COMMITMENT & INTEGRITY
DRIVE RESULTS

33 Broad Street | One Weybosset Hill
Floor 7
Providence, Rhode Island 02903
www.woodardcurran.com

T 800.426.4262
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July 13, 2020

Jim Lamphere, Town Planner
Hopkinton Town Hall
1 Town House Road
Hopkinton, RI 02833

Re: Skunk Hill Solar, Skunk Hill Road & Arcadia Road, Hopkinton
Pre-Application Review

Dear Mr. Lamphere:

On behalf of Skunk Hill Road Solar, LLC, Woodard & Curran is pleased to submit this request for Pre-Application Review to the Hopkinton Planning Board for a proposed solar development to be located off of Skunk Hill Road and Arcadia Road in Hopkinton, Rhode Island on parcels identified by the Town Assessor as Map 18 – Lots 8, 13 and 14. The project parcels are located at 0 Arcadia Road, 0 Lisa Lane and 145 Skunk Hill Road, respectively. The proposed project will involve the installation of a solar photovoltaic and electrical interconnection system. This letter and its attachments describe the existing and proposed site as required by Pre-Application Review.

BACKGROUND

The proposed project received Town Council approval in a decision adopted on June 10, 2019 (hereby referred to as the Zone Change Decision and Conditions of Approval) to change the zoning district classifications for the project parcels from RFR-80 to Commercial with restriction to solar land use through Zoning Ordinance and Comprehensive Plan Future Land Use Map Amendments. The project is grandfathered under the Chapter 246 Non-Residential Photovoltaic Solar Energy System (PSES) Ordinance adopted on July 18, 2016. The proposed development will be in conformance with the Town of Hopkinton regulations and all twenty conditions of approval listed in the recorded Zone Change Decision (attached for reference) as described in greater detail in the following Sections. Zoning district dimensional regulations and setback requirements are listed on the Proposed Site Plan (Figure 5).

EXISTING SITE CONDITIONS

The site is located south of Skunk Hill Road, northwest of Arcadia Road, and northeast of Fairview Avenue. The site is comprised of three parcels of land identified by the Town Assessor as Map 18, Lots 8, 13 and 14. The project parcels are comprised of pasture, maintained lawn areas, wetlands, wooded areas, and existing trails.

A topographic and comprehensive boundary survey for the project parcels has been completed, and a plan has been prepared by Cherenzia & Associates, LTD. This plan, entitled Existing Conditions Plan and dated May 6, 2020, is attached to this letter. The Existing Conditions Plan depicts existing site features including, but not limited to, topography, wetland boundaries, resource areas and adjacent parcels. Supplemental information from Rhode Island Geographic Information System (RIGIS) is provided on a separate Existing Conditions figure (Figure 1), as described in detail in the following sections.

A Soils Map, provided as Figure 2, identifies the soil types within the site and surrounding areas consistent with the United States Department of Agriculture (USDA) Natural Resources Conservation Services (NRCS) web soil survey.

The Aerial Map, provided as Figure 3, includes aerial imagery compiled from the RIGIS website. As depicted, the project parcels are comprised of pasture, maintained lawn areas, wetlands, wooded areas and existing trails.

The Vicinity Map, provided as Figure 4, depicts the zoning districts of the project site and surrounding area in accordance with the Hopkinton and Richmond Zoning Maps. With the exception of two small schools located south of the site, there appear to be no significant public facilities within a one-half mile radius of the project area.

Existing Structures & Road Networks

To ensure the safety of the public, the three existing buildings (a single-story residence, a barn and a shed) located within the Site will be demolished. The existing road network within and around the Site is shown on the attached Vicinity Map (Figure 4).

Existing Utilities

Overhead electrical services are located from Skunk Hill Road along an existing gravel driveway on-site to the abandoned single-story residence as well as from Arcadia Road along the southern property boundary. Additional residential utilities including septic and a private water supply well also served the structure. Refer to the existing conditions plans for all known existing site utilities.

Geology and Soils

As previously noted, the attached Soils Map (Figure 2) was prepared using the Natural Resources Conservation Service (NRCS) Web Soil Survey System. As depicted on Figure 2, the soils located within the project area vary. Many rock outcrops were identified on the survey. Some areas of prime farmland and farmland of statewide importance are present on the project parcels, as shown on the attached USDA NRCS Farmland Classification Map; however, the majority of soils are not classified as prime farmland. No topsoil will be removed from the site and topsoil will be redistributed as little as possible. Land on the project parcels is not being used for agriculture purposes.

Flood Zones

The FEMA Floodway and Flood Insurance Rate Map (FIRM) indicates that the project area is located within Flood Zone X and not a special flood hazard area. A copy of the FEMA FIRM map is attached to this letter.

Natural Resources

Wetland areas and streams have been delineated throughout the site utilizing field survey and supplementing with RIGIS data. The attached Existing Conditions Figure (Figure 1) depicts the wetland edges and perimeter buffer areas. Based on RIGIS data, there are no natural heritage areas within the project parcels. A portion of the project area appears to be located within a 250 to 500-acre unfragmented forest as shown on the Existing Conditions Figure (Figure 1).

Groundwater Aquifers & Wellhead Protection Areas

Based on the Hopkinton Groundwater and Wellhead Protection Areas Map, the northwestern portion of the site is located within a Wellhead Protection Area, and the majority of the site is located within the Primary Protection Zone as shown on the attached Existing Conditions Figure (Figure 1). The proposed solar facility will not impact groundwater conditions.

Historic & Archeological Features

Based on available RIGIS data, there are no known archaeological or historic sites or features or cemeteries on the project parcels. There are several cemeteries within the vicinity of the project area as shown on the Existing Conditions Figure (Figure 1). A letter will be sent to Rhode Island Historical Preservation & Heritage Commission to request review for any known areas of historical significance on or near the project area.

Open Space

No abutting properties are designated as Open Space areas.

Scenic Areas and Greenspace

Based on available RIGIS data, portions of the project parcels along Skunk Hill Road and Arcadia Road are located within scenic road corridors or state-designated scenic areas. The project parcels are not located within state, regional or community greenways or greenspace priorities. A greenway was identified within the vicinity of the project area south of the project parcels. Scenic areas and greenways are shown on the attached Existing Conditions Figure (Figure 1).

PROPOSED DEVELOPMENT

The project site is located in a Commercial zoning district per the zone change approval granted by the Town Council on June 10, 2019. Per District Use Regulations, photovoltaic solar energy systems are a permitted use within the Commercial district. The proposed work is comprised of the following activities:

- Site improvements including clearing, grading, and stormwater management; and
- Installation of an access drive, fencing, solar panels, inverters, transformers, and an electrical interconnect system.

Existing woodland areas on the site will be cleared only as necessary to construct the infrastructure and avoid shading impacts on the panels. Grades will be modified as necessary to provide suitable slopes in the panel area. Stormwater management will be provided for the proposed project in accordance with Town of Hopkinton and RIDEM standards. Stormwater plans will be provided as part of future submissions to the Planning Board during the development review process. Modification to the panel layout currently shown may be required to accommodate stormwater management systems.

The Proposed Site Plan, provided as Figure 5, depicts proposed site features including, but not limited to, solar panels, inverters, transformers, access drive, perimeter fence and landscaped berms (per the Zone Change Conditions of Approval). The layout shown on the provided figure is a preliminary design, and the design will be refined throughout the development process. This figure also depicts setbacks outlined in the Zone Change Conditions of Approval.

Zone Change Condition of Approval Compliance

The proposed solar development project will comply with all conditions of approval listed in the Zone Change Decision dated June 10, 2019, corrected January 27, 2020. A table documenting compliance with each of the twenty conditions is attached to this letter.

Utility Interconnection

Per Zone Change Condition of Approval #19, the project will interconnect to the grid via underground cables to the maximum extent possible and allowable by National Grid and RIDEM and exit onto Arcadia Road.

Fire Protection & Emergency Response

The proposed solar development will not create a significant fire or emergency response risk to the Town. The proposed solar development will be constructed of materials with low flammability. The system will not be staffed. Power generation will be remotely monitored, and the solar development company alerted to any interruptions in system. Hazardous materials will not be used in construction. A gravel access drive will be provided to the Site, as shown on the attached Proposed Site Plan (Figure 5).

Enclosed, please find a check for the filing fee ($390) and ten copies of the following supporting documents in accordance with Pre-Application requirements:

- Pre-Application forms
- Pre-Application Checklist
- Property Tax Records
- Proof of Registration with the State Board of Registration for Professional Land Surveyors of the State of Rhode Island for Cherenzia & Associates LTD.
- Board of Design Professionals of the State of Rhode Island Certificate of Authorization for Woodard & Curran Inc.
- Zoning Certificate
- Zoning Compliance Table, dated July 10, 2020
- Recorded Town Council Zone Change Decision, dated June 10, 2019 and corrected January 27, 2020
- Forest Assessment, prepared by Land Management Services, dated January 2, 2019 amended March 26, 2019
- Reforestation Plan, prepared by Land Management Services, dated January 2, 2019 amended March 26, 2019
- FEMA FIRM Map
- USDA NRCS Soil Survey Data and Farmland Classification Map
- Existing Conditions Survey, prepared by Cherenzia & Associates, LTD, dated May 6, 2020 (24”x36” Full Size Sets and 11”x17” Reduced Sets)
- Figure 1. Existing Conditions (24”x36” Full Size Sets and 11”x17” Reduced Sets)
- Figure 2. Soils Map (24”x36” Full Size Sets and 11”x17” Reduced Sets)
- Figure 3. Aerial Map (24”x36” Full Size Sets and 11”x17” Reduced Sets)
- Figure 4. Vicinity Map (24”x36” Full Size Sets and 11”x17” Reduced Sets)
- Figure 5. Proposed Site Plan (24”x36” Full Size Sets and 11”x17” Reduced Sets)

We trust you will find this information and associated attachments informative and complete. Please do not hesitate to contact us to discuss the submittal or any questions you may have.

Sincerely,

WOODARD & CURRAN INC.

Alan Benevides, PE
Senior Project Manager

Stephanie Kaiser
Project Manager

cc: Frank Epps, Skunk Hill Road Solar, LLC
John Schroeder, Skunk Hill Road Solar, LLC

Hopkinton **Planning Department**
RHODE ISLAND

18.1 APPLICATION FOR LAND DEVELOPMENT AND SUBDIVISION OF LAND

APPLICANTS FOR SUBDIVISION: Fill out only **(1)** below if property owner is same as applicant. Fill out **(1)** and **(2)** below if applicant is other than property owner.

(1) I, Donald G. Gordon, hereby certify that I am the owner of property, designated as Plat(s) 18, Lot(s) 8 & 13, as shown on the Town of Hopkinton Tax Assessor's Maps.

(2) I hereby authorize the application for subdivision by Skunk Hill Road Solar LLC to be
(name of applicant or agent)
submitted to the Planning Department of the Town of Hopkinton for review and decision by the Planning Board.

WITNESS its name this 15th day of June, 20 20.

BY: Donald Gordon
(Signature of Owner)

STATE OF RHODE ISLAND

County of Washington

In Rhode Island on the 15th day of June, before me personally appeared Donald G. Gordon to me known and known by me to the
(name)
party executing the foregoing instrument and acknowledged said instrument, by him/her executed, to be his free act and deed as,

individual.
(Individual, Corporation, Trustee, Partnership, Non-Profit, etc.)

Seal

Notary Public

My Commission Expires: Dec. 08, 2021

ELLEN NOORDZY NOTARY PUBLIC STATE OF RHODE ISLAND

ELLEN NOORDZY MY COMM. EXPIRES NOTARY PUBLIC 12/08/2021 STATE OF RHODE ISLAND

Hopkinton **Planning Department**
RHODE ISLAND

18.1 APPLICATION FOR LAND DEVELOPMENT AND SUBDIVISION OF LAND

APPLICANTS FOR SUBDIVISION: Fill out only **(1)** below if property owner is same as applicant. Fill out **(1)** and **(2)** below if applicant is other than property owner.

(1) I, Frank Epps, hereby certify that I am the owner of property, designated as Plat(s) 18, Lot(s) 14, as shown on the Town of Hopkinton Tax Assessor's Maps.

(2) I hereby authorize the application for subdivision by Skunk Hill Road Solar LLC to be
(name of applicant or agent)
submitted to the Planning Department of the Town of Hopkinton for review and decision by the Planning Board.

WITNESS its name this 4th day of June, 20 20.

BY: _____
(Signature of Owner)

STATE OF RHODE ISLAND

County of Kent

In Rhode Island on the 4th day of June, before me personally appeared Frank A. Epps III to me known and known by me to the
(name)
party executing the foregoing instrument and acknowledged said instrument, by him/her executed, to be his free act and deed as,

Authorized Representative - Hopkinton Land Trust 1, LLC.
(Individual, Corporation, Trustee, Partnership, Non-Profit, etc.)

Seal

ELLEN NOORDZY NOTARY PUBLIC STATE OF RHODE ISLAND

ELLEN NOORDZY MY COMM. EXPIRES NOTARY PUBLIC 12/08/2021 STATE OF RHODE ISLAND

Notary Public Ellen Noordzy

My Commission Expires: Dec. 08, 2021

Hopkinton Planning Board

RHODE ISLAND

5.2 PRE-APPLICATION / CONCEPTUAL REVIEW CHECKLIST

Name of Subdivision Skunk Hill Solar Development Plat(s) 18 Lot(s) 8, 13 & 14

This is the initial stage of Land Development and Subdivision Review in which proposals are discussed informally and receive comments and direction from municipal officials.

The Applicant shall submit to the Town Planner, ten 24 inch by 36 inch black or blueline copies, and ten, 11 inch by 17 inch reduced copies, of Pre-application maps in a scale that shall be sufficient to clearly show all of the information required below and shall be subject to the approval of the Town Planner. Sheets shall be numbered sequentially (e.g., sheet 1 of 3, 2 of 3, etc.). The plans must illustrate all parcels involved in the proposed subdivision or land development, in their entirety. Plans shall include a certification that all plans and proposed improvements conform to all existing and amended standards of the State of Rhode Island and Providence Plantations, Board of Registration of Land Surveyors.

A. PRE-APPLICATION SUBMISSION - PRE-APPLICATION DRAWING(S)

A map or plan of the proposed subdivision parcel showing the principal existing features of the site, including parcel boundaries, roads, structures, water bodies and vegetation. It should be drawn at a scale sufficient to clearly show all of the information required, depending on the size and complexity of the property. Much of this information could be shown based on USGS maps and/or orthophotos available from RIGIS. Applicants seeking a pre-application meeting or an informal concept plan review shall submit general, conceptual materials, in advance of the meeting(s), as requested by the Town Planner and which may include any of the following:

X 1. Name of proposed development

X 2. Name and address of property owner and applicant

X 3. Name, address and telephone number of person or firm preparing the Pre-application plan

X 4. Date of plan preparation, with revision date(s) if any

X 5. Graphic scale and North arrow

X 6. Assessor's plat and lot number(s) of the land being subdivided

X 7. Zoning district(s) of the land being subdivided. If more than one district, zoning boundary lines must be shown

X 8. Zoning certificate from the Building/Zoning Official

Name of Subdivision Skunk Hill Solar Development Plat(s) 18 Lot(s) 8, 13 & 14

X 9. Location of perimeter boundary lines and dimensions of existing and proposed property lines of the subdivision, drawn so as to distinguish them from other boundaries and all other existing property lines within or immediately adjacent to the parcel(s) being developed, including existing easements and rights-of-way.

X 10. Area of the subdivision parcel and proposed number of buildable lots, dwellings or other proposed improvements

X 11. Location and names of existing streets within and immediately adjacent to the subdivision parcel

X 12. Location of wooded areas and notation of existing ground cover

X 13. Estimated location of land unsuitable for development, including wetlands, ponds, watercourses and/or wetland buffers including rivers, streams, lakes, ditches, drains, special aquatic sites and vernal pools, present on or within 200 feet of the property being subdivided, as available from existing information

X 14. Size and approximate location of public or private water lines

X 15. Location of electrical, telephone, and cable service

X 16. Existing utility easements and power line right-of-ways

X 17. Width and surfacing material of existing road(s) at access points

X 18. Table stating minimum area and building setback dimensions required for the zoning district

N/A 19. Areas of agricultural use

X 20. Existing site analysis map including topography with approximated contour intervals of two feet, locations of significant existing natural and manmade environmental features including wooded areas, wetlands, steep slopes, rock out crops, easements, on or immediately adjacent to the subdivision

X 21. Location and approximate size of existing buildings, proposed buildings and/or significant above-ground structures on or immediately adjacent to the subdivision

N/A 22. Proposals, if any, for connection with existing water supply and sanitary sewer systems or a notation that wells and OWTS are proposed

X 23. Location of historic cemeteries on or immediately adjacent to the subdivision, if any

X 24. General location of any unique natural, cultural and/or archeological and historic features or sites, including stone walls, trails, and landscapes

X 25. Scenic road corridors and state-designated scenic areas

X 26. Applicant has referred to the *Town of Hopkinton Design Review Standards* for this application

Name of Subdivision Skunk Hill Solar Development Plat (s) 18 Lot(s) 8, 13 & 14

X 27. Conceptual layouts including streets, lots, lot lines, approximate lot areas and dimensions, and showing approximate areas of alteration. Proposed lot lines shall be drawn so as to distinguish them from existing property lines, on a separate drawing, if necessary, to clearly portray

X 28. Base flood elevation data from FEMA maps

N/A 29. Proposed open space areas (Residential Cluster Developments and Residential Compounds)

X 30. Record of any proceedings or decisions of the Zoning Board of Review that pertain to the application or the subject land

X 31. Street index box

X 32. Proof of paid up-to-date property taxes from the Hopkinton Tax Collector

X 33. Copy of a Certificate of Authorization issued by the Board of Design Professionals of the State of Rhode Island

X 34. Proof of current registration with the State Board of Registration for Professional Land Surveyors of the State of Rhode Island

X 35. Notation on plan if the subdivision parcel(s) is (are) located within any of the following areas:

- X Natural Heritage Areas (RIDEM)
- X Prime farmland soils (see USDA NRCS Farmland Classification Map)
- X Groundwater Protection Overlay District (Town)
- X State, regional or community greenways and greenspace priorities
- X 100-year floodplains as shown of federal flood protection maps
- X Unfragmented forest tracts
- N/A Land in active agricultural use

N/A 36. An estimate of the approximate population of the proposed subdivision

N/A 37. An estimate of the number of school-aged children to be housed in the proposed subdivision

X 38. Existing hiking, biking and bridle trails within and adjacent to the site

N/A 39. Boat launches, lake and stream access points, beaches and water trails

N/A 40. Existing playfields, playgrounds and recreational resource areas adjacent to the site

X 41. Any other information or data which is relevant to good planning and design

Name of Subdivision Skunk Hill Solar Development Plat(s) 18 Lot(s) 8, 13 & 14

B. PRE-APPLICATION SUBMISSION - SUPPORTING MATERIALS

The applicant shall submit to the Town Planner copies of a narrative report (actual number of copies to be determined by the Planner) providing a general description of the existing physical environment and existing use(s) of the property along with a general description of the uses and type of development proposed by the applicant. The narrative report shall include reduced copies of all plans required in A above plus the following:

X 1. Filing Fee - $300 + $30 per unit

X 2. General Application for Subdivision Review (see Article XVIII, Section 8.1)

X 3. An aerial photograph or a black line copy of an existing aerial photograph of the proposed subdivision parcel and surrounding area

X 4. A copy of the soils map of the subdivision parcel and surrounding area, and a general analysis of soil types and suitability for the development proposed, including information on approximate water table elevations and flood potential. If any prime agricultural soils are within the subdivision parcel(s), the soils map shall be marked to show the location of said prime agricultural soils

X 5. A vicinity map drawn to a scale of 1 inch = 400 feet or as necessary to show the area within one-half mile of the subdivision parcel showing the locations of all streets, existing lot lines, and zoning district boundaries. Schools, parks, fire stations and other significant public facilities shall be indicated on the locus map by shading and labeling the specific use

X 6. Any other information or data which is relevant to good planning and design

Note: The Planning Board, at its discretion, may vote to combine review stages and to modify and/or waive requirements as specified in Article XI. Review stages may be combined only after the Planning Board determines that all necessary requirements have been met by the applicant.

