ANDOVER PLANNING BOARD

APPLICATION FOR SPECIAL PERMIT

For: Major Non-Residential Project

Section of Bylaw: 9.4.8

APPLICATION MUST BE COMPLETE
(Please print or type)

This application, completed and signed with original signature(s), shall be submitted with 18 copies of the application and narrative, 10 copies of the full-size plans (24x36), 7 copies of 11x17 plans, 4 drainage reports and a pdf version of the application package (call Planning regarding number of copies of any other reports being submitted).

Application is hereby made for a Special Permit for Major Non-Residential Project Section 9.4.8 of the Zoning By-Law.

1. Applicant(s): Borrego Solar Systems, Inc.
   Contact Name: Carli Shroyer
   Mailing Address: 55 Technology Drive, Suite 102, Lowell, MA 01851
   Telephone Number: 860-558-4869
   Email Address: cshroyer@borregosolar.com
2. Record Owner(s) Name: Eliates and Denise Mercedat
   Mailing Address: 1320 South Street, Andover, MA 01810
3. Interest in Property: x Owner _____ Other
   (Describe): To put a Energy Storage Facility on northwest part of property
4. Engineer: Borrego Solar Systems, Inc.
   Contact Name: Carli Shroyer
   Mailing Address: 55 Technology Drive, Suite 102, Lowell, MA 01851
   Telephone Number: 860-558-4869
   Name of Professional Surveyor: Northeast Survey Consultants PLS # _____
5. Property Address: 1320 South Street, Andover, MA 01810
   Assessors Map 184 Lot(s) 3
   Zoning District(s) including overlay districts: Industrial A, MMOD
6. Lot square footage/acres: 9.881 acres
7. Frontage: 50 feet off of Moonlight Drive

8. Square footage of existing building: Total of existing buildings = 4,626 sf

   stories: _____ square footage per floor: _____ height: _____

9. Existing Use(s) Residential Proposed Use(s): Residential, Energy Storage Facility

10. Square footage of proposed building or addition: 22,643 sf (Energy Storage Facility Area)

    Total building coverage percentage: NA landscaping percentage: NA

    Total square footage: NA percentage: NA

11. Square footage of total land disturbance: 64,833 sf

12. Parking: existing NA proposed NA

13. Number of: Buildings No buildings, 12 concrete foundations Units: NA

14. Building Height: 10 ft +/-

15. Open Space: Acreage NA Percentage NA

    Percentage of Accessible Open Space NA

16. Square Footage of Roadway Construction Land Disturbance: ~27,000 SF

    Square Footage of Total Land Disturbance: 64,833 sf

17. Deed of Property Recorded In #17299 Registry of Deeds,

    Book 14298 Page 37 ,or Certificate of Title _____

    Easements and Restrictions of Record (Include description and deed reference): _____

    See Plans

18. Certified Statement as to Encumbrances on the land: _____

    See Plans

19. Describe any previous Special Permit Application or approvals for these premises _____

    See Plans

20. Provide a narrative of the project and how it meets the zoning bylaw requirements.

    See attached

I understand and agree to comply with the requirements of the Andover Planning Board's Rules Governing Special Permits.

See Owners Authorization atttached	Carli Shroyer
Signature of Record Owner	Signature of Applicant
	Carli Shroyer
Print Name	Print Name
	4/12/2022
Date	Date

(REVISED 3/22)

April 12, 2021

Honorable Chair Zachary Bergeron
And Members of the Planning Board
36 Bartlet Street
Andover, MA 01810

Re: 1320 South Street Energy Storage Facility – Site Details and Safety Memo

Dear Zachary Bergeron and Members of the Planning Board,

Below, please find a project summary for the **1320 South Street Energy Storage Project** as part of our application for a Special Permit under the Major non-residential project by-law.

Why Energy Storage?

- Battery Storage Projects help to increase reliability of the transmission grid by storing off-peak energy and discharging during seasonal demand peaks, when power is needed the most.
- By storing and shifting the time-of-use of generated electricity, Battery Storage Projects help the Commonwealth to avoid relying on the dirtiest "peaker" plants for electricity generation.
- Battery Storage Projects contribute to the Commonwealth's environmental protection goals concerning air emissions, while also having added benefits of reducing peak demand and system losses and increasing grid reliability.

Project Summary

System Design

The proposed project is for a 12MW, 48MWh battery storage system tucked into the back corner of lot 184-3. A modular design will be used to house the batteries. This modular design represents the newest generation of energy storage technology, which allows for more flexibility and safety. Each bank of batteries is housed in an individual segment, which are arrayed in rows. The proposed project will consist of four rows of these segments. Each segment is approximately 8 feet deep, 5 feet wide, and 11 feet tall and completely sealed to weather and stormwater. The containers will sit on concrete foundation pads. The area surrounding the containers within the fence line will be a permeable crushed stone.

The batteries will charge/ discharge via two (4) transformers and (4) inverters. The power conversion system and associated equipment will be located on a concrete pad and connected to pole mounted interconnection equipment via underground conduit.

Driveway

The proposed access driveway will be a 20' wide crushed stone designed to meet the loads of the design vehicles. The system will be unmanned so vehicle traffic will be limited to regular system maintenance a few times a year.

Fence and Sound Barrier

The perimeter of the facility will be partially enclosed with a standard 7' high fence per National Electric Code (NEC) requirements, and partially surrounded by an 18-foot-tall sound barrier. The sound barrier will enclose the system on three sides and reduce the auditory impact of the system to residences to the west and south. The northeast side of the facility will utilize chain link fence and contain a single vehicular gate for access to the facility. To prevent unauthorized vehicular access to the site, barrier gate will be installed at the entrance of the property.

Lighting

There will be no continuous lighting for the system. The external pad will contain a single dark sky compliant light. All fixtures are at low incident angles to reduce light pollution to abutting properties.

Stormwater

A full stormwater analysis was performed, and the report is included in submission.

Flood Plain

The project is partially located in the 500-year FEMA flood zone (Zone X). However, no pad mounted electrical equipment fall with this flood zone. The 100-year FEMA flood zone (Zone AE) is located on the property, but the project does not fall within this zone. These are called out on the plans.

Wetlands, Rivers, Vernal Pools

There are wetlands and the Shawsheen river located nearby. However, the project will be located outside of all 100' wetland buffers and 200' riverfront buffers. There is also a NHESP certified vernal pool located off site and the project will remain out of the 100' buffer. These sensitive areas are called out on the plans.

Endangered Species

NHESP has identified four (4) endangered or special concerned species occurring in the vicinity of the site. We are working with environmental consultant Boghunter Ecological services, LLC to prepare habitat assessments for each species and work with NHESP to ensure that the project will have no impacts to the species. This is currently underway, and results will be shared under separate cover. The following is a list of each species.

- Twilight Moth - Endangered
- Frosted Elfin – Special Concern
- New Jersey Tea Inchworm - Endangered
- Scrub Euchlaena – Special Concern

Battery Chemistry

Lithium-ion battery storage systems may deploy several different material configurations with respect to the metal oxide making up the battery cathode (commonly referred to as "chemistries"). At the current state of art, there are two dominant chemistries for batteries used in stationary energy storage systems, electric vehicles and consumer electronics: Lithium Nickel Manganese Cobalt (NMC) and Lithium Iron Phosphate (LFP). The chemistry of the system proposed at 1320 South Street will utilize LFP battery chemistry.

Safety Description

Lithium-ion battery storage systems are safe and reliable grid assets. Borrego Solar is highly focused on ensuring the safety of all systems we deploy and ensuring that local authorities and first responders are informed about all possible hazards and best-practices for managing energy storage systems. We prioritize system safety throughout the design, procurement, construction, and operations and maintenance of our energy storage systems.

The energy storage system will be built to all applicable UL safety standards, with battery modules third- party certified to UL 1642, UL 1973 and UN/DOT 38.3. In particular, UL 1973 contains specific provisions for safety performance tests for the battery, including electrical tests (such as short circuit and failure of cooling/thermal stability tests), mechanical tests (such as drop and impact tests, mold stress tests, and pressure release tests), and fire tests, including both internal and external fire tests to determine that no explosion hazards exist in either case. The power conversion system will be third-party certified to UL 1741, and the integrated energy storage system third-party designed to UL 9540 standards.

Installation of the system will proceed in compliance with NFPA 70 (National Electric Code), as well as local electric and fire codes. Borrego Solar mitigates project safety risks by strictly adhering to worksite policies that are enforced in parallel by an internal safety lead and an external contractor. In this way, we promote a consistent culture of safety while maintaining checks and balances on our own systems.

During operation of the energy storage system, the integrated battery management system shall monitor electrical and environmental values and control charge cycles to ensure battery modules operate within allowable parameters. During commissioning, allowable limits for minimum voltage, maximum voltage, charge current limit, discharge current limit, operating and non-operating temperature will be set. If such pre-defined limits are exceeded during operation, the system will trip offline and require a reset command to clear faults and resume operation. The energy management system shall be capable of alerting remote users when operating fault conditions occur.

System protection will be provided on the DC and AC side of the power conversion system as required by NFPA 70 (National Electrical Code) as adopted by local authorities having jurisdiction (AHJs).

Because lithium-ion batteries are categorized as non-hazardous waste, due to the low quantity of toxic metals, and are contained within the NEMA 3R enclosure, no dedicated containment is required. Lithium- ion batteries are sealed, manufactured systems and do not expose operators to toxic metals under normal operating conditions, so Tier I and Tier II reporting under EPRCA is not required. Materials safety data sheets will be provided for all lithium-ion battery cells contained within the battery container as well as for the clean agent fire suppression media and for the refrigerant contained in the HVAC system.

The integrated energy storage unit container will be provisioned with a fire detection and suppression system. Each unit includes a comprehensive package of explosion prevention and fire safety features, such as hydrogen detection and active ventilation, fire detection, fireproof insulation and optional clean agent fire suppression. Borrego will work with local fire authorities and first responders throughout our design and construction process to ensure that they understand the risks and protections within the system and have an appropriate response plan in place prior to energizing the system.

Fire Detection and Suppression

Fire protection for the energy storage system can be characterized in four tiers of hazard mitigation, prevention, detection and early warning, and passive and active response. The most consequential hazard associated with the operation of energy storage systems is potential battery thermal runaway, which is characterized by uncontrolled increase in heat dissipating from the battery module. Thermal runaway results from excessive thermal, electrical, or mechanical abuse dictated by installation or use out of compliance with manufacturer recommended handling.

Level 1

Once the system is installed, thermal and electrical abuse are the primary mechanisms which can lead to thermal runaway. To mitigate the likelihood of thermal abuse the BESS features a fully integrated HVAC and climate control system which keeps each cell

operating within ambient temperature tolerances. Additionally, during operation of the energy storage system, the integrated battery management system (BMS) monitors electrical and environmental values and control charge cycles to ensure battery modules operate within manufacturer set parameters. Each battery module is equipped with internal temperature sensors for this purpose.

Level 2

Electrical abuse is also a cause for thermal runaway prevention. The battery management system (BMS) contains manufacturer prescribed limits for minimum voltage, maximum voltage, charge current limit, discharge current limit, operating and non-operating temperature. If such pre-defined limits are exceeded during operation, the system trips offline thereby isolating the batteries and stopping power flow. Resuming operation requires a reset command with all faults and alarms cleared. The BMS can alert remote users when operating fault conditions occur.

Level 3

Where hazard mitigation and prevention fail to avoid a thermal runaway event, the BESS is equipped with a gas detection system for early alarm. This system is capable of sensing organic compounds that become vapor in a battery cell well ahead of the cell reaching thermal runaway conditions.

If all preceding prevention and early detection were to fail to stop a runaway event, a clean agent fire suppression system is designed into the battery enclosure. This system complies with NFPA 2001 and uses approved means for alarming and discharging the chemical agent to apply cooling in the container to stop fire reactions. As the fire suppression agent is gaseous and held within the enclosure, no secondary containment is required. Borrego will work with local fire authorities and first responders as required to ensure that they understand the protections within the system.

Level 4

Finally, the battery container is a purpose-built concrete enclosure with a two-hour rated firewall and 90-minute rated steel doors.

Emergency Response Planning

Prior to construction, Borrego will engage the appropriate local officials (including fire and building departments) to develop a system specific emergency response plan into a site-specific plan. The plan will at a minimum consist of the following:

- Project contacts: operations, maintenance, and emergency response
- Remote monitoring
- Hazards
    - Chemical and toxicity
    - Electrical

    - Fire and explosion
    - Confined space
- Action plan
- Site information: access, layout
- Battery enclosure information: access, FSS overview, emergency stop

Once an approved emergency response plan has been completed, Borrego will support training in coordination with the local authorities to ensure understanding and compliance with the emergency response plan. The emergency response plan will identify and document qualified personnel to service, maintain and decommission the facility, and respond to incidents involving the facility.

Noise

Borrego worked with Epsilon Associates, Inc. to perform a noise study of the energy storage system which is Attachment 3. To mitigate sound for the nearby residences, a sound absorbing wall be installed around three sides of the system. Multiple scenarios have been run in the noise analysis.

