PRE-FILED TESTIMONY

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

Quinebaug Solar, LLC petition for a declaratory ruling that no Certificate of Environmental Compatibility and Public Need is required for the proposed construction, maintenance and operation of a 50 megawatt AC solar photovoltaic electric generating facility on approximately 561 acres comprised of 29 separate and abutting privately-owned parcels located generally north of Wauregan Road in Canterbury and south of Rukstela Road and Allen Hill Road in Brooklyn, Connecticut	Petition No. 1310 November 12, 2019

PREFILED WRITTEN TESTIMONY OF HAGEN LEE

I. INTRODUCTION

Q: Please state your name, title, and business address.

A: My name is Hagen Lee. I am Director, Development for NextEra Energy Resources, LLC (NextEra). My business address is 700 Universe Boulevard, E5E/JB, Juno Beach, FL 33408.

Q: Please describe your current responsibilities at NextEra.

A: I currently lead the new development efforts for renewable energy projects in New England and permitting of several existing projects in Connecticut and New Hampshire.

Q: What has been your involvement in the Quinebaug Solar Project?

A: I am the Project Manager responsible for all aspects of the Quinebaug Solar Project (Quinebaug Solar or Project). Since June 2019, I have managed all facets of the Project redesign, including layout decisionmaking, project land acquisition, and abutter and property owner relations.

Q: What is the purpose of your testimony?

A: My testimony explains Quinebaug Solar's approach regarding Project redesign as informed by other successful Projects and adoption of regional and national best development practices.

II. SPECIFIC TESTIMONY

Q. Please describe the Quinebaug Solar Project.

A: Development of Quinebaug Solar began in Spring 2015, with initial development tasks being performed by Ranger Solar, LLC. Subsequent to the Project's acquisition in early 2017, NextEra assumed control and management of all development activities. The Project was selected in the Tri-State RFP and subsequently entered into long-term power purchase agreements (PPAs) with regional electric distribution companies. The Project will help foster the state's goal of developing renewable energy resources, such as solar and wind energy, to the maximum practicable extent and will operate as a Class I renewable energy source, aiding Connecticut in pursuit of its ambitious greenhouse gas reduction goals and RPS requirements.

Q: Please explain NextEra's approach regarding redesign of the Quinebaug Solar Project.

A: Following the Council's Initial Decision, NextEra undertook a comprehensive review of all proposed Connecticut solar projects. NextEra dedicated significant additional resources to site-specific environmental and cultural surveys, as well as a targeted resource-specific environmental analysis that incorporates current best practices using directional corridors and buffers. NextEra also devoted significant time to pre-application meetings with various agencies involved, including the Department of Energy and Environmental Protection, and the Department of Agriculture.

NextEra has considered the concerns expressed in the Initial Decision, and applied the lessons learned and best practices realized during the successful Nutmeg Solar Petition (Petition 1352) to the Quinebaug Solar Project. I believe the Quinebaug Solar Project, as redesigned, is responsive to the Council's December 2017 Decision and Order, incorporates current best practices for Connecticut solar development, and has been thoughtfully redesigned to meet DEEP air and water quality standards.

Q: Please describe changes that have been made to the Project in response to environmental concerns.

A. Multiple years of site-specific surveys were conducted to inform a complete redesign in order to minimize adverse impacts. As documented in the Petition and pre-filed testimony, the original size of the Project was **270 acres**. The redesigned Project is now proposed to be **227 acres.** The Project as modified increases wetland and watercourse buffers by 300%, or an increase of 132 acres. The Project further proposes no direct wetland impacts and will apply a standard 100-foot no-disturbance upland buffer around the majority of wetlands and watercourses, with minor deviations proposed for previously impacted resource areas. The Project also implements additional protections for vernal pools and herpetofauna habitat, including exclusion of a significant area from development as discussed in the comprehensive Herpetofauna Avoidance and Mitigation Plan in **Exhibit D.**

Q. Please describe changes that have been made to the Project in response to cultural and historic resource concerns.

A. The Project as modified achieves the desired energy output while avoiding, minimizing, and mitigating potential cultural and historic resource impacts as well. The Project excludes a significant area from development as discussed in the comprehensive Phase IB/II Report provided as a bulk filing concurrent with the Motion to Reopen as **Exhibit Q.** We are working to obtain Final State Historic Preservation Office Concurrence and will provide it to the Council upon receipt.

Q. Please describe the Project's approach to stormwater management.

A: The Project engaged an expert stormwater engineer, who was tasked with design of a principled and thoughtful approach to Project stormwater management. During stormwater management design, the Project worked closely with DEEP to address responses to its concerns. Quinebaug Solar will file an Application for a DEEP General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities as soon as possible. We believe the Project will satisfy both DEEP as the primary permitting agency responsible for stormwater, as well as the Council.

Q. Does this conclude your pre-filed testimony?

A. Yes.

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JOINT PREFILED WRITTEN TESTIMONY OF KATELIN NICKERSON AND DR. KEVIN RYAN

I. INTRODUCTION

Q: Please state your names, titles, and business addresses.

A: My name is Katelin Nickerson. I am a Professional Wetlands Scientist and for Tetra Tech, Inc. My business address is 451 Presumpscot Street, Portland, ME 04103.

My name is Dr. Kevin Ryan. I am a Wetland and Wildlife Ecologist for FB Environmental Associates (FBE). My business address is 97A Exchange Street, Suite 305, Portland, ME 04101.

Q: Please describe your current responsibilities and professional experience.

A: (Nickerson) I am the Quinebaug Solar Project Manager and lead consultant. I am a Professional Wetland Scientist, responsible for conducting wetland delineations, natural resource surveys and the compilation of the environmental conditions reports. I work directly with Project staff to survey and evaluate the natural resources present at the Project Site.

A: (Ryan) I led the herpetological surveys associated with the Quinebaug Solar Project. This included a general herpetological inventory and species-specific surveys for the pure-diploid blue spotted salamander (*Ambystoma laterale*) and eastern spadefoot toad (*Scaphiopus holbrookii*).

Q: What has been your involvement in this Project?

A: (Nickerson) I became involved in January 2018 when I was assigned as Project Manager and lead environmental consultant for the Quinebaug Solar Project. I am also the primary wetland scientist working on the Project. Since the winter of 2018, I have managed the

environmental surveys and technical reporting for the Project. I conducted wetland delineations in the fall of 2018 and spring 2019. Additionally, I worked with a professional soil scientist to confirm my delineation and the changes to wetland lines in the Study Area. I was responsible for compiling the environmental site conditions report and submittal to Connecticut Department of Energy and Environmental Protection (DEEP) Natural Diversity Database (NDDB) Program and have responded to their subsequent requests for additional information.