TOWN OF HOPKINTON
Account Level History
Receivable Group: ALL
Printed on 06/12/2020 at 11:49:19 AM

HOPKINTON TAX COLLECTOR
PO BOX 154
HOPKINTON,RI 02833-0154
MARYLYNN@HOPKINTONRI.ORG
(401) 377-7781

To: GORDON DONALD G
11 ANDERSON ROAD
POMFRET CTR CT 06259-2228

Account : 07-6790-00
Penalty as of: 06/12/2020

Plat 18 L013 Lisa Lane

Receivable	Principal	Penalty	Date	Batch	Trans#	Pay Method	Comments
2019 RP Tax Roll	5312.69						
Payment	-5312.69	-349.53	06/01/2020	10612	388923	Check #: 1653	
Balance	**0.00**						
Penalty Due	0.00						
Total Due	**0.00**						
2018 RP Tax Roll	5155.98						
Payment	-5155.98	-322.70	05/20/2019	10277	368820	Check #: 0002054153	
Balance	**0.00**						
Penalty Due	0.00						
Total Due	**0.00**						
Total Principal Due	**0.00**						
Total Penalty Due	**0.00**						
Total Due on Account	**0.00**						

TOWN OF HOPKINTON
Account Level History
Receivable Group: ALL
Printed on 06/12/2020 at 11:48:52 AM

HOPKINTON TAX COLLECTOR
PO BOX 154
HOPKINTON,RI 02833-0154
MARYLYNN@HOPKINTONRI.ORG
(401) 377-7781

To: GORDON EXCAVATING INC
11 ANDERSON RD
POMFRET CT 06259-2228

Account : 07-6969-70
Penalty as of: 06/12/2020

Plat 18 Lot 8 Arcadia Road

Receivable	Principal	Penalty	Date	Batch	Trans#	Pay Method	Comments
2019 RP Tax Roll	2562.25						
Payment	-2562.25	-168.57	06/01/2020	10612	388923	Check #: 1653	
Balance	**0.00**						
Penalty Due	0.00						
Total Due	**0.00**						
2018 RP Tax Roll	2486.67						
Payment	-2486.67	-155.63	05/20/2019	10277	368820	Check #: 0002054153	
Balance	**0.00**						
Penalty Due	0.00						
Total Due	**0.00**						
Total Principal Due	**0.00**						
Total Penalty Due	**0.00**						
Total Due on Account	**0.00**						

Customer Service
Log Out

Account Summary | Make a Payment | Transaction History | Online Documents | Account Setup

TOWN OF HOPKINTON, RI

Account Number : 08-7446-10

HOPKINTON LAND 1 LLC
C/O ENERGY DEVELOPMENT PARTNER
260 WEST EXCHANGE ST SUITE 10
PROVIDENCE RI 02903

Receivable	Amt. Billed	Amt. Due	Penalty	Total
2018 RP Tax Roll	5876.50	0.00	0.00	0.00
2019 RP Tax Roll	11603.55	0.00	0.00	0.00
			Total:	0.00

The above balance is current as of Monday, June 15 2020, 01:05:07
This penalty due is current through 06/15/2020

State of Rhode Island and Providence Plantations
Board of Registration for Professional Land Surveyors

BE IT KNOWN THAT

CHERENZIA & ASSOCIATES LTD.

having given satisfactory evidence of having the qualifications required by law is hereby authorized to practice

Land Surveying as a

Corporation

IN THE STATE OF RHODE ISLAND

Certificate of Authorization No.: A133 Issued: 06/01/2020 Expires: 05/31/2022

Chairperson

Secretary

State of Rhode Island and Providence Plantations
Board of Registration for Professional Engineers

BE IT KNOWN THAT

WOODARD & CURRAN INC.

having given satisfactory evidence of having the qualifications required by law is hereby authorized to practice

Engineering as a

Corporation

IN THE STATE OF RHODE ISLAND

Certificate of Authorization No.: PE.0005242-COA Issued: 7/1/2020 Expires: 6/30/2022

Patricia K Walker
Chairperson

Patricia D Steere
Secretary

NUMBER

Plat 18

Lot 14

ZONING CERTIFICATE

TOWN OF HOPKINTON

BUILDING / ZONING DEPARTMENT
ONE TOWN HOUSE ROAD
HOPKINTON, RI 02833

FEE PAID
$5.00

☒ Cash
☐ Check
No.

DATE RECEIVED 7-2 20 20

APPLICANT'S NAME Hopkington Land ~~Fund~~ 1 LLC

APPLICANT'S ADDRESS C/o Energy Development Partners, 260 W. Exchange St., Suite 102A, Providence RI 02903

PHONE (401) 453-2700 (Atty. Robert Craven) LOCATION ADDRESS 145 Skunk Hill Road

☒ INTENDED USE ☐ EXISTING USE (Check One)

Describe. Please Be Specific. Pre-application for Skunk Hill Road Solar in conformance with 7-10-19 Town Council Decision PARCEL REZONED TO COMMERCIAL SPECIAL FOR SOLAR ARRAY
Will require Development Plan Review before the Planning Board

(Continue on back if necessary)

	REQUIRED: YES	REQUIRED: NO	STATUS: APPLIED FOR	STATUS: GRANTED
Special Use Permit		X		
Use Variance		X		
Dimensional Variance		X		
Modification		X		
Development Plan Review	✓			

PROPERTY IS LOCATED IN ZONING DISTRICT ☐ R-1 ~~☒ RFR-80~~ ☐ NB ☒ CS ☐ M

IS ☒ INTENDED ☐ EXISTING USE PERMITTED IN THIS DISTRICT? (Check One) ☒ YES

I certify that the ☒ intended ☐ existing (check one) use of the property is fully described and agree it is the only use for which certification is requested.

APPLICANT'S SIGNATURE

The ☒ intended ☐ existing (check one) use of the property is in accordance with provisions of the Hopkinton Zoning Ordinance.

ZONING OFFICIAL'S SIGNATURE

DATE 7 5 20 20

ZONICERT.SAM/FORMS4

WOODARD &CURRAN COMMITMENT & INTEGRITY DRIVE RESULTS
33 BROAD STREET FLOOR 7
PROVIDENCE, RI 02903

CLIENT: Skunk Hill Road Solar, LLC
PROJECT: Skunk Hill Solar Development
DATE: 7/10/2020
PROJECT NO.: 231258.05

Table 1. Compliance with Skunk Hill Solar Town Council Zone Change Decision Conditions of Approval adopted on June 10, 2019, corrected January 27, 2020

No.	Condition of Approval	Statement of Compliance
1	The zoning district classifications for these parcels are changed from Residential RFR-80 to Commercial with the restrictions that the property's use hereafter shall be limited to use code 48b "Photovoltaic Solar Energy Systems" with no other commercial use of the property authorized hereunder, along with the restrictions further placed upon the use stated in Chapter 134, Section 5.3, along with the expectation that the Commercial zoning designation for the properties in question should revert back to RFR-80, subject to further public hearing and action of the Hopkinton Town Council, once the proposed use and/or actual use of the property as an operating Photovoltaic Solar Energy System is abandoned or terminated. This change is subject of the condition that the applicants have received assurances from National Grid that the use of the properties as an operating Photovoltaic Solar Energy System as proposed that such an interconnection approval will be given final approval by National Grid at the appropriate time, which is at the completion of the combined project.	The proposed project will use the property for development of a Photovoltaic Solar Energy System.
2	All decommissioning and other provisions in place for Photovoltaic Solar Energy Systems as set forth in Chapter 134 as amended, as well as under Hopkinton Planning Board requirements, shall be complied with, including but not limited to the posting of a decommissioning cash escrow bond in the amount to be determined by the Planning Board.	The project is grandfathered under the Chapter 246 Non-Residential Photovoltaic Solar Energy System (PSES) Ordinance adopted on July 18, 2016, and will be in full compliance with all provisions, including decommissioning requirements. A decommissioning cash escrow bond will be established prior to construction.
3	In conjunction with the decommissioning and other provisions referred to above, and in addition to the decommissioning cash escrow bond described above, the Petitioners shall prepare a re-forestation plan to be approved by the Planning Board and post an additional cash escrow bond in a reasonable amount to be determined by the Planning Board designed to ensure implementation and completion of the re-forestation plan so approved.	A Forest Assessment Report and Reforestation Plan Report prepared by Land Management Services were submitted to the Town Council as part of the Zone Change approval process and is attached for reference. A reforestation cash escrow bond will be established prior to construction.
4	The bottom of the perimeter fencing required by Section 5.3 of Chapter 134 shall be raised six inches (6") above the ground so as to allow migratory passage of small species through the site.	A detail of the perimeter fence showing the required six-inch gap from bottom of fence to ground surface will be provided as part of future permit application submissions.
5	The Petitions shall prepare and submit to the Planning Board for approval a reasonable plan designed to sustain the native animal species in and around the solar array facility during its construction and its operation until the facility's closure.	An analysis of native animal species will be conducted and submitted as part of the Preliminary Plan Application submission.
6	To the extent applicable, the applicants shall prepare and submit to the Planning Board any and all applications and supporting documentation necessary to obtain from said Planning Board through its normal subdivision approval process any and all subdivision approvals as may be required to create any new parcels of land that are part of the application process; and further, should said applications for subdivision approval be approved, the applicants thereafter shall conform with any and all conditions of said approvals.	Permit applications will be prepared and submitted to the Planning Board in accordance with the Town's Land Development and Subdivision Regulations. The project will comply with any associated conditions of approval.
7	While operating, the noise levels from the inverters within the solar array shall not exceed the World Health Organization's standard of 40 decibels measured at the properties' boundary lines where the solar arrays are situated. The applicants shall pay for an independent qualified company selected by the Town to conduct appropriate sound testing before logging and construction have commenced and again after the project is completed and operational.	The applicant will pay for sound testing prior to clearing and after construction per this condition of approval.
8	During the site preparation and installation stages of the construction of the solar arrays, such work shall be performed only during the Monday through Friday workweek, and only between the hours of 8:00 a.m. and 5:00 p.m.	Construction operations will be performed within the required windows.
9	Requested waivers that were requested by the applicants, including septic systems and evidence off water supply, are hereby approved.	Noted.
10	Prior to construction, applicants will sign Appendix B to RIDEM's sample Storm Water Facility Maintenance Agreement between the Town and landowners.	The RIDEM Stormwater Facility Maintenance Agreement will be prepared and signed prior to construction.
11	During construction, no blasting is allowed and no chemicals or herbicides shall be allowed during or after construction, or thereafter for maintenance purposes. All topsoil will remain onsite and the Town's designated engineer or representative shall be allowed to do periodic inspections, and the applicants shall reimburse the Town for this cost, and the applicants and/or their respective successors in interest shall be required to submit any and all inspection reports to the Town Manager or his representative every month during construction of the project.	No blasting or removal of topsoil will be permitted during construction.
12	After the completion of the project, the applicant and/or successors will allow the Town to conduct an inspection in April of every year for the life of the project and will reimburse the Town for this cost.	Noted. The applicant and / or successors will reimburse the Town for this cost.
13	The applicants will construct a 175-foot setback from Skunk Hill Road with 12-foot berms along the approximately 800-foot frontage along Skunk Hill Road. Also, the applicants will construct 12-foot berms along the eastern border with 120-foot wetlands and shading setback from the tree line. Evergreen trees will be planted along the top of the berm with shrubbery along the sides in order to shield the panels from being seen during any season from Skunk Hill Road.	The required setbacks and berms are shown on the Pre-Application Proposed Site Plan (Figure 5). They have been oriented to shield the panels from Skunk Hill Road. Landscaping details, including evergreen trees and shrub plantings, will be provided as the design progresses as part of future application submissions.
14	The applicants will protect the view scape so that no installed solar panel is visible from the first floor of any abutting neighbors' homes following construction of the arrays.	The viewscape will be protected by existing vegetation and proposed berms. The applicant will confirm that this condition is met after construction.
15	On the applicants' approximately 98 acre parcel designated as Plat 18, Lot 14, after the completion of the clearing of trees necessary for that parcel's arrays, there shall remain approximately 42.5 acres of forested land. On the approximately 70.6 acre parcel designated as Plat 18, Lots 13 and 8, after the completion of the clearing of trees necessary for that parcel's arrays, there shall remain approximately 46.1 acres of forested land.	The current pre-application submission includes approximately 42.5 acres of remaining forest on Plat 18, Lot 14, and approximately 46.1 acres on Plat 18, Lots 13 and 8. These numbers will be checked prior to each application submission to ensure this condition is met.
16	Logging and debris removal will be done primarily onto Skunk Hill Road. No offloading of machinery is allowed in the public roadways.	Noted.
17	The area known as Goat Rocks will be preserved and protected.	There is over 125 feet of wooded area between the Goat Rock site and the limit of work of the project. Therefore, the Goat Rock site will be preserved and protected.
18	Other than water and seed, no chemicals, fertilizers, weed killer or any other lawn care products will be allowed on the site. The applicant will create a pollinator habitat plan and submit it to the Planning Board for review and approval.	A pollinator habitat plan will be developed and and submitted as part of the Preliminary Plan Application submission.
19	The applicants, with RIDEM approval, will interconnect to the grid via underground cables to the maximum extent possible and allowable by National Grid and exit onto Arcadia Road. The Applicants further agree to relocate the transformers and/or electrical switching station depicted on the original plans designs onto a more central location within the parcel known as Plat 18, Lot 8. The setbacks from the solar panels to abutter property lines near Lisa Lane, Frances Barber Drive, Beverly Ann Drive and Grancera Drive shall not be less than 300 feet.	National Grid utility infrastructure will be located underground to the maximum extent practical, pending RIDEM and National Grid input. Additional details will be provided as the design progresses as part of future application submissions. The transformers and/or electrical switching station location was revised from its original location prior to the May 13, 2019 Town Council meeting. The current location of the equipment is centrally located in Plat 18, Lot 8 as shown on the Pre-Application Proposed Site Plan (Figure 5).. The required panel setbacks are provided from abutter property lines on Lisa Lane, Frances Barber Drive, Beverly Ann Drive and Grancera Drive as shown on the Pre-Application Proposed Site Plan (Figure 5).
20	The Lisa Lane access road to the parcel formerly known as the Gordon property, Plan 18, Lots 13 and 8, will be eliminated. The applicants shall provide fire and emergency training to local fire and ambulance services of a nature related to the types of fires and injuries reasonably connected with fires involving solar arrays used for the commercial generation of electricity. The applicants and their successors shall obtain and maintain personal property and liability insurance for the site, as well as related business interruption insurance and available secondary insurance with or through the manufacturers of the solar panels to be used in the arrays.	The Lisa Lane access drive will be abandoned. The applicant will provide training to local fire and ambulance services and obtain personal property and liability insurance for the site, related business interruption insurance and available secondary insurance prior to the start of construction.

CORRECTED RECORD

IN RELATION TO CHAPTER 266 AN ORDINANCE IN AMENDMENT OF MAP 13 OF THE FUTURE LAND USE MAP OF THE COMPREHENSIVE PLAN OF THE TOWN OF HOPKINTON, AS AMENDED, RECORDED AT BOOK 570, PAGE 541 IN THE TOWN OF HOPKINTON RI LAND EVIDENCE RECORDS

N.B. A scrivener's error was made in two places in Exhibit A ("Decision") to the recorded form of Chapter 266 in its first paragraph at lines 3 and line 7, whereby one of the applicants was mistakenly listed as "Atlantic Solar, LLC". This applicant should have been listed accurately as "Skunk Hill Solar LLC" in both places, consistent with the original application filed with the Town. This correction is reflected below. The remainder of the record of recorded Chapter 266 at Book 570, page 541 remains unchanged in every respect, also as reflected below.

TOWN OF HOPKINTON, RI

CHAPTER 266

AN ORDINANCE IN AMENDMENT OF MAP 13 OF THE FUTURE LAND USE MAP OF THE COMPREHENSIVE PLAN OF THE TOWN OF HOPKINTON, AS AMENDED

It is ordained by the Town Council of the Town of Hopkinton as follows:

SECTION I: FURTHER AMENDMENT TO MAP 13 OF THE FUTURE LAND USE MAP OF THE COMPREHENSIVE PLAN OF THE TOWN OF HOPKINTON, AS AMENDED

This Ordinance shall take effect upon passage subject to the fulfillment of all of the conditions set forth in the decision identified as Exhibit A attached hereto and incorporated herein.

EXHIBIT A

TOWN OF HOPKINTON, RHODE ISLAND

TOWN COUNCIL

DECISION

A public hearing was held on March 25, 2019, April 22, 2019, and May 13, 2019 on the consolidated Petitions for Comprehensive Plan Future Land Use Map Amendments to Map 13 and on the consolidated Petitions for Zoning Ordinance Amendments filed by Skunk Hill Solar LLC, 260 West Exchange Street- Ste. 102A, Providence, RI 02903, Gordon Excavating, Inc.,15 Cold Spring St., Providence, RI 02906, and Donald G. Gordon, 11 Anderson Rd., Pomfret Ctr., CT, 06259, the land owner, for property located at 0 Arcadia Rd. & 0 Lisa Ln. identified as Plat 18, Lots 8 & 13, an RFR-80 Zone, and filed by Skunk Hill Solar LLC, 260 West Exchange Street- Ste. 102A, Providence, RI 02903 and Hopkinton Land 1, LLC, 260 West Exchange Street- Ste. 102A, Providence, RI 02903, the land owner, for property located at 145 Skunk Hill Rd. identified as Plat 18, Lot 14, also an RFR-80 Zone; all filed in accordance with Chapter 16 of the Zoning Ordinances of the Town of Hopkinton , as amended. The referenced consolidated Petitions proposed to install ground-mounted photovoltaic solar arrays on the properties in question, and such use would necessarily require approval of the proposed consolidated Comprehensive Plan Future Land Use Map Amendments from Low-Density Residential to Commercial, and Zoning Map Amendments from RFR-80 to Commercial.

Following deliberations by the Hopkinton Town Council on June 10, 2019 for the Petitioners' proposal to install solar arrays involving the erection and installation of solar panels on the parcels which combined consist of approximately 168.6 acres in order to generate approximately twenty (20) megawatts AC of energy requiring a Zone changes for the parcels from RFR-80 to Commercial in accordance with Section 16[A] – [E] of the Zoning Ordinances of the Town of Hopkinton as amended, an (amended) motion to approve the consolidated Petitions was made by Councilor Thompson and seconded by Councilor Capalbo. The Town Council voted to approve said consolidated motion allowing the consolidated Petitions by a 3-2 vote, incorporating the below-listed Findings, and subject to twenty (20) Conditions, which are set forth below in their final form.

Findings

Subject to the Conditions which follow, and based upon the evidence and testimony of record presented and submitted at the March 19, 2018 hearing, the proposed consolidated Zoning Ordinance Amendments and the Proposed Comprehensive Plan Future Land Use Map Amendments to Map 13 are all consistent with the authority reserved to the Council under the Comprehensive Plan to identify those areas in Town where such uses are appropriate, and to identify the conditions under which such uses may exist; that the changes proposed will provide benefits to the Town in terms of enhanced tax revenues to be received from the property as result of the development of the solar arrays; that the changes proposed will promote an important local, state and national objective seeking alternative energy sources that are safe for the environment and the citizens of Hopkinton; that the proposed changes will not adversely affect the health, safety or welfare of the Town and are in the best interests of the community; that the proposed changes are suitable to the character of the location in question and constitute a non-noxious use; and that the proposed use is in conformance with the provisions of the Comprehensive Plan, including but not limited to Conservation goal #1, to promote conservation of Hopkinton's natural resources, particularly the protection of ground and surface waters, with Natural Resources Goal #1, to preserve, conserve and protect the significant natural resources of Hopkinton as an endowment for the future of the Town, with Public Services and Facilities Goal #3, to provide a safe, high quality and sufficient drinking water supply to the town along with effective wastewater management and solid waste disposal reduction which is sensitive to environmental concerns and growth management, and with Public Services and Facilities Goal #5, to reduce Hopkinton's energy consumption and help implement Recommendation 14, which is to evaluate the feasibility and costs of installing photovoltaic and/or wind –powered electricity generating technologies, and recommendation 18, which is to expand the current zoning regulations' allowance of photovoltaic installations in residential districts. The adoption of these consolidated amendments to the Comprehensive Plan Future Land Use Map and Zoning Map are consistent with the Town of Hopkinton's Comprehensive Plan's objective LU-1 restricting potential polluting land uses from an

aquifer protection zone or area, and with the Plan's goal ED-3 targeting development that is consistent with eliminating anything that is adverse to the quality of life including establishing business interests that will have limited to no adverse impact to the environment.

Conditions

As conditions for the approval of the proposed changes, the Petitioners and/or their successors- in-interest, must adhere to the following:

1. The zoning district classifications for these parcels are changed from Residential RFR-80 to Commercial with the restrictions that the property's use hereafter shall be limited to use code 486 "Photovoltaic Solar Energy Systems" with no other commercial use of the property authorized hereunder, along with the restrictions further placed upon the use stated in Chapter 134, Section 5.3, along with the expectation that the Commercial zoning designation for the properties in question should revert back to RFR-80, subject to further public hearing and action of the Hopkinton Town Council, once the proposed use and/or actual use of the property as an operating Photovoltaic Solar Energy System is abandoned or terminated. This change is subject of the condition that the applicants have received assurances from National Grid that the use of the properties as an operating Photovoltaic Solar Energy System as proposed that such an interconnection approval will be given final approval by National Grid at the appropriate time, which is at the completion of the combined project.

2. All decommissioning and other provisions in place for Photovoltaic Solar Energy Systems as set forth in Chapter 134 as amended, as well as under Hopkinton Planning Board requirements, shall be complied with, including but not limited to the posting of a decommissioning cash escrow bond in the amount to be determined by the Planning Board.

3. In conjunction with the decommissioning and other provisions referred to above, and in addition to the decommissioning cash escrow bond described above, the Petitioners shall prepare a re-forestation plan to be approved by the Planning Board and post an additional cash escrow bond in a reasonable amount to be determined by the Planning Board designed to ensure implementation and completion of the re-forestation plan so approved.

4. The bottom of the perimeter fencing required by Section 5.3 of Chapter 134 shall be raised six inches (6") above the ground so as to allow migratory passage of small species through the site;

5. The Petitions shall prepare and submit to the Planning Board for approval a reasonable plan designed to sustain the native animal species in and around the solar array facility during its construction and its operation until the facility's closure.

6. To the extent applicable, the applicants shall prepare and submit to the Planning Board any and all applications and supporting documentation necessary to obtain from said Planning Board through its normal subdivision approval process any and all subdivision approvals as may be required to create any new parcels of land that are part of the application process; and further, should said applications for subdivision approval be approved, the applicants thereafter shall conform with any and all conditions of said approvals.

7. While operating, the noise levels from the inverters within the solar array shall not exceed the World Health Organization's standard of 40 decibels measured at the properties' boundary lines where the solar arrays are situated. The applicants shall pay for an independent qualified company selected by the Town to conduct appropriate sound testing before logging an construction have commenced and again after the project is completed and operational.

8. During the site preparation and installation stages of the construction of the solar arrays, such work shall be performed only during the Monday through Friday workweek, and only between the hours of 8:00 a.m. and 5:00 p.m.

