PHILIP M. SMALL
ATTORNEY-AT-LAW

Direct: 860-509-6575
Fax: 860-509-6675
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185 Asylum
Street
Hartford
Connecticut
06103
tel 860.509.6500
fax 860.509.6501

February 16, 2016

VIA ELECTRONIC MAIL AND OVERNIGHT DELIVERY

Mr. Robert Stein, Chairman
Connecticut Siting Council
Ten Franklin Square
New Britain, CT 06051

Re: Petition No. 1195 – SolarCity Corporation petition for a declaratory ruling that no Certificate of Environmental Compatibility and Public Need is required for the proposed construction and operation of a 4.05 Megawatt Community Shared Solar Photovoltaic Electric Generating facility located on municipally-owned property at 1240 Poquonnock Road, Groton, Connecticut -- Development and Management Plan

Dear Chairman Stein:

Enclosed, as a bulk filing, is one hard copy and a disk containing SolarCity Corporation's Development and Management Plan as required by the Connecticut Siting Council's ruling on Petition No. 1195.

Please contact me at 860-509-6575 with any questions or if you need additional information.

Very truly yours,

BROWN RUDNICK LLP

By: _____
Philip M. Small
Counsel for SolarCity Corporation

PMS/jmb
Enclosure

62387157 v1-WorkSiteUS-031819/0001

PETITION NO. 1195 -- SOLARCITY CORPORATION
DEVELOPMENT AND MANAGEMENT PLAN

FEBRUARY 9, 2016

a) A final plan of site development to include specifications for the solar panels, supporting infrastructure, electrical equipment, equipment compound, access, including fencing and entrance gates, and maintenance roads, utility connections, and landscaping **-- See attached Exhibit A, Site Development Plan.**

b) Construction details for site clearing, site phasing, grading, water drainage, and erosion and sedimentation controls consistent with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control, as amended **-- See attached Exhibit A, Site Development Plan.**

c) Report regarding Natural Diversity Database plants in the vicinity of the project and plans to protect such species in the vicinity of project, as applicable – **See attached Exhibit B, Rare Plant Report and Exhibit A, Site Development Plan, Sheet 9.**

d) Plans to protect the bald eagle and other breeding birds including plans to relocate the osprey nesting platforms in consultation with the Department of Energy and Environmental Protection -- **Exhibit A, Site Development Plan, Sheet 5 and Sheet 6.**

e) A final Stormwater Management Report and associated site plans stamped by a Professional Engineer -- **See attached Exhibit C, Stormwater Management Report.**

f) Final wetland and vernal pool protection and reforestation plans -- **See attached Exhibit D, Wetland and Public Water Supply Protection Program and Exhibit E, Tree Count Investigation & Replanting Assessment.**

g) Construction work hours and days of work **-- Hours of operation for the driving of the support posts will be limited to 8:00am-5:00pm, seven days a week. Other general site activities will occur as proposed between 7:00am to 7:00pm, seven days a week. These work hours are consistent with information received from the Town of Groton's Manager of Inspection Services. Please note that the on-site work is expected to take approximately 12 weeks.**

h) All Points Technology has been assigned as the environmental monitor for the project.

i) Note on disposal of wood chips - All wood chips generated by the proposed project shall be removed off site for proper disposal. Spreading of wood chips on site can adversely affect soil conditions, resulting in potential impact to rare plant species known to occur within the Project Areas.

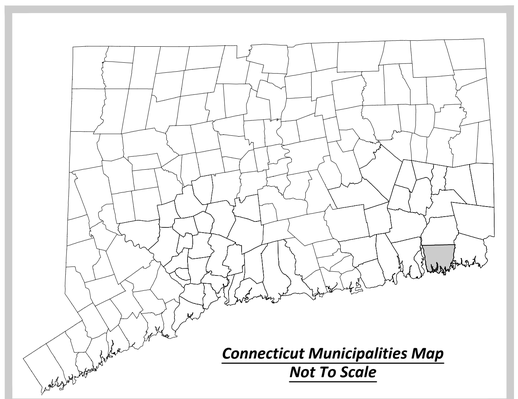
   As a majority of the listed rare plant species occur in sandy exposed soils, spreading of wood chips on-site will impact these types of potential habitats in two ways. First, wood

chips would shade out potential habitat and smother either existing rare plant occurrences, or reduce the quality for potential future volunteer rare plant species that occur in these open sandy/barren soil types. Secondly, wood chips will eventually decompose releasing nutrients into the nutrient poor top soil that is preferred by the rare plant species. Release of nutrients would promote growth of less desirable grass and weed species that would outcompete and displace rare plant species. Therefore, in order to protect existing and future rare plant species habitat, all wood chips generated by the project shall be removed off-site for proper disposal.

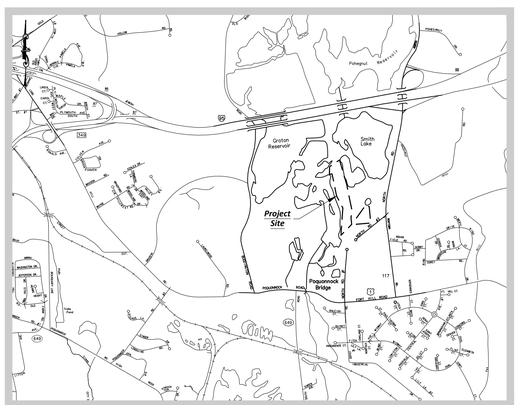
EXHIBIT A – Site Development Plan

POQUONNOCK ROAD SOLAR PROJECT
DEVELOPMENT AND MANAGEMENT PLAN
SolarCity Corporation
1240 Poquonnock Road - Groton, Connecticut
October 2015

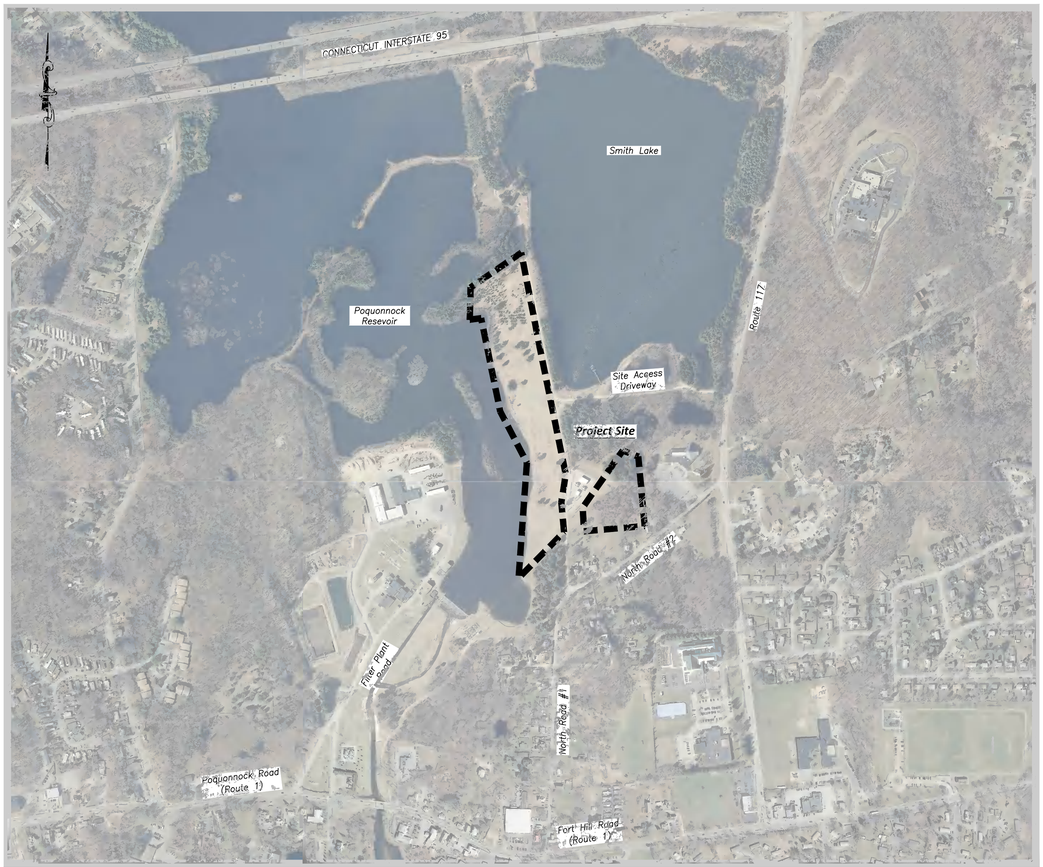
Revision "A" - Per Groton Utilities Comments - 12/09/15
Revision "B" - Add Environmental Notes - 2/09/16



Connecticut Municipalities Map
Not To Scale



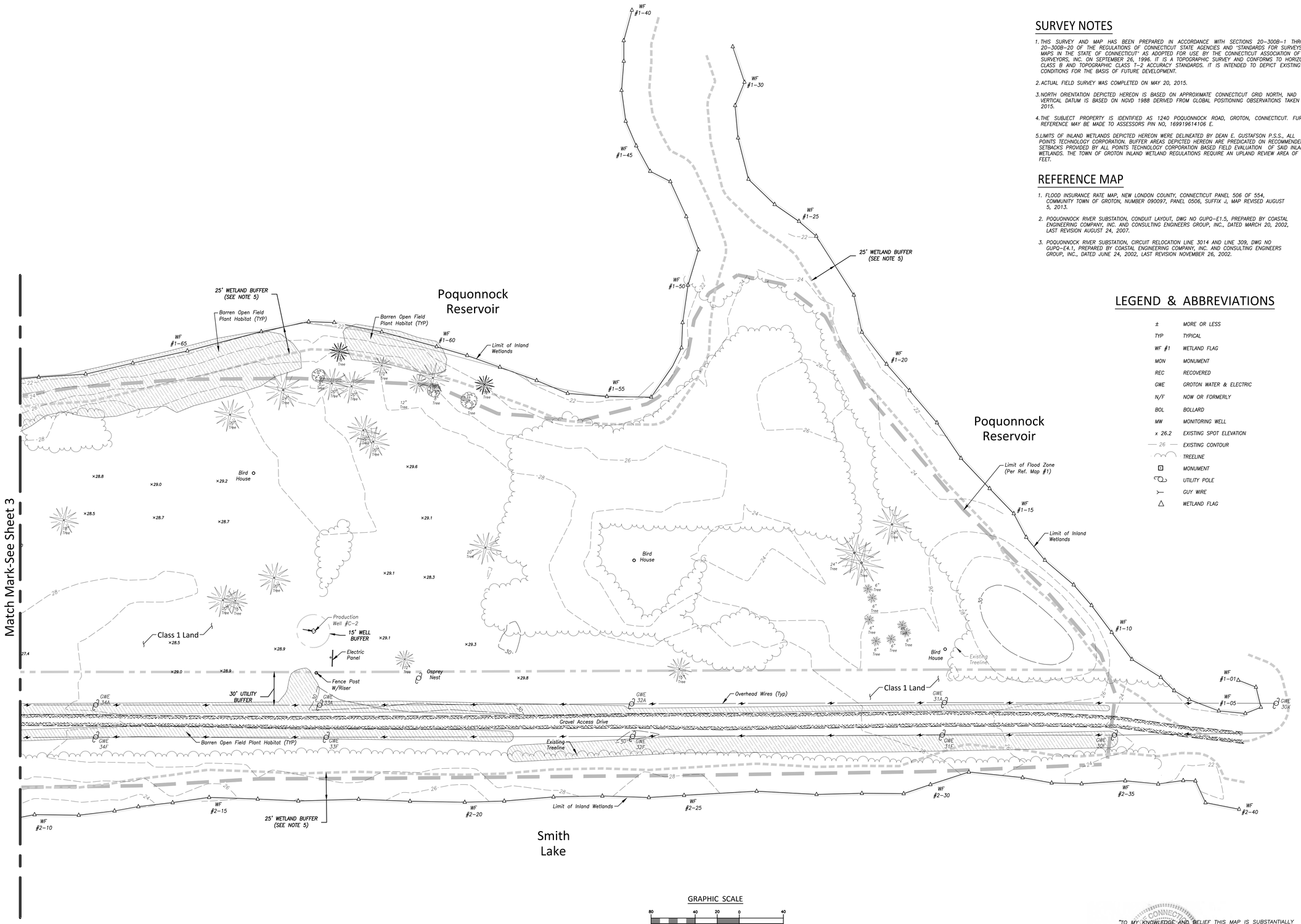
Site Location Map
Scale: 1"=2000'



Site Location Aerial View
Not To Scale

Project Information	
Developed By:	***Electrical Engineer:***
Brightfields Development, LLC *40 Walnut Street, Suite 301* *Wellesley, MA 02481*	*SolarCity Corporation* *714 Brook Street* *Rocky Hill, CT 06067*
SolarCity Corporation *714 Brook Street* *Rocky Hill, CT 06067*	***Host:*** *City of Groton* *295 Meridian Street* *Groton, CT 06340*
Civil Engineer:	***Utility:***
Boundaries LLC *179 Pachaug River Drive* *Griswold, CT 06351*	*Groton Utilities* *295 Meridian Street* *Groton, CT 06340*

Index To Drawings



SURVEY NOTES

1. THIS SURVEY AND MAP HAS BEEN PREPARED IN ACCORDANCE WITH SECTIONS 20-300B-1 THROUGH 20-300B-20 OF THE REGULATIONS OF CONNECTICUT STATE AGENCIES AND "STANDARDS FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" AS ADOPTED FOR USE BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS, INC. ON SEPTEMBER 26, 1996. IT IS A TOPOGRAPHIC SURVEY AND CONFORMS TO HORIZONTAL CLASS B AND TOPOGRAPHIC CLASS T-2 ACCURACY STANDARDS. IT IS INTENDED TO DEPICT EXISTING SITE CONDITIONS FOR THE BASIS OF FUTURE DEVELOPMENT.
2. ACTUAL FIELD SURVEY WAS COMPLETED ON MAY 20, 2015.
3. NORTH ORIENTATION DEPICTED HEREON IS BASED ON APPROXIMATE CONNECTICUT GRID NORTH, NAD 1983, VERTICAL DATUM IS BASED ON NGVD 1988 DERIVED FROM GLOBAL POSITIONING OBSERVATIONS TAKEN MAY 2015.
4. THE SUBJECT PROPERTY IS IDENTIFIED AS 1240 POQUONNOCK ROAD, GROTON, CONNECTICUT. FURTHER REFERENCE MAY BE MADE TO ASSESSORS PIN NO, 1699196141O6 E.
5. LIMITS OF INLAND WETLANDS DEPICTED HEREON WERE DELINEATED BY DEAN E. GUSTAFSON P.S.S., ALL POINTS TECHNOLOGY CORPORATION. BUFFER AREAS DEPICTED HEREON ARE PREDICATED ON RECOMMENDED SETBACKS PROVIDED BY ALL POINTS TECHNOLOGY CORPORATION BASED FIELD EVALUATION OF SAID INLAND WETLANDS. THE TOWN OF GROTON INLAND WETLAND REGULATIONS REQUIRE AN UPLAND REVIEW AREA OF 100 FEET.

REFERENCE MAP

1. FLOOD INSURANCE RATE MAP, NEW LONDON COUNTY, CONNECTICUT PANEL 506 OF 554, COMMUNITY TOWN OF GROTON, NUMBER 090097, PANEL 0506, SUFFIX J, MAP REVISED AUGUST 5, 2013.
2. POQUONNOCK RIVER SUBSTATION, CONDUIT LAYOUT, DWG NO CUPO-E1.5, PREPARED BY COASTAL ENGINEERING COMPANY, INC. AND CONSULTING ENGINEERS GROUP, INC., DATED MARCH 20, 2002, LAST REVISION AUGUST 24, 2007.
3. POQUONNOCK RIVER SUBSTATION, CIRCUIT RELOCATION LINE 3014 AND LINE 309, DWG NO GUPO-E4.1, PREPARED BY COASTAL ENGINEERING COMPANY, INC. AND CONSULTING ENGINEERS GROUP, INC., DATED JUNE 24, 2002, LAST REVISION NOVEMBER 26, 2002.

LEGEND & ABBREVIATIONS

±	MORE OR LESS
TYP	TYPICAL
WF #1	WETLAND FLAG
MON	MONUMENT
REC	RECOVERED
GWE	GROTON WATER & ELECTRIC
N/F	NOW OR FORMERLY
BOL	BOLLARD
MW	MONITORING WELL
x 26.2	EXISTING SPOT ELEVATION
26	EXISTING CONTOUR
	TREELINE
	MONUMENT
	UTILITY POLE
	GUY WIRE
	WETLAND FLAG

GRAPHIC SCALE

80 40 20 0 40

(IN FEET)
1 inch = 40 ft.

"TO MY KNOWLEDGE AND BELIEF THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON."

JOHN U. FAULISE JR. L.S. | 70016 LICENSE NO. | 2-9-2016 DATE

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www.solarbrownfields.com

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Rocky Hill, CT 06067
www.solarcity.com

SolarCity Corporation
Proposed Solar Photovoltaic System
1240 Poquonnock Road
Groton, Connecticut
Topographic Survey-Existing Conditions

SCALE: 1"=40'
DATE: October 2015
JOB I.D. NO. 15-2347

Revisions
Rev. A - Per Groton Utilities Comments - 12/09/15
Rev. B - Add Environmental Notes - 2/09/16

SHEET NO.
2
10

Poquonnock Reservoir

Smith Lake

Subject Property
The City of Groton
Volume 210 Page 679

N/F
Todd W. Johnson
Volume 1103 Page 946
& Volume 625 Page 978

N/F
The City of Groton
Volume 210 Page 679 &
Volume 201 Page 524

N/F
Michelle Lucretia Messina
Volume 780 Page 854

N/F
Town of Groton
Volume 530 Page 110

N/F
Randi J. Crowe &
Norbert Carroca
Volume 902 Page 185

N/F
Laurel J. Rodgers
Volume 287 Page 250

Class 1 Land
Class 2 Land
Match Mark-See Sheet 2
Osprey Nest
Osprey Nest Pole #27
Bird House
WF #90
WF #85
WF #80
WF #75
WF #70
WF #3-01
WF #3-05
WF #3-10
WF #3-15
WF #3-20
WF #3-25
WF #4-5
WF #4-10
WF #4-15
WF #2-05
WF #2-01
25' WETLAND BUFFER (SEE NOTE 5)
20' (MIN) WATER MAIN CORRIDOR (TYP)
30' UTILITY BUFFER
Approximate Water Main Location (From Groton Public Utilities)
Approximate Water Main (From Groton Public Utilities)
Limit of Inland Wetlands
Limit of Flood Zone (See Note #5)
Approximate Buried Electrical Conduit (Typ) (From Groton Public Utilities)
Approximate Buried TeleComm Conduit (Typ) (From Groton Public Utilities)
Barren Open Field Plant Habitat (TYP)
Overhead Wires (Typ)
Chain-Link Fence
(2) Utility Access Covers
(3) Utility Access Covers
Transformer
Edge of Crushed Stone
Poquonnock Substation
Vernal Pool #1
Vernal Pool #3
LIMIT OF VERNAL POOL NON-DISTURBANCE AREA (SEE NOTE 5)
100' Regulated Area (See Note 5)
Existing Treeline
Gravel Access Drive
Water Meter
Approximate Property Line
Mon Rec
BENCHMARK
Spike Set in GWE
Elev=28.38
GWE 38F
GWE 37F W/UG
GWE 37AW/UGE
GWE 0-381-5
GWE 0-381-6 W/UG
GWE 36A W/UG
GWE 35A
GWE 35F
GWE 34.5F
Gravel
Bol
Mon Rec
Tree

GRAPHIC SCALE
80 40 20 0 40
(IN FEET)
1 inch = 40 ft.

"TO MY KNOWLEDGE AND BELIEF THIS MAP IS SUBSTANTIALLY CORRECT AS NOTED HEREON."

JOHN U. FAULISE JR. L.S. | 70016 LICENSE NO. | 2-9-2016 DATE

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SCALE: 1"=40'
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JOB I.D. NO. 15-2347

Revisions
Rev. A - Per Groton Utilities Comments - 12/09/15
Rev. B - Add Environmental Notes - 2/09/16

SHEET NO.
3
10

GRAPHIC SCALE

200 100 50 0 100

(IN FEET)
1 inch = 100 ft.

POTENTIAL PHASE 2 SOLAR PV ARRAY

GRAPHIC SCALE

80 40 20 0 40

(IN FEET)
1 inch = 40 ft.

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1240 Poquonnock Road
Groton, Connecticut
Site Logistics Plan

SCALE: As Noted

DATE: October 2015

JOB I.D. NO. 15-2347

Revisions

Rev. A - Per Groton Utilities Comments - 12/09/15

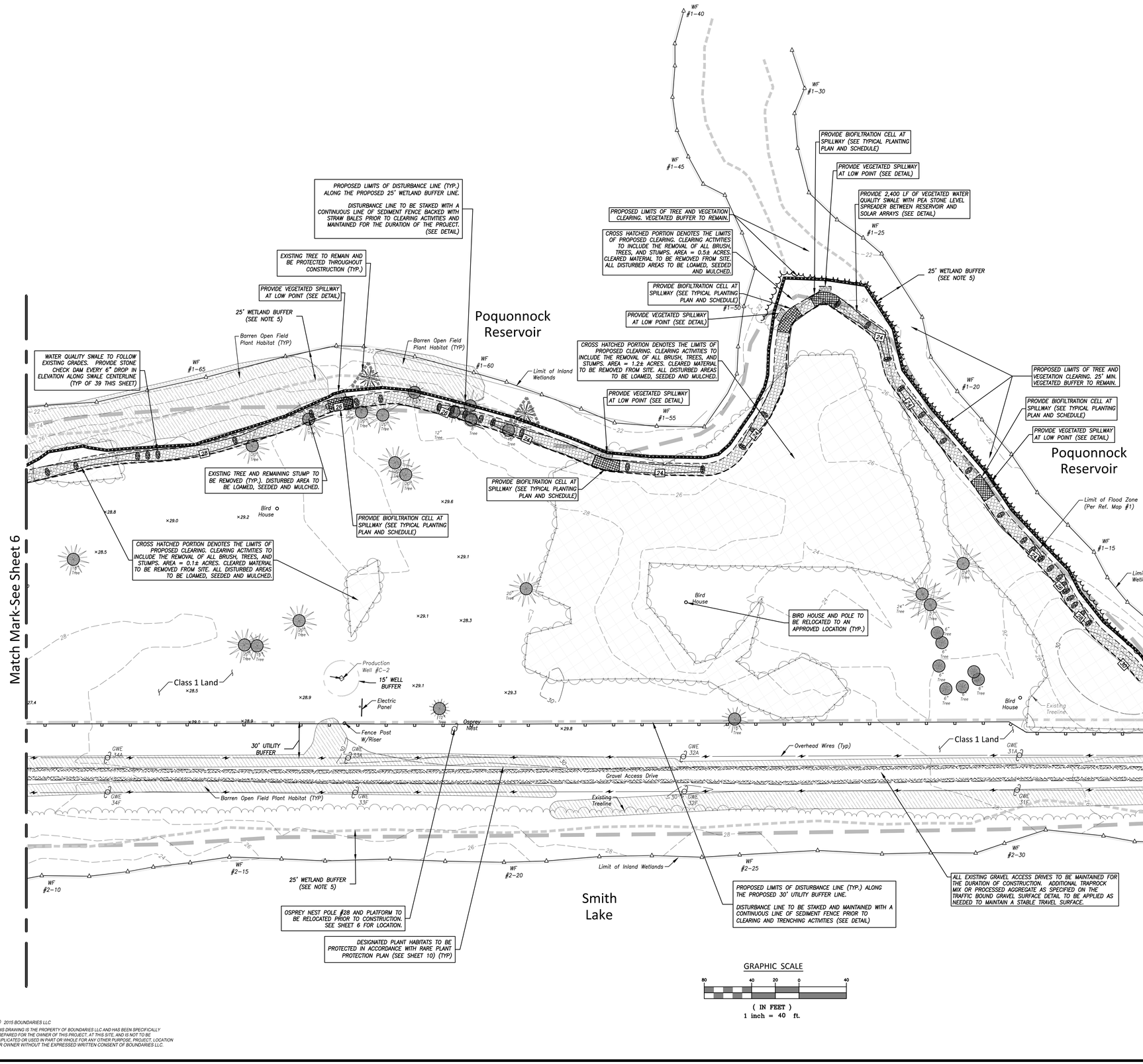
Rev. B - Add Environmental Notes - 2/09/16

SHEET NO.

