NOTICE OF INTENT

FOR

530 GLENDALE ROAD

AM 29; PARCELS 16 & 16-5

HAMPDEN, MASSACHUSETTS

NOVEMBER 2, 2023

Prepared By:

Level Design Group, L.L.C.

249 South Street, Unit 1

Plainville, MA 02762

Prepared For:

GLENDALE ROAD DEVELOPMENT, LLC

898 Sport Hill Road

Easton, CT 06612

LDG Project No.:

1958.00

LEVEL DESIGN GROUP
Civil Engineers & Land Surveyors

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LEVEL DESIGN GROUP
Civil Engineers & Land Surveyors

1. **NOTICE OF INTENT – FORM 3**

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

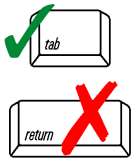
Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Hampden
City/Town

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



Note: Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

530 Glendale Road — a. Street Address
Hampden — b. City/Town
01036 — c. Zip Code

Latitude and Longitude:
42.05963 — d. Latitude
72.39670 — e. Longitude

Map 29 — f. Assessors Map/Plat Number
16 & 16-5 — g. Parcel /Lot Number

2. Applicant:

Rory — a. First Name
Walker — b. Last Name
Glendale Road Development, LLC — c. Organization
898 Sport HIll Road — d. Street Address
Easton — e. City/Town
CT — f. State
06612 — g. Zip Code
(203)731-7506 — h. Phone Number
i. Fax Number
rwalker@zpenergyconsultants.com — j. Email Address

3. Property owner (required if different from applicant): ☐ Check if more than one owner

Jonathan — a. First Name
Guinipero — b. Last Name
Stateline Property Management — c. Organization
530 Glendale Road — d. Street Address
Hampden — e. City/Town
MA — f. State
01036 — g. Zip Code
413-636-2359 — h. Phone Number
i. Fax Number
jon@statelinema.com — j. Email address

4. Representative (if any):

Nicola — a. First Name
Facendola — b. Last Name
Level Design Group, LLC — c. Company
249 South Street — d. Street Address
Plainville — e. City/Town
MA — f. State
02762 — g. Zip Code
508-695-2221 — h. Phone Number
508-695-2219 — i. Fax Number
nfacendola@leveldg.com — j. Email address

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

$2,500.00 — a. Total Fee Paid
$1,237.50 — b. State Fee Paid
$1,262.50 — c. City/Town Fee Paid

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A. General Information (continued)

6. General Project Description:

Development of a 4.95 MW AC ground mounted solar facility with associated access driveways, site grading, and utilites. The facility be an Agricultural Ground Mounted Solar System where the interior array areas will be maintained as pasture fields for grazing sheep, cattle and chickens managed by Ledge Valley Farm whom is already established at the site.

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

1. ☐ Single Family Home
2. ☐ Residential Subdivision
3. ☐ Commercial/Industrial
4. ☐ Dock/Pier
5. ☒ Utilities
6. ☐ Coastal engineering Structure
7. ☐ Agriculture (e.g., cranberries, forestry)
8. ☐ Transportation
9. ☐ Other

7b. Is any portion of the proposed activity eligible to be treated as a limited project (including Ecological Restoration Limited Project) subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1. ☐ Yes ☒ No

If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

2. Limited Project Type

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

a. County	b. Certificate # (if registered land)
Hampden	
c. Book	d. Page Number
23936	240

B. Buffer Zone & Resource Area Impacts (temporary & permanent)

1. ☐ Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
2. ☒ Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Massachusetts Department of Environmental Protection
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B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Bank	1. linear feet	2. linear feet
b. ☒ Bordering Vegetated Wetland	2,564 1. square feet	3,430 2. square feet
c. ☐ Land Under Waterbodies and Waterways	1. square feet 3. cubic yards dredged	2. square feet

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. ☐ Bordering Land Subject to Flooding	1. square feet 3. cubic feet of flood storage lost	2. square feet 4. cubic feet replaced
e. ☐ Isolated Land Subject to Flooding	1. square feet 2. cubic feet of flood storage lost	3. cubic feet replaced
f. ☒ Riverfront Area	Unnammed Stream and East Brook 1. Name of Waterway (if available) - **specify coastal or inland**	

2. Width of Riverfront Area (check one):

☐ 25 ft. - Designated Densely Developed Areas only

☐ 100 ft. - New agricultural projects only

☒ 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: 545,528 square feet

4. Proposed alteration of the Riverfront Area:

a. total square feet	b. square feet within 100 ft.	c. square feet between 100 ft. and 200 ft.
66,863	2040	64,643

5. Has an alternatives analysis been done and is it attached to this NOI? ☒ Yes ☐ No

6. Was the lot where the activity is proposed created prior to August 1, 1996? ☒ Yes ☐ No

3. ☐ Coastal Resource Areas: (See 310 CMR 10.25-10.35)

Note: for coastal riverfront areas, please complete **Section B.2.f**. above.

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Provided by MassDEP:

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Hampden
City/Town

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. ☐ Land Under the Ocean	1. square feet 2. cubic yards dredged	
c. ☐ Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. ☐ Coastal Beaches	1. square feet	2. cubic yards beach nourishment
e. ☐ Coastal Dunes	1. square feet	2. cubic yards dune nourishment

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
f. ☐ Coastal Banks	1. linear feet	
g. ☐ Rocky Intertidal Shores	1. square feet	
h. ☐ Salt Marshes	1. square feet	2. sq ft restoration, rehab., creation
i. ☐ Land Under Salt Ponds	1. square feet 2. cubic yards dredged	
j. ☐ Land Containing Shellfish	1. square feet	
k. ☐ Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above 1. cubic yards dredged	
l. ☐ Land Subject to Coastal Storm Flowage	1. square feet	

4. ☐ Restoration/Enhancement

If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here.

a. square feet of BVW

b. square feet of Salt Marsh

5. ☐ Project Involves Stream Crossings

a. number of new stream crossings

b. number of replacement stream crossings

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C. Other Applicable Standards and Requirements

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Limited Project Checklists – Required Actions (310 CMR 10.11).

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

   a. ☐ Yes ☒ No

   If yes, include proof of mailing or hand delivery of NOI to:

   Natural Heritage and Endangered Species Program
   Division of Fisheries and Wildlife
   1 Rabbit Hill Road
   Westborough, MA 01581

   August 2021 - MAGIS

   If *yes*, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); *OR* complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

   c. Submit Supplemental Information for Endangered Species Review*

      1. ☐ Percentage/acreage of property to be altered:

         (a) within wetland Resource Area _____ percentage/acreage

         (b) outside Resource Area _____ percentage/acreage

      2. ☐ Assessor's Map or right-of-way plan of site

2. ☐ Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **

   (a) ☐ Project description (including description of impacts outside of wetland resource area & buffer zone)

   (b) ☐ Photographs representative of the site

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see https://www.mass.gov/ma-endangered-species-act-mesa-regulatory-review).
Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.

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C. Other Applicable Standards and Requirements (cont'd)

(c) ☐ MESA filing fee (fee information available at https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review).
Make check payable to "Commonwealth of Massachusetts - NHESP" and ***mail to NHESP*** at above address

*Projects altering **10 or more acres** of land, also submit:*

(d) ☐ Vegetation cover type map of site

(e) ☐ Project plans showing Priority & Estimated Habitat boundaries

(f) OR Check One of the Following

1. ☐ Project is exempt from MESA review.
Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, https://www.mass.gov/service-details/exemptions-from-review-for-projectsactivities-in-priority-habitat; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2. ☐ Separate MESA review ongoing. a. NHESP Tracking # b. Date submitted to NHESP

3. ☐ Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

3. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?

a. ☐ Not applicable – project is in inland resource area only b. ☐ Yes ☐ No

If yes, include proof of mailing, hand delivery, or electronic delivery of NOI to either:

South Shore - Cohasset to Rhode Island border, and the Cape & Islands:

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
836 South Rodney French Blvd.
New Bedford, MA 02744
Email: dmf.envreview-south@mass.gov

North Shore - Hull to New Hampshire border:

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: dmf.envreview-north@mass.gov

Also if yes, the project may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional Office.

c. ☐ Is this an aquaculture project? d. ☐ Yes ☐ No

If yes, include a copy of the Division of Marine Fisheries Certification Letter (M.G.L. c. 130, § 57).

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C. Other Applicable Standards and Requirements (cont'd)

4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

a. ☐ Yes ☒ No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.

b. ACEC

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?

a. ☐ Yes ☒ No

6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?

a. ☐ Yes ☒ No

7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?

a. ☒ Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:

1. ☐ Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)

2. ☐ A portion of the site constitutes redevelopment

3. ☐ Proprietary BMPs are included in the Stormwater Management System.

b. ☐ No. Check why the project is exempt:

1. ☐ Single-family house

2. ☐ Emergency road repair

3. ☐ Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

1. ☐ USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)

2. ☒ Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.

Massachusetts Department of Environmental Protection
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D. Additional Information (cont'd)

3. ☒ Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. ☒ List the titles and dates for all plans and other materials submitted with this NOI.

Agricultural Ground Mounted Solar System
a. Plan Title

Level Design Group, LLC
b. Prepared By

Nicola Facendola, PE
c. Signed and Stamped by

October 23, 2023
d. Final Revision Date

1" = 40'
e. Scale

Stormwater Management Report
f. Additional Plan or Document Title

10/23/2023
g. Date

5. ☐ If there is more than one property owner, please attach a list of these property owners not listed on this form.

6. ☐ Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.

7. ☐ Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.

8. ☒ Attach NOI Wetland Fee Transmittal Form

9. ☒ Attach Stormwater Report, if needed.

E. Fees

1. ☐ Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

1038
2. Municipal Check Number

10/26/2023
3. Check date

1037
4. State Check Number

10/26/2023
5. Check date

Zeropoint Energy Consutlants
6. Payor name on check: First Name

7. Payor name on check: Last Name

Massachusetts Department of Environmental Protection
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F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

1. Signature of Applicant	2. Date
3. Signature of Property Owner (if different)	4. Date
5. Signature of Representative (if any)	6. Date

For Conservation Commission:
Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:
One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a **copy** of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:
If the applicant has checked the “yes” box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

LEVEL DESIGN GROUP
Civil Engineers & Land Surveyors

2. NOI - WETLAND FEE TRANSMITTAL FORM AND COPY OF FILING FEE CHECKS

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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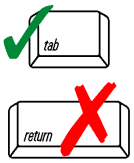


A. Applicant Information

1. Location of Project:

530 Glendale Street	Hampden
a. Street Address	b. City/Town
1037	$1,237.50
c. Check number	d. Fee amount

2. Applicant Mailing Address:

Rory		Walker	
a. First Name		b. Last Name	
Glendale Road Development, LLC			
c. Organization			
898 Sport Hill Road			
d. Mailing Address			
Easton	CT	06612	
e. City/Town	f. State	g. Zip Code	
(203)731-7506		rwalker@zpenergyconsultants.com	
h. Phone Number	i. Fax Number	j. Email Address	

3. Property Owner (if different):

Jonathan		Gunipero	
a. First Name		b. Last Name	
Stateline Property Management			
c. Organization			
530 Glendale Road			
d. Mailing Address			
Hampden	MA	01036	
e. City/Town	f. State	g. Zip Code	
413-636-2359		jon@statelinema.com	
h. Phone Number	i. Fax Number	j. Email Address	

B. Fees

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).

Fee should be calculated using the following process & worksheet. ***Please see Instructions before filling out worksheet.***

Step 1/Type of Activity: Describe each type of activity that will occur in wetland resource area and buffer zone.

Step 2/Number of Activities: Identify the number of each type of activity.

Step 3/Individual Activity Fee: Identify each activity fee from the six project categories listed in the instructions.

Step 4/Subtotal Activity Fee: Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

Step 5/Total Project Fee: Determine the total project fee by adding the subtotal amounts from Step 4.

Step 6/Fee Payments: To calculate the state share of the fee, divide the total fee in half and subtract $12.50. To calculate the city/town share of the fee, divide the total fee in half and add $12.50.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
Categorty 3 - Site Preperation	1	$1,050.00	$1,050.00
Category 4 - a.) each crossing for development or commercial road;	1	$1,450.00	$1,450.00

Step 5/Total Project Fee:

Step 6/Fee Payments:

Total Project Fee:	$2,500.00 (a. Total Fee from Step 5)
State share of filing Fee:	$1,237.50 (b. 1/2 Total Fee **less $**12.50)
City/Town share of filling Fee:	$1,262.50 (c. 1/2 Total Fee **plus** $12.50)

C. Submittal Requirements

a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
Box 4062
Boston, MA 02211

b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

To MassDEP Regional Office (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

ZEROPOINT ENERGY CONSULTANTS LLC
898 SPORT HILL RD
EASTON, CT 06612-1250

1037

51-57/119 CT
18576

Date 10/26/23

Pay To The Order Of Commonwealth of Massachusetts $ 1,237.50

one thousand two hundred & thirty-seven 50/100 Dollars

Photo Safe Deposit® Details on back

BANK OF AMERICA

ACH R/T 011900571

For State filing fee - NOI

⑈001037⑈ ⑆011900571⑆ 385018724886⑈

ZEROPOINT ENERGY CONSULTANTS LLC
898 SPORT HILL RD
EASTON, CT 06612-1250

1038

51-57/119 CT
18576

Date 10/26/23

Pay To The Order Of Town of Hampden $ 1,263.50

one thousand two hundred & sixty-three 50/100 Dollars

Photo Safe Deposit® Details on back

BANK OF AMERICA

ACH R/T 011900571

For Town filing fee - NOI

⑈001038⑈ ⑆011900571⑆ 385018724886⑈

3. NOTICE OF INTENT NARRATIVE

LEVEL DESIGN GROUP
Civil Engineers & Land Surveyors

NARRATIVE
to Support
NOTICE OF INTENT
for
AGRICULTURAL GROUND MOUNTED SOLAR SYSTEM
ASSESSOR *MAP 29; PARCEL 16 & 16-5*
530 GLENDALE ROAD
HAMPDEN, MASSACHUSETTS

The applicant, Glendale Road Development, LLC, proposes to develop and construct a commercial renewable energy facility which will be located at 530 Glendale Road Assessor Map 29, Parcels 16 & 16-5. The proposed facility will be a 4.95 MW-AC ground mounted solar photovoltaic array with required electrical equipment (transformers, switch gear, etc.) and a Lithium-Ion Battery Energy Storage System (BESS). The facility will operate in conjunction with Ledge Valley Farm as an Agricultural Ground Mounted Solar System where the interior array field areas will be utilized as pastures for grazing sheep, cattle, and poultry.

PRE-DEVELOPMENT CONDITIONS

The primary development site is a 53.0±Ac. parcel located at 530 Glendale Road (rear) located to the east of the existing single family residential parcel identified as Assessor Map16, Parcel 5. Access to the development parcel is through an existing gravel access driveway servicing both 530 Glendale Road (Assessor Map 29, Parcel 16) and the primary development site (Assessor Map 29, Parcel 16-5). The site is bound by residential parcels to the west (fronting on Glendale Road) and undeveloped residential parcels to the north, south, and east. The primary development parcel contains an existing 7,500±sf. barn which houses a small number or livestock animals which the current property owner oversees. The property owner also operates a small landscape maintenance company out of the parcel and contains multiple material stockpiles in the cleared / gravel area surrounding the existing barn.

The property is located in a R-6 Residential Zoning District and has a history of agricultural use with many multiple existing cleared and maintained fields. This is evident from USGS Topographic Mapping from 1946 and 1958 as this area shows as primarily void of dense vegetation on those historic maps. In 1989 an equestrian trotting was constructed in the southwesterly part of the site to support one of the parcel's uses at that time as an equestrian facility. A horse trotting track is located in the south westerly part of the site which contains a gravel loop trotting ring and open field area within the center of the track. The track area contains two existing surface drains which collect runoff from the internal portion of the track and direct the flow to towards a bordering vegetated wetland located to the east of the track. The remainder of the site does not contain any structural drainage or stormwater management features with all runoff from the site flowing overland towards the on-site resource areas.

The on-site soils within the area of the limits of the development are classified by Soil Survey for Hampden County, Massachusetts, Central Part as:

- Ridgebury Fine Sandy Loam, HSG D;
- Paxton Fine Sandy Loam, HSG C;
- Woodbridge Fine Sandy Loam, HSG C;
- Charlton Fine Sandy Loam, HSG A;

Based on current MAGIS Mapping the development site is NOT located in any of the following environmentally sensitive areas:

- Area of Critical Environmental Concern
- Natural Heritage and Endangered Species Program – Priority Habitats of Rare Species
- Natural Heritage and Endangered Species Program – Estimated Habitats of Rare Wildlife
- Natural Heritage and Endangered Species Program – Natural Communities
- Natural Heritage and Endangered Species Program – Certified Vernal Pools
- MADEP Wellhead Protection Areas – Zone 1 & Zone 2
- Surface Water Supply Protection Areas – Zone A, Zone B, & Zone C
- MADEP Surface Water Supply Watersheds
- Outstanding Resource Waters
- Subsurface Aquifer
- Mass Historic Commission Inventory Area or Point

The East Brook runs through the southeast corner of the parcel and through abutting parcels located to the east of the development site. The East Brook is classified by the Massachusetts Division of Fisheries and Wildlife (MADFW) as a Cold-Water Fisheries Resource (CFR). CFRs are important habitat for a number of cold-water species, including trout. Coldwater species are typically more sensitive than other species to alterations to stream flow, water quality and temperature within their aquatic habitat. The site has been designed to mitigate impacts to the East Brook and its adjacent bordering vegetated wetlands and contributing intermittent and perineal streams. A FEMA 100-Year Flood Zone (Zone A) is located within the southeast corner of the site where the East Brook crosses through the parcel. No site disturbance is proposed within the limits of the FEMA Zone A or within 300'± of the identified bank of the East Brook.

The parcel contains multiple bordering vegetated wetland (BVW) areas, intermittent streams, an unnamed perineal stream, and East Brook, a perineal stream / cold water fishery resource area located primarily off site to the east. The on-site wetland and resource area boundaries were flagged by Goddard Consulting, LLC and an Order of Resource Area Delineation (ORAD) was issued by the Town of Hampden Conservation Commission on November 04, 2022 for MADEP file # 173-023. A copy of the issued ORAD and associated existing conditions / wetland delineation plans are included with this application. A detailed description of the on-site resource and buffer zone areas is provided below:

Wetland and Buffer Zone Areas

- 699,884±sf. - Bordering Vegetated Wetland Area on Primary Development Parcel
- 952,347±sf. - 100' Buffer Zone Area to Bordering Vegetated Wetland Area on Primary Development Parcel
    - 280,384±sf – 0'-25' Hampden No Disturb Zone (NDZ) Area
        - 9,451±sf – Gravel within 0'-25' NDZ
        - 912 ±sf – Cleared, Disturbed, Stockpile within 0'-25' NDZ
        - 37,389 ±sf – Fields within 0'-25' NDZ
        - 232,632 ±sf – Natural Vegetation within 0'-25' NDZ
    - 671,963±sf – 25'-100' Buffer Zone Area
        - 36,771±sf – Gravel within 25'-100' Buffer Zone Area
        - 11,723 ±sf – Cleared, Disturbed, Stockpile within 25'-100' Buffer Zone
        - 144,666 ±sf – Fields within25'-100' Buffer Zone Area
        - 473,561±sf – Natural Vegetation within 25'-100' Buffer Zone Area
        - 5,242±sf - Building within 25'-100' Buffer Zone Area

Riverfront Areas

- 545,528±sf. – Total River Front Area (RFA) 0'-200' on Primary Development Parcel
    - 362,149±sf. – RFA 0'-200' associated with unnamed stream
    - 175,855±sf. – RFA 0'-200' associated with East Brook
- 262,119±sf. – Total 0'-100' RFA on Primary Development Parcel
    - 12,375±sf – Gravel within 0'-100' RFA
    - 19,488±sf – Fields within 0'-100' RFA
    - 230,256±sf – Natural Vegetation within 0'-100' RFA
- 283,409±sf. – Total 100'-200' RFA on Primary Development Parcel
    - 14,960±sf – Gravel within 100'-200' RFA
    - 980±sf - Cleared, Disturbed, Stockpile within 100'-200' RFA
    - 110,803±sf – Fields within 100'-200' RFA
    - 149,142 ±sf – Natural Vegetation within 100'-200' RFA
    - 7,524±sf - Building within 100'-200' RFA

POST-DEVELOPMENT CONDITIONS

The applicant proposes to develop and construct an Agricultural Ground Mounted Solar System which will be located at 530 Glendale Road Assessor Map 29, Parcel 16-Hampden, MA. The proposed facility will be 4.95 MW-AC ground mounted solar photovoltaic array with required electrical equipment (transformers, switch gear, etc.) and Lithium-Ion Battery Energy Storage System (BESS) and will operate in conjunction with Ledge Valley Farm as an Agricultural Ground Mounted Solar System. The interior array field areas will be utilized as pastures for grazing sheep, cattle, and poultry. Additional details regarding the operation of the Agricultural components of the facility can be found in the Agricultural Integration and Grazing Management Plan prepared

by United Agrovoltaics North America, LLC dated October 2023. The proposed solar facility is anticipated to be constructed in 2025 and be energized in 2026 with continuing operations for over twenty-five (25) years. The facility will generate electricity and will be interconnected to existing power infrastructure located within Glendale Road. Interconnection utility poles will be installed within a utility and access easement located on 530 Glendale Road (Assessor Map 29, Parcel 29). This easement also provide access to the development parcel as a separate driveway cannot be construed through the dedicated parcel frontage as it would require a significant alteration to existing resource areas (wetlands and streams) to construct a separate access driveway. The system will include battery energy storage systems, which are designed to level out the energy distribution of the system and provide short term energy storage in accordance with the requirements of the current Massachusetts SMART Program.

The total area of new site disturbance which excludes the existing gravel yard, access driveways, and barn to remain as they currently exist is 831,638±sf. (19.10 Ac.). The total project site area which includes the site access driveways around the site and the total cleared area for the installation of the solar panel racking, equipment and tree clearing which extends to the face of the existing barn and includes the existing track and gavel yard area is 926,65792±sf. (21.3 Ac.). This leaves over 56% of the parcel as undeveloped open space which will remain undeveloped in order to protect the complex of on-site resource areas and provide a natural buffer to installed solar system. The solar panels will be set on racks which are mounted to the ground by two (2) screw mounted posts set approximately 5' into ground and have adjustable legs which can accommodate slopes up to 25% minimizing required site grading and disturbance within the array area. The location of the proposed racks was laid out to minimize site grading and ground disturbance. A majority of the area within the systems will not require site grading and the only ground disturbance in these areas will result from tree clearing and stump removal. Site grading will be required to install the new 20' wide gravel access driveways, stormwater management basins and collection swales. The gravel driveway has been designed to accommodate public safety and maintenance vehicles with a maximum grade of 10% within the steeper areas of the site. Cleared areas outside of the array footprint and grazing fields not requiring site grading or other improvements will have the trees cut and the stumps left in place in order to preserve the existing natural ground cover. After the racking system and panels are installed, the array area will be seeded with a grazing seed mix specify designed for the solar field / pasture areas. All disturbed areas that required site grading, specifically areas adjacent to the constructed driveways will be seeded with a native pollinator seed mix and the stormwater management basins areas will be seeded with a New England Erosion Control / Restoration Mix for Detention Basin Areas. A landscape and planting plan is included within the provided site plans which provided detailed information on site seeded and stabilization requirements.

The development will include the construction of a new fully compliant stormwater management system designed in accordance with MADEP Stormwater Regulations and the Town of Hampden regulations to control peak rates of runoff from the site and promote groundwater recharge. The site will contain three (3) separate infiltration basins to mitigate peak flows from the development and provide maximum groundwater recharge. The new basins are located in naturally low-lying areas where stormwater naturally flows in the current existing site conditions which minimizes

required site grading and disturbance. A series of graded rip-rap swales and berms will collect and direct surface water from the array area and gravel driveways to the proposed basins. In areas where surface runoff is anticipated to be concentrated, rip-rap stone filter strips are provided in areas up gradient of the gravel driveway to dissipate flow as it crosses the gravel driveway. All basins contain piped outlets to ensure they fully dewater after each storm event and a rip-rap weir style emergency overflow.

PROPOSED DISTURBANCE TO AND 25' TOWN OF HAMPDEN NDZ

The construction of the proposed access driveway providing access to an isolated upland area where Sub-Array 1B is located will require the following disturbance to the resource areas listed below:

- BVW Disturbance to the GC Series Wetland between flag #s GC88 -GC 91 and GC 219 – GC 222 of 2,564± sf. for driveway construction, grading, and stormwater management facilities;
    - 903± sf. of permanent gravel driveway within wetland disturbance
    - 1,661± sf. of wetland disturbance associated with clearing, grading, and drainage
- Buffer Zone Disturbance of 5,426± sf within the Town of Hampden 25' No Disturb Zone (NDZ) for the installation of the driveway;
    - 2,871± sf. of permanent gravel driveway within 25' NDZ
    - 2,555± sf. of 25' NDZ disturbance associated with clearing, grading, and drainage

The proposed wetland crossing has been located within an existing disturbed area which has been and is currently utilized as a maintained farm field. The selected area is the most narrow area for wetland crossing between both sides of the delineated BVW and has been historically utilized as the crossing point for farm equipment to manage the existing farm field in this area. There is no identified intermittent stream which runs through the narrow 15' wide gap between the edge of the wetland in this area. A 24" HDPE culvert is proposed to be installed at grade within this 15' wide gap to maintain a hydraulic connection from the northerly side of the filled wetland area to the southerly side. The site plans include a wetland replication plan for a 3,430±sf. wetland replication area located to the north of the wetland disturbance between wetland flags GC-223 & GC-226. The wetland replication plan details the proposed wetland replication procedures, plantings, and required monitoring of the replication area.

The construction of the proposed access driveway providing access between Sub-Array 2 and Array 2, located along the northerly property line will require a disturbance within the Town of Hampden 25' NDZ. This minor disturbance within the 25' NDZ is required to install a gravel driveway to provide access to the upland area located in the easterly part of the site. The GC Series BVW extends to the center of the parcel ending approximately 30' from the northerly property line at its closest point. This is the only feasible area to install a gravel access driveway without directly impacting a BVW as it currently contains a historic cart path which runs through this part of the site. All work associated with the driveway construction is able to be kept outside of the

BVW by reducing the driveway with from 20' wide to 15' wide for a 212'± length and by installing block retaining walls along the north and south side of the driveway. A 12" HPDE culvert is proposed to maintain an existing surface flow path from the northerly abutting parcel to the GC BVW and associated intermittent stream located within the BVW which begins approximately 20'± south of the proposed driveway. The 12" HDPE culvert will replace an existing small stacked stone culvert located under the existing cart path within this area. A summary of the disturbance to the 25' NDZ for the installation of the gravel access driveway is detailed below:

- BVW Buffer Zone Disturbance of 4,048± sf within the Town of Hampden 25' No Disturb Zone (NDZ) for the installation of the driveway.
    - 683± sf. of permanent gravel driveway within 25' NDZ
    - 3,365± sf. of 25' NDZ disturbance associated with clearing, grading, and drainage

An additional minor disturbance of 1,928± sf. within the 25' NDZ associated with the gravel driveway as it turns north after passing the existing barn. This entire area is currently degraded with an existing gravel driveway and stockpile area. The work within the 1,928± sf. section is for minor regrading and shaping of the gravel driveway. In this area 1,487± sf. of gravel will be removed from the 25'NDZ along with 890± sf. of exposed material stockpile area. The 2,377± sf. mitigated area will be planted with New England Conservation / Wildlife seed.

PROPOSED DISTURBANCE 25'-100' OF THE WETLAND BUFFER ZONE

The installation of the ground mounted solar array, gravel driveway, utilities, and stormwater management facilities will require a disturbance of 323,295± sf. within the 25'-100' wetland buffer zone. A summary of the disturbance within the 25'-100' of the wetland buffer zone is detailed below:

- 7,192± sf. – gravel yard to be converted to pasture field with solar array tables within the 25'-100' wetland buffer zone
- 24,502± sf. – new gravel driveway within the 25'-100' wetland buffer zone
- 79,800± sf. – existing maintained field to be to utilized as pasture field with solar array tables within the 25'-100' wetland buffer zone
- 211,721± sf. - wooded / natural area to be converted to pasture field with solar array tables within the 25'-100' wetland buffer zone.

PROPOSED RIVER FRONT AREA DISTURBANCE

The installation of the ground mounted solar array, gravel driveway, utilities, and stormwater management facilities will require a disturbance of 64,643± sf. within the 0'-200' Riverfront Zone. The site contains two perineal streams, East Brook and an unnamed stream which ultimately ties into East Brook with associated jurisdictional Riverfront Areas totaling 545,528± sf. The proposed project disturbance will only effect Riverfront Area (RFA) associated with the unnamed stream. The area of disturbance within the RFA is all previously disturbed area which contains an existing

gravel access driveway, material stockpiles, and maintained farm fields. A summary existing state of the RFA on the main development parcel associated with the unnamed stream is detailed below:

- 545,528±sf. – Total Existing RFA 0'-200' on Primary Development Parcel
- 369,673±sf. – Total RFA 0'-200' associated with unnamed river
- 169,125±sf. – Total 0'-100' RFA associated with unnamed river
    - 12,375±sf – Gravel within 0'-100' RFA
    - 19,488±sf – Fields within 0'-100' RFA
    - 137,262±sf – Natural Vegetation within 0'-100' RFA
- 200,548±sf. – Total 100'-200' RFA on Primary Development Parcel
    - 14,960±sf – Gravel within 100'-200' RFA
    - 980±sf - Cleared, Disturbed, Stockpile within 100'-200' RFA
    - 110,803±sf – Fields within 100'-200' RFA
    - 66,281 ±sf – Natural Vegetation within 100'-200' RFA
    - 7,524±sf - Building within 100'-200' RFA

A summary proposed disturbance areas to the Riverfront Area on the main development parcel associated with the unnamed stream is detailed below:

- 66,683±sf. – Total project disturbance within RFA 0'-200' associated with unnamed river
- 2,040±sf. – total 0'-100' RFA associated with unnamed river
    - 2,040±sf – New gravel within 0'-100' RFA to create a turnaround on the existing gravel track / driveway
- 64,643±sf. – Total 100'-200' RFA on Primary Development Parcel
    - 11,488±sf – New gravel within 100'-200' RFA for construction of site access driveway
    - 2,817±sf – New Rip-Rap Stormwater Swale
    - 1,985 ±sf – Conversion of natural vegetation to pasture field / solar array within 100'-200' RFA
    - 46,246 ±sf – Installation of solar array within existing maintained field
    - -2,107 ±sf – Removal / Restoration of gravel section of unused gravel area within 100'-200' RFA

The proposed total disturbance of 64,576±sf (66,683±sf total disturbance minus 2,107±sf of mitigation area) slightly exceeds the standard allowed disturbance area of 10% of the total RFA on the development parcel which is 54,553±sf (0.10 x 545,528±sf). The proposed disturbance area includes the removal of 2,107±sf of existing gravel directly adjacent to an existing BVW to improve the RFA and BVW buffer zone. In addition to the 2,107±sf of mitigation, 46,246±sf of the proposed disturbance area will retain its current existing ground cover as a maintained pasture / farm field. This area will not be clear or exposed during construction as the only disturbance to the ground will be the installation of the required 2 mounting screws per array table with no proposed trenching of conduit as all wiring connections within this area will be above grade. Additional erosion and sediment control barriers have been added to this area to prevent

unnecessary disturbance to this area and to keep all site traffic within the limits of the new gravel driveway. Additional information on the proposed RFA disturbance and mitigation is detailed within the provided River Front Alternatives Analysis to support the Notice of Intent Application.

CONCLUSION

The construction of proposed Agricultural Ground Mounted Solar System meets or exceeds the requirements of 310 CMR 10.00 the Wetlands Protection Act. The proposed development has been designed to utilize current existing developed site features which includes the existing 750'± long gravel driveway for site access and the existing cleared and maintained field areas that will contain more than half of the ground mounted solar array. The existing field areas and newly cleared wooded areas that will be converted to field areas will be utilized as pasture fields to support agricultural operations associated with Ledge Valley Farm. Stormwater runoff from the developed areas will be managed with a proposed rip-rap swales and the installation of three new infiltration basins. A detailed erosion and sediment control plan has been developed to mitigate impacts to the resource areas within the area of construction.

4. RIVERFRONT ALTERNATIVES ANALYSIS

RIVER FRONT ALTERNATIVES ANALYSIS
to Support
NOTICE OF INTENT
for
AGRICULTURAL GROUND MOUNTED SOLAR SYSTEM
ASSESSOR *MAP 29; PARCEL 16 & 16-5*
530 GLENDALE ROAD
HAMPDEN, MASSACHUSETTS

In developing a substantially equivalent economic alternative for this site several different factors regarding the site have to be taken into account. The first, and most constraining, is the proposed site operations and the obtaining of an interconnection agreement for the local utility provider. With the utility provider governing connection protocols, the proposed project needs to adhere to the connection methodology approved under the cross-connection agreements issued by the provider. The second important factor is that the site will be constructed on Ledge Vally Farm and operated as an Agricultural Ground Mounted Solar System where the interior array field areas will be utilized as pastures for grazing sheep, cattle, and poultry. This is a unique arrangement between the developer and property owner to create a sustainable renewable energy facility that will also provide pasture land for grazing livestock.

Within **310 CMR 10.000 Section 10.58(3) Presumption:** *Where a proposed activity involves work within the riverfront area, the issuing authority shall presume that the area is significant to protect the private or public water supply; to protect the groundwater; to provide flood control; to prevent storm damage; to prevent pollution; to protect land containing shellfish; to protect wildlife habitat; and to protect fisheries.*

The proposed site development provides new stormwater management facilities to collect and infiltrate stormwater runoff proving maximum on-site groundwater recharge. This is accomplished through the installation of three (3) new on-site infiltration basins and multiple rip-rap swales with stone check damns installed throughout the site which have been designed to collect and covey stormwater runoff.

As detailed above the proposed site design overcomes all of the presumptions in the performance standards set forth in the Wetlands Protection Act under Section 10.58, Riverfront Area.

Section 10.58(4) General Performance Standard requires that**:**

...the applicant shall prove by a preponderance of the evidence that there are no practicable and substantially equivalent economic alternatives to the proposed project with less adverse effects on the interests identified in M.G.L. c.131 ' 40 and that the work, including proposed mitigation, will have no significant adverse impact on the riverfront area to protect the interests identified in M.G.L. c. 131 ' 40. A

There are four areas to be developed in an Alternatives Analysis as required by the General Performance Standards 310CMR 10.58 (4) sections (a) – (d).

310CMR 10.58 (4) section (a) Protection of Other Resource Areas

The proposed work associated with the Agricultural Ground Mounted Solar facility meets the performance standards of 10.55 (Bordering Vegetated Wetlands) with only minor buffer zone disturbance required for the installation of the solar array within the 200' RFA. A detailed description of the proposed site disturbance to the BVW and its associated buffer zone is provided within the Narrative to Support Notice of Intent For Agricultural Ground Mounted Solar System Assessor Map 29; Parcel 16 & 16-5; 530 Glendale Road Hampden, Massachusetts.

310CMR 10.58 (4) section (b) Protection of Rare Species

There are no listed rare or endangered species or habitats identified within the Agricultural Ground Mounted Solar development area based on current Massachusetts Geographic Information System MAGIS mapping for the Natural Heritage and Endangered Species Program (NHESP).

310CMR 10.58 (4) section (c) Practicable and Substantially Equivalent Economic Alternatives

Per 310 CMR 10.58 1. – The definition of Practicable is an alternative that is substantially equivalent economically if it is available and capable of being done after taking into consideration costs, existing technology, proposed use, and logistics, in light of overall project purposes. Available and capable of being done means the alternative is obtainable and feasible.

310CMR 10.58 (4) (c) 1. a. Costs

Costs include expenditures for the project within the riverfront area include land acquisition, site preparation, design, construction, landscaping and transactional expenses. Costs have a significant impact on the subject parcel and its development potential. In reviewing the costs of the development two costs should be considered. The first cost, is the development cost of the ground mounted solar array project which includes design, permitting, land acquisition equipment, construction and the fee for project interconnection to the existing electrical grid. Removal of array tables from the proposed layout will decrease the total output of the project which determines if the renewable energy project is a financially viable. The second cost to be considered is the land lease which would benefit a local small farm which is seeking alternative means of revenue keep their small farm financially viable while still having the benefit of 20+ acres of pasture land for livestock to graze on.

There are three representative physical alternatives that demonstrate that alternative site development options that are not "Practicable and Substantially equivalent Economic Alternatives" for the applicant or landowner.

Alternative Option 1 – No Build Scenario

The first option or alternative to the development as proposed would be to not develop the site as proposed. Under this scenario the property owner and manager or Ledge Valley Farm would continue to operate the existing facility as it exists today. This will have a negative impact on the ability of Ledge Valley Farm to be a financially stable operation as there are many financial challenges facing newly established small family owned and operated farms. The Hampden County Profile in the 2017 Census of Agriculture showed a 10% decrease in the number of farms in Hampden County and indicated that 48% of the farms in Hampden do less than $2,500 in sales while 97% are family farms. Both of these statistics relate to the Ledge Valley Farm. The Census also indicated that 50% of the land in farms is wooded creating for opportunities for restoration productive farmland which also applies to Ledge Valley Farm as many of the historic farm fields are now partially wooded with small trees and other low-lying vegetation. The difficulties for young aspiring farmers in the Commonwealth are well documented with the high land costs, current high interest rates and increasing costs of farmland, equipment, feed, and raw material. These conditions create an opportunity for a new sustainable system where solar developers who need land to create a renewable energy grid can partner together with farmers, paying them for the use the land and making a solar generation system that is compatible with crops working to compliment them and creating an improved land that is healthier and more productive. By leasing farmland to solar projects and maintaining agricultural land, this gives the farmers an opportunity to keep ownership of their land and utilize the field areas within the solar array for agricultural purposes while being provide economic assurance through a long-term land lease with the solar developer. The "No Build Scenario" will negatively impact the opportunities of the current land owner in creating a stable and financially viable farming operation which would benefit the local community in providing sustainably raised local meats, milk, and eggs. Under the "No Build Scenario" 4.95 MW-AC of sustainable renewable energy would not be added to the power grid where the current infrastructure is in place to support the renewable energy project as the site has an Interconnect Service Agreement (ISA) in place with National Grid for the proposed project.

Alternative Option 2 – Relocate the project to a similar parcel which would allow for a comparably sized development.

The second option or alternative is relocating the project to a similar parcel which would allow for the construction of a comparable sized Agricultural Ground Mounted Solar System. The target size of a development alternative parcel would need to be approximately 50 acres and allow for approximately one-half of the land area to be developed as an Agricultural Ground Mounted Solar System as required by Town of Hampden Zoning Bylaw section 7.16.4.D.3.a. In additional to providing the required buildable acreage the parcel would need to be located within the vicinity of existing electrical infrastructure capable of transmitting the power generated from the solar facility as the site at 530 Glendale Road provides through the issued ISA from National Grid and also provide an opportunity of a similar agricultural use as is

proposed as part of project. The agricultural component of this project has been developed by the applicant and current property owner over the past three years of working together to develop a substantiable plan for the installation of the solar array and integration of livestock grazing within the array areas. This partnership and willingness to develop a dual use site cannot be easily recreated or developed and needs to be considered when seeking an alternate parcel for the development. A review of current property listings did not provide for any available properties which would be considered as an equivalent development site within Hampden, MA of the surrounding communities.

Alternative Option 3 – Limited Build Scenario with no disturbance to the River Front Area

The third option or alternative is to limit the Agricultural Ground Mounted Solar System facility to the area located completely outside of the 200' Riverfront Area from the unnamed stream which flows north to south along the westerly property boundary though the site to the west of the existing barn. To evaluate this alternative, the proposed RFA disturbance have been separated into 3 separate areas. Area 1 is located in the northwestern part of the site and includes Riverfront area which is primarily all maintained existing fields. Area 2 is the existing degraded area which contains the existing barn, gravel driveway and yard space. Area 3 is the field area and a portion of the existing equestrian trotting loop.

Area 1 Disturbance (Sub-Array 2):

The 200' RFA within this within this section of the property is all previously disturbed area as this part of the site is an existing maintained field which gets periodically mowed / hayed multiple times per year. Removing all the proposed RFA disturbance from this area would require the proposed gravel driveway, which provides access to approximately 50% of the array tables, to be completely removed or to construct the driveway through a portion of the GC wetland. Keeping the access driveway out of the RFA would require approximately a 5,500± sf. disturbance to the GC Wetland to construct, grade, and provide required stormwater management features for the gravel driveway. This realignment would also eliminate 21 solar array tables which is approximately 325.5 KW (or 7%) of capacity of the system as proposed. If the gravel driveway could not be installed through the wetland area or the RFA an additional 140 solar array tables with an output of 2.170 MW would be eliminated.

Area 2 Disturbance (Sub-Array 1A and Equipment):

The 200' RFA within Area 2 is primarily degraded with compacted gravel ground cover and the existing barn structure. Removing all the proposed RFA disturbance from this area associated with the solar array would require the proposed gravel driveway and equipment pads to be shifted to the east into the array area. This realignment would also eliminate 5 solar array tables which is approximately 77.5 KW (or 2%) of capacity of the system as proposed.

Area 3 Disturbance: (Array 1)

The 200' RFA within the project area is previously disturbed area a section of the existing gravel trotting track and interior field area. Removing all the proposed RFA project disturbance from this area associated with the solar array would require the proposed gravel driveway turnaround area and multiple array tables to be eliminated from the project area. This realignment would also eliminate 37 solar array tables which is approximately 573.5 KW (or 12%) of capacity of the system as proposed.

Removing all the proposed site disturbance from the 200' RFA would result in a total system output reduction of approximately 976.5 KW or 20% of the system's total output. This reduction in total system output would render the proposed solar array unfeasible to construction based on current land, equipment, and construction costs.

310CMR 10.58 (4) (c) 1.b. – Existing Technology

The disturbance area within the 200' RFA has been designed using the best available measures, technology and engineering practices available. The solar development will utilize highly efficient solar panels available which allow for maximum system output while minimizing the required array footprint. The main site design component within the "disturbed" RFA area includes measures to utilize the existing ground cover and to maintain existing stormwater and runoff patterns and flow rates. The proposed gravel access driveway withing Sub-Array 2 is proposed at a minimum width of 20' wide. In Array 1 and Sub-Array 1A the existing gravel driveway / track area will be kept in place and reutilized as site access driveway. The development of the entire site complies with current MADEP Stormwater Management Standards for a new development project and includes the installation of three (3) new infiltration basins and multiple stormwater management swales with check dams throughout the site utilized to collect and convey runoff from the gravel access driveways.

310CMR 10.58 (4) (c) 1.c. – Proposed Use

The proposed use of the site as an Agricultural Ground Mounted Solar System is a low impact use of the parcel. Once the construction of the ground mounted solar system completed the use associated with the solar component of the site will be a passive use as the system generates renewable energy while the field areas are utilized as rotating pasture grazing fields. The use as the array field areas as pastures will significantly limit the required site maintenance that is required for vegetation management. The array system components and stormwater management facilities require periodic maintenance to ensure the site is performing as designed through monthly site inspections by the operations staff. The Agricultural Ground Mounted Solar System facility use provides for substantially less permanent site disturbance and overall impact to the area compared to a traditional residential subdivision which would be allowed by right in the in the R-6 Residential Zoning District for a parcel of this size. A

residential subdivision would require the development of thousands of linear feet of new paved roadways along with the associated infrastructure required to accommodate a residential development creating 20-30 new housing lots.