9. Requested waivers that were requested by the applicants, including septic systems and evidence off water supply, are hereby approved.

10. Prior to construction, applicants will sign Appendix B to RIDEM's sample Storm Water Facility Maintenance Agreement between the Town and landowners.

11. During construction, no blasting is allowed and no chemicals or herbicides shall be allowed during or after construction, or thereafter for maintenance purposes. All topsoil will remain onsite and the Town's designated engineer or representative shall be allowed to do periodic inspections, and the applicants shall reimburse the Town for this cost, and the applicants and/or their respective successors in interest shall be required to submit any and all inspection reports to the Town Manager or his representative every month during construction of the project.

12. After the completion of the project, the applicant and/or successors will allow the Town to conduct an inspection in April of every year for the life of the project and will reimburse the Town for this cost.

13. The applicants will construct a 175-foot setback from Skunk Hill Road with 12-foot berms along the approximately 800-foot frontage along Skunk Hill Road. Also, the applicants will construct 12-foot berms along the eastern border with 120-foot wetlands and shading setback from the tree line. Evergreen trees will be planted along the top of the berm with shrubbery along the sides in order to shield the panels from being seen during any season from Skunk Hill Road.

14. The applicants will protect the view scape so that no installed solar panel is visible from the first floor of any abutting neighbors' homes following construction of the arrays.

15. On the applicants' approximately 98 acre parcel designated as Plat 18, Lot 14, after the completion of the clearing of trees necessary for that parcel's arrays, there shall remain approximately 42.5 acres of forested land. On the approximately 70.6 acre parcel designated as Plat 18, Lots 13 and 8, after the completion of the clearing of trees necessary for that parcel's arrays, there shall remain approximately 46.1 acres of forested land.

16. Logging and debris removal will be done primarily onto Skunk Hill Road. No offloading of machinery is allowed in the public roadways.

17. The area known as Goat Rocks will be preserved and protected.

18. Other than water and seed, no chemicals, fertilizers, weed killer or any other lawn care products will be allowed on the site. The applicant will create a pollinator habitat plan and submit it to the Planning Board for review and approval.

19. The applicants, with RIDEM approval, will interconnect to the grid via underground cables to the maximum extent possible and allowable by National Grid and exit onto Arcadia Road. The Applicants further agree to relocate the transformers and/or electrical switching station depicted on the original plans designs onto a more central location within the parcel known as Plat 18, Lot 8. The setbacks from the solar panels to abutter property lines near Lisa Lane, Frances Barber Drive, Beverly Ann Drive and Grancera Drive shall not be less than 300 feet.

20. The Lisa Lane access road to the parcel formerly known as the Gordon property, Plan 18, Lots 13 and 8, will be eliminated. The applicants shall provide fire and emergency training to local fire and ambulance services of a nature related to the types of fires and injuries reasonably connected

with fires involving solar arrays used for the commercial generation of electricity. The applicants and their successors shall obtain and maintain personal property and liability insurance for the site, as well as related business interruption insurance and available secondary insurance with or through the manufacturers of the solar panels to be used in the arrays.

Adopted: June 10, 2019

Approved as to Form:

_____

Frank Landolfi, Council President

Dated: January ___, 2020

ATTEST: _____

Elizabeth J. Cook-Martin

Dated: January ___, 2020

CORRECTED RECORD

IN RELATION TO CHAPTER 267 AN ORDINANCE IN AMENDMENT OF CHAPTER 134 OF THE TOWN ORDINANCES OF THE TOWN OF HOPKINTON, AS AMENDED, RECORDED AT BOOK 570, PAGE 549 IN THE TOWN OF HOPKINTON RI LAND EVIDENCE RECORDS

N.B. A scrivener's error was made in two places in Exhibit A ("Decision") to the recorded form of Chapter 267 in its first paragraph at lines 3 and line 7, whereby one of the applicants was mistakenly listed as "Atlantic Solar, LLC". This applicant should have been listed accurately as "Skunk Hill Solar LLC" in both places, consistent with the original application filed with the Town. This correction is reflected below. The remainder of the record of recorded Chapter 267 at Book 570, page 549 remains unchanged in every respect, also as reflected below.

TOWN OF HOPKINTON, RI

CHAPTER 267

AN ORDINANCE IN AMENDMENT OF CHAPTER 134 OF THE TOWN ORDINANCES OF THE TOWN OF HOPKINTON, AS AMENDED

It is ordained by the Town Council of the Town of Hopkinton as follows:

SECTION I: AMENDMENT TO CHAPTER 134 OF THE TOWN OF HOPKINTON ZONING ORDINANCE, AS AMENDED; THE TOWN OF HOPKINTON ZONING MAP OCTOBER, 1994 IS HEREBY AMENDED AS FOLLOWS:

This Ordinance shall take effect upon passage subject to the fulfillment of all of the conditions set forth in the decision identified as Exhibit A attached hereto and incorporated herein.

EXHIBIT A

TOWN OF HOPKINTON, RHODE ISLAND

TOWN COUNCIL

DECISION

A public hearing was held on March 25, 2019, April 22, 2019, and May 13, 2019 on the consolidated Petitions for Comprehensive Plan Future Land Use Map Amendments to Map 13 and on the consolidated Petitions for Zoning Ordinance Amendments filed by Skunk Hill Solar LLC, 260 West Exchange Street- Ste. 102A, Providence, RI 02903, Gordon Excavating, Inc.,15 Cold Spring St., Providence, RI 02906, and Donald G. Gordon, 11 Anderson Rd., Pomfret Ctr., CT, 06259, the land owner, for property located at 0 Arcadia Rd. & 0 Lisa Ln. identified as Plat 18, Lots 8 & 13, an RFR-80 Zone, and filed by Skunk Hill Solar LLC, 260 West Exchange Street- Ste. 102A, Providence, RI 02903 and Hopkinton Land 1, LLC, 260 West Exchange Street- Ste. 102A, Providence, RI 02903, the land owner, for property located at 145 Skunk Hill Rd. identified as Plat 18, Lot 14, also an RFR-80 Zone; all filed in accordance with Chapter 16 of the Zoning Ordinances of the Town of Hopkinton , as amended. The referenced consolidated Petitions proposed to install ground-mounted photovoltaic solar arrays on the properties in question, and such use would necessarily require approval of the proposed consolidated Comprehensive Plan Future Land Use Map Amendments from Low-Density Residential to Commercial, and Zoning Map Amendments from RFR-80 to Commercial.

Following deliberations by the Hopkinton Town Council on June 10, 2019 for the Petitioners' proposal to install solar arrays involving the erection and installation of solar panels on the parcels which combined consist of approximately 168.6 acres in order to generate approximately twenty (20) megawatts AC of energy requiring a Zone changes for the parcels from RFR-80 to Commercial in accordance with Section 16[A] – [E] of the Zoning Ordinances of the Town of Hopkinton as amended, an (amended) motion to approve the consolidated Petitions was made by Councilor Thompson and seconded by Councilor Capalbo. The Town Council voted to approve said consolidated motion allowing the consolidated Petitions by a 3-2 vote, incorporating the below-listed Findings, and subject to twenty (20) Conditions, which are set forth below in their final form.

Findings

Subject to the Conditions which follow, and based upon the evidence and testimony of record presented and submitted at the March 19, 2018 hearing, the proposed consolidated Zoning Ordinance Amendments and the Proposed Comprehensive Plan Future Land Use Map Amendments to Map 13 are all consistent with the authority reserved to the Council under the Comprehensive Plan to identify those areas in Town where such uses are appropriate, and to identify the conditions under which such uses may exist; that the changes proposed will provide benefits to the Town in terms of enhanced tax revenues to be received from the property as result of the development of the solar arrays; that the changes proposed will promote an important local, state and national objective seeking alternative energy sources that are safe for the environment and the citizens of Hopkinton; that the proposed changes will not adversely affect the health, safety or welfare of the Town and are in the best interests of the community; that the proposed changes are suitable to the character of the location in question and constitute a non-noxious use; and that the proposed use is in conformance with the provisions of the Comprehensive Plan, including but not limited to Conservation goal #1, to promote conservation of Hopkinton's natural resources, particularly the protection of ground and surface waters, with Natural Resources Goal #1, to preserve, conserve and protect the significant natural resources of Hopkinton as an endowment for the future of the Town, with Public Services and Facilities Goal #3, to provide a safe, high quality and sufficient drinking water supply to the town along with effective wastewater management and solid waste disposal reduction which is sensitive to environmental concerns and growth management, and with Public Services and Facilities Goal #5, to reduce Hopkinton's energy consumption and help implement Recommendation 14, which is to evaluate the feasibility and costs of installing photovoltaic and/or wind –powered electricity generating technologies, and recommendation 18, which is to expand the current zoning regulations' allowance of photovoltaic installations in residential districts. The adoption of these consolidated amendments to the Comprehensive Plan Future Land Use Map and Zoning Map are consistent with the Town of Hopkinton's Comprehensive Plan's objective LU-1 restricting potential polluting land uses from an

aquifer protection zone or area, and with the Plan's goal ED-3 targeting development that is consistent with eliminating anything that is adverse to the quality of life including establishing business interests that will have limited to no adverse impact to the environment.

Conditions

As conditions for the approval of the proposed changes, the Petitioners and/or their successors- in-interest, must adhere to the following:

1. The zoning district classifications for these parcels are changed from Residential RFR-80 to Commercial with the restrictions that the property's use hereafter shall be limited to use code 486 "Photovoltaic Solar Energy Systems" with no other commercial use of the property authorized hereunder, along with the restrictions further placed upon the use stated in Chapter 134, Section 5.3, along with the expectation that the Commercial zoning designation for the properties in question should revert back to RFR-80, subject to further public hearing and action of the Hopkinton Town Council, once the proposed use and/or actual use of the property as an operating Photovoltaic Solar Energy System is abandoned or terminated. This change is subject of the condition that the applicants have received assurances from National Grid that the use of the properties as an operating Photovoltaic Solar Energy System as proposed that such an interconnection approval will be given final approval by National Grid at the appropriate time, which is at the completion of the combined project.

2. All decommissioning and other provisions in place for Photovoltaic Solar Energy Systems as set forth in Chapter 134 as amended, as well as under Hopkinton Planning Board requirements, shall be complied with, including but not limited to the posting of a decommissioning cash escrow bond in the amount to be determined by the Planning Board.

3. In conjunction with the decommissioning and other provisions referred to above, and in addition to the decommissioning cash escrow bond described above, the Petitioners shall prepare a re-forestation plan to be approved by the Planning Board and post an additional cash escrow bond in a reasonable amount to be determined by the Planning Board designed to ensure implementation and completion of the re-forestation plan so approved.

4. The bottom of the perimeter fencing required by Section 5.3 of Chapter 134 shall be raised six inches (6") above the ground so as to allow migratory passage of small species through the site;

5. The Petitions shall prepare and submit to the Planning Board for approval a reasonable plan designed to sustain the native animal species in and around the solar array facility during its construction and its operation until the facility's closure.

6. To the extent applicable, the applicants shall prepare and submit to the Planning Board any and all applications and supporting documentation necessary to obtain from said Planning Board through its normal subdivision approval process any and all subdivision approvals as may be required to create any new parcels of land that are part of the application process; and further, should said applications for subdivision approval be approved, the applicants thereafter shall conform with any and all conditions of said approvals.

7. While operating, the noise levels from the inverters within the solar array shall not exceed the World Health Organization's standard of 40 decibels measured at the properties' boundary lines where the solar arrays are situated. The applicants shall pay for an independent qualified company selected by the Town to conduct appropriate sound testing before logging an construction have commenced and again after the project is completed and operational.

8. During the site preparation and installation stages of the construction of the solar arrays, such work shall be performed only during the Monday through Friday workweek, and only between the hours of 8:00 a.m. and 5:00 p.m.

9. Requested waivers that were requested by the applicants, including septic systems and evidence off water supply, are hereby approved.

10. Prior to construction, applicants will sign Appendix B to RIDEM's sample Storm Water Facility Maintenance Agreement between the Town and landowners.

11. During construction, no blasting is allowed and no chemicals or herbicides shall be allowed during or after construction, or thereafter for maintenance purposes. All topsoil will remain onsite and the Town's designated engineer or representative shall be allowed to do periodic inspections, and the applicants shall reimburse the Town for this cost, and the applicants and/or their respective successors in interest shall be required to submit any and all inspection reports to the Town Manager or his representative every month during construction of the project.

12. After the completion of the project, the applicant and/or successors will allow the Town to conduct an inspection in April of every year for the life of the project and will reimburse the Town for this cost.

13. The applicants will construct a 175-foot setback from Skunk Hill Road with 12-foot berms along the approximately 800-foot frontage along Skunk Hill Road. Also, the applicants will construct 12-foot berms along the eastern border with 120-foot wetlands and shading setback from the tree line. Evergreen trees will be planted along the top of the berm with shrubbery along the sides in order to shield the panels from being seen during any season from Skunk Hill Road.

14. The applicants will protect the view scape so that no installed solar panel is visible from the first floor of any abutting neighbors' homes following construction of the arrays.

15. On the applicants' approximately 98 acre parcel designated as Plat 18, Lot 14, after the completion of the clearing of trees necessary for that parcel's arrays, there shall remain approximately 42.5 acres of forested land. On the approximately 70.6 acre parcel designated as Plat 18, Lots 13 and 8, after the completion of the clearing of trees necessary for that parcel's arrays, there shall remain approximately 46.1 acres of forested land.

16. Logging and debris removal will be done primarily onto Skunk Hill Road. No offloading of machinery is allowed in the public roadways.

17. The area known as Goat Rocks will be preserved and protected.

18. Other than water and seed, no chemicals, fertilizers, weed killer or any other lawn care products will be allowed on the site. The applicant will create a pollinator habitat plan and submit it to the Planning Board for review and approval.

19. The applicants, with RIDEM approval, will interconnect to the grid via underground cables to the maximum extent possible and allowable by National Grid and exit onto Arcadia Road. The Applicants further agree to relocate the transformers and/or electrical switching station depicted on the original plans designs onto a more central location within the parcel known as Plat 18, Lot 8. The setbacks from the solar panels to abutter property lines near Lisa Lane, Frances Barber Drive, Beverly Ann Drive and Grancera Drive shall not be less than 300 feet.

20. The Lisa Lane access road to the parcel formerly known as the Gordon property, Plan 18, Lots 13 and 8, will be eliminated. The applicants shall provide fire and emergency training to local fire and ambulance services of a nature related to the types of fires and injuries reasonably connected

with fires involving solar arrays used for the commercial generation of electricity. The applicants and their successors shall obtain and maintain personal property and liability insurance for the site, as well as related business interruption insurance and available secondary insurance with or through the manufacturers of the solar panels to be used in the arrays.

Adopted: June 10, 2019

Approved as to Form:

_____

Frank Landolfi, Council President

Dated: January ___, 2020

ATTEST: _____

Elizabeth J. Cook-Martin

Dated: January ___, 2020

LAND MANAGEMENT SERVICES
303 Courthouse Lane, Pascoag, RI 02859
401-568-3410
mstremb@cox.net

January 2, 2019 (amended 3/26/19)

Forest Assessment
Proposed Skunk Hill I & II Solar Projects
Skunk Hill I: 145 Skunk Hill Road (AP 18, Lot 14)
Skunk Hill II: 0 Arcadia Road and 0 Lisa Lane (AP 18, Lots 8 & 13)
Hopkinton, RI

Purpose:

This forest assessment is provided to document the forest resources on the total of 173.5 acres in three (3) lots that will be subject to the development of a solar array. The above-referenced project currently involves approximately 47 +/- acres that would be cleared of trees for the solar arrays, although this estimate is subject to change as the project proposal is refined.

General Site Description:

The subject properties are located southerly of Skunk Hill Road and westerly of Arcadia Road, with additional access from Lisa Lane, northwest of the Hope Valley village area in the northeast portion of the town of Hopkinton, RI. The property is situated on the southern tip of Skunk Hill, which is a long ridge flanked by the Wood River to the east and Brushy Brook (Locustville Pond) to the west. The terrain consists of a southeast-facing slope with a couple of rocky, upland knolls and interior intermittent stream valleys. These streams flow to the southeast to the Wood River just below Wyoming Pond.

According to the USDA Soil Survey, the existing soil conditions underlying the wooded upland areas of the property that will be subjected to the clearing for this project include well-drained Canton-Charlton-Rock Outcrop complex of fine sandy loams, very rocky, with 3 to 15 percent slopes, which are typically found on side slopes and crests of upland hills and ridges; excessively well-drained Hinckley gravelly sandy loam, rolling, which are typically found on terraces and glacial features such as outwash plains, kames, and eskers; and moderately well-drained Sutton very stony fine sandy loam, 0 to 8 percent slopes, which are typically found on the lower side slopes of the uplands. There are rock outcroppings present within these soil types, particularly in the southwestern area of the property. Stones and boulders can cover from 10 to 35 percent of the surface in the upland sites underlain with the Canton/Charlton soil type, with other areas that have from 0 to 10 percent of the surface covered by stones and boulders.

The available water capacity of these soils is from low in the gravelly areas, to moderate in most other areas of the property, and runoff rate is slow to medium. They are typically too stony for agricultural uses, with only the Hinckley gravelly soils suitable for pasture or hayfields. They are suited to trees and community development. These soils have a woodland productivity rating

of 4o to 5s, which is low to moderate in productivity, with site limitations for equipment operation due to the stoniness, and low fertility due to sandiness. They have a Site Index value that ranges from 52 for Red oak in the upland areas and 62 in the mid- to lower-slope sites, and 58 for White pine in the upland sites to 62 in the lower-slope sites. The gravelly, sandy loam of the Hinckley site is most suited to growing White pine, where it regenerates readily, but due to low fertility the Site Index for White pine is relatively low at 60. This Site Index value is an indication of how well trees will grow in that soil type, and those values range from poor in the upland areas to fair in the mid- to lower slope sites, in relation to other Rhode Island soils.

The USDA Soil Survey includes information on depth to bedrock, soil texture, seasonal water table influences, and suitability for certain tree species. A copy of the USDA Soil Survey report for the subject property is attached to this assessment.

There is a woods trail that enters the wooded areas of the property from the northern hayfields, and runs parallel to the western boundary down to the ledges known as Goat Rock. There is a second trail that comes in from the road frontage in the southeastern portion of the property and runs along the ledges overlooking the southern stream to the Goat Rock ledges, with several other ATV trails that run through these areas. Some of these roads are visible in the Aerial Imagery.

Forest Cover Descriptions:

The forest cover on the subject sites is predominately upland oaks (Scarlet oak, Black oak, and White oak), with some presence of Northern red oak in the upper slope areas of the western portions of the property, with a heavy understory of Mountain laurel shrubs, and in the southeast portions of the property White pine is the dominant tree species, with mature stands of pine mixed with some upland oaks, along with Black birch, Red maple, Sassafras, and a few small copses of American beech. Red maple and other hardwoods are present in a small area just south of the northwest field, where seasonally high water tables have an influence on the species found there.

There is no evidence of any recent timber harvesting activity, other than some firewood harvesting in the northern areas of the woodlot, close to the property's house site and fields. There are no signs of any harvesting of mature timber in many years. The woods roads and a couple of branch trails are still open with evidence of some vegetation maintenance for recreational access.

More recently, defoliations by Gypsy moth caterpillars has resulted in a minor amount of oak mortality. The 2016 Aerial imagery illustrates the amount of defoliation that occurred (light-colored patches that should be green with foliage), with defoliation in the upland areas of the southwestern portions of the property.

The preparation of this Forest Assessment has included a forest resource inventory, the results of which are included in each of the Stand Descriptions that will follow. Forest stands are

determined through a combination of forest cover and geographic features, with soil types, slope, and aspect each having a major influence on the delineation of these stands.

This forest inventory was conducted by the randomized distribution of variable radius sampling plots, with the use of a 10-factor prism and measuring the diameters of all "in" trees. Extrapolation of the recorded data provides average diameter and stocking data (e.g. numbers of trees) across the stand. Data recorded includes species, determination of acceptable or un-acceptable growing stock (AGS vs. UGS), understory vegetation, and any additional site factors that influences the health and viability of the stand.

Stand Descriptions:

The woodland has been delineated into three (3) upland stands, as shown on the attached Forest Stand Map, with descriptions that follow. The acreage for each of these stands includes only the acreages within the proposed limit of disturbance as provided by Woodard & Curran Engineering's Site Plan. This is the area to be cleared within the proposed fence line of the arrays and associated stormwater management facilities.

There are additional areas comprised of wetlands not subject to clearing for the solar arrays.

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Stand 1 – Mixed Hardwoods Acres: 3

TREES/A: 88 AVG. DBH: 14" AGE: 100+ years

(DBH = Diameter Breast Height = @4.5' above ground)

SOIL TYPE: Woodbridge fine sandy loam, 0 – 3 percent slopes

SITE INDEX: Red oak = 72 White pine = 65

Located at the southern end of the northwest open fields, with a seasonally high water table and moderately well-drained soil conditions, the overstory of this small patch is comprised of Red maple and other associated hardwoods.

Red maple is the most prevalent species, representing about 70% of the total stocking, and found in all size classes, with some large diameter culls present. These culls, along with some scattered large White and Scarlet oaks are likely remnant pasture trees, with an intermediate stocking of smaller diameter Red maple, White oaks, Hickory, and Black birch. American elms of various sizes were also noted.

Recent cutting of firewood in this stand has produced a fairly open understory with a growth response of Blackberry canes, clumps of Green briers, and thickets of non-native, invasive plants

such as Multi-flora rose shrubs, Japanese barberry shrubs, and Honeysuckle vines. Grasses and annual weeds are present, along with ferns and Sweet pepperbush.

