Sediment & Stormwater Project Application Package for Broadkill Estates Sussex County, DE

GreenTech

Prepared by:
GreenTech Consulting, Inc.
Milton, DE

NOTE: May contain references to earlier draft versions of documents in some cases, though general process and procedures are unaffected.

Proposed December 2015

BACKGROUND INFORMATION:

PROJECT APPLICATION MEETING

The Sediment and Stormwater Program requires a project application meeting for all proposed land disturbing activities that will require a detailed Sediment & Stormwater Plan approval. These meetings are structured to assist the owner, developer, and designer in the design process, and to provide early notification of approval requirements.

Prior to scheduling the required project application meeting, the applicant must submit a Stormwater Assessment Study (SAS) and the completed SAS Checklist to the appropriate Delegated Agency. Incomplete submittals will be returned in whole with the missing checklist items highlighted.

Responsibilities for the various elements of the project application meeting shall be as follows:

Applicant

- Provide contact information for both owner/developer and consultant
- Submit Stormwater Assessment Study (SAS) and completed SAS checklist

Delegated Agency

- Review SAS submittal for completion and schedule the project application meeting with all necessary parties
- Ensure all relevant topics are discussed and/or addressed during the project application meeting
- Forward Stormwater Assessment Report (SAR) to appropriate land use planning agency

Project application meetings will be scheduled within 2 weeks of a complete submittal. Not more than one hour will be allotted for the meeting for a single project. Topics to be covered during the project application meeting will include:

Discussion items

- Watershed master plan requirements where applicable
- Exemptions/waivers/variances
- NOI submittal requirement
- Requirements of other agencies and programs, including TMDLs, sourcewater protection, DelDOT, etc.
- Plan review/approval jurisdictions (municipal, County, DelDOT,etc.)
- Fee amounts and submittal requirements

Agreement items

- Points of analysis – onsite and offsite
- Limit of downstream analysis (10% point, etc.)
- Drainage area boundaries for existing condition
- Flow paths for existing condition
- Proposed BMP hierarchy
- Consideration of Green Technology BMPs for water quality
- Discussion of proposed quantity management and requirements for various BMPs

The Preliminary Sediment & Stormwater Plan submittal shall be based upon the discussion and agreement items from the Project Application Meeting. The Delegated Agency reserves the right to revisit the agreement items from the original Project Application Meeting if the applicant later proposes significant changes to the project which would alter the results of the original Stormwater Assessment Report (SAR).

Office Use Only
Date Received:_____
Submittal Complete: Yes / No Reviewer Initials:_____
Meeting date/time:_____
DelDOT Attendance Required? Yes / No

Stormwater Assessment Study (SAS) Checklist

Project Name: Broadkill Estates

Owner/Developer Name: Broadkill Estates, LLC

Contact Person: I. M Developer

Owner/Developer Phone: 302-555-5555

Owner/Developer e-mail: imdeveloper@delmarva.net

Consultant Name: GreenTech Consulting, Inc.

Contact Person: I. R. Engineer. PE

Consultant Phone: 302-123-4567

Consultant e-mail: irengineer@gtcinc.net

This checklist is for guidance only. The Delegated Agency reserves the right to request additional information during the review process as it deems necessary. Compliance with the checklist in no way is meant to relieve the design professional of his/her professional responsibilities.

A. Documents

Items shall be arranged in the following order:

- ✓ Narrative of existing site conditions including information on existing downstream conveyance and Points of Analysis (POAs)
  - Identify existing structures
  - Describe condition of existing structures / channels / outfalls
  - Provide photographs of structures / channels / outfalls / POAs
- ✓ Narrative of proposed development project type and description
  - Residential
  - Commercial/Institutional
  - High/Low Density
- ✓ Feedback from DelDOT Maintenance regarding drainage concerns.

  Consultant will send an e-mail to the following individuals, containing a description of the project location, including road name and project location from the nearest intersection. Parcel ID number should also be provided. DelDOT will respond by e-mail with any known drainage and flooding problems.

  - *Kent County:*
    Brad Saborio, Central District Public Works Engineer,
    Bradford.Saborio@state.de.us
  - *Sussex County:*
    Marvin Roberts, South District Public Works Manager,
    Marvin.Roberts@state.de.us
- ✓ Letter from DelDOT Subdivision based on Traffic Generation Diagram review.

  Contact Marc Cote, Subdivision Engineer, Marc.Cote@state.de.us

B. On-Line Background Information

Items shall be arranged in the following order:

- ✓ Location map
- ✓ Most recent aerial photography of the site with parcel boundary and tax map ID number.

  DataMIL link: http://datamil.delaware.gov/geonetwork/srv/en/main.home

This checklist is for guidance only. The Delegated Agency reserves the right to request additional information during the review process as it deems necessary. Compliance with the checklist in no way is meant to relieve the design professional of his/her professional responsibilities.

- ✓ 2007 Land Use/Land Cover

  DataMIL link: http://datamil.delaware.gov/geonetwork/srv/en/main.home

- X TMDL Buffered Water Features (if applicable)

  DNREC link: http://maps.dnrec.delaware.gov/inlandbayspcs/

- ✓ Wellhead Protection Areas

  DENbeta link: http://maps.dnrec.delaware.gov/navmap/

- ✓ Recharge Area Mapping

  DENbeta link: http://maps.dnrec.delaware.gov/navmap/

- ✓ FEMA Floodplain Map

  DENbeta link: http://maps.dnrec.delaware.gov/navmap/

- ✓ StreamStats map showing limit of downstream analysis. (The downstream analysis point will be located at the point in the watershed where the site area comprises less than 10% of the watershed area.)

  Stream Stats link: http://water.usgs.gov/osw/streamstats/delaware.html

- ✓ StreamStats Basin Characteristics Report

  Stream Stats link: http://water.usgs.gov/osw/streamstats/delaware.html

- X If DelDOT conveyance will be used to discharge stormwater from proposed development, submit DelDOT Road Plans for background information.

  DelDOT Archive link: http://www.deldot.gov/information/pubs_forms/archived_plans/index.shtml

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Customized Web Soil Survey reports for Stormwater Management for total site.

Link: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

The following elements are required for submittal:

SWM Soils Report Elements	Map	Table	Desc.	Report
Soil Map Tab	X			
Soil Data Explorer Tab				
Suitabilities and Limitations for Use				
Land Classifications				
Map Unit Hydric Rating	X	X	X	
Water Management				
Embankments, Dikes and Levees	X	X	X	
Excavated Ponds (Aquifer-Fed)	X	X	X	
Pond Resevoir Area	X	X	X	
Soil Properties and Qualities				
Soil Erosion Factors				
K Factor - Whole Soil	X	X	X	
Soil Qualities and Features				
Drainage Class	X	X	X	
Hydrologic Soil Group	X	X	X	
Water Features				
Depth to Water Table	X	X	X	
Flooding Frequency Class	X	X	X	
Ponding Frequency Class	X	X	X	
Soil Reports				
Building Site Development				
Roads & Streets, Shallow Excavations, Lawns & Landscaping				X
Soil Physical Properties				
Engineering Properties				X
Physical Soil Properties				X

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C. Existing Hydrology GIS mapping (1" = 100' scale)

Items shall be arranged in the following order:

- ✓ Latest aerial photography with parcel boundary
- ✓ 2007 Land Use/Land Cover (LULC) mapping
- ✓ State Wetland mapping (if applicable)
- X FEMA Floodplain mapping (if applicable)
- X Tax Ditches with tax ditch rights-of-way and watershed boundaries delineated (if applicable)

  For Tax Ditch Right-of-way information e-mail the following information to DNREC_Soil_taxditch@state.de.us:
  - *tax parcel ID number*
  - *landowner of record, and*
  - *contact information for requestor*

- ✓ Existing 1' contour topography based on latest LiDAR data
- ✓ National Hydrography Dataset (NHD) streams & water features
- ✓ Existing Drainage Features map showing flow paths, on-site sub-areas, off-site subareas and site POAs.
- ✓ Hydrologic Soil Group mapping
- ✓ Recharge Feasibility Mapping

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Broadkill Estates – Narrative

Existing Conditions

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Proposed Development

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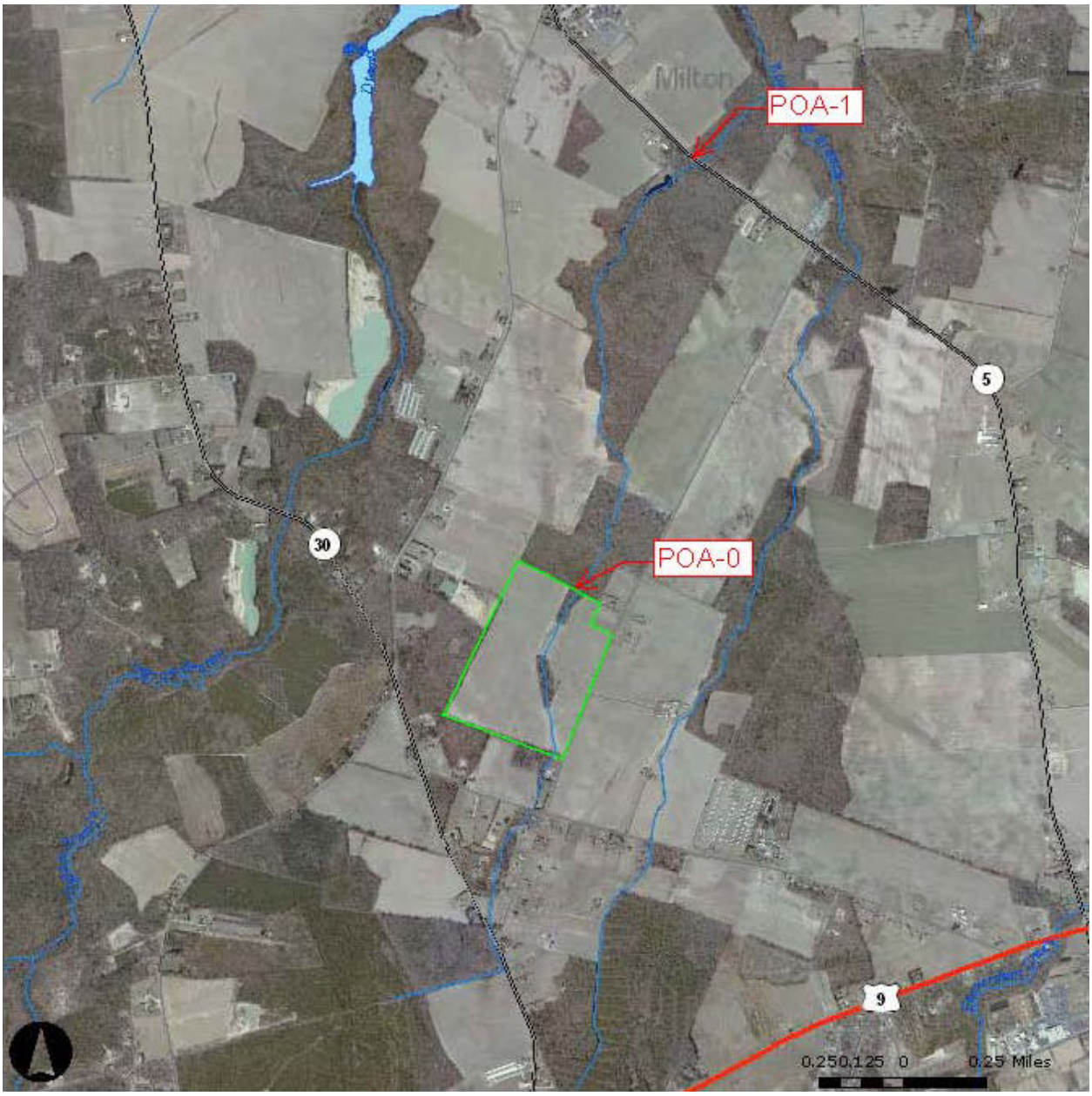

Fig. 1 Broadkill Estates – Points of Analysis (POAs)

Fig. 2 Broadkill Estates – POA-0 (looking upstream)

Fig. 3 Broadkill Estates – POA-0 (looking downstream)

Fig. 4 Broadkill Estates – POA-1 (looking upstream)

Fig. 5 Broadkill Estates – POA-1 (looking downstream)

From: South District Public Works Manager (DelDOT)
Sent: Thursday, June 18, 2009 3:11 PM
To: irengineer@gtcinc.net
Subject: RE: Proposed Broadkill Estates Subdivision

Based on our review there are no historic or known drainage problems at either the frontage along Pettyjohn Rd. nor at the Rt. 5 crossing culvert. If we can be of any further assistance on this project, please contact our office.

Public Works Manager
DelDOT Southern Maintenance District

From: irengineer@gtcinc.net
Sent: Thursday, June 18, 2009 3:04 PM
To: South District Public Works Manager (DelDOT)
Subject: Proposed Broadkill Estates Subdivision

Our firm has been selected by Mr. I. M. Developer to prepare the civil site design for the proposed Broadkill Estates residential subdivision. As part of our responsibility, we are required to contact the DelDOT Maintenance District in your area of jurisdiction to determine if there are any historic or known drainage problems which may be affected. The project is located on Pettyjohn Rd. near Milton, Delaware (see attached location map). Parcel ID is 235-25.00-44.00. There is a small un-named tributary stream through the site which eventually reaches a culvert under Rt. 5. Your assistance in this matter is greatly appreciated.

Regards,
I.R. Engineer, P.E.
Green Technology Consulting, Inc.

STATE OF DELAWARE
DEPARTMENT OF *TRANSPORTATION*
800 BAY ROAD
P.O. Box 778 DOVER,
DELAWARE 19903

CAROLANN WICKS, P.E.
SECRETARY

June 18, 2009

Mr. I. M. Developer
Broadkill Estates, LLC
P.O. Box 55555
Milton, DE 19968

RE: Proposed Broadkill Estates Traffic Generation Diagram

Dear Mr. Developer,

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Aliquam et orci sit amet ipsum suscipit tempor. Maecenas non turpis vel nibh suscipit eleifend quis eu libero. Vivamus a tellus ac risus tempus egestas non sed enim. Pellentesque in turpis elit. Mauris eget enim urna. Vivamus sollicitudin aliquet tellus a rutrum. Nullam id nisi ac turpis lobortis rutrum. Vestibulum enim turpis, convallis vitae vulputate et, cursus at felis. Cras vitae elit dolor. Aliquam id urna nec ipsum dictum tincidunt sit amet nec odio. Quisque tempus varius lacus in scelerisque. Nam facilisis odio congue nisi accumsan at tincidunt enim volutpat.

