 Annual runoff volume (liters) | 1.23E+07 | | | | | | | | | | | | | | | | | | | |
| ***Step 2 - Calculate Annual Pollutant Load*** | | | | | | | | | | | | | | | | | | | | |
| 2.1 EMC (mg/L) | | 2.00 | 0.27 | 60 | | | | | | | | | | | | | | | | |
| 2.2 Load (mg/yr) | | 2.46E+07 | 3.33E+06 | 7.39E+08 | | | | | | | | | | | | | | | | |
| 2.4 Stormwater Load (lb/ac/yr) | | 7.12 | 0.96 | 214 | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 3 - Adjust for Runoff Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 3.1 BMP Runoff Reduction (%) | N/A | | | | N/A | | | | N/A | | | | N/A | | | | N/A | | | |
| 3.2 BMP Removal Efficiency (%) | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 3.3 Adjusted load (lb/ac/yr) | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| ***Step 4 - Calculate Pollutant Reduction*** | | | | | | | | | | | | | | | | | | | | |
| 4.1 TMDL (lb/ac/yr) | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A | | 5.70 | 0.23 | N/A |
| 4.2 Reduction met? | | #N/A | #N/A | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK | | #N/A | #N/A | OK |
| ***Step 5 - Determine TMDL Offset*** | | | | | | | | | | | | | | | | | | | | |
| 5.1 TMDL Shortfall (lb/ac/yr) | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 | | #N/A | #N/A | 0 |
| 5.2 TMDL Shortfall (%) | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.3 Residual RPv Volume (in) | | N/A | N/A | N/A | | N/A | N/A | N/A | | N/A | N/A | N/A | | N/A | N/A | N/A | | N/A | N/A | N/A |
| 5.4 Req'd Additional RR to meet TMDL (in)* | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.5 Req'd Additional RR to meet TMDL (cu.ft./ac) | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |
| 5.6 Total Offset Volume (cu.ft.) | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A | | #N/A | #N/A | #N/A |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 11
**LOCATION (County):** Sussex

**CONVEYANCE EVENT (Cv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | -- | Type: | -- | Type: | -- | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Cv*** | Data | | Data | | Data | | Data | | Data | |
| 1.1 Total contributing area to BMP (ac) | 7.63 | | 7.63 | | 7.63 | | 7.63 | | 7.63 | |
| 1.2 Initial RCN | 76.56 | | | | | | | | | |
| 1.3 **10-YR** Rainfall (in.) | 5.3 | | | | | | | | | |
| 1.4 Cv runoff volume (in.) | 2.84 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 0.75 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | 0.00 | | | | | | | | | |
| 1.7 Cv allowable discharge rate (cfs) | 5.72 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | N/A | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | N/A | | #VALUE! | | #VALUE! | | #VALUE! | | #VALUE! | |
| 2.5 CN* | N/A | | #VALUE! | | #VALUE! | | #VALUE! | | #VALUE! | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | #N/A | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | #N/A | | #VALUE! | | #VALUE! | | #VALUE! | | #VALUE! | |
| 3.3 Adjusted ACN | #N/A | | #VALUE! | | #VALUE! | | #VALUE! | | #VALUE! | |
| 3.4 Event-based runoff reduction (in.) | #N/A | | #VALUE! | | #VALUE! | | #VALUE! | | #VALUE! | |
| ***Step 4 - Calculate Cv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Cv runoff volume after all reductions (in.) | #VALUE! | | #VALUE! | | #VALUE! | | #VALUE! | | #VALUE! | |
| 4.2 Total Cv runoff reduction (%) | #VALUE! | | #VALUE! | | #VALUE! | | #VALUE! | | #VALUE! | |
| 4.3 Adjusted RCN for H&H modeling | #VALUE! | | #VALUE! | | #VALUE! | | #VALUE! | | #VALUE! | |

**PROJECT:** Batson Creek Estates
**DRAINAGE SUBAREA ID:** 11
**LOCATION (County):** Sussex

**FLOODING EVENT (Fv) WORKSHEET**

| | BMP 1 | | BMP 2 | | BMP 3 | | BMP 4 | | BMP 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type: | -- | Type: | -- | Type: | -- | Type: | -- | Type: | -- |
| ***Step 1 - Calculate Initial Fv*** | **Data** | | **Data** | | **Data** | | **Data** | | **Data** | |
| 1.1 Total contributing area to BMP (ac) | 7.63 | | 7.63 | | 7.63 | | 7.63 | | 7.63 | |
| 1.2 Initial RCN | 76.56 | | | | | | | | | |
| 1.3 **100-YR** Rainfall (in.) | 9.2 | | | | | | | | | |
| 1.4 Fv runoff volume (in.) | 6.33 | | | | | | | | | |
| 1.5 LOD allowable unit discharge (cfs/ac) | 2.25 | | | | | | | | | |
| 1.6 Equiv. unit discharge outside LOD (cfs/ac) | 0.00 | | | | | | | | | |
| 1.7 Fv allowable discharge rate (cfs) | 17.17 | | | | | | | | | |
| ***Step 2 - Adjust for Retention Reduction*** | | | | | | | | | | |
| 2.1 Storage volume (cu. ft.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.2 Storage volume (ac-ft) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.3 Storage volume (in.) | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | |
| 2.4 Runoff volume after reduction (in.) | 6.33 | | #N/A | | #N/A | | #N/A | | #N/A | |
| 2.5 CN* | 76.56 | | #N/A | | #N/A | | #N/A | | #N/A | |
| ***Step 3 - Adjust for Annual Runoff Reduction*** | | | | | | | | | | |
| 3.1 Runoff reduction allowance (%) | #N/A | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.2 Annual runoff after reduction (in.) | #N/A | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.3 Adjusted ACN | #N/A | | #N/A | | #N/A | | #N/A | | #N/A | |
| 3.4 Event-based runoff reduction (in.) | #N/A | | #N/A | | #N/A | | #N/A | | #N/A | |
| ***Step 4 - Calculate Fv with BMP Reductions*** | | | | | | | | | | |
| 4.1 Fv runoff volume after all reductions (in.) | #N/A | | #N/A | | #N/A | | #N/A | | #N/A | |
| 4.2 Total Fv runoff reduction (%) | #N/A | | #N/A | | #N/A | | #N/A | | #N/A | |
| 4.3 Adjusted RCN for H&H modeling | #N/A | | #N/A | | #N/A | | #N/A | | #N/A | |

| | |
|---|---|
| **PROJECT:** | Batson Creek Estates |
| **DRAINAGE SUBAREA ID:** | 11 |
| **TMDL Watershed:** | Little Assawoman Bay |

**DURMM OUTPUT WORKSHEET**

***Site Data***

DURMM v2.beta.110802

| | | | | | |
|---|---|---|---|---|---|
| Contributing Area to BMPs (ac.) | 7.63 | | | | |
| C.A. RCN | 77 | | | | |
| Subarea LOD (ac.) | 7.63 | | | | |
| Upstream Subarea ID | 0 | 0 | 0 | 0 | |
| Upstream Subarea LOD (ac.) | 0.00 | 0.00 | 0.00 | 0.00 | |
| Combined LOD with Upstream Areas (ac.) | 7.63 | | | | |
| Combined RCN with Upstream Areas (ac.) | 76.56 | | | | |
| TMDL-TN (lb/ac/yr) | 5.70 | | | | |
| TMDL-TP (lb/ac/yr) | 0.23 | | | | |
| TMDL-TSS (lb/ac/yr) | N/A | | | | |

| BMP Selection | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| | -- | -- | -- | -- | -- |

***Resource Protection Event (RPV)***

| | | | | | |
|---|---|---|---|---|---|
| RPv for Contributing Area (in.) | 1.22 | | | | |
| Req'd RPv Reduction for Contributing Area (in.) | 0.00 | | | | |
| Req'd RPv Reduction for Contributing Area (%) | 0% | | | | |
| C.A. allowable discharge rate (cfs) | 0.39 | | | | |
| Unmanaged Polluant load, TN (lbs/ac/yr) | 7.12 | | | | |
| Unmanaged Polluant load, TP (lbs/ac/yr) | 0.96 | | | | |
| Unmanaged Polluant load, TSS (lbs/ac/yr) | 214 | | | | |

| BMP Runoff Reduction Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| RPv runoff volume after all reductions (in.) | N/A | N/A | N/A | N/A | N/A |
| Total RPv runoff reduction (in.) | N/A | N/A | N/A | N/A | N/A |
| Total RPv runoff reduction (%) | N/A | N/A | N/A | N/A | N/A |
| Req'd runoff reduction met? | N/A | N/A | N/A | N/A | N/A |

| BMP TMDL Performance | | | | | |
|---|---|---|---|---|---|
| Adjusted pollutant load, TN (lb/ac/yr) | #N/A | #N/A | #N/A | #N/A | #N/A |
| Adjusted pollutant load, TP (lb/ac/yr) | #N/A | #N/A | #N/A | #N/A | #N/A |
| Adjusted pollutant load, TSS (lb/ac/yr) | #N/A | #N/A | #N/A | #N/A | #N/A |

| Offsets Requirements | | | | | |
|---|---|---|---|---|---|
| RPv Offset (cu. ft.) | N/A | N/A | N/A | N/A | N/A |

***Conveyance Event (Cv)***

| | | | | | |
|---|---|---|---|---|---|
| Cv runoff volume (in.) | 2.84 | | | | |
| Stds-based allowable discharge (cfs) | 5.72 | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Cv runoff volume after all reductions (in.) | #VALUE! | #VALUE! | #VALUE! | #VALUE! | #VALUE! |

***Flooding Event (Fv)***

| | | | | | |
|---|---|---|---|---|---|
| Fv runoff volume (in.) | 6.33 | | | | |
| Stds-based allowable discharge (cfs) | 17.17 | | | | |

| BMP Performance | BMP 1 | BMP 2 | BMP 3 | BMP 4 | BMP 5 |
|---|---|---|---|---|---|
| Fv runoff volume after all reductions (in.) | #N/A | #N/A | #N/A | #N/A | #N/A |

***Adjusted Subarea Data for Downstream DURMM Modeling***

| | |
|---|---|
| Contributing Area (ac.) | 7.63 |
| C.A. RCN | 77 |
| LOD Area (ac.) | 7.63 |
| Weighted Target Runoff (in.) | 1.22 |
| Adjusted CN after all reductions | 0.00 |
| Adjusted RPv (in.) | 0.00 |
| Adjusted Cv (in.) | |
| Adjusted Fv (in.) | |

***Adjusted Subarea Data for H&H Modeling***

| | Rain (in.) | RCN |
|---|---|---|
| Resource Protection Event, RPv | 2.7 | N/A |
| Conveyance Event, Cv | 5.3 | #VALUE! |
| Flooding Event, Fv | 9.2 | #N/A |

**Stormwater Sub-Area & LOD Table**

| Sub-Area No. | Hydrologic Soil Group (Acs) | | | | Area | Pre-Development | Post-Development | Weighted |
|---|---|---|---|---|---|---|---|---|
| | HSG A | HSG B | HSG C | HSG D | (Acs) | Woods/Meadow (Acs) | Impervious Area (Acs) | RCN |
| | | | | | | | | |
| 1A | | | 0.31 | 0.31 | 0.62 | 0.00 | 0.13 | 81 |
| 1B | | | 1.30 | 0.37 | 1.67 | 0.00 | 0.62 | 84 |
| 2A | | | 0.19 | 0.22 | 0.41 | 0.00 | 0.20 | 88 |
| 2B | | | 0.33 | 0.08 | 0.41 | 0.00 | 0.09 | 80 |
| 2C | | | | 0.96 | 0.96 | 0.00 | 0.17 | 83 |
| 3A | | | 0.92 | 0.04 | 0.96 | 0.00 | 0.13 | 78 |
| 3B | | | 1.53 | 0.82 | 2.35 | 0.00 | 0.58 | 81 |
| 4A | | | 0.61 | | 0.61 | 0.00 | 0.12 | 79 |
| 4B | | | 1.41 | 0.05 | 1.46 | 0.00 | 0.50 | 82 |
| 5 | | | 1.04 | 0.64 | 1.68 | 0.00 | 0.37 | 81 |
| 11 | | | 4.38 | 3.25 | 7.63 | 0.00 | 0.00 | 77 |
| | | | | | | | | |
| **Total Area** | **0.00** | **0.00** | **12.02** | **6.74** | **18.76** | **0.00** | **2.91** | |
| **Percent %** | **0** | **0** | **64** | **36** | **100** | **0** | **16** | |

| Summary Table for Sub-Areas Within the LOD Draining to a Common Point of Interest (POI) [1] | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ref. # | Sub-Area ID[2] | Contributing Area (ac) | RPv Runoff Reduction Shortfall(+) or Credit(-) (in.)[3] | Adjusted RPv CN after all reductions[4] | Cv RCN for H&H Modeling[4] | Fv RCN for H&H Modeling[4] | TN Pollutant Load (lb/yr/ac) | TP Pollutant Load (lb/yr/ac) | TSS Pollutant Load (lb/yr/ac) |
| 1 | 1A+1B | 2.29 | 0.16 | 79.28 | 81.36 | 81.70 | 7.15 | 0.97 | 107.00 |
| 2 | 2A | 0.41 | -0.09 | 75.73 | 74.29 | 77.31 | 7.38 | 1.00 | 221.00 |
| 3 | 2B | 0.41 | -0.04 | 74.38 | 78.96 | 80.29 | 6.43 | 0.87 | 193.00 |
| 4 | 2C | 0.96 | -0.15 | 77.06 | 81.79 | 83.19 | 7.28 | 0.98 | 218.00 |
| 5 | 3A+3B | 3.31 | 0.00 | 75.69 | 77.68 | 78.00 | 6.08 | 0.82 | 91.00 |
| 6 | 4A+4B | 2.07 | 0.11 | 76.56 | 74.94 | 76.22 | 6.33 | 0.85 | 95.00 |
| 7 | 5 | 1.68 | -0.07 | 75.06 | 79.69 | 81.04 | 6.64 | 0.90 | 199.00 |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |
| **Summary Table for Sub-Areas Outside the LOD Draining to a Common Point of Interest (POI) [1]** | | | | | | | | | |
| 1 | 11 | 7.63 | | 77.00 | 77.00 | 77.00 | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| **Totals to Common POI** | | **18.76 ac** | **-0.08 in.** | **76.74** | **77.89** | **78.42** | **73.41 lb/yr** | **9.91 lb/yr** | **1456.23 lb/yr** |
| **RPv Runoff Reduction Goal Met?** | | | **YES** | | | | | | |
| | **If Not, Total Offset Volume Required** | | **N/A** | | | | | | |

Notes:

1. As long as the site lies within the same watershed, all sub-areas within the site can be tallied to reflect global site conditions; or, the summary table can be used to show conditions to a specific POI.
2. Only the furtherst downstream sub-area information should be entered for a series of sub-areas that drain directly into each other.
3. A RPv runoff reduction shortfall should be entered as a positive number, as it is the runoff volume still needed to be reduced. A RPv credit should be entered as a negative number, as it indicates the additional volume that was reduced past the requirement.
4. To portray an accurate total weighted CN value for the RPv, Cv and Fv events, an entry must be made for every defined sub-area. If a sub-area's contributing drainage acreage is entered, but not its corresponding CN value, then the total weighted CN will be skewed.

