



To: Brad Parsons  
Verogy

Date: September 22, 2022

Memorandum

Project #: 42889.00

From: Jeffrey Shamas, CE, CSS, SPWS

Re: Natural Resources Impact Assessment  
Verogy- North Haven Solar One Project

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At your request, Vanasse Hangen Brustlin, Inc (VHB) prepared this memorandum discussing potential impacts to the delineated inland wetlands and the observed vernal pool habitat occurring on the proposed North Haven Solar One solar photovoltaic facility at 122 Mill Road, North Haven, Connecticut (known as the Project Site). Please refer to Figure 1. This memo provides a brief discussion on the existing habitat community and potential impacts to each by the project design based on the previous reports prepared by VHB titled:

1. Wetland and Watercourse Delineation Report dated February 8, 2022.
2. Vernal Pool Investigation Technical Memorandum dated June 10, 2022.

## Site Description

The 9-acre Project Site is located in the northwestern corner of a larger ( $\pm 124$ -acre) property consisting of a mix of active agricultural field and undeveloped woodlands. This area is bound to the north by residential properties, to the west by Mill Road, to the south by undeveloped woodland and to the east by an active agricultural field and the Muddy River.

The majority of the Project Site consists of active agricultural fields, located primarily in the northcentral portion of the Site with fingers extending to both the southeast and southwest. Undisturbed forested areas within the Project Site are located in the northwest, along the eastern boundary and in the majority of the southern and southwestern portions of the Site.

Topography onsite is split into two main sections: the majority of the Project Site generally slopes to the southeast from the north and west towards the Muddy River (Figure 1); while the northwest portion of the Site slopes to the west. Elevations range from 88 feet in the southern-central portion of the Site to 32 feet in the far southeastern corner of the Site. Surficial geology consists of a mix of sandy loam and outcrop complexes.

## Agricultural Fields

As noted above, the northcentral portion of the Site contains agricultural fields with fingers extending to both the southeast and southwest. While no direct farming activity was observed within the field during the December 2021 delineation or the Spring 2022 vernal pool investigation, evidence of corn crop harvesting from the 2021 season were visible via cut corn stalks.

## Wetlands

Three separate wetland areas, each containing similar physical properties and vegetation compositions, were identified during VHB's 2022 wetland delineation (Figure 2).



### **Wetland 1**

Wetland 1 consists of a freshwater palustrine forested slope wetland system (USFWS Class: PFO1E). This groundwater slope wetland is located along the northeastern side of the property, which is where the topography slopes to the west. The wetland is on a mild incline and drains into a ~12" corrugated metal culvert located in the far southwestern corner, which flows to the west under Mill Road. **Note that the culvert is perched above the ground level by about 12", which has allowed for standing water to remain within the southern portion of the wetland** to persist (see Photo 1). A stormwater drainage ditch is located at the southwestern corner of the wetland and appears to drain stormwater surface flow from the portion of the adjacent farm field located to the southeast. This wetland is fed by groundwater discharge and surface runoff from the farm field located to the east, the residential properties to the north, and from Mill Road to the west. Dominant vegetation within Wetland 1 is predominantly red maple (*Acer rubrum*), swamp white oak (*Quercus bicolor*), northern spicebush (*Lindera benzoin*), silky dogwood (*Cornus amomum*), skunk cabbage (*Symplocarpus foetidus*), and sensitive fern (*Onoclea sensibilis*).

### **Wetland 2**

Wetland 2 consists of a freshwater palustrine forested slope wetland system (USFWS Class: PFO1E). This groundwater slope wetland is located at the southeastern corner of the property, which is where the topography slopes to the south and east. The wetland is on a mild incline and drains to the south into the Muddy River located outside of the Project area. This wetland is fed by groundwater discharge and surface runoff from upland forested areas to the northwest and the farm field located to the north. Dominant vegetation within Wetland 2 is predominantly red maple, northern spicebush, silky dogwood, skunk cabbage, and sensitive fern.

### **Wetland 3**

Wetland 3 consists of a freshwater palustrine forested slope wetland system (USFWS Class: PFO1E). This groundwater slope wetland is located along the northeastern side of the property, which is where the topography slopes to the south and east. The wetland is on a moderate incline and drains into the southeastern corner of the wetland where it discharges to a farm field and access road outside of the Project area. There is no evidence of a stream channel inside Wetland 3, but the discharge does appear to concentrate and form a stream immediately offsite to the southeast. The flow appears to continue to the southeast where it ultimately drains into the Muddy River. This wetland is fed by groundwater discharge and surface runoff from the farm field to the west and forested areas to the north. Dominant vegetation within Wetland 3 is predominantly red maple, swamp white oak, northern spicebush, and sensitive fern.