310CMR 10.58 (4) (c) 1.d. – Logistics

Logistics refers to the presence or absence of physical characteristics that may influence development. The Town of Hampden Zoning Bylaw allows for the development of large-scale photovoltaic solar sites within the R-6 Residential Zoning District with the approval of a Special Permit granted by the Town of Hampden Planning Board. The proposed project is located with a sensitive area containing two perineal streams and multiple bordering vegetated wetlands. The proposed Agricultural Ground Mounted Solar System use will provide a low impact use protecting the resource areas as opposed a full residential subdivision development which drastically alter the landscape of the area that is allowed in the R-6 Residential Zoning District.

310CMR 10.58 (4) section (d) No Significant Adverse Impact

The Agricultural Ground Mounted Solar System facility as proposed includes limited disturbance to the to 200' Riverfront Area associated with the unnamed stream which flows north to south along the westerly property boundary though the side to the west of the existing barn. The proposed total disturbance of 64,576±sf (66,683±sf total disturbance minus 2,107±sf of mitigation area) slightly exceeds the standard allowed Riverfront disturbance area of 10% of the total Riverfront area on the development parcel which is 54,553±sf (0.10 x 545,528±sf). The proposed disturbance area includes the removal of 2,107±sf of existing gravel directly adjacent to an existing BVW to improve the Riverfront Area and BVW buffer zone. In addition to the 2,107±sf of mitigation, 46,246±sf of the proposed disturbance area will retain its current existing ground cover as a maintained pasture / farm field. This area will not be cleared or exposed during construction as the only disturbance to the ground will be the installation of the required 2 mounting screws per array table with no proposed trenching of conduit as all wiring connections within this area will be above grade. Additional erosion and sediment control barriers have been added to this area to prevent unnecessary disturbance to this area and to keep all site traffic within the limits of the new gravel driveway.

A summary of the project RFA Disturbance areas is detailed below:

- 545,528±sf. – Total Existing River Front Area (RFA) 0'-200' on Primary Development Parcel
- 66,683±sf. – Total project disturbance within RFA 0'-200' associated with unnamed river
- 2,040±sf. – total 0'-100' RFA associated with unnamed river
    - 2,040±sf – New gravel within 0'-100' RFA to create a turnaround on the existing gravel track / driveway

- 64,643±sf. – Total 100'-200' RFA on Primary Development Parcel
  - 11,488±sf – New gravel within 100'-200' RFA for construction of site access driveway
  - 2,817±sf – New Rip-Rap Stormwater Swale
  - 1,985 ±sf – Conversion of natural vegetation to pasture field / solar array within 100'-200' RFA
  - 46,246 ±sf – Installation of solar array within existing maintained field
  - -2,107 ±sf – Removal / Restoration of gravel section of unused gravel area within 100'-200' RFA

Compliance with the requirements of 310CMR10.58(4)(d)1.(a-d) is detailed below:

310CMR 10.58 (4) (d) 1.a.

A 100-foot-wide area of undisturbed vegetation currently does not effectively exist within 200' RFA section which is proposed to be disturbed. This area contains existing maintained fields, the existing barn, gravel driveway / yard area, or gravel equestrian trotting track. The only proposed new site disturbance within 0'-100' RFA is for the installation of a new 2,040±sf gravel driveway turnaround which is proposed to be installed along the westerly side of existing gravel equestrian trotting track. The installation of the turnaround is to make this section existing gravel track a usable service driveway for the facility. Currently the gravel track crosses over the southerly property line. The installation of the turnaround is required to keep this existing gravel drive as a viable site access drive which requires a dedicated turnaround space for maintenance and emergency response vehicles. The proposed 2,040±sf disturbance is minimal compared to the required site disturbance to construct a new gravel access driveway providing similar access to the proposed reuse of the section of gravel track. The remaining area within the 0'-100' RFA will continue to function as it exists today.

310CMR 10.58 (4) (d) 1.b.

The development of the entire site complies with current MADEP Stormwater Management Standards for a new development project and includes the installation of three (3) new infiltration basins and multiple stormwater management swales with check dams installed throughout the site utilized to collect and convey runoff from the gravel access driveways.

310CMR 10.58 (4) (d) 1.c.

The proposed work will not impair the riverfront to provide important wildlife habitat functions. The only work within the 0'-100' RFA is the addition of the gravel driveway turnaround area. The remainder of the area will continue to be utilized as maintained field

areas with solar racking table with the exception of the installation of the section of gravel driveway within the 100'-200' RFA as detailed above.

310CMR 10.58 (4) (d) 1.d.

The proposed work will not impair groundwater quality and will not result in nonpoint source pollution. This is achieved the installation of a fully complaint stormwater management system designed to manage stormwater runoff and provide on-site recharge through three proposed infiltration basins. The design plans include a detailed erosion and sediment control plan to which contains measures to mitigate onsite erosion and nonpoint source pollution during site construction. The development will also be subject to the requirements of a NPDES General Stormwater Permit requiring the implementation of a Stormwater Pollution Prevention Plan (induced with the application in draft format) and construction monitoring form a certified stormwater inspector.

CONCLUSION

The proposed site development utilizes existing infrastructure to provide access to the development area of this project. The additional site related improvements within the RFA have been reduced to provide a viable project which will be utilized as an Agricultural Ground Mounted Solar System facility while minimizing impacts to the 200' RFA to the maximum extent practicable. The total proposed 200' RFA disturbance associated with the proposed Agricultural Ground Mounted Solar System facility is 64,576±sf. This includes a 16,345±sf. permanent disturbance for gravel driveway surfaces and stormwater management rip-rap swales. This new permanent disturbance is located within the existing cleared and maintained farm fields and will not require any new tree clearing. 46,246 ±sf of the total disturbance area is associated with installing solar array tables within existing maintained field areas. The installation of the array tables requires setting of two ground mounted screws for each table within the existing field area. These areas will not be cleared or grubbed and will primarily remain stabilized throughout construction. After the array tables are installed, any area disturbed from installation will be raked and seeded with the field pasture seed mix.

Upon completion of the construction of the Agricultural Ground Mounted Solar System facility, the array table field areas will be utilized as pasture grounds for grazing sheep, chickens and other livestock. The proposed reuse of the existing field areas for use as a ground mounted solar array and grazing pasture provides an optimal use of the land area while minimizing site disturbance. This adaptive reuse of the existing field areas will allow Ledge Valley Farm to provide sustainable local meats, eggs, and other products while the solar site provides 4.95 MW-AC of renewable energy to the community and financial surety to Ledge Valley Farm through their land lease with the solar developer.

5. AGRIVOLTAIC INTEGRATION AND GRAZING MANAGEMENT PLAN PREPARED BY UNITED AGRIVOLTAICS NORTH AMERICA, LLC

Agricultural Integration and Grazing Management Plan

ZeroPoint Energy Consultants: 530 Glendale Road Development, LLC

Prepared for:

ZeroPoint Energy Consultants

Prepared by:

United Agrivoltaics North America, LLC.

October 2023

BIO: Caleb Scott

Owner - United Agrivoltaics

Founding Member - American Solar Grazing Association

As Vice President of the American Solar Grazing Association and owner of United Agrivoltaics, Caleb and his team are helping pave the way for the development of industry standards and best practices. Being one of the nation's first solar grazing contractors, Caleb has seen the industry grow from infancy. Caleb works with a large network of farm partners and solar developers to graze sheep on PV arrays, developing and implementing full scope agrivoltaics plans. Helping communities and asset owners across the United States, he understands the benefits of using an agrivoltaic approach.

Contents

1.0 Introduction

United Agrivoltaics North America LLC (United Agrivoltaics) has prepared this Agricultural Integration and Grazing Management Plan for ZeroPoint Energy Consultants (“ ZPEC”), 530 Glendale Road Solar Project , (“Site”, “Project” or “Solar Facility”). ZPEC has engaged the services of United Agrivoltaics North America LLC to assist with the preparation of this plan. United Agrivoltaics North America LLC, is based in Central NY, with 97 agrivoltaic projects in the United States. United Agrivoltaics is owned and operated by sheep farmers with direct experience managing sheep at solar P.V facilities with 14,000 sheep under management.

1.1 Background

The Proposed 4.9+/- MW AC Solar Facility (**Figure 2)** will occupy approximately 21 acres or 39% of the Parcel which is located at 530R Glendale Road, Hampden Mass, 01036 and is owned by Jonathan Guinipero / Stateline Property Management, LLC and the primary location Ledge Valley Farm (“Farmer”) (**Figure 1**) The system design shall include a fixed tilt racking system, using 11,000 modules, 2 PV inverters and 4 BESS pads. The land is classified as farmland of statewide importance according to MassMapper Geographic Database. (**Figure 3**) There is a wetland area surrounding and running through the array from south to north. The central area of wetland will become a wildlife corridor though the site. The land has a section of prime 2 forest land on the eastern and southern borders of the property line. (**Figure 4**). With a well executed agricultural plan the farmland can be maintained and even improved. Our intention is to restore the Prime Farmland while producing renewable power so that it can be farmed for the next 25-40 years.

Figure 1

Figure 2

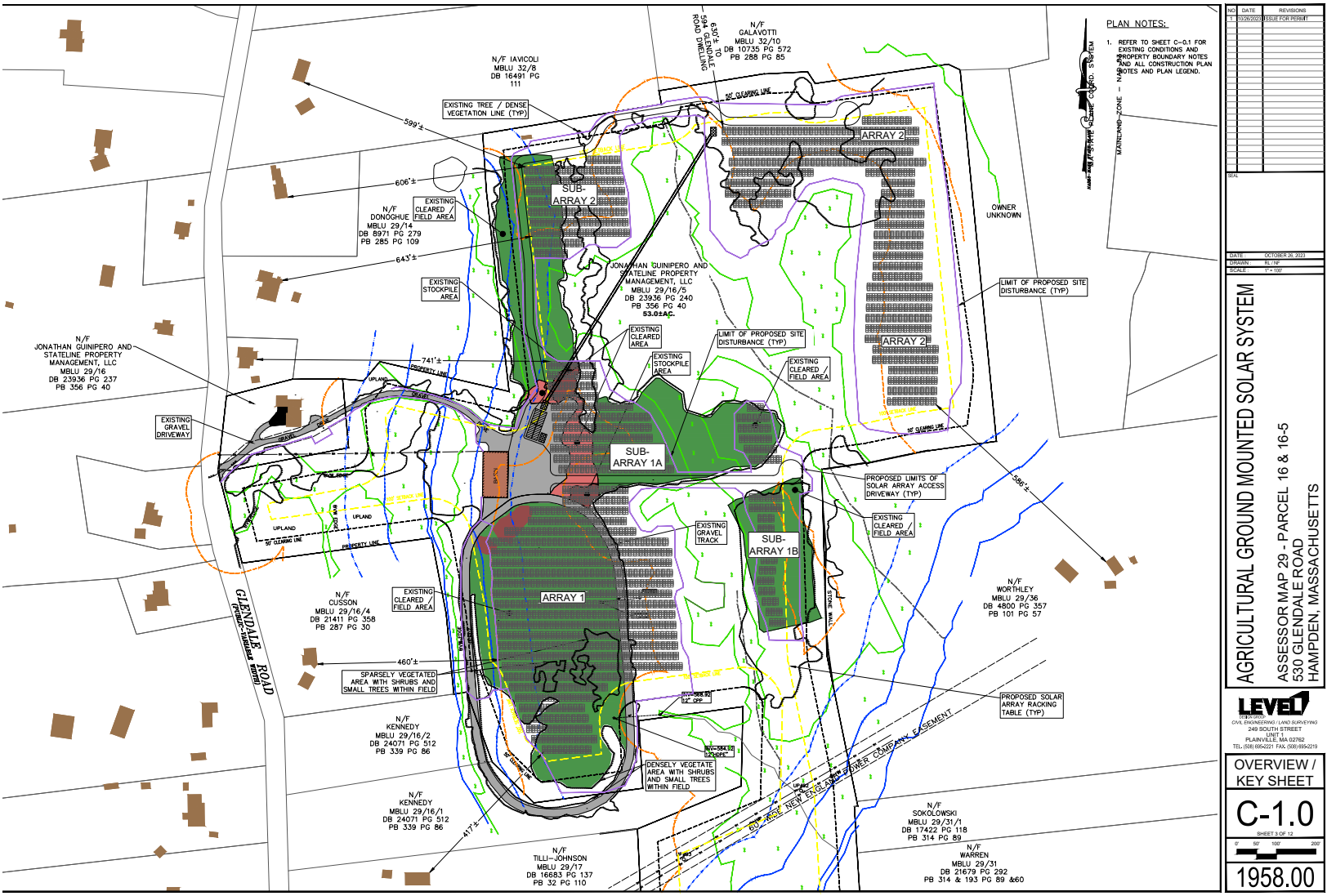


Figure 3

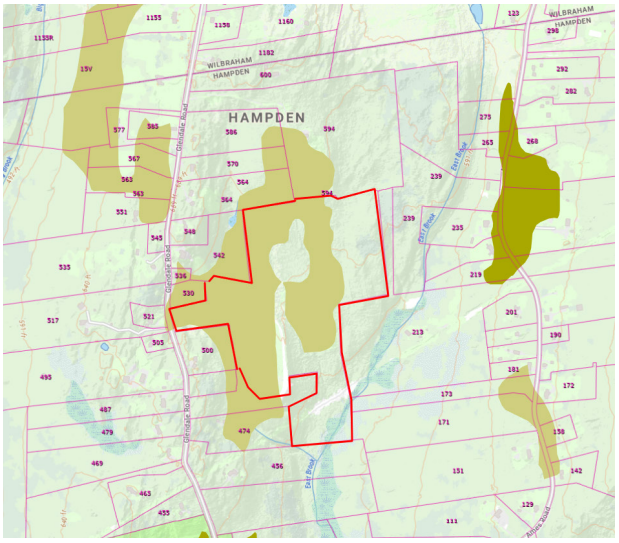
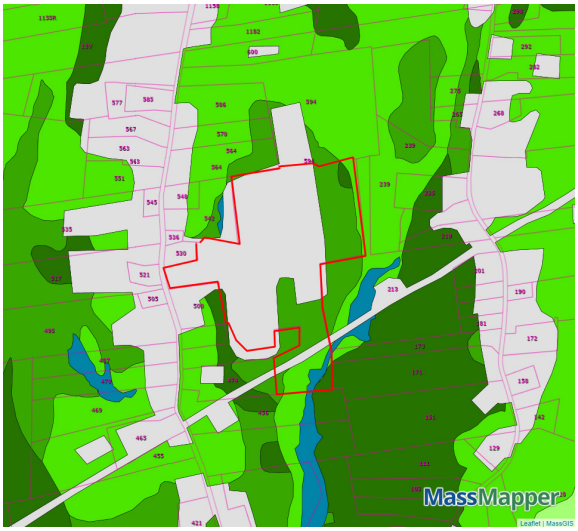


Figure 4



1.2 Design Intent

The integration of solar into agriculture or vice versa offers key advantages: renewable energy generation, efficient land use, and sustainability through eco-friendly practices. It allows farms to produce clean energy, optimize land utilization, and promote environmental stewardship.

The Project has been engineered to integrate agricultural uses, including a managed grazing system that utilizes sheep to control vegetation growth under and around the solar panels. Sheep grazing is a method of vegetation control used on solar facilities around the world and increasingly being implemented in the Northeastern United States. Recent Minnesota research shows that grazing sheep under solar improves soil quality (Pickerel 2022). Conversion of tilled row crop land into no-till pastures rebuilds soils naturally, reducing erosion, improving soil structure and nutrient density slowly over time.

ZPEC is also committed to successful agricultural integration in the state of Massachusetts for the 530 Glendale Road Site. The Project will utilize a forage and pasture seed mix, the ("Array Mix") suitable for grazing sheep, cattle, raising pigs and poultry. The "Array mix" will also be seeded in areas that can be utilized for hay production. The Projects central wetlands and setbacks will greatly benefit the animal species it supports. Even though the Project is not trying to attain the pollinator friendly adder, there will be a pollinator friendly "Perimeter" mix seeded outside of the fence line in areas that are not wooded or being used for hay. There is an existing line of trees and shrubs along all boundaries of the array offering a natural screen and a nesting area for birds and other wildlife. Additional screening with trees, fence or opaque screen will be added to the northern boundry and northeast corner. The site will be made up of four arrays, one of which is separated internally by a road and utilized as separate paddocks to raise, rotationally graze and rest the pasture. Gate signage stating "Sheep Grazing" will be posted on all entrances. Together these efforts increase agricultural output and create economic opportunity for local farmers.

1.3 Opportunity for New Generation of Farmers

The Hampden County Profile in the 2017 Census of Agriculture showed a 10% decrease in the number of farms in Hampden County and indicated that 48% of the farms in Hampden do less than $2,500 in sales while 97% are family farms. Both statistics relate to the Ledge Valley Farm. The Census also indicated that 50% of the land in farms is wooded creating opportunities for the restoration of productive farmland and the creation of silvopasture (**Figure 5**).

It is widely know that the average age of farmers is increasing. In the 2017 Census of Agriculture the average age of all farmers was 57.5 continuing it's uptrend since the mid 20th century. Aging of American farmers combined with the difficulty younger, aspiring farmers have acquiring land due to higher interest rates, increasing costs of farmland, equipment and raw materials creates an opportunity. Solar developers who need land to create a renewable energy grid can partner together with farmers, paying them for the use the land and making a solar generation system that is compatible with crops working to compliment them and creating an improved land that is healthier and more productive. When a farmer can be paid for his or her land and use that income to produce crops such as lamb, chicken pigs and cows, the economics start to work. By leasing farmland to developing solar projects and maintaining agricultural land this often gives the farmers an opportunity to keep the land for generations as we've seen on other utility scale installations. Furthermore new economic opportunities are created (eg grazing contracts) allowing families to bring the younger generations into the business and even expand operations, adding family members and other varieties of animals into their existing operations. With our plan, Ledge Valley Farm can grow from a small startup to a sustainable family farm

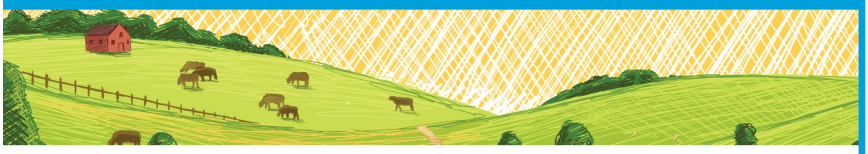
1.4 Additional Agrivoltaic Opportunities

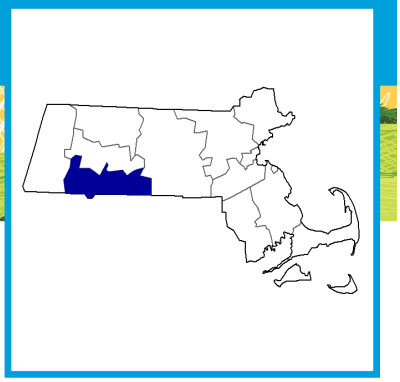
In addition to animal crops there are other opportunities that will be considered for the project.

- Pumpkins: an ideal value added crop to produce on this land. Not only can pumpkins be sold in the fall for local festivities but they can be fed to sheep, chickens and pigs adding fresh nutritive feed that effectively reduces parasites.
- Honey: Apiaries can be placed throughout the site. Bees are vital pollinators for many crops, enhancing yields and quality. Beekeeping encourages the presence of diverse plant species, benefiting local ecosystems and increasing soil fertility through increased pollination. Strong pollination services can help crops better withstand environmental stressors as well adding significant value to the agrivoltaic system.
- Eggs: sold at Ledge Valley Farms in the past, the expanded farm operation will allow the farmer to continue and expand egg production for additional calories per acre.

Figure 5

2017 CENSUS OF AGRICULTURE *County Profile*





Hampden County Massachusetts

Total and Per Farm Overview, 2017 and change since 2012

	2017	% change since 2012
Number of farms	523	-10
Land in farms (acres)	35,992	-7
Average size of farm (acres)	69	+3
Total	($)	
Market value of products sold	25,892,000	+10
Government payments	362,000	-25
Farm-related income	3,381,000	+61
Total farm production expenses	23,671,000	(Z)
Net cash farm income	5,964,000	+144
Per farm average	($)	
Market value of products sold	49,506	+22
Government payments (average per farm receiving)	10,957	
Farm-related income	22,391	
Total farm production expenses	45,259	
Net cash farm income	11,403	

5 Percent of state agriculture sales

Share of Sales by Type (%)

Crops	83
Livestock, poultry, and products	17

Land in Farms by Use (%) [a]

Cropland	33
Pastureland	7
Woodland	50
Other	9

Acres irrigated: 1,042
3% of land in farms

Farms by Value of Sales

	Number	Percent of Total [a]
Less than $2,500	253	48
$2,500 to $4,999	58	11
$5,000 to $9,999	65	12
$10,000 to $24,999	56	11
$25,000 to $49,999	29	6
$50,000 to $99,999	26	5
$100,000 or more	36	7

Percent of farms that:

Have internet access	79
Farm organically	1
Sell directly to consumers	25
Hire farm labor	20
Are family farms	97

Top Crops in Acres [d]

Forage (hay/haylage), all	5,281
Vegetables harvested, all	1,719
Corn for silage or greenchop	1,442
Sweet corn	536
Tobacco	373

Livestock Inventory (Dec 31, 2017)

Broilers and other meat-type chickens	1,235
Cattle and calves	2,407
Goats	444
Hogs and pigs	142
Horses and ponies	552
Layers	3,909
Pullets	594
Sheep and lambs	776
Turkeys	392

USDA United States Department of Agriculture
National Agricultural Statistics Service
www.nass.usda.gov/AgCensus

2.0 Managed Grazing System

Solar facilities in the Northeast require regular vegetation control during the growing season to prevent shading and produce electricity efficiently. A managed grazing system for solar sites efficiently controls vegetation and offers many benefits over traditional means of mechanical mowing and trimming which tend to compact soil and offer no regenerative benefits. Grazing is also more beneficial for pollinator friendly habitats when correctly implemented.

2.1 Overview of Vegetation Management Using Sheep

Vegetation that grows underneath panels reaching heights above the leading edge of the panels will cause shading and must be mowed or grazed several times per year. Sheep grazing at an appropriate stocking density are highly effective. Sheep will eat vegetation around and under panel areas. These areas can be hard to reach, expensive or dangerous with conventional mowing equipment, requiring additional treatments of herbicides to control vegetative growth.

Sheep are small and agile enough to easily graze underneath panels and racking equipment. Their behavior does not predispose them to standing or jumping on site equipment or chewing on electrical wiring, as goats might be inclined to do. Their size and strength mean that any rubbing on equipment is unlikely to cause damage. The perimeter fences installed as part of the solar project will serve to contain the grazing sheep within the designated grazing area. The sheep farmer (i.e., “Contractor”) will be responsible for any damages to personal or public property caused by sheep.

A correctly planned and implemented grazing plan with appropriate animal stocking density will offer comparable or superior vegetation control performance to a conventionally mowed site. The implementation of a grazing program requires consideration and evaluation of native forage blends that have the correct nutritional balance for sheep. Fortunately many forage plants add to and diversify the pollinator friendly vegetation. **Appendix A** provides 1) a sample contract for using sheep to control vegetation and, 2) a letter of intent from United Agrivoltaics to fulfill this purpose. The letter of intent describes the proposed terms of the initial treatment / and roles and responsibilities of the owner (Farmer) and the Contractor (in this case, United Agrivoltaics North America, LLC).

The scope of work defines the planned approach the contractor will use to control vegetation within the Project site. This Plan and the Scope provided by United Agrivoltaics allow for adaptive management methods to be employed during site maintenance. This ensures strategic decisions can be based on the unique and evolving site-specific conditions. Further, it ensures the Contractor and the owner have the autonomy and are empowered to act in the best interest of the operating efficiency of the project in consideration of the economic viability and the health, safety, welfare of the grazing operation.

2.2 Soil and Ecological Benefits of Grazing

Grazing is a type of regenerative agriculture that creates a healthy, nutrient dense, runoff resistant soil for the future. Sustainable agriculture is one in which natural resources are protected or improved for the next generation of farmers or landowners.

Rebuilding and restoring the soil under solar facilities by using grazing has been shown to be beneficial to the ecosystem and can actually improve the ecosystem (Waltson 2021). There are many factors that go into creating healthy pasture and healthy soil. Grazing relies on healthy soils and healthy soils can further improve the land use potential for food or energy production. According to Ohio State University soil scientist Rafiq Islam; plowing fields before planting or after a harvest harms the health of the soil and reduces its ability to spur growth and resist erosion. Soil that is repeatedly plowed before planting or after a harvest is exposed to a large amounts of oxygen that spurs microbes to feed on carbon and evaporating as CO2. (CFAES, 2017)

When soil is left undisturbed, as with pasture that is created and maintained under a solar array using an Agrivoltaic approach, it can sustain or improve carbon while reducing erosion and run-off. (Hernandez-Santana 2013) Direct fertilization of the soil biota within the project area contribute to healthy soil ecology. Proper grazing and rest periods encourage and protect plant root development vital to a healthy erosion resistant soil.

2.3 Fencing

Fencing appropriate for sheep is critical to the success of a well-managed grazing system. United Agrivoltaics recommends a 7’ agricultural fence, tightly fitted to the ground There will be 4’ farm fence installed around equipment pads, protecting the equipment, animals and keeping the pads clear for technicians to work.

2.4 Water Access

Water access is essential for successful agricultural activities such as sheep grazing. Water access is available at the barn near the entrance of the project. There will be water stations in strategic areas throughout the project in Array 1, Sub-Array 1A, Sub-Array 1B, Array 2 and Sub-Array 2. The water stations will consist of a water transfer tank or ICB tote fed into a trough via a gravity feed float valve system. The transfer tanks and troughs will be appropriately sized for the primary agricultural activities in each block.

2.5 Seeding Plan

Creating a sheep pasture blend in Massachusetts involves selecting grasses and legumes that can thrive in the region's climate and soil conditions, provide seasonal forage, and meet the nutritional needs of sheep. In preparation for the seeding United Agrivoltaics recommend a fall application of dolomitic lime at 2.5 - 4 tons per acre and application of liquid calcium as needed. A cover crop of either the final array seed mix, grain oats or low growing rye should be seeded prior to construction to stabilize the soil in accordance with the seeding final seeding time of year.

2.5.1 Forage and Pasture ("Array") Blend Selection

An optimal pasture blends includes a blend of cool season perennial grasses, legumes and forbs. Cool season grasses are utilized for abundant cover and livestock forage while legumes fix nitrogen for plant uptake and create habitat for pollinators (Gelley et al 2021).

The selected forage and pasture "Array" seed blend (**Figure 5**) is being used to create an optimal forage for grazing which naturally incorporates pollinator friendly native species. This seed mix is required to give the sheep a balance of roughage and protein. A majority of the selected grasses are shade tolerant and the forbs will provide a late season pollinator forage. These seed blends have been researched and developed in conjunction with United Agrivoltaics, local experts, and sheep farmers.

Figure 6

530 Glendale Road Forage and Pasture Mix

- 27.8% Orchardgrass
- 27.8% Meadow Fescue
- 27.7% Perennial ryegrass
- 6.25% Ladino Clover
- 6.25% Red Clover
- 4.2% Dutch Clover

6 lbs per acre total clover with no more than 1.5 lbs Dutch White clover.
30 lbs per acre total grasses.

All of these forages are fairly shade tolerant and are used heavily in orchards and silvopasture situations.

2.5.2 Pollinator ("Perimeter") Blend Selection

Even though the site is not trying to attain the pollinator friendly adder, there will be a pollinator friendly "Perimeter" mix seeded outside of the fence line in areas that are not wooded or used for hay. Ernst Conservation seeds ERNMX-105 (**Figure 5**) has been selected for this purpose and will create beneficial blooms and forage for native pollinators throughout the summer and fall attracting songbirds, wild bees, wasps and beetles. The pollinator friendly "Perimeter" mix will compliment and enhance the existing wetland areas and the newly created wildlife corridor. ERNMX-105 will be seeded at 20lb per ace rate with 30lb per ace cover crop or either grain oats or grain rye in accordance with recommended time of year

Figure 7

Ernst Conservation Seeds
8884 Mercer Pike
Meadville, PA 16335
(800) 873-3321 Fax (814) 336-5191
www.ernstseed.com

Date: October 10, 2023

Mesic to Dry Native Pollinator Mix - ERNMX-105

	Botanical Name	Common Name	Price/Lb
29.40 %	*Schizachyrium scoparium, Fort Indiantown Gap-PA Ecotype*	Little Bluestem, Fort Indiantown Gap-PA Ecotype	15.00
18.50 %	*Elymus virginicus, PA Ecotype*	Virginia Wildrye, PA Ecotype	10.36
12.00 %	*Sorghastrum nutans, PA Ecotype*	Indiangrass, PA Ecotype	14.58
8.00 %	*Echinacea purpurea*	Purple Coneflower	43.20
5.00 %	*Panicum clandestinum, Tioga*	Deertongue, Tioga	22.10
3.00 %	*Chamaecrista fasciculata, PA Ecotype*	Partridge Pea, PA Ecotype	7.20
3.00 %	*Coreopsis lanceolata*	Lanceleaf Coreopsis	28.80
3.00 %	*Rudbeckia hirta*	Blackeyed Susan	31.20
2.50 %	*Verbena hastata, PA Ecotype*	Blue Vervain, PA Ecotype	38.40
2.00 %	*Heliopsis helianthoides, PA Ecotype*	Oxeye Sunflower, PA Ecotype	33.60
2.00 %	*Zizia aurea, PA Ecotype*	Golden Alexanders, PA Ecotype	72.00
1.50 %	*Lespedeza capitata, RI Ecotype*	Roundhead Lespedeza, RI Ecotype	115.20
1.50 %	*Penstemon digitalis, PA Ecotype*	Tall White Beardtongue, PA Ecotype	168.00
1.00 %	*Asclepias tuberosa, PA Ecotype*	Butterfly Milkweed, PA Ecotype	312.00
1.00 %	*Pycnanthemum tenuifolium*	Narrowleaf Mountainmint	168.00
1.00 %	*Senna hebecarpa, VA & WV Ecotype*	Wild Senna, VA & WV Ecotype	28.80
0.90 %	*Aster pilosus, PA Ecotype*	Heath Aster, PA Ecotype	264.00
0.80 %	*Aster novae-angliae, PA Ecotype*	New England Aster, PA Ecotype	336.00
0.70 %	*Asclepias incarnata, PA Ecotype*	Swamp Milkweed, PA Ecotype	177.60
0.50 %	*Baptisia australis, Southern WV Ecotype*	Blue False Indigo, Southern WV Ecotype	96.00
0.50 %	*Geum laciniatum, PA Ecotype*	Rough Avens, PA Ecotype	192.00
0.50 %	*Rudbeckia triloba, WV Ecotype*	Browneyed Susan, WV Ecotype	57.60
0.40 %	*Monarda fistulosa, Fort Indiantown Gap-PA Ecotype*	Wild Bergamot, Fort Indiantown Gap-PA Ecotype	96.00
0.30 %	*Asclepias syriaca, PA Ecotype*	Common Milkweed, PA Ecotype	96.00
0.30 %	*Solidago nemoralis, PA Ecotype*	Gray Goldenrod, PA Ecotype	264.00
0.20 %	*Aster prenanthoides, PA Ecotype*	Zigzag Aster, PA Ecotype	432.00
0.20 %	*Eupatorium perfoliatum, PA Ecotype*	Boneset, PA Ecotype	192.00
0.20 %	*Solidago bicolor, PA Ecotype*	White Goldenrod, PA Ecotype	240.00
0.10 %	*Solidago juncea, PA Ecotype*	Early Goldenrod, PA Ecotype	336.00
100.00 %		**Mix Price/Lb Bulk:**	**$38.62**

Seeding Rate: 20 lbs/acre with 30 lbs/acre of a cover crop. For a cover crop use either grain oats (1 Jan to 31 Jul) or grain rye (1 Aug to 31 Dec).

Herbaceous Flowering Species - Herbaceous Perennial; Pollinator Favorites; Uplands & Meadows

The native wildflowers and grasses in this mix provide an attractive display of color from spring to fall. Designed for mesic to upland sites and full sun to lightly shaded areas. This mix will attract a variety of pollinators and songbirds. Mix formulations are subject to change without notice depending on the availability of existing and new products. While the formula may change, the guiding philosophy and function of the mix will not.

2.6 Multi-species Rotational Grazing

Multi-species rotational grazing, practiced in Massachusetts and elsewhere, offers several benefits for pasture management and ecosystem health:

- Improved Soil Health: Rotating different species of livestock (e.g., cattle, sheep, and poultry) on pastures can promote healthier soils by reducing compaction and enhancing nutrient cycling.
- Enhanced Pasture Productivity: Grazing multiple species with varied dietary preferences can help optimize pasture utilization, preventing overgrazing and promoting more even forage growth.
- Weed and Pest Control: Diverse grazing can naturally control weeds and reduce the need for chemical herbicides. Certain species, such as chickens, can also help manage insect pests.
- Increased Biodiversity: Multi-species grazing mimics natural ecosystems, fostering a greater diversity of plants and wildlife on the pasture.
- Reduced Disease Risk: Different species can help break the life cycles of parasites and reduce disease pressure compared to continuous grazing with a single species.
- Sustainable Management: By optimizing pasture utilization and minimizing the need for external inputs, multi-species rotational grazing supports more sustainable and environmentally friendly farming practices.
- Carbon Sequestration: Healthier pastures may sequester more carbon in the soil, contributing to climate change mitigation.

Overall, a multi-species rotational grazing plan in Massachusetts offers a holistic approach to pasture management that can benefit both the environment and the farmer's bottom line.

2.6 Grazing Rotation Plan

The Project is comprised of several areas for the purpose of this agricultural plan as follows: Array 1, Sub-Array 1A, Sub-Array 1B, Array 2 and Sub-Array 2. (**Figure 8**)

All arrays will have a minimum leading edge height of 48" to accommodate sheep pasture pigs and clipped wing poultry.

We will use the largest area (Array 1) to pasture the sheep while they're lambing out in the early spring and also in the fall and winter. As the spring flush comes in on early May we will start rotating the sheep between the other grazing sites (Sub-Array 1A, Sub-Array 1B, Array 2 and Sub-Array 2) as a way to maximize the land, reduce parasites, and sequester as much carbon back into the soil as possible. Rotating sheep just prior to gestation also maximizes fertility. As the cooler months approach in the late fall we will move the sheep into (Array 1) where they can maximize the amount of winter forage.

We will use (Sub-Array 1A) primarily for pasture pigs and a small number of clipped wing poultry. Pig boars and gilts will be separated with internal fencing that divides Array 1 from Sub-Array 1A down the access road north from south. Poultry will rotate between the primary poultry paddock (Sub-Array 1A) and (Sub-Array 1B). Ram Lambs will be brought in to these paddocks if needed in the late fall to clear out woody vegetation, and other vegetation that was not foraged by pigs and poultry. **(Figure 9)**

Figure 8

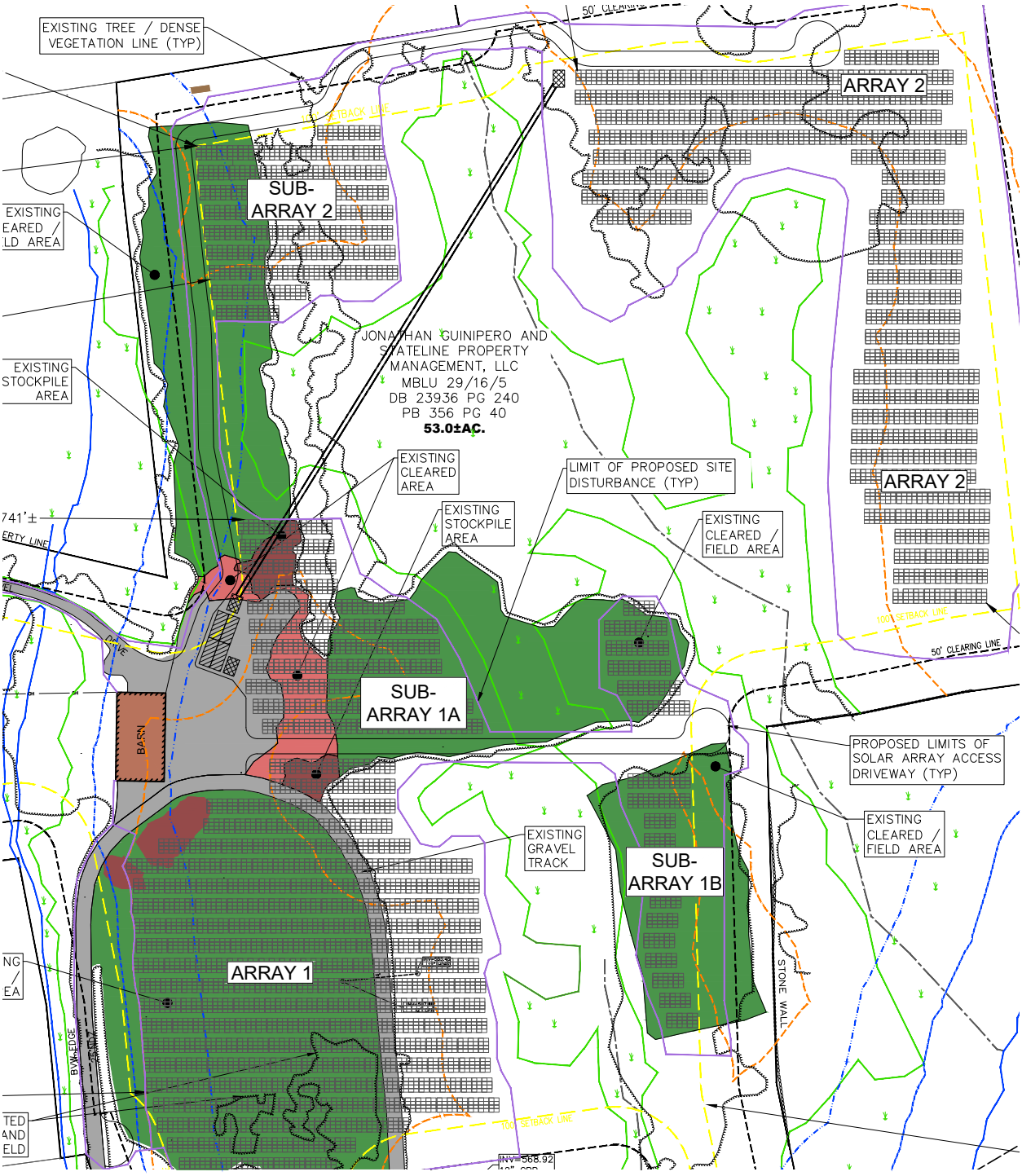
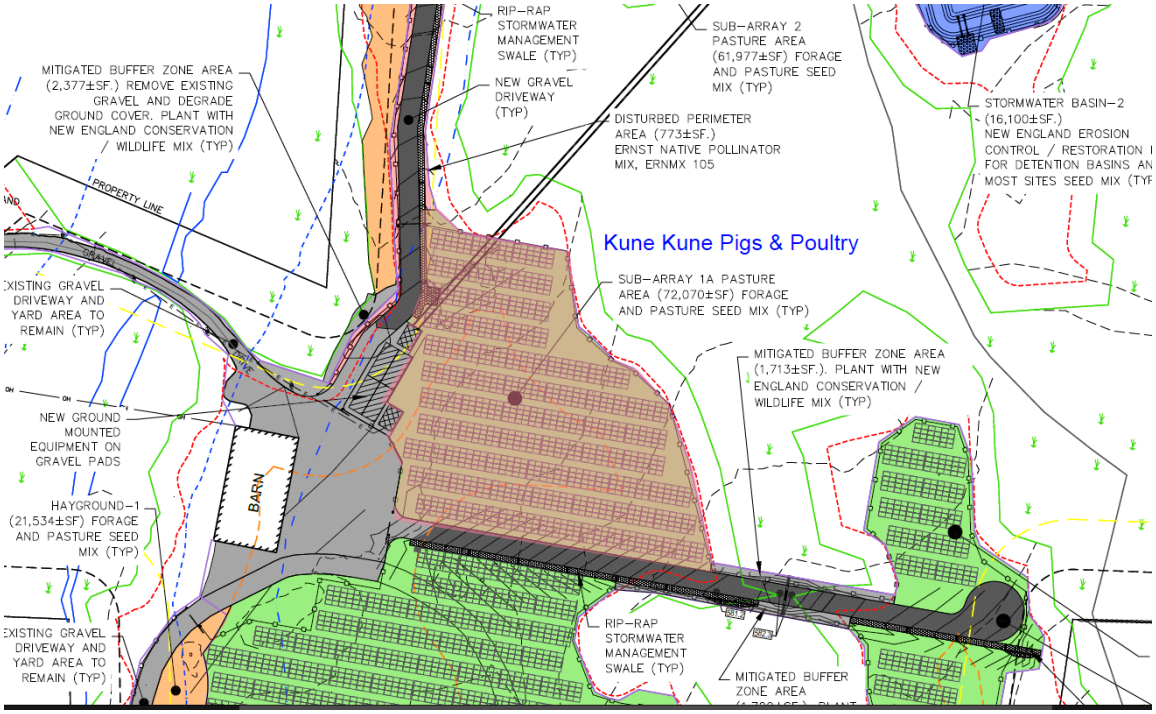


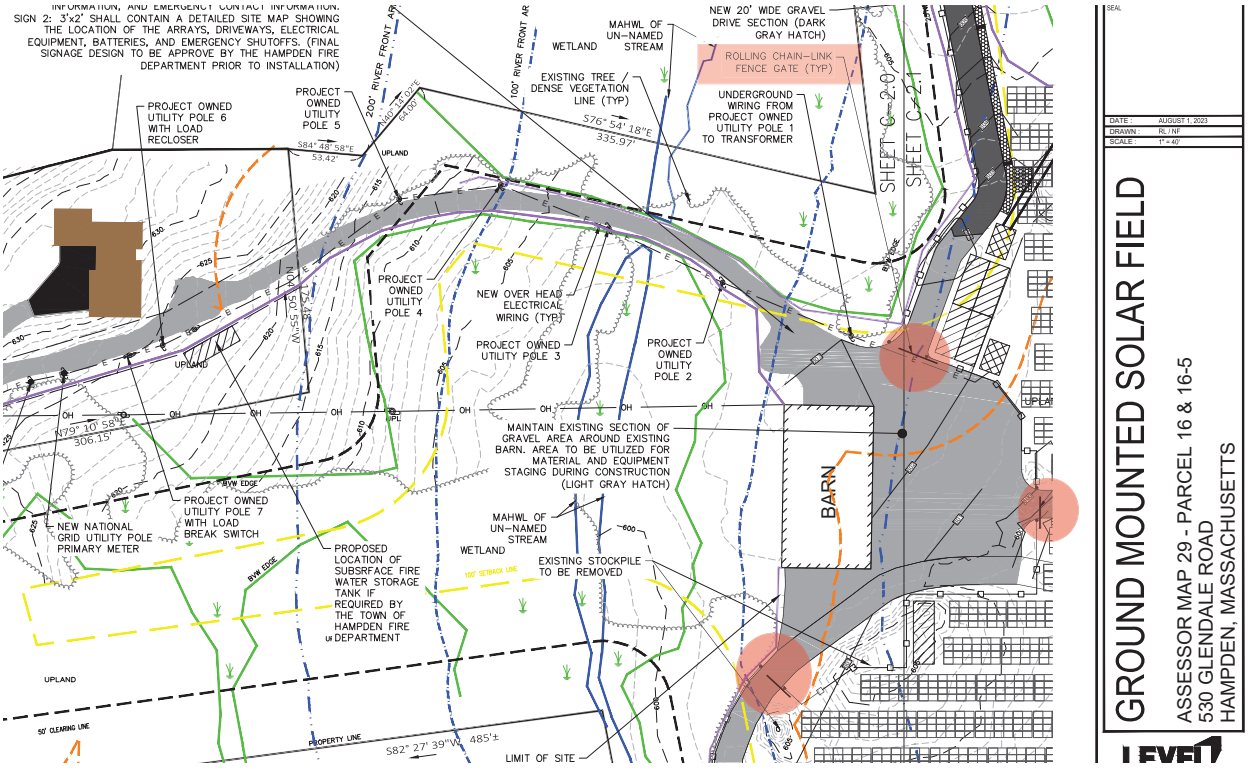
Figure 9



2.7 Gate Access for Livestock

Gates will be designed in a way to create separation between at 4 arrays and to facilitate rotational multi-species grazing between the fenced in areas. Roadways are designed to accommodate a small tractor, brush hog and UTV's and farm equipment as well as creating pathways to move livestock and water. **(Figure 10)**

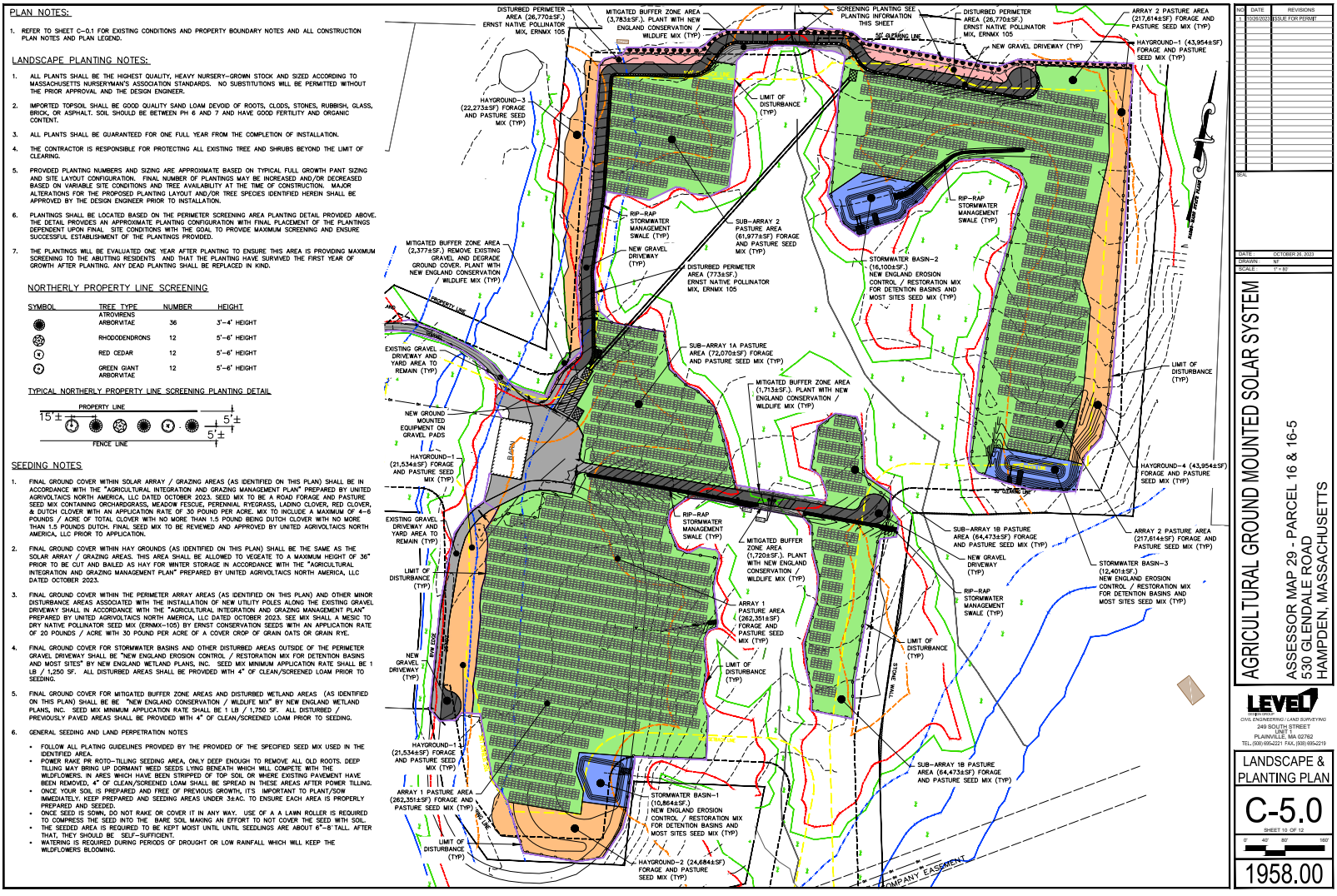
Figure 10



2.7 Internal / External Hayground

There are four areas that will be used for hay to support grazing animals. Acreage inside and outside the fence are illustrated with orange polygons, in total approximately 2.75 acres, yielding an estimated 4.69 tons of hay. Hayground-1 (1acre), Hayground-2 (.56 acre), Hayground-3 (.52 acre), Hayground-4 (.49 acre). These are the estimated areas that can be used for hay production and will be seeded with the “Array” forage and pasture seed mix. **(Figure 11)**. This hay will be baled (approximately 200 bales) and stored as supplemental winter forage. Pollinator Habitat areas will be created in areas that cannot be hayed.

