EVERSOURCE ENERGY

56 Prospect Street,
P.O. Box 270
Hartford, CT 06103

May 13, 2016

Melanie Bachman, Acting Executive Director
Connecticut Siting Council
Ten Franklin Square
New Britain, CT 06051
Britain, CT 06051

RE: Petition No. 1225 -1682 Line Upgrade Project
Wetlands and Watercourses Report and Vernal Pool Surveys

Dear Ms. Bachman:

The Connecticut Light and Power Company doing business as Eversource Energy (Eversource) filed the Petition No. 1225-1682 Line Upgrade Project on April 1, 2016 with Connecticut Siting Council ("Council").

In advance of the May 18th schedule site review, Eversource is submitting to the Council supplemental information in support of the subject petition. Specifically, a wetlands and watercourses report. The survey information contained herein was originally obtained in the course of a larger wetland survey effort and which resulted in a report that contained information on other areas not relevant to the scope of the project proposed in Petition No. 1225.

Enclosed are this original and fifteen (15) copies of report.

Thank you for your attention to this matter. If you have any questions or comments, please call me at (860) 728-4527.

Sincerely,

Kathleen M. Shanley
Manager – Transmission Siting

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Wetland and Watercourse Report and Vernal Pool Survey
Petition No. 1225: 1682 Line Upgrade Project

EVERSOURCE

1682 LINE UPGRADE PROJECT

BY

THE CONNECTICUT LIGHT AND POWER COMPANY

DOING BUSINESS AS EVERSOURCE ENERGY

WETLANDS AND WATERCOURSES REPORT

MAY 2016

Wetlands and Watercourses Report

Prepared For:

The Connecticut Light and Power Company doing business as
Eversource Energy
107 Selden Street
Berlin, CT 06037

Prepared By:

Tighe & Bond
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Middletown, CT 06457

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Section 1
Introduction

The Connecticut Light and Power Company d/b/a Eversource Energy (Eversource) proposes to rebuild approximately two (2) miles of the 115 kV 1682 line from Wilton Substation to Norwalk Junction located at 111 Danbury Road (Route 7), Wilton Connecticut in addition to minor modifications at the Wilton Substation.

This report provides a summary of wetland and watercourse inventories and delineations conducted by Tighe & Bond within the Project area. These delineations were conducted to identify both federal and Connecticut jurisdictional water resources.

1.1 Project Background and Location

The Project is required to eliminate potential transmission system thermal criteria violations and increase the line ratings based on the 2014 Southwest Connecticut Needs Assessment performed by the Independent System Operator of New England.

The proposed 1682 line upgrade is entirely located within the municipality of Wilton in Fairfield County. The line upgrades would be located within Eversource's existing transmission line right-of-way (ROW). In addition, both the Wilton and Norwalk substations are located on Eversource property.

Desktop analyses as well as on-site field delineations were completed to determine wetland boundaries in accordance with applicable state and federal regulations. The desktop and field wetland and watercourse investigations were conducted during the spring of 2015. This report discusses the methods used to identify the wetlands and watercourses encountered in the Project area and summarizes the findings of the surveys.

Tables listing all wetlands and watercourses identified during the surveys are located in Attachment A.

1.2 Physiographic and Geologic Overview

According to Dowhan and Craig (1976), the Project area is situated predominantly within the Southwest Hills physiographic region of Connecticut. This region is characterized by low, rolling to locally rugged hills of moderate elevation, broad areas of upland, and local areas of steep and rugged topography. Elevations are generally greater than 250 feet and less than 750 feet.

The bedrock is primarily metamorphic, derived from gneisses and schists, in north trending belts. The surficial geology of the corridor is predominantly characterized by thin till in uplands, and alluvium overlying sand and gravel within the Norwalk River valley.

Section 2
Wetland and Watercourses Regulations

Tighe & Bond wetland scientists identified wetlands and watercourses subject to state or federal jurisdiction based upon the Connecticut Inland Wetlands and Watercourses Act (CGS Section 22a-36 through 45) and the Federal Clean Water Act ([CWA]; 33 U.S.C. 1344).

