

Spotsylvania Solar Energy Center Landscape, Revegetation and Management Plan

December 14, 2018

1.0 Purpose

The purpose of the Landscape, Revegetation and Management Plan is to establish sPower's general guidelines and approach for landscaping, revegetation and required maintenance at the Spotsylvania Solar Energy Center (Project) located in Western Spotsylvania County, Virginia. Landscaping and revegetation for the Project will be used to enhance aesthetics, attract native pollinators, provide erosion and sediment control, and screen visibility of the Project from adjacent properties during the operational lifetime of the Project. sPower's Operations and Maintenance (O&M) staff will maintain landscaping during the lifetime of the Project. A final Landscaping and Revegetation Plan will be approved during the building permit process and be in general conformance with the guidelines established in this plan.

Landscape enhancements, buffers, and berms are proposed where the Project Site is adjacent to high density residential neighborhoods or high visibility corridors. Areas that are not immediately adjacent to the solar facility will be stabilized as necessary, and natural vegetation will be permitted to grow back. The Landscape and Revegetation Plan also discusses the installation of berms in locations where the Project abuts high density residential areas. sPower consulted with professional biologists and arborists in preparing this Landscape and Revegetation Plan.

2.0 Guidelines

The Landscape and Revegetation Plan considers the following guidelines regarding plant species:

1. Plant and tree species will be selected based on their ability to provide the desired screening after 2 years of growth.
2. A variety of plants shall be used based on availability and are expected to include evergreens and deciduous trees as appropriate.
3. Plant and tree species shall be environmentally friendly, native species (preferably) and compatible with local wildlife.
4. Plants and trees shall be installed as early as possible following establishment of erosion and stormwater management controls, provided they do not inhibit construction of the facility.
5. Plants and trees, once established, will require little maintenance and grow under natural precipitation conditions.
6. Understory vegetation and seeding, if necessary, shall conform with the County approved seed list (Exhibits A and C).

3.0 Buffer Types

Buffers and landscaping will be installed in accordance with the final GDP Landscape and Buffer Area Plan. All landscaping is subject to final site plan approval and will follow the guidelines outlined in Section 2.0 above.

3.1 Berms

sPower is proposing to construct berms comprised of mulched leftover timber slash and logging debris at the Project Site. These berms will reduce the amount of burning required on site, the number of delivery trucks exiting the site to export excess mulch, and reduce the amount of earthwork and heavy equipment required to construct earthen berms. If natural topography limits the viewshed corridor, a berm may not be necessary and natural vegetation may be present to adequately screen the facility.

