Cherrywood Solar I, LLC

Direct Testimony of Dane Bauer

Attachments

Attachment A

DANE S. BAUER

MEMBER

H&B Solutions, LLC

37534 Oliver Drive
Selbyville, DE 19975

Tel: 410.292.4385

PROFESSIONAL SUMMARY:

Mr. Bauer has forty-two (42) years of combined public/private sector experience that has focused on development, home building, engineering, and environmental/regulatory affairs, while serving in various highly technical and executive positions for State Government and private A/E firms.

Having worked in the Governor Schaffer Administration and maintained his network of high profile business leaders in the State of Maryland, he is considered to be an exceptional resource to many in the development and home building industry in solving challenging issues that delay projects and exceed allotted budgets. His technical skills relate to water and wastewater, state and local subdivision regulations, various public works agreements and facilities, and the full range of civil engineering design elements required to support successful projects.

His multifaceted government and private sector background is often considered by clients to be a difference maker in being able to overcome challenging obstacles that otherwise would prevent developments from proceeding efficiently and effectively.

EDUCATION:

UNIVERSITY OF MARYLAND — **1966-1970**
COLLEGE PARK, MD
Bachelor of Science - Microbiology

JOHNS HOPKINS UNIVERSITY
SCHOOL OF HYGIENE AND PUBLIC HEALTH — **1971**
BALTIMORE, MD
Master of Health Science – Environmental Engineering

EXPERIENCE:

H&B SOLUTIONS LLC — **2014-PRESENT**
SELBYVILLE, DE
Member | Vice President

- Mr. Bauer provides consulting, permitting, value engineering, and infrastructure solutions necessary to facilitate successful project implementation.
- Serves as the environmental/regulatory expert.
- Responsible for obtaining entitlements for projects/clients.
- Assists with project oversight, management, and coordination of contractors.
- Participates in business development/marketing.
- Provides technical input and value engineering to site plans.
- Provides public/private sector clients in need of water/sewer expertise.

DAFT-MCCUNE-WALKER, INC. (DMW) — **2007-2014**
TOWSON & BERLIN, MD
Senior Vice President | Managing Director

- Responsible for approximately thirty-five percent (35%) of the firms gross billings.

EXPERIENCE:
(CONT.)

- Lead the firm's initiatives in developing new markets and establishing business offices in Western Maryland and on Maryland's Eastern Shore.
- Project Director for numerous land development projects in Maryland and Delaware.
- Managed millions of dollars of contracted work and supervised the Ownership and Executive Group within the firm.

GEORGE, MILES & BUHR, LLC (GMB) **2000-2007**
HUNT VALLEY & SALISBURY, MD
Associate

- Responsibilities for the BBT Land Development Program included but were not limited to:
- Functioned as an Associate in the firm and served as a liaison to many of the clients - coordinating regulatory issues.
- In charge of the regulatory/permitting services for the firm, and Manager of the Hunt Valley Office.
- Lead responsibility for marketing and personnel management in addition to the senior project manager for many Maryland projects. (Contributed significantly to the firm's seventy percent (70%) growth over the period of 2000-2005.)
- Managed high profile projects that demand special environmental approaches and designs to meet regulatory requirements with predictable permit and project outcomes.
- Developed new methods for linking remote offices, and new techniques for marketing that expanded corporate business opportunities and increased operating efficiency.

MARYLAND DEPARTMENT OF ENVIRONMENT **1992-2000**
BALTIMORE, MD
Deputy Director, Water Management Administration

- Managed multiple Chesapeake Bay Cleanup Programs and a budget of over $26M.
- Supervised 360 high level technical/regulatory experts.
- Oversaw the day-to-day operations of the NPDES, stormwater, water supply, sediment and erosion control, local health programs, subdivision regulations, mining program, pretreatment, and other Chesapeake Bay Program initiatives such as TMDLs.
- Served on numerous State Task Forces including the Governor's Smart Growth Committee, Environmental Reorganization Committee, and the consolidated Permit Hearing Task Force.
- Served as member and Chairman of the Maryland Water and Wastewater Operators Certification Board.
- Led successful negotiations with the Federal EPA to delegate to Maryland the NPDES and Safe Drinking Water Programs, merging DNR's appropriations, wetlands, and mining programs within MDE.

EXPERIENCE:
(CONT.)

MARYLAND ENVIRONMENTAL SERVICE **1988-2000**
ANNAPOLIS, MD
Director, Engineering and Operations

- Directed over 160 licensed plant operators, engineers, plant superintendents, maintenance staff, scientists, technicians, laboratory technicians and other administrative and skilled staff which provided essential water, sewer, and sewage sludge utility service to over 325 federal, state, local government and corporate clients.
- Experienced in assessing problems, using innovation in regulatory compliance, and creative solutions to correct long standing operational and regulatory problems at some of the State's largest water/wastewater plants while keeping projects under budget and on schedule.

PRIOR TO 1988
Served in various high level technical and administrative positions at the Maryland Department of Health and Mental Hygiene (DHMH), Maryland Department of the Environment, and Maryland Department of Natural Resources. While employed by these various agencies, key responsibilities included but were not limited to:

- Served as Director of DNR's River Basin Planning Program.
- Developed Maryland's first regulations for land application of treated wastewater.
- Functioned as Program Manager of Compliance and Inspection Program, Environmental Health Administration, DHMH.
- Liaison to local health departments for DHMH, Environmental Health Administration.
- Served on Local Health performance review teams.
- Administrator of environmental capital programs for DHMH, Environmental Health Administration.
- Developed and Chaired MDE's Business Oversight Committee.
- Designated honorary member of the Maryland/Delaware Well Drillers Association.
- Chairman and member of the State Board of Certification for Water Supply and Waste System Operators.
- Testified as expert witness in many court cases involving water and sewer moratoriums, land development litigation, and compliance actions involving adequate facilities legislation.
- Served on several Governors' task forces that involved inter-agency permit coordination and consolidation of public hearings.

DANE S. BAUER
MEMBER

REPRESENTATIVE PROJECTS:

WHILE HOLDING HIGH LEVEL TECHNICAL AND EXECUTIVE POSITIONS IN STATE GOVERNMENT

1. Performed design reviews and issued approvals for the first vacuum collection sewer system in Maryland servicing the Ocean Pines Community.
2. Worked on the Baltimore Inner Harbor Redevelopment Projects with The Rouse Company and other development firms and assisted with innovative water and sewer designs as part of the City's Public Works upgrades to the award winning project.
3. Led the MDE initiatives to build Red Run Boulevard which was a critical infrastructure component of the Owings Mills Development in Baltimore County.
4. Oversaw the Federal and State Grants in Aid efforts which funneled millions of dollars to local governments to upgrade water and sewer facilities that both improved public health and the environment while stimulating important targeted growth.
5. Was instrumental in overseeing all of the State approvals for the State of Maryland for the Glenn Riddle Community.
6. Worked with EPA to develop the West Ocean City Consent Agreement which brought critical sewer service to this area of Worcester County.
7. Oversaw the day-to-day operations of twenty-three (23) local Health Departments and constantly updated and revised regulations and the delegation agreements that provided necessary approving authority to the Health Officers.
8. Functioned on the Governor's Task Force for Permit Consolidation and contributed significantly to the Committee's efforts to streamline and combine State permitting processes.
9. Worked with Baltimore City and the surrounding counties to develop a comprehensive agreement allowing each of the neighboring counties to participate in the financial cost and use of the City's water and sewer systems.
10. Negotiated Delegation Agreements with the Federal EPA that allowed Maryland to manage and implement the Clean Water Act and Safe Drinking Water Act.

ENVIRONMENTAL/REGULATORY/PERMITTING

Anne Arundel County CMOM Preparation (Anne Arundel County, MD)

Anne Arundel County Environmental/Regulatory Consulting (Anne Arundel County, MD)
WRF's - Annapolis, Broadneck, Broadwater, Cox Creek, Patuxent, Maryland City, and Mayo

Ashleigh Knolls Subdivision Wastewater Consulting (Howard, MD)

Assateague Island National Seashore (Worcester County, MD)

Baltimore County CMOM Preparation (Baltimore County, MD)

Bali-Hi Mobile Home Park (Worcester County, MD)

Bainbridge Water and Sewer Authority (Cecil County, MD)

Bulle Rock Water Handling System (Cecil County, MD)

REPRESENTATIVE PROJECTS:
(CONT.)

Castaways Campground WWTP Upgrades (Worcester County, MD)

Cedar Hill Mobile Home Park – Consent Order (Caroline County, MD)

Charles County Allocation Study (Charles County, MD)

Chester River Hospital Center – Groundwater Remediation Project (Talbot County, MD)

College of Southern Maryland – Hughesville Water and Sewer Feasibility (Charles County, MD)

Duke Energy Power Plant (Frederick County, MD)

Girl Scout Council of the Nation's Capital – Camp Winona Consent Order (Charles County, MD)

Holly Hills Country Club – Consent Order (Frederick County, MD)

Lighthouse Sound (Worcester County, MD)

Mattawoman ENR Upgrade Design (Charles County, MD)

Mattawoman WWTP Rerating from 15MGD to 20MGD (Charles County, MD

Oaklands Subdivision (Talbot, MD)

Ocean Pines WWTP Upgrade and Rerating from 1.5MGD to 2.7MGD (Worcester County, MD)

Ocean Resorts Golf Club (Worcester County, MD)

Perdue Farms Regulatory Services (Wicomico County, MD and Sussex County, DE)

Riddle Farm WWTP and Spray System Expansion (Worcester County, MD)

Statewide MDE BNR Study

Summerhill Mobile Home Park – Consent Order (Anne Arundel County, MD)

The Preserve at Wye Mills WWTP (Talbot County, MD)

The Rest Subdivision (Talbot, MD)

Town of Bel Air Rate Study (Harford County, MD)

Tyson WWTP Conversion (Worcester County, MD)

University of Maryland Medical Center

Villa Julie College WWTP (Baltimore County, MD)

ALTERNATIVE ENERGY PROJECTS:

Eastern Shore Communications – Fiber Optics (Worcester County, MD)

Longview Solar, LLC – LS Egret Solar Voltaic Site (Wicomico County, MD)

OneEnergy Renewables, LLC – Cambridge Solar Voltaic Site (Dorchester County, MD)

Pioneer Green, LLC – Crisfield Wind Energy Site (Somerset County, MD)

REPRESENTATIVE PROJECTS:
(CONT.)

LAND DEVELOPMENT PROJECTS (COMMERCIAL)

Finch Property (Worcester County, MD)

Frontier Town Campground (Worcester County, MD)

Jefonico Property (Worcester County, MD)

Liberty Square (Worcester County, MD)

North Carroll Plaza (Baltimore County, MD)

Ocean Landings II – Retail/Commercial (Worcester County, MD)

Pennington Commons (Worcester County, MD)

Steffey Property (Worcester County, MD)

Sun Castaways RV Resort and Campground (Worcester County, MD)

Sunset Marina/Grille Expansion (Worcester County, MD)

Twisters Activity Center (Worcester County, MD)

143rd Street Condominiums (Worcester County, MD)

LAND DEVELOPMENT PROJECTS (RESIDENTIAL)

Bonfield West (Talbot County, MD)

Captain's Cove (Accomack County, VA)

Croppers Landing (Worcester County, MD)

Davis/Taylor Farms (Worcester County, MD)

Deer Run Campground and RV Park (Worcester County, MD)

Doves Landing (Sussex County, MD)

Franklin Knolls (Worcester County, MD)

Jersey Island Condominiums (Somerset County, MD)

Laguna Vista Condominiums (Worcester County, MD)

Potomac Crossing (Charles County, MD)

Pennington Estates (Worcester County, MD)

Pepper Creek (Sussex County, DE)

Purnell Crossing (Worcester County, MD)

Red Mill Pond (Sussex County, DE)

River Run Golf Course (Worcester County, MD)

Sea Oaks (Worcester County, MD)

Seaside Village (Worcester County, MD)

REPRESENTATIVE PROJECTS:
(CONT.)

Southpointe Arundel (Anne Arundel County, MD)

Summerfield at Snow Hill (Worcester County, MD)

Sunset Island (Worcester County, MD)

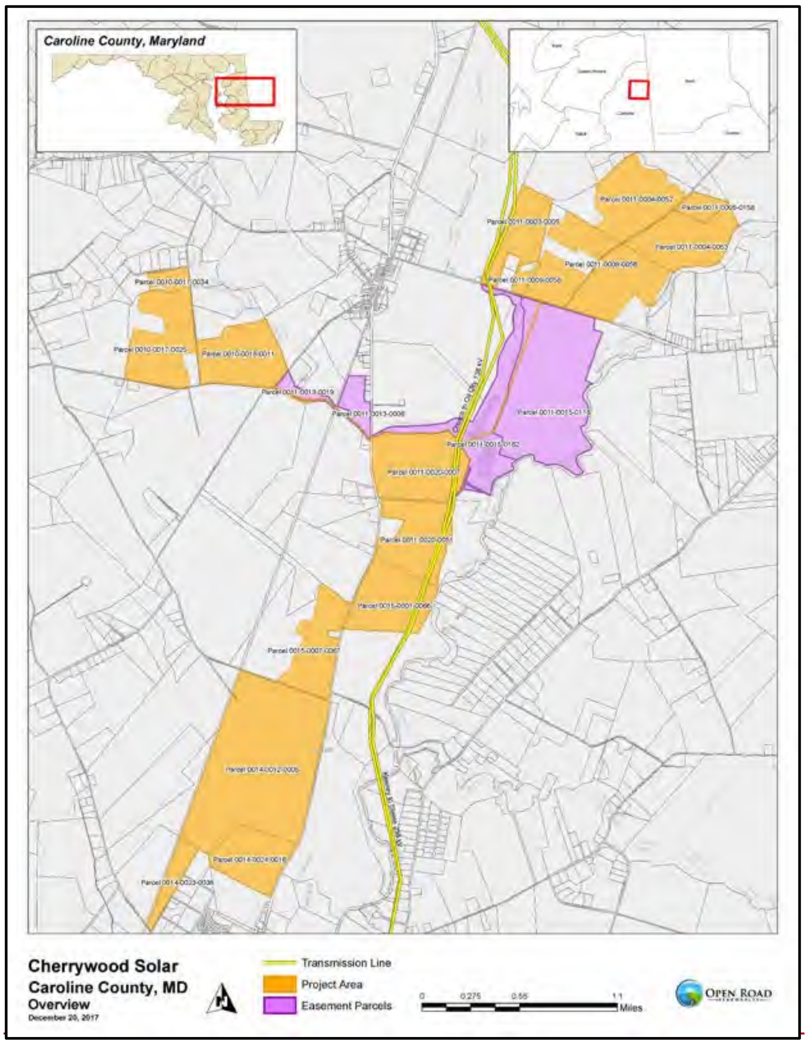
The Landings (Worcester County, MD)

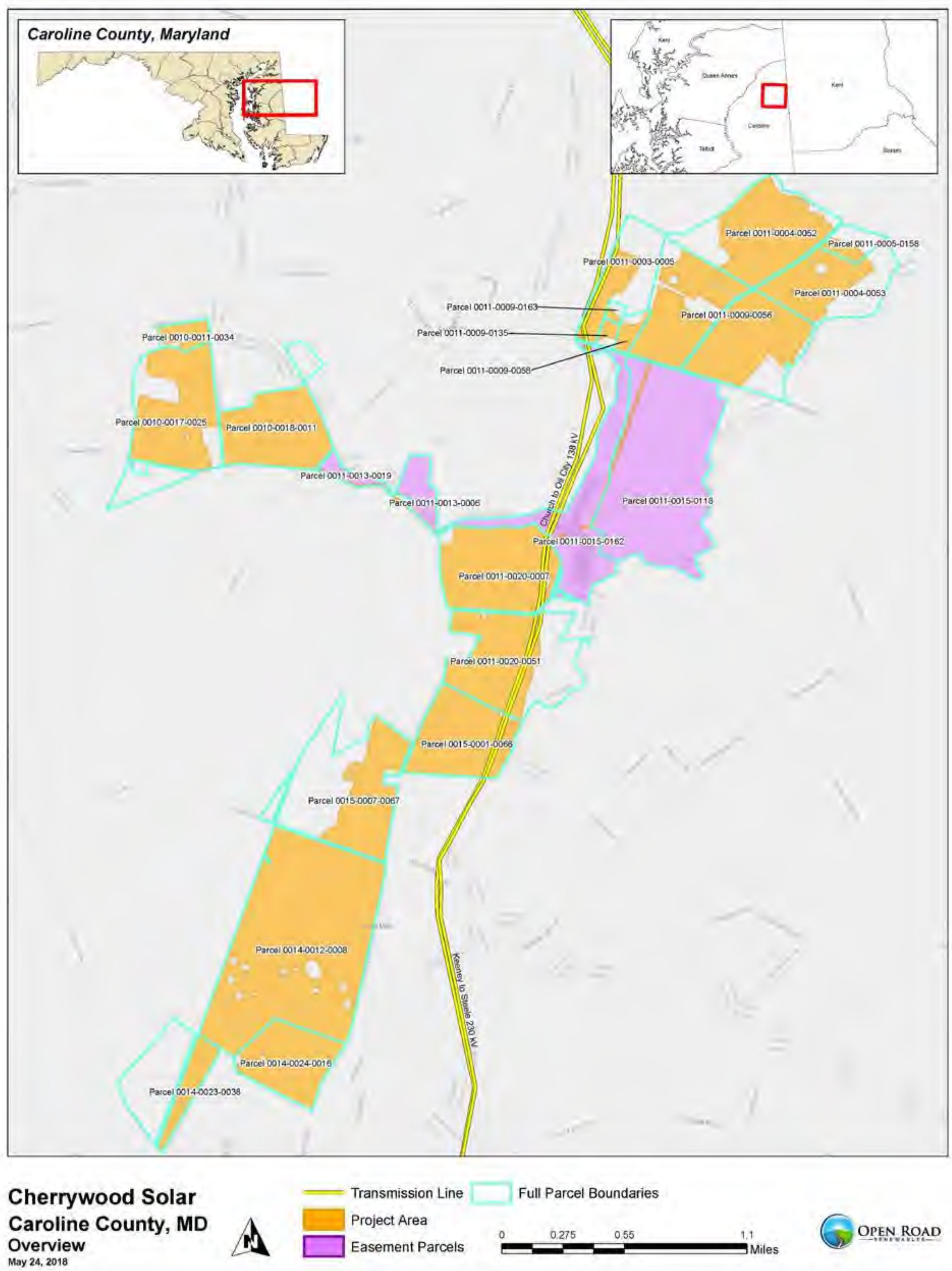
Wiley Branch Landing (Sussex County, MD)

Attachment B

ENVIRONMENTAL REVIEW DOCUMENT
PROJECT NO. 17001.00
~~JANUARY 22, 2017~~REVISED MAY 25, 2018

CHERRYWOOD SOLAR
202 MW SOLAR PROJECT
CAROLINE COUNTY, MARYLAND




Caroline County, Maryland
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Parcel 0011-0005-0158
Parcel 0011-0003-0005
Parcel 0011-0004-0053
Parcel 0011-0009-0163
Parcel 0011-0009-0056
Parcel 0011-0009-0135
Parcel 0010-0011-0034
Parcel 0011-0009-0058
Parcel 0010-0017-0025
Parcel 0010-0018-0011
Church to Oil City 138 kV
Parcel 0011-0013-0019
Parcel 0011-0015-0118
Parcel 0011-0013-0006
Parcel 0011-0015-0162
Parcel 0011-0020-0007
Parcel 0011-0020-0051
Parcel 0015-0001-0066
Parcel 0015-0007-0067
Parcel 0014-0012-0008
Keeney to Steele 230 kV
Parcel 0014-0024-0016
Parcel 0014-0023-0038
Cherrywood Solar
Caroline County, MD
Overview
May 24, 2018
Transmission Line
Full Parcel Boundaries
Project Area
Easement Parcels
0
0.275
0.55
1.1
Miles
OPEN ROAD

PREPARED FOR:

CHERRYWOOD SOLAR I, LLC
1105 Navasota St.
Austin, TX 78702

PREPARED BY:

H&B SOLUTIONS, LLC
37534 Oliver Dr.
Selbyville, DE 19975

LIST OF APPENDICES

SECTION 1 – PROJECT OVERVIEW

The Cherrywood Solar I Project is a 202 Megawatt (MW) polycrystalline photovoltaic (PV) single-axis tracking project proposed by Cherrywood Solar I, LLC (the "Applicant"). As currently proposed, the Caroline County, Maryland Solar Project (the "Project") is located on a plain of properties that run from southwest to northeast between the Towns of Greensboro and Goldsboro just west of the Choptank River (see ***Figure 1*** and ***Figure 2***). The Project will consist of ~~sixteen~~ eighteen (18~~6~~) parcels, some of which are contiguous, and approximately four (4) other additional parcels will be used for easements to accommodate the various connector lines. In addition, the Applicant will be constructing a new substation within the Limit of Construction (LOC) at Property 12. ~~Within this same Property the Applicant is currently evaluating the potential of including an estimated twenty (20) to thirty (30) acre battery storage component of the Project. If this becomes viable, a supplemental filing will be prepared which outlines the full details of this proposal.~~ The Project will be approximately two hundred two megawatts (202 MW) single axis tracking alternating current (AC) solar polycrystalline photovoltaic (PV) project proposed by Cherrywood Solar I, LLC. It is anticipated that the Project would include a development envelope of approximately one thousand eighty-~~three~~ eight (1,~~083~~088.~~62~~15) acres once buffers and setbacks have been established in addition to avoidance from environmental constraints. As shown in ***Figure 3***, the proposed Project for purposes of this Report includes three (3) sections.

The Upper Section consists of Tax Map 0011, Grid 0004, Parcel 0052 ("Property 1"), Tax Map 0011, Grid 0005, Parcel 0158 ("Property 2"), Tax Map 0011, Grid 0004, Parcel 0053 ("Property 3"), Tax Map 0011, Grid 0009, Parcel 0056 ("Property 4"), Tax Map 0011, Grid 0009, Parcel 0058 ("Property 5"), ~~and~~ Tax Map 0011, Grid 0003, Parcel 0005 ("Property 6") Tax Map 0011, Grid 0009, Parcel 0135 ("Property 17"), and Tax Map 0011, Grid 0009, Parcel 163 ("Property 18") and is comprised of approximately five hundred ~~five~~ fifteen (~~505.68~~515.98) acres of which the LOC includes approximately two hundred ninety-five (~~295.72~~295.75) acres.

The Middle Section consists of Tax Map 0010, Grid 0011, Parcel 0034 ("Property 7"), Tax Map 0011, Grid 0017, Parcel 0025 ("Property 8"), and Tax Map 0010, Grid 0018, Parcel 0011 ("Property 9") and is comprised of approximately two hundred sixty-eight (268.47) acres of which the LOC includes approximately one hundred ~~fifty-four~~forty-nine (~~154.07~~149.44) acres.

The Lower Section consists of Tax Map 0011, Grid 0020, Parcel 0007 ("Property 10"), Tax Map 0011, Grid 0020, Parcel 0051 ("Property 11"), Tax Map 0015, Grid 0001, Parcel 0066 ("Property 12"), Tax Map 0015, Grid 0007, Parcel 0067 ("Property 13"), Tax Map 0014, Grid 0012, Parcel 0008 ("Property 14"), Tax Map 0014, Grid 0024, Parcel 0016 ("Property 15"); and Tax Map 0014, Grid 0023, Parcel 0038 ("Property 16") and is comprised of approximately ~~one thousand one hundred forty-six~~nine hundred thirty-eight (~~1,146.07~~938.41) acres of which the LOC includes approximately six hundred ~~thirty-three~~twenty-eight (~~633.83~~628.50) acres.

The total acreage of the parcels evaluated consists of one thousand seven-hundred twenty-two~~nine hundred twenty~~ (~~1,920.22~~1,722.86) acres. However, as noted above, not all will be used for the Project and appropriate areas have been excluded based on environmental constraints mapping. The total LOC for this Project is approximately one thousand seventy-three~~eighty-three~~ (~~1,083.62~~1,073.69) acres. The site characteristics relative to soils, wetlands, forest conservation, etc. have been tabulated in an excel spreadsheet and included in ***Appendix 1***. The Project has contracted to either lease the underlying parcels under long-term leases or to contract land with options to purchase, from the various property owners associated with the ~~sixteen~~ eighteen (~~16~~18) parcels, and ~~eight~~ nine (~~8~~9) families (see ***Figure 3***) via an Option to Lease/Purchase Agreement. ***Table 3*** includes the various FEMA FIRM information as well as latitude and longitude for each parcel.

All of the Properties are in close proximity and drain directly to the Upper Choptank River. The Upper Choptank River watershed is predominantly rural with significant agricultural areas, as well as forest, small towns and pockets of suburban development. Large areas of land, which had poorly drained soils, were able to be developed because lands were drained by Public Drainage Association (PDA) ditches. Maintenance of these ditches is central to continuation of much of the current economic activity in the watershed. About fifty-six percent (56%) of the Upper Choptank Watershed in Maryland is prime farmland. According to the Chesapeake Bay Program's Phase 5.2 Model, the land use distribution in the watershed is approximately fifty-three percent (53%) agricultural, thirty-five percent (35%) forest, and twelve percent (12%) urban. *Appendix 2* includes the various NRCS Soils Maps for each Property.

The Critical Area Commission has determined that the Project is not located in the Critical Area. There is no activity proposed on the Site which would impact the Critical Area or impair nearby waterways and receiving streams.

The Properties are all zoned Rural (R) and all have agriculture as the existing property use. These Properties are all located in close proximity to lands with active mining permits, a local wastewater treatment facility, a drive-in movie theater, and an existing small scale solar project. Only twelve (12) non-participating residences with line-of-sight to the Project will require setbacks and landscape buffers. Participating property owner agreements allow for screening areas where needed.

The Applicant participated in a County Task Force that drafted the Caroline County Solar Ordinance. The County held several workshops and standard public information hearings which culminated in the County Commissioner adoption of same in December, 2017. Overall, and giving consideration to this new Caroline County Solar Ordinance, it is anticipated the Project will have four (4) voluntary screening options. The depth of the buffers in most areas are twenty feet (20') and comprised of different mixes and densities of trees, shrubs, pollinators, and other planting materials. In a few sensitive areas the buffers will be fifty feet (50') deep. The proposed design and screening regime will obscure views of the Project consistent with the new Caroline County Solar Ordinance (*Appendix 3*). Also, consistent with the Solar Ordinance, a fifty-foot (50') setback will be generally included from property lines with two hundred-foot (200') setbacks to non-participating residences. As noted throughout the ERD, the Project is being designed/developed to be consistent with the local code and this newly adopted Ordinance.

The surface topography is mostly flat with the majority of grades from zero percent (0%) to five percent (5%) and consists of poor, moderate, and well-draining soils with classifications and soil characteristics as defined in *Appendix 2* below. There are a few areas with fifteen percent (15%) to thirty percent (30%) slopes which will be avoided. More than fifty percent (50%) of the soils are moderate to well-draining. However, there is a large area with poorer draining soils that also has a higher percentage of drainage ditches and wetland areas, some of which will be avoided. The Maryland Department of the Environment (MDE) has guidelines for stormwater management that govern Environmentally Sensitive Design (ESD) for utility scale solar projects. If slopes within the LOC are less than ten percent (10%) non-rooftop disconnection credits are allowed and no stormwater structures are required except for level spreaders on areas with grades between five percent (5%) and ten percent (10%).

Other than construction equipment traffic, there is anticipated to be no ground disturbance for the installation of the racking and solar modules. The Sites have very little change in grade and the piles can be installed on the existing elevations. Minimal earthwork will be required for the construction of the concrete pads for the transformers and inverters. Other property improvements that will have only moderate impact/disturbance to in-situ conditions involve grading improvements and roadbed stabilization to support ingress and egress of construction vehicles, as well as delivery trucks during the construction phase of the Project. The Project will obtain a Stormwater NPDES NOI Permit prior to construction.

Total generating capacity for the Project is anticipated to be 202 MW Alternating Current (AC) output. The Project will consist of approximately ~~462,672~~499,086 First Solar Series 6 solar modules (or similar) as shown in the Solar Array Layout (see ***Figure 4***). The array will be installed using a pile-driven post-supported racking system utilizing galvanized steel posts with galvanized steel or aluminum structures for mounting the modules. A typical Solar Panel Racking Detail depicts the array with portrait racking with one row of modules positioned vertically on each rack (see ***Figure 5***). The space between rows will be approximately sixteen feet and five inches (16' 5") from post to post. The solar arrays will continuously rotate around a horizontal axis, oriented North-South, to orient the solar modules at an optimal angle to the incoming solar insolation during the day. In this configuration, the minimum leading-edge height (bottom edge of the modules) will be approximately two feet (2') from grade, and the maximum (top-edge height of the modules) will be approximately eight feet (8') from grade, although other feasible configurations are possible with higher top-edge heights. The solar arrays will be designed to withstand a snow load of twenty-five (25) pounds per square foot (psf) and wind of one hundred (100) miles per hour (mph) (risk category I per IBC 2012 for Caroline County).

There will be eighty-one (81) separate power stations where the direct current from the arrays will be converted to alternating current as transmitted to the electric grid. Each power station will include an inverter pad with one (1) inverter and one (1) liquid AC transformer. Each power station will make up 1/81 of the array AC capacity or approximately 2.5 MW. The nameplate capacity of the facility will be of 202 MW. The onsite facilities will also include a project substation and switch gear.

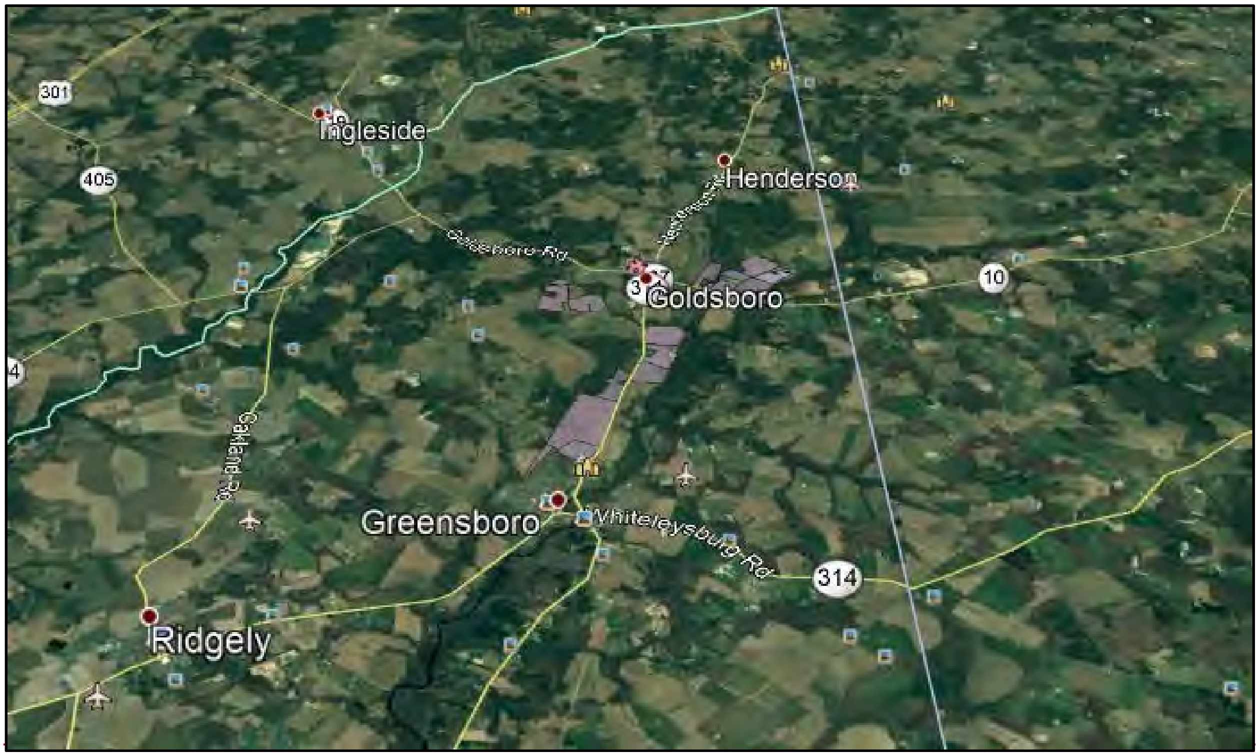
The Applicant has performed the PJM Generation Interconnection Feasibility Study and System Impact Study. Both reports are included in their entirety in ***Appendix 4***. The Project will include a new three-breaker 230 kV ring bus substation to be constructed adjacent to the Keeney-Steele 230 kV circuit. Two (2) of the positions on the ring bus will be transmission line terminals for the tie-in of Line 23009 to the substation. The other position will be a terminal configured for the interconnection of a generator. The project has been assigned Queue Position AB2-037. Based on the findings from the Generation Interconnection Feasibility Study and System Impact Study Reports, the estimated cost to build the substation is $6,491,000 with an estimated construction time of twenty-four (24) months.

The Project will be fully fenced with improved farm lane entrances primarily used wherever possible. Access permits from Caroline County will be acquired for any proposed new entrance. There is no planned need for water and sewer for the Project since there will be no operations and/or maintenance facilities and no full-time personnel located at this Site. Screening will be provided through a twenty foot (20') buffer of indigenous shrubs, trees, and grass plantings; including pollinators, consistent with the local Solar Ordinance and CPCN conditions. However, in some areas where the Project abuts nearby residences, a voluntary more robust fifty foot (50') landscape buffer is proposed in addition to a two hundred foot (200') setback. Wherever possible, the existing wooded area will remain and serve as a natural buffer.

A key feature of the Project is the close proximity of the Upper Section, Middle Section, and Lower Section which allows for short runs of underground interconnections to include two (2) underground crossings at Route 313, a sixty-six foot (66') easement crossing under an abandoned railroad track owned by the Department of Transportation (DOT), a right-of-way (ROW) from Caroline County to bury a line within a County owned ROW, a directional drill under a small private lake, and another directional drill under a Forest Stewardship Parcel. Appropriate agreements will be executed with DOT, the County, and private land owners to provide for these interconnection opportunities, the details of which will be included in future site plans and supporting documents submitted to the County for review and approval. ***Appendix 5*** includes conceptual underground crossing details for the Forest Stewardship parcel crossing, railroad crossing, and private lake crossing.

In addition to the CPCN, the Project will require National Pollutant Discharge Elimination System (NPDES) stormwater permit coverage and other State Regulatory Approvals including conformance with stormwater management, sediment and erosion control, and consistency with Critical Areas. Three (3) separate NPDES NOI Permits will likely be obtained; one (1) for each Section (Upper, Middle, and Lower). In addition to satisfying local site plan review and approval requirements, the site plan will be subject to review as part of the CPCN process in order to obtain substantial conformance with local regulatory codes.

Figure 1 – Regional Context Map


301
Ingleside
405
Henderson
Goldsboro
10
Greensboro
Whiteleysburg Rd
314
Ridgely

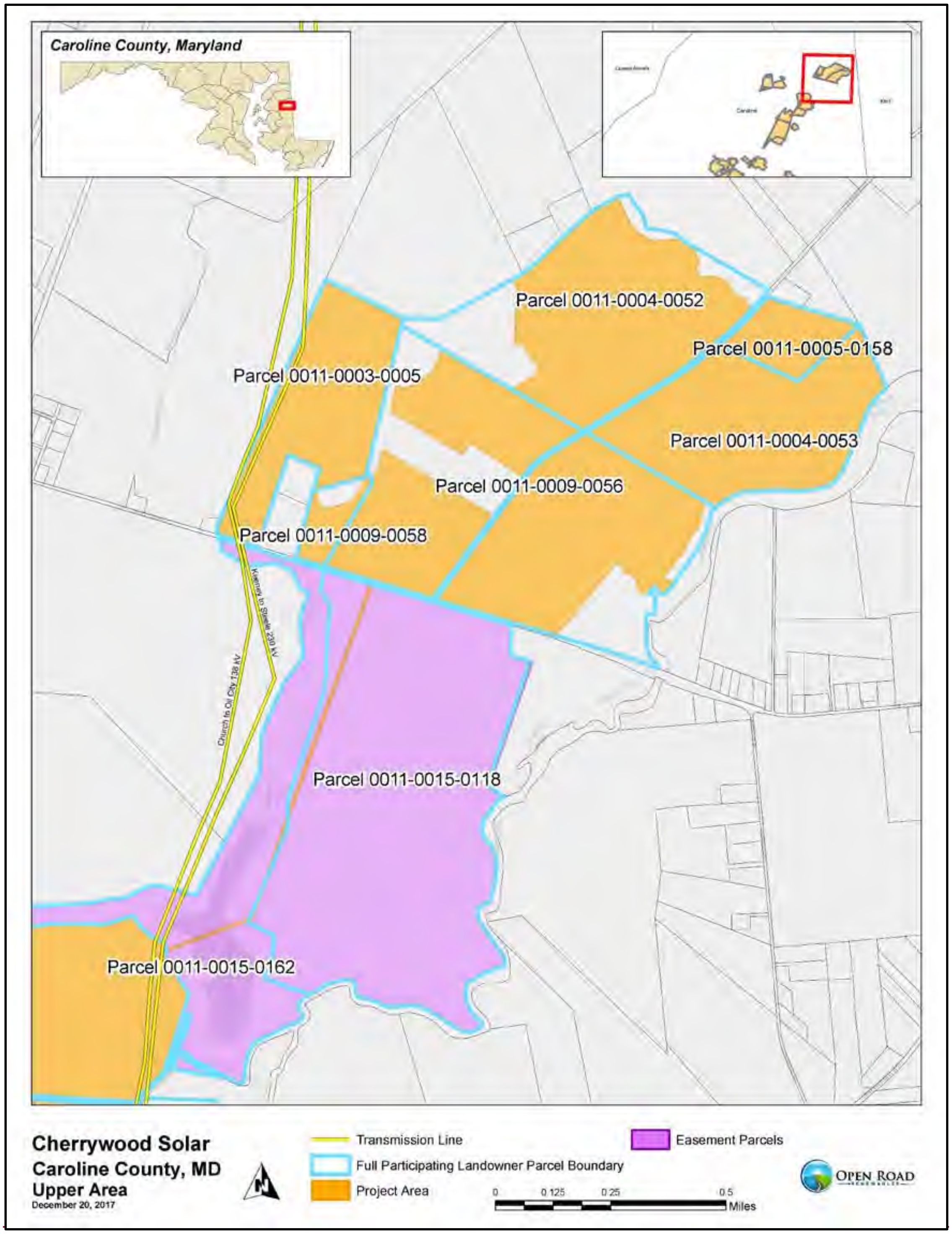

287
Goldsboro
313
© 2018 Google

Figure 2 – Local Context Map


287
Goldsboro
Greensboro


Ingleside
Henderson
Baltimore Corner
312
287
Goldsboro
10
Sandtown
313
Greensboro
© 2018 Google

Figure 3a – Project Site Location Map (Upper Section)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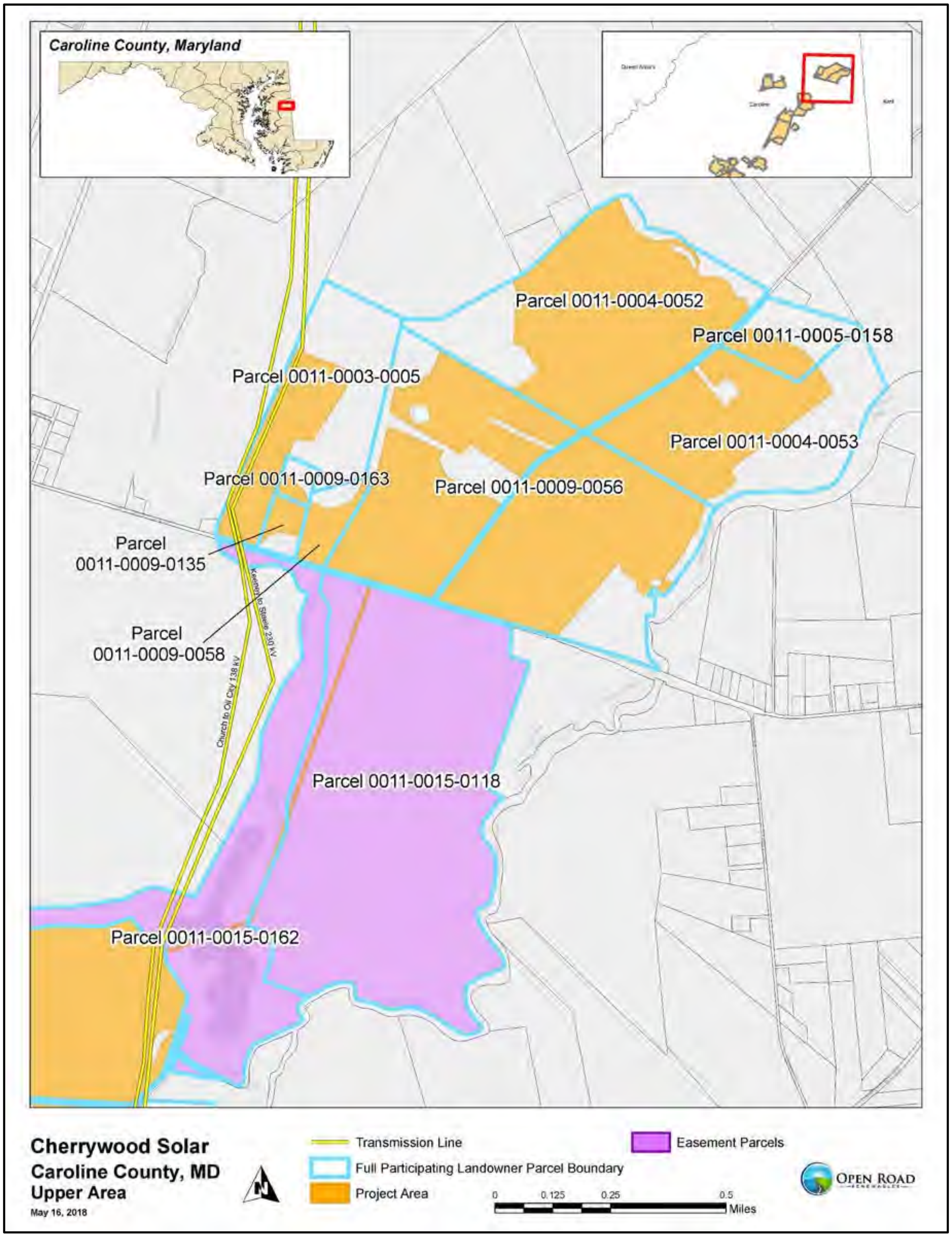
Parcel 0011-0004-0052
Parcel 0011-0005-0158
Parcel 0011-0003-0005
Parcel 0011-0004-0053
Parcel 0011-0009-0056
Parcel 0011-0009-0058
Parcel 0011-0015-0118
Parcel 0011-0015-0162
Cherrywood Solar
Caroline County, MD
Upper Area
December 20, 2017
Transmission Line
Full Participating Landowner Parcel Boundary
Project Area
Easement Parcels
0
0.125
0.25
0.5
Miles
OPEN ROAD


Caroline County, Maryland
Parcel 0011-0004-0052
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Parcel 0011-0004-0053
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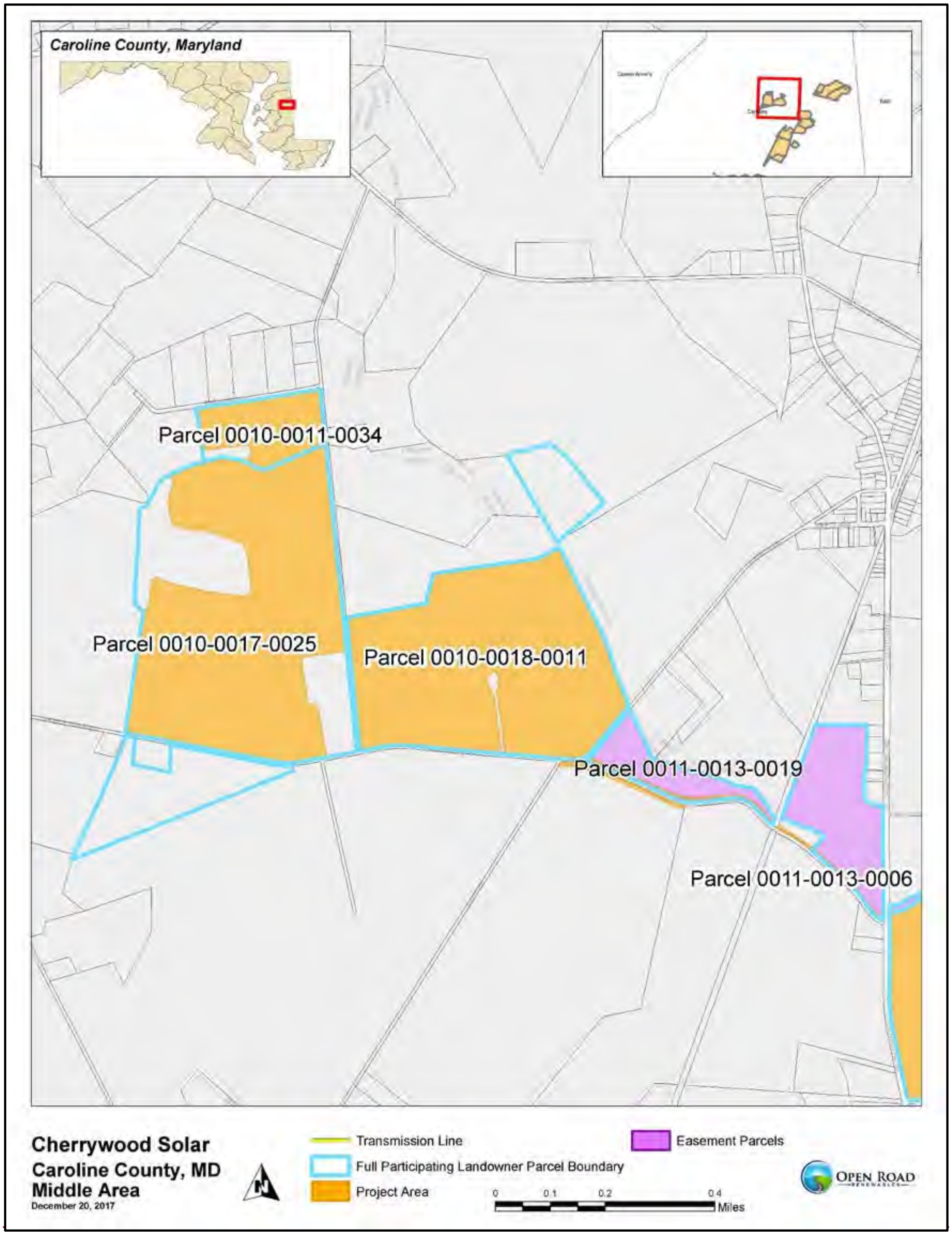
Parcel
0011-0009-0135
Parcel
0011-0009-0058
Parcel 0011-0015-0118
Parcel 0011-0015-0162
Cherrywood Solar
Caroline County, MD
Upper Area
May 16, 2018
Transmission Line
Full Participating Landowner Parcel Boundary
Project Area
Easement Parcels
0
0.125
0.25
0.5
Miles
OPEN ROAD

Figure 3b – Project Site Location Map (Middle Section)



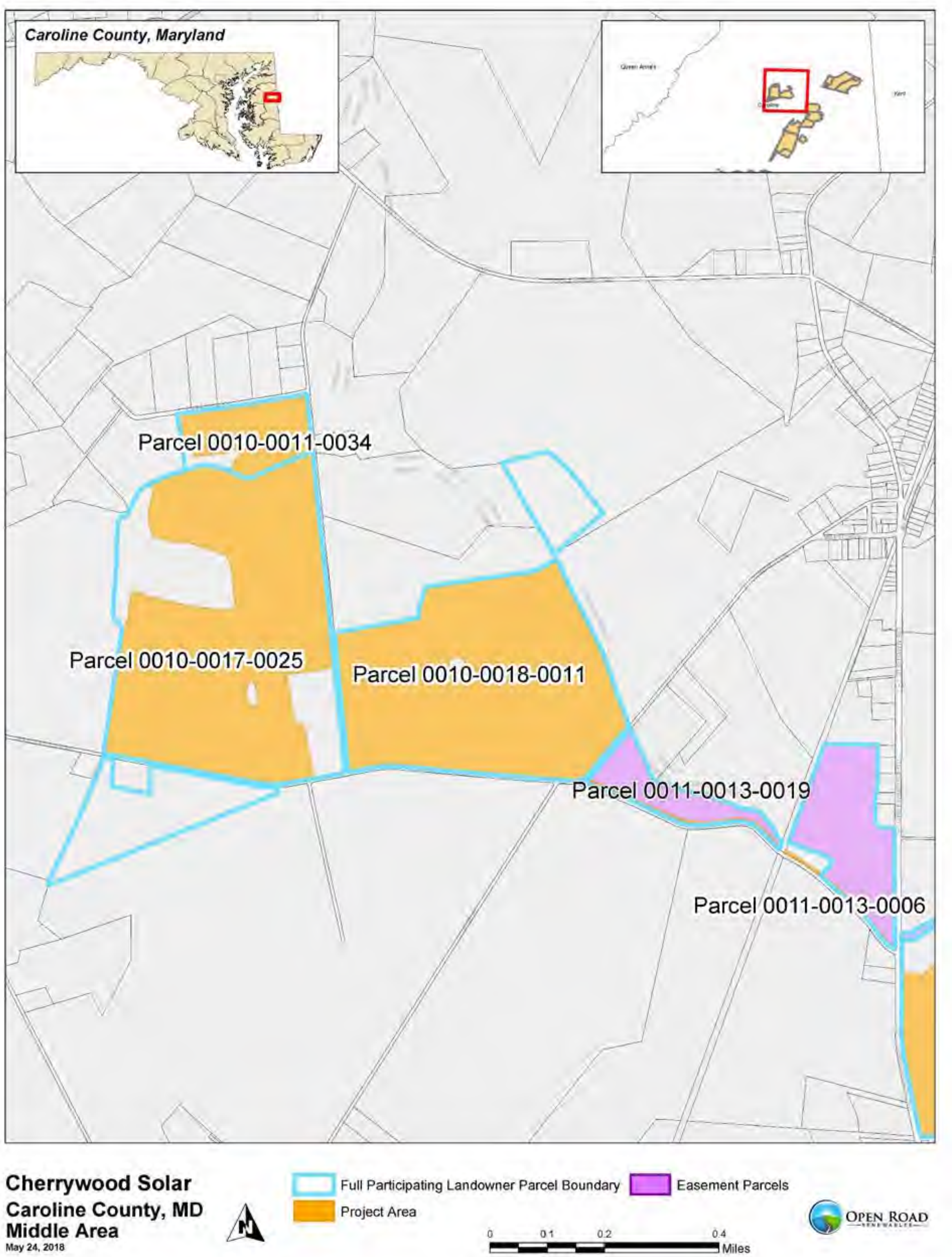
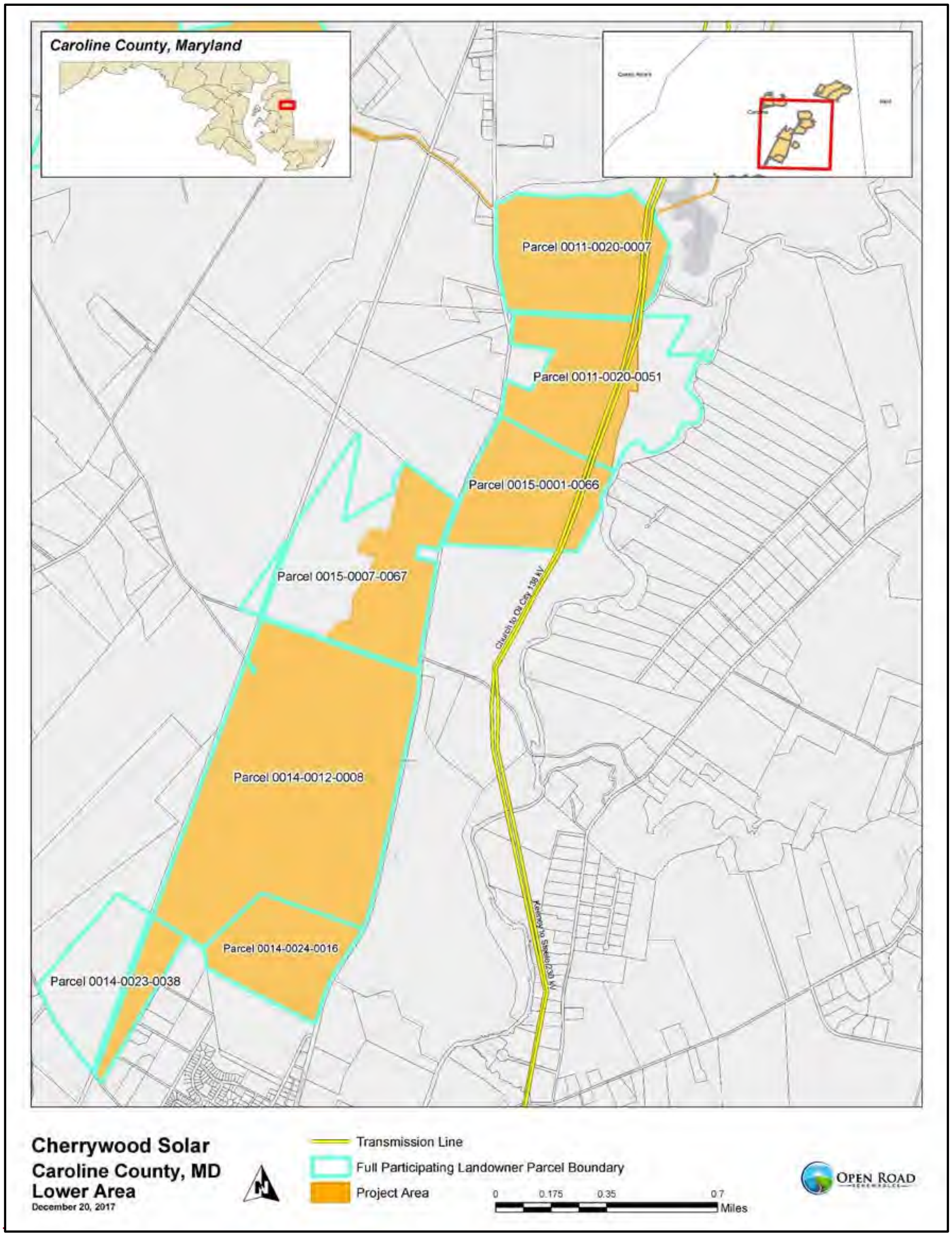

Caroline County, Maryland
Parcel 0010-0011-0034
Parcel 0010-0017-0025
Parcel 0010-0018-0011
Parcel 0011-0013-0019
Parcel 0011-0013-0006
Cherrywood Solar
Caroline County, MD
Middle Area
May 24, 2018
Full Participating Landowner Parcel Boundary
Easement Parcels
Project Area
0 0.1 0.2 0.4
Miles
OPEN ROAD

Figure 3c – Project Site Location Map (Lower Section)


Caroline County, Maryland
Parcel 0011-0020-0007
Parcel 0011-0020-0051
Parcel 0015-0001-0066
Parcel 0015-0007-0067
Parcel 0014-0012-0008
Parcel 0014-0024-0016
Parcel 0014-0023-0038
Cherrywood Solar
Caroline County, MD
Lower Area
December 20, 2017
Transmission Line
Full Participating Landowner Parcel Boundary
Project Area
0
0.175
0.35
0.7
Miles
OPEN ROAD

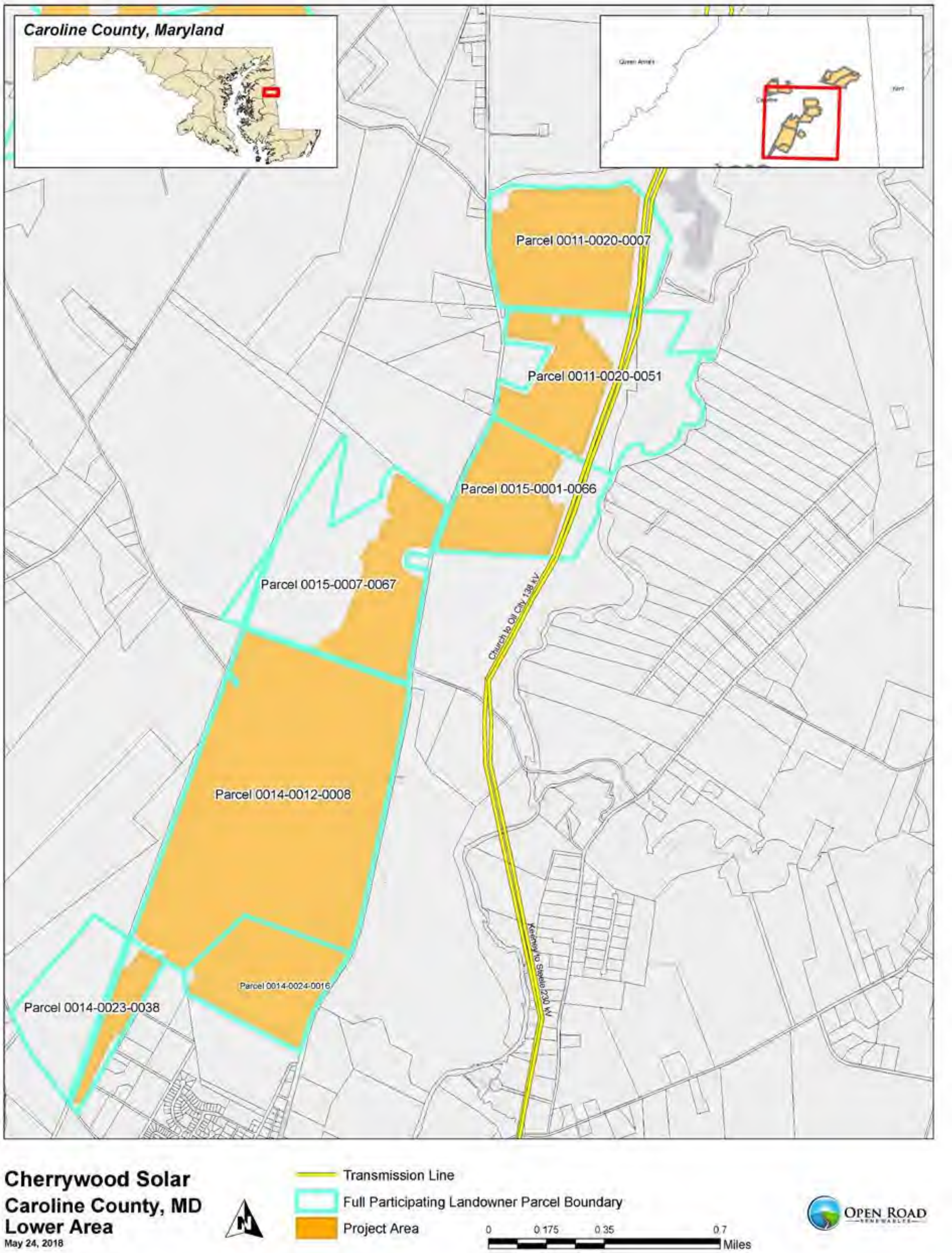

Caroline County, Maryland
Parcel 0011-0020-0007
Parcel 0011-0020-0051
Parcel 0015-0001-0066
Parcel 0015-0007-0067
Parcel 0014-0012-0008
Parcel 0014-0024-0016
Parcel 0014-0023-0038
Church to Oil City 138 kV
Kenney to Steele 230 kV
Cherrywood Solar
Caroline County, MD
Lower Area
May 24, 2018
Transmission Line
Full Participating Landowner Parcel Boundary
Project Area
0 0.175 0.35 0.7
Miles
OPEN ROAD

Figure 4a – Cherrywood Solar I – Upper Section Design Concept and Solar Array Layout

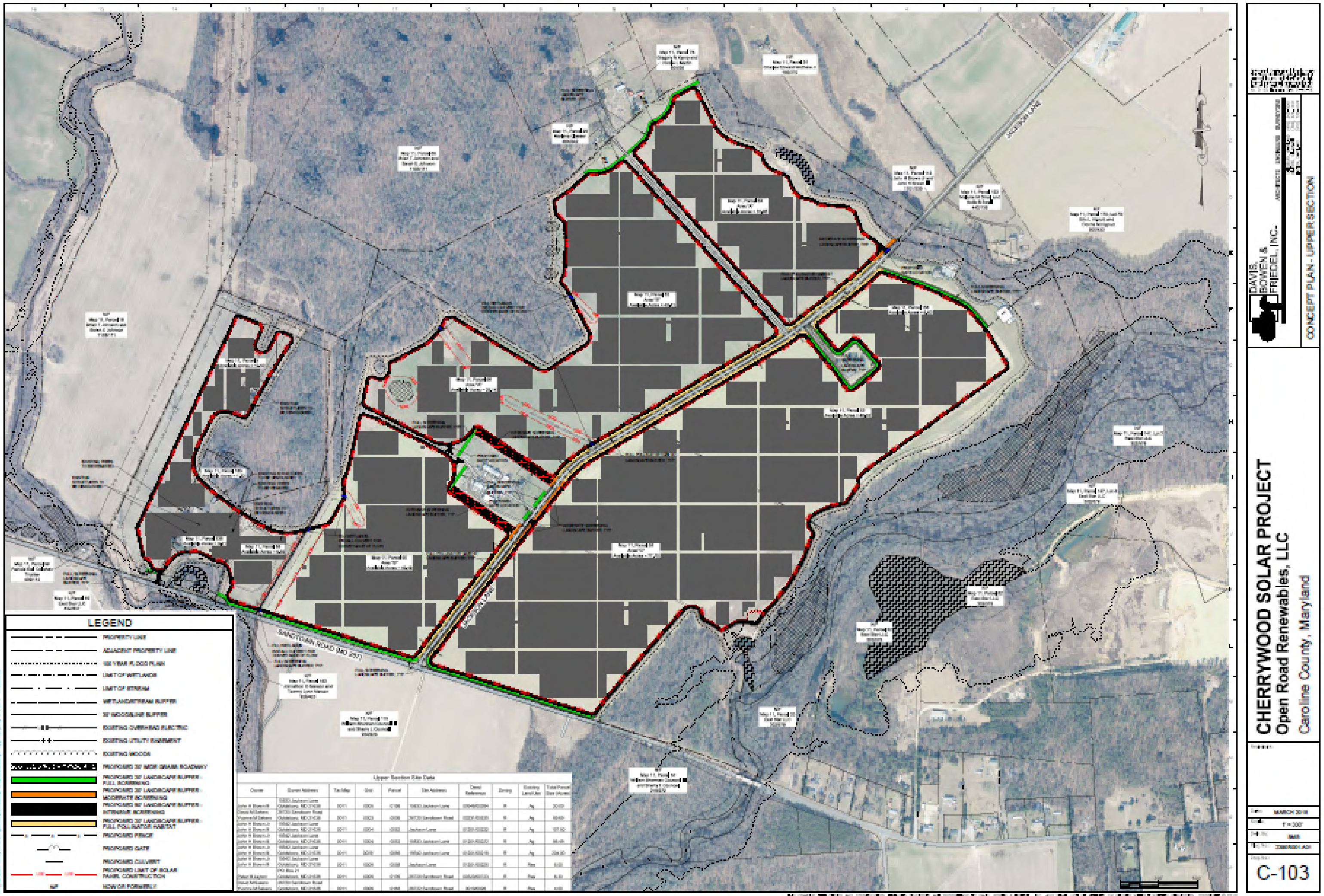
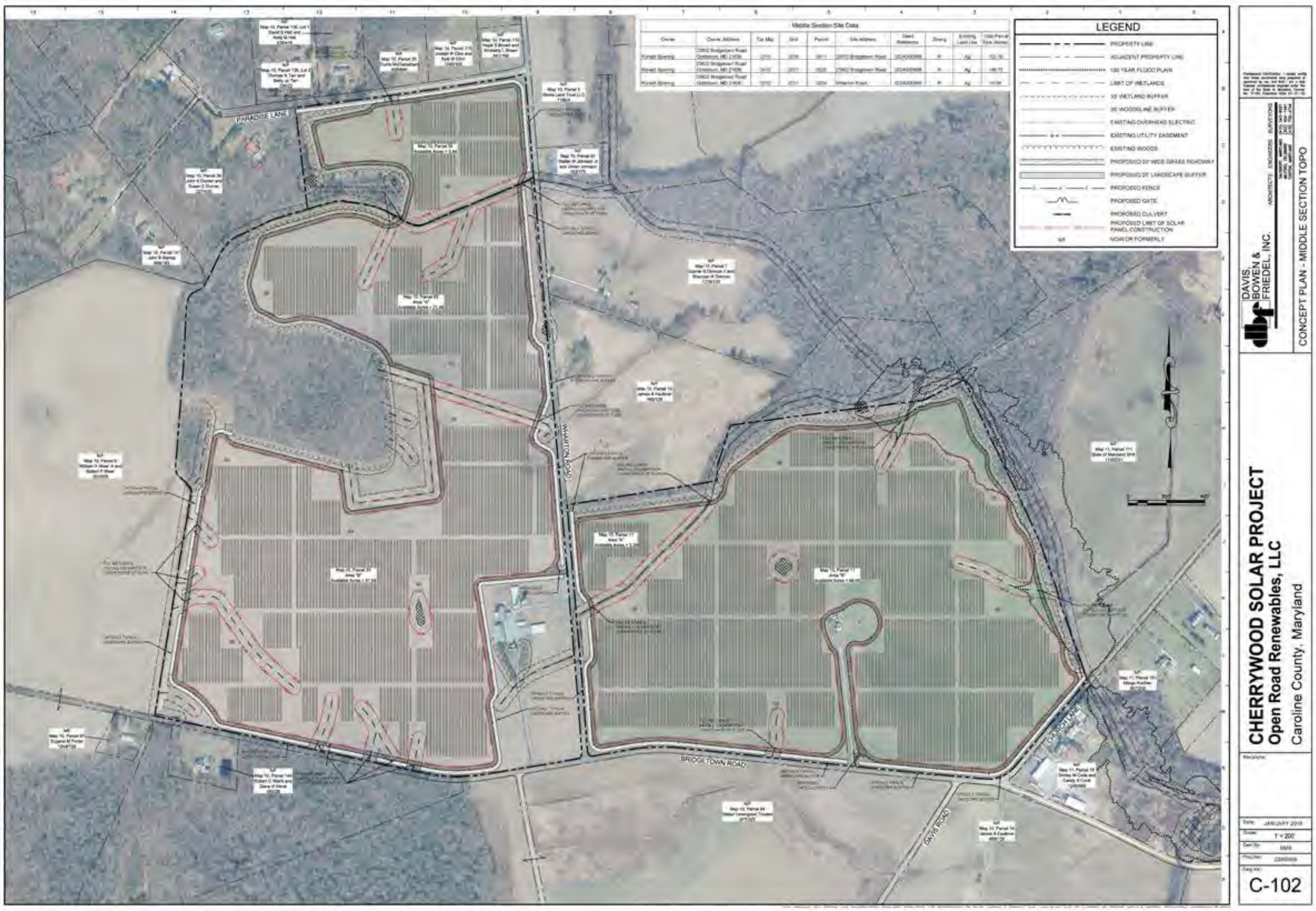


Figure 4b – Cherrywood Solar I – Middle Section Design Concept and Solar Array Layout


Middle Section Site Data
LEGEND
PROPERTY LINE
ADJACENT PROPERTY LINE
100 YEAR FLOOD PLAIN
LIMIT OF WETLANDS
EXISTING OVERHEAD ELECTRIC
EXISTING UTILITY EASEMENT
EXISTING WOODS
PROPOSED FENCE
PROPOSED GATE
PROPOSED CULVERT
PROPOSED LIMIT OF SOLAR PANEL CONSTRUCTION
NOW OR FORMERLY
BRIDGETOWN ROAD
DAVIS ROAD
DAVIS, BOWEN & FRIEDEL, INC.
CONCEPT PLAN - MIDDLE SECTION TOPO
CHERRYWOOD SOLAR PROJECT
Open Road Renewables, LLC
Caroline County, Maryland
C-102

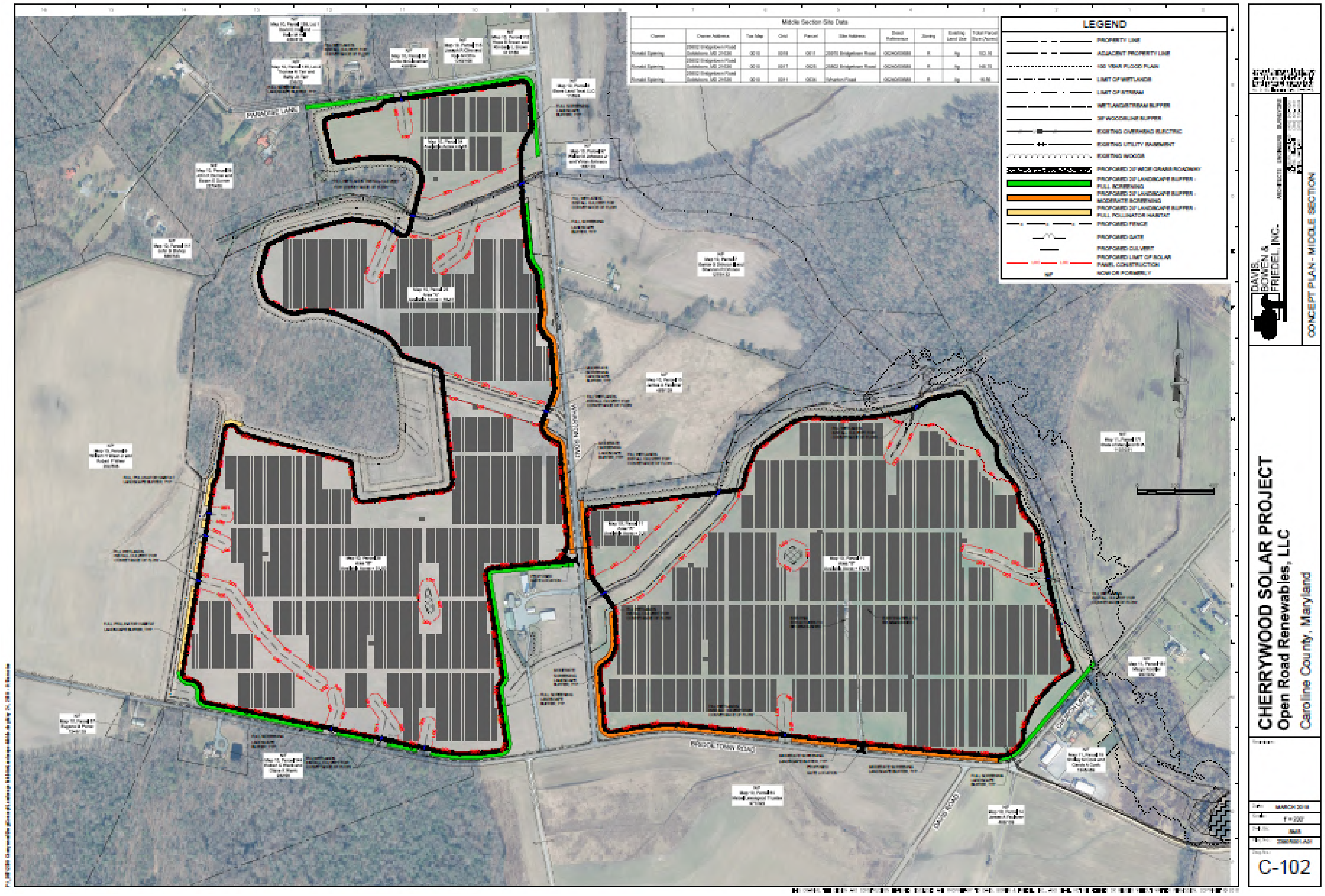
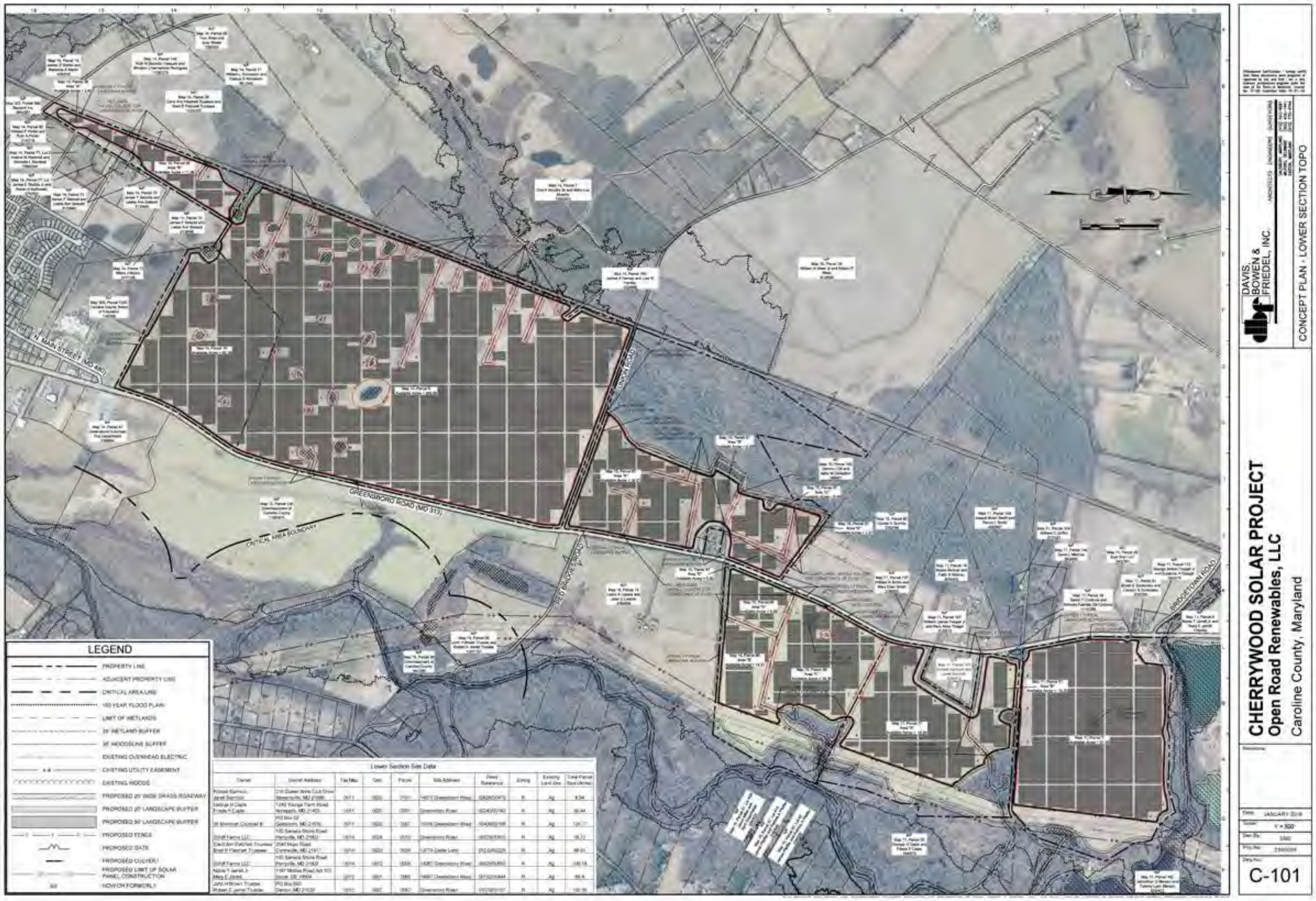

LEGEND
CHERRYWOOD SOLAR PROJECT
Open Road Renewables, LLC
Caroline County, Maryland
CONCEPT PLAN - MIDDLE SECTION
C-102

Figure 4c – Cherrywood Solar I – Lower Section Design Concept and Solar Array Layout



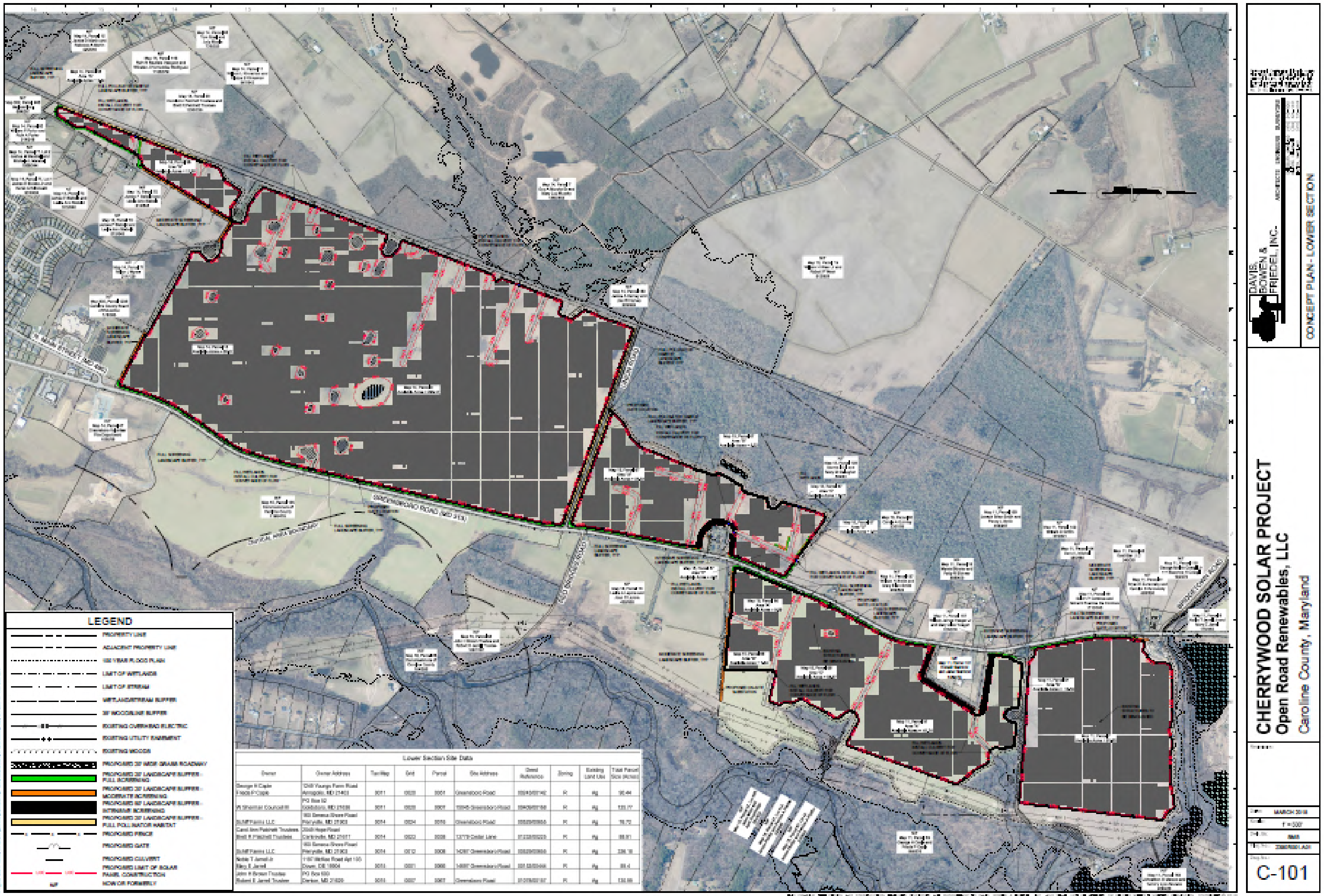


Figure 5 – Solar Array Section [Typical]

NOTES:

1. SYSTEM SPECIFICATIONS:
   TOTAL SYSTEM:
   219.6 MWP
   202.0 MW AC
   DC/AC RATION: 1.09

2. SINGLE AXIS TRACKING: 0.39 GCR

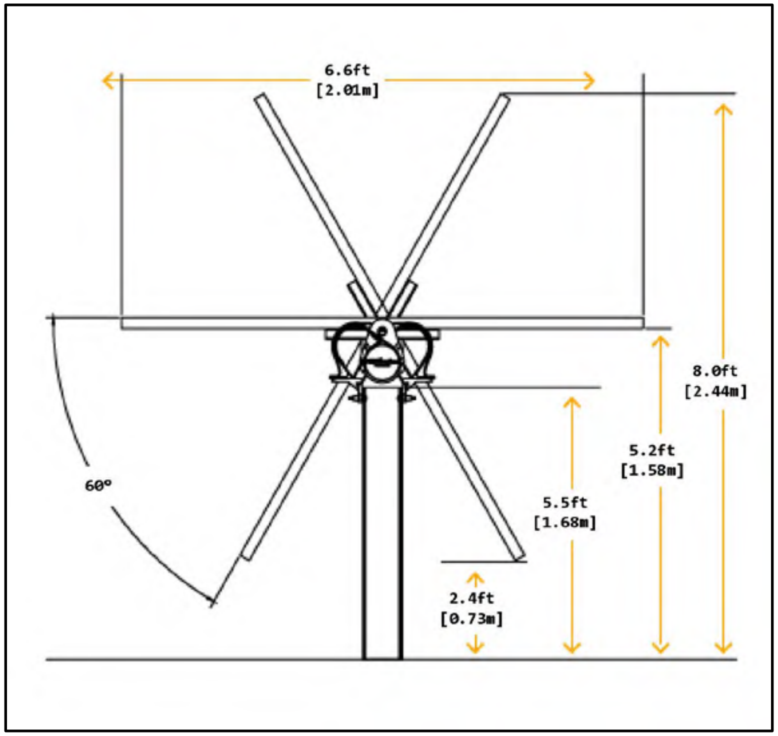
3. FENCE LAYOUT - 6' HIGH CHAIN LINK FENCE

(499,086 FIRST SOLAR FS-6440, 6 MODULES PER STRING, 83,181 STRINGS)

(APPROX. 71,298 POSTS (TYPICAL 84 PANEL ROWS WITH 12 PILES EACH))

(81 SMA SC500EV (1500V) INVERTERS WITH NAMEPLATE 2,500KW CAPACITY EACH)

(1 INVERTER AND 1 TRANSFORMER PER PAD)



SECTION 2 – STATEMENT OF NEED AND PURPOSE

The State of Maryland has enacted aggressive legal and policy standards in pursuit of more renewable energy generation within its borders. The State's goal and commitment is clear and widely considered to be among the most aggressive in the United States. Maryland's Renewable Portfolio Standard (RPS) mandates that twenty-five percent (25%) of Maryland's electricity be generated from renewable energy sources by 2020, which must include at least two and one-half percent (2.5%) solar energy. The RPS solar energy requirement increases each year from now until 2020 and the solar set-aside alone is projected to result in the need for at least 1,600 MW of solar capacity by 2020. The Applicant proposes to construct, own, and operate this 202 MW solar generation facility, which will increase the State's current solar electricity output. There will be significant economic benefits resulting from the Project to include a capital cost of approximately up to $200M and approximately two-hundred fifty to three-hundred fifty (250-350) design, management, and construction personnel working remotely or on the Site at the height of construction during the period from November, 2019 to August, 2020.

The construction schedule is estimated to be eight (8) to ten (10) months and is expected to be completed prior to December 31, 2020. Significant local resources are being employed as part of the design, entitlement, construction, and startup process. The tax revenue yield for a project of this size and type will also be beneficial. This Project will contribute to the local economy as well as the State's commitment to more instate renewable energy generation. It has been reported that Maryland imports approximately of forty-one percent (41%) of its required energy generation. This Project will help to reduce this reliance upon power generated out of state. Given the nature of solar power generation, it will also lead to reduced and more certain costs of electricity produced. Furthermore, this Project will contribute to the stated goals and objectives of Maryland Public Utilities Article § 7-702.

The public benefit of solar facilities like the Project has been clearly established by law. At the same time, the State's requirements and commitments in this area are some of the most progressive in the United States. The Applicant, through this proposal, seeks to assist the State in its effort to meet these objectives and to create more renewable energy generation in Maryland. The Project will deliver all of its output to the PJM wholesale electricity market via the Delmarva Power and Light Company (DPL) electric distribution system serving Maryland.

The Applicant is currently in discussions with multiple power purchasers for the output of the Project. However, as of the date of this submittal, an offtake agreement has not been executed.

SECTION 3 – APPLICANT INFORMATION

A. NAME AND ADDRESS OF APPLICANT

Cherrywood Solar I, LLC
c/o Todd R. Chason
233 East Redwood Street
Baltimore, MD 21202

B. PERSON AUTHORIZED TO RECEIVE NOTICES AND COMMUNICATIONS

Mr. Cyrus Tashakkori
Cherrywood Solar I, LLC
1105 Navasota St.
Austin, TX 78702
Phone 512.921.8643
cyrus@openroadrenewables.com

Mr. Todd R. Chason
Mr. David W. Beugelmans
Gordon Feinblatt LLC
233 East Redwood Street
Baltimore, MD 21202
tchason@gfrlaw.com
dbeugelmans@gfrlaw.com

C. LOCATION AT WHICH A COPY OF THE APPLICATION MAY BE INSPECTED BY THE PUBLIC

Caroline County Department of Planning and Codes
Health & Public Services Building
403 South Seventh St., Suite 210
Denton, MD 21629

SECTION 4 – STATE AND LOCAL PERMITS AND APPROVALS

(A Matrix of Permits and Approvals required for the Project follows as *Table 1*.)

A. MARYLAND PUBLIC SERVICE COMMISSION (PSC)

1. Certificate of Public Convenience and Necessity (CPCN)

This document accompanies the petition to the Commission requesting the grant of a CPCN for the Project.

B. INDEPENDENT SYSTEM OPERATOR

1. Interconnection

The Applicant has performed the PJM Generation Interconnection Feasibility Study and System Impact Study, both of which are included in their entirety in ***Appendix 4***. The Project will include a new three-breaker 230 kV ring bus substation to be constructed adjacent to the Keeney-Steele 230 kV circuit. Two (2) of the positions on the ring bus will be transmission line terminals for the tie-in of Line 23009 to the substation. The other position will be a terminal configured for the interconnection of a generator. The project has been assigned Queue Position AB2-037. Based on the findings from the Generation Interconnection Feasibility Study and System Impact Study Reports, the estimated cost to build the substation is $6,491,000 with an estimated construction time of twenty-four (24) months. The substation will be located near the transmission line on Parcel 0011-0020-0051.

C. MARYLAND DEPARTMENT OF THE ENVIRONMENT

1. NPDES General Permit for Construction Activity

A National Pollutant Discharge Elimination System (NPDES) General Permit is required for planned construction activities with a planned total disturbance of one (1) acre or greater. Coverage under the General Permit is obtained by filing a completed Notice of Intent (NOI) form with the Maryland Department of the Environment, Water Management Administration (MDE/WMA).

The completed NOI form is considered a formal application for coverage and intent to comply with the terms of the General Permit. An NOI will be submitted to MDE during the construction drawing plan review phase.

D. MARYLAND DEPARTMENT OF NATURAL RESOURCES FOREST SERVICE

1. Forest Conservation Act

Generation facilities subject to a CPCN may be exempt from compliance with the Forest Conservation Act ("FCA"). The Applicant engaged ECS Mid-Atlantic to perform a Simplified Forest Stand Delineation and prepare an associated report for submittal to Caroline County as part of its local FCA review process. The

FSD and draft FCA Worksheet are included in ***Appendix 6***. Caroline County has reviewed the Simplified FSD and draft FCA worksheet and advised that the findings are acceptable. Consistent with these documents and as part of the local site plan process a Forest Conservation Plan (FCP) will be prepared and submitted to the County.

The Simplified FSD does not require the specimen trees be located; however, ECS indicated there were numerous specimen trees in the forested areas which are not to be disturbed as part of the Project. ECS further noted the most prevalent location of the specimen trees was along the eastern boundary of the Project nearest the Choptank River. While the Project may remove very few specimen trees outside of the wooded/forested areas, the proposed landscape buffer plan adds approximately twenty-nine (29.92) acres of trees, shrubs, and pollinator habitat on land that is currently utilized for crop farming. The Lower Section includes fifteen (15.1) acres, the Middle Section includes five (5.11) acres, and the Upper Section includes nine (9.71) acres.

Because the County has accepted the Simplified FSD and draft FCA Worksheet, Caroline County has also indicated that the Project satisfies the "no net loss" requirement in the FCA. Therefore, based on the statutory exemption for projects subject to CPCN that satisfy the "no net loss" requirement, Caroline County will not require afforestation mitigation under their Forest Conservation Ordinance ("FCO"). *Appendix 17* includes the County's confirmation on Forest Conservation Exemption. There is no plan to cut forested areas and the few stand-alone and isolated trees that will be removed will be significantly offset by the many acres of trees to be planted as part of the proposed vegetative buffer plan.

In Caroline County, the fee is assessed at a rate of thirty cents ($0.30) per square foot of the conservation requirement within the designated Priority Funding Area and at a rate of thirty-six cents ($0.36) per square foot of conservation requirement outside the designated Priority Funding Area. Should any type of mitigation be required to satisfy Caroline County FCA requirements for the few trees to be removed, in addition to the fee option, the Applicant may also mitigate by planting trees at a one-to-one (1:1) ratio, placing appropriate acreage of wooded area within the same watershed and/or County into a Forest Conservation Easement (FCE) at a two-to-one (2:1) ratio, or purchasing mitigation credits from a mitigation bank at a two-to-one (2:1) ratio, or paying the County's in lieu of fee. If these options cannot be achieved within the same watershed and/or County, the mitigation rate would change from two-to-one (2:1) to four-to-one (4:1).

E. CAROLINE COUNTY PLAN REVIEW AND PERMITTING

1. Zoning and Comprehensive Plan Consistency

The underlying zoning for all of the Properties is Rural (R) with the predominant use Agriculture. Solar generation facilities are a commercial use that will undergo site plan review consistent with Caroline County's Commercial Site Plan Checklist. The County imposed a temporary moratorium on utility scale solar projects while the Task Force studied other county's regulatory approaches, including designating areas within the Delmarva Power and Light Company (DPL) distribution system where properties would be allowed for use as utility scale solar projects. The Solar Ordinance adopted in December, 2017 limits utility scale solar projects in aggregate to 2,000 acres of farmland (equivalent to approximately one and a half percent (1.5%) of the County's farmland). Additionally, ~~P~~places in the County designated for growth have been determined to be off limits for utility scale solar development.

Caroline County established an eight (8)-member Task Force, of which the Applicant was an active member, to draft and vet the proposed Ordinance. The Applicant diligently participated in discussions along with other community, government, business, and industry representatives, to ensure the proposed Project would be fully consistent with the new Solar Ordinance. Most of the components of the new Solar Ordinance are fully consistent with common PPRP approaches and include requirements relating to subjects such as decommissioning plans with financial assurance, setback and screening, height and lighting, glare, fencing, and aesthetics. The Applicant has also coordinated planning efforts for the Project with farming tenants to minimize disruption of farming activity.

The Applicant will complete the applicable local review process, which will ensure consistency with local zoning requirements including application for the Special Use Exception.

The new Solar Ordinance provides that utility-scale solar projects may not be constructed in previously-established planned growth districts within the County. In addition, it limits utility scale solar projects, in the aggregate, to 2,000 acres of agricultural land in the County. The Project falls outside the planned growth districts and, if constructed, the total amount of utility-scale solar in the County would be well within the 2,000-acre limit for agricultural land. Finally, specific design requirements, setbacks, and landscape buffers were defined based on proximity of projects to residential dwellings, all of which have been incorporated into the design of the Project.

2. *SITE PLAN REVIEW / APPROVAL AND LOCAL PERMITTING*

As with other CPCN projects, site plan requirements may include, but may not be limited to, ingress/egress, setbacks and buffers, screening, internal drive aisles and access ways, Fire Marshal conditions/requirements, electric code requirements, building code requirements/references, sediment and erosion control, stormwater management, solar panel layouts including inverter locations and switchgear, gen-tie alignment and specifications, and a number of other requirements that parallel environmental requirements of the Maryland Environmental Article as may be delegated to local jurisdictions for implementation.

Following site plan submittal to the Zoning Administrator, a Technical Advisory Committee (TAC) meeting will be held and the Applicant will receive and review comments on the submittal package. With TAC recommended approval, the revised plans will be submitted to the Planning Commission for review and approval. If a Special Exception or Conditional Use approval is needed the Project will need to submit the appropriate application and supporting documents to the Board of Zoning Appeals (BZA). The various tools to be used by the technical team to assure local submittals are consistent with local process and standards will include careful reference to the following:

www.carolinemd.org/DocumentCenter/View/192
http://www.carolinemd.org/271/PlanningZoning-Technical-Advisory-Commit
http://www.carolinemd.org/274/Site-Plans
http://www.carolinemd.org/269/Development-Review

Table 1 below outlines in more detail the State and Local permits and approvals associated with these processes.

It is important to note that in developing the site plan and addressing site stabilization requirements that will be governed by the sediment and erosion control permit, the MDE will stipulate a phasing/sequencing plan as part of the site plan approval process. Thus, the sediment and erosion control plans will have to specify how each disturbed area in the phasing plan will be stabilized before the next construction area is disturbed. Due to the relatively large size of this Project, MDE and the County will require interim stabilization every seven (7) days. Under State Code, stabilization of a site requires vegetative cover within the proposed LOC to prevent runoff and sediment and erosion regulatory violations.

This requirement will best be met through strategically planning the construction phase of the Project to include phasing plans. These phasing plans will maximize use of laydown areas, minimize truck traffic throughout the construction area, and phase contractors so that work on solar modules and wiring is preceded by completion of work installing posts and racking.

It should be noted that the State's limitation of twenty (20) acres of disturbance at any time during construction has been recently modified to be less restrictive, allowing for the State to consider other phasing options that will limit disturbance to defined areas.

3. Grading and Building Permits

A Grading Permit and Building Permit will be applied for after the Construction Drawing approval. These documents will provide the detailed engineering and specifications required to implement the approved site plan leading to necessary grading and building permits as required by Caroline County. At the same time the Grading and Building Permits are applied for, the Applicant will submit construction documents for the Electrical Permits needed for construction.

F. SUMMARY OF PERMITS/APPROVALS

Table 1 – Matrix of State/Local Permits and Approvals

Agency	Permit/Approval	Regulatory Citation (s)	Required For		Status			Waiver, Variance, or Exemption		Comments
			Construction	Operation	Application Contained Herein	Application to be Filed	Permit Approval/ Obtained	Yes	No	
State of Maryland Public Service Commission (PSC)	Certificate of Public Convenience and Necessity (CPCN)	COMAR 20.79	√		√				√	To be prepared at a later date.
PJM Interconnection, LLC	Interconnection	Condition for Issuance of CPCN		√			√		√	PJM completed the Feasibility Study Report in September, 2016. PJM completed the System Impact Study in April, 2017.
Maryland Department of the Environment (MDE)	National Pollution Discharge Elimination System (NPDES) General Permit for Construction Activity	COMAR 26.08, Clean Water Act (CWA) Section 401, 40 CFR 122	√			√			√	Application to be submitted at the time Construction Documents have been completed.
Maryland Department of Natural Resources Forest Service	Forest Conservation Act (FCA)	Natural Resources Article 5-1602(b)(5)						√		The Applicant has submitted the Simplified FSD and draft FCA Worksheet for County review. The County has indicated, based on their review, that afforestation will not be required.
Caroline County	Environmental Site Design Erosion Sediment Control Construction Drawings	Applicability varies according to Local and State Requirements	√			√			√	It is expected that the County will participate in the CPCN process and provide input regarding the site plan, stormwater management, and sediment and erosion control. Grading, Electrical, and Building Permits will be applied for after construction drawings are approved.

SECTION 5 – COMAR 20.79.03.01 DESCRIPTION OF GENERATING STATION

A. LOCATION

The Caroline County, Maryland Solar Project (the “Project”) is located on a plain of properties that run from southwest to northeast between the Towns of Greensboro and Goldsboro just west of the Choptank River. The Project will consist of ~~sixteen~~ eighteen (~~16~~18) parcels, only some of which are contiguous and approximately four (4) other additional parcels will be used for easements to accommodate the various connector lines. The Project will be approximately two-hundred two megawatts (202 MW) single axis tracking alternating current (AC) solar polycrystalline photovoltaic (PV) project proposed by Cherrywood Solar I, LLC. It is anticipated that the Project would include a development envelope of one thousand ~~eighty-three~~ seventy-three (1,073.69~~1,083.62~~) acres once buffers and setbacks have been established in addition to avoidance from environmental constraints. As shown in ***Figure 3***, the proposed Project for purposes of this Report includes three (3) sections.

The Upper Section consists of Tax Map 0011, Grid 0004, Parcel 0052 (“Property 1”), Tax Map 0011, Grid 0005, Parcel 0158 (“Property 2”), Tax Map 0011, Grid 0004, Parcel 0053 (“Property 3”), Tax Map 0011, Grid 0009, Parcel 0056 (“Property 4”), Tax Map 0011, Grid 0009, Parcel 0058 (“Property 5”), ~~and~~ Tax Map 0011, Grid 0003, Parcel 0005 (“Property 6”), Tax Map 0011, Grid 0009, Parcel 0135 (“Property 17”), and Tax Map 0011, Grid 0009, Parcel 163 (“Property 18”) and is comprised of approximately five hundred ~~five~~ fifteen (~~505.68~~515.99) acres of which the LOC includes approximately two hundred ninety-five (295.75~~2~~) acres.

The Middle Section consists of Tax Map 0010, Grid 0011, Parcel 0034 (“Property 7”), Tax Map 0011, Grid 0017, Parcel 0025 (“Property 8”), and Tax Map 0010, Grid 0018, Parcel 0011 (“Property 9”) and is comprised of approximately two hundred sixty-eight (268.47) acres of which the LOC includes approximately one hundred ~~fifty-four~~forty-nine (~~154.07~~149.44) acres.

The Lower Section consists of Tax Map 0011, Grid 0020, Parcel 0007 (“Property 10”), Tax Map 0011, Grid 0020, Parcel 0051 (“Property 11”), Tax Map 0015, Grid 0001, Parcel 0066 (“Property 12”), Tax Map 0015, Grid 0007, Parcel 0067 (“Property 13”), Tax Map 0014, Grid 0012, Parcel 0008 (“Property 14”), Tax Map 0014, Grid 0024, Parcel 0016 (“Property 15”), and Tax Map 0014, Grid 0023, Parcel 0038 (“Property 16”) and is comprised of approximately ~~one thousand one hundred forty-six~~nine hundred thirty-eight (~~1,146.07~~938.41) acres of which the LOC includes approximately six hundred ~~thirty-three~~ twenty-eight (~~633.83~~628.50) acres.

Regarding other adjacent parcels which will only be used for necessary easements to facilitate the electrical interconnection of the various Sections noted above; streams, wetlands, forests areas, and other environmental constraints can be completely avoided by directional drilling.

The parcels which will be included in the Project to facilitate interconnection of the Sections noted above include Tax Map 0011, Grid 0015, Parcel 0118; Tax Map 0011, Grid 0015, Parcel 0162; Tax Map 0011, Grid 0013, Parcel 0019; and Tax Map 0011, Grid 0013, Parcel 0006. These parcels are shown in purple on ***Figure 3***.

The proposed array layout will maintain a fifty-foot (50’) setback from road frontages and property lines that are not internal to the Project (see ***Figure 4***). Although the Project is not within the Critical Area and subject to Critical Area buffers and setbacks, the Project will be located more than one hundred feet (100’) from designated streams and thirty-five feet (35’) from the drip line of existing trees. Within this setback appropriate buffering/screening will be provided. The landscape buffer plans will be prepared by a licensed landscape architect from Davis, Bowen &

Friedel, Inc. (DBF) which will be reviewed and approved by Caroline County, and the local Soil Conservation District Office. These same agencies also review and approve other planting plans within the fence associated with site stabilization, drainage, and stormwater management. The perimeter fence, which is proposed to be a six foot (6') high chain-link fence, will be located thirty-five feet (35') from the drip line along the wooded perimeter of the Project as shown in ***Figure 4***. The electricity produced by the Project's solar modules and inverters will be delivered into the PJM Interconnection, LLC (PJM), System, the largest centrally dispatched control area in North America consisting of all or part of the States of Maryland, Pennsylvania, New Jersey, Delaware, District of Columbia, Illinois, Indiana, Kentucky, Michigan, North Carolina, Ohio, Tennessee, Virginia, and West Virginia.

All of the Properties are in close proximity and drain directly to the Upper Choptank River. The Upper Choptank River watershed is predominantly rural with significant agricultural areas, as well as forest, small towns and pockets of suburban development. Large areas of land, which had poorly drained soils, were able to be developed because lands were drained by ~~Public Drainage Association~~PDA's ditches. Maintenance of these ditches is central to continuation of much of the current economic activity in the watershed. About fifty-six percent (56%) of the Upper Choptank Watershed in Maryland is prime farmland. According to the Chesapeake Bay Program's Phase 5.2 Model, the land use distribution in the watershed is approximately fifty-three percent (53%) agricultural, thirty-five percent (35%) forest, and twelve percent (12%) urban.

Although the significant ditching of farmed properties increased productivity and contributed significantly to farming viability in this watershed, it also contributed greatly to the degradation of water quality in the Upper Choptank River. Sixty-seven percent (67%) of degraded stream miles in the watershed are artificially straightened or channelized in some way. During channelization, trees in the riparian buffer zone are often cut and woody debris is removed from the stream channel to allow for efficient movement of water away from agricultural fields. As a result, heavily channelized streams are often shallow and offer little habitat diversity. The Delmarva Peninsula contains over eight hundred (808) miles of ~~Public Drainage Association~~PDA or tax ditches that drain over 143,311 acres of land. Caroline County, which is part of the Choptank River watershed, holds the greatest number of tax ditches in the Maryland Eastern Shore. The historical loss of wetlands in the Upper Choptank River watershed is estimated to be 48,169 acres, which is a relatively large loss of wetlands compared with other similar Maryland watersheds and has contributed to the degrading of water quality in the Upper Choptank River.

As stated above, water quality in the Upper Choptank is poor. Sediment loads from the watershed to the non-tidal waters have increased, but phosphorus levels in nontidal waters have decreased. Still, nitrogen, phosphorus, and sediment levels in the tidal waters of the Upper Choptank are too high. Habitat for underwater grasses are poor because algal densities are too high and water clarity is poor. Only bottom dissolved oxygen levels are good. No underwater grass beds are found in the Upper Choptank and bottom dwelling animal populations are not healthy. The River itself is tidal for much of its length and includes an ecologically delicate estuarine ecosystem.

All waters of the State are assigned a "Designated Use" in regulation, COMAR 26.08.02.08, which is associated with a set of water quality criteria necessary to support that use. These designated uses may or may not be currently compliant; however, the Code requires that standards should be attainable. All surface waters in the Upper Choptank River watershed are designated Use I for Water Contact Recreation, and Protection of Aquatic Life. Waters designated as Use II for Shellfish Harvesting in the Choptank River are located in estuarine waters downstream of the Upper Choptank River watershed.

Stabilizing the proposed Project with a combination of grass and pollinator cover will substantively improve downstream water quality by eliminating active farming practices on this large tract of land.

B. DESIGN FEATURES

Total generating capacity for the Project is anticipated to be 202 MW Alternating Current (AC) output. The Project will consist of approximately 499,806 First Solar Series 6 solar modules (or similar) as shown in the Solar Array Layout (see *Figure 4*). The array will be installed using a pile-driven post-supported racking system utilizing galvanized steel posts with galvanized steel or aluminum structures for mounting the modules. A typical Solar Panel Racking Detail depicts the array with portrait racking with one row of modules positioned vertically on each rack (see *Figure 5*). The space between rows will be approximately sixteen feet and ten inches (16' 10") from post to post. The solar arrays will continuously rotate around a horizontal axis, oriented North-South, to orient the solar modules at an optimal angle to the incoming solar insolation during the day. In this configuration, the minimum leading-edge height (bottom edge of the modules) will be approximately two feet (2') from grade, and the maximum (top-edge height of the modules) will be approximately eight (8') from grade, although other feasible configurations are possible with higher top-edge heights. The solar arrays will be designed to withstand a snow load of twenty-five (25) pounds per square foot (psf) and wind of one hundred (100) miles per hour (mph) (risk category I per IBC 2012 for Caroline County).

There will be eighty-one (81) separate power stations where the direct current from the arrays will be converted to alternating current as transmitted by the electric grid. Each power station will include an inverter pad with one (1) inverter and one (1) liquid AC transformer. Each power station will make up 1/81 of the array AC capacity or approximately 2.5 MW. The nameplate capacity of the facility will be of 202 MW. The onsite facilities will also include a project substation and switch gear.

A six-foot (6') high chain link perimeter fence will be installed around the Project with multiple entrances from roads fronting the identified parcels as reflected in *Figure 4* above. To the extent possible, exiting farm lanes and property entrances will be used. There is limited need for water and no need for sewer at the Project site because there will be no operations and/or maintenance facilities as part of this Project and no full-time personnel located at this Site. The only water use associated with the operation of this solar generation facility will be relatively infrequent cleansing of the solar modules. Typically, this cleansing utilizes only water sprayed at relatively high speeds to remove dirt and dust from the solar modules. Washing of a plant this size would consume much less water than the irrigation requirements for an active farm. Water to accommodate these needs will be provided using tanker trucks, which will obtain water from a County and/or Municipal water supply.

1. Environmental Site Design (ESD)

a. ESD Components

i. Land Use and Cover

The Sites primarily consist of agricultural fields and have been farmed for conventional agricultural crops by landowners for several decades. The Applicant is in communication with the agricultural lease tenants and will provide notice consistent with Md. Real Property Article § 8-402(b)(3)(i).

ii. Soils and Steep Slopes

According to the Critical Area Commission, the Site is outside the Critical Area and contains soils with widely varying characteristics including poor, moderate, and well-draining. As stated above, the Upper Choptank watershed lies within the Coastal Plain physiographic region, which is a wedge-shaped mass of primarily unconsolidated sediments of the Lower Cretaceous, Upper Cretaceous

and Pleistocene Ages covered by sandy soils. The Coastal Plain Region is characterized by lower relief, and is drained by slowly meandering streams with shallow channels and gentle slopes.

Soils typically found in the Upper Choptank River watershed include Sassafras, Fallsington, Galestown, Matapeake, Westbrook, and Othello series. The Sassafras series consist of very deep, well drained soils on sandy marine and old alluvial sediments. The Fallsington series consist of very deep poorly drained on coastal plain flatlands. Saturated hydraulic conductivity is high in the subsoil and high to very high in the substratum. The Galestown series consist of very deep, somewhat excessively drained soils formed in sandy marine sediments and glacial outwash on glacial terminal moraine. The Matapeake series consist of very deep, well drained soils in silty eolian sediments underlain by coarser fluvial or marine sediments. The Westbrook series consist of very deep, very poorly drained soils formed in organic deposits over loamy mineral material. The Othello series consist of very deep, poorly drained soils, with saturated hydraulic conductivity being moderately high.

The full soils report and prime farmland classification can be found in ***Appendix 2***. As confirmed in the geotechnical report (***Appendix 7***), these soils are suitable to support solar modules, inverters, switch gear, grass covered aisle ways, access roads, and associated drainage and stormwater management. For the ~~sixteen~~ eighteen (~~16~~18) properties associated with the proposed utility scale solar project, the following soil characterizations are provided.

Upper Section:

- Property 1 – the slopes range between zero percent (0%) and five percent (5%) with the three most prominent soil classifications being Ingleside Sandy Loam, Hambrook Sandy Loam, and Lenni Loam. This is one of the better soil groupings for all of the sixteen (16) properties. These soils are moderately to well-draining soils.
- Property 2 – the slopes for most of the property range between two percent (2%) to five percent (5%). Less than two (2) acres are on steeper grades which will be avoided. These slopes range from ten percent (10%) to thirty percent (30%). The primary soils for the useable portion of the property Evesboro Sand and Hambrook Sandy Loam. Both are well-draining.
- Property 3 – the majority of the slopes range between zero percent (0%) and five percent (5%) with eleven (11.4) acres falling in the five percent (5%) to ten percent (10%) range. The prominent soil series are Ingleside Sandy Loam, Hambrook Sandy Loam, and Rosedale Sandy Loam. These soils are moderately to well-draining soils.
- Property 4 – the majority of the slopes range between zero percent (0%) and five percent (5%) with approximately six (6.0) acres out of approximately one hundred twenty-six (126) acres falling in the five percent (5%) to ten percent (10%) range. The prominent soil series are Ingleside Sandy Loam and Hambrook Sandy Loam. These soils are moderately to well-draining soils.
- Property 5 – the majority of the slopes range between zero percent (0%) and five percent (5%). The majority of soils on this property are Fallsington Sandy Loams, Hambrook Sandy Loams, and Woodstown Sandy Loams. These soils are moderately to well-draining soils.
- Property 6 – the majority of the slopes range between zero percent (0%) and five percent (5%). The majority of soils on this property are Ingleside Loamy Sand, Hammonton-

Fallsington-Corsica Complex, and Hambrook Sandy Loams. These soils are moderately to well-draining soils.

- Property 17 – the majority of the slopes range between zero percent (0%) and five percent (5%). The majority of soils on this property are ~~Fallsington Sandy Loams,~~ Hambrook Sandy Loams, and Ingleside Sandy Loam,~~and Woodstown Sandy Loams~~. These soils are ~~moderately to~~ all well-draining~~soils~~.
- Property 18 – the majority of the slopes range between zero percent (0%) and five percent (5%). The majority of soils on this property are Hambrook Sandy Loams, and Ingleside Sandy Loam. These soils are all well-draining.

As indicated in the Project Overview these ~~six~~ eight (~~6~~8) properties in the Upper Section have by far the best soil characteristics. Although one would expect these better draining properties to have fewer drainage ditches/wetlands, several of the properties had more ditches than one might expect for these better soils. These soils also include Prime Farmland Ratings of mainly "All areas are prime farmland" and "Farmland of statewide importance".

Middle Section:

- Property 7 – the slopes are generally quite flat at zero percent (0%) to two percent (2%). The Corsica and Fallsington soil series are deep and very poorly drained. The Woodstone and Hambrook are moderately well draining.
- Property 8 – the slopes are zero percent (0%) to five percent (5%). The primary soils are Fallsington Loam, Woodstown Loam, and Hambrook Loam; each is moderately to poorly draining.
- Property 9 – the slopes are zero percent (0%) to five percent (5%). The primary soils are Fallsington Sandy Loam, Woodstown Sandy Loam, and Hambrook Sandy Loam; each moderately to well-draining. Sands were mixed in with these loamy soils, which makes them somewhat better draining than Property 7 and Property 8.