2.1 Section 404 – Clean Water Act

Wetlands, springs, and other waters of the United States are regulated under Section 404 of the Federal Clean Water Act (CWA) by the U.S. Army Corps of Engineers (USACE). Federal jurisdictional wetlands include interstate wetlands, wetlands adjacent to waters of the United States, and intrastate wetlands whose degradation or destruction could affect interstate or foreign commerce as per the application of the CWA. The 1987 *Corps of Engineers Wetland Delineation Manual* (1987 Corps Manual) requires a positive wetland indicator for each of the three parameters (vegetation, soils, and hydrology). Indicators for all three of the following parameters must be present for an area to be identified as a wetland:

- Hydrophytic Vegetation: Plants growing in water or in a substrate that is at least periodically deficient in oxygen during a growing season as a result of excessive water content;

- Hydric Soils: Soils that, in an undrained condition, are saturated, flooded, or ponded long enough during a growing season to develop an anaerobic conditions that support the growth and regeneration of hydrophytic vegetation; and,

- Wetland Hydrology: Inundation or saturation by surface or groundwater at a frequency and duration during the growing season sufficient to support a prevalence of hydrophytic vegetation typically adapted for life in saturated soil conditions.

Wetlands satisfying these criteria are subject to federal jurisdiction under Section 404 of the CWA.

In January 2012, the USACE issued a *Regional Supplement to the Corps of Engineers Delineation Manual*[1] (Regional Supplement), which provides further guidance for wetland delineations in the northeastern United States. The Regional Supplement provides wetland indicators, delineation guidance, and other information specific to the Northcentral and Northeast Regions, supplementing the 1987 USACE Manual. Indicators and procedures in the 2012 Regional Supplement are designed to identify wetlands as defined jointly by the USACE (33 CFR 328.2) and the U.S. Environmental Protection Agency (40 CFR 230.3) and subject to regulation under Section 404 of the CWA.

[1] Wetlands Regulatory Assistance Program. (2012). *Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Northcentral and Northeast*, U.S. Army Engineer Research and Development Center, Vicksburg, MS

2.2 Connecticut Inland Wetlands and Watercourses Act

Connecticut regulates inland wetlands under the Inland Wetlands and Watercourses Act (Section 22a-36 through 22a-45 of the Connecticut General Statutes; The Act). These state statutes are implemented through the Inland Wetlands and Watercourses regulations as administered by individual municipalities. Under Section 2 of The Act, a wetland is defined as "land, including submerged land...which consists of poorly drained, very poorly drained, alluvial and floodplain soils as defined by the National Cooperative Soils Survey. Such areas may include filled, graded or excavated sites which possess an aquic (saturated) moisture regime as defined by the United States Department of Agriculture (USDA) Cooperative Soil Survey."

Watercourses are defined in The Act as "rivers, streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs and all other bodies of water, natural or artificial, vernal or intermittent, public or private, which are contained within, flow through or border upon the state or any portion thereof." The Act defines Intermittent Watercourses as having "a defined permanent channel bed and bank and the occurrence of two of the following: A) evidence of scour or deposits of recent alluvium or detritus, B) the presence of standing or flowing water for a duration of longer than a particular storm incident, or C) the presence of hydrophytic vegetation."

Section 3
Wetland Delineation Procedures

In the spring of 2015, Tighe & Bond soil and wetland scientists delineated wetlands within the Project area. The wetland boundaries were delineated in accordance with USACE Headquarters and New England District guidance, including the 1987 Manual, 2012 Regional Supplement, and *Field Indicators for Identifying Hydric Soils in New England, Version 3*.

State jurisdictional wetlands were characterized using Connecticut delineation methodology pursuant to the Connecticut Inland Wetlands and Watercourses Act, C.G.S. §§ 22a-36 through 22a-45 (the Act). The Act defines a wetland as land, including submerged land, consisting of poorly drained, very poorly drained, alluvial, and floodplain soils as defined by the USDA Cooperative Soil Survey. Such areas may include filled, graded, or excavated sites possessing an aquic (saturated) moisture regime as defined by the USDA Cooperative Soil Survey. The Act defines watercourses as rivers, streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs, and also other bodies of water, natural or artificial, public or private, contained within, flow through or border upon the state, or any portion thereof.

The methods of investigation included both desktop analyses and on-site field investigations to determine the wetland and watercourse resource areas within and proximate to the Project area.

3.1 Pre-Survey Desktop Investigations

Prior to performing an on-site survey and wetland delineation, a thorough review of existing Project area information was conducted, including:

- United States Geologic Survey (USGS) 7.5-minute series topographic quadrangle maps;
- Natural Resources Conservation Service (NRCS) Web Soil Survey digital soil information;
- Connecticut Department of Energy and Environmental Protection (CT DEEP) digital wetland information;
- U.S. Fish and Wildlife Service (USFWS) Region 1, National Wetland Inventory (NWI) digital information;
- CT DEEP Natural Diversity Data Base digital listed species information;
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) digital information; and,
- Aerial photographs.