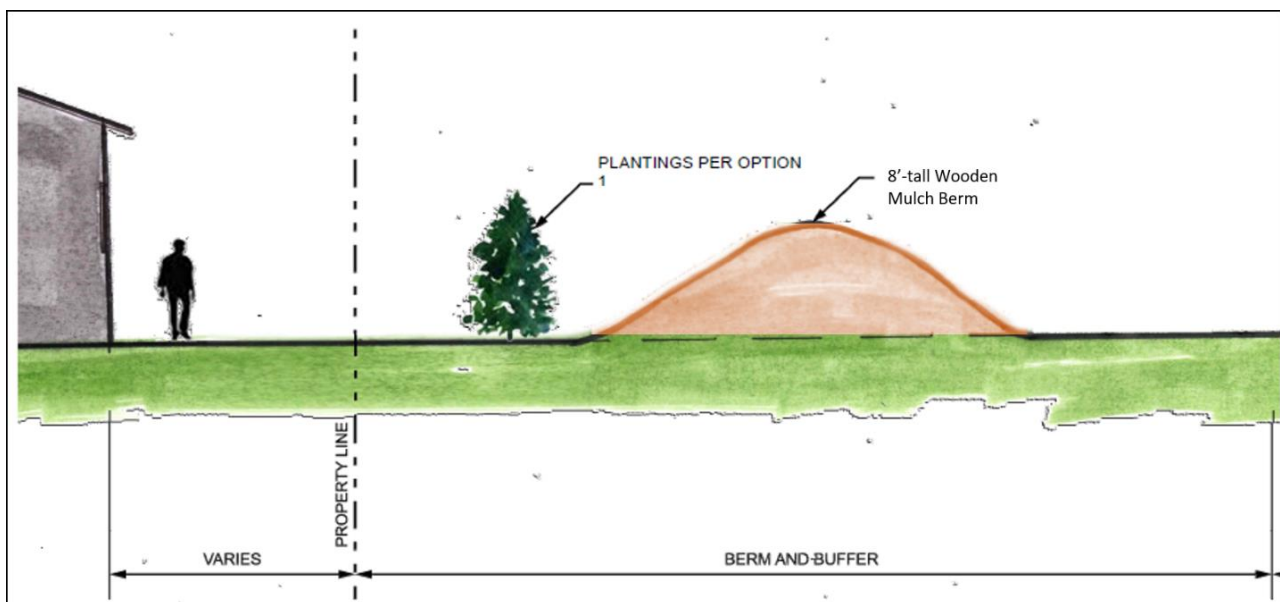


Figure 1. Drawing of proposed mulch berm for visual screening.

3.2 Supplemental Plantings

Some buffer areas may require additional screening through supplemental plantings. These plantings will be in conformance with landscaping guidelines in the Spotsylvania Design Standards Manual Article 6.

Trees and Shrubs

Based on the Section 2.0 guidelines above and consultations with certified biologists and arborists, sPower generated a list of potential plant species that could be used at the Project Site, depending on availability at the time of planting. sPower intends to use a combination of evergreen trees with low-lying, evergreen shrubs (Exhibit A).

Planting Criteria

These plantings will be in general conformance with landscaping guidelines in the Spotsylvania Design Standards Manual Article 6, or in conformance with the following guidelines from the County Staff Report:

A minimum of one (1) evergreen tree with a minimum height of six (6) feet every ten (10) feet, one (1) large deciduous tree with a minimum trunk caliper of two (2) inches at breast height (DBH) every fifteen (15) feet, one (1) understory deciduous tree with a minimum trunk caliper of two (2) inches measured diameter at breast height (DBH) every fifteen (15) feet, one (1) evergreen shrub with a minimum height of four (4) feet every ten (10) feet.

3.3 Revegetation

Allowing the naturally occurring vegetation to replenish itself provides a fast growing, thick, and effective visual screen. Examples of natural regrowth already present on the Project Site following the year's timber harvest are located below in Figure 2 and in Exhibit D.



Figure 2. Example of natural revegetation on Site C

3.4 Preservation

Throughout the facility, there are locations where existing areas were not logged along property boundaries as shown in Figure 3. These buffer areas provide outstanding natural visual screening.



Figure 3. Example of Preserved buffer along West Catharpin Rd.

4.0 Buffer and Landscaping Options

4.1 Buffers Not Adjacent to Residences

1. Maintain existing 50ft vegetated buffer as shown in Section 3.4 where they have been preserved, or...
2. Allow for 50ft natural revegetation as shown in Section 3.3. where the timber companies have harvested the existing buffer.

4.2 Buffers Adjacent to Residences

Option 1: Install 8ft-tall logging mulch berm with supplemental plantings of large evergreens 20ft on center in front of berm and natural regrowth behind the berm. Total vegetated buffer width of 100ft. Berm and evergreens provide immediate visual screening and time for natural regrowth to completely screen panels. Utilizing logging waste to create the berm will dramatically reduce the need to burn logging debris on site.