Since 2018, I have worked with the Project's engineering team to support the site redesign to protect wetlands, vernal pools, and other significant natural resources documented at the Project Study Area. Because of our continued field studies and collaboration with the design team, significant changes have been made to the Project design that avoid and protect these sensitive resources. These changes include increased wetland and watercourse setbacks, vernal pool directional buffers, a designated herpetofauna protection area, and a robust avoidance and mitigation plan to be implemented as part of the construction monitoring program.

A: **(Ryan)** I became involved with the Project in late 2017 when the need for Project-specific herpetofauna surveys became apparent. In 2018, I conducted a herpetological assessment of the site to document which reptile and amphibian species were present. The assessment also consisted of species-specific surveys to detect the presence blue-spotted salamanders and eastern spadefoot toads. The blue-spotted salamander was not detected within the site and the presence of the eastern spadefoot toad (*Scaphiopus holbrookii*) was confirmed. Due to the confirmed presence of eastern spadefoot toad, I conducted a second year of monitoring over the summer of 2019. This survey was intended to identify evidence of breeding at the Project Site. No evidence of breeding of eastern spadefoot toad was detected during the summer of 2019.

Following the herpetological assessment, I worked with the Project team to make changes in the Project design to conserve habitat for species on site, notably pool breeding amphibians and the eastern spadefoot toad and identify avoidance and mitigation measure that are to be utilized during construction to protect reptiles and amphibians that may be present.

Q: **What is the purpose of your testimony?**

A: The purpose of our testimony is to describe the existing environmental conditions and potential Project effects to environmental resources as detailed in the Environmental Site Conditions report submitted with the Petition for Declaratory Ruling. In addition, our testimony explains the expanded field studies performed since 2017 and subsequent design changes implemented based on the results of these studies.

II. <u>SPECIFIC TESTIMONY</u>

1. Background and Fieldwork

Q: Please describe the Quinebaug Solar Project Site.

A: After the Council's Opinion, Decision and Order in Petition 1310, the area studied for environmental purposes (Study Area) was expanded to better inform Project layout, construction activities, and infrastructure. The Study Area now covers approximately 516 acres, and as a result, the Project emphasizes use of previously disturbed areas and creates additional buffers and protection areas around sensitive natural resources and habitat.

The Study Area consists of a mix of existing agricultural fields, an existing network of roads and logging paths, forested areas, gravel extraction areas in various stages of use and an athletic field with associated gravel parking lots. Wetlands, watercourses, vernal pools, and mixed second growth forest have been surveyed throughout the Study Area. The agricultural fields have been used for crop production of corn, hay and soybeans. Although the site shows evidence of recent and past gravel extraction activities, some of these areas are currently inactive. However, gravel extraction operations continue to occur south of Wauregan Road, adjacent to the existing Eversource transmission right of way. During our on-site surveys, it was clear that much of the site has been previously disturbed or impacted by the various agriculture, gravel extraction, and timber harvest activities.

Q: Please explain your approach to fieldwork.

A: Environmental field studies have been conducted for the Project over the course of four years. Beginning in 2016, initial studies were completed to evaluate vernal pools, wetlands, watercourses and other protected natural resources. Following the December 2017 decision by the Council, additional field studies were performed to fill in gaps in the data and to gain a better understanding of the resources that occur within the Study Area. Over the course of the Project development process, slight changes have been made to the Study Area. Field studies conducted after 2017 include a modified Study Area to reflect a boundary that is inclusive of all adjacent natural resources. The most substantial change in this Study Area is the inclusion of Blackwell Brook and Cold Spring Brook located along its' western boundary. These resources have been delineated to ensure the appropriate setbacks can be applied to these areas.

Following initial desktop research and a listed species request to NDDB, targeted field surveys were conducted to identify any regulated natural resources or habitats on the site that are not identified in the available public literature and databases. Results from these field surveys have been used to inform the design and development of the Project, to identify sensitive resources within the Study Area, and to fulfill the anticipated regulatory requirements of the Project. The following studies have been completed for the Project to date:

- wetland and watercourse delineations – 2016, 2018 and 2019;
- general herpetological survey – spring and summer, 2018;
- eastern spadefoot toad (*Scaphiopus holbrookii*) survey and monitoring – summer 2018 and 2019;
- vernal pool surveys – spring 2016 and 2018; and

- northern long-eared bat (NLEB) (*Myotis septentrionalis*) presence/absence survey – July 2016.

Environmental surveys were conducted by qualified field biologists, in accordance with local, state, and federal regulatory guidelines.

Q: Please explain the fieldwork conducted related to wetlands and watercourses.
A: Tetra Tech conducted wetland and watercourse delineations in July and August 2016. Additional surveys were completed in 2018 and 2019. On April 23, 2019, Tetra Tech submitted a Request for Final Determination to the DEEP NDDB Program that included a detailed Environmental Site Conditions Report, and technical analysis describing the wetlands and watercourses observed at the Project site. Subsequent to this submission, additional fieldwork was conducted by Tetra Tech in the spring of 2019.

The additional fieldwork was conducted by a Tetra Tech Certified Professional Soil Scientist and Professional Wetland Scientist in April and May 2019. During this time revisions were made to the original wetland delineation included in the April 2019 report. These changes were provided as an updated wetland and watercourse report.

In addition, Tetra Tech applied the US Army Corps of Engineers Highway Methodology to complete a Functions and Values Assessment for the resources within the Project Site. In this assessment, the function and quality of wetlands were evaluated to develop an informed design that protects wetlands with higher functions and values. The final Functions and Values Assessment was formalized in October 2019, and is provided as **Attachment 1** to this testimony.

Q: Please explain the fieldwork conducted related to vernal pools.
A:

(Nickerson) Formal vernal pool surveys were conducted in 2016 and again in 2018. Informal checks on select pools were done during the spring of 2019. The spring 2016 vernal pool surveys were completed by Verdanterra, LLC and identified eight pools within the Study Area. A final report was included in the initial petition.

(Ryan) In the spring of 2018 FBE conducted an independent vernal pool assessment. Blue-spotted salamander surveys occurred concurrently with the vernal pool survey. No additional pools were identified in 2018. A detailed report outlining the results of this survey including photographs and vernal pool data sheets was included as part of the Environmental Site Conditions Report (**Exhibit D**).