GISHydro Release Version Date: May 1, 2008
Hydro Extension Version Date: April 30, 2008
Analysis Date: July 26, 2011

Landuse and Soil Distributions for:

Distribution of Landuse by Soil Group

| | Acres on Indicated Soil Group | | | |
|---|---|---|---|---|
| Land Use | A-Soil | B-Soil | C-Soil | D-Soil |
| Single Family Dwellings | 0 | 2.89 | 0.89 | 0.22 |
| Cropland | 0 | 36.03 | 15.12 | 21.13 |
| Confined Feeding Operation | 0 | 3.34 | 0 | 0.89 |
| Farmsteads and Farm Relate | 0 | 1.11 | 0.67 | 0 |
| Deciduous Forest | 0 | 0.22 | 0 | 0 |
| Mixed Forest | 0 | 0 | 0 | 1.33 |
| Man-made Reservoirs and Im | 0 | 0.22 | 0.22 | 0 |
| Wetlands | 0 | 5.12 | 0.89 | 5.78 |
| Total Area: | 0 | 48.93 | 17.79 | 29.36 |

Distribution of Land Use and Curve Numbers Used

| Land Use | Acres | Percent | A | B | C | D |
|---|---|---|---|---|---|---|
| Single Family Dwellings | 4 | 4.17 | 61 | 75 | 83 | 87 |
| Cropland | 72.28 | 75.23 | 67 | 78 | 85 | 89 |
| Confined Feeding Operation | 4.23 | 4.4 | 59 | 74 | 82 | 86 |
| Farmsteads and Farm Relate | 1.78 | 1.85 | 59 | 74 | 82 | 86 |
| Deciduous Forest | 0.22 | 0.23 | 30 | 55 | 70 | 77 |
| Mixed Forest | 1.33 | 1.39 | 30 | 55 | 70 | 77 |
| Man-made Reservoirs and Im | 0.44 | 0.46 | 100 | 100 | 100 | 100 |
| Wetlands | 11.79 | 12.27 | 100 | 100 | 100 | 100 |

Watershed Statistics for:
GISHydro Release Version Date: May 1, 2008
Hydro Extension Version Date: April 30, 2008
Analysis Date: July 26, 2011

Data Selected:
- Quadrangles Used: selbyville, frankford
- DEM Coverage: NED DEMs
- Land Use Coverage: 2002 MD/DE Landuse
- Soil Coverage: SSURGO Soils
- Hydrologic Condition: (see Lookup Table)
- Impose NHD stream Locations: Yes
- Outlet Easting: 223911 m. (DE Stateplane, NAD 1983)
- Outlet Northing: 53894.4 m. (DE Stateplane, NAD 1983)

Findings:
- Outlet Location: Coastal Plain
- Outlet State: Delaware
- Drainage Area: 0.2 square miles
  - -Coastal Plain (100.0% of area)
- Channel Slope: 7.7 feet/mile
- Land Slope: 0.006 ft/ft
- Urban Area: 4.2%
- Impervious Area: 2.2%
- Time of Concentration: 7.9 hours [W.O. Thomas, Jr. Equation]
- Time of Concentration: 2.0 hours [From SCS Lag Equation * 1.67]
- Longest Flow Path: 0.85 miles
- Basin Relief: 4.6 feet
- Average CN: 84
- % Forest Cover: 1.6
- % Storage: 12.7
- Selected Soils Data Statistics:
  - % A Soils: 0.0
  - % B Soils: 50.9
  - % C Soils: 18.5
  - % D Soils: 30.6
- STATSGO Soils Data Statistics (used in Regression Equations):
  - % A Soils: 8.0
  - % B Soils: 22.0
  - % C Soils: 6.0
  - % D Soils: 64.0
- 2-Year,24-hour Prec.: 3.38 inches
- Mean Annual Prec.: 45.27 inches

Delaware Specific Findings:
- Outlet Location: Coastal Plain
- Outlet State: Delaware
- Drainage Area: 0.2 square miles
  - -Coastal Plain (100.0% of area)
- % A Soils: 8.0
- Mean Basin Slope (%): 0.68
- Housing Density (h/ac): 0.15

U.S.G.S. Peak Flow Estimates for:
GISHydro Release Version Date: May 1, 2008
Hydro Extension Version Date: April 30, 2008
Analysis Date: July 26, 2011

Delaware Peak Flow Estimates from Ries and Dillow (2006)
Geographic Province(s):
- Coastal Plain Province (100.0% of area)

Best Estimate of Current Peak Discharges (and 90% confidence intervals):

Q(2): 13 cfs (4 - 38)
Q(5): 22 cfs (8 - 57)
Q(10): 29 cfs (11 - 74)
Q(25): 39 cfs (13 - 111)
Q(50): 46 cfs (16 - 138)
Q(100): 55 cfs (18 - 171)
Q(200): 64 cfs (20 - 211)
Q(500): 77 cfs (22 - 276)

Urban Peak Discharges based on year 2000 housing density:

UQ(2): 13 cfs
UQ(5): 24 cfs
UQ(10): 33 cfs
UQ(25): 47 cfs
UQ(50): 59 cfs
UQ(100): 72 cfs
UQ(200): 87 cfs
UQ(500): 109 cfs

Individual Province Tasker Analyses Follow:
Coastal Plain Physiographic Province
Area (mi^2): 0.2000000
Slope (%): 0.5800000
A Soils (%): 8.000000

| Freq. | Qlow90 | Qbest | Qhigh90 |
|---|---|---|---|
| 2 | 4.457947 | 13.00000 | 37.60000 |
| 5 | 8.175192 | 21.60000 | 57.10000 |
| 10 | 11.00000 | 28.60000 | 74.20000 |
| 25 | 13.30000 | 38.50000 | 111.0000 |
| 50 | 15.60000 | 46.40000 | 138.0000 |
| 100 | 17.60000 | 55.00000 | 171.0000 |
| 200 | 19.50000 | 64.20000 | 211.0000 |
| 500 | 21.60000 | 77.10000 | 276.0000 |

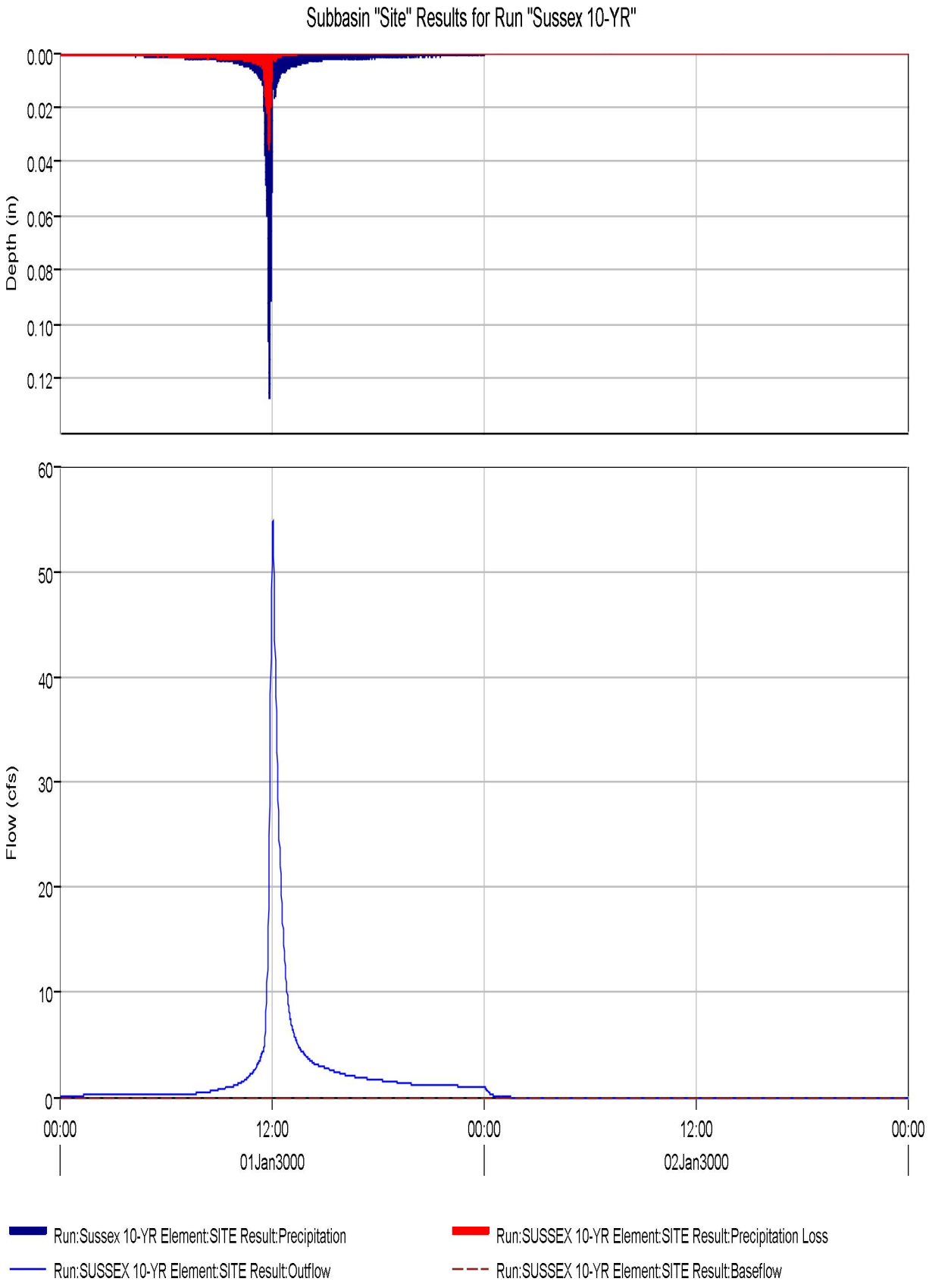
Project: HH1 Point of Analysis A
Simulation Run: Sussex 10-YR Subbasin: Site

| | | | |
|---|---|---|---|
| Start of Run: | 01Jan3000, 00:00 | Basin Model: | Project |
| End of Run: | 03Jan3000, 00:00 | Meteorologic Model: | Sussex 10-YR |
| Compute Time: | 18Aug2011, 10:02:30 | Control Specifications: | NRCS 24-HR Storm |

Volume Units: IN

Computed Results

| | | | |
|---|---|---|---|
| Peak Discharge : | 54.8 (CFS) | Date/Time of Peak Discharge : | 01Jan3000, 12:04 |
| Total Precipitation : | 5.30 (IN) | Total Direct Runoff : | 3.34 (IN) |
| Total Loss : | 1.96 (IN) | Total Baseflow : | 0.00 (IN) |
| Total Excess : | 3.34 (IN) | Discharge : | 3.34 (IN) |


Subbasin "Site" Results for Run "Sussex 10-YR"
Depth (in)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
Flow (cfs)
60
50
40
30
20
10
0
00:00
12:00
00:00
12:00
00:00
01Jan3000
02Jan3000
Run:Sussex 10-YR Element:SITE Result:Precipitation
Run:SUSSEX 10-YR Element:SITE Result:Precipitation Loss
Run:SUSSEX 10-YR Element:SITE Result:Outflow
Run:SUSSEX 10-YR Element:SITE Result:Baseflow

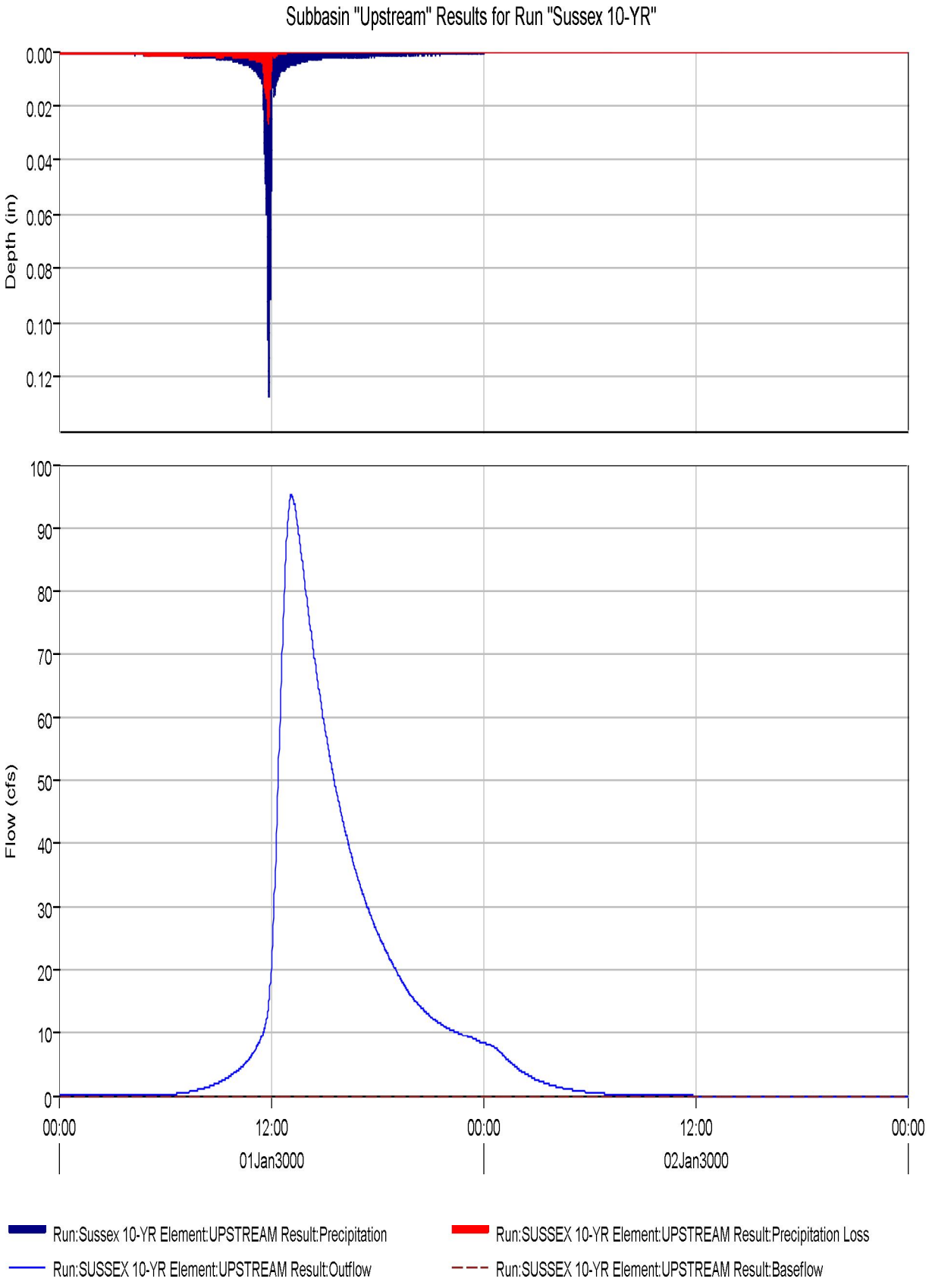
Project: HH1 Point of Analysis A
Simulation Run: Sussex 10-YR Subbasin: Upstream

| | | | |
|---|---|---|---|
| Start of Run: | 01Jan3000, 00:00 | Basin Model: | Project |
| End of Run: | 03Jan3000, 00:00 | Meteorologic Model: | Sussex 10-YR |
| Compute Time: | 18Aug2011, 10:02:30 | Control Specifications: | NRCS 24-HR Storm |

Volume Units: IN

Computed Results

| | | | |
|---|---|---|---|
| Peak Discharge : | 95.2 (CFS) | Date/Time of Peak Discharge : | 01Jan3000, 13:09 |
| Total Precipitation : | 5.30 (IN) | Total Direct Runoff : | 3.58 (IN) |
| Total Loss : | 1.72 (IN) | Total Baseflow : | 0.00 (IN) |
| Total Excess : | 3.58 (IN) | Discharge : | 3.58 (IN) |


Subbasin "Upstream" Results for Run "Sussex 10-YR"
Depth (in)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
Flow (cfs)
100
90
80
70
60
50
40
30
20
10
0
00:00
12:00
00:00
12:00
00:00
01Jan3000
02Jan3000
Run:Sussex 10-YR Element:UPSTREAM Result:Precipitation
Run:SUSSEX 10-YR Element:UPSTREAM Result:Precipitation Loss
Run:SUSSEX 10-YR Element:UPSTREAM Result:Outflow
Run:SUSSEX 10-YR Element:UPSTREAM Result:Baseflow

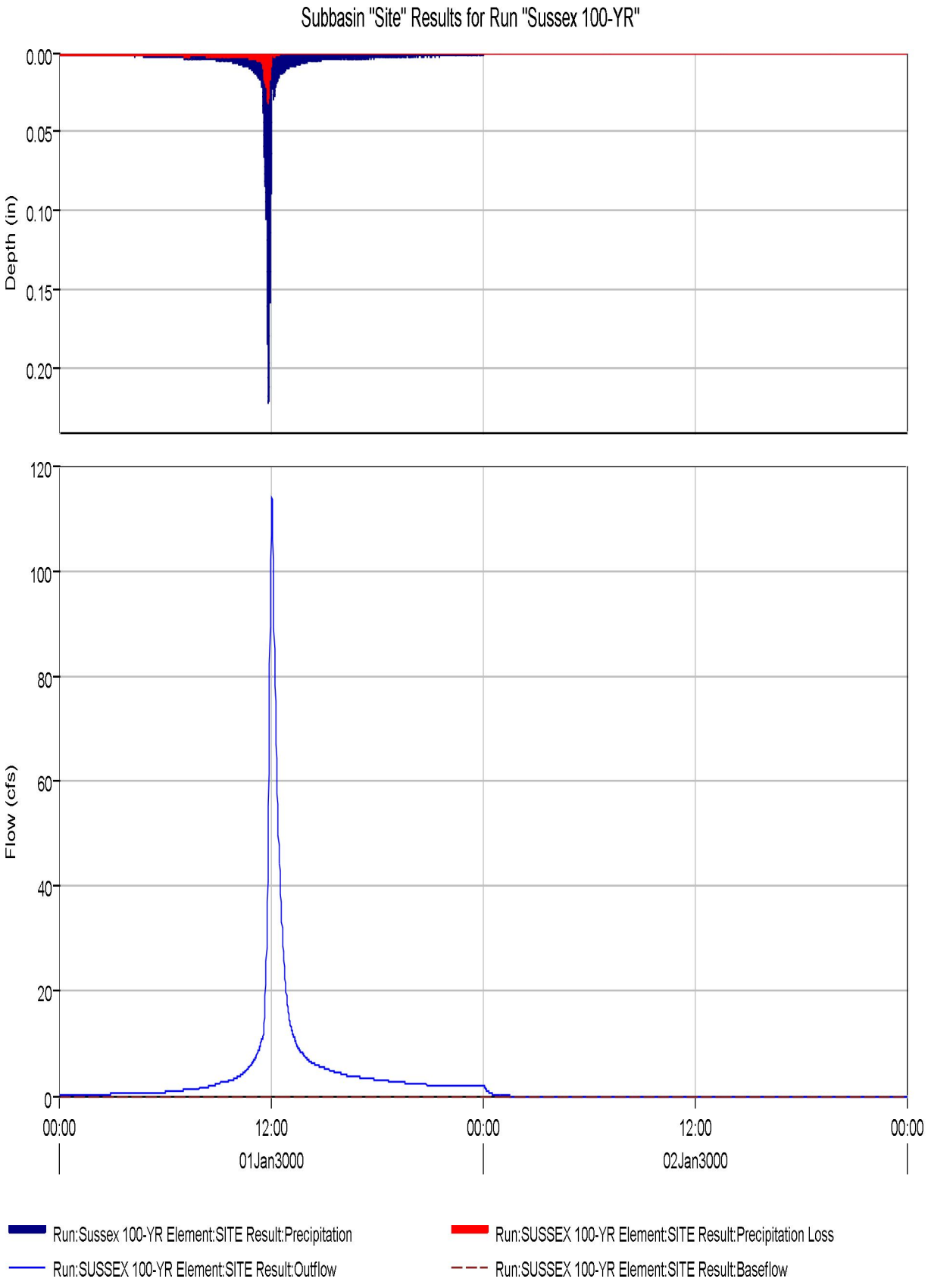
Project: HH1 Point of Analysis A
Simulation Run: Sussex 100-YR Subbasin: Site

| | | | |
|---|---|---|---|
| Start of Run: | 01Jan3000, 00:00 | Basin Model: | Project |
| End of Run: | 03Jan3000, 00:00 | Meteorologic Model: | Sussex 100-YR |
| Compute Time: | 24Aug2011, 13:55:56 | Control Specifications: | NRCS 24-HR Storm |