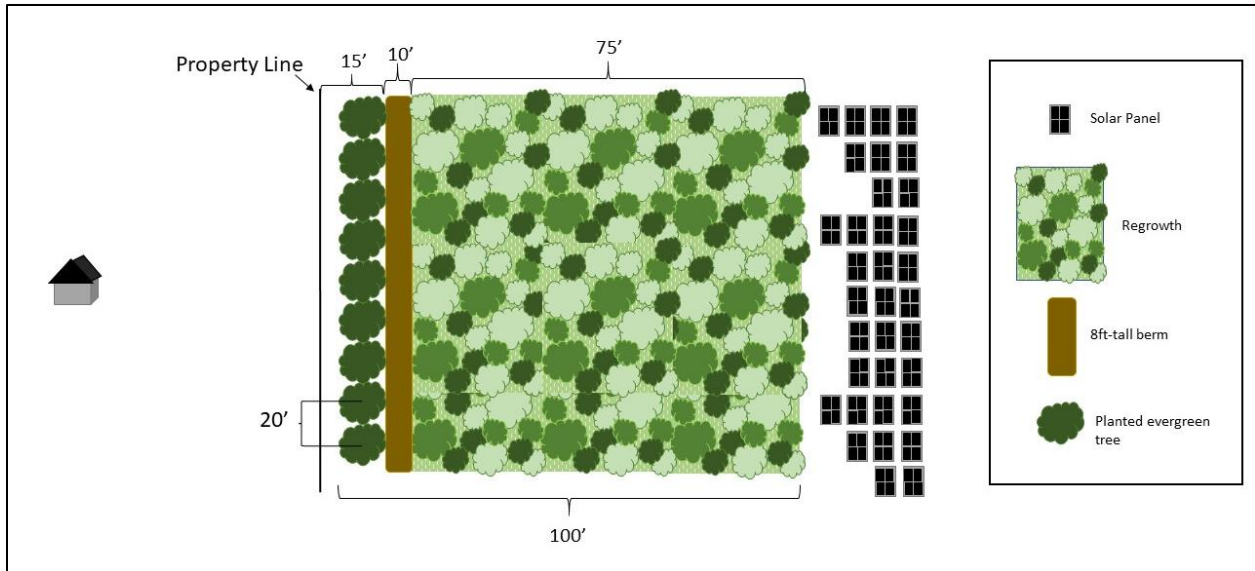


Figure 4. Drawing of Proposed Visual Screening and Buffering Option 1.

Option 2: Install supplemental plantings at residential property boundaries with natural regrowth behind. Total vegetated buffer width of 100ft. Supplemental plantings will be in general accordance with Spotsylvania Design Standards Manual Article 6 or planting criteria noted above (Section 3.0).

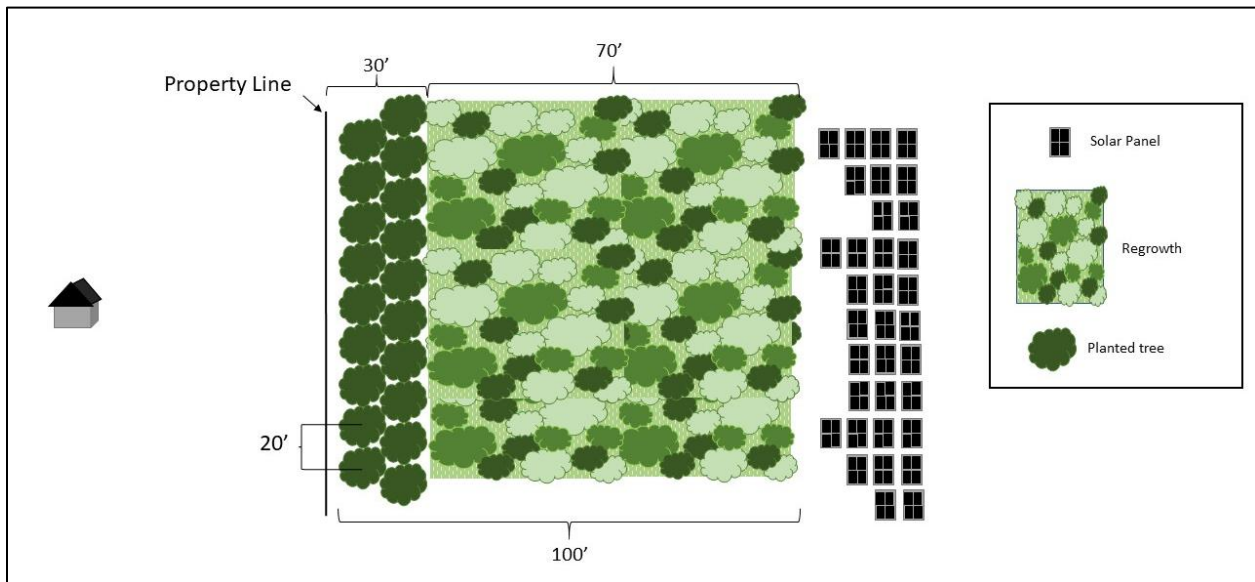


Figure 5. Drawing of Proposed Visual Screening and Buffering Option 1.

