



To: Gravel Pit Solar, LLC  
Gravel Pit Solar II, LLC  
Gravel Pit Solar III, LLC  
Gravel Pit Solar IV, LLC

Date: May 18, 2020

Memorandum

Project #: 42569.00

From: Jeff Peterson, PWS  
Chelsea Glinka ENV SP

Re: Vernal Pool Survey Report for Gravel Pit Solar Project  
East Windsor, Connecticut

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## Proposed Project and Site Description

This Vernal Pool Survey Report has been developed for the Gravel Pit Solar Project (GPS or the Project) proposed by Gravel Pit Solar, LLC, Gravel Pit Solar II, LLC, Gravel Pit Solar III, LLC, and Gravel Pit Solar IV, LLC (collectively Gravel Pit Solar or the Applicant). The Project is a proposed 120-megawatt (MW) alternating current (AC) ground-mounted solar photovoltaic system off Apothecaries Hall Road, Plantation Road, Wapping Road, and Windsorville Road in the Town of East Windsor, Connecticut. The Project Site consists of eight properties totaling 737 acres (VHB). These properties are identified by the East Windsor Tax Assessor as 057-65-001, 057-65-002, 048-65-007, 037-65-005A, 027-49-017C, 025-49-017A, 016-49-007, and 016-50-001, collectively referred to herein as the Project Site (see Figures 1 and 2, attached). The Project Area is an approximately 485-acre portion of the Project Site.

The Project Site is situated in the Connecticut River Valley and characterized by sand and gravel quarries, farmland, and forested land. A small portion of the Project Site, approximately 15 acres, is classified as vacant commercial land. Development adjacent to the Project Site includes residential homes, a gun club, sand and gravel quarries, closed landfills, solar arrays, and an active freight railroad line owned by the State of Connecticut.

## Wetlands and Vernal Pool Resources

Inland wetlands and watercourses were delineated within the Project Site between September 2019 and April 2020 by VHB wetland scientists. There are 16 wetland systems within or immediately adjacent to the Project Site. Ketch Brook flows through parcels 025-49-017A, 027-49-017C, and 037-65-005A and along the southern boundary of parcel 048-65-007. All the wetlands were investigated for vernal pool indicators by VHB biologists on March 13, 24, 26, April 7, and May 5, 2020.

## Vernal Pool Identification Criteria

The CT DEEP no longer provides a definition of vernal pool on its website (CT DEEP, 2020). Calhoun and Klemens (2002) noted that there was no official definition for a vernal pool in Connecticut and cited the following guidance provided by Donahue 1995:

- a) physical features and the presence of one or more obligate species,
- b) water for an approximate minimum of 2 months during the growing season,
- c) a confined depression that lacks a permanent outlet stream,
- d) no fish, and
- e) dries out in most years.

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The Connecticut Association of Wetland Scientist's (CAWS) website notes that a DEP Task Force developed the following vernal pool draft definition:

*Vernal pool means a seasonal watercourse in a defined depression or basin, that lacks a fish population and supports or is capable of supporting breeding and development of amphibian or invertebrate species recognized as obligate to such watercourses. These species include spotted salamander, the Jefferson salamander complex, marbled salamander, wood frog, and fairy shrimp.*

These criteria are similar, although the second does not require the pool to dry in most years. The common and scientific names for Connecticut species considered by Calhoun and Klemens (2002) to be obligate biological indicators of vernal pool habitat are listed within Table 1.

**Table 1. Vernal Pool Obligate Species**

<b>Common Name</b>	<b>Scientific name</b>
Jefferson Salamander	<i>Ambystoma jeffersonianum</i>
Blue-spotted Salamander complex	<i>Ambystoma laterale</i>
Spotted Salamander	<i>Ambystoma maculatum</i>
Marbled Salamander	<i>Ambystoma opacum</i>
Wood Frog	<i>Lithobates sylvaticus</i>
Eastern Spadefoot Toad	<i>Scaphiopus holbrookii</i>
Fairy Shrimp	<i>Eubbranchipus sp.</i>

## Methodology to Identify Vernal Pools

Vernal pools were surveyed in mid to late March, early April, and early May 2020 by traversing the wetlands to find potentially suitable pools. Once potential vernal pools were identified, VHB biologists logged any auditory cues (e.g., wood frog chorusing) and searched the pools for egg masses while wearing waders and polarized sunglasses. Biologists used dipnets to search for wood frog and spotted salamander adults, egg masses and larvae, and fairy shrimp. Discretion was used during dipnet sweeps, such that small, shallow areas containing obligate vernal pool indicators were disrupted as little as possible (i.e., mucking-up of cryptic pools was avoided). Field notes were recorded on the CAWS Vernal Pool Observation Forms and supporting photographs were taken at vernal pools. Biologists hung flagging around the perimeter of vernal pool and located flags using a global positioning device.

Upland habitat surrounding the vernal pools was also evaluated because upland terrestrial habitat is critical for supporting the adult life stages of most vernal pool obligate species. For each vernal pool, the extent of development was assessed within the vernal pool envelope (measured as the 100-ft radius from the perimeter of each vernal pool) and the critical terrestrial habitat (measured as the 100 to 750-ft radius from the limits of the vernal pool envelope). The Calhoun and Klemens' (2002) Vernal Pool Assessment Sheet defines undeveloped upland as open land largely free of roads, structures, and other infrastructure; it can be forested, partially forested, or open agricultural land.

## Findings

VHB biologists identified six pools within the Project Site that meet the vernal pool criteria presented above. All these pools were in forested areas within parcels 016-49-007, 025-49-017A, and 027-49-017C and within previously delineated wetlands (see Figure 2 for locations of the vernal pools). Obligate species identified within the pools included adult wood frogs, wood frog egg masses, wood frog larvae, spotted salamander egg masses, and fairy shrimp. A description of each vernal pool is provided below. Table 2 provides a summary of the developed and undeveloped land within the vernal pool envelope and critical terrestrial habitat areas for each vernal pool.

**Table 2. Land Use Calculations for Upland Vernal Pool Habitats**

Habitat Zone	Category	VP-1	VP-2	VP-3	VP-4	VP-5	VP-6
Vernal Pool Envelope (0-100 ft)	Undeveloped (accessible forest)	100%	100%	100%	100%	100%	75%
	Developed*	0%	0%	0%	0%	0%	25%
Critical Terrestrial Habitat (100-750 ft)	Undeveloped (accessible forest and/or agricultural land)	90%	100%	100%	100%	100%	70%
	Developed	10%	0%	0%	0%	0%	30%

\* The logging roads and all-terrain vehicle (ATV) trails are not included within the developed area calculation because they are not visible from the aeriels and therefore too small to calculate.

### Vernal Pool 1

Vernal Pool 1 is a classic vernal pool within Wetland 16 in the forested northeastern corner of parcel 016-49-007. Wetland 16 occupies a kettle hole depression that intercepts the groundwater table. No watercourse enters or leaves this wetland. Water depth within Vernal Pool 1 ranges from two to three feet and the bottom is semi-firm with a leaf litter and mud/muck substrate. Water in the pool is susceptible to high turbidity levels due to the proximity of ATV trails. The wetland is forested, with red maple (*Acer rubrum*) the dominant species, with silver maple (*A. saccharinum*) and white pine (*Pinus strobus*) also present. Canopy closure is estimated to be 70 percent.

On March 13, 2020 wood frog were chorusing at the pool and fairy shrimp were captured with a dip net. Surveys on March 24, 2020 and April 7, 2020 yielded counts of 25 wood frog egg masses and 14 spotted salamander egg masses. Adult wood frogs were also observed on April 7, 2020 along the perimeter of the pool. Facultative vernal pool species observed include caddisfly larvae, predacious diving beetles, and backswimmers.

The area of Vernal Pool 1 is approximately 1,300 square feet (SF). 100 percent of the vernal pool envelope is undeveloped and approximately 90% of the critical terrestrial habitat is undeveloped (see Table 2). Development within the outer edges of the critical terrestrial habitat includes the railroad line, tobacco barns, and a sand and gravel quarry. Vernal Pool 1 has a Tier I rating according to Calhoun and Klemens (2002) Vernal Pool Assessment Sheet, indicating that the pool is exemplary in terms of the habitat it provides to obligate vernal pool species and should be protected. See the attached Vernal Pool 1 CAWS Vernal Pool Observation Form and Vernal Pool Assessment Sheet for additional details and photographs of Vernal Pool 2.

## Vernal Pool 2

Vernal Pool 2 is within Wetland 8, a kettle hole depression formed in the ice-contact stratified drift within the north-central forested area of parcel 025-49-017A. Vernal Pool 2 does not have an inlet or outlet. A logging road/ATV trail crosses northeast of the pool. Vernal Pool 2 has a firm substrate composed of leaf litter resting on a mineral soil bottom and is between 4 to 4.5 feet deep. Woody debris in the pool is abundant. The forest adjacent to Vernal Pool 2 includes eastern hemlock (*Tsuga canadensis*), yellow birch (*Betula alleghaniensis*), pin oak (*Quercus palustris*), and red maple. The canopy closure is estimated to be 80 percent.

Chorusing wood frog were present on March 13, 2020 and an estimated 250 wood frog egg masses were inventoried on March 24 and 65 spotted salamander egg masses on April 7. The greatest concentration of wood frog egg masses was near a fallen tree on the south side of the pond. Spotted salamander egg masses were spread more evenly around the pool perimeter. Dip net surveys recorded fairy shrimp, predacious diving beetles, water striders, and caddisfly casings.