4

10

STATE OF CONNECTICUT · DAVID C. ACKLEY · 29102 · LICENSED · PROFESSIONAL ENGINEER



LEGEND & ABBREVIATIONS

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WF #1	WETLAND FLAG
MON	MONUMENT
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GWE	GROTON WATER & ELECTRIC
N/F	NOW OR FORMERLY
BOL	BOLLARD
MW	MONITORING WELL
× 26.2	EXISTING SPOT ELEVATION
26	EXISTING CONTOUR
	TREELINE
	MONUMENT
	UTILITY POLE
	GUY WIRE
	WETLAND FLAG

GRAPHIC SCALE

80 40 20 0 40

(IN FEET)

1 inch = 40 ft.

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1240 Poquonnock Road
Groton, Connecticut
Site Preparation and Demolition Plan

SCALE: 1"=40'

DATE: October 2015

JOB I.D. NO. 15-2347

Revisions

Rev. A - Per Groton Utilities Comments - 12/09/15

Rev. B - Add Environmental Notes - 2/09/16

SHEET NO.

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STATE OF CONNECTICUT · DAVID G. McKAY · 29102 · LICENSED PROFESSIONAL ENGINEER

OSPREY NEST PLATFORM TO BE PROTECTED FOR THE DURATION OF CONSTRUCTION.

BIRD HOUSE AND POLE TO BE RELOCATED TO AN APPROVED LOCATION (TYP.)

PROPOSED LIMITS OF DISTURBANCE LINE (TYP.) ALONG THE PROPOSED 25' WETLAND BUFFER LINE.

DISTURBANCE LINE TO BE STAKED WITH A CONTINUOUS LINE OF SEDIMENT FENCE BACKED WITH STRAW BALES PRIOR TO CLEARING ACTIVITIES AND MAINTAINED FOR THE DURATION OF THE PROJECT. (SEE DETAIL).

25' WETLAND BUFFER (SEE NOTE 5)

Approximate Water Main Location (From Groton Public Utilities)

Limit of Inland Wetlands

20' (MIN) WATER MAIN CORRIDOR (TYP)

EXISTING TREE AND REMAINING STUMP TO BE REMOVED (TYP.). DISTURBED AREA TO BE LOAMED, SEEDED AND MULCHED.

OSPREY NEST POLE #27 AND PLATFORM TO BE RELOCATED PRIOR TO CONSTRUCTION. SEE THIS SHEET FOR LOCATION.

PROVIDE 2,400 LF OF VEGETATED WATER QUALITY SWALE WITH PEA STONE LEVEL SPREADER BETWEEN RESERVOIR AND SOLAR ARRAYS (SEE DETAIL)

EXISTING TREE TO REMAIN AND BE PROTECTED THROUGHOUT CONSTRUCTION (TYP.)

PROPOSED LOCATION FOR OSPREY NEST POLE #27 AND PLATFORM. RELOCATION TO BE COORDINATED WITH ENVIRONMENTAL MONITOR.

WATER QUALITY SWALE TO FOLLOW EXISTING GRADES. PROVIDE STONE CHECK DAM EVERY 6" DROP IN ELEVATION ALONG SWALE CENTERLINE (TYP OF 22 THIS SHEET)

PROVIDE VEGETATED SPILLWAY AT LOW POINT (SEE DETAIL)

PROVIDE BIOFILTRATION CELL AT SPILLWAY (SEE TYPICAL PLANTING PLAN AND SCHEDULE)

Poquonnock Reservoir

Class 1 Land

Class 2 Land

Bird House

Barren Open Field Plant Habitat (TYP)

Limit of Flood Zone (See Note #5)

PROPOSED LIMITS OF DISTURBANCE LINE (TYP.) ALONG THE PROPOSED 30' UTILITY BUFFER LINE.

DISTURBANCE LINE TO BE STAKED AND MAINTAINED WITH A CONTINUOUS LINE OF SEDIMENT FENCE IMMEDIATELY FOLLOWING CLEARING ACTIVITIES (SEE DETAIL)

30' UTILITY BUFFER

MAINTAIN HIGH POINT IN SWALE AT WATER MAIN CROSSING. PROTECT EXISTING WATER MAIN DURING CONSTRUCTION.

PROVIDE BIOFILTRATION CELL AT SPILLWAY (SEE TYPICAL PLANTING PLAN AND SCHEDULE)

PROPOSED LIMITS OF DISTURBANCE LINE (TYP.) ALONG THE PROPOSED 30' UTILITY BUFFER LINE.

DISTURBANCE LINE TO BE STAKED AND MAINTAINED WITH A CONTINUOUS LINE OF SEDIMENT FENCE PRIOR TO CLEARING AND TRENCHING ACTIVITIES (SEE DETAIL)

Approximate Buried Electrical Conduit (Typ) (From Groton Public Utilities)

Approximate Water Main (From Groton Public Utilities)

Approximate Buried TeleComm Conduit (Typ) (From Groton Public Utilities)

Chain-Link Fence

Transformer

(2) Utility Access Covers

(3) Utility Access Covers

Edge of Crushed Stone

Poquonnock Substation

Barren Open Field Plant Habitat (TYP)

Overhead Wires (Typ)

LIMIT OF VERNAL POOL NON-DISTURBANCE AREA (SEE NOTE 5)

DESIGNATED PLANT HABITATS TO BE PROTECTED IN ACCORDANCE WITH RARE PLANT PROTECTION PLAN (SEE SHEET 10) (TYP)

Vernal Pool #1

Vernal Pool #3

Limit of Inland Wetlands

Existing Treeline

BENCHMARK
Spike Set in GWE
Elev=28.38

Gravel Access Drive

Water Meter

PROPOSED LOCATION FOR OSPREY NEST POLE #28 AND PLATFORM. RELOCATION TO BE COORDINATED WITH ENVIRONMENTAL MONITOR

ALL EXISTING GRAVEL ACCESS DRIVES TO BE MAINTAINED FOR THE DURATION OF CONSTRUCTION. ADDITIONAL TRAPROCK MIX OR PROCESSED AGGREGATE AS SPECIFIED ON THE TRAFFIC BOUND GRAVEL SURFACE DETAIL TO BE APPLIED AS NEEDED TO MAINTAIN A STABLE TRAVEL SURFACE.

Smith Lake

Limit of Flood Zone (Per Ref. Map #1)

PROVIDE 375 LF OF EMBEDDED CRUSHED STONE CHECK DAM (SEE DETAIL)

PROVIDE GREEN GIANT ARBORVITAE HEDGE ROW (8' SPACING) (SEE PLANTING DETAIL)

THOC2 58

PROPOSED LIMITS OF DISTURBANCE LINE ALONG EXISTING CHAIN LINK FENCE. DISTURBANCE LINE TO BE STAKED AND MAINTAINED WITH A CONTINUOUS LINE OF SEDIMENT FENCE (1000'±) PRIOR TO CLEARING ACTIVITIES (SEE DETAIL)

CROSS HATCHED PORTION DENOTES THE LIMITS OF PROPOSED CLEARING. CLEARING ACTIVITIES TO INCLUDE THE REMOVAL OF ALL BRUSH, TREES, AND STUMPS. AREA = 1.4± ACRES. CLEARED MATERIAL TO BE REMOVED FROM SITE. ALL DISTURBED AREAS TO BE LOAMED, SEEDED AND MULCHED.

PROVIDE CONTINUOUS LINE OF SEDIMENT FENCE (330'±) DOWNGRADIENT OF PROPOSED ELECTRICAL CONDUIT PRIOR TO TRENCH EXCAVATION (SEE DETAIL)

PROPOSED LIMITS OF DISTURBANCE LINE (TYP.) ALONG A PORTION OF THE PROPOSED VERNAL POOL NON- DISTURBANCE AREA.

DISTURBANCE LINE TO BE STAKED WITH A CONTINUOUS LINE OF SEDIMENT FENCE BACKED WITH STRAW BALES PRIOR TO CLEARING ACTIVITIES AND MAINTAINED FOR THE DURATION OF THE PROJECT. (SEE DETAIL) (END STRAW BALES AT CHAIN LINK FENCE, TYP. BOTH ENDS)

PROPOSED LIMITS OF TREE AND VEGETATION CLEARING. VEGETATED BUFFER TO REMAIN.

CROSS HATCHED PORTION DENOTES THE LIMITS OF PROPOSED CLEARING. CLEARING ACTIVITIES TO INCLUDE THE REMOVAL OF ALL BRUSH, TREES, AND STUMPS. AREA = 0.7± ACRES. CLEARED MATERIAL TO BE REMOVED FROM SITE. ALL DISTURBED AREAS TO BE LOAMED, SEEDED AND MULCHED.

100' Regulated Area (See Note 5)

Approximate Property Line

Match Mark-See Sheet 5

GRAPHIC SCALE

80 40 20 0 40

(IN FEET)
1 inch = 40 ft.

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SolarCity Corporation
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Site Preparation and Demolition Plan

SCALE: 1"=40'

DATE: October 2015

JOB I.D. NO. 15-2347

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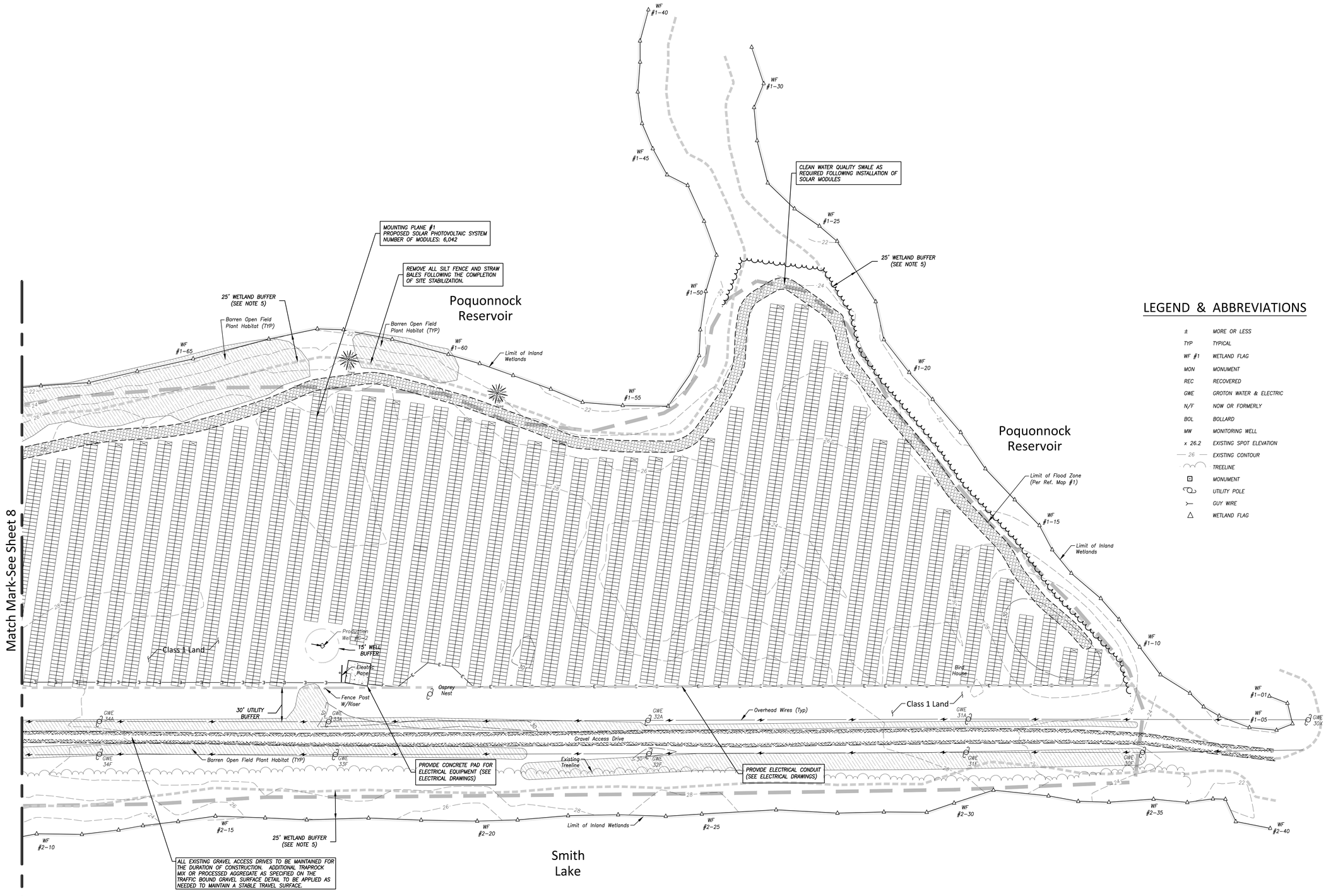
Rev. B - Add Environmental Notes - 2/09/16

SHEET NO.

6

10

STATE OF CONNECTICUT · DAVID C. McKAY · 29102 · LICENSED PROFESSIONAL ENGINEER



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1240 Poquonnock Road
Groton, Connecticut
Site Development Plan Solar Modules and Infrastructure

SCALE:	1"=40'
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JOB I.D. NO.	15-2347

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SHEET NO.

7 / 10

STATE OF CONNECTICUT
DAVID C. MOSAY
29102
LICENSED PROFESSIONAL ENGINEER

Poquonnock Reservoir

Smith Lake

Match Mark-See Sheet 7

Osprey Nest

WF #90

25' WETLAND BUFFER (SEE NOTE 5)

Approximate Water Main Location (From Groton Public Utilities)

Limit of Inland Wetlands

20' (MIN) WATER MAIN CORRIDOR (TYP)

WF #85

MOUNTING PLANE #2
PROPOSED SOLAR PHOTOVOLTAIC SYSTEM
NUMBER OF MODULES: 2,850

Class 1 Land

Osprey Nest Date #27

REMOVE ALL SILT FENCE AND STRAW BALES FOLLOWING THE COMPLETION OF SITE STABILIZATION.

RELOCATED OSPREY NEST POLE #27

Limit of Flood Zone (See Note #5)

WF #75

WF #80

Tree

Barren Open Field Plant Habitat (TYP)

WF #70

20' (MIN) WATER MAIN CORRIDOR (TYP)

GWE 38F

30' UTILITY BUFFER

Class 1 Land
Class 2 Land

Approximate Water Main (From Groton Public Utilities)

Mon Rec

GWE 37F W/UG

Gravel Access Drive

GWE 37AW/UG

Approximate Buried Electrical Conduit (Typ) (From Groton Public Utilities)

PROTECT EXISTING UTILITIES DURING CONDUIT INSTALLATION (TYP)

Barren Open Field Plant Habitat (TYP)

Overhead Wires (Typ)

30' UTILITY BUFFER

GWE 35A W/UG

Class 1 Land

Chain-Link Fence

Bol

Transformer

Bol

Bol

GWE 0-381-5

GWE 0-381-6 W/UG

(2) Utility Access Covers

Approximate Buried TeleComm Conduit (Typ) (From Groton Public Utilities)

(3) Utility Access Covers

Edge of Crushed Stone

Chain-Link Fence

Approximate Property Line

Mon Rec

MAINTAIN PROPOSED GREEN GIANT ARBORVITAE HEDGEROW AS REQUIRED

REPAIR CRUSHED STONE CHECK DAM AS REQUIRED FOLLOWING INSTALLATION OF SOLAR MODULES

PROVIDE CONCRETE PAD FOR ELECTRICAL EQUIPMENT (SEE ELECTRICAL DRAWINGS)

Poquonnock Substation

WF #3-05

MAINTAIN REQUIRED CLEARANCES FROM OVERHEAD UTILITIES DURING CONDUIT INSTALLATION (TYP)

WF #3-10

Limit of Inland Wetlands

WF #3-15

LIMIT OF VERNAL POOL NON-DISTURBANCE AREA (SEE NOTE 5)

PROVIDE CONCRETE PAD FOR ELECTRICAL EQUIPMENT (SEE ELECTRICAL DRAWINGS)

PROPOSED POINT OF INTERCONNECTION (SEE ELECTRICAL DRAWINGS)

RELOCATED OSPREY NEST POLE #28

BENCHMARK
Spike Set in GWE
Elev=28.36

WF #3-01

Vernal Pool #1

WF #3-25

WF #3-20

PROVIDE ELECTRICAL CONDUIT (SEE ELECTRICAL DRAWINGS)

ALL EXISTING GRAVEL ACCESS DRIVES TO BE MAINTAINED FOR THE DURATION OF CONSTRUCTION. ADDITIONAL TRAPROCK MIX OR PROCESSED AGGREGATE AS SPECIFIED ON THE TRAFFIC BOUND GRAVEL SURFACE DETAIL TO BE APPLIED AS NEEDED TO MAINTAIN A STABLE TRAVEL SURFACE.

Water Meter

Limit of Inland Wetlands

WF #2-05

Existing Treeline

LIMIT OF VERNAL POOL NON-DISTURBANCE AREA (SEE NOTE 5)

Class 1 Land
Class 2 Land

PROVIDE CONCRETE PAD FOR ELECTRICAL EQUIPMENT (SEE ELECTRICAL DRAWINGS)

MOUNTING PLANE #3
PROPOSED SOLAR PHOTOVOLTAIC SYSTEM
NUMBER OF MODULES: 3,572

Limit of Flood Zone (Per Ref. Map #1)

WF #2-01

REMOVE ALL SILT FENCE FOLLOWING THE COMPLETION OF SITE STABILIZATION. WOOD CHIP BERM TO REMAIN.

Class 2 Land
Class 1 Land

100' Regulated Area (See Note 5)

WF #4-10

Limit of Inland Wetlands

Chain-Link Fence

WF #4-5

Vernal Pool #3

WF #4-15

Approximate Property Line

GRAPHIC SCALE

80 40 20 0 40

(IN FEET)
1 inch = 40 ft.

STATE OF CONNECTICUT
DAVID C. McKAY
29102
LICENSED PROFESSIONAL ENGINEER

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Wellesley, MA 02481
www.solarbrownfields.com

SolarCity
714 Brook Street
Rocky Hill, CT 06067
www.solarcity.com

SolarCity Corporation
Proposed Solar Photovoltaic System
1240 Poquonnock Road
Groton, Connecticut
Site Development Plan Solar Modules And Infrastructure

SCALE: 1"=40'

DATE: October 2015

JOB I.D. NO. 15-2347

Revisions

Rev. A - Per Groton Utilities Comments - 12/09/15

Rev. B - Add Environmental Notes - 2/09/16

SHEET NO.

8 / 10

Reference Is Made To:

1. Connecticut Guidelines For Soil Erosion and Sediment Control, MAY 2002.
2. Soil Survey Of New London County Connecticut, U.S.D.A. Soil Conservation Service.

Development Schedule:

Prior to the start of construction, the contractor is to schedule a mandatory preconstruction meeting on site to discuss issues as they relate to the proposed project. These issues will include but not be limited to:

1. Resource Protection.
2. Construction Vehicle Access and Parking.
3. Construction Methods and Scheduling.
4. Existing site utilities and mark-out coordination.
5. Material delivery and stockpiling.
6. Site Inspection procedures and As-Built drawings.

General Sequence of Construction:

1. Secure all necessary local, state, and federal permits. Register for all applicable state and federal permits as required.
2. Install anti-tracking pad at construction entrance and sediment fence backed with straw bales along proposed clearing limits.
3. Clear and remove all trees within the proposed clearing limits. Wood chips to be removed from site as indicated in Wood Chip Disposal Notes.
4. Install sediment fence backed with straw bales as shown down gradient of proposed development area.
5. Grub stumps in cleared areas and restore disturbed areas by loaming, seeding and mulching. Stockpile excess topsoil for use in site restoration. Seed these stockpiles with ryegrass and surround with sediment fence or staked straw bales. All stumps are to be ground or disposed of off-site at a location approved to accept stumps.
6. Install wetlands mitigation improvements and proposed solar array system. Install conduit, concrete utility pads and electrical equipment as required for harvesting power.
7. After all areas have been permanently stabilized, remove erosion control measures.

Soil Disturbance Phasing:

The project results in an estimated total soil disturbance of approximately 4.04 acres as a result of the following activities:

1. Clearing, grubbing, and restoration of Mounting Planes 1 and 2 – 1.85 acres
2. Clearing, grubbing, and restoration of Mounting Plane 3 – 2.14 acres
3. Miscellaneous site improvements (landscaping, utilities, etc.) – 0.05 acres

Each of the soil disturbing activities referenced above will be completed and disturbed areas stabilized to insure that the total disturbed area on site does not exceed 5.0 acres at any given time.

Construction Notes:

1. The Contractor shall Call Before You Dig at 811 or 1-800-922-4455 at least 72 hours, Saturdays, Sundays, and holidays excluded, prior to excavation at any location. A copy of the Call Before You Dig project reference number(s) shall be given to the Owner prior to excavation.
2. Locations of existing pipes, conduits, utilities, foundations and other underground objects are not warranted to be correct and the Contractor shall have no claim on that account should they be other than that shown.
3. Stone walls, fences, curbs, etc. shall be removed and replaced as necessary to perform the work. Unless otherwise indicated, all such work shall be incidental to construction of the project.
4. All other areas disturbed by the Contractor beyond payment limits shall be restored at no additional cost to the Owner.
5. The wetland buffer line shall be staked out in the field prior to any clearing operations.
6. All work shall be done in accordance with OSHA requirements and the contractor is responsible for compliance with these requirements. In addition, it shall be the responsibility of the Contractor to provide any excavation safeguards, necessary barricades, flagmen, etc. for traffic control and site safety.
7. All erosion & sedimentation control measures shall be installed prior to the start of construction.
8. All fuel, oil, paint or other hazardous materials used during construction should be stored in a secondary container and removed to a locked indoor area with an impervious floor during non-work hours.

Erosion Control Operation & Maintenance:

The applicant shall be responsible for the installation and maintenance of erosion and sediment control measures throughout the project. No construction shall proceed until proper sedimentation and erosion control methods have been installed as the sequence of construction necessitates.

Every precaution shall be used during construction to prevent and minimize the degradation of the existing water quality from stormwater runoff during construction. All activities shall be in conformance to and consistent with all applicable water quality standards and management practices as set forth by local, state and federal agencies.

The applicant shall appoint an onsite agent who shall be personally responsible for implementing this erosion and sediment control plan and enforcing the prescribed safeguards during the excavation and operation period.

This responsibility includes the installation and maintenance of control measures throughout the project, informing all parties engaged on site of the requirements and objectives of the plan, notifying the proper agency and officials of any transfer of this responsibility.

All erosion and sediment control measures shall be repaired, cleaned and/or replaced as necessary throughout the project in order to maintain complete and integral erosion and sediment control protection. Once in place, all erosion and sediment control measures are to remain in place in proper condition and be continuously maintained until final site restoration has been completed. Following such permanent stabilization, the erosion and sediment control measures shall be dismantled, removed, and disposed of in an approved manner. Additional erosion and sediment control measures beyond those shown on the plans or prescribed herein shall be put in place, whenever necessary, to address field conditions and/or as ordered by the engineer.

Qualified personnel provided by the applicant shall inspect disturbed areas and the locations where vehicles enter and leave the site. These areas shall be inspected at least once every seven calendar days and within twenty-four hours of the end of a storm that is 0.5 inches or greater. Additional measures beyond those indicated and/or shown on this plan set or prescribed herein shall be put in place, whenever necessary, to address field conditions and/or as required by the engineer. Where sites have been temporarily or finally stabilized, such inspection shall be conducted at least once every month for three consecutive months.