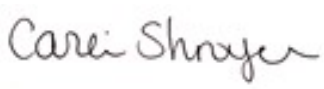
Traffic

Due to the location of the site the Town of Andover has expressed some concerns with construction hours and parking. To ensure that there are no issues, Borrego agrees to an 8am-5pm, Monday through Friday construction work schedule. There will also be parking areas onsite, so that construction vehicles will not park near residences. These notes have been added to the plans on sheet C-3.0 Layout and Materials Plan to ensure they do not get missed. Besides the construction period, the site will only require operations and maintenance around twice a year.

We are looking forward to scheduling an Informal Design Review Meeting with the necessary members to talk more about this project.

Thank you for your attention.

Sincerely,



Carli Shroyer

Civil Engineer

Borrego

Attachments

1. Site Plans
2. Product Cut Sheets
3. Noise Study
4. Owners Authorization

SITE PLANS

SITE USE PERMIT SET

1320 S STREET, ANDOVER, MA 01810
12MW/48MWh KWDC ENERGY STORAGE SYSTEM

GENERAL NOTES

1. AS CONTAINED HEREIN, "CONTRACTOR" IS ASSUMED TO BE THE EPC PROVIDER HIRED BY THE SYSTEM/PROJECT OWNER.
2. WHEN THERE IS A CONFLICT BETWEEN THESE GENERAL NOTES AND THE DRAWINGS, THE DRAWINGS SHALL GOVERN.
3. ALL WORK SHALL CONFORM TO THE MINIMUM STANDARDS OF THE FOLLOWING: LOCAL BUILDING CODE, LOCAL ELECTRICAL CODE, ANY OTHER REGULATING AGENCIES WHICH HAVE AUTHORITY OVER ANY PORTION OF THE WORK AND THOSE CODES AND STANDARDS LISTED IN THESE DRAWINGS.
4. THESE DRAWINGS SHALL NOT BE USED FOR CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DEVELOPING A CONSTRUCTION LEVEL DESIGN AND ASSOCIATED DRAWINGS AND DETAILS.
5. COORDINATE THESE DRAWINGS WITH SPECIFICATIONS AND MANUFACTURER INSTALLATION AND OPERATION MANUALS.
6. UNLESS OTHERWISE NOTED, THE DESIGN REPRESENTED ON THESE PLANS IS BASED ON THE INFORMATION AND CRITERIA LISTED IN THE "BASIS OF DESIGN" SECTION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY SUCH INFORMATION IN PREPARATION OF THE CONSTRUCTION DESIGN.
7. THE EXISTING CONDITIONS REPRESENTED ON THESE PLANS ARE BASED ON PUBLICLY AVAILABLE INFORMATION AND THE SITE DISCOVERY SUMMARIZED IN THESE DRAWINGS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE ACCURACY OF SUCH INFORMATION AND SUPPLEMENT WITH ANY ADDITIONAL REQUIRED INFORMATION.
8. UNLESS INDICATED AS EXISTING (E), ALL PROPOSED MATERIALS AND EQUIPMENT SHALL BE CONSIDERED TO BE NEW.
9. ALL EQUIPMENT AND COMPONENTS SHALL BE MOUNTED IN COMPLIANCE WITH THE MANUFACTURER'S REQUIREMENTS, CONSTRUCTION DETAILS, AND/OR PRUDENT INDUSTRY STANDARDS.
10. TO THE EXTENT THAT TRESS AND OTHER FEATURES AFFECT THE SYSTEM'S PRODUCTION, SUCH PRODUCTION MODELING IS BASED ON THE EXISTING APPROXIMATE HEIGHTS AND LOCATIONS RELATIVE TO THE SYSTEM AND MAY BE IMPACTED AS TREES GROW AND OTHER FEATURES CHANGE.

PROJECT SCOPE

THIS PROJECT CONSISTS OF THE INSTALLATION OF ENERGY STORAGE EQUIPMENT, PER THE SYSTEM DESCRIPTION, BELOW. THE ENERGY STORAGE MODULES WILL BE INSTALLED IN A PURPOSE BUILT UNIT(S), AND FIRE SUPPRESSION SYSTEMS. THE ENERGY STORAGE MODULES WILL BE WIRED IN SERIES STRINGS AND CONNECTED THROUGH DC/DC CONVERTERS, WHICH WILL CONVERT DC TO AC WHILE THE BATTERIES ARE DISCHARGING.

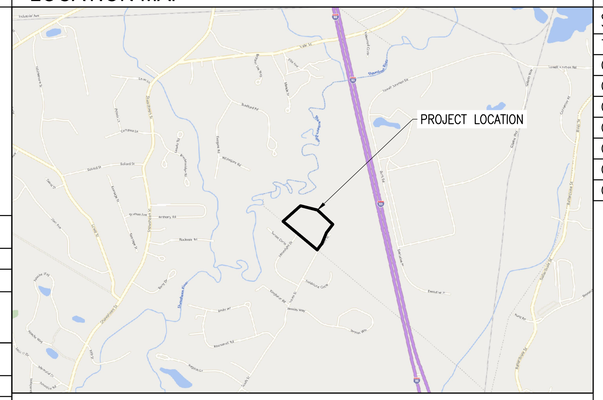
ENERGY STORAGE SYSTEM DESCRIPTION

SYSTEM POWER CAPACITY	12000 KWAC
SYSTEM ENERGY CAPACITY	48,000 KWH
POWER CONVERSION SYSTEM / INVERTER	(4) SMA SUNNY CENTRAL STORAGE 3950 UP-XT-US (POWER LIMITED TO 3333 KW)

TOTAL SYSTEM DESCRIPTION

MAXIMUM EXPORT TO UTILITY	12000 KWAC
STORAGE CHARGING MODE	GRID ONLY

LOCATION MAP



AERIAL VIEW

DRAWING LIST

SHEET NUMBER	SHEET TITLE
T-1	TITLE PAGE
CIVIL	
C-1.0	EXISTING CONDITIONS PLAN
C-2.0	TREE CLEARING PLAN
C-3.0	LAYOUT AND MATERIALS PLAN
C-4.0	GRADING AND EROSION CONTROL PLAN
C-5.0	CIVIL DETAILS
C-5.1	CIVIL DETAILS

APPLICABLE CODES AND STANDARDS

2020 MASSACHUSETTS ELECTRICAL CODE 527 CMR12.00
MASSACHUSETTS BUILDING CODE 9TH EDITION
UL-1703 – SOLAR MODULES
UL-1741 – INVERTERS, COMBINER BOXES
UL-2703 – RACKING MOUNTING SYSTEMS AND CLAMPING DEVICES FOR PV MODULES
UL-1642 – STANDARD FOR LITHIUM BATTERIES
UL-1973 – STANDARD FOR BATTERIES FOR USE IN LIGHT ELECTRIC RAIL (LER) APPLICATIONS AND STATIONARY APPLICATION
UL-9540 – STANDARD FOR ENERGY STORAGE SYSTEM AND EQUIPMENT

PROJECT DIRECTORY

LAND OWNER / HOST
TES MERCEDAT
1320 SOUTH STREET
TEWKSBURY, MA 01876
617-699-6315

AUTHORITY HAVING JURISDICTION
TOWN OF ANDOVER
36 BARTLET STREET
ANDOVER, MA 01810
978-623-8650

UTILITY
NATIONAL GRID

CIVIL ENGINEER
FIRM: BORREGO SOLAR SYSTEMS, INC.
CONTACT: BRANDON SMITH, P.E.
PHONE: 978-221-3093

ELECTRICAL ENGINEER
FIRM: BORREGO SOLAR SYSTEMS, INC
CONTACT: AHARON WRIGHT, P.E.
PHONE: 978-221-3081

DESIGN ENGINEER
FIRM: BORREGO SOLAR SYSTEMS, INC
CONTACT: STEVEN RIGGALL
PHONE: 518-309-7837

GENERAL ABBREVIATIONS

(E)	EXISTING
AHJ	AUTHORITY HAVING JURISDICTION
AL	ALUMINUM
APPROX	APPROXIMATE
ARY	ARRAY
BLDG	BUILDING
BSS	BORREGO SOLAR SYSTEM
CL	CENTERLINE
DAS	DATA ACQUISITION SYSTEM
DIA	DIAMETER
DO	DITTO
EW	EAST-WEST
FBO	FURNISHED BY OTHERS
FF	FORWARD FACING
GALV	GALVANIZED
HDG	HOT DIP GALVANIZED
HVAC	HEATING VENTILATION AND AIR CONDITIONING
ID	INSIDE DIAMETER
MFR	MANUFACTURER
MOD	SOLAR MODULE
NS	NORTH-SOUTH
NTS	NOT TO SCALE
OAE	OR APPROVED EQUAL
OC	ON CENTER
OD	OUTSIDE DIAMETER
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
PV	PHOTOVOLTAIC
PVC	POLY VINYL CHLORIDE
SCH	SCHEDULE
SS	STAINLESS STEEL
SSS	SOLAR SUPPORT STRUCTURE
STC	STANDARD TEST CONDITIONS
TBD	TO BE DETERMINED
TP	TAMPER PROOF
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
VIF	VERIFY IN FIELD
WP	WEATHER PROOF

REV 1.0

BORREGO
55 TECHNOLOGY DRIVE, SUITE 102
LOWELL, MA 01851
PHONE: (888) 898-6273
FAX: (888) 843-6778
WWW.BORREGOSOLAR.COM

NOT FOR CONSTRUCTION

COMMONWEALTH OF MASSACHUSETTS
BRANDON L. SMITH
CIVIL
NO. 55381
REGISTERED PROFESSIONAL ENGINEER
3/12/2022

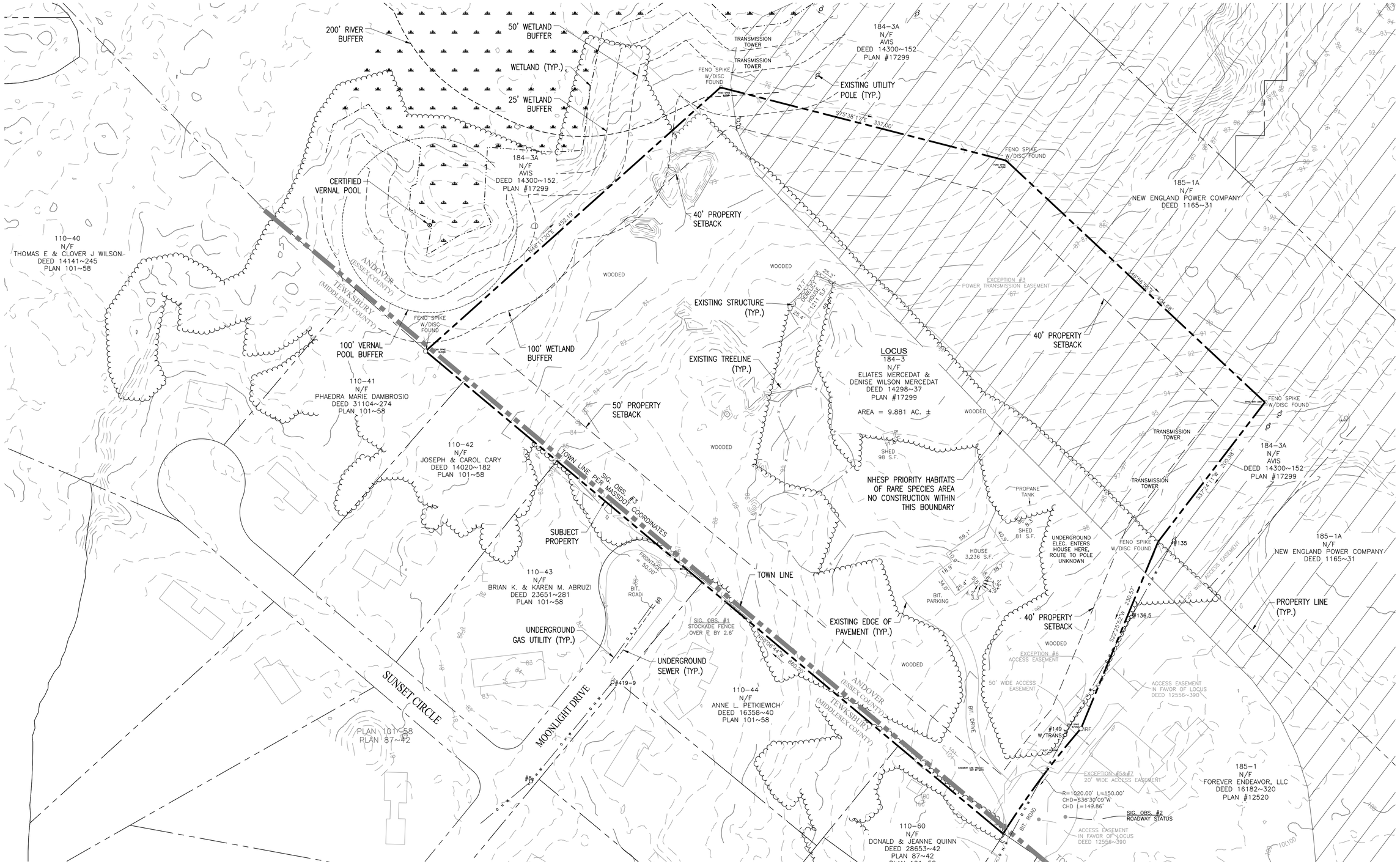
SITE USE PLAN SET
1320 S STREET
ANDOVER, MA 01810