Vernal Pool 2 is approximately 8,600 SF in area. 100 percent of the vernal pool envelope is undeveloped, and the critical terrestrial habitat envelope is nearly 100 percent undeveloped (see Table 2). Vernal Pool 2 has a Tier I rating according to Calhoun and Klemens (2002) Vernal Pool Assessment Sheet. See the attached Vernal Pool 2 CAWS Vernal Pool Observation Form and Vernal Pool Assessment Sheet for additional details and photographs of Vernal Pool 2.

## Vernal Pool 3

Vernal Pool 3 is formed in an abandoned Ketch Brook oxbow within Wetland 1. Vernal Pool 3 receives inflow from a hillside spring that flows down the face of a terrace escarpment and there is a narrow outlet at the western end of the pool closest to Ketch Brook. This vernal pool is within the active floodplain of Ketch Brook and may be flooded during large storm events. When water levels are low Vernal Pool 3 may separate into three distinct pools in the deepest parts of the oxbow. The pool contains moderate amounts of filamentous algae at the eastern end where it is shallower with an average depth of one foot. The pool bottom is soft and composed of muck and leaf litter. There is abundant woody debris throughout the pool. The forested perimeter of Vernal Pool 3 is composed of red maple, eastern hemlock, American Beech (*Fagus grandifolia*), and green ash (*Fraxinus pennsylvanica*) and the dominant herbaceous vegetation in early spring is evergreen wood fern (*Dryopteris intermedia*). Canopy cover is approximately 50 percent.

On March 24 and 26 an estimated 120 wood frog egg masses were present in Vernal Pool 3. Some of the rafts of multiple egg masses were secured to submerged branches while others were deposited directly on the leaf litter substrate. The pool was not dip-netted extensively to avoid damaging egg masses and disturbing the mucky substrate. No spotted salamander eggs masses or fairy shrimp were observed. Facultative vernal pool species observations included isopods, water striders, and predaceous diving beetle larvae.

The pool is approximately 5,300 SF in area. GIS analysis of the surrounding upland areas indicate that 100 percent of the vernal pool envelope and critical terrestrial habitat envelope are undeveloped (see Table 2). Vernal Pool 3 has a rating of Tier I according to Calhoun and Klemens' (2002) Vernal Pool Assessment Sheet. See the attached Vernal Pool 3 CAWS Vernal Pool Observation Form and Vernal Pool Assessment Sheet for additional details and photographs of Vernal Pool 3.

## Vernal Pools 4 and 5

Vernal Pools 4 and 5 are cryptic pools within forested Wetland 6. There are no watercourses flowing into or out of the wetland, though it likely provides a source of groundwater to feed the spring that flows to Vernal Pool 3. Vernal Pool 4 was formed by a tree-throw and had a maximum depth of approximately 12-inches when measured on March 26, 2020. The pool bottom is soft and composed of muck and leaf litter. Vernal Pool 5 is approximately 50 feet west of Vernal Pool 4. Vernal Pool 5 has a soft, muck bottom beneath a layer of leaf-litter. This pool was only six-inches deep when measured on March 26, 2020. Algae was abundant within both pools. Woody debris content in both pools is moderate with several submerged branches. Vegetation surrounding both pools is similar and is composed of red maple, eastern hemlock, spicebush (*Lindera benzoin*). Canopy closure is estimated at 75 percent for both pools.

VHB biologists surveyed Vernal Pools 4 and 5 on March 26, 2020 and observed 60 wood frog egg masses at Vernal Pool 4 and approximately 80 wood frog egg masses at Vernal Pool 5. No spotted salamander eggs masses or fairy shrimp were observed at either pool. The pools were not dip-netted extensively to avoid damaging egg masses and disturbing the mucky substrate. Facultative vernal pool species observations include water striders.

Vernal Pool 4 is approximately 300 SF and Vernal Pool 5 is approximately 600 SF. GIS analyses of the surrounding wetland and upland found that 100 percent of the vernal pool envelopes and critical terrestrial habitat envelopes are undeveloped (see Table 2). Based on the Calhoun and Klemens' (2002) Vernal Pool Assessment Sheet, Vernal Pools 4 and 5 are rated Tier I. However, based on the small size, shallow depth and unknown hydroperiod of each pool it is possible that these pools may act as a sink rather than a productive breeding resource that allows for the full metamorphosis of vernal pool species. Alternatively, in wetter years a larger part of Wetland 6 may be inundated and function as a larger vernal pool. VHB scientists will revisit these pools to assess function during upcoming breeding bird surveys.

## Vernal Pool 6

Vernal Pool 6 occupies the footprint of Wetland 12, a small depressional wetland adjacent to the railroad tracks in parcel 027-49-017C. This wetland has the form of an abandoned oxbow and may have been cut off from its water source during earlier development activities, including the construction of the adjacent railroad line. The average depth of the pool was approximately one foot with the maximum depth reaching 1.5 feet at the center of the pool. The substrate of Vernal Pool 6 is composed on muck and leaf litter and there is a moderate collection of woody debris within the pool. The northwest boundary of the pool is close to an earthen berm along a gravel haul road. Vegetation within and surrounding the pools includes red maple, spicebush, buttonbush (*Cephalanthus occidentalis*), multiflora rose, royal fern (*Osmunda regalis*), poison ivy (*Toxicodendron radicans*), and jewelweed (*Impatiens capensis*). The southern part of the vernal pool has approximately 70 percent canopy closure while the northern part was estimated at 50 percent canopy closure. Emergent vegetation consisting of sedges and rushes characterize the northern end of the pool.

VHB biologists surveyed Vernal Pool 6 on May 5, 2020 and observed numerous wood frog larvae. There were no remaining egg masses to count. Facultative species observed included adult green frog, predacious diving beetles, and caddisfly larvae.

Vernal Pool 6 is approximately 3,500 SF and approximately 75 percent of the surrounding vernal pool envelope is undeveloped. The adjacent railroad and gravel haul road account for the development in the pool envelope.

Approximately 30 percent of the critical terrestrial habitat is developed consisting of sand and gravel mines northwest and southeast of the pool and the railroad line. The remainder of the critical terrestrial habitat is considered undeveloped. Based on the Calhoun and Klemens' (2002) Vernal Pool Assessment Sheet, Vernal Pool 6 is rated Tier I. However, its proximity to the adjacent railroad line and sand and gravel mining operations potentially subject the pool to runoff which can impact the turbidity and water clarity of the pool. Relative to the locations of the other vernal pools, this one is considered the most vulnerable in terms of its risk for anthropogenic disturbance.

#### **Pools that Do Not Meet Vernal Pool Criteria**

There were three wetlands with standing or impounded water that did not possess vernal pool indicators. Wetland 10 is an isolated depression in a farm field next to a gravel mine within Parcel 027-49-017C. This wetland seasonally ponds water. A dip net survey on April 7, 2020 produced overwintered green frog larvae (*Lithobates clamitans*) and freshwater snails. No adult wood frog or spotted salamander, their egg masses or fairy shrimp were recovered from this wetland. Wetland 10 was determined not to be a vernal pool.

A beaver-impounded backwater pool in the Ketch Brook floodplain (Wetland 1), approximately 200 feet west of the Eversource electric transmission right-of-way was investigated first on March 5, 2020 when two facultative species were observed, adult green frog and two pairs of painted turtle (*Chrysemys picta*). This backwater pool was investigated again on March 26, 2020 and once again no obligate vernal pool species were observed.

Wetland 11 in the southwest corner of the Charbonneau Gravel Pit also contained a pool when it was visited on April 28, 2020. This depression was created during the reclamation of a corner of the gravel pit. The pool was about 40 feet long by 15 feet wide and up to one foot deep. The pool held mostly mosquito and midge larvae with some caddisfly larvae also present. No obligate species were found in this wetland.

## Conclusions

Between mid-March to early May 2020, VHB biologists identified six vernal pools within the Project Site. These included classic vernal pools formed in kettle holes and cryptic pools within larger wetland systems. A summary of findings is presented in Table 3 below. The appended CAWS Vernal Pool Observation Forms provide further data on each of the pools. The attached Vernal Pool Assessment Sheets provide a summary of biological value and land use surrounding each pool. Photos of each pool are also appended.

**Table 3. Summary of Findings**

<b>Pond ID</b>	<b>Area (SF)</b>	<b>Inlet/Outlet Flowing</b>	<b>Obligate Indicators</b>	<b>Fish Present</b>	<b>Vernal Pool Classification</b>
Vernal Pool 1	1,300	No	WFC, WFEM, SSEM, FS	No	Classic kettle hole
Vernal Pool 2	8,600	No	WFC, WFEM, SSEM, FS	No	Classic kettle hole
Vernal Pool 3	5,700	Yes	WFEM	No	Cryptic Oxbow
Vernal Pool 4	400	No	WFEM	No	Cryptic
Vernal Pool 5	550	No	WFEM	No	Cryptic
Vernal Pool 6	3,500	No	WFL	No	Cryptic oxbow

WFC: Wood frog chorusing; WFEM: Wood frog egg masses; WFL: Wood frog larvae; SSEM: Spotted salamander egg masses; FS fairy shrimp

Vernal Pool 1 supports a productive population of obligate vernal pool species suitable to its size and the hydroperiod likely supports the full metamorphosis of these species in most years of average or greater rainfall. Vernal Pool 2 supports a large population of wood frog and spotted salamander and supports the greatest biodiversity of all the pools. Vernal Pool 3 is susceptible to flooding but appears to be highly productive. The exceptionally small Vernal Pools 4 and 5 may not store enough water for wood frog larvae to complete their metamorphosis before the pools dry in average rainfall years and may act as a sink. Vernal Pool 6 provides suitable habitat conditions for wood frog larvae but is potentially vulnerable to anthropogenic disturbance from the adjacent railroad line and proximity to active sand and gravel mining operations.