5.0 Maintenance – Planting, Watering and Cutting

sPower intends to begin planting in Fall of 2019 with a means of watering during the first year of construction or until the plants have established (whichever comes first). Natural precipitation will

be the sole source of watering after plants have established. Final placement and landscape design will be coordinated with the County to provide adequate screening for the project site.

Grass Mowing

Low maintenance and low growing grasses will be utilized to minimize the mowing requirements. Grasses near the solar panels will be kept maintained at no higher than 24 inches.

Firebreak and access roads will consist of mainly graveled areas and low growing vegetation. Any low growing vegetated firebreaks will consist of year-round green grasses kept less than 24 inches high.

Herbicides and Pesticides

sPower has not identified any proposed herbicides or pesticides for use during construction and operation. If their use is required, sPower will use herbicides and pesticides that conform with EPA guidelines for use and with application that applies with Federal, State and Local regulations. Additionally, selective herbicides and pesticides would be favored over broad-based applications.

6.0 Dominion Easement

sPower will install hedges along a Dominion Easement along the north side of West Catharpin Road (refer to Exhibit A). Dominion has provided the following list of approved evergreen shrubs to be planted in this location:

Species	Height (ft)	Width (ft)
Northern Bayberry	9	9
Sweet Osmanthus	10	8
Dwarf Burford Holly	6	6
Emerald Green Arborvitae	15	4

Species and plant spacing will be determined based on availability and will be approved by Dominion prior to installation.

The depiction and images below show the detail of the Dominion easement plantings and a visual simulation of the Dominion easement.

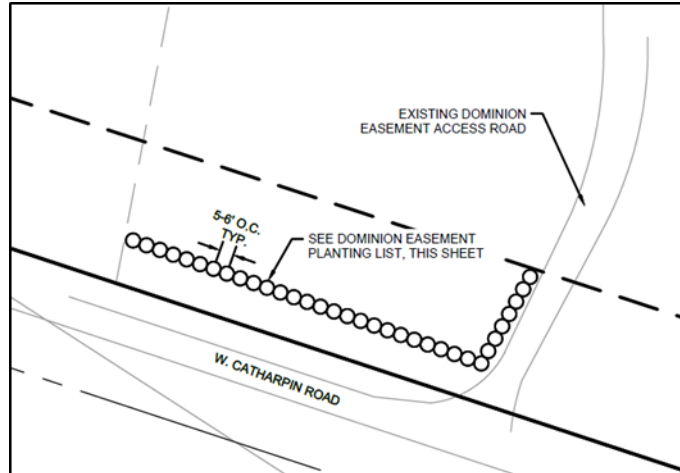


Figure 6. Dominion easement detail.



Figure 7. Dominion easement, existing condition.



Figure 8. Dominion easement, future simulation.



Figure 9. Dominion easement, future simulation with plantings.

7.0 Invasive Species Management

See Exhibit B for the Invasive Species Management Plan.

8.0 Seed Mixtures

sPower will use two types of seed mixes:

During Construction




For temporary and permanent stabilization during construction, sPower will follow the guidelines in the Virginia Erosion and Sediment Control Handbook Tables 3.31-B Temporary Seeding and Table 3.32-D Permanent Seeding. sPower will select the seed mixture that is low maintenance and low growing to minimize or eliminate mowing, fertilizer and herbicide usage.




Pollinator



sPower will plan to utilize the VADGIF recommended seed mixtures (Exhibit C) at various locations throughout the facility. If the seed mix is not available, sPower will seek alternatives that are appropriate for the geographic location. Final location of the pollinator planting locations will be determined once the panel layout and site plans are finalized. Potential areas for the pollinators will be identified in the site plan. Additionally, existing native pollinator communities will be located in approximately 3500 acres of conserved areas such as RPAs, visual setbacks/buffers, and other undeveloped areas and will include the following species: orange jewel weed, morning glory, Turk's-cap lily, Cardinal Flower, Maryland Golden Aster, etc.