3.2 Field Surveys

The wetland delineation was initiated with an inspection of the ROW to identify soil topo-drainage sequences, drainage features, and plant associations that would indicate the potential for jurisdictional wetland classification. The wetland delineation was then completed using the *Routine On-Site Wetland Determination Method* (1987 Manual). The indicator status of dominant plant species in each stratum was evaluated in the field to determine whether a hydrophytic plant association was present. Soils profiles were sampled using a Dutch auger and/or a tile spade to determine if any hydric soil indicators were present. Indicators of wetland hydrology were also observed. Specific methods for characterizing and evaluating soil, vegetation, and hydrologic indicators are described below.

3.2.1 Soils

Soil profile observations were collected at each sampling location to a depth of at least 20 inches. Typically, a soil pit was dug with an auger or tile spade (sharpshooter) to provide a soil profile for examination. Soils profiles were inspected by identifying horizons and recording the depths to each horizon boundary. For each horizon the soil texture, structure, and moist color (matrix and redoximorphic features) were observed. Matrix and redoximorphic feature soil colors were identified using a *Munsell® Soil Color Chart.* In addition to color, the kind, size, quantity and contrast of redoximorphic features were evaluated. Hydric soil indicators were field identified using the *Field Indicators for Identifying Hydric Soils in New England, Version 3.*

3.2.2 Vegetation

Dominant plant species in each vegetation stratum (herbaceous, shrub, sapling, tree, and liana) within the general vicinity of each sampling location were identified. Hydrophytic vegetation is defined as the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present. Plant species within the wetland/upland ecotone were recorded as to their percent cover and wetland indicator status according to the *National Wetland Plant List, Region 1*[2] and the NRCS Plants Database[3]. At each plot, visual estimates of dominant plant species cover was observed to determine the location of a change in plant communities from hydrophytic dominant to upland dominant. Total vegetation dominance for all strata was determined using the "50/20 rule" methodology in accordance with the 1987 Corps Manual.

3.2.3 Hydrology

The term wetland hydrology encompasses all hydrologic characteristics for areas that are periodically inundated or have soils saturated to the surface at some time during the growing season. Corps hydrology criteria consist of inundation, saturation to the surface, or the upper part of the soil for a long or very long duration. The 1987 Corps Manual suggests that this saturation must persist for at least five percent of the growing season in most years. Areas with evident characteristics for wetland hydrology are those where the presence of water has an overriding influence on the characteristics of vegetation and soils. Indicators of wetland hydrology include vegetated hummocks,

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[7] *National Wetland Plant List (Updated July 2013).* U.S. Army Engineer Research and Development Center, Vicksburg, MS

[3] http://plants.usda.gov/wetland.html

water marks on tree trunks and other vegetation, evidence of inundation or ponding (e.g., water-stained leaves), morphological adaptations of plants (e.g., buttressed trunks, adventitious roots, shallow rooting), drift lines, and drainage patterns. The depths to saturation and standing water were noted where present within 20 inches of the soil surface. The presence or absence of wetland hydrology indicators was observed at each sampling location.

3.2.4 Wetland Numbering Method

For the purpose of documenting and organizing the water resource information on tables and maps for this Project, groups of wetlands occurring along the ROW were labeled in an alpha-numeric sequence (e.g., W1, W2, W3, etc). Table 1 (Attachment A) lists the wetlands, watercourses, and waterbodies identified within the Project area.

During the field investigations, the boundaries of each wetland were identified by sequentially-numbered pink vinyl flagging tied to woody vegetation and spaced at regular intervals. Subsequent flags were numbered sequentially with the wetland or watercourse number included as a prefix. Where a break in the boundary line was necessary, a gap of ten flag numbers or greater was incorporated in the numbering sequence.

Intermittent watercourses embedded within a wetland system were delineated on the project maps based on USGS Maps, aerial photo interpretation and field verification. The banks of several larger watercourses representing the ordinary high water mark were flagged where warranted.