## References

Calhoun, A. J. K. and M. W. Klemens. 2002. Best development practices: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States. MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.

Connecticut Association of Wetland Scientists vernal pool web page fact sheet:  
[http://www.ctwetlands.org/forms/CAWS\\_VernalPoolMonitoring\\_FactSheet.pdf](http://www.ctwetlands.org/forms/CAWS_VernalPoolMonitoring_FactSheet.pdf)

Connecticut Department of Energy and Environmental Protection. March 20, 2020. Vernal Pools.  
<https://portal.ct.gov/DEEP/Water/Wetlands/Vernal-Pools>. Accessed April 22, 2020.

Donahue, D. F. 1996. A guide to the identification and protection of vernal pool wetlands in Connecticut. University of Connecticut Cooperative Extension Program.

Klemens, M. W. 1993. Amphibians and reptiles of Connecticut and adjacent regions. State Geological and Natural History Survey of Connecticut, Bulletin No. 112, Connecticut Department of Environmental Protection, Hartford, CT.

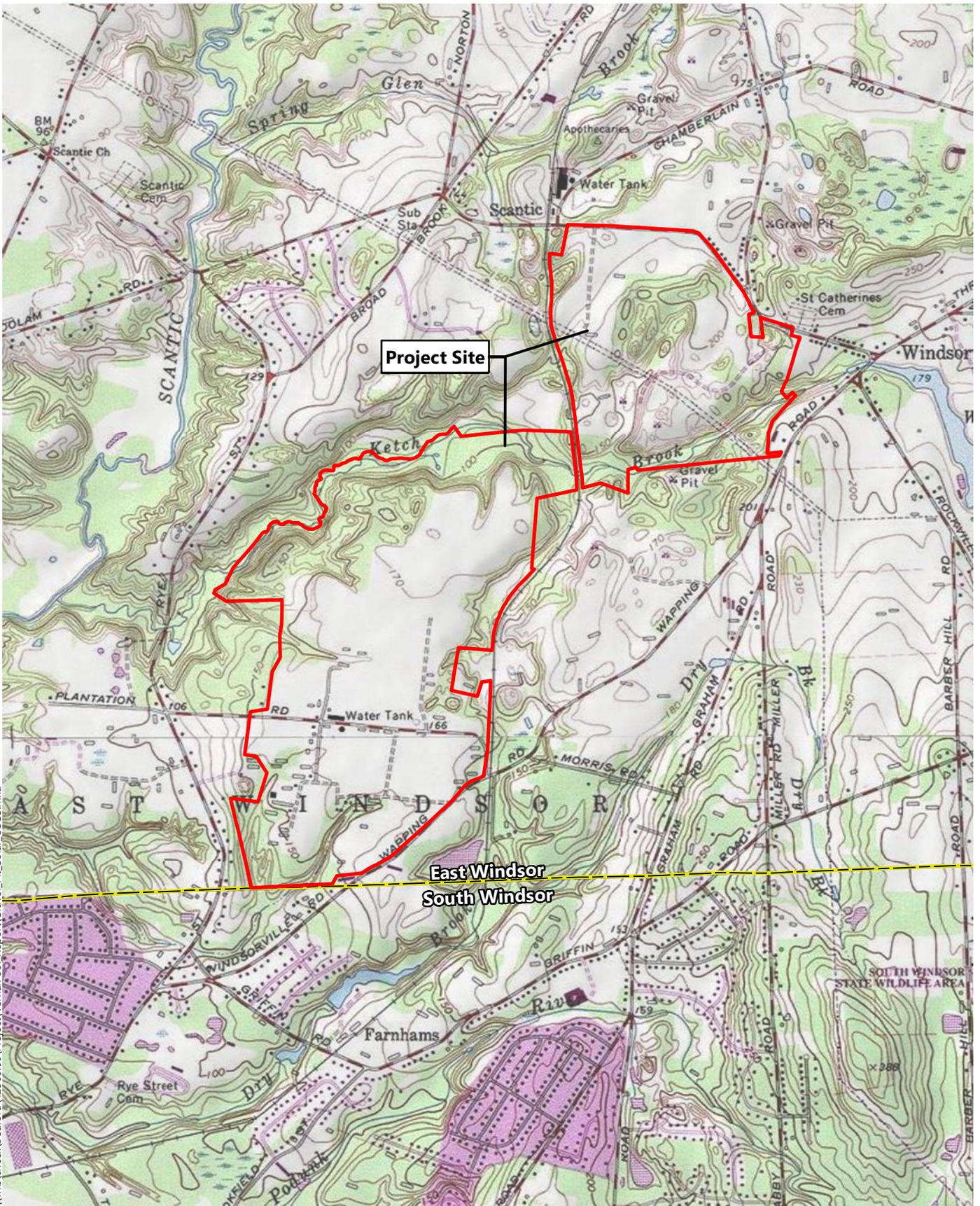
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## **Attachments**

Attachment A: Figure 1: USGS Overview Map and Figure 2: Vernal Pool Resources

Attachment B: Representative Site Photographs

Attachment C: CAWS Vernal Pool Observation Forms and Vernal Pool Assessment Sheets (5 sets of forms)



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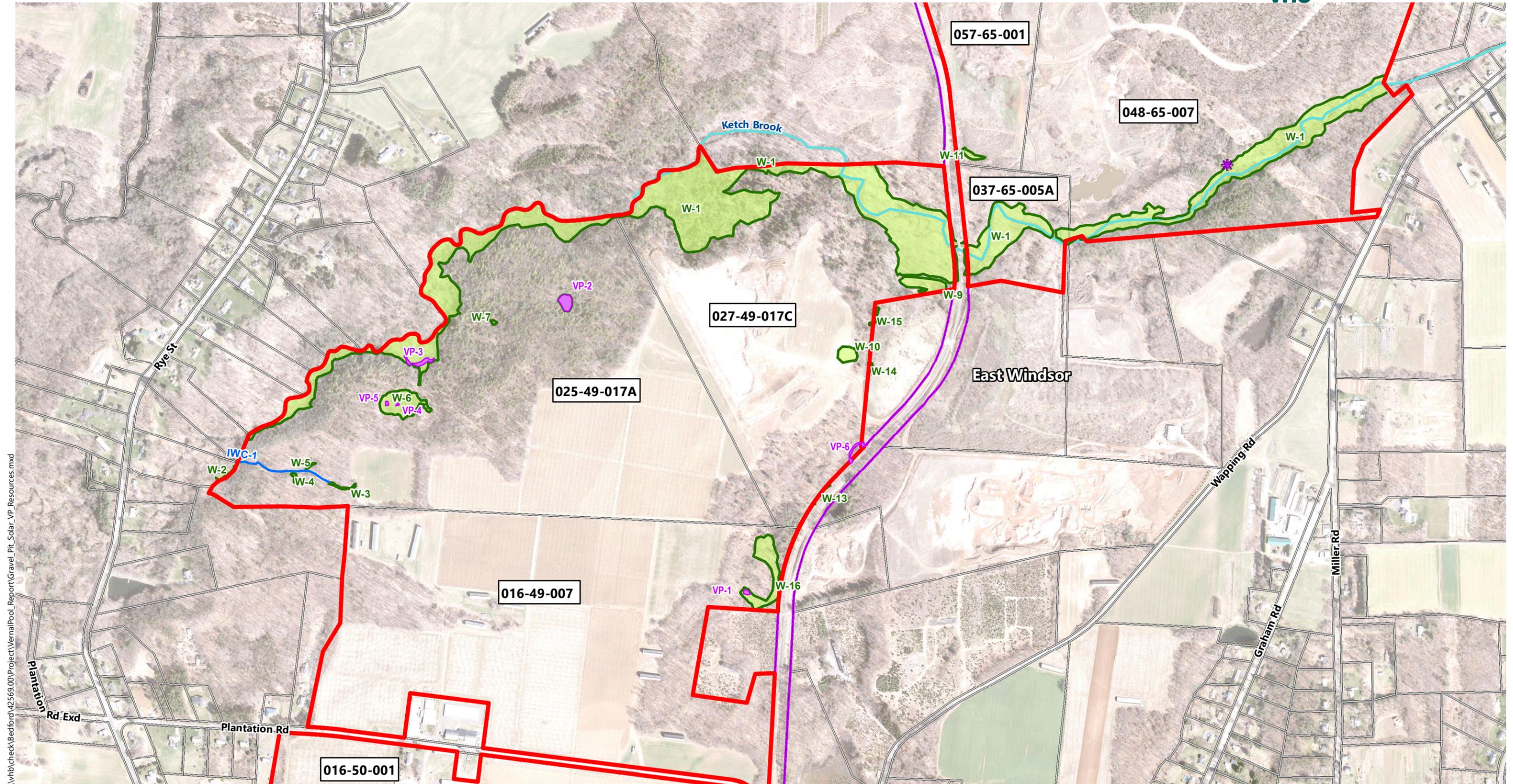
- Project Site
- Town Boundary

**Gravel Pit Solar**

**East Windsor, Connecticut**

**USGS Overview Map**

Source: VHB, CTDEEP



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- Legend**
- Project Site
  - Approximate Railroad ROW
  - Parcel Boundary
  - Town Boundary
  - Delineated Intermittent Watercourse
  - Stream/River
  - Delineated Wetland Edge
  - Approximate Delineation Buried Wetland
  - Inland Wetland Area
  - Vernal Pool
  - ✱ Beaver Impoundment Pool