This grouping had poorer draining soils than the Upper Section, which is expected because the sand content is far less and the soils are loamier in these areas. These soils also include Prime Farmland Ratings of mainly "All areas are prime farmland" and "Farmland of statewide importance".

Lower Section:

- Property 10 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hambrook Sandy Loam, Ingleside Sandy Loam, and Galestown-Rosedale soils. The Galestown-Rosedale soils will be avoided as they are fifteen percent (15%) to thirty (30%) percent slopes, which are also made up of marine sediments and are excessively well-draining.
- Property 11 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Inglestown Sandy Loam, Hambrook Sandy Loam, and Woodstown Sandy Loam. These are moderate to well-draining soils.
- Property 12 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hambrook Sandy Loam, Fallsington Loam, and Ingleside Sandy Loam. The Fallsington soils are poorly drained. The Hambrook and Ingleside are moderate to well-draining.

- Property 13 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hammonton-Fallsington-Corsica Complex and Hambrook Sandy Loam. The Hammonton-Fallsington-Corsica Complex is moderate to poorly drained. Hambrook Sandy Loam is moderate to well-draining.
- Property 14 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hammonton-Fallsington-Corsica Complex, Ingleside Sandy Loam, and Fallsington Sandy Loam. The drainage characteristics on this site are mixed with half the site being poorly drained and the other half being moderate to well-draining.
- Property 15 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hammonton-Fallsington-Corsica Complex and Ingleside Sandy Loam.
- Property 16 – the slopes are two percent (2%) to five percent (5%). The predominate soils are Ingleside Sandy Loam and Hurlock Sandy Loam. Both of these soils are moderate to well-draining.

Similar to the Middle Section, the soils are a mix between moderate to well-draining and poorly draining. The mix between the soil types, however, is more evident with higher acreage on the poorly draining soils. These soils also include Prime Farmland Ratings equally weighted between "All areas are prime farmland" and "Farmland of statewide importance".

In summary, the slopes in all areas are predominately in the zero percent (0%) to five percent (5%) range. There are a few areas with fifteen percent (15%) to thirty percent (30%) slopes, which will be avoided. More than fifty percent (50%) of the soils have moderate to well-draining soils. However, there is a large area with poorer draining soils that also has a higher percentage of drainage ditches and wetland areas, some of which will be avoided. The Maryland Department of the Environment (MDE) has guidelines for stormwater management that govern Environmentally Sensitive Design (ESD) for utility scale solar projects. If slopes within the LOC are less than ten percent (10%) non-rooftop disconnection credits are allowed and no stormwater structures are required except for level spreaders on areas with grades between five percent (5%) and ten percent (10%). Generally, areas within the LOC where solar panels will be installed are in areas where grades are ten percent (10%) or less.

Land disturbance for this Project will require very little grading or site disturbance. There will be less than one percent (1%) of impervious surface added. Impervious areas will be associated with some improvements at entrances to the properties, inverter pads, piles for the solar panel and fencing, and associated improvements. See ***Table 2a, Table 2b,*** and ***Table 2c*** – Impervious Area Tabulation below.

Table 2a – Impervious Area Tabulation
Upper Section

Impervious Area Description	Length (FT)	Width (FT)	Area (SF)	Quantity	Total Area (SF)	Comments
Invert/Equipment Pads (Concrete)	22.60	15.25	344.65	19	6,548.35	Inverter Pad Site
Racking Posts	-	-	0.03080	19,385	597.06	Array Piers & Motor Piers (W6x15 Max Size)
Array Field Access Ways – Grass Aisles	-	-	-	-	-	Grass Only, No Improvements
Proposed Entrance Improvements	-	-	-	2	2,400	Conceptual / Approximate
On-Site Substation Equipment Pad/Area (Private)	100	100	10,000	1	10,000	Equipment Pads
Total Impervious Area					19,545.41	SF
					0.449	Acres

Table 2b – Impervious Area Tabulation
Middle Section

Impervious Area Description	Length (FT)	Width (FT)	Area (SF)	Quantity	Total Area (SF)	Comments
Invert/Equipment Pads (Concrete)	22.60	15.25	344.65	13	4,480.45	Inverter Pad Site
Racking Posts	-	-	0.03080	10,099	311.05	Array Piers & Motor Piers (W6x15 Max Size)
Array Field Access Ways – Grass Aisles	-	-	-	-	-	Grass Only, No Improvements
Proposed Entrance Improvements	-	-	-	2	2,400	Conceptual / Approximate
On-Site Substation Equipment Pad/Area (Private)	100	100	10,000	1	10,000	Equipment Pads
Total Impervious Area					17,191.50	SF
					0.395	Acres

Table 2c – Impervious Area Tabulation
Lower Section

Impervious Area Description	Length (FT)	Width (FT)	Area (SF)	Quantity	Total Area (SF)	Comments
Invert/Equipment Pads (Concrete)	22.60	15.25	344.65	49	16,887.85	Inverter Pad Site
Racking Posts	-	-	0.03080	41,814	1,287.87	Array Piers & Motor Piers (W6x15 Max Size)
Array Field Access Ways – Grass Aisles	-	-	-	-	-	Grass Only, No Improvements
Proposed Entrance Improvements	-	-	-	4	4,800	Conceptual / Approximate
On-Site Substation Equipment Pad/Area (Private)	100	100	10,000	1	10,000	Equipment Pads
Total Impervious Area					32,975.72	SF
					0.757	Acres

The only grading/earth moving expected will be associated with the improved entrances as shown in *Figure 3*. Also, there may be minor grading in areas of the inverter pads and switchgear. All of the internal aisle ways will be unpaved grass roads. The proposed ESD practice (non-rooftop disconnection), screening, and other vegetative cover are expected to more than offset these minor increases to impervious areas. Any improvement to the site entrances from the access roads will be constructed with impervious material in order to stabilize this area for construction traffic to the site and will be included in the impervious calculation for the SWM report.

It is also important to note that as part of construction there will be little disturbance to the Site since the construction method includes installation of the solar modules on a pile system with minimal contact to the ground.

Because of the onsite soil characteristics and lack of steep slopes, the Site qualifies for non-rooftop disconnection credits consistent with MDE's SWM Guidelines for Solar Projects. The entire Site will be planted and maintained in low cover grass vegetation in accordance with site plans approved by the Caroline County Soil Conservation District Office and included as part of the CPCN submittal process. (The landscape buffer plans prepared by a licensed landscape architect will be submitted to the County for review and approval.) In addition to the mixture of grass seed, and pursuant to recommendations from the PPRP, the Applicant is also proposing to incorporate wild flower seed mixes with the selected grasses in order to promote the health of honey bees and other pollinators. The purpose of this project design feature would be to improve the quality and quantity of overall acreage for pollinators. Solar energy generation facilities are ideal opportunities to increase healthy habitats for pollinators.

iii. Stream Buffers and Floodplains

The Properties in the Upper, Middle, and Lower Sections of the Project are all located within three (3) FEMA FIRMs. *Table 3* below identifies the Properties, Latitude, Longitude, and applicable FEMA information.

Table 3 – FEMA FIRM Information

Property	FEMA FIRM Number	Panel	Map Date	Property Impacts	Latitude	Longitude
1	24011C0095D	95 of 375	January 16, 2015	None	39°02'29.0"N	75°45'34.2"W
2	24011C0095D	95 of 375	January 16, 2015	None	39°02'26.2"N	75°45'08.7"W
3	24011C0095D	95 of 375	January 16, 2015	Special Flood Hazard	39°02'16.5"N	75°45'20.3"W
4	24011C0095D	95 of 375	January 16, 2015	Special Flood Hazard	39°02'16.8"N	75°45'51.1"W
5	24011C0095D	95 of 375	January 16, 2015	None	39°02'06.3"N	75°46'16.4"W
6	24011C0095D	95 of 375	January 16, 2015	Special Flood Hazard	39°02'14.5"N	75°46'24.1"W
17	24011C0095D	95 of 375	January 16, 2015	Special Flood Hazard	39°02'06.7"N	75°46'21.2"W
18	24011C0095D	95 of 375	January 16, 2015	None	39°02'11.5"N	75°46'20.8"W
7	24011C0095D	95 of 375	January 16, 2015	None	39°02'10.0"N	75°48'22.0"W
8	24011C0095D	95 of 375	January 16, 2015	None	39°01'52.9"N	75°48'36.1"W
9	24011C0095D	95 of 375	January 16, 2015	Special Flood Hazard	39°01'43.3"N	75°48'04.4"W
10	24011C0095D 24011C0094D	95 of 375 94 of 375	January 16, 2015	Minor Impacts	9°01'09.8"N	75°46'58.1"W
11	24011C0095D 24011C0094D	95 of 375 94 of 375	January 16, 2015	None	39°00'52.9"N	75°47'00.1"W
12	24011C0095D	95 of 375	January 16, 2015	None	39°00'37.1"N	75°47'10.1"W
13	24011C0095D	95 of 375	January 16, 2015	None	39°00'24.8"N	75°47'33.2"W
14	24011C0156D	156 of 375	January 16, 2015	Minor Impacts	38°59'59.8"N	75°47'53.8"W
15	24011C0156D	156 of 375	January 16, 2015	None	38°59'15.1"N	75°47'01.2"W
16	24011C0156D	156 of 375	January 16, 2015	None	38°59'14.3"N	75°48'34.1"W

Of the three (3) FEMA FIRMs and various panels for the individual Properties (see *Appendix 8*) very few reflect impacts to the Properties. Adjusting the base plans to incorporate appropriate setbacks, buffers, steep grades, and wooded areas that are not to be cut resulted in no flood plains within the proposed LOC's.

The Upper Choptank is located entirely in the Mid-Atlantic coast of Maryland's Eastern Shore. The watershed is predominantly rural and agricultural with significant forest, small towns and pockets of suburban development. Open waters of the Upper Choptank mainstem exhibit limited tidal influence.

They receive fresh water input from numerous sluggish tributaries including many that are ditched and most likely many of these properties are typical of the inputs to the Choptank. There are many water restoration programs and ongoing initiatives to improve water quality by minimizing new rural housing and additional farm ditches from entering the tributaries causing further water quality impairments. Programs to stabilize as many as sixteen (16) properties in this watershed can have a positive impact and minimize runoff, drainage ditch impacts to waters subject to flooding, and other nutrient impacts that are associated with farming operations

As mentioned above, the Site is outside the Critical Area (see ***Appendix 9***) and contains soils which include poor, moderate, and well-draining. These types of soils/grades qualify for non-rooftop disconnection credits.

MDE's Mr. Alan Kampmeyer of the Nontidal Wetlands Program, Ms. Anna Allie of ECS Mid-Atlantic, representatives of H&B Solutions, and a consultant from Versar, Inc. conducted a joint site visit on December 7, 2017 to confirm the details of ECS's *ECS Mid-Atlantic Wetland Field Assessment Report*. An additional field visit was held with representatives from MDE (Mr. Alan Kampmeyer and Mr. Ace Adkins), ECS, and Versar to further evaluate a few areas with differing characteristics to confirm locations of wetlands in these areas. ECS's report of findings is included as ***Appendix 10***. MDE's response to ECS's finding is included as ***Appendix 11***. To summarize, wetlands on the site have been identified, the constraints map has avoided these areas for solar design, and appropriate setbacks and buffers have been located. ~~Any~~ Typically, any required approvals from MDE for minor disturbances, if needed, ~~will be~~are obtained through the Notice of Intent (NOI) process. However, due to the project size, and the total number of minor crossings needed to accommodate the emergency vehicle access, MDE has advised a Wetlands Permit will be needed including public notice.

H&B, ECS, and Mr. Alan Kampmeyer conducted a subsequent site visit on May 23, 2018 to review Property 17 and Property 18 to confirm ECS's field assessment. ECS's Report of Findings is included as ***Appendix 10-A*** and MDE's response to ECS's findings is included as ***Appendix 11-B***. The use of these two (2) new properties for the Project will add flexibility in the solar array design layout. The identified environmental constraints have been incorporated into the civil base plan with appropriate buffers and setbacks to demonstrate avoidance.

b. Impacts to Stormwater During Construction

COMAR 26.17.02.01-1B(1) requires that stormwater quality and quantity controls be implemented for the Project. Guidelines for Water Quality and Quantity through ESD techniques and Best Management Practices (BMPs) are included in the 2000 Maryland Stormwater Design Manual, Volumes I and II (2000) with Supplement No. 1. The specific ESD practice to be employed on the Site, as referenced above, will be the use of non-rooftop disconnection credits. This practice was selected due to application of the MDE ESD Guidelines which do not require stormwater structures for properties with less than ten percent (10%) slopes and using designs where the disconnection length is the same as the distance between rows and is greater than the width between rows. The only structures required will be level spreaders for any sloped areas within the LOC that exceed five percent (5%).

c. Impacts to Stormwater During Operations

COMAR 26.17.02.01-1B(1) requires that stormwater quality and quantity controls be implemented for the Project. Guidelines for Water Quality and Quantity through ESD techniques and BMPs are included in the 2000 Maryland Stormwater Design Manual, Volumes I and II (2000) with Supplement No. 1. The specific ESD techniques to be employed on the Site as referenced above in more detail will consist of non-rooftop disconnection credits and level spreaders.

For the ESD Storm Event, the Site will mimic a forested site in good conditions under the post-development scenario. This will improve the water quality leaving the Site versus the current crop and agricultural production being conducted. The installation of the solar array will incorporate the use of piles with platforms erected above the ground surface, thereby minimizing any need to treat or capture stormwater that is resulting from the construction operations. As a result of the proposed design and elevated panel system, vegetation will grow under the solar modules and essentially the entire field will continue to be pervious vegetative cover. Consistent with the approved SCD Sediment and Erosion Control for the project, grasses that grow to a minimum height and can be easily maintained will be selected.

2. Noise and Vibration

a. Impacts of Noise During Construction

Maryland noise pollution standards as referenced in COMAR 26.02.03 provide certain exceptions for noise sources and noise generating activities. During construction of this facility, all noise shall be maintained below the average daily ninety decibel (90 dB) rating at the property lines. *Table 4* lists the maximum allowable noise levels specified in the State regulations.

Table 4: Maximum Allowable Noise

	Zoning Designation		
	Industrial	*Commercial*	*Residential*
Day	75	67	65
Night	75	62	55

Source: COMAR 26.02.03
Note: Day refers to the hours between 7 AM and 10 PM.
Night refers to the hours between 10 PM and 7 AM.

b. Impacts of Noise During Operation

The Project, once constructed, will have no exposed moving parts, except for the slowly rotating tracker mechanisms. The only noise generated from the electrical equipment at the facility will be from the enclosed transformers and inverters. As utility scale solar generating power facilities become more common, more studies have been done demonstrating the low impact of noise during operation. Typical transformers used for a solar facility have a 50dB rating at one hundred feet (100’). The Project anticipates a low-level of noise interior to the perimeter fence. Noise dissipates at 6dB for every one hundred feet (100’) of added distance from the source. Consistent with the Solar Ordinance, the closest distance between any residential dwelling and an inverter pad will be approximately two hundred feet (200’). The dB levels at this distance will be well below the sixty-five/fifty-five (65/55) dB levels identified above.

3. Lighting

Although there are minimal lighting needs for the Project, the Applicant will comply with local lighting requirements per the Solar Ordinance.

4. Glare Analysis

The Applicant utilized the ForgeSolar PV Planning and Glare Analysis tool to conduct a desktop analysis of the proposed solar generation facility. Based on the results included in *Appendix 12* there will be no glare effects to any nearby airports. The closest airports to the sites are Spiering Airport, Ridgely Airpark, Marble Head Farm Airport, Carmean Airport, and Gary Field Airport.

Additionally, the Applicant has completed the Federal Aviation Administration (FAA) notice criteria tool, which indicated an application should filed. The Applicant has submitted this application and is awaiting confirmation from FAA that there are no glare impacts. Once the expected confirmation is received, the Applicant will provide it to PSC/PPRP as a supplemental filing.

Among other design considerations, the licensed landscape architect will prepare the landscape buffer plans with sufficient detail to identify the planting areas with appropriate dimensions and details. This plan will be reviewed with Caroline County as part of the local review process. The Applicant will also provide this plan to PPRP and the PSC via a supplemental filing. This plan will fully address the results of the glare analysis as part of the design to ensure vehicular traffic and neighboring properties are not impacted by glare.

5. Fencing and Buffering

The solar modules will be enclosed and protected using a six foot (6') high chain link fence with an access gate on the proposed entrances. A buffer/landscape plan will be provided as appropriate and depicted on the site plan submitted as part of this Application. As referenced above, the buffer/landscape plan will be included along with other site stabilization and landscaping required for the Project. This plan will be reviewed/approved by the Caroline County Department of Planning and Codes, Caroline County Department of Public Works, and the Soil Conservation District Office.

As mentioned above, it is anticipated that the Project will have four (4) voluntary standard screening options with slight variations as noted below. The size of the buffers for three (3) of the options will be twenty feet (20') and be comprised of different mixes and densities of trees, shrubs, pollinators, and other planting materials. The fourth option will include a robust fifty foot (50') wide landscape buffer. This voluntary more robust fifty foot (50') landscape buffer is proposed in addition to the two hundred foot (200') setback where the Project abuts residences. The four (4) levels of buffering/screening are currently proposed as follows, will be consistent with the Caroline County Solar Ordinance, and will be presented to Caroline County as part of the site plan review process.

The proposed landscape buffer plan adds approximately twenty-nine (29.92) acres of trees, shrubs, and pollinator habitat on land that is currently utilized for crop farming. The Lower Section includes fifteen (15.1) acres, the Middle Section includes five (5.11) acres, and the Upper Section includes nine (9.71) acres.

1. Option 1 “Full Screening” – Standard twenty-foot (20') buffer which includes two (2) rows of trees varied in height between five feet (5’) to seven feet (7’) comprised of evergreens and deciduous trees, shrubs, pollinators, and ornamental grasses.
2. Option 2 “Moderate Screening” – Modified twenty-foot (20') buffer somewhat less robust than Option 1 to include more shrubs, pollinators, and ornamental grasses with fewer trees.
3. Option 3 “Intensive Screening” – Twenty-foot (20') buffer with a mixture of ornamental grasses and pollinators.
4. Option 4 “Full Pollinator Habitat” – Fifty-foot (50') buffer with more intensive buffer plantings. This Option would be limited to very few highly impacted residential neighbors to be defined during the local site plan process.

In determining which landscape buffer plan will be recommended in each of the areas to be screened, consideration will be given to proximity of the Project to roads and residences, visibility, glare analysis, natural wooded areas, historic property locations, and other factors defined by Caroline County during the local site plan review process. The Applicant will also provide this plan to PPRP and the PSC via a supplemental filing.

6. Vegetative Stabilization

The Project will employ turf style grasses that are conducive to growing in partial shade, so that vegetation can be maintained beneath and around the arrays, will be indigenous to the area and those typically recommended for use by Caroline County Soil Conservation District Office. This will also include a type and seed mix that provides low growth and low maintenance.

As noted above, the Applicant is also proposing to plant wild flowers that will promote the health of honey bees and other pollinators. Solar energy generation facilities present excellent opportunities to increase healthy habitats for pollinators. Appropriate planting plans and plant maintenance plans will be submitted to local jurisdictions for review and approval.

7. Transportation

a. Transportation During Construction

Major material and equipment will be delivered by tractor-trailers and offloaded by construction vehicles (lulls, tracked vehicles, and front loading equipment). Appropriately sized laydown areas, as depicted on the site plan, will be utilized for unloading of equipment and materials. Daily construction traffic will include cars, pickup trucks, and other personnel vehicles. Excavation and other equipment will be utilized during construction of the Project, which may include dump trucks, trenching equipment, concrete trucks, front loaders, backhoes, post installation equipment, excavators, and other equipment.

b. Transportation During Operation

There will be limited traffic to and from the solar array during operation. Traffic will mostly be limited to maintenance crews for mowing and vegetation control. Quarterly to yearly maintenance of the solar array components will be necessary, along with site visits for any operational issues that may arise during normal operation.

C. OPERATIONAL FEATURES

The operational features will be controlled through a Project Operations & Maintenance Agreement to track performance and monitor the health and safety of the solar field. Typical duties and features of this plan are:

- Local and remote control over key features of the Solar Fields Electrical System to assure compliance with the Interconnect Agreement and safety of the plant.
- Scheduling, control, and reporting of all onsite maintenance activities.
- Operations Center with remote monitoring of performance data and physical systems 365 days a year.
- Immediate dispatch of fire, police, or contractors in the event of emergency or force outage.

D. SCHEDULE FOR ENGINEERING, CONSTRUCTION, AND OPERATION

Engineering documents are being prepared and programmed for submittal as part of the CPCN joint review process with Caroline County representatives. The engineering and construction documents will include pertinent information regarding the solar modules, inverter pads, construction methods, electrical requirements, ingress and egress, stormwater management, sediment and erosion control, electrical connection to the grid/substation, fencing within the setback, landscaping and screening, and grading. Following CPCN approval, construction is anticipated to be initiated in November, 2019 with completion and operational startup prior to October, 2020.

E. SITE SELECTION AND DESIGN

1. Project Design

See description in Section 5.B.1 above.

The design and associated energy output at the Project Site was modeled using PVSYST v6.53 shown in ***Table 5*** below. PVSYST is a photovoltaic solar project modeling software that is widely used in the solar power industry to stimulate energy output. The energy output simulated by PVSYST is based on the meteorological data at the project site, models of the system equipment such as the inverter and the solar modules, and project design specifications such as the number of solar modules in series (string sizing), system DC size, array type (fixed tilt or tracking), rack orientation, including azimuth and tilt, DC and AC wiring length, transformer losses, etc. PVSYST v6.53 was used to simulate the predicted energy output from the Project at approximately 360,774 MWhrs in the first full year of project operation.

Table 5 – PVSyst Inputs

Location:	Greensboro, MD
Time Zone:	UT-5
Nominal DC Rating (STC):	219,598 kW DC
Nominal AC Rating:	202,000 kW AC
Operating Power (50° C)	182,250 kW AC
Array Tilt:	Single-axis tracking
Array Azimuth:	0°

Inverters:	81 SMA Sunny Central 2500-US
Modules:	499,086 x 440W First Solar Series 6
Stringing:	6 modules in series

2. Solar Resource Data

A key input in simulating the power output from the project is the local solar resource data or insolation. Solar resource data is typically obtained from third party resources that provide long-term average meteorological data.

The weather file used in the production analysis was from Solar Anywhere, version 3.2. This is a tool created by Clean Power Research to provide information for solar projects within the continental United States. The data is satellite based and includes the following variables: Global Horizontal Irradiance (GHI), Direct Normal Irradiance (DNI), Diffuse Irradiance, Ambient Temperature, and Wind Speed.

The Solar Anywhere data was chosen over other common resources, such as NREL's TMY3 Class I sites, because there are no class I data sets located near the site. The site is on a peninsula of Maryland while the closest TMY3 class I sites are across the Chesapeake Bay on the mainland. Washington DC would be the closest one (over 100 miles away), followed by Baltimore (nearly 120 miles away). Proximity to large bodies of water can have noticeable effects on weather data sets. There are two NREL TMY3 Class II data sets from locations on the same peninsula, however Class II data sets are considered less accurate. Since Solar Anywhere is satellite based, it is not restricted to information from a limited number of ground measurement equipment locations.

3. Modeling

PVSYST v6.53 uses a manufacturer-provided, independently certified model for the panel, inverter, and other components to simulate the output of the plant given racking orientation, row spacing, and other design variables. This output simulation degrades over the lifetime of the plant due to degradation in panel performance. The main design variables and related settings are described in *Table 6* and *Table 7*.

Table 6 - PVSyst Modeling Assumptions

Meteo Data:	Solar Anywhere v3.2 39.05N, 75.75W
Albedo:	0.20
Thermal Loss Factor:	30.7 / 0 (per First Solar)
Wiring Ohmic Loss (DC):	1.5%
Array Soiling Loss:	Varies by month, 2.1% annual avg.
Module Quality Loss:	Gain of 1.1% (FS spectral shift calc.)
Module Mismatch Loss:	1.5% (includes 0.5% for tree shade)
Light Induced Degradation:	NA for First Solar modules
Incidence effect, ASHRAE parameterization (bo parameter)	Table of values per First Solar, see below
AC loss, wires:	1.0%
External transformer iron loss:	0.2%
Resistive/Inductive losses	1.8%

Collector Width:	2.005 meters
Collector Pitch:	5.01 meters

Table 7 – Incidence Effect Profile

0°	30°	50°	60°	65°	70°	75°	80°	90°
1.00	1.00	0.99	0.96	0.94	0.89	0.82	0.69	0.00

a. Soiling and Albedo Losses

Dust, snow, and other particles that settle on the array can attenuate the radiation that arrives at the panel and are referred to as soiling. To account for both occasional winter snow and rainfall frequency, we modeled monthly soiling values that have an annual impact of approximately two percent (2.1%) loss. With First Solar modules there is an additional monthly spectral shift calculation, that results in further modifications to the monthly soiling values and the module quality input. In the event that the plant does not receive rainfall over an extended period, the solar modules may be washed to ensure that soiling is not exacerbated.

The albedo is the fraction of sunlight that is reflected from the ground and other surfaces surrounding the PV array. Albedo contributes slightly to the diffuse irradiance incident. The energy model for the Project uses twenty percent (20%) as the albedo model parameter, which is a typical value suitable for most situations.

b. Shading

If any structure blocks the sunlight falling on the solar modules in the array, output from the shaded panel can be significantly attenuated due to the electrical characteristics and design of the solar modules. Blockage may arise from objects such as hills or undulating terrain in the distance, transmission structures, trees, and buildings. The array can also create mutual shading between the rows of solar modules, particularly when the sun is low in the sky, i.e., in the morning or evening.

Given site constraints, array design can minimize the impact of mutual shading. However, location-specific factors will result in near and horizon shading from other objects. PVSYST includes built-in, sophisticated modeling of mutual shading between rows given the size of the solar modules and spacing between rows. For locations in which near and horizon shading are unavoidable, the impact of this shading should be accounted for, but in the case of this Project located on the Eastern Shore of Maryland, this is assumed to be minimal. The model accounts for row-to-row shade between the trackers early and late in the day, and includes a minimal assumption of one half percent (0.5%) tree shade loss within the mismatch loss input.

4. Production Estimate Results

PVSyst Energy production results with estimated solar irradiation are included in ***Tables 8a*** and ***8b*** below. ***Table 8a*** summarizes total plant production for Year 1. ***Table 8b*** summarizes the detailed production statistics for the first year of operations.

Table 8a – Total Plant Production Estimate Results in Year 1

Parameter	Preliminary Estimate
Annual Generation	360,774 MWh
DC Capacity Factor	18.8%
AC Capacity Factor	20.4%

Table 8b- PVSyst Modeling Monthly Energy for a Full System in Year 1

202 MWac Tracker Thin Film 39GCR 109 ILR 1-12-18 DLG

Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR
January	66.3	28.25	0.60	97.6	80.1	17580	16651	0.777
February	84.6	42.42	-1.25	117.8	98.2	21834	20807	0.805
March	129.3	54.38	5.59	174.1	155.1	33496	31925	0.835
April	152.5	62.12	11.97	197.7	180.5	37801	35989	0.829
May	178.0	73.11	18.16	225.8	210.4	43337	41296	0.833
June	183.6	81.72	22.64	228.4	216.0	43986	41991	0.837
July	190.6	81.50	23.68	239.5	226.0	46071	44003	0.837
August	168.7	67.68	24.93	217.6	203.2	41204	39338	0.823
September	133.0	58.36	20.29	178.2	163.1	33724	32203	0.823
October	101.5	39.59	13.73	140.9	125.8	26511	25239	0.816
November	71.0	32.14	5.83	100.2	85.5	18518	17583	0.799
December	58.0	26.43	5.81	80.9	67.7	14573	13749	0.774
Year	1517.1	647.70	12.75	1998.6	1811.5	378633	360774	0.822

Legends:

GlobHor	Horizontal global irradiation	GlobEff	Effective Global, corr. for IAM and shadings
DiffHor	Horizontal diffuse irradiation	EArray	Effective energy at the output of the array
T Amb	Ambient Temperature	E_Grid	Energy injected into grid
GlobInc	Global incident in coll. plane	PR	Performance Ratio

F. *IMPACTS ON THE ECONOMICS OF THE STATE*

Based on 2012 reports, Maryland continues to import approximately forty-one percent (41%) of its generation power. This Project will provide some measurable offset to these generation import numbers.

Significant economic benefits will result from the Project, including a capital investment of up to $200M and approximately two-hundred fifty to three-hundred fifty (250-350) design, management, and construction personnel working remotely or on the Site at the height of construction during the period from November, 2019 to August, 2020.

The Applicant utilized the services of Beacon (Business Economic and Community Outreach Network at Salisbury University) to prepare a preliminary economic impact estimate for the Cherrywood Solar Project. As part of the assessment the preliminary impact estimates were developed using Social Accounting Matrix multipliers calculated by the Minnesota IMPLAN Group. Some highlights of the results and findings are listed below. The complete Beacon report can be found in *Appendix 13*.

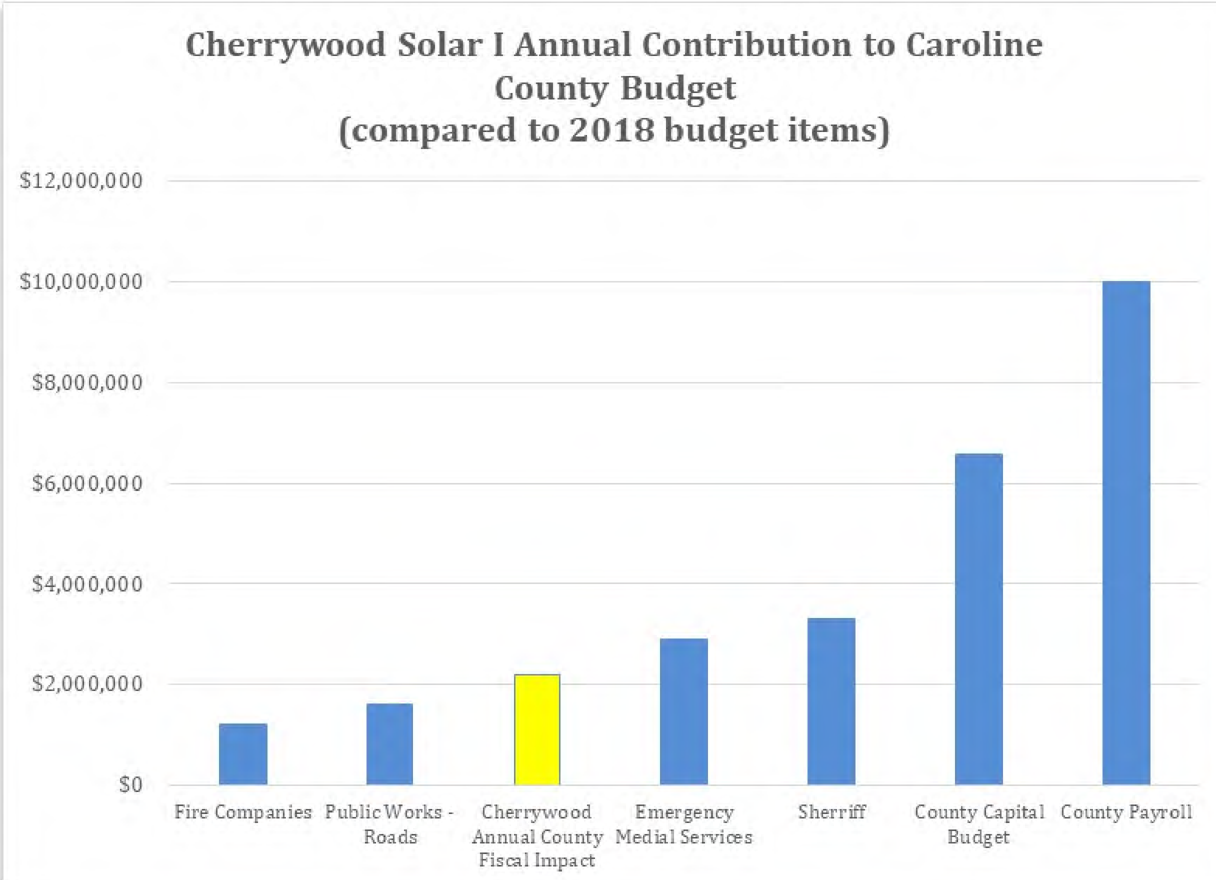
- Through construction (2019-2020) annual jobs supported will include 505 direct, 50 indirect, and 73 induced for a total of 628.
- Operation and Maintenance jobs supported during the estimated 35 years of operation would be 49.5 per year.
- The annual personal property taxes would be $2,626,000.
- The capital expenditures per MW would be $1,300,000.

Additionally, in April of 2018 the Applicant received an in-depth economic impact report from the Jacob France Institute at the University of Baltimore which examined the economic impact of a 150 MW version of the Project on 1000 acres, including a comparison of the economic impact of the project net of the current economic impact of current activities on the same parcels. The complete University of Baltimore study can be found in *Appendix 16*~~[ ]~~. Key findings included:

- Total Maryland economic impact from construction of $104.6 million
- Annual Maryland economic impact from operations of $21.1 million per year of operations
- Caroline County fiscal benefit of $2.2 million per year of operations

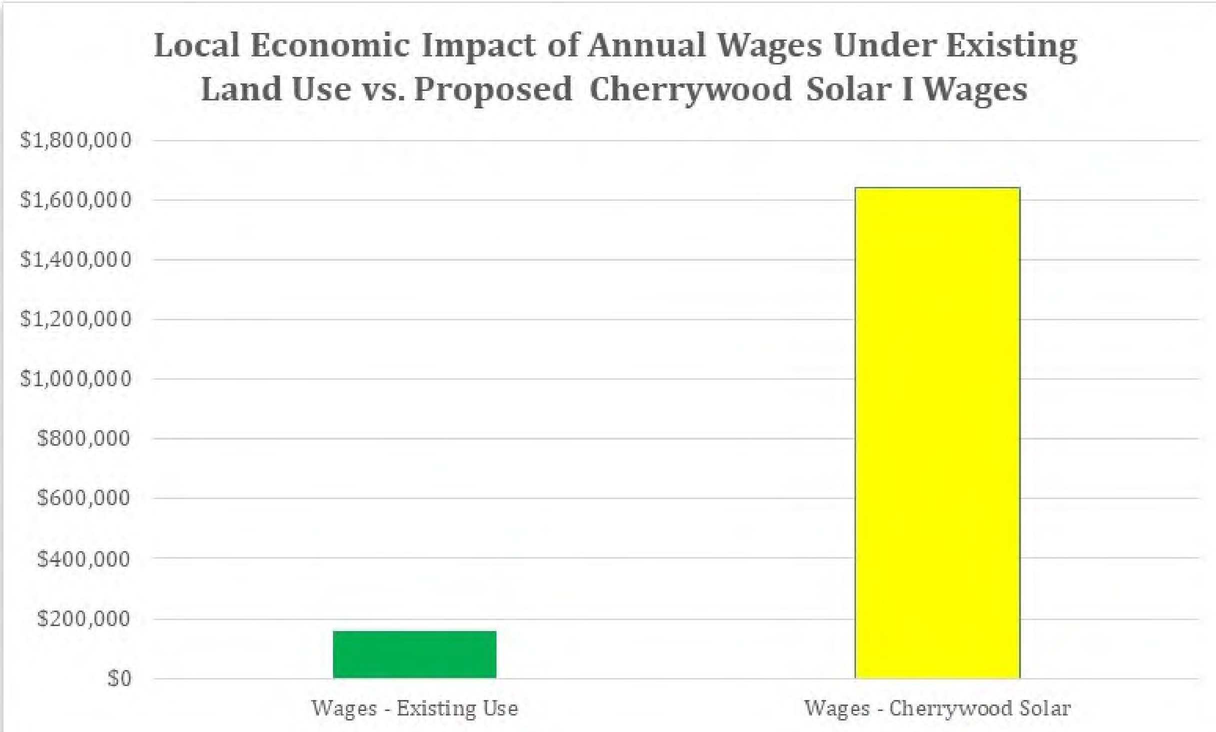
~~The below graph~~*Figure 6* includes the ~~the~~ projected annual Caroline County fiscal benefit of $2.2 million per year in the context of other major Caroline County budget expenditures in the FY 2018 county budget.

Figure 6: Annual Contribution to Caroline County Budget



The University of Baltimore report also isolated the economic impact of local wages that would be paid by the proposed Project relative to the economic impact of wages paid on the existing use of the same 1,000 acres, as depicted in ~~the below graph~~*Figure 7*:

Figure 7: Local Economic Impact of Annual Wages Under Existing Land Use vs Proposed Cherrywood Solar I Wages



By connecting with the electric distribution system serving Maryland, the Project will contribute towards compliance with the Renewable Portfolio Standard, which mandates that all suppliers that sell electricity at retail in Maryland accumulate solar renewable energy credits in an incrementally increasing percentage.

The Project will not detract from the value or diminish the characteristics of adjacent properties. PPRP has stated in its environmental review for similar projects that vegetative screening mitigates the impact of solar PV projects on neighboring property values. For instance, PPRP's environmental review in Case No. 9451 states that:

> "Limited evidence from real estate appraisal methods has not revealed any influence on property values from solar farm development. Expert opinion from a past siting case in Massachusetts, for example, concluded that utility scale photovoltaic energy systems that are not visible from surrounding properties would have no impact on their market values (Franklin County 2014). A paired comparison of market values of residential and agricultural properties near solar farms in North Carolina came to a similar conclusion (Kirkland Appraisals 2014)."

PPRP Assessment of the Proposed Chesapeake Solar Project, Case No. 9451, 32-33 (October 20, 2017).

The Project will feature various levels of vegetative screening and it will produce no noise or vibration perceptible on neighboring properties. As a result, the Project will not have an impact on neighboring property values.

G. *IMPACT ON THE STABILITY AND RELIABILITY OF THE ELECTRIC SYSTEM*

In 2016 the Applicant initiated a process to be interconnected to the electric transmission system serving Maryland by filing an Interconnection Request with PJM in conjunction with DPL. The results of the Generation Interconnection Feasibility Report and System Impact Study show no potential adverse impact to the stability or reliability of the electrical system due to the addition of the Project to the grid.

H. LOCATION AND MAJOR DESIGN FEATURES OF ELECTRIC SYSTEM UPGRADE

Cherrywood Solar I, LLC has completed the PJM Generation Interconnection Feasibility Study and System Impact Study Reports, see *Appendix 4*. The Project will include a new three breaker 230 kV ring bus substation to be constructed adjacent to the Keeney-Steele 230 kV circuit. Two of the positions on the ring bus will be transmission line terminals for the tie-in of Line 23009 to the substation. The other position will be a terminal configured for the interconnection of a generator. The project has been assigned Queue Position AB2-037.

The new substation will be built on Property 12 in such a manner so as to minimize any viewshed concern and so as to minimize noise impacts to neighboring properties. ~~As mentioned above, the Applicant is also evaluating the option to provide a battery storage facility on the same property comprising an approximately twenty (20) to thirty (30) acres.~~

Based on the findings from the Generation Interconnection Feasibility Study and System Impact Study Reports, the estimated cost to build the substation is $6,491,000 with an estimated construction time of twenty-four (24) months. The substation will be located near the transmission line on Parcel 0011-0020-0051.

I. IMPLEMENTATION SCHEDULE FOR THE PROJECT

The Project schedule includes the following approximate milestones:

- Engineering and Permitting: September, 2017 through September, 2018
- State of Construction: November, 2019
- Start of Commercial Operation: October, 2020

SECTION 6 – COMAR 20.79.03.02 ENVIRONMENTAL INFORMATION

A. GENERAL INFORMATION

1. General Description of the Site and Adjacent Areas

The Caroline County, Maryland Solar Project (the “Project”) is located on a plain of properties that run from southwest to northeast between the Towns of Greensboro and Goldsboro just west of the Choptank River. The Project will consist of ~~sixteen~~ eighteen (~~16~~18) parcels, some of which are contiguous, and approximately four (4) other additional parcels will be used for easements to accommodate the various connector lines. The Project will be approximately two hundred megawatts (200.00 MW) single axis tracking alternating current (AC) solar polycrystalline photovoltaic (PV) project proposed by Cherrywood Solar I, LLC. It is anticipated that the Project will include a development envelope of approximately one thousand ~~eighty-three~~ seventy-three (~~1,083.62~~1,073.69) acres once buffers and setbacks have been established in addition to avoidance from environmental constraints. As shown in ***Figure 3***, the proposed Project for purposes of this Report includes three (3) sections.

The Upper Section consists of Tax Map 0011, Grid 0004, Parcel 0052 (“Property 1”), Tax Map 0011, Grid 0005, Parcel 0158 (“Property 2”), Tax Map 0011, Grid 0004, Parcel 0053 (“Property 3”), Tax Map 0011, Grid 0009, Parcel 0056 (“Property 4”), Tax Map 0011, Grid 0009, Parcel 0058 (“Property 5”), ~~and~~ Tax Map 0011, Grid 0003, Parcel 0005 (“Property 6”), Tax Map 0011, Grid 0009, Parcel 135 (“Property 17”), and Tax Map 0011, Grid 0009, Parcel 163 (“Property 18”) and is comprised of approximately five hundred ~~five~~ fifteen (~~505.68~~515.98) acres of which the LOC includes approximately two hundred ninety-five (295.7~~2~~5) acres.

The Middle Section consists of Tax Map 0010, Grid 0011, Parcel 0034 (“Property 7”), Tax Map 0011, Grid 0017, Parcel 0025 (“Property 8”), and Tax Map 0010, Grid 0018, Parcel 0011 (“Property 9”) and is comprised of approximately two hundred sixty-eight (268.47) acres of which the LOC includes approximately one hundred ~~fifty-four~~ forty-nine (~~154.07~~149.44) acres.

The Lower Section consists of Tax Map 0011, Grid 0020, Parcel 0007 (“Property 10”), Tax Map 0011, Grid 0020, Parcel 0051 (“Property 11”), Tax Map 0015, Grid 0001, Parcel 0066 (“Property 12”), Tax Map 0015, Grid 0007, Parcel 0067 (“Property 13”), Tax Map 0014, Grid 0012, Parcel 0008 (“Property 14”), Tax Map 0014, Grid 0024, Parcel 0016 (“Property 15”), and Tax Map 0014, Grid 0023, Parcel 0038 (“Property 16”) and is comprised of approximately ~~one thousand one hundred forty-six~~ nine hundred thirty-eight (~~1,146.07~~938.41) acres of which the LOC includes approximately six hundred twenty-eight~~thirty-three~~ (~~633.83~~628.50) acres.

The total acreage of the parcels evaluated consists of approximately one thousand ~~nine~~ seven hundred twenty-two ~~twenty~~ (~~1,920.22~~1,722.86) acres. However, as noted above, not all will be used for the Project and appropriate areas have been excluded based on environmental constraints mapping. The total LOC for this Project is approximately one thousand ~~eighty-three~~ seventy-three (~~1,083.62~~1,073.69) acres. The site characteristics relative to soils, wetlands, forest conservation, etc. have been tabulated in an excel spreadsheet and included in *Appendix 1*.

The Properties are all actively farmed with typical crops including soy bean, corn, wheat, etc. The sites are relatively flat with very little grade (the few excessive slopes have been eliminated) and more than fifty percent

(50%) of the soils are moderate to well-draining. Once the final crop harvests have been completed, it will be relatively easy for the appropriate stabilization to take place prior to construction.

There are no wetland impacts associated with the proposed project layout/design. MDE has confirmed that the solar array does not impact any jurisdictional waters. No forest cutting or clearing will occur. There are no FEMA flood plains located at the Site and the Project is outside the Critical Area. There are no other environmental issues associated with the Site or project development.

Site information contained in this report has been discussed and reviewed with various regulatory agencies including the Maryland Department of the Environment, Maryland Department of Natural Resources, Maryland Historic Trust, Caroline County Department of Planning and Codes, Caroline County Soil Conservation District Office, and representatives from the Critical Areas Commission. This review process confirmed the information that was found online and reflected on various resource maps.

As discussed elsewhere in this Report, the Properties have historically been used for agricultural purposes. The farms are primarily comprised of agricultural fields used to grow conventional crops. Because some of the farms are prior converted wetlands, there are a few farm ditches that will be avoided as part of the design. ECS performed the wetlands field assessment (*Appendix 10* and *Appendix 10-A*) and MDE confirmed the findings (*Appendix 11* and *Appendix 11-A*). Because of the continuous disturbance of the Site associated with farming operations, all of the habitat is outside the LOC in the wooded areas on the fringe of the property and will not be disturbed. In summary, the Properties are not located within a Chesapeake Bay Critical Area, or within any stream buffer, special planning area, protected watershed, reservoir, or other impoundment drainage area.

In developing the solar array layout, the technical team met with the SCD and property owners to identify existing subsurface drainage systems and any associated PDA's. This information will define where access and future maintenance agreements will be on these various parcels. Field verifications using aerial imagery and geo-probes ~~are being~~will be performed to confirm these locations. These field verifications will include GPS identification of all previously mapped blue line streams that may have been buried in the past as well as all drainage locations that have been identified in the field or in notes from SCD, the farmer, and the landowner. Additionally, on parcels with particular drainage concerns, the Applicant will be employing a method that combines aerial and color-infrared orthophotography taken within 2-3 days of a heavy rain event that allows for manual photo-interpretation of the location of buried drainage features, which will then be field-verified as described above. All final project design and construction documents will include an overlay of GPS-located drainage features and will incorporate plans to either avoid, replace, or repair buried drainage in order to preserve or improve upon the existing drainage of the fields. SCD will be consulted throughout the field-verification process and the findings of the field verification efforts as well as final design and construction plans as they pertain to drainage features will be shared with SCD to garner input prior to construction.~~.~~

a. Geology/Soils.

As noted above, according to the Critical Area Commission, the Sites are outside the Critical Area and contains soils with widely varying characteristics including poor, moderate, and well-draining.

Soils typically found in the Upper Choptank River watershed include Sassafras, Fallsington, Galestown, Matapeake, Westbrook, and Othello series. The Sassafras series consist of very deep, well drained soils on sandy marine and old alluvial sediments. The Fallsington series consist of very deep poorly drained

soils on coastal plain flatlands. Saturated hydraulic conductivity is high in the subsoil and high to very high in the substratum. The Galestown series consist of very deep, somewhat excessively drained soils formed in sandy marine sediments and glacial outwash on glacial terminal moraine. The Matapeake series consist of very deep, well drained soils in silty eolian sediments underlain by coarser fluvial or marine sediments. The Westbrook series consist of very deep, very poorly drained soils formed in organic deposits over loamy mineral material. The Othello series consist of very deep, poorly drained soils with saturated hydraulic conductivity being moderately high.

The full soils report and prime farmland classification can be found in *Appendix 2*. As confirmed in the geotechnical report (*Appendix 7*), these soils are suitable to support solar modules, inverters, switch gear, grass covered aisle ways, access roads, and associated drainage and stormwater management features. For the sixteen (16) properties associated with the proposed utility scale solar project, the following soil characterizations are provided.

Upper Section:

- Property 1 – the slopes range between zero percent (0%) and five percent (5%) with the three most prominent soil classifications being Ingleside Sandy Loam, Hambrook Sandy Loam, and Lenni Loam. This is one of the better soil groupings for all of the sixteen (16) properties. These soils are moderately to well-draining.
- Property 2 – the slopes for most of the property range between two percent (2%) to five percent (5%). Less than two (2) acres are on steeper grades and will be avoided. These slopes range from ten percent (10%) to thirty percent (30%). The primary soils for the useable portion of the property are Evesboro Sand and Hambrook Sandy Loam. Both are well-draining.
- Property 3 – the majority of the slopes range between zero percent (0%) and five percent (5%) with eleven (11.4) acres falling in the five percent (5%) to ten percent (10%) range. The prominent soil series are Ingleside Sandy Loam, Hambrook Sandy Loam, and Rosedale Sandy Loam. These soils are moderately to well-draining.
- Property 4 – the majority of the slopes range between zero percent (0%) and five percent (5%) with approximately six (6.0) acres out of approximately one hundred twenty-six (126) acres falling in the five percent (5%) to ten percent (10%) range. The prominent soil series are Ingleside Sandy Loam and Hambrook Sandy Loam. These soils are moderately to well-draining.
- Property 5 – the majority of the slopes range between zero percent (0%) and five percent (5%). The majority of soils on this property are Fallsington Sandy Loams, Hambrook Sandy Loams, and Woodstown Sandy Loams. These soils are moderately to well-draining.
- Property 6 – the majority of the slopes range between zero percent (0%) and five percent (5%). The majority of soils on this property are Ingleside Loamy Sand, Hammonton-Fallsington-Corsica Complex, and Hambrook Sandy Loams. These soils are moderately to well-draining.
- Property 17 – the majority of the slopes range between zero percent (0%) and five percent (5%). The majority of soils on this property are Hambrook Sandy Loams, and Ingleside Sandy Loam,. These soils are all well-draining.
- Property 18– the majority of the slopes range between zero percent (0%) and five percent (5%). The majority of soils on this property are Hambrook Sandy Loams, and Ingleside Sandy Loam. These soils are all well-draining.

As indicated in the Project Overview these ~~six~~ eight (~~6~~8) properties in the Upper Section are by far the best as to soil characteristics. Although one would expect these better draining properties to have fewer drainage ditches/wetlands, several of the properties had more ditches then one might expect for these better soils. These soils also include Prime Farmland Ratings equally weighted between "All areas are prime farmland" and "Farmland of statewide importance".

Middle Section:

- Property 7 – the slopes are generally quite flat at zero percent (0%) to two percent (2%). The Corsica and Fallsington soil series are deep and very poorly drained. The Woodstone and Hambrook are moderately well draining.
- Property 8 – the slopes are zero percent (0%) to five percent (5%). The primary soils are Fallsington Loam, Woodstown Loam, and Hambrook Loam; each is moderately to poorly draining.
- Property 9 – the slopes are zero percent (0%) to five percent (5%). The primary soils are Fallsington Sandy Loam, Woodstown Sandy Loam, and Hambrook Sandy Loam; each moderately to well-draining. Sands were mixed in with these loamy soils which makes them somewhat better draining than Property 7 and Property 8.

This grouping had poorer draining soils than the Upper Section, which is expected because the sand content is far less and the soils are loamier in these areas. These soils also include Prime Farmland Ratings equally weighted between "All areas are prime farmland" and "Farmland of statewide importance".

Lower Section:

- Property 10 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hambrook Sandy Loam, Ingleside Sandy Loam, and Galestown-Rosedale soils. The Galestown-Rosedale soils will be avoided as they are fifteen percent (15%) to thirty (30%) percent slopes, which are also made up of marine sediments and are excessively well-draining.
- Property 11 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Inglestown Sandy Loam, Hambrook Sandy Loam, and Woodstown Sandy Loam. These are moderate to well-draining soils.
- Property 12 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hambrook Sandy Loam, Fallsington Loam, and Ingleside Sandy Loam. The Fallsington soils are poorly drained. The Hambrook and Ingleside are moderate to well-draining.
- Property 13 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hammonton-Fallsington-Corsica Complex and Hambrook Sandy Loam. The Hammonton-Fallsington-Corsica Complex is moderate to poorly drained. Hambrook Sandy Loam is moderate to well-draining.
- Property 14 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hammonton-Fallsington-Corsica Complex, Ingleside Sandy Loam, and Fallsington Sandy Loam. The drainage characteristics on this site are mixed with half the site being poorly drained and the other half being moderate to well-draining.
- Property 15 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hammonton-Fallsington-Corsica Complex and Ingleside Sandy Loam.

- Property 16 – the slopes are two percent (2%) to five percent (5%). The predominate soils are Ingleside Sandy Loam and Hurlock Sandy Loam. Both of these soils are moderate to well-draining.

Similar to the Middle Section, the soils are a mix between moderate to well-draining and poorly draining. The mix between the soil types, however, is more evident with higher acreage on the poorly draining soils. These soils also include Prime Farmland Ratings equally weighted between "All areas are prime farmland" and "Farmland of statewide importance".

In summary, the slopes in all areas are predominately in the zero percent (0%) to five percent (5%) range. There are a few areas with fifteen percent (15%) to thirty percent (30%) slopes which will be avoided. More than fifty percent (50%) of the soils have moderate to well-draining soils. However, there is a large area with poorer draining soils that also has a higher percentage of drainage ditches and wetland areas; some of which will be avoided. The Maryland Department of the Environment (MDE) has guidelines for stormwater management that govern Environmentally Sensitive Design (ESD) for utility scale solar projects. If slopes within the LOC are less than ten percent (10%) non-rooftop disconnection credits are allowed and no stormwater structures are required except for level spreaders on areas with grades between five percent (5%) and ten percent (10%). Generally, areas within the LOC where solar panels will be installed are in areas where grades are ten percent (10%) or less.

b. Land Use and Cover

The Sites primarily consists of agricultural fields and have been farmed for conventional agricultural crops by landowners and leases for several decades. As noted above, there are no internal environmental constraints which cannot be easily avoided through setbacks or buffers. To the extent possible, the primary entrances for the solar generation facility will be from existing improved farm entrance.

There are no other unique land uses or covers which would create any type of conflict or impairment for the proposed Project.

c. Stream Buffers and Floodplains

All of the Properties are in close proximity and drain directly to the Upper Choptank River. The Upper Choptank River watershed is predominantly rural with significant agricultural areas, as well as forest, small towns and pockets of suburban development. Large areas of land, which had poorly drained soils, were able to be developed because lands were drained by ~~Public Drainage Association~~ PDA ditches. Maintenance of these ditches is central to continuation of much of the current economic activity in the watershed. About fifty-six percent (56%) of the Upper Choptank Watershed in Maryland is prime farmland. According to the Chesapeake Bay Program's Phase 5.2 Model, the land use distribution in the watershed is approximately fifty-three percent (53%) agricultural, thirty-five percent (35%) forest, and twelve percent (12%) urban.

Although the significant ditching of farmed properties increased productivity and contributed significantly to farming viability in this watershed, it also contributed greatly to the degradation of water quality in the Upper Choptank River. Sixty-seven percent (67%) of degraded stream miles in the watershed are artificially straightened or channelized in some way. During channelization, trees in the riparian buffer zone are often cut and woody debris is removed from the stream channel to allow for efficient movement of water away from agricultural fields. As a result, heavily channelized streams are often shallow and

offer little habitat diversity. The Delmarva Peninsula contains over eight hundred (808) miles of ~~Public Drainage Association~~PDA's or tax ditches that drain over 143,311 acres of land. Caroline County, which is part of the Choptank River watershed, holds the greatest number of tax ditches in the Maryland Eastern Shore. The historical loss of wetlands in the Upper Choptank River watershed is estimated to be 48,169 acres which is a relatively large loss of wetlands compared with other similar Maryland watersheds and contributed to the degrading of water quality in the Upper Choptank River; and also explains why so many farms in the Project area contain many farm ditches.

As stated above, water quality in the Upper Choptank is poor. Sediment loads from the watershed to the non-tidal waters have increased, but phosphorus levels in nontidal waters have decreased. Still, nitrogen, phosphorus, and sediment levels in the tidal waters of the Upper Choptank are too high. Habitat for underwater grasses are poor because algal densities are too high and water clarity is poor. Only bottom dissolved oxygen levels are good. No underwater grass beds are found in the Upper Choptank and bottom dwelling animal populations are not healthy. The River itself is tidal for much of its length and includes an ecologically delicate estuarine ecosystem.

All waters of the State are assigned a “Designated Use” in regulation, COMAR 26.08.02.08, which is associated with a set of water quality criteria necessary to support that use. These designated uses may or may not be served now but they should be attainable. All surface waters in the Upper Choptank River watershed are designated Use I for Water Contact Recreation, and Protection of Aquatic Life. Waters designated as Use II for Shellfish Harvesting in the Choptank River are located in estuarine waters downstream of the Upper Choptank River watershed.

The history of the area clearly documents the degradation that occurred through drainage ditches, elimination of wetlands, and cutting of trees which created the farmland opportunity but impaired water quality. The Project will have a stabilizing impact on the environment by placing cover/grasses on over one thousand (1,000) acres, eliminating all future land disturbance, planting pollinators and landscape buffers, all which will improve water quality in the Upper Choptank River.

d. Flora Resources

There is no vegetation associated with wetlands in the Critical Area since there are no Critical Areas denoted on the Properties. There is very little vegetative diversity on the various Properties. As has been recorded in the DNR and MDE watershed documents, many of the natural wetlands in the immediate area have been lost over the years due to an abundance of farming practices along the Choptank River and poor draining soils which led to the institution of drainage ditches which essentially drained these previously prominent wetland areas. Currently the majority of wet areas are in wooded/forested locations and not internal to the active farming practices. The vegetation is typical of that found throughout the Delmarva region and is characterized by Evergreens, Red Maple, River Birch, Tulip Poplar, American Beech, American Holly, Sweetgum, etc. The understory is generally moderate and expected to be fair for wildlife habitat, providing some food sources and cover. In general, there is nothing remarkable regarding the flora characteristics of the site.

e. Fauna Resources

The Chesapeake Bay provides food, water, cover, and nesting or nursery areas to more than 3,000 migratory and resident wildlife species. The best known in the Bay is probably the Maryland Blue Crab. Crabs and oysters are indigenous to the area including the Choptank River. However, their numbers are

dwindling. From the 1950s to the 1970s, the average annual oyster catch was about 25 million pounds per year. The blue crab harvest contributed to nearly a third of the nation's catch. Today, the Bay's oyster population is a mere two percent (2%) of its historic level. Reduced amounts of underwater grass habitat, in addition to low summer levels of dissolved oxygen, continue to keep the crab population well-below the average. This is the same characterization as found in the Choptank River, which has been documented as a microcosm of the Chesapeake Bay. The most valuable resource in the Choptank River and Upper Choptank River is the striped bass spawning areas and the large number of menhaden that support this fish population.

In the Delmarva Area, and very prominently in the Choptank River, waterfowl and other birds migrate annually and use the watershed for food and shelter in coves and marshes. The Chesapeake's tidal freshwater tributaries provide spawning and nursery sites for several important species of fish, such as white and yellow perch, striped bass, herring, American shad, and hickory shad. Turtles and snakes are the most common reptiles in the watershed. Species include the diamondback terrapin, loggerhead turtles, and many types of snakes. The watershed is habitat to numerous varieties of frogs, including the northern green frog, toads, salamanders, and newts.

It has been widely reported that much of the natural habitat in the watershed, which supported waterfowl, small mammals, reptiles, etc. was greatly diminished when 47,000 acres of wetlands was lost due to the conversion of large properties from their natural conditions to active farm practices. The associated drainage ditches not only dewatered these properties but resulted in higher sediment loads and lower dissolved oxygen levels to the main stem of the Choptank River. As a result, there is very little indigenous wildlife habitat on these active farmlands except for the habitat that remains in fringe areas where wetlands and wooded areas remain.

Environmentally, a strong case can be made that using these active farmlands to utility scale solar generation facilities will improve the local environment and water quality. The solar use would place all active farmland under grass cover, stabilize the area, incorporate pollinators onsite, place these lands under maintenance programs, and essentially eliminate any type of land disturbance.

f. Other Sensitive Areas

According to the Department of Natural Resources, there are some wildlife protection considerations associated with the various Properties. Some of these species of plants and amphibians with rare, threatened, or endangered state status include: Harper's Fimbristylis, Coppery St. Jon's-wort, Black-fruit Spikerush, Featherfoil, Triangle Floater, Deciduous Holly, Sparkling Jewelwing, Blackwater Bluet, and Creeping Burhead. The complete list and agency review letter can be found in *Appendix 14*.

The Applicant has contacted Department of Natural Resources Wildlife and Heritage Services for their review of Property 17 and Property 18. Their response can be found in *Appendix 14-A*.

In general, the wildlife areas of concern are located in the woodlands on and surrounding the Project Properties, and/or are associated with downstream waterways. None of the forested areas will be cut and few hedgerows/fringe trees will be removed. Also, industry accepted BMPs will be used during construction to prevent runoff and sediment-laden water from leaving the site. During the life of the Project, impacts will essentially be absent compared to the continued use of these Properties for active farming since the entire site will be fully stabilized using an appropriate mix of grass seed and pollinators.

2. Summary of Environmental and Socioeconomic Effects

Pursuant to a response from MHT, a Phase I archeological investigation should be conducted within the LOC on Property 1, Property 3, Property 4, Property 9, Property 10, Property 11, Property 12, and Property 14. The complete MHT response letter is included in *Appendix 15*.

The Applicant has contacted MHT for their review of Property 17 and Property 18. Their response can be found in *Appendix 15-A*.

a. Environment Resources

The Project is extremely environmentally friendly. It is not located in the Critical Areas and does not impact jurisdictional waters, which have all been avoided. The Project has been reviewed by the MDE and a determination has been made that if the Applicant follows the avoidance plan prepared by ECS, that no wetland permits will be needed. The solar design incorporates a thirty-five foot (35') setback from the dripline of the trees. In summary, all mapped environmental constraints within the Project LOC have been avoided.

There are also no FEMA designated flood plain elevations per Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM). The Project will result in little additional impervious area because the structures we be built on pilings and there are very few paved areas to be created with the exception of the inverter pads, switchgear, and the new substation.

b. Cultural Resources

The Applicant has communicated with MHT and received a response indicating the Project will require a Phase I. A copy of the Project Review Form and the MHT response is included (see *Appendix 15* and *Appendix 15-A*). The results of the Phase I study and completed DOE Forms will be provided to the PSC as a supplemental filing.

c. Historic Building Environment

As noted above, the Applicant has submitted the appropriate documents to the Maryland Historic Trust (MHT) and received its written response. MHT has required DOE forms be completed consistent with its criteria for the properties identified in *Appendix 15* and *Appendix 15-A*. The results of the Phase I study and completed DOE Forms will be provided to the PSC as a supplemental filing.

d. Archeological

See items b and c above.

e. Consultation with Consulting and Interested Parties

The Applicant has consulted with Caroline County and various State Agencies, including PPRP, MHT, CAC, and DNR regarding this application.

3. Environmental Studies

a. Routine Wetlands Delineation Study

MDE's Mr. Alan Kampmeyer of the Nontidal Wetlands Program, Ms. Anna Allie of ECS Mid-Atlantic,

representatives of H&B Solutions, and a consultant from Versar, Inc. conducted a joint site visit on December 7, 2017 to confirm the details of ECS's *ECS Mid-Atlantic Wetland Field Assessment Report*. An additional field visit was held with representatives from MDE (Mr. Alan Kampmeyer and Mr. Ace Adkins), ECS, and Versar to further evaluate a few areas with differing characteristics to confirm locations of wetlands in these areas. ECS's report of findings is included as ***Appendix 10*** and ***Appendix 10-A***. MDE's response to ECS's finding is included as ***Appendix 11*** and ***Appendix 11-A***. To summarize, wetlands on the site have been identified, the constraints map has avoided these areas for solar design, and appropriate setbacks and buffers have been located. ~~Any required approvals from MDE for minor disturbances, if needed, will be obtained through the Notice of Intent (NOI) process.~~ Typically, any required approvals from MDE for minor disturbances, if needed, are obtained through the Notice of Intent (NOI) process. However, due to the project size, and the total number of minor crossings needed to accommodate the emergency vehicle access, MDE has advised a Wetlands Permit will be needed including public notice.

b. Natural Resources Inventory Plan

H&B Solutions, LLC prepared an Environmental Due Diligence and Site Feasibility Report for Cherrywood Solar I, LLC dated September 12, 2017. A summary of these findings follows:

- The Properties within the Project are all zoned Rural (R).
- The Properties within the Project are not within the Critical Area.
- Based on the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) Maps, some Properties are free from wetlands; however other Properties have riverines, streams, and other wetlands throughout. The property characteristics have been identified within the body of the report.
- According to FEMA FIRM Maps the majority of the Properties are not affected by mapped flood plains in the area of the proposed Project's LOC. However, as shown in ***Table I***, there are some minor impacts associated with Special Flood Hazard Zones as well as a few parcels affected by the 100-year flood zone. The Applicant will limit the LOC to avoid these designated areas.
- According to the Natural Resource Conservation Service (NRCS) soils maps, generally the soils fall into three (3) categories; well-draining sandy loams, moderate to poorly draining silt loams including some hydric soils, and marine sediments which can be found near riverines and stream beds. Within these soils classifications there were few slopes that exceeded ten percent (10%) and the majority of the Properties had slopes between zero percent (0%) and five percent (5%).
- As indicated above, it is anticipated that some trees may need to be cut, but these would be incidental to the total site preparation effort and would not constitute cutting of any forest. The vast majority of the project LOC will be located in areas that have been actively farmed for years and no clearing will be required. Although the Project will meet the test of "no net loss" and afforestation will not be applicable, the Applicant will work with the County in defining how mitigation will be achieved for the few fringe trees to be cleared.
- There are several interconnections that will involve obtaining easements, ROW's, access permits, directional drilling under a Forest Stewardship parcel, a private lake, and abandoned railroad as discussed above.

All of the other environmental/regulatory considerations including habitat, flora/fauna, site plan, stormwater management, sediment and erosion control, etc. can be successfully addressed with careful consideration for the site constraints identified in this report.

In addition to the CPCN, the Project will require National Pollutant Discharge Elimination System (NPDES) Permit coverage and other State Regulatory Approvals including conformance with stormwater management and sediment and erosion control requirements. In the 2017 Maryland Legislative Session, the CPCN Law was amended to require solar projects obtain consistency determinations with local zoning.

c. Environmental Review Request

As indicated above, DNR's Natural Heritage program has reviewed the project site and identified the plant or animal species that need to be protected (see *Appendix 14* and *Appendix 14-A*).

d. Cultural Resources Due Diligence Resources Investigation

As mentioned elsewhere in this report, MHT has identified several areas of interest. A Phase I study will be conducted, DOE forms will be prepared, and the results from both will be provided to the PSC/PPRP as a supplemental filing.

e. Geotechnical Investigations

The Applicant engaged ECS Mid-Atlantic to perform necessary geotechnical and seismic analysis to demonstrate the site is suitable to support the proposed solar generation facility. The Preliminary Geotechnical Assessment is included in *Appendix 7*. The findings indicate the soils onsite can support the proposed solar generation facility including the use of posts, pads to support inverters and switchgear, internal grass covered drive aisles, and related sediment and erosion controls. The seismic analysis will be performed as part of the construction document preparation.

4. Ability to Conform to Applicable Environmental Standards

The Project's design and construction will require review by state and local authorities through the CPCN process. The Project will also comply with various federal and state environmental regulatory requirements as applicable. Based on preliminary analysis the Project has avoided identified environmental constraints and it is expected that the final design will meet applicable federal, state, and local regulations. It should be noted that the State's limitation of twenty (20) acres of disturbance at any time during construction has been recently modified to be less restrictive.

B. AIR QUALITY

1. Compliance with Federal or State Air Quality Standards

As a solar generation facility, the Project will emit no pollutants, and the below listed standards, provisions, and requirements will not be applicable.

a. Air Quality During Construction

The primary air-quality issue during construction will be dust from non-point sources such as earthwork and construction traffic on unpaved roads. This type of dust is described as fugitive dust. Fugitive dust is expected to be less than a normal construction project since this Project will not require excessive earthwork activities. Other potential sources of pollutants during construction are mobile internal

combustion engines from earthwork equipment and an increase in vehicle traffic by workers. Emissions from these sources should have little impact.

b. Air Quality During Operation
The Project, like all solar generation facilities, will generate no air pollution emissions during its operation.

2. Impact on Deterioration Areas and Nonattainment Areas

The Project will have no impact on any attainment or nonattainment areas of the State.

3. Requirements Under COMAR 26.11

Generally, the provisions of COMAR 26.11 will not be applicable to the Project as the facility will not emit pollutants.

C. WATER QUALITY AND APPROPRIATION

1. Availability of Surface Water and Groundwater

As a stand-alone, unmanned facility, the Project will be monitored remotely. There will be limited water and no sewer requirements for the Project. The Project will not require surface or groundwater for construction or operation. Normal rain events will keep manual cleanings of the solar modules to a minimum. Occasional water for quarterly/semi-annual cleanings may be required. Water tank trucks may be used to manage dust during construction if required.

2. Affected Streams and Aquifers

As mentioned above MDE, with input from ECS, has determined wetland locations can be avoided during the design. Wetlands within the wooded areas onsite will not be disturbed and the Project will be located thirty-five feet (35') from the drip line of these wooded areas. Any wetlands interior to the Project will also be avoided and similar buffers established. The Site is located in the Upper Choptank watershed. No impacts to streams or aquifers are anticipated as a result of the Project design.

3. Impact on Other Water Users

No impact to other water users is anticipated as a result of the Project.

a. Impacts to Other Water Users During Construction
It is assumed that there will not be a need to use water during construction. If water is needed to control dust, a tanker truck will be provided.

b. Impacts to Other Water Users During Operation
Stormwater facility approvals, sediment and erosion control permits, grading permits, and NOI coverage under the NPDES Program will all be obtained as controls on the water quality leaving the Site. As an

unmanned facility, there will be no ongoing water consumption requirement. Any other interim water consumption required will be fairly intermittent and provided as identified above.

4. Mitigation and Minimization Techniques Evaluated

No impacts to water quality or appropriation are anticipated. As a result, mitigation and minimization techniques are not warranted.

5. Requirements Under COMAR 26.17.06.07 and 26.17.07

It is assumed that there is no reason for permits to be issued under COMAR 26.17.06.07 and 26.17.07 since no water use or appropriation is required for the Project.

D. DESCRIPTION OF EFFECT ON STATE OR PRIVATE WETLANDS

1. Public Health and Welfare

The Project's operation will not produce, emit, or discharge any significant noise, air pollutants, or water pollutants, which may have an effect on public health or welfare. Additionally, the Project will not generate, transport, store, treat, and/or dispose of hazardous waste.

2. Marine Fisheries

The Project will not impact marine fisheries.

3. Shell Fisheries

The Project will not impact shell fisheries.

4. Wildlife

The Project is not anticipated to significantly affect any wildlife habitat. The Project is not anticipated to impact critical habitats.

5. Protection of Life and Property from Flood, Hurricane, or other Natural Disaster

This Project is unique in that, during a natural disaster, there would only be destruction to the panel array itself. Total destruction of the panel array and the transformers would not release harmful gases or liquids and would have no adverse effects on surrounding property or life. All components of the Project will be designed per the local and state building codes.

6. Mitigation and Minimization or Replacement Land Acquisition

Mitigation and minimization or replacement land acquisition is not applicable to the Project.

7. License for use of State Tidal or Nontidal Wetlands

The information and forms required by the MDE regulations relating to a license for use of State tidal wetlands or nontidal wetlands under COMAR 26.23 and 26.24 are not required for this Project.

E. WASTE HANDLING

1. Waste Handling During Construction

During construction, the contractor will collect any waste material and remove it from the Site to an approved waste handling facility. Large amounts of waste during construction are not anticipated. Waste material will mainly consist of packaging materials from the framing and electrical equipment that will be delivered to the Site.

2. Waste Handling During Operation

During operation, there will be little or no waste material generated at the Site. Any waste that is generated from maintenance and/or repair operations will be removed from the Site and disposed of at an approved waste handling facility. There will be no sanitary sewer waste generated at the Site.

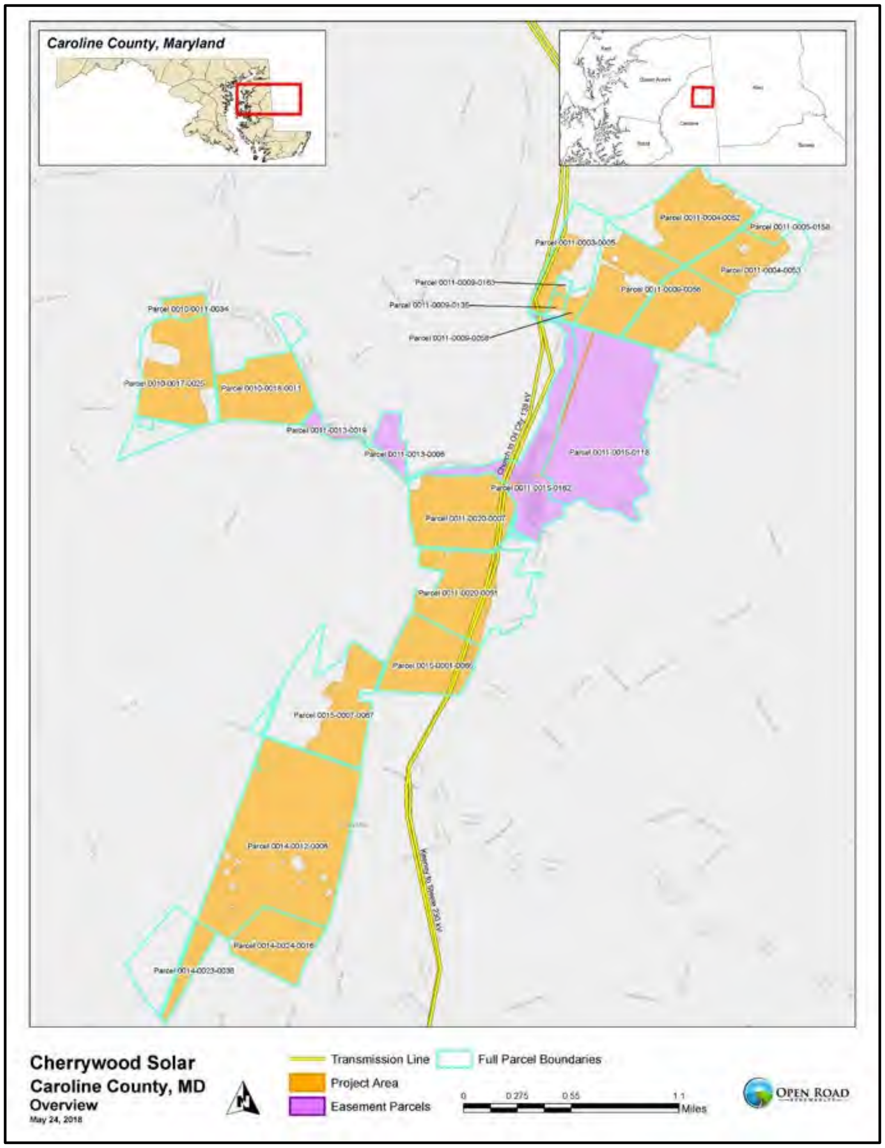
3. Waste Handling During Decommissioning

Waste associated with decommissioning and deconstruction of the Project will be handled appropriately pursuant to a Decommissioning Plan provided to the Commission and Power Plant Research Program. Once the life of the Project is complete, the land will revert back to its original condition.

Attachment C

ENVIRONMENTAL REVIEW DOCUMENT
PROJECT NO. 17001.00
REVISED MAY 25, 2018

CHERRYWOOD SOLAR
202 MW SOLAR PROJECT
CAROLINE COUNTY, MARYLAND



PREPARED FOR:

CHERRYWOOD SOLAR I, LLC
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37534 Oliver Dr.
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SECTION 1 – PROJECT OVERVIEW

The Cherrywood Solar I Project is a 202 Megawatt (MW) polycrystalline photovoltaic (PV) single-axis tracking project proposed by Cherrywood Solar I, LLC (the "Applicant"). As currently proposed, the Caroline County, Maryland Solar Project (the "Project") is located on a plain of properties that run from southwest to northeast between the Towns of Greensboro and Goldsboro just west of the Choptank River (see ***Figure 1*** and ***Figure 2***). The Project will consist of eighteen (18) parcels, some of which are contiguous, and approximately four (4) other additional parcels will be used for easements to accommodate the various connector lines. In addition, the Applicant will be constructing a new substation within the Limit of Construction (LOC) at Property 12. The Project will be approximately two hundred two megawatts (202 MW) single axis tracking alternating current (AC) solar polycrystalline photovoltaic (PV) project proposed by Cherrywood Solar I, LLC. It is anticipated that the Project would include a development envelope of approximately one thousand eighty-eight (1,088.15) acres once buffers and setbacks have been established in addition to avoidance from environmental constraints. As shown in ***Figure 3***, the proposed Project for purposes of this Report includes three (3) sections.

The Upper Section consists of Tax Map 0011, Grid 0004, Parcel 0052 ("Property 1"), Tax Map 0011, Grid 0005, Parcel 0158 ("Property 2"), Tax Map 0011, Grid 0004, Parcel 0053 ("Property 3"), Tax Map 0011, Grid 0009, Parcel 0056 ("Property 4"), Tax Map 0011, Grid 0009, Parcel 0058 ("Property 5"), Tax Map 0011, Grid 0003, Parcel 0005 ("Property 6") Tax Map 0011, Grid 0009, Parcel 0135 ("Property 17"), and Tax Map 0011, Grid 0009, Parcel 163 ("Property 18") and is comprised of approximately five hundred fifteen (515.98) acres of which the LOC includes approximately two hundred ninety-five (295.75) acres.

The Middle Section consists of Tax Map 0010, Grid 0011, Parcel 0034 ("Property 7"), Tax Map 0011, Grid 0017, Parcel 0025 ("Property 8"), and Tax Map 0010, Grid 0018, Parcel 0011 ("Property 9") and is comprised of approximately two hundred sixty-eight (268.47) acres of which the LOC includes approximately one hundred forty-nine (149.44) acres.

The Lower Section consists of Tax Map 0011, Grid 0020, Parcel 0007 ("Property 10"), Tax Map 0011, Grid 0020, Parcel 0051 ("Property 11"), Tax Map 0015, Grid 0001, Parcel 0066 ("Property 12"), Tax Map 0015, Grid 0007, Parcel 0067 ("Property 13"), Tax Map 0014, Grid 0012, Parcel 0008 ("Property 14"), Tax Map 0014, Grid 0024, Parcel 0016 ("Property 15"); and Tax Map 0014, Grid 0023, Parcel 0038 ("Property 16") and is comprised of approximately nine hundred thirty-eight (938.41) acres of which the LOC includes approximately six hundred twenty-eight (628.50) acres.

The total acreage of the parcels evaluated consists of one thousand seven-hundred twenty-two (1,722.86) acres. However, as noted above, not all will be used for the Project and appropriate areas have been excluded based on environmental constraints mapping. The total LOC for this Project is approximately one thousand seventy-three (1,073.69) acres. The site characteristics relative to soils, wetlands, forest conservation, etc. have been tabulated in an excel spreadsheet and included in ***Appendix 1***. The Project has contracted to either lease the underlying parcels under long-term leases or to contract land with options to purchase, from the various property owners associated with the eighteen (18) parcels, and nine (9) families (see ***Figure 3***) via an Option to Lease/Purchase Agreement. ***Table 3*** includes the various FEMA FIRM information as well as latitude and longitude for each parcel.

All of the Properties are in close proximity and drain directly to the Upper Choptank River. The Upper Choptank River watershed is predominantly rural with significant agricultural areas, as well as forest, small towns and pockets of suburban development. Large areas of land, which had poorly drained soils, were able to be developed because lands were drained by Public Drainage Association (PDA) ditches. Maintenance of these ditches is central to continuation of much of the current economic activity in the watershed. About fifty-six percent (56%) of the Upper Choptank

Watershed in Maryland is prime farmland. According to the Chesapeake Bay Program's Phase 5.2 Model, the land use distribution in the watershed is approximately fifty-three percent (53%) agricultural, thirty-five percent (35%) forest, and twelve percent (12%) urban. *Appendix 2* includes the various NRCS Soils Maps for each Property.

The Critical Area Commission has determined that the Project is not located in the Critical Area. There is no activity proposed on the Site which would impact the Critical Area or impair nearby waterways and receiving streams.

The Properties are all zoned Rural (R) and all have agriculture as the existing property use. These Properties are all located in close proximity to lands with active mining permits, a local wastewater treatment facility, a drive-in movie theater, and an existing small scale solar project. Only twelve (12) non-participating residences with line-of-sight to the Project will require setbacks and landscape buffers. Participating property owner agreements allow for screening areas where needed.

The Applicant participated in a County Task Force that drafted the Caroline County Solar Ordinance. The County held several workshops and standard public information hearings which culminated in the County Commissioner adoption of same in December, 2017. Overall, and giving consideration to this new Caroline County Solar Ordinance, it is anticipated the Project will have four (4) voluntary screening options. The depth of the buffers in most areas are twenty feet (20') and comprised of different mixes and densities of trees, shrubs, pollinators, and other planting materials. In a few sensitive areas the buffers will be fifty feet (50') deep. The proposed design and screening regime will obscure views of the Project consistent with the new Caroline County Solar Ordinance (*Appendix 3*). Also, consistent with the Solar Ordinance, a fifty-foot (50') setback will be generally included from property lines with two hundred-foot (200') setbacks to non-participating residences. As noted throughout the ERD, the Project is being designed/developed to be consistent with the local code and this newly adopted Ordinance.

The surface topography is mostly flat with the majority of grades from zero percent (0%) to five percent (5%) and consists of poor, moderate, and well-draining soils with classifications and soil characteristics as defined in *Appendix 2* below. There are a few areas with fifteen percent (15%) to thirty percent (30%) slopes which will be avoided. More than fifty percent (50%) of the soils are moderate to well-draining. However, there is a large area with poorer draining soils that also has a higher percentage of drainage ditches and wetland areas, some of which will be avoided. The Maryland Department of the Environment (MDE) has guidelines for stormwater management that govern Environmentally Sensitive Design (ESD) for utility scale solar projects. If slopes within the LOC are less than ten percent (10%) non-rooftop disconnection credits are allowed and no stormwater structures are required except for level spreaders on areas with grades between five percent (5%) and ten percent (10%).

Other than construction equipment traffic, there is anticipated to be no ground disturbance for the installation of the racking and solar modules. The Sites have very little change in grade and the piles can be installed on the existing elevations. Minimal earthwork will be required for the construction of the concrete pads for the transformers and inverters. Other property improvements that will have only moderate impact/disturbance to in-situ conditions involve grading improvements and roadbed stabilization to support ingress and egress of construction vehicles, as well as delivery trucks during the construction phase of the Project. The Project will obtain a Stormwater NPDES NOI Permit prior to construction.

Total generating capacity for the Project is anticipated to be 202 MW Alternating Current (AC) output. The Project will consist of approximately 499,086 First Solar Series 6 solar modules (or similar) as shown in the Solar Array Layout (see *Figure 4*). The array will be installed using a pile-driven post-supported racking system utilizing galvanized steel posts with galvanized steel or aluminum structures for mounting the modules. A typical Solar Panel Racking Detail

depicts the array with portrait racking with one row of modules positioned vertically on each rack (see ***Figure 5***). The space between rows will be approximately sixteen feet and five inches (16' 5") from post to post. The solar arrays will continuously rotate around a horizontal axis, oriented North-South, to orient the solar modules at an optimal angle to the incoming solar insolation during the day. In this configuration, the minimum leading-edge height (bottom edge of the modules) will be approximately two feet (2') from grade, and the maximum (top-edge height of the modules) will be approximately eight feet (8') from grade, although other feasible configurations are possible with higher top-edge heights. The solar arrays will be designed to withstand a snow load of twenty-five (25) pounds per square foot (psf) and wind of one hundred (100) miles per hour (mph) (risk category I per IBC 2012 for Caroline County).

There will be eighty-one (81) separate power stations where the direct current from the arrays will be converted to alternating current as transmitted to the electric grid. Each power station will include an inverter pad with one (1) inverter and one (1) liquid AC transformer. Each power station will make up 1/81 of the array AC capacity or approximately 2.5 MW. The nameplate capacity of the facility will be of 202 MW. The onsite facilities will also include a project substation and switch gear.

The Applicant has performed the PJM Generation Interconnection Feasibility Study and System Impact Study. Both reports are included in their entirety in ***Appendix 4***. The Project will include a new three-breaker 230 kV ring bus substation to be constructed adjacent to the Keeney-Steele 230 kV circuit. Two (2) of the positions on the ring bus will be transmission line terminals for the tie-in of Line 23009 to the substation. The other position will be a terminal configured for the interconnection of a generator. The project has been assigned Queue Position AB2-037. Based on the findings from the Generation Interconnection Feasibility Study and System Impact Study Reports, the estimated cost to build the substation is $6,491,000 with an estimated construction time of twenty-four (24) months.

The Project will be fully fenced with improved farm lane entrances primarily used wherever possible. Access permits from Caroline County will be acquired for any proposed new entrance. There is no planned need for water and sewer for the Project since there will be no operations and/or maintenance facilities and no full-time personnel located at this Site. Screening will be provided through a twenty foot (20') buffer of indigenous shrubs, trees, and grass plantings; including pollinators, consistent with the local Solar Ordinance and CPCN conditions. However, in some areas where the Project abuts nearby residences, a voluntary more robust fifty foot (50') landscape buffer is proposed in addition to a two hundred foot (200') setback. Wherever possible, the existing wooded area will remain and serve as a natural buffer.

A key feature of the Project is the close proximity of the Upper Section, Middle Section, and Lower Section which allows for short runs of underground interconnections to include two (2) underground crossings at Route 313, a sixty-six foot (66') easement crossing under an abandoned railroad track owned by the Department of Transportation (DOT), a right-of-way (ROW) from Caroline County to bury a line within a County owned ROW, a directional drill under a small private lake, and another directional drill under a Forest Stewardship Parcel. Appropriate agreements will be executed with DOT, the County, and private land owners to provide for these interconnection opportunities, the details of which will be included in future site plans and supporting documents submitted to the County for review and approval. ***Appendix 5*** includes conceptual underground crossing details for the Forest Stewardship parcel crossing, railroad crossing, and private lake crossing.

In addition to the CPCN, the Project will require National Pollutant Discharge Elimination System (NPDES) stormwater permit coverage and other State Regulatory Approvals including conformance with stormwater management, sediment and erosion control, and consistency with Critical Areas. Three (3) separate NPDES NOI Permits will likely be obtained; one (1) for each Section (Upper, Middle, and Lower). In addition to satisfying local site plan review and approval

requirements, the site plan will be subject to review as part of the CPCN process in order to obtain substantial conformance with local regulatory codes.

Figure 1 – Regional Context Map

Figure 2 – Local Context Map

Figure 3a – Project Site Location Map (Upper Section)

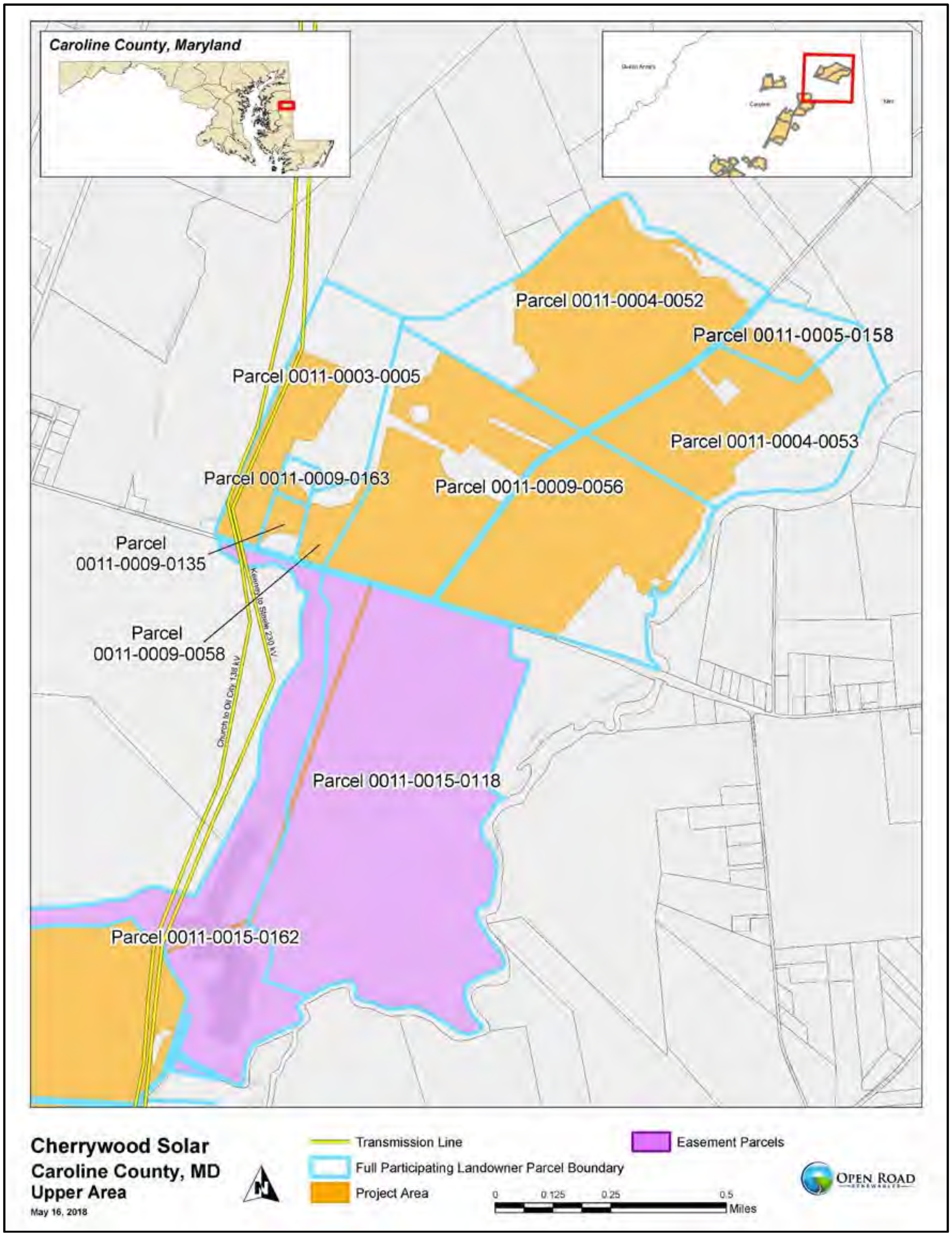


Figure 3b – Project Site Location Map (Middle Section)

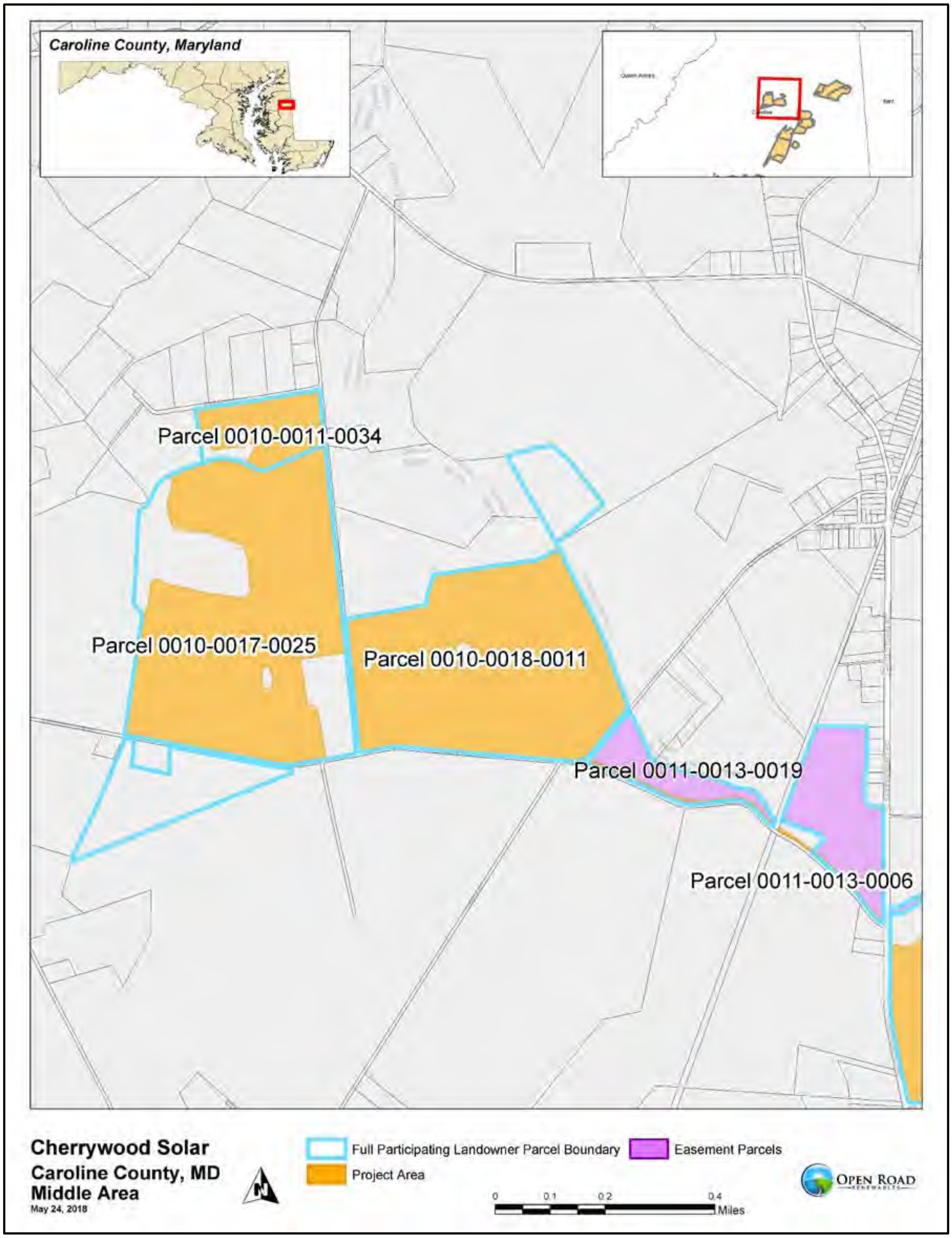


Figure 3c – Project Site Location Map (Lower Section)

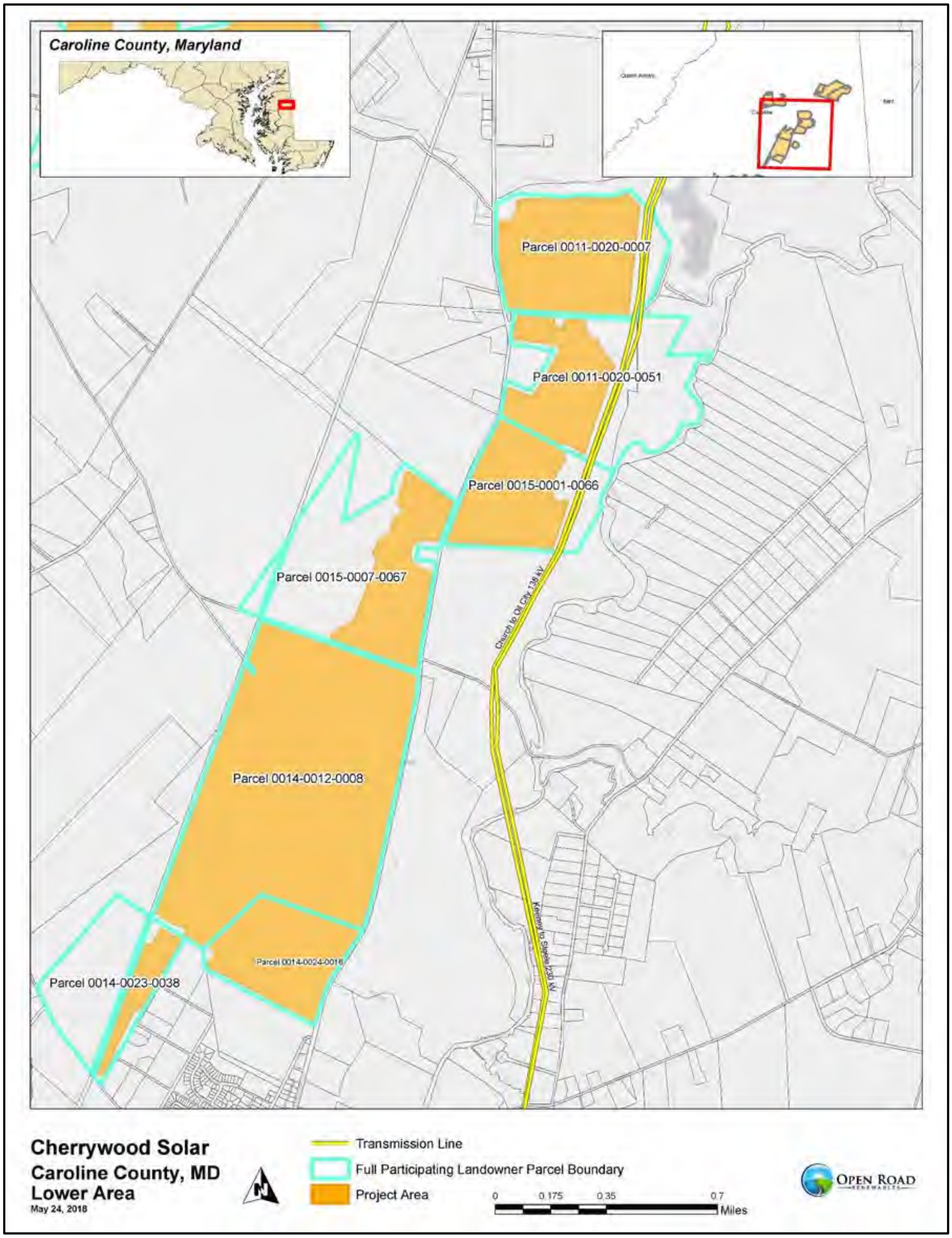


Figure 4a – Cherrywood Solar I – Upper Section Design Concept and Solar Array Layout

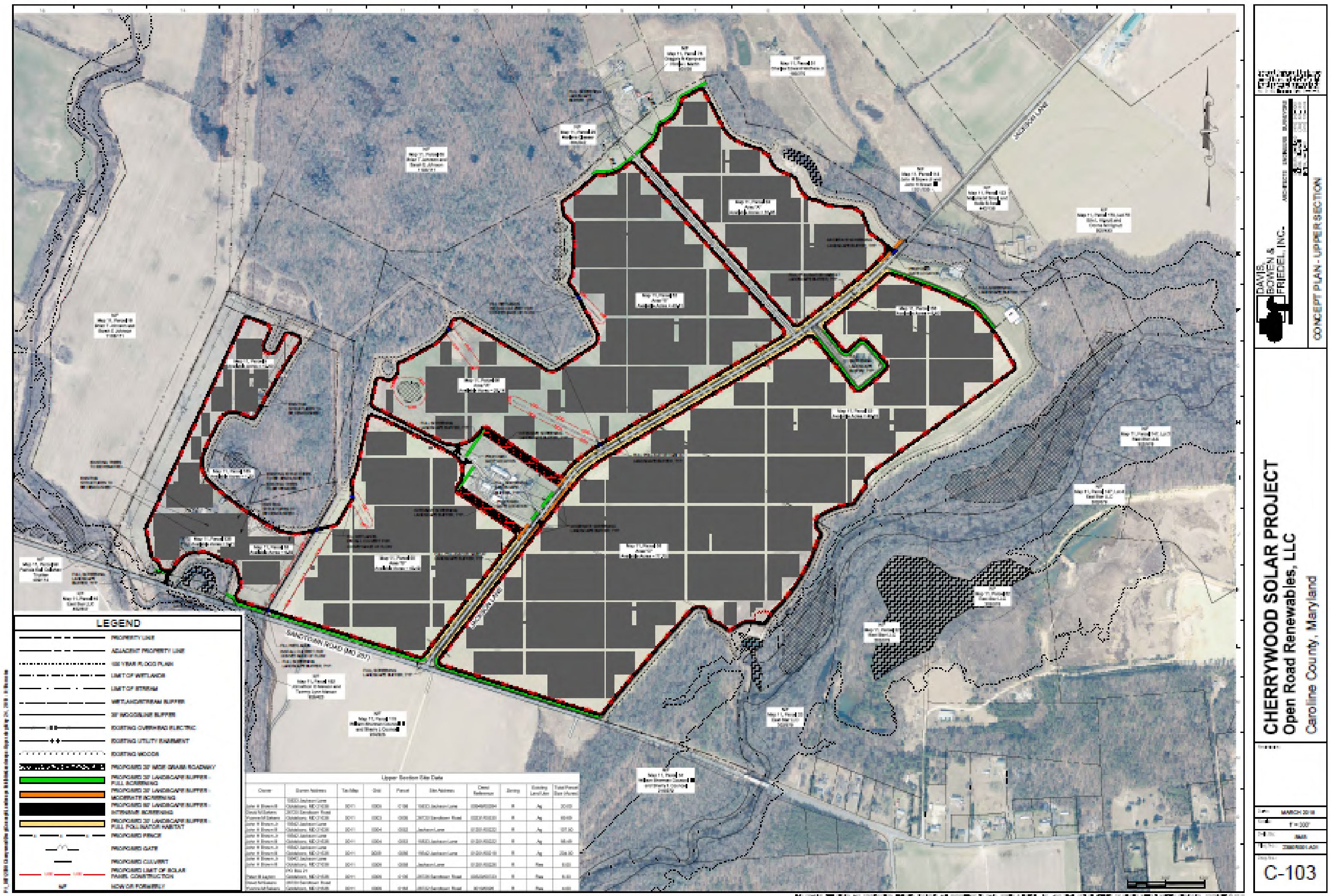


Figure 4b – Cherrywood Solar I – Middle Section Design Concept and Solar Array Layout

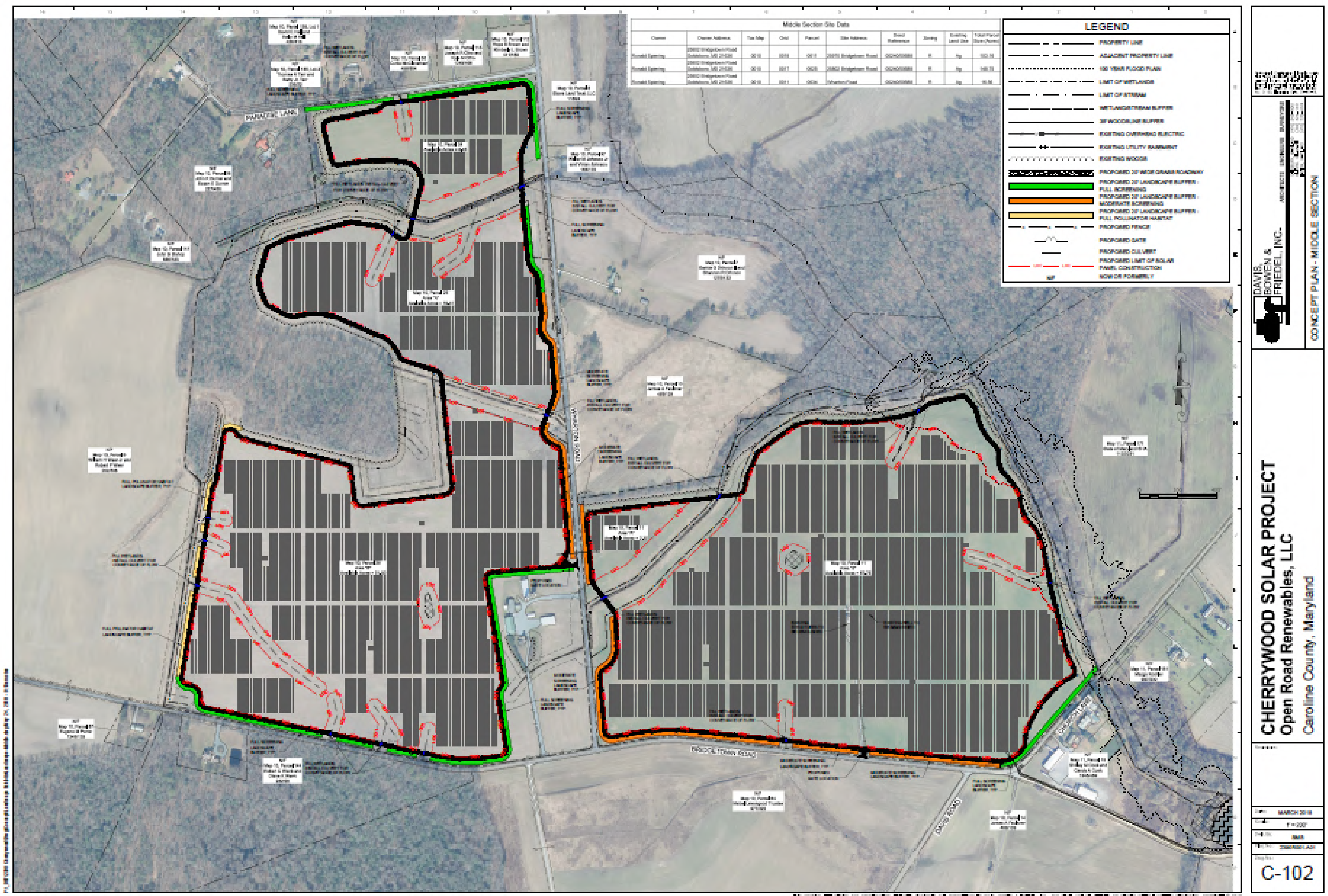


Figure 4c – Cherrywood Solar I – Lower Section Design Concept and Solar Array Layout

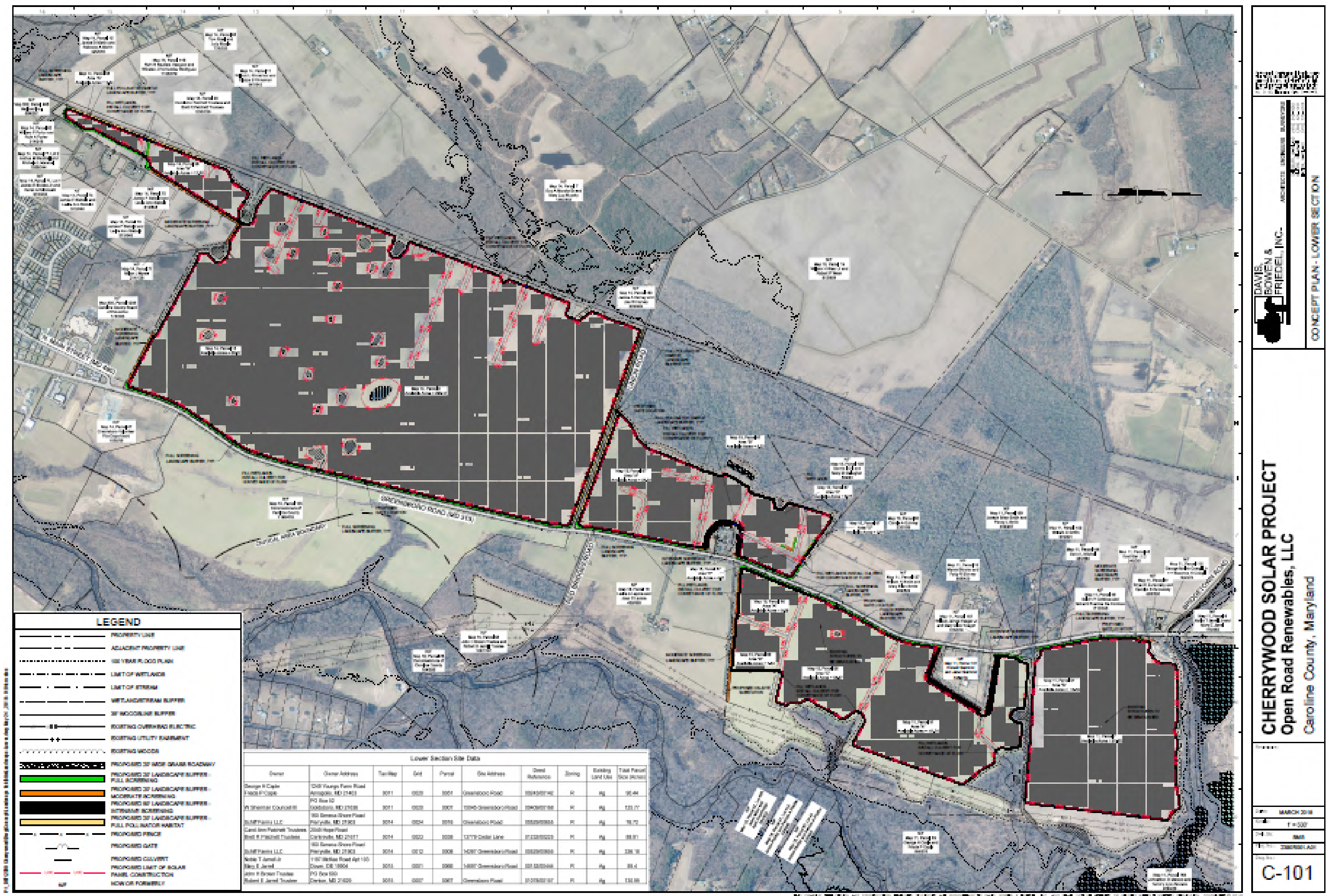
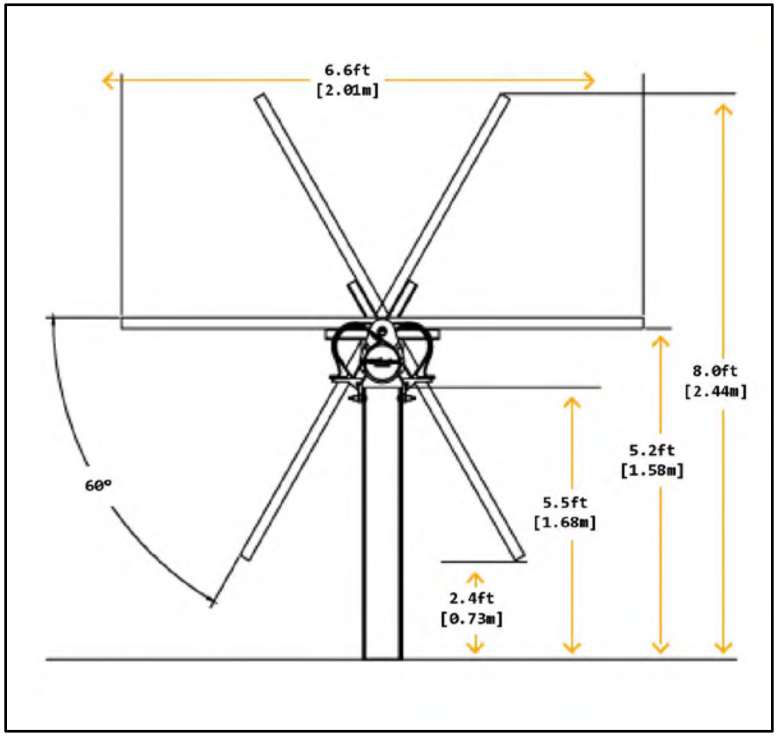


Figure 5 – Solar Array Section [Typical]



NOTES:

1. SYSTEM SPECIFICATIONS:
   TOTAL SYSTEM:
   219.6 MWP
   202.0 MW AC
   DC/AC RATION: 1.09

2. SINGLE AXIS TRACKING: 0.39 GCR

3. FENCE LAYOUT - 6' HIGH CHAIN LINK FENCE

(499,086 FIRST SOLAR FS-6440, 6 MODULES PER STRING, 83,181 STRINGS)

(APPROX. 71,298 POSTS (TYPICAL 84 PANEL ROWS WITH 12 PILES EACH))

(81 SMA SC500EV (1500V) INVERTERS WITH NAMEPLATE 2,500KW CAPACITY EACH)

(1 INVERTER AND 1 TRANSFORMER PER PAD)

SECTION 2 – STATEMENT OF NEED AND PURPOSE

The State of Maryland has enacted aggressive legal and policy standards in pursuit of more renewable energy generation within its borders. The State's goal and commitment is clear and widely considered to be among the most aggressive in the United States. Maryland's Renewable Portfolio Standard (RPS) mandates that twenty-five percent (25%) of Maryland's electricity be generated from renewable energy sources by 2020, which must include at least two and one-half percent (2.5%) solar energy. The RPS solar energy requirement increases each year from now until 2020 and the solar set-aside alone is projected to result in the need for at least 1,600 MW of solar capacity by 2020. The Applicant proposes to construct, own, and operate this 202 MW solar generation facility, which will increase the State's current solar electricity output. There will be significant economic benefits resulting from the Project to include a capital cost of approximately up to $200M and approximately two-hundred fifty to three-hundred fifty (250-350) design, management, and construction personnel working remotely or on the Site at the height of construction during the period from November, 2019 to August, 2020.