No soil, fill or other materials shall be deposited in surrounding inland wetlands.

All temporary storage and/or stockpile areas shall be properly stabilized to prevent erosion and suitably contained to prevent turbid runoff.

Dumping of oil or other deleterious materials on the ground is forbidden. The applicant shall provide a means of catching, retaining and properly disposing of drained oil, removed oil filters, or other deleterious material from equipment used on site. Vehicle maintenance shall be completed off site. All oil spills shall be immediately reported to the department of energy and environmental protection/hazardous materials office. Failure to do so may result in the imposition of fines under the applicable Connecticut General Statutes.

During construction, the applicant shall be responsible for site inspection and maintenance to assure proper performance of erosion control measures. Inspection and maintenance shall include, at a minimum, the following:

- Inspect all sediment fence and other erosion control measures. Repair or replace any damaged portion in order to insure its proper and effective operation. Remove accumulated sediment if required (greater than 4" depth).
- Inspect all stockpiles. Repair or replace any damaged portion of erosion control measures surrounding these areas in order to prevent sedimentation downgradient.
- Inspect grass restored areas. Revegetate any eroded or disturbed areas to provide permanent stabilization. Reseed and/or revegetate any areas that do not have a suitable stand of grass or any scoured areas to provide permanent stabilization.
- Inspect anti-tracking pad. Remove and dispose of pad and replace if pad is no longer functioning efficiently or accumulated sediment is to a depth of 2" below the stone surface.
- Inspect all access roadways. Stabilize surface as needed.
- Inspect downgradient areas of all solar arrays. Stabilize any eroded areas if found.

Erosion and Sediment Control Best Management Practices (BMP'S)

Minimize Disturbed Area and Protect Natural Features and Soil:

Topsoil:

Topsoil will be removed and stockpiled on site and utilized for final grading. Additional topsoil, if required will be supplied from an off-site source. Excess materials resulting from "cut slopes" in the areas of the proposed construction that are not intended for reuse will be immediately removed from the site. When soil is stockpiled, the slope of the stockpile will not exceed 2 horizontal to 1 vertical.

Installation Schedule: As noted, excavated topsoil will be stockpiled on site. Sediment fence will be placed around any stockpiles that are not immediately removed from the site to protect the existing drainage ditches and off site areas.

Maintenance and Inspection: The cut and fill areas will be inspected weekly for erosion. These areas will be stabilized immediately with erosion controls or graded to avoid possible disturbance to the existing drainage ditches or off site areas. See also maintenance and inspection procedures for silt fence.

Control Stormwater Flowing Onto and Through the Project:

Area for Silt to accumulate:

BMP/Installation Schedule: Before any grading operations begin, sediment fence backed with straw bales will be installed adjacent to the areas under construction just outside the limits of disturbance. Other adjacent off site areas will always be protected by a sediment fence or another BMP until final stabilization is achieved.

Maintenance and Inspection: The graded areas and sediment fence will be inspected weekly to ensure that there are no structural failures and immediately after rain events.

Construction Specifications

Sediment Fence

1. The material for sediment fences should be a pervious sheet of synthetic fabric such as polypropylene, nylon, polyester, or polyethylene yarn.
2. The stakes used to anchor the filter fabric should be wood or metal. Wooden stakes should be at least 3 feet long and have a minimum diameter of 2 inches if a hardwood like oak is used. Stakes from soft woods like pine should be at least 4 inches in diameter.
3. Erect sediment fence in a continuous fashion from a single roll of fabric to eliminate gaps in the fence. If a continuous roll of fabric is not available, overlap the fabric from both directions only at stakes or posts. Overlap at least 6 inches. Excavate a trench to bury the bottom of the fabric fence at least 6 inches below the ground surface. This helps to prevent gaps from forming near the ground surface. Gaps would make the fencing useless as a sediment barrier.
4. The height of the fence posts should be 16 to 34 inches above the original ground surface. Space the posts no more than 10 feet apart.
5. The fence should be designed to withstand the runoff from a 10-year peak storm event. Once installed, it should remain in place until all areas upslope have been permanently stabilized by vegetation or other means.

Installation:

1. Dig a 6" deep trench on the uphill side of the proposed barrier location.
2. Position the posts on the downhill side of the fabric barrier and drive the post 1.5 feet into the ground.
3. Lay the bottom 6" of the fabric barrier in the trench to prevent undermining and backfill.

Maintenance:

1. Sediment should be removed once it has accumulated to 4" depth.
2. Filter fabric should be replaced whenever it has deteriorated to such an extent that the effectiveness of the fabric is reduced (approximately six months).
3. Sediment fence should remain in place until disturbed areas have been permanently stabilized.
4. All sediment accumulated at the fence should be removed and properly disposed of before the fence is removed.

Inspection:

1. Inspect sediment fence before anticipated storm events (or series of storm events such as intermittent showers over one or more days) and within 24 hours after the end of a storm event of 0.5 inches or greater, and at least once every seven calendar days, at least 72 hours apart.
2. Where sites have been finally or temporarily stabilized, such inspections may be conducted once per month.

Straw Bale Barrier

Installation

1. Excavate trench 4" and place material upslope of trench.
2. Place bales in a single row in the trench, lengthwise, with ends of adjacent bales tightly abutting one another and the bindings oriented around the sides rather than along the tops and bottoms of the bales (to avoid premature rotting of the bindings).
3. Anchor each bale with at least 2 stakes, driving the first stake in each bale toward the previously laid bale to force the bales together. Stakes must be driven a minimum of 18 inches into the ground. Fill any gaps between the bales with straw to prevent water from escaping between the bales.
4. Backfill the bales with the excavated trench material to a minimum depth of 4 inches on the uphill side of the bales. Tamp by hand or machine and compact the soil. Loose straw scattered over the disturbed area immediately uphill from the hay bale barrier tends to increase barrier efficiency.

Maintenance

1. Inspect the straw bale barrier at least once a week and within 24 hours of the end of a storm with a rainfall amount of 0.5 inch or greater to determine maintenance needs. For dewatering operations, inspect frequently before, during, and after pumping operations. Remove the sediment deposits when sediment deposits reach approximately one half the height of the barrier.
2. Replace or repair the barrier within 24 hours of observed failure. Failure of the barrier has occurred when sediment fails to be retained by the barrier because:
   (a) the barrier has been overtopped, undercut or bypassed by runoff water,
   (b) the barrier has been moved out of position, or
   (c) the straw bales have deteriorated or been damaged.
3. When repetitive failures occur at the same location, review conditions and limitations for use and determine if additional controls are needed to reduce failure rate or replace straw bale barrier.
4. Maintain the straw bale barrier until the contributing area is stabilized. After the upslope areas have been permanently stabilized, pull the stakes out of the hay bales. Remove sediment.

Dust Control:

Dust from the site will be controlled by using a mobile pressure-type distributor truck that will apply potable water at rate of 300 gallons per acre and minimized as needed to avoid ponding.

Installation Schedule: Dust control will be implemented as needed once site grading has been initiated, and during windy conditions exceeding 20mph, while site grading is occurring. Spraying of potable water will be performed once per day during the months of March through May and no more than three times per day from June to September or whenever dryness of soil warrants it.

Maintenance Schedule: At least one mobile unit will be available at all times during construction to apply potable water. Each mobile unit shall be equipped with a positive shutoff valve to prevent over watering of disturbed areas.

Soil Stabilization:

Temporary Stabilization:

BMP Description: Hydromulching will be used on slopes where construction will cease for more than 14 days and over the winter months to stabilize erodible materials. Straw mulch and wood fiber will be mixed with a tackifier and applied uniformly by machine with an application rate of 2 tons (100-200 bales) per acre. The contractor will use crimping equipment to bind the mulch to the soil if the tackifier is not effective. Netting will be used on small areas with steep slopes. In areas where hydromulching is inaccessible, straw mulch will be applied by hand at the same application rate.

Temporary Seeding will be used on any area where construction activity is suspended for more than twenty-one days to stabilize erodible materials. Refer to the Erosion Control Plan for guidance on seeding mixtures, rates, and acceptable planting dates for temporary seeding.

Installation Schedule: Portions of the site where construction activities will temporarily cease for more than 14 days will be stabilized with mulch. Where construction activities will temporarily cease for more than 21 days it will be temporarily seeded. Winter stabilization will be provided between December 25 and March 30.

Maintenance and Inspection: Mulched areas will be inspected weekly to ensure that adequate coverage is provided. Repairs will be conducted as needed.

Seed Mixture For Temporary Seeding

	LBS./ACRE	LBS./1000 S.F.
Annual Ryegrass	40	1.0

See Figure TS-2 in the 2002 Guidelines for additional temporary seed mixes.

Final Stabilization:

Permanent seeding should be applied immediately after the final design grades are achieved at the site but no later than 14 days after construction activities have permanently ceased. After the entire site is stabilized, any sediment that has accumulated will be removed and hauled off site to a licensed landfill facility. Construction debris, trash, and temporary BMP's will also be removed and any areas disturbed during removal will be seeded immediately.

Seedbed Preparation:

1. Topsoil will be spread over final graded areas at a minimum depth of four inches. Topsoil shall inclusively mean a soil meeting one of the following soil textural classes established by the United States Department of Agriculture classification system based upon the proportion of sand, silt, and clay size particles after passing a 2 millimeter (mm) sieve and subjected to a particle size analysis:
   1.1. Loamy sand, including coarse, loamy fine, and loamy very fine sand, sandy loam, including coarse, fine and very fine sandy loam, loam, or silt loam with not more than 60% silt;
   1.2. Containing not less than 6% and not more than 20% organic matter as determined by loss-on-ignition of oven dried samples dried at 105 degrees centigrade;
   1.3. Possessing a ph range of 6.0-7.5, except if the vegetative practice being used specifically requires a lower ph, then ph may be adjusted accordingly;
   1.4. Having soluble salts not exceeding 500 ppm;
   1.5. And that is loose and friable and free from refuse, stumps, roots, brush, weeds, frozen particles, rocks, and stones over 1.25 inches in diameter, and any material that will prevent the formation of a suitable seedbed or prevent seed germination and plant growth.
2. Fertilizer will be applied to the seedbed as needed. Fertilizers will be commercial type of uniform composition, free-flowing and conforming to the applicable State and Federal laws. Choose native species that are adapted to local weather and soil conditions wherever possible to reduce water and fertilizer inputs and lower maintenance overall.
3. Topsoil will be loosened by raking, tilling or other suitable methods.

Final stabilization should be installed on portions of the site where construction activities have permanently ceased but no later than 14 days after construction ceases.

All seeded areas will be inspected weekly during construction activities for failure until a dense cover of vegetation has been established. If failure is noticed on the seeded area, the area will be reseeded, fertilized and mulched immediately. After construction is complete at the site permanent stabilization measures will be monitored until final stabilization is reached.

Seed Mixture For Upland Areas

	LBS./ACRE	LBS./1000 S.F.
Kentucky Bluegrass	20	0.45
Creeping Red Fescue	20	0.45
Perennial Ryegrass	5	0.10
	45	1.00

The recommended seeding dates are: April 1-June 15 and August 1-September 15

Spill Preventation and Control Plan:

1. Vehicle Maintenance: Vehicles and equipment will be maintained off-site. All vehicles and equipment including subcontractor vehicles will be checked for leaking oil and fluids upon entering the site. Vehicles leaking fluid will not be allowed on-site. Drip pans will be placed under all vehicles and equipment that are parked overnight. Parking shall be in the areas designated on the site logistics plan or as approved by the property owner.
2. Vehicle Fueling: Refueling of vehicles and equipment shall be conducted in the designated laydown area. The location within the laydown area shall be comprised of an impervious surface without access to any subsurface drainage structures.
3. Hazardous Material Storage: Hazardous materials including but not limited to fuel, oil and petroleum products and solvents will be stored in an approved covered storage unit and provided with secured secondary containment with an impervious floor in accordance with federal and municipal regulations.
4. Material safety data sheets, a material inventory, and emergency contact information will be maintained at the on-site project trailer.
5. Spill Kits: Spill kits will be stored within the material storage area,concrete washout areas, and designated fueling area.
6. Spills: All spills will be cleaned up immediately upon discovery. Spent absorbent materials and rags shall be placed in a sealed drum and will be hauled off-site immediately after the spill is cleaned up for disposal at the appropriate landfill. Spills or releases of hazardous chemicals or petroleum products shall be promptly reported to CTDEEP at 1-800-424-3338 and the National Response Center 1-800-424-8802.

In accordance with Connecticut General Statues the contractor shall within 24 hours of verbal notificationcomplete a written "Report of Petroleum or Chemical Product Discharge, Spillage or Release" and mail it to: CTDEEP, Bureau of Waste Management, 79 Elm Street, Hartford, Ct, 06106-5127.

Installation Schedule: The spill prevention and control procedures will be implemented once construction begins on-site.

Spill Prevention and Control Best Management Practices (BMP'S) Description:

1. Material Handling and Waste Management:

Waste Materials:

All waste materials will be collected and disposed of into metal waste dumpsters in designated areas. Dumpsters will have a secure tight lid, be placed away from storm water drains and structures, and will meet all federal, state, county, and local regulations. Only trash and construction debris will be placed in the dumpsters. Construction materials will not be buried on site.

Maintenance and Inspection: The dumpsters will be inspected weekly and immediately after storm events. The dumpster will be emptied weekly or more frequently if needed, and taken to the appropriate landfill.

Hazardous Waste Materials:

BMP Description: All hazardous waste materials including oil filters, petroleum products, paint, and equipment maintenance fluids will be stored in structurally sound and sealed shipping containers in a designated area. Hazardous waste materials will be stored in appropriate and clearly marked containers and segregated from other non-waste materials. Secondary containment will be provided for all waste materials in a designated area and will consist of commercially available spill pallets. Additionally, all hazardous waste materials will be disposed of in accordance with federal, state, county, and local regulations. Hazardous waste materials will not be disposed of into the on-site dumpsters.

Maintenance and Inspection: The hazardous waste materials area will be inspected weekly and after storm events. The storage area will be kept clean, well organized and equipped with ample cleanup supplies as appropriate for the materials being stored. Material safety data sheets, material inventory, and emergency contact numbers will be maintained in the office trailer.

Sanitary Waste:

BMP Description: Portable toilets, located in the staging area, will be provided at the site throughout the construction phase. The toilets will be located away from concentrated drainage flow paths and will have collection pans underneath as secondary containment.

Maintenance and Inspection: Sanitary waste will be collected a minimum of once a week and shall be inspected weekly for evidence of leaking holding tanks.

Recycling:

BMP Description: Wood pallets, cardboard boxes, and other recyclable construction scraps will be disposed of in a designated dumpster for recycling. The dumpster will have a secure watertight lid, be placed away from stormwater conveyances and drains and meet all local and state solid-waste management regulations. Only solid recyclable construction scraps from the site will be deposited in the dumpster.

Maintenance and Inspection: The recycling dumpster will be inspected weekly. The recycling dumpster will be emptied when full and taken to an approved recycling center by the contractor. If recyclable construction wastes are exceeding the dumpster's capacity, the dumpsters will be emptied more frequently.

2. Designate Washout Areas:

Concrete Washout

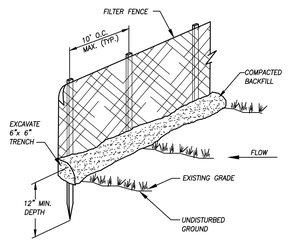
BMP Description: A designated temporary, above-grade concrete washout area will be constructed for concrete washout. The washout area will be lined with plastic sheeting at least 10 mils thick and free of holes or tears. Concrete pours will not be conducted during or before an anticipated storm event. Concrete mixer trucks and chutes will be washed in the designated washout area or concrete wastes will be properly disposed of off-site. When the temporary washout area is no longer needed for the construction project, the hardened concrete and materials used to construct the area will be removed and disposed of in accordance with all applicable local, State and Federal regulations, and the area will be stabilized.

Installation Schedule: The washout area will be constructed before concrete pours occur at the site.

3. Vehicle Fueling and Maintenance Practices:

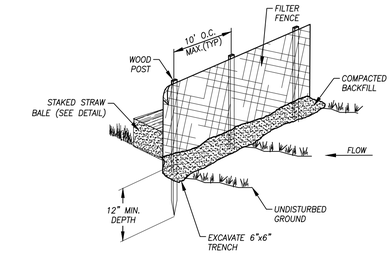
BMP Description: Several types of vehicles and equipment will be used on-site throughout the project, including graders, scrapers, excavators, loaders, rollers, trucks and trailers, backhoes, and forklifts. All major equipment/vehicle fueling will be performed in the staging area. This proposed activity is to be situated so that drainage facilities or water courses located in the area are not at risk from potential infiltration. Absorbent, spill-cleanup materials and spill kits will be available at the combined staging and materials storage area. Drip pans will be placed under all equipment parked overnight. Fuel will be delivered to the site on an as needed basis by a fuel delivery service. Fueling of equipment will only occur in designated fueling areas. Vehicle maintenance including washing is prohibited on site.

Installation Schedule: BMPs implemented for fueling activities will begin at the start of the project.



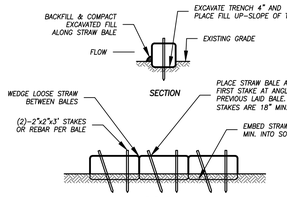
SEDIMENT FENCE DETAIL

NOT TO SCALE



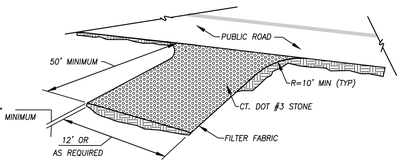
SEDIMENT FENCE WITH STAKED STRAW BALE BACKING

NOT TO SCALE



STRAW BALE BARRIER DETAIL

NOT TO SCALE



ANTI-TRACKING PAD

NOT TO SCALE

Rare Plant Protection Plan:

(Prepared by All-Points Technology Corporation)

The Rare Plant Protection Plan consists of various types of protection measures including protection of "Sand Barren" habitat areas located within and adjacent to the Project Areas, contractor awareness training, general protection measures, and post-construction protection/monitoring requirements. The Sand Barren habitat areas have been identified to support a variety of rare plant species protected by the Connecticut Endangered Species Act. Therefore, it is important the following protection measures are implemented to protect against potential impacts to any State-protected rare plants during construction activities.

It is of the utmost importance that the Contractor complies with the Rare Plant Protection Plan requirements for the implementation of these protective measures and the education of its employees and subcontractors performing work within the Project Areas. This protection program shall be implemented regardless of time of year construction activities occur. All-Points Technology Corporation, P.C. ("APT") will serve as the Project Environmental Monitor for this project to ensure that the Rare Plant Protection Plan is implemented properly. The Contractor shall contact Matthew Gustafson, Environmental Scientist at APT, at least five (5) business days prior to the pre-construction meeting. Mr. Gustafson can be reached by telephone at (860) 663-1697 ext. 202 or via email at mgustafson@allpointstech.com.

1. Sand Barren Habitat Protection Measures:

   a. All Sand Barren habitat areas shall be isolated from the Project Areas through installation of orange construction fencing. APT will stake out Sand Barren habitat areas prior to any construction activities or equipment mobilization to the Project Areas. The Contractor shall install orange construction fencing around the identified Sand Barren habitat areas to isolate them from potential encroachment by construction vehicles and equipment throughout the duration of the construction project. This isolation fencing shall be inspected daily by the Contractor to ensure that it maintained in good condition. The Contractor shall repair any damaged fencing within 24 hours.

   b. Where the Sand Barren habitat areas occur in proximity to the existing access road to be used during construction, special measures shall be employed by the Contractor for temporary crossing to avoid potential long term impacts and minimize soil disturbance and compaction. Temporary access points across the Sand Barren habitat areas shall be identified by the Contractor and inspected and approved by the Project Environmental Monitor prior to construction. Special construction matting shall be installed at these pre-determined temporary access points. Prior to the installation of mats, geotextile fabric will be placed on the ground to minimize soil and plant disturbance during mat installation and removal activities.

2. Contractor Awareness Training

   a. Prior to work on site and initial deployment/mobilization of equipment and materials, the Contractor shall attend an educational session at the pre-construction meeting with the Project Environmental Monitor. This orientation and educational session will consist of information on rare plants and the associated Sand Barren habitat areas and the need to follow protective measures as described herein.

3. General Protection Measures

   a. All wood chips generated by the Project shall be removed off site. Distribution of wood chips on site can adversely affect soil conditions, resulting in potential impact to rare plant species.

   b. To reduce the potential impacts of soil compaction as a result of the construction of the Project only low-ground-pressure equipment (<10 PSI) shall be used. If low-pressure-ground equipment is not feasible, construction mats shall be installed prior to any work to adequately distribute the weight of said vehicle to minimize soil disturbance and compaction. Prior to the installation of mats, geotextile fabric will be placed on the ground to minimize soil and plant disturbance during mat installation and removal activities. These construction mats should be removed immediately following completion of work within segments of the Project Areas.

   c. All work areas will be surveyed by the Project Environmental Monitor prior to construction. If any of the listed rare plant species should be observed they will be either protected during construction through isolation using orange construction fencing, or transplanting to an area outside the project limits, as determined by the Project Environmental Monitor.

4. Post-Construction Protection/Monitoring Requirements:

   a. Inspections will be performed throughout the Project Area for all listed rare plant species for an entire growing season following completion of construction. The primary purpose of this survey would be to detect rare plants in locations where they may be expected to be impacted by shading, and move the plant to appropriately open habitat. A report will be generated at the end of the monitoring growing season documenting any rare plant occurrences discovered, any transplanted rare plants, changes in plant communities as the result of development within the Project Areas, and any recommendations to changes of the vegetation maintenance regime.

   b. Limit mowing under the solar arrays to the minimum required to maintain system performance and maintenance standards. Modify mowing regiment as necessary following recommendations from post-construction monitoring report.

Wood Chip Disposal Notes:

(Prepared by All-Points Technology Corporation)

All wood chips generated by the proposed project shall be removed off site for proper disposal. Spreading of wood chips on site can adversely affect soil conditions, resulting in potential impact to rare plant species known to occur within the Project Areas.

As a majority of the listed rare plant species occur in sandy exposed soils, spreading of wood chips on-site will impact these types of potential habitats in two ways. First, wood chips would shade out potential habitat and smother either existing rare plant occurrences, or reduce the quality for potential future volunteer rare plant species that occur in these open sandy/barren soil types. Secondly, wood chips will eventually decompose releasing nutrients into the nutrient poor top soil that is preferred by the rare plant species. Release of nutrients would promote growth of less desirable grass and weed species that would outcompete and displace rare plant species. Therefore, in order to protect existing and future rare plant species habitat, all wood chips generated by the project shall be removed off-site for proper disposal.

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Rocky Hill, CT 06067
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SolarCity Corporation
Proposed Solar Photovoltaic System
1240 Poquonnock Road
Groton, Connecticut
Erosion & Sediment and
Spill Prevention & Control Plan

SCALE: As Noted

DATE: October 2015

JOB I.D. NO. 15-2347

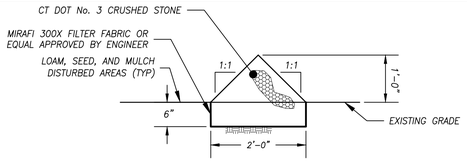
Revisions

Rev. A - Per Groton Utilities Comments - 12/09/15

Rev. B - Add Environmental Notes - 2/09/16

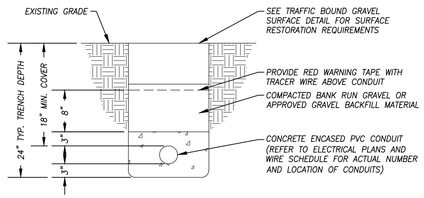
SHEET NO. 9 / 10

STATE OF CONNECTICUT · DAVID C. NICKLAS · 29102 · LICENSED PROFESSIONAL ENGINEER



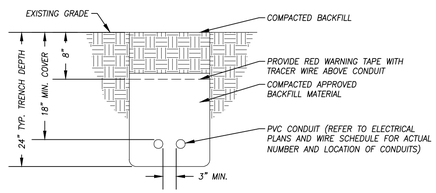
EMBEDDED STONE CHECK DAM

NOT TO SCALE



CONDUIT TRENCH THROUGH GRAVEL DRIVE DETAIL

NOT TO SCALE



NON-TRAFFIC CONDUIT TRENCH DETAIL

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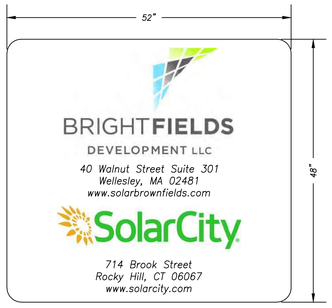
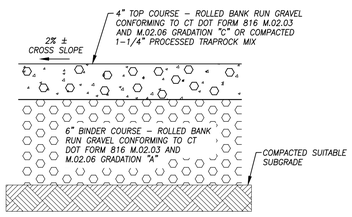


NOTE:
1. SIGNS MOUNTED ON GATES AT ALL ENTRANCES.
2. SIGNS TO BE RATED FOR OUTDOOR ENVIRONMENTS.