Figure 11



3.0 Ecosystem and Economic Benefits

Sheep grazing has an important role in maintaining the agricultural production value of the Project site – but this Project design feature will also provide ancillary benefits to the local ecosystem and economy as outlined in the subsections below.

3.1 Agricultural Economics and Crops

The grazing commitment for the Project is designed to maintain active agricultural use of the site. Synergistically, the grazing opportunity offers the following benefits for the Contractor and the long-term productivity of the land:

- Farmers can use the three-year term contract to build and scale commercial sheep enterprises. The access to securely fenced grazing can provide a resource base for a sheep flock that produces feeder or market lambs. The grazing area within the Project provides a feed stock resource that the farmer would, traditionally, need to pay to rent to use. Farmers can use their animals, time and expertise and gain an additional income stream from a vegetation maintenance contract with the Solar Facility owner.
- The income from the grazing contract provides meaningful revenue and can improve farm viability for both new and established farm operations.
- The Project has been designed with efficient grazing in mind. Entry and exit gates will be designed to roll open making it easier for the farmer to load and unload sheep at the site. 110- volt electric will be available within the Project site to provide a source of power for portable heaters to make sure water source for the animals does not freeze in the early spring and late fall months.

3.2 Contracts

ZPEC's objective is to obtain long term (3+ year) contracts for managed grazing and vegetation maintenance at the site. Having contracts of this duration offers more security for farmers and will allow them to invest in animals and facilities that they may need. As mentioned above, **Appendix A** of this report contains a sample grazing contract. The contract will also provide for mowing in the circumstance where the sheep grazing does not sufficiently reduce the vegetation to allow for effective operation of the system.

No less than one and no more than eight sheep per acre will be applied at the Project site at a time. The specific number of sheep is the Contractor's discretion and will fluctuate depending on the changing carrying capacity of the site. Sustained rotational grazing on a seasonal basis will maximize the regenerative growth and carbon sequestration opportunity. ZPEC will consider the ongoing opportunity for over winter holding and on site feeding to further the natural fertilizing of the soil. The Contractor may add or take sheep away from herd as the land, weather, and management objectives require with the primary objective remaining maintenance of vegetation to ensure the Solar Facility operates efficiently and vegetation is kept to an acceptable height. These animals may be contracted from one or more farms and provide a significant contribution to the local agricultural economy.

4.0 Conclusion

ZPECs's 21 acre 4.9 + / - MW AC 530 Glendale Road Solar Development has been engineered to integrate agricultural uses, optimizing a balance of electricity generation and agricultural production through the incorporation of a managed grazing system for vegetative management, as well as lamb, pig, cattle and poultry crops. The Solar Site is designed to properly address integration of grazing and also incorporates pollinator habitats and a wildlife corridor into areas outside of the fence. Proper grazing management is facilitated through the creation of separate areas inside the 5 main arrays. Agricultural use of the land continues through the grazing of sheep and integration of pollinator friendly array / buffer seed mixes, and agrivoltaic strategies including production of pumpkins, honey and eggs. Farming revenue is created through the production and grazing of livestock and aforementioned additional crops. Agricultural integrations are designed from an engineering standpoint to improve the land agriculturally using managed grazing to facilitate restoration of the land and by creating a system layout that accommodates other types of agricultural use in the future beyond livestock production and grazing.

Author: Kristian Woodall
United Agrivoltaics North America LLC

5.0 References

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V. Hernandez-Santana, X. Zhou, M.J. Helmers, H. Asbjornsen, R. Kolka, M. Tomer (2013) Native prairie filter strips reduce runoff from hillslopes under annual row-crop systems in Iowa, USA

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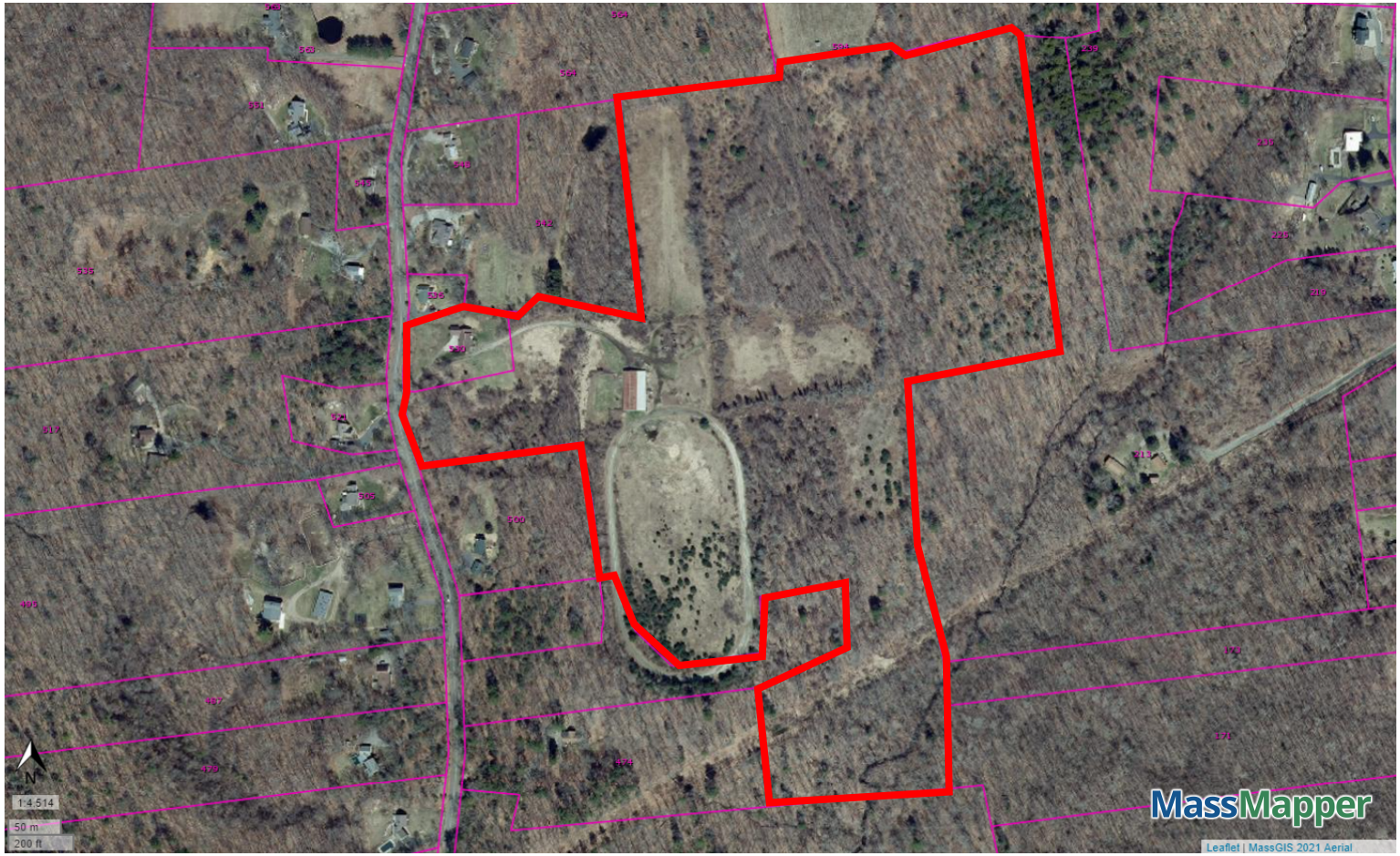
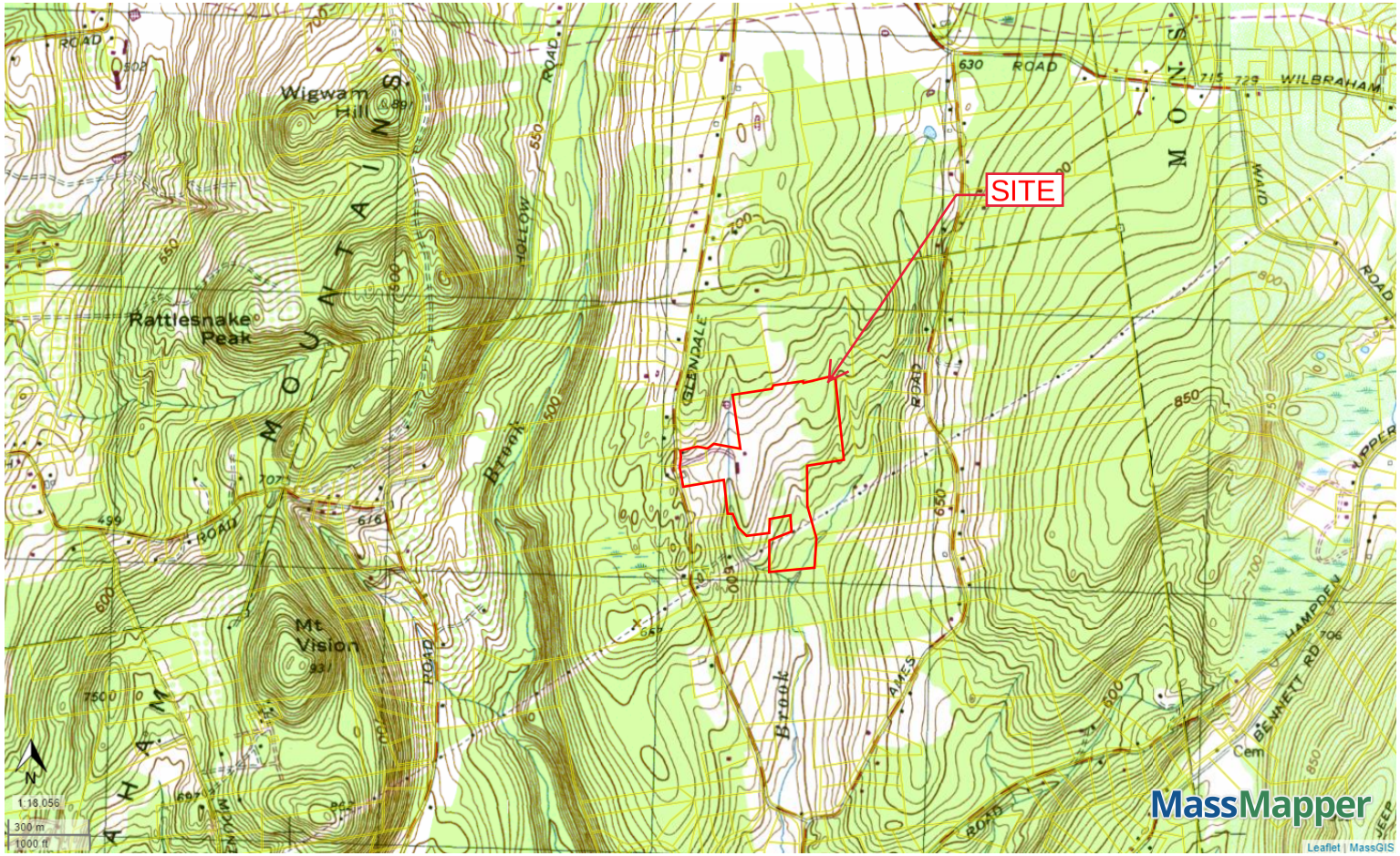
6. MASS GIS MAPPING

530 Glendale - Aerial Photo 2021



Property Tax Parcels

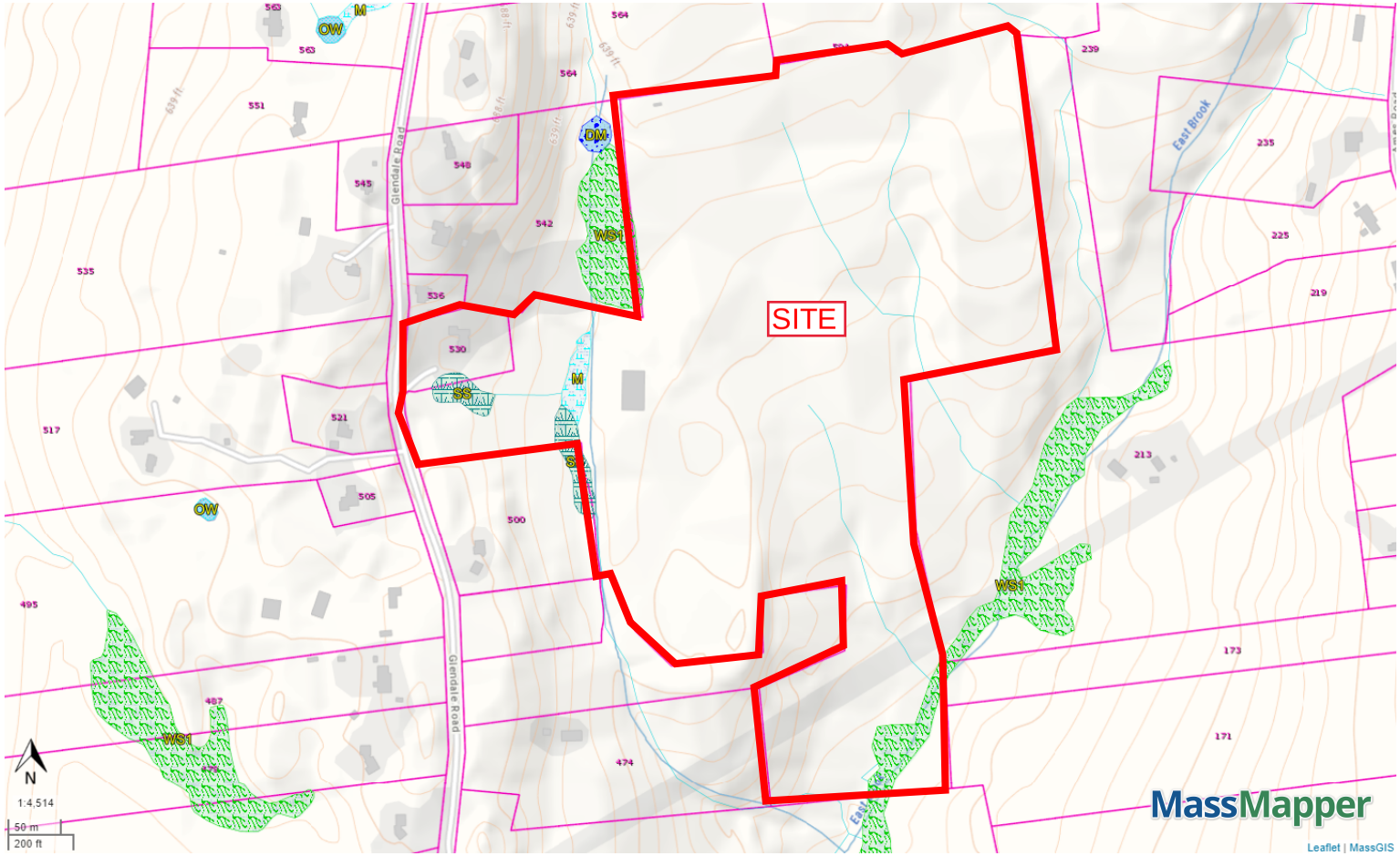
530 Glendale - USGS



Property Tax Parcels Boundaries

USGS Topographic Maps

530 Glendale - Wetlands



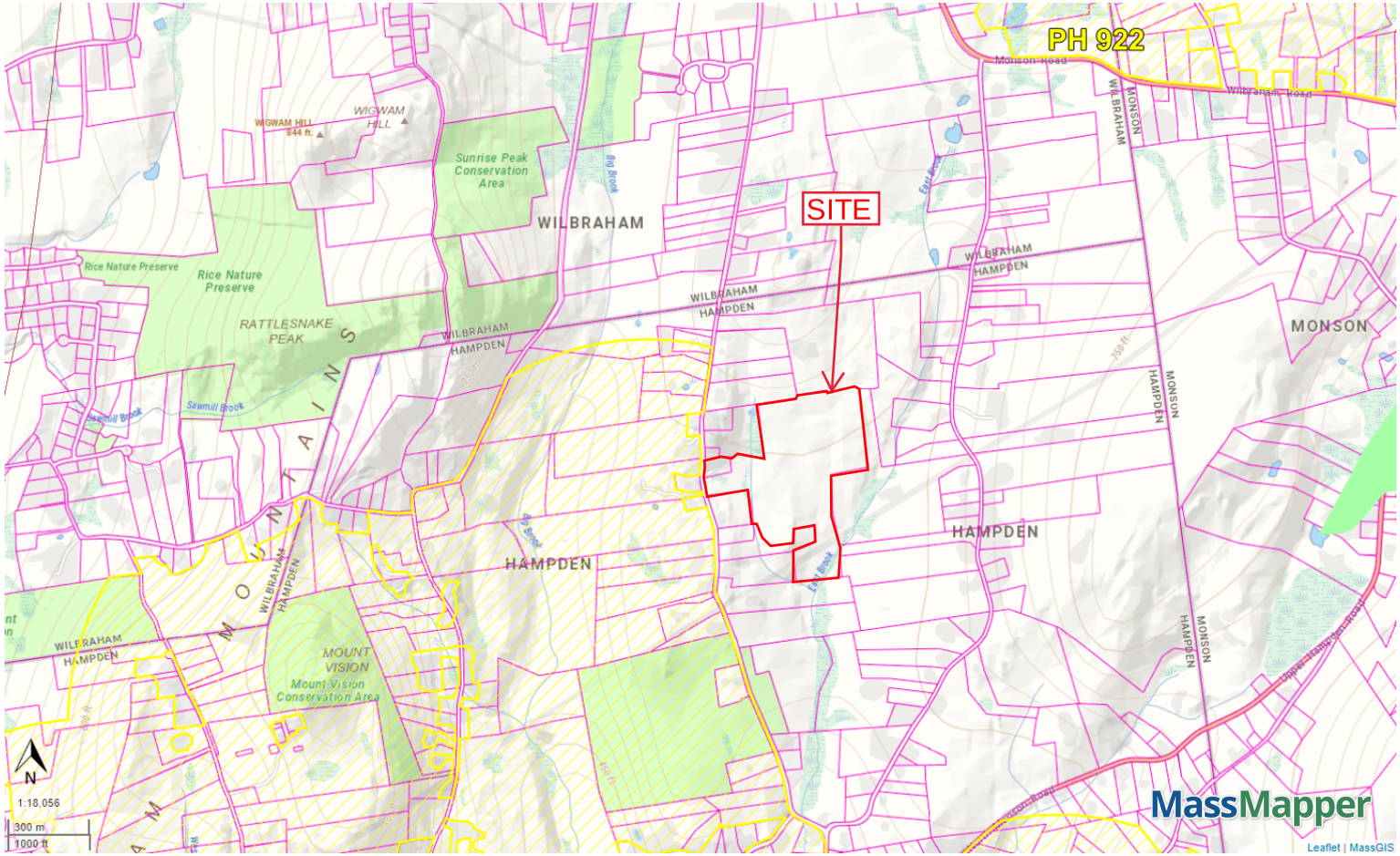
DEP Wetlands Labels

DEP Wetlands Hydrologic Connections

DEP Wetlands Detailed With Outlines

- Barrier Beach System
- Barrier Beach-Deep Marsh
- Barrier Beach-Wooded Swamp Mixed Trees
- Barrier Beach-Coastal Beach
- Barrier Beach-Coastal Dune
- Barrier Beach-Marsh
- Barrier Beach-Salt Marsh
- Barrier Beach-Shrub Swamp
- Barrier Beach-Wooded Swamp Coniferous
- Barrier Beach-Wooded Swamp Deciduous
- Bog
- Coastal Bank Bluff or Sea Cliff
- Coastal Beach
- Coastal Dune
- Cranberry Bog
- Deep Marsh
- Barrier Beach-Open Water
- Open Water
- Rocky Intertidal Shore
- Salt Marsh
- Shallow Marsh Meadow or Fen
- Shrub Swamp
- Tidal Flat
- Wooded Swamp Coniferous
- Wooded Swamp Deciduous
- Wooded Swamp Mixed Trees

530 Glendale Road - Regulated Area



Areas of Critical Environmental Concern ACECs

Outstanding Resource Waters
- ACEC
- Cape Cod National Seashore
- Protected Shoreline
- Public Water Supply Watershed
- Retired Public Water Supply
- Scenic/Protected River
- Wildlife Refuge

Zone IIs

Zone Is

IWPAs

Zone C

Zone B

Zone A

Aquifers by Yield
- High Yield
- Medium Yield

Non Potential Drinking Water Source Areas
- High Yield
- Medium Yield

NHESP Certified Vernal Pools

NHESP Priority Habitats of Rare Species

NHESP Natural Communities

NHESP Estimated Habitats of Rare Wildlife

NHESP Ecoregions

7. FEMA FIRM MAPPING

National Flood Hazard Layer FIRMette

FEMA

72°23'55"W 42°6'5"N

72°23'17"W 42°5'39"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 2/7/2022 at 4:36 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

National Flood Hazard Layer FIRMette

FEMA

72°23'53"W 42°5'50"N

72°23'15"W 42°5'23"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
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- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

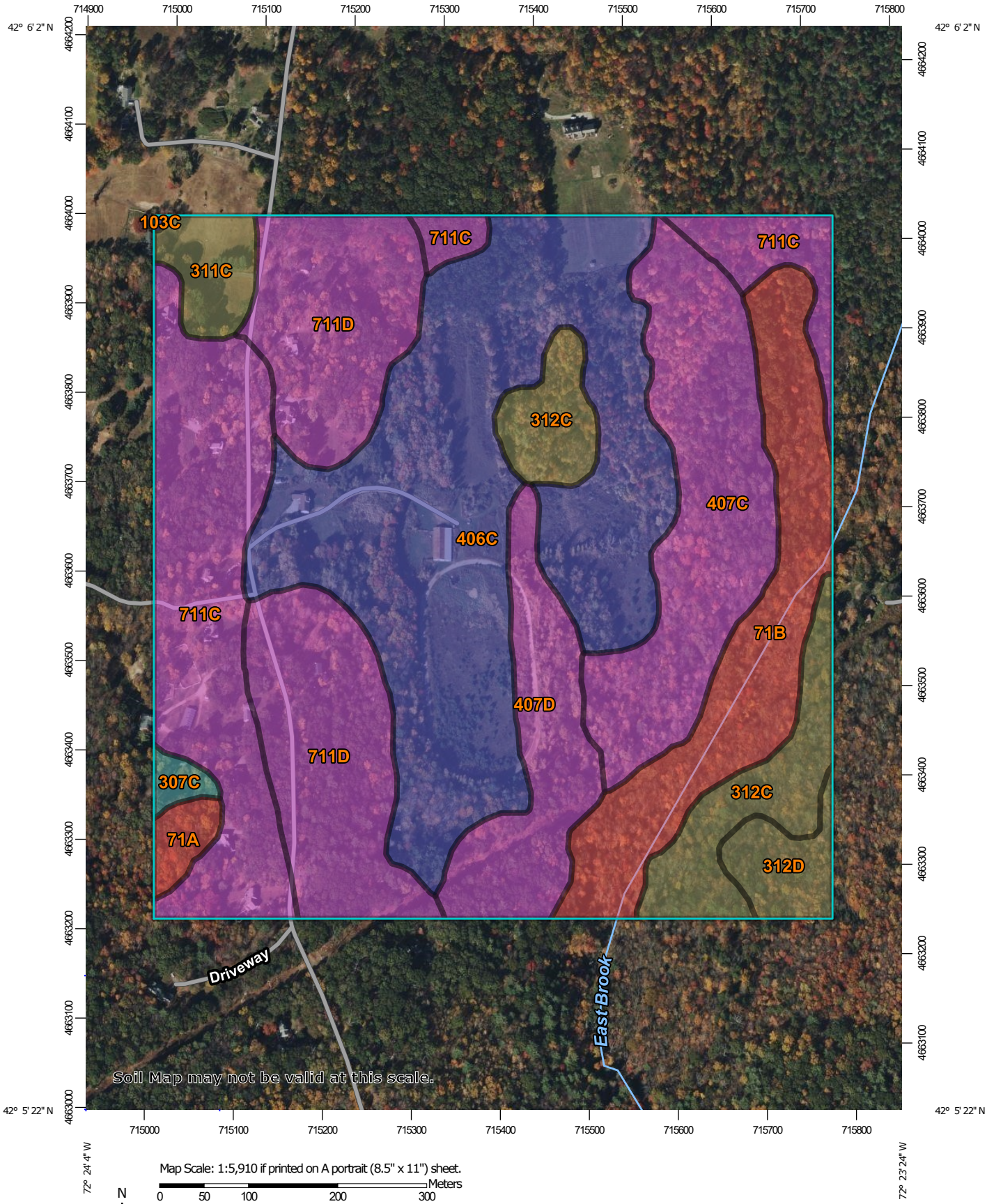
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 2/7/2022 at 4:37 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

8. ON-SITE SOILS INFORMATION

Hydrologic Soil Group—Hampden County, Massachusetts, Central Part
(530 Glendale Road)



Map Scale: 1:5,910 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

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

MAP LEGEND

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

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

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

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

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

Soil Survey Area: Hampden County, Massachusetts, Central Part
Survey Area Data: Version 16, Sep 9, 2022

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

Date(s) aerial images were photographed: Oct 15, 2020—Oct 31, 2020

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
71A	Ridgebury fine sandy loam, 0 to 3 percent slopes, extremely stony	D	1.4	1.0%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	D	15.0	10.1%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	B	0.1	0.0%
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony	C	0.8	0.6%
311C	Woodbridge fine sandy loam, 8 to 15 percent slopes, very stony	C/D	3.1	2.1%
312C	Woodbridge fine sandy loam, 8 to 15 percent slopes, extremely stony	C/D	9.8	6.6%
312D	Woodbridge fine sandy loam, 15 to 25 percent slopes, extremely stony	C/D	3.0	2.0%
406C	Charlton fine sandy loam, 8 to 15 percent slopes, very stony	B	42.6	28.6%
407C	Charlton fine sandy loam, 8 to 15 percent slopes, extremely stony	A	17.2	11.6%
407D	Charlton fine sandy loam, 15 to 25 percent slopes, extremely stony	A	9.5	6.4%
711C	Charlton-Rock outcrop-Hollis complex, 3 to 15 percent slopes	A	22.7	15.3%
711D	Charlton-Rock outcrop-Hollis complex, 15 to 25 percent slopes	A	23.5	15.8%
Totals for Area of Interest			**148.8**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

9. **SOLAR FACILITY INFORMATION**

    a. **INTERCONNECTION SERVICE AGREEMENT WITH NATIONAL GRID**

    b. **DRAFT DECOMMISSIONING PLAN**

    c. **DRAFT EMERGENCY ACTION PLAN**

    d. **SOLAR PANEL INFORMATION**

    e. **BATTERY ENERGY STORAGE SYSTEM (BES) INFORMATION**

        i. **BATTERY SYSTEM SPECIFICATION**

        ii. **INVERTER SPECIFICATION**

        iii. **FIRE FIGHTING GUITD OF FIRST RESPONDERS**

Exhibit G – Interconnection Service Agreement

1. **Parties**. This Interconnection Service Agreement ("Agreement"), dated as of 11/28/22 ("Effective Date") is entered into, by and between **Massachusetts Electric Company (doing business as National Grid)**, a Massachusetts corporation with a principal place of business at **40 Sylvan Rd, Waltham, MA 02451** (hereinafter referred to as the "Company"), and **Glendale Road Development, LLC**, a **Delaware** Limited Liability Company with a principal place of business at **898 Sport Hill Rd, Easton Ct, 06612** ("Interconnecting Customer"). (The Company and Interconnecting Customer are collectively referred to as the "Parties"). Terms used herein without definition shall have the meanings set forth in Section 1.2 of the Interconnection Tariff which is hereby incorporated by reference.

2. **Basic Understandings**. This Agreement provides for parallel operation of an Interconnecting Customer's Facility with the Company EPS to be installed and operated by the Interconnecting Customer at **530 Glendale Rd, Hampden, MA 01036**, **Account Number: 84784-02003** (Facility name, address, and end-use Customer account number, if applicable). A description of the Facility is located in Attachment 1. If the Interconnecting Customer is not the Customer, an Agreement between the Company and the Company's Retail Customer, attached as Exhibit H to the Interconnection Tariff, must be signed and included as an Attachment to this Agreement. If neither the Interconnecting Customer nor the Customer is the Landowner of the property where the Facility is sited, a Landowner Consent Agreement, attached as Exhibit I to the Interconnection Tariff, must be signed and included as an Attachment to this Agreement, unless the Company, in its sole discretion, waives this requirement.

   The Interconnecting Customer has the right to operate its Facility in parallel with the Company EPS immediately upon successful completion of the protective relays testing as witnessed by the Company and receipt of written notice from the Company that interconnection with the Company EPS is authorized ("Authorization Date").

3. **Term**. This Agreement shall become effective as of the Effective Date. The Agreement shall continue in full force and effect until terminated pursuant to Section 4 of this Agreement.

4. **Termination**.

   4.1. This Agreement may be terminated under the following conditions.

   4.1 a) The Parties agree in writing to terminate the Agreement.

   4.1 b) The Interconnecting Customer may terminate this agreement at any time by providing sixty (60) days written notice to Company.

   4.1 c) The Company may terminate this Agreement upon the occurrence of an Event of Default by the Interconnecting Customer as provided in Section 18 of this Agreement.

   4.1 d) The Company may terminate this Agreement if the Interconnecting Customer either: (1) fails to energize the Facility within 12 months of the Authorization Date; or, (2) permanently abandons the Facility. Failure to operate the Facility for any consecutive 12 month period after the Authorization Date shall constitute permanent abandonment unless otherwise agreed to in writing between the Parties.

   4.1 e) The Company, upon 30 days' notice, may terminate this Agreement if there are any changes in Department regulations or state law that have a material adverse effect on the Company's ability to perform its obligations under the terms of this Agreement.

   4.2. Survival of Obligations. The termination of this Agreement shall not relieve either Party of its liabilities and obligations, owed or continuing at the time of termination. Sections 5, 10, 12, 13, and 25 as it relates to disputes pending or for wrongful termination of this Agreement shall survive the termination of this Agreement.

   4.3. Related Agreements. Any agreement attached to and incorporated into this Agreement shall terminate concurrently with this Agreement unless the Parties have agreed otherwise in writing. If the Interconnection Service Agreement is signed prior to a Detailed Study (if applicable), the System Modifications construction schedule from the Detailed Study when finalized shall be deemed a part of the signed Interconnection Service Agreement.

5. **General Payment Terms**. The Interconnecting Customer shall be responsible for the System Modification costs and payment terms identified in Attachment 3 of this Agreement and any approved cost increases pursuant to the terms of the Interconnection Tariff. The Interconnecting Customer shall also be directly responsible to the Affected System Operator and/or Affected System Owner of any potentially Affected System for all costs of any additional studies required to evaluate the impact of the interconnection on the potentially Affected Systems and any resulting Affected System costs for its requirements, including, without limitation, modifications to the electric power system of the Affected System and operation and maintenance costs; provided, however, the Company may, in its sole discretion, elect to include the additional Affected System study and/or system modification costs known at the time of this Agreement in the Company's costs and payment terms identified in Attachment 3 of this Agreement,

and the Interconnecting Customer will pay such costs to the Company (and will be responsible for any and all actual costs thereof). Where the Company includes the Affected System costs in this Agreement, the costs will be collected by the Company and passed-through to the Affected System Operator(s). Interconnecting Customer shall not be required to pay any costs related to Company infrastructure upgrades or System Modifications upon execution of the Interconnection Service Agreement (or once the Interconnecting Customer receives the construction schedule). Interconnecting Customers shall have 60 Business Days from the date of the Interconnecting Customer's execution of an Interconnection Service Agreement to pay 25 percent of those costs; if an Interconnecting Customer pays such cost within the 60 Business Day Time Frame, the Interconnecting Customer shall have an additional 120 Business Days from the earlier of the date of first payment or 60 Business Days from the date of the Interconnecting Customer's execution of an Interconnection Service Agreement to pay the remainder of the costs. If the Company fails to sign this Interconnection Service Agreement within 15 Business Days after receipt of the first installment payment by the Interconnecting Customer, this Interconnection Service Agreement shall be deemed accepted by the Company on the 15th Business Day after receipt of the first installment payment. If the system modifications exceed $25,000, the Interconnecting Customer is eligible for a payment plan, including a payment and construction schedule with milestones for both parties, within the Time Frames for payment of such costs under the Interconnection Service Agreement in Section 3.6.2Any such payment plan shall be set forth in Attachment 3. The payment plan may include a payment schedule different than the 60 Business Day payment schedule requirements set forth in this paragraph above, but shall not exceed 180 Business Days.

Construction estimates are valid for 60 Business Days from when they are delivered to the Interconnecting Customer. If an Interconnecting Customer payment is not received within 60 Business Days of receiving the Interconnection Service Agreement in the Expedited Process, or the Impact Study in the Standard Process, the Company has the right to reassess construction costs and Time Frames. In the event that the Interconnecting Customer fails to pay the Company within the Time Frame required by this provision, the Interconnecting Customer's interconnection application and this Interconnection Service Agreement will be cancelled and its interconnection queue position will be lost. Further, any fees paid will not be refunded. The construction schedule will commence once the Interconnecting Customer's financial payment has been made in full or as otherwise provided in Attachment 3. The Company's obligation to the construction schedule (as it appears in either the Interconnection Service Agreement or the Detailed Study, if the Interconnecting Customer has opted to sign the Interconnection Service Agreement without a Detailed Study) begins on the next Business Day after the Company receives full payment for such construction or as otherwise provided in Attachment 3.

5.1. Cost or Fee Adjustment Procedures.

The Company will, in writing, advise the Interconnecting Customer in advance of any cost increase for work to be performed on the Company's EPS up to a total amount of increase of 10% only. Interconnecting Customers who elected to execute an Interconnection Services Agreement following the completion of the Impact Study but prior to the commencement of any required Detailed Study, pursuant to Section 3.4(g) of the Interconnection Tariff, shall be responsible for any System Modifications costs, ±25%, as identified by the Company in the Impact Study. An Interconnecting Customer that is part of a Group shall be responsible for the System Modification costs authorized in the Group Study Agreement. All costs that exceed the above caps will be borne solely by the Company. Any such changes to the Company's costs for the work shall be subject to the Interconnecting Customer's consent. The Interconnecting Customer shall, within thirty (30) Business Days of the Company's notice of increase, authorize such increase and make payment in the amount up to the above caps, or the Company will suspend the work and the corresponding agreement will terminate. The foregoing cost adjustment procedures shall only apply to the Company System Modification costs identified in Attachment 3. The Interconnecting Customer shall be responsible for the actual Affected System Operator and/or Affected System Owner costs, including operation and maintenance costs, and any additional Company costs necessitated as a result of the Affected System Operator and/or Affected System Owner requirements not specified as of the date of this Agreement, none of which shall be subject to any cost caps or limitations.

5.2. Final Accounting.

An Interconnecting Customer may request a final accounting report of any difference between (a) Interconnecting Customer's cost responsibility under this Agreement for the actual cost of the System Modifications, and (b) Interconnecting Customer's previous aggregate payments to the Company under the Interconnection Service Agreement for such System Modifications within 120 Business days after completion of the construction and installation of the System Modifications described in an attached exhibit to the Interconnection Service Agreement. Upon receipt of such a request from an Interconnecting Customer, the Company shall have 120 Business days to provide the requested final accounting report to the Interconnecting Customer. To the extent that Interconnecting Customer's cost responsibility in the Interconnection Service Agreement exceeds Interconnecting Customer's previous aggregate payments, the Company shall invoice Interconnecting Customer and

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Interconnecting Customer shall make payment to the Company within 45 Business Days. To the extent that Interconnecting Customer's previous aggregate payments exceed Interconnecting Customer's cost responsibility under this agreement, the Company shall refund to Interconnecting Customer an amount equal to the difference within forty five (45) Business Days of the provision of such final accounting report.

6. Operating Requirements.

6.1. General Operating Requirements.

Interconnecting Customer shall operate and maintain the Facility in accordance with the applicable manufacturer's recommended maintenance schedule, in compliance with all aspects of the Company's Interconnection Tariff. The Interconnecting Customer will continue to comply with all applicable laws and requirements after interconnection has occurred. In the event the Company has reason to believe that the Interconnecting Customer's installation may be the source of problems on the Company EPS, the Company has the right to install monitoring equipment at a mutually agreed upon location to determine the source of the problems. If the Facility is determined to be the source of the problems, the Company may require disconnection as outlined in Section 7.0 of this Interconnection Tariff. The cost of this testing will be borne by the Company unless the Company demonstrates that the problem or problems are caused by the Facility or if the test was performed at the request of the Interconnecting Customer.

6.2. No Adverse Effects; Non-interference.

Company shall notify Interconnecting Customer if there is evidence that the operation of the Facility could cause disruption or deterioration of service to other Customers served from the same Company EPS or if operation of the Facility could cause damage to Company EPS or Affected Systems. The deterioration of service could be, but is not limited to, harmonic injection in excess of IEEE Standard 1547-2003, as well as voltage fluctuations caused by large step changes in loading at the Facility. Each Party will notify the other of any emergency or hazardous condition or occurrence with its equipment or facilities which could affect safe operation of the other Party's equipment or facilities. Each Party shall use reasonable efforts to provide the other Party with advance notice of such conditions.

The Company will operate the EPS in such a manner so as to not unreasonably interfere with the operation of the Facility. The Interconnecting Customer will protect itself from normal disturbances propagating through the Company EPS, and such normal disturbances shall not constitute unreasonable interference unless the Company has deviated from Good Utility Practice. Examples of such disturbances could be, but are not limited to, single-phasing events, voltage sags from remote faults on the Company EPS, and outages on the Company EPS. If the Interconnecting Customer demonstrates that the Company EPS is adversely affecting the operation of the Facility and if the adverse effect is a result of a Company deviation from Good Utility Practice, the Company shall take appropriate action to eliminate the adverse effect.