The construction schedule is estimated to be eight (8) to ten (10) months and is expected to be completed prior to December 31, 2020. Significant local resources are being employed as part of the design, entitlement, construction, and startup process. The tax revenue yield for a project of this size and type will also be beneficial. This Project will contribute to the local economy as well as the State's commitment to more instate renewable energy generation. It has been reported that Maryland imports approximately of forty-one percent (41%) of its required energy generation. This Project will help to reduce this reliance upon power generated out of state. Given the nature of solar power generation, it will also lead to reduced and more certain costs of electricity produced. Furthermore, this Project will contribute to the stated goals and objectives of Maryland Public Utilities Article § 7-702.

The public benefit of solar facilities like the Project has been clearly established by law. At the same time, the State's requirements and commitments in this area are some of the most progressive in the United States. The Applicant, through this proposal, seeks to assist the State in its effort to meet these objectives and to create more renewable energy generation in Maryland. The Project will deliver all of its output to the PJM wholesale electricity market via the Delmarva Power and Light Company (DPL) electric distribution system serving Maryland.

The Applicant is currently in discussions with multiple power purchasers for the output of the Project. However, as of the date of this submittal, an offtake agreement has not been executed.

SECTION 3 – APPLICANT INFORMATION

A. NAME AND ADDRESS OF APPLICANT

Cherrywood Solar I, LLC
c/o Todd R. Chason
233 East Redwood Street
Baltimore, MD 21202

B. PERSON AUTHORIZED TO RECEIVE NOTICES AND COMMUNICATIONS

Mr. Cyrus Tashakkori
Cherrywood Solar I, LLC
1105 Navasota St.
Austin, TX 78702
Phone 512.921.8643
cyrus@openroadrenewables.com

Mr. Todd R. Chason
Mr. David W. Beugelmans
Gordon Feinblatt LLC
233 East Redwood Street
Baltimore, MD 21202
tchason@gfrlaw.com
dbeugelmans@gfrlaw.com

C. LOCATION AT WHICH A COPY OF THE APPLICATION MAY BE INSPECTED BY THE PUBLIC

Caroline County Department of Planning and Codes
Health & Public Services Building
403 South Seventh St., Suite 210
Denton, MD 21629

SECTION 4 – STATE AND LOCAL PERMITS AND APPROVALS

(A Matrix of Permits and Approvals required for the Project follows as ***Table 1***.)

A. MARYLAND PUBLIC SERVICE COMMISSION (PSC)

1. Certificate of Public Convenience and Necessity (CPCN)

This document accompanies the petition to the Commission requesting the grant of a CPCN for the Project.

B. INDEPENDENT SYSTEM OPERATOR

1. Interconnection

The Applicant has performed the PJM Generation Interconnection Feasibility Study and System Impact Study, both of which are included in their entirety in ***Appendix 4***. The Project will include a new three-breaker 230 kV ring bus substation to be constructed adjacent to the Keeney-Steele 230 kV circuit. Two (2) of the positions on the ring bus will be transmission line terminals for the tie-in of Line 23009 to the substation. The other position will be a terminal configured for the interconnection of a generator. The project has been assigned Queue Position AB2-037. Based on the findings from the Generation Interconnection Feasibility Study and System Impact Study Reports, the estimated cost to build the substation is $6,491,000 with an estimated construction time of twenty-four (24) months. The substation will be located near the transmission line on Parcel 0011-0020-0051.

C. MARYLAND DEPARTMENT OF THE ENVIRONMENT

1. NPDES General Permit for Construction Activity

A National Pollutant Discharge Elimination System (NPDES) General Permit is required for planned construction activities with a planned total disturbance of one (1) acre or greater. Coverage under the General Permit is obtained by filing a completed Notice of Intent (NOI) form with the Maryland Department of the Environment, Water Management Administration (MDE/WMA).

The completed NOI form is considered a formal application for coverage and intent to comply with the terms of the General Permit. An NOI will be submitted to MDE during the construction drawing plan review phase.

D. MARYLAND DEPARTMENT OF NATURAL RESOURCES FOREST SERVICE

1. Forest Conservation Act

Generation facilities subject to a CPCN may be exempt from compliance with the Forest Conservation Act ("FCA"). The Applicant engaged ECS Mid-Atlantic to perform a Simplified Forest Stand Delineation and prepare an associated report for submittal to Caroline County as part of its local FCA review process. The

FSD and draft FCA Worksheet are included in ***Appendix 6***. Caroline County has reviewed the Simplified FSD and draft FCA worksheet and advised that the findings are acceptable. Consistent with these documents and as part of the local site plan process a Forest Conservation Plan (FCP) will be prepared and submitted to the County.

The Simplified FSD does not require the specimen trees be located; however, ECS indicated there were numerous specimen trees in the forested areas which are not to be disturbed as part of the Project. ECS further noted the most prevalent location of the specimen trees was along the eastern boundary of the Project nearest the Choptank River. While the Project may remove very few specimen trees outside of the wooded/forested areas, the proposed landscape buffer plan adds approximately twenty-nine (29.92) acres of trees, shrubs, and pollinator habitat on land that is currently utilized for crop farming. The Lower Section includes fifteen (15.1) acres, the Middle Section includes five (5.11) acres, and the Upper Section includes nine (9.71) acres.

Because the County has accepted the Simplified FSD and draft FCA Worksheet, Caroline County has also indicated that the Project satisfies the "no net loss" requirement in the FCA. Therefore, based on the statutory exemption for projects subject to CPCN that satisfy the "no net loss" requirement, Caroline County will not require afforestation mitigation under their Forest Conservation Ordinance ("FCO"). ***Appendix 17*** includes the County's confirmation on Forest Conservation Exemption. There is no plan to cut forested areas and the few stand-alone and isolated trees that will be removed will be significantly offset by the many acres of trees to be planted as part of the proposed vegetative buffer plan.

In Caroline County, the fee is assessed at a rate of thirty cents ($0.30) per square foot of the conservation requirement within the designated Priority Funding Area and at a rate of thirty-six cents ($0.36) per square foot of conservation requirement outside the designated Priority Funding Area. Should any type of mitigation be required to satisfy Caroline County FCA requirements for the few trees to be removed, in addition to the fee option, the Applicant may also mitigate by planting trees at a one-to-one (1:1) ratio, placing appropriate acreage of wooded area within the same watershed and/or County into a Forest Conservation Easement (FCE) at a two-to-one (2:1) ratio, or purchasing mitigation credits from a mitigation bank at a two-to-one (2:1) ratio, or paying the County's in lieu of fee. If these options cannot be achieved within the same watershed and/or County, the mitigation rate would change from two-to-one (2:1) to four-to-one (4:1).

E. CAROLINE COUNTY PLAN REVIEW AND PERMITTING

1. Zoning and Comprehensive Plan Consistency

The underlying zoning for all of the Properties is Rural (R) with the predominant use Agriculture. Solar generation facilities are a commercial use that will undergo site plan review consistent with Caroline County's Commercial Site Plan Checklist. The County imposed a temporary moratorium on utility scale solar projects while the Task Force studied other county's regulatory approaches, including designating areas within the Delmarva Power and Light Company (DPL) distribution system where properties would be allowed for use as utility scale solar projects. The Solar Ordinance adopted in December, 2017 limits utility scale solar projects in aggregate to 2,000 acres of farmland (equivalent to approximately one and a half percent (1.5%) of the County's farmland). Additionally, places in the County designated for growth have been determined to be off limits for utility scale solar development.

Caroline County established an eight (8)-member Task Force, of which the Applicant was an active member, to draft and vet the proposed Ordinance. The Applicant diligently participated in discussions along with other community, government, business, and industry representatives, to ensure the proposed Project would be fully consistent with the new Solar Ordinance. Most of the components of the new Solar Ordinance are fully consistent with common PPRP approaches and include requirements relating to subjects such as decommissioning plans with financial assurance, setback and screening, height and lighting, glare, fencing, and aesthetics. The Applicant has also coordinated planning efforts for the Project with farming tenants to minimize disruption of farming activity.

The Applicant will complete the applicable local review process, which will ensure consistency with local zoning requirements including application for the Special Use Exception.

The new Solar Ordinance provides that utility-scale solar projects may not be constructed in previously-established planned growth districts within the County. In addition, it limits utility scale solar projects, in the aggregate, to 2,000 acres of agricultural land in the County. The Project falls outside the planned growth districts and, if constructed, the total amount of utility-scale solar in the County would be well within the 2,000-acre limit for agricultural land. Finally, specific design requirements, setbacks, and landscape buffers were defined based on proximity of projects to residential dwellings, all of which have been incorporated into the design of the Project.

2. *SITE PLAN REVIEW / APPROVAL AND LOCAL PERMITTING*

As with other CPCN projects, site plan requirements may include, but may not be limited to, ingress/egress, setbacks and buffers, screening, internal drive aisles and access ways, Fire Marshal conditions/requirements, electric code requirements, building code requirements/references, sediment and erosion control, stormwater management, solar panel layouts including inverter locations and switchgear, gen-tie alignment and specifications, and a number of other requirements that parallel environmental requirements of the Maryland Environmental Article as may be delegated to local jurisdictions for implementation.

Following site plan submittal to the Zoning Administrator, a Technical Advisory Committee (TAC) meeting will be held and the Applicant will receive and review comments on the submittal package. With TAC recommended approval, the revised plans will be submitted to the Planning Commission for review and approval. If a Special Exception or Conditional Use approval is needed the Project will need to submit the appropriate application and supporting documents to the Board of Zoning Appeals (BZA). The various tools to be used by the technical team to assure local submittals are consistent with local process and standards will include careful reference to the following:

www.carolinemd.org/DocumentCenter/View/192
http://www.carolinemd.org/271/PlanningZoning-Technical-Advisory-Commit
http://www.carolinemd.org/274/Site-Plans
http://www.carolinemd.org/269/Development-Review

Table 1 below outlines in more detail the State and Local permits and approvals associated with these processes.

It is important to note that in developing the site plan and addressing site stabilization requirements that will be governed by the sediment and erosion control permit, the MDE will stipulate a phasing/sequencing plan as part of the site plan approval process. Thus, the sediment and erosion control plans will have to specify how each disturbed area in the phasing plan will be stabilized before the next construction area is disturbed. Due to the relatively large size of this Project, MDE and the County will require interim stabilization every seven (7) days. Under State Code, stabilization of a site requires vegetative cover within the proposed LOC to prevent runoff and sediment and erosion regulatory violations.

This requirement will best be met through strategically planning the construction phase of the Project to include phasing plans. These phasing plans will maximize use of laydown areas, minimize truck traffic throughout the construction area, and phase contractors so that work on solar modules and wiring is preceded by completion of work installing posts and racking.

It should be noted that the State's limitation of twenty (20) acres of disturbance at any time during construction has been recently modified to be less restrictive, allowing for the State to consider other phasing options that will limit disturbance to defined areas.

3. Grading and Building Permits

A Grading Permit and Building Permit will be applied for after the Construction Drawing approval. These documents will provide the detailed engineering and specifications required to implement the approved site plan leading to necessary grading and building permits as required by Caroline County. At the same time the Grading and Building Permits are applied for, the Applicant will submit construction documents for the Electrical Permits needed for construction.

F. SUMMARY OF PERMITS/APPROVALS

Table 1 – Matrix of State/Local Permits and Approvals

Agency	Permit/Approval	Regulatory Citation (s)	Required For		Status			Waiver, Variance, or Exemption		Comments
			Construction	Operation	Application Contained Herein	Application to be Filed	Permit Approval/ Obtained	Yes	No	
State of Maryland Public Service Commission (PSC)	Certificate of Public Convenience and Necessity (CPCN)	COMAR 20.79	√		√				√	To be prepared at a later date.
PJM Interconnection, LLC	Interconnection	Condition for Issuance of CPCN		√			√		√	PJM completed the Feasibility Study Report in September, 2016. PJM completed the System Impact Study in April, 2017.
Maryland Department of the Environment (MDE)	National Pollution Discharge Elimination System (NPDES) General Permit for Construction Activity	COMAR 26.08, Clean Water Act (CWA) Section 401, 40 CFR 122	√			√			√	Application to be submitted at the time Construction Documents have been completed.
Maryland Department of Natural Resources Forest Service	Forest Conservation Act (FCA)	Natural Resources Article 5-1602(b)(5)						√		The Applicant has submitted the Simplified FSD and draft FCA Worksheet for County review. The County has indicated, based on their review, that afforestation will not be required.
Caroline County	Environmental Site Design Erosion Sediment Control Construction Drawings	Applicability varies according to Local and State Requirements	√			√			√	It is expected that the County will participate in the CPCN process and provide input regarding the site plan, stormwater management, and sediment and erosion control. Grading, Electrical, and Building Permits will be applied for after construction drawings are approved.

SECTION 5 – COMAR 20.79.03.01 DESCRIPTION OF GENERATING STATION

A. LOCATION

The Caroline County, Maryland Solar Project (the "Project") is located on a plain of properties that run from southwest to northeast between the Towns of Greensboro and Goldsboro just west of the Choptank River. The Project will consist of eighteen (18) parcels, only some of which are contiguous and approximately four (4) other additional parcels will be used for easements to accommodate the various connector lines. The Project will be approximately two-hundred two megawatts (202 MW) single axis tracking alternating current (AC) solar polycrystalline photovoltaic (PV) project proposed by Cherrywood Solar I, LLC. It is anticipated that the Project would include a development envelope of one thousand seventy-three (1,073.69) acres once buffers and setbacks have been established in addition to avoidance from environmental constraints. As shown in ***Figure 3***, the proposed Project for purposes of this Report includes three (3) sections.

The Upper Section consists of Tax Map 0011, Grid 0004, Parcel 0052 ("Property 1"), Tax Map 0011, Grid 0005, Parcel 0158 ("Property 2"), Tax Map 0011, Grid 0004, Parcel 0053 ("Property 3"), Tax Map 0011, Grid 0009, Parcel 0056 ("Property 4"), Tax Map 0011, Grid 0009, Parcel 0058 ("Property 5"), Tax Map 0011, Grid 0003, Parcel 0005 ("Property 6"), Tax Map 0011, Grid 0009, Parcel 0135 ("Property 17"), and Tax Map 0011, Grid 0009, Parcel 163 ("Property 18") and is comprised of approximately five hundred fifteen (515.99) acres of which the LOC includes approximately two hundred ninety-five (295.75) acres.

The Middle Section consists of Tax Map 0010, Grid 0011, Parcel 0034 ("Property 7"), Tax Map 0011, Grid 0017, Parcel 0025 ("Property 8"), and Tax Map 0010, Grid 0018, Parcel 0011 ("Property 9") and is comprised of approximately two hundred sixty-eight (268.47) acres of which the LOC includes approximately one hundred forty-nine (149.44) acres.

The Lower Section consists of Tax Map 0011, Grid 0020, Parcel 0007 ("Property 10"), Tax Map 0011, Grid 0020, Parcel 0051 ("Property 11"), Tax Map 0015, Grid 0001, Parcel 0066 ("Property 12"), Tax Map 0015, Grid 0007, Parcel 0067 ("Property 13"), Tax Map 0014, Grid 0012, Parcel 0008 ("Property 14"), Tax Map 0014, Grid 0024, Parcel 0016 ("Property 15"), and Tax Map 0014, Grid 0023, Parcel 0038 ("Property 16") and is comprised of approximately nine hundred thirty-eight (938.41) acres of which the LOC includes approximately six hundred twenty-eight (628.50) acres.

Regarding other adjacent parcels which will only be used for necessary easements to facilitate the electrical interconnection of the various Sections noted above; streams, wetlands, forests areas, and other environmental constraints can be completely avoided by directional drilling.

The parcels which will be included in the Project to facilitate interconnection of the Sections noted above include Tax Map 0011, Grid 0015, Parcel 0118; Tax Map 0011, Grid 0015, Parcel 0162; Tax Map 0011, Grid 0013, Parcel 0019; and Tax Map 0011, Grid 0013, Parcel 0006. These parcels are shown in purple on ***Figure 3***.

The proposed array layout will maintain a fifty-foot (50') setback from road frontages and property lines that are not internal to the Project (see ***Figure 4***). Although the Project is not within the Critical Area and subject to Critical Area buffers and setbacks, the Project will be located more than one hundred feet (100') from designated streams and thirty-five feet (35') from the drip line of existing trees. Within this setback appropriate buffering/screening will be provided. The landscape buffer plans will be prepared by a licensed landscape architect from Davis, Bowen &

Friedel, Inc. (DBF) which will be reviewed and approved by Caroline County, and the local Soil Conservation District Office. These same agencies also review and approve other planting plans within the fence associated with site stabilization, drainage, and stormwater management. The perimeter fence, which is proposed to be a six foot (6') high chain-link fence, will be located thirty-five feet (35') from the drip line along the wooded perimeter of the Project as shown in ***Figure 4***. The electricity produced by the Project's solar modules and inverters will be delivered into the PJM Interconnection, LLC (PJM), System, the largest centrally dispatched control area in North America consisting of all or part of the States of Maryland, Pennsylvania, New Jersey, Delaware, District of Columbia, Illinois, Indiana, Kentucky, Michigan, North Carolina, Ohio, Tennessee, Virginia, and West Virginia.

All of the Properties are in close proximity and drain directly to the Upper Choptank River. The Upper Choptank River watershed is predominantly rural with significant agricultural areas, as well as forest, small towns and pockets of suburban development. Large areas of land, which had poorly drained soils, were able to be developed because lands were drained by PDA's ditches. Maintenance of these ditches is central to continuation of much of the current economic activity in the watershed. About fifty-six percent (56%) of the Upper Choptank Watershed in Maryland is prime farmland. According to the Chesapeake Bay Program's Phase 5.2 Model, the land use distribution in the watershed is approximately fifty-three percent (53%) agricultural, thirty-five percent (35%) forest, and twelve percent (12%) urban.

Although the significant ditching of farmed properties increased productivity and contributed significantly to farming viability in this watershed, it also contributed greatly to the degradation of water quality in the Upper Choptank River. Sixty-seven percent (67%) of degraded stream miles in the watershed are artificially straightened or channelized in some way. During channelization, trees in the riparian buffer zone are often cut and woody debris is removed from the stream channel to allow for efficient movement of water away from agricultural fields. As a result, heavily channelized streams are often shallow and offer little habitat diversity. The Delmarva Peninsula contains over eight hundred (808) miles of PDA or tax ditches that drain over 143,311 acres of land. Caroline County, which is part of the Choptank River watershed, holds the greatest number of tax ditches in the Maryland Eastern Shore. The historical loss of wetlands in the Upper Choptank River watershed is estimated to be 48,169 acres, which is a relatively large loss of wetlands compared with other similar Maryland watersheds and has contributed to the degrading of water quality in the Upper Choptank River.

As stated above, water quality in the Upper Choptank is poor. Sediment loads from the watershed to the non-tidal waters have increased, but phosphorus levels in nontidal waters have decreased. Still, nitrogen, phosphorus, and sediment levels in the tidal waters of the Upper Choptank are too high. Habitat for underwater grasses are poor because algal densities are too high and water clarity is poor. Only bottom dissolved oxygen levels are good. No underwater grass beds are found in the Upper Choptank and bottom dwelling animal populations are not healthy. The River itself is tidal for much of its length and includes an ecologically delicate estuarine ecosystem.

All waters of the State are assigned a "Designated Use" in regulation, COMAR 26.08.02.08, which is associated with a set of water quality criteria necessary to support that use. These designated uses may or may not be currently compliant; however, the Code requires that standards should be attainable. All surface waters in the Upper Choptank River watershed are designated Use I for Water Contact Recreation, and Protection of Aquatic Life. Waters designated as Use II for Shellfish Harvesting in the Choptank River are located in estuarine waters downstream of the Upper Choptank River watershed.

Stabilizing the proposed Project with a combination of grass and pollinator cover will substantively improve downstream water quality by eliminating active farming practices on this large tract of land.

B. DESIGN FEATURES

Total generating capacity for the Project is anticipated to be 202 MW Alternating Current (AC) output. The Project will consist of approximately 499,806 First Solar Series 6 solar modules (or similar) as shown in the Solar Array Layout (see *Figure 4*). The array will be installed using a pile-driven post-supported racking system utilizing galvanized steel posts with galvanized steel or aluminum structures for mounting the modules. A typical Solar Panel Racking Detail depicts the array with portrait racking with one row of modules positioned vertically on each rack (see *Figure 5*). The space between rows will be approximately sixteen feet and ten inches (16' 10") from post to post. The solar arrays will continuously rotate around a horizontal axis, oriented North-South, to orient the solar modules at an optimal angle to the incoming solar insolation during the day. In this configuration, the minimum leading-edge height (bottom edge of the modules) will be approximately two feet (2') from grade, and the maximum (top-edge height of the modules) will be approximately eight (8') from grade, although other feasible configurations are possible with higher top-edge heights. The solar arrays will be designed to withstand a snow load of twenty-five (25) pounds per square foot (psf) and wind of one hundred (100) miles per hour (mph) (risk category I per IBC 2012 for Caroline County).

There will be eighty-one (81) separate power stations where the direct current from the arrays will be converted to alternating current as transmitted by the electric grid. Each power station will include an inverter pad with one (1) inverter and one (1) liquid AC transformer. Each power station will make up 1/81 of the array AC capacity or approximately 2.5 MW. The nameplate capacity of the facility will be of 202 MW. The onsite facilities will also include a project substation and switch gear.

A six-foot (6') high chain link perimeter fence will be installed around the Project with multiple entrances from roads fronting the identified parcels as reflected in *Figure 4* above. To the extent possible, exiting farm lanes and property entrances will be used. There is limited need for water and no need for sewer at the Project site because there will be no operations and/or maintenance facilities as part of this Project and no full-time personnel located at this Site. The only water use associated with the operation of this solar generation facility will be relatively infrequent cleansing of the solar modules. Typically, this cleansing utilizes only water sprayed at relatively high speeds to remove dirt and dust from the solar modules. Washing of a plant this size would consume much less water than the irrigation requirements for an active farm. Water to accommodate these needs will be provided using tanker trucks, which will obtain water from a County and/or Municipal water supply.

1. Environmental Site Design (ESD)

a. ESD Components

i. Land Use and Cover
The Sites primarily consist of agricultural fields and have been farmed for conventional agricultural crops by landowners for several decades. The Applicant is in communication with the agricultural lease tenants and will provide notice consistent with Md. Real Property Article § 8-402(b)(3)(i).

ii. Soils and Steep Slopes
According to the Critical Area Commission, the Site is outside the Critical Area and contains soils with widely varying characteristics including poor, moderate, and well-draining. As stated above, the Upper Choptank watershed lies within the Coastal Plain physiographic region, which is a wedge-shaped mass of primarily unconsolidated sediments of the Lower Cretaceous, Upper Cretaceous

and Pleistocene Ages covered by sandy soils. The Coastal Plain Region is characterized by lower relief, and is drained by slowly meandering streams with shallow channels and gentle slopes.

Soils typically found in the Upper Choptank River watershed include Sassafras, Fallsington, Galestown, Matapeake, Westbrook, and Othello series. The Sassafras series consist of very deep, well drained soils on sandy marine and old alluvial sediments. The Fallsington series consist of very deep poorly drained on coastal plain flatlands. Saturated hydraulic conductivity is high in the subsoil and high to very high in the substratum. The Galestown series consist of very deep, somewhat excessively drained soils formed in sandy marine sediments and glacial outwash on glacial terminal moraine. The Matapeake series consist of very deep, well drained soils in silty eolian sediments underlain by coarser fluvial or marine sediments. The Westbrook series consist of very deep, very poorly drained soils formed in organic deposits over loamy mineral material. The Othello series consist of very deep, poorly drained soils, with saturated hydraulic conductivity being moderately high.

The full soils report and prime farmland classification can be found in *Appendix 2*. As confirmed in the geotechnical report (*Appendix 7*), these soils are suitable to support solar modules, inverters, switch gear, grass covered aisle ways, access roads, and associated drainage and stormwater management. For the eighteen (18) properties associated with the proposed utility scale solar project, the following soil characterizations are provided.

<u>Upper Section</u>:

- Property 1 – the slopes range between zero percent (0%) and five percent (5%) with the three most prominent soil classifications being Ingleside Sandy Loam, Hambrook Sandy Loam, and Lenni Loam. This is one of the better soil groupings for all of the sixteen (16) properties. These soils are moderately to well-draining soils.
- Property 2 – the slopes for most of the property range between two percent (2%) to five percent (5%). Less than two (2) acres are on steeper grades which will be avoided. These slopes range from ten percent (10%) to thirty percent (30%). The primary soils for the useable portion of the property Evesboro Sand and Hambrook Sandy Loam. Both are well-draining.
- Property 3 – the majority of the slopes range between zero percent (0%) and five percent (5%) with eleven (11.4) acres falling in the five percent (5%) to ten percent (10%) range. The prominent soil series are Ingleside Sandy Loam, Hambrook Sandy Loam, and Rosedale Sandy Loam. These soils are moderately to well-draining soils.
- Property 4 – the majority of the slopes range between zero percent (0%) and five percent (5%) with approximately six (6.0) acres out of approximately one hundred twenty-six (126) acres falling in the five percent (5%) to ten percent (10%) range. The prominent soil series are Ingleside Sandy Loam and Hambrook Sandy Loam. These soils are moderately to well-draining soils.
- Property 5 – the majority of the slopes range between zero percent (0%) and five percent (5%). The majority of soils on this property are Fallsington Sandy Loams, Hambrook Sandy Loams, and Woodstown Sandy Loams. These soils are moderately to well-draining soils.
- Property 6 – the majority of the slopes range between zero percent (0%) and five percent (5%). The majority of soils on this property are Ingleside Loamy Sand, Hammonton-

Fallsington-Corsica Complex, and Hambrook Sandy Loams. These soils are moderately to well-draining soils.

- Property 17 – the majority of the slopes range between zero percent (0%) and five percent (5%). The majority of soils on this property are Hambrook Sandy Loams, and Ingleside Sandy Loam,. These soils are all well-draining.
- Property 18 – the majority of the slopes range between zero percent (0%) and five percent (5%). The majority of soils on this property are Hambrook Sandy Loams, and Ingleside Sandy Loam. These soils are all well-draining.

As indicated in the Project Overview these eight (8) properties in the Upper Section have by far the best soil characteristics. Although one would expect these better draining properties to have fewer drainage ditches/wetlands, several of the properties had more ditches than one might expect for these better soils. These soils also include Prime Farmland Ratings of mainly "All areas are prime farmland" and "Farmland of statewide importance".

<u>Middle Section</u>:

- Property 7 – the slopes are generally quite flat at zero percent (0%) to two percent (2%). The Corsica and Fallsington soil series are deep and very poorly drained. The Woodstone and Hambrook are moderately well draining.
- Property 8 – the slopes are zero percent (0%) to five percent (5%). The primary soils are Fallsington Loam, Woodstown Loam, and Hambrook Loam; each is moderately to poorly draining.
- Property 9 – the slopes are zero percent (0%) to five percent (5%). The primary soils are Fallsington Sandy Loam, Woodstown Sandy Loam, and Hambrook Sandy Loam; each moderately to well-draining. Sands were mixed in with these loamy soils, which makes them somewhat better draining than Property 7 and Property 8.

This grouping had poorer draining soils than the Upper Section, which is expected because the sand content is far less and the soils are loamier in these areas. These soils also include Prime Farmland Ratings of mainly "All areas are prime farmland" and "Farmland of statewide importance".

<u>Lower Section</u>:

- Property 10 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hambrook Sandy Loam, Ingleside Sandy Loam, and Galestown-Rosedale soils. The Galestown-Rosedale soils will be avoided as they are fifteen percent (15%) to thirty (30%) percent slopes, which are also made up of marine sediments and are excessively well-draining.
- Property 11 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Inglestown Sandy Loam, Hambrook Sandy Loam, and Woodstown Sandy Loam. These are moderate to well-draining soils.
- Property 12 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hambrook Sandy Loam, Fallsington Loam, and Ingleside Sandy Loam. The Fallsington soils are poorly drained. The Hambrook and Ingleside are moderate to well-draining.

- Property 13 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hammonton-Fallsington-Corsica Complex and Hambrook Sandy Loam. The Hammonton-Fallsington-Corsica Complex is moderate to poorly drained. Hambrook Sandy Loam is moderate to well-draining.
- Property 14 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hammonton-Fallsington-Corsica Complex, Ingleside Sandy Loam, and Fallsington Sandy Loam. The drainage characteristics on this site are mixed with half the site being poorly drained and the other half being moderate to well-draining.
- Property 15 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hammonton-Fallsington-Corsica Complex and Ingleside Sandy Loam.
- Property 16 – the slopes are two percent (2%) to five percent (5%). The predominate soils are Ingleside Sandy Loam and Hurlock Sandy Loam. Both of these soils are moderate to well-draining.

Similar to the Middle Section, the soils are a mix between moderate to well-draining and poorly draining. The mix between the soil types, however, is more evident with higher acreage on the poorly draining soils. These soils also include Prime Farmland Ratings equally weighted between "All areas are prime farmland" and "Farmland of statewide importance".

In summary, the slopes in all areas are predominately in the zero percent (0%) to five percent (5%) range. There are a few areas with fifteen percent (15%) to thirty percent (30%) slopes, which will be avoided. More than fifty percent (50%) of the soils have moderate to well-draining soils. However, there is a large area with poorer draining soils that also has a higher percentage of drainage ditches and wetland areas, some of which will be avoided. The Maryland Department of the Environment (MDE) has guidelines for stormwater management that govern Environmentally Sensitive Design (ESD) for utility scale solar projects. If slopes within the LOC are less than ten percent (10%) non-rooftop disconnection credits are allowed and no stormwater structures are required except for level spreaders on areas with grades between five percent (5%) and ten percent (10%). Generally, areas within the LOC where solar panels will be installed are in areas where grades are ten percent (10%) or less.

Land disturbance for this Project will require very little grading or site disturbance. There will be less than one percent (1%) of impervious surface added. Impervious areas will be associated with some improvements at entrances to the properties, inverter pads, piles for the solar panel and fencing, and associated improvements. See ***Table 2a, Table 2b,*** and ***Table 2c*** – Impervious Area Tabulation below.

Table 2a – Impervious Area Tabulation
Upper Section

Impervious Area Description	Length (FT)	Width (FT)	Area (SF)	Quantity	Total Area (SF)	Comments
Invert/Equipment Pads (Concrete)	22.60	15.25	344.65	19	6,548.35	Inverter Pad Site
Racking Posts	-	-	0.03080	19,385	597.06	Array Piers & Motor Piers (W6x15 Max Size)
Array Field Access Ways – Grass Aisles	-	-	-	-	-	Grass Only, No Improvements
Proposed Entrance Improvements	-	-	-	2	2,400	Conceptual / Approximate
On-Site Substation Equipment Pad/Area (Private)	100	100	10,000	1	10,000	Equipment Pads
Total Impervious Area					19,545.41	SF
					0.449	Acres

Table 2b – Impervious Area Tabulation
Middle Section

Impervious Area Description	Length (FT)	Width (FT)	Area (SF)	Quantity	Total Area (SF)	Comments
Invert/Equipment Pads (Concrete)	22.60	15.25	344.65	13	4,480.45	Inverter Pad Site
Racking Posts	-	-	0.03080	10,099	311.05	Array Piers & Motor Piers (W6x15 Max Size)
Array Field Access Ways – Grass Aisles	-	-	-	-	-	Grass Only, No Improvements
Proposed Entrance Improvements	-	-	-	2	2,400	Conceptual / Approximate
On-Site Substation Equipment Pad/Area (Private)	100	100	10,000	1	10,000	Equipment Pads
Total Impervious Area					17,191.50	SF
					0.395	Acres

Table 2c – Impervious Area Tabulation
Lower Section

Impervious Area Description	Length (FT)	Width (FT)	Area (SF)	Quantity	Total Area (SF)	Comments
Invert/Equipment Pads (Concrete)	22.60	15.25	344.65	49	16,887.85	Inverter Pad Site
Racking Posts	-	-	0.03080	41,814	1,287.87	Array Piers & Motor Piers (W6x15 Max Size)
Array Field Access Ways – Grass Aisles	-	-	-	-	-	Grass Only, No Improvements
Proposed Entrance Improvements	-	-	-	4	4,800	Conceptual / Approximate
On-Site Substation Equipment Pad/Area (Private)	100	100	10,000	1	10,000	Equipment Pads
Total Impervious Area					32,975.72	SF
					0.757	Acres

The only grading/earth moving expected will be associated with the improved entrances as shown in *Figure 3*. Also, there may be minor grading in areas of the inverter pads and switchgear. All of the internal aisle ways will be unpaved grass roads. The proposed ESD practice (non-rooftop disconnection), screening, and other vegetative cover are expected to more than offset these minor increases to impervious areas. Any improvement to the site entrances from the access roads will be constructed with impervious material in order to stabilize this area for construction traffic to the site and will be included in the impervious calculation for the SWM report.

It is also important to note that as part of construction there will be little disturbance to the Site since the construction method includes installation of the solar modules on a pile system with minimal contact to the ground.

Because of the onsite soil characteristics and lack of steep slopes, the Site qualifies for non-rooftop disconnection credits consistent with MDE's SWM Guidelines for Solar Projects. The entire Site will be planted and maintained in low cover grass vegetation in accordance with site plans approved by the Caroline County Soil Conservation District Office and included as part of the CPCN submittal process. (The landscape buffer plans prepared by a licensed landscape architect will be submitted to the County for review and approval.) In addition to the mixture of grass seed, and pursuant to recommendations from the PPRP, the Applicant is also proposing to incorporate wild flower seed mixes with the selected grasses in order to promote the health of honey bees and other pollinators. The purpose of this project design feature would be to improve the quality and quantity of overall acreage for pollinators. Solar energy generation facilities are ideal opportunities to increase healthy habitats for pollinators.

iii. Stream Buffers and Floodplains

The Properties in the Upper, Middle, and Lower Sections of the Project are all located within three (3) FEMA FIRMs. *Table 3* below identifies the Properties, Latitude, Longitude, and applicable FEMA information.

Table 3 – FEMA FIRM Information

Property	FEMA FIRM Number	Panel	Map Date	Property Impacts	Latitude	Longitude
1	24011C0095D	95 of 375	January 16, 2015	None	39°02'29.0"N	75°45'34.2"W
2	24011C0095D	95 of 375	January 16, 2015	None	39°02'26.2"N	75°45'08.7"W
3	24011C0095D	95 of 375	January 16, 2015	Special Flood Hazard	39°02'16.5"N	75°45'20.3"W
4	24011C0095D	95 of 375	January 16, 2015	Special Flood Hazard	39°02'16.8"N	75°45'51.1"W
5	24011C0095D	95 of 375	January 16, 2015	None	39°02'06.3"N	75°46'16.4"W
6	24011C0095D	95 of 375	January 16, 2015	Special Flood Hazard	39°02'14.5"N	75°46'24.1"W
17	24011C0095D	95 of 375	January 16, 2015	Special Flood Hazard	39°02'06.7"N	75°46'21.2"W
18	24011C0095D	95 of 375	January 16, 2015	None	39°02'11.5"N	75°46'20.8"W
7	24011C0095D	95 of 375	January 16, 2015	None	39°02'10.0"N	75°48'22.0"W
8	24011C0095D	95 of 375	January 16, 2015	None	39°01'52.9"N	75°48'36.1"W
9	24011C0095D	95 of 375	January 16, 2015	Special Flood Hazard	39°01'43.3"N	75°48'04.4"W
10	24011C0095D 24011C0094D	95 of 375 94 of 375	January 16, 2015	Minor Impacts	9°01'09.8"N	75°46'58.1"W
11	24011C0095D 24011C0094D	95 of 375 94 of 375	January 16, 2015	None	39°00'52.9"N	75°47'00.1"W
12	24011C0095D	95 of 375	January 16, 2015	None	39°00'37.1"N	75°47'10.1"W
13	24011C0095D	95 of 375	January 16, 2015	None	39°00'24.8"N	75°47'33.2"W
14	24011C0156D	156 of 375	January 16, 2015	Minor Impacts	38°59'59.8"N	75°47'53.8"W
15	24011C0156D	156 of 375	January 16, 2015	None	38°59'15.1"N	75°47'01.2"W
16	24011C0156D	156 of 375	January 16, 2015	None	38°59'14.3"N	75°48'34.1"W

Of the three (3) FEMA FIRMs and various panels for the individual Properties (see *Appendix 8*) very few reflect impacts to the Properties. Adjusting the base plans to incorporate appropriate setbacks, buffers, steep grades, and wooded areas that are not to be cut resulted in no flood plains within the proposed LOC's.

The Upper Choptank is located entirely in the Mid-Atlantic coast of Maryland's Eastern Shore. The watershed is predominantly rural and agricultural with significant forest, small towns and pockets of suburban development. Open waters of the Upper Choptank mainstem exhibit limited tidal influence.

They receive fresh water input from numerous sluggish tributaries including many that are ditched and most likely many of these properties are typical of the inputs to the Choptank. There are many water restoration programs and ongoing initiatives to improve water quality by minimizing new rural housing and additional farm ditches from entering the tributaries causing further water quality impairments. Programs to stabilize as many as sixteen (16) properties in this watershed can have a positive impact and minimize runoff, drainage ditch impacts to waters subject to flooding, and other nutrient impacts that are associated with farming operations

As mentioned above, the Site is outside the Critical Area (see *Appendix 9*) and contains soils which include poor, moderate, and well-draining. These types of soils/grades qualify for non-rooftop disconnection credits.

MDE's Mr. Alan Kampmeyer of the Nontidal Wetlands Program, Ms. Anna Allie of ECS Mid-Atlantic, representatives of H&B Solutions, and a consultant from Versar, Inc. conducted a joint site visit on December 7, 2017 to confirm the details of ECS's *ECS Mid-Atlantic Wetland Field Assessment Report*. An additional field visit was held with representatives from MDE (Mr. Alan Kampmeyer and Mr. Ace Adkins), ECS, and Versar to further evaluate a few areas with differing characteristics to confirm locations of wetlands in these areas. ECS's report of findings is included as *Appendix 10*. MDE's response to ECS's finding is included as *Appendix 11*. To summarize, wetlands on the site have been identified, the constraints map has avoided these areas for solar design, and appropriate setbacks and buffers have been located. Typically, any required approvals from MDE for minor disturbances, if needed, are obtained through the Notice of Intent (NOI) process. However, due to the project size, and the total number of minor crossings needed to accommodate the emergency vehicle access, MDE has advised a Wetlands Permit will be needed including public notice.

H&B, ECS, and Mr. Alan Kampmeyer conducted a subsequent site visit on May 23, 2018 to review Property 17 and Property 18 to confirm ECS's field assessment. ECS's Report of Findings is included as *Appendix 10-A* and MDE's response to ECS's findings is included as *Appendix 11-B*. The use of these two (2) new properties for the Project will add flexibility in the solar array design layout. The identified environmental constraints have been incorporated into the civil base plan with appropriate buffers and setbacks to demonstrate avoidance.

b. Impacts to Stormwater During Construction

COMAR 26.17.02.01-1B(1) requires that stormwater quality and quantity controls be implemented for the Project. Guidelines for Water Quality and Quantity through ESD techniques and Best Management Practices (BMPs) are included in the 2000 Maryland Stormwater Design Manual, Volumes I and II (2000) with Supplement No. 1. The specific ESD practice to be employed on the Site, as referenced above, will be the use of non-rooftop disconnection credits. This practice was selected due to application of the MDE ESD Guidelines which do not require stormwater structures for properties with less than ten percent (10%) slopes and using designs where the disconnection length is the same as the distance between rows and is greater than the width between rows. The only structures required will be level spreaders for any sloped areas within the LOC that exceed five percent (5%).

c. Impacts to Stormwater During Operations

COMAR 26.17.02.01-1B(1) requires that stormwater quality and quantity controls be implemented for the Project. Guidelines for Water Quality and Quantity through ESD techniques and BMPs are included in

the 2000 Maryland Stormwater Design Manual, Volumes I and II (2000) with Supplement No. 1. The specific ESD techniques to be employed on the Site as referenced above in more detail will consist of non-rooftop disconnection credits and level spreaders.

For the ESD Storm Event, the Site will mimic a forested site in good conditions under the post-development scenario. This will improve the water quality leaving the Site versus the current crop and agricultural production being conducted. The installation of the solar array will incorporate the use of piles with platforms erected above the ground surface, thereby minimizing any need to treat or capture stormwater that is resulting from the construction operations. As a result of the proposed design and elevated panel system, vegetation will grow under the solar modules and essentially the entire field will continue to be pervious vegetative cover. Consistent with the approved SCD Sediment and Erosion Control for the project, grasses that grow to a minimum height and can be easily maintained will be selected.

2. Noise and Vibration

a. Impacts of Noise During Construction

Maryland noise pollution standards as referenced in COMAR 26.02.03 provide certain exceptions for noise sources and noise generating activities. During construction of this facility, all noise shall be maintained below the average daily ninety decibel (90 dB) rating at the property lines. *Table 4* lists the maximum allowable noise levels specified in the State regulations.

Table 4: Maximum Allowable Noise

Zoning Designation			
	Industrial	*Commercial*	*Residential*
Day	75	67	65
Night	75	62	55

Source: COMAR 26.02.03
Note: Day refers to the hours between 7 AM and 10 PM.
Night refers to the hours between 10 PM and 7 AM.

b. Impacts of Noise During Operation

The Project, once constructed, will have no exposed moving parts, except for the slowly rotating tracker mechanisms. The only noise generated from the electrical equipment at the facility will be from the enclosed transformers and inverters. As utility scale solar generating power facilities become more common, more studies have been done demonstrating the low impact of noise during operation. Typical transformers used for a solar facility have a 50dB rating at one hundred feet (100’). The Project anticipates a low-level of noise interior to the perimeter fence. Noise dissipates at 6dB for every one hundred feet (100’) of added distance from the source. Consistent with the Solar Ordinance, the closest distance between any residential dwelling and an inverter pad will be approximately two hundred feet (200’). The dB levels at this distance will be well below the sixty-five/fifty-five (65/55) dB levels identified above.

3. Lighting

Although there are minimal lighting needs for the Project, the Applicant will comply with local lighting requirements per the Solar Ordinance.

4. Glare Analysis

The Applicant utilized the ForgeSolar PV Planning and Glare Analysis tool to conduct a desktop analysis of the proposed solar generation facility. Based on the results included in *Appendix 12* there will be no glare effects to any nearby airports. The closest airports to the sites are Spiering Airport, Ridgely Airpark, Marble Head Farm Airport, Carmean Airport, and Gary Field Airport.

Additionally, the Applicant has completed the Federal Aviation Administration (FAA) notice criteria tool, which indicated an application should filed. The Applicant has submitted this application and is awaiting confirmation from FAA that there are no glare impacts. Once the expected confirmation is received, the Applicant will provide it to PSC/PPRP as a supplemental filing.

Among other design considerations, the licensed landscape architect will prepare the landscape buffer plans with sufficient detail to identify the planting areas with appropriate dimensions and details. This plan will be reviewed with Caroline County as part of the local review process. The Applicant will also provide this plan to PPRP and the PSC via a supplemental filing. This plan will fully address the results of the glare analysis as part of the design to ensure vehicular traffic and neighboring properties are not impacted by glare.

5. Fencing and Buffering

The solar modules will be enclosed and protected using a six foot (6') high chain link fence with an access gate on the proposed entrances. A buffer/landscape plan will be provided as appropriate and depicted on the site plan submitted as part of this Application. As referenced above, the buffer/landscape plan will be included along with other site stabilization and landscaping required for the Project. This plan will be reviewed/approved by the Caroline County Department of Planning and Codes, Caroline County Department of Public Works, and the Soil Conservation District Office.

As mentioned above, it is anticipated that the Project will have four (4) voluntary standard screening options with slight variations as noted below. The size of the buffers for three (3) of the options will be twenty feet (20') and be comprised of different mixes and densities of trees, shrubs, pollinators, and other planting materials. The fourth option will include a robust fifty foot (50') wide landscape buffer. This voluntary more robust fifty foot (50') landscape buffer is proposed in addition to the two hundred foot (200') setback where the Project abuts residences. The four (4) levels of buffering/screening are currently proposed as follows, will be consistent with the Caroline County Solar Ordinance, and will be presented to Caroline County as part of the site plan review process.

The proposed landscape buffer plan adds approximately twenty-nine (29.92) acres of trees, shrubs, and pollinator habitat on land that is currently utilized for crop farming. The Lower Section includes fifteen (15.1) acres, the Middle Section includes five (5.11) acres, and the Upper Section includes nine (9.71) acres.

1. Option 1 “Full Screening” – Standard twenty-foot (20') buffer which includes two (2) rows of trees varied in height between five feet (5’) to seven feet (7’) comprised of evergreens and deciduous trees, shrubs, pollinators, and ornamental grasses.
2. Option 2 “Moderate Screening” – Modified twenty-foot (20') buffer somewhat less robust than Option 1 to include more shrubs, pollinators, and ornamental grasses with fewer trees.
3. Option 3 “Intensive Screening” – Twenty-foot (20') buffer with a mixture of ornamental grasses and pollinators.
4. Option 4 “Full Pollinator Habitat” – Fifty-foot (50') buffer with more intensive buffer plantings. This Option would be limited to very few highly impacted residential neighbors to be defined during the local site plan process.

In determining which landscape buffer plan will be recommended in each of the areas to be screened, consideration will be given to proximity of the Project to roads and residences, visibility, glare analysis, natural wooded areas, historic property locations, and other factors defined by Caroline County during the local site plan review process. The Applicant will also provide this plan to PPRP and the PSC via a supplemental filing.

6. Vegetative Stabilization

The Project will employ turf style grasses that are conducive to growing in partial shade, so that vegetation can be maintained beneath and around the arrays, will be indigenous to the area and those typically recommended for use by Caroline County Soil Conservation District Office. This will also include a type and seed mix that provides low growth and low maintenance.

As noted above, the Applicant is also proposing to plant wild flowers that will promote the health of honey bees and other pollinators. Solar energy generation facilities present excellent opportunities to increase healthy habitats for pollinators. Appropriate planting plans and plant maintenance plans will be submitted to local jurisdictions for review and approval.

7. Transportation

a. Transportation During Construction

Major material and equipment will be delivered by tractor-trailers and offloaded by construction vehicles (lulls, tracked vehicles, and front loading equipment). Appropriately sized laydown areas, as depicted on the site plan, will be utilized for unloading of equipment and materials. Daily construction traffic will include cars, pickup trucks, and other personnel vehicles. Excavation and other equipment will be utilized during construction of the Project, which may include dump trucks, trenching equipment, concrete trucks, front loaders, backhoes, post installation equipment, excavators, and other equipment.

b. Transportation During Operation

There will be limited traffic to and from the solar array during operation. Traffic will mostly be limited to maintenance crews for mowing and vegetation control. Quarterly to yearly maintenance of the solar array components will be necessary, along with site visits for any operational issues that may arise during normal operation.

C. OPERATIONAL FEATURES

The operational features will be controlled through a Project Operations & Maintenance Agreement to track performance and monitor the health and safety of the solar field. Typical duties and features of this plan are:

- Local and remote control over key features of the Solar Fields Electrical System to assure compliance with the Interconnect Agreement and safety of the plant.
- Scheduling, control, and reporting of all onsite maintenance activities.
- Operations Center with remote monitoring of performance data and physical systems 365 days a year.
- Immediate dispatch of fire, police, or contractors in the event of emergency or force outage.

D. SCHEDULE FOR ENGINEERING, CONSTRUCTION, AND OPERATION

Engineering documents are being prepared and programmed for submittal as part of the CPCN joint review process with Caroline County representatives. The engineering and construction documents will include pertinent information regarding the solar modules, inverter pads, construction methods, electrical requirements, ingress and egress, stormwater management, sediment and erosion control, electrical connection to the grid/substation, fencing within the setback, landscaping and screening, and grading. Following CPCN approval, construction is anticipated to be initiated in November, 2019 with completion and operational startup prior to October, 2020.

E. SITE SELECTION AND DESIGN

1. Project Design

See description in Section 5.B.1 above.

The design and associated energy output at the Project Site was modeled using PVSYST v6.53 shown in ***Table 5*** below. PVSYST is a photovoltaic solar project modeling software that is widely used in the solar power industry to stimulate energy output. The energy output simulated by PVSYST is based on the meteorological data at the project site, models of the system equipment such as the inverter and the solar modules, and project design specifications such as the number of solar modules in series (string sizing), system DC size, array type (fixed tilt or tracking), rack orientation, including azimuth and tilt, DC and AC wiring length, transformer losses, etc. PVSYST v6.53 was used to simulate the predicted energy output from the Project at approximately 360,774 MWhrs in the first full year of project operation.

Table 5 – PVSyst Inputs

Location:	Greensboro, MD
Time Zone:	UT-5
Nominal DC Rating (STC):	219,598 kW DC
Nominal AC Rating:	202,000 kW AC
Operating Power (50° C)	182,250 kW AC
Array Tilt:	Single-axis tracking
Array Azimuth:	0°
Inverters:	81 SMA Sunny Central 2500-US
Modules:	499,086 x 440W First Solar Series 6
Stringing:	6 modules in series

2. Solar Resource Data

A key input in simulating the power output from the project is the local solar resource data or insolation. Solar resource data is typically obtained from third party resources that provide long-term average meteorological data.

The weather file used in the production analysis was from Solar Anywhere, version 3.2. This is a tool created by Clean Power Research to provide information for solar projects within the continental United States. The data is satellite based and includes the following variables: Global Horizontal Irradiance (GHI), Direct Normal Irradiance (DNI), Diffuse Irradiance, Ambient Temperature, and Wind Speed.

The Solar Anywhere data was chosen over other common resources, such as NREL's TMY3 Class I sites, because there are no class I data sets located near the site. The site is on a peninsula of Maryland while the closest TMY3 class I sites are across the Chesapeake Bay on the mainland. Washington DC would be the closest one (over 100 miles away), followed by Baltimore (nearly 120 miles away). Proximity to large bodies of water can have noticeable effects on weather data sets. There are two NREL TMY3 Class II data sets from locations on the same peninsula, however Class II data sets are considered less accurate. Since Solar Anywhere is satellite based, it is not restricted to information from a limited number of ground measurement equipment locations.

3. Modeling

PVSYST v6.53 uses a manufacturer-provided, independently certified model for the panel, inverter, and other components to simulate the output of the plant given racking orientation, row spacing, and other design variables. This output simulation degrades over the lifetime of the plant due to degradation in panel performance. The main design variables and related settings are described in ***Table 6*** and ***Table 7***.

Table 6 - PVSyst Modeling Assumptions

Meteo Data:	Solar Anywhere v3.2 39.05N, 75.75W
Albedo:	0.20
Thermal Loss Factor:	30.7 / 0 (per First Solar)
Wiring Ohmic Loss (DC):	1.5%
Array Soiling Loss:	Varies by month, 2.1% annual avg.
Module Quality Loss:	Gain of 1.1% (FS spectral shift calc.)
Module Mismatch Loss:	1.5% (includes 0.5% for tree shade)
Light Induced Degradation:	NA for First Solar modules
Incidence effect, ASHRAE parameterization (bo parameter)	Table of values per First Solar, see below
AC loss, wires:	1.0%
External transformer iron loss:	0.2%
Resistive/Inductive losses	1.8%
Collector Width:	2.005 meters
Collector Pitch:	5.01 meters

Table 7 – Incidence Effect Profile

0°	30°	50°	60°	65°	70°	75°	80°	90°
1.00	1.00	0.99	0.96	0.94	0.89	0.82	0.69	0.00

a. Soiling and Albedo Losses

Dust, snow, and other particles that settle on the array can attenuate the radiation that arrives at the panel and are referred to as soiling. To account for both occasional winter snow and rainfall frequency, we modeled monthly soiling values that have an annual impact of approximately two percent (2.1%) loss. With First Solar modules there is an additional monthly spectral shift calculation, that results in further modifications to the monthly soiling values and the module quality input. In the event that the plant does not receive rainfall over an extended period, the solar modules may be washed to ensure that soiling is not exacerbated.

The albedo is the fraction of sunlight that is reflected from the ground and other surfaces surrounding the PV array. Albedo contributes slightly to the diffuse irradiance incident. The energy model for the Project uses twenty percent (20%) as the albedo model parameter, which is a typical value suitable for most situations.

b. Shading

If any structure blocks the sunlight falling on the solar modules in the array, output from the shaded panel can be significantly attenuated due to the electrical characteristics and design of the solar modules. Blockage may arise from objects such as hills or undulating terrain in the distance, transmission structures, trees, and buildings. The array can also create mutual shading between the rows of solar modules, particularly when the sun is low in the sky, i.e., in the morning or evening.

Given site constraints, array design can minimize the impact of mutual shading. However, location-specific factors will result in near and horizon shading from other objects. PVSYST includes built-in, sophisticated modeling of mutual shading between rows given the size of the solar modules and spacing between rows. For locations in which near and horizon shading are unavoidable, the impact of this shading should be accounted for, but in the case of this Project located on the Eastern Shore of Maryland, this is assumed to be minimal. The model accounts for row-to-row shade between the trackers early and late in the day, and includes a minimal assumption of one half percent (0.5%) tree shade loss within the mismatch loss input.

4. Production Estimate Results

PVSyst Energy production results with estimated solar irradiation are included in *Tables 8a* and *8b* below. *Table 8a* summarizes total plant production for Year 1. *Table 8b* summarizes the detailed production statistics for the first year of operations.

Table 8a – Total Plant Production Estimate Results in Year 1

Parameter	Preliminary Estimate
Annual Generation	360,774 MWh
DC Capacity Factor	18.8%
AC Capacity Factor	20.4%

Table 8b- PVSyst Modeling Monthly Energy for a Full System in Year 1

202 MWac Tracker Thin Film 39GCR 109 ILR 1-12-18 DLG

Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR
January	66.3	28.25	0.60	97.6	80.1	17580	16651	0.777
February	84.6	42.42	-1.25	117.8	98.2	21834	20807	0.805
March	129.3	54.38	5.59	174.1	155.1	33496	31925	0.835
April	152.5	62.12	11.97	197.7	180.5	37801	35989	0.829
May	178.0	73.11	18.16	225.8	210.4	43337	41296	0.833
June	183.6	81.72	22.64	228.4	216.0	43986	41991	0.837
July	190.6	81.50	23.68	239.5	226.0	46071	44003	0.837
August	168.7	67.68	24.93	217.6	203.2	41204	39338	0.823
September	133.0	58.36	20.29	178.2	163.1	33724	32203	0.823
October	101.5	39.59	13.73	140.9	125.8	26511	25239	0.816
November	71.0	32.14	5.83	100.2	85.5	18518	17583	0.799
December	58.0	26.43	5.81	80.9	67.7	14573	13749	0.774
Year	1517.1	647.70	12.75	1998.6	1811.5	378633	360774	0.822

Legends:
GlobHor Horizontal global irradiation
DiffHor Horizontal diffuse irradiation
T Amb Ambient Temperature
GlobInc Global incident in coll. plane
GlobEff Effective Global, corr. for IAM and shadings
EArray Effective energy at the output of the array
E_Grid Energy injected into grid
PR Performance Ratio

F. IMPACTS ON THE ECONOMICS OF THE STATE

Based on 2012 reports, Maryland continues to import approximately forty-one percent (41%) of its generation power. This Project will provide some measurable offset to these generation import numbers.

Significant economic benefits will result from the Project, including a capital investment of up to $200M and approximately two-hundred fifty to three-hundred fifty (250-350) design, management, and construction personnel working remotely or on the Site at the height of construction during the period from November, 2019 to August, 2020.

The Applicant utilized the services of Beacon (Business Economic and Community Outreach Network at Salisbury University) to prepare a preliminary economic impact estimate for the Cherrywood Solar Project. As part of the assessment the preliminary impact estimates were developed using Social Accounting Matrix multipliers calculated by the Minnesota IMPLAN Group. Some highlights of the results and findings are listed below. The complete Beacon report can be found in ***Appendix 13***.

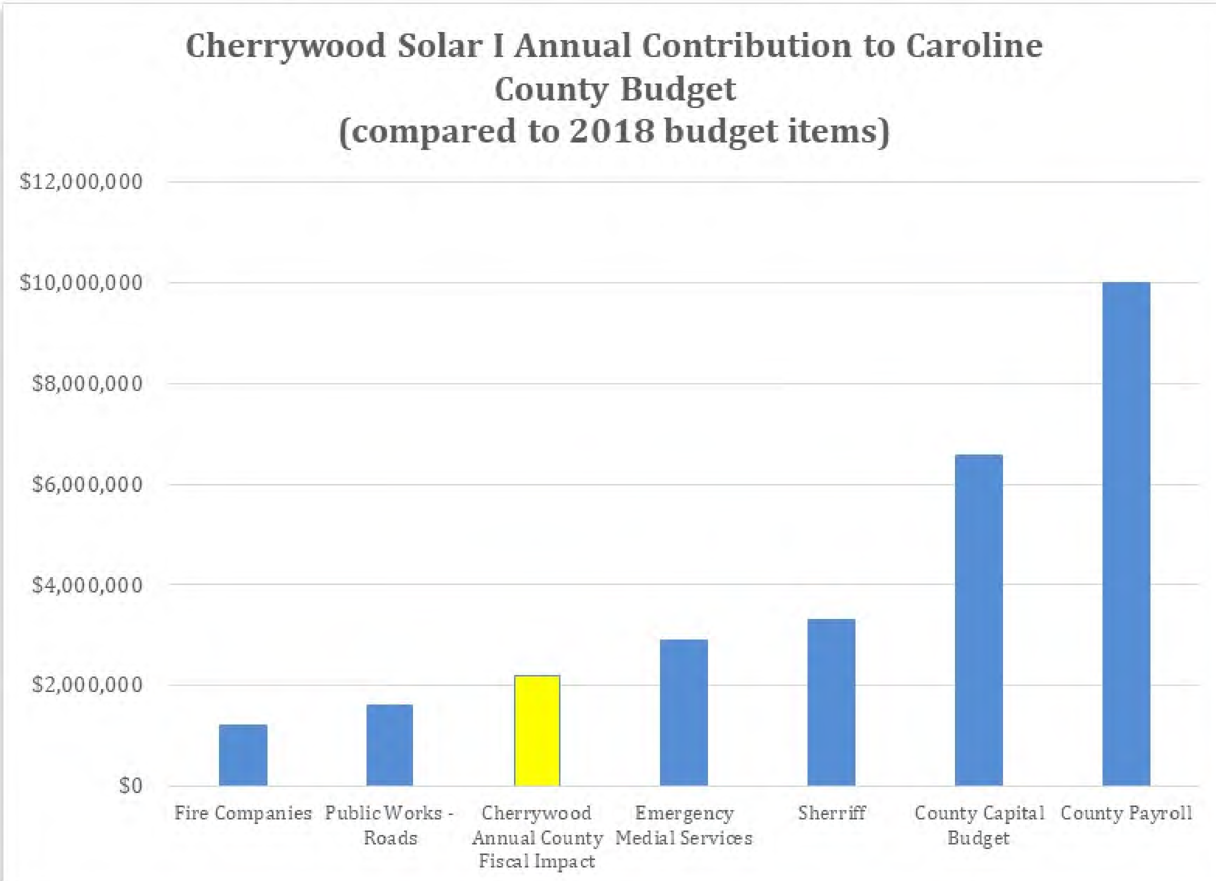
- Through construction (2019-2020) annual jobs supported will include 505 direct, 50 indirect, and 73 induced for a total of 628.
- Operation and Maintenance jobs supported during the estimated 35 years of operation would be 49.5 per year.
- The annual personal property taxes would be $2,626,000.
- The capital expenditures per MW would be $1,300,000.

Additionally, in April of 2018 the Applicant received an in-depth economic impact report from the Jacob France Institute at the University of Baltimore which examined the economic impact of a 150 MW version of the Project on 1000 acres, including a comparison of the economic impact of the project net of the current economic impact of current activities on the same parcels. The complete University of Baltimore study can be found in ***Appendix 16***. Key findings included:

- Total Maryland economic impact from construction of $104.6 million
- Annual Maryland economic impact from operations of $21.1 million per year of operations
- Caroline County fiscal benefit of $2.2 million per year of operations

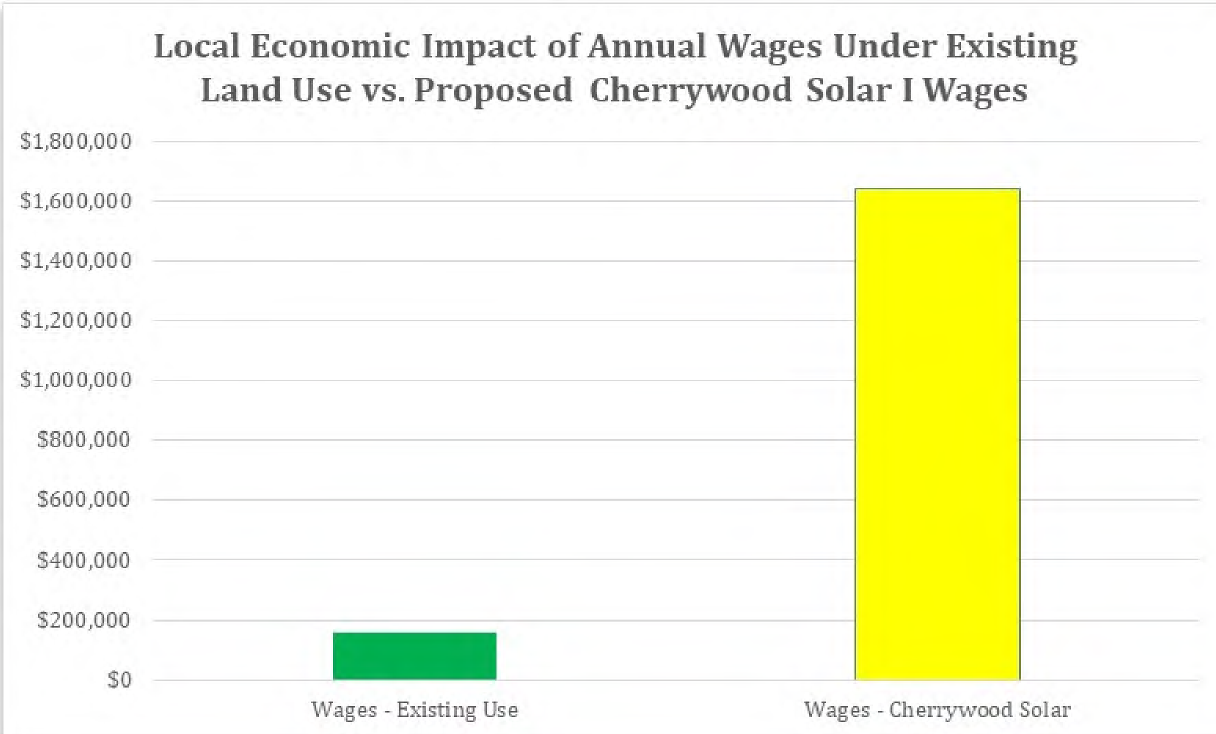
Figure 6 includes the projected annual Caroline County fiscal benefit of $2.2 million per year in the context of other major Caroline County budget expenditures in the FY 2018 county budget.

Figure 6 – Annual Contribution to Caroline County Budget



The University of Baltimore report also isolated the economic impact of local wages that would be paid by the proposed Project relative to the economic impact of wages paid on the existing use of the same 1,000 acres, as depicted in *Figure 7*.

Figure 7 – Local Economic Impact of Annual Wages Under Existing Land Use vs Proposed Cherrywood Solar I Wages



By connecting with the electric distribution system serving Maryland, the Project will contribute towards compliance with the Renewable Portfolio Standard, which mandates that all suppliers that sell electricity at retail in Maryland accumulate solar renewable energy credits in an incrementally increasing percentage.

The Project will not detract from the value or diminish the characteristics of adjacent properties. PPRP has stated in its environmental review for similar projects that vegetative screening mitigates the impact of solar PV projects on neighboring property values. For instance, PPRP's environmental review in Case No. 9451 states that:

> "Limited evidence from real estate appraisal methods has not revealed any influence on property values from solar farm development. Expert opinion from a past siting case in Massachusetts, for example, concluded that utility scale photovoltaic energy systems that are not visible from surrounding properties would have no impact on their market values (Franklin County 2014). A paired comparison of market values of residential and agricultural properties near solar farms in North Carolina came to a similar conclusion (Kirkland Appraisals 2014)."

PPRP Assessment of the Proposed Chesapeake Solar Project, Case No. 9451, 32-33 (October 20, 2017).

The Project will feature various levels of vegetative screening and it will produce no noise or vibration perceptible on neighboring properties. As a result, the Project will not have an impact on neighboring property values.

G. IMPACT ON THE STABILITY AND RELIABILITY OF THE ELECTRIC SYSTEM

In 2016 the Applicant initiated a process to be interconnected to the electric transmission system serving Maryland by filing an Interconnection Request with PJM in conjunction with DPL. The results of the Generation Interconnection Feasibility Report and System Impact Study show no potential adverse impact to the stability or reliability of the electrical system due to the addition of the Project to the grid.

H. LOCATION AND MAJOR DESIGN FEATURES OF ELECTRIC SYSTEM UPGRADE

Cherrywood Solar I, LLC has completed the PJM Generation Interconnection Feasibility Study and System Impact Study Reports, see *Appendix 4*. The Project will include a new three breaker 230 kV ring bus substation to be constructed adjacent to the Keeney-Steele 230 kV circuit. Two of the positions on the ring bus will be transmission line terminals for the tie-in of Line 23009 to the substation. The other position will be a terminal configured for the interconnection of a generator. The project has been assigned Queue Position AB2-037.

The new substation will be built on Property 12 in such a manner so as to minimize any viewshed concern and so as to minimize noise impacts to neighboring properties.

Based on the findings from the Generation Interconnection Feasibility Study and System Impact Study Reports, the estimated cost to build the substation is $6,491,000 with an estimated construction time of twenty-four (24) months. The substation will be located near the transmission line on Parcel 0011-0020-0051.

I. IMPLEMENTATION SCHEDULE FOR THE PROJECT

The Project schedule includes the following approximate milestones:

- Engineering and Permitting: September, 2017 through September, 2018
- State of Construction: November, 2019
- Start of Commercial Operation: October, 2020

SECTION 6 – COMAR 20.79.03.02 ENVIRONMENTAL INFORMATION

A. GENERAL INFORMATION

1. General Description of the Site and Adjacent Areas

The Caroline County, Maryland Solar Project (the "Project") is located on a plain of properties that run from southwest to northeast between the Towns of Greensboro and Goldsboro just west of the Choptank River. The Project will consist of eighteen (18) parcels, some of which are contiguous, and approximately four (4) other additional parcels will be used for easements to accommodate the various connector lines. The Project will be approximately two hundred megawatts (200.00 MW) single axis tracking alternating current (AC) solar polycrystalline photovoltaic (PV) project proposed by Cherrywood Solar I, LLC. It is anticipated that the Project will include a development envelope of approximately one thousand seventy-three (1,073.69) acres once buffers and setbacks have been established in addition to avoidance from environmental constraints. As shown in ***Figure 3***, the proposed Project for purposes of this Report includes three (3) sections.

The Upper Section consists of Tax Map 0011, Grid 0004, Parcel 0052 ("Property 1"), Tax Map 0011, Grid 0005, Parcel 0158 ("Property 2"), Tax Map 0011, Grid 0004, Parcel 0053 ("Property 3"), Tax Map 0011, Grid 0009, Parcel 0056 ("Property 4"), Tax Map 0011, Grid 0009, Parcel 0058 ("Property 5"), Tax Map 0011, Grid 0003, Parcel 0005 ("Property 6"), Tax Map 0011, Grid 0009, Parcel 135 ("Property 17"), and Tax Map 0011, Grid 0009, Parcel 163 ("Property 18") and is comprised of approximately five hundred fifteen (515.98) acres of which the LOC includes approximately two hundred ninety-five (295.75) acres.

The Middle Section consists of Tax Map 0010, Grid 0011, Parcel 0034 ("Property 7"), Tax Map 0011, Grid 0017, Parcel 0025 ("Property 8"), and Tax Map 0010, Grid 0018, Parcel 0011 ("Property 9") and is comprised of approximately two hundred sixty-eight (268.47) acres of which the LOC includes approximately one hundred forty-nine (149.44) acres.

The Lower Section consists of Tax Map 0011, Grid 0020, Parcel 0007 ("Property 10"), Tax Map 0011, Grid 0020, Parcel 0051 ("Property 11"), Tax Map 0015, Grid 0001, Parcel 0066 ("Property 12"), Tax Map 0015, Grid 0007, Parcel 0067 ("Property 13"), Tax Map 0014, Grid 0012, Parcel 0008 ("Property 14"), Tax Map 0014, Grid 0024, Parcel 0016 ("Property 15"), and Tax Map 0014, Grid 0023, Parcel 0038 ("Property 16") and is comprised of approximately nine hundred thirty-eight (938.41) acres of which the LOC includes approximately six hundred twenty-eight (628.50) acres.

The total acreage of the parcels evaluated consists of approximately one thousand seven hundred twenty-two (1,722.86) acres. However, as noted above, not all will be used for the Project and appropriate areas have been excluded based on environmental constraints mapping. The total LOC for this Project is approximately one thousand seventy-three (1,073.69) acres. The site characteristics relative to soils, wetlands, forest conservation, etc. have been tabulated in an excel spreadsheet and included in ***Appendix 1***.

The Properties are all actively farmed with typical crops including soy bean, corn, wheat, etc. The sites are relatively flat with very little grade (the few excessive slopes have been eliminated) and more than fifty percent (50%) of the soils are moderate to well-draining. Once the final crop harvests have been completed, it will be relatively easy for the appropriate stabilization to take place prior to construction.

There are no wetland impacts associated with the proposed project layout/design. MDE has confirmed that the solar array does not impact any jurisdictional waters. No forest cutting or clearing will occur. There are no FEMA flood plains located at the Site and the Project is outside the Critical Area. There are no other environmental issues associated with the Site or project development.

Site information contained in this report has been discussed and reviewed with various regulatory agencies including the Maryland Department of the Environment, Maryland Department of Natural Resources, Maryland Historic Trust, Caroline County Department of Planning and Codes, Caroline County Soil Conservation District Office, and representatives from the Critical Areas Commission. This review process confirmed the information that was found online and reflected on various resource maps.

As discussed elsewhere in this Report, the Properties have historically been used for agricultural purposes. The farms are primarily comprised of agricultural fields used to grow conventional crops. Because some of the farms are prior converted wetlands, there are a few farm ditches that will be avoided as part of the design. ECS performed the wetlands field assessment (*Appendix 10* and *Appendix 10-A*) and MDE confirmed the findings (*Appendix 11* and *Appendix 11-A*). Because of the continuous disturbance of the Site associated with farming operations, all of the habitat is outside the LOC in the wooded areas on the fringe of the property and will not be disturbed. In summary, the Properties are not located within a Chesapeake Bay Critical Area, or within any stream buffer, special planning area, protected watershed, reservoir, or other impoundment drainage area.

In developing the solar array layout, the technical team met with the SCD and property owners to identify existing subsurface drainage systems and any associated PDA's. This information will define where access and future maintenance agreements will be on these various parcels. Field verifications using aerial imagery and geo-probes will be performed to confirm these locations. These field verifications will include GPS identification of all previously mapped blue line streams that may have been buried in the past as well as all drainage locations that have been identified in the field or in notes from SCD, the farmer, and the landowner. Additionally, on parcels with particular drainage concerns, the Applicant will be employing a method that combines aerial and color-infrared orthophotography taken within 2-3 days of a heavy rain event that allows for manual photo-interpretation of the location of buried drainage features, which will then be field-verified as described above. All final project design and construction documents will include an overlay of GPS-located drainage features and will incorporate plans to either avoid, replace, or repair buried drainage in order to preserve or improve upon the existing drainage of the fields. SCD will be consulted throughout the field-verification process and the findings of the field verification efforts as well as final design and construction plans as they pertain to drainage features will be shared with SCD to garner input prior to construction.

a. Geology/Soils.

As noted above, according to the Critical Area Commission, the Sites are outside the Critical Area and contains soils with widely varying characteristics including poor, moderate, and well-draining.

Soils typically found in the Upper Choptank River watershed include Sassafras, Fallsington, Galestown, Matapeake, Westbrook, and Othello series. The Sassafras series consist of very deep, well drained soils on sandy marine and old alluvial sediments. The Fallsington series consist of very deep poorly drained soils on coastal plain flatlands. Saturated hydraulic conductivity is high in the subsoil and high to very high in the substratum. The Galestown series consist of very deep, somewhat excessively drained soils formed in sandy marine sediments and glacial outwash on glacial terminal moraine. The Matapeake

series consist of very deep, well drained soils in silty eolian sediments underlain by coarser fluvial or marine sediments. The Westbrook series consist of very deep, very poorly drained soils formed in organic deposits over loamy mineral material. The Othello series consist of very deep, poorly drained soils with saturated hydraulic conductivity being moderately high.

The full soils report and prime farmland classification can be found in ***Appendix 2***. As confirmed in the geotechnical report (***Appendix 7***), these soils are suitable to support solar modules, inverters, switch gear, grass covered aisle ways, access roads, and associated drainage and stormwater management features. For the sixteen (16) properties associated with the proposed utility scale solar project, the following soil characterizations are provided.

Upper Section:

- Property 1 – the slopes range between zero percent (0%) and five percent (5%) with the three most prominent soil classifications being Ingleside Sandy Loam, Hambrook Sandy Loam, and Lenni Loam. This is one of the better soil groupings for all of the sixteen (16) properties. These soils are moderately to well-draining.
- Property 2 – the slopes for most of the property range between two percent (2%) to five percent (5%). Less than two (2) acres are on steeper grades and will be avoided. These slopes range from ten percent (10%) to thirty percent (30%). The primary soils for the useable portion of the property are Evesboro Sand and Hambrook Sandy Loam. Both are well-draining.
- Property 3 – the majority of the slopes range between zero percent (0%) and five percent (5%) with eleven (11.4) acres falling in the five percent (5%) to ten percent (10%) range. The prominent soil series are Ingleside Sandy Loam, Hambrook Sandy Loam, and Rosedale Sandy Loam. These soils are moderately to well-draining.
- Property 4 – the majority of the slopes range between zero percent (0%) and five percent (5%) with approximately six (6.0) acres out of approximately one hundred twenty-six (126) acres falling in the five percent (5%) to ten percent (10%) range. The prominent soil series are Ingleside Sandy Loam and Hambrook Sandy Loam. These soils are moderately to well-draining.
- Property 5 – the majority of the slopes range between zero percent (0%) and five percent (5%). The majority of soils on this property are Fallsington Sandy Loams, Hambrook Sandy Loams, and Woodstown Sandy Loams. These soils are moderately to well-draining.
- Property 6 – the majority of the slopes range between zero percent (0%) and five percent (5%). The majority of soils on this property are Ingleside Loamy Sand, Hammonton-Fallsington-Corsica Complex, and Hambrook Sandy Loams. These soils are moderately to well-draining.
- Property 17 – the majority of the slopes range between zero percent (0%) and five percent (5%). The majority of soils on this property are Hambrook Sandy Loams, and Ingleside Sandy Loam,. These soils are all well-draining.
- Property 18– the majority of the slopes range between zero percent (0%) and five percent (5%). The majority of soils on this property are Hambrook Sandy Loams, and Ingleside Sandy Loam. These soils are all well-draining.

As indicated in the Project Overview these eight (8) properties in the Upper Section are by far the best as to soil characteristics. Although one would expect these better draining properties to have fewer drainage ditches/wetlands, several of the properties had more ditches then one might expect for these

better soils. These soils also include Prime Farmland Ratings equally weighted between "All areas are prime farmland" and "Farmland of statewide importance".

Middle Section:

- Property 7 – the slopes are generally quite flat at zero percent (0%) to two percent (2%). The Corsica and Fallsington soil series are deep and very poorly drained. The Woodstone and Hambrook are moderately well draining.
- Property 8 – the slopes are zero percent (0%) to five percent (5%). The primary soils are Fallsington Loam, Woodstown Loam, and Hambrook Loam; each is moderately to poorly draining.
- Property 9 – the slopes are zero percent (0%) to five percent (5%). The primary soils are Fallsington Sandy Loam, Woodstown Sandy Loam, and Hambrook Sandy Loam; each moderately to well-draining. Sands were mixed in with these loamy soils which makes them somewhat better draining than Property 7 and Property 8.

This grouping had poorer draining soils than the Upper Section, which is expected because the sand content is far less and the soils are loamier in these areas. These soils also include Prime Farmland Ratings equally weighted between "All areas are prime farmland" and "Farmland of statewide importance".

Lower Section:

- Property 10 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hambrook Sandy Loam, Ingleside Sandy Loam, and Galestown-Rosedale soils. The Galestown-Rosedale soils will be avoided as they are fifteen percent (15%) to thirty (30%) percent slopes, which are also made up of marine sediments and are excessively well-draining.
- Property 11 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Inglestown Sandy Loam, Hambrook Sandy Loam, and Woodstown Sandy Loam. These are moderate to well-draining soils.
- Property 12 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hambrook Sandy Loam, Fallsington Loam, and Ingleside Sandy Loam. The Fallsington soils are poorly drained. The Hambrook and Ingleside are moderate to well-draining.
- Property 13 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hammonton-Fallsington-Corsica Complex and Hambrook Sandy Loam. The Hammonton-Fallsington-Corsica Complex is moderate to poorly drained. Hambrook Sandy Loam is moderate to well-draining.
- Property 14 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hammonton-Fallsington-Corsica Complex, Ingleside Sandy Loam, and Fallsington Sandy Loam. The drainage characteristics on this site are mixed with half the site being poorly drained and the other half being moderate to well-draining.
- Property 15 – the slopes are zero percent (0%) to five percent (5%). The predominate soils are Hammonton-Fallsington-Corsica Complex and Ingleside Sandy Loam.
- Property 16 – the slopes are two percent (2%) to five percent (5%). The predominate soils are Ingleside Sandy Loam and Hurlock Sandy Loam. Both of these soils are moderate to well-draining.

Similar to the Middle Section, the soils are a mix between moderate to well-draining and poorly draining. The mix between the soil types, however, is more evident with higher acreage on the poorly draining soils. These soils also include Prime Farmland Ratings equally weighted between "All areas are prime farmland" and "Farmland of statewide importance".

In summary, the slopes in all areas are predominately in the zero percent (0%) to five percent (5%) range. There are a few areas with fifteen percent (15%) to thirty percent (30%) slopes which will be avoided. More than fifty percent (50%) of the soils have moderate to well-draining soils. However, there is a large area with poorer draining soils that also has a higher percentage of drainage ditches and wetland areas; some of which will be avoided. The Maryland Department of the Environment (MDE) has guidelines for stormwater management that govern Environmentally Sensitive Design (ESD) for utility scale solar projects. If slopes within the LOC are less than ten percent (10%) non-rooftop disconnection credits are allowed and no stormwater structures are required except for level spreaders on areas with grades between five percent (5%) and ten percent (10%). Generally, areas within the LOC where solar panels will be installed are in areas where grades are ten percent (10%) or less.

b. Land Use and Cover

The Sites primarily consists of agricultural fields and have been farmed for conventional agricultural crops by landowners and leases for several decades. As noted above, there are no internal environmental constraints which cannot be easily avoided through setbacks or buffers. To the extent possible, the primary entrances for the solar generation facility will be from existing improved farm entrance.

There are no other unique land uses or covers which would create any type of conflict or impairment for the proposed Project.

c. Stream Buffers and Floodplains

All of the Properties are in close proximity and drain directly to the Upper Choptank River. The Upper Choptank River watershed is predominantly rural with significant agricultural areas, as well as forest, small towns and pockets of suburban development. Large areas of land, which had poorly drained soils, were able to be developed because lands were drained by PDA ditches. Maintenance of these ditches is central to continuation of much of the current economic activity in the watershed. About fifty-six percent (56%) of the Upper Choptank Watershed in Maryland is prime farmland. According to the Chesapeake Bay Program's Phase 5.2 Model, the land use distribution in the watershed is approximately fifty-three percent (53%) agricultural, thirty-five percent (35%) forest, and twelve percent (12%) urban.

Although the significant ditching of farmed properties increased productivity and contributed significantly to farming viability in this watershed, it also contributed greatly to the degradation of water quality in the Upper Choptank River. Sixty-seven percent (67%) of degraded stream miles in the watershed are artificially straightened or channelized in some way. During channelization, trees in the riparian buffer zone are often cut and woody debris is removed from the stream channel to allow for efficient movement of water away from agricultural fields. As a result, heavily channelized streams are often shallow and offer little habitat diversity. The Delmarva Peninsula contains over eight hundred (808) miles of PDA's or tax ditches that drain over 143,311 acres of land. Caroline County, which is part of the Choptank River watershed, holds the greatest number of tax ditches in the Maryland Eastern Shore. The historical loss of wetlands in the Upper Choptank River watershed is estimated to be 48,169 acres which is a relatively large loss of wetlands compared with other similar Maryland watersheds and contributed to the degrading

of water quality in the Upper Choptank River; and also explains why so many farms in the Project area contain many farm ditches.

As stated above, water quality in the Upper Choptank is poor. Sediment loads from the watershed to the non-tidal waters have increased, but phosphorus levels in nontidal waters have decreased. Still, nitrogen, phosphorus, and sediment levels in the tidal waters of the Upper Choptank are too high. Habitat for underwater grasses are poor because algal densities are too high and water clarity is poor. Only bottom dissolved oxygen levels are good. No underwater grass beds are found in the Upper Choptank and bottom dwelling animal populations are not healthy. The River itself is tidal for much of its length and includes an ecologically delicate estuarine ecosystem.

All waters of the State are assigned a “Designated Use” in regulation, COMAR 26.08.02.08, which is associated with a set of water quality criteria necessary to support that use. These designated uses may or may not be served now but they should be attainable. All surface waters in the Upper Choptank River watershed are designated Use I for Water Contact Recreation, and Protection of Aquatic Life. Waters designated as Use II for Shellfish Harvesting in the Choptank River are located in estuarine waters downstream of the Upper Choptank River watershed.

The history of the area clearly documents the degradation that occurred through drainage ditches, elimination of wetlands, and cutting of trees which created the farmland opportunity but impaired water quality. The Project will have a stabilizing impact on the environment by placing cover/grasses on over one thousand (1,000) acres, eliminating all future land disturbance, planting pollinators and landscape buffers, all which will improve water quality in the Upper Choptank River.

d. Flora Resources

There is no vegetation associated with wetlands in the Critical Area since there are no Critical Areas denoted on the Properties. There is very little vegetative diversity on the various Properties. As has been recorded in the DNR and MDE watershed documents, many of the natural wetlands in the immediate area have been lost over the years due to an abundance of farming practices along the Choptank River and poor draining soils which led to the institution of drainage ditches which essentially drained these previously prominent wetland areas. Currently the majority of wet areas are in wooded/forested locations and not internal to the active farming practices. The vegetation is typical of that found throughout the Delmarva region and is characterized by Evergreens, Red Maple, River Birch, Tulip Poplar, American Beech, American Holly, Sweetgum, etc. The understory is generally moderate and expected to be fair for wildlife habitat, providing some food sources and cover. In general, there is nothing remarkable regarding the flora characteristics of the site.

e. Fauna Resources

The Chesapeake Bay provides food, water, cover, and nesting or nursery areas to more than 3,000 migratory and resident wildlife species. The best known in the Bay is probably the Maryland Blue Crab. Crabs and oysters are indigenous to the area including the Choptank River. However, their numbers are dwindling. From the 1950s to the 1970s, the average annual oyster catch was about 25 million pounds per year. The blue crab harvest contributed to nearly a third of the nation’s catch. Today, the Bay’s oyster population is a mere two percent (2%) of its historic level. Reduced amounts of underwater grass habitat, in addition to low summer levels of dissolved oxygen, continue to keep the crab population well-below the average. This is the same characterization as found in the Choptank River, which has been

documented as a microcosm of the Chesapeake Bay. The most valuable resource in the Choptank River and Upper Choptank River is the striped bass spawning areas and the large number of menhaden that support this fish population.

In the Delmarva Area, and very prominently in the Choptank River, waterfowl and other birds migrate annually and use the watershed for food and shelter in coves and marshes. The Chesapeake's tidal freshwater tributaries provide spawning and nursery sites for several important species of fish, such as white and yellow perch, striped bass, herring, American shad, and hickory shad. Turtles and snakes are the most common reptiles in the watershed. Species include the diamondback terrapin, loggerhead turtles, and many types of snakes. The watershed is habitat to numerous varieties of frogs, including the northern green frog, toads, salamanders, and newts.

It has been widely reported that much of the natural habitat in the watershed, which supported waterfowl, small mammals, reptiles, etc. was greatly diminished when 47,000 acres of wetlands was lost due to the conversion of large properties from their natural conditions to active farm practices. The associated drainage ditches not only dewatered these properties but resulted in higher sediment loads and lower dissolved oxygen levels to the main stem of the Choptank River. As a result, there is very little indigenous wildlife habitat on these active farmlands except for the habitat that remains in fringe areas where wetlands and wooded areas remain.

Environmentally, a strong case can be made that using these active farmlands to utility scale solar generation facilities will improve the local environment and water quality. The solar use would place all active farmland under grass cover, stabilize the area, incorporate pollinators onsite, place these lands under maintenance programs, and essentially eliminate any type of land disturbance.

f. Other Sensitive Areas

According to the Department of Natural Resources, there are some wildlife protection considerations associated with the various Properties. Some of these species of plants and amphibians with rare, threatened, or endangered state status include: Harper’s Fimbristylis, Coppery St. Jon’s-wort, Black-fruit Spikerush, Featherfoil, Triangle Floater, Deciduous Holly, Sparkling Jewelwing, Blackwater Bluet, and Creeping Burhead. The complete list and agency review letter can be found in *Appendix 14*.

The Applicant has contacted Department of Natural Resources Wildlife and Heritage Services for their review of Property 17 and Property 18. Their response can be found in *Appendix 14-A*.

In general, the wildlife areas of concern are located in the woodlands on and surrounding the Project Properties, and/or are associated with downstream waterways. None of the forested areas will be cut and few hedgerows/fringe trees will be removed. Also, industry accepted BMPs will be used during construction to prevent runoff and sediment-laden water from leaving the site. During the life of the Project, impacts will essentially be absent compared to the continued use of these Properties for active farming since the entire site will be fully stabilized using an appropriate mix of grass seed and pollinators.

2. Summary of Environmental and Socioeconomic Effects

Pursuant to a response from MHT, a Phase I archeological investigation should be conducted within the LOC on Property 1, Property 3, Property 4, Property 9, Property 10, Property 11, Property 12, and Property 14. The complete MHT response letter is included in *Appendix 15*.

The Applicant has contacted MHT for their review of Property 17 and Property 18. Their response can be found in *Appendix 15-A*.

a. Environment Resources

The Project is extremely environmentally friendly. It is not located in the Critical Areas and does not impact jurisdictional waters, which have all been avoided. The Project has been reviewed by the MDE and a determination has been made that if the Applicant follows the avoidance plan prepared by ECS, that no wetland permits will be needed. The solar design incorporates a thirty-five foot (35') setback from the dripline of the trees. In summary, all mapped environmental constraints within the Project LOC have been avoided.

There are also no FEMA designated flood plain elevations per Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM). The Project will result in little additional impervious area because the structures we be built on pilings and there are very few paved areas to be created with the exception of the inverter pads, switchgear, and the new substation.

b. Cultural Resources

The Applicant has communicated with MHT and received a response indicating the Project will require a Phase I. A copy of the Project Review Form and the MHT response is included (see *Appendix 15* and *Appendix 15-A*). The results of the Phase I study and completed DOE Forms will be provided to the PSC as a supplemental filing.

c. Historic Building Environment

As noted above, the Applicant has submitted the appropriate documents to the Maryland Historic Trust (MHT) and received its written response. MHT has required DOE forms be completed consistent with its criteria for the properties identified in *Appendix 15* and *Appendix 15-A*. The results of the Phase I study and completed DOE Forms will be provided to the PSC as a supplemental filing.

d. Archeological

See items b and c above.

e. Consultation with Consulting and Interested Parties

The Applicant has consulted with Caroline County and various State Agencies, including PPRP, MHT, CAC, and DNR regarding this application.

3. Environmental Studies

a. Routine Wetlands Delineation Study

MDE's Mr. Alan Kampmeyer of the Nontidal Wetlands Program, Ms. Anna Allie of ECS Mid-Atlantic, representatives of H&B Solutions, and a consultant from Versar, Inc. conducted a joint site visit on

December 7, 2017 to confirm the details of ECS's *ECS Mid-Atlantic Wetland Field Assessment Report*. An additional field visit was held with representatives from MDE (Mr. Alan Kampmeyer and Mr. Ace Adkins), ECS, and Versar to further evaluate a few areas with differing characteristics to confirm locations of wetlands in these areas. ECS's report of findings is included as *Appendix 10* and *Appendix 10-A*. MDE's response to ECS's finding is included as *Appendix 11* and *Appendix 11-A*. To summarize, wetlands on the site have been identified, the constraints map has avoided these areas for solar design, and appropriate setbacks and buffers have been located. Typically, any required approvals from MDE for minor disturbances, if needed, are obtained through the Notice of Intent (NOI) process. However, due to the project size, and the total number of minor crossings needed to accommodate the emergency vehicle access, MDE has advised a Wetlands Permit will be needed including public notice.

b. Natural Resources Inventory Plan

H&B Solutions, LLC prepared an Environmental Due Diligence and Site Feasibility Report for Cherrywood Solar I, LLC dated September 12, 2017. A summary of these findings follows:

- The Properties within the Project are all zoned Rural (R).
- The Properties within the Project are not within the Critical Area.
- Based on the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) Maps, some Properties are free from wetlands; however other Properties have riverines, streams, and other wetlands throughout. The property characteristics have been identified within the body of the report.
- According to FEMA FIRM Maps the majority of the Properties are not affected by mapped flood plains in the area of the proposed Project's LOC. However, as shown in ***Table I***, there are some minor impacts associated with Special Flood Hazard Zones as well as a few parcels affected by the 100-year flood zone. The Applicant will limit the LOC to avoid these designated areas.
- According to the Natural Resource Conservation Service (NRCS) soils maps, generally the soils fall into three (3) categories; well-draining sandy loams, moderate to poorly draining silt loams including some hydric soils, and marine sediments which can be found near riverines and stream beds. Within these soils classifications there were few slopes that exceeded ten percent (10%) and the majority of the Properties had slopes between zero percent (0%) and five percent (5%).
- As indicated above, it is anticipated that some trees may need to be cut, but these would be incidental to the total site preparation effort and would not constitute cutting of any forest. The vast majority of the project LOC will be located in areas that have been actively farmed for years and no clearing will be required. Although the Project will meet the test of "no net loss" and afforestation will not be applicable, the Applicant will work with the County in defining how mitigation will be achieved for the few fringe trees to be cleared.
- There are several interconnections that will involve obtaining easements, ROW's, access permits, directional drilling under a Forest Stewardship parcel, a private lake, and abandoned railroad as discussed above.

All of the other environmental/regulatory considerations including habitat, flora/fauna, site plan, stormwater management, sediment and erosion control, etc. can be successfully addressed with careful consideration for the site constraints identified in this report.

In addition to the CPCN, the Project will require National Pollutant Discharge Elimination System (NPDES) Permit coverage and other State Regulatory Approvals including conformance with stormwater management and sediment and erosion control requirements. In the 2017 Maryland Legislative Session,

the CPCN Law was amended to require solar projects obtain consistency determinations with local zoning.

c. Environmental Review Request

As indicated above, DNR's Natural Heritage program has reviewed the project site and identified the plant or animal species that need to be protected (see *Appendix 14* and *Appendix 14-A*).

d. Cultural Resources Due Diligence Resources Investigation

As mentioned elsewhere in this report, MHT has identified several areas of interest. A Phase I study will be conducted, DOE forms will be prepared, and the results from both will be provided to the PSC/PPRP as a supplemental filing.

e. Geotechnical Investigations

The Applicant engaged ECS Mid-Atlantic to perform necessary geotechnical and seismic analysis to demonstrate the site is suitable to support the proposed solar generation facility. The Preliminary Geotechnical Assessment is included in *Appendix 7*. The findings indicate the soils onsite can support the proposed solar generation facility including the use of posts, pads to support inverters and switchgear, internal grass covered drive aisles, and related sediment and erosion controls. The seismic analysis will be performed as part of the construction document preparation.

4. Ability to Conform to Applicable Environmental Standards

The Project's design and construction will require review by state and local authorities through the CPCN process. The Project will also comply with various federal and state environmental regulatory requirements as applicable. Based on preliminary analysis the Project has avoided identified environmental constraints and it is expected that the final design will meet applicable federal, state, and local regulations. It should be noted that the State's limitation of twenty (20) acres of disturbance at any time during construction has been recently modified to be less restrictive.

B. AIR QUALITY

1. Compliance with Federal or State Air Quality Standards

As a solar generation facility, the Project will emit no pollutants, and the below listed standards, provisions, and requirements will not be applicable.

a. Air Quality During Construction

The primary air-quality issue during construction will be dust from non-point sources such as earthwork and construction traffic on unpaved roads. This type of dust is described as fugitive dust. Fugitive dust is expected to be less than a normal construction project since this Project will not require excessive earthwork activities. Other potential sources of pollutants during construction are mobile internal combustion engines from earthwork equipment and an increase in vehicle traffic by workers. Emissions from these sources should have little impact.

b. Air Quality During Operation
The Project, like all solar generation facilities, will generate no air pollution emissions during its operation.

2. Impact on Deterioration Areas and Nonattainment Areas

The Project will have no impact on any attainment or nonattainment areas of the State.

3. Requirements Under COMAR 26.11

Generally, the provisions of COMAR 26.11 will not be applicable to the Project as the facility will not emit pollutants.

C. WATER QUALITY AND APPROPRIATION

1. Availability of Surface Water and Groundwater

As a stand-alone, unmanned facility, the Project will be monitored remotely. There will be limited water and no sewer requirements for the Project. The Project will not require surface or groundwater for construction or operation. Normal rain events will keep manual cleanings of the solar modules to a minimum. Occasional water for quarterly/semi-annual cleanings may be required. Water tank trucks may be used to manage dust during construction if required.

2. Affected Streams and Aquifers

As mentioned above MDE, with input from ECS, has determined wetland locations can be avoided during the design. Wetlands within the wooded areas onsite will not be disturbed and the Project will be located thirty-five feet (35') from the drip line of these wooded areas. Any wetlands interior to the Project will also be avoided and similar buffers established. The Site is located in the Upper Choptank watershed. No impacts to streams or aquifers are anticipated as a result of the Project design.

3. Impact on Other Water Users

No impact to other water users is anticipated as a result of the Project.

a. Impacts to Other Water Users During Construction
It is assumed that there will not be a need to use water during construction. If water is needed to control dust, a tanker truck will be provided.

b. Impacts to Other Water Users During Operation
Stormwater facility approvals, sediment and erosion control permits, grading permits, and NOI coverage under the NPDES Program will all be obtained as controls on the water quality leaving the Site. As an unmanned facility, there will be no ongoing water consumption requirement. Any other interim water consumption required will be fairly intermittent and provided as identified above.

4. Mitigation and Minimization Techniques Evaluated

No impacts to water quality or appropriation are anticipated. As a result, mitigation and minimization techniques are not warranted.

5. Requirements Under COMAR 26.17.06.07 and 26.17.07

It is assumed that there is no reason for permits to be issued under COMAR 26.17.06.07 and 26.17.07 since no water use or appropriation is required for the Project.

D. DESCRIPTION OF EFFECT ON STATE OR PRIVATE WETLANDS

1. Public Health and Welfare

The Project's operation will not produce, emit, or discharge any significant noise, air pollutants, or water pollutants, which may have an effect on public health or welfare. Additionally, the Project will not generate, transport, store, treat, and/or dispose of hazardous waste.

2. Marine Fisheries

The Project will not impact marine fisheries.

3. Shell Fisheries

The Project will not impact shell fisheries.

4. Wildlife

The Project is not anticipated to significantly affect any wildlife habitat. The Project is not anticipated to impact critical habitats.

5. Protection of Life and Property from Flood, Hurricane, or other Natural Disaster

This Project is unique in that, during a natural disaster, there would only be destruction to the panel array itself. Total destruction of the panel array and the transformers would not release harmful gases or liquids and would have no adverse effects on surrounding property or life. All components of the Project will be designed per the local and state building codes.

6. Mitigation and Minimization or Replacement Land Acquisition

Mitigation and minimization or replacement land acquisition is not applicable to the Project.

7. License for use of State Tidal or Nontidal Wetlands

The information and forms required by the MDE regulations relating to a license for use of State tidal wetlands or nontidal wetlands under COMAR 26.23 and 26.24 are not required for this Project.

E. WASTE HANDLING

1. Waste Handling During Construction

During construction, the contractor will collect any waste material and remove it from the Site to an approved waste handling facility. Large amounts of waste during construction are not anticipated. Waste material will mainly consist of packaging materials from the framing and electrical equipment that will be delivered to the Site.

2. Waste Handling During Operation

During operation, there will be little or no waste material generated at the Site. Any waste that is generated from maintenance and/or repair operations will be removed from the Site and disposed of at an approved waste handling facility. There will be no sanitary sewer waste generated at the Site.

3. Waste Handling During Decommissioning

Waste associated with decommissioning and deconstruction of the Project will be handled appropriately pursuant to a Decommissioning Plan provided to the Commission and Power Plant Research Program. Once the life of the Project is complete, the land will revert back to its original condition.

Attachment D

APPENDIX 1

Property Characteristic List/Table

Sections	Property #	Parcel Name	Tax Map	Grid	Parcel	Address	Acreage	LOD Acerage	Zoning	Property Use	PFA	Lat/Long	Wetlands	Trees Cut	FCE - Onsite	CAC	MHT Phase I/DOE Required	FEMA				Soils	
																		Date	Map #	Panel #	Y/N	Hydric	Well-Draining (WD)
Upper	1	John H. Brown, Jr.	0011	0004	0052	15642 Jackson Lane Goldsboro	107.50	75.36	R	Ag	N	39°02'29.0"N 75°45'34.2"W	Few ditches	No	No	No	Phase I / DOE	January 16, 2015	24011C0095D	95 of 375	N	N	Moderate to Well-Draining
Upper	2	Jack Brown	0011	0005	0158	15833 Jackson Lane Goldsboro	20.00	6.60	R	Ag	N	39°02'26.2"N 75°45'08.7"W	Few if any in solar area Wetlands in woods	No	Yes	No		January 16, 2015	24011C0095D	95 of 375	N	N	Moderate to Well-Draining
Upper	3	John H. Brown, Jr.	0011	0004	0053	15833 Jackson Lane Goldsboro	98.49	48.03	R	Ag	N	39°02'16.5"N 75°45'20.3"W	Few if any in solar area Wetlands in woods	No	Yes	No	Phase I / DOE	January 16, 2015	24011C0095D	95 of 375	Special Flood Hazard	N	Moderate to Well-Draining
Upper	4	John H. Brown, Jr.	0011	0009	0056	15642 Jackson Lane Goldsboro	204.00	143.34	R	Ag	N	39°02'16.8"N 75°45'51.1"W	Yes - 2 significant ditches	No	No	No	Phase I / DOE	January 16, 2015	24011C0095D	95 of 375	Special Flood Hazard	N	Moderate to Well-Draining
Upper	5	John H. Brown, Jr.	0011	0009	0058	15642 Jackson Lane Goldsboro	6.00	5.39	R	Residential	N	39°02'06.3"N 75°46'16.4"W	Few if any	Yes - Minor	No	No	DOE	January 16, 2015	24011C0095D	95 of 375	N	N	Moderate to Well-Draining
Upper	6	David M. Sakers	0011	0003	0005	26720 Sandtown Road Goldsboro	69.69	12.50	R	Ag	N	39°02'14.5"N 75°46'24.1"W	In woods and ditches	Few	Yes 50% of site	No		January 16, 2015	24011C0095D	95 of 375	Special Flood Hazard	N	Moderate to Well-Draining
Upper	17	Peter M. Layton	0011	0009	0135	26726 Sandtown Road Goldsboro	6.30	3.21	R	Ag	N	39°02'06.7"N 75°46'21.2"W	In woods.	Few	No	No	TBD	January 16, 2015	24011C0095D	95 of 375	Special Flood Hazard	N	Well-Draining
Upper	18	David M. Sakers Yvonne M Sakers	0011	0009	0163	26722 Sandtown Road Goldsboro	4.000	1.32	R	Ag	N	39°02'11.5"N 75°46'20.8"W	In woods.	Few	Yes	No	TBD	January 16, 2015	24011C0095D	95 of 375	None	N	Well-Draining
Upper Total Acreage							***515.98***	***295.75***															
Middle	7	Ronald Spiering	0010	0011	0034	15644 Wharton Road Goldsboro	16.56	8.43	R	Ag	N	39°02'10.0"N 75°48'22.0"W	Minor ditches	No	No	No		January 16, 2015	24011C0095D	95 of 375	N	Y	Poorly-Draining
Middle	8	Ronald Spiering	0010	0017	0025	25802 Bridgetown Road Goldsboro	148.75	70.91	R	Ag	N	39°01'52.9"N 75°48'36.1"W	In ditches and surrounding wooded areas	Few	Yes 15% of site	No	DOE	January 16, 2015	24011C0095D	95 of 375	N	Y	Moderate to Poorly-Draining
Middle	9	Ronald Spiering	0010	0018	0011	25970 Bridgetown Road Goldsboro	103.16	70.10	R	Ag	N	39°01'43.3"N 75°48'04.4"W	In ditches and surrounding wooded areas	No	No	No	Phase I / DOE	January 16, 2015	24011C0095D	95 of 375	Special Flood Hazard	Y/N	Well-Draining to Poorly-Draining
Middle Total Acreage							***268.47***	***149.44***															
Lower	10	Sherman W. Councell	0011	0020	0007	15045 Greensboro Road Goldsboro	125.77	91.3	R	Ag	N	9°01'09.8"N 75°46'58.1"W	Numerrous wet areas/ditches	No	No	No	Phase I	January 16, 2015	24011C0095D 24011C0094D	95 of 375 94 of 375	Part of 94 in boarders flood Zone AE	N	Well-Draining
Lower	11	George Caple	0011	0020	0051	14875 Greensboro Road Goldsboro	90.44	51.43	R	Ag	N	39°00'52.9"N 75°47'00.1"W	Numerous wet areas/ditches	ot recommende	Few	no	Phase I	January 16, 2015	24011C0095D 24011C0094D	95 of 375 94 of 375	N	N	Well-Draining
Lower	12	Nobleur T. Jarrell	0015	0001	0066	14697 Greensboro Road Goldsboro	89.40	50.90	R	Ag	N	39°00'37.1"N 75°47'10.1"W	5 significant ditches	No	Few	no	Phase I / DOE	January 16, 2015	24011C0095D	95 of 375	N	Y/N	Poorly-Draining to Well-Draining
Lower	13	John H. Brown, Trustee	0015	0007	0067	14558 Greensboro Road Goldsboro	130.99	55.43	R	Ag	N	39°00'24.8"N 75°47'33.2"W	Several significant ditches	No	No	No		January 16, 2015	24011C0095D	95 of 375	N	N	Moderate to Well-Draining
Lower	14	Schiff Farms, LLC	0014	0012	0008	14267 Greensboro Road Greensboro	336.18	298.47	R	Ag	N	38°59'59.8"N 75°47'53.8"W	Numerous wet areas/ditches	No	No	No - partial used is not within	Phase I	January 16, 2015	24011C0156D	156 of 375	Boarders 100yr	N	Moderate to Well-Draining
Lower	15	Schiff Farms, LLC	0014	0024	0016	14267 Greensboro Road Greensboro	76.72	66.27	R	Ag	N	38°59'15.1"N 75°48'01.2"W	Numerous wet areas	No	No	No		January 16, 2015	24011C0156D	156 of 375	N	N	Moderate to Well-Draining
Lower	16	R. Bett Patchett	0014	0023	0038	13779 Cedar Lane Greensboro	88.91	14.70	R	Ag	N	38°59'14.3"N 75°48'34.1"W	Several ditches	No	No	No	DOE	January 16, 2015	24011C0156D	156 of 375	N	N	Moderate to Well-Draining
Lower Total Acreage							***938.41***	***628.50***															
TOTAL ACREAGE							**1722.86**	**1073.69**															

Sections		Parcel Name	Tax Map	Grid	Parcel	Address	Acreage		Zoning	Property Use	PFA	Lat/Long	Wetlands	Trees Cut	FCE - Onsite	CAC		FEMA				Soils	
																		Date	Map #	Panel #	Y/N	Hydric	Well-Draining (WD)
Easement		William Sherman Councell	0011	0015	0118	26835 Sandtown Road Goldsboro	284.00		R	Ag	N	39°01'38.0"N 75°46'05.8"W	Few if any										
Easement		Johnathon Merson	0011	0015	0162	14955 Greensboro Road Goldsboro	140.81		R	Ag	N	39°01'16.0"N 75°46'48.7"W	Yes										
Easement			0011	0014	0161						Y Municiple PFA	39°01'56.4"N 75°47'01.6"W	Few if any										
Easement		Shirley Cook	0011	0013	0019	15620 Greensboro Road Goldsboro	14.55		R	Ag	N	39°01'29.0"N 75°47'16.8"W	No										

NOTE

Environmental constraints mapping for these easement parcels is considered unnecessary as directional drilling would more than likely be used as the method of installation in wooded areas and areas with wetlands, FEMA, or other environmental limitations.

APPENDIX 2

NRCS Soils Report and Prime Farmland Classifications

APPENDIX 2 – NRCS Soils Report

75° 46' 40" W

75° 45' 59" W

432700 432800 432900 433000 433100 433200 433300 433400 433500 433600

39° 2' 40" N

39° 2' 40" N

4322000 4321900 4321800 4321700 4321600 4321500 4321400 4321300 4321200 4321100 4321000 4320900 4320800

39° 1' 58" N

39° 1' 58" N

432700 432800 432900 433000 433100 433200 433300 433400 433500 433600

75° 46' 40" W

75° 45' 59" W

Map Scale: 1:6,270 if printed on A portrait (8.5" x 11") sheet.