**Gravel Pit Solar** | East Windsor, Connecticut

**Vernal Pool Resources**

**Gravel Pit Solar  
Vernal Pool Survey Photo Log**

**Vernal Pool 1 Photos**

<b>Vernal Pool 1 - Photo 1</b>	<b>Description:</b>
	<p>A southeasterly view of Vernal Pool 1, a classic vernal pool in a kettle hole (Wetland 16). No watercourse enters or leaves this wetland. Water depth within Vernal Pool 1 ranges from two to three feet and the bottom is semi-firm with a leaf litter and mud/muck substrate.</p>
<b>Vernal Pool 1 - Photo 2</b>	<b>Description:</b>
	<p>A view of a wood frog egg mass. Field surveys on March 24 and April 7, 2020 yielded a count of 25 wood frog egg masses.</p>

<p><b>Vernal Pool 1 - Photo 3</b></p>  A photograph showing a white dip net held over dark, rippling water. Inside the net, two large, translucent, yellowish-brown egg masses are visible, along with some debris and a small dark object.	<p><b>Description:</b></p> <p>A view of two spotted salamander egg masses. Dip net surveys within Vernal Pool 1 yielded a count of 14 spotted salamander egg masses.</p>
<p><b>Vernal Pool 1 - Photo 4</b></p>  A photograph of an adult wood frog sitting in a shallow, rocky vernal pool. The frog is partially submerged, with its head and back visible above the water. The water is clear, and the surrounding rocks and vegetation are visible.	<p><b>Description:</b></p> <p>One of several adult wood frogs that were observed along the perimeter of the pool on April 7, 2020.</p>

## Vernal Pool 2 Photos

**Vernal Pool 2 - Photo 1**



**Description:**

A westerly view of Vernal Pool 2 taken on March 24, 2020. Vernal Pool 2 is a classic vernal pool (Wetland 8) occupying a kettle hole depression. Vernal Pool 2 does not have an inlet or outlet. This pool has a firm bottom with a leaf litter substrate. Maximum depths are 4 to 4.5 feet.

**Vernal Pool 2 - Photo 2**



**Description:**

A northerly view of Vernal Pool 2 taken on April 7, 2020. A thin film of pollen covered the pool surface. This pollen layer did not inhibit observations of egg masses or dip net surveys.

<p><b>Vernal Pool 2 - Photo 3</b></p>  A photograph showing a large, white, spherical egg mass of a wood frog attached to a submerged branch in a vernal pool. The egg mass is covered in a dense layer of green, fuzzy algae. The water is clear, and the surrounding trees and sky are reflected in the surface.	<p><b>Description:</b></p> <p>A wood frog egg mass on a submerged branch. This egg mass was colonized by symbiotic algae. VHB biologists inventoried an estimated 250 wood frog egg masses in Vernal Pool 2.</p>
<p><b>Vernal Pool 2 - Photo 4</b></p>  A close-up photograph of a cluster of spotted salamander egg masses on submerged branches. The egg masses are white and spherical, with a mottled pattern of dark spots. A person's gloved hand is visible, holding one of the egg masses. The water is clear, and the surrounding trees and sky are reflected in the surface.	<p><b>Description:</b></p> <p>A cluster of spotted salamander egg masses on submerged branches. On April 7, 2020 VHB biologists inventoried an estimated 65 spotted salamander egg masses.</p>

## Vernal Pool 3 Photos

<p><b>Vernal Pool 3 - Photo 1</b></p> 	<p><b>Description:</b></p> <p>A northeasterly view of the eastern end of Vernal Pool 3, an abandoned oxbow of Ketch Brook (Wetland 1). Vernal Pool 3 is in the wetland floodplain of the brook. The pool is spring fed from a high gradient watercourse emanating from the terrace escarpment south of the pool. The eastern end of this pool outlets to Wetland 1 and Ketch Brook .</p>
<p><b>Vernal Pool 3 - Photo 2</b></p> 	<p><b>Description:</b></p> <p>A northerly view of Vernal Pool 3. The pond bottom is soft and composed of muck and leaf litter and contains abundant woody debris from fallen trees and branches. The pool is an abandoned stream channel cut at the base of a terrace escarpment visible in the eastern (right) side of the photograph.</p>

<b>Vernal Pool 3 - Photo 3</b>	<b>Description:</b>
	<p>A cluster of wood frog egg masses attached to a submerged branch in Vernal Pool 3. VHB biologists counted 120 wood frog egg masses in Vernal Pool 3 on March 24, 2020.</p>
<b>Vernal Pool 3 - Photo 4</b>	<b>Description:</b>
	<p>A raft of wood frog egg masses at the eastern end of Vernal Pool 3, some attached to submerged branches and some nestled in filamentous algae. The eastern stretch of the oxbow is shallower than the western portion, with an average depth of one foot.</p>

### Vernal Pool 4 Photos

<p><b>Vernal Pool 4 - Photo 1</b></p> 	<p><b>Description:</b></p> <p>Vernal Pool 4 is a cryptic vernal pool formed by a tree-throw in Wetland 6. On March 26 this small pool had a maximum depth of one foot.</p>
<p><b>Vernal Pool 4 - Photo 2</b></p> 	<p><b>Description:</b></p> <p>A raft of wood frog egg masses attached to submerged branches. VHB biologists counted 60 egg masses during the survey on March 26, 2020. This is an exceedingly large number of egg masses given the small size of the pool and may indicate that water levels in Wetland 6 were below normal this spring.</p>

<b>Vernal Pool 4 - Photo 3</b>	<b>Description:</b>
	A westerly view of the root mound left by the tree throw that created Vernal Pool 4.
<b>Vernal Pool 4 - Photo 4</b>	<b>Description:</b>
	Racoon prints were observed along the perimeter of Vernal Pool 4, a potential predator of egg masses and/or adult frogs.

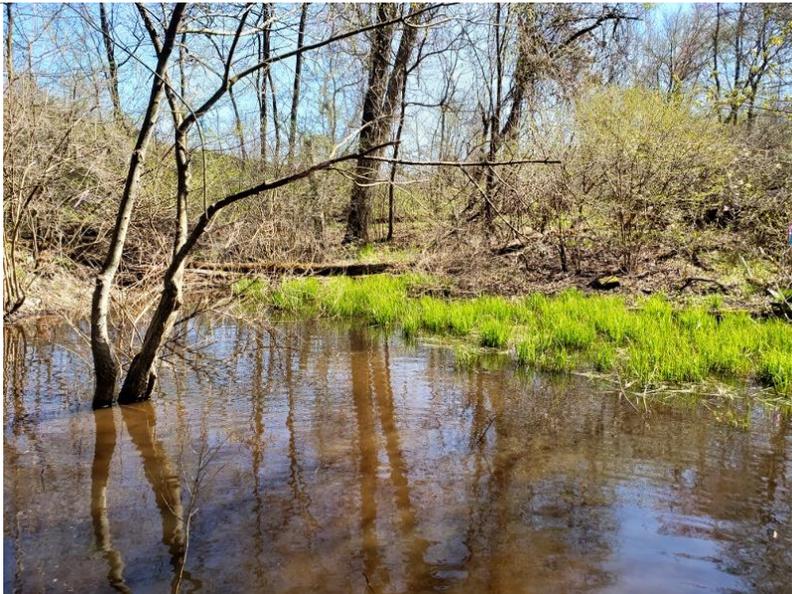
## Vernal Pool 5 Photos

<p><b>Vernal Pool 5 - Photo 1</b></p> 	<p><b>Description:</b></p> <p>An easterly view of Vernal Pool 5, another cryptic pool within Wetland 6. Vernal Pool 5 has a soft, muck bottom beneath a layer of leaf-litter. This pool was only six-inches deep when measured on March 26, 2020. This pool is at high risk of drying out before wood frog larvae can complete metamorphosis and leave the pool and is likely a sink this year.</p>
<p><b>Vernal Pool 5 - Photo 2</b></p> 	<p><b>Description:</b></p> <p>A raft of wood frog egg masses attached to submerged branches. VHB biologists counted approximately 80 egg masses on March 26, 2020.</p>

<p><b>Vernal Pool 5 - Photo 3</b></p> 	<p><b>Description:</b> A raft of wood frog egg masses above the deciduous leaf substrate.</p>
<p><b>Vernal Pool 5 - Photo 4</b></p> 	<p><b>Description:</b> A view of the southern end of Vernal Pool 5 where it transitions to the surrounding wetland system. This area was too shallow to support egg masses.</p>

## Vernal Pool 6 Photos

<p><b>Vernal Pool 6 - Photo 1</b></p> 	<p><b>Description:</b></p> <p>An easterly view of Vernal Pool 6, a small depressional wetland adjacent to the active freight railroad line owned by the State of Connecticut. This wetland has the form of an abandoned oxbow and may have been cut off from its water source during earlier development activities, including the construction of the adjacent railroad line.</p>
<p><b>Vernal Pool 6 - Photo 2</b></p> 	<p><b>Description:</b></p> <p>A view of the southern end of Vernal Pool 6. VHB biologists observed numerous wood frog larvae when they visited the pool on May 5, 2020. The southern part of the vernal pool has approximately 70 percent canopy closure.</p>

<b>Vernal Pool 6 - Photo 3</b>		<b>Description:</b> A view of the northern end of Vernal Pool 6. Canopy closure of this end of the pool is approximately 50 percent. The semi-open canopy has facilitated the growth of emergent vegetation, including sedges and rushes.
<b>Vernal Pool 6 - Photo 4</b>		<b>Description:</b> A view of a wood frog larva netted in Vernal Pool 6. Characteristic identification features include the clear tail fin and dark body.