PROJECT NUMBER:
120-0345

REV	DATE	DRAWN	CHECKED	RELEASE LEVEL
1	4/12/21	CS	BS	SITE USE PERMIT SET

SCALES STATED ON DRAWINGS ARE VALID ONLY WHEN PLOTTED ARCH D 24" X 36"

T-1
TITLE PAGE



EXISTING CONDITIONS PLAN

SCALE: 1" = 50'

0 50' 100'

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COMMONWEALTH OF MASSACHUSETTS
BRANDON L. SMITH
CIVIL
NO. 55382
REGISTERED PROFESSIONAL ENGINEER
5/12/2022

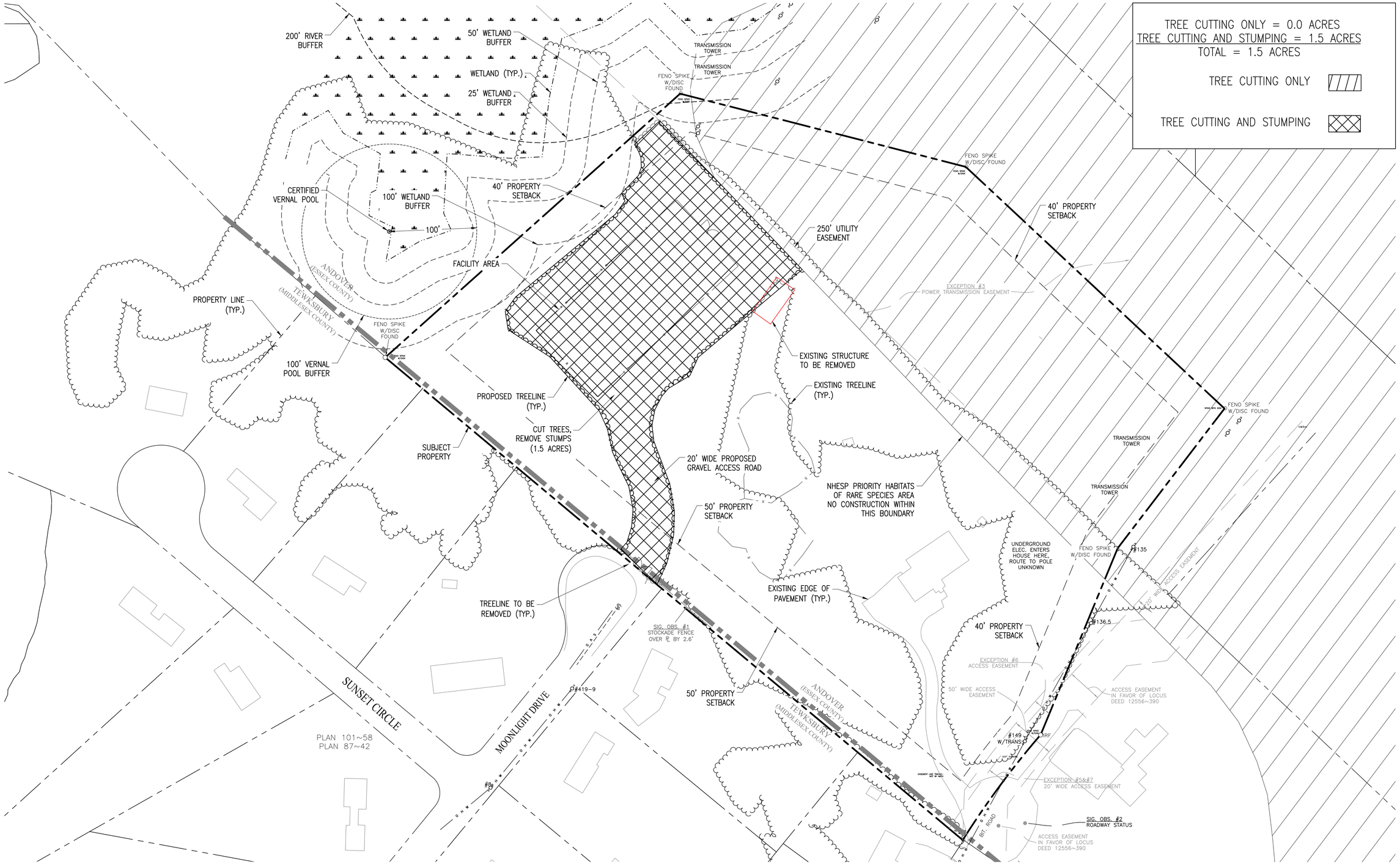
SITE USE PLAN SET
1320 S STREET
ANDOVER, MA 01810

PROJECT NUMBER: 120-0345

REV	DATE	DRAWN	CHECKED	RELEASE LEVEL
1	4/12/21	CS	BS	SITE USE PERMIT SET

SCALES STATED ON DRAWINGS ARE VALID ONLY WHEN PLOTTED ARCH D 24" X 36"

C-1.0
EXISTING CONDITIONS PLAN



TREE CLEARING PLAN

SCALE: 1" = 50'

0 50' 100'

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COMMONWEALTH OF MASSACHUSETTS
BRANDON L. SMITH
CIVIL
NO. 55382
REGISTERED PROFESSIONAL ENGINEER
4/12/2022

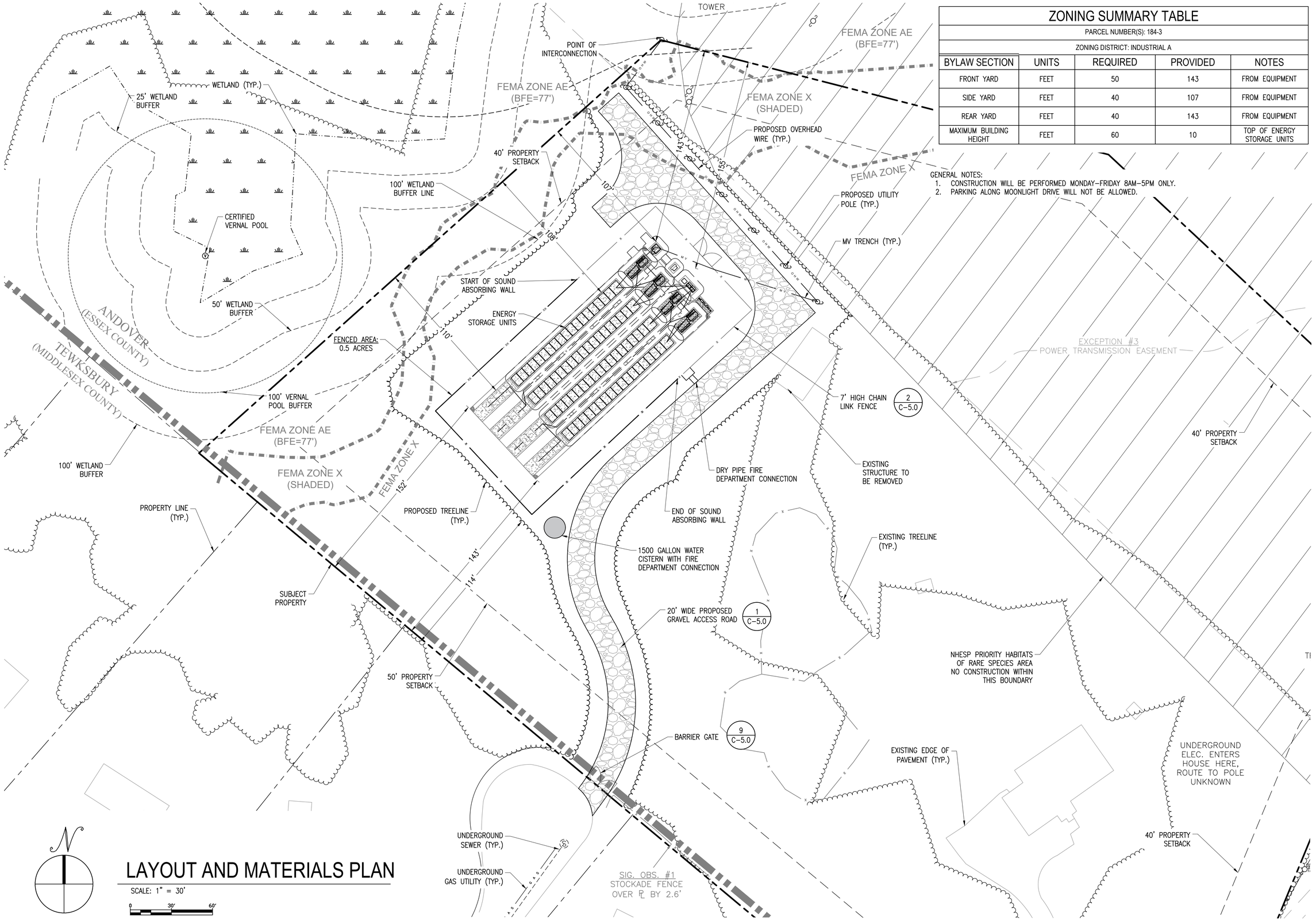
SITE USE PLAN SET
1320 S STREET
ANDOVER, MA 01810

PROJECT NUMBER: 120-0345

REV	DATE	DRAWN	CHECKED	RELEASE LEVEL
1	4/12/21	CS	BS	SITE USE PERMIT SET

SCALES STATED ON DRAWINGS ARE VALID ONLY WHEN PLOTTED ARCH D 24" X 36"

C-2.0
TREE CLEARING PLAN



ZONING SUMMARY TABLE

PARCEL NUMBER(S): 184-3

ZONING DISTRICT: INDUSTRIAL A

BYLAW SECTION	UNITS	REQUIRED	PROVIDED	NOTES
FRONT YARD	FEET	50	143	FROM EQUIPMENT
SIDE YARD	FEET	40	107	FROM EQUIPMENT
REAR YARD	FEET	40	143	FROM EQUIPMENT
MAXIMUM BUILDING HEIGHT	FEET	60	10	TOP OF ENERGY STORAGE UNITS

GENERAL NOTES:
1. CONSTRUCTION WILL BE PERFORMED MONDAY–FRIDAY 8AM–5PM ONLY.
2. PARKING ALONG MOONLIGHT DRIVE WILL NOT BE ALLOWED.

LAYOUT AND MATERIALS PLAN

SCALE: 1" = 30'

0 30' 60'

