

June 24, 2020

Via Electronic Mail

Ms. Melanie Bachman, Esq.
Executive Director
Connecticut Siting Council
Ten Franklin Square
New Britain, CT 06051

Re: ***Petition 1397*** – Constitution Solar, LLC petition for a declaratory ruling, pursuant to Connecticut General Statutes §4-176 and §16-50k, for the proposed construction, maintenance and operation of a 20-megawatt AC solar photovoltaic electric generating facility on approximately 149 acres comprised of four separate parcels located off of Cornell Road in Plainfield, Connecticut and associated electrical interconnection –

Dear Ms. Bachman:

On behalf of the petitioner, Constitution Solar, LLC, enclosed please find responses to the Connecticut Siting Council's June 10, 2020 interrogatories in connection with the above-referenced proceeding.

Please feel free to contact me should you have any questions regarding this submission.

Very truly yours,



David W. Bogan

DWB:

Petition No. 1397

**Petitioner's Responses to
Connecticut Siting Council Interrogatories
Set Two**

June 24, 2020

79. Referring to the Town's comments to the Council dated May 26, 2020, a property subdivision map dated 03/23/20 is attached. This map was not included with the petition filing.
- Please clarify the purpose of this map and where it has been filed.
 - Please explain the purpose of the parcel subdivision.
 - Are there other site maps that have been modified since the petition was filed that depict changes in project design? If so, please submit.

Company's Response:

- The map was provided to the Town at their request, for discussion purposes. It was not intended to be a final depiction of the property, and was not provided to the Council for this reason.
- The Petitioner is in discussions regarding a final site design that would divide ownership of the Project Site among two entities. If the Project is approved by the Siting Council, Constitution Solar will transfer ownership of the Collector Substation pursuant to a separate commercial agreement. Constitution Solar will own the rest of the Project Site pursuant to various agreements with the landowners as described in Section 3 of the Petition.
- There are no other maps that have been modified.

80. Referring to the Petition site plans, Proposed Condition series- clearing call outs in the area of the substation are located beyond the limit of work demarcation lines. Additionally, clearing in this area is not shown on the demolition series maps. Please submit a site plan that shows the correct clearing limits in the area of the substation.

Company's Response:

The clearing call outs in this area were included on the plans in error. They have been removed and the corrected Sheet C-024 is provided as Attachment CSC-80.

81. Is the residence at 146 Cornell Road at a higher elevation than the proposed substation and adjacent solar field? What is the expected view of the proposed substation and adjacent solar field from this residence?

Company's Response:

The residence is slightly higher in elevation than the proposed switchyard and solar array. The photos provided in Attachment CSC-81 show the view of the current field from Cornell Road, near the driveway of 146 Cornell Road.

There is a row of vegetation between the proposed array and the residence, and the house itself is set back approximately 100-feet from Cornell Road. The switchyard is not expected to emit a significant amount of noise as described in the acoustics analysis provided in Exhibit N of the Petition. Additionally, the array itself will not have lighting, and lighting for the switchyard will only be used when maintenance is being performed. Otherwise the light will be off at all times.

Constitution Solar has met and discussed the Project with the residents at 146 Cornell Road, and they have not expressed concern about the proximity of the Project in relation to their home.

82. In regards to the proposed substation, describe the compound base material. What equipment would be installed? List the heights of substation equipment/infrastructure.

Company's Response:

The switchgear equipment pad and height specifications will be provided by the switchgear manufacturer. Switchgear dimensions differ based on the manufacturer's design, hence whomever manufactures the switchgear will provide drawings with all necessary dimensions. As there is no substation proposed for the Project, all the components will be embedded in the metal-clad switchgear. The height of the switchgear will be approximately 10 feet, depending on final equipment selected and grades. It is expected that the gear will be installed on a concrete foundation pad surrounded by crushed stone as the finished ground condition.

The switchgear is mainly composed of the following components:

- Rack-out switchgear;
- Two position disconnects/ground switches on both sides;
- Revenue grade meter, metering class Current Transformers (CTs), current and voltage test switches;
- Protection relay and protection class CTs;
- Auxiliary power supply;
- Uninterruptible Power Supply (UPS) and charger;
- Receptacle;
- Lighting; and
- Separate box for all communications and remote trip/close via supervisory control and data acquisition (SCADA).

83. Given the amount of road frontage on Cornell Road, can the proposed substation be relocated to another area and not across from the residence at 146 Cornell Road?

Company's Response:

To avoid locating the switchgear across from the residence located at 146 Cornell Road, the Point of Common Coupling would have to be moved southeast on Cornell Road, away from this customer. Such modification may have an impact on the road crossing agreement between the Petitioner and Eversource Energy and the studies and design being undertaken by Eversource Energy. This modification also would likely impact construction costs and schedule.

84. Will the new 4.54 mile long feeder to the Frye Brook Substation require new and/or replacement utility poles? If so, estimate the number of new/replacement utility poles to be installed.

Company's Response:

Eversource Energy has identified 171 poles that will need to be replaced along the feeder to the Frye Brook Substation.

85. Did the wetland investigation include the area along the old farm road between W11 and S09?

Company's Response:

Yes, the wetland investigation was conducted within the entire Study Area as defined in the Petition on page v, and as shown on Exhibit A, Figure 1 of the Petition. This includes the old farm road between Wetland W11 and Stream S09.

86. Can panel installation be relocated from the wooded areas between Wetlands W7 and W11, and Wetlands W11 and W10/W08? If panels cannot be relocated from these areas, what is the overall impact to project output (nameplate and in MW/hrs) if panels are eliminated in each of these areas?

Company's Response:

The site layout was completed in coordination with the natural resources team and in consideration of the wetlands and watercourses delineated within the Study Area. The Project avoids direct impacts to all wetlands and watercourses identified on site and maintains a 100-foot buffer around all resources, with a few exceptions. As such, any modification to relocate panels from the wooded areas would result in impacts to resources or resource buffers.

Eliminating panels between Wetlands W7 and W11 would result in a loss of approximately 2,016 modules, which have a combined generating capacity of 0.8366 MW DC or 1,062 MW/hrs. Eliminating panels between Wetlands W11 and W10/08 would result in a loss of approximately 780 modules, which have a combined generating capacity of 0.3237 MW DC or 411 MW/hrs.

87. Referring to Site Detail Plan C-029 and DEEP comments dated April 24 on p. 4, can the Solar Array Chain Link Fence- bottom minimum clearance be increased to 6 inches above grade?

Company's Response:

Yes, the 4-inch gap proposed on sheet C-029 can be increased to 6-inches around the perimeter of the Project, with some exceptions. The switchyard fence will comply with the National Electric Safety Code, National Electric Code, and any Council requirements. The fence directly adjacent to Project access points will not include a 6-inch gap for security purposes.

88. Invasive plants were identified in the botanical survey. How does the Petitioner intend to control invasive species at the site?

Company's Response:

Invasive species management, as it pertains to botanical resources, will be implemented during construction and throughout Project operations. Best practices will be implemented to reduce the spread of invasive species around the site during construction. Regular mowing of the site during operations will limit the ability of invasive plant species that currently occur on the site from proliferating. If woody invasive species become a safety concern or threaten Project infrastructure, the use of herbicide in targeted applications may be required. The Petitioner does not propose the use of broadcast aerial herbicide applications.

89. Has the petitioner examined shade tolerant grasses to ensure vegetative growth beneath the 13 degree tilt solar panels? What shade tolerant grasses were investigated/selected?

Company's Response:

The Petitioner has experience utilizing a low growing solar mix for solar installations with various tilt angles and array table sizes and has not had an issue with growth of vegetation at these sites. This

seed mix has proven to be robust for germination and growth throughout New England in areas of direct sun and full shade. No specific shade tolerant grasses are proposed at this time, aside from the standard solar mix that typically includes a blend of fescue, rye grasses and clover.

90. The response to Council interrogatory #51, states in part *Wildlife searches will be conducted as needed*. Define “as needed” and who determines when the searches will occur.

Company’s Response:

It is anticipated that, prior to commencement of construction, the environmental monitor and the Project construction team will determine the best times for wildlife searches to take place during the construction period. Installation of the perimeter silt fence will trigger the need for wildlife searches as this is a critical time when smaller mammals and herpetofauna have the potential to be trapped within the work area. Wildlife searches will be conducted if the perimeter silt fence is damaged and requires repair, or during times of year when wildlife may be more active, for example during the spring vernal pool season. In addition to time of year, the various phases of construction will guide the timing and extent of wildlife searches required.

91. Referring to the fencing within the stormwater basins, what is the clearance from the bottom of the fence to the maximum basin ponding level?

Company’s Response:

Upon further review, and to avoid potential maintenance issues, the fence within the stormwater basins has been removed from the site design. The updated drawings on Sheet C-017 are provided in Attachment CSC-91.

92. Has CS met with the DEEP Stormwater Division since 2018? If so, when? Were modifications to the Stormwater Plan made after 2018 based on input from DEEP?

Company’s Response:

The Petitioner continues to prepare a Stormwater Pollution Control Plan and is working to schedule a pre-application meeting prior to filing its registration for a Construction General Permit.

93. What areas of the site are available to relocate solar panels in the event that DEEP Stormwater requests larger or additional stormwater basins in areas currently proposed for the solar array?

Company’s Response:

The Project area is constrained on space and there is no room to relocate panels without impacting resources or resource buffers. Larger or additional stormwater basins would likely result in a system size reduction.

94. What is the current status of the NDDB review?

Company’s Response:

Following recent correspondence with NDDB regarding botanical resources, the Petitioner has received a letter from the Program, dated May 28, 2020, indicating a Final Determination is currently in draft, and will include a condition to avoid impacts to areas mapped as Hinckley soils. This condition is intended to protect botanical resources that have the potential to occur on site including low frostweed (*Crocianthemum propinquum*) and Allegheny plum (*Prunus alleghaniensis*).

The Petitioner submitted a response to NDDDB on June 1, 2020, providing the results of the site-specific soil survey completed within the proposed development area in December 2019. The results of this survey depict the areas mapped as Hinckley soils and provides a more accurate representation of soils on site in comparison to the soil mapping available through online resources. Based on the results of the 2019 survey, Hinckley soils are mapped along the steeper slopes on the western boundary of the Project where development is not proposed; additionally, there is one area mapped as Hinckley soils that occurs in an agricultural field. The presence of this soil type within the active agricultural field indicates this area has a very low probability of supporting either species. The Petitioner proposes not avoiding the soils in this area.

The Petitioner has not received a response from NDDDB since the June 1 submission. Attachment CSC-94 includes a copy of the recent correspondence between NDDDB and the Petitioner.

95. Is a project construction laydown area proposed? If so, provide the location, dimensions, and substrate. Would it include office trailers and portable sanitary facilities?

Company's Response:

There is currently no official laydown area proposed. There is limited availability of space for laydown on site outside the footprint of the Project. The current plan is to manage deliveries and equipment storage in a manner that minimizes construction impacts, provides an efficient use of the construction site, and maintains movement of equipment and materials around the site. Portable sanitary facilities will be available on site.

96. Would fuels be stored on site during construction? If so, where? Would a spill prevention and control plan be developed for the site?

Company's Response:

There is no plan for bulk storage of fuel on site during construction. Vehicle and equipment storage will be maintained on site in accordance with applicable regulations. A spill prevention plan will be developed if the quantity of fuel being stored on site mandates such a plan be developed.

Attachment CSC – 80

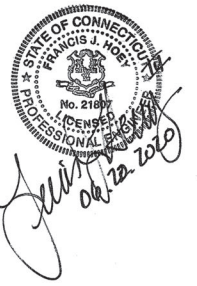
Site Plan Sheet C-024

C-022
C-024

MAP 1, BLOCK 78, LOT 100
N/F
AMY ZUROWSKI &
LYNN D. KAPSZUKIEWICZ
VOL 478, PAGE 645



Tighe & Bond
Engineers | Environmental Specialists



**PERMIT SET
NOT FOR
CONSTRUCTION**

**Constitution
Solar**

Constitution
Solar, LLC

Plainfield,
Connecticut

MARK	DATE	DESCRIPTION
1	06/16/2020	CSC COMMENT

PROJECT NO:	R0317-003
DATE:	03/23/2020
FILE:	Constitution Proposed PD.dwg
DRAWN BY:	ALG/ELD
CHECKED BY:	BSH/JEC
APPROVED BY:	FJH

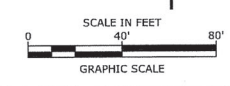
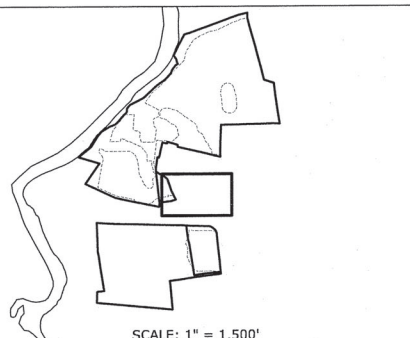
PROPOSED CONDITIONS -
10

SCALE: 1"=40'

C-024



Last Saved: 6/16/2020
Printed On: 6/16/2020 12:24pm By: AGIchrist
Tighe & Bond: J:\R0317_Ranger_Solar\Re-0317-3_Constitution\Drawings\Sheets\Permit Drawings\Constitution Proposed PD.dwg



Attachment CSC – 81

Representative Site Photos

Photo: 1

Description: View of Project site from Cornell Road near the driveway of 146 Cornell Road (looking west).



Photo: 2

Description: View of Project site from Cornell Road near the driveway of 146 Cornell Road (looking southwest).



Attachment CSC - 91

Site Plan Sheet C-017

MAP 1, BLOCK 78, LOT 46
N/F
STATE OF CONNECTICUT
VOL. 118, PG. 550
"SUGAR BROOK FARM"



Francis J. Hoy
06.22.2020



[Signature]
6/22/20

**PERMIT SET
NOT FOR
CONSTRUCTION**

**Constitution
Solar**

Constitution
Solar, LLC

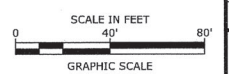
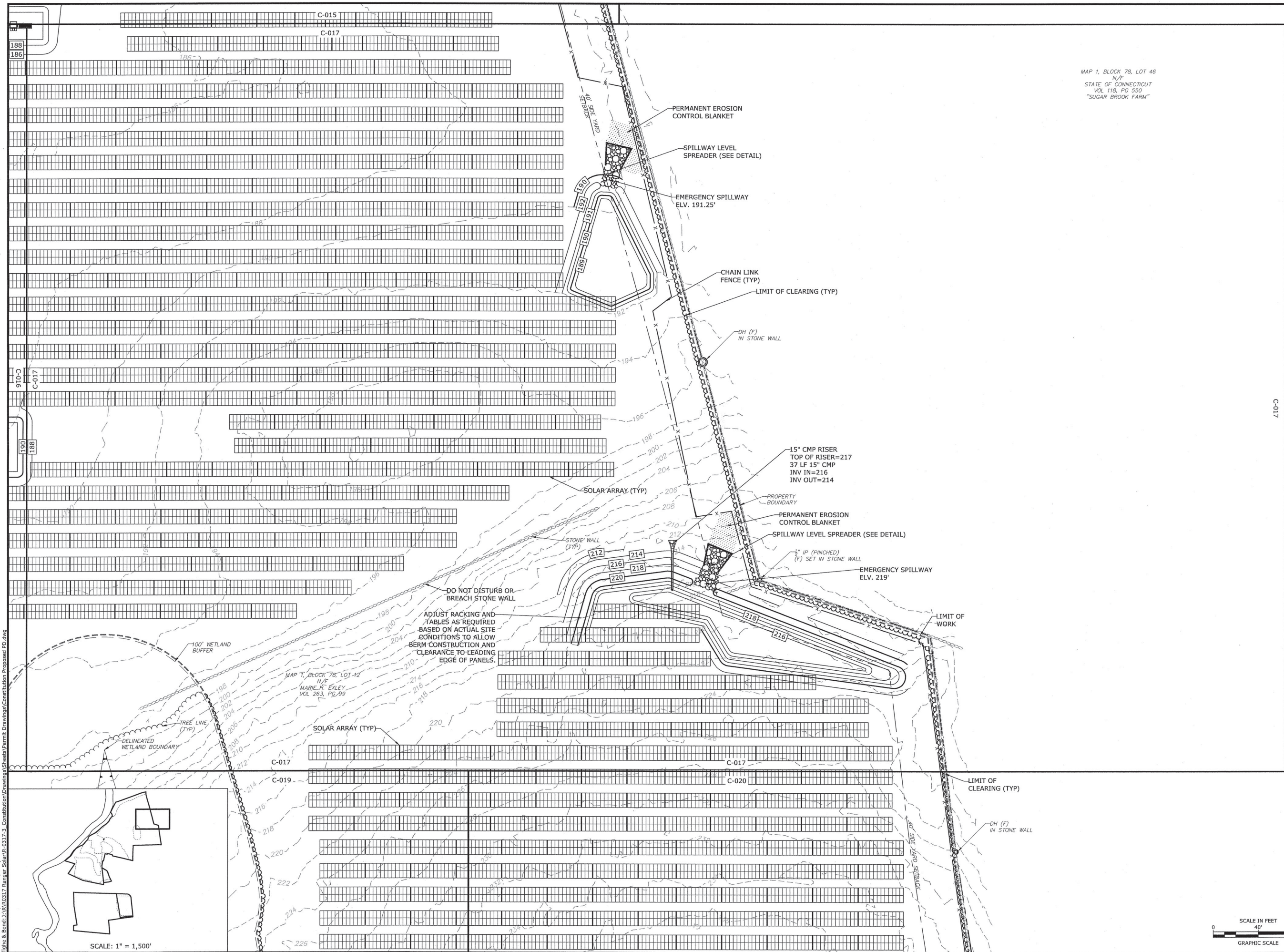
Plainfield,
Connecticut

MARK	DATE	DESCRIPTION
1	06/16/2020	CSC COMMENT
PROJECT NO: R0317-003		
DATE: 03/23/2020		
FILE: Constitution Proposed PD.dwg		
DRAWN BY: ALG/ELD		
CHECKED BY: BSH/JEC		
APPROVED BY: FJH		

PROPOSED CONDITIONS -
3

SCALE: 1"=40'

C-017



Last Saved: 6/16/2020 12:12:12pm By: AGI/ehriet
 Plotted On: Jun 16, 2020 12:12:12pm By: AGI/ehriet
 Tighe & Bond: 31.16.2020 12:12:12pm By: AGI/ehriet

SCALE: 1" = 1,500'

Attachment CSC – 94

Constitution Solar Recent Correspondence with NDDB Program

- May 28, 2020 – Letter received from NDDB
- June 1, 2020 – Response to NDDB from the petitioner, including the results of the December 2019 soil survey

May 28, 2020

Katelin Nickerson
TetraTech, Inc.
451 Presumpscot Street
Portland ME 04103
Katelin.nickerson@tetrattech.com

Re. NDDDB 201905175 Constitution Solar Project

Katelin;

I have been in communication with Dawn and reviewed the most recent material related to the Constitution Solar Project.