Volume Units: IN

Computed Results

| | | | |
|---|---|---|---|
| Peak Discharge : | 113.7 (CFS) | Date/Time of Peak Discharge : | 01Jan3000, 12:03 |
| Total Precipitation : | 9.20 (IN) | Total Direct Runoff : | 6.94 (IN) |
| Total Loss : | 2.26 (IN) | Total Baseflow : | 0.00 (IN) |
| Total Excess : | 6.94 (IN) | Discharge : | 6.94 (IN) |


Subbasin "Site" Results for Run "Sussex 100-YR"
Depth (in)
0.00
0.05
0.10
0.15
0.20
Flow (cfs)
120
100
80
60
40
20
0
00:00
12:00
00:00
12:00
00:00
01Jan3000
02Jan3000
Run:Sussex 100-YR Element:SITE Result:Precipitation
Run:SUSSEX 100-YR Element:SITE Result:Precipitation Loss
Run:SUSSEX 100-YR Element:SITE Result:Outflow
Run:SUSSEX 100-YR Element:SITE Result:Baseflow

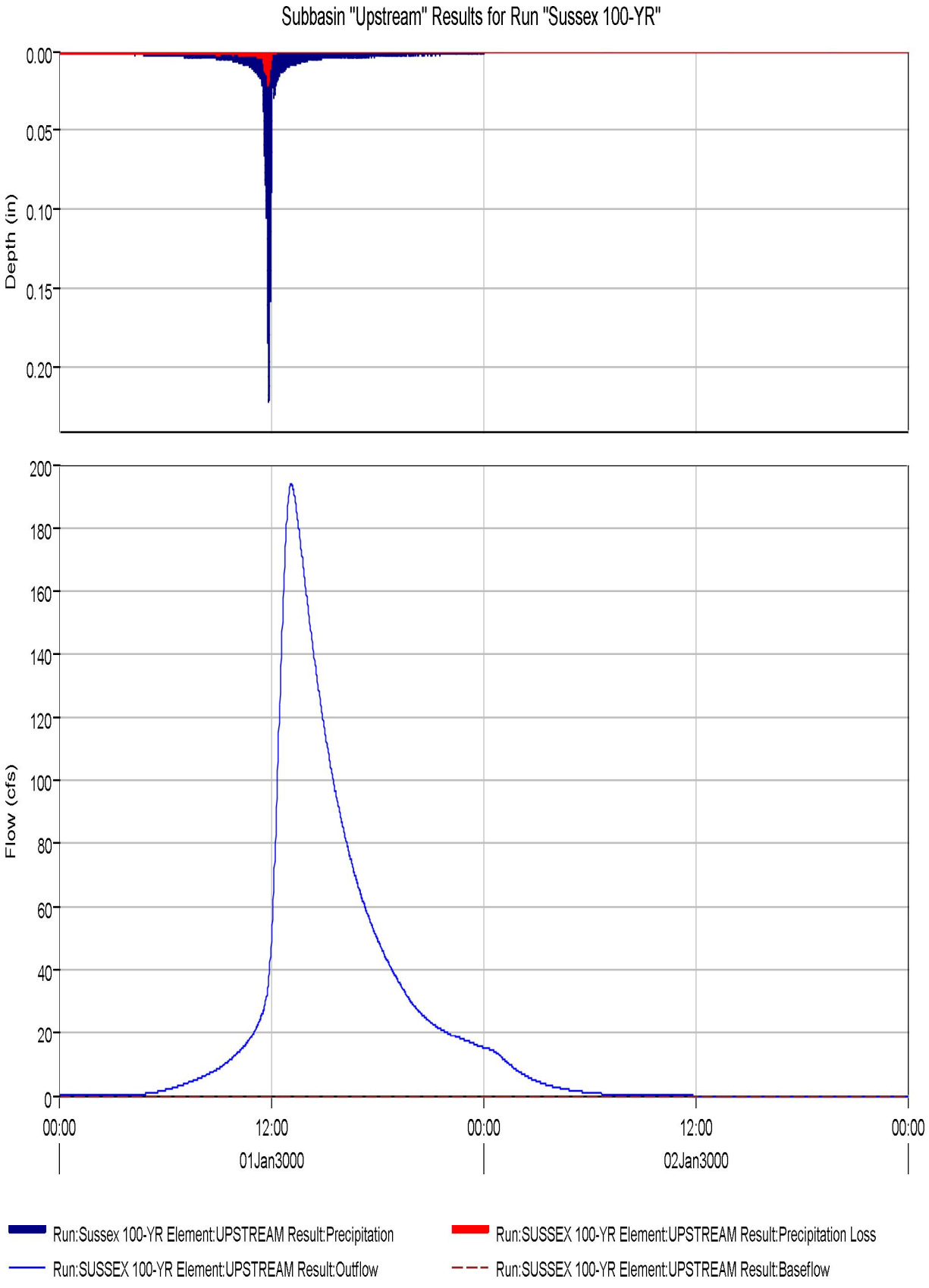
Project: HH1 Point of Analysis A
Simulation Run: Sussex 100-YR Subbasin: Upstream

| | | | |
|---|---|---|---|
| Start of Run: | 01Jan3000, 00:00 | Basin Model: | Project |
| End of Run: | 03Jan3000, 00:00 | Meteorologic Model: | Sussex 100-YR |
| Compute Time: | 24Aug2011, 13:55:56 | Control Specifications: | NRCS 24-HR Storm |

Volume Units: IN

Computed Results

| | | | |
|---|---|---|---|
| Peak Discharge : | 194.0 (CFS) | Date/Time of Peak Discharge : | 01Jan3000, 13:08 |
| Total Precipitation : | 9.20 (IN) | Total Direct Runoff : | 7.30 (IN) |
| Total Loss : | 1.90 (IN) | Total Baseflow : | 0.00 (IN) |
| Total Excess : | 7.30 (IN) | Discharge : | 7.30 (IN) |


Subbasin "Upstream" Results for Run "Sussex 100-YR"
Depth (in)
0.00
0.05
0.10
0.15
0.20
Flow (cfs)
200
180
160
140
120
100
80
60
40
20
0
00:00
12:00
00:00
12:00
00:00
01Jan3000
02Jan3000
Run:Sussex 100-YR Element:UPSTREAM Result:Precipitation
Run:SUSSEX 100-YR Element:UPSTREAM Result:Precipitation Loss
Run:SUSSEX 100-YR Element:UPSTREAM Result:Outflow
Run:SUSSEX 100-YR Element:UPSTREAM Result:Baseflow

| Summary Table H & H Analysis 1 for Cv & Fv Events to a Common Point of Interest (POI)[1] | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Storm Event** | **Upstream Area (Ac.)** | **Site Area (Ac.)** | **Upstream Peak Discharge (Q) cfs** | **Site Peak Discharge (Q) cfs** | **Site LAG Time (0.6Tc) min.** | **Upstream LAG Time (0.6Tc) min.** | **Upstream Time to Peak (Tp) min.** | **Site Time to Peak (Tp) min.** | **Site Time to Inflection (Tinf) min.** | **Compliance Check T(inf)<T(p)** |
| | | | | | | | | | | |
| **Conveyance (Cv) Storm** | 128 | 18.76 | 95.2 | 54.8 | 8.8 | 72.0 | 789.0 | 724.0 | 732.3 | **OK** |
| | | | | | | | | | | |
| **Flooding (Fv) Storm** | 128 | 18.76 | 194.0 | 113.7 | 8.8 | 72.0 | 788.0 | 723.0 | 731.3 | **OK** |
| | | | | | | | | | | |

# Map


Tax Ditch Segments

- 1 - 4
- 5 - 10
- 11 - 60
- Special Access ROW

FEMA Flood Maps

- X 500
- A

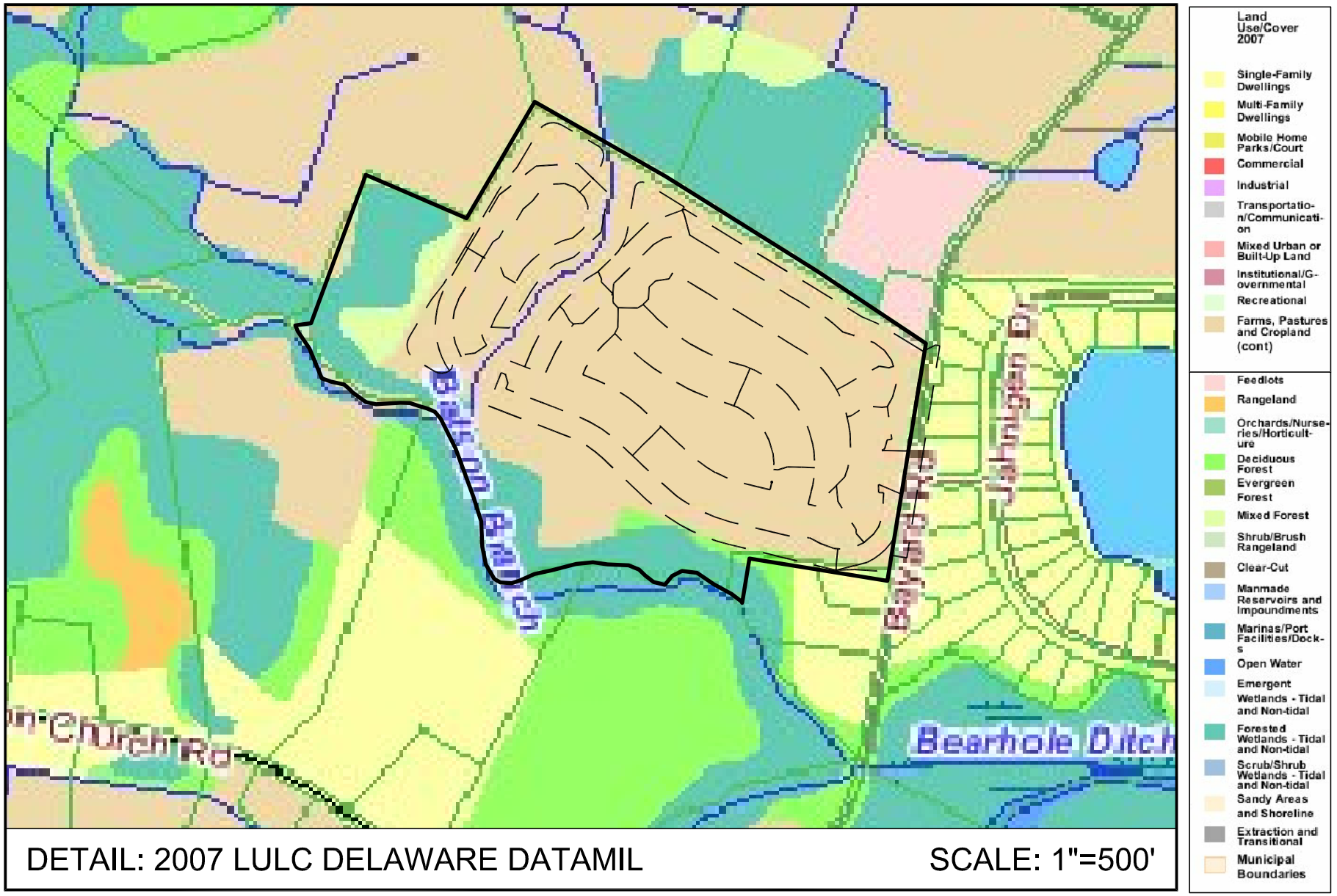
State Wetlands

- Estuarine
- Lacustrine
- Marine

State Wetlands (continued)

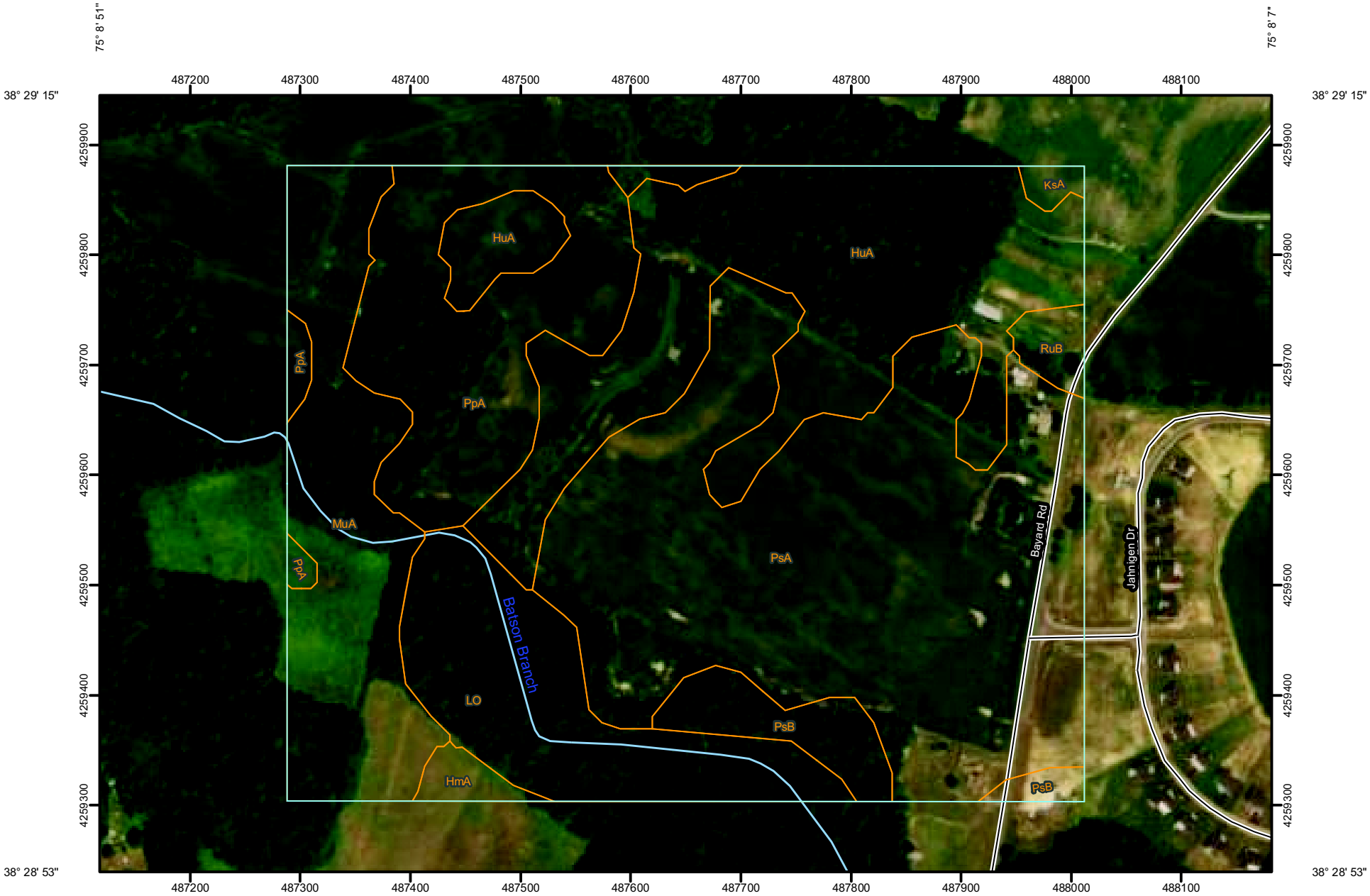
- Other
- Palustrine
- Riverine

Effective April 2016




DETAIL: 2007 LULC DELAWARE DATAMIL SCALE: 1"=500'

Effective April 2016


75° 8' 51"
75° 8' 7"
38° 29' 15"
38° 28' 53"
487200
487300
487400
487500
487600
487700
487800
487900
488000
488100
4259900
4259800
4259700
4259600
4259500
4259400
4259300
HuA
HuA
KsA
RuB
PpA
PpA
PpA
MuA
PsA
PsB
PsB
LO
HmA
Batson Branch
Bayard Rd
Jahnigen Dr
Map Scale: 1:5,050 if printed on A size (8.5" x 11") sheet.
N
Meters
0
50
100
200
300
Feet
0
250
500
1,000
1,500

## MAP LEGEND

**Area of Interest (AOI)**
- Area of Interest (AOI)

**Soils**
- Soil Map Units

**Special Point Features**
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

**Special Line Features**
- Gully
- Short Steep Slope
- Other

**Political Features**
- Cities

**Water Features**
- Streams and Canals

**Transportation**
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

## MAP INFORMATION

Map Scale: 1:5,050 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N NAD83

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

Soil Survey Area: Sussex County, Delaware
Survey Area Data: Version 9, Oct 18, 2006

Date(s) aerial images were photographed: 7/17/2006

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

# Map Unit Legend

| Sussex County, Delaware (DE005) | | | |
|---|---|---|---|
| **Map Unit Symbol** | **Map Unit Name** | **Acres in AOI** | **Percent of AOI** |
| HmA | Hammonton loamy sand, 0 to 2 percent slopes | 0.9 | 0.8% |
| HuA | Hurlock loamy sand, 0 to 2 percent slopes | 23.8 | 23.0% |
| KsA | Klej loamy sand, 0 to 2 percent slopes | 0.5 | 0.4% |
| LO | Longmarsh and Indiantown soils, frequently flooded | 10.6 | 10.2% |
| MuA | Mullica-Berryland complex, 0 to 2 percent slopes | 13.5 | 13.1% |
| PpA | Pepperbox loamy sand, 0 to 2 percent slopes | 13.2 | 12.8% |
| PsA | Pepperbox-Rosedale complex, 0 to 2 percent slopes | 36.5 | 35.3% |
| PsB | Pepperbox-Rosedale complex, 2 to 5 percent slopes | 3.4 | 3.3% |
| RuB | Runclint loamy sand, 2 to 5 percent slopes | 1.0 | 1.0% |
| **Totals for Area of Interest** | | **103.3** | **100.0%** |



Effective April 2016

# Map Unit Description (Brief)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the selected area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit. A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

The "Map Unit Description (Brief)" report gives a brief, general description of the major soils that occur in a map unit. Descriptions of nonsoil (miscellaneous areas) and minor map unit components may or may not be included. This description is written by the local soil scientists responsible for the respective soil survey area data. A more detailed description can be generated by the "Map Unit Description" report.