The current health condition of the dominant trees is moderate, with storm-damaged crowns and broken stems of large Red maple culls, and some mortality of the oaks scattered throughout the stand due to recent defoliations. The defoliation would not have been extensive due to the diversity of hardwoods present in the stand, and the moist, fertile soil conditions that enhance the health and productivity of the trees.

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Stand 2 – Upland Oaks Acres: 24

TREES/A: 135 AVG. DBH: 9.8” AGE: 80 - 90 years

SOIL TYPE: Canton/Charlton/Rock Outcrop Complex, 3 to 15 percent slopes

SITE INDEX: Red oak = 52 - 58 White pine = 58 - 65

Located in the central and southwest portions of the property, comprising the acreage of Skunk Hill Solar I, and situated on the mid-slopes of the hillside, with rocky knoll inclusions, and with a southeastern aspect, the overstory of this stand is dominated by mixed oaks in the 12 to 22 inch dbh size classes. Most of the oak stocking is comprised of the upland Black and Scarlet oaks.

Due to the higher soil moisture content of the soils underlying the northern and eastern edges of the stand, there is a component of better quality Northern red oaks present, along with several Red maples in those transition areas. Here there are some oaks and a few White pines that are found in the 20 to 26 inch dbh size classes.

Altogether, the oaks comprise about 80% of the dominant overstory trees, and about 55% of the total growing stock.

Other hardwoods present in the stand include some co-dominant White oaks and Black birch, and an intermediate and suppressed stocking of small to medium diameter Black birch, Hickory, mixed oaks, Sassafras, Black gum, and Red maple. There are some scattered White and Pitch pines present, along with some smaller diameter pine saplings, which are now being released by the recent mortality of oaks.

The current stocking level is 62%, which is a fully-stocked condition on the Upland Central Hardwood stocking chart.

The current health condition of these oaks is poor to moderate, with some crown dieback in most of the dominant and co-dominant stems, and some mortality scattered throughout the stand due to recent drought and defoliations. The upper slopes have significant amounts of oak mortality, comprising about 40% of the overstory in some areas.

The understory includes scattered White pine and Black birch saplings. Mountain laurel is pervasive throughout much of the stand's understory, and appears as the light green color on the 2014 Aerial Imagery. Other shrubs include scattered Highbush blueberry and Witch hazel shrubs, along with Huckleberry and Lowbush blueberry. Greenbriers are present in most areas of the understory.

The stand includes an access trail that runs parallel to the western boundary and leads to the Goat Rock outcroppings in the southwest corner of the property.

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Stand 3 – Pine/Hardwoods Acres: 20

TREES/A: 160 AVG. DBH: 10.1" AGE: 90+ years

SOIL TYPE: Hinckley gravelly sandy loam; Sutton very stony fine sandy loam

SITE INDEX: Red oak = 49 - 62 White pine = 60 - 62

Located in the southeastern portions of the property, comprising the acreage of Skunk Hill Solar II, and situated on rolling terrain and a ridgeline between the two streams on this property, the overstory of this stand is dominated by mature White pines.

The southern portion of the stand has the higher concentration of pine stocking, with an increased component of upland oaks in the northern portions of the stand.

The pines are found in all size classes, from 10 inches dbh up to larger, mature stems up to 30 inches dbh. Overall, the White pines comprise about 55% of the total stocking, and about 75% of the large sawtimber size classes of 20 inches dbh and up.

The oak component is comprised of Scarlet, Black, and White oaks, along with some scattered Northern red oak. They are found in the 12 to 24 inches dbh size classes, with most of the oak stocking in the 12 to 18 inches dbh size classes. These are typically short-bodied, poor to moderate quality stems due to the gravelly soil conditions they are growing in. The northwest portion of the stand, where the terrain slopes down towards the adjacent wetland area, has improved soil moisture conditions with underlying Sutton soils. The oaks found in this area have better form and quality.

The current stocking level is 70%, which is a fully-stocked condition on the Mixed Wood stocking chart.

The understory includes pine and Black birch saplings and small diameter trees in the 4 to 6 inch dbh size classes. There are scattered patches of Mountain laurel, along with Witch hazel, Highbush blueberry, and Lowbush blueberry/Huckleberry shrubs.

The stand includes a woodland path that runs along the southern edge, on the rim of the valley overlooking the southern stream valley. Visible in the 1939 Aerial Imagery, this was once a cart path that led to Goat Rock, and also branches off to run northeast through the stand. Kept open by ATV's and hikers, the pine overstory along that southern valley provides a mature canopy over that trail system.

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Wetland Areas Acres: 50+/-

SOIL TYPE: Ridgebury extremely stony fine sandy loams

Located in the stream valleys that cut through the central and southern portions of the property, the overstory of this stand, which is not subject to the clearing for the proposed solar project, is comprised of a mix of hardwoods, including mixed oaks, Red maple, Hickory, Black birch, White ash, Tulip poplar, Black gum, and some scattered mature White pines.

Some oak mortality was noted in the transitional, lower slope areas of the valleys, where the oak overstory is more dominant and was subjected to the defoliations by Gypsy moths.

The understory is typical of forested wetlands, with Highbush blueberry and Clethra (Sweet pepperbush) heavily present in the more saturated sites of the stand. Heavy thickets of Mountain laurel are present within some areas of these wetlands, where soil conditions are not saturated, but are stony and include the stream channels.

Summary of Observations:

The overall condition of this forested tract is one of diverse species composition, with varying stand density (stocking) conditions. Most of the acreage is dominated by mixed oaks, with White pine comprising a significant component of the southeast area of the property. A significant percentage of the trees are in sizes of 20 inches dbh or larger (approximately 9% on average across the areas to be cleared for the solar arrays).

Much of the forest soil and slope conditions are only moderately productive for oak due to the droughty conditions and stoniness on the upland knoll and ridges that limits the ability of the trees to attain any significant height or growth rates. There is an area of mid- to lower slope sites in the central portions of the property, with transition zones where soil moisture conditions improve to provide a more productive site capability, and there are some good quality, maturing oaks in this area.

The health conditions of the woodlands include significant impacts to the oak overstory in the upper slope sites due to recent defoliations by Gypsy moth and/or Forest tent caterpillars, and by several years of moderate drought conditions. Along with significant mortality in those sites, there is some observable dieback in the crowns of the surviving upland oaks, and additional

mortality may yet occur due to the widespread presence of the two-lined Chestnut borer that attacks weakened and stressed oaks.

Projections for more frequent drought events, warmer temperatures, and more severe precipitation events will continue to have a negative impact on the forest health of upland oak stands in Rhode Island. Oaks are susceptible to Gypsy moth and Forest tent caterpillar defoliations, and to the follow-up attacks on stressed trees by the Two-lined Chestnut borer, which may occur with increased frequency as spring droughts become more common.

The pine-dominated forest of the southeast portion of the property, with its underlying gravelly sandy loams, does not appear to have any significant health concerns, although some Gypsy moth defoliation of the upland oaks in the northern portion of that area has impacted the understory pines. High stocking levels of this un-managed stand of pine has led to natural mortality of small diameter pines due to competition.

The weighted average of trees per acre for the 47 acres of woodlands to be cleared for this project equals 142, for a total of 6,704 trees to be removed for this project.

Prepared By: Marc J. Tremblay, CF

MA Forester Lic #239, CT Certified Forester #F-517, RI Lic. Arborist #104

Certification: I hereby attest that the above Forest Assessment Report prepared for the referenced property has been prepared according to the appropriate standards and information available, and the information provided is as accurate as current forestry practices allow.

Marc J. Tremblay, CF

Attachments:

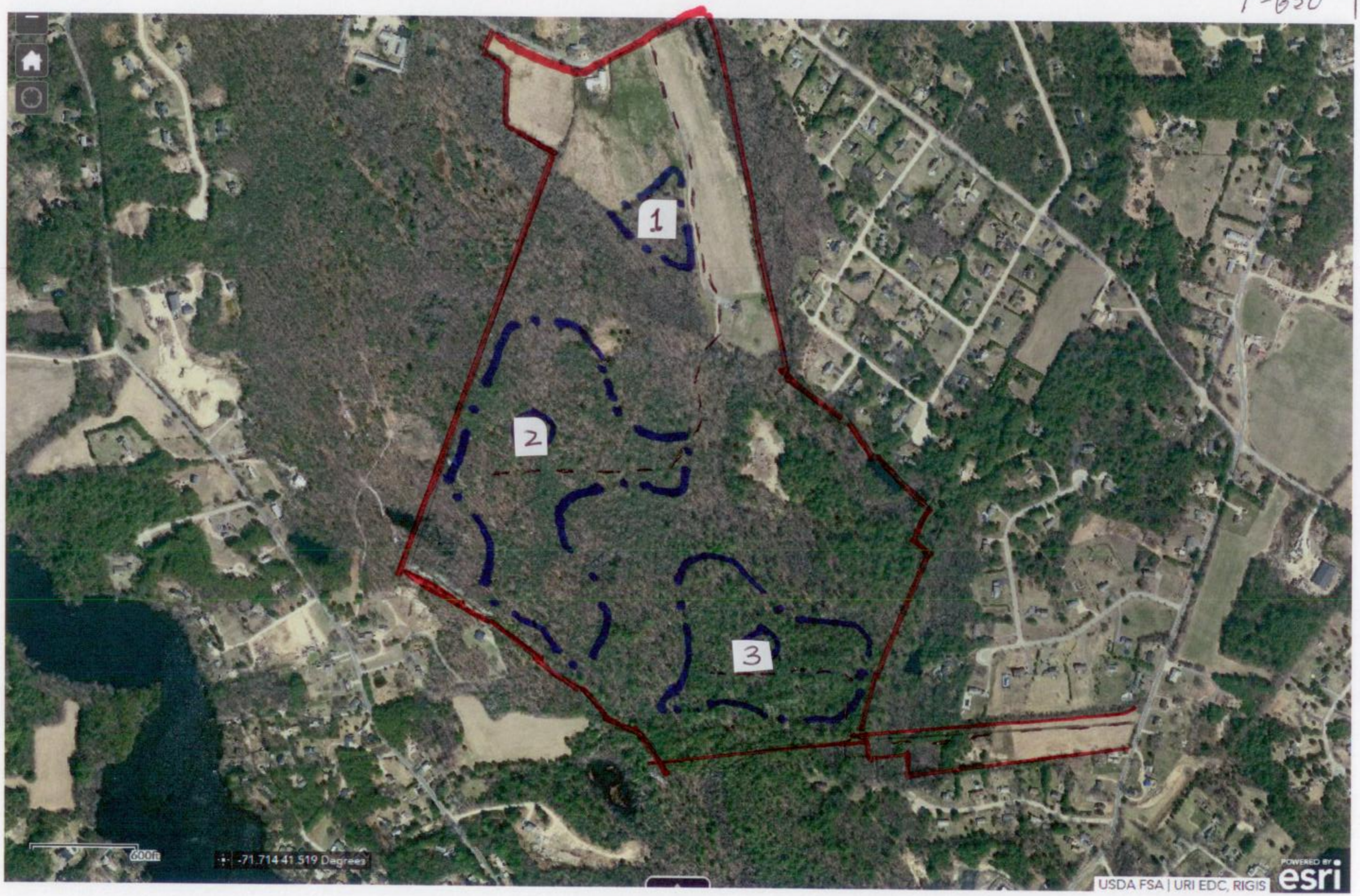
- 2014 Imagery with Forest Stands
- 2016 Imagery showing GM Defoliation Impacts
- Topographical Map
- USDA Web Soil Survey Map & Report (Forestland Productivity) (12pp)

2014 AERIAL IMAGERY

WITH FOREST STAND DELINEATIONS

SKUNK HILL I & II SOLAR PROJECT, HOPKINTON, RI

1" = 650'



2016 AERIAL IMAGERY

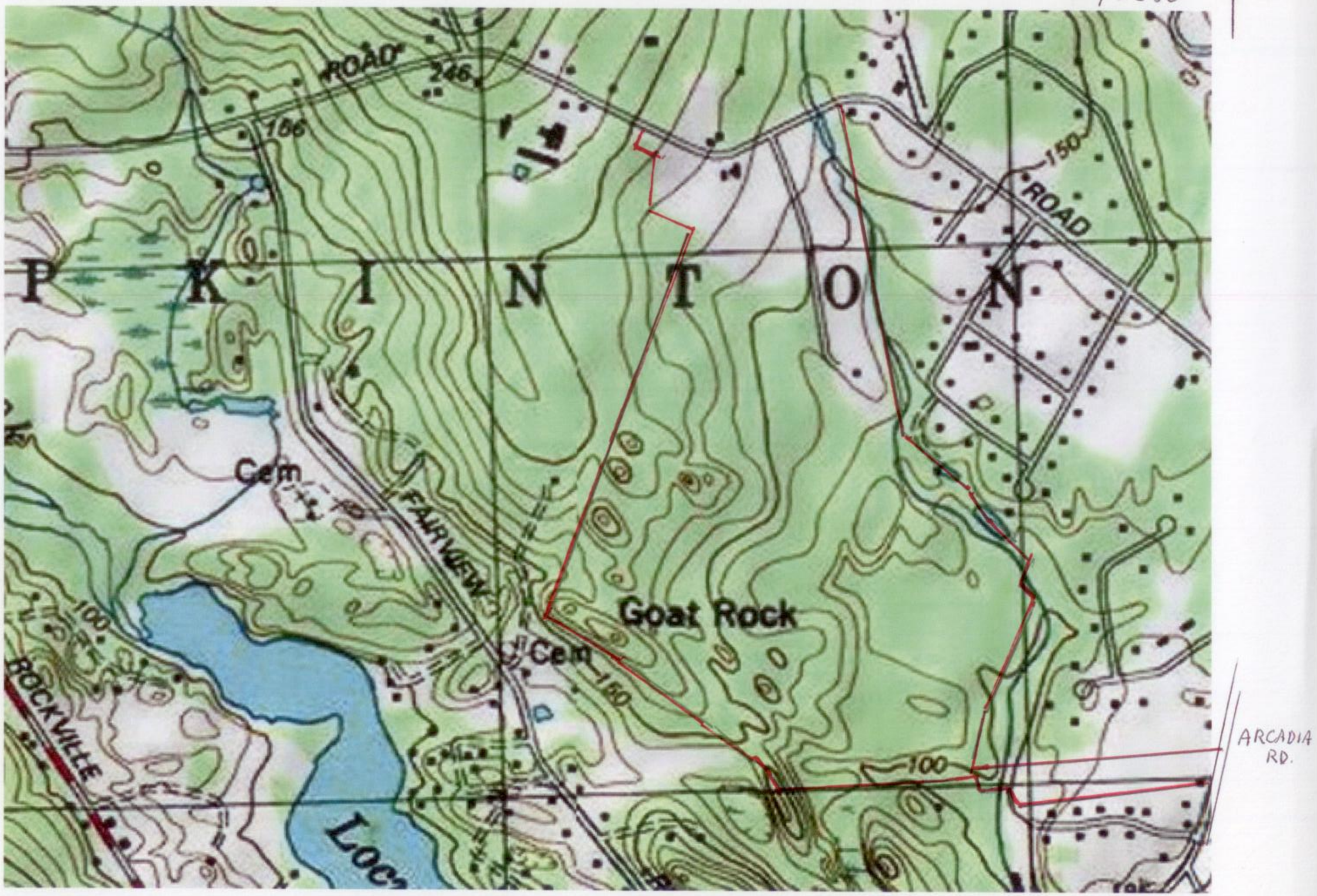
SHOWING GYPSY MOTH DEFOLIATION EXTENT

SKUNK HILL I & II SOLAR PROJECT, HOPKINTON, RI

TOPOGRAPHIC MAP

SKUNK HILL I & II SOLAR PROJECT, HOPKINTON, RI

1" = 650'



United States Department of Agriculture

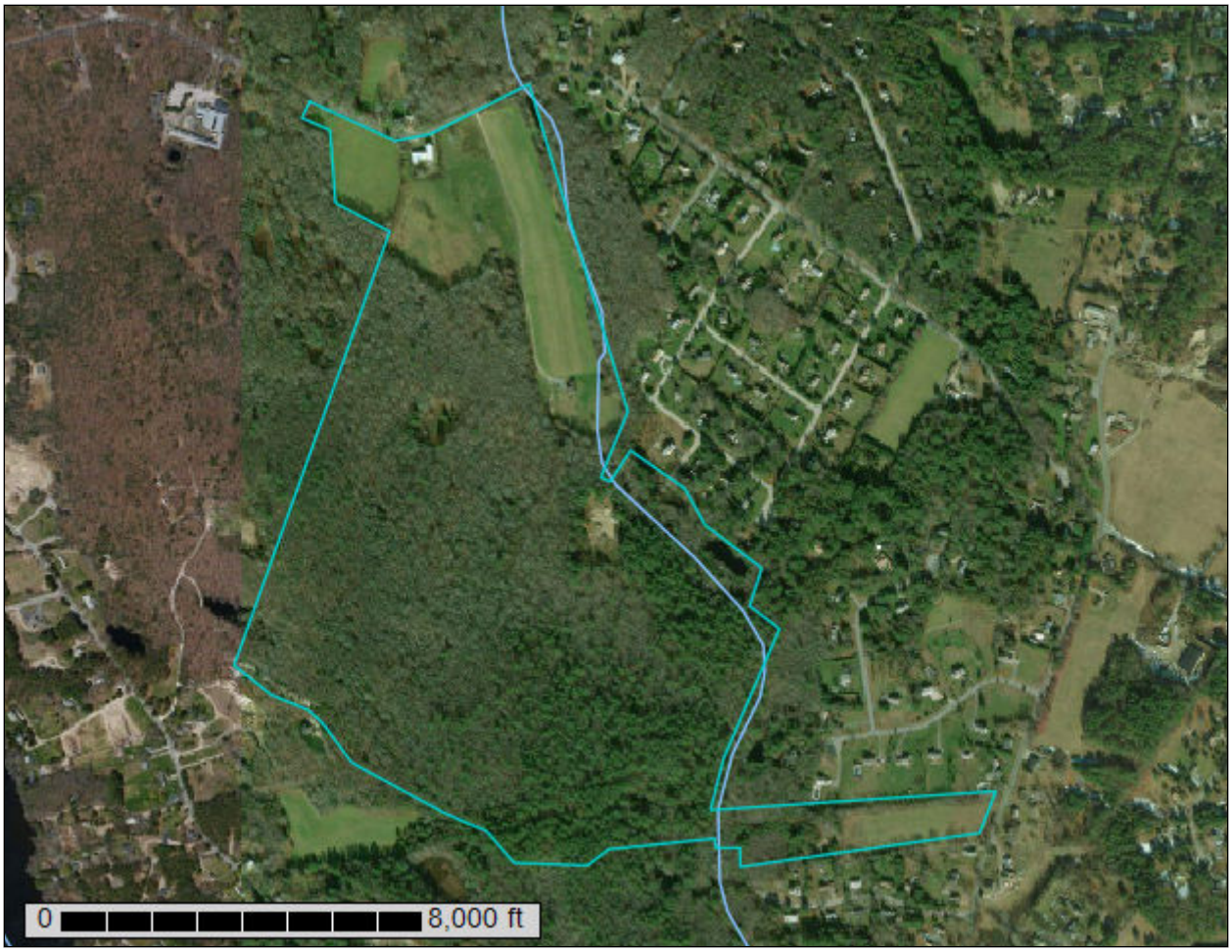
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

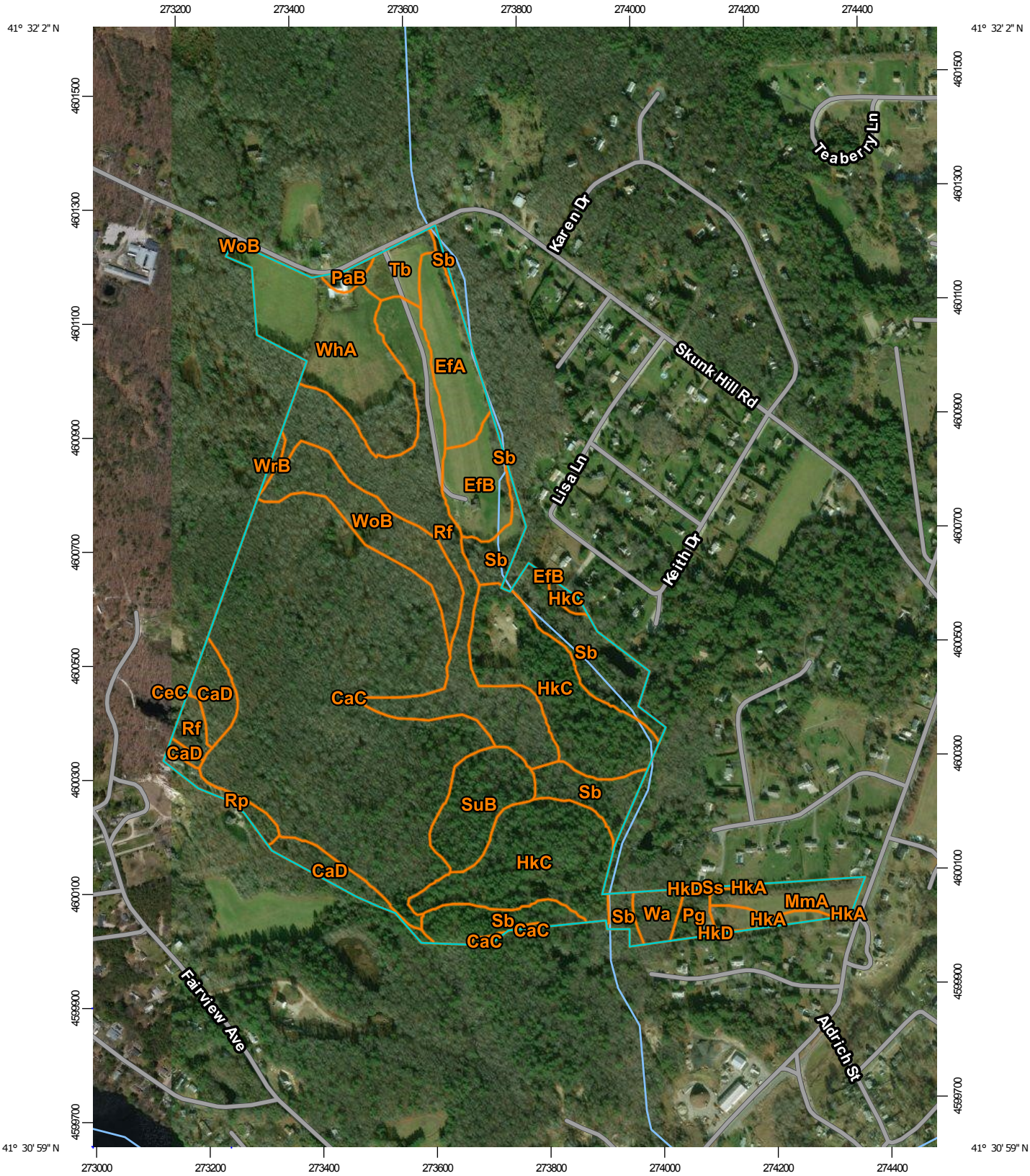
Custom Soil Resource Report for State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties

Skunk Hill I & II Solar, Hopkinton, RI



December 27, 2018

Custom Soil Resource Report
Soil Map



Map Scale: 1:9,570 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 450 900 1800 2700

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

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

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties
Survey Area Data: Version 18, Dec 6, 2018

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

Date(s) aerial images were photographed: May 14, 2010—Apr 1, 2017

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CaC	Canton-Charlton-Rock outcrop complex, 3 to 15 percent slopes	55.3	32.8%
CaD	Canton-Charlton-Rock outcrop complex, 15 to 35 percent slopes, very stony	4.8	2.8%
CeC	Canton and Charlton fine sandy loams, 3 to 15 percent slopes, very rocky	0.0	0.0%
EfA	Enfield silt loam, 0 to 3 percent slopes	5.7	3.4%
EfB	Enfield silt loam, 3 to 8 percent slopes	4.7	2.8%
HkA	Hinckley loamy sand, 0 to 3 percent slopes	1.5	0.9%
HkC	Hinckley loamy sand, 8 to 15 percent slopes	23.5	14.0%
HkD	Hinckley loamy sand, 15 to 25 percent slopes	0.0	0.0%
MmA	Merrimac fine sandy loam, 0 to 3 percent slopes	3.2	1.9%
PaB	Paxton fine sandy loam, 3 to 8 percent slopes	0.6	0.4%
Pg	Pits, gravel	1.3	0.7%
Rf	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	20.3	12.0%
Rp	Rock outcrop-Canton complex, 0 to 35 percent slopes, very stony	1.3	0.8%
Sb	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	15.2	9.0%
Ss	Sudbury sandy loam	0.1	0.0%
SuB	Sutton fine sandy loam, 0 to 8 percent slopes, very stony	5.8	3.4%
Tb	Tisbury silt loam	2.4	1.4%
Wa	Walpole sandy loam, 0 to 3 percent slopes	1.7	1.0%
WhA	Woodbridge fine sandy loam, 0 to 3 percent slopes	13.5	8.0%
WoB	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	7.4	4.4%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
WrB	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	0.3	0.2%
Totals for Area of Interest		**168.5**	**100.0%**

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Vegetative Productivity

This folder contains a collection of tabular reports that present vegetative productivity data. The reports (tables) include all selected map units and components for each map unit. Vegetative productivity includes estimates of potential vegetative production for a variety of land uses, including cropland, forestland, hayland, pastureland, horticulture and rangeland. In the underlying database, some states maintain crop yield data by individual map unit component. Other states maintain the data at the map unit level. Attributes are included for both, although only one or the other is likely to contain data for any given geographic area. For other land uses, productivity data is shown only at the map unit component level. Examples include potential crop yields under irrigated and nonirrigated conditions, forest productivity, forest site index, and total rangeland production under of normal, favorable and unfavorable conditions.

Forestland Productivity

This table can help forestland owners or managers plan the use of soils for wood crops. It shows the potential productivity of the soils for wood crops.

Potential productivity of merchantable or *common trees* on a soil is expressed as a site index and as a volume number. The *site index* is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that forestland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability. More detailed information regarding site index is available in the "National Forestry Manual," which is available in local offices of the Natural Resources Conservation Service or on the Internet.

The *volume of wood fiber*, a number, is the yield likely to be produced by the most important tree species. This number, expressed as cubic feet per acre per year and calculated at the age of culmination of the mean annual increment (CMAI), indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

Trees to manage are those that are preferred for planting, seeding, or natural regeneration and those that remain in the stand after thinning or partial harvest.

Reference:
United States Department of Agriculture, Natural Resources Conservation Service, National Forestry Manual.

Report—Forestland Productivity

Forestland Productivity–State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties				
Map unit symbol and soil name	**Potential productivity**			**Trees to manage**
	Common trees	**Site Index**	**Volume of wood fiber**	
			Cu ft/ac/yr	
CaC—Canton-Charlton-Rock outcrop complex, 3 to 15 percent slopes				
Canton	Eastern white pine	58	100.00	Eastern white pine, White spruce
	Northern red oak	52	29.00	
Charlton	Eastern white pine	65	114.00	Eastern hemlock, Eastern white pine, European larch, Red pine, White spruce
	Northern red oak	65	43.00	
	Red maple	55	29.00	
	Red pine	70	129.00	
	Red spruce	50	114.00	
	Shagbark hickory	—	0.00	
	Sugar maple	55	29.00	
Rock outcrop	—	—	—	—
CaD—Canton-Charlton-Rock outcrop complex, 15 to 35 percent slopes, very stony				
Canton, very stony	Eastern white pine	58	100.00	Eastern white pine, White spruce
	Northern red oak	52	29.00	
Charlton, very stony	Eastern white pine	65	114.00	Eastern hemlock, Eastern white pine, European larch, Northern red oak, Norway spruce, Red pine, Scarlet oak, Sugar maple, Tuliptree, White ash, White oak, White spruce
	Northern red oak	65	43.00	
	Red maple	55	29.00	
	Red pine	70	129.00	
	Red spruce	50	114.00	
	Shagbark hickory	—	0.00	
	Sugar maple	55	29.00	
Rock outcrop	—	—	—	—

Forestland Productivity–State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties				
Map unit symbol and soil name	**Potential productivity**			**Trees to manage**
	Common trees	**Site Index**	**Volume of wood fiber**	
			Cu ft/ac/yr	
CeC—Canton and Charlton fine sandy loams, 3 to 15 percent slopes, very rocky				
Canton, very stony	Eastern hemlock	—	—	Beech, Bitternut hickory, Black oak, Eastern hemlock, Eastern white pine, Gray birch, Mockernut hickory, Northern red oak, Pignut hickory, Red maple, Shagbark hickory, Sugar maple, White ash, White oak, Yellow birch
	Eastern white pine	58	100.00	
	Northern red oak	52	29.00	
	Red maple	55	29.00	
	Shagbark hickory	—	0.00	
	Sugar maple	55	29.00	
	White oak	—	—	
Charlton, very stony	Eastern white pine	65	114.00	Eastern white pine, European larch, Northern red oak, Norway spruce, Red pine, Scarlet oak, Sugar maple, Tuliptree, White ash, White oak
	Northern red oak	65	43.00	
	Red maple	55	29.00	
	Red pine	70	129.00	
	Red spruce	50	114.00	
	Shagbark hickory	—	0.00	
	Sugar maple	55	29.00	
EfA—Enfield silt loam, 0 to 3 percent slopes				
Enfield	Eastern white pine	74	129.00	Eastern white pine, European larch
	Northern red oak	65	43.00	
	Shagbark hickory	—	0.00	
EfB—Enfield silt loam, 3 to 8 percent slopes				
Enfield	Eastern white pine	74	129.00	Eastern white pine, European larch
	Northern red oak	65	43.00	
	Shagbark hickory	—	0.00	
HkA—Hinckley loamy sand, 0 to 3 percent slopes				
Hinckley	Eastern white pine	61	100.00	Black oak, Eastern white pine, Pitch pine
	Northern red oak	49	29.00	
	Paper birch	60	54.00	
	Pitch pine	60	—	
	Red pine	54	92.00	
	Red spruce	39	86.00	
	Sugar maple	59	30.00	
	White spruce	52	114.00	

Forestland Productivity–State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties				
Map unit symbol and soil name	**Potential productivity**			**Trees to manage**
	Common trees	**Site Index**	**Volume of wood fiber**	
			Cu ft/ac/yr	
HkC—Hinckley loamy sand, 8 to 15 percent slopes				
Hinckley	Eastern white pine	61	100.00	Black oak, Eastern white pine, Pitch pine
	Northern red oak	49	29.00	
	Paper birch	60	54.00	
	Pitch pine	60	—	
	Red pine	54	92.00	
	Red spruce	39	86.00	
	Sugar maple	59	30.00	
	White spruce	52	114.00	
HkD—Hinckley loamy sand, 15 to 25 percent slopes				
Hinckley	Eastern white pine	61	100.00	Black oak, Eastern white pine, Pitch pine
	Northern red oak	49	29.00	
	Paper birch	60	54.00	
	Pitch pine	60	—	
	Red pine	54	92.00	
	Red spruce	39	86.00	
	Sugar maple	59	30.00	
	White spruce	52	114.00	
MmA—Merrimac fine sandy loam, 0 to 3 percent slopes				
Merrimac	—	—	—	—
PaB—Paxton fine sandy loam, 3 to 8 percent slopes				
Paxton	Black oak	67	—	Eastern white pine, European larch, Northern red oak, Norway spruce, Red pine, Scarlet oak, Sugar maple, Tuliptree, White ash, White oak
	Eastern white pine	72	114.00	
	European larch	80	—	
	Northern red oak	68	43.00	
	Red pine	70	—	
	Scarlet oak	67	—	
	Sugar maple	75	43.00	
	White ash	89	—	
	White oak	60	—	
Pg—Pits, gravel				
Pits	—	—	—	—

Forestland Productivity–State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties				
Map unit symbol and soil name	**Potential productivity**			**Trees to manage**
	Common trees	**Site Index**	**Volume of wood fiber**	
			Cu ft/ac/yr	
Rf—Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony				
Ridgebury, extremely stony	Eastern white pine	63	114.00	American elm, Blackgum, Green ash, Pin oak, Red maple, Swamp white oak, Yellow birch
	Northern red oak	66	43.00	
	Red maple	62	—	
	Sugar maple	56	29.00	
	White ash	60	—	
Leicester, extremely stony	Eastern white pine	69	129.00	Green ash, Red maple, Tuliptree
	Northern red oak	56	43.00	
	Red maple	70	43.00	
	Yellow birch	—	—	
Whitman, extremely stony	Blackgum	52	—	—
	Eastern white pine	56	100.00	
	Northern red oak	70	—	
	Red maple	60	29.00	
	Red spruce	44	86.00	
	White oak	57	—	
Rp—Rock outcrop-Canton complex, 0 to 35 percent slopes, very stony				
Rock outcrop	—	—	—	—
Canton, very stony	Eastern white pine	58	100.00	Eastern white pine, White spruce
	Northern red oak	52	29.00	
Sb—Scarboro mucky fine sandy loam, 0 to 3 percent slopes				
Scarboro	Atlantic white cedar	45	—	Atlantic white cedar
	Red maple	55	29.00	
Ss—Sudbury sandy loam				
Sudbury	Eastern white pine	60	100.00	Eastern white pine, European larch, Norway spruce, Red pine, White spruce
	Northern red oak	45	29.00	
	Red pine	60	86.00	
	Red spruce	47	100.00	

Forestland Productivity–State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties				
Map unit symbol and soil name	**Potential productivity**			**Trees to manage**
	Common trees	**Site Index**	**Volume of wood fiber**	
			Cu ft/ac/yr	
SuB—Sutton fine sandy loam, 0 to 8 percent slopes, very stony				
Sutton, very stony	Black cherry	72	43.00	Eastern white pine, European larch, Northern red oak, Norway spruce, White oak, White spruce
	Eastern white pine	62	114.00	
	Northern red oak	62	43.00	
	Red spruce	50	114.00	
	Sugar maple	54	29.00	
	White oak	—	—	
Tb—Tisbury silt loam				
Tisbury	Eastern white pine	75	143.00	Eastern white pine
	Northern red oak	70	57.00	
Wa—Walpole sandy loam, 0 to 3 percent slopes				
Walpole	Eastern hemlock	54	114.00	—
	Eastern white pine	68	114.00	
	Red maple	75	43.00	
	White ash	61	43.00	
WhA—Woodbridge fine sandy loam, 0 to 3 percent slopes				
Woodbridge	Black oak	77	—	Ash, Northern red oak, Sugar maple, Tuliptree, White oak
	Eastern white pine	67	114.00	
	Northern red oak	72	57.00	
	Red pine	65	114.00	
	Red spruce	50	114.00	
	Sugar maple	65	43.00	
	White oak	—	—	
	Yellow poplar	84	—	
WoB—Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony				
Woodbridge, very stony	Black oak	77	—	Ash, Northern red oak, Sugar maple, Tuliptree, White oak
	Eastern white pine	67	114.00	
	Northern red oak	72	57.00	
	Red pine	65	114.00	
	Red spruce	50	114.00	
	Sugar maple	65	43.00	
	Yellow poplar	84	—	

Forestland Productivity–State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties				
Map unit symbol and soil name	**Potential productivity**			**Trees to manage**
	Common trees	**Site Index**	**Volume of wood fiber**	
			Cu ft/ac/yr	
WrB—Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony				
Woodbridge, extremely stony	Black oak	77	—	Ash, Northern red oak, Sugar maple, Tuliptree, White oak
	Eastern white pine	67	114.00	
	Northern red oak	72	57.00	
	Red pine	65	114.00	
	Red spruce	50	114.00	
	Sugar maple	65	43.00	
	Yellow poplar	84	—	

LAND MANAGEMENT SERVICES
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January 2, 2019 (amended 3/26/19)

Reforestation Plan
Proposed Skunk Hill I & II Solar Project
Skunk Hill I: 145 Skunk Hill Road (AP 18, Lot 14)
Skunk Hill II: 0 Arcadia Road and 0 Lisa Lane (AP 18, Lots 8 & 13)
Hopkinton, RI

Purpose:

The proposed development of a solar array on the subject property will involve establishment of access roads, sediment basins, electrical equipment, and the rows of ground-mounted solar panels on approximately 65 acres of the 173.5 acres in three (3) lots that will be subject to the development of a solar array. The project as currently designed involves approximately 47 +/- acres that would be cleared of trees, and approximately 18 acres of open fields, although this estimate is subject to change as the project proposal is refined.

This Reforestation Plan addresses the future process and costs associated with the reforestation of the affected acres upon decommissioning of the solar project. The projected timeframe for this plan is 30 years from its installation, and the plan would be implemented upon completion of the removal of the solar arrays from the property. Therefore the reforestation practices are projected for the year 2050, with present costs calculated. Present costs can be amortized for the year 2050. There are options to renew contracts for energy production, depending on the technology and demand for this type of renewable energy at that time. Projected costs would need to be adjusted for any advanced timeframes at that time.

Scope of Project:

As designed by Woodard & Curran Engineering, the solar array sites on the subject property encompass a total of 65 +/- acres of land. Included within that acreage are access roads that should be retained for future use as woods roads. These access roads occupy approximately 1 acre of land, resulting in 64 +/- acres of land that will be re-vegetated upon decommissioning of the solar project in 2050. This reforestation plan assumes the planting of tree and shrub species on all of the disturbed areas, save the access roads mentioned above.

This 64+/- acres includes 17.5+/- acres of land that is currently open agricultural land (hayfields) in the northern portion of the Skunk Hill I project, and additional open land in the southeast portion of the project where an access road will be located. Upon de-commissioning, the northern hayfields, located on prime agricultural soils, could be re-established as agricultural land rather than plant trees and shrubs. Doing so would contribute to the local farm economy.

There are options for the establishment of forest vegetation on the site. They include:

- Bare-root planting of seedlings 3-5' tall;
- Bare-root shrubs;
- Direct seeding method of acorns and hickory nuts;
- Indirect seeding method of light seeds from pine species;
- Encouraging natural regeneration.

Environmental Factors Impacting Reforestation Efforts:

There are a number of factors that will influence the nature and success of reforestation efforts on this property. These include:

- existing soil types and extent of exposed ledge on the site;
- the extent of grading to establish the solar project;
- soil compaction during the construction and future maintenance of the arrays;
- disturbance and compaction during the removal of the arrays;
- vegetation that becomes established during the 30-year period, including non-native invasive plants;
- the slope and aspect of the planting sites;
- and any effects that climate change will have on species selection.

These factors, along with the deer population at that time, will all have roles to play in determining what species to plant and the success of the reforestation efforts in 2050 or beyond.

This reforestation plan must take into consideration an impacted site as a worst-case scenario, with reforestation of the areas similar to that of mine reclamation efforts in the coal fields of Appalachia. Further discussion of these factors is provided following the details of the reforestation plan.

REFORESTATION PLAN

The following reforestation process is subject to review and revision prior to its implementation due to any of the factors that may influence the appropriateness of these recommendations in the year 2050 or beyond. Species selection is dependent on climatic conditions and the physical impacts to the soil conditions from installation and decommissioning activities.

Soil Types & Slope Conditions:

The existing site conditions include moderately-well drained to extremely-well drained and rocky mid-to upper slopes, with most of the project having a southeasterly aspect. Only in the extreme northern strip of the property, where the level, open fields are present, does the aspect not have any influence on species selection.

The soils underlying the site range from moderately-well drained Woodbridge fine sandy loam in the northern hayfields, to well-drained Canton/Charlton very stony fine sandy loam in the upland areas of the central hillside and rocky knolls, to excessively well-drained Hinckley gravelly

sandy loam in the glacial sand deposits of the southeastern portions of the site. There are patches of exposed ledge and rocky knolls, particularly in the central areas of the site.

These conditions require the establishment of vegetation that will be able to survive seasonally droughty conditions, especially on the gravelly areas and the thin soils of the upland slopes in the central areas of the property.

Site Preparation:

Protection of existing vegetation between the rows of solar arrays will provide erosion control while the tree cover is being established.

Removal of solar arrays will provide rows of disturbed soils that will now facilitate planting of bare-root seedlings and also provide a mineral soil seedbed for natural seeding of the site.

Removal of the rows of solar panel mounting poles will provide rows of post holes approximately 8 to 12 feet apart, resulting in an average 10' spacing for calculation of planting stock quantities (please refer to the PV Array Distance Schematic attached).

Upon removal of solar arrays, some site preparation may be necessary, to the extent needed to allow the future planting crews' safe access to plant trees. Control of any non-native invasive plants that may have become established may be necessary to prevent the site from being dominated by shrubs such as multi-flora rose, Autumn-olive, and non-native trees such as Ailanthus (Tree-of-Heaven). Vines such as honeysuckle and bittersweet may also be present.

Tree & Shrub Species Selection:

Based upon the factors that influence the reforestation of the subject site, the following tree and shrub species are recommended for the various soil and slope conditions:

- Well-drained Upland sites:
    - Trees: White oak (*Quercus alba*); Pitch pine (*Pinus rigida*); Pignut hickory (*Carya glabra*);
    - Shrubs: Lowbush blueberry (*Vaccinium angustifolium*); Black huckleberry (*Gaylussacia baccata).*
- Moderately well-drained lower slope sites:
    - Trees: White pine (*Pinus strobus*); Black oak (*Quercus velutina*);
    - Shrubs: Highbush blueberry (*V. corymbosum*); Witch hazel (*Hamamalis virginiana*); Maple-leaved viburnum (*V. acerifolia*); Highbush cranberry (*V. trilobum*).
- Excessively well-drained, gravelly sites:
    - Trees: White pine (*Pinus strobus*)
    - Shrubs: Lowbush blueberry (*Vaccinium angustifolium*); Black huckleberry (*Gaylussacia baccata*).
- Moderately well-drained agricultural sites:
    - Trees: European larch (Larix spp.); Black walnut (*Juglans nigra*);
    - Shrubs: Highbush blueberry (*V. corymbosum*); Witch hazel (*Hamamalis virginiana*); Maple-leaved viburnum (*V. acerifolia*); Highbush cranberry (*V. trilobum*).

The Site Plan has been marked up to indicate what areas of the proposed solar array sites are appropriate for the three planting scenarios provided above. See Attachment A.

Planting Methods & Practices:

Plant 235 bare-root pine and hardwood seedlings and 200 bare-root shrubs in a staggered fashion, utilizing the disturbed soil within the rows of post holes, to create a full stocking condition of mixed pine and hardwood species interspersed with native shrubs to provide habitat and water quality benefits.

Protect planted tree seedlings with tree tubes (fact sheet attached) that will allow seedlings to become established without being browsed by deer. Some girdling of seedlings by rodents will occur.

With the exposed mineral soil in the strips of removed panels, natural seed sources that surround the sites will contribute pine seeds along with a variety of hardwood seeds, including Black birch and Black cherry, to complete the reforestation process.

Provide supervision and inspection by a qualified forester and/or tree-planting technician to assure quality control of the planting.

Provide annual inspections for a period of five (5) years following the initial planting to determine seedling survival, natural seed establishment, and adequacy of the reforestation effort.

Excessive mortality must be remedied through additional plantings and additional protection measures.