Thank you for providing the *Agalinis acuta* survey results and report; we accept the findings relative to this species and additional Agalinis-specific protection measures will not be required. Because this is a federally listed species, you may need to consult with the US Fish and Wildlife Service; their website will offer guidance as to whether consultation is required.

I would like to take this opportunity to clarify any NDDDB program expectations that you may have felt were not clearly articulated in our conversations regarding the *Agalinis*. As you are aware, Preliminary Assessment 201706152 noted two additional plant species; low frostweed (*Crocianthemum propinquum*) and Allegheny plum (*Prunus alleghaniensis*), with the latter species believed to be extirpated. That preliminary assessment included instructions to survey and submit results including the following information:

1. Survey date(s) and duration
2. Site descriptions and photographs
3. List of component vascular plant species within the survey area (including scientific binomials)
4. Data regarding population numbers and/or area occupied by State-listed species
5. Detailed maps of the area surveyed including the survey route and locations of State-listed species
6. Statement/résumé indicating the biologist's qualifications
7. Conservation strategies or protection plans that indicate how impacts may be avoided for all state-listed species present on the site.
8. Please be sure when you hire a consulting qualified biologist to help conduct this site survey that they have the proper experience with target taxon and have a CT scientific collectors permit to work with state listed species for this specific project.

These two species have not been sufficiently addressed thus far. The Environmental Site Conditions report submitted in September, 2019 included a list of plant species observed during field surveys, but did not include survey dates, duration, or maps of survey routes. The report did not indicate who conducted the surveys, and a botanist resume was not included.

The text discussion of both species indicate that they are not expected to occur due to the absence of documentation within Windham County (Allegheny plum and low frostweed), and that it was not observed during on-site wetland delineation surveys or other natural resources surveys (low frostweed). The plant reference material included in the Literature Cited section is limited to the New England Wildflower Society Go Botany website; with no other botanical reference provided, NDDDB assumes this is the source of the information. In fact, NDDDB has recent (5 years or less) documentation of low frostweed at multiple locations in Windham County.

Subsequent correspondence between NDDDB and TetraTech provided:

- survey dates (June 13-15, 2017, additional notes collected June 8, 2018, and additional info collected summer of 2020 during herpetofuana surveys)
- limited text description of survey routes: *"Site-specific botanical data were collected during wetland and watercourse delineations and other natural resource investigations. These surveys were conducted to evaluate habitats and associated botanical communities present at the site. Meander surveys were conducted throughout the entire Study Area."*

It is unclear from this description as to whether or not specific, targeted botanical surveys were implemented, or whether botanical information was gathered incidentally while other field work was being conducted.

Because the survey requirements provided in the Preliminary Assessment have not been met, and there is no indication that the conclusions drawn were prepared by a qualified Botanist, we cannot concur that the species is not present on site.

However, in order to further the process, the NDDDB program will issue a final determination; this determination will require protection of project areas that contain Hinckley soils, the most likely location for the listed low frostweed, should it be present on-site. Dawn will draft the determination letter and issue it shortly.

As we continue to conduct NDDDB reviews in the future, please insure that when listed species include the plant taxa, a qualified botanist, with the proper educational training and botanical experience is engaged in any required survey work and/or habitat assessment. While the background of a professional wetland scientist may provide some plant identification skills, this expertise is predominantly in soil knowledge and wetland delineation. A botanist is specifically trained in the foundational skill of plant identification and ecology; it's simply a different science, and for purposes of NDDDB survey report submissions, we do not consider wetland scientists to hold the botanical expertise needed.

Please feel free to call if you have any questions.

Robin Blum
Supervising Wildlife Biologist
CT DEEP Wildlife Division
(860) 424-4137
Robin.blum@ct.gov

From: [Nickerson, Katelin](#)
To: [Blum, Robin](#)
Cc: [DEEP Nddbrequest](#); [McKay, Dawn](#); [Dickson, Jenny](#); [Aguaze, Junior](#); [Flinn, Natalie](#)
Subject: RE: Constitution Solar Botanical Habitat Survey - NDDB Assessment #201905175
Date: Monday, June 01, 2020 1:36:00 PM
Attachments: [image004.png](#)
[image006.jpg](#)
[image007.jpg](#)
[Constitution Solar Soil Report 2_21_20 w attach.pdf](#)
[image002.jpg](#)

Robin,

Thank you for your email, and thank you for the clarification on NDDB expectations, as this represents a change from our other recent project work. We are working our best to get you the data you need to make informed decisions about this project, and we welcome the feedback.

We appreciate the Department's efforts to move this Request for Final Determination towards a conclusion. However, we do not believe that the proposal to avoid all Hinckley soils is appropriate. Low frostweed shares the same habitat as Sandplain agalinis, therefore, the results of the habitat survey this spring arguably applies to this species as well. Additionally, this species is more persistent and generally grow in clumps that would have been indefinable during the site visit this spring. Avoiding Hinckley soil would not necessarily protect for the potential presence of Alleghany plum.

A soil survey was completed for this site last fall to support the Project engineering. As a result, the areas mapped as Hinckley soils differ from what is shown on the USDA NRCS map of the site and should be considered as you develop the Final Determination. Generally, the Hinckley soils on site occur on the steeper slopes down to the Quinebaug River floodplain with a small pocket located in the agricultural field in the northern part of the site. A copy of this soils report is attached for your convenience. The areas of steeper slopes are not slated for development, and the agricultural field does not contain suitable habitat for any of the species listed in the preliminary site assessment.

If you are still uncomfortable with this assessment, we could mobilize our botanical team during the growing season this summer to assess for the presence of all three species. If this is satisfactory to you, please confirm that Mr. Gillman's botanical credentials are adequate, and the results of his surveys will be accepted by NDDB.

In the interim, we ask that NDDB issue a final determination contingent upon reviewing the results of the soil survey and/or a summer 2020 survey for low frostweed and Allegheny plum. In the event either species is found to be present (or any other sensitive botanical resource is documented at the site), Constitution Solar will prepare an Avoidance and Mitigation plan for NDDB's review. Again, in the event these species or suitable habitat is not observed at the site, no further mitigation should be necessary.

Please let us know if this proposal is sufficient to address any remaining issues. If so, we ask that the Department issue a Final Determination consistent with the proposal outlined herein.

Respectfully,

Katelin

Katelin Nickerson, PWS, CWS | Project Manager/Senior Wetland Scientist
Direct 207.358.2396 | Main 207.358.2400 | Cell 207.233.6175 | katelin.nickerson@tetrattech.com



From: Blum, Robin <Robin.Blum@ct.gov>
Sent: Thursday, May 28, 2020 4:14 PM
To: Nickerson, Katelin <Katelin.Nickerson@tetrattech.com>
Cc: DEEP Nddbrequest <DEEP.Nddbrequest@ct.gov>; McKay, Dawn <Dawn.McKay@ct.gov>
Subject: RE: Constitution Solar Botanical Habitat Survey - NDDB Assessment #201905175

⚠ CAUTION: This email originated from an external sender. Verify the source before opening links or attachments. **⚠**

Hello Katelin,

I hope you are doing well. Thank you for submitting the agalinis information; we have found this to be complete and no further protection measures will be required for this species.

I have drafted comments (attached) to address the additional plant species identified in the preliminary assessment and clarify NDDB requirement for plant survey work. While these plant species have not been adequately addressed, we will provide a final determination with no additional survey work needed, but with protection of areas with appropriate soils.

I'm hopeful that the attached comments do help clear up any confusion or lack of clarity as to the required components of a plant survey. Feel free to contact me if you have any questions (email is best these days).

Dawn is working on your final determination and will have it to you shortly.

Thanks,
Robin

Robin Blum
Wildlife Biologist
Wildlife Division
Bureau of Natural Resources
Connecticut Department of Energy and Environmental Protection
209 Hebron Road, Marlborough, CT 06447
P: 860.424.4137 | F: 860.295.8175 | E: robin.blum@ct.gov

**Site Specific Soil Report
for Constitution Solar Project,
Plainfield, Connecticut**

February 2020



Prepared for:

Tetra Tech
451 Presumpscot St.
Portland, Maine
04101

Prepared by:

Broadwater Environmental, LLC
18 Grand Street
South Portland, Maine
04106

Table of Contents

	Page
1.0 Introduction.....	3
2.0 Methodology.....	3
2.1 Soil Map Units.....	4
2.2 Wetland Survey and Hydric Soils.....	5
3.0 Summary of Findings.....	5
References.....	7

APPENDICES

Appendix A: Map Unit Descriptions

Appendix B: Soil Test Pit Logs

Appendix C: NRCS Soil Series Descriptions

Appendix D: Soil Maps

 D-1 NRCS Existing Soil Map

 D-2 Site Specific Soil Map for Stormwater Design

1.0 Introduction

NextEra Energy, Inc. is proposing construction of a solar farm on an area of land measuring approximately 95 acres in Plainfield, Connecticut. A majority of the land where the development is proposed is currently farmed and is located off of the north end of Cornell Road (see inset on revised soil map in Appendix D, Map D-2). Tetra Tech, Inc. (Tetra Tech) has been retained by NextEra Energy, Inc. to complete engineering and permitting of the proposed facility.

As part of the permitting process, Tetra Tech decided to have a review of the soils on the property conducted to support stormwater engineering calculations. Tetra Tech retained Broadwater Environmental, LLC (BE-LLC) of South Portland, Maine to complete the site-specific evaluation. Ian Broadwater, owner, is a Certified Soil Scientist (SS305) in Maine and meets the criteria the State of Connecticut uses to define a Soil Scientist but there is no certification process in Connecticut.

This site was surveyed for wetlands by Tetra Tech in 2017 and 2018. Information obtained during the wetland survey was used to supplement data collected during the site-specific soil evaluation fieldwork. The soil fieldwork indicates that wetland boundaries were consistent with hydric soil series boundaries as discussed in Section 3.0.

This report consists of this introduction, a discussion of the methodology used to complete the site-specific soil evaluation, and a discussion of the results including a revised soil map based on the observation made at the site. Four appendices are also attached to this document and they include:

- soil map unit descriptions,
- test pit logs,
- official published soil series description by the U.S. Natural Resource Conservation Service (NRCS), and
- a revised soil map.

2.0 Methodology

The evaluation consisted of reviewing the existing NRCS mapping on the NRCS's Web Soil Survey web site and the existing wetland and stream map of the site developed by Tetra Tech.

A field investigation was then planned and executed and included completion of 10 test pits (Appendix D, Map D-2) with an excavator and field reconnaissance of the map unit boundaries. A Global Positioning System (GPS), capable of submeter accuracy, was used to collect data on the location of the test pits and revised soil map unit boundaries, where observed.

Fieldwork was conducted over three days, from December 11th to December 13th, 2019. After a Dig Safe ticket was issued for the site, an excavation company was retained by BE-LLC to complete test pits on the proposed development site. Test pits were logged and then backfilled. An excavator was needed due to the high potential of contacting dense soils with coarse fragments. Before and after the test pits were completed, the soil map units depicted by NRCS

were reviewed in the field with a screw auger and/or Dutch auger. The depth of auger borings was limited in some map units due to dense soils with coarse fragments in soil profiles.

Interpreted revised soil unit boundaries were then located using the GPS. GPS data was then provided to Tetra Tech and a draft map was created showing the location of test pits and proposed revised boundaries. BE-LLC reviewed the map and drafted revised soil map that more accurately reflects the current conditions at the site.

The general field procedures used follow those of the National Soil Survey Handbook (NRCS, 2017). The soils mapped are established soil series used in the State of Connecticut by the NRCS as depicted in the state soil catena revised 2014.

After soil series boundaries and characteristics were interpreted, map unit descriptions were created specific to this site and they are provided in Appendix A. Soil test pit logs were completed and are provided in Appendix B. NRCS official soil series descriptions are contained in Appendix C. Appendix D, Map D-1 contains the existing NRCS soil map of the site and Appendix D, Map D-2 contains a revised soil map based on observations made during the field investigation.

2.1 Soil Map Units

The soil series interpretations provided are based on information in the soil series descriptions and technical information provided by the NRCS web soil survey (NRCS, 2020). All limitations and constraints invoked by the NRCS for such interpretations also apply to this soil evaluation and the revised map.

The map units observed are described in Appendix A. These descriptions are within the NRCS range for each official Soil Series Description unless otherwise noted. The taxonomic classification follows Keys to Soil Taxonomy (Soil Survey Staff, 2014). Information on soil morphology and physical characteristics were obtained from the NRCS website.

The soil map units used for this survey are consociations and complexes. Consociations are dominated by a single soil series and similar soils. A complex is two or more soils that are so intermingled that they cannot be mapped individually. One complex, Paxton and Montauk fine sandy loams, was used on the existing NRCS mapping and was retained and used on the revised map as well.

Several soil consociation map units are also used on the existing NRCS soil survey map and revised map, both contained in Appendix D. Consociations used on the NRCS map and the revised map include Woodbridge fine sandy loam, Windsor loamy sand, Hinckley loamy sand, Scarboro muck, and Sudbury sandy loam. The revised map also included consociations Ridgebury fine sandy loam, Leicester fine sandy loam and Deerfield loamy fine sand.

In accordance with the soil mapping standards, the map units will have a minimum of 75% of the named soil or similar soils. The named soil will be the most common of all similar soils. The total number of dissimilar soils in any one mapping unit for consociations should not exceed 25% of the map unit of which no more than 15% is limiting. Similar soils are alike in most properties and share similar limitations such as depth to water table or content of organic matter. Dissimilar soils do not share limits of some important diagnostic properties of the named soil and

may have different use or management requirements for a particular land use. It is important to note that some dissimilar soils are more limiting in their use than the named soil. For instance, an inclusion of poorly drained soils can occur within a moderately well-drained soil map unit.

Slope phases, when pertinent, are designated with a letter at the end of the map unit symbol. Designation may be A through E which refers to slope class. The topographic slope class range for each series is shown on the map legend. Several slope ranges were expanded from the State of Connecticut listed series slope class to reflect conditions by the topographic data. The soil series with expanded ranges are noted in the legend on the map (Appendix D, Map D-2).

2.2 Wetland Survey and Hydric Soils

In preparation for this project, a wetland survey was conducted by Tetra Tech in 2017 and 2018. Some flagging was still present during the soil survey fieldwork. Delineated wetlands were, in general, found to coincide with the hydric-nonhydric soil boundaries. Hydric soils refer to those soil series the NRCS considers to be either poorly or very poorly drained. Areas of hydric soils are defined as wetlands in the State of Connecticut.

3.0 Summary of Findings

The following summarizes the results of the soil survey. In general, the site has gentle to moderate slopes and is agricultural field used for growing corn. On the west side of the site is the Quinebaug River. Slopes along the river edge are generally severe measuring over 45% in some locations. There are several areas of hydric soils (i.e., wetlands) that were identified by Tetra Tech and confirmed during this evaluation. Tetra Tech also mapped several stream segments and they are shown on the revised soil map in Appendix D, Map D-2.

There were four areas of the site that notable changes to the existing NRCS mapping were made based on the site-specific evaluation. These are discussed below.

Area 1- This area is in the northeast corner of the project area around TP-1. The NRCS had mapped this area as Hinckley loamy sand and it was found to be Windsor loamy sand. Therefore, the boundary of between the Hinckley and Windsor map units was moved north, closer to the edge of a severe slope that showed characteristics of a Hinckley. Area 1 is shown on the NRCS map contained in Appendix D, Map D-1.

Area 2- The existing NRCS mapping showed a fairly extensive map unit of Scarboro muck on the west side of the site. This area is noted on the existing NRCS mapping in Appendix D, Map D-1. Instead of Scarboro, the soils within a wetland on the east side of the Scarboro map unit resembled Leicester fine sandy loam and not Scarboro muck.

The Windsor loamy sand map unit depicted on the NRCS map, west of the Scarboro muck unit, was found to be slightly more extensive than shown. To the south of the Windsor map unit, an area mapped as Hinckley loamy sand on the NRCS map was found to resemble a Deerfield fine loamy sand as there were no appreciable coarse fragments in the top 30 inches. Adjacent, a map unit of Sudbury was included on the site-specific soil map. Although the soil was coarser than a typical Sudbury, it was moderately well drained which is the typical condition of Sudbury and not the typical drainage condition of Hinckley (excessively drained).