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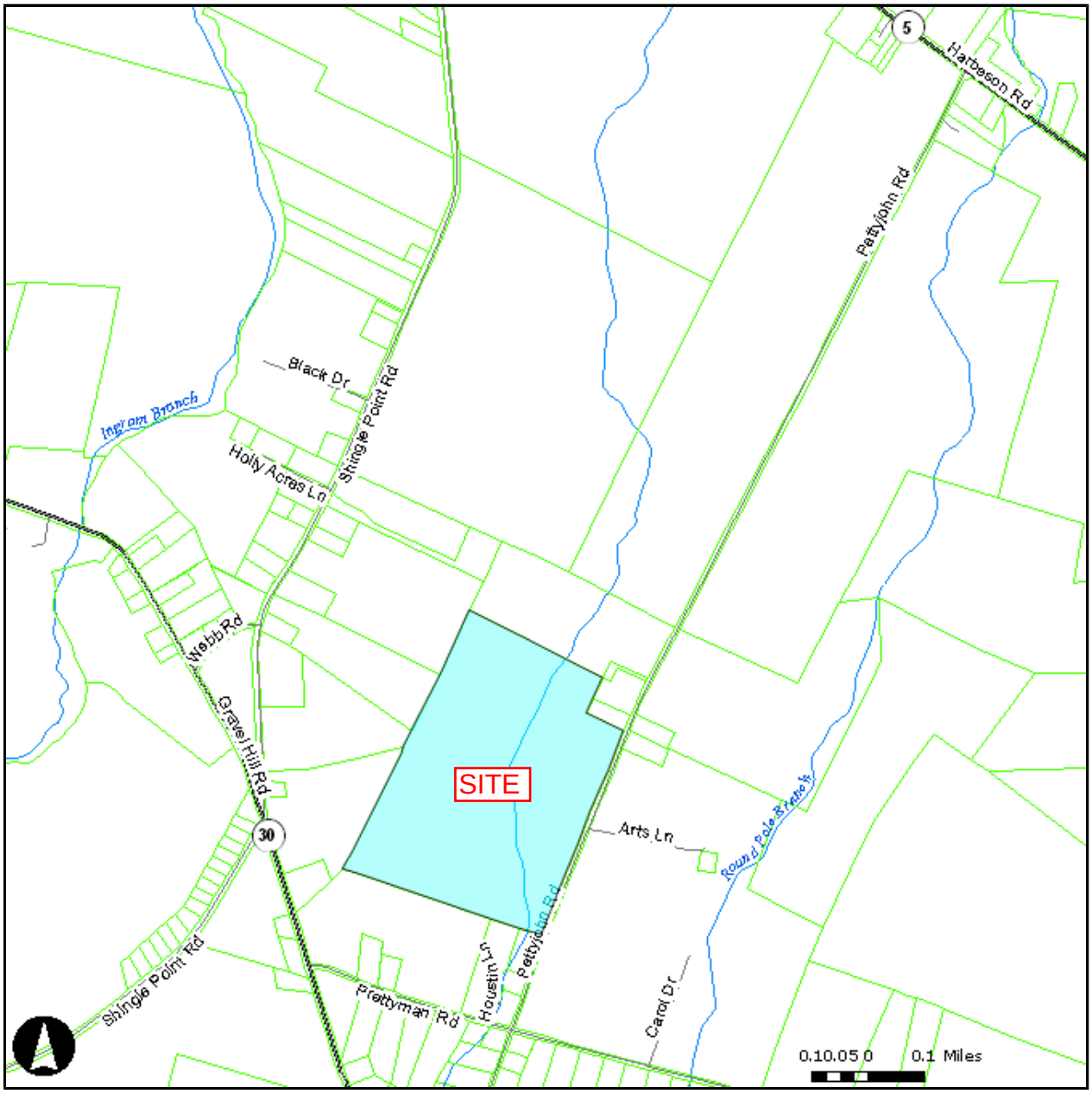
Sincerely,

Subdivision Engineer

Map



2 (Parcels - Sussex)

Rivers Lakes and Bays

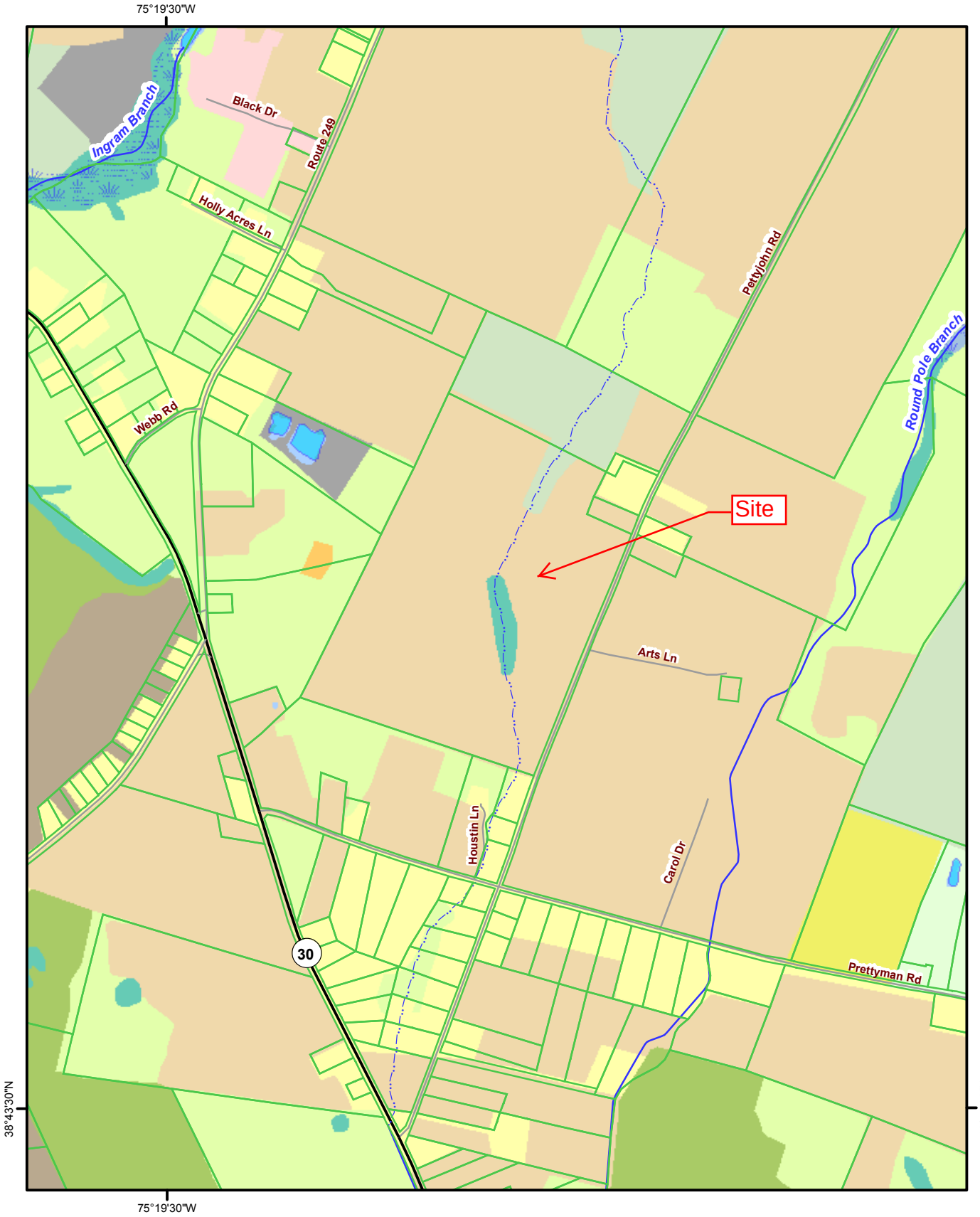
Proposed December 2015

Map

Rivers Lakes and Bays

Proposed December 2015

State of Delaware



Data on map are based on Delaware framework data layers. The Delaware DataMIL is maintained by the Delaware Geological Survey (DGS) and served via the Delaware Department of Technology and Information (DTI) internet.