Habitat Enhancement for Wildlife Species:

The RI Wildlife Action Plan identifies a number of amphibians, mammals, and bird species that are of Greatest Conservation Need. At the time of decommissioning and re-forestation, there will be an opportunity to enhance the habitat values of this landscape for a number of these species, with the New England cottontail, a variety of listed birds, pollinating insects, and other scrub/shrub habitat species benefitting from the re-establishment phase of the forest.

The shrub species listed above, as well as some of the tree species, are flowering plants that are known to provide good pollinator food sources, as well as nesting, brooding, and feeding sites for birds and small mammals. The scrub/shrub conditions of the establishment phase provides escape cover that is critical to their survival.

Reforestation Cost Estimates

The present costs of this reforestation plan covers the seedlings, shrubs, tree tubes, stakes, and ties, along with the labor, equipment costs, and overhead required for conducting the planting operation. Cost Estimates are provided for two scenarios, the entire area of solar arrays, and the currently wooded areas only. These costs are subject to change depending on specific site conditions and final species selection and plant availability at the time of decommissioning.

Scenario 1: Reforestation of Entire Area, including 18 acres of open fields

Total Area for Planting = 65 acres

Number of plants (Tree and Shrub) per acre = 435

Total # of Plants Required = 28,275 @ $1.66 per plant = $46,937

Qu. 15,275 4" x 48"Tree Tubes, Stakes, & Ties @ $3.00 each = $45,825

Labor, Equipment, & Overhead Costs* = $575 per acre = $37,375

(7.5 hours per acre time estimated for planting & tree tubes, plus supervision & equipment costs)

Total Reforestation Cost Estimate = $130,137

Scenario 2: Reforestation of Currently Wooded Area

Total Area for Planting = 47 acres

Number of plants (Tree and Shrub) per acre = 435

Total # of Plants Required = 20,445 @ $1.66 per plant = $33,939

Qu. 11,045 4" x 48"Tree Tubes, Stakes, & Ties @ $3.00 each = $33,135

Labor, Equipment, & Overhead Costs* = $575 per acre = $27,025

(7.5 hours per acre time estimated for planting & tree tubes, plus supervision & equipment costs)

Total Reforestation Cost Estimate = $94,099

* From USDA Natural Resource Conservation Service Conservation Practice Scenario Costs, developed for EQIP program implementation: www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/financial/?cid=nrcseprd1328426

Factors Affecting the Implementation of this Reforestation Plan:

- Soil conditions: According to the USDA Soil Survey, the existing soil conditions underlying the proposed solar array sites on the property include well-drained Canton/Charlton series, with rock outcroppings and generally very stony conditions, along with Hinckley gravelly sandy loam. The northern agricultural fields are underlain with Woodbridge fine sandy loam, which is a moderately well-drained, fertile soil.

  The USDA Soil Survey includes information on depth to bedrock, soil texture, seasonal water table influences, and suitability for certain tree species. These constraints are factored into the selection of tree species for this reforestation plan.

- Grading: The extent of topsoil disturbance and grading during site preparation, and the resulting depth of soil for rooting by trees will have an impact on the success of the reforestation efforts. Shallow topsoil conditions and exposed ledge will limit root development, and lack of organic soil conditions, with trees planted in nutrient poor sub-soil, will impact seedling survival and limit the development of mature trees.

- Soil compaction: Access by heavy equipment during site preparation and solar array installation and maintenance phases of the project will lead to compacted soils, particularly between the rows of panels. Removal of the panels will also require access by some type of equipment. Disturbance of the soils at each panel location from their removal may help in loosening up compacted soils and create favorable planting conditions.

- On-site vegetation: Vegetation maintenance of the array sites, according the Operation & Maintenance Plan, will include mowing and weed-whacking 2 or 3 times a year to maintain a grassy condition.

  Pioneer seeding of tree seedlings and shrubs will likely occur during the 30-year time period, despite the regular mowing schedule. Root systems will develop with repeated cutting of the plant's stem, and these naturally-seeded trees and shrubs, including non-native invasive species, will then be in a position to respond to the removal of the solar arrays and cessation of mowing activities. This will be particularly true at the edges of the solar array sites, contributing to the screening provided in the Landscape Plan.

  Natural seeding from adjacent vegetation is routine and typical of abandoned fields and habitat clearings promoted by wildlife biologists for creating early-successional habitat. Natural seeding will eventually return this disturbed area to a forested condition, even if no efforts are made to reforest the site. The natural succession process takes time, and there is no control over which species become dominant. The subject site includes forested wetlands stocked with a mix of deciduous trees, and there are scattered clumps and individual stems of mature White pine along the south edges of the property, and scattered throughout the wetland areas not being cleared. This source of pine seed is sufficient to cast seed over most of the property's acreage, so that a significant

component of the pioneer species would consist of pine species, including White and Pitch pines.

- Slope and Aspect: Species selected for reforestation must factor in the slope position and aspect of the specific locations for planting, as well as the soil types. South-facing upper slopes will require planting with drought-tolerant species, while lower slope sites and east-facing slopes can be planted with a wider variety of species that can take advantage of these more favorable sites.

  Most of the project's solar array sites are located on rocky, upland sites with south and southeast-facing slopes, with the agricultural fields in the northern portions of the property having level terrain. Upper level slopes will require planting with more drought-tolerant species such as Pitch pine and White oak, with White pine and Black oak planted on the mid- to lower-slope sites.

- Climate Change: Projections for more frequent drought events, warmer temperatures, and more severe precipitation events require that any reforestation efforts in 2050 or beyond take into consideration the impacts on tree species selection and planting success. Will planting of southern pine species in 2050 be required?

  The Northern Institute of Applied Climate Science have provided projections for the Southern and Coastal New England sub-area, where species such as White pine and Quaking aspen (poplar) are predicted to decline, while other species such as White oak, Black oak, and Pitch pine are likely to increase their presence in the landscape. (See enclosed Fact Sheet). Southern species, such as Virginia pine and Sweetgum, may be good choices for planting in 2050 and beyond.

  New insect and disease problems will also occur between now and 2050 which will impact the final selection of tree species for this reforestation effort. Oaks are susceptible to Gypsy moth defoliations, which may occur with increased frequency as spring droughts become more common, and the Southern pine beetle has been found in Rhode Island. This beetle will feed on and kill Pitch pine.

- Animal damage: Browse impacts from deer, mice, and other species will have an impact on the survival and species composition of the re-forested site. Of particular concern will be the deer population at that time, and what efforts are provided to control its presence during the establishment of the new forest. Although the 6' fence around the site will limit the travel of deer through the site, taller fencing is needed to keep the stronger adult jumpers from getting in and feeding on established plant material. In the event de-commissioning includes removal of all fencing as well as the solar arrays, then other means of protecting planted trees will be required.

  Use of tree shelters will be needed to improve success rates, with subsequent maintenance needed to remove the shelters once trees have attained a suitable height to avoid browse damage.

Prepared By: Marc J. Tremblay, CF

MA Forester Lic #239, CT Certified Forester #F-517, RI Lic. Arborist #104

Certification: I hereby attest that the above Reforestation Plan prepared for the proposed Woodville Solar Project has been prepared according to the appropriate standards and information available, and the information provided is as accurate as current forestry practices allow.

Marc J. Tremblay, CF

Attachments:

- Att. A: Schematic of Species to Plant by Soil and Slope
- Plan Detail Showing Distance Between Rows of Panels
- Climate Change Projections for Individual Tree Species, Southern and Coastal New England – Northern Institute of Applied Climate Science (2 pp)
- Protex Pro/Gro Solid Tube Tree Protectors info sheet from Forestry Suppliers, Inc.
- Tree Planting Guidelines, from the USDA Natural Resources Conservation Service, Texas Forestry Technical Note, TX-FS-12-4 (9 pp)

ATTACHMENT A—2014 AERIAL IMAGERY

REFORESTATION SPECIES BY SITE CONDITION

SKUNK HILL I & II SOLAR PROJECT, HOPKINTON, RI

N

1" = 500'

FOR SPECIES BY SITE, REFER TO PG. 3 OF REFORESTATION PLAN

BY: M. TREMBLAY, CF
LAND MANAGEMENT SERVICES

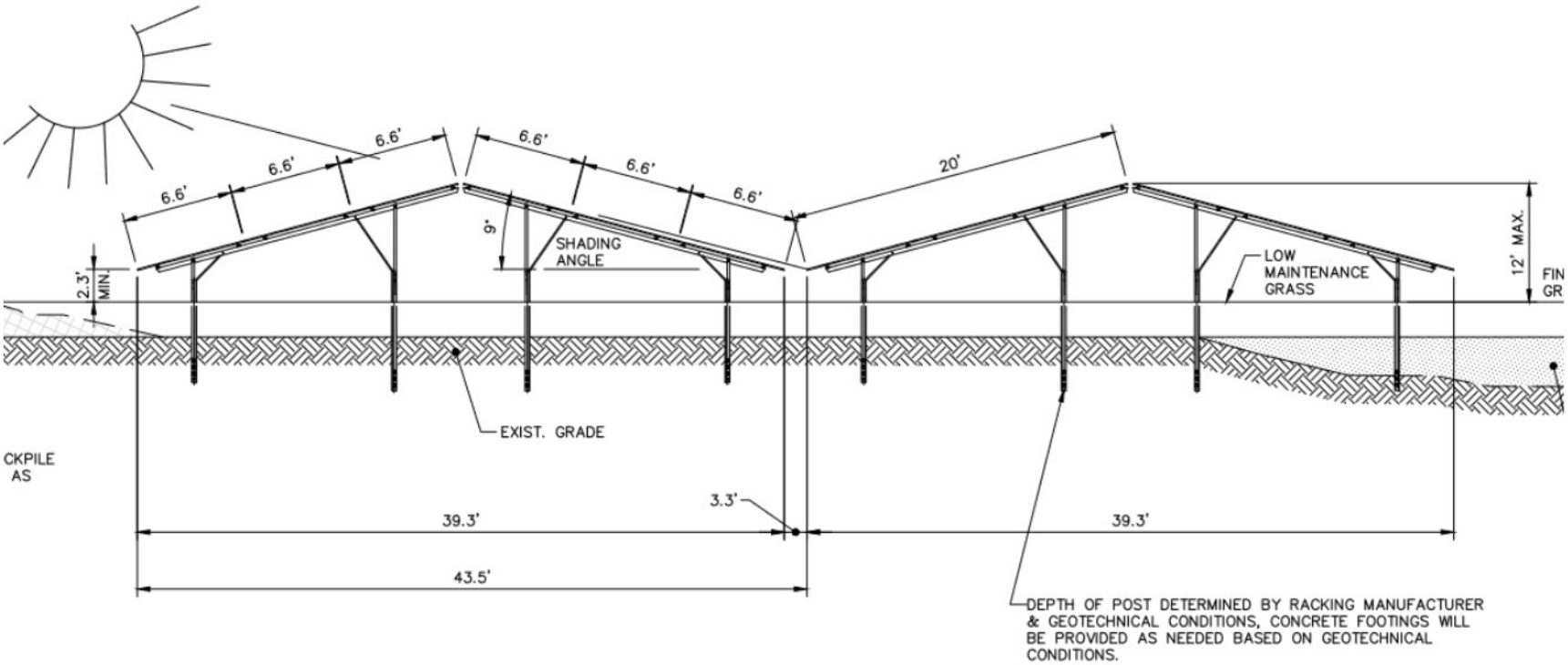
LEGEND

I - WELL-DRAINED UPLAND
II - MOD. WELL-DRAINED MID-SLOPE
III - EXCESSIVELY WELL-DRAINED GRAVELLY SITE
IV - AGRICULTURAL SOIL

TYPICAL SOLAR PANEL ARRAYS

ATLANTIC SOLAR PROJECT, HOPKINTON, RI

SHOWING DISTANCE BETWEEN POSTS FOR PLANTING HOLES



TYPICAL SOLOR PANELS & RACK SCHEMATIC

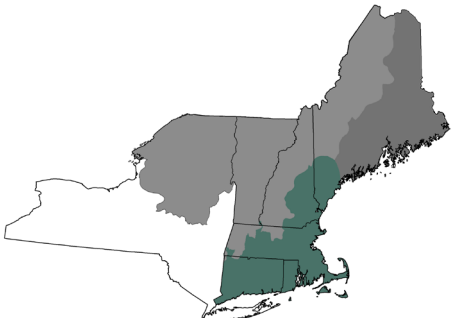
NOT TO SCALE

(SEE RACKING DESIGN DRAWINGS)

CLIMATE CHANGE PROJECTIONS FOR INDIVIDUAL TREE SPECIES

SOUTHERN AND COASTAL NEW ENGLAND

The region's forests will be affected by a changing climate during this century. A team of forest managers and researchers created an assessment that describes the vulnerability of forests in New England and northern New York (Janowiak et al. in press). This report includes information on the current landscape, observed climate trends, and a range of projected future climates. It also describes many potential climate change impacts to forests and summarizes key vulnerabilities for major forest types. This handout is summarized from the full assessment.



Remember that models are just tools, and they're not perfect. Model projections don't account for some factors that could be modified by climate change, like droughts, wildfire activity , and invasive species. If a species is rare or confined to a small area, Tree Atlas results may be less reliable. These factors, and others, could cause a particular species to perform better or worse than a model projects. Human choices will also continue to influence forest distribution, especially for tree species that are projected to increase. Planting programs may assist the movement of future-adapted species, but this will depend on management decisions.

TREE SPECIES INFORMATION:

This assessment uses two climate scenarios to "bracket" a range of possible futures. These future climate projections were used with two forest impact models (Tree Atlas and LANDIS) to provide information about how individual tree species may respond to a changing climate. More information on the climate and forest impact models can be found in the assessment. Results for "low" and "high" climate scenarios can be compared on page 2 of this handout.

Despite these limits, models provide useful information about future expectations. It's perhaps best to think of these projections as indicators of possibility and potential change. The model results presented here were combined with information from published reports and local management expertise to draw conclusions about potential risk and change in the region's forests.

SPECIES	ADDITIONAL CONSIDERATIONS
LIKELY TO DECREASE	
Balsam fir	Requires cold climate and susceptible to drought, fire, and insects
Eastern white pine	Good disperser, but susceptible to drought and insects
Paper birch	Early-sucessional colonizer, but susceptible to insects and drought
Quaking aspen	Early-sucessional colonizer, but susceptible to heat and drought
Red spruce	Needs a particular type of habitat, limited seedling establishment
Striped maple	Shade tolerant and easily established, but susceptible to drought
MAY DECREASE	
American beech	Affected by beech bark disease, extremely shade tolerant
Bigtooth aspen	Early-sucessional colonizer, but susceptible to drought
Eastern hemlock	Hemlock woolly adelgid causes mortality
Gray birch	Disperses easily, but susceptible to drought, fire, and insects
Red pine	Fire-adapted, but susceptiple to some insects
Yellow birch	Good disperser, but susceptible to fire, insects, and disease
NO CHANGE	
Black cherry	Susceptible to insects and fire, but tolerates some drought
White ash	Emerald ash borer causes mortality

SPECIES	ADDITIONAL CONSIDERATIONS
MAY INCREASE	
American elm	Affected by Dutch elm disease, grows across a variety of sites
Black oak	Drought-tolerant, but susceptible to insects and disease
Eastern hophornbeam	Grows across a variety of sites and tolerates shade
Eastern redcedar	Drought-tolerant, but susceptible to insects and fire
Pitch pine	Susceptible to some insect pests
Shagbark hickory	Susceptible to some insect pests
White oak	Fire-adapted and grows on a variety of sites
MIXED MODEL RESULTS	
Chestnut oak	Grows on a variety of sites, but susceptible to insects and disease
Northern red oak	Susceptible to some insect pests
Pignut hickory	Grows on a variety of sites, but susceptible to drought and insects
Red maple	Competitive colonizer tolerant of disturbance and diverse sites
Scarlet oak	Drought- and fire-adapted, but susceptible to insects and disease
Sugar maple	Grows across a variety of sites and tolerates shade
Sweet birch	Susceptible to drought, fire topkill, and insects

SOURCE: Janowiak et al. in review. New England and New York forest ecosystem vulnerability assessment and synthesis: a report from the New England Climate Change Response Framework. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. ***www.forestadaptation.org/new-england/vulnerability-assessment***

NIACS
Northern Institute of Applied Climate Science

www.forestadaptation.org

FUTURE PROJECTIONS

Data for the end of the century are summarized for two forest impact models under two climate change scenarios. The Climate Change Tree Atlas (www.fs.fed.us/nrs/atlas) models future suitable habitat, while LANDIS models changes in forest growth over time (future tree density presented in this table; additional data are available in the assessment).

- ▲ **INCREASE** *Projected increase of >20% by 2100*
- ● **NO CHANGE** *Little change (<20%) projected by 2100*
- ▼ **DECREASE** *Projected decrease of >20% by 2100*
- ★ **NEW HABITAT** *Tree Atlas projects new habitat for species not currently present*

ADAPTABILITY

Factors not included in the models, such as the ability to respond favorably to disturbance, may make a species more or less able to adapt to future stressors.

- \+ high *Species may perform better than modeled*
- · medium
- – low *Species may perform worse than modeled*

	LOW CLIMATE CHANGE (PCM B1)		HIGH CLIMATE CHANGE (GFDL A1FI)		
SPECIES	TREE ATLAS	LANDIS	TREE ATLAS	LANDIS	ADAPT
American basswood	●		▲		·
American beech	●	●	▼	▼	·
American chestnut	●		●		·
American elm	▲		▲		·
American holly	●		▲		·
American hornbeam	●		▲		·
American mountain-ash	●		●		–
Bald cypress	★		★		·
Balsam fir	▼	▼	▼	▼	–
Balsam poplar	▼		▼		·
Bigtooth aspen	●		▼		·
Black ash	▼		▼		–
Black cherry	●	●	●	●	–
Black hickory			★		·
Black oak	▲	●	▲	●	·
Black spruce	▼	▼	▼	▼	·
Black walnut	★		★		·
Blackgum	▲		▲		+
Blackjack oak			★		+
Boxelder	●		●		+
Bur oak	●		▲		+
Cherrybark oak			★		·
Chestnut oak	▲	▲	▲	▼	+
Chinkapin oak			★		·
Common persimmon	★		★		+
Eastern hemlock	●	●	▼	▼	–
Eastern hophornbeam	●		▲		+
Eastern redbud	★		★		·
Eastern redcedar	▲		▲		·
Eastern white pine	▼	▼	▼	▼	·
Flowering dogwood	▲		▲		·
Gray birch	●		▼		·
Green ash	●		▲		·
Hackberry	●		▲		+
Loblolly pine	★		★		·
Mockernut hickory	▲		▲		+
Mountain maple	●		▼		+
Northern red oak	●	●	▼	●	+
Northern white-cedar	▼	▼	▼	▼	·
Overcup oak			★		–

	LOW CLIMATE CHANGE (PCM B1)		HIGH CLIMATE CHANGE (GFDL A1FI)		
SPECIES	TREE ATLAS	LANDIS	TREE ATLAS	LANDIS	ADAPT
Paper birch	▼		▼		·
Pignut hickory	▲	●	▲	▼	·
Pin cherry	●		●		·
Pin oak	▲		▲		–
Pitch pine	▲	●	●	●	·
Pond pine	★		★		–
Post oak	▲		▲		+
Quaking aspen	▼	▼	▼	▼	·
Red maple	●	●	▼	●	+
Red pine	●		▼		·
Red spruce	▼	▼	▼	▼	–
Sassafras	▲		▲		·
Scarlet oak	▲	●	▲	▼	·
Serviceberry	●		▼		·
Shagbark hickory	▲	●	▲	●	·
Shingle oak			★		·
Shortleaf pine	★		★		·
Silver maple	▲		▲		+
Slippery elm	●		▲		·
Sourwood	▲		▲		+
Southern red oak	★		★		+
Striped maple	▼		▼		·
Sugar maple	●	●	●	▼	+
Sugarberry			★		·
Swamp chestnut oak	●		▲		·
Swamp tupelo	★				–
Sweet birch	▲		▼		–
Sweetbay	★				·
Sweetgum	★		★		·
Sycamore	▲		▲		·
Tamarack (native)	▼		▼		–
Virginia pine	★	●	★	●	·
Water oak			★		·
White ash	●	●	●	●	–
White oak	▲	●	▲	●	+
White spruce	▼		▼		·
Willow oak			★		·
Winged elm	●		▲		·
Yellow birch	●	●	▼	▼	·
Yellow-poplar	▲	▲	▲	●	+

Protex® Pro/Gro Solid Tube Tree Protectors

Acts as a miniature greenhouse.

★ ★ ★ ★ ★ 12 customer reviews

Availability: In Stock

Stock Number: 17141

Size: 48"H

Quantity	Price
1+	$2.95
200+	$2.75
400+	$2.55

Quantity: 1 Add To Cart

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Description | Specifications | Reviews (12) | Q&A (3)

48" Protex Pro/Gro Solid Tube Tree Protectors

Each 4" diameter tube speeds photosynthesis by trapping moisture, thereby raising relative humidity and ambient temperature inside the tube. Also protects the tree from animals, wind desiccation, small rodents, and insects. Use optional cable ties to install optional bamboo stakes or wood guard stakes with each tube for support. Stakes and cable ties sold separately. Constructed of type 2 recyclable polyethylene.

Natural Resources Conservation Service
Texas Forestry Technical Note, TX-FS-12-4

Tree planting is a widely used method to regenerate cutover sites and return cropland or pastures back to forested land. Planting trees allows one to adjust tree species and density on their acres while influencing wildlife habitat as well. Tree planting can also be used to create windbreaks and shelter belts providing a buffer from wind, snow, dust and noise.