Meters: 0 50 100 200 300

N

Feet: 0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	3.2	4.5%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	8.6	12.3%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	12.3	17.6%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	17.8	25.3%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	20.4	29.0%
IeC	Ingleside loamy sand, 5 to 10 percent slopes	1.1	1.6%
LgA	Lenni loam, 0 to 2 percent slopes	3.0	4.2%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	0.4	0.6%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	2.0	2.8%
Za	Zekiah sandy loam, frequently flooded	1.4	2.0%
Totals for Area of Interest		**70.2**	**100.0%**

Soil Map—Caroline County, Maryland
(Soils Map)

Map Scale: 1:6,800 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 100, 200, 400, 600

Feet: 0, 300, 600, 1200, 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

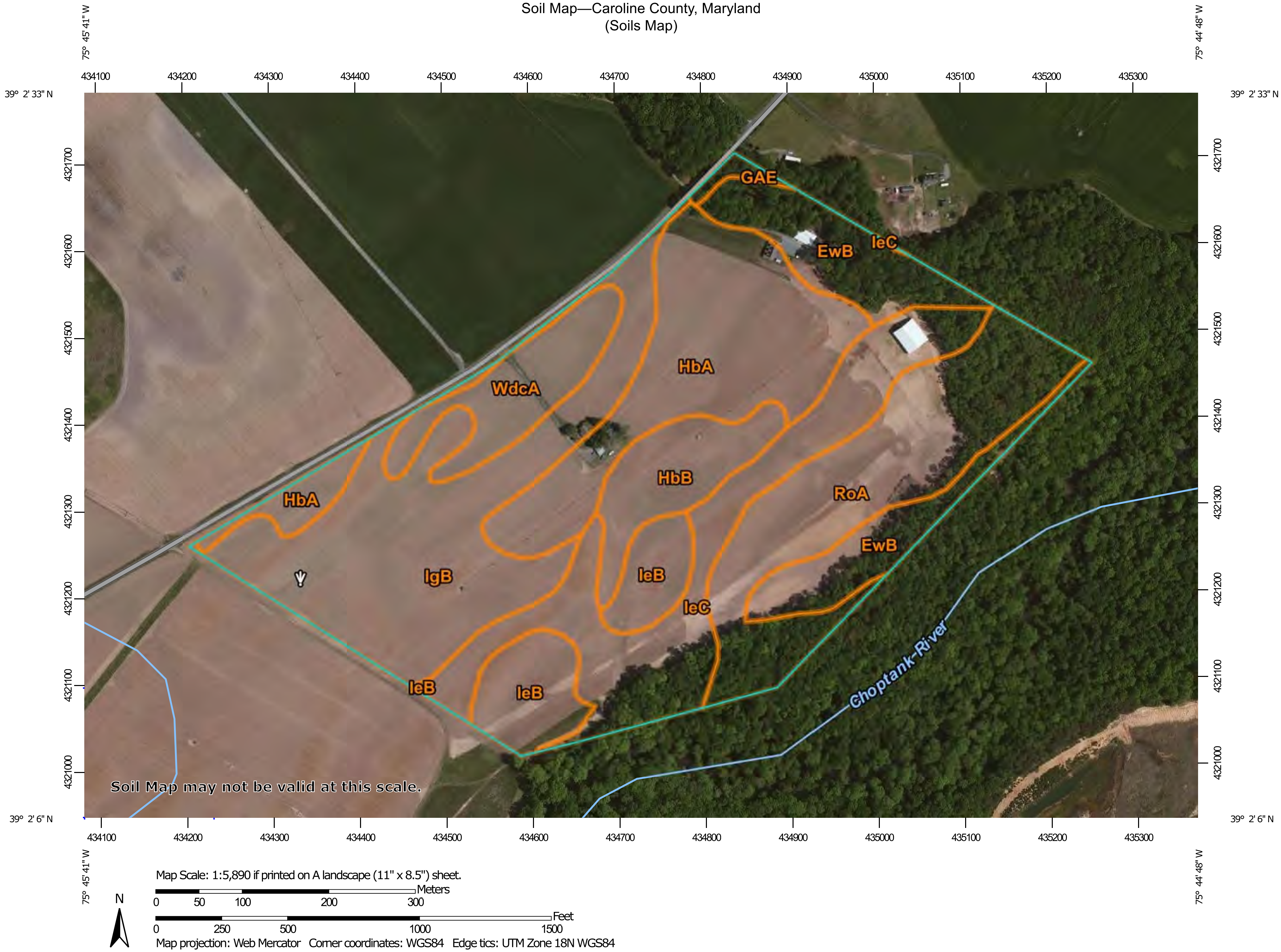
Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	6.3	6.6%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	0.4	0.4%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	20.1	21.2%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	7.0	7.4%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	0.3	0.3%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	52.3	55.2%
LgA	Lenni loam, 0 to 2 percent slopes	8.4	8.9%
Totals for Area of Interest		**94.7**	**100.0%**

Soil Map—Caroline County, Maryland
(Soils Map)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EwB	Evesboro sand, 2 to 5 percent slopes	9.5	10.6%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	0.5	0.5%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	16.1	17.9%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	4.9	5.4%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	5.9	6.6%
IeC	Ingleside loamy sand, 5 to 10 percent slopes	13.6	15.1%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	19.5	21.6%
RoA	Rosedale loamy sand, 0 to 2 percent slopes	14.8	16.5%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	5.2	5.8%
Totals for Area of Interest		**90.0**	**100.0%**

Map Scale: 1:8,250 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 100, 200, 400, 600

Feet: 0, 400, 800, 1600, 2400

Map projection: Web Mercator   Corner coordinates: WGS84   Edge tics: UTM Zone 18N WGS84

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

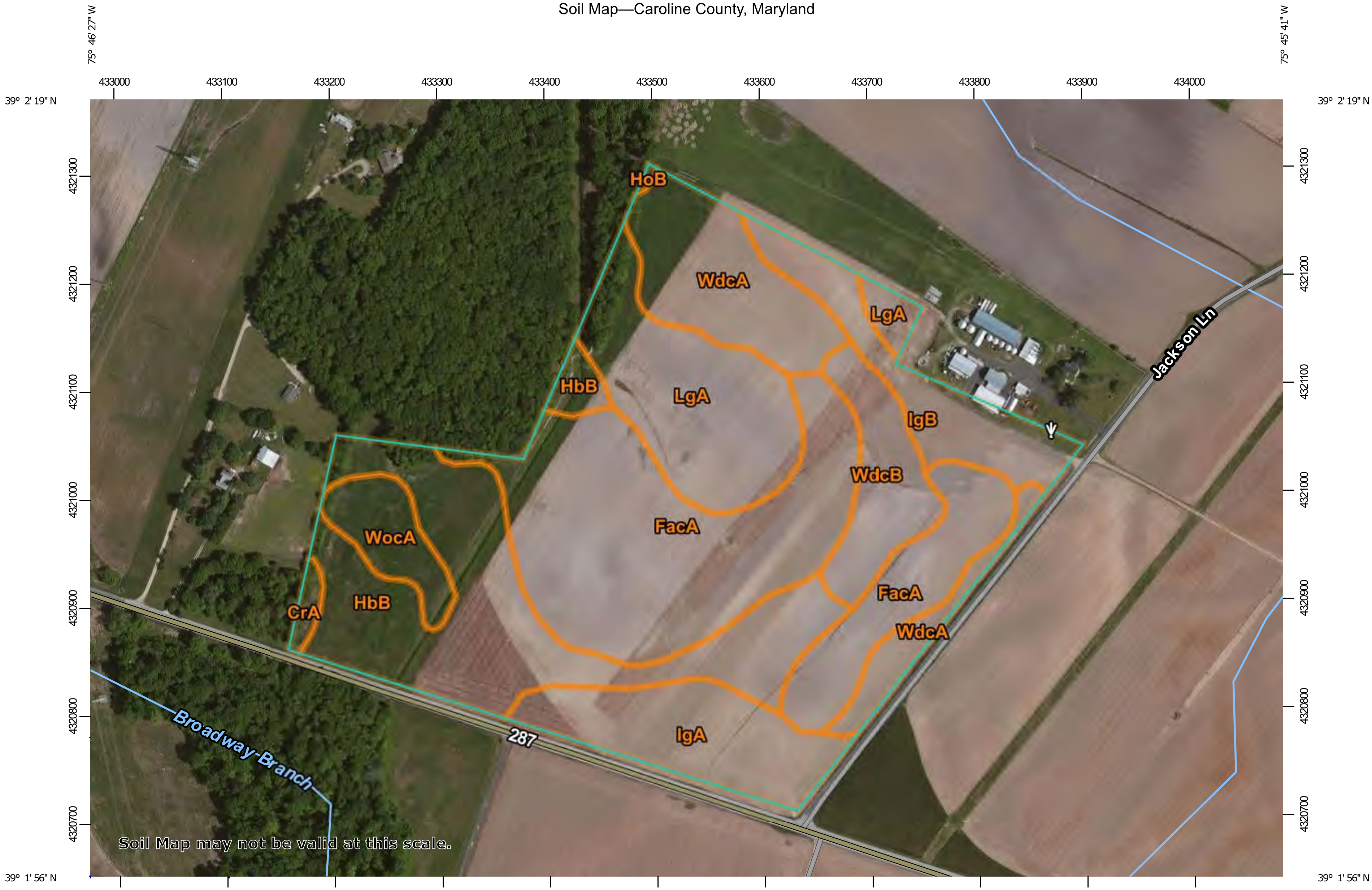
Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	4.3	3.4%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	20.5	16.3%
HbC	Hambrook sandy loam, 5 to 10 percent slopes	0.1	0.1%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	8.8	7.0%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	9.2	7.3%
IeC	Ingleside loamy sand, 5 to 10 percent slopes	5.9	4.7%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	19.4	15.4%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	46.5	37.0%
LgA	Lenni loam, 0 to 2 percent slopes	3.7	3.0%
RoB	Rosedale loamy sand, 2 to 5 percent slopes	0.5	0.4%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	6.7	5.3%
Totals for Area of Interest		**125.7**	**100.0%**

Soil Map—Caroline County, Maryland



Map Scale: 1:5,070 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 200, 400, 800, 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	0.4	0.6%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	17.1	29.6%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	12.2	21.1%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	0.1	0.1%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	5.1	8.7%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	3.9	6.8%
LgA	Lenni loam, 0 to 2 percent slopes	7.3	12.6%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	6.5	11.2%
WdcB	Woodstown sandy loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	3.3	5.7%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	2.0	3.5%
Totals for Area of Interest		**57.9**	**100.0%**

Soil Map—Caroline County, Maryland
(TM 135 and 163)

Map Scale: 1:1,830 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

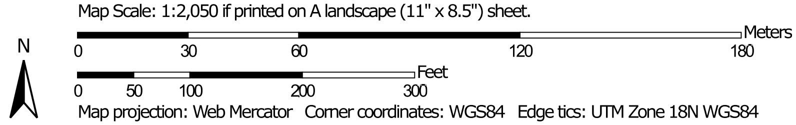
Date(s) aerial images were photographed: Dec 31, 2009—Mar 16, 2017

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	2.0	20.6%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	3.2	32.4%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	2.4	24.5%
IeC	Ingleside loamy sand, 5 to 10 percent slopes	0.8	7.7%
LgA	Lenni loam, 0 to 2 percent slopes	1.0	9.7%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	0.1	0.9%
Za	Zekiah sandy loam, frequently flooded	0.4	4.2%
Totals for Area of Interest		**9.9**	**100.0%**

Map Scale: 1:2,050 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
CoA	Corsica mucky loam, 0 to 2 percent slopes	0.2	1.6%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Altlantic Coastal Plain	6.6	45.4%
HcA	Hambrook loam, 0 to 2 percent slopes	2.6	17.7%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	0.0	0.2%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	1.1	7.5%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	4.0	27.6%
Totals for Area of Interest		**14.5**	**100.0%**

75° 48' 50" W | 75° 48' 15" W

429600 429700 429800 429900 430000 430100 430200 430300

39° 2' 10" N

4321100 4321000 4320900 4320800 4320700 4320600 4320500 4320400 4320300 4320200 4320100

39° 1' 34" N

429600 429700 429800 429900 430000 430100 430200 430300

75° 48' 50" W | 75° 48' 15" W

Map Scale: 1:5,410 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
CoA	Corsica mucky loam, 0 to 2 percent slopes	0.0	0.0%
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	2.9	2.9%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Altlantic Coastal Plain	24.4	24.5%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	2.9	2.9%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	11.7	11.8%
HcA	Hambrook loam, 0 to 2 percent slopes	14.6	14.7%
LgA	Lenni loam, 0 to 2 percent slopes	12.3	12.4%
LhA	Lenni silt loam, 0 to 2 percent slopes	3.1	3.1%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	4.4	4.5%
WdcB	Woodstown sandy loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	1.7	1.7%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	21.2	21.3%
Totals for Area of Interest		**99.3**	**100.0%**

Map Scale: 1:5,030 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 50, 100, 200, 300

Feet: 0, 200, 400, 800, 1200

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 15, Sep 22, 2016

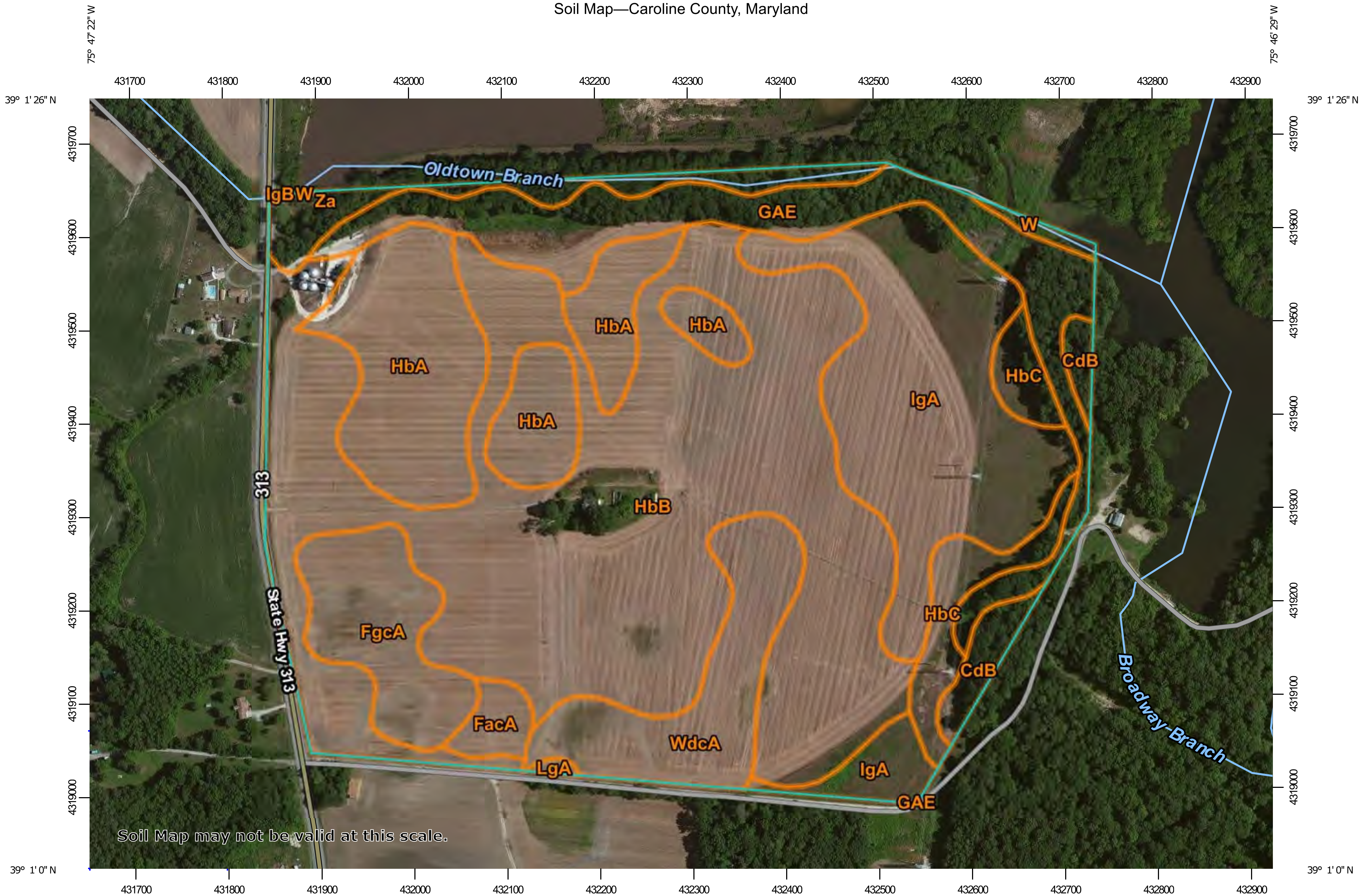
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
CoA	Corsica mucky loam, 0 to 2 percent slopes	5.4	6.2%
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	2.2	2.5%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	0.5	0.5%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	0.1	0.1%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	57.7	66.4%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	1.7	2.0%
LgA	Lenni loam, 0 to 2 percent slopes	2.4	2.8%
LhA	Lenni silt loam, 0 to 2 percent slopes	12.9	14.8%
WdcB	Woodstown sandy loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	4.1	4.7%
Za	Zekiah sandy loam, frequently flooded	0.0	0.0%
Totals for Area of Interest		**86.9**	**100.0%**



Map Scale: 1:5,820 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
CdB	Cedartown loamy sand, 2 to 5 percent slopes	2.1	1.6%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	1.4	1.0%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Altlantic Coastal Plain	6.6	5.0%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	13.3	10.0%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	16.7	12.6%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	54.7	41.4%
HbC	Hambrook sandy loam, 5 to 10 percent slopes	4.5	3.4%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	20.6	15.6%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	0.0	0.0%
LgA	Lenni loam, 0 to 2 percent slopes	0.2	0.1%
W	Water	0.5	0.4%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	8.2	6.2%
Za	Zekiah sandy loam, frequently flooded	3.7	2.8%
Totals for Area of Interest		**132.4**	**100.0%**

Soil Map—Caroline County, Maryland

75° 47' 18" W | 75° 46' 42" W

431800 431900 432000 432100 432200 432300 432400 432500 432600

39° 1' 9" N

4319200 4319100 4319000 4318900 4318800 4318700 4318600 4318500 4318400 4318300 4318200 4318100

39° 0' 32" N

431800 431900 432000 432100 432200 432300 432400 432500 432600

75° 47' 18" W | 75° 46' 42" W

Map Scale: 1:5,610 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

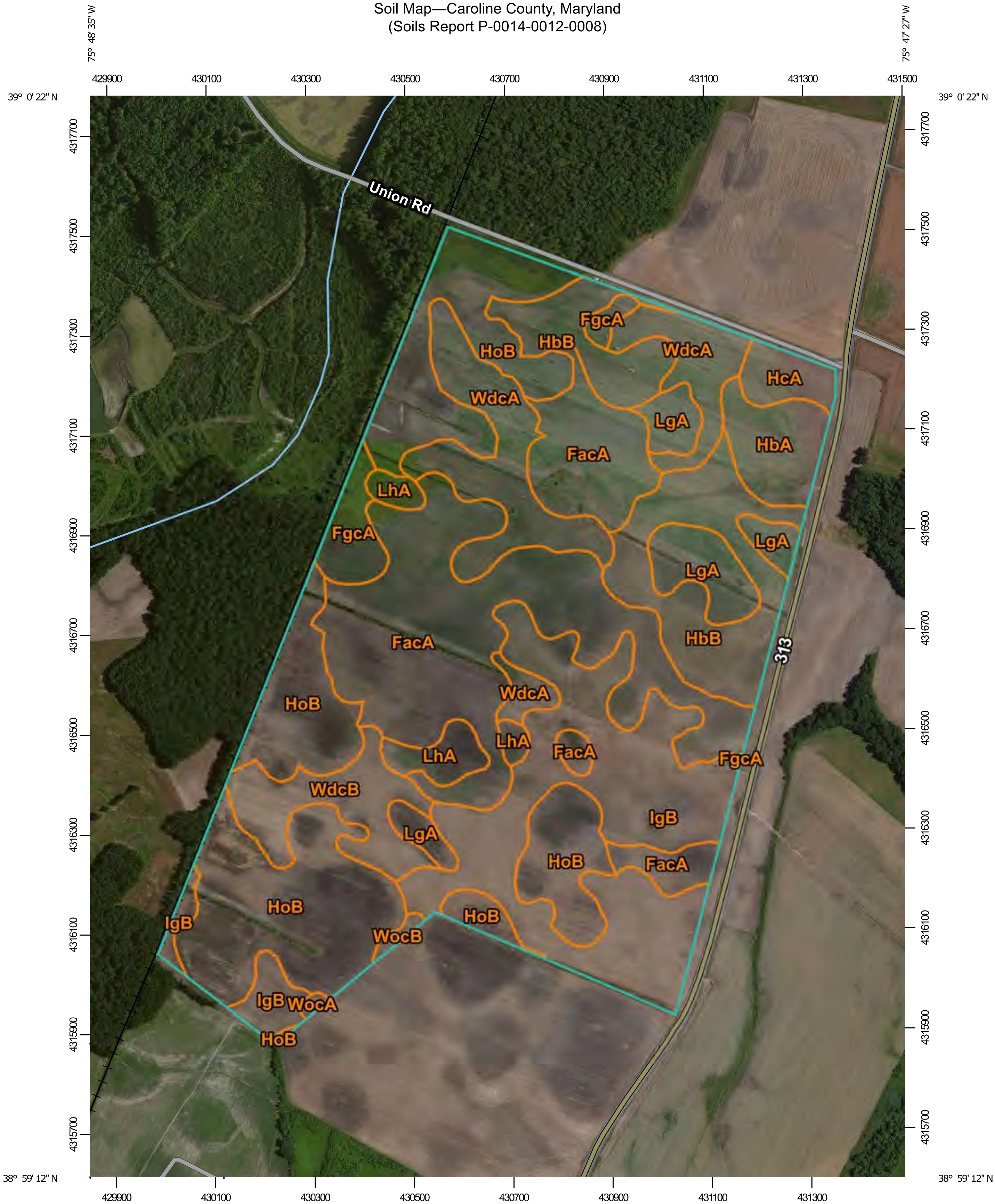
Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	3.6	4.5%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	7.2	9.1%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	3.6	4.6%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	20.0	25.3%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	25.5	32.3%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	2.3	3.0%
LgA	Lenni loam, 0 to 2 percent slopes	1.6	2.1%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	15.2	19.3%
Totals for Area of Interest		**79.1**	**100.0%**

Soil Map—Caroline County, Maryland
(Soils Report P-0014-0012-0008)



Map Scale: 1:10,600 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 150, 300, 600, 900

Feet: 0, 500, 1000, 2000, 3000

N

Map projection: Web Mercator   Corner coordinates: WGS84   Edge tics: UTM Zone 18N WGS84

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

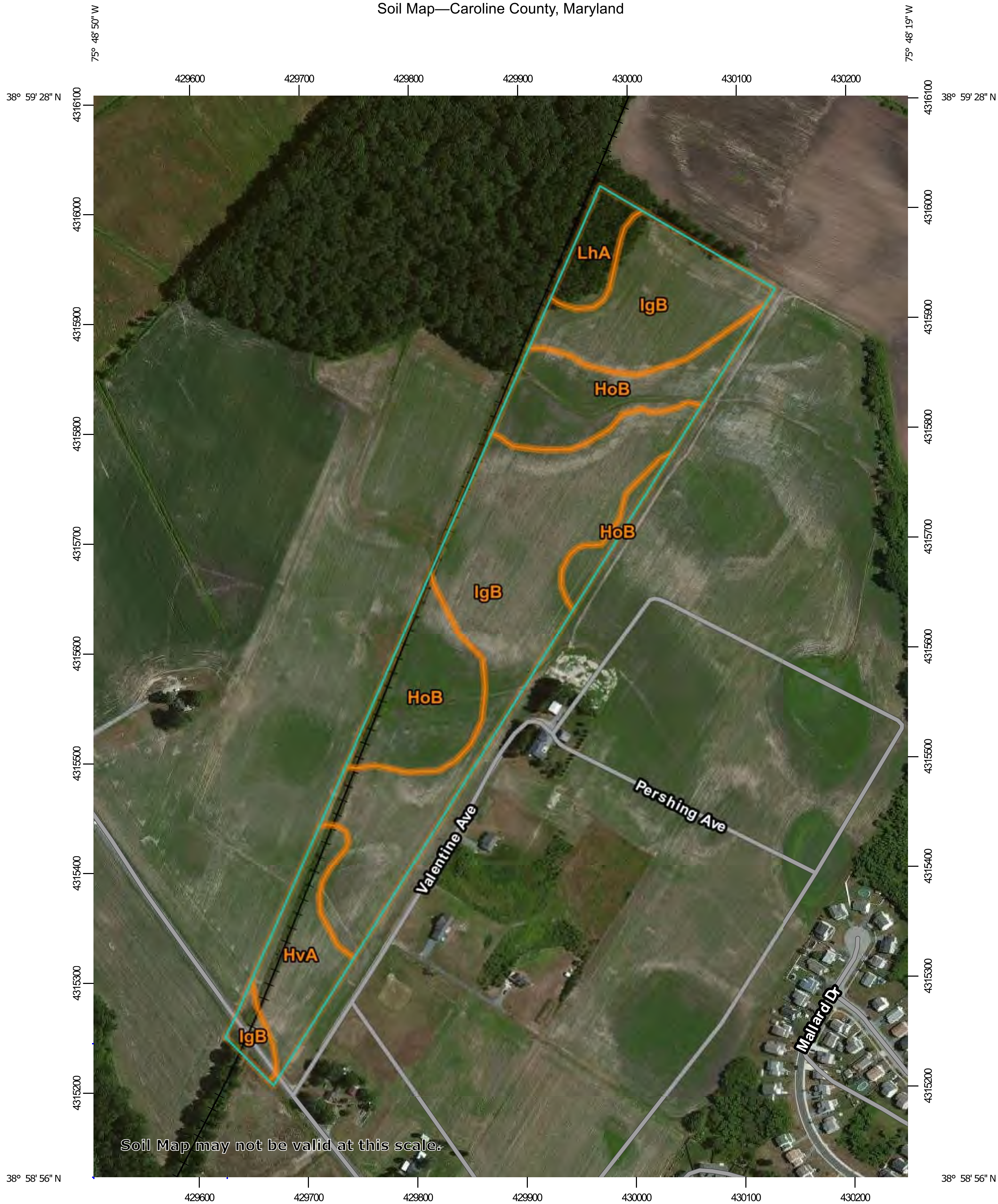
Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	75.8	22.9%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Altlantic Coastal Plain	6.7	2.0%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	9.2	2.8%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	33.0	9.9%
HcA	Hambrook loam, 0 to 2 percent slopes	4.6	1.4%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	78.8	23.8%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	57.1	17.2%
LgA	Lenni loam, 0 to 2 percent slopes	14.4	4.4%
LhA	Lenni silt loam, 0 to 2 percent slopes	6.7	2.0%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	30.0	9.0%
WdcB	Woodstown sandy loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	13.9	4.2%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	0.4	0.1%
WocB	Woodstown loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	0.8	0.2%
Totals for Area of Interest		**331.3**	**100.0%**

Soil Map—Caroline County, Maryland



Map Scale: 1:4,800 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 50, 100, 200, 300

Feet: 0, 200, 400, 800, 1200

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—Jul 4, 2010

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

Caroline County, Maryland (MD011)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	6.8	26.6%
HvA	Hurlock sandy loam, 0 to 2 percent slopes	2.5	9.5%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	15.3	59.6%
LhA	Lenni silt loam, 0 to 2 percent slopes	1.1	4.2%
Totals for Area of Interest		**25.7**	**100.0%**


75° 47' 37" W
75° 46' 44" W
39° 0' 48" N
39° 0' 21" N
431300
431400
431500
431600
431700
431800
431900
432000
432100
432200
432300
432400
432500
4318500
4318400
4318300
4318200
4318100
4318000
4317900
4317800
WdcA
WdcA
FacA
LgA
FacA
HbB
IgA
IgA
GAE
HbB
313
FgcA
IgB
GAE
HbB
Greensboro Rd
WdcA
IgA
GAE
Soil Map may not be valid at this scale.
Map Scale: 1:5,830 if printed on A landscape (11" x 8.5") sheet.
Meters
0
50
100
200
300
Feet
0
250
500
1000
1500
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	0.3	0.4%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Altlantic Coastal Plain	30.0	35.4%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	0.7	0.8%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	25.8	30.4%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	7.6	8.9%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	11.5	13.6%
LgA	Lenni loam, 0 to 2 percent slopes	4.9	5.8%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	4.0	4.7%
Totals for Area of Interest		**84.8**	**100.0%**

Soil Map—Caroline County, Maryland

Map Scale: 1:6,030 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 50, 100, 200, 300

Feet: 0, 250, 500, 1000, 1500

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

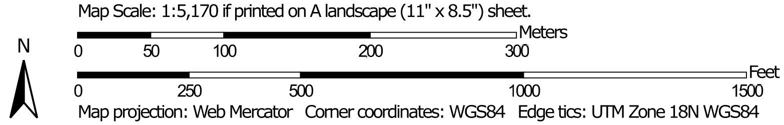
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	1.4	1.9%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	18.4	24.4%
HcA	Hambrook loam, 0 to 2 percent slopes	6.0	8.0%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	34.1	45.3%
LgA	Lenni loam, 0 to 2 percent slopes	8.3	11.0%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	7.0	9.3%
Totals for Area of Interest		**75.2**	**100.0%**

Soil Map—Caroline County, Maryland
(Soils Map)

Map Scale: 1:5,170 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

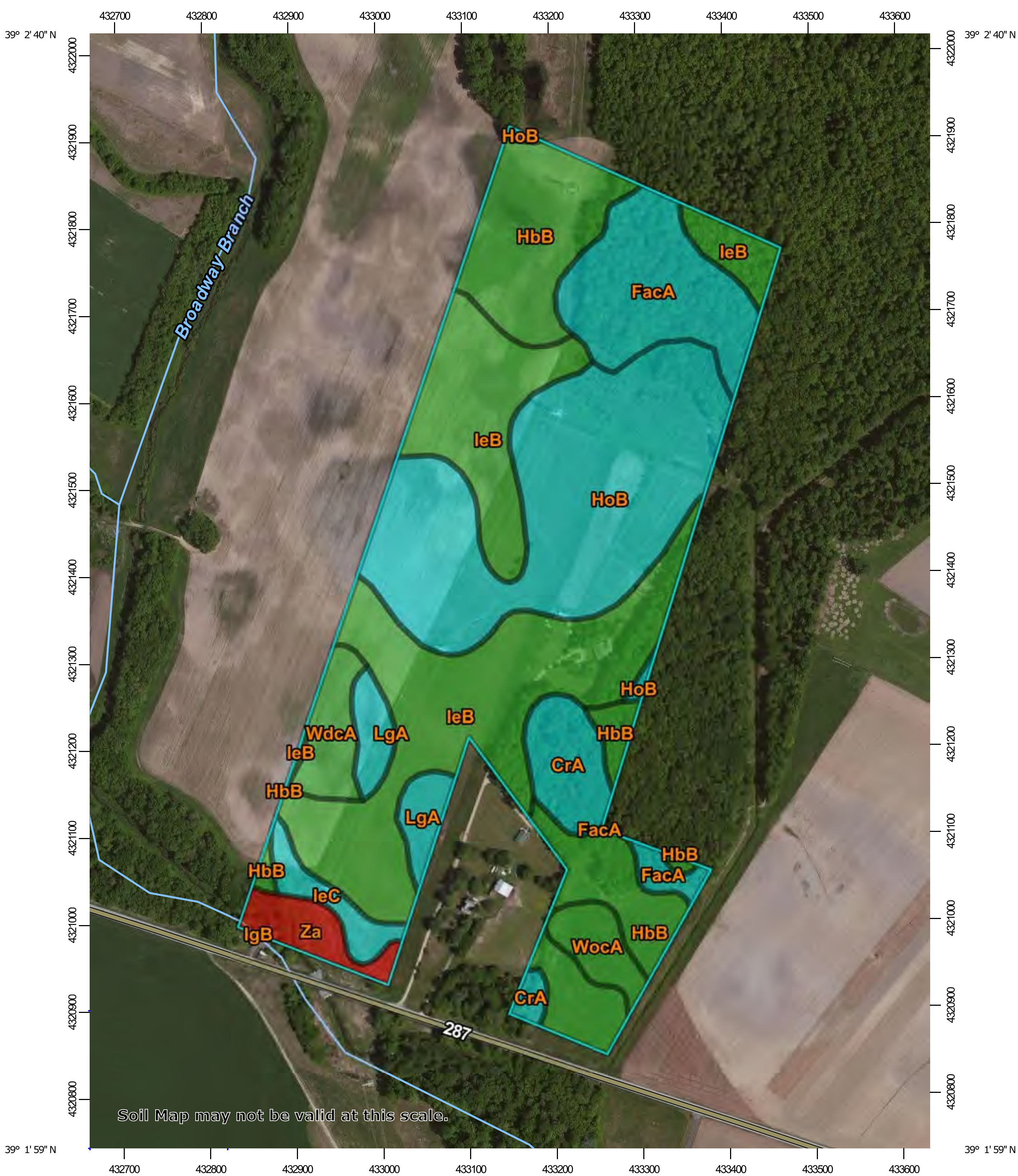
Date(s) aerial images were photographed: Jun 17, 2010—Jul 4, 2010

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HnA	Hammonton sandy loam, 0 to 2 percent slopes	1.8	2.6%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	22.5	33.4%
HvA	Hurlock sandy loam, 0 to 2 percent slopes	8.3	12.4%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	25.4	37.6%
LgA	Lenni loam, 0 to 2 percent slopes	2.7	4.0%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	4.2	6.2%
WocB	Woodstown loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	2.6	3.8%
Totals for Area of Interest		**67.4**	**100.0%**

APPENDIX 2 – Prime Farmland Classification



Map Scale: 1:6,250 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	Farmland of statewide importance	3.4	4.2%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	8.4	10.3%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	13.4	16.4%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	Farmland of statewide importance	21.1	25.8%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	All areas are prime farmland	25.0	30.6%
IeC	Ingleside loamy sand, 5 to 10 percent slopes	Farmland of statewide importance	1.7	2.0%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	0.0	0.0%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	2.5	3.1%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	2.3	2.8%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	1.8	2.3%
Za	Zekiah sandy loam, frequently flooded	Not prime farmland	2.0	2.5%
Totals for Area of Interest			**81.6**	**100.0%**

Description

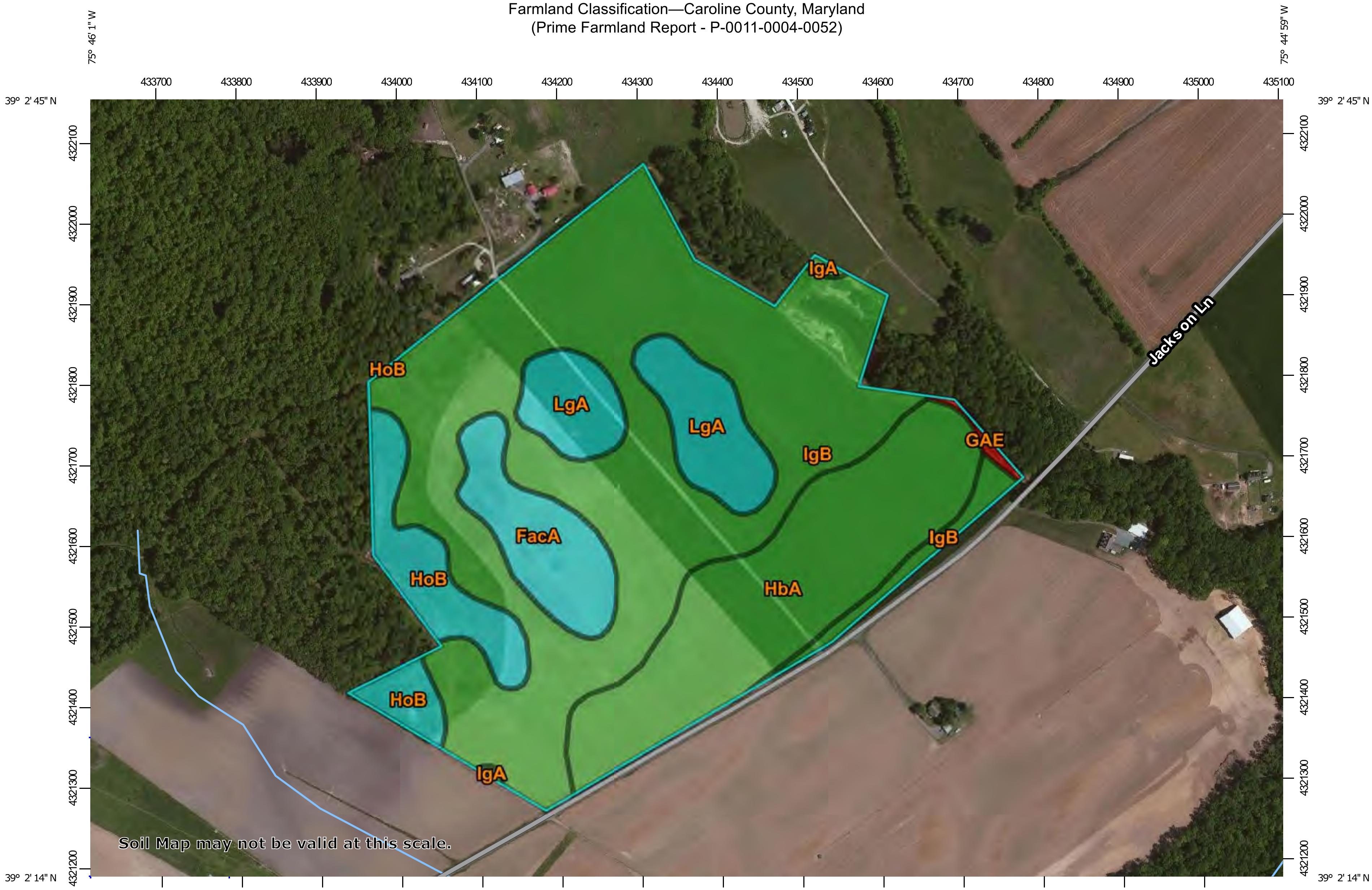
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0004-0052)



Map Scale: 1:6,800 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 100, 200, 400, 600

Feet: 0, 300, 600, 1200, 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	6.3	6.6%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	Not prime farmland	0.4	0.4%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	All areas are prime farmland	20.1	21.2%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	Farmland of statewide importance	7.0	7.4%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	All areas are prime farmland	0.3	0.3%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	52.3	55.2%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	8.4	8.9%
Totals for Area of Interest			**94.7**	**100.0%**

Description

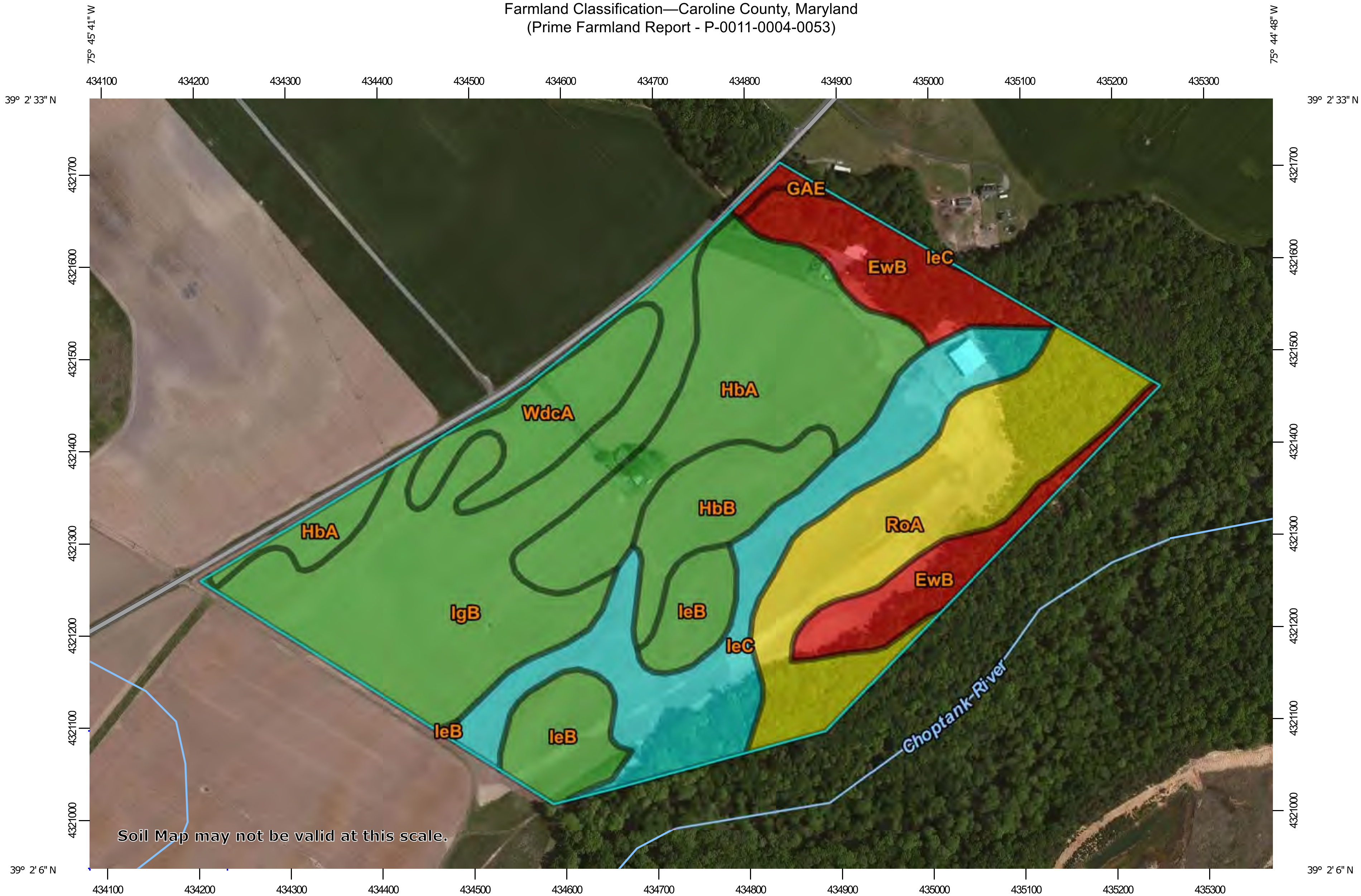
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0004-0053)



Map Scale: 1:5,890 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
EwB	Evesboro sand, 2 to 5 percent slopes	Not prime farmland	9.5	10.6%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	Not prime farmland	0.5	0.5%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	All areas are prime farmland	16.1	17.9%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	4.9	5.4%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	All areas are prime farmland	5.9	6.6%
IeC	Ingleside loamy sand, 5 to 10 percent slopes	Farmland of statewide importance	13.6	15.1%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	19.5	21.6%
RoA	Rosedale loamy sand, 0 to 2 percent slopes	Prime farmland if irrigated	14.8	16.5%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	5.2	5.8%
Totals for Area of Interest			**90.0**	**100.0%**

Description

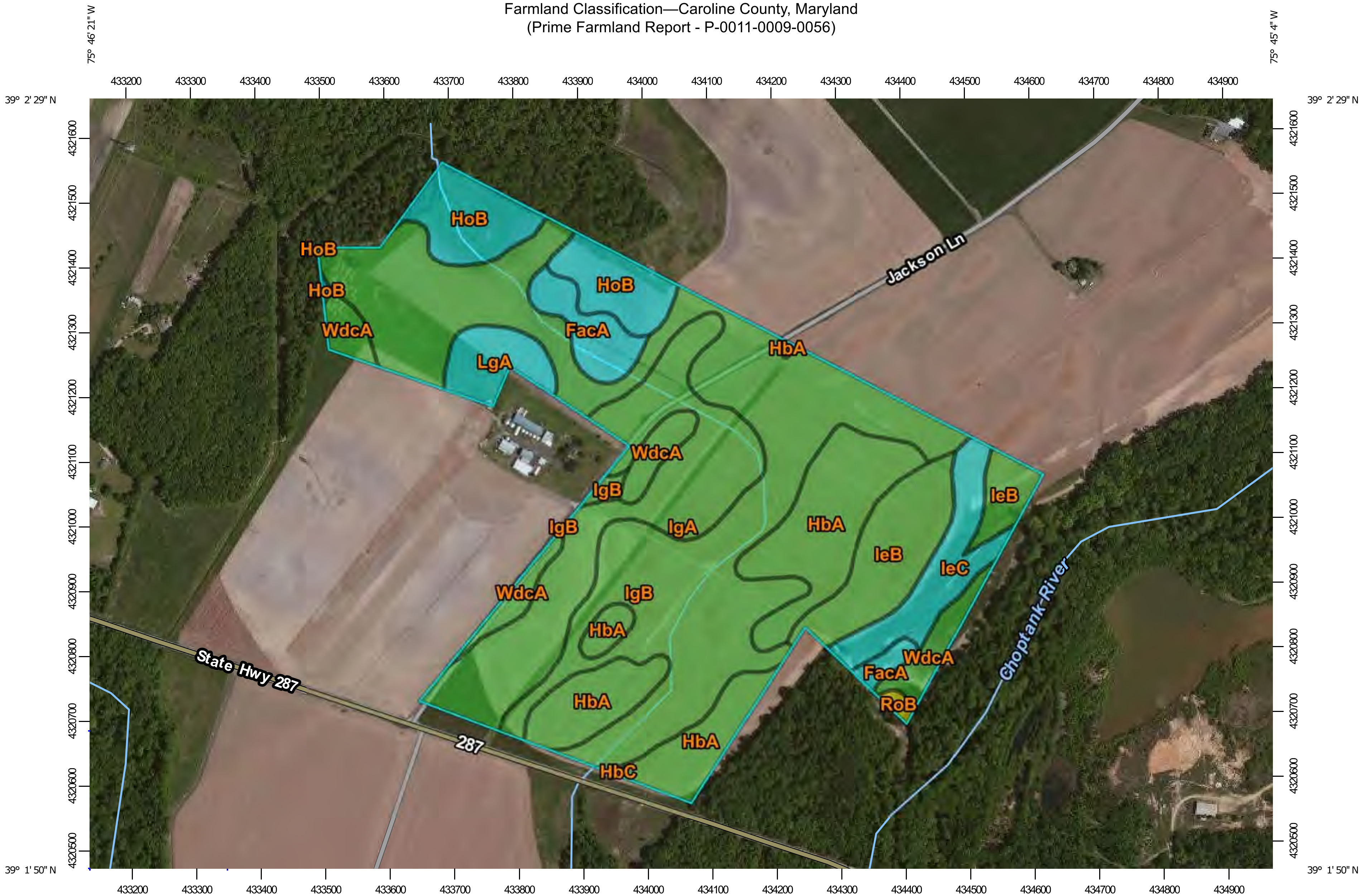
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

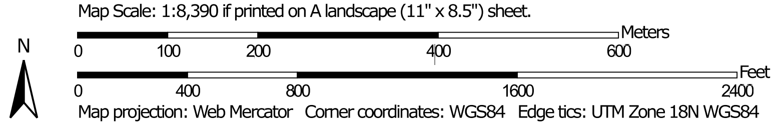
Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0009-0056)



Map Scale: 1:8,390 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

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Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	4.3	3.3%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	All areas are prime farmland	19.8	15.4%
HbC	Hambrook sandy loam, 5 to 10 percent slopes	Farmland of statewide importance	0.1	0.1%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	Farmland of statewide importance	9.4	7.3%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	All areas are prime farmland	9.8	7.6%
IeC	Ingleside loamy sand, 5 to 10 percent slopes	Farmland of statewide importance	6.1	4.8%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	All areas are prime farmland	19.2	14.9%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	49.4	38.4%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	3.5	2.8%
RoB	Rosedale loamy sand, 2 to 5 percent slopes	Prime farmland if irrigated	0.4	0.3%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	6.7	5.2%
Totals for Area of Interest			**128.8**	**100.0%**

Description

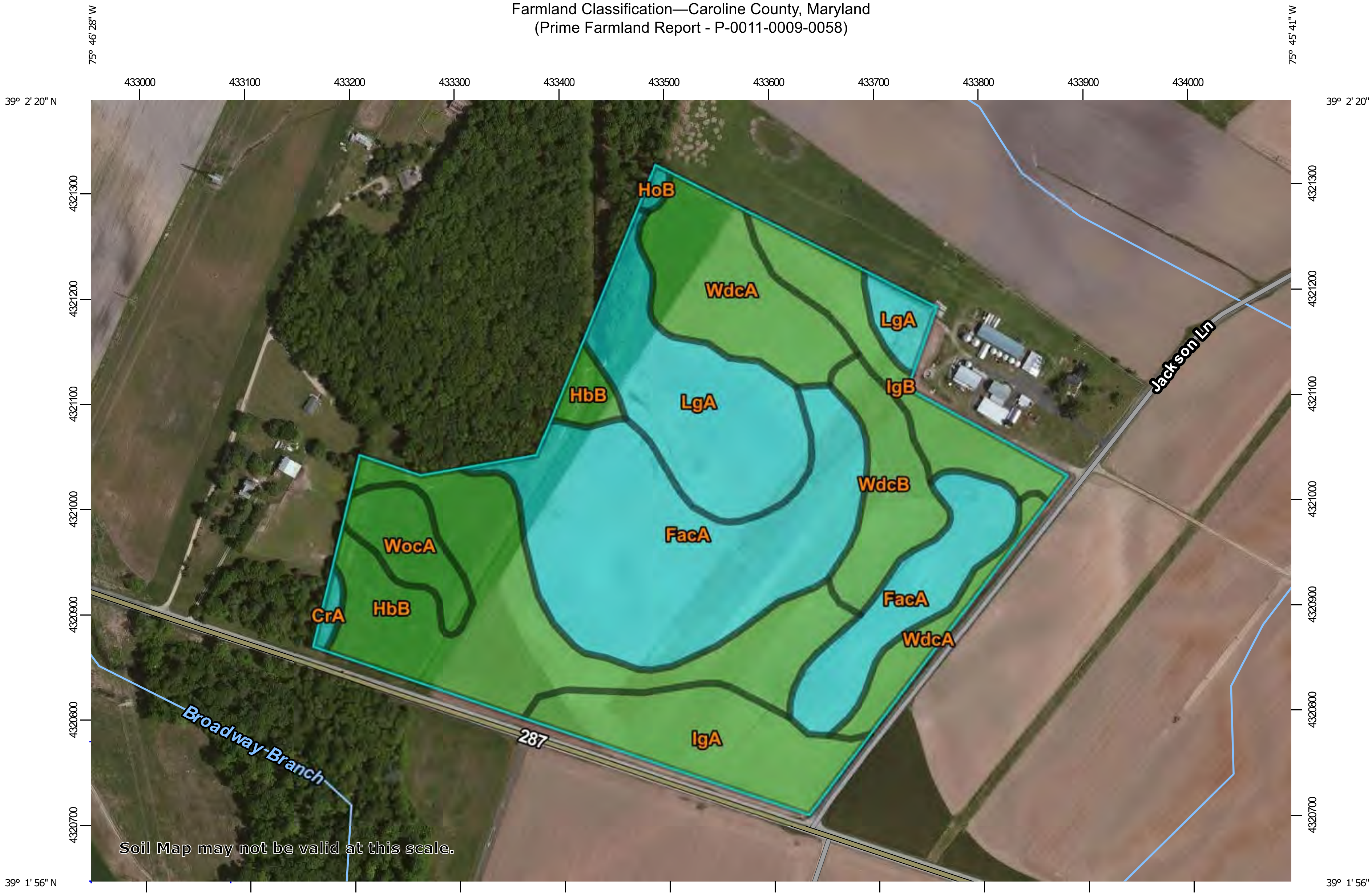
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0009-0058)



Map Scale: 1:5,240 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 50, 100, 200, 300

Feet: 0, 250, 500, 1000, 1500

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

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Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	Farmland of statewide importance	0.3	0.5%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	17.3	29.6%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	11.6	20.0%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	Farmland of statewide importance	0.2	0.3%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	All areas are prime farmland	5.1	8.7%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	3.6	6.2%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	8.0	13.7%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	6.9	11.8%
WdcB	Woodstown sandy loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	3.3	5.7%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	2.0	3.5%
Totals for Area of Interest			**58.3**	**100.0%**

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Prime and other Important Farmlands

This table lists the map units in the survey area that are considered important farmlands. Important farmlands consist of prime farmland, unique farmland, and farmland of statewide or local importance. This list does not constitute a recommendation for a particular land use.

In an effort to identify the extent and location of important farmlands, the Natural Resources Conservation Service, in cooperation with other interested Federal, State, and local government organizations, has inventoried land that can be used for the production of the Nation's food supply.

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. The water supply is dependable and of adequate quality. Prime farmland is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

For some of the soils identified in the table as prime farmland, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures.

A recent trend in land use in some areas has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops, such as citrus, tree nuts, olives, cranberries, and other fruits and vegetables. It has the special combination of soil quality, growing season, moisture supply, temperature, humidity, air drainage, elevation, and aspect needed for the soil to economically produce sustainable high yields of these crops when properly managed. The water supply is dependable and of adequate quality. Nearness to markets is an additional consideration. Unique farmland is not based on national criteria. It commonly is in areas where there is a special microclimate, such as the wine country in California.

In some areas, land that does not meet the criteria for prime or unique farmland is considered to be *farmland of statewide importance* for the production of food, feed, fiber, forage, and oilseed crops. The criteria for defining and delineating farmland of statewide importance are determined by the appropriate State agencies. Generally, this land includes areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some areas may produce as high a yield as prime farmland if conditions are favorable. Farmland of statewide importance may include tracts of land that have been designated for agriculture by State law.

In some areas that are not identified as having national or statewide importance, land is considered to be *farmland of local importance* for the production of food, feed, fiber, forage, and oilseed crops. This farmland is identified by the appropriate local agencies. Farmland of local importance may include tracts of land that have been designated for agriculture by local ordinance.

Report—Prime and other Important Farmlands

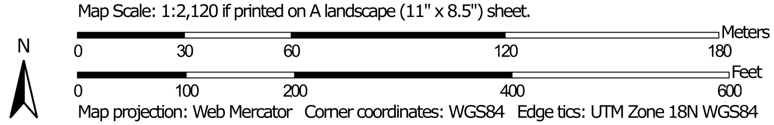
Prime and other Important Farmlands–Caroline County, Maryland		
Map Symbol	**Map Unit Name**	**Farmland Classification**
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	Farmland of statewide importance
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland
IeB	Ingleside loamy sand, 2 to 5 percent slopes	All areas are prime farmland
IeC	Ingleside loamy sand, 5 to 10 percent slopes	Farmland of statewide importance
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland
Za	Zekiah sandy loam, frequently flooded	Not prime farmland

Data Source Information

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0010-0011-0034)

Map Scale: 1:2,120 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

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

Soils

Soil Rating Polygons
- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines
- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points
- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

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Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Mar 16, 2017

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.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CoA	Corsica mucky loam, 0 to 2 percent slopes	Farmland of statewide importance	0.3	2.3%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Altlantic Coastal Plain	Farmland of statewide importance	6.4	43.4%
HcA	Hambrook loam, 0 to 2 percent slopes	All areas are prime farmland	2.5	17.2%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	All areas are prime farmland	0.0	0.3%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	1.4	9.4%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	4.0	27.3%
Totals for Area of Interest			**14.6**	**100.0%**

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

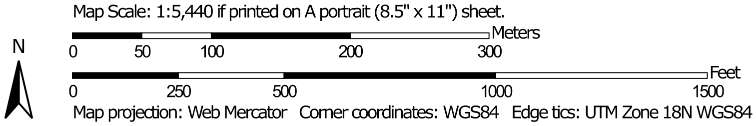
Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0010-0017-0025)

Map Scale: 1:5,440 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CoA	Corsica mucky loam, 0 to 2 percent slopes	Farmland of statewide importance	0.1	0.1%
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	Farmland of statewide importance	3.1	3.2%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Altlantic Coastal Plain	Farmland of statewide importance	22.0	22.6%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	All areas are prime farmland	2.5	2.6%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	11.8	12.1%
HcA	Hambrook loam, 0 to 2 percent slopes	All areas are prime farmland	14.9	15.3%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	12.3	12.6%
LhA	Lenni silt loam, 0 to 2 percent slopes	Farmland of statewide importance	3.1	3.2%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	4.5	4.6%
WdcB	Woodstown sandy loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	1.5	1.6%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	21.3	21.9%
Totals for Area of Interest			**97.2**	**100.0%**

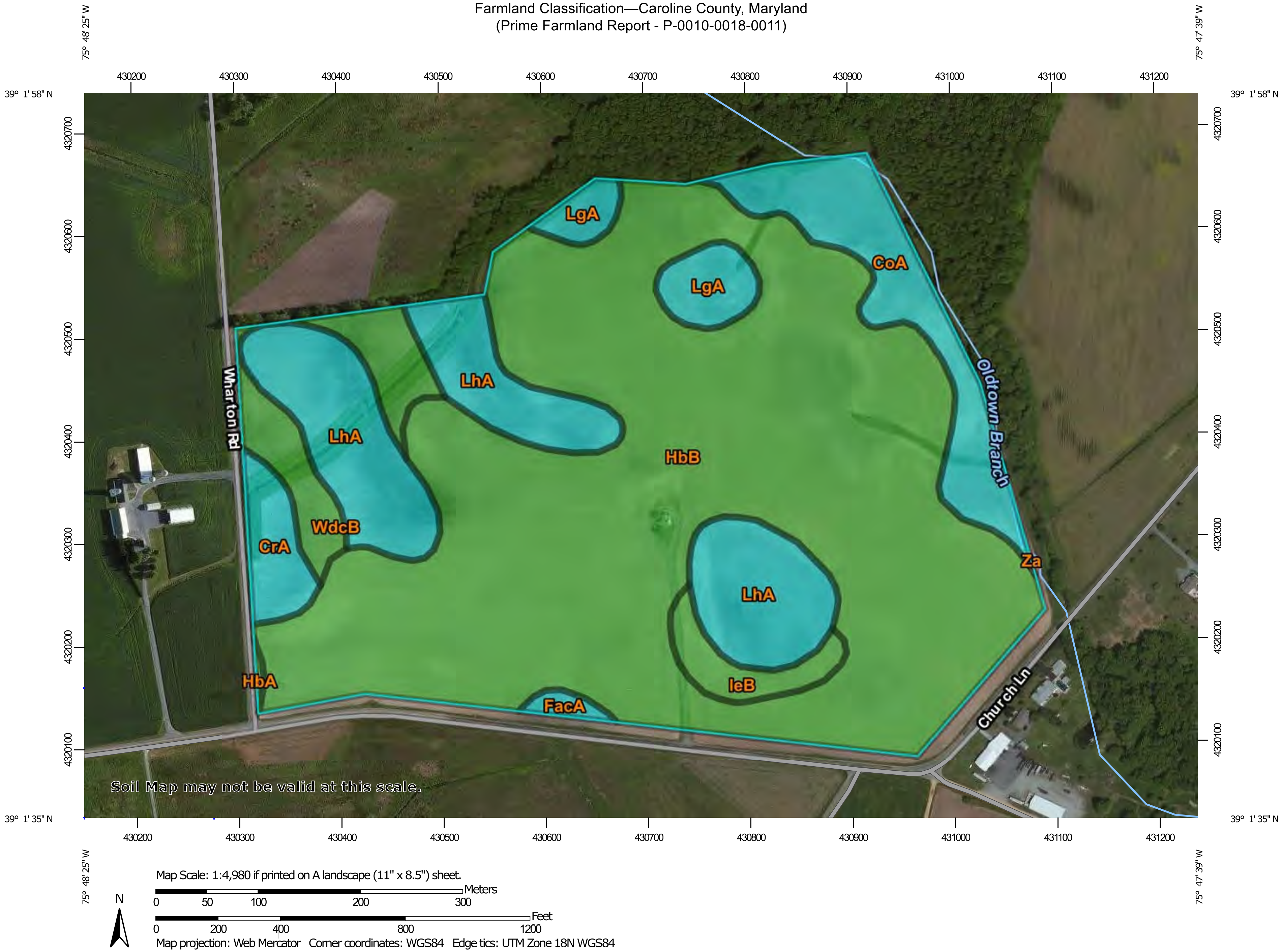
Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower


75° 48' 25" W
75° 47' 39" W
39° 1' 58" N
39° 1' 35" N
430200
430300
430400
430500
430600
430700
430800
430900
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431100
431200
4320700
4320600
4320500
4320400
4320300
4320200
4320100
LgA
LgA
CoA
LhA
LhA
LhA
HbB
WdcB
CrA
HbA
FacA
IeB
Za
Oldtown Branch
Wharton Rd
Church Ln
Soil Map may not be valid at this scale.
Map Scale: 1:4,980 if printed on A landscape (11" x 8.5") sheet.
Meters
0 50 100 200 300
Feet
0 200 400 800 1200
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CoA	Corsica mucky loam, 0 to 2 percent slopes	Farmland of statewide importance	6.3	7.3%
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	Farmland of statewide importance	1.9	2.2%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	0.4	0.5%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	All areas are prime farmland	0.1	0.1%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	56.4	65.6%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	All areas are prime farmland	1.7	2.0%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	2.4	2.8%
LhA	Lenni silt loam, 0 to 2 percent slopes	Farmland of statewide importance	12.9	15.0%
WdcB	Woodstown sandy loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	3.9	4.5%
Za	Zekiah sandy loam, frequently flooded	Not prime farmland	0.0	0.0%
Totals for Area of Interest			**85.9**	**100.0%**

Description

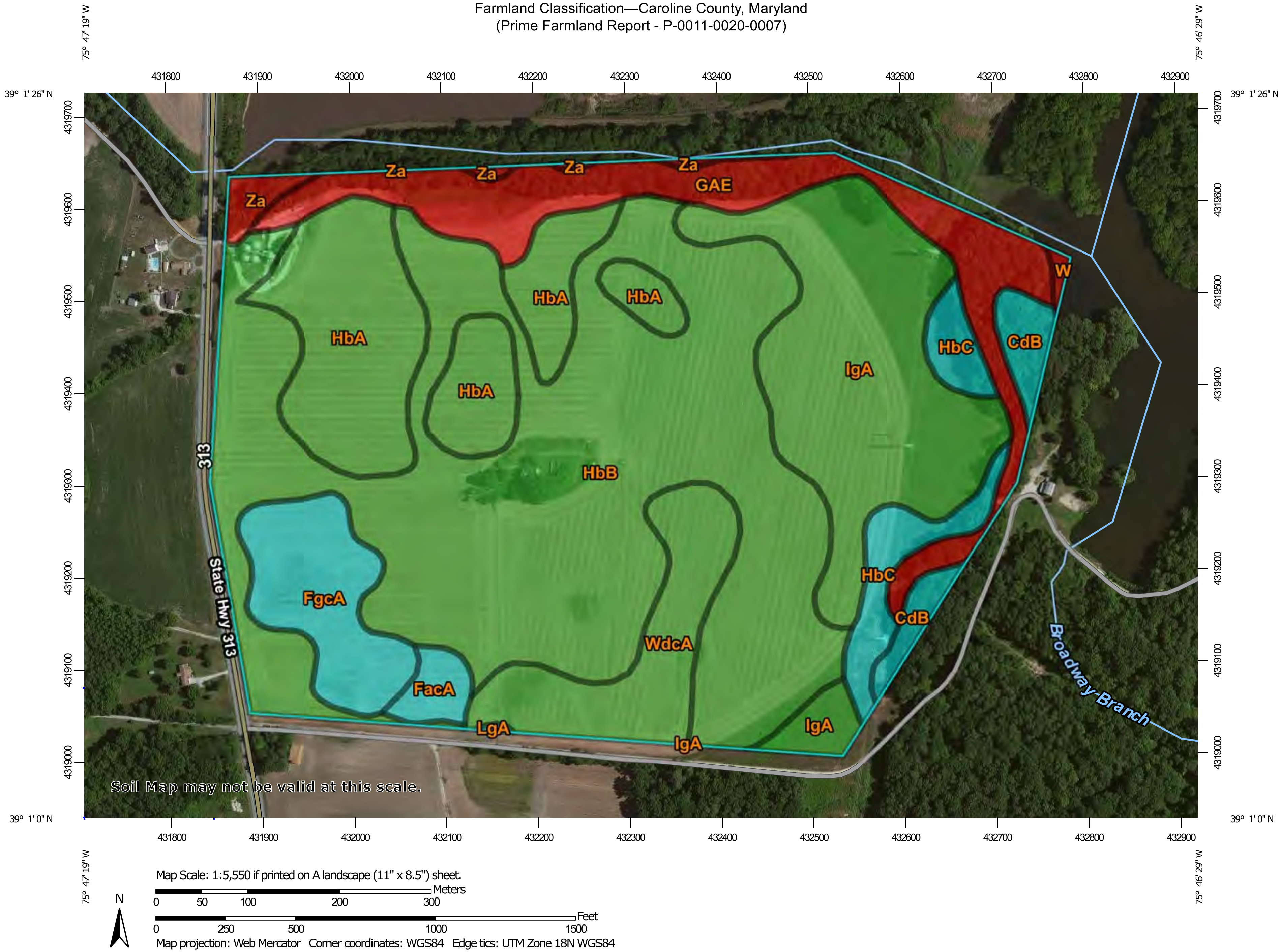
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0020-0007)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CdB	Cedartown loamy sand, 2 to 5 percent slopes	Farmland of statewide importance	2.5	2.0%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	1.4	1.1%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Altlantic Coastal Plain	Farmland of statewide importance	6.6	5.2%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	Not prime farmland	12.8	10.1%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	All areas are prime farmland	16.7	13.1%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	53.4	42.1%
HbC	Hambrook sandy loam, 5 to 10 percent slopes	Farmland of statewide importance	4.4	3.5%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	All areas are prime farmland	20.0	15.7%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	0.1	0.0%
W	Water	Not prime farmland	0.2	0.2%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	7.7	6.1%
Za	Zekiah sandy loam, frequently flooded	Not prime farmland	1.2	1.0%
Totals for Area of Interest			**126.9**	**100.0%**

Description

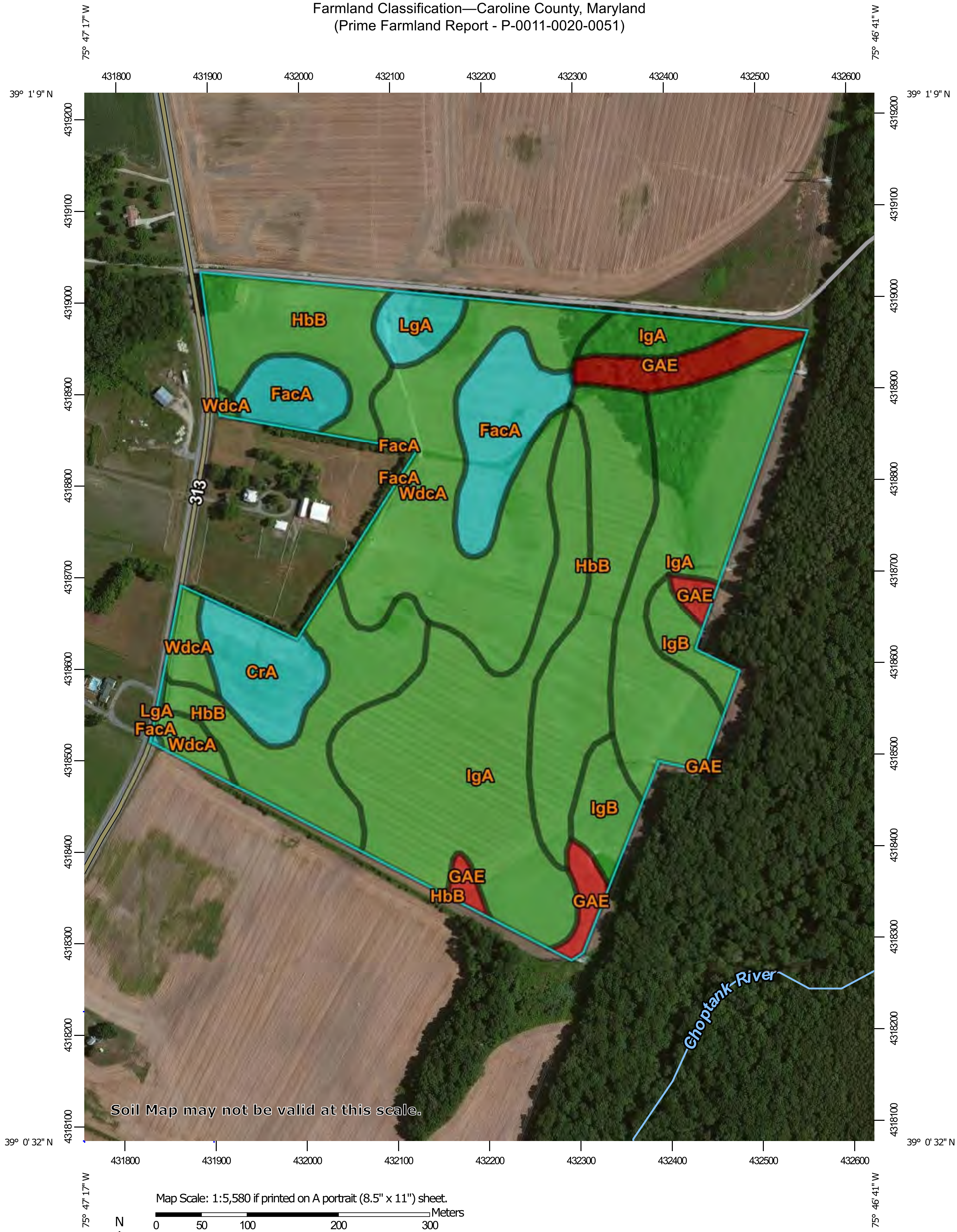
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0020-0051)



Map Scale: 1:5,580 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 50, 100, 200, 300

Feet: 0, 250, 500, 1000, 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	Farmland of statewide importance	3.4	4.2%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	6.3	7.8%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	Not prime farmland	3.8	4.7%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	20.0	24.8%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	All areas are prime farmland	27.7	34.2%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	3.2	3.9%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	1.5	1.9%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	15.0	18.5%
Totals for Area of Interest			**80.9**	**100.0%**

Description

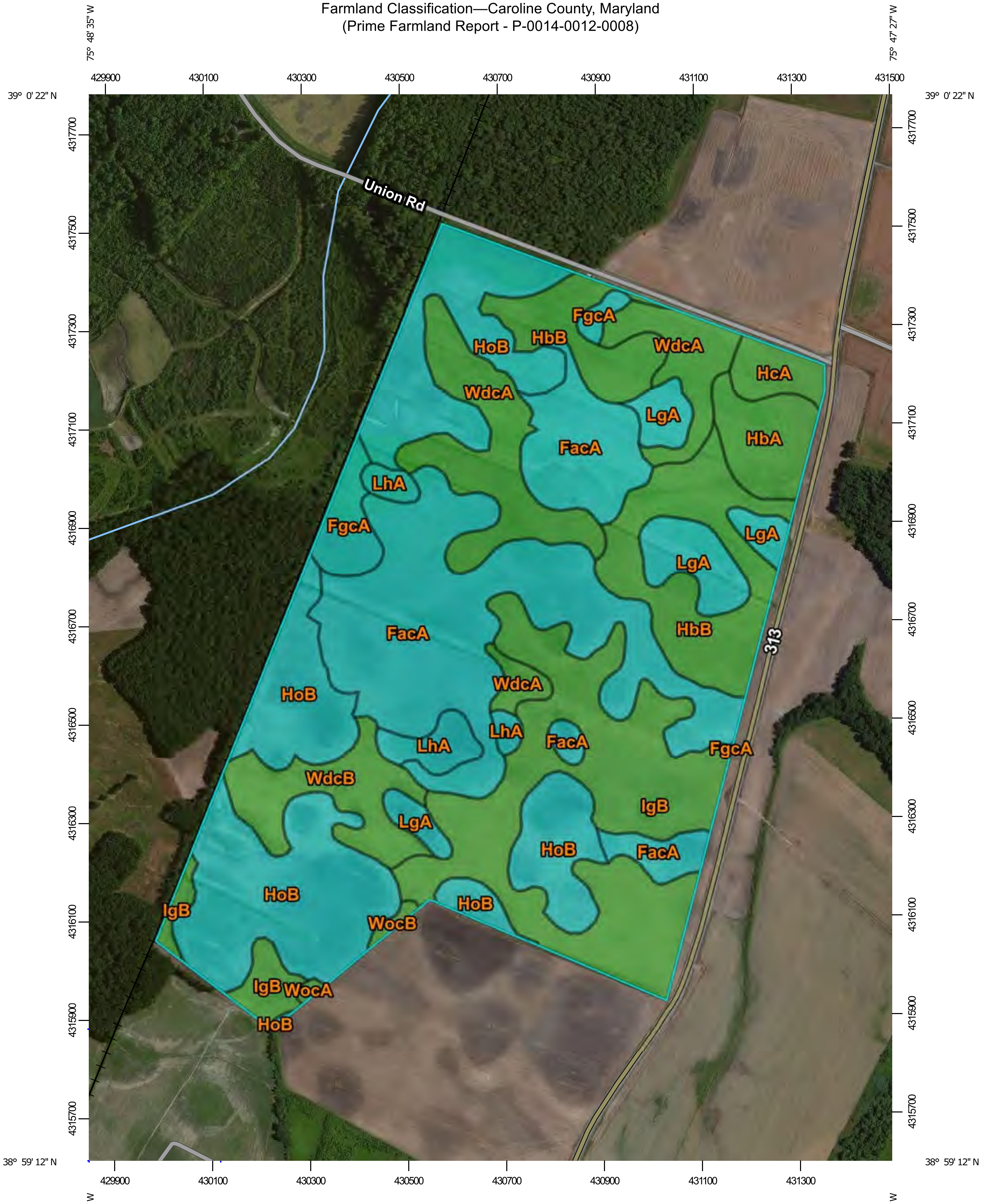
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0014-0012-0008)



Map Scale: 1:10,600 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 150, 300, 600, 900

Feet: 0, 500, 1000, 2000, 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	75.8	22.9%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Altlantic Coastal Plain	Farmland of statewide importance	6.7	2.0%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	All areas are prime farmland	9.2	2.8%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	33.0	9.9%
HcA	Hambrook loam, 0 to 2 percent slopes	All areas are prime farmland	4.6	1.4%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	Farmland of statewide importance	78.8	23.8%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	57.1	17.2%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	14.4	4.4%
LhA	Lenni silt loam, 0 to 2 percent slopes	Farmland of statewide importance	6.7	2.0%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	30.0	9.0%
WdcB	Woodstown sandy loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	13.9	4.2%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	0.4	0.1%
WocB	Woodstown loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	0.8	0.2%
Totals for Area of Interest			**331.3**	**100.0%**

Description

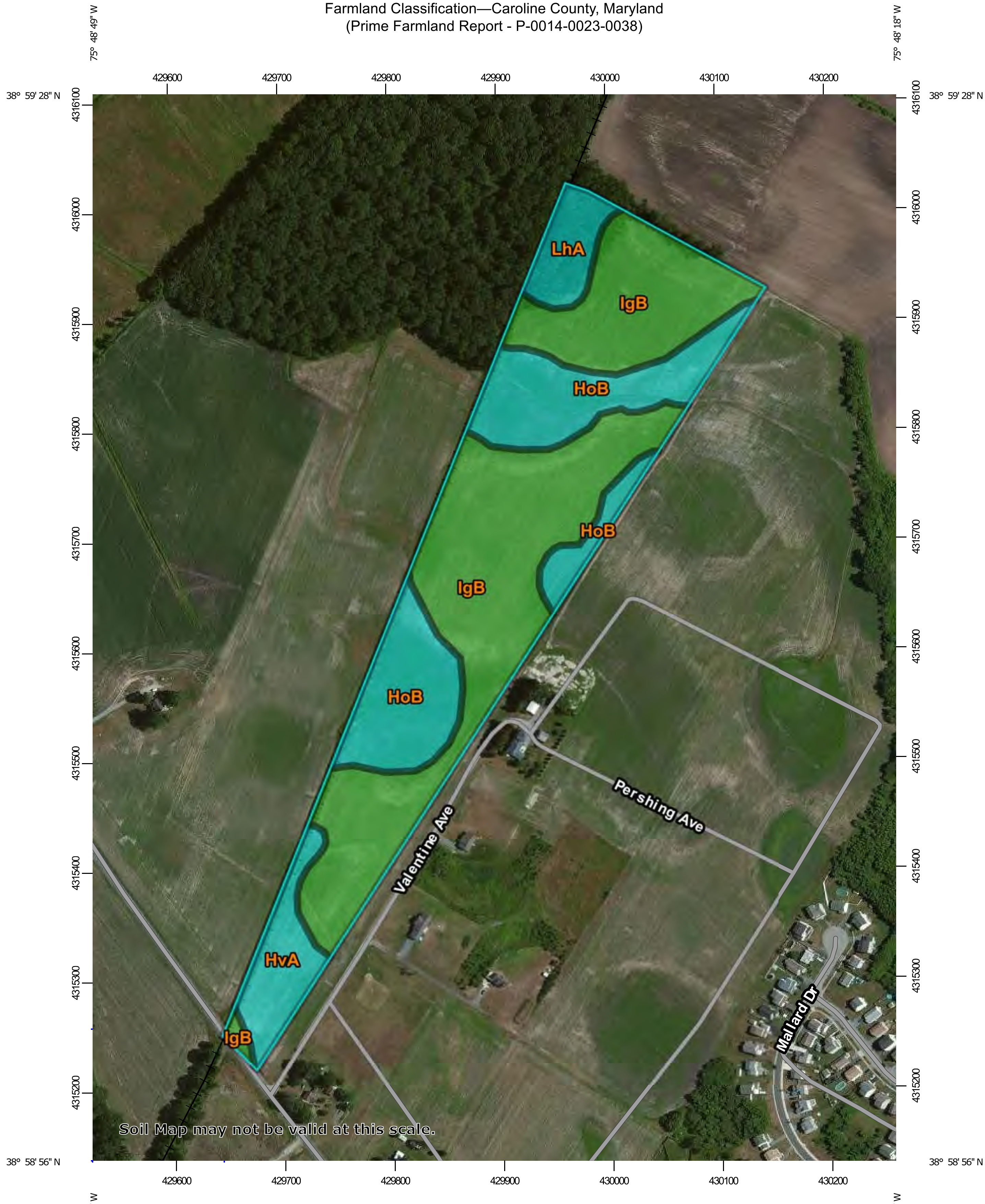
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0014-0023-0038)



Map Scale: 1:4,740 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 200, 400, 800, 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—Jul 4, 2010

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.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	Farmland of statewide importance	7.2	27.8%
HvA	Hurlock sandy loam, 0 to 2 percent slopes	Farmland of statewide importance	1.9	7.4%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	15.5	59.5%
LhA	Lenni silt loam, 0 to 2 percent slopes	Farmland of statewide importance	1.4	5.3%
Totals for Area of Interest			**26.0**	**100.0%**

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0015-0001-0066)

Map Scale: 1:5,800 if printed on A landscape (11" x 8.5") sheet.

N

0 50 100 200 300 Meters

0 250 500 1000 1500 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	0.9	1.0%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Altlantic Coastal Plain	Farmland of statewide importance	29.7	35.3%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	Not prime farmland	0.7	0.8%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	25.2	29.9%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	All areas are prime farmland	7.6	9.1%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	11.4	13.5%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	4.9	5.9%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	3.8	4.5%
Totals for Area of Interest			**84.2**	**100.0%**

Description

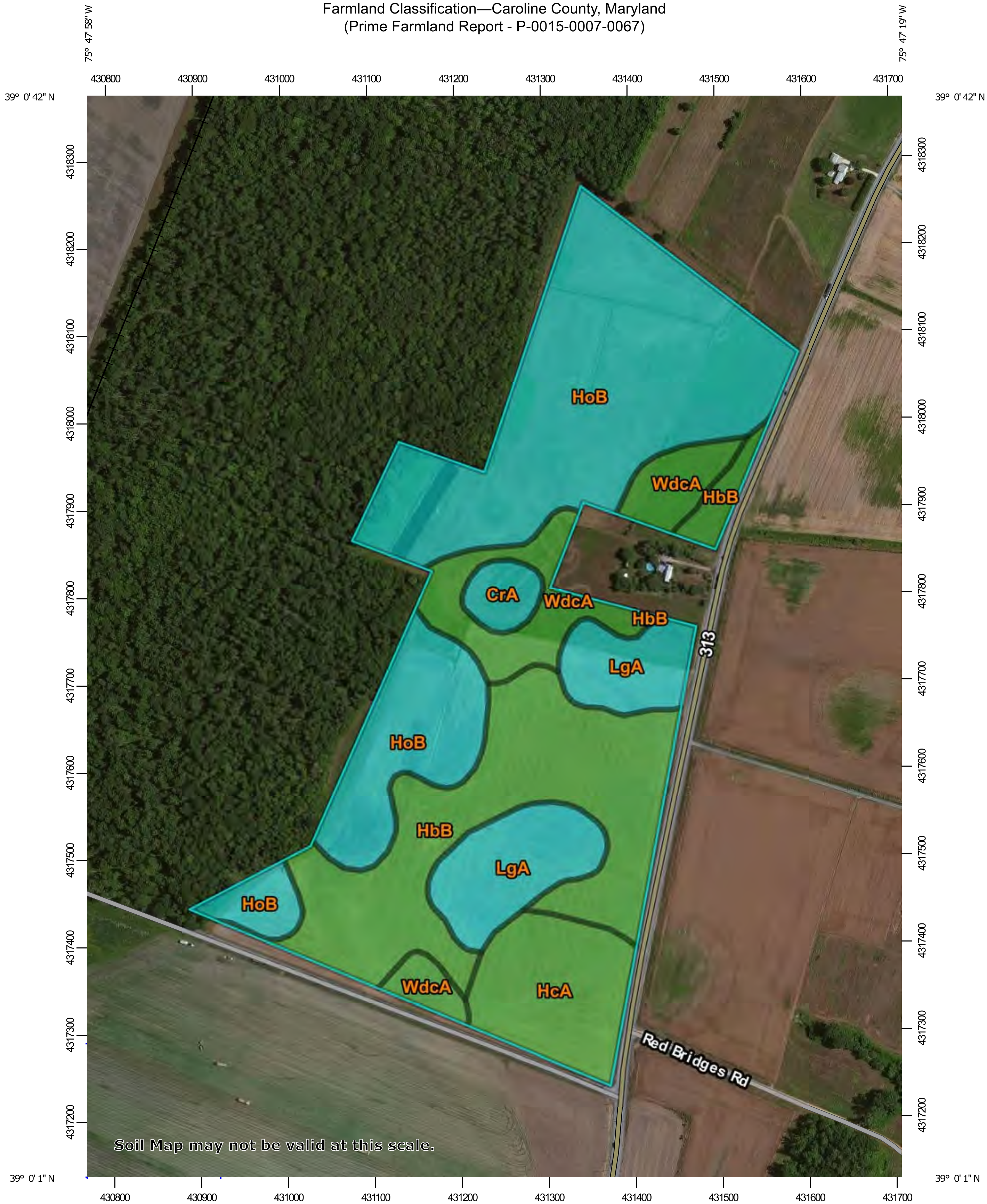
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0015-0007-0067)



Map Scale: 1:6,040 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 250, 500, 1000, 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

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

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	Farmland of statewide importance	1.4	1.9%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	18.8	25.1%
HcA	Hambrook loam, 0 to 2 percent slopes	All areas are prime farmland	6.7	9.0%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	Farmland of statewide importance	31.8	42.4%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	8.5	11.3%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	7.8	10.4%
Totals for Area of Interest			**75.0**	**100.0%**

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0024-0024-0016)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

MAP INFORMATION

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Caroline County, Maryland
Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—Jul 4, 2010

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.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
HnA	Hammonton sandy loam, 0 to 2 percent slopes	All areas are prime farmland	1.8	2.6%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	Farmland of statewide importance	22.5	33.4%
HvA	Hurlock sandy loam, 0 to 2 percent slopes	Farmland of statewide importance	8.3	12.4%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	25.4	37.6%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	2.7	4.0%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	4.2	6.2%
WocB	Woodstown loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	2.6	3.8%
Totals for Area of Interest			**67.4**	**100.0%**

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

APPENDIX 3

Caroline County Solar Ordinance

COUNTY COMMISSIONERS OF CAROLINE COUNTY, MARYLAND

ORDINANCE #2017-2

PUBLIC HEARING:	OCTOBER 17, 2017; BEGINNING AT 6:15 PM COURTHOUSE, 109 MARKET STREET, ROOM 106, DENTON, MARYLAND
ENACTED:	DECEMBER 12, 2017
EFFECTIVE:	DECEMBER 12, 2017

Chapter 175 – Zoning – Solar Energy Systems

AN Act concerning Solar Energy Systems in Caroline County; **FOR** the purpose of revising the Zoning chapter to permit and provide conditions for Accessory and Commercial Solar Energy Systems; **BY** repealing and reenacting, with amendments, and transferring §175-85 to §175-46 of the Code of Public Local Laws of Caroline County and **BY** renumbering §175-86 to §175-85 of the Code of Public Local Laws of Caroline County, Maryland.

Short Title

This Act may be referred to as Chapter 175 – Zoning – Solar Energy Systems.

WHEREAS, the County Commissioners of Caroline County, Maryland (the "County Commissioners") are authorized under the Land Use Article, Title 4 of the Annotated Code of Maryland to enact and administer zoning and land use ordinances; and

WHEREAS, the Commissioners established a temporary moratorium on the permitting of certain solar energy systems via Resolution #2017-008 (the "Resolution") in order to evaluate the taxing, siting and construction of additional solar energy systems and current requirements for such systems in light of changing technology, changing consumer demands, and changes to existing infrastructure in the County; and

WHEREAS, the Resolution established a workgroup to review Land Use Issues (the "Workgroup") related to the subject of the temporary moratorium; and

WHEREAS, the Workgroup held several public meetings to study relevant data, different legislative and regulatory models, industry best practices, and other pertinent information, in the context of the goals of the Caroline County Comprehensive Plan; and

WHEREAS, as the result of its study, the Workgroup recommended certain changes to the Zoning Chapter of the Code of Public Local Laws of Caroline County, Maryland (the "Code") to the Caroline County Planning Commission ("Planning Commission"); and

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WHEREAS, the County Commissioners have received the positive recommendation of the Planning Commission the staff of the Caroline County Department of Planning and Codes regarding the textual amendments proposed in this Ordinance, as reflected herein; and

WHEREAS, the County Commissioners have determined this Ordinance is necessary and appropriate to protect and improve the general health, safety, and welfare of the County and its residents; and

WHEREAS, this Ordinance may also be known by its short title "Chapter 175 – Zoning – Solar Energy Systems."

NOW, THEREFORE, be it enacted by the County Commissioners of Caroline County, Maryland, that:

SECTION 1. §175-8, Definitions, of the Code of Public Local Laws of Caroline County, Maryland is hereby repealed and reenacted, with amendments as follows:

ARTICLE II
Definitions

§175-8. Word usage; terms defined

B. Terms defined. As used in this chapter, the following terms shall have the meanings indicated:

Solar ~~power plants~~ **ENERGY SYSTEMS**

~~A mid- or utility-scale commercial facility comprised of one or more freestanding, ground-mounted devices that converts sunlight into electricity, whether by photovoltaics (PV), concentrating solar thermal devices (CST) or various experimental solar technologies, for the primary purpose of wholesale or retail sales of generated electricity.~~

~~(1) Concentrating Solar Thermal Devices~~

~~Also known as "concentrated solar thermal power (CST)" are systems that use lenses or mirrors, and often tracking systems, to focus or reflect a large area of sunlight into a small area. The concentrated energy is absorbed by a transfer fluid or gas and used as a heat source for either a conventional power plant, such as a steam power plant, or a power conversion unit, such as a sterling engine.~~

~~(2) Photovoltaics~~

~~A technology that converts light directly into electricity. Photovoltaic (PV) systems and concentrated photovoltaic (CPV) systems are included within this definition.~~

ACCESSORY: ANY ROOF MOUNTED OR FREESTANDING SOLAR ARRAY THAT IS ACCESSORY TO AND INCORPORATED INTO THE DEVELOPMENT OF AN AUTHORIZED USE ON A PARCEL, AND WHICH ARE DESIGNED FOR THE PURPOSE OF REDUCING OR MEETING ON-SITE ENERGY NEEDS.

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COMMERCIAL: A NON-ACCESSORY COMMERCIAL FACILITY, INCLUDING SHARED COMMUNITY FACILITIES, COMPRISED OF ONE OR MORE FREESTANDING, GROUND MOUNTED DEVICES THAT CONVERTS SUNLIGHT INTO ELECTRICITY FOR THE PRIMARY PURPOSE OF WHOLESALE OR RETAIL SALES OF GENERATED ELECTRICITY. A SOLAR ENERGY SYSTEM MAY BE MADE UP OF 1 OR MORE PARCELS. UTILITY CONNECTIONS ARE NOT SUBJECT TO SOLAR ENERGY SYSTEM REGULATIONS.

(1) SMALL SCALE
A SOLAR ENERGY SYSTEM THAT IS ENGINEERED AND DESIGNED TO PRODUCE UP TO TWO MEGAWATTS (2 MW) OF POWER.

(2) LARGE SCALE – A SOLAR ENERGY SYSTEM THAT IS ENGINEERED AND DESIGNED TO PRODUCE OVER TWO MEGAWATTS (2 MW) OF POWER

SECTION 2. §175-85, Solar Power Plants, of the Code of Public Local Laws of Caroline County, Maryland is hereby repealed and reenacted, with amendments as follows:

ARTICLE IX
Accessory Structures and Uses

§ 175-85. Solar **ENERGY SYSTEMS** ~~power plant~~.

A. **SITING.** ~~Permitted locations.~~ **A COMMERCIAL SOLAR ENERGY SYSTEM** ~~solar power plant~~ that complies with the provisions of this section may be permitted as described in § 175-13, table of uses **EXCEPT AS FOLLOWS:**~~.~~

(1) THE COMBINED ADDITIONAL AGGREGATE ACREAGE OF COMMERCIAL SOLAR ENERGY SYSTEMS UTILIZED THROUGHOUT THE COUNTY SHALL NOT EXCEED ~~**3000**~~ ***2000*** **ACRES.**

(2) PARCELS LOCATED IN THE TRANSFERABLE DCEVELOPMENT RIGHTS RECEIVING AREAS.

(3) ***PARCELS UNDER LAND PRESERVATION EASEMENTS EXCEPTING RIGHTS OF WAY FOR INFRASTRUCTURE BURIED AT LEAST THREE (3) FEET.***

(4) WHERE SOLAR ENERGY SYSTEMS ARE PROPOSED FOR PARCELS IDENTIFIED AS "GREENBELTS" OR "GROWTH AREAS" IN ANY COMPREHENSIVE PLAN FOR AN INCORPORATED MUNICIPALITY, THE IMPACTED JURISDICTION MUST BE NOTIFIED.

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B. Design standards.

~~Minimum lot size. No concentrated solar power plant shall be erected on any lot less than forty (40) acres in size. No photovoltaic solar power plant shall be erected on any lot less than ten (10) acres in size.~~ Siting. Considerations **SHALL** ~~should~~ be made to siting such as avoiding areas/locations with a high potential for biological conflict such as wilderness study areas, areas of environmental concern, county and state parks, historic trails, special management areas or important wildlife habitat or corridors; avoiding **SIGNIFICANT IMPACTS TO** visual corridors that are prominent scenic viewsheds, or scenic areas designated by the county; avoiding **SIGNIFICANT IMPACTS TO** areas of erodible slopes and soils, where concerns for water quality, severe erosion, **AND**/or high storm runoff potential have been identified; and avoiding known sensitive historical, cultural or archeological resources.

(1) **SCREENING. CONSIDERATIONS SHALL BE MADE FOR VISUAL SCREENING TO ENSURE THE SOLAR ENERGY SYSTEM DOES NOT CAUSE NEGATIVE SIGNIFICANT IMPACTS TO THE AESTHETIC AND SCENIC QUALITY OF THE PROJECT AREA/LOCATION. WHERE SCREENING BUFFERS ARE REQUIRED, THEY SHALL BE OPAQUE WITHIN 3 YEARS AND SHALL CONSIST OF MIXED VEGETATION INCLUDING TREES, SHRUBS, AND ORNAMENTAL GRASSES. WHERE APPROPRIATE, POLLINATOR HABITAT MAY BE USED IN LIEU OF SCREENING BUFFERS.**

(2) Tree removal. The structures comprising the solar facility shall be constructed and located in a manner so as to minimize the necessity to remove existing trees upon the **PARCEL**~~lot~~, and in no event shall wooded acreage comprising more than 2% of the deeded acreage of the **PARCEL**~~lot~~ or portion of the **PARCEL**~~lot~~ devoted to the solar facility use be removed without demonstrating that such removal is necessary for the reasonable construction and efficient performance of the use.

(3) Setbacks.

(A) REQUIRED SETBACKS. SOLAR **ENERGY** system structures shall meet the minimum zoning setback for the zoning district in which located, or twenty-five (25) feet, whichever is greater. In addition, solar **ENERGY SYSTEMS** ~~power plant structures~~ must be located at least **TWO** ~~one~~ hundred feet from all residentially zoned **PARCELS**~~lot~~ and existing residences.

(B) SETBACK MODIFICTIONS. MODIFICATIONS FROM THESE REQUIREMENTS MAY BE GRANTED BY OWNERS OF RESIDENTIALLY ZONED PARCELS OR EXISTING RESIDENCES PROVIDED A SETBACK MODIFICATION AGREEMENT IS SUBMITTED. A SETBACK MODIFICATION AGREEMENT SHALL BE REQUIRED FOR EACH PROPERTY LINE ABUTTING A SOLAR ENERGY SYSTEM STRUCTURE FOR WHICH A MODIFICATION IS REQUESTED AND SHALL SET FORTH THE PROPERTY OWNERS' CONSENT TO A MODIFIED SETBACK. SETBACK

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MODIFICATIONS ON ANY PARCEL SHALL NOT BE INTERPRETED AS APPLYING TO REQUIRED SETBACKS FROM ANY OTHER PARCEL. SETBACK MODIFICATION AGREEMENTS SHALL BE IN A FORM PROVIDED FROM THE DEPARTMENT AND AFTER REVIEW SHALL BE FILED IN THE LAND RECORDS FOR CAROLINE COUNTY. **WHERE A SOLAR ENERGY SYSTEM ENCOMPASSES MULTIPLE PARCELS, SETBACKS SHALL NOT BE REQUIRED FROM INNER PARCEL BOUNDARY LINES.** Additional setbacks may be required to mitigate **AESTHETIC,** noise, **SAFETY,** ~~and~~ glare, **OR ANY OTHER IDENTIFIED SIGNIFICANT** impacts, or to provide for designated road or utility corridors.

(C) INTENT. SETBACK MODIFICATIONS RUN FOR THE DURATION OF THE UNDERLYING SOLAR ENERGY SYSTEM CONTRACT AND DO NOT RUN WITH THE LAND. THIS SECTION SHALL NOT BE CONSTRUED TO ALLOW A PROPERTY OWNER TO MODIFY A SETBACK FOR ANY OTHER PROPERTY OWNER.

(4) Height. Solar ~~power electric generation~~ **ENERGY SYSTEM PANEL** structures shall not exceed the height of fifteen (15) feet as measured from the grade at the base of the structure to the apex of the structure. **NECESSARY ACCESSORY STRUCTURES (E.G. LIGHTNING RODS) ARE SUBJECT TO APPROVAL.**

(5) Utility connections. Reasonable efforts shall be made to place all utility connections from the solar installation underground, depending on appropriate soil conditions, shape, and topography of the site and any requirements of the utility provider. Electrical transformers for utility interconnections may be above ground if required by the utility provider. All electrical interconnections and distribution components must comply with all applicable codes and public utility requirements.

(6) Visibility. Solar **ENERGY** systems shall be designed to blend into the architecture of the building or be screened from routine view from public right-of-ways or adjacent residentially-zoned **PARCELS**~~property~~. To the extent reasonably possible, use materials, colors, and textures that will blend the facility into the existing environment.

(7) Glare. No solar **ENERGY SYSTEM** ~~power plant~~ shall produce glare that would constitute a nuisance to occupants of neighboring **PARCELS**~~properties~~ or persons traveling neighboring roads.

(8) Lighting. Lighting of the solar **ENERGY SYSTEM** ~~power plant~~ and accessory structures shall be limited to the minimum necessary for safety and operational purposes, and shall be reasonably shielded from abutting properties. **LIGHTING SHALL BE ACTIVATED BY MOTION SENSORS AND SHALL BE FULLY SHIELDED AND DOWNCAST TO PREVENT LIGHT FROM SHINING ONTO ADJACENT PARCELS OR INTO THE NIGHT SKY.**

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(9) Fencing. A secure chain-link fence at least **SIX** ~~seven~~ feet in height shall enclose the entire solar **ENERGY SYSTEM** ~~facility~~ to restrict unauthorized access.

(10) **IN ADDITION TO THESE DESIGN STANDARDS, ALL SOLAR ENERGY SYSTEMS SHALL MEET ALL APPLICABLE STATE REGULATIONS AND PERMIT REQUIREMENTS.** ~~Screening. Every abutting property shall be visually screened from the project through any one or combination of the following: location, distance, plantings, existing vegetation or fencing~~

C. Decommissioning. The solar **ENERGY SYSTEM** ~~electricity facility~~ shall be completely decommissioned by the facility owner within twelve (12) months after the end of the **ENERGY PRODUCING** ~~useful life~~, abandonment or termination of such facility. Decommissioning shall include removal of all solar electric systems, buildings, cabling, electrical components, roads, foundations, pilings, and any other associated facilities, **TO THE EXTENT** ~~so~~ that any agricultural ground upon which the facility was located is again tillable and suitable for agricultural uses. **ANY COMPONENTS OF THE SOLAR ENERGY SYSTEM BURIED GREATER THAN THREE (3) FEET MAY REMAIN TO AVOID UNECESSARY TOPSOIL DISTRUBANCE.** Disturbed earth shall be graded and re-seeded unless the land owner requests in writing that the access roads or other land surface areas not be restored. The owner of the facility shall secure the costs of decommissioning by appropriate bond, letter of credit, or escrow agreement satisfactory to the county and shall include a mechanism for calculating increased removal costs due to inflation. **BOTH A DECOMISSIONING PLAN AND** ~~Such~~ estimate costs shall be submitted by the owner and subject to approval by the county prior to issuance of any permits required.

D. Signs. **A SIGN, NOT TO EXCEED ONE (1) SQUARE FOOT, SHALL BE POSTED AT EACH ENTRANCE TO THE SOLAR ENERGY SYSTEM TO IDENTIFY THE PROPERTY OWNER, THE SOLAR ENERGY SYSTEM OWNER, AND 24-HOUR EMERGENCY CONTACT PHONE NUMBER, AND** ~~The manufacturers' or installers' identification and~~ 24-hour emergency contact phone number. **INFORMATON ON THE SIGN SHALL BE KEPT CURRENT. THE SIGN** shall be ~~provided along with appropriate warning signage shall be~~ posted at the site in a clearly visible manner.

E. ~~Interconnection agreement. A copy of the interconnection agreement with the local electric utility company must be provided or a written explanation from the utility company outlining why an interconnection agreement is not necessary for the installation of an interconnected customer-owned generator.~~ Agreements/easements. If the land on which the project is proposed is to be leased, rather than owned, by the solar energy development company, all property within the project boundary must be included in a recorded easement(s), lease(s) or consent agreement(s) specifying the applicable uses for the duration of the project.

~~G.~~ **F.** Public safety. Identify and address any known or suspected potential hazards to adjacent properties, public roadways, communities, aviation, etc., which may be created by the project.

~~H.~~ **G.** FAA. Must demonstrate compliance with federal aviation administration (faa) regulations pertaining to hazards to air navigation.

~~I.~~ **H.** Project rationale. Project rationale, including estimated construction schedule, project life, phasing, and likely buyers or markets for the generated energy must be provided.

~~J.~~ **I.** Site and development plans. A site plan drawn at an appropriate scale shall be provided identifying the following:

(1) AT THE TIME OF APPLICATION, A CONCEPT PLAN DRAWN AT AN APPROPRIATE SCALE SHALL BE PROVIDED IDENTIFYING THE FOLLOWING:

i. A COPY OF THE INTERCONNECTION APPLICATION OR A WRITTEN EXPLANATION WHY AN INTERCONNECTION AGREEMENT IS NOT NECESSARY FOR AN INTERCONNECTED CUSTOMER-OWNED GENERATOR.

~~1)~~ **ii. PARCEL** ~~Property~~ lines, setbacks and physical features including access routes and proposed road improvements;

~~2)~~ **iii.** All existing and proposed structures including impervious surface calculations;

~~3)~~ **iv.** Proposed changes to the landscape of the site, grading, vegetation clearing and planting, exterior lighting, and screening vegetation or structures;

~~4) Blueprints or drawings of the solar installation showing the proposed layout of the system and any potential shading from nearby structures or vegetation;~~

~~5)~~ **v.** Any existing residential dwellings within one-quarter mile of **THE SOLAR ENERGY SYSTEM PROJECT** ~~a photovoltaic solar project or one-half mile of a concentrated solar project~~;

~~6)~~ **vi.** Existing utilities and transmission lines, proposed utility lines, and utility and maintenance structures

~~7)~~ **vii.** Existing topographic contours and mapped soils;

~~8)~~ **viii.** Existing vegetation (list type and percent of coverage; i.e. grassland, plowed field, wooded areas, etc.)

~~9)~~ **ix.** Revegetation areas and methods;

~~10)~~ **x.** Dust and sediment and erosion control;

~~11)~~ **xi.** Proposed stormwater management measures;

~~12)~~ **xii.** Any floodplains or wetlands; and

~~13)~~ **xiii.** Fencing **LOCATION** ~~details~~

~~14)~~ **xiv.** Total site acreage;

~~15)~~ **xv.** Landscape and buffer areas;

~~16) The number of panels to be installed, the proposed location and spacing of solar panels, and location of any associated accessory structures~~

~~17) An operation and maintenance plan~~

~~18) Landscape plan.~~

(2) **BEFORE FINAL APPROVAL, A MAJOR SITE PLAN DRAWN AT AN APPROPRIATE SCALE SHALL BE PROVIDED IDENTIFYING ALL ITEMS LISTED IN (1), AS WELL AS:**

i. **ENGINEERED DRAWINGS OF THE SOLAR INSTALLATION SHOWING THE PROPOSED LAYOUT OF THE SYSTEM AND ANY POTENTIAL SHADING FROM NEARBY STRUCTURES OR VEGETATION;**

ii. **THE NUMBER OF PANELS TO BE INSTALLED, THE PROPOSED LOCATION AND SPACING OF SOLAR PANELS, AND LOCATION OF ANY ASSOCIATED ACCESSORY STRUCTURES**

iii. **AN OPERATION AND MAINTENANCE PLAN**

iv. **LANDSCAPE AND LANDSCAPE MAINTENANCE PLAN**

v. **A COPY OF THE INTERCONNECTION AGREEMENT OR A WRITTEN EXPLANATION WHY AN INTERCONNECTION AGREEMENT IS NOT NECESSARY.**

SECTION 3. §175-85, Solar Energy Systems, of the Code of Public Local Laws of Caroline County, Maryland is hereby transferred to § Article V – Supplementary Regulation, Section 175-46.

SECTION 4. §175-86, Accessory Ground-Mounted Solar Power Electric Generation Structures, of the Code of Public Local Laws of Caroline County, Maryland is hereby renumbered as to § Article IV – Accessory Structures and Uses, Section 175-85.

SECTION 5. Matter deleted is shown by ~~strikethrough~~. Matter added is shown in **BOLD CAPITALIZATION.** Matter added by Amendment is shown by ***BOLD ITALICIZED CAPITALIZATION***. Matter deleted by Amendment is shown by ~~double strikethrough~~.

SECTION 6. The Recitals to this Ordinance are incorporated herein and deemed a substantive part of this Bill.

SECTION 7. The provisions of this Ordinance are declared to be severable. If any section, subsection, sentence, clause, phrase, or portion of this Ordinance is for any reason held invalid or unconstitutional by any court or competent jurisdiction, the same shall be deemed separate, distinct, and independent from, and such holding shall not affect the validity of, the remaining portions of this Ordinance, it being the intent of the County that this Ordinance shall stand, notwithstanding the invalidity of any section, subsection, sentence, clause, phrase, or portion hereof.

SECTION 8. The Publishers of the Code of Public Local Laws of Caroline County, Maryland (the "Code") in consultation with and subject to the approval of the County shall make non-substantive corrections to codification, style, capitalization, punctuation, grammar, spelling, organization, and any internal or external reference or citations to the Code that is incorrect or

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obsolete, with no further action required by the County Commissioners. All such corrections shall be adequately referenced and described in the editor's note following the section affected.

SECTION 9. The title of this Ordinance, or a condensed version thereof, shall be deemed to be, and is, a fair summary of this Ordinance for publication and all other purposes.

SECTION 10. This Ordinance shall take effect on December 12, 2017

Enacted this 12th day of December 2017.

ATTEST:

Jennifer M. Farina
Administrative Coordinator

(SEAL)

COUNTY COMMISSIONERS OF CAROLINE COUNTY, MARYLAND

Daniel J. Franklin, President

Larry C. Porter, Vice President

Wilbur Levengood, Jr., Commissioner

STATE OF MARYLAND CAROLINE COUNTY
FILED FOR RECORD
At 11:00 o'clock am on 12/13 2017
and duly recorded in Liber FDM 2
Folio 462 one of the Ordinance
record books for the aforesaid and
J Dale Minner, Clerk
Recording Fee

liber 2 page 470

RESOLUTION # 2017-037

LIFTING THE TEMPORARY EXTENDED MORATORIUM ON THE PERMITTING OF CERTAIN SOLAR ENERGY SYSTEMS

WHEREAS, the County Commissioners of Caroline County, Maryland (the "County Commissioners") by adoption of Resolution #2017-006 on May 2, 2017, imposed a six (6) month temporary moratorium on the siting and construction of additional solar energy systems in order to study issues related thereto and adopt policy changes to better achieve the goals expressed in the Caroline County Comprehensive Plan;

WHEREAS, during this moratorium period, the County Commissioners appointed workgroups to publicly study these issues and make recommendations, the Caroline County Planning Commission conducted further public review and discussion of those recommendations, and the County Commissioners held a public input process that exceeded the minimum requirements of the legislative process;

WHEREAS, because additional time was required for public discussion of the workgroup recommendations, the County Commissioners by adoption of Resolution #2017-029 on October 31, 2017, extended the temporary moratorium on the siting and construction of additional solar energy systems for an additional two (2) months;

WHEREAS, the County Commissioners have adopted Legislative Bill #2017-4: Chapter 166 – Taxation – Business Personal Property Taxation and Ordinance #2017-2: Chapter 175 – Zoning – Solar Energy Systems; and

WHEREAS, with the adoption of Legislative Bill #2017-4 and Ordinance #2017-2, the County Commissioners have met the purpose of the temporary moratorium, which was to protect the public health, safety and welfare of the residents of Caroline County and to protect natural resources, agricultural, and environmentally sensitive lands, and to conserve and preserve the rural character of the County.

NOW, THEREFORE, BE IT RESOLVED by the County Commissioners for Caroline County, Maryland, that the temporary moratorium on the issuance of permits for approval and construction of certain solar energy systems in Caroline County, imposed by Resolution #2017-006 and extended by Resolution #2017-029, is hereby lifted.

ADOPTED/EFFECTIVE: December 12, 2017

ATTEST:

Jennifer M. Farina
Jennifer M. Farina
Administrative Coordinator

(SEAL)

Approved for Legal Sufficiency:

Heather L. Price
Heather L. Price, County Attorney

COUNTY COMMISSIONERS OF CAROLINE COUNTY, MARYLAND

Daniel J. Franklin, President

Larry C. Porter, Vice President

Wilbur Levengood, Jr., Commissioner

STATE OF MARYLAND CAROLINE COUNTY
FILED FOR RECORD
At 11:00 o'clock am on 12/13 2017
and duly recorded in Liber FDM 6
Folio 42 one of the Resol.
record books for the aforesaid and
J. Dale Minner, Clerk
Recording Fee

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APPENDIX 4

PJM Generation Interconnection Feasibility Study and System Impact Study

Generation Interconnection
Feasibility Study Report
Queue Position AB2-037

The Interconnection Customer (IC) has proposed a 250 MW (95 MWC) solar generating facility to be located in Caroline County, Maryland. PJM studied AB2-037 as a 250 MW injection into the Delmarva Power and Light Company (DPL) system at a tap of the Keeney-Steele 230 kV circuit and evaluated it for compliance with reliability criteria for summer peak conditions in 2020. The planned in-service date, as stated during the project kick-off call, is October 31, 2019.

Point of Interconnection

The Interconnection Customer requested a transmission level interconnection. As a result, AB2-037 will interconnect with the DPL system at a new three breaker 230 kV ring bus substation to be constructed adjacent to the Keeney-Steele 230 kV circuit.

Transmission Owner Scope of Work

Substation Interconnection Estimate
Scope: Build a new 230 kV substation with a 3 position ring bus. Two of the positions on the ring bus will be transmission line terminals for the tie-in of Line 23009 to the substation. The other position will be a terminal configured for the interconnection of a generator.

Estimate: $6,491,000
Construction Time: 24 months

Major Equipment Included in Estimate:

- Control Enclosure, 20' x 15' Qty. 1
- Power Circuit Breaker, 230 kV, 2000A, 40kA, 3 cycle Qty. 3
- Disconnect Switch, 230 kV, 2000A, Manual Wormgear, Arcing Horns Qty. 9
- CT/VT Combination Units, 230 kV Qty. 3
- CVT, 230 kV Qty. 6
- Disconnect Switch Stand, High, 230 kV, Steel Qty. 5
- Disconnect Switch Stand, Low, 230 kV, Steel Qty. 4
- CT/VT Stand, Single Phase, Low, 230 kV, Steel Qty. 3
- CVT Stand, Single Phase, Low, 230 kV, Steel Qty. 6
- SSVT, 230 kV/240-120 V Qty. 1
- Relay Panel, Transmission Line, FL/BU (20") Qty. 6
- Control Panel, 230 kV Circuit Breaker (10") Qty. 3
- Take-off structure, 230 kV Qty. 2
- Bus Support Structure, 3 phase, 230 kV, Steel Qty. 8

Estimate Assumptions:

- Land purchase for the substation is not included.
- A 3.5 acre, relatively square lot is available for use.
- Site clearing and grading performed by Developer.
- Lightning protection (lightning masts) are not required.

Required Relaying and Communications

New protection relays are required for the new terminals.

An SEL-487 will be required for primary protection and an SEL-387 will be required for back-up protection. Two 20" relay panels for each generator terminal will be required for front line and back-up protection (2 total).

New protection relays are required for the new line terminals. An SEL-421 will be required for primary protection and an SEL-311C will be required for back-up protection. Two 20" relay panels will be required for each transmission line terminal (4 total).

An SEL-451 relay on a 20" breaker control panel will be required for the control and operation of each new 230 kV circuit breaker.

The project will require re-wiring and adjustment of existing relay schemes to accommodate the new 230 kV substation.

The cost of the required relay and communications is included in the Substation Interconnection Estimate.

Metering

Three phase 230 kV revenue metering points will need to be established. DPL will purchase and install all metering instrument transformers as well as construct a metering structure. The secondary wiring connections at the instrument transformers will be completed by DPL's metering technicians. The metering control cable and meter cabinets will be supplied and installed by DPL. DPL will install conduit for the control cable between the instrument transformers and the metering enclosure. The location of the metering enclosure will be determined in the construction phase. DPL will provide both the Primary and the Backup meters. DPL's meter technicians will program and install the Primary & Backup solid state multi-function meters for each new metering position. Each meter will be equipped with load profile, telemetry, and DNP outputs. The IC will be provided with one meter DNP output for each meter. DPL will own the metering equipment for the interconnection point, unless the IC asserts its right to install, own, and operate the metering system.

The Interconnection Customer will be required to make provisions for a voice quality phone line within approximately 3 feet of each Company metering position to facilitate remote interrogation and data collection.

It is the IC's responsibility to send the data that PJM and DPL requires directly to PJM. The IC will grant permission for PJM to send DPL the following telemetry that the IC sends to PJM: real time MW, MVAR, volts, amperes, generator status, and interval MWH and MVARH. The estimate for

DPL to design, purchase, and install metering as specified in the aforementioned scope for metering is included in the Substation Interconnection Estimate.

Interconnection Customer Scope of Work

The Interconnection Customer is responsible for all design and construction related to activities on their side of the Point of Interconnection. Site preparation, including grading and an access road, as necessary, is assumed to be by the IC. Route selection, line design, and right-of-way acquisition of the direct connect facilities is not included in this report, and is the responsibility of the IC. Protective relaying and metering design and installation must comply with DPL's applicable standards. The IC is also required to provide revenue metering and real-time telemetering data to PJM in conformance with the requirements contained in PJM Manuals M-01 and M-14 and the PJM Tariff.