Additional information about the map units described in this report is available in other Soil Data Mart reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the Soil Data Mart reports define some of the properties included in the map unit descriptions.

# Report—Map Unit Description (Brief)

## Sussex County, Delaware

**Description Category:** SOI

**Map Unit:** HmA—Hammonton loamy sand, 0 to 2 percent slopes

Hammonton component makes up 80 percent of the map unit. All areas are prime farmland. The assigned Kw erodibility factor is .15. This soil is moderately well drained. The slowest permeability within 60 inches is moderately rapid. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is none ponded. The top of the seasonal high water table is at 24 inches. There are no saline horizons. It is in the irrigated land capability class 2w. It is in nonirrigated land capability class 2w. This component is not a hydric soil.

**Map Unit:** HuA—Hurlock loamy sand, 0 to 2 percent slopes

Hurlock, undrained component, makes up 40 percent of the map unit. Farmland of statewide importance. The assigned Kw erodibility factor is .02. This soil is poorly drained. The slowest permeability within 60 inches is moderate. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is occasionally ponded. The top of the seasonal high water table is at 5 inches. There are no saline horizons. It is in nonirrigated land capability class 4w. This component is a hydric soil. Hurlock, drained component, makes up 40 percent of the map unit. Farmland of statewide importance. The assigned Kw erodibility factor is .15. This soil is poorly drained. The slowest permeability within 60 inches is moderate. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is rarely ponded. The top of the seasonal high water table is at 14 inches. There are no saline horizons. It is in nonirrigated land capability class 3w. This component is a hydric soil.

**Map Unit:** KsA—Klej loamy sand, 0 to 2 percent slopes

Klej component makes up 70 percent of the map unit. Farmland of statewide importance. The assigned Kw erodibility factor is .10. This soil is somewhat poorly drained. The slowest permeability within 60 inches is moderate. Available water capacity is high and shrink swell potential is low. This soil is not flooded and is not ponded. The top of the seasonal high water table is at 12 inches. There are no saline horizons. It is in the irrigated land capability class 3w. It is in nonirrigated land capability class 3w. This component is not a hydric soil.

**Map Unit:** LO—Longmarsh and Indiantown soils, frequently flooded

Longmarsh component makes up 40 percent of the map unit. The assigned Kw erodibility factor is .02. This soil is very poorly drained. The slowest permeability within 60 inches is moderate. Available water capacity is very high and shrink swell potential is low. This soil is frequently flooded and is frequently ponded. The top of the seasonal high water table is at 5 inches. There are no saline horizons. It is in nonirrigated land capability class 5w. This component is a hydric soil. Indiantown component makes up 40 percent of the map unit. The assigned Kw erodibility factor is .37. This soil is very poorly drained. The slowest permeability within 60 inches is moderate. Available water capacity is very high and shrink swell potential is low. This soil is frequently flooded and is frequently ponded. The top of the seasonal high water table is at 5 inches. There are no saline horizons. It is in nonirrigated land capability class 5w. This component is a hydric soil.

**Map Unit:** MuA—Mullica-Berryland complex, 0 to 2 percent slopes

Berryland, drained component, makes up 25 percent of the map unit. Prime farmland if drained. The assigned Kw erodibility factor is .10. This soil is very poorly drained. The slowest permeability within 60 inches is rapid. Available water capacity is high and shrink swell potential is low. This soil is not flooded and is rarely ponded. The top of the seasonal high water table is at 5 inches. There are no saline horizons. It is in the irrigated land capability class 2w. It is in nonirrigated land capability class 2w. This component is a hydric soil. Mullica, drained component, makes up 25 percent of the map unit. Prime farmland if drained. The assigned Kw erodibility factor is .15. This soil is very poorly drained. The slowest permeability within 60 inches is moderately rapid. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is rarely ponded. The top of the seasonal high water table is at 5 inches. There are no saline horizons. It is in the irrigated land capability class 2w. It is in nonirrigated land capability class 2w. This component is a hydric soil. Berryland, undrained component, makes up 15 percent of the map unit. Prime farmland if drained. The assigned Kw erodibility factor is . 02. This soil is very poorly drained. The slowest permeability within 60 inches is rapid. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is frequently ponded. The top of the seasonal high water table is at 2 inches. There are no saline horizons. It is in nonirrigated land capability class 4w. This component is a hydric soil. Mullica, undrained component, makes up 15 percent of the map unit. Prime farmland if drained. The assigned Kw erodibility factor is .02. This soil is very poorly drained. The slowest permeability within 60 inches is moderately rapid. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is frequently ponded. The top of the seasonal high water table is at 2 inches. There are no saline horizons. It is in nonirrigated land capability class 4w. This component is a hydric soil.

**Map Unit:** PpA—Pepperbox loamy sand, 0 to 2 percent slopes

Pepperbox component makes up 80 percent of the map unit. Prime farmland if irrigated. The assigned Kw erodibility factor is .15. This soil is moderately well drained. The slowest permeability within 60 inches is moderately slow. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is none ponded. The top of the seasonal high water table is at 24 inches. There are no saline horizons. It is in the irrigated land capability class 2w. It is in nonirrigated land capability class 2w. This component is not a hydric soil.

**Map Unit:** PsA—Pepperbox-Rosedale complex, 0 to 2 percent slopes

Rosedale component makes up 45 percent of the map unit. Prime farmland if irrigated. The assigned Kw erodibility factor is .10. This soil is well drained. The slowest permeability within 60 inches is moderate. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is none ponded. The top of the seasonal high water table is at 45 inches. There are no saline horizons. It is in the irrigated land capability class 2s. It is in nonirrigated land capability class 2s. This component is not a hydric soil. Pepperbox component makes up 45 percent of the map unit. Prime farmland if irrigated. The assigned Kw erodibility factor is .15. This soil is moderately well drained. The slowest permeability within 60 inches is moderately slow. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is none ponded. The top of the seasonal high water table is at 24 inches. There are no saline horizons. It is in the irrigated land capability class 2w. It is in nonirrigated land capability class 2w. This component is not a hydric soil.

**Map Unit:** PsB—Pepperbox-Rosedale complex, 2 to 5 percent slopes

Pepperbox component makes up 45 percent of the map unit. Prime farmland if irrigated. The assigned Kw erodibility factor is .10. This soil is moderately well drained. The slowest permeability within 60 inches is moderately slow. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is none ponded. The top of the seasonal high water table is at 24 inches. There are no saline horizons. It is in the irrigated land capability class 2e. It is in nonirrigated land capability class 2e. This component is not a hydric soil. Rosedale component makes up 45 percent of the map unit. Prime farmland if irrigated. The assigned Kw erodibility factor is .10. This soil is well drained. The slowest permeability within 60 inches is moderate. Available water capacity is very high and shrink swell potential is low. This soil is not flooded and is none ponded. The top of the seasonal high water table is at 45 inches. There are no saline horizons. It is in the irrigated land capability class 2e. It is in nonirrigated land capability class 2e. This component is not a hydric soil.

**Map Unit:** RuB—Runclint loamy sand, 2 to 5 percent slopes

Runclint component makes up 75 percent of the map unit. The assigned Kw erodibility factor is .10. This soil is excessively drained. The slowest permeability within 60 inches is moderate. Available water capacity is moderate and shrink swell potential is low. This soil is not flooded and is none ponded. The top of the seasonal high water table is at 45 inches. There are no saline horizons. It is in the irrigated land capability class 3s. It is in nonirrigated land capability class 4s. This component is not a hydric soil.

## Data Source Information

Soil Survey Area: Sussex County, Delaware
Survey Area Data: Version 9, Oct 18, 2006

# Dwellings and Small Commercial Buildings

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. This table shows the degree and kind of soil limitations that affect dwellings and small commercial buildings.

The ratings in the table are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

*Dwellings* are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

*Small commercial buildings* are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Information in this table is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this table. Local ordinances and regulations should be considered in planning, in site selection, and in design.

## Report—Dwellings and Small Commercial Buildings

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The table shows only the top five limitations for any given soil. The soil may have additional limitations]

| Dwellings and Small Commercial Buildings– Sussex County, Delaware | | | | | | | |
|---|---|---|---|---|---|---|---|
| Map symbol and soil name | Pct. of map unit | Dwellings without basements | | Dwellings with basements | | Small commercial buildings | |
| | | Rating class and limiting features | Value | Rating class and limiting features | Value | Rating class and limiting features | Value |
| HmA—Hammonton loamy sand, 0 to 2 percent slopes | | | | | | | |
| Hammonton | 80 | Somewhat limited | | Very limited | | Somewhat limited | |
| | | Depth to saturated zone | 0.39 | Depth to saturated zone | 1.00 | Depth to saturated zone | 0.39 |
| HuA—Hurlock loamy sand, 0 to 2 percent slopes | | | | | | | |
| Hurlock, undrained | 40 | Very limited | | Very limited | | Very limited | |
| | | Ponding | 1.00 | Ponding | 1.00 | Ponding | 1.00 |
| | | Depth to saturated zone | 1.00 | Depth to saturated zone | 1.00 | Depth to saturated zone | 1.00 |
| Hurlock, drained | 40 | Very limited | | Very limited | | Very limited | |
| | | Depth to saturated zone | 1.00 | Depth to saturated zone | 1.00 | Depth to saturated zone | 1.00 |
| KsA—Klej loamy sand, 0 to 2 percent slopes | | | | | | | |
| Klej | 70 | Very limited | | Very limited | | Very limited | |
| | | Depth to saturated zone | 1.00 | Depth to saturated zone | 1.00 | Depth to saturated zone | 1.00 |

| Dwellings and Small Commercial Buildings– Sussex County, Delaware | | | | | | | |
|---|---|---|---|---|---|---|---|
| Map symbol and soil name | Pct. of map unit | Dwellings without basements | | Dwellings with basements | | Small commercial buildings | |
| | | Rating class and limiting features | Value | Rating class and limiting features | Value | Rating class and limiting features | Value |
| LO—Longmarsh and Indiantown soils, frequently flooded | | | | | | | |
| Indiantown | 40 | Very limited | | Very limited | | Very limited | |
| | | Ponding | 1.00 | Ponding | 1.00 | Ponding | 1.00 |
| | | Flooding | 1.00 | Flooding | 1.00 | Flooding | 1.00 |
| | | Depth to saturated zone | 1.00 | Depth to saturated zone | 1.00 | Depth to saturated zone | 1.00 |
| | | Organic matter content | 1.00 | | | Organic matter content | 1.00 |
| Longmarsh | 40 | Very limited | | Very limited | | Very limited | |
| | | Ponding | 1.00 | Ponding | 1.00 | Ponding | 1.00 |
| | | Flooding | 1.00 | Flooding | 1.00 | Flooding | 1.00 |
| | | Depth to saturated zone | 1.00 | Depth to saturated zone | 1.00 | Depth to saturated zone | 1.00 |
| MuA—Mullica-Berryland complex, 0 to 2 percent slopes | | | | | | | |
| Berryland, drained | 25 | Very limited | | Very limited | | Very limited | |
| | | Depth to saturated zone | 1.00 | Depth to saturated zone | 1.00 | Depth to saturated zone | 1.00 |
| Mullica, drained | 25 | Very limited | | Very limited | | Very limited | |
| | | Depth to saturated zone | 1.00 | Depth to saturated zone | 1.00 | Depth to saturated zone | 1.00 |
| Berryland, undrained | 15 | Very limited | | Very limited | | Very limited | |
| | | Ponding | 1.00 | Ponding | 1.00 | Ponding | 1.00 |
| | | Depth to saturated zone | 1.00 | Depth to saturated zone | 1.00 | Depth to saturated zone | 1.00 |
| Mullica, undrained | 15 | Very limited | | Very limited | | Very limited | |
| | | Ponding | 1.00 | Ponding | 1.00 | Ponding | 1.00 |
| | | Depth to saturated zone | 1.00 | Depth to saturated zone | 1.00 | Depth to saturated zone | 1.00 |
| PpA—Pepperbox loamy sand, 0 to 2 percent slopes | | | | | | | |
| Pepperbox | 80 | Somewhat limited | | Very limited | | Somewhat limited | |
| | | Depth to saturated zone | 0.39 | Depth to saturated zone | 1.00 | Depth to saturated zone | 0.39 |

| Dwellings and Small Commercial Buildings– Sussex County, Delaware | | | | | | | |
|---|---|---|---|---|---|---|---|
| Map symbol and soil name | Pct. of map unit | Dwellings without basements | | Dwellings with basements | | Small commercial buildings | |
| | | Rating class and limiting features | Value | Rating class and limiting features | Value | Rating class and limiting features | Value |
| PsA—Pepperbox-Rosedale complex, 0 to 2 percent slopes | | | | | | | |
| Pepperbox | 45 | Somewhat limited | | Very limited | | Somewhat limited | |
| | | Depth to saturated zone | 0.39 | Depth to saturated zone | 1.00 | Depth to saturated zone | 0.39 |
| Rosedale | 45 | Not limited | | Somewhat limited | | Not limited | |
| | | | | Depth to saturated zone | 0.73 | | |
| PsB—Pepperbox-Rosedale complex, 2 to 5 percent slopes | | | | | | | |
| Pepperbox | 45 | Somewhat limited | | Very limited | | Somewhat limited | |
| | | Depth to saturated zone | 0.39 | Depth to saturated zone | 1.00 | Depth to saturated zone | 0.39 |
| Rosedale | 45 | Not limited | | Somewhat limited | | Not limited | |
| | | | | Depth to saturated zone | 0.73 | | |
| RuB—Runclint loamy sand, 2 to 5 percent slopes | | | | | | | |
| Runclint | 75 | Not limited | | Somewhat limited | | Not limited | |
| | | | | Depth to saturated zone | 0.73 | | |

## Data Source Information

Soil Survey Area: Sussex County, Delaware
Survey Area Data: Version 9, Oct 18, 2006

# Ponds and Embankments

This table gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

*Pond reservoir areas* hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the saturated hydraulic conductivity (Ksat) of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

*Embankments, dikes, and levees* are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. Embankments that have zoned construction (core and shell) are not considered. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

*Aquifer-fed excavated ponds* are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, Ksat of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Information in this table is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this table. Local ordinances and regulations should be considered in planning, in site selection, and in design.

## Report—Ponds and Embankments

[Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The table shows only the top five limitations for any given soil. The soil may have additional limitations]

| Ponds and Embankments– Sussex County, Delaware | | | | | | | |
|---|---|---|---|---|---|---|---|
| Map symbol and soil name | Pct. of map unit | Pond reservoir areas | | Embankments, dikes, and levees | | Aquifer-fed excavated ponds | |
| | | Rating class and limiting features | Value | Rating class and limiting features | Value | Rating class and limiting features | Value |
| HmA—Hammonton loamy sand, 0 to 2 percent slopes | | | | | | | |
| Hammonton | 80 | Very limited | | Very limited | | Very limited | |
| | | Seepage | 1.00 | Depth to saturated zone | 0.99 | Cutbanks cave | 1.00 |
| | | | | Seepage | 0.43 | Depth to saturated zone | 0.01 |
| HuA—Hurlock loamy sand, 0 to 2 percent slopes | | | | | | | |
| Hurlock, undrained | 40 | Very limited | | Very limited | | Very limited | |
| | | Seepage | 1.00 | Ponding | 1.00 | Cutbanks cave | 1.00 |
| | | | | Depth to saturated zone | 1.00 | | |
| | | | | Seepage | 0.26 | | |
| Hurlock, drained | 40 | Very limited | | Very limited | | Very limited | |
| | | Seepage | 1.00 | Depth to saturated zone | 1.00 | Cutbanks cave | 1.00 |
| | | | | Seepage | 0.26 | | |

| Ponds and Embankments– Sussex County, Delaware | | | | | | | |
|---|---|---|---|---|---|---|---|
| Map symbol and soil name | Pct. of map unit | Pond reservoir areas | | Embankments, dikes, and levees | | Aquifer-fed excavated ponds | |
| | | Rating class and limiting features | Value | Rating class and limiting features | Value | Rating class and limiting features | Value |
| KsA—Klej loamy sand, 0 to 2 percent slopes | | | | | | | |
| Klej | 70 | Very limited | | Very limited | | Very limited | |
| | | Seepage | 1.00 | Depth to saturated zone | 1.00 | Cutbanks cave | 1.00 |
| | | | | Seepage | 0.36 | | |
| LO—Longmarsh and Indiantown soils, frequently flooded | | | | | | | |
| Indiantown | 40 | Very limited | | Very limited | | Very limited | |
| | | Seepage | 1.00 | Ponding | 1.00 | Cutbanks cave | 1.00 |
| | | | | Depth to saturated zone | 1.00 | | |
| | | | | Seepage | 0.31 | | |
| Longmarsh | 40 | Very limited | | Very limited | | Very limited | |
| | | Seepage | 1.00 | Ponding | 1.00 | Cutbanks cave | 1.00 |
| | | | | Depth to saturated zone | 1.00 | | |
| | | | | Seepage | 0.07 | | |
| MuA—Mullica-Berryland complex, 0 to 2 percent slopes | | | | | | | |
| Berryland, drained | 25 | Very limited | | Very limited | | Very limited | |
| | | Seepage | 1.00 | Depth to saturated zone | 1.00 | Cutbanks cave | 1.00 |
| | | | | Seepage | 0.99 | | |
| Mullica, drained | 25 | Very limited | | Very limited | | Very limited | |
| | | Seepage | 1.00 | Depth to saturated zone | 1.00 | Cutbanks cave | 1.00 |
| | | | | Seepage | 0.84 | | |
| Berryland, undrained | 15 | Very limited | | Very limited | | Very limited | |
| | | Seepage | 1.00 | Ponding | 1.00 | Cutbanks cave | 1.00 |
| | | | | Depth to saturated zone | 1.00 | | |
| | | | | Seepage | 0.99 | | |
| Mullica, undrained | 15 | Very limited | | Very limited | | Very limited | |
| | | Seepage | 1.00 | Ponding | 1.00 | Cutbanks cave | 1.00 |
| | | | | Depth to saturated zone | 1.00 | | |
| | | | | Seepage | 0.84 | | |