Area 3-Woodbridge fine sandy loam in the large central field was found to be less extensive than mapped by the NRCS. Instead, Ridgebury fine sandy loam was found to be more prevalent in the central field around what appears to be a man-made drainage. Area 3 is labeled on the NRCS map in Appendix D, Map D-1.

Area 4-In the southern field, Ridgebury fine sandy loam in a somewhat poorly drained condition was found throughout but this area had been mapped as Woodbridge fine sandy loam. The change in soil types on the revised map reflects more accurately the drainage condition observed in the field (somewhat poorly drained versus moderately well drained). Area 4 is the southern field and is highlighted on Appendix D, Map D-1.

In conclusion, the revised soil map contained in Appendix D, Map D-2 should more accurately reflect the soil series present at the site as it was supported with current field data, and interpreted boundaries were located with an accurate GPS.

References

NRCS, 2020. Web Soil Survey at www.websoilsurvey.sc.egov.usda.gov, Natural Resource Conservation Service, 2017.

NRCS, 2017. “National Soil Survey Handbook”, Natural Resource Conservation Service, 2017.

Soil Survey Staff, 2014. “Keys to Soil Taxonomy”, Natural Resource Conservation Service, 2014.

APPENDIX A-MAP UNIT DESCRIPTIONS

Appendix A

Soil Map Unit Descriptions

Ridgebury fine sandy loam (SWP) - This map unit contains Ridgebury fine sandy loam in a somewhat poorly drained condition as the primary series in the unit. Ridgebury fine sandy loam is one of a few series that spans two drainage classes; somewhat poorly drained and poorly drained. Dissimilar soils that may occur in this unit would include Ridgebury fine sandy loam in a poorly drained condition or Whitman loam a very poorly drained soil.

Ridgebury fine sandy loam (PD) - This map unit contains Ridgebury fine sandy loam in a poorly drained condition as the primary series. Areas mapped as Ridgebury (PD) are wetlands as defined by the State of Connecticut. Ridgebury fine sandy loam is one of a few series that spans two drainage classes; somewhat poorly drained and poorly drained. Dissimilar soils that may occur in this unit would include Ridgebury fine sandy loam in a somewhat poorly drained condition. Similar soils that may occur include Whitman loam, a very poorly drained soil.

Leicester fine sandy loam-This map unit is dominated by Leicester fine sandy loam, a poorly drained soil. Dissimilar soils that may occur in this map unit include Sutton or Woodbridge fine sandy loams. It may also continue Ridgebury in a somewhat poorly or poorly drained condition with the later being a similar soil.

Scarborough muck-This map unit contains Scarborough muck in a very poorly drained condition as the primary series. Similar series that may also be present include Walpole sandy loam, a poorly drained soil. Dissimilar soils may in this map unit include Sudbury fine sandy loam or Deerfield loamy fine sand.

Sudbury sandy loam-This soil series, similar to Ridgebury, spans two drainage classes; moderately well drained and somewhat poorly drained. It is estimated that most of the Sudbury soil series observed on this site was in a moderately well drained condition. Similar soils that may occur in the map unit include Sudbury in a somewhat poorly drained condition. and potentially small inclusions of Hinckley loamy sand. Dissimilar soils in this map unit may include the poorly drained Walpole series, very poorly drained Scarborough muck or excessively drained Hinckley loamy sand.

Deerfield loamy fine sand-This map unit is dominated by Deerfield fine loamy sand, a moderately well drained soil. Other dissimilar soils that may occur in this map unit include Windsor loamy sand which is excessively drained and small inclusions of Scarborough muck, a very poorly drained soil.

Windsor loamy sand-This map unit is dominated by Windsor loamy sand and may contain the dissimilar soils Deerfield fine loamy. Similar soils that may be present in small inclusion include Hinckley loamy sand.

Hinckley loamy sand-This map unit occurs along the steep slopes to the Quinebaug River and on the east side of the northern most field. Similar soils that may occur in the unit include Merrimac loamy sand and Windsor loamy sand. Small inclusions of the dissimilar soils, Walpole and Scarborough may also be present.

Woodbridge fine sandy loam- This map unit contains Woodbridge fine sandy loam as the primary series with potential inclusions of the similar soils Ridgebury fine sandy loam in a somewhat poorly drained condition and Paxton sandy loam, a well drained soil.

Paxton and Montauk fine sandy loams- In this complex, Paxton sandy loam and Montauk loam occur in irregular patterns that make them too hard to map individually. Within this map unit, very stony phases of Paxton and Montauk may be encountered. The similar soil series, Woodbridge fine sandy loam. Dissimilar soils in this map unit may include Ridgebury fine sandy loam in a somewhat poorly drained or poorly drained condition, Leicester fine sandy loam or Whitman loam may also be present in small percentages.

APPENDIX B-TEST PIT LOGS

Attachment B

Test Pit Logs

TP-1

0"-10" 10YR 3/2 fine loamy sand, v. friable, 10% fine to medium roots, moist

10"-17" 7.5YR 5/6 fine loamy sand, v. friable, organic matter staining on grains in upper 2" of horizon, moist

17"-29" 7.5YR 6/6 fine loamy sand, friable, moist

29"-48" Salt and pepper colored loamy sand with 15% coarse fragments as fine to coarse gravel and cobbles, iron nodules present at 32" below ground surface (bgs), moist

TP-2

0"-6" 10YR 3/2 fine loamy sand, friable, 15% fine- medium roots, moist

6"-11" 7.5YR 5/8 fine loamy sand, friable, weak granular structure, moist

11"-25" 10YR 5/6 fine loamy sand, friable, moist

25"-43" 10YR 7/2 loamy sand, medium, poorly graded, very friable, weak granular structure, faint bands of iron staining at 27"

43"-50" 7.5YR 5/6 loamy sand with 15% coarse fragments as gravel and cobbles (rounded), moist

TP-3

0"-6" 10YR 3/2 fine loamy sand, friable, 10% fine roots, moist

6"-10" 7.5YR 6/6 fine loamy sand, friable, weak granular structure, moist

10"-16" 7.5YR 6/8 fine loamy sand, friable, weak granular structure, moist

16"-24" 2.5Y 6/4 fine loamy sand with 20% coarse fragments as rounded gravel and cobbles, dense, moist

24"-48" Salt/pepper gravelly sand (rounded gravel), 15% cobbles, dense, redox concentrations of 7.5YR 6/8 common at 44"; moist

TP-3A

0"-5" 10YR 3/2 sandy loam with 15% coarse fragments as f-c gravel, friable, moist

5"-11" 7.5YR 5/6 sandy loam with 15% coarse fragments as f-c gravel, friable, moist

11"-22" 10YR 5/4 loamy sand with 20% coarse fragments as gravel and cobbles, dense, moist

22"-50" Salt and pepper gravelly sand with 10% cobbles; dense, moist, iron staining on rock and sand grains at 35" and lenses of staining below

TP-4

0"-7" 10YR 3/2 fine loamy sand, friable, 10% fine roots, moist

7"-32" 10YR 5/6 fine loamy sand, friable, micro-channels in profile face, weak granular structure, moist, common redox depletions of 10YR 7/2 (large) at 30" bgs

32"-49" 2.5Y 4/3 loamy sand with 10% coarse fragments as rounded f-m gravel, dense, moist-saturated but no free water

TP-5

0"-7" 10YR 3/2 loamy sand, friable, 15% fine roots, moist

6"-16" 10YR 5/4 loamy sand with 5% f-m gravel, friable, micro-channels with organic matter or Mn staining, weak granular structure, moist, common redox depletions of 10YR 7/1 at 11" bgs

16"-28" 10YR 4/3 loamy sand, friable, weak granular structure, moist

28"-45" 10YR 4/4 loamy sand, dense, platy structure, free water seeping out of profile at 28" bgs

45"-50" Salt and pepper gravelly sand with 15% cobbles; dense, moist, no free water

TP-7

0"-9" 10YR 2/2 fine loamy sand, friable, 15% fine roots, moist

9"-23" 10YR 5/8 fine loamy sand, friable, weak granular structure, moist

23"-29" 2.5Y 6/2 fine loamy sand, dense, moist, common redox concentrations of 7.5YR 5/8 at 24" bgs, depletions of 10YR 7/1 also present

16"-24" 2.5Y 6/4 fine loamy sand with 20% coarse fragments as rounded gravel and cobbles, dense, moist

24"-49" 10YR 4/3 loamy sand with 30% coarse fragments as gravel and cobbles, dense, moist, water seep at 32" bgs on pit wall

TP-8

0"-9" 10YR 3/2 fine loamy sand, friable, 10% fine roots, moist

9"-20" 7.5YR 5/6 loamy sand, friable, 10% fine roots, moist

20"-42" 7.5YR 5/8 loamy sand with 10% coarse fragments as rounded f-m gravel, loose and single grained, moist, redox concentrations of 5YR 5/8 at 38" and depletions of 10YR 7/1 common

42"-50" 7.5YR 5/6 coarse loamy sand dense, moist-saturated, water seep at 43" bgs

TP-9

0"-5" 10YR 3/2 fine sandy loam, friable, granular structure, 30% fine roots, moist

5"-9" 10YR 4/6 fine sandy loam with 10% coarse fragments as f-c gravel, friable, moist

9"-17" 10YR 5/6 sandy loam with 20% coarse fragments, friable, redox concentrations of 7.5 YR 5/8 and depletions of 10YR 7/1 are common at 11" bgs, moist

17"-31" 10YR 2/1 mucky loam, massive, moist-saturated, 10% fine roots, possible buried horizon

31"-50" 10 YR 5/4 sandy loam with 25% coarse fragments as f-c gravel and cobbles, dense, water seep at 31" bgs

TP-10

0"-7" 10YR 3/2 fine sandy loam, friable, granular structure, 10% fine roots, moist

7"-17" 10YR 4/4 fine sandy loam, friable, worm/root tunnel, trace fine roots, depletions of 10YR 7/1 are common at 15"; moist

17"-29" 10YR 6/4 sandy loam, friable, redox concentrations of 7.5 YR 5/6 are common, moist

29"-50" 10 YR 5/3 sandy loam, 20% coarse fragments as f-c gravel, dense, moist

Water flowing out of the profile at 30" bgs

APPENDIX C-NRCS OFFICAL SERIES DESCRIPTIONS

LOCATION DEERFIELD

MA+CT ME NH NY RI VT

Established Series
Rev. CAW-MFF-JTI
05/2018

DEERFIELD SERIES

The Deerfield series consists of very deep, moderately well drained soils formed in glaciofluvial deposits. They are nearly level to strongly sloping soils on terraces, deltas, and outwash plains. Slope ranges from 0 to 15 percent. Saturated hydraulic conductivity is high or very high. Mean annual temperature is about 9 degrees C. and mean annual precipitation is about 1194 mm.

TAXONOMIC CLASS: Mixed, mesic Aquic Udipsamments

TYPICAL PEDON: Deerfield loamy fine sand in a hayfield at an elevation of about 19 meters. (Colors are for moist soil.)

Ap --0 to 23 cm; very dark brown (10YR 2/2) loamy fine sand; weak fine and medium granular structure; very friable; common fine roots; moderately acid; abrupt smooth boundary. (15 to 30 cm thick)

Bw1 --23 to 43 cm; strong brown (7.5YR 5/6) loamy fine sand; weak fine and medium granular structure; very friable; common fine roots; moderately acid; clear smooth boundary.

Bw2 --43 to 64 cm; yellowish brown (10YR 5/6) loamy fine sand; weak fine granular structure; very friable; few fine faint brownish yellow (10YR 6/6), moist, masses of oxidized iron accumulation; strongly acid; clear wavy boundary. (Combined thickness of the Bw horizons is 13 to 69 cm.)

BC --64 to 84 cm; yellowish brown (10YR 5/6) fine sand; single grain structure; loose; common fine and medium distinct strong brown (7.5YR 5/8) masses of oxidized iron accumulation and common fine and medium distinct light brownish gray (10YR 6/2) iron depletions; strongly acid; clear broken boundary. (0 to 51 cm thick)

C1 --84 to 102 cm; light brownish gray (10YR 6/2) stratified sand and fine sand; single grain structure; loose; common fine prominent strong brown (7.5YR 5/8) masses of oxidized iron accumulation; strongly acid; clear wavy boundary.

C2 --102 to 152 cm; light brownish gray (10YR 6/2) stratified sand and gravelly sand; single grain structure; loose; common fine and medium prominent strong brown (7.5YR 5/8) masses of oxidized iron accumulation; 10 percent rounded fine granite and quartzite gravel; very strongly acid; individual strata contain up to 20 percent gravel.

TYPE LOCATION: Essex County, Massachusetts; Town of Andover, 2,525 feet north-northwest (345 deg) of the intersection of Laurel Lane and Old River Road, in a hayfield. USGS Lawrence, Massachusetts topographic quadrangle; Lat. 42 degrees 41 minutes 49.57 seconds N. and long. 71 degrees 12 minutes 52.52 seconds W., WGS 84.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 38 to 100 cm. Gravel, generally fine gravel, ranges from 0 to less than 15 percent in the solum and 0 to 20 percent in the substratum. Reaction ranges from extremely acid through slightly acid unless limed. Iron depletions with chroma of two or less are between depths of 38 and 100 cm from the mineral soil surface.

The O horizon, where present, has a hue of 5YR to 10YR, value of 2 to 3, and chroma of 1 to 3. It is slightly to highly decomposed plant material.

The Ap horizon has hue of 7.5YR or 10YR, value of 2 to 4, and chroma of 1 to 3. It is fine sandy loam, sandy loam, loamy fine sand, loamy sand, fine sand, or sand. Undisturbed pedons commonly have an O horizon and a thin sequence of A, E, and Bs, Bhs or Bh horizons. They may also have an AB or AE horizon. The Ap or A horizon has weak or moderate very fine to medium granular structure and is friable or very friable.

The Bw horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 3 to 6. Texture of the upper part of the Bw horizon, within a depth of 25 cm from the soil surface, has the same range as the A horizon. Below 25 cm the texture is loamy fine sand, loamy sand, fine sand, sand or coarse sand. Structure is weak, very fine to medium granular or subangular blocky, or is single grain. Moist consistence is friable, very friable, or loose.

The BC horizon has hue of 7.5YR to 2.5Y, value of 3 to 6, and chroma of 2 to 4. Texture range is the same as the lower part of the Bw horizon. Structure is weak, very fine to medium subangular blocky, or is single grain. Moist consistence is friable, very friable, or loose.

The C horizon has hue of 7.5YR to 5Y, value of 4 to 6, and chroma of 1 to 4. Texture is loamy fine sand, loamy sand, fine sand, sand or coarse sand. Stratified textures of these textures and gravel, coarse sand, or loamy coarse sand are present in some pedons. It is single grain or massive. Moist consistence is friable, very friable or loose.

COMPETING SERIES: These are the [Algansee](#), [Altmar](#), [Birchwood](#), [Brems](#), [Brockatonorton](#), [Elnora](#), [Fortress](#), [Livonia](#), [Meckling](#), [Morocco](#), [Ottokee](#), [Partridge](#), [Succotash](#), [Tedrow](#), and Zaborowsky series. The Algansee, Brems, Brockatonorton, Meckling, Morocco, Ottokee, Partridge, Tedrow, and Zaborowsky soils are from outside of region R. Algansee soils have an irregular decrease of organic matter with depth. Altmar soils have rock fragments dominated by sandstone. Birchwood soils formed in sandy sediments over glacial till. Brems and Ottokee soils have sola more than 100 cm thick, and Ottokee soils have lamellae. Elnora soils contain more fine sand in the lower part of the series control section. Fortress soils formed in anthropotransported soil material from eolian sand, outwash, ordredging activities. Livonia soils formed in glaciolacustrine parent material with neutral to moderately alkaline reaction and average less than 960 mm of annual precipitation. Meckling soils are calcareous throughout. Morocco soils have redox features within a depth of 38 cm. Partridge soils have bedrock at depths of 50 to 100 cm. Succotash soils formed in sandy eolian and/or marine overwash deposits. Tedrow and [Zaborosky](#) soils have carbonates.

GEOGRAPHIC SETTING: Deerfield soils are level to strongly sloping soils on outwash terraces, outwash deltas, and outwash plains. Slope gradients are commonly 0 to 3 percent, but range to 15 percent. The soils formed in thick deposits of sand derived mainly from granite, gneiss and quartzite, but in places containing materials from schist and sandstone. The sand is poorly graded; medium sand is generally dominant and typically contains little or no gravel. The mean annual precipitation typically ranges from 965 to 1397 mm but the range includes as low as 660 mm in some places east of Adirondack Mountains in the Champlain Valley of New York. The mean annual temperature ranges from 7 to 11 degrees C. The frost-free period ranges from 120 to 200 days.

GEOGRAPHICALLY ASSOCIATED SOILS: Deerfield soils are in a drainage sequence that includes the excessively drained [Carver](#) and [Windsor](#) soils, the somewhat poorly drained [Wareham](#) and [Pipestone](#) soils, and the very poorly drained [Scarboro](#) soils. The well drained [Agawam](#), moderately well drained [Ninigret](#), and poorly drained [Walpole](#) soils are terrace associates that are loamy over stratified sand and gravel. The somewhat excessively drained [Merrimac](#) and the excessively drained [Hinckley](#) and [Penwood](#) soils are on nearby glaciofluvial landforms and have sandy and gravelly substrata. The excessively drained [Plymouth](#), somewhat excessively drained [Gloucester](#), well drained [Canton](#), [Charlton](#), [Cheshire](#), [Essex](#) and [Paxton](#), and moderately well drained [Woodbridge](#) soils are on nearby glacial till uplands.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Moderately well drained. Runoff is

negligible to low. Saturated hydraulic conductivity is high or very high.