Wetlands that were considered to be hydraulically connected or part of a larger ecological functional unit were typically included within the same alpha-numeric label. Frequently, wetlands that appeared to lack direct surface water connectivity (such as those bisected by historic disturbance activities such as road construction) were included under the same wetland label if they were considered to be part of the same hydrologic system. A similar approach was taken for small wetlands arrayed along the length of a connecting watercourse.

3.2.5 GPS Mapping

Wetland boundary flags and watercourse centerlines, or in some cases the ordinary high water (OHW) mark were located using a Trimble Geo7X® Global Positioning System (GPS) with sub-meter accuracy. A minimum of 20 static measurements with a Precision Dilution of Position (PDOP) no greater than 6.0 was also collected at each survey point to enhance the sub-meter level of accuracy. Real time positions were then post-processed for additional accuracy using static data available at public continuously operating reference stations (CORS) and referenced to the Connecticut State Plane Coordinate System NAD 83.

3.3 Wetland and Watercourse Classification

While in the field, Tighe & Bond wetland scientists classified the various wetlands according to the "Cowardin system", which is a system described in the *Classification of Wetlands and Deepwater Habitats of the United States*. Identified wetlands were classified as Palustrine Forested (PFO), Palustrine Emergent (PEM), Palustrine Scrub-Shrub (PSS) and Palustrine Open Water (POW) and are further described below. In some cases, a wetland complex contained more than one wetland classification type. In

those situations, each wetland type is listed and the first classification type represents the more dominant type. For example, within the portions of the ROW that Eversource presently manages in shrub-scrub vegetation compatible with the existing overhead transmission lines, wetlands include PEM, POW, or PSS; in certain locations, the portions of these wetlands that extend into non-managed portions of the ROW are characterized by forested (PFO) vegetation.

3.3.1 Palustrine Forested Wetlands (PFO)

Forested wetlands are characterized by woody vegetation that is six meters (approximately 20 feet) tall or taller and normally includes an overstory of trees, an understory of young trees and/or shrubs, and an herbaceous layer.

3.3.2 Palustrine Scrub-Shrub Wetlands (PSS)

Scrub-shrub wetlands are dominated by woody vegetation less than six meters (approximately 20 feet) tall. Scrub-shrub land types may represent a successional stage leading to a forested wetland and include shrubs, saplings, and trees or shrubs that are small and/or stunted due to environmental conditions or ongoing management.

3.3.3 Palustrine Emergent Wetlands (PEM)

Emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes not including mosses and lichens. These wetlands maintain the same appearance year after year, and are typically dominated by perennial plants that are present for the majority of the growing season.

3.3.4 Palustrine Open Water (POW)

Areas of permanent or semi-permanent open water that border on palustrine systems are referred to as POW. Areas of open water may exist as man-made or natural waterbodies.

3.4 Post-Survey Desktop Analysis

Wetland and watercourse boundaries were plotted on 2012 Aerial Imagery with 0.5-foot resolution at 100 scale and reviewed and confirmed by Tighe & Bond personnel responsible for the field delineation of wetlands. The aerial photograph based maps show the locations of the delineated resources relative to the limits of the ROW.

Section 4
Results

4.1 Wetlands

A total of twelve (12) wetlands and watercourses were identified within Eversource's easements or fee-owned properties in proximity to Project activities. A summary of the wetlands identified within the Project area is provided in Table 1 (Attachment A).

Many of the wetlands identified in Project area are characterized by complexes containing both Connecticut (moderately well to excessively-drained alluvial soils) and federal wetlands because much of the Project area is located within floodplains associated with the Norwalk River and associated floodplains.

4.1.1 Wetlands Vegetation

The predominant wetland type identified in the Project area included Palustrine Emergent Marsh (PEM) largely associated with the Norwalk River floodplain. These emergent wetlands in the Project area commonly dominated by perennial forbs such as sensitive fern (*Onoclea sensibilis*), joe-pye weed (*Eupatorium* spp.), roughstem goldenrod *(Solidago rugosa),* poison ivy (*Toxicodendron radicans*), steeplebush (*Spiraea tomentosa*), purple loosestrife *(Lythrum salicaria),* tussock sedge (*Carex stricta*), woolgrass (*Scirpus cyperinus*), broad-leaved cattail (*Typha latifolia*), spotted touch-me-not *(Impatiens capensis)*, and skunk cabbage *(Symplocarpus foetidus)*.