DPL Interconnection Customer Scope of Direct Connection Work Requirements:

- DPL requires that an IC circuit breaker is located within 500 feet of the new 230 kV substation to facilitate the relay protection scheme between DPL and the IC at the Point of Interconnection (POI).

Special Operating Requirements

1. DPL will require the capability to remotely disconnect the generator from the grid by communication from its System Operations facility. Such disconnection may be facilitated by a generator breaker, or other method depending upon the specific circumstances and the evaluation by DPL.

2. DPL reserves the right to charge the Interconnection Customer operation and maintenance expenses to maintain the Interconnection Customer attachment facilities, including metering and telecommunications facilities, owned by DPL.

Additional Interconnection Customer Responsibilities:

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

Summer Peak Analysis - 2020

Transmission Network Impacts

Potential transmission network impacts are as follows:

Generator Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

None

Multiple Facility Contingency
(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

1. (PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 97.56% to 98.94% (DC power flow) of its emergency rating (796 MVA) for the bus fault outage of 'CHI230B1/* $ DELCO $ CHI230B1 $ B'. This project contributes approximately 24.47 MW to the thermal violation.

   CONTINGENCY 'CHI230B1/* $ DELCO $ CHI230B1 $ B'
   DISCONNECT BUS 213489 /* CHICHST1 230.00 $ DELCO $
   CHI230B1 $ B
   END/* $ DELCO $ CHI230B1 $ B

   Please refer to Appendix 1 for a table containing the generators having contribution to this flowgate.

2. (PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 97.56% to 98.94% (DC power flow) of its emergency rating (796 MVA) for the line fault with failed breaker contingency outage of 'CHICH045/* $ DELCO $ CHICH045 $ STBK'. This project contributes approximately 24.47 MW to the thermal violation.

   CONTINGENCY 'CHICH045/* $ DELCO $ CHICH045 $ STBK'
   DISCONNECT BUS 213489 /* CHICHST1 230.00 $ DELCO $
   CHICH045 $ STBK
   DISCONNECT BUS 213627 /* FOULK8 230.00 $ DELCO $
   CHICH045 $ STBK
   END/* $ DELCO $ CHICH045 $ STBK

3. (DP&L - DP&L) The TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) loads from 38.26% to 43.36% (DC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 39.44 MW to the thermal violation.

   CONTINGENCY 'DBL_4NC' /* RED LION-CEDAR CREEK
   230;RED LION-CARTANZA 230
   OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1
   OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1
   END

   Please refer to Appendix 2 for a table containing the generators having contribution to this flowgate.

Contribution to Previously Identified Overloads
(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

None

Summer Peak Load Flow Analysis Reinforcements

New System Reinforcements
(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

1&2. To mitigate the (PECO - AE) DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) overloads will require reinforcements to increase the emergency rating of the Delco Tap to Mickleton 230 kV line. Reinforcements include the replacement of substation equipment and substation bus at Mickleton Substation. The estimate to perform this work is **$905,000** and will take **18 months** to complete.

3. To mitigate the (DP&L) TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) over load will require reinforcements to increase the emergency rating of the Townsend to Middletown Tap 138 kV line. Reinforcements include rebuilding a short section of the circuit and installation of new poles and re-mounting of 138 kV disconnect switches. The estimate to perform this work is **$800,000** and will take **18 months** to complete.

Contribution to Previously Identified System Reinforcements
(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)
(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

None

Steady-State Voltage Requirements
(Results of the steady-state voltage studies should be inserted here)

To be performed during later study phases.

Short Circuit
(Summary of impacted circuit breakers)

No issues identified.

Stability and Reactive Power Requirement
(Results of the dynamic studies should be inserted here)

To be performed during later study phases.

Light Load Analysis - 2020
Light Load Studies to be conducted during later study phases (as required by PJM Manual 14B).

Facilities Study Estimate
(If a Facilities Study is required, provide the estimated duration and cost estimate to perform the Study)

7 months; $100,000

Delivery of Energy Portion of Interconnection Request
PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.
Only the most severely overloaded conditions are listed. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed, which will study all overload conditions associated with the overloaded element(s) identified.

1. (PECO - PECO) The LINWOOD-CHICHST1 230 kV line (from bus 213750 to bus 213489 ckt 1) loads from 102.07% to 103.42% (DC power flow) of its emergency rating (1593 MVA) for the single line contingency outage of '220-39'. This project contributes approximately 47.62 MW to the thermal violation.

    ```
    CONTINGENCY '220-39'                              /* $ DELCO $ 220-39 $ L
    TRIP BRANCH FROM BUS 213490 TO BUS 213750 CKT 1         /*
    END
    ```

2. (PECO - PECO) The LINWOOD-CHICHST2 230 kV line (from bus 213750 to bus 213490 ckt 1) loads from 101.92% to 103.26% (DC power flow) of its emergency rating (1593 MVA) for the single line contingency outage of '220-43/* $ DELCO $ 220-43 $ L'. This project contributes approximately 47.55 MW to the thermal violation.

    ```
    CONTINGENCY '220-43/* $ DELCO $ 220-43 $ L'
    TRIP BRANCH FROM BUS 213489 TO BUS 213750 CKT 1         /*
    END/*     $ DELCO $ 220-43 $ L
    ```

Delmarva Power and Light Costs
Cost estimates will further be refined as a part of the Impact Study and Facilities Study for this project. The Interconnection Customer will be responsible for all costs incurred by DPL in

connection with the AB2-037 project. Such costs may include, but are not limited to, any transmission system assets currently in DPL's rate base that are prematurely retired due to the AB2-037 project. PJM shall work with DPL to identify these retirement costs and any additional expenses. DPL reserves the right to reassess issues presented in this document and, upon appropriate justification, submit additional costs related to the AB2-037 project.

Appendices

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact.
It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

Appendix 1

(PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 97.56% to 98.94% (DC power flow) of its emergency rating (796 MVA) for the bus fault outage of 'CHI230B1/* $ DELCO $ CHI230B1 $ B'. This project contributes approximately 24.47 MW to the thermal violation.

CONTINGENCY 'CHI230B1/* $ DELCO $ CHI230B1 $ B'
DISCONNECT BUS 213489 /* CHICHST1 230.00 $ DELCO $ CHI230B1 $ B
END/* $ DELCO $ CHI230B1 $ B

Bus Number	*Bus Name*	*Full Contribution*
213400	*COVANTA DELA*	*10.48*
231916	*EM3*	*3.48*
231901	*EM4*	*7.09*
231900	*EM5*	*26.32*
231908	*HR1*	*5.1*
231909	*HR2*	*5.05*
231910	*HR3*	*5.1*
231505	*HR4*	*10.82*
232923	*MR1*	*1.45*
232924	*MR2*	*1.45*
213888	*PHLISCT1*	*12.48*

213889	*PHLISCT2*	*12.48*
213890	*PHLISCT3*	*12.48*
213893	*PHLISST1*	*11.37*
297077	*V2-028 E*	*0.35*
904212	*V4-022E*	*0.29*
901004	*W1-003 E*	*0.42*
901014	*W1-004 E*	*0.42*
901024	*W1-005 E*	*0.42*
901034	*W1-006 E*	*0.42*
905132	*W4-015 E*	*-8.99*
907052	*X1-032 E*	*0.37*
907324	*X1-096 E*	*8.61*
910572	*X3-008 E*	*1.18*
910592	*X3-015 E*	*1.14*
910822	*X3-066 E*	*0.37*
920352	*X4-027*	*0.84*
913362	*Y1-079 E*	*0.61*
913412	*Y1-080 E*	*0.2*
920543	*Y3-054 E*	*1.08*
915542	*Y3-058 E*	*0.86*
920582	*Z1-076 C*	*0.49*
920583	*Z1-076 E*	*0.8*
920592	*Z1-077 C*	*0.35*
920593	*Z1-077 E*	*0.57*
916282	*Z1-081 E*	*0.37*
917082	*Z2-012 E*	*1.15*
920763	*Z2-076 E*	*0.18*
920773	*Z2-077 E*	*0.18*
920812	*Z2-097 C*	*0.36*
920813	*Z2-097 E*	*0.15*
921122	*AA1-059 C*	*0.4*
921123	*AA1-059 E*	*0.16*
921142	*AA1-061 C*	*1.27*
921143	*AA1-061 E*	*0.62*
921442	*AA1-110 C*	*0.4*
921443	*AA1-110 E*	*0.2*
921592	*AA1-140 C*	*0.69*
921593	*AA1-140 E*	*1.13*
921602	*AA1-141 C*	*0.53*
921603	*AA1-141 E*	*0.86*
921872	*AA2-069*	*45.33*
922213	*AA2-129 E*	*1.85*
922222	*AA2-130*	*0.19*
922752	*AB1-056 C OP*	*5.86*
922753	*AB1-056 E OP*	*16.68*

922762	*AB1-057 C*	*5.95*
922763	*AB1-057 E*	*16.95*
923282	*AB1-137 C*	*1.28*
923283	*AB1-137 E*	*0.55*
923322	*AB1-141 C OP*	*1.35*
923323	*AB1-141 E OP*	*0.63*
923332	*AB1-142 C OP*	*1.35*
923333	*AB1-142 E OP*	*0.63*
923452	*AB1-162 C OP*	*0.63*
923453	*AB1-162 E OP*	*1.03*
923602	*AB1-176 C*	*0.34*
923603	*AB1-176 E*	*0.56*
923902	*AB2-030 E*	*0.37*
923921	*AB2-032 C*	*1.36*
923922	*AB2-032 E*	*0.64*
923931	*AB2-033 C*	*0.66*
923932	*AB2-033 E*	*0.26*
923951	*AB2-036 C*	*4.51*
923952	*AB2-036 E*	*7.35*
923961	*AB2-037 C*	*9.3*
923962	*AB2-037 E*	*15.17*
924191	*AB2-063 C*	*0.76*
924192	*AB2-063 E*	*1.23*
924361	*AB2-084 C*	*0.35*
924362	*AB2-084 E*	*0.57*
924461	*AB2-095 C*	*1.04*
924462	*AB2-095 E*	*1.7*
924562	*AB2-105 E*	*0.02*
924681	*AB2-120 C OP*	*3.51*
924682	*AB2-120 E OP*	*5.72*
924781	*AB2-130 C OP*	*3.49*
924782	*AB2-130 E OP*	*5.7*
924801	*AB2-133 C OP*	*3.21*
924802	*AB2-133 E OP*	*4.31*
924821	*AB2-135 C*	*2.93*
924822	*AB2-135 E*	*4.43*
924831	*AB2-136 C OP*	*2.34*
924832	*AB2-136 E OP*	*3.32*
924881	*AB2-142 C*	*0.5*
924882	*AB2-142 E*	*0.81*
924891	*AB2-143 C OP*	*0.76*
924892	*AB2-143 E OP*	*1.24*
924971	*AB2-153 C*	*0.76*
924972	*AB2-153 E*	*1.24*
925071	*AB2-164 C OP*	*0.7*

925072	*AB2-164 E OP*	*1.15*
925081	*AB2-165 C OP*	*0.7*
925082	*AB2-165 E OP*	*1.15*
925091	*AB2-166 C*	*0.18*
925092	*AB2-166 E*	*0.32*
925101	*AB2-167 C*	*0.49*
925102	*AB2-167 E*	*0.8*
925111	*AB2-168 C*	*0.43*
925112	*AB2-168 E*	*0.7*
925151	*AB2-172 C OP*	*1.8*
925152	*AB2-172 E OP*	*2.94*
925231	*AB2-177 C*	*0.23*
925232	*AB2-177 E*	*0.38*
925251	*AB2-179 C OP*	*3.99*
925252	*AB2-179 E OP*	*1.32*
925261	*AB2-180 C*	*1.3*
925262	*AB2-180 E*	*0.56*
925271	*AB2-185 C OP*	*1.38*
925272	*AB2-185 E OP*	*0.59*
925311	*AB2-192 C OP*	*0.7*
925312	*AB2-192 E OP*	*1.15*

Appendix 2

(DP&L - DP&L) The TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) loads from 38.26% to 43.36% (DC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 39.44 MW to the thermal violation.

```
CONTINGENCY 'DBL_4NC'                          /* RED LION-CEDAR CREEK
230;RED LION-CARTANZA 230
  OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1
  OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1
  END
```

Bus Number	*Bus Name*	*Full Contribution*
232900	*DEMECSMY*	*2.15*
232851	*DUP-SFR1*	*0.41*
232902	*EASTMUNI*	*3.4*
232923	*MR1*	*3.36*
232924	*MR2*	*3.36*
232910	*NRG_G1*	*2.43*
232911	*NRG_G2*	*2.43*

292089	T-011	0.17
297076	V2-028 C	0.09
297077	V2-028 E	0.75
904212	V4-022E	0.61
232813	VAUGHN	0.15
232919	VN10	0.57
901004	W1-003 E	0.89
901014	W1-004 E	0.89
901024	W1-005 E	0.89
901034	W1-006 E	0.89
901411	W1-062	2.28
907052	X1-032 E	0.79
907324	X1-096 E	18.27
910571	X3-008 C	0.32
910572	X3-008 E	2.68
910591	X3-015 C	0.3
910592	X3-015 E	2.51
910821	X3-066 C	0.17
910822	X3-066 E	1.41
913361	Y1-079 C	0.24
913362	Y1-079 E	1.96
913411	Y1-080 C	0.05
913412	Y1-080 E	0.43
915751	Y3-033	1.46
915752	Y3-033	9.76
920543	Y3-054 E	2.48
915541	Y3-058 C	0.22
915542	Y3-058 E	1.86
920582	Z1-076 C	1.05
920583	Z1-076 E	1.71
920592	Z1-077 C	0.75
920593	Z1-077 E	1.22
916281	Z1-081 C	0.2
916282	Z1-081 E	1.65
917082	Z2-012 E	2.44
920763	Z2-076 E	0.4
920773	Z2-077 E	0.4
920812	Z2-097 C	1.57
920813	Z2-097 E	0.65
921122	AA1-059 C	0.84
921123	AA1-059 E	0.33
921142	AA1-061 C	2.87
921143	AA1-061 E	1.41
921442	AA1-110 C	1.78
921443	AA1-110 E	0.89

921592	*AA1-140 C*	*1.51*
921593	*AA1-140 E*	*2.47*
921602	*AA1-141 C*	*1.13*
921603	*AA1-141 E*	*1.84*
921872	*AA2-069*	*104.81*
922213	*AA2-129 E*	*3.94*
922222	*AA2-130*	*0.39*
922752	*AB1-056 C OP*	*12.79*
922753	*AB1-056 E OP*	*36.43*
922762	*AB1-057 C*	*12.99*
922763	*AB1-057 E*	*37.03*
923282	*AB1-137 C*	*2.79*
923283	*AB1-137 E*	*1.2*
923322	*AB1-141 C OP*	*5.3*
923323	*AB1-141 E OP*	*2.47*
923332	*AB1-142 C OP*	*5.3*
923333	*AB1-142 E OP*	*2.47*
923452	*AB1-162 C OP*	*2.4*
923453	*AB1-162 E OP*	*3.92*
923602	*AB1-176 C*	*1.29*
923603	*AB1-176 E*	*2.12*
923902	*AB2-030 E*	*0.79*
923921	*AB2-032 C*	*5.34*
923922	*AB2-032 E*	*2.51*
923931	*AB2-033 C*	*1.41*
923932	*AB2-033 E*	*0.56*
923951	*AB2-036 C*	*13.81*
923952	*AB2-036 E*	*22.54*
923961	*AB2-037 C*	*14.99*
923962	*AB2-037 E*	*24.45*
924191	*AB2-063 C*	*2.87*
924192	*AB2-063 E*	*4.69*
924361	*AB2-084 C*	*0.75*
924362	*AB2-084 E*	*1.22*
924461	*AB2-095 C*	*2.27*
924462	*AB2-095 E*	*3.7*
924681	*AB2-120 C OP*	*7.49*
924682	*AB2-120 E OP*	*12.21*
924781	*AB2-130 C OP*	*7.73*
924782	*AB2-130 E OP*	*12.62*
924801	*AB2-133 C OP*	*14.2*
924802	*AB2-133 E OP*	*19.08*
924821	*AB2-135 C*	*12.06*
924822	*AB2-135 E*	*18.18*
924831	*AB2-136 C OP*	*5.19*

924832	*AB2-136 E OP*	*7.37*
924881	*AB2-142 C*	*1.14*
924882	*AB2-142 E*	*1.85*
924891	*AB2-143 C OP*	*3.37*
924892	*AB2-143 E OP*	*5.5*
924971	*AB2-153 C*	*2.98*
924972	*AB2-153 E*	*4.87*
925071	*AB2-164 C OP*	*1.5*
925072	*AB2-164 E OP*	*2.44*
925081	*AB2-165 C OP*	*1.5*
925082	*AB2-165 E OP*	*2.44*
925091	*AB2-166 C*	*0.4*
925092	*AB2-166 E*	*0.7*
925101	*AB2-167 C*	*1.05*
925102	*AB2-167 E*	*1.72*
925151	*AB2-172 C OP*	*4.11*
925152	*AB2-172 E OP*	*6.7*
925231	*AB2-177 C*	*0.49*
925232	*AB2-177 E*	*0.81*
925251	*AB2-179 C OP*	*26.29*
925252	*AB2-179 E OP*	*8.67*
925261	*AB2-180 C*	*2.8*
925262	*AB2-180 E*	*1.2*
925271	*AB2-185 C OP*	*4.42*
925272	*AB2-185 E OP*	*1.89*
925311	*AB2-192 C OP*	*1.5*
925312	*AB2-192 E OP*	*2.44*

Generation Interconnection System Impact Study Report

For

PJM Generation Interconnection Request Queue Position AB2-037

"Keeney-Steele 230 kV"

April 2017

Preface

The intent of the System Impact Study is to determine a plan, with approximate cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by the Interconnection Customer. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system. All facilities required for interconnection of a generation interconnection project must be designed to meet the technical specifications (on PJM web site) for the appropriate transmission owner.

In some instances an Interconnection Customer may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection or merchant transmission upgrade, may also contribute to the need for the same network reinforcement. The possibility of sharing the reinforcement costs with other projects may be identified in the Feasibility Study, but the actual allocation will be deferred until the System Impact Study is performed.

The System Impact Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The Interconnection Customer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

General

Cherrywood Solar 1, LLC, the Interconnection Customer (IC), has proposed a 212.5 MW (80.75 MWC) solar generating facility to be located in Caroline County, Maryland. PJM studied AB2-037 as a 212.5 MW injection into the Delmarva Power and Light Company (DPL) system at a tap of the Keeney-Steele 230 kV circuit and evaluated it for compliance with reliability criteria for summer peak conditions in 2020. The planned in-service date, as stated during the project kick-off call, is October 31, 2019.

Point of Interconnection

The Interconnection Customer requested a transmission level interconnection. As a result, AB2-037 will interconnect with the DPL system at a new three breaker 230 kV ring bus substation to be constructed adjacent to the Keeney-Steele 230 kV circuit (see Attachment 1).

Transmission Owner Scope of Work

Substation Interconnection Estimate

Scope: Build a new 230 kV substation with a 3 position ring bus. Two of the positions on the ring bus will be transmission line terminals for the tie-in of Line 23009 to the

substation. The other position will be a terminal configured for the interconnection of a generator.

Estimate: $6,491,000
Construction Time: 24 months

Major Equipment Included in Estimate:

- Control Enclosure, 20' x 15' — Qty. 1
- Power Circuit Breaker, 230 kV, 2000A, 40kA, 3 cycle — Qty. 3
- Disconnect Switch, 230 kV, 2000A, Manual Wormgear, Arcing Horns — Qty. 9
- CT/VT Combination Units, 230 kV — Qty. 3
- CVT, 230 kV — Qty. 6
- Disconnect Switch Stand, High, 230 kV, Steel — Qty. 5
- Disconnect Switch Stand, Low, 230 kV, Steel — Qty. 4
- CT/VT Stand, Single Phase, Low, 230 kV, Steel — Qty. 3
- CVT Stand, Single Phase, Low, 230 kV, Steel — Qty. 6
- SSVT, 230 kV/240-120 V — Qty. 1
- Relay Panel, Transmission Line, FL/BU (20") — Qty. 6
- Control Panel, 230 kV Circuit Breaker (10") — Qty. 3
- Take-off structure, 230 kV — Qty. 2
- Bus Support Structure, 3 phase, 230 kV, Steel — Qty. 8

Estimate Assumptions:

- Land purchase for the substation is not included.
- A 3.5 acre, relatively square lot is available for use.
- Site clearing and grading performed by Developer.
- Lightning protection (lightning masts) are not required.

Required Relaying and Communications

New protection relays are required for the new terminals.

An SEL-487 will be required for primary protection and an SEL-387 will be required for back-up protection. Two 20" relay panels for each generator terminal will be required for front line and back-up protection (2 total).

New protection relays are required for the new line terminals. An SEL-421 will be required for primary protection and an SEL-311C will be required for back-up protection. Two 20" relay panels will be required for each transmission line terminal (4 total).

An SEL-451 relay on a 20" breaker control panel will be required for the control and operation of each new 230 kV circuit breaker.

The project will require re-wiring and adjustment of existing relay schemes to accommodate the new 230 kV substation.

The cost of the required relay and communications is included in the Substation Interconnection Estimate.

Metering

Three phase 230 kV revenue metering points will need to be established. DPL will purchase and install all metering instrument transformers as well as construct a metering structure. The secondary wiring connections at the instrument transformers will be completed by DPL's metering technicians. The metering control cable and meter cabinets will be supplied and installed by DPL. DPL will install conduit for the control cable between the instrument transformers and the metering enclosure. The location of the metering enclosure will be determined in the construction phase. DPL will provide both the Primary and the Backup meters. DPL's meter technicians will program and install the Primary & Backup solid state multi-function meters for each new metering position. Each meter will be equipped with load profile, telemetry, and DNP outputs. The IC will be provided with one meter DNP output for each meter. DPL will own the metering equipment for the interconnection point, unless the IC asserts its right to install, own, and operate the metering system.

The Interconnection Customer will be required to make provisions for a voice quality phone line within approximately 3 feet of each Company metering position to facilitate remote interrogation and data collection.

It is the IC's responsibility to send the data that PJM and DPL requires directly to PJM. The IC will grant permission for PJM to send DPL the following telemetry that the IC sends to PJM: real time MW, MVAR, volts, amperes, generator status, and interval MWH and MVARH.
The estimate for DPL to design, purchase, and install metering as specified in the aforementioned scope for metering is included in the Substation Interconnection Estimate.

Interconnection Customer Scope of Work

The Interconnection Customer is responsible for all design and construction related to activities on their side of the Point of Interconnection. Site preparation, including grading and an access road, as necessary, is assumed to be by the IC. Route selection, line design, and right-of-way acquisition of the direct connect facilities is not included in this report, and is the responsibility of the IC. Protective relaying and metering design and installation must comply with DPL's applicable standards. The IC is also required to provide revenue metering and real-time telemetering data to PJM in conformance with the requirements contained in PJM Manuals M-01 and M-14 and the PJM Tariff.

DPL Interconnection Customer Scope of Direct Connection Work Requirements:

- DPL requires that an IC circuit breaker is located within 500 feet of the new 230 kV substation to facilitate the relay protection scheme between DPL and the IC at the Point of Interconnection (POI).

Special Operating Requirements

1. DPL will require the capability to remotely disconnect the generator from the grid by communication from its System Operations facility. Such disconnection may be facilitated by a generator breaker, or other method depending upon the specific circumstances and the evaluation by DPL.

2. DPL reserves the right to charge the Interconnection Customer operation and maintenance expenses to maintain the Interconnection Customer attachment facilities, including metering and telecommunications facilities, owned by DPL.

Additional Interconnection Customer Responsibilities:

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

Summer Peak Analysis - 2020

Transmission Network Impacts

Potential transmission network impacts are as follows:

Generator Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

None

Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

1. (PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 95.87% to 98.09% (AC power flow) of its emergency rating (796 MVA) for the bus fault outage of 'CHI230B1/* $ DELCO $ CHI230B1 $ B'. This project contributes approximately 20.77 MW to the thermal violation.

   CONTINGENCY 'CHI230B1/* $ DELCO $ CHI230B1 $ B'

DISCONNECT BUS 213489/* CHICHST1 230.00 $ DELCO $ CHI230B1 $ B
END/* $ DELCO $ CHI230B1 $ B

Please refer to Appendix 1 for a table containing the generators having contribution to this flowgate.

2. (PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 95.87% to 98.09% (AC power flow) of its emergency rating (796 MVA) for the line fault with failed breaker contingency outage of 'CHICH045/* $ DELCO $ CHICH045 $ STBK'. This project contributes approximately 20.77 MW to the thermal violation.

   CONTINGENCY 'CHICH045/* $ DELCO $ CHICH045 $ STBK'
   DISCONNECT BUS 213489/* CHICHST1 230.00 $ DELCO $ CHICH045 $ STBK
   DISCONNECT BUS 213627/* FOULK8 230.00 $ DELCO $ CHICH045 $ STBK
   END/*$ DELCO $ CHICH045 $ STBK

3. (DP&L - PECO) The CLAY_230-LINWOOD 230 kV line (from bus 231000 to bus 213750 ckt 1) loads from 91.58% to 94.62% (AC power flow) of its emergency rating (1071 MVA) for the line fault with failed breaker contingency outage of 'LINWO225/* $ DELCO $ LINWO225 $ STBK'. This project contributes approximately 38.36 MW to the thermal violation.

   CONTINGENCY 'LINWO225/* $ DELCO $ LINWO225 $ STBK'
   TRIP BRANCH FROM BUS 213750 TO BUS 231001 CKT 1/* LINWOOD 230.00 EDGEMR 5 230.00 $ DELCO $ LINWO225 $ STBK
   REMOVE MACHINE 1 FROM BUS 213888/* PHLISCT1 18.00 $ DELCO $ LINWO225 $ STBK
   REMOVE MACHINE 1 FROM BUS 213889/* PHLISCT2 18.00 $ DELCO $ LINWO225 $ STBK
   END/*$ DELCO $ LINWO225 $ STBK

   Please refer to Appendix 2 for a table containing the generators having contribution to this flowgate.

4. (DP&L - DP&L) The EDGEMR 5-CLAY_230 230 kV line (from bus 231001 to bus 231000 ckt 1) loads from 92.39% to 95.26% (AC power flow) of its emergency rating (1035 MVA) for the line fault with failed breaker contingency outage of 'LINWO225/* $ DELCO $ LINWO225 $ STBK'. This project contributes approximately 34.86 MW to the thermal violation.

   CONTINGENCY 'LINWO225/* $ DELCO $ LINWO225 $ STBK'
   TRIP BRANCH FROM BUS 213750 TO BUS 231001 CKT 1/* LINWOOD 230.00 EDGEMR 5 230.00 $ DELCO $ LINWO225 $ STBK

REMOVE MACHINE 1 FROM BUS 213888/* PHLISCT1 18.00 $ DELCO $ LINWO225 $ STBK
REMOVE MACHINE 1 FROM BUS 213889/* PHLISCT2 18.00 $ DELCO $ LINWO225 $ STBK
END/*$ DELCO $ LINWO225 $ STBK

Please refer to Appendix 3 for a table containing the generators having contribution to this flowgate.

5. (DP&L - DP&L) The MIDLTNTP-MT PLSNT 138 kV line (from bus 232106 to bus 232104 ckt 1) loads from 94.27% to 95.57% (AC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 33.53 MW to the thermal violation.

   CONTINGENCY 'DBL_4NC'/* RED LION-CEDAR CREEK 230;RED LION-CARTANZA 230
   OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1
   OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1
   END

   Please refer to Appendix 4 for a table containing the generators having contribution to this flowgate.

6. (DP&L - DP&L) The TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) loads from 88.61% to 92.13% (AC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 33.53 MW to the thermal violation.

   CONTINGENCY 'DBL_4NC'/* RED LION-CEDAR CREEK 230;RED LION-CARTANZA 230
   OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1
   OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1
   END

   Please refer to Appendix 5 for a table containing the generators having contribution to this flowgate.

Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

None

Summer Peak Load Flow Analysis Reinforcements

New System Reinforcements
(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

1&2. To mitigate the (PECO - AE) DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) overloads will require reinforcements to increase the emergency rating of the Delco Tap to Mickleton 230 kV line. Reinforcements include the replacement of substation equipment and substation bus at Mickleton Substation. The estimate to perform this work is **$905,000** and will take **18 months** to complete.

Cost allocation is as follows:

Queue	MW contribution	Percentage of Cost	Cost($0.905M)	Contingency Name	Contingency Type
AB2-036	10.05	21.01%	$190,118.10	'CHI230B1/* $ DELCO $ CHI230B1 $ B'	bus
AB2-037	**20.77**	**43.42%**	**$392,910.74**	**'CHI230B1/* $ DELCO $ CHI230B1 $ B'**	**bus**
AB2-120	9.22	19.27%	$174,416.81	CHI230B1/* $ DELCO $ CHI230B1 $ B'	bus
AB2-130	7.80	16.30%	$147,554.35	CHI230B1/* $ DELCO $ CHI230B1 $ B'	bus

3. To mitigate the (DP&L - PECO) CLAY_230-LINWOOD 230 kV line (from bus 231000 to bus 213750 ckt 1) overload will require terminal upgrades at both the Claymont and Linwood Substations. The estimate to perform this work is **$800,000**. The final ratings would be 1253/1519 MVA.

Cost allocation is as follows:

Queue	MW contribution	Percentage of Cost	Cost($0.8M)	Contingency Name	Contingency Type
AB2-036	18.43	15.97%	127764.298	LINWO225/* $ DELCO $ LINWO225 $ STBK'	breaker
AB2-037	**38.36**	**33.24%**	**265927.21**	**LINWO225/* $ DELCO $ LINWO225 $ STBK'**	**breaker**
AB2-120	17.19	14.90%	119168.111	LINWO225/* $ DELCO $ LINWO225 $ STBK'	breaker
AB2-130	14.56	12.62%	100935.875	LINWO225/* $ DELCO $ LINWO225 $ STBK'	breaker
AB2-133	11.63	10.08%	80623.9168	LINWO225/* $ DELCO $ LINWO225 $ STBK'	breaker
AB2-135	11.59	10.04%	80346.6205	LINWO225/* $ DELCO $ LINWO225 $ STBK'	breaker
AB2-153	3.64	3.15%	25233.9688	LINWO225/* $ DELCO $ LINWO225 $ STBK'	breaker

Note: There is a potential baseline to upgrade the ratings from 805 emergency to 1035 MVA, which is required to be built before this project can go into service.

4. To mitigate the (DP&L - DP&L) EDGEMR 5-CLAY_230 230 kV line (from bus 231001 to bus 231000 ckt 1) overload will require terminal upgrades at both the Edgemore and Claymont Substations. The estimate to perform this work is $800,000. The final ratings would be 1253/1519 MVA.

Cost allocation is as follows:

Queue	MW contribution	Percentage of Cost	Cost($0.8M)	Contingency Name	Contingency Type
AB2-036	16.56	19.64%	$157,134.39	LINWO225/* $ DELCO $ LINWO225 $ STBK'	breaker
AB2-037	**34.86**	**41.35%**	**$330,779.27**	**LINWO225/* $ DELCO $ LINWO225 $ STBK'**	**breaker**
AB2-120	15.56	18.46%	$147,645.59	LINWO225/* $ DELCO $ LINWO225 $ STBK'	breaker
AB2-130	13.17	15.62%	$124,967.38	LINWO225/* $ DELCO $ LINWO225 $ STBK'	breaker
AB2-136	4.16	4.93%	$39,473.37	LINWO225/* $ DELCO $ LINWO225 $ STBK'	breaker

Note: There is a potential baseline to upgrade the ratings from 805 emergency to 1035 MVA, which is required to be built before this project can go into service.

5. To mitigate the (DP&L) MIDLTNTP-MT PLSNT 138 kV line (from bus 232106 to bus 232104 ckt 1) overload will require reinforcements to increase the emergency rating of the Middletown Tap to Mount Pleasant 138 kV line. Those reinforcements include rebuilding a small section of the circuit and installing new poles and the re-mounting of 138 kV disconnect switches. The estimated cost to perform this work is **$800,000** and will take **18 months** to complete following a fully executed Interconnection Services Agreement (ISA) and Interconnection Construction Services Agreement (CSA). (PJM Network Upgrade Number n5300)

Cost allocation is as follows:

Queue	MW contribution	Percentage of Cost	Cost($0.8M)	Contingency Name	Contingency Type
AB2-032	7.84	3.32%	$26,546	DBL_4NC'	tower
AB2-036	30.169	12.77%	$102,151	DBL_4NC'	tower
AB2-037	**33.53**	**14.19%**	**$113,532**	**DBL_4NC'**	**tower**
AB2-063	7.56	3.20%	$25,598	DBL_4NC'	tower
AB2-120	19.70	8.34%	$66,704	DBL_4NC'	tower
AB2-130	17.30	7.32%	$58,577	DBL_4NC'	tower
AB2-133	28.36	12.00%	$96,026	DBL_4NC'	tower
AB2-135	27.49	11.64%	$93,080	DBL_4NC'	tower
AB2-136	10.70	4.53%	$36,230	DBL_4NC'	tower

AB2-153	7.85	3.32%	$26,580	DBL_4NC'	tower
AB2-172	10.81	4.58%	$36,602	DBL_4NC'	tower
AB2-179	34.96	14.80%	$118,374	DBL_4NC'	tower

6. To mitigate the (DP&L) TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) overload will require reinforcements to increase the emergency rating of the Townsend to Middletown Tap 138 kV line. Those reinforcements include rebuilding a small section of the circuit and installing new poles and the re-mounting of 138 kV disconnect switches. The estimated cost to perform this work is **$800,000** and will take **18 months** to complete following a fully executed Interconnection Services Agreement (ISA) and Interconnection Construction Services Agreement (CSA). (PJM Network Upgrade Number n5301)

   Cost allocation is as follows:

Queue	MW contribution	Percentage of Cost	Cost($0.8M)	Contingency Name	Contingency Type
AB2-032	7.84	3.32%	$26,547.02	DBL_4NC'	tower
AB2-036	30.16	12.77%	$102,124.78	DBL_4NC'	tower
AB2-037	**33.53**	**14.19%**	**$113,535.93**	**DBL_4NC'**	**tower**
AB2-063	7.56	3.20%	$25,598.92	DBL_4NC'	tower
AB2-120	19.70	8.34%	$66,706.17	DBL_4NC'	tower
AB2-130	17.30	7.32%	$58,579.53	DBL_4NC'	tower
AB2-133	28.36	12.00%	$96,029.80	DBL_4NC'	tower
AB2-135	27.49	11.64%	$93,083.89	DBL_4NC'	tower
AB2-136	10.70	4.53%	$36,231.27	DBL_4NC'	tower
AB2-153	7.85	3.32%	$26,580.89	DBL_4NC'	tower
AB2-172	10.81	4.58%	$36,603.74	DBL_4NC'	tower
AB2-179	34.96	14.80%	$118,378.06	DBL_4NC'	tower

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study) (Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

None

Steady-State Voltage Requirements

No issues identified.

Short Circuit

No issues identified.

Stability and Reactive Power Requirement

No issues identified. See Attachment 2 for full report.

Light Load Analysis - 2020

Light Load Studies to be conducted during later study phases (as required by PJM Manual 14B).

Facilities Study Estimate

7 months; $100,000

Delivery of Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Only the most severely overloaded conditions are listed. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed, which will study all overload conditions associated with the overloaded element(s) identified.

1. (PECO - PECO) The CHICHST1-EDDYSTN4 230 kV line (from bus 213489 to bus 213588 ckt 1) loads from 94.12% to 96.22% (AC power flow) of its emergency rating (1078 MVA) for the single line contingency outage of '220-04/* $ DELCO $ 220-04 $ L'. This project contributes approximately 26.66 MW to the thermal violation.

   CONTINGENCY '220-04/* $ DELCO $ 220-04 $ L'
   DISCONNECT BUS 213627/* CHICHST1 230.00 FOULK8 230.00 $ DELCO $ 220-04 $ L
   END/*$ DELCO $ 220-04 $ L

2. (PECO - PECO) The LINWOOD-CHICHST1 230 kV line (from bus 213750 to bus 213489 ckt 1) loads from 104.54% to 106.7% (AC power flow) of its emergency rating (1593 MVA) for the single line contingency outage of '220-39'. This project contributes approximately 40.43 MW to the thermal violation.

   CONTINGENCY '220-39'/* $ DELCO $ 220-39 $ L
   TRIP BRANCH FROM BUS 213490 TO BUS 213750 CKT 1/*
   END

3. (PECO - PECO) The LINWOOD-CHICHST2 230 kV line (from bus 213750 to bus 213490 ckt 1) loads from 104.54% to 106.69% (AC power flow) of its emergency rating (1593 MVA) for the single line contingency outage of '220-43/* $ DELCO $ 220-43 $ L'. This project contributes approximately 40.37 MW to the thermal violation.

   CONTINGENCY '220-43/* $ DELCO $ 220-43 $ L'

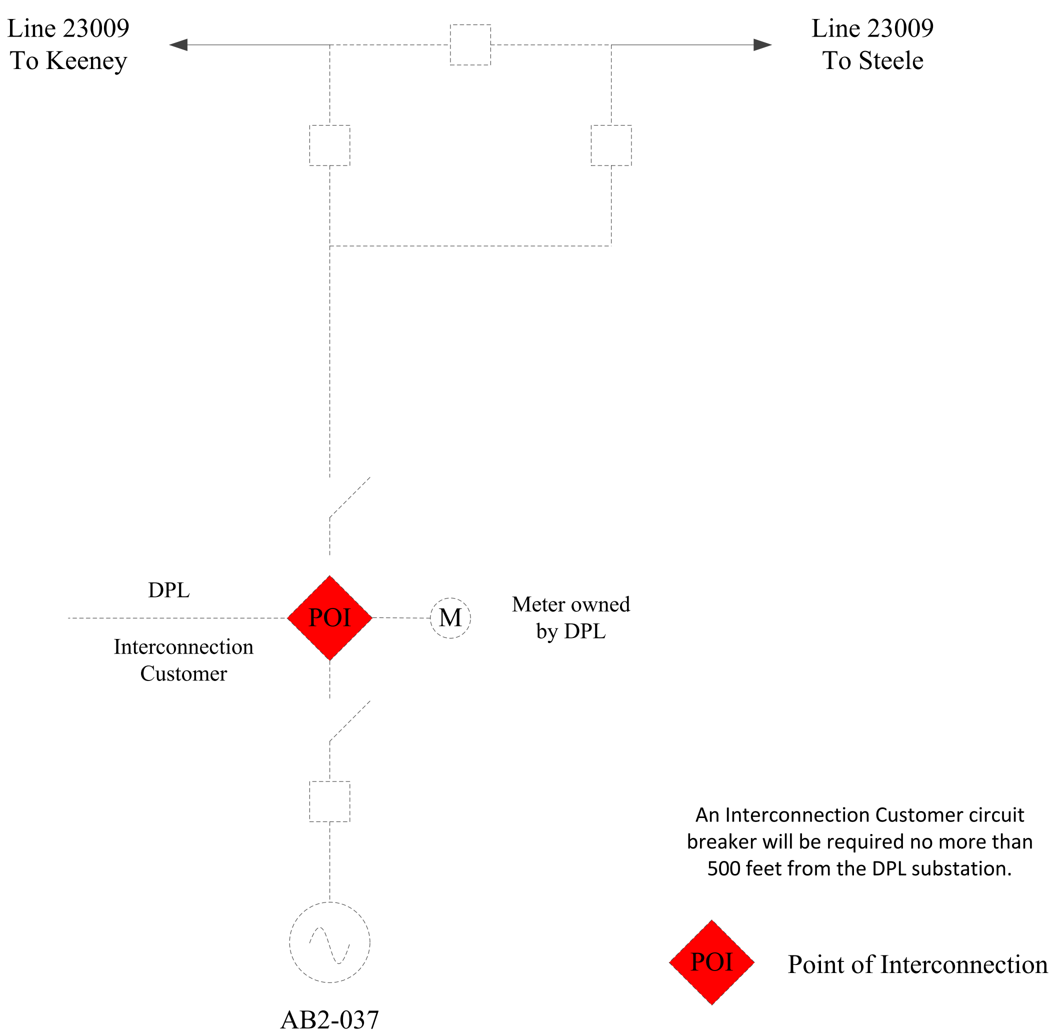
TRIP BRANCH FROM BUS 213489 TO BUS 213750 CKT 1/*
END/* $ DELCO $ 220-43 $ L

Delmarva Power and Light Costs

Cost estimates will further be refined as a part of the Impact Study and Facilities Study for this project. The Interconnection Customer will be responsible for all costs incurred by DPL in connection with the AB2-037 project. Such costs may include, but are not limited to, any transmission system assets currently in DPL's rate base that are prematurely retired due to the AB2-037 project. PJM shall work with DPL to identify these retirement costs and any additional expenses. DPL reserves the right to reassess issues presented in this document and, upon appropriate justification, submit additional costs related to the AB2-037 project.

Attachment 1

AB2-037
Keeney – Steele 230 kV
New 230 kV Substation



Attachment 2

AB2-037

System Impact Study

Dynamic Simulation Analysis

Prepared by	**Michael Yang** **PSC Australia**
For	**PJM Interconnection, LLC**
Reference	**AB2-037-3-0**
Date	**February 15, 2017**
	Proprietary & Confidential

Revision Table

Revision	Issue Date	Description
0	February 15, 2017	Initial Release

Reviewers

Name	Interest	Date
Christopher Spencer	Peer Review	February 15, 2017

Approval

Name	Position	Date
Christopher Spencer	Senior Power Systems Engineer	February 15, 2017

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Executive Summary

Generator Interconnection Request AB2-037 is for a 212.5 MW Maximum Facility Output (MFO) solar powered generating facility with a Point of Interconnection (POI) at a tap of the Keeney – Steele 230kV circuit in the Delmarva Power and Light Company (DPL) system, Caroline County, Maryland.

This report describes a dynamic simulation analysis of AB2-037 as part of the overall system impact study.

The load flow scenario for the analysis was based on the RTEP 2020 Summer Peak case, modified to include applicable queue projects. AB2-037 has been dispatched online at maximum power output, with 1.0 pu voltage at the generator bus.

AB2-037 was tested for compliance with NERC, PJM, Transmission Owner and other applicable criteria. 55 contingencies were studied, each with a 10 second simulation time period. Studied faults included:

a) Steady state operation (20 second simulation);
b) Three phase faults with normal clearing time;
c) Single phase faults with stuck breaker;
d) Single phase faults placed at 80% of the line with delayed (Zone 2) clearing at line end remote from fault due to primary communications/relaying failure.
e) Three-phase faults with loss of multi-circuit tower line.

No relevant bus or High Speed Reclosing (HSR) contingencies were found.

For all simulations, the queue project under study along with the rest of the PJM system were required to maintain synchronism and with all states returning to an acceptable new condition following the disturbance.

For the all 55 fault contingencies tested on the 2020 Summer Peak case:

a) Post-contingency oscillations were positively damped with a damping margin of at least 3%.
b) The AB2-037 generator was able to ride through all faults (except for faults where protective action trips a generator(s)).
c) Following fault clearing, all bus voltages recovered to a minimum of 0.7 per unit after 2.5 seconds (except where protective action isolates that bus).
d) No transmission element tripped, other than those either directly connected or designed to trip as a consequence of that fault.

A spike in the PELEC output, greater than Pmax, was noted for the AB2-037 generator at fault clearance for contingencies 1B.04 - 1B.12, 1D.01 and 1D.03 - 1D.09.

No mitigations were found to be required.

1. Introduction

Generator Interconnection Request AB2-037 is for a 212.5 MW Maximum Facility Output (MFO) solar powered generating facility with a Point of Interconnection (POI) at a tap of the Keeney-Steele 230kV circuit in the Delmarva Power and Light Company (DPL) system, Caroline County, Maryland.

This analysis is effectively a screening study to determine whether the addition of AB2-037 will meet the dynamic requirements of the NERC, PJM and Transmission Owner reliability standards.

In this report the AB2-037 project and how it is proposed to be connected to the grid are first described, followed by a description of how the project is modeled in this study. The fault cases are then described and analyzed, and lastly a discussion of the results is provided.

2. Description of Project

AB2-037 consists of 102 x SMASC 2.08 MW inverters. AB2-037 will be connected to the POI via a 230 / 34.5 kV main collector transformer with a rating of 250 MVA (OA) connected to a 34.5 / 0.385 kV lumped equivalent transformer representing 102 x 2.25 MVA generator step up (GSU) transformers.

The AB2-037 Point of Interconnection (POI) is at a tap of the Keeney – Steele 230kV circuit in the Delmarva Power and Light Company (DPL) system, Caroline County, Maryland as shown in Figure 1.

Table 1 lists the parameters given in the impact study data and the corresponding parameters of the AB2-037 loadflow models.

The dynamic model for the AB2-037 plant is based on the SMA Sunny Central 2200-US PSS/E user defined model supplied by PJM, as indicated by the Developer.

Additional project details are provided in Attachments 1 through 4:

- Attachment 1 contains the Impact Study Data which details the proposed AB2-037 project.
- Attachment 2 shows the one line diagram of the DPL network in the vicinity of AB2-037.
- Attachment 3 provides a diagram of the PSS/E model in the vicinity of AB2-037.
- Attachment 4 gives the AB2-037 PSS/E loadflow and dynamic models of the AB2-037 plant.

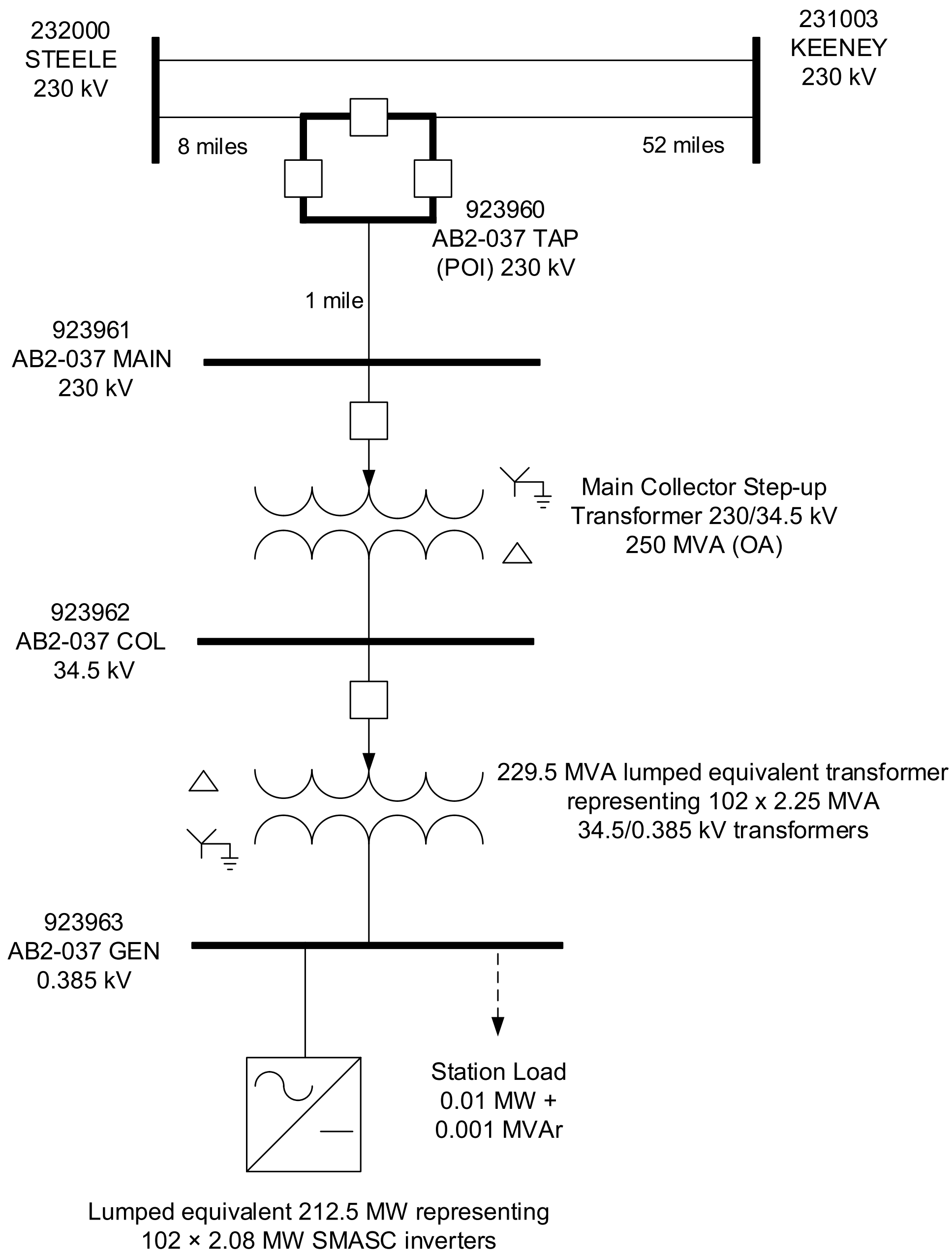


Figure 1: AB2-037 Plant Model

Table 1: AB2-037 Plant Model

	Impact Study Data	Model
Inverter Type	102 × 2.080 MW SMA Sunny Central 2200-US inverters MVA base = 224.4 MVA Vt = 0.385 kV Unsaturated sub-transient reactance = j10000 pu @ MVA base	Lumped equivalent representing 102 × 2.080 MW SMA Sunny Central 2200-US inverters Pgen 212.5 MW Pmax 212.5 MW Pmin 0 MW Qmax 69.8 MVAr Qmin -69.8 MVAr Mbase 224.4 MVA Zsorce j10000 pu @ Mbase
GSU transformer(s)	102 x 34.5/0.385 kV 2.25 MVA two winding transformers Dyn Rating = 2.25 MVA Transformer base = 2.25 MVA (OA) Impedance = 0.01 + j0.0575 pu @ MVA base Number of taps = 5 Tap step size = 2.5%	Lumped equivalent representing 102 x 34.5/0.385 kV 2.25 MVA transformers Transformer base = 229.5 MVA Rating = 229.5 MVA Impedance = 0.01 + j0.0575 pu @ MVA base Number of taps = 5 Tap step size = 2.5%
Main collector step-up transformer	1 x 230/34.5 kV Two winding transformer YNd Rating = 250 MVA (OA/F1/F2) Transformer base = 250 MVA Impedance = 0.0018 + j0.09 pu @ MVA base Number of taps = 5 Tap step size = 2.5%	1 x 230/34.5 kV Two winding transformer Rating = 250 MVA Transformer base = 250 MVA Impedance = 0.0018 + j0.09 pu @ MVA base Number of taps = 5 Tap step size = 2.5%
Station load	0.01 MW + 0.001 MVAr	0.01 MW + 0.001 MVAr (Switched off)
Auxiliary load	N/A	N/A
Transmission line	230 kV 230 MVA Length = 1 mile Impedance = 0.00002 + j0.00014 B = 0.0003	230 kV 230 MVA Length = 1 mile Impedance = 0.00002 + j0.00014 B = 0.0003

3. Loadflow and Dynamics Case Setup

The dynamics simulation analysis was carried out using PSS/E Version 33.7.0.
The load flow scenario and fault cases for this study are based on PJM's Regional Transmission Planning Process[1].
The selected load flow scenario is the RTEP 2020 Summer Peak case with the following modifications:

a) Addition of all applicable queue projects prior to AB2-037.
b) Addition of AB2-037 queue project.
c) Removal of withdrawn and subsequent queue projects in the vicinity of AB2-037.
d) Dispatch of units in the PJM system to maintain slack generators within limits.
e) Merchant transmission projects X3-028 and S57/S58 set online and at maximum power import into PJM.

The AB2-037 initial conditions are listed in Table 2, indicating maximum power output, with 1.0 pu voltage at the generator bus.

Table 2: AB2-037 machine initial conditions

Bus	Name	Unit	PGEN	QGEN	ETERM	POI Voltage
923963	AB2-037GEN	1	212.5	-9.38 MVAr	1.000 pu	1.003 pu

Generation within the PJM500 system (area 225 in the PSS/E case) and within the vicinity of AB2-037 has been dispatched online at maximum output (PMAX). The dispatch of generation in the vicinity of AB2-037 is given in Attachment 5.

[1] Manual 14B: PJM Region Transmission Planning Process, Rev 33, May 5 2016, Attachment G : PJM Stability, Short Circuit, and Special RTEP Practices and Procedures.

4. Fault Cases

Tables 3 to 7 list the contingencies that were studied, with representative worst case total clearing times provided by PJM. Each contingency was studied over a 10 second simulation time interval.

The studied contingencies include:

a) Steady state operation (20 second simulation);
b) Three phase faults with normal clearing time;
c) Single phase faults with stuck breaker;
d) Single phase faults placed at 80% of the line with delayed (Zone 2) clearing at line end remote from fault due to primary communications/relaying failure.
e) Three-phase faults with loss of multi-circuit tower line.

No relevant bus or High Speed Reclosing (HSR) contingencies were found.

Buses at which the faults listed above will be applied are

- AB2-037 TAP 230 kV POI
- Steele 230 kV
- Keeney EHV 230 kV

The three phase faults with normal clearing time were performed under network intact conditions.

Additional delayed (Zone 2) clearing at remote and faults will be applied on lines from Harmony 230 kV, Red Lion 230 kV, Milford 230 kV and Vienna 230 kV towards the queue project.

Clearing times listed in Tables 4 to 7 are as per Revision 19 of "*2016 Revised Clearing times for each PJM company"* spreadsheet.

Attachment 2 contains the one-line diagrams of the DPL network in the vicinity of AB2-037, showing where faults were applied.

The positive sequence fault impedances for single line to ground faults were derived from a separate short circuit case, modified to ensure that connected generators in the vicinity of AB2-037 have not withdrawn from the PJM queue, and are not greater than the queue position under study.

5. Evaluation Criteria

This study is focused on AB2-037, along with the rest of the PJM system, maintaining synchronism and having all states return to an acceptable new condition following the disturbance. The recovery criteria applicable to this study are as per PJM's Regional Transmission Planning Process and Transmission Owner criteria:

a) The system with AB2-037 included is transiently stable and post-contingency oscillations should be positively damped with a damping margin of at least 3%.

b) The AB2-037 is able to ride through faults (except for faults where protective action trips AB2-037).

c) Following fault clearing, all bus voltages recover to a minimum of 0.7 per unit after 2.5 seconds (except where protective action isolates that bus).

d) No transmission element trips, other than those either directly connected or designed to trip as a consequence of that fault.

6. Summary of Results

Plots from the dynamic simulations are provided in Attachment 6, with results summarized in Table 3 through Table 7.

For the 55 fault contingencies tested on the 2020 summer peak case:

a) Post-contingency oscillations were positively damped with a damping margin of at least 3%.

b) The AB2-037 generator was able to ride through all faults (except for faults where protective action trips a generator(s)).

c) Following fault clearing, all bus voltages recover to a minimum of 0.7 per unit after 2.5 seconds (except where protective action isolates that bus).

d) No transmission element trips, other than those either directly connected or designed to trip as a consequence of that fault.

A spike in the PELEC output, greater than Pmax, was noted for the AB2-037 generator at fault clearance for contingencies 1B.04 – 1B.12, 1D.01, 1D.03 – 1D.09.

7. Recommendations and Mitigations

No adverse impacts attributable to the queue project under study were found and as such, no mitigations were found to be required.

Table 3: Steady State Operation

Fault ID	Duration	AB2-037 No Mitigation
SS.01	Steady state 20 sec	Stable

Table 4: Three-phase Faults With Normal Clearing

Fault ID	Fault description	Clearing Time Near & Remote (Cycles)	AB2-037 No Mitigation
3N.01	Fault at AB2-037 POI 230 kV on AB2-037 (Trips AB2-037).	7	Stable
3N.02	Fault at AB2-037 POI 230 kV on Keeney EHV circuit 23009.	7	Stable
3N.03	Fault at AB2-037 POI 230 kV on Steele circuit 23009.	7	Stable
3N.04	Fault at Keeney EHV 230 kV on AB2-037 POI circuit 23009.	7	Stable
3N.05	Fault at Keeney EHV 230 kV on Harmony circuit 23010.	7	Stable
3N.06	Fault at Keeney EHV 230 kV on Keeney EHV 230 / 34.5 kV Transformer T2.	7	Stable
3N.07	Fault at Keeney EHV 230 kV on Steele circuit 23001.	7	Stable
3N.08	Fault at Keeney EHV 230 kV on Keeney EHV 230 / 500 kV Transformer AT50.	7	Stable
3N.09	Fault at Keeney EHV 230 kV on Keeney EHV 230 / 500 kV Transformer AT51.	7	Stable
3N.10	Fault at Keeney EHV 230 kV on Harmony circuit 23013.	7	Stable
3N.11	Fault at Keeney EHV 230 kV on Red Lion circuit 23011.	7	Stable
3N.12	Fault at Keeney EHV 230 kV on Keeney EHV 230 / 138 kV Transformer AT20.	7	Stable
3N.13	Fault at Steele 230 kV on AB2-037 POI circuit 23009.	7	Stable
3N.14	Fault at Steele 230 kV on Milford circuit 23076.	7	Stable
3N.15	Fault at Steele 230 kV on Vienna circuit 23085.	7	Stable
3N.16	Fault at Steele 230 kV on Steele 230 / 138 kV Transformer AT21.	7	Stable
3N.17	Fault at Steele 230 kV on Steele 230 / 138 kV Transformer AT20.	7	Stable
3N.18	Fault at Steele 230 kV on Keeney EHV circuit 23001.	7	Stable
3N.19	Fault at Steele 230 kV on Steele 230 / 138 kV Transformer AT22.	7	Stable

Table 5: Single-phase Faults With Stuck Breaker

Fault ID	Fault description	Clearing Time Near & Remote (Cycles)	AB2-037 No Mitigation
1B.01	Fault at AB2-037 POI 230 kV on AB2-037. Breaker to Keeney EHV circuit 23009 stuck. Fault cleared with loss of Keeney EHV circuit 23009 (Trips AB2-037).	7 / 17.5	Stable*
1B.02	Fault at AB2-037 POI 230 kV on Keeney EHV circuit 23009. Breaker to Steele circuit 23009 stuck. Fault cleared with loss of Steele circuit 23009 (Trips AB2-037).	7 / 17.5	Stable*
1B.03	Fault at AB2-037 POI 230 kV on Steele circuit 23009. Breaker to Keeney EHV circuit 23009 stuck. Fault cleared with loss of Keeney EHV circuit 23009 (Trips AB2-037).	7 / 17.5	Stable*
1B.04	Fault at Keeney EHV 230 kV on AB2-037 POI circuit 23009. Breaker 240 stuck. Fault cleared with loss of Harmony circuit 23010.	7 / 17.5	Stable
1B.05	Fault at Keeney EHV 230 kV on Harmony circuit 23010. Breaker 240 stuck. Fault cleared with loss of AB2-037 POI circuit 23009.	7 / 17.5	Stable
1B.06	Fault at Keeney EHV 230 kV on Keeney EHV 230 / 34.5 kV Transformer T2. Breaker 232 stuck. Fault cleared with loss of Red Lion circuit 23011.	7 / 17.5	Stable
1B.07	Fault at Keeney EHV 230 kV on Steele circuit 23001. Breaker 237 stuck. Fault cleared with loss of Keeney EHV 230 / 500 kV Transformer AT50.	7 / 17.5	Stable
1B.08	Fault at Keeney EHV 230 kV on Keeney EHV 230 / 500 kV Transformer AT50. Breaker 237 stuck. Fault cleared with loss of Steele circuit 23001.	7 / 17.5	Stable
1B.09	Fault at Keeney EHV 230 kV on Keeney EHV 230 / 500 kV Transformer AT51. Breaker 234 stuck. Fault cleared with loss of Harmony circuit 23013.	7 / 17.5	Stable
1B.10	Fault at Keeney EHV 230 kV on Harmony circuit 23013. Breaker 234 stuck. Fault cleared with loss of Keeney EHV 230 / 500 kV Transformer AT51.	7 / 17.5	Stable
1B.11	Fault at Keeney EHV 230 kV on Red Lion circuit 23011. Breaker 231 stuck. Fault cleared with loss of Keeney EHV 230 / 138 kV Transformer AT20.	7 / 17.5	Stable
1B.12	Fault at Keeney EHV 230 kV on Keeney EHV 230 / 138 kV Transformer AT20. Breaker 231 stuck. Fault cleared with loss of Red Lion circuit 23011.	7 / 17.5	Stable

* One instance of non-convergence at AB2-037 generator bus was observed during the fault application (at 0.1125s).

Fault ID	Fault description	Clearing Time Near & Remote (Cycles)	AB2-037 No Mitigation
1B.13	Fault at Steele 230 kV on AB2-037 POI circuit 23009. Breaker 256 stuck. Fault cleared with loss of Steele 230 / 138 kV Transformer AT22.	7 / 17.5	Stable*
1B.14	Fault at Steele 230 kV on AB2-037 POI circuit 23009. Breaker 9240 stuck. Fault cleared with loss of Milford circuit 23076.	7 / 17.5	Stable*
1B.15	Fault at Steele 230 kV on Milford circuit 23076. Breaker 9240 stuck. Fault cleared with loss of AB2-037 POI circuit 23009.	7 / 17.5	Stable*
1B.16	Fault at Steele 230 kV on Milford circuit 23076. Breaker 9230 stuck. Fault cleared with loss of Vienna circuit 23085.	7 / 17.5	Stable*
1B.17	Fault at Steele 230 kV on Vienna circuit 23085. Breaker 9230 stuck. Fault cleared with loss of Milford circuit 23076.	7 / 17.5	Stable*
1B.18	Fault at Steele 230 kV on Vienna circuit 23085. Breaker 252 stuck. Fault cleared with loss of Steele 230 / 138 kV Transformer AT21.	7 / 17.5	Stable*
1B.19	Fault at Steele 230 kV on Steele 230 / 138 kV Transformer AT21. Breaker 252 stuck. Fault cleared with loss of Vienna circuit 23085.	7 / 17.5	Stable*
1B.20	Fault at Steele 230 kV on Steele 230 / 138 kV Transformer AT20. Breaker 9210 stuck. Fault cleared with loss of Keeney EHV circuit 23001.	7 / 17.5	Stable*
1B.21	Fault at Steele 230 kV on Keeney EHV circuit 23001. Breaker 9210 stuck. Fault cleared with loss of Steele 230 / 138 kV Transformer AT20.	7 / 17.5	Stable*
1B.22	Fault at Steele 230 kV on Keeney EHV circuit 23001. Breaker 257 stuck. Fault cleared with loss of Steele 230 / 138 kV Transformer AT22.	7 / 17.5	Stable*
1B.23	Fault at Steele 230 kV on Steele 230 / 138 kV Transformer AT22. Breaker 257 stuck. Fault cleared with loss of Keeney EHV circuit 23001.	7 / 17.5	Stable*
1B.24	Fault at Steele 230 kV on Steele 230 / 138 kV Transformer AT22. Breaker 256 stuck. Fault cleared with loss of AB2-037 POI circuit 23009.	7 / 17.5	Stable*

* One instance of non-convergence at AB2-037 generator bus was observed during the fault application (at 0.1s).

Table 6: Single-phase Faults With Delayed (Zone 2) Clearing at line end closest to AB2-037 POI

Fault ID	Fault description	Clearing Time Near & Remote (Cycles)	AB2-037 No Mitigation
1D.01	Fault at 80% of 230 kV line from AB2-037 POI on Keeney EHV circuit 23009. Delayed clearing at AB2-037 POI 230 kV.	7 / 25	Stable
1D.02	Fault at 80% of 230 kV line from AB2-037 POI on Steele circuit 23009. Delayed clearing at AB2-037 POI 230 kV.	7 / 25	Stable*
1D.03	Fault at 80% of 230 kV line from Keeney EHV on Harmony circuit 23010. Delayed clearing at Keeney EHV 230 kV.	7 / 25	Stable
1D.04	Fault at 80% of 230 kV line from Keeney EHV on Steele circuit 23001. Delayed clearing at Keeney EHV 230 kV.	7 / 25	Stable
1D.05	Fault at 80% of 230 kV line from Keeney EHV on Harmony circuit 23013. Delayed clearing at Keeney EHV 230 kV.	7 / 25	Stable
1D.06	Fault at 80% of 230 kV line from Keeney EHV on Red Lion circuit 23011. Delayed clearing at Keeney EHV 230 kV.	7 / 25	Stable
1D.07	Fault at 80% of 230 kV line from Steele on Milford circuit 23076. Delayed clearing at Steele 230 kV.	7 / 25	Stable
1D.08	Fault at 80% of 230 kV line from Steele on Vienna circuit 23085. Delayed clearing at Steele 230 kV.	7 / 25	Stable
1D.09	Fault at 80% of 230 kV line from Steele on Keeney EHV circuit 23001. Delayed clearing at Steele 230 kV.	7 / 25	Stable

* One instance of non-convergence at AB2-037 generator bus was observed during the fault application (at 0.1s).

Table 7: Three-phase Faults With Loss of Multiple-Circuit Tower Line

Fault ID	Fault description	Clearing Time Near & Remote (Cycles)	AB2-037 No Mitigation
3T.01	Fault at Keeney EHV 230 kV on Harmony circuit 23010 resulting in tower failure. Fault cleared with loss of Redlion - Hay Road circuit 23020 (Trips Hay Road Generating units HR5, HR6, HR7, HR8 and X1-074). CONTINGENCY 'B47_DPL2	7	Stable
3T.02	Fault at Keeney EHV 230 kV on Red Lion circuit 23011 resulting in tower failure. Fault cleared with loss of Redlion - Hay Road circuit 23020 (Trips Hay Road Generating units HR5, HR6, HR7, HR8 and X1-074). CONTINGENCY 'B47_DPL1	7	Stable

Attachment 1. Impact Study Data

Attachment 2. DPL One Line Diagram

Attachment 3. PSS/E Model One Line Diagram

Attachment 4. AB2-037 PSS/E Dynamic Model

Attachment 5. AB2-037 PSS/E Case Dispatch

Attachment 6. Plots from Dynamic Simulations

Appendices

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact.
It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

Appendix 1

(PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 95.87% to 98.09% (AC power flow) of its emergency rating (796 MVA) for the bus fault outage of 'CHI230B1/* $ DELCO $ CHI230B1 $ B'. This project contributes approximately 20.77 MW to the thermal violation.

CONTINGENCY 'CHI230B1/* $ DELCO $ CHI230B1 $ B'
DISCONNECT BUS 213489 /* CHICHST1 230.00 $ DELCO $ CHI230B1 $ B
END/* $ DELCO $ CHI230B1 $ B

Bus Number	*Bus Name*	*Full Contribution*
213400	*COVANTA DELA*	*11.*
231916	*EM3*	*3.65*
231901	*EM4*	*7.44*
231900	*EM5*	*27.6*
231908	*HR1*	*5.34*
231909	*HR2*	*5.3*
231910	*HR3*	*5.34*
231505	*HR4*	*11.35*
232923	*MR1*	*1.45*
232924	*MR2*	*1.45*
213888	*PHLISCT1*	*13.09*
213889	*PHLISCT2*	*13.09*
213890	*PHLISCT3*	*13.09*
213893	*PHLISST1*	*11.47*
297077	*V2-028 E*	*0.35*
904212	*V4-022E*	*0.29*
901004	*W1-003 E*	*0.42*
901014	*W1-004 E*	*0.42*
901024	*W1-005 E*	*0.42*
901034	*W1-006 E*	*0.42*

905143	*W4-016*	*-41.35*
907052	*X1-032 E*	*0.37*
907324	*X1-096 E*	*8.6*
910572	*X3-008 E*	*1.17*
910592	*X3-015 E*	*1.14*
910822	*X3-066 E*	*0.37*
920352	*X4-027*	*0.88*
913362	*Y1-079 E*	*0.61*
913412	*Y1-080 E*	*0.2*
915542	*Y3-058 E*	*0.86*
920582	*Z1-076 C*	*0.49*
920583	*Z1-076 E*	*0.8*
920592	*Z1-077 C*	*0.35*
920593	*Z1-077 E*	*0.57*
916282	*Z1-081 E*	*0.37*
917082	*Z2-012 E*	*1.14*
920763	*Z2-076 E*	*0.18*
920773	*Z2-077 E*	*0.18*
920813	*Z2-097 E*	*0.15*
921123	*AA1-059 E*	*0.16*
921142	*AA1-061 C*	*1.27*
921143	*AA1-061 E*	*0.62*
921443	*AA1-110 E*	*0.2*
921592	*AA1-140 C*	*0.69*
921593	*AA1-140 E*	*1.13*
921602	*AA1-141 C*	*0.53*
921603	*AA1-141 E*	*0.86*
921872	*AA2-069*	*45.25*
922213	*AA2-129 E*	*1.84*
922222	*AA2-130*	*0.18*
922752	*AB1-056 C OP*	*5.85*
922753	*AB1-056 E OP*	*16.65*
922762	*AB1-057 C*	*5.94*
922763	*AB1-057 E*	*16.92*
923282	*AB1-137 C*	*1.27*
923283	*AB1-137 E*	*0.55*
923322	*AB1-141 C OP*	*1.35*
923323	*AB1-141 E OP*	*0.63*
923332	*AB1-142 C OP*	*1.35*
923333	*AB1-142 E OP*	*0.63*
923452	*AB1-162 C OP*	*0.63*
923453	*AB1-162 E OP*	*1.03*
923602	*AB1-176 C*	*0.34*
923603	*AB1-176 E*	*0.56*
923902	*AB2-030 E*	*0.37*

923921	*AB2-032 C*	*1.36*
923922	*AB2-032 E*	*0.64*
923931	*AB2-033 C*	*0.66*
923932	*AB2-033 E*	*0.26*
923951	*AB2-036 C*	*3.82*
923952	*AB2-036 E*	*6.24*
923961	*AB2-037 C*	*7.89*
923962	*AB2-037 E*	*12.88*
924191	*AB2-063 C*	*0.76*
924192	*AB2-063 E*	*1.23*
924361	*AB2-084 C*	*0.35*
924362	*AB2-084 E*	*0.57*
924681	*AB2-120 C OP*	*3.5*
924682	*AB2-120 E OP*	*5.72*
924781	*AB2-130 C OP*	*2.97*
924782	*AB2-130 E OP*	*4.84*
924801	*AB2-133 C OP*	*3.21*
924802	*AB2-133 E OP*	*3.2*
924821	*AB2-135 C*	*2.97*
924822	*AB2-135 E*	*3.39*
924832	*AB2-136 E OP*	*2.48*
924881	*AB2-142 C*	*0.5*
924882	*AB2-142 E*	*0.81*
924971	*AB2-153 C*	*0.76*
924972	*AB2-153 E*	*1.24*
925091	*AB2-166 C*	*0.18*
925092	*AB2-166 E*	*0.32*
925101	*AB2-167 C*	*0.49*
925102	*AB2-167 E*	*0.8*
925111	*AB2-168 C*	*0.43*
925112	*AB2-168 E*	*0.59*
925151	*AB2-172 C OP*	*1.8*
925152	*AB2-172 E OP*	*2.93*
925231	*AB2-177 C*	*0.23*
925232	*AB2-177 E*	*0.38*
925251	*AB2-179 C OP*	*3.98*
925252	*AB2-179 E OP*	*1.31*
925261	*AB2-180 C*	*1.3*
925262	*AB2-180 E*	*0.56*
925271	*AB2-185 C OP*	*1.38*
925272	*AB2-185 E OP*	*0.59*

Appendix 2

(DP&L - PECO) The CLAY_230-LINWOOD 230 kV line (from bus 231000 to bus 213750 ckt 1) loads from 91.58% to 94.62% (AC power flow) of its emergency rating (1071 MVA) for the line fault with failed breaker contingency outage of 'LINWO225/* $ DELCO $ LINWO225 $ STBK'. This project contributes approximately 38.36 MW to the thermal violation.

```
CONTINGENCY 'LINWO225/* $ DELCO $ LINWO225 $ STBK'
  TRIP BRANCH FROM BUS 213750 TO BUS 231001 CKT 1          /* LINWOOD 230.00
EDGEMR 5 230.00 $ DELCO $ LINWO225 $ STBK
  REMOVE MACHINE 1 FROM BUS 213888                         /* PHLISCT1 18.00 $ DELCO $
LINWO225 $ STBK
  REMOVE MACHINE 1 FROM BUS 213889                         /* PHLISCT2 18.00 $ DELCO $
LINWO225 $ STBK
  END/*       $ DELCO $ LINWO225 $ STBK
```

Bus Number	*Bus Name*	*Full Contribution*
231917	*EM10*	*1.08*
231916	*EM3*	*6.49*
231901	*EM4*	*13.02*
231900	*EM5*	*46.78*
231908	*HR1*	*9.36*
231909	*HR2*	*9.43*
231910	*HR3*	*9.36*
231505	*HR4*	*19.23*
232923	*MR1*	*2.75*
232924	*MR2*	*2.75*
213641	*PELTZ*	*-0.32*
297077	*V2-028 E*	*0.65*
904212	*V4-022E*	*0.53*
901004	*W1-003 E*	*0.78*
901014	*W1-004 E*	*0.78*
901024	*W1-005 E*	*0.78*
901034	*W1-006 E*	*0.78*
907052	*X1-032 E*	*0.69*
907211	*X1-074*	*44.04*
907324	*X1-096 E*	*16.03*
910572	*X3-008 E*	*2.18*
910592	*X3-015 E*	*2.11*
910822	*X3-066 E*	*0.67*
910902	*X3-081 E*	*-0.07*
913362	*Y1-079 E*	*1.12*
913412	*Y1-080 E*	*0.37*
915542	*Y3-058 E*	*1.61*
920582	*Z1-076 C*	*0.91*
920583	*Z1-076 E*	*1.49*

920592	*Z1-077 C*	*0.65*
920593	*Z1-077 E*	*1.07*
916282	*Z1-081 E*	*0.68*
917082	*Z2-012 E*	*2.13*
920763	*Z2-076 E*	*0.34*
920773	*Z2-077 E*	*0.34*
920813	*Z2-097 E*	*0.27*
921123	*AA1-059 E*	*0.29*
921142	*AA1-061 C*	*2.35*
921143	*AA1-061 E*	*1.16*
921443	*AA1-110 E*	*0.36*
921592	*AA1-140 C*	*1.29*
921593	*AA1-140 E*	*2.11*
921602	*AA1-141 C*	*0.98*
921603	*AA1-141 E*	*1.6*
921872	*AA2-069*	*85.66*
922213	*AA2-129 E*	*3.44*
922222	*AA2-130*	*0.34*
922752	*AB1-056 C OP*	*10.93*
922753	*AB1-056 E OP*	*31.14*
922762	*AB1-057 C*	*11.1*
922763	*AB1-057 E*	*31.65*
923282	*AB1-137 C*	*2.38*
923283	*AB1-137 E*	*1.02*
923322	*AB1-141 C OP*	*2.46*
923323	*AB1-141 E OP*	*1.15*
923332	*AB1-142 C OP*	*2.46*
923333	*AB1-142 E OP*	*1.15*
923452	*AB1-162 C OP*	*1.15*
923453	*AB1-162 E OP*	*1.88*
923602	*AB1-176 C*	*0.62*
923603	*AB1-176 E*	*1.02*
923902	*AB2-030 E*	*0.69*
923921	*AB2-032 C*	*2.48*
923922	*AB2-032 E*	*1.17*
923931	*AB2-033 C*	*1.23*
923932	*AB2-033 E*	*0.49*
923951	*AB2-036 C*	*7.*
923952	*AB2-036 E*	*11.44*
923961	*AB2-037 C*	*14.57*
923962	*AB2-037 E*	*23.79*
924191	*AB2-063 C*	*1.38*
924192	*AB2-063 E*	*2.25*
924361	*AB2-084 C*	*0.65*
924362	*AB2-084 E*	*1.07*

924681	*AB2-120 C OP*	*6.53*
924682	*AB2-120 E OP*	*10.66*
924781	*AB2-130 C OP*	*5.53*
924782	*AB2-130 E OP*	*9.03*
924801	*AB2-133 C OP*	*5.83*
924802	*AB2-133 E OP*	*5.81*
924821	*AB2-135 C*	*5.41*
924822	*AB2-135 E*	*6.17*
924832	*AB2-136 E OP*	*4.6*
924881	*AB2-142 C*	*0.92*
924882	*AB2-142 E*	*1.49*
924971	*AB2-153 C*	*1.38*
924972	*AB2-153 E*	*2.26*
925091	*AB2-166 C*	*0.34*
925092	*AB2-166 E*	*0.6*
925101	*AB2-167 C*	*0.91*
925102	*AB2-167 E*	*1.5*
925111	*AB2-168 C*	*0.74*
925112	*AB2-168 E*	*1.01*
925151	*AB2-172 C OP*	*3.33*
925152	*AB2-172 E OP*	*5.44*
925231	*AB2-177 C*	*0.43*
925232	*AB2-177 E*	*0.7*
925251	*AB2-179 C OP*	*7.1*
925252	*AB2-179 E OP*	*2.34*
925261	*AB2-180 C*	*2.42*
925262	*AB2-180 E*	*1.04*
925271	*AB2-185 C OP*	*2.53*
925272	*AB2-185 E OP*	*1.08*

Appendix 3

(DP&L - DP&L) The EDGEMR 5-CLAY_230 230 kV line (from bus 231001 to bus 231000 ckt 1) loads from 92.39% to 95.26% (AC power flow) of its emergency rating (1035 MVA) for the line fault with failed breaker contingency outage of 'LINWO225/* $ DELCO $ LINWO225 $ STBK'. This project contributes approximately 34.86 MW to the thermal violation.

CONTINGENCY 'LINWO225/* $ DELCO $ LINWO225 $ STBK'
TRIP BRANCH FROM BUS 213750 TO BUS 231001 CKT 1 /* LINWOOD 230.00 EDGEMR 5 230.00 $ DELCO $ LINWO225 $ STBK
REMOVE MACHINE 1 FROM BUS 213888 /* PHLISCT1 18.00 $ DELCO $ LINWO225 $ STBK
REMOVE MACHINE 1 FROM BUS 213889 /* PHLISCT2 18.00 $ DELCO $ LINWO225 $ STBK
END/* $ DELCO $ LINWO225 $ STBK

Bus Number	*Bus Name*	*Full Contribution*
231920	*CHRIST2*	*1.45*
231901	*EM4*	*10.27*
231900	*EM5*	*46.62*
231908	*HR1*	*7.37*
231910	*HR3*	*7.37*
231505	*HR4*	*19.17*
232923	*MR1*	*2.48*
232924	*MR2*	*2.48*
213641	*PELTZ*	*-0.29*
297077	*V2-028 E*	*0.59*
904212	*V4-022E*	*0.48*
901004	*W1-003 E*	*0.71*
901014	*W1-004 E*	*0.71*
901024	*W1-005 E*	*0.71*
901034	*W1-006 E*	*0.71*
907052	*X1-032 E*	*0.62*
907211	*X1-074*	*39.74*
907324	*X1-096 E*	*14.51*
910572	*X3-008 E*	*1.97*
910592	*X3-015 E*	*1.91*
910822	*X3-066 E*	*0.6*
910902	*X3-081 E*	*-0.06*
913362	*Y1-079 E*	*1.01*
913412	*Y1-080 E*	*0.33*
915542	*Y3-058 E*	*1.45*
920582	*Z1-076 C*	*0.83*
920583	*Z1-076 E*	*1.35*
920592	*Z1-077 C*	*0.59*
920593	*Z1-077 E*	*0.96*

916282	*Z1-081 E*	*0.6*
917082	*Z2-012 E*	*1.93*
920763	*Z2-076 E*	*0.31*
920773	*Z2-077 E*	*0.31*
920813	*Z2-097 E*	*0.24*
921123	*AA1-059 E*	*0.27*
921142	*AA1-061 C*	*2.12*
921143	*AA1-061 E*	*1.05*
921443	*AA1-110 E*	*0.32*
921592	*AA1-140 C*	*1.17*
921593	*AA1-140 E*	*1.91*
921602	*AA1-141 C*	*0.89*
921603	*AA1-141 E*	*1.45*
921872	*AA2-069*	*77.44*
922213	*AA2-129 E*	*3.11*
922222	*AA2-130*	*0.31*
922752	*AB1-056 C OP*	*9.89*
922753	*AB1-056 E OP*	*28.18*
922762	*AB1-057 C*	*10.05*
922763	*AB1-057 E*	*28.64*
923282	*AB1-137 C*	*2.15*
923283	*AB1-137 E*	*0.92*
923322	*AB1-141 C OP*	*2.19*
923323	*AB1-141 E OP*	*1.02*
923332	*AB1-142 C OP*	*2.19*
923333	*AB1-142 E OP*	*1.02*
923452	*AB1-162 C OP*	*1.03*
923453	*AB1-162 E OP*	*1.68*
923602	*AB1-176 C*	*0.55*
923603	*AB1-176 E*	*0.91*
923902	*AB2-030 E*	*0.62*
923921	*AB2-032 C*	*2.21*
923922	*AB2-032 E*	*1.04*
923931	*AB2-033 C*	*1.11*
923932	*AB2-033 E*	*0.44*
923951	*AB2-036 C*	*6.29*
923952	*AB2-036 E*	*10.28*
923961	*AB2-037 C*	*13.24*
923962	*AB2-037 E*	*21.62*
924191	*AB2-063 C*	*1.23*
924192	*AB2-063 E*	*2.01*
924361	*AB2-084 C*	*0.59*
924362	*AB2-084 E*	*0.97*
924681	*AB2-120 C OP*	*5.91*
924682	*AB2-120 E OP*	*9.65*

924781	*AB2-130 C OP*	*5.*
924782	*AB2-130 E OP*	*8.17*
924801	*AB2-133 C OP*	*5.17*
924802	*AB2-133 E OP*	*5.16*
924821	*AB2-135 C*	*4.81*
924822	*AB2-135 E*	*5.49*
924832	*AB2-136 E OP*	*4.16*
924881	*AB2-142 C*	*0.83*
924882	*AB2-142 E*	*1.35*
924971	*AB2-153 C*	*1.23*
924972	*AB2-153 E*	*2.01*
925091	*AB2-166 C*	*0.31*
925092	*AB2-166 E*	*0.55*
925101	*AB2-167 C*	*0.82*
925102	*AB2-167 E*	*1.35*
925111	*AB2-168 C*	*0.63*
925112	*AB2-168 E*	*0.87*
925151	*AB2-172 C OP*	*3.01*
925152	*AB2-172 E OP*	*4.92*
925231	*AB2-177 C*	*0.39*
925232	*AB2-177 E*	*0.64*
925251	*AB2-179 C OP*	*6.19*
925252	*AB2-179 E OP*	*2.04*
925261	*AB2-180 C*	*2.19*
925262	*AB2-180 E*	*0.94*
925271	*AB2-185 C OP*	*2.27*
925272	*AB2-185 E OP*	*0.97*

Appendix 4

(DP&L - DP&L) The MIDLTNTP-MT PLSNT 138 kV line (from bus 232106 to bus 232104 ckt 1) loads from 94.27% to 95.57% (AC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 33.53 MW to the thermal violation.

```
CONTINGENCY 'DBL_4NC'                    /* RED LION-CEDAR CREEK 230;RED LION-CARTANZA 230
  OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1
  OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1
  END
```

Bus Number	*Bus Name*	*Full Contribution*
232900	*DEMECSMY*	*2.25*
232851	*DUP-SFR1*	*0.43*
232902	*EASTMUNI*	*3.57*
232923	*MR1*	*3.36*
232924	*MR2*	*3.36*
232910	*NRG_G1*	*2.55*
232911	*NRG_G2*	*2.55*
297077	*V2-028 E*	*0.75*
904212	*V4-022E*	*0.61*
232813	*VAUGHN*	*0.16*
901004	*W1-003 E*	*0.89*
901014	*W1-004 E*	*0.89*
901024	*W1-005 E*	*0.89*
901034	*W1-006 E*	*0.89*
901411	*W1-062*	*2.39*
907052	*X1-032 E*	*0.79*
907324	*X1-096 E*	*18.27*
910571	*X3-008 C*	*0.34*
910572	*X3-008 E*	*2.68*
910591	*X3-015 C*	*0.32*
910592	*X3-015 E*	*2.51*
910821	*X3-066 C*	*0.18*
910822	*X3-066 E*	*1.41*
913361	*Y1-079 C*	*0.25*
913362	*Y1-079 E*	*1.96*
913411	*Y1-080 C*	*0.05*
913412	*Y1-080 E*	*0.43*
915751	*Y3-033*	*1.19*
915752	*Y3-033*	*7.93*
915542	*Y3-058 E*	*1.86*
920582	*Z1-076 C*	*1.05*
920583	*Z1-076 E*	*1.71*

920592	*Z1-077 C*	*0.75*
920593	*Z1-077 E*	*1.22*
916281	*Z1-081 C*	*0.21*
916282	*Z1-081 E*	*1.65*
917082	*Z2-012 E*	*2.44*
920763	*Z2-076 E*	*0.4*
920773	*Z2-077 E*	*0.4*
920812	*Z2-097 C*	*0.32*
920813	*Z2-097 E*	*0.65*
921123	*AA1-059 E*	*0.33*
921142	*AA1-061 C*	*2.87*
921143	*AA1-061 E*	*1.42*
921442	*AA1-110 C*	*0.36*
921443	*AA1-110 E*	*0.89*
921592	*AA1-140 C*	*1.51*
921593	*AA1-140 E*	*2.47*
921602	*AA1-141 C*	*1.13*
921603	*AA1-141 E*	*1.84*
921872	*AA2-069*	*104.83*
922213	*AA2-129 E*	*3.94*
922222	*AA2-130*	*0.39*
922752	*AB1-056 C OP*	*12.8*
922753	*AB1-056 E OP*	*36.44*
922762	*AB1-057 C*	*12.99*
922763	*AB1-057 E*	*37.04*
923282	*AB1-137 C*	*2.79*
923283	*AB1-137 E*	*1.2*
923322	*AB1-141 C OP*	*5.3*
923323	*AB1-141 E OP*	*2.47*
923332	*AB1-142 C OP*	*5.3*
923333	*AB1-142 E OP*	*2.47*
923452	*AB1-162 C OP*	*2.4*
923453	*AB1-162 E OP*	*3.92*
923602	*AB1-176 C*	*1.29*
923603	*AB1-176 E*	*2.12*
923902	*AB2-030 E*	*0.79*
923921	*AB2-032 C*	*5.34*
923922	*AB2-032 E*	*2.51*
923931	*AB2-033 C*	*1.41*
923932	*AB2-033 E*	*0.56*
923951	*AB2-036 C*	*11.45*
923952	*AB2-036 E*	*18.72*
923961	*AB2-037 C*	*12.73*
923962	*AB2-037 E*	*20.8*
924191	*AB2-063 C*	*2.87*

924192	*AB2-063 E*	*4.69*
924361	*AB2-084 C*	*0.75*
924362	*AB2-084 E*	*1.22*
924681	*AB2-120 C OP*	*7.49*
924682	*AB2-120 E OP*	*12.22*
924781	*AB2-130 C OP*	*6.58*
924782	*AB2-130 E OP*	*10.73*
924801	*AB2-133 C OP*	*14.2*
924802	*AB2-133 E OP*	*14.16*
924821	*AB2-135 C*	*12.84*
924822	*AB2-135 E*	*14.65*
924832	*AB2-136 E OP*	*5.51*
924831	*AB2-136C OP*	*1.07*
924881	*AB2-142 C*	*1.14*
924882	*AB2-142 E*	*1.85*
924971	*AB2-153 C*	*2.98*
924972	*AB2-153 E*	*4.87*
925091	*AB2-166 C*	*0.4*
925092	*AB2-166 E*	*0.7*
925101	*AB2-167 C*	*1.05*
925102	*AB2-167 E*	*1.72*
925151	*AB2-172 C OP*	*4.11*
925152	*AB2-172 E OP*	*6.7*
925231	*AB2-177 C*	*0.49*
925232	*AB2-177 E*	*0.81*
925251	*AB2-179 C OP*	*26.29*
925252	*AB2-179 E OP*	*8.67*
925261	*AB2-180 C*	*2.8*
925262	*AB2-180 E*	*1.2*
925271	*AB2-185 C OP*	*4.42*
925272	*AB2-185 E OP*	*1.89*

Appendix 5

(DP&L - DP&L) The TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) loads from 88.61% to 92.13% (AC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 33.53 MW to the thermal violation.

```
CONTINGENCY 'DBL_4NC'                    /* RED LION-CEDAR CREEK
230;RED LION-CARTANZA 230
  OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1
  OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1
  END
```

Bus Number	*Bus Name*	*Full Contribution*
232900	*DEMECSMY*	*2.25*
232851	*DUP-SFR1*	*0.43*
232902	*EASTMUNI*	*3.57*
232923	*MR1*	*3.36*
232924	*MR2*	*3.36*
232910	*NRG_G1*	*2.55*
232911	*NRG_G2*	*2.55*
297077	*V2-028 E*	*0.75*
904212	*V4-022E*	*0.61*
232813	*VAUGHN*	*0.16*
901004	*W1-003 E*	*0.89*
901014	*W1-004 E*	*0.89*
901024	*W1-005 E*	*0.89*
901034	*W1-006 E*	*0.89*
901411	*W1-062*	*2.39*
907052	*X1-032 E*	*0.79*
907324	*X1-096 E*	*18.27*
910571	*X3-008 C*	*0.34*
910572	*X3-008 E*	*2.68*
910591	*X3-015 C*	*0.32*
910592	*X3-015 E*	*2.51*
910821	*X3-066 C*	*0.18*
910822	*X3-066 E*	*1.41*
913361	*Y1-079 C*	*0.25*
913362	*Y1-079 E*	*1.96*
913411	*Y1-080 C*	*0.05*
913412	*Y1-080 E*	*0.43*
915751	*Y3-033*	*1.19*
915752	*Y3-033*	*7.93*
915542	*Y3-058 E*	*1.86*
920582	*Z1-076 C*	*1.05*
920583	*Z1-076 E*	*1.71*

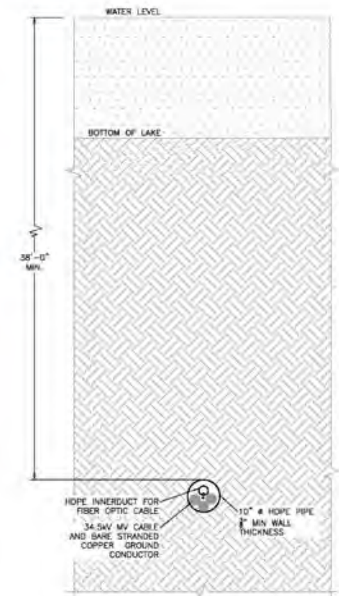
920592	*Z1-077 C*	*0.75*
920593	*Z1-077 E*	*1.22*
916281	*Z1-081 C*	*0.21*
916282	*Z1-081 E*	*1.65*
917082	*Z2-012 E*	*2.44*
920763	*Z2-076 E*	*0.4*
920773	*Z2-077 E*	*0.4*
920812	*Z2-097 C*	*0.32*
920813	*Z2-097 E*	*0.65*
921123	*AA1-059 E*	*0.33*
921142	*AA1-061 C*	*2.87*
921143	*AA1-061 E*	*1.42*
921442	*AA1-110 C*	*0.36*
921443	*AA1-110 E*	*0.89*
921592	*AA1-140 C*	*1.51*
921593	*AA1-140 E*	*2.47*
921602	*AA1-141 C*	*1.13*
921603	*AA1-141 E*	*1.84*
921872	*AA2-069*	*104.83*
922213	*AA2-129 E*	*3.94*
922222	*AA2-130*	*0.39*
922752	*AB1-056 C OP*	*12.8*
922753	*AB1-056 E OP*	*36.44*
922762	*AB1-057 C*	*12.99*
922763	*AB1-057 E*	*37.04*
923282	*AB1-137 C*	*2.79*
923283	*AB1-137 E*	*1.2*
923322	*AB1-141 C OP*	*5.3*
923323	*AB1-141 E OP*	*2.47*
923332	*AB1-142 C OP*	*5.3*
923333	*AB1-142 E OP*	*2.47*
923452	*AB1-162 C OP*	*2.4*
923453	*AB1-162 E OP*	*3.92*
923602	*AB1-176 C*	*1.29*
923603	*AB1-176 E*	*2.12*
923902	*AB2-030 E*	*0.79*
923921	*AB2-032 C*	*5.34*
923922	*AB2-032 E*	*2.51*
923931	*AB2-033 C*	*1.41*
923932	*AB2-033 E*	*0.56*
923951	*AB2-036 C*	*11.45*
923952	*AB2-036 E*	*18.72*
923961	*AB2-037 C*	*12.73*
923962	*AB2-037 E*	*20.8*
924191	*AB2-063 C*	*2.87*

924192	*AB2-063 E*	*4.69*
924361	*AB2-084 C*	*0.75*
924362	*AB2-084 E*	*1.22*
924681	*AB2-120 C OP*	*7.49*
924682	*AB2-120 E OP*	*12.22*
924781	*AB2-130 C OP*	*6.58*
924782	*AB2-130 E OP*	*10.73*
924801	*AB2-133 C OP*	*14.2*
924802	*AB2-133 E OP*	*14.16*
924821	*AB2-135 C*	*12.84*
924822	*AB2-135 E*	*14.65*
924832	*AB2-136 E OP*	*5.51*
924831	*AB2-136C OP*	*1.07*
924881	*AB2-142 C*	*1.14*
924882	*AB2-142 E*	*1.85*
924971	*AB2-153 C*	*2.98*
924972	*AB2-153 E*	*4.87*
925091	*AB2-166 C*	*0.4*
925092	*AB2-166 E*	*0.7*
925101	*AB2-167 C*	*1.05*
925102	*AB2-167 E*	*1.72*
925151	*AB2-172 C OP*	*4.11*
925152	*AB2-172 E OP*	*6.7*
925231	*AB2-177 C*	*0.49*
925232	*AB2-177 E*	*0.81*
925251	*AB2-179 C OP*	*26.29*
925252	*AB2-179 E OP*	*8.67*
925261	*AB2-180 C*	*2.8*
925262	*AB2-180 E*	*1.2*
925271	*AB2-185 C OP*	*4.42*
925272	*AB2-185 E OP*	*1.89*

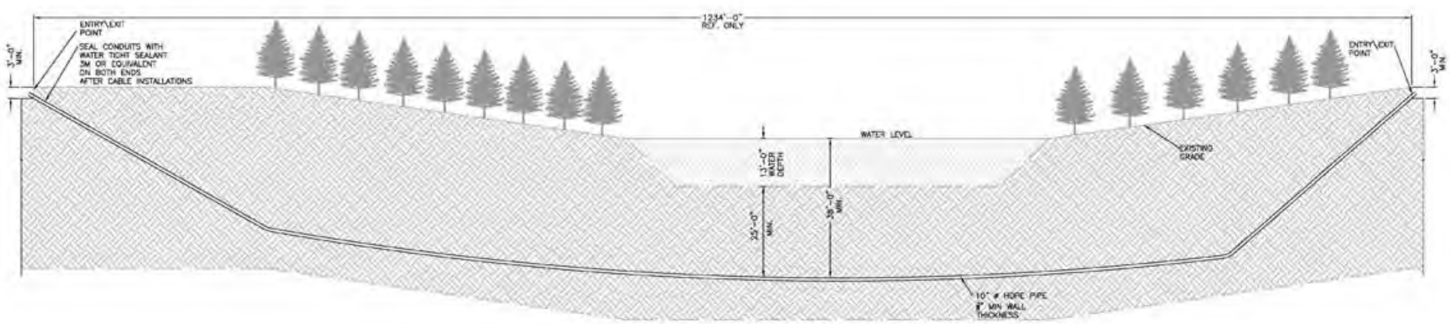
APPENDIX 5

Conceptual Underground Crossing Detail

DIRECTIONAL BORING WATER CROSSING
CAROLINE COUNTY, MD
SCALE: 1"=30'-0"



SECTION B-B
SCALE: NONE



SECTION A-A
SCALE: NONE

GENERAL NOTES:

1. ALL NEW UNDERGROUND POWER CABLES AND FIBER OPTIC TRENCHES/BORES WITHIN ROUTE/ROW PROVIDED BY CLIENT.
2. THE CONTRACTOR SHALL EXCAVATE THE TRENCHES TO A WIDTH SUFFICIENT FOR SATISFACTORY AND SAFE WORKING CONDITIONS AND SHALL COMPLY WITH ALL RELEVANT ACTS, REGULATIONS AND REQUIREMENTS OF PUBLIC OR STATUTORY AUTHORITIES IN STATE OF MARYLAND AND CAROLINE COUNTY.
3. THE CONTRACTOR SHALL PROVIDE ALL MATERIALS REQUIRED FOR THE EXCAVATION INCLUDING, BUT NOT LIMITED TO PUMPING EQUIPMENT, SHORING, BACKFILL, ETC.
4. EXCAVATION IN EXCESS OF THAT SPECIFIED FOR THE LAYING OF THE CONDUITS/CABLES SHALL BE MADE GOOD AT THE CONTRACTOR'S EXPENSE. IN THE CASE OF EXCESSIVE EXCAVATIONS, APPROVED SAND FILLING FOR THE BOTTOM OF TRENCHES SHALL BE USED.
5. EXCAVATION WILL BE FULLY PROTECTED AGAINST HAZARD TO THE PUBLIC AND WILL BE BRACED TO PREVENT CAVING. PROPER PROTECTIVE MEASURES WILL BE USED WHERE EXCESSIVE CAVING IS ENCOUNTERED OR WHERE PROTECTION IS REQUIRED FOR ADJACENT EXISTING STRUCTURES OR ROADS.
6. CONTRACTOR IS SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, AND PROCEDURES. CONTRACTOR SHALL PROVIDE TEMPORARY ERECTION BRACING AND SHORING AS REQUIRED DURING EXCAVATION AND DURING DRILLING, COMPLYING WITH ALL OSHA REGULATIONS. EXCAVATION, TRENCHING, DRILLING AND SHORING SHALL BE PER OSHA REGULATIONS, 29 CFR CH. XVII, STANDARD 1926, SUBPART "P".
7. PRIOR TO PERFORMING DIRECTIONAL BORING, THE CONTRACTOR SHALL CALL "MISS UTILITY" SERVICE FOR ANY UNDERGROUND UTILITY LOCATIONS.
8. THE CONTRACTOR SHALL FURNISH ALL MATERIALS, EQUIPMENT, LABOR, TOOLS, SUPERVISION REQUIRED TO PERFORM THE DIRECTIONAL BORES.
9. THE CONTRACTOR SHALL PLACE CONDUITS/PIPES AT THE DESIGN DEPTH AND INLINE WITH THE TRENCH LINE. THIS SHALL BE ACCOMPLISHED USING A LOCATER WITH DEPTH READING AT EVERY 10FT MINIMUM.

LEGEND:

- EXISTING UTILITY POLE
- EXIST. OVERHEAD LINE
- 24 EXIST. CONTOUR LINES
- COLLECTION CIRCUIT LINE (UNDERGROUND)
- COLLECTION CIRCUIT CROSSING UNDER WATER (DIRECTIONAL BORING)
- 10" ⌀ HDPE PIPE
- PROPERTY LINE

NOTES

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	DRWN	CHK'D	APRV'D
A	10/27/17	ISSUED FOR REVIEW	DS	DS	MJN

PRELIMINARY DRAWING NOT FOR CONSTRUCTION

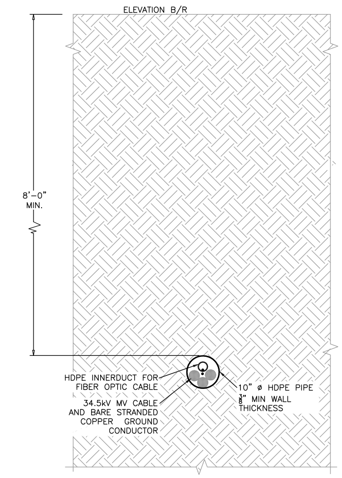
MSE Engineering, LLC
1643 CENTRAL AVE.
SUITE 196
ALBANY, NY 12205

CHERRYWOOD SOLAR
CHERRYWOOD SOLAR, LLC

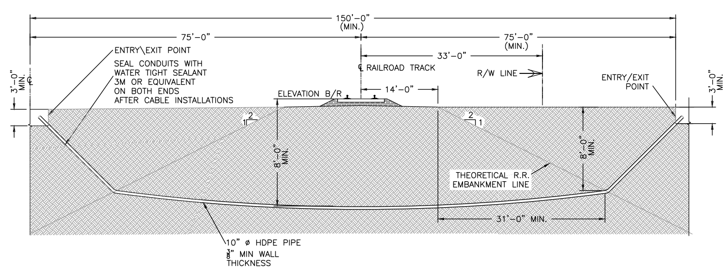
34.5kV COLLECTOR SYSTEM
UNDERGROUND WATER CROSSING DETAILS

PROJ. NO.:	SCALE:	DWG. NO.:	SHEET:	REV.:
	AS NOTED	800	01	A

DIRECTIONAL BORING RAILROAD TRACK CROSSING
CAROLINE COUNTY, MD
SCALE: 1"=10'-0"



SECTION B–B
SCALE: NONE



SECTION A–A
SCALE: 3/32"=1'-0"

GENERAL NOTES:

1. ALL NEW UNDERGROUND POWER CABLES AND FIBER OPTIC TRENCHES/BORES WITHIN ROUTE/ROW PROVIDED BY CLIENT.
2. THE CONTRACTOR SHALL EXCAVATE THE TRENCHES TO A WIDTH SUFFICIENT FOR SATISFACTORY AND SAFE WORKING CONDITIONS AND SHALL COMPLY WITH ALL RELEVANT ACTS, REGULATIONS AND REQUIREMENTS OF PUBLIC OR STATUTORY AUTHORITIES IN STATE OF MARYLAND AND CAROLINE COUNTY.
3. THE CONTRACTOR SHALL PROVIDE ALL MATERIALS REQUIRED FOR THE EXCAVATION INCLUDING, BUT NOT LIMITED TO PUMPING EQUIPMENT, SHORING, BACKFILL, ETC.
4. EXCAVATION IN EXCESS OF THAT SPECIFIED FOR THE LAYING OF THE CONDUITS/CABLES SHALL BE MADE GOOD AT THE CONTRACTOR'S EXPENSE. IN THE CASE OF EXCESSIVE EXCAVATIONS, APPROVED SAND FILLING FOR THE BOTTOM OF TRENCHES SHALL BE USED.
5. EXCAVATION WILL BE FULLY PROTECTED AGAINST HAZARD TO THE PUBLIC AND WILL BE BRACED TO PREVENT CAVING. PROPER PROTECTIVE MEASURES WILL BE USED WHERE EXCESSIVE CAVING IS ENCOUNTERED OR WHERE PROTECTION IS REQUIRED FOR ADJACENT EXISTING STRUCTURES OR ROADS.
6. CONTRACTOR IS SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, AND PROCEDURES. CONTRACTOR SHALL PROVIDE TEMPORARY ERECTION BRACING AND SHORING AS REQUIRED DURING EXCAVATION AND DURING DRILLING, COMPLYING WITH ALL OSHA REGULATIONS. EXCAVATION, TRENCHING, DRILLING AND SHORING SHALL BE PER OSHA REGULATIONS, 29 CFR CH. XVII, STANDARD 1926, SUBPART "P".
7. PRIOR TO PERFORMING DIRECTIONAL BORING, THE CONTRACTOR SHALL CALL "MISS UTILITY" SERVICE FOR ANY UNDERGROUND UTILITY LOCATIONS.
8. THE CONTRACTOR SHALL FURNISH ALL MATERIALS, EQUIPMENT, LABOR, TOOLS, SUPERVISION REQUIRED TO PERFORM THE DIRECTIONAL BORES.
9. THE CONTRACTOR SHALL PLACE CONDUITS/PIPES AT THE DESIGN DEPTH AND INLINE WITH THE TRENCH LINE. THIS SHALL BE ACCOMPLISHED USING A LOCATER WITH DEPTH READING AT EVERY 10FT MINIMUM.