## Non-Vernal Pool Photos

<p><b>Wetland 10 - Photo 1</b></p> 	<p><b>Description:</b></p> <p>A southerly view of the isolated depression within Wetland 10. The wetland is in a highly disturbed area and is surrounded by 10- to 15-foot high piles of tree stumps around approximately half of its perimeter. The water depth was approximately six inches when surveyed on April 7, 2020 and the water was highly turbid.</p>
<p><b>Wetland 10 - Photo 2</b></p> 	<p><b>Description:</b></p> <p>A dip net survey of the pool within Wetland 10 on April 7, 2020 produced overwintered green frog larvae and freshwater snails. No obligate vernal pool species were present.</p>

<b>Beaver Impoundment - Photo 1</b>	<b>Description:</b>
	<p>An easterly view of the beaver-impounded backwater pool along Ketch Brook in Wetland 1, approximately 200 feet west of the Eversource electric transmission right-of-way. This picture is taken from the location of the beaver dam that has caused the impoundment.</p>
<b>Beaver Impoundment - Photo 2</b>	<b>Description:</b>
	<p>Adult green frog, pictured here, were observed in the pool on March 5, 2020 in addition to two pairs of painted turtles. No obligate vernal pool species were observed when the pool was investigated again on March 26, 2020.</p>

## VERNAL POOL DATA SHEET

Survey Date: 3/24/2020	Investigator(s): C. Glinka, M. Murphy	Town: East Windsor	CAWS Pool #: VP1	CAWS Project #:
Town Staff Contacted? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Project/property name: Gravel Pit Solar		Pool Type:	Development: <input type="checkbox"/> Reference: <input type="checkbox"/>
Address/location (or include annotated map): Off Plantation Road, Parcel ID 016-49-007			Investigator's Contact information: cglinka@vhb.com	

**SEARCH CONDITIONS AND METHODS (required)**

**WEATHER:**

Precipitation: Within last 24 hours  
0" ~<1" snow

Cloud Cover:  
 clear   
 partly cloudy   
 mostly cloudy   
 full cloud cover

Start time: 930  
End time: 1030

Methods used:  
 Visual   
 Dipnetting

Type of Inspection:  
 baseline  Polarized sunglasses used? Yes   
 during construction  No   
 post construction

Comments:  
 Temporary flagging used to mark egg masses? Yes  No

**AMPHIBIAN EGG MASS COUNTS (required)**

**Wood frogs:**

1-25  26-49 ~~50~~ Abundance categories

condition	50-75	<input type="checkbox"/>	250-300	<input type="checkbox"/>
If condition mixed, note "some", "many" or "most"	75-100	<input type="checkbox"/>	300-400	<input type="checkbox"/>
	100-150	<input type="checkbox"/>	400-500	<input type="checkbox"/>
	150-200	<input type="checkbox"/>	500-750	<input type="checkbox"/>
intact: All	200-250	<input type="checkbox"/>	750-1000	<input type="checkbox"/>
breaking up:			1000-1250	<input type="checkbox"/>
hatching:			>1250	<input type="checkbox"/>

Describe estimation method used for a large raft:  
Actual count: 25

**Spotted Salamanders:**

Condition:  
 intact: All  
 breaking up:  
 hatching:

Total Number	
1st visit: 1	2nd visit: 14

**ADDITIONAL NOTES: (optional)**

VP 1 is a classic vernal pool within Wetland 16 which occupies a kettle hole depression. Wood frog egg masses were mostly clustered around the east side of the pool within the submerged branches of a fallen tree.

The sound of the active gravel pit (approximately 1/3 mile east) is audible from VP1

Chorusing wood frogs were heard during a previous visit on March 13, 2020. Fairy shrimp were also observed on this visit via dip net surveys.

During a second visit on April 7, 2020 14 spotted salamander egg masses were observed and several adult wood frogs were present along the edge of the pool.

**CONDITIONS/OBSERVATIONS WITHIN POOL (required data)**

Inlet observed? No  Yes  Flowing  Not flowing   
 Outlet observed? No  Yes   
 finfish observed? No  Yes   
 Estimated water depth range? 2-3 ft.

Optional Data (see also back of sheet)

**Other Vernal Pool Species:**  
 fairy shrimp present? Yes  No   
 marbled salamander larvae present? Yes  No

**Vegetation (within or overhanging pool):**  
 Trees/Saplings: red & silver maple, white pine  
 Shrubs/Vines: Multiflora rose, speckled alder  
 Herbs: jewelweed  
 Percent tree canopy closure? 70%  
 Woody debris content? High  Med.  Low

**Pool Substrate: (top three)**  
 Mud/muck  Sand/Silt  Peat   
 Leaf Litter  Silt/clay  Bedrock   
 Gravel/cobbles

**Water Quality:**  
 pH  conductivity (uS/cm)  temperature (°C)   
 Nitrate-N (mg/l)  Total P (ug/l)  DO (mg/l)   
 turbidity (NTU's)  Sulphidic odor? No  Yes   
 Approximate % cover by algal mat or duckweed? 0%  
 GPS coordinates: 41° 52' 44.217" N, 72° 33' 26.761" W

**CONDITIONS IN ENVELOPE WITHIN 100 FT OF POOL (required data)**

Give approximate percentage or show on sketch on back

Landuses/conditions	forest	100%	shrubland	<input type="checkbox"/>	meadow	<input type="checkbox"/>
	pasture	<input type="checkbox"/>	lawn	<input type="checkbox"/>	building	<input type="checkbox"/>
	exposed soil	<input type="checkbox"/>	grading	<input type="checkbox"/>	ag. field	<input type="checkbox"/>
	road	<input type="checkbox"/>	busy (>1 car/10 min.)	yes <input type="checkbox"/>	no <input type="checkbox"/>	
	parking lot	<input type="checkbox"/>				

Comments:  
ATV trails are proximate to the vernal pool

**Leaf Litter: If variable, note location (e.g. "N. shore")**

none/low:	
moderate:	
high:	X

**Cover Objects:**

	Logs	Rocks
none:		X
low:		
moderate:	X	
high:		

**Dominant vegetation (optional)**

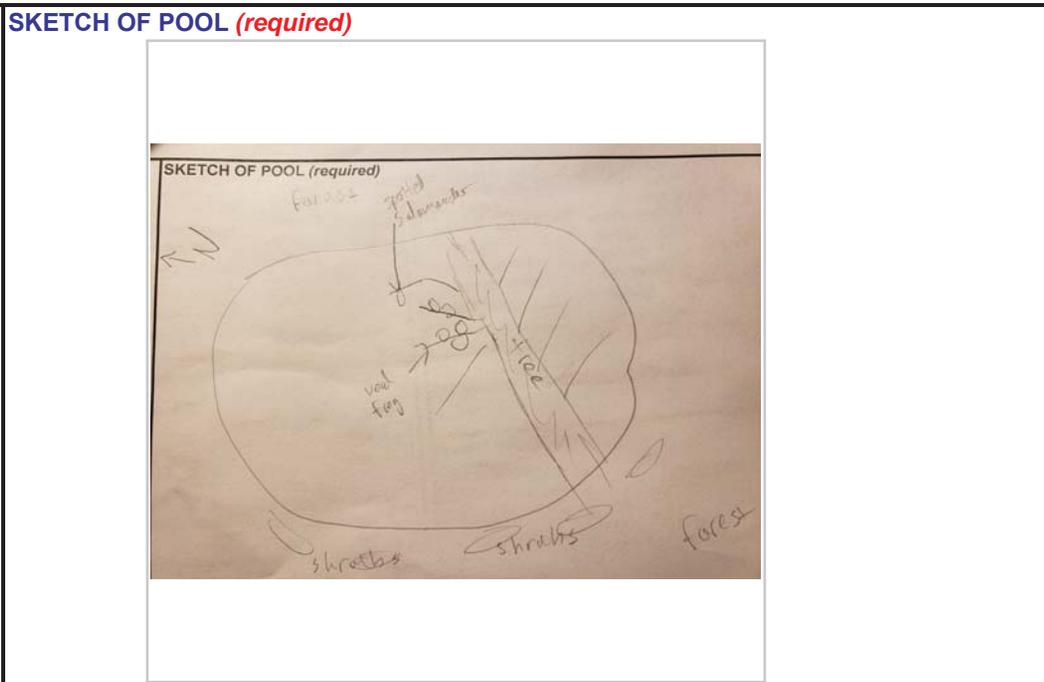
Trees/saplings: red & silver maple, white pine  
 Shrubs/Vines: Multiflora rose, speckled alder  
 Herbs: jewelweed

**ADDITIONAL NOTES: (optional)**

# VERNAL POOL DATA SHEET, p. 2

Survey Date: 3/24/2020	Investigator(s): C. Glinka, M. Murphy	Town: East Windsor	CAWS Pool #: VP1	CAWS Project #:
Project/property name: Gravel Pit Solar			Pool Type:	Development: <input type="checkbox"/> Reference: <input type="checkbox"/>

Draw a **rough, quick** sketch of the pool showing **approximate locations of egg mass rafts & clusters** in relation to pool features, like logs, algal mats, and islands. Show inlet/outlet if present. Include north arrow and approximate scale.