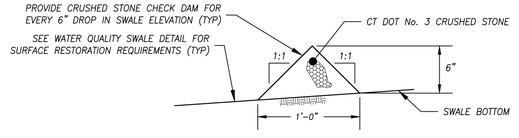
IDENTIFICATION SIGNAGE

NOT TO SCALE



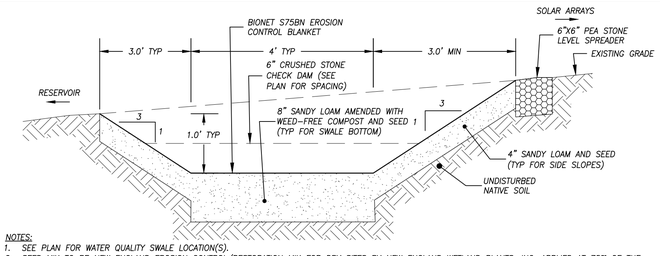
TRAFFIC BOUND GRAVEL SURFACE DETAIL

NOT TO SCALE



WATER QUALITY SWALE CHECK DAM DETAIL

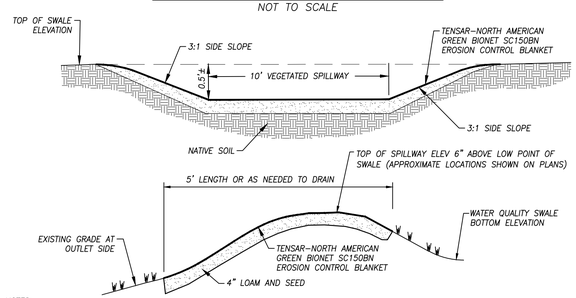
NOT TO SCALE



NOTES:
1. SEE PLAN FOR WATER QUALITY SWALE LOCATION(S).
2. SEED MIX TO BE NEW ENGLAND EROSION CONTROL/RESTORATION MIX FOR DRY SITES BY NEW ENGLAND WETLAND PLANTS, INC. APPLIED AT 75% OF THE MANUFACTURER'S RECOMMENDED APPLICATION RATE AND NEW ENGLAND CONSERVATION/WILDLIFE MIX BY NEW ENGLAND WETLAND PLANTS, INC. APPLIED AT 50% OF THE MANUFACTURER'S RECOMMENDED APPLICATION RATE.
3. STRIP TOPSOIL FROM WATER QUALITY SWALE AREA; AMEND WITH WEED–FREE COMPOST (30% TO 40% BY VOLUME) TO PROVIDE SOIL MEDIA FOR WATER QUALITY SWALE BASE; EXCAVATE FROM EXISTING GRADE; LOAM, SEED AND STABILIZE WITH TENSAR–NORTH AMERICAN GREEN BIONET S75BN EROSION CONTROL BLANKET.
4. EROSION CONTROL BLANKET TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.

WATER QUALITY SWALE DETAIL

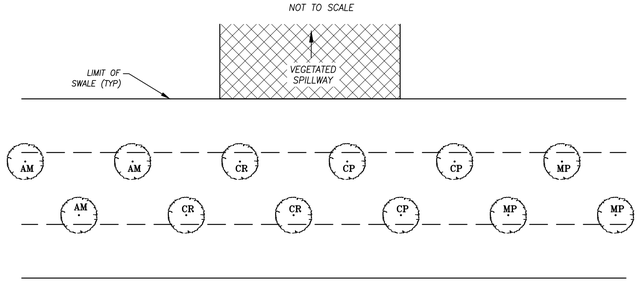
NOT TO SCALE



NOTES:
1. SEE PLAN FOR APPROXIMATE SPILLWAY LOCATION(S). FINAL LOCATIONS TO BE DETERMINED BASED ON ACTUAL LOW POINTS IN SWALE GRADING.
2. SEED MIX TO BE NEW ENGLAND EROSION CONTROL/RESTORATION MIX FOR DRY SITES BY NEW ENGLAND WETLAND PLANTS, INC. APPLIED AT 75% OF THE MANUFACTURER'S RECOMMENDED APPLICATION RATE AND NEW ENGLAND CONSERVATION/WILDLIFE MIX BY NEW ENGLAND WETLAND PLANTS, INC. APPLIED AT 50% OF THE MANUFACTURER'S RECOMMENDED APPLICATION RATE.
3. STRIP TOPSOIL FROM SPILLWAY AREA; EXCAVATE FROM EXISTING GRADE; LOAM, SEED AND STABILIZE WITH TENSAR–NORTH AMERICAN GREEN BIONET SC150BN EROSION CONTROL BLANKET.
4. EROSION CONTROL BLANKET TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.

VEGETATED SPILLWAY DETAIL

NOT TO SCALE



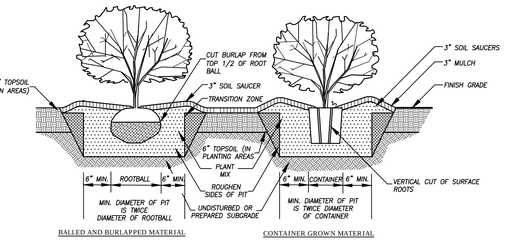
BIOFILTRATION CELL PLANTING SCHEDULE

SYMBOL	BOTANICAL NAME	COMMON NAME	SIZE	QUANTITY	SPACING
TREES AND SHRUBS					
AM	ARONIA MELANOCARPA	BLACK CHOKEBERRY	3'–4'	27	3–5 FT O.C.
CP	COMPTONIA PEREGRINA	SWEET FERN	3'–4'	27	3–5 FT O.C.
CR	CORNUS RACEMOSA	GRAY DOGWOOD	3'–4'	27	3–5 FT O.C.
MP	MORELLA (MYRICA) PENSYLVANICA	BAYBERRY	3'–4'	27	3–5 FT O.C.

NOTES:
1. WATER QUALITY SWALE TO BE UNDERSOWN WITH A NATIVE SEED MIX TO BE NEW ENGLAND EROSION CONTROL/RESTORATION MIX FOR DRY SITES APPLIED AT 75% OF THE MANUFACTURER'S RECOMMENDED APPLICATION RATE AND NEW ENGLAND CONSERVATION/WILDLIFE MIX APPLIED AT 50% OF THE MANUFACTURER'S RECOMMENDED APPLICATION RATE (SUPPLIED BY NEW ENGLAND WETLAND PLANTS, INC. (413–548–8000), OR APPROVED EQUIVALENT).
2. SHRUBS SHALL BE PROVIDED IN #2 CONTAINERS.

BIOFILTRATION CELL TYPICAL PLANTING DETAIL

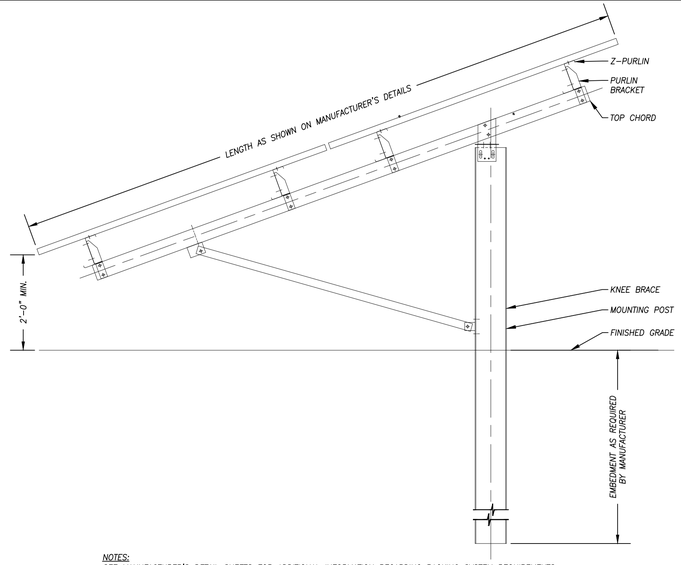
NOT TO SCALE



NOTES:
1. SET CROWN OF ROOTBALL 2" ABOVE FINISH GRADE.
2. FOR CONTAINER GROWN STOCK USE FINGERS OR A SHARP KNIFE TO LOOSEN ROOTS OUT OF THE OUTER LAYER OF POTTING SOIL; THEN CUT OR PULL APART ANY ROOTS CIRCLING THE PERIMETER OF THE CONTAINER.
3. AT PLANTING THOROUGHLY SOAK THE ROOT MASS AND ADJACENT SOIL. REPEAT SEVERAL TIMES DURING THE FIRST MONTH AND THROUGHOUT THE FOLLOWING TWO SUMMERS.

SHRUB PLANTING DETAIL

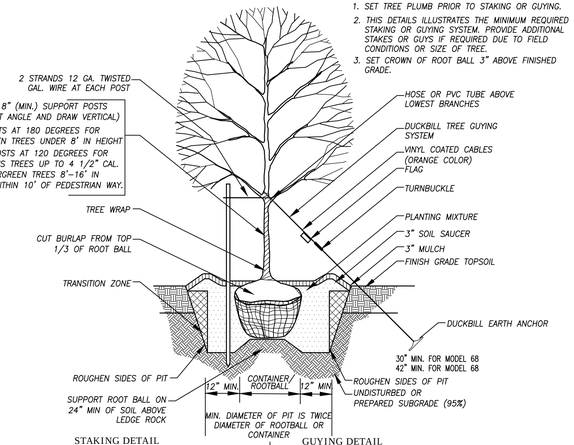
NOT TO SCALE



NOTES:
SEE MANUFACTURER'S DETAIL SHEETS FOR ADDITIONAL INFORMATION REGARDING RACKING SYSTEM REQUIREMENTS AND INSTALLATION PROCEDURES. RACKING SYSTEM TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.

TYPICAL POST MOUNTED RACKING SYSTEM DETAIL

NOT TO SCALE



STAKING DETAIL

FOR USE WITH:
A. DECIDUOUS TREES UNDER 3" CALIPER.
B. DECIDUOUS TREES 3"–4 1/2" CALIPER WHEN PLANTED WITHIN 10' OF PEDESTRIAN WAYS.
C. EVERGREEN TREES UNDER 8' IN HEIGHT.
D. EVERGREEN TREES 8'–16' IN HEIGHT WHEN PLANTED WITHIN 10' OF PEDESTRIAN WAYS.

GUYING DETAIL

FOR USE WITH:
A. DECIDUOUS TREES 3"–4 1/2" CALIPER WHEN PLANTED GREATER THAN 10' OUTSIDE OF PEDESTRIAN WAYS.
B. DECIDUOUS TREE OVER 4 1/2" CALIPER.
C. EVERGREEN TREES 8'–16' IN HEIGHT WHEN PLANTED GREATER THAN 10' OUTSIDE OF PEDESTRIAN WAYS.
D. EVERGREEN TREES OVER 16' IN HEIGHT.

NOTES:
1. SET TREE PLUMB PRIOR TO STAKING OR GUYING.
2. THIS DETAILS ILLUSTRATES THE MINIMUM REQUIRED STAKING OR GUYING SYSTEM. PROVIDE ADDITIONAL STAKES OR GUYS IF REQUIRED DUE TO FIELD CONDITIONS OR SIZE OF TREE.
3. SET CROWN OF ROOT BALL 3" ABOVE FINISHED GRADE.

TREE PLANTING DETAIL

NOT TO SCALE

LANDSCAPE SCHEDULE

SYMBOL	BOTANICAL NAME	COMMON NAME	SIZE	QUANTITY	COMMENT
TREES AND SHRUBS					
THOC2	Thuja Standishii x Plicata	"Green Giant" Arborvitae	4'–5' Height	58	C.G.

PLANTING SPECIFICATIONS:

1. All materials and construction methods shall conform to the requirements of the Connecticut Association of Landscape Contractors Specification. All plants shall be nursery grown and conform to the latest edition of ANSI Z60.1, AMERICAN STANDARD FOR NURSERY STOCK and also the minimum guidelines established for nursery stock published by the American Association of Nurserymen, Inc.
2. No substitution of plant materials will be allowed without the prior written consent of the Project Owner. Where a plant size range is provided at least 50% of the plants shall be of the larger size.
3. All lawn and planting area soil preparation shall be fertilized and amended according to recommendations of a soil analysis provided by an approved soil testing laboratory.
4. All exterior ground areas disturbed by construction and not covered by buildings, structures, paving, continuous planting beds or other site improvements shall be graded, topsoiled to a minimum depth of 4" and grass seeded. Provide lawn development in all areas of selective clearing as directed.
5. All plant pits must be free draining. Break up the bottom of the hole by fork if necessary to ensure plant has proper drainage.
6. Set all plants in center of plant pits, plumb and straight and as detailed on the drawing. All plant material shall bear the same relationship to finished grade as to original planting grade prior to digging. Trees shall be planted with the junction of roots and stem level with finished grade.
7. Handle balled and burlapped plants from the ball only. Once positioned in the hole, remove the top 1/3 of the burlap from the root ball without disturbing the roots.
8. Face each plant to give the best appearance. Final location of plant material should be approved by the Project Owner in the field.
9. Fill plant pits 2/3 their depth with prepared planting mixture, water thoroughly and allow to settle. Complete back–filling, water thoroughly to eliminate any voids and air pockets. Provide additional back–fill as necessary to conform to required elevation and as detailed.
10. Form saucer and install mulch over entire plant pit and saucer area as detailed.
11. All tree staking or guying shall be completed immediately after planting, but in no instance more than 24 hours after planting. See staking/guying detail. At the completion of the maintenance period remove all stakes, flags, guys, tree wrap, and anchors.
12. Mulch all new shrub beds and plant pits to achieve a 3" depth after settlement. Mulch all ground cover beds to achieve a 2" depth after settlement. Mulch for saucers and planting areas to be a double shredded bark mulch.
13. All plants shall be guaranteed for a period of one full year after inspection and acceptance by the Owner's representative, and shall have at least 80% healthy growth at the end of the guarantee period.
14. Landscape planting materials as proposed by this plan are Connecticut native and/or non–invasive species. This landscape plan has been designed to incorporate species which are prolific in USDA plant hardiness zone 6b and which require minimal energy input for upkeep and maintenance. References utilized for Connecticut native and non–invasive species selection include the Connecticut Botanical Society, the Connecticut agricultural experiment station, the U.S. Department of Transportation Federal Highway Administration, 2004 Connecticut Stormwater Quality Manual, New England Wetland Plants, Inc., and other sources.

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SolarCity Corporation
Proposed Solar Photovoltaic System
1240 Poquonnock Road
Groton, Connecticut
Site Details

SCALE: As Noted
DATE: October 2015
JOB I.D. NO. 15-2347

Revisions
Rev. A - Per Groton Utilities Comments - 12/09/15
Rev. B - Add Environmental Notes - 2/09/16

SHEET NO.
10
10

EXHIBIT B – Rare Plants Report

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20 January 2016

All Points Technology, P. C.
3 Saddlebrook Drive
Killingworth, CT 06419

To Whom it may concern,

I am writing report the results of my rare plant survey and potential habitat assessment at the site of the proposed Brightfields Solar Array at 1240 Poquonnock Road, on City-owned property in Groton, Connecticut, and recommend mitigation that would minimize the potential impacts of the rare plant occurrences, known and potential, at the site if the solar array was constructed, at least in largest part, this spring.

I am a consulting field botanist with 28 years of experience conducting surveys for rare plants and plant communities in the Northeast, the bulk of that time working in Connecticut. I was commissioned in December 2015 to:

1) conduct a survey for any of the below-listed State-listed[1] plants that could be detected in December, under the current conditions in the areas (the "Study Area", hereinafter) depicted in Attachment 1 ;

[1] "State-listed plants" are those species listed in the Regulations of the State of Connecticut R.C.S.A. Sec. 22a-306-4 through 22a-306-6 as "Endangered Species", "Threatened Species", or "Species of Special Concern"

2) to attempt to assess whether, in my opinion, potential habitat exists in the Study Area for those of the below-listed plants that cannot be reliably detected in December, under current conditions at the site, and assess the likelihood that these plants occur on the site;
3) Develop, if possible, suggestions for an approach to construction and mitigation measures that would maximize the likelihood that the solar array could be constructed in spring 2016 without significant harm to known and potential rare plant occurrences at the site.

The 11 rare plants addressed by this survey and potential habitat assessment were identified in a communication from Nelson DeBarros, Botanist/Ecologist, Connecticut Department of Energy and Environmental Protection's Natural Diversity Data Base (CTDEEP-NDDB) to All Points Technology Corporation (APT) in November 2015. The 11 rare plants are listed in Table 1, below.

Table 2. Survey Target Plant Species at Proposed Brightfields Solar Panel Site at 1240 Poquonnock Road, Groton, CT.						
Species Index #	SCIENTIFIC NAME	COMMON NAME	LISTING STATUS[1]	YEAR LAST OBSERVED CA. SITE	HABITAT AFFINITY IN CT (note: all species are evidently light-demanding)	DETECTABILITY IN DECEMBER AT THIS SITE
1	*Carex oligosperma*	Few-seeded sedge	SC*	1909[2]	Bog-like wetlands	Probably good in not-recently mowed habitat
2	*Cuphea viscosissima*	Blue waxweed	SC*	1905[2]	Upland, probably restricted to dry, sandy sites	Unknown
3	*Eleocharis quadrangulata* var. *crassior*	Square-stemmed spikesedge	E	2014	Wetlands and sandy or peaty shores, especially seasonally flooded/exposed	Good
4	*Eupatorium album*	White thoroughwort	E	2015	Dry, sandy and rocky upland	Good in not-recently-mowed habitat, poor otherwise
5	*Eurybia spectabilis*	Showy aster	T	2001	Dry sandy and rocky upland, including sandy sites with a seasonally high water table	Good for fertile stems in not-recently mowed habitat, possibly reasonably good in even when mowed in thinly vegetated habitat
6	*Hydrocotyle umbellata*	Water pennywort	E	2010	Wetlands and sandy or peaty shores, especially seasonally flooded/exposed	Good
7	*Ludwigia sphaerocarpa*	Globe-fruited false-loosestrife	E	2005	Wetlands and sandy or peaty shores, especially seasonally flooded/exposed	Good
8	*Lycopus amplectens*	Clasping-leaved water-horehound	SC	1932	Wetlands and sandy or peaty shores, especially seasonally flooded/exposed	Good
9	*Opuntia humifusa*	Eastern prickly pear	SC	1998	Dry, sandy and rocky upland	Good

Table 2. Survey Target Plant Species at Proposed Brightfields Solar Panel Site at 1240 Poquonnock Road, Groton, CT.						
10	*Polygala nuttallii*	Nuttall's milkwort	T	1999	Dry sandy and rocky upland, including sandy sites with a seasonally high water table	Poor
11	*Rhynchospora macrostachya*	Tall beaksedge	T	2005	Bog-like wetlands and sandy or peaty shores	Probably Good

Table Notes:
[1]"E" = State-Endangered; "T" = State-Threatened; "SC" = State-Special Concern; "SC*" = State-Special Concern (Historic – i.e., not observed in the last ~25 years)
[2]also year last observed in Connecticut

The rare plants listed in Table 1 are hereinafter referred to as the "Survey Target Species". Certain other State-listed rare plants are detectable in December, and my survey methodology was such that this was also a survey for those species, effectively. Among these rare plants was the only State-listed plant actually observed at the site, *Aristida longespica* Needlegrass (State-Special Concern), and *Paspalum laeve* Field Paspalum (State-Endangered), which occurs within 2 miles of the site in habitat similar to parts of the site. This species is easily detected in December, and was not observed during this survey.

RARE PLANT SURVEY METHODOLOGY

On December 15, 21 and 28, 2015, I conducted a survey and reconnaissance of the Study Area (See Attachment 1. Snow cover was absent. With the exception of Reservoir shore and wetter portions of the fringing wetlands and forested sections, the entire Study Area had been mowed, at least as recently as August 2015, by my estimation. The southernmost portion of the Study Area (0.75 ac) was closely and more recently mown (ca. 3" high), while most of the Study Area had not been mown for at least several weeks, by my estimation.

The areas that I judged to have at least some arguable potential for at least one of the Survey Target Species were surveyed by walking parallel transects, the distance between transects was determined based upon the visibility potential visibility of the Survey Target Species in the habitat, and my judgment of the habitat's potential. In the above-mentioned closely mowed southernmost 0.75-ac, transects were 2± m apart, because any individuals of Survey Target Species would be very short and one would have to be close to spot them. Transects were ~7.5 m apart in the less recently mowed 7.25± ac section to north (i.e., east of the Reservoir and west of the existing service road). Areas of Sand Barren-like grassland habitat, which I judged to have higher potential as habitat for Survey Target Species, were surveyed more intensely, and their boundaries surveyed by

APT. Forested areas were judged to have no potential for Survey Target Species, and were not surveyed closely. I reconnoitered open habitat areas, including the area proposed for the southeastern solar array and the area around Vernal Pool #1, but did not survey transects because I judged these areas to have no potential as habitat for Survey Target Species (due to their being mesic grassland or meadow). I walked transects with the assistance of Matthew Gustafson of APT, whom I had briefed regarding what to look for. Mr. Gustafson recorded our routes of survey and his portion of the survey transects on Trimble GPS unit (See Attachment 4).

During the period of field survey of the Study Area, I visited known sites for *Polygala nuttallii*, *Eurybia spectabilis*, and *Eupatorium album*, to assess their detectability and the appearance of their habitats at this time of year.

HABITAT POTENTIAL ASSESSMENT METHODOLOGY

As I am personally familiar with most of the occurrences of the Survey Target Species in Connecticut that have been documented in in the last 30 years, my habitat potential assessment was based in largest part upon my experience of the known habitats in this region. However, I also researched the botanical literature of Connecticut for information on habitat affinities for each species that might be beyond my personal experience, and incorporated that into my assessment of the potential of the occurrence in the Study Area of Survey Target Species that could not be reliably detected by this field survey. In making this assessment, I judged the two most important observable parameters to be soil characteristics and plant community composition and structure.

RESULTS

RARE PLANT SURVEY

The four State-listed plants documented in the Study Area by this field survey are listed below in Table 2. Three are Survey Target Species, and one was an unexpected discovery. Locations of these occurrences are shown in Attachments 2 and 3. The Survey Target Species that were not found during this survey are discussed individually below after those that were found.

Table 2. State-listed plants documented in the Study Area by field surveys in December 2015.

Species Index #	SCIENTIFIC NAME	COMMON NAME	LISTING STATUS[1]	HABITAT AFFINITY IN CT (note: all species are evidently light-demanding)
3	*Eleocharis quadrangulata* var. *crassior*	Square-stemmed spikesedge	E	Wetlands and shores, especially seasonally flooded/exposed
6	*Hydrocotyle umbellata*	Water pennywort	E	Wetlands and shores, especially seasonally flooded/exposed
7	*Ludwigia sphaerocarpa*	Globe-fruited false-loosestrife	E	Wetlands and shores, especially seasonally flooded/exposed
NA	*Aristida longespica*	Needlegrass	SC	Dry sandy upland, including sandy sites with a seasonally high water table and sandy draw-down shores and depressions

Table Notes:
[1]"E" = State-Endangered; "SC" = State-Special Concern

Species 3, 6, and 7 occur in large numbers along the east shore of the Reservoir in fringing wetlands and draw-down lake-shore habitat. These populations are at least 50 feet from the nearest proposed solar panels and 25 feet from the proposed storm water treatment swale.