Exhibit A



Plant and Tree Species

Species	Description	Image
Evergreen Trees		
Norway Spruce	Tall timber tree with dark green evergreen needles on dense branches. Medium to fast growth rate at 13 to 25 inches per year. Reaches 40 to 60 ft. tall and 25 to 30 ft. wide.	
White Spruce	Pendulous branches covered with short, densely packed needles. Medium growth rate at 13 to 24 inches per year. Reaches 40 to 60 ft. tall, 10 to 20 ft. wide.	
Nellie R Stevens Holly	Vigorous growing with a broad pyramidal tree-like form, dense branching, and lustrous, dark green, leathery foliage. An excellent hedge, screen, or specimen. Quickly reaches 15 to 25 ft. tall, 10 to 15 ft. wide. Both male and female plants are proposed for this species.	

Eastern Red Cedar	Evergreen tree with reddish wood that has a spreading canopy. Medium rate at 13 to 24 inches per year. Reaches up to 40 to 50 ft. tall, 8 to 20 ft. wide.	
American Holly	Considered both an evergreen and ornamental tree that keeps foliage year-round. Slow to medium growth rate at 12 to 24 inches per year. Reaches up to 40 to 50 ft. tall, 18 to 40 ft. wide. Both male and female plants are proposed for this species.	
Evergreen Shrubs		
Southern Wax Myrtle	Shrub with clusters of waxy, bluish gray berries that tends to develop multiple stems. Medium growth rate that can reach to 12 ft. tall and 8 to 10 ft. wide.	

Rose Azalea	Semi-evergreen foliage with rose-red blossoms. Medium growth rate that can reach 2 to 4 ft. tall and 3 to 5 ft. wide.	
Swamp Azalea	Multi-stemmed shrub with abundant white flowers. Medium growth rate that can reach 5 to 8 ft. tall and wide.	

DOMINION EASEMENT

Species	Description	Image
Northern Bayberry	Fragrant, dense foliage in a compact form. Medium growth rate that reaches 9 ft. tall with equal width.	
Sweet Osmanthus	Large evergreen shrub with broad upright form that is densely branched and covered with finely toothed, dark foliage. Slow growth rate that reached 10 ft. tall, 6 to 8 ft. wide.	



Dwarf Burford Holly	Evergreen shrub with large, bright red berries. Slow growth rate that reaches 4 to 6 ft. tall with equal width.	
Emerald Green Arborvitae	A narrow, pyramidal evergreen with dense, emerald green foliage that holds its color throughout winter. Medium growth rate that reaches 15 ft. tall, 3 to 4 ft. wide.	

Exhibit B

Invasive Species Management Plan

Invasive Species Management Plan

1.0 INTRODUCTION

Sustainable Power Group (sPower) has prepared this Invasive Species Management Plan (Plan) in support of the Spotsylvania Solar Energy Center (Project) located in western Spotsylvania County, Virginia. The Plan provides guidelines for managing and preventing the spread and propagation of noxious and invasive species and weeds during construction and operation of the Project.

1.1 Project Description

The Project is a 500-megawatt (MW) solar energy facility that consists of three non-contiguous project sites (Site A, B, and C) that total approximately 6,350 acres, of which approximately 3,500 acres will be developed for the Project. The remaining 2,850 acres will be set aside as open space. The Project will utilize photovoltaic (PV) panels installed on single-axis trackers. Electricity will be delivered via transmission lines that will run from the Project to the adjacent Spotsylvania Switching Station owned by the Virginia Electric and Power Company.

1.2 Invasive Species

An invasive species is defined as a non-native species to an ecosystem whose introduction causes economical, medical, and/or environmental harm. The ability for non-native species to establish themselves and become invasive is incredibly difficult as they are usually not as well adaptive to the surroundings as native species and usually require a “leg-up” usually in the form of a disturbance event. Invasive spread is generally categorized into 5 stages:

1. Introduction
2. Colonization
3. Establishment
4. Dispersal
5. Invasive Spread

The best strategy for managing invasive is to 1) minimize their introduction and 2) foster and support native species which will naturally out-compete non-native species and prevent them from colonizing (stage 2). The following management plan is designed to accomplish both those objectives.

2.0 BEST MANAGEMENT PRACTICES

2.1 Prevention Measures

Preventing introduction of non-native species is often the most effective way of managing invasive species for a project. These prevention practices can also limit the spread of non-native species that may have already been present to new areas, both inside and outside of the project site.