6.3. Safe Operations and Maintenance.

Each Party shall operate, maintain, repair, and inspect, and shall be fully responsible for, the facility or facilities that it now or hereafter may own unless otherwise specified in this Agreement. Each Party shall be responsible for the maintenance, repair and condition of its respective lines and appurtenances on their respective side of the PCC. The Company and the Interconnecting Customer shall each provide equipment on its respective side of the PCC that adequately protects the Company's EPS, personnel, and other persons from damage and injury.

6.4. Access.

The Company shall have access to the disconnect switch of the Facility at all times.

6.4 a) Company and Interconnecting Customer Representatives.

Each Party shall provide and update as necessary the telephone number that can be used at all times to allow either Party to report an emergency.

6.4 b) Company Right to Access Company-Owned Facilities and Equipment.

If necessary for the purposes of the Interconnection Tariff and in the manner it describes, the Interconnecting Customer shall allow the Company access to the Company's equipment and the Company's facilities located on the Interconnecting Customer's or Customer's premises. To the extent that the Interconnecting Customer does not own all or any part of the property on which the Company is required to locate its equipment or facilities to serve the Interconnecting Customer under the Interconnection Tariff, the Interconnecting Customer shall secure and provide in favor of the Company the necessary rights to obtain access to such equipment or facilities, including easements if the circumstances so require. In addition to any rights and easements required by the Company in accordance with the

above provision, the Interconnecting Customer shall obtain an executed Landowner Consent Agreement (Exhibit I) from the Landowner, unless the Company, in its sole discretion, waives this requirement.

6.4 c) Right to Review Information.

The Company shall have the right to review and obtain copies of Interconnecting Customer's operations and maintenance records, logs, or other information such as, unit availability, maintenance outages, circuit breaker operation requiring manual reset, relay targets and unusual events pertaining to Interconnecting Customer's Facility or its interconnection with the Company EPS. This information will be treated as customer-confidential and only used for the purposes of meeting the requirements of Section 4.2.4 in the Interconnection Tariff.

7. Disconnection.

7.1. Temporary Disconnection.

7.1 a) Emergency Conditions. Company shall have the right to immediately and temporarily disconnect the Facility without prior notification in cases where, in the reasonable judgment of Company, continuance of such service to Interconnecting Customer is imminently likely to (i) endanger persons or damage property or (ii) cause a material adverse effect on the integrity or security of, or damage to, Company EPS or to the electric systems of others to which the Company EPS is directly connected. Company shall notify Interconnecting Customer promptly of the emergency condition. Interconnecting Customer shall notify Company promptly when it becomes aware of an emergency condition that affects the Facility that may reasonably be expected to affect the Company EPS. To the extent information is known, the notification shall describe the emergency condition, the extent of the damage or deficiency, or the expected effect on the operation of both Parties' facilities and operations, its anticipated duration and the necessary corrective action.

7.1 b) Routine Maintenance, Construction and Repair. Company shall have the right to disconnect the Facility from the Company EPS when necessary for routine maintenance, construction and repairs on the Company EPS. The Company shall provide the Interconnecting Customer with a minimum of seven calendar days planned outage notification consistent with the Company's planned outage notification protocols. If the Interconnecting Customer requests disconnection by the Company at the PCC, the Interconnecting Customer will provide a minimum of seven days' notice to the Company. Any additional notification requirements will be specified by mutual agreement in the Interconnection Service Agreement. Company shall make an effort to schedule such curtailment or temporary disconnection with Interconnecting Customer.

7.1 c) Forced Outages. During any forced outage, Company shall have the right to suspend interconnection service to effect immediate repairs on the Company EPS; provided, however, Company shall use reasonable efforts to provide the Interconnecting Customer with prior notice. Where circumstances do not permit such prior notice to Interconnecting Customer, Company may interrupt Interconnection Service and disconnect the Facility from the Company EPS without such notice.

7.1 d) Non-Emergency Adverse Operating Effects. The Company may disconnect the Facility if the Facility is having an adverse operating effect on the Company EPS or other Customers that is not an emergency, and the Interconnecting Customer fails to correct such adverse operating effect after written notice has been provided and a maximum of 45 days to correct such adverse operating effect has elapsed.

7.1 e) Modification of the Facility. Company shall notify Interconnecting Customer if there is evidence of a material modification to the Facility and shall have the right to immediately suspend interconnection service in cases where such material modification has been implemented without prior written authorization from the Company.

7.1 f) Re-connection. Any curtailment, reduction or disconnection shall continue only for so long as reasonably necessary. The Interconnecting Customer and the Company shall cooperate with each other to restore the Facility and the Company EPS, respectively, to their normal operating state as soon as reasonably practicable following the cessation or remedy of the event that led to the temporary disconnection.

7.2. Permanent Disconnection.

The Interconnecting Customer has the right to permanently disconnect at any time with 30 days written notice to the Company.

7.2 a) The Company may permanently disconnect the Facility upon termination of the Interconnection Service Agreement in accordance with the terms thereof.

8. Metering. Metering of the output from the Facility shall be conducted pursuant to the terms of the Interconnection Tariff.

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9. Assignment. Except as provided herein, Interconnecting Customer shall not voluntarily assign its rights or obligations, in whole or in part, under this Agreement without Company's written consent. Any assignment Interconnecting Customer purports to make without Company's written consent shall not be valid. Company shall not unreasonably withhold or delay its consent to Interconnecting Customer's assignment of this Agreement. Notwithstanding the above, Company's consent will not be required for any assignment made by Interconnecting Customer to an Affiliate or as collateral security in connection with a financing transaction. In all events, the Interconnecting Customer will not be relieved of its obligations under this Agreement unless, and until the assignee assumes in writing all obligations of this Agreement and notifies the Company of such assumption.

10. Confidentiality. Company shall maintain confidentiality of all Interconnecting Customer confidential and proprietary information except as otherwise required by applicable laws and regulations, the Interconnection Tariff, or as approved by the Interconnecting Customer in the Simplified or Expedited/Standard Application form or otherwise.

11. Insurance Requirements.

11.1. General Liability.

11.1 a) In connection with Interconnecting Customer's performance of its duties and obligations under the Interconnection Service Agreement, Interconnecting Customer shall maintain, during the term of the Agreement, general liability insurance with a combined single limit of not less than:

i) Five million dollars ($5,000,000) for each occurrence and in the aggregate if the Gross Nameplate Rating of Interconnecting Customer's Facility is greater than five (5) MW.

ii) Two million dollars ($2,000,000) for each occurrence and five million dollars ($5,000,000) in the aggregate if the Gross Nameplate Rating of Interconnecting Customer's Facility is greater than one (1) MW and less than or equal to five (5) MW;

iii) One million dollars ($1,000,000) for each occurrence and in the aggregate if the Gross Nameplate Rating of Interconnecting Customer's Facility is greater than one hundred (100) kW and less than or equal to one (1) MW;

iv) Five hundred thousand dollars ($500,000) for each occurrence and in the aggregate if the Gross Nameplate Rating of Interconnecting Customer's Facility is greater than ten (10) kW and less than or equal to one hundred (100) kW, except for as provide below in subsection 11.1(b).

11.1 b) Pursuant to 220 CMR §18.03(2), no insurance is required for Interconnecting Customers with facilities eligible for Class 1 Net Metering (facilities less than or equal to sixty (60) kW. However, the Company recommends that the Interconnecting Customer obtain adequate insurance to cover potential liabilities.

11.1 c) Any combination of General Liability and Umbrella/Excess Liability policy limits can be used to satisfy the limit requirements stated above.

11.1 d) The general liability insurance required to be purchased in this Section 11 may be purchased for the direct benefit of the Company and shall respond to third party claims asserted against the Company (hereinafter known as "Owners Protective Liability"). Should this option be chosen, the requirement of Section 11.2(a) will not apply but the Owners Protective Liability policy will be purchased for the direct benefit of the Company and the Company will be designated as the primary and "Named Insured" under the policy.

11.1 e) The insurance hereunder is intended to provide coverage for the Company solely with respect to claims made by third parties against the Company.

11.1 f) In the event the Commonwealth of Massachusetts, or any other governmental subdivision thereof subject to the claims limits of the Massachusetts Tort Claims Act, G.L. c. 258 (hereinafter referred to as the "Governmental Entity") is the Interconnecting Customer, any insurance maintained by the Governmental Entity shall contain an endorsement that strictly prohibits the applicable insurance company from interposing the claims limits of G.L. c. 258 as a defense in either the adjustment of any claim, or in the defense of any lawsuit directly asserted against the insurer by the Company. Nothing herein is intended to constitute a waiver or indication of an intent to waive the protections of G.L. c. 258 by the Governmental Entity.

11.1 g) Notwithstanding the requirements of section 11.1(a) through (f), insurance for certain Governmental Entity facilities may be provided as set forth in section 11.1(g)(i) and (ii) below. Nothing herein changes the provision in subsection 11.1(a)(iv) that exempts Class I Net Metering facilities (less than or equal to 60 kW) from the requirement to obtain

insurance. In addition, nothing shall prevent the Governmental Entity from obtaining insurance consistent with the provisions of subsection 11.1(a) through (f), if it is able and chooses to do so.

i) For solar photovoltaic (PV) facilities with a Gross Nameplate Rating in excess of 60 kW up to 500 kW, the Governmental Entity is not required to obtain liability insurance. Any liability costs borne by the Company associated with a third-party claim for damages in excess of the claims limit of the Massachusetts Tort Claims Act, M.G.L. c. 258, and market-based premium-related costs, if any, borne by the Company associated with insurance for such third-party claims shall be recovered annually on a reconciling basis in Company rates in a manner that shall be reviewed and approved by the Department.

ii) For (a) PV facilities with a Gross Nameplate Rating in excess of 500 kW up to 5 MW, (b) wind facilities with a Gross Nameplate Rating in excess of 60 kW up to 5 MW, and (c) highly efficient combined heat and power facilities with a Gross Nameplate Rating of in excess of 60 kW up to 5 MW, the Governmental Entity is not required to obtain liability insurance, subject to the requirements of the following paragraph.

The Company shall either self-insure for any risk associated with possible third-party claims for damages in excess of the Massachusetts Tort Claims Act limit, or obtain liability insurance for such third-party claims, and the Company is authorized to charge and collect from the Governmental Entity its pro-rata allocable share of the cost of so doing, plus all reasonable administrative costs. The coverage and cost may vary with the size and type of facility, and may change (increase or decrease) over time, based on insurance market conditions, and such cost shall be added to, and paid for as part of the Governmental Entity's electric bill.

11.2. Insurer Requirements and Endorsements.

All required insurance shall be carried by reputable insurers qualified to underwrite insurance in MA having a Best Rating of at least "A-". In addition, all insurance shall, (a) include Company as an additional insured; (b) contain a severability of interest clause or cross-liability clause; (c) provide that Company shall not incur liability to the insurance carrier for payment of premium for such insurance; and (d) provide for thirty (30) calendar days' written notice to Company prior to cancellation, termination, or material change of such –insurance; provided that to the extent the Interconnecting Customer is satisfying the requirements of subpart (d) of this paragraph by means of a presently existing insurance policy, the Interconnecting Customer shall only be required to make good faith efforts to satisfy that requirement and will assume the responsibility for notifying the Company as required above.

If the requirement of clause (a) in the paragraph above prevents Interconnecting Customer from obtaining the insurance required without added cost or due to written refusal by the insurance carrier, then upon Interconnecting Customer's written Notice to Company, the requirements of clause (a) shall be waived.

11.3. Evidence of Insurance.

Evidence of the insurance required shall state that coverage provided is primary and is not in excess to or contributing with any insurance or self-insurance maintained by Interconnecting Customer.

The Interconnecting Customer is responsible for providing the Company with evidence of insurance in compliance with the Interconnection Tariff on an annual basis.

Prior to the Company commencing work on System Modifications, and annually thereafter, the Interconnecting Customer shall have its insurer furnish to the Company certificates of insurance evidencing the insurance coverage required above. The Interconnecting Customer shall notify and send to the Company a certificate of insurance for any policy written on a "claims-made" basis. The Interconnecting Customer will maintain extended reporting coverage for three years on all policies written on a "claims-made" basis.

In the event that an Owners Protective Liability policy is provided, the original policy shall be provided to the Company.

11.4. Self Insurance.

If Interconnecting Customer has a self-insurance program established in accordance with commercially acceptable risk management practices. Interconnecting Customer may comply with the following in lieu of the above requirements as reasonably approved by the Company:

- Interconnecting Customer shall provide to Company, at least thirty (30) calendar days prior to the Date of Initial Operation, evidence of such program to self-insure to a level of coverage equivalent to that required.

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- If Interconnecting Customer ceases to self-insure to the standards required hereunder, or if Interconnecting Customer is unable to provide continuing evidence of Interconnecting Customer's financial ability to self-insure, Interconnecting Customer agrees to promptly obtain the coverage required under Section 11.1.

This section shall not allow any Governmental Entity to self-insure where the existence of a limitation on damages payable by a Government Entity imposed by the Massachusetts Tort Claims Act, G.L. c. 258, or similar law, could effectively limit recovery (by virtue of a cap on recovery) to an amount lower than that required in Section 11.1(a).

11.5. All insurance certificates, statements of self-insurance, endorsements, cancellations, terminations, alterations, and material changes of such insurance shall be issued and submitted to the following:

National Grid
Attention: **Risk Management**
300 Erie Blvd West
Syracuse, NY 13202

12. Indemnification. Except as the Commonwealth is precluded from pledging credit by Section 1 of Article 62 of the Amendments to the Constitution of the Commonwealth of Massachusetts, and except as the Commonwealth's cities and towns are precluded by Section 7 of Article 2 of the Amendments to the Massachusetts Constitution from pledging their credit without prior legislative authority, Interconnecting Customer and Company shall each indemnify, defend and hold the other, its directors, officers, employees and agents (including, but not limited to, Affiliates and contractors and their employees), harmless from and against all liabilities, damages, losses, penalties, claims, demands, suits and proceedings of any nature whatsoever for personal injury (including death) or property damages to unaffiliated third parties that arise out of or are in any manner connected with the performance of this Agreement by that Party except to the extent that such injury or damages to unaffiliated third parties may be attributable to the negligence or willful misconduct of the Party seeking indemnification.

13. Limitation of Liability. Each Party's liability to the other Party for any loss, cost, claim, injury, liability, or expense, including court costs and reasonable attorney's fees, relating to or arising from any act or omission in its performance of this Agreement, shall be limited to the amount of direct damage or liability actually incurred. In no event shall either Party be liable to the other Party for any indirect, incidental, special, consequential, or punitive damages of any kind whatsoever. The Interconnecting Customer further understands and acknowledges that, consistent with Section 3.4 of the Interconnection Tariff, the Company will coordinate with the Affected System Operator and/or Affected System Owner to facilitate the interconnection of the Facility to the Company's EPS; however the Company does not represent the Affected System Operator and/or Affected System Owner and is not responsible for any action or inaction on the part of the Affected System Operator and/or Affected System Owner. The Affected System Operator and/or Affected System Owner are not parties to this Agreement even though the Company may incorporate some Affected System Operator and/or Affected System Owner requirements herein. The Company disclaims any and all responsibility and liability in connection with any ASO Studies and Affected System modifications and the Interconnecting Customer hereby waives recourse against and releases the Company, its directors, officers, employees and agents from any and all losses, penalties, claims, demands, fees, damages or other liabilities arising from or attributable to, either directly or indirectly, such ASO Studies and/or Affected System modifications.

14. Amendments and Modifications. No amendment or modification of this Agreement shall be binding unless in writing and duly executed by both Parties.

15. Permits and Approvals. Interconnecting Customer shall obtain all environmental and other permits lawfully required by governmental authorities for the construction and operation of the Facility. Prior to the construction of System Modifications the Interconnecting Customer will notify the Company that it has initiated the permitting process. Prior to the commercial operation of the Facility the Interconnecting Customer will notify the Company that it has obtained all permits necessary. Upon request the Interconnecting Customer shall provide copies of one or more of the necessary permits to the Company.

16. Force Majeure. For purposes of this Agreement, "Force Majeure Event" means any event:

a) that is beyond the reasonable control of the affected Party; and

b) that the affected Party is unable to prevent or provide against by exercising commercially reasonable efforts, including the following events or circumstances, but only to the extent they satisfy the preceding requirements: acts of war or terrorism, public disorder, insurrection, or rebellion; floods, hurricanes, earthquakes, lightning, storms, and other natural calamities; explosions or fire; strikes, work stoppages, or labor disputes; embargoes; and sabotage. If a Force Majeure Event prevents a Party from fulfilling any obligations under this Agreement, such Party will promptly notify the other Party in writing, and will keep the other Party informed on a continuing basis of the scope and duration of the Force Majeure Event. The affected Party will specify in reasonable detail the circumstances of the Force Majeure

Event, its expected duration, and the steps that the affected Party is taking to mitigate the effects of the event on its performance. The affected Party will be entitled to suspend or modify its performance of obligations under this Agreement, other than the obligation to make payments then due or becoming due under this Agreement, but only to the extent that the effect of the Force Majeure Event cannot be mitigated by the use of reasonable efforts. The affected Party will use reasonable efforts to resume its performance as soon as possible. In no event will the unavailability or inability to obtain funds constitute a Force Majeure Event.

17. Notices.

17.1. Any written notice, demand, or request required or authorized in connection with this Agreement ("Notice") shall be deemed properly given on the date actually delivered in person or five (5) Business Days after being sent by certified mail, e-mail or fax with confirmation of receipt to the person specified below:

If to Company:
National Grid
Attn: **Distributed Generation – Customer Energy Integration**
40 Sylvan Rd
Waltham, MA 02451
E-mail: **Distributed.Generation@nationalgrid.com**
Fax: **N/A**

If to Interconnecting Customer:
Glendale Road Development, LLC
Attn: **Rory Walker**
898 Sport Hill Rd,
Easton, CT 06612
E-mail: **rwalker@zpenergyconsultants.com**
Phone: **203-731-7506**
Fax: **N/A**

17.2. A Party may change its address for Notices at any time by providing the other Party Notice of the change in accordance with Section 17.1.

17.3. The Parties may also designate operating representatives to conduct the daily communications, which may be necessary or convenient for the administration of this Agreement. Such designations, including names, addresses, email addresses, and phone numbers may be communicated or revised by one Party's Notice to the other.

18. Default and Remedies.

18.1. Defaults. Any one of the following shall constitute "An Event of Default."

i) Interconnecting Customer fails to pay amounts due for System Modifications in accordance with the Time Frames set out in Section 5 of this Agreement and Section 3.6.2 of the Tariff;

ii) One of the Parties shall fail to pay any undisputed bill for charges incurred under this Agreement or other amounts which one Party owes the other Party as and when due, except as noted in Section 18.1(i), above and such failure shall continue for a period of thirty (30) days after written notice of nonpayment from the affected Party to the defaulting Party; or

iii) One of the Parties fails to comply with any other provision of this Agreement or breaches any representation or warranty in any material respect and fails to cure or remedy that default or breach within sixty (60) days after notice and written demand by the affected Party to cure the same or such longer period reasonably required to cure (not to exceed an additional 90 days unless otherwise mutually agreed upon), provided that the defaulting Party diligently continues to cure until such failure is fully cured.

18.2. Remedies. Upon the occurrence of an Event of Default, the affected Party may at its option, in addition to any remedies available under any other provision herein, do any, or any combination, as appropriate, of the following:

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a) Continue to perform and enforce this Agreement;

b) Recover damages from the defaulting Party except as limited by this Agreement;

c) By written notice to the defaulting Party terminate this Agreement;

d) Pursue any other remedies it may have under this Agreement or under applicable law or in equity.

19. Entire Agreement. This Agreement, including any attachments or appendices, is entered into pursuant to the Interconnection Tariff. Together the Agreement and the Interconnection Tariff represent the entire understanding between the Parties, their agents, and employees as to the subject matter of this Agreement. Each Party also represents that in entering into this Agreement, it has not relied on any promise, inducement, representation, warranty, agreement or other statement not set forth in this Agreement or in the Company's Interconnection Tariff.

20. Supercedence. In the event of a conflict between this Agreement, the Interconnection Tariff, or the terms of any other tariff, Exhibit or Attachment incorporated by reference, the terms of the Interconnection Tariff, as the same may be amended from time to time, shall control. In the event that the Company files a revised tariff related to interconnection for Department approval after the effective date of this Agreement, the Company shall, not later than the date of such filing, notify the signatories of this Agreement and provide them a copy of said filing.

21. Governing Law. This Agreement shall be interpreted, governed, and construed under the laws of the Commonwealth of Massachusetts without giving effect to choice of law provisions that might apply to the law of a different jurisdiction.

22. Non-waiver. None of the provisions of this Agreement shall be considered waived by a Party unless such waiver is given in writing. The failure of a Party to insist in any one or more instances upon strict performance of any of the provisions of this Agreement or to take advantage of any of its rights hereunder shall not be construed as a waiver of any such provisions or the relinquishment of any such rights for the future, but the same shall continue and remain in full force and effect.

23. Counterparts. This Agreement may be signed in counterparts.

24. No Third Party Beneficiaries. This Agreement is made solely for the benefit of the Parties hereto. Nothing in the Agreement shall be construed to create any rights in or duty to, or standard of care with respect to, or any liability to, any person not a party to this Agreement.

25. Dispute Resolution. Unless otherwise agreed by the Parties, all disputes arising under this Agreement shall be resolved pursuant to the Dispute Resolution Process set forth in the Interconnection Tariff.

26. Severability. If any clause, provision, or section of this Agreement is ruled invalid by any court of competent jurisdiction, the invalidity of such clause, provision, or section, shall not affect any of the remaining provisions herein.

27. Signatures.

IN WITNESS WHEREOF, the Parties hereto have caused two (2) originals of this Agreement to be executed under seal by their duly authorized representatives.

Interconnecting Customer:		Company:	
Glendale Road Development, LLC		**Massachusetts Electric Company, d/b/a National Grid**	
By:	Rory Walker	By:	Eric Munzert
Name:	Rory Walker	Name:	Eric Munzert
Title:	Manager	Title:	Sr Consultant
Date:	November 23, 2022	Date:	11/28/22

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Attachment 1: Description of Facilities, including demarcation of Point of Common Coupling

Reference to Interconnecting Customer's Case Number 354101. Interconnecting Customer has proposed a Facility located at 530 Glendale Rd, Hampden, MA 01036, consisting of a **4,992** kW / **4,992** kVA AC photovoltaic system with DC coupled energy storage system ("ESS"). The Facility export shall not exceed **4,992** kW / **4,992** kVA AC. The proposed Facility is an Independent Power Producer. The Facility will interconnect to the Company EPS via the 13.2 kV distribution feeder 507L1, pole 73 on Glendale Rd out of the Wilbraham Substation. It is the Interconnecting Customer's responsibility to ensure that its proposed Facility design and configuration (including, without limitation, metering) meets all Company, state, federal, and local requirements, including without limitation, with respect to any programs or services in which the Interconnecting Customer (or Customer) intends to participate.

a. **Description of Interconnecting Customer's proposed design/configuration:**
   - Forty Eight (48) customer-owned [Sungrow SG125HV] inverters [3 Phase, 600 VAC, 125 kW/kVA, factory limited to 104 kW/kVA] with a max total output of 4,992 kW/kVA for generation
   - Twelve (12) customer-owned 250 kW DC Coupled ESS for a total of 3,000 kW DC and 6,576 kWh.
   - Two (2) customer-owned 2,500 kVA, 13.2 kV wye ground - 600 V delta, interface transformer [Z=5.75%, X/R=7.1] with a 20 Ω neutral grounding reactor.
   - One (1) customer-owned recloser with [SEL-651R] relay assembly
   - One (1) customer-owned 15 kV, 600A rated gang operated disconnect switch, lockable and visible when open, accessible to Company personnel 24/7

   It is the Interconnecting Customer's responsibility to, at its sole cost, install and maintain all customer-owned cable, conduit, equipment, and related appurtenances for the Facility from the Interconnecting Customer's side of the PCC.

b. **Metering**: Interconnecting Customer is proposing to install the Facility behind the Company's new 13.2 kV pole-mounted primary revenue meter. Please refer to Electric Service Bulletin ("ESB") 750 Section 7.0 and ESB 756 Section 3.0 and Appendix C for service installation and meter installation detail.

c. **Point of Common Coupling (PCC)**: The PCC will be designated as the customer's side of the Company's pole-mounted primary meter at pole 73-3 on Glendale Road. The Interconnecting Customer must install its facilities up to the Company revenue meter and must provide sufficient conductor to allow the Company to make final connections at the meter pole. The Company will connect the Interconnecting Customer's conductors to the Company meter.

The Company's design personnel will specify the installation details and location of Company owned equipment and facilities to be located on or about the property where the Facility is sited. The Interconnecting Customer shall, at its sole cost, provide the Company with 24/7 unencumbered direct access to the Company's equipment and facilities along an accessible plowed driveway or road (maintained free and clear of all snow, vegetation, and any other obstructions) satisfactory to the Company in its sole discretion. Unless otherwise approved or required by the Company in its sole discretion, the Company owned equipment and facilities shall not be placed behind the Interconnecting Customer's locked gate. If the Company approves or requires the location of its equipment or facilities behind a locked gate, the gate must be double locking with both the Company's and Interconnecting Customer's locks employed.

The Interconnecting Customer shall submit surveyed plans and detailed drawings of any planned Facility construction (and related work) within any Company (or Company's transmission affiliate) right of way (R.O.W.), showing elevation grades of all phases of construction within the R.O.W, to the Company's R.O.W. Real-Estate group and Engineering and Construction group (if applicable) for review and comment ("R.O.W. Review"). The Interconnecting Customer is not authorized to begin any work within any R.O.W unless and until such plans are approved in the Company's sole discretion. There may be delays, additional costs, and other requirements associated with the R.O.W. Review including, without limitation, required oversight of construction in, or adjacent to, the R.O.W., and modifications to Company owned facilities as a result of the Interconnecting Customer's proposed Facility construction (and related work). These costs and requirements are in addition to, and not included in the scope of, this Agreement.

Attachment 2: Description of System Modifications

The Company's estimated scope of System Modifications required for the interconnection of Facility are as follows:

On or near Facility site:

- Install approximately 200 circuit feet of 1/0 OH line extension

Exhibit G – Interconnection Service Agreement

- Install one (1) pole-mounted recloser.
- Install one (1) pole-mounted gang operated load break.
- Install one (1) pole-mounted wireless primary meter and metering assembly.
- Install three (3) poles

On the Company EPS:

- Re-build 1.2 miles of 1-1/0 AL with 3-477 AL Spacer OH conductor from P71 Monson Rd to P73 Glendale Rd.
- Remove 1-65K fuse on P71 Monson Rd.
- Re-conductor 4,000 circuit feet of 3-1/0 AL to 3-477 AL Spacer from P48 to P71 Monson Rd. and 425 circuit feet from P106 South Main St to P3 Monson Rd.
- Relocate 1-167 kVA ratio bank and 1-25K fuse from P110 Glendale Rd. past the Point of Interconnection.

It will be the responsibility of the Interconnecting Customer, at its sole cost and expense, to secure and obtain in favor of itself and the Company, the following: any and all rights, consents, permits, approvals, and easements (free and clear from any encumbrances), as are required by the Company for the Company's System Modifications on any Interconnecting Customer-owned property or any third-party owned property (collectively "Third Party Rights and Approvals"). The Interconnecting Customer shall use the Company's standard form when obtaining all Third Party Rights and Approvals, as applicable. The Company will seek to obtain, at the Interconnecting Customer's sole cost and expense, any and all rights, consents, permits, approvals, and easements for the System Modifications on any Company owned property or within any public roadway as the Company determines necessary in its sole discretion ("Other Rights and Approvals"; together with Third Party Rights and Approvals referred to as "System Modification Required Approvals"). The Interconnecting Customer will fully cooperate with the Company in obtaining the Other Rights and Approvals. The Company shall not be required to accept any System Modification Required Approvals that are not in form or on terms satisfactory to the Company in its sole discretion, or that impose additional liabilities or costs on the Company. The Company shall not be required to appeal or challenge the denial of any System Modification Required Approvals or the imposition of any unsatisfactory term or condition. The Company shall not be obligated to commence the construction of the System Modifications unless and until it has received all System Modification Required Approvals in accordance with this provision, Sections 6.4 and 15 of this Agreement, and the Company's applicable tariffs, including, without limitation, the Interconnection Tariff and the Company's Terms and Conditions for Distribution Service, as amended from time to time.

Attachment 3: Costs of System Modifications and Payment Terms

At present, the estimated costs for the System Modifications detailed in Attachment 2 for this Facility ("Facility System Modification Costs") are **$1,548,245** which is itemized as:

- Cost of Facility specific system modifications on or near the Facility site as mentioned in Attachment 2 above is **$187,806** (includes capital, removal, and O&M costs).
- Cost of Facility specific system modifications on the Company EPS as mentioned in Attachment 2 above is $**1,169,491** (includes capital, removal, and O&M costs).
- Cost of witness testing and EMS integration: **$7,500**.
- Tax gross-up adder: **$183,448** (*A 2022 tax rate of 16.47% is expected to apply to contributions in aid of construction ("CIAC") payments received by Massachusetts Electric Company from the Interconnecting Customer. The calculation of the tax gross-up adder is included in this cost estimate on the basis of tax guidance published by the Internal Revenue Service, but tax rates and decisions are ultimately subject to IRS discretion. By signing this Agreement, the Interconnecting Customer understands and agrees that the tax has been estimated for convenience and that the Interconnecting Customer remains liable for all tax due on CIAC payments, payable upon the Company's demand.*)

The Facility System Modification Costs were developed by the Company with a general understanding of the project and based upon information provided by the Interconnecting Customer in writing and/or collected in the field. The cost estimates were prepared using historical cost data, data from similar projects, and other assumptions, and while they are presumed valid for 60 business days from the date of the Impact Study, the Company reserves the right to adjust the estimated costs as authorized under this Agreement, the Interconnection Tariff, or by law and to require the Interconnecting Customer to pay any such additional costs.

The estimated System Modification costs above, without limitation, do not include any costs for Third Party Rights and Approvals (as defined in Attachment 2) or any other third-party costs including, but not limited to, poles set or removed by other companies, telecommunications, costs incurred by municipalities, and the installation, transfer, removal, or replacement of pole mounted equipment owned by other entities. These costs, to the extent applicable, are in addition to the estimated System Modification costs

above and must be paid directly by the Interconnecting Customer to the appropriate third party.

This Agreement does not cover any charges that may be incurred under the Company's electric service tariffs, and any other regulations and laws governing the provision of electric services.

Payment Terms: The Interconnecting Customer shall pay the Facility System Modification Costs in accordance with the schedule below. Nothing herein shall prevent the Interconnecting Customer from making any payment, or the full payment, due to the Company earlier than the dates provided. Funds received may be immediately expended or committed as determined by the Company in its sole discretion.

- The first payment of 25% of the estimated cost (**$387,061**) is due within 60 business days from the Interconnecting Customer's execution of this Agreement ("Initial 60 Day Due Date"). Upon receipt of the first payment, the Company will initiate the detailed design.
- The final payment for the remaining balance (**$1,161,184**) is due no later than 120 business days from when the first payment is made or the Initial 60 Day Due Date, whichever is earlier.
- The Company is not required to begin construction until all payments are processed.

Attachment 4: Special Operating Requirements

1. Interconnecting Customer shall adhere to the Interconnection Tariff and the Company's Electric System Bulletins, standards and policies, as the same may be amended from time to time, including, without limitation, the following standards which are incorporated in their entirety by reference:

   a. Electric System Bulletin 750 "Specifications for Electrical Installations", available at: http://www.nationalgridus.com/non_html/shared_constr_esb750.pdf

   b. Electric System Bulletin 756 "Requirements for Parallel Generation Connected to a National Grid-Owned EPS", ESB756, available at: www.nationalgridus.com/non_html/shared_constr_esb756.pdf

2. Interconnecting Customer shall adhere to the requirements identified in the Impact Study dated 9/6/22. If any study requirements are in direct conflict with a requirement set forth in this Agreement, this Agreement shall control provided, however, that the Interconnecting Customer shall not be relieved of its obligations under any requirement until it has notified the Company of such conflict and the Company has made a written determination that a conflict exists (a more stringent requirement shall not constitute a conflict unless otherwise determined by the Company).

3. The Interconnecting Customer is not authorized to make any changes or modifications to the Facility, and must provide prior written notice to the Company of any proposed changes which will be subject to the Company's review and processed in accordance with the Interconnection Tariff.

4. Interconnecting Customer may not be allowed to operate with the local EPS in an abnormal state. The Company may disconnect the Facility to maintain the safe and reliable operation of the EPS including, without limitation, when abnormal system conditions develop, circuit reconfiguration takes place on the EPS, and/or as otherwise permitted by tariff or law.

5. Interconnecting Customer may only generate onto the feeder referenced in Attachment 1, unless otherwise required by the Company in its sole discretion. For systems with redundant relaying, National Grid's Regional Control Center must first give permission, in its sole discretion, to the Interconnecting Customer to allow the operation of their system.

6. Per section 6.4 of this Agreement, Interconnecting Customer shall provide an external AC UTILITY DISCONNECT, accessible at all times by Company personnel. Interconnecting Customer's AC UTILITY DISCONNECT switch shall be labeled "AC UTILITY DISCONNECT". If the AC UTILITY DISCONNECT switch is not adjacent to the meter and/or PCC, Interconnecting Customer shall provide a permanent plaque locating the switch.

Exhibit G – Interconnection Service Agreement

7. The AC UTILITY DISCONNECT shall be gang operated, have a visible break when open, be rated to interrupt the maximum generator output and be capable of being locked open, tagged and grounded on the Company side by Company personnel. The visible break requirement can be met by opening the enclosure to observe the contact separation. The Company shall have the right to open this disconnect switch in accordance with the Interconnection Tariff. The switch has to be installed at the DR output on the current carrying lines. Shunt mechanisms are not permitted.

8. All customer-owned meters shall be labeled "CUSTOMER-OWNED METER"

9. All plaques as described in NEC 705.10, 705.12 (7), 690.56, 692.4 and 705.70 shall be installed, as applicable.

10. The Company may require the Interconnecting Customer to include additional information on PLACARDS/LABELLING identifying other generation facilities located on the same structure and/or property.

11. Interconnecting Customer shall be responsible for providing necessary easements, environmental and/or municipal permits/approvals, as requested by Company.

12. For systems greater than 60kW, Interconnecting Customer shall provide a means of communication to the Company's revenue meter that shall be maintained in good working order at all times. This may be accomplished with an analog/POTS (Plain Old Telephone Service) phone line (capable of direct inward dial without human intervention or interference from other devices such as fax machines, etc.) or, in locations with suitable wireless service, a wireless meter. Feasibility of wireless service must be demonstrated by Interconnecting Customer, to the satisfaction of the Company. Additional charges may be applicable under the Company's electric service tariffs related to the communications and data requirements.

13. Interconnecting Customer shall provide Compliance Documentation as requested by, and to the satisfaction of, the Company.

14. A Witness Test will be required at the Company's sole discretion and in accordance with the Interconnection Tariff. If a Witness Test is required the Interconnecting Customer shall develop, in form and substance satisfactory to the Company, a functional test procedure, including but not limited to settings for relaying scheme. Witness Test plan must be approved by Company prior to scheduling Company personnel for witness test.

15. Interconnecting Customer's protection scheme submitted for review must meet the Company's specific protection requirements. Interconnecting Customer shall submit a PE stamped one-line, including relay settings, that meets the requirements specified within this document to the Company for review and approval before a Witness Test plan can be reviewed. Please refer to the completion documentation checklist available on the Company's website for additional required documentation.

16. The Facility shall not contribute to greater than a 3.0% change in voltage on the Company EPS under any conditions.

17. For photovoltaic (PV) and ESS inverter(s), in order to minimize the impact on the EPS and area customers, Interconnecting Customer shall maintain a power factor of unity at the PCC.

18. The Interconnecting Customer shall charge the ESS solely from the on-site solar that is behind the PCC and the Company's primary revenue meter.

19. The Interconnecting Customer shall limit the Facility's export as described in Attachment 1.

20. Consistent with the operational profile provided by the Interconnecting Customer and approved by the Company with the interconnection application, discharge of the ESS shall occur in accordance with the discharge schedule detailed in section 4 of the Impact Study dated 9/6/22. Customer control equipment shall be required to enforce the schedule. As system conditions warrant, the Company or Interconnecting Customer may propose modifications to this schedule. Any Interconnecting Customer proposed modifications to this schedule are subject to the Company's review and approval, and may necessitate technical evaluation or a revised System Impact Study with a mutually accepted timeline, and require additional system modifications, all at the Interconnecting Customer's sole cost.

21. The maximum rate of change for the ESS operation shall be limited to 2.6% (78kW) per second of the ESS inverter kW ratings.

Exhibit G – Interconnection Service Agreement

Attachment 5: Agreement between the Company and the Company's Retail Customer

If the Interconnecting Customer is not the Company's retail Customer (account holder), then the Interconnecting Customer must obtain and deliver a fully executed Exhibit H (Agreement Between the Company and the Company's Retail Customer) with this Agreement. It shall be the responsibility of the Interconnecting Customer to notify the Company if the retail Customer associated with Facility changes and to provide an updated executed Exhibit H if the Interconnecting Customer is not the retail Customer. If not applicable at the time of the Agreement but applicable anytime thereafter, Interconnecting Customer shall obtain and deliver to the Company an Exhibit H. Exhibit H, when executed, shall be incorporated by reference and shall be considered an attachment to this Agreement.

Attachment 6: Landowner Consent Agreement

If neither the Interconnecting Customer nor the Customer is the Landowner, then the Interconnecting Customer must obtain and deliver a fully executed Landowner Consent Agreement ("Exhibit I") with this Agreement. The Interconnecting Customer shall provide any title documentation requested by the Company. Exhibit I is in addition to any other System Modification Required Approvals required by the Company in accordance with this Agreement. It shall be the responsibility of the Interconnecting Customer to notify the Company if the Landowner associated with Facility changes, and to provide an updated Exhibit I if applicable. If not applicable at the time of the Agreement but applicable anytime thereafter, Interconnecting Customer shall obtain and deliver to the Company an Exhibit I. Exhibit I, when executed, shall be incorporated by reference and shall be considered an attachment to this Agreement.

Exhibit G – Interconnection Service Agreement

Attachment 7 – Appendix A: System Modifications Construction Schedule

Below is an estimated construction milestone schedule. This conceptual schedule is based upon assumptions and knowledge regarding the project, the site, and activities as of the date of the Impact Study. These estimations of construction time frames and duration do not include any time that the Company's performance is on hold, delayed, or interrupted, reset, extended, or otherwise affected including, without limitation, while waiting on information or on the performance of obligations by the Interconnecting Customer and/or third parties (including, without limitation, Affected System operators, Verizon, ISO-NE and/or railroad), as a result of changes to the project, site and/or activities, as a result of environmental and/or permitting issues, events of force majeure, and/or as a result of required transmission outages. The Interconnecting Customer shall, in a timely manner, provide all information and documentation required by the Company in order to process the interconnection of the Facility.

The start-date for this construction schedule is deemed to have occurred once: (1) the Interconnection Service Agreement ("ISA") has been signed by both the Company and the Interconnecting Customer; and (2) the first payment has been submitted by the Interconnecting Customer to the Company; provided, however, that the Company shall not be required to provide any services or order any equipment without receiving adequate payment therefore from the Interconnecting Customer nor will it be required to initiate any construction before it has received: (i) full payment from the Interconnecting Customer for the Facility's System Modifications costs; (ii) and all System Modification Required Approvals.

Total System Modification Construction Duration: **76** weeks. The duration represents the estimated-total number of weeks the Company will work on this project. This duration does not represent the timeline for interconnection.

Milestone	Estimated Duration	Responsible Party
First Payment	Start	Interconnecting Customer
Distribution System Modification Design	Twenty-Seven (27) weeks	Company
Secure Required Permits/Approvals/Easements and Petition for Company Distribution Work*	Sixteen (16) weeks (Before Construction Begins)	Interconnecting Customer & Company
Submit Final Payment	As per ISA (Before Construction Begins)	Interconnecting Customer
Distribution System Schedule Coordination and Construction	Twenty-Four (24) weeks	Company
Witness Test Documentation Review and Approval / Witness Test Date Scheduled**	Four (4) weeks	Company
Compliance Documentation Review and Approval**	Two (2) weeks	Company
Meter Installation***	Two (2) weeks	Company
Issue Authorization to Interconnect****	Five (5) Business Days	Company

*Estimated duration dependent on third party.
**Timelines for documentation review are reliant upon receipt of documentation that is accurate and complete. This can be completed in parallel with construction schedule.
***Meter procurement requires 10 to 12 week lead time and will commence after the Interconnecting Customer provides an acceptable wireless signal test or dedicated phone line.
****If assets require registration with ISO-NE, this shall be completed prior to Authorization to Interconnect.

Exhibit I – Landowner Consent Agreement

(Note: This Consent is to be signed by the owner of the land where the distributed generation installation and interconnection will be placed, when the owner or operator of the distributed generation installation is not also the owner of the land, and the landowner's electric facilities will not be involved in the interconnection of such distributed generation installation.)

This Consent is executed by Stateline Property Management LLC, (the "Landowner"; as used herein the term shall include the Landowner's successors in interest to the Property), as owner of the real property situated in the City/Town of Hampden, Hampden County, Massachusetts, known as 530 Glendale Rd [street address] (the "Property"), at the request of Glendale Road Development, LLC [name of Interconnecting Customer] (the "Interconnecting Customer"; as used herein the term shall include the Interconnecting Customer's successors and assigns) and for the benefit of **Massachusetts Electric Company (doing business as National Grid)**, a Massachusetts corporation with a principal place of business at **40 Sylvan Road, Waltham, MA 02451** (the "Company"); as used herein the term shall include the Company's successors and assigns).

1. The purpose of this Consent is to provide the Company with assurance that the installation of a distributed generation facility (the "Facility") by the Interconnecting Customer on the Property has been approved by the Landowner.

2. The Landowner hereby acknowledges that it has authorized the Facility to be installed and operated by Interconnecting Customer on the Property pursuant to agreements between the Landowner and the Interconnecting Customer that are in full force and effect as of the date hereof.

3. The Landowner hereby acknowledges that the Landowner shall look solely to the Interconnecting Customer for the performance of and compliance with all of the terms of any agreements between the Landowner and the Interconnecting Customer, and that the Company shall not, by virtue of any agreement between the Company and the Interconnecting Customer, be deemed to have assumed any obligation or liability to the Landowner.

4. The Company hereby acknowledges that the Company shall look solely to the Interconnecting Customer for the performance of and compliance with all of the terms of any agreements between the Company and the Interconnecting Customer , and that the Landowner shall not, by virtue of any agreement between the Landowner and the Interconnecting Customer, be deemed to have assumed any obligation or liability to the Company.

5. The Landowner hereby grants the Company access as necessary to the Property for Company personnel, contractors or agents, to perform Company's duties under the agreements with the Interconnecting Customer.

6. Landowner acknowledges and agrees that the Company shall have no liability to the Landowner, whether in tort or contract, or under any other legal theory, and specifically excluding any indirect, incidental, special, consequential, or punitive damages of any kind whatsoever, for any loss, cost, claim, injury, liability, or expense, including court costs and reasonable attorney's fees, relating to or arising from (a) the installation or operation of the Facility on the Property, or (b) any act or omission in the Interconnecting Customer's performance of its agreements with the Landowner or the Company, except to the extent caused solely by the negligence or willful misconduct of the Company, its agents, contractors or employees.

7. This Agreement shall be interpreted, governed, and construed under the laws of the Commonwealth of Massachusetts without giving effect to choice of law provisions that might apply the law of a different jurisdiction.