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NOT FOR CONSTRUCTION

BRANDON L. SMITH CIVIL NO. 55382 REGISTERED PROFESSIONAL ENGINEER
COMMONWEALTH OF MASSACHUSETTS
4/12/2022

SITE USE PLAN SET
1320 S STREET
ANDOVER, MA 01810

PROJECT NUMBER: 120-0345

REV	DATE	DRAWN	CHECKED	RELEASE LEVEL
1	4/12/21	CS	BS	SITE USE PERMIT SET

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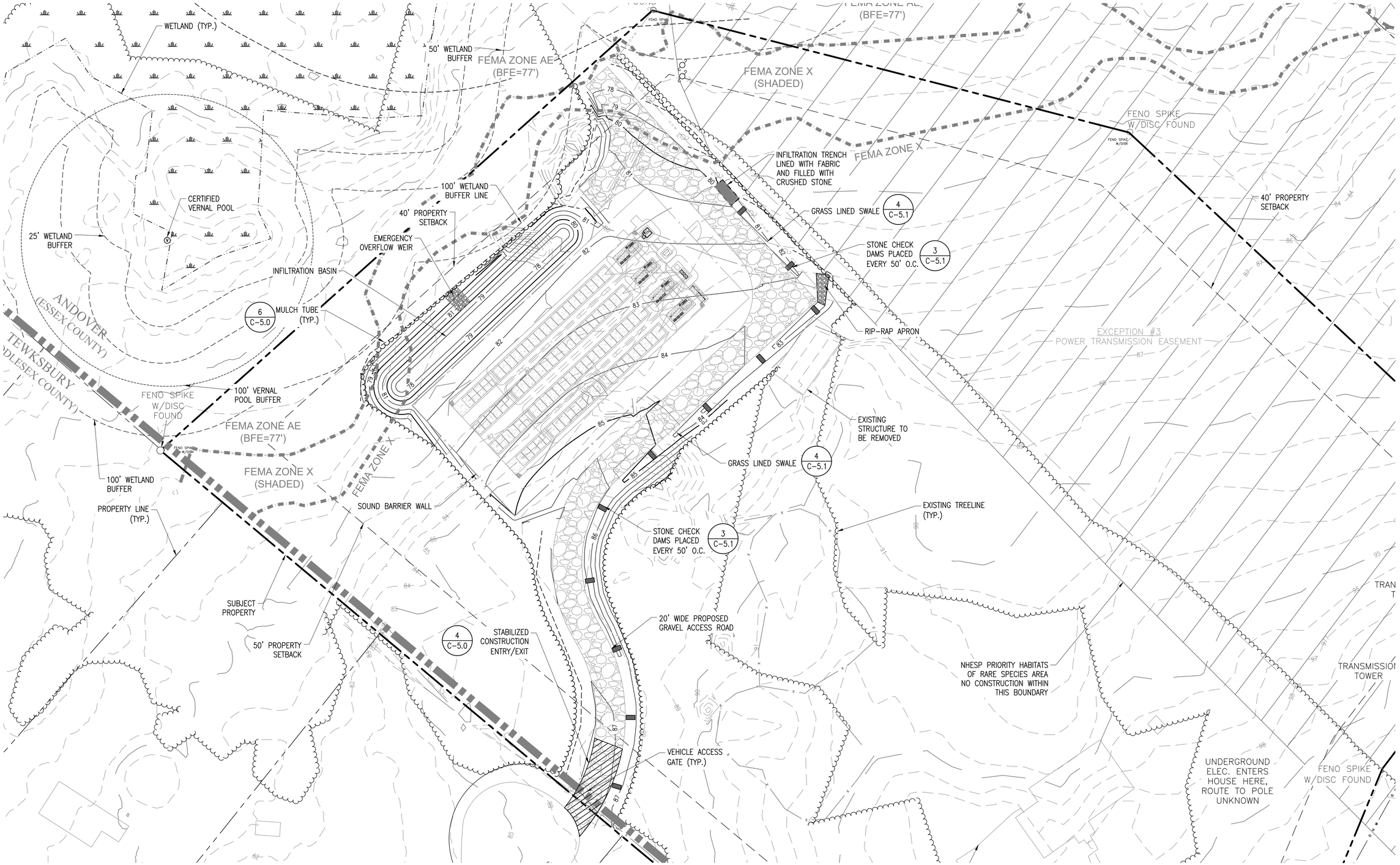
C-3.0
LAYOUT AND MATERIALS PLAN



GRADING AND EROSION CONTROL PLAN

SCALE: 1" = 30'

0 30' 60'

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COMMONWEALTH OF MASSACHUSETTS
BRANDON L. SMITH
CIVIL
NO. 55362
REGISTERED PROFESSIONAL ENGINEER
4/12/2022

SITE USE PLAN SET
1320 S STREET
ANDOVER, MA 01810

PROJECT NUMBER: 120-0345

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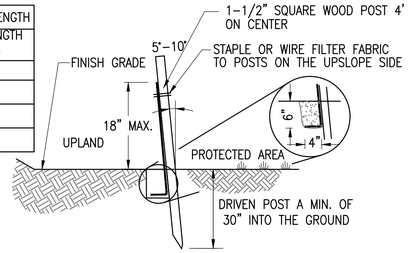
1	4/12/21	CS	BS	SITE USE PERMIT SET

SCALES STATED ON DRAWINGS ARE VALID ONLY WHEN PLOTTED ARCH D 24" X 36"

C-4.0
GRADING AND EROSION CONTROL PLAN

MAX ALLOWABLE SLOPE LENGTH	
STEEPNESS	MAX LENGTH (FT.)
2:1	25
3:1	50
4:1	75
5+:1	100



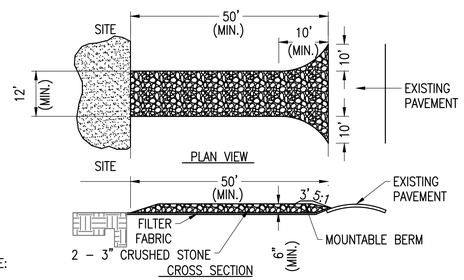
NOTES:

1. MAX DRAINAGE AREA FOR OVERLAND FLOW SHALL NOT EXCEED 1/4 ACRE-FOOT PER 100 FEET OF FENCE.
2. FILTER FABRIC TO BE FASTENED SECURELY TO FENCE POST WITH WIRE TIES OR STAPLES. POST SHALL BE STEEL EITHER "T" OR "U" SHAPED OR HARDWOOD.
3. FILTER CLOTH SHALL BE FASTENED SECURELY WITH TIES SPACED EVERY 24" AT TOP AND MID-SECTION.
4. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY 6 INCHES AND FOLDED. FILTER CLOTH SHALL BE FILTER X, MIRAFI 100X, STABILENKA T140N, OR APPROVED EQUAL.
5. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUAL.
6. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SEDIMENT FENCE.

7 SILT FENCE

SCALE: NTS

XD_CIVIL_EROSION_SILT FENCE_P 2014-10-17



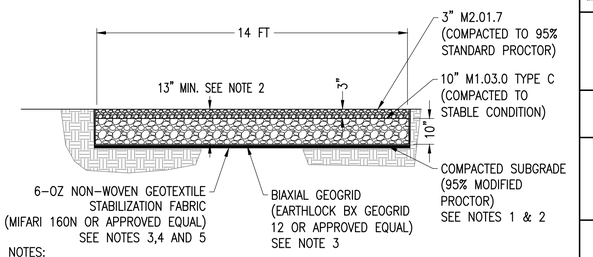
NOTE:

1. ENTRANCE WIDTH SHALL BE A TWENTY-FOUR (24) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
2. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH SHALL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY. BERM SHALL BE PERMITTED. PERIODIC INSPECTION AND MAINTENANCE SHALL BE PROVIDED AS NEEDED.

4 STABILIZED CONSTRUCTION EXIT

SCALE: NTS

XD_CIVIL_TEMPORARY CONSTRUCTION_STABILIZED CONSTRUCTION EXIT 06-10-2016



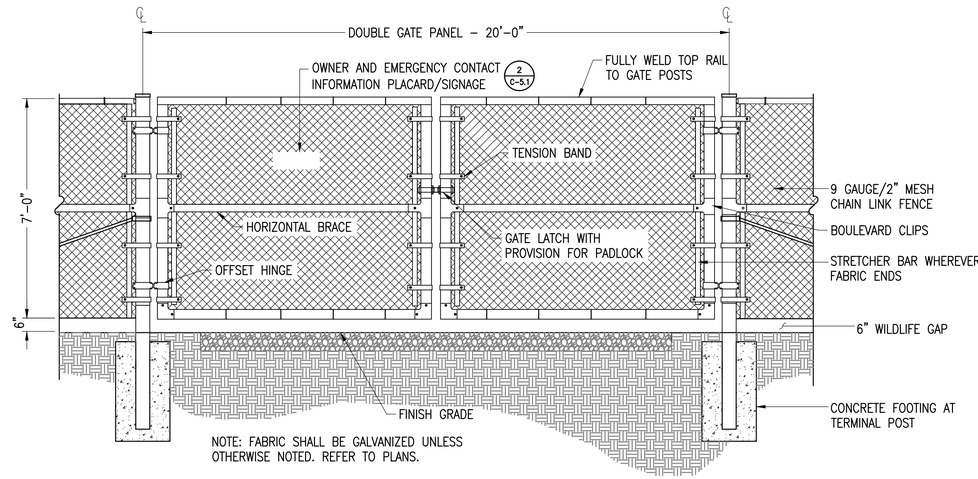
NOTES:

1. SUBCONTRACTOR SHALL EXCAVATE TO SUITABLE MATERIAL FOR SUBGRADE.
2. SUBCONTRACTOR SHALL COMPACT SUBGRADE TO PROVIDE SUITABLE SURFACE TO PLACE ROAD. REFER TO GEOTECHNICAL REPORT FOR SUBGRADE PREPERATION CRITERIA.
3. SUBCONTRACTOR SHALL FOLLOW MANUFACTURER INSTALLATION PROCEDURES.
4. WHERE OVERLAPPING OF GEOTEXTILE FABRIC IS REQUIRED, SUBCONTRACTOR SHALL OVERLAP A MINIMUM OF 24".
5. SUBCONTRACTOR SHALL REMOVE TEMPORARY CONSTRUCTION ACCESS ROADS, AND RESTORE TO PRE-CONSTRUCTION CONDITIONS TO THE SATISFACTION OF THE CEOR AND THE GOVERNING AGENCIES.
6. SUBCONTRACTOR SHALL INSTALL CONDUITS FOR ALL ELECTRICAL CONDUIT CROSSINGS PRIOR TO INSTALLATION OF THE GEOGRID MATERIAL. THE GEOGRID SHALL NOT BE HORIZONTALLY CUT ONCE INSTALLED.

1 GRAVEL ACCESS ROAD

SCALE: NTS

XD_CIVIL_GRAVEL_ROAD_IL 04-30-2019

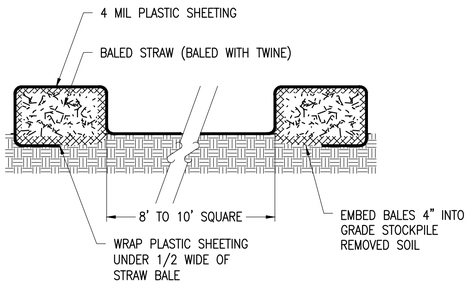


NOTE: FABRIC SHALL BE GALVANIZED UNLESS OTHERWISE NOTED. REFER TO PLANS.

8 VEHICLE GATE WITH WILDLIFE GAP

SCALE: NTS

XD_CIVIL_FENCE_VEHICLE GATE_7' 07-02-2020

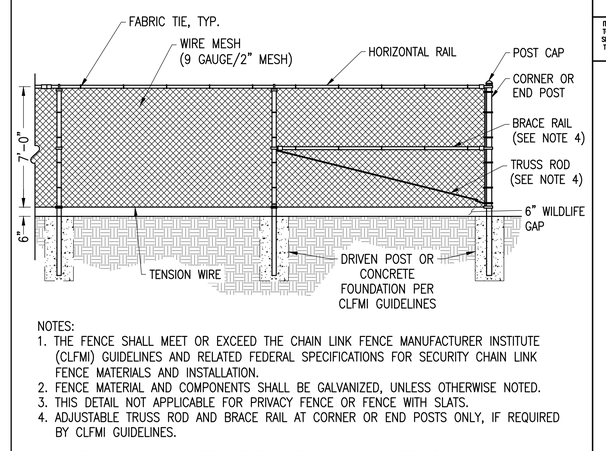


NOTE: PLASTIC SHEETING SHALL BE FREE OF TEARS OR HOLES. AFTER BASIN IS USED, WASHWATER FROM WASHOUT BASIN SHALL EVAPORATE OR BE VACUUMED OUT. REMOVE REMAINING HARDENED SOLIDS. REPLACE PLASTIC SHEETING AND STRAWBALES AS REQUIRED.

5 CONCRETE WASHOUT BASINS

SCALE: NTS

XD_CIVIL_CONCRETE WASHOUT BASINS 07-24-2017



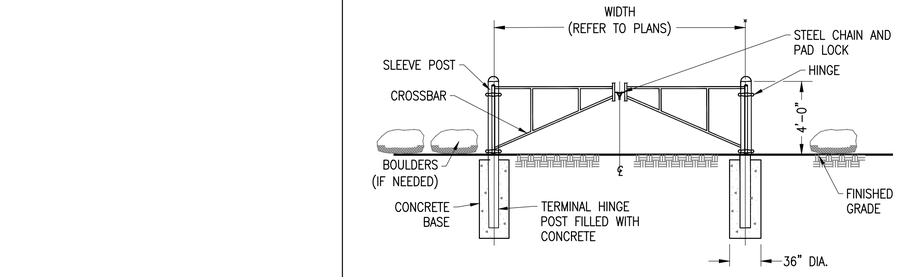
NOTES:

1. THE FENCE SHALL MEET OR EXCEED THE CHAIN LINK FENCE MANUFACTURER INSTITUTE (CLFMI) GUIDELINES AND RELATED FEDERAL SPECIFICATIONS FOR SECURITY CHAIN LINK FENCE MATERIALS AND INSTALLATION.
2. FENCE MATERIAL AND COMPONENTS SHALL BE GALVANIZED, UNLESS OTHERWISE NOTED.
3. THIS DETAIL NOT APPLICABLE FOR PRIVACY FENCE OR FENCE WITH SLATS.
4. ADJUSTABLE TRUSS ROD AND BRACE RAIL AT CORNER OR END POSTS ONLY, IF REQUIRED BY CLFMI GUIDELINES.