Scale 1:13,020

0 0.05 0.1 0.2
Kilometers

0 350 700 1400
Feet

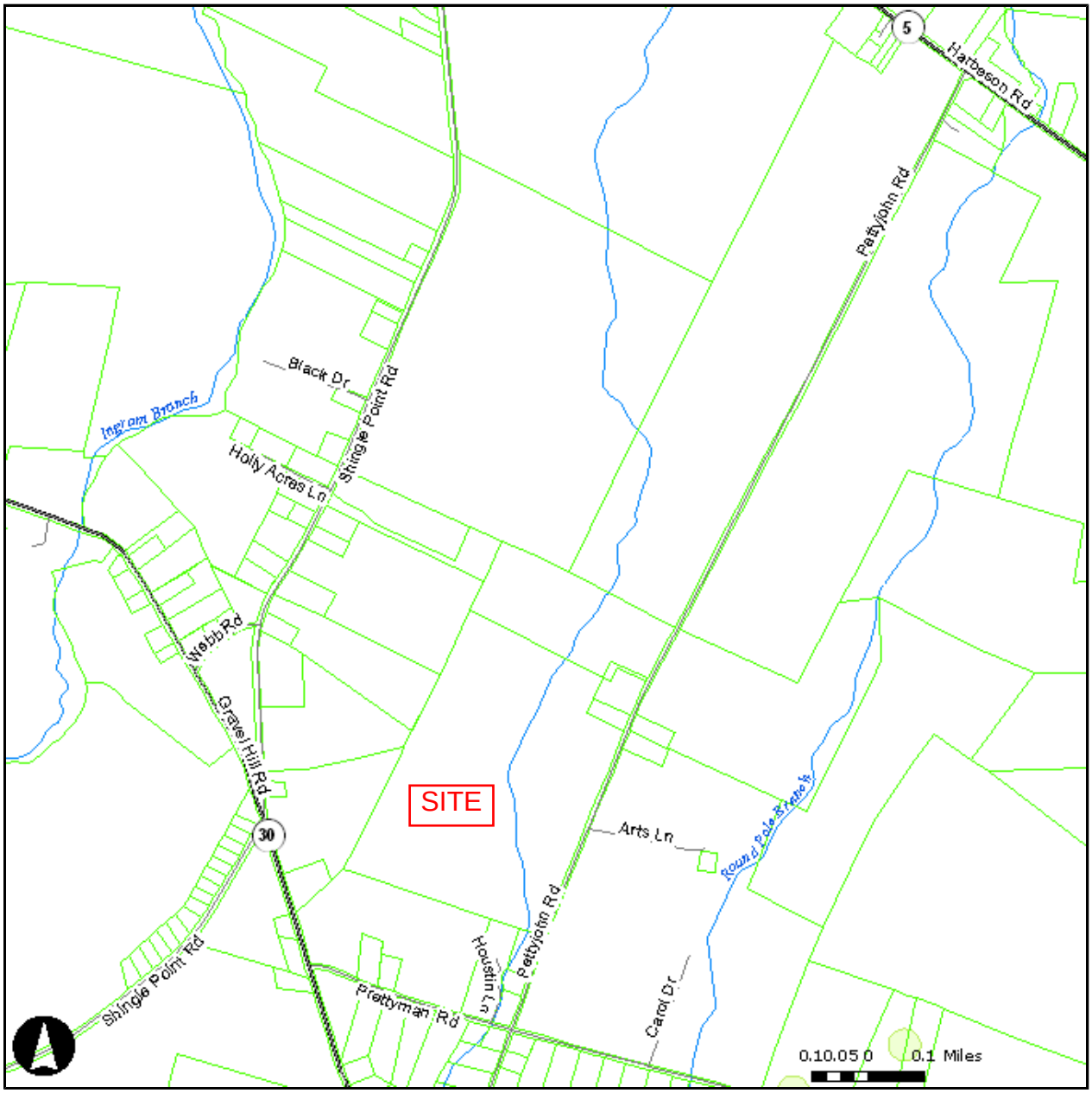
3.02.1.5-18

Magnetic Declination

DataMIL Mini Map

Proposed December 2015

Map

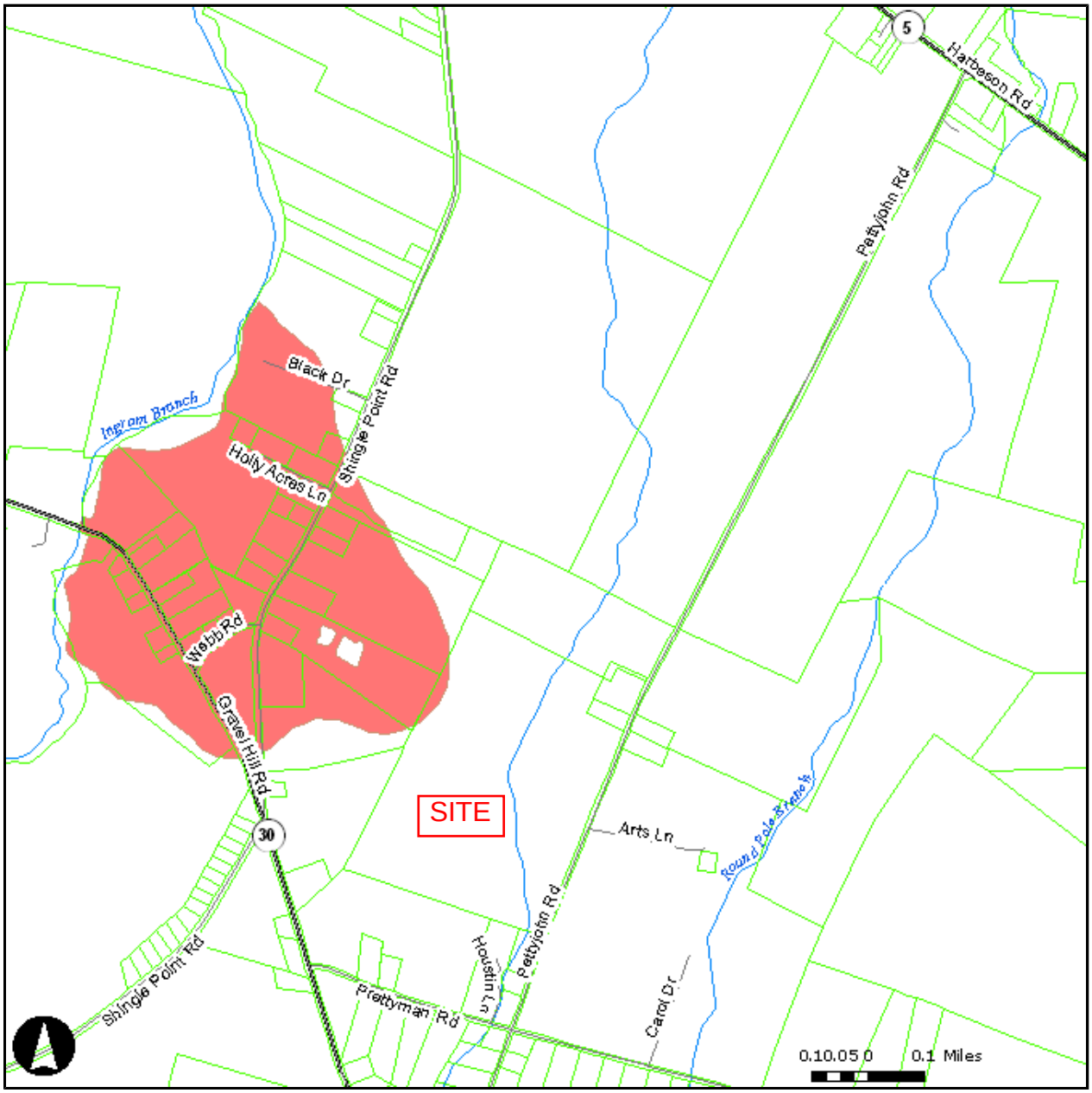


Wellhead Protection Areas

Rivers Lakes and Bays

Proposed December 2015

Map

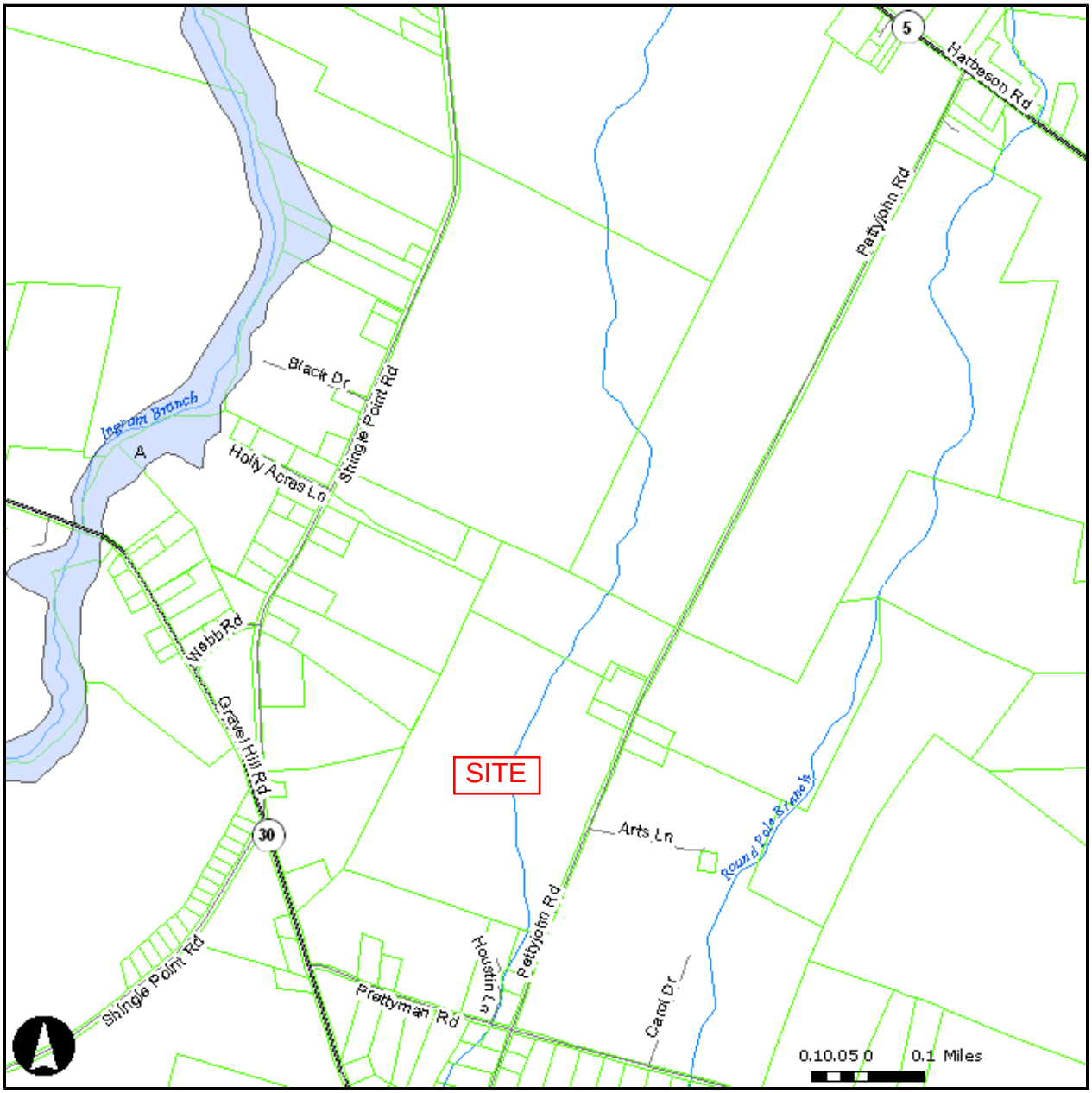


Recharge Areas

Rivers Lakes and Bays

Proposed December 2015

Map

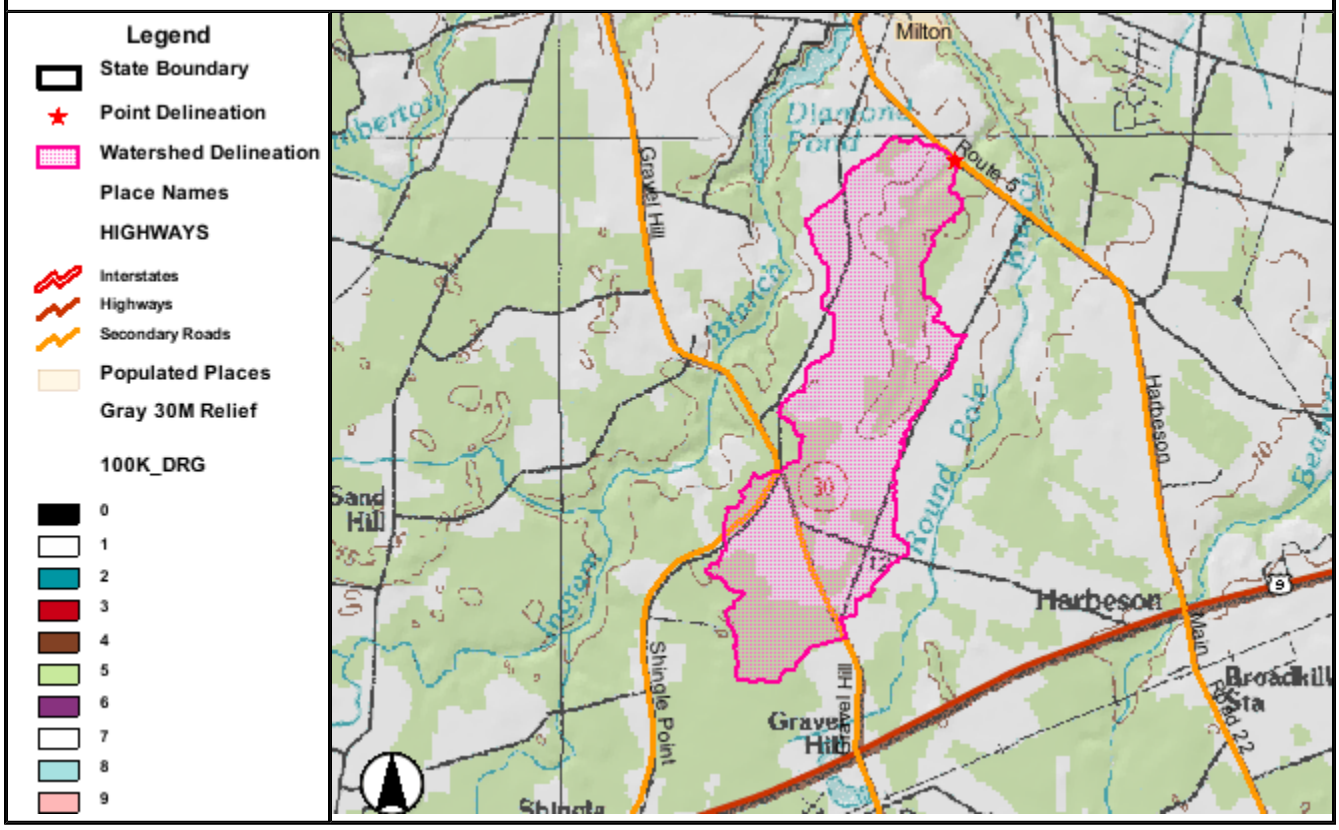


FEMA Flood Maps
- X 500
- A
- AE
- AO
- VE

Rivers Lakes and Bays

Proposed December 2015

Site 1 - 10% Watershed Delineation



Proposed December 2015

Basin Characteristics Report

Date: Thu May 7 2009 10:52:56
Latitude (NAD83): 38.7580 (38 45 28)
Longitude (NAD83): -75.3073 (-75 18 26)

Parameter	Value
Area that drains to a point on a stream, in square miles	1.71
Mean basin slope computed from 10 m DEM	0.69
Percentage of area covered by forest	32.2
_2000 housing density in homes per acre	0.0658
Percentage of area in STATSGO Hydrologic Soils Group A	26.5
Percentage of impervious area determined from NLCD 2001 impervious dataset	0.3
Percent storage (wetlands and waterbodies) determined from 1:24K NHD	0.39

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Sussex County, Delaware

SWM Soils Report for Broadkill Estates

Proposed December 2015

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Proposed December 2015

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
- Oceans
- Streams and Canals

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

MAP INFORMATION

Map Scale: 1:6,240 if printed on A size (8.5" × 11") sheet.

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

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**
CdB	Cedartown loamy sand, 0 to 5 percent slopes	4.2	3.9%
DnA	Downer loamy sand, 0 to 2 percent slopes	4.8	4.4%
DnB	Downer loamy sand, 2 to 5 percent slopes	7.5	6.9%
EvB	Evesboro loamy sand, 0 to 5 percent slopes	0.5	0.5%
FhA	Fort Mott-Henlopen complex, 0 to 2 percent slopes	32.7	30.2%
HnA	Hammonton sandy loam, 0 to 2 percent slopes	7.6	7.0%
HpB	Henlopen loamy sand, 2 to 5 percent slopes	14.1	13.0%
KgB	Klej-Galloway complex, 0 to 5 percent slopes	15.6	14.3%
PsA	Pepperbox-Rosedale complex, 0 to 2 percent slopes	21.5	19.8%
Totals for Area of Interest		**108.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

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

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the

contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Sussex County, Delaware

CdB—Cedartown loamy sand, 0 to 5 percent slopes

Map Unit Setting

Elevation: 10 to 70 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days

Map Unit Composition

Cedartown and similar soils: 75 percent
Minor components: 25 percent

Description of Cedartown

Setting

Landform: Knolls, flats, dunes
Landform position (three-dimensional): Rise, talf
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Sandy eolian deposits and/or fluviomarine sediments

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 40 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability (nonirrigated): 3s

Typical profile

0 to 6 inches: Loamy sand
6 to 14 inches: Sand
14 to 30 inches: Loamy sand
30 to 42 inches: Loamy sand
42 to 64 inches: Sand
64 to 80 inches: Fine sandy loam

Minor Components

Galestown

Percent of map unit: 10 percent
Landform: Knolls, flats

Rosedale

Percent of map unit: 5 percent
Landform: Flats

Klej

Percent of map unit: 5 percent
Landform: Depressions

Evesboro

Percent of map unit: 5 percent
Landform: Dunes, knolls, flats
Landform position (three-dimensional): Rise

DnA—Downer loamy sand, 0 to 2 percent slopes

Map Unit Setting

Elevation: 20 to 70 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days

Map Unit Composition

Downer and similar soils: 80 percent
Minor components: 20 percent

Description of Downer

Setting

Landform: Flats, knolls, fluviomarine terraces
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Loamy fluviomarine sediments

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability (nonirrigated): 1

Typical profile

0 to 11 inches: Loamy sand
11 to 35 inches: Sandy loam
35 to 80 inches: Loamy sand

Minor Components

Galestown
Percent of map unit: 10 percent
Landform: Flats, fluviomarine terraces

Hammonton
Percent of map unit: 5 percent
Landform: Flats, depressions, swales

Ingleside
Percent of map unit: 5 percent
Landform: Flats

DnB—Downer loamy sand, 2 to 5 percent slopes

Map Unit Setting
Elevation: 20 to 70 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days

Map Unit Composition
Downer and similar soils: 80 percent
Minor components: 20 percent

Description of Downer

Setting
Landform: Flats, knolls, fluviomarine terraces
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Loamy fluviomarine sediments

Properties and qualities
Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.5 inches)

Interpretive groups
Land capability classification (irrigated): 2e
Land capability (nonirrigated): 2e

Typical profile
0 to 11 inches: Loamy sand
11 to 35 inches: Sandy loam

35 to 80 inches: Loamy sand

Minor Components

Galestown
Percent of map unit: 10 percent
Landform: Flats, fluviomarine terraces

Ingleside
Percent of map unit: 5 percent
Landform: Flats

Hammonton
Percent of map unit: 5 percent
Landform: Flats, depressions, swales

EvB—Evesboro loamy sand, 0 to 5 percent slopes

Map Unit Setting
Elevation: 10 to 70 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days

Map Unit Composition
Evesboro and similar soils: 75 percent
Minor components: 25 percent

Description of Evesboro

Setting
Landform: Flats, knolls, fluviomarine terraces, dunes
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Sandy eolian deposits and/or fluviomarine sediments

Properties and qualities
Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.9 inches)

Interpretive groups
Land capability classification (irrigated): 3s
Land capability (nonirrigated): 4s

Typical profile

0 to 4 inches: Loamy sand
4 to 16 inches: Loamy sand
16 to 39 inches: Loamy sand
39 to 80 inches: Sand

Minor Components

Runclint

Percent of map unit: 10 percent
Landform: Flats, knolls, dunes

Cedartown

Percent of map unit: 5 percent
Landform: Flats, knolls, dunes

Fort mott

Percent of map unit: 5 percent
Landform: Dunes, knolls, flats

Galloway

Percent of map unit: 5 percent
Landform: Flats, depressions
Landform position (three-dimensional): Dip

FhA—Fort Mott-Henlopen complex, 0 to 2 percent slopes

Map Unit Setting

Elevation: 20 to 70 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days

Map Unit Composition

Fort mott and similar soils: 45 percent
Henlopen and similar soils: 35 percent
Minor components: 20 percent

Description of Fort Mott

Setting

Landform: Flats, fluviomarine terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy eolian deposits over fluviomarine sediments

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (1.28 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability (nonirrigated): 2s

Typical profile

0 to 10 inches: Loamy sand
10 to 24 inches: Loamy sand
24 to 36 inches: Sandy loam
36 to 80 inches: Loamy sand

Description of Henlopen

Setting

Landform: Marine terraces, dunes
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy eolian deposits and loamy fluviomarine sediments

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability (nonirrigated): 3s

Typical profile

0 to 10 inches: Loamy sand
10 to 46 inches: Loamy sand
46 to 62 inches: Sandy loam
62 to 80 inches: Sand

Minor Components

Ingleside

Percent of map unit: 5 percent
Landform: Flats

Runclint

Percent of map unit: 5 percent
Landform: Dunes, knolls, flats

Rosedale

Percent of map unit: 5 percent
Landform: Flats, knolls

Downer
Percent of map unit: 5 percent
Landform: Flats

HnA—Hammonton sandy loam, 0 to 2 percent slopes

Map Unit Setting
Elevation: 0 to 120 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days

Map Unit Composition
Hammonton and similar soils: 80 percent
Minor components: 20 percent

Description of Hammonton

Setting
Landform: Flats, depressions, drainageways
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Loamy fluviomarine sediments

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 20 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.4 inches)

Interpretive groups
Land capability classification (irrigated): 2w
Land capability (nonirrigated): 2w

Typical profile
0 to 11 inches: Sandy loam
11 to 30 inches: Sandy loam
30 to 80 inches: Sand

Minor Components

Ingleside
Percent of map unit: 5 percent
Landform: Flats

Klej

Percent of map unit: 5 percent
Landform: Flats, depressions, swales

Hurlock

Percent of map unit: 5 percent
Landform: Depressions, flats
Landform position (three-dimensional): Dip

Rosedale

Percent of map unit: 5 percent
Landform: Flats, knolls

HpB—Henlopen loamy sand, 2 to 5 percent slopes

Map Unit Setting

Elevation: 20 to 70 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days

Map Unit Composition

Henlopen and similar soils: 80 percent
Minor components: 20 percent

Description of Henlopen

Setting

Landform: Marine terraces, dunes
Down-slope shape: Linear, convex
Across-slope shape: Linear
Parent material: Sandy eolian deposits and loamy fluviomarine sediments