IN WITNESS WHEREOF, the Landowner and the Company have caused this Consent to be executed under seal by its duly authorized representatives.

Landowner		Company	
	Stateline Property Management LLC.		**Massachusetts Electric Company, d/b/a National Grid:**
By:	Stateline Property Management LLC	By:	Eric Munzert
Name:	Jonathan Guinipero	Name:	Eric Munzert
Title:	owner	Title:	Sr. Consultant
Date:	4/22/21	Date:	11/28/22

Application Number: MA- 30391226
Case# 354101

DRAFT Decommissioning Plan

Glendale Road Development, LLC

530 Glendal Road Hampden, MA

1 INTRODUCTION

Glendale Road Development, LLC is the project owner and will be referred all together as "The Project Owner" throughout this document. The Project Owner proposes to develop a solar facility with a maximum name plate capacity of approximately 4.95megawatts (MW-AC) located at 530 Glendale Road Hampden, MA.

Its purpose is the generation of electricity and will interconnect to existing electrical distribution lines at this location. The Project is a ground-mounted solar array; the solar panels are mounted on a single-axis tracker racking system that tracks the suns path from East to West. The Project conforms to local wetlands, storm water control, and zoning regulations. The solar array will be connected to a series of string inverters, which are current conversion equipment. The electric power from the inverters will be run via underground conduit to electric utility interconnect equipment at the edge of the arrays, and from that to the electricity distribution line (i.e., grid) that runs along the street frontage of the property.

The Decommissioning Plan is being submitted to the Town of Hampden Planning Board and represents a comprehensive description of decommissioning.

The Decommissioning Plan describes how The Project Owner proposes to restore the project location to a clean and safe condition suitable for the likely future use of the land on which it is located. The report provides an overview of all anticipated activities during the decommissioning phase of the project and outlines mitigation measures to address potential negative environmental effects as a result of these activities. It also discusses the restoration of land and water and the management of excess materials and waste.

2 THE PROPONENT

The Project Owner, Glendale Road Development, LLC, endeavors to work closely with all interested stakeholders in their projects including landowners, local communities, the general public, municipalities, government agencies and ministries. The Project Owner's main objective is to design and construct projects that are environmentally beneficial, technologically efficient, and financially viable.

Contact information for the proponent is as follows:

Full Name of Company:	Glendale Road Development, LLC
Prime Contact:	Rory Walker, Manager
Address:	898 Sport Hill Road, Easton CT 06612
Telephone:	(203) 731-7506
Email:	rwalker@zpenergyconsultants.com

Level Design Group is the third-party contractor responsible for the preparation of civil engineering and for consultation activities for the development of the photovoltaic solar and energy storage facility.

Full Name of Company:	Level Design Group
Prime Contact:	Nicola Facendola, PE
Address:	Level Design Group, 249 South Street, Unit 1, Plainville, MA 02762
Telephone:	(508) 695-2221
Fax:	(508) 695-2219
Email:	nfacendola@leveldg.com

3 PROJECT LOCATION

The proposed Facility is located along Glendale Road within the Town of Hampden, Massachusetts.

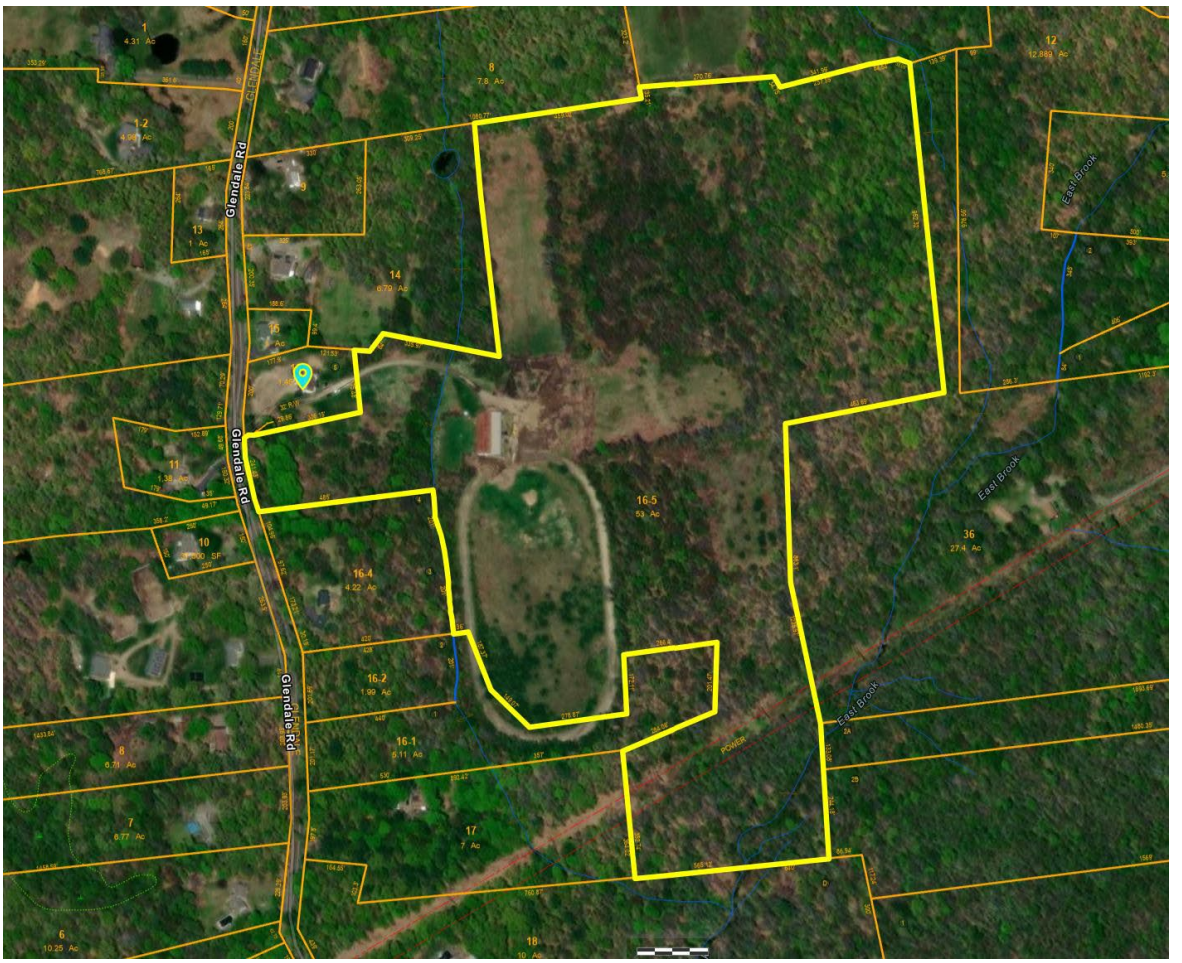

Figure 1 shows the proposed location of the site in Hampden, Massachusetts. The project comprises approximately 20 acres as part of approximately 53 acres of privately-owned land.

4 DECOMMISSIONING PLAN OVERVIEW

Decommissioning consists of the removal of facility components, management of excess wastes and materials and the restoration of project location lands and waters, as applicable. The exact procedures for decommissioning of the project will depend upon the future use of the project location (e.g., for an agricultural use decommissioning will involve returning the land to productivity). Activities are expected to take between 5-6 weeks. Potential negative environmental effects from decommissioning of the facility will be mitigated through established measures. These measures include the use of erosion and sediment control measures, maintaining a buffer from natural features, timing decommissioning activities so that they do not interfere with wildlife breeding times, and rapidly establishing a vegetative cover on disturbed areas. The Project Owner's staff and contractors will be made aware of the environmental management commitments contained in these reports to ensure they are implemented.

The Project Owner will restore the project location to its pre-construction condition. All decommissioning and restoration activities will be in accordance with all applicable federal, state and local permitting. As with the construction phase, a manager responsible for safety will be present on site (generally the contractor's project manager) while decommissioning activities are taking place.

The decommissioning plan is based on current procedures and experience. These procedures may be subject to revision based on new experiences and requirements over time. At the time of decommissioning various options and procedures will be re-evaluated to ensure that decommissioning is safe and beneficial to the environment. Soil erosion and sedimentation control measures, as well as other mitigation measures used during construction will be re-implemented during the decommissioning phase and until the site is stabilized.

4.1 DECOMMISSIONING DURING CONSTRUCTION (ABANDONMENT OF PROJECT)

While not expected and considered to be extremely unlikely, in the event that construction or operation activities cease prior to facility completion, with no expectation of construction restart, the project would be decommissioned in a manner as described in Section 5 of this report. Any installed components will be removed and managed as per Section 5.1 and 5.4 and the site will be restored as per Section 5.2 and 5.3. Potential negative effects related to construction and decommissioning (e.g., dust and sedimentation or erosion) and appropriate mitigation measures are addressed in the plans for final decommissioning and site restoration as outlined in this document.

4.2 DECOMMISSIONING AFTER CEASING OPERATION

Properly maintained photovoltaic (PV) panels have an expected lifespan between twenty-five (25) years and forty (40) years. At the time of decommissioning the installed components will be removed and reused/recycled, where possible, and the site restored in accordance with the activities discussed in Table 1 and Table 2. As with the steps for decommissioning during construction, mitigation measures will be implemented. All removal of equipment will be done in accordance with applicable regulations.

4.3 RESTORATION OF LANDS NEGATIVELY AFFECTED BY THE FACILITY

As with the project's construction, noise levels during the decommissioning work will increase. Proper steps will be followed to minimize this disturbance, such as working only during daylight hours. Also, as with the project's construction, road traffic in the area may increase temporarily due to crews and equipment movements. Further details on site restoration are included in Section 5.3.

5 DECOMMISSIONING OF THE RENEWABLE ENERGY GENERATION FACILITY

5.1 EQUIPMENT DISMANTLING AND REMOVAL

After the facility has been disconnected from the utility power grid and all electrical components have been disconnected within the facility, components will be dismantled and removed as outlined in Table 1. Decommissioning will be undertaken by licensed subcontractors using similar techniques and equipment as those employed during construction.

Table 1: Equipment Dismantling and Removal

Component	Description
PV modules and associated equipment	• Disconnect all wiring, cables and electrical interconnections. • Remove PV modules from racks, temporarily store on-site in delineated area before removal. • Dismantle and remove all racks and support structures; temporarily store on-site before removal.
Inverter units, Energy Storage Units, Transformers, Disconnects	• Disconnect all electrical equipment; • Remove inverters, energy storage units transformers, disconnects, meters, fans, lighting fixture and other electrical • components and recycle off-site by an approved recycler; • Remove all waste.
Access roads	• Consult with Town to determine if access roads should be left in place for their continued use; • If access road is deemed unnecessary, remove access road and restored access road location as near as practical to its original condition with native soils and seeding.
Equipment foundations	• The system is proposed as ground mounted. Steel and concrete foundation components will be removed in their entirety.
Underground cables	• Underground electrical lines running between inverters and the substation will be removed in their entirety by pulling and/or trenching.
Other components	• Above ground lines and poles that are not owned by the utility will be removed, along with associated equipment (isolation switches,

	fuses, metering) and holes will be filled with clean fill. • Fences and gates will be removed.

5.2 ENVIRONMENTAL EFFECTS

Decommissioning activities, particularly the removal of project components and grading could cause negative environmental effects similar to those of the construction phase. For example, there is the potential for disturbance (erosion/sedimentation/fuel spills) to significant natural features. Mitigation measures similar to those employed during the construction phase of the project will be implemented. These will remain in place until the site is stabilized in order to mitigate erosion and silt/sediment runoff and any potential effects on the significant natural features located adjacent to the project location.

Road traffic will temporarily increase due to the movement of decommissioning crews and equipment. There may be an increase in particulate matter (dust) in adjacent areas during the decommissioning phase. Decommissioning activities will lead to temporary elevated noise levels from heavy machinery and an increase in trips to the project location. Work will be undertaken during daylight hours and conform to all local noise By-laws.

5.3 SITE RESTORATION

A detailed description of environmental conditions and natural features at the project location prior to construction is provided via a ESA Phase I report. Through the decommissioning phase, the project location will be restored to a state similar to its former condition or to a condition required for the future intended land use.

All project components will be removed as discussed in Table 1. The Project Owner will consult the town at the time of decommissioning to determine whether the access road will either be left as is or the aggregate and filter fabric will be removed and the area graded to restore terrain profiles. Topsoil will be replaced as necessary. Rehabilitated lands may be seeded with a low-growing native vegetation to help stabilize soil conditions, enhance soil structure and increase soil fertility.

The site will be restored so that the post decommissioning drainage patterns and the quality/quantity of stormwater will be similar to pre-construction conditions. It is not expected that the lands surrounding the facility will require any special remediation since any hazardous materials used on the site will be contained with adequate spill protection.

Prior to abandonment of the site, a land survey will be conducted to ensure that conditions satisfy those set in an agreement with agencies (e.g., Town Board, Planning Board).

5.4 MANAGING EXCESS MATERIALS AND WASTE

During the decommissioning phase a variety of excess materials and wastes (listed in Table 2) will be generated. Most of the materials used in a solar facility are reusable or recyclable and some equipment may have manufacturer take-back and recycling requirements. Any remaining materials will be removed and disposed of off-site at an appropriate facility. The Project Owner will maximize recycling and reuse and will work with manufacturers, local subcontractors and waste firms to segregate material to be recycled, reused and/or disposed of.

The Project Owner will be responsible for arranging for the collection and recycling of the PV modules and for minimizing the potential for modules to be discarded in the municipal waste stream. If there is no possibility for reuse, panels will either be returned to the manufacturer for appropriate recycling/disposal or will be transported to a recycling facility where the glass, metal and semiconductor materials will be separated and recycled. Panels will be managed as per best management practices that may be in effect at the time of decommissioning.

Table 2: Management of Excess Materials and Waste

Material/Waste	Means of Managing
PV panels	If there is no possibility for reuse, the panels will either be returned to the manufacturer for appropriate recycling/disposal or will be transported to a recycling facility where the glass, metal and semiconductor materials will be separated and recycled. Panels will be managed as per best management practices that may be in effect at the time of decommissioning.
Metal array mounting racks and steel supports	These materials will be recycled offsite at an approved facility.
Energy Storage Units	The lithium-ion cells will be recycling offsite at an approved facility.
Transformers and substation components	The substation transformer will be transported offsite for re-use or disposal at an approved facility.
Inverter units	The metal components of the inverters, fans and fixtures will be recycled, where possible. The step-up transformers will be transported off-site for reuse or disposal at an approved facility
Gravel (or other granular)	It is assumed that the material will be removed from the project location by truck to a location where the aggregate can be processed for salvage. It will then be reused as fill for construction.
Geotextile fabric	It is assumed that during excavation of the aggregate that a large portion of the geotextile will be "picked up" and sorted out of the aggregate at the aggregate reprocessing site. Geotextile fabric that is remaining or large pieces that can be readily removed from the excavation aggregate will be disposed of at an approved disposal facility.
Concrete inverter/transformer foundations	Concrete foundations will be broken down and transported by the contractor to landfill or a recycling facility.
Cables and wiring	Cables and lines will be disconnected and recycled (if possible), or disposed of at an approved facility. Associated electronic equipment (isolation switches, fuses, metering) will also be removed will be sent to either a recycling depot or an approved disposal facility.
Material/Waste	**Means of Managing**
Fencing	Fencing will be removed and recycled at a metal recycling facility.
Debris	Any remaining debris on the site will be separated into recyclables/wastes and will be transported from the site and managed as appropriate.

Recyclable materials will be transported off-site by truck and managed at appropriate facilities in accordance with federal, state, and local waste management regulations. Residual waste materials for disposal will be removed by a licensed contractor and transported to landfill. It is not anticipated that any waste materials will be left onsite. All underground electrical wiring will be removed from the site along with all concrete foundations. Given that methods of managing wastes and recyclables may change in the future, information in this report will be updated as necessary to conform to future local and state requirements.

6 DECOMMISSIONING ESTIMATE

For this proposal, it is assumed that the fencing, electrical cabinetry, solar racks, solar panels, wiring and all other equipment hold no salvage value and therefore are left out of the cost proposal. The cost of decommissioning is the labor to dismantle and load as well as the cost of trucking. The concrete pads will be broken up at the site and hauled to the nearest transfer station.

The primary cost of decommissioning is the labor to dismantle and load as well as the cost of trucking. Proper disposal of all solid or hazardous materials and wastes from the site in accordance with local, State and Federal solid/hazardous waste-disposal regulations. Restoration of the location of The Project to its natural condition, including stabilization and re-vegetation of the site as necessary to minimize erosion and runoff; landscaping consistent with the character of the site and neighborhood may remain.

We estimate that the removal work will take 12-16 weeks to complete. All electrical equipment will be removed from their concrete pads. The electrical equipment will be sold back to the manufacturers or to a recycling facility. The project contains copper, aluminum and other metals that will be recycled. Racking materials and fencing will be pulled from the ground and folded for transport. This estimate assumes the project lifetime is 25 years and an annual escalator of 2 percent as the Inflation Adjustment. **The final estimated cost of the facility decommissioning shall be reviewed and approved by the Town of Hampden Planning Board as part of a Special Permit Approval**

7 DECOMMISSIONING NOTIFICATION

The process for notification of decommissioning activities will be the same as the process for notification of construction activities and non-emergency communications. The Project Owner will provide notifications of decommissioning activities via certified letter to the required parties.

Decommissioning activities may require the notification of stakeholders given the potential for increased noise and traffic volumes at the project location. The local municipality in particular will be notified prior to commencement of any decommissioning activities to discuss the potential for activities to interfere with traffic on local roads or any other municipal services.

Six months prior to decommissioning The Project Owner will update their list of stakeholders and notify, as appropriate, of decommissioning activities. Federal, state and local authorities will be notified, as needed to discuss the potential approvals required to engage in decommissioning activities. Once the facility has been fully decommissioned, all responders and stakeholders will be notified. This will allow those parties to make the appropriate changes to their own plans and organization.

In the event any subsidiary or successors assume ownership of the Glendale Road Development, LLC, the subsidiary or successor also assumes responsibility in fulfilling regulatory requirements as mandated by the federal, state and local government agencies for the decommissioning of the photovoltaic and energy storafge facility. Notification to the Planning Board will be provided within sixty (60) days of any such change in ownership.

In the event that the facility has not operated for a continuous period of twelve (12) months where such inactivity is not the result of a casualty, equipment problem, permitting matter, natural disaster, or financial matter that The Project Owner is in good faith attempting to remedy and in the absence of notification by the Project Owner of a designated decommissioning date, this would constitute a cease in operation

8 OTHER APPROVALS

Well-planned and well-managed renewable energy facilities are not expected to pose environmental risks at the time of decommissioning. The Project Owner will ensure that the decommissioning stage of the project is carried out in accordance with conservation requirements and with the measures and practices described in this report. The Project Owner understands that the Planning Board could request any additional information with regards to decommissioning in the future and that the Planning Board will use its powers of compliance enforcement, as appropriate, to ensure risks are managed.

Glendale Road Development, LLC is aware that decommissioning activities may also require permits from other government agencies or entities, which are expected to be similar to those required in the construction phase of the project. The Project Owner shall obtain all required permits and approvals prior to commencement of decommissioning activities.

The Decommissioning Plan will be updated as necessary in the future to ensure that changes in available technology and site restoration methods are taken into consideration.

9 FAILURE TO DECOMMISSION

In the event that The Project Owner fails to undertake decommissioning within one (1) year of cease of operations, the Town of Hampden shall have the right to undertake decommissioning activities and make a claim against the Decommissioning Assurance. In this event, The Project Owner and Property Owner, if different, shall agree to allow access to the site for the Town's contractors to complete the decommissioning.

Additionally, in the event that the Project Owner fails to decommission the project and the Town undertakes such actions under the terms of this document, then the Project Owner shall indemnify the Town for

expenses reasonably incurred by the Town in connection to the decommissioning, if such expenses exceed the amount of the Decommissioning Assurance.

10 FORM OF DECOMMISSIONING ASSURANCE

Prior to the issuance of the building permit for the Project, the Project Owner shall provide a form of surety bond or a letter of credit to the Town for the amount equal or greater to the decommissioning estimate approved by the Town of Hampden Planning Board. Such surety bond or letter of credit shall be reviewed and approved by the Town prior to the issuance of the building permit. The Decommissioning Assurance shall be in place for the lifetime of the Project.

11 CONCLUSIONS

This Decommissioning Plan has been completed to assist The Project Owner and any subsidiary or successors in fulfilling regulatory requirements as mandated by the federal, state and local government agencies for the decommissioning of the Glendale Road Installation. In the event of the abandonment of the proposed facility or in the event that the solar operation ceases, Glendale Road Development, LLC and any subsidiary or successors will adhere to all decommissioning requirements provided in this report, or stipulated by the Planning Board, and will ensure that the project location is properly restored to a safe, clean, pre-facility condition. The Glendale Road Installation and any ancillary equipment will be conducted in such a manner as to ensure that there will be no significant negative environmental or social effects.

-DRAFT-

EMERGENCY RESPONSE PLAN

Prepared for Glendale Road Development, LLC

530 Glendale Road, Hampden MA 01036

Dated:

EPC Contact: To be determined.

1 OVERVIEW

This Emergency Response and Communications Plan (ECRP) for its proposed solar photovoltaic facility (Facility) to be constructed on 530 Glendale Road, In the Town of Hampden.

This ERCP outlines the general procedures followed for all emergency situations and incidents that could arise as a result of the operation, maintenance and decommissioning of the solar photovoltaic facility due to weather events, equipment failure, human error, or other accident. Shortly after commercial operation, Granville Solar Site or its successor will meet with the local emergency service personnel (fire, police, and EMS) to review and discuss the operation and decommissioning processes, including unique equipment, the overall process, as well as schedule and phasing. Any hazardous materials that may be present during each phase will be discussed. Ongoing communication between town officials and police, fire, and emergency services officials will help assure adequate levels of safety and protection. A site specific Health and Safety Plan (HASP) will also be developed and maintained on site. Based on relevant experience, Glendale Road Development believes that the following types of hazards are most likely to have the potential to occur during maintenance and decommissioning activities.

- Personnel injury or medical emergency
    - Electrocution
    - Slips, trips and falls
    - Medical Emergency
- Auto and heavy equipment accidents
- Natural or electrical fire
- Hazardous material spills
    - Gasoline
    - Diesel fuel
    - Hydraulic oil
    - Lubricating oil and grease
    - Cleaning solvents

Glendale Road Development is committed to protecting the community, personal property, wildlife, and the environment in adherence to all applicable local, state, and federal laws and regulations.

2 EMERGENCY CONTACT INFORMATION

Glendale Road Development or its successor personnel, including a specified Emergency Response Coordinator, will be available to the site and may be utilized to assist during emergency situations and/or provide first aid as needed. For all emergency services including hospital, fire, etc. call 9-1-1. During operation of the facility, a phone number where Glendale Road Development or its successor representative can be reached 24 hours a day will be established and provided to local emergency personnel along with the location of the nearest hospital.

3 INTERNAL REPORTING

The following procedures will be prescribed for internal reporting of emergencies:

a) Once notified by local emergency service personnel, the Emergency Response Coordinator will notify any on-site personnel, including any visitors, of the nature of the emergency either in person or via phone.
b) The Emergency Response Coordinator will specify the location for the first responders, if they are not already present onsite. A designated employee or contractor will meet the emergency response personnel at the access road of the emergency.
c) The Emergency Response Coordinator will notify local emergency personnel, if not already present, of the emergency using the contact information to be provided.
d) The Emergency Response Coordinator will identify any need for access control measures at the facility during the emergency and designate a competent person to implement.
e) Personnel will be trained that when any person identifies an emergency situation, or the potential for an emergency situation, and reports it to the Emergency Response Coordinator or his/her designee, the Emergency Response Coordinator will then activate the Plan.

4 EXTERNAL REPORTING

The following procedures will be prescribed for external reporting of emergencies.

a) If immediate emergency response assistance is required, the Emergency Response Coordinator or his designee will call 9-1-1.
b) A member of management or the Emergency Response Coordinator or his/her designee are the only persons authorized to speak on Glendale Road Development LLC's behalf to outside agencies (police, fire department, medical services etc.) during an emergency situation.
c) In the event of a spill of a hazardous material in excess of reportable limits, the spill must be reported to the Department of Environmental Protection or relevant federal authority.

5 EMERGENCY RESPONSE PROCEDURE

5.1 PERSONNEL INJURY OR MEDICAL EMERGENCY

a) Provide First Aid to all injured employees or contractors regardless of severity.
b) A First Aid kit will be maintained onsite. First Aid kits are to be inspected regularly and restocked as needed following usage.
c) Call 9-1-1 if the injury is serious and needs immediate medical treatment.
d) For local emergency response assistance, a designated employee or contractor will meet the emergency responders at the access road of the tower site and direct them to the location of the emergency/injured employee.
e) The designated employee or contractor should have a hand held orange safety flag to use to get the attention of the responding emergency services.

5.2 AUTO AND HEAVY EQUIPMENT ACCIDENTS

a) Personnel scheduled to work on site will be briefed prior to arrival on facility road conditions, speed limits, and hazards
b) Ground guides will be used in situations requiring cranes, excavators, lifts and other heavy equipment to operate in the vicinity of plant equipment, personnel and other vehicles.
c) Personnel will be briefed not to approach working heavy equipment without first receiving acknowledgement and approval from the vehicle operator.

d) Additional care will be exercised by all auto and equipment operators during periods of darkness, rain, snow, and icy conditions.
e) All collisions or near misses, regardless of severity, will be reported to the Emergency Response Coordinator or his/her representative.
f) Accidents requiring medical or firefighting personnel will follow the instructions listed in those sections.

5.3 FIRE

If a natural, vehicle, or equipment related fire exists at the facility, personnel or contractors will follow the following procedures. The Fire Department will be notified in the event of any fire at the site.

a) Provided it is safe to do so, employees can extinguish small fires using the onsite fire extinguisher.
b) For all other fires, alert others on site to immediately vacate the area and assemble at a specified location for accountability.
c) Shutdown the facility at the point of utility interconnection, provided it is safe to do so.
d) Restrict the area.
e) Request assistance from firefighting personnel, if needed, in controlling the fire.
f) If local emergency response personnel are required, have an employee go to the access road of incident site, to meet emergency personnel and direct them to the fire.
g) Employees will use a hand held orange safety flag, safety vest or other brightly covered material to get the attention of the responding emergency service personnel.

5.4 HAZARDOUS MATERIALS

Cautionary labeling will be provided for any hazardous chemicals and the associated Material Safety Data Sheets (MSDS) or Globally Harmonized System (GHS) documentation will be provided accordingly.

a) The MSDS/GHS for all hazardous materials used at the facility will be provided to the local fire department and emergency service providers upon request.
b) Drip pans and associated control measures will be used for all refueling and hydraulic maintenance activities.
c) Small spills will be cleaned up immediately using absorbent materials such as hay, sand, socks or pads.
d) If the spill is of such magnitude that it cannot be contained, the Emergency Response Coordinator will contact the appropriate authority for assistance.
e) Personnel and contractors will be instructed to report all spills, regardless of severity, to the Emergency Response Coordinator.
f) Once a spill is identified, the Emergency Response Coordinator or his/her designee will maintain access control measures to safeguard personnel and environmental safety until the spill mitigation is complete.

5.5 SITE RESTORATION / REMEDIATION

If any accident or incident at the facility necessitates site restoration or remediation, the restoration / remediation will be conducted according to applicable federal, state and local requirements.

5.6 INCIDENT REPORTING

After every accident or incident, the Emergency Response Coordinator or designee will conduct a post incident evaluation to determine the following.

a) Suitability of the organization's structure, operations, equipment, communication plans, adequacy of training, alarm systems, security and access control, spill containment and recovery procedures, monitoring and safety programs.
b) If any of the above are found to be inadequate, the Emergency Response Coordinator will make necessary changes.

5.7 SAFETY TRAINING

On-site training for local emergency personnel may be given, upon request, by the Emergency Response Coordinator or their designees regarding the content, requirements, and appropriate actions to comply with the provisions of the Plan. The training will occur:

a) At the facility;
b) When changes are made to the ECRP;
c) At the request of local emergency personnel;
d) When Emergency Response Coordinator determines.

5.8 RECORDING OF RESPONDER COMPLAINTS

a) Any and all complaints from responders will be kept in both a log book and an electronic log.
b) The name, address, telephone number, date and time of all responders issuing a complaint will be included with the responder's complaint.
c) Assurance will be provided to all responders that complaint has been mitigated and will not reoccur.
d) In addition to the above, complaints requiring significant plan or operational adjustments will be answered in writing within 7 days of the complaint.

6 CONCLUSIONS

This Emergency Response Plan has been completed to assist the Town of Hampden police and fire department and any subsidiary or successors in fulfilling regulatory requirements as mandated by the federal, state, and local government agencies for emergency services located at the property.

In the event of the abandonment of the proposed facility or in the event that the solar operation ceases, Glendale Road Development any subsidiary or successors will adhere to all emergency requirements provided in this report, or stipulated by the local emergency service personnel (fire, police, and EMS) as a condition of approval, and will ensure that the project location maintains as a safe working environment and properly attend any emergency.

SOLAR PANELS

1.1 Solar Panels: Construction and Durability

Solar PV panels typically consist of glass, polymer, aluminum, copper, and semiconductor materials that can be recovered and recycled at the end of their useful life.[2] Today there are two PV technologies used in PV panels at utility-scale solar facilities, silicon, and thin film. As of 2016, all thin film used in North Carolina solar facilities are cadmium telluride (CdTe) panels from the US manufacturer First Solar, but there are other thin film PV panels available on the market, such as Solar Frontier's CIGS panels. Crystalline silicon technology consists of silicon wafers which are made into cells and assembled into panels, thin film technologies consist of thin layers of semiconductor material deposited onto glass, polymer or metal substrates. While there are differences in the components and manufacturing processes of these two types of solar technologies, many aspects of their PV panel construction are very similar. Specifics about each type of PV chemistry as it relates to toxicity are covered in subsections a, b, and c in section 1.2.2; on crystalline silicon, cadmium telluride, and CIS/CIGS respectively. The rest of this section applies equally to both silicon and thin film panels.

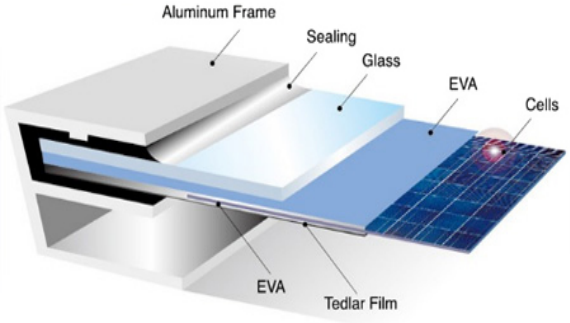

Figure 2: Components of crystalline silicon panels. The vast majority of silicon panels consist of a glass sheet on the topside with an aluminum frame providing structural support. Image Source: www.riteksolar.com.tw

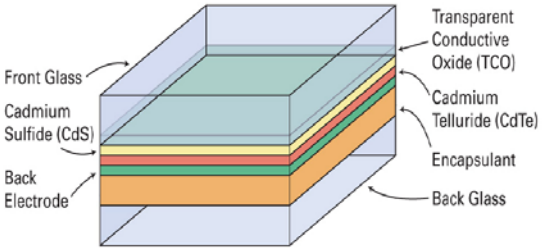

Figure 3: Layers of a common frameless thin-film panel (CdTe). Many thin film panels are frameless, including the most common thin-film panels, First Solar's CdTe. Frameless panels have protective glass on both the front and back of the panel. Layer thicknesses not to scale. Image Source: www.homepower.com

To provide decades of corrosion-free operation, PV cells in PV panels are encapsulated from air and moisture between two layers of plastic. The encapsulation layers are protected on the top with a layer of tempered glass and on the backside with a polymer sheet. Frameless modules include a protective layer of glass on the rear of the panel, which may also be tempered. The plastic ethylene-vinyl acetate (EVA) commonly provides the cell encapsulation. For decades, this same material has been used between layers of tempered glass to give car windshields and hurricane windows their great strength. In the same way that a car windshield cracks but stays intact, the EVA layers in PV panels keep broken panels intact (see Figure 4). Thus, a damaged module does not generally create small pieces of debris; instead, it largely remains together as one piece.

Figure 4: The mangled PV panels in this picture illustrate the nature of broken solar panels; the glass cracks but the panel is still in one piece. Image Source: http://img.alibaba.com/photo/115259576/broken_solar_panel.jpg

PV panels constructed with the same basic components as modern panels have been installed across the globe for well over thirty years.[3] The long-term durability and performance demonstrated over these decades, as well as the results of accelerated lifetime testing, helped lead to an industry-standard 25-year power production warranty for PV panels. These power warranties warrant a PV panel to produce at least 80% of their original nameplate production after 25 years of use. A recent SolarCity and DNV GL study reported that today's quality PV panels should be expected to reliably and efficiently produce power for thirty-five years.[4]

Local building codes require all structures, including ground mounted solar arrays, to be engineered to withstand anticipated wind speeds, as defined by the local wind speed requirements. Many racking products are available in versions engineered for wind speeds of up to 150 miles per hour, which is significantly higher than the wind speed requirement anywhere in North Carolina. The strength of PV mounting structures were demonstrated during Hurricane Sandy in 2012 and again during Hurricane Matthew in 2016. During Hurricane Sandy, the many large-scale solar facilities in New Jersey and New York at that time suffered only minor damage.[5] In the fall of 2016, the US and Caribbean experienced destructive winds and torrential rains from Hurricane Matthew, yet one leading solar tracker manufacturer reported that their numerous systems in the impacted area received zero damage from wind or flooding.[6]

In the event of a catastrophic event capable of damaging solar equipment, such as a tornado, the system will almost certainly have property insurance that will cover the cost to cleanup and repair the project. It is in the best interest of the system owner to protect their investment against such risks. It is also in their interest to get the project repaired and producing full power as soon as possible. Therefore, the investment in adequate insurance is a wise business practice for the system owner. For the same

reasons, adequate insurance coverage is also generally a requirement of the bank or firm providing financing for the project.

1.2 Photovoltaic (PV) Technologies

a. Crystalline Silicon

This subsection explores the toxicity of silicon-based PV panels and concludes that they do not pose a material risk of toxicity to public health and safety. Modern crystalline silicon PV panels, which account for over 90% of solar PV panels installed today, are, more or less, a commodity product. The overwhelming majority of panels installed in North Carolina are crystalline silicon panels that are informally classified as Tier I panels. Tier I panels are from well-respected manufacturers that have a good chance of being able to honor warranty claims. Tier I panels are understood to be of high quality, with predictable performance, durability, and content. Well over 80% (by weight) of the content of a PV panel is the tempered glass front and the aluminum frame, both of which are common building materials. Most of the remaining portion are common plastics, including polyethylene terephthalate in the backsheet, EVA encapsulation of the PV cells, polyphenyl ether in the junction box, and polyethylene insulation on the wire leads. The active, working components of the system are the silicon photovoltaic cells, the small electrical leads connecting them together, and to the wires coming out of the back of the panel. The electricity generating and conducting components makeup less than 5% of the weight of most panels. The PV cell itself is nearly 100% silicon, and silicon is the second most common element in the Earth's crust. The silicon for PV cells is obtained by high-temperature processing of quartz sand (SiO_2) that removes its oxygen molecules. The refined silicon is converted to a PV cell by adding extremely small amounts of boron and phosphorus, both of which are common and of very low toxicity.

The other minor components of the PV cell are also generally benign; however, some contain lead, which is a human toxicant that is particularly harmful to young children. The minor components include an extremely thin antireflective coating (silicon nitride or titanium dioxide), a thin layer of aluminum on the rear, and thin strips of silver alloy that are screen-printed on the front and rear of cell.[7] In order for the front and rear electrodes to make effective electrical contact with the proper layer of the PV cell, other materials (called glass frit) are mixed with the silver alloy and then heated to etch the metals into the cell. This glass frit historically contains a small amount of lead (Pb) in the form of lead oxide. The 60 or 72 PV cells in a PV panel are connected by soldering thin solder-covered copper tabs from the back of one cell to the front of the next cell. Traditionally a tin-based solder containing some lead (Pb) is used, but some manufacturers have switched to lead-free solder. The glass frit and/or the solder may contain trace amounts of other metals, potentially including some with human toxicity such as cadmium. However, testing to simulate the potential for leaching from broken panels, which is discussed in more detail below, did not find a potential toxicity threat from these trace elements. Therefore, the tiny amount of lead in the grass frit and the solder is the only part of silicon PV panels with a potential to create a negative health impact. However, as described below, the very limited amount of lead involved and its strong physical and chemical attachment to other components of the PV panel means that even in worst-case scenarios the health hazard it poses is insignificant.

As with many electronic industries, the solder in silicon PV panels has historically been a lead-based solder, often 36% lead, due to the superior properties of such solder. However, recent advances in lead-free solders have spurred a trend among PV panel manufacturers to reduce or remove the lead in their panels. According to the 2015 Solar Scorecard from the Silicon Valley Toxics Coalition, a group that tracks environmental responsibility of photovoltaic panel manufacturers, fourteen companies (increased from twelve companies in 2014) manufacture PV panels certified to meet the European Restriction of

Hazardous Substances (RoHS) standard. This means that the amount of cadmium and lead in the panels they manufacture fall below the RoHS thresholds, which are set by the European Union and serve as the world's de facto standard for hazardous substances in manufactured goods.[8] The Restriction of Hazardous Substances (RoHS) standard requires that the maximum concentration found in any homogenous material in a produce is less than 0.01% cadmium and less than 0.10% lead, therefore, any solder can be no more than 0.10% lead.[9]

While some manufacturers are producing PV panels that meet the RoHS standard, there is no requirement that they do so because the RoHS Directive explicitly states that the directive does not apply to photovoltaic panels.[10] The justification for this is provided in item 17 of the current RoHS Directive: "The development of renewable forms of energy is one of the Union's key objectives, and the contribution made by renewable energy sources to environmental and climate objectives is crucial. Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources (4) recalls that there should be coherence between those objectives and other Union environmental legislation. Consequently, this Directive should not prevent the development of renewable energy technologies that have no negative impact on health and the environment and that are sustainable and economically viable."

The use of lead is common in our modern economy. However, only about 0.5% of the annual lead consumption in the U.S. is for electronic solder for all uses; PV solder makes up only a tiny portion of this 0.5%. Close to 90% of lead consumption in the US is in batteries, which do not encapsulate the pounds of lead contained in each typical automotive battery. This puts the lead in batteries at great risk of leaching into the environment. Estimates for the lead in a single PV panel with lead-based solder range from 1.6 to 24 grams of lead, with 13g (less than half of an ounce) per panel seen most often in the literature.[11] At 13 g/panel[12], each panel contains one-half of the lead in a typical 12-gauge shotgun shell. This amount equates to roughly 1/750th of the lead in a single car battery. In a panel, it is all durably encapsulated from air or water for the full life of the panel.[14]

As indicated by their 20 to 30-year power warranty, PV modules are designed for a long service life, generally over 25 years. For a panel to comply with its 25-year power warranty, its internal components, including lead, must be sealed from any moisture. Otherwise, they would corrode and the panel's output would fall below power warranty levels. Thus, the lead in operating PV modules is not at risk of release to the environment during their service lifetime. In extreme experiments, researchers have shown that lead can leach from crushed or pulverized panels.[15, 16] However, more real-world tests designed to represent typical trash compaction that are used to classify waste as hazardous or non-hazardous show no danger from leaching.[17, 18] For more information about PV panel end-of-life, see the Panel Disposal section.

As illustrated throughout this section, silicon-based PV panels do not pose a material threat to public health and safety. The only aspect of the panels with potential toxicity concerns is the very small amount of lead in some panels. However, any lead in a panel is well sealed from environmental exposure for the operating lifetime of the solar panel and thus not at risk of release into the environment.

b. Cadmium Telluride (CdTe) PV Panels

This subsection examines the components of a cadmium telluride (CdTe) PV panel. Research demonstrates that they pose negligible toxicity risk to public health and safety while significantly reducing the public's exposure to cadmium by reducing coal emissions. As of mid-2016, a few hundred MWs of

cadmium telluride (CdTe) panels, all manufactured by the U.S. company First Solar, have been installed in North Carolina.

Questions about the potential health and environmental impacts from the use of this PV technology are related to the concern that these panels contain cadmium, a toxic heavy metal. However, scientific studies have shown that cadmium telluride differs from cadmium due to its high chemical and thermal stability.[19] Research has shown that the tiny amount of cadmium in these panels does not pose a health or safety risk.[20] Further, there are very compelling reasons to welcome its adoption due to reductions in unhealthy pollution associated with burning coal. Every GWh of electricity generated by burning coal produces about 4 grams of cadmium air emissions.[21] Even though North Carolina produces a significant fraction of our electricity from coal, electricity from solar offsets much more natural gas than coal due to natural gas plants being able to adjust their rate of production more easily and quickly. If solar electricity offsets 90% natural gas and 10% coal, each 5-megawatt (5 MW_{AC}, which is generally 7 MW_{DC}) CdTe solar facility in North Carolina keeps about 157 grams, or about a third of a pound, of cadmium *out of* our environment.[22, 23]

Cadmium is toxic, but all the approximately 7 grams of cadmium in one CdTe panel is in the form of a chemical compound cadmium telluride,[24] which has $1/100^{th}$ the toxicity of free cadmium.[25] Cadmium telluride is a very stable compound that is non-volatile and non-soluble in water. Even in the case of a fire, research shows that less than 0.1% of the cadmium is released when a CdTe panel is exposed to fire. The fire melts the glass and encapsulates over 99.9% of the cadmium in the molten glass.[27]

It is important to understand the source of the cadmium used to manufacture CdTe PV panels. The cadmium is a byproduct of zinc and lead refining. The element is collected from emissions and waste streams during the production of these metals and combined with tellurium to create the CdTe used in PV panels. If the cadmium were not collected for use in the PV panels or other products, it would otherwise either be stockpiled for future use, cemented and buried, or disposed of.[28] Nearly all the cadmium in old or broken panels can be recycled which can eventually serve as the primary source of cadmium for new PV panels.[29]

Similar to silicon-based PV panels, CdTe panels are constructed of a tempered glass front, one instead of two clear plastic encapsulation layers, and a rear heat strengthened glass backing (together >98% by weight). The final product is built to withstand exposure to the elements without significant damage for over 25 years. While not representative of damage that may occur in the field or even at a landfill, laboratory evidence has illustrated that when panels are ground into a fine powder, very acidic water is able to leach portions of the cadmium and tellurium,[30] similar to the process used to recycle CdTe panels. Like many silicon-based panels, CdTe panels are reported (as far back ask 1998[31]) to pass the EPA's Toxic Characteristic Leaching Procedure (TCLP) test, which tests the potential for crushed panels in a landfill to leach hazardous substances into groundwater.[32] Passing this test means that they are classified as non-hazardous waste and can be deposited in landfills.[33, 34] For more information about PV panel end-of-life, see the Panel Disposal section.