(Nickerson) One additional vernal pool was identified during the spring 2019 wetland and watercourse field surveys. Vernal pool nine (VP9) was observed on the south edge of the Study Area, adjacent to Wauregan Road in the expanded Study Area. Documentation of this pool is provided in the May 2019 Wetland and Watercourse Report (**Exhibit D**).

2. Water Quality

Q: Please explain Quinebaug Solar's approach to protecting water resources.

A: The Project utilizes the previously impacted portions of the site as much as possible. This approach allows for beneficial re-use of disturbed land, and provides protection for the adjacent natural resources. Protecting the functions and quality of water resources within and adjacent to the Development Area is a key facet of the redesigned Project. The Project will follow best practices and endeavor to take all measures necessary to protect water quality of adjacent wetlands and watercourses. This includes regular inspections of stormwater controls, biological monitoring, training of construction and operations personnel, and documentation and reporting of observations.

Q: Please explain the revisions to wetland and watercourse buffers.

A: Generally, Quinebaug Solar plans to maintain buffers around all watercourses at a minimum of 100 feet, except in limited circumstances in the vicinity of existing gravel roads that will be used for site access and around previously impacted low-value wetlands and watercourses.

As previously stated, a wetland functions and values assessment was performed to evaluate the quality of the wetlands in the Study Area and apply appropriate buffers and setbacks to each resource. This assessment uses a widely accepted evaluation tool to describe and assess resource functions and values. The results provide detailed rationale for areas where a less than a 100-foot upland buffer is proposed. The Project has considered avoidance and minimization of natural resource impacts throughout the redesign process. Our assessment concludes that wetland functions and values will be retained for all wetlands and improved for wetlands with no existing vegetated upland buffer. In these cases, converting active agricultural land to meadow will eliminate current agricultural runoff, and allow natural vegetation to establish in these areas.

Q: How does the Project account for stormwater impacts to water quality?

A: A comprehensive erosion and sediment control plan is being developed for the Project. This plan will be included as part of the Stormwater Management Report to be submitted to DEEP for the Stormwater General Permit (General Permit). Best management practices will be followed to ensure proper erosion and sediment control is maintained and that all water is treated before leaving the Project Site to ensure the water quality of adjacent watercourses is maintained.

In addition to regular stormwater controls, particular attention will be given to the areas directly upslope from Blackwell Brook and Cold Spring Brook. The Project will control stormwater and protect water quality of these watercourses as they provide habitat for a variety of species, in particular, mussels. This includes regular inspections of stormwater controls, biological monitoring, training of construction and operations personnel, and documentation and reporting of observations. (**Exhibit D**).

Along with the Stormwater Management Report, the Project is committing to the development and implementation of an environmental monitoring plan. This plan will be prepared and/or reviewed by the biologists and natural resource scientists who conducted field studies at the Project site. Consistent monitoring throughout the construction process will allow for real-time adjustments to be made to protect adjacent natural resources.

3. Wildlife

Q: Explain Quinebaug Solar's approach to protecting wildlife.

A: In addition to the 100-foot standard wetland buffer, a portion of forested upland area between wetlands W05 and W06, located in the southern portion of the Study Area will be excluded from development to preserve important upland habitat and overland access for amphibian species that breed in vernal pool VP8, located in wetland W06. The forested upland area between wetlands W06 and W05 has been conserved through a directional buffer to maintain intact terrestrial habitat and overland connection for vernal pool breeding species. Following the 2015 Vernal Pool Best Management Practices published by the US Army Corps of Engineers, this directional buffer preserves critical terrestrial habitat around vernal pool VP8 while allowing for Project development connectivity on the eastern side of the vernal pool and wetland complex.

The western portion of the Study Area will also maintain an undeveloped herpetofauna protection area to protect habitat around a cluster of high-functioning vernal pools (VP4 and VP5) that have been documented in this area. The herpetofauna protection area encompasses wetlands W11, W12, W13, W14, watercourses S05 and S02, and a swath of forested area that extends to the west and eventually connects to the floodplain wetlands associated with Cold Spring Brook and Blackwell Brook. Avoiding development within this area will protect the principal function of these wetlands as wildlife habitat as well as maintain habitat connectivity between these wetlands and vernal pools and the resources that border the western Project boundary.

The Project will use existing roads to minimize impacts to natural resources by reducing the number of new roads that need to be constructed. These roads have been previously developed to access the site for agriculture, recreation, and gravel extraction. The continued use of these roads is not anticipated to significantly impact the current condition of these resources. All internal site roads will be maintained to allow for wildlife passage and movement throughout the site.

The perimeter fence for the Project will have a six-inch wildlife gap in select areas where wildlife passage is expected to be highest. This will allow for smaller wildlife species to pass through the site once the Project is constructed.

A Herpetofauna Avoidance and Mitigation Plan has been developed for the Project and will be implemented beginning with environmental training for contractors. **(Exhibit D)**. This plan includes guidance regarding limit of work restrictions, construction timing,

personnel training, exclusion fencing, inspections and monitoring, documentation, and operational avoidance practices.

Q: Explain the status of Quinebaug Solar's Request for Final Determination with DEEP NDDB.

A: Quinebaug Solar originally submitted a species list request to DEEP NDDB in October 2016. The Project submitted a revised listed species request to NDDB on March 27, 2019. Following phone communication with Project staff, DEEP directed the Project to submit a Request for Final Determination instead, which was submitted on April 23, 2019. Supplements to the original Environmental Site Conditions report were provided to NDDB on May 30, August 28, and October 23, 2019, as demonstrated in Exhibit D. This report and the supplemental information provided includes the cumulative results of all field studies completed for the Project and the avoidance and mitigation strategies to be employed to protect natural resources and sensitive species known to occur or that have the potential to occur in the Study Area. The Petitioner continues to promote an open dialogue, answer questions, provide additional information and work with DEEP NDDB to secure a Final Determination that will be provided to the Council upon receipt.

III. CONCLUSION

Q: Please explain your overall assessment of the redesigned Quinebaug Solar Project.

A: We believe the Quinebaug Solar Project adequately avoids and mitigates potential impacts to water quality, wildlife, and natural resources. An additional two years of environmental surveys have been used to inform the Project redesign and enable best management practices throughout the planning and construction phases of the Project. Working closely with the engineering team, we have been able to increase buffers and setbacks to wetlands, set aside land with higher value to wildlife for the life of the Project, and develop a construction monitoring plan to be implemented at the throughout Project construction.