### **Surrounding Land Use**

Land use surrounding the Site includes residential properties and roadway to the east, residential properties to the north, active agricultural fields to the east and undeveloped woodland to the south. The Muddy River is located approximately 300 feet to the south and 700 feet to the southeast of the Project.



### **Potential Wetland Impacts**

Based on the wetland locations and Limits of Disturbance (LOD) on VHB's site plans, dated September 22, 2022, no direct wetland impacts are proposed. The stormwater management measures will be no closer than 50-feet from wetlands and the solar panels will be no closer than 100-feet from the edge of wetlands. The solar facility will be constructed primarily within the existing active agricultural fields, while some tree clearing will occur due to shading issues related to the solar panel layout and access road design. Tree clearing is proposed to be no closer than 50-feet from wetlands. The solar facility is a low impact land use and coupled with the temporary and permanent stormwater management measures, they are not expected to pose impacts to the wetlands.

For these reasons and based on the current site design, we do not anticipate long-term function and value impacts to the delineated wetlands.

### **Vernal Pool**

Wetland 1 was found to contain one (1) cryptic vernal pool breeding area (see Figure 2), which was delineated in the field with blue flagging labeled PVP-1-100 to PVP-1-120. Observed obligate vernal pool species included wood frog tadpoles (see Photo 6). No fairy shrimp, marbled salamander, or state-listed vernal pool breeding amphibians were observed. The vernal pool area exhibits a soft, leafy, silty bottom and flood depths within the breeding area at approximately 10-12 inches. The vernal pool (VP) 1 breeding area was a long and broad pool located within the southern portion of Wetland 1. The pool is approximately 230 long and 80-feet wide at the northern extent, tapering down to approximately 40 feet wide at the southern extent.

The pool contained a moderate number of woody debris and snags. Herbaceous hydrophytic vegetation was present throughout the pool, of which there of which the majority have an obligate (OBL) wetland indicator status, which thrive in inundated conditions, including blue flag Iris (*Iris versicolor*), northern arrowhead (*Sagittaria cuneata*) and fowl manna grass (*Glyceria striata*). The pool also contained creeping yellow-loosestrife (*Lysimachia nummularia*), which has a wetland indicator status of FACW and more often grows in wet soil as opposed to within standing water. An estimated 100+ wood frog tadpoles were observed but the pool likely contained more given that the herbaceous vegetation impaired the ability to observe some portions of the pool. From the 100s of wood frog tadpoles observed, it is estimated that there were at least 5 wood frog egg masses deposited within the vernal pool.

While VP-1 does contain a permanent culverted outlet, it is a restricted outlet in that the culvert is perched above the ground by approximately 12-inches, which allows for the presence of standing water. Based on the depth of the pool, and the presence of a mix of OBL and FACW species, it is not clear if the pool completely dries out on an annual basis. Given the strong presence of OBL plant species, it appears likely that the pool may occasionally dry down completely, but likely experiences only partial drying during most years (i.e., semi-permanent).



**Table 2- Obligate Vernal Pool Species Indicators and Observations**

Cryptic VP ID	Wood Frog Egg Masses*	Total Egg Mass Count	Wood Frog Larvae**	Other amphibians
VP 1	0	0	100-200	-

**Notes:**

\* *The VP assessment was conducted at a time when the wood frogs egg masses were hatched and no longer present or visible for observation.*

\*\* *The overall amount of wood frog larvae is estimated based on visual and dip net observations.*

**Terrestrial Vernal Pool Habitat & Potential Impacts**

Figure 2 shows 100-foot “vernal pool envelope” and 750-foot “Critical Terrestrial Habitat” (CTH) surrounding vernal pool breeding area. GIS aerial imagery were used to determine the land uses surrounding the breeding areas and GIS analysis were used to quantify potential habitat areas within 750 feet of the pool. Table 3 presents land use percentages for each habitat zone. Overall, suitable terrestrial habitat is somewhat limited.

Upland forest totals are only 28 percent of the 100-foot vernal pool envelope. Although, substantial portions of the vernal envelope are “undeveloped”, there is a limited amount of actual suitable/preferred upland habitat; the surrounding cover includes palustrine forest (hydric marginal/ non-habitat), agricultural field (corn field, i.e., non-habitat), impervious surfaces and developed residential areas.

While upland forest totals 43 percent of the 750-foot CTH for the identified breeding area, much of that forested area is separated from the vernal pool by Mill Road and developed residential property to the west and agricultural fields to the east and southeast.

The observation of over 100-wood frog tadpoles within Wetland 1, coupled with the surrounding non-exemplary terrestrial habitat appears to indicate habitat suitable for more edge or generalist species. For example, wood frogs have been known to breed in tire ruts that are not vernal pools but can pond water during the breeding season. The regularly plowed agricultural fields do not offer suitable habitat for wood frogs. It is therefore expected that actual habitat use is presumed to be limited to the drier areas of Wetland 1, a narrow strip of upland forest along the eastern side of Wetland 1, the forested area north of Wetland 1, and upland forested areas located across the agricultural field to the southwest and northeast of Wetland 1.