Shrub wetlands are commonly dominated by common winterberry (*Ilex verticillata*), silky dogwood *(Cornus amomum)*, highbush blueberry (*Vaccinium corymbosum*), and northern arrowwood (*Viburnum recognitum*). Common herbaceous species include skunk cabbage, cinnamon fern (*Osmunda cinnamomea*), spotted touch-me-not and occasionally false hellebore (*Veratrum viride*). *Sphagnum* sp. moss is common in many of the seasonally saturated or temporarily flooded wetland areas.

4.1.2 Wetland Suficial Geology, Soils, and Hydrology

Soil types within the Project area associated with the Norwalk River floodplain are predominantly alluvial. These soil types are characterized by moderately well drained Pootatuck and poorly drained Rippowam soils.

Other soil types identified within the Project area includes the Charlton-Chatfield series and the Hollis-Chatfield catena which are the representative soil type continuum throughout the majority of the Project area. These catena's includes well drained Canton, Paxton, and Montauk soils, moderately well drained Woodbridge and Sutton soils, and poorly drained to very poorly drained Ridgebury, Leicester and Whitman soils.

The most common water regime identified within the wetlands is seasonally saturated. These wetlands commonly support wetter areas that are saturated to temporarily flooded. A few marsh area locations exhibit water regimes that are seasonally flooded to semi-permanently flooded. Permanently flooded areas include small ponds and the deeper parts of the perennial watercourses and rivers.

Section 5
References

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APPENDIX A:
TABLE 1 – DELINEATED WETLANDS AND WATERCOURSES WITHIN THE PROJECT AREA

Table 1: Wetlands and Watercourses within the Project Area

Municipality; Mapsheet No	Wetland No. [1]	Dominant NWI Class[2]	Other NWI Classes	Water Regime	Associated Watercourse
Wilton					
1	W25	PSS	PEM	Seasonally saturated	
1/2	W25A	PEM	POW	Seasonally saturated	
2	W26	PSS		Seasonally saturated	
2	W26A	PEM		Seasonally saturated	Norwalk River
2/3	W27	PSS	PEM	Temporarily flooded	Norwalk River
3	W28	PSS	PEM	Temporarily flooded	Unnamed intermittent watercourse[3]
3	W29	PSS	PEM	Saturated	Norwalk River
4	W30	PSS	POW	Saturated	
4	W31	POW		Saturated	Unnamed Pond
4	W32	PEM	PSS	Seasonally saturated	
4	W33	PSS		Temporarily flooded	Norwalk River
4	W34	PEM	PSS	Seasonally saturated	

[1] Wetland No. refers to the number generated during the 2015 field surveys to identify wetlands within the Project area.

[2] Wetlands classified according to Cowardin et al 1979; PEM = Palustrine Emergent Wetland; PFO = Palustrine Forested Wetland; PSS = Palustrine Scrub-Shrub Wetland; POW = Palustrine Open Water.

[3] Intermittent watercourses within wetlands based on USGS mapping, aerial photo interpretation and field verification.

1682 Line Upgrade Project – Vernal Pool Surveys

TO: Eversource Energy

FROM: Devleena Ghosh-Brower, PWS, CPESC, Tighe & Bond

COPY: Daniel Rukakoski

DATE: May 12, 2016

INTRODUCTION

The following memorandum details vernal pool surveys conducted by Tighe & Bond along Line 1682 in the spring of 2015. This work was conducted in support of The Connecticut Light and Power Company d/b/a Eversource Energy's ("Eversource") petition to the Connecticut Siting Council for 1682 Line Upgrade Project within an existing right-of-way (ROW) in Wilton, Connecticut (the "Project"). As documented below, no vernal pools were identified in the vicinity of the 1682 line upgrades.

VERNAL POOL DEFINITION

A number of vernal pool definitions have been developed by both regulatory authorities and conservation organizations. The Connecticut Department of Energy and Environmental Protection (CT DEEP) generally describes vernal pools on its website, but cautions that the data provided is informational in nature and should not supplement regulations of municipal inland wetlands agencies. CT DEEP describes vernal pools as *"small bodies of standing fresh water found throughout the spring"* that are *"usually temporary"* and *"result from various combinations of snowmelt, precipitation and high water tables associated with the spring season"*.