As described in the wetland functions and values assessment, following Project construction, wetland areas are anticipated to maintain their existing functions and values. In addition, many wetlands that are historically impacted by agricultural practices will see a net benefit once the Project is operational and agriculture uses are suspended during the life of the Project.

The designated herpetofauna protection area will be set aside throughout the life of the Project to protect higher functioning vernal pools and provide habitat connectivity between these pools and the floodplain forest of Blackwell Brook and Cold Spring Brook. This area is also located entirely within an area mapped as Hinckley soils, the preferred soil type for eastern spadefoot toad.

The development team has negotiated with the landowner to install solar arrays on land currently used for gravel extraction operations, resulting in a beneficial re-use of disturbed land. Additionally, the site design leverages existing roads to avoid impacts associated with new road development around sensitive resources. Overall the Project redesign has

substantially changed the Project footprint and provides significant protections for water quality and wildlife.

ATTACHMENT 1

Wetland Functions and Values Assessment

Quinebaug Solar Project
Brooklyn and Canterbury, Connecticut

Prepared by:
Tetra Tech, Inc.

Prepared for:
Quinebaug Solar, LLC

October 2019

Introduction

On behalf of Quinebaug Solar, LLC, Tetra Tech, Inc. completed this functions and values assessment of the wetlands delineated for the Quinebaug Solar Project (Project) located in the towns of Brooklyn and Canterbury, Connecticut. This assessment is intended to serve as a supplement to the Wetland and Watercourse Report to further describe the condition of the resources identified and provide context for the use of appropriate natural resource buffers and setbacks proposed for the Project.

Quinebaug Solar has designed the Project to avoid and minimize impacts to natural resources as much as practicable and no direct impacts to wetlands or watercourses are proposed. Additionally, appropriate upland buffers are allocated to water resources based on the results of this functions and values assessment. The Project design includes a minimum standard 100-foot no-disturbance upland buffer around the wetlands and associated watercourses that are found to contain the highest functions and values within the 516-acre Project site (Study Area). A smaller upland buffer is proposed for select wetlands and watercourses with fewer functions and values, or resources with ongoing or previous disturbances, such as agricultural activities or existing roadways.

This assessment uses a widely accepted evaluation tool to describe resource functions and values. Detailed rationale is provided for areas where a less than a 100-foot upland buffer is proposed. Additionally, a high-level summary of the functions and values for all wetland areas identified at the Project site is included.

Approach and Methodology

This functions and values assessment was conducted in accordance to the *Highway Methodology Workbook, Wetland Functions and Values: A Descriptive Approach Supplement* (Highway Methodology) published by the US Army Corps of Engineers (USACE) New England District in 2015[1]. While the Project does not fall under the jurisdiction of the USACE, this is currently the most widely recognized tool used to evaluate and quantify wetland functions and values.

Functions are defined as self-sustaining properties of a wetland ecosystem that exist in the absence of society and that are a product of the living and non-living components or characteristics of a wetland. Values are defined as benefits that derive from either one or more functions and physical characteristics associated with a wetland[2]. This evaluation assessed eight functions and five values based on a combination of field observations and desktop analysis of the existing natural resources and the surrounding landscape within the Quinebaug River Watershed.

This method incorporates wetland science along with best professional judgment regarding more qualitative values and benefits. As part of this method, the evaluator takes into account a number of considerations and qualifiers that can be used as indicators or descriptors of a wetland function or value.

Functions and Values

This assessment is used to give a descriptive analysis of the wetlands and assist with identifying proper setbacks to these resources so that the Project will not negatively affect existing functions and values. The following is a list of the 13 functions and values used in this analysis to evaluate the natural resources within the Project site.

1. Groundwater Recharge/Discharge (Function) — A wetland that serves as a groundwater recharge and/or discharge area, relating to the potential for the wetland to contribute water to an aquifer or to the potential for the wetland to serve as an area where groundwater can be discharged to the surface.
2. Floodflow Alteration (Function) — The potential of a wetland to reduce flood damage following precipitation events.

[1] United States Army Corps of Engineers (USACE), New England District. 2015. The Highway Methodology Workbook Supplement. Wetland Functions and Values. April 6, 2015. Available online at: http://www.nae.usace.army.mil/Portals/74/docs/regulatory/Forms/HighwaySupplement6Apr2015.pdf

[2] USACE New England District 2015

3. Fish and Shellfish Habitat (Function) — The effectiveness of seasonal or permanent waterbodies associated with a wetland to provide fish and shellfish habitat.
4. Sediment/Toxicant/Pathogen Retention (Function) — A wetland that acts as a trap for sediments, toxicants, or pathogens as a prevention or reduction of water quality degradation.
5. Nutrient Removal/Retention/Transformation (Function) — A wetland that prevents the adverse effects of excess nutrients entering aquifers or surface waters such as ponds, lakes, streams, rivers, or estuaries.
6. Production Export (Function) — The ability of a wetland to produce food or usable products for humans or other living organisms.
7. Sediment/Shoreline Stabilization (Function) — The effectiveness of a wetland to stabilize streambanks and shorelines against erosion.
8. Wildlife Habitat (Function) — A wetland that provides habitat for various types and populations of animals typically associated with wetlands and the wetland edge.
9. Recreation (Value) — A wetland that can provide recreational opportunities such as canoeing, boating, fishing, hunting, and other active or passive recreational activities.
10. Educational/Scientific Value (Value) — A wetland that could be used as a site for an "outdoor classroom" or as a location for scientific study or research.
11. Uniqueness/Heritage (Value) — A wetland that exhibits special values such as: archaeological sites, unusual aesthetic quality, historical events; or unique plants, animals, or geologic features.
12. Visual Quality/Aesthetics (Value) — Visual and aesthetic qualities of a wetland.
13. Threatened or Endangered Species Habitat (Value) — A wetland or associated waterbodies that supports threatened or endangered species.

Wetland Delineation and Wildlife Surveys

Wetlands were delineated in the field in accordance with the 1987 USACE Wetland Delineation Manual[3] and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0[4]. Additionally, wetland and watercourses surveys were completed in accordance with the Inland Wetlands and Watercourses Regulations of the Town of Brooklyn[5] and the Inland Wetlands and Watercourses Regulations of the Town of Canterbury[6], where applicable. Additional surveys completed for the Project include, a northern long-eared bat (*Myotis septentrionalis*) presence/absence survey, vernal pool survey, general herpetological survey, and an eastern spadefoot toad (*Scaphiopus holbrookii*) survey. The results of all field surveys and desktop analyses completed for the Project are considered in this assessment.