| Ponds and Embankments– Sussex County, Delaware | | | | | | | |
|---|---|---|---|---|---|---|---|
| Map symbol and soil name | Pct. of map unit | Pond reservoir areas | | Embankments, dikes, and levees | | Aquifer-fed excavated ponds | |
| | | Rating class and limiting features | Value | Rating class and limiting features | Value | Rating class and limiting features | Value |
| PpA—Pepperbox loamy sand, 0 to 2 percent slopes | | | | | | | |
| Pepperbox | 80 | Very limited | | Very limited | | Very limited | |
| | | Seepage | 1.00 | Depth to saturated zone | 0.99 | Cutbanks cave | 1.00 |
| | | | | Seepage | 0.06 | Depth to saturated zone | 0.01 |
| PsA—Pepperbox-Rosedale complex, 0 to 2 percent slopes | | | | | | | |
| Pepperbox | 45 | Very limited | | Very limited | | Very limited | |
| | | Seepage | 1.00 | Depth to saturated zone | 0.99 | Cutbanks cave | 1.00 |
| | | | | Seepage | 0.06 | Depth to saturated zone | 0.01 |
| Rosedale | 45 | Very limited | | Somewhat limited | | Very limited | |
| | | Seepage | 1.00 | Seepage | 0.11 | Cutbanks cave | 1.00 |
| | | | | Depth to saturated zone | 0.02 | Depth to saturated zone | 0.68 |
| PsB—Pepperbox-Rosedale complex, 2 to 5 percent slopes | | | | | | | |
| Pepperbox | 45 | Very limited | | Very limited | | Very limited | |
| | | Seepage | 1.00 | Depth to saturated zone | 0.99 | Cutbanks cave | 1.00 |
| | | | | Seepage | 0.06 | Depth to saturated zone | 0.01 |
| Rosedale | 45 | Very limited | | Somewhat limited | | Very limited | |
| | | Seepage | 1.00 | Seepage | 0.11 | Cutbanks cave | 1.00 |
| | | | | Depth to saturated zone | 0.02 | Depth to saturated zone | 0.68 |
| RuB—Runclint loamy sand, 2 to 5 percent slopes | | | | | | | |
| Runclint | 75 | Very limited | | Somewhat limited | | Very limited | |
| | | Seepage | 1.00 | Seepage | 0.90 | Cutbanks cave | 1.00 |
| | | | | Depth to saturated zone | 0.02 | Depth to saturated zone | 0.68 |

# RUSLE2 Related Attributes

This report summarizes those soil attributes used by the Revised Universal Soil Loss Equation Version 2 (RUSLE2) for the map units in the selected area. The report includes the map unit symbol, the component name, and the percent of the component in the map unit. Soil property data for each map unit component include the hydrologic soil group, erosion factors Kf for the surface horizon, erosion factor T, and the representative percentage of sand, silt, and clay in the surface horizon.

## Report—RUSLE2 Related Attributes

| RUSLE2 Related Attributes– Sussex County, Delaware | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Map symbol and soil name | Pct. of map unit | Slope length (ft) | Hydrologic group | Kf | T factor | Representative value | | |
| | | | | | | % Sand | % Silt | % Clay |
| HmA—Hammonton loamy sand, 0 to 2 percent slopes | | | | | | | | |
| Hammonton | 80 | — | B | .15 | 5 | 80.0 | 16.0 | 4.0 |
| HuA—Hurlock loamy sand, 0 to 2 percent slopes | | | | | | | | |
| Hurlock, undrained | 40 | — | D | .02 | 5 | 0.0 | 0.0 | 0.0 |
| Hurlock, drained | 40 | — | B | .15 | 5 | 85.0 | 7.0 | 8.0 |
| KsA—Klej loamy sand, 0 to 2 percent slopes | | | | | | | | |
| Klej | 70 | — | C | .10 | 5 | 83.0 | 12.0 | 5.0 |
| LO—Longmarsh and Indiantown soils, frequently flooded | | | | | | | | |
| Indiantown | 40 | — | D | .37 | 5 | 14.0 | 76.0 | 10.0 |
| Longmarsh | 40 | — | D | .02 | 5 | 0.0 | 0.0 | 1.0 |
| MuA—Mullica-Berryland complex, 0 to 2 percent slopes | | | | | | | | |
| Berryland, drained | 25 | — | B | .10 | 5 | 75.0 | 21.0 | 4.0 |
| Mullica, drained | 25 | — | B | .15 | 5 | 69.0 | 23.0 | 8.0 |
| Berryland, undrained | 15 | — | D | .02 | 5 | 0.0 | 0.0 | 1.0 |
| Mullica, undrained | 15 | — | D | .02 | 5 | 0.0 | 0.0 | 1.0 |
| PpA—Pepperbox loamy sand, 0 to 2 percent slopes | | | | | | | | |
| Pepperbox | 80 | — | C | .15 | 5 | 81.0 | 13.0 | 6.0 |
| PsA—Pepperbox-Rosedale complex, 0 to 2 percent slopes | | | | | | | | |
| Pepperbox | 45 | — | C | .15 | 5 | 81.0 | 13.0 | 6.0 |
| Rosedale | 45 | — | A | .10 | 5 | 80.0 | 14.0 | 6.0 |

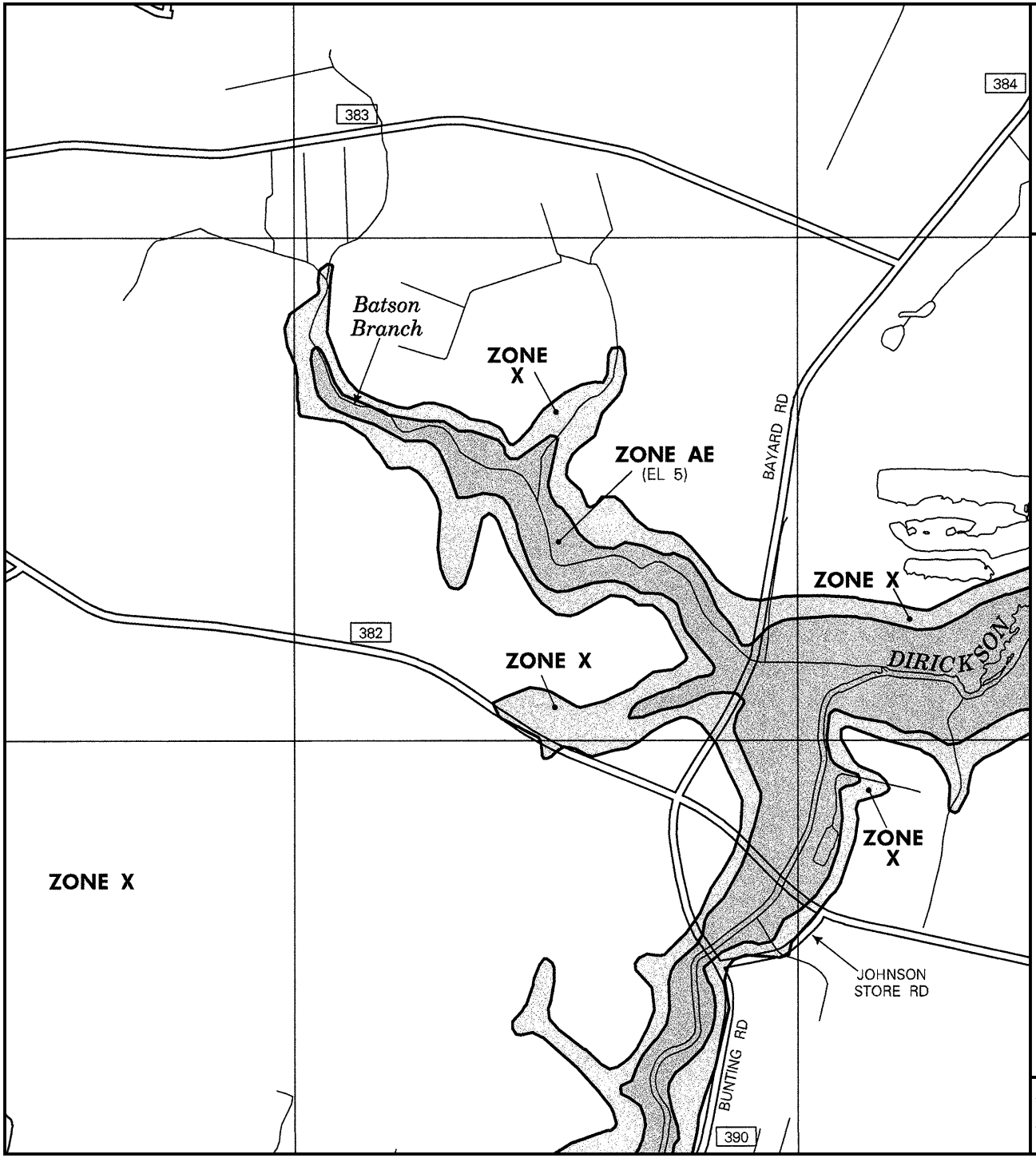


Effective April 2016

| RUSLE2 Related Attributes– Sussex County, Delaware | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Map symbol and soil name | Pct. of map unit | Slope length (ft) | Hydrologic group | Kf | T factor | Representative value | | |
| | | | | | | % Sand | % Silt | % Clay |
| PsB—Pepperbox-Rosedale complex, 2 to 5 percent slopes | | | | | | | | |
| Pepperbox | 45 | — | C | .10 | 4 | 81.0 | 13.0 | 6.0 |
| Rosedale | 45 | — | A | .10 | 5 | 80.0 | 14.0 | 6.0 |
| RuB—Runclint loamy sand, 2 to 5 percent slopes | | | | | | | | |
| Runclint | 75 | — | A | .10 | 5 | 81.0 | 13.0 | 6.0 |

## Data Source Information

Soil Survey Area: Sussex County, Delaware
Survey Area Data: Version 9, Oct 18, 2006




MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

**PANEL 0635J**

# FIRM

## FLOOD INSURANCE RATE MAP

SUSSEX COUNTY, DELAWARE AND INCORPORATED AREAS

**PANEL 635 OF 660**

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---|---|---|---|
| SUSSEX COUNTY | 100029 | 0635 | J |

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

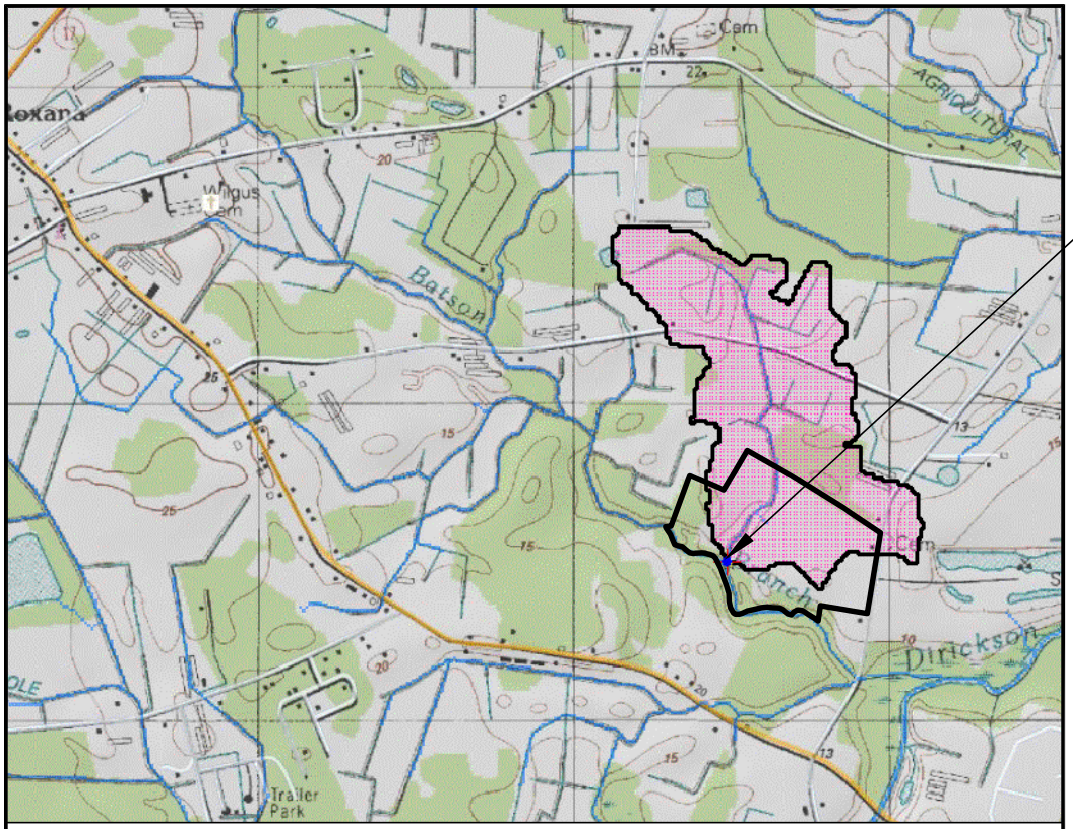
**MAP NUMBER 10005C0635J**

**MAP REVISED JANUARY 6, 2005**

Federal Emergency Management Agency



Effective April 2016




DETAIL: USGS DELAWARE STREAMSTATS SCALE: 1"=2000'

U.S.G.S. PEAK FLOW ESTIMATES REPORT
(Urban Peak Discharges Year 2000 Housing Density)
DRAINAGE AREA = 0.20 mi² (128 Acres)
PERCENT IMPERV.= 2.2%
PERCENT HSG "A" = 8.0 %
2-YEAR PEAK = 13 cfs
10-YEAR PEAK = 33 cfs
25-YEAR PEAK = 47 cfs
100-YEAR PEAK = 72 cfs

Effective April 2016

# SEDIMENT & STORMWATER MANAGEMENT PLANS

## FOR PROPERTY KNOWN AS:

# EXAMPLE PLAN - RESIDENTIAL SITE

## PLAN DATA

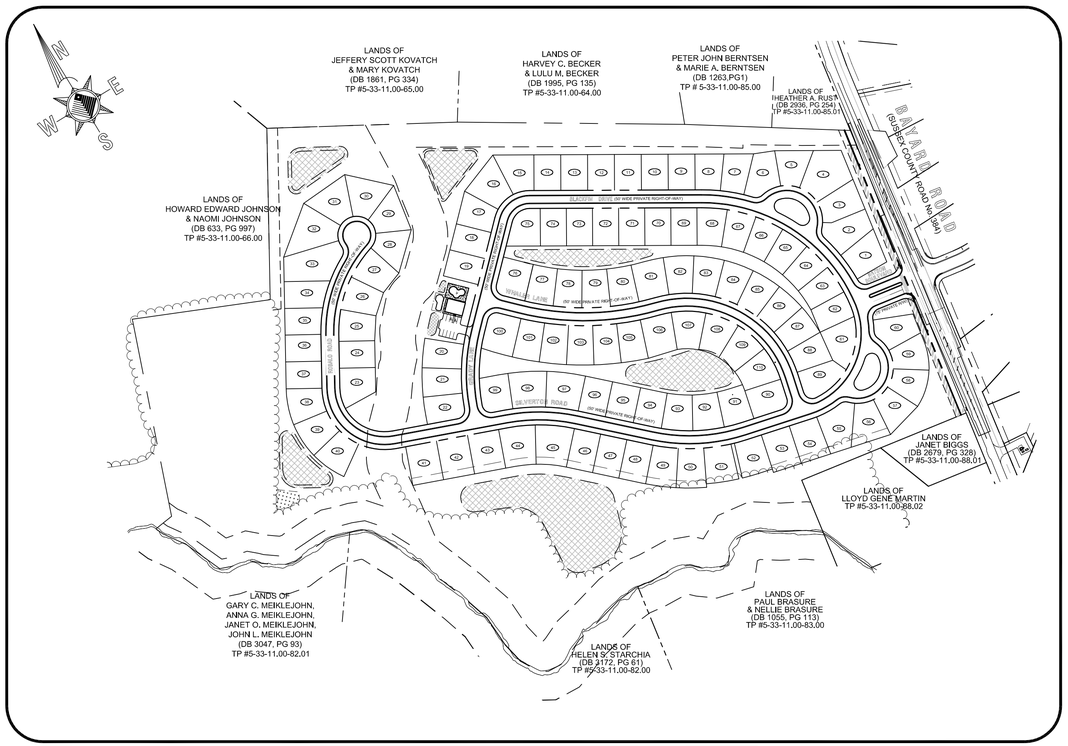
| | | |
|---|---|---|
| PARCEL I.D. NOS. | * | 5-33-11.00-84.00 |
| DEED REFERENCE | * | DB 2190, PG 325 |
| PLUS # | * | #2007-12-01 |
| DNREC # | * | |
| SITE ADDRESS | * | BAYARD ROAD |
| LATITUDE/LONGITUDE | * | N038° 29' 00.10" / W075° 08' 16.95" |
| ZONING DISTRICT | * | AR-1 (AGRICULTURAL / RESIDENTIAL)<br>(ENVIRONMENTALLY SENSITIVE DEVELOPMENT DISTRICT OVERLAY ZONE) |
| SEWAGE DISPOSAL | * | SUSSEX COUNTY SANITARY SEWER SYSTEM<br>(JOHNSON'S CORNER SANITARY SEWER DISTRICT)<br><br>SEWERAGE IS SUBJECT TO APPROVAL OF THE SUSSEX COUNTY DEPARTMENT OF PUBLIC WORKS AND THE DELAWARE STATE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL. |
| WATER SUPPLY | * | ARTESIAN WATER COMPANY (CENTRAL WATER SYSTEM)<br><br>WATER IS SUBJECT TO THE APPROVAL OF THE DELAWARE STATE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL AND THE DELAWARE DIVISION OF PUBLIC HEALTH |
| OWNER/DEVELOPER | * | CONTACT NAME<br>COMPANY / LLC<br>ADDRESS<br>CITY, STATE ZIP CODE<br>PHONE: (302) ###-####<br>FAX: (302) ###-#### |
| VERTICAL DATUM | * | NAVD 1988 |
| HORIZONTAL DATUM | * | DELAWARE STATE PLANE COORDINATE SYSTEM NAD 1983 - BY GPS |
| LOT AREA RATIONALE | * | GROSS AREA = 55.20 AC. (100.00%)<br>AREA DEDICATED TO BAYARD ROAD = 0.29 AC. (0.52%)<br>AREA IN SINGLE FAMILY LOTS = 22.12 AC.(40.06%)<br>AREA DEDICATED TO PRIVATE STREETS = 6.78 AC.(12.28%)<br>AREA IN PRIVATE OPEN SPACE / STORMWATER = 26.01 AC.(47.12%)<br>(AREA IN WETLANDS = 5.78 AC.)<br>(AREA RESERVED FOR COMMUNITY AREA = 0.44 AC.) |
| WOODLAND PRESERVATION RATIONALE | * | EXISTING GROSS WOODLAND AREA = 12.61 AC. (100.00%)<br>WOODLAND AREAS TO BE PRESERVED = 12.61 AC.(100%)<br>WOODLAND AREAS TO BE REMOVED = 0.00 AC.(0%) |
| PROJECT DENSITY | * | NO. OF SINGLE FAMILY LOTS = 110<br>GROSS AREA (AR-1 CLUSTER) = 55.2 AC.<br>GROSS DENSITY = 1.99 D.U./AC. |