Aristida longespica Needlegrass is the only one of the State-listed species whose occurrence overlaps with the area of proposed solar panels. It is a low to medium-height,

Figure 5. *Ludwigia Sphaerocarpa* stand.

Figure 6. *Ludwigia spaerocarpa* fruiting spike.

Figure 4. *Hydrocotyle umbellata* leaves

Figure 3. *Eleocharis quadrangulata* stand

Figure 2. *Eleocharis quadrangulata* spikes, having shed fruit.

Figure 1. *Arisida longespica* plants - arrow indicates one of several in photo.

Figure 7. Aristida longespica habitat.

annual grass with a very late phenology, often not fruiting till October. It occurs in the Study Area is Sand Barren-like habitat on a west-facing, moderate slope within 60± ft of the east shore of the Reservoir. The population size (30± genets) and area (300± sq ft) are small compared with many other Connecticut populations. There are two recognized varieties of this species in Connecticut, var. *geniculata* and var. *longespica*. Legally, both are listed under the species name as Special Concern. However, one authority[2] believes that only var. *geniculata* is native to New England. The plants at the Study Area appear to be var. *longespica*, based on the relatively short awns and glumes.

Carex oligosperma Few-seeded Sedge, a grass-like plant that grows to about 40 inches, and which has apparently not been documented in Connecticut since 1917, was not found. However, bog-like habitat with arguable potential for it was identified in the vicinity of Eleocharis quadrangulata suboccurrence "ELO QUA 3" on Attachments 2 and 3. I have no personal experience from which to judge how persistent and detectable *Carex oligosperma* remains into winter, but those *Carex* spp. most closely related to it are fairly persistent. However, a portion of the potential habitat had been mowed not long ago, and perhaps several times earlier this year, and so it could be present and yet very hard to detect. However, it is strictly a wetland plant, and thus would be protected by the minimum 25-foot upland buffer between the proposed construction and the wetland boundary.

Cuphea viscosissima Blue Waxweed, an opposite-leaved annual forb that has apparently not been documented in Connecticut since 1905, was not found. However, suspected

[2] Haines, A. 2011. Flora Novae Angliae. New England Wildflower Society, Framingham, CT, and Yale Univ. Press, New Haven, CT. 973 pp.

potential was found and delineated in the Study Area. It is the Survey Target Species about which we know the least, regarding its ecological behavior in Connecticut and how detectable it might be at the time of this survey. Based on its habitat affinities in other parts of its range and the limited Connecticut habitat information available from historic collections, it is a plant of relatively open, dry ground, which probably includes Sand Barren-like habitat. Little is known regarding its response to mowing.

Eupatorium album White thoroughwort, a rhizomatous opposite-leaved perennial forb that grows to ~2.5 ft tall, was not found in the Study Area, but the above-mentioned Sand Barren-like habitat that was delineated is potential habitat for it. It is persistent and relatively easily detected and identified at this time of year, when not recently mowed so close to the ground that the dried stem leaves cannot be seen. This species would therefore not be detectable in the above-mentioned 0.75-ac closely mowed section at the southwest end of the proposed solar panel array. It is uncertain whether the species may have been detectable in the less closely mowed 7.25 ac portion to the north. This species' response to various mowing regimes is not known, but a nearby robust occurrence is in a location that appears to have been mowed at least once/year for many years.

Eurybia spectabilis Showy Aster is a perennial alternate-leaved so-called "American-aster" growing to 1-2.5 ft high, with showy purple, violet, or light blue flowers (due to recent taxonomic revisions to this section of the Aster family, we no longer have any native species in the *Aster* genus, hence the term "American-aster" to distinguish between these and true *Aster* sp.). This Survey Target Species was not found during this survey, but the above-mentioned Sand Barren-like habitat that was delineated is potential habitat for it. Plants with stems should be reasonably detectable at this time of year in an un-mowed situation (see Figs. 8 and 9), and plants with only basal rosettes should be reasonably detectable in thinly vegetated habitat such as Sand Barren-like habitat. Plants without stems or with mowed stems would be difficult to detect in the more densely vegetated cool-season grassland and meadow habitat that occupies most of the northern 7.25 ac of the Study Area.

Figure 8. *Eurybia spectabilis* flowering head renmant in December (at site in Voluntown).

In addition to dry sandy or rocky soils, this species occurs on sandy soils that have a seasonally high water table, and so portions of the 50-foot wetland buffer zone, on the west side of the western proposed solar panel array, are potential habitat, at least with regards to hydrology. These are areas near the transition to wetland soils, and they are relatively densely vegetated, and primarily for that reason, I suspect that *Eurybia spectabilis* most likely does not occur there. Based upon all my experience to-date with this species, it does not occur in more densely vegetated grasslands and meadows.

Figure 9. *Eurybia spectabilis* basal rosette leaves (green) with shrivelled leaves of the year (Voluntown site).

Lycopus amplectens Clasping-leaved Water-horehound is a perennial opposite-leaved forb in the Mint family that grows typically 1-2.5 ft high. It is a plant restricted to wetlands and sandy and peaty shores that experience a seasonal draw-down. It was not found during this survey, and I was not able to determine its detectability at this time of year (I was unable to find plants at the one known population I visited). There is abundant potential habitat along the east shore of the Reservoir, and it may occur there. However, determining whether or not it is present is not critical, as its potential habitat is almost 100% occupied by one or more of the Survey Target Species 3, 6, and 7, and the

provisions in the site development plan that protect these species and the wetland habitat also will protect the *Lycopus amplectens*.

Opuntia humifusa Eastern Prickly Pear is a succulent evergreen forb in the Cactus family that grows close to the ground on open and semi-open, xeric, very sandy and rocky sites that are thinly vegetated. It is quite detectable at this time of year, was not found during this survey, and I do not believe that it occurs in the Study Area. The above-mentioned Sand Barren-like habitat that was delineated may be potential habitat for it, at least the sandier portions, but it is currently un-occupied by this species.

Polygala nuttallii Nuttall's milkwort is a small, alternate-leaved, annual forb in the Milkwort family that grows to about 1 foot high. It occurs in dry Sand Barrens and Sand Barren-like habitat, and also on sandy Sand Barren-like sites which experience a seasonally high water table or seepage. It is evidently tolerant of frequent mowing, based on its presence at one nearby site. It does not entirely disappear in winter, but it is very difficult to detect in closely and recently mowed habitat (see Fig. 10). It does not, in my experience, grow in densely vegetated grasslands and meadows (see Fig. 11). It was not found during this survey, but the above-mentioned Sand Barren-like habitat that was delineated is potential habitat for it. I believe that plants of the past year should have been reasonably detectable in these habitats, but because it is an annual, its absence in a given year is not strong evidence that it is not present in the seed bank at the site.

Figure 10. *Polygala nuttallii* in December at neabry closely-mowed site in Groton.

Figure 11. *Polygala nuttallii* habitat at neabry closely-mowed site in Groton.

The closely mowed 0.75 ac area at the southeast corner of the proposed solar panel array may be potential habitat for *Polygala nuttallii*, because of its more thinly vegetated condition and a prevalence of the warm-season grasses *Schizachyrium scoparium* Little Bluestem and *Andropogon virginicus* Broomsedge Bluestem (*Polygala nuttallii* typically occurs with one or both of these species). The soil in this area is a sandy loam cap of fill, similar that that in the more densely vegetated area to the north, and I believe that the relative thinness of the vegetation and prevalence of the bluestems in this area has probably been produced by the frequent mowing in this area. Other species that are prominent associates of *Polygala nuttallii* at its known sites, including *Danthonia spicata* Poverty Oatgrass, *Polytrichum* haircap moss, and lichen species, are absent or rare in this area. Thus, in my judgment, this area is likely not potential habitat for *Polygala nuttallii*, based on the soil texture and community composition, but I am relatively less confident that it does not occur hear than in the more densely vegetated cool-season grassland and meadow habitat to the north.

Rhynchospora macrostachya Tall Beaksedge is a perennial grass-like plant in the Sedge family that grows to nearly 4 ft. It grows in bog-like wetlands and sandy or peaty shores. It was not found during this survey, but bog-like habitat with potential for it was identified in the vicinity of Eleocharis quadrangulata suboccurrence "ELO QUA 3" on Attachments 2 and 3, and the draw-down shore of the Reservoir may also be potential habitat for it. I do not have personal experience of its detectability at this time of year, but based on its life-history, it should be detectable because of the production of erect shoots in the autumn. Determining whether or not it is present is not critical, as its potential habitat is largely occupied by one or more of the Survey Target Species 3, 6,

and 7, and the provisions in the site development plan that protect these species and the wetland habitat also will also protect the *Rhynchospora macrostachya*.

To summarize, of the 8 Survey Target Species that were not found in the Study Area by this December field survey, I can state with reasonable confidence that Survey Target Species 9, *Opuntia humifusa* Eastern Prickly Pear, does not occur in the Study Area, because it is highly detectable at this time of year under the conditions of this field survey (i.e., no snow cover, mostly more or less recently mowed habitats). Survey target species 1, 8, and 11 (*Carex oligosperma* Eastern Few-fruited Sedge, *Lycopus amplectens* Clasping-leaved Water-horehound, and *Rhynchospora macrostachya* Tall Beaksedge, respectively) are wetland species whose detectability in winter in the Study Area is uncertain, but based on their habitat affinity, all of their potential habitat at the site will be preserved and protected by the proposal. Of the four Survey Target Species that are restricted to upland habitats, I believe that the potential habitat in the Study Area is mostly likely limited to several Sand Barren-like areas that were delineated during the survey. The mesic and dry-mesic portions of the Study Area that support relatively dense cover of cool-season grasses and/or forbs are not, in my opinion, likely habitat for these species. However, there is relatively less known about the full range of habitat affinities of Survey Target Species 2 and 10 (*Cuphea viscosissima* Blue Waxweed and *Polygala nuttallii* Nuttall's Milkwort, respectively), the two annuals among the Survey Target Species, and so the preceding statement cannot be made with as much confidence as for the two perennial species, *Eupatorium album* White thoroughwort and *Eurybia spectabilis* Showy Aster. In particular, I have relatively less confidence that the 0.75 ac closely mowed area at the southwest corner of the Study Area is not potential habitat for the two annual species.

POTENTIAL RARE PLANT HABITAT ASSESSMENT

An overview and descriptions of existing habitats in the Study Area is presented in "Environmental assessment: Solar Facility Installation, 1240 Poquonnock Road, Groton, Connecticut, New London County", authored by APT and dated October 2015. For the purposes of this survey and potential habitat assessment, I excluded from consideration certain portions of the Study Area that judged to have no potential as habitat for the Survey Target Species, all of which are light-demanding plants of open and semi-open habitats ("semi-open" habitats include, e.g., forest edges, areas under canopy openings in forests, gaps between trees in woodlands, etc.). Habitat thus excluded included closed-canopy forest and more heavily shaded portions of evergreen woodland, and any other non-wetland areas with dense cover of invasive shrubs.

Prior to field inspection, I initially included all open, semi-open, and edge habitats to be potential habitat for Survey Target Species. Based on field reconnaissance, I have divided these habitats in the subsets below, based on their potential as habitat for one or more of the 11 Survey Target Species. Note that Species 9, *Opuntia humifusa* Eastern Prickly Pear, was the one species whose absence was documented by this field survey.

Figure 12. Dry-Mesic Cool-Season Grassland – portion near north end of Study Area.

Figure 13. Dry-Mesic Cool-Season Grassland and Meadow – wetland boundary near based of photo..

Dry-Mesic Cool-Season Grassland and Meadow (low potential, with qualification, for upland species 2, 4, 5, 9, and 10). The majority of the proposed project area is cool-season grassland with an admixture of dry-mesic and mesic meadow (i.e., areas with forbs dominant or co-dominant) with relatively dense vegetative cover (i.e., very little or no exposed soil surface). The distribution of this habitat correlates with the soil on most of the area being a sandy loam cap of fill 12+ inches thick. The dominant species of the grassland habitat are introduced turf and cover grasses, including most prominently *Agrostis capillaris* Rhode Island Bent (rhizomatous) and *Schedonorus arundinaceus* Tall Fescue, with *Holcus lanatus* Common Velvetgrass, *Festuca rubra* Red Fescue, *Festuca trachyphylla* Hard Fescue, *Poa pratensis* Kentucky Bluegrass, *Lolium* sp. Ryegrass, and *Dactylis glomerata* Orchardgrass. Dominant meadow forbs include *Solidago altissima* Tall Goldenrod, *Solidago rugosa* Rough Goldenrod, *Solidago juncea* Early Goldenrod, and, in places, *Artemisia vulgaris* Mugwort. Images in Figs. 12 and 13 are representative of the less closely mowed portion of this habitat. This habitat has, based on my experience and other available information, has low potential as habitat for the five upland rare plants targeted by this survey. All of these species generally occur on sandier substrates with thinner vegetative cover than occurs in this habitat in the Study Area. Most of this habitat on the site was not closely mowed at the time of this field survey, and it appears that less frequent mowing has been the normal regime for the last several years. This has allowed more dense cover of grasses and forbs to develop, lowering the potential for the Survey Target Species. This probability estimate must be qualified, however, as follows. To my knowledge, this kind of habitat has generally not been well surveyed for rare plants in Connecticut (exceptions being my recent surveys of several hundred acres of similar habitat at Groton-New London and Stratford Airports), in part because regular mowing makes many rare species hard to detect, and in part it has been generally assumed that rare plants do not occur in these habitats, so the actual frequency of rare plant occurrences occurrence in this kind of habitat is almost certainly unknown and less rare than it appears, based on existing records. For this reason, I am recommending treating this area, including the portion discussed in the next paragraph as potential rare plant habitat during construction of the solar panel array and surveying for rare plants in 2016 after construction (see Recommendations section).

A portion of the dry-mesic grassland, 0.75± acre at the southwest corner of the Study Area, has been recently closely mowed (Figs. 14 and 15), and appears that this may be the representative of the normal mowing regime for at least the last several years. This area has very similar soils to the less closely mowed areas, but the grass species assemblage is different in that the warm-season native grasses *Schizachyrium scoparium* Little Bluestem and *Andropogon virginicus* Broomsedge Bluestem are much more prominent, and the vegetative cover is thinner. I believe that this area also has low potential for the five upland Survey Target Species, based on the loam soil, absence of certain associate species (see discussion of Sand Barren-like habitat), and the probable intolerance of at least Species 4, 5, and 9 for frequent close mowing. However, Species 2 and 10, *Cuphea viscosissima* Blue Waxweed and *Polygala nuttallii* Nuttall's Milkwort, can be ruled out with relatively less confidence, because the true habitat affinity and tolerance of mowing for Species 2 is unknown, and Species 10 is known to be tolerant, in some measure, of frequent, close mowing. In general, frequently and closely mown habitats have been poorly surveyed for rare plants, and it is thus more

Figure 15. Closely mown portion of Dry-Mesic Cool-Season Grassland and Meadow habitat, at SW corner of Study Area; view looking ~west. Tawny colored patches are Little and Broomsedge Bluestem.

Figure 14. Closely mown portion of Dry-Mesic Cool-Season Grassland and Meadow habitat, at SW corner of Study Area; view looking ~south. Tawny colored patches are Little and Broomsedge Bluestem.

difficult to rule them out as potential habitat for rare plants, on the basis of the mowing regime alone.

Mesic Cool-Season Grassland and Meadow (very low potential for upland species 2, 4, 5, 9, and 10). This evidently mostly frequently and closely mowed habitat (see Fig. 17) occurs as the dominant open habitat in the southeast portion of Study Area. The dominant grasses are the same, but the more mesophytic species are dominant. These include *Festuca rubra* Red Fescue, *Poa pratensis* Kentucky Bluegrass, and *Dactylis glomerata* Orchardgrass. These areas have low potential as rare plant habitat because of the evidently moist and higher-fertility soil conditions. However, because of our lack of knowledge of the true habitat affinities of *Cuphea viscosissima* Blue Waxweed, I am recommending the same precautions during construction and post-construction surveys as for the Dry-Mesic Cool-Season Grassland portion of the Study Area.

Vernal Pool and Fringing Wet Meadow Vegetation (low potential for wetland and upland Survey Target Species). Survey target species 1, 3, 6, 7, 8, and 11 are all species of relatively oligotrophic wetlands, and the nutrient regime of the vernal pool and fringing wet meadow are not evidently oligotrophic wetlands. In addition, at least three of the Survey Target Species are known to be highly detectable this time of year, and were not observed during the field survey. I suspect the other three species are also detectable in December, and my having not detected them is actual evidence of absence, but in any case, the vernal pool nor the wet meadow bear little floristic resemblance to know habitats for these species.

Figure 16. Vernal pool and surrounding wet meadow habitat.

<u>Forest Edges</u> (low potential for wetland or upland Survey Target Species). This habitat (see Fig. 17) occurs at the borders of above- and below-described open habitats, and may be generally considered to have somewhat different potential as habitat for the same Survey Target Species that might occur in the adjacent open habitat. The edge habitat may have somewhat higher-potential because of the less frequent mowing, but this may be balanced out or negated altogether by the attenuation of the light levels due to the half shading of the trees and shading and competition by shrubs, vines, and tall forbs, which in many cases are abundant at the forest edges. Based on my field survey, all of the forest edge habitats in the Study Area have low potential as Survey Target Species habitat.

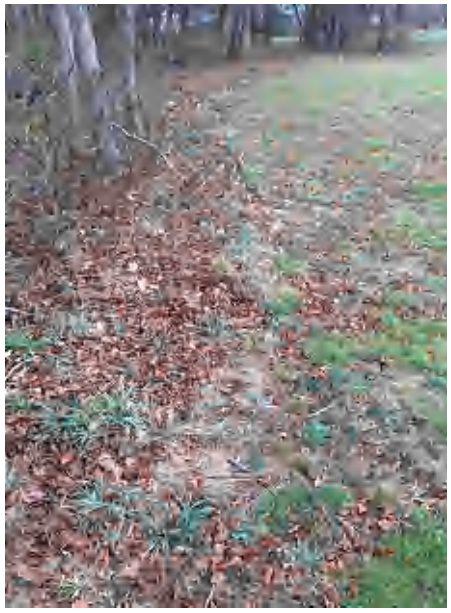


Figure 17. Mesic Cool-Season Grassland and Meadow and Forest Edge habitat.

<u>Sand Barren-like Habitat</u> (moderate to high potential for upland species 2, 4, 5, 9, and 10). This dry-xeric grassland occupies small portions of the Study Area, and has been delineated by APT and mapped (labeled "BOFH", for "Barren/Old Field Habitat" on Attachments 2 and 3). Its most extensive occurrence is as a border to extensive portions of the service road (see Fig. 19) on the east side of the northern portion of the Study Area. It occurs on more or less level sites on sandier soil than the majority of the grassland habitat, and also on moderately to gently sloping, west-facing slopes on the west side of the Study Area (see Fig. 7), where the soil texture is approximately the same as the Cool-Season Grassland and Meadow habitat (the slope and hot aspect presumably tipping conditions in favor of the barren-like conditions at these sites). Vegetative cover of vascular plant species native warm-season grasses *Schizachyrium scoparium* Little Bluestem and *Andropogon virginicus* Broomsedge Bluestem are co-dominant, or the former is dominant with latter an associate. Other associate and indicator species include *Hypericum gentianoides* Orange-grass, *Danthonia spicata* Poverty Oatgrass, *Eragrostis*

spectabilis Purple Lovegrass, the non-native grass *Aristida oligantha* Prairie Three-awn, *Crocanthemum bicknellii* Hoary Frostweed, *Desmodium obtusum* Stiff Tick-trefoil, and other species. In addition to the above-listed indictor plants, lichen and moss cover is high, and these together distinguish this habitat from areas that are thinly vegetated due to recent disturbance and or frequent close mowing. I use the term "Sand Barren-like" here

Figure 18. Sand Barren-like habitat along west side of service road.

Figure 19. Sand Barren-like habitat along east side of service road, toward north end of Study Area.

to avoid confusion of this habitat in the Study Area with our native Sand Barrens, where the above-listed species occur on natural sand and gravel deposits in association with *Pinus rigida* Pitch Pine, *Quercus ilicifolia* Bear Oak, and others. The most extensive and highest quality occurrence of this habitat, in my opinion, is on the east side of the service road in the northeastern part of the Study Area (see Fig. 18).

The one State-listed upland plant documented on the site during this survey, *Aristida longespica* Needlegrass (State-Special Concern) occurs in this habitat (see Figs. 1 and 7).

<u>Draw-down Shore and Reservoir Fringing Wetlands</u> (moderate to high potential for Species 1, 3, 7, 8, and 11; actual habitat for species 3, 6, and 7). This wetland and, in part, seasonally aquatic/seasonally exposed habitat, is the most significant ecological feature of the Study Area, with respect to plant and plant community biodiversity. Different elements are shown in Figs. 3, 5, 20, and 21. Survey Target Species 3, 6, and 7 occur individually, two together, or all three together along nearly the entire eastern shoreline of the Reservoir. Each species is treated in more detail in the Rare Plant Survey Results section. I consider a subset of this habitat complex to have reasonably high

potential for the two wetland Survey Target Species (1 and 11) that were not detected during this survey (see discussions in the Rare Plant Survey Results section).

Figure 21. Draw-down shore community toward southwest end of Study Area. *Hydrocotyle umbellata* occurs here.

Figure 20. *Cephalanthus occidentalis* marsh near northwest end of Study Area. *Ludwigia sphaerocarpa* and *Eleocharis quadrangulata* occur together here, and bog-like potential habitat for *Carex oligosperma* and *Rhynchospora macrostachya* occurs near upland border.

MITIGATION RECOMMENDATIONS

Figure 22. Existing solar panel array in Galstonbury, CT.

The following recommendations are intended to avoid potential impacts, and minimize and mitigate unavoidable impacts of this project to rare plants that occur, or potentially occur, in the Study Area. For the purposes of the following discussion, it is assumed that the solar panel array must be constructed, at least in largest part, in spring 2016, before the actual presence/absence of rare plants in the Study Area can be determined by field survey. It is also assumed that the solar panel array will spatially resemble the solar panel array pictured in Fig. 22, which is an existing facility in Glastonbury, CT.

In my judgment, the following are the potential short-term impacts of the project to potential and known rare plant populations.

A. Soil compaction and soil and vegetation disturbance by heavy equipment, storage of material, etc., including areas outside of the proposed solar panel array areas.
B. Excavation of holes for and installation of solar panel support posts (an unavoidable impact).
C. Construction of storm water treatment swale and bio-filter (unavoidable).

D. Erosion, sedimentation, and pollution due to storm water run-off from construction site.

In my judgment, the following are the actual and potential long-term impacts of the proposed project to potential and known rare plant populations.

i. Permanent shading of slightly under 50% of the existing open habitat.
ii. Displacement of existing habitat by storm water treatment swale and bio-filter (also a long-term habitat enhancement, in part, if constructed as indicated in Recommendation d. below).
iii. Changes in patterns of precipitation and run-off.

Recommendations I. through VI. below address specifically the avoidance and minimization of the potential impacts inherent from constructing the solar panel array prior to conducting field survey for the Survey Target Species during their growing season, when they are most detectable.