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability (nonirrigated): 3s

Typical profile

0 to 10 inches: Loamy sand
10 to 46 inches: Loamy sand

46 to 62 inches: Sandy loam
62 to 80 inches: Sand

Minor Components

Ingleside
Percent of map unit: 5 percent
Landform: Flats

Runclint
Percent of map unit: 5 percent
Landform: Dunes, knolls, flats

Rosedale
Percent of map unit: 5 percent
Landform: Flats, knolls

Fort mott
Percent of map unit: 5 percent
Landform: Flats

KgB—Klej-Galloway complex, 0 to 5 percent slopes

Map Unit Setting
Elevation: 0 to 100 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days

Map Unit Composition
Klej and similar soils: 45 percent
Galloway and similar soils: 35 percent
Minor components: 20 percent

Description of Klej

Setting
Landform: Flats, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Sandy eolian deposits and/or fluviomarine sediments

Properties and qualities
Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.57 to 19.98 in/hr)
Depth to water table: About 10 to 20 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability (nonirrigated): 3w

Typical profile

0 to 7 inches: Loamy sand
7 to 14 inches: Loamy sand
14 to 20 inches: Loamy sand
20 to 62 inches: Loamy sand
62 to 80 inches: Sand

Description of Galloway

Setting

Landform: Depressions, flats
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Sandy eolian deposits and/or fluviomarine sediments

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.38 to 99.90 in/hr)
Depth to water table: About 20 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability (nonirrigated): 2e

Typical profile

0 to 12 inches: Loamy sand
12 to 15 inches: Loamy sand
15 to 30 inches: Loamy sand
30 to 80 inches: Sand

Minor Components

Hammonton

Percent of map unit: 5 percent
Landform: Flats

Runclint

Percent of map unit: 5 percent
Landform: Dunes, flats, knolls
Landform position (three-dimensional): Rise

Hurlock

Percent of map unit: 5 percent
Landform: Flats, depressions, drainageways, swales

Berryland

Percent of map unit: 5 percent
Landform: Depressions, drainageways, swales

PsA—Pepperbox-Rosedale complex, 0 to 2 percent slopes

Map Unit Setting

Elevation: 0 to 70 feet
Mean annual precipitation: 42 to 48 inches
Mean annual air temperature: 52 to 58 degrees F
Frost-free period: 180 to 220 days

Map Unit Composition

Pepperbox and similar soils: 45 percent
Rosedale and similar soils: 45 percent
Minor components: 10 percent

Description of Rosedale

Setting

Landform: Flats
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy eolian deposits over fluviomarine sediments

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: About 40 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability (nonirrigated): 2s

Typical profile

0 to 9 inches: Loamy sand
9 to 25 inches: Loamy sand
25 to 38 inches: Sandy loam
38 to 68 inches: Loamy sand
68 to 80 inches: Sandy clay loam

Description of Pepperbox

Setting

Landform: Flats, depressions
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave

Parent material: Sandy eolian deposits over fluviomarine sediments

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 1.98 in/hr)
Depth to water table: About 20 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 8.2 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability (nonirrigated): 2w

Typical profile

0 to 10 inches: Loamy sand
10 to 25 inches: Loamy sand
25 to 37 inches: Sandy loam
37 to 65 inches: Sandy clay loam
65 to 80 inches: Sandy clay loam

Minor Components

Fort mott

Percent of map unit: 5 percent
Landform: Knolls, flats
Landform position (three-dimensional): Rise

Rockawalkin

Percent of map unit: 5 percent
Landform: Flats

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Hydric Rating by Map Unit

This rating indicates the proportion of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is designated as "all hydric," "partially hydric," "not hydric," or "unknown hydric," depending on the rating of its respective components.

"All hydric" means that all components listed for a given map unit are rated as being hydric, while "not hydric" means that all components are rated as not hydric. "Partially hydric" means that at least one component of the map unit is rated as hyric, and at least one component is rated as not hydric. "Unknown hydric" indicates that at least one component is not rated so a definitive rating for the map unit cannot be made.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part

(Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

Custom Soil Resource Report
Map—Hydric Rating by Map Unit

Proposed December 2015

MAP LEGEND

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

Soils
- Soil Map Units

Soil Ratings
- All Hydric
- Partially Hydric
- Not Hydric
- Unknown Hydric
- Not rated or not available

Political Features
- Cities

Water Features
- Oceans
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Transportation
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Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N NAD83

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

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Table—Hydric Rating by Map Unit

Hydric Rating by Map Unit— Summary by Map Unit — Sussex County, Delaware				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
CdB	Cedartown loamy sand, 0 to 5 percent slopes	Not Hydric	4.2	3.9%
DnA	Downer loamy sand, 0 to 2 percent slopes	Not Hydric	4.8	4.4%
DnB	Downer loamy sand, 2 to 5 percent slopes	Not Hydric	7.5	6.9%
EvB	Evesboro loamy sand, 0 to 5 percent slopes	Not Hydric	0.5	0.5%
FhA	Fort Mott-Henlopen complex, 0 to 2 percent slopes	Not Hydric	32.7	30.2%
HnA	Hammonton sandy loam, 0 to 2 percent slopes	Partially Hydric	7.6	7.0%
HpB	Henlopen loamy sand, 2 to 5 percent slopes	Not Hydric	14.1	13.0%
KgB	Klej-Galloway complex, 0 to 5 percent slopes	Partially Hydric	15.6	14.3%
PsA	Pepperbox-Rosedale complex, 0 to 2 percent slopes	Not Hydric	21.5	19.8%
Totals for Area of Interest			**108.5**	**100.0%**

Rating Options—Hydric Rating by Map Unit

Aggregation Method: Absence/Presence

Tie-break Rule: Lower

Water Management

Water Management interpretations are tools for evaluating the potential of the soil in the application of various water management practices. Example interpretations include pond reservoir area, embankments, dikes, levees, and excavated ponds.

Embankments, Dikes, and Levees

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. 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 about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the suitability of the undisturbed soil for supporting the 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.

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 the specified use. "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 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).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report
Map—Embankments, Dikes, and Levees

Proposed December 2015

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

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

MAP INFORMATION

Map Scale: 1:6,240 if printed on A size (8.5" × 11") sheet.

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

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.

Tables—Embankments, Dikes, and Levees

Embankments, Dikes, and Levees— Summary by Map Unit — Sussex County, Delaware						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
CdB	Cedartown loamy sand, 0 to 5 percent slopes	Somewhat limited	Cedartown (75%)	Seepage (0.67)	4.2	3.9%
				Depth to saturated zone (0.02)		
DnA	Downer loamy sand, 0 to 2 percent slopes	Somewhat limited	Downer (80%)	Seepage (0.31)	4.8	4.4%
DnB	Downer loamy sand, 2 to 5 percent slopes	Somewhat limited	Downer (80%)	Seepage (0.31)	7.5	6.9%
EvB	Evesboro loamy sand, 0 to 5 percent slopes	Somewhat limited	Evesboro (75%)	Seepage (0.90)	0.5	0.5%
FhA	Fort Mott-Henlopen complex, 0 to 2 percent slopes	Somewhat limited	Fort Mott (45%)	Seepage (0.12)	32.7	30.2%
			Henlopen (35%)	Seepage (0.22)		
HnA	Hammonton sandy loam, 0 to 2 percent slopes	Very limited	Hammonton (80%)	Depth to saturated zone (1.00)	7.6	7.0%
				Seepage (0.43)		
HpB	Henlopen loamy sand, 2 to 5 percent slopes	Somewhat limited	Henlopen (80%)	Seepage (0.22)	14.1	13.0%
KgB	Klej-Galloway complex, 0 to 5 percent slopes	Very limited	Klej (45%)	Depth to saturated zone (1.00)	15.6	14.3%
				Seepage (0.36)		
			Galloway (35%)	Depth to saturated zone (1.00)		
				Seepage (0.90)		
PsA	Pepperbox-Rosedale complex, 0 to 2 percent slopes	Very limited	Pepperbox (45%)	Depth to saturated zone (1.00)	21.5	19.8%
				Seepage (0.06)		
Totals for Area of Interest					**108.5**	**100.0%**

Embankments, Dikes, and Levees— Summary by Rating Value		
Rating	**Acres in AOI**	**Percent of AOI**
Somewhat limited	63.8	58.8%
Very limited	44.7	41.2%
Totals for Area of Interest	**108.5**	**100.0%**

Rating Options—Embankments, Dikes, and Levees

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Excavated Ponds (Aquifer-Fed)

Excavated ponds (aquifer-fed) 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, saturated hydraulic conductivity (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.

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 the specified use. "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 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).

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Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report
Map—Excavated Ponds (Aquifer-Fed)

Proposed December 2015

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

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

MAP INFORMATION

Map Scale: 1:6,240 if printed on A size (8.5" × 11") sheet.

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

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

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Tables—Excavated Ponds (Aquifer-Fed)

Excavated Ponds (Aquifer-Fed)— Summary by Map Unit — Sussex County, Delaware						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
CdB	Cedartown loamy sand, 0 to 5 percent slopes	Very limited	Cedartown (75%)	Cutbanks cave (1.00)	4.2	3.9%
				Depth to saturated zone (0.68)		
DnA	Downer loamy sand, 0 to 2 percent slopes	Very limited	Downer (80%)	Depth to water (1.00)	4.8	4.4%
DnB	Downer loamy sand, 2 to 5 percent slopes	Very limited	Downer (80%)	Depth to water (1.00)	7.5	6.9%
EvB	Evesboro loamy sand, 0 to 5 percent slopes	Very limited	Evesboro (75%)	Depth to water (1.00)	0.5	0.5%
FhA	Fort Mott-Henlopen complex, 0 to 2 percent slopes	Very limited	Fort Mott (45%)	Depth to water (1.00)	32.7	30.2%
			Henlopen (35%)	Depth to water (1.00)		
HnA	Hammonton sandy loam, 0 to 2 percent slopes	Very limited	Hammonton (80%)	Cutbanks cave (1.00)	7.6	7.0%
				Depth to saturated zone (0.00)		
HpB	Henlopen loamy sand, 2 to 5 percent slopes	Very limited	Henlopen (80%)	Depth to water (1.00)	14.1	13.0%
KgB	Klej-Galloway complex, 0 to 5 percent slopes	Very limited	Klej (45%)	Cutbanks cave (1.00)	15.6	14.3%
			Galloway (35%)	Cutbanks cave (1.00)		
				Depth to saturated zone (0.00)		
PsA	Pepperbox-Rosedale complex, 0 to 2 percent slopes	Very limited	Rosedale (45%)	Cutbanks cave (1.00)	21.5	19.8%
				Depth to saturated zone (0.68)		
			Pepperbox (45%)	Cutbanks cave (1.00)		
				Depth to saturated zone (0.00)		
Totals for Area of Interest					**108.5**	**100.0%**

Excavated Ponds (Aquifer-Fed)— Summary by Rating Value		
Rating	**Acres in AOI**	**Percent of AOI**
Very limited	108.5	100.0%
Totals for Area of Interest	**108.5**	**100.0%**

Rating Options—Excavated Ponds (Aquifer-Fed)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Pond Reservoir Areas

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.

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 the specified use. "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 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).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report
Map—Pond Reservoir Areas

Proposed December 2015

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

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

MAP INFORMATION

Map Scale: 1:6,240 if printed on A size (8.5" × 11") sheet.

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

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

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Tables—Pond Reservoir Areas

Pond Reservoir Areas— Summary by Map Unit — Sussex County, Delaware						
Map unit symbol	**Map unit name**	**Rating**	**Component name (percent)**	**Rating reasons (numeric values)**	**Acres in AOI**	**Percent of AOI**
CdB	Cedartown loamy sand, 0 to 5 percent slopes	Very limited	Cedartown (75%)	Seepage (1.00)	4.2	3.9%
DnA	Downer loamy sand, 0 to 2 percent slopes	Very limited	Downer (80%)	Seepage (1.00)	4.8	4.4%
DnB	Downer loamy sand, 2 to 5 percent slopes	Very limited	Downer (80%)	Seepage (1.00)	7.5	6.9%
EvB	Evesboro loamy sand, 0 to 5 percent slopes	Very limited	Evesboro (75%)	Seepage (1.00)	0.5	0.5%
FhA	Fort Mott-Henlopen complex, 0 to 2 percent slopes	Very limited	Fort Mott (45%)	Seepage (1.00)	32.7	30.2%
			Henlopen (35%)	Seepage (1.00)		
HnA	Hammonton sandy loam, 0 to 2 percent slopes	Very limited	Hammonton (80%)	Seepage (1.00)	7.6	7.0%
HpB	Henlopen loamy sand, 2 to 5 percent slopes	Very limited	Henlopen (80%)	Seepage (1.00)	14.1	13.0%
KgB	Klej-Galloway complex, 0 to 5 percent slopes	Very limited	Klej (45%)	Seepage (1.00)	15.6	14.3%
			Galloway (35%)	Seepage (1.00)		
PsA	Pepperbox-Rosedale complex, 0 to 2 percent slopes	Very limited	Rosedale (45%)	Seepage (1.00)	21.5	19.8%
			Pepperbox (45%)	Seepage (1.00)		
Totals for Area of Interest					**108.5**	**100.0%**

Pond Reservoir Areas— Summary by Rating Value		
Rating	**Acres in AOI**	**Percent of AOI**
Very limited	108.5	100.0%
Totals for Area of Interest	**108.5**	**100.0%**

Rating Options—Pond Reservoir Areas

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Erosion Factors

Soil Erosion Factors are soil properties and interpretations used in evaluating the soil for potential erosion. Example soil erosion factors can include K factor for the whole soil or on a rock free basis, T factor, wind erodibility group and wind erodibility index.

K Factor, Whole Soil

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Custom Soil Resource Report
Map—K Factor, Whole Soil

Proposed December 2015

MAP LEGEND

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

Soils
- Soil Map Units

Soil Ratings
- .02
- .05
- .10
- .15
- .17
- .20
- .24
- .28
- .32
- .37
- .43
- .49
- .55
- .64
- Not rated or not available

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

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

MAP INFORMATION

Map Scale: 1:6,240 if printed on A size (8.5" × 11") sheet.

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

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.

Table—K Factor, Whole Soil

K Factor, Whole Soil— Summary by Map Unit — Sussex County, Delaware				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
CdB	Cedartown loamy sand, 0 to 5 percent slopes	.10	4.2	3.9%
DnA	Downer loamy sand, 0 to 2 percent slopes	.15	4.8	4.4%
DnB	Downer loamy sand, 2 to 5 percent slopes	.15	7.5	6.9%
EvB	Evesboro loamy sand, 0 to 5 percent slopes	.10	0.5	0.5%
FhA	Fort Mott-Henlopen complex, 0 to 2 percent slopes	.15	32.7	30.2%
HnA	Hammonton sandy loam, 0 to 2 percent slopes	.20	7.6	7.0%
HpB	Henlopen loamy sand, 2 to 5 percent slopes	.15	14.1	13.0%
KgB	Klej-Galloway complex, 0 to 5 percent slopes	.10	15.6	14.3%
PsA	Pepperbox-Rosedale complex, 0 to 2 percent slopes	.15	21.5	19.8%
Totals for Area of Interest			**108.5**	**100.0%**

Rating Options—K Factor, Whole Soil

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Layer Options: Surface Layer

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Drainage Class

"Drainage class (natural)" refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime

by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized-excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the "Soil Survey Manual."

Proposed December 2015

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Not rated or not available

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

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

MAP INFORMATION

Map Scale: 1:6,240 if printed on A size (8.5" × 11") sheet.