A total of 30 wetlands totaling approximately 70 acres, and 10 watercourses are identified within the Project's 516-acre Study Area. Physical characteristic data were collected at each wetland and evaluated as part of this functions and values assessment. Wetland delineation and other specific wildlife surveys were conducted over a period of 3 years between 2016 and 2019. As part of these survey efforts, vegetation, soils, hydrological data, geomorphic location, and wildlife observations were documented and used in this evaluation.

[3] Environmental Laboratory. 1987. United States Army Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87 1, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS. 100 pp.

[4] U.S. Army Corps of Engineers (USACE). 2012. Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Northcentral and Northeast Region (Version 2.0). ed. J, S. Wakeley, R. W. Lichvar, C.W. Noble, and J. F. Berkowitz. ERDC/EL TR-12-1. Vicksburg, MS. U.S. Army Corps of Engineer Research and Development Center.

[5] Town of Brooklyn. 2013. Inland Wetland and Watercourses Regulations. Published by the Town of Brooklyn, Connecticut. October 2013. 77 pp. Available online at: https://www.brooklynct.org/sites/brooklynct/files/file/file/brooklyn_iwwc_october_2013_0.pdf. Accessed October 17, 2018.

[6] Town of Canterbury. No date. Inland Wetland and Watercourses Regulations. Published by the Town of Canterbury, Connecticut. 21 pp. Available online at: http://www.canterburyct.org/documents/IWWA%20Regs.pdf. Accessed October 17, 2018.

Functions and Values Analysis

Many of the wetlands within the Study Area have been impacted by humans historically, mainly through clearing for agricultural use. The purpose of this assessment is to evaluate the quality of the resources and apply buffers and setbacks accordingly. The Project is proposing no direct wetland impacts and will apply a standard 100-foot no-disturbance upland buffer around the majority of (higher quality) wetlands and watercourses. Wetlands that are proposed to maintain a 50-foot buffer for the Project have the greatest amount of existing disturbance. These wetlands occur in fields that are regularly used for growing corn (*Zea mays*), soybeans (*Glycine max*), and hay; or that are bisected by an existing road. Figure 1 shows the resources mapped in the Study Area, and the proposed buffers assigned to each resource. Table 1, at the end of this section, provides a summary of all wetland resources' functions and values and the specific buffers proposed for each.

The majority of wetlands within the Study Area are palustrine forested (PFO) wetlands with some instances of palustrine emergent wetland (PEM), palustrine scrub shrub (PSS) wetland, and unconsolidated bottom/open water wetland. Common functions and values associated with these resources include wildlife habitat, sediment/toxicant/pathogen retention, nutrient removal/retention/ transformation, groundwater discharge, and floodflow alteration. Other water resources within the Study Area include intermittent and ephemeral streams, and two larger perennial streams (Blackwell Brook and Cold Spring Brook) located along the western boundary of the Project site. The following descriptive analysis provides details regarding each wetland that is proposed to have an upland buffer that is less than 100 feet.

Wetland W01

Resource Description

Wetland W01 is a 6,261 square foot depression located in an active corn field in the northeast portion of the Study Area. This wetland is classified as a PEM wetland. Vegetation in this wetland at the time of survey consisted of corn.

Resource Functions and Values

The principal function of this wetland is sediment/toxicant/pathogen retention and nutrient removal/retention/transformation. The land use within and directly adjacent to this wetland consists of active cornfields and other agricultural activities that presumably contribute excess nutrients (fertilizers) and toxicants (pesticides) to the landscape. Other functions associated with this wetland include floodflow alteration.

Proposed No-Disturbance Buffers

A 50-foot buffer is proposed around the entire wetland that will allow the wetland and the adjacent upland to be removed from regular crop rotations and soil disturbance, which will promote growth of natural revegetation within the wetland and upland buffer area. Ultimately, this will improve the function of this resource within the landscape. Discontinuing regular soil disturbance and application of fertilizers and pesticides within this resource may increase the ability for natural soil processes to take place and simultaneously increase the ability of this resource to store water and protect surrounding uplands from runoff and flooding.