## SUSSEX CONSERVATION DISTRICT (SCD) SEDIMENT AND STORMWATER NOTES

1. D.N.R.E.C., SEDIMENT AND STORMWATER MANAGEMENT PROGRAM ( SUSSEX CONSERVATION DISTRICT ) MUST BE NOTIFIED IN WRITING FIVE (5) DAYS PRIOR TO COMMENCING WITH CONSTRUCTION TO SCHEDULE A PRE-CONSTRUCTION MEETING. FAILURE TO DO SO CONSTITUTES A VIOLATION OF THE APPROVED SEDIMENT AND STORMWATER MANAGEMENT PLAN.
2. REVIEW AND OR APPROVAL OF THE SEDIMENT AND STORMWATER MANAGEMENT PLAN SHALL NOT RELIEVE THE CONTRACTOR FROM HIS OR HER RESPONSIBILITIES FOR COMPLIANCE WITH THE REQUIREMENTS OF THE SEDIMENT AND STORMWATER REGULATIONS, NOR SHALL IT RELIEVE THE CONTRACTOR FROM ERRORS OR OMISSIONS IN THE APPROVED PLAN.
3. IF THE APPROVED PLAN NEEDS TO BE MODIFIED, ADDITIONAL SEDIMENT AND STORMWATER CONTROL MEASURES MAY BE REQUIRED AS DEEMED NECESSARY BY THE SUSSEX CONSERVATION DISTRICT.
4. THE SUSSEX CONSERVATION DISTRICT RESERVES THE RIGHT TO ENTER PRIVATE PROPERTY FOR PURPOSES OF PERIODIC SITE INSPECTION.
5. FOLLOWING SOIL DISTURBANCE OR REDISTURBANCE, PERMANENT OR TEMPORARY STABILIZATION SHALL BE COMPLETED WITHIN 14 CALENDAR DAYS AS TO THE SURFACE OF ALL PERIMETER SEDIMENT CONTROLS, TOPSOIL STOCKPILES, AND ALL OTHER DISTURBED OR GRADED AREAS ON THE PROJECT SITE.
6. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IN ACCORDANCE WITH THE DELAWARE EROSION AND SEDIMENT CONTROL HANDBOOK, DATED 1989 OR LATEST EDITION.
7. IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN AND REPAIR ALL EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT PRACTICES DURING UTILITY INSTALLATION.
8. ALL SEDIMENT AND STORMWATER MANAGEMENT PLANS SHALL CONTAIN CERTIFICATION BY THE OWNER OR DEVELOPER OF THE RIGHT OF THE DEPARTMENT OR DELEGATED INSPECTION AGENCY TO CONDUCT ON-SITE INSPECTIONS.
9. A CLEAR STATEMENT OF DEFINED MAINTENANCE SHALL BE ESTABLISHED DURING THE PLAN REVIEW AND APPROVAL PROCESS.
10. APPROVED PLANS REMAIN VALID FOR 3 YEARS FROM THE DATE OF AN APPROVAL.
11. POST CONSTRUCTION VERIFICATION DRAWINGS ARE TO BE SUBMITTED TO THE DISTRICT WITHIN 60 DAYS OF STORMWATER MANAGEMENT FACILITY COMPLETION.
12. APPROVAL OF A SEDIMENT AND STORMWATER PLAN DOES NOT GRANT OR IMPLY A RIGHT TO DISCHARGE STORMWATER RUNOFF. THE OWNER/DEVELOPER IS RESPONSIBLE FOR ACQUIRING ANY AND ALL AGREEMENTS, EASEMENTS, ETC., NECESSARY TO COMPLY WITH STATE DRAINAGE AND OTHER APPLICABLE LAWS.
13. THE NOTICE OF INTENT FOR STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY UNDER A NPDES GENERAL PERMIT FOR THIS PROJECT IS # XXXX(TO BE FILLED IN ONCE RECEIVED), AT ANY TIME THE OWNERSHIP FOR THIS PROJECT CHANGES, A TRANSFER OF AUTHORIZATION OR A DCO-PERMITTEE APPLICATION MUST BE SUBMITTED TO DNREC. THE PERMITTEE OF RECORD SHALL NOT BE RELIEVED OF THEIR RESPONSIBILITIES UNTIL A NOTICE OF TERMINATION HAS BEEN PROCESSED BY DNREC.

## GENERAL NOTES

1. ACREAGE OF DISTURBED AREA: 10.56 ACRES ± (AS DEFINED BY THE LIMITS OF DISTURBANCE).
2. ALL CONSTRUCTION SHALL BE PER SCD REGULATIONS AND THE DETAILS SHOWN ON THIS PLAN. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED PERIODICALLY AND AFTER EACH RAINFALL. MAINTENANCE MUST BE PERFORMED AFTER EACH INSPECTION AS NECESSARY. ANY ERODED AREAS SHALL BE STABILIZED AND ANY ACCUMULATED SEDIMENT SHALL BE REMOVED AND DISPOSED OF ACCORDING TO PLAN.
3. THE EROSION AND SEDIMENT CONTROL OBJECTIVES WILL BE ACHIEVED BY MINIMIZING EXPOSURE TIME OF POTENTIALLY EROSIVE SOILS TO RUNOFF, AND INSTALLATION OF THE TEMPORARY AND PERMANENT CONSERVATION MEASURES IN PROPER SEQUENCE WITH CONSTRUCTION.
4. TOPSOIL STOCKPILED ON THE SITE SHALL BE STABILIZED WITH SEED AND MULCH WITHIN 5 CALENDAR DAYS OF PLACEMENT OF THE TOPSOIL. THE TEMPORARY TOPSOIL STOCKPILE SHALL BE USED FOR FINAL GRADING OF SITE ALL REMAINING STOCKPILED MATERIAL, IF APPLICABLE SHALL BE REMOVED FROM THE SITE IN AN APPROVED MANNER.
5. CONTRACTOR SHALL TAKE CARE NOT TO "TRACK" MUD OFF SITE WITH CONSTRUCTION VEHICLES AND EQUIPMENT.
6. ALL AREAS NOT STABILIZED BY STONE BASE COARSE OR PAVING ARE TO BE STABILIZED ACCORDING TO THE STABILIZATION SCHEDULE IMMEDIATELY AFTER DESIGN GRADE IS ACHIEVED, HYDRO SEEDING IS RECOMMENDED WHERE SLOPES EXCEED 3:1.
7. IN THE EVENT EARTHWORK OPERATIONS ARE HALTED FOR THE WINTER MONTHS, BEFORE FINAL GRADING AND SEEDING OF ALL DISTURBED AREAS ARE COMPLETED, THOSE AREAS ARE TO BE STABILIZED PER THE STABILIZATION GUIDELINES OR STABILIZED WITH A MULCH, OR TACKED WITH A CHEMICAL ADHESIVE.
8. EROSION CONTROL MATTING SHALL BE USED ON ALL SLOPES THAT ARE 3:1 (3 UNITS HORIZONTAL TO 1 UNIT VERTICAL) OR GREATER AND IN AREAS OF CONCENTRATED FLOW WHERE GRADES EXCEED 1% AND IN DISTURBED AREAS WHERE HIGHLY EROSIVE SOILS ARE PRESENT. EROSION CONTROL BLANKET SHALL BE TYPE S-150 AS MANUFACTURED BY NORTH AMERICAN GREEN OR AN APPROVED EQUIVALENT.
9. IF DUST CONTROL BECOMES A PROBLEM, METHODS SUCH AS MULCHING, OR SPRINKLING WATER SHALL BE IMPLEMENTED.
10. ALL HIGH DENSITY POLYETHYLENE PIPE TO BE SMOOTH WALLED HANCOR SURE-LOK, Hi-Q, OR AN APPROVED EQUIVALENT.
11. UPON COMPLETION OF STORMWATER MANAGEMENT FACILITIES, STORMWATER CONVEYANCE SYSTEMS AND DRAINAGE STRUCTURES MAINTENANCE WILL BE THE RESPONSIBILITY OF THE DEVELOPER, THE PROPERTY OWNERS WITHIN THIS SUBDIVISION OR BOTH. WHEN ALL LOTS ARE PURCHASED, THE PROPERTY OWNERS WILL BE SOLELY RESPONSIBLE FOR THE MAINTENANCE OF THE STORMWATER SYSTEM.
12. THIS DRAWING DOES NOT INCLUDE NECESSARY COMPONENTS FOR CONSTRUCTION SAFETY. ALL CONSTRUCTION MUST BE DONE IN COMPLIANCE WITH THE OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970 AND ALL RULES AND REGULATIONS THERETO APPURTENANT.
13. ALL MATERIALS, STANDARDS & SPECIFICATIONS SHALL BE AS SPECIFIED ON THE PLAN OR A DNREC APPROVED EQUIVALENT CAN BE SUBSTITUTED.




## SITE LOCATION PLAN

(SCALE: 1"=200')

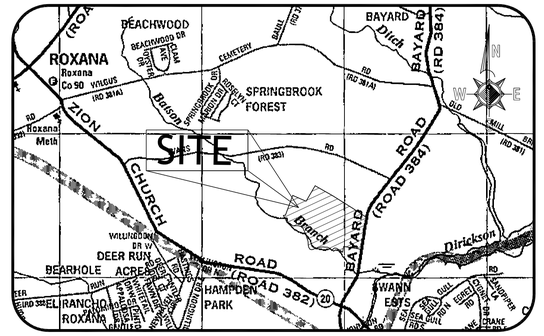
## TAX PARCEL NO. 5-33-11.00-84.00

SITUATE IN

## BALTIMORE HUNDRED

## INLAND BAYS WATERSHED - LITTLE ASSAWOMAN BAY

## SUSSEX COUNTY * STATE OF DELAWARE




LOCATION MAP - SCALE: 1" = 2000 FEET



## LEGEND

| | |
|---|---|
| PROPERTY LINE & STREET R/W | |
| EASEMENT LINE | |
| CENTERLINE | |
| EX. CONTOUR | 30 |
| PR. CONTOUR | 30 |
| TREELINE | |
| WETLAND BOUNDARY | |
| WETLANDS AREA | |
| FLOODPLAIN BOUNDARY | |
| NRCS SOILS BOUNDARY | PSA / HUA |
| SUBAREA DRAINAGE BOUNDARY | |
| SILT FENCE | SF |
| LIMIT OF DISTURBANCE | LOD |
| FILTER STRIP | FS |
| TIME OF CONCENTRATION PATH (Tc) | Tc |
| DRAINAGE ARROW | |
| LAWN/GRASS COVER | |
| IMPERVIOUS LAND COVER | |
| PR. WATER LINE | W |
| EX.WATER LINE | W |
| PR. SANITARY SEWER | 8"SS> |
| EX.SANITARY SEWER | W |
| PR. STORM SEWER | 18"STORM |
| EX. STORM SEWER | 14"x23"RCP |
| EX. OVERHEAD ELECTRIC | OHE |
| CONCRETE MONUMENT FOUND | |
| CAPPED REBAR FOUND | |
| IRON PIPE FOUND | |
| SIGN | |
| UTILITY POLE | |
| BENCH MARK | |
| TEST BORE | |
| CATV | |
| CATCH BASIN | |
| CAPPED IRON PIPE FOUND | |
| CONCRETE MONUMENT SET | |
| CLEANOUT | |
| CAPPED REBAR SET | |
| DRILL HOLE FOUND | |
| DRILL HOLE SET | |
| ELECTRIC METER | |

**SHEET INDEX:**



WETLAND CERTIFICATION

THIS PROPERTY, TAX MAP # XXX, HAS BEEN EXAMINED BY {COMPANY NAME} FOR THE PRESENCE OF WATERS OF THE UNITED STATES, INCLUDING WETLANDS (SECTION 404 AND SECTION 10), STATE SUBAQUEOUS LANDS AND STATE REGULATED WETLANDS AS ESTABLISHED BY THE REVIEWING AGENCIES IN THE FORM OF MANUALS, POLICIES AND PROCEDURES IN PLACE AT THE TIME THAT THE INVESTIGATION WAS CONDUCTED. THE WETLAND INFORMATION CONTAINED IN THIS PLAN SET IS IN ACCORDANCE WITH THIS CRITERIA (OR, THERE WERE NO WETLANDS FOUND WITHIN THE SUBJECT PROPERTY), PER STATE JD #XXXX, AND / OR ARMY CORPS JD #XXXX {AS APPLICABLE}.

WETLAND DELINEATOR'S NAME, TITLE DATE:
COMPANY/LLC
STREET ADDRESS
TOWN, STATE, ZIP CODE
PHONE #
FAX #

OWNER'S CERTIFICATION

I, THE UNDERSIGNED, CERTIFY THAT ALL LAND CLEARING, CONSTRUCTION AND DEVELOPMENT SHALL BE DONE PURSUANT TO THE APPROVED PLAN AND THAT RESPONSIBLE PERSONNEL (I.E., BLUE CARD HOLDER) INVOLVED IN THE LAND DISTURBANCE WILL HAVE A CERTIFICATION OF TRAINING PRIOR TO INITIATION OF THE PROJECT, AT A DNREC SPONSORED OR APPROVED TRAINING COURSE FOR THE CONTROL OF EROSION AND SEDIMENT DURING CONSTRUCTION. IN ADDITION, I GRANT THE DNREC SEDIMENT AND STORMWATER PROGRAM AND / OR THE RELEVANT DELEGATED AGENCY THE RIGHT TO CONDUCT ON-SITE REVIEWS, AND I UNDERSTAND MY RESPONSIBILITIES UNDER THE NPDES CONSTRUCTION GENERAL PERMIT, AS REFERENCED ON THIS COVERSHEET.

OWNER'S NAME, TITLE DATE:
COMPANY/LLC
STREET ADDRESS
TOWN, STATE, ZIP CODE
PHONE #
FAX #

ENGINEER'S CERTIFICATION

I, ROGER A. GROSS, P.E., DO HEREBY CERTIFY THAT I AM A REGISTERED PROFESSIONAL ENGINEER IN THE STATE OF DELAWARE, AND THAT THE INFORMATION SHOWN HEREON HAS BEEN PREPARED UNDER MY SUPERVISION AND TO THE BEST OF MY KNOWLEDGE AND BELIEF REPRESENTS GOOD ENGINEERING PRACTICES AS REQUIRED BY THE APPLICABLE LAWS OF THE STATE OF DELAWARE.