USE AND VEGETATION: Mainly cleared and used for truck crops, tobacco, potatoes, hay, pasture and silage corn. Forested areas have pitch pine, white pine, gray birch, red maple, oaks, and sugar maple. Many areas are in urban uses.

DISTRIBUTION AND EXTENT: New Hampshire, Vermont, Maine, Massachusetts, Rhode Island, Connecticut, and New York. (MLRAs 101, 142, 144A, 144B, 145, and 149B) The soils of this series are moderately extensive.

SOIL SURVEY REGIONAL OFFICE (SSRO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Franklin County, Massachusetts, 1964.

REMARKS: Diagnostic horizons and features recognized in this pedon include:

Ochric epipedon - the zone from 0 to 23 cm (Ap horizon).

Redox depletions with chroma of 2 or less - the zone from 64 to 152 cm. (BC, Cg1, and Cg2 horizons).

ADDITIONAL DATA: Full characterization data for pedons with User Pedon IDs of S1959MA005001, S1970MA011004, S1991MA023005, S2005CT003003, and S2013NY085002. Pedons analyzed by the KSSL, Lincoln, NE. The laboratory characterization data for these pedons and similar soils is available through the National Cooperative Soil Survey Soil Characterization Database: <http://ncsslabdatamart.sc.egov.usda.gov/>

National Cooperative Soil Survey
U.S.A.

LOCATION HINCKLEY

MA+CT ME NH NJ NY RI VT

Established Series
Rev. CAW-SMF-DCP
08/2017

HINCKLEY SERIES

The Hinckley series consists of very deep, excessively drained soils formed in glaciofluvial materials. They are nearly level through very steep soils on outwash terraces, outwash plains, outwash deltas, kames, kame terraces, and eskers. Saturated hydraulic conductivity is high or very high. Slope ranges from 0 to 60 percent. Mean annual temperature is about 7 degrees C, and mean annual precipitation is about 1143 mm.

TAXONOMIC CLASS: Sandy-skeletal, mixed, mesic Typic Udorthents

TYPICAL PEDON: Hinckley loamy sand in woodland at an elevation of about 240 meters. (All colors are for moist soil.)

Oe -- 0 to 3 cm; moderately decomposed plant material derived from red pine needles and twigs. (0 to 5 cm thick.)

Ap -- 3 to 20 cm; very dark grayish brown (10YR 3/2) loamy sand; weak fine and medium granular structure; very friable; many fine and medium roots; 5 percent fine gravel; very strongly acid; abrupt smooth boundary. (3 to 25 cm thick.)

Bw1 -- 20 to 28 cm; strong brown (7.5YR 5/6) gravelly loamy sand; weak fine and medium granular structure; very friable; common fine and medium roots; 20 percent gravel; very strongly acid; clear smooth boundary.

Bw2 -- 28 to 41 cm; yellowish brown (10YR 5/4) gravelly loamy sand; weak fine and medium granular structure; very friable; common fine and medium roots; 25 percent gravel; very strongly acid; clear irregular boundary. (Combined thickness of the Bw horizon is 8 to 41 cm.)

BC -- 41 to 48 cm; yellowish brown (10YR 5/4) very gravelly sand; single grain; loose; common fine and medium roots; 40 percent gravel; strongly acid; clear smooth boundary. (0 to 13 cm thick)

C -- 48 to 165 cm; light olive brown (2.5Y 5/4) extremely gravelly sand consisting of stratified sand, gravel and cobbles; single grain; loose; common fine and medium roots in the upper 20 cm and very few below; 60 percent gravel and cobbles; moderately acid.

TYPE LOCATION: Worcester County, Massachusetts; Town of Petersham, Harvard Forest, 240 feet north of Tom Swamp Road at a point 1.15 miles east of the intersection of Athol Road and Tom Swamp Road. USGS Athol, MA topographic quadrangle, Latitude 42 degrees, 30 minutes, 41.8 seconds N., and Longitude 72 degrees, 12 minutes, 28.9 seconds W., NAD 1983.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 30 to 87 cm. Rock fragment content of the solum ranges from 5 through 50 percent gravel, 0 through 30 percent cobbles, and 0 through 3 percent stones. Rock fragment content of individual horizons of the substratum ranges from 10 through 55 percent gravel, 5 through 25 percent cobbles, and 0 through 5 percent stones. In some places gravel content throughout the soil ranges up through 75 percent. The soil ranges from extremely acid through moderately acid, except where limed.

The O horizons, where present, consist of slightly, moderately, and/or highly decomposed plant material. They have hue N or 2.5YR through 7.5YR, value of 2 or 3, and chroma of 0 through 3.

The Ap horizon has hue of 7.5YR or 10YR, value of 2 through 4, and chroma of 1 through 4. Texture of the fine-earth fraction is very fine sandy loam, fine sandy loam, sandy loam, coarse sandy loam, loamy fine sand, loamy sand, or loamy coarse sand. Structure is weak or moderate very fine through coarse granular or subangular blocky. Consistence is friable or very friable. Undisturbed areas have an A horizon that has hue of 10YR, value of 2 or 3, and chroma of 1 through 4.

Some pedons have thin E, Bhs, Bh, or Bs horizons below the A horizon.

The upper part of the Bw horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 3 through 8. The lower part has hue of 7.5YR through 2.5Y, value of 3 through 6, and chroma of 3 through 8. Texture, to a depth of 25 cm from the surface, is fine sandy loam, sandy loam, coarse sandy loam, loamy fine sand, loamy sand, or loamy coarse sand in the fine-earth fraction. Below 25 cm it is loamy fine sand, loamy sand, loamy coarse sand, fine sand, sand, or coarse sand in the fine-earth fraction. Structure commonly is weak fine and/or medium granular or the horizon is structureless, but ranges through weak subangular blocky in some places. It is very friable, friable, or loose.

Some pedons have a BC horizon with characteristics similar to both the B and 2C horizons.

The C horizon has hue of 7.5YR through 5Y, value of 3 through 7, and chroma of 2 through 8. Texture is loamy fine sand, loamy sand, loamy coarse sand, fine sand, sand or coarse sand in the fine-earth fraction, and is stratified.

COMPETING SERIES: These are the [Bonaparte](#), [Manchester](#), [Mecosta](#), [Multorpor](#), [Otisville](#), [Quonset](#), and [Rikers](#) series. Mecosta and Multorpor soils are from outside [Land](#) Resource Region R. Bonaparte soils have carbonates within a depth of 100 cm. Manchester soils have 5YR or redder hue in the Bw and C horizons. Mecosta soils are calcareous and Multorpor soils do not have Bw horizons. Otisville soils have rock fragments dominated by sandstone, shale, and slate. Quonset soils have rock fragments dominated by phyllite, slate, and shale. Rikers soils have carboliths in the soil.

GEOGRAPHIC SETTING: Hinckley soils are nearly level through very steep soils on outwash terraces, outwash plains, outwash deltas, kames, kame terraces, and eskers. Slope is generally 0 through 8 percent on tops of the terraces, outwash plains and deltas. Slope of 8 through 60 percent or more are on the kames, eskers and margins of the outwash plains, deltas, and terraces. The soils formed in glaciofluvial sand and gravel derived principally from granite, gneiss, and schist. Mean annual temperature ranges from 7 to 13 degrees C, and mean annual precipitation ranges from 1016 to 1270 mm. Length of the growing season ranges from 140 through 240 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Agawam](#), [Canton](#), [Charlton](#), [Deerfield](#), [Essex](#), [Gloucester](#), [Horseneck](#), [Mashpee](#), [Massasoit](#), [Merrimac](#), [Paxton](#), [Pompton](#), [Riverhead](#), [Scarboro](#), [Sudbury](#), [Walpole](#), [Wareham](#), and [Windsor](#) soils on nearby landscapes. Horseneck, Pompton, and Riverhead soils are commonly associates in the extreme southern portions of MLRA 144A. Agawam, Merrimac, and Riverhead soils are similar to Hinckley soils, but have cambic horizons. Canton, Charlton, Essex, Gloucester, and Paxton soils formed in till. Deerfield, Horseneck, and Sudbury soils are moderately well drained and Horseneck and Sudbury soils have Cambic horizons. Pompton soils have Cambic horizons and are moderately well and somewhat poorly drained. Scarboro soils are very poorly drained. Windsor soils have less than 15 percent rock fragments. Mashpee and Massasoit soils are poorly drained with spodic horizons. Walpole and Wareham soils are poorly drained.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Excessively drained. Surface runoff is negligible through low. Saturated hydraulic conductivity is high or very high.

USE AND VEGETATION: Cleared areas are used for hay, pasture, and silage corn. In the southern Connecticut River Valley, Hinckley soils are used for growing tobacco and truck crops and in eastern Massachusetts, truck crops. Most areas are forested, brush land or used as urban land. Northern red, black, white, scarlet and scrub oak, eastern white and pitch pine, eastern hemlock, and gray birch are the common trees. Unimproved pasture and idle land support hardhack, little bluestem, bracken fern, sweet fern, and low bush blueberry.

DISTRIBUTION AND EXTENT: Connecticut, southern Maine, Massachusetts, New Hampshire, northern New Jersey, New York, Rhode Island, and Vermont. MLRA's 101, 141, 142, 144A, 145, and 149B. The series is extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Oneida County, New York, 1913.

REMARKS: The use of the Hinckley series in frigid areas of Maine, and in MLRA 143 and 144B, is relic to before temperature classes. These have been removed from the SC file.

Diagnostic horizons and features recognized in this pedon are:

1. Ochric epipedon - the zone from 3 to 20 cm (Ap horizon).
2. Sandy-skeletal feature - the zone from 25 to 100 cm has a weighted average content of rock fragments of 51 percent and a particle size of the fine-earth fraction is sandy (Bw, BC, and C horizons).

ADDITIONAL DATA: Reference samples from pedons S55NH015002, S56MA011002, S56MA011003, S57MA023005, S58NH015002, S73MA009001, S73MA005002, S73MA009004, S73MA005005, S96NH013003 from Massachusetts and New Hampshire, samples by NSSL, Lincoln, NE, various dates.

National Cooperative Soil Survey
U.S.A.

LOCATION LEICESTER

CT+MA ME NH NY RI

Established Series
Rev. MFF-SMF-JTI
05/2016

LEICESTER SERIES

The Leicester series consists of very deep, poorly drained soils formed in coarse-loamy till. They are nearly level or gently sloping soils in drainageways and low-lying positions on hills. Slope ranges from 0 to 8 percent. Permeability is moderate or moderately rapid in the surface layer and subsoil and moderate to rapid in the substratum. Mean annual temperature is about 9 degrees C, and mean annual precipitation is about 1205 mm.

TAXONOMIC CLASS: Coarse-loamy, mixed, superactive, acid, mesic Aeric Endoaquepts

TYPICAL PEDON: Leicester fine sandy loam - forested, extremely stony. (Colors are for moist soil.)

Oe--0 to 3 cm; black (10YR 2/1) moderately decomposed plant material. (0 to 10 cm thick)

A--3 to 18 cm; black (10YR 2/1) fine sandy loam; moderate medium granular structure; friable; common fine and medium roots; 10 percent gravel and cobbles; strongly acid; clear wavy boundary. (10 to 15 cm thick)

Bg1--18 to 25 cm; grayish brown (2.5Y 5/2) fine sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; 10 percent gravel and cobbles; common medium prominent yellowish red (5YR 5/6) masses of iron accumulation; strongly acid; gradual wavy boundary.

Bg2--25 to 46 cm; light brownish gray (2.5Y 6/2) fine sandy loam; weak medium subangular blocky structure; friable; few fine and medium roots; 10 percent gravel and cobbles; common fine prominent yellowish brown (10YR 5/6) masses of iron accumulation; strongly acid; gradual wavy boundary. (Combined thickness of the Bg horizons is 16 to 68 cm.)

BC--46 to 61 cm; pale brown (10YR 6/3) fine sandy loam; massive; friable; few fine roots; 10 percent gravel and cobbles; many medium distinct yellowish brown (10YR 5/6) and yellowish red (5YR 4/6) masses of iron accumulation; strongly acid; clear wavy boundary. (0 to 20 cm thick)

C1--61 to 84 cm; dark yellowish brown (10YR 4/4) gravelly fine sandy loam; massive; friable; 15 percent gravel and cobbles; many medium distinct yellowish brown (10YR 5/6) masses of iron accumulation and prominent pinkish gray (7.5YR 6/2) iron depletions; strongly acid; gradual wavy boundary.

C2--84 to 155 cm; dark yellowish brown (10YR 4/4) gravelly fine sandy loam; massive; friable; 15 percent gravel and cobbles; few fine distinct yellowish brown (10YR 5/6) masses of iron accumulation; strongly acid.

TYPE LOCATION: New Haven County, Connecticut; town of Prospect, 5,200 feet north of the Prospect-Bethany town line and 130 feet west of Route 69; USGS Mount Carmel topographic quadrangle; latitude 41 degrees 28 minutes 48.88 seconds N. and longitude 72 degrees 58 minutes 14.81 seconds W., WGS 84.

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 46 to 100 cm. Depth to bedrock is commonly more than 183 cm. Rock fragments range from 5 to 35 percent by volume to a depth of 100 cm and up to 50 percent below 100 cm. Except where the surface is stony, the fragments are mostly subrounded gravel and typically comprise 60 percent or more of the total rock fragments. Unless limed, reaction is very strongly

acid or strongly acid in the upper 100 cm and ranges from very strongly acid to moderately acid below.

The O horizon, where present, consists of slightly, intermediately, and/or highly decomposed organic material.

The A horizon has hue of 10YR, value of 2 or 3 and chroma of 1 or 2. Disturbed pedons have an Ap horizon that includes chroma of 3. The A or Ap horizon is fine sandy loam, very fine sandy loam, or loam in the fine-earth fraction. It has weak or moderate granular structure and is very friable or friable.

Some pedons have a thin Eg horizon below the A horizon. It has hue of 10YR to 5Y, value of 4 to 7, and chroma of 1 or 2. Texture, structure, and consistence are like the underlying B horizon.

The B horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 to 4. Chroma of 3 and 4 are limited to subhorizons. Chroma of 1 or 2 is in some subhorizons within a 50 cm depth. The horizon has distinct or prominent redoximorphic features. Texture is fine sandy loam, loam, or sandy loam in the fine-earth fraction. Structure is weak granular or subangular blocky, or the horizon is massive.

The BC horizon, where present, has hue of 10YR to 5Y, value of 4 to 6, and chroma of 3 or 4. The horizon has distinct or prominent redoximorphic features. Texture is fine sandy loam, loam, or sandy loam in the fine earth fraction. Structure is weak subangular blocky or massive.

The C horizon has hue of 7.5YR to 5Y, value of 4 to 6, and chroma of 1 to 4. It has redoximorphic features that typically decrease in abundance with depth. Texture is fine sandy loam or sandy loam in the fine-earth fraction, but may range to loamy sand at depth. Some pedons have pockets or thin lenses of silt loam, loamy sand, or sand. The horizon is massive or it has weak plates. Consistence commonly is very friable or friable but some pedons have lenses or layers that are firm.

COMPETING SERIES: There are no other series currently in the same family.

The [Fredon](#), [Lamson](#), [Lyme](#), [Mansfield](#), [Massena](#), [Menlo](#), [Neversink](#), [Newstead](#), [Raynham](#), [Raypol](#), [Red Hook](#), [Ridgebury](#), [Stissing](#), [Sun](#), and [Whitman](#) series are similar soils in related families. Fredon, Lamson, Red Hook, and Raynham soils formed in water sorted materials and are nonacid. Lyme soils are in a frigid family. Mansfield, Menlo, and Whitman soils have a dense substratum and are very poorly drained. The Massena, Newstead, and Sun soils are nonacid. Raypol soils are coarse-loamy over sandy or sandy-skeletal. Ridgebury and Stissing soils are nonacid and have a dense substratum. Neversink soils have rock fragments dominated by sandstone, siltstone, and shale.

GEOGRAPHIC SETTING: Leicester soils are nearly level to gently sloping and are in low-lying depressional areas and drainageways of glaciated hills. Slope commonly is less than 3 percent but the range includes 0 to 8 percent. The soils formed in acid coarse-loamy till derived from granite, gneiss, and/or schist. Mean annual temperature ranges from 4 to 13 degrees C, and the mean annual precipitation ranges from 910 to 1800 mm. The frost-free period ranges from 140 to 240 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing [Ridgebury](#) and [Whitman](#) soils and the [Acton](#), [Broadbrook](#), [Brookfield](#), [Canton](#), [Charlton](#), [Chatfield](#), [Essex](#), [Georgia](#), [Gloucester](#), [Hollis](#), [Montauk](#), [Narragansett](#), [Paxton](#), [Rainbow](#), [Scituate](#), [Stockbridge](#), [Sutton](#), [Wapping](#), and [Woodbridge](#) soils. The well drained Charlton and the moderately well drained Sutton soils are associated in a drainage sequence. Acton soils are sandy and moderately well drained. Broadbrook, Essex, Montauk, and Paxton soils are well drained with a dense substratum. Brookfield, Canton, Narragansett, and Stockbridge soils are well drained. Chatfield and Hollis soils have bedrock at 50 to 100 cm and 25 to 50 cm depths, respectively. Georgia and Wapping soils are moderately well drained. Gloucester soils are sandy and excessively drained. Rainbow, Scituate, and Woodbridge soils are moderately well drained and have a dense substratum.