2 CHAIN LINK FENCE WITH WILDLIFE GAP

SCALE: NTS

XD_CIVIL_FENCE_7'_CHAIN_LINK_WILDLIFE_GAP 07-02-2020

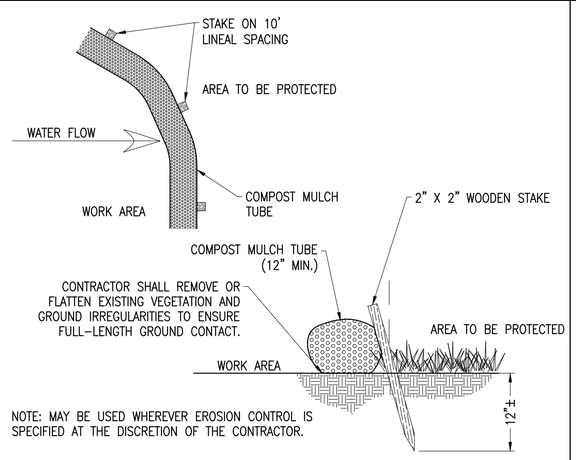


NOTE:
CONTRACTOR SHALL ENSURE NO VEHICULAR ACCESS (INCLUDING MOTORCYCLES, ATV'S, ETC.) AROUND BARRIER GATE.

9 BARRIER GATE

SCALE: NTS

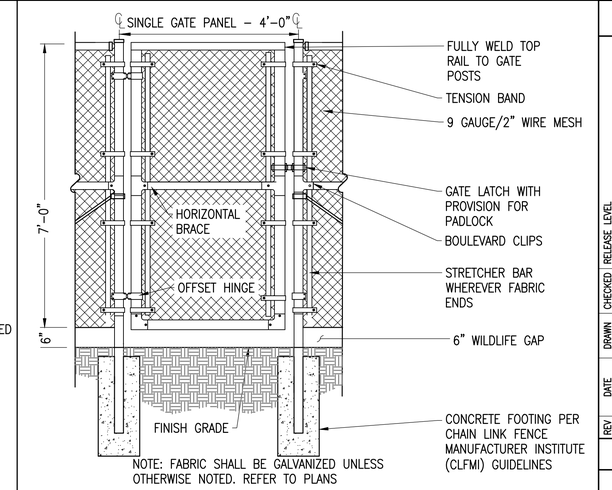
XD_CIVIL_ACCESS_BARRIER_GATE 10-24-2018



NOTE: MAY BE USED WHEREVER EROSION CONTROL IS SPECIFIED AT THE DISCRETION OF THE CONTRACTOR.

6 MULCH TUBE

SCALE: NTS



NOTE: FABRIC SHALL BE GALVANIZED UNLESS OTHERWISE NOTED. REFER TO PLANS

3 4' ACCESS GATE WITH WILDLIFE GAP

SCALE: NTS

XD_CIVIL_SITE CONSTRUCTION_4' WALK THROUGH GATE 07-25-2017

BORREGO
55 TECHNOLOGY DRIVE, SUITE 102
LOWELL, MA 01851
PHONE: (888) 898-6273
FAX: (888) 843-6778
WWW.BORREGOSOLAR.COM

NOT FOR CONSTRUCTION

COMMONWEALTH OF MASSACHUSETTS
BRANDON L. SMITH
CIVIL
NO. 55382
REGISTERED PROFESSIONAL ENGINEER
1/12/2022

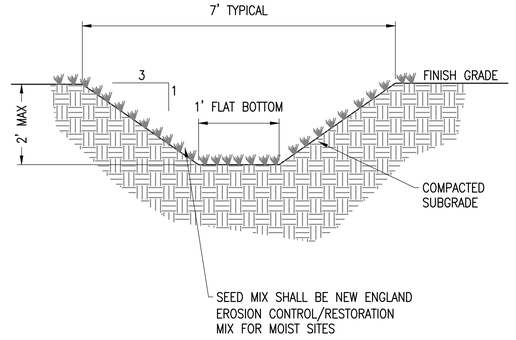
SITE USE PLAN SET
1320 S STREET
ANDOVER, MA 01810

PROJECT NUMBER: 120-0345

REV	DATE	DRAWN	CHECKED	RELEASE LEVEL
1	4/12/21	CS	BS	SITE USE PERMIT SET

SCALES STATED ON DRAWINGS ARE VALID ONLY WHEN PLOTTED ARCH D 24" X 36"

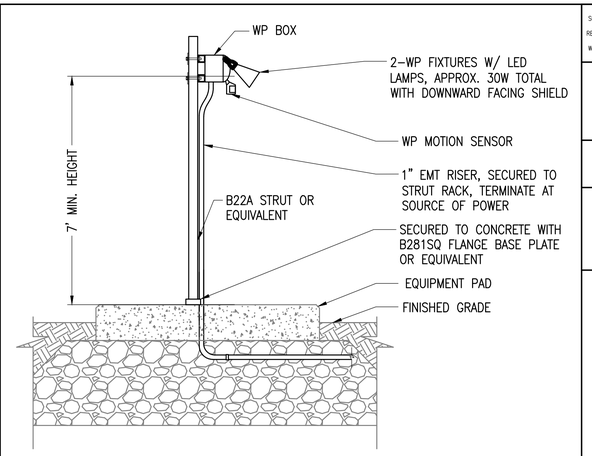
C-5.0
CIVIL DETAILS



4 GRASS LINED SWALE

SCALE: NTS

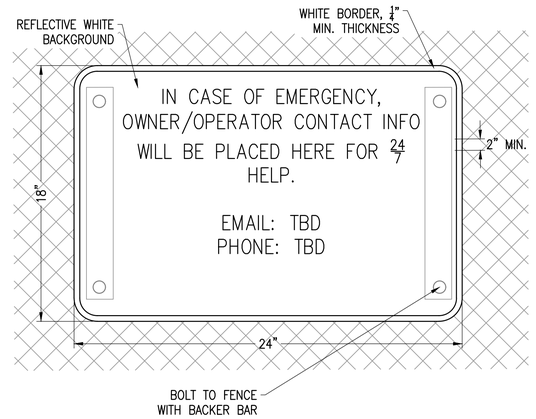
XD_CIVIL_DRAINAGE_GRASS_SWALE 07-12-21



1 STAND ALONE LIGHT MOUNTING

SCALE: NTS

XD_ELEC_STAND ALONE LIGHT MOUNTING 2016-10-17

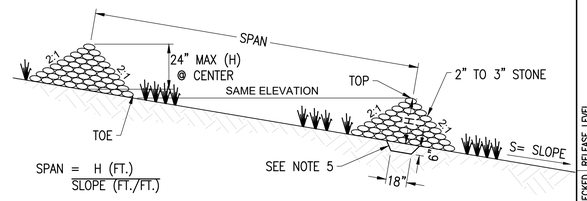


2 EMERGENCY CONTACT SIGN

LOCATED AT VEHICLE GATES

SCALE: NTS

XD_CIVIL_SIGNAGE_EMERGENCY 2019-2-22



NOTES:
1. MAXIMUM DRAINAGE AREA ≤ 2 ACRES
2. USE MA DOT M.2.01.1 CRUSHED STONE
3. H=24" MAX @ CENTER
4. STONE SHALL BE PLACED ON A FILTER FABRIC FOUNDATION
5. INSTALL 6" DEEP CUT-OFF TRENCH BELOW
6. EXTEND THE STONE A MINIMUM OF 1.5' BEYOND THE DITCH BANKS TO PREVENT CUTTING AROUND THE DAM

3 STONE CHECK DAM

SCALE: N.T.S.

XD_CIVIL_CHECK DAM 08-15-2016

BORREGO
55 TECHNOLOGY DRIVE, SUITE 102
LOWELL, MA 01851
PHONE: (888) 898-6273
FAX: (888) 843-6778
WWW.BORREGOSOLAR.COM

NOT FOR CONSTRUCTION

COMMONWEALTH OF MASSACHUSETTS
BRANDON L SMITH
CIVIL
55382
REGISTERED PROFESSIONAL ENGINEER
4/12/2022

SITE USE PLAN SET
1320 S STREET
ANDOVER, MA 01810

PROJECT NUMBER: 120-0345

REV	DATE	DRAWN	CHECKED	RELEASE LEVEL
1	4/12/21	CS	BS	SITE USE PERMIT SET

SCALES STATED ON DRAWINGS ARE VALID ONLY WHEN PLOTTED ARCH D 24" X 36"

C-5.1
CIVIL DETAILS

PRODUCT CUT SHEETS

POWIN

PRODUCT: Stack750E PLATFORM: Centipede

Centipede is Powin's modular battery energy storage platform, purpose-built for the most grueling environments and use cases. Designed to dramatically increase site energy density, decrease installation times and simplify capacity augmentation, Centipede is ready to perform a diverse set of market applications including Frequency Response/Regulation, T&D Deferral, Flexible Peaking Capacity, Renewable Integration and more.

Modular, Scalable and Configurable

Centipede's modular design allows you to easily scale up your project size from a single standalone unit to gigawatt-hours per project site. Centipede utilizes Powin's field-proven Stack hardware and StackOS software platform to ensure continuity and familiarity between Powin's product lines to perform a variety of simple and advanced market applications.

Enhanced Safety and Quality

Centipede combines Powin's safest-in-class LFP Stack hardware and integrated enclosures into one standardized, factory-built, outdoor product to ensure maximum quality control. Each Centipede unit includes a comprehensive package of explosion prevention and fire safety features, such as hydrogen detection and active ventilation, fire detection, fireproof insulation, and optional clean agent fire suppression.

End to End Cost Savings

Centipede's factory-built and tested design allows for units to be installed on site in a fraction of the time it takes for traditional enclosure-based systems to be installed. The increased energy density also reduces the amount of land that is required to install a system per MWh. The highly serviceable design includes field-swappable, redundant components that minimizes downtime and service costs. These advantages, paired with Powin's diverse supply chain and Tier 1 cell procurement strategy give Powin's customers continual cost advantages upfront and over the lifespan of a system.

POWIN STACK750 TECHNICAL SPECIFICATIONS

		STACK750E		
Electrical	DC Voltage	1,210 - 1,491 V		
	Duration	2+ hrs		
	Maximum Energy Capacity[1]	750 kWh DC per segment & 250 MWh AC per acre		
	Rated Duration of Discharge	2 hrs	3 hrs	4 hrs
	DC Power @ Rated Duration	369.5 kW	247.5 kW	186.5 kW
	DC Energy Capacity @ Rated Duration[2]	739 kWh	742.5 kWh	746 kWh
	Aux Load per Stack (Standby/Peak)[3]	0.25 kW / 5.6 kW	0.24 kW / 5.5 kW	0.23 kW / 5.4 kW
	Daily Aux Energy per Stack[3]	29 - 31 kWh	21 - 23 kWh	17 - 19 kWh
	Auxiliary Power Input	3-phase 480V AC / 60 Hz (50 Hz option available)		
Performance & Safety	DC Round Trip Efficiency	93%	94%	95%
	Cycle Life[4,5]	7,300 cycles		
	Calendar Life[5]	20 years		
	Cell Manufacturers	CATL & EVE		
	Cell Chemistry	Lithium Iron Phosphate (LFP)		
	Depth of Discharge	100%		
	Explosion Prevention & Mitigation	Off-gas detection with dedicated, fail-safe active & passive ventilation systems		
	Fire Suppression	Addressable fire panel, smoke & heat detectors, heat activated sprinkler system with remote FDC dry standpipe connection, fire rated insulation, strobes, and horn; optional clean agent fire suppression		
	Heating & Cooling[6]	Redundant, field-swappable, high efficiency HVAC with humidity control		
	Codes & Compliance	UL 9540A, UL 1642, UL 1973, UL 9540, NFPA 1, NFPA 69, NFPA 855, IFC, IEC 62619, IEC 6100-6-2, IEC 62477, UN3480, UN38.3		
Mechanical	Weight (Approximate)	20,000 lbs (9,074 kg)		
	Battery Segment Dimensions	8'1" D x 5'2" L x 10'8" H (2,443mm x 1,572mm x 3,282mm)		
	Enclosure Type / Rating[7]	NEMA 4/IP 56 standard; NEMA 4X available		
	Ambient Operating Temperature Range[8]	-30° C to +50° C		
Software	BMS + EMS + Solar + Environmental Controls	StackOS™		
	Analytics + Optimization + Data Warehouse	StackOS+™		
	First Responder HMI	Powin for First Responders™		
	Communications Interface	Modbus TCP (MESA/Sunspec) & REST API		

Note: Specifications in the above table are design estimates only and are not guaranteed. Contact Powin for a project-specific estimate as final values depend on system design, location, and use case.