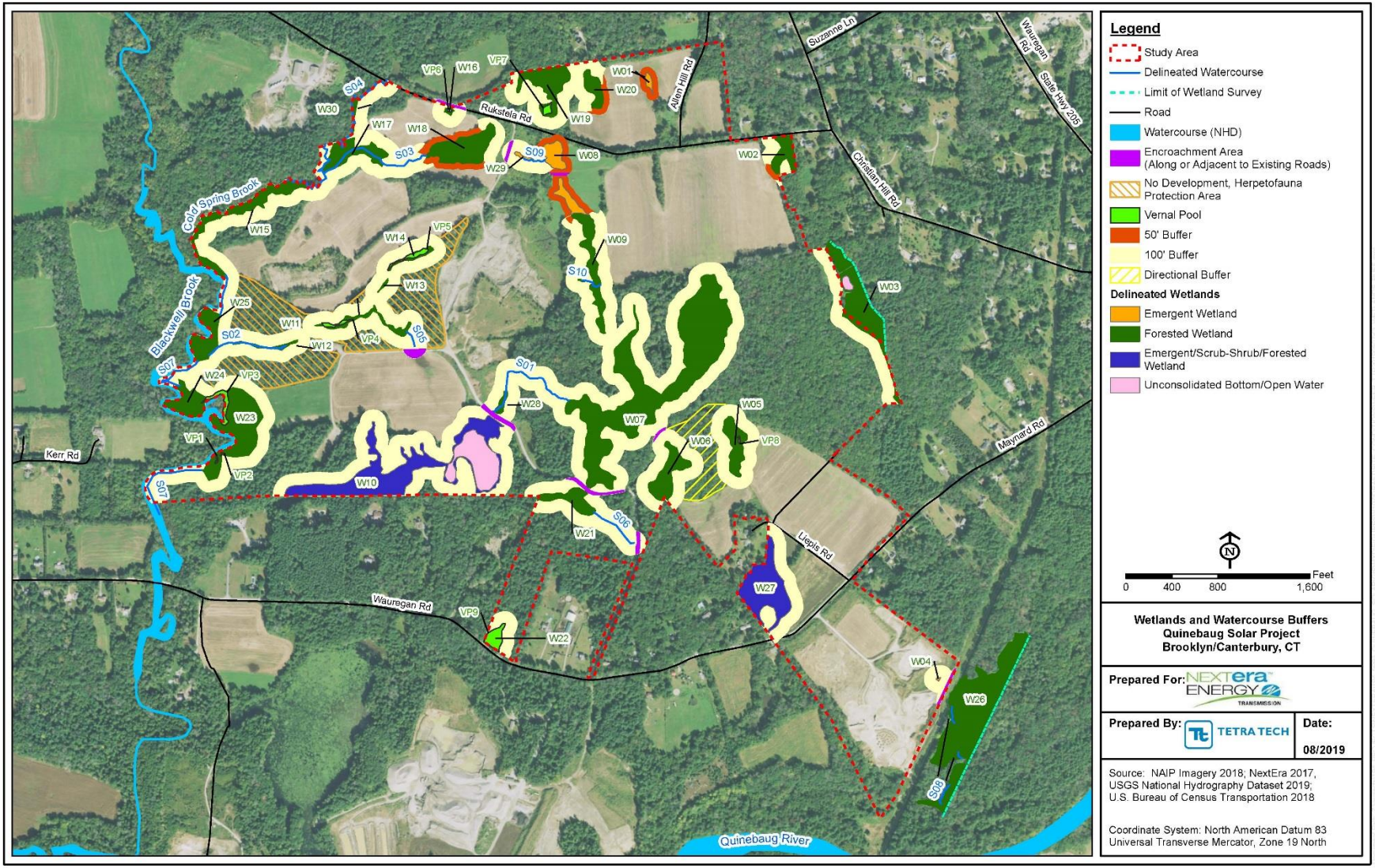

Figure 1. Quinebaug Solar Wetlands and Watercourses and Proposed No-Disturbance Buffers

Wetland W02

Resource Description

Wetland W02 is a PFO wetland occurring along the northeast boundary of the Study Area. Approximately 0.95 acres of the wetland occurs within the Study Area while the remainder of the wetland extends off-site to the east. A surface water drainage occurs within this wetland just outside of the Study Area. Wetland vegetation consists predominantly of red maple (*Acer rubrum*), skunk cabbage (*Symplocarpus foetidus*), poison ivy (*Toxicodendron radicans*), cinnamon fern (*Osmundastrum cinnamomeum*), rambler rose (*Rosa multiflora*), and swamp white oak (*Quercus bicolor*).

Resource Functions and Values

The principal function of this wetland is floodflow alteration. The wetland is adjacent to an existing road and is downslope from agricultural fields in a relatively flat area. Signs of variable water levels indicate the ability to retain water. Other functions of this wetland include production export, sediment/shoreline stabilization, sediment/toxicant/pathogen retention and nutrient removal/retention/transformation.

Proposed No-Disturbance Buffer

A 100-foot buffer will be maintained for majority of the wetland and clearing any existing forested habitat will be avoided. A 50-foot buffer is proposed for the portion at the southwest corner of the wetland that is located within an existing cleared field. These buffers will maintain the existing forested habitat and will allow the adjacent field located within 50 feet of the wetland to be removed from regular crop rotations promoting natural revegetation. Discontinuing regular soil disturbance and application of fertilizers and pesticides around this resource will decrease the chances for erosion and sedimentation of soil and input of excess nutrients into this wetland.

Wetlands W06 and W07

Resource Description

These two PFO wetlands are centrally located within the Study Area. They occur in a forested area that has been selectively harvested for timber in the recent past.

Resource Functions and Values

The principal function of these wetlands is wildlife habitat and groundwater recharge/discharge. They occur in a forested section of the Study Area, and likely provide habitat for local wildlife that would otherwise be displaced by agricultural and gravel extraction activities nearby. Other functions include sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, and production export.

Proposed No-Disturbance Buffer

A 100-foot buffer will be maintained around the majority of both wetlands, except for a small encroachment proposed for the development of an access road that will connect the east and west sides of the Project. The proposed road will be approximately 90 feet from wetland W06, and approximately 70 feet from W07 at its closest point. The road will be used for site access during construction and operation and will be built within the existing disturbed skidder trail to the extent practicable. The road will be constructed at similar or existing grades and is not expected to inhibit wildlife passage between these wetlands.

Wetland W08

Resource Description

Wetland W08 is a PEM wetland occurring within a field and on the edge of a recently cut over area in the north central portion of the Study Area. Based on field observations in combination with analysis of historic aerial photos, it is apparent that this wetland was historically tile drained and has been maintained as an agricultural field for over 80 years.

Resource Functions and Values

The principal function of this wetland is groundwater recharge/discharge. The wetland is located between an agricultural field and a gravel extraction area, with a portion of the wetland in a field that was historically disturbed from tile drains, and that currently show signs of failure, such as saturated soils and surface water. Other functions associated with this wetland include floodflow alteration, sediment/toxicant/pathogen retention, production export, and nutrient removal/retention/transformation.

Proposed No-Disturbance Buffer

The wetland is proposed to have a 50-foot buffer on the north and southeastern boundaries located in existing cleared fields. A 100-foot buffer will be maintained along the western boundary at the tree line where intermittent stream S09 flows between wetlands W08 and W29. Additionally, where a Project site road is proposed to follow an existing field road between wetlands W08 and W09, a distance of 30 feet will be maintained to wetland W08 where this existing road will be utilized. Leaving this wetland out of development will reduce the chance of disrupting old tile drains that may cause erosion and sedimentation during Project construction and encourage natural vegetation to establish. However, the low functionality of this wetland within the larger landscape does not necessitate a larger buffer in these areas.

Wetland W09

Resource Description

Wetland W09 is a PEM and PFO wetland that is located south of wetland W08 and north of wetland W07. The emergent portion of this wetland is similar to W08 and occurs in an historically disturbed tile drained field. It receives surface hydrology from the adjacent cornfield located to the northeast. There is an ephemeral stream (S10) flowing west from the forested portion of the wetland.

Resource Functions and Values

The principal function of this wetland is groundwater recharge/discharge. The wetland is located between an agricultural and a gravel extraction area, with a portion of the wetland in a field that was historically drained using tile drains, and that have shown recent signs of failure, such as soil saturation, and surface water. Other functions associated with this wetland include floodflow alteration sediment/toxicant/pathogen retention, production export and nutrient removal/retention/transformation.