LEGEND:

- 24 — EXIST. CONTOUR LINES
- COLLECTION CIRCUIT LINE (UNDERGROUND)
- COLLECTION CIRCUIT CROSSING UNDER WATER (DIRECTIONAL BORING)
- 10" ø HDPE PIPE
- ROW

NOTES

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	DRWN	CHK'D	APPRV'D
A	11/29/17	ISSUED FOR REVIEW	DS	DS	MJN

PRELIMINARY DRAWING NOT FOR CONSTRUCTION

MSE Engineering, LLC
1843 CENTRAL AVE.
SUITE 196
ALBANY, NY 12205

CHERRYWOOD SOLAR
CHERRYWOOD SOLAR, LLC

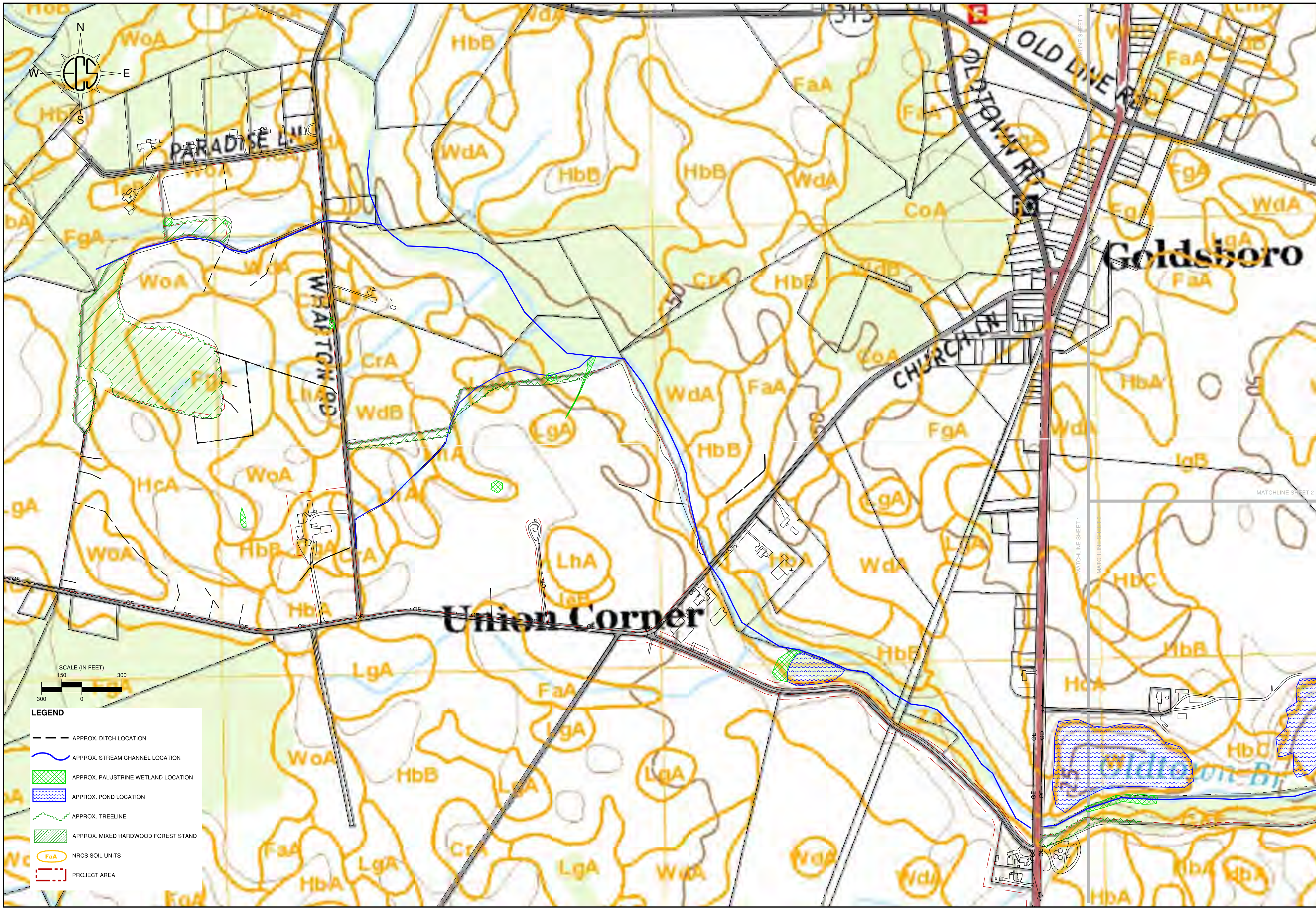
34.5kV COLLECTOR SYSTEM
RAILROAD TRACK CROSSING DETAILS

PROJ. NO.:	SCALE:	DWG. NO.:	SHEET:	REV.:
2017023	AS NOTED	810	01	A

APPENDIX 6

ECS Mid-Atlantic Simplified Forest Stand Delineation Report & Draft FCA Worksheet

ECS – Simplified Forest Stand Delineation



SIMPLIFIED FOREST STAND DELINEATION MAP
CHERRYWOOD SOLAR I, LLC

CHERRYWOOD PROJECT
GREENSBORO AND GOLDSBORO
CAROLINE COUNTY, MARYLAND

ECS - MID-ATLANTIC, LLC
14026 THUNDERBOLT PLACE
SUITE 100
CHANTILLY, VA 20151
1-800-822-3489
703-471-8400
(FAX) 703-834-5527

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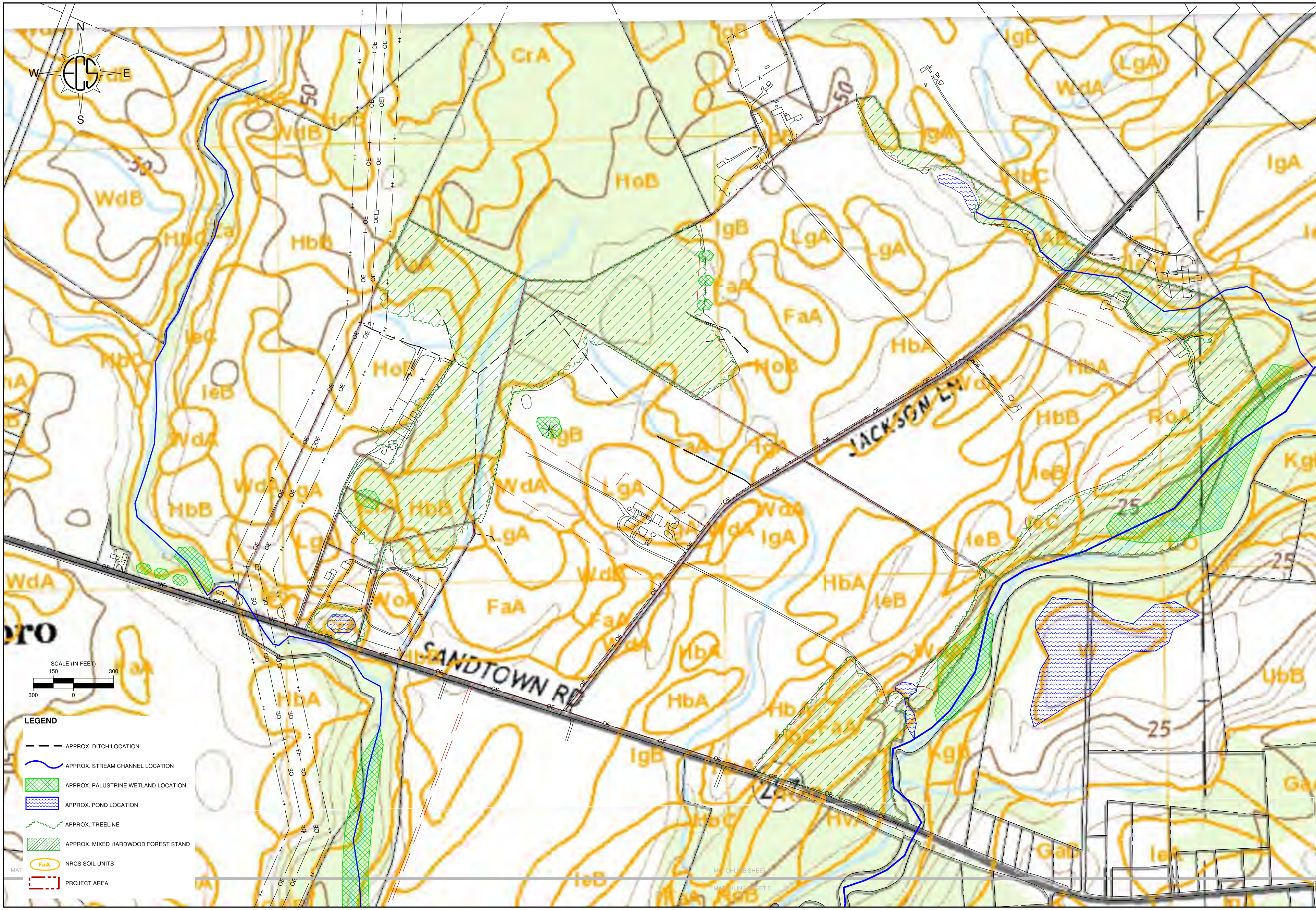
ECS REVISIONS

ENGINEER	DRAFTING
AMM	AEA

SCALE 1" - 300'
PROJECT NO. 47:4881
SHEET 1 OF 5
DATE 12-6-17



SIMPLIFIED FOREST STAND DELINEATION MAP

CHERRYWOOD SOLAR I, LLC

CHERRYWOOD PROJECT GREENSBORO AND GOLDSBORO

CAROLINE COUNTY, MARYLAND

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ECS REVISIONS

ENGINEER	DRAFTING
AMM	AEA
SCALE	1" - 300'
PROJECT NO.	47:4881
SHEET	2 OF 5
DATE	12-6-17

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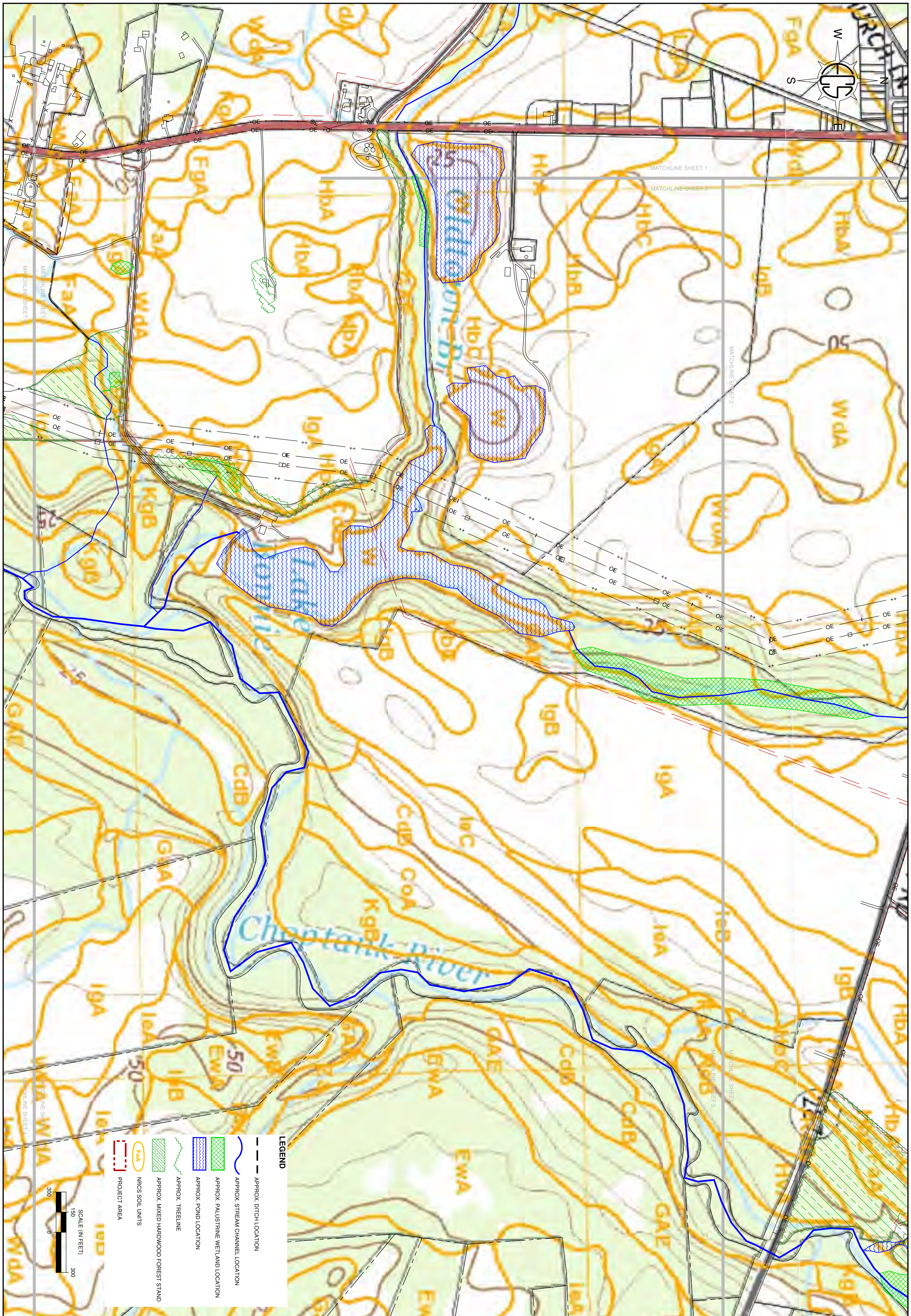

SIMPLIFIED FOREST STAND DELINEATION MAP

CHERRYWOOD SOLAR I, LLC

CHERRYWOOD PROJECT GREENSBORO AND GOLDSBORO

CAROLINE COUNTY, MARYLAND

ENGINEER	DRAFTING	SCALE	PROJECT NO.	SHEET	DATE
AMM	AEA	1" - 300'	47:4881	3 OF 5	12-6-17

ECS REVISIONS

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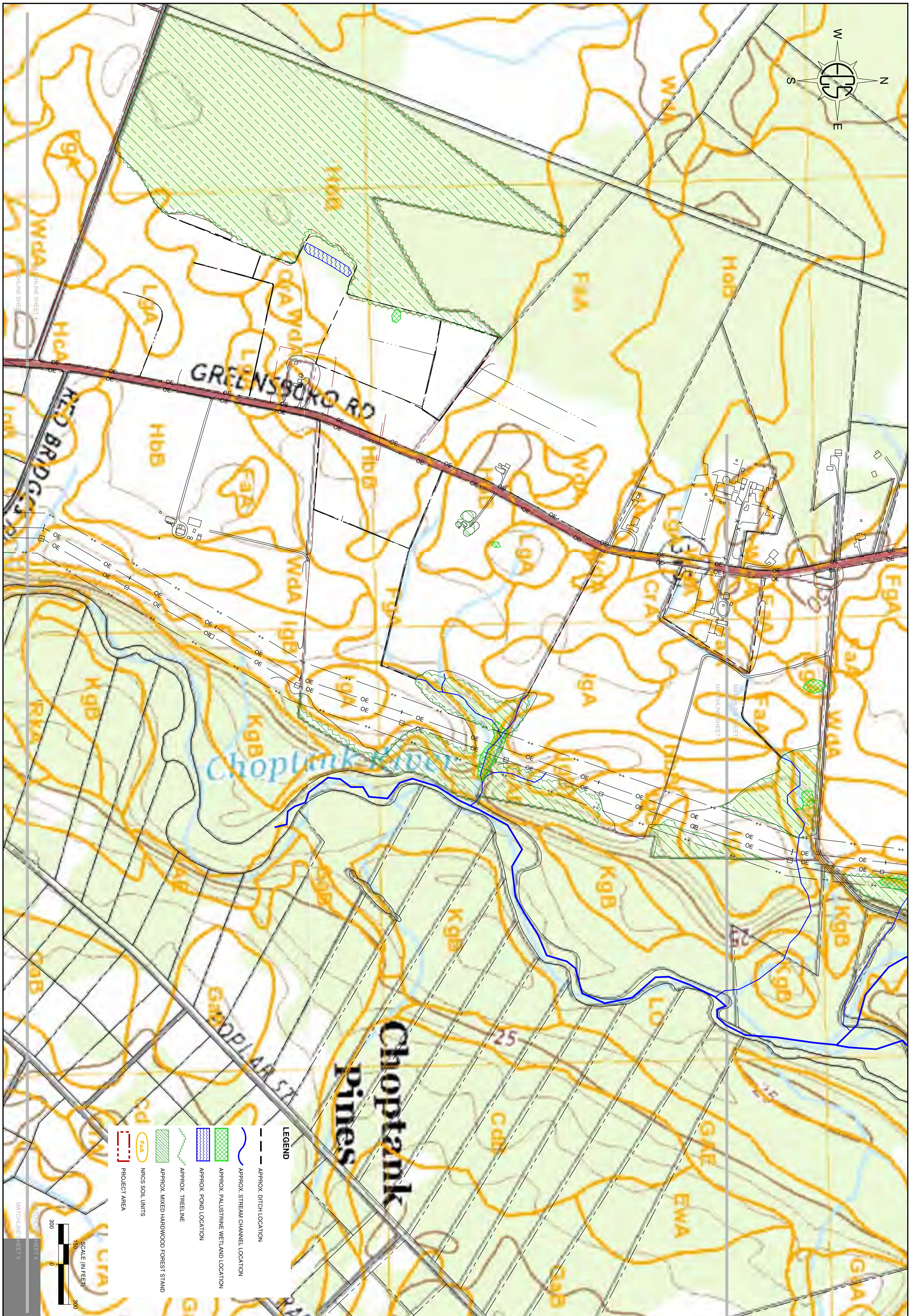

SIMPLIFIED FOREST STAND DELINEATION MAP	CHERRYWOOD PROJECT GREENSBORO AND GOLDSBORO
CHERRYWOOD SOLAR I, LLC	CAROLINE COUNTY, MARYLAND

ECS REVISIONS

ENGINEER	AMM
DRAFTING	AEA
SCALE	1" - 300'
PROJECT NO.	47:4881
SHEET	4 OF 5
DATE	12-6-17

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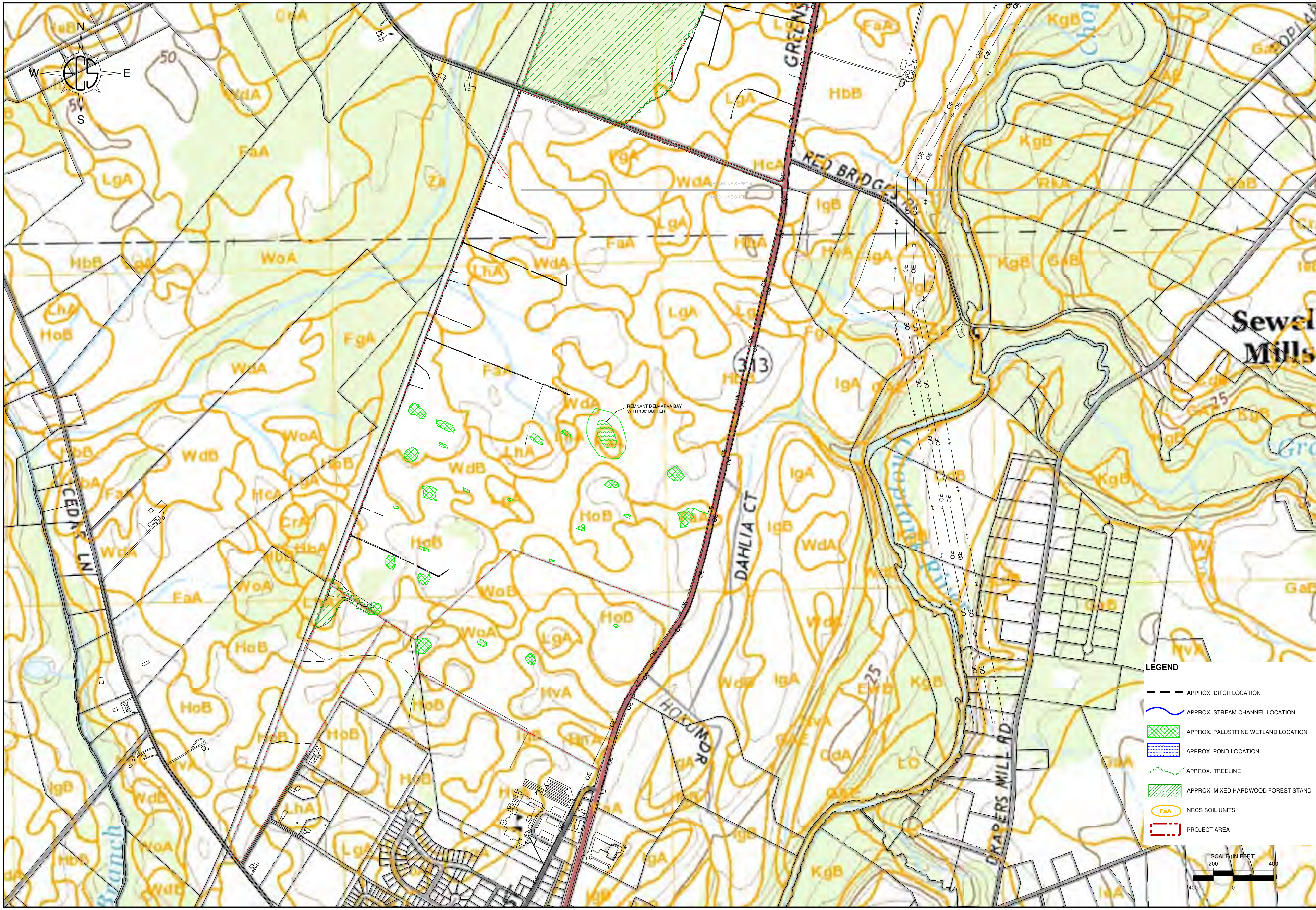

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GREENSBORO AND GOLDSBORO
CAROLINE COUNTY, MARYLAND

SIMPLIFIED FOREST STAND DELINEATION MAP
CHERRYWOOD SOLAR I, LLC

ECS REVISIONS	
ENGINEER AMM	DRAFTING AEA
SCALE	1" - 400'
PROJECT NO.	47:4881
SHEET	5 OF 5
DATE	12-6-17

ECS – Draft FCA Worksheet

FOREST CONSERVATION WORKSHEET	**Note: Use 0 for all negative numbers that result from the calculations.**
Net Tract Area	
A. *Total Tract Area*	**A=** 1667-ac
B. *Deductions* (Critical Area, area restricted by local ordinance or program)	**B=** 51-ac
C. *Net Tract Area* Net Tract Area = Total Tract (A) - Deductions (B)	**C=** 1616-ac
Land Use Category: Agricultural	
D. *Afforestation Threshold* (Net Tract Area [C] x 20 %)	**D =** 323-ac
E. *Conservation Threshold* (Net Tract Area [C] x 50 %)	**E=** 808-ac
Existing Forest Cover	
F. *Existing Forest Cover within the Net Tract Area*	**F=** 226-ac
G. *Area of Forest Above Conservation Threshold* If the Existing Forest Cover (F) is greater than the Conservation Threshold (E), then G = F – E; otherwise G = 0.	**G=** 0-ac
Breakeven Point	
H. *Breakeven Point* (Amount of forest that must be retained so that no mitigation is required) (1) If the Area of Forest Above Conservation Threshold (G) is greater than 0, then H = (0.2 x the Area of Forest Above Conservation Threshold (G)) + the Conservation Threshold (E); (2) If the Area of Forest Above Conservation Threshold (G) is equal to 0, then H= Existing Forest Cover (F)	**H=** 226-ac
I. *Forest Clearing Permitted Without Mitigation* I = Existing Forest Cover (F) – Breakeven point (H)	**I=** 0-ac
Proposed Forest Clearing	
J. *Total Area of Forest to be Cleared*	**J=** 0-ac
K. *Total Area of Forest to be Retained* K = Existing Forest Cover (F) – Forest to be Cleared (J)	**K=** 226-ac
Planting Requirements	
If the Total Area of Forest to be Retained (K) is at or above the Breakeven Point (H), no planting is required, and no further calculations are necessary (L=0, M=0, N=0, P=0, Q=0, R=0). Otherwise, calculate the planting requirement(s) as follows:	
L. *Reforestation for Clearing Above the Conservation Threshold* (1) If the Total Area of Forest to be Retained (K) is greater than the Conservation Threshold (E), then L = the Area of Forest to be Cleared (J) x 0.25; (2) If the Forest to be Retained (K) is less than or equal to the Conservation Threshold (E), then L = Area of Forest Above Conservation Threshold (G) x 0.25	**L=** 0
M. *Reforestation for Clearing Below the Conservation Threshold* (1) If Existing Forest Cover (F) is greater than the Conservation Threshold (E) and the Forest to be Retained (K) is less than or equal to the Conservation Threshold (E), then M = 2.0 x (Conservation Threshold (E) – Forest to be Retained (K)) (2) If Existing Forest Cover (F) is less than or equal to the Conservation Threshold (E), then M = 2.0 x Forest to be Cleared (J)	**M=** 0
N. *Credit for Retention Above the Conservation Threshold* If the area of Forest to be Retained (K) is greater than the Conservation Threshold (E), then N = K – E; Otherwise N=0	**N =** 0
P. *Total Reforestation Required* P = L + M – N	**P=** 0
Q. *Total Afforestation Required* If Existing Forest Cover (F) is less than the Afforestation Threshold (D), then Q = Afforestation Threshold (D) – Existing Forest Cover (F)	**Q=** 97-ac*
R. *Total Planting Requirement* R = P + Q	**R=** 97-ac*

* Although the afforestation threshold indicates 97-ac of planting required, it should be noted that there is no net loss of forested area proposed by this project, and numerous acres will be planted as part of the landscape buffers.

APPENDIX 7

ECS Mid-Atlantic Preliminary Geotechnical Assessment Report

REPORT OF PRELIMINARY
SUBSURFACE EXPLORATION, LABORATORY TESTING, AND GEOTECHNICAL ENGINEERING ANALYSES

Cherrywood Solar
Goldsboro, Caroline County, Maryland

ECS Project No. 02-8631

Prepared For:

OPEN ROAD RENEWABLES
1105 NAVASOTA STREET
AUSTIN, TX 78702

January 17, 2018

ECS MID-ATLANTIC, LLC
"Setting the Standard for Service"
Geotechnical • Construction Materials • Environmental • Facilities

January 17, 2018

Cyrus Tashakkori
Open Road Renewables
1105 Navasota Street
Austin, TX 78702

ECS Project No. 02-8631

Reference: Report of Preliminary Subsurface Exploration, Laboratory Testing and Geotechnical Engineering Analyses for **Cherrywood Solar**, Goldsboro, Caroline County, Maryland

Dear Mr. Tashakkori:

As requested, ECS Mid-Atlantic, LLC (ECS) has completed the preliminary subsurface exploration, laboratory testing and geotechnical engineering analyses for the above-referenced project. This work was performed in accordance with ECS Proposal No. 02-17704-P, dated September 21, 2017. This report contains a discussion of our current understanding of the proposed development, the subsurface exploration procedures employed, the exploration and laboratory test results, and our preliminary recommendations for the design and construction of the geotechnical aspects of the proposed development.

It has been our pleasure to be of service to Open Road Renewables for this project. We would appreciate the opportunity to continue our role as Geotechnical Engineer of Record during final design and subsequent construction. If you have any questions with regard to the information contained in the enclosed report, or if we can be of further assistance to you during the planning or construction phases of the project, please contact us.

Most sincerely,

ECS Mid-Atlantic, LLC

Katie Buckley, E.I.T.
Project Manager

Hasan M. Aboumatar, Ph.D., P.E.
Principal Engineer

STATE OF MARYLAND
HASAN M. ABOUMATAR
No. 29553
PROFESSIONAL ENGINEER

Professional Certification I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.

License No *29553*. Expiration Date: *12/31/2019*

REPORT OF PRELIMINARY SUBSURFACE EXPLORATION, LABORATORY TESTING, AND GEOTECHNICAL ENGINEERING ANALYSES

Cherrywood Solar
Goldsboro, Caroline County, Maryland

ECS Project No. 02-8631

Prepared For:

OPEN ROAD RENEWABLES 1105 NAVASOTA STREET AUSTIN, TX 78702

Submitted by:

ECS Mid-Atlantic, LLC
1340 Charwood Road, Suite B
Hanover, Maryland 21076

January 17, 2018

CHERRYWOOD SOLAR

TABLE OF CONTENTS

INTRODUCTION

Project Location

The site location is near 15642 Jackson Lane in the Goldsboro area of Caroline County, Maryland. A Site Location Diagram is provided in the Appendix.

Project Information and Site Conditions

Our understanding of the project is based on the information provided to us, which included a site plan dated July 25, 2017 prepared by Open Road Renewables. The provided site plan depicts the proposed parcels for the solar panel project. In addition, we have discussed the project and soil boring locations with you.

Based on the provided information, we understand that the proposed construction consists of solar arrays. The proposed solar arrays will be located in open fields in the parcels depicted in the provided plan. Based on our previous experience with such structures, we anticipate the ground mount solar panels will be supported on driven beams. In addition, we understand that direction drilling will be required for the transmission lines at multiple locations.

The sites are currently agricultural fields. Site grading information was not provided at the time this report was prepared; however, we anticipate minor or no grading will be required.

Structural loading for the solar panels was not available at the time this report was prepared; therefore, we provided preliminary soil properties for preliminary driven beam considerations.

Scope of Services

Our scope of services included drilling twenty-four (24) soil borings, designated as B-1 through B-25, to evaluate the subsurface conditions for the proposed solar arrays and directional drilling for transmission lines. Boring B-23 was not drilled due to the presence of drain tiles in the field. The borings were drilled to depths of 20 feet to 60 feet, each below existing grades and in general accordance with ASTM D 1586 standards. The approximate boring locations are presented on the Boring Location Plan in the Appendix.

The scope of work also included visually classifying soil boring samples, performing laboratory testing on selected soil samples from the borings, performing various engineering analyses, and providing this preliminary written report of findings, evaluations and preliminary recommendations.

The report contains the following information:

a. Observations from our site reconnaissance including current site conditions, surface drainage features, and surface topographic conditions.
b. A review of the published geologic conditions and their relevance to your planned development.
c. A subsurface characterization and a description of the field exploration and laboratory tests performed. Ground water concerns relative to the planned construction, if any, are summarized.
d. Final logs of the soil borings and records of the field exploration prepared in accordance with the standard practice for geotechnical engineering. A boring location plan is included, and the results of the laboratory tests is plotted on the final boring logs or included on a separate test report sheet.
e. Preliminary recommendations for soil parameters for the design of driven piles and L-pile analysis for the mounted solar array.
f. Preliminary recommendations for equipment pad construction and roadways, including recommendations for subgrade improvements, if needed.
g. Evaluation of the on-site soil characteristics encountered in the soil borings. Specifically, the suitability of the on-site materials for reuse as engineered fill to support grade slab. We also included compaction requirements and suitable material guidelines.
h. Recommendations for seismic site classification in accordance with the International Building Code (IBC 2015). This analysis is based on the Standard Penetration Test (SPT) method described in Section 1615.1.5 of IBC.

EXPLORATION PROCEDURES

Subsurface Exploration Procedures

The soil borings were drilled with an ATV-mounted drill rig, using continuous-flight, hollow-stem augers to advance the boreholes. Drilling fluid was not used during advancement of the boreholes. The boring locations were located in the field by ECS personnel using GPS methods.

Representative soil samples were obtained by means of the split-barrel sampling procedure in general accordance with ASTM D 1586. In the split-barrel sampling procedure, a 2-inch O.D. split-barrel sampler is driven into the soil a distance of 18 inches by means of a 140-pound hammer falling 30 inches.

The number of hammer blows required to drive the sampler through the second and third 6-inch drive increments is termed the Standard Penetration Test (SPT) value (blow count, or N-value) and is indicated for each sample on the Boring Logs. In the borings, split-barrel sampling was performed at 2.5 ft intervals to depths of 10 ft and at 5.0 ft intervals thereafter.

N-values can be used to provide a qualitative indication of the in-place relative density of cohesionless soils. In a less reliable way, N-values also provide an indication of consistency for cohesive soils. The indications of relative density and consistency are qualitative, since many

factors can significantly affect N-values and prevent direct correlations, including differences among drill crews, drill rigs, drilling procedures, and hammer-rod-sampler assemblies.

A field log of the subsurface conditions encountered in the borings was maintained by the Drill Crew during the drilling operations. Each recovered soil sample was removed from the sampler and visually classified by the Drill Crew. Representative portions of soil samples were sealed in glass jars and returned to the ECS laboratory for further visual examination and possible laboratory testing.

Laboratory Testing Program

The laboratory testing program included visual classification of the boring samples by an experienced Geotechnical Engineer. The classifications were based on texture and plasticity in accordance with the Unified Soil Classification System (USCS). A brief explanation of the USCS is included in the Appendix of this report. The USCS group symbol for each soil type is indicated in parentheses following the soil descriptions on the Boring Logs.

During the visual classification procedures, the Geotechnical Engineer grouped the various soil types into the major strata noted on the Boring Logs. The stratification lines designating the interfaces between various soil strata on the Boring Logs are approximate. In situ, these transitions will likely be gradual and could occur at slightly different levels from those shown on the Boring Logs.

The limited laboratory testing program included moisture contents, gradation analysis, and Atterberg Limit tests on selected samples from the soil borings. The results of the laboratory testing are included in the Appendix. In addition, laboratory thermal resistivity testing is being performed on selected samples. However, the thermal resistivity tests were not completed at the time this report was prepared and will be submitted as an Addendum to this report once completed.

The soil samples will be retained in the ECS laboratory for a period of 60 days. After that holding period, the samples will be discarded, unless ECS receives other instructions regarding their disposition.

EXPLORATION RESULTS

Geologic Conditions

The project site is located within the Atlantic Coastal Plain Physiographic Province, which is characterized by marine and river sediments deposited during successive periods of fluctuating sea level and moving shorelines. Generally, the sediments thicken from west to east, towards the Atlantic Ocean. The uppermost sediments are often comprised of interbedded sands, gravels, clays, and silts.

Based on the results of the test borings and a review of the *Geologic Map of Maryland*, dated 1968, the natural soils at the project site are generally described as Upland Deposits (Eastern Shore) which is described as:

> *"Gravel, sand, silt, and clay. Mostly cross-bedded, poorly sorted, medium- to coarse-grained white to red sand and gravel, boulders near base; minor pink and yellow silts and clays; (Wicomico Formation of earlier reports); thickness 0 to 90 feet, locally thicker in paleochannels."*

Subsurface Conditions

In general, the subsurface conditions encountered during our field exploration consisted of 6 inches to 16 inches of topsoil overlying natural soils.

Natural soils were encountered below the surficial material in all of the borings. The natural soils were generally brown, gray, tan, orangish brown, grayish brown, greenish brown, greenish gray, and orangish gray in color and generally consisted of SAND (SP), SAND with Silt (SP-SM), Silty SAND (SM), Clayey SAND (SC), Sandy SILT (ML), SILT (ML), Sandy Clayey SILT (ML/CL), Clayey SILT (ML/CL), Sandy Silty CLAY (CL/ML), Silty CLAY (CL/ML), Sandy Lean CLAY (CL), Lean CLAY (CL), Sandy Organic CLAY (OH), Organic CLAY (OH), and Fat CLAY (CH) soil types. The N-values recorded in the natural granular soils ranged from 3 blows per foot (bpf) to 46 bpf, indicating very loose to dense relative densities. The N-Values recorded in the natural cohesive soils ranged from 2 bpf to 22 bpf, indicating very soft to very stiff relative consistencies.

More detailed descriptions of the encountered subsurface conditions are provided on the boring log in the Appendix.

Water Level Observations

Groundwater level observations were made in the boreholes, generally during the drilling operations and at completion of drilling operations, both before and after removal of the drilling augers. Groundwater was encountered in all borings, with the exception of Boring B-18, at depths ranging from 3 ft to 23 ft below existing grades. Groundwater was not encountered in Boring B-18 to the depth explored. Cave-in depths for the borings also were observed after removal of the drilling augers from the boreholes and ranged from 4.9 ft to 19.3 ft below existing grades.

Observations regarding the presence and absence of groundwater levels reflect the conditions at the time of this exploration only. Fluctuations in the locations of groundwater tables or perched water levels could occur as a result of seasonal variations in evaporation, precipitation, surface water run-off, and other factors. Therefore, water levels at future times could vary from those observed at the time of the borings.

PRELIMINARY ANALYSES AND RECOMMENDATIONS

Solar Array Foundation Considerations

Based on the provided information, we anticipate that the solar panel construction and pads will generally follow the existing grades and minor grading, if any, would be required to establish final grades. Based on the project characteristics, the encountered subsurface conditions and the geotechnical engineering analysis, it is ECS' opinion that the solar panel array can be supported on a driven beam foundation system. Equipment pads and any other light weight structures can be supported on shallow foundations and slabs-on-grade.

Driven Beam Considerations for Solar Panels (Preliminary)

Based on the subsurface conditions encountered during our preliminary subsurface exploration, it should be feasible for the proposed solar panels to be supported on a deep foundation system consisting of driven beams embedded at a sufficient depth to resist compression loads, lateral loads, uplift and overturning. Specific design information was not available at this preliminary stage. Therefore, we have provided tables of soil properties anticipated for encountered soils for use in the preliminary foundation design.

Considering the size of the site and in order to provide more specific preliminary recommendations for the different sections of the site, we have divided the site into four areas: the Northeastern area is represented by Borings B-1 through B-7; the Northwestern area is represented by Borings B-8 through B-12; the Central area is represented by Borings B-13 through B-20; and the Southern area is represented by Borings B-21 through B-25. The recommendations for each area are presented below.

Northeastern Area (B-1 through B-7)

The following table summarizes the engineering characteristics of the soils encountered at the northeastern portion of the site as represented by Borings B-1 through B-7. Organic silty clay material was encountered in Boring B-1 at depths of 4 ft to 12 ft below existing grades and in B-2 at depths of 13 ft to 20 ft. Based on the boring results, groundwater level was estimated at a depth of 7 ft for these preliminary recommendations.

Approx. Depth (ft)	Soil Type	Effective Total Unit Weight (pcf)	Internal Angle of Friction (ϕ)	Cohesion (psf)	E_{50} Value	Soil Modulus k (pci)	Unit Skin Friction (psf)
0.00' - 4.00'	Granular	120.0	30	----	----	25	50
4.00' - 7.00'	Cohesive (B-1)	100.0	----	250	0.02	----	100
	Granular	120.0	31	----	----	90	100
7.00' – 15.00'	Cohesive (B-1 & B-2)	37.6	----	250	0.02	----	100
	Granular	57.6	31	----	----	60	200
15.00' – 20.00'	Cohesive (B-1 & B-2)	37.6	----	350	0.02	----	150
	Granular	57.6	30	----	----	20	250

Northwestern Area (B-8 through B-12)

The following table summarizes the engineering characteristics of the soils encountered at the northwestern portion of the site as represented by Borings B-8 through B-12. Organic silty clay material was encountered in Boring B-11 at depths 9 ft to 17 ft below existing grades. Based on the boring results, groundwater level was estimated at a depth of 5 ft for these preliminary recommendations.

Approx. Depth (ft)	Soil Type	Effective Total Unit Weight (pcf)	Internal Angle of Friction (ϕ)	Cohesion (psf)	E_{50} Value	Soil Modulus k (pci)	Unit Skin Friction (psf)
0.00' – 5.00'	Granular	120.0	31	----	----	25	50
5.00' – 10.00'	Granular	57.6	31	----	----	60	150
10.00' - 15.00'	Cohesive (B-11)	37.6	----	250	0.02	----	100
	Granular	57.6	30	----	----	20	200
15.00' – 20.00'	Cohesive (B-11)	37.6	----	350	0.02	----	150
	Granular	57.6	31	----	----	60	250

Central Area (B-13 through B-20)

The following table summarizes the engineering characteristics of the soils encountered at the central portion of the site as represented by Borings B-13 through B-20. Organic silty clay material was encountered in B-14 at depths of 22 ft to 42 ft below existing grades and in B-15 at depths of 31 ft to 47 ft below existing grades. Based on the boring results, groundwater level was estimated at a depth of 10 ft for these preliminary recommendations.

Approx. Depth (ft)	Soil Type	Effective Total Unit Weight (pcf)	Internal Angle of Friction (ϕ)	Cohesion (psf)	E_{50} Value	Soil Modulus k (pci)	Unit Skin Friction (psf)
0.00' – 5.00'	Granular	120.0	30	----	----	25	50
5.00' – 10.00'	Granular	120.0	31	----	----	90	150
10.00' – 15.00'	Granular	57.6	31	----	----	60	250
15.00' – 20.00'	Granular	57.6	30	----	----	20	300

Southern Area (B-21 through B-25)

The following table summarizes the engineering characteristics of the soils encountered at the southern portion of the site as represented by Borings B-21 through B-25. Based on the boring results, groundwater level was estimated at a depth of 7 ft for these preliminary recommendations.

Approx. Depth (ft)	Soil Type	Effective Total Unit Weight (pcf)	Internal Angle of Friction (ϕ)	Cohesion (psf)	E_{50} Value	Soil Modulus k (pci)	Unit Skin Friction (psf)
0.00' - 3.00'	Granular	120.0	30	----	----	25	25
3.00' – 7.00'	Granular	120.0	31	----	----	90	100
7.00' – 12.00'	Cohesive (B-25)	52.6	----	500	0.01	----	200
	Granular	57.6	31	----	----	60	200
12.00' – 16.00'	Granular	57.6	30	----	----	60	250
16.00' – 20.00'	Granular	57.6	30	----	----	60	200

Shallow Foundation Considerations

No information regarding equipment pads (substation, inverter, etc.) were available at the time this report was prepared. However, should such structures be required to be supported on foundations or if light weight structures are needed for the project, the following preliminary recommendations are provided for shallow foundation design.

Based on the soil boring results, lightly loaded structures can be supported on spread footings designed for net allowable bearing pressure on the order of 2,000 pounds per square foot (psf). The net allowable soil bearing pressure refers to the pressure that can be transmitted to the foundation bearing soils in excess of the final overburden pressure at the base of a footing.

Prior to the placement of reinforcement and concrete for footings, the bases of the footing excavations should be observed, tested, and approved by a qualified representative of the Geotechnical Engineer to verify that soil conditions at each footing location are suitable for the design bearing pressure. If unsuitable soils are encountered at planned subgrade levels for any footing, the unsuitable soils should be undercut to suitable bearing materials. The footing can be directly supported on the competent soils at greater depths or, alternatively, the design footing bearing level can be restored through placement of lean concrete or select engineered fill materials.

If the design bearing level is restored using select engineered fill, then the excavation to remove the unsuitable soils should extend at least 0.5 ft laterally beyond the bottom edge of the footing for each 1 ft of vertical undercut below the footing bearing level. The select engineered fill materials should be placed and compacted as discussed in greater detail later in this report.

Settlement of the equipment pad foundations will be a function of the compressibility of the underlying subgrade soils, the actual applied loads, and other factors. The anticipated total settlements of individual footings, designed and constructed as outlined in this report, should be less than 1 inch. Maximum differential settlements within the proposed solar panel array and equipment pads are expected to be ½ inch over a horizontal distance of 30 feet.

In order to reduce the possibility of foundation bearing failure and excessive settlement due to local shear or "punching" action, we recommend that continuous footings have a minimum width of 1.5 feet and that isolated footings have a minimum lateral dimension of 2.5 feet. In addition, footings should be placed at a sufficient depth to provide adequate protection against frost heave. We recommend that all footings be placed at a minimum depth of 30 inches below finished grade.

Ground Supported Floor Slabs/Pads

Equipment pads, if required, may be ground-supported on subgrades prepared in accordance with the recommendations in the sections titled Subgrade Preparation and Fill Placement. It is important that pad/slab subgrade be firm and stable before the placement of the granular subbase materials, and the concrete. Based on the test boring results and the anticipated

planned finished grades, the anticipated slab subgrade should generally consist of firm natural soils, or new engineered fill.

The existing subgrade should be thoroughly proofrolled with suitable equipment and/or probed by a qualified representative of the Geotechnical Engineer in an effort to detect unstable or otherwise unacceptable soil conditions. Soils in any excessively unstable areas should be undercut and replaced with new engineered fill. Recommendations for construction of engineered fill are presented in the Fill Placement section of this report.

It is recommended that equipment pads and ground-supported slabs be underlain by a minimum of 4 inches of CR-6 or GA S/B dense-graded aggregate or approved equivalents. Acceptable granular subbase materials should have no aggregate size greater than 1.5 inches, 95 to 100 percent passing the 1 inch sieve, and less than 12 percent by total weight passing the Number 200 sieve. The granular subbase materials will provide a capillary break between the subgrade and the concrete slab, a higher modulus of subgrade reaction, and more uniform support conditions.

All granular materials should be compacted; however, if the granular subbase materials have more than 5 percent fines, those materials should be compacted to a minimum of 98 percent of the maximum dry density as determined by the Standard Proctor compaction test method (ASTM D 698). For structural design purposes, a modulus of subgrade reaction (k) of 100 pounds per cubic inch (pci) may be utilized for the structural design of slabs, provided a 4-inch subbase is utilized and the subgrade has been prepared in accordance with the recommendations presented herein.

The majority of the encountered soils near the surface are considered susceptible to frost. Should frost heave be an issue for the planned equipment pads, we recommend either lowering the pad bottoms to 30 inches below finished grade or over-excavating and replacing the upper 30 inches with a non-susceptible frost material such as CR-6/RC-6 material.

In the event there is a significant time lag between the site grading work and the fine grading of concrete slab areas prior to the placement of the subbase stone or concrete, the Geotechnical Engineer should verify the condition of the prepared subgrade. Prior to final pad/slab construction, the subgrade may require scarification and re-compaction to provide firm and stable conditions.

Seismic Design

Section 1613.3.2 of the IBC 2012 refers to Chapter 20 of ASCE7 for seismic site classification, which is based on various criteria, one of which is the Standard Penetration Resistance, N_{bar}, derived from the Standard Penetration Test Procedure (ASTM D-1586). ASCE7 Table 20.3.1 provides correlations for Site Classes C, D, and E with various ranges of N_{bar} to be calculated for the top 100 feet of the subsurface materials at a site in accordance with procedures described in Section 20.4.2 of ASCE7. In addition, the table presents criteria related to various soil properties for Site Classes E and F. ECS has used Table 20.3.1 of ASCE7 and the procedures outlined in Section 20.4.2 of ASCE7 to evaluate the Site Class for this project site.

Based on our review of the soil test boring results, it appears that the average N_{bar} value should be in the range of 15 to 50 blows per foot over a depth of 100 ft. This N_{bar} places the project site within the Site Classification of D, according to Table 20.3.1 of ASCE7.

General Site Development Considerations

Based on the provided project information, we anticipate that access roadways may be required for the site development. Based on the boring results, generally the near-surface soils should be adequate to remain in-place to support grass roadways; however, very loose granular soils were encountered below the topsoil in several areas of the site. Such material may be densified in-place or over-excavated to firm subgrade and backfilled as recommended in this report. In addition, subgrade compaction may be required for the construction of grass roadways.

Based on the borings, some of the natural soils consisted of granular soils, which may be considered suitable to support infiltration practices, if required. It is our opinion that the site conditions should be adequate to support SWM facilities, perimeter roads, access roads, and other civil site improvements planned for the project. Additionally, standard sediment and erosion control measures would be suitable for the project.

Construction entrances to the site will be subjected to heavy loads, which will require additional support. For such entrances, 12 inches to 18 inches of No. 2 stone may be required to provide a stable construction entrance, provided that the topsoil has been removed.

We understand that directional drilling will be required in some areas for the transmission lines. Based on the boring results in such areas, the subgrades soils generally consisted of Silty Sand (SM), Sandy to Clayey Silt (ML to ML/CL), Clayey Sand (SC), and Organic Clay (OH), which should not be problematic for directional drilling.

Earthwork Operations

The following paragraphs detail our recommendations regarding subgrade preparation and compaction requirements, if required.

<u>Subgrade Preparation</u>

Subgrade preparation for structures requiring footings and slabs-on-grade should generally include the stripping of any unsuitable surface materials from the planned structure areas. It is recommended that the stripping of unsuitable surficial materials should extend to a minimum of 10 feet beyond the structure area limits, where feasible.

Subsequent to stripping operations, the exposed subgrade soils in the planned solar panel array areas should be examined by a qualified representative of the Geotechnical Engineer. The exposed soils should be thoroughly proofrolled by a vehicle having an axle weight of at least 20 tons, such as a fully-loaded tandem-axle dump truck. This procedure is intended to

assist in identifying any localized loose or yielding materials. In the event that any yielding materials are encountered during the proofrolling operations, those subgrade soils should either be thoroughly densified in-place, or undercut to firm ground and replaced with controlled, compacted fill to final subgrade elevations.

Fill Placement

Prior to placement of compacted fill, representative bulk samples (about 50 pounds) should be taken of the proposed fill soils and laboratory tests should be conducted to determine Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships for compaction. These test results will be necessary for proper control of construction for new engineered fill.

Upon achieving competent subgrade conditions, the Contractor can place and compact engineered fill to reach final subgrade levels. In general, any materials to be used as structural fill should consist of soil types classified as ML or more granular, in accordance with ASTM D 2487, and should have a Liquid Limit less than 40 and a Plasticity Index less than 15.

Finer-grained, more plastic, and organic soil types, if encountered at the site, may be used as fill materials in non-structural areas. Any such materials encountered during grading operations should be either stockpiled for later use in landscape fills, or should be placed in approved disposal areas either on-site or off-site.

Prior to the utilization of any on-site or off-site borrow materials, the Geotechnical Engineer should be provided with representative samples in order to determine the suitability of the materials for use as a controlled compacted fill and to develop moisture-density relationships. In order to expedite the earthwork operations, it is recommended that any off-site borrow materials generally should be comprised of SM or more granular soil types.

All structural fill should be placed in loose lifts, which do not exceed 8 inches in thickness, and should be compacted to at least 95 percent of the maximum dry density, as determined by the Standard Proctor Compaction Test (ASTM D 698). Fill placed in non-structural areas should be compacted to at least 90 percent of the Standard Proctor maximum dry density in order to avoid significant subsidence. Generally, the moisture content of the fill material should be maintained within ± 2 percentage points of the optimum moisture content for the fill material, as determined by ASTM D 698.

All filling operations should be observed on a full-time basis by a qualified representative of the Geotechnical Engineer to determine that minimum compaction requirements are being achieved. A minimum of one compaction test per lift should be made per 2,500 square feet of fill lift area, but not fewer than two tests per lift should be made for any lift. The elevations and locations of the field density tests should be clearly identified at the time of fill placement and compaction.

Compaction equipment suitable for the soil types being used as fill should be selected to compact the fill. Theoretically, any equipment type can be used, so long as the required density is achieved. Ideally, a steel drum roller generally will be the most efficient for compaction of

granular soil types and for sealing the surface soils, while a sheepsfoot roller or pneumatic-tire roller generally will be most efficient for compaction of cohesive soil types.

At the end of each work day, all fill areas should be graded to facilitate surface drainage of any surface runoff associated with precipitation, and should be sealed by use of a smooth-drum roller to limit infiltration of surface water. During placement and compaction of new fill at the beginning of each workday, the Contractor should scarify existing subgrade soils so that a weak plane will not be formed between the new fill and the existing subgrade soils. We recommend that subgrade soils should be scarified to depths of about 4 inches prior to placement of new fill.

Fill materials should not be placed on frozen soils, frost-heaved soils, and/or excessively wet soils. All frozen, frost-heaved, or excessively wet soils should be removed prior to continuation of fill operations. Borrow fill materials should not contain frozen materials at the time of placement. All frozen, frost-heaved, or excavated wet soils should be removed prior to placement of controlled, compacted fill. Moisture contents for excessively wet soils will need to be lowered to the range limits previously discussed.

If any problems are encountered during the earthwork operations, or if site conditions deviate from those indicated by the borings, the Geotechnical Engineer should be notified immediately.

Construction Considerations

The on-site soils contain silt and clay fines that will be sensitive to moisture increases and to construction disturbance. Construction activities in the presence of excessive moisture can lead to softening of the subgrade soils and loss of bearing capacity. Therefore, it will be prudent to schedule earthwork operations during the warmer and drier seasons that generally occur from late spring to early fall. Measures should also be taken to limit site disturbance, especially from rubber-tired heavy construction equipment, and to provide for drainage of surface water from areas being developed.

A firm working surface for the placement of engineered fill should be established prior to construction of new fills. The moisture content of the fill soils at the time of placement should be carefully controlled to ensure that the required compaction effort can be achieved without excessive pumping or movement of the fill mass.

In the event that the earthwork operations are accomplished during the cooler and wetter periods of the year, delays and additional costs should be anticipated. At these times, reduction of soil moisture may need to be accomplished by a combination of mechanical manipulation and the use of chemical additives, such as lime or cement, in order to lower moisture contents to levels appropriate for compaction.

As noted in the **Water Level Observations** section of this report, groundwater was encountered in all borings, with the exception of Boring B-18, at depths ranging from 3 ft to 23 ft below existing grade. Any other groundwater encountered during construction should be the result of perched water and should be readily managed by interceptor trenches and localized systems of sumps and pumps.

Foundation excavations must be protected to prevent the disturbance of the subgrade materials and to minimize any potential loss of support capacity. Foundation concrete generally should be placed for foundations during the same day that the foundation excavations are made and approved. Should excavating and placing the foundation concrete the same day not be practical, we recommend that a concrete mud mat, 2 to 3 inches thick, be placed to protect the subgrade soils from moisture changes and disturbance. If protection of the soils is not provided, then undercutting of softened or loosened soils may be necessary prior to the placement of reinforcing steel and foundation concrete.

Prior to the placement of any foundation concrete or mud mat, the subgrade soils must be carefully examined and tested by a qualified representative of the Geotechnical Engineer to confirm the availability of the design soil bearing capacity. To minimize disturbance to the subgrade soils during excavation, we recommend that a bucket without scarifying teeth, in addition to hand excavation methods, be used during the final phases of the excavation for the foundations.

Any cuts or excavations associated with solar panel array and utility excavations may require forming or bracing, slope flattening, or other physical measures to control sloughing and/or to prevent slope failures. An examination of the applicable OSHA codes and requirements should be made by the appropriate Contractor to ensure that adequate protection of the excavations and trench walls is provided. The surface soils contain some silt and fine sands and are considered erodible. The Contractor should provide and maintain good site drainage during earthwork operations to help to maintain the integrity of the surface soils.

All erosion and sedimentation shall be controlled in accordance with sound engineering practice and current local requirements. Surface water should be directed away from the construction area, and the site should be sloped at gradients of 1 to 2 percent to reduce the potential for ponding water and the subsequent saturation of the surface soils.

CLOSING

This report has been prepared to provide Open Road Renewables with subsurface information and evaluations and recommendations to guide geotechnical-related design and construction for development of the site. The report scope is limited to this specific project and the location described. The project description represents our current understanding of the significant aspects of the proposed development relevant to geotechnical considerations for the project.

The evaluations and recommendations presented in this report are, of necessity, based on the information made available to us at the time of the actual writing of the report and the site conditions, surface and subsurface, that existed at the time the exploratory borings were drilled. Further assumption has been made that the limited exploratory borings, in relation both to the aerial extent of the site and to depth, are representative of general subsurface conditions across the site. If subsurface conditions are encountered that differ significantly from those reported herein, the Geotechnical Engineer should be notified immediately so that the analyses and recommendations presented in this report can be reviewed for validity.

Should there be significant changes to the proposed construction; ECS may need to review the changes to determine whether the evaluations and recommendations of this report will remain valid. ECS should be provided with appropriate plans and other information as project design progresses, so that we can review the information and provide additional geotechnical exploration, testing analyses, and guidance, as needed. In addition, the Geotechnical Engineer should be retained to prepare, or at least to review, the earthwork specifications, to assure that the recommendations of the geotechnical report have been properly interpreted and included in the construction documents.

APPENDIX

- Site Location Diagram
- Reference Notes for Boring Logs
- Laboratory Test Results
- Boring Logs
- Generalized Subsurface Profiles
- Boring Location Plan

SITE LOCATION DIAGRAM

CHERRYWOOD SOLAR

GOLDSBORO MD 21636
OPEN ROAD RENEWABLES

ENGINEER	KFB
SCALE	NTS
PROJECT NO.	02:8631
SHEET	1 OF 1
DATE	12/28/2017

REFERENCE NOTES FOR BORING LOGS

MATERIAL[1,2]

Symbol	Material
	ASPHALT
	CONCRETE
	GRAVEL
	TOPSOIL
	VOID
	BRICK
	AGGREGATE BASE COURSE
FILL[3]	MAN-PLACED SOILS
GW	**WELL-GRADED GRAVEL** gravel-sand mixtures, little or no fines
GP	**POORLY-GRADED GRAVEL** gravel-sand mixtures, little or no fines
GM	**SILTY GRAVEL** gravel-sand-silt mixtures
GC	**CLAYEY GRAVEL** gravel-sand-clay mixtures
SW	**WELL-GRADED SAND** gravelly sand, little or no fines
SP	**POORLY-GRADED SAND** gravelly sand, little or no fines
SM	**SILTY SAND** sand-silt mixtures
SC	**CLAYEY SAND** sand-clay mixtures
ML	**SILT** non-plastic to medium plasticity
MH	**ELASTIC SILT** high plasticity
CL	**LEAN CLAY** low to medium plasticity
CH	**FAT CLAY** high plasticity
OL	**ORGANIC SILT or CLAY** non-plastic to low plasticity
OH	**ORGANIC SILT or CLAY** high plasticity
PT	**PEAT** highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

Designation		Particle Sizes
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

Unconfined Compressive Strength, Q_P[4]	SPT[5] (BPF)	Consistency[7] (Cohesive)
<0.25	<3	Very Soft
0.25 - <0.50	3 - 4	Soft
0.50 - <1.00	5 - 8	Medium Stiff
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

Relative Amount[7]	Coarse Grained (%)	Fine Grained (%)
Trace	<5	<5
Dual Symbol *(ex: SW-SM)*	10	10
With	15 - 20	15-25
Adjective *(ex: "Silty")*	25 - <50	30 - <50

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT[5]	Density
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

WATER LEVELS[6]

WL	Water Level (WS)(WD)
	(WS) While Sampling
	(WD) While Drilling
SHW	Seasonal High WT
ACR	After Casing Removal
SWT	Stabilized Water Table
DCI	Dry Cave-In
WCI	Wet Cave-In

[1] *Classifications and symbols per ASTM D 2488-09 (Visual-Manual Procedure) unless noted otherwise.*

[2] *To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.*

[3] *Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-**FILL**)].*

[4] *Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).*

[5] *Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf).*

[6] *The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.*

[7] *Minor deviation from ASTM D 2488-09.*

Laboratory Testing Summary

Sample Source	Sample Number	Depth (feet)	MC[1] (%)	Soil Type[2]	Atterberg Limits[3]			Percent Passing No. 200 Sieve[4]	Moisture - Density (Corr.)[5]		CBR Value[6]	Other
					LL	PL	PI		Maximum Density (pcf)	Optimum Moisture (%)		
B-1												
	S-1	1.00 - 2.50	15.4									
	S-2	3.50 - 5.00	60.3									
	S-3	6.00 - 7.50	57.7	OH	87	31	56	57.7				
	S-4	8.50 - 10.00	51.8									
	S-5	13.50 - 15.00	59.1									
B-4												
	S-1	1.00 - 2.50	8.5									
	S-2	3.50 - 5.00	4.6									
	S-3	6.00 - 7.50	10.5									
	S-4	8.50 - 10.00	18.8	SM	19	NP	NP	22.0				
	S-5	13.50 - 15.00	18.3									
B-7												
	S-1	1.00 - 2.50	4.3									
	S-2	3.50 - 5.00	4.3									
	S-3	6.00 - 7.50	2.7									
	S-4	8.50 - 10.00	14.0									
	S-5	13.50 - 15.00	13.3									
B-8												
	S-1	1.00 - 2.50	11.9									
	S-2	3.50 - 5.00	13.0									
	S-3	6.00 - 7.50	20.9									
	S-4	8.50 - 10.00	34.6									
	S-5	13.50 - 15.00	24.7									
B-11												
	S-1	1.00 - 2.50	8.9									
	S-2	3.50 - 5.00	16.9									
	S-3	6.00 - 7.50	18.1									

Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content (ASTM D 2974)

Project No. 02:8631
Project Name: Cherrywood Solar
PM: Katie Buckley
PE: Hasan M. Aboumatar
Printed On: Wednesday, January 10, 2018

ECS MID-ATLANTIC, LLC
1340 Charwood Road, Suite A
Hanover, MD 21076
Phone: (410) 859-4300
Fax: (410) 859-4324

Laboratory Testing Summary

Sample Source	Sample Number	Depth (feet)	MC[1] (%)	Soil Type[2]	Atterberg Limits[3] LL	PL	PI	Percent Passing No. 200 Sieve[4]	Moisture - Density (Corr.)[5] Maximum Density (pcf)	Optimum Moisture (%)	CBR Value[6]	Other
	S-4	8.50 - 10.00	7.6									
	S-5	13.50 - 15.00	63.4									
B-12												
	S-1	1.00 - 2.50	18.2									
	S-2	3.50 - 5.00	16.0									
	S-3	6.00 - 7.50	19.5									
	S-4	8.50 - 10.00	21.6									
	S-5	13.50 - 15.00	24.7	SP-SM	20	NP	NP	10.0				
B-14												
	S-1	1.00 - 2.50	12.6									
	S-2	3.50 - 5.00	10.2									
	S-3	6.00 - 7.50	6.8									
	S-4	8.50 - 10.00	8.2									
	S-5	13.50 - 15.00	6.2									
	S-7	23.50 - 25.00	64.2	OH	92	37	55	63.8				
B-15												
	S-1	1.00 - 2.50	13.0									
	S-2	3.50 - 5.00	8.6									
	S-3	6.00 - 7.50	3.6									
	S-4	8.50 - 10.00	11.9									
	S-5	13.50 - 15.00	20.7									
B-18												
	S-1	1.00 - 2.50	7.9									
	S-2	3.50 - 5.00	4.1									
	S-3	6.00 - 7.50	9.5									
	S-4	8.50 - 10.00	13.2									
	S-5	13.50 - 15.00	10.2									
B-20												

Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content (ASTM D 2974)

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Laboratory Testing Summary

Sample Source	Sample Number	Depth (feet)	MC[1] (%)	Soil Type[2]	Atterberg Limits[3]			Percent Passing No. 200 Sieve[4]	Moisture - Density (Corr.)[5]		CBR Value[6]	Other
					LL	PL	PI		Maximum Density (pcf)	Optimum Moisture (%)		
	S-1	1.00 - 2.50	13.8									
	S-2	3.50 - 5.00	10.9									
	S-3	6.00 - 7.50	12.0									
	S-4	8.50 - 10.00	16.8									
	S-5	13.50 - 15.00	8.7									
	S-7	23.50 - 25.00	54.8	ML	28	NP	NP	62.2				
B-21												
	S-1	1.00 - 2.50	10.1									
	S-2	3.50 - 5.00	11.9									
	S-3	6.00 - 7.50	13.4									
	S-4	8.50 - 10.00	9.0									
	S-5	13.50 - 15.00	13.0									
B-25												
	S-1	1.00 - 2.50	12.6									
	S-2	3.50 - 5.00	10.4									
	S-3	6.00 - 7.50	17.8									
	S-4	8.50 - 10.00	25.3	CH	54	24	30	81.2				
	S-5	13.50 - 15.00	23.1									

Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content (ASTM D 2974)

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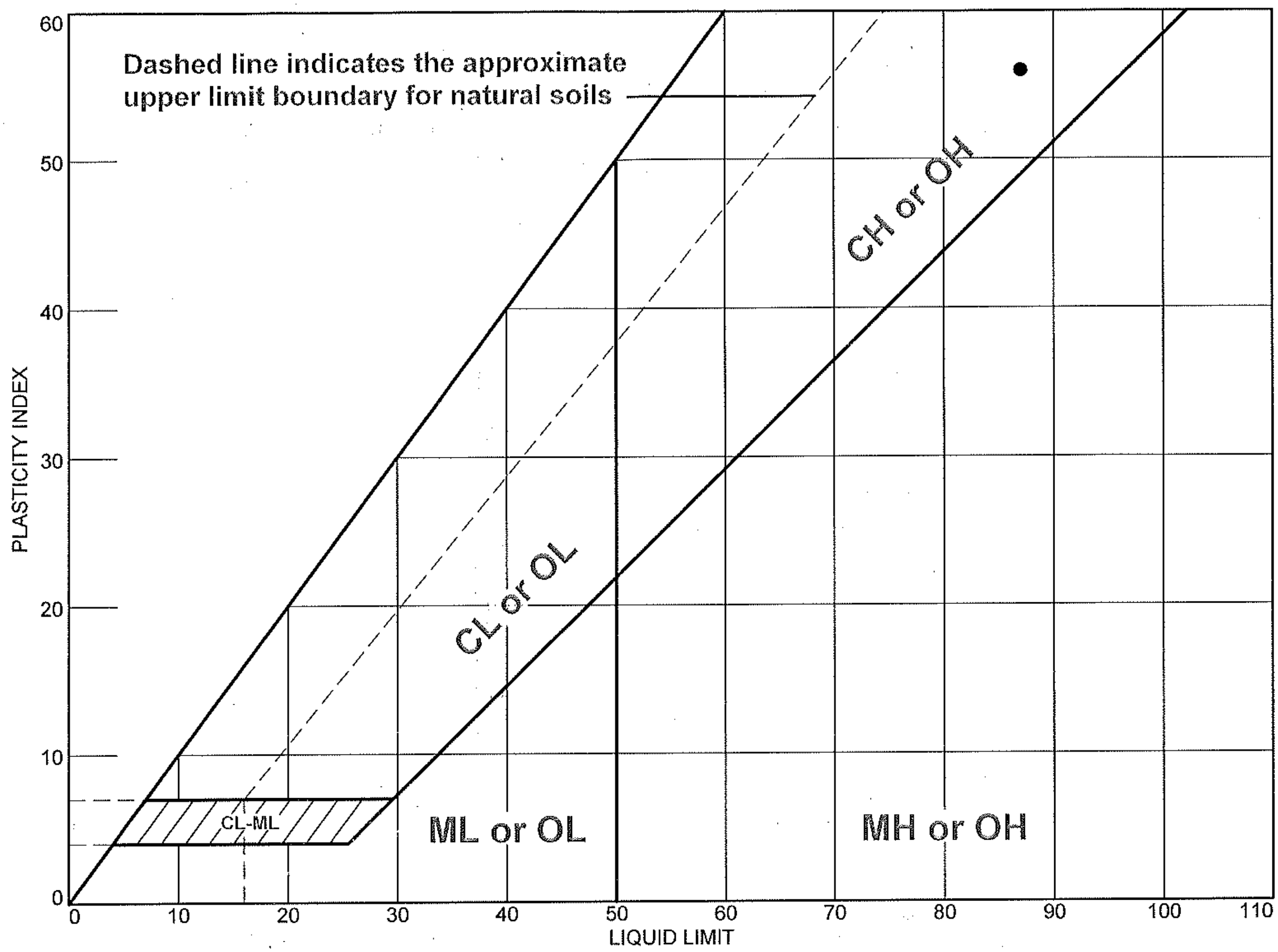
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	(ML/CL) CLAYEY SILT, dark gray, moist, firm to stiff	87	31	56		57.7	OH

Project No. 8631 **Client:** Open Road Renewables

Project: Cherrywood Solar

● **Source of Sample:** B-1 **Depth:** 6.00-7.50 **Sample Number:** S-3

Remarks:

● 2nd Liquid Limit = 50

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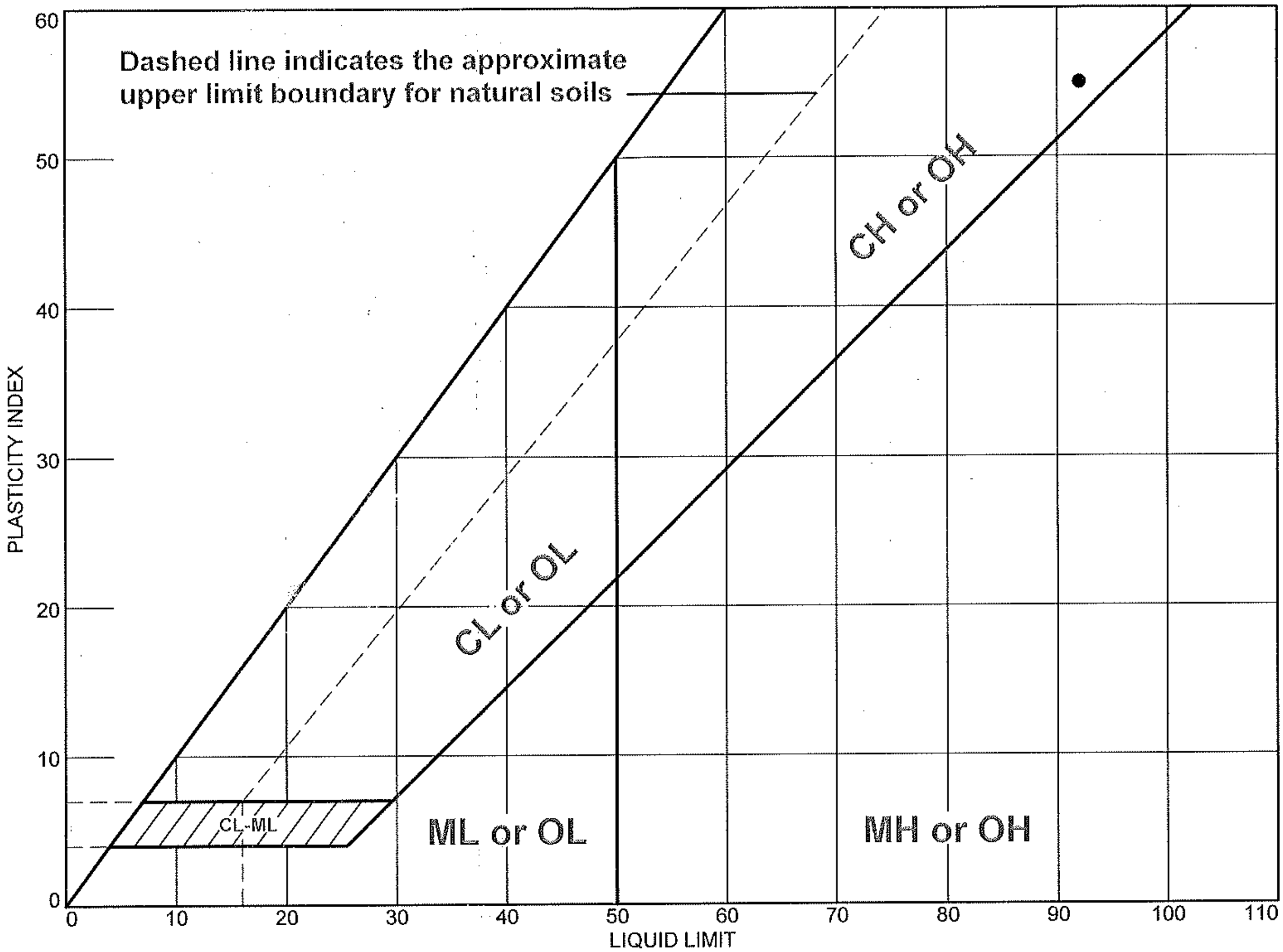
Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	(CL/ML) SILTY CLAY, dark gray, moist, soft to firm	92	37	55		63.8	OH

Project No. 8631 **Client:** Open Road Renewables

Project: Cherrywood Solar

● **Source of Sample:** B-14 **Depth:** 23.50-25.00 **Sample Number:** S-7

Remarks:

● 2nd Liquid Limit = 52

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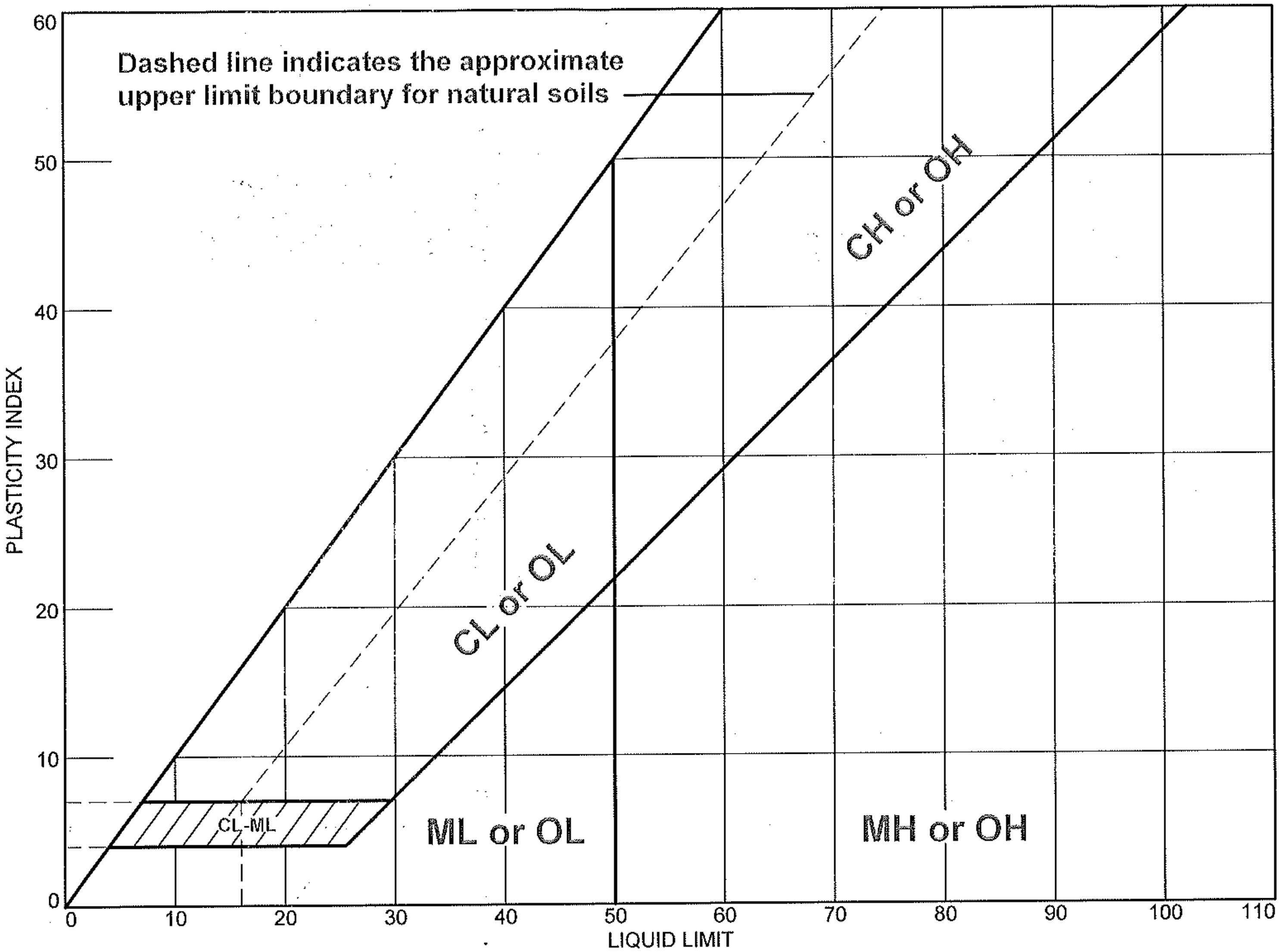
Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	(CL/ML) SILTY CLAY, dark gray, moist, firm	28	NP	NP		62.2	ML

Project No. 8631 **Client:** Open Road Renewables

Project: Cherrywood Solar

● **Source of Sample:** B-20 **Depth:** 23.50-25.00 **Sample Number:** S-7

Remarks:

● 2nd Liquid Limit = 22

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Figure

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-1	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION
15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

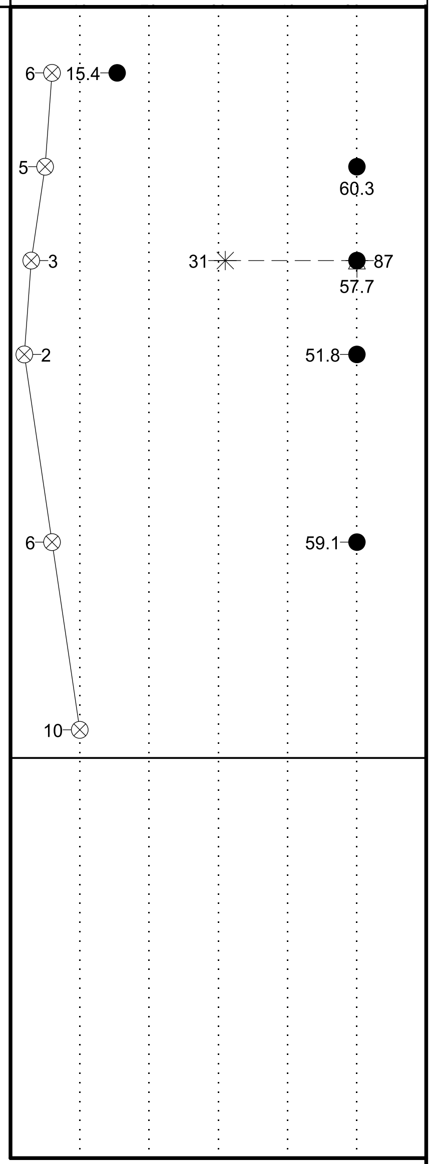
ROCK QUALITY DESIGNATION & RECOVERY
RQD% — — — REC% ———

PLASTIC LIMIT% ✕ — WATER CONTENT% ● — LIQUID LIMIT% △

⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS
BOTTOM OF CASING — LOSS OF CIRCULATION
SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [6.00"]			
					(SC) CLAYEY SAND, brown, moist, loose			
	S-1	SS	18	12				2 2 4
	S-2	SS	18	18	(OH) ORGANIC CLAY, dark gray, moist, medium stiff to soft			2 2 3
5								
	S-3	SS	18	18				1 1 2
					(OH) ORGANIC CLAY, dark gray, wet, very soft			
	S-4	SS	18	18				1 1 1
10								
					(ML/CL) SANDY CLAYEY SILT, dark gray, moist, medium stiff to stiff			
	S-5	SS	18	18				2 3 3
15								
	S-6	SS	18	18				3 4 6
20					END OF BORING @ 20'			
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 8.0 WS ☐ WD ☒	BORING STARTED 12/04/17	CAVE IN DEPTH @ 17.7'
WL(SHW) WL(ACR) 2.1	BORING COMPLETED 12/04/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-2	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION

15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – – – REC% ———

PLASTIC LIMIT% — WATER CONTENT% — LIQUID LIMIT%

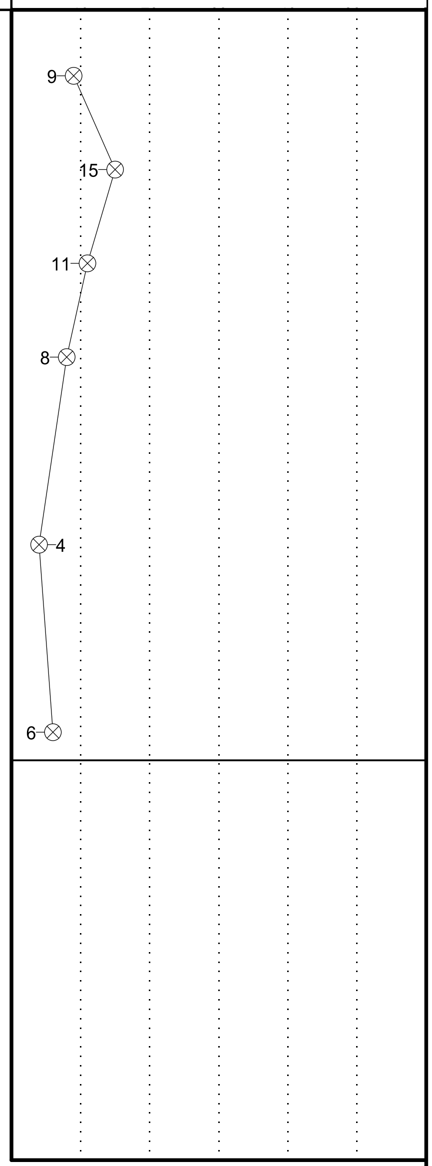
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [10.00"]			
	S-1	SS	18	12	(SM) SILTY SAND, trace clay, light gray, moist, loose			2 3 6
	S-2	SS	18	16	(SM) SILTY SAND, trace clay, light gray, wet, medium dense			4 7 8
5								
	S-3	SS	18	16				4 5 6
	S-4	SS	18	16	(ML/CL) SANDY CLAYEY SILT, trace gravel, light gray, wet, medium stiff			3 4 4
10								
	S-5	SS	18	18	(OH) ORGANIC CLAY, trace silt, dark gray, moist, soft to medium stiff			1 2 2
15								
	S-6	SS	18	18				2 3 3
20					END OF BORING @ 20'			
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 8.0 WS ☐ WD ☒	BORING STARTED 12/04/17	CAVE IN DEPTH @ 14.2'
WL(SHW) WL(ACR) 3.1	BORING COMPLETED 12/04/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-3	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION
15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT²

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – – – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS
BOTTOM OF CASING / LOSS OF CIRCULATION
SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					Topsoil Depth [6.00"]				
					(SM) SILTY SAND, brown, moist, loose				
	S-1	SS	18	16				2 2 4	6
					(SM) SILTY SAND, tan, moist, medium dense				
	S-2	SS	18	18				5 7 8	15
5									
	S-3	SS	18	18				4 6 10	16
					(SC) CLAYEY SAND, trace gravel, tan, wet, loose				
	S-4	SS	18	18				4 5 5	10
10									
						▽			
	S-5	SS	18	18				2 2 3	5
15									
					(SM) SILTY SAND WITH GRAVEL, gray, wet, medium dense				
	S-6	SS	18	16				3 4 7	11
					(ML) SANDY SILT, greenish gray, wet, stiff				
20					END OF BORING @ 20'				
25									
30									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 11.0 WS ☐ WD ☒	BORING STARTED 12/04/17	CAVE IN DEPTH @ 6.5'
WL(SHW) WL(ACR) DRY	BORING COMPLETED 12/04/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-4	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION

15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY

RQD% – – – REC% ———

PLASTIC LIMIT% ✕ — WATER CONTENT% ● — LIQUID LIMIT% △

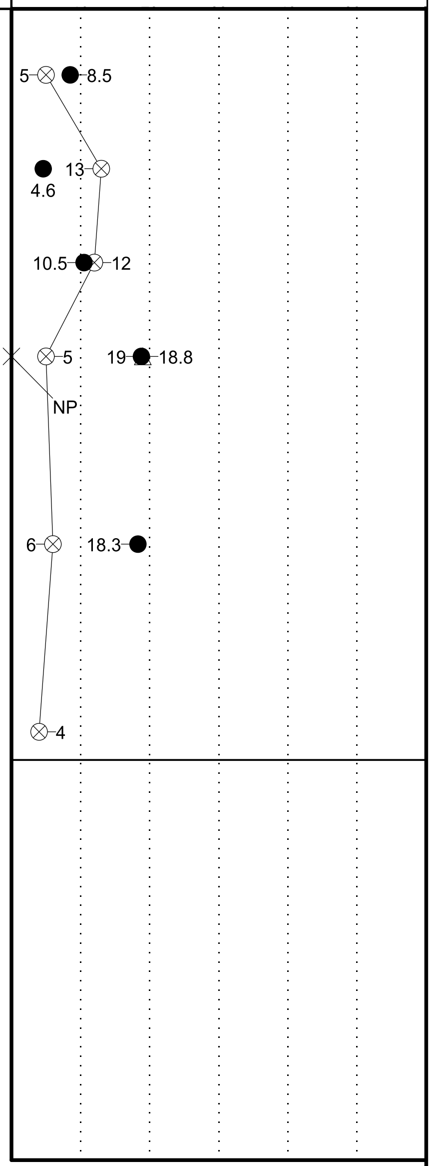
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [12.00"]			
	S-1	SS	18	18	(SM) SILTY SAND, brown, moist, loose to medium dense			1 2 3
	S-2	SS	18	18				4 6 7
5								
	S-3	SS	18	18				3 5 7
	S-4	SS	18	18	(SM) SILTY SAND, light gray, wet, loose	▽		2 2 3
10								
	S-5	SS	18	18				2 3 3
15								
	S-6	SS	18	18	(SC) CLAYEY SAND WITH GRAVEL, tan, wet, very loose			2 2 2
20					END OF BORING @ 20'			
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

▽ WL 9.0 WS ☐ WD ☒	BORING STARTED 12/04/17	CAVE IN DEPTH @ 8.1'
▽ WL(SHW) ▼ WL(ACR) DRY	BORING COMPLETED 12/04/17	HAMMER TYPE Auto
▽ WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-5	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION
15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

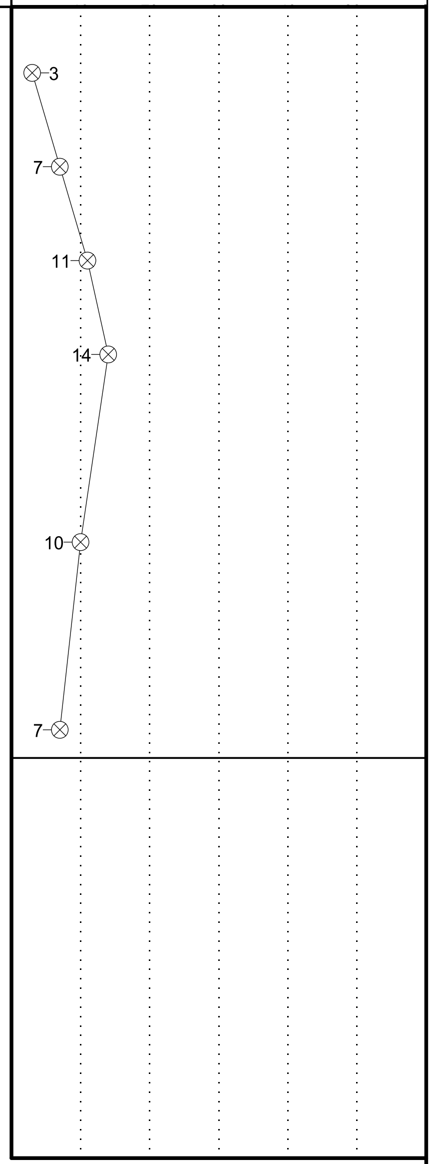
ROCK QUALITY DESIGNATION & RECOVERY
RQD% – – – REC% ———

PLASTIC LIMIT% ✕ — WATER CONTENT% ● — LIQUID LIMIT% △

⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS
BOTTOM OF CASING — LOSS OF CIRCULATION 100%
SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					Topsoil Depth [8.00"]				
					(SM) SILTY SAND, brown, moist, very loose to loose				
	S-1	SS	18	18				1 1 2	3
	S-2	SS	18	16				2 3 4	7
5					(SM) SILTY SAND, tan, moist, medium dense				
	S-3	SS	18	18				3 5 6	11
	S-4	SS	18	18				4 7 7	14
10									
					(SM) SILTY SAND, tan, wet, loose	▽			
	S-5	SS	18	18				3 5 5	10
15									
	S-6	SS	18	16				2 3 4	7
20					END OF BORING @ 20'				
25									
30									



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 13.0 WS ☐ WD ☒	BORING STARTED 12/04/17	CAVE IN DEPTH @ 5.7'
WL(SHW) WL(ACR) DRY	BORING COMPLETED 12/04/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-6	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION
15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT²

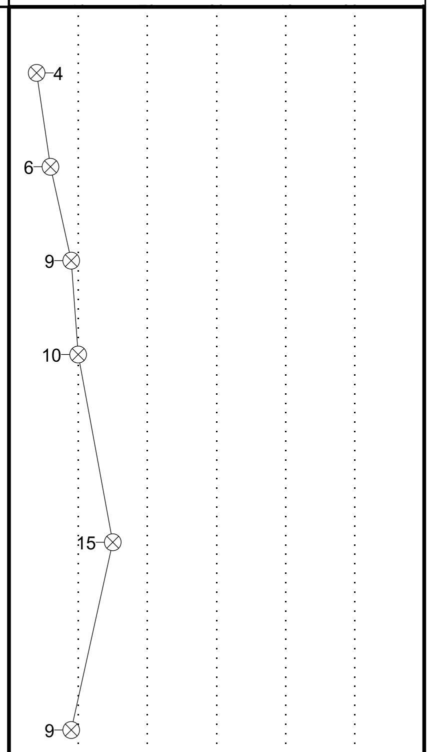
ROCK QUALITY DESIGNATION & RECOVERY
RQD% – – – REC% ———

PLASTIC LIMIT% — WATER CONTENT% — LIQUID LIMIT%

⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS
BOTTOM OF CASING — LOSS OF CIRCULATION
SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					Topsoil Depth [6.00"]				
					(SM) SILTY SAND, brown, moist, very loose to loose				
	S-1	SS	18	14				1 2 2	4
	S-2	SS	18	18				2 3 3	6
5									
	S-3	SS	18	18				3 4 5	9
	S-4	SS	18	18				3 4 6	10
10									
					(SM) SILTY SAND WITH GRAVEL, orangish brown, wet, medium dense to loose	▽			
	S-5	SS	18	18				3 6 9	15
15									
	S-6	SS	18	18				3 4 5	9
20					END OF BORING @ 20'				
25									
30									



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 12.0 WS ☐ WD ☒	BORING STARTED 12/04/17	CAVE IN DEPTH @ 5.9'
WL(SHW) WL(ACR) DRY	BORING COMPLETED 12/04/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-7	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION

15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

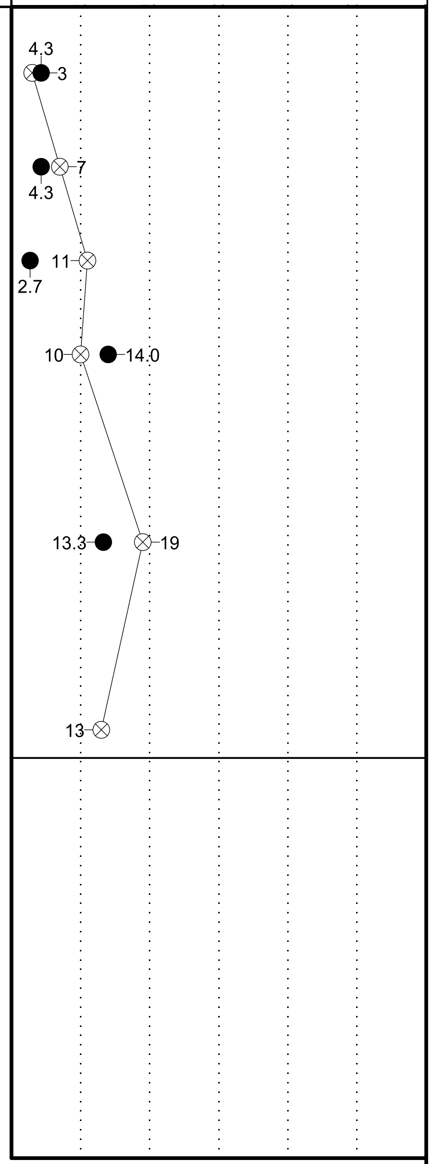
ROCK QUALITY DESIGNATION & RECOVERY
RQD% – – – REC% ———

PLASTIC LIMIT% ✕ — WATER CONTENT% ● — LIQUID LIMIT% △

⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS
BOTTOM OF CASING — LOSS OF CIRCULATION 100%
SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [8.00"]			
	S-1	SS	18	18	(SM) SILTY SAND, brown, moist, very loose to loose			1 1 2
	S-2	SS	18	18				2 3 4
5					(SM) SILTY SAND, brown, moist, medium dense			
	S-3	SS	18	18				3 5 6
					(SM) SILTY SAND WITH GRAVEL, grayish brown, wet, loose	▽		
	S-4	SS	18	16				3 5 5
10								
					(SM) SILTY SAND, tan, wet, medium dense			
	S-5	SS	18	16				5 8 11
15								
					(SM) SILTY SAND WITH GRAVEL, tan, wet, medium dense			
	S-6	SS	18	16				4 6 7
20					END OF BORING @ 20'			
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 8.0 WS ☐ WD ☒	BORING STARTED 12/04/17	CAVE IN DEPTH @ 6.1'
WL(SHW) WL(ACR) DRY	BORING COMPLETED 12/04/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-8	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION

15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY

RQD% – – – REC% ———

PLASTIC LIMIT% × — WATER CONTENT% ● — LIQUID LIMIT% △

⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT	WATER CONTENT%
0					Topsoil Depth [10.00"]					
	S-1	SS	18	16	(ML/CL) SANDY CLAYEY SILT, gray, moist, medium stiff to stiff			2 2 4	6	11.9
	S-2	SS	18	18		▼		4 5 6	11	13.0
5										
	S-3	SS	18	16	(CL) SANDY LEAN CLAY, gray, moist, medium stiff	▽		4 5 3	8	20.9
					(SM) SILTY SAND, tan and gray, wet, very loose to loose					
	S-4	SS	18	16				2 1 2	3	34.6
10										
	S-5	SS	18	16				2 3 3	6	24.7
15										
	S-6	SS	18	18				3 4 4	8	
20					END OF BORING @ 20'					
25										
30										

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 7.0 WS ☐ WD ☒	BORING STARTED 12/04/17	CAVE IN DEPTH @ 7.9'
WL(SHW) WL(ACR) 4.6	BORING COMPLETED 12/12/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-9	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION

15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY

RQD% – – – REC% ———

PLASTIC LIMIT% ✕ — WATER CONTENT% ● — LIQUID LIMIT% △

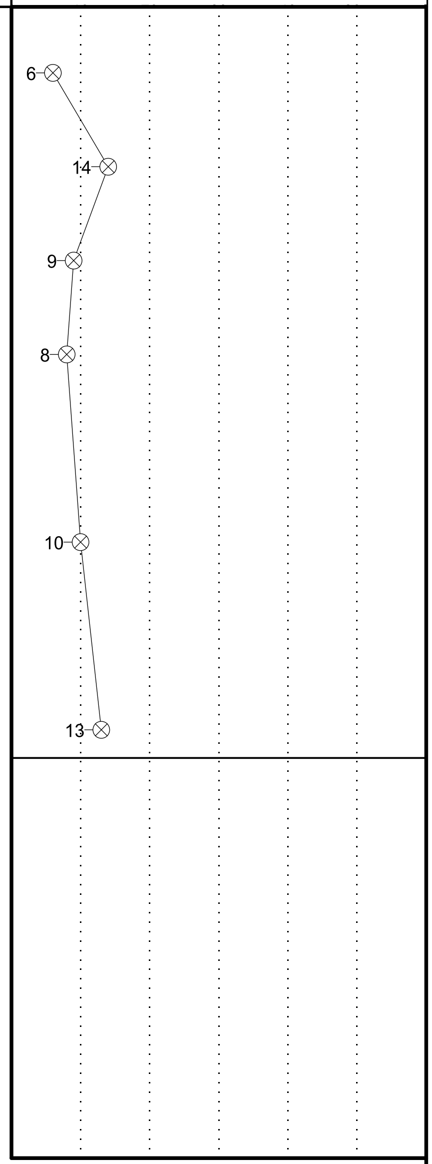
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					Topsoil Depth [10.00"]				
	S-1	SS	18	18	(ML/CL) SANDY CLAYEY SILT, gray, moist, medium stiff			2 3 3	6
	S-2	SS	18	18	(SM) SILTY SAND, trace clay, gray, moist, medium dense			3 5 9	14
5									
	S-3	SS	18	14	(SC) CLAYEY SAND, gray, moist, loose			3 4 5	9
	S-4	SS	18	18				3 4 4	8
10									
					(SM) SILTY SAND, trace gravel, tan and gray, wet, loose to medium dense	▽			
	S-5	SS	18	18				3 4 6	10
15									
	S-6	SS	18	16				4 6 7	13
20					END OF BORING @ 20'				
25									
30									



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 12.0 WS ☐ WD ☒	BORING STARTED 12/12/17	CAVE IN DEPTH @ 10.3'
WL(SHW) WL(ACR) DRY	BORING COMPLETED 12/12/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-10	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION

15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY

RQD% – – – REC% ———

PLASTIC LIMIT% ✕ WATER CONTENT% ● LIQUID LIMIT% △

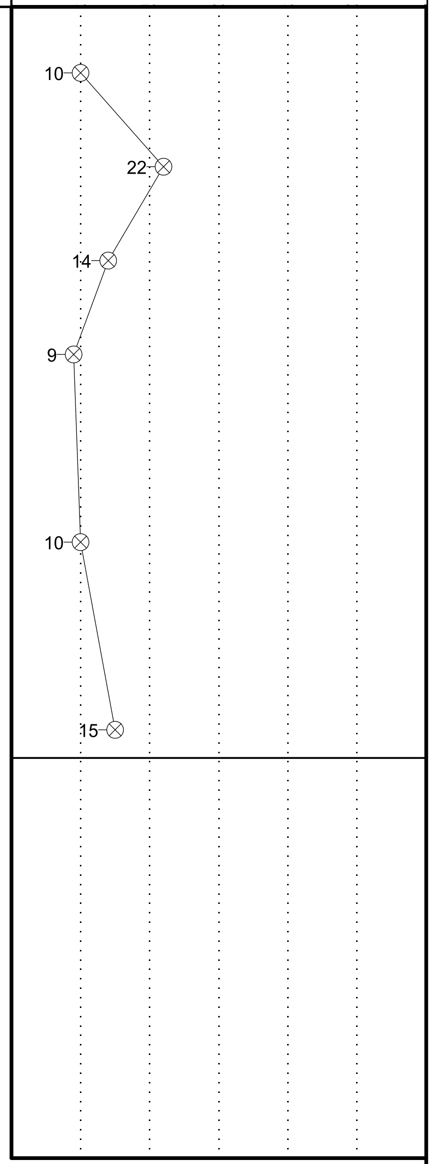
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [12.00"]			
	S-1	SS	18	14	(SM) SILTY SAND, gray and brown, moist, loose to medium dense			3 4 6
	S-2	SS	18	18				6 9 13
5								
	S-3	SS	18	18		▼		5 7 7
	S-4	SS	18	18	(SC) CLAYEY SAND, dark gray, wet, loose			3 4 5
10								
					(SM) SILTY SAND WITH GRAVEL, tan, wet, loose	▽		
	S-5	SS	18	18				3 4 6
15								
					(ML/CL) CLAYEY SILT, greenish brown, wet, stiff			
	S-6	SS	18	18				4 6 9
20					END OF BORING @ 20'			
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

▽ WL 12.0 WS ☐ WD ☒	BORING STARTED 12/12/17	CAVE IN DEPTH @ 7.4'
▽ WL(SHW) ▼ WL(ACR) 6.8	BORING COMPLETED 12/12/17	HAMMER TYPE Auto
▽ WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-11	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION

15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% — — — REC% ———

PLASTIC LIMIT% × —— WATER CONTENT% ● —— LIQUID LIMIT% △

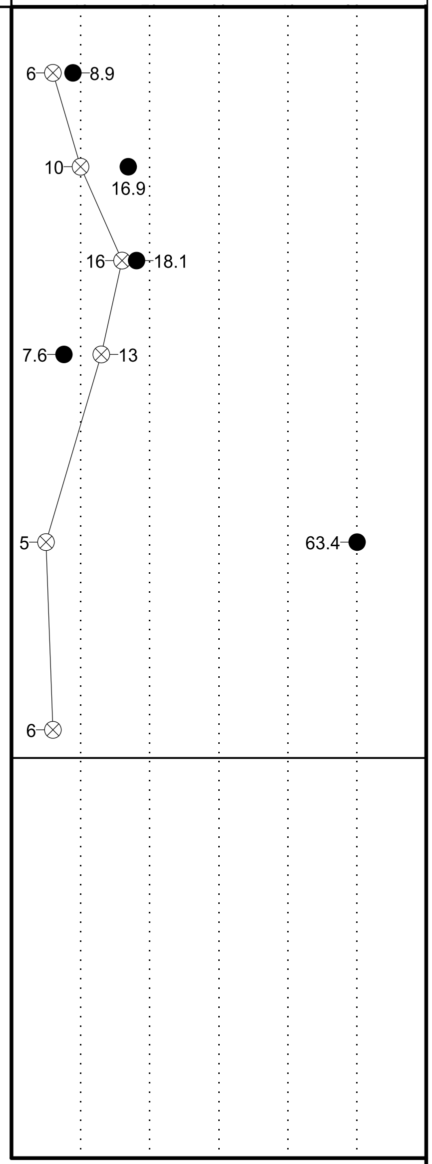
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	SPT (BLOWS/FT)	WATER CONTENT%
0					Topsoil Depth [14.00"]					
	S-1	SS	18	18	(SM) SILTY SAND, brown, moist, loose			2 3 3	6	8.9
					(SM) SILTY SAND, brown, wet, loose	▼				
	S-2	SS	18	12				3 4 6	10	16.9
5										
	S-3	SS	18	10	(SM) SILTY SAND, trace gravel, brown, wet, medium dense			5 7 9	16	18.1
	S-4	SS	18	16	(OH) SANDY ORGANIC CLAY, dark gray, moist, stiff			8 8 5	13	7.6
10										
					(OH) ORGANIC CLAY, trace sand, dark gray, moist, medium stiff					
	S-5	SS	18	14				2 2 3	5	63.4
15										
					(ML/CL) CLAYEY SILT, trace sand, dark gray, moist, medium stiff					
	S-6	SS	18	18				2 3 3	6	
20					END OF BORING @ 20'					
25										
30										



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 3.0 WS ☐ WD ☒	BORING STARTED 12/13/17	CAVE IN DEPTH @ 5.4'
WL(SHW) WL(ACR) 2.8	BORING COMPLETED 12/13/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-12	1 OF 2

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION

15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY

RQD% — — — REC% ———

PLASTIC LIMIT% — WATER CONTENT% — LIQUID LIMIT%

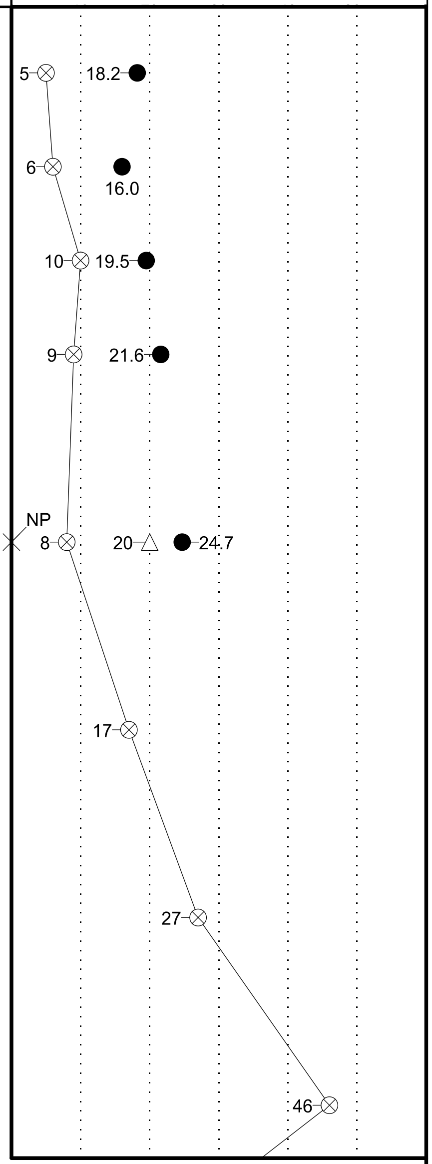
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [12.00"]			
	S-1	SS	18	18	(CL/ML) SANDY SILTY CLAY, brown, moist, medium stiff			2 2 3
	S-2	SS	18	18	(SC) CLAYEY SAND, brown, moist, loose			2 2 4
5								
	S-3	SS	18	18				3 4 6
	S-4	SS	18	18	(SP-SM) SAND WITH SILT, brown, wet, loose			4 4 5
10								
						▽ (12.0)		
	S-5	SS	18	18		▼ (14.1)		4 3 5
15								
					(SC) CLAYEY SAND WITH GRAVEL, gray and brown, wet, medium dense			
	S-6	SS	18	12				37 9 8
20								
					(SM) SILTY SAND WITH GRAVEL, orangish brown, wet, medium dense to dense			
	S-7	SS	18	14				15 16 11
25								
	S-8	SS	18	12				12 19 27
30								



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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

▽ WL 12.0 WS ☐ WD ☒	BORING STARTED 12/13/17	CAVE IN DEPTH @ 19.3'
WL(SHW) ▼ WL(ACR) 14.1	BORING COMPLETED 12/13/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-12	2 OF 2

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION

15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — –   REC% ———

PLASTIC LIMIT% ✕ — WATER CONTENT% ● — LIQUID LIMIT% △

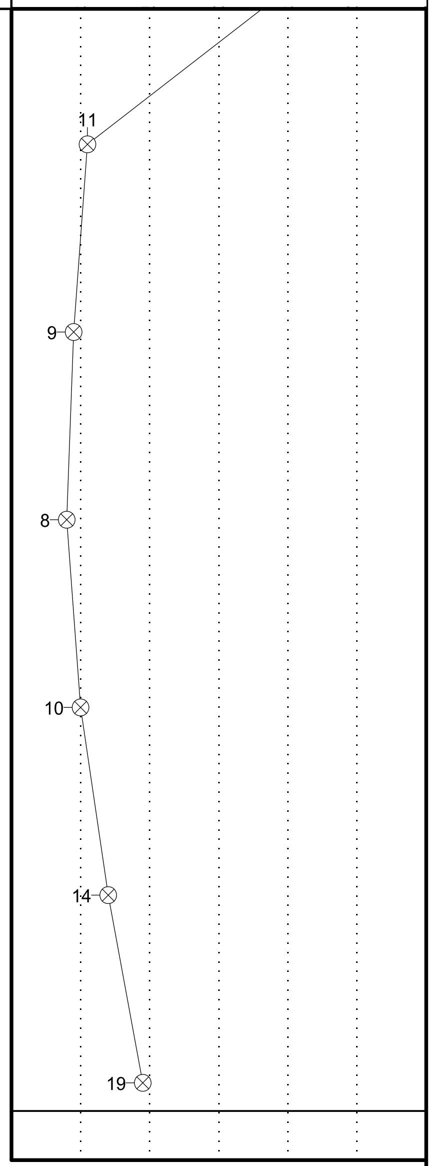
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					(SM) SILTY SAND WITH GRAVEL, orangish brown, wet, medium dense to dense			
					(CL/ML) SANDY SILTY CLAY, dark gray, moist, stiff to medium stiff			
35	S-9	SS	18	18				3 5 6
40	S-10	SS	18	18				3 4 5
45	S-11	SS	18	18				3 4 4
50	S-12	SS	18	18				3 4 6
					(SM) SILTY SAND, dark greenish gray, moist, medium dense			
55	S-13	SS	18	18				5 6 8
60	S-14	SS	18	18				6 9 10
					END OF BORING @ 60'			



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 12.0 WS ☐ WD ☒	BORING STARTED 12/13/17	CAVE IN DEPTH @ 19.3'
WL(SHW) WL(ACR) 14.1	BORING COMPLETED 12/13/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-13	1 OF 2

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION

15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY

RQD% – – – REC% ———

PLASTIC LIMIT% — WATER CONTENT% — LIQUID LIMIT%

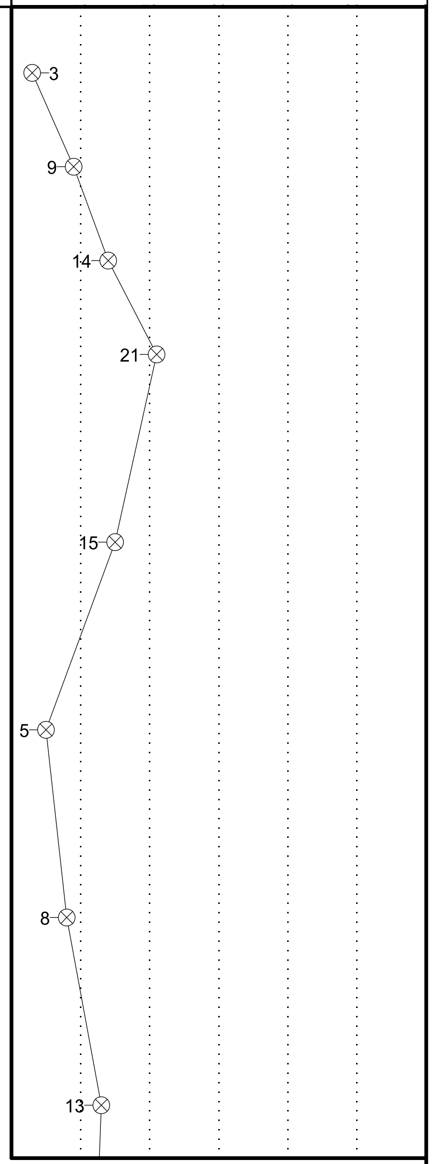
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [12.00"]			
	S-1	SS	18	18	(SM) SILTY SAND, brown, moist, very loose to loose			1 1 2
	S-2	SS	18	18				3 4 5
5					(SM) SILTY SAND, gray and brown, moist, medium dense			
	S-3	SS	18	18				4 6 8
	S-4	SS	18	18				5 8 13
10								
	S-5	SS	18	18				4 6 9
15								
					(CL) LEAN CLAY, gray, moist, medium stiff			
	S-6	SS	18	18				2 2 3
20								
					(SM) SILTY SAND WITH GRAVEL, gray, wet, loose to medium dense	▽		
	S-7	SS	18	14				2 3 5
25								
	S-8	SS	18	12				4 6 7
30								



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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 23.0 WS ☐ WD ☒	BORING STARTED 12/05/17	CAVE IN DEPTH @ 13.9'
WL(SHW) WL(ACR) DRY	BORING COMPLETED 12/05/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-13	2 OF 2

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION
15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-O- CALIBRATED PENETROMETER TONS/FT^2

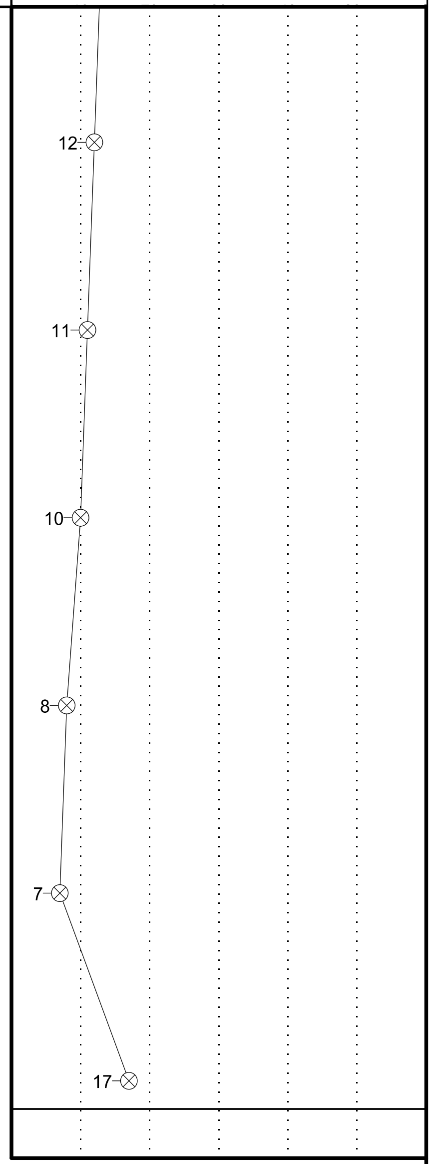
ROCK QUALITY DESIGNATION & RECOVERY
RQD% – – – REC% ———

PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT%

⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS
BOTTOM OF CASING — LOSS OF CIRCULATION 100%
SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					(SM) SILTY SAND WITH GRAVEL, gray, wet, loose to medium dense			
					(ML/CL) CLAYEY SILT, dark gray, moist, stiff			
35	S-9	SS	18	18				3 5 7
					(ML/CL) SANDY CLAYEY SILT, dark gray, moist, stiff			
40	S-10	SS	18	18				4 5 6
45	S-11	SS	18	18				4 4 6
50	S-12	SS	18	18				3 4 4
					(ML) SANDY SILT, gray, moist, medium stiff, contains shells			
55	S-13	SS	18	18				3 3 4
					(SM) SILTY SAND, gray, wet, medium dense, contains significant shells			
60	S-14	SS	18	14				5 7 10
					END OF BORING @ 60'			



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 23.0 WS ☐ WD ☒	BORING STARTED 12/05/17	CAVE IN DEPTH @ 13.9'
WL(SHW) WL(ACR) DRY	BORING COMPLETED 12/05/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-14	1 OF 2

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION
15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

–○– CALIBRATED PENETROMETER TONS/FT^2

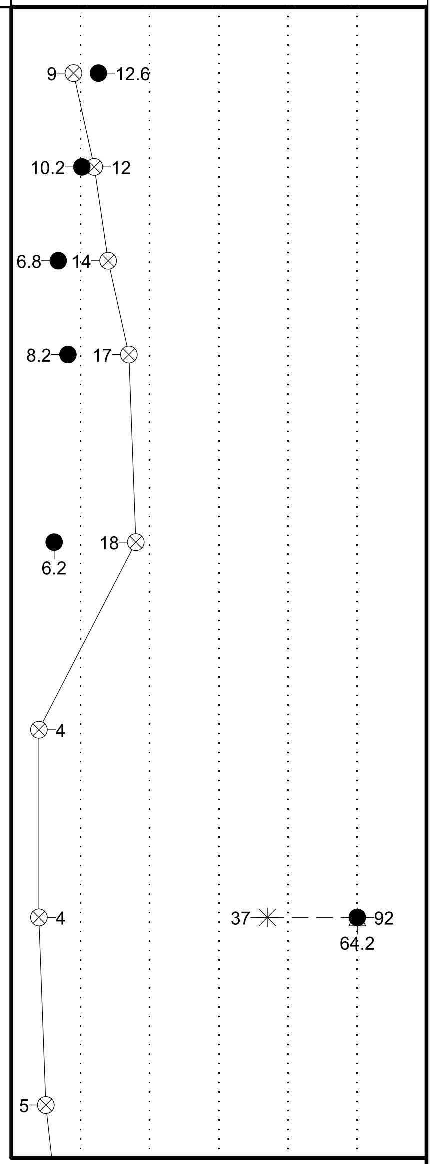
ROCK QUALITY DESIGNATION & RECOVERY
RQD% – – – REC% ———

PLASTIC LIMIT% — WATER CONTENT% — LIQUID LIMIT%

⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS
BOTTOM OF CASING — LOSS OF CIRCULATION
SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [6.00"]			
	S-1	SS	18	10	(SM) SILTY SAND, trace clay, brown, moist, loose			2 4 5
	S-2	SS	18	14	(SM) SILTY SAND, brown, moist, medium dense			4 5 7
5	S-3	SS	18	18	(SM) SILTY SAND, trace clay, gray and brown, moist, medium dense			4 7 7
	S-4	SS	18	16				6 8 9
10	S-5	SS	18	16	(SM) SILTY SAND, trace gravel, orangish brown, moist, medium dense			7 10 8
15	S-6	SS	18	12	(SC) CLAYEY SAND, trace gravel, orangish brown, wet, very loose	▽		1 2 2
20	S-7	SS	18	18	(OH) ORGANIC CLAY, trace sand, dark gray, moist, soft to medium stiff			2 2 2
25	S-8	SS	18	18				2 3 2
30								



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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 18.0 WS ☐ WD ☒	BORING STARTED 12/07/17	CAVE IN DEPTH @ 15.2'
WL(SHW) WL(ACR) DRY	BORING COMPLETED 12/07/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-14	2 OF 2

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION: 15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING | EASTING | STATION