1 Per acre energy capacity represents fully installed AC BESS, including inverters, transformers, and auxilaries; excludes augmentation

2 Energy capacity is recorded at the DC bus

3 Assumes 1 full cycle per day at rated power in a temperate climate; active cell balancing contribution de minimous

4 Assumes 1 full cycle per day and includes calendar aging for the day; 2-hr systems may provide fewer cycles depending on the cell used

5 End of life depends both on BESS age and usage; actual lifetime may be less than 20 years

6 Degree of HVAC redundancy (partial or full) depends on location and use case

7 IP rating applicable only for the compartments containing batteries and electronics

8 StackOS may automatically derate power at high/low ambient temperatures or after extended operation to mantain proper cell temperatures

NOISE STUDY

SOUND LEVEL MODELING REPORT

South Street Energy Storage Project
Andover, Massachusetts

Prepared for:

Borrego Solar Systems, Inc
30 Century Hill Drive, Suite 301
Latham, NY 12110

Prepared by:

Epsilon Associates, Inc.
3 Mill & Main Place, Suite 250
Maynard, MA 01754

April 12, 2022

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1.0 EXECUTIVE SUMMARY

The South Street Energy Storage Project (the Project) is a proposed energy storage facility with a capacity of approximately 12 megawatts (MW) in Andover, Massachusetts. The Project is being developed by Borrego Solar Systems, Inc (Borrego). Epsilon Associates Inc. (Epsilon) has been retained by Borrego to conduct a sound level modeling study for this Project. This report presents results of the sound level modeling from the proposed energy storage system in Andover.

This sound level assessment includes computer modeling to predict worst-case future L_{eq} sound levels from the Project. The Project will initially include seventy-six energy storage containers and will be augmented in the future with sixteen additional containers. The analysis was conservatively conducted for the full future build out scenario which includes ninety-two energy storage containers and four associated central inverters. Sound level modeling was conducted for both unmitigated and mitigated scenarios.

The worst-case L_{eq} sound levels produced by the Project were predicted through modeling. The highest predicted unmitigated Project Only L_{eq} sound level at a modeling receptor is 54 dBA. The highest predicted mitigated Project Only L_{eq} sound level at a modeling receptor is 46 dBA which occurs at the home located on the Project parcel. The highest predicted mitigated Project Only L_{eq} sound level at a noise sensitive property line is 45 dBA.

2.0 INTRODUCTION

The proposed Project will consist of ninety-two (92) energy storage containers and four (4) associated central inverters. Figure 2-1 shows the location of the Project in Andover over aerial imagery.

This report presents the findings of a sound level modeling analysis for the Project. The Project components were modeled in CadnaA using sound data provided by Borrego or calculated by Epsilon. The results of this analysis are found within this report.

G:\Projects2\MA\Andover\6495\MXD\2-1_Aerial_Locus_20220411.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

1320 South Street Energy Storage Project **Andover, Massachusetts**

Epsilon ASSOCIATES INC.

Figure 2-1
Aerial Locus

3.0 SOUND TERMINOLOGY

There are several ways in which sound levels are measured and quantified. All of them use the logarithmic decibel (dB) scale. The following information defines the sound level terminology used in this analysis.

The decibel scale is logarithmic to accommodate the wide range of sound intensities found in the environment. A property of the decibel scale is that the sound pressure levels of two or more separate sounds are not directly additive. For example, if a sound of 50 dB is added to another sound of 50 dB, the total is only a 3-decibel increase (53 dB), which is equal to doubling in sound energy, but not equal to a doubling in decibel quantity (100 dB). Thus, every 3-dB change in sound level represents a doubling or halving of sound energy. The human ear does not perceive changes in the sound pressure level as equal changes in loudness. Scientific research demonstrates that the following general relationships hold between sound level and human perception for two sound levels with the same or very similar frequency characteristics[1]:

- 3 dBA increase or decrease results in a change in sound that is just perceptible to the average person,
- 5 dBA increase or decrease is described as a clearly noticeable change in sound level, and
- 10 dBA increase or decrease is described as twice or half as loud.

Another mathematical property of decibels is that if one source of sound is at least 10 dB louder than another source, then the total sound level is simply the sound level of the higher-level source. For example, a sound source at 60 dB plus another sound source at 47 dB is equal to 60 dB.

A sound level meter (SLM) that is used to measure sound is a standardized instrument.[2] It contains "weighting networks" (e.g., A-, C-, Z-weightings) to adjust the frequency response of the instrument. Frequencies, reported in Hertz (Hz), are detailed characterizations of sounds, often addressed in musical terms as "pitch" or "tone". The most commonly used weighting network is the A-weighting because it most closely approximates how the human ear responds to sound at various frequencies. The A-weighting network is the accepted scale used for community sound level measurements; therefore, sounds are frequently reported as detected with a sound level meter using this weighting. A-weighted sound levels emphasize middle frequency sounds (i.e., middle pitched – around 1,000 Hz), and de-emphasize low and high frequency sounds. These sound levels are reported in decibels designated as "dBA". The C-weighting network has a nearly flat response for frequencies between 63 Hz and 4,000 Hz and is noted as dBC. Z-weighted sound

---

1 Bies, David, and Colin Hansen. 2009. *Engineering Noise Control: Theory and Practice*, 4th Edition. New York: Taylor and Francis.

2 *American National Standard Specification for Sound Level Meters*, ANSI S1.4-1983 (R2006), published by the Standards Secretariat of the Acoustical Society of America, Melville, NY.

levels are measured sound levels without any weighting curve and are otherwise referred to as "unweighted". Sound pressure levels for some common indoor and outdoor environments are shown in Figure 3-1.

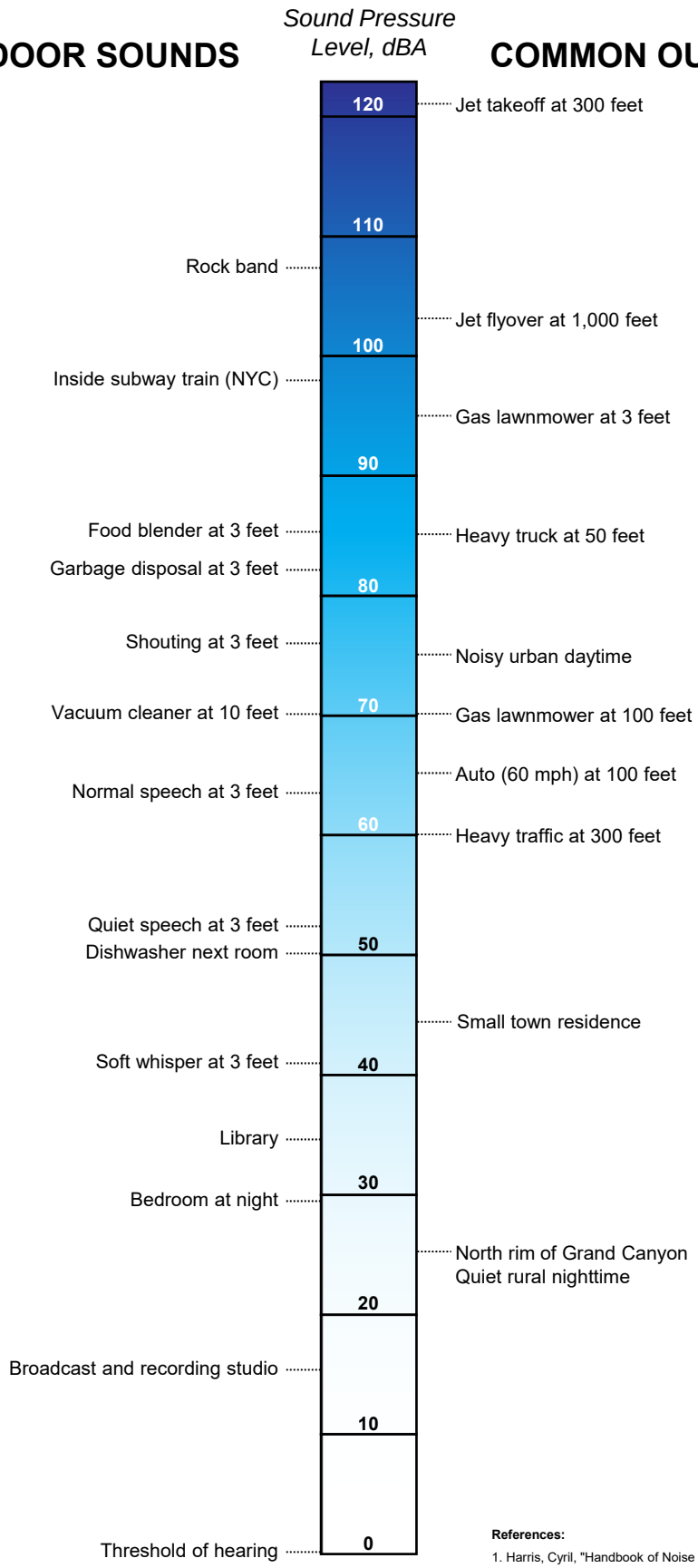
Because the sounds in our environment vary with time they cannot simply be described with a single number. Two methods are used for describing variable sounds. These are exceedance levels and the equivalent level, both of which are derived from some number of moment-to-moment A-weighted sound level measurements. Exceedance levels are values from the cumulative amplitude distribution of all of the sound levels observed during a measurement period. Exceedance levels are designated L_n, where n can have a value between 0 and 100 in terms of percentage. Several sound level metrics that are commonly reported in community sound level monitoring are described below.

- L_{10} is the sound level exceeded only 10 percent of the time. It is close to the maximum level observed during the measurement period. The L_{10} is sometimes called the intrusive sound level because it is caused by occasional louder sounds like those from passing motor vehicles.

- L_{50} is the sound level exceeded 50 percent of the time. It is the median level observed during the measurement period. The L_{50} is affected by occasional louder sounds like those from passing motor vehicles; however, it is often found comparable to the equivalent sound level under relatively steady sound level conditions.

- L_{90} is the sound level exceeded 90 percent of the time during the measurement period. The L_{90} is close to the lowest sound level observed. It is essentially the same as the residual sound level, which is the sound level observed when there are no obvious nearby intermittent sound sources.

- L_{eq}, the equivalent level, is the level of a hypothetical steady sound that would have the same energy (*i.e.,* the same time-averaged mean square sound pressure) as the actual fluctuating sound observed. The equivalent level is designated L_{eq} and is typically A-weighted. The equivalent level represents the time average of the fluctuating sound pressure, but because sound is represented on a logarithmic scale and the averaging is done with linear mean square sound pressure values, the L_{eq} is mostly determined by loud sounds if there are fluctuating sound levels.



References:

1. Harris, Cyril, "Handbook of Noise Acoustical Measurements and Noise Control", p 1-10., 1998
2. "Controlling Noise", USAF, AFMC, AFDTC, Elgin AFB, Fact Sheet, August 1996
3. California Dept. of Trans., "Technical Noise Supplement", Oct, 1998

Figure 3-1

Common Indoor and Outdoor Sound Levels

4.0 MODELED SOUND LEVELS

4.1 Sound Sources

4.1.1 Energy Storage Systems

The primary sources of sound from the South Street Energy Storage facility will be the central inverters and energy storage containers. Sound pressure level data for this equipment was provided by Borrego. Sound Level data and number of each modeled sound source is presented in Table 1.

Table 4-1 Sound Level Data

Sound Source	Sound Pressure (per unit)	Number of Units Modeled
Inverter[1]	65 dBA at 10m (33 feet)	4
BESS Unit[2]	67 dBA at 2m (6.6 feet)	92

Notes: 1) SMA SCS 3950-UP-US unit.
2) Powin Stack 750E; Centipede platform.

A sound barrier wall was also included for the mitigated acoustic modeling scenario. The 3-sided sound barrier wall was assumed to be acoustically absorptive and will be 5.5 meters (18 feet) tall. The location of the sound barrier wall is shown in Figure 4-3.

4.2 Modeling Methodology

The sound impacts associated with the proposed energy storage systems were predicted using the CadnaA sound level calculation software developed by DataKustik GmbH. This software uses the ISO 9613-2 international standard for sound propagation.[3] The benefits of this software are a more refined set of computations due to the inclusion of topography, ground attenuation, multiple building reflections (if applicable), drop-off with distance, and atmospheric absorption. The CadnaA software allows for octave band calculation of sound from multiple sources as well as computation of diffraction.

Inputs and significant parameters employed in the model are described below.

- *Project Layout:* This analysis is for the layout provided to Epsilon on March 2, 2022. The proposed Project layout is identified in Figure 4-1 and location coordinates are provided in Appendix A.

[3] *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation,* International Standard ISO 9613-2:1996 (International Organization for Standardization, Geneva, Switzerland, 1996).