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

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

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Survey Area Data: Version 9, Oct 18, 2006

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

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Table—Drainage Class

Drainage Class— Summary by Map Unit — Sussex County, Delaware				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
CdB	Cedartown loamy sand, 0 to 5 percent slopes	Somewhat excessively drained	4.2	3.9%
DnA	Downer loamy sand, 0 to 2 percent slopes	Well drained	4.8	4.4%
DnB	Downer loamy sand, 2 to 5 percent slopes	Well drained	7.5	6.9%
EvB	Evesboro loamy sand, 0 to 5 percent slopes	Excessively drained	0.5	0.5%
FhA	Fort Mott-Henlopen complex, 0 to 2 percent slopes	Well drained	32.7	30.2%
HnA	Hammonton sandy loam, 0 to 2 percent slopes	Moderately well drained	7.6	7.0%
HpB	Henlopen loamy sand, 2 to 5 percent slopes	Somewhat excessively drained	14.1	13.0%
KgB	Klej-Galloway complex, 0 to 5 percent slopes	Somewhat poorly drained	15.6	14.3%
PsA	Pepperbox-Rosedale complex, 0 to 2 percent slopes	Moderately well drained	21.5	19.8%
Totals for Area of Interest			**108.5**	**100.0%**

Rating Options—Drainage Class

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Hydrologic Soil Group

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

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

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

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

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

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

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

Custom Soil Resource Report
Map—Hydrologic Soil Group

Proposed December 2015

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

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

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

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

MAP INFORMATION

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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.

Table—Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Sussex County, Delaware				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
CdB	Cedartown loamy sand, 0 to 5 percent slopes	A	4.2	3.9%
DnA	Downer loamy sand, 0 to 2 percent slopes	B	4.8	4.4%
DnB	Downer loamy sand, 2 to 5 percent slopes	B	7.5	6.9%
EvB	Evesboro loamy sand, 0 to 5 percent slopes	A	0.5	0.5%
FhA	Fort Mott-Henlopen complex, 0 to 2 percent slopes	A	32.7	30.2%
HnA	Hammonton sandy loam, 0 to 2 percent slopes	B	7.6	7.0%
HpB	Henlopen loamy sand, 2 to 5 percent slopes	A	14.1	13.0%
KgB	Klej-Galloway complex, 0 to 5 percent slopes	C	15.6	14.3%
PsA	Pepperbox-Rosedale complex, 0 to 2 percent slopes	A	21.5	19.8%
Totals for Area of Interest			**108.5**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Water Features

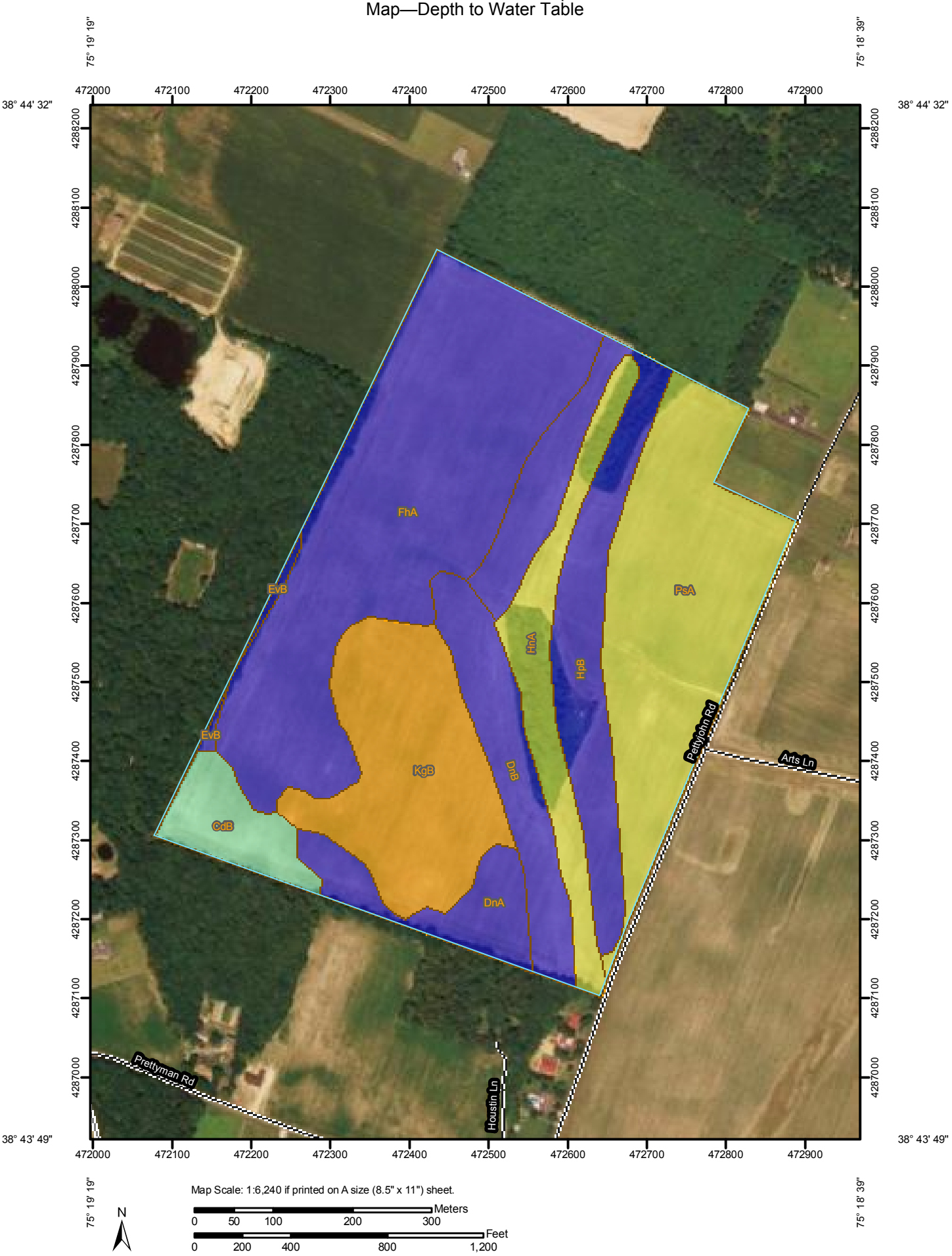
Water Features include ponding frequency, flooding frequency, and depth to water table.

Depth to Water Table

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Custom Soil Resource Report
Map—Depth to Water Table



Proposed December 2015

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

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

MAP INFORMATION

Map Scale: 1:6,240 if printed on A size (8.5" × 11") sheet.

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

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

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Table—Depth to Water Table

Depth to Water Table— Summary by Map Unit — Sussex County, Delaware				
Map unit symbol	**Map unit name**	**Rating (centimeters)**	**Acres in AOI**	**Percent of AOI**
CdB	Cedartown loamy sand, 0 to 5 percent slopes	114	4.2	3.9%
DnA	Downer loamy sand, 0 to 2 percent slopes	>200	4.8	4.4%
DnB	Downer loamy sand, 2 to 5 percent slopes	>200	7.5	6.9%
EvB	Evesboro loamy sand, 0 to 5 percent slopes	>200	0.5	0.5%
FhA	Fort Mott-Henlopen complex, 0 to 2 percent slopes	>200	32.7	30.2%
HnA	Hammonton sandy loam, 0 to 2 percent slopes	61	7.6	7.0%
HpB	Henlopen loamy sand, 2 to 5 percent slopes	>200	14.1	13.0%
KgB	Klej-Galloway complex, 0 to 5 percent slopes	30	15.6	14.3%
PsA	Pepperbox-Rosedale complex, 0 to 2 percent slopes	61	21.5	19.8%
Totals for Area of Interest			**108.5**	**100.0%**

Rating Options—Depth to Water Table

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December

Flooding Frequency Class

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent.

"None" means that flooding is not probable. The chance of flooding is nearly 0 percent in any year. Flooding occurs less than once in 500 years.

"Very rare" means that flooding is very unlikely but possible under extremely unusual weather conditions. The chance of flooding is less than 1 percent in any year.

"Rare" means that flooding is unlikely but possible under unusual weather conditions. The chance of flooding is 1 to 5 percent in any year.

"Occasional" means that flooding occurs infrequently under normal weather conditions. The chance of flooding is 5 to 50 percent in any year.

"Frequent" means that flooding is likely to occur often under normal weather conditions. The chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year.

"Very frequent" means that flooding is likely to occur very often under normal weather conditions. The chance of flooding is more than 50 percent in all months of any year.

Custom Soil Resource Report
Map—Flooding Frequency Class

Proposed December 2015

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- None
- Very Rare
- Rare
- Occasional
- Frequent
- Very Frequent

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

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

MAP INFORMATION

Map Scale: 1:6,240 if printed on A size (8.5" × 11") sheet.

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

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.

Table—Flooding Frequency Class

Flooding Frequency Class— Summary by Map Unit — Sussex County, Delaware				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
CdB	Cedartown loamy sand, 0 to 5 percent slopes	None	4.2	3.9%
DnA	Downer loamy sand, 0 to 2 percent slopes	None	4.8	4.4%
DnB	Downer loamy sand, 2 to 5 percent slopes	None	7.5	6.9%
EvB	Evesboro loamy sand, 0 to 5 percent slopes	None	0.5	0.5%
FhA	Fort Mott-Henlopen complex, 0 to 2 percent slopes	None	32.7	30.2%
HnA	Hammonton sandy loam, 0 to 2 percent slopes	None	7.6	7.0%
HpB	Henlopen loamy sand, 2 to 5 percent slopes	None	14.1	13.0%
KgB	Klej-Galloway complex, 0 to 5 percent slopes	None	15.6	14.3%
PsA	Pepperbox-Rosedale complex, 0 to 2 percent slopes	None	21.5	19.8%
Totals for Area of Interest			**108.5**	**100.0%**

Rating Options—Flooding Frequency Class

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: More Frequent

Beginning Month: January

Ending Month: December

Ponding Frequency Class

Ponding is standing water in a closed depression. The water is removed only by deep percolation, transpiration, or evaporation or by a combination of these processes. Ponding frequency classes are based on the number of times that ponding occurs over a given period. Frequency is expressed as none, rare, occasional, and frequent.

"None" means that ponding is not probable. The chance of ponding is nearly 0 percent in any year.

"Rare" means that ponding is unlikely but possible under unusual weather conditions. The chance of ponding is nearly 0 percent to 5 percent in any year.

"Occasional" means that ponding occurs, on the average, once or less in 2 years. The chance of ponding is 5 to 50 percent in any year.

"Frequent" means that ponding occurs, on the average, more than once in 2 years. The chance of ponding is more than 50 percent in any year.

Custom Soil Resource Report
Map—Ponding Frequency Class

Proposed December 2015

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- None
- Rare
- Occasional
- Frequent

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

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

MAP INFORMATION

Map Scale: 1:6,240 if printed on A size (8.5" × 11") sheet.

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

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

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Table—Ponding Frequency Class

Ponding Frequency Class— Summary by Map Unit — Sussex County, Delaware				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
CdB	Cedartown loamy sand, 0 to 5 percent slopes	None	4.2	3.9%
DnA	Downer loamy sand, 0 to 2 percent slopes	None	4.8	4.4%
DnB	Downer loamy sand, 2 to 5 percent slopes	None	7.5	6.9%
EvB	Evesboro loamy sand, 0 to 5 percent slopes	None	0.5	0.5%
FhA	Fort Mott-Henlopen complex, 0 to 2 percent slopes	None	32.7	30.2%
HnA	Hammonton sandy loam, 0 to 2 percent slopes	None	7.6	7.0%
HpB	Henlopen loamy sand, 2 to 5 percent slopes	None	14.1	13.0%
KgB	Klej-Galloway complex, 0 to 5 percent slopes	None	15.6	14.3%
PsA	Pepperbox-Rosedale complex, 0 to 2 percent slopes	None	21.5	19.8%
Totals for Area of Interest			**108.5**	**100.0%**

Rating Options—Ponding Frequency Class

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: More Frequent

Beginning Month: January

Ending Month: December

Proposed December 2015

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Building Site Development

This folder contains a collection of tabular reports that present soil interpretations related to building site development. The reports (tables) include all selected map units and components for each map unit, limiting features and interpretive ratings. Building site development interpretations are designed to be used as tools for evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its described condition and does not consider present land use. Example interpretations can include corrosion of concrete and steel, shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping.

Roads and Streets, Shallow Excavations, and Lawns and Landscaping

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 local roads and streets, shallow excavations, and lawns and landscaping.

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).

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel,

crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

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—Roads and Streets, Shallow Excavations, and Lawns and Landscaping

[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]

Roads and Streets, Shallow Excavations, and Lawns and Landscaping– Sussex County, Delaware							
Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
CdB—Cedartown loamy sand, 0 to 5 percent slopes							
Cedartown	75	Not limited		Very limited		Somewhat limited	
				Cutbanks cave	1.00	Droughty	0.68
				Depth to saturated zone	0.73		
DnA—Downer loamy sand, 0 to 2 percent slopes							
Downer	80	Not limited		Very limited		Not limited	
				Cutbanks cave	1.00		
DnB—Downer loamy sand, 2 to 5 percent slopes							
Downer	80	Not limited		Very limited		Not limited	
				Cutbanks cave	1.00		
EvB—Evesboro loamy sand, 0 to 5 percent slopes							
Evesboro	75	Not limited		Very limited		Somewhat limited	
				Cutbanks cave	1.00	Droughty	0.60
FhA—Fort Mott-Henlopen complex, 0 to 2 percent slopes							
Fort mott	45	Not limited		Very limited		Somewhat limited	
				Cutbanks cave	1.00	Droughty	0.01
Henlopen	35	Not limited		Very limited		Somewhat limited	
				Cutbanks cave	1.00	Droughty	0.20
HnA—Hammonton sandy loam, 0 to 2 percent slopes							
Hammonton	80	Somewhat limited		Very limited		Somewhat limited	
		Depth to saturated zone	0.19	Depth to saturated zone	1.00	Depth to saturated zone	0.19
				Cutbanks cave	1.00		
HpB—Henlopen loamy sand, 2 to 5 percent slopes							
Henlopen	80	Not limited		Very limited		Somewhat limited	
				Cutbanks cave	1.00	Droughty	0.20

Roads and Streets, Shallow Excavations, and Lawns and Landscaping– Sussex County, Delaware							
Map symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Lawns and landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
KgB—Klej-Galloway complex, 0 to 5 percent slopes							
Klej	45	Very limited		Very limited		Very limited	
		Depth to saturated zone	1.00	Depth to saturated zone	1.00	Depth to saturated zone	1.00
				Cutbanks cave	1.00	Droughty	0.50
Galloway	35	Somewhat limited		Very limited		Somewhat limited	
		Depth to saturated zone	0.19	Depth to saturated zone	1.00	Droughty	0.55
				Cutbanks cave	1.00	Depth to saturated zone	0.19
PsA—Pepperbox-Rosedale complex, 0 to 2 percent slopes							
Pepperbox	45	Somewhat limited		Very limited		Somewhat limited	
		Depth to saturated zone	0.19	Depth to saturated zone	1.00	Depth to saturated zone	0.19
				Cutbanks cave	1.00		
Rosedale	45	Not limited		Very limited		Somewhat limited	
				Cutbanks cave	1.00	Droughty	0.01
				Depth to saturated zone	0.73		

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the

content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash.