DRAINAGE AND PERMEABILITY: Poorly drained. Surface runoff is slow. Saturated hydraulic conductivity is moderately high or high. Leicester soils have a water table at or near the surface much of the year.

USE AND VEGETATION: Most areas are wooded. Some areas are in brushy unimproved pasture. Cleared areas are used for hay or pasture. Tree species include alder, gray birch, red maple, eastern hemlock, American elm, and spruce. Shrub species include northern spicebush, winterberry, and silky dogwood. Herb species include skunk cabbage, green false hellebore, sensitive fern, cinnamon fern, jewelweed, and water-tolerant sedges and rushes.

DISTRIBUTION AND EXTENT: Low-lying areas on glaciated uplands in Connecticut, Massachusetts, Maine, New Hampshire, eastern New York, and Rhode Island; MLRAs 144A and 145. The series is of large extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Windham County, Connecticut, 1947.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

1. Ochric epipedon - the zone from 0 to 18 cm (Oe and A horizons)
2. Cambic horizon - the zone from 18 to 46 cm (Bg horizons).
3. Aquic moisture regime as indicated by 2 chroma matrix color with redox concentrations at 18 cm (Bg horizons).
4. Endosaturation - based on saturation to a depth of 200 cm from the mineral soil surface.
5. Aeric great group based on matrix color and chroma of 3 or more in one subhorizon between the Ap and 75 cm. (BC horizon).
6. Particle-size class in control section from 25 to 100 cm - coarse-loamy.
7. Acid reaction class and mesic temperature regime.

National Cooperative Soil Survey
U.S.A.

LOCATION PAXTON

CT+MA NH NY RI VT

Established Series
Rev. MFF-SMF-JTI
04/2015

PAXTON SERIES

The Paxton series consists of well drained loamy soils formed in lodgment till. The soils are very deep to bedrock and moderately deep to a densic contact. They are nearly level to steep soils on hills, drumlins, till plains, and ground moraines. Slope ranges from 0 to 45 percent. Saturated hydraulic conductivity is moderately high or high in the surface layer and subsoil and low or moderately low in the substratum. Mean annual temperature is about 10 degrees C., and mean annual precipitation is about 1194 mm.

TAXONOMIC CLASS: Coarse-loamy, mixed, active, mesic Oxyaquic Dystrudepts

TYPICAL PEDON: Paxton fine sandy loam - in a brushy field at an elevation of about 850 feet. (Colors are for moist soil unless otherwise noted.)

Ap -- 0 to 20 cm; dark brown (10YR 3/3) fine sandy loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots; 5 percent gravel; strongly acid; abrupt smooth boundary. (13 to 28 cm thick)

Bw1 -- 20 to 38 cm; dark yellowish brown (10YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable; common fine roots; 5 percent gravel; few earthworm casts; strongly acid; gradual wavy boundary.

Bw2 -- 38 to 66 cm; olive brown (2.5Y 4/4) fine sandy loam; weak medium subangular blocky structure; friable; few fine roots; 10 percent gravel; strongly acid; clear wavy boundary. (Combined thickness of the Bw horizon is 38 to 94 cm thick.)

Cd -- 66 to 165 cm; olive (5Y 5/3) gravelly fine sandy loam; medium plate-like divisions; massive; very firm, brittle; 25 percent gravel; many dark coatings on plates; strongly acid.

TYPE LOCATION: New Haven County, Connecticut; town of Prospect, 0.4 mile east of Straitsville Road and 0.5 mile north of the Bethany - Prospect town line; USGS Mount Carmel, CT topographic quadrangle; Latitude 41 degrees, 28 minutes, 34 33.79 seconds N., Longitude 72 degrees, 59 minutes, 16 119.19 seconds W., WGS 84

RANGE IN CHARACTERISTICS: Thickness of the mineral solum and depth to the densic contact ranges from 50 to 100 cm. Depth to bedrock is commonly more than 1.5 meters. Rock fragments range from 5 through 35 percent by volume in the mineral soil. Except where the surface is stony, the fragments are mostly subrounded gravel and typically make up 60 percent or more of the total rock fragments. Unless limed, reaction ranges from very strongly acid to slightly acid in the mineral soil.

The O horizon, where present, has hue of 5YR to 10YR or it is neutral, value of 2 or 3 and chroma of 0 to 2. It is mainly composed of slightly, moderately, or highly decomposed plant material.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 to 4. Dry value is 6 or more. The structure is commonly granular but the range includes subangular blocky in some pedons. Undisturbed pedons have a thin A horizon with value of 2 or 3 and chroma of 1 or 2. The Ap or A horizon is loam, fine sandy loam,

or sandy loam in the fine-earth fraction.

Some pedons have a thin E horizon below the A horizon. It has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 3.

The upper part of the Bw horizon has hue of 7.5YR or 2.5Y, value of 4 to 6, and chroma of 4 to 8. The lower part of the Bw horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 3 to 6. Some pedons have few faint redoximorphic features just above the Cd horizon. The Bw horizon is loam, fine sandy loam, or sandy loam with less than 65 percent silt plus very fine sand. It has granular or subangular blocky structure. Consistence is friable or very friable.

Some pedons have a BC horizon up to 20 cm thick.

Some pedons have an E or E' horizon up to 8 cm thick below the B horizon. It has hue of 10YR to 5Y, value of 5 or 6, and chroma of 2 or 3. Typically, it is coarser textured than the overlying horizon.

The Cd has hue of 10YR to 5Y, value of 4 to 6, and chroma of 2 to 4. In some pedons there are a few faint or distinct areas of iron depletion or masses of iron accumulation in the upper part. Texture is loam, fine sandy loam, sandy loam, or coarse sandy loam in the fine-earth fraction. A few thin lenses of loamy sand are in some pedons. The structure is geogenetically derived, appearing in the form of medium to very thick plates, or it is massive. Consistence is firm or very firm. Some pedons have a friable C horizon above the Cd horizon.

COMPETING SERIES: These are [Amostown](#), [Bernardston](#), [Broadbrook](#), [Horseneck](#), [Nantucket](#), [Scituate](#), and [Wethersfield](#) series. Amostown soils are underlain by stratified very fine sand or silt within a depth of 100 cm. Bernardston and Broadbrook soils have a solum with more than 65 percent silt plus very fine sand. Horseneck soils lack a densic contact. Nantucket soils have a lithologic discontinuity. Scituate soils have sandy substrata. Wethersfield soils have 5YR or redder hue in the B and C horizons.

GEOGRAPHIC SETTING: Paxton soils are nearly level to steep and are on till plains, ground moraines, hills, and drumlins. Slope commonly is 0 to 35 percent, but range from 0 to 45 percent in some pedons. The soils formed in acid lodgment till derived mostly from schist, gneiss, and granite. Mean annual temperature ranges from 7 to 11 degrees C., mean annual precipitation ranges from 940 to 1245 mm, and the growing season ranges from 115 to 180 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing [Bernardston](#), [Broadbrook](#), and [Scituate](#) soils and the [Canton](#), [Charlton](#), [Chatfield](#), [Georgia](#), [Hollis](#), [Leicester](#), [Montauk](#), [Narragansett](#), [Pittstown](#), [Ridgebury](#), [Stockbridge](#), [Sutton](#), [Wapping](#), [Whitman](#), and [Woodbridge](#) soils on nearby landscapes. The moderately well drained Woodbridge, poorly drained Ridgebury, and the very poorly drained Whitman soils are associated in a drainage sequence. Canton soils have a friable loamy sand substratum. Well drained Stockbridge and moderately well drained Georgia soils have higher base status. Hollis soils have bedrock within a depth of 25 to 50 cm. Leicester soils are poorly drained and do not have a dense substratum. Montauk soils have sandy substrata. Narragansett soils have a lithologic discontinuity within a depth of 100 cm and a solum high in silt and very fine sand. Sutton and Wapping soils are moderately well drained and do not have a dense substratum.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Well drained. Water may perch on the densic contact for brief periods in late fall through early spring. Surface runoff is negligible to high. Saturated hydraulic conductivity is moderately high or high in the mineral solum and low or moderately low in the substratum.

USE AND VEGETATION: Many areas are cleared and used for cultivated crops, hay, or pasture. Scattered areas are used for community development. Some areas are wooded. Common trees are red, white, and black oak, hickory, sugar maple, red maple, gray and black birch, eastern white pine, and eastern hemlock.

DISTRIBUTION AND EXTENT: Glaciated uplands in Connecticut, Massachusetts, New Hampshire, eastern

New York, Rhode Island, and Vermont. MLRAs 144A and 145. The series is of large extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts

SERIES ESTABLISHED: Worcester County, Massachusetts, 1922.

REMARKS: Paxton is the state soil of Massachusetts.

Prior revisions included changes to the range in characteristics as well as general updating to metric units. Cation exchange activity class placement was determined from a review of limited lab data and similar or associated soils. Paxton soils were previously classified as Typic Dystrochrepts, and before that as Typic Fragiochrepts.

The Paxton series was previously used in some surveys in Maine. Maine determined from soil temperature studies that the mesic soil temperature regime would no longer be used. Maine is re-evaluating the soil temperature regimes in southern Maine as of the date of this revision.

Diagnostic horizons and features recognized in this pedon include:

1. Ochric epipedon - the zone from 0 to 20 cm (Ap horizon).
2. Cambic horizon - the zone from 20 to 66 cm (Bw horizons).
3. Densic material - the zone from 66 to 165 cm (Cd horizon).
4. Oxyaquic subgroup - based on saturation in one or more layers within 100 cm of the mineral surface, for one month or more per year, in 6 out of 10 years.
- 5) Particle-size control section - the zone from 20 to 66 cm (Bw horizons).

ADDITIONAL DATA: Full characterization data for pedons with User Pedon IDs of S1955MA027002, S1955NH015001, S1973MA005001, S1973MA005006, S1975CT013001, S1996NH013001, S1999NY061001. Pedons analyzed by the NSSL, Lincoln, NE. Laboratory characterization data for these pedons and similar soils is available through the National Cooperative Soil Survey Soil Characterization Database:
<http://ncsslabdatamart.sc.egov.usda.gov/>

National Cooperative Soil Survey
U.S.A.

LOCATION RIDGEBURY

MA+CT NH NJ NY RI

Established Series
Rev. SMF-JTI-DHZ
03/2015

RIDGEBURY SERIES

The Ridgebury series consists of very deep, somewhat poorly and poorly drained soils formed in lodgment till derived mainly from granite, gneiss and/or schist. They are commonly shallow to a densic contact. They are nearly level to gently sloping soils in depressions in uplands. They also occur in drainageways in uplands, in toeslope positions of hills, drumlins, and ground moraines, and in till plains. Slope ranges from 0 to 15 percent. Saturated hydraulic conductivity is moderately high or high in the solum and very low to moderately low in the substratum. Mean annual temperature is about 9 degrees C. and the mean annual precipitation is about 1143 mm.

TAXONOMIC CLASS: Loamy, mixed, superactive, acid, mesic, shallow Aeric Endoaquepts

TYPICAL PEDON: Ridgebury sandy loam - on a 3 to 8 percent slope in an extremely stony wooded area at an elevation of about 334 m. (Colors are for moist soil.)

A--0 to 13 cm; black (N 2/0) fine sandy loam; weak medium and coarse granular structure; friable; many very fine, fine and medium tree roots; 5 percent gravel and 5 percent cobbles; very strongly acid; abrupt smooth boundary. (5 to 25 cm thick)

Bw--13 to 23 cm; brown (10YR 4/3) sandy loam; weak medium subangular blocky structure; friable; few fine tree roots; 5 percent gravel and 5 percent cobbles; very strongly acid; abrupt wavy boundary. (8 to 22 cm thick)

Bg--23 to 46 cm; dark gray (10YR 4/1) gravelly sandy loam; massive; friable; 10 percent gravel and 5 percent cobbles; common fine prominent yellowish brown (10YR 5/6) and common medium distinct reddish brown (5YR 4/4) masses of iron accumulation; very strongly acid; gradual wavy boundary. (10 to 43 cm thick)

Cd--46 to 165 cm; gray (5Y 5/1) gravelly sandy loam; massive; firm; 10 percent gravel and 5 percent cobbles; common fine prominent reddish yellow (7.5YR 6/8) masses of iron accumulation; very strongly acid.

TYPE LOCATION: Hampshire County, Massachusetts; Town of Pelham; 1,600 feet east of Route 202 at a point 3,950 feet south of its junction with Amherst Road; USGS Shutesbury quadrangle; latitude 42 degrees 22 minutes 53 seconds N. and longitude 72 degrees 23 minutes 45 second W., NAD 27.

RANGE IN CHARACTERISTICS: Depth to the dense till commonly is 36 to 49 cm. The A horizon has 5 to 25 percent gravel, 0 to 10 percent cobbles, and 0 to 25 percent stones by volume. The B and C horizons have 5 to 25 percent gravel, 0 to 5 percent cobbles and 0 to 5 percent stones. Rock fragments within the soil range from 5 to 35 percent by volume and are subangular fragments. The unlimed soil ranges from very strongly acid to slightly acid.

The O horizon, where present, has hue of 7.5YR to 2.5Y, value of 2, 2.5, or 3 and chroma of 0 to 2.

The A or Ap horizon is neutral or has hue of 10YR to 5Y, value of 2, 2.5, or 3 and chroma of 0 to 2. Texture is sandy loam, fine sandy loam or loam in the fine-earth fraction.

Some pedons have a thin E horizon with hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 or 2. Texture is the

same as the A horizon.

The B horizon is neutral or has hue of 7.5YR to 5Y, value of 4 to 6, and chroma of 0 to 3. The chroma is 4 in some places. Chroma of 3 or 4 is restricted to subhorizons. Redoximorphic features are few to many and are distinct or prominent. Texture is sandy loam, fine sandy loam, very fine sandy or loam in the fine earth fraction with fifteen percent or more fine sand or coarser and clay content less than 18 percent. The B horizon has subangular blocky structure, weak to moderate very thin to medium platy structure or is massive. It is very friable or friable.

The Cd horizon has hue of 10YR to 5Y, value of 3 to 6, and chroma of 1 to 4. It commonly has distinct or prominent redoximorphic features which generally become less abundant with depth but the range includes faint. Texture is coarse sandy loam, sandy loam, fine sandy loam, very fine sandy or loam in the fine-earth fraction. Consistence is firm or very firm and brittle. It is massive or has plates. Any physical aggregation is considered to not be pedogenic.

Some pedons have a C horizon below the Cd that is firm but not brittle.

COMPETING SERIES: There are no series currently in the same family.

The [Painesville](#), [Punsit](#), and [Sun](#) series are in a closely related family. Painesville soils lack a densic contact. Punsit soils have more than 60 percent silt plus very fine sand in the particle size control section. Sun soils formed in till derived from limestone and sandstone.

GEOGRAPHIC SETTING: The nearly level to gently sloping Ridgebury soils are in depressions and drainageways of till uplands. They also occur in toeslope positions and concave microfeatures of hills, drumlins, and ground moraines, and in till plains. Slope ranges from 0 to 15 percent. The soils formed in loamy lodgment till derived mainly from granite, gneiss and schist. Mean annual air temperature ranges from 7 to 11 degrees C and mean annual precipitation ranges from 1016 to 1270 mm. Mean growing season ranges from 100 to 195 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These include the [Charlton](#), [Chatfield](#), [Hollis](#), [Leicester](#), [Paxton](#) and [Sutton](#), [Whitman](#) and [Woodbridge](#) soils. Ridgebury is a member of a drainage sequence that includes the well drained Paxton, moderately well drained Woodbridge, and very poorly drained Whitman soils. Charlton and Sutton soils are better drained and have friable substrata. Chatfield and Hollis soils have bedrock within depths of 100 and 50 cm respectively. Leicester soils do not have a densic contact.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Commonly poorly drained but the range includes the wetter part of somewhat poorly drained. Runoff is negligible to medium. Saturated hydraulic conductivity is moderately high or high in the solum and very low to moderately low in the substratum. A perched, fluctuating water table above the dense till saturates the solum to or near the surface for 7 to 9 months of the year.

USE AND VEGETATION: Largely forested to gray birch, yellow birch, red maple, hemlock, elm, spruce and balsam fir. Cleared areas are used mainly for hay and pasture.

DISTRIBUTION AND EXTENT: Glaciated landforms in Connecticut, Massachusetts, New Hampshire, New Jersey, New York, and Rhode Island. (MLRAs 142, 144A, 145, and 149B) The series is extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Franklin County, Vermont, 1948.

REMARKS: An analysis of Ridgebury soils in 2002 for 38 surveys showed that this series most commonly has a densic contact at 40 to 60 cm including 8 surveys with the depth to a densic contact at 50 cm. The average

depth to a densic contact was 50 cm - the data showed an almost even split between depth class occurrences. A review of characterization data for Ridgebury soils shows a very slight dominance in the acid reaction class. Any physical aggregation in the Cd is considered to not be pedogenic. The type location is currently within the officially designated mesic zone in Massachusetts. Previous revision of this series was 12/2005.

Diagnostic horizons and features in this pedon include:

1. Ochric epipedon - the zone from 0 to 13 cm (A horizon).
2. Aeric feature 100 percent of the zone from 13 to 23 cm has hue of 10YR and both color value moist of 4 and chroma moist of 3 (Bw1 horizon).
3. Cambic horizon - the zone from 13 to 46 cm (Bw and Bg horizons).
3. Densic contact root limiting material begins at 46 cm (Cd horizon).
4. Endosaturation the zone from 23 to 46 cm is saturated above the densic contact (Bw2 horizon). A seasonal high water table is perched above the densic materials.
5. Reaction - the pH in the zone from 25 to 46 cm (control section for reaction) is presumed less than 5.0 in 0.01 M CaCl₂ (1:2) (see remarks).
6. Series control section - the zone from 0 to 71 cm.