Proposed No-Disturbance Buffer

As proposed, this wetland will retain a 100-foot buffer around the forested portion of the wetland, while a 50-foot buffer will be applied to the disturbed portion within the agricultural field. Additionally, where a Project site road is proposed to follow an existing field road between wetlands W08 and W09, a distance of 21 feet will be maintained to wetland W09 where this existing road will be utilized. Leaving the tile-drained portion of the wetland out of development will reduce the chances of disrupting old tile drains that may cause erosion and sedimentation during Project construction and encourage natural vegetation to establish. However, the low functionality of this wetland within a historic agricultural field does not necessitate a larger buffer in these areas.

Wetland W18

Resource Description

W18 is a forested wetland that drains to the west into watercourse S03. The upland surrounding the wetland is mostly cleared field to the north and the south, while the areas adjacent to the east and west boundaries are forested.

Resource Functions and Values

The principal function of this wetland is groundwater discharge. The wetland contains an outlet in the form of intermittent/perennial stream S03, which flows into W17 before connecting to Cold Spring Brook (S04). Other

functions associated with this wetland include floodflow alteration, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, production export and wildlife habitat.

Proposed No-Disturbance Buffer

The eastern and western boundaries where the adjacent upland is forested and where watercourse S03 flows will retain a 100-foot buffer, while a 50-foot buffer is proposed to be maintained along the cleared areas to the north and south. Leaving forested areas intact and discontinuing regular soil disturbance and application of fertilizers and pesticides around this resource will reduce the chances of erosion and sedimentation of soils and input of excess nutrients into the wetland. Allowing a 50-foot buffer in areas that are currently disturbed will allow for native vegetation to grow around the wetland.

Wetland W20

Resource Description

W20 is a PFO wetland in the northern portion of the Study Area between wetlands W19 and W01. The wetland is downslope from the agricultural field that contains wetland W01, with the field occurring close to the wetland edge in this area.

Resource Functions and Values

The principal function of this wetland is sediment/toxicant/pathogen retention. The wetland is downslope from agricultural activities that presumably contribute excess nutrients (fertilizers) and toxicants (pesticides) to the landscape. Other functions and values associated with this wetland include floodflow alteration, nutrient removal/retention/transformation, production export and wildlife habitat.

Proposed No-Disturbance Buffer

A 100-foot buffer will be maintained for the majority of the wetland and will encompass much of the forested portion of land between W20 and W19. The portion of the wetland adjacent to the cleared agricultural area is proposed to maintain a 50-foot buffer. Leaving forested areas intact and discontinuing regular soil disturbance and application of fertilizers and pesticides around this resource will reduce the chances of erosion and sedimentation of soils and excess input of nutrients into the wetland. Allowing a 50-foot buffer in areas that are currently disturbed will allow for native vegetation to grow around the wetland.

Discussion and Conclusion

The standard 100-foot buffer being applied is based on previous guidance issued by DEEP. A 2006 guidance document published by the then Connecticut Department of Environmental Protection (DEP)[7], which references the Upland Review Area Regulations document[8], also published by DEP, indicates a 100-foot-wide upland review area is sufficient for reviewing construction activities surrounding wetlands or watercourses. The document further defines the term *upland review area* as the area around wetlands and watercourses that should be regulated on a case-by-case basis rather than a total prohibition of construction within regulated natural resources and the areas immediately around them. While Section 22a-42 (a) of the Connecticut Inland Wetland and Watercourses Act gives authority to local municipalities to regulate activities within buffers or upland review areas, these documents serve as the foundation for local wetland and watercourse regulations. Consequently, many municipalities regulate activities within 100 feet of wetlands and watercourses. Therefore, this standard also has been applied to the resources delineated within the Project site.

[7] State of Connecticut Department of Environmental Protection. 2006. Inland Wetlands and Watercourses Model Municipal Regulations, Fourth Edition. 79 Elm Street Hartford, Connecticut. 1 May 2006. Available online at: https://www.ct.gov/deep/lib/deep/water_inland/wetlands/modelregsfinalof4thedition.pdf

[8] Stat of Connecticut Department of Environmental Protection. 1997. Guidelines; Upland Review Area Regulations Connecticut's Inland Wetlands and Watercourses Act. Connecticut Wetlands Management Section, Bureau of Water Management. June 1997.

The Project is utilizing existing roads to the extent practicable. While most of the roads are located in upland areas, there are six locations where these roads were built directly adjacent to wetlands or within 100-feet of a resource. The Project will use these existing roads to minimize impacts to natural resources by reducing the number of new roads that need to be constructed. These roads have been previously developed to access the site for agriculture, recreation, and gravel extraction. These existing roads are shown on Figure 1. No additional impacts are anticipated to the functions or values of these wetlands. All internal site roads will be maintained to allow for wildlife passage and movement throughout the site.

There are several vernal pools within the Study Area that are located primarily within forested wetlands. To provide protection for amphibians and reptiles that are dependent on these habitats, such as wood frogs (*Lithobates sylvaticus*) and spotted salamanders (*Ambystoma maculatum*), directional buffers and a herpetofauna protection area have been established around the most productive pools.

In addition to the 100-foot standard wetland buffer, a portion of forested upland area between wetlands W05 and W06, located in the southern portion of the Study Area will be excluded from development to preserve important terrestrial habitat and overland access for amphibian species that breed in vernal pool VP8 through creation of a directional buffer (Figure 1). The principal function of the wetlands within this area is wildlife habitat, which is a function that is dependent on connection to other upland and wetland habitats of similar quality. This directional buffer preserves critical terrestrial habitat for vernal pool VP8 while allowing for Project development connectivity on the eastern side of the vernal pool and wetland complex.

The western portion of the Study Area will maintain an undeveloped herpetofauna protection area to protect habitat around a cluster of high-functioning vernal pools (VP4 and VP5) that have been documented in this area (Figure 1). The herpetofauna protection area encompasses wetlands W11, W12, W13, W14, watercourses S05 and S02, and a swath of forested area that extends to the west and eventually connects to the floodplain wetlands associated with Cold Spring Brook and Blackwell Brook. Avoiding development within this area will protect the principal function of these wetlands by maintaining wildlife habitat connectivity between these wetlands and vernal pools and the resources that border the western Project boundary. Additionally, a Herpetofauna Avoidance and Mitigation Plan[9] has been developed for the Project and is included as part of the Environmental Site Conditions Report.