Calhoun and Klemens (2002) *Best development practices: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States* (BDP Manual) provides the following operational definition of vernal pools:

Vernal pools are seasonal bodies of water that attain maximum depths in the spring or fall, and lack permanent surface water connections with other wetlands or water bodies. Pools fill with snowmelt or runoff in the spring, although some may be fed primarily by groundwater sources. The duration of surface flooding, known as hydroperiod, varies depending upon the pool and the year; vernal pool hydroperiods range along a continuum from less than 30 days to more than one year. Pools are generally small in size (<2 acres), with the extent of vegetation varying widely. They lack established fish populations, usually as a result of periodic drying, and support communities dominated by animals adapted to living in temporary, fishless pools. In the region, they provide essential breeding habitat for one or more wildlife species including Ambystomid salamanders (Ambystoma spp., called "mole salamanders" because they live in burrows), wood frogs (Rana sylvatica), and fairy shrimp (Eubranchipus spp.).

Vernal pool physical characteristics can vary widely while still providing habitat for indicator species. "Classic" vernal pools are natural depressions in a wooded upland with no hydrologic connection to other wetland systems. Anthropogenic depressions such as quarry holes, old farm ponds and borrow pits can also provide similar habitat. Often, vernal pools are depressions or impoundments embedded within larger wetland systems. These vernal pool habitats are commonly referred to as "cryptic" vernal pools.

Several species of amphibians depend on vernal pools for reproduction and development. These species are referred to as indicator[1] vernal pool species, and their presence in a temporary wetland during the breeding season helps to identify that area as a vernal pool. Indicator species present in Connecticut include the following:

- Blue-spotted salamander (*Ambystoma laterale*);
- Wood frog (*Rana sylvatica*);
- Spotted salamander (*Ambystoma maculatum*);
- Jefferson salamander (*Ambystoma jeffersonianum*);
- Eastern spadefoot toad (*Scaphiopus holbrookii*);
- Marbled salamander (*Ambystoma opacum*); and
- Fairy shrimp (*Branchiopoda anostraca*).

Facultative vernal pool species are fauna that utilize but do not necessarily require vernal pools for reproductive success. Examples of facultative species include spotted turtles (*Clemmys guttata*) and four-toed salamander (*Hemidactylium scutatum*). These species may breed or feed in vernal pools, but are also capable of carrying out all phases of their lifecycle in other types of wetlands or water bodies. Evidence of breeding by facultative species alone is not considered indicative of the presence of a vernal pool.

For the purposes of this memorandum, a vernal pool is defined as an area that meets the physical characteristics described above, contains evidence of breeding activity of any of the indicator species listed above including the presence of egg masses and larvae, and provides suitable hydrology for their successful development.

EXISTING WETLANDS ALONG THE PROJECT ROW

Project wetlands are predominantly characterized by active flood zones and riparian corridors, and are generally lacking suitable vernal pool hydrology and morphology (seasonally flooded wetland depressions). Wetland hydrology within Project wetlands is typically characterized by short duration, early season flooding; or permanent flooding. These hydrologic regimes are not conducive to providing productive vernal pool habitat.

Many of the Project wetlands are subject to short duration flooding events. These wetlands typically lack defined depressions, active micro-topography, and are often underlain by coarse-textured soils which promote surface-water infiltration. These characteristics limit the potential for an extended hydroperiod capable of supporting indicator species such as spotted salamander and wood frog. In some cases these areas were found to provide habitat for species such as American toad *(Bufo a. americanus)* which can complete breeding and development in short-hydroperiod systems.

Permanently flooded wetland areas (e.g. Wetlands W30, and portions of W31 and W32), while possessing a sufficient hydroperiod to support indicator species, are often inhabited by

[1] Calhoun and Klemens (2002) argue that "indicator" species is a better word than the commonly used "obligate" species, as they will occasionally breed in roadside ditches and small ponds that are not vernal pools.

predatory species such as fish, green frog *(Lithobates clamitans),* and American bullfrog *(Lithobates catesbeianus)* which can limit the productivity of these areas.

VERNAL POOL SURVEYS

Vernal pool surveys were conducted within the Project area by Tighe & Bond Wetland Scientists Devleena Ghosh-Brower, and Melissa P. Coady on May 4 through May 6, 2015. Survey methods included visual surveys to identify vernal pool indicator species adults, larvae and egg masses, and dip-net surveys to identify amphibian larvae.

All wetlands were visually evaluated for potential vernal pool habitat, and surveys were conducted in Wetlands W25 and W30 where evidence of periodic, shallow surface-water inundation was present. No vernal pool indicator species or vernal pools within the project area were identified during the 2015 surveys.

Amphibian and reptile species observed within Project wetlands included American bullfrog, and green frog.