There is also concern of environmental impact resulting from potential catastrophic events involving CdTe PV panels. An analysis of worst-case scenarios for environmental impact from CdTe PV panels, including earthquakes, fires, and floods, was conducted by the University of Tokyo in 2013. After reviewing the extensive international body of research on CdTe PV technology, their report concluded, "Even in the worst-case scenarios, it is unlikely that the Cd concentrations in air and sea water will exceed the environmental regulation values."[35] In a worst-case scenario of damaged panels abandoned on the ground, insignificant amounts of cadmium will leach from the panels. This is because this scenario is

much less conducive (larger module pieces, less acidity) to leaching than the conditions of the EPA's TCLP test used to simulate landfill conditions, which CdTe panels pass.[36]

First Solar, a U.S. company, and the only significant supplier of CdTe panels, has a robust panel take-back and recycling program that has been operating commercially since 2005.[37] The company states that it is "committed to providing a commercially attractive recycling solution for photovoltaic (PV) power plant and module owners to help them meet their module (end of life) EOL obligation simply, cost-effectively and responsibly." First Solar global recycling services to their customers to collect and recycle panels once they reach the end of productive life whether due to age or damage. These recycling service agreements are structured to be financially attractive to both First Solar and the solar panel owner. For First Solar, the contract provides the company with an affordable source of raw materials needed for new panels and presumably a diminished risk of undesired release of Cd. The contract also benefits the solar panel owner by allowing them to avoid tipping fees at a waste disposal site. The legal contract helps provide peace of mind by ensuring compliance by both parties when considering the continuing trend of rising disposal costs and increasing regulatory requirements.

c. CIS/CIGS and other PV technologies

Copper indium gallium selenide PV technology, often referred to as CIGS, is the second most common type of thin-film PV panel but a distant second behind CdTe. CIGS cells are composed of a thin layer of copper, indium, gallium, and selenium on a glass or plastic backing. None of these elements are very toxic, although selenium is a regulated metal under the Federal Resource Conservation and Recovery Act (RCRA).[38] The cells often also have an extremely thin layer of cadmium sulfide that contains a tiny amount of cadmium, which is toxic. The promise of high efficiency CIGS panels drove heavy investment in this technology in the past. However, researchers have struggled to transfer high efficiency success in the lab to low-cost full-scale panels in the field.[39] Recently, a CIGS manufacturer based in Japan, Solar Frontier, has achieved some market success with a rigid, glass-faced CIGS module that competes with silicon panels. Solar Frontier produces the majority of CIS panels on the market today.[40] Notably, these panels are RoHS compliant,[41] thus meeting the rigorous toxicity standard adopted by the European Union even thought this directive exempts PV panels. The authors are unaware of any completed or proposed utility-scale system in North Carolina using CIS/CIGS panels.

1.3 Panel End-of-Life Management

Concerns about the volume, disposal, toxicity, and recycling of PV panels are addressed in this subsection. To put the volume of PV waste into perspective, consider that by 2050, when PV systems installed in 2020 will reach the end of their lives, it is estimated that the global annual PV panel waste tonnage will be 10% of the 2014 global e-waste tonnage.[42] In the U.S., end-of-life disposal of solar products is governed by the Federal Resource Conservation and Recovery Act (RCRA), as well as state policies in some situations. RCRA separates waste into hazardous (not accepted at ordinary landfill) and solid waste (generally accepted at ordinary landfill) based on a series of rules. According to RCRA, the way to determine if a PV panel is classified as hazardous waste is the Toxic Characteristic Leaching Procedure (TCLP) test. This EPA test is designed to simulate landfill disposal and determine the risk of hazardous substances leaching out of the landfill.[43, 44, 45] Multiple sources report that most modern PV panels (both crystalline silicon and cadmium telluride) pass the TCLP test.[46, 47] Some studies found that some older (1990s) crystalline silicon panels, and perhaps some newer crystalline silicon panels (specifics are not given about vintage of panels tested), do not pass the lead (Pb) leachate limits in the TCLP test.[48, 49]

The test begins with the crushing of a panel into centimeter-sized pieces. The pieces are then mixed in an acid bath. After tumbling for eighteen hours, the fluid is tested for forty hazardous substances that all must be below specific threshold levels to pass the test. Research comparing TCLP conditions to conditions of damaged panels in the field found that simulated landfill conditions provide overly conservative estimates of leaching for field-damaged panels.[50] Additionally, research in Japan has found no detectable Cd leaching from cracked CdTe panels when exposed to simulated acid rain.[51]

Although modern panels can generally be landfilled, they can also be recycled. Even though recent waste volume has not been adequate to support significant PV-specific recycling infrastructure, the existing recycling industry in North Carolina reports that it recycles much of the current small volume of broken PV panels. In an informal survey conducted by the NC Clean Energy Technology Center survey in early 2016, seven of the eight large active North Carolina utility-scale solar developers surveyed reported that they send damaged panels back to the manufacturer and/or to a local recycler. Only one developer reported sending damaged panels to the landfill.

The developers reported at that time that they are usually paid a small amount per panel by local recycling firms. In early 2017, a PV developer reported that a local recycler was charging a small fee per panel to recycle damaged PV panels. The local recycling firm known to authors to accept PV panels described their current PV panel recycling practice as of early 2016 as removing the aluminum frame for local recycling and removing the wire leads for local copper recycling. The remainder of the panel is sent to a facility for processing the non-metallic portions of crushed vehicles, referred to as "fluff" in the recycling industry.[52] This processing within existing general recycling plants allows for significant material recovery of major components, including glass which is 80% of the module weight, but at lower yields than PV-specific recycling plants. Notably almost half of the material value in a PV panel is in the few grams of silver contained in almost every PV panel produced today. In the long-term, dedicated PV panel recycling plants can increase treatment capacities and maximize revenues resulting in better output quality and the ability to recover a greater fraction of the useful materials.[53] PV-specific panel recycling technologies have been researched and implemented to some extent for the past decade, and have been shown to be able to recover over 95% of PV material (semiconductor) and over 90% of the glass in a PV panel.[54]

A look at global PV recycling trends hints at the future possibilities of the practice in our country. Europe installed MW-scale volumes of PV years before the U.S. In 2007, a public-private partnership between the European Union and the solar industry set up a voluntary collection and recycling system called PV CYCLE. This arrangement was later made mandatory under the EU's WEEE directive, a program for waste electrical and electronic equipment.[55] Its member companies (PV panel producers) fully finance the association. This makes it possible for end-users to return the member companies' defective panels for recycling at any of the over 300 collection points around Europe without added costs. Additionally, PV CYCLE will pick up batches of 40 or more used panels at no cost to the user. This arrangement has been very successful, collecting and recycling over 13,000 tons by the end of 2015.[56]

In 2012, the WEEE Directive added the end-of-life collection and recycling of PV panels to its scope.[57] This directive is based on the principle of extended-producer-responsibility. It has a global impact because producers that want to sell into the EU market are legally responsible for end-of-life management. Starting in 2018, this directive targets that 85% of PV products "put in the market" in Europe are recovered and 80% is prepared for reuse and recycling.

The success of the PV panel collection and recycling practices in Europe provides promise for the future of recycling in the U.S. In mid-2016, the US Solar Energy Industry Association (SEIA) announced that they are starting a national solar panel recycling program with the guidance and support of many

leading PV panel producers.[58] The program will aggregate the services offered by recycling vendors and PV manufacturers, which will make it easier for consumers to select a cost-effective and environmentally responsible end-of-life management solution for their PV products. According to SEIA, they are planning the program in an effort to make the entire industry landfill-free. In addition to the national recycling network program, the program will provide a portal for system owners and consumers with information on how to responsibly recycle their PV systems.

While a cautious approach toward the potential for negative environmental and/or health impacts from retired PV panels is fully warranted, this section has shown that the positive health impacts of reduced emissions from fossil fuel combustion from PV systems more than outweighs any potential risk. Testing shows that silicon and CdTe panels are both safe to dispose of in landfills, and are also safe in worst case conditions of abandonment or damage in a disaster. Additionally, analysis by local engineers has found that the current salvage value of the equipment in a utility scale PV facility generally exceeds general contractor estimates for the cost to remove the entire PV system.[59, 60, 61]

1.4 Non-Panel System Components (racking, wiring, inverter, transformer)

While previous toxicity subsections discussed PV panels, this subsection describes the non-panel components of utility-scale PV systems and investigates any potential public health and safety concerns. The most significant non-panel component of a ground-mounted PV system is the mounting structure of the rows of panels, commonly referred to as "racking". The vertical post portion of the racking is galvanized steel and the remaining above-ground racking components are either galvanized steel or aluminum, which are both extremely common and benign building materials. The inverters that make the solar generated electricity ready to send to the grid have weather-proof steel enclosures that protect the working components from the elements. The only fluids that they might contain are associated with their cooling systems, which are not unlike the cooling system in a computer. Many inverters today are RoHS compliant.

The electrical transformers (to boost the inverter output voltage to the voltage of the utility connection point) do contain a liquid cooling oil. However, the fluid used for that function is either a non-toxic mineral oil or a biodegradable non-toxic vegetable oil, such as BIOTEMP from ABB. These vegetable transformer oils have the additional advantage of being much less flammable than traditional mineral oils. Significant health hazards are associated with old transformers containing cooling oil with toxic PCBs. Transfers with PCB-containing oil were common before PCBs were outlawed in the U.S. in 1979. PCBs still exist in older transformers in the field across the country.

Other than a few utility research sites, there are no batteries on- or off-site associated with utility-scale solar energy facilities in North Carolina, avoiding any potential health or safety concerns related to battery technologies. However, as battery technologies continue to improve and prices continue to decline we are likely to start seeing some batteries at solar facilities. Lithium ion batteries currently dominate the world utility-scale battery market, which are not very toxic. No non-panel system components were found to pose any health or environmental dangers.

Operations and Maintenance – Panel Washing and Vegetation Control

Throughout the eastern U.S., the climate provides frequent and heavy enough rain to keep panels adequately clean. This dependable weather pattern eliminates the need to wash the panels on a regular basis. Some system owners may choose to wash panels as often as once a year to increase production, but most in N.C. do not regularly wash any PV panels. Dirt build up over time may justify panel washing a few times over the panels' lifetime; however, nothing more than soap and water are required for this activity.

The maintenance of ground-mounted PV facilities requires that vegetation be kept low, both for aesthetics and to avoid shading of the PV panels. Several approaches are used to maintain vegetation at NC solar facilities, including planting of limited-height species, mowing, weed-eating, herbicides, and grazing livestock (sheep). The following descriptions of vegetation maintenance practices are based on interviews with several solar developers as well as with three maintenance firms that together are contracted to maintain well over 100 of the solar facilities in N.C. The majority of solar facilities in North Carolina maintain vegetation primarily by mowing. Each row of panels has a single row of supports, allowing sickle mowers to mow under the panels. The sites usually require mowing about once a month during the growing season. Some sites employ sheep to graze the site, which greatly reduces the human effort required to maintain the vegetation and produces high quality lamb meat.[62]

In addition to mowing and weed eating, solar facilities often use some herbicides. Solar facilities generally do not spray herbicides over the entire acreage; rather they apply them only in strategic locations such as at the base of the perimeter fence, around exterior vegetative buffer, on interior dirt roads, and near the panel support posts. Also unlike many row crop operations, solar facilities generally use only general use herbicides, which are available over the counter, as opposed to restricted use herbicides commonly used in commercial agriculture that require a special restricted use license. The herbicides used at solar facilities are primarily 2-4-D and glyphosate (Round-up®), which are two of the most common herbicides used in lawns, parks, and agriculture across the country. One maintenance firm that was interviewed sprays the grass with a class of herbicide known as a growth regulator in order to slow the growth of grass so that mowing is only required twice a year. Growth regulators are commonly used on highway roadsides and golf courses for the same purpose. A commercial pesticide applicator license is required for anyone other than the landowner to apply herbicides, which helps ensure that all applicators are adequately educated about proper herbicide use and application. The license must be renewed annually and requires passing of a certification exam appropriate to the area in which the applicator wishes to work. Based on the limited data available, it appears that solar facilities in N.C. generally use significantly less herbicides per acre than most commercial agriculture or lawn maintenance services.

Electromagnetic Fields (EMF)

PV systems do not emit any material during their operation; however, they do generate electromagnetic fields (EMF), sometimes referred to as radiation. EMF produced by electricity is non-ionizing radiation, meaning the radiation has enough energy to move atoms in a molecule around (experienced as heat), but not enough energy to remove electrons from an atom or molecule (ionize) or to damage DNA. As shown below, modern humans are all exposed to EMF throughout our daily lives without negative health impact. Someone outside of the fenced perimeter of a solar facility is not exposed to significant EMF from the solar facility. Therefore, there is no negative health impact from the EMF

produced in a solar farm. The following paragraphs provide some additional background and detail to support this conclusion.

Since the 1970s, some have expressed concern over potential health consequences of EMF from electricity, but no studies have ever shown this EMF to cause health problems.[63] These concerns are based on some epidemiological studies that found a slight increase in childhood leukemia associated with average exposure to residential power-frequency magnetic fields above 0.3 to 0.4 μT (microteslas) (equal to 3.0 to 4.0 mG (milligauss)). μT and mG are both units used to measure magnetic field strength. For comparison, the average exposure for people in the U.S. is one mG or 0.1 μT, with about 1% of the population with an average exposure in excess of 0.4 μT (or 4 mG).[64] These epidemiological studies, which found an association but not a causal relationship, led the World Health Organization's International Agency for Research on Cancer (IARC) to classify ELF magnetic fields as "possibly carcinogenic to humans". Coffee also has this classification. This classification means there is limited evidence but not enough evidence to designate as either a "probable carcinogen" or "human carcinogen". Overall, there is very little concern that ELF EMF damages public health. The only concern that does exist is for long-term exposure above 0.4 μT (4 mG) that may have some connection to increased cases of childhood leukemia. In 1997, the National Academies of Science were directed by Congress to examine this concern and concluded:

> "Based on a comprehensive evaluation of published studies relating to the effects of power-frequency electric and magnetic fields on cells, tissues, and organisms (including humans), the conclusion of the committee is that the current body of evidence does not show that exposure to these fields presents a human-health hazard. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects."[65]

There are two aspects to electromagnetic fields, an electric field and a magnetic field. The electric field is generated by voltage and the magnetic field is generated by electric current, i.e., moving electrons. A task group of scientific experts convened by the World Health Organization (WHO) in 2005 concluded that there were no substantive health issues related to *electric* fields (0 to 100,000 Hz) at levels generally encountered by members of the public.[66] The relatively low voltages in a solar facility and the fact that electric fields are easily shielded (i.e., blocked) by common materials, such as plastic, metal, or soil means that there is no concern of negative health impacts from the electric fields generated by a solar facility. Thus, the remainder of this section addresses magnetic fields. Magnetic fields are not shielded by most common materials and thus can easily pass through them. Both types of fields are strongest close to the source of electric generation and weaken quickly with distance from the source.

The direct current (DC) electricity produced by PV panels produce stationary (0 Hz) electric and magnetic fields. Because of minimal concern about potential risks of stationary fields, little scientific research has examined stationary fields' impact on human health.[67] In even the largest PV facilities, the DC voltages and currents are not very high. One can illustrate the weakness of the EMF generated by a PV panel by placing a compass on an operating solar panel and observing that the needle still points north.

While the electricity throughout the majority of a solar site is DC electricity, the inverters convert this DC electricity to alternating current (AC) electricity matching the 60 Hz frequency of the grid. Therefore, the inverters and the wires delivering this power to the grid are producing non-stationary EMF, known as extremely low frequency (ELF) EMF, normally oscillating with a frequency of 60 Hz. This frequency is at the low-energy end of the electromagnetic spectrum. Therefore, it has less energy than

other commonly encountered types of non-ionizing radiation like radio waves, infrared radiation, and visible light.

The wide use of electricity results in background levels of ELF EMFs in nearly all locations where people spend time – homes, workplaces, schools, cars, the supermarket, etc. A person's average exposure depends upon the sources they encounter, how close they are to them, and the amount of time they spend there.[68] As stated above, the average exposure to magnetic fields in the U.S. is estimated to be around one mG or 0.1 μT, but can vary considerably depending on a person's exposure to EMF from electrical devices and wiring.[69] At times we are often exposed to much higher ELF magnetic fields, for example when standing three feet from a refrigerator the ELF magnetic field is 6 mG and when standing three feet from a microwave oven the field is about 50 mG.[70] The strength of these fields diminish quickly with distance from the source, but when surrounded by electricity in our homes and other buildings moving away from one source moves you closer to another. However, unless you are inside of the fence at a utility-scale solar facility or electrical substation it is impossible to get very close to the EMF sources. Because of this, EMF levels at the fence of electrical substations containing high voltages and currents are considered "generally negligible".[71, 72]

The strength of ELF-EMF present at the perimeter of a solar facility or near a PV system in a commercial or residential building is significantly lower than the typical American's average EMF exposure.[73, 74] Researchers in Massachusetts measured magnetic fields at PV projects and found the magnetic fields dropped to very low levels of 0.5 mG or less, and in many cases to less than background levels (0.2 mG), at distances of no more than nine feet from the residential inverters and 150 feet from the utility-scale inverters.[75] Even when measured within a few feet of the utility-scale inverter, the ELF magnetic fields were well below the International Commission on Non-Ionizing Radiation Protection's recommended magnetic field level exposure limit for the general public of 2,000 mG.[76] It is typical that utility scale designs locate large inverters central to the PV panels that feed them because this minimizes the length of wire required and shields neighbors from the sound of the inverter's cooling fans. Thus, it is rare for a large PV inverter to be within 150 feet of the project's security fence.

Anyone relying on a medical device such as pacemaker or other implanted device to maintain proper heart rhythm may have concern about the potential for a solar project to interfere with the operation of his or her device. However, there is no reason for concern because the EMF outside of the solar facility's fence is less than 1/1000 of the level at which manufacturers test for ELF EMF interference, which is 1,000 mG.[77] Manufacturers of potentially affected implanted devices often provide advice on electromagnetic interference that includes avoiding letting the implanted device get too close to certain sources of fields such as some household appliances, some walkie-talkies, and similar transmitting devices. Some manufacturers' literature does not mention high-voltage power lines, some say that exposure in public areas should not give interference, and some advise not spending extended periods of time close to power lines.[78]

Electric Shock and Arc Flash Hazards

There is a real danger of electric shock to anyone entering any of the electrical cabinets such as combiner boxes, disconnect switches, inverters, or transformers; or otherwise coming in contact with voltages over 50 Volts.[79] Another electrical hazard is an arc flash, which is an explosion of energy that can occur in a short circuit situation. This explosive release of energy causes a flash of heat and a shockwave, both of which can cause serious injury or death. Properly trained and equipped technicians and electricians know how to safely install, test, and repair PV systems, but there is always some risk of

injury when hazardous voltages and/or currents are present. Untrained individuals should not attempt to inspect, test, or repair any aspect of a PV system due to the potential for injury or death due to electric shock and arc flash, The National Electric Code (NEC) requires appropriate levels of warning signs on all electrical components based on the level of danger determined by the voltages and current potentials. The national electric code also requires the site to be secured from unauthorized visitors with either a six-foot chain link fence with three strands of barbed wire or an eight-foot fence, both with adequate hazard warning signs.

Fire Safety

The possibility of fires resulting from or intensified by PV systems may trigger concern among the general public as well as among firefighters. However, concern over solar fire hazards should be limited because only a small portion of materials in the panels are flammable, and those components cannot self-support a significant fire. Flammable components of PV panels include the thin layers of polymer encapsulates surrounding the PV cells, polymer backsheets (framed panels only), plastic junction boxes on rear of panel, and insulation on wiring. The rest of the panel is composed of non-flammable components, notably including one or two layers of protective glass that make up over three quarters of the panel's weight.

Heat from a small flame is not adequate to ignite a PV panel, but heat from a more intense fire or energy from an electrical fault can ignite a PV panel.[80] One real-world example of this occurred during July 2015 in an arid area of California. Three acres of grass under a thin film PV facility burned without igniting the panels mounted on fixed-tilt racks just above the grass.[81] While it is possible for electrical faults in PV systems on homes or commercial buildings to start a fire, this is extremely rare.[82] Improving understanding of the PV-specific risks, safer system designs, and updated fire-related codes and standards will continue to reduce the risk of fire caused by PV systems.

PV systems on buildings can affect firefighters in two primary ways, 1) impact their methods of fighting the fire, and 2) pose safety hazard to the firefighters. One of the most important techniques that firefighters use to suppress fire is ventilation of a building's roof. This technique allows superheated toxic gases to quickly exit the building. By doing so, the firefighters gain easier and safer access to the building, Ventilation of the roof also makes the challenge of putting out the fire easier. However, the placement of rooftop PV panels may interfere with ventilating the roof by limiting access to desired venting locations.

New solar-specific building code requirements are working to minimize these concerns. Also, the latest National Electric Code has added requirements that make it easier for first responders to safely and effectively turn off a PV system. Concern for firefighting a building with PV can be reduced with proper fire fighter training, system design, and installation. Numerous organizations have studied fire fighter safety related to PV. Many organizations have published valuable guides and training programs. Some notable examples are listed below.

- The International Association of Fire Fighters (IAFF) and International Renewable Energy Council (IREC) partnered to create an online training course that is far beyond the PowerPoint click-and-view model. The self-paced online course, "Solar PV Safety for Fire Fighters," features rich video content and simulated environments so fire fighters can practice the knowledge they've learned. www.iaff.org/pvsafetytraining
- Photovoltaic Systems and the Fire Code: Office of NC Fire Marshal
- Fire Service Training, Underwriter's Laboratory

- Firefighter Safety and Response for Solar Power Systems, National Fire Protection Research Foundation
- Bridging the Gap: Fire Safety & Green Buildings, National Association of State Fire Marshalls
- Guidelines for Fire Safety Elements of Solar Photovoltaic Systems, Orange County Fire Chiefs Association
- Solar Photovoltaic Installation Guidelines, California Department of Forestry & Fire Protection, Office of the State Fire Marshall
- PV Safety & Firefighting, Matthew Paiss, Homepower Magazine
- PV Safety and Code Development: Matthew Paiss, Cooperative Research Network

Summary

The purpose of this paper is to address and alleviate concerns of public health and safety for utility-scale solar PV projects. Concerns of public health and safety were divided and discussed in the four following sections: (1) Toxicity, (2) Electromagnetic Fields, (3) Electric Shock and Arc Flash, and (4) Fire. In each of these sections, the negative health and safety impacts of utility-scale PV development were shown to be negligible, while the public health and safety benefits of installing these facilities are significant and far outweigh any negative impacts.

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NC CLEAN ENERGY TECHNOLOGY CENTER

Certificate of Compliance

Certificate: 70116160 **Master Contract:** 253758

Project: 80003926 **Date Issued:** 2019-05-13

Issued to: SUNGROW POWER SUPPLY CO., LTD.
No. 1699 Xiyou Rd,
New & High Technology
Industrial Dev Zone
Hefei, 230088
CHINA

Attention: Sen Chen

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.

C US

Issued by: Allen Yao
Allen Yao

PRODUCTS

CLASS - C531109 - POWER SUPPLIES - Distributed Generation Power Systems Equipment
CLASS - C531189 - POWER SUPPLIES - Distributed Generation Power Systems Equipment - Certified to U.S. Standards

Transformerless Grid Support Utility Interactive Inverter, Model SG125HV and SG125HV-20, permanently connected.

For details related to rating, size, configuration, etc., reference should be made to the CSA Certification Record, Certificate of Compliance Annex A, or the Descriptive Report.

APPLICABLE REQUIREMENTS

CSA C22.2 No. 107.1-16 - General Use Power Supplies
*UL1741 - Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources (Second Edition, Revision February 15, 2018)
*Note: Conformity to UL 1741 (Second Edition, Revision February15, 2018) includes compliance with applicable requirements of IEEE 1547-2003 (R2008), IEEE 1547.1-2005(R2011), California Rule 21 and Supplement SA.

Supplement to Certificate of Compliance

Certificate: 70116160 **Master Contract:** 253758

The products listed, including the latest revision described below, are eligible to be marked in accordance with the referenced Certificate.

Product Certification History

Project	Date	Description
80003926	2019-05-13	Update to 70116160 to verify grid support function.
70213849	2019-02-22	Update to 70116160 to add grid support function Frequency-Watt and Voltage-Watt.
70201636	2019-02-01	Update Report 70116160 to add new model SG125HV-20, add new alternate components for model SG125HV and SG125HV-20; Delate AFD function for model SG125HV and SG125HV-20 (including AFD Board). Update operating temperature to -30˚C to 60˚C;
70177241	2018-08-28	Update Report 70116160 to update ARC fault detection.
70146372	2017-07-07	Update Report 70116160 to update grid support function and update user manual.
70116160	2017-03-13	Transformerless Utility Interactive Inverter, Model SG125HV, permanently connected.(C/US)

All information is Tentative

Stem, Inc.
890-076, Specification, Samsung E3 Battery, E3 2P276S_V01, PS 8.2.1
Rev 01.00

Battery System Specification

Battery System Specification E3,2P276S V0.1

Customer	
PJT Name	
Battery Platform	E3
Series	2P276S
Parallel	
Bank	
Revision	0.1
Date	2019-04-09

ESS Business Division, Samsung SDI

1. Introduction

Samsung SDI is pleased to propose Samsung battery specification to XXX in response to the yyy project

This battery specification ('specification' hereinafter) has been preraped to specifiy the Samsung battery energy storage system which is consisted with safety proven Samsung Lithium ion battery cell.

Samsung SDI, established in 1970, officially launched its lithium ion battery business in 2000, initially manufacturing and providing batteries to electronics industry. Samsung SDI is headquartered in Gi-heung, South Korea and operates nine production sites in six countries, 11 global sales offices, and four R&D centers.

Over the last few years Samsung SDI has established itself as the #1 Li-ion battery energy storage system providers around the world especially by expanding presence of utility scale track records.

The battery energy storage system architecture described in this proposal is based on leading-edge, safety-proven Samsung SDI lithium–ion battery technology. We believe that Samsung SDI can strongly support the goals of this project.

We appreciate your considering our proposal and look forward to discussing any comments or questions that the customer may have.

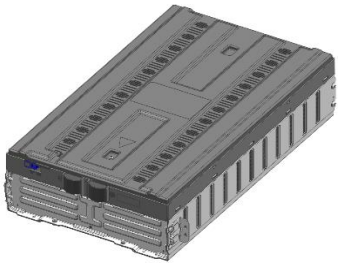
2. Battery system proposal

2.1 Module

Samsung SDI's energy storage systems employ a hierarchical modular design which allows for customized configurations, ease of maintenance, and future expansion capability. Modules, the basic building block of Samsung SDI ESS, are formed by configuring 2P12S of SDI's NCM cells.

Module is connected with a battery management system (BMS) to form a rack mountable module assembly. Multiple module assemblies are then combined into a rack. Each rack contains rack-level BMS.

[Table 1. Module specification]

Image	Parameter		Specification
 2P12S Module	Configuration		E3, 2P12S
	Applied cell type		Prismatic, 100Ah
	Dimension [mm]		370 x 637 x160
	Weight [Kg]		57
	Typ. Energy [KWh]*		8.832
	Operation Voltage range	Max [V]	49.80 V
		TYP [V]	44.16 V
		Min [V]	38.40 V
	Max Power [CP rate]	Continuous	0.5
		Peak (CHG)	-
		Peak (DCHG)	-
	Recommended charging method	Method	CC-CV
		Voltage limit [V]	49.8V
		Current [A]	66A
		End condition	6A
	Recommended discharging method	Method	CC
		Current [A]	66A
		End condition	38.4V

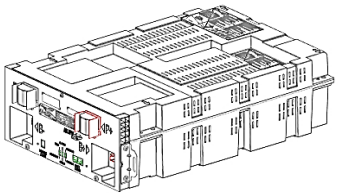
* Typical energy : Measured dischargeable energy by following a method of Samsung recommended procedure.

2.2 Switchgear

Rack BMS, which is equipped in switchgear, has full function of measuring whole voltages and current for all cells in the RACK. It can protect batteries according to its own algorithm. Rack SOC and SOH are also automatically calculated and updated very precisely by Rack BMS.

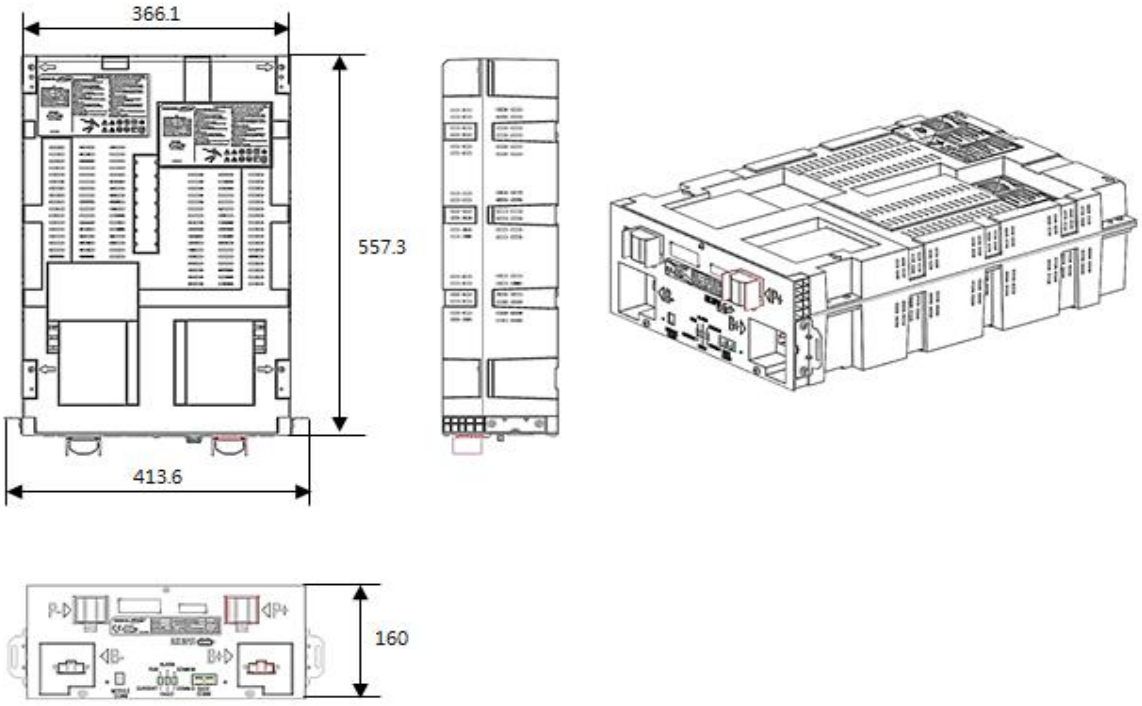
Among many functions, (+) and (-) poles are controlled separately with dedicated DC contactors. For safety, each string has serially connected fuse, which has enough margin over operating range and fast fusing characteristic for safety. Automatic rack balancing function allows convenience of maintenance. This function is different from pre-charge function for charging up capacitors in PCS.

[Table 2. Switchgear specification]

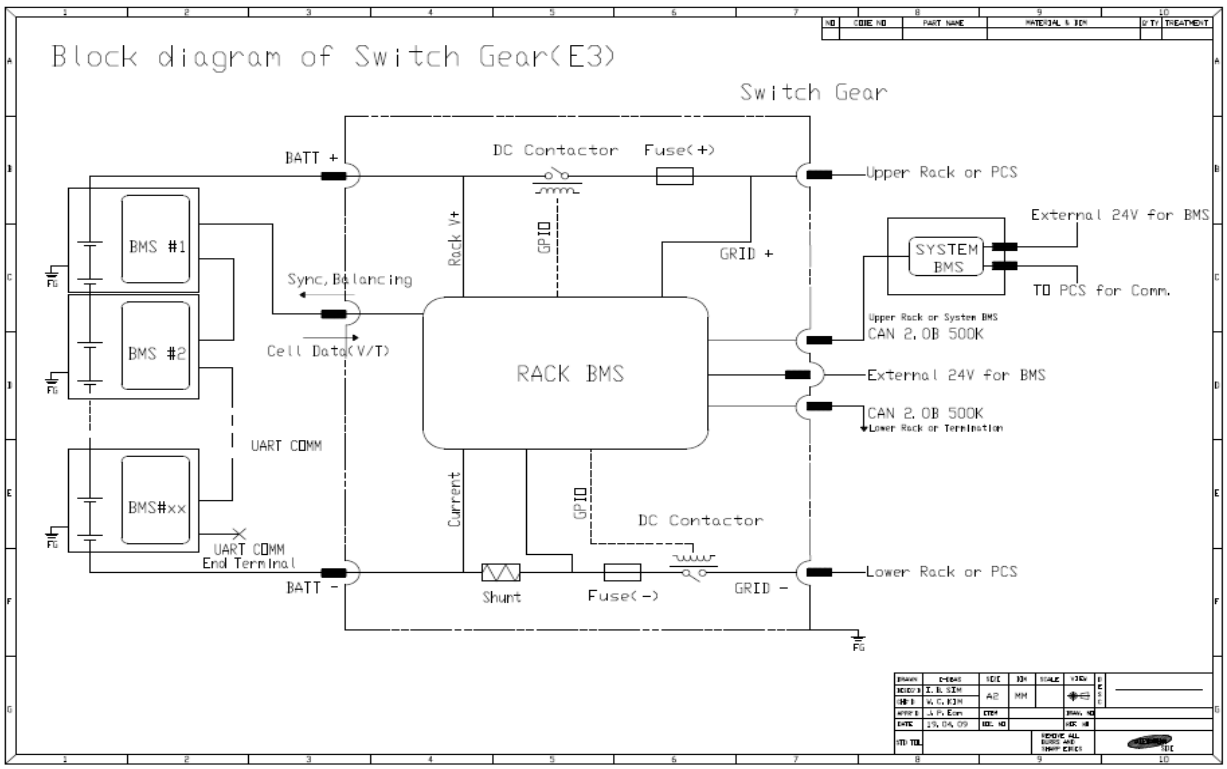
Image	Parameter		Specification
	Type		E3
	Dimension		413.6 x 557.3 x 160
	Coverage		1 String
	Key component	Rack BMS	1
		DC Contactor	2
		DC Fuse	2
		V, I Sensing	YES
	Power consumption*	Input voltage	24Vdc ± 5%
		Aux A (BMS)	13 / 70 (Max)
		Aux B (FAN)	-
	Electrical rating	Voltage	1500V
		Current	180A
	Communication	to Module	UART
		to System BMS	CAN 2.0B

* 20% of operation margin is required to operate reliably.
* Rrequired power is calculated under supplying 24Vdc external aux power.
* If system BMS installed in Switchgear, 2.4W have to be added into the Max power of Aux A.

[Figure 3. Switchgear drawing]



[Figure 4. Switchgear electrical drawing]

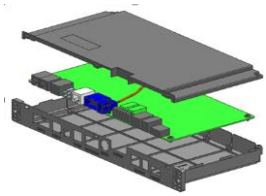


2.3 System BMS

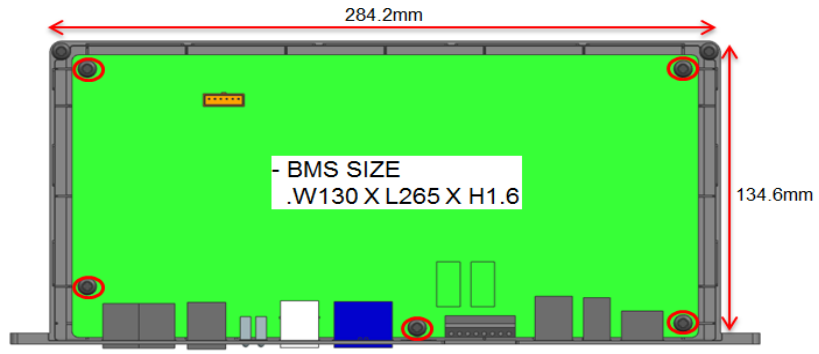
The system BMS assembly provides data to the PCS (or EMS) while controlling and monitoring multiple racks up to 128 through MODBUS TCP/IP or MODBUS RTU.

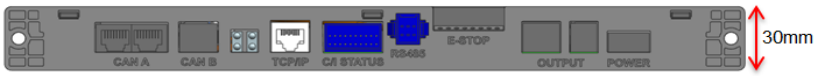
System BMS will be installed inside of the last Rack frame

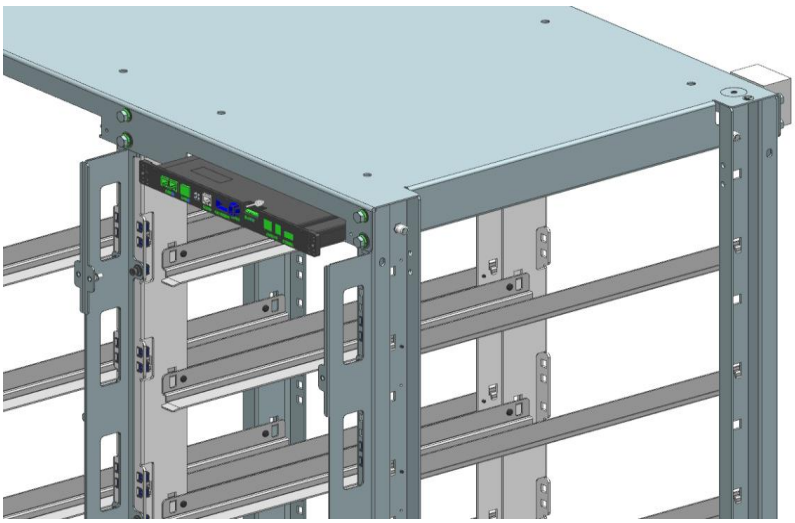
[Table 3. System BMS specification]

Image	Parameter		Specification
	key component		System BMS
	Dimension [mm]		134.6 x 284.2 x 30
	Communication	To Rack	CAN 2.0B
		To EMS	MODBUS TCP/IP
	Aux power consumption		2.4W / 12W (Max)

[Figure 5. System BMS drawing]







2.4 Rack frame

Samsung SDI's unit Rack frame has 24 slots to accommodate configuring 2P276S

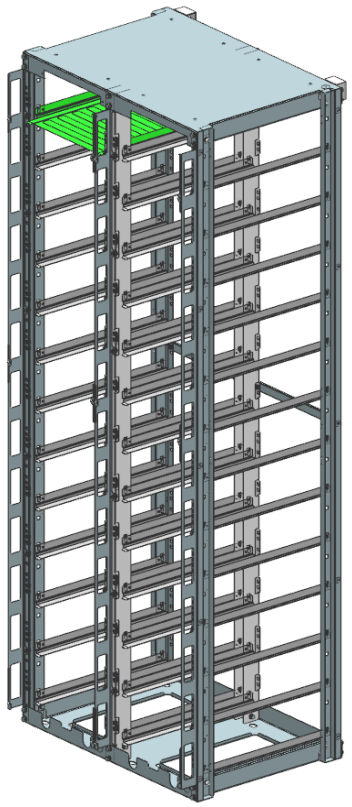
Racks are connected in parallel and paired with a system BMS to meet the power and energy requirements of the application at hand.
All wire connections are placed on the front side of the rack to allow for easy installation and maintenance.

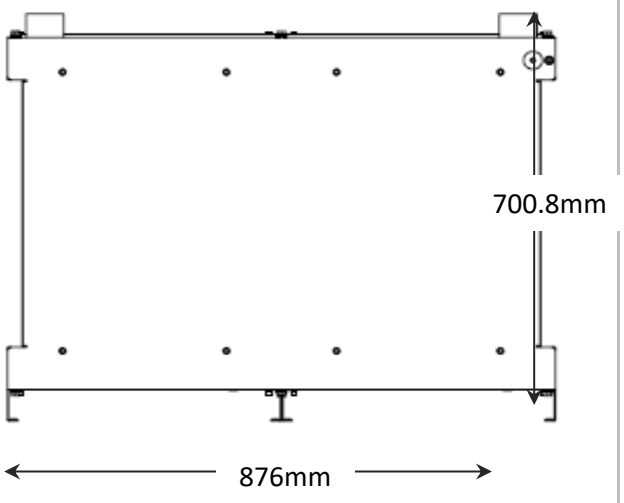
[Table 4. Rack frame spcification]

Parameter	Specification
Number of slot	24
Foot print [mm]	876.0 x 700.8
Height [mm]	2121.9
Weight [Kg]	96
Material	SGHC
Seismic category	None

[Figure 6. Rack frame image]

Rack frame





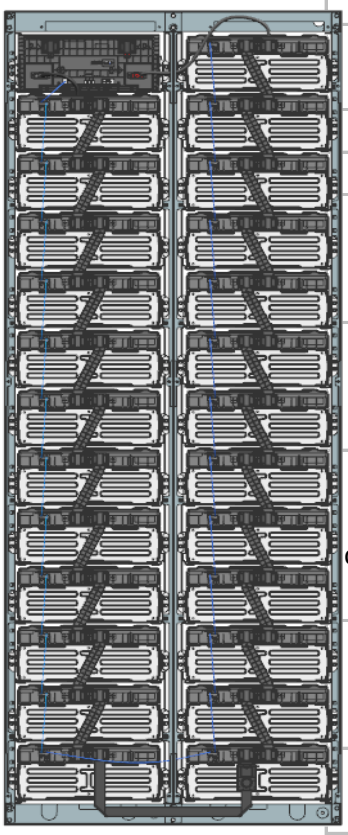
2.5 Rack

Battery Rack is the minimum operation level of Samsung battery system and it is configured with stacked module in series, controlling switchgear, rack frame and accessary cables.

Samsung have adopted modular design concept, the battery operation voltage range can be easily adjusted by changing the number of module in series and battery capacity can be expanded by just connecting battery racks in parallel.

In addition, Samsung design all maintenance and installation task can perform in front face All maintenance and operation will perform at the front side of Rack.

[Table 5. Rack specification]

Image	Parameter		Specification
	Configuration		E3, 2P276S
	Number of module		23
	Dimension [mm]	Foot print [mm]	876.0 x 700.8
		Height [mm]	2121.9
	Weight [Kg]		1420
	Typical Energy [KWh]*		203.136
	Operation Voltage range	Max [V]	1145.4
		TYP [V]	1015.68
		Min [V]	883.2
	Max Power [KW]	Continuous	101.568
		Peak (CHG)	-
		Peak (DCHG)	-
	Recommended charging method	Method	CC-CV or CP-CV
		Volt limit [V]	1145.4V
		Current [A]	66A
		End condition	6A or SOC100%
	Recommended discharging method	Method	CC or CP
		Current [A]	66A
		End condition	883.2Vor SOC0%
	Aux power consumption**	Aux A (BMS)	13 / 70 (Max)
		Aux B (FAN)	-
	Expected fault current [KA]		10.8
	Switchgear position		Top

* Typical energy : Measured dischargeable energy by following a method of Samsung recommended procedure
** 20% of operation margin is required to operate reliably
** All required wattage is calculated under supplying 24Vdc external aux power.