ROGER A. GROSS, P.E. DATE:
MERESTONE CONSULTANTS, INC.
19633 BLUE BIRD LANE, SUITE 9
REHOBOTH BEACH, DELAWARE 19971
PHONE: (302) 226-5880
FAX: (302) 226-5883


MERESTONE CONSULTANTS, INC.
ENGINEERS - PLANNERS - SURVEYORS

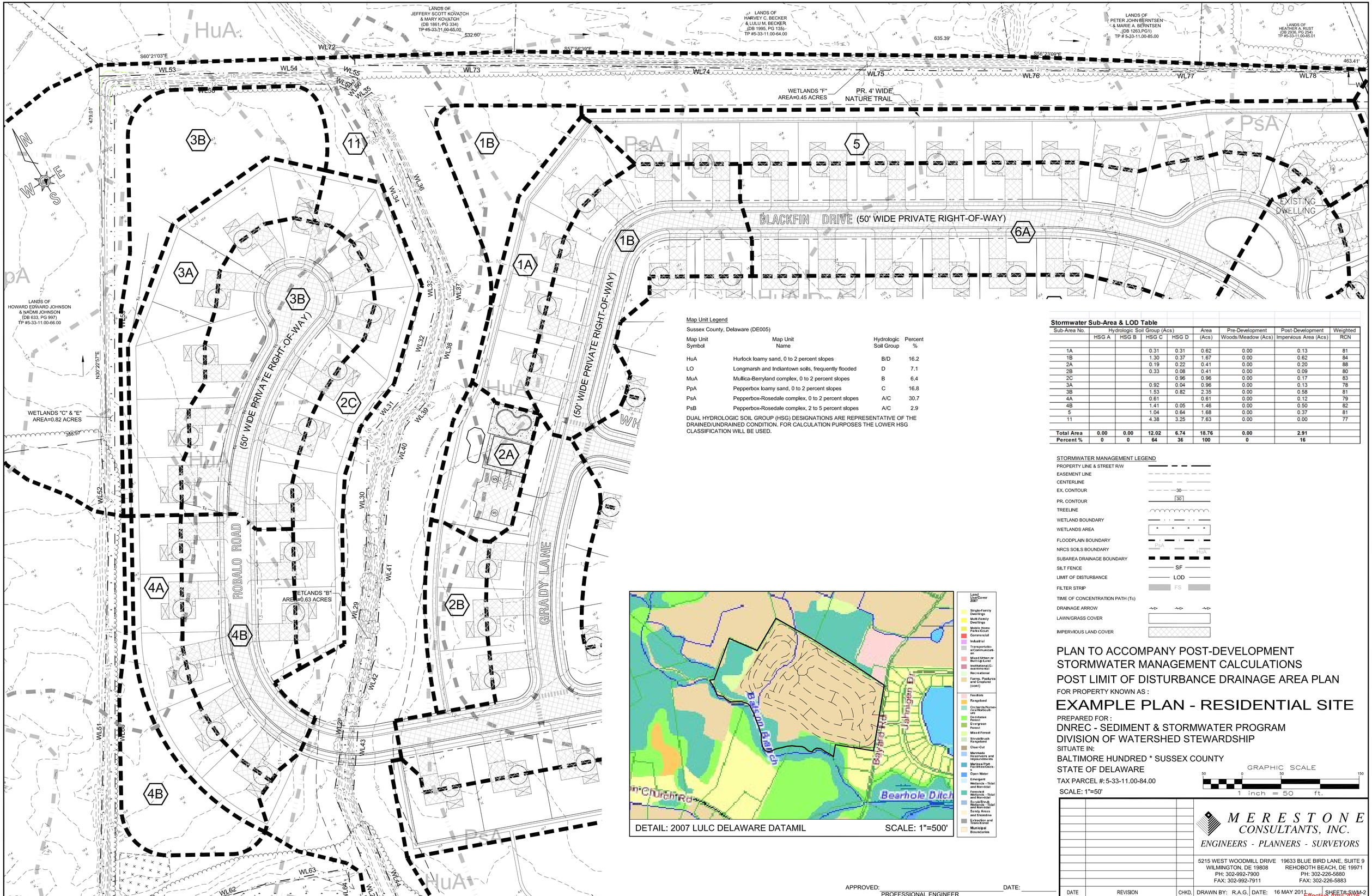
5215 WEST WOODMILL DRIVE
WILMINGTON, DE 19808
PH: 302-992-7900
FAX: 302-992-7911

19633 BLUE BIRD LANE, SUITE 9
REHOBOTH BEACH, DE 19971
PH: 302-226-5880
FAX: 302-226-5883


| DATE | REVISION | CHKD. |
|---|---|---|

DRAWN BY: R.A.G. | DATE: 16 MAY 2011 | SHEET#: SWM-1

PLAN #: 20745RA-325701




Map Unit Legend

Sussex County, Delaware (DE005)

| Map Unit Symbol | Map Unit Name | Hydrologic Soil Group | Percent % |
|---|---|---|---|
| HuA | Hurlock loamy sand, 0 to 2 percent slopes | B/D | 16.2 |
| LO | Longmarsh and Indiantown soils, frequently flooded | D | 7.1 |
| MuA | Mullica-Berryland complex, 0 to 2 percent slopes | B | 6.4 |
| PpA | Pepperbox loamy sand, 0 to 2 percent slopes | C | 16.8 |
| PsA | Pepperbox-Rosedale complex, 0 to 2 percent slopes | A/C | 30.7 |
| PsB | Pepperbox-Rosedale complex, 2 to 5 percent slopes | A/C | 2.9 |

DUAL HYDROLOGIC SOIL GROUP (HSG) DESIGNATIONS ARE REPRESENTATIVE OF THE DRAINED/UNDRAINED CONDITION. FOR CALCULATION PURPOSES THE LOWER HSG CLASSIFICATION WILL BE USED.

**Stormwater Sub-Area & LOD Table**

| Sub-Area No. | Hydrologic Soil Group (Acs) | | | | Area | Pre-Development | Post-Development | Weighted |
|---|---|---|---|---|---|---|---|---|
| | HSG A | HSG B | HSG C | HSG D | (Acs) | Woods/Meadow (Acs) | Impervious Area (Acs) | RCN |
| 1A | | | 0.31 | 0.31 | 0.62 | 0.00 | 0.13 | 81 |
| 1B | | | 1.30 | 0.37 | 1.67 | 0.00 | 0.62 | 84 |
| 2A | | | 0.19 | 0.22 | 0.41 | 0.00 | 0.20 | 88 |
| 2B | | | 0.33 | 0.08 | 0.41 | 0.00 | 0.09 | 80 |
| 2C | | | | 0.96 | 0.96 | 0.00 | 0.17 | 83 |
| 3A | | | 0.92 | 0.04 | 0.96 | 0.00 | 0.13 | 78 |
| 3B | | | 1.53 | 0.82 | 2.35 | 0.00 | 0.58 | 81 |
| 4A | | | 0.61 | | 0.61 | 0.00 | 0.12 | 79 |
| 4B | | | 1.41 | 0.05 | 1.46 | 0.00 | 0.50 | 82 |
| 5 | | | 1.04 | 0.64 | 1.68 | 0.00 | 0.37 | 81 |
| 11 | | | 4.38 | 3.25 | 7.63 | 0.00 | 0.00 | 77 |
| **Total Area** | **0.00** | **0.00** | **12.02** | **6.74** | **18.76** | **0.00** | **2.91** | |
| **Percent %** | **0** | **0** | **64** | **36** | **100** | **0** | **16** | |

STORMWATER MANAGEMENT LEGEND

PROPERTY LINE & STREET R/W
EASEMENT LINE
CENTERLINE
EX. CONTOUR — 30
PR. CONTOUR — 30
TREELINE
WETLAND BOUNDARY
WETLANDS AREA
FLOODPLAIN BOUNDARY
NRCS SOILS BOUNDARY — PsA / HuA
SUBAREA DRAINAGE BOUNDARY
SILT FENCE — SF
LIMIT OF DISTURBANCE — LOD
FILTER STRIP — FS
TIME OF CONCENTRATION PATH (Tc)
DRAINAGE ARROW
LAWN/GRASS COVER
IMPERVIOUS LAND COVER




DETAIL: 2007 LULC DELAWARE DATAMIL SCALE: 1"=500'

# PLAN TO ACCOMPANY POST-DEVELOPMENT STORMWATER MANAGEMENT CALCULATIONS

## POST LIMIT OF DISTURBANCE DRAINAGE AREA PLAN

FOR PROPERTY KNOWN AS :

## EXAMPLE PLAN - RESIDENTIAL SITE

PREPARED FOR :
DNREC - SEDIMENT & STORMWATER PROGRAM
DIVISION OF WATERSHED STEWARDSHIP
SITUATE IN:
BALTIMORE HUNDRED * SUSSEX COUNTY
STATE OF DELAWARE
TAX PARCEL #:5-33-11.00-84.00
SCALE: 1"=50'

GRAPHIC SCALE
50 0 50 150
1 inch = 50 ft.

APPROVED: _____ DATE: _____
PROFESSIONAL ENGINEER

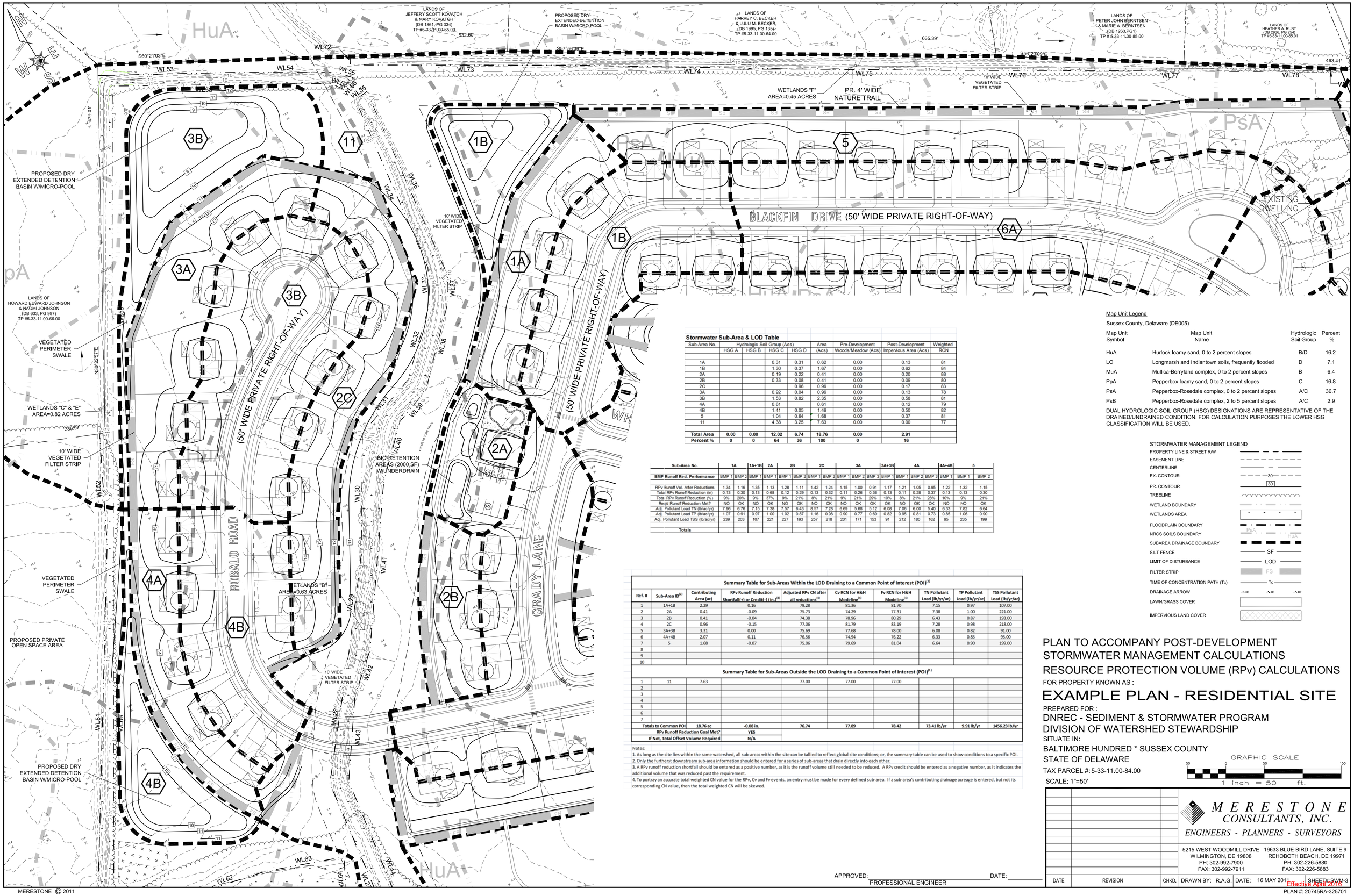

MERESTONE CONSULTANTS, INC.
ENGINEERS - PLANNERS - SURVEYORS
5215 WEST WOODMILL DRIVE
WILMINGTON, DE 19808
PH: 302-992-7900
FAX: 302-992-7911
19633 BLUE BIRD LANE, SUITE 9
REHOBOTH BEACH, DE 19971
PH: 302-226-5880
FAX: 302-226-5883


| DATE | REVISION | CHKD. | DRAWN BY: R.A.G. | DATE: 16 MAY 2011 | SHEET#:SWM-2 |
|---|---|---|---|---|---|



Effective April 2016

PLAN #: 20745RA-325701




**Stormwater Sub-Area & LOD Table**

| Sub-Area No. | Hydrologic Soil Group (Acs) | | | | Area | Pre-Development | Post-Development | Weighted |
|---|---|---|---|---|---|---|---|---|
| | HSG A | HSG B | HSG C | HSG D | (Acs) | Woods/Meadow (Acs) | Impervious Area (Acs) | RCN |
| 1A | | | 0.31 | 0.31 | 0.62 | 0.00 | 0.13 | 81 |
| 1B | | | 1.30 | 0.37 | 1.67 | 0.00 | 0.62 | 84 |
| 2A | | | 0.19 | 0.22 | 0.41 | 0.00 | 0.20 | 88 |
| 2B | | | 0.33 | 0.08 | 0.41 | 0.00 | 0.09 | 80 |
| 2C | | | | 0.96 | 0.96 | 0.00 | 0.17 | 83 |
| 3A | | | 0.92 | 0.04 | 0.96 | 0.00 | 0.13 | 78 |
| 3B | | | 1.53 | 0.82 | 2.35 | 0.00 | 0.58 | 81 |
| 4A | | | 0.61 | | 0.61 | 0.00 | 0.12 | 79 |
| 4B | | | 1.41 | 0.05 | 1.46 | 0.00 | 0.50 | 82 |
| 5 | | | 1.04 | 0.64 | 1.68 | 0.00 | 0.37 | 81 |
| 11 | | | 4.38 | 3.25 | 7.63 | 0.00 | 0.00 | 77 |
| **Total Area** | **0.00** | **0.00** | **12.02** | **6.74** | **18.76** | **0.00** | **2.91** | |
| **Percent %** | **0** | **0** | **64** | **36** | **100** | **0** | **16** | |

| Sub-Area No. | 1A | 1A+1B | 2A | 2B | 2C | 3A | 3A+3B | 4A | 4A+4B | 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **BMP Runoff Red. Performance** | BMP 1 | BMP 2 | BMP 1 | BMP 1 | BMP 1 | BMP 2 | BMP 1 | BMP 2 | BMP 3 | BMP 1 | BMP 1 | BMP 2 | BMP 1 | BMP 1 | BMP 2 | BMP 3 | BMP 1 | BMP 1 | BMP 2 |
| RPv Runoff Vol. After Reductions | 1.34 | 1.16 | 1.35 | 1.13 | 1.28 | 1.11 | 1.42 | 1.24 | 1.15 | 1.00 | 0.91 | 1.17 | 1.21 | 1.05 | 0.95 | 1.22 | 1.32 | 1.15 | |
| Total RPv Runoff Reduction (in) | 0.13 | 0.30 | 0.13 | 0.68 | 0.12 | 0.29 | 0.13 | 0.32 | 0.11 | 0.26 | 0.36 | 0.13 | 0.11 | 0.28 | 0.37 | 0.13 | 0.13 | 0.30 | |
| Tota RPv Runoff Reduction (%) | 9% | 20% | 9% | 37% | 9% | 21% | 8% | 21% | 9% | 21% | 29% | 10% | 8% | 21% | 28% | 10% | 9% | 21% | |
| Rev'd Runoff Reduction Met? | NO | OK | NO | OK | NO | OK | NO | OK | NO | OK | OK | OK | NO | OK | OK | NO | NO | OK | |
| Adj. Pollutant Load TN (lb/ac/yr) | 7.96 | 6.76 | 7.15 | 7.38 | 7.57 | 6.43 | 8.57 | 7.28 | 6.69 | 5.68 | 5.12 | 6.08 | 7.06 | 6.00 | 5.40 | 6.33 | 7.82 | 6.64 | |
| Adj. Pollutant Load TP (lb/ac/yr) | 1.07 | 0.91 | 0.97 | 1.00 | 1.02 | 0.87 | 1.16 | 0.98 | 0.90 | 0.77 | 0.69 | 0.82 | 0.95 | 0.81 | 0.73 | 0.85 | 1.06 | 0.90 | |
| Adj. Pollutant Load TSS (lb/ac/yr) | 239 | 203 | 107 | 221 | 227 | 193 | 257 | 218 | 201 | 171 | 153 | 91 | 212 | 180 | 162 | 95 | 235 | 199 | |
| **Totals** | | | | | | | | | | | | | | | | | | | |

**Summary Table for Sub-Areas Within the LOD Draining to a Common Point of Interest (POI)[1]**

| Ref. # | Sub-Area ID[2] | Contributing Area (ac) | RPv Runoff Reduction Shortfall(+) or Credit(-) (in.)[3] | Adjusted RPv CN after all reductions[4] | Cv RCN for H&H Modeling[4] | Fv RCN for H&H Modeling[4] | TN Pollutant Load (lb/yr/ac) | TP Pollutant Load (lb/yr/ac) | TSS Pollutant Load (lb/yr/ac) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1A+1B | 2.29 | 0.16 | 79.28 | 81.36 | 81.70 | 7.15 | 0.97 | 107.00 |
| 2 | 2A | 0.41 | -0.09 | 75.73 | 74.29 | 77.31 | 7.38 | 1.00 | 221.00 |
| 3 | 2B | 0.41 | -0.04 | 74.38 | 78.96 | 80.29 | 6.43 | 0.87 | 193.00 |
| 4 | 2C | 0.96 | -0.15 | 77.06 | 81.79 | 83.19 | 7.28 | 0.98 | 218.00 |
| 5 | 3A+3B | 3.31 | 0.00 | 75.69 | 77.68 | 78.00 | 6.08 | 0.82 | 91.00 |
| 6 | 4A+4B | 2.07 | 0.11 | 76.56 | 74.94 | 76.22 | 6.33 | 0.85 | 95.00 |
| 7 | 5 | 1.68 | -0.07 | 75.06 | 79.69 | 81.04 | 6.64 | 0.90 | 199.00 |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

**Summary Table for Sub-Areas Outside the LOD Draining to a Common Point of Interest (POI)[1]**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 11 | 7.63 | | 77.00 | 77.00 | 77.00 | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| **Totals to Common POI** | | **18.76 ac** | **-0.08 in.** | **76.74** | **77.89** | **78.42** | **73.41 lb/yr** | **9.91 lb/yr** | **1456.23 lb/yr** |
| **RPv Runoff Reduction Goal Met?** | | | **YES** | | | | | | |
| **If Not, Total Offset Volume Required** | | | **N/A** | | | | | | |

Notes:
1. As long as the site lies within the same watershed, all sub-areas within the site can be tallied to reflect global site conditions; or, the summary table can be used to show conditions to a specific POI.
2. Only the furtherst downstream sub-area information should be entered for a series of sub-areas that drain directly into each other.
3. A RPv runoff reduction shortfall should be entered as a positive number, as it is the runoff volume still needed to be reduced. A RPv credit should be entered as a negative number, as it indicates the additional volume that was reduced past the requirement.
4. To portray an accurate total weighted CN value for the RPv, Cv and Fv events, an entry must be made for every defined sub-area. If a sub-area's contributing drainage acreage is entered, but not its corresponding CN value, then the total weighted CN will be skewed.