2.1.1 Worker Environmental Training

Mandatory site environmental instruction for the Construction and Operations Teams, contractors, or related personnel entering the site during operation of the Project will include weed management awareness training. Personnel involved will include the Construction and Operations Teams, contractors, subcontractors, construction managers, construction personnel, and individuals bringing vehicles or equipment onto the Project Site. Proposed measures to prevent the spread of weeds in areas currently not infested, and controls on their proliferation when already present, will also be explained.

2.1.2 Rumble Strip Stations

Equipment and vehicles that have been cleaned prior to being staged on the Project Site require no further cleaning to prevent the spread of weeds. In the event of large-scale maintenance activities that require heavy vehicles and equipment to access the Project Site, the Construction and Operations Teams will set up rumble strip stations at ingress and egress locations to remove mud and dirt from vehicles and equipment. This will prevent the spread of weed seeds; trucks with mud and dirt containing seeds is one of the most common ways weed seeds are spread to new environments. Heavy equipment entering the Project Site on trailers during large-scale maintenance activities will also require cleaning prior to entering the Project Site. The Construction and Operations Teams will ensure that vehicles and equipment are free of soil and debris capable of transporting weed seeds, roots, or rhizomes before the vehicles and equipment are allowed to use access roads and enter the Project Site.

2.1.3 Site Soil Management

Prior to operations, contractors will stabilize disturbed areas of the Project Site utilizing ground stabilization methods such as application of mulch or hydro-mulch containing a native seed mix. Application of a pre-emergent, EPA-approved herbicide, designed to prevent weed growth without affecting existing vegetation, may also be included and would be applied per Federal, County and State regulations.

During the Operations Phase, the Operations and Maintenance Team will limit the amount of soil disturbance to the absolute minimum necessary.

2.1.4 Site Mowing

Mowing will primarily be used as a method to maintain vegetation height for fire safety concerns, rather than weed management. Mowing will prevent maturation (“going to seed”) of unwanted species that may be present and limits their dispersal. During mowing activities, the Construction and Operations Teams will avoid transporting soil within the Project Site to avoid any dispersal of unwanted species.

2.1.5 Revegetation and Plantings

All revegetation products shall use seeding, seedling, and sapling material native to the region. All preventative measures as outlined in this Plan shall be implemented during revegetation activities and after during operation and maintenance phase of the Project.

3.2 Noxious Weed Control Methods

3.2.1 Physical Removal

Physical control methods range from manual hand pulling of weeds to the use of hand tools to provide enough leverage to pull out the entire plant and associated root systems. Hand or power tools can also be used to uproot, girdle, or cut plants. For localized weed control, this is the most effective method. Employees during both the Construction and Operation phases will be encouraged to use this method during the training mentioned in section 2.1.1.

3.2.2 Chemical Removal

Herbicide application is a widely used, effective control method for removing invasive weed species. Prior to application of herbicide, contractors will be required to obtain required permits from state and local authorities. Permits may contain additional terms and conditions that go beyond the scope of this Plan. Only a State of Virginia and federally certified contractor will be permitted to perform herbicide applications. Should their use be deemed necessary, herbicides will be applied in accordance with applicable laws, regulations, and permit stipulations.

5.0 DURATION

Implementation of this Plan will be required during the both the construction phase and the operational phase of the Project.