2.6 Battery system specification

Battery system is configured by connecting battery rack parallel to have a target energy capacity

[Table 6. Battery system specification]

Parameter		Specification		
		Bank	Total	Comment
Configuration				
Number of module per string		23	23	
Number of string				
Number of system BMS				
Typ. Energy [KWh]				
Operation Voltage range	Max [V]	1145.4	1145.4	
	TYP [V]	1015.68	1015.68	
	Min [V]	883.2	883.2	
Max Power [CP rate]	Continuous			
	Peak (CHG)*	-	-	
	Peak (DCHG)*	-	-	
Recommended charging method	Method	CC-CV or CP-CV	CC-CV or CP-CV	
	Volt limit [V]	1145.4V	1145.4V	
	Current [A]			
	End condition			
Recommended discharging method	Method	CC or CP	CC or CP	
	Current [A]			
	End condition	883.2V	883.2V	or SOC0%
Aux power consumption**	Aux A (Typ)			
	Aux A (Max)			
	Aux B (FAN)	-	-	

[Table 7. Certification list]

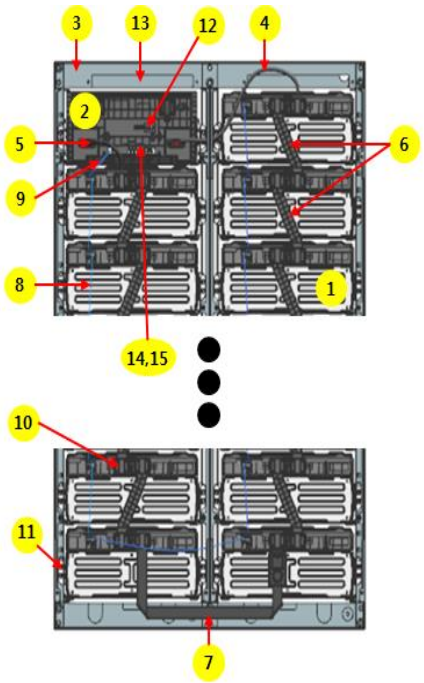
Category	Subcategory		Comment
Cell	Safety	UL1642	
Pack	UL	UL1973	
	CE	IEC62619	Complied, Sub-clause 8.1
		IEC62477	Complied, Sub-clause 5
	EMC	IEC61000-6-2	
		IEC61000-6-4	
	Transportation	UN38.3	

[Table 8. Environment condition]

Parameter			Specification	Comment
Operation	Temperature [℃]	Set point*	23	Set point & ambient temp of battery room.
		Variation	±5	Instantaneous variation
		Uniformity	less than 5	Max and Min Temp difference in single string
	Humidity		Less than 80%	Not condensed
Storage	Temperature		5 to 28 (0 to 40 for S/G)	Unless specify in warranty and life simulation
	Humidity		Less than 80%	Not condensed
Environment	Altitude		Less than 2000m	
	Seiemic		NA	

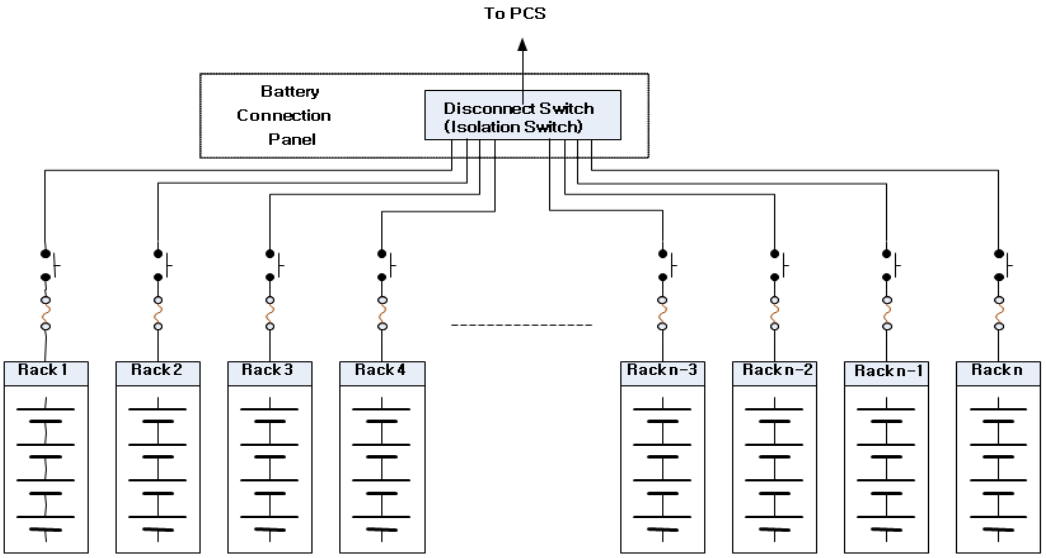
* The customer have to be control the ambient battery room temperature (daily average temperature) to meet set point unless specify different number in warranty document.

[Table 9. Supplied part list] (TBD)

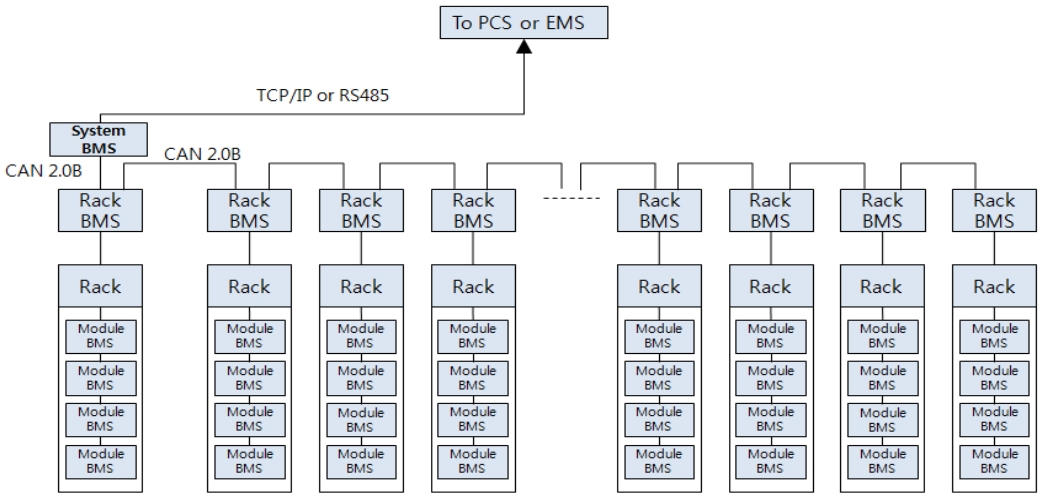
Image	No	Category	Description	Supplied
 TBD	1	Module	2P12S Module	Y
	2	Switchgear	Switchgear	Y
	3	Rack frame	Rack frame (Single, Double)	Y
	4	Power cable	Module to SG(+)	Y
	5		Module to SG(-)	Y
	6		Module to module	Y
	7		Module to module(Rack)	Y
	8	Comm. Cable	Module to Module	Y
	9		Module to SG	Y
	10	Bolt	Power cable fixation	Y
	11		Module, SG fixation	Y
	12	Aux cable	20m, Aux Power IN	Y
	13	System BMS	System BMS	Y
	14	Comm. Cable	Between SG	Y
	15		CAN terminal Resistor	Y
	16	Installation Accessaries	Power cable to PCS	N
			Comm cable to PCS	N
			Inter Rack frame fixation	N
			Rack frame fixation	N
			GND cable and related	N

* Other

2.7 General block diagram of battery system



2.8 Communication block diagram



2.9 BMS functionality

Further extending Samsung SDI's commitment to safety, ESS employs a sophisticated, multilevel battery management system (BMS) for system monitoring and control. At the lower level is the Module BMS, which is designed to detect voltage, temperature and execute cell balance functions for each individual cell

The rack BMS can manage Max 25 module BMS units and detects total voltage, current, and executes protection functions by switching its own DC-contactor.

Finally, a system level or master BMS manages rack BMS units and communicates with PCS. The table below outlines BMS units of the system.

[Table 10. BMS functionality]

		Module BMS	Rack BMS	System BMS
Measurement	Rack voltage		O	
	Rack current		O	
	Cell voltage	O		
	Cell temperature	O		
Calculation	SOC calculation		O	O
	SOH calculation		O	O
	Power prediction		O	O
Control	Contactor control		O	
	Cell balancing	O	O	
	System control			O
Communication	UART	O	O	
	CAN 2.0B		O	O
	MODBUS TCP/IP			O

3. Battery placement concept drawing

To be determine

4. Battery life simulation

To be determine

To be determine

[Appendix. Must know for safe operation of battery system]

For the safe usage of battery product, all users have to be read and understand manual, description of safety mark prior to access the battery system, otherwise it have to be prohibited to handling the battery system

Mis-handling precaution

In case dropping or shocked to the battery module, the battery module has to be removed from the battery systems and move to the safe place.

a) The battery module need to be observed carefully in safe place more than 20 min whether the module produce abnormal smoke, smell or heating. If smoke, smell or heating is happened dispose the battery module following 10. Issues on battery module
b) Measure the module voltage and insulation resistance with wearing level 1 of PPE. If voltage or insulation resistance is not normal, mark the contents on top of module and packaging box.
c) The module cannot use again. Contact to Samsung engineer

Access in module

While connecting and after installation the module, Samsung recommends that only authorized personnel with good understanding of the total battery system can access the system. The access to the battery system during normal operation is to be restricted.

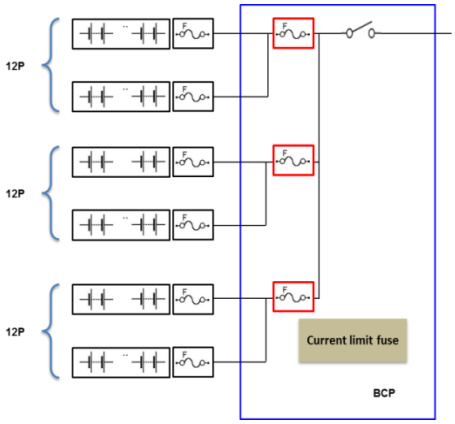
The voltage of battery system is above 1000Vdc and the resistance of the connected battery system is extremely low for better efficiency, the battery system can therefore generate high arc energy. Therefore wearing proper Personal Protective Equipment (PPE) is mandatory.

Before accessing to the battery system, all users have to understand safety instructions. Please be aware that the battery system cannot be shut down completely, so it takes always care to arc flash hazard during accessing battery system.

Parallel connection

In general case, the unit racks are connected in parallel to the grid, in order to meet the power and energy requirement. However each rack can produce huge amount of fault current due to extremly lower impedance of battery system, the amount of fault current distribution have to be considered before installation.

In order to reduce the risk from the high fault current,
Samsung recommend
1) Install MCCB and DC fuses between Battery Rack and PCS.
2) MCCB and DC fuses have to have an enough fault current capability
3) Fuses have to install at least every group of 12 battery racks



Required action when "system stop" bit is set

Samsung battery system provide enhanced system stop function to have reinforced overall battery safety. This function sometimes conflict with partial operation scheme so it may decrease overall system availability rate. However this function can protect the battery system from the failure which may lead to critical event. Therefore it is mandatory to follow the below guideline when this system stop bit is set.

1. Where is system stop bit

Modbus TCP/IP, Register 30031 (0x001E) bit 11 - More detail, please refer MODBUS protocol
Note. System stop bit are not commands that are automatically sent to EMS. EMS should read the bit information periodically

2. When system stop bit is set

One of below conditions are occurred, then System BMS set "system stop bit" to 1

1) The number of operable racks are less than pre-defined Rack number.
2) E-stop signal was received from SPD or surge monitor device
3) Critical faults are happened in battery rack
   - Cell undervoltage protection && Over temperature protection
   - Cell voltage imbalance protection && Over temperature protection
   - PCB Over temperature protection
   - Both DC contactors are permanent ON and cannot be control anymore

3. Further action from system BMS after setting system stop bit

When system stop bit was set, system BMS act following below procedure.

1) System BMS changes CCL / DCL to 0
2) Monitor Rack current flowing
3) If the current = 0, System BMS turns off all Rack's DC contactors.
4) If the current ≠ 0, System BMS waits another 10 sec, then turns off all DC contactors.

* Remark : Turning OFF DC contactor under load condition may give critical failure to the DC contactor itself. Therefore it is mandatory to stop PCS operation when PCS receive the hard-wired signal from SPD.

4. Action required to PCS (or EMS)

If this system stop bit was set, PCS shall stop charge and discharge immediately.
Otherwise DC contactor may damaged critically and it may lead to exchange all DC contactor and DC fuses

Operation guide

Battery system generally operates as passive system which means the battery system does not control the current flow actively before reaching the serious conditions. Therefore PCS (or EMS) have to be monitor and control the battery and all environmental condition carefully to keep the battery system in the best conditions. If the PCS (or EMS) cannot control battery system properly, the battery system can goes into the abnormal situation and it can lead to faster life degradation and battery can be irreversible damages. In order to prevent such a worst situation, each rack equips safety function consisted with BMS, DC contactors and fuses, BMS send an alarm to PCS under the situation and trip the battery system under the worse situation by itself.
In order to prevent the battery damages from abnormal situation, the following items shall be checked during installation and operation carefully.

When BMS report alarm or protection bit, then it is recommended to stop operating and check the battery system. After checking, the system can be restarted.

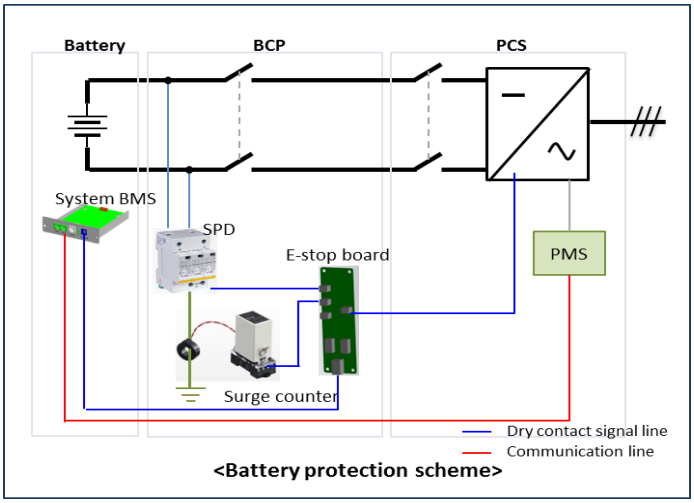
Battery grounding requirement

The each Rack frame has to have separate grounding from the PCS system in order to prevent malfunction or battery damages from the spike noise comes from GND line.

[Recommendation]
Battery rack frame ground are seperate from PCS (and other switching devices) ground

Surge protection

In order to prevent battery damages from the external high surge voltage, it is strongly recommended to install surge protection device (SPD) and surge monitoring devices in DC side of PCS. Otherwise, the customer have to control the surge not only DC line but also GND line less than 1500V at any condition
It is also be recommended sending a signal from SPD, Surge monitoring devices to System BMS by hard-wired signal, then the battery system can be protected more safely



<Battery protection scheme>

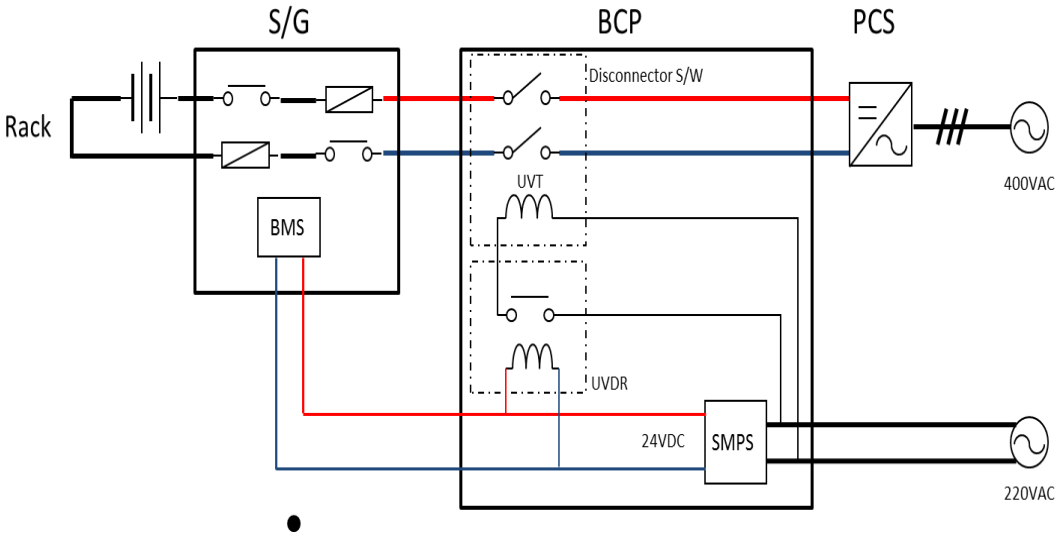
All information is Tentative

Seamless 24V Aux power supply

Samsung SDI battery system requires external 24V power supply for BMS and FAN operation. The auxiliary power consumption is specified in Watts [W] in the below table

DC contactors open when no 24V aux power is available regardless loading condition. If the 220V power (to 24V) fails during charging and discharging, DC contactor might be destroyed due to breaking force of load condition. Therefore it is critical to the battery system seamless supplying 24V aux power to each rack.

[Recommendation]
a) Separate SMPS units are required for supplying BMS AUX power and FAN power
For example, SMPS A supply BMS power and SMPS B supply FAN power
b) It is recommended to use multiple units of small SMPS rather than one high capacity SMPS
For example, install 5 SMPS units for 30Racks. Each SMPS cover 6 Racks.
c) UPS system needs to be installed to supply BMS aux power.
d) Installing under voltage trip (UVT) devices in BCP, and as a result the MCCB in BCP will cut off the current before happening DC contactor open sequence in battery system



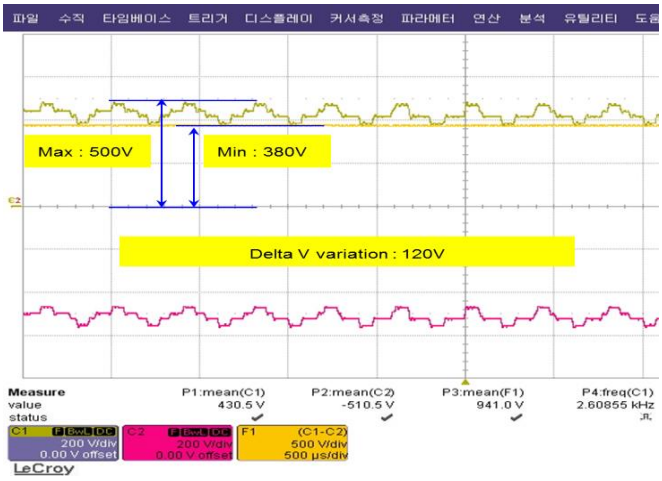
Common mode voltage control

In order to secure the battery operation reliably the battery GND have to be stable and it can be detected by measuring the voltage difference between the battery DC terminal and GND. The common mode voltage is important not only reliable operation but also battery safety. If the CMV is too high, the isolation of battery module can be broken and it cause safety risk as well. In addition this CMV can be varied depends on operating condition and period. Therefore it needs to be checked regularly.

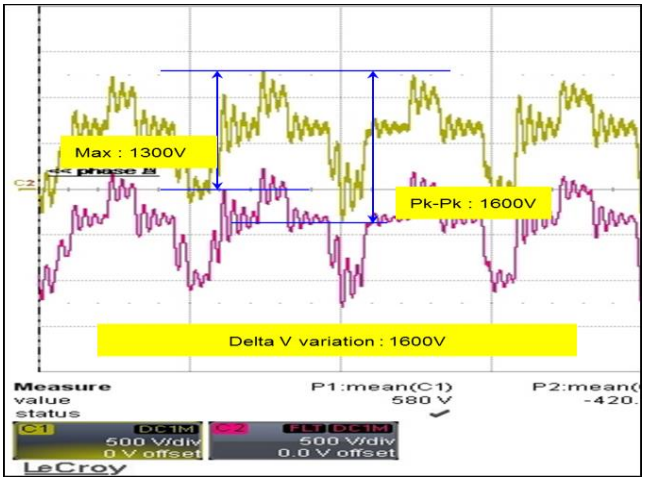
[Recommend criteria]
- The peak voltage shall be less than 800V
- Peak to Peak shall be less than 300V

[How to reduce CMV]
- Concrete battery frame GND and it have to be separated with PCS
- Well synchronized operation of PCS, Etc.

[Desirable CMV Scheme]



[Avoid CMV scheme]



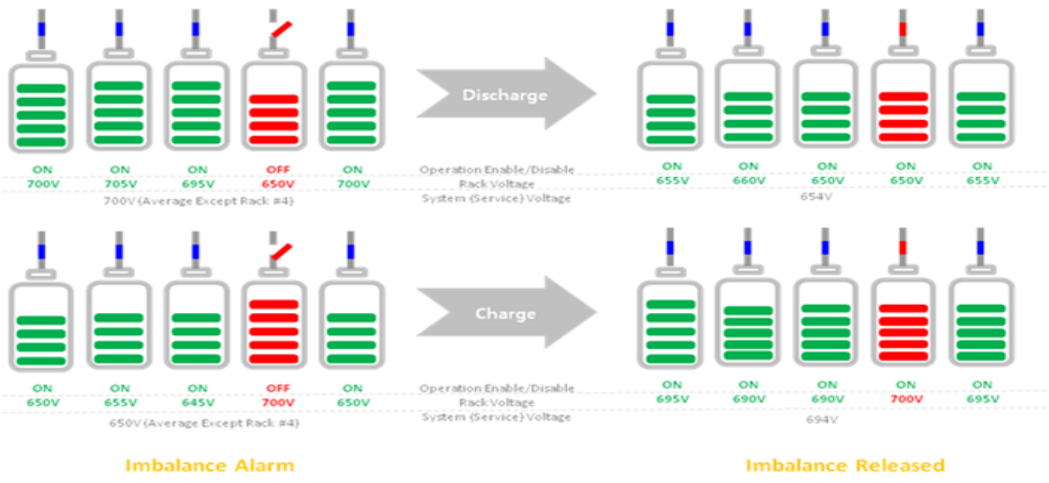
Understand about partial operation

SDI battery system can be temporarily operated in Partial Operation mode. The partial operation functionality enables to maintain the availability ratio by preventing the need to stop all the system when only some of racks become out of order. For example, 5 racks of 13 racks become out of order, 8 battery racks are still able to operate rather than stop whole battery system.

This functionality is designed for helping seamless operation with reduced power in the case when some battery racks are out of order but the battery system should not be operated with partial racks continuously. Operating under the Partial Operation mode can expose the still active racks to higher C-rate than the expected nominal load profile. As a result the battery life degradation can be accelerated. Therefore in order to prevent such unexpected battery degradation, customer shall report to and consult with Samsung SDI within 1 week in such occurrence

Note. Partial operation functionality is a feature for temporary use only to mitigate the loss of revenue by the customer. The battery system shall be rapidly checked and fixed for resuming normal operation. It is required to contact SAMSUNG SDI CS as soon as possible when there is protection in any racks

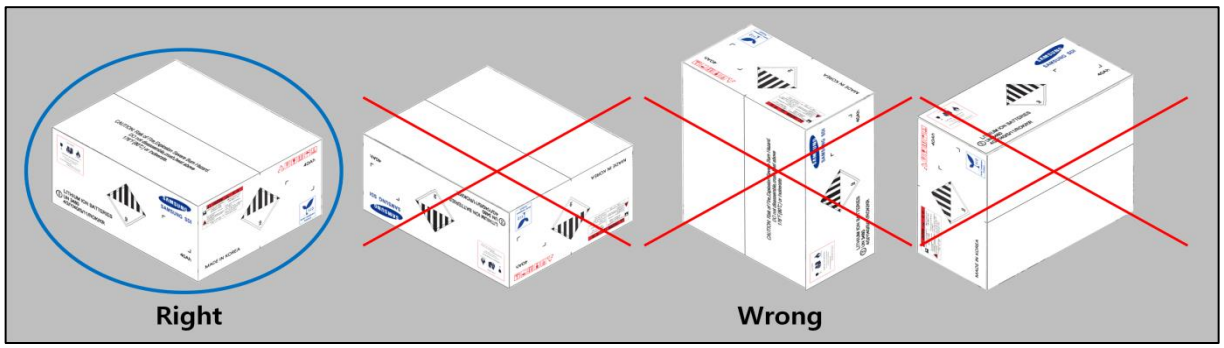
The general control principles of the Partial Operation Mode are:
- The system BMS will not command to close the DC contactors of any rack showing a higher than normal voltage imbalance (Differential Voltage set parameter) with the other racks on the same DC bus
- The system BMS will report an “Imbalance Stop” alarm word to the PCS (or EMS) in the case when the number of racks which are inactive (because of their voltage imbalance, or because in fault protection) exceeds the set limit.
- In case of “Imbalance Stop” when the battery system is running, the PCS shall shut-down the battery system. If “Imbalance Stop” is set, the battery system will be stop operation (turn off all DC contactors) within 10 sec regardless current flowing. It can negative effect on DC contactor’s durability and it may lead to critical safety issues.
- In case of “Imbalance Stop” the System BMS will not apply any All Contactor ON (close) command received from the PCS.



Handling instruction

Unloading and Unpacking
Carefully remove the plastic cover from the pallet. The packages are situated on a pallet on which it can be transported via forklift from location to location.
A damaged box or rattles during transport may indicate rough handling. Make a descriptive notation on the delivery receipt before signing. If damage is found, request an inspection by the carrier and file a damage claim. Pay particular attention to a damaged crate or staining from electrolyte or other fluids. Delay in notifying carrier may result in the loss of reimbursement for damages.

Storage
Follow the guidelines below when storing boxed Battery Trays. The Battery Tray box should be upright as in Figure below. Do not place upside down when storing the Battery Tray box.



When the battery system needs to be stored, it is recommended to follow below condition to reduce the battery degradation and keep battery system in reliable.

[Environment condition]
- The battery system possible to store the temperature range of Store the battery system -20 to 60degC without warranty
- However it is required to store the battery system less than 23degC to secure the warranty requirement.
- 0~80% Humidity condition is required and any moisture condensing in/outside of battery module is not allowed.

[SOC condition]
- Less than SOC 20% is recommended to store. The OCV of battery module need to be monitored every 6 months, and if the OCV is lower than the threshold, the battery module need to be re-charged for further storage.

Platform	Energy	Medium	Power
Re-charge threshold	3.474/Cell	3.45V/Cell	3.417/Cell
Charge up to	3.594/Cell	3.58V/Cell	3.577/Cell

SG125HV

String Inverter for 1500 Vdc System

SUNGROW
Clean power for all

HIGH YIELD

- Patented five-level topology, max. efficiency 98.9 %, European efficiency 98.7 %, CEC efficiency 98.5 %
- Full power operation without derating at 50 ℃
- Patented anti-PID function

EASY O&M

- Virtual central solution, easy for O&M
- Compact design and light weight for easy installation

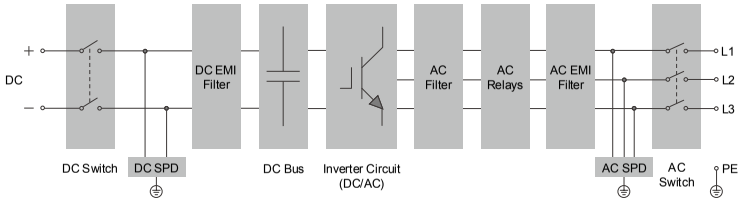
SAVED INVESTMENT

- DC 1500V,AC 600V, low system initial investment
- 1 to 5MW power block design for lower AC transformer and labor cost
- Max.DC/AC ratio up to 1.5

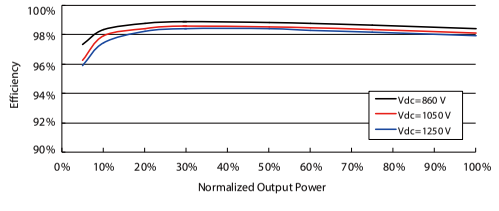
GRID SUPPORT

- Compliance with both IEC and UL safety,EMC and grid support regulations
- Low/High voltage ride through(L/HVRT)
- Active & reactive power control and power ramp rate control

CIRCUIT DIAGRAM



EFFICIENCY CURVE



Type designation	SG125HV
Input (DC)	
Max. PV input voltage	1500 V
Min. PV input voltage / Start-up input voltage	860 V / 920 V
Nominal PV input voltage	1050 V
MPP voltage range	860 – 1450 V
MPP voltage range for nominal power	860 – 1250 V
No. of independent MPP inputs	1
No. of DC inputs	1
Max. PV input current	148 A
Max. DC short-circuit current	240 A
Output (AC)	
AC output power	125 kVA @ 50 ℃
Max. AC output current	120 A
Nominal AC voltage	3 / PE, 600 V
AC voltage range	480 – 690 V
Nominal grid frequency / Grid frequency range	50 Hz / 45 – 55 Hz, 60 Hz / 55 – 65 Hz
THD	< 3 % (at nominal power)
DC current injection	< 0.5 % In
Power factor at nominal power / Adjustable power factor	> 0.99 / 0.8 leading - 0.8 lagging
Feed-in phases / connection phases	3 / 3
Efficiency	
Max. efficiency / European efficiency	98.9% / 98.7%
CEC efficiency	98.5%
Protection	
DC reverse connection protection	Yes
AC short-circuit protection	Yes
Leakage current protection	Yes
Grid monitoring	Yes
DC switch	Yes
AC switch	Yes
Q at night function	optional
Anti-PID function	Yes
Overvoltage protection	DC Type II / AC Type II
General Data	
Dimensions (W*H*D)	670*902*296 mm 26.4''*35.5''*11.7''
Weight	76 kg 167.5 lb
Isolation method	Transformerless
Degree of protection	IP 65 NEMA 4X
Night power consumption	< 4 W
Operating ambient temperature range	-25 to 60 ℃ (> 50 ℃ derating) -13 to 140 ℉ (> 122 ℉ derating)
Allowable relative humidity range (non-condensing)	0 – 100 %
Cooling method	Smart forced air cooling
Max. operating altitude	4000 m (> 3000 m derating) 13123 ft (> 9843 ft derating)
Display / Communication	LED, Bluetooth+APP / RS485
DC connection type	OT or DT terminal (Max. 185 mm² 350 Kcmil)
AC connection type	OT or DT terminal (Max. 185 mm² 350 Kcmil)
Compliance	UL1741, UL1741SA, IEEE1547, IEEE1547.1, CSA C22.2 107.1-01-2001, FCC Part15 Sub-part B Class A Limits, California Rule 21, IEC 62109-1/-2, IEC 61000-6-2/-4, IEC 61727, IEC62116, BDEW, UNE 206007-1:2013, P.O.12.3, UTE C15-712-1:2013, CEI 0-16:2017, IEC 61683, PEA, NTCO
Grid Support	Q at night function (optional), LVRT, HVRT, ZVRT, active & reactive power regulation, PF control, soft start/stop
Type designation	SG125HV-20

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Version 0 :

Fire Fighting & Safety Handling Guide for First Responder

SAMSUNG SDI ESS System

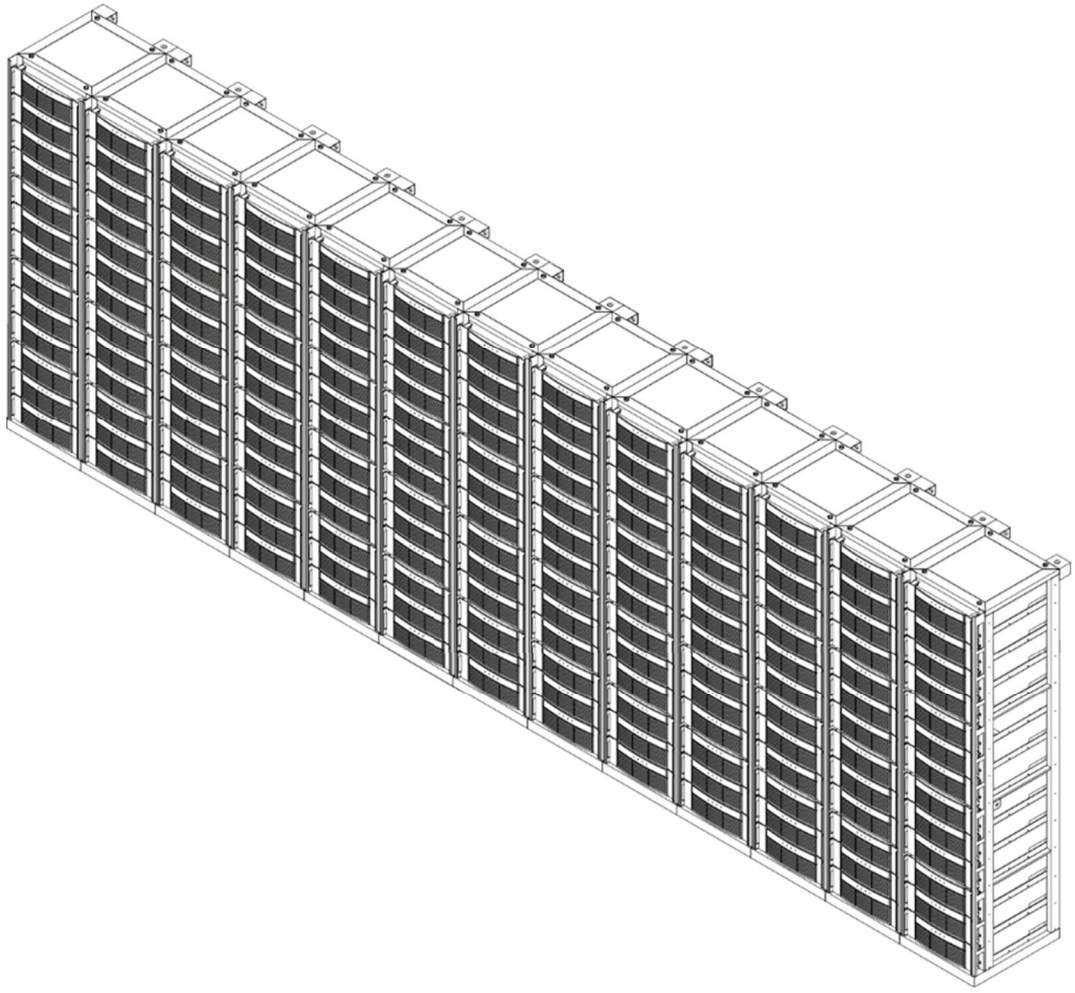
Release Date : 2019-03-12

Index

1. Introduction

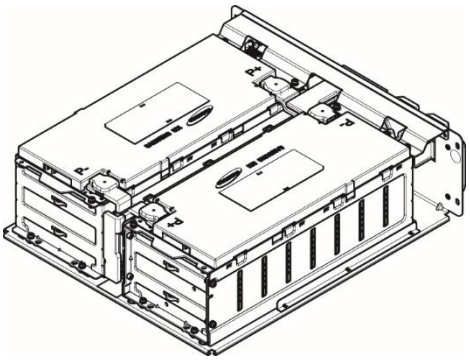
This guide is the manual for the first responder to handle the SAMSUNG SDI ESS. SAMSUNG ESS has demonstrated an excellent safety record with proper handling but in case of accident, this guide suggests the handling method.

When installed properly the system will looks like the below figure.



The ESS system consists of trays and other parts. Trays are the packed battery made of cells. Other parts are relatively safer than battery. However the lithium

ion cells inside the battery can be a big threat in case of fire. One tray looks like the below figure. The cell is inside battery.



There are several hazards that ESS fire can cause. This guide handles not only direct danger of fire but also several other dangers that can happen from fire like gas, electric shock, etc.

For the person who discover the accident at first but is not a first responder, do not make any dangerous action. Call the responsible person and move away from the system.

We recommend to keep a Class D extinguisher near the ESS system for emergency as normal extinguisher like CO2, ABC class is not efficient for lithium ion battery fire.

2. Basic information

A. ESS consists of lithium ion batteries(trays), cables, and several other electrical devices. The main potential of hazards comes from lithium ion batteries. The

lithium battery has more energy density than the previous generation batteries but this advantage makes the potential hazards more severe. One should be aware that even if the fire is off, still there is a possibility of later fire from self-reaction in the overheated battery and keep the alert.

B. There are three main hazards from the lithium ion batteries. (Battery in the later part of this manual means the lithium ion battery unless notified otherwise.) One is from the electrical shock that a person is exposed to short circuit unintended, second is from the fire when a battery burns, and third is the toxic chemical gas & liquid from battery contents. When there is a fire in the battery, one should be aware that there is a hidden hazard of toxic gas, liquid and electrical short.

C. To prevent the potential hazard from toxic gas when there is fire or explosion on the battery, the first responder should work with proper equipment. The full-face SCBA(Self-Contained Breathing apparatus) and personal protective equipment is required.

D. To prevent the potential hazard of electrical shock from short circuit when there is fire or explosion on the battery, the first responder should use the proper equipment to keep protection from electrical shock. It is better to assume that there can be a hidden electrical hazard unless the safety is ensured. When there is any hazard, cut off the power to battery if possible without a risk after wearing proper safety equipment to provide the

insulation to the human body. However, even if the power is turned off, the battery can sustain a short circuit when there is damage to the battery product. So the first responder should check the leakage of electric power from battery and wear proper protection device.

E. Fire can be very severe hazards when it is on the batteries (cell/tray). When fire is on the other parts of ESS except trays & cells, normal extinguisher can be used.(lie ABC, CO2). However, normal extinguisher (ABC, CO2, etc…) is not enough to extinguish the fire from the battery. The lithium ion battery keeps fire from internal chemical reaction once it breaks the limit point. Class D extinguisher is most efficient for the first reaction. **We recommend to keep a Class D extinguisher near the ESS system for emergency.** In case of class D extinguisher is not supplied enough, continuous supply of large amounts of water is final way to cool down the burning battery. But this can cause the short circuit so that one must use the proper equipment to keep from electrical shock.

F. There is a risk of the battery re-igniting after the fire is extinguished. Always advise the second responders (law enforcement, tow personnel) to check the temperature and visual status of battery before any working. After the battery product has been involved in a submersion, fire, or a collision that has compromised the high voltage battery, always keep the product in safe place and remove other flammable materials near it.

G. The electrolyte in the battery is toxic and harmful to human's skin and body. If there is anyone who are exposed to the gas or the liquid, move the man to the outer place and call the medical service.

H. In all cases, turn off the system by shut down the MCCB if one can access to the MCCB without danger. This will prevent the cascading of hazards.

3. Handling method of hazards related to hot cells

i. Minimum Equipment Required

1. Infrared temperature probe
2. Safety glasses
3. Helmet with impact resistant face shield
4. Non-conductive extended pliers

ii. Basic Action

1. There is the over temperature protection that stops the system in the SAMSUNG battery if the cell goes over 65℃. But in case of some accident when this protection does not work, or protection fails to stop the over heat of cells, so that the cell goes over 65℃, this is hot cell hazard. As soon as it is known that a hot cell situation exists, completely evacuate all personnel from the area.

The area should be secured such that no unnecessary persons enter. There is the possibility that hot cells explode or start to fire.

2. If the person who first noticed the hot cell has an ability to check the system and the situation, he should turn off the system using the MCCB (even if the protection automatically stops the system, still turn off the system manually for ensuring the safety). And then he should check the presence of an external short circuit and remove it as soon as possible. Otherwise, the first responder should do this work.
3. After the short has been removed, the cell should start to cool. However the area should remain evacuated until the cell has cooled to room temperature and has been removed from the area. The temperature of the cell should be monitored periodically with a remote sensing device such as an infrared temperature sensor. If the hot cell situation persists, then the following course of action can be considered.

iii. Procedure

• As soon as a hot cell (cell over 65°C) is detected, completely evacuate the area of all personnel.

• Turn off the system using the MCCB.

• Periodically monitor the temperature of the cell with the remote probe for the first two hours or until one of the three following

situations occurs:

- the cell starts to cool;

- the cell vents; or

- the cell explodes.

• If the cell starts to cool, monitor its temperature once an hour until it returns to ambient temperature.

• If remote temperature sensing equipment is not available, do not handle the cell for a period of 24 hours.

• Remove the cell from the work area once it has cooled and return to normal operations.

• Dispose of the cell in accordance with local, state and federal hazardous waste regulations.

• Procedures for handling cells that continue to heat and, resultantly, either vent or explode will be addressed in next section.

4. Handling method of hazards of cells/trays that have vented

A. Minimum Equipment Required

i. A Class D fire extinguisher

ii. Eye protection or face shield

iii. Respirator suitable for toxic vapors

iv. Neoprene rubber gloves

v. Lab coat or chemically resistant apron

vi. Bicarbonate of soda (baking soda), calcium oxide (lime) –or acid spill clean up kit

vii. Vermiculite, 3M Power Sorb (universal absorbent material),

viii. Speedy-Dry (clay absorbent)

ix. Individual thick plastic bags with sealing mechanism

B. Basic information

All lithium batteries are hermetically sealed in a case. A seal is used as an electrical feed through for the positive terminal. Under normal operating conditions, a cell will not leak or vent. However, cell leakage or venting could occur if the cell or tray(pack) is overheated or the glass seal is compromised by excessive physical abuse.

The severity of a vent condition can range from a slight leak around the glass-to-metal seal to a violent expulsion of material through the seal, thereby causing the cell to become a projectile. The electrolyte contained within the lithium cells/trays can cause severe irritation to the respiratory tract, eyes. In addition, violent cell/tray venting could result in a room full of either corrosive or flammable vapors.

The first responder should take all precautions and wear proper devices like SCBA to limit exposure to the electrolyte vapor.

C. Procedure

• Evacuate personnel from all areas which are affected by the gas.

• Turn off the system using the MCCB

• Ventilation should be initiated and continued until after the cell is removed from the area and the pungent odor is no longer detectable.

• If the cell/tray vented as a result of excessive heating, it must be allowed to cool to ambient temperature before handling. (Refer to hot cell procedure in section 4.1)

• Put on lab coat, rubber gloves, safety glasses and respirator. Remove the cell/tray to a well ventilated area.

• Place each leaking cell in a separate, sealable plastic bag. Eliminate excess air and seal the bag.

• Place one cup of vermiculite or other absorbent material in a second bag along with the first bag. Eliminate excess air and seal.

• Place the double-bagged cell in a third bag containing approximately one cup of lime or baking soda. Seal the bag.

• Absorb and/or neutralize spilled electrolyte with an absorbent material or baking soda.

• Sweep contaminated baking soda or absorbent material into a sealable plastic bag for disposal.

• Clean the area with copious amounts of water or ammonia based cleaner.

• Dispose of the vented cell and contaminated absorbent material in accordance with local, state and federal hazardous waste disposal regulations.

5. First Aid Method in case of contact with electrolyte
    a. EYES -- Immediately flush eyes with a direct stream of water for at least 15 minutes while forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissue. GET IMMEDIATE MEDICAL ATTENTION.
    b. SKIN -- Flush with cool water or get under a shower, remove contaminated garments. Continue to flush for at least 15 minutes. Get medical attention, if necessary.
    c. INHALATION -- Move to fresh air. If breathing is difficult have trained person administer oxygen. If respiration stops, give mouth-to mouth resuscitation. GET MEDICAL ATTENTION IMMEDIATELY

6. Handling method of CELLS/TRAYS THAT HAVE EXPLODED
    A. Minimum Equipment Required
        • A Class D fire extinguisher
        • ABC Class fire extinguisher (for possible secondary fires)
        • Respirator suitable for toxic vapors
        • Anti fire cloth

• Eye protection or face shield

• Rubber gloves, lab coat or chemically resistant apron

• Bicarbonate of soda or calcium oxide (lime) –or acid spill clean up kit (J.T. Baker Co.)

• Vermiculite, 3M Power Sorb (universal absorbent material), Speedy-Dry (clay absorbent)

• Individual thick plastic bags with sealing mechanism, glass jars.

B. Basic information

Electrochemical cells in the trays have the highest energy density of any commercial lithium battery on the market. It is the combination of high voltage and capacity, coupled with light weight, that makes our cells attractive for many specialty applications. However, when a large amount of energy is contained in a small package, the results can be energetic if the system is abused.

It is unlikely that any lithium battery would involuntarily explode. These events are rare and are usually the result of an abusive condition that raises the cell's temperature above its critical point. However, in the event of a lithium battery explosion, a room could fill quickly with dense white smoke which could cause severe irritation to the respiratory tract, eyes and skin. All precautions must be taken to limit exposure to these fumes.