ADDITIONAL DATA: Reference samples from pedons with User Pedon IDs of S2000CT013002, S1995NH013005, and S1996NH013002

from Connecticut and New Hampshire, samples by NSSL, Lincoln, NE, various years. The laboratory data for these pedons and similar soils is available through the National Cooperative Soil Survey Soil Characterization Database: <http://ncsslabdatamart.sc.egov.usda.gov/>

National Cooperative Soil Survey
U.S.A.

LOCATION SCARBORO

MA CT NH NY RI VT

Established Series
Rev. WHT-SMF-MFF
03/2010

SCARBORO SERIES

The Scarboro series consists of very deep, very poorly drained soils in sandy glaciofluvial deposits on outwash plains, deltas, and terraces. They are nearly level soils in depressions. Slope ranges from 0 through 3 percent. Saturated hydraulic conductivity is high or very high. Mean annual temperature is about 49 degrees F. (9 degrees C.) and the mean annual precipitation is about 44 inches (1118 millimeters).

TAXONOMIC CLASS: Sandy, mixed, mesic Histic Humaquepts

TYPICAL PEDON: Scarboro mucky fine sandy loam woodland; in an area of Scarboro mucky fine sandy loam at an elevation of about 212 meters. (Colors are for moist soil.)

Oi-- 0 to 1 inch (0 to 3 centimeters); slightly decomposed maple leaves and other plant material

Oa-- 1 to 8 inches (3 to 20 centimeters); dark brown (10YR3/3) mucky peat; thin platy structure; friable; common fine roots; very strongly acid; abrupt wavy boundary. (Combined thickness of Oi, Oe, and Oa horizons is 8 to 13 inches (20 to 33 centimeters).)

A-- 8 to 14 inches (20 to 36 centimeters); black (N 2/0) mucky fine sandy loam; weak medium granular structure; friable; common fine roots; very strongly acid; abrupt smooth boundary. (0 to 14 inches (0 to 36 centimeters) thick.)

Cg1-- 14 to 19 inches (36 to 48 centimeters); grayish brown (2.5Y 5/2) loamy sand; massive; friable; many fine roots; very strongly acid; abrupt irregular boundary.

Cg2-- 19 to 22 inches (48 to 56 centimeters); grayish brown (2.5Y 5/2) sand; massive; friable; few fine roots; 10 percent rock fragments; common medium prominent dark brown (7.5YR 3/2) areas of iron depletion and common medium prominent yellowish red (5YR 4/6) masses of iron; very strongly acid; clear wavy boundary.

Cg3-- 22 to 65 inches (56 to 165 centimeters); grayish brown (2.5Y 5/2) gravelly sand; single grain; loose; 15 percent rock fragments; strongly acid.

TYPE LOCATION: 60 feet north of Electric Avenue near the south edge of Forest Hill Cemetery in the City of Fitchburg, Massachusetts. USGS Fitchburg, MA topographic quadrangle, Latitude 42 degrees, 34 minutes, 0.3 seconds N., and Longitude 71 degrees, 48 minutes, 33.3 seconds W., NAD 1983.

RANGE IN CHARACTERISTICS: Stones range from 0 through 5 percent by volume in the A horizon and upper part of the C horizon and are absent in the lower part of the C horizon. Cobbles range from 0 through 10 percent in the A horizon, 0 through 5 percent in the upper part of the C horizon, and are absent in the lower part of the C horizon. Gravel ranges from 0 through 10 percent by volume in the A horizon, 0 through 20 percent in the upper part of the C horizon to a depth of 30 inches (76 centimeters), and 0 through 50 percent in the C horizon below a depth of 30 inches (76 centimeters). Reaction ranges from very strongly acid through moderately acid in the A horizon and upper part of the C horizon, and from very strongly acid through neutral in the lower part of the C horizon.

The O horizon is commonly mucky peat or muck, but the range includes thin layers of peat at the surface. The O horizon is neutral or has hue 5YR through 10YR, value of 2 or 3, and chroma of 0 through 3.

The A horizon where present is neutral or has hue of 5YR through 2.5Y, value of 2 through 3, and chroma of 0 through 2. It is fine sandy loam, sandy loam, loamy fine sand, loamy sand, fine sand, sand or their mucky analogues in the fine-earth fraction. This horizon commonly is 5 through 14 inches (13 through 36 centimeters) thick, but in some places may be less than 5 inches (13 centimeters) thick or absent.

The upper part of the Cg horizon is neutral or has hue of 10YR through 5Y, value of 3 through 7, and chroma of 0 through 3. Some pedons have few or common fine through coarse redoximorphic features. Texture is fine sandy loam, sandy loam, loamy fine sand, loamy coarse sand, loamy sand, fine sand, or sand in the fine-earth fraction.

The lower part of the C horizon is neutral or has hue of 10YR through 5Y or 5GY, value of 3 through 6, and chroma of 0 through 4. Redoximorphic features range from none through many and are fine through coarse. Texture is loamy fine sand, loamy sand, fine sand, sand, loamy coarse sand, or coarse sand in the fine-earth fraction. The C horizon is structureless and loose, very friable, or friable. It is often stratified.

COMPETING SERIES: These are the [Ackerman](#) and [Antung](#) series. These soils are from outside LRR R and S. Ackerman soils are more alkaline in the organic horizons and the upper part of the C horizon. They also contain coprogenous material. Antung soils are more alkaline and effervesce in the C horizon.

GEOGRAPHIC SETTING: Scarboro soils are in level or nearly level depressions on outwash plains, deltas, and terraces. Slope is less than 3 percent. The soils formed in sandy glaciofluvial deposits. Mean annual temperature ranges from 46 through 57 degrees F. (8 through 14 degrees C.) and mean annual precipitation ranges from 38 through 55 inches (965 through 1397 millimeters).

GEOGRAPHICALLY ASSOCIATED SOILS: The excessively drained [Hinckley](#), [Windsor](#) and [Penwood](#) soils, somewhat excessively drained [Merrimac](#) soils, moderately well drained [Sudbury](#) and [Deerfield](#) soils, poorly drained Mashpee(T) and Massasoit(T) soils, somewhat poorly and poorly drained [Walpole](#) and [Wareham](#) soils are on higher positions on associated glaciofluvial landforms. The poorly drained [Rippowam](#) soils and very poorly drained [Saco](#) soils are on nearby flood plains. The very poorly drained [Rainberry](#) soils lack a Histic epipedon and have Spodic horizons.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Very poorly drained. Saturated hydraulic conductivity is high or very high. Surface runoff is high or very high. The water table is at or near the surface for 6 to 12 months of the year, and many areas are ponded for short periods.

USE AND VEGETATION: Shrub and brush land or woodland. Common shrubs are speckled alder, smooth alder, rhoda azalea, steeplebush spirea, leatherleaf, labrador-tea, winterberry, highbush blueberry, large cranberry, black huckleberry, poison sumac, and sheep laurel. Common trees are red maple, slippery elm, Atlantic white cedar, tamarack, eastern white pine, willow, and gray birch.

DISTRIBUTION AND EXTENT: Glaciofluvial landforms in Connecticut, Massachusetts, New Hampshire, Rhode Island, eastern New York, and Vermont. MLRAs 142, 144A, 145, and 149B. Scarboro soils are extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Cumberland County, Maine; 1915.

REMARKS: 1. Geographical location (latitude and longitude) determined from the published soil survey.

2. The use of the Scarboro series in Maine, and in MLRA 144B, is relict to before temperature classes. These have been removed from the SC file.

Diagnostic horizons and features recognized in this pedon are:

1. Histic epipedon - the zone from the soil surface to a depth of 8 inches (20 centimeters), (Oi and Oa horizons).
2. Thickness of organic soil materials is 8 inches (20 centimeters).

3. Aquic conditions - Histic epipedon or the zone from 19 to 22 inches (48 to 56 centimeters) has 50 percent or more 2 chroma with redox concentrations (Cg2 horizon).

National Cooperative Soil Survey
U.S.A.

LOCATION SUDBURY

MA+CT NH NY RI VT

Established Series
Rev. DGG-MFF-DCP
01/2013

SUDBURY SERIES

The Sudbury series consists of very deep, moderately well and somewhat poorly drained soils on outwash plains. They are nearly level through strongly sloping soils in slight depressions and on terraces and foot slopes in areas of outwash or glaciofluvial deposits. Slope ranges from 0 through 15 percent. Saturated hydraulic conductivity is moderately high or high in the upper solum and high or very high in the lower solum and substratum. Mean annual temperature is about 48 degrees F. (9 degrees C.) and the mean annual precipitation is about 43 inches (1092 millimeters).

TAXONOMIC CLASS: Sandy, mixed, mesic Aquic Dystrudepts

TYPICAL PEDON: Sudbury fine sandy loam in a cultivated field at an elevation of about 92 feet (28 meters). (Colors are for moist soils unless otherwise stated.)

Ap -- 0 to 13 inches (0 to 33 centimeters); very dark grayish brown (10YR 3/2) fine sandy loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; very friable; many fine roots; 5 percent gravel; moderately acid; abrupt smooth boundary. (6 to 14 inches, 15 to 36 centimeters thick.)

Bw -- 13 to 19 inches (33 to 48 centimeters); yellowish brown (10YR 5/6) sandy loam; weak medium granular structure; very friable; common grass roots; 10 percent fine gravel; few fine and medium prominent dark reddish gray (5YR 4/2) areas of iron depletion in the lower 3 inches (8 centimeters); moderately acid; abrupt wavy boundary. (2 to 20 inches, 5 to 51 centimeters thick.)

2CB -- 19 to 26 inches (48 to 66 centimeters); yellowish brown (10YR 5/4) gravelly coarse sand; single grain; loose; few fine roots; yellowish red (5YR 4/8) coatings on some sand grains; 20 percent gravel; many fine prominent dark reddish brown (2.5YR 3/4) and common coarse prominent reddish yellow (5YR 6/8) masses of iron accumulations; moderately acid; abrupt wavy boundary. (0 to 10 inches, 0 to 25 centimeters thick.)

2C -- 26 to 65 inches (66 to 165 centimeters); light olive brown (2.5Y 5/4) very gravelly coarse sand; single grain; loose; many sand grains coated with strong brown (7.5YR 5/6) and some sand grains slightly cemented, and many pebbles and cobbles coated with black (5YR 2/1); few fine roots; strata of sand and gravel consisting of about 50 percent gravel and some cobbles; common medium prominent strong brown (7.5YR 5/6) masses of iron accumulation; moderately acid.

TYPE LOCATION: Essex County, Massachusetts; town of Beverly, 0.2 miles south of the junction of Essex Street and Cole Street and 150 feet south of railroad track. USGS Salem, MA quadrangle; Latitude 42 degrees, 33 minutes, 52 seconds N., Longitude 70 degrees, 51 minutes, 38 seconds W., NAD 1983.

RANGE IN CHARACTERISTICS: Thickness of the solum and depth to stratified sand and gravel range from 18 through 36 inches (46 through 91 centimeters). Depth to redoximorphic features ranges from 12 through 24 inches (30 through 60 centimeters) and must include redoximorphic depletions with chroma of 2 or less. Rock fragment content of individual horizons of the solum ranges from 0 through 30 percent by volume. The fragments are primarily fine gravel but include some medium gravel, coarse gravel and cobbles. Rock fragment content of the C horizon ranges from 0 through 75 percent, and consists of 0 through 65 percent gravel and 0

through 25 percent cobbles and stones. The fragments are mainly granite or gneiss with less than 25 percent dark, fine-grained shale, slate, or phyllite. Reaction ranges from extremely acid through slightly acid in the solum, unless limed, and from very strongly acid through slightly acid in the substratum.

Some pedons have an O horizon.

The Ap or A horizon has hue of 7.5YR or 10YR, value of 2 through 4, and chroma of 0 through 4. It is fine sandy loam, sandy loam, or very fine sandy loam in the fine-earth fraction. Structure is granular or subangular blocky.

Some pedons have an E horizon that has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 1 or 2. The E horizon has the same texture range as the A horizon. Structure is granular or subangular blocky.

The Bw horizon has hue of 7.5YR through 2.5Y, value of 3 through 5, and chroma of 2 through 8. The upper part of the B horizon is fine sandy loam or sandy loam and the lower part ranges from sandy loam through coarse sand in the fine-earth fraction. Structure is granular or subangular blocky or the horizon is massive. The structure may be single grain in the lower part in some pedons.

The 2CB horizon, where present, has hue of 7.5YR through 2.5Y, value of 3 through 6, and chroma of 2 through 8. Texture ranges from loamy sand through coarse sand in the fine-earth fraction.

The 2C horizon has hue of 7.5YR through 5Y, value of 4 through 6, and chroma of 2 through 8. It consists of stratified sand, gravel, and cobbles and ranges from loamy fine sand through coarse sand in the fine-earth fraction.

COMPETING SERIES: There are no other series in the same family.

The [Deerfield](#), [Merrimac](#), [Ninigret](#), [Tisbury](#), and [Walpole](#) series are in related families. Deerfield soils have loamy fine sand or coarser textures below a depth of 10 inches (25 centimeters). Merrimac soils are somewhat excessively drained. Ninigret soils are coarse loamy over sandy or sandy-skeletal. Tisbury soils are silt loam or very fine sandy loam in the upper part of the B horizon. Walpole soils are poorly drained.

GEOGRAPHIC SETTING: Sudbury soils are nearly level through strongly sloping soils in slight depressions on outwash plains and on gentle foot slopes. Slope ranges from 0 through 15 percent. The soils formed in water sorted sandy and gravelly glaciofluvial materials derived mainly from granite, gneiss, and schist. Mean annual precipitation ranges from 30 through 55 inches (762 through 1397 millimeters) and mean annual temperature ranges from 45 through 50 degrees F. (7 through 10 degrees C.). Mean growing season ranges from 120 through 240 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Agawam](#), [Deerfield](#), [Hinckley](#), [Merrimac](#), [Walpole](#) and [Windsor](#) soils on nearby landscapes. Agawam, Hinckley, Merrimac, and Windsor soils do not have redox depletions within 24 inches (60 centimeters) of the surface. In addition, the Hinckley and Windsor soils have loamy sand or coarser textures in the B horizon. Deerfield soils have loamy fine sand or coarser textures below a depth of 10 inches (25 centimeters). Walpole soils are poorly drained.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Moderately well and somewhat poorly drained. The potential for surface runoff is low to very high. The internal drainage is restricted by a seasonal high water table. Saturated hydraulic conductivity is moderately high or high in the upper solum and high or very high in the lower solum and substratum.

USE AND VEGETATION: Most areas used for growing hay, pasture, field and truck crops. Some are forested areas with mainly red maple, gray birch, eastern hemlock, larch, eastern white pine, and red, black, and scarlet oaks.

DISTRIBUTION AND EXTENT: Massachusetts, Connecticut, Rhode Island, Vermont, New Hampshire and

eastern New York. MLRAs 144A, 145, and 149B. The series is of moderate extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Middlesex County, Massachusetts, 1924.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

1. Ochric epipedon - the zone from the soil surface to a depth of 13 inches (33 centimeters) (Ap horizon).
2. Cambic horizon - the zone from 13 to 19 inches (33 to 48 centimeters) (Bw horizon).
3. Aquic subgroup - redox depletions with a chroma of 2 within 24 inches (60 centimeters) of the soil surface.

National Cooperative Soil Survey
U.S.A.

LOCATION WHITMAN

MA+CT NH NJ NY RI

Established Series
Rev. DGG-WHT-SMF
01/2018

WHITMAN SERIES

The Whitman series consists of very deep, very poorly drained soils formed in lodgment till derived mainly from granite, gneiss, and schist. They are shallow to a densic contact. These soils are nearly level or gently sloping soils in depressions and drainageways on uplands. Saturated hydraulic conductivity is moderately high or high in the solum and very low to moderately low in the substratum. Mean annual precipitation is about 1143 mm and mean annual temperature is about 9 degrees C.

TAXONOMIC CLASS: Loamy, mixed, superactive, acid, mesic, shallow Typic Humaquepts

TYPICAL PEDON: Whitman loam - on a 0 percent slope in an idle area at an elevation of about 214 meters. (Colors are for moist soils.)

Ap -- 0 to 25 cm; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak medium granular structure; friable; 10 percent rock fragments; common medium distinct red (2.5YR 4/8) masses of iron accumulation lining pores; moderately acid; abrupt wavy boundary. (5 to 35 cm thick.)

Bg -- 25 to 46 cm; gray (5Y 5/1) fine sandy loam; massive; friable; 10 percent rock fragments, few medium distinct pale olive (5Y 6/4) and light olive brown (2.5Y 5/4) masses of iron accumulation; strongly acid; abrupt wavy boundary. (15 to 44 cm thick.)

Cdg -- 46 to 79 cm; gray (5Y 6/1) fine sandy loam; moderate medium plates; firm; 10 percent rock fragments; many medium distinct light olive brown (2.5Y 5/4) masses of iron accumulation; moderately acid; clear wavy boundary.

Cd1 -- 79 to 122 cm; olive (5Y 4/3) fine sandy loam; massive; firm; 10 percent rock fragments; few medium prominent dark reddish brown (2.5YR 3/4) masses of iron accumulation; moderately acid; gradual wavy boundary.

Cd2 -- 122 to 165 cm; olive (5Y 5/3) fine sandy loam; massive; firm; 10 percent rock fragments; moderately acid.