**WILDLIFE OBSERVATIONS: (optional)**

**Checklist of Facultative Herptile Fauna (Pool & Fringe):**

Green Frog	<input type="checkbox"/>	Spring Peeper	<input type="checkbox"/>
Pickereel Frog	<input type="checkbox"/>	Gray Tree Frog	<input type="checkbox"/>
Bull Frog	<input type="checkbox"/>	Pickereel Frog	<input type="checkbox"/>
Eastern Toad	<input type="checkbox"/>	Painted Turtle	<input type="checkbox"/>
Spotted Turtle	<input type="checkbox"/>	Snapping Turtle	<input type="checkbox"/>
N. Water Snake	<input type="checkbox"/>	Blue-spot. salam.	<input type="checkbox"/>

**Other Observed Fauna (Pool & Fringe):**

caddisfly larvae, predacious diving beetle, backswimmers

Draw a **rough, quick** sketch of the pool's **terrestrial envelope**, extending at least 200' from pool in all directions. Provide **detail on conditions & landuses within 100 feet of edge of pool**. Include north arrow and approximate scale.

**SKETCH OF TERRESTRIAL ENVELOPE AROUND POOL (required)**

Circle any of the following factors that impaired your ability to observe egg masses, and indicate severity of impairment.

Factor	Severity (Low/Mod./High)
1. Surface algae	<input type="checkbox"/>
2. Surface pollen	<input type="checkbox"/>
3. Dark, tannin-colored water	<input checked="" type="checkbox"/> Low
4. Deep water	<input type="checkbox"/>
5. Turbidity	<input type="checkbox"/>
6. Dense shrubs	<input type="checkbox"/>
7. Other (specify)	<input type="checkbox"/>

**ADDITIONAL NOTES: (optional)**

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## VERNAL POOL DATA SHEET

Survey Date: 3/24/2020	Investigator(s): C. Glinka, M. Murphy	Town: East Windsor	CAWS Pool #: VP2	CAWS Project #:
Town Staff Contacted? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Project/property name: Gravel Pit Solar		Pool Type:	Development: <input type="checkbox"/> Reference: <input type="checkbox"/>
Address/location (or include annotated map): Off Plantation Road, Parcel ID 025-49-017A			Investigator's Contact information: cglinka@vhb.com	

**SEARCH CONDITIONS AND METHODS (required)**

**WEATHER:**

Precipitation: Within last 24 hours  
0" ~<1" snow

Cloud Cover:  
clear   
partly cloudy   
mostly cloudy   
full cloud cover

Start time: 1100  
End time: 1200

Methods used:  
Visual   
Dipnetting

Type of Inspection:  
baseline   
during construction   
post construction

Polarized sunglasses used? Yes  No

Temporary flagging used to mark egg masses? Yes  No

Comments:

**AMPHIBIAN EGG MASS COUNTS (required)**

Wood frogs:  1-25  26-49  50-75  75-100  100-150  150-200  200-250   >250

Abundance categories:  
250-300   
300-400   
400-500   
500-750   
750-1000   
1000-1250   
>1250

condition:  50-75  75-100  100-150  150-200  200-250   >250

If condition mixed, note "some", "many" or "most"

intact: All   
breaking up:   
hatching:

Describe estimation method used for a large raft:  
Actual count: ~250; counted in groups of approximately 10

**Spotted Salamanders:**

Condition:  
intact: All   
breaking up:   
hatching:

Total Number:  
1st visit: 2 2nd visit: 65

**ADDITIONAL NOTES: (optional)**

VP 2 is a classic vernal pool within Wetland 8 which occupies a kettle hole depression. Wood frog egg masses were mostly clustered around the east/southeast side of the pool within the submerged branches of a fallen tree. Chorusing wood frogs were heard during a previous visit on March 13, 2020. Fairy shrimp were also observed on this visit via dip net surveys.

During a second visit on April 7, 2020 65 spotted salamander egg masses were observed around the perimeter of the pool.

**CONDITIONS/OBSERVATIONS WITHIN POOL (required data)**

Inlet observed? No  Yes   
Outlet observed? No  Yes   
finfish observed? No  Yes   
Estimated water depth range? 1-4.5 ft.

Flowing  Not flowing

Optional Data (see also back of sheet)

Other Vernal Pool Species:  
fairly shrimp present? Yes  No   
marbled salamander larvae present? Yes  No

Vegetation (within or overhanging pool):  
Trees/Saplings: eastern hemlock, yellow birch, red maple  
Shrubs/Vines: yellow birch  
Herbs: \_\_\_\_\_

Percent tree canopy closure? 80%  
Woody debris content? High  Med.  Low

Pool Substrate: (top three)  
Mud/muck  Sand/Silt  Peat   
Leaf Litter  Silt/clay  Bedrock   
Gravel/cobbles

Water Quality:  
pH  conductivity (µS/cm)  temperature (°C)   
Nitrate-N (mg/l)  Total P (µg/l)  DO (mg/l)   
turbidity (NTU's)  Sulphidic odor? No  Yes   
Approximate % cover by algal mat or duckweed? 0%  
GPS coordinates: 41° 53' 4.840" N, 72° 33' 44.470" W

**CONDITIONS IN ENVELOPE WITHIN 100 FT OF POOL (required data)**

Give approximate percentage or show on sketch on back

Landuses/conditions:  
forest 100% shrubland  meadow   
pasture  lawn  building   
exposed soil  grading  ag. field   
road  busy (>1 car/10 min.) yes  no   
parking lot

Comments:  
ATV trails are proximate to the vernal pool

Leaf Litter: If variable, note location (e.g. "N. shore")  
none/low: \_\_\_\_\_  
moderate: \_\_\_\_\_  
high: \_\_\_\_\_ X

Cover Objects: Logs Rocks  
none: \_\_\_\_\_ X  
low: \_\_\_\_\_  
moderate: \_\_\_\_\_  
high: \_\_\_\_\_ X

Dominant vegetation (optional)  
Trees/saplings: eastern hemlock, yellow birch, red maple, pin oak  
Shrubs/Vines: yellow birch  
Herbs: \_\_\_\_\_

**ADDITIONAL NOTES: (optional)**



## VERNAL POOL DATA SHEET

Survey Date: 3/24/2020	Investigator(s): C. Glinka, M. Murphy	Town: East Windsor	CAWS Pool #: VP3	CAWS Project #:
Town Staff Contacted? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Project/property name: Gravel Pit Solar		Pool Type:	Development: <input type="checkbox"/> Reference: <input type="checkbox"/>
Address/location (or include annotated map): Off Plantation Road, Parcel ID 025-49-017A			Investigator's Contact information: cglinka@vhb.com	

**SEARCH CONDITIONS AND METHODS (required)**

**WEATHER:**

Precipitation: Within last 24 hours  
0" ~<1" snow

Cloud Cover:  
clear   
partly cloudy   
mostly cloudy   
full cloud cover

Start time: 1305  
End time: 1445

Methods used:  
Visual   
Dipnetting

Type of Inspection:  
baseline   
during construction   
post construction

Polarized sunglasses used? Yes  No

Temporary flagging used to mark egg masses? Yes  No

Comments:

**AMPHIBIAN EGG MASS COUNTS (required)**

Wood frogs:  1-25  26-49  50-75  75-100  100-150  150-200  200-250  >250

Abundance categories:  
250-300   
300-400   
400-500   
500-750   
750-1000   
1000-1250   
>1250

condition: 50-75  
If condition mixed, note "some", "many" or "most": 75-100  
intact: All: 100-150  
breaking up: 150-200  
hatching: 200-250

Describe estimation method used for a large raft:  
Actual count: ~120; counted in groups of approximately 10

**Spotted Salamanders:**

Condition:  
intact:   
breaking up:   
hatching:

Total Number: 0

**ADDITIONAL NOTES: (optional)**

VP 3 is a cryptic vernal pool within an abandoned oxbow of Ketch Brook. It is within the floodplain of Ketch Brook (Wetland 1).

Western end of pool nearest Ketch Brook has an outlet. Eastern end of the pool is shallower than the western end and contains moderate algae cover.

VP3 likely receives flow from hillside spring on terrace escarpment south of the pool, but during both visits the surface water flow of the spring did not reach the pool. May be fed via seep/groundwater related to spring.

A second visit was made to the pool on March 26, 2020 to GPS record flags delineating the pool boundary, no new egg masses were counted.

**CONDITIONS/OBSERVATIONS WITHIN POOL (required data)**

Inlet observed? No  Yes   
Outlet observed? No  Yes   
finfish observed? No  Yes   
Estimated water depth range? 1-2 ft

Flowing  Not flowing

Optional Data (see also back of sheet)

Other Vernal Pool Species:  
fairly shrimp present? Yes  No   
marbled salamander larvae present? Yes  No

Vegetation (within or overhanging pool):  
Trees/Saplings: eastern hemlock, red maple, American beech  
Shrubs/Vines: American beech  
Herbs: evergreen wood fern  
Percent tree canopy closure? 50%  
Woody debris content? High  Med.  Low

Pool Substrate: (top three)  
Mud/muck  Sand/Silt  Peat   
Leaf Litter  Silt/clay  Bedrock   
Gravel/cobbles

Water Quality:  
pH  conductivity (uS/cm)  temperature (°C)   
Nitrate-N (mg/l)  Total P (ug/l)  DO (mg/l)   
turbidity (NTU's)  Sulphidic odor? No  Yes   
Approximate % cover by algal mat or duckweed? 50%  
GPS coordinates: 41° 53' 0.618" N, 72° 33' 58.535" W

**CONDITIONS IN ENVELOPE WITHIN 100 FT OF POOL (required data)**

Give approximate percentage or show on sketch on back

Landuses/conditions:  
forest 100%  
pasture   
exposed soil   
road  busy (>1 car/10 min.) yes  no   
parking lot

shrubland   
lawn   
grading   
yes  no

meadow   
building   
ag. field

Comments:  
VP3 is within floodplain of Ketch Brook

Leaf Litter: If variable, note location (e.g. "N. shore")  
none/low:   
moderate:   
high: X

Cover Objects: Logs Rocks  
none:    
low:  X  
moderate:   
high: X

Dominant vegetation (optional)  
Trees/saplings: eastern hemlock, red maple, American beech, green ash  
Shrubs/Vines: American beech  
Herbs: evergreen wood fern

**ADDITIONAL NOTES: (optional)**

# VERNAL POOL DATA SHEET, p. 2

Survey Date: 3/24/2020	Investigator(s): C. Glinka, M. Murphy	Town: East Windsor	CAWS Pool #: VP3	CAWS Project #:
Project/property name: Gravel Pit Solar			Pool Type:	Development: <input type="checkbox"/> Reference: <input type="checkbox"/>

Draw a **rough, quick** sketch of the pool showing **approximate locations of egg mass rafts & clusters** in relation to pool features, like logs, algal mats, and islands. Show inlet/outlet if present. Include north arrow and approximate scale.