The functions and values of these resources in the broader landscape have fluctuated based on previous and current uses of the land. Quinebaug Solar has meticulously created a design and construction plan to avoid direct and indirect wetland impacts. In addition to wetland protections, land has been set aside to preserve wildlife habitat connectivity. The proposed Project has considered avoidance and minimization of natural resource impacts throughout the planning process. Overall wetland functions and values will be retained for all wetlands and improved for wetlands with no existing vegetated upland buffer, due to discontinuing agricultural use, and allowing natural vegetation to establish in these areas.

[9] Tetra Tech, Inc. 2019. Environmental Site Conditions Report.

Table 1: Summary of All Project Wetlands Functions and Values.

Wetland Characteristics						Functions and Values*												
Resource ID	Classification	Area (acres)	Adjacent land	Associated Resources	Buffer (Feet)	Ground Water Recharge/ Discharge	Floodflow Alteration	Fish and Shellfish Habitat	Sediment / Toxicant / Pathogen Retention	Nutrient Removal / Retention / Transformation	Production Export	Sediment / Shoreline Stabilization	Wildlife Habitat	Recreation	Education / Scientific Value	Uniqueness / Heritage	Visual Quality / Aesthetics	Threatened or Endangered Species Habitat
W01	**PEM**	**0.14**	**agriculture**	**none**	**50**	**-**	**x**	**-**	**P**	**P**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
W02	**PFO**	**0.95**	**agriculture/forest**	**none**	**50-100**	**x**	**P**	**-**	**x**	**x**	**x**	**x**	**x**	**-**	**-**	**-**	**-**	**-**
W03	PFO	3.70	forest/lawn	none	100	x	P	-	x	x	x	x	x	-	-	-	-	-
W04	PEM	0.02	gravel extraction	none	100	-	x	-	P	-	x	-	-	-	-	-	-	-
W05	PFO	1.32	forest/agriculture	VP8	100	-	x	-	x	x	x	-	P	-	-	-	-	-
W06	**PFO**	**1.65**	**forest/agriculture**	**none**	**90–100**	**-**	**x**	**-**	**x**	**x**	**x**	**-**	**P**	**-**	**-**	**-**	**-**	**-**
W07	**PFO**	**15.11**	**forest/agriculture**	**S01**	**70–100**	**P**	**x**	**-**	**x**	**x**	**x**	**-**	**P**	**-**	**-**	**-**	**-**	**-**
W08	**PEM**	**0.78**	**hayfield/ agriculture**	**S09**	**50**	**P**	**x**	**-**	**x**	**x**	**x**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
W09	**PFO/PEM**	**2.37**	**forest/ agriculture/hayfield**	**S10**	**50 - 100**	**P**	**x**	**-**	**x**	**x**	**x**	**-**	**x**	**-**	**-**	**-**	**-**	**-**
W10	PFO/PEM/PSS/PUB	9.80	forest/agriculture	S01	100	x	x	-	x	x	x	x	P	-	x	x	-	x
W11	PFO	0.69	forest/agriculture	VP4, S05	100	x	x	-	x	x	x	x	P	-	-	-	-	x
W12	PFO	0.24	forest/agriculture	S02	100	x	P	-	x	x	-	x	x	-	-	-	-	-
W13	PFO	0.05	forest/agriculture	none	100	-	P	-	x	x	-	x	x	-	-	-	-	-
W14	PFO	0.35	forest/agriculture	VP5	100	-	x	-	x	x	x	x	P	-	-	-	-	x
W15	PFO	2.19	forest/agriculture	S04, S07	100	P	x	x	x	x	x	P	P	-	-	x	-	x
W16	PFO	0.08	forest/agriculture	VP6	100	-	-	-	x	x	x	-	P	-	-	-	-	-
W17	PFO	1.64	forest/agriculture	S03, S04	100	x	x	x	x	x	x	P	P	-	-	-	-	x
W18	**PFO**	**2.48**	**forest/agriculture**	**S03**	**50-100**	**P**	**x**	**-**	**x**	**x**	**x**	**-**	**x**	**-**	**-**	**-**	**-**	**-**
W19	PFO	2.12	forest/agriculture	VP7	100	-	x	-	x	x	x	-	P	-	-	-	-	x
W20	**PFO**	**0.75**	**forest/agriculture**	**none**	**50-100**	**-**	**x**	**-**	**P**	**x**	**x**	**-**	**x**	**-**	**-**	**-**	**-**	**-**
W21	PFO	1.08	forest	S06	100	x	P	-	x	x	x	-	x	-	-	-	-	-
W22	PFO	0.51	forest	VP9	100	-	x	-	x	x	-	-	P	-	-	-	-	-

Wetland Characteristics						Functions and Values*											
Resource ID	**Classification**	**Area (acres)**	**Adjacent land**	**Associated Resources**	**Buffer (Feet)**	**Ground Water Recharge/ Discharge**	**Floodflow Alteration**	**Fish and Shellfish Habitat**	**Sediment / Toxicant / Pathogen Retention**	**Nutrient Removal / Retention / Transformation**	**Production Export**	**Sediment / Shoreline Stabilization**	**Wildlife Habitat**	**Recreation**	**Education / Scientific Value**	**Uniqueness / Heritage**	**Visual Quality / Aesthetics**	**Threatened or Endangered Species Habitat**
W23	PFO	4.44	forest/athletic field	VP1, VP2, VP3, S07	100	x	x	x	x	x	x	P	P	-	-	x	-	x
W24	PFO	1.39	forest	VP3, S02, S07	100	x	x	x	x	x	x	P	P	-	-	-	-	x
W25	PFO	1.55	forest	S02, S07	100	x	x	x	x	x	x	P	P	-	-	-	-	-
W26	PFO	8.98	forest/gravel extraction	S08	100	x	x	-	x	x	x	x	P	x	-	-	-	-
W27	PFO/PEM/PSS	3.78	forest/agriculture	none	100	x	x	-	x	x	x	-	P	-	-	-	-	-
W28	PFO	0.22	forest/gravel extraction	S01	100	x	x	-	P	x	x	x	x	-	-	x	-	-
W29	PEM	0.09	agriculture	S09	100	x	x	-	P	x	-	-	-	-	-	-	-	-
W30	PFO	0.18	forest/agriculture	S04	100	x	x	x	x	x	x	P	P	-	-	x	-	-

Notes:
Wetland with less than 100-foot buffer indicated in bold.

Function and Values:
- “P” Principal function and value
- “x“ Function and value present
- “-“ Function or value does not occur