I. Postpone construction in the delineated Sand Barren-like habitat until field surveys for potential Survey Target Species have been completed in those areas, and any rare plants that are found that may be impacted are moved (including *Aristida longespica* plants of known population). These surveys should be complete by early September, at the latest.
II. Avoid soil compaction during construction by use of geo-tech fabric and/or low-ground-pressure equipment. If geo-tech fabric is used, ensure that it does not remain in place for more than a few days during the growing season (mid-March through early November).
III. Conduct field survey for the Survey Target Species in the solar panel array area after construction. The primary purpose of this survey would be to detect rare plants as early as possible in locations where they may be expected to be impacted by shading, and move the plants to appropriately open habitat. Another purpose of this survey would be to identify rare plant areas which

may require special attention in the future (e.g., avoidance, special management, etc.).

IV. Mow the solar panel array area the minimum amount required to prevent vegetation from overtopping the panels, and avoid mowing at all from early July through September.

V. Monitor condition of vegetation during and after construction, and adapt methodology if as avoidable impacts are detected.

Recommendations a. through f. below deal with mitigation of the unavoidable impacts of the proposed project. The principal unavoidable impacts are the area displaced by the solar panel support posts, the area permanently shaded by the panels, and the conversion of grassland/meadow habitat to storm water treatment swale and bio-filter (note: this last may be a net rare plant habitat enhancement, if there are no existing rare plant populations in the area – see recommendation d. below).

a. Move *Aristida longespica* plants in known population and additional rare plants that may be found harm's way during above-recommended surveys to suitable nearby habitat, monitor condition until persistence appears likely, and manage as deemed necessary to preserve and enhance.
b. Adjust mowing regime in project area to maximize potential as habitat for the Survey Target Species, if any, found in the area by the above-mentioned surveys. The exact mowing regime will probably depend upon the species found, but once or twice per year, avoiding late summer and early fall, will likely be appropriate.
c. Clearing of forest and woodland, which is already proposed as part of the project, can be considered an expansion of potential habitat for the Survey Target Species. Wood chips must be disposed of off-site, not spread upon the site.
d. Use material with high sand content (i.e., sand or loamy sand) to construct/dress sides and slopes of storm water treatment swale and bio-filter. All of the Survey Target Species are sand-lovers, and creation of sandy (as opposed to

loamy) substrates in the Study Area will create potential colonization sites for these species.

e. Disturbance of the soil during construction, in the absence of soil compaction, may result in a net benefit to rare species by exposing the seed bank, especially of the two annual species.

f. Monitor condition and behavior of rare plant populations at site and conduct occasional resurveys of Study Area for incipient rare plant populations.

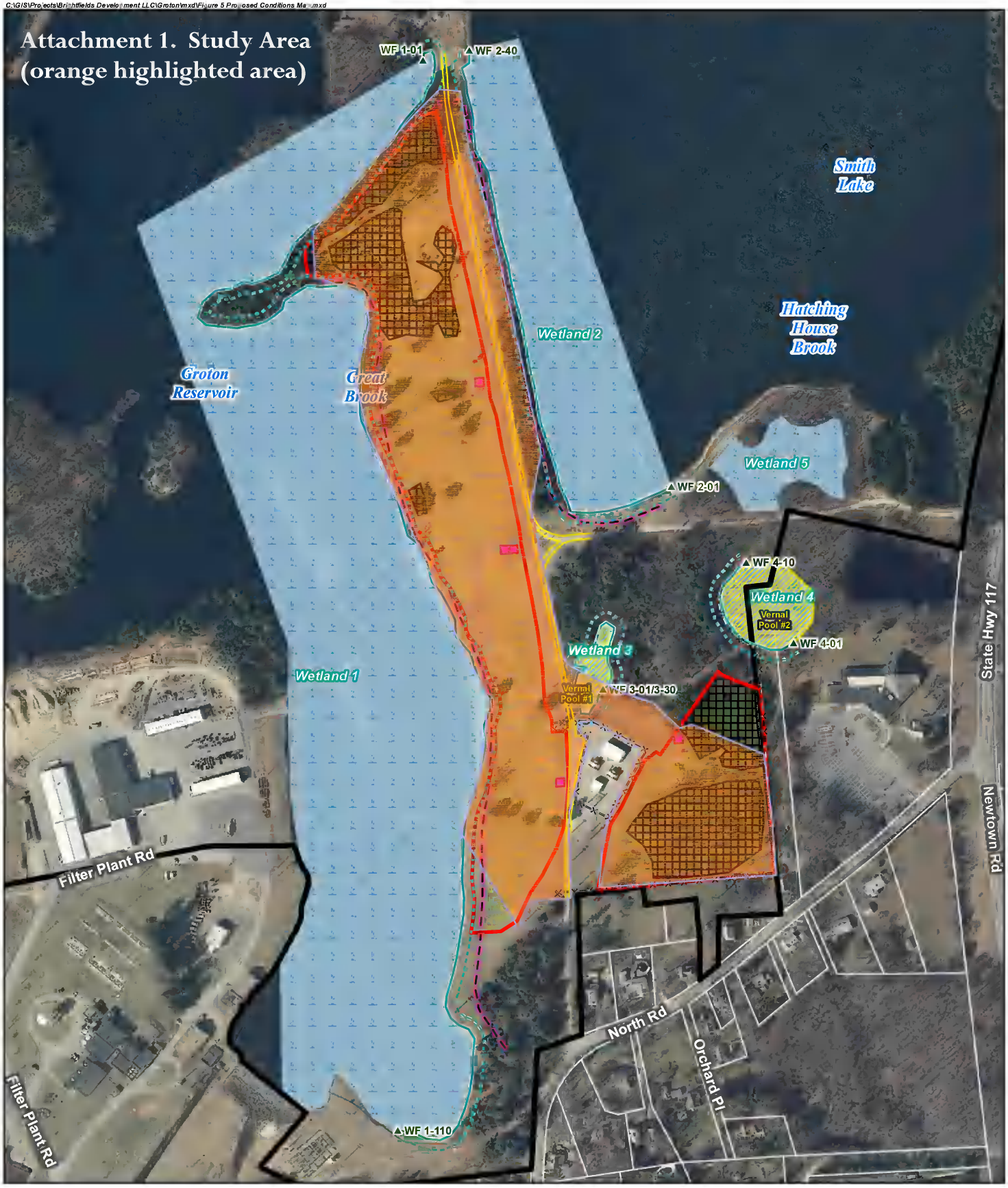
……..

Respectfully submitted,

William H. Moorhead III, Consulting Field Botanist

Attachments:

Attachment 1. Study Area
Attachment 2. Rare Plant Occurrences and sand Barren-like Habitat with Proposed Conditions
Attachment 3. Rare Plant Occurrences and sand Barren-like Habitat over Existing Conditions
Attachment 4. Routes of Transect Survey
Attachment 5. List of Vascular Plants Observed in Study Area in December 2015
Moorhead Curriculum Vitae



Legend

- Site Boundary
- Project Area (+/-13.48 acres)
- Proposed Equipment
- Proposed Solar Modules
- Proposed Clearing and Grubbing Area
- Proposed Site Improvement Area
- Approximate Assessor Parcel Boundary (CTDEEP)
- Existing Gravel Access Drive
- Existing Fence Line
- Start/End Wetland Flag
- Wetland Boundary
- 25' Wetland Buffer
- Limit of 500-Year Flood Zone
- Wetland Area
- Vernal Pool

Map Notes:
Base Map Source: 2012 Aerial Phetegraph (CTECO)
Map Scale: 1 inch = 325 feet
Map Date: October 2015

325 162.5 0 325 Feet

N W E S

Figure 5
Proposed Conditions Map

Proposed Solar Facility
1240 Poquonnock Road
Groton, Connecticut

BRIGHTFIELDS DEVELOPMENT LLC

ALL-POINTS TECHNOLOGY CORPORATION

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Attachment 2. Rare Plant Occurrences and Sand Barren-like Habitat with Proposed Conditions

Legend

- Site Boundary
- Project Area (+/-13.48 acres)
- Approximate Assessor Parcel Boundary (CTDEEP)
- Existing Gravel Access Drive
- Existing Fence Line
- Proposed Clearing and Grubbing Area
- Proposed Site Improvement Area
- Proposed Equipment
- Proposed Solar Modules

Species Surveyed:

- ELEO QUA
- HYD UMB
- LUD SPH
- ELEO QUA Species
- HYD UMB
- LUD SPH
- ARI LON 1
- Barren/Open Field Habitat (BOFH)

Map Notes:
Base Map Source: 2012 Aerial Phetegraph (CTECO)
Map Scale: 1 inch = 325 feet
Map Date: December 2015

325 162.5 0 325 Feet

N W E S

Rare Species Map

Proposed Solar Facility
1240 Poquonnock Road
Groton, Connecticut

BRIGHTFIELDS DEVELOPMENT LLC

ALL-POINTS TECHNOLOGY CORPORATION

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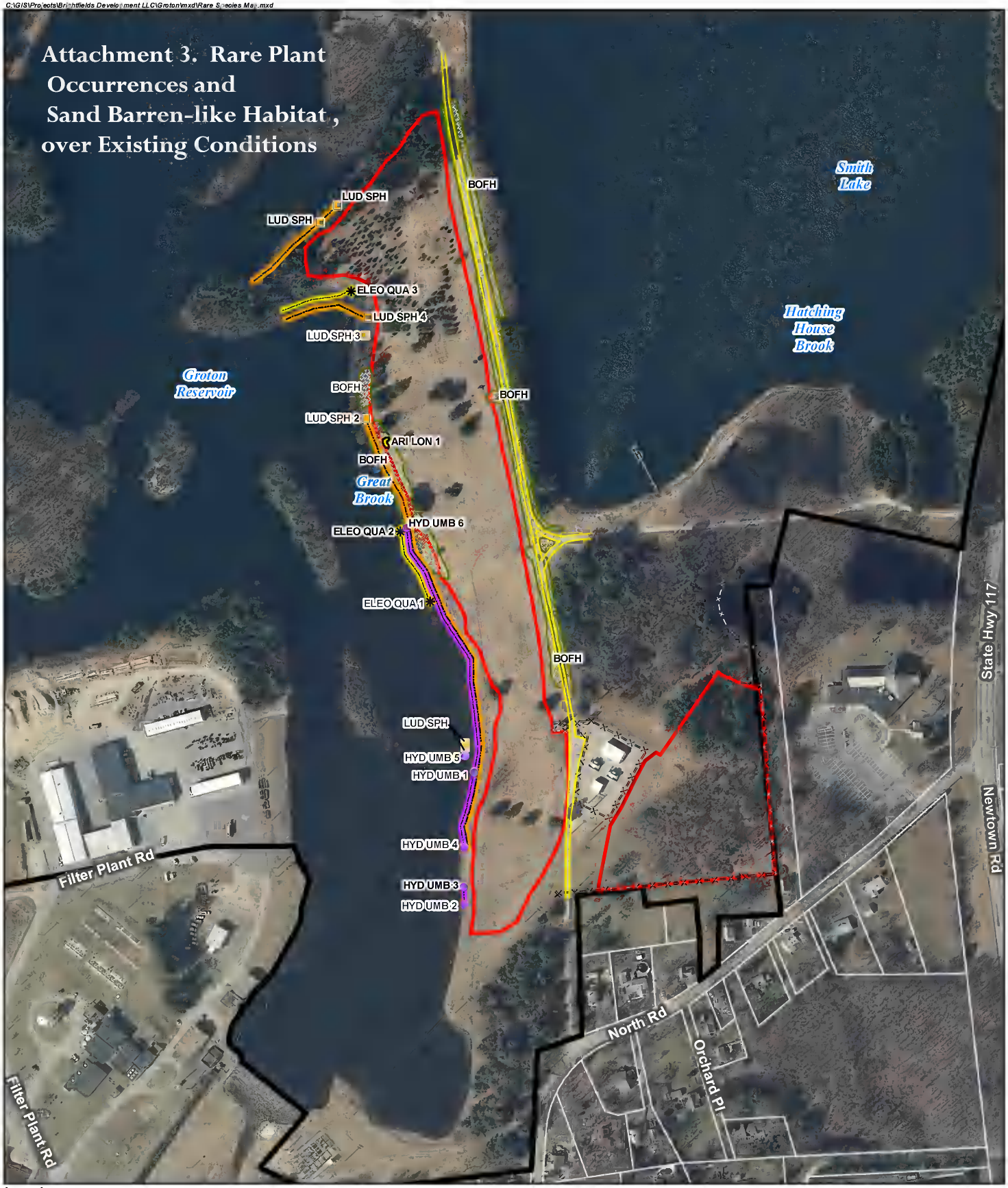
Attachment 3. Rare Plant Occurrences and Sand Barren-like Habitat, over Existing Conditions



Legend

- Site Boundary
- Project Area (+/-13.48 acres)
- Approximate Assessor Parcel Boundary (CTDEEP)
- Existing Gravel Access Drive
- Existing Fence Line

Species Surveyed:

- ELEO QUA
- HYD UMB
- LUD SPH
- ELEO QUA Species
- HYD UMB
- LUD SPH
- ARI LON 1
- Barren/Open Field Habitat (BOFH)

325 162.5 0 325 Feet

N W E S

Rare Species Map

Proposed Solar Facility
1240 Poquonnock Road
Groton, Connecticut

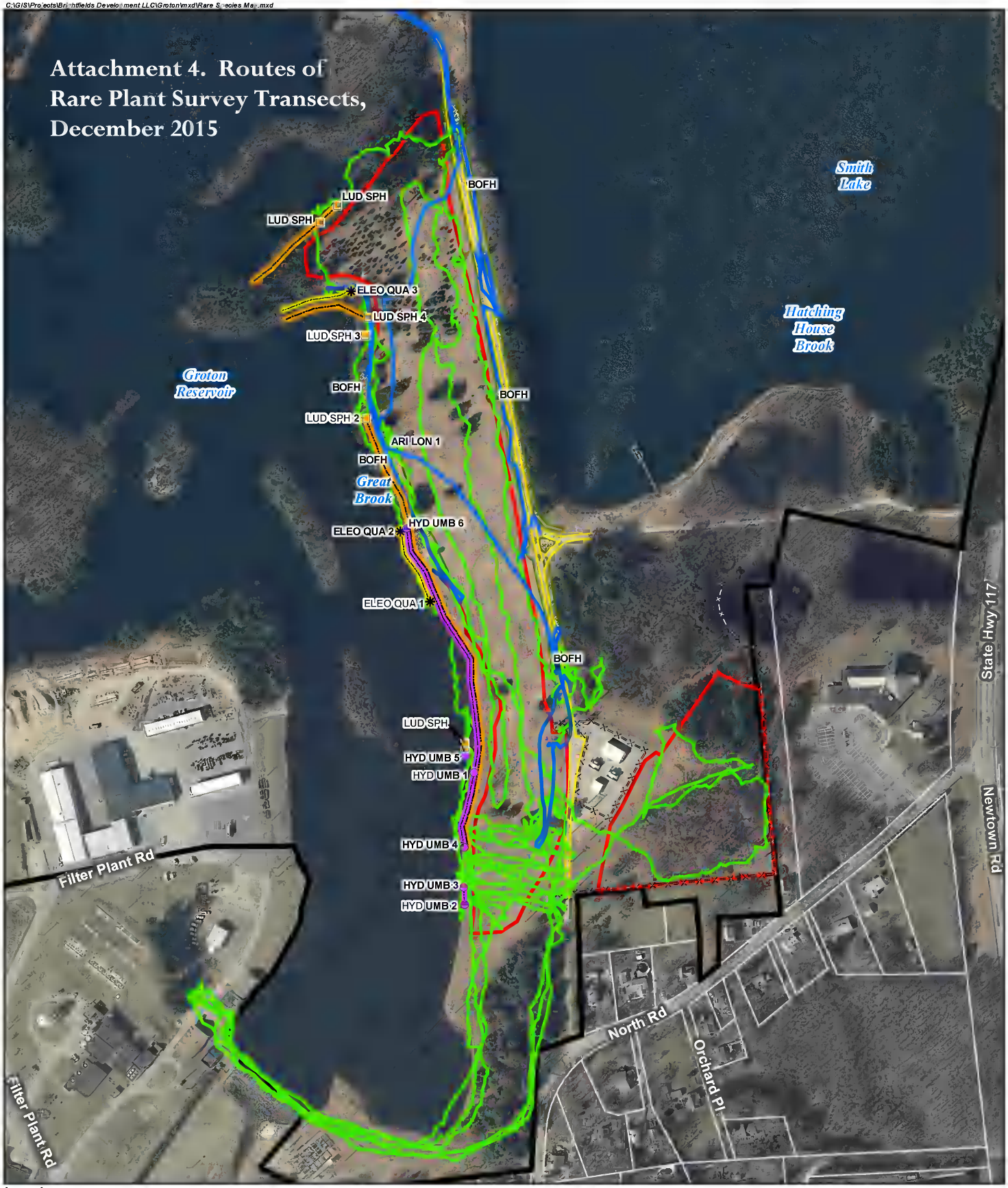
Map Notes:
Base Map Source: 2012 Aerial Phetegraph (CTECO)
Map Scale: 1 inch = 325 feet
Map Date: December 2015

BRIGHTFIELDS DEVELOPMENT LLC

ALL-POINTS TECHNOLOGY CORPORATION

C:\GIS\Projects\Brightfields Development LLC\Groton\mxd\Rare Species Map.mxd

Attachment 4. Routes of Rare Plant Survey Transects, December 2015



Legend

- Site Boundary
- Project Area (+/-13.48 acres)
- Approximate Assessor Parcel Boundary (CTDEEP)
- Existing Gravel Access Drive
- Existing Fence Line

Species Surveyed:

- ELEO QUA
- HYD UMB
- LUD SPH
- ELEO QUA Species
- HYD UMB
- LUD SPH
- ARI LON 1
- Barren/Open Field Habitat (BOFH)

- Track Walked on 12/15/2015
- Track Walked on 12/28/2015

Rare Species Map

Proposed Solar Facility
1240 Poquonnock Road
Groton, Connecticut

325 162.5 0 325 Feet

N W E S

Map Notes:
Base Map Source: 2012 Aerial Phetegraph (CTECO)
Map Scale: 1 inch = 325 feet
Map Date: December 2015

BRIGHTFIELDS DEVELOPMENT LLC

ALL-POINTS TECHNOLOGY CORPORATION

Taxon	ID question?	Common Name	Native vs. non-native in CT[3]	Invasive Status in CT[1,2]	Legal E/T/SC status in CT[4]
Achillea millefolium L.		Yarrow	native		
Agrostis capillaris L.		Rhode Island Bent	non-native		
Andropogon virginicus L. var. *virginicus*		Broomsedge Bluestem	native		
Aristida dichotoma Michx. var. *dichotoma*		Churchmouse Threeawn	native		
Aristida longespica Poir. var. *longespica*		Needlegrass	non-native?		State-Special Concern
Aristida oligantha Michx.		Prairie Three-awn	non-native		
Artemisia vulgaris L. var. *vulgaris*		wormwood	non-native		
Betula populifolia Marsh.		Gray Birch	native		
Bidens discoidea (Torr. & Gray) Britt.		Small Beggar-ticks.	native		
Bromus inermis Leyss. ssp. *inermis*		Smooth Brome-grass	non-native		
Carex crinita Lam.		a sedge	native		
Carex longii Mackenzie		a sedge	native		
Carex lupulina Muhl. *ex* Willd.		Hop Sedge	native		
Carex tonsa (Fern.) Bickn.		a sedge	native		
Centaurea stoebe L. ssp. *micranthos* (Gugler) Hayek		Spotted Knapweed	non-native	WI/banned	
Cephalanthus occidentalis L.		Bouttonbush	native		
Ceratophyllum demersum L.		Common Hornwort	native		
Ceratophyllum echinatum Gray		Spineless Hornwort	native		
Chamaedaphne calyculata (L.) Moench		Leatherleaf	native		
Crocanthemum bicknellii (Fern.) Barnh.		Hoary Frostweed	native		
Dactylis glomerata L.		Orchard Grass	non-native		
Danthonia spicata (L.) Beauv. *ex* Roemer & J.A. Schultes		Poverty Grass	native		
Daucus carota L.		Queen Anne's Lace	non-native		
Decodon verticillatus (L.) Ell.		Swamp-willow	native		
Desmodium obtusum (Muhl. ex Willd.) DC.	?	Stiff Tick-trefoil	native		
Dichanthelium acuminatum (Sw.) Gould & C.A. Clark		a panic grass	native		
Dichanthelium clandestinum (L.) Gould		Deertongue	native		
Dichanthelium dichotomum (L.) Gould ssp. *microcarpon* (Muhl. ex Ell.) Freckmann & Lelong		a panic grass	native		
Dichanthelium sphaerocarpon (Ell.) Gould		a panic grass	native		
Digitaria Haller.		crabgrass	?		
Eleocharis acicularis (L.) Roemer & J.A. Schultes		a spikerush	native		
Eleocharis quadrangulata (Michx.) Roemer & J.A. Schultes		Spike-rush var. crassior	native		State-Endangered

Taxon	ID question?	Common Name	Native vs. non-native in CT[3]	Invasive Status in CT[1,2]	Legal E/T/SC status in CT[4]
Elymus repens (L.) Gould		Quackgrass	non-native		
Eragrostis spectabilis (Pursh) Steud.		Purple Love-grass	native		
Euphorbia cyparrisias L.		Cypress Spurge	non-native	WI/banned	
Euthamia graminifolia (L.) Nutt.		Grass-leaved Goldenrod	native		
Fallopia japonica (Houtt.) Dcne. var. *japonica*		Japanese Knotweed	non-native	WI/banned	
Festuca filiformis Pourret		Fine-leaved Sheep Fescue	non-native		
Festuca ovina L.		Sheep Fescue	non-native		
Festuca rubr a L.		Red Fescue	non-native		
Festuca trachyphylla (Hack.) Krajina		Hard Fescue	non-native		
Frangula alnus P. Mill.		European Buckthorn	non-native	WI	
Glyceria R. Br.		unidentified manna grass	native		
Hieracium L. sp.[acaulescent]		non-native hawkweed	non-native		
Holcus lanatus L.		Common Velvetgrass	non-native		
Hydrocotyle umbellata L.		Water Pennywort	native		State-Endangered
Hypericum gentianoides (L.) B.S.P.		Orange-grass	native		
Hypericum L.		St.-John's-wort	?		
Hypericum perforatum L.		Common St. Johnswort	non-native		
Hypochaeris L.		unidentified cat's-ear	non-native		
Juncus dudleyi Wieg.		a rush	native		
Juncus effusus L.		Soft Rush	native		
Juncus militaris Bigelow		Bayonet Rush	native		
Juniperus virginiana L. var. *virginiana*		Eastern Red Cedar	native		
Kummerowia striata (Thunb.) Schindl.		Japanese-clover	non-native		
Larix laricina (Du Roi) K. Koch		Amercian Larch	native and introduced		
Lechea L.		pinweed	native		
Leersia oryzoides (L.) Sw.		Rice Cut-grass	native		
Lespedeza capitata Michx.		Round-headed Bush-clover	native		
Leucanthemum vulgare		Ox-eye Daisy	non-native		
Ligustrum vulgare L.		European Privet	non-native	PI	
Lolium L.		unidentified rye-grass	non-native		
Lonicera japonica Thunb.		Japanese Honeysuckle	non-native	WI/banned	
Lonicera morrowii Gray		Morrow's Honeysuckle	non-native	WI/banned	
Lotus corniculatus L.		Birdsfoot Trefoil	non-native		
Ludwigia palustris (L.) Ell.		Water Purslane	native		
Ludwigia sphaerocarpa Ell.		Round-pod Water-primrose			State-Endangered
Nymphaea odorata Ait.		Fragrant White Water-lily	native		
Onoclea sensibilis L.		Sensitive Fern	native		

Taxon	ID question?	Common Name	Native vs. non-native in CT[3]	Invasive Status in CT[1,2]	Legal E/T/SC status in CT[4]
Persicaria hydropiperoides (Michx.) Small		Mild Water-pepper	native		
Persicaria punctata (Ell.) Small		Dotted Smartweed	native		
Pinus resinosa Ait.		Red Pine			
Pinus strobus L.		Eastern White Pine	native		
Plantago aristata Michx.		Buckhorn	non-native		
Plantago lanceolata L.		English Plantain	non-native		
Poa pratensis L. ssp. *pratensis*		Kentucky Bluegrass	non-native		
Potentilla canadensis L.		Dwarf Cinquefoil	native		
Potentilla simplex Michx.		Common Cinquefoil	native		
Prunus serotina Ehrh. var. *serotina*		Black Cherry	native		
Rosa multiflora Thunb. *ex* Murr.		Multiflora Rose	non-native	WI/banned	
Rosa palustris Marsh.		Swamp Rose	non-native		
Rubus hispidus L.		Swamp Dewberry	native		
Rubus L. [shrub]		unidentified blackberry	native		
Rumex acetosella L.		Common Sheep Sorrel	non-native	PI/banned	
Salix L.		willow	?		
Schedonorus arundinaceus (Schreb.) Dumort		Tall Fescue	non-native		
Schizachyrium scoparium (Michx.) Nash var. *scoparium*		Little Bluestem	native		
Smilax glauca Walt.		Sawbrier	native		
Smilax rotundifolia L.		Comon Greenbrier	native		
Solidago altissima L. ssp. *altissima*		Tall Goldenrod	native		
Solidago juncea Ait.		Early Goldenrod	native		
Solidago nemoralis Ait. ssp. *nemoralis*		Gray Goldenrod	native		
Solidago rugosa P. Mill. ssp. *rugosa*		Wrinkle-leaved Goldenrod	native		
Sparganium L.		bur-reed	native		
Symphyotrichum laeve (L.) A. & D. Löve var. *laeve*		Smooth American-aster	native		
Symphyotrichum pilosum (Willd.) Nesom		Awl American-aster	native		
Taraxacum officinale G.H. Weber *ex* Wiggers		Common Dandelion	non-native		
Thelypteris palustris Schott var. *pubescens* (Lawson) Fern.		Marsh Fern	native		
Trichostema dichotomum L.		Bastard Pennyroyal	native		
Trifolium pratense L.		Red Clover	non-native		
Typha latifolia L.		Broad-leaved Cat-tail	native		
Vinca minor L.		Lesser Periwinkle	non-native		
Viola primulifolia L.		Primrose-leaved Violet	native		

TABLE NOTES:

Taxon	ID question?	Common Name	Native vs. non-native in CT[3]	Invasive Status in CT[1,2]	Legal E/T/SC status in CT[4]

[1]Invasives status abbreviations: WI = Widespread and Invasive; PI = Potentially Invasive (from Mehrhoff, L. J., K. J. Metzler, and E. E. Corrigan. 2003. Non-native invasive and potentially invasive vascular plants in Connecticut. Center for Conservation and Biodiversity, University of Connecticut, Storrs. 4-page pamphlet.