TYPE LOCATION: Worcester County, Massachusetts; Town of Leominster, 1 mile west intersection of Pleasant and Wachusett Streets, and 500 feet north of Wachusett Street. USGS Sterling, MA topographic quadrangle, Latitude 42 degrees, 30 minutes, 4 seconds N.; Longitude 71 degrees, 47 minutes, 40 seconds W., NAD 1983.

RANGE IN CHARACTERISTICS: Depth to a densic contact commonly is 30 to 58 cm. The A horizon has 5 to 30 percent gravel, 0 to 15 percent cobbles, and 0 to 25 percent stones by volume. The B and C horizons have 5 to 30 percent gravel, 0 to 15 percent cobbles, and 0 to 10 percent stones. The soil reaction, unless limed, ranges from extremely acid to slightly acid in the solum and very strongly acid to slightly acid in the substratum.

The O horizon, where present, ranges in thickness from 2 to 20 centimeters. It has hue 7.5YR or 10YR, value 2 or 3, and chroma 1 or 2. It consists of slightly, intermediately, and/or highly decomposed organic material.

The A horizon is neutral or has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 0 to 2. It sandy loam, fine sandy loam, very fine sandy loam, loam, or silt loam or their mucky analogues. Structure is weak granular or subangular blocky, or the horizon is massive. Consistence is very friable or friable.

The Bg horizon is neutral or has hue of 7.5YR to 5Y, value of 4 through 6, and chroma of 0 to 2. Redoximorphic concentrations range from few to many where matrix chroma is 2 and none to many where chroma is 1. Texture is sandy loam, fine sandy loam, very fine sandy loam, or loam in the fine earth fraction. It has fifteen percent or more fine sand or coarser with clay content less than 18 percent. Structure is weak granular or subangular blocky, or the horizon is massive. Consistence is very friable or friable.

The Cdg or Cd layer is neutral or has hue of 10YR to 5Y, value of 4 through 6, and chroma of 0 to 2. The chroma is 3 or 4 in some pedons. Redoximorphic features range from few to many. Texture is loam, very fine sandy loam, fine sandy loam, or sandy loam in the fine earth fraction. Consistence commonly is firm to extremely firm and the layer may be brittle in some part. Geogenic structure is commonly in the form of weak or moderate thin plates in the upper part. Otherwise it is massive throughout.

COMPETING SERIES: There are no series currently in the same family.

GEOGRAPHIC SETTING: Whitman soils are nearly level and gently sloping soils in depressions and in drainage ways of glacial uplands. Slopes are typically 0 to 2 percent, but range up to 8 percent where wetness is due to seepage water. The soils formed in loamy, till derived mainly from granite, gneiss and schist. Mean annual precipitation ranges from 1016 to 1422 mm and mean annual temperature ranges from 7 to 11 degrees C. The frost free period is 100 to 195 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Charlton](#), [Chatfield](#), [Hollis](#), [Leicester](#), [Paxton](#), [Ridgebury](#), [Sutton](#), and [Woodbridge](#) soils. The well drained Paxton, moderately well drained Woodbridge, and somewhat poorly and poorly drained Ridgebury soils are in a drainage sequence with Whitman soils. Charlton, Leicester, and Sutton soils have friable substrata. Chatfield and Hollis soils have bedrock within depths of 100 and 50 cm respectively.

DRAINAGE AND PERMEABILITY: Very poorly drained. Runoff potential is high or very high. Saturated hydraulic conductivity is moderately high or high in the solum and very low to moderately low in the densic material. A perched water table, or excess seepage water, is at or near the surface for about 9 months of the year.

USE AND VEGETATION: Nearly all areas are forested. Only a few areas are cleared and drained and used for pasture. Tree species include alder, gray birch, red maple, eastern hemlock, American elm, and spruce. Shrub species include northern spicebush, winterberry, red maple, and silky dogwood. Herb species include skunk cabbage, green false hellebore, sensitive fern, cinnamon fern, jewelweed, and water-tolerant sedges and rushes.

DISTRIBUTION AND EXTENT: Connecticut, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. MLRAs 142, 144A, 145, 149B. The series is extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Plymouth County, Massachusetts, 1911.

REMARKS: 1. Location previously revised to 500 feet north of Wachusett Street after review of soil map showed no Whitman map unit 50 feet north of road.

2. Before the existence of the Shallow family class, some pedons were correlated as Whitman that are moderately deep to a densic contact.

3. Diagnostic horizons and features in this pedon include:

- a. Umbric epipedon - the zone from the soil surface to a depth of 25 cm (Ap horizon).
- b. Cambic horizon - the zone from 25 to 46 cm (Bg horizon).
- c. Aquic conditions - as evidenced by chroma of 1 in the Bg horizon.
- d. Densic contact - root limiting layer begins at 46 cm .
- e. Shallow depth class - depth to a densic contact is less than 50 cm (Cdg begins at 46 cm).

ADDITIONAL DATA: Reference samples from pedons S1977MA005002, S1977MA005004, S1977MA005005, S1995NH013005, S2000CT013001. Lab characterization data for these pedons and pedons of similar soils are available through the National Cooperative Soil Survey Soil Characterization Database: <http://ncsslabdatamart.sc.egov.usda.gov/>

National Cooperative Soil Survey
U.S.A.

LOCATION WINDSOR

CT+MA NH NY RI VT

Established Series
Rev. MFF-SMF-DCP
03/2014

WINDSOR SERIES

The Windsor series consists of very deep, excessively drained soils formed in sandy outwash or eolian deposits. They are nearly level through very steep soils on glaciofluvial landforms. Slope ranges from 0 through 60 percent. Saturated hydraulic conductivity is high or very high. Mean annual temperature is about 10 degrees C and mean annual precipitation is about 1092 mm.

TAXONOMIC CLASS: Mixed, mesic Typic Udipsamments

TYPICAL PEDON: Windsor loamy sand - forested, 3 percent slope, at an elevation of about 24 meters. (Colors are for moist soil.)

Oe--0 to 3 cm; black (10YR 2/1) moderately decomposed forest plant material; many very fine and fine roots; very strongly acid; abrupt smooth boundary. (0 to 8 cm thick.)

A--3 to 8 cm; very dark grayish brown (10YR 3/2) loamy sand; weak medium granular structure; very friable; many very fine and fine roots; strongly acid; abrupt wavy boundary. (3 to 25 cm thick.)

Bw1--8 to 23 cm; strong brown (7.5YR 5/6) loamy sand; very weak fine granular structure; very friable; many fine and medium roots; strongly acid; gradual wavy boundary.

Bw2--23 to 53 cm; yellowish brown (10YR 5/6) loamy sand; very weak fine granular structure; very friable; common fine and medium roots; strongly acid; gradual wavy boundary.

Bw3--53 to 64 cm; light yellowish brown (10YR 6/4) sand; single grain; loose; few coarse roots; strongly acid; clear wavy boundary. (Combined thickness of the Bw horizons is 23 to 86 cm.)

C--64 to 165 cm; pale brown (10YR 6/3) and light brownish gray (10YR 6/2) sand; single grain; loose; few coarse roots; strongly acid.

TYPE LOCATION: Hartford County, Connecticut; town of South Windsor, 1100 feet northwest along Chapel Road from the intersection of Chapel Road and Ellington Road and 100 feet due south of Chapel Road. USGS Manchester, CT topographic quadrangle, Latitude 41 degrees, 48 minutes, 35 seconds N., Longitude 72 degrees, 36 minutes, 22 seconds W., NAD 1983

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 25 to 92 cm. Rock fragments, dominantly fine gravel, range from 0 through 10 percent by volume in the solum and from 0 to 15 percent in the substratum. Thin strata of gravel or thin subhorizons of coarse sand or loamy coarse sand are present in some pedons. Unless limed, reaction in the solum commonly is extremely acid to moderately acid, but the range includes slightly acid. Unless limed, reaction in the substratum commonly is very strongly acid to slightly acid, but the range includes neutral.

O horizons are present in some pedons.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3. Many pedons have an Ap horizon up to 12 inches thick with value of 3 or 4 and chroma of 2 to 4. The A or Ap horizon is loamy fine sand, loamy sand, fine sand, or sand. It has weak or moderate granular structure and is very friable, friable, or loose.

Some pedons have a thin E horizon with hue 7.5YR or 10YR, value of 4 to 6, and chroma of 1 or 2.

The upper part of the Bw horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 4 to 8. The lower part of Bw horizon has hue of 7.5YR to 5Y, value of 4 to 7, and chroma of 3 to 6. The Bw horizon is loamy sand or loamy fine sand in the upper part and loamy fine sand, loamy sand, fine sand, or sand in the lower part. The Bw horizon has weak granular or weak subangular blocky structure, or it is massive or single grain. Consistence is very friable or loose.

Some pedons have a BC horizon similar to the lower part of the Bw horizon.

The C horizon has hue of 5YR to 5Y, value of 4 to 7, and chroma of 1 to 6. It is fine sand, sand, coarse sand, loamy fine sand, or loamy sand. The horizon is massive or single grain and consistence is very friable or loose.

COMPETING SERIES: These are the [Acquango](#), [Aldo](#), [Bigapple](#), [Biltmore](#), [Boplain](#), [Breeze](#), [Caesar](#), [Chute](#), [Dabney](#), [Hodge](#), [Oakville](#), [Osolo](#), [Pahuk](#), [Penwood](#), [Perks](#), [Pinegrove](#), [Plainfield](#), [Poquonock](#), [Ronda](#), [Samoa](#), [Sardak](#), [Sarpy](#), [Scotah](#), [Spessard](#), [Suncook](#), [Tyner](#), and [Wapanucket](#) series. Acquango, Aldo, Biltmore, Boplain, Chute, Dabney, Hodge, Osolo, Pahuk, Perks, Ronda, Samoa, Sardak, Spessard, and Tyner soils are from outside of LRRs L, R, and S. Acquango soils are very slightly to moderately saline within the soil profile. Aldo soils have a water table and saturation within the series control section for as much as one month per year in 6 out of 10 years. Bigapple soils formed in human transported soil material from dredging activities. Biltmore and Spessard soils are well drained. Breeze soils formed in human transported sandy soil materials intermingled with construction debris. Caesar soils contain more coarse sand. Chute, Hodge, and Sarpy soils contain free carbonates and do not have a B horizon. Dabney soils do not have a B horizon and receive more than 152 cm of precipitation annually. Oakville soils typically average 50 percent or more fine sand in the subsoil. Osolo soils have a solum thicker than 1.5 m. Penwood soils have hue of 5YR or redder in the B horizon. Pahuk, Perks, Samoa, and Suncook soils do not have a B horizon. Plainfield soils are less moist in all parts of the control section for the 120 days following the summer solstice. Poquonock soils have a densic contact with in 1 m. Ronda soils formed in alluvium from residuum sources. Sardak soils formed in alluvium and are calcareous. Tyner soils have a thicker solum. Wapanucket soils are underlain by glaciolacustrine deposits with in the series control section.

GEOGRAPHIC SETTING: Windsor soils are nearly level through very steep soils typically on glaciofluvial landforms but include late-Wisconsin-aged dunes. The steeper slopes are typically on terrace escarpments. Slope ranges from 0 to 60 percent. The soils formed in outwash or eolian deposits of poorly graded sands and loamy sands derived mainly from crystalline rocks. Mean annual temperature ranges from 7 to 12 degrees C, and the mean annual precipitation typically ranges from 965 to 1270 mm, but the range includes as low as 660 mm in some places east of Adirondack Mountains in the Champlain Valley of New York. The growing season ranges from 120 to 190 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the [Deerfield](#), [Hinckley](#), [Merrimac](#), [Quonset](#), [Suncook](#), [Agawam](#), [Hadley](#), [Haven](#), [Occum](#), [Pootatuck](#), [Scarboro](#), [Sudbury](#), [Walpole](#), [Wareham](#), and [Winooski](#) soils on nearby landscapes. The moderately well drained Deerfield and Sudbury, the somewhat poorly drained and poorly drained Walpole and Wareham, and the very poorly drained Scarboro soils are common drainage associates. Agawam and Haven soils are coarse-loamy over sandy or sandy-skeletal or coarse-loamy terrace associates, respectively. Hadley, Occum, Pootatuck, and Winooski soils are on nearby flood plains.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Excessively drained. Surface runoff is negligible to medium. Saturated hydraulic conductivity is high or very high.

USE AND VEGETATION: Most areas are forested or in low growing brushy vegetation. Some areas are used

for silage corn, hay, and pasture. Small areas, mostly irrigated, are used for shade tobacco, vegetables and nursery stock. Some areas are in community development. Common trees are white, black, and northern red oak, eastern white pine, pitch pine, gray birch, poplar, red maple, and sugar maple.

DISTRIBUTION AND EXTENT: Late Wisconsin glaciofluvial or eolian landforms in Connecticut, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont; MLRAs 101, 142, 144A, and 145. The series is of large extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Connecticut Valley Area, 1899.

REMARKS: The use of the Windsor series in Maine, and in MLRAs 141, 144B, and 143 is relict to before temperature classes in soil taxonomy. These have been removed from the SC file.

Diagnostic horizons and features recognized in this pedon include:

1. Ochric epipedon - the zone from 0 to 8 cm (Oe and A horizons).
2. Particle-size class - averages sandy in the control section from 25 to 100 cm.
3. No cambic horizon and development of color - the zone from 8 to 64 cm demonstrates development of color with no illuvial accumulation of material (Bw horizons).

ADDITIONAL DATA: Reference samples from pedons 54MA023005, 63VT011001, 63VT011002, 64NH017003, 64NH017004, 70CT003003, 70MA011003, 70VT017002, 73MA005003, 73MA005004, 91MA023006, 95NH013001, 96NH013004, 98NY045002, 98NY085002, S07VT011004.

National Cooperative Soil Survey
U.S.A.

LOCATION WOODBRIDGE

CT+MA NH NY RI

Established Series
Rev. MFF-JTI-DHZ
05/2016

WOODBRIDGE SERIES

The Woodbridge series consists of moderately well drained loamy soils formed in lodgment till. They are very deep to bedrock and moderately deep to a densic contact. They are nearly level to moderately steep soils on hills, drumlins, till plains, and ground moraines. Slope ranges from 0 to 25 percent. Saturated hydraulic conductivity ranges from moderately high to high in the surface layer and subsoil and low or moderately low in the dense substratum. Mean annual temperature is about 9 degrees C., and mean annual precipitation is about 1168 mm.

TAXONOMIC CLASS: Coarse-loamy, mixed, active, mesic Aquic Dystrudepts

TYPICAL PEDON: Woodbridge fine sandy loam - grass field, at an elevation of about 177 meters. (Colors are for moist soil unless otherwise noted.)

Ap--0 to 18 cm; very dark grayish brown (10YR 3/2) fine sandy loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine and medium roots; few very dark brown (10YR 2/2) earthworm casts; 5 percent gravel; moderately acid; abrupt wavy boundary. (10 to 30 cm thick.)

Bw1--18 to 46 cm; dark yellowish brown (10YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable; common fine roots; few very dark brown (10YR 2/2) earthworm casts; 10 percent gravel; moderately acid; gradual wavy boundary.

Bw2--46 to 66 cm; dark yellowish brown (10YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable; common fine roots; few very dark brown (10YR 2/2) earthworm casts; 10 percent gravel; few medium prominent strong brown (7.5YR 5/6) masses of iron accumulation and light brownish gray (10YR 6/2) areas of iron depletion; moderately acid; gradual wavy boundary.

Bw3--66 to 76 cm; light olive brown (2.5Y 5/4) fine sandy loam; weak medium subangular blocky structure; friable; few fine roots; 10 percent gravel; common medium prominent strong brown (7.5YR 5/6) masses of iron accumulation and light brownish gray (10YR 6/2) areas of iron depletion; moderately acid; clear wavy boundary. (Combined thickness of the Bw horizons is 31 to 94 cm.)

Cd1--76 to 109 cm; light olive brown (2.5Y 5/4) gravelly fine sandy loam; weak thick plates of geogenic origin; very firm, brittle; 20 percent gravel; many medium prominent strong brown (7.5YR 5/8) masses of iron accumulation and light brownish gray (10YR 6/2) areas of iron depletion; moderately acid; gradual wavy boundary.

Cd2--109 to 165 cm; light olive brown (2.5Y 5/4) gravelly fine sandy loam; weak thick plates of geogenic origin; very firm, brittle; few fine prominent very dark brown (10YR 2/2) coatings on plates; 25 percent gravel; common fine prominent strong brown (7.5YR 5/8) masses of iron accumulation; moderately acid.

TYPE LOCATION: Tolland County, Connecticut; town of Mansfield, 0.75 mile south of the intersection of Connecticut Routes 275 and 195, and 0.25 mile east on the University of Connecticut Agronomy Farm, 800 feet north of the greenhouses near the corner of a brushy field. USGS Spring Hill, CT topographic quadrangle, Latitude 41 degrees, 47 minutes, 53.43 seconds N., Longitude 72 degrees, 13 minutes, 48.69 seconds W., WGS

1984.

RANGE IN CHARACTERISTICS: The thickness of the solum and depth to densic materials is 50 to 100 cm. Depth to bedrock is commonly more than 2 meters. Rock fragments commonly range from 0 to 35 percent. Except where the surface is stony, the fragments are mostly subrounded gravel and typically make up 60 percent or more of the total rock fragments. Unless limed, reaction ranges from very strongly acid to slightly acid.

Some pedons have an O horizon.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. Dry value is 6 or more. Undisturbed pedons have a thin A horizon commonly with hue of 7.5YR or 10YR but the range includes 2.5Y, value of 2 or 3 and chroma of 1 or 2. The Ap or A horizon is loam, fine sandy loam, or sandy loam in the fine-earth fraction.