Exhibit C

VDGIF Seed Mix

Species #	Common Name	Scientific Name	Native to East	VA Native	Annual/Biennial / Perennial	Warm Season / Cool Season	Seeds per pound	Seeds per SF at 1 pound of pure live seed (PLS) per acre	Pounds of Pure Live Seed (PLS) per Acre to Deliver 3 Seeds per SF	Seed Cost per Pound (Ernst, 9/2017)	Cost per Acre of 3 Seeds per SF	Cost per Acre of 4.5 Seeds per SF
Potential Pollinator Mix with Plants 2 Feet or Shorter for Solar Farms in the Southern Piedmont on Well-drained Soils												
2013	Deertongue	<i>Dichanthelium clandestinum</i>	✓	✓	Perennial	Warm Season	350,000	8.03	0.37	18.00	6.72	10.08
2020	Lovegrass, Purple	<i>Eragrostis spectabilis</i>	✓	✓	Perennial	Warm Season	1,059,100	24.31	0.12	180.00	22.21	33.31
2079	Pea, Partridge	<i>Chamaecrista fasciculata</i>	✓	✓	Annual	Warm Season	65,000	1.49	2.01	16.00	32.17	32.17
2125	Coneflower, Pale Purple	<i>Echinacea pallida</i>	✓	No	Perennial	Warm Season	106,000	2.43	1.23	84.00	103.56	155.34
2127	Coneflower, Purple	<i>Echinacea purpurea</i>	✓	No	Perennial	Warm Season	115,664	2.66	1.13	36.00	40.67	61.01
2129	Coreopsis, Lanceleaf	<i>Coreopsis lanceolata</i>	✓	No	Perennial	Warm Season	221,000	5.07	0.59	20.00	11.83	17.74
2139	Goldenrod, Gray	<i>Solidago nemoralis</i>	✓	✓	Perennial	Warm Season	1,008,000	23.14	0.13	360.00	46.67	70.01
2151	Indian Blanket	<i>Gaillardia pulchella</i>	✓	No	Perennial	Warm Season	238,144	5.47	0.55	30.00	16.46	24.69
2178	Primrose, Showy Evening	<i>Oenothera speciosa</i>	✓	No	Perennial	Warm Season	3,039,069	69.77	0.04	50.00	2.15	3.23
2190	Spiderwort, Ohio	<i>Tradescantia ohioensis</i>	✓	✓	Perennial	Warm Season	1,750,000	40.17	0.07	210.00	15.68	23.52
2191	Spiderwort, Virginia	<i>Tradescantia virginiana</i>	✓	✓	Perennial	Warm Season	1,750,000	40.17	0.07	400.00	29.87	44.80
										Total	327.99	475.90
Alternative Pollinator Mix Species 2 Feet or Shorter for Solar Farms in the Southern Piedmont on Well-drained Soils												
2073	Indigo, Wild Yellow	<i>Baptisia tinctoria</i>	✓	✓	Perennial	Warm Season	300,000	6.89	0.44	600.00	261.36	392.04
2075	Lespedeza, Roundhead	<i>Lespedeza capitata</i>	✓	✓	Perennial	Warm Season	174,000	3.99	0.75	108.00	81.11	121.67
2078	Milkvetch, Canada	<i>Astragalus canadensis</i>	✓	✓	Perennial	Warm Season	270,500	6.21	0.48	80.00	38.65	57.97
2086	Alexander, Golden	<i>Zizia aurea</i>	✓	✓	Perennial	Warm Season	121,800	2.80	1.07	240.00	257.50	386.25
2115	Blue-eyed Grass, Narrowleaf	<i>Sisyrinchium angustifolium</i>	✓	✓	Perennial	Warm Season	757,000	17.38	0.17	160.00	27.62	41.43
2120	Butterflyweed	<i>Asclepias tuberosa</i>	✓	✓	Perennial	Warm Season	70,000	1.61	1.87	136.00	253.89	380.84
2123	Columbine, Wild	<i>Aquilegia canadensis</i>	✓	✓	Perennial	Warm Season	515,616	11.84	0.25	300.00	76.03	114.05
2152	Indian Paintbrush	<i>Castilleja coccinea</i>	✓	✓	Perennial	Warm Season	325,000	7.46	0.40	490.00	197.03	295.54
2176	Poppy, Purple	<i>Callischoe involucriata</i>	✓	✓	Perennial	Warm Season	600,000	13.77	0.22	180.00	39.20	58.81
2200	Susan, Black-eyed	<i>Rudbeckia hirta</i>	✓	✓	Biennial	Warm Season	1,575,760	36.17	0.08	20.00	1.66	2.49
Seed Density for Wildlife and Pollinator Seed Mixes at Best Dates: 30 seeds per SF drilled, 45 seeds per SF broadcast												
Seed Density for Wildlife and Pollinator Seed Mixes before Best Dates: 45 seeds per SF drilled, 70 seeds per SF broadcast												
Wildlife Mix: no more than 50% native grass by seeds per SF												
Pollinator Mix: 2 native grasses and 9 native legumes and forbs												
Pollinator Mix: no more than 20% native grass by seeds per SF												

Exhibit D

Natural Regrowth at SSEC



Site C - 1 year regrowth, winter



Site A - 1.5 years regrowth



Site A – 1.5 years regrowth



Site A – 1 years regrowth