C. Procedure

• Evacuate personnel from all areas which are affected by the smoke.

• Shut down all the related power system such as circuit breaker, PV system, charger, etc.

• Ventilation should be initiated and continued until after the cell is removed from the area and the pungent odor is no longer detectable.

• Although this scenario is unlikely, should there be a fire resulting from an explosion, methods for dealing with this contingency are addressed in next section about fire handling.

• The exploded cell may be hot. It must be allowed to cool to ambient temperature before handling. (See hot cell procedures)

• Put on a lab coat, rubber gloves, safety glasses and respirator.

• Anti fire cloth is not needed right now but be aware of fire after explosion

• If a cell explodes the surrounding area may be covered with black carbonaceous material along with metal parts from the cell. Cover the black carbonaceous material with a 50/50 mixture of baking soda (or lime) with vermiculite or other universal absorbent material.

• Sweep the contaminated baking soda/vermiculite mixture into a sealable plastic bag. Gather in such a way as to avoid excessive dust. Metal parts can also be included in this container. Note:

Metal fragments should never be packaged with live cells. This could cause

the cell to become shorted.

• Seal the plastic bags in a glass jar and dispose of contents in accordance with local, state and federal hazardous waste disposal regulations.

• Clean the area with copious amounts of a baking soda/water solution, or an ammonia-based cleaner. Follow with soapy water.

7. Handling method of FIRES INVOLVING LITHIUM BATTERIES

WARNING : DO NOT USE ABC OR CO2 TYPE EXTINGUISHERS ON LITHIUM BATTERY(cells/trays) FIRES. USE class D extinguishers.

They can be used for the fire on other parts except battery to prevent fire cascading but not proper the battery fire.

A. Basic information

All metals will burn under proper conditions depending on such factors as physical form, oxidizing atmosphere, and severity of the ignition source. Alkali metals such as lithium will burn in a normal atmosphere.

It should also be noted that lithium in the battery reacts explosively with water to form hydrogen. The presence of minute amounts of water may ignite the material and the hydrogen gas.

Once ignited, a metal fire is difficult to extinguish with ordinary means like ABC or CO2 class extinguishers.

This is due to the intense heat produced by the burning metal, the temperature of which may reach as high as 3000°F.

Specially formulated extinguishing agents are required to control or put out a lithium fire. In particular, a graphite based extinguisher class D (Lith-x) should be used. These agents function generally by forming a layer or crust of material over the burning metal, thereby excluding air that is required to sustain combustion. Lith-x, which is a popularly used graphite based agent, may be applied from an class D extinguisher or by shoveling the loose powder onto the fire.

In the event of a lithium battery fire, a room could become filled with dense white smoke, mostly comprised of lithium oxide and/or other metal oxides.

This condition could cause severe irritation to the respiratory tract, eyes and skin. All precautions must be taken to limit exposure to these fumes.

It should also be noted that the following procedures are only applicable to fires involving a few cells in the battery. Larger fires involving multiple cells should be handled by professionally trained people and usually only be extinguished by the large amount of continuous water supply which gives up the system to prevent the fire

cascading into near buildings.

In addition, it is electrochemical practice to use an extinguishing agent best suited to quench the bulk of the fuel available. For example, if a single cell were to start burning during a destructive analysis a class D lith-x extinguisher would be used to quench the fire. If other combustibles catch fire as result of the lithium battery then use the appropriate extinguishing agent to douse these secondary fires. A BC type or CO2 extinguisher could be used on solvent/electrical fires or a general purpose ABC type could be used on all combustible materials. It is important to address each type of fire with the appropriate extinguisher.

In case of large fires on several cells which makes it impractical to use class D extinguisher enough, usage of large amount of water is a final option to cool down the other materials so that the fire does not grow up. However, one should be aware that there can be a potential hazard of electrical shock in water and this will result heavy damage on the system.

B. Minimum Equipment Required

- A Class D fire extinguisher (Lith-x)
- An ABC class fire extinguisher (for possible secondary fires not for cell/tray fire)

• Self-contained breathing apparatus

• Full fire-fighting protective clothing

• Heat resistant gloves

• Goggles or safety glasses

• Non-conductive extended pliers

• Shovel, mineral oil

B. Procedure

1. Initial Response

• In order to respond adequately to any emergency situation a primary response team should be established. After training in safety and handling procedures, along with first aid and fire fighting methods, the primary response team will be able to respond to situations involving lithium batteries.

• When a fire is detected the first action is to completely evacuate all personnel from the area and sound the fire alarm immediately.

• Turn off all related system if one can access the MCCB/switch without danger.

• The primary response team is paged to the area where the fire is located. The team is informed of any pertinent information regarding the situation by the person who reported the fire.

• Quarantine the area. Ventilation should be initiated and continued until the burning material is removed from the area and the pungent odor is no

longer detectable.

• Two members of the team will then enter the area with the appropriate fire-fighting and safety equipment.

NOTE: Lithium in the battery melts at 180°C. It becomes highly reactive and when ignited, lithium fires can throw off molten lithium metal particles.

Furthermore, cells adjacent to any burning material could overheat causing a violent explosion. Fire-fighting teams must be made aware of any hazardous materials in the vicinity of the fire.

• Completely bury the burning material with Lith-x to extinguish the fire. Never leave the fire unattended because it may reignite.

• If necessary, attend to any secondary fires with the appropriate extinguishing agent.

• After all material has apparently burned and cooled, carefully turn over the remaining residue and be prepared to extinguish, should recognize occur.

• Carefully place the residue in a steel drum using a long-handled shovel, and cover with excess Lith-x. The residue may contain unreacted lithium, therefore limit exposure to moisture. This can be accomplished by covering the residue with mineral oil.

2. Clean-up

• A lab coat, rubber gloves, safety glasses or goggles and respirator

should be worn during cleanup.

• The surrounding area may be covered with black carbonaceous material along with metal parts from the cell. Cover the black carbonaceous material with a 50/50 mixture of baking soda (or lime) with vermiculite. A wet sweeping compound may also be used to avoid dust. Nonetheless, gather the material in such a way as to avoid excessive dust.

• Sweep the contaminated baking soda/vermiculite mixture into a sealable plastic bag. Metal parts can also be included in this container.

• Seal the plastic bags in a glass jar or other suitable container.

• Clean the area with copious amounts of a baking soda/water solution, or an ammonia-based cleaner. Follow with soapy water.

• Dispose of all materials in accordance with local, state and federal hazardous waste disposal regulations.

Contact Point

(Please change as convenient)

SDI America

Craig M. Miesse, Ph.D.

Director of Engineering

3655 North First Street

San Jose, CA 95134

+1-408-406-8788

10. NOTIFICATIN INFORMATION

a. **COPY OF CERTIFIED ABUTTERS LIST**

b. **ABUTTER NOTIFICATION**

c. **AFFIDAVIT OF SERVICE**

BOARD OF ASSESSORS
TOWN OF HAMPDEN
625 Main Street
Hampden, MA 01036

Kelly McCormick, Principal Assessor MAA
Jane Ferrentino, Associate Assessor MAA
Phone: (413) 566-2151 ext.106

CERTIFIED LIST OF ABUTTERS

SUBJECT PROPERTY MAP, BLOCK + LOT	LOCATION OF SUBJECT PROPERTY	OWNERS AND MAILING ADDRESSES
29-16-5	Glendale Rd	Jonathan Guinipero and Stateline Property Management LLC 530 Glendale Rd Hampden, MA 01036

PLEASE SEE ATTACHED LIST OF ABUTTERS

Per the Assessors records I certify that the attached lists of persons are the abutters of record for the subject property within 300 feet of the outer perimeter.

To the best of our knowledge, this list represents the most current owners of the properties. The accuracy of this listing is based solely on the information currently available in our database.

8/7/23
Date

Kelly McCormick
Kelly McCormick, MAA Principal Assessor
Town of Hampden

RECEIVED
JUL 24 2023
HAMPDEN BOARD OF ASSESSORS

BOARD OF ASSESSORS
TOWN OF HAMPDEN

625 Main Street
Hampden, MA 01036

Norman Charest, Chairman
Robert Makuch, Assessor
Jason Barroso, Assessor

Kelly McCormick, Principal Assessor MAA
Jane Ferrentino, Associate Assessor MAA
Phone: (413) 566-2151 ext.106

REQUEST FOR CERTIFIED ABUTTERS LIST

FEE SCHEDULE

Certified Abutters List	**$35.00***

*Subject to additional fee of $1.00 per abutter if over 20 abutters.
(Administrative fee of $17.50 will apply if request is cancelled.)

Requested by Jonathan Guinipero Date 7/24/23

Property Location Glendale Rd Property Owner Jonathan

Parcel ID (Map/Block/Lot) 29-16-5 Fee Paid (check or cash) $7 (JP)

Type of Request: (Please Select)

- [x] Planning Board (300 ft. Certified list per MGL 40A Sec. 11)
- [ ] ZBA (300 ft. Certified list per MGL 40A Sec. 11)
- [ ] Board of Selectmen – Pole Hearing (300 ft. Certified list per BOS)
- [x] Conservation Commission (300 ft. Certified list per DEP)
- [ ] Special Request – Please be specific (include maps to identify points for NOI):

(Note: Special Request Fees Apply)

Contact Information – Please provide mailing address, phone number or email and we will contact you once your request is complete. Please allow 10 business days for processing.

Rory Walker (203) 731-7506

rwalker@zpenergyconsultants.com

Signature

300 feet Abutters List Report

Hampden, MA
August 08, 2023

Subject Property:

Parcel Number: 29-016-005
CAMA Number: 29-016-005
Property Address: GLENDALE RD

Mailing Address: JONATHAN GUINIPERO AND STATELINE PROPERTY MANAGEME
530 GLENDALE RD
HAMPDEN, MA 01036

Abutters:

Parcel Number: 29-009-000
CAMA Number: 29-009-000
Property Address: 495 GLENDALE RD

Mailing Address: VALLANDINGHAM JAMES D & DONNA D
495 GLENDALE RD
HAMPDEN, MA 01036

Parcel Number: 29-010-000
CAMA Number: 29-010-000
Property Address: 505 GLENDALE RD

Mailing Address: SNOPEK PAUL A
505 GLENDALE RD
HAMPDEN, MA 01036

Parcel Number: 29-011-000
CAMA Number: 29-011-000
Property Address: 521 GLENDALE RD

Mailing Address: GAGLIARDUCCI CHRISTOPHER A
521 GLENDALE RD
HAMPDEN, MA 01036

Parcel Number: 29-011-001
CAMA Number: 29-011-001
Property Address: 517 GLENDALE RD

Mailing Address: TELES ERICA
517 GLENDALE RD
HAMPDEN, MA 01036

Parcel Number: 29-012-000
CAMA Number: 29-012-000
Property Address: 535 GLENDALE RD

Mailing Address: HOWELL SANDRA J &
535 GLENDALE RD
HAMPDEN, MA 01036

Parcel Number: 29-014-000
CAMA Number: 29-014-000
Property Address: 542 GLENDALE RD

Mailing Address: DONOGHUE ROBERT J
542 GLENDALE RD
HAMPDEN, MA 01036

Parcel Number: 29-015-000
CAMA Number: 29-015-000
Property Address: 536 GLENDALE RD

Mailing Address: LUFF JAMES EDWARD
536 GLENDALE RD
HAMPDEN, MA 01036

Parcel Number: 29-016-000
CAMA Number: 29-016-000
Property Address: 530 GLENDALE RD

Mailing Address: JONATHAN GUINIPERO AND STATELINE PROPERTY MANAGEME
530 GLENDALE RD
HAMPDEN, MA 01036

Parcel Number: 29-016-001
CAMA Number: 29-016-001
Property Address: GLENDALE RD

Mailing Address: KENNEDY JACK C
52 FAVORITE LANE
EAST LONGMEADOW, MA 01028

Parcel Number: 29-016-002
CAMA Number: 29-016-002
Property Address: GLENDALE RD

Mailing Address: KENNEDY JACK C
52 FAVORITE LANE
EAST LONGMEADOW, MA 01028

300 feet Abutters List Report

Hampden, MA
August 08, 2023

Parcel Number:	29-016-004	Mailing Address:	CUSSON JOSHUA A 500 GLENDALE RD HAMPDEN, MA 01036
CAMA Number:	29-016-004		
Property Address:	500 GLENDALE RD		
Parcel Number:	29-017-000	Mailing Address:	TILLI-JOHNSON DENISE M 474 GLENDALE RD HAMPDEN, MA 01036
CAMA Number:	29-017-000		
Property Address:	474 GLENDALE RD		
Parcel Number:	29-018-000	Mailing Address:	KNODE OLIVER M III 456 GLENDALE ROAD HAMPDEN, MA 01036
CAMA Number:	29-018-000		
Property Address:	456 GLENDALE RD		
Parcel Number:	29-030-000	Mailing Address:	STONE NICHOLAS & JENNIFER ANN 151 AMES RD HAMPDEN, MA 01036
CAMA Number:	29-030-000		
Property Address:	151 AMES RD		
Parcel Number:	29-031-000	Mailing Address:	WARREN FREDERICK A & HEATHER A 171 AMES RD HAMPDEN, MA 01036
CAMA Number:	29-031-000		
Property Address:	171 AMES RD		
Parcel Number:	29-031-001	Mailing Address:	SOKOLOWSKI WALTER M + 173 AMES RD HAMPDEN, MA 01036
CAMA Number:	29-031-001		
Property Address:	173 AMES RD		
Parcel Number:	29-036-000	Mailing Address:	WORTHLEY JOHN L 213 AMES RD HAMPDEN, MA 01036
CAMA Number:	29-036-000		
Property Address:	213 AMES RD		
Parcel Number:	32-007-000	Mailing Address:	SCHMIDT DENNIS F 570 GLENDALE ROAD HAMPDEN, MA 01036
CAMA Number:	32-007-000		
Property Address:	570 GLENDALE RD		
Parcel Number:	32-008-000	Mailing Address:	IAVICOLI EDWARD 564 GLENDALE RD HAMPDEN, MA 01036
CAMA Number:	32-008-000		
Property Address:	564 GLENDALE RD		
Parcel Number:	32-009-000	Mailing Address:	NADEAU DAVID J & MARY A 548 GLENDALE RD HAMPDEN, MA 01036
CAMA Number:	32-009-000		
Property Address:	548 GLENDALE RD		
Parcel Number:	32-010-000	Mailing Address:	GALAVOTTI LOUIS J 594 GLENDALE ROAD HAMPDEN, MA 01036
CAMA Number:	32-010-000		
Property Address:	594 GLENDALE RD		
Parcel Number:	32-012-000	Mailing Address:	BARROSO JASON J & KAYLA A 239 AMES RD HAMPDEN, MA 01036
CAMA Number:	32-012-000		
Property Address:	239 AMES RD		

BARROSO JASON J & KAYLA A
239 AMES RD
HAMPDEN, MA 01036

CUSSON JOSHUA A
500 GLENDALE RD
HAMPDEN, MA 01036

DONOGHUE ROBERT J
542 GLENDALE RD
HAMPDEN, MA 01036

GAGLIARDUCCI CHRISTOPHER
521 GLENDALE RD
HAMPDEN, MA 01036

GALAVOTTI LOUIS J
594 GLENDALE ROAD
HAMPDEN, MA 01036

HOWELL SANDRA J &
535 GLENDALE RD
HAMPDEN, MA 01036

IAVICOLI EDWARD
564 GLENDALE RD
HAMPDEN, MA 01036

JONATHAN GUINIPERO AND ST
530 GLENDALE RD
HAMPDEN, MA 01036

KENNEDY JACK C
52 FAVORITE LANE
EAST LONGMEADOW, MA 01028

KNODE OLIVER M III
456 GLENDALE ROAD
HAMPDEN, MA 01036

LUFF JAMES EDWARD
536 GLENDALE RD
HAMPDEN, MA 01036

NADEAU DAVID J & MARY A
548 GLENDALE RD
HAMPDEN, MA 01036

SCHMIDT DENNIS F
570 GLENDALE ROAD
HAMPDEN, MA 01036

SNOPEK PAUL A
505 GLENDALE RD
HAMPDEN, MA 01036

SOKOLOWSKI WALTER M +
173 AMES RD
HAMPDEN, MA 01036

STONE NICHOLAS & JENNIFER
151 AMES RD
HAMPDEN, MA 01036

TELES ERICA
517 GLENDALE RD
HAMPDEN, MA 01036

TILLI-JOHNSON DENISE M
474 GLENDALE RD
HAMPDEN, MA 01036

VALLANDINGHAM JAMES D & D
495 GLENDALE RD
HAMPDEN, MA 01036

WARREN FREDERICK A & HEAT
171 AMES RD
HAMPDEN, MA 01036

WORTHLEY JOHN L
213 AMES RD
HAMPDEN, MA 01036

August 8, 2023

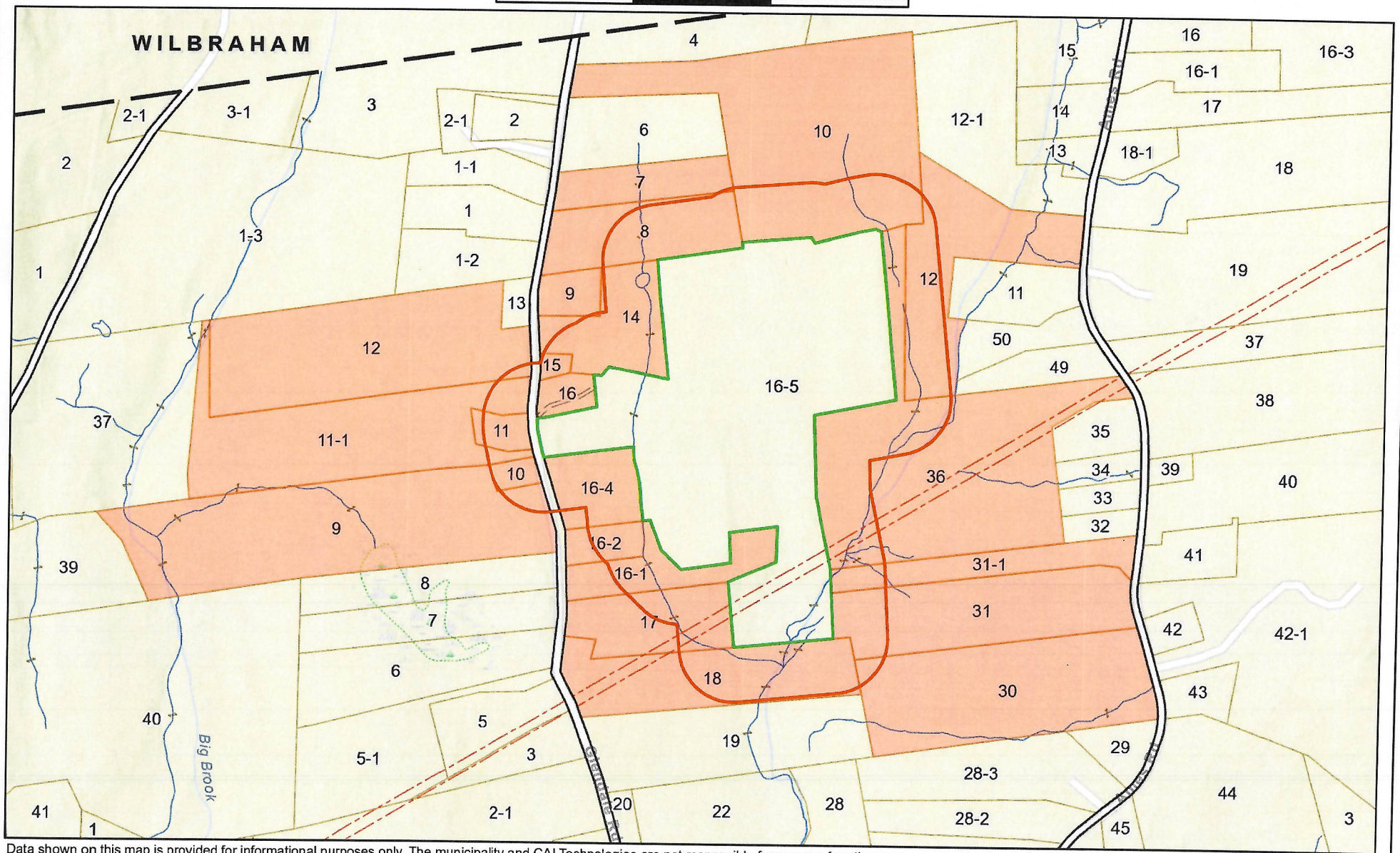
Town of Hampden, MA

1 inch = 752 Feet

0 752 1504 2256

CAI Technologies
Precision Mapping, Geospatial Solutions

www.cai-tech.com



BOARD OF ASSESSORS
TOWN OF HAMPDEN
625 Main Street
Hampden, MA 01036

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Robert Makuch, Assessor
Jason Barroso, Assessor

Kelly McCormick MAA, Principal Assessor
Jane Ferrentino MAA, Associate Assessor
Phone: (413) 566-2151 ext.106

CERTIFIED LIST OF ABUTTERS

SUBJECT PROPERTY MAP, BLOCK + LOT	LOCATION OF SUBJECT PROPERTY	OWNERS AND MAILING ADDRESSES
29-16-0	530 Glendale Rd	Jonathan Guinipero and Stateline Property Management LLC 530 Glendale Rd Hampden, MA 01036

PLEASE SEE ATTACHED LIST OF ABUTTERS

Per the Assessors records I certify that the attached lists of persons are the abutters of record for the subject property within 300 feet of the outer perimeter.

To the best of our knowledge, this list represents the most current owners of the properties. The accuracy of this listing is based solely on the information currently available in our database.

11/6/2023
Date

Kelly McCormick
Kelly McCormick, MAA Principal Assessor
Town of Hampden

BOARD OF ASSESSORS
TOWN OF HAMPDEN

625 Main Street
Hampden, MA 01036

Norman Charest, Chairman
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Jason Barroso, Assessor

Kelly McCormick MAA, Principal Assessor
Jane Ferrentino, Associate Assessor
Phone: (413) 566-2151 ext. 106

REQUEST FOR CERTIFIED ABUTTERS LIST

FEE SCHEDULE

Certified Abutters List	**$35.00***

*Subject to additional fee of $1.00 per abutter if over 20 abutters.
(Administrative fee of $17.50 will apply if request is cancelled.)

Requested by RORY WALKER Date 10/30/23

Property Location 530 Glendale Rd Property Owner Jonathan Guinipero

Parcel ID (Map/Block/Lot) 29-16 Fee Paid (check or cash) $35

Type of Request: (Please Select)

- [X] Planning Board (300 ft. Certified list per MGL 40A Sec. 11)
- [ ] ZBA (300 ft. Certified list per MGL 40A Sec. 11)
- [ ] Board of Selectmen – Pole Hearing (300 ft. Certified list per BOS)
- [X] Conservation Commission (300 ft. Certified list per DEP)
- [ ] Special Request – Please be specific (include maps to identify points for NOI):

(Note: Special Request Fees Apply)

Contact Information – Please provide mailing address, phone number or email and we will contact you once your request is complete. Please allow 10 business days for processing.

Email- RWALKER@ZPENERGYCONSULTANTS.COM
Phone - (203) 731-7506

Signature 10/30/23

300 feet Abutters List Report

Hampden, MA
October 31, 2023

Subject Property:

Parcel Number:	29-016-000	Mailing Address:	JONATHAN GUINIPERO AND STATELINE PROPERTY MANAGEME
CAMA Number:	29-016-000		530 GLENDALE RD
Property Address:	530 GLENDALE RD		HAMPDEN, MA 01036

Abutters:

Parcel Number:	29-010-000	Mailing Address:	SNOPEK PAUL A
CAMA Number:	29-010-000		505 GLENDALE RD
Property Address:	505 GLENDALE RD		HAMPDEN, MA 01036
Parcel Number:	29-011-000	Mailing Address:	GAGLIARDUCCI CHRISTOPHER A
CAMA Number:	29-011-000		521 GLENDALE RD
Property Address:	521 GLENDALE RD		HAMPDEN, MA 01036
Parcel Number:	29-011-001	Mailing Address:	TELES ERICA
CAMA Number:	29-011-001		517 GLENDALE RD
Property Address:	517 GLENDALE RD		HAMPDEN, MA 01036
Parcel Number:	29-012-000	Mailing Address:	HOWELL SANDRA J &
CAMA Number:	29-012-000		535 GLENDALE RD
Property Address:	535 GLENDALE RD		HAMPDEN, MA 01036
Parcel Number:	29-014-000	Mailing Address:	DONOGHUE ROBERT J
CAMA Number:	29-014-000		542 GLENDALE RD
Property Address:	542 GLENDALE RD		HAMPDEN, MA 01036
Parcel Number:	29-015-000	Mailing Address:	LUFF JAMES EDWARD
CAMA Number:	29-015-000		536 GLENDALE RD
Property Address:	536 GLENDALE RD		HAMPDEN, MA 01036
Parcel Number:	29-016-004	Mailing Address:	CUSSON JOSHUA A
CAMA Number:	29-016-004		500 GLENDALE RD
Property Address:	500 GLENDALE RD		HAMPDEN, MA 01036
Parcel Number:	29-016-005	Mailing Address:	JONATHAN GUINIPERO AND STATELINE PROPERTY MANAGEME
CAMA Number:	29-016-005		530 GLENDALE RD
Property Address:	GLENDALE RD		HAMPDEN, MA 01036

Town of Hampden, MA

1 inch = 560 Feet

0 560 1120 1680

October 31, 2023

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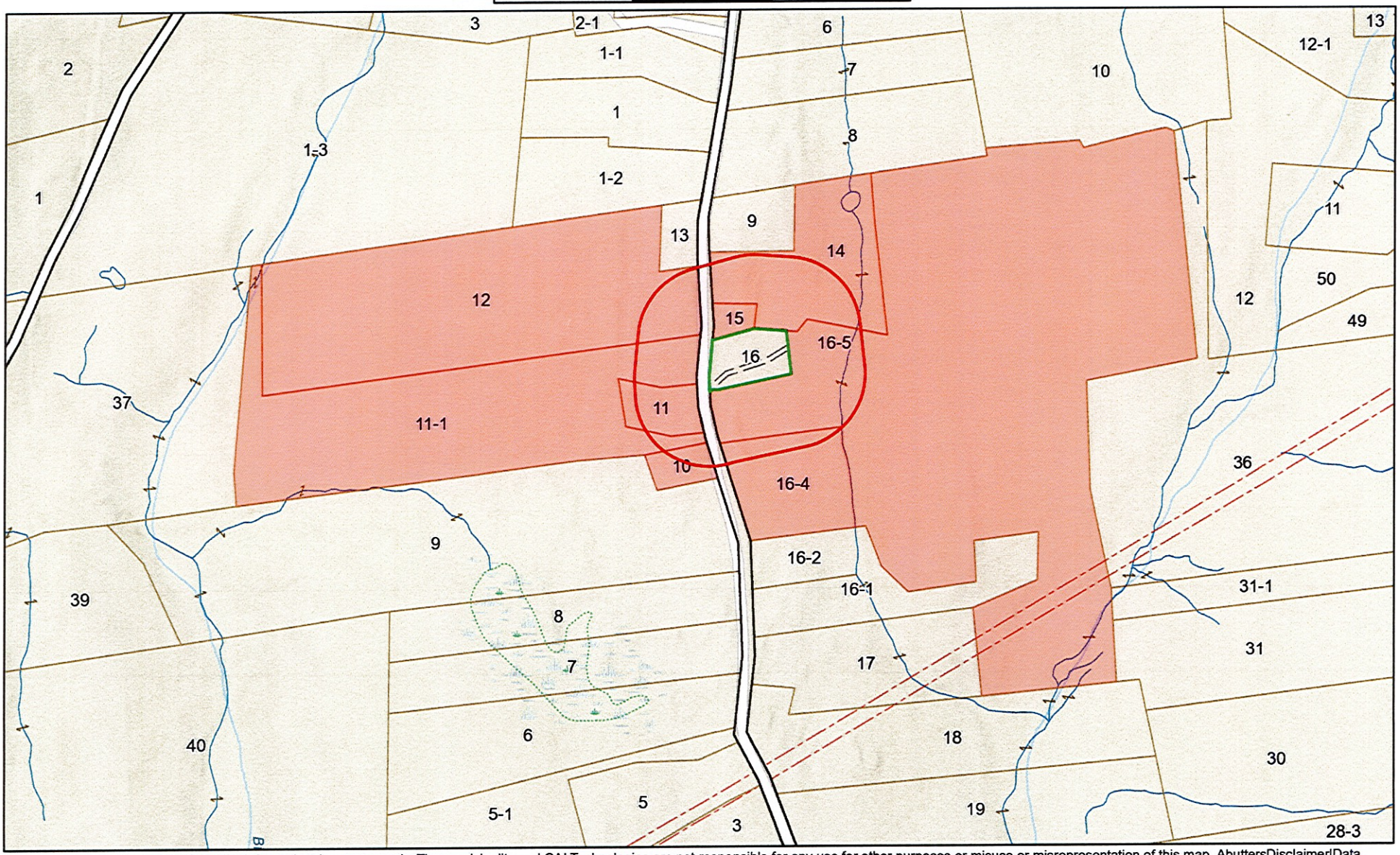

CUSSON JOSHUA A
500 GLENDALE RD
HAMPDEN, MA 01036

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HAMPDEN, MA 01036

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505 GLENDALE RD
HAMPDEN, MA 01036

TELES ERICA
517 GLENDALE RD
HAMPDEN, MA 01036

Notification to Abutters

By Hand Delivery, Certified Mail (return receipt requested), or Certificates of Mailing

This is a notification required by law. You are receiving this notification because you have been identified as the owner of land abutting another parcel of land for which certain activities are proposed. Those activities require a permit under the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40).

In accordance with the second paragraph of the Massachusetts Wetlands Protection Act, and 310 CMR 10.05(4)(a) of the Wetlands Regulations, you are hereby notified that:

A. A Notice of Intent was filed with the Hamden, MA Conservation Commission on November 6, 2023 seeking permission to remove, fill, dredge, or alter an area subject to protection under M.G.L. c. 131 §40. The following is a description of the proposed activity/activities:

> The applicant, Glendale Road Development, LLC, proposes to develop and construct a commercial renewable energy facility which will be located at 530 Glendale Road (rear) Assessor Map 29, Parcel 16-5. The proposed facility will be a 4.95 MW-AC ground mounted solar photovoltaic array with required electrical equipment (transformers, switch gear, etc.) and a Lithium-Ion Battery Energy Storage System (BESS). The facility will operate in conjunction with Ledge Valley Farm as an Agricultural Ground Mounted Solar System where the interior array field areas will be utilized as pastures for grazing sheep, cattle, and poultry.

B. The name of the applicant is: Glendale Road Development, LLC.

C. The address of the land where the activity is proposed is: 530 Glendale Road Hampden, MA Assessor Map 29, Parcels 16 & 16-5

D. Copies of the Notice of Intent may be examined or obtained at the office of the Hampden, MA Conservation Commission, located at 625 Main Street, Melville Room Offices, Hampden, MA 01036. The regular business hours of the Commission are Monday – Thursday 8:00 AM to 1:00 PM, and the Commission may be reached at (413) 566-2151 (ext. 110).

E. Copies of the Notice of Intent may be obtained from their representative, Nick Facendola, PE of Level Design Group, LLC, by calling 508-695-2221 Monday – Friday 8:00 AM – 4:00 PM. An administrative fee may be applied for providing copies of the NOI and plans.

F. Information regarding the date, time, and place of the public hearing may be obtained from the bulletin board at the Town Hall or the Wilbraham-Hampden Time or The Reminder at least five days before the Hearing or the Town's Website http://www.hampdenma.gov/ (under the calendars tab). You may also call the Conservation Commission office at (413) 566-3513 Monday - Thursday between 8:00 AM and 1:00 PM or send an email to conservation@hampdenma.gov with any questions.

Notification provided pursuant to the above requirement does not automatically confer standing to the recipient to request Departmental Action for the underlying matter. See 310 CMR 10.05(7)(a)4. For more information about this application or the Wetlands Protection Act you may also contact the Western Regional Office of the Department of Environmental Protection at (413) 784-1100

LEVEL DESIGN GROUP
Civil Engineers & Land Surveyors

AFFIDAVIT OF SERVICE

Under the Massachusetts Wetlands Protection Act

I, Nicola Facendola, PE. do hereby certify under the pains and penalties of perjury that on **November 6, 2023,** I gave notification to abutters in compliance with the second paragraph of Massachusetts General Laws Chapter 131, Section 40, and the DEP Guide to Abutter Notification dated April 8, 1994, in connection with the following matter:

> Notice of Intent (NOI) filed under the Massachusetts Wetlands Protection Act by Glendale Road Development, LLC, filed with the Town of Hampden Conservation Commission on **November 6** for a property identified as 530 Glendale Road in Hampden, MA (AM 29 PR 16 & 16-5).

The form of the notification and list of the abutters to whom it was given and their addresses, are attached to this Affidavit of Service.

Nicola Facendola

Name: Nicola Facendola.

11/06/2023
Date

11. COPY OF SUBMITTAL LETTERS

a. **MADEP WESTERN OFFICE SUBMISSION LETTER**

b. **MADEP LOCK BOX SUBMISSION LETTER**

c. **HAMPDEN CONSERVATION COMMISSION SUBMISSION LETTER**

November 2, 2023

Massachusetts Department of Environmental Protection
Western Regional Office
436 Dwight Street
Springfield, MA 01103

Re: Notice of Intent Filing
530 Glendale Road
Hampden, MA 01036
Assessor Parcel: Map 29 Lots 16 & 16-5
LDG Proj. No.: 1958.00

To Whom it May Concern:

Level Design Group, L.L.C. (LDG), on behalf of Glendale Road Development, LLC, is submitting a Notice of Intent (NOI) for the above referenced parcel. Glendale Road Development, LLC, proposes to develop and construct a commercial renewable energy facility which will be located at 530 Glendale Road Assessor Map 29, Parcels 16 & 16-5. The proposed facility will be a 4.95 MW-AC ground mounted solar photovoltaic array with required electrical equipment (transformers, switch gear, etc.) and a Lithium-Ion Battery Energy Storage System (BESS). The facility will operate in conjunction with Ledge Valley Farm as an Agricultural Ground Mounted Solar System where the interior array field areas will be utilized as pastures for grazing sheep, cattle, and poultry.

Enclosed are the following:

- One (1) copy of the ANRAD and associated Site Plans.
- Copy of Lock Box Letter

Should you have any questions, please do not hesitate to contact me.

Truly yours,
LEVEL DESIGN GROUP, L.L.C.

Nicola Facendola

Nicola Facendola, P.E.
Principal/Project Manger

Cc: Glendale Road Development, LLC
File

November 2, 2023

Department of Environmental Protection
Lock-Box
P.O. Box 4062
Boston, MA 02211

Re: Notice of Intent Filing
530 Glendale Road
Hampden, MA 01036
Assessor Parcel: Map 29 Lots 16 & 16-5
LDG Proj. No.: 1958.00

To Whom it May Concern:

Level Design Group, L.L.C. (LDG), on behalf of Glendale Road Development, LLC has submitted a Notice of Intent (NOI) for the above referenced parcel with the Town of Hampden Conservation Commission and MADEP Western Regional Office.

Enclosed is the following:

- Copy of the Wetland Fee Transmittal Form
- Filing Fee $1,237.50

Should you have any questions, please do not hesitate to contact me.

Truly yours,
LEVEL DESIGN GROUP, L.L.C.

Nicola Facendola

Nicola Facendola, P.E.
Principal/Project Manger

Cc: Glendale Road Development, LLC
File

November 1, 2023

Town of Glendale
Conservation Commission
625 Main Street
Melville Room Offices
Hampden, MA 01036

Re: ANRAD Filing
530 Glendale Road (rear)
Hampden, MA 01036
Assessor Parcel: Map 29 Lot 16-5
LDG Proj. No.: 1958.00

Members of the Commission:

Level Design Group, L.L.C. (LDG), on behalf of Glendale Road Development, LLC, is submitting a Notice of Intent (NOI) for the above referenced parcel. Glendale Road Development, LLC, proposes to develop and construct a commercial renewable energy facility which will be located at 530 Glendale Road Assessor Map 29, Parcels 16 & 16-5. The proposed facility will be a 4.95 MW-AC ground mounted solar photovoltaic array with required electrical equipment (transformers, switch gear, etc.) and a Lithium-Ion Battery Energy Storage System (BESS). The facility will operate in conjunction with Ledge Valley Farm as an Agricultural Ground Mounted Solar System where the interior array field areas will be utilized as pastures for grazing sheep, cattle, and poultry.

Enclosed are the following:

- Ten (10) copies of the NOI Application and supporting materials
- Three (3) full size copies of the project development Site Plans
- Ten (10) reduced size copy of the development Site Plans

Should you have any questions, please do not hesitate to contact me.

Truly yours,
LEVEL DESIGN GROUP, L.L.C.
Nicola Facendola

Nicola Facendola, P.E.
Principal/Project Manger

Cc: Glendale Road Development, LLC
File

12. ORAD – MADEP File # 173-0233 Issued 11/02/2022

For Registry of Deeds Use Only

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4B – Order of Resource Area Delineation

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
173-0233
MassDEP File Number

eDEP Transaction Number

Hampden
City/Town

A. General Information

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

Note: Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

From: Hampden Conservation Commission
1. Conservation Commission

2. This Issuance is for (check one):

a. X ☐ Order of Resource Area Delineation

b. ☐ Amended Order of Resource Area Delineation

3. Applicant:

Rory
a. First Name

Walker
b. Last Name

c. Organization

898 Sport Hill Road
d. Mailing Address

Easton
e. City/Town

CT
f. State

06612
g. Zip Code

4. Property Owner (if different from applicant):

Jonathan
a. First Name

Guinipero
b. Last Name

Stateline Management, LLC
c. Organization

530 Glendale Road
d. Mailing Address

Hampden
e. City/Town

MA
f. State

01036
g. Zip Code

5. Project Location:

530 Glendale Road
a. Street Address

Hampden
b. City/Town

01036
c. Zip Code

29
d. Assessors Map/Plat Number

Parcel 016-000 and -005
e. Parcel/Lot Number

Latitude and Longitude (in degrees, minutes, seconds):

72d23m17s
f. Latitude

42d5m35s
g. Longitude

6. Dates: Feb 8, 2022 (rc'd Feb 15, 2022)

11/02/2022
b. Date Public Hearing Closed

c. Date of Issuance

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4B – Order of Resource Area Delineation

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
173-0233
MassDEP File Number

eDEP Transaction Number

Hampden
City/Town

A. General Information (cont.)

7. Title and Date (or Revised Date if applicable) of Final Plans and Other Documents:

C-1.0 1958.0, C-2.0 1958.0, C-3.0 1958.0, C-4.0 1958.0, C-5.0 1958.0, C-6.0 1958.0, C-7.0 1958.0

9-26-~~2022~~ 2021 4m4B
b. Date

Abbreviated Notice of Resource Area Delineation -Prepared by Level Design Grp - LDG Project#1958.00 Prepared for Glendale Road Dev, LLC

2-15-2022 (original - 5 revs see attchd)

B. Order of Delineation

1. The Conservation Commission has determined the following (check whichever is applicable):

a. ☐ **Accurate**: The boundaries described on the referenced plan(s) above and in the Abbreviated Notice of Resource Area Delineation are accurately drawn for the following resource area(s):

1. ☒ Bordering Vegetated Wetlands

2. ☒ Other resource area(s), specifically:

a. Flag Series GC-300, Series GC-600, SeriesGC-700, Series GC-800 East Brook incl. Bank/MAHW 1-73

b. ☒ **Modified**: The boundaries described on the plan(s) referenced above, as modified by the Conservation Commission from the plans contained in the Abbreviated Notice of Resource Area Delineation, are accurately drawn from the following resource area(s):

1. ☒ Bordering Vegetated Wetlands

2. ☒ Other resource area(s), specifically:

a. BVW Flag Series GC110-GC 117 Rev GC110R-GC125R; Series GC-230-232 Rev 230R, 230-2R, GC231-R, GC-232R, GC-233R Series GC406-GC-409 Rev GC-402R-GC-409R, Series GC-413-GC-427 rev GC413R-GC427R, Bank/LUWW - Stream S1-77, SA 1-31 (GCS 39-77) Redefined as perennial and 3 Bank (intermittent streams) w/in BVW "Island" delin

c. ☐ **Inaccurate**: The boundaries described on the referenced plan(s) and in the Abbreviated Notice of Resource Area Delineation were found to be inaccurate and cannot be confirmed for the following resource area(s):

1. ☐ Bordering Vegetated Wetlands

2. ☐ Other resource area(s), specifically:

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4B – Order of Resource Area Delineation

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
173-0233
MassDEP File Number

eDEP Transaction Number

Hampden
City/Town

B. Order of Delineation (cont.)

3. ☐ The boundaries were determined to be inaccurate because:

C. Findings

This Order of Resource Area Delineation determines that the boundaries of those resource areas noted above, have been delineated and approved by the Commission and are binding as to all decisions rendered pursuant to the Massachusetts Wetlands Protection Act (M.G.L. c.131, § 40) and its regulations (310 CMR 10.00). This Order does not, however, determine the boundaries of any resource area or Buffer Zone to any resource area not specifically noted above, regardless of whether such boundaries are contained on the plans attached to this Order or to the Abbreviated Notice of Resource Area Delineation.

This Order must be signed by a majority of the Conservation Commission. The Order must be sent by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate DEP Regional Office (see https://www.mass.gov/service-details/massdep-regional-offices-by-community).

D. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate DEP Regional Office to issue a Superseding Order of Resource Area Delineation. When requested to issue a Superseding Order of Resource Area Delineation, the Department's review is limited to the objections to the resource area delineation(s) stated in the appeal request. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order of Resource Area Delineation will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order or Determination, or providing written information to the Department prior to issuance of a Superseding Order or Determination.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act, (M.G.L. c. 131, § 40) and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal bylaw or ordinance, and not on the Massachusetts Wetlands Protection Act or regulations, the Department of Environmental Protection has no appellate jurisdiction.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4B – Order of Resource Area Delineation

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
173-0233
MassDEP File Number

eDEP Transaction Number

Hampden
City/Town

11/02/2022
Date of Issuance

4
1. Number of Signers

E. Signatures

Please indicate the number of members who will sign this form.

Signatures

Judy McKinley Brewer Signature of Conservation Commission Member	Judy McKinley Brewer Printed Name
Theodore M Zebert Signature of Conservation Commission Member	Ted Zebert Printed Name
— Signature of Conservation Commission Member	~~Andrew Netherwood~~ Printed Name
John K Cushman Signature of Conservation Commission Member	John Cushman Printed Name
Greg D'Agostino Signature of Conservation Commission Member	Greg D'Agostino Printed Name
— Signature of Conservation Commission Member	~~Tom Page~~ Printed Name
Signature of Conservation Commission Member	Printed Name
Signature of Conservation Commission Member	Printed Name
Signature of Conservation Commission Member	Printed Name

This Order is valid for three years from the date of issuance.

If this Order constitutes an Amended Order of Resource Area Delineation, this Order does not extend the issuance date of the original Final Order, which expires on unless extended in writing by the issuing authority.

This Order is issued to the applicant and the property owner (if different) as follows:

2. ☒ By hand delivery on
11/02/2022
a. Date

3. ☐ By certified mail, return receipt requested on
a. Date

* Please refer to attached findings (12 pages)
Hampden-ORAD- MassDEP WE 173-0233