Some pedons have a thin E horizon below the A horizon. It has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 3.

The upper part of the Bw horizon has hue of 7.5YR to 2.5Y, value of 3 to 6, and chroma of 3 to 8. The lower part of the Bw horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 3 to 6. Iron depletions are within 60 cm. The Bw horizon is loam, fine sandy loam, or sandy loam with less than 65 percent silt plus very fine sand.

Some pedons have a thin BC horizon.

Some pedons have an E or E' horizon up to 8 cm thick below the B horizon. It has hue of 10YR to 5Y, value of 5 or 6, chroma of 2 or 3, and has redoximorphic features. Typically, it is coarser-textured than the overlying horizon.

Some pedons have a C horizon above the Cd horizon.

The Cd horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 to 4. It commonly has redoximorphic features. Texture is loam, fine sandy loam, sandy loam, or coarse sandy loam in the fine-earth fraction. The structure is not pedogenetically derived, and appears in the form of medium to very thick plates, or it is massive. Consistence is firm or very firm.

COMPETING SERIES: These are the [Chautauqua](#), [North Meadow](#), [Pittstown](#), [Pompton](#), [Rainbow](#), [Sutton](#), [Wapping](#), and [Wilbraham](#) series. Chautauqua, Pompton, Sutton, and Wapping soils do not have a dense substratum. North Meadow soils have a cap of human transported material 25 to 100 cm thick. Pittstown and Rainbow soils have more than 65 percent silt plus very fine sand in the solum. Wilbraham soils are poorly drained and developed from red parent materials (originating from reddish sandstone, shale, and conglomerate with some basalt).

GEOGRAPHIC SETTING: Woodbridge soils are nearly level to moderately steep and are on hills, drumlins, till plains, and ground moraines. Slope commonly is less than 8 percent, but the range includes 0 to 25 percent. The soils formed in acid till derived mostly from schist, gneiss, and granite. Mean annual temperature ranges from 7 to 13 degrees C and mean annual precipitation ranges from 940 to 1250 mm, and the growing season ranges from 115 to 180 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing [Rainbow](#), [Sutton](#), and [Wapping](#) soils and the [Bernardston](#), [Broadbrook](#), [Canton](#), [Charlton](#), [Chatfield](#), [Georgia](#), [Hollis](#), [Leicester](#), [Montauk](#), [Paxton](#), [Ridgebury](#), [Scituate](#), and [Whitman](#) soils on nearby landscapes. The well drained Paxton, somewhat poorly and poorly drained Ridgebury, and the very poorly drained Whitman soils are associated in a drainage sequence. Bernardston and Broadbrook soils are well drained and are finer textured. Canton and Charlton soils are well drained and do not have a dense substratum. Chatfield and Hollis soils have bedrock within depths of 50 to 100 and 25 to 50 cm, respectively. Georgia soils are calcareous within 200 cm. Leicester soils are poorly drained and do not have a dense substratum. Montauk soils are well drained and are coarser textured. Scituate soils have a

loamy sand substratum.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Moderately well drained. The potential for surface runoff is moderate to very high. Saturated hydraulic conductivity is moderately high or high in the solum and low or moderately low in the dense substratum.

USE AND VEGETATION: Many areas are cleared and used for cultivated crops, hay, or pasture. Scattered areas are used for community development. Some areas are wooded. Common trees are red, white, and black oak, hickory, white ash, sugar maple, red maple, eastern hemlock, and eastern white pine.

DISTRIBUTION AND EXTENT: Glaciated uplands of Connecticut, Massachusetts, New Hampshire, eastern New York, and Rhode Island. MLRAs 144A, 145, and 149B. The series is of large extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts

SERIES ESTABLISHED: Essex County, Massachusetts, 1925.

REMARKS: Woodbridge soils were previously used in Maine. Soil temperature studies in Maine have resulted in the use of the frigid soil temperature regime for soils in areas formerly identified as mesic.

Diagnostic horizons and features recognized in this pedon include:

1. Ochric epipedon - the zone from 0 to 18 cm (Ap horizon).
2. Cambic horizon - the zone from 18 to 76 cm (Bw horizons).
3. Aquic feature - low chroma areas of iron depletion within 60 cm (Bw2 horizon).
4. Densic materials - the zone from 76 to 165 cm (Cd1 and Cd2 horizons).
- 5) Particle-size control section - the zone from 18 to 76 cm (Bw horizons).

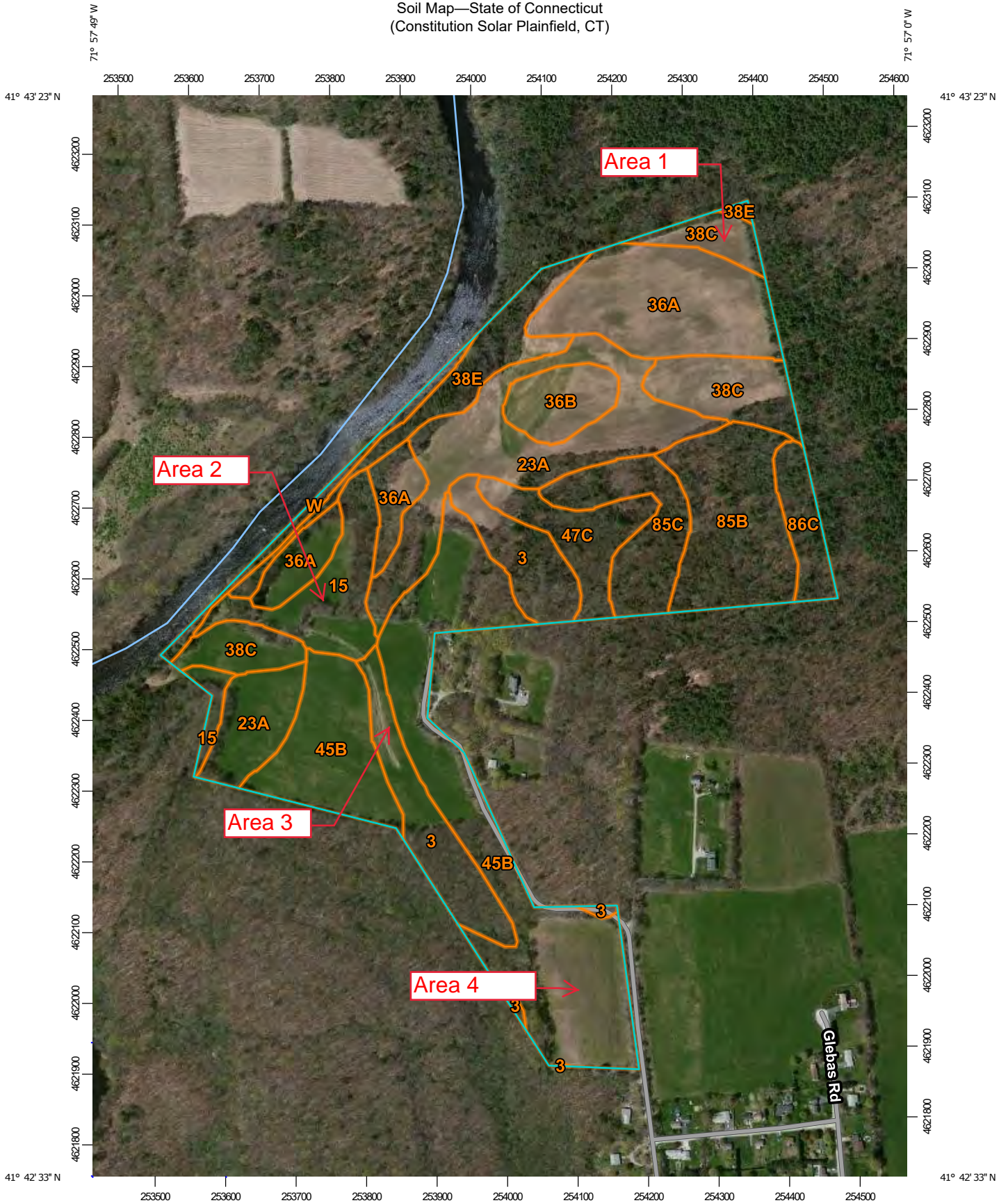
ADDITIONAL DATA: Full characterization data for pedons with User Pedon IDs of S2000CT013003, S1956NH017002, S1956NH017003, S1958CT013004, S1958MA015002, S1978NH011002, and S1991MA023007. Pedons analyzed by the NSSL, Lincoln, NE. The laboratory characterization data for these pedons and similar soils is available through the National Cooperative Soil Survey Soil Characterization Database: <http://ncsslabsdatamart.sc.egov.usda.gov/>

National Cooperative Soil Survey
U.S.A.

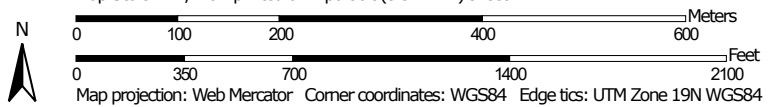
APPENDIX D-SOIL MAPS

APPENDIX D, Map D-1
NRCS SOIL MAP

Soil Map—State of Connecticut
(Constitution Solar Plainfield, CT)



Map Scale: 1:7,440 if printed on A portrait (8.5" x 11") sheet.



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 Connecticut

Survey Area Data: Version 19, Sep 13, 2019

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

Date(s) aerial images were photographed: Mar 30, 2011—May 1, 2011

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.

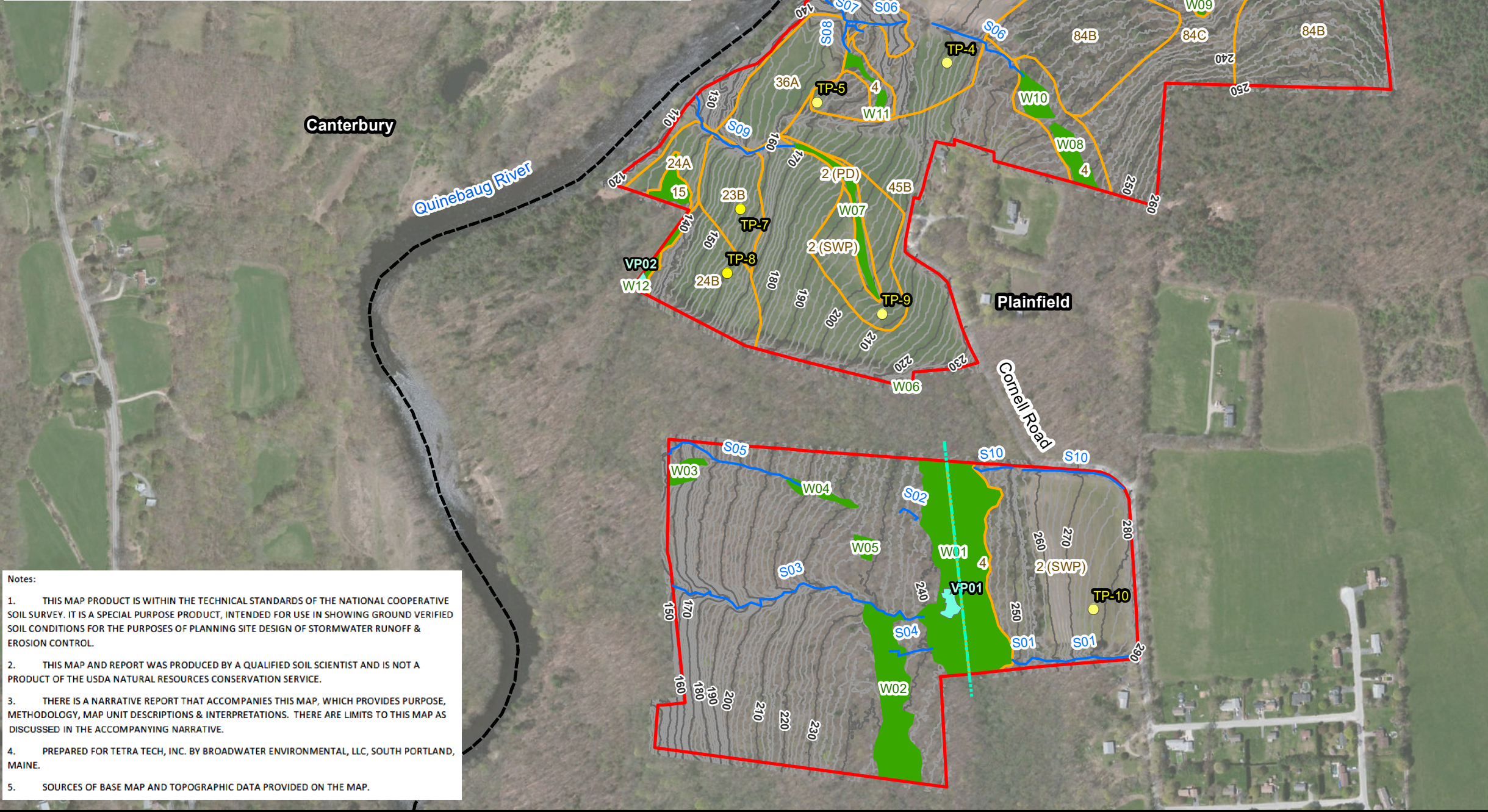
Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	9.9	8.5%
15	Scarboro muck, 0 to 3 percent slopes	6.7	5.8%
23A	Sudbury sandy loam, 0 to 5 percent slopes	16.3	14.0%
36A	Windsor loamy sand, 0 to 3 percent slopes	14.9	12.7%
36B	Windsor loamy sand, 3 to 8 percent slopes	3.3	2.8%
38C	Hinckley loamy sand, 3 to 15 percent slopes	8.8	7.5%
38E	Hinckley loamy sand, 15 to 45 percent slopes	5.3	4.6%
45B	Woodbridge fine sandy loam, 3 to 8 percent slopes	27.6	23.6%
47C	Woodbridge fine sandy loam, 3 to 15 percent slopes, extremely stony	4.5	3.8%
85B	Paxton and Montauk fine sandy loams, 3 to 8 percent slopes, very stony	9.5	8.1%
85C	Paxton and Montauk fine sandy loams, 8 to 15 percent slopes, very stony	5.7	4.9%
86C	Paxton and Montauk fine sandy loams, 3 to 15 percent slopes, extremely stony	2.7	2.3%
W	Water	1.6	1.4%
Totals for Area of Interest		117.0	100.0%

APPENDIX D, MAP D-2
REVISED SITE SPECIFIC SOIL MAP

Map Unit ID	Map Unit	Slope (%)	Drainage Class
2 (SWP)	Ridgebury fine sandy loam (SWP)	0-8 ²	Somewhat poorly drained
2 (PD)	Ridgebury fine sandy loam (PD)	0-8 ²	Poorly drained
4	Leicester fine sandy loam	0-8 ²	Poorly drained
15	Scarborough muck	0-3	Very poorly drained
23A	Sudbury sandy loam	0-8 ²	Moderately well drained
23B	Sudbury sandy loam	8-15	Moderately well drained
24A	Deerfield loamy fine sand	0-8 ²	Moderately well drained
24B	Deerfield loamy fine sand	8-15	Moderately well drained
36A	Windsor loamy sand	0-3	Well drained
38C	Hinckley loamy sand	3-15	Excessively drained
38E	Hinckley loamy sand	15-45	Excessively drained
45B	Woodbridge fine sandy loam	3-8	Moderately well drained
84B	Paxton and Montauk fine sandy loams	3-8	Well drained
84C	Paxton and Montauk fine sandy loams	8-15	Well drained

1. SWP=somewhat poorly drained condition; PD=poorly drained condition
2. Range modified from State unit listing to reflect local conditions.



Notes:

1. THIS MAP PRODUCT IS WITHIN THE TECHNICAL STANDARDS OF THE NATIONAL COOPERATIVE SOIL SURVEY. IT IS A SPECIAL PURPOSE PRODUCT, INTENDED FOR USE IN SHOWING GROUND VERIFIED SOIL CONDITIONS FOR THE PURPOSES OF PLANNING SITE DESIGN OF STORMWATER RUNOFF & EROSION CONTROL.
2. THIS MAP AND REPORT WAS PRODUCED BY A QUALIFIED SOIL SCIENTIST AND IS NOT A PRODUCT OF THE USDA NATURAL RESOURCES CONSERVATION SERVICE.
3. THERE IS A NARRATIVE REPORT THAT ACCOMPANIES THIS MAP, WHICH PROVIDES PURPOSE, METHODOLOGY, MAP UNIT DESCRIPTIONS & INTERPRETATIONS. THERE ARE LIMITS TO THIS MAP AS DISCUSSED IN THE ACCOMPANYING NARRATIVE.
4. PREPARED FOR TETRA TECH, INC. BY BROADWATER ENVIRONMENTAL, LLC, SOUTH PORTLAND, MAINE.
5. SOURCES OF BASE MAP AND TOPOGRAPHIC DATA PROVIDED ON THE MAP.

Legend

- Study Area
- Soil Unit
- Township Boundary
- Delineated Wetland
- Vernal Pool
- Elevation Contour (10 ft)
- Elevation Contour (2 ft)
- Extent of Soil Survey
- Watercourse
- Test Pit

0 250 500 1,000 Feet

**Site-Specific Soil Map
Constitution Solar
Plainfield, Connecticut**

Prepared For: **NEXTERA ENERGY RESOURCES**

Prepared By: **TETRA TECH** Date: **06/2020**

Source: Esri, et. al., 2018; NextEra, 2019

Coordinate System: North American Datum, 1983
Universal Transverse Mercator, Zone 19 North