**SKETCH OF POOL (required)**

A hand-drawn sketch of a pool on a piece of paper. The sketch shows an irregularly shaped pool with several features. At the top right, there is a line labeled 'outlet' with an arrow pointing right. At the top center, there is a north arrow labeled 'N'. In the middle left, there are several vertical lines labeled 'fallen trees'. At the bottom left, there is a small circle labeled 'spring'. There are also some faint scribbles and lines representing the pool's edge and internal features.

**WILDLIFE OBSERVATIONS: (optional)**

**Checklist of Facultative Herptile Fauna (Pool & Fringe):**

Green Frog	<input type="checkbox"/>	Spring Peeper	<input type="checkbox"/>
Pickereel Frog	<input type="checkbox"/>	Gray Tree Frog	<input type="checkbox"/>
Bull Frog	<input type="checkbox"/>	Pickereel Frog	<input type="checkbox"/>
Eastern Toad	<input type="checkbox"/>	Painted Turtle	<input type="checkbox"/>
Spotted Turtle	<input type="checkbox"/>	Snapping Turtle	<input type="checkbox"/>
N. Water Snake	<input type="checkbox"/>	Blue-spot. salam.	<input type="checkbox"/>

**Other Observed Fauna (Pool & Fringe):**

isopods, predacious diving beetles, water striders,

Draw a **rough, quick** sketch of the pool's **terrestrial envelope**, extending at least 200' from pool in all directions. Provide **detail on conditions & landuses within 100 feet of edge of pool**. Include north arrow and approximate scale.

**SKETCH OF TERRESTRIAL ENVELOPE AROUND POOL (required)**

Circle any of the following factors that impaired your ability to observe egg masses, and indicate severity of impairment.

Factor	Severity (Low/Mod./High)
1. Surface algae <input checked="" type="checkbox"/>	moderate
2. Surface pollen <input type="checkbox"/>	
3. Dark, tannin-colored water <input type="checkbox"/>	
4. Deep water <input type="checkbox"/>	
5. Turbidity <input type="checkbox"/>	
6. Dense shrubs <input type="checkbox"/>	
7. Other (specify) <input type="checkbox"/>	

**ADDITIONAL NOTES: (optional)**

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## VERNAL POOL DATA SHEET

Survey Date: 3/26/2020	Investigator(s): C. Glinka, M. Murphy	Town: East Windsor	CAWS Pool #: VP4	CAWS Project #:
Town Staff Contacted? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Project/property name: Gravel Pit Solar		Pool Type: Development: <input type="checkbox"/> Reference: <input type="checkbox"/>	
Address/location (or include annotated map): Off Plantation Road, Parcel ID 025-49-017A			Investigator's Contact information: cglinka@vhb.com	

**SEARCH CONDITIONS AND METHODS (required)**

**WEATHER:**

Precipitation: Within last 24 hours  
0" light precipitation

Cloud Cover:  
 clear   
 partly cloudy   
 mostly cloudy   
 full cloud cover

Start time: 900  
End time: 955

Methods used:  
 Visual   
 Dipnetting

Type of Inspection:  
 baseline  Polarized sunglasses used? Yes  No   
 during construction   
 post construction

Comments:  
37 F during visit

Temporary flagging used to mark egg masses? Yes  No

**AMPHIBIAN EGG MASS COUNTS (required)**

Wood frogs:  1-25  26-49  50  51-100  101-250  251-500  501-1000  1001-2500  2500-5000  >5000

Abundance categories:  
 50-75   
 75-100   
 100-150   
 150-200   
 200-250   
 >250

condition   
 If condition mixed, note "some", "many" or "most"   
 intact: All   
 breaking up:   
 hatching:

Describe estimation method used for a large raft:  
Actual count: 60

**Spotted Salamanders:**

Condition:  
 intact:   
 breaking up:   
 hatching:

Total Number: 0

**ADDITIONAL NOTES: (optional)**

VP 4 is a cryptic vernal pool within forested Wetland 6.

VP 4 supports a high density of wood frog egg masses relative to its small size. This pool may be a sink.

**CONDITIONS/OBSERVATIONS WITHIN POOL (required data)**

Inlet observed? No  Yes  Flowing  Not flowing   
 Outlet observed? No  Yes   
 finfish observed? No  Yes   
 Estimated water depth range? 6-12 inches

Optional Data (see also back of sheet)

Other Vernal Pool Species:  
 fairy shrimp present? Yes  No   
 marbled salamander larvae present? Yes  No

Vegetation (within or overhanging pool):  
 Trees/Saplings: red maple, eastern hemlock  
 Shrubs/Vines: spice bush  
 Herbs: skunk cabbage  
 Percent tree canopy closure? 50%  
 Woody debris content? High  Med.  Low

Pool Substrate: (top three)  
 Mud/muck  Sand/Silt  Peat   
 Leaf Litter  Silt/clay  Bedrock   
 Gravel/cobbles

Water Quality:  
 pH  conductivity (µS/cm)  temperature (°C)   
 Nitrate-N (mg/l)  Total P (µg/l)  DO (mg/l)   
 turbidity (NTU's)  Sulphidic odor? No  Yes   
 Approximate % cover by algal mat or duckweed? 70%  
 GPS coordinates: 41° 52' 57.478" N, 72° 34' 1.543" W

**CONDITIONS IN ENVELOPE WITHIN 100 FT OF POOL (required data)**

Give approximate percentage or show on sketch on back

Landuses/conditions:  
 forest 100% shrubland  meadow   
 pasture  lawn  building   
 exposed soil  grading  ag. field   
 road  busy (>1 car/10 min.) yes  no   
 parking lot

Comments:  
Logging operations may occur >1000 ft away from pool

Leaf Litter: If variable, note location (e.g. "N. shore")  
 none/low:   
 moderate:   
 high: X

Cover Objects: Logs Rocks  
 none:    
 low:  X  
 moderate: X   
 high:

Dominant vegetation (optional)  
 Trees/saplings: eastern hemlock, red maple  
 Shrubs/Vines: spice bush  
 Herbs: skunk cabbage

**ADDITIONAL NOTES: (optional)**



## VERNAL POOL DATA SHEET

Survey Date: 3/26/2020	Investigator(s): C. Glinka, M. Murphy	Town: East Windsor	CAWS Pool #: VP5	CAWS Project #:
Town Staff Contacted? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Project/property name: Gravel Pit Solar		Pool Type:	Development: <input type="checkbox"/> Reference: <input type="checkbox"/>
Address/location (or include annotated map): Off Plantation Road, Parcel ID 025-49-017A			Investigator's Contact information: cglinka@vhb.com	

**SEARCH CONDITIONS AND METHODS (required)**

**WEATHER:**

Precipitation: Within last 24 hours  
0" light precipitation

Cloud Cover:  
 clear   
 partly cloudy   
 mostly cloudy   
 full cloud cover

Start time: 1000  
End time: 1036

Methods used:  
 Visual   
 Dipnetting

Type of Inspection:  
 baseline   
 during construction   
 post construction

Polarized sunglasses used? Yes  No

Comments:  
37 F during visit

Temporary flagging used to mark egg masses? Yes  No

**AMPHIBIAN EGG MASS COUNTS (required)**

Wood frogs:  1-25  26-49  50  51-80  81-100  101-150  151-200  201-250  250-300  300-400  400-500  500-750  750-1000  1000-1250  >1250

condition: 50-75  75-100  100-150  150-200  200-250

If condition mixed, note "some", "many" or "most"

intact: All   
 breaking up:   
 hatching:

Describe estimation method used for a large raft:  
Actual count: 80

**Spotted Salamanders:**

Condition:  
 intact:  Total Number: 0  
 breaking up:   
 hatching:

**ADDITIONAL NOTES: (optional)**

VP 5 is a cryptic vernal pool within forested Wetland 6.

VP 5 supports a high density of wood frog egg masses relative to its small size. This pool may be a sink.

Due to the shallowness of the pool limited dipnetting was performed to keep the integrity of the pool bottom.