[2]"banned " means it is illegal in Connecticut to import, move, sell, purchase, cultivate, or distribute this species, per Connecticut Public Acts 02-136 and 04-203

[3]"native" and "non-native" means native or non-native to Connecticut, mostly according to Dowhan, J.J. 1979. A preliminary checklist of the vascular flora of Connecticut (growing without cultivation). State Geological & Natural History Survey of Connecticut. Report of Investigations No. 8. 176 pp. For some species, I have accepted judgemetn of more recent references (see References section of report) that contradict Dowhan (1979)

[4]listing status of plant in the Regulations of Connecticut State Agencies Sections 26-306-4 to 26-306-6, pubilshed in the Connecticut Law Journal June 29, 2004.

Curriculum Vitae

William H. Moorhead III

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whmoorhead@optonline.net

TECHNICAL EXPERTISE

- Inventory for Rare/Threatened/Endangered plants, plant & natural communities, and Critical Habitats
- Mapping of vegetation, plant/natural communities using both traditional and modern tools and techniques (including various remote sensing coverages and GIS softwares)
- Classification and mapping of vegetation, plant and natural communities, and Critical Habitats in the northeastern U.S.
- Various methods for sampling vegetation and plant populations, for purposes of description and monitoring over time
- Restoration, management, and monitoring of rare plant populations and plant/natural communities
- Interpretation and ground-truthing aerial photographic imagery and other remote sensing coverages
- Delineation of Tidal Wetlands in Connecticut
- Federal Jurisdictional ("Army Corps") Wetlands delineation
- Sampling, identification, and analysis of freshwater aquatic macro-invertebrate communities for water quality evaluation
- Lecturer and instructor in native and invasive plant identification, rare plant and plant/community inventory, ecology and management, and wetland delineation, at secondary school, college undergraduate, graduate school, and adult professional levels
- Wetland restoration and mitigation planning, implementation, and monitoring
- Review and technical critique of wetlands permit and other environmental applications
- Review of conservation & management plans, technical journal articles, books relating to rare plant conservation, identification and ecology
- Invasive plant control and eradication in rare plant/natural communities and Critical Habitats

PROFESSIONAL EXPERIENCE

Twenty-eight years distributed in above-listed areas.

EMPLOYMENT

10/00-present **Independent Consulting Field Botanist/Ecologist:** rare plant and natural community, Critical Habitat survey and inventory; classification and mapping of ecological

communities and Critical Habitats; wetland delineation; technical support of environmental permit applications; technical support of oppositions to environmental .
MAJOR PROJECTS:

- Contract botanical survey for MA NHESP in June, 2010, to relocate/update status of not-recently-observed State-listed plant populations in Berkshire County, in support of BIOMAPS 2 critical habitat mapping project. Twenty-seven populations documented.
- Contract botanical survey for MA NHESP in 2009, for globally rare sedge *Eleocharis diandra*, along Connecticut River in MA. Eight *Eleocharis diandra* populations documented, *Eleocharis ovata* documented for the first time (3 populations) on the CT River, 21 populations of other State-listed plants documented.
- Contract botanical survey for MA NHESP, 2008-2009, surveying for State-listed plants within 500-m-radius of Housatonic River from Pittsfield to Sheffield, MA. Approx. 138 new State-listed plant populations documented, including rediscovery of 1 State-Historic species and 1 Berkshire County-Historic species, 19 previously known populations relocated & updated.
- From 2008-2009, employed part-time by University of Connecticut Dept. of Ecology & Evolutionary Biology to create a digital GIS coverage of natural communities identified In Connecticut's Comprehensive Wildlife Conservation Strategy as "Critical Habitats", using a synthesis of interpretation of remote sensing imagery, Connecticut Natural Diversity Database data, and data from past and current field surveys of my own and others. Responsible for creating or editing more than 2000 critical habitat polygons and populating associated attribute data base.
- Principal Investigator in 2006-2009 research project, funded by the Long Island Sound License Plate Fund, describing and mapping the complex mosaic of plant communities in a 330-acre brackish tidal wetland system on the lower Connecticut River, involving collection and analysis of 950 stratified random floristic plots.
- In 2006, employed by Parsons (consultant to CONN-DOT), conducted an inventory of State-listed endangered plants and significant natural communities, and classified and mapped vegetation of 500-ac Groton-New London Airport; 9 new State-listed species documented on property.
- Research and preparation, 2004-2006, of the Eightmile River Watershed Biodiversity Report, commissioned by the National Park Service and the Eightmile River Wild & Scenic Study Committee.
- Co-investigator in 2005-2007 rare plant and natural community survey for private landowner of 600+ ac in Alford and West Stockbridge, MA; 5 new State-listed and 3 Watch-list species documented.
- In 2005, as subcontractor to The Maguire Group (consultant to CONN-DOT), classified and described vegetation and natural communities, and performed avian point counts along 15 avian survey transects (14 cumulative miles) in the proposed Rte. 11 corridor in Salem, East Lyme, Montville, and Waterford, CT; ancillary to main tasks, new occurrences of 1 Federally-Threatened and 4 State-listed plants were documented.
- Co-investigator in 2004 survey to rediscover a State-historic plant in Greenfield, Massachusetts, funded by a Massachusetts Natural Heritage and Endangered Species Program's Small Research Grant; occurrences of 5 State-listed and 4 Watch-list species documented.
- In 2003 and 2004, botanical consultant to Northwest Conservation District and King's

Mark Environmental Review Team, in review of large proposed golf course-subdivision project in Norfolk, CT; 5 new State-rare species occurrences documented.

- Survey, 2003-2006, of the 62-mi^2 Eightmile River watershed in Middlesex and New London Counties, CT, for rare plants and significant natural communities, commissioned by the National Park Service and the Eightmile River Wild & Scenic Study Committee; 35 new rare species occurrences (more than doubling number of know extant occurrences) and 101 priority natural community occurrences were documented; results delivered as digital GIS product.
- Farmington River Watershed Association's 2002 Farmington River Biodiversity Project: 7-month inventory of rare plants and priority natural communities in 7-town (214 mi^2) study area in the lower Farmington River watershed; approx. 100 new rare species populations documented, tripling number of known extant occurrences, and 160 priority natural community occurrences documented.
- Inventory, 2000-2007, of nine parcels in western Connecticut ranging from 60 to 400 acres, in technical support of applications for State Open Space Acquisition Grants by local and national land preservation groups, including Trust For Public Land, Roxbury Land Trust, Sharon Land Trust, Cornwall Land Trust, and Southbury Land Trust.

7/96 – 1/05 **Contract Inventory Botanist/Ecologist for Connecticut Natural Diversity Data Base, Connecticut Department of Environmental Protection:**

Scope of services:

- Survey for and documentation of State-listed vascular plants. Highlights of this work: rediscovery of 19 State-Historic taxa; ~390 new populations and unmapped historic sites discovered/rediscovered; first state records for 2 native species; and first state records for several non-native species.
- Vegetation reconnaissance and collection of relevé data from plant communities of special conservation significance; data used in development of state and national vegetation classifications.
- Rare plant inventory and classification and digital (GIS) mapping of the vegetation of the 2000-acre Canaan Mountain Natural Area Preserve in North Canaan and Canaan, Litchfield Co., CT.
- Rare plant inventory, classification and mapping of the vegetation of 570-acre Kitchel Natural Area Preserve in Colebrook, Litchfield Co., CT.
- Rare plant inventory, classification and mapping of the vegetation of Pachaug Great Meadow and Mount Misery Natural Area Preserves (cumulatively 626 acres) in Voluntown, New London Co., CT.
- Classification and digital (GIS) mapping of the vegetation of 280-ac Matianuck Natural Area Preserve, in Windsor, Hartford Co., CT.
- Assistance with environmental review, periodic reevaluation of state ranks and legal status of species in state, training of interns, coordination with The Nature Conservancy and other NGOs.

2/94 – 7/96 **Ecologist: Virginia's Natural Heritage Program (VA Department of Conservation and Recreation, Division of Natural Heritage)**:

Key responsibilities:

- Together with the Division's other two ecologists, development of vegetation classifications of study areas in Virginia's mountain provinces and in the southeastern coastal plain, via the collection and analysis of relevé data using the Braun-Blanquet tabular comparison approach. Project leader responsibility for:
  - an intensive vegetation survey of a 4000-ha study area in the George Washington National Forest in the Ridge and Valley Province. Tasks included collection and analysis of 50+ relevés, classification and mapping of the vegetation at the Land Type Phase level, and production of accompanying report for U.S.D.A. Forest Service contract
  - Nature Conservancy contract calling for collection/assemblage of relevés from Virginia's pitch pine-scrub oak woodland and related vegetation. Tasks included collection of new relevés, a Braun-Blanquet analysis and classification of these and existing relevés, and production of a report.
- Analysis of relevé data and other community data to advance Virginia state vegetation classification.
- Inventory for and collection of relevés and other documentation from Virginia's globally rare, state-rare, and exemplary natural communities, both in fulfillment of contracts with the Jefferson National Forest, Dept. of Defense, and NASA, and *de novo* inventory.
- Technical assistance, including advice and collection of relevé data, to natural area preserve stewardship section in development of resource management plans
- Technical assistance, including project review, to the environmental review section.

6/93 - 1/94 **Independent Consulting Field Ecologist, doing business as Western Highlands Consulting, Woodbury, Connecticut.**

Key Projects:

- Contract work for CT-DEP-Natural Diversity Data Base: performing field surveys to locate and characterize occurrences of RTE plant species; collecting relevé data from Atlantic White Cedar swamp and calcareous fens for use in development of state and national vegetation classifications
- Sampling and identification of stream macro-invertebrates, using RBP III and other protocols, as subcontractor to several environmental consulting firms.
- Survey, characterization, and mapping of vegetation and habitats for several clients in support of land use permit applications, *e.g.* wetlands permit applications, Superfund clean-up plans.

1/91 - 6/93 **Environmental Analyst (Biological): Office of Long Island Sound Programs (OLISP), Connecticut Department of Environmental Protection.**

Key responsibilities:

- investigation of violations of State Tidal Wetlands Act and Structures, Dredging, and Fill Statutes, using botanical/ecological expertise and aerial photo interpretive skills to determine jurisdictional boundaries, identify violations, determine degree of environmental harm and make recommendations to the Commissioner for appropriate

site remediation requirements
- negotiation of consent orders with violators of Tidal Wetlands and Structures & Dredging Acts
- provide testimony at enforcement hearings and trials
- documentation of State-listed species occurrences
- technical assistance within my areas of expertise to OLISP Permitting and Coastal Programs sub-offices, other DEP bureaus and State agencies, municipalities, and private entities
- coordination of the Long Island Sound Clean Water Account Research Fund
- review and evaluation of site remediation and restoration plans
- review and processing of applications for Structures & Dredging and Tidal Wetlands permits.

3/83 - 12/90 **Consulting Field Biologist/Ecologist, Stereo-photogrammetrist, and Seller of Maps, doing business as Western Highlands Consulting, Woodbury, Connecticut.** Field biology/ecology component less than ½ time until about 12/87, full-time thereafter. Representative projects:

- Survey and mapping of occurrences of RTE plant species and critical habitats in and near the proposed right-of-way for the Iroquois Gas Transmission System Ltd. 24" natural gas pipeline: surveyed the entire CT portion and part of the NY portion, a total of approximately 700 acres and 55 linear miles. Also provided botanical support for the delineation of Federal Jurisdictional Wetlands. 3/90-6/91.
- Sampling, identification, and analysis of freshwater aquatic macro-invertebrate communities, using RBP III and other protocols, as subcontractor to The Ecological Consulting Services (EcoS), East Haven (now Hamden), CT.
- Performed multi-season bird and wildlife inventories, vegetation inventories and habitat/plant community maps, water quality assessments of streams, ponds, and lakes, delineation of Federal Jurisdictional Wetlands, delineation of watercourses, and site design evaluations, working as subcontractor to EcoS on a number of residential and commercial development projects seeking permits in Colchester, Fairfield, Marlborough, Glastonbury, Westport, West Hartford, East Lyme, Stamford, Cromwell, and Rocky Hill, Connecticut. 9/85-3/90.
- Produced an evaluation of construction-related sedimentation impacts and a wetland restoration plan for a 5-acre inland wetland on the site of the Mall at Buckland Hills, Manchester, CT, 8/89-8/90. Client: Fuss & O'Neill, Inc., Manchester, CT.
- Performed a biological/ecological inventory of a large seasonal pond, provided site design recommendations, and testified before the Glastonbury Conservation Commission on behalf of The Balf Co., Newington, CT, in support of their application for a town mining/excavation permit, 4/89-2/90. Client: Fuss & O'Neill, Inc.
- Planning and installation of a number of interpretive nature trails on Girl Scouts of America properties, 4/84-5/90.
- Provided technical support to a citizen's group opposing a proposed 19-lot subdivision in Brooklyn, CT, in the form of application review and testimony before the local zoning commission on biological issues, 11/89.

SPECIAL PROJECTS

Partner in research funded in part by The Nature Conservancy into changes in vegetation due to beaver activity at Beckley Bog, Norfolk, CT, 5/87-7/90.

EDUCATION

1986 **B.S. Chemistry with concentration in Biology**, Charter Oak College, based on course work completed at Middlesex Community College, University of Connecticut, and Central Connecticut State University.

1983 **A.S. Environmental Science**, Middlesex Community College.

***Post-graduate course work*:**

2005 ***Isoetes* Identification –** 1.5-day identification and ecology workshop, Delta Institute of Natural History, Bowdoin, ME. Instructor: Carl Lewis.

2005 ***Dryopteris* and its Hybrids** – 1.5-day identification workshop, Delta Institute of Natural History, Bowdoin, ME. Instructor: James D. Montgomery.

2002 **Dragonflies and Damselflies of Southern New England** – 1-day workshop, Center for Conservation & Biodiversity, University of Connecticut. Instructors: Dave Wagner, Mike Thomas.

1996 ***Carex* section Ovales Identification Workshop** – 2-day course, University of Connecticut and Connecticut Museum of Natural History. Intructor: Dr. Anton Reznicek.

1996 ***Sphagnum* Identification Workshop** – 2-day course, University of Connecticut and Connecticut Museum of Natural History. Instructor: Dr. Anton Damman.

1995 **Prescribed Burn Crew Training Workshop** – 2 day workshop, certificate, Virginia Dept. of Conservation and Recreation, Division of Natural Heritage.

1993 **Field Methods in Ecology** (EEB 452) - graduate level, 2 credits, University of Connecticut. Instructor: Dr. Anton Damman. Grade: A.

1993 **Soils** (PLSC 250) - undergraduate level, 3 credits, University of Connecticut. Grade: A.

1992 **Sedge Identification and Ecology** – 1-week workshop, certificate, Eagle Hill Wildlife Research Station, Steuben, ME. Instructor: Dr. Anton Reznicek.

1991 **Wetland Evaluation Technique (W.E.T. III)** – 32-hour training seminar, certificate, National Highway Institute, Federal Highway Administration.

1989 **Delineation of Federal Jurisdictional Wetlands** - training seminar, certificate, The National Wetland Science Training Cooperative.

1987 **Geomorphology** - graduate level, 3 credits, University of New Haven. Grade: A.

PRESENTATIONS

Moorhead, W.H. "Old Growth Forests of Peters Mountain, Alleghany County, Virginia." Presented at the 73rd Annual Meeting of the Virginia Academy of Science, May 23-26, 1995, VMI, Lexington, VA.

REPRESENTATIVE TECHNICAL REPORTS

Moorhead, W.H. III. 2010. A Survey for Rare Plants at Aton Forest: Results of Moorhead Field Surveys 2005-2010. 31 pp. plus appendices, including digital GIS products.

Moorhead, W.H. III, C. Chadwick, S. Prisloe, J. Barrett, and N.E. Barrett. 2009. The Vegetation Mosaic of Ragged Rock Creek Tidal Marsh, Connecticut River, Old Saybrook, Connecticut. A final report to Department of Environmental Protection, State of Connecticut. A Long Island Sound License Plate Research Fund project. 39 pp. plus appendices, including digital GIS products.

Moorhead, W.H. III. 2006. Eightmile River Watershed Biodiversity Report. Prepared for the Eightmile River Wild and Scenic Study Committee. 138 pp. plus digital GIS product.

Moorhead, W.H. III. 2005. Pachaug Great Meadow Natural Area Preserve and Mount Misery Brook – Rhododendron Sanctuary Natural Area Preserve, Voluntown, New London County, Connecticut: A Survey of Rare Vascular Plant Species and Provisional Classification and Mapping of Vegetation and Natural Communities. 69 pp. plus appendices, including digital GIS products.

Moorhead, W.H. III. 2004. Final Summary Report of Eightmile River Watershed Rare Plant and Community Survey, 19 Jun – 27 Oct 2003. 19 pp. plus appendices, including digital GIS products.

Moorhead, W.H. III. 2004. Matianuck Sand Dunes Natural Area Preserve, Windsor, Hartford County, Connecticut: Provisional Classification and Mapping of Vegetation and Natural Communities. 23 pp. plus appendices, including digital GIS products.

Moorhead, W.H. III. 2003. Farmington River Watershed Association 2002 Biodiversity Project. Rare Plant and Natural Community Inventory. Summary Report. 22 pp. plus

Moorhead, W.H. III. 2001. Kitchel Natural Area Preserve, Litchfield County, Connecticut. A survey of rare vascular plant species and significant natural communities and provisional classification and mapping of vegetation and natural communities. 69 pp. plus appendices.

Moorhead, W.H. III. 2000. Canaan Mountain Natural Area Preserve, Litchfield County, Connecticut: a survey of rare vascular plant species and significant natural communities, and provisional mapping of vegetation and natural communities. Unpublished report submitted to the Connecticut Natural Diversity Data Base, Connecticut Dept. of Environmental Protection. 128 pp. plus appendices.

Fleming, G.P. and W.H. Moorhead III. 1998. Comparative wetlands ecology study of the Great Dismal Swamp, Northwest River, and North Landing River in Virginia. Natural Heritage Tech. Rep. 98-9, VA Dept. of Conservation and Recreation, Div. of Natural Heritage, Richmond. Unpublished report submitted to the U.S. EPA.
181 pp. plus appendices

Fleming, G.P. and W.H. Moorhead III. 2000. Plant communities and ecological land units of the

Peters Mountain area, James River Ranger District, George Washington and Jefferson National Forests, Virginia. Natural Heritage Tech. Rep. 00-07, VA Dept. of VA Dept. of Conservation and Recreation, Div. of Natural Heritage, Richmond. Unpublished report submitted to the USDA Forest Service. 195 pp. plus appendices

Fleming, G.P. and W.H. Moorhead III. 1996. Ecological land units of the Laurel Fork area, Highland County, Virginia. Natural Heritage Tech. Rep. 96-08, VA Dept. of VA Dept. of Conservation and Recreation, Div. of Natural Heritage, Richmond. Unpublished report submitted to the USDA Forest Service. 114 pp. plus appendices

Belden, A. Jr. and W.H. Moorhead III. 1996. A Natural Heritage Inventory of the Clinch Ranger District III, George Washington and Jefferson National Forests, Virginia. Natural Heritage Tech. Rep. 96-10, VA Dept. of VA Dept. of Conservation and Recreation, Div. of Natural Heritage, Richmond. Unpublished report submitted to the USDA Forest Service. 106 pp. plus appendix.

Ludwig, J.C., W.H. Moorhead, and A. Belden. 1995. A Natural Heritage Inventory of the Clinch Ranger District II, George Washington and Jefferson National Forests. Natural Heritage Tech. Report 95-3. Virginia Dept. of Conservation and Recreation, Division of Natural Heritage. Unpuplished report submitted to the USDA Forest Service. 66 pp. plus appendices.

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AFFILIATIONS

Josselyn Botanical Society, 2010 - present (member)
New England Plant Conservation Program (NEPCoP), CT Task Force, 1996 – present (member)
Aton Forest, Inc. Research Committee, 2009 – present (board member)
Board of Directors, CT Chapter, The American Chestnut Foundation, 2009 - present (board member)
Flora Novae Angliae Advisory Committee, 2005 – present (committee member)
Flora Conservanda Update Committee, 2008 – present (committee member)
New England Botanical Club, 1999 – present (member).

Southern Appalachian Botanical Society, 1997 – present (member).
Torrey Botanical Society, 2001 – present (member).
Natural Areas Association, 1996 – 2002 (member).
North American Benthological Society, 1989 – 1993 (member).
The Wildlife Society, 1990 – 1993 (member).

References and samples of previous work furnished upon request

EXHIBIT C – Stormwater Management Report

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STORMWATER MANAGEMENT REPORT

PREPARED FOR:

SOLARCITY CORPORATION
DEVELOPMENT AND MANAGEMENT PLAN
GROTON RESERVOIR SOLAR PROJECT
1240 POQUONNOCK ROAD

GROTON, CONNECTICUT

OCTOBER 2015
(UPDATED DECEMBER 3, 2015)

PREPARED BY:

BOUNDARIES LLC

PROJECT I.D. NO. 15-2347

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Introduction

On behalf of SolarCity Corporation, Boundaries LLC has prepared the following stormwater management report for the proposed solar photovoltaic development to be located at 1240 Poquonnock Road in Groton, Connecticut. The proposed development consists of an approximately 4.1 MW DC solar photovoltaic development on open space adjacent to the Groton reservoir (three locations/mounting planes). This stormwater management report has been prepared to determine the potential for the proposed development to impact existing stormwater runoff patterns and flow rates. The proposed development makes use of low impact development techniques in order to limit the impacts to stormwater flow patterns and flow rates.