-O- CALIBRATED PENETROMETER TONS/FT^2

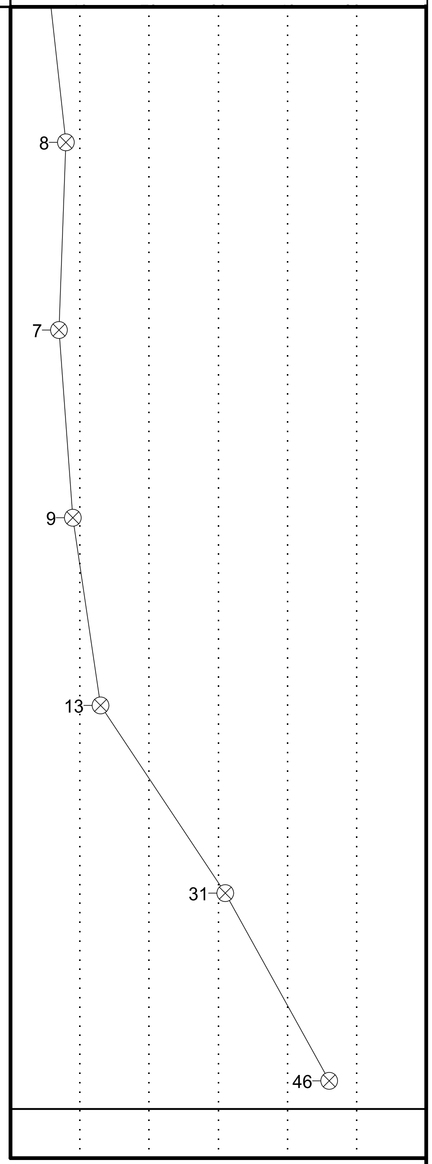
ROCK QUALITY DESIGNATION & RECOVERY
RQD% — — — REC% ———

PLASTIC LIMIT% — WATER CONTENT% — LIQUID LIMIT%

⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS
BOTTOM OF CASING — LOSS OF CIRCULATION
SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
					(OH) ORGANIC CLAY, trace sand, dark gray, moist, soft to medium stiff				
35	S-9	SS	18	14				2 3 5	8
40	S-10	SS	18	18				2 3 4	7
					(CL/ML) SILTY CLAY, trace sand, dark gray, moist, stiff				
45	S-11	SS	18	18				3 4 5	9
					(SM) SILTY SAND, dark greenish gray, moist, medium dense, contains slight shells				
50	S-12	SS	18	18				4 6 7	13
					(SM) SILTY SAND, dark gray, moist, dense, contains significant shells				
55	S-13	SS	18	16				10 14 17	31
60	S-14	SS	18	15				15 19 27	46
					END OF BORING @ 60'				



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 18.0 WS ☐ WD ☒	BORING STARTED 12/07/17	CAVE IN DEPTH @ 15.2'
WL(SHW) WL(ACR) DRY	BORING COMPLETED 12/07/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-15	1 OF 2

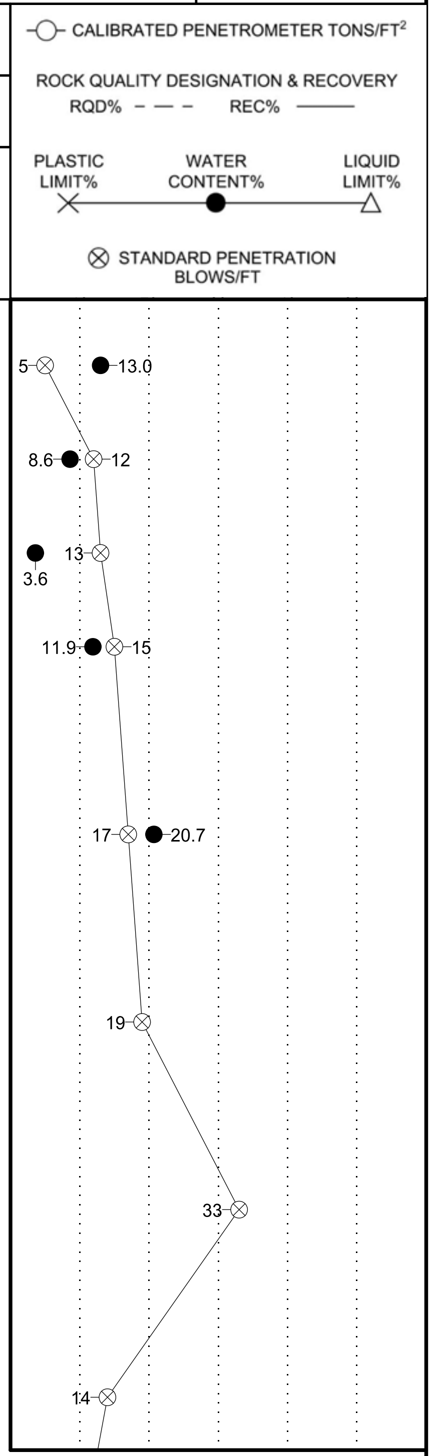
PROJECT NAME: Cherrywood Solar

ARCHITECT-ENGINEER: Open Road Renewables

SITE LOCATION: 15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING | EASTING | STATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [10.00"]			
	S-1	SS	18	12	(SC) CLAYEY SAND, brown, moist, loose			2 2 3
	S-2	SS	18	16	(SM) SILTY SAND, brown, moist, medium dense			3 5 7
5								
	S-3	SS	18	18				4 6 7
	S-4	SS	18	18	(SM) SILTY SAND WITH GRAVEL, brown, moist, medium dense			4 6 9
10								
					(SC) CLAYEY SAND, trace gravel, brown, moist, medium dense			
	S-5	SS	18	16				4 7 10
15								
					(SM) SILTY SAND WITH GRAVEL, gray and brown, wet, medium dense to dense	▽		
	S-6	SS	18	12				5 8 11
20								
	S-7	SS	18	16				9 14 19
25								
	S-8	SS	18	18	(OH) ORGANIC CLAY, trace sand, dark gray, moist, stiff to medium stiff			13 7 7
30								



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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 18.0 WS ☐ WD ☒	BORING STARTED 12/08/17	CAVE IN DEPTH @ 16.3'
WL(SHW) WL(ACR) DRY	BORING COMPLETED 12/08/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-15	2 OF 2

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION

15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

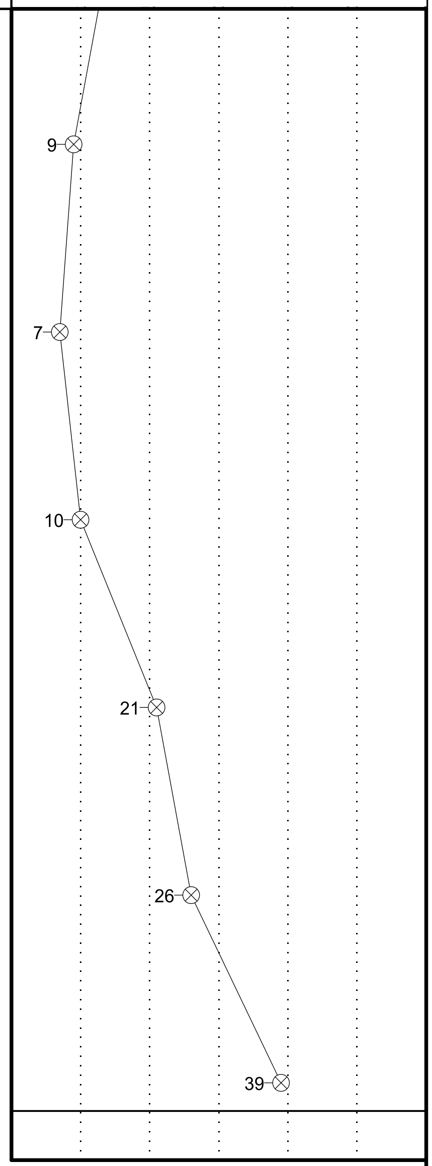
ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — –   REC% ———

PLASTIC LIMIT% — WATER CONTENT% — LIQUID LIMIT%

⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS
BOTTOM OF CASING — LOSS OF CIRCULATION
SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
					(OH) ORGANIC CLAY, trace sand, dark gray, moist, stiff to medium stiff				
35	S-9	SS	18	18				4 4 5	9
40	S-10	SS	18	18				3 3 4	7
45	S-11	SS	18	18				4 5 5	10
					(CL/ML) SILTY CLAY WITH SAND, dark gray, moist, very stiff				
50	S-12	SS	18	18				7 10 11	21
					(SM) SILTY SAND, dark gray, wet, medium dense, contains slight shells				
55	S-13	SS	18	18				9 11 15	26
60	S-14	SS	18	16				14 17 22	39
					END OF BORING @ 60'				



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 18.0 WS ☐ WD ☒	BORING STARTED 12/08/17	CAVE IN DEPTH @ 16.3'
WL(SHW) WL(ACR) DRY	BORING COMPLETED 12/08/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-16	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION
15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

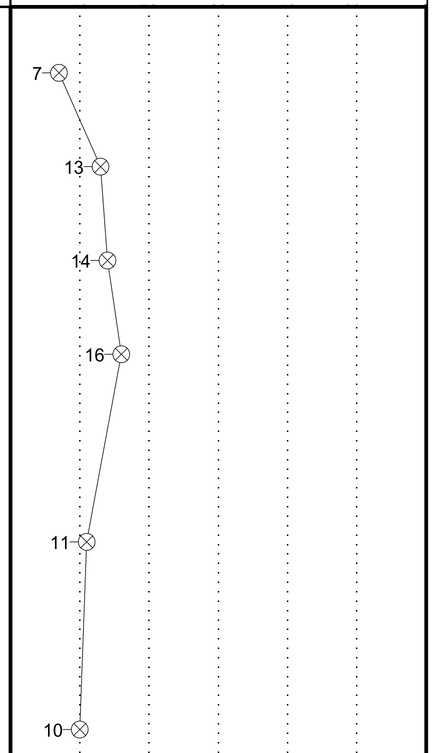
ROCK QUALITY DESIGNATION & RECOVERY
RQD% – – – REC% ———

PLASTIC LIMIT% — WATER CONTENT% — LIQUID LIMIT%

⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS
BOTTOM OF CASING — LOSS OF CIRCULATION 100%
SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					Topsoil Depth [14.00"]				
	S-1	SS	18	16	(SC) CLAYEY SAND, gray, moist, loose			2 2 5	7
					(SM) SILTY SAND, trace clay, grayish brown, moist, medium dense	▼ (3.3)			
	S-2	SS	18	16				4 6 7	13
5									
	S-3	SS	18	18				5 6 8	14
					(SM) SILTY SAND, gray and brown, wet, medium dense	▽ (8.0)			
	S-4	SS	18	15				5 7 9	16
10									
					(ML) SILT, brown, wet, stiff				
	S-5	SS	18	16	(SP) SAND WITH GRAVEL, tan, wet, medium dense			3 5 6	11
15									
					(SC) CLAYEY SAND WITH GRAVEL, orangish gray, wet, loose				
	S-6	SS	18	12				4 5 5	10
20					END OF BORING @ 20'				
25									
30									



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 8.0 WS ☐ WD ☒	BORING STARTED 12/08/17	CAVE IN DEPTH @ 7.9'
WL(SHW) WL(ACR) 3.3	BORING COMPLETED 12/08/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-17	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION: 15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY: RQD% – – – REC% ———

PLASTIC LIMIT% × — WATER CONTENT% ● — LIQUID LIMIT% △

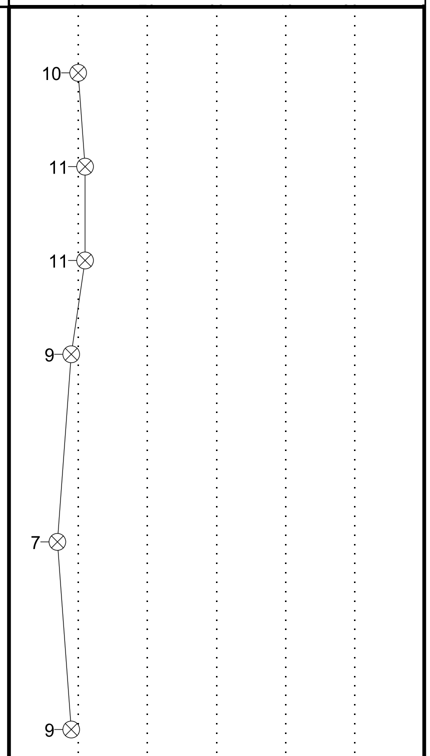
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [8.00"]			
	S-1	SS	18	14	(SM) SILTY SAND, brown, moist, loose to medium dense			3 4 6
	S-2	SS	18	14				3 5 6
5								
	S-3	SS	18	18				4 6 5
	S-4	SS	18	18	(SC) CLAYEY SAND, orangish brown, moist, loose			3 4 5
10								
					(SC) CLAYEY SAND, trace gravel, orangish brown, wet, loose	∇		
	S-5	SS	18	18				2 3 4
15								
	S-6	SS	18	18	(CH) FAT CLAY, trace silt, dark gray, moist, stiff			4 5 4
20					END OF BORING @ 20'			
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

∇ WL 12.0 WS ☐ WD ☒	BORING STARTED 12/08/17	CAVE IN DEPTH @ 6.9'
∇ WL(SHW) ▼ WL(ACR) DRY	BORING COMPLETED 12/08/17	HAMMER TYPE Auto
∇ WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-18	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION
15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

CALIBRATED PENETROMETER TONS/FT^2
ROCK QUALITY DESIGNATION & RECOVERY
RQD% REC%
PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT%
STANDARD PENETRATION BLOWS/FT

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	SPT (BLOWS/FT)	WATER CONTENT %
0					Topsoil Depth [12.00"]					
	S-1	SS	18	14	(SM) SILTY SAND, brown, moist, very loose			1 2 2	4	7.9
	S-2	SS	18	16	(SM) SILTY SAND, gray and tan, moist, loose to medium dense			3 3 5	8	4.1
5	S-3	SS	18	18				4 5 7	12	9.5
	S-4	SS	18	18				5 7 6	13	13.2
10					(SC) CLAYEY SAND WITH GRAVEL, gray and brown, moist, medium dense					
	S-5	SS	18	12				6 6 5	11	10.2
15	S-6	SS	18	14				5 7 10	17	
20					END OF BORING @ 20'					
25										
30										

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS ☐ WD ☒	BORING STARTED 12/11/17	CAVE IN DEPTH @ 7.7'
WL(SHW) WL(ACR) DRY	BORING COMPLETED 12/11/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-19	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION

15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY

RQD% – – – REC% ———

PLASTIC LIMIT% ✕ — WATER CONTENT% ● — LIQUID LIMIT% △

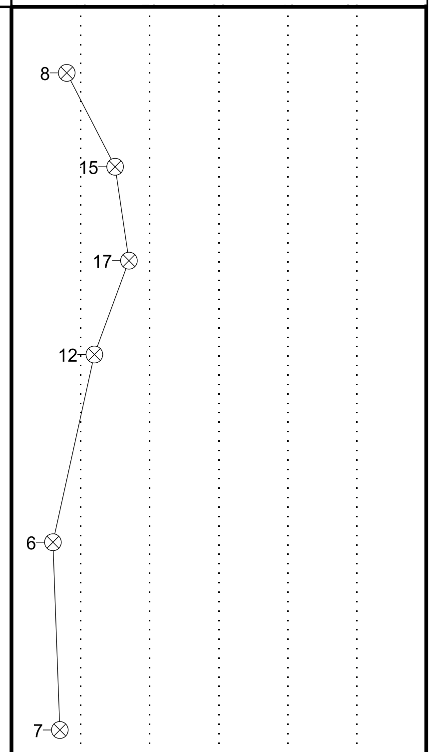
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					Topsoil Depth [14.00"]				
	S-1	SS	18	18	(SM) SILTY SAND, brown, moist, loose to medium dense			3 4 4	8
	S-2	SS	18	16				5 7 8	15
5									
	S-3	SS	18	16				5 8 9	17
					(SC) CLAYEY SAND, trace gravel, brown and gray, wet, medium dense	▽			
	S-4	SS	18	18				4 6 6	12
10									
					(SC) CLAYEY SAND, gray and brown, wet, loose				
	S-5	SS	18	12				3 2 4	6
15									
					(SC) CLAYEY SAND, trace gravel, gray and brown, wet, loose				
	S-6	SS	18	16				2 3 4	7
20					END OF BORING @ 20'				
25									
30									



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 8.0 WS ☐ WD ☒	BORING STARTED 12/11/17	CAVE IN DEPTH @ 6.1'
WL(SHW) WL(ACR) DRY	BORING COMPLETED 12/11/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-20	1 OF 2

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION

15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT²

ROCK QUALITY DESIGNATION & RECOVERY

RQD% – — – REC% ———

PLASTIC LIMIT% — WATER CONTENT% — LIQUID LIMIT%

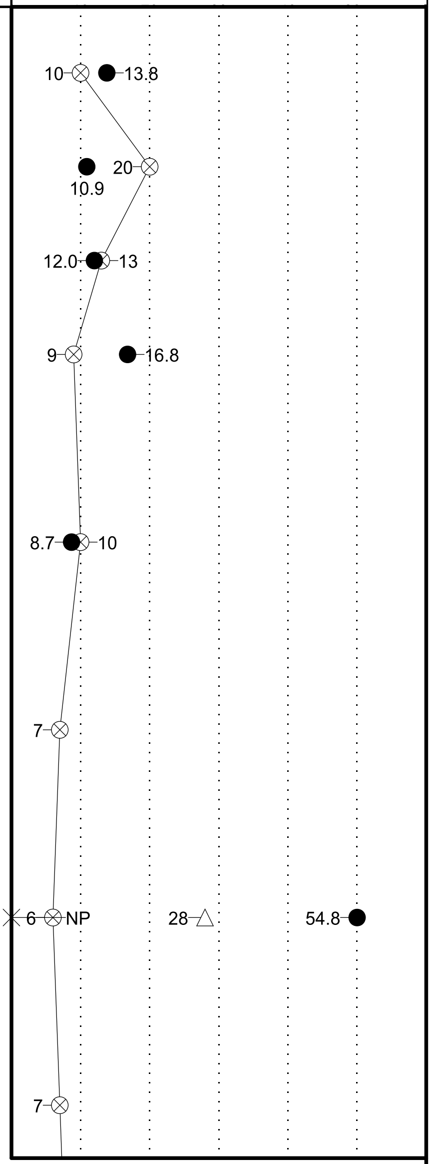
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [4.00"]			
					(SM) SILTY SAND, trace clay, gray, moist, loose to medium dense			
	S-1	SS	18	14				2 4 6
						▼		
	S-2	SS	18	15				5 7 13
5								
	S-3	SS	18	18				4 6 7
					(SC) CLAYEY SAND, gray, wet, loose			
	S-4	SS	18	18				4 4 5
10								
					(SC) CLAYEY SAND WITH GRAVEL, gray, wet, loose			
	S-5	SS	18	12				3 4 6
15								
					(ML/CL) CLAYEY SILT, trace sand, dark gray, moist, medium stiff			
	S-6	SS	18	18				2 3 4
20								
					(ML) SILT, dark gray, moist, medium stiff			
	S-7	SS	18	18				2 3 3
25								
					(ML/CL) CLAYEY SILT, dark gray, moist, medium stiff to stiff			
	S-8	SS	18	18				3 3 4
30								



CONTINUED ON NEXT PAGE.

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 3.0 WS ☐ WD ☒	BORING STARTED 12/11/17	CAVE IN DEPTH @ 12.8'
WL(SHW) WL(ACR) 2.9	BORING COMPLETED 12/11/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-20	2 OF 2

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION

15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY

RQD% – – – REC% ———

PLASTIC LIMIT% | WATER CONTENT% | LIQUID LIMIT%

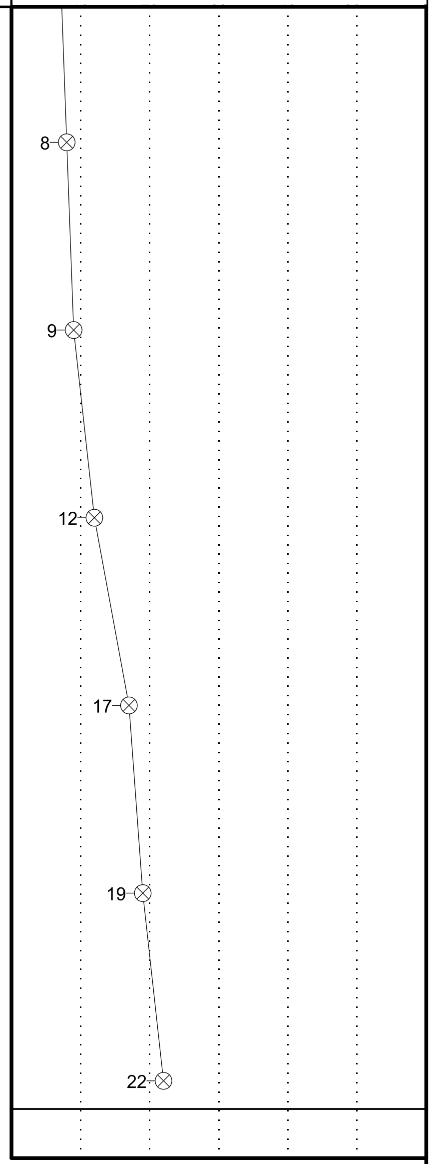
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
					(ML/CL) CLAYEY SILT, dark gray, moist, medium stiff to stiff			
35	S-9	SS	18	18				3 4 4
40	S-10	SS	18	18				3 4 5
45	S-11	SS	18	18				4 5 7
					(ML/CL) SANDY CLAYEY SILT, dark gray, moist, very stiff			
50	S-12	SS	18	18				7 8 9
					(SC) CLAYEY SAND, dark gray, moist, medium dense			
55	S-13	SS	18	18				6 8 11
					(ML/CL) SANDY CLAYEY SILT, dark gray, moist, very stiff			
60	S-14	SS	18	18				16 10 12
					END OF BORING @ 60'			



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 3.0 WS ☐ WD ☒	BORING STARTED 12/11/17	CAVE IN DEPTH @ 12.8'
WL(SHW) WL(ACR) 2.9	BORING COMPLETED 12/11/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-21	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION

15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – – – REC% ———

PLASTIC LIMIT% × WATER CONTENT% ● LIQUID LIMIT% △

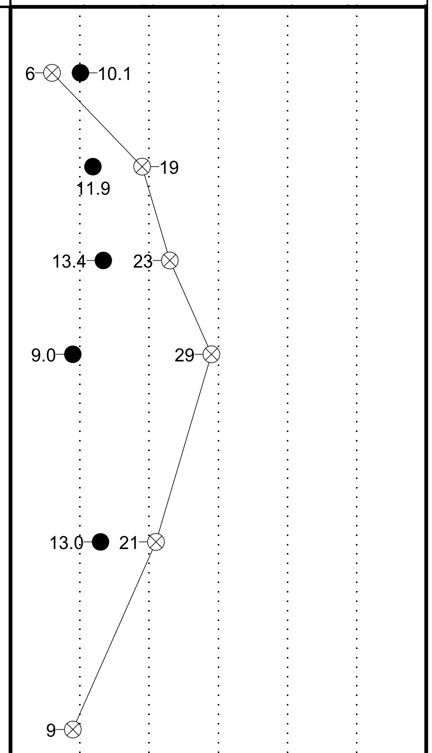
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [10.00"]			
	S-1	SS	18	10	(SM) SILTY SAND, tan and dark brown, moist, loose			4 2 4
	S-2	SS	18	14	(SC) CLAYEY SAND, gray, moist, medium dense	▼		5 8 11
5								
	S-3	SS	18	12		▽		7 10 13
					(SM) SILTY SAND WITH GRAVEL, gray, wet, medium dense			
	S-4	SS	18	14				9 14 15
10								
					(SC) CLAYEY SAND WITH GRAVEL, gray, wet, medium dense			
	S-5	SS	18	14				7 9 12
15								
					(SM) SILTY SAND, grayish brown, wet, loose			
	S-6	SS	18	12				5 4 5
20					END OF BORING @ 20'			
25								
30								



Sample	SPT (blows/ft)	Water Content %
S-1	6	10.1
S-2	19	11.9
S-3	23	13.4
S-4	29	9.0
S-5	21	13.0
S-6	9	

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

▽ WL 7.0 WS ☐ WD ☒	BORING STARTED 12/11/17	CAVE IN DEPTH @ 4.9'
▽ WL(SHW) ▼ WL(ACR) 4.1	BORING COMPLETED 12/11/17	HAMMER TYPE Auto
▽ WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-22	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION

15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

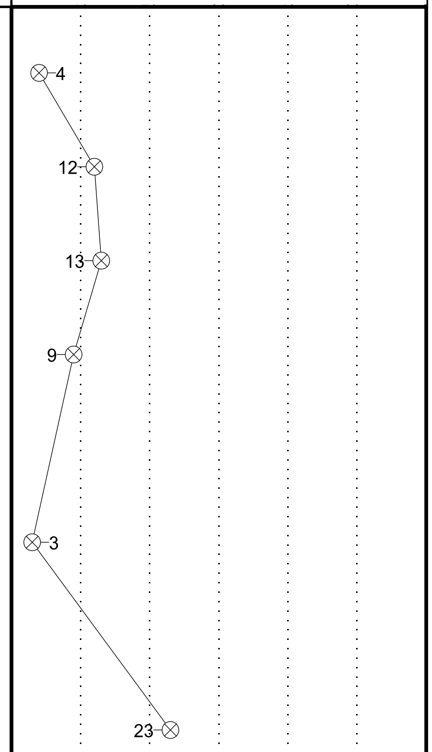
ROCK QUALITY DESIGNATION & RECOVERY
RQD% – — –   REC% ———

PLASTIC LIMIT% ✕ WATER CONTENT% ● LIQUID LIMIT% △

⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS
BOTTOM OF CASING — LOSS OF CIRCULATION
SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [10.00"]			
	S-1	SS	18	18	(SC) CLAYEY SAND, orangish brown, moist, very loose			1 2 2
	S-2	SS	18	18	(SC) CLAYEY SAND, orangish brown, moist, medium dense			3 5 7
5								
	S-3	SS	18	18				4 7 6
	S-4	SS	18	16	(SC) CLAYEY SAND, trace gravel, orangish brown, wet, loose			3 4 5
10								
					(ML) SANDY SILT, orangish brown, wet, soft			
	S-5	SS	18	18				1 1 2
15								
	S-6	SS	18	1	(SC) CLAYEY SAND, greenish brown, wet, medium dense, cemented sandstone			8 11 12
20					END OF BORING @ 20'			
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 8.0 WS ☐ WD ☒	BORING STARTED 12/12/17	CAVE IN DEPTH @ 9.5'
WL(SHW) WL(ACR) 7.3	BORING COMPLETED 12/12/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-23	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION
15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY

RQD% – – – REC% ———

PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT%

⊗ STANDARD PENETRATION BLOWS/FT

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS) BOTTOM OF CASING / LOSS OF CIRCULATION 100% / SURFACE ELEVATION	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
20					WAS NOT DRILLED DUE TO DRAIN TILES IN FIELD			
25								
30								
35								
40								
45								
50								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL WS ☐ WD ☒	BORING STARTED 12/12/17	CAVE IN DEPTH
WL(SHW) WL(ACR)	BORING COMPLETED 12/12/17	HAMMER TYPE Manual
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-24	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION

15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

–○– CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – – – REC% ———

PLASTIC LIMIT% ✕ WATER CONTENT% ● LIQUID LIMIT% △

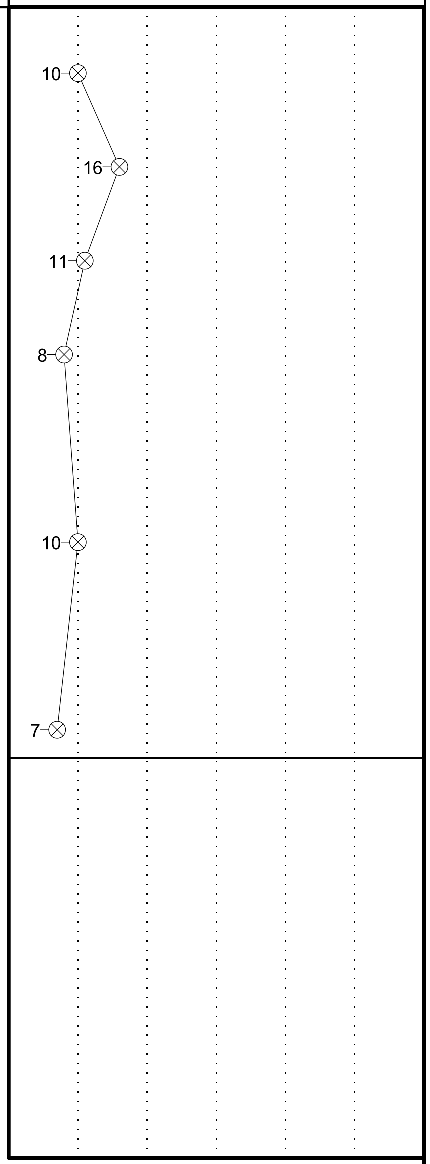
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					Topsoil Depth [16.00"]				
	S-1	SS	18	14	(SM) SILTY SAND, gray, moist, loose to medium dense			3 4 6	10
	S-2	SS	18	14				4 7 9	16
5					(SM) SILTY SAND, gray, wet, medium dense	▼			
	S-3	SS	18	14				4 6 5	11
					(ML) SANDY SILT, trace clay, light gray, wet, medium stiff	▽			
	S-4	SS	18	18				4 4 4	8
10									
					(SC) CLAYEY SAND WITH GRAVEL, light gray and tan, wet, loose				
	S-5	SS	18	12				4 6 4	10
15									
					(SC) CLAYEY SAND WITH GRAVEL, tan, wet, loose				
	S-6	SS	18	2				3 3 4	7
20					END OF BORING @ 20'				
25									
30									



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 8.0 WS ☐ WD ☒	BORING STARTED 12/12/17	CAVE IN DEPTH @ 7.2'
WL(SHW) WL(ACR) 5.8	BORING COMPLETED 12/12/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT	Job #:	BORING #	SHEET
Open Road Renewables	02:8631	B-25	1 OF 1

PROJECT NAME	ARCHITECT-ENGINEER
Cherrywood Solar	Open Road Renewables

SITE LOCATION

15642 Jackson Lane, Goldsboro, Caroline County, MD

NORTHING	EASTING	STATION

-○- CALIBRATED PENETROMETER TONS/FT^2

ROCK QUALITY DESIGNATION & RECOVERY
RQD% – – – REC% ———

PLASTIC LIMIT% — WATER CONTENT% — LIQUID LIMIT%

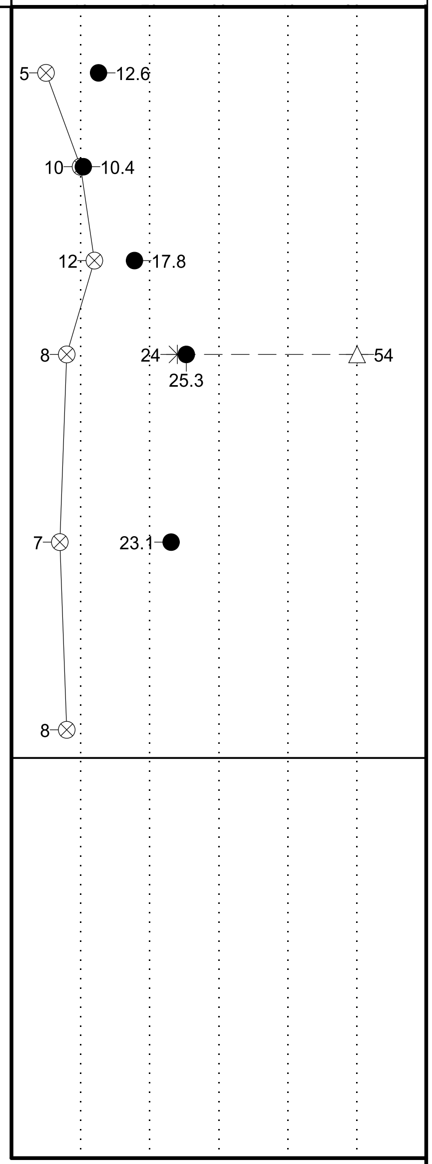
⊗ STANDARD PENETRATION BLOWS/FT

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [10.00"]			
	S-1	SS	18	12	(SM) SILTY SAND, brown, moist, loose			2 2 3
	S-2	SS	18	18	(SM) SILTY SAND, trace clay, trace gravel, brown, moist, loose			4 5 5
5	S-3	SS	18	16	(SC) CLAYEY SAND, trace gravel, tan, moist, medium dense			3 5 7
10	S-4	SS	18	18	(CH) FAT CLAY, gray, moist, medium stiff	▼ (10.1) ▽ (12.0)		5 4 4
15	S-5	SS	18	18	(SC) CLAYEY SAND, orangish brown, wet, loose			3 4 3
	S-6	SS	18	18	(SM) SILTY SAND, trace clay, orangish brown, wet, loose			2 3 5
20					END OF BORING @ 20'			
25								
30								



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 12.0 WS ☐ WD ☒	BORING STARTED 12/12/17	CAVE IN DEPTH @ 10.2'
WL(SHW) WL(ACR) 10.1	BORING COMPLETED 12/12/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

SOIL CLASSIFICATION LEGEND

GW - WELL GRADED GRAVEL; GM - SILTY GRAVEL; GP - POORLY GRADED GRAVEL; GC - CLAYEY GRAVEL; SW - WELL GRADED SAND; ML - LOW PLASTICITY SILT; ST - SHELBY TUBE; CL - LOW PLASTICITY CLAY; MH - HIGH PLASTICITY SILT; SM - SILTY SAND; RC - ROCK CORE; SP - POORLY GRADED SAND; SC - CLAYEY SAND; CH - HIGH PLASTICITY CLAY; PM - PRESSURE METER; OH - HIGH PLASTICITY ORGANIC SILTS AND CLAYS; OL - LOW PLASTICITY ORGANIC SILTS AND CLAY; PT - PEAT; WR - WEATHERED ROCK; PWR - PARTIALLY WEATHERED ROCK; FILL; POSSIBLE FILL; PROBABLE FILL

SURFACE MATERIALS

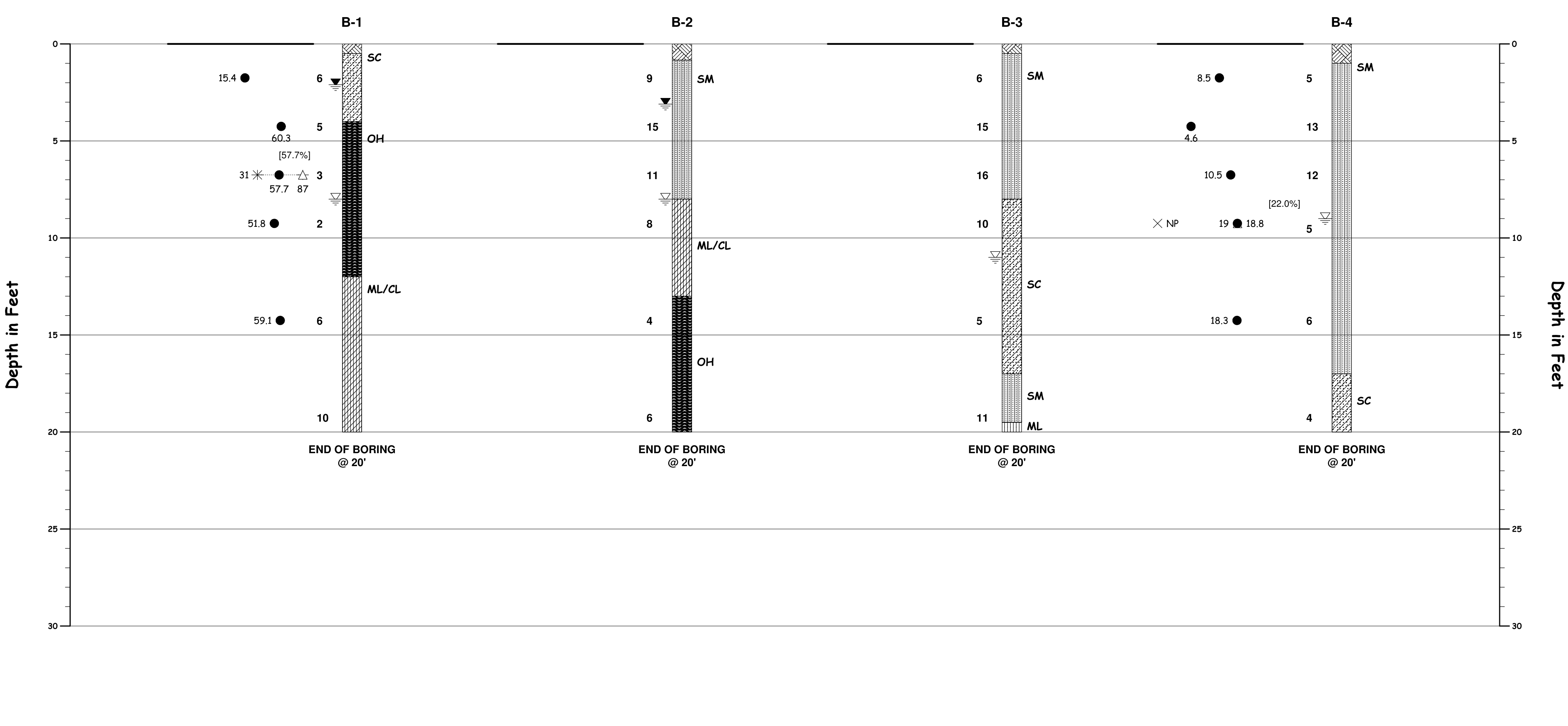
TOPSOIL; CONCRETE; ASPHALT; VOID; GRAVEL

ROCK TYPES

IGNEOUS; METAMORPHIC; SEDIMENTARY

SYMBOL LEGEND

WATER LEVEL - DURING DRILLING/SAMPLING; WATER LEVEL - SEASONAL HIGH WATER; WATER LEVEL - AFTER CASING REMOVAL; WATER LEVEL - AFTER 24 HOURS; PLASTIC LIMIT% — WATER CONTENT% — % PASSING #200 SIEVE [88%] — LIQUID LIMIT%



NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
3 HORIZONTAL DISTANCES ARE NOT TO SCALE.

ECS

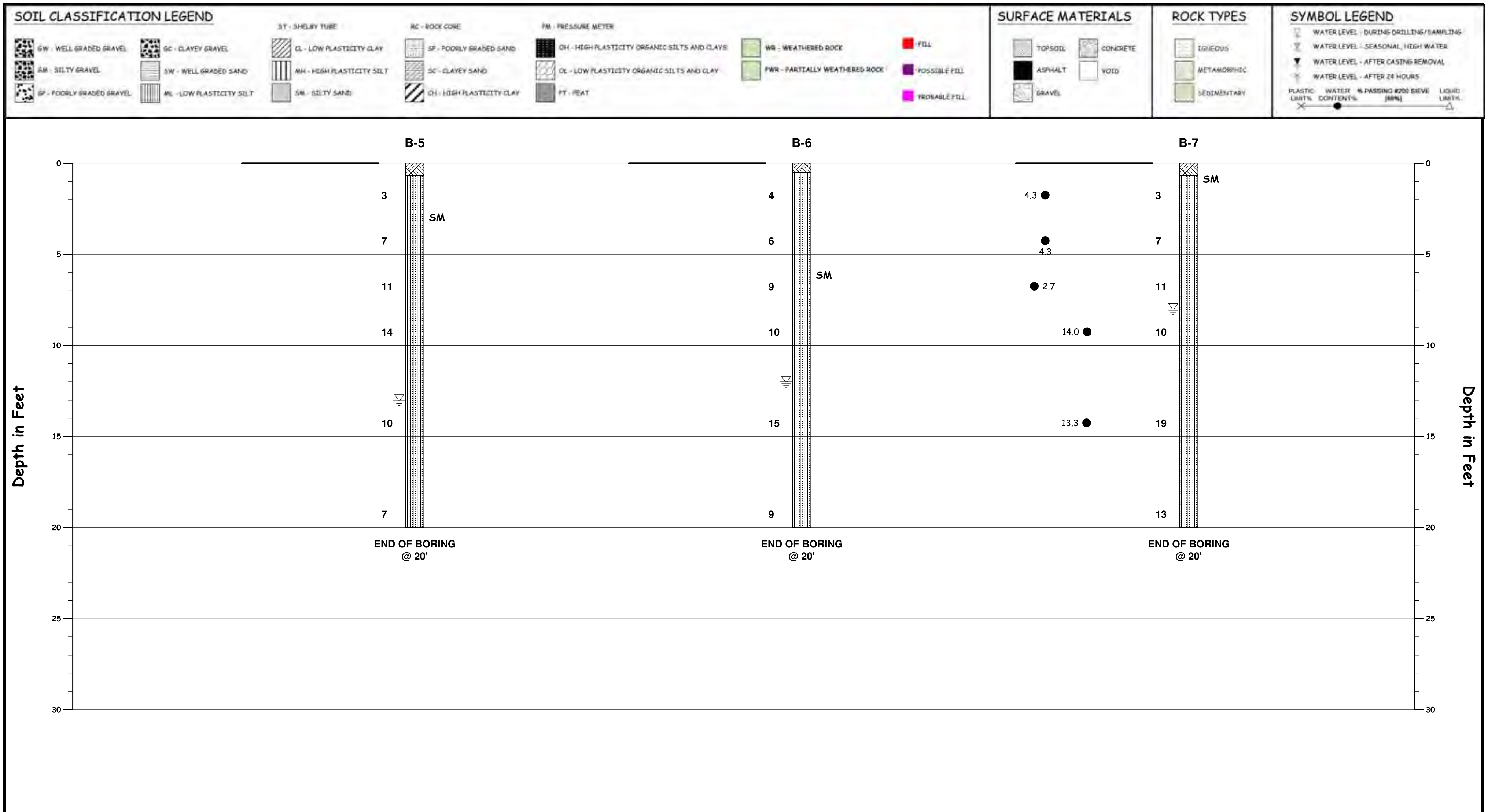
Subsurface Soil Profile (NORTHEAST AREA)

Cherrywood Solar

Open Road Renewables

15642 Jackson Lane, Goldsboro, Caroline County, MD

PROJECT NO.: 8631 | DATE: 1/15/2018 | VERTICAL SCALE: 1"=5'



NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
3 HORIZONTAL DISTANCES ARE NOT TO SCALE.

Subsurface Soil Profile

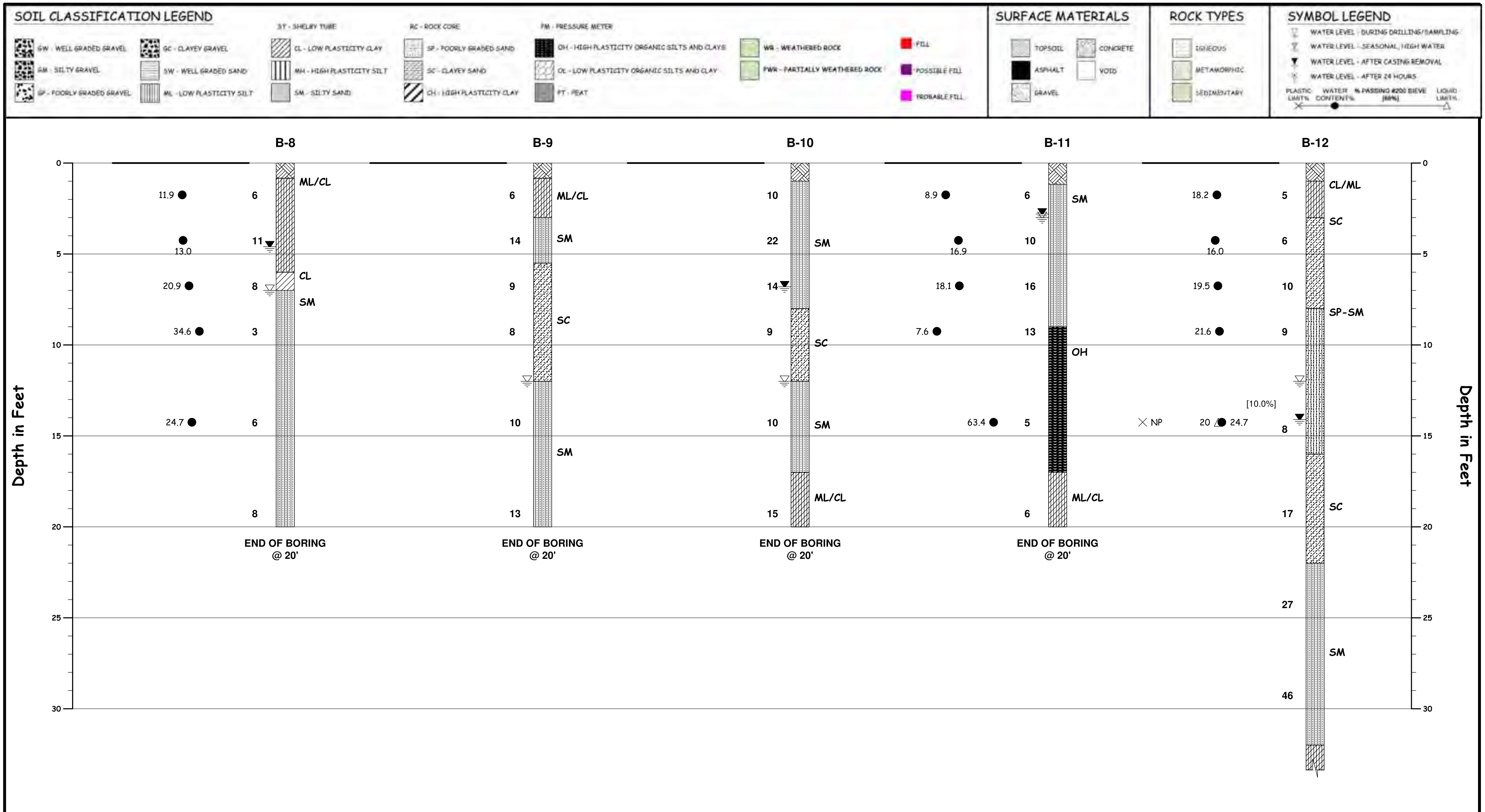
(NORTHEAST AREA)

Cherrywood Solar

Open Road Renewables

15642 Jackson Lane, Goldsboro, Caroline County, MD

PROJECT NO.: 8631 | DATE: 1/15/2018 | VERTICAL SCALE: 1"=5'



NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
3 HORIZONTAL DISTANCES ARE NOT TO SCALE.

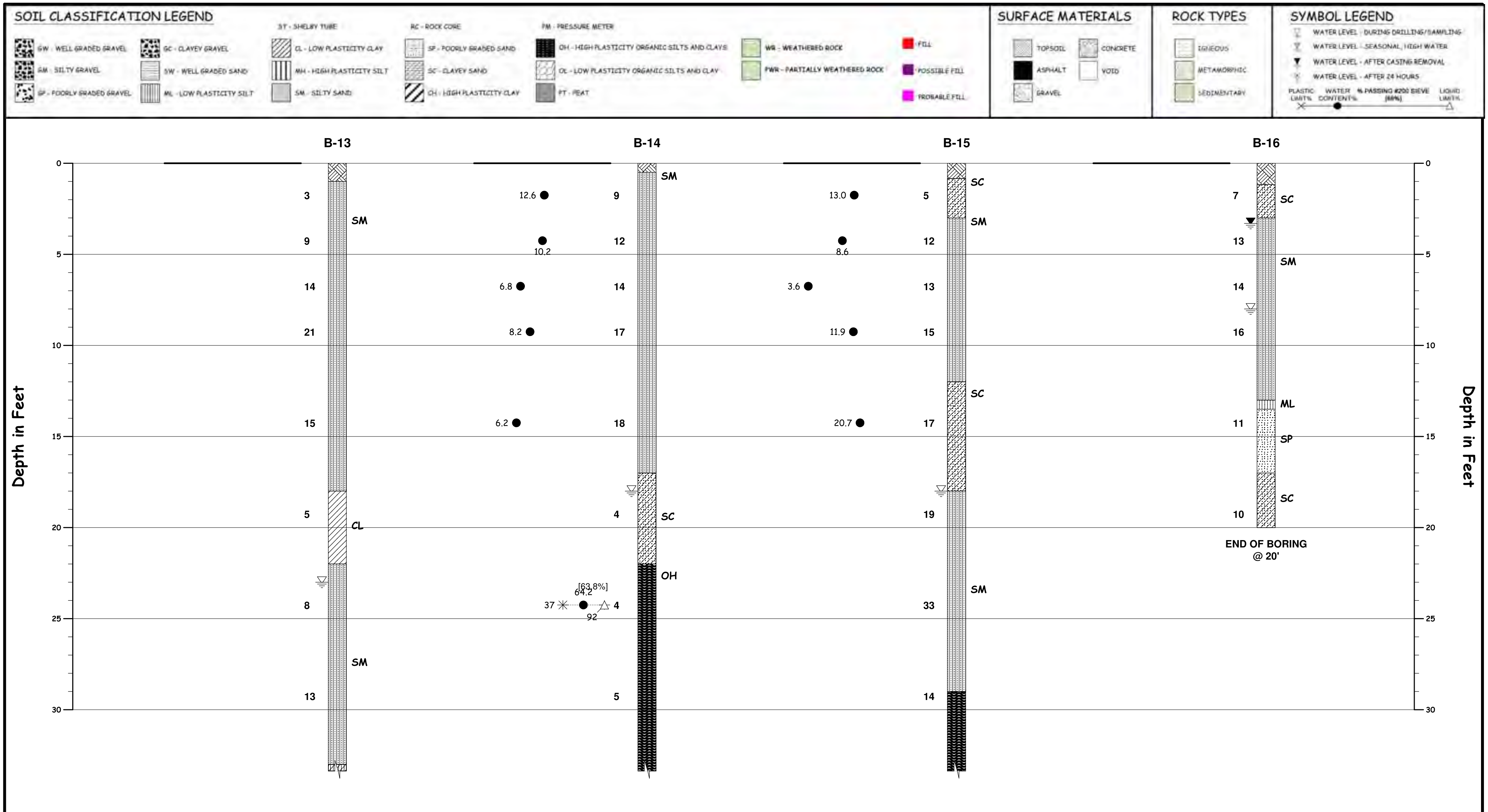
ECS

Subsurface Soil Profile

(NORTHWEST AREA)

Cherrywood Solar
Open Road Renewables
15642 Jackson Lane, Goldsboro, Caroline County, MD

PROJECT NO.: 8631 | DATE: 1/15/2018 | VERTICAL SCALE: 1"=5'



NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
3 HORIZONTAL DISTANCES ARE NOT TO SCALE.

ECS

Subsurface Soil Profile

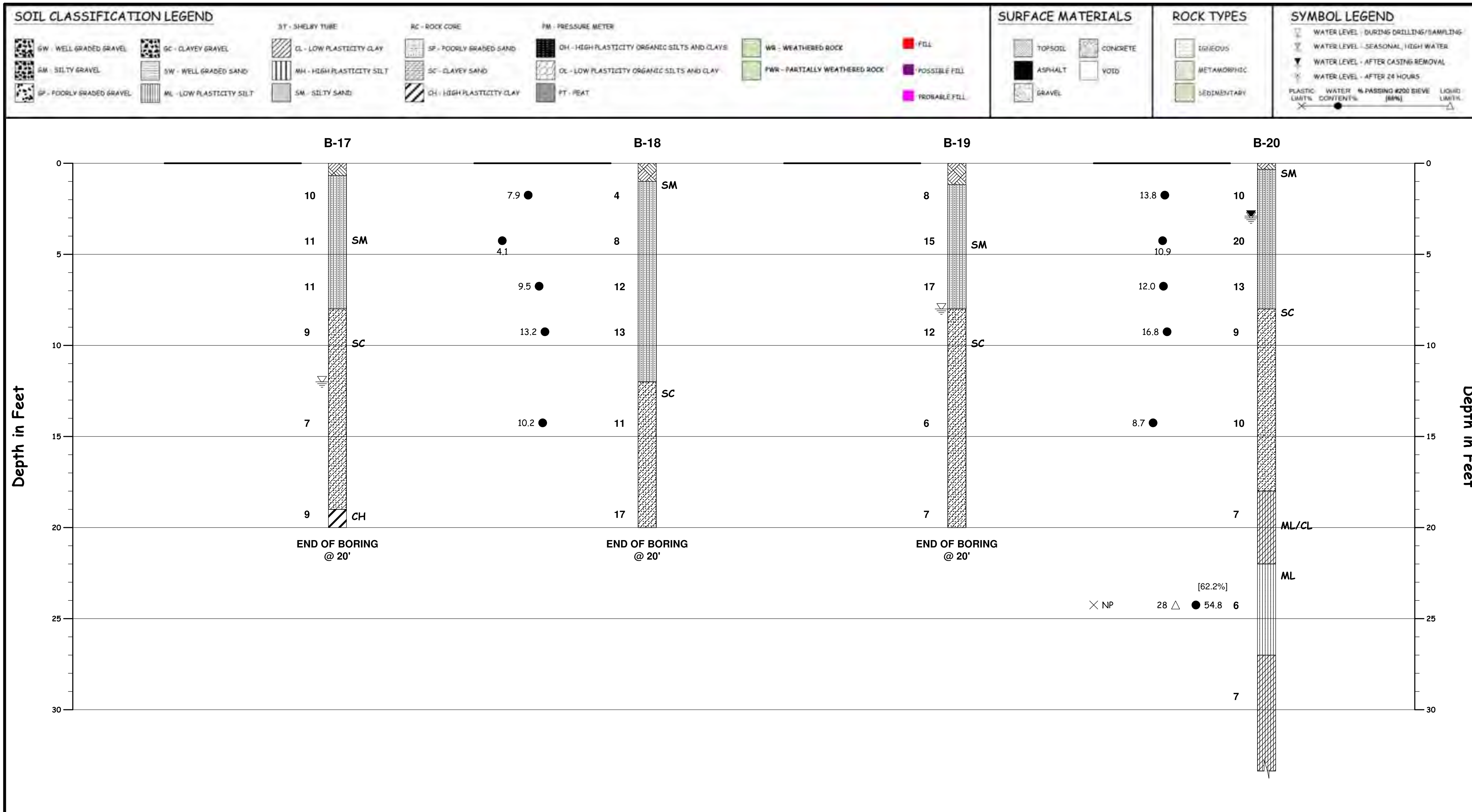
(CENTRAL AREA)

Cherrywood Solar

Open Road Renewables

15642 Jackson Lane, Goldsboro, Caroline County, MD

PROJECT NO.: 8631 | DATE: 1/15/2018 | VERTICAL SCALE: 1"=5'



NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
3 HORIZONTAL DISTANCES ARE NOT TO SCALE.

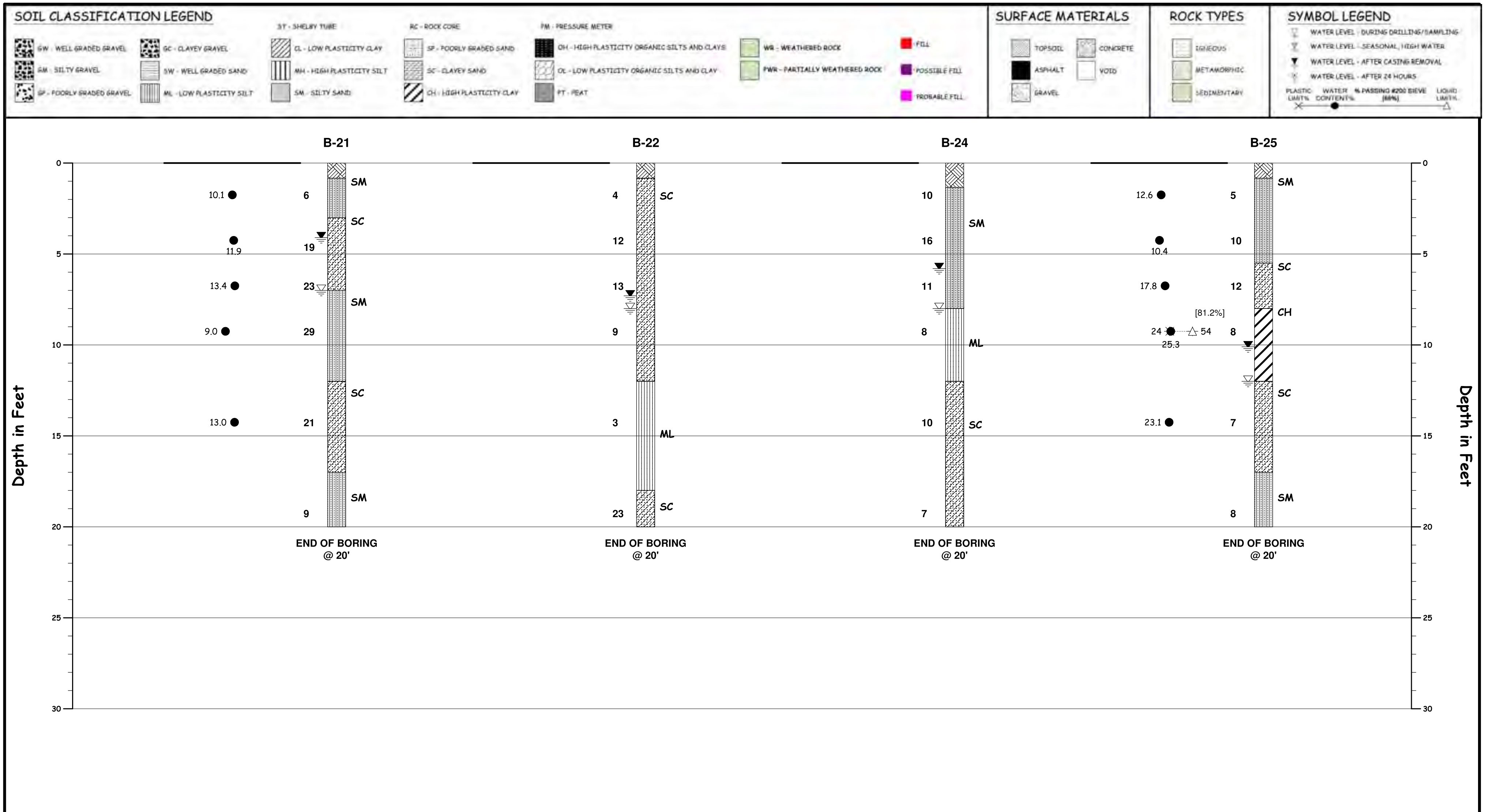
ECS

Subsurface Soil Profile

(CENTRAL AREA)

Cherrywood Solar
Open Road Renewables
15642 Jackson Lane, Goldsboro, Caroline County, MD

PROJECT NO.: 8631 | DATE: 1/15/2018 | VERTICAL SCALE: 1"=5'



NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
3 HORIZONTAL DISTANCES ARE NOT TO SCALE.

Subsurface Soil Profile

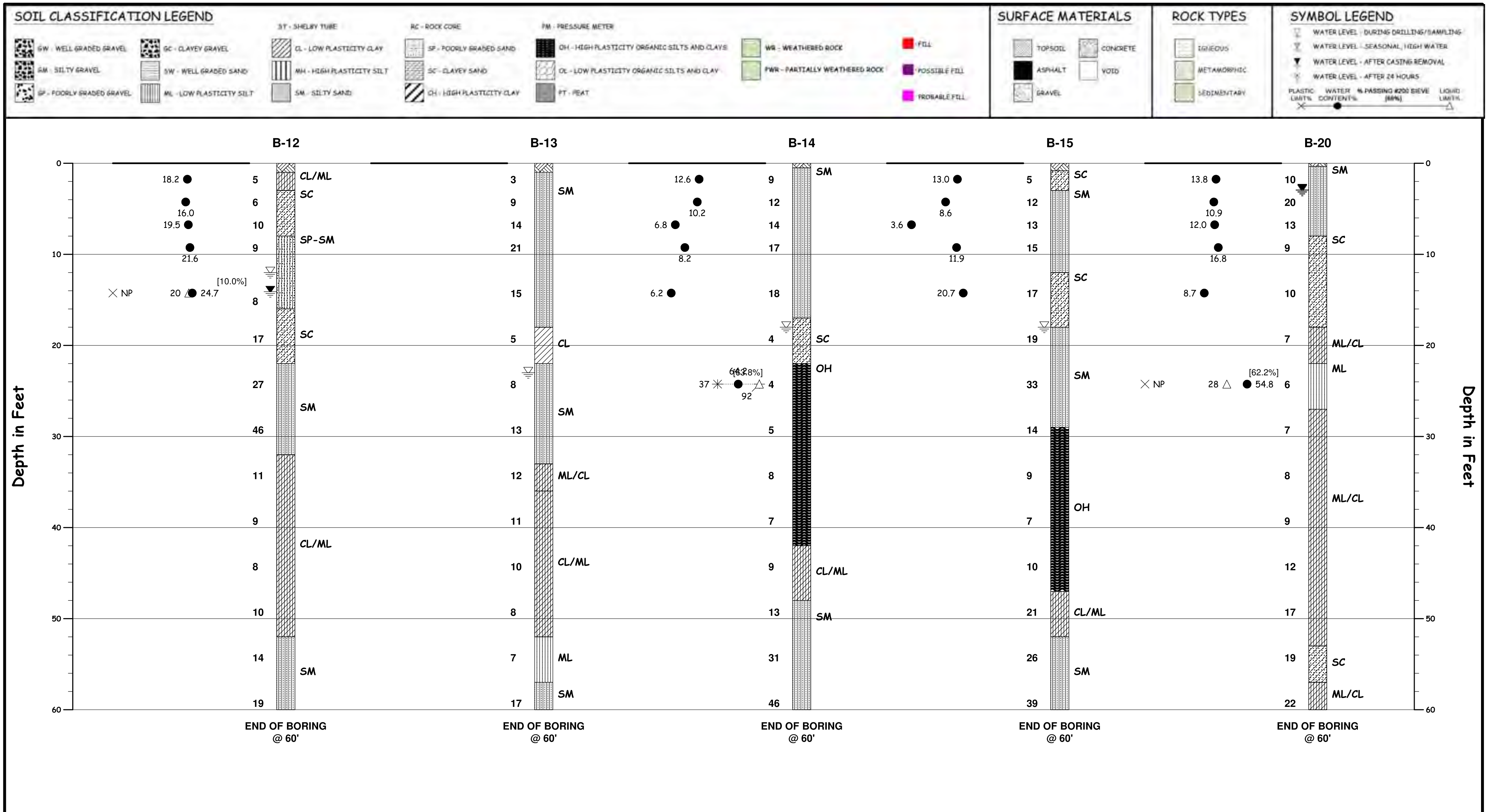
(SOUTHERN AREA)

Cherrywood Solar

Open Road Renewables

15642 Jackson Lane, Goldsboro, Caroline County, MD

PROJECT NO.: 8631 | DATE: 1/15/2018 | VERTICAL SCALE: 1"=5'



NOTES:

1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.

2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).

3 HORIZONTAL DISTANCES ARE NOT TO SCALE.

ECS

Subsurface Soil Profile

(DEEP BORINGS)

Cherrywood Solar

Open Road Renewables

15642 Jackson Lane, Goldsboro, Caroline County, MD

PROJECT NO.: 8631 | DATE: 1/15/2018 | VERTICAL SCALE: 1"=10'

LEGEND
- ECS Boring Location
- Boring Not Drilled

REVISIONS	Boring Location Plan Cherrywood Solar					
	Open Road Renewables					
	KFB	HMA	01/11/18	NTS	8631	1 OF 1

APPENDIX 8

FEMA Flood Insurance Rate Maps

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

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NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov/.

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Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

The AE Zone category has been divided by a **Limit of Moderate Wave Action (LiMWA)**. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LiMWA (or between the shoreline and the LiMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

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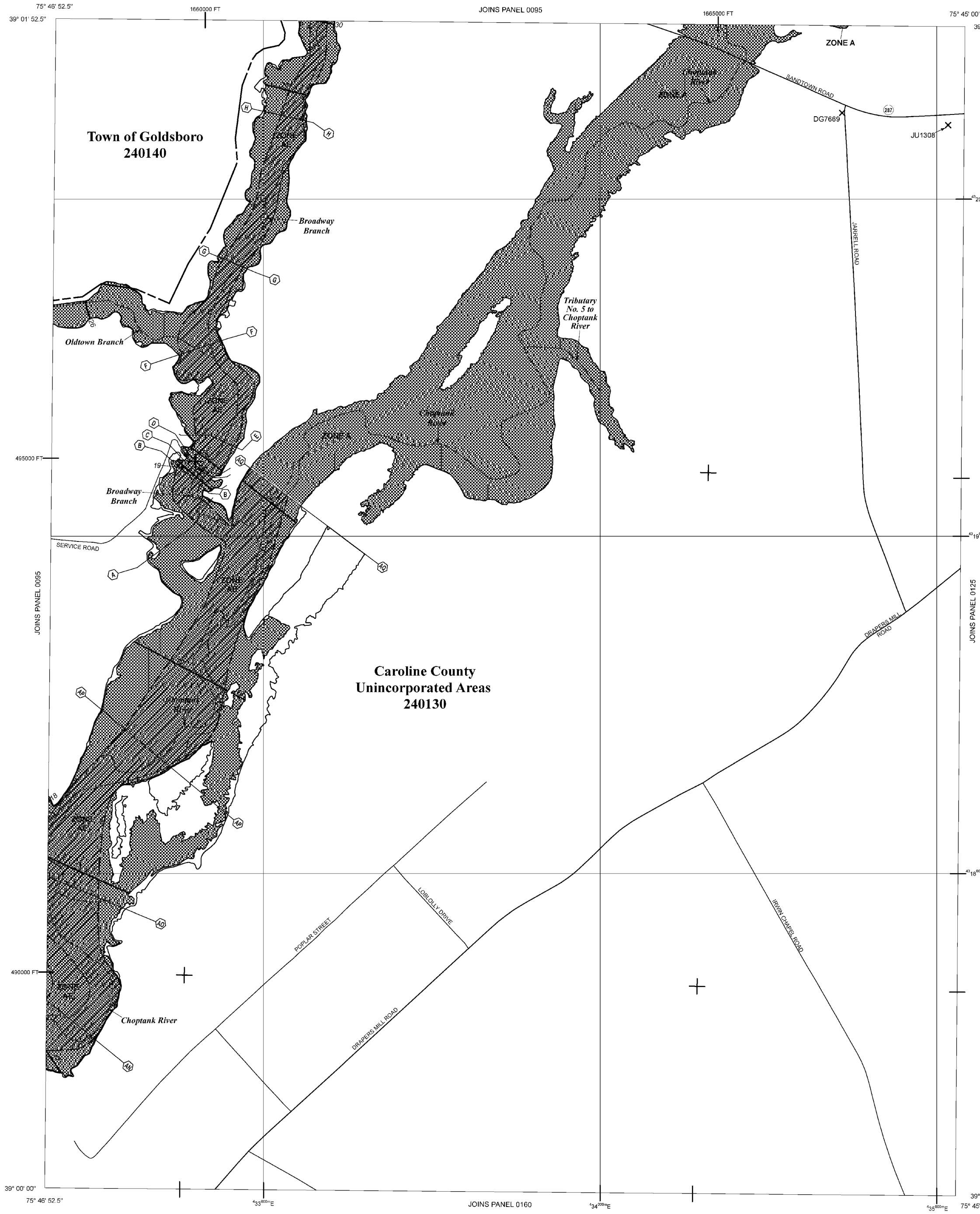

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAS)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities
- Limit of Moderate Wave Action
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- Bridge
- Footbridge
- Culvert
- (A)—(A) Cross section line
- (23)—(23) Transect line
- 87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- $^{41}23^{000M}$N — 1000-meter Universal Transverse Mercator grid values, zone 18 North
- 600000 FT — 5000-foot grid ticks: Maryland State Plane coordinate system (FIPSZONE 1900), Lambert Conformal Conic projection
- DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- ● M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP

JANUARY 16, 2015

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

N

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0094D

FIRM
FLOOD INSURANCE RATE MAP

CAROLINE COUNTY, MARYLAND
AND INCORPORATED AREAS

PANEL 94 OF 375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CAROLINE COUNTY	240130	0094	D
GOLDSBORO, TOWN OF	240140	0094	D

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

MAP NUMBER
24011C0094D

EFFECTIVE DATE
JANUARY 16, 2015

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

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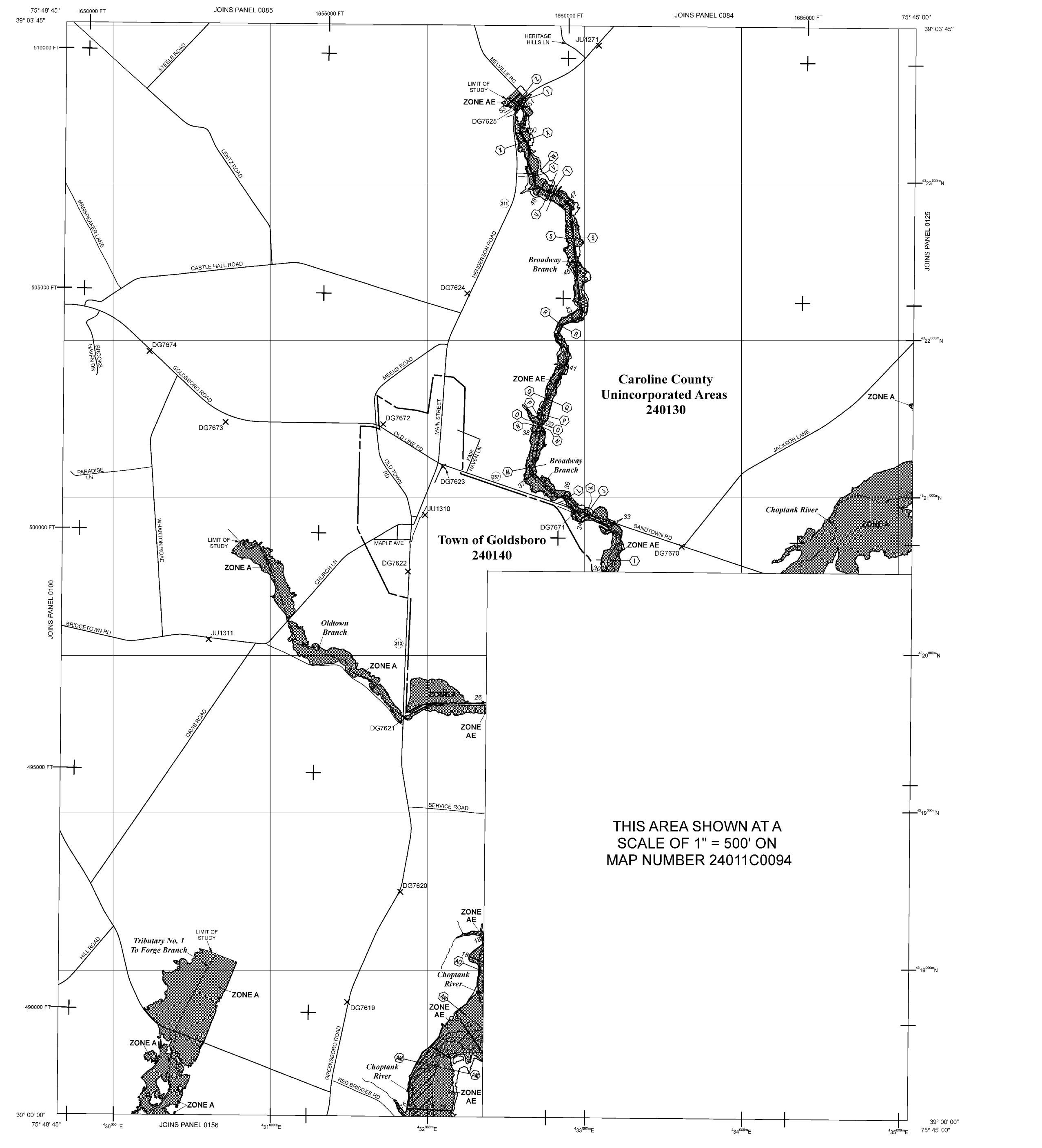

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

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FLOODWAY AREAS IN ZONE AE

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OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
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OTHERWISE PROTECTED AREAS (OPAS)

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1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities
Limit of Moderate Wave Action

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

	Bridge
	Footbridge
	Culvert
A — A	Cross section line
23 - - - 23	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
$^{41}23^{000M}$N	1000-meter Universal Transverse Mercator grid values, zone 18 North
600000 FT	5000-foot grid ticks: Maryland State Plane coordinate system (FIPSZONE 1900), Lambert Conformal Conic projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP

JANUARY 16, 2015

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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N

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0095D

FIRM
FLOOD INSURANCE RATE MAP

CAROLINE COUNTY, MARYLAND
AND INCORPORATED AREAS

PANEL 95 OF 375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CAROLINE COUNTY	240130	0095	D
GOLDSBORO, TOWN OF	240140	0095	D

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MAP NUMBER
24011C0095D

EFFECTIVE DATE
JANUARY 16, 2015

Federal Emergency Management Agency

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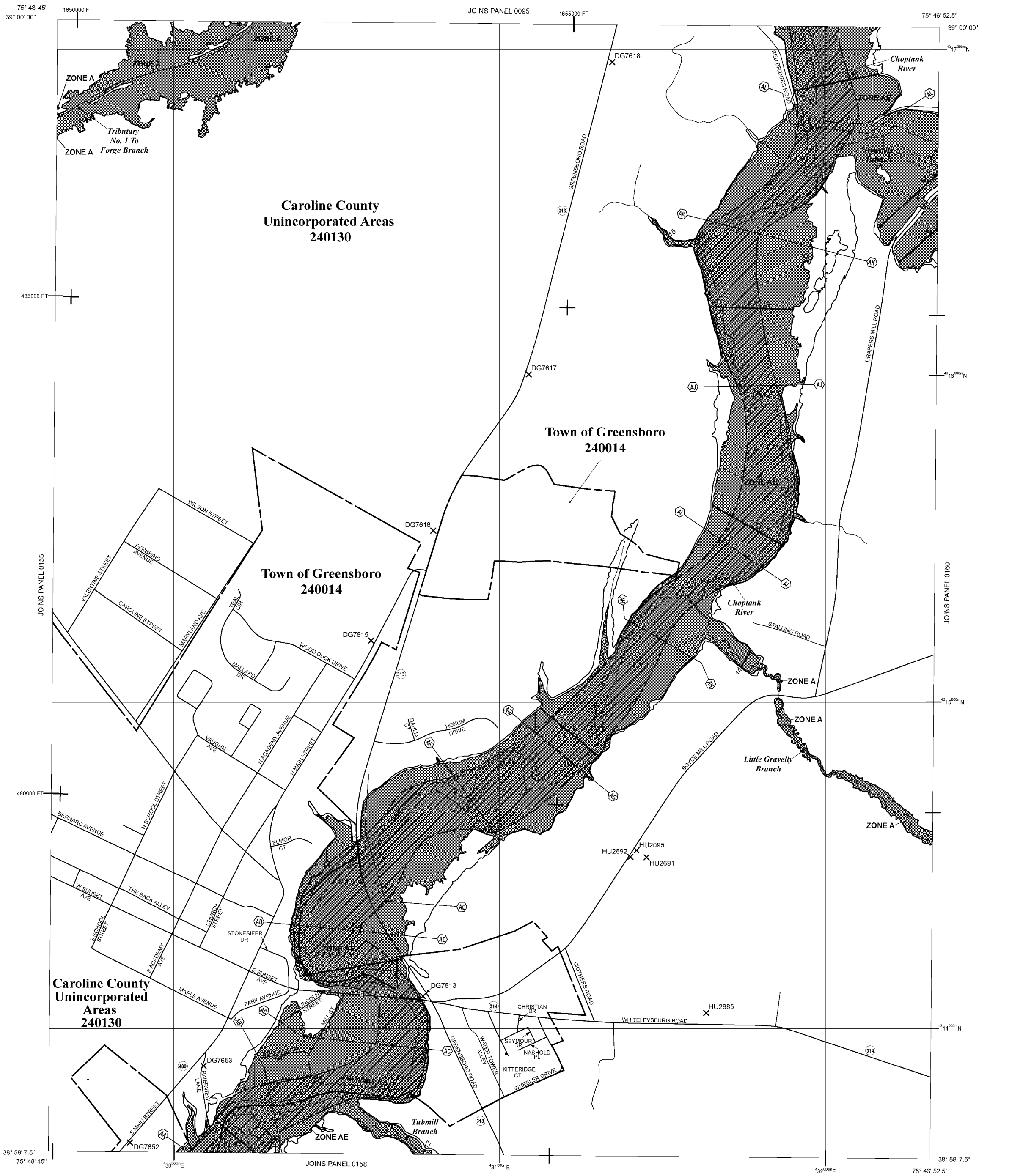

LEGEND

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ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
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ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

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COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAS)

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1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities
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* Referenced to the North American Vertical Datum of 1988

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	Footbridge
	Culvert
A — A	Cross section line
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MAP REPOSITORY
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EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP

JANUARY 16, 2015

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N

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250 0 500 1000 FEET

150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0156D

FIRM
FLOOD INSURANCE RATE MAP

CAROLINE COUNTY, MARYLAND
AND INCORPORATED AREAS

PANEL 156 OF 375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CAROLINE COUNTY	240130	0156	D
GREENSBORO, TOWN OF	240014	0156	D

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U.S. DEPARTMENT OF HOMELAND SECURITY

MAP NUMBER 24011C0156D

EFFECTIVE DATE JANUARY 16, 2015

Federal Emergency Management Agency

APPENDIX 9

Critical Area Commission Confirmation Memo

From: Claudia Jones -DNR-
To: Dane Bauer
Cc: Melissa Hall; Julie Roberts -DNR-; Nick Kelly -DNR-
Subject: Re: CAC - Confirmations
Date: Tuesday, August 8, 2017 11:49:15 AM

Dane,

These are All outside of the Critical Area even the one on Tax Map 15, Par 68.
All of Tax Map 15 is outside the CA.
Claudia

MD Logo.png

dnr.maryland.gov/criticalarea

Claudia Jones
Science Advisor
Critical Area Commission for the
Chesapeake & Atlantic Coastal Bays
1804 West Street, Suite 100
Annapolis, MD 21401
410-260-3482(office)
claudia.jones@maryland.gov

On Tue, Aug 1, 2017 at 10:52 AM, Dane Bauer <dbauer@hallandbauer.com> wrote:

> Claudia:
>
> We are working on a new project and have used the ESRGC Maps to provide a desktop review of the parcels to determine if they are in the Critical Area. Only one parcel may be slightly impacted, however the designs will most likely avoid any impact.
>
> Could you please confirm the following tax maps/parcels are not within the Critical Area.

TM	G	Parcel
0011	0004	0052
0011	0005	0158
0011	0004	0053
0011	0009	0056
0011	0009	0058
0011	0003	0005
0010	0018	0011
0010	0011	0034
0010	0017	0025
0011	0020	0007
0011	0020	0051
0015	0001	0066
0015	0007	0067
0015	0007	0068 - partially within CA
0014	0012	0008

0014 0023 0038

Thanks for your help.

--

Dane S. Bauer
410.812.9109

37534 Oliver Dr.
Selbyville, DE 19975

APPENDIX 10

ECS Mid-Atlantic Wetland Field Assessment Report

PRELIMINARY WATERS OF THE U.S. DETERMINATION REPORT
CHERRYWOOD SOLAR PROJECT

CAROLINE COUNTY, MARYLAND

ECS PROJECT NO. 47: 4881

FOR

CHERRYWOOD SOLAR I, LLC
(c/o H&B Solutions)

NOVEMBER 2017

November 27, 2017

Mr. David Savage
Cherrywood Solar I, LLC
1105 Navasota Street
Austin, Texas 78702
david@openroadrenewables.com

ECS Project No. 47:4881

Reference: Preliminary Waters of the U.S. Determination, Cherrywood Solar Project, Greensboro and Goldsboro, Caroline County, Maryland

Dear Mr. Savage:

ECS Mid-Atlantic (ECS) is pleased to present this Preliminary Waters of the U.S. Determination for the above-referenced project in general accordance with ECS Proposal No. 47:5529-EPR, dated September 20, 2017. A Preliminary Waters of the U.S. Determination entails the gathering of appropriate secondary information; including but not limited to, USGS, NWI, county soils mapping, and aerial photography. Secondly, a site visit is made to determine if areas of concern may be present and exhibit wetland or other Waters of the United States characteristics. Some field data is gathered to make these determinations but it is not adequate for submittal to the U.S. Army Corps of Engineers or Maryland Department of the Environment for confirmation, nor are the boundaries of such areas flagged.

PROPERTY DESCRIPTION

The site is comprised of parcels and easements totaling approximately 1,900-acres located generally along Greensboro Road between Goldsboro and Greensboro in Caroline County, Maryland. The study area can generally be described as agricultural with some wooded areas. Proposed development of the site includes a solar power generating facility.

SECONDARY INFORMATION

Secondary Information entails the background research and review of recorded data and mapping pertaining to the project site. Resources include but are not limited to the:

- U. S. Geological Survey (USGS) Topographic Map, Denton and Goldsboro Quadrangles, 2016
- U. S. Fish and Wildlife Service (USFWS), National Wetlands Inventory (NWI) Online Mapper, http://wetlands.fws.gov/mapper_tool.htm
- Natural Resources Conservation Service (NRCS), Electronic Field Office Technical Guide, Caroline County Soils, www.nrcs.usda.gov/technical/efotg/
- Available aerial photography and GIS data.

The USGS Denton and Goldsboro quadrangle maps show elevations ranging from approximately 25 to 50 feet above mean sea level (MSL) throughout the site (Figure 2). As shown on the USGS Map, the project site drains to the Choptank River, located along portions of the eastern site boundary, and is within the Choptank watershed, identified as Hydrologic Unit Code (HUC) 02060005. The NWI map depicts freshwater forested and emergent wetlands, ponds, and riverine features within the study area (Figure 3). The soil survey indicates that the site is underlain primarily by the soil units listed in Table 1 below (also see Figure 4).

Table 1: Soil Map Units Onsite

Map unit symbol	Map unit name	Hydric Rating (%)
CdB	Cedartown loamy sand, 2 to 5 percent slopes	0
CoA	Corsica mucky loam, 0 to 2 percent slopes	95
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	82
EwB	Evesboro sand, 2 to 5 percent slopes	0
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	78
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	81
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	0
HbA/B/C	Hambrook sandy loam, 0 to 2/2 to 5/5 to 10 percent slopes	0
HcA	Hambrook loam, 0 to 2 percent slopes	0
HnA	Hammonton sandy loam, 0 to 2 percent slopes	5
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	53
HvA	Hurlock sandy loam, 0 to 2 percent slopes	85
IeB/C	Ingleside loamy sand, 2 to 5/5 to 10 percent slopes	0
IgA/B	Ingleside sandy loam, 0 to 2/2 to 5 percent slopes	0
KgB	Klej-Galloway complex, 0 to 5 percent slopes	15
LgA	Lenni loam, 0 to 2 percent slopes	85
LhA	Lenni silt loam, 0 to 2 percent slopes	85
LO	Longmarsh and Indiantown soils, frequently flooded	95
RoA/B	Rosedale loamy sand, 0 to 2/2 to 5 percent slopes	0
UbB	Udorthents, borrow area, 0 to 5 percent slopes	5
WdcA/B	Woodstown sandy loam, 0 to 2/2 to 5 percent slopes, Mid-Atlantic Coastal Plain	6
WocA/B	Woodstown loam, 0 to 2/2 to 5 percent slopes, Mid-Atlantic Coastal Plain	6
Za	Zekiah sandy loam, frequently flooded	95

FIELD VISIT FINDINGS

A field evaluation was conducted on October 25 and 26, 2017, during which time ECS observed potentially jurisdictional Waters onsite (see attached map). The agricultural fields were transected by numerous ditches. Small areas of potential wetlands were also observed in the fields. Oldtown Branch is located along the property boundaries in the central portion of the site, draining to the Choptank River along the eastern site boundary. Unnamed tributary stream channels and forested wetlands located within the wooded areas of the site drained primarily to the east. The locations of wetlands and streams appear to be governed primarily by topography with wetland areas present in low-lying topographical positions. A photographic log of site conditions is included in Appendix II.

Based on these findings, ECS recommends avoidance of these areas. Please refer to these areas as field mapping which needs to be confirmed through a Maryland Department of the Environment (MDE) site visit. We look forward to meeting with H&B Solutions and MDE to conduct the site visit to confirm the findings of this report. Please let us know when H&B Solutions and MDE are available to meet.

ECS would like to thank Cherrywood Solar I, LLC for the opportunity to provide you with this Preliminary Waters of the U.S. Determination. We look forward to assisting you further with this project and other environmental concerns you may have. If you have any questions, please feel free to contact us at any time at 703-471-8400.

Sincerely,

ECS MID-ATLANTIC, LLC

Anna Allie, MEM, ISA-CA
Environmental Project Manager
AAllie@ecslimited.com

Adam M. Meurer, CHMM, PWS
Environmental Principal
AMeurer@ecslimited.com

\\S47-ARES2K8\data_e-projects\4800-4899\4881 Cherrywood Solar Goldsboro MD\Preliminary Wetlands Letter.doc

Appendix 1 – Figures
Appendix 2 – Site Photographs

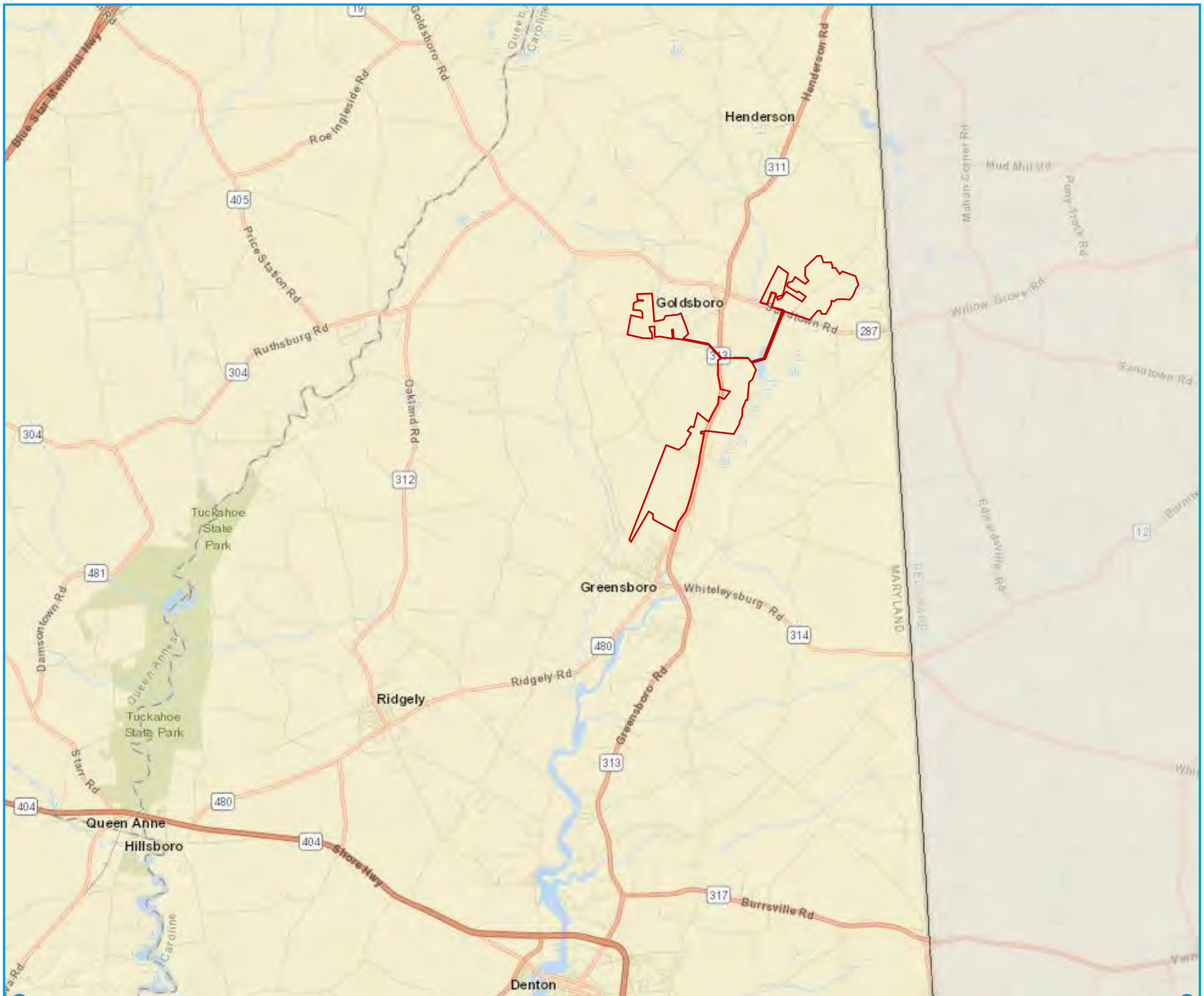

FIGURE 1: SITE LOCATION MAP

PROJECT #47:4881 — CHERRYWOOD PROJECT

CAROLINE COUNTY, MARYLAND

N
W
E
S

NOT TO SCALE

PRELIMINARY WETLAND DETERMINATION

FOR: CHERRYWOOD SOLAR I, LLC

NOVEMBER 2017

SOURCE: MERLIN

ECS MID-ATLANTIC, LLC
14026 THUNDERBOLT PLACE
SUITE 100
CHANTILLY, VA 20151
703-471-8400

www.ecslimited.com

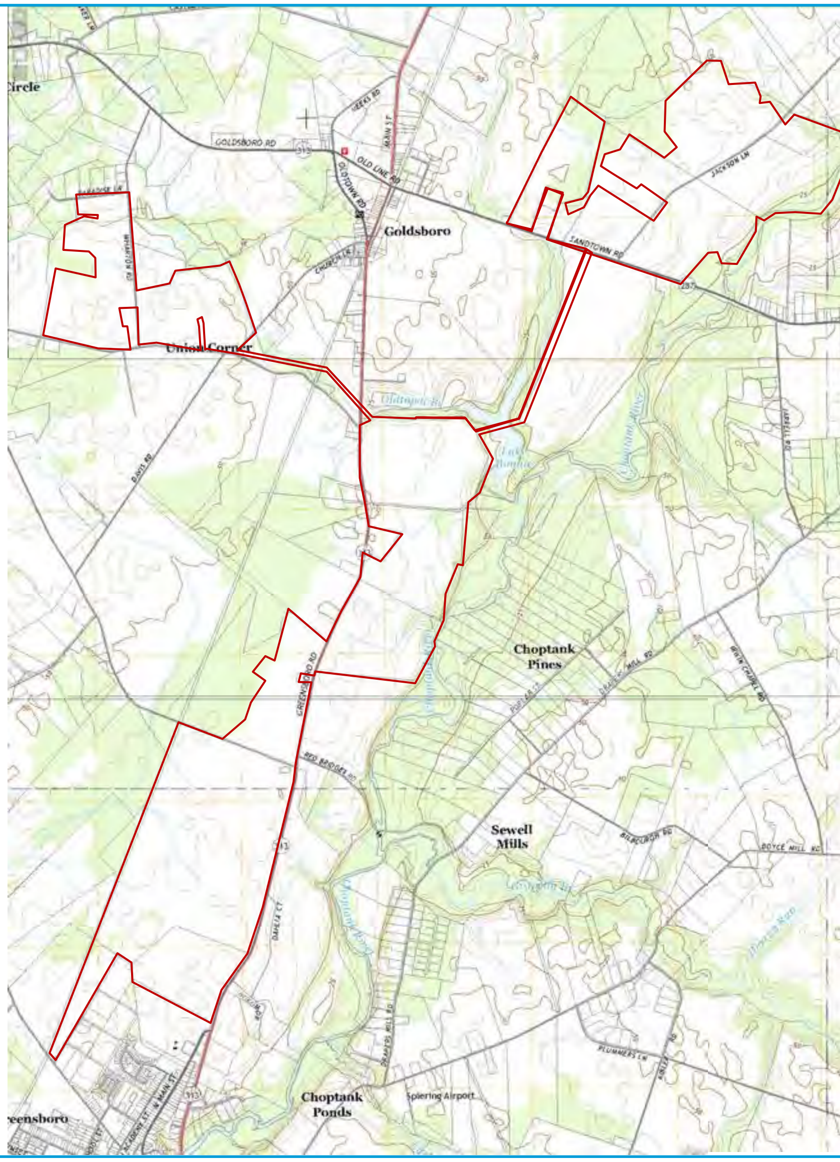

FIGURE 2: USGS TOPOGRAPHIC MAP

PROJECT #47:4881 — CHERRYWOOD PROJECT

CAROLINE COUNTY, MARYLAND

N
W E
S

NOT TO SCALE

PRELIMINARY WETLAND DETERMINATION

FOR: CHERRYWOOD SOLAR I, LLC

NOVEMBER 2017

SOURCE: MERLIN

ECS MID-ATLANTIC, LLC
14026 THUNDERBOLT PLACE
SUITE 100
CHANTILLY, VA 20151
703-471-8400

www.ecslimited.com

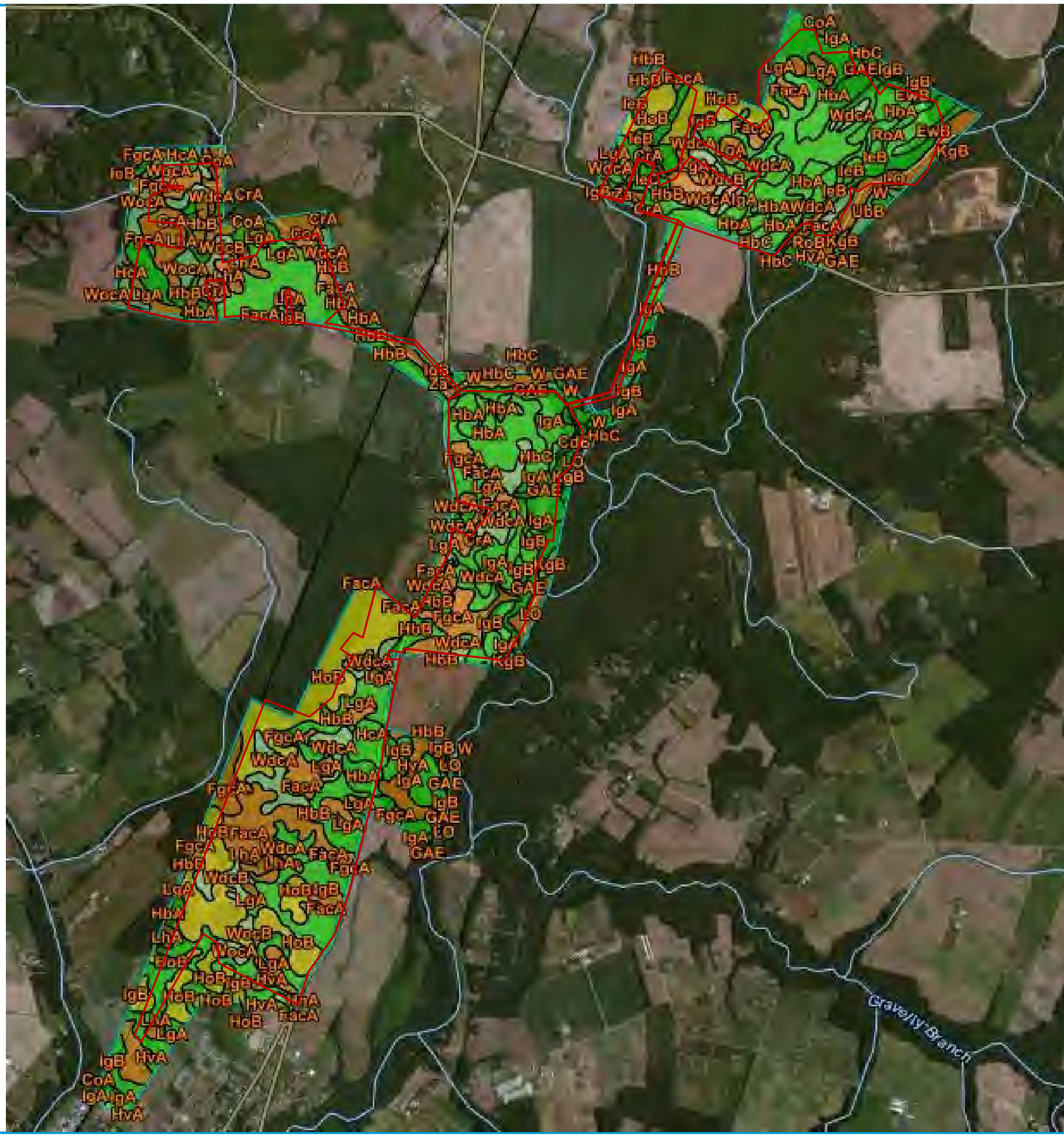

FIGURE 3: USDA SOILS MAP

PROJECT #47:4881 — CHERRYWOOD PROJECT

CAROLINE COUNTY, MARYLAND

N

W E

S

NOT TO SCALE

PRELIMINARY WETLAND DETERMINATION

FOR: CHERRYWOOD SOLAR I, LLC

NOVEMBER 2017

SOURCE: NRCS WEB SOIL SURVEY

ECS MID-ATLANTIC, LLC
14026 THUNDERBOLT PLACE
SUITE 100
CHANTILLY, VA 20151
703-471-8400

www.ecslimited.com

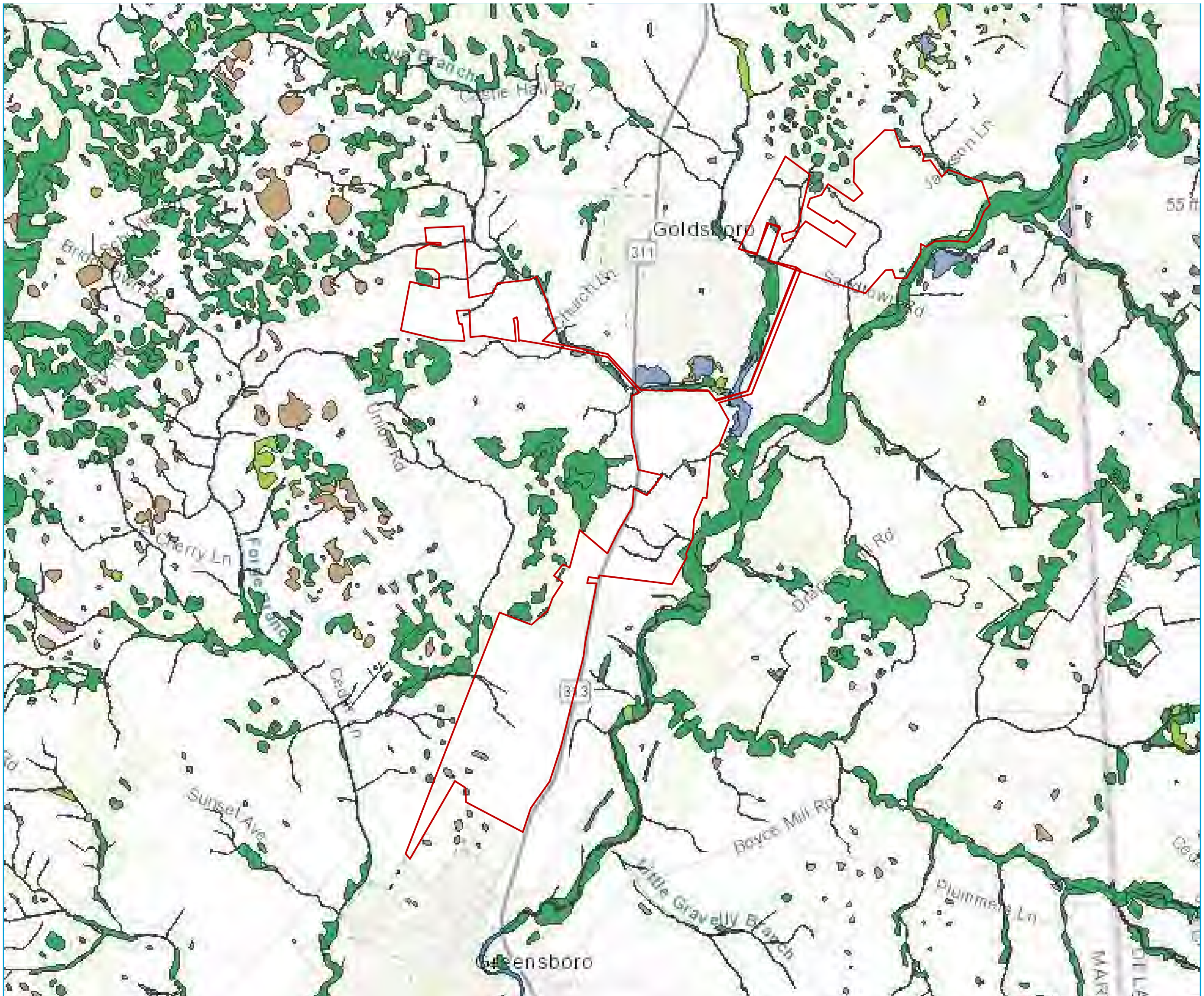

FIGURE 4: NATIONAL WETLANDS INVENTORY MAP
PROJECT #47:4881 — CHERRYWOOD PROJECT
CAROLINE COUNTY, MARYLAND

N W E S

NOT TO SCALE

PRELIMINARY WETLAND DETERMINATION

FOR: CHERRYWOOD SOLAR I, LLC

NOVEMBER 2017

SOURCE: USFWS WETLANDS MAPPER

ECS MID-ATLANTIC, LLC
14026 THUNDERBOLT PLACE
SUITE 100
CHANTILLY, VA 20151
703-471-8400

www.ecslimited.com

Photograph 1: Oldtown Branch on eastern property line of the northwest portion of the study area.

Photograph 2: View of a typical potentially jurisdictional wetland area observed within the study area limits.

Photograph 3: View of drainage channel the northwest portion of the site.

Photograph 4: View of drainage channel/potentially jurisdictional wetland area.

Photograph 5: View of drainage channel.

Photograph 6: View of drainage channel.

Photograph 7: View of typical drainage channel the northwest portion of the site.

Photograph 8: View of a typical potentially jurisdictional wetland area observed along Choptank River in the northeast portion of the study area.

Photograph 9: View of typical potentially jurisdictional wetland area observed along Choptank River.

Photograph 10: View of drainage channel.

Photograph 11: View of pond on east side of northeast portion of the study area limits.

Photograph 12: View of Choptank River on east side study area limits.

Photograph 13: View of a potentially jurisdictional wetland within the study area limits.

Photograph 14: View of a potentially jurisdictional wetland within the study area limits.

Photograph 15: View of drainage channel.

Photograph 16: View of potentially jurisdictional wetland adjacent to Broadway Branch north side of Sandtown Road.

Photograph 17: Transmission line easement to the northeast portion of the site.

Photograph 18: Transmission line easement along Route 313.

Photograph 19: Transmission line easement along Bridgetown Road.

Photograph 20: Transmission line easement along Bridgetown Road.

Photograph 21: Lake Bonnie.

Photograph 22: Transmission line to the northeast portion of the site.

Photograph 23: Transmission line to the north of Lake Bonnie.

Photograph 24: View of a potentially jurisdictional wetland area observed near transmission lines in the southeast portion of the site.

Photograph 25: View of same potentially jurisdictional wetland area observed within the study area limits.

Photograph 26: View of a typical ditch in the central portion of the site.

Photograph 27: View of a stream channel in the central portion of the site.

Photograph 28: Stream and wetland area beneath transmission line in the central portion of the site.

Photograph 29: Potentially jurisdictional wetland area and farm fields in the central portion of the site.

Photograph 30: View of potential wetland area and farm fields in the southern portion of the site.

Photograph 31: View of ditch along the western property boundary in the southern portion of the site.

Photograph 32: View of ditch and fields in the southern portion of the site.

Photograph 33: View towards a typical potentially jurisdictional wetland area observed in the southern portion of the site.

Photograph 34: View of a potentially jurisdictional wetland area in the southern portion of the site.

Photograph 35: View of a typical potentially jurisdictional wetland area observed within the study area limits.

Photograph 36: View of a typical potentially jurisdictional wetland area observed within the study area limits.