**Potential Vernal Pool Impacts**

The Vernal Pool Assessment Sheet (Calhoun and Klemens 2002) provided in VHB’s Vernal Pool report (June 10, 2022) presented biological values, habitat conditions, and tier rankings for VP 1. Based on the Vernal Pool Assessment sheet, VP 1 is a Tier III breeding area.

The solar facility may temporarily disturb the upland areas within the 750-foot CTH during construction, however it is within a disturbed and actively used area presently and it is not anticipated to create an adverse impact to VP-1 long term. Any previous amphibian species movement through the active farm fields that the solar array will occupy is still

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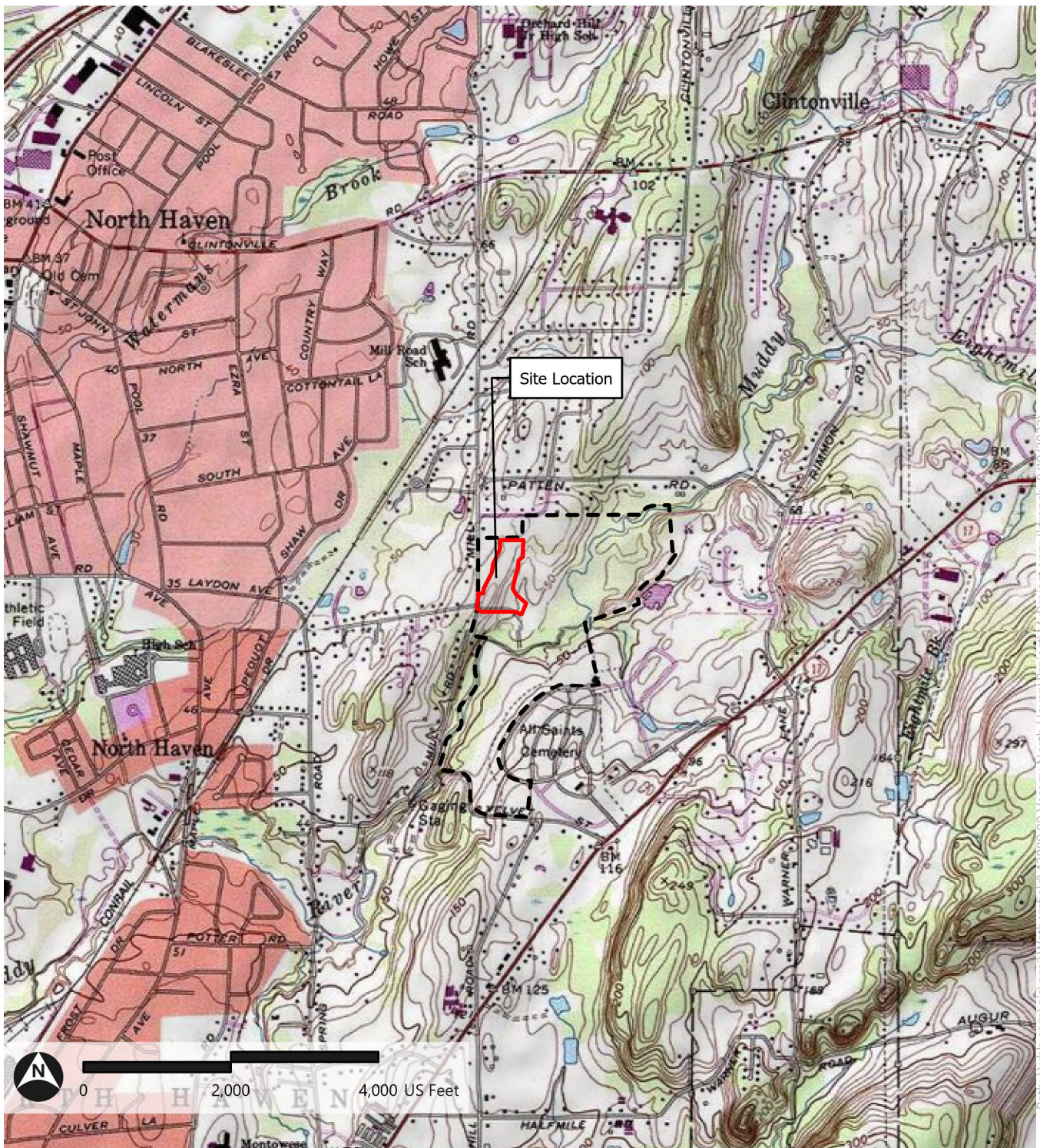
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expected to allow for mobility of the species post-construction and may aid as shade and cover from predators during movement through the array.