Engineering Properties– Sussex County, Delaware												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
CdB—Cedartown loamy sand, 0 to 5 percent slopes												
Cedartown	0-6	*Loamy sand, Sand	SM, SP-SM	A-2-4, A-3	0	0	98-100	95-100	50-85	5-20	0-26	NP-6
	6-14	*Sand, Loamy sand	SM, SP-SM	A-2-4, A-3	0	0	98-100	95-100	50-85	5-20	0-23	NP-6
	14-30	*Loamy sand	SC-SM, SM	A-2-4	0	0	98-100	95-100	50-75	15-30	17-26	3-9
	30-42	*Loamy sand, Sand	SM	A-2-4	0	0	95-100	90-100	50-85	5-30	0-21	NP-4
	42-64	*Sand	SM, SP-SM	A-3, A-2-4	0	0	95-100	90-100	50-80	5-15	0-20	NP-4
	64-80	*Fine sandy loam, Silt loam, loam	CL-ML, SC-SM	A-2-4, A-4	0	0	95-100	90-100	70-100	15-90	16-36	2-17
DnA—Downer loamy sand, 0 to 2 percent slopes												
Downer	0-11	*Loamy sand, Sandy loam	SM	A-2-4	0	0	90-100	85-100	50-75	15-40	16-33	1-10
	11-35	*Sandy loam	SC-SM, SC, SM	A-2-4	0	0	90-100	85-100	45-90	10-70	16-29	2-11
	35-80	*Loamy sand, Sand, gravelly sand	SM, SP-SM	A-2-4, A-3	0	0	80-100	60-100	30-90	5-35	0-19	NP-2

Engineering Properties– Sussex County, Delaware												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
DnB—Downer loamy sand, 2 to 5 percent slopes												
Downer	0-11	*Loamy sand, Sandy loam	SM	A-2-4	0	0	90-100	85-100	50-75	15-40	16-33	1-10
	11-35	*Sandy loam	SC, SM	A-2-4	0	0	90-100	85-100	45-90	10-70	16-29	2-11
	35-80	*Loamy sand, Sand, gravelly sand	SM, SP-SM	A-2-4, A-3	0	0	80-100	60-100	30-90	5-35	0-19	NP-2
EvB—Evesboro loamy sand, 0 to 5 percent slopes												
Evesboro	0-4	*Loamy sand, Moderately decomposed plant material, sand	PT, SM, SP-SM	A-8, A-2-4, A-3	0	0	95-100	60-100	50-85	5-30	0-26	NP-6
	4-16	*Loamy sand, Sand	SM, SP-SM	A-2-4, A-3	0	0	95-100	60-100	50-85	5-30	0-23	NP-6
	16-39	*Loamy sand, Sand	SM, SP-SM	A-2-4, A-3	0	0	95-100	60-100	50-85	5-30	0-23	NP-6
	39-80	*Sand, Loamy sand	SP-SM, SM	A-2, A-3	0	0	95-100	60-100	50-85	5-30	0-20	NP-4

Engineering Properties– Sussex County, Delaware												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
FhA—Fort Mott-Henlopen complex, 0 to 2 percent slopes												
Fort mott	0-10	*Loamy sand, Sand	SM, SP-SM	A-2, A-3	0	0	95-100	90-100	20-95	3-50	0-26	NP-6
	10-24	*Loamy sand	SM	A-2	0	0	95-100	90-100	20-95	10-50	0-24	NP-6
	24-36	*Sandy loam, Sandy clay loam	SC, SC-SM, SM	A-2, A-7	0	0	90-100	90-100	20-90	15-70	18-41	3-15
	36-80	*Loamy sand, Sand	SM, SP-SM	A-2, A-3	0	0	90-100	70-100	10-95	3-50	0-23	NP-6
Henlopen	0-10	*Loamy sand, Sand	SM, SP-SM	A-2, A-3	0	0	95-100	90-100	20-95	3-50	0-26	NP-6
	10-46	*Loamy sand, Sand	SM	A-2	0	0	95-100	90-100	20-95	10-50	0-24	NP-6
	46-62	*Sandy loam, Sandy clay loam, loam	SC, SC-SM, SM	A-2, A-7	0	0	90-100	90-100	20-90	15-70	18-41	3-15
	62-80	*Sand, Loamy sand	SM, SP-SM	A-2, A-3	0	0	90-100	70-100	10-95	3-50	0-23	NP-6
HnA—Hammonton sandy loam, 0 to 2 percent slopes												
Hammonton	0-11	*Sandy loam, Loamy sand	SM	A-2-4	0	0	90-100	85-100	50-75	15-40	16-33	1-10
	11-30	*Sandy loam	SM, SC	A-2-4	0	0	90-100	85-100	45-90	10-70	16-29	2-11
	30-80	*Sand, Gravelly sand, loamy sand	SM, SP-SM	A-2-4, A-3	0	0	80-100	60-100	30-90	5-35	0-19	NP-2

Engineering Properties– Sussex County, Delaware												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
HpB—Henlopen loamy sand, 2 to 5 percent slopes												
Henlopen	0-10	*Loamy sand, Sand	SM, SP-SM	A-2-4, A-3	0	0	95-100	90-100	20-95	3-50	0-26	NP-6
	10-46	*Loamy sand, Sand	SM	A-2-4	0	0	95-100	90-100	20-95	10-50	0-24	NP-6
	46-62	*Sandy loam, Sandy clay loam, loam	SC, SC-SM, SM	A-2-4, A-7	0	0	90-100	90-100	20-90	15-70	18-41	3-15
	62-80	*Sand, Loamy sand	SM, SC-SM	A-2-4, A-3	0	0	90-100	70-100	10-95	3-50	0-23	NP-6

Engineering Properties– Sussex County, Delaware												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
KgB—Klej-Galloway complex, 0 to 5 percent slopes												
Klej	0-7	*Loamy sand, Loamy fine sand, fine sand	SM, SP-SM	A-2-4, A-3	0	0	95-100	90-100	50-90	5-50	0-26	NP-6
	7-14	*Loamy sand, Fine sand, loamy fine sand	SM, SP-SM	A-2-4, A-3	0	0	95-100	90-100	50-90	5-50	0-29	NP-6
	14-20	*Loamy sand, Coarse sand, loamy fine sand	SM, SP-SM	A-2-4, A-1	0	0	95-100	90-100	40-90	10-50	0-23	NP-6
	20-62	*Loamy sand, Sand, sandy loam	SP-SM, SM, SP	A-2-4, A-3	0	0	95-100	75-100	50-85	4-30	0-27	NP-10
	62-80	*Sand, Sandy clay loam, loamy sand	SP, SM, SP-SM, SC	A-7, A-2-4, A-3	0	0	95-100	55-100	50-90	4-75	0-41	NP-21
Galloway	0-12	*Loamy sand, Sand	SM, SP-SM	A-2-4, A-3	0	0	95-100	90-100	50-85	5-40	0-26	NP-6
	12-15	*Loamy sand, Sand	SM, SP-SM	A-2-4, A-3	0	0	95-100	90-100	50-85	5-40	0-23	NP-6
	15-30	*Loamy sand, Sand	SP-SM, SM	A-2-4, A-3	0	0	95-100	90-100	50-85	5-30	0-20	NP-4
	30-80	*Sand, Loamy sand	SP-SM, SM	A-2, A-3	0	0	95-100	90-100	50-85	5-30	0-20	NP-4

Engineering Properties– Sussex County, Delaware												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
PsA—Pepperbox-Rosedale complex, 0 to 2 percent slopes												
Pepperbox	0-10	*Loamy sand, Loamy fine sand, sand	SM, SP-SM	A-2-4, A-3	0	0	95-100	90-100	80-95	3-50	0-20	NP-4
	10-25	*Loamy sand, Sand, loamy fine sand	SM, SP-SM	A-2-4, A-3	0	0	95-100	90-100	80-95	3-50	0-20	NP-4
	25-37	*Sandy loam, Fine sandy loam	SM, SC-SM	A-4, A-2-4	0	0	95-100	90-100	55-90	15-70	16-29	2-11
	37-65	*Sandy clay loam, Clay loam, sandy clay	CL, SC	A-6, A-7	0	0	95-100	90-100	35-100	35-90	29-61	13-39
	65-80	*Sandy clay loam, Sandy clay, silty clay	SC, CL, MH	A-7, A-6	0	0	95-100	90-100	35-100	35-90	29-61	5-39
Rosedale	0-9	*Loamy sand, Sand	SM, SP-SM	A-2-4, A-3	0	0	95-100	90-100	20-95	3-50	0-26	NP-6
	9-25	*Loamy sand	SM	A-2-4	0	0	95-100	90-100	20-95	10-50	0-24	NP-6
	25-38	*Sandy loam, Sandy clay loam	SC, SC-SM, SM	A-2-4, A-7	0	0	90-100	90-100	20-90	15-70	18-41	3-15
	38-68	*Loamy sand, Sand	SM, SC-SM	A-2-4, A-3	0	0	90-100	70-100	10-95	3-50	0-23	NP-6
	68-80	*Sandy clay loam, Clay loam, sandy loam	SC-SM, CL, SC	A-2, A-6, A-7	0	0	95-100	85-100	35-100	15-90	22-61	7-39

Physical Soil Properties

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion.

There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:
United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (http://soils.usda.gov)

Physical Soil Properties– Sussex County, Delaware														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
CdB—Cedartown loamy sand, 0 to 5 percent slopes														
Cedartown	0-6	70-85- 98	2-12- 25	2- 3- 10	1.55-1.70	42.00-705.00	0.05-0.15	0.0-2.9	0.2-2.0	.10	.10	5	2	134
	6-14	70-94- 98	2- 2- 25	2- 4- 10	1.60-1.75	42.00-705.00	0.02-0.10	0.0-2.9	0.2-0.5	.10	.10			
	14-30	70-84- 90	2- 7- 25	6- 9- 14	1.60-1.80	42.00-141.00	0.07-0.10	0.0-2.9	0.0-0.5	.10	.10			
	30-42	70-80- 95	2-13- 25	1- 7- 8	1.60-1.80	42.00-705.00	0.02-0.10	0.0-2.9	0.0-0.5	.10	.10			
	42-64	85-88- 98	2- 8- 14	1- 4- 7	1.60-1.80	141.00-705.00	0.02-0.05	0.0-2.9	0.0-0.5	.05	.05			
	64-80	43-78- 85	2-13- 80	5- 9- 25	1.50-1.80	4.00-42.00	0.16-0.22	0.0-2.9	0.0-0.5	.28	.28			
DnA—Downer loamy sand, 0 to 2 percent slopes														
Downer	0-11	50-80- 90	2-14- 35	4- 6- 15	1.55-1.75	14.00-141.00	0.10-0.20	0.0-2.9	0.5-3.0	.15	.15	5	2	134
	11-35	43-68- 85	1-19- 35	5-13- 17	1.50-1.60	14.00-42.00	0.12-0.13	1.0-2.9	0.0-0.5	.17	.17			
	35-80	70-84- 98	1-13- 30	1- 3- 5	1.55-1.70	42.00-705.00	0.02-0.10	0.0-2.9	0.0-0.5	.15	.15			
DnB—Downer loamy sand, 2 to 5 percent slopes														
Downer	0-11	50-80- 90	2-14- 35	4- 6- 15	1.55-1.75	14.00-141.00	0.10-0.20	0.0-2.9	0.5-3.0	.15	.15	5	2	134
	11-35	43-68- 85	1-19- 35	5-13- 17	1.50-1.60	14.00-42.00	0.12-0.13	1.0-2.9	0.0-0.5	.17	.17			
	35-80	70-84- 98	1-13- 30	1- 3- 5	1.55-1.70	42.00-705.00	0.02-0.10	0.0-2.9	0.0-0.5	.15	.15			

Physical Soil Properties– Sussex County, Delaware														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
EvB—Evesboro loamy sand, 0 to 5 percent slopes														
Evesboro	0-4	70-82- 98	2-13- 25	1- 5- 10	0.15-1.70	42.00-705.00	0.05-0.60	0.0-2.9	0.2-85.0	.10	.10	5	2	134
	4-16	70-82- 98	2-15- 25	1- 3- 10	1.60-1.80	42.00-705.00	0.02-0.10	0.0-2.9	0.0-0.5	.10	.10			
	16-39	70-80- 98	2-14- 25	1- 6- 10	1.60-1.80	42.00-705.00	0.02-0.10	0.0-2.9	0.0-0.5	.10	.10			
	39-80	70-95- 98	2- 2- 25	1- 3- 7	1.60-1.80	42.00-705.00	0.02-0.10	0.0-2.9	0.0-0.5	.05	.05			
FhA—Fort Mott-Henlopen complex, 0 to 2 percent slopes														
Fort mott	0-10	70-80- 98	8-14- 20	3- 6- 10	1.55-1.75	45.00-705.00	0.05-0.10	0.0-2.9	0.5-2.0	.15	.15	5	2	134
	10-24	70-82- 90	8-14- 20	3- 4- 10	1.60-1.75	45.00-141.00	0.08-0.10	0.0-2.9	0.2-1.0	.20	.20			
	24-36	43-73- 85	8-12- 50	7-15- 25	1.55-1.75	9.00-42.00	0.13-0.15	0.0-2.9	0.1-0.5	.17	.17			
	36-80	70-84- 98	8- 8- 20	3- 8- 10	1.55-1.75	45.00-705.00	0.05-0.10	0.0-2.9	0.1-0.4	.10	.10			
Henlopen	0-10	70-80- 98	8-14- 20	3- 6- 10	1.55-1.75	42.00-705.00	0.05-0.10	0.0-2.9	0.5-2.0	.15	.15	5	2	134
	10-46	70-82- 90	8-14- 20	3- 4- 10	1.60-1.75	42.00-141.00	0.08-0.10	0.0-2.9	0.2-1.0	.20	.20			
	46-62	43-77- 85	8-13- 50	7-10- 22	1.55-1.75	4.00-42.00	0.13-0.15	0.0-2.9	0.1-0.5	.17	.17			
	62-80	70-90- 98	4- 6- 20	3- 4- 10	1.55-1.75	42.00-705.00	0.05-0.10	0.0-2.9	0.1-0.4	.10	.10			
HnA—Hammonton sandy loam, 0 to 2 percent slopes														
Hammonton	0-11	50-68- 90	2-20- 35	4-12- 15	1.50-1.65	14.00-141.00	0.10-0.30	0.0-2.9	0.5-3.0	.20	.20	5	3	86
	11-30	43-65- 85	2-19- 35	5-16- 17	1.50-1.60	14.00-42.00	0.12-0.13	1.0-2.9	0.0-0.5	.20	.20			
	30-80	70-88- 98	2- 7- 30	1- 5- 5	1.55-1.70	45.00-705.00	0.02-0.10	0.0-2.9	0.0-0.5	.05	.05			