**CONDITIONS/OBSERVATIONS WITHIN POOL (required data)**

Inlet observed? No  Yes  Flowing  Not flowing   
 Outlet observed? No  Yes   
 finfish observed? No  Yes   
 Estimated water depth range? 6 inches at deepest point

Optional Data (see also back of sheet)

Other Vernal Pool Species:  
 fairy shrimp present? Yes  No   
 marbled salamander larvae present? Yes  No

Vegetation (within or overhanging pool):  
 Trees/Saplings: red maple, eastern hemlock  
 Shrubs/Vines: spice bush  
 Herbs: skunk cabbage  
 Percent tree canopy closure? 50%  
 Woody debris content? High  Med.  Low

Pool Substrate: (top three)  
 Mud/muck  Sand/Silt  Peat   
 Leaf Litter  Silt/clay  Bedrock   
 Gravel/cobbles

Water Quality:  
 pH  conductivity (µS/cm)  temperature (°C)   
 Nitrate-N (mg/l)  Total P (µg/l)  DO (mg/l)   
 turbidity (NTU's)  Sulphidic odor? No  Yes   
 Approximate % cover by algal mat or duckweed? 70%  
 GPS coordinates: 41° 52' 57.439" N, 72° 34' 0.516" W

**CONDITIONS IN ENVELOPE WITHIN 100 FT OF POOL (required data)**

Give approximate percentage or show on sketch on back

Landuses/conditions:  
 forest 100% shrubland  meadow   
 pasture  lawn  building   
 exposed soil  grading  ag. field   
 road  busy (>1 car/10 min.) yes  no   
 parking lot

Comments:  
Logging operations may occur >1000 ft away from pool

Leaf Litter: If variable, note location (e.g. "N. shore")  
 none/low:   
 moderate:   
 high:  X

Cover Objects: Logs Rocks  
 none:    
 low:  X  
 moderate: X   
 high:

Dominant vegetation (optional)  
 Trees/saplings: eastern hemlock, red maple  
 Shrubs/Vines: spice bush  
 Herbs: skunk cabbage

**ADDITIONAL NOTES: (optional)**



## VERNAL POOL DATA SHEET

Survey Date: 5/52020	Investigator(s): C. Glinka, M. Murphy, J. Peterson	Town: East Windsor	CAWS Pool #: VP6	CAWS Project #:
Town Staff Contacted? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Project/property name: Gravel Pit Solar		Pool Type: Development: <input type="checkbox"/>	Reference: <input type="checkbox"/>
Address/location (or include annotated map): Off Plantation Road, near RR Line, Parcel ID 027-49-017C			Investigator's Contact information: cglinka@vhb.com	

**SEARCH CONDITIONS AND METHODS (required)**

**WEATHER:**

Precipitation: Within last 24 hours  
 Current 0"      0"

Cloud Cover:  
 clear   
 partly cloudy   
 mostly cloudy   
 full cloud cover

Start time: 1000      End time: 1050

Methods used:  
 Visual   
 Dipnetting

Type of Inspection:  
 baseline       Polarized sunglasses used? Yes  No   
 during construction   
 post construction

Comments:  
 50 F during visit      Temporary flagging used to mark egg masses? Yes  No

**AMPHIBIAN EGG MASS COUNTS (required)**

Wood frogs:  1-25     26-49     50     51-75     76-100     101-150     151-200     201-250     250-300     300-400     400-500     500-750     750-1000     1000-1250     >1250

condition: 50-75    75-100    100-150    150-200    200-250

If condition mixed, note "some", "many" or "most"

intact: All    breaking up:    hatching:

Describe estimation method used for a large raft:  
 Wood frog larvae present; no egg masses

**Spotted Salamanders:**

Condition:  
 intact:    Total Number: 0  
 breaking up:    hatching:

**ADDITIONAL NOTES: (optional)**

Vernal Pool 6 occupies the footprint of Wetland 12, a small depressional wetland adjacent to the railroad tracks

No egg masses were present during the field investigation, but many wood frog larvae were present.

**CONDITIONS/OBSERVATIONS WITHIN POOL (required data)**

Inlet observed? No  Yes       Flowing  Not flowing   
 Outlet observed? No  Yes   
 finfish observed? No  Yes   
 Estimated water depth range? 6 inches at deepest point

Optional Data (see also back of sheet)

Other Vernal Pool Species:  
 fairy shrimp present? Yes  No   
 marbled salamander larvae present? Yes  No

Vegetation (within or overhanging pool):  
 Trees/Saplings: red maple  
 Shrubs/Vines: spice bush, buttonbush  
 Herbs: royal fern, jewelweed  
 Percent tree canopy closure? 50-70%  
 Woody debris content? High  Med.  Low

Pool Substrate: (top three) Peat   
 Mud/muck  Sand/Silt  Bedrock   
 Leaf Litter  Silt/clay  Gravel/cobbles

Water Quality:  
 pH  conductivity (µS/cm)  temperature (°C)   
 Nitrate-N (mg/l)  Total P (µg/l)  DO (mg/l)   
 turbidity (NTU's)  Sulphidic odor? No  Yes   
 Approximate % cover by algal mat or duckweed? 0%  
 GPS coordinates: 41° 52' 54.5" N, 72° 33' 16.2" W

**CONDITIONS IN ENVELOPE WITHIN 100 FT OF POOL (required data)**

Give approximate percentage or show on sketch on back

Landuses/conditions:  
 forest 75%    shrubland     meadow   
 pasture     lawn     building   
 exposed soil     grading     ag. field   
 road 25% busy (>1 car/10 min.) yes  no   
 parking lot

Comments:  
 Road includes gravel haul road and railroad line

Leaf Litter: If variable, note location (e.g. "N. shore")  
 none/low:    moderate:    high: X

Cover Objects:      Logs      Rocks  
 none:    low: X    moderate:    high:

Dominant vegetation (optional)  
 Trees/saplings: red maple  
 Shrubs/Vines: spice bush  
 Herbs: skunk cabbage, jewelweed

**ADDITIONAL NOTES: (optional)**

**VERNAL POOL DATA SHEET, p. 2**

Survey Date: 5/5/2020	Investigator(s): C. Glinka, M. Murphy, J. Peterson	Town: East Windsor	CAWS Pool #: VP6	CAWS Project #:
Project/property name: Gravel Pit Solar			Pool Type:	Development: <input type="checkbox"/> Reference <input type="checkbox"/>

Draw a **rough, quick** sketch of the pool showing **approximate locations of egg mass rafts & clusters** in relation to pool features, like logs, algal mats, and islands. Show inlet/outlet if present. Include north arrow and approximate scale.

**SKETCH OF POOL (required)**

**WILDLIFE OBSERVATIONS: (optional)**

**Checklist of Facultative Herptile Fauna (Pool & Fringe):**

Green Frog	<input checked="" type="checkbox"/>	Spring Peeper	<input type="checkbox"/>
Pickereel Frog	<input type="checkbox"/>	Gray Tree Frog	<input type="checkbox"/>
Bull Frog	<input type="checkbox"/>	Pickereel Frog	<input type="checkbox"/>
Eastern Toad	<input type="checkbox"/>	Painted Turtle	<input type="checkbox"/>
Spotted Turtle	<input type="checkbox"/>	Snapping Turtle	<input type="checkbox"/>
N. Water Snake	<input type="checkbox"/>	Blue-spot. salam.	<input type="checkbox"/>

**Other Observed Fauna (Pool & Fringe):**

predacious diving beetles, caddisfly larvae

Draw a **rough, quick** sketch of the pool's **terrestrial envelope**, extending at least 200' from pool in all directions. Provide **detail on conditions & landuses within 100 feet of edge of pool**. Include north arrow and approximate scale.

**SKETCH OF TERRESTRIAL ENVELOPE AROUND POOL (required)**

Circle any of the following factors that impaired your ability to observe egg masses, and indicate severity of impairment.

Factor	Severity (Low/Mod./High)
1. Surface algae	<input type="checkbox"/>
2. Surface pollen	<input checked="" type="checkbox"/> moderate
3. Dark, tannin-colored water	<input checked="" type="checkbox"/> moderate
4. Deep water	<input type="checkbox"/>
5. Turbidity	<input type="checkbox"/>
6. Dense shrubs	<input type="checkbox"/>
7. Other (specify)	<input type="checkbox"/>

**ADDITIONAL NOTES: (optional)**

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**VERNAL POOL ASSESSMENT SHEET**

**A. Biological Value of the Vernal Pool**

- (1) Are there *any* state-listed species (Endangered, Threatened, or Special Concern) present or breeding in the pool?  
Yes \_\_\_\_\_ No  \_\_\_\_\_
- (2) Are there two or more vernal pool indicator species breeding (i.e., evidence of egg masses, spermatophores [sperm packets], mating, larvae) in the pool?  
Yes  \_\_\_\_\_ No \_\_\_\_\_
- (3) Are there 25 or more egg masses (regardless of species) present in the pool by the conclusion of the breeding season?  
Yes  \_\_\_\_\_ No \_\_\_\_\_

**B. Condition of the Critical Terrestrial Habitat**

- (1) Is at least 75% of the vernal pool envelope (100 feet from pool) undeveloped?  
Yes  \_\_\_\_\_ No \_\_\_\_\_ (100%)
- (2) Is at least 50% of the critical terrestrial habitat (100-750 feet) undeveloped?  
Yes  \_\_\_\_\_ No \_\_\_\_\_ (90%)

NOTE: For these purposes, “undeveloped” means open land largely free of roads, structures, and other infrastructure. It can be forested, partially forested, or open agricultural land.

**Cumulative Assessment**

Number of questions answered YES in category A	Number of questions answered YES in category B	Tier Rating
1-3	2	Tier I
1-3	1	Tier II
0	1-2	Tier III
1-3	0	Tier III

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Yes  \_\_\_\_\_ No \_\_\_\_\_

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 Yes  \_\_\_\_\_ No \_\_\_\_\_ (75%)
- (2) Is at least 50% of the critical terrestrial habitat (100-750 feet) undeveloped?  
 Yes  \_\_\_\_\_ No \_\_\_\_\_ (70%)

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