**Figure 1: USGS Site Location Map**

North Haven Solar One | North Haven, CT



- Development Site
- Project Area

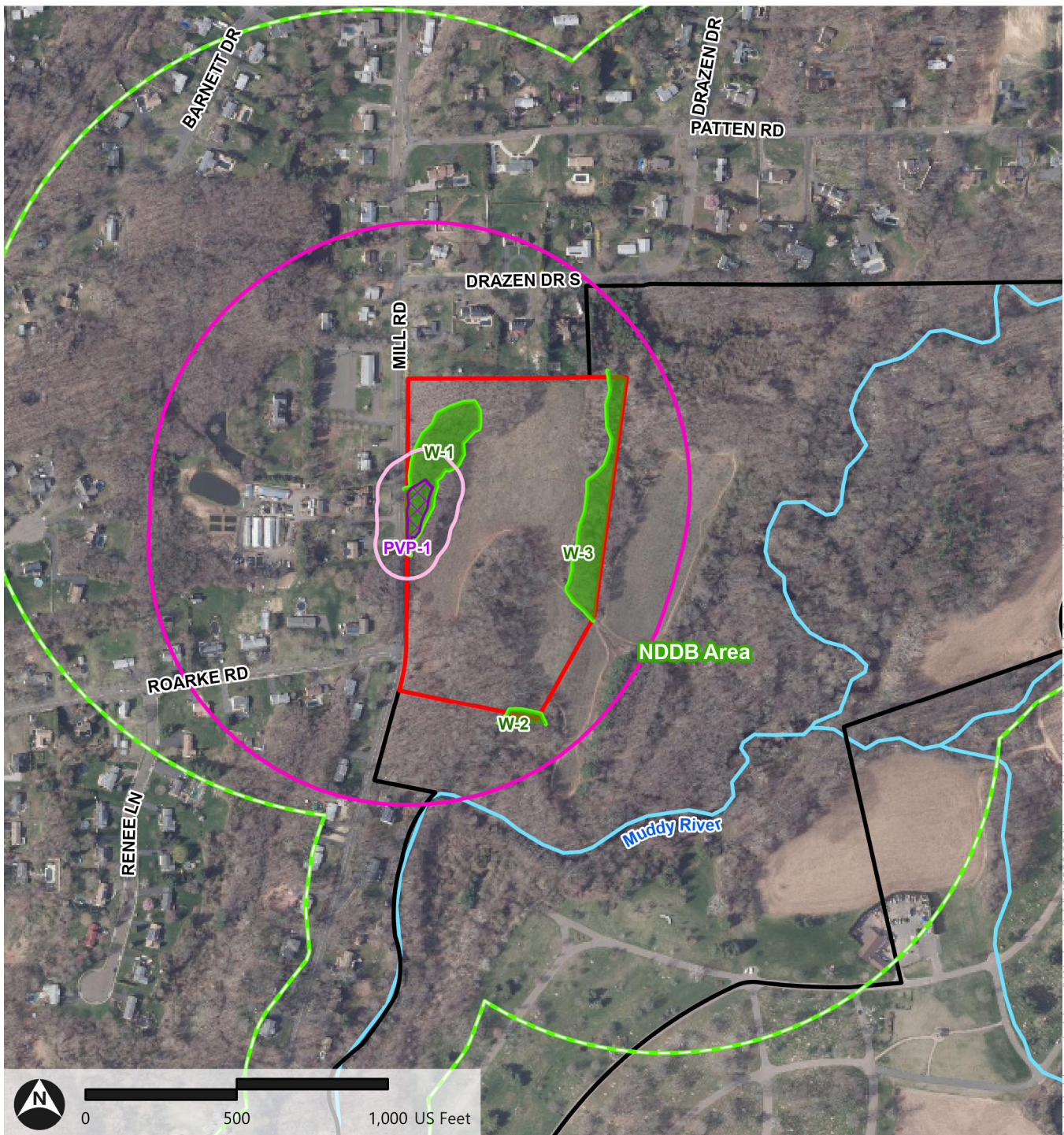
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**Figure 2: Vernal Pool Habitat Assessment Map**

Verogy North Haven | North Haven, CT



- |                              |                                  |  |
|------------------------------|----------------------------------|--|
| Study Area                   | Delineated Wetland Edge          | NDDB Rare Species Area (Dec 2021)        |
| Property Line                | Delineated Potential Vernal Pool | 100-ft Vernal Pool Envelope              |
| Watercourse (Non Delineated) | Wetland Resource Area            | 750-ft Critical Terrestrial Habitat Zone |

Source: VHB, ArcGIS Online

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