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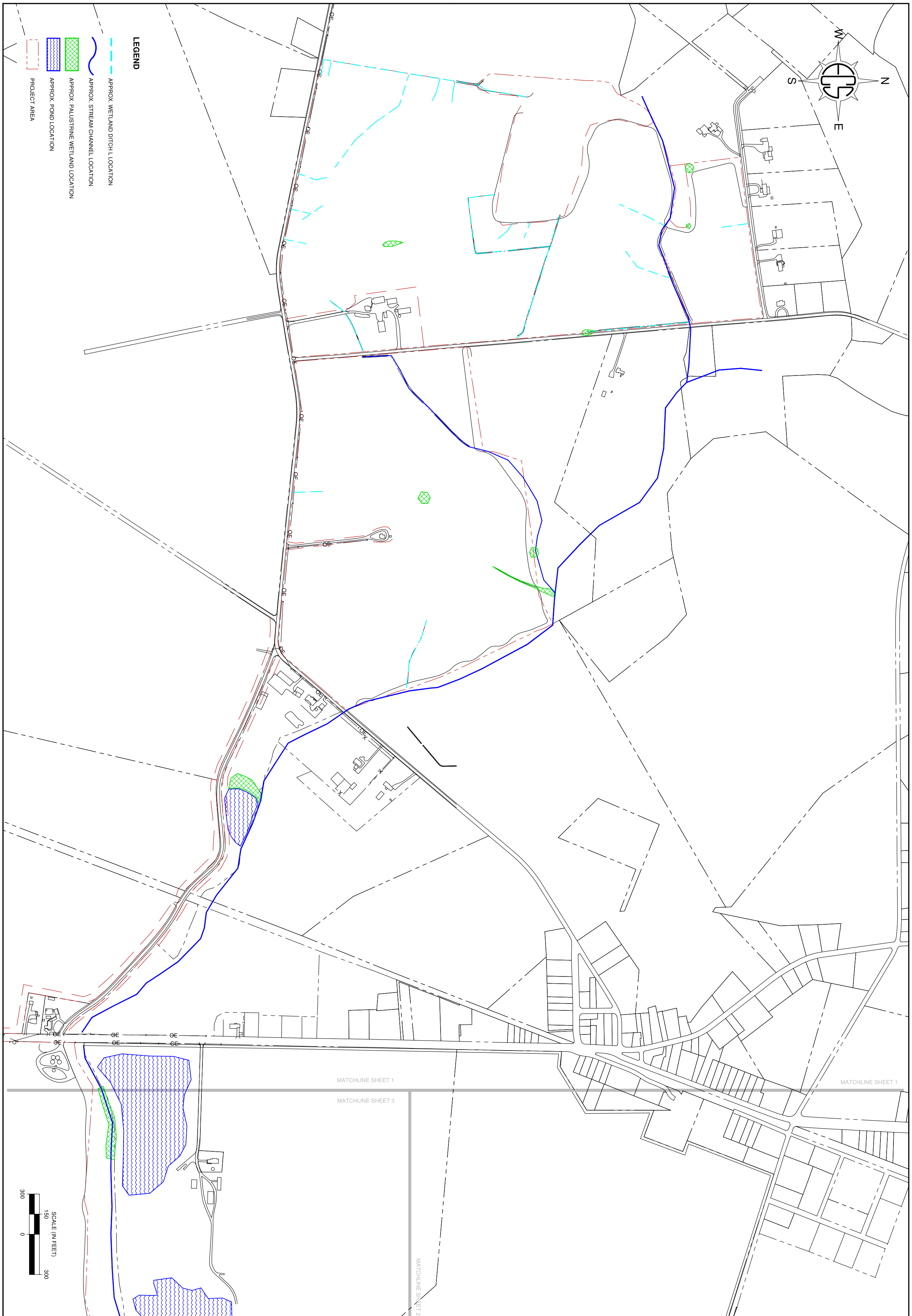

ENGINEER	DRAFTING	ECS REVISIONS
AMM	AEA	12-20-17 AEA
SCALE	1" - 300'	
PROJECT NO.	47-4881	
SHEET	1 OF 5	
DATE	11-20-17	

WATERS OF THE U.S. DETERMINATION MAP

CHERRYWOOD SOLAR I, LLC

CHERRYWOOD PROJECT GREENSBORO AND GOLDSBORO

CAROLINE COUNTY, MARYLAND

ECS - MID-ATLANTIC, LLC
14026 THUNDERBOLT PLACE
SUITE 100
CHANTILLY, VA 20151
1-800-822-3489
703-471-8400
(FAX) 703-834-5527

CELEBRATING OVER 25 YEARS OF EXCELLENCE

"SETTING THE STANDARD FOR SERVICE"

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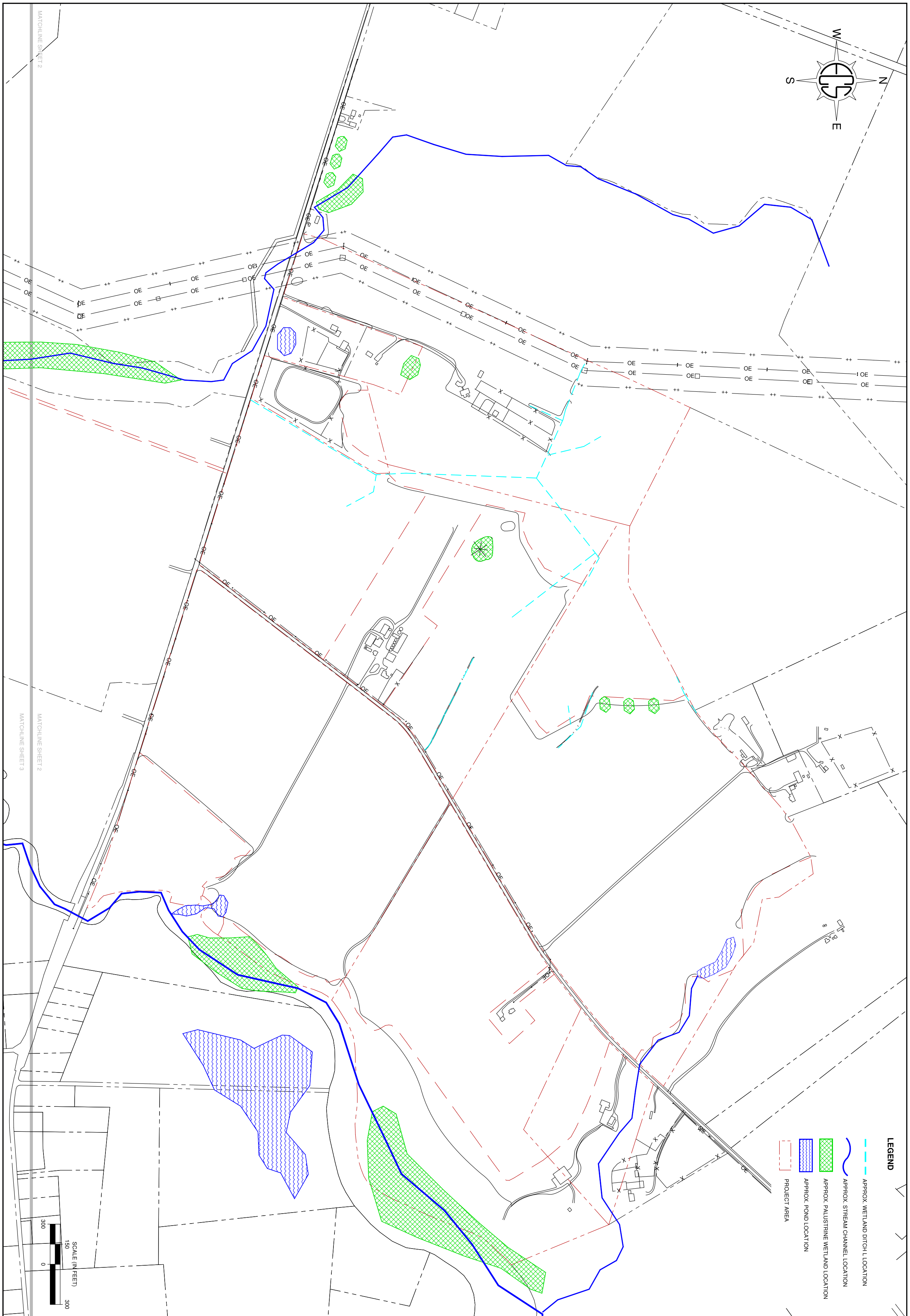

DATE 11-20-17	SHEET 2 OF 5	PROJECT NO. 47:4881	SCALE 1" - 300'	ENGINEER AMM	DRAFTING AEA

ECS REVISIONS
12-20-17 AEA

WATERS OF THE U.S. DETERMINATION MAP

CHERRYWOOD SOLAR I, LLC

CHERRYWOOD PROJECT GREENSBORO AND GOLDSBORO

CAROLINE COUNTY, MARYLAND

ECS - MID-ATLANTIC, LLC
14026 THUNDERBOLT PLACE
SUITE 100
CHANTILLY, VA 20151
1-800-822-3489
703-471-8400
(FAX) 703-834-5527

CELEBRATING OVER 25 YEARS OF EXCELLENCE

"SETTING THE STANDARD FOR SERVICE"

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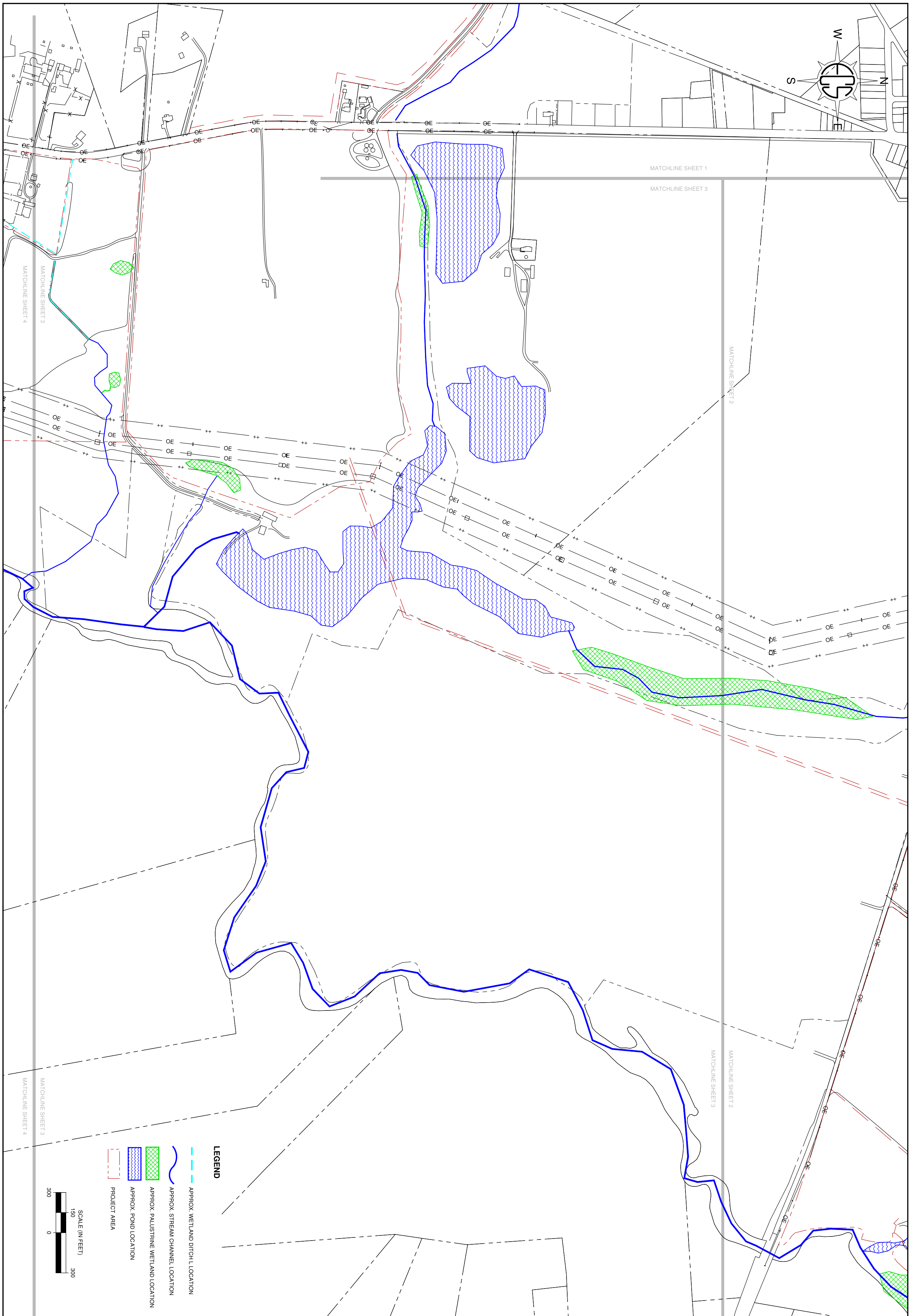

ECS REVISIONS	ENGINEER	DRAFTING
12-20-17 AEA	AMM	AEA
	SCALE	1" - 300'
	PROJECT NO.	47:4881
	SHEET	3 OF 5
	DATE	11-20-17

WATERS OF THE U.S. DETERMINATION MAP

CHERRYWOOD SOLAR I, LLC

CHERRYWOOD PROJECT GREENSBORO AND GOLDSBORO

CAROLINE COUNTY, MARYLAND

ECS - MID-ATLANTIC, LLC
14026 THUNDERBOLT PLACE
SUITE 100
CHANTILLY, VA 20151
1-800-822-3489
703-471-8400
(FAX) 703-834-5527

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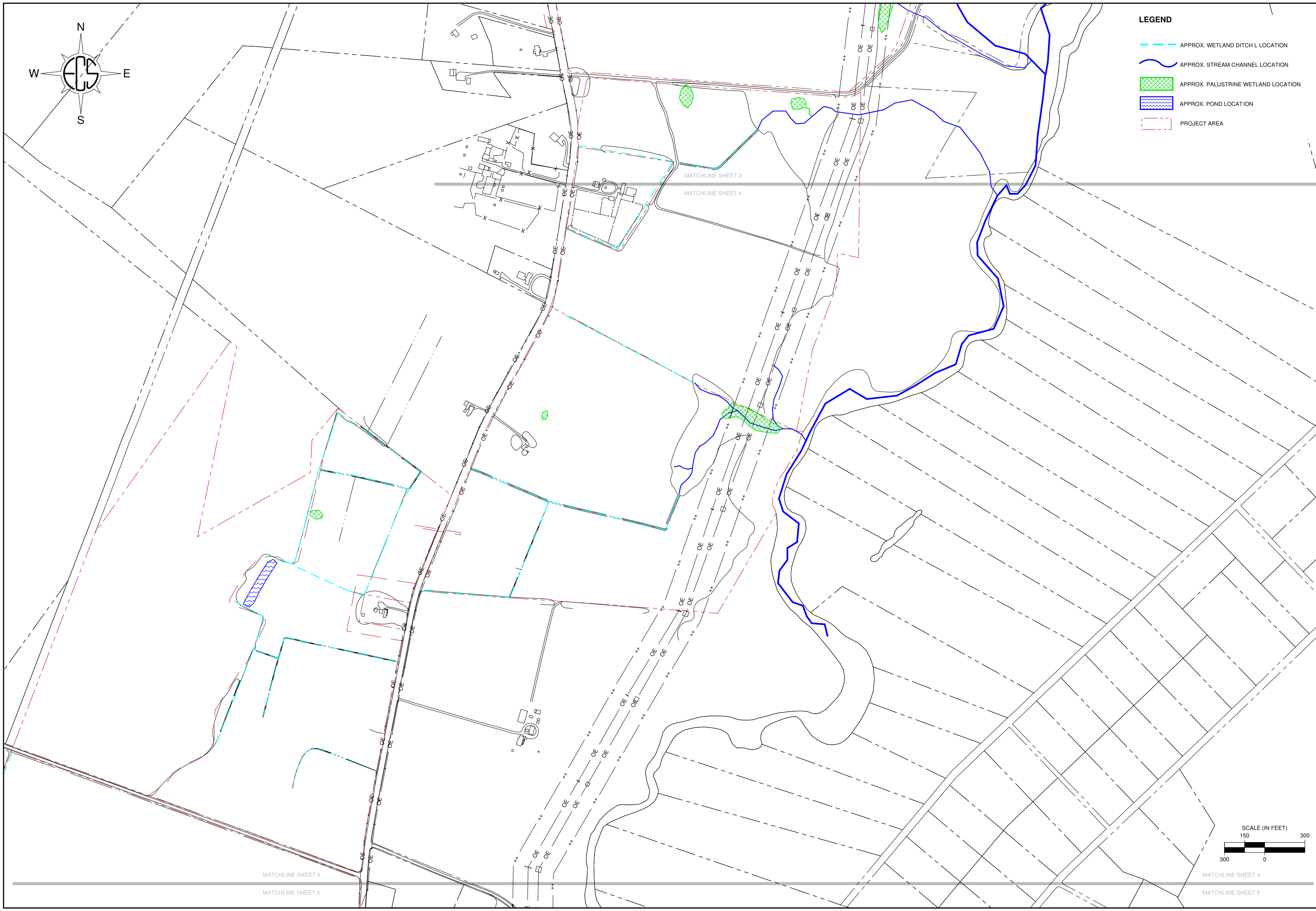

WATERS OF THE U.S. DETERMINATION MAP

CHERRYWOOD SOLAR I, LLC

CHERRYWOOD PROJECT GREENSBORO AND GOLDSBORO

CAROLINE COUNTY, MARYLAND

ECS - MID-ATLANTIC, LLC
14026 THUNDERBOLT PLACE
SUITE 100
CHANTILLY, VA 20151
1-800-822-3489
703-471-8400
(FAX) 703-834-5527

CELEBRATING OVER 25 YEARS OF EXCELLENCE

"SETTING THE STANDARD FOR SERVICE"

ECS REVISIONS	
12-20-17 AEA	
ENGINEER AMM	DRAFTING AEA
SCALE 1" - 300'	
PROJECT NO. 47:4881	
SHEET 4 OF 5	
DATE 11-20-17	

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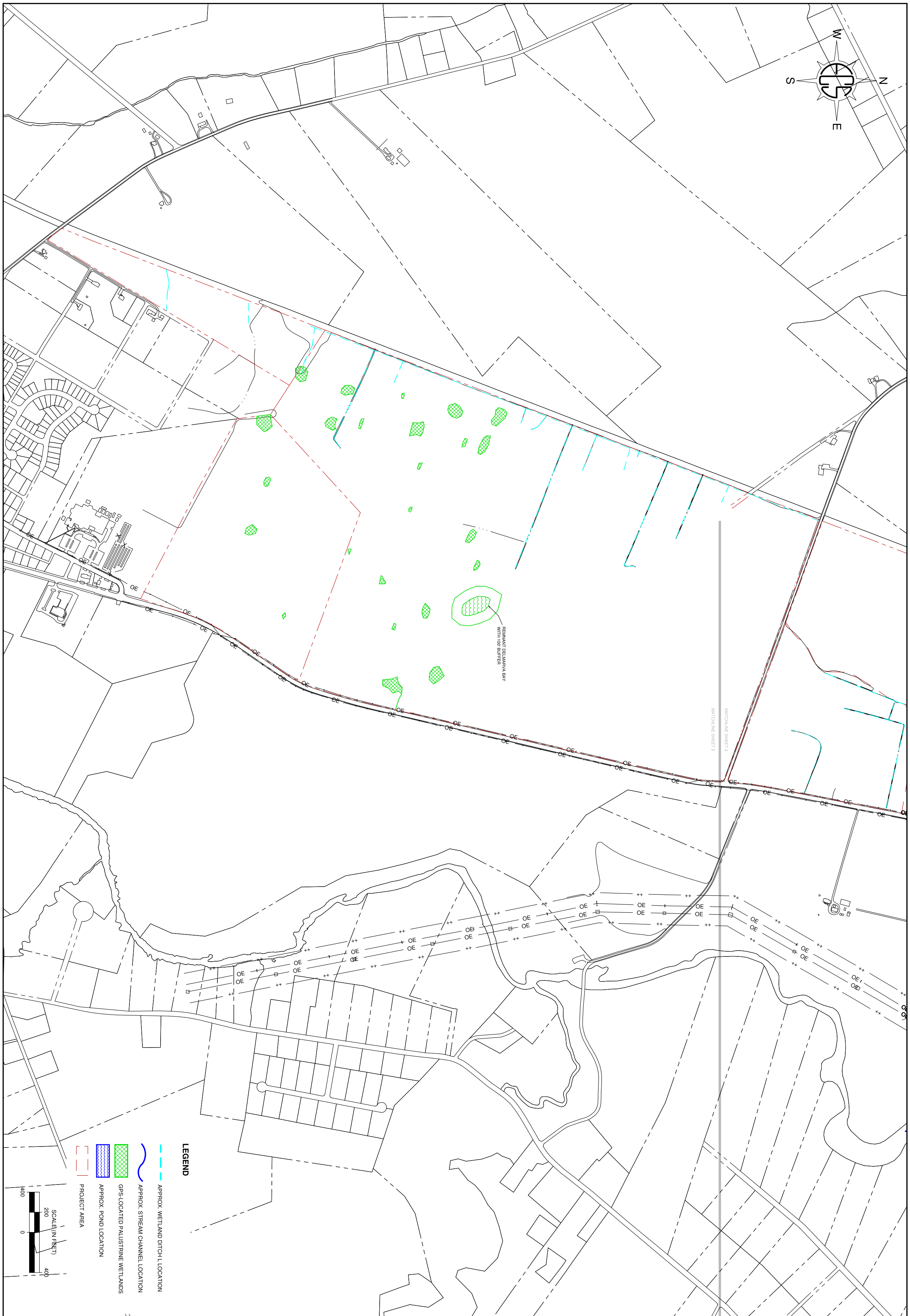


WATERS OF THE U.S. DETERMINATION MAP	CHERRYWOOD PROJECT GREENSBORO AND GOLDSBORO	ECS - MID-ATLANTIC, LLC 14026 THUNDERBOLT PLACE SUITE 100 CHANTILLY, VA 20151 1-800-822-3489 703-471-8400 (FAX) 703-834-5527	CELEBRATING OVER 25 YEARS OF EXCELLENCE
CHERRYWOOD SOLAR I, LLC	CAROLINE COUNTY, MARYLAND	"SETTING THE STANDARD FOR SERVICE"	

ENGINEER	DRAFTING	ECS REVISIONS
AMM	AEA	12-20-17 AEA
SCALE	1" - 400'	
PROJECT NO.	47:4881	
SHEET	5 OF 5	
DATE	11-20-17	

APPENDIX 10-A

ECS Mid-Atlantic Wetland Field Assessment Report (Parcel 135)

April 23, 2018
Revised May 30, 2018

Mr. Cyrus Tashakkori
Cherrywood Solar I, LLC
1105 Navasota Street
Austin, Texas 78702
david@openroadrenewables.com

ECS Project No. 47:4881

Reference: Preliminary Waters of the U.S. Determination, Cherrywood Solar Project, Greensboro and Goldsboro, Caroline County, Maryland

Dear Mr. Tashakkori:

In April 2018, ECS Mid-Atlantic (ECS) performed a Preliminary Waters of the U.S. Determination at the above-referenced project site. The site is comprised of approximately 6.3-acres located at the physical address 26726 Sandtown Road in Goldsboro, Caroline County, Maryland.

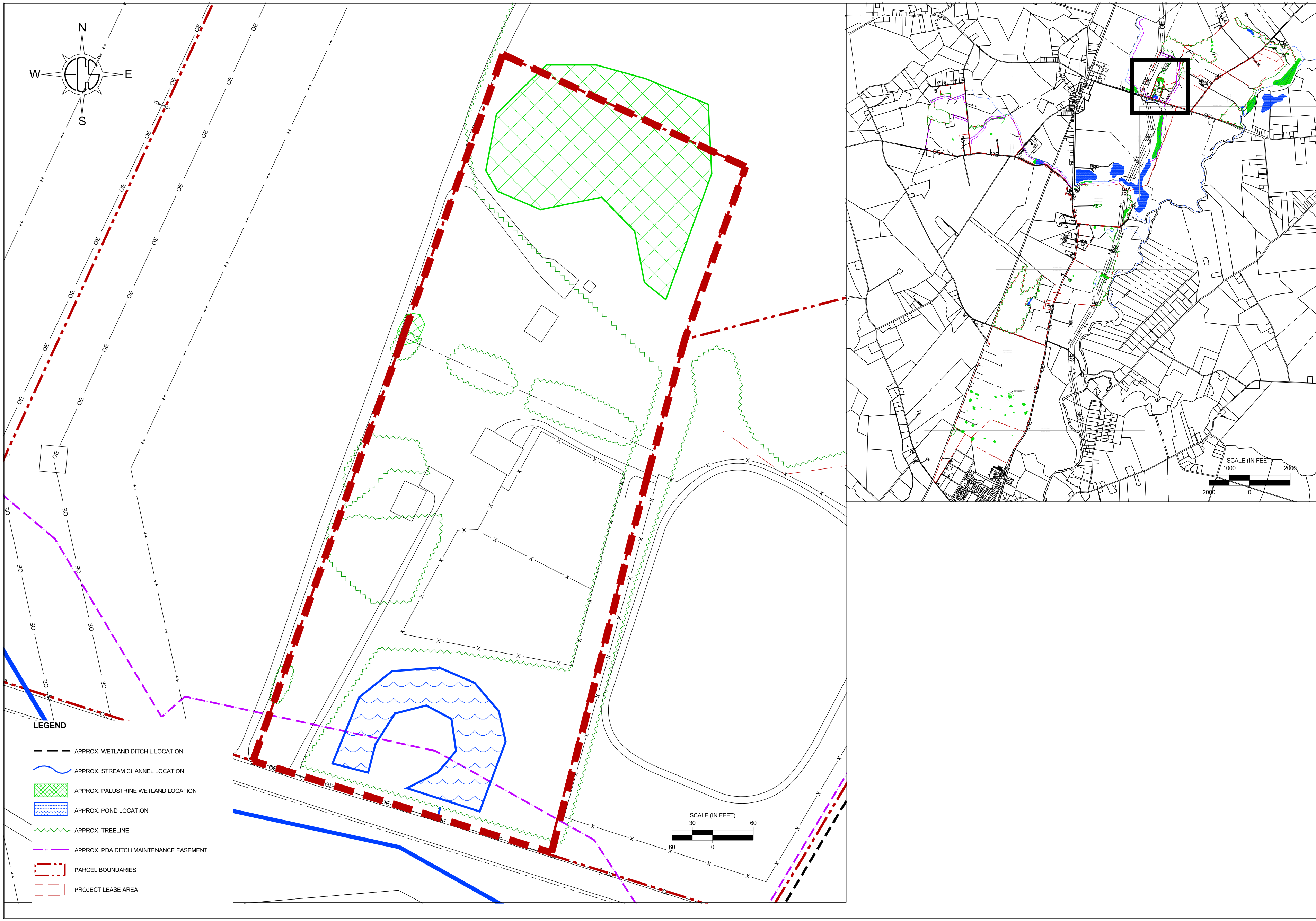
A field evaluation was conducted on April 11, 2018, during which time ECS observed potentially jurisdictional Waters onsite (see attached map). A pond and its outfall were located in the wooded area adjacent to Sandtown Road. During the May 23 site visit with MDE, a small palustrine emergent wetland was observed along the gravel road near the northwest property corner. The remainder of the site was occupied by a single-family residence, driveway, barn, and horse exercise area.

Attached is the updated wetland map including this area as a part of the overall Cherrywood project. If you have any questions, please feel free to contact us at any time at 703-471-8400.

Sincerely,

ECS MID-ATLANTIC, LLC

Anna Allie, MEM, ISA-CA
Environmental Project Manager



WATERS OF THE U.S.
DETERMINATION MAP
CHERRYWOOD SOLAR I, LLC

CHERRYWOOD PROJECT ADD.
GREENSBORO AND GOLDSBORO
CAROLINE COUNTY, MARYLAND

ECS - MID-ATLANTIC, LLC
14026 THUNDERBOLT PLACE
SUITE 100
CHANTILLY, VA 20151
1-800-822-3489
703-471-8400
(FAX) 703-834-5527

CELEBRATING
OVER 25 YEARS
OF EXCELLENCE

"SETTING THE STANDARD FOR SERVICE"

ECS REVISIONS

ENGINEER AMM	DRAFTING AEA
SCALE	1" - 60'
PROJECT NO.	47:4881
SHEET	1 of 1
DATE	5/30/18

APPENDIX 11

MDE Jurisdictional Nontidal Wetlands Confirmation Memo

MEMORANDUM

To: Dane Bauer/Melissa Hall

From: Al Kampmeyer/Project Reviewer
Maryland Department of the Environment/Nontidal Wetlands Division

Date: January 19, 2018

Re: Cherrywood Solar Project, Goldsboro to Greensboro, Caroline County, Maryland

The Maryland Department of the Environment, Nontidal Wetlands Division has reviewed the project limits of disturbance and nontidal wetlands, wetland buffers, streams, and 100-year floodplain for the proposed Cherrywood solar facility, planned from north of Goldsboro, on Jackson Lane, then south to Greensboro. The Department is in agreement with the nontidal wetlands delineation and stream locations and has determined that the project shall have no impacts to jurisdictional areas of the State, including nontidal wetlands, 25 foot nontidal wetland buffer, streams, and 100-year nontidal floodplain, as depicted in the document titled Preliminary Waters of the U.S. Report, Cherrywood Solar Project, prepared by ECS, and dated and revised November 2017. Please be advised the streams have not been designated intermittent or perennial, only as regulated waterways. These waterways also have nontidal wetlands in or along the streams so there are as depicted a wetlands buffer to these waterways as well. If this project does not disturb nontidal wetlands, wetland buffers, streams, or 100-year nontidal floodplain then no authorization from this office is necessary. It is our desire to see that these types of projects can take place without sacrificing any wetland and waterway functions that might exist on potential sites within the region. The Department is pleased that these specific projects have been designed to avoid such wetland losses. If I can be of further assistance, please feel free to contact me at alan.kampmeyer@maryland.gov or at 410-713-3685.

APPENDIX 11-A

MDE Jurisdictional Nontidal Wetlands Confirmation Memo (Parcel 135)

The Applicant conducted a field meeting with MDE as noted in the ERD. However, the ECS Field Assessment has not been finalized; therefore, MDE cannot provide concurrence on wetlands avoidance at the time of this submittal. Once this document is completed, the Applicant will prepare a supplemental filing of same to PPRP.

APPENDIX 12

Forge Solar Glare Analysis Report

GlareGauge Glare Analysis Results

Site Configuration: Carmean Airport

Project site configuration details and results.

Created **Oct. 19, 2017 4:59 p.m.**
DNI **varies** and peaks at **1,000.0 W/m^2**
Analyze every **1** minute(s)
0.5 ocular transmission coefficient
0.002 ft pupil diameter
0.017 ft eye focal length
9.3 mrad sun subtended angle
Site Configuration ID: 10723.1874

Summary of Results No glare predicted!

PV name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced
	deg	deg	min	min	kWh
PV array 1	0.0	0.0	0	0	-

Component Data

PV Array(s)

Name: PV array 1
Axis tracking: Single-axis rotation
Tracking axis orientation: 0.0 deg
Tracking axis tilt: 0.0 deg
Tracking axis panel offset: 0.0 deg
Limit tracking rotation? Yes
Maximum tracking angle: 60.0 deg
Rated power: -
Panel material: Smooth glass without AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 6.55 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	ft	ft	ft
1	39.037853	-75.784206	52.17	0.00	52.17
2	39.042120	-75.774593	49.57	0.00	49.57
3	39.039186	-75.762577	43.79	0.00	43.79
4	39.036786	-75.763264	45.43	0.00	45.43
5	39.029052	-75.770130	44.21	0.00	44.21
6	39.023718	-75.775280	22.56	0.00	22.56
7	39.018917	-75.778027	27.96	0.00	27.96
8	39.012248	-75.779400	12.22	0.00	12.22
9	39.000243	-75.782661	19.76	0.00	19.76
10	38.994373	-75.794334	40.38	0.00	40.38
11	38.983165	-75.800858	40.75	0.00	40.75
12	38.984766	-75.809097	43.18	0.00	43.18
13	38.990103	-75.808411	41.72	0.00	41.72
14	39.000243	-75.803604	44.56	0.00	44.56
15	39.008780	-75.796051	47.04	0.00	47.04
16	39.016783	-75.791931	46.11	0.00	46.11
17	39.027452	-75.786438	51.74	0.00	51.74

Flight Path Receptor(s)

Name: FP 1
Description:
Threshold height: 50 ft
Direction: 82.4 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 120.0 deg

Point	Latitude deg	Longitude deg	Ground elevation ft	Height above ground ft	Total elevation ft
Threshold	38.930571	-75.893898	56.08	50.00	106.08
2-mile point	38.934395	-75.857014	41.52	618.02	659.54

Name: FP 2
Description:
Threshold height: 50 ft
Direction: 156.79 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 120.0 deg

Point	Latitude deg	Longitude deg	Ground elevation ft	Height above ground ft	Total elevation ft
Threshold	38.934310	-75.891151	55.16	50.00	105.17
2-mile point	38.907737	-75.876486	54.68	603.94	658.62

PV Array Results

PV array 1

Component	Green glare (min)	Yellow glare (min)	Red glare (min)
FP: FP 1	0	0	0
FP: FP 2	0	0	0

Assumptions

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values may differ.
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.

GlareGauge Glare Analysis Results

Site Configuration: Gary Field Airport

Project site configuration details and results.

Created **Oct. 19, 2017 4:59 p.m.**
DNI **varies** and peaks at **1,000.0 W/m^2**
Analyze every **1** minute(s)
0.5 ocular transmission coefficient
0.002 ft pupil diameter
0.017 ft eye focal length
9.3 mrad sun subtended angle
Site Configuration ID: 10723.1874

Summary of Results No glare predicted!

PV name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced
	deg	deg	min	min	kWh
PV array 1	0.0	0.0	0	0	-

Component Data

PV Array(s)

Name: PV array 1
Axis tracking: Single-axis rotation
Tracking axis orientation: 0.0 deg
Tracking axis tilt: 0.0 deg
Tracking axis panel offset: 0.0 deg
Limit tracking rotation? Yes
Maximum tracking angle: 60.0 deg
Rated power: -
Panel material: Smooth glass without AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 6.55 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	ft	ft	ft
1	39.037853	-75.784206	52.17	0.00	52.17
2	39.042120	-75.774593	49.57	0.00	49.57
3	39.039186	-75.762577	43.79	0.00	43.79
4	39.036786	-75.763264	45.43	0.00	45.43
5	39.029052	-75.770130	44.21	0.00	44.21
6	39.023718	-75.775280	22.56	0.00	22.56
7	39.018917	-75.778027	27.96	0.00	27.96
8	39.012248	-75.779400	12.22	0.00	12.22
9	39.000243	-75.782661	19.76	0.00	19.76
10	38.994373	-75.794334	40.38	0.00	40.38
11	38.983165	-75.800858	40.75	0.00	40.75
12	38.984766	-75.809097	43.18	0.00	43.18
13	38.990103	-75.808411	41.72	0.00	41.72
14	39.000243	-75.803604	44.56	0.00	44.56
15	39.008780	-75.796051	47.04	0.00	47.04
16	39.016783	-75.791931	46.11	0.00	46.11
17	39.027452	-75.786438	51.74	0.00	51.74

Flight Path Receptor(s)

Name: FP 1
Description:
Threshold height: 50 ft
Direction: 271.91 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 120.0 deg

Point	Latitude deg	Longitude deg	Ground elevation ft	Height above ground ft	Total elevation ft
Threshold	38.898426	-75.904713	40.80	50.00	90.80
2-mile point	38.899389	-75.941886	28.78	615.48	644.25

Name: FP 2
Description:
Threshold height: 50 ft
Direction: 197.65 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 120.0 deg

Point	Latitude deg	Longitude deg	Ground elevation ft	Height above ground ft	Total elevation ft
Threshold	38.901454	-75.909176	45.12	50.00	95.13
2-mile point	38.873902	-75.920454	31.18	617.40	648.58

PV Array Results

PV array 1

Component	Green glare (min)	Yellow glare (min)	Red glare (min)
FP: FP 1	0	0	0
FP: FP 2	0	0	0

Assumptions

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values may differ.
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.

GlareGauge Glare Analysis Results

Site Configuration: Marble Head Farm Airport

Project site configuration details and results.

Created **Oct. 19, 2017 4:59 p.m.**
DNI **varies** and peaks at **1,000.0 W/m^2**
Analyze every **1** minute(s)
0.5 ocular transmission coefficient
0.002 ft pupil diameter
0.017 ft eye focal length
9.3 mrad sun subtended angle
Site Configuration ID: 10723.1874

Summary of Results No glare predicted!

PV name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced
	deg	deg	min	min	kWh
PV array 1	0.0	0.0	0	0	-

Component Data

PV Array(s)

Name: PV array 1
Axis tracking: Single-axis rotation
Tracking axis orientation: 0.0 deg
Tracking axis tilt: 0.0 deg
Tracking axis panel offset: 0.0 deg
Limit tracking rotation? Yes
Maximum tracking angle: 60.0 deg
Rated power: -
Panel material: Smooth glass without AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 6.55 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	ft	ft	ft
1	39.037853	-75.784206	52.17	0.00	52.17
2	39.042120	-75.774593	49.57	0.00	49.57
3	39.039186	-75.762577	43.79	0.00	43.79
4	39.036786	-75.763264	45.43	0.00	45.43
5	39.029052	-75.770130	44.21	0.00	44.21
6	39.023718	-75.775280	22.56	0.00	22.56
7	39.018917	-75.778027	27.96	0.00	27.96
8	39.012248	-75.779400	12.22	0.00	12.22
9	39.000243	-75.782661	19.76	0.00	19.76
10	38.994373	-75.794334	40.38	0.00	40.38
11	38.983165	-75.800858	40.75	0.00	40.75
12	38.984766	-75.809097	43.18	0.00	43.18
13	38.990103	-75.808411	41.72	0.00	41.72
14	39.000243	-75.803604	44.56	0.00	44.56
15	39.008780	-75.796051	47.04	0.00	47.04
16	39.016783	-75.791931	46.11	0.00	46.11
17	39.027452	-75.786438	51.74	0.00	51.74

Flight Path Receptor(s)

Name: FP 1
Description:
Threshold height: 50 ft
Direction: 79.87 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 120.0 deg

Point	Latitude deg	Longitude deg	Ground elevation ft	Height above ground ft	Total elevation ft
Threshold	38.989036	-75.870037	58.89	50.00	108.89
2-mile point	38.994121	-75.833376	54.45	607.89	662.34

Name: FP 2
Description:
Threshold height: 50 ft
Direction: 259.56 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 120.0 deg

Point	Latitude deg	Longitude deg	Ground elevation ft	Height above ground ft	Total elevation ft
Threshold	38.990370	-75.860424	59.28	50.00	109.29
2-mile point	38.985131	-75.897050	56.84	605.90	662.74

PV Array Results

PV array 1

Component	Green glare (min)	Yellow glare (min)	Red glare (min)
FP: FP 1	0	0	0
FP: FP 2	0	0	0

Assumptions

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values may differ.
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.

GlareGauge Glare Analysis Results

Site Configuration: Ridgely Airpark

Project site configuration details and results.

Created **Oct. 19, 2017 4:59 p.m.**
DNI **varies** and peaks at **1,000.0 W/m^2**
Analyze every **1** minute(s)
0.5 ocular transmission coefficient
0.002 ft pupil diameter
0.017 ft eye focal length
9.3 mrad sun subtended angle
Site Configuration ID: 10723.1874

Summary of Results No glare predicted!

PV name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced
	deg	deg	min	min	kWh
PV array 1	0.0	0.0	0	0	-

Component Data

PV Array(s)

Name: PV array 1
Axis tracking: Single-axis rotation
Tracking axis orientation: 0.0 deg
Tracking axis tilt: 0.0 deg
Tracking axis panel offset: 0.0 deg
Limit tracking rotation? Yes
Maximum tracking angle: 60.0 deg
Rated power: -
Panel material: Smooth glass without AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 6.55 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	ft	ft	ft
1	39.037853	-75.784206	52.17	0.00	52.17
2	39.042120	-75.774593	49.57	0.00	49.57
3	39.039186	-75.762577	43.79	0.00	43.79
4	39.036786	-75.763264	45.43	0.00	45.43
5	39.029052	-75.770130	44.21	0.00	44.21
6	39.023718	-75.775280	22.56	0.00	22.56
7	39.018917	-75.778027	27.96	0.00	27.96
8	39.012248	-75.779400	12.22	0.00	12.22
9	39.000243	-75.782661	19.76	0.00	19.76
10	38.994373	-75.794334	40.38	0.00	40.38
11	38.983165	-75.800858	40.75	0.00	40.75
12	38.984766	-75.809097	43.18	0.00	43.18
13	38.990103	-75.808411	41.72	0.00	41.72
14	39.000243	-75.803604	44.56	0.00	44.56
15	39.008780	-75.796051	47.04	0.00	47.04
16	39.016783	-75.791931	46.11	0.00	46.11
17	39.027452	-75.786438	51.74	0.00	51.74

Flight Path Receptor(s)

Name: FP 1
Description:
Threshold height: 50 ft
Direction: 109.16 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 120.0 deg

Point	Latitude deg	Longitude deg	Ground elevation ft	Height above ground ft	Total elevation ft
Threshold	38.973156	-75.878878	60.42	50.00	110.42
2-mile point	38.963667	-75.843707	51.39	612.48	663.88

Name: FP 2
Description:
Threshold height: 50 ft
Direction: 290.88 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 120.0 deg

Point	Latitude deg	Longitude deg	Ground elevation ft	Height above ground ft	Total elevation ft
Threshold	38.966817	-75.856733	65.24	50.00	115.24
2-mile point	38.977121	-75.891518	60.45	608.24	668.70

Name: FP 3
Description:
Threshold height: 50 ft
Direction: 207.93 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 120.0 deg

Point	Latitude deg	Longitude deg	Ground elevation ft	Height above ground ft	Total elevation ft
Threshold	38.975825	-75.866003	59.74	50.00	109.75
2-mile point	38.950280	-75.883443	64.19	599.01	663.20

PV Array Results

PV array 1

Component	Green glare (min)	Yellow glare (min)	Red glare (min)
FP: FP 1	0	0	0
FP: FP 2	0	0	0
FP: FP 3	0	0	0

Assumptions

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values may differ.
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.

ForgeSolar

GlareGauge Glare Analysis Results

Site Configuration: Spiering Airport

Project site configuration details and results.

Created **Oct. 19, 2017 4:59 p.m.**
DNI **varies** and peaks at **1,000.0 W/m^2**
Analyze every **1** minute(s)
0.5 ocular transmission coefficient
0.002 ft pupil diameter
0.017 ft eye focal length
9.3 mrad sun subtended angle
Site Configuration ID: 10723.1874

Summary of Results No glare predicted!

PV name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced
	deg	deg	min	min	kWh
PV array 1	0.0	0.0	0	0	-

Component Data

PV Array(s)

Name: PV array 1
Axis tracking: Single-axis rotation
Tracking axis orientation: 0.0 deg
Tracking axis tilt: 0.0 deg
Tracking axis panel offset: 0.0 deg
Limit tracking rotation? Yes
Maximum tracking angle: 60.0 deg
Rated power: -
Panel material: Smooth glass without AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 6.55 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	ft	ft	ft
1	39.037853	-75.784206	52.17	0.00	52.17
2	39.042120	-75.774593	49.57	0.00	49.57
3	39.039186	-75.762577	43.79	0.00	43.79
4	39.036786	-75.763264	45.43	0.00	45.43
5	39.029052	-75.770130	44.21	0.00	44.21
6	39.023718	-75.775280	22.56	0.00	22.56
7	39.018917	-75.778027	27.96	0.00	27.96
8	39.012248	-75.779400	12.22	0.00	12.22
9	39.000243	-75.782661	19.76	0.00	19.76
10	38.994373	-75.794334	40.38	0.00	40.38
11	38.983165	-75.800858	40.75	0.00	40.75
12	38.984766	-75.809097	43.18	0.00	43.18
13	38.990103	-75.808411	41.72	0.00	41.72
14	39.000243	-75.803604	44.56	0.00	44.56
15	39.008780	-75.796051	47.04	0.00	47.04
16	39.016783	-75.791931	46.11	0.00	46.11
17	39.027452	-75.786438	51.74	0.00	51.74

Flight Path Receptor(s)

Name: FP 1
Description:
Threshold height: 50 ft
Direction: 68.96 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 120.0 deg

Point	Latitude deg	Longitude deg	Ground elevation ft	Height above ground ft	Total elevation ft
Threshold	38.982364	-75.781116	51.71	50.00	101.71
2-mile point	38.992744	-75.746361	51.57	603.60	655.16

Name: FP 2
Description:
Threshold height: 50 ft
Direction: 248.2 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 120.0 deg

Point	Latitude deg	Longitude deg	Ground elevation ft	Height above ground ft	Total elevation ft
Threshold	38.983698	-75.776653	52.38	50.00	102.38
2-mile point	38.972961	-75.811229	35.26	620.57	655.84

Name: FP 3
Description:
Threshold height: 50 ft
Direction: 152.24 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 120.0 deg

Point	Latitude deg	Longitude deg	Ground elevation ft	Height above ground ft	Total elevation ft
Threshold	38.984499	-75.780430	51.41	50.00	101.41
2-mile point	38.958914	-75.763085	55.87	599.00	654.87

PV Array Results

PV array 1

Component	Green glare (min)	Yellow glare (min)	Red glare (min)
FP: FP 1	0	0	0
FP: FP 2	0	0	0
FP: FP 3	0	0	0

Assumptions

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values may differ.
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.

APPENDIX 13

Beacon Economic Impact Estimate

BEACON
Business Economic and Community Outreach Network
At Salisbury University

December 14, 2017

Cyrus Tashakkori, President
Open Road Renewables
1105 Navasota Street, Austin, TX 78702

Dear Mr. Tashakkori,

On December 4, 2017, you asked us to prepare a preliminary economic impact estimate for the Cherrywood Solar Project in Caroline County, MD.

Based on the project parameters you provided, we understand that construction for each of the three phases of this project last twelve months, beginning with 2019 and each phase will be operational upon completion of construction. You expect the project to have a 35-year operational life.

The additional project parameters you provided (per phase) were:

1. The project would have a footprint of 1,212 acres at 6 acres per MW;
2. The capital expenditures per MW would be $1,300,000;
3. There would be five construction jobs per MW;
4. There would be eight jobs supported per annum for operations;
5. There would be 50% State Abatement;
6. The annual personal property taxes would be $2,626,000;
7. The annual property taxes on the land would go from $4,513 to $118,776;
8. The annual landowner payments would be $1,333,200;
9. The annual operational costs would be $8,000 per MW.

Based on these parameters and on additional research we conducted, we prepared preliminary impact estimates using Social Accounting Matrix multipliers calculated by the Minnesota IMPLAN Group. These estimates are presented on the next page.

Perdue Hall Suite 100, 1101 Camden Avenue, Salisbury, MD 21801-6860
Phone (410) 546-6001 Fax (410) 546-6002 Email beacon@salisbury.edu

<u>CONSTRUCTION IMPACTS (2019 through 2022 in phases):</u>

Output: $656.5M direct, $89.8M indirect, and $111.6M induced for a total of $857.9M.

Annual Jobs Supported: 500 direct, 49 indirect, and 72 induced for a total of 621.

Annual Fiscal Impact: $3.1M (Excluding property taxes which are estimated in the O&M phase).

<u>OPERATION AND MAINTENANCE IMPACTS (35 Years)</u>:

Net Output: $311M direct and $145M induced impact ($269M total in 2020 dollars).

Jobs Supported: 61.5 jobs per year of operation.

Fiscal Impact including net new property taxes: $112M ($84M in 2020 dollars).

<u>PAYMENT TO LANDOWNERS IMPACTS (35 Years):</u>

Output: $118.8M direct and $32.8M indirect ($269M total in 2020 dollars).

Annual Jobs Supported: 8 direct and 7 induced for a total of 15.

Please note that these preliminary estimates are not actual forecasts. These estimates are simple scenario analyses that indicate what the likely impact outcomes would be under the assumptions used. It should also be noted that these numbers are subject to change when a comprehensive economic impact assessment is undertaken using more precise project data. It is possible that such a study could yield results that are +/- 10 to 15% different than these preliminary estimates.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Dr. Memo Diriker, Director

APPENDIX 14

DNR Wildlife and Heritage Response Letter

Larry Hogan, *Governor*
Boyd Rutherford, *Lt. Governor*
Mark Belton, *Secretary*
Joanne Throwe, *Deputy Secretary*

November 30, 2017

Mr. Dane S. Bauer
H&B Solutions, LLC
37534 Oliver Drive
Selbyville, Delaware 19975

RE: Environmental Review for Cherrywood Solar I, LLC - Cherrywood Central Solar Project, Project No: 17011.00, Proposed 202 MW Solar Photovoltaic Power Project, along Route 313, Caroline County, Maryland.

Dear Mr. Bauer:

The Wildlife and Heritage Service has the following areas of potential concern for this proposed project, broken down by the three sections for easier reference:

Upper Section

For **Property 1** (Tax Map 11, Parcel 52), **Property 2** (Tax Map 11, Parcel 158), **Property 3** (Tax Map 11, Parcel 53), **Property 4** (Tax Map 11, Parcel 56), **Property 5** (Tax Map 11, Parcel 58), and **Property 6** (Tax Map 11, Parcel 5), the Wildlife and Heritage Service has determined that these parcels fall within the drainage area of the Crescent macrosite, which is a complex of nontidal wetlands known to support several species of plants and amphibians with rare, threatened or endangered state status, including:

Scientific Name	Common Name	State Status
Fimbristylis perpusilla	Harper's Fimbristylis	Endangered
Hypericum denticulatum	Coppery St. John's-wort	Threatened
Eleocharis melanocarpa	Black-fruit Spikerush	Endangered
Hottonia inflata	Featherfoil	Endangered

It is important to note that we do not have any such records documented as occurring on these specific parcels, however, any nontidal wetlands present on them could be potential habitat for such species. We would suggest that activities on these parcels be planned so that there are not adverse impacts to the surrounding hydrology or water quality.

For **Property 3** and **Property 4**, in addition to the above comments, these parcels are located within the drainage to a portion of the Upper Choptank River that is known to support rare, threatened or endangered species. In fact, there are records for a population of state-listed endangered Triangle Floater (*Alasmidonta undulata*) and a population of state rare Deciduous Holly (*Ilex decidua*) that overlap the parcel boundaries of both **Property 3** and **Property 4**. Direct impacts to the Deciduous Holly population are unlikely given that there is to be no forest disturbance. As freshwater mussels are known to be very susceptible to the effects of siltation or changes in water quality, we would encourage the applicant to adhere stringently to all appropriate best management practices for sediment and erosion control during any activities on these parcels, in order to reduce the likelihood of adverse impacts to the Triangle Floater population, and other native aquatics in the Upper Choptank.

Middle Section

For **Property 7** (Tax Map 10, Parcel 34), **Property 8** (Tax Map 11, Parcel 25), and **Property 9** (Tax Map 10, Parcel 11), the Wildlife and Heritage Service has determined that there are no official State or Federal records for listed plant or animal species within the delineated area shown on the map provided. As a result, we have no specific concerns regarding potential impacts or recommendations for protection measures at this time, for these parcels.

Lower Section

For **Property 10** (Tax Map 11, Parcel 7), **Property 11** (Tax Map 11, Parcel 51), **Property 12** (Tax Map 15, Parcel 66), and **Property 16** (Tax Map 15, Parcel 68), the Wildlife and Heritage Service has determined that these parcels are located within the drainage to a portion of the Upper Choptank River that is known to support several rare, threatened or endangered species. In addition, **Property 11** and **Property 12** are located within very close proximity to records of state-listed endangered Triangle Floater and state rare Sparkling Jewelwing (*Calopteryx dimidiata*). Both of these species have an aquatic larval stage that is very susceptible to the effects of siltation or changes in water quality. **Property 16** overlaps with a portion of the Upper Choptank River that is designated in state regulations as a Nontidal Wetland of Special State Concern. This wetland, along with its 100-foot upland buffer, is regulated as a Nontidal Wetland of Special State Concern by Maryland Department of the Environment. The species in close proximity to **Property 16**, for which the wetland is designated, include: Sparkling Jewelwing, Deciduous Holly, state rare Blackwater Bluet (*Enallagma weewa*), and state-listed endangered Creeping Burhead (*Echinodorus cordifolius*). Avoiding impacts to the regulated 100-foot buffer to this portion of the Upper Choptank River on this parcel would serve to protect these occurrences of rare, threatened and endangered species, although your project may need review by Maryland Department of the Environment for any permits needed in association with this wetland.

For the **property added** to the review request in your October 23, 2017 email (Tax Map 14, Parcel 16), the Wildlife and Heritage Service has determined that there are no official State or Federal records for listed plant or animal species within the delineated area shown on the map provided. As a result, we have no specific concerns regarding potential impacts or recommendations for protection measures at this time, for this parcel.

For the **overall project study area**, our remote analysis suggests that the forested area on this property contains Forest Interior Dwelling Bird habitat. Populations of many bird species which depend on this type of forested habitat are declining in Maryland and throughout the eastern United States. Interested landowners can contact us for further voluntary guidelines to help conserve this important habitat, although we have no concerns for this habitat if there is no disturbance to forested areas from the proposed project.

Thank you for allowing us the opportunity to review this project. If you should have any further questions regarding this information, please contact me at (410) 260-8573.

Sincerely,

Lori A. Byrne

Lori A. Byrne,
Environmental Review Coordinator
Wildlife and Heritage Service
MD Dept. of Natural Resources

ER# 2017.1602.cn
Cc: S. Gray, DNR

APPENDIX 14-A

DNR Wildlife and Heritage Response Letter (Parcel 135)

MARYLAND
DEPARTMENT OF
NATURAL RESOURCES

Larry Hogan, Governor
Boyd Rutherford, Lt. Governor
Mark Belton, Secretary
Joanne Throwe, Deputy Secretary

May 24, 2018

Mr. Dane S. Bauer
H&B Solutions, LLC
37534 Oliver Drive
Selbyville, Delaware 19975

RE: Environmental Review for Cherrywood Solar I, LLC - Cherrywood Central Solar Project, Additon of Layton Parcel (Tax Map 11 Parcel 135), Project No: 17011.00), Caroline County, Maryland.

Dear Mr. Bauer:

The Wildlife and Heritage Service has determined that there are no official State or Federal records for listed plant or animal species within the delineated area shown on the map provided. However, it is important to note that this parcel falls within the drainage area of the Crescent macrosite, which is a complex of nontidal wetlands known to support several species of plants and amphibians with rare, threatened or endangered state status. Activities on these parcels should be planned so that there are not adverse impacts to the surrounding hydrology or water quality.

Please be sure to let us know if the limits of proposed disturbance or overall site boundaries change and we will provide you with an updated evaluation. Thank you for allowing us the opportunity to review this project. If you should have any further questions regarding this information, please contact me at (410) 260-8573.

Sincerely,

Lori A. Byrne

Lori A. Byrne,
Environmental Review Coordinator
Wildlife and Heritage Service
MD Dept. of Natural Resources

ER# 2018.0699.cn
Cc: S. Gray, DNR

APPENDIX 15

MHT Response Letter

November 30, 2017

Mr. Dane Bauer
H&B Solutions
37534 Oliver Dr.
Selbyville, DE 19975

Re: MHT Review of Proposed Cherrywood Central Solar Project (Cherrywood Solar I, LLC)
Caroline County, Maryland

Dear Mr. Bauer:

Thank you for providing the Maryland Historical Trust (MHT) with preliminary project information and site location maps for the above-referenced undertaking. In response to your request, we are reviewing the proposed undertaking to assess potential effects on historic properties in accordance with the Maryland Historical Trust Act, §§ 5A-325 and 5A-326 of the State Finance and Procurement Article. We understand that the construction of the proposed solar facility on the 1,000-1,200-acre site will require a CPCN license from the Maryland Public Service Commission (PSC) and is therefore subject to state historic preservation law. Below are our preliminary comments and recommendations regarding potential effects on historic properties.

The Cherrywood Central Solar Project undertaking is a 202 MW solar generation facility proposed on approximately 1,000-1,200 acres located on 19 parcels between Goldsboro and Greensboro, Caroline County. To better identify potential historic properties please provide the MHT with an area of potential effects (APE) for this undertaking. The APE is defined before the identification of any historic properties and is "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties", if any such properties exist. The APE should reflect the potential visual, auditory, and physical effects to the setting of historic properties. The APE should also take into account topography and existing vegetation. Once a defensible APE is identified all resources over 50 years of age within that boundary must be identified and evaluated for listing in the National Register of Historic Places.

Archeology: Some of the parcels that are intended to be developed as part of the solar generation facility are located in areas that are archeologically sensitive -- such as the areas along the Choptank River and Oldtown Branch. While the majority of the proposed project area has not been systematically surveyed for archeological resources, MHT files indicate that six prehistoric archeological sites (18CA79, 18CA80, 18CA174, 18CA175, 18CA196, and 18CA197) have already been identified within the project area boundaries. In addition, MHT files also indicate that the sites of two early 19th century farmsteads -- CAR-22, (still extant) and CAR-23 (razed) -- are located within the project area, and aerial photographs and the 1875 atlas of Caroline County suggest that several other 19th century dwellings and/or farmsteads once stood within the project area.

Given the presence of the already-recorded prehistoric sites and the evidence of various 19th century farmsteads, it is our opinion that *some* parcels that are identified as part of the Cherrywood Central Solar project area have a moderate to high potential for containing additional archeological deposits that have not yet been identified. We are therefore recommending that Phase I archeological investigations take place prior to construction within *eight* of the proposed parcels that are outlined on the Cherrywood Solar Project map (dated October 23, 2017) to determine if any previously unidentified sites are located within the impact areas and to determine if

the known sites will be affected by the proposed undertaking. The parcels that require archeological survey work include the following:

- Parcel No. 0010-0018-0011
- Parcel No. 0011-0004-0052
- Parcel No. 0011-0004-0053
- Parcel No. 0011-0009-0056
- Parcel No. 0011-0020-0007
- Parcel No. 0011-0020-0051
- Parcel No. 0015-0001-0066
- Parcel No. 0014-0012-0008

The remaining parcels may be excluded from the Phase I investigations, as it is our opinion that they have a lower potential for containing significant archeological deposits that would be eligible for the National Register of Historic Places. The survey work must be carried out by a qualified professional archeologist and performed in accordance with the *Standards and Guidelines for Archeological Investigations in Maryland* (Shaffer and Cole 1994). Upon our review of the survey results, additional (Phase II) investigations of identified sites *may* be necessary.

Historic Built Environment: Due to the large scale of the project, there is high potential for direct or indirect effects on historic buildings and landscapes. With respect to the historic built environment, MHT should be provided with the following information, which will allow us to identify historic properties that might be affected by the undertaking and begin assessing the possible effects of the project on them as the proposed undertaking could be adversely affect the resources by changing their setting and view. The MHT has taken a cursory look at project area and adjacent properties and at a minimum the following resources must be evaluated for the National Register using the MHT's Determination of Eligibility (DOE) form:

- 14267 Greensboro Road (Maryland Inventory of Historic Property No. CAR-23, Parcel No. 0014-0023-0038);
- 14697 Greensboro Road (MIHP No. CAR-22, Parcel No. 0015-0001-0066);
- 15045 Greensboro Road (MIHP No. CAR-167, Parcel No. 0011-0020-0001);
- 15642 Jackson Lane (Parcel No. 0011-0009-0056);
- 15642 Jackson Lane (Parcel No. 0011-0009-0058);
- 15833 Jackson Lane (Parcel No. 0011-0004-0053);
- Jackson Lane (MIHP No. CAR-107, Parcel No. 0011-0004-0052);
- 25970 Bridgetown Rd (Parcel No. 0010-0018-0011);
- 25802 Bridgetown Rd (Parcel No. 0010-0017-0025);
- 25799 Bridgetown Rd (Parcel No. 0010-0018-0064);
- 26047 Bridgetown Rd (Parcel No. 0010-0018-0014);
- 15551 Wharton Rd (Parcel No. 0010-0012-0007);
- 14875 Greensboro Rd (Parcel No. 0011-0020-0101);
- 14880 Greensboro Rd (Parcel No. 0011-0019-0018);
- 14558 Greensboro Rd (MIHP No. CAR-142, Parcel No. 0015-0001-0107);
- 13869 Cedar Lane (MIHP No. CAR-169, Parcel No. 0014-0017-0011);
- Any other resources over 50 years of age within the APE.

Please note that DOE forms for any farm complexes should include all associated buildings. If any property has been identified with an MIHP record but the historic structures are no longer extant, please complete MIHP Addenda form for that record and submit it with the other completed DOE forms. MHT would recommend that once you have hired a qualified consultant, they should conduct a review the APE for any additional resources over 50 years of age, not listed above, that may be need to have a DOE form completed.

DOE forms must contain sufficient description of buildings, structures, areas of land use, and the overall landscape of a property to evaluate its significance under National Register Criterion C and its historic integrity. This should include information about feature age, form, stylistic elements, methods of construction, materials, and condition. Forms must also contain sufficient historical context to evaluate a property under National Register Criteria A and B. This should include information derived from historic maps and land records; examination of the existing buildings, structures, and landscape as historical sources; and relevant information from existing reports and other secondary sources. All DOE forms must be completed by a qualified architectural historian, preservationist, or historian and be accompanied by supporting materials as described in *General Guidelines for Compliance-Generated Determinations of Eligibility* and *Standards and Guidelines for Architectural and Historical Investigations in Maryland.*

Upon our receipt of this information, we will be able to continue our review and provide informed recommendations regarding the project's potential effects on significant cultural resources. We look forward to receiving the information requested above and to further coordination as project planning proceeds. Additional information regarding the historic preservation review process and the *Standards and Guidelines* can be found on our website at http://mht.maryland.gov. If you have any questions or we may be of assistance, please do not hesitate to contact either Dixie Henry (regarding archeological resources) at dixie.henry@maryland.gov /410-697-9553 or Natalie Loukianoff (regarding historic buildings and landscapes) at natalie.loukianoff@maryland.gov /410-697-9587. Thank you for providing us with this opportunity to comment.

Sincerely,

Dixie Henry

Dixie L. Henry, Ph.D.
Preservation Officer
Maryland Historical Trust

DLH/NSL/201705810
cc: Susan Gray (DNR)
Gail Owings (Stories of the Chesapeake Heritage Area)

APPENDIX 15-A

MHT Submittal Package (Parcel 135)

H&B Solutions, LLC

37534 Oliver Drive
Selbyville, DE 19975

Tel: 410.292.4385

May 8, 2018

Maryland Historical Trust
100 Community Place
Crownsville, MD 21032

Attn: Ms. Dixie Henry

Re: Cherrywood Solar I, LLC
Cherrywood Central Solar Project
Addition of Layton Parcel
Tax Map 11 Parcel 135
Caroline County, MD
Project No: 17011.00

Dear Ms. Henry:

Since our last request on October 10, 2017 regarding the above referenced project, the Applicant has added a parcel to the solar array area. Tax Map 11, Parcel 135 consists of approximately six (6) acres and will be used to expand the solar array footprint. This parcel is located on the top right side of Sheet C-7 in the Upper Section of the Project. The exhibit enclosed is a sheet from the most recent site plan which shows the proposed array layout within the parcel and orientation to the rest of the parcels within the Upper Section. The existing structures shown on the plan will most likely be demolished or relocated.

Also enclosed is a completed Project Review Form for your information and use.

We would respectfully request your review this additional area and let us know if there are any concerns with regard to Historic Properties within this parcel.

Thank you for your consideration in these regards. You may contact me at the below address, using my email (dbauer@hallandbauer.com), or on my cell 410.812.9109.

Sincerely,

H&B Solutions, LLC

Dane S. Bauer
Member

Enclosures

MARYLAND HISTORICAL TRUST

PROJECT REVIEW FORM

Request for Comments from the Maryland Historical Trust/ MDSHPO on State and Federal Undertakings

MHT USE ONLY	
Date Received:	Log Number:

Project Name: Cherrywood Central Solar Project (Cherrywood Solar I, LLC)
County: Caroline

Primary Contact:

Contact Name: Dane Bauer
Company/Agency: H&B Solutions, LLC
Mailing Address: 37534 Oliver Dr.
City: Selbyville
State: Delaware
Zip: 19975
Email: dbauer@hallandbauer.com
Phone Number: +1 (410) 812-9109
Ext.:

Project Location:

Address: 26726 SANDTOWN RD
City/Vicinity: Goldsboro
Coordinates (if known): Latitude: Longitude:
Waterway: Choptank

Project Description:

List federal and state sources of funding, permits, or other assistance (e.g. Bond Bill Loan of 2013, Chapter #; HUD/ CDBG; MDE/COE permit; etc.).	Agency Type	Agency/Program/Permit Name	Project/Permit/Tracking Number (if applicable)

This project includes (check all applicable): ☒ New Construction ☐ Demolition ☐ Remodeling/Rehabilitation

☐ State or Federal Rehabilitation Tax Credits ☒ Excavation/Ground Disturbance ☐ Shoreline/Waterways/Wetlands

Other\Additional Description: Utility scale solar project with posts, racks, panels, inverters, switchgear, substation, and interconnection

Known Historic Properties:

This project involves properties (check all applicable): ☐ Listed in the National Register ☐ Subject to an easement held by MHT

☐ Included in the Maryland Inventory of Historic Properties ☐ Designated historic by a local government

☐ Previously subject to archeological investigations

Property\District\Report Name: 6 acre parcel containing woods, a residence, barn, storage building, fenced area for training horses

Attachments:

All attachments are required. Incomplete submittals may result in delays or be returned without comment.

☒ Aerial photograph or USGS Quad Map section with location and boundaries of project clearly marked.

☒ Project Description, Scope of Work, Site Plan, and\or Construction Drawings.

☒ Photographs (print or digital) showing the project site including images of all buildings and structures.

☒ Description of past and present land uses in project area (wooded, mined, developed, agricultural uses, etc).

MHT Determination:

☐ There are **NO HISTORIC PROPERTIES** in the area of potential effect ☐ The project will have **NO ADVERSE EFFECT WITH CONDITIONS**

☐ The project will have **NO EFFECT** on historic properties ☐ The project will have **ADVERSE EFFECTS** on historic properties

☐ The project will have **NO ADVERSE EFFECT** on historic properties ☐ **MHT REQUESTS ADDITIONAL INFORMATION**

MHT Reviewer: Date:

Submit printed copy of form and all attachments by mail to: Beth Cole, MHT, 100 Community Place, Crownsville, MD 21032

Revised 6/21/2013

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Date:	MARCH 2018
Scale:	1" = 300'
Dwn.By:	SMS
Proj.No.:	2390R001.A01
Dwg.No.:	C-7

Revisions:
△ APRIL 2018: COUNTY COMMENTS

CHERRYWOOD SOLAR PROJECT
Cherrywood Solar I, LLC
Caroline County, Maryland

DAVIS, BOWEN & FRIEDEL, INC.
ARCHITECTS ENGINEERS SURVEYORS
SALISBURY, MARYLAND (410) 543-9091
MILFORD, DELAWARE (302) 424-1441
EASTON, MARYLAND (410) 770-4744

OFF-SITE UTILITIES

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland, License No. 31100, Expiration Date: 01-21-19.

APPENDIX 16

Economic Impacts of the Cherrywood Solar Farm on Caroline County and the State of Maryland

Economic Impacts of the Cherrywood Solar Farm on Caroline County and the State of Maryland

Kenneth Stanton
JACOB FRANCE INSTITUTE
UNIVERSITY OF BALTIMORE

APRIL 2018

Introduction and Summary

The proposed Cherrywood Solar I project proposed for Caroline County is a solar photovoltaic project of up to 202 megawatts (AC) under development in Caroline County, MD. This report seeks to estimate the economic impact of a 150 megawatt (AC) version of the project on the local and state economy. Development of the project will involve the purchase and leasing of a total of 1000 acres of land currently devoted to crop production. The conversion to a utility scale 150 megawatt (AC) photovoltaic solar farm requires large investments in equipment, site preparation and a myriad of other construction and installation expenditures needed to produce solar electricity. After the planned one year construction phase, the solar farm will continue to produce electricity for 35 years. Each of these two phases will have significant economic impacts on Maryland and Caroline County in terms of jobs, income and fiscal consequences. The operating phase impacts, although smaller than the construction phase impacts, are annually repeating, so ultimately, a large multiple of the annual operating effects estimated in this study.

The goals of this analysis are to:

- Analyze the state and county economic impacts of the construction phase of the solar farm;
- Analyze the state and county economic impacts of the operating phase of the farm; and
- Analyze the net fiscal and other economic gains for the Caroline County economy resulting from the conversion of the 1000 acre Cherrywood site from crop production to solar.

To estimate these effects, we employed MIG IMPLAN models of the State of Maryland and Caroline County economies. The key findings of these analyses are as follows:

- Additional Maryland jobs, labor income and output from the construction phase:
    - <u>Total of 777 jobs</u> = Direct employment of 460 + 73 indirect + 244 induced[1] jobs
    - <u>Labor income of $52.4 million</u> = Direct labor income of $35.1M + $5.1M indirect + $12.2M induced labor income
    - <u>Total gain in output of $104.6 million</u> = $55.5M direct + $13.5M indirect + $35.6M induced
- Additional Caroline County jobs, labor income and output from the construction phase:
    - <u>Total of 479 jobs</u> = 348 direct + 37 indirect + 94 induced
    - <u>Labor income of $27.9 million</u> = $23.5 million direct + $1.4 million indirect + $3.0 million induced
    - <u>$51.6 million gain in output</u> = $35.4M direct + $5.0M indirect + $11.2M induced.
- Fiscal benefits from the construction phase:
    - <u>Total state and local government revenues of $5.5 million</u>[2], of which the revenue shares are:
        - Maryland state government revenues $3.3 million
        - All local governments in MD combined $2.2 million
            - Caroline County (local) government share $1.2 million
- Additional jobs, labor income and output from the operating and maintenance phase: Every year of operation, Maryland gains the benefits of:

[1] Explanations of the terms, direct, indirect and induced are provided in the appendix to this report.

[2] MIG IMPLAN models combine state and local revenue estimates. The state and local government revenues were separated from the total of state and local taxes using US Census data to estimate the state and local shares of each tax and fee item from Implan. The county specific estimates were calculated in the same manner, from the Caroline County IMPLAN model.

    - Total of 47 more jobs = 12 direct employees + 19 indirect + 16 induced
    - $3.0 million/year in labor income = $1.0M direct + $1.1M indirect + $0.8M induced
    - $21.1 million/year in output = $15.9M direct + $2.9M indirect + $2.3M induced.
- Additional Caroline County jobs. labor income and output from the operating phase: Every year of operation, Caroline County gains the benefits of:
        - Total of 35 jobs = 10 direct jobs + 18 indirect + 7 induced
        - Additional $1.6 million in labor income = $550k direct +$872k indirect + $216k induced
        - $19.3 million in output = $15.9M direct + $2.6M indirect + $0.8M induced
- Annual fiscal benefits from the operating and maintenance phase:
    - Total Maryland state and local government revenues of $2.9 million/year of operation, of which, the estimated revenue shares are:
        - State government of Maryland — $617 thousand
        - All Maryland local governments — $2.3 million
            - Caroline County (local) government — $2.2 million

Subtracting the economic contributions to the Caroline County economy which currently originate from using the 1000 acre site to produce crops, the *net benefit* of the operating and maintenance phase was estimated to add an additional 29.6 jobs, $1.5 million per year in labor income and $2.2 million per year in county tax revenues—over and above the effects originating from crop production. The net increase in output was estimated to be $18.5 million per year.

Cherrywood Solar I

The proposed solar farm as studied for the purpose of this report has a generating capacity of 195 megawatts (DC) which will yield 150 megawatts (AC). This is a utility scale project and will carry with it, substantial expenditures for site preparation, equipment installation and construction. At the end of its planned 35 year lifespan, it will be decommissioned and the site returned to agricultural use. In this report, we present analyses of the economic impact of the construction, and operating and maintenance phases of the solar farm.

As proposed, Cherrywood Solar I, LLC, will purchase 300 acres and lease the remaining 700 acres of farmland needed. The purchase price of the land will be $3.9 million and the annual lease payments will be $700,000.

Modern solar farms involve several construction steps, each of which present economic opportunities for local businesses and labor. Once delivered to the site, the solar modules must be mounted on racks which are attached to pilings driven into the ground. The modules are connected to buried cables which carry the current to the inverters and eventually to substations and into the transmission grid. Pavement, concrete and other impervious surfaces are minimal, and the site is almost entirely devoted to low growing grasses and other cover vegetation among the modules. For aesthetic reasons, views of the site from the perimeter will be screened with plantings of shrubs and trees. Since the skillsets required for large portions of this work are readily available in the region, the construction and installation phase of the project will create a large number of job opportunities within Caroline County and the State of Maryland.

A summary of the Year 0 construction phase expenditures used as inputs in the estimation models is shown in Table 1. The total anticipated installed cost is projected to be close to $195 million which is in keeping with current utility scale solar installation costs of $1000 per kilowatt. Most of the $128 million in equipment will be purchased outside of Maryland, but some of the components will be locally sourced. Approximately $4.3 million in buried cable and other electrical components is required to bring the electricity from the modules to the inverters and eventually to the transmission lines. In state suppliers are likely to provide much of those requirements.

The most significant line item for Maryland and Caroline County is the labor component of the construction and installation. Close to 100 percent of the $37 million construction and installation labor component will be Maryland sourced, mostly from within the local region. Estimates for the purchase and planting of trees and other horticultural and landscaping needs will approach $3 million.

Table 1: Year 0 Construction Phase Expenditures

Installation Costs	Cost	Cost Per kW	Percent of Total Cost
Materials & Equipment			
Mounting (rails, clamps, fittings, etc.)	$23,595,000	$121	12%
Modules	$79,950,000	$410	41%
Electrical (cables, connectors, breakers, etc.)	$4,324,466	$22	2%
Inverters	$20,475,000	$105	10%
Subtotal	$128,344,466	$658	66%
Labor			
Installation	$37,050,000	$190	19%
Total labor, materials and equipment	$165,394,466	$848	85%
Other Costs			
Permitting, overhead and miscellaneous	$29,640,000	$152	15%
Total installed cost	$195,034,466	$1,000	100%

Source: NREL, Cherrywood Solar I and JFI.

Once built, the Year 1 operation and maintenance phase begins. During its operation, Cherrywood Solar will directly employ an estimated 10 to 12 people to monitor and repair the equipment and to maintain the site. The overall number of jobs generated will be much larger, given not only the purchases of third party goods and services by Cherrywood Solar itself, but the ripple effects that arise as each of those individuals and businesses in turn, make further expenditures.

After construction is finished, the operating phase of Cherrywood Solar will have the following direct economic effects:

- Payments to employees
- Purchases of goods and services such as equipment, materials and groundskeeping services
- Lease payments to landowners
- Property and other tax payments

A summary of the expected Year 1 operating expenditures appears in Table 2. Onsite workers will include technicians as well as other support personnel, required to monitor, maintain and repair the

equipment and to manage the general care and upkeep of the property. The annual labor expenditure is projected to be $975,000. Materials and services add another $585,000 per year to the basic operating costs. The labor and a large share of the materials and services requirements will be locally sourced. Other annually recurring expenditures not directly included in the operating expenditures in the table, include lease payments to local landowners and more than $2 million in property taxes—in all, adding $2.75 million over and above the $1.56 million basic operating and maintenance expenditures. The lease payments will begin in Year 0, whereas it is assumed that the property tax payments will begin in Year 1, after the construction phase has been completed.

Table 2: Annual Operating Phase Expenditures

Expenditures	Cost	Cost Per kW	Percent of Total Cost
Basic operating expenditures			
Labor			
Technicians and other personnel	$975,000	$5	63%
Materials and Services			
Materials, equipment and services	$585,000	$3	38%
Total	$1,560,000	$8	100%
Other annually recurring expenditures not included above			
Lease payments to landowners	$700,000		
Property taxes (personal)	$1,950,000		
Property taxes (real estate)	$98,000		

Source: NREL, Cherrywood Solar and JFI

The expenditures presented for the construction and operating phases above provide a baseline for the immediate impact of Cherrywood Solar on the local and regional economy, but the effects do not end there. The initial inflow of additional money, once spent by the recipients, generates further rounds of spending, all of which can be estimated.

Economic Contributions of Cherrywood Solar I to Caroline County and the State of Maryland

In order to estimate the complete effects of the construction and operating phases of the solar farm on the economy, MIG IMPLAN models were used to determine the effects on jobs, labor income and economic output. Estimates for Maryland and the county require separate IMPLAN models. Caroline County effects appear in sections following the discussion of the effects of the construction and operating phases on the State of Maryland.

Construction Phase Economic Effects of Cherrywood Solar on Maryland

Table 3 summarizes the economic effects on the State of Maryland. The model indicates that a solar construction and installation project of this scale is likely to directly provide 460 jobs. This represents the labor required for site preparation, installation of the equipment and landscaping services, business managers and support staff, as well as the professional service jobs provided to engineers, lawyers and others needed in the site development and construction process. Initial estimates by Cherrywood Solar I indicated that the onsite direct construction and installer labor force will be approximately 400 workers. Although they are presented with some caveats in terms of the appropriateness of doing so, each of the average labor income per job values is shown as a simple division of the estimated labor income values by the corresponding projected number of jobs. Simple explanations and meanings of the direct, indirect and induced economic effects are provided in the final section of this report.

The state IMPLAN model estimates indicate that once the expenditures have cycled through the economy of Maryland, the total effects of the construction phase on employment and labor income include 777 jobs and $52.4 million respectively. The output measure of $104.6 million is the dollar value of all the goods and services produced by Maryland based resources as a result of the construction project. That is, the total impact on output includes not only the value of the solar construction itself, but the total output produced by property, plant, equipment and labor in Maryland as a consequence of the original construction expenditures.

The construction phase has a sizeable fiscal impact. Total state and local taxes of $5.5 million are predicted by the State of Maryland model. Local governments are expected to collect $2.2 million of that total with $3.3 million going to the state. From a separate IMPLAN model of Caroline County, estimates indicate $2.2 million will enter the county revenue stream. As previously stated, it is assumed that the additional taxes on real estate and personal property will not arise until the year following completion of the construction, so ultimately Caroline County will see not only the short run boost of $1.2 million from the construction phase, but annual taxes of $2.2 million in the first year of operation. It is noted that the personal property tax portion will decline by 3.33 percent per year, if there are no further capital investment additions. Undiscounted, the total personal property tax revenues over the 35 year project life will exceed $40 million which is more than $20 million in present value terms. Furthermore, any increases to the assessed value of the real property will offset the 3.33 percent annual decrement to the personal property tax.

Table 3: Impact of the Construction Phase on and within the State of Maryland

Item	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Output ($s)	$55,520,216	$13,545,654	$35,572,491	$104,638,361
Employment (# of Jobs)	459.7	73.4	244.2	777.3
Labor Income ($s)	$35,132,422	$5,112,522	$12,169,033	$52,413,977
Average Labor Income/Job ($s)	$76,425	$69,653	$49,832	$67,431
Fiscal Impact ($s)	--	--	--	$5,537,763
Comprised of:	Estimated State Government Revenues			$3,310,253
	Estimated Local Government Revenues			$2,227,510
	Caroline County Share of Local Government Revenues			$1,239,870

Source: IMPLAN and JFI

The Maryland IMPLAN model also sheds light on the economic sectors that will gain the most from the construction phase of Cherrywood Solar I. Table 4 shows the ten sectors with the largest increase in jobs and Table 5 shows those gaining the most in labor income. Not surprisingly, the largest gains occur in the construction sector since the largest Maryland expenditures will be the labor needed to install the equipment and associated wiring. There will be 379.8 construction jobs created and 43.4 more in the landscape and horticultural services sector. Wholesale trade also sees a substantial job gain with 29 jobs created. Other sectors see gains of less than 15 jobs. Most obvious is the impact on restaurants, hospitals and food and beverage stores which will presumably see large portions of those gains arising from the construction and installation labor force itself.

Table 5 shows similar results, but ranked on labor income rather than the number of jobs. Not surprisingly, the construction sector leads, with more than $30 million in labor income. Wholesale trade follows with $2.5 million. The management sector and landscaping and horticultural services sector will gain $1.8 million and $1.6 million respectively, in labor income. Smaller effects of less than $1 million can be expected in sectors such as hospitals and the professional sector of architects, engineering and related services.

Table 4: Sectors in Maryland with the Largest Construction Phase Gains in Employment

Description	Employment	Labor Income	Output
Construction	379.8	$30,016,502	$43,367,839
Landscape & horticultural services	43.4	$1,581,299	$2,857,027
Wholesale trade	29.0	$2,488,795	$7,033,181
Management of companies & enterprises	14.8	$1,776,999	$3,620,842
Real estate	14.4	$507,221	$3,550,724
Hospitals	13.0	$996,857	$2,064,371
Limited-service restaurants	12.9	$279,240	$1,179,972
Full-service restaurants	12.6	$318,917	$677,355
Architectural, engineering, & related	9.0	$910,952	$1,615,002
Retail - Food & beverage stores	8.0	$283,669	$603,853

Source:IMPLAN

Table 5: Sectors in Maryland with the Largest Construction Phase Gains in Labor Income

Description	Employment	Labor Income	Output
Construction	379.8	$30,016,502	$43,367,839
Wholesale trade	29.0	$2,488,795	$7,033,181
Management of companies & enterprises	14.8	$1,776,999	$3,620,842
Landscape & horticultural services	43.4	$1,581,299	$2,857,027
Hospitals	13.0	$996,857	$2,064,371
Architectural, engineering, & related services	9.0	$910,952	$1,615,002
Offices of physicians	7.8	$762,246	$1,119,151
Real estate	14.4	$507,221	$3,550,724
All other misc. Electr. equip. & components	6.4	$499,713	$1,669,732
Comm. & indust. machinery & equip. leasing	2.1	$339,440	$932,077

Source: IMPLAN

The third measure of economic impact, presented in Table 6, is output. In the present case, output is the dollar value of all of the goods and services produced as a result of the activity infused into the Maryland economy by the construction of Cherrywood Solar. As before, the construction and wholesale trade sectors see the largest gains—$43 million and $7 million respectively. Owner occupied dwellings is a sector within the IMPLAN model which captures the imputed income from owner occupied housing, which experiences a gain of $5 million in output. The next largest contributions to output arise from the management and real estate sectors with gains of $3.6 million each. The landscape and horticultural services sector gains $2.9 million and hospitals contribute over $2 million to output. The remaining sectors see output increases of less than $2 million each.

Table 6: Sectors in Maryland with the Largest Construction Phase Gains in Output

Description	Employment	Labor Income	Output
Construction	379.8	$30,016,502	$43,367,839
Wholesale trade	29.0	$2,488,795	$7,033,181
Owner-occupied dwellings	0.0	$0	$5,006,875
Management of companies & enterprises	14.8	$1,776,999	$3,620,842
Real estate	14.4	$507,221	$3,550,724
Landscape & horticultural services	43.4	$1,581,299	$2,857,027
Hospitals	13.0	$996,857	$2,064,371
All other misc. electr. equip. & components	6.4	$499,713	$1,669,732
Architectural, engineering, & related services	9.0	$910,952	$1,615,002
Limited-service restaurants	12.9	$279,240	$1,179,972

Source: IMPLAN

Operating Phase Economic Effects of Cherrywood Solar on Maryland

Although the scale of the economic effects from the operating phase are nearly all far smaller than those of the construction phase, these annual effects repeat throughout the planned 35 year operational life of Cherrywood Solar. A summary of the estimated effects on the Maryland economy appears in Table 7.

The direct employment impact is expected to be approximately 12 workers. However, the ripple effects of purchases by Cherrywood Solar, its employees, and the ensuing subsequent rounds of activity add total impact measures of 46.8 jobs and labor income of almost $3 million per year. The total impact on output, of more than $21 million is the sum of the dollar values of all of the goods and services added by Cherrywood's operations and maintenance and all of the subsequent transactions that result from its addition to the economy. A large part of that new activity is accounted for by the value of the electricity generated. Since those revenues from electricity sales will be paid to a public company which is likely to be owned primarily by investors who are outside of the local economy, it is important to acknowledge that the economic measures of jobs and labor income may in this case be more relevant than the output measure. However, this does tell us the value of the additional goods and services produced by Maryland labor and other resources that result because of Cherrywood's activities.

Caution in interpreting the entries of average labor income per job is advised, especially when it is applied to a smaller number of jobs. An estimate of one or two more jobs would significantly change the average for example, all else equal. Similarly, the inclusion of one or two professionals' salaries in the total would push the average above the more representative salary of a technician or groundskeeper.

The annual fiscal effects on the state are much smaller in the operational phase than the short run benefit we found in the construction phase, with revenues of just over $617 thousand per year. However, it is to be emphasized that these are annually recurring, not just a one year boost. Because of

the scale of property taxes, the local tax component is much larger. The estimates of local taxes and fees are $2.3 million per year. With the benefit of the estimates from a separate Caroline County specific model, which is discussed in later sections of this report, the Caroline County portion of the state and local tax impact is estimated to be $2.2 million per year.

As with the construction phase estimates, we can also predict which sectors of the economy will see the largest gains in jobs, labor income and output. Table 8 outlines the ten largest gains as measured by employment. The largest job gain is in the solar electricity generating sector, with 12 jobs and more than $1 million in labor income. Next in line, IMPLAN predicts a gain of 2.9 jobs in the miscellaneous professional, scientific and technical services sector, accompanied by a labor income gain of almost $138,000. Other sectors such as hospitals, construction and repair services, wholesale trade and restaurants will see increases of 1 or 2 jobs per sector. The sector, charter transportation and transportation support services is predicted to gain 1.8 jobs and just under $121 thousand in labor income. Note that this sector includes charter bus operators, which in Caroline County is a substitute for the major bus lines that one would find more prominent in other regions of Maryland. In a rural area which does not have multiple public transit options or thick schedules, charter bus companies will not only see an uptick in tours to Baltimore and elsewhere, but also in custom bookings, airport service and other regional transportation services.

When ranked by labor income, in Table 9, the leading gain arises in the solar generating sector itself with an increase of over $1 million. Sectors gaining more between $106 thousand and more than $137 thousand include as with the job rankings, miscellaneous professional, scientific and technical services, charter transportation and related support activities and the maintenance and repair nonresidential construction services sectors. The remaining sectors in the top ten list gain between $50 thousand and $90 thousand in labor income and include hospitals, legal services, employment services and restaurants. Monetary authorities and depository credit intermediaries are also among the top ten with just under $54 thousand in additional labor income arising through 0.6 more jobs.

Table7: Impact of the Operation and Maintenance Phase of Cherrywood Solar I on the State of Maryland

Item	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Output ($s)	$15,898,465	$2,877,300	$2,344,536	$21,120,301
Employment (# of Jobs)	12.0	18.7	16.1	46.8
Labor Income ($s)	$1,042,026	$1,126,049	$804,078	$2,972,153
Average Labor Income/Job ($s)	$86,836	$60,217	$49,943	$63,508
Fiscal Impact ($s)	--	--	--	$2,902,754
Comprised of:	Estimated State Government Revenues			$617,253
	Estimated Local Government Revenues			$2,285,501
	Estimated Caroline County Government Revenues			$2,214,542

Source: IMPLAN and JFI

Table 8: Maryland Sectors with the Largest Operating Phase Gains in Employment

Description	Employment	Labor Income	Output
Electric power generation – Solar	12.0	$1,042,297	$15,899,600
Misc. professional, scientific, & tech. services	2.9	$137,898	$213,523
Full-service restaurants	2.1	$53,398	$113,413
Charter transportation & support activities	1.8	$120,898	$306,349
Employment services	1.7	$84,743	$164,989
Maint. & repair construction (nonresidential)	1.7	$106,102	$272,081
Real estate	1.3	$47,439	$332,090
Wholesale trade	1.0	$88,338	$249,636
Limited-service restaurants	1.0	$20,928	$88,433
Hospitals	0.9	$67,213	$139,190

Source: IMPLAN

Table 9: Maryland Sectors with the Largest Operating Phase Gains in Labor Income

Description	Employment	Labor Income	Output
Electric power generation – Solar	12.0	$1,042,297	$15,899,600
Misc. professional, scientific, & tech. services	2.9	$137,898	$213,523
Charter transportation & support activities	1.8	$120,898	$306,349
Maintenance & repair construction (nonresidential)	1.7	$106,102	$272,081
Wholesale trade	1.0	$88,338	$249,636
Employment services	1.7	$84,743	$164,989
Legal services	0.8	$67,958	$157,318
Hospitals	0.9	$67,213	$139,190
Monetary authorities & dep. credit intermed.	0.6	$53,735	$148,919
Full-service restaurants	2.1	$53,398	$113,413

Source: IMPLAN

With the exception of the solar generating sector itself, which adds $15.9 million to output, the top ten ranked by output, in Table 10, experience output gains between $148 thousand and $333 thousand. The sector which reflects the imputed income from owner occupied housing follows the solar generating sector with a gain of $332,501 in output. The other sectors ranked by this measure were all present in either Table 8 or Table 9, although there may be some variation in their rankings. The most significant results from the Maryland IMPLAN estimates of the operating phase of Cherrywood Solar are the 46.8 additional jobs, the annual gain of $2.9 million in labor income and the $2.9 million per year increase in local government revenues.

Table 10: Maryland Sectors with the Largest Operating Phase Gains in Output

Description	Employment	Labor Income	Output
Electric power generation - Solar	12.0	$1,042,297	$15,899,600
Owner-occupied dwellings	0.0	$0	$332,501
Real estate	1.3	$47,439	$332,090
Charter transportation and trans. Services	1.8	$120,898	$306,349
Maint. & repair constr. nonres. structures	1.7	$106,102	$272,081
Wholesale trade	1.0	$88,338	$249,636
All other misc. prof., scientific, & tech svcs.	2.9	$137,898	$213,523
Employment services	1.7	$84,743	$164,989
Legal services	0.8	$67,958	$157,318
Monetary authorities & dep. credit intermed.	0.6	$53,735	$148,919

Source: IMPLAN

The Construction Phase Effects of Cherrywood Solar on Caroline County

From an IMPLAN model of Caroline County, we constructed estimates of the economic impacts of the construction phase and the operating phase of Cherrywood Solar on the economy of the county, just as we did at the state level. As shown in Table 11, the model predicts that the direct effect of the construction project on county employment will be 348.3 jobs, which grows to a total of 478.6 jobs after including the indirect and induced effects of the construction and installation expenditures. In total, labor income will increase by $27.9 million and economic output by $51.6 million within the county. Average labor income is presented with some cautionary caveats but represents the outcome of simply dividing the labor income by the number of jobs within each column. One important note is that within IMPLAN, labor income includes the dollar amount of salaries plus all employer paid benefits.

The estimate of an increase of 348.3 via direct employment is in keeping with the initial projections of approximately 400 onsite construction and installation workers and consistent with the results from the Maryland model. The direct impact at the county level is likely to include more construction workers and installers and fewer professional service personnel—lawyers and technical services, for example—which helps to explain the lower estimate of average labor income per job. It is to be expected that many of the construction phase workers will commute to the county, although a significant number are predicted to be residents.

After accounting for indirect and induced economic activities, the total job increase rises to a gain of 478.6 workers and a $27.9 million increase in labor income. The total impact on output from the construction project will be $51.6 million, which includes the dollar value of all of the additional goods and services produced by Caroline County labor and other resources that results from the Cherrywood Solar construction phase. As noted in the State of Maryland discussion in earlier sections, the fiscal impact of the construction phase on the county will be $1.2 million. This amount will increase as a result of local personal property taxes in subsequent years.

Table 11: Impact of the Construction Phase on Caroline County

Item	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Output ($s)	$35,400,791	$4,978,740	$11,220,573	$51,600,103
Employment (# of Jobs)	348.3	36.8	93.5	478.6
Labor Income ($s)	$23,548,261	$1,371,678	$2,952,016	$27,871,956
Average Labor Income/Job ($s)	$67,609	$37,274	$31,572	$58,236
Caroline County Fiscal Impact ($s)	--	--	--	$1,239,870

Source: IMPLAN and JFI

Table 12: Caroline County Sectors with the Largest Construction Phase Effects on Employment

Description	Employment	Labor Income	Output
Construction	292.5	$21,537,278	$30,132,532
Landscape and horticultural services	42.9	$1,516,160	$2,770,645
Wholesale trade	24.8	$886,504	$4,211,698
Limited-service restaurants	6.1	$97,757	$487,555
Retail - General merchandise stores	5.5	$139,161	$377,530
Services to buildings	5.1	$51,062	$137,986
Retail - Food and beverage stores	4.3	$115,841	$275,815
Other educational services	3.9	$16,541	$73,812
Hospitals	3.9	$243,227	$551,764
Auto repair & maintenance, except car washes	3.6	$54,961	$122,939

Source: IMPLAN

In Table 12, the ten industrial sectors which will see the largest increases in employment are shown. The first three, replicate the results from the Maryland model, with construction, landscape and horticultural services, and wholesale trade gaining 292.5, 42.9 and 24.8 jobs respectively. If we combine the results from the limited service restaurants (6.1 jobs) and retail food and beverage sectors (4.3 jobs), the total impact on this food sector is 10.4 jobs. The impact of the construction phase is also evident in the 5.5 additional jobs in the general merchandise sector, the 3.9 additional jobs in the hospital and educational services sectors and the addition of 3.6 jobs in automobile repair. A significant portion of these gains is very likely generated directly by the activities of the construction and installation workforce itself.

Table 13 ranks the gaining sectors by labor income. The rankings of the first 3 are identical to the rankings obtained in Table 12. The top gain is seen in the construction sector, with a labor income of $21.5 million while the landscape sector and wholesale trade sector gain $1.5 million and more than $886 thousand, respectively. Medical sectors and the trucking sector will see labor income benefits within the $200 thousand to $243 thousand range. Combining the two automotive sectors in the table, the total labor income is over $328 thousand. Finishing out the top ten list, the accounting, tax preparation, bookkeeping and payroll services sector is projected to generate more than $120 thousand in labor income benefits.

Table 13: Caroline County Sectors with the Largest Construction Phase Effects on Labor Income

Description	Employment	Labor Income	Output
Construction	292.5	$21,537,278	$30,132,532
Landscape and horticultural services	42.9	$1,516,160	$2,770,645
Wholesale trade	24.8	$886,504	$4,211,698
Hospitals	3.9	$243,227	$551,764
Truck transportation	3.2	$237,699	$594,013
Offices of physicians	3.4	$205,253	$364,354
Auto repair & maintenance, except car washes	3.5	$181,656	$338,358
Retail - Motor vehicle and parts dealers	2.9	$146,650	$337,825
Retail - General merchandise stores	5.5	$139,161	$377,530
Accounting, tax prep. & payroll services	2.1	$120,825	$213,736

Source: IMPLAN

Ranking the sectors by output in Table 14, the dollar value of the construction sector activity resulting from the construction phase of Cherrywood is projected to be more than $30 million. The value going to the wholesale trade sector adds another $4.2 million. The third spot is claimed by the imputed income from owner occupied dwellings. This is a special sector in Implan, intended to value the revenues that would otherwise be paid as rent—in this case, $2.8 million. This is nearly equal to the output attributed to the landscape and horticultural services sector. The remaining sectors in the list will experience output gains between $377 thousand and $595 thousand each. The electric power transmission and distribution sector itself, will see relatively small benefits in jobs and labor income, but add $383 thousand to Caroline County output.

Table 14: Caroline County Sectors with the Largest Construction Phase Effects on Output

Description	Employment	Labor Income	Output
Construction	292.5	$21,537,278	$30,132,532
Wholesale trade	24.8	$886,504	$4,211,698
Owner-occupied dwellings	0.0	$0	$2,812,770
Landscape and horticultural services	42.9	$1,516,160	$2,770,645
Truck transportation	3.2	$237,699	$594,013
Hospitals	3.9	$243,227	$551,764
Retail - nonstore retailers	3.2	$88,981	$512,436
Limited-service restaurants	6.1	$97,757	$487,555
Electric power transmission and distribution	0.3	$43,124	$483,237
Retail - General merchandise stores	5.5	$139,161	$377,530

Source: IMPLAN

Operating and Maintenance Phase Effects of Cherrywood Solar on Caroline County

After the completion of the construction and installation phase, the operations and maintenance of Cherrywood Solar remains as an ongoing contributor to the Caroline County economy. Table 15 summarizes the impact of the Year 1 effects. These are annual figures, which continue over the 35 year life of the project, as stated previously. It is projected that Cherrywood will directly involve 10 jobs, labor income of $550 thousand and output of $15.9 million within the Caroline County economy. Once all of the indirect and induced effects are added in, these figures increase to 34.6 jobs, with a corresponding $1.6 million in labor income and $19.3 million in economic output. From the perspective of Caroline County residents, the benefits are most likely best measured by the number of jobs and the labor income attributable to Cherrywood Solar. This table provides a clear demonstration of how the effects of an initial addition to the economy such as that provided by the 10 jobs and $550 thousand in labor income that is directly provided by Cherrywood, ultimately grows into much larger numbers as the spending works its way through successive rounds of purchases and related job additions. It is also noteworthy that in the operating phase, the property taxes paid by Cherrywood Solar introduce a substantial addition to the Caroline County revenues. Taking all of the tax impacts together, the county fiscal impact is predicted to exceed $2.2 million per year. As points of comparison and to emphasize that this is a significant annual contribution, the Caroline County FY2018 budget proposed the following expenditures:

- Sheriff $3.3 million
- Fire companies $1.2 million
- Emergency Services: Medical services $2.9 million

Table 15: Impact of the Operations and Maintenance Phase of Cherrywood Solar on Caroline County

Item	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Output ($s)	$15,898,465	$2,618,646	$820,888	$19,337,999
Employment (# of Jobs)	10.0	17.8	6.8	34.6
Labor Income ($s)	$550,603	$871,663	$215,617	$1,637,883
Average Labor Income/Job ($s)	$55,060	$48,970	$31,708	$47,338
Caroline County Fiscal Impact ($s)	--	--	--	$2,214,542

Source: IMPLAN and JFI

As can be seen in Table 16, the largest sectoral benefits in terms of jobs, arise in the solar electricity generating sector itself, with 10 direct jobs projected. Charter transportation and transportation support services gains 3.4 jobs and the maintenance and repair construction sector receives an addition of 3.2

jobs. Another 1.2 jobs will be created within the wholesale trade sector. The remaining sectors in the top ten will experience job gains of between 0.7 and 1.0 job. Among the sectors filling out the rest of the list are various professional and business services such as accounting and legal services as well as the monetary authorities and depository credit intermediation sector.

Ranked by labor income, the top three sectors shown in Table 17 duplicate the Table 16 results. The solar power sector adds more than $550 thousand in labor income, which is almost twice the benefit generated by the number two charter transport sector's $269 thousand addition. The maintenance and repair sector receives a $134 thousand benefit while the remaining sectors on the list gain less than $50 thousand per sector. Completing the top ten list, the final two spots are rail transportation and the postal services sectors, each of which are expected to receive approximately $26 thousand in labor income.

Table 16: Caroline County Sectors with the Largest Operating Phase Impacts on Employment

Description	Employment	Labor Income	Output
Electric power generation - Solar	10.0	$550,603	$15,898,465
Charter transport and support activities	3.4	$268,594	$628,672
Maintenance & repair construction (nonresidential)	3.2	$134,314	$414,141
Wholesale trade	1.2	$43,957	$208,836
Accounting, tax prep. and payroll services	0.9	$49,399	$87,385
Services to buildings	0.9	$8,474	$22,900
Monetary authorities and dep. credit intermed.	0.8	$45,827	$156,954
Legal services	0.8	$14,352	$77,003
Warehousing and storage	0.7	$24,422	$58,066
Business support services	0.7	$33,591	$46,529

Source: IMPLAN

Table 17: Caroline County Sectors with the Largest Operating Phase Impacts on Labor Income

Description	Employment	Labor Income	Output
Electric power generation - Solar	10.0	$550,603	$15,898,465
Charter transport and support activities	3.4	$268,594	$628,672
Maintenance & repair construction (nonresidential)	3.2	$134,314	$414,141
Accounting, tax preparation and payroll services	0.9	$49,399	$87,385
Water, sewage and other systems	0.4	$46,887	$101,494
Monetary authorities and dep. credit intermed.	0.8	$45,827	$156,954
Wholesale trade	1.2	$43,957	$208,836
Business support services	0.7	$33,591	$46,529
Rail transportation	0.2	$26,281	$68,115
Postal service	0.3	$25,893	$31,249

Source: IMPLAN

Table 18: Caroline County Sectors with the Largest Operating Phase Impacts on Output

Description	Employment	Labor Income	Output
Electric power generation - Solar	10.0	$550,603	$15,898,465
Charter transport and support activities	3.4	$268,594	$628,672
Maintenance and repair construction (nonresidential)	3.2	$134,314	$414,141
Owner-occupied dwellings	0.0	$0	$209,285
Wholesale trade	1.2	$43,957	$208,836
Electric power transmission and distribution	0.1	$16,419	$183,984
Monetary authorities and dep. credit intermed.	0.8	$45,827	$156,954
Water, sewage and other systems	0.4	$46,887	$101,494
Petroleum refineries	0.0	$19	$96,310
Accounting, tax prep. and payroll services	0.9	$49,399	$87,385

Source: IMPLAN

Table 18 lists the impacts ranked by the dollar value of output generated as a consequence of the operations of Cherrywood Solar. The solar power sector is predicted to add $15.9 million to Caroline County's economic output as the largest sectoral impact. The remaining output effects are far more modest, with the second leading sector—charter transportation—giving rise to a $629 thousand contribution to output. The remaining sectors on the top ten list fall in line between $87 thousand and just over $414 thousand. The imputed income from owner occupied housing, explained in prior sections, is attributed $209 thousand in economic output, which is nearly equal to the contribution expected from the wholesale trade sector. The water, sewage and other systems sector will provide an output contribution gain of $101 thousand, accompanied by a labor income boost of almost $47 thousand. Petroleum refineries add $96 thousand in output, although this sector's contribution to jobs and labor income within Caroline County are very small. The accounting and tax preparation sector fills the tenth spot, contributing $87 thousand in output accompanied by job and labor income gains of 0.9 jobs and $49 thousand, respectively.

Contributions of Cherrywood Solar Operating Phase Net of Agricultural Use

Highlights of the impact of the operating and maintenance phase of Cherrywood Solar on Caroline County discussed above include 34.6 jobs added, $2.2 million in county revenues, $1.6 million in labor income and an overall addition to economic output of $19.3 million each year of operation. Utilizing 1000 acres of farmland does however displace its current use growing primarily corn and soybeans. With that in mind, we conducted an IMPLAN estimate of the economic impact of the current agricultural land use on Caroline County and then subtracted those economic effects from the operating and maintenance phase effects of Cherrywood Solar to obtain the net contributions. The total impact of the agricultural usage as shown in Table 19, is summarized as $829 thousand, 5.0 jobs and labor income of less than $159 thousand. Largely because agricultural land receives favorable tax treatment, the

Caroline County fiscal benefit generated from all of the activities related to the 1000 acres of farmland is estimated as just over $5 thousand.

Table 20 presents the net effects of Cherrywood Solar, obtained by subtracting the amounts in Table 19 from the operating and maintenance summary effects in Table 15. The highlights of the net benefits listed in Table 20 include:

- Additional employment 29.6 jobs
- Additional labor income $1.5 million per year of operation
- Additional Caroline County revenues $2.2 million per year of operation
- Additional Caroline County output $18.5 million per year of operation.

As noted previously, this phase of the solar farm is planned to continue for 35 years. The job gains are not temporary and it is emphasized that the other measures of net additions to the economy are annually recurring.

Table 19: Impact of Agricultural Use of the 1000 Acre Cherrywood Site on Caroline County

Item	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Output ($s)	$566,288	$208,107	$54,803	$829,198
Employment (# of Jobs)	2.9	1.6	0.5	5.0
Labor Income ($s)	$81,324	$63,165	$14,380	$158,869
Average Labor Income/Job ($s)	$28,043	$39,478	$28,760	$31,774
Caroline County Fiscal Impact ($s)	--	--	--	$5,103

Source: USDA, IMPLAN and JFI

Table 20: Annual Net Gains from the Conversion of the Cherrywood Site from Agriculture to Solar (Table 20 equals Table 15 *minus* Table 19)

Item	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Net Changes in:				
Output ($s)	$15,332,177	$2,410,539	$766,085	$18,508,801
Employment (# of Jobs)	7.1	16.2	6.3	29.6
Labor Income ($s)	$469,279	$808,498	$201,237	$1,479,014
Average Labor Income/Job ($s)	$27,018	$9,492	$2,948	$15,564
Caroline County Fiscal Impact ($s)	--	--	--	$2,209,438

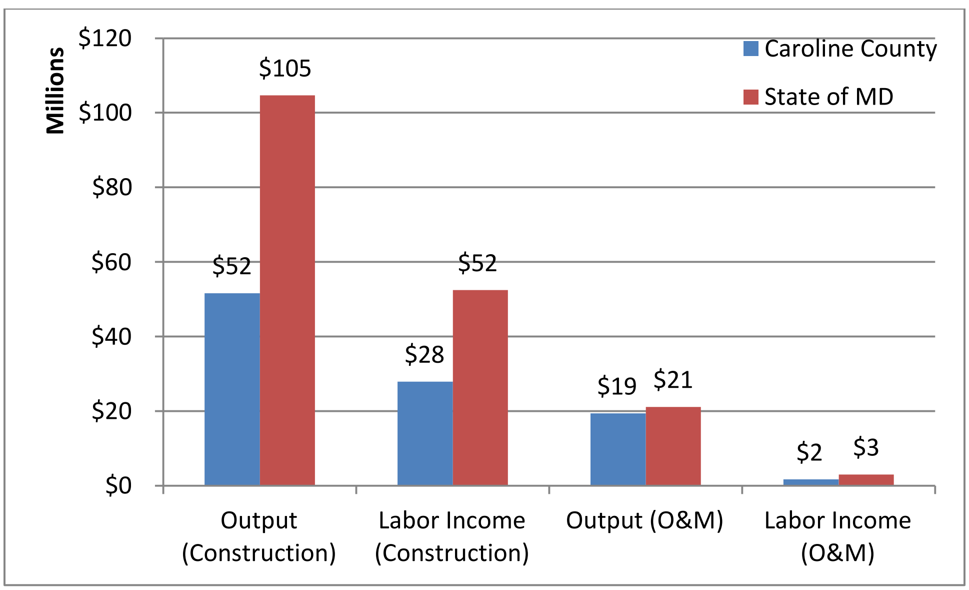
Source: USDA, IMPLAN and JFI

Summary of Economic Impacts of Cherrywood Solar on the Economies of Caroline County and the State of Maryland

In order to more readily visualize the county and state level impacts of Cherrywood Solar on the state and county, Figure 1 shows the labor income and economic output effects which were discussed separately in the Maryland and Caroline County sections above. Figure 2 shows the same side by side comparison for the job gains. The figures show that in the construction phase, the impacts on the state are almost twice those of the county. This is not surprising given that the county economy is small and a major share of the resources needed for the comparatively large construction and installation phase will necessarily come from beyond the county itself. Still, the county gains 478.6 of the state level estimates of the 777.3 construction phase job gain and $27.9 million of the state level $52.4 million labor income effect. In the operating phase, the county projections of $1.6 million per year in labor income and 34.6 job gains compare to the state's $3 million per year addition to labor income and 46.8 added jobs.

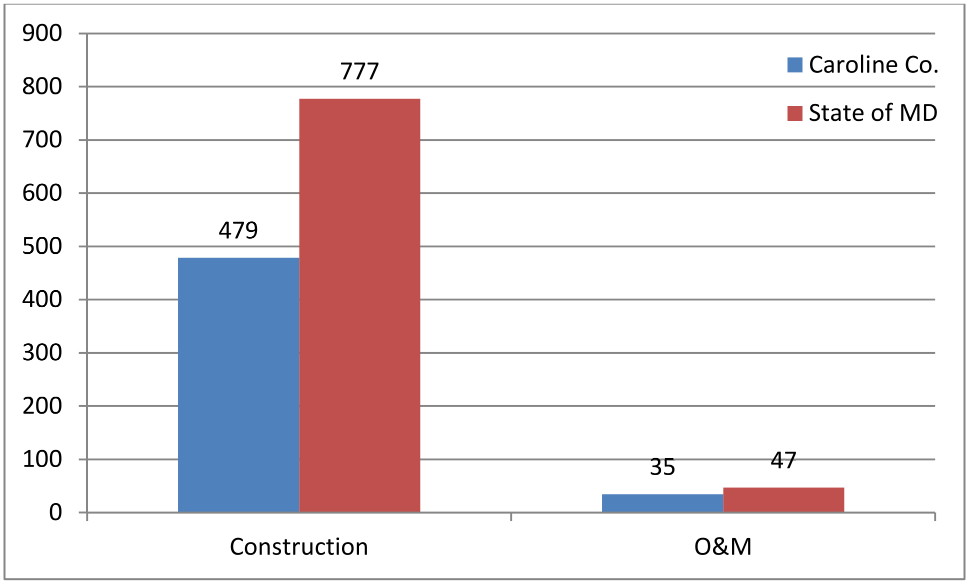
Figure 3 and Figure 4 show the distributions of the government revenues from taxes and fees that arise due to the construction phase and the operating phase, respectively. These are taxes and fees that result from all of the direct, indirect and induced activities.

Figure 1: Caroline County and State of Maryland Output and Labor Income Impacts



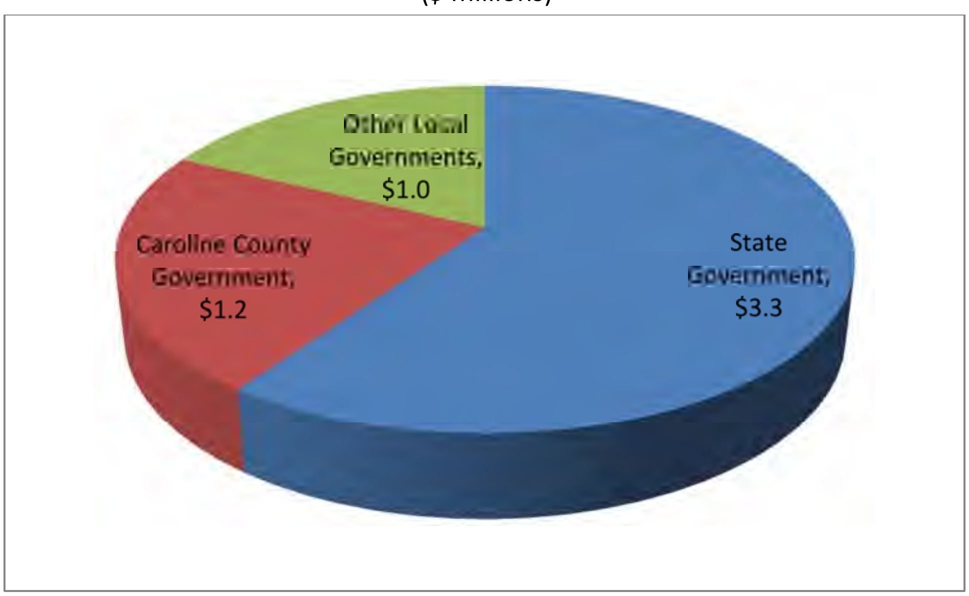
Source: IMPLAN

Figure 2: Caroline County and State of Maryland Construction Phase and Operating Phase Job Impacts.



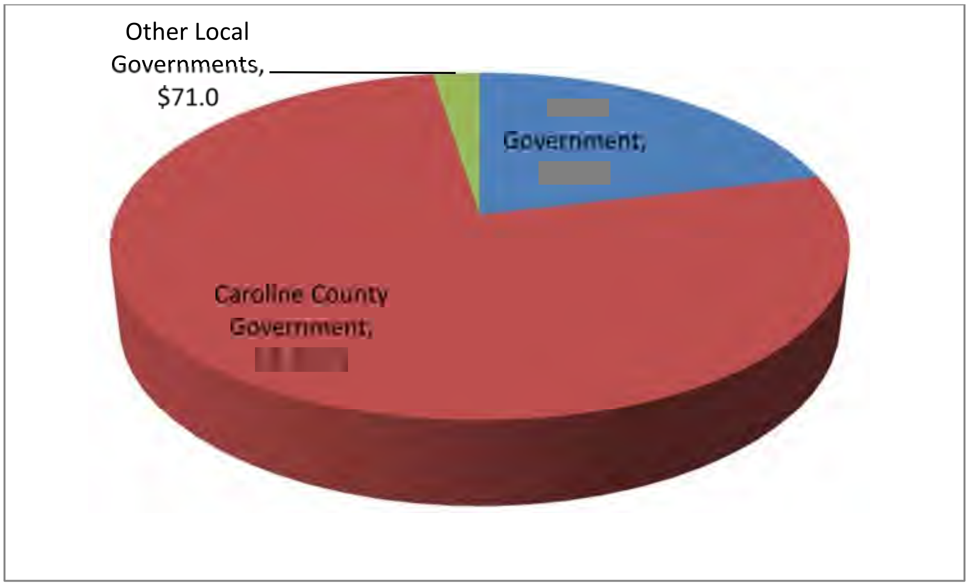
Source: IMPLAN

Figure 3: Distribution of Government Revenues within Maryland from the Construction Phase ($ millions)



Source: IMPLAN and JFI

Figure 4: Distribution of Government Revenues within Maryland from the Operating and Maintenance Phase ($ thousands per year)



Source: IMPLAN and JFI

Economic Impact Methodology and Terms

The JFI prepared this analysis of the economic contributions of the Cherrywood Solar I project on the Maryland and Caroline County economies using the IMPLAN input-output models for the State of Maryland and Caroline County. IMPLAN is one of the most widely used models in the nation, and can be used to analyze the impacts of companies, projects, or of entire industries. An input-output analysis examines the relationships among businesses and among businesses and final consumers. Input-output analysis is based on the use of multipliers, which describe the response of an economy to a change in demand or production. Multipliers measure the effects on an economy from a source of economic activity, in this case the jobs and revenues associated with the construction and subsequent operation of the Cherrywood Solar farm.

The economic activity generated in a city, county, region or state is greater than the simple total of spending associated with the event or activity being studied. This is because as this money is earned it is, in turn, spent, earned and re-spent by other businesses and workers in the local economy through successive cycles of spending, earning and spending. However, the spending in each successive cycle is less than in the preceding cycle because a certain portion of spending "leaks" out of the economy in each round of spending. Leakages occur though purchases of goods or services from outside of the region and via federal taxation. The IMPLAN multipliers used in this analysis capture the effects of these multiple rounds of spending based on observed spending patterns within the region of study. This analysis focuses on three measures of economic impact:

- **Output**. The total value of production or sales in all industries.
- **Employment**. The total number of full and part time jobs in all industries.
- **Labor Income**. The wages and salaries, including benefits, and other labor income earned by the workers holding the jobs created.

Four measures of the economic activity and impact of the construction spending and operating expenditures of the solar farm are included in this report:

- **Direct effects**. The change in economic activity being analyzed—in this case the jobs and revenues directly associated with the solar farm.
- **Indirect effects**. The changes in inter-industry purchases, for example the purchase of goods or services to support the construction and production activities, in response to the change in demand from the directly affected industry.
- **Induced effects**. The changes in spending from households as income and population increase due to changes in production.
- **Total effects**. The combined total of direct, indirect and induced effects.

APPENDIX 17

Caroline County
Forest Conservation Exemption Letter

Caroline County
Department of Planning & Codes

Katheleen Freeman, Director
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May 30, 2018

Ryan D. Showalter
McAllister, DeTar, Showalter & Walker
100 N. West Street
Easton, Maryland 21601

Re: Forest Conservation Exemption, Cherrywood Solar I, LLC

Dear Mr. Showalter,

The Caroline County Department of Planning & Codes has reviewed the simplified forest stand delineation for the 202 MW solar generation project proposed by Cherrywood Solar I, LLC. No clearing of forest is proposed by this project. Buffers of forest vegetation will be established along portions of the project and will remain in place at least for the duration of the use, which we understand may be 30+ years.

Pursuant to Section 109-3(B)(5) of the Caroline County Code, the proposed land development activity for a solar electric generating station licensed under Section 7-207, 7-208 or 7-205 of the Public Utility Companies Article of the Maryland Code is exempt from the requirements of the Forest Conservation Chapter, provided that:

(a) A required certificate of public convenience and necessity ("CPCN") is issued in accordance with Natural Resources Article § 5-1603(f), Annotated Code of Maryland; and
(b) Cutting or clearing of the forest is conducted to minimize the loss of forest.

Development of the project will require a CPCN from the Maryland Public Service Commission. The avoidance of forest clearing and planting of trees for landscape buffers, even if temporary, are consistent with the State's policy of no-net-loss of forest and warrant exemption from the provisions of the Forest Conservation Chapter of the Code.

This letter shall confirm the project's exemption from Caroline County forest conservation requirements, unless the project (i) is able to be constructed without a CPCN, or (ii) changes to include clearing of forest. If any forest clearing is proposed, this exemption will be revisited.

Sincerely,

Katheleen Freeman, AICP
Director, Caroline County Planning & Codes