The new construction includes solar panels mounted on pole driven racking and electrical equipment installed on concrete pads. The mounting posts for the solar arrays will be pole driven approximately 8-feet into the ground. The existing gravel roadways and perimeter security fence will be utilized for this project thus minimizing land disturbance and construction impacts. The proposed project areas are shown on the Location Map included as Figure 1.

The primary purpose of this stormwater management report is to demonstrate how the proposed solar arrays may affect the existing runoff flow patterns. The proposed solar panel system is raised above grade by approximately 2-feet at its leading edge (lowest end). With the exception of selected areas to be cleared, and the installation of the pole driven supports and equipment pads, the proposed project area surfaces and terrain remain essentially unchanged. These low impact techniques will result in minimal impact on the runoff flow and flow patterns.

According to the Natural Resources Conservation Service (NRCS) Web Soil Survey the soils on the reservoir site are classified Haven and Enfield soils, 0 to 3% slopes. Haven and Enfield soils are classified as Hydrologic Soil Group B. The Soils Report is provided in Appendix A.

Existing and post-development conditions hydrographs were estimated using the hydrologic modeling program HydroCAD. The methodology selected was NRCS TR-20. Times of concentration were estimated using multiple segment flow paths as described in the NRCS TR-55 manual. The Type III 24-hour storm was analyzed under antecedent moisture condition two. HydroCAD modeling results are presented in Appendix B.

The regulated inland wetlands resource areas in the vicinity of the project were determined by Matthew Gustafson of All-Points Technology, a certified soil scientist. The wetland areas are primarily adjacent to the Groton Reservoir on the western side of the site and Smith Lake on the eastern side of the site. Two vernal pools were also identified in the wooded area east of Mounting Plane 2 and north of Mounting Plane 3. Buffer areas (defined by All-Points Technology) will be maintained between the proposed project areas and the wetland resource areas to minimize impacts to the regulated resources. For additional information regarding the locations of the regulated wetland resources within the project areas, please see Sheets 2 and 3 of the Proposed Site Development Plans included in Appendix C.

Existing Conditions

The proposed project area consists of approximately 13.5 acres of the 290.5-acre parcel that contains the Groton reservoir, water treatment plant, the existing Poquonnock Road electrical substation, transmission lines, and various parcels of open space. The property is zoned RS-20. The open space on the property consists of wooded areas and open fields mowed periodically by the Groton Utilities

Department. The property is adjacent to residential properties to the south and west, by Interstate 95 to the north, and by CT Route 117 and a church to the east. Existing conditions of the property are shown below.

Aerial Photograph of Project Area

During storm events, excess runoff flows overland from the Mounting Planes 1 and 2 to the Groton reservoir, or flows overland along the existing gravel road to the wooded areas to the east of the proposed solar arrays. Runoff from Mounting Plane 3 primarily flows overland to the adjacent properties owned by the City and Town of Groton to the south. A small portion of Mounting Plane 3 also flows overland to a wooded property to the east. Existing conditions sub-watersheds are shown on Figure 2. Existing conditions sub-watersheds were delineated using recent topographic survey data. Land uses were estimated based on site inspections, aerial photography and survey data.

Runoff Curve Numbers (CN) used for the existing conditions analysis are as follows: 61 (>75% grass cover) for the grassed areas in Hydrologic Soil Group B, 60 (woods with fair ground cover) for the wooded areas in Hydrologic Soil Group B, and 85 (gravel roads) for existing unpaved access drives and gravel/stone areas associated with the existing electrical utilities and substation.

The existing conditions sub-watersheds are described further below:

Drainage Area #1S (DA #1S)

This 5.1± acre drainage area encompasses the northern portion of Mounting Plane 1. The drainage area is comprised of dense grass and wooded areas. The weighted CN of the drainage area is 60. This area drains generally northwesterly via overland flow through the open field to the wooded area along the border of the Groton Reservoir. The drainage area is bounded by the reservoir to the north and west and the existing gravel access road and Smith Lake to the east.

Drainage Area #2S (DA #2S)

This 5.4± acre drainage area encompasses the southwestern portion of Mounting Plane 1 and the central and southern portions of Mounting Plane 2. The drainage area is comprised of dense grass with some isolated trees and a portion of the existing gravel access drive and electrical substation. The weighted CN of the drainage area is 62. This area drains generally westerly via overland flow through the open field to the reservoir. The drainage area is bounded by the reservoir to the west and the existing gravel access drive to the east.

Drainage Area #3S (DA #3S)

This 4.0± acre drainage area encompasses the southern portion of Mounting Plane 1and the northern portion of Mounting Plane 2. The drainage area is comprised of dense grass and a portion of the existing gravel access drive and electrical substation. The weighted CN of the drainage area is 64. This area drains generally southeasterly via overland flow along the existing transmission lines before entering the wooded area to the east.

Drainage Area #4S (DA #4S)

This 4.3± acre drainage area encompasses the majority of Mounting Plane 3. The drainage area is comprised of woods, some dense grass areas, and a portion of the existing gravel access drive and electrical substation. The weighted CN of the drainage area is 62. This area drains generally southerly via overland flow through the wooded areas before flowing off-site to the undeveloped properties to the south owned by the City and Town of Groton.

Drainage Area #5S (DA #5S)

This 0.4± acre drainage area encompasses the eastern portion of Mounting Plane 3. The drainage area is comprised of woods and some maintained grass areas. The weighted CN of the drainage area is 60. This area drains generally easterly via overland flow to the adjacent wooded property.

Existing conditions peak runoff rates were analyzed at the downgradient limits of the proposed development areas. The existing conditions peak runoff rates will be compared to the post-development peak runoff rates to determine the effect of the proposed development on existing stormwater runoff patterns. Existing conditions peak flow rates are summarized below in Tables 1 through 2. Detailed modeling results are included in Appendix B.

Table 1
Peak Runoff Rates – Mounting Planes 1 and 2 Existing Conditions

Storm Event	DA #1S (CFS)	DA #2S (CFS)	DA #3S (CFS)
2-Year	1.2	1.7	1.2
5-Year	2.8	3.5	2.3
10-Year	4.2	5.2	3.3
25-Year	5.8	7.0	4.4
50-Year	7.3	8.7	5.4
100-Year	9.4	11.0	6.8

Table 2
Peak Runoff Rates – Mounting Plane 3 Existing Conditions

Storm Event	DA #4S (CFS)	DA #5S (CFS)
2-Year	0.8	0.1
5-Year	1.7	0.2
10-Year	2.5	0.3
25-Year	3.4	0.4
50-Year	4.2	0.5
100-Year	5.3	0.7

Proposed Conditions

The proposed improvements to the site include the installation of solar panels mounted on steel posts driven into the ground and electrical equipment mounted on concrete pads. Additionally, approximately 3.9 acres of wooded areas will be cleared and seeded with grass to accommodate the solar arrays.

Installation of the solar arrays will consist of clearing the select wooded areas located within the project limits, seeding and mulching the disturbed areas, mowing the dense grass inside the proposed development areas, installing proposed metal racking posts, installing and anchoring the solar array panels to the racking system, and installing the necessary electrical equipment for harvesting power.

The stormwater analysis was conducted to determine if the proposed development would result in significant changes to existing flow patterns, water quality, or peak runoff rates. The design

incorporates measures for limiting disturbed areas and minimizing increases in new impervious area. Proposed impervious areas are limited to the steel posts for the proposed racking system, and the proposed electrical equipment pads. The existing gravel access drives will be utilized for access to the project area.

The W8X10 steel posts each cover 2.96 square inches (0.02 square feet) and they are spaced approximately 16 feet along each row of solar arrays. The proposed concrete equipment pads are approximately 20 feet by 20 feet and cover approximately 400 square feet each. The changes in impervious areas and CN values for each drainage area as a result of the proposed development are presented below in Table 3 – Impervious Area Summary. The increases in CN values are primarily due to the clearing required to install the proposed solar arrays.

Table 3
Impervious Area Summary

Drainage Area	Proposed Racking System (SF)	Proposed Concrete Pads (SF)	Total Proposed Impervious Area (SF)	Total Watershed Area (SF)	CN (Pre)	CN (Post)
DA #1S-A	0	0	0	0	60	57
DA #1S-B	8	0	8	221,024	60	61
DA #2S-A	0	0	0	0	62	61
DA #2S-B	4	800	804	235,573	62	62
DA #3S	4	800	804	174,284	64	64
MP-1/2 Total	**16**	**1,600**	**1,616**	**630,881**	**62**	**62**
DA #4S	7	400	407	187,084	62	63
DA #5S	1	0	1	18,251	60	61
MP-3 Total	**8**	**400**	**408**	**205,335**	**62**	**63**

Proposed conditions sub-watersheds are shown on Figure 3. Proposed conditions sub-watersheds were delineated using topographic survey data. Land uses were estimated based on site inspections and by using the proposed site development plan.

Runoff Curve Numbers (CN) used for the proposed conditions analysis are as follows: 61 (>75% grass cover) for the grassed areas (solar array areas) in Hydrologic Soil Group B, 60 (woods with fair ground cover) for wooded areas in Hydrologic Soil Group B, 85 (gravel roads) for existing unpaved access drives and gravel/stone areas associated with the existing electrical utilities and substation, and 98 (impervious) for solar array posts and concrete equipment pads.

The proposed improvements to the existing conditions sub-watersheds are described further below:

Drainage Area #1S-A (DA #1S-A)

DA #1S-A consists of the approximately 1.3 acres of undisturbed land between the reservoir and the proposed water quality swale. This area is partially wooded and has a dense grass cover in non-wooded areas. The weighted CN of the drainage area is 57. The drainage area is bounded by the reservoir to the north and west and the proposed water quality swale to the south and east. The existing runoff flow paths will not be affected by the proposed development as there is no proposed grading of the area.

Drainage Area #1S-B (DA #1S-B)

Approximately 1.8 acres of the existing wooded area (2.6 acres in total) will be cleared, seeded with grass, and mulched prior to construction. The remaining area will be mowed prior to construction. The proposed improvements to this drainage area include the installation of approximately 372 posts (8 square feet) for the proposed racking system. The posts are spaced at approximately 16 feet along the proposed solar arrays and will support the solar modules. The weighted CN of the drainage area is 61. This area drains generally northwesterly via overland flow through the open field to the proposed water quality swale at the limit of the solar arrays. There is a decrease in the time of concentration travel time in comparison to existing conditions due to the clearing required for installation of the solar modules in this area. The result of the shorter travel time is an increase in peak runoff rates. In order to attenuate the peak runoff rates and provide treatment of the stormwater runoff the water quality swale will collect runoff in bio-filtration cells at the low points. The bio-filtration cells will overflow to the reservoir through vegetated swales during inundated conditions. The drainage area is bounded by the water quality swale to the north and west and the existing gravel access road and Smith Lake to the east. The existing runoff flow paths will not be affected by the proposed development as there is no proposed grading of the site, other than the construction of the water quality swale. The proposed water quality swale/bio-filtration cells will result in the reduction in peak runoff rates.

Drainage Area #2S-A (DA #2S-A)

DA #2S-A consists of the approximately 1.0 acres of undisturbed land between the reservoir and the proposed water quality swale. The area consists of a dense grass cover. The weighted CN of the drainage area is 61. The drainage area is bounded by the reservoir to the west and the proposed water quality swale to the east. The existing runoff flow paths will not be affected by the proposed development as there is no proposed grading of the area.

Drainage Area #2S-B (DA #2S-B)

In Drainage Area #2S-B, individual trees will be cleared and the minor disturbed areas will be seeded and mulched prior to construction. The grassed area will be mowed prior to construction. The proposed improvements to this drainage area include the installation of approximately 167 posts (4 square feet) for the proposed racking system. The posts are spaced at approximately 16 feet along the proposed solar arrays and will support the solar modules. Two 20 foot by 20 foot concrete equipment pads will also be constructed in this area. The weighted CN of the drainage area is 62. This area drains generally westerly via overland flow through the open field to the water quality swale. The drainage area is bounded by the water quality swale to the west and the existing gravel access drive to the east. In order to provide treatment of the stormwater runoff the water quality swale will collect runoff in bio-filtration cells at the low points. The bio-filtration cells will overflow to the reservoir through vegetated swales during inundated conditions. The existing runoff flow paths will not be affected by the proposed development given there is no proposed grading of the site, other than the construction of the proposed water quality swale.

Drainage Area #3S (DA #3S)

In Drainage Area #3S, individual trees will be cleared and the minor disturbed areas will be seeded and mulched prior to construction. The grassed area will be mowed prior to construction. The proposed improvements to this drainage area include the installation of approximately 211 posts (4 square feet) for the proposed racking system. The posts are spaced at approximately 16 feet along the proposed solar arrays and will support the solar modules. Two 20 foot by 20 foot concrete

equipment pads will also be constructed in this area. The weighted CN of the drainage area is 64. This area drains generally southeasterly via overland flow along the existing transmission lines before entering the existing wooded area to the east. The existing runoff flow paths will not be affected by the proposed development given there is no proposed grading of the site.

Drainage Area #4S (DA #4S)

Approximately 1.9 acres of the existing wooded area (2.2 acres in total) will be cleared, seeded with grass, and mulched prior to construction. The remaining area will be mowed prior to construction. The proposed improvements to this drainage area include the installation of approximately 331 posts (7 square feet) for the proposed racking system. The posts are spaced at approximately 16 feet along the proposed solar arrays and will support the solar modules and wiring. One 20 foot by 20 foot concrete equipment pad will also be constructed in this area. The weighted CN of the drainage area is 63. This area drains generally southerly via overland flow through the proposed solar array areas before flowing off-site to the undeveloped properties to the south owned by the City and Town of Groton. There is a decrease in the time of concentration travel time in comparison to existing conditions due to the clearing required for installation of the solar modules in this area. The result of the shorter travel time is an increase in peak runoff rates. In order to dissipate the concentrated flow of runoff and reduce the flow velocities, a crushed stone check dam/berm will be constructed along the downgradient edge of the solar array area in the areas to be cleared. The check dam results in a longer time of concentration travel time and reduces the peak runoff rates from the cleared areas. The existing runoff flow paths will not be affected by the proposed development as there is no proposed grading of the site. The proposed stone check dam will result in the reduction in peak runoff rates.

Drainage Area #5S (DA #5S)

The approximately 0.2 acres of woods in the area will be cleared, seeded with grass, and mulched prior to construction. The remaining area will be mowed prior to construction. The proposed improvements to this drainage area include the installation of approximately 36 posts (1 square foot) for the proposed racking system. The posts are spaced at approximately 16 feet along the proposed solar arrays and will support the solar modules. The weighted CN of the drainage area is 61. This area drains generally easterly via overland flow to the adjacent wooded property. The existing runoff flow paths will not be affected by the proposed development as there is no proposed grading of the site.

Proposed conditions peak flow rates were analyzed at the down-gradient limit of the proposed development areas as there are no existing stormwater management systems in place on these sites and runoff flows overland. The change in peak runoff rates as a result of the proposed improvements are summarized below in Tables 4 and 5. Detailed modeling results are included in Appendix B.

Table 4
Peak Runoff Rates – Mounting Planes 1 and 2 Post-Development vs. Pre-Development

	DA #1S-A/B			DA #2S-A/B			DA #3S		
Storm Event	Post (CFS)	Pre (CFS)	Change (CFS)	Post (CFS)	Pre (CFS)	Change (CFS)	Post (CFS)	Pre (CFS)	Change (CFS)
2-Year	1.2	1.2	+0.0	1.6	1.7	-0.1	1.2	1.2	+0.0
5-Year	2.7	2.8	-0.1	3.3	3.5	-0.2	2.3	2.3	+0.0
10-Year	4.1	4.1	+0.0	4.8	5.2	-0.4	3.3	3.3	+0.0
25-Year	5.6	5.8	-0.2	6.5	7.0	-0.5	4.4	4.4	+0.0
50-Year	6.9	7.3	-0.4	8.1	8.7	-0.6	5.4	5.4	+0.0
100-Year	8.9	9.4	-0.5	10.3	11.0	-0.7	6.8	6.8	+0.0

Table 5
Peak Runoff Rates –Mounting Plane 3 Post-Development vs. Pre-Development

	DA #4S			DA #5S		
Storm Event	Post (CFS)	Pre (CFS)	Change (CFS)	Post (CFS)	Pre (CFS)	Change (CFS)
2-Year	0.8	0.8	+0.0	0.1	0.1	+0.0
5-Year	1.6	1.7	-0.1	0.2	0.2	+0.0
10-Year	2.4	2.5	-0.1	0.3	0.3	+0.0
25-Year	3.2	3.4	-0.2	0.5	0.4	+0.1
50-Year	4.0	4.2	-0.2	0.6	0.5	+0.1
100-Year	5.0	5.3	-0.3	0.7	0.7	+0.0

Due to the minimal impervious area increase associated with the proposed post mounted solar arrays there is a very limited impact on the post-development CN values. The peak flow rates are impacted more by the reduced times of concentrations and the limited clearing associated with the project than as a result in the minimal increases in impervious areas. To mitigate the effects of the change in surface conditions the following measures have been included in the proposal:

- A water quality swale is proposed between DA #1S-B (Mounting Plane 1) and DA #2S-B (Mounting Plane 2) and the reservoir. The swale will collect the runoff in small bio-filtration cells, reducing velocities and providing treatment of runoff. Runoff will be discharged through vegetated overflow channels constructed at low points along the swale.
- A crushed stone check dam is proposed south of DA #4S (Mounting Plane 3) to dissipate the concentrated runoff flow and increase the travel times, resulting in an attenuation of peak runoff rates.

As presented above, the proposed low impact development has extremely limited effects on peak runoff rates.

Runoff from DA #5S increases slightly as a result of the proposed development, as presented above in Table 5. Runoff from this drainage area currently flows overland to an adjacent wooded buffer along an existing parking lot. Due to the wooded cover in the area of off-site overland flow and the lack of an existing stormwater management system point discharge, and current conditions being maintained and essentially unchanged, it is believed that the minimal increases in peak flow rates should not negatively impact down gradient areas. Additionally, the decreases in peak runoff rates from DA #4S result in a net decrease in peak runoff rates from the Mounting Plane 3 development area when viewed as a whole.

The stormwater management system is also required to treat the runoff from the proposed impervious areas. The two proposed stormwater mitigation measures described above meet the treatment requirements as described in the 2004 DEP Stormwater Quality Manual. The required groundwater recharge volume and water quality volume is 397 cubic feet. The calculations of the treatment volumes are included in Appendix B.

- The proposed bio-filtration cells in the water quality swale will provide the storage capacity to meet the requirements for both the water quality volume for pollutant reduction as well as groundwater recharge. The volume calculations for the proposed bio-filtration cells are included in Appendix B. Approximately 55 cubic feet of storage is provided per bio-filtration cell, for a total of approximately 495 cubic feet of retention.
- The proposed crushed stone check dam will be embedded into the existing grade to provide the storage capacity to meet the requirements for both the water quality volume for pollutant reduction as well as groundwater recharge. The volume calculations for the proposed check dam is included in Appendix B. Approximately 150 cubic feet of retention is provided.

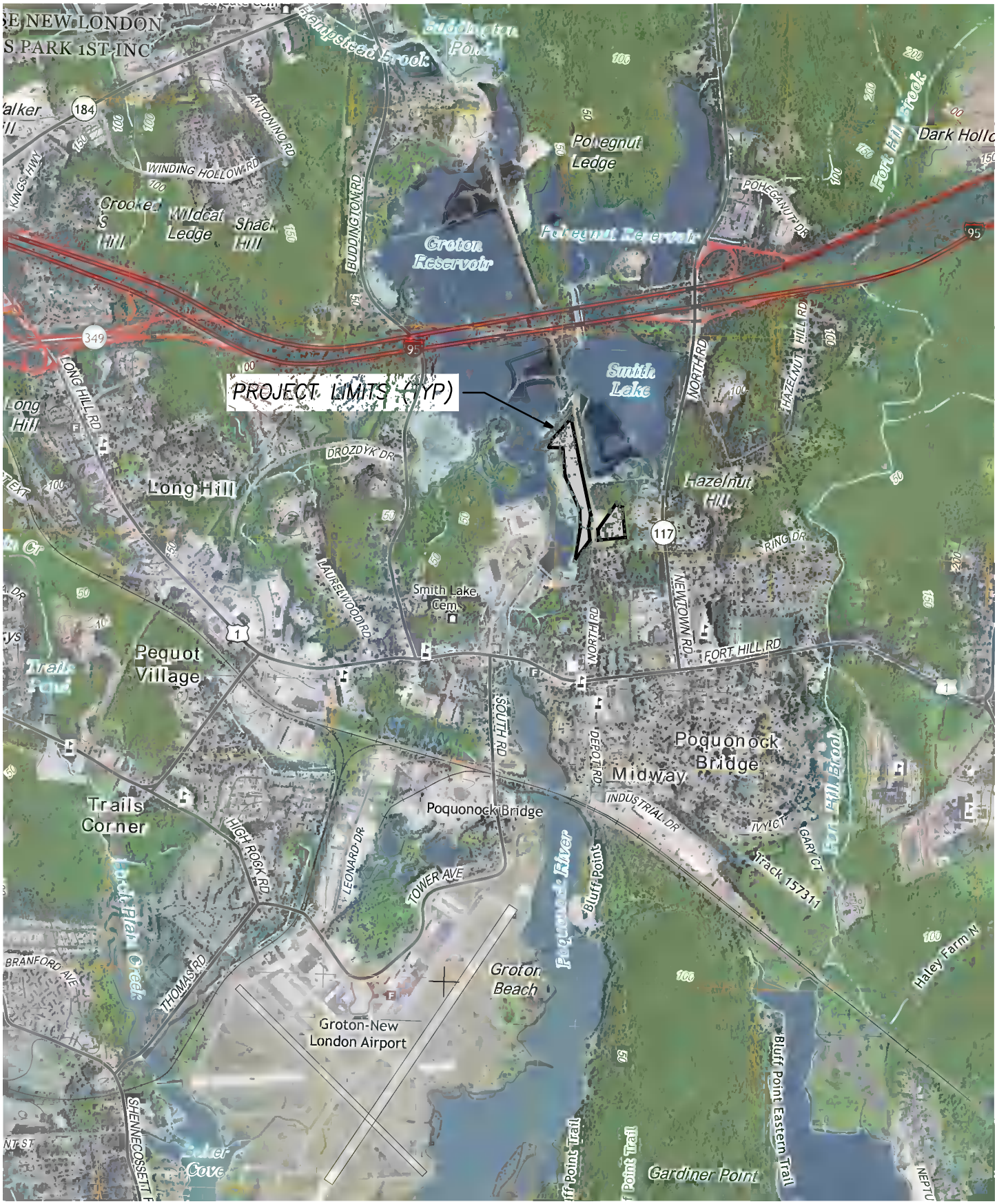
Because the total amount of runoff retained on-site (645 cubic feet) exceeds the required volume of 397 cubic feet the proposed stormwater treatment measures are sufficient to offset the minimal increases in impervious area associated with the project.

Summary

As discussed above the proposed development has been expressly designed to limit the impacts to existing stormwater runoff flow rates and patterns. The existing runoff flow paths will be maintained and while there are minor modeled increases in some peak runoff rates from the existing sites, we are confident that they should not have a negative impact on down gradient areas.

The proposed improvements are shown on plans titled “Poquonnock Road Solar Project, Development and Management Plan, Prepared for SolarCity Corporation, 1240 Poquonnock Road, Groton, Connecticut, September 2015, Job I.D. No. 15-2347, Cover Sheet through Sheet 10 of 10” prepared by Boundaries LLC.

Figures



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Location Map
(New London Quad)
SolarCity Corporation
1240 Poquonnock Road, Groton, CT

SCALE:	1"=2,000'
DATE:	September 2015
JOB NO.	15-2347
FIGURE	1