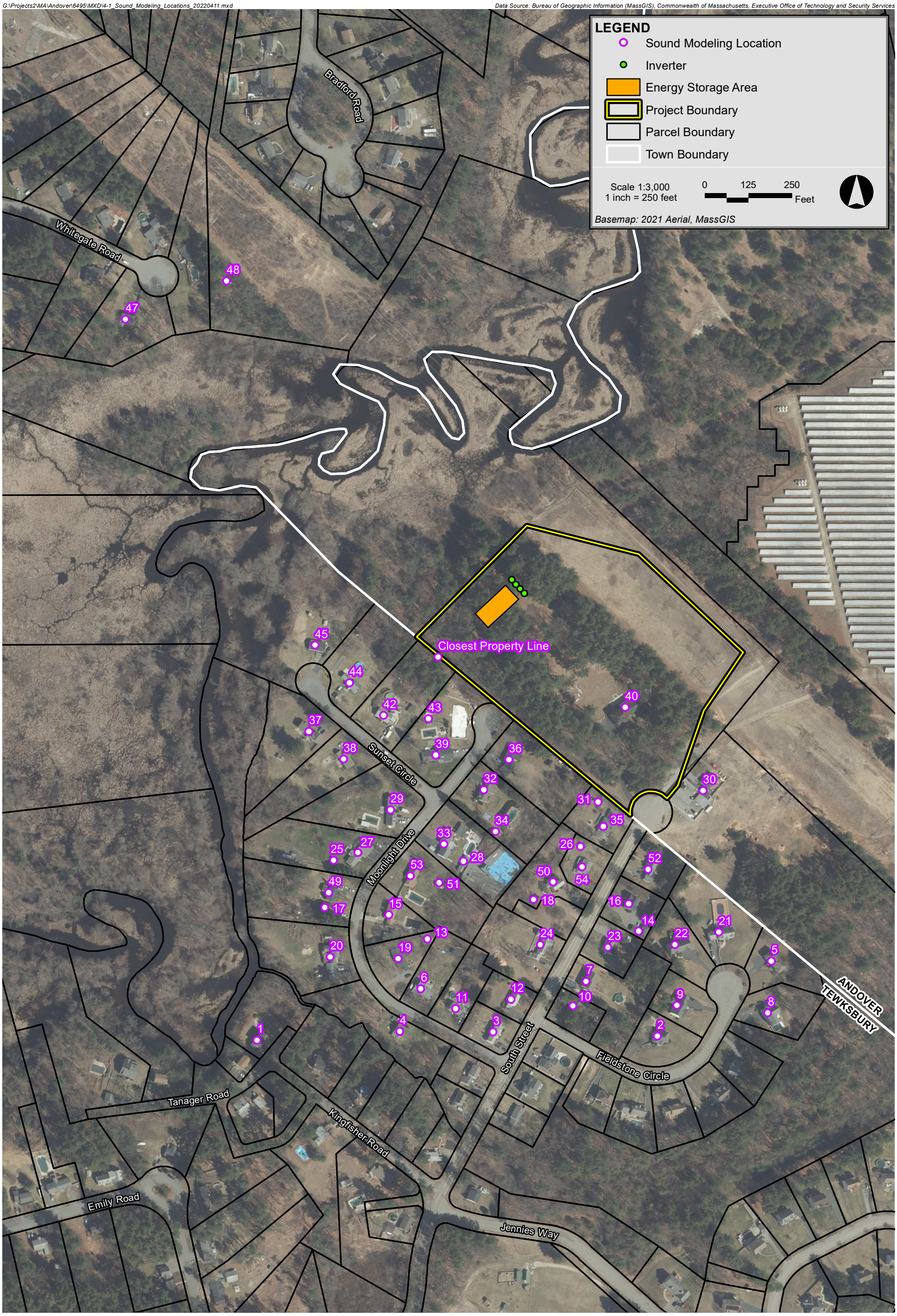
- *Modeling Receptor Locations:* a modeling receptor dataset including 52 receptors was provided by Borrego and input into the sound level model. Epsilon also included a receptor point to represent the closest noise sensitive property line adjacent to the Project. All modeling receptors were input as discrete points at a height of 1.5 meters above ground level to mimic the ears of a typical standing person.
- *Modeling Grid:* A modeling grid with 10-meter spacing was calculated for the entire region surrounding the Project. The grid was modeled at a height of 1.5 meters above ground level for consistency with the discrete modeling points. This modeling grid allowed for the creation of sound level isolines.
- *Terrain Elevation:* Elevation contours for the modeling domain were directly imported into CadnaA which allowed for consideration of terrain shielding where appropriate. The terrain height contour elevations for the modeling domain were generated from elevation information derived from the National Elevation Dataset (NED) developed by the U.S. Geological Survey.
- *Source Sound Levels:* Sound pressure levels used in the modeling were described in Section 4.1. These pressure levels were provided to Epsilon by South Street Energy Storage.
- *Meteorological Conditions:* A temperature of 10°C (50°F) and a relative humidity of 70% was assumed in the model.
- *Ground Attenuation:* Spectral ground absorption was calculated using a G-factor of 0.5 which corresponds to "mixed ground" consisting of both hard and porous ground cover. The model, consistent with the standard, allows inputs between 0 (hard ground) and 1 (porous ground). This is a conservative approach as the majority of the area consists of grass or wetlands.

Several modeling assumptions inherent in the ISO 9613-2 calculation methodology, or selected as conditional inputs by Epsilon, were implemented in the CadnaA model to ensure conservative results (i.e., higher sound levels), and are described below:

- All modeled sources were assumed to be operating simultaneously and at their maximum load corresponding to the greatest sound level impacts.
- As per ISO 9613-2, the model assumed favorable conditions for sound propagation, corresponding to a moderate, well-developed ground-based temperature inversion, as might occur on a calm, clear night or equivalently downwind propagation.
- Meteorological conditions assumed in the model (T=10°C/RH=70%) were selected to minimize atmospheric attenuation in the 500 Hz and 1 kHz octave bands where the human ear is most sensitive.
- No additional attenuation due to tree shielding, air turbulence, or wind shadow effects was considered in the model.

G:\Projects2\MA\Andover\6495\MXD\4-1_Sound_Modeling_Locations_20220411.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



1320 South Street Energy Storage Project Andover, Massachusetts

Epsilon Associates Inc.

Figure 4-1

Sound Modeling Locations

4.3 Sound Level Modeling Results

All modeled sound levels, as output from CadnaA are A-weighted equivalent sound levels (L_{eq}, dBA).

4.3.1 Unmitigated Project Only Results

Table B-1 in Appendix B shows the predicted unmitigated "Project Only" broadband (L_{eq}, dBA) sound levels at the 53 receptors modeled in the vicinity of the Project. These broadband sound levels range from 34 to 54 dBA and represent the worst-case sound levels produced solely by the Project equipment. The highest predicted sound level of 54 dBA occurs at the closest noise sensitive property line adjacent to the project equipment. In addition to the discrete modeling points, sound level isolines generated from the modeling grid are presented in Figure 4-2.

4.3.2 Mitigated Project Only Results

Table B-1 in Appendix B shows the predicted mitigated "Project Only" broadband (L_{eq}, dBA) sound levels at the 53 receptors modeled in the vicinity of the Project. These broadband sound levels range from 32 to 46 dBA and represent the worst-case sound levels produced solely by the Project equipment with the proposed sound barrier wall. The highest predicted sound level of 46 dBA occurs at receptor #40, which is located on the Project Parcel. The highest predicted sound level at a noise sensitive property line is 45 dBA. In addition to the discrete modeling points, sound level isolines generated from the modeling grid are presented in Figure 4-3.

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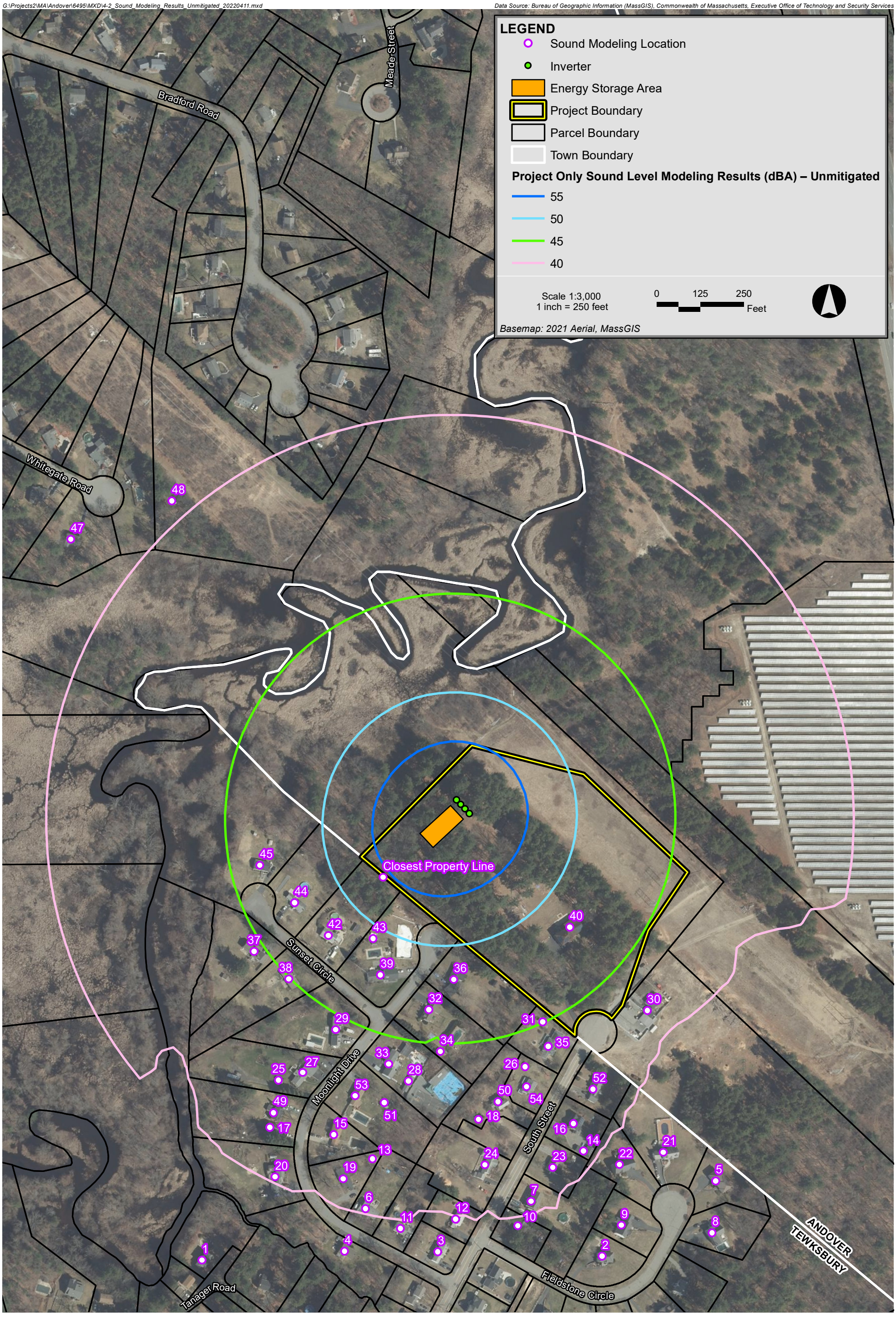
Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



1320 South Street Energy Storage Project Andover, Massachusetts

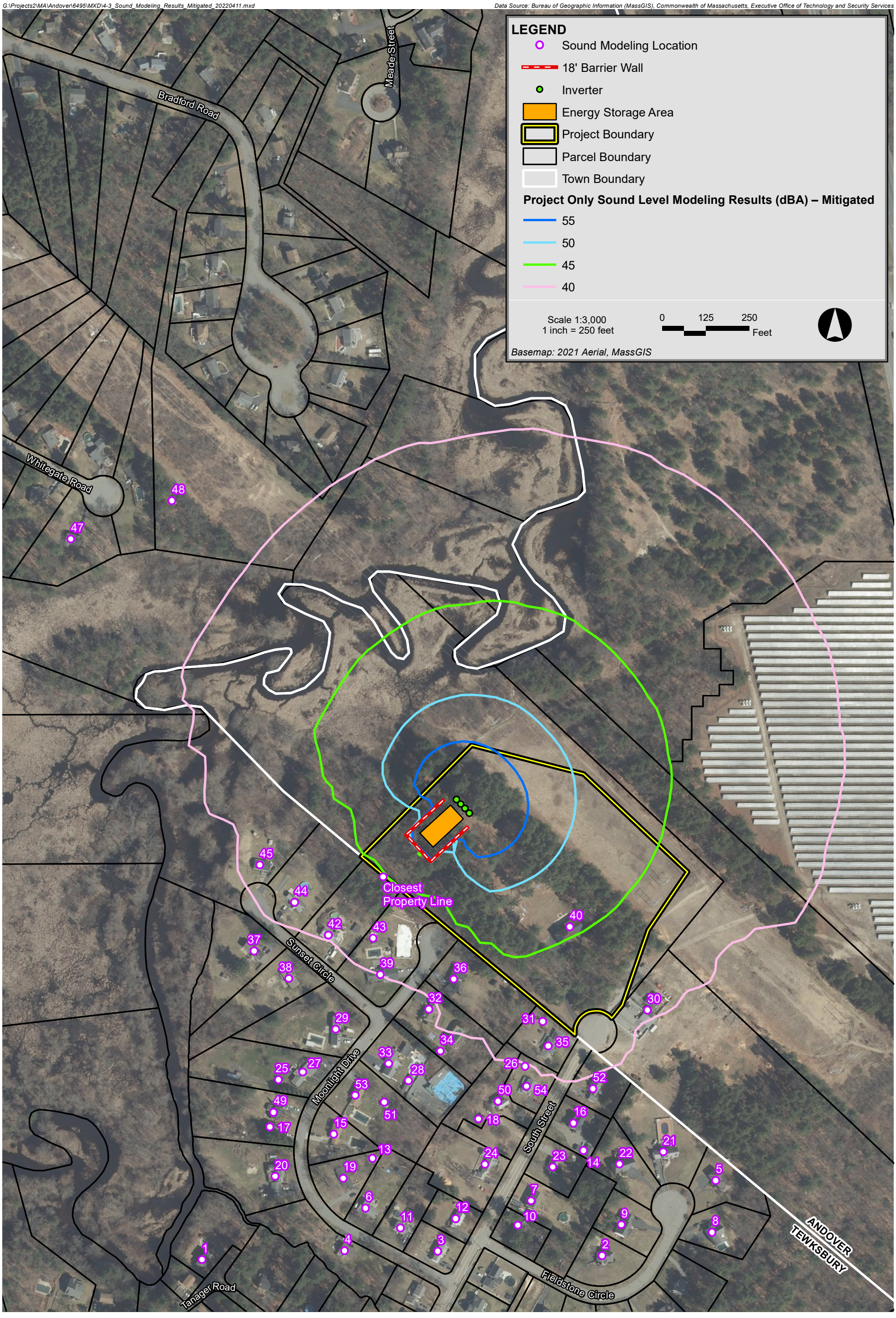
Epsilon ASSOCIATES INC.