Physical Soil Properties– Sussex County, Delaware														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
HpB—Henlopen loamy sand, 2 to 5 percent slopes														
Henlopen	0-10	70-80- 98	8-14- 20	3- 6- 10	1.55-1.75	42.00-705.00	0.05-0.10	0.0-2.9	0.5-2.0	.15	.15	5	2	134
	10-46	70-82- 90	8-14- 20	3- 4- 10	1.60-1.75	42.00-141.00	0.08-0.10	0.0-2.9	0.2-1.0	.20	.20			
	46-62	43-77- 85	8-13- 50	7-10- 22	1.55-1.75	4.00-42.00	0.13-0.15	0.0-2.9	0.1-0.5	.17	.17			
	62-80	70-90- 98	4- 6- 20	3- 4- 10	1.55-1.75	42.00-705.00	0.05-0.10	0.0-2.9	0.1-0.4	.10	.10			
KgB—Klej-Galloway complex, 0 to 5 percent slopes														
Klej	0-7	75-83- 98	8-12- 20	2- 5- 10	1.40-1.70	42.00-141.00	0.05-0.15	0.0-2.9	0.2-2.0	.10	.10	5	2	134
	7-14	75-82- 98	8-14- 20	3- 4- 10	1.40-1.75	45.00-141.00	0.02-0.10	0.0-2.9	0.0-0.5	.10	.10			
	14-20	70-84- 98	2-11- 30	1- 5- 10	1.50-1.80	45.00-705.00	0.01-0.10	0.0-2.9	0.0-0.5	.10	.10			
	20-62	70-82- 94	2-14- 45	1- 4- 15	1.60-1.80	28.00-705.00	0.02-0.13	0.0-2.9	0.0-0.5	.10	.10			
	62-80	45-87- 98	2-10- 30	1- 3- 25	1.60-1.80	4.00-705.00	0.02-0.13	0.0-2.9	0.0-0.5	.05	.05			
Galloway	0-12	70-82- 98	2-13- 25	1- 5- 10	1.30-1.70	45.00-705.00	0.05-0.15	0.0-2.9	0.2-2.0	.10	.10	5	2	134
	12-15	70-80- 98	2-14- 25	1- 6- 10	1.50-1.80	45.00-705.00	0.02-0.10	0.0-2.9	0.0-0.5	.10	.10			
	15-30	70-82- 98	2-13- 25	1- 5- 7	1.60-1.80	45.00-705.00	0.02-0.10	0.0-2.9	0.0-0.5	.10	.10			
	30-80	70-95- 98	2- 2- 25	1- 3- 7	1.60-1.80	45.00-705.00	0.02-0.10	0.0-2.9	0.0-0.5	.05	.05			

Physical Soil Properties– Sussex County, Delaware														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
PsA—Pepperbox-Rosedale complex, 0 to 2 percent slopes														
Pepperbox	0-10	75-81- 98	2-13- 20	2- 6- 10	1.50-1.75	42.00-705.00	0.05-0.10	0.0-2.9	0.5-3.0	.15	.15	5	2	134
	10-25	75-81- 98	2-13- 20	2- 6- 10	1.50-1.75	45.00-705.00	0.05-0.10	0.0-2.9	0.1-1.0	.20	.20			
	25-37	43-70- 85	2-18- 50	5-12- 17	1.50-1.75	14.00-42.00	0.13-0.16	0.0-2.9	0.0-0.5	.17	.17			
	37-65	20-62- 80	2- 8- 53	20-30- 55	1.50-1.75	1.40-14.00	0.11-0.19	0.0-6.0	0.0-0.5	.24	.24			
	65-80	0-63- 80	2- 9- 53	20-28- 55	1.50-1.60	0.42-14.00	0.11-0.19	0.0-6.0	0.0-0.5	.24	.24			
Rosedale	0-9	70-80- 98	8-14- 20	3- 6- 10	1.55-1.75	42.00-705.00	0.05-0.10	0.0-2.9	0.5-2.0	.10	.10	5	2	134
	9-25	70-82- 90	8-14- 20	3- 4- 10	1.60-1.80	45.00-141.00	0.08-0.10	0.0-2.9	0.2-1.0	.20	.20			
	25-38	43-77- 85	8-13- 50	7-10- 22	1.55-1.75	4.00-42.00	0.13-0.15	0.0-2.9	0.1-0.5	.17	.17			
	38-68	70-84- 98	8- 8- 20	3- 8- 10	1.55-1.80	45.00-705.00	0.05-0.10	0.0-2.9	0.1-0.4	.10	.10			
	68-80	20-62- 80	2- 8- 53	12-30- 40	1.50-1.75	1.40-42.00	0.11-0.19	0.0-2.9	0.0-0.5	.24	.24			

References

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Broadkill Estates
2007 Aerial Photo

Legend

Site

500 250 0 500 Feet

N

Proposed December 2015

Broadkill Estates
2007 Land Use/Land Cover

Legend

- Site

2007 LULC

- <all other values>

VECTOR.ospc_de_lulc07_a.LULCSTRING

- Single-Family Dwellings
- Multi-Family Dwellings
- Mobile Home Parks/Court
- Commercial
- Industrial
- Transportation/Communication
- Mixed Urban or Built-Up Land
- Institutional/Governmental
- Recreational
- Farms, Pastures and Cropland
- Feedlots
- Rangeland
- Orchards/Nurseries/Horticulture
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Brush Rangeland
- Clear-Cut
- Manmade Reservoirs and Impoundments
- Marinas/Port Facilities/Docks
- Open Water
- Emergent Wetlands - Tidal and Non-tidal
- Forested Wetlands - Tidal and Non-tidal
- Scrub/Shrub Wetlands - Tidal and Non-tidal
- Sandy Areas and Shoreline
- Extraction and Transitional

500 250 0 500 Feet

N

Proposed December 2015

Broadkill Estates
State Wetlands Mapping Project (SWMP)

Legend

Site

State Wetlands

<all other values>

CLASS

PEM1/SS1C7
PEM1A
PEM1E7
PFO1/4A
PFO1A
PFO1C
PFO1E7
PFO4A
PSS1C
PSS3/1C7
PUBFx
PUBHh7
PUBHx

500 250 0 500 Feet

N

Proposed December 2015

Broadkill Estates
Existing Topography

Legend

Site

1-ft Contours

500 250 0 500 Feet

Proposed December 2015

Broadkill Estates
National Hydrography Dataset (NHD)