Map Unit Legend

Sussex County, Delaware (DE005)

| Map Unit Symbol | Map Unit Name | Hydrologic Soil Group | Percent % |
|---|---|---|---|
| HuA | Hurlock loamy sand, 0 to 2 percent slopes | B/D | 16.2 |
| LO | Longmarsh and Indiantown soils, frequently flooded | D | 7.1 |
| MuA | Mullica-Berryland complex, 0 to 2 percent slopes | B | 6.4 |
| PpA | Pepperbox loamy sand, 0 to 2 percent slopes | C | 16.8 |
| PsA | Pepperbox-Rosedale complex, 0 to 2 percent slopes | A/C | 30.7 |
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DUAL HYDROLOGIC SOIL GROUP (HSG) DESIGNATIONS ARE REPRESENTATIVE OF THE DRAINED/UNDRAINED CONDITION. FOR CALCULATION PURPOSES THE LOWER HSG CLASSIFICATION WILL BE USED.

STORMWATER MANAGEMENT LEGEND

PROPERTY LINE & STREET R/W
EASEMENT LINE
CENTERLINE
EX. CONTOUR — 30
PR. CONTOUR — 30
TREELINE
WETLAND BOUNDARY
WETLANDS AREA
FLOODPLAIN BOUNDARY
NRCS SOILS BOUNDARY — PsA / HuA
SUBAREA DRAINAGE BOUNDARY
SILT FENCE — SF
LIMIT OF DISTURBANCE — LOD
FILTER STRIP — FS
TIME OF CONCENTRATION PATH (Tc) — Tc
DRAINAGE ARROW
LAWN/GRASS COVER
IMPERVIOUS LAND COVER

# PLAN TO ACCOMPANY POST-DEVELOPMENT STORMWATER MANAGEMENT CALCULATIONS RESOURCE PROTECTION VOLUME (RPv) CALCULATIONS

FOR PROPERTY KNOWN AS :

# EXAMPLE PLAN - RESIDENTIAL SITE

PREPARED FOR :
DNREC - SEDIMENT & STORMWATER PROGRAM
DIVISION OF WATERSHED STEWARDSHIP
SITUATE IN:
BALTIMORE HUNDRED * SUSSEX COUNTY
STATE OF DELAWARE
TAX PARCEL #: 5-33-11.00-84.00
SCALE: 1"=50'

GRAPHIC SCALE
50 0 50 150
1 inch = 50 ft.

APPROVED: _____ DATE: _____
PROFESSIONAL ENGINEER

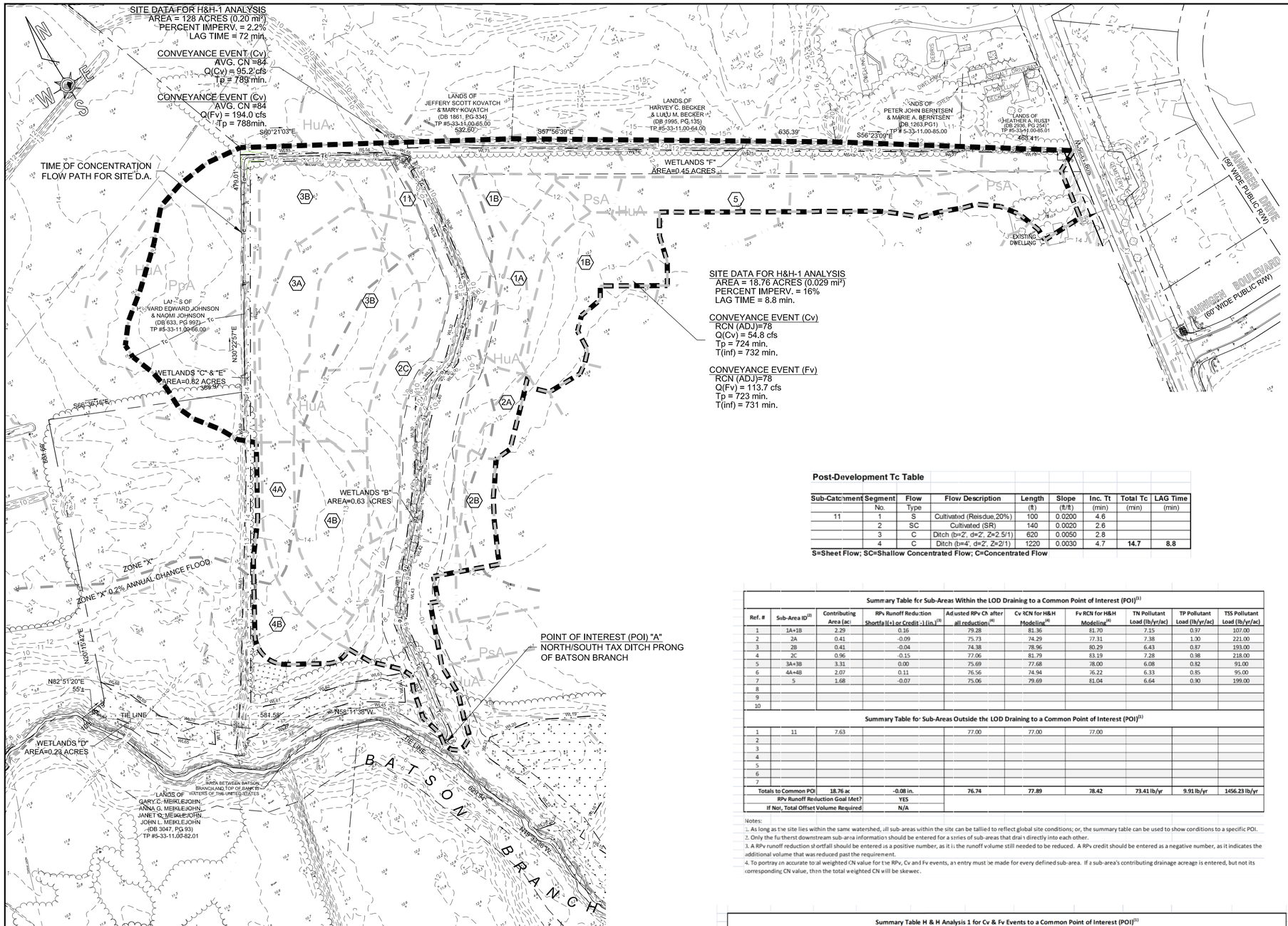

MERESTONE CONSULTANTS, INC.
ENGINEERS - PLANNERS - SURVEYORS
5215 WEST WOODMILL DRIVE
WILMINGTON, DE 19808
PH: 302-992-7900
FAX: 302-992-7911
19633 BLUE BIRD LANE, SUITE 9
REHOBOTH BEACH, DE 19971
PH: 302-226-5880
FAX: 302-226-5883

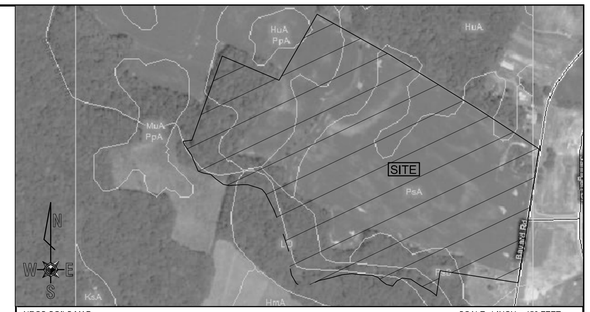

| DATE | REVISION | CHKD. | DRAWN BY: R.A.G. | DATE: 16 MAY 2011 | SHEET#: SWM-3 |
|---|---|---|---|---|---|



Effective April 2016

PLAN #: 20745RA-325701




Map Unit Legend

Sussex County, Delaware (DE005)

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| PpA | Pepperbox loamy sand, 0 to 2 percent slopes | C | 16.8 |
| PsA | Pepperbox-Rosedale complex, 0 to 2 percent slopes | A/C | 30.7 |
| PsB | Pepperbox-Rosedale complex, 2 to 5 percent slopes | A/C | 2.9 |

DUAL HYDROLOGIC SOIL GROUP (HSG) DESIGNATIONS ARE REPRESENTATIVE OF THE DRAINED/UNDRAINED CONDITION. FOR CALCULATION PURPOSES THE LOWER HSG CLASSIFICATION WILL BE USED.

**Post-Development Tc Table**

| Sub-Catchment | Segment No. | Flow Type | Flow Description | Length (ft) | Slope (ft/ft) | Inc. Tt (min) | Total Tc (min) | LAG Time (min) |
|---|---|---|---|---|---|---|---|---|
| 11 | 1 | S | Cultivated (Reisdue,20%) | 100 | 0.0200 | 4.6 | | |
| | 2 | SC | Cultivated (SR) | 140 | 0.0020 | 2.6 | | |
| | 3 | C | Ditch (b=2', d=2', Z=2.5/1) | 620 | 0.0050 | 2.8 | | |
| | 4 | C | Ditch (b=4', d=2', Z=2/1) | 1220 | 0.0030 | 4.7 | **14.7** | **8.8** |

**S=Sheet Flow; SC=Shallow Concentrated Flow; C=Concentrated Flow**

**Summary Table for Sub-Areas Within the LOD Draining to a Common Point of Interest (POI)[1]**

| Ref. # | Sub-Area ID[2] | Contributing Area (ac) | RPv Runoff Reduction Shortfall (+) or Credit - ) (in.)[3] | Adjusted RPv CN after all reduction[4] | Cv RCN for H&H Modeling[4] | Fv RCN for H&H Modeling[4] | TN Pollutant Load (lb/yr/ac) | TP Pollutant Load (lb/yr/ac) | TSS Pollutant Load (lb/yr/ac) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1A+1B | 2.29 | 0.16 | 79.28 | 81.36 | 81.70 | 7.15 | 0.97 | 107.00 |
| 2 | 2A | 0.41 | -0.09 | 75.73 | 74.29 | 77.31 | 7.38 | 1.00 | 221.00 |
| 3 | 2B | 0.41 | -0.04 | 74.38 | 78.96 | 80.29 | 6.43 | 0.87 | 193.00 |
| 4 | 2C | 0.96 | -0.15 | 77.06 | 81.79 | 83.19 | 7.28 | 0.98 | 218.00 |
| 5 | 3A+3B | 3.31 | 0.00 | 75.69 | 77.68 | 78.00 | 6.08 | 0.82 | 91.00 |
| 6 | 4A+4B | 2.07 | 0.11 | 76.56 | 74.94 | 76.22 | 6.33 | 0.85 | 95.00 |
| 7 | 5 | 1.68 | -0.07 | 75.06 | 79.69 | 81.04 | 6.64 | 0.90 | 199.00 |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

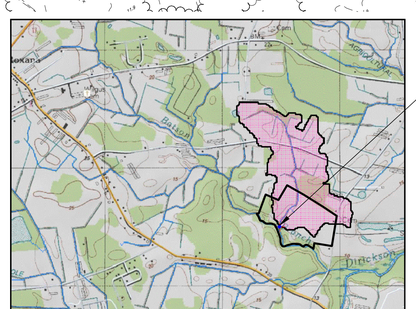
**Summary Table for Sub-Areas Outside the LOD Draining to a Common Point of Interest (POI)[1]**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 11 | 7.63 | | 77.00 | 77.00 | 77.00 | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| **Totals to Common POI** | | **18.76 ac** | **-0.08 in.** | **76.74** | **77.89** | **78.42** | **73.41 lb/yr** | **9.91 lb/yr** | **1456.23 lb/yr** |
| **RPv Runoff Reduction Goal Met?** | | | **YES** | | | | | | |
| **If Not, Total Offset Volume Required** | | | **N/A** | | | | | | |

Notes:
1. As long as the site lies within the same watershed, all sub-areas within the site can be tallied to reflect global site conditions; or, the summary table can be used to show conditions to a specific POI.
2. Only the furthest downstream sub-area information should be entered for a series of sub-areas that drain directly into each other.
3. A RPv runoff reduction shortfall should be entered as a positive number, as it is the runoff volume still needed to be reduced. A RPv credit should be entered as a negative number, as it indicates the additional volume that was reduced past the requirement.
4. To portray an accurate total weighted CN value for the RPv, Cv and Fv events, an entry must be made for every defined sub-area. If a sub-area's contributing drainage acreage is entered, but not its corresponding CN value, then the total weighted CN will be skewed.

**Summary Table H & H Analysis 1 for Cv & Fv Events to a Common Point of Interest (POI)[1]**

| Storm Event | Upstream Area (Ac.) | Site Area (Ac.) | Upstream Peak Discharge (Q) cfs | Site Peak Discharge (Q) cfs | Site LAG Time (0.6Tc) min. | Upstream LAG Time (0.6Tc) min. | Upstream Time to Peak (Tp) min. | Site Time to Peak (Tp) min. | Site Time to Inflection (Tinf) min. | Compliance Check T(inf)<T(p) |
|---|---|---|---|---|---|---|---|---|---|---|
| Conveyance (Cv) Storm | 128 | 18.76 | 95.2 | 54.8 | 8.8 | 72.0 | 789.0 | 724.0 | 732.3 | OK |
| Flooding (Fv) Storm | 128 | 18.76 | 194.0 | 113.7 | 8.8 | 72.0 | 788.0 | 723.0 | 731.3 | OK |




DETAIL: USGS DELAWARE STREAMSTATS SCALE: 1"=2000'

U.S.G.S. PEAK FLOW ESTIMATES REPORT
(Urban Peak Discharges Year 2000 Housing Density)
DRAINAGE AREA = 0.20 mi² (128 Acres)
PERCENT IMPERV.= 2.2%
PERCENT HSG "A" = 8.0 %
2-YEAR PEAK = 13 cfs
10-YEAR PEAK = 33 cfs
25-YEAR PEAK = 47 cfs
100-YEAR PEAK = 72 cfs

STORMWATER MANAGEMENT LEGEND

- PROPERTY LINE & STREET R/W
- EASEMENT LINE
- CENTERLINE
- EX. CONTOUR (30)
- PR. CONTOUR (30)
- TREE OR BRUSH LINE
- WETLAND BOUNDARY
- WETLANDS AREA
- FLOODPLAIN BOUNDARY
- NRCS SOILS BOUNDARY (PsA / HuA)
- SUBAREA DRAINAGE BOUNDARY
- SILT FENCE (SF)
- LIMIT OF DISTURBANCE (LOD)
- FILTER STRIP (FS)
- TIME OF CONCENTRATION PATH (Tc)
- DRAINAGE ARROW
- LAWN/GRASS COVER
- IMPERVIOUS LAND COVER

# PLAN TO ACCOMPANY POST-DEVELOPMENT STORMWATER MANAGEMENT CALCULATIONS CONVEYANCE EVENT (Cv) & FLOODING EVENT (Fv) PLAN

FOR PROPERTY KNOWN AS :

## EXAMPLE PLAN - RESIDENTIAL SITE

PREPARED FOR :
DNREC - SEDIMENT & STORMWATER PROGRAM
DIVISION OF WATERSHED STEWARDSHIP
SITUATE IN:
BALTIMORE HUNDRED * SUSSEX COUNTY
STATE OF DELAWARE
TAX PARCEL #: 5-33-11.00-84.00
SCALE: 1"=100'

GRAPHIC SCALE
100 0 100 300
1 inch = 100 ft.

APPROVED: _____ DATE: _____
PROFESSIONAL ENGINEER


MERESTONE CONSULTANTS, INC.
ENGINEERS - PLANNERS - SURVEYORS
5215 WEST WOODMILL DRIVE
WILMINGTON, DE 19808
PH: 302-992-7900
FAX: 302-992-7911
19633 BLUE BIRD LANE, SUITE 9
REHOBOTH BEACH, DE 19971
PH: 302-226-5880
FAX: 302-226-5883


| DATE | REVISION | CHKD. | DRAWN BY: R.A.G. | DATE: 16 MAY 2011 | SHEET#: SWM-4 |
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Effective April 2016

PLAN #: 20745RA-325701