Figure 4-2

Sound Level Modeling Results - Unmitigated

G:\Projects2\MA\Andover\6495\MXD\4-3_Sound_Modeling_Results_Mitigated_20220411.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services



1320 South Street Energy Storage Project **Andover, Massachusetts**

Epsilon ASSOCIATES INC.

Figure 4-3

Sound Level Modeling Results - Mitigated

5.0 CONCLUSIONS

A sound level modeling assessment was conducted for the proposed South Street Energy Storage Project. A total of ninety-two (92) energy storage containers and four (4) central inverters are included for this Project for both unmitigated and mitigated scenarios. Sound levels resulting from the operation of these two scenarios were calculated at 53 discrete modeling points, and isolines were generated from a grid encompassing the area surrounding the Project using the provided layout. The predicted sound levels at the modeling receptors ranged from 34 to 56 dBA for the unmitigated scenario, and 32 to 46 dBA for the mitigated scenario.

Appendix A
Sound Source Coordinates

Table A-1: Sound Source Coordinates

Name	ID	Hub Height (m)	Coordinates NAD83 UTM Zone 18N (meters)	
			X (Easting)	Y (Northing)
Inverter	1	2.32	321304.10	4719533.77
Inverter	2	2.32	321300.57	4719537.81
Inverter	3	2.32	321297.03	4719541.84
Inverter	4	2.32	321293.35	4719546.04
Energy Storage Unit	1	3.28	321277.59	4719510.47
Energy Storage Unit	2	3.28	321278.83	4719511.56
Energy Storage Unit	3	3.28	321280.07	4719512.64
Energy Storage Unit	4	3.28	321273.96	4719514.61
Energy Storage Unit	5	3.28	321282.56	4719514.82
Energy Storage Unit	6	3.28	321281.31	4719513.73
Energy Storage Unit	7	3.28	321275.20	4719515.70
Energy Storage Unit	8	3.28	321270.33	4719518.75
Energy Storage Unit	9	3.28	321286.28	4719518.08
Energy Storage Unit	10	3.28	321285.04	4719517.00
Energy Storage Unit	11	3.28	321278.93	4719518.96
Energy Storage Unit	12	3.28	321283.80	4719515.91
Energy Storage Unit	13	3.28	321276.44	4719516.78
Energy Storage Unit	14	3.28	321277.69	4719517.87
Energy Storage Unit	15	3.28	321291.25	4719522.44
Energy Storage Unit	16	3.28	321290.01	4719521.35
Energy Storage Unit	17	3.28	321272.82	4719520.92
Energy Storage Unit	18	3.28	321274.06	4719522.01
Energy Storage Unit	19	3.28	321288.76	4719520.26
Energy Storage Unit	20	3.28	321282.65	4719522.22
Energy Storage Unit	21	3.28	321293.73	4719524.61
Energy Storage Unit	22	3.28	321267.95	4719523.98
Energy Storage Unit	23	3.28	321296.21	4719526.79
Energy Storage Unit	24	3.28	321270.43	4719526.15
Energy Storage Unit	25	3.28	321294.97	4719525.70
Energy Storage Unit	26	3.28	321286.38	4719525.49
Energy Storage Unit	27	3.28	321285.14	4719524.40
Energy Storage Unit	28	3.28	321276.54	4719524.19
Energy Storage Unit	29	3.28	321269.19	4719525.06
Energy Storage Unit	30	3.28	321279.03	4719526.36
Energy Storage Unit	31	3.28	321287.62	4719526.58
Energy Storage Unit	32	3.28	321277.78	4719525.28
Energy Storage Unit	33	3.28	321292.49	4719523.53
Energy Storage Unit	34	3.28	321266.71	4719522.89
Energy Storage Unit	35	3.28	321283.89	4719523.31
Energy Storage Unit	36	3.28	321281.41	4719521.14
Energy Storage Unit	37	3.28	321275.30	4719523.10
Energy Storage Unit	38	3.28	321287.52	4719519.17
Energy Storage Unit	39	3.28	321280.17	4719520.05

Table A-1: Sound Source Coordinates

Name	ID	Hub Height (m)	Coordinates NAD83 UTM Zone 18N (meters)	
			X (Easting)	Y (Northing)
Energy Storage Unit	40	3.28	321271.57	4719519.84
Energy Storage Unit	41	3.28	321274.16	4719529.42
Energy Storage Unit	42	3.28	321298.70	4719528.97
Energy Storage Unit	43	3.28	321272.91	4719528.33
Energy Storage Unit	44	3.28	321291.34	4719529.84
Energy Storage Unit	45	3.28	321281.51	4719528.54
Energy Storage Unit	46	3.28	321276.64	4719531.59
Energy Storage Unit	47	3.28	321287.72	4719533.98
Energy Storage Unit	49	3.28	321281.61	4719535.94
Energy Storage Unit	50	3.28	321280.36	4719534.86
Energy Storage Unit	51	3.28	321286.48	4719532.89
Energy Storage Unit	52	3.28	321295.07	4719533.11
Energy Storage Unit	53	3.28	321285.23	4719531.80
Energy Storage Unit	54	3.28	321293.83	4719532.02
Energy Storage Unit	55	3.28	321277.88	4719532.68
Energy Storage Unit	56	3.28	321279.12	4719533.77
Energy Storage Unit	57	3.28	321288.96	4719535.07
Energy Storage Unit	58	3.28	321284.09	4719538.12
Energy Storage Unit	60	3.28	321287.81	4719541.39
Energy Storage Unit	61	3.28	321286.57	4719540.30
Energy Storage Unit	62	3.28	321291.44	4719537.25
Energy Storage Unit	63	3.28	321285.33	4719539.21
Energy Storage Unit	65	3.28	321282.85	4719537.03
Energy Storage Unit	66	3.28	321290.20	4719536.16
Energy Storage Unit	68	3.28	321292.59	4719530.93
Energy Storage Unit	69	3.28	321282.75	4719529.63
Energy Storage Unit	70	3.28	321290.10	4719528.75
Energy Storage Unit	71	3.28	321283.99	4719530.72
Energy Storage Unit	72	3.28	321275.40	4719530.50
Energy Storage Unit	73	3.28	321297.46	4719527.88
Energy Storage Unit	74	3.28	321288.86	4719527.67
Energy Storage Unit	75	3.28	321271.67	4719527.24
Energy Storage Unit	76	3.28	321280.27	4719527.45
Energy Storage Unit	48	3.28	321265.46	4719521.87
Energy Storage Unit	59	3.28	321264.23	4719520.81
Energy Storage Unit	64	3.28	321261.75	4719518.68
Energy Storage Unit	67	3.28	321260.50	4719517.58
Energy Storage Unit	77	3.28	321263.05	4719519.76
Energy Storage Unit	78	3.28	321265.41	4719514.50
Energy Storage Unit	79	3.28	321269.05	4719517.68
Energy Storage Unit	80	3.28	321267.85	4719516.63
Energy Storage Unit	81	3.28	321264.15	4719513.40
Energy Storage Unit	82	3.28	321266.62	4719515.55

Table A-1: Sound Source Coordinates

Name	ID	Hub Height (m)	Coordinates NAD83 UTM Zone 18N (meters)	
			X (Easting)	Y (Northing)
Energy Storage Unit	83	3.28	321267.70	4719509.14
Energy Storage Unit	84	3.28	321270.21	4719511.34
Energy Storage Unit	85	3.28	321271.41	4719512.41
Energy Storage Unit	86	3.28	321268.96	4719510.24
Energy Storage Unit	87	3.28	321272.70	4719513.53
Energy Storage Unit	88	3.28	321273.93	4719507.19
Energy Storage Unit	89	3.28	321275.15	4719508.30
Energy Storage Unit	90	3.28	321276.38	4719509.36
Energy Storage Unit	91	3.28	321272.72	4719506.12
Energy Storage Unit	92	3.28	321271.49	4719505.05

Appendix B

Project Only Sound Level Modeling Results at Discrete Points

Table B-1: Sound Level Modeling Results Sorted by Receptor ID

Receptor ID	Coordinates UTM NAD83 Zone 18N		Source Only L_{eq} Broadband Sound Level Unmitigated (dBA)	Source Only L_{eq} Broadband Sound Level Mitigated (dBA)
	X (m)	Y (m)		
Closest Property Line	321227.28	4719480.41	54	45
1	321059.65	4719151.24	38	33
2	321408.51	4719144.48	35	34
3	321265.59	4719152.51	39	34
4	321184.27	4719155.58	38	33
5	321509.52	4719207.25	35	34
6	321203.71	4719192.01	40	34
7	321347.93	4719194.14	40	36
8	321505.22	4719161.96	34	32
9	321426.23	4719171.05	38	34
10	321335.85	4719173.20	40	36
11	321233.56	4719173.85	40	34
12	321281.87	4719180.54	40	35
13	321210.96	4719235.29	41	35
14	321394.90	4719236.80	41	38
15	321177.83	4719257.36	42	35
16	321386.98	4719260.76	42	39
17	321122.26	4719265.30	41	35
18	321304.38	4719266.73	43	38
19	321184.83	4719218.66	41	35
20	321125.56	4719222.12	40	34
21	321464.61	4719233.51	36	35
22	321426.25	4719223.88	39	35
23	321367.88	4719223.15	41	37
24	321308.91	4719227.19	41	37
25	321131.12	4719306.15	42	36
26	321346.47	4719311.71	44	40
27	321152.39	4719312.24	43	36
28	321244.21	4719302.10	44	37
29	321181.99	4719348.72	45	38
30	321454.49	4719357.39	43	41
31	321362.84	4719350.13	45	42
32	321263.73	4719363.77	46	40
33	321227.44	4719317.46	44	37
34	321272.85	4719326.88	45	39
35	321366.96	4719328.83	44	41
36	321286.33	4719389.25	48	42
37	321112.89	4719419.04	45	39
38	321142.44	4719393.99	45	38
39	321222.60	4719395.25	47	40
40	321388.87	4719432.11	48	46
42	321178.21	4719431.04	48	40
43	321217.19	4719427.30	49	41
44	321149.42	4719460.40	47	41
45	321120.37	4719493.96	46	41

Table B-1: Sound Level Modeling Results Sorted by Receptor ID

Receptor ID	Coordinates UTM NAD83 Zone 18N		Source Only L_{eq} Broadband Sound Level Unmitigated (dBA)	Source Only L_{eq} Broadband Sound Level Mitigated (dBA)
	X (m)	Y (m)		
47	320963.88	4719782.91	39	37
48	321052.88	4719813.77	40	38
49	321125.98	4719278.08	42	35
50	321321.81	4719281.81	43	39
51	321222.50	4719283.97	43	36
52	321404.86	4719290.21	42	40
53	321197.38	4719290.66	43	36
54	321347.27	4719294.09	43	39

OWNERS AUTHORIZATION

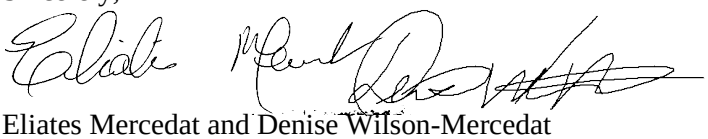
EXHIBIT F

February 1, 2022

To Whom It May Concern

Borrego Solar Systems, Inc. and its employees and affiliates are hereby authorized to act as our agent for submission of applications and related plans and documents, and to appear before boards and other officials, with respect to obtaining approvals for solar installations and/or energy storage systems to be constructed on my property located at 1320 South Street Andover, MA.

Sincerely,



Eliates Mercedat and Denise Wilson-Mercedat