N

Legend

Site

NHD Streams

500 250 0 500 Feet

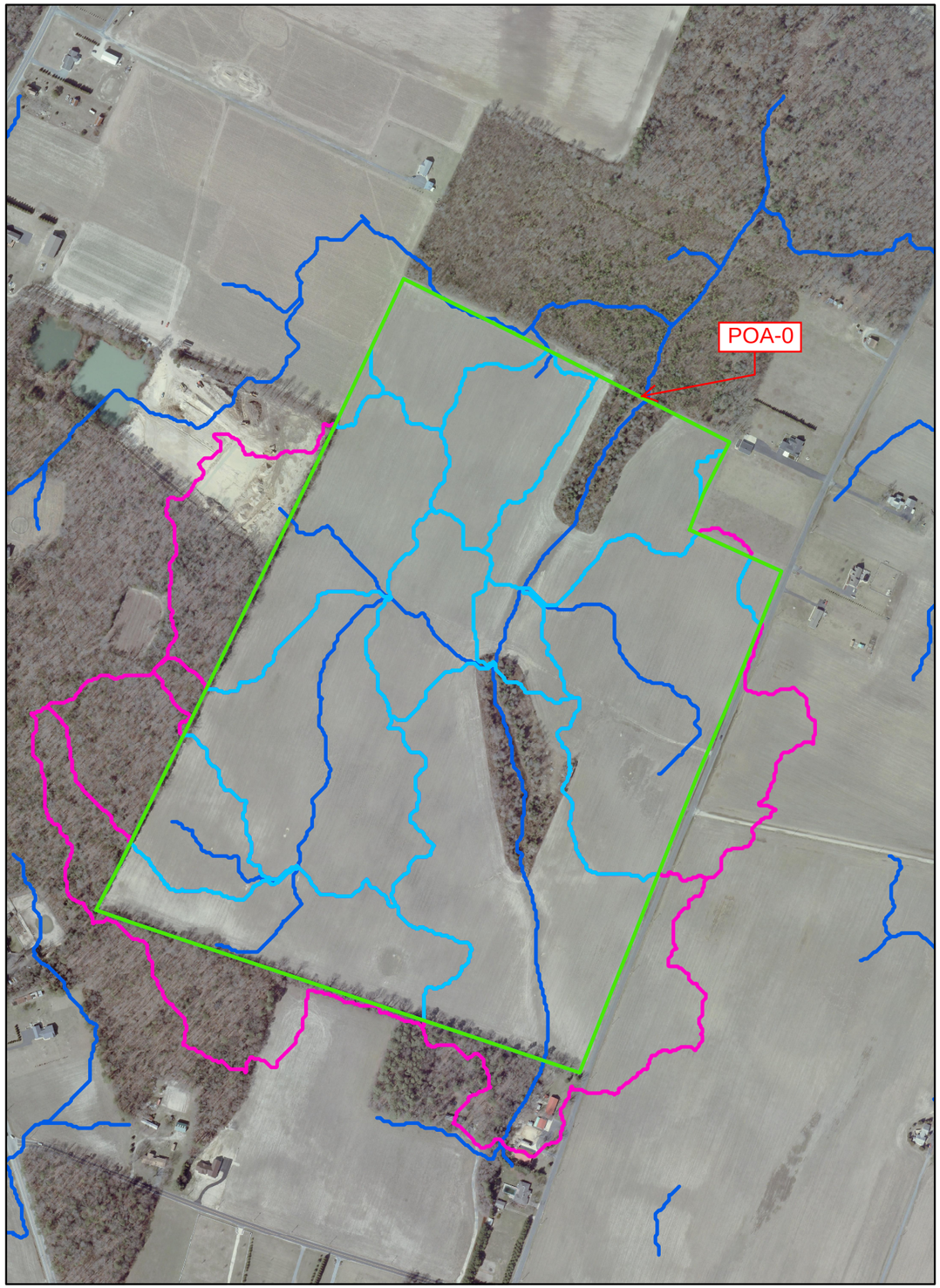
Proposed December 2015

Broadkill Estates
Existing Drainage Features

Legend

- Site
- Flowpaths
- OnSite Drainage
- Offsite Drainage

500 250 0 500 Feet



N

Proposed December 2015

Broadkill Estates
Hydrologic Soil Group

Legend

Site

Sussex Soils

<all other values>

HYDGRP

Water

A

A/C

B

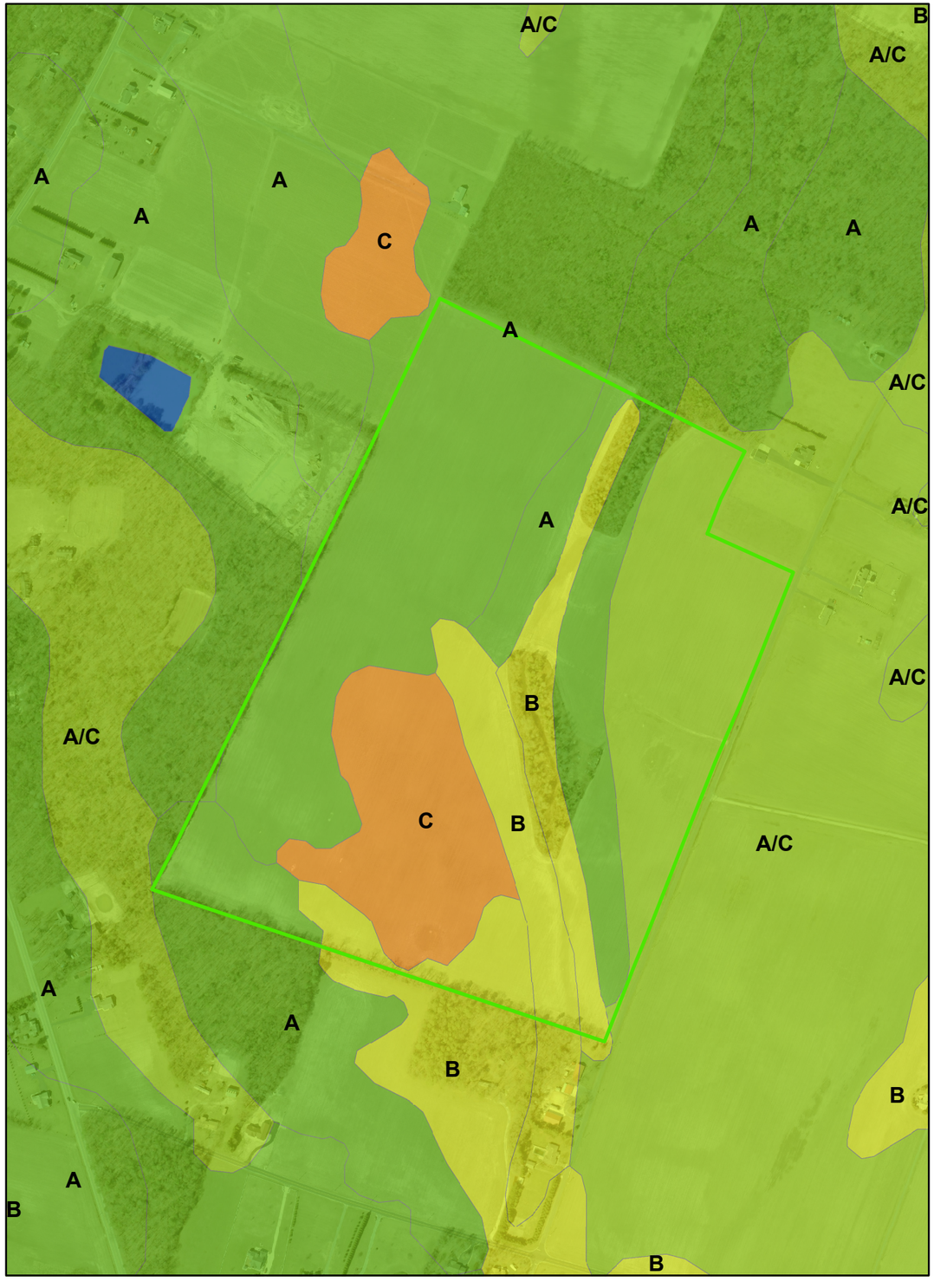
B/D

C

C/D

D

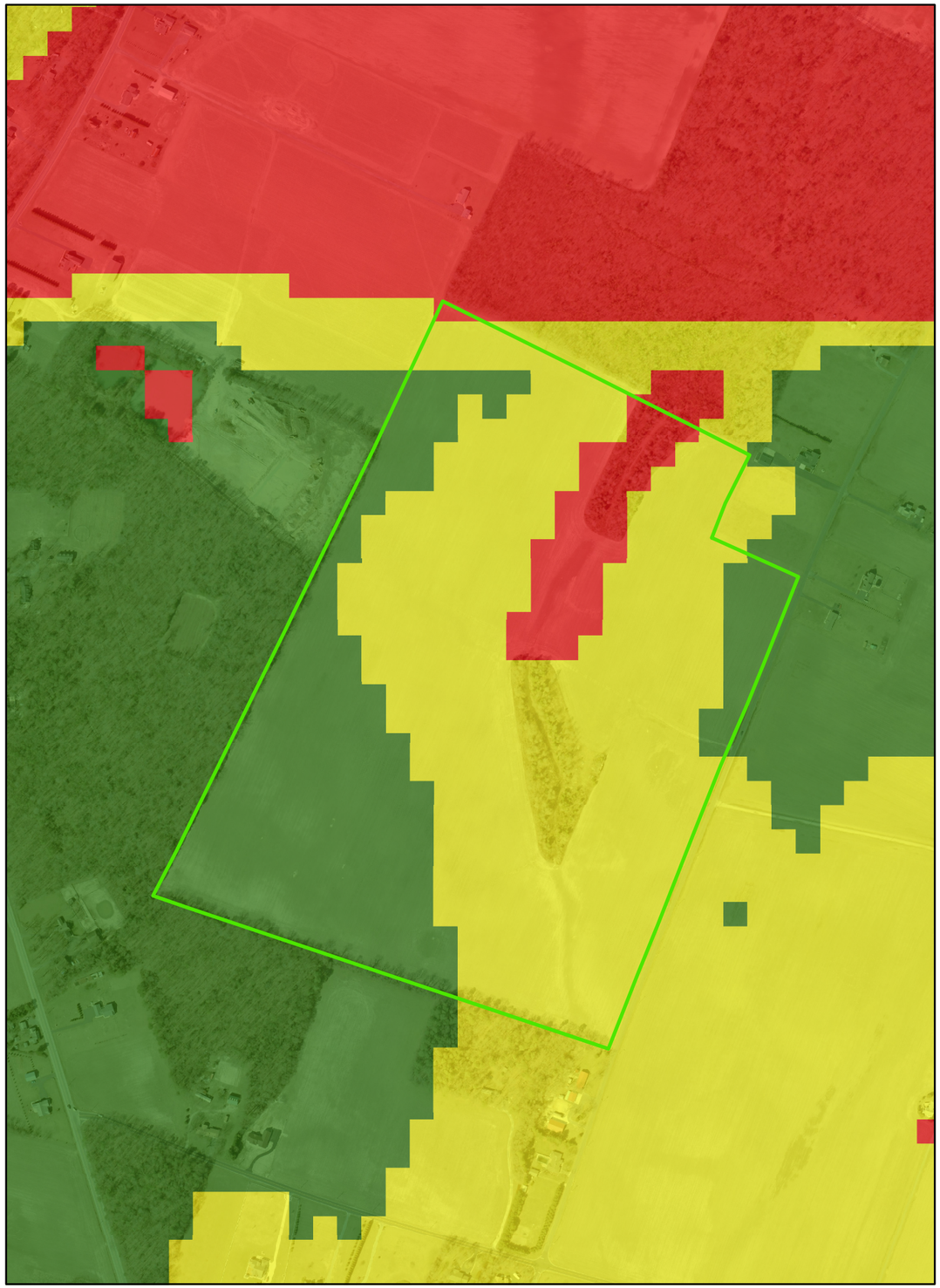
500 250 0 500 Feet



N

Proposed December 2015

Broadkill Estates
Recharge Feasibility



N

Legend

- Site
- Low Feasibility
- Moderate Feasibility
- High Feasibility

500 250 0 500 Feet

Proposed December 2015

DRAFT – 10/09

Sediment and Stormwater Program Project Application Meeting Discussion and Agreement Items

Project Name: Broadkill Estates
Meeting Date: _____

Discussion Items:

1. TMDLs
   a. Is this site in a TMDL watershed with an approved Pollution Control Strategy (PCS)? **YES / NO**
      - ☐ Inland Bays
      - ☐ Watershed X
      - ☐ Watershed Y
      - ☐ Watershed Z

   b. Pollutant reduction requirement:
      i. Nitrogen: _____
      ii. Phosphorus: _____
      iii. Other: _____

   c. List the proposed method of meeting TMDL PCS requirements through stormwater management BMPs on this site:
      - ☐ Standards-based (i.e., full buffer or forest area)
      - ☐ Performance-based (i.e., BMPs)

   d. Buffer requirements/preferences

      - ☐ Nutrient Management Plan if reduced width utilized to be done by certified consultants (provide contact reference list/link), in deed restrictions and bylaws, kept on file by HOA, HOA to sign and accept responsibility.

      - ☐ Common open space.

      - ☐ Buffers to be on final site plans/plats.

      - ☐ Buffers to be marked (Prefer LOD to be coincident with buffer and not within.)

      - ☐ Prefer buffer to be native forested vegetation (provide guidance references)

2. Groundwater Mapping
   a. Wellhead Protection Areas: **YES /NO**
   b. Recharge Classification: _____
   c. Depth to Water Table (Normal): _____
   d. Recharge feasibility: _____

Proposed December 2015

3. Watershed Master Plan
    a. Does this site fall within an area served by a watershed master plan? **YES / NO**
        - ☐ Appoquinimink WS
        - ☐ Murderkill WS
        - ☐ Upper Nanticoke WS
        - ☐ Other: _____

    b. What special design criteria are set for this project based upon its location in a watershed having a master plan?

4. The site contains tax ditches: **YES / NO**

Tax Ditch Name	Right-of-way Information

    a. Is there a proposal for changing tax ditch watershed boundaries? **YES / NO**

    b. The tax ditch requires a court order change (COC) for development to occur as planned? **YES / NO**

    c. Additional information regarding court order change:

5. Proposed grading plan.
    a. Proposed grading plan must not block drainage from offsite areas currently draining onto the site.
    b. Disturbed areas greater than 20 acres to any single discharge point will require engineered control practices designed for bare earth conditions under a 1-YR storm event.

6. The plan areas will be reviewed and approved as follows:

    a. Onsite areas: [AGENCY NAME]

    b. Offsite roadway improvements: [AGENCY NAME]

7. Fees - The fees to be submitted to [AGENCY NAME] are as follows:
    a. Fee Schedule:

       Due: (Step)
    b. Construction Inspection Fee Schedule:

       Due: (Step)
    c. Stormwater Facility Maintenance Inspection Fee Schedule:

       Due: (Step)

8. The Notice of Intent (NOI) must be submitted to DNREC prior to Sediment and Stormwater Plan approval. The NOI fee is $195.

Agreement Items:

1. Points of Analysis (POAs)

    a. Onsite points of analysis
        - ☐ POAs in accordance with SAS plan submitted
        - ☐ POAs modified as follows:
        - ☐ New POA(s) added as follows:

    b. Offsite / downstream points of analysis and subareas based upon 10% rule
        - ☐ POAs in accordance with SAS plan submitted
        - ☐ POAs modified as follows:
        - ☐ New POA(s) added as follows:
        - ☐ Existing conditions drainage area boundaries In accordance with SAS drainage area plan submitted
        - ☐ Modified as per project application meeting (see revised plan)

2. For Unit Discharge approach, existing conditions land cover will be considered as:
    a. Non-Woods/Non-Meadow (ac): _____
    b. Woods/Meadow (ac): _____
    c. Woods/Meadow HSG-A (ac): _____
    d. Off-site areas (ac): _____

3. Existing drainage features:
    - ☐ In accordance with SAS drainage features map as submitted
    - ☐ Modified as per project application meeting (see marked-up plan)

4. Stormwater Quality Management
    a. The *Delaware Sediment and Stormwater Regulations* require that Green Technology BMPs (GTBMPs) be given the first consideration in water quality management. The following GTBMPs are being considered for the site:
        - ☐ Biofiltration
        - ☐ Filter strips
        - ☐ Bioretention
        - ☐ Infiltration
        - ☐ Disconnection of impervious areas
        - ☐ Other (LID, etc)

    b. Justification if GTBMPs are not being considered for the site. (*NOTE: Justification must be based on engineering limitations and/or hardship issues*):

    c. List other runoff reduction techniques(s) to be used other than GTBMPs:

    d. List method of compliance for the Resource Protection Event:

    e. List basis for any variances anticipated to be requested:

    f. Additional notes regarding stormwater quality management for the site:

5. Stormwater Quantity Management
    a. Green Technology BMPs will be used to manage **SOME / ALL** / **NONE**-(circle one) of stormwater quantity for the site.

    b. The following BMPs will be used for stormwater quantity management:

        - ☐ Green Technology BMPs
        - ☐ Wet Pond
            - Liner Required? **YES / NO**
        - ☐ Dry Pond
            - Adequate cross-slope must be provided
        - ☐ Infiltration
            - Soils report must indicate that infiltration is feasible
        - ☐ Underground Storage

- *(NOTE: should be located in an area where maintenance and/or replacement of the system will be possible with minimal disruption to the site)*

☐ Other (list):

c. List method of compliance for the Conveyance Event:

d. List method of compliance for the Flooding Event:

e. List any variances anticipated to be requested for stormwater quantity management on site:

f. Additional notes regarding stormwater quantity management for the site:

6. Review Stormwater Assessment Report (SAR) to be sent to County or Municipality as a group and come to agreement on individual ratings.
   a. Site qualifies for Unit Discharge Approach? **YES / NO**
   b. Mitigation under consideration for "Significant" ratings:
      ☐ Over-management
      ☐ Off-site improvements
      ☐ Easement(s)

The Preliminary Sediment & Stormwater Plan shall be based upon the discussion and agreement items from this Project Application Meeting. The Delegated Agency reserves the right to revisit the agreement items from the original Project Application Meeting if the applicant later proposes significant changes to the project which would alter the results of the original Stormwater Assessment Report (SAR). Signing below indicates presence and participation at this Project Application Meeting for the project identified in this document, as well as agreement to the items referenced in this document.

Printed Name	Company or Agency	Signature

DRAFT

Stormwater Assessment Report

Project: Broadkill Estates

Owner/Developer: I. M. Developer

Consultant: GreenTech Consulting, Inc.

Assessment Item	*Anticipated Engineering Effort*		
	Minor	*Moderate*	*Significant*
1. Soils - On-site soils have low permeability, high water table, or other limitations that could adversely affect adequate stormwater management for the proposed project.	☐	☐	☐
2. Runoff Potential - Change in land cover due to removal of trees, increases in impervious cover, etc. could adversely affect adequate stormwater management for the proposed project.	☐	☐	☐
3. Water Quality - Pollutant loadings associated with proposed project could adversely affect adequate stormwater management.	☐	☐	☐
4. Sump Conditions - Existing topography of site creates depressional areas (closed 2' contours) where runoff tends to collect without direct discharge.	☐	☐	☐
5. Discharge Points - Areas where stormwater runoff leaves the site have limitations due to low gradient, backwater effects, lack of a defined channel or other hydraulic limitations.	☐	☐	☐
6. Off-Site Drainage - Areas draining into the site could adversely affect adequate stormwater management for the proposed project.	☐	☐	☐
7. Conveyance - Downstream conditions such as inadequate pipe or channel capacity could limit adequate drainage from the site.	☐	☐	☐

Mitigation under consideration for “Significant” ratings:

- ☐ Over-management
- ☐ Off-site improvements
- ☐ Easement(s)

Reporting Agency: _____

Contact Person: _____

Date of Pre-Application Meeting: _____

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Assessment Item	***Rating Criteria***		
	Minor	*Moderate*	*Significant*
1. Soils - On-site soils have low permeability, high water table, or other limitations that could adversely affect adequate stormwater management for the proposed project.	<15% of developed portion of the site has soils with limitations to development (i.e. high water table, erosivity, excavations)	15% - 50% of developed portion of the site has soils with limitations to development (i.e. high water table, erosivity, excavations)	>50% of developed portion of the site has soils with limitations to development (i.e. high water table, erosivity, excavations)
2. Runoff Potential - Change in land cover due to removal of trees, increases in impervious cover, etc. could adversely affect adequate stormwater management for the proposed project.	<25% existing woods/meadow to be disturbed **OR** <25% proposed impervious area	25%-50% existing woods/meadow to be disturbed **OR** 25%-50% proposed impervious area	> 50% existing woods/meadow to be disturbed **OR** > 50% proposed impervious area
3. Water Quality - Pollutant loadings associated with proposed project could adversely affect adequate stormwater management.	Targeted pollutants capable of treatment with standard BMPs	Targeted pollutants will require treatment train approach to achieve reduction goals	Targeted pollutants will require a Best Available Technology solution to achieve reduction goals
4. Sump Conditions - Existing topography of site creates depressional areas (closed 2' contours) where runoff tends to collect without direct discharge.	<15% of site area drains to sump areas	15% - 50% of site area drains to sump areas	>50% of site area drains to sump areas
5. Discharge Points - Areas where stormwater runoff leaves the site have limitations due to low gradient, backwater effects, lack of a defined channel or other hydraulic limitations.	Zero (0) site discharge points with identified problems **OR** <10% of site area drains to a discharge point with an identified problem	At least one (1) site discharge point with an identified problem **OR** 10% - 50% of site area drains to a discharge point with an identified problem	Multiple (more than 1) discharge point with an identified problem **OR** >50% of site area drains to a discharge point with an identified problem **OR** Lack of easements and/or alteration of drainage patterns could raise potential "right-to-discharge" issues.
6. Off-Site Drainage - Areas draining into the site could adversely affect adequate stormwater management for the proposed project.	<25% offsite area relative to site area draining onto site	25% - 50% offsite area relative to site area draining onto site	>50% offsite area relative to site area draining onto site
7. Conveyance - Downstream conditions such as inadequate pipe or channel capacity could limit adequate drainage from the site.	Zero (0) known historic drainage problems **OR** Zero (0) in-line structures prior to the 10% analysis point	At least one (1) known historic drainage problem **OR** At least one (1) in-line structure prior to the 10% analysis point	Multiple (more than 1) known historic drainage problems **OR** Multiple (more than 1) in-line structures prior to the 10% analysis point **OR** Stream channel condition degraded due to vegetation, slope, erosion, etc.

Assessment Item	Rating Value			
	Number	Yes/No	Acres	%
1. Soils - On-site soils have low permeability, high water table, or other limitations that could adversely affect adequate stormwater management for the proposed project.				
1.1 Hydric Soils (ac)				
1.2 "Very limited" for embankments, dikes and levees (ac)				
1.3 "Very limited" for excavated ponds due to depth to water table (ac)				
1.4 "Very limited" for excavated ponds due to cutbanks cave (ac)				
1.5 "Very limited" for pond reservoir areas (ac)				
1.6 Soil "K-factor" > 0.30 (ac)				
1.7 Drainage class "Poorly drained" or "Very poorly drained" (ac)				
1.8 Hydrologic Soil Group "D" (ac)				
1.9 Depth to water table < 100 cm (ac)				
1.10 Flood frequency class "Frequent" or "Very frequent" (ac)				
1.11 Ponding frequency class "Frequent" (ac)				
1.12 "Very limited" for local roads and streets (ac)				
1.13 "Very limited" for shallow excavations (ac)				
1.14 "Very limited" for lawns and landscaping (ac)				
2. Runoff Potential - Change in land cover due to removal of trees, increases in impervious cover, etc. could adversely affect adequate stormwater management for the proposed project.				
2.1 Existing wooded or meadow areas to be disturbed (ac)				
2.2 Proposed impervious area (ac)				
3. Water Quality - Pollutant loadings associated with proposed project could adversely affect adequate stormwater management.				
3.1 Project is located in TMDL watershed (yes/no)				
3.2 Project is located in high removal TMDL watershed (yes/no)				
4. Sump Conditions - Existing topography of site creates depressional areas (closed 2' contours) where runoff tends to collect without direct discharge.				
4.1 Site area that drains to sump (ac)				
5. Discharge Points - Areas where stormwater runoff leaves the site have limitations due to low gradient, backwater effects, lack of a defined channel or other hydraulic limitations.				
5.1 Discharge points with identified problems (no.)				
5.2 Site area that drains to discharge point with identified problem (ac)				
6. Off-Site Drainage - Areas draining into the site could adversely affect adequate stormwater management for the proposed project.				
6.1 Off-site areas draining onto site (ac)				
7. Conveyance - Downstream conditions such as inadequate pipe or channel capacity could limit adequate drainage from the site.				
7.1 Known historic drainage problems (no.)				
7.2 In-line structures between site and 10% analysis point (no.)				
7.3 Stream channel condition degraded (yes/no)				