Seedling Planting Guidelines

CAUTION – READ

1. Safety – the planting operation should be performed safely as the environment will have several hazards that can make walking difficult such as briars, down woody material, etc.
2. Seedling care – Seedlings should not be exposed to extreme temperatures, wind or contaminants (fuel or herbicides).
3. Seedling roots must not be exposed to excessive drying conditions – do not hold a handful of seedlings while you are planting or leave the bag or box of seedlings open.
4. Planting quality – Seedlings should be planted to the proper depth and firmly packed to ensure the highest likelihood of survival. One can tell if the seedlings are packed tight by grasping a few needles and pull upward – If the seedling moves it is not firmly packed, if the needles pull off then it is firmly packed.

Seedling handling: Handling involves seedling storage, transit and field handling.

Seedling Storage:

1. Avoid damaging seedling bags or boxes to minimize damage to seedlings, tape up any hole to prevent moisture loss and drying of the seedlings.
2. Keep seedlings and their containers out of direct sunlight.
3. Allow space for air circulation between seedling boxes/bags.
4. Don't allow seedlings to freeze. (Don't plant seedlings frozen for more than 2 days)
5. Plant seedlings within two weeks of lifting if possible.
6. Seedlings four weeks or older should be carefully checked for mildew, mold or decay.

Transit:

1. Prevent injury when lifting seedling bags or boxes by keeping your back straight and lifting with your legs.
2. Keep seedlings shaded and covered. A tarp will work if the vehicle is not covered (ie. van or truck with camper shell.
3. Drive at speeds allowed by law and road conditions.

4. Keep seedlings away from contamination commonly fuels or herbicides.
5. Keep the area with seedlings free from sharp objects.
6. Don't allow seedlings to freeze.
7. Don't stack seedlings more than 2 boxes/bags deep without spacers to provide support.

Handling seedlings before and during planting:

1. Keep seedlings moist – Dry roots kill seedlings.
2. Keep seedlings shaded and covered - High temperatures kill seedlings.
3. Don't prune the roots unless the laterals are long (5" or longer) – prune the laterals with a sharp machete to 3 to 4 inches in length. A good root system is essential to seedling growth and survival.
4. Don't beat seedlings against objects to remove clay slurry
5. Close boxes or bags and place out of direct sunlight
6. Remove only minimum number or seedlings that can be planted quickly to avoid exposing roots to wind and sun very long.
7. Discard cull seedlings – seedlings with a stem diameter smaller in diameter than a kitchen match, dry seedlings, or seedlings without a good root system.
8. Don't dump out the whole box or bag of seedlings to sort them before planting.

Hand Planting:

Hand planting allows areas to be planted not suitable for machinery due to debris, terrain, wet conditions and availability of suitable machines.

1. If area has duff, litter, etc., rake to bare mineral soil to ensure proper seedling depth and tightness.
2. Remove no more than 3 or 4 seedlings (drop any culls) from the planting bag.
3. Make the planting hole wide and deep enough to insert the root system so the seedling is straight and the roots are straight down in the planting hole. (It is highly undesirable to have the roots curled up in the planting hole).
4. Lift the seedling up in the hole until the root collar is slightly below the soil level for loblolly, slash and shortleaf pines and for longleaf pine plant the root collar at the soil level keeping the terminal bud above ground.
5. Pack the seedling firmly using your planting tool eliminating the air pockets. See diagram at the back of this document.
6. Plant when there is good soil moisture.
7. Don't plant when the ground is frozen.

Tools for hand planting include a dibble bar, hoe dad, or sharp shooter shovel. A planter bag worn around the waist makes the planting faster and more efficient keeping the seedlings moist and readily available. Seedlings properly planted by hand should have a high percentage of surviving trees.

Hand planting with bare-root seedlings usually occurs between late December and early April. The seedlings have to "harden off" or set buds at the end of the growing season and in southern nurseries this usually does not occur until late November or early December. This hardening off is a little easier to

visualize with hardwood seedlings as the leaves fall off and one can easily see the buds. In planting loblolly, slash or shortleaf pines and the hardwood species, the seedlings should be planted at the root collar which is the location the seedling grew in the nursery (where the above ground and below ground portion of the seedling meet). Longleaf seedlings should be planted at a depth where the root collar is slightly above the soil line ensuring that the terminal bud stays above the ground.

The earlier one can plant their seedlings (Jan – Feb) the more time the seedling will have to establish their root systems. The better the roots get established, the better the seedlings can survive dry conditions that will occur during the summer months.

Containerized seedlings have a wider window for planting beginning in late October and going through April. Containerized seedlings are grown in tubes that help the seedling develop a dense root system that is fairly easy to plant. Containerized loblolly, slash and shortleaf pines can be planted with the entire root plug placed in the planting hole. The terminal bud is well away from the ground line. Containerized longleaf pines however are planted in the grass stage meaning that you have a root plug, a very short stem and a terminal bud surrounded by the needles. Plant containerized longleaf pine with a small portion of the plug above the planting hole to ensure the terminal bud is above the ground.

The photo shows an example of hand planting hardwood seedlings. Some positive things to notice is only one seedling out of the container, a wide planting bar, seedlings with their roots protected and moist in the bucket.

Some common hand planting errors include:

- Planting the seedling too shallow: The root collar and roots are exposed above the soil drying out the roots.
- Planting the seedling too deep: The hardwood seedlings root collar is 2” or more below the soil surface and loblolly/shortleaf/slash pines terminal bud is within 2” of the ground line while longleaf pines has the terminal bud below the soil line.

- J or U Roots: Roots form a J or U shape from the seedling being pushed into the planting hole resulting in the primary root to point to the side or back upward. This problem contributes to poor root development and seedling problems. (Avoid by making the planting hole a little wider before planting the seedling.
- Seedling too loose: A firm pull on the seedling should not move the plant. The seedling should be packed firmly in the soil.
- Seedling not erect: The tap root should not be planted at more than 30° from perpendicular.

Machine Planting:

Machine planting can be accomplished on areas that have received good site preparation, have little debris remaining on the site; areas that have been windrowed or bedded; old fields or farmland being converted back to forests.

There are many safety concerns to consider during machine planting operations as a person is being pulled behind a tractor or dozer. Some items to consider for safety are how the planter communicates with the tractor operator, first aid kit, personal safety gear, fire extinguisher, etc.

1. Only open enough seedlings to fill the planting box. Keep the seedlings upright with the roots down out of the wind. A little water can be added to the planter box to keep the roots moist.
2. Do not cut or prune the roots.
3. Do not leave unplanted seedlings exposed to sun and wind.
4. Plant seedlings along the contour.
5. Do not plant the seedlings to deep or to shallow, when holding the seedlings and placing them in the planting rip do not release them until the packing wheels start to close the rip. Otherwise the seedlings will drop to deep covering the terminal bud. On the other side, do not pull the seedlings upward as the seedling will be planted to shallow exposing some roots.
6. Periodically check the planted seedlings for firmness or packing, planting depth and number of seedlings per acre.
7. Look for skips in planting as the planter may have difficulty in getting seedlings out of the holding tray.
8. The planting operation needs to occur at speeds where the proper number of seedlings are planted which takes coordination between the operator and planter.

Machine planting is an effective method of planting seedlings if the operator and planter work as a team. The operator has to be constantly aware of the safety hazards and protect the individual riding in the planter.

- With machine planting, make sure the seedling depth is satisfactory and that the seedlings are not leaning due to being dragged by the planter. The seedlings should be upright and firmly packed in the soil.

How many seedlings per acre:

Everyone has their reasons for a particular planting density and spacing. One might want to mow between the planted rows so the rows need to be wider than the available equipment. There are many options available (see Table 1). You can calculate the number of seedlings needed per acre by multiplying the spacing between seedlings, for example (10 X 10 = 100); dividing 43,560 sq ft per acre by the sq ft spacing provides the number of seedlings needed per acre. Our example: 43,560/100 = 436 seedlings per acre. Thus, you can substitute any spacing and determine the number of seedlings needed per acre.

Table 1: Various spacings and initial planting densities for tree seedlings

Spacing (feet)	Square Feet per	Number of Tree/Shrub Seedlings per Acre
5 x 5	25	1,742
6 x 6	36	1,210
6 x 8	48	907
8 x 8	64	680
8 x 10	80	544
10 x 10	100	436
10 x 14	140	311
12 x 12	144	302
12 x 16	192	227
14 x 14	196	222
10 x 20	200	218

Ideally, the planting operation should be checked out by personnel with the Texas Forest Service. However, in some instances the TFS may not be available so an approved Technical Service Provider may be used. Thirdly, NRCS personnel may be used to evaluate the planting operation. If this is the case, here are some tips on checking out a planting job.

How to quickly check behind a planting operation:

What needs to be checked? Proper planting of seedlings – depth and firmness; number of seedlings properly planted per acre.

How many seedlings per acre?

A quick way to determine the number of seedlings planted on an acre is to obtain a cane pole or an extending fishing pole at least 12 feet in length. Mark on either a point at 11’8” long. This distance is equivalent to a 1/100th acre plot radius. Holding the pole over a fixed point and then move the pole around making a circle and count each seedling that is contained in the 1/100th acre plot. Each seedling represents 100 seedlings per acre. For plantings with fewer than 600 trees per acre a 1/50th acre plot may be used (16.7’ plot radius). Sample multiple plots and average the seedlings per acre.

For example: The goal is to hand plant 545 trees per acre (8 X 10) spacing. The planting check found:

Plot 1 = 5 seedlings; Plot 2 = 6 seedlings; Plot 3 = 5 seedlings; Plot 4 = 5 seedlings, you would have 525 seedlings planted per acre. That's the average number of seedlings tallied in the sampled plots. The field measurements are compared against the targeted seedlings per acre and should be within 10% for a satisfactory planting job. The 525 is within the 10% guide for number of seedlings per acre. The question is now how many of the seedlings were satisfactorily planted. From this example, 21 seedlings were located on our 1/100th acre plots so no more than 2 seedlings can be unsatisfactory, if 3 or more are unsatisfactory then the planting will fail.

The following provides a guide in determining number of plots needed per acre by tract acreage:

1 to 60 acres – 1 plot per acre
61 – 90 acres – 1 plot per 2 acres for hand plantings to 5 acres for machine plantings
91+ acres – 1 plot per 3 acres

Tract maps can be created with plots laid out on the proper spacing to fulfill the requirements provided above using newer versions of ArcGIS or other GIS mapping software.
Once at the tract, the inspector should orient their self and use their map to navigate to plot 1.

- Mark the center of the plot with a pin flag
- Using a plot radius tape or device, count and check all seedlings in the specified plot radius.
- Seedlings should be checked for proper planting depth, proper closure of the hole, and proper packing of the seedling in soil. To check that seedlings are properly packed, grab a seedling by 3 to 5 needles and gently pull on the seedling, if the seedling moves up or down then the seedling is not properly packed.
- Results should be documented on the seedling inspection form
- When between plots (i.e. traveling from one plot to the next) carefully dig up two seedlings and check for underground planting problems but properly replant seedlings to maximize survival. **(This is not required for container plantings)**
- Results should be documented on the seedling inspection form
- Continue to next four plots and repeat.
- After plot 5 the inspector will need to calculate the excavation factor. The excavation factor is the percentage of good seedlings being dug up and can be calculated by dividing the number of good trees that have been dug up by the total number of seedlings that have been dug up. (See example below)

Calculating Excavation Factor:
After 5 plots
10 total trees dug up
1 J-root for a total of 9 good out of the 10
Good trees divided by total = percentage or in this case 9 ÷ 10 = 0.90 or 90%

The excavation factor should be calculated after every 5th plot. If at any time during the inspection the percentage falls below 90% the inspector should begin digging up four trees rather than two. While digging up four seedlings, if the percentage rises back above 90% then the inspector may resume digging up only two seedlings.

Once the entire tract has been inspected the inspector should then determine the total trees per acre. The total trees per acre should be within 10% above or below the original planting prescription. Above ground problems should be documented for each plot and deducted from the plot total while below ground problems will be deducted from the total inspection number and both will be used to determine whether the tract passes or fails.

Above ground

1. Examine a planted seedling as it should be planted close to the root collar where it grew in the nursery. For longleaf pine, be sure the terminal bud is not buried and is above the soil line. For other pine species, the root collar can be planted below the soil line but do not cover the terminal bud, in fact it should be 2" or higher above the soil line.
2. For pine species, pull upward on a few needles. If the seedling is planted firmly, the needles should pull off in your hand. If the seedling starts lifting out of the ground, the seedling is not firmly planted. No seedling should be capable of moving up or down easily in a planting hole.
3. Seedlings not firmly planted will dry out in the planting hole and not survive.
4. The main root should be completely below the soil line.
5. For pine seedlings, the green side goes up.
6. For Hardwood seedlings, the root collar should not be more than 2" below the soil line.
7. Hardwood seedlings should be firmly packed in the soil and if pulled on they should not easily move in the planting hole.
8. Be observant in the field, you may find discarded seedlings, piles of roots that have been cut off of the seedlings, unplanted seedling boxes or bags exposed to full sunlight. These are practices that you do not want occurring on your planting site.
9. Spacing – improper spacing will cause either too many or too few seedling per acre.
10. Planting hole not closed up, additional holes created to close the planting hole should be stomped shut.
11. Excessive lean in seedlings.

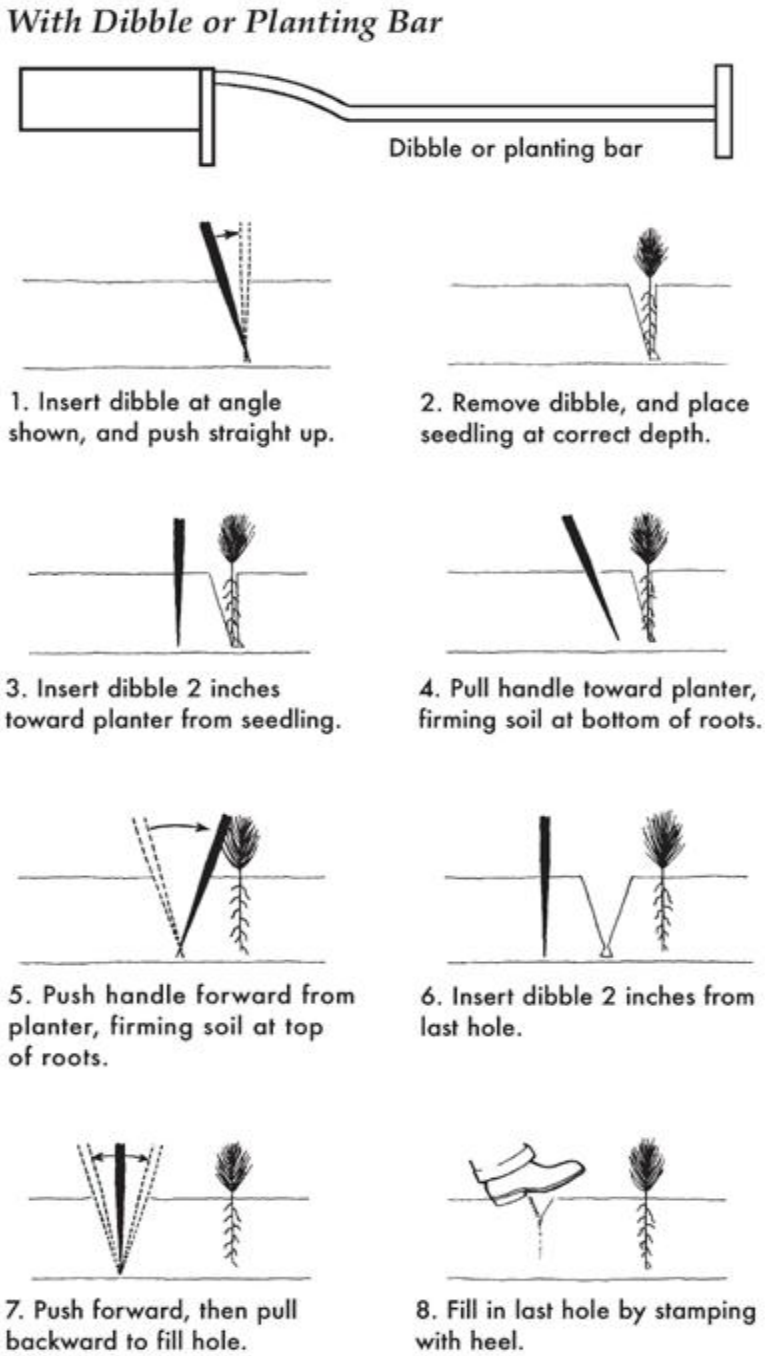
Below ground

12. A few seedlings will need to be dug up to examine for J, L or U roots by using a shovel. Carefully remove the soil and notice the shape of the roots. No more than 10% of all seedlings planted should have J, L or U roots (the primary tap root).
13. Tap root not 5 inches long, the tap root should be a minimum of 5 inches or be culled.
14. Cull seedlings less than 1/8th inches in diameter.

A planting check-out form is available labeled "*planting check sheet*" that you can use to document the planting operation. Ninety percent of the planted seedlings should be satisfactory.

Written by: Williams, Richard, State Forester-Texas NRCS and Shane Harrington, Farm Bill Coordinator, Texas Forest Service.

The following illustration shows the proper hand planting technique:



Machine planting a cut-over site.

Machine planting pine seedlings. (note: the green side is up, nearly straight with the roots below the ground line, minimal soil disturbance)

Planting hardwood seedlings.

Hardwood seedling roots, note where the root was undercut in the nursery, new root growth

41°31'59.19"N

71°43'7.99"W

41°29'53.37"N

71°41'14.51"W

FLOOD HAZARD INFORMATION

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

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can beordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by USDA, Farm Service Agency (FSA). This information was derived from NAIP, dated April 11, 2018.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **4/8/2020 4:48:12 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. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

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

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.

SCALE

N

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map please see the Flood Insurance Study(FIS) Report for your community at https://msc.fema.gov

1 inch = 500 feet **1:6,000**

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

0 50 100 200 300 400 Meters

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

WASHINGTON COUNTY
RHODE ISLAND
ALL JURISDICTIONS

PANEL **64** OF **368**

Panel Contains:

COMMUNITY	NUMBER	PANEL
TOWN OF HOPKINTON RHODE ISLAND	440028	0064
TOWN OF RICHMOND RHODE ISLAND	440031	0064

MAP NUMBER
44009C0064J
EFFECTIVE DATE
04/03/2020

United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties

June 30, 2020

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:9,170 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 400 800 1600 2400

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

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

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties
Survey Area Data: Version 19, Sep 12, 2019

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

Date(s) aerial images were photographed: May 14, 2010—Apr 1, 2017

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CaC	Canton-Charlton-Rock outcrop complex, 3 to 15 percent slopes	56.3	29.7%
CaD	Canton-Charlton-Rock outcrop complex, 15 to 35 percent slopes, very stony	3.9	2.0%
CeC	Canton and Charlton fine sandy loams, 3 to 15 percent slopes, very rocky	0.4	0.2%
EfA	Enfield silt loam, 0 to 3 percent slopes	6.0	3.2%
EfB	Enfield silt loam, 3 to 8 percent slopes	4.8	2.5%
HkA	Hinckley loamy sand, 0 to 3 percent slopes	1.7	0.9%
HkC	Hinckley loamy sand, 8 to 15 percent slopes	25.0	13.2%
HkD	Hinckley loamy sand, 15 to 25 percent slopes	0.0	0.0%
MmA	Merrimac fine sandy loam, 0 to 3 percent slopes	4.3	2.3%
PaB	Paxton fine sandy loam, 3 to 8 percent slopes	1.6	0.8%
Pg	Pits, gravel	1.0	0.5%
Rf	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	23.2	12.2%
Sb	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	22.9	12.1%
Ss	Sudbury sandy loam	0.3	0.1%
SuB	Sutton fine sandy loam, 0 to 8 percent slopes, very stony	5.8	3.1%
Tb	Tisbury silt loam	2.9	1.5%
Wa	Walpole sandy loam, 0 to 3 percent slopes	1.7	0.9%
WhA	Woodbridge fine sandy loam, 0 to 3 percent slopes	15.8	8.3%
WoB	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	8.0	4.2%
WrB	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	3.9	2.1%
Totals for Area of Interest		**189.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas

shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties

CaC—Canton-Charlton-Rock outcrop complex, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9ltx
Elevation: 0 to 810 feet
Mean annual precipitation: 44 to 50 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 115 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition

Canton and similar soils: 40 percent
Rock outcrop: 20 percent
Charlton and similar soils: 20 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting

Landform: Hills
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy and gravelly melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: gravelly fine sandy loam
Bw1 - 3 to 15 inches: gravelly loam
Bw2 - 15 to 24 inches: gravelly loam
Bw3 - 24 to 30 inches: gravelly loam
2C - 30 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 3 to 15 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Charlton

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Ap - 0 to 4 inches: fine sandy loam
Bw1 - 4 to 7 inches: fine sandy loam
Bw2 - 7 to 19 inches: fine sandy loam
Bw3 - 19 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 15 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Rock Outcrop

Setting

Parent material: Igneous, metamorphic and sedimentary rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 0 to 4 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Narragansett

Percent of map unit: 6 percent
Landform: Till plains, hills
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Gloucester

Percent of map unit: 6 percent
Landform: Hills
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Paxton

Percent of map unit: 5 percent
Landform: Drumlins, hills
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Sutton

Percent of map unit: 3 percent
Landform: Depressions, drainageways
Down-slope shape: Linear, concave
Across-slope shape: Concave
Hydric soil rating: No

CaD—Canton-Charlton-Rock outcrop complex, 15 to 35 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2w826
Elevation: 0 to 800 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Canton, very stony, and similar soils: 40 percent
Charlton, very stony, and similar soils: 20 percent
Rock outcrop: 20 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton, Very Stony

Setting

Landform: Moraines, ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
Bw1 - 5 to 16 inches: fine sandy loam
Bw2 - 16 to 22 inches: gravelly fine sandy loam
2C - 22 to 67 inches: gravelly loamy sand

Properties and qualities

Slope: 15 to 35 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Hills, ridges
Parent material: Igneous and metamorphic rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Description of Charlton, Very Stony

Setting

Landform: Ground moraines, hills, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 15 to 35 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Gloucester, very stony

Percent of map unit: 6 percent
Landform: Moraines, ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Narragansett, very stony

Percent of map unit: 6 percent
Landform: Ridges, hills

Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Paxton, very stony

Percent of map unit: 5 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Sutton, very stony

Percent of map unit: 3 percent
Landform: Ground moraines, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

CeC—Canton and Charlton fine sandy loams, 3 to 15 percent slopes, very rocky

Map Unit Setting

National map unit symbol: 2w81y
Elevation: 0 to 820 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Canton, very stony, and similar soils: 55 percent
Charlton, very stony, and similar soils: 30 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton, Very Stony

Setting

Landform: Moraines, ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest, nose slope
Down-slope shape: Convex, linear

Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
Bw1 - 5 to 16 inches: fine sandy loam
Bw2 - 16 to 22 inches: gravelly fine sandy loam
2C - 22 to 67 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 15 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Charlton, Very Stony

Setting

Landform: Ground moraines, hills, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 15 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 5 percent
Landform: Hills, ridges
Hydric soil rating: Unranked

Sutton, very stony

Percent of map unit: 4 percent
Landform: Ground moraines, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Gloucester, very stony

Percent of map unit: 4 percent
Landform: Moraines, ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Chatfield, very stony

Percent of map unit: 2 percent
Landform: Hills, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

EfA—Enfield silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9lvb

Elevation: 0 to 810 feet
Mean annual precipitation: 44 to 50 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 120 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Enfield and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Enfield

Setting

Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-silty eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile

Oi - 0 to 3 inches: slightly decomposed plant material
Oe - 3 to 4 inches: moderately decomposed plant material
Ap - 4 to 12 inches: silt loam
Bw1 - 12 to 20 inches: silt loam
Bw2 - 20 to 26 inches: silt loam
Bw3 - 26 to 30 inches: silt loam
2C - 30 to 37 inches: stratified coarse sand to very gravelly loamy sand
3C - 37 to 65 inches: stratified very gravelly coarse sand to loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Bridgehampton

Percent of map unit: 3 percent
Landform: Outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 2 percent
Landform: Outwash plains, eskers, terraces, kames
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Agawam

Percent of map unit: 2 percent
Landform: Outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Merrimac

Percent of map unit: 2 percent
Landform: Outwash plains, terraces, kames
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Tisbury

Percent of map unit: 1 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Concave, linear
Hydric soil rating: No

EfB—Enfield silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9lvc
Elevation: 0 to 810 feet
Mean annual precipitation: 44 to 50 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Enfield and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Enfield

Setting

Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Coarse-silty eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile

Oi - 0 to 3 inches: slightly decomposed plant material
Oe - 3 to 4 inches: moderately decomposed plant material
Ap - 4 to 12 inches: silt loam
Bw1 - 12 to 20 inches: silt loam
Bw2 - 20 to 26 inches: silt loam
Bw3 - 26 to 30 inches: silt loam
2C - 30 to 37 inches: stratified coarse sand to very gravelly loamy sand
3C - 37 to 65 inches: stratified very gravelly coarse sand to loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Bridgehampton

Percent of map unit: 3 percent
Landform: Outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 2 percent
Landform: Outwash plains, eskers, terraces, kames
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Merrimac

Percent of map unit: 2 percent
Landform: Outwash plains, terraces, kames
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Agawam

Percent of map unit: 2 percent
Landform: Outwash plains

Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Tisbury

Percent of map unit: 1 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Concave, linear
Hydric soil rating: No

HkA—Hinckley loamy sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svm7
Elevation: 0 to 1,420 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hinckley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley

Setting

Landform: Outwash deltas, kame terraces, outwash plains, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear, concave
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 5 percent
Landform: Kame terraces, outwash deltas, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, concave, linear
Across-slope shape: Linear, convex, concave
Hydric soil rating: No

Merrimac

Percent of map unit: 5 percent
Landform: Kame terraces, outwash deltas, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, concave, linear
Across-slope shape: Linear, convex, concave
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Kame terraces, outwash deltas, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, concave, linear
Across-slope shape: Linear, convex, concave
Hydric soil rating: No

HkC—Hinckley loamy sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2svm9
Elevation: 0 to 1,480 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hinckley and similar soils: 85 percent
Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley

Setting

Landform: Kame terraces, outwash plains, moraines, outwash deltas, eskers, outwash terraces, kames
Landform position (two-dimensional): Shoulder, toeslope, footslope, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, riser
Down-slope shape: Linear, convex, concave
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 5 percent
Landform: Kame terraces, outwash plains, outwash deltas, moraines, outwash terraces, eskers, kames
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, riser
Down-slope shape: Linear, convex, concave
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Merrimac

Percent of map unit: 5 percent

Landform: Moraines, outwash plains, eskers, outwash terraces, kames
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Side slope, crest, head slope, nose slope, riser
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Kame terraces, outwash plains, moraines, outwash deltas, outwash terraces
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

HkD—Hinckley loamy sand, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2svmc
Elevation: 0 to 1,460 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Hinckley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley

Setting

Landform: Outwash plains, moraines, outwash deltas, kame terraces, eskers, outwash terraces, kames
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, riser
Down-slope shape: Convex, linear, concave
Across-slope shape: Linear, convex, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand

Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 8 percent
Landform: Moraines, outwash plains, outwash terraces, eskers, kames
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, crest, head slope, nose slope, riser
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Landform: Outwash plains, outwash deltas, moraines, kame terraces, outwash terraces, eskers, kames
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, riser
Down-slope shape: Convex, linear, concave
Across-slope shape: Linear, convex, concave
Hydric soil rating: No

Sudbury

Percent of map unit: 2 percent
Landform: Outwash plains, moraines, outwash deltas, kame terraces, outwash terraces, eskers
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave, linear, convex
Across-slope shape: Linear, concave, convex
Hydric soil rating: No

MmA—Merrimac fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tyqr
Elevation: 0 to 1,100 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Merrimac and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Eskers, outwash terraces, moraines, outwash plains, kames
Landform position (two-dimensional): Backslope, footslope, summit, shoulder
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Sudbury

Percent of map unit: 5 percent
Landform: Terraces, deltas, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Eskers, deltas, outwash plains, kames
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Agawam

Percent of map unit: 3 percent
Landform: Eskers, outwash terraces, moraines, outwash plains, stream terraces, kames
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Windsor

Percent of map unit: 2 percent
Landform: Outwash terraces, deltas, outwash plains, dunes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

PaB—Paxton fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2t2qp
Elevation: 0 to 1,570 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Paxton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Paxton

Setting

Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Backslope, summit, shoulder
Landform position (three-dimensional): Side slope, crest, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 8 inches: fine sandy loam
Bw1 - 8 to 15 inches: fine sandy loam
Bw2 - 15 to 26 inches: fine sandy loam
Cd - 26 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 18 to 39 inches to densic material
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Woodbridge

Percent of map unit: 9 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Backslope, footslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Ridgebury

Percent of map unit: 6 percent
Landform: Ground moraines, depressions, hills, drainageways

Landform position (two-dimensional): Toeslope, backslope, footslope
Landform position (three-dimensional): Base slope, head slope, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Charlton

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Pg—Pits, gravel

Map Unit Setting

National map unit symbol: 9lwh
Elevation: 0 to 810 feet
Mean annual precipitation: 44 to 50 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 140 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Pits: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pits

Setting

Parent material: Sandy and gravelly glaciofluvial deposits derived from granite and gneiss

Minor Components

Water

Percent of map unit: 2 percent
Hydric soil rating: Unranked

Hinckley

Percent of map unit: 1 percent
Landform: Outwash plains, kames, eskers, terraces
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Urban land

Percent of map unit: 1 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 1 percent
Hydric soil rating: No

Rf—Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2t2qt
Elevation: 0 to 1,480 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Ridgebury, extremely stony, and similar soils: 40 percent
Leicester, extremely stony, and similar soils: 35 percent
Whitman, extremely stony, and similar soils: 17 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ridgebury, Extremely Stony

Setting

Landform: Depressions, drainageways, hills, ground moraines, drumlins
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 6 inches: fine sandy loam
Bw - 6 to 10 inches: sandy loam
Bg - 10 to 19 inches: gravelly sandy loam
Cd - 19 to 66 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 15 to 35 inches to densic material
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None

Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: Yes

Description of Leicester, Extremely Stony

Setting
Landform: Depressions, drainageways, hills, ground moraines
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave
Parent material: Coarse-loamy melt-out till derived from gneiss, granite, and/or schist

Typical profile
Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 7 inches: fine sandy loam
Bg - 7 to 18 inches: fine sandy loam
BC - 18 to 24 inches: fine sandy loam
C1 - 24 to 39 inches: gravelly fine sandy loam
C2 - 39 to 65 inches: gravelly fine sandy loam

Properties and qualities
Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: High (about 9.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Description of Whitman, Extremely Stony

Setting
Landform: Depressions, drainageways, hills, ground moraines, drumlins
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave

Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 1 inches: peat
A - 1 to 10 inches: fine sandy loam
Bg - 10 to 17 inches: gravelly fine sandy loam
Cdg - 17 to 61 inches: fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 7 to 38 inches to densic material
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: Yes

Minor Components

Woodbridge, extremely stony

Percent of map unit: 6 percent
Landform: Hills, ground moraines, drumlins
Landform position (two-dimensional): Backslope, footslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Swansea

Percent of map unit: 2 percent
Landform: Bogs, swamps
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sb—Scarboro mucky fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svky
Elevation: 0 to 1,320 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Scarboro and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scarboro

Setting

Landform: Depressions, outwash deltas, drainageways, outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy glaciofluvial deposits derived from schist and/or sandy glaciofluvial deposits derived from gneiss and/or sandy glaciofluvial deposits derived from granite

Typical profile

Oe - 0 to 3 inches: mucky peat
A - 3 to 11 inches: mucky fine sandy loam
Cg1 - 11 to 21 inches: sand
Cg2 - 21 to 65 inches: gravelly coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (1.42 to 14.17 in/hr)
Depth to water table: About 0 to 2 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Minor Components

Swansea

Percent of map unit: 10 percent
Landform: Bogs, swamps
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Walpole

Percent of map unit: 5 percent
Landform: Outwash plains, depressions, depressions, outwash terraces, deltas
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip, talf
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Wareham

Percent of map unit: 5 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Ss—Sudbury sandy loam

Map Unit Setting

National map unit symbol: 9lx8
Elevation: 0 to 810 feet
Mean annual precipitation: 44 to 50 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 100 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Sudbury and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sudbury

Setting

Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 5 inches: sandy loam
Bw1 - 5 to 17 inches: gravelly sandy loam
Bw2 - 17 to 25 inches: sandy loam
2C - 25 to 60 inches: Error

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 3 percent
Landform: Outwash plains, kames, eskers, terraces
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Ninigret

Percent of map unit: 2 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Merrimac

Percent of map unit: 1 percent
Landform: Outwash plains, kames, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Agawam

Percent of map unit: 1 percent
Landform: Outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Windsor

Percent of map unit: 1 percent
Landform: Outwash plains, kames, terraces
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Deerfield

Percent of map unit: 1 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Walpole

Percent of map unit: 1 percent
Landform: Depressions on terraces, drainageways on terraces
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

SuB—Sutton fine sandy loam, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2xfff
Elevation: 0 to 1,410 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Sutton, very stony, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sutton, Very Stony

Setting

Landform: Hills, ground moraines
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave

Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: fine sandy loam
Bw1 - 7 to 19 inches: fine sandy loam
Bw2 - 19 to 27 inches: sandy loam
C1 - 27 to 41 inches: gravelly sandy loam
C2 - 41 to 62 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 12 to 27 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B/D
Hydric soil rating: No

Minor Components

Charlton, very stony

Percent of map unit: 7 percent
Landform: Hills, ridges, ground moraines
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Canton, very stony

Percent of map unit: 4 percent
Landform: Moraines, ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Leicester, very stony

Percent of map unit: 3 percent
Landform: Depressions, drainageways, hills, ground moraines
Landform position (two-dimensional): Footslope, toeslope

Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman, very stony
Percent of map unit: 1 percent
Landform: Depressions, drainageways, hills, ground moraines, drumlins
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Tb—Tisbury silt loam

Map Unit Setting
National map unit symbol: 9lxf
Mean annual precipitation: 44 to 50 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 120 to 195 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Tisbury and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tisbury

Setting
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Concave, linear
Parent material: Coarse-silty eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile
Ap - 0 to 8 inches: silt loam
Bw1 - 8 to 18 inches: silt loam
Bw2 - 18 to 26 inches: silt loam
2C - 26 to 60 inches: stratified very gravelly sand to loamy sand

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 18 to 30 inches

Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.6 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Enfield
Percent of map unit: 4 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Bridgehampton
Percent of map unit: 3 percent
Landform: Outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Raypol
Percent of map unit: 3 percent
Landform: Outwash plains
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Wa—Walpole sandy loam, 0 to 3 percent slopes

Map Unit Setting
National map unit symbol: 2svkl
Elevation: 0 to 1,020 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Walpole and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Walpole

Setting

Landform: Depressions, outwash plains, depressions, deltas, outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip, talf
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy glaciofluvial deposits derived from igneous, metamorphic and sedimentary rock

Typical profile

Oe - 0 to 1 inches: mucky peat
A - 1 to 7 inches: sandy loam
Bg - 7 to 21 inches: sandy loam
BC - 21 to 25 inches: gravelly sandy loam
C - 25 to 65 inches: very gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 4 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Sudbury

Percent of map unit: 10 percent
Landform: Outwash plains, terraces, deltas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Scarboro

Percent of map unit: 10 percent
Landform: Outwash plains, outwash terraces, deltas
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

WhA—Woodbridge fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2w686
Elevation: 0 to 1,420 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Woodbridge and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodbridge

Setting

Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw1 - 7 to 18 inches: fine sandy loam
Bw2 - 18 to 30 inches: fine sandy loam
Cd - 30 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Paxton

Percent of map unit: 7 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Ridgebury

Percent of map unit: 6 percent
Landform: Hills, drainageways, depressions, drumlins, ground moraines
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sutton

Percent of map unit: 1 percent
Landform: Hills, ground moraines
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Whitman, extremely stony

Percent of map unit: 1 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

WoB—Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2t2qr
Elevation: 0 to 1,440 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Woodbridge, very stony, and similar soils: 82 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodbridge, Very Stony

Setting

Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Backslope, footslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 9 inches: fine sandy loam
Bw1 - 9 to 20 inches: fine sandy loam
Bw2 - 20 to 32 inches: fine sandy loam
Cd - 32 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 19 to 27 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Paxton, very stony

Percent of map unit: 10 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Ridgebury, very stony

Percent of map unit: 8 percent
Landform: Hills, drainageways, depressions, ground moraines, drumlins
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave

Hydric soil rating: Yes

WrB—Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2t2qs
Elevation: 0 to 1,580 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Woodbridge, extremely stony, and similar soils: 82 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodbridge, Extremely Stony

Setting

Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Backslope, footslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 9 inches: fine sandy loam
Bw1 - 9 to 20 inches: fine sandy loam
Bw2 - 20 to 32 inches: fine sandy loam
Cd - 32 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 19 to 27 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Paxton, extremely stony

Percent of map unit: 10 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 8 percent
Landform: Hills, drainageways, depressions, ground moraines, drumlins
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

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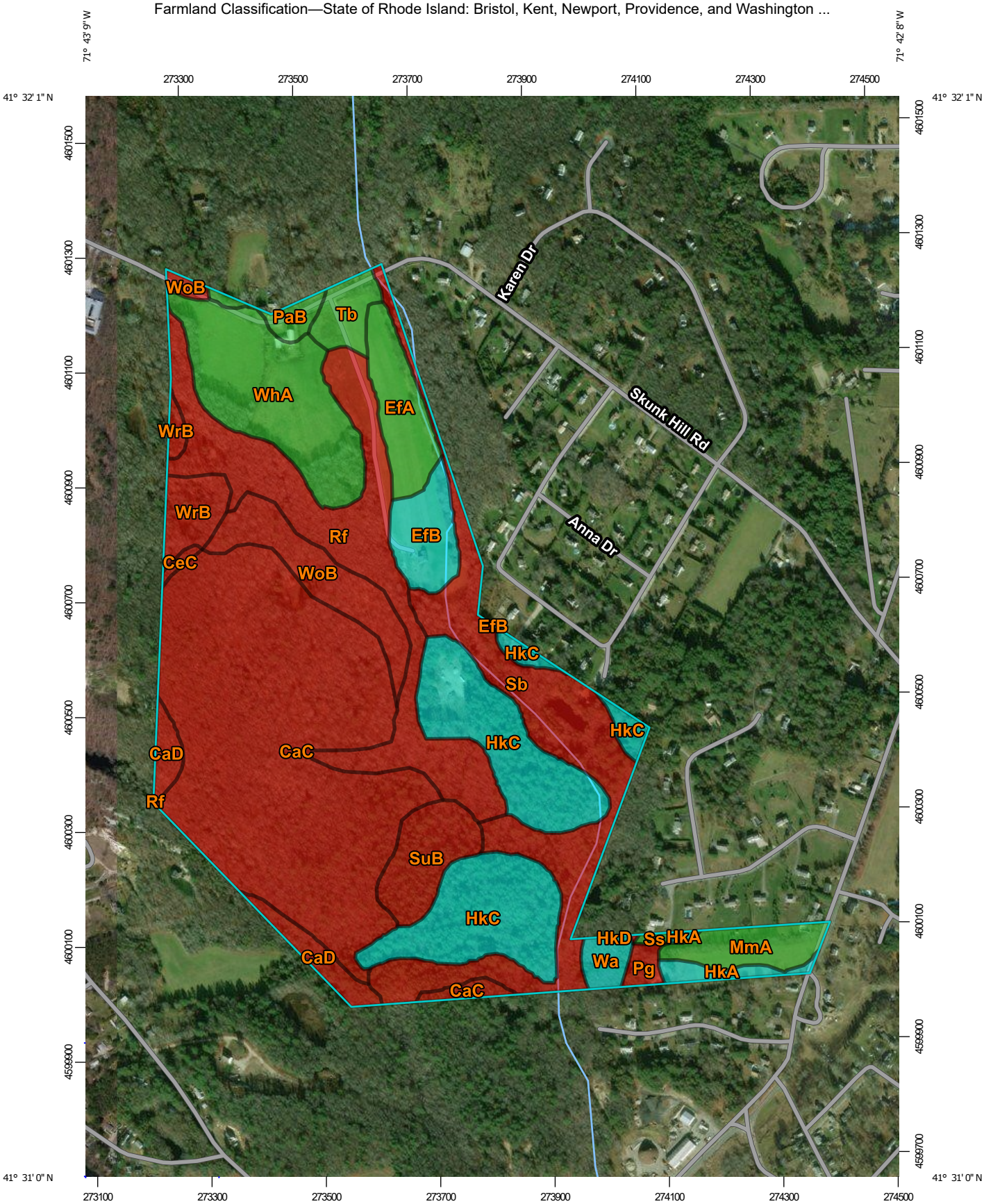

Map Scale: 1:9,170 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 400 800 1600 2400

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated
- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated
- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated

- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

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

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

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

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

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

Soil Survey Area: State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties
Survey Area Data: Version 19, Sep 12, 2019

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

Date(s) aerial images were photographed: May 14, 2010—Apr 1, 2017

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

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CaC	Canton-Charlton-Rock outcrop complex, 3 to 15 percent slopes	Not prime farmland	56.3	29.7%
CaD	Canton-Charlton-Rock outcrop complex, 15 to 35 percent slopes, very stony	Not prime farmland	3.9	2.0%
CeC	Canton and Charlton fine sandy loams, 3 to 15 percent slopes, very rocky	Not prime farmland	0.4	0.2%
EfA	Enfield silt loam, 0 to 3 percent slopes	All areas are prime farmland	6.0	3.2%
EfB	Enfield silt loam, 3 to 8 percent slopes	Farmland of statewide importance	4.8	2.5%
HkA	Hinckley loamy sand, 0 to 3 percent slopes	Farmland of statewide importance	1.7	0.9%
HkC	Hinckley loamy sand, 8 to 15 percent slopes	Farmland of statewide importance	25.0	13.2%
HkD	Hinckley loamy sand, 15 to 25 percent slopes	Not prime farmland	0.0	0.0%
MmA	Merrimac fine sandy loam, 0 to 3 percent slopes	All areas are prime farmland	4.3	2.3%
PaB	Paxton fine sandy loam, 3 to 8 percent slopes	All areas are prime farmland	1.6	0.8%
Pg	Pits, gravel	Not prime farmland	1.0	0.5%
Rf	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	Not prime farmland	23.2	12.2%
Sb	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	Not prime farmland	22.9	12.1%
Ss	Sudbury sandy loam	All areas are prime farmland	0.3	0.1%
SuB	Sutton fine sandy loam, 0 to 8 percent slopes, very stony	Not prime farmland	5.8	3.1%
Tb	Tisbury silt loam	All areas are prime farmland	2.9	1.5%
Wa	Walpole sandy loam, 0 to 3 percent slopes	Farmland of statewide importance	1.7	0.9%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
WhA	Woodbridge fine sandy loam, 0 to 3 percent slopes	All areas are prime farmland	15.8	8.3%
WoB	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	Not prime farmland	8.0	4.2%
WrB	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	Not prime farmland	3.9	2.1%
Totals for Area of Interest			**189.5**	**100.0%**

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower